

HIGH HERPETOLOGICAL DIVERSITY IN THE CAUCASIAN ECOREGION: AN ANNOTATED LIST OF SPECIES INCLUDING COMMENTS ON BIOGEOGRAPHY AND CONSERVATION

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A new annotated list of amphibian and reptile species in the Caucasian ecoregion is proposed, including comments on their biogeography and conservation. The updated list includes 128 species of amphibians and reptiles. 18 amphibian species belonging to two orders are known there; half of them (nine species) being endemic. The Caucasian ecoregion is inhabited by 110 reptile species: 5 species being turtles and tortoises, and 59 and 46 species representing lizards and snakes, respectively. Among them, 32 species (44 subspecies) are endemic to the ecoregion.

Keywords: amphibians, reptiles, diversity, endemism, Caucasus

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The Caucasus has always been one of the most alluring places for herpetologists. In spite of a long-term history of herpetological research in this unique region, many issues remain unclear ranging from taxonomic diversity, different views on taxonomic position and intraspecific structure of herps inhabiting the Caucasus.

Due to its geographical location, properties of landscapes and climates, and geological history of the formation the Caucasus Isthmus fauna has been characterized by exceptional high diversity of its flora and fauna. Recognition of this fact and obvious evidences of biodiversity loss have driven the Critical Ecosystem Partnership Fund (CEPF), an organization dedicated to promotion of global conservation in biodiversity-rich areas, to designate the Caucasus ecoregion in 2004. According to World Wide Fund for Nature (WWF), this region is among the world's 200 ecoregions containing biodiversity of global importance. As to CEPF (www.panda.org/caucasus/cepf), the Caucasus belongs to 25 biodiversity hotspots that are biologically most diverse, but also most vulnerable to environmental degradation (Zazanashvili et al., 2004). These 25 hotspots are selected on a basis of species diversity per unit of area: covering only 1.4% of the Earth's land, they accommodate about 44% of all species of vascular plants and 35% of all species in four terrestrial groups (Myers et al., 2000). Hence, the Caucasus has been globally perceived

as a problematic ecoregion with unique flora and fauna which is inhabited by rare, relict and endemic species and which has a global importance for preservation of our planet's biological diversity.

The Caucasus ecoregion, historically considered as the isthmus between the Black Sea, Sea of Azov and the Caspian Sea, covers an area of 580,000 km² and comprises Abkhazia, Armenia, Azerbaijan, Georgia, Caucasian part of the Russian Federation, South Ossetia, northeastern Turkey and northwestern Iran (Fig. 1). To reflect the fullness of biodiversity, five priority areas (*corridors*) were identified. They serve as home to the majority of threatened species and their relatively preserved distribution areas (Fig. 2). These are the corridors of the Greater Caucasus Ridge, western and eastern corridors of the Lesser Caucasus, Caspian and Hyrcanian corridors. The governments of all countries of the Caucasus ecoregion have joined important international conventions to reinforce their efforts in biodiversity conservation.

Research and progress of environmental strategies and priorities in the Caucasus require current knowledge of taxonomic and ecological diversity of animal species and understanding of trends in range structure of these species.



Fig. 1. The map of the Caucasus ecoregion.

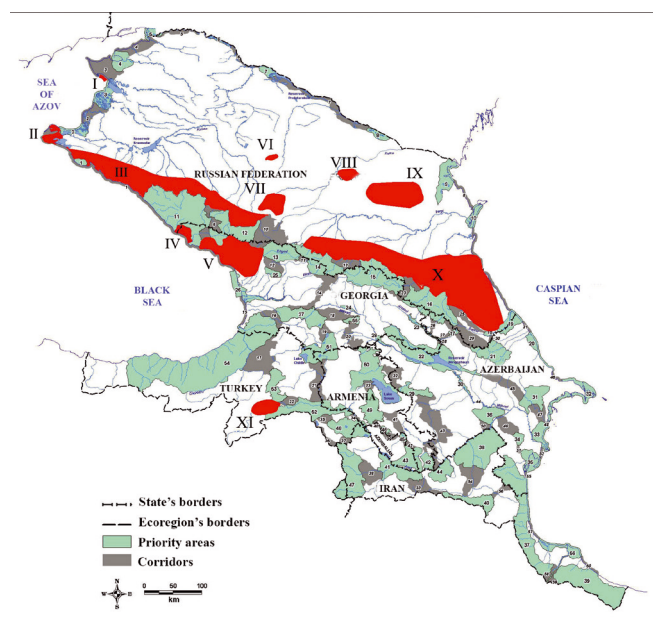


Fig. 2. The regions of conservation priority and their corridors in the Caucasus ecoregion with our modifications highlighted in red (from Tuniyev et al., 2019).

In the first ecoregion conservation plan for the Caucasus (Williams et al., 2006), there were mentioned 77 species of reptiles in the Caucasus with 28 endemics among them and 14 species of amphibians with 4 endemic species. In 2010, the Caucasus Biodiversity Council (CBC) and WWF proposed revising the ecoregion conservation plan. Since then, the herpetofauna of

Ecoregion has undergone a number of major changes due new finds of species, description of new species and subspecies, progress of molecular-research and observations in poorly visited areas (mainly high-mountains). That is why, the main task is to support and contribute to the concluding steps of the ECP 2012 revision process through compilation and structuring updated information on Reptiles and Amphibians of the Caucasus ecoregion. The Caucasus has been characterized by an extreme high diversity of vipers *Vipera* sensu lato (19 of approximately 40 species in the world fauna), the *Pelias* species (14 of 22 known species) as well as the rock lizards (*Darevskia* spp.) (27 of 41 species). Many of these species occupy total ranges of only a few thousand square kilometres. Discovering of the high level of diversity of shield-head vipers in the Caucasus ecoregion is essential to establish the conservation status of rare narrow spread species, the vast majority of whom are included in the IUCN Red List of Threatened species (2024). The lizards of the genus *Darevskia* from the Lacertidae family demonstrate particular diversity. In other words, this area plays a key role in the conservation of the variety of species of shield-head vipers and lacertid lizards (Tuniyev, 2016).

Therefore, we provide the update full list of herpetofauna of the Caucasian ecoregion on the base of literature sources, databases and own results of study of the Caucasian herpetofauna. The taxonomic and nomenclature changes and additions follow recent literature sources and databases (Frost, 2024; Uetz et al., 2024; IUCN Red List of Threatened species, 2024) with some modifications. Knowledge about biodiversity remains inadequate because most species living on Earth were still not formally described (the Linnean shortfall) and because geographical distributions of most species are poorly understood and usually contain many gaps (the Wallacean shortfall) (Bini et al., 2006; Hortal et al., 2015).

We did not set the goal of listing all the synonymy in the taxonomy of amphibians and reptiles of the Caucasus ecoregion, as well as a detailed discussion of the existing different and sometimes controversial views on the status of different species/subspecies. At the same time, on the base of current data and own research of this region for many decades, we offer our opinion on the composition and distribution of herpetofauna in the Caucasus ecoregion with comments on taxonomic and conservation status of included taxa. Type territories indicated for endemics of the Caucasus only given in the tables 1–4. In these tables, we marked with an asterisk those species which status is under discussion and a revision of their status is possible. For the conservation purposes many forms under consideration are included in the Red Data lists including the IUCN Red List of Threatened species (2024), and accessed a certain conservation status

AMPHIBIANS AND REPTILES DIVERSITY

Amphibians. During the last decades, several forms of amphibians were described from the Caucasus ecoregion, such as *Bufo verrucosissimus tertyshnikovii* Kidov, 2009 from Stavropol Highland (Russia); *Bufo eichwaldi* Litvinchuk, Borkin, Skorinov et Rosanov, 2008 and *Hyla orientalis gumilevskii* Litvinchuk, Borkin, Skorinov et Rosanov, 2008 from Talysh Mountains (Azerbaijan). Genus's names' changes took place in salamanders (from *Triturus* Rafinesque, 1815 (part) to *Lissotriton* Bell, 1839 and *Ommatotriton* Gray, 1850, from *Batrachuperus* Boulenger, 1878 and *Iranodon* Dubois and Raffaelli, 2012 to *Paradactylodon* Risch, 1984, Green Frogs (from *Rana* Linnaeus, 1758 to *Pelophylax* Fitzinger, 1843) and in Green Toads (from *Bufo* Garzault, 1764 to *Bufotes* Rafinesque, 1815). Taxonomic status was changed for Shelkownikow's treefrog to *Hyla orientalis* Bedriaga, 1890; taxonomic position risen up with changes of genus names at Banded Newt – *Ommatotriton ophryticus* (Berthold, 1846) and Lantz's Smooth Newt – *Lissotriton lantzi* (Wolterstorff, 1914). Taxonomic status of Karelín's Crested Newt – *Triturus karelinii* (Strauch, 1870) was changed to species level. Beside, Persian Mountain Salamander – *Iranodon persicus* (Eiselt et Steiner, 1970) was absent in List of the Caucasus ecoregion species (Zazanashvili, 2009). Only 40 years after the changes in status to the species level of *Bufo verrucosissimus* (Pallas, 1814) (Orlova, Tuniyev, 1989), the species status was recognized as valid based on the results of molecular genetic studies (Özdemir et al., 2020). The species status of *Mertensiella djanaschvilii* (Tartarashvili et Bakradze, 1989) (Frost, 2024), was not immediately recognized. The problems of species diversity in the genera *Bufotes* Rafinesque, 1815 and *Pelophylax* Fitzinger, 1843 remains open.

As for 1 July 2024 there are known 18 amphibian species belonging to the two orders. The order Caudata in the Caucasian ecoregion includes two families: Hynobiidae with one genus *Paradactylodon* (one species) and Salamandridae with four genera: *Mertensiella* (two species), *Triturus* (one species), *Ommatotriton* (one species), and *Lissotriton* (one species). The order Anura is represented with five families: Bombinatoridae with one genus *Bombina* (one species); Bufonidae with two genera *Bufo* (two species) and *Bufotes* (one species); Hylidae with one genus *Hyla* (two species); Pelobatidae with one genus *Pelobates* (two species); Pelodytidae with one genus *Pelodytes* (one species); Ranidae with two genera *Pelophylax* (one species) and *Rana* (two species). The half (nine species) of these amphibians are endemics (Table 1, Fig. 3–6). The Caucasian Salamander (*Mertensiella caucasica*) and Djanashvili's Salamander (*Mertensiella djanaschvilii*) are found in the western part of Lesser Caucasus in Georgia and in Pontic Ridge in Turkey only with slightly irradiations beyond of ecoregion. Persian Salamander (*Paradactylodon persicus*)



Fig. 3. Endemic Caudata Amphibians: 1 – *Lissotriton lantzi*, 2 – *Paradactylodon persicus*, 3 – *Mertensiella caucasica*, 4 – *Mertensiella djanaschvilii*.



Fig. 4. Distribution of *Ommatotriton ophryticus*.

occurs in Hyrcanian forests of the Alborz Mountains in Iran. Banded Newt (*Ommatotriton ophryticus*) and Lantz's Smooth Newt (*Lissotriton lantzi*) are distributed mainly in western half of ecoregion. Caucasian Parsley Frog (*Pelodytes caucasicus*) and Colchis Toad (*Bufo verrucosissimus*) live in mountain forests of the Western Caucasus with a limited reach to Central Transcaucasus and separately on uppermost part of Stavropol Upland. Hyrcanian Toad (*Bufo eichwaldi*) is endemic of Hyrcanian forests in the Talysh and Alborz Mountains. Five species were included in the IUCN Red List in categories NT (Table 1); four amphibian species still not assessed.

Reptiles. Previously 77 species of reptiles were registered in the Caucasus (Williams et al., 2006). The

Table 1. List of amphibian species of the Caucasian ecoregion

№	Species / subspecies		Status of endemism; distribution in the Caucasian ecoregion; comments	Conservation IUCN status
	Common name	Latin name		
CLASS AMPHIBIA De Blainville, 1816				
ORDER CAUDATA Scopoli, 1777 (URODELA Duméril, 1806)				
FAMILY ASIATIC SALAMANDERS – HYNOBIIIDAE Cope, 1859				
Genus Mountain Salamanders or Middle Eastern Stream Salamanders – <i>Paradactylodon</i> Risch, 1984				
1	Persian Salamander	<i>Paradactylodon persicus</i> (Ei- selt et Steiner, 1970)	Endemic of Hyrcanian forests of the Alborz mountains in Iran (Gilan, Golestan, Ardabil, and Mazandaran provinces); record in Azerbaijan was not conformed. Type locality: Talysh Mountains near Assalem, Ghilan Province, Iran, small creek, about 800 meters elevation.	NT
Family true salamanders and newts – Salamandridae Goldfuss, 1820				
Genus Caucasian Salamanders – <i>Mertensiella</i> Wolterstorff, 1925				
2	Caucasian Salamander	<i>Mertensiella caucasica</i> (Waga, 1876)	Endemic of western part of Lesser Caucasus and northeast Turkey from east of Giresun Province to Borzhomi in the Lesser Caucasus Mountains of southern Georgia, 400–2800 m elevation. Type locality: Zekari Mountain Pass between river Kura and Rioni, Georgia.	NT
3	Djanashvili's Salamander	<i>Mertensiella djanashvilii</i> (Tartarashvili et Bakradze, 1989)	Endemic of southwestern Georgia (Adjaria); northeastern Turkey (Murgul, vicinity of Arhavi and Artvin). Type locality: Murala Mountain, environs of Batumi City, Adjaria, Georgia.	No status in IUCN Red List
Genus Alpine Newts – <i>Triturus</i> Rafinesque, 1815				
4	Karelin's Crested Newt	<i>Triturus karelinii</i> (Strauch, 1870)	Extreme southern Russia east of the Azov Sea and the western (Krasnodar Territory, Adygea Republic, Stavropol Territory) and eastern (Dagestan Republic) periphery of the Caucasus Range; north-eastern Turkey; Abkhazia Republic; Georgia; North Iran (Mazandaran, Golestan, Gilan, East Azerbaijan, and West Azerbaijan provinces) along the southern coast of the Caspian Sea; north-west and south-east Azerbaijan; possibly in South Ossetia Republic. Type locality: southern shore of the Caspian Sea in Persia (= Iran).	LC
Genus Banded Newts – <i>Ommatotriton</i> Gray, 1850				
5	Banded Newt	<i>Ommatotriton ophryticus</i> (Berthold, 1846)	Endemic. Russia: Krasnodar Territory, Republics of Karachay-Cherkessia and Adygea, northeastern Turkey; Abkhazia Republic; Georgia; northern Armenia; South Ossetia Republic; possibly in the extreme western Azerbaijan. Records in Stavropol Territory belong to introduced animals. Type locality: near Tiflis (= Tbilisi), Georgia.	NT
Genus Smooth Newts – <i>Lissotriton</i> Bell, 1839				
6	Lantz's Smooth Newt	<i>Lissotriton lantzi</i> (Wolterstorff, 1914)	Endemic. Russia: Krasnodar Territory, Stavropol Territory, Republics of Dagestan, Chechen, Ingushetia, North Ossetia-Alania, Karachay-Cherkessia, Adygea; Georgia; northern Armenia; extreme northeastern Turkey; Abkhazia Republic; South Ossetia Republic. Origin and current state of population from southeastern Azerbaijan is doubtful. Type localities: “Novorossiysk, Borjan (Boshan)”, “Poti”, and “Borjom (Borshom)”, northwestern section of Caucasus Mountains, Georgia.	No status in IUCN Red List

Table 1. Continuation

№	Species / subspecies		Status of endemism; distribution in the Caucasian ecoregion; comments	Conservation IUCN status
	Common name	Latin name		
ORDER ANURA Fischer-Waldheim, 1813				
FAMILY FIREBELLY TOADS – BOMBINATORIDAE Gray, 1825				
Genus Fire-Bellied Toad – <i>Bombina</i> Oken, 1816				
7	Fire-bellied Toad	<i>Bombina bombina</i> Linnaeus, 1761	Western and Central Ciscaucasia (from Taman Peninsula to Stavropol Territory, Russia).	LC
Family TRUE TOADS – BUFONIDAE Goldfuss, 1820				
Genus True Toads – <i>Bufo</i> Garsault, 1764				
8	Hyrcanian Toad	<i>Bufo eichwaldi</i> Litvinchuk, Borkin, Skorinov et Rosanov, 2008	Endemic of Hyrcanian forests. Southeastern Azerbaijan in the Talysh Mountains and extending into the Talysh and Alborz mountains of northern Iran (reported for Golestan, Mazandaran, and Gilan provinces and probably to be found in Ardabil Province). Type locality: “near an office of the Girkansky Nature Reserve in Azfilial (vicinity of Avrora village), 38°39' N48°48' E, Lenkoran District, Azerbaijan”.	No status in IUCN Red List
9	Colchis Toad	<i>Bufo verrucosissimus</i> (Pallas, 1814):	Endemic. Russia: Krasnodar Territory, Stavropol Territory, including isolated population on Strizhament Mountain (Stavropol Highland) and forests in the middle part of Kuban River Valley from stanitsa Barsukovskaya (Stavropol Territory) to stanitsa Uspenskaya (Krasnodar Territory); Republics of Karachay-Cherkessia, Adygea; Georgia; north-western Azerbaijan; northeastern Turkey; Abkhazia Republic; South Ossetia Republic. Further research required to confirm the distribution along the southern coastal region of Turkey from eastern Antalya Province and the presence of isolated populations in western coastal Syria and Lebanon, due to lack of biogeographically basis.	NT
9a		<i>Bufo verrucosissimus verrucosissimus</i> (Pallas, 1814)	Endemic subspecies of Colchis and south slope of Grater Caucasus. Type locality: Colchis at the Black Sea shore of the Caucasus.	
9b	North-West Caucasus Toad	<i>Bufo verrucosissimus circassicus</i> Orlova et Tuniyev, 1989	Endemic subspecies of North-West Caucasus.	
9c	Stavropol Highland Toad	<i>Bufo verrucosissimus tertyshnikovi</i> Kidov, 2009	Type locality: Krepostnaya Stanitsa (settlement), 40 km from Krasnodar, Krasnodar Territory, Russia. Endemic subspecies of Stavropol Highland and probably forests in the middle part of Kuban River Valley.	
9d	Turow's Toad	<i>Bufo verrucosissimus turowi</i> Krasovsky, 1933)	Type locality: Novokaterinovskaya stanitsa (settlement), Shpakovskiy District, Stavropol Territory, Russia. Endemic subspecies of northwestern slope of Grater Caucasus. Type locality: Chernorechye cordon of Caucasian State Biosphere reserve near confluence of Urushten River and Malaya Laba River, Krasnodar Territory, Russia.	
Genus Eurasian or Palearctic Green Toads – <i>Bufo</i> es Rafinesque, 1815				
10	Green Toad	<i>Bufo</i> es viridis (Laurenti, 1768)	Entire Caucasian Isthmus.	LC
FAMILY TREE FROGS – HYLIDAE Rafinesque, 1815				
Genus Holarctic Treefrogs – <i>Hyla</i> Laurenti, 1768				
11	Eastern Treefrog	<i>Hyla orientalis</i> Bedriaga:	Almost entire Caucasian isthmus (except east semideserts of Azerbaijan); disjunctly in the Talysh Mountains of Iran (Gilan, Mazandaran and Golestan provinces).	No status in IUCN Red List

Table 1. End

№	Species / subspecies		Status of endemism; distribution in the Caucasian ecoregion; comments	Conservation IUCN status
	Common name	Latin name		
11a		<i>Hyla orientalis orientalis</i> Bedriaga, 1890	All mentioned above area, except Talysh and Alborz mountains.	
11b	Hyrceanian Treefrog	<i>Hyla orientalis gumilevskii</i> Litvinchuk, Borkin, Skorin- ov et Rosanov, 2008	Endemic subspecies of Hyrcanian forests. South-east Azerbaijan; Caspian Iran. Type locality: Lenkoranka River, about 38°44' N48°51' E, Lenkoran District, southeastern Azerbaijan.	
12	Yellow-lemon Treefrog	<i>Hyla savignyi</i> Audouin, 1812	Eastern Turkey; western Iran; Armenia; southern Georgia; isolated population in Abkhazia Republic; south Azerbaijan.	LC
FAMILY SPADEFOOTS OR SPADEFOOT TOADS – PELOBATIDAE Bonaparte, 1850				
Genus European Spadefoot Toads – <i>Pelobates</i> Wagler, 1830				
13	Common Spadefoot	<i>Pelobates fuscus</i> (Laurenti, 1768)	The Caucasian ecoregion – Ciscaucasia (Russia): Krasnodar Territory, Stavropol Territory, Republics of Dagestan, Chechen, Ingushetia, North Ossetia-Alania, Adygea.	LC
14	Eastern Spadefoot	<i>Pelobates syriacus</i> Boettger, 1889	Northeastern Turkey; sporadically on the southern slopes of the Caucasus, from East Georgia to Azerbaijan; Armenia; Russia (south Dagestan); Iran (Golestan).	LC
FAMILY PARSLEY FROGS – PELODYTIDAE Bonaparte, 1850				
Genus Parsley Frogs – <i>Pelodytes</i> Bonaparte, 1838				
15	Caucasian Parsley Frog	<i>Pelodytes caucasicus</i> Boulenger, 1896	Endemic of the West Caucasus and south slope of Grater Caucasus. Russia (Krasnodar Territory, Adygea Republic); Abkhazia Republic; South Ossetia Republic; Georgia (except semiarid areas); extreme north-western Azerbaijan; northeastern Turkey (from Trabzon province to the east). Type locality: Lomis-Mta Mountain, vicinity of Borjomi Town, Lesser Caucasus, Georgia.	NT
FAMILY TRUE FROGS – RANIDAE Rafinesque, 1814				
Genus Green or Water Frogs – <i>Pelophylax</i> Fitzinger, 1843				
16	Lake, or Marsh Frog	<i>Pelophylax ridibundus</i> (Pallas, 1771)	Almost entire Caucasian ecoregion.	LC
Genus Holarctic True Frogs, Pond Frogs or Brown Frogs – <i>Rana</i> Linnaeus, 1758				
17	Caucasian Brown Frog	<i>Rana macrocnemis</i> Boulenger, 1885	Almost entire mountainous territory of the Caucasian ecoregion, except plain area of Ciscaucasia, arid regions of Kura-Araxian Lowland and high mountain belts up from 3200 m: Russia; Georgia; Armenia; Azerbaijan; Abkhazia Republic; South Ossetia Republic; north-western Iran; northeastern Turkey.	LC
18	Hyrceanian Wood Frog	<i>Rana pseudodalmatina</i> Eiselt and Schmidtler, 1971	Endemic of Hyrcanian forests. Southwestern and southern margin of the Caspian Sea in Iran; southeastern Azerbaijan (districts of Astara, Lenkoran, Lerik, Masally, Yardymly and Jalilabad). Type locality: Weyser (SW Chalus = Tschalus), 1150 m a.s.l, Mazanderan Province”, Iran.	LC



Fig. 5. Endemic Toads of the Caucasus ecoregion: 1a – *Bufo verrucosissimus circassicus*, 1b – *B. v. turowi*, 1c – *B. v. tertyshnikovii*, 1d – *B. v. verrucosissimus*, 2 – *B. eichwaldi*.



Fig. 6. Distribution of *Pelodytes caucasicus*.

update list includes 110 species: 5 species of the turtles and tortoises, 59 species of lizards and 46 species of snakes (Table 2–4). Among them 32 species (44 subspecies) are endemic to the ecoregion.

The members of four families present the Caucasian fauna of the turtles and tortoises. They are Emydidae with two genera *Emys* Dumeril, 1806 (one species with four subspecies); *Trachemys* Agassiz, 1857 (one introduced species); Geoemydidae with one genus *Mauremys* Gray, 1869 (one species); Cheloniidae with one genus *Chelonia* Brongniart, 1800 (one species) and Testudiniidae with one genus *Testudo* Linnaeus, 1758 (one species with four subspecies). Three species were included in the IUCN Red List in categories from NT to EN; one species (*Mauremys caspica*) still not assessed (Table 2).

A confusing situation arose around subspecies structure of *Emys orbicularis* and *Testudo graeca*. Eichwald described *Emys orbicularis iberica* from Astrakhan. There, according to modern concepts, lives the nominative subspecies. Animals from southern Dagestan and Transcaucasia were described as subspecies *E. o. kurae* Fritz, 1994. Later *E. o. kurae* was transferred to the list of synonyms (Uetz et al., 2024). However, we considered it possible to apply this name to turtles of this sector of the Caucasus ecoregion. It is important to note that the intraspecific taxonomy of *Emys orbicularis* and *Testudo graeca* remains controversial, also to the point of denying the validity of *Testudo graeca nikolskii* Ckhikvadze et Tuniyev, 1986 and synonymizing it with *Testudo graeca iberica* Pallas, 1814 (Türkozan et al., 2021).

The Caucasian saurofauna (Table 3) is characterized by high taxonomic diversity and is presented by the members of five families. They are: Agamidae with three genera, *Paralaudakia* Baig, Wagner, Ananjeva et Bohme, 2012 (one species), *Trapelus* Cuvier, 1817 (two species) and *Phrynocephalus* Kaup, 1825 (four species); Gekkonidae with three genera *Mediodactylus* Szczerbak et Golubev, 1977 (one species), *Hemidactylus* Goldfuss, 1820 (one introduced species) and *Tenuidactylus* Szczerbak et Golubev, 1984 (one species); Anguidae with two genera *Anguis* Linnaeus, 1758 and *Pseudopus* Merrem, 1820, with one species each; Scincidae with three genera: *Ablepharus* Fitzinger in Eversmann, 1823 (three species), *Eumeces* Wiegmann, 1834 (one species) and *Heremites* Gray, 1845 (one species). The most taxonomically (42 species) and phylogenetically diverse is Lacertidae (Bonaparte, 1831) family. It is presented by eight genera: *Darevskia* Arribas, 1997 (29 species), *Iranolacerta* Arnold, Arribas et Carranza, 2007 (one species), *Eremias* Wiegmann, 1834 (five species), *Lacerta* Linnaeus, 1758 (three species), *Ophisops* Menetries, 1832 (one species), *Parvilacerta* Harris, Arnold et Thomas, 1998 (one species), *Phoenicolacerta* Arnold, Arribas et Carranza, 2007 (one introduced species) and *Podarcis* Wagler, 1830 (one introduced species) (Table 3). According to the First Ecoregion Conservation Plan for the Caucasus (Williams et al., 2006), that time from the known 26 species of genus *Darevskia* in the world, 25 species were noted in the Caucasus, with 23 endemics of ecoregion. The next Ecoregion Conservation Plan for the Caucasus mentioned 21 bisexual species (36 subspecies) and four parthenogenetic species (Tuniyev et al., 2020). The Caucasian Ecoregion is one of the main centre of taxonomical diversity of rock lizards from genus *Darevskia*. The present upgraded list includes 24 bisexual species (40 subspecies) within Caucasus ecoregion from the known 31 bisexual species (54 subspecies) in the world and 5 parthenogenetic species of seven in the world fauna (Table 3). In recent decades, several species and subspecies have been described in the Caucasus ecoregion, including *Darevskia caucasica vedenica* (Darevsky et Roitberg, 1999), *D.*

Table 2. List of turtles and tortoises species of the Caucasian ecoregion

№	Species / subspecies		Status of endemism; distribution in the Caucasian ecoregion; comments	Conservation status
	Common name	Latin name		
Order TURTLES and TORTOISES – Testudines Batsch, 1788				
FAMILY AMERICAN FRESH WATER TURTLES – Emydidae Rafinesque, 1815				
Genus European Pond Turtles – <i>Emys</i> Dumeril, 1806				
1	European Pond Turtle, or Swamp Turtle	<i>Emys orbicularis</i> (Linnaeus, 1758) <i>Emys orbicularis orbicularis</i> (Linnaeus, 1758)	Russia: Ciscaucasia and West Caucasus (Krasnodar Territory, except extreme south-east Black Sea coast in Sochi City, Stavropol Territory, Adygea Republic, Chechen Republic and Dagestan Republic, except south Dagestan); Azerbaijan, Georgia, Armenia, South Ossetia Republic; Abkhazia Republic; Turkey, Iran.	NT
1a				NT
1b	Colchis Pond Turtle	<i>Emys orbicularis colchica</i> Fritz, 1994	Endemic subspecies of Colchis: Russia (extreme southeast Black Sea coast in Krasnodar Territory); Republic of Abkhazia; West Georgia; northeastern coastal Turkey. Type locality: Batumi City, Georgia (Adjara).	In Red Data Book of Russia – CR A4ab-cde; Blab(i, ii, iii, iv, v)
1c	Westcaspian Pond Turtle	* <i>Emys orbicularis kurae</i> Fritz, 1994 (<i>E. o. iberica</i> Eichwald, 1831)	Endemic subspecies of East Transcaucasia: Russia (south Dagestan); South Ossetia Republic; East Georgia, northernmost and south Armenia, Azerbaijan (except Lenkoran Lowland and Talysh). Type locality: Bank (Bank Promisl) an der Kura-Mundung, Aserbaidshan.	NT
1d	Persian Pond Turtle	<i>Emys orbicularis persica</i> Eichwald, 1831	Endemic subspecies of Hyrcania: southeast Azerbaijan (Lenkoran Lowland and Talysh); Caspian region of Iran. Type locality: Mazandaran, Iran.	
Genus Pond Sliders – <i>Trachemys</i> Agassiz, 1857				
2	Red-eared Slider or Red-eared Terrapin	<i>Trachemys scripta elegans</i> (Wied-Neuwied, 1839)	Introduced in Russia: Krasnodar Territory (vicinity of Sochi City), Stavropol Territory (vicinity of Mineralnye Vody City), Dagestan Republic (Tarumovsky District); introduced in coastal Abkhazia Republic.	LC
FAMILY ASIAN FRESH WATER TURTLES – GEOEMYDIDAE Theobald, 1868				
Genus Eurasian Fresh Water Turtles – <i>Mauremys</i> Gray, 1869				
3	Caspian Turtle	<i>Mauremys caspica</i> (Gmelin, 1774)	Russia (south Dagestan); East Georgia; Azerbaijan; south Armenia; Turkey; Iran.	This species has not yet been assessed for the IUCN Red List
FAMILY Cheloniid sea turtles – Cheloniidae Oppel, 1811				
Genus Green Sea Turtles – <i>Chelonia</i> Brongniart, 1800				
4	Green Seaturtle	<i>Chelonia mydas</i> (Linnaeus, 1758)	Twice found on seashore of Abkhazia (in 2010 and in 2016)..	EN A2bd
FAMILY LAND TORTOISES – Testudinidae Batsch, 1788				
Genus Mediterranean Tortoises – <i>Testudo</i> Linnaeus, 1758				
5	Mediterranean Spur-thighed Tortoise	<i>Testudo graeca</i> Linnaeus, 1758	Russia: Krasnodar Territory, Dagestan; Abkhazia Republic; Armenia; Azerbaijan; Georgia; northwest Iran; northeastern Turkey.	VU A1cd

Table 2. End

№	Species / subspecies		Status of endemism; distribution in the Caucasian ecoregion; comments	Conservation status
	Common name	Latin name		
5a	Armenian Spur-thighed Tortoise	<i>Testudo graeca armeniaca</i> Ckhikvadze et Bakradze, 1991	Endemic subspecies of South Transcaucasia: Arax River Valley: south Armenia; Northeast Turkey; Azerbaijan (Nakhichevan). Type locality: Megri Town, South Armenia.	VU A1cd
5b	Georgian Spur-thighed Tortoise	<i>Testudo graeca iberica</i> Pallas, 1814	Endemic subspecies of East Transcaucasia: East Georgia; Azerbaijan (except Nakhichevan); northernmost Armenia. Type locality: Tbilisi City, Georgia.	VU A1cd
5c	Nikolsky's Spur-thighed Tortoise	<i>Testudo graeca nikolskii</i> Ckhikvadze et Tuniyev, 1986	Endemic subspecies of north Caucasian Black Sea coast: Russia (Krasnodar Territory); Abkhazia Republic (Myussera Highland). Type locality: Nebug Settlement, Tuapse District, Krasnodar Territory, Russia. Endemic subspecies of East Ciscaucasia: Russia (Daghestan).	CR A1abcde+2bcde In Red Data Book of Russia EN A3bcd
5d	Pallas's Spur-thighed Tortoise	<i>Testudo graeca pallasi</i> Ckhikvadze et Bakradze, 2002	Type locality: vicinity of Gilyary-Dag Settlement, Dagestan.	VU A1cd In Red Data Book of Russia — EN A3bcd

Table 3. List of lizard species of the Caucasian ecoregion

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
ORDER SQUAMATES – SQUAMATA Oppel, 1811 INFRAORDER LIZARDS – SAURIA McCarthney, 1822 FAMILY AGAMAS, or AGAMIDS – AGAMIDAE Spix, 1825 Genus Asian Rock Agamas – <i>Paralaudakia</i> Baig, Wagner, Ananjeva et Bohme, 2012				
1	Caucasian Agama	<i>Paralaudakia caucasica</i> (Eichwald, 1831)	Russia: mountain Dagestan Republic; eastern Georgia; Armenia; <i>Azerbaijan</i> (except Northwestern part); northern Iran, northern Turkey. Type locality: Tiflis (= Tbilisi, Republic of Georgia) and Baku (Azerbaijan).	LC
Genus Plain Agamas – <i>Trapelus</i> Cuvier, 1817				
2	Horny-scaled Agama	<i>Trapelus ruderatus</i> (Olivier, 1804)	Iran; south Azerbaijan (Jebrael, Zangelan).	LC
3	Steppe Agama	<i>Trapelus sanguinolentus</i> (Pallas, 1814) <i>Trapelus sanguinolentus sanguinolentus</i> (Pallas, 1814)	Endemic subspecies of Russian East Ciscaucasia. (Nogay Steppe in Dagestan Republic, Stavropol Territory and Chechen Republic). During last decades, it is extinct in majority of localities. Type locality: Russia, Kum-Ankatar in Terek River valley.	LC
Genus Toad-headed Agamas, or Toad Agamas – <i>Phrynocephalus</i> Kaup, 1825				
4	Spotted Toad-Headed Agama	<i>Phrynocephalus guttatus</i> (Gmelin, 1789)	Russia: East Ciscaucasia, Nogay Steppe in Dagestan Republic, Stavropol Territory and Chechen Republic.	LC

Table 3. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
5	Transcaucasian Toad Headed Agama	<i>Phrynocephalus horvathi</i> Mehely, 1894	Endemic of the Caucasus: middle Arax River valley; south Armenia (Gorovan sands), northern Turkey (Aralykh sands). It is extinct in several localities in Armenia. Type locality: Turkey, Vilayet Agri, Aralykh sands.	CR A2c
6	Dagestan Toad –Headed Agama	<i>Phrynocephalus mystaceus</i> (Pallas, 1776)	North Iran, Russia: Dagestan Republic (Sary-Kum sand dune and Nogay Steppe), Chechen Republic, Stavropol Territory (Nogay Steppe). During last decades, it is extinct in majority of localities in Nogay Steppe.	LC
7	Persian Toad Agama Persian Toad-headed Agama	<i>Phrynocephalus persicus</i> De Filippi, 1863	According to the latest data (The IUCN Red List of Threatened Species. Version 2023–1) an isolated population presents in south <i>Azerbaijan</i> (Zuvand).	VU A2c
FAMILY GECKOS – GEKKONIDAE Gray, 1825				
Genus Mediterranean Thin-toed Geckos – <i>Mediodactylus</i> Szczerbak et Golubev, 1977				
8	Mediterranean Thin-toed Gecko, or Kotschy’s Gecko Colchis Thin-toed Gecko	<i>Mediodactylus kotschy</i> (Steindachner, 1870) <i>Mediodactylus kotschy</i> <i>colchicus</i> (Nikolsky, 1902)	North-east Turkey.	LC
Genus <i>Hemidactylus</i> Goldfuss, 1820				
9	Mediterranean House Gecko, Turkish Gecko	<i>Hemidactylus turcicus</i> (Linnaeus, 1758)	Introduced population presents in Russia (Sochi City).	LC
Genus Bent-Toed Gecko – <i>Tenuidactylus</i> Szczerbak et Golubev, 1984				
10a	Caspian Bent-Toed Gecko, or Caspian Thin-Toed Gecko	<i>Tenuidactylus caspius</i> (Eichwald, 1831)	Eastern Georgia; Abkhazia (introduced in Sukhum); south Armenia; north-eastern Turkey; north-west Iran; Russia (Dagestan Republic – introduced; Krasnodar Territory – Sochi City in Black Sea coast – introduced). Probably, native populations present in south Armenia and south Azerbaijan. Type locality: Baku, Azerbaijan.	LC
10b	Wulf Bent-Toed Gecko	<i>Tenuidactylus caspius insularis</i> (Akhmedov et Szczerbak, 1978)	Endemic subspecies of Wulf Island. Only in type locality. Type locality: Wulf Island, Azerbaijan.	
FAMILY ANGUIDS, or LATERAL-FOLD LIZARDS – ANGUIDAE Gray, 1825				
Genus Slow Worms – <i>Anguis</i> Linnaeus, 1758				
11	Colehis Glass Lizard	<i>Anguis colchica</i> (Nordmann, 1840)	Russia: Krasnodar Territory, Stavropol Territory, Republics of Dagestan, Chechen, Ingushetia, North Ossetia-Alania, Kabardino-Balkaria, Karachay-Cherkessia, Adygea; Abkhazia; South Ossetia; Georgia; northern Armenia, northeastern Turkey; northern Iran; southeastern and northern <i>Azerbaijan</i> . Type locality: Kuban region (SW Russia) and Mingrelia (Western Republic of Georgia).	No status in IUCN Red List
Genus Armour Glass Lizards – <i>Pseudopus</i> Merrem, 1820				
12	Zheltopusik	<i>Pseudopus apodus</i> (Pallas, 1775)	South Russia: Krasnodar Territory (Black Sea coast and Taman Peninsular), northern parts of North Ossetia-Alania, Kabardino-Balkaria, Chechen republics (Tersky, Sunzhensky, Bragunsky ridges), submontane areas of Dagestan Republic; Georgia; Armenia; <i>Azerbaijan</i> ; Turkey, Iran. Type locality: Russia, North Caucasus, Terek River region.	LC

Table 3. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
FAMILY SKINKS – SCINCIDAE Oppel, 1811				
Genus Snake-Eyed Skinks, or Lidless Skinks – <i>Ablepharus</i> Fitzinger in Eversmann, 1823				
13	Two-streaked Snake-eyed Skink	<i>Ablepharus bivittatus</i> Menetries	Sporadically in north, central and southeastern Armenia: southeast <i>Azerbaijan</i> (including Nakhichevan); north Iran, easternmost Turkey. Type locality: Azerbaijan, Talysh mountains, vicinity of village Perimbel.	LC
14	Chernov’s Skink	<i>Ablepharus chernovi</i> Darevsky, 1953	Armenia (Razdan gorge), eastern Turkey. Type locality: Armenia, Ashtarak District, middle flow of Razdan River, vicinity of village Thit.	LC
15	Asian Snake-eyed Skink	<i>Ablepharus pannonicus</i> Lichtenstein, 1823	South-east Georgia (Vashlovani); eastern Azerbaijan (isolated populations in Zhiloy and Oblivnoy islands of Bakinsky Archipelago; in the mainland – in Kobystan = Gobustan); northern Iran.	LC
Genus Long-legged Skinks – <i>Eumeces</i> Wiegmann, 1834				
16	Schneider’s Long-legged Skink, or Berber Skink, Gold Skink	<i>Eumeces schneideri</i> (Daudin, 1802) <i>Eumeces schneideri princeps</i> Eichwald, 1839)	Russia (southern Dagestan Republic); Eastern Georgia; southern Armenia; submontane Azerbaijan; north Iran, easternmost Turkey.	LC
Genus African Mabuyas – <i>Heremites</i> Gray, 1845				
17	Golden Grass Mabuya, Southern Grass Skink	<i>Heremites septemtaeniatus</i> (Reuss, 1834)	Eastern Georgia; Azerbaijan; central, south and southeast Armenia; north Iran, easternmost Turkey.	LC
FAMILY LACERTIDS, or TYPICAL LIZARDS – LACERTIDAE Bonaparte, 1831				
Genus Rock Lizards – <i>Darevskia</i> Arribas, 1997 (Bisexual species)				
18	Ajarian Rock Lizard	<i>Darevskia adjarica</i> (Darevsky et Eiselt, 1980)	Endemic of Lesser Caucasus. Northeastern Turkey; southwestern Georgia. Type locality: Georgia, Abastumani (1400 m a.s.l.).	No status in IUCN Red List.
19	Agasyan’s Rock Lizard	<i>Darevskia aghasyani</i> Tuniyev et Petrova, 2019	Endemic of South Armenia. Type locality: Armenia, Ararat District, crest of Urts Ridge (2000 m a.s.l.).	No status in IUCN Red List. Conservation status CR
20	Alpine Rock Lizard	<i>Darevskia alpina</i> (Darevsky, 1967)	Endemic of the West Caucasus. Russia: high mountain areas of Krasnodar Territory, Republics of Kabardino-Balkaria, Karachay-Cherkessia, Adygea; Abkhazia; western Georgia. Type locality: Russia, Kabardino-Balkaria, Baksan River gorge, vicinity of village Terskol.	B2ac(iv) is recommended. VU B1ab(i, iii, v)
21	Arribas’s Rock Lizard	<i>Darevskia arribasi</i> Tuniyev, Lotiev et Petrova, 2023	Endemic of South Ossetia. Possible to find in neighboring Georgia. Type locality: Republic of South Ossetia. Ertso Lake (1720 m a.s.l.). Rocks near lake.	No status in IUCN Red List. Recommended Conservation status is NT

Table 3. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
22	Brauner's Rock Lizard	<i>Darevskia braueri</i> (Méhely, 1909)	Endemic of West Caucasus. Russia: Krasnodar Territory, Republics of Karachay-Cherkessia, Adygea; Abkhazia Republic; westernmost Georgia.	LC
22a		<i>Darevskia braueri braueri</i> (Méhely, 1909)	All mentioned above areas, except seashore cliff in Mysusera Highland and bottom of Gagra ridge in Abkhazia Republic. Type locality: Russia, Krasnodar Territory, Krasnaya Polyana settlement.	No status in IUCN Red List. Recommended Conservation status is CR A4acd; B2ab(i, ii, iii, iv)
22b	Mysusera Rock Lizard	<i>Darevskia braueri myusseri-ca</i> Doronin, 2011	Endemic subspecies of Abkhazia, narrow seashore banks and cliffs between towns Gagra and Gudauta. Type locality: Abkhazia, Gudauta District, vicinity of Lidzava village, seashore cliff of Mysusera Highland.	
23	Caucasian Rock Lizard	<i>Darevskia caucasica</i> (Méhely, 1909):	Endemic of Central and East Caucasus. Russia: Republics of Kabardino-Balkaria, North Ossetia-Alania, Ingushetia, Chechen, Dagestan; north Georgia; South Ossetia Republic; northern Azerbaijan. Type localities: Georgia, Mtskheta-Mtianeti, Kazbegi Municipality, Mt. Kazbek.	LC
23a		<i>Darevskia caucasica caucasica</i> (Méhely, 1909)	All mentioned above species' areas except Vedeno District in Chechen Republic. Type localities: Georgia, Mtskheta-Mtianeti, Kazbegi Municipality, Mt. Kazbek.	
23b	Vedeno Rock Lizard	<i>Darevskia caucasica vedenica</i> (Darevsky et Roitberg, 1999)	Endemic subspecies of limited part of Chechen Republic, Russia..	
24	Green-bellied Rock Lizard	<i>Darevskia chlorogaster</i> (Boulenger, 1908)	Type locality: Russia, Chechen Republic, Vedensky District, vicinity of village Vedeno.	LC
25	Clark's Rock Lizard	<i>Darevskia clarkorum</i> (Darevsky et Vedmederija, 1977)	Endemic of Hyrcanian forests in Talysh – Albers. Southeast Azerbaijan; northern Iran. Type locality: Iran, Gilian Province, Enseli City.	
26	Dagestan Rock Lizard	<i>Darevskia daghestanica</i> (Darevsky, 1967)	Endemic of western part of Lesser Caucasus. Southwestern Georgia (Adjara); north-eastern Turkey. Type locality: Cankurtaran Pass between Hopa and Borçka, Artvin province, NE Turkey.	EN B1ab(i, iii)
27	Defilippi's Rock Lizard	<i>Darevskia defilippii</i> (Camerano, 1877)	Endemic of the East and Central Caucasus. Russia: Republics of North Ossetia-Alania, Ingushetia, Chechen, Dagestan; South Ossetia Republic; north-east Georgia; north-west Azerbaijan.	LC
28	Artvine Rock Lizard, Derjugin's Rock Lizard	* <i>Darevskia derjugini</i> (Nikolsky, 1898):	Type locality: Russia, Dagestan Republic, Levashinsky District, vicinity of village Levashi.	
28a		<i>Darevskia derjugini derjugini</i> (Nikolsky, 1898) -	Endemic of Western Alborz in Iran. Rich the south westernmost part of Caucasian ecoregion.	LC
28b	Abkhasian Derjugin's Lizard	<i>Darevskia derjugini abchasica</i> (Bischoff, 1982)	Endemic of western part of the Caucasian Isthmus. Russia: Krasnodar Territory, Adygea Republic; northeastern Turkey; Abkhazia Republic; South Ossetia Republic; West and north Georgia; extreme northwestern Azerbaijan (Zakataly). Type locality: Turkey, vicinity of Artvin..	NT
			Endemic subspecies of Artvin Hollow on Choroch River. Type locality: Artvin, Turkey.	
			Endemic subspecies of Abkhazia Republic. Type locality: vicinity of Sukhumi City (=Sukhum).	

Table 3. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
28c	Adjarian Derjugin's Lizard, or Baran's Artvin Lizard	<i>Darevskia derjugini barani</i> (Bischoff, 1982)	Endemic subspecies of south-west Georgia (Adjara) and neighboring area of Lasistan (Turkey). Type locality: Adjara, Botanical garden, Batumi City.	
28d	Boehme's Artvin Lizard	<i>Darevskia derjugini boehmei</i> (Bischoff, 1982)	Endemic subspecies of Sochi City area, Russia. Type locality: Russia, Krasnodar Territory, Sochi City, Mountain Akhun.	
28e	Orlova's Artvin Lizard	<i>Darevskia derjugini orlowae</i> (Bischoff, 1984)	Endemic subspecies of East Georgia, South Ossetia Republic and north-westernmost Azerbaijan. Type locality: Georgia, Mtskheta-Mtianeti Region, Pasanauri settlement.	
28f	Ciscaucasian Artvin Lizard	<i>Darevskia derjugini silvatica</i> (Bartenjew et Rjesnikowa, 1931)	Endemic subspecies of northern slope of West Caucasus within areas of Krasnodar Territory and Adygea Republic (Russia). Type locality: Russia, Krasnodar Territory, glade Lagernaya on the Belaya River (cor-don Lagerny of Caucasian Reserve).	
29	Charnali Rock Lizard	* <i>Darevskia dryada</i> (Darevsky et Tuniyev, 1997)	Local endemic of northeast foothills of Pontic ridge. South-west Georgia (Ajaria), probably northeast Turkey. Type locality: Georgia, Adjara, Charnali River gorge.	CR B2ab(iii, v)
30	Hybrid, or Bastard Rock Lizard	<i>Darevskia mixta</i> (Méhely, 1909)	Endemic of western part of Lesser Caucasus. Southwestern Georgia; South Ossetia; northeastern Turkey. Type locality: Georgia, vicinity of Abastumani.	NT
31	Nairi Rock Lizard	<i>Darevskia nairensis</i> (Darevsky, 1967)	Endemic of northern part of Armenian Highland and western part of Lesser Caucasus. Western and central Armenia, southern Georgia and northeastern Turkey (Vilayets Kars, Erzurum, Agri). Type locality: Armenia, Gegharkunik Province, Lake Sevan, vicinity of village Lchashen.	No status in IUCN Red List.
32	Red-bellied Rock Lizard	<i>Darevskia parvula</i> (Lantz et Cyrén, 1913)	Endemic of western part of Lesser Caucasus. Northeastern Turkey. Type locality: Turkey, vicinity of Artvin, Choroch river valley near Borchkha.	LC
33	Pontic Lizard	* <i>Darevskia pontica pontica</i> (Lantz et Cyrén, 1918)	Endemic subspecies. Russia: Krasnodar Territory, Stavropol Territory, Republic of Adygea, northernmost part of Karachay-Cherkessia Republic; Abkhazia Republic. Type locality: Abkhazia, vicinity of Gagra City.	Status needs in revision. No status in IUCN Red List.
34 34a	Kura River Rock Lizard	<i>Darevskia portschinskii</i> (Kessler, 1878): <i>Darevskia portschinskii portschinskii</i> (Kessler, 1878)	Endemic of northern slope of the Lesser Caucasus. North Armenia; South Georgia; southwestern Azerbaijan. All mentioned above areas, except upper Kura River basin. Type locality: Georgia, vicinity of Tbilisi City.	LC
34b	Nigritic Rock Lizard	* <i>Darevskia portschinskii nigrita</i> (Bakradze, 1976)	Endemic subspecies of upper Kura River basin in South Georgia and probably adjoining area of Turkey (Ardahan). Type locality: Georgia, Kvemo Kartli Region, vicinity of Village Dmanisi.	
35	Meadow Lizard	* <i>Darevskia praticola</i> (Eversmann, 1834)	Endemic. Russia: Stavropol Territory, Republics of Karachay-Cherkessia, Kabardino-Balkaria, North Ossetia-Alania, Ingushetia, Chechen, Dagestan; South Ossetia Republic; Azerbaijan; Caspian Iran; north Armenia; East Georgia.	NT
35a		<i>Darevskia praticola praticola</i> (Eversmann, 1834)	Russia: Stavropol Territory, Republics of Karachay-Cherkessia, Kabardino-Balkaria, North Ossetia-Alania, Ingushetia, Chechen, Dagestan; South Ossetia Republic; East Georgia. Type locality: Russia, Stavropol Territory, Kislovodsk City, spring Narzan.	

Table 3. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
35b	Hyrcanian Meadow Lizard	<i>Darevskia praticola hyrcanica</i> Tuniyev, Doronin, Kidov et Tuniyev, 2011	Endemic subspecies of Talysh – Alborz Mountains in southeast Azerbaijan and Caspian Iran. Type locality: Azerbaijan, Astara District, place Gada-Zyga-Khi.	
35c	Lori Meadow Lizard	<i>Darevskia praticola loriensis</i> Tuniyev, Doronin, Tuniyev, Aghasyan, Kidov et Aghasyan, 2013	Endemic subspecies of northern Armenia and southmost Georgia. Type locality: Armenia, Lori Marz (Province), vicinity of Stepanavan, village Gyunlagarak (1438 m a.s.l.).	
36	Azerbaijani or Radde's Rock Lizard	<i>Darevskia raddei raddei</i> (Boettger, 1892)	South Armenia, south Azerbaijan, north-west Iran, northeast Turkey. Type locality: Nyuvadi Village, Vegri District, Armenia.	LC
37	Georgian or Spiny-tailed Rock Lizard	<i>Darevskia rudis</i> (Bedriaga, 1886)	Endemic for Grater and western part of Lesser Caucasus. Russia: Republics of Ingushetia, Chechen, Dagestan Republic; Azerbaijan; Georgia; South Ossetia; Turkey.	LC
37a		<i>Darevskia rudis rudis</i> (Bedriaga, 1886)	Endemic subspecies of North-east Turkey. Type locality: Turkey, City Trabzon.	
37b	Bischoff's Spiny-tailed Rock Lizard	<i>Darevskia rudis bischoffi</i> (Bohme et Budak, 1977)	Endemic subspecies of northeast Turkey. Type locality: vicinity of Arhavi.	
37c	Chechen Republic Spiny-tailed Rock Lizard	<i>Darevskia rudis chechenica</i> (Eiselt et Darevsky, 1991)	Endemic subspecies of Central Caucasus. Type locality: Russia, Chechen Republic, vicinity of Village Sovetskoe (=Shatoy), canyon of the Argun River.	
37d	Large spotted Spiny-tailed Rock Lizard	<i>Darevskia rudis macromaculata</i> (Darevsky, 1967)	Endemic subspecies of Samtskhe-Javakheti Region of Georgia. Type locality: Georgia, Samtskhe-Javakheti Region, vicinity of City Akhalkalaki.	
37e	Pontic Ridge Spiny-tailed Rock Lizard	<i>Darevskia rudis mirabilis</i> Arribas, Ilgaz, Kumlutaş, Durmuş, Avci et Üzümlü, 2013	Endemic subspecies of Mountain Kachkar in Turkey. Type locality: Mt. Kachkar.	
37f	Dark Spiny-tailed Rock Lizard	<i>Darevskia rudis obscura</i> (Lantz et Cyrén, 1936)	Endemic subspecies of Samtskhe-Javakheti Region, Georgia. Type locality: vicinity of City Borjomi, Georgia.	
37g	Svanetia Spiny-tailed Rock Lizard	<i>Darevskia rudis svanetica</i> (Darevsky et Eiselt, 1980)	Endemic subspecies of south slope of Western Caucasus. Type locality: Georgia, Svanetia, vicinity of Mestia town.	
38	True Rock Lizard	<i>Darevskia saxicola</i> (Eversmann, 1834)	Endemic of north macroslope of easternmost part of West Caucasus and Central Caucasus. Russia: east of Krasnodar Territory, Karachay-Cherkessia Republic, Stavropol Territory, west part of Kabardino-Balkaria Republic.	LC
39	Szczerbak's Rock Lizard	<i>Darevskia szczyrbaki</i> (Lukina, 1963)	Type locality: Russia, Stavropol Territory, vicinity of City. Kislovodsk, southern slope of the Borgustan Ridge. Endemic of Black Sea coast of Krasnodar Territory. Type locality: Vysoky bereg (= Vysoky beach), Rocky cliff in City Anapa, Krasnodar Territory, Russia.	No status in IUCN Red List. Recommended Conservation status EN B2ab(ii, iii, iv, v); C2a(i). (Red Date Book of Russia)

Table 3. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
40	Tuniyev's Rock Lizard	<i>Darevskia tuniyevi</i> Arribas, Candan, Kurnaz, Kumultas, Caynak et Ilgaz, 2022	Endemic of southwestern part of Lesser Caucasus. Northeastern Turkey: Artvin Province, Meskhet and Shavshat Ridges on the right bank of Choroch River; perhaps in Georgia, along the Adjarsckhali River gorge. Type locality: Turkey, Artvin, Pirmali.	No status in IUCN Red List.
41	Valentin's Rock Lizard	<i>Darevskia valentini</i> (Boettger, 1892)	Endemic of Lesser Caucasus and Armenian Highland. Armenia; southwestern Azerbaijan; southern Georgia; northeastern Turkey. Type locality: East Armenia, Syunik Province, vicinity of village Basarkent.	LC
Genus Rock Lizards – <i>Darevskia</i> Arribas, 1997 (Unisexual species)				
42	Armenian Rock Lizard	<i>Darevskia armeniaca</i> (Méhely, 1909)	Endemic of Lesser Caucasus and Armenian Highland. Central and western Armenia; southwestern Azerbaijan; southern Georgia; northeastern Turkey. Type locality: Armenia, Gegharkunik Province, town Sevan.	LC
43	Dahl's Rock Lizard	<i>Darevskia dahl</i> (Darevsky, 1957)	Endemic of western part of the Lesser Caucasus. Northern Armenia and southern Georgia. Type locality: Armenia, Lori Province, vicinity of Village Shagali.	NT
44	Rostombekov's Rock Lizard	<i>Darevskia rostombekovi</i> (Darevsky, 1957)	Endemic of central and the eastern Lesser Caucasus. Northern Armenia; southwestern Azerbaijan. Type locality: North Armenia, Tavush Province, vicinity of City Idzhevan.	EN B lab(i, iii)
45	White-bellied Rock Lizard	<i>Darevskia unisexualis</i> (Darevsky, 1966)	Endemic of Armenian Highland: Central Armenia (mountainland and Sevan Basin); northeastern Turkey; southernmost Georgia (upper flow of Kura River). Type locality: Armenia, Kotayk Province, vicinity of Akhta Village (= City Hrazdan), in the canyon of the Razdan River.	NT
46	Uzzell's Rock Lizard -	<i>Darevskia uzzelli</i> (Darevsky et Danielyan, 1977)	Endemic of upper flows of Arax and Ephrata rivers in Armenian Highland. Northeastern Turkey. Type locality: Turkey, Eastern Anatolia Region, 25 km southward from Kars City.	NT
Genus Persian Lizards – <i>Iranolacerta</i> Arnold, Arribas et Carranza, 2007				
47	Brandt's Persian Lizard	<i>Iranolacerta brandtii</i> (De Filippi, 1865)	Northwestern Iran: East Azerbaijan Province; southern Azerbaijan (Talysh and Zuvand). It is probably extinct in Azerbaijan.	DD
Genus Racerunners, or Desert Lacertas – <i>Eremias</i> Wiegmann, 1834				
48	Steppe-runner	<i>Eremias arguta</i> (Pallas 1773):	Russia: Ciscaucasia (Krasnodar Territory, Stavropol Territory, Republics of North Ossetia–Alania, Ingushetia, Chechen, Dagestan), submontane Dagestan Republic; Azerbaijan; eastern Georgia; northwestern Iran (western slopes of Talysh).	NT
48a	Desert Steppe-runner	<i>Eremias arguta deserti</i> Gmelin, 1789	All mentioned above areas except Sevan Lake basin.	
48b	Transcaucasian Steppe-runner	<i>Eremias arguta transcaucasica</i> Darevsky, 1953)	Endemic subspecies of Armenia (Sevan Lake basin). Type locality: Armenia, Vardenis district, environs of Mets-Mazra.	
49	Transcaucasian Racerunner	<i>Eremias pleskei</i> Bedriaga, 1907	Endemic of middle Arax River valley; south Armenia (Gorovan sands); northeastern Turkey (Aralyk sands); southern Azerbaijan (Nakhichevan), northwestern Iran. Type locality: Azerbaijan, vicinity of Nakhichevan City.	CR A2c
50	Strauch's Racerunner	<i>Eremias strauchi</i> Kessler, 1878	Endemic of Armenian Highland. Southern Armenia; southern Azerbaijan; northeastern Turkey; northwestern Iran. Type locality: Armenia, vicinity of Echmiadzin town.	LC Status needs in revision.

Table 3. End

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
51	Suphan Racerunner, Basoglu's Racerunner	<i>Eremias suphani</i> Basoglu et Hellmich, 1968	Eastern Turkey (Anatolia, Lake Van region, perhaps to Burdur in the west); northwestern Iran (on the road from Firoragh to Chaldoran in Ali Sheykh village).	LC
52	Caucasian Rapid Racerunner	<i>Eremias velox caucasicus</i> Lantz, 1928	Russia: Ciscaucasia (Stavropol Territory, Chechen, Dagestan); Azerbaijan; eastern Georgia. Type locality: Azerbaijan, Bibi-Eybat near Baku.	LC
Genus Green Lizards – <i>Lacerta</i> Linnaeus, 1758				
53	Sand Lizard	<i>Lacerta agilis</i> Linnaeus, 1758:	Russia: Eastern Ciscaucasia: Krasnodar Territory, Stavropol Territory, Republics of Dagestan, Chechen, Ingushetia, North Ossetia-Alania, Kabardino-Balkaria, Karachay-Cherkessia, Adygea; Abkhazia; South Ossetia; Georgia; northern Armenia; northwestern Azerbaijan; northeastern Turkey. Five endemic subspecies inhabit the Caucasian ecoregion.	LC
53a	Dagestan Republic Sand Lizard	<i>Lacerta agilis boemica</i> Suchow, 1929	Endemic subspecies of northern slope of Central and East Caucasus.	
53b	Short-tailed Sand Lizard	<i>Lacerta agilis brevicaudata</i> Peters, 1958	Type locality: Russia, North Ossetia-Alania, City Vladikavkaz.	
53c	Eastern Sand Lizard	<i>Lacerta agilis exigua</i> Eichwald, 1831	Endemic subspecies of southern part of Caucasian ecoregion.	
53d	Georgian Sand Lizard	<i>Lacerta agilis grusinica</i> Peters, 1960	Type locality: Armenia, town Stepanovan.	
53e	River Iori Sand Lizard	<i>Lacerta agilis iorensis</i> Peters et Muskhelischwilli	Widespread subspecies of steppe zone of Eurasia..	
53f	River Mzymta Sand Lizard	<i>Lacerta agilis mzymtensis</i> Tuniyev et Tuniyev, 2008	Endemic subspecies of eastern Black Sea coast. Type locality: Abkhazia, vicinity of Sukhum City.	
54	Medium Lizard	<i>Lacerta media</i> Lantz et Cyrén, 1920	Endemic subspecies of East Georgia. Type locality: Georgia, Iori River valley near town Tianeti.	LC
55	Five-streaked Lizard, Caucasus Emerald Lizard	<i>Lacerta sfrigata</i> Eichwald, 1831	Endemic subspecies of mountain north Colchis. Type locality: Russia, Krasnodar Territory, Adler area of Sochi City, Mountain Aishkha-2.	
Genus Snake-eyed Lizards – <i>Ophisops</i> Menetries, 1832				
56	Snake-eyed Lizard	<i>Ophisops elegans</i> Menetries, 1832	Russia: Black Sea coast of Krasnodar Territory (between City Anapa and City Gelendjik), submont Dagestan Republic; Abkhazia; eastern Georgia; Armenia; Azerbaijan; northwestern Iran, eastern Turkey. Type locality: Georgia, Tbilisi City.	LC
Genus Anatolian Lizards – <i>Parvilacerta</i> Harris, Arnold et Thomas, 1998				
57	Dwarf Lizard	<i>Parvilacerta parva</i> (Boulenger, 1887)	Russia: east of Krasnodar Territory, Stavropol Territory, Chechen Republic (Nogay Steppe), Dagestan Republic; eastern Georgia; Abkhazia (probably extinct now); Armenia; Azerbaijan; northeastern Turkey; Northern Iran (southern coast of the Caspian Sea).	LC
Genus Lebanon Lizards – <i>Phoenicolacerta</i> Arnold, Arribas et Carranza, 2007				
58	Lebanon Lizard	<i>Phoenicolacerta laevis</i> (Gray, 1838)	Russia: southern Dagestan Republic, probably extinct in southern part of Chechen Republic; eastern Georgia; Armenia; Azerbaijan; northwestern Iran; eastern Turkey (except Black Sea coast within Caucasian ecoregion boundaries). Type locality: Azerbaijan, vicinity of Baku City.	LC
59	Italian Wall Lizard	<i>Podarcis siculus</i> (Rafinesque-Schmaltz, 1810)	Northwestern Armenia: Spitak District; eastern Turkey.	LC

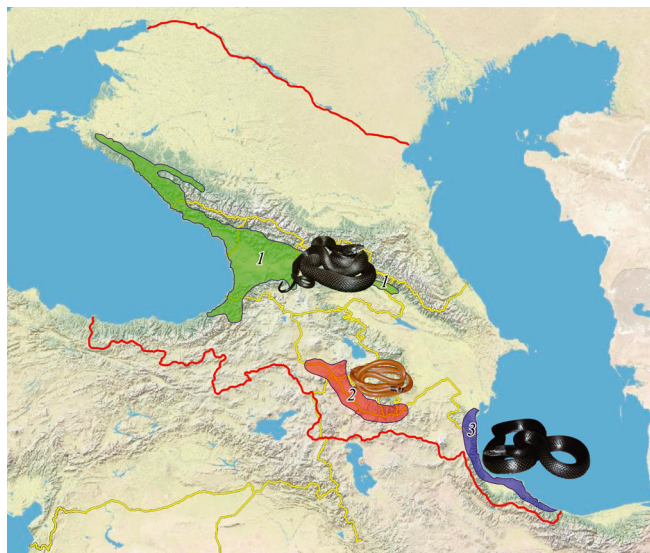


Fig. 7. Endemic colubrids of the Caucasus ecoregion: 1 – *Natrrix megalocephala*, 2 – *Rhynchocalamus satunini*, 3 – *Zamenis persicus*.

brauneri myusserica Doronin, 2011, *D. praticola hyrcanica* Tuniyev, Doronin, Kidov et Tuniyev, 2011, *D. praticola loriensis* Tuniyev, Doronin, Tuniyev, Aghasyan, Kidov et Aghasyan, 2013, *D. rudis mirabilis* Arribas, Ilgaz, Kumlutaş, Durmuş, Avci et Üzümlü, 2013, *D. aghasyani* Tuniyev et Petrova, 2019, *D. tuniyevi* Arribas, Candan, Kurnaz, Kumultas, Caynak et Ilgaz, 2022 and *D. arribasi* Tuniyev, Lotiev et Petrova, 2023. *D. raddei* and *D. defilippi* is now regarded as a complex of cryptic species as well as *D. chlorogaster* (Ahmadzadeh et al. 2013). A number of subspecies have been elevated to species level, such as *Darevskia brauneri* (Méhely, 1909), *D. szcezbaki* (Lukina, 1963), *D. pontica* (Lantz et Cyrén, 1918), *D. nairensis* (Darevsky, 1967), *D. alpina* (Darevsky, 1967), *D. daghestanica* (Darevsky, 1967), *D. adjarica* (Darevsky et Eiselt, 1980). At the same time, many open questions remain with the systematics of the Caucasian rock lizards. The allocation of subspecies to species such as *Darevskia rudis* (Bedriaga, 1886) and *Darevskia valentini* (Boettger, 1892) has been questioned (Candan et al., 2021). The status of taxa (species/subspecies) of the “*Darevskia praticola* – *pontica*” complex is controversial (Tuniyev et al., 2011; Freitas et al., 2016; Speybroeck et al., 2020). In addition, the subspecific rank of *D. p. hyrcanica* and *D. p. loriensis* is recognized by some authors (Freitas et al., 2016) and rejected by others (Saber-Pirooz et al., 2018). The validity of the name *Darevskia dryada* (Darevsky et Tuniyev, 1997) is disputed (Schmidtler et al., 2002); Arribas et al. (2021) argue the ambiguity of such a conclusion. It was suggested that the continuous range and clinal variability revealed in *Darevskia derjugini* (Nikolsky, 1898) indicate monotypy and conspecificity of the described

subspecies (Tuniyev, Ostrovskikh, 2006), which is also confirmed in the Turkish part of the species range (Kurnaz et al., 2017). The known parallels in the abdominal coloration and osteology characters of *Darevskia parvula* (Lantz et Cyrén, 1913) and *Darevskia defilippii* (Camerano, 1877) in two mesophilic tertiary refugia of the Caucasus ecoregion (Colchis and Hyrcanica) require further more detailed study of these species and their relationships (Arribas, 2012). In our opinion, the species status for *Darevskia portschinskii nigrita* (Bakradze, 1976), *D. caucasica vedenica* (Darevsky et Roitberg, 1999) and *Lacerta agilis boemica* Suchow, 1929 cannot be ruled out. Fourteen species were included in the IUCN Red List in categories from NT to CR, one species has category DD, and eight species are still not assessed (Table 3).

The analysis of taxonomic diversity of the Caucasian snakes shows that new records, phylogenetic studies and taxonomic revisions have led to the most significant changes in the numbers of genera and species. Recent taxonomic views were made on the base of the new results of study of the phylogeny of advanced snakes (Colubroidea) (Pyron et al., 2010) with resurrection of the family Psammophiidae Boie in Fitzinger, 1826 in particular with genera *Malpolon* Fitzinger, 1826 and *Psammophis* Boie in Fitzinger, 1826 for the Caucasian herpetofauna. Tuniyev et al., (2019) carried out a detailed analysis of this fauna according to its status as of 2019. This monograph provides a comprehensive bibliography on all aspects of the diversity of the ophidiofauna of the Caucasus up to 2019. In present paper, due to its limited volume, we use and review more recent works in this field, as well as new descriptions. All snake species occurring in the Caucasus are related to the five families. They are Typhlopidae with one genus *Xerotyphlops* Hedges, Marion, Lipp, Merin et Vidal, 2014 (one species), Boidae with genus *Eryx* Daudin, 1803 (two species) and taxonomically and phylogenetically diverse family Colubridae (ten genera with 21 species) with two subfamilies: Natricinae with one genus *Natrix* Laurenti, 1768 (three species), and Colubrinae with nine genera: *Dolichophis* Gistel 1868 (two species), *Hemorrhois* Boie, 1826 (two species), *Platycephalus* Blyth, 1860 (one species), *Coronella* Laurenti, 1768 (one species), *Eirenis* Jan, 1863 (four species), *Elaphe* Fitzinger, 1833 (three species), *Zamenis* Wagler, 1830 (three species), *Rhynchocalamus* Günther, 1864 (one species) and *Telescopus* Wagler, 1830 (one species). The family Psammophiidae is represented in the Caucasian ecoregion by two genera: *Malpolon* (one species) and *Psammophis* (one species). The assessment of taxonomic diversity of the groups *Elaphe* sensu lato and *Coluber* sensu lato is problematic and undergoing radical changes, stimulated by remarkable discoveries of new taxa. The system of colubrid systematics hinges on the results of intensive phylogenetic and taxonomic studies, research of nomenclature and colubrid descriptions (Salvi et al.,

Table 4. List of snake species of the Caucasian ecoregion

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
ORDER SQUAMATES – SQUAMATA Oppel, 1811 INFRAORDER SNAKES – SERPENTES Linnaeus, 1758 F A M I L Y WORM, or BLIND SNAKES – TYPHLOPIDAE Merrem, 1820 Genus Blind Snakes – <i>Xerophlops</i> Hedges, Marion, Lipp, Merin et Vidal, 2014				
1	European Blind Snake	<i>Xerophlops vermicularis</i> (Merrem, 1820)	Russia: southern Dagestan Republic; southern Armenia; Azerbaijan except northwestern part; eastern Georgia; northeastern Turkey; northwestern Iran..	LC
F A M I L Y BOAS – BOIDAE Gray, 1825 Subfamily Erycinae Bonaparte, 1831 Genus Sand Boas – <i>Eryx</i> Daudin, 1803				
2	Javelin Sand Boa West Javelin Sand Boa	<i>Eryx jaculus</i> (Linnaeus, 1758) <i>Eryx jaculus familiaris</i> Eichwald, 1831	Russia: the Eastern Caucasus and Eastern Ciscaucasia (some regions of the Stavropol Territory, Chechen and Dagestan Republics; probably extinct in North Ossetia-Alania and Ingushetia Republics); southern, central and northernmost Armenia; eastern Georgia; Azerbaijan except northwestern part; northern Turkey; northwestern Iran.	LC
3	Desert Sand Boa, Nogay Steppe Sand Boa	<i>Eryx miliaris</i> (Pallas, 1773) <i>Eryx miliaris nogatorum</i> Nikolsky, 1910	Endemic subspecies of Russia: Nogayskaya Steppe on the boundary of Chechen and Dagestan Republics, Stavropol Territory, the coastline of the Kizliarsky Bay in Dagestan Republic, Kalmykia. Type locality: “Karanogayskaya Steppe” (Dagestan).	LC
F A M I L Y COLUBERS – COLUBRIDAE Oppel, 1811 Subfamily Natricinae Bonaparte, 1838 Genus Grass and Water Snakes – <i>Natrix</i> Laurenti, 1768				
4	Large-headed or Colchis Water Snake	<i>Natrix megalcephala</i> Orlov et Tuniyev, 1987*	Endemic of the West Caucasus and Colchis, including Colchis refugees on the southern slope of the Greater Caucasus eastward to Zakataly in Azerbaijan, western part of Lesser Caucasus. Russia: Krasnodar Territory (from the vicinity of Gelendzhik on the northern slope of the Markotkh Ridge and Aderba River southeastward to Psou River and north-eastward to Malaya Laba River), Karachay-Cherkessia Republic (Bolshaya Laba River basin); Abkhazia (from Psou River to Inguri River); Georgia (from Inguri River to Choroh River and Borjomi Gorge; isolated near Lagodekhi); South Ossetia; Azerbaijan (Zakataly, Belokany); Turkey (along the Black Sea slope of the Pontic (Lazistan) Ridge westward to Rize). Type locality: Pitsunda Cape (Abkhazia).	VU A4ce
5	Grass Snake	<i>Natrix natrix</i> (Linnaeus, 1758);	Almost entire Caucasian ecoregion, with the exceptions of the arid areas of the Kura-Arax Lowland, Absheron Peninsula and Greater Caucasus highlands.	LC
5a	Persian Grass Snake	<i>Natrix natrix persa</i> Pallas, 1814	The eastern part of the Caucasian ecoregion from Dagestan Republic southward to north-eastern Turkey and northwestern Iran. Status of subspecies is under discussion/	
5b	Scutated Grass Snake	<i>Natrix natrix scutata</i> Pallas, 1771)	Ciscaucasia and the western half of the Caucasian ecoregion.	
6	Dice Snake	<i>Natrix tessellata</i> (Laurenti, 1768)	Throughout most of the Caucasus (along the big and small water flows and along the Azov, Black and Caspian Sea coastlines). Russia: Abkhazia; South Ossetia; Georgia; Azerbaijan; Armenia; Turkey; Iran.	LC

Table 4. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
Subfamily Colubrinae Oppel, 1811 Genus <i>Dolichophis</i> Gistel 1868				
7	Caspian Whip Snake	<i>Dolichophis caspius</i> (Gmelin, 1789)	Russia: foothill strip along the Black Sea coast from Psou River to the Taman Peninsula inclusive, steppe and forest-steppe zones in the Krasnodar Territory and the Republic of Adygea, Stavropol Territory, northern foothills of the Karachaevo-Cherkesia Republic, Kabardino-Balkaria, North Ossetia-Alania, Ingushetia, Chechen republiks and Dagestan Republic. Abkhazia: foothill strip along the Black Sea coast from Psou River to Sukhum. Isolated in Artvin Hollow (Turkey).	LC
8	Red-bellied Racer	<i>Dolichophis schmidti</i> (Nikolsky, 1909)	Northern Turkey, Iran, Armenia, eastern Georgia, Azerbaijan and southern Russia (Dagestan Republic, seashore of Caspian Sea southward from Makhachkala City). Type locality: “in salsis Ad’zi, Mugan’ Steppe, Azerbaijan”.	LC
Genus <i>Hemorrhois</i> Boie, 1826				
9	Leaden-coloured Racer	<i>Hemorrhois nummifer</i> (Reuss, 1834)	Armenia (Ararat Valley and surrounding mountains); Azerbaijan, including Nakhichevan; northern Turkey and northern Iran.	LC
10	Spotted Whip Snake	<i>Hemorrhois ravergieri</i> (Ménétriés, 1832)	From the foothills and some semiarid hollows of Dagestan Republic (Russia) through the Kura-Arax Lowland to eastern Georgia, Armenia, Azerbaijan (Zuvand), northeast Turkey and Iran. Type locality: Baku (Azerbaijan).	LC
Genus Whip Snakes – <i>Platyceps</i> Blyth, 1860				
11 11a	Dahl’s Whip Snake	<i>Platyceps najadum</i> (Eichwald, 1831): <i>Platyceps najadum najadum</i> Eichwald, 1831	Russia: foothills and mountains of Dagestan Republic, Chechen Republic (Itum-Kali Hollow); Armenia, eastern Georgia, Azerbaijan, northeast Turkey and Iran. An isolated western enclave is known from the Black Sea coast of the Krasnodar Territory (Russia, from Sukko to the Psou River) and in Abkhazia (from Psou River to Sukhum). Another isolated population lives on the Black Sea coast of Adjaria (Georgia) and Lazistan (Turkey). Not conformed by recent finds in Ingushetia Republic, North Ossetia-Alania Republic and the adjacent areas of the Stavropol Territory. Type locality: Azerbaijan, City Baku.	LC
11b	Hyrcanian Whip Snake	<i>Platyceps najadum albitemporalis</i> (Darevsky et Orlov, 1994)	Endemic Hyrcanian subspecies. Southeast Azerbaijan (Talysh and Lenkoran lowland) and north Iran (Caspian coast of Alborz Mts.). Type locality: “6 km West of Lenkoran, south-eastern Azerbaijan”.	
Genus Smooth Snakes – <i>Coronella</i> Laurenti, 1768				
12	Smooth Snake	<i>Coronella austriaca</i> Laurenti, 1768	Almost entire Caucasian Isthmus to the south of the Kuma-Manych Depression, reaching the northern parts of Turkey and Iran (including the Talysh Mts. and Alborz Mts.) except the Nogay Steppe and Kura-Arax lowland.	LC
Genus Dwarf Snakes – <i>Eirenis</i> Jan, 1863				
13 13a	Collared Dwarf Snake	<i>Eirenis collaris</i> (Ménétriés, 1832): <i>Eirenis collaris collaris</i> Ménétriés, 1832;	South Russia (foothills of Dagestan Republic), south-east Georgia, south Armenia, Azerbaijan (except north-western part); Turkey. South Russia (foothills of Dagestan Republic), south-east Georgia, south Armenia (except south-west part), Azerbaijan (except north-western part); Turkey (except Armenian Par Ridge). Type locality: Beshbarmak mountain, Divichinsky District (Azerbaijan).	LC

Table 4. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
13b	Armenian Collared Dwarf Snake	<i>Eirenis collaris macrospilotus</i> (Werner, 1903)	Endemic subspecies of South-west Armenia and northeast Turkey (Armenian Par Ridge). Type locality: mountains westward from Mt. Ararat (Turkey). Eastern Georgia, south and northernmost Armenia, Azerbaijan (except arid areas of Kurax Lowland and Absaron Peninsula), south Russia (mountainous Dagestan Republic), north-east Turkey and north-west Iran. Type locality: Trabzon (Turkey). Armenia, southern foothills of the Meghri Ridge in front of the Arax River, Tsiranidzor Gorge. Probably in adjusting area of Karadagh Ridge in north Iran. Southern Armenia, southwestern and southeastern Azerbaijan (Nakhichevan, Zuvand), Turkish and Iranian parts of the Caucasus. Type locality: Armenia.	LC
14	Ring-headed Dwarf Snake	<i>Eirenis modestus</i> (Martin, 1838)		
15	Dark-headed Dwarf Racer	<i>Eirenis persicus</i> (Anderson, 1872)		
16	Dotted Dwarf Snake	<i>Eirenis punctatolineatus</i> (Boettger, 1892)		
Genus Ratsnakes – <i>Elaphe</i> Fitzinger, 1833				
17	Steppes Ratsnake	<i>Elaphe dione</i> (Pallas, 1773)	South Russia (Stavropol territory, Ingushetia Republic, Chechen Republic, Dagestan Republic), eastern Georgia, Azerbaijan and northern Iran. Finds in Eastern Georgia and Krasnodar Territory (Russia) need conformation.	LC
18	Eastern Four-lined Ratsnake	<i>Elaphe sauromates</i> (Pallas, 1811)	North-western Ciscaucasia (Taman Peninsula to Kabardinka), Kalmykia, Chechen Republic, Stavropol Territory, Ingushetia, Dagestan, Transcaucasus (eastern Georgia, Armenia, Azerbaijan), eastern Turkey and north-western Iran.	LC
19	Urartu Four-lined Ratsnake	<i>Elaphe urartica</i> Jablonski, Kukushkin, Avci, Bunyatova, Ilgaz, Tuniyev et Jandzik, 2019	South Russia (mountainous Dagestan Republic), east Turkey, eastern Georgia, Armenia, Azerbaijan, north-west Iran.	No status in IUCN Red List
Genus <i>Zamenis</i> Wagler, 1830				
20	Transcaucasian Ratsnake	<i>Zamenis hohenackeri</i> (Strauch, 1873)	Eastern Georgia, Armenia, Azerbaijan and neighboring areas of Turkey and Iran. In the Russian part of the Caucasus, the Transcaucasian ratsnake occurs sporadically in Dagestan and Chechen Republics. Finds in Ingushetia Republic and North Ossetia-Alania Republic need conformation. Type locality: Khanlar (Azerbaijan).	LC
21	Aesculapian Snake	<i>Zamenis longissimus</i> (Laurenti, 1768)	The range is split into at least four patches: (1) foothills of the Krasnodar Territory (Russia) from the Navagir Ridge to the Psou River and then through Abkhazia Republic to Sukhum in the east; (2) Azishtau Ridge and middle-flow basin of Belaya River in the Adygea Republic (Russia) on northern macroslope of the Greater Caucasus; (3) Lagodekhi in eastern Georgia; (4) eastern foothills of the Colchis Lowland – Adjara (Georgia) and Lazistan in Turkey.	LC
22	Persian Ratsnake	<i>Zamenis persicus</i> (Werner, 1913)	Hyrcanian Endemic. Forests of southeastern Azerbaijan (Lenkoran Lowland and foothills of the Talysh Mts.); the lower belt of the Alborz Ridge along the Caspian Sea coast in Iran (Gilan and Mazandaran provinces). Type locality: Barferush, Mazandaran Province (northern Iran).	DD

Table 4. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
Genus Ground Snakes – <i>Rhynchocalamus</i> Günther, 1864				
23	Satunin’s Black-headed Dwarf Snake	<i>Rhynchocalamus satunini</i> Nikolsky, 1899	Endemic of Arax River valley and neighboring foothills of northern part of Armenian Highland. A limited number of records are known from the left bank of the Arax River in southern Armenia from Yerevan suburbs in the west to the Shvanidzor village in the east (southern foothills of the Meghri Ridge); Azerbaijan (Nakhichevan), Mentioned for northeast Turkey and north-west Iran. Type locality: vicinity of Meghri Town (Armenia).	LC
Genus Cat Snakes – <i>Telescopus</i> Wagler, 1830				
24	Soosan Snake Iberian Cat Snake -	<i>Telescopus fallax</i> (Fleischmann, 1831) <i>Telescopus fallax iberus</i> (Eichwald, 1831)	Endemic subspecies of east part of the Caucasian ecoregion: Russia (the foothills of Dagestan Republic along the Caspian Sea coast), Azerbaijan, eastern Georgia, Armenia and adjacent areas of Turkey and Iran in the south. Type locality: Tbilisi (Georgia).	LC
FAMILY OLD WORLD SAND SNAKES – Psammophiidae Boie in Fitzinger, 1826 Genus <i>Malpolon</i> Fitzinger, 1826				
25	Eastern Montpellier Snake	<i>Malpolon insignitus</i> (Geoffroy, 1827)	The range in the Caucasus ecoregion is split into two areas. The northern area is located in the East Ciscaucasia, forming a geographical isolate spread in Russia (eastern Kalmykia, Stavropol Territory, Rostov Province, and some sites on the left bank of the Volga River in the Astrakhan Province outside of ecoregion). The southern area covers almost entire Azerbaijan (with the exception of the north-western part), southern Armenia, southeastern Georgia, north-western Turkey and north-western Iran.	LC
Genus <i>Psammophis</i> Boie in Fitzinger, 1826				
26	Steppe Ribbon Racer	<i>Psammophis lineolatus</i> (Brandt, 1838)	Known only from the Nakhichevan Depression in the middle part of the Arax River basin (Azerbaijan) separated from Armenia’s Ararat Valley by the anticlinorium of the Volchie Vorota (Wolf Gates). Perhaps presents on surrounding area of Iran.	LC
FAMILY VIPERS – VIPERIDAE Laurenti, 1768 Subfamily Pit Vipers – Crotalinae Oppel, 1811 Genus Pit Vipers – <i>Gloydius</i> Hoge et Romano-Hoge, 1981				
27	Caucasian Pit Viper	<i>Gloydius caucasicus</i> (Nikolsky, 1916)	Occurs in southeastern Azerbaijan (Lenkoran Lowland, Talysh Mts. and Zuvand) and the adjacent areas of the Alborz Ridge in Iran. Type locality: Dzhi Village, Lenkoran District (Azerbaijan).	LC
Subfamily True vipers – Viperinae Laurenti, 1768 Genus Mountain Vipers – <i>Montivipera</i> Nilson, Tuniyev, Andrén, Orlov, Joger et Herrmann, 1999				
28	White-horned Mountain Viper	* <i>Montivipera albicornuta</i> (Nilson et Andrén, 1985)	A small part of the range extends into the Caucasus ecoregion in northwestern Iran. <i>Montivipera albicornuta</i> possibly conspecific with <i>M. raddei</i> (Van Wallach et al., 2014; Uezt et al., 2024). However, <i>M. albicornuta</i> has been assessed for the IUCN Red List of Threatened Species in 2008 as a distinct species and listed as Vulnerable under criteria A4d/	VU A4d.
29	Armenian or Radde’s Viper	<i>Montivipera raddei</i> (Boettger, 1890):	Endemic of Armenian Highland.	NT

Table 4. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
29a		<i>Montivipera raddei raddei</i> (Boettger, 1890)	Nominative subspecies – endemic of ecoregion. A chain of isolated habitat patches in southern Armenia and Nakhichevan (Azerbaijan) from the Mt. Aragats eastwards to the Meghri Ridge inclusive as well as in adjacent areas of Turkey and Iran. Type locality: Kazikkoparan (Tuzluca, Kars Province, Turkey).	
29b	Kurdistan Viper	<i>Montivipera raddei kurdistanica</i> (Nilson et Andrén, 1986)	Southeast Turkey, adjacent Iraq and Iran. Occurs in southernmost part of ecoregion in bordering area of west Iran and east Turkey.	
30	Wagner's Viper	<i>Montivipera wagneri</i> (Nilson et Andrén, 1984)	Endemic of Armenian Highland. Reliable records are known from the canyons of the upper Arax River in eastern Turkey, Karakurt, Kagizman and Horasan. Possible also exist in the Arax riverside near the junction with the Akhurian River and in the Akhurian River basin in Armenia. An individual was found in the Euphrates River basin (upper Murat River).	CR A2a+4c.
Genus Giant Vipers – <i>Macrovipera</i> Reus, 1927				
31	Blunt-nosed Viper, Lebetine Viper Caucasus Blunt-nosed Viper	<i>Macrovipera lebetina</i> (Linnaeus, 1758): <i>Macrovipera lebetina obtusa</i> (Dwigubsky, 1832))	The range in the Caucasus extends from the foothills of Dagestan Republic (Russia) in the north through all Azerbaijan (except for the Talysh Mts., Grater Caucasus and highlands of the Lesser Caucasus) to eastern Georgia, Armenia (aside from highlands of the Lesser Caucasus and the Armenian Highland), Nakhichevan (Azerbaijan) and further to north-eastern Turkey and north-western Iran. Type locality: Geok Tapa (Gyanja), Azerbaijan.	LC
Genus Shield-head Vipers – <i>Pelias</i> Merrem, 1820				
32	Turkish Viper, Baran's viper, Adapazar viper	<i>Pelias berus barani</i> Böhme et Joger, 1983	Endemic subspecies of the Pontic Ridge in the north Turkey. Occurs in ecoregion in northeast Turkey.	NT
33	Darevsky's viper	<i>Pelias darevskii</i> (Vedmederija, Orlov et Tuniyev, 1986)	Endemic of Armeno-Javakheti Highland (north-westernmost part of Armenian Highland) and Turkish Lesser Caucasus.	CR B1ab(ii, iii)+2ab(ii, iii)
33a	Darevsky's Viper	<i>Pelias darevskii darevskii</i> (Vedmederija, Orlov et Tuniyev, 1986);	Endemic subspecies of southeastern part of the Javakheti Ridge in Armenia (Mt. Ach-kasar) and in South Georgia (Mt. Madatapa in Javakheti Ridge and Mt. Airilanbashi in Akhaltsikhe Highland). Type locality: Mt. Sevsar, Dzhevakhetskiy (Kechutskiy) Ridge, Ashotsk (former Gukasyan) district, northwestern Armenia.	
33b	Uzum's Viper	<i>Pelias darevskii uzumorum</i> Tuniyev, Avci, Ilgaz, Olgun Petrova, Bodrov, Geniez et Teynié, 2018;	Endemic subspecies of southern part of the Yalvizçam Dağları (Arsiyansky) Ridge in its most warm calcareous part. Type locality: the Yalvizçam Dağları Ridge, vicinity of Zekeriya Village, Artvin Province (Turkey).	
33c	Kumlutas's Viper	<i>Pelias darevskii kumlutasi</i> Tuniyev, Avci, Ilgaz, Olgun Petrova, Bodrov, Geniez, Teynié, 2018)	Endemic subspecies of northern part of the Yalvizçam Dağları (Arsiyansky) Ridge within the limits of upper basin of Kura River from Bağdaşan Village to Ardahan pass. Type locality: the Yalvizçam Dağları Ridge, vicinity of Bağdaşan Village, Ardahan Province (Turkey).	
34	Dinnik's Viper	<i>Pelias dinniki</i> (Nikolsky, 1913)	Endemic of Grater Caucasus: Russia (Krasnodar Territory and the Republic of Adygheya, Karachaevo-Cherkessia Republic, Kabardino-Balkaria Republic, North Ossetia-Alania Republic, Chechen Republic and Dagestan Republic), Republic of Abkhazia, Republic of South Ossetia, Republic of Georgia, perhaps in north-west Azerbaijan. Type locality: Upper stream of the Laba River, 8000 feet a.s.l. in Krasnodar Territory (Russia).	VU B1ab (iii, v)

Table 4. Continuation

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
35	Iranian Mountain-steppe Viper	<i>Pelias ebneri</i> (Knoepffler et Sochurek, 1955)	The northwestern periphery of the species range extends into the Caucasian ecoregion within the Zuvand area in Azerbaijan and adjacent areas of northern Iran.	VU B2ab(iii)
36	Armenian Steppe Viper	<i>Pelias eriwanensis</i> (Reuss, 1933)	Endemic of Armenian Highland and Lesser Caucasus. The greater part of the Armenian Highland in Armenia, northeastern Turkey and southwestern Azerbaijan, including the Karabakh Highland and Nakhichevan. Type locality: Lake Sevan above Shordzha at 2000 m a.s.l. [Yerevan], Armenia.	VU B1ab(iii, v)
37	Kaznakov's or Caucasian Viper -	<i>Pelias kaznakovi</i> (Nikolsky, 1909)	Endemic of Western Transcaucasia: Russian Black Sea coast from Tuapse town southward to Psou River; Republic of Abkhazia, West Georgia (except Colchis Lowland) with Adjara and north-east humid Turkey with Lazistan coast. Type locality: Tsebel'da, Sukhumi district (Abkhazia).	EN B2ab (ii, iii, v)
38	Lotiev's Viper	<i>Pelias lotievi</i> Nilson, Tuniyev, Orlov, Höggren et Andrén, 1995	Endemic of middle-mountain belt of northern macroslope of Grater Caucasus with mountain steppes and oreoxerophytic landscapes. Russia (Karachaevo-Cherkessia, Kabardino-Balkaria, North Ossetia-Alania, Ingushetia, Chechen Republics, Dagestan Republic) and north-western Azerbaijan. An isolated population is known from the eastern part of the Krasnodar Territory (Mt. Magisho). Type locality: Armkhi, near the foothills of the Mt. Stolovaya, 2000 m a.s.l., Republic of Ingushetia (formerly Checheno-Ingushetia), Russia.	NT
39	Magnificent, or Relic Viper	* <i>Pelias magnifica</i> (Tuniyev et Ostrovskikh, 2001)	Endemic of north macroslope of West Caucasus: southern slope of the Skalistyi Ridge in the Republic of Adygheya (Mt. Afonka) and the Krasnodar Territory (Malyi Bambak Ridge). It is possible to expect the records of this species in Karachaevo-Cherkesskaya Republic. Type locality: Shakhgireevskoye Gorge, Malaya Laba River, Krasnodar Territory (Russia).	EN B1ab(ii, iii, v)
40	Olgun's Viper	* <i>Pelias olguni</i> (Tuniyev S., Avci A., Tuniyev B., Agasian A. et Agasian L., 2012)	Endemic of Türkğözü Plateau. Recent distribution of species is limited by vicinities of Town Posof in the borderline district of Turkey with Georgia, from where this species is known within Türkğözü Plateau and slopes of mountain Ilgar-Dağ in the left-bank basin of upper flow Kura River and from mountain Gumbati in Georgia in the Erusheti Mountains. Type locality: Mt. Ilgar-Dağ, (2020 m a.s.l.), Town Posof, Ardahan Province (Turkey).	VU B2ab(iii)
41	Orlov's Viper	<i>Pelias orlovi</i> Tuniyev et Ostrovskikh, 2001	Endemic of north-western Transcaucasus. A chain of patches in the Krasnodar Territory on both slopes of the lowest north-western part of the Greater Caucasus. It includes Mt. Papai, Ubin and Praskoveevka villages, Mikhailovsky Pass, Mt. Oblogo and Mt. Bolshoi Pseushkho. Some isolated populations can be present near Gelenjik. Type locality: Papai Mountain, Krasnodar Territory (Russia).	CR B1ab(i, v)
42	Black Sea Viper	<i>Pelias pontica</i> Billing, Nilson et Sattler, 1990	Endemic of low stream of Chorukh River. Known from its type locality in the lower Çoruh River basin downstream from Artvin, not far from the Turkish-Georgian border. Supposedly, it also exists in the Kura River basin near Gori (Georgia) and near Kemurlu in the Çoruh basin (Erzurum Province, Turkey). Type locality: Çoruh valley, Province Artvin, northeastern Turkey.	EN B1ab(i, iii, v), C1

Table 4. End

№	Species / subspecies		Status of endemism and distribution in the Caucasian ecoregion	Conservation status
	Common name	Latin name		
43	Meadow Viper	<i>Pelias renardi</i> Christoph, 1861	The range covers all Ciscaucasia (aside from the Nogayskaya Steppe and arid Caspian semi-deserts) from where vipers permeate into the foothills of the West Caucasus (Raevszkaya Stanitsa, Apsheronsk and Khadyshensk Towns, Gerpegem Ridge) along the riversides (Psekups, Pshish, Belaya, Malaya Laba).	VU A1c+2c
44	Shemakha Steppe Viper	<i>Pelias shemakhensis</i> Tuniyev, Orlov, Tuniyev et Kidov, 2013	Endemic of middle flow basin of Kura River in East Georgia and west Azerbaijan. Needs to be included in the Red List of IUCN and Red Data Books of Azerbaijan and Georgia with the category of status of CR B1ab (i, ii, iii, iv, v.).	No status in IUCN Red List
44a		<i>Pelias shemakhensis shemakhensis</i> Tuniyev Orlov, Tuniyev et Kidov, 2013	Azerbaijan: Shemakha District of Azerbaijan, from here it is known from vicinity of Shemakha town, village Demirchi; Gobustan District – village Maraza. Type locality: Vicinity of Shemakhan (=Shemakha, northeastern Azerbaijan).	
44b	Kakhetia Steppe Viper	<i>Pelias shemakhensis kakhetiensis</i> Tuniyev, Iremashvili, Petrova et Kravchenko, 2018	Endemic subspecies of East Georgia: sporadically distributes in vicinity of Tbilisi and in Goriyari Village, the peripheral areas Shirak Plateau in two neighboring regions – vicinity of village Chinkani and village Zemo Kedi; in vicinity of village Dedoplistskaro near Khornabudji Fortress, also known as the Fortress of Queen Tamar; at north foot of mountain Artsivis Kheoba. Type locality: vicinity of the Dedoplistskaro Village, Fortress Khornabudji, Shirak Plateau, Kakhetia, East Georgia.	
45	Tuniev's Viper	* <i>Pelias tuniyevi</i> Ananjeva, Petrova, Lotiev, Iremashvili, Gabaev, 2021	Endemic of westernmost part of East Transcaucasia in the left-bank basin of the middle flow of the Kura River from the Borzhom Georgia (east slope of Meskheti Ridge) in Georgia to middle-mountain districts of South Ossetia (east foothills of Likhsy Ridge and south spurs of Central Caucasus). Type locality: vicinity of Kharisdzhin Village (=Tormaneuli Village), 42.2504°N, 43.8398°E, 1010 m a.s.l. Znaur District, South Ossetia. Needs to be included in the Red List of IUCN and Red Data Books of South Ossetia and Georgia with the category of status of CR B1ab(ii, iii)+2ab(ii, iii).	No status in IUCN Red List
Genus True Vipers – <i>Vipera</i> Laurenti, 1768				
46	Transcaucasian Long-nosed Viper	<i>Vipera transcaucasiana</i> Boulenger, 1913	Georgia: Meskheti and Trialeti Ridges, eastern parts of the Adjara-Imereti Ridge and the canyon in the upper Kura River southeastwards to Akhalkalaki; Turkey: Artvin Province (Artvin, Ardahan, Borçka).	NT



Fig. 8. Endemic vipers of *kaznakovi*-complex of the Caucasus ecoregion: 1 – *Pelias orlovi*, 2 – *P. magnifica*, 3 – *P. dinniki*, 4 – *P. kaznakovi*, 5 – *P. pontica*, 6 – *P. olguni*, 7 – *P. tuniyevi*, 8a – *P. darevskii darevskii*, 8b – *P. d. kumlutasi*, 8c – *P. d. uzumorum*.



Fig. 9. Endemic vipers of *ursinii-renardi*-complex of the Caucasus ecoregion: 1 – *Pelias lotievi*, 2a – *P. shemakhensis kakhetiensis*, 2b – *P. sh. shemakhensis*, 3 – *P. erivanensis*.

2018; Tuniyev et al., 2019; Uetz et al., 2024) (Fig. 7). Seventeen species were included in the IUCN Red List in categories from NT to CR, one species has category DD, and three species still not assessed (Table 4).

The diverse family (20 species) of Viperidae family includes the members of two subfamilies: Crotalinae with one genus *Gloydius* Hoge et Romano-Hoge,

1981 (one species) and Viperinae with four genera: *Montivipera* Nilson, Tuniyev, Andrén, Orlov, Joger et Herrmann, 1999 (three species), *Macrovipera* Reus, 1927 (one species), *Pelias* Merrem, 1820 (14 species) and *Vipera* Laurenti, 1768 (one species). The Caucasus has been characterized by an extreme diversity of vipers *Vipera* sensu lato (19 out of approximately 40 species of this genus occur here) and represents the node

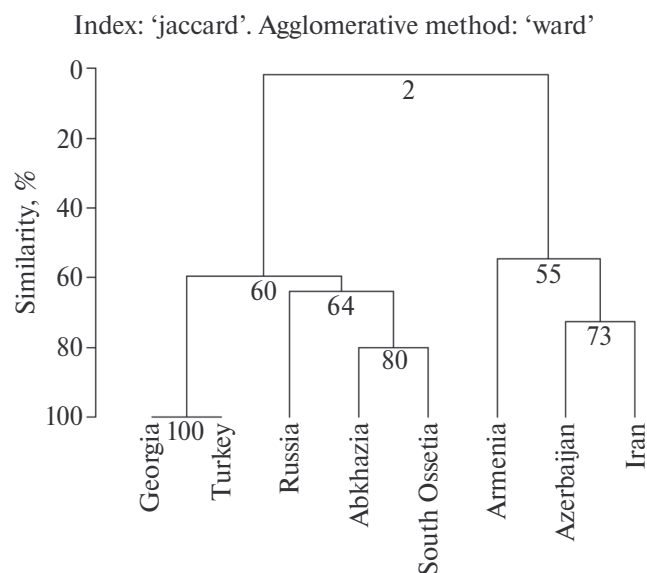


Fig. 10. Similarity of the batrachofauna of the countries of the Caucasus ecoregion according to the Jaccard coefficient.

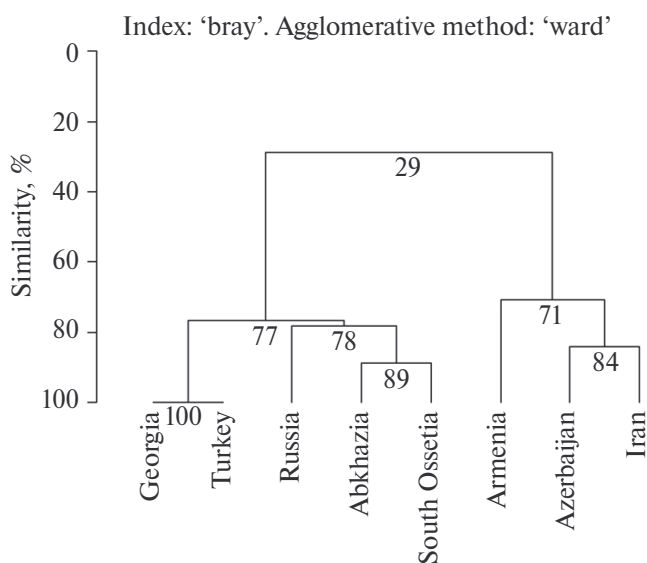


Fig. 11. Similarity of the batrachofauna of the countries of the Caucasus ecoregion according to the Sørensen-Chekanovsky coefficient.

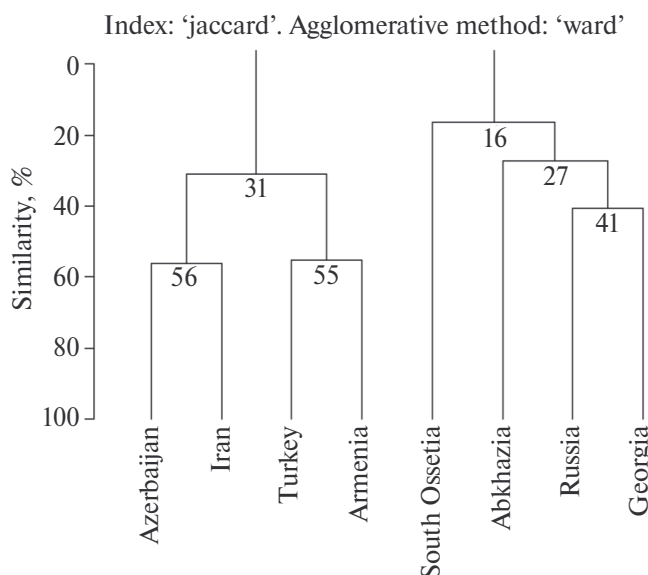


Fig. 12. Similarity of the herpetofauna of the countries of the Caucasus ecoregion according to the Jaccard coefficient.

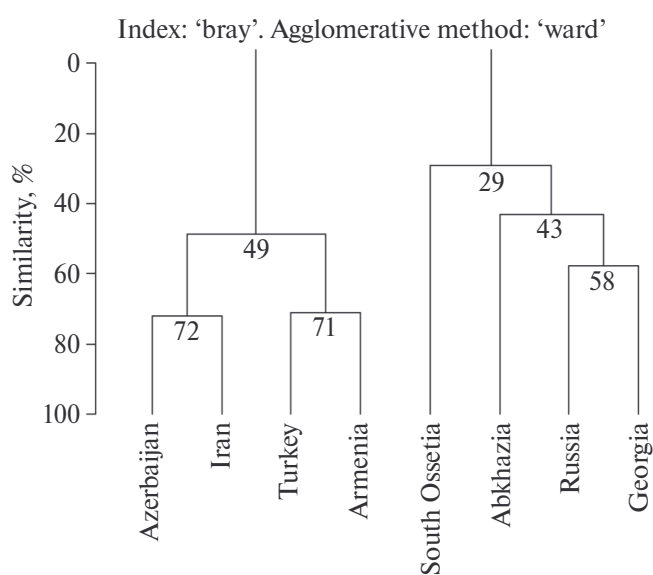


Fig. 13. Similarity of the herpetofauna of the countries of the Caucasus ecoregion according to the Sørensen–Chekanovsky coefficient.

of taxonomic diversity of the *Pelias* species (14 of 22 known species).

Cryptic speciation plays a significant role in the formation of this group. Tracking the history of research of the *Pelias* vipers in the Caucasus in the past 100 years one can find a trend in description of cryptic species from the Caucasus vipers of *P. kaznakovi* – *P. renardii* species groups (Tuniyev, 2016; Tuniyev et al., 2019; Freitas et al., 2020) (Fig. 8, 9). The results of recent phylogenetic research of the Caucasian vipers have demonstrated the polyphyly of the evolutionary lineages of *P. ursinii*, *P. orlovi*, *P. renardi* and *P. dinniki*, making the existence of complexes of cryptic species and/or the hybrid origin of some species quite possible (Zinenko et al., 2015, 2016; Thanou et al., 2023). The latest genome-wide data show the nuclear diversity of Palearctic vipers and supports the results obtained by ddRAD-seq analyses on particular species sets (Zinenko et al., 2016; Joger, Zinenko, 2021; Thanou et al., 2023; Dufresnes et al., 2024). They broadly corresponds to the mitochondrial phylogeny (Freitas et al., 2020) and underlines the importance of the hybridization both within and between the major clades. As many species living in the Caucasus ecoregion have disjunctive ranges, their distribution patterns can be considered as the result of relict insularization.

The discovery of a high level of diversity of *Pelias* vipers in the Caucasus has important implications for the assessment of conservation status of rare and narrowly distributed species many of which are recorded on the IUCN Red List of Threatened Species (Table 4). In the future, we should expect changes in the taxonomic composition of the ophidofauna because of new records, discovery of new cryptic

taxa of vipers and new revisions of taxonomically complicated genera of colubrids and viperids.

A number of species mentioned for the Caucasus ecoregion were not confirmed: (*Pelophylax lessonae* (Camerano, 1882), *Chamaeleo chamaeleon* (Linnaeus, 1758), either provided by local finds of the alien species, in particular *Phoenicolacerta laevis* (Gray, 1838) from western Georgia, *Trachemys scripta elegans* (Wied-Neuwied, 1839) in Krasnodar and Stavropol Territories and Dagestan, *Hemidactylus turcicus* (Linnaeus, 1758) in Sochi (Kukushkin et al., 2017; Dunaev, Imshenitzky, 2018; Tuniyev et al., 2023).

Comparative analysis of the herpetofauna of the countries of the Caucasus ecoregion, using cluster analysis of the values of the Sørensen–Czekanovsky and Jaccard coefficients by the method of Ward (1963), showed identical results on the dendrograms (Fig. 10–13). At the same time, the results of the analysis for amphibians and reptiles were somewhat different. Stably, common clusters for amphibians and reptiles were formed by Azerbaijan and Iran. In terms of the level of similarity of the batrachofauna, the Colchis refugium contributes to the formation of a common cluster of Georgia and Turkey, with sufficient proximity to Russia, while the dominant mountainous xerophilic landscapes of the Armenian Highlands affect the high similarity of the reptile fauna of Armenia with Turkey. The presence of both mesophilic and xerophilic landscapes in Russia and Georgia unites the reptilian fauna of these countries into a common cluster, which is closest to the single cluster of small areas of the southern macroslope of the Greater Caucasus in Abkhazia and South Ossetia.

ENDEMIC SPECIES: RICHNESS AND CONSERVATION STATUS AND THREATS

Endemic species richness is high in the Caucasian ecoregion (Russia, states of Transcaucasia, northeast Turkey and Caspian Iran). They are concentrated in a number of refugia, both mesophyllic (Caucasian Black Sea coast of Russia, Georgia, Turkey; southeast Azerbaijan and Caspian coast of Iran) and xerophyllous (Turkey eastward from Anatolian Diagonal; Armenia, Azerbaijan (Nakhichevan, Zuvand), Georgia (Vashlovani), Russia (Dagestan, semiarid Hollows in East Caucasus) (Tuniyev et al., 2019). The updated list includes 18 amphibians' species with endemic 13 subspecies of 10 species, nine species of which occur in Caucasian ecoregion only (Table 1). Among 110 reptile species in the ecoregion, 32 are endemic species and 44 are endemic subspecies (Tables 2–4). The distribution of the number of endemic species across the countries of the ecoregion is uneven and depends on both the area occupied and the landscape diversity. The maximum number of endemics inhabit the territories of Georgia (28 species), Turkey (24 species) and Russia (19 species) (Fig. 14). Taking into account the artificiality of the administrative approach to assessing the originality of faunas, we note the importance of understanding the volume of biodiversity of endemic species both for the countries themselves and for the adoption of transboundary conservation strategies.

Globally threatened species: CR, EN, VU redlisting categories according to IUCN. We compiled a dataset of 18 extant species of amphibians and 110 species

reptiles occurring in the Caucasus ecoregion from the Reptile Database and IUCN Red List of Threatened Species. Of these, 112 have published assessments of extinction risk on the IUCN Red List. Twenty-two species (28 subspecies, 19.6%) were assessed as threatened with extinction (categories Vulnerable, Endangered and Critically Endangered). Two species has category Data Deficient (DD) and 17 species – Near Threatened (NT). Therefore, 71 species (63.4%) belong to category Least Concern (LC) in Caucasus ecoregion. Sixteen species (9.6%) are still not assessed, due to late descriptions or changes in taxonomy. In addition, the assessments are absent for almost all subspecies, with exceptions of *Testudo graeca nikolskii*. The declining populations present majority of species.

Regionally threatened species. In the Caucasus ecoregion, as in many other regions of the world, the conservation of herpetofauna is actually effective only in nature reserves and national parks, although it is formally organized in protected areas of a lower level. Therefore, the analysis of compliance of the extant Econet (network of protected areas) to the needs of herpetofauna preservation becomes a profoundly important task. It should be emphasized that despite the inclusion of many species in regional Red Books (Table 5), the normative form of protection, as experience shows, is not very productive and for the effective conservation of the herpetofauna of the Caucasian ecoregion. The recent international experience shows that that a territorial form of protection is optimal and should be applied as an effective conservation measure for the Caucasian ecoregion.



Fig. 14. Representation of endemic species in the countries of the Caucasus ecoregion (see Chapter Endemic Species: Richness and Conservation Status and Threats and Table 5).

Table 5. Representation of amphibian and reptile species in the regional red data books of the Caucasian ecoregion

Species / Territory	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Paradactylodon persicus</i>																
<i>Mertensiella caucasica</i>				+												
<i>Mertensiella djanaschvili</i>				+ ²⁴												
<i>Triturus karelinii</i>	+	+			+	+					+				+	+
<i>Ommatotriton ophtyticus</i>	+		+		+					+	+					+
<i>Lissotriton lantzi</i>	+	+			+	+	+ ²²	+		+	+		+	+	+	+
<i>Bombina bombina</i>					+				+							
<i>Bufo eichwaldi</i>		+														
<i>Bufo verrucosissimus</i>	+	+			+					+	+			+		+
<i>Bufotes viridis</i>																
<i>Hyla orientalis</i>							+ ²³							+		
<i>Hyla savignyi</i>																
<i>Pelobates fuscus</i>					+ ¹⁷		+	+					+ ¹⁷		+	
<i>Pelobates syriacus</i>	+	+	+	+		+										
<i>Pelodytes caucasicus</i>	+	+			+					+	+					+
<i>Pelophylax ridibundus</i>																
<i>Rana macrocnemis</i>					+						+			+		
<i>Rana pseudodalmatina</i>																
<i>Emys orbicularis</i>	+ ¹				+						+ ¹⁶					+
<i>Trachemys scripta</i>																
<i>Mauremys caspica</i>						+										
<i>Chelonia mydas</i>																
<i>Testudo graeca</i>	+	+	+	+		+					+				+	
<i>Paralaudakia caucasia</i>																
<i>Trapelus ruderatus</i>		+														
<i>Trapelus sanguinolentus</i>	+					+								+	+	
<i>Phrynocephalus guttatus</i>						+			+					+	+	
<i>Phrynocephalus horvathi</i>		+ ¹¹	+											+	+	
<i>Phrynocephalus mystaceus</i>	+					+			+					+	+	
<i>Phrynocephalus persicus</i>		+ ¹²														
<i>Mediodactylus kotschy</i>	+															
<i>Hemidactylus turcicus</i>																
<i>Tenuidactylus caspius</i>																
<i>Anguis colchica</i>														+ ²¹		
<i>Pseudopus apodus</i>	+ ²						+	+	+		+		+	+	+	
<i>Ablepharus bivittatus</i>		+														
<i>Ablepharus chernovi</i>			+													
<i>Ablepharus pannonicus</i>		+		+												
<i>Eumeces schneideri</i>						+										
<i>Heremites septemtaeniatus</i>		+	+													
<i>Darevskia adjarica</i>																
<i>Darevskia aghasyani</i>																
<i>Darevskia alpina</i>					+			+		+	+					
<i>Darevskia armeniaca</i>																
<i>Darevskia brauneri</i>																
<i>Darevskia caucasica</i>																
<i>Darevskia chlorogaster</i>																
<i>Darevskia clarkorum</i>				+												

Table 5. Continuation

Species / Territory	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Darevskia daghestanica</i>																+
<i>Darevskia dahli</i>			+	+												
<i>Darevskia derjugini</i>					+						+					+
<i>Darevskia dryada</i>																
<i>Darevskia mixta</i>				+												+
<i>Darevskia nairensis</i>																
<i>Darevskia parvula</i>																
<i>Darevskia pontica</i>																
<i>Darevskia portschinskii</i>																
<i>Darevskia praticola</i>			+													
<i>Darevskia rostombekovi</i>			+													
<i>Darevskia rudis</i>													+			
<i>Darevskia saxicola</i>														+		
<i>Darevskia szczyrbaki</i>	+										+					
<i>Darevskia tuniyevi</i>																
<i>Darevskia unisexualis</i>			+													
<i>Darevskia uzzelli</i>																
<i>Darevskia valentini</i>																
<i>Iranolacerta brandti</i>																
<i>Eremias arguta</i>	+ ³		+ ¹⁹				+	+			+	+	+		+	
<i>Eremias pleskei</i>			+													
<i>Eremias strauchi</i>																
<i>Eremias suphani</i>																
<i>Eremias velox</i>	+					+			+				+		+	
<i>Lacerta agilis</i>	+ ⁴										+ ⁴		+ ¹⁸			+
<i>Lacerta media</i>	+ ⁵					+					+					+
<i>Lacerta strigata</i>									+		+					
<i>Ophisops elegans</i>	+			+		+									+	
<i>Parvilacerta parva</i>			+													
<i>Podarcis siculus</i>																
<i>Phoenicolacerta laevis</i>																
<i>Xerotyphlops vermicularis</i>																
<i>Eryx jaculus</i>	+			+		+	+		+				+		+	
<i>Eryx miliaris</i>	+					+			+					+	+	
<i>Coronella austriaca</i>		+							+			+		+		
<i>Dolichophis caspius</i>	+ ⁶				+		+	+	+	+	+	+	+	+	+	
<i>Dolichophis schmidtii</i>						+										+
<i>Eirenis collaris</i>				+												
<i>E. modestus</i>																
<i>E. persicus</i>			+													
<i>E. punctatolineatus</i>																
<i>Elaphe dione</i>								+		+		+	+	+	+	
<i>E. sauromates</i>	+					+		+	+	+	+	+	+	+	+	
<i>E. urartica</i>	+ ⁷	+ ¹³				+ ⁷										
<i>Hemorrhois nummifer</i>																
<i>H. ravergeri</i>						+										
<i>Natrix megalcephala</i>	+				+						+					+
<i>N. natrix</i>																
<i>N. tessellata</i>																

Table 5. Continuation

Species / Territory	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Platycephalus najadum</i>	+ ⁸						+				+		+	+	+	
<i>Rhynchocalamus satunini</i>		+	+													
<i>Telescopus fallax</i>	+		+			+										
<i>Zamenis hohenackeri</i>	+	+	+			+	+						+		+	
<i>Z. longissimus</i>	+				+						+					
<i>Z. persicus</i>		+														
<i>Malpolon insignitus</i>				+ ²⁵					+					+		
<i>Psammophis lineolatus</i>		+														
<i>Gloydius caucasicus</i>																
<i>Macrovipera lebetina</i>	+					+										
<i>Montivipera albicornuta</i>																
<i>M. raddei</i>		+	+													
<i>M. wagneri</i>																
<i>Pelias berus barani</i>																
<i>P. darevskii</i>			+													
<i>P. dinniki</i>	+			+	+	+		+		+	+		+		+	+
<i>P. ebneri</i>																
<i>P. eriwanensis</i>			+													
<i>P. kaznakovi</i>	+			+	+						+					
<i>P. lotievi</i>								+		+	+		+		+	
<i>P. magnifica</i>	+				+						+					
<i>P. olguni</i>																
<i>P. orlovi</i>	+										+					
<i>P. pontica</i>																
<i>P. renardi</i>	+ ¹⁰				+	+		+	+	+	+	+	+	+	+	
<i>P. shemakhensis</i>		+ ¹⁴														
<i>P. tuniyevi</i>																+ ¹⁵
<i>Vipera transcaucasiana</i>																
Total	34	21	21	14	18	23	9	11	13	11	27	6	16	18	22	15

Notes: In horizontal: 1 – Russian Federation (RF); 2 – Azerbaijan; 3 – Armenia; 4 – Georgia; 5 – Adygey, RF; 6 – Dagestan, RF; 7 – Ingushetia, RF; 8 – Kabardino-Balkaria, RF; 9 – Kalmykia, RF; 10 – Karachay-Cherkessia, RF; 11 – Krasnodar Territory, RF; 12 – Rostov Region, RF; 13 – North Ossetia – Alania, RF; 14 – Stavropol Territory, RF; 15 – Chechen Republic, RF; 16 – South Ossetia.

In columns in uppercase: 1 – subspecies *Emys orbicularis colchica* Fritz, 1994; 2 – populations from Crimea Peninsular and Caucasian Black Sea coast; 3 – populations from Crimea Peninsular and Krasnod Territory; 4 – subspecies *Lacerta agilis grusinica* Peters 1960 and *L. a. mzymtensis* (Tuniyev S. et Tuniyev B., 2008); 5 – populations from Caucasian Black Sea coast; 6 – populations from Caucasian Black Sea coast; 7 – within *Elaphe sauromatmes*; 9 – populations from Caucasian Black Sea coast; 10 – populations of Crimea Peninsular and Precaucasia; 11 – named as *Phrynocephalus helioscopus*; 12 – named as *Phrynocephalus helioscopus*; 13 – within *Elaphe sauromatmes*; 14 – within *Pelias renardi*; 15 – mentioned as *Pelias kaznakovi*; 16 – Black Sea coast population; 17 – mentioned as *Pelobates vespertinus*; 18 – subspecies *Lacerta agilis exigua*; 19 – subspecies *Eremias arguta transcaucasica*; 20 – subspecies *Darevskia caucasica vedenica*; 21 – mentioned as *Anguis fragilis*; 22 – mentioned as *Triturus vulgaris*; 23 – mentioned as *Hyla arborea*; 24 – within *Mertensiella caucasica*; 25 – mentioned as *Malpolon monspessulanus* Mertens et Mueller 1928.

The Priority Conservation Areas (PCA) and the corridors between them designated by CEPF in the Caucasus (Fig. 2) almost fully represent the key areas of the most important ecosystems in Armenia, Georgia, Azerbaijan and the neighbouring areas of Turkey and Iran. In these countries, the regional Econets are delineated as based mainly on the existing or planned

protected areas. The Caucasian parts of Turkey and Iran are nearly fully set aside as priority areas. The situation in Russia and Abkhazia is different. The central axial part of highlands of the Greater Caucasus Ridge is defined quite artificially and almost deprived of herpetofauna. The vast tracts of the Black Sea coast, remnants of pristine steppes and meadow-steppes in the West

and Central Ciscaucasus, unique dry steppes and sandy lands in the East Ciscaucasus, foothills and mid-elevations in the northern Jurassic depression between the Skalistyi and Bokovoy ridges, foothills and maritime Dagestan regions remain greatly underrepresented in protected areas (Tuniyev et al., 2019).

Biodiversity should be preserved in its intrinsic diversity and complexity, but the foremost regional goal and responsibility is set on saving endemic species from extinction. The status of such endemic species as *Natrix megalcephala*, *Zamenis persicus*, *Pelias dinniki*, *P. lotievi* and *Montivipera raddei* is quite safe because a substantial part of their ranges is covered by protected areas. Contrary to this, a number of other species are represented in protected areas insignificantly (*Phrynocephalus horvathi*, *Darevskia szczyrbaki*, *Eremias pleskei*, *Pelias kaznakovi*, *P. magnifica*, *P. eriwanensis*, *P. ebneri*, *P. tuniyevi*) or not at all (*Trapelus sanguinolentus sanguinolentus*, *Darevskia aghasyani*, *Darevskia arribasi*, *Darevskia caucasica vedenica*, *Darevskia dryada*, *Pelias orlovi*, *P. pontica*, *Eryx miliaris nogajorum*). Moreover, the habitats of *Pelias orlovi* and *P. magnifica* were not even embraced by CEPF's PCAs.

To preserve the Szczyrbak's Rock Lizard and Orlov's viper, it is essential to establish a reserve or a national park between Gelenjik and Jubga, incorporating the peaks Oblego and Papai, and to expand the territory of Sochi National Park so that to include the Mt. Bolshoi Pseushkho (Tuniyev, 2016). Some of these areas are in establishing now. Conservation of the Relict viper also implies adding the Malyi Bambak Ridge to Caucasian Biosphere Reserve. The Black Sea viper can be saved solely by creating a national park near Borçka. The Lake Arpi National Park was established in Armenia in 2009 largely for the protection of the Darevsky's viper. The Steppe Agama, Desert Sand boa and associated psammophilic communities can be protected only through the establishment of Nogaysky Steppe Reserve. The Shemakha and Kakhety Steppe Vipers need special protected areas near Shamakhi in Azerbaijan and on Shirak Plateau in Georgia.

The next regional goal is focused on conservation of globally threatened or endangered species of wide distribution, in the Caucasus – *Pelias renardi*, *Elaphe saurimates* and *Dolichophis caspius*. The first species is left beyond the PCAs and the last two are almost neglected. No large protected areas can be set aside for *Pelias renardi* for the strong patchiness of its remnant habitats. However, it is feasible to establish zoological natural monuments or cluster sites of existing protected areas, e.g. in the East Priazovie (Yasenskaya Spit and others), foothills of the West and Central Caucasus (vicinities of the Raevskaya village, Maikop and Kislovodsk towns, Gerpegem Ridge), along the Kuma-Manych Depression (Lake Manych-Gudilo shoreline). These areas are also important for preservation of the Caspian whip snake

and the Eastern four-lined ratsnake, but it also demands for the establishment of new protected areas between the Cape Bolshoi Utrish and the Kabardinka Settlement on the Black Sea coast, in Primanychie (area around the Lake Manych-Gudilo) and the Kudriavaya (Curly) Ravine in the Stavropol Territory. Caspian whip snakes will also benefit from the above-mentioned Nogaysky Steppe Reserve.

Particular attention should be paid to the hotspots of amphibians and reptiles species diversity in the Caucasian ecoregion. Such areas are the Black Sea coast (excluding the Rioni Lowland), lower çoruh basin, semi-arid depressions in the East Ciscaucasus, maritime Dagestan, Artwin Hollow, Kura-Arax Lowland (aside from its deserts), Arax riverside in Armenia and Azerbaijan, and the Talysh–Alborz massif.

The analysis of biological diversity, spatial and altitudinal distribution of existing protected areas, including water bodies and wetlands, demonstrates the inability of protected areas to fulfill their goals and to ensure sustainable management of natural ecosystems in their complexity (Krokhmal, Tuniyev, 2003). First, the Econet in Russian Caucasus and Abkhazia needs much improvement (Fig. 2). In these two countries, protected areas are concentrated in mid-elevation and highland areas of the West and Central Caucasus to protect their natural heritage. In Chechen and Dagestan Republics (East Caucasus), highlands and mid-elevations are not protected, including the unique limestone region of Inner Dagestan saturated with xerophilic endemics and relicts. In nearly all the North Caucasus, protected areas with stringent protection regime (reserves) are lacking at low elevations 800–1200 m a.s.l. The two areas retaining the unique for Russia Mediterranean semi-arid juniper and pistachio-juniper forests (Anapa – Gelenjik and foothills of Dagestan) are out of state protection as well. The northernmost enclave of the Hyrcano-Alborz biota in the Samur mouth is in Samur National Park in Dagestan and Samur-Yalama National park is located in Azerbaijan.

Much effort in international cooperation is required to establish such transboundary protected areas as East Caucasus Transboundary Area (Russia, Azerbaijan, and Georgia), North-West Caucasus (Kavkazsky, Pskhugumista reserves, Teberdinsky, Ritsa Relict and Sochi National Parks in Russia and Abkhazia) and Kolkhida International Biosphere Polygon (Sochi National Park, Psou – Bzyb interfluvium and Pitsunda-Mussera Reserve in Russia and Abkhazia). Implementation of this Econet development programme, along with other conservation measures described above for preservation of endemic and threatened species, will allow approaching the long-term goal of sustainable conservation of herpetofauna and other biodiversity in the Caucasian ecoregion.

MAIN THREATS AND PROPOSED CONSERVATION ACTIONS

The main threats to ECA reptiles, according to the IUCN Red List of Threatened Species (2024) are agriculture, residential/commercial development, and biological resource use. These threats primarily cause habitat fragmentation and loss (Visconti et al., 2018).

The major threat of habitat loss affects in particular relic forest species, and species of the 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, wormwood semi-desert, and highly specific soils, habitat conversion can have a major impact. The disappearance of steppe vipers of the “*ursinii-renardi*” complex throughout most of the previously occupied habitats in the ECA is associated with ploughing of steppes for agriculture (Tuniyev, 2016).

Significant threats include the illegal capture of commercially valuable species for the pet trade (all representatives of the vipers, turtles, and some species of lizards) in Turkey, the Caucasus and Central Asia. Prosecution of snake species continues in the area, especially in Turkey, the Caucasus, southern regions of Russia, which is associated with low levels of environmental education (Visconti et al., 2018).

Invasive and other predatory species play a particularly important role for endemic and relic species. For example, *Procyon* impact is very high to amphibians in Western Caucasus and Lenkoran-Talysh region.

Climate change is likely to play a major role in the region in the future. Climate change has led to an increase in summer temperatures and length of dry summer period in the Western Caucasus, resulting in a reduction of habitats of mesophylic Colchis reptile species (*Darevskia derjugini*) and the increase in the number of Eastern Mediterranean species of snakes (*Dolycophis caspius*, *Platiceps najadum*) on the Black Sea Coast.

Other threats are less prominent in the IUCN Red List of Threatened species (2024) such as pollution; however, a recent risk evaluation of pesticide use to protected European reptiles suggests that ten species, including all six Habitat Directive Annex II turtles, are at above-average pesticide risk (Visconti et al., 2018).

Some examples for conservation strategy:

Aghasyan's Lizard – *Darevskia aghasyani*. Conservation status of taxa assessed as CR B2ac(iv) “Critically Endangered”, because on the basis of expert estimates found that the habitat area is less than 10 km², it may have fragmented, but at the moment consists of only one

locality and marked by extreme fluctuations in number of mature individuals (Tuniyev, Petrova, 2019). Previously Urts Ridge was part of “Khosrov Forest” State Reserve, as a cluster area. Given the exceptional uniqueness of flora and fauna of this ridge, description of about ten species of plants from Urts Ridge and the breeding for Mouflon, together with our species of relic described lizards, it is advisable to consider returning Urts Ridge to the Khosrov Reserve.

Darevsky's Viper – *Pelias darevskii*. The new finds of species in Armenia (Agasian, Agasian, 2008) were located in direct closeness (12 km) from type locality and actually did not extend the known distributional area of species. In July 2014 the species actually was found by us in Ninotsminda, Akhalkalaki, Aspidindza, Akhaltsihe districts of Somkheto-Dzhavakheti Region of Georgia at Dzhavakheti Highland (Mt. Madatapa) and Erusheti Mountains (Mt. Gumbati, Mt. Airilanbashi) (Tuniyev et al., 2014). Established guidance on finding the Darevsky's viper in Turkey at a considerable distance from the known habitat were of great interest. Our research in Turkey showed that vicinity of Posof inhabits a distinct species – *Pelias olguni* (Tuniyev S. et al., 2012). Endemic subspecies live in humid (*Pelias darevskii uzumorum*) and semidry (*Pelias darevskii kumlutasi*) segments of Yalvizçam Dağları (Arsiyansky) Ridge. The taxonomic status of other finds is under discussion (Tuniyev, 2016).

The density of populations of *Pelias darevskii* in Armenia is extremely low, as the number of vipers in the identified locality in Georgia. The main threats are the killing of animals, overgrazing, trapping for the illegal zoo trade. The expansion of Darevsky's viper distribution range cannot substantially influence on its conservation status. The Darevsky's viper still remains narrow distributed sporadically spread species, not forming high-dense populations. Category rarities on the global population estimated as CR B2ab (ii, iii). Species is listed in the IUCN Red List of Threatened species (2024) and Red Data Book of the Republic of Armenia (2010) (Table 5).

Species effectively guarded exclusively in Arpilich National Park (Armenia). It is necessary to include it to recently creating Dzhavakheti National Park in Georgia area on the Dzhavakheti Highland and Erusheti Mountains and optimization borders transboundary with Arpilich National Park Mt. Madatapa in Georgia, with the participation of Darevsky's viper biotopes (Tuniyev, 2016).

Dinnik's Viper – *Pelias dinniki*. It is endemic to the Highlands of the Great Caucasus, sporadically distributed within the Russian Federation, republics of Abkhazia, Georgia and South Ossetia (Tuniyev et al., 2009). In Russian Federation, it is known from the Krasnodar Territory and republics of Adygei, Karachay-Cherkessia, Chechen and Dagestan (Tuniyev, Tuniyev, 2008; Red Data Book of Ingushetia Republic, 2007). During the last decade significantly expanded understanding of the range of the species. We have found isolated populations

on Mt. Zhitnaya of Lagonaksky Ridge, Adygei (north-western limit), the tops of Hakudzh, Lysaya of Chernomorsky Chain, Krasnodar region (western limit) (Tuniyev, Tuniyev, 2007, 2013); in vicinity of pass Genukh and upper basin of Dzhurmut River, Dagestan (eastern limit). In addition, the new localities we have discovered on Aibga Ridge (Krasnodar Territory), Kutakheku Ridge (Abkhazia), upper basin of Bolshaya Liakhvi River (South Ossetia), etc. There are no reliable findings in the territory of the republics of Kabardino-Balkaria and Ingushetia yet, but it is likely they live there too (Tuniyev, 2016). Probably represents a complex of cryptic forms in the east of range.

It is listed in the IUCN Red List of Threatened species (2024), the Red Books of the Russian Federation (2021), Krasnodar Territory (2017), the republics of Adygei (2021), Karachay-Cherkessia (2013), Chechen (2020), Dagestan (2020), Republic of North Ossetia-Alania (2022), Kabardino-Balkaria (2018) and Republic of South Ossetia (2017) (Table 5). In Chechen Republic and Dagestan species is extremely rare, sporadically distributed on most mesophyllous parts of subalpine belt. The main threats for western populations is a recreational development, construction of ski facilities on the territory of Sochi National Park, the planned mastering of the Caucasian reserve, development of resorts in the North Caucasus on existing protected territories; for eastern populations is overgrazing and absence of high rank protected areas (reserves and national parks). Category rarities on the global population estimated as VU B1ab (iii, v), in a new edition of the Red Data Book of the Russian Federation (2021) mind category VU C1 + 2a.

To save the polymorphic populations of species, it is necessary to abandon ambitious plans for transformation of natural landscapes in the Highlands of the Sochi National Park (Aibga Ridge) and in Caucasian reserve (basins of the upper flowing of rivers Mzymta and Malaya Laba); create a new Federal protected areas in the Itum-Kalinskaya Hollow of Chanty-Argun River (based on former Soviet sanctuary) in Chechen Republic and Dagestan reserve plots clustered Tokhor River, Mt. Gunton and vicinity of Genukh pass (Tuniyev, 2016).

Armenian Steppe Viper – *Pelias eriwanensis*. Disjunctive distributed on the southern slopes of the Lesser Caucasus and the Armenian Highland endemic relict species. The species range includes Armenia, Azerbaijan, Turkey and Northwestern Iran (Rajabizadeh et al., 2011). Recently, the species has been found on the shores of Lake Kartsakhi in South Georgia (Tuniyev S. et al., 2014) and on Bargushat Ridge in Armenia (Tuniyev, 2016).

Isolated populations of *Pelias eriwanensis* inhabit rocky mountain meadow-steppe, juniper bushes on the slopes of quite volcanoes and arid ridges (Urc, Karabakh, etc.), rarely rise down along the canyons of the rivers to the middle-mountain belts, where the steppe outliers in the canyons (Kasakh River, Armenia). Sporadic

animals, rarely up to 5 specimens at 1 km of the route. The main threats are the killing of animals and destruction of their habitats, overgrazing both in Transcaucasian Republics and in Turkey. Category rarities on the global population estimated as VU B1ab (iii, v). Species is listed in the Red Book of Armenia (2010) (Table 5). It is necessary to list species in Red Books of Republics Azerbaijan and Georgia. .

Erevan mountain-steppe viper currently protected in Armenia on Khosrov reserve territory, formally defined in Sevan National Park and Zangezur Sanctuary. Species habitats on Urc (former Sarajbulag) Ridge has dropped out from under protection in connection with the deletion of this site from the Khosrov reserve. To save the species requires the creation of transboundary protected area around Kartsakhi Lake in South Georgia and Turkey, creating local reserves on Coast of Childyr Lake in Turkey.

Kaznakov's Viper – *Pelias kaznakovi*. The oppressed relict endemic to Colchis with slightly irradiation, sporadically distributed in foothill areas of Krasnodar Territory, Republics of Abkhazia, Adygei, in western Georgia and Adzharia within the former Soviet Union and on the Lazistan coast of Turkey (Orlov, Tuniev, 1986). In the Russian Federation, area covers foothill areas along the Black Sea coast from vicinity of Tuapse to the border with Abkhazia, on the northern slope of the Western Caucasus from the town Goryachy Kluch to the foothills of Apsheronsky District of Krasnodar Territory and Tulsy District of Adygei Republic. It is found in a number of new localities in Turkey (Afsar, Afsar, 2009; Tuniyev et al., 2019).

Pelias kaznakovi has never been numerous and now progressively disappears throughout the area (Ostrovskikh, 1991). Currently, most biotypes, or destroyed or heavily transformed in connection with the construction of Olympic venues and involving them in the infrastructure of the Mzymta – Psou Rivers area. Apparently, the total number of species in the Russian Federation is not more than 2000 individuals.

The main threats are the killing of animals and destruction of their habitats, intensive trapping for the illegal zoo trade, recreational mastering the Black Sea coast of the Caucasus, to change the zoning of the Sochi National Park, with the transfer of plots of vipers and the protected habitat of protected zones in the lower category of zoning. Category rarities on the global population estimated as EN B2ab (ii, iii, v), in a new edition of the Red Data Book of the Russian Federation (2021) mind category EN A4abcd; B2ab (i, ii, iii, iv, v). *Pelias kaznakovi* is listed in the IUCN Red List of Threatened species (2024), was listed the Red Book of the USSR (1984), the Red Data Book of Georgian SSR of the former Georgian Soviet Socialist Republic (1982). It is included into the Red List of Georgia (2024), Red Books of Russian

Federation (2021), Krasnodar Territory (2017), Republic of Adygei (2021) (Table 5).

The bulk of the range in Russia remains on the territory of Sochi National Park, small populations are found in the Caucasian reserve. Formally, species is protected in Ritza relic National Park, Pskhu-Gumista reserve (Abkhazia), in the Kintrish reserve and Mtrala National Park (Georgia), Kamili National Park (Turkey).

To save *Pelias kaznakovi* in Sochi National Park it should be included in the functional zoning in especially protected or reserved zone. Important measure is breeding in captivity with subsequent reintroduction (Tuniyev, 2016).

Lotiev's Viper – *Pelias lotievi*. Endemic species probably represents a complex of cryptic forms. The total area covers mainly middle mountain area of Great Caucasus within Russia, with little penetration in Georgia and Azerbaijan. In the Russian Federation, this snake was found in semi-arid hollows in Eastern and Central Caucasus, where it inhabits shibliaks, frigana, mountain-steppe areas from 1200 to 1800 m a.s.l. In the Krasnodar Territory found in the midlands band at an altitude of 1500–1700 m a.s.l., where *Pelias lotievi* inhabits xerophyllous subalpine meadows, scrub and rocky associations and talus slopes. For species description material was available only from 8 localities; but later after the numerous expeditions, covering the whole of the Northern Caucasus the detailed distribution data (about 70 localities) were collected. In the East, the range of *Pelias lotievi* reaches coastal Dagestan in vicinity of settlement Izerbash (Kolichi River), covering almost the entire foothill and mountainous Dagestan, except in the highland sections of the Main Ridge. To the west, *Pelias lotievi* inhabits semiarid hollows of Chechen Republic, Ingushetia, North Ossetia-Alania, xerophyllous slopes of Mt. Elbrus and Skalisty (Rocky) Ridge in Kabardino-Balkaria. Further west it is a chain of isolates in hemixerophyllous landscapes of Bokovoy (Forward) and Skalisty (Rocky) ridges in the Karachay-Cherkessia Republic up to the extreme western finds at the watershed of Bolshaya Laba and Malaya Laba Rivers in the Krasnodar Territory.

The main threats are overgrazing, reducing the protective properties of biotopes, direct destruction of man, and weak coverage of the habitats of the species by existing network of high rank protected areas, i.g. reserves and national parks. Category rarities on the global population estimated as NT, in relation to the total area of the species, not exceeding 20000 km². *Pelias lotievi* is listed in the Red Books of Krasnodar Territory (2017), the Chechen (2020), North Ossetia-Alania (2022), Kabardino-Balkaria (2018) and Karachay-Cherkessia Republics (2013) (Table 5). An isolated population is protected in the territory of the Caucasian reserve; part of the range is included in Teberdinsky, Prielbrusye, Alania National Parks, Erzi, Kabardino-Balkarsky

Vysokogornyy and Severo-Ossetinsky reserves. Formally preserved on the territory of Charodinsky sanctuary in Dagestan. It is necessary to create new protected areas in Sadono-Unal'skaya Hollow of North-Ossetia-Alania, Itum-Kalinskaya Hollow of Chechen Republic, and in several places of inner-mountain Dagestan (Tuniyev, 2016).

Relic Viper – *Pelias magnifica*. The oppressed endemic relict species, has a limited amount of habitat, conservation depends even on short anthropogenic influences. The entire area is located in the Russian Federation and covers Skalysty (Rocky) Ridge within Krasnodar Territory, Republic of Adygei, possibly being in the Karachay-Cherkessia Republic (Tuniyev, Ostrovskikh, 2006). Species range covers so-called Belo-Labinsky Refugio of Colchis biota (Tuniyev, 1990) and represents a complex option derivatives of Colchis vegetation enriched with elements of Mediterranean and even the steppe vegetation. Habitats represented by light oak groves, dry stretches of grassy meadows and shrubs on rocky limestone cornices of arrays in the range of heights from 700 to 1000 m a.s.l. (Tuniyev, 2016; Tuniyev et al., 2016).

Population's density is extremely low for a day excursion numbered no more than three specimens. The main threats are naturally archaic area, which constantly highlights the grassroots fires, increasing recreational press, trapping animals for illegal zoo trade.

Pelias magnifica included in the IUCN Red List of Threatened species (2024) category EN A1cd + 2 CD, Red Data Book of the Russian Federation (2021) with category EN A2abc; B2ac(iv), Red Book of Krasnodar Territory (2017) with category EN A1cd+2cd and Red Book of Adygei Republic (2021) with category EN B1ab(i, ii, iii, v); C2a(i) (Table 5). Thus, a rapid assessment of the year 2014 allowed to state the existence of stable small, exposed to anthropogenic limiting factors population of Relic Viper in the type locality and agree to the terms in the IUCN Red List of Threatened species (2024) category of threats the existence of species within Krasnodar Territory – EN A1cd+2cd (Tuniyev S. et al., 2016). Insignificant part of the population is protected in the Caucasian reserve, to which it is necessary to include the Maly Bambak Ridge.

Orlov's Viper – *Pelias orlovi*. Endangered relict endemic species with number declining progressively. The entire area is located in the Krasnodar Territory of the Russian Federation and covers both slopes of the lowest Northwestern part of the Greater Caucasus from Markhot Ridge in the West to the peak Bolshoy Pseushkho in the East. Distribution area lies entirely within the area of influence of the Mediterranean climate and development of xero-mesophyt habitats. Species occurs in different versions of submediterranean landscapes: from intrazonal riparian glades to steppe-meadows and ecotones of Juniper forests. Range of high-altitude

distribution ranges from 450 to 950 m a.s.l. (Tuniyev, 2016).

The number of species is very low, at the end of the last century for a day excursion numbered no more than 3 specimens. Express score 2014–2016 years testified to the disappearance of a species in a number of localities (northern foothill of Mt. Papay, vicinity of Gelendzhik City, etc.) and a catastrophic populations' density decreasing in the surviving habitats. The main threat was and it remains illegal trapping of animals for zoo trade. Category rarities on the global population estimated as CR B1ab (i, v); C2A(i), in a new edition of the Red Data Book of the Russian Federation (2021) has category EN A2abcd. It is listed in the IUCN Red List of Threatened species (2024) and Red Book of Krasnodar Territory (2017).

This species formally defined at recent organizing regional Markhot Nature Park. It is necessary to organize cluster plot of Utrish reserve at Mt. Papay, or creation of a full-fledged Novorossiysk reserve. It is in accordance with the earlier recommendations as well as implementing the decision of UNEP within the framework of the compensatory actions Sochi-2014 Winter Olympics to include in the composition of the Sochi National Park Mt. Bolshoy Pseushkho (Tuniyev, Timukhin, 2013).

Eastern Steppe Viper — *Pelias renardi*. Species is reduced and continuing to reduce population size and habitat caused by human activities. The total area covers the steppe and semi-desert area of the South-Eastern European countries, Kazakhstan and Central Asia. In the Russian Federation, it is found from the Volga-Kama region north to the Precaucasia region South and Central Altai Mountains in the East (Ananjeva et al., 2006). In the Caucasus ecoregion, area covers the lowland and the foothills of the Northern Caucasus. According to our observations, in the Central Caucasus *Pelias renardi* maximum penetrates mountain country.

Found on the plains of various types (loess, alluvial-loess, terraced), on hills, in lower-mountain belts. It inhabits forest edge, shrub associations, shibliaks, steppe slopes (Ostrovskikh, Plotnikov, 2003). In the Southeast of the range rises up in Krasnodar Territory to 1000 m a.s.l., is able to live on the sandy sea spits. In conditions of anthropogenic landscape forms narrow stripe-like settlements in badlands and bargain sites, tree planting, etc. (Ostrovskikh, Plotnikov, 2003a). In the Central Caucasus, in the area of the Elbrus gap forest vegetation, *Pelias renardi* together with other steppe species of plants and animals penetrate mountains up to 1500 m a.s.l. (Tuniyev, 2016).

At the end of the last century, the density in the Caucasus had up to 30 animals per 1 hectare. Currently the number of habitats and the number of snakes they declined sharply. Major threats remain steppe and forest-steppe landscape transformation and physical

extermination by man. Category rarities on the global population estimated as VU A1c+2c, in a new edition of the Red Data Book of the Russian Federation (2021) has category VU A4cd; B1ab (i, ii, iii, iv). *Pelias renardi* is listed in the IUCN Red List of Threatened species (2024), in the Caucasus ecoregion — in the Red Books of Stavropol (2013) and Krasnodar (2017) territories, republics of Dagestan (2020), Chechen (2020), Karachay-Cherkessia (2013), Adygei (2021), North Ossetia-Alania (2022), Kabardino-Balkaria (2018).

In the Caucasian part of the distributional area species it is not protected, a tiny population exists on the northern periphery of the reserve Utrish and Kislovodsk National Park. The cluster is required to organize sections of the existing reserves in areas of dense habitation vipers, an extension of the recently established Kislovodsk National Park, with including of *Pelias renardi*'s biotopes in the Region of Caucasian Mineral Waters (Tuniyev, 2016).

Shemakha Viper — *Pelias shemakhensis*. Narrow-endemic, oppressed relic species, whose area covers the Shamakhi District of Azerbaijan. Until recently, no records was known from the northeastern steppe regions of Eastern Georgia. In 2016, it was rediscovered here (Tuniyev et al., 2018). Alekperov (1978) wrote that in vicinity of Shemakha a viper occurs on the altitude of a 700 m a.s.l. on the stony areas of mountains, covering by a xerophyllous grasses and shrub vegetation, also in the small agricultural sowing, in the heaps of stone on the plough-lands and along the roads. According to our observations, the biotopes of species (in both Azerbaijan and Georgia) are presented by shibliaks of *Paliurus spina-christy* and ecotones of dry *Andropogon* steppes and derivatives of the broad-leaved forests on the stony slopes of foothills. Alekperov (1978) recorded the numerous specimens originated from Shemakha: only for feeding study, 22 specimens were dissected. At present, the species became very rare in Northwest Azerbaijan; in Northeast Georgia is on the verge of extinction. As a rare taxa, limited in range and abundance, *Pelias shemakhensis* named as *Pelias renardi* is included in the Red Book of Azerbaijan (2013). *Pelias shemakhensis* should be included in the IUCN Red List of Threatened species (2024) and Red Book of Georgia with the status category CR B1ab (i, ii, iii, iv, v).

To save the species it is necessary to organize protected areas in vicinity of Shemakha in Azerbaijan and cluster plots of Vashlovani reserve on the Shirak Plateau in Georgia.

Tuniyev's Viper — *Pelias tuniyevi*. Endangered narrow distributed relict endemic species with declining progressively number. All known finds are located in the left-bank basin of the middle flow of the Kura River from the Borzhom Gorge (east slope of Meskheti Ridge) in Georgia to middle-mountain districts of South Ossetia (east foothills of Likhsky Ridge and south

spurs of Central Caucasus) (Ananjeva et al., 2021). It inhabits mid-altitude broad-leaved forests, *Carpinus orientalis* shibliak and post-forest glades in the range of elevations from 700–850 m in the Borzhom Gorge of Georgia to more than 1300 m a.s.l. in the ruins of Atsriskhevi of South- Ossetian Reserve. Currently, biotopes of *P. tuniyevi* are characterized by more xero-mesophilic traits and moderately warm mezo-climate in comparison with typical mesophilic biotopes of North-Colchian (Krasnodar Territory – Abkhazia) and, especially, Adzharo-Lazistanian for *P. kaznakovi*, living in the humid subtropical climate.

Pelias tuniyevi is listed in the Red Books of Republic of South Ossetia (2017) (named *P. kaznakovi*) and partly under name *P. kaznakovi* in Red Data Book of Georgian SSR (1982). Small parts of area protected in South-Ossetian Reserve and Borjomi-Kharagauli National Park.

As can be seen from the foregoing material, relatively positive protection present with such endemics as *Pelias darevskii*, *P. dinniki*, *P. lotievi*, a significant part of the habitats of these vipers is covered by the territories of the nature reserves and national parks. At the same time, it is not a case for *Pelias orlovi*, *P. shemakhensis*; *Pelias kaznakovi*, *P. magnifica*, *P. ebneri*, *P. eriwanensis* and *P. tuniyevi* which are poorly represented within the protected areas. Moreover, *Pelias orlovi* and *P. magnifica* habitats were not even included in the priority regions of the CEPF.

We provide the recommendations on the organization of new protected areas, or the expansion of existing protected areas within the Caucasian Isthmus. Analysis of biological diversity and spatio-altitudinal characteristics of protected natural territories and species in the Caucasus showed that they not fully ensure the main goals for the protection and rational use of natural resources, including long-term preservation of shield-head vipers. In some cases, international cooperation is required to create protected areas. They are East-Caucasian Transboundary Territory, uniting Mt. Guton, Tlyaratinsky Sanctuary, vicinity of Genukh pass, Lagodekhi and Zakataly State Reserves, Shakhdag National Park (Russia, Azerbaijan, Georgia); North Colchis Transboundary Territory, uniting Caucasian, Pskhu-Gumista, Pitsunda-Myussera Reserves, Sochi and Ritza National Parks (Abkhazia, Russia) and Ashotsk-Javakheti Transboundary Territory, uniting the Arpilich National Park, Javakheti National Park and Erusheti Mountains (Armenia, Georgia, Turkey).

Of course, this is not a complete list of protected areas which should be considered for the transboundary cooperation between Georgia and Turkey, between Armenia, Iran and Azerbaijan. This important goal should be the subject of a separate discussion. The implementation of this programme, along with suggested above other protected areas for the protection of all endemic

and endangered species, will come as close to a sustainable long-term reliable completeness of viperidae snakes biodiversity conservation (as an umbrella-species) in the Caucasian ecoregion.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The present work is based on the literature sources and own long-term study of the Caucasian ecoregion which does not contain any sources on human, or animals that meet the criteria of Directive 2010/63/EU.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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ВЫСОКОЕ ГЕРПЕТОЛОГИЧЕСКОЕ РАЗНООБРАЗИЕ КАВКАЗСКОГО ЭКОРЕГИОНА: АННОТИРОВАННЫЙ СПИСОК ВИДОВ, ВКЛЮЧАЯ КОММЕНТАРИИ ПО БИОГЕОГРАФИИ И ОХРАНЕ

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Кавказ всегда был одним из самых интересных регионов для герпетологов. Несмотря на многолетнюю историю герпетологических исследований, многие вопросы остаются нерешенными. Мы представляем наиболее полный список видов, отражающий герпетологическое разнообразие фауны этого региона, учитывая различные взгляды на таксономическое положение и внутривидовую структуру видов, населяющих Кавказ. Эти данные использованы для разработки теоретических основ охраны уникального фаунистического разнообразия. Используя современные публикации, сведения из баз данных и опубликованные результаты собственных многолетних исследований, мы предлагаем обновленный аннотированный список видов амфибий и рептилий Кавказского экорегиона, в том числе комментарии по их биогеографии и охране. Полный список содержит 128 видов амфибий и рептилий. Для фауны региона известно 18 видов амфибий, относящихся к двум отрядам; половина из них (девять видов) являются эндемиками. Кавказский экорегион населяют 110 видов рептилий: пять видов черепах, 59 видов ящериц и 46 видов змей. Из этого количества рептилий 32 вида (44 подвида) являются эндемиками для экорегиона.

Ключевые слова: амфибии, рептилии, биоразнообразие, эндемизм, Кавказ