



ECOREGIONAL CONSERVATION PLAN
FOR THE **CAUCASUS**

2020 EDITION

SUPPLEMENTARY REPORTS




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TBILISI 2020



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FOREWORD AND ACKNOWLEDGEMENTS

The 2020 Edition of the Ecoregional Conservation Plan (ECP) for the Caucasus is published in two parts. The first and main part – “Ecoregional Conservation Plan for the Caucasus: 2020 Edition” – presents an overview of the Ecoregion’s biodiversity and the general threats which it faces, describes the main actors in the field of biodiversity conservation in the Caucasus, explains the role of the ECP as a regional instrument for implementing international agreements related to biodiversity, discusses the main conceptual approaches for developing this edition of ECP, and presents the plan itself with its targets and actions.

This second part of the ECP presents supplementary reports that include an explanation of the rationale for the Ecoregion’s boundaries, a detailed description of the Key Biodiversity Areas and Conservation Landscapes (which form the basis of the Ecological Network envisaged by the ECP), and information about the status of the Ecoregion’s threatened species in the following groups: large carnivores, large herbivores, birds, amphibians and reptiles, freshwater fish and lampreys, and flora (vascular plants) and vegetation. The chapters also include information on physical-geographical features of the Caucasus, terrestrial ecoregions within the boundaries of the Caucasus combined ecoregion, biomes that create the basis of the main habitats, particular threats to the groups, and on-going conservation efforts and proposals for additional conservation actions.

The compilers of each report represent all six countries of the Caucasus ecoregion: Armenia, Azerbaijan, Georgia, Iran, Russia and Turkey. The order of the compilers’ names (after the first author who wrote the main text) usually follows the alphabetical order of the ecoregion’s countries’ names with some exceptions (when the co-authors’ order follows their input to the particular report).

The editors and compilers of this publication are grateful to the governmental organizations and agencies who kindly provided data for the reports. We extend our thanks to all experts and specialists who supported the preparation of ECP 2020 and its separate parts by providing materials or personal communications.

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TERMS AND ABBREVIATIONS

Aggregation	A geographically restricted clustering of individuals that typically occurs during a specific life history stage or process such as breeding, feeding or migration. This clustering is indicated by highly localised relative abundance, two or more orders magnitude larger than the species' average recorded numbers or densities at other stages during its life-cycle (IUCN, 2016).
a. s. l.	Above sea level
Bern Convention	Convention on the Conservation of European Wildlife and Natural Habitats
Biosphere Reserve	The UNESCO World Network of Biosphere Reserves covers internationally designated protected areas, each known as biosphere reserves. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use.
BL	Bridging Landscape
BMZ	German Federal Ministry for Economic Cooperation and Development
Bridging Landscape	A physical-geographical entity that physically connects Conservation Landscapes.
CBD	Convention on Biological Diversity
CEPF	The Critical Ecosystem Partnership Fund
CL	Conservation Landscape
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CNF	Caucasus Nature Fund
Conservation Landscape	A geographically defined large area, typically larger than 5000 km ² , identified as priority for conserving biodiversity and maintaining healthy ecological processes and environmental services.
CR	Critically Endangered, category of the IUCN Red List of Threatened Species.
DD	Data Deficient, according to the IUCN Red List: a taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.
ECF	Eco-Corridors Fund for the Caucasus (WWF/BMZ/KfW long-term project)
ECP	The Ecoregional Conservation Plan for the Caucasus
Ecological Corridor	A clearly defined geographical space that is governed and managed over the long-term to conserve or restore effective landscape connectivity, with associated ecosystem services and cultural and spiritual values (slightly modified from a draft definition by Hilty et al., 2019).
Emerald network	The Emerald network is a network of Areas of Special Conservation Interest to conserve wild flora and fauna and their natural habitats of Europe, launched by Council of Europe under the Bern Convention.
EN	Endangered, category of the IUCN Red List of Threatened Species.
European Diploma for Protected Areas	A prestigious international award granted since 1965 by the Committee of Ministers of the Council of Europe. It recognises natural and semi-natural areas and landscapes of exceptional European importance for the preservation of biological, geological and landscape diversity, which are managed in an exemplary way.
FAO	Food and Agriculture Organization of the United Nations
GEF	The Global Environment Facility
Geographically Restricted Species	Species having a restricted global distribution, as measured by range, extent of suitable habitat or area of occupancy, and hence largely confined or endemic to a relatively small portion of the globe such as bioregion, ecoregion or site (IUCN, 2016).
Global 200	The Global 200 is the list (and the map) of ecoregions identified by WWF as priorities for conservation.
Globally Threatened Species	Species categorised in the IUCN Red List of Threatened Species as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU).
IBA	An Important Bird and Biodiversity Area (IBA) is an area identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations.

IDEA	International Dialogue for Environmental Action
IUCN	The International Union for Conservation of Nature
KBA	Key Biodiversity Area
KfW	KfW Development Bank
LC	Least Concern, category of the IUCN Red List of Threatened Species
Managed Nature Reserve	This term is used for protected areas that are differently named in different countries, but all of them correspond to IUCN Category IV – Habitat/Species Management Area; synonyms of it are e.g. Sanctuary, Wildlife Refuge, in Russ. – Zakaznik.
NACRES	Centre for Biodiversity Conservation and Research, NGO
Nature Reserve, State Nature Reserve	We use the term Nature Reserve or State Nature Reserve (Zapovednik in Russ.) as synonyms of Strict Nature Reserve, IUCN Category I.
NGO	Non-governmental organization
North Caucasus	Geographical name used in Soviet and Russian geographic publications for the Russian part of the Caucasus, covering Dagestan, Chechnya, Ingushetia, Kabardino-Balkaria, Karachay-Cherkessia, Adygea republics, Stavropol and Krasnodar regions of the Russian Federation.
NP	National Park
NT	Near Threatened, category of the IUCN Red List of Threatened Species.
Other effective area-based conservation measure (OECM)	A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values (2018 UN Biodiversity Conference).
Pers. comm.	Personal communication: unpublished information provided by experts to the Report's authors.
Protected Area (PA)	In the ECP the term “protected area” has the meaning given to it by the IUCN, which is: a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values.
Ramsar Convention	Convention on Wetlands of International Importance, especially as Waterfowl Habitat
Ramsar site	A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention.
South Caucasus	Political-geographical term, which includes the three Caucasus countries: Armenia, Azerbaijan, Georgia.
Southern Caucasus	Not a common term. The ECP uses it as a name for the area covered by the South Caucasus countries, plus the Iranian and Turkish parts of the Caucasus.
Southern Caucasus (Volcanic) Uplands	Not a common term. The ECP uses it as a name for the geographical-geological entity covering the volcanic plateaus and ranges of the Southern Caucasus (within Armenia, Georgia, Turkey and Iran) that by origin and by general character of landscapes do not belong to the Lesser Caucasus and the Talysh-Alborz mountain ranges.
TJS	Transboundary Joint Secretariat for the South Caucasus financed by the German Government (BMZ/KfW)
UNESCO	United Nations Educational, Scientific and Cultural Organization
VU	Vulnerable, category of the IUCN Red List of Threatened Species
WHC	Convention Concerning the Protection of the World Cultural and Natural Heritage
World (Natural) Heritage Site	A World Heritage Site is a landmark or area, selected by the UNESCO under WHC for having cultural, historical, scientific, natural or other form of global significance (outstanding value), which is legally protected by international treaties.
WWF	World Wide Fund for Nature

THE BOUNDARIES AND BIO-PHYSICAL FEATURES OF THE CAUCASUS ECOREGION

Compiled by

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Contents: Introduction; Boundary definition; Physical-geographical features; Terrestrial Ecoregions; Biodiversity Hotspots; Conclusions; Acknowledgements; References; Suggested citation.

Introduction

The boundaries of the Caucasus ecoregion (Map 1) were decided during the preparation of the first edition of the Ecoregional Conservation Plan. The boundaries incorporate several of the terrestrial ecoregions of the world defined in Olson et al (2001)¹ and Global 200 Ecoregions described in Olson and Dinerstein (2002). For the stakeholders of the Caucasus, the term Caucasus ecoregion is accepted and easy to understand as a geographical hotspot of biodiversity. It is also quite commonly used in scientific and popular publications in the fields of biodiversity, geography and nature protection (GRID Arendal 2008; Lewis, 2012; Gorenflo et al., 2012; Bondirev, Davitashvili, Singh, 2015; see also the webpage of the Scientific Network for the Caucasus Mountain Region, <http://caucasus-mt.net>).

During Soviet times the southern border of the Caucasus was defined by the political borders of the USSR, particularly by the southern borders of the Soviet Republics of Armenia, Azerbaijan and Georgia (Dobrinin, 1948; Tushinsky, Davidova, 1976; Milkov, Gvozdetsky, 1986, etc.). After the dissolution of the Soviet Union and when work began in the late 1990s on identifying global biodiversity hotspots, a new definition of the region was needed (Mittermeier et al., 1999; Myers et al., 2000).

The boundaries of the Caucasus ecoregion were delineated in a series of regional and national workshops in which more than 250 experts and stakeholders, representatives of academia, governmental and non-governmental organizations from all six countries of the Caucasus participated. The political situation at that time presented a challenge for an expert-driven, regional planning process (and continues to present a challenge today). In spite of the difficulties, the participants reached consensus and the new geographical shape of the Caucasus was published for the first time in the book “Hotspots: Earth’s Biologically Richest and Most Endangered Terrestrial Ecoregions of the World” (Mittermaier et al., 1999; Zazanashvili, Sanadiradze & Bukhnikashvili, 1999) and subsequently in the CEPF Ecosystem Profile for the Caucasus (CEPF 2003) and the first version of the Conservation Plan (ECP) for the Caucasus (Williams et al., 2006). The experts who participated in the first revision of the ECP agreed to keep the same shape (Zazanashvili et al., 2013), which also was supported by the experts who worked on this new edition (Map 1).

With this shape, the Caucasus represents a composite ecoregion partly or fully covering ten terrestrial ecoregions (Map 2). It is not the first interpretation of the Caucasus as a composite ecoregion: the Caucasus-Anatolian-Hyrcanian Temperate Forest of Global 200, which stretches from Bulgaria in the west to Turkmenistan in the east is also a composite ecoregion, and covers six terrestrial ecoregions (Caucasus Mixed Forests, Euxine-Colchic Deciduous Forests, Northern Anatolian Conifer and Deciduous forests,

¹ See also ecoregions2017.appspot.com

Caspian Hyrcanian Mixed Forests, Elburz Range Forest Steppe and Kopet Dag Woodlands and Forest Steppe). In this case, the composite ecoregion is formed using typological principles and mostly temperate broadleaved and coniferous forest types. This is why forestless parts of Azerbaijan and the North Caucasus and some other areas of the Caucasus are omitted (Olson & Dinerstein, 1998, 2002).

Within the boundaries of the Caucasus ecoregion there are several prominent mountain ranges and chains (with the highest peak being Mt. Elbrus, 5,642 m in the Central Greater Caucasus), and plateaus, plains and lowlands between them. The biodiversity of the Caucasus, the characteristics of which are exceptional for the temperate world, are defined mostly by the following conditions: (a) transitional geographical location between east and west, north and south that creates a large natural corridor effect; (b) location on the crossroads of different bio-geographical regions; (c) existence of sharp orographic barriers, which, together with characteristic movement of air masses in the region, supported the creation of two warm and humid refugia during the ice-ages (Colchic and Hyrcanian) with a number of relict and endemic species that continue to play a very important role in Caucasus biodiversity; (d) because of the wide variety of orographic-climatic conditions, great landscape diversity varying from temperate rainforests (with mean annual precipitation of 4,500 mm) to deserts (with 150 mm annual precipitation), and from marine and coastal ecosystems to alpine grasslands, glaciers and permanent snowfields; (e) two large (along the western Caspian and the eastern Black Sea) and several smaller flyways of migratory birds that cross the Caucasus.

Kazbegi peak (5,054 m) at the border of the Central and Eastern Greater Caucasus Conservation Landscapes



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Boundary definition

A mixed approach was taken to delineating the boundaries of the Caucasus ecoregion, combining mostly geographical (including historic-geographical) and some bio-geographical concepts.

The northern boundary follows the so-called Kuma-Manych tectonic depression, which served as a natural channel between the Caspian and Black Seas in the geological past and which formed during the Pliocene (Gvozdetsky, 1954; Dumitrashko et al., 1966).² The depression is rich in lakes, wetlands, including some of international importance (Sirin, 2012), and artificial channels; it serves as an ecological corridor for waterbirds (Ataev et al., 2016).

The ecoregion's southern border coincides with the boundary between the Black and Caspian Seas' catchment basins and the catchment basins of the Indian Ocean and nearby large brackish lakes such as Van (Turkey) and Urmia (Iran). This interpretation closely matches the southern border of the Euro-Siberian phyto-geographical region and particularly its Pontic province within the section of the Caucasus (Zohary, 1973).

The south-western and south-eastern borders are connected with two refugia of Tertiary flora: Euxine-Colchic Deciduous Forest (which is a distinct type of temperate rainforest) and Caspian Hyrcanian Mixed Forests, also classified as rainforest (Nakhutsrishvili, Zazanashvili & Batsatsashvili, 2011; Nakhutsrishvili et al., 2015), and two distinct terrestrial ecoregions (Olson et al., 2001) (Map 2, see also ecoregions2017.appspot.com).

The south-western border was drawn on the Melet river close to the city of Ordu (Turkey) because it is recognised by phyto-geographers as the border between the Colchic and Euxinian sub-provinces of the Euxinian province, dividing the relatively higher and wetter mountainous area of the eastern Black Sea (Colchic) part with its higher density of species of Euxine-Colchic origin from the relatively drier and less mountainous western part (Davis, 1971; Dolukhanov, 1980; Browicz, 1989; Avci, 1996).

Deciding the south-eastern border was more difficult. Iranian exerts proposed including the entire Hyrcanian region in the Caucasus ecoregion. From a purely biogeographical viewpoint this would have made sense, but the ecoregion would then have almost directly bordered Turkmenistan – part of Central Asia – which would have gone against the traditional, general geographical and historical-geographical understanding of the Caucasus as a piece of land or isthmus located between the Black and Caspian Seas (Encyclopaedia Britannica 2018). Finally, it was agreed to include in the Caucasus Biodiversity Hotspot only the western, most humid and most typical part of Caspian-Hyrcanian Mixed Forests and to draw the ecoregion boundary on the administrative border of Gilan province of Iran, close to the town of Ramsar. Within the Hyrcanian bio-geographical province, precipitation decreases quite steeply from west to east, while mean annual temperature increases in the same direction; as a result the summer-dry season is much longer in the east. These climatic difference affect vegetation character: in the east one can find semi-arid ecosystems, which are not typical for Hyrcanian forests, and elements of flora that are much more typical of Central Asia (Talebi, Sajedi, Pourhashemi, 2014; Tohidifar et al., 2016; Khalili & Rahimi, 2018, etc.).

² Alignment of the northern boundary of the Caucasus with the Kuma-Manych tectonic depression follows the approach of Russian geographers.

Map 1. The Caucasus Ecoregion



Explanation: (a) dotted lines show the Ecoregion's boundaries; (b) solid lines - state borders drawn according to UN map (<http://www.un.org/Depts/Cartographic/map/profile/world.pdf>); (c) hatched lines - territories of current political conflicts.

Physical-geographical features

The Caucasus ecoregion covers about 586,800 km², extending over all of Armenia, Azerbaijan and Georgia, the North Caucasian part of the Russian Federation (including the republics of Dagestan, Chechnya, Ingushetia, North Ossetia, Kabardino-Balkaria, Karachay-Cherkessia and Adygea, and the Krasnodar and Stavropol administrative regions of Russia), north-eastern Turkey, and part of north-western Iran.

The forest biome covers around 20% of the region's total area, freshwater ecosystems – nearly 12%, high mountains (more than 1,800 m above sea level) – 18%. The remaining 50% is covered by coastal ecosystems (there are 4,139 kilometres of coastline in the Ecoregion) and dry ecosystems (dry open woodlands and scrublands, steppes and semideserts).

The Ecoregion has several major topographic features (Map 1):

- **The North Caucasus Plains** extend from the northern side of the Greater Caucasus mountain range to the Kuma-Manych Depression. The southern part of the plains belong mostly to the Pontic Steppe terrestrial ecoregion. The western part of the plains is covered by cultivated lands, which were once grassland steppe, the eastern part by semideserts (used as winter pastures). The principal fauna species in the near past included the globally threatened Saiga Antelope, which is possibly extinct from the region because of the dramatic decline of the Kalmykia source population (Kuznetsov & Lushchekina, 2002; Neronov et al., 2013).

The North Caucasus Plains lie entirely in the Russian Federation and contain the Kuma-Manych Conservation Landscape (see the chapter “Conservation Landscapes”).

- **The Greater Caucasus Mountain Range** extends across the Ecoregion from the northwest to the southeast for nearly 1,500 km extending into Azerbaijan, Georgia and the Russian Federation. The highest summits rise to more than 5,000 m in the central part (reaching 5,642 m on the summit of Mt. Elbrus, the highest peak of the Caucasus) and to more than 4,000 m in the western and eastern parts of the range. The main ecosystems include different types of forest, high mountain grasslands and shrubs, and sub-nival and nival ecosystems. It is considered to be one of the centres of origin of high mountain species (Dolukhanov, 1966). The principal fauna species include the globally threatened Leopard, Bezoar Goat and endemic Western Tur, as well as Brown Bear, endemic Eastern Tur, Caucasian Chamois and Caucasian Red Deer (see also the brief descriptions of Western, Central and Eastern Greater Caucasus Conservation Landscapes in the chapter “Conservation Landscapes”).
- **The Transcaucasian (or South Caucasus) Depression** lies between the Greater and Lesser Caucasus mountain ranges and extends across Georgia and Azerbaijan. The Kura river (the longest river in the region – 1,515 km) flows through the eastern part of depression for much of its length on its way to the Caspian Sea. There are three prominent elements within the depression:
 - (a) humid Kolkheti Lowlands** in the western part of the depression covered by endemic alder forests and wetlands (including unique percolation bogs) that are related to the Colchic refuge of Tertiary flora (Garsteki et al., 2017) and also classified as temperate rainforests (Nakhutsrishvili, Zazanashvili & Batsatsashvili, 2011); it is an important stopover site for migrating birds;
 - (b) dry Kura-Ara(k)s Lowlands** in the eastern (Caspian) part comprising steppes, semideserts and deserts, and flood plain (so called Tugai type) forests, fragmented remnants of which have survived along rivers; the fauna of this element includes the globally threatened goitered gazelle;
 - (c) the Iori-Ajinour Plateau**, located in the north-eastern part of the depression, and which is represented by low mountains and plateaus covered by a combination of dry pistachio-juniper open woodlands, steppes and semideserts. Fauna in the near past included the globally threatened Leopard.

The Kolkheti and Iori-Mingachevir Conservation Landscapes correspond to the “a” and “c” elements of the depression. The Caspian Conservation Landscape partly covers the most eastern part of Kura-Ara(k)s Lowlands. Also, important is the Likhi Bridging Landscape that divides the western and eastern parts of the depression and serves as a natural bridge between the Greater and Lesser Caucasus.

- **The Lesser Caucasus Mountain Chain** (and the Doğu Karadeniz Dağları)³ borders the Southern Uplands from the north, east, and west and extends across Georgia, Turkey, Armenia, Azerbaijan, and into Iran. The highest summits rise to nearly 4,000 m. The main habitats include different types of temperate forests and high mountain grasslands. The north-western part of the chain mostly belongs to the Black Sea catchment basin. It is humid (with a maximum mean annual precipitation of 4,500 mm at Mt. Mtirala in Georgia) and covered by refugial Colchic forests with tall evergreen underwood and concentrations of Tertiary relict and endemic plant species. These forests are also classified as temperate rainforests (Nakhutsrishvili, Zazanashvili & Batsatsashvili, 2011). In contrast, the south-eastern part of the chain is much drier: juniper open woodlands, mountain steppes and xeric shrubs predominate along with drier types of temperate broad-leaved forests.

Most of the Western and Eastern Lesser Caucasus Conservation Landscapes lie in this mountain chain. The fauna of the western part includes the relict and endemic Caucasian Salamander and Caucasian Viper, as well as Brown Bear, European Lynx and Caucasian Red Deer; in the eastern part the principal species are the globally threatened Leopard, Bezoar Goat and Mouflon.

- **The Southern Uplands**⁴, made up of lava ridges and a broad volcanic plateau, are surrounded by the Lesser Caucasus mountain chain. The Southern Uplands extend across parts of Georgia, Armenia, Azerbaijan (Nakhchivan), Turkey, and Iran. The feature has an average elevation of 1,700-1,900 m and rises to more than 5,000 m at its highest point). The area is dry, mostly forestless, covered by mountain steppes, high mountain grasslands and dry shrub communities; it is moderately rich in lakes and wetlands. Fauna includes Brown Bear, European Lynx and a variety of reptiles.

The Sarikamish-Maku and South Caucasus Uplands Conservation Landscapes and three Bridging Landscapes lie in this area.

- **The Talysh-Western Alborz Mountains** in the south-eastern Caucasus extend along the Caspian Sea across the border between Azerbaijan and Iran. These mountains, which rise to more than 4,000 m (within the Caucasus boundaries), are separated from the Lesser Caucasus mountain chain by river depressions and mountain ridges. Lower slopes (up to 800-1,000 m) facing the Caspian Sea are covered by relict humid Hyrcanian broad-leaved forests; at higher elevations the climate becomes drier and Hyrcanian forests are replaced by temperate broad-leaved forests and mountain steppes. Principal fauna species are Leopard, European Lynx and Brown Bear.

The Hyrcan Conservation Landscape almost fully coincides with the area.

- **The Sabalan (Savalan)** mountain range, named after the inactive volcano Sabalan (4,811 m), is formed from parallel ridges and serves as a natural bridge between the Lesser Caucasus and Talysh-Alborz mountains within north-western Iran. Its main habitats include mountain steppes (up to 2,300-2,500 m) and high mountain grasslands with thornbush communities at higher elevations up to approximately 4,000 m (Encyclopaedia Iranica 2011). The principal fauna species is Leopard.

The Arasbaran Conservation Landscape partly coincides with the Sabalan mountain range.

³ Doğu Karadeniz Dağları – Eastern Black Sea Mountains of Turkey that we consider as the most western part of the Lesser Caucasus mountain chain.

⁴ Southern Uplands or Southern Caucasus Uplands – we use this toponym for all mountainous areas, ridges and plateaus bounded by the Lesser Caucasus mountain chain from west, north and east.

Terrestrial Ecoregions

The Caucasus Ecoregion fully or partly covers the following terrestrial ecoregions (Map 2), see also the interactive map at ecoregions2017.appspot.com);

Fully:

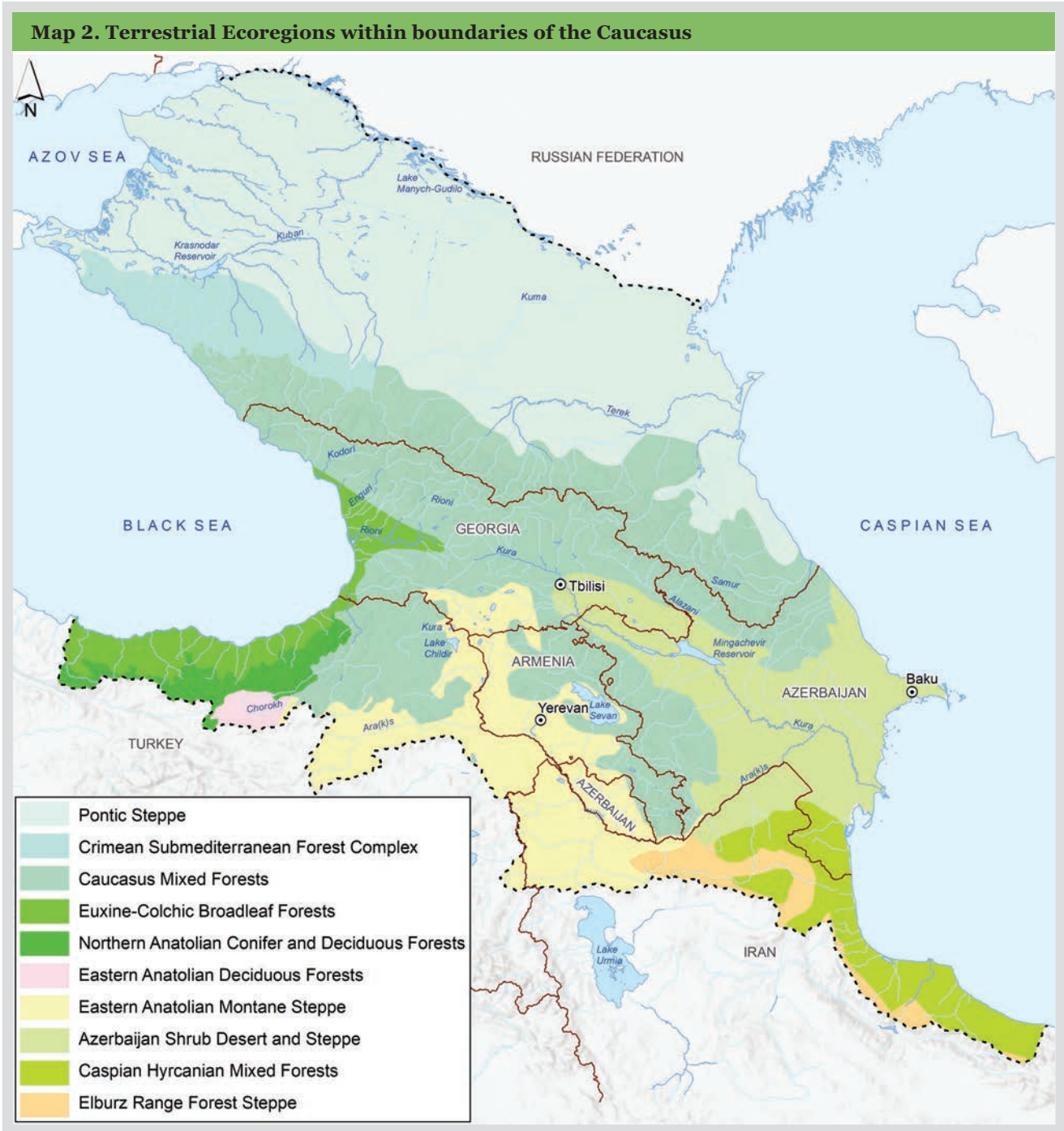
- **Caucasus mixed forests**
(<https://www.worldwildlife.org/ecoregions/pa0408>);
- **Azerbaijan shrub desert and steppe**
(<https://www.worldwildlife.org/ecoregions/pa1305>);

Partly:

- **Western part of Caspian-Hyrcanian mixed forests**
(<https://www.worldwildlife.org/ecoregions/pa0407>);
- **Eastern part of Crimean- Submediterranean forest complex**
(<https://www.worldwildlife.org/ecoregions/pa0416>);
- **The most northern portion of Eastern Anatolian deciduous forests**
(<https://www.worldwildlife.org/ecoregions/pa0420>);
- **Eastern, Colchic part of Euxine-Colchic deciduous (broadleaf) forest**
(<https://www.worldwildlife.org/ecoregions/pa0422>; *shape of this terrestrial ecoregion needs substantial revision, see e.g. Nakhutsrishvili et al., 2011*);
- **A small portion of the most western part of Elburz Range Forest Steppe**
(<https://www.worldwildlife.org/ecoregions/pa0507>);
- **A small portion of the most eastern part of Northern Anatolian Conifer and Deciduous Forest**
(<https://www.worldwildlife.org/ecoregions/pa0515>);
- **A small portion of the Northern part of Eastern Anatolian Montane Steppe**
(<https://www.worldwildlife.org/ecoregions/pa0805>);
- **A small portion of the Southern part of Pontic Steppe**
(<https://www.worldwildlife.org/ecoregions/pa0814>).

The Caucasus Ecoregion's southern borders are mostly in line with biogeographical concepts accepted by Caucasus specialists (Davis, 1971; Zohary, 1973; Dolukhanov, 1980; Browicz, 1989; Avci, 1996, etc.). Furthermore, the importance of geographical barriers, such as main watersheds, larger river valleys in determining climatic patterns and correspondingly patterns of vegetation has been known for a long time; it was used for one of the first botanical-geographical divisions of the Caucasus that is partly valid even today (Kuznetsov, 1909).

Delineation of the northern border is based mostly on geological criteria because there is no obvious biogeographical border. Looking at the interactive map of terrestrial ecoregions, we see that the Pontic Steppe (PA0814) ecoregion extends far beyond the Caucasus boundaries up to the Ural mountains in the north-east. Unlike this ecoregion, the Crimean Submediterranean Forest Complex (PA0416) has much closer phyto-geographic and geographic relations with the Caucasus (Kuznetsov, 1909; Doluhanov mit Bohn, 2000-2003; Doniță et al., 2000-2003).



Biodiversity Hotspots

At the time the boundaries of the Caucasus Ecoregion were being decided, 25 Biodiversity Hotspots were identified worldwide (Mittermeier et al., 1999; Myers et al., 2000). Since then, more Hotspots have been added and the shapes of some Hotspots revised: today, 36 Biodiversity Hotspots are considered as priorities for global conservation (Marchese, 2015)⁵. In the early 2000s, the Irano-Anatolian Biodiversity Hotspot was mapped. Covering 1,384,926 km² ⁶, the hotspot extends from the western part of central Turkey (western Anatolia) through Iran to Turkmenistan in the east, and from southern Georgia in the north almost to the Indian Ocean in the south, coinciding to a large degree with the western part of the Irano-Turanian Floristic Region (Takhtajan, 1986). During this exercise, the boundaries of the Caucasus Hotspot were revised: along with some other changes, the most northern part of the Terrestrial Ecoregion PA0805 Eastern Anatolian Montane Steppe, initially included in the Caucasus, was cut and added to the newly delineated Irano-Anatolian Hotspot (Mittermaier et al., 2004).

The map of the Caucasus Hotspot with its revised boundaries is attached to the corresponding chapter of the second edition of the World's Hotspots book (Zazanashvili et al., 2004). Those boundaries are supported by a number of concepts (Gagnidze, 1999; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000; Olson & Dinerstein, 2002, etc.), but some parts of the boundary are highly questionable. Especially doubtful is the northern-most part of the Eastern Anatolian Montane Steppe ecoregion, represented by the volcanic uplands of Djavakheti (Georgia), Arpi Lake (Armenia) and Childir Lake (Turkey). This part of the Caucasus is a single continuous assemblage of high mountain and freshwater ecosystems where steppe plant communities occur along with widespread mesic subalpine and alpine grasslands and herb lands that are also typical for other parts of the Caucasus. Other characteristic elements are the remnants of Caucasian subalpine pine (on drier slopes) and poplar-ash-birch woodlands that were quite common in the past in certain habitats (Troitsky, 1927; Sosnovsky, 1933; Gulisashvili, 1952; Dolukhanov, 2010, etc.). The area's fauna, particularly mammalian fauna, is also quite "circumboreal" (it is not similar to the fauna of the Irano-Turanian region of the Ancient-Mediterranean sub-kingdom, according to Takhtajan, 1978, 1986) and does not differ substantially from other parts of the Caucasus.

From the perspective of conservation planning and management, Caucasian specialists also think that it does not make much sense to include a small portion of the Caucasus into the Irano-Anatolian hotspot: e.g. Armenia's portion of the Irano-Anatolian hotspot is less than 1% of its total area, Georgia's portion – around 0.2%, and the same for Azerbaijan (part of Nakhchivan).

Conclusions

The Caucasus ecoregion's boundaries are based on a mixed concept and the process of deciding them was driven by stakeholders and experts. While the boundaries are still conditional, they are much more natural than the political-administrative borders that defined the Caucasus during the Soviet period. At the same time, we retain the initially agreed concept of the Caucasus (Biodiversity Hotspot) boundaries (Mittermaier et al., 1999; Williams et al., 2006), noting that revision of the agreed boundaries would require a considerable amount of research to identify the proportions of Caucasian (in a broad sense) and non-Caucasian biogeographic features within the areas of interest.

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⁵ See also <https://www.cepf.net/our-work/biodiversity-hotspots/hotspots-defined>

⁶ See <https://www.cepf.net/our-work/biodiversity-hotspots/irano-anatolian> and <https://atlas-for-the-end-of-the-world.com/hotspots/irano-anatolian.pdf>

References

- Ataev, Z. V., Bratkov, V. V., Abdulaev, K. A., Baluev, T. R., Gadzhibekov, M. I. (2016): Geographical Aspects of Biological and Landscape Diversity in the Designed Samur National Park in the Eastern Caucasus. Dagestan State Pedagogical University. *Journal. Natural and Exact Sciences* 10 (3), 91-102. [In Russ. with Engl. summary].
- Avcı, M. (1996): The floristic regions of Turkey and a geographical approach for Anatolian diagonal. *Review of the Department of Geography, University of Istanbul*, 3, 59-91.
- CEPF 2003. Critical Ecosystem Partnership Fund, Ecosystem Profile, Caucasus Biodiversity Hotspot. https://www.cepf.net/sites/default/files/final.caucasus.ep_.pdf
- Bondirev, I.V., Davitashvili, Z.V., Singh, V.P. (2015): *The Geography of Georgia: Problems and Perspectives*. Springer International Publishing, Switzerland.
- Browicz, K. (1989): Chorology of the Euxinian and Hyrcanian element in the woody flora of Asia. Pp. 305-314 in Ehrendorfer, F., ed. Special edition of "Plant Systematics and Evolution", Vol. 162. Schpringer-Verlag Wien GmbH.
- Davis, P. H. (1971): Distribution Patterns in Anatolia with Particular Reference to Endemism. Pp. 15-27 in: Davis, P.H., Harper, P. C. & Hedge, I. C., eds. *Plant Life of South-West Asia*. The Botanical Society of Edinburgh, Edinburgh.
- Dobrinin, B.F. (1948): *Physical Geography of SSSR. European Part and Caucasus*. Uchdetgiz, Moscow. [In Russ.].
- Dolukhanov, A.G. (1966): Vegetation cover. Pp. 233-255 in Gerasimov, I.P. (ed.-in-chief). *Caucasus*. Nauka, Moscow. [In Russ.].
- Dolukhanov, A.G. (1980): *Colchic Underwood*. Metsniereba, Tbilisi. [In Russ.].
- Dolukhanov, A.G. (2010): *Forest vegetation of Georgia*. Tbilisi Bot. Gard. And Institute, "Universal", Tbilisi. [In Russ.].
- Duluhanov, A.G. mit Berträgen von Bohn, U. (2000-2003): Formation F.7 Kaukasische Hainbuchen-Eichenmischwälder. Pp. 351-356 in Bohn, U., Neuhäusl, R. unter Mitarbeit von Gollub, G., Hettwer, C., Neuhäuslova, Z., Schlüter, H. & Weber, H. *Karte der natürlichen Vegetation Europas*. Bundesamt für Naturschutz, Münster (Landwirtschafisverlag).
- Doniță, N. mit Bohn, U., Raus, Th. & Wagner, H. (2000-2003): Formation G Thermophile sommergrüne Laubmischwälder. Pp. 357-383 in Bohn, U., Neuhäusl, R. unter Mitarbeit von Gollub, G., Hettwer, C., Neuhäuslova, Z., Schlüter, H. & Weber, H. *Karte der natürlichen Vegetation Europas*. Bundesamt für Naturschutz, Münster (Landwirtschafisverlag).
- Dumitrashko, N.V., Buianovsky, M.S., Gvozdetsky, N.A., Maslov, E.P. (1966): Introduction. Pp. 7-17 in Gerasimov, I.P. (ed.-in-chief). *Caucasus*. Nauka, Moscow. [In Russ.].
- Encyclopaedia Britannica 2018. <https://www.britannica.com/place/Caucasus> downloaded on 28.12.18.
- Encyclopaedia Iranica 2011: Sabalān Mountain, (Eckart Ehlers), Originally Published: January 14, 2011, Last Updated: January 14, 2011. – <http://www.iranicaonline.org/articles/sabalan-mountain>.
- Gagnidze, R. (1999): Arealogical review of Colchic evergreen broad-leaved mesophyllous dendroflora species. Pp. 199-216 in Klötzli, F. & Walther, G.-R., eds. *Recent shifts in vegetation boundaries of deciduous forests, especially due to general global warming*. Birkhäuser Verlag, Basel – Boston – Berlin.
- Garsteki, T. (author) et al. (2017): Feasibility assessment for a World Heritage nomination of the Colchic Forests and Wetlands under the natural criteria: scoping and feasibility study. Succow Stiftung, WWF. – http://eprints.iliauni.edu.ge/6829/1/FS_WH_Colchic_Forests_%26_Wetlands_final.pdf
- Gorenflo, L. J., Romaine, S., Mittermeier, R.A. & Walker-Painemilla, K. (2012): Co-occurrence of linguistic and biological diversity in biodiversity hotspots and high biodiversity wilderness areas. *PNAS* 109 (21), 8032-8037.

- GRID Arendal 2008: Caucasus Ecoregion – environment and human development issues. - <http://www.grida.no/resources/7910>
- Gulisashvili, V. (1952): Forest vegetation and regularity of its distribution. *Proceedings of Inst. of Forestry* 4, 3-23. [In Georg.].
- Gvozdetsky, N.A. (1954): *Physical Geography of the Caucasus*, v. I. Moscow University Publishing, Moscow. [In Russ.].
- Khalili, A., Rahimi, J. (2018): Climate. Pp. 19-33 in Roozitalab M., Siadat H., Farshad A., eds. *The Soils of Iran. World Soils Book Series. Springer, Cham.*
- Kuznetsov, N.I. (1909): *Principles of division of the Caucasus on botanical-geographical provinces.* Transactions of Imperial Academy of Sciences, series 8, physics and mathematics class, vol. 24, 1, St-Petersburg, 174 p. + 2 maps. [In Russ.].
- Kuznetsov, V. & Lushchekina, A. (2002): Kalmyk saiga is on the verge of catastrophe. *Stepnoy bulluten*, 11, 28–32. [In Russ.].
- Lewis, M.W. (2012): Where is the Caucasus? GeoCurrents. – <http://www.geocurrents.info/place/russia-ukraine-and-caucasus/where-is-the-caucasus>
- Marchese, C. (2015): Biodiversity hotspots: A shortcut for a more complicated concept. *Global Ecology and Conservation* 3, 297-309.
- Milkov, F.N., Gvozdetsky, N.A. (1986): *Physical Geography of SSSR: Overview, European Part, Caucasus.* Visshaia Shkola, Moscow. [In Russ.].
- Mittermeier, R.A., Myers, N., Robles Gil, P. & Mittermeier, C.G., eds. (1999): *Hotspots: Earth's biologically richest and most endangered terrestrial ecoregion.* CEMEX/Agrupación Sierra Madre, Monterrey.
- Mittermeier, R.A., Robles Gil, P., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier C.G., Lamoreux, J., da Fonseca G.A.B., eds. (2004): *Hotspots revisited: Earth's biologically richest and most endangered ecoregions.* CEMEX/Agrupacion Sierra Madre, Mexico City.
- Myers, N., Mittermeier, R.A., Mittermeier, C.G., da Fonseca, G.A., Kent, J. (2000): Biodiversity hotspots for conservation priorities. *Nature* 403, 853-858.
- Nakhutsrishvili, G., Zazanashvili, N. & Batsatsashvili, K. (2011): Regional Profile: Colchic and Hyrcanic Temperate Rainforest of the Western Eurasian Caucasus. Pp. 214-221 in DellaSala, D.A., ed. *Temperate and Boreal Rainforest of the World: Ecology and Conservation.* Island Press, Washington-Covelo-London.
- Nakhutsrishvili, G., Zazanashvili, N., Batsatsashvili, K. & Montalvo, C.S. (2015): Colchic and Hyrcanian forests of the Caucasus: similarities, differences and conservation status. *Fl. Medit.* 25 (*Special Issue*), 185-192.
- Neronov, V.M., Arilova, N. Yu., Dubinin, M. Yu., Karimova, T.Yu., Luschekina, A.A. (2013): Current state and perspectives of Saiga Antelope conservation in the North-West Pre-Caspian region. *Aridnie ekosistemi*, 19, 2 (55), 5-14. [In Russ.].
- Olson, D. M. & Dinerstein, E. (1998): The Global 200: A representation approach to conserving the Earth's most biologically valuable ecoregions. *Conservation Biology* 12, 502–515.
- Olson, D.M. & Dinerstein, E. (2002): The global 200: priority ecoregions for global conservation. *Annals of the Missouri Botanical Garden*, 89, 2, 199-224.
- Olson, D.M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V. N., Underwood, E. C., D'Amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengel, W. W., Hedao, P., Kassem, K. R. (2001): Terrestrial ecoregions of the world: a new map of life on Earth. *Bioscience* 51 (11): 933-938.
- Sirin, A. A., ed. (2012): *Wetlands of International Importance in Russia.* Wetlands International Russia Programme Publication, Moscow.

- Sosnovsky, D.I. (1933): On the floristic features of Djavakheti. – Reprint from the book “Djavakhetia”, Tbilisi, Pp. 229-235. [In Russ.].
- Takhtajan, A.G. (1978): *Floristic regions of the world*. Nauka, Leningrad. [In Russ.].
- Takhtajan, A. (1986): *Floristic regions of the world*. University of California Press, Berkeley, CA.
- Talebi, S.K., Sajedi, T., Pourhashemi, M. (2014): *Forest of Iran: a Treasure for the Past, a Hope for the Future*. Springer, Dordrecht, Heidelberg, New York, London.
- Tohidifar, M., Moser, M., Zehzad, B. & Ghadirian, T. (2016): Biodiversity of the Hyrcanian Forests: A synthesis report. UNDP/GEF/FRWO Caspian Hyrcanian Forest Project, Iran, 41 pp.
- Troitsky, N.A. (1927): Remnants of forests in Akhalkalaki district. *Bulletin of Tiflis Bot. Gard.*, new series 3-4, 107-122. [In Russ.].
- Tushinsky, G.K., Davidova, M.I. (1976): *Physical geography of USSR*. Prosveschenie, Moscow. [In Russ.].
- Williams, L., Zazanashvili, N., Sanadiradze, G. & Kandaurov, A., eds. (2006): *An ecoregional conservation plan for the Caucasus*. WWF-BMZ-KfW-CEPF-MacArthur Foundation, Tbilisi.
- Zazanashvili, N., Gagnidze, R. & Nakhutsrishvili, G. (2000): Main types of vegetation zonation on the mountains of the Caucasus. *Acta Phytogeographica Suecica* 85, 7-16.
- Zazanashvili, N., Garforth, M., Jungius, H., Gamkrelidze, T., Montalvo, C., eds. (2013): Ecoregion Conservation Plan for the Caucasus. 2012 revised and updated edition. WWF, KfW, BMZ, Tbilisi.
- Zazanashvili, N., Sanadiradze, G. & Bukhnikashvili, A. (1999): Caucasus. Pp. 269-273 in Mittermeier, R. A., Myers, N., Robles Gil, P. & Mittermeier, C. G., eds. *Hotspots: Earth's biologically richest and most endangered terrestrial ecoregion*. CEMEX, Agrupación Sierra Madre, Monterrey.
- Zazanashvili, N., Sanadiradze, G., Bukhnikashvili, A., Kandaurov, A., Tarkhnishvili, D. (2004): Caucasus. Pp. 148-153 in Mittermeier, R. A., Robles Gil, P., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier C.G., Lamoreux, J., da Fonseca G.A.B., eds. *Hotspots Revisited: Earth's biologically richest and most endangered terrestrial ecoregions*. CEMEX/Agrupacion Sierra Madre, Mexico City.
- Zohary, M. (1973): *Geobotanical Foundations of the Middle East*, Vol. 1-2. Gustav Fischer Verlag, Stuttgart und Swets & Zeitlinger Amsterdam.

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KEY BIODIVERSITY AREAS IN THE CAUCASUS ECOREGION

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Contents: Introduction; Identification of Key Biodiversity Areas; Key highlights from the process of KBAs identification; Conclusions; Acknowledgements; References; Suggested citation.

Introduction

The concept of Key Biodiversity Areas (KBAs) - defined as “sites of global significance for biodiversity conservation” (Eken et al. 2004, Langhammer et al. 2007) or “sites that contribute significantly to the global persistence of biodiversity” (IUCN 2016) - is widely acknowledged. KBAs are identified through the application of standard criteria that cover all levels of ecological organisation, including genetic diversity, species and ecosystems (KBA Standards and Appeals Committee 2019).

The first significant steps towards the identification of sites of global importance for biodiversity conservation in the Caucasus were taken during the development of the regional conservation programme (Caucasus Biodiversity Hotspot Profile) of the Critical Ecosystem Partnership Fund (CEPF), co-facilitated with the support of Conservation International’s Center for Applied Biodiversity Science and WWF Caucasus in the 2000s. The Caucasus Profile defined conservation outcomes for the Hotspot at three levels:

- (i) **Species Outcomes** – target species that were globally threatened according to the most recent IUCN Red List for that time. A total of 51 species of six taxa – mammals, birds, reptiles, amphibians, fish and plants - were considered as the species outcomes;
- (ii) **Site Outcomes** – areas that were important for the conservation of globally threatened target species. The CEPF identified 205 site outcomes that harboured the target species and covered around 19% of the Caucasus Hotspot; and
- (iii) **Corridor Outcomes** – large-scale landscapes allowing persistence of biodiversity by ensuring connectivity and maintaining ecological processes (CEPF 2003).

The CEPF’s methodological approach for the identification of sites critical for the conservation of threatened biodiversity is still valid. In the ECP 2020, the core concept of the CEPF approach has been expanded and the main principles of the *IUCN Global Standard for the Identification of Key Biodiversity Areas (IUCN 2016)* have been followed in identifying KBAs in the Caucasus Ecoregion.

Identification of Key Biodiversity Areas

The identification of KBAs in the Caucasus for ECP 2020 was built on the experience of defining the site outcomes for the CEPF Caucasus Biodiversity Hotspot Profile (CEPF 2003); in particular, 205 site outcomes were used as the baseline for identifying KBAs in the Ecoregion. The informational base also included 56 priority conservation areas and 60 corridors identified for the very first Ecoregional Conservation Plan for the Caucasus using a species-based methodology adapted from the one developed by the scientific unit of WWF-US (Williams et al., 2006).

Identification of KBAs was based on principles that approximate to the criteria defined in the above-mentioned IUCN global standard for identifying KBAs that contribute to the global persistence of threatened species (criterion A1), individual geographically restricted species (criterion B1) and demographic aggregations of species (criterion D1). Species categorized in the IUCN Red List of Globally Threatened Species (IUCN 2019) as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) were applied with criterion A1, species with restricted distribution with criterion B1, and species that aggregate in particular areas during a specific life-history stage or process such as breeding, feeding or migration with criterion D1.

The process of KBAs identification involved over 100 experts from the Ecoregion, representing scientific, governmental and non-governmental organizations, working together at national and regional meetings and in distance consultations.

The process of identifying KBAs followed six steps:

- Identification of globally threatened species (trigger species under criterion A1) occurring in the Caucasus Ecoregion.
- For the South Caucasus countries - Armenia, Azerbaijan and Georgia – the second step was to compile basic data and map the distribution of identified globally threatened species. In the case of Iran, Russia and Turkey, the second step was to refine the borders of previously identified CEPF site outcomes taking into consideration changes to the threat categories of species in the IUCN Red List and the distributions of newly listed globally threatened species.
- Overlaying GIS layers of CEPF site outcomes (used as the baseline) and areas of distribution of globally threatened species, and delineating KBAs.
- Assessing delineated KBAs against two more criteria: individual geographically restricted species (trigger species under criterion B1) and demographic aggregations of species (trigger species under criterion D1).
- Assessing whether potential trigger species meet the relevant thresholds in delineated KBAs.
- Refining the delineated boundaries of KBAs by considering other existing important biodiversity areas, such as protected areas, Important Bird Areas, Ramsar sites and Emerald sites as well as topographic features.

A total of 362 globally threatened species triggering criterion A1, 14 species triggering criterion B1 and 66 species triggering criterion D1 were considered during the identification of KBAs. Out of the globally threatened species, 121 are listed as vulnerable, 119 as endangered and 122 as critically endangered; they comprise 276 species of plants, 17 species of mammals, 23 species of birds, 21 species of reptiles, two species of amphibians, 22 species of fish and one species of crustaceans (Table 1, Annex 1).

Table 1. The IUCN Globally Threatened Species of the Caucasus Ecoregion (2019)

Taxa	Number of Species	IUCN Category			Distribution by Countries					
		Vulnerable	Endangered	Critically Endangered	Armenia	Azerbaijan	Georgia	Iran	Russia	Turkey
Mammals	17	9	5	3	9	8	10	7	12	5
Birds	23	15	5	3	17	21	19	20	23	19
Reptiles	21	8	7	6	6	8	8	4	8	13
Amphibians	2	2	0	0	0	1	1	1	0	1
Fish	22	8	2	12	3	11	12	9	14	10
Crustaceans	1	1	0	0	0	0	1	0	0	0
Plants	276	78	100	98	73	46	63	1	49	90
Total	362	121	119	122	108	95	114	42	106	138

At the conclusion of the process, 231 KBAs were identified in the Ecoregion. The KBAs vary in size from 0.44 km² to 3,757.4 km². The total area of all KBAs is 130,113 km² - about 22.2 % of the Ecoregion`s entire territory (Map 1, Annex 2, Annex 5).

As at 2020, 36.5% of the area covered by KBAs in the Ecoregion is protected through different categories of PAs and 6.2% of the area is under strict protection as it is covered by PAs of IUCN Category I - Strict Nature Reserve (Table 2, Map 2).

Table 2. KBA coverage and portion protected by country

Country	Number of KBAs	Area of KBAs (km ²)	KBAs Protected (km ²)	KBAs Protected (%)	KBAs under strict protection (km ²)	KBAs under strict protection (%)
Armenia	22	10,294	3,718	36.1	351	3.4
Azerbaijan	48	15,846	8,184	51.6	1,156	7.3
Georgia	60	21,335	6,616	31.0	1,206	5.7
Iran	15	16,483	4,390	26.6	0	0
Russia	54	38,861	20,108	51.7	5,316	13.7
Turkey	32	27,293	4,512	16.5	15	0.1
Total	231	130,113	47,527	36.5	8,044	6.2

Map 1. Key Biodiversity Areas



Sources: Important Bird Areas Database, Birdlife International; Ramsar Sites Database, Secretariat of Ramsar Convention; Emerald Sites Database, Secretariat of Bern Convention; Protected Areas - see sources of Map 2 below; KBAs database (2016 update) of Nature Society (Doğa Derneği), Turkey; Outputs of ECP 2020 National and Regional Workshops and Experts' Review.

Map 2. Coverage of KBAs by all categories of Protected Areas

Sources: Ministry of Environment, Armenia; Ministry of Ecology and Natural Resources, Azerbaijan; Ministry of Environmental Protection and Agriculture/Agency of Protected Areas, Georgia; Department of Environment, Iran; Ministry of Agriculture and Forestry/General Directorate of Nature Conservation and National Parks, Turkey; WWF Caucasus Programme Office; WWF Armenia Branch; WWF Azerbaijan Branch; WWF-Russia.

Key highlights from the process of KBAs identification

The Caucasus is a region of global importance for biodiversity conservation, being one of the world's biodiversity hotspots with its exceptionally rich biodiversity and high level of endemism (Mittermaier et al., 1999, 2004). Over 70% of all trigger species for KBA identification are local, country or regional endemics. All plant trigger species are endemics and they are covered by the threatened species criterion (A1). As for fauna, over 20% of all animal trigger species and around 40% of threatened trigger species are endemics and they are covered by the threatened species (A1) and individual geographically restricted species (B1) criteria. Endemics are represented in over 70% of KBAs and their number varies from 1 to 32 species in KBAs (Annex 3).

Around 34% of KBAs are triggered by the single criterion A1, 60% of KBAs - by two criteria (A1-B1 or A1-D1), and 6% of KBAs – by all three criteria (A1-B1-D1). The number of all trigger species in KBAs varies from 1 to 43 (Annex 3). When all KBAs had been delineated, there remained 22 species out of the 362 initially identified globally threatened species which are out of any KBAs in the Ecoregion, including 12 critically endangered species.

Defining whether potential trigger species met the relevant population-size threshold at delineated KBAs was the most challenging part of KBA identification because the required data was often lacking or not sufficient in most cases. More intense and consistent research and comprehensive assessment are required to compile all the necessary information and confirm that KBAs meet the quantitative threshold associated with the KBA identification global standard. Threatened species have a relatively high probability of extinction and even small populations of these species can contribute to their conservation and survival (Eken et al. 2004). It is important not to miss or exclude KBAs which may harbour populations of global conservation significance simply because of limitations in research and lack of relevant data.

The application of thresholds was approached differently for plant and animal trigger species. In the case of plants, for over 95% of trigger species, it was assessed whether they satisfy the relevant population-size threshold at respective KBAs. In the case of fauna, an absolute threshold for the occurrence of trigger species in KBAs was applied. The endemism rate of the globally threatened trigger species should be considered in relation to population-size threshold because a high rate of endemism substantially lowers risks associated with disregard of the population-size threshold. The application of the absolute threshold for the occurrence of trigger fauna species provides a reasonable basis for further intense research and monitoring of the identified KBAs to fill data gaps and better inform relevant stakeholders.

Conclusions

The 231 KBAs identified as geographic priorities for ECP 2020 will underpin the conservation planning and the development of protected areas networks at both national and regional levels in the Caucasus Ecoregion. Furthermore, together with the information collated during their identification, the KBAs can be used to guide investments in conservation, foster biodiversity research in areas where data are insufficient, increase political recognition, and support informed decisions for biodiversity conservation, sustainable development and management practices.

Although the KBAs are sites of global significance for preventing biodiversity loss, it does not mean that the KBA approach is sufficient by itself and that no other sites are important for biodiversity conservation. The identification of areas of significance for the conservation of nationally and regionally threatened biodiversity is also crucial (Langhammer et al., 2007; IUCN 2016). Besides, further detailed assessment of identified KBAs from the perspective of their importance for nationally and regionally threatened biodiversity is a very important additional step ahead towards proper planning and prioritization of relevant conservation measures and establishment of better management practices.

Many KBAs have been formally designated as protected areas and at the same time, many protected areas have been identified as KBAs. However, the identification of KBAs does not imply that all identified sites should be legally protected: formal protection may not be feasible or relevant for all KBAs. It is important to manage the identified KBAs in a way that ensures the persistence of trigger species or other biodiversity elements for which the particular KBAs were recognized. KBAs which fall outside of protected area systems may be managed by a variety of approaches (Dudley et al., 2014).

Finally, it should be highlighted that KBAs identification and refining of their boundaries is an iterative process as our environment is dynamic, the knowledge of biodiversity is changing over time and new data becomes available continuously. Generally, all KBAs should be considered as priorities for research as data on conservation targets triggering the KBAs need to be updated and reconfirmed (Langhammer et al., 2007; IUCN 2016).

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References

- CEPF 2003. Critical Ecosystem Partnership Fund, Ecosystem Profile, Caucasus Biodiversity Hotspot. https://www.cepf.net/sites/default/files/final.caucasus.ep_.pdf
- Dudley, N., Boucher, J.L., Cuttelod, A., Brooks, T.M., and Langhammer, P.F. (Eds). 2014. Applications of Key Biodiversity Areas: end-user consultations. Cambridge, UK and Gland, Switzerland: IUCN.
- Eken, G., Bennun, L., Brooks, T.M., Darwall, W., Fishpool, L.D.C., Foster, M., Knox, D., Langhammer, P., Matiku, P., Radford, E., Salaman, P., Sechrest, W., Smith, M.L., Spector, S. & Tordoff, A. (2004): Key biodiversity areas as site conservation targets. *BioScience* 54, 1110-1118. <https://academic.oup.com/bioscience/article/54/12/1110/329687>
- Freyhof, J., Khorozyan, I., Sadigov, F., Japoshvili, B., Batsatsashvili, K., Fayvush, G., Shukurov, E. (lead authors), et al. (2015): Freshwater key biodiversity areas: critical sites for threatened freshwater biodiversity. Pp. 8-21 in Garforth, M., ed. Towards sustainable dam and hydropower in the South Caucasus. WWF, Tbilisi.
- IUCN 2016. A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. First edition. Gland, Switzerland: IUCN.
- IUCN 2019. The IUCN Red List of Threatened Species. Version 2019-3. <<https://www.iucnredlist.org>>
- KBA Standards and Appeals Committee 2019. *Guidelines for using a Global Standard for the Identification of Key Biodiversity Areas*. Version 1.0. Prepared by the KBA Standards and Appeals Committee of the IUCN Species Survival Commission and IUCN World Commission on Protected Areas. Gland, Switzerland: IUCN. viii + 148pp.
- Langhammer, P.F., Bakarr, M.I., Bennun, L.A., Brooks, T.M., Clay, R.P., Darwall, W., De Silva, N., Edgar, G.J., Eken, G., Fishpool, L.D.C., Fonseca, G.A.B. da, Foster, M.N., Knox, D.H., Matiku, P., Radford, E.A., Rodrigues, A.S.L., Salaman, P., Sechrest, W., and Tordoff, A.W. (2007): *Identification and Gap Analysis of Key Biodiversity Areas: Targets for Comprehensive Protected Area Systems*. Gland, Switzerland: IUCN.
- Mittermeier, R.A., Myers, N., Robles Gil, P. & Mittermeier, C.G., eds. (1999): *Hotspots: Earth's biologically richest and most endangered terrestrial ecoregion*. CEMEX/Agrupación Sierra Madre, Monterrey.

Mittermeier, R.A., Robles Gil, P., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier C.G., Lamoreux, J., da Fonseca G.A.B., eds. (2004): *Hotspots revisited: Earth's biologically richest and most endangered ecoregions*. CEMEX/Agrupacion Sierra Madre, Mexico City.

Solomon, J., T. Shulkina & J.I. Schatz, eds. (2013): *Red List of the Endemic Plants of the Caucasus: Armenia, Azerbaijan, Georgia, Iran, Russia and Turkey*. Monographs in Systematic Botany from the Missouri Botanical Garden (MSB) 125. Missouri Botanical Garden Press. Saint Louis.

Williams, L., Zazanashvili, N., Sanadiradze, G. & Kandaurov, A., eds. (2006): *An Ecoregional Conservation Plan for the Caucasus*. WWF, BMZ, KfW, CEP, MacArthur Foundation, Tbilisi.

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CONSERVATION LANDSCAPES IN THE CAUCASUS ECOREGION

Compiled by

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Contents: Introduction; The first large landscape attempt; Conservation landscape approach of ECP 2020; Conservation Landscapes of ECP 2020 and Corridor Outcomes of CEPF 2003; Brief analysis; Conclusions; Acknowledgements; References; Suggested citation.

Introduction

Large landscape approaches to nature conservation, especially approaches that originated in the USA, are being applied increasingly around the world. As the Center for Large Landscape Conservation explains⁷, “Large landscape conservation looks beyond national parks, beyond strict lines on maps between civilization and wilderness, to connect and sustain vast areas where wildlife live and move freely, clean water and other ecological benefits are supplied, working lands support sustainable communities, indigenous cultures thrive, and the places that are special to us and vital to the Earth’s ecology remain healthy for present and future generations. Large landscape conservation transcends boundaries – crossing political jurisdictions, cultures, socio-economic barriers, and disciplines of knowledge – to safeguard intact, healthy landscapes for the lasting benefit of nature and people the world over.”

In our rapidly industrialising world, habitat fragmentation is one of the main threats to biodiversity (Haddad et al., 2015; Tucker et al., 2018). This is why “connectivity” is now one of the most important considerations in conservation. But maintaining or restoring connectivity at the large landscape level requires healthy ecosystems and ecological processes, and these can be achieved only with the active involvement of the local population and cross- and trans-boundary cooperation (Worboys, Francis & Lockwood, 2010; Correa Ayram, 2016; Curtin & Tabor, 2016; Tabor et al., 2019). Especially important is the role the local population could play in the development of OECMs - “other effective area-based conservation measures”, which will be crucial if the world is to protect and manage land for biodiversity on the scale that is needed (Wilson, 2016; Dudley et al., 2018).⁸

The first Large Landscape attempt

In the Caucasus the Large Landscape approach was applied for the first time during planning and implementation of the regional conservation programme of the Critical Ecosystem Partnership Fund (CEPF) in the 2000s. The CEPF’s approach was based on three pillars: species outcomes (globally threatened species); site outcomes (subsequently transformed into the concept of Key Biodiversity Areas); and so called corridor outcomes (CEPF 2003).

The third pillar - corridor – conceptually is the same as large landscape: as the CEPF explains, “Corridor outcomes are large-scale landscapes that need to be conserved in order to allow persistence of biodiversity. While protecting sites alone will not be sufficient to conserve biodiversity in the long-term, conservation of landscapes (corridors)

⁷ <https://largelandscapes.org/>

⁸ see also <https://natureneedshalf.org/>

large enough to allow the persistence of biodiversity must be anchored on core areas (site outcomes), embedded in a matrix of other natural habitat and anthropogenic land uses. The CEPF identified and delineated corridors within the Caucasus using the following criteria: coverage of site outcomes; existence of large-scale intact biota assemblages; needs of wide-ranging (landscape) species; connectivity of habitats; and opportunities for maintaining ecological and evolutionary processes. Areas that were considered for corridors included intact rivers and landscapes, natural mountain passes, known migratory corridors and areas with spatial heterogeneity that could serve as steppingstones for many species” (CEPF 2003).



During the CEPF's planning, the experts for the Caucasus hotspot identified and delineated ten conservation corridors/large landscapes: Kuma-Manych; Greater Caucasus; West Lesser Caucasus; Javakheti; East Lesser Caucasus; Iori- Mingachevir; Caspian; Hyrcan; Arasbaran; and Southern Uplands (Map 1). The total area of the ten corridor outcomes was 20.8 million hectares, constituting 35.5 percent of the hotspot. Corridor outcomes contained the majority of the globally threatened species that occur in the Caucasus (according to IUCN Red List 2002) and were - and still are - important areas for Caucasian endemics. The majority of the protected areas in the hotspot fell within the boundaries of the 10 corridors. Corridors included 84 percent of the sites by number identified in site outcomes, and 94 percent by area. Of the ten corridors, using certain criteria, five were determined to be priority (target) corridors for conservation and CEPF investments (CEPF 2003).

Conservation Landscapes approach of ECP 2020

The CEPF's conceptual approach is still valid but in the 2020 edition of the ECP, instead of "site outcomes" we apply the more recent and widely-adopted concept of Key Biodiversity Areas (KBAs) (IUCN 2016) and instead of the CEPF's "large-scale intact biota assemblages" we focus on relatively large areas with undisturbed or less disturbed ecosystems (in the Caucasus, "large-scale intact biota assemblages" have survived only in the highest belt of high mountain landscapes).

The criteria which were used to identify the Conservation Landscapes in ECP 2020 are:

- (a) Coverage of KBAs, including Important Bird Areas (IBA) and Freshwater KBAs (Freyhof et al., 2015);
- (b) Possibility to address habitat fragmentation and consequently to maintain or restore ecological connectivity at the large landscape level, which:
 - (b1) implies the existence, and takes account of the needs, of species that range over large landscapes, and the existence of large areas of undisturbed or less disturbed ecosystems; and
 - (b2) supports the maintenance of the whole spectrum of ecological and evolutionary processes and environmental services, taking into account regional patterns of global climate change.

During 2016-2018 nine national and two regional workshops were convened to review and revise the thematic and geographical priorities of ECP 2020, including Conservation Landscapes. Additionally, national experts did a substantial amount of homework between workshops to correct and perfect the shapes of the Conservation Landscapes. The results were screened and adopted by experts and stakeholders from all six countries of the Caucasus at a final regional workshop in December 2018. The final outcome was 13 Conservation Landscapes and the experts also mapped seven so called Bridging Landscapes (Map 2, Annex 4, Annex 5). With one exception which is discussed below, Bridging Landscapes are not large enough to perform all the functions of Conservation Landscapes but they have an important connectivity role as corridors for wide-range species, supporting genetic flow between populations of different Conservation Landscapes.

Conservation Landscapes of ECP 2020 and Corridor Outcomes of CEPF 2003

In the ECP 2020, the shapes of six CEPF 2003 Corridor Outcomes are slightly changed while four are substantially changed: Greater Caucasus, West Lesser Caucasus, East Lesser Caucasus and Caspian (Table 1).

Caucasian experts concluded that the Greater Caucasus, which extends across the Caucasus from the northwest to the southeast for nearly 1,500 kilometres, is too large and diverse to be considered a single landscape for conservation planning. Following the traditional physical-geographic division of the range (Gvozdetsky, 1954; Maruashvili, 1986; etc.), it was divided into three smaller segments: Western, Central, and Eastern Greater Caucasus. Elbrus and Kazbegi Peaks are the major landmarks between these segments. Thus, instead of the single Corridor Outcome in 2003, the ECP 2020 has three Conservation Landscapes.

From the West Lesser Caucasus Corridor Outcome, its littoral part represented by the Kolkheti lowlands has been removed and mapped as a separate landscape (Kolkheti Conservation Landscape): although the Western Lesser Caucasus and Kolkheti Lowlands have some integrated processes, they are significantly different both in origin and ecosystems (Gerasimov, 1966; Svanidze, 1989; Kiknadze, 1990).

Armenian experts drew a new shape for the East Lesser Caucasus Corridor Outcome with the effect that in ECP 2020, the equivalent Eastern Lesser Caucasus Conservation Landscape extends from the northern to the southern borders of the country covering half of the territory of Armenia.

The Caspian Corridor Outcome was significantly narrowed within the coastal area of Azerbaijan and at the same time, it was expanded by a narrow strip along the Kura river. The main reason for this was to create the possibility in the future of restoring the pathways of anadromous fish, especially globally threatened sturgeon species.

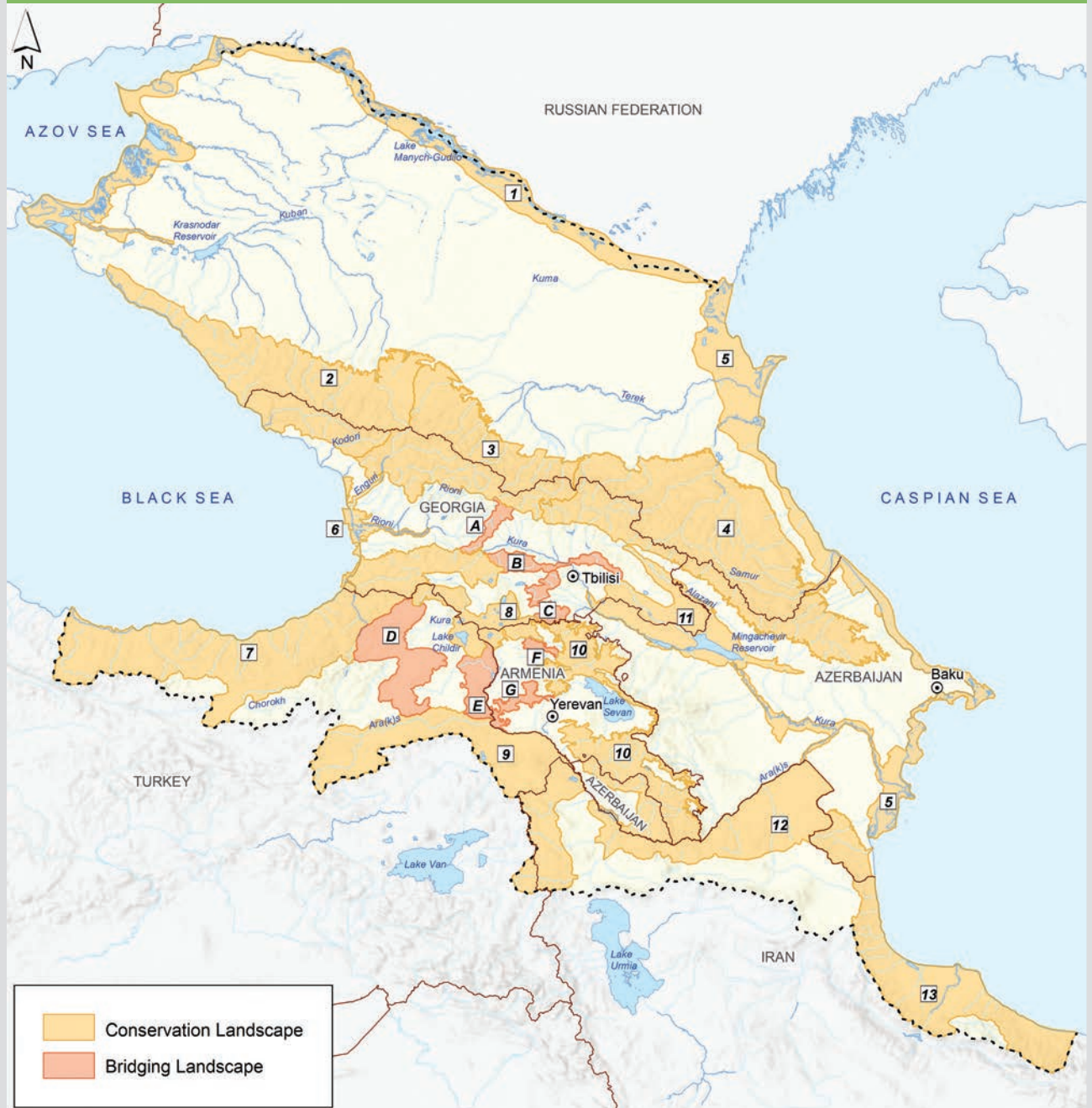
Table 1. Corridor Outcomes, CEPF 2003 and Conservation Landscapes, ECP 2020: changes of shapes

# and name, CEPF 2003	# and name, ECP 2020	Main changes
1. Kuma-Manych	1. Kuma-Manych	Eastern part slightly extended.
2. Greater Caucasus	2. Western Greater Caucasus 3. Central Greater Caucasus 4. Eastern Greater Caucasus	(a) Divided into three parts; (b) Enlarged, especially on the northern slope of the range in Russia: here the border coincides with the 1,000 m a.s.l. isoline.
3. Caspian	5. Caspian	(a) Narrowed within the coastal area of Azerbaijan; (b) expanded by a narrow strip along the Kura river.
4. West Lesser Caucasus	6. Kolkheti 7. Western Lesser Caucasus	(a) A small part (Erusheti volcanic massif) removed and added to Javakheti/South Caucasus Uplands; (b) Kolkheti Lowlands with coastal and littoral areas mapped as a separate landscape.
5. Javakheti	8. South Caucasus Uplands	See (a) in the row immediately above.
6. East Lesser Caucasus	10. Eastern Lesser Caucasus	Enlarged.
7. Iori- Mingachevir	11. Iori- Mingachevir	Almost no changes.
8. Southern Uplands	9. Sarikamish-Maku	Small, western-most portion removed and included in the Sarikamish-Posof Bridging Landscape
9. Arasbaran	12. Arasbaran	Almost no changes.
10. Hyrcan	13. Hyrcan	Almost no changes.

Brief analysis

Of the thirteen Conservation Landscapes, ten are transboundary, covering more than one country, and three are “national” (Table 2): Kolkheti (Georgia), Arasbaran (Iran) and Kuma-Manych (Russia). Kolkheti directly borders the Western Greater Caucasus and Western Lesser Caucasus. Arasbaran directly borders the Eastern Lesser Caucasus and Hyrcan and almost borders Sarikamish-Maku. Kuma-Manych geographically is comparatively isolated; from a biodiversity viewpoint it is a landscape mostly for birds and fish that migrate long distances.

The total area of the thirteen Conservation Landscapes is 251,408 km² (terrestrial – 243,492 km² and marine – 7,916 km²), comprising approximately 43% of the Caucasus region compared with 35.5% for CEPF Corridor Outcomes. Conservation Landscapes contain almost all globally threatened species which occur in the region and are important areas of waterfowl congregations and Caucasian endemics. Conservation Landscapes include 189 of the Ecoregion’s 231 KBAs (more than 81%, by number, which is almost the same percentage as for CEPF 2003). Bridging Landscapes include a further 10 KBAs, taking the total to 199 or over 86%. The remaining 32 KBAs (around 14%) lie outside Conservation and Bridging Landscapes.

Map 2. Conservation Landscapes and Bridging Landscapes

Explanation: Conservation Landscapes: 1 - Kuma-Manych; 2 - Western Greater Caucasus; 3 - Central Greater Caucasus; 4 - Eastern Greater Caucasus; 5 - Caspian; 6 - Kolkheti; 7 - Western Lesser Caucasus; 8 - South Caucasus Uplands; 9 - Sarikamish-Maku; 10 - Eastern Lesser Caucasus; 11 - Iori-Mingachevir; 12 - Arasbaran; 13 - Hyrcan.

Bridging Landscapes: A - Likhi; B - Trialeti-Gombori; C - Algeti-Loqi; D - Sarikamish-Posof; E - Aras; F - Bazum; G - Aragats.

Sources: Corridor Outcomes (CEPF 2003); Maps of KBAs and PAs – see above; Outputs of ECP 2020 National and Regional Workshops, and Experts' Review; Report on Mapping of Anatolian Steppe and Ecosystem Types in Anatolian Steppe (FAO/UN, 2019).

In terms of area, over 86% of KBAs are in the Conservation Landscapes and over five percent of KBAs fall within the Bridging Landscapes while around nine percent of KBAs are out of the Conservation and Bridging Landscapes. In addition, the majority of the 362 protected areas in the Caucasus fall within the boundaries of ECP 2020 Conservation Landscapes. The proportion of the area of each Conservation Landscape and of the area of KBAs within them which are included in Protected Areas is shown in Table 2.

Overall, around 20% of the area of Conservation Landscapes and 38.8% of the area of KBAs within the Conservation Landscapes are covered by PAs. PA coverage is highest in the three Conservation Landscapes of the Greater Caucasus: in the Western section, 42.2% in total and 66.9% for KBAs; in the Central section, 24.3% and 40.4%; in the Eastern section, 31.5% and 82.3%. The Kolkheti, South Caucasus Uplands, Eastern Lesser Caucasus and Arasbaran Conservation Landscapes have a PA coverage of more than 22% of their total areas and more than 30% of the KBAs inside them. The Western Lesser Caucasus and Hyrcan Conservation Landscapes have only a little more than 10% of PA coverage of their total areas and little more than 20% of the KBAs inside them: this is too low considering that these Conservation Landscapes are the two main areas of concentration of tertiary relict species and unique temperate rainforests.

Bridging Landscapes on average are considerably smaller than Conservation Landscapes and contain far fewer KBAs and protected areas (Table 3, Annex 5). The only exception is the Sarikamish-Posof Bridging Landscape in Turkey which connects Sarikamish-Maku Conservation Landscape with Western Lesser Caucasus and South Caucasus Uplands Conservation Landscapes. KBAs cover more than 76% of Sarikamish-Posof, but the PA coverage is inadequate: only 5% of the total area of KBAs is covered by PAs.

Table 2. Conservation Landscapes, KBAs and PAs (inside CLs)

#	Conservation Landscape	Countries ^a	Area (km ²)	Number of KBAs	Area of CL covered by KBAs (%)	Number of PAs	Area of CL covered by PA (%)	Area of KBAs covered by PA (%)
1	Kuma-Manych	RU	23,769 ^b	10	42.8	4	4.4	9.6
2	Western Greater Caucasus	GEO, RU	26,070 ^c	18	55.5	28	42.2	66.9
3	Central Greater Caucasus	GEO, RU	21,133	14	56.6	22	24.3	40.4
4	Eastern Greater Caucasus	AZ, GEO, RU	38,445	23	25.9	36	31.5	82.3
5	Caspian	AZ, RU	21,835 ^d	25	34.5	20	16.9	48.5
6	Kolkheti	GEO	1,970 ^e	8	71.4	2	22.7	31.7
7	Western Lesser Caucasus	GEO, TR	33,237 ^f	24	50.3	35	10.2	20.2
8	South Caucasus Uplands	AM, GEO, TR	5,648	15	57.8	10	22.6	39.1
9	Sarikamish-Maku	IR, TR	20,905	12	41.9	4	6.4	13.1
10	Eastern Lesser Caucasus	AM, AZ	15,347	14	62.6	34	23.1	36.2
11	Iori-Mingachevir	AZ, GEO	10,729	16	52.3	17	14.2	27.2
12	Arasbaran	IR	13,643	5	48.8	6	28.2	52.5
13	Hyrcan	AZ, IR	18,677	8	31.9	17	10.9	23.6
	Total		251,362.2	192^g	44.4	252	19.8	38.4

Explanation: (a) Abbreviations: AM – Armenia, AZ – Azerbaijan, GEO – Georgia, IR – Iran, RU – Russia, TR – Turkey; (b) Including both terrestrial (22,424 km²) and marine (1,345 km²) parts; (c) Including both terrestrial (25,847 km²) and marine (223 km²) parts; (d) Including both terrestrial (16,266 km²) and marine (5,570 km²) parts; (e) Including both terrestrial (1,449 km²) and marine (521 km²) parts; (f) Including both terrestrial (32,980 km²) and marine (257 km²) parts; (g) overall, there are 189 KBAs within the Conservation Landscapes: three KBAs - #42 (Gorge of the Eshkakon and Malka rivers), # 62 (Svaneti 2) and #63 (Range Kodori) fall in both Western and Central Greater Caucasus Conservation Landscapes, which gives a total count of 192 KBAs.

Bridging Landscapes are poorly protected: three of the seven have one or no protected areas. KBAs inside Bridging Landscapes also are mostly not covered by protected areas. Protected area coverage exceeds 10% in only one Bridging Landscape (Trialeti-Gombori). In contrast, only two Conservation Landscapes (Kuma-Manych and Sarikamish-Maku) have a protected area coverage of less than 10%.

Table 3. Bridging Landscapes, KBA and PAs (inside BLs)

#	Bridging Landscape	Countries	Area (km ²)	Number of KBAs	Area of BL covered by KBAs (%)	Number of PAs	Area of BL covered by PA (%)	Area of KBAs covered by PA (%)
A	Likhi	GEO	1,032	0	0	0	0	0
B	Trialeti-Gombori	GEO	1,972	1	10.7	2	11.2	100
C	Algeti-Loqi	GEO	1,461	1	9.6	2	0.7	0
D	Sarikamish-Posof	TR	6,955	3	76.1	5	3.8	5.0
E	Aras	TR	2,523	2	11.9	3	3.8	32.4
F	Bazum	AM	404	0	0	1	6.6	0
G	Aragats	AM	1,179	3	61.7	1	0.3	0.4
	Total		15,527	10	42.9	14	4.0	8.6

Conclusions

Connectivity has become one of the most important considerations in conservation: without maintaining or restoring connectivity at the landscape level, it is not possible to guarantee long-term survival of viable biodiversity, healthy ecological processes and associated ecosystem services. Experts from the six countries of Ecoregion delineated 13 priority Conservation Landscapes and 7 Bridging Landscapes to provide a spatial framework for ECP 2020 targets and actions. The Conservation and Bridging Landscapes are not equally protected, but all of them need equal attention for addressing connectivity issues using different approaches and methodologies, including establishment of traditional PAs and other effective area-based conservation measures, transboundary cooperation where feasible, and creation of ecological corridors with participation of local communities.

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References

- CEPF 2003. Critical Ecosystem Partnership Fund, Ecosystem Profile, Caucasus Biodiversity Hotspot. – https://www.cepf.net/sites/default/files/final.caucasus.ep_.pdf
- Correa Ayram, C.A., Mendoza, M.E., Etter, A. and Salicrup, D.R.P. (2016): Habitat connectivity in biodiversity conservation: a review of recent studies and applications. *Progress in Physical Geography* 40 (1), 7-37. <https://doi.org/10.1177/0309133315598713>
- Curtin, S.G. & Tabor, G.M. (2016): Large Landscape Conservation: Addressing the Realities of Scale and Complexity. In *Scott Elias (Ed.-in-Chief). Reference Module in Earth Systems and Environmental Sciences*. DOI: 10.1016/B978-0-12-409548-9.09210-1

- Dinerstein, E., Olson, D., Joshi, A., Vynne, C., Burgess, N.D., Wikramanayake, E., Hahn, N., Palminteri, S., Hedao, P., Noss, R. et al. (2017): An ecoregion-based approach to protecting half the terrestrial realm. *BioScience* 67(6), 534-545. <https://doi.org/10.1093/biosci/bix014>
- Dudley, N., Jonas, H., Nelson, F., Parrish, J., Pyhälä, A., Stolton, S., Watson, J. E. W. (2018): The essential role of other effective area-based conservation measures in achieving big bold conservation targets. *Global Ecology and Conservation* 15, e00424. <https://doi.org/10.1016/j.gecco.2018.e00424>
- Eken, G., Bennun, L., Brooks, T.M., Darwall, W., Fishpool, L.D.C., Foster, M., Knox, D., Langhammer, P., Matiku, P., Radford, E., Salaman, P., Sechrest, W., Smith, M.L., Spector, S. & Tordoff, A. (2004): Key biodiversity areas as site conservation targets. *BioScience* 54, 1110-1118.
- Freyhof, J., Khorozyan, I., Sadigov, F., Japoshvili, B., Batsatsashvili, K., Fayvush, G., Shukurov, E. (lead authors), et al. (2015): Freshwater key biodiversity areas: critical sites for threatened freshwater biodiversity. Pp. 8-21 in Garforth, M., ed. "Towards sustainable dam and hydropower in the South Caucasus". WWF, Tbilisi. ISBN 978-9941-0-8588-8
- Gerasimov, I.P., ed. in chief (1966): *Caucasus*. Nauka, Moscow. [In Russ.].
- Gvozdetsky, N.A. (1954): *Physical Geography of the Caucasus*, v. I. Moscow University Publishing, Moscow. [In Russ.].
- Haddad, N.M., Brudvig, L.A., Clobert, J., Davies, K.F., Gonzalez, A., Holt, R.D. et al. (2015): Habitat fragmentation and its lasting impact on Earth's ecosystems. *Science Advances* 1(2), e1500052. <https://doi.org/10.1126/sciadv.1500052>
- IUCN 2016. A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. First edition. Gland, Switzerland: IUCN.
- Kiknadze, T.Z., ed. (1990): *Kolkhida Lowland: scientific background for utilization*. Nauka, Moscow. [In Russ.].
- Langhammer, P.F., Bakarr, M.I., Bennun, L.A., Brooks, T.M., Clay, R.P., Darwall, W., De Silva, N., Edgar, G.J., Eken, G., Fishpool, L.D.C., Fonseca, G.A.B. da, Foster, M.N., Knox, D.H., Matiku, P., Radford, E.A., Rodrigues, A.S.L., Salaman, P., Sechrest, W., and Tordoff, A.W. (2007): *Identification and Gap Analysis of Key Biodiversity Areas: Targets for Comprehensive Protected Area Systems*. Gland, Switzerland: IUCN.
- Maruashvili, L. (1986): *Physical geography of the Caucasus: combined description of natural regions, historic bibliography*. Vakhushti Institute of Geography, Georgian Acad. of Sci., Metsniereba, Tbilisi. [In Georg.].
- Svanidze, G.G., ed. (1989): *Kolkhida Lowland: natural conditions and socio-economic aspects*. Gidrometizdat, Leningrad. [In Russ.].
- Tabor, Cen G. (Lead Author) et al. (2019): Ecological Connectivity: A bridge to preserving Biodiversity. Pp. 24-37 in UNEP (2019). *Frontiers 2018/19 Emerging Issues of Environmental Concern*. United Nations Environment Programme, Nairobi.
- Tucker, M.A., Böhning-Gaese, K., Fagan W.F., Fryxell J.M., Van Moorter, B., Alberts, S.C. et al. (2018): Moving in the Anthropocene: Global reductions in terrestrial mammalian movements. *Science* 359(6374), 466-469. <https://doi.org/10.1126/science.aam9712>
- Wilson, E.O. (2016): *Half-Earth: our planet's fight for life*. W.W. Norton & Company, London.
- Worboys, G.L., Francis, W.L. & Lockwood, M. (eds.) (2010): *Connectivity conservation management: a global guide*. Earthscan, London.

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STATUS OF LARGE CARNIVORES IN THE CAUCASUS

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Contents: Introduction; Leopard; Striped Hyena; Eurasian Lynx; Brown Bear; Conclusions; Acknowledgements; References; Suggested citation.

Introduction

There are five large carnivore species in the Caucasus: Leopard (*Panthera pardus*), Eurasian Lynx (*Lynx lynx*), Striped Hyena (*Hyaena hyaena*), Brown Bear (*Ursus arctos*) and Grey Wolf (*Canis lupus*). Four are listed in the Bern Convention, namely Brown Bear, Grey Wolf, Leopard (all listed in Appendix II), and Eurasian Lynx (Appendix III) (Breitenmoser, 2010). However, in this review we do not discuss the status of Grey Wolf: it is common and widespread throughout the ecoregion. Indeed, Grey Wolf is a main actor in human-wildlife conflicts reported from the majority of administrative districts of Georgia, Armenia and Azerbaijan and some parts of the Iranian Caucasus.⁹ Other larger or medium-size carnivores widespread in the region are Golden Jackal (*Canis aureus*), Red Fox (*Vulpes vulpes*), Eurasian Badger (*Meles meles*) and rarer Jungle Cat (*Felis chaus*) and Eurasian Otter (*Lutra lutra*).

Leopard

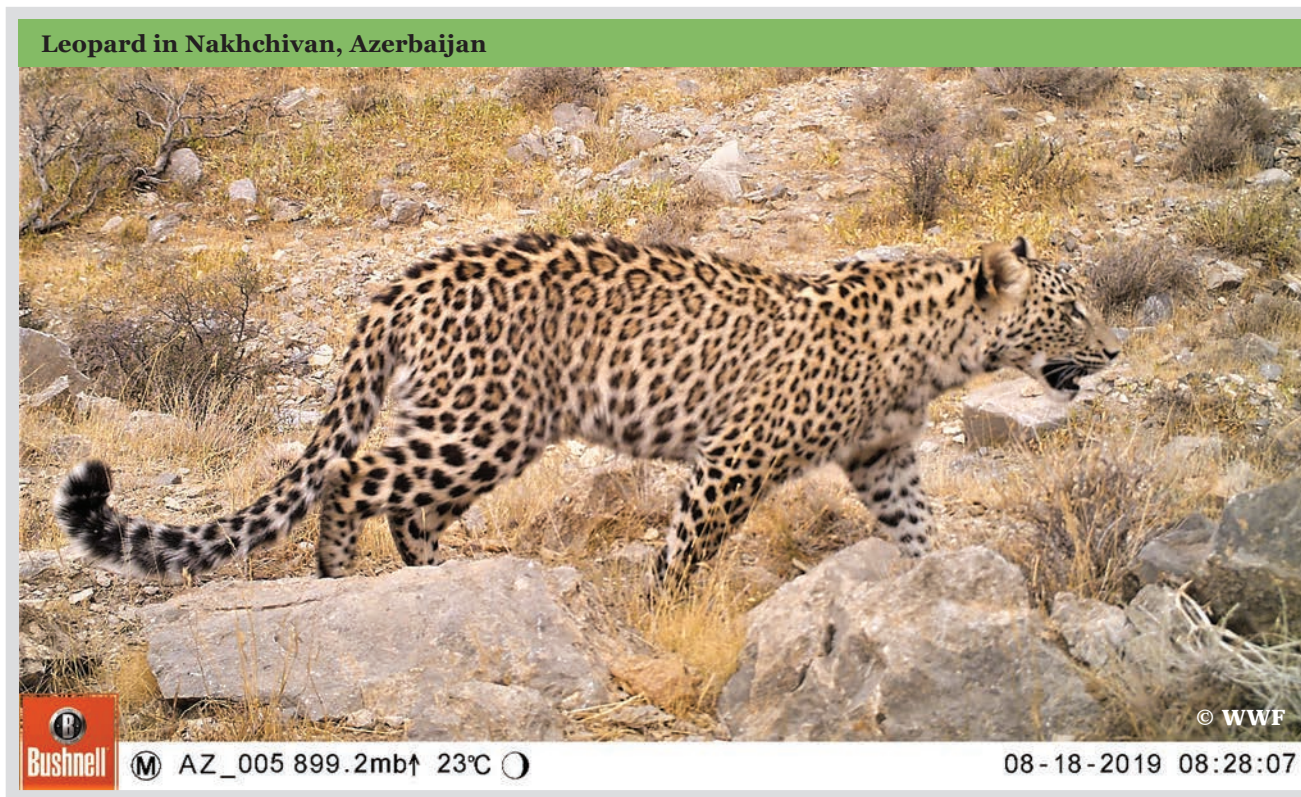
The Leopard (*Panthera pardus*)¹⁰ is recognised as a flagship animal in the Caucasus ecoregion (Williams, Zazanashvili, Sanadiradze & Kandaurov, 2006; Caucasus Leopard Working Group, 2017). Despite concern that this globally threatened species, assessed as Vulnerable according to the IUCN criteria (Stein et al., 2016), had disappeared from the region altogether, surveys organised in 2002–2005 within the framework of the WWF Leopard Conservation Programme in the South Caucasus showed that the Leopard still inhabits four “islands”. These are: (1) Nakhchivan/Azerbaijan-southern Armenia-Karadag range, Iran, (2) Talysh mountains of Azerbaijan and Iran, (3) Iori-Ajinour Plateau (south-eastern Georgia - north-western Azerbaijan), and (4) eastern Greater Caucasus (Georgia-Daghestan/Russian Federation). Considering the results of those surveys, WWF Caucasus Programme Office has focused on assisting governments in establishing new protected areas (PAs), improving their capacity, management effectiveness and monitoring Leopard and its prey species.

⁹ As research in Georgia shows, the main ecological and socio-economic reasons of the wolf's ability to survive in landscapes greatly modified and occupied by humans are: reduction in the number wild prey; existence of open land fills close to settlements that attract some carnivores; changes in land use and husbandry (particularly switching from agriculture to cattle breeding after the collapse of the USSR because of changed market demand; corresponding appearance of many unskilled farmers who lacked the ability to protect domestic animals); also changes in landscape composition such as restoration of scrubs, abandonment of tea and some other plantations, etc. that some carnivores use as shelters (Kopaliani et al., 2009).

¹⁰ Previously, the Leopard subspecies that occurs in the Caucasus was identified as Persian (*P.p. saxicolor*) or Caucasian (*P.p. ciscaucasica*) Leopard. Recently the taxonomy of *Panthera pardus* has been revised: all southwest Asian subspecies, including *saxicolor* and *ciscaucasica*, are now unified under one of the former names - *tulliana* (Kitchener et al., 2017). Therefore, today we also use *Panthera pardus tulliana* as the scientific name for the Caucasian Leopard, also known as Persian Leopard.

In 2007, with the support of the IUCN/SSC Cat Specialist Group, a regional status report was produced (Breitenmoser & Breitenmoser, 2007) in which the above mentioned findings of Leopard distribution were presented (Lukarevsky et al., 2007) and a Caucasus Regional Strategy for Leopard Conservation was prepared based on inputs of national experts (Ch. Breitenmoser, U. Breitenmoser, Mallon, & Zazanashvili, 2007). Development of the strategy was followed by the elaboration of corresponding National Action Plans in Armenia, Azerbaijan and Georgia. The Regional Strategy¹¹ and National Action Plans in turn facilitated further development of conservation actions, especially expansion of PAs and monitoring in those three countries.

What do we know exactly about the Leopard's status in the Caucasus?



One point that we be certain about is that the status of the Leopard is significantly improved in the Eastern Lesser Caucasus Conservation Landscape, which covers the Southern Armenia-Nakhchivan region of Azerbaijan and is linked with Kiamaki Wildlife Refuge in Iran (Askerov et al., 2015). In southern Armenia, the first two Leopard photos were obtained and 19 scats collected in 2004-2005 from 3 sites (Khorozyan & Abramov, 2007; Khorozyan, Cazon, Malkhasyan, & Abramov, 2007). Leopard survey in the Nakhchivan section of the Eastern Lesser Caucasus brought the first hard evidence as recently as 2012 (Avgan et al., 2012). Since then, because of the hunting ban in Nakhchivan, the establishment of new PAs in the Eastern Lesser Caucasus (mostly during the 2000s both in Armenia and Azerbaijan), and acceleration of monitoring activities under the WWF Programme (and, consequently, the growing population of Leopard here), hundreds of Leopard photo-video materials, as well as considerable amount of scats, have been collected (Table 1). Recently, the number of individuals that inhabit this area was estimated as 20-24 (Askerov et al., 2019), including 10-12 animals living in Kiamaki (Sanei et al., 2016), but it seems that the number of individuals could be even more: such supposition is based on photos depicting the second event of reproduction here - a different mother with two cubs. The first such event was documented in 2016 with three cubs (Breitenmoser et al., 2017).

Thus, we can say that the Eastern Lesser Caucasus population is still vulnerable, but quite stable and has a good reproductive potential.

¹¹ The strategy was revised in 2017 (Caucasus Leopard Working Group 2017): updating of the National Action Plan in Armenia is completed and in Azerbaijan is going on.

We also know that the second reproductive nucleus in the region is the Talysh mountains of Azerbaijan: two cubs were captured by camera-trap in 2016 (Breitenmoser et al., 2017). On the other hand, this area is more affected by poaching (Askerov et al., 2015; Maharramova et al., 2018) and this may be the main reason why the Leopard population size here is smaller: approximately half of the Eastern Lesser Caucasus population.

The question of connecting these two populations via bridge ridges located within north-western Iran is still open and needs more detailed research.

In Iran, according to the last information provided by expert E. M. Moqanaki (2017), Leopard occurs in the following PAs: Arasbaran Protected Area and National Park, Kantal National Park and Kiamaki wildlife Refuge, Dizmar Protected Area,¹² Marakan Protected Area, Siahroud Roudbar, Sarvelat va javaherdasht and Gashtrudkhan Protected Areas, also Dorfak-Deylaman No Hunting Area (see also Table 2).

Table 1. Number of photo and video records of Leopard obtained in the period of August 2014 - June 2019 in the South-Eastern Lesser Caucasus (from the Khosrov Reserve to Nakhchivan) and the Talysh Mountains

Area/ Time period	Camera-trap sites	Leopard photos/videos	Female and male together	Female with cubs	Identified Leopards	Killed Leopards reported
Nakhchivan, AZ, 11/2014-06/2019	80	251/66	6	10	10	0
Talysh, AZ 05/2015-06/2019	21	23/3	0	1	6	1
S. Armenia 09/2014-06/2019	72	53/23	0	0	8	0

Notes: (a) a sequence of images/footages taken within several minutes at the same site was counted as one photo/video; (b) among four Leopards (2 ♀ and 2 ♂) forming 3 coupling combinations, Leopards Eve ♀ and Basat ♂ are caught together only once, Eve ♀ and Araz ♂ are caught on two occasions, Burla ♀ and Basat ♂ – on three occasions; (c) six records of a female with cubs in Nakhchivan show Eve and four records show Burla; (d) several of the same individuals have been recorded in Nakhchivan and in Armenia; three animals have been identified for Armenia that have not been recorded in Nakhichevan; it means that during the observation period the total number of identified individuals for southern Armenia-Nakhchivan/Azerbaijan is not 11+8, but 11+3=14 individuals.

Table 2. C1/Hard Fact records in Iranian Caucasus since 2008

#	Year	Number of observations	Locality	Province
1	2008	1	Dorfak-Deylaman No Hunting Area	Gilan
2	2012	1	Dorfak-Deylaman No Hunting Area	Gilan
3	2015	3	Dorfak-Deylaman No Hunting Area	Gilan
4	2016	1	Dorfak-Deylaman No Hunting Area	Gilan
5	2006	1	Siahroud Roudbar Protected Area	Gilan
6	2010	1	Siahroud Roudbar Protected Area	Gilan
7	2014	1	Sarvelat va javaherdasht Protected Area	Gilan
8	2016	1	Sarvelat va javaherdasht Protected Area	Gilan
9	2015	1	Gashtrudkhan Protected Area	Gilan
10	2008	2 times	Kantal National Park	East Azarbaijan
11	2009	5 times	Kantal National Park	East Azarbaijan
12	2014	1	Kantal National Park	East Azarbaijan
13	2015	1	Kantal National Park	East Azarbaijan

¹² In Iran the term “protected area” has two meanings: (a) protected area as a common term and (b) Protected Area as one of the categories of protected area management in Iran (approximately corresponding to the IUCN Category IV).

Within the framework of the Programme of Persian Leopard reintroduction in the Russian Federation, three individuals were released in the Western Greater Caucasus in 2016: one female and two males were reintroduced to the Kavkazsky Biosphere Reserve (WWF 2016), but unfortunately, two of them have not survived (one was poached outside the Reserve's border and one died of unclear causes). In 2018, one male was added to that population (WWF-Russia's and internet information).

A small population appears to have survived in the Eastern Greater Caucasus: in February 2015, one individual was occasionally recorded on video in Dagestan/Russian Federation, close to Tlyarata Managed Nature Reserve (Yarovenko & Zazanashvili, 2016). Two further sightings were reported in North Ossetia (Interfax 2017). Also, two more individuals were released here from Sochi Leopard Breeding Centre in July 2018 (WWF 2018).

This year (2020), it is planned to release five Leopards in the Western Greater Caucasus and North Ossetia (WWF Russia's information).

As for the 4th "island" of Leopard occurrence – Iori plateau and Turianchay Nature Reserve¹³ (eastern Georgia, north-western Azerbaijan), located between the Greater and Lesser Caucasus - one male Leopard was frequently caught by camera-traps in Vashlovani National Park (Georgia) between 2004 and 2008 (Lortkipanidze, Darchiashvili, Kopaliani, 2004). Its footprints were also observed on the left bank of the Alazani river in the Akhar-Bakhar section of Ilisu Nature Reserve (Azerbaijan). However, since 2009 this individual has not been recorded again (Presentation of B. Lortkipanidze, NACRES at the regional Leopard conservation workshop, Tbilisi, October 2014). Expert V. Lukarevsky, who surveyed the area in May 2019, has concluded that currently there are no Leopards within the whole of this Conservation Landscape, which is generally rich in wildlife.

More surveys need to be conducted in the Turkish Caucasus for the presence of Leopard in this part of the ecoregion, especially in its eastern part, close to the state border with the countries where the species occurs (Spasov, Ignatov & Acosta-Pankov, 2016).

Striped Hyena

The Striped Hyena (*Hyaena hyaena*) is on the verge of extinction in the Caucasus. This globally Near Threatened (NT) species (AbiSaid & Dloniak, 2015) is included in the Red Lists or Red Data Books of Armenia, Azerbaijan, Georgia and the Russian Federation as Critically Endangered.

The Striped Hyena used to be widespread in the eastern Caucasus, mostly in dry landscapes (semideserts, steppes and dry open Pistachio-Juniper woodlands) from lowlands to middle mountains (Heptner & Sludsky, 1972; Tembotova, 2015), but Hyena number decreased drastically in the first half of the 20th century mostly due to their persecution by hunters. According to N. Vereschagin (1959), in the 1930s, a small population of Hyena survived in sparsely populated areas of western Azerbaijan and eastern Georgia: between 1930 to 1940, 26 individuals were killed in the area and only 5-6 during next 10 years, indicating a strong negative trend. In Georgia, from 1950 to 1970, only one to two individuals were recorded each year, mostly in remote gorges of the Vashlovani Strict Nature Reserve and in sanctuaries along the Iori river floodplain.

In Armenia, after more than 60 years with no sightings, in October 2010, a dead Striped Hyena was found entangled on an orchard's barbed-wire fence in the extreme south of the country (WWF 2010; Khorozyan, Malkasyan & Murtskhvaladze, 2011).

In Azerbaijan, since 2003 Hyena has been recorded a few times in Zuvand (dry, upper part of Talysh mountains) and in arid landscapes around Mingechevir Water Reservoir. The last hard evidence (photo) is dated May 2009 in north-eastern Azerbaijan, Shabran district (Baghirov & Aliyev, 2013).

¹³ We use the term "Nature Reserve" or "State Nature Reserve" (Zapovednik in Russ.) as synonyms of Strict Nature Reserve, IUCN Category I. Kavkazsky and Teberdinsky Biosphere Reserves in Russia also correspond to that category.

In the mid 1990s, researchers from the NACRES found traces of Hyena in arid landscapes of eastern Georgia at the border with Azerbaijan (Mills & Hofer, 1998; Butkhuzi, 2002), but since that time no more hard evidence has been documented in the country. The same unpromising status is communicated by the Department of Environment of Iran.

There have been no recent sightings of Hyena in the Turkish Caucasus (Kasperek et al., 2004). The last record was in 1970 when one individual, which was shot and injured by villagers in Sebinkarahisar district (Giresun province), was later found dead in a garden. The pelt of the animal was sold to a rich man in Ankara (Ref: Ahmet Emre Kütükçü, upon personal communication with locals).

Therefore, before discussing conservation measures for survival of Striped Hyena, comprehensive regional surveys need to be taken to identify if the animal is extant in the Caucasus.

Eurasian Lynx

Eurasian Lynx (*Lynx lynx*)¹⁴ is categorized in the IUCN's Red List as Least Concern (LC) (Breitenmoser, U. et al., 2015), but special studies to assess the species' status in the Caucasus ecoregion have never been conducted. One field study was carried out in Iran in a single protected area located outside the boundaries of the ecoregion (Moqanaki et al., 2015).

In the Soviet Union, for a long time the Lynx's fur was considered as a natural resource; statistics on the number of killed animals can therefore be considered to be an indicator of population dynamics. In the Russian Caucasus:

- between 1924-1932, from 54 to 152 animals were killed per year;
- between 1956-1960, an average of 63 animals a year;
- between 1961-1970, an average of 29 animals;
- between 1971-1975, an average of 30 animals; and
- between 1971-1975, an average of 14.5 animals (Red Data Book of Krasnodar Krai 2007-2008).

As Armenia, Azerbaijan and Georgia at that time were part of Soviet Union, the same negative trend can be extrapolated to the South Caucasus.

The same source indicates that an opposite trend was observed after 1975, particularly between 1980-2005, when the number of Lynx in the North Caucasus increased from 140 to 550. This trend can also be extrapolated to the South Caucasus. The reason for this reversal is that since the 1980s in the USSR and its successor states, more attention has been paid to nature conservation. The first Red Data Books were published in the 1980s and enforced; e.g. Lynx was included in the Red Data Books of Georgia (Kacharava et al., 1982) in the category "species on the verge of extinction" and Azerbaijan in the category "rare subspecies" (Aleksperov, 1989).

It needs to be underlined that even in case of the North Caucasus we are talking only about a trend, not about exact numbers: data are provided mostly by hunting authorities rather than conservation authorities and are not fully reliable. According to today's assessments, the species occurs in the Russian Caucasus in small numbers (Kavkazsky 2018). Reliable data provided by Prof. Dr. A.N. Kudaktin via personal communication to the Red Data Book of Krasnodar indicates 12-16 individuals for Kavkazsky Biosphere Reserve. In Sochi National Park, no Lynx were recorded during the regular winter census in 2018 (Sochi National Park 2019), which indicates that the number of individuals is very low.

¹⁴ The subspecies of Eurasian Lynx distributed in the Caucasus mountains, south to Turkey, Iraq and Iran is identified as *Lynx lynx dinniki* (Satunin, 1915; Breitenmoser, U. et al., 2015)

Eurasian Lynx, Vashlovani National Park, Georgia

The current situation in the South Caucasus appears to be better than in the North. WWF's and its partner organizations' camera-trap photo-video materials show that this species is quite widespread in the South Caucasus: Lynx occur in many forested PAs here. During the last 5-6 years, camera-trap materials depicting Lynx (sometimes with cubs) have been obtained from the following PAs:

- in Armenia – Arevik National Park, Khosrov Forest State Reserve, Shikahogh State Nature Reserve, Khustup and Zangezur Managed Nature Reserves;¹⁵
- in Azerbaijan – Zagatala State Nature Reserve, Illisu State Nature Reserve (including Akhar-Bakhar section), Shakhdag National Park, Korchay Strict and Managed Nature Reserves, Hyrcan National Park, Zangezur National Park;
- in Georgia – Lagodekhi Strict and Managed Nature Reserves, Tusheti, Vashlovani and Borjomi-Kharagauli Strict Nature Reserves and National Parks, Pshav-Khevsureti National Park and Managed Nature Reserve, Mtirala and Kintrishi National Parks. In addition, Lynx was registered outside PAs as well.

The species is widespread in the Iranian Caucasus, occurring in the following PAs: Arasbaran Biosphere Reserve, Kantal National Park and Kiamaki wildlife Refuge, Marakan Protected Area, Lisar Protected Area and Dorfak-Deylaman No Hunting Area (Mousavi et al., 2016).

The most recent assessment for the Turkish Caucasus puts the number of individuals at between 100-200 with a decreasing trend (Kütükçü, 2019). The main reason for the trend could be habitat fragmentation and conversion of natural habitats into urban and agricultural lands.

It is not possible to give a more accurate assessment of the status of Lynx in the Caucasus without a dedicated study.

¹⁵ Managed Nature Reserve – this term is used for protected areas that are differently named in different countries of the region, but all of them more or less correspond to the IUCN Category IV – Habitat/Species Management Area; synonyms of it are e.g. Nature Sanctuary, Sanctuary, Wildlife Refuge, in Russ. – Zakaznik.

Brown Bear

The Brown Bear (*Ursus arctos*) is a keystone species¹⁶ and top predator in the food chain in most habitats in the Caucasus. Together with Leopard, the Brown Bear serves as an indicator, reflecting the state of ecosystems and biodiversity as a whole. Brown Bear has a wide range and occupies mountain forests but it also occurs in high mountain meadows, mountain steppes, flood plain forests and open woodlands in foothills and low mountains; it occurs in almost all forested and many non-forested PAs of the Caucasus. Poaching is the main threat along with habitat loss. While the Brown Bear is categorised in the IUCN Red List as LC (McLellan et al., 2017), in the National Red Data Books or Lists of South Caucasus countries (Armenia, Azerbaijan and Georgia) it is assessed as being at higher risk. Together with Grey Wolf, Brown Bear is a main “actor” in human-wildlife conflicts reported from many rural areas of the region.¹⁷

B. Lortkipanidze (2010) tentatively assesses the Brown Bear population in the South Caucasus countries (Armenia, Azerbaijan, Georgia) as 2,000-2,500. A.C. Burton et al. (2018), based on a study conducted in May-October in Vayots Dzor district of Armenia, write: “Bears occurred throughout most of our study area, and the estimated density - 59 Bears/1,000 km², corresponding to an abundance of 171 Bears across our 2,900 km² state-space — exceeds estimates for many Brown Bear populations in North America and Europe. Furthermore, it exceeds previous ad hoc estimates from the South Caucasus by nearly 5-fold (13/1,000 km²-Lortkipanidze, 2010), highlighting the risk of relying on limited data for local and regional conservation planning. Without extending our surveys spatially and temporally, it is difficult to know whether our study area supported a high density of Bears or densities in other areas have been underestimated”.

According to official data provided by the Department of Environment of Iran, Brown Bear is common in the Iranian Caucasus too (Moqanaki, 2017). Brown Bear occurs in the following PAs: Lisar, Siahroud Roudbar, Sarvelat va javaherdasht, Gashtrudkhan Protected Areas and Dorfak-Deylaman No Hunting Area,

Brown Bear with cubs, Kavkazsky Biosphere Reserve, Russia



© S. Trepel, Kavkazsky Biosphere Reserve, Russia

¹⁶ A keystone species is a species that has a disproportionately large effect on its environment relative to its abundance. Keystone species play a critical role in maintaining the structure of an ecological community, affecting many other organisms in an ecosystem and helping to determine the types and numbers of various other species in the community.

¹⁷ In general, Grey Wolf, Brown Bear and Leopard are the main carnivores involved in human-wildlife conflict worldwide (Torres, Oliveira & Alves, 2018). In the Caucasus, the Leopard is occasionally registered as the actor of the conflict with humans that could be explained by low number of Leopards in the region.

Arasbaran Protected Area and National Park, Kantal National Park and Kiamaki Wildlife Refuge, and Dizmar Protected Area. DNA analysis of Bear scats shows an abundance of the animal in Arasbaran Biosphere Reserve – 40 individuals (2.5–97.5% Bayesian Credible Intervals = 27–70; density = 4.88 bears/100 km²) (Moqanaki et al., 2018); there are also reports of human-Bear conflict from some parts of Iranian Caucasus.

In the North Caucasus, Kavkazsky Biosphere Reserve reports around 400 individuals in early summer (Ministry of Natural Resources and Ecology of the Russian Federation 2017). There is also information indicating 80-90 individuals in Teberdinsky Biosphere Reserve (Donbay info 2015). In the early 2000s, 240 to 330 individuals were counted in Sochi National Park (Laysheva, 2006); today the Park still reports 211 individuals as a mean number from long-term surveys, and an actual number of 265 (Sochi National Park 2019). However, it needs to be considered that at least 80% of individuals inhabiting Kavkazsky Biosphere Reserve and Sochi National Park is a shared population (about 300 individuals); this means that the bear population in these two large protected areas together is still high, at slightly less than 400 individuals (Trepets et al., 2020).

It seems that, within Russia, in the eastern part of Greater Caucasus the population is lower, perhaps because coverage by PAs is much lower in the east; still, the species occurs in all PAs in this part of the ecoregion too (National Park Alania, Erzi State Nature Reserve, Tlyaratinsky Federal Managed Nature Reserve, etc.); Severo-Ossetinsky Nature Reserve (around 30,000 ha) reports a population of 30-35 individuals (ru.wikipedia 2019).

Totally, the Brown Bear population in the Russian Caucasus could be estimated as 2,000-2,100 individuals (WWF Russia's information).

In the Turkish Caucasus, according to an estimate made by A.E. Kütükçü (2019), Brown Bear population size could be from 500 to 1,000 individuals with a decreasing trend: Brown Bear occur in almost all PAs located within the Turkish Caucasus.

Conclusions

Based on the above review, we can state that the Striped Hyena has the worst status among carnivores in the Caucasus ecoregion.

The Leopard's status has improved considerably during last decade, but the species is still at risk in the ecoregion and active conservation measures need to be continued, including science-based monitoring with the engagement of local enthusiasts, measures for mitigation of human-wildlife conflicts and awareness raising. The Leopard is the main focal species for the Eastern Lesser Caucasus ecological corridor, which is under creation within WWF's Eco-Corridors Fund project (ECF) supported by the German Government (BMZ/KfW)¹⁸. The project is being implemented in close cooperation with the local population and significantly contributing to the conservation of Leopard and other focal species in the region.

The Eurasian Lynx is evidently common for the Caucasus forest areas, but the lack of dedicated studies does not provide an opportunity for more accurate assessments of the species' status.

Brown Bear has the best status of the four large carnivores discussed in this chapter, but even for this species, regional studies need to be conducted to determine more exactly the status of the different Bear populations and the existing threats.

The situation with law enforcement within PAs appears to be satisfactory in every part of the region. Conservation efforts need to focus on species protection outside PAs: measures could include line-type and further creation of stepping-stone type ecological corridors with the active involvement of the local population, and implementation of anti-poaching activities and other measures.

¹⁸ <https://www.ecfcaucasus.org>

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References

- AbiSaid, M. & Dloniak, S.M.D. 2015. *Hyaena hyaena*. *The IUCN Red List of Threatened Species* 2015: e.T10274A45195080. <http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T10274A45195080.en>. Downloaded on 14 May 2019.
- Alekperov Kh.M. (1989): Lynx. Pp. 31-32 in Adigozelov B.M., Alekperov U.K., Musayev M.A., eds. *The Red Data Book of Azerbaijan SSR*. Ishyg, Baku. [In Azer. and Russ].
- Askerov E., Talibov T., Manvelyan K., Zazanashvili, N., Malkhasyan, A., Fatullayev, P., & Heidelberg, A. (2015): South-Eastern Lesser Caucasus: the most important landscape for conserving the Leopard (*Panthera pardus*) in the Caucasus region (Mammalia: Felidae). *Zoology in the Middle East*, 61, 95-101.
- Askerov E., Talibov T., Manvelyan K., Zazanashvili, N., Fatullayev, P., & Malkhasyan, A. (2019): Leopard (*Panthera pardus*) reoccupying its historic range in the South Caucasus: a first evidence (Mammalia: Felidae). *Zoology in the Middle East*, 65, 1, 88-90.
- Avgan, B., Huseynali, T. T., Ismaylov, A., Fatallayev, P., Askerov, E., & Breitenmoser, U. (2012): First hard evidence of Leopard in Nakhchivan. *Cat News*, 57, 33.
- Baghirov, H.S. & Aliyev, J.A. (co-chairmen of editorial staff) (2013): *Red Book of Azerbaijan Republic*. Baku. [In Azer. and Engl.].
- Breitenmoser, Ch., Breitenmoser, U., Mallon, D., & Zazanashvili, N. (2007): Strategy for the conservation of the Leopard in the Caucasus ecoregion. Results from the Strategic Planning Workshop on Leopard Conservation in the Caucasus. Tbilisi, Georgia, 30 May - 1 June 2007. WWF, IUCN and Cat Specialist Group.
- Breitenmoser, U., & Breitenmoser, Ch., eds. (2007): Status and conservation of the Leopard in the Caucasus. *Cat News*, Special Issue, 2, 1-40.
- Breitenmoser, U. (2010): Large carnivore in the Caucasus. Report of a Symposium at the 19th International Conference on Bear Research and Management, 18 May 2010, Tbilisi (Georgia). Convention on the Conservation of European Wildlife and Natural Habitats.
- Breitenmoser, U., Breitenmoser-Würsten, C., Lanz, T., von Arx, M., Antonevich, A., Bao, W. & Avgan, B. 2015. *Lynx lynx* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2015: e.T12519A121707666. Downloaded on 16 May 2019.
- Breitenmoser, U., Askerov, E., Soofi, M., Breitenmoser-Würsten, Ch., Heidelberg, A., Manvelyan, K., & Zazanashvili, N. (2017): Transboundary Leopard conservation in the Lesser Caucasus and the Alborz Range. *Cat News*, 65, 24-25.
- Burton, A.C., Fisher, J. T., Adriaens, P., Treweek, J., Paetkau, D., Wikstrom, M., Callender, A., Vardanyan, R., Stepanyan, A. (2018): Density and distribution of a Brown Bear (*Ursus arctos*) population within the Caucasus biodiversity hotspot. *Journal of Mammalogy*, 99, 1249-1260.
- Butkhuzi, L. (2002): Striped riddle. In Macharashvili, I., ed. Hyena, Giurza, etc. NACRES, Tbilisi. [In Georg.].
- Caucasus Leopard Working Group 2017. Strategy for the Conservation of the Leopard in the Caucasus Ecoregion. Revised Version 2017. IUCN/SSC Cat Specialist Group, Muri b. Bern, Switzerland and WWF Caucasus Office, Tbilisi, Georgia. 29 pp.

- Donbay info 2015. Animal World [In Russ.]. - <http://www.dombayinfo.ru/zapovednik/animal/print>
- Interfax 2017. In North Ossetia second time in this year was observed Leopard that considered as extinct [In Russ.]. - <https://www.interfax.ru/russia/586293>
- Heptner, V.G. & Sludsky, A.A. (1972): *Mammals of the Soviet Union*. Vol. 2. Carnivores (Hyenas and cats). Vysshaya Shkola, Moscow. [In Russ.].
- Kavkazsky 2018. Animals which we protect [In Russ.]
- Kitchener, A. C., Breitenmoser-Würsten, Ch., Eizirik, E., Gentry, A., Werdelin, L., Wilting, A., Yamaguchi, N., Abramov, A., Christiansen, P., Driscoll, C., Duckworth, W., Johnson W., Luo, S.-J., Meijaard, E., O'Donoghue, P., Sanderson J., Seymour, K., Bruford, M., Groves, C., Hoffmann, M., Nowell, K., Timmons, Z., & Tobe, S. (2017): A new taxonomy of the Felidae. The final report of the Cat Classification Task Force of the IUCN Cat Specialist Group. *Cat News Special Issue*, 11, 1-88.
- Khorozyan, I., & Abramov, A. V. (2007): The Leopard, *Panthera pardus* (Carnivora: Felidae) and its resilience to human pressure in the Caucasus. *Zoology in the Middle East*, 41, 11--24.
- Khorozyan, I., Cazon, A., Malkhasyan, A. G., & Abramov, A. V. (2007): Using thin-layer chromatography of fecal bile acids to study the Leopard (*Panthera pardus ciscaucasica*) population. *Biology Bulletin*, 34, 361–366.
- Khorozyan, I., Malkasyan, A. & Murtskhvaladze, M. (2011): The Striped Hyena *Hyaena hyaena* (Hyaenidae, Carnivora) rediscovered in Armenia. *Folia Zool.* 60, 3, 253-261.
- Kopaliani, N., Gurielidze, Z., Tevzadze, G., Shakarashvili, M., Qurkhuli, T. (2009). Human-wolf conflict in Georgia. Report, Ilia State University, Tbilisi. [in Georg.]. DOI: 10.13140/RG.2.2.28808.26886
- Kütükçü, A.E. (2019): Unpublished report on status of large carnivores in Turkish Caucasus. WWF-Turkey.
- Laysheva, O.A. (2006): Brown Bear of Western Caucasus: ecology, behavior, protection. Abstract of PhD thesis. [In Russ.]. -<http://earthpapers.net/buryy-medved-zapadnogo-kavkaza-ekologiya-povedenie-ohrana>
- Lortkipanidze, B. (2010): Brown Bear distribution and status in the South Caucasus. *Ursus* 21, 1, 97-103.
- Lortkipanidze, B., Darchiashvili, G., Kopaliani, N. 2004. Leopard in Georgia (new evidence). Proceedings of the Institute of Zoology (Georgian Academy of Sciences), 22, 325-328. [In Georg. with Engl. sum.].
- Lukarevsky, V., Akkiev, M., Askerov, E., Agili, A., Can, E., Gurielidze, Z., Kudakti, A.N., Malkhasyan, A. & Yarovenko, Yu. (2007): Status of the Leopard in the Caucasus. *Cat News*, Special Issue, 2, 15–21.
- McLellan, B.N., Proctor, M.F., Huber, D. & Michel, S. 2017. *Ursus arctos* (amended version of 2017 assessment). *The IUCN Red List of Threatened Species* 2017:e.T41688A121229971.
- Maharramova, E., Moqanaki, E.M., Askerov, E., Faezi, S., Alinezhad, H., Mousavi, M., Kuemmerle, T., Heidelberg, A., & Zazanashvili, N. (2018): Transboundary Leopard movement between Azerbaijan and Iran in the Southern Caucasus. *Cat News*, 67, 8-10.
- Mills, M.G.L. & Hofer, H. (compilers) (1998): Hyaenas. Status Survey and Conservation Action Plan. IUCN/SSC Hyaena Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. vi + 154 pp.
- Ministry of Natural Resources and Ecology of Russian Federation 2017. On the results of Bear survey in June, 2017 in Kavkazsky Zapovednik [In Russ.]. - <http://www.kgpbz.ru/node/1129>
- Moqanaki, E. M. (2017): Conservation planning for Leopard in the Iranian Caucasus. Unpublished report. Tehran, Iran. [In Farsi].
- Moqanaki, E. M., Jafarzadeh, F., Hosseini-Zavarei, F. & Farhadinia, M. S. (2015): Assessing the status of the Eurasian Lynx (*Lynx Lynx*) in Anguran Wildlife Refuge using multiple survey methods. *Iranian Journal of Animal Environment*, 7, 47-56. (In Farsi with Engl. abstract).
- Mousavi, M., Moqanaki, E.M., Farhadinia, M.S., Adibi, M.A., Rabee, K. & Khosravi, S. (2016): The largest lesser cat in Iran – current status of Eurasian Lynx. *Cat News*, special issue 10, 33-37.
- Moqanaki, E. M., Jimenez, J., Bensch, S., Vicente Lopes-Bao, J. (2018): Counting Bears in the Iranian Caucasus: Remarkable mismatch between scientifically-sound population estimates and perceptions. *Biological conservation*, 220, 182-191.

- Kacharava, V., Ketskhoveli, N., Maruashvili, L., Kurashvili, B., eds. (1982): Red Data Book of Georgian SSR. Acad. of Sci. of Georgian SSR and Tbilisi State University, Sabchota Sakartvelo, Tbilisi.
- Red Data Book of Krasnodar Krai 2007-2008. <http://mprkk.ru/redbook/index.htm> Department of Biological Resources and Environment Protection of Krasnodar Krai. [In Russ.]. ru.wikipedia 2019. Severo-Osetinsky Zapovednik [In Russ.]. - https://ru.wikipedia.org/wiki/Северо-Осетинский_заповедник
- Sanei, A., Mousavi, M., Kiabi, B. H., Masoud, M. R., Mardi, E. G., Mohamadi, H., Shakiba, M., Zehi, A. B., Teimouri, M., & Raeesi, T. (2016): Status assessment of the Persian Leopard in Iran. *Cat News Special Issue*, 10, 43-50.
- Satunin, K.A. (1915): *Mammals of the Caucasus region*. Vol. 1. Chancellery of the Caucasus Governor, Tiflis. [In Russ.].
- Sochi National Park 2019: Unpublished report on animal census in Sochi National Park. Sochi National Park, Russian Federation. [In Russ.].
- Spassov, N., Ignatov, A. & Acosta-Pankov, I. (2016): On the status of the Leopard in Turkey, again. *Cat News*, 64, 18-22.
- Stein, A.B., Athreya, V., Gerngross, P., Balme, G., Henschel, P., Karanth, U., Miquelle, D., Rostro-Garcia, S., Kamler, J.F., Laguardia, A., Khorozyan, I. & Ghoddousi, A. 2016. *Panthera pardus* (errata version published in 2016). *The IUCN Red List of Threatened Species* 2016: e.T15954A102421779. <http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T15954A50659089.en>. Downloaded on 17 May 2019.
- Tembotova, F.A. (2015): *Mammals of the Caucasus and its sea waters, key book*. Russian Academy of Sciences, A.K. Tembotov Institute of Ecology and Mountain Areas. [In Russ.].
- Torres, D.F., Oliveira, E.C. & Alves, R.R.N. (2018): Conflicts between humans and terrestrial vertebrates: a global review. *Tropical conservation science*, 11, 1-15.
- Trepet, S.A., Eskina T.G., Pkhitikov A.B., Kudaktin A.N., Bibina K.V. (2020): Modern condition and dynamics of the Brown Bear population (*Ursus arctos meridionalis*) within the Western Caucasus. *Zoological Journal*, 99, 3, 1-10. [in Russ.].
- Williams, L., Zazanashvili, N., Sanadiradze, G., & Kandaurov, A. (Eds.) (2006): *An ecoregional conservation plan for the Caucasus*. WWF, BMZ, KfW, CEPF, MacArthur Foundation, Tbilisi.
- WWF 2010. WWF discovers Striped hyaena in Armenia for the first time after more than 60 years of disappearance. – <http://wwf.panda.org/?195611/WWF-discovers-Striped-hyaena-in-Armenia-for-the-first-time-after-more-than-60-years-of-disappearance>
- WWF 2016. Persian Leopards return to the Caucasus. – <https://www.worldwildlife.org/stories/persian-leopards-return-to-caucasus>
- WWF 2018. Two Persian Leopards released into the wild of North Ossetia. – http://wwf.panda.org/wwf_news/press_releases/local_press_releases/?331912/Two-Persian-Leopards-released-into-the-wild-of-North-Ossetia
- Yarovenko, Yu. & Zazanashvili, N. (2016): Recent hard evidence for the occurrence of the Leopard, *Panthera pardus* (Mammalia: Felidae), in the Eastern Greater Caucasus. *Zoology in the Middle East* 62, 1: 88-90.

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STATUS OF LARGE HERBIVORES IN THE CAUCASUS

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Contents: Introduction; Eastern and Western Turs; Bezoar Goat; Mouflon; Goitered Gazelle (Djeiran); European Bison (Wisent); Northern Chamois; Red Deer; Conclusions; Acknowledgements; References; Suggested citation.

Introduction

Ten species of large herbivores are found over a relatively small area of the Caucasus today: East Caucasian (Eastern) and West Caucasian (Western) Turs (*Capra caucasica* and *Capra cylindricornis*)¹⁹, Bezoar Goat (*Capra aegagrus*), Northern Chamois (*Rupicapra rupicapra*), Mouflon (*Ovis orientalis*)²⁰, Red Deer and particularly its Caucasian subspecies (*Cervus elaphus maral*)²¹, Goitered Gazelle (*Gazella subgutturosa*)²², European Bison (*Bison bonasus*)²³, European Roe Deer (*Capreolus capreolus*) and Wild Boar (*Sus scrofa*).

An eleventh species - Saiga Antelope (*Saiga tatarica*) - was frequently observed by one of the co-authors of this review (N. Zazanashvili) during the springs of 1987 and 1988 in herds of 80–120 in their natural habitat on the Kizlyar steppes and semideserts in northern Dagestan, which is part of the ecoregion (Zazanashvili & Bolkvadze, 1989). Nowadays, it seems this globally Critically Endangered species, which historically was distributed even into the north-eastern corner of the South Caucasus, is extinct in the region mostly due to the dramatic decline of the Kalmykia source population (Kuznetsov & Lushchekina, 2002; Neronov et al., 2013). Consequently, Goitered Gazelle is the only remaining representative of the Antilopinae subfamily in the Caucasus.

From the ten large herbivore species listed above, five are considered to be globally threatened: Western Tur - Endangered (EN), Bezoar Goat, Mouflon, Goitered Gazelle and European Bison - Vulnerable (VU). The status of Eastern Tur was reassessed several years ago: the species is now categorised in the IUCN Red List as Near Threatened (NT), though it is still listed as nationally threatened in the Red List of Georgia. Two other species are listed as nationally threatened in the Red Lists/Books of South Caucasus countries: Red Deer (Armenia, Azerbaijan and Georgia) and Northern Chamois (Azerbaijan and Georgia).

This review is focused on the five globally threatened species and the three species listed as threatened in the National Red Lists/Books.

¹⁹ There is no consensus among scientists as to whether Eastern and Western Turs are separate species (Lydekker, 1913; Nasimovich, 1950; Tsalkin, 1955; Sokolov, 1959; Vereshchagin, 1959; Heptner et al., 1961; Ellerman & Morrison-Scott, 1966; Kotov, 1968; Kuliev & Mamedov, 1974; Schaller, 1977; Baryshnikov 1981; Aiunts & Kolomyts, 1986; Veinberg, 1993; Kazanskaya, 2007; Weinberg, Akkiev & Buchukuri, 2010, and others). The IUCN Red List refers to them as separate species.

²⁰ According to the last assessments accepted by IUCN (Valdez, 2008), all Mouflons and Urials are considered to be one species (*Ovis orientalis* Gmelin, 1774). At the subspecies level, the IUCN Red List recognises *Ovis orientalis gmelinii* (with the common name Armenian Sheep) as a taxa occurring within the boundaries of the Caucasus (see <https://www.iucnredlist.org/species/15739/5076068#taxonomy>). However, there are still different, sometimes controversial, opinions about the taxonomy of Mouflon species and subspecies (Shackleton & Lovari, 1997; Valdez, 2011a). Taxonomic disputes do not change the actual status of Mouflon, which differs morphologically from all neighbouring wild sheep taxa.

²¹ Caucasian Red Deer, together with Crimean (*C. e. braueri*) and European (*C. e. elaphus*) subspecies, are now considered as more closely related to each other forming the elaphus group of subspecies (Gubb, 1990; Grubb & Gardner, 1998).

²² Previously a single species, Goitered Gazelle (*Gazella subgutturosa*), commonly known in the Caucasus as Djeiran, was recently divided into two: Goitered Gazelle, retaining the original Latin name, and Arabian Sand Gazelle (*Gazella marica*) (Wacher, 2010; IUCN SSC Antelope Specialist Group 2017).

²³ Bison taxonomy is contradictory. Some authors consider American and European Bison as a single species due to genetic closeness and despite evident morphological differences, others as two separate species: European (*Bison bonasus*) and American (*Bison Bison*) (see Danilkin, 2005).

Eastern and Western Tur

Turs are endemics of the Caucasus and particularly of the Greater Caucasus mountain range. Turs occur in all three countries sharing the Greater Caucasus: Georgia, Azerbaijan and Russian Federation.

The westernmost area still harbouring Tur is Mt. Abago in the Tchugush mountain massif in Adygea. The eastern limit is quite distinct, being situated on Mt. Babadagh massif in Azerbaijan. The total length of the contemporary area of distribution is about 750 km with a width of up to 65 km in the basins of the Avar Koisu and Andi Koisu rivers in Dagestan (Magomedov, Akhmedov & Yarovenko, 2001), and up to 80 km closer to Mt. Elbrus (Zalikhanov, 1967; Kopaliani & Gurielidze, 2009; M. Akkiev pers. comm.). The area of distribution is narrowest (about 12 km) in North Ossetia (Veinberg, 2000). Tur are mostly absent from the southern branches of the Greater Caucasus' Main (Watershed)²⁴ Range such as the Kodori and Svaneti ranges in Georgia (Gavashelishvili, 2004; Kopaliani & Gurielidze, 2009). Because of the steepness and narrowness of the southern slope of the Greater Caucasus, especially its eastern part, the Tur's range there is naturally narrow. The situation is better on the northern slope, which is considerably wider and where animals usually inhabit the parallel structural ranges of the Greater Caucasus, mainly in Kabardino-Balkaria and partly in Karachay-Cherkessia (Zalikhanov, 1967; M. Akkiev pers. comm.) and North Ossetia.

In the late 1960s and early 1970s, the total number of Tur in the North Caucasus was estimated at 46,000 animals (Ravkin, 1975). These data are fairly reliable, except those for Krasnodar region, including the Kavkazsky Biosphere Reserve, where 26,000 and 16,000 animals were counted respectively; this obviously was an overestimation. Later, a revised estimate for that period based on the same census results put the number in the Kavkazsky Biosphere Reserve at a maximum of 6,900, (Romashin, 2001; Trepet, 2014). We can conclude that the number of Tur in the North Caucasus was around 35,000.

Western (West Caucasian) Tur, Kavkazsky Biosphere Reserve, Russia



© S. Trepet, Kavkazsky Biosphere Reserve, Russia

²⁴ The Greater Caucasus has a complicated geomorphological structure consisted of three parallel (longitudinal) Ranges (Main, Side and Rocky) and many perpendicular (lateral) branches. The Main or Watershed Range of the Greater Caucasus is the Range that forms the watershed between the north-flowing and south-flowing waters belonging to the Black Sea's (in the western part) and the Caspian Sea's (in the eastern part) catchment basins. The Side Range is located to the north of and close to the main Range; the highest points of the Greater Caucasus – Mount Elbrus (5,642 m), Kazbegi peak and some others – are situated on the Side Range. The Rocky Range is the final Range to the north and the lowest of the three.

In Georgia, the number started to fall in the mid-seventies (Eriashvili, 1990). The population also fell in Russia, but starting later, in the mid-1980s, continuing through the 1990s during the disintegration of the Soviet Union. The decline was the most drastic in the western Caucasus and North Ossetia, and particularly evident in Nature Reserves (Kavkazsky, Teberdinsky and Severo-Ossetinsky) where numbers dropped by up to two thirds (Romashin, 2001; Trepets, 2014; Weinberg, 2000). The situation was considerably better in Kabardino-Balkaria and Dagestan.

On the northern slope of the Greater Caucasus in Russia, the Western Tur is found only west of Teberda, mostly in Krasnodar region and Adygea where the majority of animals inhabit the Kavkazsky Biosphere Reserve (Trepets, 2014); only a little more than 100 individuals occur outside the reserve (State Report on status of land-use and nature conservation in Krasnodar Kray 2018). The number of individuals in the Kavkazsky Biosphere Reserve is considerably lower than in the 1960-80s but still exceeds 3,000 individuals, after having dropped to about 1,000 at the beginning of the 2000s. However, the population trend is distinctly positive now (Trepets, 2018).

In Georgia, the number of Western Tur is very low (Table 1). Tur occurs in Svaneti and probably Racha regions; there is a hybridization zone between the upper reaches of the Enguri and Rioni rivers (Kopaliani & Gurielidze, 2009), which closely corresponds to the headwaters of the Kuban and Bezengi rivers on the northern slope of the Greater Caucasus in Russia. Reports of Western Tur number in Georgia are contradictory. In the 1990s, numbers were estimated to be 2,500 individuals (NACRES 1996) and in the 2000s, 1,000 individuals (Kopaliani & Gurielidze, 2009). Data for 2013 indicates about 100 Western Turs in Georgia (Gurielidze, 2013, 2018), but recent more precise survey in Svaneti region provides a more realistic figure – approx. 520 (Gurielidze, Daraselia, Kerdikoshvili, 2019; Table 1). Such absolutely different figures may have been caused by different approaches to Tur taxonomy or survey methodology.

Tur populations of Karachay-Cherkessia and Kabardino-Balkaria in Russia might be considered as hybrid. Their total numbers are about 12,000 and growing at a moderate rate (State report on status of nature conservation in Karachay-Cherkessia Republic 2014 and 2018; State report on status of nature conservation in Kabardino-Balkaria Republic 2018; Akkiev, 2018). Out of the 12,000, 1,470-1,940 inhabit Teberdinsky Biosphere Reserve and about 500 – Daut Managed Nature Reserve (J. Tekeev, pers. comm.), and up to 6,000 occur in Kabardino-Balkarsky Nature Reserve (M. Akkiev, pers. comm.).

The distribution of the Eastern Tur is much wider and the number is much higher. In Russia, it occurs in North Ossetia, Ingushetia, Chechnya and Dagestan. The total population in the Russian North Caucasus is about 19,000, of which up to 2,300 individuals occur in Severo-Ossetinsky Nature Reserve and Alania National Park, with a positive trend (State report on status of nature conservation in Chechen Republic 2018; Weinberg, 2018; Yu. Yarovenko & A. Yarovenko, 2018).

In Georgia, the species range runs eastwards from the Tergi (Terek) river basin. Numbers reached 3,300 at the beginning of the 2000s. Later, in 2013-14, estimates based on aerial surveys put the number of Tur in Georgia between 3,000 and 5,800 (Table 1).

Table 1. Current Tur numbers

Country	Taxon			Total
	Western Tur	Hybrid	Eastern Tur	
Russia	3,000 ¹	12,000 ^{3,4}	19,000 ^{5,6,7}	34,000
Georgia	520 ²		4,000 ⁸	4,520
Azerbaijan			7,000 –8,000 ⁹	7,000-8,000
Total	3,520	12,000	28,000*	43,520*

Sources: ¹Trepets, 2018; ²Gurielidze, Daraselia, Kerdikoshvili, 2019; ³State report on status of nature conservation in Republic of Kabardino-Balkaria, 2018; ⁴Akkiev, 2018; ⁵State report on status of nature conservation in Chechen Republic 2018; ⁶Weinberg, 2018; ⁷Yarovenko & Yarovenko, 2018; ⁸ average figure from results of surveys in 2012-2014 - Gurielidze, 2013; Report 2015; ⁹this study).

Note: *totals of the Eastern Tur have been calculated considering the transboundary character of the populations in Russia, Georgia and Azerbaijan.

In the mid-1940s, about 2,000 Turs were hunted and killed annually in Azerbaijan (Vereshchagin, 1947). If that data is accurate, the number of individuals in Azerbaijan could have been at least 20,000 animals. The population has declined since then. In 2006-2007, 5,300 Turs were counted on the southern slope, and 1,000 more could have occurred on the northern slope (Guliyev, Weinberg & Askerov, 2009). An overall census has not been carried out in Azerbaijan since then, but extrapolation of results of surveys conducted in summer 2013 came up with more than 13,000 animals (Yarovenko & Weinberg, 2013), which might be an overestimate. It should be noted that even in middle of the last century, Tur density in the eastern section of Azerbaijan's part of the Greater Caucasus (the Shahdag area) was considerably lower than in the western part (in Gabala, Sheki, Gakh and Zagatala districts). Our best estimate of current numbers is the following: total population in Azerbaijan up to 10,000 but more likely to be 7,000-8,000 individuals; of those, in 2018, less than 2,000 occurred in Zagatala and about 1,300 in Ilisu Nature Reserves [A. Muradov's pers. comm.].

Thus, we estimate the total number of the Eastern Tur to be 28,000 (Table 1).

Eastern (East Caucasian) Tur, Lagodekhi State Reserve, Georgia



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Western Tur is listed as Endangered (A2ad) in IUCN Red List (Weinberg, 2008a), and Eastern Tur as Near Threatened (Weinberg, 2008b). Both Tur species are included in the Red List of Georgia: Eastern Tur - as Vulnerable (VU) and Western Tur as Endangered (EN) (Government of Georgia 2014).

Turs, and especially Western Tur, need stronger measures to protect them from poaching, which is the main threat. Measures could include: creation of protected areas in the Svaneti-Racha section of the Greater Caucasus in Georgia; improvement of law enforcement outside protected areas (training, proper equipping of responsible staff, increasing the number of staff); awareness raising of the local population including schoolchildren; engaging with local hunters and creating incentives for them to get involved in species conservation activities). The idea of creating a restoration centre for Western Tur in Georgia also exists (Gurielidze, 2018).

Eastern Tur is a target species for the Ecoregional Corridor Fund (ECF) project, which aims at creating an ecological corridor in the Eastern Greater Caucasus Conservation Landscape in Azerbaijan (see chapter on Conservation Landscapes); the ECF is funded by the German Government (KfW/BMZ).

The CNF with support of WWF and TJS, together with Georgian NGO NACRES and experts from Azerbaijan, recently initiated regular monitoring of Tur (and Red Deer) in the transboundary area of Lagodekhi (Georgia) and Zagatala (Azerbaijan) in the Eastern Greater Caucasus, including satellite monitoring using radio collars which will show patterns of Tur movement and contribute to better planning of conservation actions. The CNF, through a GEF grant, currently runs a wildlife monitoring programme for a number of selected PAs in South Caucasus countries that will also contribute to the stability and improvement of the status of Tur populations.

Bezoar Goat

The Bezoar Goat's geographic range extends from Pakistan to Turkey. In the Caucasus, there are two distinct populations: one inhabits the Lesser Caucasus and is connected with Iranian and Turkish populations; the other inhabits the Greater Caucasus and is isolated from other populations. In the Greater Caucasus, Bezoar Goat occurs in its eastern part, in the river basins of Argun (Georgia and Chechnya), Andi Koisu (Georgia and Dagestan) and Avar Koisu and in Chirakhchai in south-eastern Dagestan (Babaev et al., 2017). In the Lesser Caucasus mountain chain, the species survives only in the its south-eastern part.

Bezoar Goat, Khosrov Forest State Reserve, Armenia



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Being residents of forested steep slopes, it is difficult to survey Bezoars by methods of direct counting traditional for mountain ungulates. This explains the variability in population data for the Greater Caucasus, which were often based on rough estimations provided by state hunting authorities (e.g. Ravkin, 1975; Tochiev, 1975). Data for the Dagestan part of the species' range are the most detailed and presumably more precise, especially for the 1990s-2010s: surveys conducted by zoologists indicated 1,500 animals in the 1990s (Weinberg, 1999) and 2,500 at the end of the 1990s–beginning of 2000s (Magomedov et al., 2014). Thus, the data do not show significant population growth in Dagestan in the 1970s-1990s (Table 2).

Data for Chechnya are poor: estimates for the 1970s suggest 250-600 individuals (Ravkin, 1975; Tochiev, 1975; Batkhiev, 1980) and there are even suppositions that the species is close to extinction or is already extinct there (e.g. Magomedov et al., 2014). In any case, the bulk of the Bezoar Goat population in the Greater Caucasus inhabits Dagestan, where human impact is growing and Bezoar numbers are decreasing; currently there are about 1,500 individuals (Babaev et al., 2017).

All sources for Georgia state that there were just 100-300 animals in Tusheti and Khevsureti from the 1970s to 2010s (Kapanadze, 1978; Arabuli, 1989; Veinberg, 1999; Mallon et al., 2007; NACRES 2010; Gurielidze, 2013; NACRES 2013; Report 2015).

Based on the national data, the current Bezoar Goat population in the Greater Caucasus is up to 1,500 animals (Table 2).

Table 2. Dynamics of Bezoar Goat numbers in the Greater Caucasus				
Year	Area (Country)			Total
	Chechnya (Russia)	Dagestan (Russia)	Khevsureti-Tusheti (Georgia)	
1970s	250 ¹ - 600 ² 350-360 ³	550 ¹	200-300 ⁴	1,000 ¹
1980s		1,000 ⁵	300 ⁶	1,300
1990s		1,500 ⁷		1,500
1998-2010s		2,500-2,600 ⁸	125 ⁹	2,600-2,700
2010s		1,200-1,500 ¹⁰	180 ¹¹ -310 ^{12,13}	1,200-1,500

Sources: ¹Ravkin, 1975; ²Tochiev, 1975; ³Batkhiev, 1980; ⁴Kapanadze, 1978; ⁵Prilutskaya and Pishvanov, 1989; ⁶Arabuli, 1989; ⁷Weinberg, 1999; ⁸Magomedov et al., 2014; ⁹Mallon et al., 2007; ¹⁰Babaev et al., 2017; ¹¹NACRES 2010; ¹²average figure from results of surveys in 2012-2013 - Gurielidze, 2013; Report 2015; ¹³NACRES 2013.

In Georgia, Bezoar Goat is being protected in Tusheti Strict Nature Reserve (IUCN Category I) and Tusheti National Park (Cat. II), Pshav-Khevsureti National Park (Cat. II) and Asa Managed Nature Reserve (Cat. IV). In Russia, there are no strict nature reserves or national parks within the range of Bezoar Goat; there are just one federal and two regional managed nature reserves (IUCN Cat. IV).²⁵

In the Lesser Caucasus, Bezoar Goat occurs in Armenia and Azerbaijan. In the 1970s, the population in Azerbaijan was estimated at 1,800-2,000, almost all of it in Nakhchivan region (Aleksperov, Yerofoeva & Rakhmatulina, 1976). At the beginning of the 2000s, the population was estimated at 800-1,200 animals, again almost all of it in Nakhchivan (Guliyev, 2013d), and for 2006-2007, 1,000 Bezoars were estimated for Nakhchivan (Talibov et al., 2009). More than 500 animals were counted during the latest surveys in 2018 in the south-eastern part of the region. Results indicate definite growth of the population in Nakhchivan since 2006-2007 (Weinberg, 2019a); so, there are undoubtedly more than 1,200 animals there, no less than 50% of which inhabit Zangezur National Park and Ordubad Managed Nature Reserve.

²⁵ There are two types of Managed Nature Reserve (Zakaznik) in Russia: Federal - centrally managed and Regional – managed by regional authorities.

In Armenia, there were reported to be 400-700 animals in the 1970s (Ayrumyan and Gasparyan, 1976), which was almost certainly an underestimate. Surveys carried out in 2006-2007 showed a much higher number - 1,000-1,500 individuals (Khorozyan, Weinberg & Malkhasyan, 2009). In 2009-2013, 1,134 Bezoars were counted in 10 areas, 235 of those in the central section of the Zangezur range, 258 in Nrnadzor area (now Arevik National Park and Zangezur Managed Nature Reserve), 168 in Noravank Canyon (Arpa Protected Landscape/Community Conserved Area), and 145 in Khosrov State Forest Reserve (Weinberg & Malkhasyan, 2011, 2013). These areas are only a small proportion of the whole Bezoar Goat range in Armenia, so total numbers definitely exceed 2,500 animals.

In Turkey, Bezoar Goat inhabited several protected areas in the Turkish part of the Caucasus (Kence and Tarhan, 1997) but no numbers are available. During a survey in Barhal Valley of Kaçkar mountains stretching along the south-eastern coast of the Black Sea, 64 individuals were counted. Surveys carried out by the National Parks – Hunting and Wildlife Directorate of Artvin in 2008 counted 898 Bezoars on an area of 235 km² in the Çoruh river basin from Artvin to Uzundere (Diker et al., 2009). Moreover, an estimated population of 300 is reported from the Giresun area on the most western end of the Caucasus region by WWF-Turkey based on regular observations in the region by wildlife expert staff. The latest report from the General Directorate of Nature Conservation & National Parks (2018) estimated 1,980 animals occurring in the same area now, indicating that the population is increasing. However, the species is still facing numerous threats in the country including feral dogs, illegal hunting and diseases from domestic animals such as rinderpest.

In Iran, in 1991, 4,000 Bezoar Goats inhabited Alborz-Markazy Protected Area²⁶ (Ziaie, 1997) but no data were available on populations closer to Ara(k)s river. Census data for Bezoar Goat from 2009 to 2018 are presented in Table 3 (DoE 2018). The current population in protected areas in the Iranian Caucasus exceeds 4,500 animals.

Table 3. Dynamics of Bezoar Goat numbers in the Iranian part of the Caucasus

Year	Area (Province)				
	Marakan (West Azarbaijan)	Kantal & Kiamaki (East Azarbaijan)	Arasbaran (East Azarbaijan)	Alamdardaghi & Yekanat (East Azarbaijan)	Gilan Province
2009	1,925	984	953	158	100
2010	1,227	1,186	806	164	41
2011	?	1,075	689	83	133
2012	2,165	1,119	704	133	51
2013	2,006	981	494	70	68
2014	2,694	1,067	504	62	184
2015	2,001	1,378	789	109	125
2016	2,221	1,378	598	98	199
2017	3,150	1,181	827	87	159
2018	2,458	1,476	711	5	135

²⁶ In Iran, the term “protected area” has two meanings: (a) protected area as common term and (b) Protected Area as one of categories of protected area management in Iran (corresponds to approx. IUCN Category IV).

Based on the data for each country, the total estimated number of Bezoar Goat in the ecoregion is around 10,000 animals, at least 7,500 of which inhabit protected areas of different categories.

Bezoar Goat is categorised as Vulnerable (VU) in the IUCN Red List (Weinberg et al., 2008). In the current Red Data Book of the Russian Federation, the species is categorised as “Diminishing and being on the periphery of the distribution” (Weinberg, 2000). In the proposed new version of the Red List of Russia the species is listed as Vulnerable.

In the Red List of Georgia, Bezoar Goat is categorised as Critically Endangered (Government of Georgia 2014). Consequently, hunting of the species is prohibited in the country. It is listed as Vulnerable (VU B2ab; C2a) in the Red Book of Armenia (Malkhasyan, 2010a), and as a “Species whose number has declined in the past and still is low” in the Red Book of Azerbaijan (Guliyev, 2013d). In Iran, Bezoar Goat is considered as a Protected Species according to Iran environmental conservation laws & regulations.

Bezoar Goat is also listed in Appendix III of CITES (*as Capra hircus aegagrus*).

Improvement of the status of Bezoar Goat in the region and particularly in the Greater Caucasus, requires the creation of new protected areas in the Russian part of the species range and strengthening the management of existing protected area.

In the mid-2000s, reintroduction of the Bezoar Goat to the northern part of the Lesser Caucasus (from Armenia to Borjomi-Kharagauli National Park) was attempted but was unsuccessful. Learning from that failed attempt, a new reintroduction plan could be prepared and implemented in the mid-term (after all necessary resources have been identified and secured).

In Armenia and Azerbaijan/Nakhchivan, protection is provided by the responsible governmental organizations and by WWF as part of the Leopard Conservation Programme for the South Caucasus (Bezoar Goat is one of the main prey species of Leopard). Bezoar Goat is also a target species for the ECF project which is aiming to create an ecological corridor in the Eastern Lesser Caucasus Conservation Landscape in Armenia (see the chapter on Conservation Landscapes); ECF is funded by the German Government (KfW/BMZ).

CNF’s wildlife monitoring programme, which is being implemented in a number of selected protected areas of South Caucasus countries, will also contribute to improving the status of Bezoar Goat in the region.

Mouflon

The Lesser Caucasus is the north-western limit of the Mouflon’s range. Within the Caucasus ecoregion Mouflon occurs in Armenia, Azerbaijan, Iran and Turkey. There was an indication of Mouflon presence in Georgia, at the border with Turkey (Arabuli, 1989), but this was not supported by other sources.

In Armenia, earlier information on Mouflon describes its distribution but does not specify population size or density (Sarkisov, 1944). The first population census was carried out in the 1970s and produced a figure of 350-400 animals for Armenia and the Nakhchivan region of Azerbaijan together (Yavruyan, 1975). There are two apparently isolated areas of Mouflon distribution in Armenia: the first on Aiotzsoz Massif and the adjoining Urts range, near the western part of Nakhchivan/Azerbaijan; the second on the Zangezur range (southern Armenia and eastern Nakhchivan) and the adjoining Bargushat Range; this second population extends into Nakhchivan (see below). During the latest surveys, 50 animals were counted on Urts, and 104 on Zangezur and Bargushat ranges; the total number for Armenia was estimated as not less than 250 (Weinberg & Malkhasyan, 2010). Animals counted on Zangezur and Bargushat occur in Arevik National Park and Zangezur Managed Nature Reserve of Armenia. Despite the fact that later counts show a larger number of animals, Mouflon numbers in Armenia have definitely declined since the 1950s-70s, as observed by all zoologists, hunters, shepherds and other knowledgeable persons we interviewed. It should also be noted that the political conflict and increased military infrastructure on both sides of Armenia-Nakhchivan/Azerbaijan border worsened the situation here.

Mouflon, Zangezur Mountain Range, Armenia

© A. Malkhasyan, WWF

In Azerbaijan, data on the Mouflon population from the first half of the 20th century are vague (Dinnik, 1910; Sarkisov, 1944). In the 1970s, the Nakhchivan population was estimated to be 1,000-1,200 individuals (Alekperov, Yerofoeva & Rakhmatulina, 1976), while another source estimated 350-400 animals for both Armenia and Nakhchivan together (Yavruyan, 1975, see above). In 1993, 1,200-1,500 animals were estimated for Nakhchivan (Guliyev, 2000b). Nowadays, in Nakhchivan region, as in Armenia, there are two areas of Mouflon distribution: one in the western part and the other in the eastern part of the region (Talibov et al., 2009). The latest counts, conducted in December 2018 in the south-eastern ‘corner’ of Nakhchivan, produced the largest Mouflon number since 2006: 119 individuals on Negramdagh Plateau and 90 ones on the Darydagh Massif and its foothills. The estimate of the total number of individuals is 150 and 120 respectively for each surveyed area (Weinberg, 2019a). The Mouflon population in Nakhchivan has undoubtedly grown since the beginning of 2000s, but we should take into consideration that this population is transboundary with Armenia. However, all Mouflons were spotted rather far from the Zangezur range, in the lowland part of Nakhchivan, closer to the Ara(k)s river. There are lowland areas west from the Zangezur range, in Nakhchivan, but no such areas east of the range, in Armenia. It may happen that winter conditions and disturbance along the border restrict Mouflon movement across the Zangezur range. In that case, numbers on the Armenian and Nakhchivan slopes of Zangezur shouldn’t be summed up. However, a conservative estimate might be about 400 Mouflons in Nakhchivan.

In Turkey, according to Kence and Tarhan (1997), Mouflon occurs along the border with Iran. However, there are no estimates of the size of the Turkish population.

In Iran, there is no data on Mouflon for the north-western part of the country before the 2000s. According to the latest data (DoE 2018), there are the following Mouflon populations in PAs of East and West Azarbaijan Provinces of Iran: Kantal National Park and Kiamaki Wildlife Refuge – 25 individuals, Marakan Protected Area – 965 individuals. Personal communications also substantiate information on the number and density of Mouflon there. Census data of Mouflon from 2009 to 2018 is presented in Table 4 (DoE 2018).

Table 4. Mouflon census data for Iranian part

Year	Area (Province)	
	Marakan (West Azarbaijan)	Kantal & Kiamaki (East Azarbaijan)
2009	1,486	44
2010	984	29
2011	?	66
2012	1,670	36
2013	2,397	24
2014	1,373	44
2015	1,411	39
2016	1,373	37
2017	1,073	65
2018	965	25

Based on the most recent estimates of national population sizes, the total number of Mouflon in the Caucasus could be around 1,900-2,000 individuals.

Mouflon is listed as Endangered (EN) in the Red Data Book of Armenia (Malkhasyan, 2010b), and as a “Species whose number declined in the past and is still low” in the Red Data Book of Azerbaijan (Guliyev, 2013e). In Iran, the Mouflon is also considered as a Protected Species according to Iran environmental conservation laws & regulations. It is listed as Vulnerable (VU) in the IUCN Red List.

In Azerbaijan/Nakhchivan and Armenia, measures to protect Mouflon are taken by responsible governmental organizations and by WWF under the Leopard Conservation Programme for the South Caucasus (Mouflon is one of the main prey species of Leopard). Mouflon (like Bezoar Goat) is also a target herbivore species for WWF’s ECF project, which is aiming to create an ecological corridor in the Eastern Lesser Caucasus Conservation Landscape in Armenia (see the chapter on Conservation Landscapes); the ECF is funded by the German Government (KfW/BMZ).

One of the most effective measures significantly contributing to the recovery of Leopard numbers and the number of its prey species, including Mouflon, is the enforcement of a total hunting ban in Nakhchivan since 2001. However, considering the low rate of Mouflon population growth, it may be necessary to identify and implement additional measures for Mouflon conservation in the region. The CNF wildlife monitoring programme will also contribute to Mouflon conservation as well as to the other species included in the programme.

Goitered Gazelle (Djeiran)

In the Caucasus, Goitered Gazelle populated the Kura-Ara(k)s river lowlands entirely until after the start of the 20th century, almost reaching Tbilisi; its range in the South Caucasus was considered to be the north-western limit of the specie's distribution. By 1938, their numbers had decreased to between five and six thousand and the species range had split into several fragments due to intensive hunting and agricultural expansion (Vereshchagin, 1939).

In the 1960s, the species became extinct in Georgia (Mallon, Askerov and Zazanashvili, 2016) and the total number of animals in Azerbaijan dramatically decreased to 200²⁷ (Safarov, 1961). However, after 1961, several managed nature reserves were established for Gazelle protection and consequently, Gazelle numbers started increasing. For example, in the 1960s, in Byandovan Managed Nature Reserve on the Shirvan Steppe, there were just 70 animals and by 1975, in Shirvan Nature Reserve, established in the same area, there were already 1,700 individuals and the population in the whole of Azerbaijan reached 2,700 (Kotlyarov, 1975). By 1981, the population reached 3,000-3,500 (Aleksperov & Kuliev, 1981). In addition, in 2003, Shirvan National Park was established with the main purpose of Gazelle conservation.

The population continued to grow and in 2015, a census revealed more than 6,200 animals in Azerbaijan. Today, Shirvan National Park protects about 90% of the Gazelles in Azerbaijan. A small population survives in Korchay Protected Areas south from Mingechevir water reservoir in the eastern and central sectors of Bozdag mountains – a landscape of low ridges and hills with flat steppe plains. The estimated population here was 250 in 2004 and, probably, about 600 in 2015 (Mallon, Askerov & Zazanashvili, 2016).

After a feasibility study conducted in 2008 by Dr. David Mallon, reintroduction activities started in Azerbaijan in different areas suitable for Gazelle. In 2013, the Azerbaijan-Georgia transboundary area was included in the reintroduction activities. Altogether, around 250 individuals have been translocated from Shirvan to several sites in Azerbaijan and the Georgian part of the Samukh Steppe. According to the 2019 autumn census, 157 animals occur on the Ajinour Steppe (A. Muradov, pers. comm.). Animals can move freely across the state border and the population can already be considered as transboundary. Based on regular field monitoring, the estimated number on the Georgian side, particularly in Samukh Steppe, currently is about 120-130 individuals (Report 2019).²⁸

Goitered Gazelle is categorised in the IUCN Red List as Vulnerable (VU) (IUCN SSC Antelope Specialist Group 2017). In the Red Book of Azerbaijan, it is listed as a “species distributed at the edge of its global range, which can become extinct without protection measures” (Guliyev, 2013b). In the Red List of Georgia, the species is listed as extinct in the country (Government of Georgia 2014) but if the further stages of the species’ restoration in Georgia are successful, it will be re-categorised.



²⁷ The figure of 200 may be an underestimate because aerial counts usually omit single animals and small groups. Nevertheless it is clear that the population in the South Caucasus was close to extinction at that time.

²⁸ This extremely important initiative of species restoration was made possible by many different organisations, but particular thanks go to the Government of Azerbaijan and IDEA – International Dialogue for Environmental Action, also the Governments of Georgia and Germany and WWF.

Measures that need to be taken to further improve the species' conservation status in the Caucasus are the continuation of translocation activities and improvement of monitoring, especially transboundary monitoring (first attempts for establishing joint transboundary monitoring are being made by WWF with the involvement of scientists and experts from academia, NGOs and protected areas of Azerbaijan and Georgia).

European Bison (Wisent)

At the beginning of the 20th century, the Caucasian subspecies of European Bison *B. b. caucasicus* survived in the West Caucasus but became extinct soon afterwards (Vereshchagin, 1959).

In 1940, the first *Bison bonasus* × *B. Bison* hybrids were translocated from Askania-Nova Nature Reserve (Ukraine) to an enclosure in the Kavkazsky Zapovednik (Strict Nature Reserve). Later, individuals of *B. bonasus* were added to minimize the occurrence of *B. bison* genes in the population; in addition, hybrid males were excluded from reproduction. In 1955, the animals were set free and in 1960, supplementary winter feeding was stopped (Trepet, 2014). Since then, the Bison population in Kavkazsky Zapovednik and adjoining areas has grown to 1,100 individuals (TASS 2018). This population is the largest one in the Caucasus, but is considered as an inter-specific hybrid and is not included in the European Bison Pedigree Book²⁹.

In 1968, 16 *B. b. bonasus* × *B. b. caucasicus* were released in Kizgich Valley in the Arkhyz branch of Teberdinsky Zapovednik. The Kizgich herd never exceeded 55, and by 2012 had shrunk to 5 animals (Semyonov, 2014). In 2012 and 2013, 8 and 10 animals respectively were added. However, the release area was not well-chosen: animals cannot survive there without supplementary winter feeding. In the period of 1959-1975, two more attempts at reintroduction of Bison in North Caucasus were not successful (Lipkovich, 1988).

Bison in reintroduction site, Shahdag National Park, Azerbaijan



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²⁹ The European Bison Pedigree Book has its Editorial Office in Bialoveja National Park, Poland.

In 1964-68, 47 *B. b. bonasus* × *B. b. caucasicus* were translocated to Tseisky Managed Nature Reserve (Federal Zakaznik) in North Ossetia. The population grew steadily until the beginning of 1990s, reaching about 220-250 animals within the Zakaznik and in the adjoining area of the Severo-Ossetinsky Strict Nature Reserve. Besides, 27 animals inhabited the neighbouring State Game Reserve. In 1992, the population started decreasing and it consisted of about 50 animals by 1997 (Weinberg and Komarov, 2004). This decline continued up to 2011. In 2010, 10 animals were brought in from Prioksko-Terrasny Breeding Center and 10 more in 2012. This triggered growth of the population and 96 animals were registered in February 2019 (Weinberg, 2019b).

In 2018, a new reintroduction, initiated by WWF, was started in North Ossetia. Ten pure-bred animals from Oksky Breeding Centre and Sweden were brought to Turmon Regional Managed Reserve (Weinberg, 2019b).

In the South Caucasus, until very recently, only one attempt had been made at reintroduction: in 1969, 12 animals were released on the southern slope of the Greater Caucasus in the newly founded Ismaily Managed Nature Reserve in Azerbaijan (later reorganized into a Nature Reserve that finally became part of Shahdag National Park). The reintroduction was not successful (Gajiev, 2000; Askerov et al., 2014).

A new reintroduction initiative was started in 2019 in almost the same area in a joint effort of the Azerbaijan Government, IDEA and WWF through the TJS. 12 genetically appropriate animals, collected in European Zoos, were transported to a specially created and arranged reintroduction site.

Thus, excluding the very recently established small Azerbaijan/Ismaily population, currently there are just three free-ranging pure-bred (*B. b. bonasus* × *B. b. caucasicus*) populations in the Caucasus, all of them in protected areas on the northern slope of the Greater Caucasus in Russia: (1) Tseisky Federal Managed Nature Reserve and North-Ossetinsky Strict Nature Reserve – 96 animals, (2) Turmon Regional Managed Reserve – 10 animals (newly released), and (3) Arkhyz Branch of Teberdinsky Biosphere Reserve – 20-25 animals; altogether – about 120 individuals.

European Bison is listed as Vulnerable (VU, D1) in the IUCN Red List (Olech, 2008). It is categorised in the Red Data Book of the Russian Federation as “Under threat of extinction” (Danilov-Danilyan, 2000), which corresponds to the IUCN category Endangered (EN).

For restoration of the species on the southern slope of the Greater Caucasus, reintroduction efforts need to be continued and strengthened. In Azerbaijan, individuals need to be added to the Ismaily population and complementary activities maintained. Restoration of the species on the southern slope of the central section of Greater Caucasus in Georgia is under discussion by government officials and conservation experts.

Northern Chamois

Chamois inhabits the Greater and the Lesser Caucasus; however, in the Lesser Caucasus it is presently confined to the northern and western parts in the Adjara-Imereti mountain range (Vereshchagin, 1947; Gurielidze, 2015). In Azerbaijan, there is evidence that Chamois occurred in the Lesser Caucasus, on the Murovdagh range, until the early decades of the 20th century (Vereshchagin, 1959), but probably became extinct in that area by the 1940s (Vereshchagin, 1947).

In the Greater Caucasus, Chamois sporadically inhabits all three highest, longitudinal ranges - the Main, the Side and the Rocky - and sometimes occurs at lower altitudes on pastures and in forests. The outer limits of distribution in the Greater Caucasus has not changed much during the last 50 years, except the westernmost part, where they do not occur anymore. The species range in the Greater Caucasus is considerably larger than the ranges of both Tur species, but it is much more fragmented. The actual area occupied by Chamois is therefore much smaller and their number is much lower than those of Tur.

In 1972, about 9,000 Chamois were estimated to occur on the northern slope of the Greater Caucasus in Russia, almost 6,000 of them in Krasnodar region (5,000 of those in the Kavkazsky Biosphere Reserve)

and 1,200 in Stavropol region (Ravkin, 1975). The population declined and by the beginning of the 2000s, there were estimated to be 1,500 individuals in the Western Greater Caucasus (without Kavkazsky Reserve), up to 1,300 in the Central Greater Caucasus, and more than 400 animals in Dagestan (Danilkin, 2005). In addition, there were about 1,000 Chamois in the Kavkazsky Biosphere Reserve (Trepets, 2014). Thus, the total population in the Russian North Caucasus was about 5,500. The most recent data are as follows: about 3,500 individuals in the Western Greater Caucasus, up to 1,000 in the central part, and about 800 in Chechnya and Dagestan: totally about 5,300 in the Russian Caucasus (State Reports on the Status of Nature Conservation for the respective regions, see References). Of these, about 1,200 animals occur in the Kavkazsky Biosphere Reserve (Trepets, 2018), 300 in Sochi National Park (Semyonov, 2018), about 200 animals in Teberdinsky Biosphere Reserve (J. Tekeev, pers. comm.), about 250 in the North Severo-Ossetinsky Nature Reserve, Tseysky Managed Nature Reserve and Alania National Park (Weinberg, 2018).

In Georgia, in the 1970s, numbers were estimated at 20,000 (Kapanadze, 1978), but this figure was clearly too high. Just 10 years later, at the end of 1980s, only 5,000 were estimated (Arabuli, 1989), and in 2013, combined aerial counts and ground surveys produced about 3,260 individuals in the Greater Caucasus and 500-600 in the Lesser Caucasus (Gurielidze, 2015).

Chamois, Kavkazsky Biosphere Reserve, Russia



© S. Trepets, Kavkazsky Biosphere Reserve, Russia

In the 1950-60s, on the southern slope of the Greater Caucasus in Azerbaijan, there were 2,000-2,500 animals. The population was shrinking and by the end of the 1990s, only 600-800 individuals remained (Guliyev, 2000a). In Zagatala Nature Reserve, 341 animals were counted in 2015 and 315 in 2018; in Ilisu Nature Reserve, in the same years, 24 and 18 animals were counted (A. Muradov, pers. comm.) (Table 5). Unfortunately, there are no data from Shahdag National Park – the largest protected area in Azerbaijan located in the Eastern Greater Caucasus.

The total number of individuals on the southern slope of the Greater Caucasus is about 4,000 animals and the total for the entire Greater Caucasus, approximately 9,000. Numbers are declining (Table 5).

Table 5. Dynamics of Chamois number in the Greater Caucasus

Year	Country			Total
	Russia	Georgia	Azerbaijan	
1960s -1970s	9,000 ¹	20,000 ⁴	2,000-2,500 ⁷	31,000
1980s		5,000 ⁵		
1990s			600-800 ⁷	
2000s	5,500 ²			
2010s	5,300 ³	3,300 ⁶	400 ⁸	9,000

Sources: ¹Ravkin, 1975; ²Danilkin, 2005; ³State reports 2017, 2018; ⁴Kapanadze, 1978; ⁵Arabuli, 1989; ⁶Gurielidze, 2015; ⁷Guliyev, 2000a; ⁸A. Muradov, pers. comm.

In Turkey, Chamois occurs only in the north-eastern part of the country, mainly the mountains situated along the south-eastern coast of the Black Sea especially in Rize and Artvin regions as well as Erzurum with the southernmost population observed in Gumushane. Chamois was known to occur in a number of PAs in that part of Turkey in the 1990s (Kence and Tarhan, 1997) but data on population size were not available until the 2000s. Nowadays, according to the General Directorate of Nature Conservation & National Parks of Turkey (2018), there are about 25 animals in their north-eastern PAs. The population size estimate based on work of WWF-Turkey is more than 100.

Chamois is listed in the Red Data Book of Azerbaijan as a “Species whose number declined in the past and is still low” (Guliyev, 2013c). In the Red List of Georgia, it is categorised as Endangered (EN/A2a) (Government of Georgia 2014). Chamois is expected to be included in the new Red List of the Russian Federation (it was not included in previous versions). It is categorised as Least Concern (LC) in the IUCN Red List.

Directly or indirectly, Chamois conservation is ongoing within the framework of WWF’s ECF project funded by the German Government (BMZ/KfW): Chamois is one of the target species for the creation of ecological corridors within Georgia’s part of the Western Lesser Caucasus and Azerbaijan’s part of the Eastern Greater Caucasus Conservation Landscapes (see the corresponding chapter).

However, those measures are not enough: Chamois is now quite rare in the Caucasus; larger scale, comprehensive, regional or transboundary surveys need to be organized to better understand the reasons for the population declining and to provide a sound basis for planning further measures to improve Chamois’ conservation status.

Red Deer

The range of the Caucasian subspecies of Red Deer extends over the entire Caucasus, the adjoining Alborz mountains and Kopetdagh (Baryshnikov, 1981).

Until the mid-20th century, Red Deer were common in the Caucasus, though its distribution was already smaller than it was at the beginning of 20th century, especially in the foothills and the adjoining plains (Dinnik, 1910). In the 1920-30s, Red Deer was extirpated in the mountainous part of the Central Caucasus – North Ossetia and Kabardino-Balkaria (Naniev, 1956; Tembotov & Shkhashamishv, 1984). Approximately at the same time, the previously continuous range of Red Deer started to separate into two different and isolated groups of habitats: montane forests and subalpine meadows, and lowland riverside forests (Khekhneva, 1972).

Red Deer vanished from Armenia in the first part of the 20th century (Dahl, 1954), but sporadic migrations from neighbouring countries may have occurred until recently (Khorozyan, 2010). In Azerbaijan, Red Deer was extirpated in the Lesser Caucasus at the end of 19th century and in the Talysh mountains at the beginning of 20th century. Reintroduction activities were conducted in the Lesser Caucasus in the 1960s: the number of animals in Goygol Reserve in mid-1980s reached 125, but in the 1990s, because of the Armenia-Azerbaijan armed conflict, the population dramatically declined again. A very small population survives in the Kura river flood plain forests in Garayazi-Aghstafa protected areas. The larger part of Azerbaijan's Red Deer population occurs on the southern slope of the Greater Caucasus, e.g. in Zagatala and Illisu reserves (Vereshchagin, 1959; Guliyev, 2012).

In the 1960s, individuals of the Crimean and European subspecies were introduced into Kabardino-Balkaria and North Ossetia.

At the beginning of the 1970s, there were about 10,000 Red Deer on the northern slope of the Greater Caucasus in Russia, almost 9,000 of them in Krasnodar region, including 7,000 in Kavkazsky Biosphere Reserve (Ravkin, 1975). Nowadays, Krasnodar region in the north-western Caucasus harbours the largest Red Deer population, including: ca. 1,800-1,900 animals concentrated in Kavkazsky Strict Nature Reserve – possibly it is the maximum viable number considering the carrying capacity of the Reserve's ecosystems (the population has been growing there since the 1990s; Trepets, 2018; S. Trepets pers. comm.), 400 in Sochi National Park (Semyonov, 2018) and about 200-250 outside protected areas. The number in Karachay-Cherkessia, including Teberdinsky Strict Nature Reserve, is much lower (Trepets, 2014). There are fewer than 200 non-native Red Deer individuals in Kabardino-Balkaria (Akkiev, 2018), about 350 in North Ossetia (Weinberg, 2018), and a small number of aboriginal Deer in Terek river's riparian forests.

In Chechnya, the State Report on Nature Conservation (2018) mentions 120 individuals in 2017, but the dynamics of the population are not certain. In Dagestan, there are about 500 individuals, almost all of which belong to population that inhabits the Greater Caucasus Range; the majority spend winters on the southern slope of the range in Georgia and Azerbaijan (Yu. Yarovenko and A. Yarovenko, 2018). A small population survives in the riparian forests of Terek and, probably, Sulak rivers.

Thus, the total number of Red Deer on the northern slope of the Greater Caucasus is about 3,500 (Table 6) mainly in two completely isolated (western and eastern) populations - almost two thirds fewer than in the 1970s - mainly because of much lower numbers in Krasnodar region, including Kavkazsky Reserve. Numbers in the Eastern Greater Caucasus have not changed significantly since the 1970s (Ravkin, 1975). However, the trend now is moderately positive in the Western Caucasus and stable in Dagestan.

As is shown in the report of the Agency of Protected Areas of Georgia (APA 2018), after a dramatic decrease in Red Deer populations in the 1990s to the beginning of 2000s, when numbers fell to 200 individuals, the trend has been positive, especially since 2013. At the beginning of 2019, there were about 1,100 animals in the country, mostly in two locations: (1) around 350 animals in Lagodekhi Strict Nature Reserve and Managed

Red Deer in the breeding centre, Dilijan National Park, Armenia



Nature Reserve in the south-eastern Greater Caucasus at the border with Azerbaijan (adjacent to Zagatala Nature Reserve) and Dagestan/Russia (adjacent to Tliarata Federal Managed Nature Reserve), and (2) an isolated population of around 650 animals in Borjomi–Kharagauli Protected Areas (Strict Nature Reserve, National Park and Managed Nature Reserve) - in the northern part of the Lesser Caucasus (central Georgia). Small self-restored populations are reported from Tusheti Protected Areas (Strict Nature Reserve and National Park) and Tbilisi National Park³⁰ (Saguramo Branch of the Greater Caucasus) – around 50 individuals each. It is possible that a very small population of 10-12 individuals survives in Gardabani Managed Nature Reserve (in what remains of the Kura river floodplains) bordering Azerbaijan (adjacent to Garayazi-Aghstafa protected areas).

A study by NGO NACRES also shows that the largest population is concentrated in Borjomi-Kharagauli Protected Areas – up to 500 individuals (for 2015). The Lagodekhi population was assessed as 350 animals (National Geographic Georgia 2016; Lagodekhi Protected Areas Facebook 2015).

In Azerbaijan, as it was mentioned above, the main population occurs on the southern slope of the Greater Caucasus: Zagatala Nature Reserve reports more than 700 individuals in 2018 and Ilisu Nature Reserve about 70 (A. Muradov, pers. comm.) (Table 6). The range of this population, which is connected with the Lagodekhi population in Georgia, continues eastwards towards Ismaili (Shahdag National Park) and extends into Dagestan (see above). The overall trend is moderately positive. A small population survives in floodplain forests adjacent to the Kura river in Garayazi-Aghstafa protected areas (transboundary with Gardabani, Georgia, see above). Because of armed conflict, the Lesser Caucasus population which existed in the recent past in Goygol National Park (formerly Strict Nature Reserve) (Guliyev, 2014) is most likely extinct or survives in a very small number.

³⁰ There are some doubts about the presence of Red Deer in this location.

The total number of Red Deer in Azerbaijan is probably about 800-1,000, shared with Russia and partly with Georgia.

Based on the above-mentioned figures, the Red Deer population in the Greater Caucasus (Russian Federation, Georgia and Azerbaijan) might be 4,000 animals (Table 6) and in the Lesser Caucasus about 700 individuals, 85-90% of which inhabit Borjomi-Kharagauli National Park and adjacent areas.

Table 6. Dynamics of Red Deer numbers in the Greater Caucasus

Year	Country			Total
	Russia	Georgia	Azerbaijan	
1960s -1970s	10,000 ¹			
2010s	3,500-3,600 ^{2,3,4,5}	~ 400 ⁶	800-10,008	~ 4,500*

Sources: ¹Ravkin, 1975; ²Trepet, 2018; ³S. Trepet pers. comm.; ⁴Semyonov, 2018; ⁵State report Chechen Republic, 2018; ⁶Yarovenko and Yarovenko, 2018; ⁷Lagodekhi Protected Areas Facebook 2015; APA 2018; ⁸A.Muradov, pers. comm. * Considering transboundary character of the populations.

In Iran, according to official data, about 87 individuals occur in the wild in Gilan Province (the Alborz range) but it is believed that almost all of them are males (DoE 2018). In the recent past, the population of Red Deer in Iran was higher, especially outside the Caucasus, in the east of the Alborz range, Golestan National Park – around 2,000 individuals in 1970s and 500 individuals in 2003 (Kiabi et al., 2004).

There are 103 individuals of unknown origin in north-western Turkey (General Directorate 2018).

Thus, the total number of Caucasian Red Deer in the ecoregion is about 5,000 with an overall stable trend and moderately positive one in certain areas.

Red Deer is listed as a “Species whose number declined in the past and is still low” in the Red Data Book of Azerbaijan (Guliyev, 2013a), and as Critically Endangered (CR D) in the Red Book of Armenia (Khorozyan, 2010) and the Red List of Georgia (CR) (Government of Georgia 2014). Red Deer is considered as a Protected Species according to Iran environmental conservation laws and regulations. Red Deer is not listed in the Red Book of Russia but it is included in the Red Books of the Republics of Adygea and Kabardino-Balkaria. The IUCN Red List categorises Red Deer as Least Concern (LC).

Priority conservation measures for Red Deer in the Caucasus are better protection against poaching, creation of connectivity for isolated populations, and translocations or reintroduction. WWF (through the TJS) with CNF is currently supporting the Government of Armenia in reintroducing Red Deer into the country: a Red Deer breeding centre has been established in Dilijan National Park. Thanks to the Government of Iran, 8 animals have been already received and put into a 10 ha enclosure at the Breeding Centre (5 more animals are expected in near future); 3 individuals have been born there.

Red Deer is a target species for the Western Lesser Caucasus (Georgia) and Eastern Greater Caucasus (Azerbaijan) ecological corridors that are under creation with the active participation of the local population in the framework of the ECF project funded by the German Government (BMZ/KfW) and which is being implemented by WWF.

CNF and WWF (through TJS) together with the NGO NACRES and experts from Azerbaijan recently established transboundary monitoring of Red Deer in Lagodekhi-Zagatala area.

Establishing a breeding centre in Georgia is under consideration and is being discussed among national experts, responsible governmental organizations and international conservation organizations.

As mentioned above, the CNF currently operates a wildlife monitoring programme for a number of selected protected areas of South Caucasus countries that will contribute to Red Deer conservation.

Conclusions

All the species discussed in this chapter need special attention for stabilising their status and/or recovering or restoring their populations. Appropriate measures are reflected in targets and planned actions of this new edition of the ECP (see the first volume – Ecoregional Conservation Plan for the Caucasus).

Restoration of large herbivore species is a major challenge but also a priority: in many parts of the region relevant habitats are “empty” – large herbivores are hardly visible; this situation negatively affects some basic ecological processes and reduces eco-tourism potential and the corresponding potential for alternative income for the local population. For these reasons, on-going initiatives of species restoration should be supported and continued, and new programmes and projects initiated.

Weak law enforcement and inadequate monitoring, determined by different factors, are probably the main root causes that need to be addressed for effective mitigation of direct threats such as poaching and habitat destruction.

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References

- APA2018. Agency of Protected Areas of Georgia, Report for 2018. – <https://apa.gov.ge/ge/angariSebi> [In Georg.].
- Aiunts, K.R. & Kolomyts, E.G. (1986): Morphological index of variability in Caucasian Tur and its connection with highland climate. *Proceedings of the Highland Geophysical Institute* 64, 3-21 [In Russ.].
- Akkiev, M.I. (2018): Evaluation of potential Leopard habitats in Kabardino-Balkaria. Pp. 165-212 in Semyonov, U.A. ed. Restoration of Leopard in the Caucasus. Partnership of scientific publications KMK, Moscow. [In Russ.].
- Alekperov, Kh.M., Yerofeeva, I.K. & Rakhmatulina, I.K. (1976): Contemporary status of some mammal species of Azerbaijan. Pp. 28-34 in Sokolov, V.Ye., ed. Rare mammals of the USSR fauna. Nauka, Moscow. [In Russ.].
- Arabuli, A.B. (1989): Contemporary status of rare ungulate species of Georgia. Pp. 28-29 in Sablina, T.B., ed. Ecology, morphology, use and protection of wild ungulates, part 1. Moscow. [In Russ.].
- Askerov, E.K., Treboganova, N.V., Tsibizova, Ye.L., Garibov, A., & Ragimov, F. (2014): Conclusion on possibility of establishing free-ranging population of European Bison (*Bison bonasus*) on the territory of Ismailly branch of Shahdag National Park of Azerbaijan Republic. WWF Unpublished Report. [In Russ.].
- Ayrumyan, K.A. & Gasparyan, K.M. (1976): Rare ungulates and predators of Armenia. Pp. 35-42 in Sokolov, V.Ye. ed. Rare mammals of USSR fauna. Nauka, Moscow. [In Russ.].
- Babaev, E.A., Yarovenko, Yu.A., Magomedov, U.M., Gamodova, M.Kh. & Yarovenko, A.Yu. (2017): Population status of ungulates of Dagestan. *Communications of Dagestan State Pedagogical Institute. Natural and hard sciences* 3, 11, 44-50 [In Russ.].
- Baryshnikov, G.F. (1981): Artiodactyla. Pp. 244-408 in Gromov, I.M. & Baranova, G.I., eds. Catalogue of Mammals of the USSR. Nauka, Leningrad. [In Russ.].
- Batkhiyev, A.M. (1980): Distribution and numbers of wild Goat in Chechen-Ingushetia. Pp. 46-56 in Tembotov, A.K., ed. Fauna, ecology and conservation of animals of the North Caucasus. Kabardino-Balkarskiy gosuniversitet, Nal'chik. [In Russ.].
- Dahl, S.K. (1954): *Animal world of Armenian SSR*. Acad. Sci. Armenian SSR, Yerevan. [In Russ.].
- Danilkin, A.A. (2005): *Hollow-horned ungulates* (Bovidae). Partnership of scientific publications KMK, Moscow. [In Russ.].
- Danilov-Danilyan, V.I., ed. (2000): *Red Book of Russian Federation (animals)*. AST-Astrel', Moscow. [In Russ.].

- Diker, H., Diker, E., Özalp, M., Avcioglu, D. & Kalem, S. (2009): The status of Bezoar Goat (*Capra aegagrus*) in the Kaçkar Mountains, Turkey. Pp. 32-35 in Zazanashvili, N. & Mallon, D., eds. Status and protection of Globally Threatened Species in the Caucasus. CEPF, WWF, Tbilisi.
- Dinnik, N.Ya. (1910): *Mammals of the Caucasus*. Notes of Caucasian Section of the Russian Geographic Society, 27. [In Russ.].
- DoE 2018. Department of Environment of Iran, annual census data, 2018.
- Eriashvili, I.G. (1990): Long-term data on dynamics of numbers of Tur and Red Deer in Lagodekhi Reserve. Pp. 337-340 in Filonov, K.P., ed. Nature reserves of the USSR, their present and future. Goskomitet SSSR po okhrane prirody, Novgorod. [In Russ.].
- Gajiev, D.V. (2000): European Bison – Bison bonasus L. P. 624 in Gadjiyev, D.V. & Pakhmatulina, I.K., eds. Animal world of Azerbaijan. Vol. 3. Vertebrates. Elm, Baku. [In Russ.].
- Gavashelishvili, A. (2004): Habitat selection by East Caucasian Tur (*Capra cylindricornis*). *Biological Conservation* 120, 391–398.
- General Directorate 2018. General Directorate of Nature Conservation and National Parks of Turkey. Report 2018.
- Government of Georgia 2014. Decree of the Government of Georgia on Adoption of Georgian “Red List”. [In Georg.]. – <https://matsne.gov.ge/ka/document/view/2256983?publication=0> Sakartvelos sakanondeblo matsne Publisher, Tbilisi. Downloaded 21/08/2018.
- Grubb, P. (1990): List of deer species and subspecies. Deer specialist group newsletter № 8. Appendix. Species survival commission.
- Grubb, P. & Gardner A.L. (1998): List of species and subspecies of the families Tragulidae, Moschidae, and Cervidae. Pp. 6-16 in Blouch, R., McCarthy, A., Moore, D., Wemmer, Christen M. Deer. Status Survey and Conservation Action Plan. IUCN/SSC Deer specialist group. Inform. Press., Oxford.
- Guliyev S.M. (2000a): Chamois – *Rupicapra rupicapra* L. Pp. 604-606 in: Gadjiyev, D.V. & Pakhmatulina, I.K., eds. Animal world of Azerbaijan, vol. III. Vertebrates. Elm, Baku. [In Russ.].
- Guliyev, S.M. (2000b): Asiatic Mouflon – *Ovis orientalis Gmelin*. Pp. 613-616 in: Gadjiyev, D.V. & Pakhmatulina, I.K., eds. Animal world of Azerbaijan, vol. III. Vertebrates. Elm, Baku. [In Russ.].
- Guliyev (= Kuliyeve) S.M. (2012). Contemporary ecological conditions of some mammal species of Azerbaijan and ways of their survival. *Proceedings of Samara scientific center of Russian Academy of Science*, 14, 1, 192-196. [In Russ.].
- Guliyev, S.M. (2013a): Red Deer *Cervus elaphus* Linnaeus, 1758. In Red Book of Azerbaijan. East-West Publs., Baku. - <http://redbook.az>
- Guliyev, S.M. (2013b): Goitered *Gazelle Gazella subgutturosa* Guldenstaedt, 1780. In Red Book of Azerbaijan. East-West Publs., Baku. - <http://redbook.az>
- Guliyev, S.M. (2013c): Chamois *Rupicapra rupicapra* L, 1758. In Red Book of Azerbaijan. East-West Publs., Baku. - <http://redbook.az>
- Guliyev, S.M. (2013d): Wild Goat *Capra aegagrus* Erxleben, 1777. In Red Book of Azerbaijan. East-West Publs., Baku. - <http://redbook.az>
- Guliyev, S.M. (2013e): Asiatic Mouflon *Ovis orientalis* Gmelin, 1774. In Red Book of Azerbaijan. East-West Publs., Baku. - <http://redbook.az>
- Guliyev, S.M. (2014): Reproduction of Caucasian Red Deer in Azerbaijan. *Annals of Biological Research*, 5 (4), 90-94. - <https://www.scholarsresearchlibrary.com/articles/reproduction-of-caucasian-red-deer-in-azerbaijan.pdf>
- Guliyev, S.M., Weinberg, P.J. & Askerov, E. (2009): Dagestan Tur (*Capra cylindricornis* Blyth) conservation strategy in Azerbaijan. Pp. 53-61 in: Zazanashvili, N. and Mallon, D, eds. Status and protection of Globally Threatened Species in the Caucasus. CEPF, WWF, Tbilisi.
- Gurielidze, Z., ed. (2013). On the survey/study of the objects of animal world. Report. Institute of Ecology, Ilia State University, Tbilisi. [In Georg.].
- Gurielidze, Z. (2015): Mountain inhabitants // Liberali, 12 June, 2015 [in Georg.].

- Gurielidze, Z. (2018): Zurab Gurielidze firstly in Georgia creates reintroduction center for endangered Tur [In Georg.]. Comersant.ge - <https://commersant.ge/ge/post/saqartveloshi-pirvelad-gadashenebis-pirasmyofi-dasavlet-kavkasiuri-djixvis-reintroduqciis-centri-iqmneba>
- Gurielidze, Z., Daraselia, I., Qerdikoshvili, N. (2019): Methods and 2019 results of Western Tur (*Capra caucasica*) census. Ilia State University, Tbilisi. Unpublished report. [In Georg.].
- IUCN SSC Antelope Specialist Group. 2017. *Gazella subgutturosa*. The IUCN Red List of Threatened Species 2017: e. T8976A50187422. <http://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T8976A50187422.en>
- Kazanskaya, E.Yu. (2007): Origin of the West Caucasian Tur (*Capra caucasica*, Bovidae, Artiodactyla). P. 179 in Rozhnov, V.V., ed. Mammalian fauna of Russia and adjoining territories. Partnership of scientific publications KMK. Moscow. [In Russ.].
- Kapanadze, A.D. (1975): Structure and number of populations of highland ungulates of the Caucasus. Pp. 137-138 in Panteleev, P.A., ed. 2nd congress of all-Union theriological society. Nauka, Moscow. [In Russ.].
- Kence, A. and Tarhan, M.S. (1997): Turkey. Pp. 134-138 in: Shackleton, D.M. ed. Wild sheep and Goats and their relatives. International Union for Conservation of Nature, Gland, Switzerland and Cambridge, UK.
- Khekhneva, T.D. (1972): Game mammals of Dagestan. PhD thesis. Makhachkala [In Russ.].
- Khorozyan, I. (2010): Caspian Red Deer or maral – *Cervus elaphus* maral Gray, 1758. P. 349 in Aghasyan, A. and Kalashyan, M. eds. The Red Book of Animals of the Republic of Armenia – Invertebrates and Vertebrates, Second Edition. Ministry of Nature Protection, Yerevan.
- Khorozyan, I.G, Weinberg, P.I & Malkhasyan, A.G. (2009): Conservation strategy for Armenian Mouflon (*Ovis [orientalis] gmelini* Blyth) and Bezoar Goat (*Capra aegagrus* Erxleben) in Armenia. Pp. 46-53 in Zazanashvili, N. and Mallon, D., eds. Status and protection of Globally Threatened Species in the Caucasus. CEPF, WWF, Tbilisi.
- Kiabi, B.H., Ghaemi, R.A., Jahanshahi, M. & Sassani, A. (2004): Population status, biology and ecology of the Maral, *Cervus elaphus maral*, in Golestan National Park, Iran. *Zool. in the Middle East*, 33(1), 125-138.
- Kopaliani, N. & Gurielidze, Z. 2009. Status of Tur in Georgia and Conservation Action Plan. Pp. 61-68 in Zazanashvili, N. and Mallon, D., eds. Status and protection of Globally Threatened Species in the Caucasus. CEPF, WWF, Tbilisi.
- Kotlyarov, Ye.A. (1975): Conditions of Gazelle dwelling on protected areas of Azerbaijan. Pp. 266-267 in Sokolov, V.Ye, ed. Ungulates of the USSR fauna. Nauka, Moscow. [In Russ.].
- Kuznetsov, V. & Lushchekina, A. (2002) Kalmyk Saiga is on the verge of catastrophe [In Russian]. *Stepnoy bulluten*, 11, 28–32. [In Russ.].
- LagodekhiProtectedAreasFacebook2015. [In Georg.]-<https://www.facebook.com/LagodekhiProtectedAreas/posts/880398692057915/>
- Lydekker, R. (1913): *Catalogue of the ungulate mammals in the Natural History Museum*. Natural History Museum, London, England, 1.
- Magomedov, M.-R.D, Akhmedov, E.G. & Yarovenko, Yu.A. (2001): *Dagestan Tur. Population and trophic aspects of ecology*. Nauka, Moscow. [In Russ.].
- Magomedov, M.-RD, Akhmedov, E.G., Yarovenko, Yu.A. & Nasrulayev, N.I. (2014): Wild Goat in Dagestan: organization of populations and peculiarities of ecology. Partnership of scientific publications KMK, Moscow. . [In Russ.].
- Malkhasyan, A. (2010a): Bezoar Goat – *Capra aegagrus* Erxleben, 1777). P. 347 in Aghasyan, A. and Kalashyan, M. eds. The Red Book of Animals of the Republic of Armenia – Invertebrates and Vertebrates, Second Edition. Ministry of Nature Protection, Yerevan.
- Malkhasyan, A. (2010b): Armenian Mouflon – *Ovis orientalis gmelinii* (Blyth, 1841). P. 348 in Aghasyan, A. and Kalashyan, M. eds. The Red Book of Animals of the Republic of Armenia – Invertebrates and Vertebrates, Second Edition. Ministry of Nature Protection, Yerevan.
- Mallon, D., Askerov, E., Zazanashvili, N. (2016): Restoration of Goitered Gazelle in the South Caucasus. Unpublished report. WWF-Caucasus and WWF-Azerbaijan.

- Mallon, D., Weinberg, P. & Kopaliani, N. (2007): Status of the prey species of the Leopard in the Caucasus. *Cat News* Special issue 2, 22-27.
- NACRES 1996: Country study report on biodiversity of Georgia. Unpublished report, Tbilisi.
- NACRES 2010: Report on biodiversity assessment of Tusheti Protected Areas. Unpublished report, UNDP/GEF project “Catalyzing Financial Sustainability of Georgia’s Protected Areas System”, Tbilisi.
- NACRES 2013: Report on assessment of Leopard and Its prey species in Khevsureti. Unpublished report, WWF Caucasus program office project, Tbilisi. [In Georg.].
- Naniev, V.I. (1956): Certain changes of distribution and species composition of mammals of North Ossetian ASSR. *Sci. notes North Osset. Ped. Institute* 23, 283–298. [In Russ.].
- National Geographic Georgia 2016: M. Akhsiasvili. Small Grants for Biodiversity Protection [In Georg.]. -
- Neronov, V.M., Arilova, N.Yu., Dubinin, M.Yu., Karimova, T.Yu., Lushekina, A.A. (2013): Current state and perspectives of Saiga Antelope conservation in the North-West Pre-Caspian region. *Aridnie ekosistemi*, 19, 2 (55), 5-14. [In Russ.].
- Olech, W. (IUCN SSC Bison Specialist Group). 2008. Bison bonasus. The IUCN Red List of Threatened Species 2008: e.T2814A9484719. – <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T2814A9484719.en>
- Prilutskaya, L.I & Pishvanov, Yu.V. (1989): Range and number of the wild Goat in Dagestan. Pp. 243-245 in Sablina, T.B., ed. Ecology, morphology, use and protection of wild ungulates, part 2. USSR Theriological Society Publication, Moscow. [In Russ.].
- Ravkin, Ye.S. (1975): Resources of the wild ungulates in the North Caucasus and anthropogenic impact upon them. Pp. 17-18 in Sokolov, V.Ye, ed. Ungulates of the USSR fauna. Nauka, Moscow. [In Russ.].
- Report 2015. Georgia’s Fifth National Report to the Convention on Biological Diversity. Ministry of Environment and Natural Resources Protection of Georgia. <https://www.cbd.int/doc/world/ge/ge-nr-05-en.pdf>
- Report 2019. Gazelle reintroduction project: monthly monitoring report prepared by V. Kochiashvili, November 2019. Unpublished report, WWF-Caucasus archive. [In Georg.].
- Romashin, A.V. (2001): *Ecological-population analysis of highland ungulates of the West Caucasus and their sustainable use*. SPP, Soci. [In Russ.].
- Safarov, M.A. (1961): Results of aerial census of Gazelle numbers in Azerbaijan. *Proceedings Acad. Sci. USSR, biol. and medical sciences* 8, 51-55. [In Russ.].
- Sarkisov A.A. (1944): Nasonov’s Armenian Mouflon *Ovis ophion armeniana*. *Proceedings Yerevan Zool. Garden* III, 5-52. [In Russ.].
- Semyonov, U.A. (2014): *European Bison in Karachay-Cherkessia*. Partnership of scientific publications KMK, Moscow. [In Russ.].
- Semyonov, U.A. & Voronin, N.Ye. (2018): Evaluation of the territory of Sochi National Park to be included into Leopard restoration program in the Caucasus. Pp. 50-120 in Semyonov, U.A., ed. Restoration of Leopard in the Caucasus. Partnership of scientific publications KMK, Moscow. [In Russ.].
- Shackleton, D.M. & Lovari, S. (1997): Classification adopted for the Caprinae survey. Pp. 9-14 in Shackleton, D.M. and the IUCN/SSC Caprinae Specialist Group, eds. Wild sheep and Goats and their relatives. Status survey and Conservation Action Plan for Caprinae. International Union for Conservation of Nature, Gland, Switzerland.
- Sokolov, I.I. (1959): USSR fauna. Mammals (Artiodactyla and Perissodactyla). *Proceedings of Zoological Institute of Academy of Sciences of the USSR* 14, 1-295. [In Russ.].
- State report on ecological situation in Republic of Adygea in 2017. 2018. Maikop [In Russ.]. <http://www.adygheya.ru/ministers/departments/upravlenie-po-okhrane-okruzhayushchey-sredy-i-prirodnym-resursam/informatsi/doklady/>
- State report on ecological situation in Republic of North Ossetia–Alania in 2016. 2017. Vladikavkaz. [In Russ.]. – <http://minprirod.ru>
- State report on status of land-use and nature conservation in Krasnodar Krai in 2017. 2018. Krasnodar. [In Russ.]. – <http://www.mprkk.ru>

- State report on status of nature conservation in Republic of Dagestan in 2016. 2017. Makhachkala. [In Russ.].
– <http://mprdag.ru/gosdoklady>
- State report on status of nature conservation in Chechen Republic 2017. 2018. Grozny. [In Russ.]. –
<http://mpr-chr.ru>
- State report on status of nature conservation in Kabardino-Balkarian Republic in 2017. 2018. Nal'chik.
[In Russ.]. – <http://pravitelstvo.kbr.ru/oigv/minprirod/deyatelnost/gosdoklad.php>
- State report on status of nature conservation in Karachay-Cherkessian Republic in 2017. 2018. Cherkessk.
[In Russ.]. – http://www.okrsredkchr.ru/index/tekushhaja_deyatelnost/0-4
- Talibov, T.H., Weinberg, P.I., Mammadov, I.B., Mammadov, E.N. & Talibov, S.T. (2009): Conservation Strategy of the Asiatic Mouflon (*Ovis [orientalis] gmelini* Blyth) and Bezoar Goat (*Capra aegagrus Erxleben*) in Azerbaijan. Pp. 46-53 in Zazanashvili, N. and Mallon, D. eds. Status and protection of Globally Threatened Species in the Caucasus. CEPF, WWF, Tbilisi.
- TASS 2018. Number of Bisons in Kavkazsky zapovedniks reached carrying capacity of environment. [In Russ.].
– <https://tass.ru/v-strane/5705483>
- Tembotov, A.K. & Shkhashamishv, Kh.Kh. (1984): *Animal world of Kabardino-Balkaria*. “Elbrus”, Nal'chik.
- Trepet, S.A. (2014): *Ungulates of the North-West Caucasus. Contemporary status and mechanisms of stability of populations*. Kuban Publishers, Krasnodar. [In Russ.].
- Trepet, S.A. (2018): Historic range and prospects of Leopard restoration in Krasnodar Kray and Adygea. Pp. 19-50 In Semyonov, U.A., ed. Restoration of Leopard in the Caucasus. Partnership of scientific publications KMK, Moscow. [In Russ.].
- Tsalkin, V.I. (1955): Variability and systematics of Tur of the West Caucasus (Caprinae, Artiodactyla). *Bulletin of Moscow Naturalist Society*, Biological Section 60, 17-33. [In Russ.].
- Valdez, R. 2008. *Ovis orientalis*. The IUCN Red List of Threatened Species 2008: e.T15739A5076068. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T15739A5076068.en>. Downloaded on 25 May 2019.
- Valdez, R. (2011). Anatolian sheep *Ovis gmelinii*. Pp. 727-728 in Wilson, R.D and Mittermeier, R.A, eds. Handbook of the mammals of the world. Vol.2 Hoofed mammals. Lynx Ediciones, Barseleona.
- Weinberg, P.I. (2000): East-Caucasian Tur (*Capra cylindricornis* Blyth, 1841). Pp. 256-258 in Amirkhanov, A.M., ed. Animal world of Republic of North Ossetia-Alania. Proekt Press. Vladikavkaz. [In Russ.].
- Vereshchagin, N.K. (1939): Gazelle in Azerbaijan. *Proceedings Zool. Institute Acad. Sci. USSR*, issue 10, 109-122. [In Russ.].
- Vereshchagin, N.K. (1947): *Game animals of the Caucasus*. Azerbaijan Acad. Sci., Baku. [In Russ.].
- Vereshchagin, N.K. (1959): *Mammals of the Caucasus*. USSR Acad. Sci., Moscow–Leningrad. [In Russ.].
- Wacher, T., Wronski, T., Hammond, R.L., Winney, B., Blackett, M.J., Hundertmark, K.J., Mohammed, O.B., Omer, Sa., Macasero, W., Lerp, H., Plath, M. & Bleidorn, C. (2010): Phylogenetic analysis of mitochondrial DNA sequences reveals polyphyly in the Goitered Gazelle (*Gazella subgutturosa*). *Conservation Genetics* 12: 827–831.
- Weinberg, P.J. (1999): The present state and biology of the wild Goat (*Capra aegagrus Erxleben*) Dagestan population. *Bulletin of Moscow Naturalist Society*, Biological Section 104 (4), 2-21 (in Russ. with Engl. summ.).
- Weinberg P.J. (2000): Wild Goat. Pp. 717-718 in Danilov-Danilyan, V.I., ed. Red Data Book of Russia. Astrel' Pubs. Moscow. [In Russ.].
- Weinberg, P. (2008a): *Capra caucasica*. The IUCN Red List of Threatened Species 2008: e.T3794A10088217. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T3794A10088217.en>. Downloaded on 01 April 2019.
- Weinberg P. (2008b): *Capra cylindricornis*. The IUCN Red List of Threatened Species 2008: e.T3795A91283066. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T3795A10088954.en>. Downloaded on 01 April 2019.
- Weinberg, P.J. (2018): Survey in Republic of North Ossetia–Alania in order to evaluate possibility of inclusion into Leopard restoration in the Caucasus. Pp. 213-258 in Semyonov, U.A., ed. Restoration of Leopard in the Caucasus. Partnership of scientific publications KMK, Moscow. [In Russ.].

- Weinberg, P.J. (2019a): Survey of wild Goat (*Capra aegagrus*) and Asiatic Mouflon (*Ovis gmelinii*) within distribution of Leopard (*Panthera pardus*) range in Nakhchivan AR in 2018. Unpublished report. WWF.
- Weinberg, P.J. (2019b): European Bison monitoring in North Ossetia–Alania. Unpublished report. WWF.
- Weinberg, P., Jdeidi, T., Masseti, M., Nader, I., de Smet, K. & Cuzin, F. 2008. *Capra aegagrus*. The IUCN Red List of Threatened Species 2008: e.T3786A10076632. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T3786A10076632.en>. Downloaded on 01 April 2019.
- Weinberg, P.J., Akkiev, M.I. & Buchukuri, R.G. (2010): Clineal Variation in Caucasian Tur and its taxonomic relevance. *Galemys* 22 (n° special), 375-394.
- Weinberg, P.J. & Komarov, Yu.Ye. (2004): Contemporary status of European bison population in North Ossetia – Alania. Pp. 85-90 in Problems of restoring and preserving European bison. Danki. [In Russ.].
- Weinberg, P. & Malkhasyan, A. (2010): Armenian Mouflon in Armenia – present and future. Unpublished report. Peoples Trust for Endangered Species.
- Weinberg, P. & Malkhasyan, A. (2013): Implications for conservation of Armenia’s mountain ecosystems. Unpublished Report 2013. Rufford Foundation.
- Yarovenko, Yu. A. & Weinberg, P. (2013): Monitoring of mountain ungulates in Azerbaijan Republic. Unpublished report. GIZ.
- Yarovenko, Yu.A. & Yarovenko, A.Yu. (2018): Survey of the north-western part of montane Dagestan and feasibility of Leopard reintroduction there. Pp. 259-308 in Semyonov, U.A. ed. Restoration of Leopard in the Caucasus. Partnership of scientific publications KMK, Moscow. [In Russ.].
- Yavruyan, E.G. (1975): Number and methods of protection of the wild sheep in Armenia and Nakhichevan ASSR. P. 285 in Sokolov, V.Ye., ed. Mammals of USSR fauna. Nauka, Moscow. [In Russ.].
- Zalikhyanov, M.Ch. (1967): Tur in *Kabardino-Balkaria*. Kabardino-Balkarskoye Knizhnoye Izdatel’stvo, Nal’chik. [In Russ.].
- Zazanashvili, N. & Bolkvadze, I. (1989): Some results of geo-botanical survey of Kizlyar winter pastures. *Nature Protection in Georgia*, 17, 44–54. [In Georg.].
- Ziaie, H. (1997): Iran. Pp. 49-55 in: Shackleton, D.M. ed. Wild sheep and goats and their relatives. International Union for Conservation of Nature, Gland, Switzerland and Cambridge, UK.

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STATUS OF BIRDS IN THE CAUCASUS

Compiled by

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Contents: *Introduction; Number of species recorded in the countries; Endemic and restricted range birds of the Caucasus; Important places for the conservation of breeding and migratory birds: Important Bird and Biodiversity Areas and migration bottlenecks; Major threats to birds in the Caucasus; References; Suggested citation.*

Introduction

The existence of large oro-climatic barriers in the Caucasus Ecoregion such as the Greater Caucasus mountain range and Lesser Caucasus mountain chain has created conditions in which a great diversity of landscapes has developed. Those landscapes include broadleaved and coniferous mountain forests, mountain steppes and open dry woodlands, subalpine and alpine meadows, coastal, inland and highland wetlands, riparian forests and semi-deserts.

This landscape diversity and the geographic position of the region at the crossroads of different bio-geographical zones support a diverse avifauna. Over 450 species of birds are recorded for the region, among them 23 globally threatened species according to the IUCN Red List (IUCN 2019): 3 Critically Endangered (CR), 5 Endangered (EN) and 15 Vulnerable (VU) (see Table 1).

Number of species recorded in the countries

Armenia

Different sources indicate different number of bird species for Armenia:

- Adamian & Klem (1997) mention 349 species;
- Armenian Society for the Protection of Birds³¹ indicates 366 species;
- Armenian Bird Census³²- 376; and
- Avibase³³- 383.

According to Birdlife International, there are 14 globally threatened species in Armenia (1 CR, 4 EN and 9 VU) together with 16 species in the Near Threatened (NT) category (BirdLife International 2019a). However, according to recent data from the country, there are 17 globally threatened species in Armenia (1 CR, 4 EN and 12 VU) (see Table 1).

96 bird species are listed in the Red Data Book of Armenia (Aghasyan & Kalashyan, 2010).

³¹ <http://www.aspbirds.org>

³² <https://www.abcc-am.org>

³³ <https://avibase.bsc-eoc.org/checklist.jsp?region=AM>

Azerbaijan

According to different sources, the number of bird species recorded in Azerbaijan varies between 348 and 411:

- Birdlife International (2019b) reports 348 species;
- Azerbaijan Ornithological Society³⁴ - 403 species;
- M. Patrikeev (2004) – 372;
- The Cornell Lab of Ornithology³⁵ – 378;
- Azerbaijan Birds.Watch³⁶ – 397; and
- Avibase³⁷ – 411.

The number of globally threatened species also varies according to the different sources. According to the Azerbaijan Ornithological Society (aos.az) and Avibase, there are 23 globally threatened species. Birdlife International (2019) lists 19 species (3 CR, 4 EN and 12 VU) together with 18 species of Near Threatened (NT) category (BirdLife International 2019b). However, according to recent data from the country, there are 21 globally threatened species (3 CR, 5 EN and 13 VU).

72 bird species are listed in the Red Data Book of Azerbaijan (Azerbaijan Ornithological Society 2013).

Georgia

Differences in bird count exists for Georgia too:

- The Cornell Lab of Ornithology indicates 339 bird species for Georgia³⁸;
- The Special Protected Areas for Birds in Georgia³⁹ – 403; and
- Avibase⁴⁰ - 408.

According to the Avibase checklist - Georgia⁴¹, there are 21 globally threatened bird species in Georgia (2 CR, 5 EN and 14 VU) together with 21 species considered as NT (BirdLife International 2019c). However, according to recent data from the country, there are 19 globally threatened species (1 CR, 5 EN and 13 VU).

35 bird species are included in the Red List of Georgia (Decree 2014).

Iran (West and East Azarbaijan Regions and Gilan)

According to Birdlife International, over 360 bird species are recorded in the Caucasian part of Iran; of those, 16 species are globally threatened⁴² (Birdlife International 2019d). However, according to recent data, there are 20 globally threatened species (3 CR, 5 EN and 12 VU) (see Table 1).

Russia (North Caucasus Region)

According to the Avibase checklist, 379 bird species are recorded in the North Caucasus region (Southern Federal District). The increasing number of species of the avifauna of the region listed in recent decades is associated with a growing number of observers. According to V.P. Belik et al. (2016), the avifauna of the Russian Caucasus includes 402 species. The analysis of new findings and reports shows that 408 bird species are registered in the region: 273 species nest or presumably nest, 44 species are recorded during migration, 24 species over-winter in the region and 67 species are migratory (NCAVC 2017, 2018). Out of the mentioned 408 birds species, 23 species are globally threatened (3 CR, 5 EN and 15 VU).

³⁴ www.aos.az

³⁵ <https://ebird.org/country/AZ?yr=all>

³⁶ <https://azerbaijan.birds.watch>

³⁷ <https://avibase.bsc-eoc.org/checklist.jsp?region=AZ>

³⁸ <https://ebird.org/region/GE?yr=all>

³⁹ aves.biodiversity-georgia.net

⁴⁰ <https://avibase.bsc-eoc.org/checklist.jsp?region=GE>

⁴¹ <https://avibase.bsc-eoc.org/checklist.jsp?lang=EN®ion=ge&list=clements>

⁴² Avibase checklist – Iran (West Azarbaijan, East Azarbaijan, Gilan), <https://avibase.bsc-eoc.org/checklist.jsp?region=IRwa>, <https://avibase.bsc-eoc.org/checklist.jsp?region=IRwa>, <https://avibase.bsc-eoc.org/checklist.jsp?region=IRwa>, <https://avibase.bsc-eoc.org/checklist.jsp?region=IRgi>

Turkey (Black Sea Region)

There are 400 bird species recorded regularly in Turkey of which 313 species are known to breed in the country (Boyla et al., 2019). The Turkish check list exceeds 481 species and gets longer each year with an increasing number of birdwatchers. 394 species are recorded in the Black Sea Region, which roughly corresponds to the Caucasian part of Turkey. Out of these 394 bird species, 19 species are globally threatened⁴³ (2 CR, 5 EN and 12 VU).

Table 1. The IUCN Globally Threatened Bird Species in the Caucasus (2019)

#	Scientific Name	Common Name	IUCN Category			Distribution by Countries					
			VU	EN	CR	Armenia	Azerbaijan	Georgia	Iran	Russia	Turkey
	Birds	23	15	5	3	17	21	19	20	23	19
1	<i>Anser erythropus</i>	Lesser White-fronted Goose	+			+	+	+	+	+	+
2	<i>Aquila heliaca</i>	Eastern Imperial Eagle	+			+	+	+	+	+	+
3	<i>Aquila nipalensis</i>	Steppe Eagle		+		+	+	+	+	+	+
4	<i>Aythya ferina</i>	Common Pochard	+			+	+	+	+	+	+
5	<i>Branta ruficollis</i>	Red-breasted Goose	+			+	+	+	+	+	+
6	<i>Chlamydotis macqueenii</i>	Macqueen's Bustard	+				+			+	
7	<i>Clanga clanga</i>	Greater Spotted Eagle	+			+	+	+	+	+	+
8	<i>Clangula hyemalis</i>	Long-tailed Duck	+			+	+	+	+	+	+
9	<i>Emberiza rustica</i>	Rustic Bunting	+			+	+			+	
10	<i>Falco cherrug</i>	Saker Falcon		+		+	+	+	+	+	+
11	<i>Haliaeetus leucoryphus</i>	Pallas's Fish-eagle		+			+	+	+	+	
12	<i>Leucogeranus leucogeranus</i>	Siberian Crane			+		+		+	+	
13	<i>Marmaronetta angustirostris</i>	Marbled Teal	+			+	+	+	+	+	+
14	<i>Melanitta fusca</i>	Velvet Scoter	+			+	+	+	+	+	+
15	<i>Neophron percnopterus</i>	Egyptian Vulture		+		+	+	+	+	+	+
16	<i>Numenius tenuirostris</i>	Slender-billed Curlew			+		+		+	+	+
17	<i>Otis tarda</i>	Great Bustard	+			+	+	+	+	+	+
18	<i>Oxyura leucocephala</i>	White-headed Duck		+		+	+	+	+	+	+
19	<i>Podiceps auritus</i>	Horned Grebe	+			+	+	+	+	+	+
20	<i>Puffinus yelkouan</i>	Yelkouan Shearwater	+					+		+	+
21	<i>Rissa tridactyla</i>	Black-legged Kittiwake	+					+	+	+	+
22	<i>Streptopelia turtur</i>	European Turtle-dove	+			+	+	+	+	+	+
23	<i>Vanellus gregarius</i>	Sociable Lapwing			+	+	+	+	+	+	+

⁴³ Avibase checklist – Turkey (Black Sea Region) <https://avibase.bsc-eoc.org/checklist.jsp?region=TRan>

Endemic and restricted range birds of the Caucasus

Endemic species

All the region's endemic species occur in mountain forest, subalpine and alpine zones. Subalpine and alpine habitats are important for two Caucasus endemic species - Caucasian Snowcock (*Tetraogallus caucasicus*) and Caucasian Grouse (*Lyrurus mlokosiewicsi* = *Tetrao mlokosiewicsi*) as well as for two restricted range species - Caucasian Chiffchaff (*Phylloscopus lorenzii*) and Green Warbler (*Phylloscopus nitidus*) (BirdLife International 2019e).

Caucasian Snowcock occur only on dry, steep subalpine and alpine slopes with scree and grasslands in the Greater Caucasus in Georgia, Azerbaijan and Russia.

Caucasian Grouse is closely associated with timberline habitats, subalpine forests often with birch trees (*Betula spp.*), subalpine-alpine Rhododendron caucasicum thickets and grasslands. This species occurs in both the Greater and Lesser Caucasus mountain ranges. The largest populations are in Georgia and Russia, with smaller populations in Azerbaijan, Armenia, Iran and northeastern Turkey (Sultanov et al., 2003; Sultanov, 2006; Sultanov, 2018; Isfendiyaroglu et al., 2007).

Upper mountain and subalpine forests are important breeding habitats for the Caucasian Chiffchaff (*Phylloscopus lorenzii*). This species was considered to be a subspecies of Mountain Chiffchaff (*Phylloscopus sindianus*), although later it was accepted as full species (Roselaar, 1995; Monroe, Sibley, 1993; Kirwan et al., 2006). Caucasian Chiffchaff breeds in the high mountain forests of the Greater Caucasus, most of the Lesser Caucasus and adjacent parts of north-eastern Turkey. In winter, it disperses south as far as Iraq.

Mountain broadleaf forests of the Caucasus are important habitat for Green Warblers. The species breeds in mountain forests dominated by oriental beech (*Fagus orientalis*), oriental spruce (*Picea orientalis*) and Caucasian fir (*Abies nordmanniana*). Green Warbler is distributed in a continuous belt on the northern slopes of the Greater Caucasus, has a scattered distribution on south facing slopes and in the western part of the Black Sea basin, and is rare in areas with low humidity. The species winters in the southern part of the Indian subcontinent.

Caucasian Grouse, Zangezur Managed Nature Reserve, Armenia



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Restricted range species

The breeding area of Armenian gull (*Larus armenicus*) extends around lakes in Armenia, Georgia and Turkey; it is also common in the Nakhchivan Autonomous Republic of Azerbaijan, and some colonies occur on the lakes of middle eastern part of Turkey and in Iran (Svensson, 2009).

Velvet Scoter (*Melanitta fusca*) is an endangered sea duck, which is classified as Vulnerable by the IUCN Red List and has a distinct breeding population in the Caucasus region (Birdlife International 2018). This species breeds on alpine lakes of the Caucasus (Kirwan et al., 2008) and occurs rarely in Caspian Sea wetlands in Azerbaijan in winter, e.g. in Gyzylagach National Park (personal communication with E. Sultanov, 2019). It has been declared extinct in Turkey (Boyla et al., 2019).

Great Rosefinch (*Carpodacus rubicilla*) and White-winged Redstart (*Phoenicurus erythrogastrus*) are high mountain species with disjunctive distributions. Isolated populations breed in the Greater Caucasus and mountains of Asia (Himalayas, Tangshan, Tibet, Altay). Caucasian populations of both species have been isolated from larger Asian populations for around 500,000 years (Tietze et al., 2013).

The Caucasus is also important for some other bird species with restricted range such as the most northern populations of Caspian Snowcock (*Tetraogallus caspius*), Radde's Accentor (*Prunella ocularis*) and significant European populations of Semi-collared Flycatcher (*Ficedula semitorquata*), Red-fronted Serin (*Serinus pusillus*) and a marginal population of Krüper's Nuthatch (*Sitta krueperi*) (Aghababayan et al., 2017, BirdLife International 2019e).

The Caucasus region holds significant breeding populations of some raptors, e.g., the largest breeding population of the globally Near Threatened Bearded Vulture (*Gypaetus barbatus*) in Europe (Supplementary Material 2015) and a large population of the globally Endangered Egyptian Vulture (*Neophron percnopterus*). The Caucasus populations of both species represent more than 10% of their global populations (Botha et al., 2017).

Imperial Eagle hunts a snake, Vashlovani National Park, Georgia



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Important places for the conservation of breeding and migratory birds: Important Bird and Biodiversity Areas and migration bottlenecks

Existence of Important Bird and Biodiversity Areas⁴⁴ (IBAs) and occurrence of globally threatened species (CR, EN, VU) of the IUCN Red List are among the criteria applied for identifying Key Biodiversity Areas (KBAs) in the new edition of the Caucasus Ecoregional Conservation Plan (Zazanashvili et al., 2020). During mapping of KBAs almost all IBAs in the Caucasus Ecoregion were considered.

There are 231 IBAs within the Caucasus Ecoregion boundaries, almost half of which (111) are in the Northern Caucasus. Georgia has the largest area of IBAs as a proportion of territory - 20.55%, comprised of 31 IBAs covering 14,330 km².

Two large migration routes (along the coasts of the Caspian and the Black Seas) and several smaller ones cross the Caucasus and add to the Caucasus Ecoregion's international importance for biodiversity.

The following paragraphs provide data for the countries of the Ecoregion.

Armenia

There are 18 IBAs in Armenia with a total area of 4,151 km² covering 13.95% of Armenia's territory (BirdLife International 2019a). Major bird wintering and migration stopover places are Lake Sevan, Armash fishponds and Metsamor river system. The IBAs require revision to reflect recent changes in the IUCN Red List (e.g. the threat status of European Turtle Dove (*Streptopelia turtur*) has been increased (Aghababyan, 2020) while that of Lesser Kestrel (*Falco naumanni*) has been decreased) and to take account of recent findings for endangered breeding species in the country, e.g. Saker Falcon (*Falco cherrug*) (Korepov & Aghababyan, 2020).

The existing IBAs cover a significant portion of breeding ranges for several endangered species, e.g. Khosrov Reserve IBA covers all the known breeding sites of Cinereous Vulture (*Aegypius monachus*) (Aghababyan & Khanamirian, 2019).

Azerbaijan

There are 53 IBAs in Azerbaijan with a total area of 8,428 km² covering 9.7% of Azerbaijan's territory (BirdLife International 2019b).

The western Caspian flyway is one of the largest in the region: here at the Besh Barmag bottleneck (situated 80 km north from Baku at the foothills of the Greater Caucasus), an estimated 1.24–1.51 million migrants passed through in autumn 2011 and a further 0.65–0.82 million in spring 2012, elevating this bottleneck to international importance (Heiss, 2016).

Azerbaijan has the main waterbird wintering and migration stopover places in the Western Palearctic. Some of the largest waterbird wintering sites in Azerbaijan are Kyzylagach and lake Sarysu (about 500,000 wintering waterbirds in the 1990s-2000s), Absheron-Gobustan seacoast (up to 200,000 waterbirds), Aggyol and Mahmudchala wetlands (up to 100,000 wintering waterbirds), Kura estuary (up to 75,000 waterbirds) (Azerbaijan Ornithological Society, 2013; Sultanov, 2013, 2019). The population of Eastern Imperial Eagle (*Aquila heliaca*) in Azerbaijan - about 120 pairs - is estimated to be the largest in Europe (without Russia) and the Caucasus (Sultanov et al., 2011).

⁴⁴ An Important Bird and Biodiversity Area is an area identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations (see <https://www.birdlife.org/worldwide/programme-additional-info/important-bird-and-biodiversity-areas-ibas>).

Georgia

There are 31 IBAs in Georgia with a total area of 14,330 km² covering 20.55 % of Georgia`s territory (BirdLife International 2019c).

One of the world`s largest raptor migration bottlenecks is located near Batumi, in the southwest of Georgia. The area is known as the Batumi raptor migration bottleneck or Eastern Black Sea Migration Bottleneck. Over one million raptors of about 35 species migrate through this bottleneck every autumn (Galvez et al., 2005; Wehrmann et al., 2019).

The coastal wetlands of the Kolkheti lowlands are very important for wintering waterbirds. Over 200,000 waterfowl (Anseriformes) winter here annually. Georgian territorial waters of the Black Sea are the most significant wintering area for the Black Sea Anchovy (*Engraulis encrasicolus*) (Chashchin, 1996). The large concentration of fish attracts wintering Charadriiformes and Podicipediformes in significant numbers. Over 200,000 Gulls (predominantly *Larus cachinnans* and *Chroicocephalus ridibundus*) and up to 100,000 Great Crested Grebes (*Podiceps cristatus*) winter in the estuaries of rivers Enguri, Rioni, Supsa and Chorokhi. Those sites are also important for wintering of vulnerable Yelkouan Shearwater (*Puffinus yelkouan*): flocks of up to 4,000 birds are recorded every year, feeding on schools of the Black Sea Anchovy (Javakhishvili et al., 2014).

Iran

There are eight IBAs within the territory of the Iranian Caucasus: Arasbaran Protected Area, Kiamaki, Akh Gol, Dasht-e-Moghan, Lavandavil Wildlife Refuges, Lisar Protected Area, Anzali Mordab Complex and Bandar Kiashar Lagoon, and Mouth of Sefid Rud.

IBA Arasbaran Protected Area is important for conservation of the most south-eastern population of Caucasian Grouse. These four sites - Anzali Mordab complex, Bandar Kiashar lagoon, and mouth of Sefid Rud and Dasht-e-Moghan - are important for migratory waterbirds (BirdLife International 2019d).

Russia

There are 111 IBAs within the territory of North Caucasus with a total area of 33,034 km². 32 IBAs of highest conservation importance were identified and proposed to the Russian Government as potential protected areas (Lyubimova et al., 2009). IBAs in North Caucasus support the conservation of habitats and populations of various groups of birds inhabiting steppe, wetlands, forest and mountain ecosystems.

Turkey

There are 10 IBAs within the territory of Turkish Caucasus: Eastern Black Sea, Karchal mountains, Aygir Lake, Aktash Lake, Ardahan Forest, Childir Lake, Kars Plain, Sarikamish Forest, Igdirdir Plain and Yalnizcham Mountains. Coastal KBAs are important for globally significant congregations of wintering waterfowl (Eken et al., 2006) and they also host significant numbers of Yelkouan Shearwater (*Puffinus yelkouan*) (Ortega and Isfendiyaroglu, 2016).

The Borchkha raptor migration bottleneck is important for migratory raptors of the western Palearctic. More than 200,000 raptors of 31 species migrate through Borchkha valley every year (Zalles and Bildstein, 2000). These figures are underrepresented due to lack of observer/researcher activities. The results of the Batumi raptor count highlight the significance of the Borchkha bottleneck.

Griffon and Black Vultures, Vashlovani National Park, Georgia



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Major threats to birds in the Caucasus

Habitat loss, degradation and fragmentation, and illegal hunting are the major threats to populations of breeding birds in the Caucasus. As stated in FAO, UNECE 2019: in the South Caucasus countries - Armenia, Azerbaijan and Georgia (as well as Central Asian countries) - “there are strong anthropogenic pressures on the forests, notably from fuelwood demand for local communities, leading to illegal/ excessive logging, as well as from overgrazing, leading to forest degradation, and from irrigation and hydroelectric schemes along the rivers, leading to loss of forest cover.”

Heavy grazing pressure by domestic livestock affects grassland ecosystems in the high mountains (summer pastures), and steppes and semideserts in the lowlands (winter pastures).

In the most water-rich parts of the Caucasus, large, medium and small hydropower construction is causing major changes in river flow regimes. In addition, unsustainable water management practices are causing drying or disappearing of some wetlands.

Poaching and egg robbery is still a significant problem for hunted species and raptors. Also, pollution from mining is a problem in certain countries of the Caucasus.

References

- NCAVC 2017. Activity of the North Caucasus Avifaunistic Committee in 2017. Pp. 123-131 in Strepet: Fauna, ecology and protection of birds of South Palearctic. Vol. 15 (2), Rostov-on-Don. [In Russ.].
- NCAVC 2018. Activity of the North Caucasus Avifaunistic Committee in 2018. Pp. 123-128 in Strepet: Fauna, ecology and protection of birds of South Palearctic. Vol. 16 (1-2), Rostov-on-Don. [In Russ.].
- Adamian, M. & Klem, D. (1997): *A Field Guide to Birds of Armenia*. American University of Armenia, Yerevan.
- Aghababyan K. (2020): Assessment of the state of European Turtle-dove *Streptopelia turtur* Linnaeus, 1758 in Armenia. Submitted to *Polish Journal of Science*, 23(2): 6-10.
- Aghababyan K., Ter-Voskanyan H., Khachatryan A., Gevorgyan V., Khanamirian G. (2017): The State of Semi-collared Flycatcher (*Ficedula semitroquata* Homeyer, 1885) in Armenia. Pp. 7-11 in Proc. of III International Scien. Conf. "Biological diversity and conservation problems of the fauna - 3", September 27-29, 2017, Yerevan, Republic of Armenia.
- Aghababyan K., Khanamirian G. (2019): The state of Cinereous Vulture *Aegypius monachus* (Linnaeus 1766) in Armenia. In: P. 115 in Rabaça, J.E., Roque, I., Lourenço, R. & Godinho, C., eds. Bird Numbers 2019: counting birds counts. Book of Abstracts of the 21st Conf. of the European Bird Census Council. University of Évora, Évora.
- Aghasyan A., and Kalashyan M., eds. (2010): Red Data Book of Animals of the Republic of Armenia. Ministry of Nature Protection, Yerevan. Asoghik. - http://www.mnp.am/red_book_fauna/
- Azerbaijan Ornithological Society 2013. Birds of Azerbaijan - <https://www.aos.az/en/2013-01-10-09-21-19/bird-s-world-of-azerbaijan>.
- Belik V.P., Karavaev A.A., Tilba P.A., Muzaev V.M., Komarov Yu.E., Fedosov V.N. (2016): The avifauna of Southern Russia: current distribution and character of presence of the species in the regions // Strepet: Fauna, ecology and protection of birds of South Palearctic. Rostov-on-Don. Vol. 14. № 1-2. P. 98 -197
- BirdLife International 2019a. Country profile: Armenia. Available from <http://www.birdlife.org/datazone/country/armenia>. Checked: 2019-06-01
- BirdLife International 2019b. Country profile: Azerbaijan. Available from <http://www.birdlife.org/datazone/country/azerbaijan>. Checked: 2019-06-01
- BirdLife International 2019c. Country profile: Georgia. Available from <http://www.birdlife.org/datazone/country/georgia>. Checked: 2019-06-22
- BirdLife International 2019d. Country profile: Iran, Islamic Republic of. Available from <http://www.birdlife.org/datazone/country/iran>. Checked: 2019-06-22
- BirdLife International 2019e. Endemic Bird Areas factsheet: Caucasus. Downloaded from <http://www.birdlife.org> on 16/06/2019. <http://datazone.birdlife.org/eba/factsheet/87>
- BirdLife International 2018. *Melanitta fusca*. The IUCN Red List of Threatened Species 2018: e.T22724836 A132654594. <http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22724836A132654594.en>. Downloaded on 10 September 2019.
- Boyla, K.A., Sinav, L. ve Dizdaroğlu, D.E. (2019): *Türkiye Üreyen Kuş Atlası*. WWF-Türkiye, Doğal Hayatı Koruma Vakfı, İstanbul.
- Botha, A. J., Andevski, J., Bowden, C. G. R., Gudka, M., Safford, R. J., Tavares, J. and Williams, N. P. (2017): Multi-species Action Plan to Conserve African-Eurasian Vultures. CMS Raptors MOU Technical Publication No. 5. CMS Technical Series No. 35. Coordinating Unit of the CMS Raptors MOU, Abu Dhabi, United Arab Emirates. ISBN 978-3-937429-23-6
- Chashchin, A.K. (1996): The Black Sea populations of anchovy The European Anchovy and its Environment. Pp. 219-225 in Palomera, I. & Rubies, P., eds. SCI. MAR., 60 (Supl. 2).
- Decree 2014. Decree of the Government of Georgia on Adoption of Georgian "Red List". [In Georg.]. – <https://matsne.gov.ge/ka/document/view/2256983?publication=0>

- Sakartvelos sakanondeblo matsne Publisher, Tbilisi. Downloaded 21/08/2018.
- Eken G., Bozdoğan M., İsfendiyaroğlu S., Kılıç D.T., ve Lise Y. (Editors) 2006. Key Biodiversity Areas of Turkey, Kitap Publishing, İstanbul, 1200 pg (in Turkish)
- Eken, G., İsfendiyaroğlu, S., Yenyurt, C., Erkol, I.L., Karataş, A., Ataol, M. (2016): Selection and conservation status of Key Biodiversity Areas in Turkey: Applying the “Key Biodiversity Areas” approach at the national scale. *International Journal of Biodiversity Science, Ecosystem Services and Management*, 12 (3), 181-190.
- FAO, UNECE 2019. State of forests of the Caucasus and Central Asia. <http://www.unece.org/fileadmin/DAM/timber/publications/sp-47-soccaf-en.pdf>
- Galvez, R., Gavashelishvili, A., Javakhishvili, Z. (2005): Raptors and Owls of Georgia. GCCW and Buneba print publishing, Tbilisi.
- Heiss, M. (2016): Migratory behaviour of bird species occurring in critical numbers at Besh Barmag bottleneck in Azerbaijan. *Bird Conservation International*, 26 (2), 243-255. <https://doi.org/10.1017/S095927091500009X>
- İsfendiyaroğlu, S., Welch, G., Ataol, M. (2007): The Caucasian black grouse *Tetrao mlokosiewiczzi* in Turkey: recent survey results and conservation recommendations. *Wildl. Biol.* 13 (Suppl. 1), 13-20.
- IUCN 2019, The IUCN Red List of Threatened Species. Version 2019-3. <<https://www.iucnredlist.org>>
- Javakhishvili, Z., Paposhvili, N., Ninua, L., Dekanoidze, D., Kerdikoshvili, N., Mamuchadze, J. (2014): Wintering waterfowl monitoring in the Kolkheti National Park. Unpublished report. Ilia State University & Agency of protected Areas, Tbilisi. [in Georg.].
- Kirwan, G.M., Boyla, K. A., Castell, P., Demirci, B., Özen, M., Welch, H., Marlow, T. (2008): *Birds of Turkey*. Christopher Helm, London.
- Korepov M., Aghababyan K. (2020): Breeding of Saker Falcon *Falco cherrug* in Armenia. *Sandgrouse*, 42, 118-121.
- Lyubimova, K., Bukreev, S., Sviridova, T. & Dzhamirzoev, D. (2009): Site Network for Birds and Wetlands: Inventory, Protection and Community Management. Pp. 122-124 in Zazanashvili, N. & Mallon, D., eds. *Status and Protection of Globally Threatened Species in the Caucasus*. CEPF, WWF, Tbilisi.
- Monroe, Jr., B.L. & Sibley, C.G. (1993): *A World Checklist of Birds*. Yale University Press, New Haven and London.
- Ortega, M.P., İsfendiyaroğlu, S. (2016): Predicting foraging hotspots for Yelkouan Shearwater in the Black Sea. *Deep Sea Research Part II Topical Studies in Oceanography* 07/2016; DOI:10.1016/j.dsr2.2016.07.007
- Patrikeev, M. (2004): *The Birds of Azerbaijan*. Pensoft Publishers. Pensoft Series Faunistica vol. 38.
- Red Book of Armenia 2010. - http://www.mnp.am/red_book_fauna/
- Roselaar, C.S. (1995): *Songbirds of Turkey: Atlas of Biodiversity of Turkish Passerine Birds*. Pica Press, Robertsbridge, UK.
- Sultanov, E. (2006): Surveys in Caucasian Black Grouse habitats in Azerbaijan. Pp. 25-28 in Grouse News, Newsletter of the WPA/BirdLife/IUCN/SSC Grouse Specialist Group, 31.
- Sultanov, E.H., Kerimov, T.A., Mammadov, A.F., Samadov, E.S., Isayev, S.A., Jabraili, G.N. (2011): [*Imperial Eagle, Egyptian Vulture and Lesser Kestrel in Azerbaijan*, Nakhchivan Tusi, 74 p.] in Azerbaijani.
- Sultanov, E. (2013): Main results of recent winter counts of waterbirds and main threats for its existence in Azerbaijan. BIRD NUMBERS 2013. XIX conference of the European Bird Census Council, CLUJ Romania 17-21 Sept. 2013.
- Sultanov, E. (2018): Modern State of Caucasian Black Grouse in Azerbaijan. GROUSE NEWS 56. December 2018. Newsletter of the Grouse Group of the IUCN-SSC Galliformes Specialist Group Chair Grouse Group within the IUCN-SSC Galliformes Specialist Group Editorial Board. Abstracts from 14th International Grouse Symposium, Logan, Utah, USA 24-28 September 2018, p.38.

- Sultanov, E. (2019): Biodiversity and nature conservation importance of Caspian wetlands in Azerbaijan. Pp. 5-8 in *Natural Ecosystems of the Caspian Region: the past, the present and the future*. Proceedings of the Scientific Conference dedicated to 100-year Anniversary of Astrakhan State Reserve. Ministry of Nat. Res. and Ecol. of Rus. Fed., FGBU “Astrakhan State Reserve”.
- Sultanov, E., Karimov, T., Klaus, S. & Etsold, J. 2003: Qafqaz tetrasi. - Azerbaijan Ornithological Society, Baku. [in Az. with Engl. sum.].
- Supplementary Material 2015. *Gypaetus barbatus* (Bearded Vulture). European Red List of Birds, Supplementary Material. The IUCN Red List of Threatened Species, Birdlife International. – http://datazone.birdlife.org/userfiles/file/Species/erlob/supplementarypdfs/22695174_gypaetus_barbatus.pdf
- Svensson, L. (2009): *Birds of Britain and Europe*. Collins Bird Guide, Second Edition. Harper Collins Publishers Ltd., London.
- Tietze, D., Packert, M., Martens, J., Lehmann, H., Sun, Y. (2013): Complete phylogeny and historical biogeography of true rosefinches (Aves: Carpodacus). *Zool J Linn Soc*, 169, 215–234.
- Wehrmann, J., de Boer, F., Benjumea, R., Cavaillès, S., Engelen, D., Jansen, J., Verhelst, B., Vansteelant, W. M. G. (2019): Batumi Raptor Count: autumn raptor migration count data from the Batumi Bottleneck, Republic of Georgia. *Zookeys* 836, 135-157.
- Zalles, J. I. & Bildstein, K.L., eds. (2000): *Raptor Watch: A global directory of raptor migration sites*. Cambridge, UK: Birdlife international; and Kempton Pa, USA: Hawk Mountain Sanctuary (Birdlife Conservation Series No.9).
- Zazanashvili, N., Sanadiradze, G., Garforth, M., Bitsadze, M., Manvelyan, K., Askerov, E., Mousavi, M., Krever, V., Shmunk, V., Kalem, S. and Devranoğlu Tavsel, S., eds. (2020). *Ecoregional Conservation Plan for the Caucasus: 2020 Edition*. WWF, KfW, Tbilisi.
- Zazanashvili, N., Garforth, M., Jungius, H., Gamkrelidze, T., Montalvo, C., eds. (2013): *Ecoregion Conservation Plan for the Caucasus*. 2012 revised and updated edition. WWF, KfW, BMZ, Tbilisi.

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AMPHIBIANS AND REPTILES OF THE CAUCASUS

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Contents: Introduction; The Number of amphibian and reptile species in the Caucasus; Globally and regionally threatened species in the Caucasus; Main threats and possible conservation actions; Conclusions; References; Suggested citation.

Introduction

In the first edition of the Ecoregion Conservation Plan for the Caucasus – ECP (Williams et al., 2006) – there were listed 77 species of reptiles for the Caucasus, from which 28 are endemics to the region. The most interesting reptiles are endemic Caucasian vipers (*Pelias spp.*) and rock lizards (*Darevskia spp.*). Many of these species occupy geographical ranges of only a few thousand square kilometres. The genus *Darevskia* from the Family of true lizards are particularly diverse. Out of the 35 known species in the world, 25 occur in the Caucasus and 23 are regional endemics.

Fourteen amphibian species were known in the Caucasus; four of them endemic to the Region. The Caucasian Salamander (*Mertensiella caucasica*), one of the oldest relicts of the Caucasus, is found only in the western part of Lesser Caucasus in Georgia and Turkey; this formal species is comprised of two deeply divergent lineages, *de facto* undescribed species, one of which occurs only in Borjomi-Kharagauli National Park in Georgia (Tarkhnishvili et al., 2000; Tarkhnishvili & Kaya, 2009). Caucasian Parsley Frog (*Pelodytes causicus*) and Colchic Toad (*Bufo verrucosissimus*) live in mountain forests of the Western Caucasus and separately on the uppermost part of Stavropol Upland in the Northern Caucasus. All three species, as well as endemic Caucasian mountain vipers, are included in the IUCN Red List as globally threatened.⁴⁵

Since 2001-2005, there have been a number of changes in taxonomic nomenclature in the Ecoregion due to new species' and subspecies' descriptions, re-naming, findings of species not previously known for the region (such as the introduced *Phoenicolacerta laevis*), new molecular-genetic studies, surveys in poorly known areas (mainly in high mountains), and inclusion of earlier forgotten forms of amphibians and reptiles into the species list.

The list of amphibians and reptiles was not updated during the ECP's first revision and updating in 2012 and it could be useful to do it now: e.g. a description of the high level of diversity of shield-headed vipers (*Pelias*) in the Caucasus Ecoregion is essential to establish the conservation status of rare narrow-ranged species, part of which are included in the IUCN Red list as globally threatened and used to identify Key Biodiversity Areas of the Caucasus. While it is important to preserve the biodiversity of all the snakes of the Caucasus Ecoregion, from a global perspective the main task and responsibility is to conserve the taxa endemic

⁴⁵ Later, *Pelodytes causicus* and *Bufo verrucosissimus* have been downlisted to NT – Near Threatened.

to the Caucasus, which, with the exception of *Pelias renardi*, include all other shield-headed vipers that occur in the region. In other words, the Caucasus plays a key role in the conservation of the vast number of species of shield-headed vipers (Tuniyev, 2016).

Substantial progress has been made in the research of rock lizards (*Darevskia*). This group probably has the highest level of speciation (related to the overall occupied area) among lizards in the temperate climate zone. These lizards are particularly diverse and have a high level of local endemism; they include seven parthenogenetic taxa and are a perfect group for studying the process of speciation in mountain habitats.

Two relict amphibians, Caucasian Salamander and Caucasian Parsley Frog, are thought to have been isolated in the west of the Caucasus ecoregion since the Miocene or even earlier and are therefore living fossils deserving special attention by evolutionary biologists. Similarly, two species of relict salamanders of the genus *Paradactylodon* are found in the north of Iran.

The Number of amphibian and reptile species in the Caucasus

In recent decades, multiple changes have been made to names of genera and species of amphibians and reptiles, and new taxa have been described. At the present time, there are 102 formally described species of reptile including 33 endemic species and 75 subspecies, and 16 species of amphibian with 6 endemic species and 12 subspecies. There are no endemic species of turtle or tortoise, but there are 7 endemic subspecies which occur only in the Caucasus Ecoregion.

As mentioned above, in ECP 2006, from the 35 known species of the genus *Darevskia* worldwide, 26 species occur in the Caucasus and 18 of them are endemic to the Ecoregion. The Caucasus Ecoregion is the main centre of taxonomical diversity of rock lizards of the genus *Darevskia* Arribas, 1997. Currently scientists recognise 21 bisexual species (36 subspecies) and four parthenogenetic species within the Caucasus Ecoregion.⁴⁶

In addition, one endemic species and one endemic subspecies of toad-headed agamas (*Phrynocephalus*); 1 endemic species and 1 endemic subspecies of runners (*Eremias*), and 5 endemic subspecies of green lizards (*Lacerta*) occur in the Caucasus.

Caucasian Toad



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⁴⁶ *D. defilippi*, which was previously considered to be a subspecies of *D. raddei*, is now regarded as one of a group of four cryptic species, which also includes *D. chlorogaster* (Ahmadzadeh et al., 2013).

The known Caucasian ophidiofauna belongs to 4 families, 19 genera and 46 species (52 subspecies). Colubrid fauna consists of 3 subfamilies: Natricinae with 1 genus (*Natrix*) and 3 species and Colubrinae with 11 genera and 23 species and Psammophiinae.⁴⁷ There are 5 genera of the family Viperidae in the fauna of the Caucasus belonging to two subfamilies: Crotalinae (containing the genus *Gloydius*) and Viperidae (containing the genera *Macrovipera*, *Pelias*, *Montivipera* and *Vipera* sensu stricto). Nowadays, there are estimated to be 12 endemic species (15 subspecies) of snakes.

From the 18 known shield-headed vipers in the world, 13 species are found in the Caucasus Ecoregion, 9 of which occur only in the Caucasus. Endemic species richness is particularly high in the western Lesser Caucasus in Georgia and Turkey, in the western Greater Caucasus in Georgia and Russia, and in the south-western Caspian area in Iran and Azerbaijan. A xeric refugium occurs in the valley of the Ara(k)s river in Armenia, Azerbaijan and Iran.

The endemic amphibian and reptile species of the Caucasus region are listed in Table 1.

Table 1. List of amphibian and reptile species endemic to the Caucasus			
#	Common name	Latin name	Distribution
AMPHIBIANS			
1	Persian Salamander	<i>Paradactylodon persicus</i>	Southern Caspian area, Iran
2	Caucasian Salamander	<i>Mertensiella caucasica</i>	W Lesser Caucasus (Georgia, Turkey)
3	Lantz's Smooth Newt	<i>Lissotriton lantzi</i>	Russia, Georgia, probably extinct in Azerbaijan and no new conformation for N Armenia and Turkey*
4	Hyrcanian Toad	<i>Bufo eichwaldi</i>	SE Azerbaijan, Caspian Iran
5	Colchic Toad	<i>Bufo verrucosissimus</i>	Mostly W. Caucasus (Georgia, Turkey, Russia), Azerbaijan, Armenia (uncertain)
6	Caucasian Parsley Frog	<i>Pelodytes caucasicus</i>	Russia, Georgia, Turkey, and NE Azerbaijan**
REPTILES			
Agamas			
7	Transcaucasian Toad Agama	<i>Phrynocephalus horvathi</i>	Armenia, Azerbaijan (Nakhchivan), Turkey
Lizards			
8	Aghasyan's Rock Lizard	<i>Darevskia aghasyani</i>	Armenia
9	Alpine Rock Lizard	<i>Darevskia alpina</i>	W Caucasus (Russia, Georgia)
10	Brauner's Rock Lizard	<i>Darevskia brauneri</i>	Russia, Georgia
11	Caucasian Rock Lizard	<i>Darevskia caucasica</i>	Russia, Georgia, Azerbaijan
12	Clark's Rock Lizard	<i>Darevskia clarkorum</i>	Turkey
13	Dagestan Rock Lizard	<i>Darevskia daghestanica</i>	Russia, Georgia, Azerbaijan
14	Artwin, or Derjugin's Lizard	<i>Darevskia derjugini</i>	Russia, Georgia, Azerbaijan, Turkey
15	Charnali Rock Lizard	<i>Darevskia dryada</i>	SW Georgia
16	Hybrid, or Confuse Rock Lizard	<i>Darevskia mixta</i>	Georgia

⁴⁷ Characteristics of these genera and their species are provided in Böhme 1993, 1999.

#	Common name	Latin name	Distribution
Lizards			
17	Red-bellied Rock Lizard	<i>Darevskia parvula</i>	Georgia, Turkey
18	Kura River Rock Lizard	<i>Darevskia portschinskii</i>	Georgia, Armenia, Azerbaijan
19	True Rock Lizard	<i>Darevskia saxicola</i>	Russia
20	Szczerbak's Rock Lizard	<i>Darevskia szczerbaki</i>	Russia
21	Armenian Rock Lizard	<i>Darevskia armeniaca</i>	Armenia, Georgia, Turkey
22	Dahl's Rock Lizard	<i>Darevskia dahli</i>	Armenia, Georgia
23	Rostombekov's Rock Lizard	<i>Darevskia rostombekovi</i>	Georgia, Armenia, Azerbaijan
24	White-bellied Rock Lizard	<i>Darevskia unisexualis</i>	Armenia, Turkey
25	Uzzell's Rock Lizard	<i>Darevskia uzzelli</i>	Turkey
26	Transcaucasian Racerunner	<i>Eremias pleskei</i>	Armenia, Azerbaijan, Turkey, Iran
Snakes			
27	Large-headed or Colchic Water Snake	<i>Natrix megalcephala</i> ***	Russia, Georgia, Azerbaijan, Turkey
28	Persian Ratsnake	<i>Zamenis persicus</i>	Azerbaijan, Iran
29	Satunin's Black-headed Dwarf Snake	<i>Rhynchocalamus satunini</i>	Armenia, Turkey, Azerbaijan (Nakhichevan), Iran
30	Darevsky's Viper	<i>Pelias darevskii</i>	Armenia, Georgia, Turkey
31	Dinnik's Viper	<i>Pelias dinniki</i>	Russia, Georgia
32	Kaznakov's or Caucasian Viper	<i>Pelias kaznakovi</i>	Russia, Georgia, Turkey
33	Lotiev's Viper	<i>Pelias lotievi</i>	Russia, NE Azerbaijan
34	Magnificent, or Relic Viper	<i>Pelias magnifica</i>	Russia
35	Olgun's Viper	<i>Pelias olguni</i>	Turkey, Georgia (Mt. Gumbati)
36	Orlov's Viper	<i>Pelias orlovi</i>	Russia
37	Black Sea Viper	<i>Pelias pontica</i>	Turkey and probably Georgia
38	Shemakha Steppe Viper	<i>Pelias shemakhensis</i>	NW Azerbaijan, E Georgia
39	Caucasian Pit Viper	<i>Gloydius caucasicus</i>	NW Iran, SE Azerbaijan
<p>Notes: *for Turkey see Wielstra, Bozkurt, Olgun, 2015; **see Ganiev, Gasimova, 2012; Gasimova, 2013; ***controversial species according to Venchi and Sindaco, 2006; Kindler et al., 2013 and some others that conducted revision of <i>Natrix</i> based on the molecular genetic studies: <i>Natrix megalcephala</i> is with the synonym of <i>Natrix natrixscutata</i>.</p>			

Globally and regionally threatened species in the Caucasus

Of the 117 species of amphibians and reptiles (16 extant species of amphibians and 101 species of reptiles) that occur in the Caucasus, 108 have been assessed for extinction risk and included in the IUCN Red List of Threatened Species. Twenty-three species (24 subspecies, 21.3%) were assessed as globally threatened (Vulnerable, Endangered and Critically Endangered). One species is categorized as Data Deficient (DD) and 13 as Near Threatened (NT) (Table 2). Seventy-one species (65.7%) belong to the category Least Concern (LC). Nine species (7.7%) are still not assessed because they have been described only recently. In addition, assessments do not exist for almost all subspecies, with the exception of *Testudo graeca nikolskii* (European Reptile & Amphibian Specialist Group 1996). Most species show a declining population trend.

Darevsky's Viper, Mount Sevsar, Armenia



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In the Caucasus Ecoregion, as in many other regions worldwide, conservation of amphibians and reptiles is reasonably effective in Nature Reserves and National Parks but is perfunctory in lower-level protected areas and unprotected natural landscapes. Many landscapes and habitats that are critically important for herpetofauna are underrepresented in the Ecoregion's protected areas' systems. In the North Caucasus, for example, underrepresented habitats include Black Sea coastal habitats, remnant pristine steppe and meadow-steppe in the western and central parts, unique dry steppe and sandy habitats in the eastern part, sub-montane landscapes in the Jurassic depression between the Rocky and Side ranges of the Greater Caucasus⁴⁸, and sub-montane and maritime habitats in Dagestan. Generally, protected areas with stricter protection are lacking in nearly the whole North Caucasus at lower elevations (up to 1.200 m a.s.l.) (Krokhmal, Tuniyev, 2003; Tuniyev, 2008).

⁴⁸ The geomorphological structure of the Greater Caucasus is quite complicated. It consists of three parallel ranges (Main, Side and Rocky) and many perpendicular branches. The Main or Watershed Range of the Greater Caucasus is the Range that forms the watershed between the north-flowing and south-flowing waters belonging to the Black Sea's (in the western part) and the Caspian Sea's (in the eastern part) catchment basins. The Side Range is located to the north of and close to the Main Range; the highest points of the Greater Caucasus – Mount Elbrus (5,642 m), Kazbegi peak and some others – are situated on the Side Range. The Rocky Range is the final Range to the north and the lowest of the three.

Table 2. The IUCN globally threatened and near threatened amphibian and reptile species in the Caucasus (2019)

#	Common name	Latin name	CR	EN	VU	NT	DD	Ref.
AMPHIBIANS								
1	Persian Mountain Salamander	<i>Paradactylodon persicus</i>				+		<i>Papenfuss et al., 2009</i>
2	Caucasian Salamander	<i>Mertensiella caucasica</i>			+			<i>Kaya et al., 2009a</i>
3	Banded Newt	<i>Ommatotriton ophryticus</i>				+		<i>Olgun et al., 2009</i>
4	Hyrceanian Toad	<i>Bufo eichwaldi</i>			+			<i>IUCN SSC Amphibian Specialist Group 2012</i>
5	Colchis Toad	<i>Bufo verrucosissimus</i>				+		<i>Tuniyev et al., 2009a</i>
6	Caucasian Parsley Frog	<i>Pelodytes causicus</i>				+		<i>Kaya et al., 2009b</i>
REPTILES								
7	European Pond or Swamp Turtle	<i>Emys orbicularis</i>				+		Tortoise & Freshwater Turtle Specialist Group 1996
8	Mediterranean Spur-thighed Tortoise	<i>Testudo graeca</i>			+			Dijk et al., 2004
9	Transcaucasian Toad Agama	<i>Phrynocephalus horvathi</i>	+					Ananjeva & Agasyan, 2009
10	Persian Toad Agama	<i>Phrynocephalus persicus</i>			+			Anderson et al., 2009
11	Alpine Rock Lizard	<i>Darevskia alpina</i>			+			Tuniyev et al., 2009b
12	Clark's Rock Lizard	<i>Darevskia clarkorum</i>		+				Tuniyev et al., 2009c
13	Artwin, or Derjugin's Rock Lizard	<i>Darevskia derjugini</i>				+		Tuniyev et al., 2009d
14	Charnali Rock Lizard	<i>Darevskia dryada</i>	+					Tuniyev et al., 2009e
15	Hybrid, or Confuse Rock Lizard	<i>Darevskia mixta</i>				+		Tuniyev et al., 2009f
16	Dahl's Rock Lizard	<i>Darevskia dahli</i>				+		Agasyan & Ananjeva, 2009a
17	Rostombekow's Rock Lizard	<i>Darevskia rostombekovi</i>		+				Agasyan & Ananjeva, 2009b
18	White-bellied Rock Lizard	<i>Darevskia unisexualis</i>				+		Agasyan & Ananjeva, 2009c
19	Uzzell's Rock Lizard	<i>Darevskia uzzelli</i>		+				Akarsu et al., 2009
20	Brandt's Persian Lizard	<i>Iranolacerta brandti</i>					+	Tuniyev et al., 2009g
21	Transcaucasian Racerunner	<i>Eremias pleskei</i>	+					Tuniyev et al., 2009h
22	Large-headed or Colchic Water Snake	<i>Natrix megalcephala</i>			+			Tuniyev et al., 2009i
23	White-horned Mountain Viper	<i>Montivipera albicornuta</i>			+			Nilson, 2009
24	Armenian or Radde's Viper	<i>Montivipera raddei</i>				+		Nilson et al., 2009a
25	Wagner's Viper	<i>Montivipera wagneri</i>	+					Kaska et al., 2009

26	Turkish Viper	<i>Pelias barani</i>				+		Tok et al., 2009
27	Darevsky's Viper	<i>Pelias darevskii</i>	+					Tuniyev et al., 2009j
28	Dinnik's Viper	<i>Pelias dinniki</i>				+		Tuniyev et al., 2009k
29	Iranian Mountain-steppe Viper	<i>Pelias ebneri</i>				+		Nilson&Sharifi, 2009
30	Armenian Steppe Viper	<i>Pelias*eriwanensis</i>				+		Tuniyev et al., 2009l
31	Kaznakov's or Caucasian Viper	<i>Pelias kaznakovi</i>		+				Tuniyev et al., 2009m
32	Lotiev's Viper	<i>Pelias lotievi</i>				+		Tuniyev et al., 2009n
33	Magnificent (or Relic) Viper	<i>Pelias magnifica</i>		+				Tuniyev et al., 2009o
34	Orlov's Viper	<i>Pelias orlovi</i>	+					Tuniyev et al., 2009p
35	Black Sea Viper	<i>Pelias pontica</i>	+					Nilson et al., 2009b
36	Eastern Steppe Viper	<i>Pelias renardi</i>				+		Nilson et al., 2009c
37	Transcaucasian Long-nosed Viper	<i>Vipera transcaucasiana</i>				+		Tuniyev et al., 2009q

Note: All species of genus *Pelias* listed above are still indicated in the IUCN Red List of Threatened Species as species of genus *Vipera*.

The narrow-ranged species of rock lizards (*Darevskia*) and some vipers (*Pelias*) strongly depend on limited areas in the Greater and the Lesser Caucasus, some of which are not protected or are insufficiently protected. Borjomi-Kharagauli National Park in Georgia hosts at least five species of rock lizard and one species of endemic *Pelias*; this is a single area where the eastern species of *Mertensiella caucasica* group (*M. sp.1* in the sense of Tarkhnishvili et al., 2000) is found. The system of protected areas of south Colchis (Machakhela, Mtirala, Kintrishi) hosts to 4 species of endemic *Darevskia* and one protected *Pelias*, as well as Caucasian Salamander and Caucasian Parsley Frog.

The status of endemic species such as *Zamenis persicus*, *Pelias dinniki*, *P. lotievi* and *Montivipera raddei* is quite safe because substantial parts of their ranges are covered by protected areas. In contrast, several other species are barely represented in protected areas (*Pelias kaznakovi*, *P. magnifica*, *P. eriwanensis*, *P. ebneri*) or not at all (*Pelias orlovi*, *P. pontica*, *Eryx miliaris nogajorum*).

The regionally threatened non-endemic species with a broad distribution include the snakes *Pelias renardi* (VU), *Elaphe sauromates* (LC) and *Hierophis caspius* (LC). The KBAs identified for current edition of the ECP consider almost all globally threatened species, including reptiles and amphibians; however, those three species call for special conservation attention in the Caucasus.

Particular attention needs to be paid to the hotspots of snake species diversity in the Caucasus. Here, such areas containing at least 7 snake species are the Black Sea coast (excluding the Rioni Lowland), lower Çoruh (Chorokhi) basin, semi-arid depressions in the eastern North Caucasus, maritime Dagestan, Kura-Ara(k)s Lowland (aside from its deserts), Ara(k)s riverside in Armenia and Azerbaijan, and the Talysh-Alborz mountains.

Transboundary protected areas could strengthen preservation of amphibian and reptile fauna, e.g. in the Eastern Greater Caucasus between the neighbouring Tliarata (Russia), Lagodekhi (Georgia) and Zagatala (Azerbaijan) protected areas, as well as in other relevant parts of the Caucasus. Much more effort should be put into establishing such transboundary protected areas.

The regionally/nationally threatened snake species that occur in Armenia, Azerbaijan, Georgia and the Russia Federation are listed in Table 3.

Table 3. List of snake species included in the National Red Data Books/Lists of Armenia, Azerbaijan, Georgia and Russia

Species	Armenia	Azerbaijan	Georgia	Russia	Globally Threatened
<i>Eryx jaculus</i>			+	+	
<i>Eryx miliaris</i>				+	
<i>Coronella austriaca</i>		+			
<i>Dolichophis caspius</i>				+*	
<i>Eirenis persicus</i>	+				
<i>E. collaris</i>			+		
<i>Elaphe sauromates</i>		+		+	
<i>E. urartica</i> ***		+		+	
<i>Malpolon insignitus</i>			+		
<i>Natrix megalcephala</i>				+	
<i>Platyceps najadum</i>				+*	
<i>Rhynchocalamus satunini</i>	+	+			
<i>Telescopus fallax</i>	+			+	
<i>Zamenis hohenackeri</i>	+	+		+	
<i>Z. longissimus</i>				+	
<i>Z. persicus</i>		+			
<i>Psammophis lineolatus</i>		+			
<i>Gloydus caucasicus</i>					
<i>Macrovipera lebetina</i>				+	
<i>Montivipera albicornuta</i>					
<i>M. raddei</i>	+	+			+
<i>Pelias darevskii</i>	+				+
<i>P. dinniki</i>			+	+	+
<i>P. eriwanensis</i>	+				+
<i>P. kaznakovi</i>			+	+	+
<i>P. magnifica</i>				+	+
<i>P. orlovi</i>				+	+
<i>P. shemakhensis</i>		+			
<i>P. renardi</i>				+**	+

Notes: * - populations of the Black Sea coast of Caucasus; ** - populations of Crimea and North Caucasus (Pre-Caucasia); *** - in volume of *E. sauromates*.

The list is compiled according to: Red Book Armenia 2010; Red Book Azerbaijan 2013; Decree 2014; Red Book Russia 2001.

Main threats and possible conservation actions

The main threats to reptiles of Europe and Central Asia countries (ECA), according to the IUCN Red List, are agriculture, residential/commercial development, and biological resource use. These threats primarily cause habitat fragmentation and loss (Visconti et al., 2018).

Habitat loss threatens, in particular, relict forest species and species of steppe and semi-desert ecosystems, which are often not able to persist on agricultural and other transformed lands. *Eremias pleskei* (Armenia, Azerbaijan, Turkey and Iran) is listed as Critically Endangered, based on a population decline of more than 80% over ten years; its natural sandy habitat has virtually disappeared due to human disturbance. For habitat “specialists” such as *Phrynocephalus horvathi* (Critically Endangered), which is primarily limited to patches of saltwort and wormwood semi-desert and highly specific soils, habitat conversion can have a major impact. The disappearance of steppe vipers of the “*ursinii-renardi*” complex from most of the habitats which it previously occupied in the ECA is associated with ploughing of steppes for agriculture (Tuniyev, 2016); overgrazing is also a major problem, particularly in Turkey, Azerbaijan and Georgia.

Significant threats include the illegal capture of commercially valuable species for the pet trade (all representatives of vipers and turtles, and some species of lizards). Snake species suffer from indiscriminate killing, which is associated with insufficient environmental awareness (Visconti et al., 2018).

Invasive and other predatory species of mammals and birds are a significant threat for endemic and relict species; for example, raccoon (*Procyon lotor*) is a serious threat to amphibians in the Western Caucasus and Lenkoran-Talysh region.

Climate change will likely play a major role in the region in the future. In the Western Caucasus, higher summer temperatures and longer dry periods will reduce the habitable range of mesic Colchis reptile species (*Darevskia derjugini*) and lead to an increase in the number of Eastern Mediterranean species of snakes (*Dolycophis caspius*, *Platicepsna jadum*) on the Black Sea Coast (Tuniyev, 2012). However, so far there is no evidence of a decline in the ranges of mesic amphibians and reptiles. Tree encroachment and upward movements of tree lines are other impacts of climate change that could affect alpine species.

To respond to these threats we have developed brief conservation concepts for different species of threatened vipers (*Pelias darevskii*, *P. dinniki*, *P. eriwanensis*, *P. kaznakovi*, *P. lotievi*, *P. magnifica*, *P. orlovi*, *P. renardi*, *P. shemakhensis*), as well as for Aghasyan’s Lizard (*Darevskia aghasyani*), the Caucasian Salamander (Tarkhnishvili & Kaya, 2009), rock lizards of genus *Darevskia*, and some other species. Conservation actions proposed in the concepts include: expansion of existing protected areas; establishing new protected areas, including transboundary protected areas; revising the internal functional zoning of certain National Parks; revising some development plans taking into consideration nature conservation needs; adding certain species to National Red Lists/Red Data Books; implementing sustainable range management approaches; perfecting legislation against illegal trapping and trade of amphibians and reptiles and enhancing law enforcement; regular monitoring of habitats for the absence/presence of a species.

Caucasian Viper



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Conclusions

More regional and national attention and efforts are needed if we are to achieve adequate protection of rare and threatened species of amphibians and reptiles and ensure their long-term conservation in the Caucasus. While some species are quite well protected, for example the endemics *Pelias darevskii*, *P. dinniki*, *P. lotievi* (a significant part of the habitats of these vipers is covered by Nature reserves and National Parks), the ranges of *Pelias orlovi* and *P. shemakhensis* are not protected at all. Furthermore, *Pelias kaznakovi*, *P. magnifisa*, *P. ebneri* and *P. eriwanensis* are poorly represented within protected areas.

The refugial areas in the south-western part of the Caucasus Region, including Western Lesser Caucasus and Black Sea mountains in Georgia and Turkey, host a high number of endemic amphibians and reptiles which require special attention. They include: the relict Caucasian Salamander, with its two *de facto* evolutionary species, one completely limited to Borjomi-Kharagauli National Park; three other endemic amphibians; at least two endemic vipers, *Pelias kaznakovi* and *P. barani*; seven species of endemic rock lizards. Other important areas are the Western Greater Caucasus with its diversity of mountain viper species, the valley of the Ara(k)s river with its variety of species of runners, toad lizard and small runner (*Rhynchocalamus*), and arid shrublands in the valleys of the Lori and Kura rivers where is an especially high variety of snakes and lizards adapted to a semi-arid environment.

In some areas, conservation targets cannot be achieved by national actions alone: transboundary actions through international cooperation are essential. Such areas include KBAs within the Eastern Greater Caucasus Conservation Landscape (Azerbaijan, Georgia, Russia), Western Lesser Caucasus Conservation Landscape (Turkey-Georgia), and South Caucasus Uplands Conservation Landscape (Armenia-Georgia, Georgia-Turkey), and are partly addressed by actions listed in the first part of ECP 2020.

References

- Agasyan A. & Ananjeva N.B. 2009a. *Darevskia dahli* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009: e.T164720A114536951. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164720A5920615.en>.
- Agasyan A. & Ananjeva N.B. 2009b. *Darevskia rostombekovi* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009: e.T164563A114536228. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164563A5908109.en>.
- Agasyan A. & Ananjeva N.B. 2009c. *Darevskia unisexualis* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009: e.T164578A114536582. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164578A5909545.en>.
- Ahmadzadeh F., Flecks M., Carretero M.A., Mozaffari O., Böhme W., Harris D.J., Freitas S. and Rödder D. (2013): Cryptic speciation patterns in Iranian Rock Lizards uncovered by integrative taxonomy. *PLoS ONE*, 8, 12:e80563. DOI:10.1371.
- Akarsu F., Tuniyev B., Ananjeva N.B., Agasyan A., Orlov N.L. & Tuniyev S. 2009. *Darevskia uzzelli* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164776A114576211. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164776A5925159.en>.
- Ananjeva N., Agasyan A. 2009. *Phrynocephalus horvathi*. *The IUCN Red List of Threatened Species* 2009: e.T164759A5923724. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164759A5923724.en>.
- Anderson S., Tuniyev B. & SoheilaShafieiBafti. 2009. *Phrynocephalus persicus*. *The IUCN Red List of Threatened Species* 2009: e.T164647A5915480. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164647A5915480.en>.
- Decree 2014. Decree of the Government of Georgia on Adoption of Georgian “Red List”. [In Georg.]. – <https://matsne.gov.ge/ka/document/view/2256983?publication=0> Sakartvelos sakanondeblo matsne Publisher, Tbilisi. Downloaded 21/08/2018.
- Dijk, P.P., Corti, C., Mellado, V.P. & Cheylan, M. 2004. *Testudo graeca*. *The IUCN Red List of Threatened Species* 2004: e.T21646A9305080.
- European Reptile & Amphibian Specialist Group 1996. *Testudo graeca ssp. nikolskii*. *The IUCN Red List of Threatened Species* 1996:e.T21646A9305693. e.T21654A9307594. <http://dx.doi.org/10.2305/IUCN.UK.1996.RLTS.T21654A9307594.en>.
- Ganiev, F.R., Gasimova, G.H. (2012): Some data on the Caucasian Parsley Frog – *Pelodytes caucasicus* Boulenger, 1896 (Amphibia, Anura, Pelodytidae) – within the boundaries of Azerbaijan. *Transac. Azer. Nat. Acad. Scien.*, 30 (2), 122-125.
- Gasimova, G.H. (2013): Caucasian endemic species of amphibians distributed in Azerbaijan. Pp. 75-81 in *International Caucasian Forestry Symposium, Abstract Book*. Artvin, Turkey.
- Böhme, W., ed. (1993): *Handbuch der Reptilien und Amphibien Europas*. Bd.3/I. Herausgegeben von Wolfgang Böme. Wiesbaden, Aula-Verlag.
- Böhme, W., ed. (1999): *Handbuch der Reptilien und Amphibien Europas*. Bd.3/IIA. Herausgegeben von Wolfgang Böme. Wiesbaden, Aula-Verlag.
- IUCN SSC Amphibian Specialist Group 2012. *Bufo eichwaldi*. *The IUCN Red List of Threatened Species* 2012: e.T190987A1964861. <http://dx.doi.org/10.2305/IUCN.UK.2012-1.RLTS.T190987A1964861.en>.
- Kaska Y., Kumlutaş Y., Avci A., Nilson G. 2009. *Montivipera wagneri*. *The IUCN Red List of Threatened Species* 2009:e.T22998A9406944. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T22998A9406944.en>.
- Kaya U., Tuniyev B., Ananjeva N., Orlov N., Papenfuss Th., Kuzmin S., Tarkhnishvili D., Tuniyev S., Sparreboom M., Ugurtas I., Anderson S. 2009a. *Mertensiella caucasica*. *The IUCN Red List of Threatened Species* 2009:e.T13198A3418986. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T13198A3418986.en>.
- Kaya U., Tuniyev B., Tuniyev S., Kuzmin S., Tarkhnishvili D., Tuniyev B., Papenfuss Th., Sparreboom M., Ugurtas I., Anderson S., Eken G., Kiliç T., Gem E. 2009b. *Pelodytes caucasicus*. *The IUCN Red List of Threatened Species* 2009: e.T39422A10236383. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T39422A10236383.en>.

- Kindler, C., Böhme, W., Corti, C., Gvozdik, V., Jablonski, D., Jandzik, D., Metallinou, M., Siroky, P. & Fritz, U. (2013): Mitochondrial phylogeography, contact zones and taxonomy of grass snakes (*Natrix natrix*, *N. megalcephala*). *Zoologica Scripta* 42 (5), 458–472, doi:10.1111/zsc.12018.
- Krokhmal A.G., Tuniyev B.S. (2003): Condition and perspectives of development of protected areas of North Caucasus Ecoregion. Pp. 46-57 in B.S. Tuniyev, ed. 80-years of Caucasian Reserve: way from Grate Duce Hunting area to World Nature Heritage. Prospect, Sochi. [In Russ.].
- Nilson G. 2009. *Montivipera albicornuta*. *The IUCN Red List of Threatened Species* 2009: e.T164717A5920222. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164717A5920222.en>.
- Nilson G., Akarsu F., Tuniyev B., Agasyan A., Orlov N.L. & Tuniyev S. 2009b. *Vipera pontica* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T23002A114576777. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T23002A9407542.en>.
- Nilson G., Andrén C., Tuniyev B. 2009c. *Vipera renardi*. *The IUCN Red List of Threatened Species* 2009: e.T157268A5066267.
- Nilson G., Andrén C., Avci A., Akarsu F. 2009a. *Montivipera raddei*. *The IUCN Red List of Threatened Species* 2009: e.T22993A9406370. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T22993A9406370.en>.
- Nilson G. & Sharifi M. 2009. *Vipera ebneri* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164657A114576583. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164657A5915911.en>.
- Olgun K., Arntzen J.W., Kuzmin S., Papenfuss Th., Ugurtas I., Tarkhnishvili D., Sparreboom M., Anderson S., Tuniyev B., Ananjeva N., Kaska Y., Kumlutaş Y., Avci A., Üzüüm N., Kaya U. 2009. *Ommatotriton ophryticus*. *The IUCN Red List of Threatened Species* 2009:e.T136019A4230151. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T136019A4230151.en>.
- Papenfuss, T., Anderson, S., Kuzmin, S., Rastegar-Pouyani, N., Nilson, G. & Sharifi, M. 2009. *Iranodon persicus* (errata version published in 2016). *The IUCN Red List of Threatened Species* 2009:e.T2665A86081638. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T2665A9465867.en>.
- Red Book Armenia 2010. The Red Book of Animals of the Republic of Armenia. Invertebrates and Vertebrates. Second Edition. Ministry of Nature Protection, Yerevan.
- Red Book Azerbaijan 2013. Red Book of the Republic of Azerbaijan. Rare and endangered animal species. Ministry of Ecology and Natural Resources Protection. Second Edition. Baku.
- Red Book Russia 2001. Red Data Book of Russian Federation (Animals). 2001. Astrel, Moscow. [In Russian]
- Sinsch U, Schneider H, Tarkhnishvili D. (2009): *Bufo bufo* superspecies. Pp. 187-337 in: Grossenbacher, K., ed. *Handbuch der Reptilien und Amphibien Europas. Froschlurche II*. Aula Verlag.
- Tarkhnishvili, D., (2012): Evolutionary History, Habitats, Diversification, and Speciation in Caucasian Rock Lizards. Pp. 79-120 in: Jenkins, O. P., ed. *Advances in Zoology Research*, 2. NOVA Science Publishers, UK.
- Tarkhnishvili, D. (2014): *Historical Biogeography of the Caucasus*. NOVA scientific publishers, New-York.
- Tarkhnishvili, D & Gokhelashvili, R. (1999). *The Amphibians of the Caucasus*. Pensoft, Sofia.
- Tarkhnishvili, D, Kandaurov A, Bukhnikashvili A. (2002): Declines of amphibians and reptiles in Georgia during 20th century: virtual vs. actual problems. *Zeitschrift fuer Feldherpetologie*, 9, 89-107.
- Tarkhnishvili, D. & Kaya, U. (2009): Status and conservation of the Caucasian Salamander (*Mertensiellacaucasica*). Pp. 157-164 in Zazanashvili, N. & Mallon. D., eds. *Status and Protection of Globally Threatened Species in the Caucasus*. CEPF, WWF, Tbilisi.
- Tarkhnishvili, D.N., Thorpe, R.S & Arntzen, JW. (2000): Pre-Pleistocene refugia and differentiation between populations of the Caucasian Salamander (*Mertensiella caucasica*). *Molecular Phylogenetics and Evolution*, 14, 3, 414-422.
- Tok C.V., Ugurtas I., Sevinç M., Böhme W., Crochet P.-A., Joger U., Kaska Y., Kumlutaş Y., Kaya U., Avci A., Üzüüm N., Yenyurt C., Akarsu F. 2009. *Viper abarani*. *The IUCN Red List of Threatened Species* 2009: e.T164774A5925027. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164774A5925027.en>.

- Tortoise & Freshwater Turtle Specialist Group 1996. *Emys orbicularis* (errata version published in 2016). *The IUCN Red List of Threatened Species* 1996:e.T7717A97292665. <http://dx.doi.org/10.2305/IUCN.UK.1996.RLTS.T7717A12844431.en>.
- Tuniyev B.S. (1995): On the Mediterranean influence on the formation of herpetofauna of the Caucasian Isthmus and its main xerophylous refugia. *Russian Journal of Herpetology* 2, 2, 95–119.
- Tuniyev B.S. (2008): Results of thirty-year investigations of herpetofauna in the Caucasian reserve. *Proc. of Caucasian State Nature Biosphere reserve*, 18, 99–115. [In Russ.]
- Tuniyev B.S. (2012): First consequences of climate variation and use of natural resources in the Biota of the West Caucasus. Pp. 438–443 in V. Snakin, ed. *Global Environmental Processes*. Academia, Moscow [In Russ.].
- Tuniyev B.S. (2016): Rare species of shield-head vipers in the Caucasus. *Nature Conservation Research*, 1, 3, 11–25.
- Tuniyev B., Ananjeva N.B., Agasyan A., Orlov N.L. & Tuniyev S. 2009b. *Darevskia alpina* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T11120A114549788. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T11120A3251991.en>.
- Tuniyev B., Ananjeva N.B., Agasyan A., Orlov N.L. & Tuniyev S. 2009c. *Darevskia clarkorum* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T11117A114549398. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T11117A3251827.en>.
- Tuniyev B., Ananjeva N.B., Agasyan A., Orlov N.L. & Tuniyev S. 2009d. *Darevskia derjugini* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164576A114550064. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164576A5909273.en>.
- Tuniyev B., Ananjeva N.B., Agasyan A., Orlov N.L. & Tuniyev S. 2009e. *Darevskia dryada* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164722A114557459. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164722A5920819.en>.
- Tuniyev B., Ananjeva N.B., Agasyan A., Orlov N.L. & Tuniyev S. 2009f. *Darevskia mixta* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164638A114550849. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164638A5914190.en>.
- Tuniyev B., Ananjeva N.B., Agasyan A., Orlov N.L., Tuniyev S. & Anderson S. 2009g. *Iranolacerta brandtii* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164697A114559373. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164697A5918527.en>.
- Tuniyev B., Ananjeva N.B., Agasyan A., Orlov N.L. & Tuniyev S. 2009h. *Eremias pleskei* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164583A114550294. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164583A5910262.en>.
- Tuniyev B., Ananjeva N.B., Orlov N.L. & Tuniyev S. 2009i. *Natrix megalcephala* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T14367A114559942. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T14367A4436144.en>.
- Tuniyev B., Nilson B., Agasyan A., Orlov N., Tuniyev S. 2009j. *Vipera darevskii*. *The IUCN Red List of Threatened Species* 2009:e.T23000A9407153. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T23000A9407153.en>.
- Tuniyev B., Nilson G., Agasyan A., Orlov N.L. & Tuniyev S. 2009k. *Vipera dinniki* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T23001A114547350. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T23001A9407314.en>.
- Tuniyev B., Nilson G., Agasyan A., Orlov N.L. & Tuniyev S. 2009l. *Vipera eriwanensis* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164679A114547682. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164679A5917380.en>.
- Tuniyev B., Nilson G., Agasyan A., Orlov N.L. & Tuniyev S. 2009m. *Vipera kaznakovi* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T22990A114546825. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T22990A9405808.en>.
- Tuniyev B., Nilson G., Agasyan A., Orlov N.L. & Tuniyev S. 2009n. *Vipera lotievi* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164736A114548310. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164736A5921596.en>.

- Tuniyev B., Nilson G., Agasyan A., Orlov N.L. & Tuniyev S. 2009o. *Vipera magnifica* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164734A114548021. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164734A5921361.en>.
- Tuniyev B., Nilson G., Agasyan A., Orlov N.L. & Tuniyev S. 2009p. *Vipera orlovi* (errata version published in 2017) *The IUCN Red List of Threatened Species* 2009:e.T164756A114548690. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164756A5923491.en>.
- Tuniyev B., Nilson G., Kasaka Y., Avci A., Agasyan A., Orlov N.L. & Tuniyev S. 2009q. *Vipera transcaucasiana* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2009:e.T164708A114549008. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T164708A5919515.en>.
- Tuniyev B., Nilson G., Ananjeva N., Agasyan A., Orlov N., Tuniyev S., Anderson S., Kuzmin S., Stöck M., Papenfuss Th., Rastegar-Pouyani N., Ugurtas I., Tarkhnishvili D., 2009a. *Bufo verrucosissimus*. *The IUCN Red List of Threatened Species* 2009: e.T39421A10235921. <http://dx.doi.org/10.2305/IUCN.UK.2009.RLTS.T39421A10235921.en>.
- Venchi, A. & Sindaco, R. (2006): Annotated checklist of the reptiles of the Mediterranean countries, with keys to species identification. Part 2 -Snakes (Reptilia, Serpentes). Pp. 259-364 in *Annali del Museo Civico di Storia Naturale G. Doria, XCVIII. Genova*.
- Visconti P., Elias, V.V., Sousa P.I., Fischer M. et al., 2018. Status, trends and future dynamics of biodiversity and ecosystems underpinning Nature's contributions to people. Pp. 187-384 in *The IPBES Regional Assessment Report on Biodiversity and Ecosystem Services for Europe and Central Asia*. IPBES, Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany.
- Wielstra, B., Bozkurt, E., Olgun, K. (2015): The distribution and taxonomy of Lissotriton newts in Turkey (Amphibia, Salamandridae). *ZooKeys* 484, 11–23, doi: 10.3897/zookeys.484.8869
- Williams, L., Zazanashvili, N., Sanadiradze, G., & Kandaurov, A. (Eds.) (2006): *An ecoregional conservation plan for the Caucasus*. WWF, BMZ, KfW, CEPF, MacArthur Foundation, Tbilisi.

Suggested citation: Tuniyev, B.S., Tarkhnishvili, D., Aghasyan, A.L., Bunyatova, S.N., Kamali, K., Mirghazanfari, S.M., Tok, C.V. & Çiçek, K. (2020). *Amphibians and reptiles of the Caucasus*. Pp. 83 - 96 in Zazanashvili, N., Garforth, M. and Bitsadze, M., eds. *Ecoregional Conservation Plan for the Caucasus, 2020 Edition: Supplementary Reports*. WWF, KfW, Tbilisi.

FRESHWATER FISH AND LAMPREYS OF THE CAUCASUS

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Contents: Introduction; Number of freshwater fish and lamprey species in the Caucasus; Endemic freshwater fish and lamprey species of the Caucasus; Number of species recorded in the countries; Globally threatened species of freshwater fish and lampreys in the Caucasus; Important places for the conservation of freshwater fish in the Caucasus Ecoregion; Main threats and possible conservation actions; List of the publications used for preparation of the review; Suggested citation.

Introduction

All together 162 species of freshwater fish and four species of lampreys are known from the Caucasus Ecoregion, of which 51 are endemic and 11 alien to the region. The fauna is biogeographically close to the adjacent faunas of the Caspian and Black Seas and many species occur beyond the Caucasus or are closely related to species outside of the Caucasus. The Caucasus represents a regional centre of endemism for freshwater fish. Remarkably diverse are the fishes of the Kura and Ara(k)s rivers with 16 endemic species and the Kuban, with eight endemic species. An important single hotspot is the upper Kura in the area of Ardahan (Turkey) where a very locally endemic loach (*Oxynoemacheilus cyri*) co-occurs with an endemic genus and species of freshwater fish (*Leucalburnus satunini*).

Since 2000 the fish fauna of the Ecoregion is much better understood due to a revolution in molecular methods of identification and a strongly increased engagement in the exploration of fish diversity in the Caucasus and in adjacent Europe, Iran and Turkey. However, not all taxonomic challenges have been resolved; new species will be recorded in the future and others might be excluded from the list due to taxonomic changes.

The conservation status of Caucasian freshwater fish and lampreys has been only incompletely assessed but the region holds major conservation responsibilities. On the forefront of fish conservation have always been sturgeons which spawn in rivers flowing to the Black and Caspian Seas. Sturgeons are still poached and sold in the Caucasus. Although all sturgeons are protected by national legislation, there is a problem of law enforcement. The actual situation of sturgeons in the Caucasus remains unclear as information about their status is contradictory. Sturgeons still spawn in the Rioni river in Georgia and are believed to spawn in the Kura river in Azerbaijan and in the Sefid river in Iran. Other threatened or endemic species in the region are generally ignored when it comes to the construction of hydropower plants or other modifications of rivers. The exploitation of rivers for hydropower is now a massive threat even for protected areas and it harms the region's biodiversity resources considerably.

Freshwater fish and lamprey species in the Caucasus

There are four species of lamprey in the Caucasus, one of them (*Lampetra ninae*) endemic to the regions of the Black Sea coastal streams. The Caspian lamprey (*Caspiomyzon wagneri*) is widespread in the Caspian Sea basin, and the Turkish brook lamprey (*L. lanceolate*) is found at a few sites in northern Anatolia. There is also a lamprey in the Kuban river, which is usually identified as *Eudontomyzon mariae*. This species is in a need of taxonomic re-assessment and might also represent an endemic species. Most recognised from the overall 162 species of freshwater fish and four species of lampreys in the Caucasus are sturgeons (Acipenseridae). Once, seven out of nine European sturgeons species spawned in the Caucasus region, while only one of them had its global stronghold in the region (*Acipenser persicus*), others preferring larger rivers in the northern Black and Caspian Sea basins for reproduction.

Other groups of anadromous fish species are represented by shads (Clupeidae) and trouts (Salmonidae); they receive much attention due to the interests in commercial (shads) and recreational fisheries (trouts). Indeed, the diversity of shads and trouts in the Caucasus and all over the Black and Caspian Sea basins is very poorly understood. Previous morphology-based hypotheses on shad and trout diversity are strongly challenged by molecular studies. Speciation events had been suggested to be very recent for trouts in the region. Shads might represent a species flock of very recent origin and future studies are urgently needed to understand the species and evolutionary processes within these groups.

The largest species diversity in freshwater fish in the Caucasus is within the order Cypriniformes, where eight families hold most of the Caucasus freshwater fish biodiversity: Acheilognathidae (2 species), Cobitidae (10 species), Cyprinidae (16 species), Gobionidae (11 species), Leuciscidae (38 species), Nemacheilidae (9 species), Tincidae (1 species) and Xenocyprididae (1 species); these families are the most important building blocks of Caucasus freshwater fish diversity in terms of their contribution to fish biomass and functional role in river ecosystems. Still there are some taxonomic issues to be clarified, especially in the family Nemacheilidae and Leuciscidae, but generally the fauna is well understood and most species of freshwater fish are known and recognised. Minor fish families represented in the Caucasus are Anguillidae (1 species), Atherinidae (1 species), Esocidae (1 species), Gasterosteidae (2 species), Lotidae (1 species), Moronidae (1 species), Mugilidae (6 species), Percidae (6 species), Siluridae (1 species) and Syngnathidae (2 species); none of these families include regionally endemic species. In the Caucasus, five fish families are composed of only alien species: Adrianichthyidae (1 species), Coregonidae (2 species), Ictaluridae (1 species), Poeciliidae (1 species) and Xenocyprididae (1 species).

Two other fish families should be mentioned. These are gobies Gobiidae and Gobionellidae, which are an important component of most freshwater and coastal fish communities in the Caucasus. One alien and 25 native species of gobies are known, five of them endemic to the region.

Endemic freshwater fish and lamprey species of the Caucasus

There are all together 51 species of freshwater fish and one species of lampreys (*Lampetra ninae*) endemic to the Caucasus (Table 1). The validity of *Oxynoemacheilus lenkoranensis* is doubtful. Besides, the generic position of two species - *Pseudophoxinus atropatenus* and *P. sojuchbulagi* - has been recently changed back to *Rutilus* and they will be referred to in future as *Rutilus atropatenus* and *R. sojuchbulagi*. The given report considers these species as they are currently referred to in the IUCN Red List - *Pseudophoxinus atropatenus* and *P. sojuchbulagi*.

Table 1. List of Freshwater Fish and Lamprey Species Endemic to the Caucasus

Family	Species	Family	Species
Acheilognathidae	<i>Rhodeus colchicus</i>	Gobionidae	<i>Romanogobio pentatrichus</i>
Clupeidae	<i>Clupeonella abrau</i>	Gobionidae	<i>Romanogobio parvus</i>
Cobitidae	<i>Cobitis derzhavini</i>	Leuciscidae	<i>Alburnoides eichwaldii</i>
Cobitidae	<i>Cobitis satunini</i>	Leuciscidae	<i>Alburnoides fasciatus</i>
Cobitidae	<i>Sabanejewia aurata</i>	Leuciscidae	<i>Alburnoides gmelini</i>
Cobitidae	<i>Sabanejewia caucasica</i>	Leuciscidae	<i>Alburnoides kubanicus</i>
Cobitidae	<i>Sabanejewia caspica</i>	Leuciscidae	<i>Chondrostoma colchicum</i>
Cobitidae	<i>Sabanejewia kubanica</i>	Leuciscidae	<i>Chondrostoma cyri</i>
Cyprinidae	<i>Barbus ciscaucasicus</i>	Leuciscidae	<i>Chondrostoma kubanicum</i>
Cyprinidae	<i>Barbus kubanicus</i>	Leuciscidae	<i>Chondrostoma oxyrhynchum</i>
Cyprinidae	<i>Barbus rionicus</i>	Leuciscidae	<i>Leucalburnus satunini</i>
Cyprinidae	<i>Capoeta banarescui</i>	Leuciscidae	<i>Petroleuciscus ahipsi</i>
Cyprinidae	<i>Capoeta capoeta</i>	Leuciscidae	<i>Phoxinus colchicus</i>
Cyprinidae	<i>Capoeta ekmekciae</i>	Leuciscidae	<i>Pseudophoxinus atropatenus</i>
Cyprinidae	<i>Capoeta kaput</i>	Leuciscidae	<i>Pseudophoxinus sojuchbulagi</i>
Gobiidae	<i>Ponticola constructor</i>	Leuciscidae	<i>Squalius agdamicus</i>
Gobiidae	<i>Ponticola cyrius</i>	Leuciscidae	<i>Squalius orientalis</i>
Gobiidae	<i>Ponticola iranicus</i>	Leuciscidae	<i>Squalius turcicus</i>
Gobiidae	<i>Ponticola rizensis</i>	Nemacheilidae	<i>Oxynoemacheilus brandtii</i>
Gobiidae	<i>Ponticola turani</i>	Nemacheilidae	<i>Oxynoemacheilus cyri</i>
Gobionidae	<i>Gobio artvinicus</i>	Nemacheilidae	<i>Oxynoemacheilus lenkoranensis</i>
Gobionidae	<i>Gobio caucasicus</i>	Nemacheilidae	<i>Oxynoemacheilus merga</i>
Gobionidae	<i>Gobio holurus</i>	Nemacheilidae	<i>Oxynoemacheilus veyseli</i>
Gobionidae	<i>Gobio kubanicus</i>	Petromyzontidae	<i>Lampetra ninae</i>
Gobionidae	<i>Romanogobio ciscaucasicus</i>	Salmonidae	<i>Salmo ezenami</i>
Gobionidae	<i>Romanogobio macropterus</i>	Salmonidae	<i>Salmo ischchan</i>

Number of species recorded in the countries

In the Armenian part of the Caucasus region, 41 species of freshwater fish and one species of lamprey are recorded; one species (*Salmo ischchan*) is endemic to Armenia but has been introduced to Azerbaijan and Georgia and to Central Asia. In Azerbaijan, 85 species (lampreys & fish) are found, four of them endemic to Azerbaijan (*Cobitis derzhavini*, *Oxynoemacheilus lenkoranensis*, *Pseudophoxinus atropatenus*, *Pseudophoxinus sojuchbulagi*). One of these species - *Oxynoemacheilus lenkoranensis* - needs a critical taxonomic review and one endemic species - *Pseudophoxinus sojuchbulagi* - seems to be extinct. In Georgia, 95 species are recorded, none of them endemic to Georgia. In the Gilan region of Iran, 79 species are found, none of them endemic.

In the Russian North Caucasus, 125 species occur and 14 of them are endemic to the Russian Caucasus (*Clupeonella abrau*, *Sabanejewia caucasica*, *Sabanejewia kubanica*, *Barbus kubanicus*, *Gobio holurus*, *Gobio kubanicus*, *Romanogobio ciscaucasicus*, *Romanogobio parvus*, *Romanogobio pentatrichus*, *Alburnoides kubanicus*, *Chondrostoma kubanicum*, *Chondrostoma oxyrhynchum*, *Petroleuciscus aphipsi*, *Salmo ezenami*). In the Turkish Caucasus, 86 species are recorded and four of them are endemic to the Turkish Caucasus (*Ponticola rizensis*, *Ponticola turani*, *Leucalburnus satunini*, *Oxynoemacheilus cyri*).

Globally threatened species of freshwater fish and lampreys in the Caucasus

There are 19 species of freshwater fish, one species of lamprey and two species of marine fish listed as being globally threatened – vulnerable (VU), endangered (EN) and critically endangered (CR) - in the Caucasus Ecoregion (Table 2). *Pseudophoxinus sojuchbulagi*, which has not been seen for decades, is likely to be extinct. Furthermore, *Acipenser sturio* as well as *A. nudiventris* seems no longer to spawn in the Caucasus. Most important from a global perspective are six threatened species that are endemic to the Caucasus region (*Clupeonella abrau*, *Ponticola rizensis*, *P. turani*, *Pseudophoxinus atropatenus*, *Salmo ischchan*, *S. ezenami*) as well as the threatened sturgeons potentially still spawning in the area. Not all species have been reassessed for their conservation status yet and several assessments are out of date and need to be renewed.

Table 2. The IUCN Globally Threatened Fish and Lamprey Species in the Caucasus (2019)

#	Scientific Name	Common Name	IUCN Category			Distribution by Countries					
			VU	EN	CR	Armenia	Azerbaijan	Georgia	Iran	Russia	Turkey
	Fish	22	8	2	12	3	11	12	9	14	10
1	<i>Acipenser gueldenstaedtii</i>	Russian Sturgeon			+		+	+	+	+	+
2	<i>Acipenser nudiventris</i>	Ship Sturgeon			+		+	+	+	+	+
3	<i>Acipenser persicus</i>	Persian Sturgeon			+		+	+	+	+	
4	<i>Acipenser ruthenus</i>	Sterlet	+				(+)		(+)	+	
5	<i>Acipenser stellatus</i>	Stellate Sturgeon			+		+	+	+	+	+
6	<i>Acipenser sturio</i>	European (Atlantic) Sturgeon			+			+			
7	<i>Alosa immaculata</i>	Pontic shad	+					+		+	
8	<i>Anguilla anguilla</i>	European Eel			+			+		+	+
9	<i>Clupeonella abrau</i>	Abrau tyulka			+					+	
10	<i>Cyprinus carpio</i>	Wild Common Carp	+			+	+	+	+	+	+
11	<i>Huso huso</i>	Beluga			+		+	+	+	+	+
12	<i>Lampetra lanceolata</i>	Turkish Brook Lamprey		+							+
13	<i>Luciobarbus brachycephalus</i>	Aral Barbel	+				+		+	+	
14	<i>Luciobarbus capito</i>	Bulatmai Barbel	+			+	+	+	+	+	+
15	<i>Pomatomus saltatrix</i>	Bluefish	+					+		+	
16	<i>Ponticola rizensis</i>	Iyidere Goby		+							+
17	<i>Ponticola turani</i>	Aksu Goby	+								+
18	<i>Pseudophoxinus atropatenus</i>	Azerbaijani Spring Roach			+		+				
19	<i>Pseudophoxinus sojuchbulagi</i>	Akstafa Spring Roach			+		+				
20	<i>Salmo ischchan</i>	Sevan Trout			+	+					
21	<i>Salmo ezenami</i>	Kezenoi-am Trout			+					+	
22	<i>Squalus acanthias</i>	Spiny Dogfish	+					+			

Important places for the conservation of freshwater fish in the Caucasus

Freyhof et al. (2015a) cover freshwater KBAs for Armenia, Azerbaijan and Georgia and give some details on the fish species in the region. In this report we highlight only a few sites; many other important sites require protection.

Lake Sevan (Armenia)

Lake Sevan is the largest freshwater lake in the Caucasus. The site is completely covered by Lake Sevan National Park, Ramsar Site and Lake Sevan IBA. It hosts the endemic trout species *Salmo ischchan* which is close to extinction in the wild; this taxon was once represented by four “forms” which most likely were different species. Artificial drainage of the lake in the mid-1950s for irrigation and hydropower caused irreversible changes in ecosystem functioning and biodiversity, destroying the lake’s globally unique diversity of trout. Currently, only two “forms” of Sevan trout survive, largely by artificial breeding and subsequent release into the lake. Action is being taken to restore the lake, the original diversity of trout cannot be restored because several “forms” are extinct or have hybridised with each-other.

Springs in Lower Kura (Azerbaijan)

Springs in the Lower Kura drainage are inhabited by two very locally endemic species of Leuciscid (*Pseudophoxinus atropatenus* and *P. sojuchbulagi*) which seem to be very sensitive to habitat degradation and alien species invasion. *Pseudophoxinus sojuchbulagi* may already be extinct, while *P. atropatenus* is still found at few places as detailed by Artaev et al. (2018).

Kura and Ara(k)s Rivers and Mingechevir Reservoir (Azerbaijan, Armenia, Iran)

The Kura and Ara(k)s rivers and their tributaries host 13 endemic species of freshwater fish and are by this hotspots of endemic fishes in the Caucasus. The distribution of endemic species (many not threatened and still widespread) is poorly understood but several species are rheophilic inhabitants of fast flowing, natural rivers, with gravel bottoms and not affected by dams. These wild river sections are vulnerable to many threats and large sections should be protected. The lower Kura and Ara(k)s rivers are impacted by many threats and their conservation status is poor. However, they still provide a migration route and spawning area for many fish species coming from the Caspian Sea. Shads such as *Alosa kessleri* and others still migrate in the rivers and spawn here. Sturgeons spawned in the area historically and a few individuals seem still to spawn in the rivers. Other migratory fish species still have considerable populations, spawning in the Kura and Ara(k)s below dams.

Mingechevir reservoir on the lower Kura river inhibits the migration of fishes into the middle Kura. At the same time it provides shelter from overfishing for one of the last populations of *Luciobarbus brachycephalus* in the Caspian Sea basin. This migratory species became landlocked due to the construction of the dam and survived here while almost all stocks were the victim of massive over-exploitation elsewhere.

Rioni River (Georgia)

The Rioni river is critical for the only surviving population of *Acipenser persicus*⁴⁹ in the Black Sea basin and for the globally critically endangered *Acipenser stellatus*, *Acipenser gueldenstaedtii* and *Huso huso*. This makes this river a global hotspot for the conservation of sturgeons. However, the conservation status of sturgeons is poorly understood and intensive research is needed. Furthermore, there is a remarkable population of the migratory shad *Alosa immaculata* which spawns in this river. Removal of the obsolescent hydropower plants in the lower Rioni has been recommended to strengthen the sturgeon populations and conservation actions have been discussed by Freyhof et al. (2015).

⁴⁹ There are taxonomic debates about the Black Sea population of *Acipenser persicus*: sometimes it is treated as a subspecies of *A. persicus* and referred as *A. persicus colchicus* or treated as a separate species - *Acipenser colchicus*. However, the formal listing is still valid for *Acipenser persicus*.

The River Rioni – the last spawning river for sturgeon in the eastern Black Sea



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Anzali wetland (Iran)

Very few larger coastal wetlands are left in the area; the Anzali wetland, on the estuary of the Sefid river, is one of the few that is still largely intact. The most common freshwater fish species of the southern Caspian Sea basin use this wetland for spawning and it is of exceptional importance for regional fish reproduction. It is also remarkable for hosting a population of *Sabanejewia caspia*, a small loach found at no more than three places worldwide (the other two are in Azerbaijan).

Middle Kuban River and its tributaries (Russia)

The Kuban River hosts eight endemic species which inhabit small tributaries of the lower Kuban (*Petroleuciscus ahipsi*) and the remaining large stretches of wild and free flowing rivers in the lower and middle section of the Kuban catchment (*Alburnoides kubanicus*, *Barbus kubanicus*, *Chondrostoma kubanica*, *Gobio kubanicus*, *Romanogobio parvus*, *Romanogobio pentatrichus*, *Sabanejewia kubanica*). These species are of exceptional value for fish conservation. All except two are rheophilic inhabitants of fast flowing, natural rivers, with gravel bottoms. Sadly, these important areas for fish conservation have been degraded by the construction of dams, which inhibit the spawning migration of sturgeons and other migratory fishes, which were abundant in former times. The few wild river sections that remain are vulnerable to many threats and large sections should be protected.

Middle Terek (Russia)

The sections of the rivers Terek, Sulak and some smaller adjacent rivers in the Russian Caucasus host eight freshwater fish species endemic to the north-eastern Caucasus region (*Romanogobio ciscaucasicus*, *Gobio holurus*, *Sabanajewia caucasica*, *Chondrostoma oxyrhynchum*, *Barbus ciscaucasicus*, *Alburnoides gmelini*,

Oxynoemacheilus merga, *Salmo ezenami* (endemic to one lake)); this makes these rivers hotspots for fish conservation. Some of these species also occur in northern Azerbaijan. All species, except one, are rheophilic inhabitants of fast flowing, natural rivers, with gravel bottoms and that are not affected by dams. These wild river sections are vulnerable to many threats and large sections should be protected; however, they are poorly studied and fieldwork is needed to better understand the distribution of the endemic species for the purpose of designating protected areas.

Upper reaches of the Kura at Ardahan (Turkey)

The high altitude headwater streams of the upper Kura at Ardahan (Turkey) are inhabited by the only endemic fish genus of the Caucasus. This genus and species, *Leucalburnus satunini*, has only been found in Turkey and is endemic to a small highland plateau. It is one of very few endemic freshwater fish genera in Turkey. Interestingly, a second fish species, *Oxynoemacheilus cyri*, is endemic to the region and both are found together in the same streams. Because the area is relatively flat, no hydropower plants have been built there and none are planned; the area is mostly used by herders and threat levels seem to be low. Nevertheless, the area should be protected because it hosts such unique biodiversity.

Main threats and possible conservation actions

In the Caucasus, as all over the West Palearctic, populations of large and long-distance migratory fish species such as sturgeons have vanished or almost vanished due to dam construction and overfishing. Nevertheless, the conservation status of most freshwater fish in the Caucasus is relatively good compared to other regions in Europe and the Middle East. Sturgeons still spawn in the Caucasus and many endemic species are in a relatively good conservation status: this is because few species are restricted to small ranges and only a small number are restricted to areas with high water stress and semi-arid climate; furthermore, many “wild” rivers still exist in the region, providing habitat for the group of rheophilic fishes to which most endemic species belong.

Hydropower development continues to be the greatest threat to fish and aquatic habitats in the region. Other significant threats are overfishing, pollution (which regionally is a massive challenge), water abstraction especially in the eastern Caucasus, and invasive alien species used in commercial and recreational fisheries. The region’s fish biodiversity and aquatic habitats are poorly protected from these threats. In particular, remaining long sections of free-flowing rivers are in urgent need of protection - they host most of the region’s 52 endemic fish species and thus are one of the region’s most important biodiversity values.

Publications used for preparation of the review

- Abdurakhmanov, Y.A. (1962): *Freshwater fishes of Azerbaijan*. Inst. of Zool., Acad. Scien. Azer. SSR, Baku. [In Russ.].
- Aghasyan, A. & Kalashyan, M. (2010): Osteichthyes. The Red Book of Animals of the Republic of Armenia. – Available from: http://mnp.am/red_book_fauna/index.htm (May 1, 2019)
- Artaev, O.N., Levin, B.A., Mustafayev, N.D. & Simonov, E. P. (2018): Caucasian Relict Fish - Azerbaijani Spring Roach. *Priroda*, 5, 57-61.
- Baghirov, H.S. & Aliyev, J.A. (co-chairmen of editorial staff) (2013): *Red Book of Azerbaijan Republic*. Baku. [In Azer. and Engl.].
- Bayçelebi, E., Turan, D. & Japoshvili, B. (2015): Fish Fauna of Çoruh River and Two First Record for Turkey. *Turkish Journal of Fisheries and Aquatic Sciences*, 15, 738-794.
- Berg, L.S. (1949): *Freshwater fishes of the USSR and adjacent countries*. Israel program for scientific translations. [In Russ.], Jerusalem.
- Bogutskaya, N., Kijashko, P. & Naseka, A.M. (2013): *Identification keys for fish and invertebrates of the Caspian Sea. Vol. 1 Fish and molluscs*. Tovarishestvo Naucnikh Izdaniy KMK, Moscow. [In Russ.].
- Dadikyan, M.G. (1986): *Fishes of Armenia*. Acad. Scien. Arm. SSR, Yerevan. [In Russ.].
- Esmaili, H.R., Sayyadzadeh, G., Eagderi, S. & Abbasi, K. (2018): Checklist of freshwater fishes of Iran. *FishTaxa*, 3, 1-95.

- Freyhof, J., Guchmanidze, A., Rukhadze, A., Bitsadze, M. & Zazanashvili, N. (2015). Feasibility study on strengthening sturgeon conservation in Georgia (A Call for Action: Sturgeons in the Rioni River). Unpublished report, WWF Caucasus Programme Office.
- Freyhof, J., Khorozyan, I., Sadigov, F., Japoshvili, B., Batsatsashvili, K., Fayvush, G., Shukurov, E., Beruchashvili, G., Arobelidze, N., Kandaryan, A., Bitsadze, M., Zazanashvili, N., Manvelyan, K., Askerov, E., Karapetyan, K. & Ahmadova, K. (2015): *Towards sustainable dam and hydropower in the south Caucasus*. WWF, Norwegian Ministry of Foreign Affairs, Tbilisi.
- Gabrielyan, B.K. (2001): An annotated checklist of freshwater fishes of Armenia. Naga, *The ICLARM Quarterly*, 24 (3-4), 23-29.
- Gandlin, A.A., Mustafaev, N.D., Yakimov, A. V. & Levin, B.A. (2017): Updating the geographical range of Terek barbel *Barbus ciscaucasicus* Kessler, 1877 (Cyprinidae) using the cytochrome b molecular marker. *Inland Water Biology*, 10, 115-119.
- Ibrahimov, S.R. & Mustafayev, N.J. (2015): Current status of Azerbaijan ichthyofauna. *Proc. Inst. Zool. Azer. Nat. Acad. Sci.* 33, 58-68. [In Azer.].
- Kottelat, M. & Freyhof, J. (2007): *Handbook of European freshwater fishes*. Publications Kottelat, Cornol and Freyhof, Berlin.
- Levin, B.A., Prokofiev A.M., Roubenyan, A.R. (2019): A new species of algae eaters *Capoeta kaput* sp. nov. (Teleostei, Cyprinidae) from Transcaucasia. *Inland Water Biology*, 12 (1) 32-41
- Levin, B. & Roubenyan, H.R. (2012): New ichthyological findings in Armenia. *Russ. J Biol. Invasions*, 3 (2), 105-109.
- Levin, B.A. & Rubenyan, A.R. (2010): Annotated Checklist of Ichthyofauna of Armenia. Pp. 229-242 in Pavlov, D. S., Gabrielyan, B. K. and Krylov, A. B., eds. Ecology of Lake Sevan during a raise of its level. The Results of Russian-Armenian Biological Expedition for Hydroecological Survey of Lake Sevan (Armenia) (2005–2009). Nauka DNTS, Makhachkala [In Russ.].
- Levin, B.A., Simonov, E., Matveyev, M.P., Artaev, O.N., Mustafayev, N.J., Pashkov, A.N. & Roubenyan, H.R. (2016): DNA barcoding of the fishes of the genus *Alburnoides* (Actinopterygii, Cyprinidae) from Caucasus. *Mitochondrial DNA Part A: DNA Mapping, Sequencing, and Analysis*, 29, 49-55.
- Levin, B., Simonov, E., Rastorguev, S., Boulygina, E., Sharko, F., Tsygankova, S., Gabrielyan, B., Roubenyan, H., Mayden, R. & Nedoluzhko, A. (2018): High-throughput sequencing of the mitochondrial genomes from archived fish scales: an example of the endangered putative species flock of Sevan trout *Salmo ischchan*. *Hydrobiologia*, 822 (1), 217-228.
- Mousavi-Sabet, H., Vatandoust, S. & Doadrio, I. (2015): Review of the genus *Alburnoides* Jeitteles, 1861 (Actinopterygii, Cyprinidae) from Iran with description of three new species from the Caspian Sea and Kavir basins. *Caspian J. Env. Sci.* 13, 293-331.
- Mumladze, L., Japoshvili, B. & Anderson, E.P. (2019): Faunal biodiversity research in the republic of Georgia: a short review of trends, gaps, and needs in the Caucasus biodiversity hotspot. ArxivPreprint
- Mustafayev, N.J., Ibrahimov, Sh.R. & Levin, B.A. (2015): Korean sharpbelly *Hemiculter leucisculus* (Basilewsky, 1855) (Cypriniformes, Cyprinidae) is a new species of Azerbaijan fauna. *Russ. J Biol. Invasions*, 6 (4), 252-259.
- Naseka, A. & Bogutskaya, N. (2009): Fishes of the Caspian Sea: zoogeography and updated check-list. *Zoosystematica Rossica*, 18, 295-317.
- Naseka, A.M. & Freyhof, J. (2004): *Romanogobio parvus*, a new gudgeon from River Kuban, southern Russia (Cyprinidae, Gobioninae). *Ichthyological Exploration of Freshwaters* 15, 17-23.
- Naseka, A.M. (2010): Zoogeographical Freshwater Divisions of the Caucasus as a Part of the West Asian Transitional Region. *Proc. Zool. Inst. Russ. Acad. Sci.* 314 (4), 469-492.
- Ninua, N., Japoshvili B., Bochorishvili V. (2013): Fishes of Georgia. Tsignieri, Tbilisi.
- Ninua, L., Tarkhnishvili, D & Gvazava, E. (2018): Phylogeography and taxonomic status of trout and salmon from the Ponto-Caspian drainages, with inferences on European Brown Trout evolution and taxonomy. *Ecology and Evolution*, 8 (5), 2645-2658.
- Ninua, N. Sh. & Japoshvili, B.O. (2008): Checklist of fishes of Georgia. *Proc. Inst. Zool. Georg. Acad. Sci.* 23, 163-176.

- Pipoyan, S. (2012): *Ichthyofauna of Armenia: stages of formation and current state*. Palmarium Academic Publishing. [In Russ.].
- Turan, D., Japoshvili, B., Aksu, I. & Bektaş, Y. (2016): Description of two new species of the genus *Gobio* (Teleostei: Cyprinidae) from the Black Sea coast of Turkey. *Zoology in the Middle East*, 62 (2), 1-13.
- Turan, D., Kaya, C., Kalayci, G., Bayçelebi, E. & Aksu, İ. (2019): *Oxynoemacheilus cemali*, a new species of stone loach (Teleostei: Nemacheilidae) from the Çoruh River drainage, Turkey. *Journal of Fish Biology* 94, 3, 458-468.
- Turan, D., Kottelat M., Ekmekçi, F.G. & Imamoglu, H.O. (2006): A review of *Capoeta tinca*, with descriptions of two new species from Turkey (Teleostei: Cyprinidae). *Revue Suisse de Zoologie*, 113, 421-436.
- Turan, D., Kottelat, M., Kirankaya, S.G. & Engin, S. (2006): *Capoeta ekmekciae*, a new species of cyprinid fish from northeastern Anatolia (Teleostei: Cyprinidae). *Ichthyological Exploration of Freshwaters*, 17, 147-156.
- Tutman, P., Freyhof, J., Dulčić, J., Glamuzina, B. & Geiger, M. (2017): *Lampetra soljani*, a new brook lamprey from the southern Adriatic Sea basin (Petromyzontiformes: Petromyzontidae). *Zootaxa*, 4273, 531-548.
- Vasil'eva, E.D. (2017): Diagnostic features and taxonomy of the Mediterranean species of the big-scale sand smelts belonging to *Atherina boyeri* group (Atherinidae). *Journal of Ichthyology*, 57, 791-802.
- Vasil'eva, E. D., Solovyeva, E. N., Levin, B. A. & V. P. Vasil'ev (2020). *Cobitis derzhavini* sp. Nova—a New Spined Loach Species (Teleostei: Cobitidae) Discovered in the Transcaucasia. *Journal of Ichthyology*, 60, 135-153.
- Vasil'eva, E.D. & Vasil'ev, V.P. (2012): *Cobitis amphilekta* sp. nova, a new species of spined loaches (Cobitidae, Cypriniformes) from the Caspian Sea basin. *Journal of Ichthyology*, 52, 200-206.

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FLORA AND VEGETATION OF THE CAUCASUS

Compiled by

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Contents: *Flora; Vegetation; Attachment A - Mountain zonation types of the Caucasus vegetation; References; Suggested citation.*

Flora

The diverse physical-geographic conditions in the Caucasus support a rich flora and a wide variety of vegetation types. According to botanical literature, the number of vascular plant species in the Caucasus is about 6,500; however, this number does not consider northeastern Turkey and northwestern Iran, which are parts of the Caucasus Ecoregion; the number almost certainly exceeds 7,000.

When Site Outcomes were being developed for the CEPF Ecosystem Profile for the Caucasus Hotspot (CEPF 2003), the IUCN Red List - the basis for Site Outcomes - contained only one globally threatened plant species from the Caucasus – Tigran's Elder (*Sambucus tigranii*).

The situation with plant red-listing in the Caucasus fundamentally changed during implementation of the CEPF's Caucasus programme, particularly as a consequence of the CEPF-funded regional plant red-listing project led by Missouri Botanical Garden, in which experts from all six countries of the Ecoregion participated. The project identified 2,791 endemic species. The number of endemic genera is 21; most of the endemic genera are monotypic and oligotypic (J. Solomon, Shulkina & G. Solomon, 2014). These are:

- *Agasyllis, Arafoë, Chymysydia, Macrosciadium, Mandenovia, Symphyoloma* of the family Apiaceae;
- *Alboiodoxa, Cladochaeta, Grossheimia, Kemulariella* of the family Asteraceae;
- *Trigonocaryum* of the family Boraginaceae;
- *Pseudovesicaria, Zuvanda* of the family Brassicaceae;
- *Gadellia, Muehlbergella* of the family Campanulaceae;
- *Charesia, Petrocoma* of the family Caryophyllaceae;
- *Sredinskya* of the family Primulaceae;
- *Woronowia* of the family Rosaceae;
- *Paederotella* of the family Scrophulariaceae;
- *Pseudobetckea* of the family Valerianaceae.

Subsequently, 600 endemic species were submitted to the IUCN Red List authorities for consideration. Today, 385 species are included in the IUCN Red List out of which 276 species are considered as globally threatened: 98 Critically Endangered (CR), 100 Endangered (EN) and 78 Vulnerable (VU). More than 200 plant species are still under assessment by the IUCN Red List authorities.

The species included in the IUCN Red List as globally threatened (together with relevant animal species) were applied to the identification of the Key Biodiversity Areas (KBAs) of ECP 2020 (see chapter on KBAs).

Southern Colchic relict and endemic *Rhododendron ungerii*, Mtirala National Park, Georgia



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Vegetation

The vegetation of the Caucasus is present in patterns formed under the influence of abiotic drivers and biotic interactions during the history of ecosystem development and these patterns reflect major climatic differences between larger parts of the Caucasus featuring vegetation vertical zonation types along elevation gradients. The French botanist Joseph Pitton de Tournefort visited Armenia and Georgia during his travels of 1700-1702 and for the first time observed vertical zonation patterns on Mt. Ararat (Tournefort, 1717). The first scheme of mountain zonation for the southwestern Caucasus was developed by Wagner (1848) and the first vegetation map of the Caucasus was created by German botanist Karl Koch (1850). Later a number of other researchers addressed the question of the Caucasus vegetation classification and zonation in their publications (Kuznetsov, 1890; Alboff 1896; Radde, 1899; Sosnovsky, 1915; Busch 1935; Maghakyan 1941; Takhtajan 1938, 1941, 1946; Fedorov 1942; Shiffers, 1953; Stanukovich, 1955, 1973; Gagnidze, 1970; Gadjiyev, 1970; Grebenshikov & Zimina, 1974; Golubev et al., 1974; Kolakovsky et al., 1974; Gadjiyev, 1990; Nakhutsrishvili, 1999, 2013; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000; Asatryan, Fayvush, 2013; Fayvush, Alexanyan, 2016).

The description of the Caucasus' vegetation cover by A. Grossheim (1948) is a landmark in the history of regional vegetation studies. Another more recent landmark with respect to vegetation classifications for the whole region is The Map of the Natural Vegetation of Europe (Bohn et al., 2000/2003; Bohn et al., 2004), fundamental units of which are based on a dominant plant community and/or community mosaic linked into a hierarchical scheme (Bohn, Zazanashvili, Nakhutsrishvili, 2007). The paper by Zazanashvili et al. (2000) considers vegetation zonation of the entire Caucasus, identifies four distinct vertical vegetation zonation types, enlists vegetation types for each zone and, wherever relevant, belts constituting the zones. Below we attempt

to describe the vegetation of the Caucasus and the distinctive floristic and ecological attributes of its units through a synthesis of the Caucasian vegetation scheme adopted in The Map of the Natural Vegetation of Europe (Bohn et al., 2000/2003; Bohn et al., 2004) and the detailed scheme of vegetation zonation suggested by Zazanashvili et al. (2000).

Plant nomenclature mostly follows the major source papers used for the present characterisation of the Caucasus' flora and vegetation (i.e. Bohn et al., 2000/2003; Bohn et al., 2004; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000).

The scheme adopted for the Natural map of vegetation of Europe (Bohn et al., 2000/2003; Bohn et al., 2004) starts from polar deserts and subnival-nival vegetation of high mountains followed by vegetation of lower latitudes and elevations. In the following descriptions the lowest and highest elevation limits of each vegetation unit for the entire Caucasus are given.

A. Subnival-nival vegetation (from 2,900 to > 4,200 m a.s.l.) containing about 300 species of vascular plants, 70-80 of which are typical of the ultimate highlands devoid of permanent snow. The belt is present in three of the four vertical zonation types identified for the Caucasus (I, II, and III; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000; see Attachment A); the more continental the regional climate is, the higher are elevations where this type of vegetation occurs: in the South Caucasian zonation type it occurs at elevations 400 and 500 m higher than in the eastern and western Caucasian zonation types, respectively. The vegetation is composed of subnival rock and scree open plant communities with the following dominant species: *Cerastium polymorphum*, *Minuartia trautvetteriana* (Caryophyllaceae), *Pseudoversicaria digitata* (Brassicaceae), *Saxifraga scleropoda* (Saxifragaceae) in the West Caucasus; *Cerastium kasbek* (Caryophyllaceae), *Tripleurospermum subnivale* (Asteraceae) in the East Caucasus; and *Draba araratica* (Brassicaceae), *Saxifraga hirculus* (Saxifragaceae), *Poa araratica* (Poaceae) in the South Caucasus. Cryptogams dominate in the uppermost parts of the subnival-nival vegetation belt (Nakhutsrishvili, 2013).

B. Alpine vegetation on carbonate and silicate strata (from 2,400 to 3,600 m a.s.l.) consisting mainly of (i) alpine grasslands, (ii) carpet-type snow-bed communities, (iii) alpine shrub heaths predominantly made up of *Rhododendron caucasicum*, and (iv) rock and scree plant communities. The alpine zone is absent from vegetation zone type IV in Hyrcan (Talysh mountains). The climate-driven altitudinal patterns change from west to east: in the eastern and especially southern parts of the region respective vegetation zones are located at higher elevations than in the western part (see Attachment A).

Alpine grasslands: In the West, grasslands in the lower alpine belt are largely dominated by grasses such as *Festuca djimilensis*, *Agrostis Lazica* and *Nardus stricta*, the latter growing on gentle slopes of almost all exposures throughout the Caucasus; in the upper belt by *F. supina* reaching highest elevations (2,700-2,900 m a.s.l.) of the alpine zone within the East Caucasian zonation type, and a sedge *Kobresia schoenoides*. *Geranium gymnocaulon* is a characteristic forb of the West as well as East Caucasian alpine meadows throughout the vertical range of the zone. In the East *Nardus stricta*, *Festuca varia*, *F. supina*, *Poa alpina*, *Bromopsis variegata* are dominant grasses and *Carex tristis*, and *Kobresia macrolepis* and *K. humilis* dominant sedges of the lower alpine belt; *Festuca varia* and *Carex tristis* maintain their dominant positions in the upper belt, while *Koeleria macrolepis* is substituted by *K. schoenoides*.

Alpine carpet-type snow-bed communities: Alpine carpet-type snow-bed communities (mats) occur in the upper alpine belt; they require or tolerate persistent snow cover (7–9 months or throughout the year) and are composed of low stature geophytes and caespitose forb species such as *Cerastium cerastoides*, *Ranunculus svaneticus* and *Potentilla crantzii* in the West, and *Sibbaldia parviflora*, *Carum caucasicum*, *Campanula biebersteiniana*, *C. tridentata*, *C. argunensis*, *Alchemilla caucasica*, *Plantago saxatilis var. alpina*, *Taraxacum stevenii*, *Veronica gentianoides* and *Myosotis alpestris* in the East. In the South Caucasian zonation type, formed under the influence of the Iranian-Minor Asian continental climate with annual precipitation lower

than 1,000 mm, alpine steppes made up of *Festuca varia*, *F. chalcophaea*, *Alopecurus aucheri* and *Carex tristis* create the major land cover; no carpet-type communities occur.

Alpine shrub heaths: Along with predominant *Rhododendron caucasicum* the heaths in the West, East and South Caucasian zonation types are made up of low stature junipers (*Juniperus communis* subsp. *hemisphaerica* and *J. sabina*) occasionally inter-spread with *Rhododendron caucasicum* scrub, and dwarf shrub *Dryas caucasica* as well as *Vaccinium myrtillus* growing on northern to north-western stony slopes. Alpine shrubs are found in small spots, some types with *Vaccinium myrtillus* and *V. vitis-idaea* growing on moist habitats of the northern slopes with a significant development of soil cover; xerophilous semi-shrubs *Thymus caucasicus* (*Th. praecox* subsp. *caucasicus*), *Th. nummularius* and *Astragalus beckerianus* are found on the southern and eastern, rarely northern slopes (Gadjiyev, 1970).

Rock and scree communities: Rock and scree plant communities include oreo-xerophilous vascular plants and cryptogams and predominate at upper limits of the zone throughout the Caucasus (Bohn et al., 2000/2003; Bohn et al., 2004; Bohn, Zazanashvili, Nakhutsrishvili, 2007; Ketskhoveri, 1960; Nakhutsrishvili, 1999, 2013; Nakhutsrishvili et al., 2017). In the southern Caucasus one of distinctive representatives of screes is *Vavilovia formosa*.

Rhododendron caucasicum heaths, Eastern Greater Caucasus



C. Caucasian crooked and open woodlands zone (from 1,600 to 2,700 m a.s.l.). The vegetation cover is mainly made up of: (i) mesophilous crooked forests, (ii) subalpine shrublands, (iii) tall herb vegetation, and (iv) grasslands of various ecology. The zone is mostly absent in the Talysh mountains in the Hyrcanian bio-geographic region, but exists in the Hyrcanian part of the Alborz mountain range in Iran: there are no mesic types of subalpine forests such as *Betula* spp. Forests, or shrub communities such as *Rhododendron* thickets, but *Quercus macranthera* and *Juniperus* shrub communities are quite common (Akhani et al., 2010). Generally, zonation in the upper altitudes of Alborz mountains is more similar to the South Caucasian type of zonation (Attachment A).

Crooked forests are formed by beech, oak and birch (*Fagus orientalis*, *Quercus pontica*, *Betula medwedewii*, *B. megrelica*) with a **Colchic understory in the West Caucasus**; in the upper belt they are partly substituted by birch and ash-birch crooked woodlands with *Betula litwinowii*, and *Sorbus caucasigena*. Birch and ash (*Betula litwinowii*, *B. raddeana*, *Sorbus caucasigena*) are major trees of the subalpine woodlands in both the lower and upper belts in the eastern zonation type. Dark coniferous and beech-dark coniferous forests, the major vegetation of Zone D (see below), often with a Colchic understorey are also present in the lower subalpine belt of the western crooked and open woodlands zone; oak, pine and maple woodlands, including open woodlands (*Quercus macranthera*, *Pinus kochiana*, *Acer trautvetteri*) occur in the lower belt of the eastern subalpine zone. *Quercus macranthera* is the only species that makes up subalpine woodlands in the respective zone of the South Caucasian zonation type.

Above the treeline *Rhamnus imeretina*, *Sorbus subfusca*, *Corylus colchica* scrub and Colchic thickets of *Rhododendron ponticum*, *Rh. ungerii*, *Laurocerasus officinalis*, *Ilex colchica*, *Ruscus colchicus*, *Vaccinium arctostaphylos* are typical of the West Caucasus, while low and prostrate juniper open communities (*Juniperus hemisphaerica*, *J. sabina*) growing on rocks and screes and especially *Rhododendron caucasicum* scrub (although the latter is widespread throughout the Caucasus and reaches the upper limits of the alpine zone) are mostly characteristic of the eastern Caucasus.

Tall herb vegetation occurs in the West, East and South Caucasus and is formed by giant species (megaphorbs) of 1.5-2 m tall herbs of various families; in the West *Heracleum ponticum*, *Ligusticum physospermifolium* and *Senecio cladobotrys* are the most frequent, while *Heracleum sosnowskyi*, *Agasyllis latifolia*, *Aconitum nasutum*, *A. orientale*, *Cephalaria gigantea*, *Cicerbita macrophylla*, *Knautia montana*, *Senecio rhombifolius*, *Doronicum macrophyllum*, *Delphinium flexuosum* and *Inula helenium* are typical of the eastern and southern Caucasus (Takhtajan, 1941; Gagnidze, 1974, 1977; Gadjiyev, 1970).

Grasslands: Subalpine meadows of the western Caucasus are largely dominated by *Calamagrostis arundinacea*, *Poa iberica* and *Geranium platypetalum* in the lower subalpine belt; *Calamagrostis arundinacea* is also a dominant grass in the upper belt along with *Festuca djimilensis*, which also dominates in the above alpine meadows. Limestone endemic communities of *Woronowia speciosa* and *Carex pontica* are also worth a special mention. In the eastern and southern Caucasus *Bromopsis variegata*, *Agrostis tenuis*, *Hordeum violaceum*, *Geranium ibericum* and *G. platypetalum* are dominant species in the lower subalpine belt. *Anemone fasciculata* and *Polygonum carneum*, *Betonica macrantha* communities are widespread almost throughout the Caucasus on moderately humid northern and north-western slopes. *Veratrum lobelianum* is a frequently abundant species on grazed slopes. *Calamagrostis arundinacea* communities are found here on wet gentle slopes, mostly within the range of birch woodlands. *Deschampsia cespitosa* communities occur on river terraces and wetlands. So-called meadow steppe communities formed by xeromorphic species are also widespread in suitable environments in the eastern and southern Caucasus; the dominant species of these communities are: *Festuca ovina*, *Carex humilis*, *Bromopsis variegata* and *Thymus collinus* in the East, and *Bromopsis variegata*, *Phleum nodosum* and *Koeleria caucasica* in the South. In the eastern and southern upper subalpine zone and the alpine zone *Festuca varia* dominates in grasslands along with *Inula orientalis*, *Geranium ibericum* and *Betonica macrantha*. Some southern parts of south Caucasus characterized by the most continental climate in the region features mountain steppes with *Festuca valesiaca*, *Koeleria macrantha*, and *Sesleria phleoides*, and tragacanth communities of *Astragalus aureus*, *A. lagurus* and *Onobrychis cornuta*; similar communities are also present elsewhere in the Caucasus, particularly, in the eastern Greater Caucasus in appropriate local environments, e.g. communities of *Astragalus captiosus* and *A. denudatus* in the eastern part of the Central Greater Caucasus (Alizade et al., 2019; Bohn et al., 2000/2003; Bohn et al., 2004; Bohn, Zazanashvili, Nakhutsrishvili, 2007; Gadjiyev, 1970; Ketskhoveri, 1960; Nakhutsrishvili, 1999, 2013; Nakhutsrishvili et al., 2017).

D. Mesophytic and hydromesophytic coniferous and mixed forests (between 1,000 and 2,100 m, with core area between 1,400 and 1,800 m a.s.l.) of *Abies nordmanniana*, *Picea orientalis* and *Fagus orientalis*, partly with Colchic understorey: *Rhododendron ponticum*, *Rh. ungerii*, *Laurocerasus officinalis*, *Ilex colchica*, *Ruscus colchicus*, *Vaccinium arctostaphylos* and *Viburnum orientale* (Bohn, Zazanashvili, Nakhutsrishvili, 2007; Ketskhoveli, 1960; Nakhutsrishvili, 1999, 2013; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000). These forests spread eastwards along the Greater Caucasus: fir reaches Liakhvi gorge and spruce, Aragvi gorge; along the Lesser Caucasus they spread to Algeti (Ketskhoveli, 1960; Dolukhanov, 2010). At the uppermost level Dolukhanov (2010) classifies the dark coniferous and mixed forests according to presence of the Colchic understorey; sub-types at this further level of classification are distinguished according to the major species of shrub understorey or herb cover and include:

(i) Dark coniferous forests with Colchic understorey: dark coniferous forests with *Rhododendron ponticum*, dark coniferous forests with *Laurocerasus officinalis*, dark coniferous forests with *Ilex colchica*, dark coniferous forests with *Vaccinium arctostaphylos*, dark coniferous forests with *V. orientale*, rock spruce and fir forests;

(ii) Dark coniferous forests without Colchic understorey: spruce forests with patchy moss cover, dark coniferous forests with *Festuca drymeja*, hemixerophilous spruce forests, fir forests with *Luzula spicata*, dark coniferous forests with small herbs, fir forests with *Trachystemon orientale*, beech-spruce forests with ferns, fir forests with *Calamagrostis arundinacea*, fir forests with mixed herb cover, fir forests with sparse herb cover. The beech forest type with Colchic understorey spreading up to 1,000 (1,200) m a.s.l. is considered within formation H. Hygro-thermophilous mixed deciduous broadleaved forests, below.

Mixed temperate forest, Western Lesser Caucasus



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F6. Caucasian oriental beech and oriental beech-hornbeam forests (from 800 to 2,000 m, with core area between 1,000-1,800 m a.s.l.). In the west this formation is designated as *Humid beech forest* and is made up of *Fagus orientalis* forest often with a Colchic understorey; also dark coniferous and mixed beech-dark-coniferous forests (*Abies nordmanniana*, *Picea orientalis*, *Fagus orientalis*), partly with a Colchic understorey; Colchic thickets (see specific composition above). In the east and southeast the formation is designated as *Mesic beech forest* with *Fagus orientalis* in both vegetation zonation types; *Quercus macranthera* and *Pinus kochiana* forests and woodlands in the eastern vegetation zonation type (Bohn, Zazanashvili, Nakhutsrishvili, 2007; Ketskhoveli, 1960; Nakhutsrishvili, 1999, 2013; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000). Beech and hornbeam-beech forests (*Fagus orientalis*, *Carpinus caucasica*) within the lower mountain forests of the eastern zonation type and humid thermophilous Hyrcanian broad-leaved forests of the southeastern zonation type (Zazanashvili, Gagnidze & Nakhutsrishvili, 2000; see Attachment A) should be considered within the zone F6 in the classification scheme by Bohn et al. (2007).

At the uppermost level Dolukhanov (2010) classifies beech forests according to presence of the Colchic understorey; sub-types at the further level are distinguished according to the major species of shrub understorey or herb cover and include:

(i) Beech forests with Colchic understorey: beech forests with *Rhododendron ponticum*, beech forests with *Laurocerasus officinalis*, beech forests with *Ilex colchica*, beech forests with *Ruscus colchica*, dark coniferous forests with *Vaccinium arctostaphylos*, beech forests with *Rhododendron luteum*, dark coniferous forests with *Viburnum orientale*;

(ii) Beech forests without Colchic understorey: beech forests with *Festuca drymeja*, hemixerophilous beech forests, beech forests with dead ground cover, beech forests with *Dentaria iberica*, beech forests with *Asperula caucasica*, beech forests with *Asarum intermedium* and *Symphytum grandiflorum*, beech forests with *Rubus hirtus s.l.*, beech forests with *Trachystemon orientale*, beech forests with ferns (*Matteuccia struthiopteris*, *Dryopteris filix mas*), beech forests with *Luzula spicata*. Prilipko (1954) also identified beech forests with *Taxus baccata*, subalpine beech forests with *Pyraecantha coccinea*, in Talysh Mountains - beech forests with *Ilex hyrcana*, as well as with *Hedera pastuchovii* and *Danae racemosa*. Beech forests with Colchic understorey, especially, below 1000 (1200) m a.s.l., i.e. occurring within the humid thermophilous Colchic broad-leaved forest zone as defined by Zazanashvili et al. (2000) should be considered within the scope of the formation H (see below).

All Colchic forest types (described in Formation C, D, F and H; see also Attachment A. Colchic type) as well as Hyrcanian forests under formation H are also classified as temperate rainforests (Nakhutsrishvili, Zazanashvili & Batsatsashvili, 2011).

F7. Hornbeam-oak mixed forests of the Caucasus / G. Thermophilous mixed deciduous broad-leaved forests. These formations have a different ecology and different elevational distribution in the Caucasus vegetation zonation types. According to Zazanashvili et al. (2000), the following types should be considered within the scope of the F7 / G zones designated by Bohn et al. (2007): the eastern zonation type willow (*Salix spp.*) species on the first river terrace; riparian oak and poplar-oak forests (*Quercus pedunculiflora*, *Populus hybrida*, *P. nigra* with *Acer velutinum*, *Ulmus suberosa*) and hornbeam-oak forests on the slopes (*Quercus iberica*, *Carpinus orientalis*) within the *Riparian and foothill forest belt* (< 500-600 (1,000) m a.s.l.) as well as oak-hornbeam forests (*Quercus iberica*, *Carpinus caucasica*) within the lower mountain forest belt (from 500 to 1,000 (1,200) m a.s.l.). Thermophilous hornbeam-oak forests with *Quercus iberica*, *Carpinus caucasica* and *C. orientalis* also occur in relatively dry habitats within the humid thermophilous Colchic broad-leaved forest zone of the west Caucasian vegetation zonation type (Zazanashvili, Gagnidze & Nakhutsrishvili, 2000). The F7 / G zones also include *Quercus macranthera* woodlands within the *Hemi-xeric* woodlands of the southern zonation type (from 1,600 to 2,300 (2,400) m a.s.l.) as well as

Quercus maranthera forests with *Acer campestre*, *A. hyrcanum*, *Fraxinus excelsior*, *Carpinus caucasica*, *Sorbus boissieri*, *Pyrus syriaca*, *Malus orientalis*, *Viburnum lantana*, *Sorbus graeca*, known from Arasbaran, Iran (Assadi, 1987); by elevational distribution (1,500-2,000 m) the latter type partly corresponds to the upper part of the Mesic beech forest zone and lower part of the Steppe and xeric dwarf semi-shrub zone of the south eastern zonation type Zazanasvili et al (2000). In the southern zonation type, oak-hornbeam forests dominated by *Quercus iberica* or *Q. macranthera* and *Carpinus caucasica*, and hornbeam-beech and beech forests with *Fagus orientalis* or also typical. The fruit forests with different *Pyrus* species, *Prunus divaricata*, etc. are specific for southern Caucasus. *Quercus castaneifolia* thermophytic forest sporadically with *Parrotia persica*, *Zelkova carpinifolia*, *Acer velutinum*, *Gleditsia caspia*; *Quercus iberica*-*Carpinus caucasica* forests are considered within *Humid thermophilous Hyrcanian broad-leaved forests* (from 600 to 1,000 (1,200) m a.s.l.) of the southeastern (Hyrcanian) zonation type (Bohn, Zazanasvili, Nakhutsrishvili, 2007; Ketskhoveli, 1960; Nakhutsrishvili, 1999, 2013; Zazanasvili, Gagnidze & Nakhutsrishvili, 2000).

Colchic forest, Kintrishi State Reserve, Georgia



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A special feature of the Caucasus ecoregion is two refugia of the Tertiary identified as the zone H. Hygrothermophilous mixed deciduous broadleaved forests. This vegetation occurs within the distribution areas of two vegetation zonation types: Colchic and Hyrcanian and spreads up to 1,000 (1,200) m a.s.l. in both regions. The Colchic forest is made up of *Castanea sativa*, *Carpinus caucasica*, *Fagus orientalis*, *Quercus hartwissiana* and *Zelkova carpinifolia*, with a Colchic understory including *Rhododendron ponticum*, *Laurocerasus officinalis* and *Ruscus colchicus* as well as the lianas *Hedera colchica*, *H. helix*, *Dioscorea caucasica* and *Vitis sylvestris*. Riparian and wetland forests of *Alnus glutinosa* with *Pterocarya carpinifolia* occur within

the range of these forests. The major constituents of the Hyrcanian forests are: oak-parrotia, parrotia-hornbeam-oak, oak-hornbeam-azad forests (*Quercus castaneifolia*, *Parrotia persica*, *Zelkova carpinifolia*, *Carpinus caucasica*, *Albizzia julibrissin*, *Ficus hyrcana*, *Diospiros lotus*, *Ulmus glabra* with shrubs and semishrubs: *Ilex hyrcana*, *Ruscus hyrcanus*, *Danaë racemosa*, and lianas: *Smilax excelsa*, *Periploca graeca*, *Hedera pastuchowii*); these forests spread up to 600 m a.s.l. Alluvial forests have been almost entirely replaced by cultural landscapes in the South Caspian area of Iran but still exist in small areas (e.g. in Gilan); they are composed of *Alnus glutinosa* with *Populus caspica*, *Pterocarya fraxinifolia*, *Ulmus minor*, *Cornus australis*, *Alnus subcordata*, *Diospyros lotus*, *Buxus hyrcana* and *Ilex spinigera* and belong to the same type (Akhani et al., 2010). As stated above, from 600 to 1,000 (1,200) m a.s.l. mainly *Quercus castaneifolia* thermophytic forest grows sporadically with *Parrotia persica*, *Zelkova carpinifolia*, *Acer velutinum*, *Gleditsia caspia* (Bohn, Zazanashvili, Nakhutsrishvili, 2007; Dolukhanov, 1980; Ketskhoveli, 1960; Nakhutsrishvili, 1999, 2013; Nakhutsrishvili et al., 2015; Safarov, 2010; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000).

M. Steppes. Steppes are spread in the Caucasus from north of the Black Sea to the Caspian lowland, in East Georgia and subalpine areas in the form of islets. The main constituents are: *Stipa spp.*, *Botriochloa ischaemum*, *Festuca valesiaca*, *Bromopsis riparia*, *Carex humilis*, with *Stipa tirsia*, *Festuca valesiaca*, *Koeleria cristata*, *Nepeta grossheimii* at higher elevations, from 1,600 to 2,300 (2,400) m a.s.l. and higher); a number of species of grasses in the genera *Dianthus*, *Salvia*, *Onobrychis*, *Astragalus*, and geophytes species of *Tulipa*, *Crocus*, *Gagea*, *Iris*, etc. are present. In the North Caucasus, steppes are spread up to 500–600(700) m a. s. l. between semi-deserts in the west and deserts in the east; steppe and semi-desert are interrupted in places by marshes and forests on wetlands. The following types are part of the Riverside and foothill forest belt of the eastern zonation type and xeric grass, semi-shrub and woodland zones of the southern zonation type: steppes interspersed with arid woodlands (*Pistacia mutica*, *Juniperus polycarpus*, *J. foetidissima*, *Celtis caucasica*) and shibliak (*Paliurus spina-christi*, *Rhamnus pallasii*, *Atraphaxis spinosa*, *Ephedra procera*), as well as with low woodlands (*Pyrus spp.*, *Acer hyrcanum*, *Crataegus spp.*, *Juniperus polycarpus*), hemi-xeric shrublands (*Cotoneaster spp.*, *Sorbus graeca*) and elements of tomillares (*Thymus kotschianus*, *Scutellaria spp.*, *Stachchys inflata*) and friganoids (*Ambliopogon spp.*, *Caccinia rauwolfii*, *Hedysarum formosum*) (Bohn, Zazanashvili, Nakhutsrishvili, 2007; Ketskhoveli, 1960; Nakhutsrishvili, 1999, 2013; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000).

N. Oreoxerophytic vegetation of thorn-cushion communities. The main constituents of this formation are *Astragalus caucasicus*, *A. microcephalus*, *A. denudatus*, *A. gudrathi*, *A. meyeri*, *Onobrychis cornuta* and *Acantholimon spp.*, e.g. *A. schemachense*, *A. bracteatum*, *A. araxanum*. The formation occurs in severe conditions of winter cold, summer dryness and high solar radiation of rocky areas throughout the Caucasus. Oreoxerophytic vegetation of Central Dagestan is worth special emphasis. A typical feature of zonation in Dagestan is that compared to the West and Central Greater Caucasus elevation zones shift upwards almost by 1,000 m, and in places even by 1,500 m owing to climate aridity. More than 900 endemic species of Caucasus plants are reported from the northern macroslope of the Eastern Caucasus (Murtazaliev & Litvinskaya, 2009), which is 72.35% of all Caucasus endemics recorded in the Russian part of the region (Litvinskaya & Murtazaliev 2009). Three of the 21 monotypic genera of the Caucasus: *Muehlenbergella*, *Pseudobetckea*, and *Mandenovia* occur there as well.

The formation **O. Deserts** occurs in the Caspian depression, valleys of the rivers Kura and Ara(k)s and as small fragments in various regions of the South Caucasus, mostly below 1,200 m a.s.l. They include dwarf semi-shrub deserts with *Artemisia fragrans*, *Salsola spp.* with ephemeroids such as *Poa bulbosa*, *Catabrosella humilis*; deserts with *Halocnemum strobilaceum*, *Suaeda microphylla*, *Salsola dendroides*, *S. nodulosa* on saline soils; thorn-cushion communities (*Artemisia microcephalus*, *A. vedicus*, *A. karjaginii*) (Asadova K, 2008; Bohn et al., 2007; Ketskhoveli, 1960; Movsumova, 2005; Nakhutsrishvili, 1999, 2013; Zazanashvili, Gagnidze & Nakhutsrishvili, 2000).

Open Juniper woodland, southern Armenia



Azonal vegetation: ***P. Coastal vegetation and inland halophytic vegetation and R. Tall reed vegetation and tall sedge swamps, aquatic vegetation*** are also represented at various elevations within the Caucasus ecoregion (Bohn, Zazanashvili, Nakhutsrishvili, 2007; Nakhutsrishvili, 1999, 2013).

Vegetation types of the Caucasus are conserved in a number of Protected Areas in all countries of ecoregion. Research for three countries (Armenia, Azerbaijan, Georgia) showed that the least protected are steppes, deserts (including semideserts) and vegetation of flood plains; vegetation types of formations D and F are also quite far from 17% protection required by CBD 2020 targets (Montalvo Mancheno, Zazanashvili & Beruchashvili, 2017). Further development of protected areas systems is needed to fill typological and spatial gaps in terms of conservation of vegetation types. Work on the Emerald Network ongoing in the South Caucasus countries will help guide development of PAs and generally will add value to plant and vegetation conservation in the Caucasus.

Attachment A: Mountain zonation types of Caucasus vegetation (according to Zazanashvili et al., 2000)

I. West Caucasian (Colchic)	II. East Caucasian	III. South Caucasian	IV. Southeast Caucasian (Hyrcanian)
IA. Humid thermophilous Colchic broad-leaved forest zone, up to 1,000 (1,200) m: IA1. Mixed broad-leaved forest belt, up to 500 (600) m; IA2. Chestnut forest belt, from 500-1,000 (1,200) m.	IIA1. Riverside and foothill forest belt, below 500-600 (1,000) m; IIA2. Lower mountain belt, from 500-1,000 (1,200) m.	IIIA. Desert zone, below 800 m.	IVA. Humid thermophilous Hyrcanian broad-leaved forest zone, below 1,000 (1,200) m: IVA1. Mixed broad-leaved forest belt, up to 600 m; IVA2. Oak forest belt, from 600 to 1,000 (1,200) m.
IB. Humid beech forest zone, between 1,000 (800)-1,400 (1,800) m.	IIB. Mesic beech forest zone, from 1,000-1,800 (2,000) m: IIB1. Middle mountain belt, 1,000-1,500 m; IIB2. Upper mountain belt, 1,500-1,900 (2,000) m.	IIIB. Xeric grass and semi-shrub zone, 800 (1,200)-1,600 m.	IVB. Mesic beech forest zone, from 1,000 -1,600 (1,800) m.
IC. Nemoral humid coniferous forest zone, from 1,400 (1,000) -1,800 (2,100) m.		IIIC. Hemi-xeric woodland zone, 1,600-2,300 (2,400) m.	IVC. (Talysh mountains): Steppe and xeric dwarf semi-shrub zone, from 1,600 to 2,300 (2,500) m.
ID. Subalpine elfin wood and meadow zone, from 1,800 (1,600)-2,400 (2,700) m: ID1. Lower subalpine belt, from 1,800 (1,600)-2,100 (2,200); ID2. Upper subalpine belt. This belt, from 2,100 to 2,400 (2,700) m.	IIC. Subalpine elfin wood and meadow zone, between 1,900 (2,000) and 2,500 (2,700) m: IIC1. Lower subalpine belt, 1,900 -2,200 m; IIC2. Upper subalpine belt, 2,200 - 2,500 (2,600) m.	IIID. Subalpine woodland and grassland zone, between 2,300 and 2,800 (2,900) m.	
IE. Alpine grassland and thicket zone, between 2,400- 2,900 (3,000) m: IE1. Lower alpine belt, from 2,400 to 2,750 m; IE2. Upper alpine belt, from 2,750 to 2,900 (3,000) m.	IID. Alpine grassland and thicket zone, between 2,500 and 3,000 (3,200) m: IID1. Lower alpine belt, between 2,500 and 2,800 m; IID2. Upper alpine belt, from 2,800-3,000(3,200) m.	IIIE. Alpine grassland zone, 2,800-3,400 (3,600) m.	
IF. Subnival zone, from 2,900-3,700 (4,000) m.	IIE. Subnival open zone, 3,000 - 4,000 m.	IIIF. Subnival open zone, between 3,400 and 4,200 (4,400) m.	
IG. Nival cryptogam zone, above 3,700 m.	IIF. Nival cryptogam zone, above 4,000 m.	IIIG. Nival cryptogam zone, above 4,200 m.	

References

- Akhani, H., Djamali, M., Ghorbanalizadeh, A. & Ramezani, E. (2010): Plant biodiversity of Hyrcanian relict forests, N Iran: an overview of the flora, vegetation, palaeoecology and conservation. *Pakistan Jour. of Bot.*, 42 (Special Issue), 231-258.
- Alboff, N. (1896): Les forêts de la Transcaucasie occidentale. *Bull. Herbarier Boissier*, 4, 61-78.
- Alizade V.M., Mehdiyeva N.P., Karimov V.N., Ibrahimova A.Q. (2019): *Plants of the Greater Caucasus (Azerbaijan)*. "Red N Line" publishing house, Baku.
- Asadova K.K. (2008): Fodder resources of Jeiranchel Feed resources of the Jeyranchel massif of Azerbaijan. Pp. 34-37 in Problems of desert development, 3. Ministry of Nature Protection of Turkmenistan, National Institute of Deserts, Flora and Fauna, Ashkhabad.
- Assadi, M. (1987): Plants of Arasbaran Protected Area, NW Iran (part I). *Iran. Jour. Bot.*, 3 (2), 129-175.

- Asatryan, A., Fayvush, G. (2013): *Important plant areas representing the rare and threatened habitat types of Armenia*. Yerevan.
- Asatryan, A., Fayvush, G. (2013): Habitats of Armenia. The Classification Scheme. Yerevan
- Bohn, U., Gollub, G., Hettwer, C., Neuhäuslová, Z., Raus, Th., Schlüter, H., Weber, H. [Bearb./Eds.] (2004): *Karte der natürlichen Vegetation Europas/Map of the Natural Vegetation of Europe*, Maßstab/Scale 1:2.500.000, Interaktive/Interactive CD-ROM, Erläuterungstext, Legende, Karten / Explanatory Text, Legend, Maps. Landwirtschaftsverlag, Münster.
- Bohn, U., Neuhäusl, R., Gollub, G., Hettwer, C., Neuhäuslová, Z., Raus, T., Schlüter, H. and Weber, H. (2003): *Karte der natürlichen Vegetation Europas/Map of the natural vegetation of Europe. Maßstab/Scale 1: 2 500 000. Teil 3/Part 3: Karten/Maps*. Landwirtschaftsverlag, Münster.
- Bohn, U., Zazanashvili, N., Nakhutsrishvili, G. (2007): The Map of the Natural Vegetation of Europe and its application in the Caucasus Ecoregion. *Bull. Georg. Natl Acad. Scien.*, 175, 112-121.
- Busch, N.A. (1935): *Botanical and geographical studies of the Caucasus*. USSR Acad. Scien., Moscow-Leningrad. [in Russ.].
- CEPF 2003. Critical Ecosystem Partnership Fund, Ecosystem Profile, Caucasus Biodiversity Hotspot. – https://www.cepf.net/sites/default/files/final.caucasus.ep_.pdf
- Dolukhanov, A.G. (1980): *Colchic underwood*. Metsniereba, Tbilisi. [In Russ.].
- Dolukhanov, A.G. (2010): *Forest vegetation of Georgia*. Universal, Tbilisi. [In Russ.].
- Fayvush, G., Aleksanyan, A. (2016): *Habitats of Armenia*. Institute of Botany Nat. Acad. Scien, Yerevan. [In Russ. and Engl.].
- Fedorov, A. (1942): Alpine carpets of the Caucasus and their origin. *Proc. Arm. Branch. USSR Acad. Scien.*, 9-10: 137-155. [In Russ.].
- Gadjiyev V.D. (1970): *Alpine vegetation of the Greater Caucasus and its economic importance*. Elm, Baku. [In Russ.].
- Gadjiyev V.D. (1990): *Alpine vegetation of the Lesser Caucasus (within Azerbaijan)*. Elm, Baku. [In Russ.].
- Gagnidze, R. (1970): On the typology of altitudinal zonation in the Caucasus. *Bull. Georg. Acad. Sci.* 59(3), 673-676. [In Georg.].
- Gagnidze, R. (1974): *Botanical and geographical analysis of the florocoenotic complex of tall herb vegetation of the Caucasus*. Metsniereba, Tbilisi. [In Russ.].
- Gagnidze, R. (1977): The ecological-coenotic characteristic and analysis of vertical distribution of tall herbaceous species in the Caucasus. Pp. 41-83 in *Zametki Sistem. Geogr. Rastenii*, 34. Bot. Inst. USSR Acad. Scien. [In Russ.].
- Golubev, G.N., Tushinski, G.K., Grebenshikov, O.S. & Zimina, R.P. (1974): Geomorphology and altitudinal belts of natural ecosystems. Baksan river valley-Itkol. Pp. 78-85 in *France-Soviet Geographical Symposium "Alps-Caucasus": Guide of the Caucasus (Symposium materials)*. Inst. of Geogr. USSR Acad. Scien. Nauka, Moscow-Tbilisi. [In Russ.].
- Grebenshikov, O.S. & Zimina, R.P. (1974): Natural ecosystems and vertical belts. Pp. 8-12 in *France-Soviet Geographical Symposium "Alps-Caucasus": Guide of the Caucasus (Symposium materials)*. Inst. of Geogr. USSR Acad. Scien. Nauka, Moscow-Tbilisi. [In Russ.].
- Grossheim, A. A. (1948): *Vegetation cover of the Caucasus*. MOIP, Moscow.
- Ketskhoeli, N. (1959): Georgia's vegetation cover. Metsniereba, Tbilisi. [In Georg.].
- Koch, K. (1850): *Karte von dem Kaukasischen Isthmus und von Armenien*. Berlin
- Kolakovski, A.A., Maruashvili, L.I., Sokhadze, E.V., Ukleba, D.B. & Urushadze, T.F. (1974): Geomorphology and vertical belts of natural ecosystems. Sukhumi-Ritsa lake-Avadkhara. Pp. 152-162 in *France-Soviet Geographical Symposium "Alps-Caucasus": Guide of the Caucasus (Symposium materials)*. Inst. of Geogr. USSR Acad. Scien. Nauka, Moscow-Tbilisi. [in Russ.].
- Kuznetsov, N. I. (1890): Geobotanical study of the Caucasus northern slope. *Proc. Imper. Russ. Geogr. Soc.* 17, 55-73. [In Russ.].
- Litvinskaya S, Murtazaliev, R. (2009): Caucasian element in the flora of Russian *Caucasus: geography, zoology, ecology*. Prosveschenie-Jug, Krasnodar. [In Russ.].

- Maghakyan, A. (1941): *Vegetation of Armenian SSR*. USSR Acad. Scien., Moscow-Leningrad. [In Russ.].
- Movsumova F.G. (2005): *Flora and vegetation of saltwort deserts of Nakhchivan Autonomous Republic*. Shams, Baku.
- Montalvo Mancheno, C.S., Zazanashvili, N. & Beruchashvili, G. (2017): Effectiveness of the network of protected areas of the South Caucasus in representing terrestrial ecosystems after the dissolution of the Soviet Union. *Environmental Conservation*, 44 (2), 158-165.
- Murtazaliev R, Litvinskaya, S. (2009): Analysis of flora endemism in Russian part of the Caucasus. Pp. 143-145 in *Materials of the intern. scien. conf. Biological and Humanitarian Resources of Mountain Regions Development*. Makhachkala
- Nakhutsrishvili, G. (1999): *Vegetation of Georgia (Caucasus)*. Braun-Blanquetia, 15.
- Nakhutsrishvili, G. (2013): *Vegetation of Georgia (Caucasus)*, the 2nd ed. Springer, Heidelberg.
- Nakhutsrishvili, G., Abdaladze, O., Batsatsashvili, K., Spehn, E. & Koerner, Ch. (2017): *Plant Diversity in the Central Great Caucasus: A Quantitative Assessment*. Springer, Cham.
- Nakhutsrishvili, G., Zazanashvili, N. & Batsatsashvili, K. (2011): Regional Profile: Colchic and Hyrcanic Temperate Rainforest of the Western Eurasian Caucasus. Pp. 214-221 in DellaSala, D.A., ed. *Temperate and Boreal Rainforest of the World: Ecology and Conservation*. Island Press, Washington-Covelo-London.
- Nakhutsrishvili, G., Zazanashvili, N., Batsatsashvili, K. & Montalvo, C.S. (2015): Colchic and Hyrcanian forests of the Caucasus: similarities, differences and conservation status. *Flora Mediterranea*, 25, 185-192.
- Prilipko L.I. (1954): *Forest vegetation of Azerbaijan*. Azer.Acad. Scien., Baku. [In Russ.].
- Radde, G. (1899): *Grundzüge der Pflanzenverbreitung in den Kaukasusländern*. Die Vegetation der Erde, Vol. 3. Wilhem Engelmann Verlag, Leipzig.
- Safarov H.M. (2009): Rare and endangered plant species in Hirkan National Park and its environs. Pp. 193-198 in Zazanashvili, N. and D. Mallon, eds. *Status and protection of globally threatened species in the Caucasus*. CEPF, WWF, Tbilisi.
- Safarov H.M. (2010): Zur Waldvegetation des Nationalparks Hirkan in Talysch (Azerbaidshan). *Mitt. Deutsch. Dendrol. Ges. (MDDG)*, 95, 175-180.
- Shiffers, E.V. (1953): *Vegetation of the North Caucasus and its natural ranges*. USSR Acad. Scien., Moscow-Leningrad. [In Russ.].
- Solomon, J.C., Shulkinia, T.V. & Solomon, G.E., eds. (2014): *Red list of the endemic plants of the Caucasus: Armenia, Azerbaijan, Georgia, Iran, Russia, and Turkey*. MBG Press, St. Louis.
- Sosnovsky, D.I. (1915): Sketch of the vegetation of the Upper Svaneti. *Bull. Russ. Flora*, 1 (3), 119-144. [In Russ.].
- Stanukovich, K.V. (1955): General types of zonation for the mountains of USSR. *Proc. USSR Geogr. Soc.*, 87(3), 232-243. [In Russ.].
- Stanukovich, K.V. (1973): *Mountain vegetation of the USSR*. Donish, Dushanbe. [In Russ.].
- Takhtajan, A. (1938): Xerophilous vegetation of skeletal mountains of Armenia. *Transactions of Arm. Branch USSR Acad. Scien., Ser. Boil.*, 2, 61-130. [In Russ.].
- Takhtajan, A. (1941): *Botanical and geographical essay of Armenia*. Transactions of Bot. Inst. Arm. Branch USSR Acad. Scien., 2, 179 p. [in Russ.].
- Takhtajan, A. (1946): On the history of development of the vegetation of Armenia. Transactions of Bot. Inst. Arm. Branch USSR Acad. Scien., 4, 51-107. [In Russ.].
- Tournefort, J. (1717). *Relation d'un Voyage du Levant*. Vol. XXX, 1,2. Paris.
- Wagner, M. (1848): *Reise nach dem Ararat und dem Hochland Armenien* (Vol. 10). Cotta.
- Williams L., Zazanashvili N., Sanadiradze G. & A. Kandaurov, eds. (2006): *Ecoregional Conservation Plan for the Caucasus*. WWF, KfW, BMZ, CEPF, MacArthur Foundation, Tbilisi.
- Zazanashvili N., Garforth M., Jungius H., Gamkrelidze T. with participation of Ch. Montalvo, eds. (2013): *Ecoregion Conservation Plan for the Caucasus. 2012 revised and updated edition*. WWF, KfW, BMZ, Tbilisi.
- Zazanashvili, N., Gagnidze, R. and Nakhutsrishvili, G. (2000): Main types of vegetation zonation on the mountains of the Caucasus. *Acta Phytogeographica Suecica*, 85, 7-16

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Annex 1: THE IUCN GLOBALLY THREATENED SPECIES IN THE CAUCASUS ECOREGION (2019)

#	Scientific Name	Common Name	IUCN Category 2019			Distribution by Countries						Local, Country or Regional Endemics
			Vulnerable	Endangered	Critically Endangered	Armenia	Azerbaijan	Georgia	Iran	Russia	Turkey	
	Mammals	17	9	5	3	9	8	10	7	12	5	6
1	<i>Bison bonasus</i>	European Bison	+							+		
2	<i>Capra aegagrus</i>	Wild (bezoar) Goat	+			+	+	+	+	+	+	
3	<i>Capra caucasica</i>	West Caucasian Tur		+				+		+		+
4	<i>Gazella subgutturosa</i>	Goitered Gazelle	+				+	+	+			
5	<i>Meriones dahli</i>	Dahl's Jird		+		+					+	+
6	<i>Mustela lutreola</i>	European Mink			+			+		+		
7	<i>Myotis hajastanicus</i>	Armenian Whiskered Bat			+	+						+
8	<i>Nyctalus lasiopterus</i>	Giant Noctule	+			+	+	+		+	+	
9	<i>Ovis orientalis</i>	Mouflon	+			+	+		+		+	
10	<i>Panthera pardus</i>	Leopard	+			+	+	+	+	+		
11	<i>Phoca caspica (Pusa caspica)</i>	Caspian Seal		+			+		+	+		
12	<i>Rhinolophus mehelyi</i>	Mehely's Horseshoe Bat	+			+	+	+	+	+		
13	<i>Saiga tatarica</i>	Saiga Antelope			+					+		
14	<i>Sicista armenica</i>	Armenian Birch Mouse		+		+						+
15	<i>Sicista caucasica</i>	Caucasian Birch Mouse	+					+		+		+
16	<i>Sicista kazbegica</i>	Kazbeg Birch Mouse		+				+		+		+
17	<i>Vormela peregusna</i>	Marbled Polecat	+			+	+	+	+	+	+	
	Birds	23	15	5	3	17	21	19	20	23	19	0
18	<i>Anser erythropus</i>	Lesser White-fronted Goose	+			+	+	+	+	+	+	
19	<i>Aquila heliaca</i>	Eastern Imperial Eagle	+			+	+	+	+	+	+	
20	<i>Aquila nipalensis</i>	Steppe Eagle		+		+	+	+	+	+	+	
21	<i>Aythya ferina</i>	Common Pochard	+			+	+	+	+	+	+	
22	<i>Branta ruficollis</i>	Red-breasted Goose	+			+	+	+	+	+	+	
23	<i>Chlamydotis macqueenii</i>	Macqueen's Bustard	+				+			+		
24	<i>Clanga clanga</i>	Greater Spotted Eagle	+			+	+	+	+	+	+	
25	<i>Clangula hyemalis</i>	Long-tailed Duck	+			+	+	+	+	+	+	
26	<i>Emberiza rustica</i>	Rustic Bunting	+			+	+			+		
27	<i>Falco cherrug</i>	Saker Falcon		+		+	+	+	+	+	+	
28	<i>Haliaeetus leucoryphus</i>	Pallas's Fish-eagle		+			+	+	+	+		
29	<i>Leucogeranus leucogeranus</i>	Siberian Crane			+		+		+	+		
30	<i>Marmaronetta angustirostris</i>	Marbled Teal	+			+	+	+	+	+	+	
31	<i>Melanitta fusca</i>	Velvet Scoter	+			+	+	+	+	+	+	
32	<i>Neophron percnopterus</i>	Egyptian Vulture		+		+	+	+	+	+	+	
33	<i>Numenius tenuirostris</i>	Slender-billed Curlew			+		+		+	+	+	
34	<i>Otis tarda</i>	Great Bustard	+			+	+	+	+	+	+	
35	<i>Oxyura leucocephala</i>	White-headed Duck		+		+	+	+	+	+	+	
36	<i>Podiceps auritus</i>	Horned Grebe	+			+	+	+	+	+	+	
37	<i>Puffinus yelkouan</i>	Yelkouan Shearwater	+					+		+	+	
38	<i>Rissa tridactyla</i>	Black-legged Kittiwake	+					+	+	+	+	
39	<i>Streptopelia turtur</i>	European Turtle-dove	+			+	+	+	+	+	+	
40	<i>Vanellus gregarius</i>	Sociable Lapwing			+	+	+	+	+	+	+	

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	Reptiles	21	8	7	6	6	8	8	4	8	13	19
41	<i>Darevskia alpina</i>		+					+		+		+
42	<i>Darevskia bendimahiensis</i>			+							+	+
43	<i>Darevskia clarkorum</i>	Clarks' Lizard		+							+	+
44	<i>Darevskia dryada</i>	Charnali Lizard			+			+			+	+
45	<i>Darevskia rostombekowi</i>	Rostombekov's Rock Lizard		+		+	+					+
46	<i>Darevskia uzzelli</i>	Uzzell's Lizard		+							+	+
47	<i>Eremias pleskei</i>	Pleske's Racerunner			+	+	+		+		+	+
48	<i>Montivipera wagneri</i>	Wagner's Viper			+						+	+
49	<i>Natrix megalcephala</i>	Large-headed Water Snake	+				+	+		+	+	+
50	<i>Phrynocephalus horvathi</i>	Toad-headed Agama			+	+	+				+	+
51	<i>Phrynocephalus persicus</i>	Persian Toad Agama	+				+		+			+
52	<i>Testudo graeca</i>	Common / Mediterranean Tortoise	+			+	+	+	+	+	+	
53	<i>Vipera darevskii</i>	Darevsky's Viper			+	+		+			+	+
54	<i>Vipera dinniki</i>	Dinnik's Viper	+					+		+		+
55	<i>Vipera ebneri</i>	Iranian Mountain Steppe Viper	+				+		+			+
56	<i>Vipera eriwanensis</i>	Alburzi Viper	+			+	+	+			+	+
57	<i>Vipera kaznakovi</i>	Caucasian Viper		+				+		+	+	+
58	<i>Vipera magnifica</i>	Magnificent Viper		+						+		+
59	<i>Vipera orlovi</i>	Orlov's Viper			+					+		+
60	<i>Vipera pontica</i>	Pontic Viper		+							+	+
61	<i>Vipera renardi</i>	Eastern Steppe Viper	+							+		
	Amphibians	2	2	0	0	0	1	1	1	0	1	2
62	<i>Bufo eichwaldi</i>	Eichwald's Toad	+				+		+			+
63	<i>Mertensiella caucasica</i>	Caucasian Salamander	+					+			+	+
	Fish	22	8	2	12	3	11	12	9	14	10	7
64	<i>Acipenser gueldenstaedtii</i>	Russian Sturgeon			+		+	+	+	+	+	
65	<i>Acipenser nudiventris</i>	Ship Sturgeon			+		+	+	+	+	+	
66	<i>Acipenser persicus</i>	Persian Sturgeon			+		+	+	+	+		
67	<i>Acipenser ruthenus</i>	Sterlet	+				+		+	+		
68	<i>Acipenser stellatus</i>	Stellate Sturgeon			+		+	+	+	+	+	
69	<i>Acipenser sturio</i>	European (Atlantic) Sturgeon			+			+				
70	<i>Alosa immaculata</i>	Pontic shad	+					+		+		
71	<i>Anguilla anguilla</i>	European Eel			+			+		+	+	
72	<i>Clupeonella abrau</i>				+					+		+
73	<i>Cyprinus carpio</i>	Wild Common Carp	+			+	+	+	+	+	+	
74	<i>Huso huso</i>	Beluga			+		+	+	+	+	+	
75	<i>Lampetra lanceolata</i>	Turkish Brook Lamprey		+							+	
76	<i>Luciobarbus brachycephalus</i>	Aral Barbel	+				+		+	+		
77	<i>Luciobarbus capito</i>	Bulatmai Barbel	+			+	+	+	+	+	+	
78	<i>Pomatomus saltatrix</i>	Bluefish	+					+		+		
79	<i>Ponticola rizensis</i>	Iyidere Goby		+							+	+

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			Vulnerable	Endangered	Critically Endangered	Armenia	Azerbaijan	Georgia	Iran	Russia	Turkey	
	Fish	22	8	2	12	3	11	12	9	14	10	7
80	<i>Ponticola turani</i>	Aksu Goby	+								+	+
81	<i>Pseudophoxinus atropatenus</i>	Azerbaijani Spring Roach			+		+					+
82	<i>Pseudophoxinus sojuchbulagi</i>	Akstafa Spring Roach			+		+					+
83	<i>Salmo ezenami</i>	Kezenoi-am Trout			+					+		+
84	<i>Salmo ischchan</i>	Sevan Trout			+	+						+
85	<i>Squalus acanthias</i>	Spiny Dogfish	+					+				
	Crustaceans	1	1	0	0	0	0	1	0	0	0	0
86	<i>Astacus astacus</i>	Noble Crayfish	+					+				
	Plants	276	78	100	98	73	46	63	1	49	90	276
87	<i>Acer divergens</i>	Çoruh Akçağacı	+								+	+
88	<i>Achnatherum roshevitzii</i>	Roshevich's Achnatherum	+				+					+
89	<i>Aethionema grandiflorum</i> var. <i>sintenisii</i>	Persian Stonecress			+						+	+
90	<i>Alcea grossheimii</i>	Grossheim's Alcea		+		+						+
91	<i>Allium baytopiorum</i>	Baytop's Onion			+						+	+
92	<i>Allium czelghauricum</i>	Czelghaurian Onion			+						+	+
93	<i>Allium pseudoalbidum</i>	Onion		+							+	+
94	<i>Allium struzlianum</i>	Struzl's Onion		+		+						+
95	<i>Allochrysa takhtajanii</i>	Takhtadjan's Allochrysa			+	+						+
96	<i>Alyssum artvinense</i>	Artvinian Alyssum		+							+	+
97	<i>Amblyopyrum muticum</i>	Curtailed Amblyopyrum		+		+						+
98	<i>Anabasis eugeniae</i>	Eugenia's Anabasis	+				+					+
99	<i>Angelica adzharica</i>	Adjarian Angelica		+				+				+
100	<i>Arabis kazbegi</i>	Kazbegian Rock-cress	+					+				+
101	<i>Asperula virgata</i>	Rod-shaped Woodruff		+							+	+
102	<i>Asphodeline tenuior</i>	Thin Asphodeline	+							+		+
103	<i>Asplenium daghestanicum</i>	Dagestania Spleenwort			+					+		+
104	<i>Asplenium hermannii-christii</i>	Asplenium of Hermann Christ	+					+				+
105	<i>Astracantha atenica</i>	Atenian Astracantha	+					+				+
106	<i>Astragalus acmophylloides</i>	Sharp-leaved Milk Vetch			+						+	+
107	<i>Astragalus albanicus</i>	Albanian Astragalus		+			+					+
108	<i>Astragalus aspindzicus</i>	Aspindzian Astragalus	+					+				+
109	<i>Astragalus bylowae</i>	Bylov's Milk Vetch			+	+						+
110	<i>Astragalus cuscutae</i>	Dodder Astragalus		+			+			+		+
111	<i>Astragalus daghestanicus</i>	Dagestania Milk Vetch			+					+		+
112	<i>Astragalus eliasianus</i>	Eliasian Milk Vetch			+						+	+
113	<i>Astragalus hirtulus</i>	Milk Vetch	+					+				+
114	<i>Astragalus holophyllus</i>	Entire-leaved Milk Vetch	+			+						+
115	<i>Astragalus ignarius</i>	Milk Vetch			+		+					+
116	<i>Astragalus longivexillatus</i>	Long-flagged Milk Vetch			+						+	+
117	<i>Astragalus magnificus</i>	Big Astragalus			+			+				+

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118	<i>Astragalus maraziensis</i>	Marazinian Astragalus		+			+				+
119	<i>Astragalus nigrocalycinus</i>	Black-calyx Milk Vetch			+						+
120	<i>Astragalus olurensis</i>	Olurian Milk Vetch			+						+
121	<i>Astragalus schachbuzensis</i>	Shakhbuzian Milk Vetch			+		+				+
122	<i>Astragalus shagalensis</i>	Shagalian Milk Vetch	+			+					+
123	<i>Astragalus tatlii</i>	Tatli's Milk Vetch			+						+
124	<i>Astragalus trabzonicus</i>	Trabzonian Milk Vetch			+						+
125	<i>Astragalus vardziae</i>	Vardzian Astragalus		+				+			+
126	<i>Astrantia colchica</i>	Colchic Masterwort		+				+			+
127	<i>Barbamine ketskhoveli</i>	Ketskhoveli's Barbamine	+					+			+
128	<i>Barbarea grandiflora</i>	Large-flowered Barbarea		+					+		+
129	<i>Barbarea lutea</i>	Artvinian Barbarea		+						+	+
130	<i>Betula megrelica</i>	Megrelian Birch		+				+			+
131	<i>Bilacunaria caspia</i>	Caspian Bilacunaria		+			+		+		+
132	<i>Bufonia takhtajanii</i>	Takhtadjan's Bufonia			+	+					+
133	<i>Bupleurum kosopolianskyi</i>	Kozo-poljanskyi's Thoroughwax	+			+					+
134	<i>Bupleurum schistosum</i>	Divided Thoroughwax		+						+	+
135	<i>Bupleurum wittmannii</i>	Wittmann's Thoroughwax	+				+	+			+
136	<i>Callothlaspi abchasicum</i>	Abkhazian Callothlaspi	+					+			+
137	<i>Campanula aghrica</i>	Aghrian Bellflower			+					+	+
138	<i>Campanula autraniana</i>	Autran's Campanula		+					+		+
139	<i>Campanula choruhensis</i>	Choruhian Bellflower		+						+	+
140	<i>Campanula dzyschrica</i>	Dzyschrican Campanula	+					+	+		+
141	<i>Campanula engurensis</i>	Engurian Bellflower	+					+			+
142	<i>Campanula fonderwisii</i>	Bellflower	+					+			+
143	<i>Campanula kachethica</i>	Kakhetian Bellflower		+				+			+
144	<i>Campanula kantschavelii</i>	Kanchaveli's Bellflower			+			+			+
145	<i>Campanula kolakovskiji</i>	Kolakovskiy's Bellflower	+					+			+
146	<i>Campanula lazica</i>	Lazian Campanula			+					+	+
147	<i>Campanula massalskyi</i>	Massalsky's Campanula		+		+				+	+
148	<i>Campanula pontica</i>	Pontic Campanula	+					+		+	+
149	<i>Campanula seraglio</i>	Serail Bellflower			+					+	+
150	<i>Campanula songutica</i>	Songutian Campanula		+					+		+
151	<i>Campanula suanetica</i>	Svanetian Bellflower	+					+			+
152	<i>Campanula troegerae</i>	Bellflower			+					+	+
153	<i>Carum grossheimii</i>	Grossheim's Caraway	+					+			+

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154	<i>Carum komarovii</i>	Komarov's Caraway		+		+	+					+
155	<i>Centaurea caroli-henrici</i>	Karl-Henrikh's Centaury			+	+						+
156	<i>Centaurea daralageozica</i>	Daralagezian Tomanthea	+			+	+					+
157	<i>Centaurea demirizii</i>	Demiriz's Centaury			+						+	+
158	<i>Centaurea drabifolioides</i>	Whitlow-grass-leaved Centaury			+						+	+
159	<i>Centaurea hajastana</i>	Hayastanian Centaury		+		+						+
160	<i>Centaurea leptophylla</i>	Thin-leaved Centaury			+						+	+
161	<i>Centaurea rhizocalathium</i>	Root-headed Centaury		+		+					+	+
162	<i>Centaurea tamanianaie</i>	Tamanyan's Centaury			+	+						+
163	<i>Centaurea vavilovii</i>	Vavilov's Centaury			+	+						+
164	<i>Centaurea woronowii</i>	Woronow's Centaury		+				+			+	+
165	<i>Cephalaria anatolica</i>	Anatolian Cephalaria			+						+	+
166	<i>Cerastium svanicum</i>	Svanetian Chickweed	+					+				+
167	<i>Chaerophyllum karsianum</i>	Karsian Chervil			+						+	+
168	<i>Chaerophyllum posofianum</i>	Posofian Chervil			+						+	+
169	<i>Cirsium albowianum</i>	Albov's Thistle		+				+				+
170	<i>Cirsium czerkessicum</i>	Cherkessian Thistle		+						+		+
171	<i>Cirsium davisianum</i>	Davis' Thistle			+						+	+
172	<i>Cirsium eliasianum</i>	Thistle			+						+	+
173	<i>Cirsium oblongifolium</i>	Oblong-leaved Thistle	+					+				+
174	<i>Cirsium trachylepis</i>	Rough-scaly Thistle	+								+	+
175	<i>Colchicum greuteri</i>	Greuter's Colchicum			+	+						+
176	<i>Colchicum leptanthum</i>	Thin-flowered Colchicum			+						+	+
177	<i>Colchicum mirzoevae</i>	Mirzoeva's Merendera		+		+						+
178	<i>Convolvulus ruprechtii</i>	Ruprecht's Bindweed		+						+		+
179	<i>Corydalis tarkiensis</i>	Tarkian Corydalis	+							+		+
180	<i>Corylus colchica</i>	Colchian Hazel	+					+				+
181	<i>Cousinia araxena</i>	Araxian Cousinia		+		+	+					+
182	<i>Cousinia gabrieljaniae</i>	Gabrielyan's Cousinia		+		+	+					+
183	<i>Cousinia iljinii</i>	Ilyin's Cousinia		+		+	+					+
184	<i>Cousinia lomakinii</i>	Lomakin's Cousinia		+		+	+					+
185	<i>Cousinia takhtajanii</i>	Takhtadjan's Cousinia		+		+						+
186	<i>Cousinia woronowii</i>	Voronov's Cousinia	+								+	+
187	<i>Crambe armena</i>	Armenian Sea-kale		+		+	+					+
188	<i>Crataegus turcicus</i>	Turkish Hawthorn			+						+	+
189	<i>Crocus aeriis</i>	Aerial Crocus		+							+	+

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190	<i>Cryptotaenia flahaultii</i>	Flahault's Cryptotaenia	+					+				+
191	<i>Cynoglossum imeretinum</i>	Imeretian Hound's-tongue	+					+				+
192	<i>Delphinium iris</i>	Larkspur			+						+	+
193	<i>Delphinium munzianum</i>	Larskpur			+						+	+
194	<i>Dianthus charadzeae</i>	Kharadze's Pink		+				+				+
195	<i>Dianthus grossheimii</i>	Grossheim's Pink		+		+						+
196	<i>Dianthus kubanensis</i>	Kubanian Poppy	+							+		+
197	<i>Draba meskhetica</i>	Meskhetian Whitelow Grass	+					+				+
198	<i>Draba narmanensis</i>	Narmanian Whitlow-grass			+						+	+
199	<i>Dryopteris liliana</i>	Buckler Fern	+					+			+	+
200	<i>Dryopteris raddeana</i>	Radde's Buckler Fern		+			+					+
201	<i>Echinops foliosus</i>	Polyphyllous Globe Thistle	+					+				+
202	<i>Echinops sintensisii</i>	Sintensi's Globe Thistle		+							+	+
203	<i>Erigeron schalbusi</i>	Shalbusian Fleabane		+						+		+
204	<i>Erodium hendrikii</i>	Heron's Bill			+						+	+
205	<i>Erodium sosnowskianum</i>	Sosonovskiy's Heron's-bill			+	+						+
206	<i>Erysimum caspicum</i>	Caspian Treacle Mustard	+				+			+		+
207	<i>Erysimum contractum</i>	Constricted Treacle Mustard	+					+				+
208	<i>Erysimum deflexum</i>	Bent Treacle Mustard			+						+	+
209	<i>Erysimum leptocarpum</i>	Thin-fruited Treacle Mustard		+							+	+
210	<i>Erysimum wagifii</i>	Treacle Mustard		+		+	+					+
211	<i>Euphorbia aristata</i>	Bearded Spurge		+						+		+
212	<i>Euphorbia grossheimii</i>	Grossheim's Spurge		+		+	+					+
213	<i>Ferula caucasica</i>	Caucasian Giant Fennel	+				+					+
214	<i>Ferula mervynii</i>	Mervyn's Giant Fennel			+						+	+
215	<i>Festuca pontica</i>	Pontic Fescue		+							+	+
216	<i>Festuca xenophontis</i>	Fescue		+							+	+
217	<i>Fritillaria grandiflora</i>	Big-flowered Fritillary			+		+					+
218	<i>Galanthus koenenianus</i>	Koenen's Snowdrop	+								+	+
219	<i>Gladiolus hajastanicus</i>	Armenian Sword-lily	+			+						+
220	<i>Gypsophila robusta</i>	Robust Chalk Plant	+				+	+				+
221	<i>Gypsophila steupii</i>	Steup's Chalk Plant		+				+		+		+
222	<i>Gypsophila szovitsii</i>	Szovits' Gypsophila	+			+	+					+
223	<i>Helianthemum dagestanicum</i>	Dagestanian Sun Rose		+						+		+
224	<i>Helichrysum artvinense</i>	Artvinian Everlasting			+						+	+

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225	<i>Heracleum egrissicum</i>	Egrissian Cow-Parsnip		+				+			+
226	<i>Hieracium adenobrachion</i>	Glandular-branched Hawkweed		+					+		+
227	<i>Hieracium caucasiense</i>	Caucasian Hawkweed		+					+		+
228	<i>Hornungia angustilimbata</i>	Narrow-limbed Hornungia			+				+		+
229	<i>Hypericum fissurale</i>	Cracked Saint John's Wort			+					+	+
230	<i>Hypericum theodori</i>	Theodor's Saint John's Wort		+			+		+		+
231	<i>Iris camillae</i>	Kamilla's Iris	+				+				+
232	<i>Iris spuria subsp. notha</i>	Mimic Iris	+						+		+
233	<i>Iris timofejewii</i>	Timofeev's Iris		+					+		+
234	<i>Isatis karjaginii</i>	Karyagin's Woad		+		+	+				+
235	<i>Jacobaea buschiana</i>	Busch's Groundsel	+						+		+
236	<i>Jacobaea trapezuntina</i>	Trapezuntian Groundsel			+					+	+
237	<i>Jurinea akinfievii</i>	Akinfiev's Jurinea			+				+		+
238	<i>Jurinea alata</i>	Winged Jurinea	+						+		+
239	<i>Jurinea bellidioides</i>	English Daisy-like Jurinea	+						+		+
240	<i>Jurinea brachypappa</i>	Short-thistledowned Jurinea	+						+		+
241	<i>Jurinea coronopifolia</i>	Wart-cress-leaved Jurinea	+						+		+
242	<i>Jurinea exuberans</i>	Profuse Jurinea	+					+			+
243	<i>Jurinea galushkoi</i>	Galushko's Jurinea		+					+		+
244	<i>Jurinea iljinii</i>	Iljin's Jurinea		+					+		+
245	<i>Jurinea praetermissa</i>	Neglected Jurinea		+		+					+
246	<i>Jurinea sosnowskyi</i>	Sosnovsky's Jurinea		+					+		+
247	<i>Jurinea woronowii</i>	Voronov's Jurinea	+						+		+
248	<i>Kemulariella abchasica</i>	Abkhazian Kemulariella	+					+	+		+
249	<i>Kemulariella colchica</i>	Colchic Kemulariella	+					+	+	+	+
250	<i>Lamium tschorochense</i>	Chorokhian Dead Nettle			+					+	+
251	<i>Laserpitium affine</i>	Similar Laserwort		+				+		+	+
252	<i>Lilium ciliatum</i>	Ciliate Lily		+						+	+
253	<i>Lotus armeniacus</i>	Armenian Bird's Foot Trefoil			+					+	+
254	<i>Mandenovia komarovii</i>	Komarov's Mandenovia	+					+	+		+
255	<i>Muehlbergella oweriniana</i>	Owerin's Muchlenbergella			+				+		+
256	<i>Myosotis daralagezica</i>	Daralagezian Forget-me-not		+		+					+
257	<i>Nepeta alaghezi</i>	Alaghezian Catmint		+		+					+
258	<i>Noccaea sintensisii</i>	Sintensis' Penny-cress	+							+	+
259	<i>Nonea karsensis</i>	Karsian Nonea			+					+	+
260	<i>Omphalodes kusnetzovii</i>	Kuznetsov's Navelwort	+					+			+

THE IUCN GLOBALLY THREATENED SPECIES IN THE CAUCASUS ECOREGION (2019)												
#	Scientific Name	Common Name	IUCN Category 2019			Distribution by Countries						
			Vulnerable	Endangered	Critically Endangered	Armenia	Azerbaijan	Georgia	Iran	Russia	Turkey	Local, Country or Regional Endemics
261	<i>Onosma arcuata</i>	Curved Goldendrop			+						+	+
262	<i>Onosma nigricaulis</i>	Black-stem Goldendrop			+						+	+
263	<i>Onosma obtusifolia</i>	Amblyophyllous Goldendrop		+							+	+
264	<i>Ornithogalum gabrielianiae</i>	Gabrielyan's Starflowers			+	+						+
265	<i>Ornithogalum hyrcanum</i>	Hyrkanyan Starflowers	+				+					+
266	<i>Papaver roseolum</i>	Pinkish Poppy		+		+	+					+
267	<i>Papaver talyshense</i>	Talyshian Poppy	+				+					+
268	<i>Pimpinella lazica</i>	Lazian Burnet Saxifrage	+								+	+
269	<i>Pimpinella schatiliensis</i>	Shatilian Anise	+					+				+
270	<i>Podospermum grigorashvili</i>	Grigorashvili's Salsify		+				+				+
271	<i>Podospermum grossheimii</i>	Grossheimi's Salsify			+		+					+
272	<i>Podospermum idae</i>	Ida's Salsify			+			+				+
273	<i>Podospermum schischkinii</i>	Shishkin's Salsify		+						+		+
274	<i>Polygala urartu</i>	Urartuan Milkwort		+		+						+
275	<i>Polygonum caspicum</i>	Caspian Knotweed			+		+					+
276	<i>Polylophium panjutinii</i>	Panjutin's Polylophium		+				+				+
277	<i>Potentilla seidlitziana</i>	Zeidlits' Five-fingers			+	+						+
278	<i>Psephellus adjaricus</i>	Adjarian Psephellus			+			+				+
279	<i>Psephellus appendicigerus</i>	Appendage-bearing Centaury		+							+	+
280	<i>Psephellus avaricus</i>	Awarian Centaury			+					+		+
281	<i>Psephellus boissieri</i>	Boissier's Psephellus		+						+		+
282	<i>Psephellus cronquistii</i>	Cronquists's Cornflower		+		+						+
283	<i>Psephellus debedicus</i>	Debedian Cornflower		+		+						+
284	<i>Psephellus erivanensis</i>	Yerevanian Centaury	+			+	+				+	+
285	<i>Psephellus galushkoi</i>	Galushko's Psephellus		+						+		+
286	<i>Psephellus geghamensis</i>	Geghamian Cornflower		+		+						+
287	<i>Psephellus gracillimus</i>	Very slender Psephellus			+						+	+
288	<i>Psephellus kolakovskiyi</i>	Kolakovsky's Psephellus	+					+				+
289	<i>Psephellus manakyanii</i>	Manakyan's Cornflower		+		+						+
290	<i>Psephellus pecho</i>	Centaury		+							+	+
291	<i>Psephellus ruprechtii</i>	Ruprecht's Centaury		+						+		+
292	<i>Psephellus straminicephalus</i>	Straw-colour-headed Psephellus		+							+	+
293	<i>Psephellus taochius</i>	Centaury		+		+					+	+
294	<i>Psephellus troitzkyi</i>	Troitsky's Psephellus		+						+		+
295	<i>Psephellus zangezuri</i>	Zangezurian Cornflower		+		+						+

THE IUCN GLOBALLY THREATENED SPECIES IN THE CAUCASUS ECOREGION (2019)												
#	Scientific Name	Common Name	IUCN Category 2019			Distribution by Countries					Local, Country or Regional Endemics	
			Vulnerable	Endangered	Critically Endangered	Armenia	Azerbaijan	Georgia	Iran	Russia		Turkey
296	<i>Pyrus browiczii</i>	Brovich's Pear			+	+						+
297	<i>Pyrus complexa</i>	Mixed Pear	+			+						+
298	<i>Pyrus daralagezi</i>	Daralagezian Pear		+		+						+
299	<i>Pyrus gergerana</i>	Gergeranian Pear			+	+						+
300	<i>Pyrus hajastana</i>	Hayastanyan Pear		+		+						+
301	<i>Pyrus nutans</i>	Drooping Pear		+		+	+					+
302	<i>Pyrus sosnovskyi</i>	Sosnovsky's Pear		+		+						+
303	<i>Pyrus tamamschianae</i>	Tamamshyan's Pear		+		+						+
304	<i>Pyrus theodorovii</i>	Teodorov's Pear		+		+						+
305	<i>Pyrus voronovii</i>	Voronov's Pear			+	+						+
306	<i>Ranunculus aragazi</i>	Aragatsian Buttercup			+	+						+
307	<i>Ranunculus tempskyanus</i>	Buttercup			+						+	+
308	<i>Ranunculus vermirrhizus</i>	Worm-rooted Buttercup			+						+	+
309	<i>Rhodothamnus sessilifolius</i>	Sessile-leaved Rhodothamnus			+						+	+
310	<i>Rosa dolichocarpa</i>	Long-fruited Brier			+					+		+
311	<i>Rosa sosnovskyana</i>	Sosnovsky's Rose		+		+	+					+
312	<i>Rosa zangezura</i>	Zangezurian Rose	+			+	+					+
313	<i>Rubus takhtadjanii</i>	Takhtadjan's Blackberry			+	+						+
314	<i>Rubus zangezurus</i>	Zangezurian Blackberry		+		+						+
315	<i>Sambucus tigranii</i>	Tigran's elder	+			+		+				+
316	<i>Sameraria glastifolia</i>	Sameraria	+			+	+				+	+
317	<i>Saxifraga artvinensis</i>	Artvinian Rockfoil			+						+	+
318	<i>Scabiosa adzharica</i>	Adjarian Scabious		+				+				+
319	<i>Scorzonera czerepanovii</i>	Czerepanov's Scorzonera	+				+	+				+
320	<i>Scorzonera ketskhoveli</i>	Ketskhoveli's Salsify			+			+				+
321	<i>Scorzonera kozlovskiyi</i>	Kozlovskiy's Salsify			+			+				+
322	<i>Scorzonera safievii</i>	Safiev's Salsify		+		+						+
323	<i>Scrophularia capillaris</i>	Capillary Figwort			+						+	+
324	<i>Scrophularia olgae</i>	Olga's Fig-wort	+			+						+
325	<i>Scutellaria rhomboidalis</i>	Rhomboid Skullcap			+		+					+
326	<i>Sedum euxinum</i>	Euxinian Stonecrop			+						+	+
327	<i>Sempervivum charadzeae</i>	Kharadze's Houseleek	+					+				+
328	<i>Seseli cuneifolium</i>	Wedge-leaved Meadow Saxifrage	+				+					+
329	<i>Seseli saxicolom</i>	Saxicolous Seseli	+					+				+
330	<i>Silene alpicola</i>	Alpine Catchfly	+					+		+		+

THE IUCN GLOBALLY THREATENED SPECIES IN THE CAUCASUS ECOREGION (2019)												
#	Scientific Name	Common Name	IUCN Category 2019			Distribution by Countries						Local, Country or Regional Endemics
			Vulnerable	Endangered	Critically Endangered	Armenia	Azerbaijan	Georgia	Iran	Russia	Turkey	
331	<i>Silene chustupica</i>	Khustup Campion			+	+						+
332	<i>Silene ispirensis</i>	Ispirian Catchfly			+						+	+
333	<i>Sonchus araraticus</i>	Araratian Sow-thistle			+	+						+
334	<i>Sorbus roopiana</i>			+		+	+					+
335	<i>Stachys bayburtensis</i>	Bayburt Woundwort			+						+	+
336	<i>Stachys choruhensis</i>	Choruh Woundwort			+						+	+
337	<i>Stachys sosnowskyi</i>	Sosnowsky's Woundwort			+						+	+
338	<i>Sterigmostemum acanthocarpum</i>	Prickly-fruited Sterigmostemum	+			+	+					+
339	<i>Stipa karjaginii</i>	Karjagin's Feather-grass	+				+					+
340	<i>Symphytum hajastanum</i>	Hajastanian Comfrey		+		+						+
341	<i>Symphytum podcumicum</i>	Podkumian Comfrey		+						+		+
342	<i>Symphytum savvalense</i>	Savvalian Comfrey			+						+	+
343	<i>Tanacetum oxystegium</i>	Sharp-stegium Tansy			+						+	+
344	<i>Thesium maritimum</i>	Coastal Bastard Toad-flax	+				+			+		+
345	<i>Thlaspi zangezuristicum</i>	Zangezurian Pennycress			+	+						+
346	<i>Thymus markhotensis</i>	Markhotian Thyme	+							+		+
347	<i>Tragopogon armeniicus</i>	Armenian Salsify		+		+						+
348	<i>Tragopogon makaschwilii</i>	Makashvilis's Goat's Beard			+			+				+
349	<i>Tragopogon meskheticus</i>	Meskhetian Goat's Beard		+				+				+
350	<i>Tragopogon otschiaurii</i>	Ochiauri's Goat's Beard			+			+				+
351	<i>Trapa colchica</i>	Colchis Water-Chestnut			+			+				+
352	<i>Trapa maleevii</i>	Maleev's Water-Chestnut	+					+				+
353	<i>Trifolium bobrovii</i>	Bobrov's Clover			+		+					+
354	<i>Tripleurospermum fissurale</i>	Fissural Tripleurospermum		+							+	+
355	<i>Tulipa gumusanica</i>	Gumushanian Tulip			+						+	+
356	<i>Verbascum decursivum</i>	Decurrent Mullein			+						+	+
357	<i>Verbascum transcaucasicum</i>	Transcaucasian Speedwell			+						+	+
358	<i>Veronica allahuekberensis</i>	Allahuekberian Speedwell			+						+	+
359	<i>Veronica transcaucasica</i>	Spicate Pseudolysimachion		+		+						+
360	<i>Vicia erzurumica</i>	Erzurumian Vetch			+						+	+
361	<i>Vicia quadrijuga</i>	Quadrijugous Vetch			+						+	+
362	<i>Zelkova carpiniolia</i>	Caucasian Zelkova	+				+	+	+			+
	Total	362	121	119	122	108	95	114	42	106	138	310

Annex 2: Key Biodiversity Areas with Associated Trigger Species						
KBA #	KBA Name	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
		FAUNA	FLORA			
RUSSIA (54 KBAs)						
1	Abrausky Peninsula	<i>Nyctalus lasiopterus</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Neophron percnopterus</i> , <i>Podiceps auritus</i> , <i>Puffinus yelkouan</i> , <i>Rissa tridactyla</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Vipera renardi</i> , <i>Clupeonella abraui</i>	<i>Asphodeline tenuior</i> , <i>Podospermum schischkinii</i> , <i>Thymus markhotensis</i>	Waterfowl, Waders (aggregations)	47,670	Out of CL/BL
2	Tamanskiy	<i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Falco cherrug</i> , <i>Otis tarda</i> , <i>Melanitta fusca</i> , <i>Podiceps auritus</i> , <i>Rissa tridactyla</i> , <i>Streptopelia turtur</i> , <i>Oxyura leucocephala</i> , <i>Puffinus yelkouan</i> , <i>Vipera renardi</i> , <i>Acipenser stellatus</i> , <i>Acipenser ruthenus</i> , <i>Cyprinus carpio</i>		Waterfowl, Waders (aggregations)	172,342	Kuma-Manyeh
3	Delta Kuban	<i>Mustela lutreola</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Falco cherrug</i> , <i>Otis tarda</i> , <i>Oxyura leucocephala</i> , <i>Podiceps auritus</i> , <i>Rissa tridactyla</i> , <i>Streptopelia turtur</i> , <i>Vipera renardi</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser naidiventris</i> , <i>Acipenser ruthenus</i> , <i>Cyprinus carpio</i> , <i>Anguilla anguilla</i>		Waterfowl, Waders (aggregations)	239,503	Kuma-Manyeh
4	Krimsky	<i>Mustela lutreola</i> , <i>Streptopelia turtur</i> , <i>Vipera renardi</i>			21,063	Kuma-Manyeh
5	Primorsko-Akhtarsk Salt Lakes	<i>Mustela lutreola</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Clangula hyemalis</i> , <i>Otis tarda</i> , <i>Oxyura leucocephala</i> , <i>Streptopelia turtur</i> , <i>Vipera renardi</i> , <i>Cyprinus carpio</i>	<i>Iris spuria</i> subsp. <i>notha</i>	Waterfowl, Waders (aggregations)	115,674	Kuma-Manyeh
6	Lower reaches of the Beisug and Chelbas Rivers	<i>Mustela lutreola</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Otis tarda</i> , <i>Oxyura leucocephala</i> , <i>Streptopelia turtur</i> , <i>Vipera renardi</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser ruthenus</i> , <i>Cyprinus carpio</i> , <i>Anguilla anguilla</i>		Waterfowl, Waders (aggregations)	76,515	Kuma-Manyeh
7	Lower Ei	<i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Otis tarda</i> , <i>Oxyura leucocephala</i> , <i>Streptopelia turtur</i> , <i>Vipera renardi</i> , <i>Acipenser stellatus</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser ruthenus</i> , <i>Cyprinus carpio</i> , <i>Anguilla anguilla</i>		Waterfowl, Waders (aggregations)	41,559	Kuma-Manyeh / Outside of CL/BL
8	Don Delta	<i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Podiceps auritus</i> , <i>Rissa tridactyla</i> , <i>Streptopelia turtur</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser gueldenstaedtii</i> , <i>Cyprinus carpio</i> , <i>Anguilla anguilla</i> , <i>Alosa immaculata</i>		Waterfowl, Waders (aggregations)	81,384	Kuma-Manyeh
9	Novoberezhanskiy	<i>Vormela peregrina</i> , <i>Otis tarda</i> , <i>Streptopelia turtur</i> , <i>Vipera renardi</i>			34,797	Outside of CL/BL

KBA #	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
	KBA Name	FAUNA			
RUSSIA (54 KBAs)					
10	Sredne-Labinskiy	<i>Streptopelia turtur</i> , <i>Vipera renardi</i>		13,756	Outside of CL/BL
11	Novotroitskiy	<i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i>		7,258	Outside of CL/BL
12	Veselovskoye Reservoir	<i>Vormela peregusna</i> , <i>Anser erythropus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Otis tarda</i> , <i>Oxyura leucocephala</i> , <i>Vipera renardi</i>		183,853	Kuma-Manych
13	Manych-Gudilo Lake	<i>Vormela peregusna</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Chlamydotis macqueenii</i> , <i>Clangula hyemalis</i> , <i>Numenius tenuirostris</i> , <i>Oxyura leucocephala</i> , <i>Otis tarda</i> , <i>Podiceps auritus</i> , <i>Streptopelia turtur</i> , <i>Vanellus gregarius</i> , <i>Vipera renardi</i>		48,622	Kuma-Manych
14	Dadynskiy Lake	<i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Otis tarda</i> , <i>Oxyura leucocephala</i>		47,343	Kuma-Manych
15	Irgakliskaya Forest Area	<i>Vormela peregusna</i> , <i>Otis tarda</i>		3,711	Outside of CL/BL
16	Kizlyar Bay	<i>Mustela lutreola</i> , <i>Anser erythropus</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Clangula hyemalis</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Oxyura leucocephala</i> , <i>Vipera renardi</i> , <i>Acipenser gueldenstaedtii</i> , <i>Huso huso</i>		76,143	Caspian
17	Tarumovsky	<i>Mustela lutreola</i> , <i>Otis tarda</i> , <i>Vipera renardi</i> , <i>Acipenser nudiventris</i> , <i>Acipenser stellatus</i>		73,898	Caspian
18	Argakhanskiy	<i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Vormela peregusna</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Oxyura leucocephala</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiventris</i> , <i>Acipenser stellatus</i> , <i>Huso huso</i>		72,063	Caspian
19	Yangiyurtovskiy-Sulakskaya	<i>Mustela lutreola</i> , <i>Vormela peregusna</i> , <i>Anser erythropus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Branta ruficollis</i> , <i>Clanga clanga</i> , <i>Leucogeranus leucogeranus</i> , <i>Melanitta fusca</i> , <i>Podiceps auritus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser stellatus</i>		59,316	Caspian
20	Dagestanskiy (Sarykumskiy Barkhan)	<i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Testudo graeca</i>	<i>Corydalus tarkiensis</i> , <i>Thesium maritimum</i>	416	Caspian

21	Melishitinskiy	<i>Panthera pardus</i> , <i>Aquila heliaca</i> , <i>Testudo graeca</i>	<i>Convolvulus ruprechtii</i> , <i>Helianthemum dagestanicum</i>		20,476	Eastern Greater Caucasus / Outside of CL/BL
22	Kayakentskiy- Deshlagarskiy	<i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Testudo graeca</i>	<i>Astragalus cuscutae</i> , <i>Corydalis tarkiensis</i>		46,000	Eastern Greater Caucasus / Outside of CL/BL
23	Papas (Adji) Lake	<i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Clangula hyemalis</i> , <i>Oxyura leucocephala</i> , <i>Podiceps auritus</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Thesium maritimum</i>	Waterfowl, Waders (aggregations)	4,668	Caspian
24	Itsari	<i>Capra aegagrus</i> , <i>Aquila heliaca</i> , <i>Neophron percnopterus</i>		<i>Lyurus mlkosiewiczi</i> (<i>Tetrao mlkosiewiczi</i>), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> (restricted)	40,926	Eastern Greater Caucasus / Outside of CL/BL
25	Samurskiy	<i>Mustela lutreola</i> , <i>Nyctalus lasiopterus</i> , <i>Anser erythropus</i> , <i>Aquila heliaca</i> , <i>Aythya ferina</i> , <i>Branta ruficollis</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Leucogeranus leucogeranus</i> , <i>Marmaronetta angustirostris</i> , <i>Melanitta fusca</i> , <i>Neophron percnopterus</i> , <i>Numenius tenuirostris</i> , <i>Otis tarda</i> , <i>Oxyura leucocephala</i> , <i>Podiceps auritus</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser ruthenus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Luciobarbus capito</i>	<i>Thesium maritimum</i>	Waterfowl, Waders (aggregations)	22,143	Caspian
26	Berkubinskiy	<i>Anser erythropus</i> , <i>Clanga clanga</i> , <i>Testudo graeca</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser ruthenus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiventris</i> , <i>Acipenser gueldenstaedtii</i>			13,633	Caspian
27	Shalbuздag	<i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera dimniki</i>	<i>Erigeron schalbusi</i> , <i>Hypericum theodori</i>	<i>Lyurus mlkosiewiczi</i> (<i>Tetrao mlkosiewiczi</i>), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> , <i>Carpodacus rubicilla</i> (restricted)	38,203	Eastern Greater Caucasus
28	Laman-Kam Area	<i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Testudo graeca</i> , <i>Luciobarbus capito</i>	<i>Iris timofejewii</i>	<i>Falconiformes</i> (aggregations)	17,266	Eastern Greater Caucasus
29	Tlyaratinskiy	<i>Capra aegagrus</i> , <i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera dimniki</i>	<i>Barbarea grandiflora</i> , <i>Mandenovia komarovii</i>	<i>Lyurus mlkosiewiczi</i> (<i>Tetrao mlkosiewiczi</i>), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> , <i>Carpodacus rubicilla</i> (restricted)	65,640	Eastern Greater Caucasus

KBA #	The IUCN Globally Threatened Species (2019)		KBA Name	Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
	FAUNA	FLORA				
RUSSIA (54 KBAs)						
30	Kosobsko-Kelebsky	<i>Capra aegagrus</i> , <i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera dimniki</i>	<i>Erigeron schalbusi</i> , <i>Mandenovia komarovii</i>	<i>Lyrurus mlkosiewiczi</i> (Tetrao mlkosiewiczi), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> , <i>Carpodacus rubicilla</i> (restricted)	81,587	Eastern Greater Caucasus
31	Bezhtinskiy	<i>Capra aegagrus</i> , <i>Panthera pardus</i> , <i>Sicista caucasica</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera dimniki</i>	<i>Barbarea grandiflora</i>	<i>Lyrurus mlkosiewiczi</i> (Tetrao mlkosiewiczi), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> , <i>Carpodacus rubicilla</i> (restricted)	43,192	Eastern Greater Caucasus
32	Khunzakhskiy	<i>Capra aegagrus</i> , <i>Panthera pardus</i> , <i>Aquila heliaca</i> , <i>Neophron percnopterus</i>	<i>Convulvulus ruprechtii</i> , <i>Muehlenbergella ouerimiana</i> , <i>Helianthemum dagestanicum</i> , <i>Iris timofejewii</i> , <i>Psephellus boissieri</i>	<i>Lyrurus mlkosiewiczi</i> (Tetrao mlkosiewiczi), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> , <i>Carpodacus rubicilla</i> (restricted)	2,723	Eastern Greater Caucasus
33	Kezenoi-Am (Lake Elzenam) Basin	<i>Capra aegagrus</i> , <i>Neophron percnopterus</i> , <i>Salmo ezenami</i>	<i>Psephellus boissieri</i>		15,426	Eastern Greater Caucasus
34	Erzi	<i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Vipera dimniki</i>		<i>Lyrurus mlkosiewiczi</i> (Tetrao mlkosiewiczi), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> , <i>Carpodacus rubicilla</i> (restricted)	44,844	Eastern Greater Caucasus
35	Ingushskiy	<i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Neophron percnopterus</i>	<i>Mandenovia komarovii</i>		23,585	Eastern Greater Caucasus
36	Severno-Osetinskiy-Tsetskiy	<i>Bison bonasus</i> , <i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Vipera dimniki</i>	<i>Campanula songutica</i> , <i>Jurinea akinfevii</i> , <i>Jurinea brachypappa</i> , <i>Jurinea bellidioides</i>	<i>Lyrurus mlkosiewiczi</i> (Tetrao mlkosiewiczi), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> , <i>Carpodacus rubicilla</i> (restricted)	132,553	Central Greater Caucasus
37	Alania	<i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Vipera dimniki</i>	<i>Campanula songutica</i>	<i>Lyrurus mlkosiewiczi</i> (Tetrao mlkosiewiczi), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastrus</i> , <i>Carpodacus rubicilla</i> (restricted)	56,158	Central Greater Caucasus

38	Kabardino-Balkarskiy	<i>Capra caucasica</i> , <i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Vipera dinniki</i>	<i>Jurinea alata</i> , <i>Jurinea coronopifolia</i> , <i>Jurinea galushkoi</i>	<i>Lyrurus mikosiewiczii</i> (Tetrao mikosiewiczii), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogasterus</i> , <i>Carpodacus rubicilla</i> (restricted)	80,515	Central Greater Caucasus
39	Kara-Su Sanctuary	<i>Panthera pardus</i> , <i>Neophron percnopterus</i>	<i>Jurinea alata</i> , <i>Jurinea galushkoi</i>	<i>Lyrurus mikosiewiczii</i> (Tetrao mikosiewiczii), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>) (restricted)	16,646	Central Greater Caucasus
40	Baksan Gorge	<i>Capra caucasica</i> , <i>Aquila heliaca</i> , <i>Neophron percnopterus</i>	<i>Asphodeline tenuior</i> , <i>Jurinea alata</i> , <i>Jurinea coronopifolia</i> , <i>Jurinea sosnovskiyi</i>		96,736	Central Greater Caucasus / Outside of CL/BL
41	Prielbrusie	<i>Capra caucasica</i> , <i>Aquila heliaca</i> , <i>Vipera dinniki</i> , <i>Darevskia alpina</i>	<i>Jurinea alata</i> , <i>Jurinea coronopifolia</i>	<i>Lyrurus mikosiewiczii</i> (Tetrao mikosiewiczii), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogasterus</i> , <i>Carpodacus rubicilla</i> (restricted)	101,535	Central Greater Caucasus
42	Gorge of the Eshkakon and Malka Rivers	<i>Aquila heliaca</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i>	<i>Jurinea alata</i>	<i>Lyrurus mikosiewiczii</i> (Tetrao mikosiewiczii), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>) (restricted)	144,966	Western Greater Caucasus / Central Greater Caucasus
43	Surrounding of Kislovodsk	<i>Aquila heliaca</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Vipera renardi</i>	<i>Asphodeline tenuior</i> , <i>Hieracium adenobrachion</i> , <i>Hieracium caucastense</i> , <i>Jurinea alata</i> , <i>Genista angustifolia</i> , <i>Symphytum podcaucicum</i> , <i>Iris spuria</i> subsp. <i>notha</i>	<i>Falconiformes</i> (aggregations)	19,178	Central Greater Caucasus
44	Upstreams of the Podkumok and Kuma Rivers	<i>Aquila heliaca</i> , <i>Neophron percnopterus</i> , <i>Vipera renardi</i>	<i>Iris spuria</i> subsp. <i>notha</i>	<i>Falconiformes</i> (aggregations)	40,851	Western Greater Caucasus
45	Dautskiy	<i>Capra caucasica</i> , <i>Panthera pardus</i> , <i>Aquila heliaca</i> , <i>Vipera dinniki</i> , <i>Darevskia alpina</i>	<i>Jurinea alata</i> , <i>Jurinea coronopifolia</i>		75,197	Western Greater Caucasus
46	Teberdinski-Marukhskiy	<i>Bison bonasus</i> , <i>Capra caucasica</i> , <i>Mustela lutreola</i> , <i>Nyctalus lasiopterus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Vipera dinniki</i> , <i>Darevskia alpina</i>	<i>Dianthus kabanensis</i> , <i>Jurinea alata</i> , <i>Jurinea coronopifolia</i> , <i>Jurinea woronowii</i> , <i>Psephellus troitzkyi</i>	<i>Lyrurus mikosiewiczii</i> (Tetrao mikosiewiczii), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogasterus</i> , <i>Carpodacus rubicilla</i> (restricted), <i>Falconiformes</i> (aggregations)	198,713	Western Greater Caucasus
47	Upstreams of the Urup River	<i>Aquila heliaca</i> , <i>Neophron percnopterus</i>		<i>Phylloscopus nitidus</i> (restricted)	97,824	Outside of CL/BL
48	Akhmet-Skala Ridge	<i>Panthera pardus</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera renardi</i>		<i>Phylloscopus nitidus</i> (restricted)	13,062	Outside of CL/BL

KBA #	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
	FAUNA	FLORA			
RUSSIA (54 KBAs)					
49	Damkhurtskiy	Capra caucasica, Panthera pardus, Neophron percnopterus, Vipera dimniki, Darevskia alpina		30,050	Western Greater Caucasus
50	Psebay	Panthera pardus, Aquila nipalensis, Neophron percnopterus, Natrrix megaloecephala, Vipera magnifica		37,567	Western Greater Caucasus
51	Gorge of the White River	Aquila nipalensis, Neophron percnopterus, Natrrix megaloecephala, Vipera kaznakovi		3,975	Outside of CL/BL
52	Caucasian	Capra caucasica, Mustela lutreola, Nyctalus lasiopterus, Panthera pardus, Siciasta caucasica, Aquila nipalensis, Aquila heliaca, Aythya ferina, Branta ruficollis, Clanga clanga, Neophron percnopterus, Streptopelia turtur, Vipera kaznakovi, Vipera dimniki, Natrrix megaloecephala, Darevskia alpina, Vipera magnifica	Campanula autraniana, Silene czerkessicum, Silene alpica, Genista angustifolia, Hieracium adenobrachion, Jurinea coronopifolia, Jurinea sosnowskiyi, Jacobaea buschiana	313,333	Western Greater Caucasus
53	Northern Black Sea Region	Nyctalus lasiopterus, Anser erythropus, Aythya ferina, Branta ruficollis, Neophron percnopterus, Puffinus yelkouan, Rissa tridactyla, Streptopelia turtur, Natrrix megaloecephala, Testudo graeca, Vipera orlovi, Clupeonella abraui	Asphodeline tenuior, Campanula autraniana, Thymus markhotensis, Podospermum schischkini	293,945	Western Greater Caucasus
54	Sochinsky	Nyctalus lasiopterus, Aythya ferina, Branta ruficollis, Clanga clanga, Neophron percnopterus, Otis tarda, Streptopelia turtur, Vipera kaznakovi, Vipera dimniki, Testudo graeca, Natrrix megaloecephala, Vipera orlovi, Darevskia alpina	Campanula autraniana, Campanula dzyschrica, Cirsium czerkessicum, Gypsophila steupii, Jurinea ifinii, Kemulariella abchasica, Kemulariella colchica, Silene alpica	236,146	Western Greater Caucasus
GEORGIA (60 KBAs)					
55	Arabika	Nyctalus lasiopterus, Natrrix megaloecephala	Astrantia colchica, Corylus colchica, Dianthus charadzeae, Kemulariella abchasica, Psephellus kolakovskiyi	16,654	Western Greater Caucasus
56	Ritsa	Capra caucasica, Mustela lutreola, Nyctalus lasiopterus, Siciasta caucasica, Vipera kaznakovi, Natrrix megaloecephala	Campanula dzyschrica, Campanula kolakovskiyi, Kemulariella abchasica	16,412	Western Greater Caucasus
57	Bzipi	Nyctalus lasiopterus, Natrrix megaloecephala, Vipera kaznakovi	Astragalus magnificus, Asplenium hermanni-christii, Kemulariella abchasica	4,244	Western Greater Caucasus
58	Range Bzipi	Nyctalus lasiopterus	Campanula dzyschrica, Corylus colchica, Carum grossheimii, Omphalodes kusnetzovii, Psephellus kolakovskiyi	23,976	Western Greater Caucasus
Total Area of KBAs in Russia - 3,886,146 ha					

59	Bichvinta-Miusera	<i>Nyctalus lasiopterus</i> , <i>Testudo graeca</i>	<i>Campanula kolakovskiji</i> , <i>Kemulariella abchasica</i>	4,014	Western Greater Caucasus
60	Pskhu-Gumista	<i>Capra caucasica</i> , <i>Mustela lutreola</i> , <i>Nyctalus lasiopterus</i> , <i>Sicista caucasica</i> , <i>Vipera kaznakovi</i>	<i>Cryptoaenia flahaultii</i> , <i>Seseli saxicolum</i>	40,365	Western Greater Caucasus
61	Abkhazia	<i>Capra caucasica</i> , <i>Nyctalus lasiopterus</i> , <i>Sicista caucasica</i> , <i>Vipera kaznakovi</i> , <i>Vipera dimniki</i> , <i>Darevskia alpina</i> , <i>Testudo graeca</i>	<i>Carum grossheimii</i> , <i>Cirsium albouianum</i>	36,161	Western Greater Caucasus
62	Svaneti (2)	<i>Capra caucasica</i> , <i>Vipera dimniki</i>	<i>Lyrrurus mlkosieviczi</i> (<i>Tetrao mlkosieviczi</i>), <i>Tetraogallus caucasicus</i> , <i>Phylloscopus lorenzii</i> (<i>Phylloscopus sindianus</i>), <i>Phylloscopus nitidus</i> , <i>Phoenicurus erythrogastus</i> , <i>Carpodacus rubicilla</i> (<i>restricted</i>)	30,958	Western Greater Caucasus / Central Greater Caucasus
63	Range Kodori	<i>Vipera dimniki</i>	<i>Carum grossheimii</i> , <i>Corylus colchica</i>	47,198	Western Greater Caucasus / Central Greater Caucasus
64	Lake Bebesiri	<i>Natrix megalcephala</i>	<i>Trapa malevii</i> , <i>Trapa colchica</i>	136	Kolkheti
65	Svaneti (1)	<i>Capra caucasica</i> , <i>Nyctalus lasiopterus</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Vipera dimniki</i>	<i>Barbamine ketzkhoveli</i> , <i>Carum grossheimii</i> , <i>Campanula engrensis</i> , <i>Cerastium svanicum</i> , <i>Campanula suanetica</i> , <i>Seseli saxicolum</i> , <i>Cirsium albouianum</i> , <i>Kemulariella colchica</i> , <i>Jurinea exuberans</i>	224,680	Central Greater Caucasus
66	Racha	<i>Nyctalus lasiopterus</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Vipera kaznakovi</i> , <i>Vipera dimniki</i>	<i>Carum grossheimii</i> , <i>Heracleum egrissicum</i> , <i>Sempervivum charadzeae</i> , <i>Jurinea exuberans</i>	138,740	Central Greater Caucasus
67	Askhi Massif	<i>Capra caucasica</i> , <i>Nyctalus lasiopterus</i> , <i>Vipera kaznakovi</i>	<i>Astrantia colchica</i> , <i>Betula megretica</i> , <i>Campanula fonderwisi</i> , <i>Corylus colchica</i> , <i>Polylophium panjutinii</i> , <i>Heracleum egrissicum</i> , <i>Kemulariella colchica</i> , <i>Dianthus charadzeae</i> , <i>Seseli saxicolum</i>	82,306	Central Greater Caucasus
68	Khvamli	<i>Nyctalus lasiopterus</i> , <i>Vipera kaznakovi</i>	<i>Astrantia colchica</i> , <i>Campanula fonderwisi</i> , <i>Cirsium oblongifolium</i> , <i>Kemulariella colchica</i>	5,023	Outside of CL/BL
69	Sataplia	<i>Nyctalus lasiopterus</i> , <i>Rhinolophus mehelyi</i>		364	Outside of CL/BL

KBA #	KBA Name	The IUCN Globally Threatened Species (2019)		KBA Area (ha)	Aggregations and Geographically Restricted Species (Birds)	Conservation and Bridging Landscapes (CLs and BLs)
		FAUNA	FLORA			
GEORGIA (60 KBAs)						
70	Kolkheti (Aquatory)	<i>Aythya ferina</i> , <i>Podiceps auritus</i> , <i>Puffinus yelkouan</i> , <i>Rissa tridactyla</i> , <i>Acipenser sturio</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Huso huso</i> , <i>Alosa immaculata</i> , <i>Anguilla anguilla</i> , <i>Squalus acanthias</i> , <i>Pomatomus saltatrix</i>		15,845	<i>Anas platyrhynchos</i> , <i>Anas crecca</i> , <i>Podiceps cristatus</i> , <i>Phalacrocorax carbo</i> , <i>Larus cachinnans</i> , <i>Larus ridibundus</i> (aggregations)	Kolkheti
71	Enguri River	<i>Nyctalus lasiopterus</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser gueldenstaedtii</i> , <i>Alosa immaculata</i> , <i>Anguilla anguilla</i> , <i>Cyprinus carpio</i> , <i>Pomatomus saltatrix</i>	<i>Dianthus charadzeae</i>	24,684	<i>Anas platyrhynchos</i> , <i>Anas crecca</i> , <i>Podiceps cristatus</i> , <i>Phalacrocorax carbo</i> , <i>Larus cachinnans</i> , <i>Larus ridibundus</i> (aggregations)	Kolkheti
72	Khobi River	<i>Nyctalus lasiopterus</i> , <i>Huso huso</i> , <i>Acipenser persicus</i> , <i>Acipenser stellatus</i> , <i>Alosa immaculata</i> , <i>Anguilla anguilla</i> , <i>Cyprinus carpio</i> , <i>Pomatomus saltatrix</i> , <i>Astacus astacus</i>		3,853	<i>Anas platyrhynchos</i> , <i>Anas crecca</i> , <i>Podiceps cristatus</i> , <i>Phalacrocorax carbo</i> , <i>Larus cachinnans</i> , <i>Larus ridibundus</i> (aggregations)	Kolkheti
73	Kolkheti	<i>Nyctalus lasiopterus</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Podiceps auritus</i> , <i>Oxyura leucocephala</i> , <i>Streptopelia turtur</i> , <i>Vanellus gregarius</i> , <i>Huso huso</i> , <i>Acipenser sturio</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Alosa immaculata</i> , <i>Anguilla anguilla</i> , <i>Cyprinus carpio</i> , <i>Pomatomus saltatrix</i> , <i>Astacus astacus</i>	<i>Trapa colchica</i> , <i>Trapa maleevii</i>	52,246	<i>Anas platyrhynchos</i> , <i>Anas crecca</i> , <i>Podiceps cristatus</i> , <i>Phalacrocorax carbo</i> , <i>Larus cachinnans</i> , <i>Larus ridibundus</i> (aggregations)	Kolkheti
74	Rioni River	<i>Nyctalus lasiopterus</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Podiceps auritus</i> , <i>Oxyura leucocephala</i> , <i>Streptopelia turtur</i> , <i>Huso huso</i> , <i>Acipenser sturio</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Alosa immaculata</i> , <i>Anguilla anguilla</i> , <i>Cyprinus carpio</i> , <i>Pomatomus saltatrix</i> , <i>Astacus astacus</i>		37,070	<i>Anas platyrhynchos</i> , <i>Anas crecca</i> , <i>Podiceps cristatus</i> , <i>Phalacrocorax carbo</i> , <i>Larus cachinnans</i> , <i>Larus ridibundus</i> (aggregations)	Kolkheti
75	Supsa River	<i>Nyctalus lasiopterus</i> , <i>Alosa immaculata</i> , <i>Anguilla anguilla</i> , <i>Cyprinus carpio</i> , <i>Astacus astacus</i>		2,013	<i>Anas platyrhynchos</i> , <i>Anas crecca</i> , <i>Podiceps cristatus</i> , <i>Phalacrocorax carbo</i> , <i>Larus cachinnans</i> , <i>Larus ridibundus</i> (aggregations)	Kolkheti
76	Batumi 1	<i>Nyctalus lasiopterus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Darevskia dryada</i> , <i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i>	<i>Trapa colchica</i> , <i>Trapa maleevii</i>	26,303	<i>Pernis ptilorhynchus</i> , <i>Milvius migrans</i> , <i>Clanga pomarina</i> , <i>Hieraetus pennatus</i> , <i>Circus gallicus</i> , <i>Circus aeruginosus</i> , <i>Circus pygargus</i> , <i>Circus macrourus</i> (aggregations)	Western Lesser Caucasus
77	Chorokhi-Sampi	<i>Nyctalus lasiopterus</i> , <i>Aythya ferina</i> , <i>Podiceps auritus</i> , <i>Puffinus yelkouan</i> , <i>Vanellus gregarius</i> , <i>Rissa tridactyla</i> , <i>Darevskia dryada</i> , <i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser gueldenstaedtii</i> , <i>Anguilla anguilla</i> , <i>Cyprinus carpio</i> , <i>Pomatomus saltatrix</i> , <i>Astacus astacus</i>		4,711	<i>Anas platyrhynchos</i> , <i>Anas crecca</i> , <i>Podiceps cristatus</i> , <i>Phalacrocorax carbo</i> , <i>Larus cachinnans</i> , <i>Larus ridibundus</i> , <i>Pelecanus crispus</i> (aggregations)	Kolkheti

78	Batumi 2	<i>Nyctalus lasiopterus</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Aquila nipalensis</i> , <i>Streptopelia turtur</i> , <i>Dareuska dryada</i> , <i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i>	<i>Pernis ptilorvus</i> , <i>Milvus migrans</i> , <i>Clanga pomarina</i> , <i>Hieraaetus pennatus</i> , <i>Circus gallicus</i> , <i>Circus aeruginosus</i> , <i>Circus pygargus</i> , <i>Circus macrourus</i> (aggregations)	10,337	Western Lesser Caucasus
79	Machakhela	<i>Nyctalus lasiopterus</i> , <i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i> , <i>Anguilla anguilla</i> , <i>Cyprinus carpio</i> , <i>Astacus astacus</i>	<i>Laserpitiium affine</i>	25,863	Western Lesser Caucasus
80	Shavsheti Range (2)	<i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i>	<i>Angelica adzharica</i> , <i>Erysimum contractum</i>	21,439	Western Lesser Caucasus
81	Mtirala-Kintrishi	<i>Rhinolophus mehelyi</i> , <i>Dareuska dryada</i> , <i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i>	<i>Dryopteris liliata</i> , <i>Laserpitiium affine</i> , <i>Psephellus adjaricus</i> , <i>Scabiosa adzharica</i>	29,213	Western Lesser Caucasus
82	Bakhmaro	<i>Nyctalus lasiopterus</i> , <i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i>		33,239	Western Lesser Caucasus
83	Goderdzi Pass	<i>Nyctalus lasiopterus</i> , <i>Mertensiella caucasica</i>	<i>Angelica adzharica</i> , <i>Campanula pontica</i>	26,954	Western Lesser Caucasus
84	Shavsheti Range (1)	<i>Nyctalus lasiopterus</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i>	<i>Angelica adzharica</i> , <i>Campanula pontica</i> , <i>Scabiosa adzharica</i>	55,498	Western Lesser Caucasus
85	Borjomi-Kharagauli	<i>Nyctalus lasiopterus</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i> , <i>Luciobarbus capito</i>	<i>Lyururus mlkosiewiczzi</i> (Tetrao mlkosiewiczzi), <i>Tetraogallus caspius</i> (restricted)	147,259	Western Lesser Caucasus
86	Nedzvi	<i>Nyctalus lasiopterus</i> , <i>Mertensiella caucasica</i> , <i>Luciobarbus capito</i>	<i>Lyururus mlkosiewiczzi</i> (Tetrao mlkosiewiczzi), <i>Tetraogallus caspius</i> (restricted)	9,213	Western Lesser Caucasus
87	Trialeti Range	<i>Nyctalus lasiopterus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i>	<i>Lyururus mlkosiewiczzi</i> (Tetrao mlkosiewiczzi), <i>Tetraogallus caspius</i> (restricted)	27,274	Western Lesser Caucasus
88	Ktsia-Tabatskuri	<i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Melanitta fusca</i> , <i>Neophron percnopterus</i> , <i>Oxyura leucocephala</i> , <i>Streptopelia turtur</i> , <i>Vipera darevskii</i> , <i>Cyprinus carpio</i> , <i>Astacus astacus</i>	<i>Larus armenicus</i> , <i>Grus grus</i> (restricted)	20,476	Western Lesser Caucasus
89	Tetrobi	<i>Vipera darevskii</i>	<i>Scorzoneria ketzkhoveli</i> , <i>Scorzoneria kozlowskaji</i>	3,089	Western Lesser Caucasus
90	Meskhethi	<i>Nyctalus lasiopterus</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Vipera darevskii</i>	<i>Lyururus mlkosiewiczzi</i> (Tetrao mlkosiewiczzi) (restricted)	82,239	South Caucasus Uplands

KBA #	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
	FAUNA	FLORA			
GEORGIA (60 KBAs)					
91	Kartsakhi-Sulda Mire	<i>Vormela peregusna</i> , <i>Aythya ferina</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Melanitta fusca</i> , <i>Neophron percnopterus</i> , <i>Oxyura leucocephala</i> , <i>Streptopelia turtur</i> , <i>Vipera erivanensis</i> , <i>Cyprinus carpio</i> , <i>Astacus astacus</i>	<i>Aythya nyroca</i> , <i>Crex crex</i> , <i>Tadorna ferruginea</i> , <i>Pelecanus crispus</i> , <i>Pelecanus onocrotalis</i> (aggregations), <i>Larus armenicus</i> , <i>Grus grus</i> (restricted)	467	South Caucasus Uplands
92	Javakheti	<i>Vormela peregusna</i> , <i>Vipera dareuskii</i> , <i>Vipera erivanensis</i> , <i>Cyprinus carpio</i> , <i>Astacus astacus</i>		13,314	South Caucasus Uplands
93	Khanchali Lake	<i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Melanitta fusca</i> , <i>Oxyura leucocephala</i> , <i>Streptopelia turtur</i> , <i>Vanellus gregarius</i>	<i>Anas platyrhynchos</i> , <i>Anas crecca</i> , <i>Podiceps cristatus</i> , <i>Phalacrocorax carbo</i> (aggregations), <i>Larus armenicus</i> , <i>Grus grus</i> (restricted)	727	South Caucasus Uplands
94	Bugdasheni Lake	<i>Vormela peregusna</i> , <i>Aythya ferina</i> , <i>Melanitta fusca</i> , <i>Oxyura leucocephala</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Otis tarda</i> , <i>Cyprinus carpio</i>	<i>Pelecanus crispus</i> , <i>Crex crex</i> (aggregations)	119	South Caucasus Uplands
95	Madatapa Lake	<i>Vormela peregusna</i> , <i>Aythya ferina</i> , <i>Melanitta fusca</i> , <i>Oxyura leucocephala</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Otis tarda</i> , <i>Vipera erivanensis</i> , <i>Cyprinus carpio</i> , <i>Astacus astacus</i>	<i>Aythya nyroca</i> , <i>Crex crex</i> , <i>Tadorna ferruginea</i> , <i>Pelecanus crispus</i> , <i>Pelecanus onocrotalis</i> (aggregations), <i>Larus armenicus</i> , <i>Grus grus</i> (restricted)	1,398	South Caucasus Uplands
96	Saghamo Lake	<i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Melanitta fusca</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Cyprinus carpio</i>	<i>Aythya nyroca</i> , <i>Crex crex</i> , <i>Tadorna ferruginea</i> , <i>Pelecanus crispus</i> , <i>Pelecanus onocrotalis</i> (aggregations), <i>Larus armenicus</i> , <i>Grus grus</i> (restricted)	3,531	South Caucasus Uplands
97	Paravani Lake	<i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Melanitta fusca</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Cyprinus carpio</i> , <i>Astacus astacus</i>	<i>Aythya nyroca</i> , <i>Crex crex</i> , <i>Tadorna ferruginea</i> , <i>Pelecanus crispus</i> , <i>Pelecanus onocrotalis</i> (aggregations), <i>Larus armenicus</i> , <i>Grus grus</i> (restricted)	4,106	South Caucasus Uplands
98	Javakheti Range	<i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Vipera dareuskii</i> , <i>Vipera erivanensis</i>		71,221	South Caucasus Uplands
99	Bedeni	<i>Nyctalus lasiopterus</i>	<i>Tragopogon makaschwilii</i>	13,977	Algeti-Loqi
100	Kvernaki Ridge	<i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Astragalus hirtulus</i>	21,117	Outside of CL/BL

101	Tbilisi National Park	<i>Nyctalus lasiopterus</i> , <i>Rhinolophus mehelyi</i> , <i>Aquila heliaca</i> , <i>Neophron percnopterus</i> , <i>Testudo graeca</i>	<i>Echinops foliosus</i> , <i>Gypsophila robusta</i>	21,031	Trialeti-Gombori
102	Kazbegi	<i>Sicista kazbegica</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Vipera dinniki</i>	<i>Arabis kazbegi</i>	105,765	Central Greater Caucasus
103	Pshav-Khevsureti	<i>Capra aegagrus</i> , <i>Nyctalus lasiopterus</i> , <i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera dinniki</i>	<i>Mandenvia komarovii</i> , <i>Pimpinella schatliensis</i> , <i>Podospermum grigorashviliti</i> , <i>Tragopogon otschiaurii</i>	110,229	Eastern Greater Caucasus
104	Tusheti	<i>Capra aegagrus</i> , <i>Nyctalus lasiopterus</i> , <i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera dinniki</i>	<i>Podospermum grigorashviliti</i> , <i>Jurinea exuberans</i>	113,618	Eastern Greater Caucasus
105	Babaneuri	<i>Rhinolophus mehelyi</i>	<i>Zelkova carpinifolia</i>	834	Eastern Greater Caucasus
106	Eastern Caucasus	<i>Nyctalus lasiopterus</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Vipera dinniki</i>		30,217	Eastern Greater Caucasus
107	Lagodekhi	<i>Capra aegagrus</i> , <i>Nyctalus lasiopterus</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera dinniki</i>		24,257	Eastern Greater Caucasus
108	Alazani Valley	<i>Nyctalus lasiopterus</i> , <i>Rhinolophus mehelyi</i> , <i>Anser erythropus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Marmaronetta angustirostris</i> , <i>Otis tarda</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Vanellus gregarius</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>		88,893	Iori-Mingachevir
109	Artsivi Gorge		<i>Campanula kachethica</i>	98	Outside of CL/BL
110	Chachuna-Vashlovani	<i>Gazella subgutturosa</i> , <i>Nyctalus lasiopterus</i> , <i>Rhinolophus mehelyi</i> , <i>Aquila heliaca</i> , <i>Anser erythropus</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>		114,923	Iori-Mingachevir

KBA #	KBA Name	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
		FAUNA	FLORA			
GEORGIA (60 KBAs)						
111	Iori-Korugi	<i>Aquila heliaca</i> , <i>Anser erythropus</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>			19,099	Iori-Mingachevir
112	Iori Plateau	<i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Oxyura leucocephala</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i>	<i>Bupleurum wittmannii</i>	<i>Tetrax tetrax</i> , <i>Grus grus</i> , <i>Anthropoides virgo</i> (<i>Grus virgo</i>), <i>Pelecanus crispus</i> (aggregations), <i>Phalacrocorax pygmaeus</i> (<i>Microcorbo pygmaeus</i>), <i>Falco naumanni</i> (restricted)	40,026	Iori-Mingachevir
113	Jandari Lake	<i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Oxyura leucocephala</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Bupleurum wittmannii</i>	<i>Phalacrocorax pygmaeus</i> (<i>Microcorbo pygmaeus</i>), <i>Pelecanus crispus</i> (aggregations)	787	Iori-Mingachevir
114	Gardabani	<i>Nyctalus lasiopterus</i> , <i>Anser erythropus</i> , <i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>			3,734	Iori-Mingachevir
Total Area of KBAs in Georgia - 2,133,542 ha						
AZERBAIJAN (48 KBAs)						
115	Garayazi	<i>Aquila heliaca</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i> , <i>Pseudophoxinus sojuchbulagi</i>	<i>Bupleurum wittmannii</i> , <i>Iris camillae</i>	<i>Milvus migrans</i> (aggregation)	9,669	Iori-Mingachevir
116	Jandar Lake	<i>Aquila heliaca</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i>		<i>Anas platyrhynchos</i> , <i>Anas penelope</i> (<i>Mareca penelope</i>) (aggregations)	633	Iori-Mingachevir
117	Agstapha	<i>Aquila heliaca</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Bupleurum wittmannii</i> , <i>Iris camillae</i>	<i>Milvus migrans</i> (aggregation)	9,580	Iori-Mingachevir
118	Shamkir	<i>Vormela peregusna</i> , <i>Aythya ferina</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i>		<i>Anas platyrhynchos</i> , <i>Anas penelope</i> (<i>Mareca penelope</i>), <i>Larus cachinnans</i> , <i>Sterna hirundo</i> (aggregation)	10,091	Iori-Mingachevir
119	Shortepe	<i>Vormela peregusna</i> , <i>Testudo graeca</i>	<i>Bupleurum wittmannii</i> , <i>Gypsophila szovitsii</i>	<i>Hirundo rustica</i> , <i>Delichon urbicum</i> (aggregations)	12,376	Outside of CL/BL
120	Gyzilja	<i>Neophron percnopterus</i> , <i>Testudo graeca</i> , <i>Dareuska rostombekowi</i>	<i>Carum komarovii</i>	<i>Hirundo rustica</i> , <i>Delichon urbicum</i> (aggregations)	5,140	Outside of CL/BL
121	Goy-Gol	<i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Aythya ferina</i> , <i>Dareuska rostombekowi</i>	<i>Gypsophila szovitsii</i>	<i>Ijyrus mlkostiewiczi</i> (<i>Tetrao mlkostiewiczi</i>), <i>Tetrao gallus caspius</i> (restricted)	26,130	Outside of CL/BL
122	Lachin	<i>Capra aegagrus</i> , <i>Rhinolophus mehelyi</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Dareuska rostombekowi</i>	<i>Trifolium bobrovii</i>	<i>Tetrao gallus caspius</i> (restricted)	20,081	Outside of CL/BL

123	Gubadli	<i>Rhinolophus mehelyi</i> , <i>Neophron percnopterus</i> , <i>Testudo graeca</i> , <i>Darevskia rostombekovi</i>				20,117	Outside of CL/BL
124	Dashalty	<i>Rhinolophus mehelyi</i>				1,572	Outside of CL/BL
125	Orta Kur Akhmazy	<i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i>	<i>Gypsophila robusta</i> , <i>Gypsophila szovitsii</i>			27,642	Caspian
126	Turyanchay	<i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i>	<i>Ferula caucasica</i> , <i>Gypsophila robusta</i>			23,092	Iori-Mingachevir
127	Korchay	<i>Gazella subgutturosa</i> , <i>Rhinolophus mehelyi</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Anser erythropus</i> , <i>Streptopelia turtur</i> , <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Ferula caucasica</i>			19,917	Iori-Mingachevir
128	Qabirri-Mingachevir	<i>Gazella subgutturosa</i> , <i>Rhinolophus mehelyi</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Anser erythropus</i> , <i>Streptopelia turtur</i> , <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Ferula caucasica</i>				
129	Ajinohur	<i>Gazella subgutturosa</i> , <i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Testudo graeca</i>	<i>Ferula caucasica</i>		<i>Tetrax tetrax</i> , <i>Phoenicopterus roseus</i> , <i>Glareola pratincola</i> (aggregations)	28,155	Iori-Mingachevir
130	Ilisu (Akhar-Bakhar)	<i>Gazella subgutturosa</i> , <i>Panthera pardus</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i>				5,106	Iori-Mingachevir
131	Sheki	<i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Pseudophoxinus atropatenus</i>				10,387	Outside of CL/BL
132	Ganikh Valley	<i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>				35,832	Iori-Mingachevir
133	Zagatala	<i>Streptopelia turtur</i> , <i>Testudo graeca</i>			<i>Phylloscopus sindianus</i> (<i>Phylloscopus lorenzii</i>), <i>Lyrurus mlokosiewiczii</i> (<i>Tetrao mlokosiewiczii</i>), <i>Tetraogallus caucasicus</i> (restricted)	54,350	Eastern Greater Caucasus
134	Ilisu-Gakh	<i>Streptopelia turtur</i> , <i>Testudo graeca</i>			<i>Phylloscopus sindianus</i> (<i>Phylloscopus lorenzii</i>), <i>Lyrurus mlokosiewiczii</i> (<i>Tetrao mlokosiewiczii</i>), <i>Tetraogallus caucasicus</i> (restricted)	23,949	Eastern Greater Caucasus
135	Shahdag	<i>Rhinolophus mehelyi</i> , <i>Streptopelia turtur</i> , <i>Neophron percnopterus</i> , <i>Aythya ferina</i> , <i>Testudo graeca</i>	<i>Hypericum theodori</i>		<i>Phylloscopus sindianus</i> (<i>Phylloscopus lorenzii</i>), <i>Lyrurus mlokosiewiczii</i> (<i>Tetrao mlokosiewiczii</i>) (restricted)	130,498	Eastern Greater Caucasus
136	Shahdag Mountain (1)	<i>Aquila heliaca</i> , <i>Neophron percnopterus</i> , <i>Aythya ferina</i>	<i>Achnatherum roshevitzi</i> , <i>Hypericum theodori</i>		<i>Lyrurus mlokosiewiczii</i> (<i>Tetrao mlokosiewiczii</i>), <i>Tetraogallus caucasicus</i> (restricted)	81,938	Eastern Greater Caucasus
137	Shahdag Mountain (2)	<i>Podiceps auritus</i>			<i>Lyrurus mlokosiewiczii</i> (<i>Tetrao mlokosiewiczii</i>), <i>Tetraogallus caucasicus</i> (restricted)	10,520	Eastern Greater Caucasus

KBA #	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
	FAUNA	FLORA			
AZERBAIJAN (48 KBAs)					
138	Samur-Yalama-Gusar	<i>Nyctalus lasiopterus</i> , <i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Aquila heliaca</i> , <i>Aythya ferina</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser ruthenus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Astragalus cuscuteae</i> , <i>Thesium maritimum</i>	88,481	Caspian
139	Aghzibir Lakes	<i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Branita ruficollis</i> , <i>Falco cherrug</i> , <i>Marmaronetta angustirostris</i> , <i>Falco cherrug</i> , <i>Numenius tenuirostris</i> , <i>Podiceps auritus</i> , <i>Streptopelia turtur</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Astragalus albanicus</i> , <i>Bilacunaria caspia</i>	9,084	Caspian
140	Altyaghach	<i>Streptopelia turtur</i> , <i>Aquila heliaca</i> , <i>Testudo graeca</i>	<i>Erysimum caspicum</i> , <i>Seseli cuneifolium</i> , <i>Hypericum theodori</i>	11,530	Eastern Greater Caucasus
141	Garghabazar and Gush-Gaya Mountains	<i>Aquila nipalensis</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i>	<i>Bilacunaria caspia</i>	6,172	Outside of CL/BL
142	Absheron Archipelago and Pirallahi Bay	<i>Gazella subgutturosa</i> , <i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Melanitta fusca</i> , <i>Podiceps auritus</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser stellatus</i> , <i>Huso huso</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Astragalus igniarius</i> , <i>Bilacunaria caspia</i> , <i>Polygonum caspicum</i>	39,224	Caspian
143	Gyrmyzygol Lake	<i>Anser erythrorus</i> , <i>Aythya ferina</i> , <i>Oxyura leucocephala</i> , <i>Phrynocephalus persicus</i>		813	Caspian
144	Factory Shelf	<i>Aythya ferina</i>		3,783	Caspian
145	Gobustan	<i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Neophron percnopterus</i> , <i>Testudo graeca</i>	<i>Astragalus maraziensis</i> , <i>Astragalus albanicus</i> , <i>Astragalus cuscuteae</i>	4,315	Outside of CL/BL
146	Alat Bay-Baku Archipelago (1)	<i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Oxyura leucocephala</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser stellatus</i> , <i>Huso huso</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Astragalus igniarius</i> , <i>Astragalus maraziensis</i>	7,457	Caspian

147	Alat Bay-Baku Archipelago (2)	<i>Nyctalus lasiopterus</i> , <i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Oxyura leucocephala</i>			<i>Cygnus olor</i> , <i>Larus melanocephalus</i> , <i>Glareola pratinctola</i> , <i>Netta rufina</i> (aggregations)	46	Caspian
148	Alat Bay-Baku Archipelago (3)	<i>Gazella subgutturosa</i> , <i>Nyctalus lasiopterus</i> , <i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Oxyura leucocephala</i>			<i>Cygnus olor</i> , <i>Larus melanocephalus</i> , <i>Glareola pratinctola</i> , <i>Netta rufina</i> (aggregations)	311	Caspian
149	Alat Bay-Baku Archipelago (4)	<i>Nyctalus lasiopterus</i> , <i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Oxyura leucocephala</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiventris</i> , <i>Acipenser stellatus</i> , <i>Huso huso</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>			<i>Cygnus olor</i> , <i>Larus melanocephalus</i> , <i>Glareola pratinctola</i> , <i>Netta rufina</i> (aggregations)	59	Caspian
150	Alat Bay-Baku Archipelago (5)	<i>Gazella subgutturosa</i> , <i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Oxyura leucocephala</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiventris</i> , <i>Acipenser stellatus</i> , <i>Huso huso</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>			<i>Cygnus olor</i> , <i>Larus melanocephalus</i> , <i>Glareola pratinctola</i> , <i>Netta rufina</i> (aggregations)	1,451	Caspian
151	Alat Bay-Baku Archipelago (6)	<i>Nyctalus lasiopterus</i> , <i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Oxyura leucocephala</i>			<i>Cygnus olor</i> , <i>Larus melanocephalus</i> , <i>Glareola pratinctola</i> , <i>Netta rufina</i> (aggregations)	44	Caspian
152	Shirvan	<i>Gazella subgutturosa</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Anser erythropus</i> , <i>Marmaronetta angustirostris</i> , <i>Falco cherrug</i> , <i>Podiceps auritus</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i>	<i>Gypsophila szovitsii</i>		<i>Tetrax tetrax</i> , <i>Anas platyrhynchos</i> , <i>Anas penelope</i> (<i>Mareca penelope</i>), <i>Phoenicopus roseus</i> , <i>Anser anser</i> , <i>Fulica atra</i> (aggregations)	65,557	Caspian
153	Kura Delta	<i>Nyctalus lasiopterus</i> , <i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Numenius tenuirostris</i> , <i>Podiceps auritus</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser ruthenus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiventris</i> , <i>Acipenser gueldenstaedtii</i>			<i>Pelecanus crispus</i> , <i>Microcarbo pygmaeus</i> , <i>Ardea purpurea</i> , <i>Platalea leucorodia</i> , <i>Nycticorax nycticorax</i> (aggregations)	14,174	Caspian
154	Gizilaghach	<i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Anser erythropus</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Brania nycticollis</i> , <i>Clangula hyemalis</i> , <i>Falco cherrug</i> , <i>Leucogeranus leucogeranus</i> , <i>Marmaronetta angustirostris</i> , <i>Melanitta fusca</i> , <i>Otis tarda</i> , <i>Podiceps auritus</i> , <i>Testudo graeca</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser ruthenus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>			<i>Anas platyrhynchos</i> , <i>Anas penelope</i> (<i>Mareca penelope</i>), <i>Anas clypeata</i> (<i>Spatula clypeata</i>), <i>Aythya fuligula</i> , <i>Fulica atra</i> , <i>Netta rufina</i> , <i>Phoenicopus roseus</i> , <i>Anser anser</i> , <i>Larus minutus</i> (<i>Hydrocoloeus minutus</i>), <i>Himantopus himantopus</i> , <i>Tringa totanus</i> , <i>Tringa ochropus</i> , <i>Tringa glareola</i> , <i>Recurvirostra aocetha</i> , <i>Calidris alba</i> , <i>Calidris alpina</i> , <i>Larus argentatus</i> , <i>Phalaropus lobatus</i> (aggregations)	99,279	Caspian
155	Hyrkan Forests	<i>Nyctalus lasiopterus</i> , <i>Panthera pardus</i> , <i>Testudo graeca</i> , <i>Bufo eichwaldi</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Dryopteris raddeana</i> , <i>Fritillaria grandiflora</i> , <i>Ornithogalum hyrcanum</i> , <i>Papaver talyschense</i> , <i>Zelkova carpinifolia</i>			160,340	Hyrkan

KBA #	KBA Name	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
		FAUNA	FLORA			
AZERBAIJAN (48 KBAs)						
156	Zuvand	<i>Panthera pardus</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Phrynocephalus persicus</i> , <i>Vipera ebnerei</i>	<i>Centaurea daralagozica</i> , <i>Psephellus erivanensis</i> , <i>Fritillaria grandiflora</i> , <i>Papaver talyshense</i> , <i>Podospermum grossheimii</i>		14,555	Hyrcan
157	Mahmud-Chala Lake	<i>Vormela peregusna</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Marmaronetta angustirostris</i> , <i>Oxyura leucocephala</i> , <i>Cyprinus carpio</i>	<i>Tetrax tetrax</i> , <i>Anas platyrhynchos</i> , <i>Anas penelope</i> (<i>Mareca penelope</i>), <i>Phoenicopterus roseus</i> , <i>Anser anser</i> , <i>Fulica atra</i> (<i>aggregations</i>)		11,125	Outside of CL/BL
158	Araz-Bahramtepe	<i>Leucogeranus leucogeranus</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser stellatus</i> , <i>Huso huso</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>			12,518	Caspian
159	Ag-Gol-Sanisu	<i>Gazella subgutturosa</i> , <i>Vormela peregusna</i> , <i>Anser erythropus</i> , <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Marmaronetta angustirostris</i> , <i>Melanitta fusca</i> , <i>Streptopelia turtur</i> , <i>Oxyura leucocephala</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>		<i>Tetrax tetrax</i> (<i>aggregations</i>)	61,843	Caspian
160	Zangezur-Darasham	<i>Capra aegagrus</i> , <i>Rhinolophus mehelyi</i> , <i>Panthera pardus</i> , <i>Ovis orientalis</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Eremias pleskei</i> , <i>Phrynocephalus horvathi</i> , <i>Testudo graeca</i> , <i>Vipera erivanensis</i>	<i>Anabasis eugeniae</i> , <i>Astragalus schachbuzensis</i> , <i>Astragalus ignarius</i> , <i>Centaurea daralagozica</i> , <i>Carum komarovii</i> , <i>Cousinia araxena</i> , <i>Cousinia gabrieljaniae</i> , <i>Cousinia ijirii</i> , <i>Cousinia lomakinii</i> , <i>Crambe armena</i> , <i>Erysimum wagifii</i> , <i>Euphorbia grossheimii</i> , <i>Pyrus nutans</i> , <i>Sameraria glastifolia</i> , <i>Sterigmostemum acanthocarpum</i> , <i>Rosa sosnovskaya</i> , <i>Rosa zangezura</i> , <i>Gypsophila szovitsii</i> , <i>Isatis karjagini</i> , <i>Scorzonera czerepanovii</i> , <i>Stipa karjagini</i> , <i>Scutellaria rhomboidalis</i>	<i>Tetrax tetrax</i> (<i>aggregations</i>), <i>Tetraogallus caspius</i> (<i>restricted</i>)	174,956	Eastern Lesser Caucasus
161	Aras Reservoir	<i>Aythya ferina</i> , <i>Anser erythropus</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Sameraria glastifolia</i>		9,841	Eastern Lesser Caucasus
162	Sadarak	<i>Vormela peregusna</i> , <i>Capra aegagrus</i> , <i>Ovis orientalis</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera erivanensis</i>	<i>Crambe armena</i> , <i>Centaurea daralagozica</i> , <i>Papaver roseolum</i> , <i>Rosa sosnovskaya</i> , <i>Scutellaria rhomboidalis</i> , <i>Stipa karjagini</i>		69,520	Eastern Lesser Caucasus
Total Area of KBAs in Azerbaijan - 1,584,584 ha						

ARMENIA (22 KBAs)							
163	Lake Arpi	<i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Vipera darsukii</i> , <i>Cyprinus carpio</i>			<i>Larus armenicus</i> , <i>Circus pygargus</i> , <i>Pelecanus onocrotalus</i> (aggregations)	35,239	South Caucasus Uplands
164	Mount Achkasar	<i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Vipera darsukii</i>			<i>Gallinago media</i> , <i>Larus armenicus</i> , <i>Circus macrourus</i> , <i>Tetrax tetrax</i> (aggregations)	8,470	South Caucasus Uplands
165	Tashir	<i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Neophron percnopterus</i> , <i>Vipera erivanensis</i>	<i>Astragalus shagalensis</i>		<i>Gallinago media</i> , <i>Circus macrourus</i> , <i>Clanga pomarina</i> , <i>Anthropoides virgo</i> (<i>Grus virgo</i>) (aggregations)	15,037	South Caucasus Uplands
166	Jajur	<i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i>	<i>Allium struzlianum</i> , <i>Centaurea tamaricifolia</i> , <i>Tragopogon armeniacus</i>		<i>Phylloscopus sindianus</i> (<i>Phylloscopus lorentzii</i>) (restricted)	6,279	Outside of CL/BL
167	Akhuryan Reservoir	<i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Otis tarda</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Astragalus shagalensis</i> , <i>Centaurea hajastana</i> , <i>Tragopogon armeniacus</i> , <i>Sambucus tigranii</i>		<i>Tetrax tetrax</i> (aggregations)	6,244	Outside of CL/BL
168	Armavir	<i>Meriones dahli</i> , <i>Rhinolophus mehelyi</i> , <i>Vormela peregusna</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Marmarometta angustirostris</i> , <i>Neophron percnopterus</i> , <i>Otis tarda</i> , <i>Streptopelia turtur</i> , <i>Phrynocephalus horvathi</i> , <i>Testudo graeca</i> , <i>Eremias pleskei</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Alecea grossheimii</i> , <i>Campanula massalskii</i> , <i>Centaurea hajastana</i> , <i>Colchicum greuteri</i> , <i>Papaver rosolum</i> , <i>Scorzonera saffevii</i>		<i>Gallinago media</i> , <i>Limosa limosa</i> , <i>Calidris ferruginea</i> , <i>Larus armenicus</i> , <i>Circus macrourus</i> , <i>Pelecanus crispus</i> , <i>Tetrax tetrax</i> , <i>Pernis apivorus</i> , <i>Milvus milvus</i> , <i>Buteo buteo</i> (aggregations)	66,120	Outside of CL/BL
169	Aragats	<i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera erivanensis</i>	<i>Erodium sosnovskianum</i> , <i>Nepeta alaghezi</i> , <i>Ornithogalum gabrielianiae</i> , <i>Potentilla seidlitziana</i> , <i>Ranunculus aragazi</i> , <i>Gladiolus hajastanicus</i>		<i>Prunella ocularis</i> (restricted)	27,153	Outside of CL/BL
170	Mount Ara	<i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Vipera erivanensis</i>	<i>Alecea grossheimii</i> , <i>Rosa sosnovskiana</i> , <i>Mjosofo daralagheza</i> , <i>Polygala urartu</i> , <i>Sambucus tigranii</i>		<i>Lyrurus mlkosiewiczzi</i> (<i>Tetrao mlkosiewiczzi</i>) (restricted)	3,705	Outside of CL/BL
171	Northeast	<i>Nyctalus lasiopterus</i> , <i>Sicista armenica</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Dareuska rostombekowi</i> , <i>Testudo graeca</i> , <i>Vipera erivanensis</i>	<i>Astragalus shagalensis</i> , <i>Rosa sosnovskiana</i> , <i>Rubus zangezurus</i> , <i>Bupleurum kosopolianskii</i> , <i>Colchicum mirzoevae</i> , <i>Jurinea praetermissa</i> , <i>Psephellus cronquistii</i> , <i>Psephellus debedicus</i> , <i>Psephellus manakyanii</i> , <i>Scrophularia olgae</i> , <i>Symphytum hajastanum</i> , <i>Veronica transcaucasica</i> , <i>Sambucus tigranii</i>		<i>Gallinago media</i> , <i>Circus macrourus</i> , <i>Gyps fulvus</i> (aggregations), <i>Lyrurus mlkosiewiczzi</i> (<i>Tetrao mlkosiewiczzi</i>) (restricted)	273,244	Eastern Lesser Caucasus

KBA #	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
	FAUNA	FLORA			
ARMENIA (22 KBAs)					
172	Sevan Ridge	<i>Capra aegagrus</i> , <i>Myotis hajastanicus</i> , <i>Vormela nipalensis</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Marmaronetta angustirostris</i> , <i>Neophron perenopterus</i> , <i>Streptopelia turtur</i> , <i>Dareuskaia rostombekowi</i> , <i>Vipera erivanensis</i> , <i>Salmo isichchan</i>	Scrophularia olgae, Sorbus roopiana	25,626	Eastern Lesser Caucasus
173	Lake Sevan	<i>Myotis hajastanicus</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Marmaronetta angustirostris</i> , <i>Neophron perenopterus</i> , <i>Streptopelia turtur</i> , <i>Dareuskaia rostombekowi</i> , <i>Vipera erivanensis</i> , <i>Salmo isichchan</i>	<i>Rosa sosnovskiyana</i> , <i>Papaver roseolum</i> , <i>Polygala urartu</i> , <i>Sorbus roopiana</i> , <i>Scrophularia olgae</i>	146,346	Outside of CL/BL
174	Khosrov Forest	<i>Capra aegagrus</i> , <i>Meriones dahli</i> , <i>Ovis orientalis</i> , <i>Panthera pardus</i> , <i>Rhinolophus mehelyi</i> , <i>Vormela nipalensis</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron perenopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera erivanensis</i> , <i>Testudo graeca</i> , <i>Eremias pleskei</i>	<i>Allium struzitanum</i> , <i>Allochrysa takhtajanii</i> , <i>Amblyopyrum muticum</i> , <i>Astragalus holophyllus</i> , <i>Bufoonia takhtajanii</i> , <i>Bupleurum kosopolianskyi</i> , <i>Centaurea daralagozica</i> , <i>Centaurea rhizocalathium</i> , <i>Centaurea vavilovii</i> , <i>Crambe armena</i> , <i>Erodium sosnovskianum</i> , <i>Euphorbia grossheimii</i> , <i>Gladiolus hajastanicus</i> , <i>Gypsophila szovitsii</i> , <i>Isatis karlaginii</i> , <i>Myosotis daralaghezaca</i> , <i>Pyrus complexa</i> , <i>Pyrus hajastana</i> , <i>Pyrus sosnovskiyi</i> , <i>Pyrus tamamschianae</i> , <i>Pyrus theodorovii</i> , <i>Rosa sosnovskiyana</i> , <i>Rosa zangezura</i> , <i>Polygala urartu</i> , <i>Potentilla seidlitziana</i> , <i>Psephellus erivanensis</i> , <i>Psephellus geghamensis</i> , <i>Sterigmostemum acanthocarpum</i> , <i>Symphytum hajastanum</i>	78,042	Eastern Lesser Caucasus
175	Khor Virap	<i>Meriones dahli</i> , <i>Aythya ferina</i> , <i>Marmaronetta angustirostris</i>	<i>Psephellus erivanensis</i>	618	Outside of CL/BL
176	Armash Fish Ponds	<i>Aythya ferina</i> , <i>Clanga clanga</i> , <i>Marmaronetta angustirostris</i> , <i>Oxyura leucocephala</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Gypsophila szovitsii</i> , <i>Psephellus erivanensis</i> , <i>Sterigmostemum acanthocarpum</i> , <i>Sonchus araraticus</i>	7,750	Outside of CL/BL
177	Goravan Sands	<i>Meriones dahli</i> , <i>Eremias pleskei</i> , <i>Phrynocephalus horvathi</i> , <i>Testudo graeca</i>	<i>Gypsophila szovitsii</i> , <i>Psephellus erivanensis</i>	400	Eastern Lesser Caucasus

178	Urts Range	<i>Capra aegagrus</i> , <i>Ovis orientalis</i> , <i>Panthera pardus</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera erivanensis</i> , <i>Testudo graeca</i>	<i>Centaurea daralagoezica</i> , <i>Centaurea vavilovii</i> , <i>Euphorbia grossheimii</i> , <i>Myosotis daralagoezica</i> , <i>Psephellus erivanensis</i> , <i>Gypsophila szovitsii</i> , <i>Isatis karjaginii</i>	20,432	Eastern Lesser Caucasus
179	Gndasar	<i>Capra aegagrus</i> , <i>Panthera pardus</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Vipera erivanensis</i>	<i>Dianthus grossheimii</i> , <i>Gladiolus hajastanicus</i> , <i>Psephellus geghamensis</i> , <i>Pyrus nutans</i> , <i>Sorbus roopiana</i>	27,876	Eastern Lesser Caucasus
180	Arpa	<i>Capra aegagrus</i> , <i>Ovis orientalis</i> , <i>Panthera pardus</i> , <i>Vormela peregusna</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i> , <i>Pyrus complexa</i>	<i>Centaurea tamanianiae</i> , <i>Samaveria glastifolia</i> , <i>Pyrus complexa</i>	29,493	Eastern Lesser Caucasus
181	Jermuk-Eghegis	<i>Capra aegagrus</i> , <i>Myotis hajastanicus</i> , <i>Panthera pardus</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Vipera erivanensis</i>	<i>Alcea grossheimii</i> , <i>Centaurea caroli-henrici</i> , <i>Centaurea daralagoezica</i> , <i>Colchicum mirzoevae</i> , <i>Gladiolus hajastanicus</i> , <i>Pyrus brouiczii</i> , <i>Pyrus complexa</i> , <i>Pyrus daralagezi</i> , <i>Pyrus gegerana</i> , <i>Pyrus hajastana</i> , <i>Pyrus nutans</i> , <i>Pyrus sosnovskiyi</i> , <i>Rosa sosnovskiyana</i> , <i>Sambucus tigranii</i>	76,287	Eastern Lesser Caucasus
182	Meghri	<i>Capra aegagrus</i> , <i>Nyctalus lasiopterus</i> , <i>Ovis orientalis</i> , <i>Panthera pardus</i> , <i>Rhinolophus mehelyi</i> , <i>Vormela peregusna</i> , <i>Aquila heliaca</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Eremias pleskei</i> , <i>Vipera erivanensis</i> , <i>Testudo graeca</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i>	<i>Carum komarovii</i> , <i>Centaurea rhizocalathium</i> , <i>Cousinia araxena</i> , <i>Cousinia ijinii</i> , <i>Cousinia lomakinii</i> , <i>Cousinia takhtajanii</i> , <i>Cousinia gabrieljaniae</i> , <i>Erysimum waqjfi</i> , <i>Psephellus zangezuri</i> , <i>Pyrus complexa</i> , <i>Pyrus daralagezi</i> , <i>Pyrus hajastana</i> , <i>Pyrus nutans</i> , <i>Pyrus sosnovskiyi</i> , <i>Pyrus tamamschianae</i> , <i>Pyrus voronovii</i> , <i>Rosa zangezura</i> , <i>Rubus takhtajanii</i> , <i>Rubus zangezurus</i> , <i>Samaveria glastifolia</i> , <i>Scrophularia olgae</i> , <i>Silene chustupica</i> , <i>Sterigmotenum acanthocarpum</i> , <i>Sorbus roopiana</i> , <i>Thlaspi zangezuristicum</i>	144,465	Eastern Lesser Caucasus
183	Tatev	<i>Capra aegagrus</i> , <i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Clanga clanga</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i>	<i>Centaurea rhizocalathium</i> , <i>Cousinia takhtajanii</i> , <i>Gladiolus hajastanicus</i> , <i>Isatis karjaginii</i> , <i>Psephellus zangezuri</i> , <i>Rosa zangezura</i> , <i>Veronica transcaucasica</i>	27,182	Eastern Lesser Caucasus
184	Khndzoresk	<i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i>	<i>Astragalus bylowae</i> , <i>Psephellus taochius</i>	3,428	Eastern Lesser Caucasus
				Total Area of KBAs in Armenia - 1,029,435 ha	

KBA #	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
	FAUNA	FLORA			
TURKEY (32 KBAs)					
185	Giresun and Ordu Coast	<i>Vormela peregusna</i> , <i>Dareuskaia clar-korum</i>		55,887	Western Lesser Caucasus
186	Giresun Mountains	Mertensiella caucasica	<i>Centaurea drabifolioides</i> , <i>Cirsium trachylepis</i> , <i>Lilium ciliatum</i>	134,115	Western Lesser Caucasus
187	Zigana Mountain	Capra aegagrus, Mertensiella caucasica	<i>Campanula pontica</i> , <i>Centaurea rhizocalathium</i> , <i>Cirsium trachylepis</i> , <i>Crocus aerius</i> , <i>Echinops sintenisii</i> , <i>Erysimum deflexum</i> , <i>Festuca pontica</i> , <i>Festuca xenophontis</i> , <i>Lilium ciliatum</i> , <i>Tulipa gumusanica</i> , <i>Pimpinella lazica</i>	91,675	Western Lesser Caucasus
188	Karadere	Mertensiella caucasica	<i>Astragalus trabzonicus</i> , <i>Bupleurum schistosum</i> , <i>Erodium hendrikii</i> , <i>Galanthus koenenianus</i>	45,845	Western Lesser Caucasus
189	Ikizdere and Soganlı Mountain	Neophron percnopterus, Mertensiella caucasica, <i>Ponticola rizensis</i> , <i>Ponticola turani</i> , <i>Lampetra lanceolata</i>	<i>Aethionema grandiflorum</i> var. <i>sintenisii</i> , <i>Crocus aerius</i> , <i>Lilium ciliatum</i> , <i>Ranunculus tempiskyanus</i> , <i>Sedum euxinum</i> , <i>Noccaea sintenisii</i> , <i>Pimpinella lazica</i> , <i>Psephellus appendicigerus</i> , <i>Scrophularia capillaris</i>	91,326	Western Lesser Caucasus
190	Upper Chorukh Valley	Neophron percnopterus, <i>Ponticola rizensis</i> , <i>Ponticola turani</i>	<i>Alyssum arbutinense</i> , <i>Crocus aerius</i> , <i>Erysimum leptocarpum</i> , <i>Verbascum decursivum</i>	114,516	Western Lesser Caucasus
191	North Kackars	Capra aegagrus, <i>Dareuskaia clar-korum</i> , <i>Natrix megalcephala</i> , <i>Vipera pontica</i> , <i>Mertensiella caucasica</i> , <i>Ponticola rizensis</i> , <i>Ponticola turani</i>	<i>Campanula massalskyi</i> , <i>Campanula lazica</i> , <i>Centaurea drabifolioides</i> , <i>Cirsium trachylepis</i> , <i>Dryopteris liliانا</i> , <i>Festuca pontica</i> , <i>Galanthus koenenianus</i> , <i>Laserpitium affine</i> , <i>Noccaea sintenisii</i> , <i>Scrophularia capillaris</i> , <i>Pimpinella lazica</i> , <i>Psephellus appendicigerus</i> , <i>Ranunculus tempiskyanus</i>	200,407	Western Lesser Caucasus

192	South Kackars	Neophron percnopterus, Streptopelia turtur, Mertensiella caucasica, Ponticola rizenis, Ponticola turani	<i>Alyssum arvinense</i> , <i>Asperula virgata</i> , <i>Astragalus acnophylloides</i> , <i>Campanula troegerae</i> , <i>Campanula seraglio</i> , <i>Campanula choruhensis</i> , <i>Centaurea leptophylla</i> , <i>Colchicum leptanthum</i> , <i>Crocus aeriis</i> , <i>Dryopteris lilitana</i> , <i>Erysimum leptocarpum</i> , <i>Ferula mervynii</i> , <i>Helichrysum arvinense</i> , <i>Kemulariella colchica</i> , <i>Psephellus pecho</i> , <i>Psephellus straminecephalus</i> , <i>Stachys choruhensis</i> , <i>Sedum euxinum</i> , <i>Silene ispirensis</i> , <i>Tripleurospermum fissurale</i> , <i>Verbascum decurstivum</i>	<i>Lyrurus mlkosiewiczzi</i> (Tetrao mlkostewiczi), <i>Phylloscopus sindianus</i> (<i>Phylloscopus lorenzii</i>) (restricted)	247,439	Western Lesser Caucasus
193	Hatila Valley		<i>Helichrysum arvinense</i> , <i>Rhodothamnus sessilifolius</i> , <i>Saxifraga arvinensis</i> , <i>Sedum euxinum</i> , <i>Symphytum savvalense</i> , <i>Bupleurum schistosum</i> , <i>Alyssum arvinense</i> , <i>Campanula troegerae</i> , <i>Centaurea uoronowii</i> , <i>Hypericum fissurale</i>	<i>Lyrurus mlkosiewiczzi</i> (Tetrao mlkostewiczi), <i>Phylloscopus nitidus</i> (restricted)	61,664	Western Lesser Caucasus
194	Hopa	<i>Aquila nipalensis</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Vipera kaznakovi</i> , <i>Natrix megalcephala</i> , <i>Vipera erivanensis</i> , <i>Darevskia dryada</i> , <i>Mertensiella caucasica</i>	<i>Bupleurum schistosum</i> , <i>Dryopteris lilitana</i> , <i>Psephellus pecho</i>	<i>Phylloscopus nitidus</i> (restricted)	40,276	Western Lesser Caucasus
195	Karcal Mountains	<i>Vipera kaznakovi</i> , <i>Mertensiella caucasica</i>	<i>Alyssum arvinense</i> , <i>Bupleurum schistosum</i> , <i>Campanula pontica</i> , <i>Cousinia uoronowii</i> , <i>Lamium tschorochense</i> , <i>Psephellus pecho</i> , <i>Saxifraga arvinensis</i> , <i>Tripleurospermum fissurale</i>	<i>Lyrurus mlkosiewiczzi</i> (Tetrao mlkostewiczi), <i>Phylloscopus sindianus</i> (<i>Phylloscopus lorenzii</i>), <i>Phylloscopus nitidus</i> (restricted)	151,554	Western Lesser Caucasus
196	Yalnizcam Mountains	<i>Vormela peregusna</i> , <i>Neophron percnopterus</i> , <i>Vipera erivanensis</i> , <i>Vipera darevskii</i> , <i>Mertensiella caucasica</i>	<i>Barbarea lutea</i> , <i>Centaurea uoronowii</i> , <i>Chrysium trachylepis</i> , <i>Crataegus turcicus</i> , <i>Dryopteris lilitana</i> , <i>Erysimum leptocarpum</i> , <i>Helichrysum arvinense</i> , <i>Jacobaea trapezuntina</i> , <i>Psephellus pecho</i> , <i>Ranunculus uermirrhizus</i> , <i>Verbascum decurstivum</i>	<i>Phylloscopus sindianus</i> (<i>Phylloscopus lorenzii</i>), <i>Phylloscopus nitidus</i> (restricted)	197,729	Sarikamish-Posof
197	Posof Forest	<i>Vipera darevskii</i> , <i>Natrix megalcephala</i> , <i>Mertensiella caucasica</i>	<i>Chaerophyllum posofianum</i>	<i>Lyrurus mlkosiewiczzi</i> (Tetrao mlkostewiczi), <i>Phylloscopus sindianus</i> (<i>Phylloscopus lorenzii</i>) (restricted)	57,588	South Caucasus Uplands
198	Ardahan Plain and Forest	<i>Aythya ferina</i> , <i>Vipera erivanensis</i> , <i>Vipera darevskii</i>	<i>Chaerophyllum posofianum</i> , <i>Delphinium iris</i>	<i>Phylloscopus sindianus</i> (<i>Phylloscopus lorenzii</i>) (restricted)	48,549	Outside of CL/BL

KBA #	The IUCN Globally Threatened Species (2019)		KBA Name	Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
	FAUNA	FLORA				
TURKEY (32 KBAs)						
199	Aktas Lake	Melanitta fusca			5,859	South Caucasus Uplands
200	Cildir Lake	Aythya ferina		Cirsium eliasianum	27,056	South Caucasus Uplands
201	Kuyucuk Lake	Aythya ferina, Oxyura leucocephala		Important for breeding waterbirds	9,281	Aras
202	Kars Ovasi	Aythya ferina, Oxyura leucocephala, Vipera erivanensis, Vipera darseski		Chaerophyllum karsianum	20,613	Aras
203	Allahuekber Mountains	Falco cherrug, Neophron percnopterus		Allium czelghauricum, Onosma nigricaulis, Stachys sosnowskyi, Tripleurospermum fissurale, Veronica allahuekberensis	260,701	Sarikamish-Posof
204	Sarikamish Forests			Astragalus eliasianus	70,571	Sarikamish-Posof
205	Olur-Oltu Steppe	Neophron percnopterus		Astragalus acmophylloides, Astragalus nigrocalycinus, Bupleurum schistosum, Campanula choruhensis, Cousinia woronowii, Draba narmanensis, Delphinium munzianum, Psephellus taochius, Psephellus pecho, Tripleurospermum fissurale, Tanacetum oxystegium	140,221	Outside of CL/BL
206	Tortum Basin	Neophron percnopterus		Asperula virgata, Bupleurum schistosum, Cephalaria anatolica, Cirsium davisianum, Cousinia woronowii, Delphinium munzianum, Ferula mervynii, Psephellus straminecephalus, Vicia erzurumica	180,141	Outside of CL/BL
207	Kop Mountain	Darevskia uzzelli, Mertensiella caucasica		Campanula lazica, Stachys bayburtensis	37,190	Outside of CL/BL
208	Palandoken Mountain	Vipera erivanensis			2,977	Sarikamish-Maku
209	Bingol Mountains	Neophron percnopterus		Erysimum leptocarpum	31,517	Sarikamish-Maku
210	Karasu Plain	Otis tarda, Neophron percnopterus			33,852	Sarikamish-Maku
211	Aras Valley	Neophron percnopterus, Vipera erivanensis, Montivipera wagneri		Cousinia woronowii, Lotus armeniacus, Nonna karsensis, Sameraria glastifolia, Verbascum transecaucasicum	41,142	Sarikamish-Maku

212	Igdir Plain	<i>Meriones dahli</i> , <i>Falco cherrug</i> , <i>Marmaronetta angustirostris</i> , <i>Testudo graeca</i> , <i>Vipera erivanensis</i> , <i>Eremias pleskei</i> , <i>Phrynocephalus horvathi</i>	<i>Allium baytopiorum</i>	56,952	Sarikamish-Maku
213	Agri Mountain	<i>Neophron percnopterus</i> , <i>Eremias pleskei</i> , <i>Phrynocephalus horvathi</i>	<i>Allium baytopiorum</i> , <i>Astragalus longivexillatus</i>	133,408	Sarikamish-Maku
214	Dogubeyazit Marshes	<i>Falco cherrug</i> , <i>Darevskia bendimahiensis</i> , <i>Eremias pleskei</i> , <i>Phrynocephalus horvathi</i>	<i>Astragalus longivexillatus</i> , <i>Campanula aghrica</i>	17,377	Sarikamish-Maku
215	Tendurek Mountain	<i>Neophron percnopterus</i> , <i>Darevskia bendimahiensis</i>	<i>Centaurea demirizii</i> , <i>Psephellus gracillimus</i>	35,443	Sarikamish-Maku
216	Eastern Van Mountains	<i>Ovis orientalis</i> , <i>Neophron percnopterus</i> , <i>Oxyura leucocephala</i>		86,386	Sarikamish-Maku
Total Area of KBAs in Turkey - 2,729,260 ha					
IRAN (15 KBAs)					
217	Maku and Iran West Border	<i>Ovis orientalis</i> , <i>Rhinolophus mehelyi</i> , <i>Capra aegagrus</i> , <i>Anser erythropus</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Testudo graeca</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Aquila chrysaetos</i> (<i>Falco chrysaetos</i>), <i>Francoelinus francoelinus</i> , <i>Falco subbuteo</i> , <i>Glareola nordmanni</i> , <i>Tetraogallus caspius</i> (<i>aggregations</i>)	324,754	Sarikamish-Maku
218	Maku	<i>Ovis orientalis</i> , <i>Rhinolophus mehelyi</i> , <i>Capra aegagrus</i> , <i>Anser erythropus</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Otis tarda</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Aquila chrysaetos</i> (<i>Falco chrysaetos</i>), <i>Francoelinus francoelinus</i> , <i>Falco subbuteo</i> , <i>Glareola nordmanni</i> , <i>Tetraogallus caspius</i> (<i>aggregations</i>)	86,290	Sarikamish-Maku
219	Agh-Gol	<i>Ovis orientalis</i> , <i>Rhinolophus mehelyi</i> , <i>Capra aegagrus</i> , <i>Aquila heliaca</i> , <i>Anser erythropus</i> , <i>Clanga clanga</i>	<i>Tetraogallus caspius</i> , <i>Aquila chrysaetos</i> (<i>Falco chrysaetos</i>), <i>Francoelinus francoelinus</i> , <i>Falco subbuteo</i> , <i>Glareola nordmanni</i> (<i>aggregations</i>)	27,385	Sarikamish-Maku
220	Aras Dam Lake	<i>Anser erythropus</i> , <i>Marmaronetta angustirostris</i> , <i>Oxyura leucocephala</i> , <i>Luciobarbus brachycephalus</i> , <i>Luciobarbus capito</i>	<i>Anser albifrons</i> , <i>Haliaeetus albicilla</i> , <i>Pelecanus onocrotalus</i> (<i>aggregations</i>)	9,514	Arasbaran
221	Marakan	<i>Ovis orientalis</i> , <i>Capra aegagrus</i> , <i>Panthera pardus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Phrynocephalus persicus</i> , <i>Vipera ebnere</i> , <i>Eremias pleskei</i>	<i>Tetraogallus caspius</i> , <i>Gypaetus barbatus</i> (<i>aggregations</i>)	103,248	Arasbaran
222	Kiamaky-Kantal	<i>Ovis orientalis</i> , <i>Panthera pardus</i> , <i>Capra aegagrus</i> , <i>Falco cherrug</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i> , <i>Vipera ebnere</i>	<i>Tetraogallus caspius</i> , <i>Gypaetus barbatus</i> (<i>aggregations</i>)	96,709	Arasbaran
223	Dizmar-Arasbaran	<i>Capra aegagrus</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Neophron percnopterus</i> , <i>Streptopelia turtur</i> , <i>Testudo graeca</i>	<i>Tetraogallus caspius</i> , <i>Falco subbuteo</i> , <i>Aquila chrysaetos</i> (<i>Falco chrysaetos</i>), <i>Phalacrocorax pygmaeus</i> (<i>Microcarbo pygmaeus</i>), <i>Phasianus colchicus</i> , <i>Gypaetus barbatus</i> , <i>Accipiter gentilis</i> (<i>aggregations</i>), <i>Lyrurus mlkosiewiczzi</i> (<i>Tetrao mlkosiewiczzi</i>) (<i>restricted</i>)	375,740	Arasbaran

KBA #	KBA Name	The IUCN Globally Threatened Species (2019)		Aggregations and Geographically Restricted Species (Birds)	KBA Area (ha)	Conservation and Bridging Landscapes (CLs and BLs)
		FAUNA	FLORA			
IRAN (15 KBAs)						
224	Parsabad	<i>Gazella subgutturosa</i> , <i>Anser erythropus</i> , <i>Branita ruficollis</i> , <i>Clanga clanga</i> , <i>Leucogeranus leucogeranus</i> , <i>Marmaronetta angustirostris</i> , <i>Oxyura leucocephala</i>		<i>Aythya nyroca</i> , <i>Francoelinus francoelinus</i> , <i>Tetrax tetrax</i> (aggregations)	79,883	Arasbaran
225	Mountain Sahand-Sabalan	<i>Ovis orientalis</i> , <i>Panthera pardus</i> , <i>Capra aegagrus</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i>		<i>Aquila chrysaetos</i> (<i>Falco chrysaetos</i>), <i>Gyps fulvus</i> (aggregations), <i>Sturnus roseus</i> (<i>Pastor roseus</i>), <i>Tetraogallus caspius</i> (restricted)	123,968	Outside of CL/BL
226	Lavandvil	<i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser gueldenstaedtii</i>		<i>Phasianus colchicus</i> (restricted)	89,656	Hyrcaan
227	Lisar	<i>Panthera pardus</i> , <i>Aquila nipalensis</i> , <i>Bufo etchwaldi</i>	<i>Zelkova carpinifolia</i>		31,194	Hyrcaan
228	Anzali Lagoon	<i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Anser erythropus</i> , <i>Aquila heliaca</i> , <i>Clanga clanga</i> , <i>Falco cherrug</i> , <i>Leucogeranus leucogeranus</i> , <i>Marmaronetta angustirostris</i> , <i>Oxyura leucocephala</i> , <i>Podiceps auritus</i> , <i>Vanellus gregarius</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Cyprinus carpio</i>			137,304	Hyrcaan
229	Cashiroodkhan	<i>Panthera pardus</i>			39,626	Hyrcaan
230	Sepirud River and Bujagh	<i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Anser erythropus</i> , <i>Aquila heliaca</i> , <i>Branita ruficollis</i> , <i>Clanga clanga</i> , <i>Clangula hyemalis</i> , <i>Numenius tenuirostris</i> , <i>Oxyura leucocephala</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser ruthenus</i> , <i>Cyprinus carpio</i>		<i>Pelecanus crispus</i> (aggregations)	29,806	Hyrcaan
231	Amirkelayah	<i>Phoca caspica</i> (<i>Pusa caspica</i>), <i>Aquila heliaca</i> , <i>Anser erythropus</i> , <i>Branita ruficollis</i> , <i>Clanga clanga</i> , <i>Clangula hyemalis</i> , <i>Numenius tenuirostris</i> , <i>Oxyura leucocephala</i> , <i>Huso huso</i> , <i>Acipenser stellatus</i> , <i>Acipenser persicus</i> , <i>Acipenser nudiiventris</i> , <i>Acipenser gueldenstaedtii</i> , <i>Acipenser ruthenus</i> , <i>Cyprinus carpio</i>		<i>Pelecanus crispus</i> (aggregations)	93,263	Hyrcaan
Total Area of KBAs in Iran - 1,648,341 ha						
Area of all KBAs in the Ecoregion - 13,011,309 ha						

Annex 3: Summary of Species Parameters of Key Biodiversity Areas

KBA #	KBA Name	Number of Globally Threatened Species	Aggregations or Number of Aggregate Species	Number of Geographically Restricted Species	Total Number of all Trigger Species	Number of Endemic Species (local, country, regional)	Number of Critically Endangered Species	KBA Area (ha)
RUSSIA (54 KBAs)								
1	Abrausky Peninsula	15	√	-	15	4	1	47,670
2	Tamanskiy	15	√	-	15	-	1	172,342
3	Delta Kuban	18	√	-	18	-	6	239,503
4	Krimsky	3	-	-	3	-	1	21,063
5	Primorsko-Akhtarsk Salt Lakes	11	√	-	11	1	1	115,674
6	Lower reaches of the Beisug and Chelbas Rivers	13	√	-	13	-	4	76,515
7	Lower Ei	12	√	-	12	-	3	41,559
8	Don Delta	11	√	-	11	-	4	81,384
9	Novoberezenskiy	4	-	-	4	-	-	34,797
10	Sredne-Labinskiy	2	-	-	2	-	-	13,756
11	Novotroitskiy	3	-	-	3	-	-	7,258
12	Veselovskoye Reservoir	11	-	-	11	-	-	183,853
13	Manych-Gudilo Lake	13	√	-	13	-	2	48,622
14	Dadynskiye Lake	5	√	-	5	-	-	47,343
15	Irgakliskaya Forest Area	2	-	-	2	-	-	3,711
16	Kizlyar Bay	12	√	-	12	-	3	76,143
17	Tarumovsky	5	√	-	5	-	3	73,898
18	Argakhanskiy	13	√	-	13	-	5	72,063
19	Yangiyurtovskiy-Sulakskaya	14	1	-	15	-	6	59,316
20	Dagestanskiy (Sarykumskiy Barkhan)	9	√	-	9	2	-	416
21	Melishtinskiy	5	-	-	5	2	-	20,476
22	Kayakentsky-Deshlagarsky	6	-	-	6	2	-	46,000
23	Papas (Adji) Lake	9	√	-	9	1	-	4,668
24	Itsari	3	-	5	8	2	-	40,926
25	Samurskiy	26	√	-	26	1	8	22,143
26	Berkubinsky	9	-	-	9	-	5	13,633
27	Shalbuzdag	9	-	6	15	5	-	38,203
28	Laman-Kam Area	6	√	-	6	1	-	17,266
29	Tlyaratinsky	10	-	6	16	5	-	65,640
30	Kosobsko-Kelebsky	10	-	6	16	5	-	81,587
31	Bezhtinskiy	10	-	6	16	5	-	43,192
32	Khunzakhskiy	9	-	6	15	7	1	2,723
33	Kezenoi-Am (Lake Eizenam) Basin	4	-	-	4	2	1	15,426
34	Erzi	6	-	6	12	3	-	44,844
35	Ingushskiy	4	-	-	4	1	-	23,585
36	Severno-Osetinsky-Tseiskiy	12	-	6	18	7	1	132,553
37	Alania	7	-	6	13	4	-	56,158
38	Kabardino-Balkarskiy	8	-	6	14	7	-	80,515
39	Kara-Su Sanctuary	4	-	3	7	4	-	16,646
40	Baksan Gorge	7	-	-	7	5	-	96,736
41	Prielbrusie	6	-	6	12	7	-	101,535
42	Gorge of the Eshkakon and Malka Rivers	4	-	3	7	3	-	144,966

KBA #	KBA Name	Number of Globally Threatened Species	Aggregations or Number of Aggregate Species	Number of Geographically Restricted Species	Total Number of all Trigger Species	Number of Endemic Species (local, country, regional)	Number of Critically Endangered Species	KBA Area (ha)
RUSSIA (54 KBAs)								
43	Surrounding of Kislovodsk	10	√	-	10	6	-	19,178
44	Upstreams of the Podkumok and Kuma Rivers	4	√	-	4	1	-	40,851
45	Dautskiy	7	-	-	7	5	-	75,197
46	Teberdinski-Marukhskiy	15	√	6	21	10	1	198,713
47	Upstreams of the Urup River	2	-	1	3	-	-	97,824
48	Akhmet-Skala Ridge	4	-	1	5	-	-	13,062
49	Damkhurtskiy	5	-	1	6	3	-	30,050
50	Psebay	5	-	1	6	2	-	37,567
51	Gorge of the White River	4	-	-	4	2	-	3,975
52	Caucasian	24	-	5	29	16	1	313,333
53	Northern Black Sea Region	16	√	-	16	7	2	293,945
54	Sochinsky	21	-	5	26	15	1	236,146
GEORGIA (60 KBAs)								
55	Arabika	7	-	-	7	6	-	16,654
56	Ritsa	9	-	-	9	7	1	16,412
57	Bzipi	6	-	-	6	5	1	4,244
58	Range Bzipi	6	-	-	6	5	-	23,976
59	Bichvinta-Miusera	2	-	-	2	-	-	4,014
60	Pskhu-Gumista	7	-	-	7	5	1	40,365
61	Abkhazia	9	-	-	9	7	-	36,161
62	Svaneti (2)	4	-	6	10	6	-	30,958
63	Range Kodori	3	-	6	9	5	-	47,198
64	Lake Bebesiri	3	-	-	3	3	1	136
65	Svaneti (1)	15	-	6	21	13	-	224,680
66	Racha	10	-	6	16	8	-	138,740
67	Askhi Massif	12	-	-	12	11	-	82,306
68	Khvamli	6	-	-	6	5	-	5,023
69	Satapia	2	-	-	2	-	-	364
70	Kolkheti (Aquatory)	14	6	-	20	-	7	15,845
71	Enguri River	10	6	-	16	1	5	24,684
72	Khobi River	9	6	-	15	-	4	3,853
73	Kolkheti	21	6	-	27	2	9	52,246
74	Rioni River	18	6	-	24	-	7	37,070
75	Supsa River	5	6	-	11	-	1	2,013
76	Batumi 1	12	8	-	20	5	2	26,303
77	Chorokhi-Sarpi	17	7	-	24	3	7	4,711
78	Batumi 2	8	8	-	16	3	1	10,337
79	Machakhela	7	-	-	7	3	1	25,863
80	Shavsheti Range (2)	4	-	2	6	5	-	21,439
81	Mtiralala-Kintrishi	8	-	2	10	8	2	29,213
82	Bakhmaro	3	-	2	5	3	-	33,239
83	Goderdzi Pass	4	-	2	6	4	-	26,954
84	Shavsheti Range (1)	10	-	2	12	6	-	55,498

KBA #	KBA Name	Number of Globally Threatened Species	Aggregations or Number of Aggregate Species	Number of Geographically Restricted Species	Total Number of all Trigger Species	Number of Endemic Species (local, country, regional)	Number of Critically Endangered Species	KBA Area (ha)
GEORGIA (60 KBAs)								
85	Borjomi-Kharagauli	10	-	2	12	5	-	147,259
86	Nedzvi	3	-	-	3	1	-	9,213
87	Trialeti Range	6	-	1	7	2	-	27,274
88	Ktsia-Tabatskuri	11	-	2	13	1	1	20,476
89	Tetrobi	3	-	-	3	3	3	3,089
90	Meskheti	16	-	1	17	9	2	82,239
91	Kartsakhi-Sulda Mire	12	5	2	19	1	-	467
92	Javakheti	5	-	-	5	2	1	13,314
93	Khanchali Lake	10	4	2	16	-	1	727
94	Bugdashedeni Lake	11	2	-	13	-	-	119
95	Madatapa Lake	13	5	2	20	1	-	1,398
96	Saghamo Lake	9	5	2	16	-	-	3,531
97	Paravani Lake	10	5	2	17	-	-	4,106
98	Javakheti Range	8	-	-	8	3	2	71,221
99	Bedeni	1	-	-	1	-	-	13,977
100	Kvernaki Ridge	10	-	-	10	1	-	21,117
101	Tbilisi National Park	7	-	-	7	2	-	21,031
102	Kazbegi	9	-	6	15	5	-	105,765
103	Pshav-Khevsureti	13	-	6	19	7	1	110,229
104	Tusheti	11	-	6	17	5	-	113,618
105	Babaneuri	2	-	-	2	1	-	834
106	Eastern Caucasus	7	-	6	13	3	-	30,217
107	Lagodekhi	7	-	6	13	3	-	24,257
108	Alazani Valley	15	3	2	20	1	-	88,893
109	Artsivi Gorge	1	-	-	1	1	-	98
110	Chachuna-Vashlovani	12	3	2	17	-	-	114,923
111	Iori-Korugi	9	-	-	9	-	-	19,099
112	Iori Plateau	10	4	2	16	1	-	40,026
113	Jandari Lake	12	2	-	14	1	-	787
114	Gardabani	12	-	-	12	-	-	3,734
AZERBAIJAN (48 KBAs)								
115	Garayazi	8	1	-	9	3	1	9,669
116	Jandar Lake	6	2	-	8	-	-	633
117	Agstapha	7	1	-	8	2	-	9,580
118	Shamkir	4	4	-	8	-	-	10,091
119	Shortepe	4	2	-	6	2	-	12,376
120	Gyzilja	4	2	-	6	2	-	5,140
121	Goy-Gol	5	-	2	7	3	-	26,130
122	Lachin	6	-	1	7	2	1	20,081
123	Gubadli	4	-	-	4	1	-	20,117
124	Dashalty	1	-	-	1	-	-	1,572
125	Orta Kur Akhmazy	6	-	-	6	2	-	27,642

KBA #	KBA Name	Number of Globally Threatened Species	Aggregations or Number of Aggregate Species	Number of Geographically Restricted Species	Total Number of all Trigger Species	Number of Endemic Species (local, country, regional)	Number of Critically Endangered Species	KBA Area (ha)
AZERBAIJAN (48 KBAs)								
126	Turyanchay	7	-	-	7	2	-	23,092
127	Korchay	7	-	-	7	-	-	19,917
128	Qabirri-Mingachevir	12	4	-	16	1	-	151,331
129	Ajinohur	7	3	-	10	1	-	28,155
130	Ilisu (Akhar-Bakhar)	7	-	-	7	-	-	5,106
131	Sheki	5	-	-	5	1	1	10,387
132	Ganikh Valley	7	-	-	7	-	-	35,832
133	Zagatala	2	-	3	5	2	-	54,350
134	Ilisu-Gakh	2	-	3	5	2	-	23,949
135	Shahdag	6	-	2	8	2	-	130,498
136	Shahdag Mountain (1)	5	-	2	7	4	-	81,938
137	Shahdag Mountain (2)	1	-	2	3	2	-	10,520
138	Samur-Yalama-Gusar	17	-	-	17	2	5	88,481
139	Aghzibir Lakes	15	14	-	29	2	1	9,084
140	Altyaghach	6	-	-	6	3	-	11,530
141	Garghabazar and Gush-Gaya Mountains	4	-	-	4	1	-	6,172
142	Absheron Archipelago and Pirallahi Bay	19	10	-	29	3	7	39,224
143	Gyrmyzygol Lake	4	-	-	4	1	-	813
144	Factory Shelf	1	2	-	3	-	-	3,783
145	Gobustan	7	-	-	7	3	-	4,315
146	Alat Bay-Baku Archipelago (1)	14	4	-	18	2	6	7,457
147	Alat Bay-Baku Archipelago (2)	3	4	-	7	-	-	46
148	Alat Bay-Baku Archipelago (3)	4	4	-	8	-	-	311
149	Alat Bay-Baku Archipelago (4)	11	4	-	15	-	5	59
150	Alat Bay-Baku Archipelago (5)	11	4	-	15	-	5	1,451
151	Alat Bay-Baku Archipelago (6)	3	4	-	7	-	-	44
152	Shirvan	12	6	-	18	1	-	65,557
153	Kura Delta	12	5	-	17	-	6	14,174
154	Gizilaghach	22	18	-	40	-	6	99,279
155	Hyrkan Forests	12	-	-	12	6	1	160,340
156	Zuvand	11	-	-	11	7	2	14,555
157	Mahmud-Chala Lake	7	6	-	13	-	-	11,125
158	Araz-Bahramtepe	9	-	-	9	-	6	12,518
159	Ag-Gol-Sarisu	11	1	-	12	-	-	61,843
160	Zangezur-Darasham	37	1	1	39	25	5	174,956
161	Aras Reservoir	6	-	-	6	1	-	9,841
162	Sadarak	13	-	-	13	7	1	69,520

KBA #	KBA Name	Number of Globally Threatened Species	Aggregations or Number of Aggregate Species	Number of Geographically Restricted Species	Total Number of all Trigger Species	Number of Endemic Species (local, country, regional)	Number of Critically Endangered Species	KBA Area (ha)
ARMENIA (22 KBAs)								
163	Lake Arpi	9	3	-	12	1	1	35,239
164	Mount Achkarasar	5	4	-	9	1	1	8,470
165	Tashir	5	4	-	9	2	-	15,037
166	Jajur	10	-	1	11	3	1	6,279
167	Akhuryan Reservoir	11	1	-	12	4	-	6,244
168	Armavir	21	10	-	31	9	3	66,120
169	Aragats	13	-	1	14	7	4	27,153
170	Mount Ara	8	-	1	9	7	-	3,705
171	Northeast	23	3	1	27	17	-	273,244
172	Sevan Ridge	8	-	-	8	4	1	25,626
173	Lake Sevan	17	4	1	22	9	2	146,346
174	Khosrov Forest	43	-	-	43	32	6	78,042
175	Khor Virap	4	3	-	7	2	-	618
176	Armash Fish Ponds	10	9	-	19	4	1	7,750
177	Goravan Sands	6	-	-	6	5	2	400
178	Urts Range	18	-	-	18	8	1	20,432
179	Gndasar	13	-	-	13	6	-	27,876
180	Arpa	13	-	-	13	3	1	29,493
181	Jermuk-Eghegis	24	-	-	24	16	4	76,287
182	Meghri	41	-	1	42	27	5	144,465
183	Tatev	13	3	-	16	7	-	27,182
184	Khndzoresk	5	2	-	7	2	1	3,428
TURKEY (32 KBAs)								
185	Giresun and Ordu Coast	2	-	-	2	2	-	55,887
186	Giresun Mountains	4	-	1	5	4	1	134,115
187	Zigana Mountain	13	-	1	14	12	2	91,675
188	Karadere	5	-	2	7	6	2	45,845
189	Ikizdere and Soganli Mountain	14	-	3	17	13	4	91,326
190	Upper Chorukh Valley	7	-	2	9	7	1	114,516
191	North Kackars	20	-	3	23	20	4	200,407
192	South Kackars	26	-	2	28	25	11	247,439
193	Hatila Valley	10	-	2	12	11	7	61,664
194	Hopa	11	-	1	12	8	1	40,276
195	Karcil Mountains	10	-	3	13	11	2	151,554
196	Yalnizcam Mountains	16	-	2	18	14	6	197,729
197	Posof Forest	4	-	2	6	5	2	57,588
198	Ardahan Plain and Forest	5	-	1	6	4	3	48,549
199	Aktas Lake	1	-	-	1	-	-	5,859

KBA #	KBA Name	Number of Globally Threatened Species	Aggregations or Number of Aggregate Species	Number of Geographically Restricted Species	Total Number of all Trigger Species	Number of Endemic Species (local, country, regional)	Number of Critically Endangered Species	KBA Area (ha)
TURKEY (32 KBAs)								
200	Cildir Lake	2	-	-	2	1	1	27,056
201	Kuyucuk Lake	2	-	-	2	-	-	9,281
202	Kars Ovasi	5	-	-	5	3	2	20,613
203	Allahuekber Mountains	7	-	1	8	5	4	260,701
204	Sarikamish Forests	1	-	1	2	1	1	70,571
205	Olur-Oltu Steppe	12	-	-	12	11	5	140,221
206	Tortum Basin	10	-	-	10	9	5	180,141
207	Kop Mountain	4	-	-	4	4	2	37,190
208	Palandoken Mountain	1	-	-	1	1	-	2,977
209	Bingol Mountains	2	-	-	2	1	-	31,517
210	Karasu Plain	2	-	-	2	-	-	33,852
211	Aras Valley	8	-	-	8	7	3	41,142
212	Igdir Plain	8	-	-	8	5	3	56,952
213	Agri Mountain	5	-	-	5	4	4	133,408
214	Dogubeyazit Marshes	6	-	-	6	5	4	17,377
215	Tendurek Mountain	4	-	-	4	3	2	35,443
216	Eastern Van Mountains	3	-	-	3	-	-	86,386
IRAN (15 KBAs)								
217	Maku and Iran West Border	9	5	-	14	-	-	324,754
218	Maku	9	5	-	14	-	-	86,290
219	Agh-Gol	6	5	-	11	-	-	27,385
220	Aras Dam Lake	5	3	-	8	-	-	9,514
221	Marakan	9	2	-	11	3	1	103,248
222	Kiamaky-Kantal	7	2	-	9	1	-	96,709
223	Dizmar-Arasbaran	7	7	1	15	1	-	375,740
224	Parsabad	7	3	-	10	-	1	79,883
225	Mountain Sahand-Sabalan	5	2	2	9	-	-	123,968
226	Lavandvil	7	-	1	8	-	5	89,656
227	Lisar	4	-	-	4	2	-	31,194
228	Anzali Lagoon	16	-	-	16	-	7	137,304
229	Gashtroodkhan	1	-	-	1	-	-	39,626
230	Sepirud River and Bujagh	15	1	-	16	-	6	29,806
231	Amirkelayeh	15	1	-	16	-	6	93,263

Annex 4: Description of Conservation and Bridging Landscapes

CONSERVATION LANDSCAPES

1. Kuma-Manych

Countries: Russia

Location: along the northern border of the Caucasus, in the North Caucasus Plains, includes the eastern coast of the Azov Sea.

Central coordinates:¹ 41° 30' 43" E; 46° 47' 58" N; **North:** 41° 9' 47"E; 47° 14' 21"N; **West:** 36° 30' 5"E; 45° 18' 1" N; **East:** 46° 41' 39"E; 44° 48' 32.90"N; **South:** 41° 33' 46" E; 46° 35' 16"N

Maximal elevation (m above sea level): 164

Minimal elevation (m above sea level): 10

Total Area (km²): 23,769

Terrestrial area: 22,424

Marine area: 1,345

Average length (km): 805

Average width (km) 258

KBAs (number): 10

KBAs: *Tamanskiy, Delta Kuban, Krimsky, Primorsko-Akhtarsk Salt Lakes, Lower reaches of the Beisug and Chelbas Rivers, Lower Ei, Don Delta, Veselovskoye Reservoir, Manych-Gudilo Lake, Dadynskiye Lake*

KBAs (total area, km²): 10,160.3

KBA coverage (% of CL's total area): 42.7%

Protected Areas (number): 4

Protected Areas (total area within the CL, km²): 1,036.5

Protected Areas coverage 1 (% of CL's total area): 4.4%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 9.6%

Areas under International Conventions: four Ramsar Sites.

Main habitats: wetlands, large lakes and channels surrounded by steppes and semideserts.

Principal fauna species: important place for waterfowl, European Mink, several species of sturgeon, various bird and reptile species.

Important phenomena: eight wetland sites hold globally significant congregations of waterfowl, such as the Red-breasted Goose and Lesser White-fronted Goose.

Basis for delineation: importance for migratory waterfowl, its significant number of IBAs and high coverage of KBAs.

Threats: parts of the corridor have been severely impacted by grazing, farming, poaching and overfishing.

Conservation focus: increasing PA effectiveness and coverage, increasing connectivity, strengthening law enforcement and monitoring capacity.

¹ Under the N, W, E, S coordinates the extreme points are considered that are further north, south, east or west than any other location in the Landscapes.

2. Western Greater Caucasus

Countries: Russian Federation, Georgia

Location: western section of the Greater Caucasus range, the Black Sea catchment basin, approx. until longitude of Mt. Elbrus.

Central coordinates: 40° 42' 35" E; 43° 44' 29" N; **North:** 40° 35' 42"E; 44° 7' 43" N; **West:** 37° 49' 44" E; 44° 41' 44"N; **East:** 42° 26' 20.53" E; 43° 21' 10" N; **South:** 40° 32' 44"E; 43° 7' 23"N

Maximal elevation (m above sea level): 4,046

Minimal elevation (m above sea level): 304

Total Area (km²): 26,070.4

Terrestrial area: 25,847

Marine area: 223

Average length (km): 403

Average width (km): 139

KBAs (number): 18

KBAs: *Gorge of the Eshkakon and Malka Rivers, Upstreams of the Podkumok and Kuma Rivers, Dautskiy, Teberdinski-Marukhskiy, Damkhurtskiy, Psebay, Caucasian, Northern Black sea region, Sochinsky, Arabika, Ritsa, Bzipi, Range Bzipi, Bichvinta-Miusera, Pskhu-Gumista, Abkhazia, Svaneti (2), Range Kodori*

KBAs (total area, km²): 14,461

KBA coverage (% of PCL's total area): 55.5%

Protected Areas (number): 28

Protected Areas (total area within the CL, km²): 10,999.4

Protected Areas coverage 1 (% of CL's total area): 42.2%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 67%

Areas under International Conventions: one World Natural Heritage Site (Western Caucasus, Russia), two Biosphere Reserves (Kavkazskiy and Teberda, Russia), one European Diploma Protected Area (Teberda Biosphere Reserve, Russia).

Main habitats: humid Colchic mixed forests/temperate rainforests, temperate broad-leaved, coniferous and mixed forests, high mountain krumholtz², grasslands, meadows and thickets, sub-nival areas.

Principal fauna species: Western Tur, Red Deer, Brown Bear, Leopard (reintroduced), various bird and reptile species.

Important phenomena: large areas of pristine forests; evolutionary phenomena of Colchic relict forests; globally significant congregations of the endemic Caucasian Black Grouse (Teberda Biosphere Reserve).

Basis for delineation: high number and coverage of KBAs.

Threats: infrastructure development (mostly roads), unsustainable tourism, poaching, illegal logging, habitat fragmentation.

Conservation focus: increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, Leopard reintroduction, Western Tur conservation.

² A type of stunted, deformed vegetation encountered in subarctic and subalpine tree line landscapes, shaped by continual exposure to fierce, freezing winds.

3. Central Greater Caucasus

Countries: Russian Federation, Georgia

Location: central section of the Greater Caucasus range, approx. between longitudes of Mt. Elbrus and upper Terek river basin (including both).

Central coordinates: 43° 17' 3" E; 43° 1' 8"N; **North:** 42° 49' 53" E; 43° 57' 24"N; **West:** 41° 36' 48"E; 42° 54' 55N; **East:** 44° 51' 30"E; 42° 35' 30" N; **South:** 43° 10' 7"E; 42° 34' 51"N

Maximal elevation (m above sea level): 5,642

Minimal elevation (m above sea level): 388

Total Area (km²): 21,132.7

Average length (km): 272

Average width (km): 163

KBAs (number): 14

KBAs: *Severno-Osetinsky-Tseiskiy, Alania, Kabardino-Balkarskiy, Kara-Su Sanctuary, Baksan Gorge, Prielbrusie, Gorge of the Eshkakon and Malka Rivers, Surrounding of Kislovodsk, Svaneti (1), Svaneti (2), Range Kodori, Racha, Askhi Massif, Kazbegi*

KBAs (total area, km²): 11,954.1

KBA coverage (% of CL's total area): 56.6%

Protected Areas (number): 24

Protected Areas (total area within the CL, km²): 5,130

Protected Areas coverage 1 (% of CL's total area): 24.3%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 40.4%

Areas under International Conventions: none.

Main habitats: temperate mixed forests, high mountain krumholtz, grasslands, meadows and thickets, sub-nival and nival areas.

Principal fauna species: Leopard, Eastern Tur, Northern Chamois, Brown Bear, European Lynx, various species of birds and small mammals.

Important phenomena: one of the centres of high mountain plant species origination; large areas of intact high mountain habitats.

Basis for delineation: high number and coverage of KBAs.

Threats: infrastructure development (hydro power, roads, electricity transmission lines, gas pipelines), poaching and habitat fragmentation, unsustainable tourism.

Conservation focus: establishment of new protected areas and increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, restoration of European Bison, Western Tur conservation.

4. Eastern Greater Caucasus

Countries: Russian Federation, Azerbaijan, Georgia

Location: eastern section of the Greater Caucasus range, approx. east from upper Terek river basin.

Central coordinates: 46° 46' 5" E; 42° 2' 41" N; **North:** 46° 44' 52"E; 43° 2' 38"N; **West:** 44° 18' 18"E; 42° 29' 22"N; **East:** 49° 13' 0"E; 40° 46' 42"N; **South:** 46° 58' 21"E; 41° 22' 19"N

Maximal elevation (m above sea level): 4,492

Minimal elevation (m above sea level): 355

Total Area (km²): 38,445.1

Average length (km): 451

Average width (km): 167

KBAs (number): 23

KBAs: *Melishtinskiy, Kayakentsky-Deshlagarsky, Itsari, Shalbuzdag, Laman-Kam Area, Tlyaratinskiy, Kosobsko-Kelebsky, Bezhtinskiy, Khunzakhskiy, Kezenoi-Am (Lake Eizenam) Basin, Erzi, Ingushskiy, Pshav-Khevsureti, Tusheti, Babaneuri, Eastern Caucasus, Lagodekhi, Zagatala, Ilisu-Gakh, Shahdag, Shahdag Mountain (1), Shahdag Mountain (2), Altyaghach*

KBAs (total area, km²): 9,981.7

KBA coverage (% of CL's total area): 26%

Protected Areas (number): 36

Protected Areas (total area within the CL, km²): 12,108.6

Protected Areas coverage 1 (% of CL's total area): 31.5%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 82.3%

Areas under International Conventions: none.

Main habitats: temperate broad-leaved forests, high mountain krumholtz, grasslands, meadows and thickets, sub-nival areas.

Principal fauna species: Leopard, Bezoar Goat, Eastern Tur, Northern Chamois, Red Deer, Brown Bear, European Lynx, various bird species.

Important phenomena: one of the centres of high mountain plant species origination; large areas of intact forest and high mountain habitats.

Basis for delineation: high number and coverage of KBAs.

Threats: infrastructure development (roads, hydro power), unsustainable tourism, overgrazing, poaching, illegal logging, habitat fragmentation.

Conservation focus: establishment of ecological corridors (mostly for Red Deer and Eastern Tur) and increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, restoration of European Bison range, transboundary conservation.

5. Caspian

Countries: Russian Federation, Azerbaijan

Location: along the western coast of the Caspian Sea, both in coastal and marine areas from the Talysh mountains in the south to the northern border of the Caucasus, and into Kura river flood plains within Azerbaijan.

Central coordinates: 47° 29' 55" E; 40° 13' 14" N; **North:** 47° 0' 48"E; 44° 51' 0"N; **West:** 47° 0' 44"E; 40° 45' 44"N; **East:** 50° 39' 2"E; 40° 17' 41"N; **South:** 48° 48' 38"E; 38° 51' 30"N

Maximal elevation (m above sea level): 846

Minimal elevation (m above sea level): 2

Total Area (km²): 21,835.3

Terrestrial area: 16,265.5

Marine area: 5,569.8

Average length (km): 257

Average width (km): 70

KBAs (number): 25

KBAs: *Kizlyar Bay, Tarumovsky, Argakhanskiy, Yangiyurtovskiy-Sulakskaya, Dagestanskiy (Sarykumskiy barkhan), Papas (Adji) Lake, Samurskiy, Berkubinsky, Orta Kur Akhmazy, Samur-Yalama-Gusar, Aghzibir Lakes, Absheron Archipelago and Pirallahi Bay, Gyrgyzgol Lake, Factory Shelf, Alat Bay-Baku Archipelago (1-6), Shirvan, Kura Delta, Gizilaghach, Araz-Bahramtepe, Ag-Gol-Sarisu*

KBAs (total area, km²): 11,954.1

KBA coverage (% of CL's total area): 34.5%

Protected Areas (number): 20

Protected Areas (total area km² within the CL): 3,698.6

Protected Areas coverage 1 (% of CL's total area): 16.9%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 48.5%

Areas under International Conventions: two Ramsar Sites (Ghizil-Agaj, Agh-Ghol, Azerbaijan).

Main habitats: coastal wetlands, river and marine habitats, lakes, semideserts, deserts and flood plains.

Principal fauna species: globally threatened species of sturgeon, various bird species, Caspian Seal and Goitered Gazelle.

Important phenomena: the largest flyway of migrating birds in the Caucasus, around 20 KBAs have important congregations of waterfowl, and some KBAs are critical spawning areas for sturgeon populations; globally important population of Goitered Gazelle containing around 10% of the total number of mature individuals (Shirvan National Park).

Basis for delineation: importance for migratory waterfowl and sturgeon group of species, its significant number of IBAs, key freshwater areas and KBAs.

Threats: infrastructure development (oil & gas, roads, tourism), illegal fishing and bird poaching, illegal logging, habitat fragmentation.

Conservation focus: increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, restoration of historic range of Gazelles via translocation from Shirvan National park.

6. Kolkheti

Countries: Georgia

Location: between the Western Greater, Western Lesser Caucasus and Likhi ridge (Landscapes), including deltas of Rioni and Chorokhi rivers, and marine section along to the Black Sea coast from Kolkheti Lowlands to Georgia's border with Turkey.

Central coordinates: 42° 6' 20" E; 42° 10' 3" N; **North:** 41° 31' 46"E; 42° 42' 21"N; **West:** 41° 30' 29"E; 42° 12' 9"N; **East:** 42° 44' 21"E; 42° 9' 52"N; **South:** 41° 32' 53"E; 41° 31' 24"N

Maximal elevation (m above sea level): 448

Minimal elevation (m above sea level): 1

Total Area (km²): 1,969.7

Terrestrial area: 1,448.9

Marine area: 520.9

Average length (km): 143

Average width (km): 103

KBAs (number): 8

KBAs: *Lake Bebesiri, Kolkheti (Aquatory), Enguri River, Khobi River, Kolkheti, Rioni River, Supsa River, Chorokhi-Sarpi*

KBAs (total area, km²): 1,405.6

KBA coverage (% of CL's total area): 71.4%

Protected Areas (number): 2

Protected Areas (total area km² within the CL): 446

Protected Areas coverage 1 (% of CL's total area): 22.6%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 31.7%

Areas under International Conventions: two Ramsar Sites (Wetlands of Central Kolkheti and Ispani Mires, Georgia).

Main habitats: swamp alder forests, wetlands, river and marine habitats.

Principal fauna species: various bird species, sturgeon species.

Important phenomena: evolutionary importance of lowland endemic Colchic forests; important wetland habitats (percolating bogs); important stopover site for migrating birds with congregations of waterfowl; the last spawning grounds of sturgeon in the eastern Black Sea (Rioni river).

Basis for delineation: importance for migratory waterfowl and sturgeon group of species, its significant number of IBAs, key freshwater areas and KBAs.

Threats: coastal infrastructure development (sea ports, oil terminals, roads), mass tourism, illegal fishing and bird poaching, habitat degradation due to melioration.

Conservation focus: establishment of new protected areas (especially freshwater and marine), increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, conservation of the last spawning grounds of sturgeon in the eastern Black Sea.

7. Western Lesser Caucasus

Countries: Georgia, Turkey

Location: north-western and western parts of Lesser Caucasus mountain chain (Meskheta range, Georgia), Doğu Karadeniz mountains (Turkey) and several other associated mountain ranges, extends along the Black Sea from north-eastern Turkey to south-western Georgia, ending in central Georgia.

Central coordinates: 40° 40' 56" E; 40° 43' 41" N; **North:** 42° 44' 7"E; 41° 59' 46"N; **West:** 37° 37' 10"E; 40° 45' 29"N; **East:** 43° 48' 33"E; 41° 45' 8"N; **South:** 39° 50' 37"E; 39° 58' 35"N

Maximal elevation (m above sea level): 3,937

Minimal elevation (m above sea level): 49

Total Area (km²): 33,236.8

Marine area: 257.2

Terrestrial area: 32,979.6

Average length (km): 546

Average width (km): 170

KBAs (number): 24

KBAs: *Batumi 1, Batumi 2, Machakhela, Shavsheti Range (1), Shavsheti Range (2), Mtirala-Kintrishi, Bakhmaro, Goderdzi pass, Borjomi-Kharagauli, Nedzvi, Trialeti Range, Ktsia-Tabatskuri, Tetrobi, Giresun and Ordu Coast, Giresun Mountains, Zigana Mountain, Karadere, Ikizdere and Soganli Mountain, Upper Chorukh Valley, North Kackars, South Kackars, Hatila Valley, Hopa, Karcal Mountains*

KBAs (total area, km²): 16,708.6

KBA coverage (% of CL's total area): 50.3%

Protected Areas (number): 35

Protected Areas (total area within the CL, km²): 3,393.8

Protected Areas coverage 1 (% of CL's total area): 10.2%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 20.2%

Areas under International Conventions: one Biosphere Reserve (Camili, Turkey)

Main habitats: mixed relict Colchic forests, temperate broad-leaved forests, high mountain krumholtz, grasslands, meadows and thickets.

Principal fauna species: relict and endemic Caucasian Salamander, Red Deer, Northern Chamois, Brown Bear, European Lynx, various raptor species.

Important phenomena: the highest level of mean annual precipitation in the Caucasus (up to 4,500 mm); evolutionary phenomena of Colchic Forest also classified as Temperate Rainforest: contains the highest levels of woody plant diversity in the region with a large percentage of endemic and relic species; one of the most important sites of raptor's autumn migration (so called Batumi Bottleneck, at the Black Sea coast).

Basis for delineation: importance of Colchic forest habitats, its significant number of IBAs and KBAs.

Threats: infrastructure development (hydropower), tourism, poaching, illegal logging, habitat fragmentation.

Conservation focus: establishment of ecological corridors (mostly for Caucasian Red Deer, Chamois and Brown Bear), increasing connectivity, effectiveness of PAs, strengthening the law enforcement and monitoring capacity, transboundary conservation.

8. South Caucasus Uplands

Countries: Armenia, Georgia, Turkey.

Location: in the northern part of the Southern Uplands on the border of Armenia, Georgia and Turkey.

Central coordinates: 43° 27' 11" E; 41° 2' 55" N; **North:** 43° 54' 50"E; 41° 32' 8"N; **West:** 42° 33' 29"E; 41° 30' 19"N; **East:** 44° 19' 17"E; 41° 12' 45"N; **South:** 43° 25' 40"E; 40° 48' 60"N

Maximal elevation (m above sea level): 3,008

Minimal elevation (m above sea level): 735

Total Area (km²): 5,648.3

Average length (km): 165

Average width (km): 83

KBAs (number): 15

KBAs: *Meskheta, Kartsakhi-Sulda Mire, Javakheti, Khanchali Lake, Bugdasheni Lake, Madatapa Lake, Saghamo Lake, Paravani Lake, Javakheti Range, Lake Arpi, Mount Achkar, Tashir, Posof Forest, Aktas Lake, Cildir Lake*

KBAs (total area, km²): 3,263.7

KBA coverage (% of CL's total area): 57.8%

Protected Areas (number): 10

Protected Areas (total area within the CL, km²): 1,274.6

Protected Areas coverage 1 (% of CL's total area): 22.6%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 39.1%

Areas under International Conventions: one Ramsar Site (Lake Arpi, Armenia).

Main habitats: high mountain wetlands with lakes of volcanic origin, grasslands, meadows and steppes, remnants of pine forests and kromholtz.

Principal fauna species: various bird species.

Important phenomena: one of the three important migratory corridors for birds in the Caucasus with sites of significant congregations of waterfowl.

Basis for delineation: importance for migratory birds, its number of IBAs and KBAs.

Threats: infrastructure development (hydropower, roads), unsustainable water management, poaching of birds and overgrazing, habitat fragmentation.

Conservation focus: increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, transboundary conservation.

9. Sarikamish-Maku

Countries: Turkey, Iran, Armenia

Location: southern part of the Southern Uplands on the border of Turkey, Iran and Armenia, along the southern border of the Caucasus.

Central coordinates: 43° 3' 38" E; 40° 8' 31" N; **North:** 43° 29' 56"E; 40° 10' 26"N; **West:** 41° 10' 25"E; 39° 37' 11"N; **East:** 44° 58' 48"E; 39° 26' 57"N; **South:** 44° 26' 4"E; 38° 22' 41"N

Maximal elevation (m above sea level): 5,165

Minimal elevation (m above sea level): 784

Total Area (km²): 20,904.8

Average length (km): 345

Average width (km): 178

KBAs (number): 12

KBAs: *Palandoken Mountain, Bingol Mountains, Karasu Plain, Aras Valley, Igdir Plain, Agri Mountain, Dogubeyazit Marshes, Tendurek Mountain, Eastern Van Mountains, Maku and Iran West Border, Maku, Agh-Gol*

KBAs (total area, km²): 8,774.8

KBA coverage (% of CL's total area): 42%

Protected Areas (number): 4

Protected Areas (total area km² within the CL): 1,333.8

Protected Areas coverage 1 (% of CL's total area): 6.4%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 13.1%

Areas under International Conventions: no.

Main habitats: mountain steppes, thornbush communities and scattered wetlands.

Principal fauna species: Bezoar Goat, Mouflon, Leopard, various bird and reptile species.

Important phenomena: diversity of plant species and vegetation at the Mt. Ararat (Ağrı Dağı), the highest peak in southern Caucasus (5,137 m), including small growth of birch – the most southern border of birch kromholtz in the Caucasus; bird diversity, including congregations, mostly along the Ara(k)s river.

Basis for delineation: its significant number of IBAs and KBAs.

Threats: overgrazing, poaching.

Conservation focus: establishment of protected areas, effectiveness of PAs, strengthening the law enforcement and monitoring capacity, Leopard survey.

10. Eastern Lesser Caucasus

Countries: Armenia, Azerbaijan (Nakhchivan Region)

Location: in the eastern and south-eastern parts of the Lesser Caucasus Mountain Chain, from northern border of Armenia with Georgia to Armenia's and Nakhchivan Region's (Azerbaijan) borders with Iran.

Central coordinates: 46° 2' 54" E; 39° 11' 39" N; **North:** 46° 44' 52"E; 43° 2' 38"N; **West:** 44° 18' 18"E; 42° 29' 22"N; **East:** 49° 13' 0"E; 40° 46' 42"N; **South:** 46° 58' 21"E; 41° 22' 19"N

Maximal elevation (m above sea level): 3,550

Minimal elevation (m above sea level): 815

Total Area (km²): 15,347.5

Average length (km): 323

Average width (km): 117

KBAs (number): 14

KBAs: *Zangezur-Darasham, Aras Reservoir, Sadarak, Northeast, Sevan Ridge, Khosrov Forest, Goravan Sands, Urts Range, Gndasar, Arpa, Jermuk-Eghegis, Meghri, Tatev, Khndzoresk*

KBAs (total area, km²): 9,607.9

KBA coverage (% of CL's total area): 62.6

Protected Areas (number): 34

Protected Areas (total area within the CL, km²): 3,542

Protected Areas coverage 1 (% of CL's total area): 23.1%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 36.2%

Areas under International Conventions: two Ramsar sites (Lake Sevan and Khor Virap marsh); one European Diploma Protected Area (Khosrov Forest Reserve, Armenia).

Main habitats: temperate broad-leaved forests, open Juniper woodlands, mountain steppes and thornbush communities, high mountain grasslands.

Principal fauna species: Leopard, Bezoar Goat, Mouflon, Brown Bear, various reptile species.

Important phenomena: one of the centres of wild relatives of cultivated plants; the most important area for Leopard conservation in the Caucasus (southern part of CL).

Basis for delineation: its significant number of KBAs (with coverage more than 60% of CL's total area).

Threats: infrastructure development (hydropower, roads), poaching (except Nakhchivan where poaching ban enacts since 2001), overgrazing and habitat fragmentation.

Conservation focus: establishment of ecological corridors (mostly for Leopard and its prey species) and increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, Leopard and its prey species conservation, Red Deer reintroduction.

11. Iori-Mingachevir

Countries: Azerbaijan, Georgia

Location: central part of Transcaucasian Depression, Iori-Ajinour plateau, south from Eastern Greater Caucasus on the border between Azerbaijan and Georgia.

Central coordinates: 46° 30' 20" E; 41° 8' 22" N; **North:** 45° 33' 17"E; 42° 1' 19"N; **West:** 44° 59' 7"E; 41° 32' 19"N; **East:** 48° 0' 45"E; 40° 38' 47"N; **South:** 46° 29' 48"E; 40° 49' 4"N

Maximal elevation (m above sea level): 990

Minimal elevation (m above sea level): 82

Total Area (km²): 10,728.6

Average length (km): 273

Average width (km): 88

KBAs (number): 16

KBAs: *Alazani Valley, Chachuna-Vashlovani, Iori-Korugi, Iori Plateau, Jandari Lake, Gardabani, Garayazi, Jandar Lake, Agstapha, Shamkir, Turyanchay, Korchay, Qabirri-Mingachevir, Ajinohur, Ilisu (Akhar-Bakhar), Ganikh Valley*

KBAs (total area, km²): 5,608.7

KBA coverage (% of CL's total area): 52.3%

Protected Areas (number): 17

Protected Areas (total area within the CL, km²): 1,526.2

Protected Areas coverage 1 (% of CL's total area): 14.2%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 27.2%

Areas under International Conventions: one European Diploma Protected Area (Vashlovani National Park, Georgia).

Main habitats: dry open Pistachio-Juniper woodlands, steppes, semideserts and flood plain forests.

Principal fauna species: Goitered Gazelle, Brown Bear, European Lynx, various bird and reptile species.

Important phenomena: intact arid plateau and foothill habitats with pistachio-juniper woodlands; significant portion of the floodplain forests in the region; sites with bird congregations.

Basis for delineation: its significant number of KBAs with more than 50% coverage.

Threats: overgrazing, poaching, conversion of lands into agriculture.

Conservation focus: establishment of protected areas, ecological corridors (mostly for Gazelle) and increasing connectivity, effectiveness of PAs, strengthening the law enforcement and monitoring capacity, restoration of historic range of Gazelles via translocation from Shirvan National park, transboundary conservation.

12. Arasbaran

Countries: Iran

Location: extreme north-western part of Iran at the junction of the Southern Uplands and south-eastern part of Lesser Caucasus in the west and Talysh-Alborz Mountains in the east, along the Ara(k)s river and border with Azerbaijan and Armenia in the north.

Central coordinates: 47° 30' 59" E; 39° 7' 32" N; **North:** 47° 23' 25"E; 39° 28' 7"N; **West:** 45° 5' 54"E; 38° 55' 21"N; **East:** 48° 22' 7"E; 39° 22' 53"N; **South:** 47° 10' 32"E; 38° 40' 8"N

Maximal elevation (m above sea level): 3,358

Minimal elevation (m above sea level): 24

Total Area (km²): 13,643.1

Average length (km): 292

Average width (km): 103

KBAs (number): 5

KBAs: *Aras Dam Lake, Dizmar-Arasbaran, Kiamaky-Kantal, Marakan, Parsabad*

KBAs (total area, km²): 6,650.9

KBA coverage (% of CL's total area): 48.7%

Protected Areas (number): 6

Protected Areas (total area km² within the CL): 3,845.8

Protected Areas coverage 1 (% of CL's total area): 28.2%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 52.5%

Areas under International Conventions: one Biosphere Reserve (Arasbaran).

Main habitats: remnants of temperate broad-leaved forests, steppes and wetlands (Ara(k)s river watershed).

Principal fauna species: Leopard, Bezoar Goat, Mouflon, various bird and reptile species.

Important phenomena: one of the most important areas for Leopard conservation in the region; bird congregations; the most southern Caucasian temperate forests.

Basis for delineation: its significant number of KBAs with almost 50% coverage.

Threats: overgrazing, poaching, dam and road construction.

Conservation focus: increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, restoration of Caucasian Red Deer.

13. Hyrcan

Countries: Iran, Azerbaijan

Location: Talysh Mountains and western part of Alborz Mountains, along with a section of the Caspian coast.

Central coordinates: 49° 43' 6" E; 37° 5' 19" N; **North:** 48° 23' 41"E; 39° 10' 26"N; **West:** 48° 32' 47"E; 37° 58' 21"N; **East:** 51° 27' 45"E; 36° 40' 32"N; **South:** 49° 52' 38"E; 36° 47' 14"N

Max. elevation (m above sea level): 4,805

Min. elevation (m above sea level): -19

Total Area (km²): 18,676.6

Average length (km): 410

Average width (km): 129

KBAs (number): 8

KBAs: *Hyrkan Forests, Zuwand, Lavandvil, Lisar, Anzali Lagoon, Gashtroodkhan, Sepirud River and Bujagh, Amirkelayeh*

KBAs (total area, km²): 5,957.4

KBA coverage (% of CL's total area): 31.9%

Protected Areas (number): 17

Protected Areas (total area within the CL, km²): 2,031.6

Protected Areas coverage 1 (% of CL's total area): 10.9%

Protected Areas coverage 2 (% of total area of KBAs within the CL): 23.6%

Areas under International Conventions: Hyrcanian Forests (within Iranian part) was recently inscribed on World Heritage list; three Ramsar Sites (Iran).

Main habitats: Hyrcanian refugial broad-leaved forests, temperate broad-leaved forests and woodlands, high mountain steppes and grasslands, and partly coastal wetlands.

Principal fauna species: Leopard, Brown Bear, various bird species, sturgeon species.

Important phenomena: evolutionary phenomena of Hyrcanian forests, also classified as temperate rainforests; some coastal wetlands - important wintering grounds for endangered bird species.

Basis for delineation: importance of Hyrcanian forests and number of IBAs and KBAs.

Threats: unsustainable logging, poaching and partly overfishing of sturgeon species.

Conservation focus: establishment of new protected areas, increasing connectivity, effectiveness of PAs, strengthening law enforcement and monitoring capacity, Leopard conservation.

BRIDGING LANDSCAPES

A. Likhi

Countries: Georgia

Location: water divider ridge between the Black and Caspian Seas' basins, connects the Greater and Lesser Caucasus Mountains in the western part of the Caucasus.

Central coordinates: 43° 36' 26" E; 42° 13' 11" N; **North:** 43° 40' 23"E; 42° 31' 58"N; **West:** 43° 31' 2"E; 42° 15' 42"N; **East:** 43° 56' 16"E; 42° 18' 38"N; **South:** 43° 15' 46"E; 41° 56' 32"N

Maximal elevation (m above sea level): 2,470

Minimal elevation (m above sea level): 759

Total Area (km²): 1,031.8

Average length (km): 82

Average width (km): 33

KBAs (number): 0

Protected Areas (number): 0

Areas under International Conventions: none.

Main habitats: Colchic and temperate mixed forests.

Principal fauna species: Brown Bear, European Lynx.

Important phenomena: only natural corridor between Greater and Lesser Caucasus; eastern closing ridge of Colchic refugia.

Basis for delineation: important natural corridor function.

Threats: illegal harvesting of fuelwood, poaching.

Conservation focus: establishment of protection regime.

B. Trialeti-Gombori

Countries: Georgia

Location: central part of the Caucasus, mostly Trialeti and Gombori ridges between Western Lesser Caucasus and Iori-Mingachevir Conservation Landscapes.

Central coordinates: 44° 0' 25" E; 41° 51' 7" N; **North:** 43° 58' 27"E; 41° 57' 31"N; **West:** 43° 39' 53"E; 41° 49' 5"N; **East:** 45° 29' 36"E; 41° 44' 6"N; **South:** 44° 29' 9"E; 41° 45' 28"N

Maximal elevation (m above sea level): 2,757

Minimal elevation (m above sea level): 520

Total Area (km²): 1,972.4

Average length (km): 167

Average width (km): 31

KBAs (number): 1

KBAs: *Tbilisi National Park*

KBAs (total area, km²): 210.3

KBA coverage (% of BL's total area): 10.7%

Protected Areas (number): 2

Protected Areas (total area within the BL, km²): 220.5

Protected Areas coverage 1 (% of BL's total area): 11.2%

Protected Areas coverage 2 (% of total area of KBAs within the BL): 100%

Areas under International Conventions: none.

Main habitats: temperate broad-leaved and pine forests.

Principal fauna species: Brown Bear.

Important phenomena: Tbilisi National Park is considered as the most eastern border of distribution of some Colchic relict species.

Basis for delineation: potential ecological corridor function of the area.

Threats: illegal harvesting of fuelwood, poaching.

Conservation focus: establishment of protected areas and ecological corridors.

C. Algeti-Loqi

Countries: Georgia

Location: south from central part of Trialeti ridge to border with Armenia covering southern wings of Trialeti and northern slopes of Loqi mountain ridge, connects Trialeti-Gombori BL (and trough it Western Lesser Caucasus) with Eastern Greater Caucasus Conservation Landscape.

Central coordinates: 44° 25' 55" E; 41° 18' 18" N; **North:** 44° 29' 9" E; 41° 45' 28"N; **West:** 44° 8' 49"E; 41° 30' 58"N; **East:** 44° 28' 0"E; 41° 29' 14"N; **South:** 44° 32' 47"E; 41° 11' 29"N

Maximal elevation (m above sea level): 2,122

Minimal elevation (m above sea level): 1,088

Total Area (km²): 1,461.2

Average length (km): 65

Average width (km): 45

KBAs (number): 1

KBAs: *Bedeni*

KBAs (total area, km²): 139.8

KBA coverage (% of BL's total area): 9.6%

Protected Areas (number): 2

Protected Areas (total area within the BL, km²): 10.5

Protected Areas coverage 1 (% of BL's total area): 0.7%

Protected Areas coverage 2 (% of total area of KBAs within the BL): 0

Areas under International Conventions: none.

Main habitats: temperate mixed forests, secondary scrublands, steppes and grasslands

Principal fauna species: Brown Bear.

Important phenomena: none.

Basis for delineation: its corridor function.

Threats: illegal harvesting of fuelwood, poaching, overgrazing.

Conservation focus: establishment of protected areas and ecological corridors.

D. Sarikamish-Posof

Countries: Turkey

Location: the largest BL, mountain ridges and plateaus within Southern Uplands connecting Western Lesser Caucasus and South Caucasus Uplands CLs with Sarikamish-Maku CL, valleys of Chorukh (Choroki) and Oltu rivers and between upper Kura river and upper Ara(k)s river

Central coordinates: 42° 2' 47" E; 40° 59' 17" N; **North:** 42° 30' 9"E; 41° 26' 29"N; **West:** 41° 44' 54"E; 40° 45' 54"N; **East:** 43° 2' 1"E; 40° 48' 43"N; **South:** 42° 35' 37"E; 40° 12' 9"N

Maximal elevation (m above sea level): 3,165

Minimal elevation (m above sea level): 753

Total Area (km²): 6,955.2

Average length (km): 140

Average width (km): 102

KBAs (number): 3

KBAs: *Yalnizcam Mountains, Allahuekber Mountains, Sarikamis Forests*

KBAs (total area, km²): 5,290

KBA coverage (% of BL's total area): 76.1%

Protected Areas (number): 5

Protected Areas (total area within the BL, km²): 262.1

Protected Areas coverage 1 (% of BL's total area): 3.8%

Protected Areas coverage 2 (% of total area of KBAs within the BL): 5%

Areas under International Conventions: none.

Main habitats: pine and temperate broad-leaved and mixed forests, fragments of Mediterranean scrublands, mountain steppes and grasslands, partly high mountain wetlands.

Principal fauna species: Bezoar Goat, Northern Chamois, Brown Bear, European Lynx, Caucasian Salamander, various bird species.

Important phenomena: the southernmost intact pine forests in the region (Sarikamish National Park).

Basis delineation: importance for migratory waterfowl, its significant number of IBAs and KBAs.

Threats: infrastructure development (oil & gas, roads, tourism), illegal fishing and bird poaching, illegal logging, habitat fragmentation.

Conservation focus: establishment of protected areas and ecological corridors.

E. Aras

Countries: Turkey

Location: mountainous area from Southern Caucasus Uplands to Iğdir Plain, Arpachay (Akhurian) river valley on the border between Turkey and Armenia, connects South Caucasus Uplands and Sarikamish-Maku Conservation Landscapes.

Central coordinates: 43° 28' 53" E; 40° 33' 58" N; **North:** 43° 33' 31"E; 40° 59' 41"N; **West:** 43°13' 16"E; 40° 32' 50"N; **East:** 43° 44' 53"E; 40° 40' 36"N; **South:** 43° 29' 56"E; 40° 10' 27"N;

Maximal elevation (m above sea level): 2,695

Minimal elevation (m above sea level): 1,239

Total Area (km²): 2,523.3

Average length (km): 93

Average width (km): 48

KBAs (number): 2

KBAs: *Kuyucuk Lake, Kars Ovasi*

KBAs (total area, km²): 298.9

KBA coverage (% of BL's total area): 11.8%

Protected Areas (number): 3

Protected Areas (total area within the BL, km²): 96.7

Protected Areas coverage 1 (% of BL's total area): 3.8%

Protected Areas coverage 2 (% of total area of KBAs within the BL): 32.4%

Areas under International Conventions: one Ramsar Site.

Main habitats: mountain steppes and thornbush communities, grasslands, riverside and mountain wetlands, lakes/reservoirs.

Principal fauna species: Bezoar Goat, Brown Bear, various bird species.

Important phenomena: important stopover sites of migrating birds (e.g. Lake Kuyucuk – Ramsar site); bird congregations; regionally important wildlife migration.

Basis for delineation: its ecological corridor function and importance for migratory waterfowl.

Threats: overgrazing, poaching.

Conservation focus: establishment of protected areas and ecological corridors.

F. Bazum

Countries: Armenia

Location: Bazum mountain ridge in northern Armenia connecting South Caucasus Uplands and East Lesser Caucasus Conservation Landscapes.

Central coordinates: 44° 19' 0" E; 40° 56' 58" N; **North:** 44° 20' 45"E; 41° 0' 29"N; **West:** 44° 4' 57"E; 40° 59' 30"N; **East:** 44° 35' 33"E; 40° 53' 1"N; **South:** 44° 14' 53"E; 40° 53' 28"N

Maximal elevation (m above sea level): 2,992

Minimal elevation (m above sea level): 1,400

Total Area (km²): 403.9

Average length (km): 45

Average width (km): 15

KBAs (number): 0

Protected Areas (number): 1

Protected Areas (total area within the BL, km²): 26.5

Protected Areas coverage 1 (% of BL's total area): 6.6%

Protected Areas coverage 2 (% of total area of KBAs within the BL): 0

Areas under International Conventions: none.

Main habitats: mountain steppes and high mountain grasslands, partly temperate broad-leaved forests.

Principal fauna species: Brown Bear, various reptile diversity.

Important phenomena: none.

Basis for delineation: its corridor function.

Threats: poaching, illegal fuelwood harvesting.

Conservation focus: establishment of protected areas and ecological corridors.

G. Aragats

Countries: Armenia

Location: central part of Armenia, serves as bridge between Eastern Lesser Caucasus and Sarikamish-Maku Conservation Landscapes; within this BL is located Mt. Aragats, the highest peak in Armenia.

Central coordinates: 43° 55' 48" E; 40° 18' 50" N; **North:** 44° 12' 10"E; 40° 34' 52"N; **West:** 43°41' 28"E; 40° 21' 25"N; **East:** 44° 32' 25"E; 40° 24' 32"N; **South:** 43° 52' 53"E; 40° 2' 37"N

Maximal elevation (m above sea level): 4,090

Minimal elevation (m above sea level): 962

Total Area (km²): 1,179.3

Average length (km): 83

Average width (km): 40

KBAs (number): 3

KBAs: *Mount Ara, Aragats, Armavir (partially)*

KBAs (total area, km²): 728.1

KBA coverage (% of CL's total area): 61.7%

Protected Areas (number): 1

Protected Areas (total area within the BL, km²): 3.0

Protected Areas coverage 1 (% of BL's total area): 0.3%

Protected Areas coverage 2 (% of total area of KBAs within the BL): 0.4%

Areas under International Conventions: none.

Main habitats: mountain steppes and high mountain grasslands, partly wetlands.

Principal fauna species: various bird and reptile species.

Important phenomena: none.

Basis for delineation: its corridor function.

Threats: poaching.

Conservation focus: establishment of protected areas and ecological corridors.

Annex 5: Map of Key Biodiversity Areas, and Conservation and Bridging Landscapes



Key Biodiversity Areas:

- | | | |
|---|---|------------------------------------|
| Russia | 76. Batumi 1 | 155. Hyrcan Forests |
| 1. Abrausky Peninsula | 77. Chorokhi-Sarpi | 156. Zuvand |
| 2. Tamanskiy | 78. Batumi 2 | 157. Mahmud-Chala Lake |
| 3. Delta Kuban | 79. Machakhela | 158. Araz-Bahramtepe |
| 4. Krimsky | 80. Shavsheti Range (2) | 159. Ag-Gol-Sarisu |
| 5. Primorsko-Akhtarsk Salt Lakes | 81. Mtirala-Kintrishi | 160. Zangezur-Darasham |
| 6. Lower reaches of the Beisug and Chelbas Rivers | 82. Bakhmaro | 161. Aras Reservoir |
| 7. Lower Ei | 83. Goderdzi Pass | 162. Sadarak |
| 8. Don Delta | 84. Shavsheti Range (1) | Armenia |
| 9. Novoberezenskiy | 85. Borjomi-Kharagauli | 163. Lake Arpi |
| 10. Sredne-Labinskiy | 86. Nedzvi | 164. Mount Achkasar |
| 11. Novotroitskiy | 87. Trialeti Range | 165. Tashir |
| 12. Veselovskoye Reservoir | 88. Ktsia-Tabatskuri | 166. Jajur |
| 13. Manych-Gudilo Lake | 89. Tetrobi | 167. Akhuryan Reservoir |
| 14. Dadynskiye Lake | 90. Meskheti | 168. Armavir |
| 15. Irgakliskaya Forest Area | 91. Kartsakhi-Sulda Mire | 169. Aragats |
| 16. Kizlyar Bay | 92. Javakheti | 170. Mount Ara |
| 17. Tarumovsky | 93. Khanchali Lake | 171. Northeast |
| 18. Argakhanskiy | 94. Bugdasheni Lake | 172. Sevan Ridge |
| 19. Yangiyurtovskiy-Sulakskaya | 95. Madatapa Lake | 173. Lake Sevan |
| 20. Dagestanskiy (Sarykumskiy Barkhan) | 96. Saghamo Lake | 174. Khosrov Forest |
| 21. Melishtinskiy | 97. Paravani Lake | 175. Khor Virap |
| 22. Kayakentsky-Deshlagarsky | 98. Javakheti Range | 176. Armash Fish Ponds |
| 23. Papas (Adji) Lake | 99. Bedeni | 177. Goravan Sands |
| 24. Itsari | 100. Kvernaki Ridge | 178. Urts Range |
| 25. Samurskiy | 101. Tbilisi National Park | 179. Gndasar |
| 26. Berkubinskiy | 102. Kazbegi | 180. Arpa |
| 27. Shalbuzdag | 103. Pshav-Khevsureti | 181. Jermuk-Eghegis |
| 28. Laman-Kam Area | 104. Tusheti | 182. Meghri |
| 29. Tlyaratinskiy | 105. Babaneuri | 183. Tatev |
| 30. Kosobsko-Kelebsky | 106. Eastern Caucasus | 184. Khndzoresk |
| 31. Bezhtinskiy | 107. Lagodekhi | Turkey |
| 32. Khunzakhskiy | 108. Alazani Valley | 185. Giresun and Ordu Coast |
| 33. Kezenoi-Am (Lake Eizenam) Basin | 109. Artsivi Gorge | 186. Giresun Mountains |
| 34. Erzi | 110. Chachuna-Vashlovani | 187. Zigana Mountain |
| 35. Ingushskiy | 111. Iori-Korugi | 188. Karadere |
| 36. Severno-Osetinskiy-Tseiskiy | 112. Iori Plateau | 189. Ikizdere and Soganli Mountain |
| 37. Alania | 113. Jandari Lake | 190. Upper Chorukh Valley |
| 38. Kabardino-Balkarskiy | 114. Gardabani | 191. North Kackars |
| 39. Kara-Su Sanctuary | Azerbaijan | 192. South Kackars |
| 40. Baksan Gorge | 115. Garayazi | 193. Hatila Valley |
| 41. Prielbrusie | 116. Jandar Lake | 194. Hopa |
| 42. Gorge of the Eshkakon and Malka Rivers | 117. Agstapha | 195. Karcal Mountains |
| 43. Surrounding of Kislovodsk | 118. Shamkir | 196. Yalnizcam Mountains |
| 44. Upstreams of the Podkumok and Kuma Rivers | 119. Shortepe | 197. Posof Forest |
| 45. Dautskiy | 120. Gyuljila | 198. Ardahan Plain and Forest |
| 46. Teberdinski-Marukhskiy | 121. Goy-Gol | 199. Aktas Lake |
| 47. Upstreams of the Urup River | 122. Lachin | 200. Cildir Lake |
| 48. Akhmet-Skala Ridge | 123. Gubadli | 201. Kuyucuk Lake |
| 49. Damkhurtskiy | 124. Dashalty | 202. Kars Ovasi |
| 50. Psebay | 125. Orta Kur Akhmazy | 203. Allahuekber Mountains |
| 51. Gorge of the White River | 126. Turyanchay | 204. Sarikamish Forests |
| 52. Caucasian | 127. Korchay | 205. Olur-Oltu Steppe |
| 53. Northern Black Sea Region | 128. Qabirri-Mingachevir | 206. Tortum Basin |
| 54. Sochinskiy | 129. Ajinohur | 207. Kop Mountain |
| Georgia | 130. Iliu (Akhar-Bakhar) | 208. Palandoken Mountain |
| 55. Arabika | 131. Sheki | 209. Bingol Mountains |
| 56. Ritsa | 132. Ganikh Valley | 210. Karasu Plain |
| 57. Bzipi | 133. Zagatala | 211. Aras Valley |
| 58. Range Bzipi | 134. Iliu-Gakh | 212. Igdri Plain |
| 59. Bichvinta-Miusera | 135. Shahdag | 213. Agri Mountain |
| 60. Pskhu-Gumista | 136. Shahdag Mountain (1) | 214. Dogubeyazit Marshes |
| 61. Abkhazia | 137. Shahdag Mountain (2) | 215. Tendurek Mountain |
| 62. Svaneti (2) | 138. Samur-Yalama-Gusar | 216. Eastern Van Mountains |
| 63. Range Kodori | 139. Aghzibir Lakes | Iran |
| 64. Lake Bebesiri | 140. Altyaghach | 217. Maku and Iran West Border |
| 65. Svaneti (1) | 141. Garghabazar and Gush-Gaya Mountains | 218. Maku |
| 66. Racha | 142. Absheron Archipelago and Pirallahi Bay | 219. Agh-Gol |
| 67. Askhi Massif | 143. Gyrmzygol Lake | 220. Aras Dam Lake |
| 68. Khvamli | 144. Factory Shelf | 221. Marakan |
| 69. Sataplia | 145. Gobustan | 222. Kiamaky-Kantal |
| 70. Kolkheti (Aquatory) | 146. Alat Bay-Baku Archipelago (1) | 223. Dizmar-Arasbaran |
| 71. Enguri River | 147. Alat Bay-Baku Archipelago (2) | 224. Parsabad |
| 72. Khobi River | 148. Alat Bay-Baku Archipelago (3) | 225. Mountain Sahand-Sabalan |
| 73. Kolkheti | 149. Alat Bay-Baku Archipelago (4) | 226. Lavandvil |
| 74. Rioni River | 150. Alat Bay-Baku Archipelago (5) | 227. Lisar |
| 75. Supsa River | 151. Alat Bay-Baku Archipelago (6) | 228. Anzali Lagoon |
| | 152. Shirvan | 229. Gashtroodkhan |
| | 153. Kura Delta | 230. Sepirud River and Bujagh |
| | 154. Gizilaghach | 231. Amirkelayeh |

Conservation Landscapes:

- | | |
|------------------------------|------------------------------|
| 1 - Kuma-Manych | 8 - South Caucasus Uplands |
| 2 - Western Greater Caucasus | 9 - Sarikamish-Maku |
| 3 - Central Greater Caucasus | 10 - Eastern Lesser Caucasus |
| 4 - Eastern Greater Caucasus | 11 - Iori-Mingachevir |
| 5 - Caspian | 12 - Arasbaran |
| 6 - Kolkheti | 13 - Hyrcan |
| 7 - Western Lesser Caucasus | |

Bridging Landscapes:

- | |
|----------------------|
| A - Likhi |
| B - Trialeti-Gombori |
| C - Algeti-Loqi |
| D - Sarikamish-Posof |
| E - Aras |
| F - Bazum |
| G - Aragats |

