BATS CONSERVATION ACTION PLAN FOR THE CAUCASUS

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The Critical Ecosystem Partnership Fund is a joint initiative of Conservation International, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation.

Armenian Nature Protectors Union, ANPU

The Center of Biological Diversity, Azerbaijan

Field Researchers` Union – CAMPESTER, Georgia

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Authors' Foreword

This document is the first attempt to develop a Regional Action Plan for Caucasian Bat Conservation. It is also the first attempt in the Caucasus to create an integrated conservation action plan addressing a group of species that are found on the territory of several countries. The Action Plan agreed by regional specialists is an important guiding paper in the field of the bat conservation. This Plan is intended to serve as guidelines for generating National Action Plans in the countries of the Caucasus: Armenia, Azerbaijan, Georgia, and Russia.

Hereinafter countries of the region as well as names of the authors are listed in alphabetical order.

In view of the international character of the document, authors agreed to use only Latin names of animals, avoiding their common names in the national languages of the participating countries or working languages of the international team, i.e. Russian and English. Common names have been used only in essays on individual species.

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Introduction

Problem Identification

Bats are an essential component of ecosystems and account for a significant part of the Caucasus mammals. They play an important role in protecting human health and destroying agricultural and forest pests. Also, the Chiroptera are probably the only order of mammals living side by side with humans yet actually doing no harm to them. However, human impact resulting in habitat change and expanding areas of land under economic use cause threat for half of all the Caucasus Chiroptera, and these need human help and protection in order to survive.

Bats are closely linked to men, with men providing shelters for them in their attics, their cult and ritual facilities, mines, galleries (adits), artificial caves, etc. The population in general has rather neutral attitude to bats in the Caucasus. People rarely do harm to bats, usually because of lack of knowledge, vandalism or because the animals choose wrong places for roosting. Sometimes conflicts between bats and men are due to religious beliefs, but the main man-caused harm is associated with economic activity that leads to destruction of bat's habitats, disappearance of potential roosting sites, and pollution of the environment with pesticides. Altogether, these lead to the decline in the bat population size both in the Caucasus and worldwide.

A lot of places where big bat colonies are found are located beyond protected areas. Such roosting places frequently experience different adverse impacts. At the state level, Chiroptera roosts are sometimes protected as tourist attractions, yet tourism that is not duly controlled usually has an adverse impact on these animals.

Bats are very susceptible to environmental changes and could be used as an indicator group (Catto et al. 2003). Monitoring of populations of some species permits evaluation of trends in the volatile biodiversity of the region as well as offers possibilities to control the overall environmental status in our countries.

In the same time, none of the countries in the region has a program for the conservation of bats and their key habitats, nor any examples of having solved the problem in practice. The main reason is lack of awareness among state environmental policy-making agencies about bat conservation problems and potential solutions both at the national and at the intergovernmental level (for migrating species). Lack of information about the actual status of each vulnerable Chiroptera species and its habitats in the entire Caucasus makes it more difficult to protect key areas for bat conservation within all countries. In addition, lack of coordination between the countries reduces efficiency of efforts for protecting species that migrate between their summer and winter roosts located on territories of different countries.

The Caucasus ecoregion occupies the entire Caucasus isthmus from Kuma-Manych depression in the north to the watersheds between rivers flowing to the Black and Caspian Seas and rivers feeding inland basins in Turkey and Iran or other seas. The Black and Azov Seas limit the ecoregion from the west, and the Caspian Sea bounds it from the east. This territory represents a whole range of landscapes, from humid subtropics and semi-deserts to the Alpine belt in mountain. The variety of landscapes and ecosystems conditions the rich diversity of the Caucasus fauna. The ecoregion is a home to over 150 species of mammals (Hotspots Revisited 2004). The 35 species of bats account for 23,3% of the number of mammal species of the Caucasus and are one of the key components of its biodiversity. Seven bat species are identified as priority species in the CEPF Ecosystem Profile**,** which is 13,7% of the total of 51 species of animals and plants that CEPF has prioritised for the Caucasus. Almost 40% of mammals of the CEPF priority list are the Chiroptera.

The Caucasus is important for biodiversity conservation on our planet. Conservation International (CI) of the United States has listed the Caucasus among 34 biodiversity hotspots (Hotspots Revisited 2004), i.e. areas distinguished for their rich biodiversity yet running the highest risk of biodiversity loss. WWF has listed the Caucasus among 238 Ecological Regions critical for biodiversity conservation at the global level (Global 200, Places that should survive).

The Regional Action Plan for Bat Conservation covers three countries of the South Caucasus (Armenia, Azerbaijan, and Georgia) and the Caucasian part of the Russian Federation. For most efficient use of the limited resources available, the authors focused their efforts on areas most populated by bats and critical for biodiversity conservation in our countries, namely, on the northern and southern slopes of the Greater Caucasus, the Lesser Caucasus, and the intermontane depression between them.

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The Critical Ecosystem Partnership Fund is a joint initiative of Conservation International, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation.

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PART I. CAUCASIAN BATS AND THEIR CONSERVATION

Brief Description of the Chiroptera

The order *Chiroptera* is divided into two suborders: the *Megachiroptera*, and the *Microchiroptera*. All Chiroptera found in the Caucasus belong to the *Microchiroptera*. These are small mammals that have adapted to active flight. The forelimbs of bats are developed as wings. A skin membrane is stretched between their fingers, shoulder, forearm sides, hind legs, and the tail. The head has big auricles. The head and body are covered with soft, thick dark fur of average length. The membranes are covered with sparse hairs.

Bats are found on different landscapes from the north forest boundary to deserts. They are most diverse in the tropics. Bats are active in twilight and at night; during the daytime they stay in roosts, hanging upside down with their wings folded, or hide in cracks. In winter bats hibernate; some species seasonally migrate for long distances from places of reproduction to wintering areas in the south.

All bats found in Eurasia feed on insects and other arthropods. During reproduction and winter periods, the Chiroptera live in colonies. There are species that gather in colonies with dozens of millions individuals. There are colonies of bats in the Caucasus where the number of the bats is several hundreds or thousands of individuals. Separate non-reproducing individuals sometimes stay solitary both when hunting or in daytime roosts.

Female bats usually haves one young per litter, rarely two or three youngs. Pups stay alone in the roosts for some time while their mothers find their prey. Usually they start flying independently after a month or two after birth.

The Caucasian Bats

The Chiroptera are one of the most biologically diverse and least studied order of mammals in the Caucasus. In this Action Plan the taxonomy of the Caucasus Chiroptera species is given according to accepted in IUCN classification (Koopman 1993, 1994). In the Caucasus are registered 35 species of bats that represent 11 genera of three families of the order *Chiroptera* (Rakhmatulina 1996; Rakhmatulina 1999; Benda, Tsytsulina 2000; Gazaryan 2004). A full list of the bat species occurred in Caucasus is enclosed in Annex 1. In recent years, *Pipistrellus pygmaeus* (Rakhmatulina, Hasanov 2002; Bukhnikashvili et al. 2004) and *Myotis dasycneme* (Gazaryan 2004) have been first found in the Caucasus, and *Myotis daubentonii* has been found in the South Caucasus (Gazaryan 2003). Bats from the group “mystacinus”: *Myotis aurascens, M. hajastanicus* (Benda, Tsytsulina 2000) and the long-eared bat *Plecotus macrobullaris* (Spitzenberger et al. 2003) registered in the Caucasus region have been recently singled out into separate Chiroptera species.

Different numbers of species have been registered in different countries of the Caucasus: 28 species registered in Armenia and Georgia each, 29 in Azerbaijan, and 30 species in Russia. The 23 species are found in all the four countries. Two species - *Myotis schaubi* and *Myotis hajastanicus* are found only in Armenia, 2 more species - *Myotis dasycneme* and *Eptesicus bobrinskoi* are found only in Russia. Four species (*Myotis bechsteinii, Myotis brandtii, Myotis daubentonii u Nyctalus lasiopterus)* are associated with humid landscapes of the western part of the region. The first two species spread farther onto the territory of Azerbaijan along the slopes of the Greater Caucasus Range, and the other two are found only in Georgia and Russia. Two more species (*Eptesicus bottae, Barbastella leucomelas*) populate arid landscapes of the eastern part of the region. The *Eptesicus bottae* is found only in Armenia and Azerbaijan, and *Barbastella leucomelas* is also found in Daghestan (Russia).

The spread of the *Rhinolophus blasii, Eptesicus nilssonii*, and *Tadarida teniotis* in the Caucasus has not been sufficiently studied, and the available data are insufficient for identifying trends in their occurrence in the region (see Table 1).

Zoogeographic Characteristics of the Caucasus as the Action Plan Implementation Region

Geographically, the area of Bat Conservation Action Plan covers the Caucasus isthmus from the southern borders of Armenia, Azerbaijan, and Georgia in the south to the Kuma-Manych depression in the north. It borders upon the Black and Azov Seas in the west and the Caspian Sea in the east. Close neighbourhood of areas with different natural conditions is typical for the Caucasus. Distances between high mountains and coastal lowlands or between humid or arid subtropics and coniferous forests are rarely more than dozens of kilometres, and are frequently less than ten kilometres. The isthmus has historically served as the area of transit for many species in the process of exploring new areas and as a migration corridor for many animals.

Table 1. Bats of the Caucasus and their protecting status

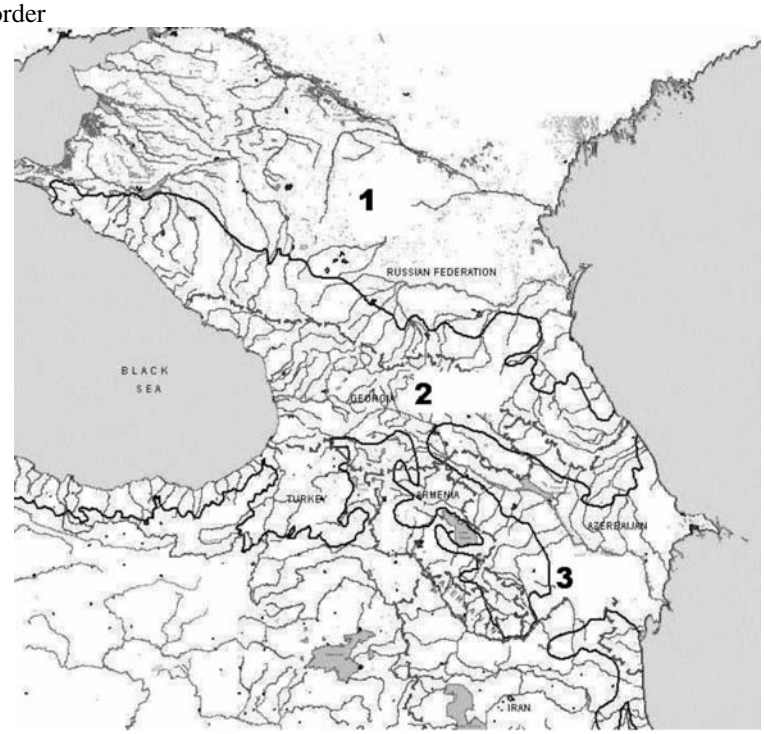
Notes: **+** registered in the country; ⬢ protected by the national law;

№	*Name of Species*	**Armenia**	**Azerbaijan**	**Georgia**	**Russia**	**IUCN**
1.	*Rhinolophus ferrumequinum*	+	+	+	⬢	LC
2.	*Rhinolophus hipposideros*	+	+	+	⬢	LC
3.	*Rhinolophus euryale*	⬢	⬢	⬢	+	VU
4.	*Rhinolophus blasii*	+	+	+		NT
5.	*Rhinolophus mehelyi*	⬢	+	⬢	⬢	VU
6.	*Myotis blythii*	+	+	+	⬢	LC
7.	*Myotis bechsteinii*	+	+	⬢	+	VU
8.	*Myotis emarginatus*	+	+	+	⬢	VU
9.	*Myotis nattereri*	+	+	+	+	LC
10.	*Myotis schaubi*	⬢				EN
11.	*Myotis mystacinus*	+	+	+	+	LC
12.	*Myotis aurascens*	+	+	+	+	LC
13.	*Myotis hajastanicus*	+				NE
14.	*Myotis brandtii*		+	+	+	LC
15.	*Myotis daubentonii*		+	+	+	LC
16.	*Myotis dasycneme*				+	VU
17.	*Eptesicus serotinus*	+	+	+	+	LC
18.	*Eptesicus bottae*	+	+			LC
19.	*Eptesicus nilssonii*		+	+	+	LC
20.	*Eptesicus bobrinskoi*				+	LC
21.	*Nyctalus lasiopterus*			+	⬢	NT
22.	*Nyctalus leisleri*	+	+	+	+	NT
23.	*Nyctalus noctula*	+	+	+	+	LC
24.	*Pipistrellus kuhlii*	+	+	+	+	LC
25.	*Pipistrellus nathusii*	+	+	+	+	LC
26.	*Pipistrellus pipistrellus*	+	+	+	+	LC
27.	*Pipistrellus pygmaeus*	+	+	+	+	LC
28.	*Hypsugo savii*	+	+	+	+	LC
29.	*Barbastella barbastellus*	+	+	⬢	+	VU
30.	*Barbastella leucomelas*	*	+		+	LC
31.	*Plecotus auritus*	+	+	+	+	LC
32.	*Plecotus macrobullaris*	+	+	+	+	LC
33.	*Vespertilio murinus*	+	+	+	+	LC
34.	*Miniopterus schreibersii*	⬢	⬢	+	⬢	LC
35.	*Tadarida teniotis*	⬢	⬢		+	LC
	Total	**28**	**29**	**28**	**30**	**35**
	Species protected by law	**6**	**3**	**4**	**7**	**8**

From the viewpoint of zoogeography, the entire Caucasus is located in the Holarctic or Palearctic kingdom or zone, depending on the terminology used by experts in zoogeographic zoning. We use the zoning of

the World Geographic Atlas of 1964 published in Moscow[1]. According to Vereshchagin's map (1964), the Caucasus Ecoregion includes several zoogeographic sub-zones. In the north of the region there are two districts of the Kazakhstan-Mongolian province of the Central Asian sub-zone. The middle of the ecoregion is mountains of the Greater and Lesser Caucasus and Talysh that belong to the Caucasus part of the Circumboreal sub-zone isolated from the main part of the sub-zone by steppes. The Circumboreal sub-zone is sometimes referred to as the sub-zone of Western Eurasia, which in principle does not change its characteristics and boundaries in the Caucasus (World of Geography 1984). Southern boundaries of the Caucasus Ecoregion lie within the Anterior Asian district of the Mediterranean province and Kura district (almost entire Azerbaijan) of the Iranian-Turan province. Both these provinces belong to the Mediterranean sub-zone. Thus, three zoogeographic sub-zones and four zoogeographic provinces neighbour in the Caucasus. Map 1 clearly shows that in some locations boundaries of the zoogeographic sub-zones come very close to each other. Thus, the distance between all the three sub-zones is less than 100 kilometres in the area of the Russia-Azerbaijan border.

Map 1. Boundaries of Zoogeographic Sub-zones
1. Central-Asian 2. Circumboreal 3. Mediterranean
Solid line is the zoogeographic sub-zone boundary
Dash line is the state border



The Caucasus is a home to species typical for all the three sub-zones, which conditions the rich diversity of flora and fauna in general, and the *Chiroptera* in particular.

Habitats

Bats populate both forest and open landscapes. They can be found in rocks and at steeps, near water, in populated areas. There are few species in the Caucasus that live only on one and the same landscape. With the rich mosaic of habitats (biotopes) and close vicinity of diverse landscapes it is difficult to clearly associate species with a particular habitat. Most of the Chiroptera species use forest-landscapes as well as open and rocky landscapes depending on where big numbers of insects are found. Yet habitat preferences do occur as well as preferences of different habitats and landscape features at different moments of the life cycle.

Conventionally, the Chiroptera can be divided into forest species, species populating open landscapes, and so-called 'eurytopic' species.

There are 14 forest bat species, including *Rhinolophus euryale, Myotis bechsteinii, M. nattereri, M. daubentonii, M. dasycneme, M. brandtii, Nyctalus lasiopterus, N. noctula* and *N. leisleri, Barbastella barbastellus, Plecotus auritus, Eptesicus nilssonii, Pipistrellus nathusii, Vespertilio murinus.* Only five species -

[1] We refer to the zoning presented in the World Physical-Geographic Atlas (1964) first of all because one of the map authors was N.K. Vereshchagin, author of *The Mammals of the Caucasus; A History of the Evolution of the Fauna* (1959), a fundamental monography also including a detailed map of the Caucasus zoogeographic zoning based on theriology data. It is no secret that boundaries of zoogeographic areas depend not only on preferences of theory authors but also on spatial distribution of features taken as a basis for boundary identification. This it seems reasonable to base on the map generated by scientists who long worked in the Caucasus and produced the zoogeographic map on the basis of mammal distribution data.

Rhinolophus euryale, Myotis bechsteinii, M. brandtii, Barbastella barbastellus, and Plecotus auritus are always found in forests or close to them. Dendrophilous species such as noctules (*Nyctalus),* find their prey flying rather far away from tree hollows they colonize.

There are 11 bat species that prefer open landscapes: *Rhinolophus blasii, Rhinolophus mehelyi, Myotis hajastanicus, M. schaubi, Barbastella leucomelas, Plecotus macrobularis, Eptesicus bottae, E. bobrinskoi, Pipistrellus kuhlii, Hypsugo savii* and *Tadarida teniotis.* Only one species – *Eptesicus bottae* – belongs to those found only on open landscapes. There are no species living only in rocks in the Caucasus. Three bat species are most associated with big rock outcrops and steeps in mountains and in the lowland; these are *Myotis schaubi, Hypsugo savii* and *Tadarida teniotis*.

Ten species that are found both in forests and on open landscapes are the *Rhinolophus ferrumequinum, R. hipposideros, Myotis blythii, M. mystacinus, M. aurascens, M. emarginatus, Eptesicus serotinus, Pipistrellus pipistrellus, P. pygmaeus* and *Miniopterus schreibersii.*

Roosting sites and feeding areas are key areas for bats. Food available in hunting areas around nursery roosts is of particular importance. Yet the roosts are not necessarily close to feeding places, so safe and easy flying routes between roosts and from roosts to the feeding areas are also critical for the bats population's well-being.

In the Caucasus as well as in other parts of the moderate climate zone, key habitats for bats can be divided into five main groups, namely:

- Forests (all types of forests in mountains, light forests and floodplain forests);
- Open landscapes (semi-deserts, steppes, and mountain meadows);
- Water habitats (shores and water surface of fresh pools and marshes);
- Rock outcrops and steep slopes of gorges;
- Areas with manmade structures (so-called 'residential' landscape).

Bats find their prey near water and over water surface, in forests, in and above trees, in fields and deep ravines and along steep gorges where insects are concentrated (Kuzyakin 1950). The Chiroptera rarely prey in coniferous forests or over large pastures.

For preying and to reach their preying areas, bats frequently fly along linear features of the landscape: paths, alleys, fences, railways, canals, roads with light traffic, pipeline right-of-ways, etc. (Limpens et al. 1989; Limpens and Kapteyn 1991; Verboom 1998). Big species, such as *Eptesicus serotinus* or *Nyctalus noctula* frequently cross open spaces and less follow line features than smaller bats *Myotis nattereri, M. daubentonii, M. brandtii* or *Pipistrellus pipistrellus*.

Many bat species populate areas with manmade structures. They use them as comfortable winter and summer roosting areas, namely, living in parks and green zone trees, feed near fountains and street lamps. *Eptesicus serotinus, Nyctalus noctula, Myotis blythii, Rhinolophus hipposideros* are the species usually found in populated areas yet keeping away from very urbanized areas populated by *Pipistrellus pipistrellus* or *P. kuhlii*.

Bats distribution by altitude depends on the air temperature and concentrations of flying insects. Generally, most of bats do not live higher than 1500 meters above the sea level. Some species, such as *Rhinolophus hipposideros, Myotis brandtii, M. daubentonii, M. emarginatus, M. nattereri, Nyctalus noctula, E. serotinus, Plecotus auritus, Pipistrellus nathusii, Hypsugo savii,* and occasionally also *Barbastella barbastellus* can be found as high as 1800 meters a.s.l. *Myotis blythii, M. mystacinus, Nyctalus lasiopterus, Pipistrellus pipistrellus, Vespertilio murinus, Plecotus auritus, Myotis brandtii, Eptesicus serotinus, Tadarida teniotis* have been noticed at over 2000 meters a.s.l.

Roosts

Bats very depend on the suitable roosts. They are absolutely defenseless, so they have to hide from predators. Also, because of their physiology, bats cannot stay under the open sky for long during the daytime. Bats need roosts with certain and more or less stable conditions to breed and winter. They have to hide somewhere from inclement weather (frosts or drought) during their activity season. Some species use only some specific type of roosts, others change roosts during the year, for instance, moving from tree hollows and attics to caves or cellars for wintering.

During passage migration, seasonal or feeding movements' bats move from one roost to another, sometimes staying in them for several days. All the Caucasus bats also use roosts for mating.

Thus, functionally, roosts can be used as:

- Nursery roosts, where female bats give birth to and nurture their offspring;
- Wintering roosts, where bats hibernate in winter;
- Summer roosts, used by males and those females that do not participate in reproduction and usually live separately from nursing females and form summer colonies.
- Transit roosts used for a limited time during migration or movements;

- Rutting roosts used by male bats for attracting females and coupling, where temporary rutting colonies are established.

Bats of the same species can use the same roosts for different purposes in different seasons of the year. Sometimes different species use a roost simultaneously, yet for different purposes (e.g. a nursery colony can share a cave with solitary bats from the same or other species). There have been cases of two species using the same underground retreats in different seasons. Thus, an artificial cave of Dodos-Rka (cave complex of David Gareji, Eastern Georgia) is a wintering place for *Rhinolophus ferrumequinum,* whereas in summer it is occupied by *M. blythii* (Natradze et al., 2003); the Sirab cave in Nakhchyvan, Azerbaijan, is colonized by *Myotis blythii* and *Miniopterus schreibersii* in summer and by *Rhinolophus ferrumequinum* in winter (Rakhmatullina, Hasanov 2008).

In the Caucasus as well as in other areas with moderate climate, bat roosts can be divided into four major groups:

1) underground sites ;
2) trees (hollows, crevices and loosened rind);
3) overground buildings;
4) rock crevices.

Larger nursery colonies roost in warm caves and big buildings.

Isolated caves where no sharp fluctuations of temperature occur are of particular importance as for roosting in winter. They are used for wintering not only by cave bats, but also by bats that roost in buildings or tree hollows in summer. Larger caves are colonized by bats both in summer and winter. Some caves where large concentrations of bats live in summer are also used by solitary male bats in winter, while solitary male bats from a large colony wintering in a cave sometimes remain in the same cave in summer. Small caves are usually used for one season only.

In areas with mild climate, bats roost in deep and large basements year-round.

Large colonies do not roost in tree hollows. Forest colonies use several tree hollows. Bats living in forests frequently move from one hollow to another, and the population of the same hollow changes. Forests with many old hollow trees offer sufficient roosts for bats and are usually densely populated.

Cracks in buildings and rocks can be also used for breeding and wintering, yet they are more frequently occupied by individual bats (Rakhmatulina, 2005). Several bats often share one and the same crevice (or tree hollow) in winter (Abelentsev et al., 1956; Kurskov, 1981; Kepka 1976). In cold winters bats frequently die there as the temperature inside is only several degrees higher than outside, with sharp fluctuations (Abelentsev et al., 1956; Bogdanov, 1953; Rakhmatulina, 2005; Reimov et al., 1988; Wissing 1986-1987).

All the above listed types of roosts can be used as temporary or permanent daytime, rutting or transit roosts in summer, spring and winter.

Movements and Migrations

Depending on the biology of each species, bats can roost in one and the same place year-round or move for different distances between roosts of the same or different types. Distances of bat movement or migration mainly depend on the vicinity of good wintering roosts, and for one and the same species the distances can vary from several dozens to several thousands of kilometres in different countries. For instance, *Pipistrellus pipistrellus* that populate the European part of Russia in summer migrate over a distance of 1150 km to the south and southwest in winter; on the territory of Western and Central Europe (Hutterer et al. 2005). In South Caucasus, Central Asia, and other regions in south of their area *Pipistrellus pipistrellus* live a settled life, and their seasonal movements rarely exceed a hundred of kilometres.

By distance of seasonal migrations, Caucasian as well European bats can be divided into three categories (Roer 1995; Gaisler et al. 2003):

- long-distance migrants, probably including all noctules (*Nyctalus*), *Vespertilio murinus* and *Pipistrellus nathusii* that seasonally migrate beyond the Caucasus region;
- species migrating within the region, namely, almost all *Myotis*, also *Miniopterus schreibersii* and *Eptesicus serotinus* that seasonally migrate for distances from several dozens to several hundreds of kilometres within the Caucasus (Rakhmatulina, 2005; Bukhnikashvili, Natradze, 2008);
- settled species, including horseshoe bats (*Rhinolophus*), *Myotis mystacinus, M. nattereri*, and long-eared bats (*Plecotus*) (Rakhmatulina, 2005).

Migration behaviour can change; sometimes some individual animals migrate while others stay settled in the same place. Thus, some female bats of the *Nyctalus noctula* stay in the Caucasus in summer and reproduce close to their wintering places (Strelkov, 1997).

Caucasian bats migrate for long distances to their breeding areas as well as for short distances from their wintering places to feeding areas and to breeding roosts (Kuzyakin, 1950; Panyutin, 1980; Rakhmatulina 2005; Strelkov, 1970, 1971, 1972). Short-term migrations can be vertical (up and down the mountain slopes) or

horizontal (between roosts located approximately at the same altitude above the sea level). Bat-ringing data from Azerbaijan showed that in areas with mild winter a lot of mass Chiroptera species move between summer and winter roosts (Rakhmatulina, 1995, 2005). The cave-dweling bats frequently migrate for short distances, whereas no long-distance migrations of them have been reported in the Caucasus (Rakhmatulina, 1971, 1980, 1988). The long-distance migrations are documented only for *Nyctalus noctula* (Gazaryan, Kazakov, 2002) and *Pipistrellus nathusii* (Rakhmatulina, 2005). According to indirect data, migrating species of the region also include *Nyctalus lasiopterus* and *Nyctalus leisleri* as well as *Vespertilio murinus*. The *Nyctalus noctula* are known to fly for a distance of 1600 km, and *Pipistrellus nathusii* fly on 1800 km (Sluiter, van Heerdt, 1966; Strelkov, 1969).

Both migrating and settled species fly from their roosts to feeding areas every day. The flying distances to the foraging places vary depending on the species' flying abilities, location of the closest foraging places (usually, near water) and season: horseshoe-nosed bats (*Rhinolophus*), long-eared bats (*Plecotus*), barbastelles (*Barbastella*), myotis (*Myotis*) and pipistrelles (*Pipistrellus*) hunt at the distance of 0.1-6 km from daytime roosts (Krochko, 1970; Rakhmatulina, 2005; Bauerova 1978, Bontadina et al. 2002; Helmer 1983; Krull et al. 1987; Racey, Swift 1985); *Eptesicus serotinus* and noctules (*Nyctalus*) fly for a longer distance – 5-10 km; by different estimates, *Miniopterus schreibersii* fly for 3 to 40 km (Krochko 1970; Kuzyakin 1950).

Migrating species are very vulnerable during the flights. A lot of bats die, especially in inclement weather, if a transit roost where they stayed for years is no longer available or the feeding area has changed and the forage there is insufficient for the bats to restore before continuing the flight.

Food

Bats eat insects and rarely other invertebrates. Each species' diet consists of different proportions of different arthropods. Dipterans (*Diptera*) and but terflies (*Lepidoptera*) are the main forage for bats. Small myotis (*Myotis*) and pipistrelles (*Pipistrellus*) feed on smaller insects; bigger species, such as *Nyctalus noctula* and *Eptesicus serotinus*, consume bigger insects, with harder covers, e.g. beetles of the superfamilia *Scarabaeidae* (may-bugs, July chafers, dung beetles, etc). Mainly, bats consume insects in the imago stage. All bat species, each in its size class, try to capture bigger insects. In addition to adult flying insects, some bats feed on larvae and other flightless insects (Petrusenko et al. 1988).

Bats use a wide range of preying strategies corresponding to the wide range of the forage. Many bats prey in aggregations of small insects immediately above water or in its vicinity; forest species find their prey under trees or in leafage, also above the trees of the upper storey, at the external and internal ecotones in the forest (in glades and at forest edges); some bats prey in treeless areas. Bat species capable of flying fast and for long distances eat insects that form large concentrations high in the air (so-called 'forage fields'). Other bats collect invertebrates from leaves and branches or from grass in open landscapes, even alighting on plants or earth to eat the prey. Diets of such species include a lot of flightless arthropods and arthropods active in the daytime.

Actively flying animals need a lot of food. Every night a bat should get food totaling 50 to 100% of its body mass (Kurta et al. 1989, Kunz et al. 1995). Eating a lot of insects, including pests and disease carriers, the Chiroptera play a role in regulating their number and thus are of great importance for protecting crops and human health.

Use of pesticides in agriculture and forestry might lead to decline amounts of food and poisoning of bats. Bats die getting the poison via the food chain, i.e. eating poisoned insects or licking the poison off their own fur that wipes it off from plant leaves or during pesticide spraying. Naturally, species that alight on the ground or on plants more frequently contact pesticides than those preying high in the air. Species that collect flightless invertebrates from a substrate more often eat poisoned insects and get a bigger doze of the poison.

Similarly, through the food chain, bats experience the impact of increased pollution of water and feeding areas with industrial waste and emissions.

The impact of pollution and pesticide use on bats has never been studied in the Caucasus, yet one might suggest that the impact causes decrease in the number of bats similar to that in regions where the issue has been studied well (Clawson et al. 1989; Clark 1988; Cockrum 1969, 1970; Leeuwangh & Voûte 1985; Reidinger & Cockrum 1978).

When choosing methods and time for treating crops and areas with pesticides/chemicals, consideration should be given to protected animal species that populate the area.

Predators

Bats have few active natural enemies. In the Caucasus these are mainly bat-eating predators: birds of prey and preying mammals. Birds of prey mainly include owls, especially – church owl (*Tyto alba*) and grey tawny owl (*Strix aluco*), and birds of prey hunting in the daytime – falcons (*Falco*) and hawks (*Accipiter*) (Kuzyakin 1950; Golodushko 1960; Kržanowski 1973; Kowalski, Lesinski 1986, 1990; Ruprecht 1990), buzzards *(Buteo buteo*). Bat-eating mammals include mustelids (*Mustelidae*), foxes (*Vulpes vulpes*), rats (*Rattus*), fat dormice (*Myoxus glis*), domestic cats (*Felis catus*), lynxes (*Lynx lynx*) (Abelentsev et al. 1956; Ilyin 1988, 1990; Rakhmatulina 2005; Winkler, Adams 1972; Urbanczyk 1981; Wroe, Wroe 1982; Slim, Stumpel 1986; Bekker, Mosteri 1991;

Romanowski, Lesinski 1991; Tryjanowski 1997). According to most zoologists, bat losses caused by these enemies are not high and rarely exceed 1-3% of bat population (Bogdanov 1953; Kuzyakin 1950; Lipej, Gjerkes 1992; Nicodem 1982; Nowosad, Salata-Pilacinska 1987). Occasionally, the loss may be as high as 10% (Kowalski, Lesinski 1990; Rakhmatulina 2005), but even in such cases preying is not a factor causing decline in the number of the Chiroptera.

Parasites

Internal parasites of bats in the South Caucasus have been studied rather well (Kurashvili et al. 1989; Matsaberidze 1976, 1982, 1986; Musaev 1967; Musaev, Veisov 1961; Musaev, Gauzer 1971; Poleshuk et al. 2003; El Sayed Bedavi Metvali 1993; Sadykhov 1978; Shakhtakhinskaya et al. 1971; Zeiniev, Rakhmatulina 1990). The overall infection rate among bats varies seasonally, reaching 66.6% in summer, 51.4% in spring, 13.6% in autumn, and 29.7% in winter.

In the recent decade there has been an increase in the number of bats carrying rabies (*Neuroiyctes rabid*) in North America, Africa, Europe, Turkey, Russia (Greenhall 1968, Dorward et al. 1977, Kalko et al. 1987, Wilson 1998, Botvinkin et al. 1996, Zorya 2002, Poleshuk et al. 2003). In the Caucasus region a virus from the rabies virus group (lissavirus) has been found in bats in the North Caucasus (Poleshuk et al. 2003), but none was ever recorded in bats in the South Caucasus.

There are different levels of information available on external parasites of the Caucasus. While in Armenia, Azerbaijan and Russia these have been studied rather well (Dubovchenko 1968, 1969; Mularskaya, Dubovchenko 1969; Hadjiyev, Dubovchenko 1970, 1972, 1976; Mularskaya 1978; Hadjiyev et al. 1982; Yavruyan 1989,1991, 1995; El Sayed Bedavi 1993; Arutunyan 1999; Papov 2003; Gazaryan 2007), they have not been actually studied in Georgia.

The invasion types and rates are diverse and high in animals forming dense aggregations. The fauna of the ectoparasites is most diverse in bats living in caves, on which over 70 species of external parasites are found. Fewer species (34) are found on synanthropic species and only 8 species in forest bats.

According to Dubovchenko (1968), out of 90 species of external parasites found in bats in Azerbaijan, over 20 species may be reservoirs and vectors of infectious and invasive diseases. Yet in view of the ecological isolation and lack of cases of mass infection among these mammals, the possibility of getting infected from bats is very low (Rybin 1980). A. Kuzyakin (1950, 1974) repeatedly pointed to the fact that an agent of a disease dangerous for humans found in bats does not by itself lay any grounds for associating the bats with potential sources of the disease, and all the Chiroptera species in moderate climate areas are useful for men.

Ectoparasites also affect bats behaviour, potentially making them change their roosts from time to time, yet they pose no danger for humans.

Environmental and Economic Importance of the Chiroptera

By eating a lot of insects, insectivorous bats are known to play an important role in insect control as well as in protecting crops, human health, and the health of animals and plants. (Hutson et al. 2001). The environmental role and economic importance of the Chiroptera are determined by the fact that these animals are the primary consumers of twilight and night insects that are actually unavailable to birds. Most part of their diet is pests of trees, vegetable cultures and crops as well as vectors of different infections. Bats eat insects from different groups including *Diptera*, *Lepidoptera, Coleoptera, Homoptera, Hemiptera* and *Trichoptera* (Rakhmatulina 2005; Ross 1967; Black 1974; Kunz 1974; Whitaker and Black 1976; Anthony and Kunz 1977; Whitaker *et al.* 1977; Warner 1984; Swift *et al.* 1985; Dalton *et al.* 1986; Rydell 1986; Kunz *et al.* 1995). At night a bat can consume insects that are 50 to 100% of its own body mass (Kurta et al. 1989; Kunz et al. 1995). The biggest bat colonies can destroy several tons of insects in a night (Kunz et al. 1995; McCracken 1996; MacKinnon et al. 1996).

With roosts available, bat colonies can consist of the maximum number of bats possible in view of the volumes of food available in adjacent areas. A complex of Chiroptera species with different food preferences influence the number of a wide range of insects, preying on different insects in all vertical feeding zones, in different habitats throughout the night.

Data from two studies published in the "*Science"* Journal suggest that bats have a higher impact on the number of insects living tropical plant leaves than insectivorous birds. Thus, in vegetated areas covered by a mesh to protect them from birds during the daytime there were 65% more arthropods than in a control area open day and night; and in areas protected from forest bats at night the number of insects was 153% higher than in the control area. In the same time, areas closed for birds were 76% more destroyed by insects and those closed for bats – by 209% more than the control areas open to birds and bats respectively (Kalka et al., 2008). Probably bats eat more arthropods than birds generally or at least in some seasons of the year (Williams-Guillen 2008).

Bat conservation is important for sustaining natural ecosystems and protecting agricultural plants from pests. A specific feature of bats is their ability to prey at night when there are no useful insects (pollinators and entomophagans) flying around, whereas birds eat all types of the insects in the daytime.

By eating mosquitoes, including vectors of leishmaniasis and malaria (*Anopheles*), bats also protect human health. Mosquitoes are an important component of the Chiroptera's diet. Faeces of some small bats from the *Myotis* consist of 85% of insect remnants (Fascione et al., 1991). In the same time, the Chiroptera might carry rabies and other infectious diseases, and potentially pose some risk for human health if not treating them safely.

Another local role that bat colonies play is their faeces and dead bodies giving food for many organisms in caves: the specific cave flora and fauna consisting of bacteria, mushrooms, worms and insects.

In principle, bats may attract tourists. Thus about 100,000 tourists come to the town of Austin, Texas, every year to see the 1.5 million strong colony of Brazilian free-tailed bats (*Tadarida brasiliensis*) that roost in the town. Yet there are no large colonies in the Caucasus or colonies that could stand such an inflow of tourists. Neither are there any respective tourist agencies oriented at bats as an attraction.

The economic importance of bats in the Caucasus has not been fully evaluated so far. The evaluation of amount of the eaten insects has been done only in Azerbaijan for a few bat species (Rakhmatulina 2005).

Special studies are necessary to evaluate the importance of Caucasus Chiroptera populations for protecting crops and human health.

Legal Framework for Bats Conservation in the Caucasus Countries

Protection at the National Level

As of 2008, national legislations of all countries envisage responsibility for illegal destruction of fauna components and their habitats. Chiroptera as well as other animals are formally protected in all countries of the region.

In all Caucasus countries, protection and use of animal resources are regulated by Laws on Fauna Protection:

- In Armenia, the Law of the Republic of Armenia On Fauna entered into force in 2000;
- In Azerbaijan, Law On Fauna entered into force in 1999;
- In Georgia, the President signed the Law On Wildlife in 1996, and should be updated recently;
- In Russia, Federal Law on Fauna was adopted on April 24 1995.

The Laws prohibit unauthorized withdrawal of animals from nature, yet the scope of application and the severity of punishment vary in different countries.

In Armenia, measures for regulating the number of separate species of wild animals are carried out by following decision of the Armenian Government only in exceptional cases, i.e. human epidemics, epizootic diseases in wild and domestic animals, threat to animal breeding, risk to ecological balance. By law, measures for regulating the number of separate animal species should have no adverse impact on other species and their habitats. Animal species to be regulated as well as the regulation action procedures are established by the Armenian Government.

In Azerbaijan, no withdrawal of animals from the wild is allowed without authorization of the Ministry of Ecology and Natural Resources. The Ministry's permission is required for fauna studies in all reserves, banding of different vertebrates, withdrawal of single individuals for study, regulation of the number of separate animal species without impact on their populations, habitats and biodiversity. The Ministry's authorization is also needed to study Chiroptera throughout the country, for ringing as well as capture for scientific studies. Permissions and licenses for ringing are issued only in case serious justification is provided.

In Georgia any withdrawal of animals, including bats, from the wild is prohibited unless authorized by the Ministry of Environmental Protection and Natural Resources. Exceptions are allowed only in cases when an animal needs emergency veterinarian care, yet with an obligation to return the animal back to its habitat after the care is provided. However, the new law permits unauthorized killing of an animal in case it attracts a man or causes damage to his property. The latter case allows for different interpretations when defining the damage caused.

Russia prohibits extraction, collection, storage, purchase, selling or transmission of any animal species, their products, parts or derivates without adequate permission or in violation of conditions envisaged by the permission, or in breach of any other established procedure. In the Russian Federation, withdrawal of Red Data Booked wild animal species is allowed in exceptional cases upon permission (regulating license) issued by an authorized state environmental agency according to procedure established by the Government of the Russian Federation. Actually, agencies responsible for issuing permissions for species not included in Red Data Books or hunting lists do not control issuance of their withdrawal licenses, and in practice they can be captured without any license.

National Red Lists of Red Data Books

Nationally red listed animal species are subject to special protection. Actual species to be protected by the State are identified by Laws on the Red List and/or Red Data Book available in any country:

- In Armenia, the Regulations On Keeping up the Red Data Book of the Republic of Armenia was signed in 2007;
- In Azerbaijan, the Law on the Red Data Book of Azerbaijan was adopted in 1989;
- Georgia adopted the Law of Georgia On the Red List and Red Data Book of Georgia in 1996;
- In Russia, the State Committee on Ecology adopted Regulations of Keeping up the Red Data Book of the Russian Federation on October 3 1997.

The procedure for including species into the national Red List /Red Data Book is also regulated by legislations of all the countries.

Each country adopts Procedures for Including Species in the national Red List/Red Data Book. The extent to which these procedures comply with IUCN procedures might be different yet this regulation mechanism is available and defines the criteria for proposing species to be included in the national Red List/Red Data Book.

The Armenian procedure adopted in 2007 complies with the IUCN procedure. Species can be included in the Red Data Book of the Republic of Armenia on the basis of data on declined number and range, deteriorated conditions for existence and threat of extinction. Final decision on including/excluding a species into/from the Red Data Book is made by the Red Data Book Commission of the Republic of Armenia. The Red Data Book should be based on data from the State Fauna Registry and should be periodically updated.

Resolution no. 125 of the Cabinet of Ministers of Azerbaijan adopted on July 15 2000 approved the Procedure for Including Species in the Red Data Book Second Edition'. The national Red List is based on nine IUCN categories.

Georgian rules for enlisting species fully comply with IUCN Procedures for Regional Red Lists.

Russian procedures only partially comply with the IUCN Procedures and are rather original in many aspects (Regulation On Keeping up the Red Data Book of the Russian Federation 1997). Yet some parallels could be made between the Russian definition of the protected species status and definition of categories adopted by IUCN. Thus, Category 1 (Endangered) are 'Taxa and populations whose population number have declined to critical levels slowing them to become extinct in the near future', which somewhat corresponds to the IUCN category of Critically Endangered species (CR).

Category 2 (Decreasing number) is 'Taxa and populations whose number is constantly decreasing. If the negative factors reducing the number continue, the taxa may be moved to the category of endangered in a short term'. This category could be referred to the IUCN category of Endangered species (EN).

Category 3 (Rare) - 'Taxa and populations a low number of individuals inhabiting a limited territory (or a marine area) or sporadically distributed over am extensive territory (or marine area) can be interpreted as Vulnerable, VU.

Each country has established a special body responsible for keeping the Red List.

In Armenia, the Red Data Book is approved by the national Government, and the procedure for keeping the Red Data Book is established and implemented by the Ministry of Nature Protection as an authorized state body of the Armenian Government. A Red Data Book Commission of the Republic of Armenia was established at the Ministry.

In Azerbaijan, nine Chiroptera species were pre-listed for the new edition of the Red Data Book by the Ministry of Ecology and Natural Resources (Decree no.167 of the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan of 25.04.2005 On Establishing Commission on Animal and Plant Species).

In Georgia, the status of endangered species is evaluated by a commission established at the National Academy of Sciences. After wide discussions of the species status by experts, the Commission made the first Red List that was approved by the President of Georgia in 2006 (Presidential Decree no.303, 2006). Further modifications to the Red List, including addictions, exclusions of species or changes of their status, shall be made by the Ministry of Environmental Protection and Natural Resources upon recommendation of the Academy's Commission.

In Russia, the Commission of Rare and Endangered Species of Animals, Plants and Mushrooms was established at the Ministry of Natural Resources (MNR) by RF MNR Decree no. 699 On Provisions for Keeping the Red Data Book of the Russian Federation issued on October 21 2002.

Each country has a National Red List including Chiroptera species.

Armenia is using the Red Data Book of the Armenian SSR issued in 1987. The Book consists of 88 species, all of them vertebrates, including 6 Chiroptera species. Status classification in the Armenian Red Data Book does not correspond to modern requirements and hardly correlates to the IUCN classification. A new Red List of Armenia is now being prepared.

The Red List of Azerbaijan consists of 104 species including 68 vertebrates, and 3 Chiroptera species including two Endangered (EN) and one vulnerable species (VU).

The Georgian Red List of 2006 enlists 137 animal species, including 93 vertebrates (and 4 more subspecies), among them only 4 Chiroptera species that have the status of Vulnerable (VU).

In Russia, the list includes 434 animal species, 279 of them vertebrates, including 7 species of Chiroptera: one species of Status 1 (or CR according to IUCN classification), 3 species of status 2 (or EN), and three species of status 3 (or VU).

Thus, in Georgia and Russia Red Lists already exist and can be regularly updated, and in Armenia and Azerbaijan new editions of national Red Data Books are being prepared in full compliance with IUCN recommendations of 2001.

Legislations of all the countries envisage responsibility for violation of laws on fauna protection.

Armenia prohibits any activity that might entail reduction in the number of species listed in the Red Data Book of the Republic of Armenia or deterioration of their habitats. The Armenian law stipulates criminal responsibility for violations of fauna legislation, punishable with incarceration for 3-5 years for serious offences and fines for minor violations.

Regulation no. 176 On Fines and Penalty for Damage Inflicted to Red Listed Species adopted by the Cabinet of Ministers of Azerbaijan on November 2 2004 stipulates a fine of 100 of conventional units (approximately equivalent to a US dollar each) for damage inflicted to bats.

Georgian Criminal Code includes articles stipulating punishment for destruction of protected species' habitats (Articles 287-289), punishable with imprisonment for 3-5 years. Illegal withdrawal of animals from their natural environment entails a fine for administrative offence and damage compensation. The amounts of the fine and compensation are currently being revised.

Russia criminalized both actions and omissions that might lead to death, reduction in number or disturbance to the environment of animal species enlisted in the Red Data Book of the Russian Federation or protected under international treaties. Penalties include confiscation of the captured items and equipment as well as administrative fines in the following amounts: for citizens – 15 to 20 minimum salaries; for public officials – 30 to 40 minimum salaries; or legal entities – from 300 to 400 minimum salaries. Destruction of critical habitats for organisms included in the Russian Red Data Book that entails death of their populations is punishable under Article 259 of the RF Criminal Code with potential imprisonment for up to 3 years (RF Criminal Code of June 13 1996, no. 63-FZ).

International Conventions for Bats Conservation

At the international level, Chiroptera are protected under several Conventions directed at animal and habitat protection. Thus, bats in Europe are included on the following lists:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), Appendix II;
- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), Appendix II;
- The EU Habitats and Species Directive - EC Directive 92/43/EEC on the conservation of natural habitats of wild fauna and flora, Annex II and Annex IV.

In addition, bats are subject to the Convention on Biodiversity, and their habitats, though indirectly, are protected under the Ramsar Convention on Wetlands.

Specifically, bats in Europe are protected by EUROBATS - The Agreement on the Conservation of Populations of European Bats.

All the Caucasian States have signed the Convention on Biological Diversity (CBD) and the Ramsar Convention on Wetlands. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) has been signed by Armenia and Georgia. Azerbaijan signed the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982) in 2000, and Russia jointed the Convention in the observer status. The Bonn and Bern Conventions apply to the area of all Caucasus countries and the countries can sign them in future. Georgia is a party to EUROBATS (see Table 2). The EU Habitats and Species Directive - EC Directive 92/43/EEC on the conservation of natural habitats of wild fauna and flora applies only to EU Member States, and none of the Caucasus country is a EU member. The aspiration for European integration declared by our countries, at least in the area of nature protection, suggests expectations for accession to the Bonn and Bern Conventions in perspective.

Caucasus countries have different levels of compliance with the requirements of the signed international agreements and conventions. Sometimes interests of biodiversity conservation in general and conservation of bats in particular step back under the burden of economic problems. It should be noted that the EU Habitats and Species Directive envisages an enforcement mechanism to have the parties comply with their obligations for legal protection of natural areas, up to sanctions imposed by the European Court. The enforcement mechanism for legal obligations following from other conventions signed by countries falls under the jurisdiction of international law that has limited possibilities for sanctioning.

Table 2. International Treaties Signed by Project Member States

Conventions \ Countries	Armenia	Azerbaijan	Georgia	Russia
CBD	✓	✓	✓	✓
Bonn Convention (CMS)	✓		✓	
Bern Convention		✓		
EUROBATS			✓	
Ramsar Convention	✓	✓	✓	✓

EUROBATS

EUROBATS (The Agreement on the Conservation of Populations of European Bats) is the most important treaty protecting well-being of the Chiroptera in Europe and in the Caucasus. EUROBATS was developed on the basis of the Bonn Convention and entered into effect in 1994.

The Agreement is based on recognition of the unfavourable conservation status of bats in Europe and non-European Range States and in particular the serious threat to them from habitat degradation, disturbance of roosting sites and pesticides. In compliance with EUROBATS, all the 45 Chiroptera species found in Europe are subject to conservation, as threats to the Chiroptera are similar in European and non-European countries and both for migrating and non-migrating species, as they frequently share the same roosts.

The purpose of the Agreement is to achieve close cooperation between the Parties to ensure and sustain unfavourable conservation status of bats in Europe and non-European Range States and to counteract threats to these species.

As of 2008, the Agreement has been ratified by 31 European countries, including Georgia where the Agreement entered into force in 2002. Armenia, Azerbaijan and Russia have sent their lead specialists in the field of Chiroptera studies to the EUROBATS Advisory Committee.

EUROBATS Secretariat and Advisory Committee through Working Groups collect and process a large volume of data on the status of bat populations in Europe and the status of their conservation in the countries. Annual meetings of the EUROBATS Advisory Committee discuss and approve recommendations drafted by the Working Groups. Most important joint decisions are made at Meeting of Parties once in four years. This Action Plan is a result of one of the recommendations approved by the Parties at their meeting in Ljubljana in 2006 (EUROBATS.MoP5.Record.Annex13) and fully complies with the Parties' obligations.

The IUCN Red List and it Regional Application

The IUCN Red List an internationally recognized instrument for biodiversity conservation and reduction of the number of endangered species. Though the IUCN Red List is advisory only, IUCN's reputation, scientifically justified conclusions of IUCN experts, and long-term application for biodiversity conservation have made the Red List an effective argument in favour of protecting the Red listed species. For almost 30 years before 1994 special categories had been used for Red Data Books and Red Lists that sometimes were rather subjective. In 1989 the IUCN/SSC Steering Committee approached the IUCN Board with a request for developing more objective criteria. In 1994 the IUCN Board adopted a principally new system of Red List categories. The criteria were then several times corrected and updated (1999, 2000), with the latest update made in 2001 (Categories & Criteria, 2001 (version 3.1)).

Since late 1990s, the status of animal and plant populations has been globally evaluated according to the IUCN classifications that identify nine categories of species condition. These categories are described in Appendix I also published as separate brochures every time after the criteria are updated (IUCN 1994, IUCN 1996, IUCN 2001).

The main 'endangered' categories include:

- Critically Endangered, CR
- Endangered, EN
- Vulnerable, VU

Species whose population status can be evaluated as meeting the criteria of one of these three categories (CR, EN and VU) are recognized as needing protection and active action targeted at their conservation. In order to evaluate a population status, one should know its number, range and specific habitats.

While large mammalshave been studied in rather great detail, small mammals representing the orders *Insectivora*, *Rodentia* and *Chiroptera* have not been studied well, and evaluations of their population status for a

long time remained rather groundless. The global status of mammal species` is evaluated with use of the procedure of Global Mammal Assessment (GMA) by the IUCN/SSC Steering Committee. The latest meeting dedicated to GMA (including Chiroptera) was arranged by the IUCN/SSC in November 2005 in Samsun, Turkey. The meeting was attended by representatives of countries from the Caucasus: S. Baloyan from Armenia, candidate of biological science A.K. Bukhnikashvili from Georgia, and candidate of biological science E. Tsytsulina from Russia.

For the first time after the Chiroptera status was re-assessed in the course of the Global Assessment and Action Plan for Microchiroptera Conservation (Hutson et al. 2001), the meeting evaluated the condition of bats populations. Finalization of the GMA is scheduled for 2008.

According to the rules of producing regional and national Red Lists adopted by IUCN in 2003 (IUCN 2003), the list should not include species found at the boundaries of their range and rarely entering the area for which the Red List is generated. Such species whose population status has not been yet assessed by IUCN criteria fall under the category of NE (Not Evaluated). Therefore some rare species, such as *Rhinolophus blasii, Eptesicus nilssonii, Hypsugo savii* are missing in the Red Lists or Red Data Books of the Caucasus countries and are not included as target species in this Action Plan. These species require serious additional studies to identify their population status in the Caucasus. Some poorly studied species cannot be adequately assessed for the risk of extinction based on their population range and/or status information. Such species fall under the category of DD (Data Deficient). Logic demands that such species should be regarded as potentially endangered before sufficient data are collected to make a confident evaluation of their status.

National and Regional Status of Target Chiroptera Species by IUCN Categories

Chiroptera whose populations in the Caucasus fall under the status categories of CR, EN, VU and DD have been recognized as requiring protection and active intervention for their conservation. The species have been identified as target species for this Action Plan, first of all targets to improve the status of their populations in the Caucasus.

The collected data have been used to make an evaluation of the target species status at the national and regional levels. Table 3 shows the status of the Project target species at the global, regional and national levels.

Table 3. National, Regional and Global Status of Caucasus Chiroptera by IUCN categories

№	Name of Species	Armenia	Azerbaijan	Georgia	Russia	Caucasus	IUCN
1.	*Rhinolophus ferrumequinum*	NT	NT	VU	EN	VU	
2.	*Rhinolophus hipposideros*	VU	VU	LC	NT	NT	
3.	*Rhinolophus euryale*	EN	EN	VU	CR	EN	VU A2c
4.	*Rhinolophus mehelyi*	CR	CR	CR	CR	CR	VU A2c
5.	*Myotis blythii*	VU	LC	LC	NT	NT	
6.	*Myotis bechsteinii*	NE	DD	NE	DD	DD	VU A2c
7.	*Myotis dasycneme*				NE	NE	VU A2c
8.	*Myotis emarginatus*	VU	VU	EN	EN	EN	VU A2c
9.	*Myotis schaubi*	DD				DD	EN B1+2c, C2a, D
10.	*Nyctalus lasiopterus*			DD	DD	DD	
11.	*Barbastella barbastellus*	DD	NT	VU	VU	VU	VU A2c
12.	*Barbastella leucomelas*	NT	DD		DD	DD	
13.	*Miniopterus schreibersii*	EN	VU	VU	EN	EN	
14.	*Tadarida teniotis*	DD	DD	NE	DD	DD	
	Total Target Species	**12**	**11**	**11**	**13**	**14**	
	Species protected by the State	**6**	**3**	**4**	**7**		
	Endangered species among the Target Species	**6**	**5**	**6**	**6**	**6**	**8**

Species evaluation at the global level does not necessarily coincide with evaluation of their status at the regional level or evaluation of a population in a separate country (i.e. species status in the national Red List).

Specialists evaluate the status of Caucasian populations[2] of some Chiroptera species as more severe (worse) than that by evaluation made during the Global Mammal Assessment (GMA). We can see that the regional evaluation of species status identifies one species as critical (CR) and three species as endangered (EN). Yet three species from the IUCN Red List (two with VU status and a species with EN status) cannot be evaluated similarly at the regional level because of the lack of data.

Species listed in Table 3 were identified as Project Target Species, and the Action Plan has been designed first of all for improving the status of their populations in the Caucasus.

Practical Actions for Bat Conservation to Date

Currently as well as in the recent past, conservation of the Caucasian bats has had a declarative character. In fact, neither bats nor their habitats have been ever specifically protected. Most of the caves where large colonies occur are located beyond protected areas and are frequently subject to different adverse impacts. At the national level, such caves are protected as tourist attractions, but uncontrolled tourism usually causes harm to bats (Watson et al. 1997). For instance, several large colonies of bats were found in the Novy Afon Cave when the cave was first discovered, yet after regular mass tourist visits were organized to the cave, only individual bats remained there. The same is true about caves Sataplia, Tskhaltubo II (archieves of the Karst Study Laboratory of Vakhushti Bagrationi Geography Institute, contemporary data), caves Vorontsovskaya, Khajokh, Takhira, Tigrovaya, Navalishenskaya, Akhshtyrskaya caves (Gazaryan, contemporary data) as well as Maralinskaya, Sirab caves (Rakhmatulina 2005, contemporary data).

According to local population, after recreational loads decreased in some karst caves, the number of bats started to increase again. The need for tourism regulation is evident in such areas, as well as the need for special protection of bat concentration places in order to restore their initial numbers.

There is only one bat colony place in the Caucasus that is protected by local (municipal) law. It is Cave Canyon, a natural monument status site approved by head of Krasnodar Administration (Russia) on May 24 2001 (degree no. 546 On Declaration of Natural Sites as Monuments of Nature of Territorial Importance). Unfortunately, though the cave is located on the territory of the Chernogorye Sanctuary, there is no real protection available there. There are some karst caves that local population protects without any official regulation (e.g. the Gogolati Cave in Georgia). There have been cases when NGOs installed grates at cave entrances; some priests and building owners take care of bats that populate their buildings. Yet these are rather exceptions to the rule than a positive trend.

In general, these actions by no means correspond to the scale of the problem of bats conservation in the Caucasus Region.

Common Threats for all the Chiroptera

Global Drivers

A driver is defined as: *a factor, force or condition, and a fundamental process in society, that leads to a direct impact on the environment through a change in either the state of biodiversity and/or the human footprint.* Drivers are complex and interrelated.

Factors that more frequently and powerfully than others affect protected species and areas in places of 'human footprint', are called Global Priority Drivers. There are five Global Priority Drivers, including:

- Public sector finance
- Private sector finance
- Private sector standards
- National and international legal and policy frameworks affecting natural resource management
- Consumption choices and attitudes towards nature, including lifestyle and values.

Public and private sector finance implies finances (or lack of finances) allocated for addressing environmental problems or development of economy.

Public sector finance is important because state-controlled resources (budgets, banks and international aid) determine the extent to which the natural resources are used, and to which environmental needs are incorporated in all sectors of economy.

Public sector finance (private banks, insurance capital, investments in industry, etc) determine business activity, development of industries, technology (use of modern technologies), and the extent of areas of economy that have negative environmental impact.

Private sector standards are methods, standards, guidelines, principles and ethics of companies and enterprises in sectors that have an impact on the environment. These are important because industry and

[2] Hereinafter 'Caucasian populations' mean bat populations found in four countries of the Caucasus: Azerbaijan, Armenia, Georgia, and Russia.

agriculture without relevant standards increase the biodiversity loss and adverse human impact on the environment.

National and international legal and policy frameworks and strategies in the area of water, flora and fauna use, those regulating the energy sector, agriculture, forestry, fishery, land use and land ownership, determining directions of economy development and poverty elimination, are all closely interconnected and have a considerable influence on biodiversity conservation success.

Consumption choices and attitudes towards nature determine the extent of resource use. Use of energy and materials from renewable sources and a choice in favour of goods produced using environmental-friendly technologies could significantly decrease adverse human impact on wildlife.

Hhuman population, production and prosperity growth that leads to increased consumption worldwide strengthens the above and many other drivers. Processes leading to global biodiversity loss are fully apparent in the Caucasus as well. These affect all animal species, including bats. This impact is reflected in the disappearance of known bat roosts and in decline of numbers in colonies. Global drivers of biodiversity loss are manifested in concrete factors affecting certain species. The following factors have been identified (Hutson et al., 2001) as this way or another having an impact on bats in the Caucasus:

- Population declines
- Increased human impact
- Habitat destruction
- Roost site disturbance
- Persecution
- Lack of information
- Introduced predators

All these factors are differently manifested in the Caucasus.

Population declines

Reduction in bat number in colonies and disappearance of colonies from long-populated roosts can be observed in many countries of the region. In principle, the reduction may be due to two reasons: intrapopulation number-regulating processes or impact of unfavourable environment. In many cases there is a connection between the colony reduction and changes in the roost or habitat. Some examples are given in the brief essays for separate species in Part IV. No reduction in the population size caused by intrapopulation processes has been ever recorded in the Caucasus.

Increased human impact

Increasing human impact on bats is manifested, inter alia, in destruction and deterioration of habitats, increasing disturbance in roosts and more frequent cases of direct bat chasing.

Habitat destruction

The main threat of habitat destruction has two key components:

- Destruction of roosts
- Destruction and/or deterioration of feeding areas.

Roost destruction may be due to the following factors:

- Use of new materials and structures to construct buildings, which decreases the number of shelters used by some species for roosting
- Reconstruction and re-commissioning of many cultic structures and historical monuments that prevent access to them for bats;
- Felling of old hollow trees in populated areas and their vicinity;
- Increasing number of tourists visiting caves, for which the caves are ‘equipped’; and illumination and microclimate inside change.
- Destruction or anthropogenic degradation (thinning) of forests on the ground surface above caves (thinning) causing changes of hydrological regime and subsequent microclimate change in the caves;
- River regulation (by dams and channels) and increased open-cast and underground mining that lead to microclimate change within and limit access to, caves.

Destruction and/or deterioration of feeding areas may result from the following:

- Economic activities on new areas;
- Lack of pollution control, including air emissions and discharge of wastewater to natural water reservoirs;
- Inappropriate use of pesticides (mainly insecticides) and chemical fertilizers in agriculture;

- Destruction of bat forage species due to two aspects of forest felling: cutting of trees populated by insects on large areas, and floating of felled trees through mountain streams that destroys small water reservoirs where the insects reproduce;
- Loss of water invertebrates caused by poison and electricity used for fish poaching.

Roost site disturbance

- The number of cave visitors is increasing, with no regard given to the need for protecting bat colonies there. Caves are 'equipped' for the visitors by changing entrances and installing artificial lights. There have been cases when restaurants were opened at entrances to caves colonized by bats;
- Places with old hollow trees in populated areas and parks are frequented by people, and cafes or other attractions are opened there.
- A growing number of people visit cultural and religious buildings. Even if the reconstructed and re-opened religious and historical buildings are still colonized by bats, the level of disturbance there is much higher than prior to the reconstruction and in many cases the colonies gradually disappear.

Persecution

The population does not directly chase bats in the Caucasus, and the attitude to bats is mainly neutral. People rarely kill bats and these rare cases do not seriously influence the decline in the number of Caucasian bats. In the same time, destruction of event one colony of a rare species could lead to serious consequences. Vandalism and superstitions sometimes lead to the death of many bats. There are more frequent 'conflicts of interests' between bats and men when reconstructing buildings or in cases when bat colonies roost in 'inappropriate' places, e.g. churches. In such cases the colony is sometimes destroyed.

Lack of information

Lack of information among decision-makers in areas of economy and environmental protection is a danger far more serious for bats than lack of awareness in broad public. For quite a long the focus has been on large mammals and birds, while the status of bats as well as other small mammals is gradually deteriorating. There is no mechanism in place for raising awareness about protected species among decision-makers.

Many aspects of the Chiroptera biology remain unknown; there are particular gaps in information about regional populations of rare and threatened species. Analysis of gaps in the local bat knowledge has shown the need for systematic studies of the regional Chiroptera fauna, as well as biology and ecology of separate species. Chapter 'Recommendations' lists the first priority objectives for researchers.

Introduced predators

There are no introduced predators in the Caucasus that could have a negative impact on bat populations. The only possible species is common racoon (*Procyon lotor*) that can catch a bat roosting in a tree hollow. In general, this threat has low priority in the Caucasus.

Indirectly, invasive insect species may have serious negative impact. National authorities try to control outbreaks in the number of such unwelcome guests by using all strong pesticides available. Pesticides destroy forage supplies for local birds and bats and may even poison the bats. Unfortunately, no evidence was found to confirm connection between bat deaths and the campaign against the fall webworm (*Hyphantria cunea*) in Western Georgia and Russia, or against the potato (Colorado) beetle (*Leptinotarsa decemlineata*) in Armenia and Georgia; yet the connection cannot be ruled out.

Part II. Action Plan as a Bat Protection Strengthening Tool

Bat vulnerability due to their specific biology as well as the above-listed threats to the bat status in the Caucasus requires actions for their protection. The actions should be planned, and control over their implementation should be provided. Standard practice of managing such actions requires development of an Action Plan. Both global action plans (Hutson, A. et al., 2001;) as well as species-specific action plans for a particular country (E.G., UK Biodiversity Group Tranche 2, 1998) are usually used for this purpose. In the Caucasus, Action Plans have been recently developed and implemented for a group of species (*Capra sp.*) in a particular country (Kopaliani N. et al., 2006) and for a particular species (*Aquila heliaca*) in the region consisting of several countries (Horváth, M. et al., 2006). Due to the problem specifics, it was decided to develop an Action Plan for conserving a group of species within the region covering four countries, and then use it as a basis for developing National Action Plans in each country. The Regional Action Plan has been developed following the Logical Framework (Log Frame) approach (Breitenmoser U. et al., 2007), as a matrix of objectives, purposes and actions (see more details in Annex 3). Long-term *Vision* and *Goal* of the Action Plan identify a reference point in future. Problem analysis has revealed potential obstacles in achieving the goal and thus enabled identification of *Objectives* that need to be fulfilled in order to overcome the obstacles and achieve the *Goal*. The *Objectives* have been broken down into more specific *Purposes* and *Actions*.

The Action Plan should be used as guidelines for the Caucasian Chiroptera conservation region-wide. Therefore *Objectives* and *Purposes* listed in the Regional Action Plan refer to issues to be addressed at the regional level and/or requiring international cooperation. In most cases, though, *Actions* should be implemented in one country and should be planned in detail in the National Action Plans, so the *Purposes* and *Actions* do not indicate the time of implementation and the action implementing agency. The *Action* Priority Matrix by country would assist in detailing the *Actions* listed in the Regional Action Plan when developing National Action Plans. In general, the Regional Action Plan specifies 6 *Objectives*, 16 *Purposes* and 58 *Actions*.

Target Species of the Action Plan

Initially the Action Plan was intended to address seven bat species from the IUCN Red List. But after the application was submitted another globally conserved species, *Myotis dasycneme* (Gazaryan 2004), was discovered in the Caucasus that was not on the initial list of target species yet met the CEPF requirements to target species. Species protected by national laws (i.e. those included in the Red List of Georgia, Red Data Books of Armenia, Azerbaijan, and Russia) was also taken into consideration. Thus, it was decided to include all bats whose population status in the Caucasus countries could be classified as falling under the IUCN categories (CR, EN, and VU). So the nationally protected species were also included in the Action Plan. Therefore, this Acton Plan has been developed to address conservation needs of 14 nationally protected species in the region. Table 3 shows status of the species at the global, regional, and national levels.

The Action Plan is intended, first of all, to improve the status of the Caucasian bat populations. Since these populations are most vulnerable and cover all possible life-forms of bats in the Caucasus, one may hope that improving the status of these populations would stabilize populations of all other Caucasian bat species, and the goal of the Action Plan would be achieved.

Threats identified by experts in the Caucasus

Prior to developing the Action Plan, key factors limiting bat wellbeing and as key threats to their existence in the region were identified.

The limiting factors include:

1. Destruction and deterioration of habitats
2. Lack of forage
3. Disturbance factors
4. Environmental pollution - food and water poisoning (via the food chain)
5. Impact of the climate change and natural disasters
6. Persecution

All threats have been classified according to these limiting factors. The only factor not addressed separately in the Action Plan is the 'Persecution'. The authors believe that appropriate bat conservation management by the state as well as development of mechanisms for bat and man coexistence would minimize the weight of this factor, insignificant as it is today. All other limiting factors have been reflected in the analysis of threats and have been broken down as follows:

Destruction and Deterioration of Habitats

In roosts

- Roosts destruction by humans (including felling of hollow trees)

- Roost deterioration because of human change of environment
- Design change and reconstruction of buildings (leaving no place for bats)
- Fires

  In feeding areas and flyways
- Destruction of forest shelter belts
- Use of watercourse shores for industrial zones and recreation
- Construction of line structures (transmission lines, roads, etc)

Lack of Forage

- Human change of vegetative cover structure
- Expansion of agricultural lands at the expense of natural landscapes – increasing areas of fields and rangeland
- Pesticide use in agriculture and forestry
- Water pollution leading to insect loss (agricultural runoff, industrial and domestic wastewater)
- Changed reservoir productivity because of changes in hydrological regime (water engineering structures)
- Impact of climate change and human activity on the status (number) of invertebrate species wintering in roosts together with bats

Disturbance factors

In roosts:

- Increased number of cave visitors
- Increased number of visitors and greater use of cultic facilities and old buildings
- Long-term impact of noise and vibration from building and industry

Outside roosts:

- Lights at roost entrances and in feeding areas
- Noise and vibration – industrial noise close to roosts and feeding areas, mainly related to mining, transport or construction activities.

Pollution of environment – bat poisoning by food and water (via the food chain)

- Pesticide runoff from fields into fresh water bodies leading to forage loss
- Pesticide use in agriculture and forestry (and accumulating in insects)
- Water and air pollution by toxic wastes and emissions from industries and transport

Climate change

- Climate change decreasing species performance (by increasing mortality and decreasing birthrates)
- Microclimate change in roosts making them unfit for roosting
- Vegetation and reservoir changes deteriorating forage resources
- Climate change leading to roost loss.

Threat priority tables have been produced for each country for ranking of threats to the Chiroptera species by assessing a threat in the country and the impact it has on bat populations in this or that country of the region. The highest priority (most critical) threats are marked with 1, the least critical – with 3. Zero (0) means that national experts assessed this type of threats as missing in the country or having no serious impact on the Chiroptera. Regional ranking is based on arithmetical means of the national rankings. The highest priority regional threats are identified as 1, in case the arithmetical mean is in the range of 1,67 to 2,5. For arithmetical means higher than 2,5, the regional threat ranking is 3 as being the lowest priority threat. This ranking system has been used in this Plan for threats by country and by species as shown in Tables 4 and 5.

In order to assess threats for separate Chiroptera species, each country produced a table of threats by species discussed in this Action Plan. They assessed the potential impact the threat could have on a species within this or that country of the region. The Tables are included in Annex 2. Table 5 below shows threat ranking for each species in the region. The rightmost column shows threat rankings for target species altogether in the Caucasus, except for *Myotis dasycneme*: since this newly discovered species is very rare, threats for its populations have never been assessed.

Table 4 Threats Ranking by Country

1 – Most critical threats **2 – Critical threats** **3 – Less critical threats** **0 – No impact on the species**	**Armenia**	**Azerbaijan**	**Georgia**	**Russia**	***Caucasus***
Destruction and Deterioration of Habitats					
Roost destruction by man (including felling of hollow trees)	1	1	1	1	**1**
Roost deterioration because of human change of environment	1	1	1	1	**1**
Design change and reconstruction of buildings (leaving no place for bats)	2	2	3	1	**2**
Fires	3	2	3	3	**3**
In feeding areas and flyways					
Destruction of forest belts	2	2	3	0	**3**
Use of watercourse shores for industrial zones and recreation	3	1	3	0	**3**
Construction of line structures (transmission lines, roads, etc)	0	2	0	0	**3**
Lack of Forage					
Human change of vegetative cover structure	3	2	3	0	**3**
Expansion of agricultural lands at the expense of natural landscapes – increasing areas of fields and rangeland	3	2	3	0	**3**
Pesticide use in agriculture and forestry	0	1	1	0	**3**
Water pollution leading to insect loss (agricultural runoff, industrial and domestic wastewater, sawdust)	0	2	2	0	**3**
Changed reservoir productivity because of changes in hydrological regime	0	2	2	0	**3**
Impact of climate change and human activity on the status (number) of invertebrate species wintering in roosts (caves, tree hollows, attics, etc) together with bats	3	2	3	0	**3**
Disturbance factors: *In roosts*					
Increased number of cave visitors	1	2	2	1	**1**
Increased number of visitors and greater use of cultic facilities and old buildings	1	1	2	2	**1**
Long-term impact of noise and vibration from building and industry	3	3	1	0	**3**
Outside roosts:					
Lights at roost entrances and in feeding areas	2	0	3	2	**3**
Noise and vibration	2	3	2	0	**3**
Environmental Pollution – bat poisoning by food and water					
Pesticide runoff from fields into fresh water bodies leading to forage loss	3	1	1	0	**2**
Pesticide use in agriculture and forestry (and accumulating in insects)	3	1	1	0	**2**
Water and air pollution by toxic wastes and emissions from industries and transport	2	1	2	0	**2**
Climate change					
Climate change decreasing species performance (by increasing mortality and decreasing birthrates)	2	1	2	1	**1**
Microclimate change in roosts making them unfit for roosting	1	2	3	1	**2**
Vegetation and reservoir changes deteriorating forage resources	0	1	2	0	**3**
Climate change leading to roost loss	2	2	1	3	**2**

Table 5 Threats Ranking by Target Species

1 – Most critical threats **2 – Critical threats** **3 – Less critical threats** **0 – No impact on the species**	*Rh. ferrumequinum*	*Rh. hipposideros*	*Rhinolophus euryale*	*Rhinolophus mehelyi*	*Myotis blythii*	*Myotis bechsteinii*	*Myotis emarginatus*	*Myotis schaubi*	*Nyctalus lasiopterus*	*B. barbastellus*	*B. leucomelas*	*Miniopterus schreibersii*	*Tadarida teniotis*	***Threat ranking for all species***
Number of countries where the species is assessed	4	4	3	4	4	3	4	1	2	4	3	4	3	
Destruction and Deterioration of Habitats														
Roost destruction by man (including felling of hollow trees)	1	1	1	2	1	1	1	1	1	1	2	1	3	**1**
Roost deterioration because of human change of environment	1	1	1	1	2	1	1	1	1	1	2	1	2	**1**
Design change and reconstruction of buildings (leaving no place for bats)	2	2	2	2	2	2	2	0	3	2	1	3	2	**2**
Fires	2	2	2	2	3	2	2	2	1	1	2	2	1	**2**
In feeding areas and flyways														
Destruction of forest belts	2	2	2	2	3	2	2	2	2	2	3	2	1	**2**
Use of watercourse shores for industrial zones and recreation	2	2	3	2	3	2	2	2	3	2	3	3	2	**2**
Construction of line structures (transmission lines, roads, etc)	2	2	2	3	2	2	2	2	3	1	1	2	2	**2**
Lack of Forage														
Human change of vegetative cover structure	2	2	2	2	2	1	2	2	3	1	2	2	2	**2**
Expansion of agricultural lands at the expense of natural landscapes – increasing areas of fields and rangeland	2	2	2	2	2	1	2	2	2	1	2	2	2	**2**
Pesticide use in agriculture and forestry	2	2	2	2	2	2	2	2	2	1	2	2	2	**2**
Water pollution leading to insect loss (agricultural runoff, industrial and domestic wastewater, sawdust)	2	2	2	2	2	2	2	2	2	2	2	2	2	**2**
Changed reservoir productivity because of changes in hydrological regime	2	2	2	2	2	2	2	2	2	2	3	2	2	**2**
Impact of climate change and human activity on the status (number) of invertebrate species wintering in roosts (caves, tree hollows, attics, etc) together with bats	2	2	2	2	2	2	2	0	2	1	2	2	2	**2**
Disturbance factors: *In roosts*														
Increased number of cave visitors	1	1	1	1	1	1	1	2	3	2	2	1	1	**1**
Increased number of visitors and greater use of cultic facilities and old buildings	2	2	2	2	1	2	2	2	3	2	2	2	2	**2**
Long-term impact of noise and vibration from building and industry	2	2	2	2	2	3	2	2	2	2	3	2	2	**2**
Outside roosts: Lights	2	2	2	2	1	2	2	2	3	2	3	2	2	**2**
Noise and vibration	1	1	1	1	2	2	2	2	3	2	2	2	2	**2**
Environmental Pollution – bat poisoning by food and water														
Pesticide flushing from fields into reservoirs leading to forage loss	2	2	2	2	2	2	2	2	2	2	2	2	2	**2**
Pesticide use in agriculture and forestry (and accumulating in insects)	2	2	2	2	2	2	2	2	2	2	2	2	1	**2**
Water and air pollution by toxic wastes and emissions from industries and transport	3	3	3	3	3	3	3	2	3	3	3	3	2	**3**
Climate change														

Climate change decreasing species performance (by increasing mortality and decreasing birthrates)	1	1	1	1	1	1	1	2	1	1	1	1	1	**1**
Microclimate change in roosts making them unfit for roosting	1	1	1	1	1	1	1	1	1	1	1	1	1	**1**
Vegetation and reservoir changes deteriorating forage resources	2	2	2	2	1	1	1	1	2	1	2	2	1	**2**
Climate change leading to roost loss	2	2	2	2	2	2	2	3	2	2	2	2	1	**2**

As seen from Table 4 and 5, the treats have different priorities for different countries and species. The following threats have been identified as most critical (priority 1) for all the species in all the countries of the region: **roost destruction by man**, **increased number of cave visitors, deterioration of habitats because of man-made environmental changes** and **climate change decreasing species performance**. **Increased number of visitors and greater use of cultic facilities and old buildings** has been identified as a critical threat in two countries, while in the other two it was first generally evaluated as priority 1, but with regard to the target species of the Action Plan the ranking dropped to priority 2. The threat of **Water and air pollution by toxic wastes and emissions from industries and transport** was also re-prioritised from priority 2 to priority 3. It might be due to the fact that there are no direct data confirming the impact of polluted air and water on the forage of the target bat species in the Caucasus. Overall, most of the threats have a higher priority by target species than by countries. Fourteen threats of priority 3 according to the by-country evaluation turned out to be priority 2 by species, and a by-country priority-2 threat (**microclimate change in roosts**) was evaluated as priority 3 by species. It well illustrates the fact that the species chosen as target species for this Action Plan are very vulnerable and need immediate conservation actions. It is especially important to stop destruction of roosts and habitats by man, to protect colonies from disturbance and mitigate adverse impact of anthropogenic and natural factors on areas populated by bats.

The study included a Gap Analysis and Enabling Conditions Assessment. To avoid duplication of the data, we included results of the Gap Analysis in brief essays on target species (see part IV), as the extent of the species study data is different and most of the gaps are associated with some details of biology and ecology.

The Enabling Conditions Assessment has shown that regional enabling conditions include fauna protecting legislation, expert groups in all the countries of the region, some international 'pressure' for compliance with the signed agreements, foreign colleagues' interest to our fauna, and rather neutral or indifferent attitude of the local population to bats. These factors have different impact on all the species and are present in all the countries, so that there was no use evaluating their priorities.

The above information has been used as a basis for formulating a *Vision* and developing the Action Plan.

The Action Plan

Vision and Objectives of the Regional Action Plan for bat conservation in the Caucasus

'Stable populations of all the Chiroptera species in the Caucasus Ecoregion prospering in their natural biotopes (habitats) or in man-made habitats in the entire Caucasus Ecoregion in harmony with man' is the long-term **vision** of the Chiroptera conservation in the Caucasus Ecoregion for a term of 20-25 years.

The vision will become a reality after reaching the **Action Plan Goal** (about 10-15 years after starting to implement the Plan in the countries of the region). The **Goal** is defined as: Establishing mechanisms for sustainable coexistence of the Chiroptera and man in the entire Caucasus Region and preventing decline in the population's numbers and range of distribution of all bat species.

The Goal will be achieved through implementing medium-term (10-15 years) Objectives. There are six such Objectives:

1. Bat habitats are protected from destruction
2. Stable food supply available for bats
3. Key-habitats for bat and roosts are protected from disturbance
4. No significant impact of pollutants on bat populations
5. No significant impact of the climate change on bat populations
6. No persecution of bats and no destruction of their roosts by the population

The work to achieve each of these objectives can be divided into 16 interconnected purposes.

Purposes

1.1 Monitoring of key habitats and colonies
1.2 Key habitats and roosts in each country having the status of Protected Areas
1.3 Forests and parks managed in a manner to preserve the structure of bat habitats

1.4 Bat roosts conserved outside PAs

2.1 Food resources of vulnerable species and factors influencing their number identified
2.2 Food supplies not destroyed by artificial change of vegetation
2.3 Areas of forage invertebrate concentration protected from insecticides and pollution

3.1 Critical underground roost outside PAs protected by special structures and controlled by state authorities
3.2 All visitors of structures and underground roosts with bat colonies regulated
3.3 Disturbance of economic activity outside roosts minimized

4.1 Influence of pesticides and toxic waste on bat populations limited
4.2 Feeding areas protected from insecticides and pollution

5.1 Most vulnerable species and key habitats to be affected by global clime change identified
5.2 Measures taken to mitigate climate change impact on bat populations

6.1 Local population participating in the protection of bats and their roosts
6.2 Bats protected by law

The purposes can be achieved by certain actions, about 3-5 actions per purpose.

Actions
1.1.1 Make an inventory of bat roosts and colonies
1.1.2 Have Key-habitats for bat sand colonies registered by the State
1.1.3 Develop and publish guidelines for bat monitoring
1.1.4 Develop and provide with resources networks of monitoring specialists in each country
1.2.1 Change existing PA management plans to meet the needs for bat protection
1.2.2 Incorporate special actions for bat protection in new PA management plans
1.2.3 Initiate creation of a PA for identified key habitats
1.2.4 Develop guidelines for bat conservation for PA managers
1.3.1 Develop guidelines for bat conservation in forests and parks
1.3.2 Incorporate recommendations for bat conservation in national forest use plans and rules
1.3.3 Involve Chiroptera experts in planning economic activities in forests and parks
1.4.1 Inform local authorities and historical/cultural heritage site management about the presence of bat colonies within their area and/or site
1.4.2 Give a special status to buildings colonized by bats
1.4.3 Prior to destruction or reconstruction of a building colonized by bats, prepare artificial alternative bat shelters meeting the needs of the species in the colony
1.4.4 Develop guidelines for bat colonies protection in buildings
1.4.5 Inform relevant authorities about the presence of underground bat roosts in areas they are responsible for
1.4.6 Give a special status to underground bat roosts
1.4.7 Protect entrances of (i.e. mechanically limit access to) underground bat roosts
1.4.8 Develop guidelines for bat colonies protection in underground roosts
1.4.9 Specially label trees colonized by bats
1.4.10 Compensate for felling trees colonized by bats, if necessary, by providing a tree house of a relevant design

2.1.1 Study the diet of vulnerable bat species
2.1.2 Identify factors influencing the number of insects that are the main food for bats
2.2.1 Develop guidelines on Sustainable Use of Agricultural Lands to conserve natural vegetative cover around plantations
2.2.2 Disseminate the sustainable land use guidelines in the area of agriculture
2.2.3 Consider the guidelines for agricultural land use planning
2.2.4 Hold consultationswith expert-zoologists for agricultural land use planning
2.3.1 Support implementation of international conventions limiting pesticide use in our countries
2.3.2 Recommend establishing treatment facilities in populated areas and strengthen control over discharge of industrial and domestic waste

3.1.1 Identify roost most susceptible to disturbance, and have them registered by state authorities
3.1.2 Where necessary, establish specially designed protection structures
3.2.1 Develop management plans (regulations) for roost use

3.2.2 Inform owners and users about the need for special agreements and consultations for conducting any kind of works in bat roosts
3.2.3 Develop methods not interfering with bat presence and human activity in cultic structures
3.3.1 Conduct Bat Impact Evaluation as part of economic activity planning
3.3.2 Regulate building terms to minimize impact on bats
3.3.3 When possible, use noiseless and vibration-free technologies
3.3.4 Never install artificial lights at roost entrances, feeding areas and flyways

4.1.1 Identify potential impacts of pollution on bat populations
4.1.2 Identify least harmful pesticides, optimum terms and conditions of their use
4.1.3 Develop guidelines to minimize pollution impact on bat populations
4.1.4 Make the guidelines known to the public and authorities
4.1.5 Introduce state and public monitoring of environmental pollution
4.2.1 Support implementation of international conventions limiting pesticide use in our countries
4.2.2 Recommend establishing treatment facilities in populated areas and Strengthen control over discharge of industrial and domestic waste

5.1.1 Analyse potential consequences of the global climate change on Caucasian bats
5.2.1 Develop measures to mitigate the climate change consequences
5.2.2 Protect Bat roosts from the potential climate change consequences

6.1.1 Identify target population groups having an impact on bats (speleologists, rangers, teachers, tourists, government officials)
6.1.2 Develop training materials and train specialists for working with target groups
6.1.3 Conduct educational campaigns and trainings for target groups
6.1.4 Set up a networks of volunteers in key habitats
6.1.5 Advocate in media for conscientious attitude to bats, and condemn cases of vandalism
6.2.1 Analyse and identify gaps in the national legislations
6.2.2 Initiate relevant draft laws and amendments to the national legislations
6.2.3 Adopt procedures for regulating economic activities of owners and users of buildings/sites ocupied by bats
6.2.4 Continue the process of affiliating to key conservation conventions and agreements
6.2.5 Promote implementation of national commitments under signed international conventions

The actions envisaged by the Plan may have different priority depending on the species and country as well as different possibilities for implementation. All the actions were evaluated in view of the needs and possibilities for their implementation by country (Annex 5, Table 6) and in view of their efficiency for the species conservation (Annex 5, Table 7). The most urgent actions in countries and respectively, most efficient for conservation of certain species are marked by 1, and the least urgent by 3. Zero (0) in Table 7 means that the actions will not be efficient for the actual species in view of the modern knowledge of its biology.

The tables present assessment of the actions for most of the countries (Table 6) and most of the species (Table 7). This assessment coincides with the ranking based on the arithmetical means by country. The highest-priority ranking is 1 in cases of the arithmetical means being in the range of 0,5 to 1,5. The medium ranking (2) is given when the arithmetical mean is within 1,5 and 2,5. For the arithmetical mean higher than 2,5, the ranking is 3, and the action is the lowest priority. The actions implementation timing is as planned as follows:

- priority 1 actions (most urgent) will be implemented within the first five years,
- priority 2 actions will be implemented within 10 years after starting realization of the Action plan,
- the other actions are planned for the period of 15-20 years.

Of course, some actions with different priorities can be implemented in parallel, if funds are available for their implementation.

Action Plan Matrix

Objectives	Purposes	Actions
1. Bat habitats protection from destruction	1.1 Monitoring of key habitats and colonies	1.1.1 Make an inventory of bat roosts and colonies
		1.1.2 Have Kay habitats for bats and colonies registered by the State
		1.1.3 Develop and publish guidelines for bat monitoring
		1.1.4 Develop and provide with resources networks of monitoring specialists in each country
	1.2 Key habitats and roosts in each country having the status of Protected Areas	1.2.1 Change existing PA management plans to meet the needs for bat protection
		1.2.2 Incorporate special actions for bat protection in new PA management plans
		1.2.3 Initiate creation of a PA for identified key habitats
		1.2.4 Develop guidelines for bat conservation for PA managers
	1.3 Forests and parks managed in a manner to preserve the structure of bat habitats	1.3.1 Develop guidelines for bat conservation in forests and parks
		1.3.2 Incorporate recommendations for bat conservation in national forest use plans and rules
		1.3.3 Involve Chiroptera experts in planning economic activities in forests and parks
	1.4 Bat roosts conserved outside PAs	1.4.1 Inform local authorities and historical/cultural heritage site management about the presence of bat colonies within their area and/or site
		1.4.2 Give a special status to buildings colonized by bats
		1.4.3 Prior to destruction or reconstruction of a buildings colonized by bats, prepare artificial alternative bat shelters meeting the needs of the species in the colony
		1.4.4 Develop guidelines for bat colonies protection in buildings
		1.4.5 Inform relevant authorities about the presence of underground bat roosts in areas they are responsible for
		1.4.6 Give a special status to underground bat roosts
		1.4.7 Protect entrances of (i.e. mechanically limit access to) underground bat roosts
		1.4.8 Develop guidelines for bat colonies protection in underground roosts
		1.4.9 Specially label trees colonized by bats
		1.4.10 Compensate for felling trees colonized by bats, if necessary, by providing a tree house of a relevant design
2. Stable food supply available for bats	2.1 Food resources of vulnerable species and factors influencing their number identified	2.1.1 Study the diet of vulnerable bat species
		2.1.2 Identify factors influencing the number of insects that are the main food for bats
	2.2 Food supplies not destroyed by artificial change of	2.2.1 Develop guidelines on Sustainable Use of Agricultural Lands to

Objectives	Purposes	Actions
	vegetation	conserve natural vegetative cover around plantations
		2.2.2 Disseminate the sustainable land use guidelines in the area of agriculture
		2.2.3 Consider the guidelines for agricultural land use planning
		2.2.4 Hold consultationswith expert-zoologists for agricultural land use planning
	2.3 Areas of forage invertebrate concentration protected from insecticides and pollution	2.3.1 Support implementation of international conventions limiting pesticide use in our countries
		2.3.2 Recommend establishing treatment facilities in populated areas and strengthen control over discharge of industrial and domestic waste
3. Kay habitats for bats and roosts protection from disturbance	3.1 Critical underground roost outside PAs protected by special structures and controlled by state authorities	3.1.1 Identify roost most susceptible to disturbance, and have them registered by state authorities
		3.1.2 Where necessary, establish specially designed protection structures
	3.2 All visitors of structures and underground roosts with bat colonies regulated	3.2.1 Develop management plans (regulations) for roost use
		3.2.2 Inform owners and users about the need for special agreements and consultations for conducting any kind of works in bat roosts
		3.2.3 Develop methods not interfering with bat presence and human activity in cultic structures
	3.3 Disturbance of economic activity outside roosts minimized	3.3.1 Conduct Bat Impact Evaluation as part of economic activity planning
		3.3.2 Regulate building terms to minimize impact on bats
		3.3.3 When possible, use noiseless and vibration-free technologies
		3.3.4 Never install artificial lights at roost entrances, feeding areas and flyways
4. No significant impact of pollutants on bat populations	4.1 Influence of pesticides and toxic waste on bat populations limited	4.1.1 Identify potential impacts of pollution on bat populations
		4.1.2 Identify least harmful pesticides, optimum terms and conditions of their use
		4.1.3 Develop guidelines to minimize pollution impact on bat populations
		4.1.4 Make the guidelines known to the public and authorities
		4.1.5 Introduce state and public monitoring of environmental pollution
	4.2 Feeding areas protected from insecticides and pollution	4.2.1 Support implementation of international conventions limiting pesticide use in our countries
		4.2.2 Recommend establishing treatment facilities in populated areas and Strengthen control over discharge of industrial and domestic waste
5. No significant impact of the climate change on bat populations	5.1 Most vulnerable species and key habitats to be affected by global clime change identified	5.1.1 Analyse potential consequences of the global climate change on Caucasian bats
	5.2 Measures taken to mitigate climate change impact on bat populations	5.2.1 Develop measures to mitigate the climate change consequences
		5.2.2 Protect Bat roosts from the potential climate change consequences
6. No persecution of bats and no destruction of their roosts by	6.1 Local population participating in the protection of bats and their roosts	6.1.1 Identify target population groups having an impact on bats (speleologists, rangers, teachers, tourists, government officials)

Objectives	Purposes	Actions
population		6.1.2 Develop training materials and train specialists for working with target groups
		6.1.3 Conduct educational campaigns and trainings for target groups
		6.1.4 Set up a networks of volunteers in key habitats
		6.1.5 Advocate in media for conscientious attitude to bats, and condemn cases of vandalism
	6.2 Bats protected by law	6.2.1 Analyse and identify gaps in the national legislations
		6.2.2 Initiate relevant draft laws and amendments to the national legislations
		6.2.3 Adopt procedures for regulating economic activities of owners and users of buildings/sites ocupied by bats
		6.2.4 Continue the process of affiliating to key conservation conventions and agreements
		6.2.5 Promote implementation of national commitments under signed international conventions

Table 6 'Assessment of Needs and Possibilities for Implementing Actions by Country' lists 20 actions of priority 1, 23 actions of priority 2 and 15 actions with priority 3. Table 7 'Assessment of the Action Efficiency for Target Species Conservation' identifies 31 actions as priority 1 (most urgent), 13 actions as priority 2 and 14 actions as priority 3. It shows the difference between the need for urgent actions to conserve target species (31 action of priority 1) and possibilities available in the countries for their implementation (23 actions of priority 1). It should be noted that almost all the actions have been assessed as needed and relevant for most of the target species. Thus, 37 out of 58 actions have been identified as relevant for ten species and more. These include 13 actions of priority 1, 7 actions of priority 2 and 11 actions of priority 3. Only 9 actions address less than half of the target species (7 and less). Two actions address one species each because of their specifics.

Most of the urgent actions in countries are needed to achieve the following Objectives: 1. Bat habitats are protected from destruction; 3. Key-habitats for bat and roosts are protected from disturbance; 6. No chase of bats and no destruction of their roosts by the population. In total, these objectives require implementation of 17 urgent actions (priority 1), 17 actions of priority 2 and 6 actions of priority 3 (see Table 6, Annex 5). Of course, main efforts should be focused on achieving these three objectives first, and only after certain success is achieved actions should start to address the other three objectives. Though, respective sections of the Action Plan Matrix referring to these objectives include some urgent actions. Thus, thus Action Plan should be implemented in six major directions.

Part III. Recommendations for Target Species Conservation

Common Recommendations for all Species

Common recommendations for all the target species are based on the objectives and purposes of this Action Plan. For easier understanding, all the recommended actions, both included in the Action Plan and in brief essays by Species are grouped into several big blocks below. A more detailed breakdown of the actions is given in the Action Plan Matrix and brief essays.

1. Safely protect bat habitats and roosts underground, in buildings and forests by

- Having all bat colonies registered by the state;
- Creating protected areas (PAs) in areas of key-habitats for bats for their protection, and strengthening bat protection in the PAs;
- Adopting a procedure regulating economic activities of owners and users of buildings colonized by bats,
- Reflecting the need for protecting bat colonies in the legislation.

This recommendation should be implemented through Actions 1.1.1 - 1.1.4, 1.2.1 – 1.2.4, 1.3.1 - 1.3.3, 1.4.1, 1.4.2, 1.4.4 - 1.4.7, 1.4.9, 3.2.1, 3.2.2, 6.2.1 - 6.2.5 (ref. numbering in the Action Plan).

2. Minimize bat disturbance in roosts as much as possible by

- Taking action to harmonize coexistence of bats and men,
- Minimizing the damage to bat populations by any activity in roosts or their close vicinity;

This recommendation should be implemented through Actions 1.1.1, 1.1.2, 1.4.1, 1.4.2, 1.4.4, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1 - 3.3.4.

3. Prevent bat loss because of food supplies destructed by men by:

- Studying the diet of vulnerable Chiroptera species,
- Advocating for the use of bat-friendly technologies in agriculture and forestry,
- Minimizing bat habitats pollution with pesticides and industrial wastes.

This recommendation should be implemented through Actions 2.1.1, 2.2.1 - 2.2.4, 2.3.1, 2.3.2, 4.1.1 - 4.1.5, 4.2.1, 4.2.2.

4. Prevent direct or indirect destruction of bats by man by:

- Involving population in bat conservation and carrying out awareness raising campaigns in communities that may have an impact on bats;
- Improving national legislation for better bat conservation, and insure compliance with the country's commitments for bat conservation according to signed international agreements.

This recommendation should be implemented through Actions 3.3.4, 6.1.1 - 6.1.4, 6.2.1, 6.2.2, 6.2.4, 6.2.5.

5. Develop actions for mitigating the impact of global climate change (5.2.1, 5.2.2)

6. Update Red Data Books and Red Lists comply with the IUCN Red Data List. Currently in some countries documents regulating legal protection of animal species do not fully meet international standards.

Specific Recommendations for Target Species

In addition to recommendations for all Caucasus Chiroptera and all target species of this Action Plan. There are some immediate recommendations for conserving separate bat species:

1. Provide for efficient regional coordination of studies and protection of the *Barbastella leucomelas, Nyctalus lasiopterus, Miniopterus schreibersii* and *Tadarida teniotis.*
2. Have EIA incorporated into all projects in habitat areas of the *Myotis blythii* and *Nyctalus lasiopterus.*
3. Create protected areas (PAs) in areas of habitats and/or concentrations of *Myotis bechsteinii* and *Barbastella barbastellus*, with the PA Management Plans including measures for protecting the habitats and sites of the aggregations of these species.
4. Physically protect known roosts of the *Myotis dasycneme* from visitors.
5. Specify the actual status (status of populations, number dynamics and distribution ranges) of the *Rhinolophus euryale, Myotis dasycneme, Myotis emarginatus, Myotis schaubi,* and *Barbastella leucomelas.*
6. Make efforts to find the following species in habitats that meet their requirements: *Myotis dasycneme, Myotis schaubi, Barbastella barbastellus, Barbastella leucomelas, Tadarida teniotis.*

Some species should be included in the National Red Lists or National Red Data Books.

For Armenia, it is recommended to consider the need for including the *Rhinolophus ferrumequinum* in the Red Data Book, and to include the *Rhinolophus hipposideros, Myotis blythii, M. emarginatus, and Barbastella barbastellus.*

For Azerbaijan, it is recommended to consider the need for including the *Rhinolophus ferrumequinum* in the Red Data Book, and to include the *Rhinolophus hipposideros, Rh. mehelyi, Myotis bechsteinii, M. emarginatus, and Barbastella barbastellus, B. leucomelas.*

For Georgia, it is recommended to include the *Rhinolophus ferrumequinum, Myotis emarginatus, and Miniopterus schreibersii* in the National Red Data List.

For Russia, it is recommended to include the *Rhinolophus euryale, Myotis bechsteinii, Barbastella barbastellus,* and *B. leucomelas* in the Red Data Book.

In addition, the *Myotis bechsteinii, Barbastella barbastellus* and *B. leucomelas* are proposed for inclusion in the Red Data Books of federal units of the Russian Federation where these species are found.

In three countries (Armenia, Georgia and Russia) it is proposed to step up the regional status of the red-listed and red-booked Mehely's horseshoe bat *Rhinolophus mehelyi,* from Vulnerable (VU) to Critical (CR) on the regional level.

Scientific research required

Additional studies of the biology and ecology of some bat species is necessary for providing more data to support the need for their conservation in the Caucasus. The following studies are proposed in the first place:

1. Study the diet and factors influencing the number of the forage species of the following bat species: *Myotis blythii, M. bechsteinii, M. schaubi, Nyctalus lasiopterus, Barbastella barbastellus, B. leucomelas, Miniopterus schreibersii, Tadarida teniotis*;
2. Specify the range of distribution of the *Myotis bechsteinii, M. dasycneme, M. schaubi, Nyctalus lasiopterus* in the Caucasus;
3. Study the character of habitat use by the *Myotis schaubi, Barbastella barbastellus, Tadarida teniotis* (including radiotelemetry);
4. Determine reproductive performance of populations of the *Barbastella barbastellus, B. leucomelas, Miniopterus schreibersii* by means of annual monitoring in key habitats;
5. Identify specific reasons for decreasing number of the *Myotis blythii, M. dasycneme, M. schaubi* and factors preventing their spread in the Caucasus;
6. Study the impact of the global climate change on the populations of the *Myotis bechsteinii* and *Nyctalus lasiopterus.*
7. Study the taxonomic status of intraspecific forms of the *Myotis blythii* and *Myotis schaubi* and their range in Armenia;
8. Comprehensively study the biology and status of populations of the *Myotis schaubi*.

Important Areas for Bats Conservation

Important areas for bat conservation are areas with large aggregations of bats, numerouse of wintering or nursery roosts, and rich diversity of species. The rich diversity of species is the main eligibility criteria for key habitat selection as these are areas with sufficient number of roosts, where target species are found. After an analysis of data on bat habitats in the Caucasus and data from field observations, key habitats were identified for each vulnerable bat species, as well as areas of high diversity of species. That permitted justification of the need for conservation and possibilities for monitoring populations of the 14 protected bat species in the key habitats of the Caucasus, in geographically isolated and definite areas (subregions). A subregion can also include several adjacent key areas.

In Armenia, six subregions have been identified: ravines of the rivers Debet, Agstav and Bldanchay in the northeast of the country; Areguni and Sevan ridges of the Lake Sevan basin; caves in the Armavir district; Khosrov Reserve and adjacent mountain slopes; ravine of the Vorotan River and northern and western slopes of the Vayotsdzor and Zangezur ridges; eastern slopes of the Zangezur Ridge, Sunik plateau, Megri Ridge from the town of Kafan to the border with Iran. These subregions include 14 'important bat areas'. Most of the six subregions are representative of Armenian landscapes least affected by anthropogenic transformation. Efficient protection of the 'important bat areas'would ensure conservation of all bat species countrywide.

Four large subregions have been identified in Azerbaijan; these are the Nakhchyvan Autonomous Republic, slopes of the Greater Caucasus Mountains from the Belokany-Zakatala to the Caspian lowland of the Khachmass district; vicinities of the Mingechaur Reservoir; Hirkan National Park and its vicinities within the Lenkoran, Astara and Lerik districts. The area includes 15 'important bat areas'. These four subregions are actually representative of all main landscapes and theriological complexes of the country. Conservation of the entire diversity of bat species in these subregions would ensure their conservation countrywide.

Ten subregions have been identified in Georgia. These are the central and southern parts of the Racha and Lechkhumi Ridges; karst mount Urta; low-mountain forests in the coastal part of Adjara; Borjomi-Kharagauli National Park; the Trialeti Ridge; middle course of the Khrami River; the River Aragvi ravine; Lagodekhi Reserve; western and central part of the Iori plateau; floodplain forests of the Kura, Alazani and Iori rivers. These ten subregions include almost 44 'important bat areas'and are representative of the best-preserved bat habitats in Georgia. It is critically important to conserve the entire diversity of the Chiroptera species in these subregions.

There are six subregions with over 31 'important bat areas'identified in Russia, including the Black Sea coast and foothills of the southern Greater Caucasus; northern slopes of the Greater Caucasus from the Ili River basin to the Belaya River basin; Caucasus Reserve, western part of the Skirda Ridge; ridges of the Skalisty Range between the Bolshaya Laba and Fiagdon river valleys; the Nalchik river valley between vil. Belaya Rechka and the town of Nalchik; the Chonkatau Range in Tabasaran district of Daghestan. These subregions represent the entire spectre of the Russian Caucasus landscapes. Conservation of the 'important bat areas' would promote conservation of all bat species in the North Caucasus.

More detailed information on key Chiroptera areas in the Caucasus is given in the Gazetteer in Annex 4.

Part IV. Breef species' essays

The Greater Horseshoe Bat – *Rhinolophus ferrumequinum*

Threats

Colonies of the Greater Horseshoe Bat in underground and overground roosts throughout the Caucasian region are vulnerable because of increasing disturbance. With the decreasing number of roosts in all countries of the region, some earlier known colonies are reported to have vanished, and declinein number is observed in other colonies.

Protection Status

Status under the IUCN Red List: NT. In 2000 the species status was defined as LR/nt according 1994 IUCN Red List categories (version 2.3).

- Armenia: Not protected;
- Azerbaijan: Not included in the Red Data Book; habitats protected under Bern Convention (Appendix II);
- Georgia: Protected under EUROBATS (Agreement on the Conservation of Populations of European Bats);
- Russia: Included in the Red Data Book under category 3: 'Rare';
- Regional status by expert evaluation: 'Vulnerable' (VU).

Biological Assessment

The geographic range of the species covers the South Palaearctic region from Portugal to China, including all of the Caucasus, where the greater horseshoe bat occurs in areas from humid subtropics at the coastline at the Mtsvane Kontskhi, with annual precipitation of up to 2500 mm (Bukhnikashvili et al. 2004), to semi-deserts with annual precipitation of 300 mm and less (Bukhnikashvili et al. 2004; Rakhmatulina 2005). In the Caucasus, the species can be encountered in Armenia (28 spots), Azerbaijan (53 spots), Georgia (76 spots), and Russia (76 spots). The greater horseshoe bat is a resident species, associated with large caves and man-made underground sites.

Slow reproduction rates of the species populations are due to the fact that female bats reach maturity at the age of 3-4 and give only one cub at a time. Female bats have offspring in June-early July, in the midst of the tourist season with a lot of people visiting caves and historical sites. Nursery colonies may consist of several dozens to hundreds of individuals, often mixed with the Lesser Horseshoe Bat (*R. hipposideros*), the Mediterranean Horseshoe Bat (*R. euryale*), the Common Bent Winged Bat *(Miniopterus schreibersii*), the Geoffrey's bat (*Myotis emarginatus*) and the Lesser Mouse-Eared Bat (*M. blythii*). In winter, bats make accumulations of up to several hundred individuals.

Nursery and wintering colonies located in easily accessible and large roosts make the greater horseshoe bat vulnerable to disturbance. As the greater horseshoe bats hang openly and are quite visible, these little animals often fall victims of senserless extermination. Large underground sites and historical buildings colonized by the bats frequently attract visitors for tourism and recreation, and are more and more frequently used by man. Building design changes limit the chances to use their attics for summer roosting.

The following factors also have an essential impact of the species in all the countries:

- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Pesticide use in agriculture and forestry leading to insect loss and subsequent reduction in food supplies.
- Microclimate change in roosts due to the global climate change;

Certain negative impact may result from:

- Use of watercourse shores for industrial zones and recreation, construction of line structures (transmission lines, roads, etc), and human change of vegetative cover structure leading to destruction and deterioration of natural habitats.
- Pesticide use in agriculture and forestry and water pollution (agricultural runoff, industrial and domestic wastewater) leading to insect loss and resultant reduction in food supplies.
- Increased number of visitors and greater use of cultic facilities and old buildings, Long-term impact of noise and vibration from building and industry either within or around the roosts;

Actions taken for the species conservation in the Caucasus

In all of these four countries - Armenia, Azerbaijan, Georgia, and Russia, some of the natural habitats are included in the PA, but are not subject to special protection. In Armenia, a grating was installed to protect the colony in Mozrov Cave.

Recommendations for Conservation

- Include the species in the Red List of Georgia and consider including it into the Red Data Books of Armenia and Azerbaijan (See Table 3. National, Regional and Global Status of Caucasus Chiroptera by IUCN categories).

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Monitor the status of the species populations in the Caucasus. (1.1.3, 1.1.4)
- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Establish PAs in areas of Key-habitats for bats for habitat protection (1.2.3)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Take action to harmonize coexistence of bats and men (3.2.3, 3.3.4)
- Involve population in bat conservation (6.1.4)

The Lesser Horseshoe Bat – *Rhinolophus hipposideros*

Threats

Colonies of the Lesser Horseshoe Bat in underground and overground roosts throughout the Caucasian region are vulnerable because of increasing disturbance. With the decreasing number of roosts in all countries of the region, some earlier known colonies are reported to have vanished, and declinein number is observed in other colonies. Because of their small size and strong metabolism, lesser horseshoe bats quickly die from poisoning with pesticides; also if insects vanish from feeding areas treated with insecticides, especially during the bat reproduction period; or if frequently awakened from hibernation by roost visitors.

Protection Status

Status under the IUCN Red List: LC. In 2004, the status was defined as LC according 2004 IUCN Red List categories (version 3.1), whereas previously, in 1996, the status was defined as vulnerable - VU

- Armenia: Not protected;
- Azerbaijan: Not included in the Red Data Book; habitats protected under Bern Convention (Appendix II);
- Georgia: Protected under EUROBATS;
- Russia: Included in the Red Data Book under category 3: 'Rare';
- Regional status by expert evaluation: NT.

Biological Assessment

The geographic range of *R. hipposideros* covers North-West Africa, Southern Europe, the Caucasus, Asia Minor, Midle Asia and Central Asia, the Arabian Peninsula and the African Horn. In the Caucasus, the Lesser Horseshoe Bat can be found in the area from the humid subtropics along the Mtsvane Kontskhi coastline with the annual precipitation of up to 2500 mm (Bukhnikashvili et al. 2004) to semi-deserts with annual precipitation of 300 mm and less (Bukhnikashvili et al. 2004; Rakhmatulina 2005) also high in mountains up to 2350 meters a.s.l., at the area of Isti-Su (Rakhmatulina 2005).

In the Caucasus, this species can be encountered in Armenia (6 spots), Azerbaijan (45 spots), Georgia (78 spots), and Russia (98 spots). In the western part of the Caucasian Isthmus, this species occurs more frequently and in larger quantities than in the east. In Eastern Georgia the largest accumulation (a nursery colony) of *R. hipposideros* is found in a deserted house in Borjomi region, with the number of bats ranging from 45 to 50 for several years (Natradze et al. 2003). In Russia more than one hundred individuals come together in a system of caves (Gazaryan, personal letter).

R. hipposideros is a resident species, closely associated with large caves, man-made underground sites, deserted buildings, cellars, attics, etc.

Female bats usually have one offspring in June- early July, in the midst of the tourist season, when people visit caves and historical sites. Nursery colonies comprising dozens of individuals roost in warm spaces (in

grottos, at cave entrances, in attics), with female bats hanging openly there, which increases chances for their being killed by predators and random visitors. In wintering accumulations gatherings, individual animals usually hang one by one. Because of its small size and small colonies, the species rarely becomes an object of persecution.

Nursery and wintering colonies located in easily accessible and large roosts make the lesser horseshoe bat vulnerable to disturbance. The large underground sites and historical buildings colonized by the bats frequently attract visitors for tourism and recreation, and are actively used by men for economic activities. Because of their small size and strong metabolism, the lesser horseshoe bats exhaust quickly and die if frequently awakened during the hibernation period, which further contributes to reduction in number in the bat colonies. Disappearance of insects after forage areas are treated with insecticides, especially in the bat reproduction period, has a negative impact on the Lesser Horseshoe Bat. Because of their small size and strong metabolism, the Lesser Horseshoe Bats frequently die of pesticides getting into their body with insects or from their shells (Red Data Book of the Russian Federation, 1983).

In all countries, the following factors also cause an essential negative impact:

- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Microclimate change in roosts due to the global climate change;

Certain negative impact may result from:

- Use of watercourse shores for industrial zones and recreation, construction of line structures (transmission lines, roads, etc), and human change of vegetative cover structure leading to destruction and deterioration of natural habitats.
- Design change and reconstruction of buildings (leaving no place for bats).
- Pesticide use in agriculture and forestry water pollution (agricultural runoff, industrial and domestic wastewater) leading to insect loss and resultant reduction in food supplies;
- Increased number of visitors and greater use of cultic facilities and old buildings, Long-term impact of noise and vibration from building and industry either within or around the roosts;

Actions taken to protect the species in the Caucasus

In all the four countries, including Armenia, Azerbaijan, Georgia, and Russia, some of the natural habitats are included on the PA lists, but the lesser greater horseshoe bat is not subject to special protection.

Recommendations for Conservation

To include the species in the Red Data Books of Armenia and Azerbaijan (See Table 3. National, Regional and Global Status of Caucasus Chiroptera by IUCN categories).

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Monitor the status of the species populations in the Caucasus. (1.1.3, 1.1.4)
- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Establish PAs in areas of Key-habitats for batsfor habitat protection (1.2.3)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Take action to harmonize coexistence of bats and men (3.2.3, 3.3.4)
- Involve population in bat conservation (6.1.4)

The Mediterranean Horseshoe Bat – *Rhinolophus euryale*

Threats

Colonies of the Mediterranean Horseshoe Bat in underground and overground roosts are vulnerable because of increasing disturbance. The number of roosts is continuously decreasing, with some earlier known colonies in Russia reported to have vanished.

Protection status

Status in the IUCN Red List: VU. In 1996, the status was assessed as 'vulnerable' (VU A2c under the 1994 version)

- Armenia: Included in the Red Data Book (1987) and classified as a species whose 'peripheral part of the range is located in the USSR', also as 'A rare and scarce species. Included in the Red Data Book of the USSR';
- Azerbaijan: Included in the Red Data Book as 'rare, peripheral species with limited number and limited habitat'. Habitats protected under Bern Convention (Appendix II);
- Georgia: Included in the national Red List as vulnerable - VU. Similar to all other bats, also protected under EUROBATS;
- Russia: Not protected at the Federal level, included in the Red Data Book of the Krasnodar Area under category 0 as 'possibly extinct';
- Regional status by expert evaluation: Endangered (EN)

Biological Assessment

The geographic range of *R. euryale* covers forest karst areas of North-East Africa, Southern Europe, the Caucasus, Middle East and Central Asia at the altitude of no more the 800 meters above-sea level. Practically everywhere in the Western Transcaucasia, these areas are used under orchards, tea plantations and fields, with rarely alternating natural woods and man-made forests (Gazaryan, Ivanitsky 2005). In the Caucasus, the Mediterranean Horseshoe Bat is not distributed equally. In Western Georgia (Western Transcaucasia) the status of the species is satisfactory (Gazaryan, Ivanitsky 2005), while in the rest of the Caucasus, it is very scarce. The largest nursery colony in the Caucasus – up to 300 individuals – was found in the cave of Tsutskhvati VII, in 2006, when this Action Plan was being prepared. In the Caucasus, the species has been found in 31 spots, including 21 spots in Georgia (20 of them in Western Georgia), 4 spots in Armenia and 4 spots in Azerbaijan. In the past, there used to be only 2 spots in Russia, both around the city of Sochi. Though the bats have never occurred there in the past decade, the Mediterranean Horseshoe Bat was found in two other places during studies for preparing this Action Plan.

The Mediterranean Horseshoe Bat is a resident species. It mainly roosts in caves, underground grottos, artificial underground sites and attics. The Mediterranean Horseshoe Bat frequently shares its roosts with other horseshoe bats, the Common Bent-Winged Bat (*Miniopterus schreibersii)*, the Lesser Mouse-Eared Bat (*Myotis blythii)* and the Geoffrey's bat *(M. emarginatus)*. The monospecific colonies, consisting only of the Mediterranean Horseshoe Bat, are rare. The species biology has not been studied thoroughly. The bats are known to have offspring in June – early July, in the midst of the tourist season with a lot of people coming to visit caves and historical sites. Nursery colonies comprising up to several dozens or rarely hundreds of individuals, roost in warm places (grottos, warm sections of caves, attics). Female bats hang openly. The bats winter in small colonies from 2 to 70 animals. All these factors increase chances for the bats to be killed by predators and random visitors. As the Mediterranean Horseshoe Bat rarely occurs in residential houses, serious conflicts with house owners are rare. Large underground sites and historical buildings colonized by the bats frequently attract visitors for tourism and recreation, and are actively used by men for economic activities. Our observations showed that the Mediterranean Horseshoe Bat is especially sensitive to disturbance. Thus a colony roosting in a tunnel in Tbilisi changed its roost because of rare but regular visits of the tunnel by people. In the gorge of the river Samarkha Khevi, where the tunnel is located, this species have been recently caught in nets, but not found in the tunnel itself.

The following factors have an essential impact on the species in all the countries:

- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Pesticide use in agriculture and forestry leading to insect loss and subsequent reduction in food supplies.
- Pesticide flushing from fields into reservoirs leading to animal poisoning through food and water (trophic transfer);
- Increased number of visitors and greater use of cultic facilities and old buildings;
- Long-term impact of noise and vibration from building and industry either within or around the roosts.
- Microclimate change in roosts due to the global climate change;

Certain negative impact may be caused resulting from:

- Construction of line structures (transmission lines, roads, etc);
- Water pollution (agricultural runoff, industrial and domestic wastewater) leading to insect loss and resultant reduction in food;
- Changed reservoir productivity because of changes in hydrological regime;
- Increased number of visitors and greater use of cultic facilities and old buildings, Long-term impact of noise and vibration from building and industry either within or around the roosts;
- Design change and reconstruction of buildings (leaving no place for bats).

Actions taken to protect the species in the Caucasus

In the USSR Red Data Book, the species is classified under category III: Species reducing in quantity. Though in the Caucasus countries the Mediterranean Horseshoe Bat has been protected by law since 1970-1980s, no real steps have been taken to protect either the species or its habitats. While in West Georgia no such protection is required, it is an urgent need for all other parts of the geographic area. In all the four countries, including Armenia, Azerbaijan, Georgia, and Russia, some of the bat roosts are situated in protected areas, yet are not subject to special protection in the PAs.

The populations in Azerbaijan and Armenia are not numerous because of the limited number of potential habitats for mesophilous species.

Recommendations for Conservation

- Include the species in the Red Data Book of Russia.
- In the Russian part of the region, the area of the Mediterranean horseshoe bat is rather changeable. The status of the *R. euryale* populations found in West Transcaucasia, beyond the Russian territory, causes no concern, yet the number of individuals in populations found in the Caucasus needs to be evaluated and the size of known sub-populations specified. The species status in plains of East Georgia should be also studied in more detail.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Monitor the status of the species populations in the Caucasus (1.1.3, 1.1.4)
- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Establish PAs in areas of Key-habitats for bats for habitat protection (1.2.3)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Take action to harmonize coexistence of bats and men (3.2.3, 3.3.4)
- Involve population in bat conservation (6.1.4)

The Mehely's Horseshoe Bat – *Rhinolophus mehelyi*

Threats

Colonies of the Spectacled Horseshoe Bat in underground and overground roosts are vulnerable because of increasing disturbance. With the decreasing number of roosts in all countries of the region, some earlier known colonies are reported to have vanished and declinein number is observed in other colonies. A limiting factor is low air humidity in roosts.

Protection Status

Status under the IUCN Red List: VU A2c

- Armenia: Included into the Red Data Book (1987) as found in Armenia – Eastern Border of the Range; having a tendency to area reduction;
- Azerbaijan: Habitats protected under Bern Convention (Appendix II); planned to be included in the 2nd edition of the Red Data Book of Azerbaijan;

- Georgia: included in the National Red List as vulnerable – VU. Also, similar to all other bats, protected under EUROBATS;
- Russia: Included in the Red Data Book under category 2: 'Reducing in number';
- Regional status by expert evaluation: Critically Endangered (CR).

Biological Assessment

The geographic range of the Mehely's Horseshoe Bat is highly fragmented. In the Mediterranean region, the species populates all major islands, occurs in central Spain and southern France, in Africa, at Gibraltar and in the lower reach of the Nile (DeBlase 1972), in the southern Balkans and in Asia Minor and Lebanon. It can be found in the Caucasus, Iraq and Iran. There is an isolated population of the bats in Afghanistan. This species occurs in arid submountain areas with steppe landscape (semi-steppes, upland steppes and upland xerophytes) (Panyutin 1983; Rakhmatulina 1980). The bats roost in caves, grottos, and in old dump basements and ruins (Kuzyakin 1950; Yavruyan 1990). In Armenia, Azerbaijan, Georgia and Russia, the Mehely's Horseshoe Bat has been found in 25 spots, 14 of them in Azerbaijan (Rakhmatulina 2005, Rakhmatulina new findings), 5 spots in Armenia (Yavruyan 1977), and 7 of them in Georgia (Bukhnikashvili et al. 2004, Bukhnikashvili et al. new findings). In Russia, there is only one known colony of the bat in Daghestan (Amirkhanov 1974, 1980, Gazaryan, Jamirzoev 2005).

Rhinolophus mehelyi rarely occurs in the Caucasus, yet forms rather large colonies there. The biggest accumulation of the species (up to 2000 individuals) was discovered by Kh. M. Alekperov in the Azykh (Vorovan) Cave, Nagorny Karabakh in 1953 (Alekperov 1966; Alekperov, Rakhmatulina 1975; Rakhmatulina 1980, 1989). In Armenia, colonies comprising over 1000 bats were discovered in the period from 1969 to 1977 (Yavruyan 1977). Large colonies of 500 – 2000 individuals have been found only in arid areas of the Southern Caucasus, in the east of the Lesser Caucasus. In Daghestan, a big colony of the Mehely's Horseshoe Bat roosted in a cave located in a mountain steppe with very high grass (Gazaryan, personal communication).

All major colonies have been found in foothills and mountain areas at 1800-1965 meters above the sea level. Most of the colonies have been found in natural and artificial caves with high humidity, and only some – in stone buildings.

The Mehely's Horseshoe Bat is a resident species, hibernating at summer roosts and often in large colonies. In the Azykh Cave, the bat colony remains year-round (Rakhmatulina 1980), while in other places the bats are observed to seasonally migrate between local summer and winter roosts (Yavruyan 1977). In summer, female bats of *Rhinolophus mehelyi* mostly make up large nursery colonies (up to 1000 individuals) together with other horseshoe bats, the Lesser Mouse-Eared Bat *(Myotis blythii)* and the Common Bent-Winged Bat *(Miniopterus schreibersii)*. In other seasons, no mixed colonies have been discovered. In nursery colonies of the Mehely's Horseshoe Bat, male and female bats are found together, though divided in separate groups. Yet there are also exclusively male colonies (Kuzyakin 1950; DeBlase 1980). In summer, some individuals keep aloof.

A decline in the number of *Rhinolophus mehelyi* has been recorded since 1980s (Rakhmatulina 1980, 1989, 2005; Gazaryan, Jamirzoev 2005). The authors believe that the main reason is permanent disturbance by cave visitors. A similar reduction trend is reported in the southwest of France (Tupinier 1971), Rumania (Dumitrescu et al. 1963), and Iran (Lay 1967; DeBlase 1980).

No Mehely's Horseshoe Bats are now found in underground sites of the Republic of Nakhchyvan, where they were reported to roost previously.

There are little data available on the ecology of the Mehely's Horseshoe Bat. In the Caucasus, female bats are known to have one cub in June (Rakhmatulina 1980). Nursery and wintering colonies located in easily accessible and large roosts make the Mehely's horseshoe bat vulnerable to disturbance. Sometimes the little animals fall victims of senserless extermination. Roosts in large underground sites and historical buildings often attract visitors for tourism and recreation. In the same time, though populating arid areas, the species seems to need high air humidity in roosts (Rakhmatulina 2005). As roosts with sufficient air humidity are rather rare in the bat's range, the population of the Mehely's Horseshoe Bat is very dependent on the same roosts and is largely exposed to direct extermination.

- The following factors have an essential impact on the species in all the countries:
- Increased number of visitors and greater use of caves and cultic facilities and old buildings;
- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Increased number of cave visitors;
- Increased number of visitors and greater use of cultic facilities and old buildings;
- Microclimate change in roosts due to the global climate change or human impact on the environment in close vicinity to the roosts.

Certain negative impact may result from:

- Long-term impact of noise and vibration from building and industry either within or around the roosts;
- Design change and reconstruction of buildings (leaving no place for bats);
- Microclimate change in roosts;
- Human change of vegetative cover structure; expansion of agricultural lands at the expense of natural landscapes, increasing areas of fields and rangeland;
- Pesticide use in agriculture and forestry;
- Deterioration of food supplies due to change of vegetation and reservoirs resulting from the of global climate change.

Actions taken in the Caucasus to protect the species

Before the collapse of the USSR, the Azykh, Big Shusha and Sirab caves in Azerbaijan populated by the Mehely's Horseshoe Bat were given the status of natural monuments. No more Mehely's Horseshoe Bats are found in the Sirab cave at present.

Recommendations for Conservation

- Include the species in the Red Data Book of Azerbaijan and consider stepping up its category in the Red List and Red Data Book to 'being on the verge of extinction' (CR) in all the countries (See Table 3. National, Regional and Global Status of Caucasus Chiroptera by IUCN categories).

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Monitor the status of the species populations in the Caucasus. (1.1.3, 1.1.4)
- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Establish PAs in areas of Key-habitats for batsfor habitat protection (1.2.3)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Take action to harmonize coexistence of bats and men (3.2.3, 3.3.4)
- Involve population in bat conservation (6.1.4)

The Lesser Mouse-Eared Bat – *Myotis blythii*

Threats

Colonies of the Lesser Mouse-Eared Bat in underground and overground roosts are vulnerable because of increasing disturbance. Some earlier known colonies are reported to have vanished in Armenia, and declinein number is observed in some other colonies.

Protection Status

Status under the IUCN Red List: LC. In 1996, the status was identified as LR/lc according to 1994 IUCN Red List categories (version 2.3).

- Armenia: Not protected;
- Azerbaijan: Not included in the Red Data Book, habitats protected under Bern Convention (Appendix II);
- Georgia: Not included in the Red List; protected under EUROBATS;
- Russia: Included in the Red Data Book under category 2 - 'Reducing in number';
- Regional status by expert evaluation: NT.

Biological Assessment

Myotis blythii is a widely spread species. Various subspecies of *Myotis blythii* can be found in the west of North Africa, in the south of Western Europe, in Eastern Europe, Asia Minor, Near and Central Asia and farther

to Southern Kazakhstan and China. It lives in the Balkan Peninsula, in the Carpathian Mountains, the Crimea, the Caucasus, the Altai and the Himalayas.

In the Caucasus, this species occurs everywhere in the region (Arutyunyan 1999; Bedavi 1993; Bukhnikashvili 2004; Gazaryan 2007; Papov 2003; Rakhmatulina 2005; Yavruyan 1991), from humid subtropics along the Green Cape coast with annual precipitation of 2500 mm (Bukhnikashvili et al. 2004) to semi-deserts with annual precipitation of 300 mm and less (Bukhnikashvili et al. 2004; Rakhmatulina 2005). There are known 17 spots where the bat is found in Armenia, 36 spots in Azerbaijan (Rakhmatulina 2005, Rakhmatulina new findings) 65 spots in Georgia (Bukhnikashvili 2004, Rakhmatulina new findings) and 110 spots in Russia (Gazaryan 2007, Gazaryan new findings). The northernmost part of the range is located in the Russian Caucasus. In the Caucasus, *Myotis blythii* lives at any altitude zones, except for alpine meadows; also in woodlands and arid landscapes starting from the sea level (the Black and Caspian coasts) up to 2356 meters a.s.l. (village Tsapatakh, Nagorny Karabakh).

Myotis blythii is a resident species, closely associated with large and relatively warm caves and man-made underground spaces. The bat colonies roost in basements, under bridges, in attics, abandoned buildings and ruins, and hide in cracks of buildings, tree hollows and crevices. The bat migrates seasonally to its wintering sites. The mouse-eared bat forms both monospecific and mixed colonies together with horseshoe bats, the Geoffrey's bat *(M. emarginatus)* and the Common Bent-Winged Bat (*Miniopterus schreibersii)*. Nursery colonies of female bats usually consist of 200-500 individuals. Reportedly, there are even larger colonies comprising up to several thousands of bats (the Azykh Cave in Nagorny Karabakh, the Gliana Cave in Western Georgia,). In summer male bats live in nursery colonies or in separate groups, usually consisting of 5-20 bats, rarely up to 50-70 individuals. In nursery colonies roosting in large warm caves or big attics, the bats hang on walls and from ceilings, forming a whole multi-raw mass. Female bats usually have one cub in late June – early July. The breeding period coincides with the period when many people come to visit caves and other roosts. The high density of bats in colonies results in a high rates of parasitic infections.

Nursery and wintering colonies located in easily accessible and large roosts make the Lesser Mouse-Eared bat to disturbance. Sometimes these animals fall victims of senserless extermination. Roosts in large underground sites and at historical sites frequently attract visitors for tourism and recreation and are used by men for economic activities. One known colony of the lesser mouse-eared bat in Armenia are reported to have vanished after a restaurant was built at the cave entrance. In some cases, rehabilitation of cultic buildings, historical monuments, reconstruction of basements into offices, shops, etc. make these animals subject to chasing. *Myotis blythii* is sensitive not only to the increased recreation activity, but also to changes in the roost microclimate. Thus a nursery colony of 500-600 individuals that had roosted in a man-made cave of the Natlismtsemeli cave monastery in Eastern Georgia in 1999-2004 (Natradze et al. 2003) declined twice in 2005 because of increased aeration of the cave after the monks reconstructed the cave entrance after the colonies broke up in late autumn.

By expert evaluation, the following factors have an essential impact on the species in all the countries:

- Pesticide use in agriculture and forestry and pesticide runoff from fields into reservoirs;
- Human change of vegetative cover structure leading to habitat destruction and deterioration; expansion of agricultural lands at the expense of natural landscapes;
- Deterioration of food supplies due to changes in vegetation and water reservoirs caused by man or natural factors (i.e. resulting from the climate change);
- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Design change and reconstruction of buildings (leaving no place for bats);
- Lights at cave entrances.

Until 1980s, *Myotis blythii* was considered one of the most numerous and widespread species in Armenia. Yet big colonies of *Myotis blythii* have been reducing in number in the recent years (in 2000-2007). These animals are more frequently found in small groups (10-30 individuals) or as solitary individuals. In Azerbaijan and Georgia, no such change in the population number has been observed (Natradze et al. 2003; Rakhmatulina 2005).

Actions taken to protect the species in the Caucasus

The species is protected by law only in Russia, while in other countries neither the species, nor their habitats are protected. Moreover, even in Russia no effective actions have been taken so far to ensure conservation of habitats of *Myotis blythii*. Given the sharp reduction in the species number, the Union of Environmental Protection of Armenia and personally E. G. Yavruyan suggested including the species in the List of Rare and Threatened Species at a session of the Board of the Armenian Ministry of Natural Resources in 2006.

Some habitats are included in the list of protected areas yet not subject to special protection. In Armenia, a grating was installed at the entrance to the cave Mozrov to protect the bat colony there.

Recommendations for Conservation

- Include the species in the Red Data Book of Armenia;
- Conduct State Environmental Examination and EIA for any projects in areas of the species habitats.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Monitor the status of the species populations in the Caucasus. (1.1.3, 1.1.4)
- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Establish PAs in areas of Key-habitats for batsfor habitat protection (1.2.3)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Take action to harmonize coexistence of bats and men (3.2.3, 3.3.4)
- Involve population in bat conservation (6.1.4)

Scientific targets include the following to be done in countries of the South Caucasus:

- Conduct genetic studies to precisely define the taxonomic status of intraspecific forms of *Myotis blythii* that occur in the Southern Caucasus;
- Should more than one subspecies be confirmed in the Caucasus, specify the subspecies habitat boundaries and identify zones of intraspecific hybridisation;
- Identify causes for declines in the number of *Myotis blythii* in Armenia;
- Carry out a study of the species' food supplies and forage needs to establish adequate practices of land management and roost use.

The Bechstein's bat – *Myotis bechsteinii*

Threats

Forest fragmentation and reduction of habitat area; reduction in the number of summer roosts due to felling of old and dead hollow trees; disturbance in wintering roosts.

Protection Status

Status under the IUCN Red List: *VU*. In 1996 the status was defined as VU A2c according to 1994 IUCN Red List categories (version 2.3).

- Armenia: Not protected;
- Azerbaijan: Not included in the Red Data Book; habitats protected under Bern Convention (Appendix II);
- Georgia: included in the National Red List as vulnerable – VU. Similar to other bats, also protected under EUROBATS;
- Russia: Not protected; included in the Red Data Book of the Krasnodar Area under category 2 as Vulnerable;
- Regional status by expert evaluation: Data Deficient (DD).

Biological Assessment

The geographic range of this species is fragmented, with its major part covering Western Europe from the north of Spain to the south of Great Britain and southern part of the Scandinavian Peninsula in the west, and spreads over Central Europe and almost all of Eastern Europe. Isolated segments are located in the south of Spain, on large islands of the Mediterranean and in the Caucasus. The Bechstein's bat occurs in Turkey and Northern Iran. In the Caucasus, the species has been found in 14 spots in Russia, including 12 spots located in the Western Caucasus, a spot at the mouth of the river Samur and a spot in Sevastopol (Kuzyakin 1950). However, information about this finding is not confirmed by collected material and hence, raises certain doubts. In Georgia, the species is known from two previous findings: one in the vicinity of Zugdidi (Kuzyakin 1950) and another in the Borjomi Gorge (Avaliani 1976). In Azerbaijan, there is a nursery colony in village Khazara, near the Samur River. Until recently, the species was never found in Armenia. One specimen found there recently (Yavruyan, personal comm.).

The Bechstein's bat is a forest species. In the Caucasus, it is found only in broad-leaved forests. The bat finds its prey in forests, over small clearings, at forest edges and in forest openings, collecting insects from leaves and grass. Nursery colonies consist of several dozens of female bats, settling in old tree hollows and rarely – in abandoned buildings. In June-early July female bats give birth to one young. As very frequent changes of roosts are typical for nursery colonies, availability of many hollows is a precondition for colonizing a forest area. Underground roosts are used for wintering and also as summer roosts by animals not participating in reproduction. Underground roosts are also important for autumn swarming. *Myotis bechsteinii* is a resident species. Most of the animals in the Caucasus probably remain in their hollows for wintering.

The following factors have an essential impact on the species in all the countries:

- Destruction of roosts by man and loss of hollow trees
- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Human change of vegetative cover structure; expansion of agricultural lands at the expense of natural landscapes, increasing areas of fields and rangeland;
- Loss of woodland belts
- Microclimate change in roosts due to global climate change or human impact on the environment in close vicinity of roosts.

Certain negative impact may result from:

- Increased number of visitors and greater use of cultic facilities and old buildings;
- Long-term impact of noise and vibration from building and industry either within or around the roosts;
- Lights at roost entrances;
- Use of watercourse shores for industrial zones and recreation, construction of line structures (transmission lines, roads, etc), and human change of vegetative cover structure leading to destruction and deterioration of natural habitats.
- Forage deterioration because of change of vegetative cover and water reservoirs caused by global climate change, and Changed reservoir productivity because of changes in hydrological regime;
- Pesticide use in agriculture and forestry and water pollution due to fertilizer runoff from fields to reservoirs;
- Water pollution (agricultural runoff, industrial and domestic wastewater) leading to insect loss and resultant reduction in food supplies;
- Forest fires.

Actions taken for the species conservation in the Caucasus

Most of the species habitats are found in existing PAs or in their vicinity. No special measures have been taken to conserve the species in the Caucasus.

Recommendations for Conservation

- Include the species in the Red Data Books of Azerbaijan, Russia, and also the Republic of Daghestan, the Russian Federation.
- Make changes in Management Plans of existing PAs where the Bechstein's bat is found to ensure protection of the species habitats there.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Take measures for bat conservation in forests and parks (1.3.1 - 1.3.3, 1.4.9)
- Take action to harmonize coexistence of bats and men (3.3.4)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Strengthen bat conservation in PAs (1.2.1-1.2.4)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Long-term purposes require actions to be taken within 15 years:

- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)

The Bechstein's bat is a species not yet thoroughly studied in the Caucasus. Scientific studies required for successful conservation of the species in the Caucasus are listed below:

- Identify key summer habitats and mass wintering roosts.
- Continue searching for new colonies and habitats by means of radio telemetry.
- Study the species diet and identify factors affecting the number of forage species.
- Collect data on potential impact of the global climate change on the Bechstein's bat populations.

The Pond Bat – *Myotis dasycneme*

Threats

No threats have been identified for the species in the Caucasus. In other parts of its geographic range, threats are associated with disturbance of nursery colonies, changes of habitats, use of insecticides; water pollution in reservoirs used as feeding areas.

Protection Status

Status under the IUCN Red List: VU. In 1996 the status was defined as VU A2c according to 1994 IUCN Red List categories (version 2.3).

- Armenia: Not found on the territory of Armenia;
- Azerbaijan: Not found on the territory of Azerbaijan; habitats subject to protection under Bern Convention (Appendix II);
- Georgia: Not found on the territory of Georgia; subject to protection under EUROBATS;
- Russia: Not protected; included into the Red Data Books of some Russian regions, in particular, of the Krasnodar Area, under category 5: Data Deficient;
- Regional status by expert evaluation: Not Evaluated (NE).

Biological Assessment

The geographical range of *Myotis dasycneme* covers Central and Eastern Europe, southern part of Western Siberia and northern Kazakhstan; isolated findings are also reported from Manchuria. In the Caucasus, a wintering individual of *M. dasycneme* was found in 2003 in the Gunkin IV karst cave located in the Urup district, the Karachai-Cherkess Republic (the nearest settlement is village Psebay, Mostov district, Krasnodar Area, Russia). In addition, a scull of a pond bat was found in 1999, in subfossil materials obtained from the Canyon cave (Apsheron district of the Krasnodar Area), located approximately 100 km to the west of the cave. It could be a random bat that flew in from the main part of the range. Nursery colonies of the Pond Bat located closest to the Caucasus have been registered at 500 km to the north from the location where the bat was found in the Caucasus, in Volgograd and Rostov provinces of Russia.

In some regions of European Russia, the Pond Bat is an ordinary species in winter and summer roosts. It populates lowlands and low foothills near water reservoirs with calm water. In summer, it often roosts in villages and towns. Nursery colonies may comprise up to 500 bats, but usually consists of several dozens of individuals. They roost in large attics of big buildings and under church domes. In summer, male bats, either solitary or in small groups, roost in tree hollows, rock crevices and other places. The Pond Bat winters in caves, tunnels and other underground spaces. It feeds over water reservoirs with calm water, preying on insects and mosquitoes living near water.

Experts identify no threats for the species in the Caucasus region. In other parts of its geographic area, threats are associated with habitat changes caused by rehabilitation and use of buildings and in particular, by treatment of wooden parts of the building with insecticides. A limiting factor could be water pollution in reservoirs where the bats feed or the reservoir shrinking. Nursery and wintering colonies located in easily accessible and large roosts make the pond bat vulnerable to disturbance. Sometimes these small animals fall victims of senserless extermination and chase.

Actions taken for the species conservation in the Caucasus

No actions have been ever taken to conserve *Myotis dasycneme* in the Caucasus, as the species has not been subject to protection in Russia and was first found in the Caucasus in 2003.

Recommendations for Conservation

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Identify areas important for the species survival (1.1.1)
- Protect bat colonies in buildings (1.4.1-1.4.4).

Additionally, it would be also advisable to:

- Specify the status of the species presence in the Caucasus;
- Take measures to physically protect known roosts of the Pond Bat;
- Involve local population and speleotourists in collecting data on Pond Bat colonies in buildings and underground sites.

Scientific targets include actions to:

- Continue the search of the Pond Bat habitats in the Caucasus region;
- Identify species range boundaries in southern Russia and Ukraine;
- In known permanent habitats, collect detailed information on factors that might potentially affect the population number and limit possibilities for the Pond Bat to spread further to the south.

The Geoffrey's Bat – *Myotis emarginatus*

Threats

Colonies of the Geoffrey's Bat in underground and overground roosts are vulnerable due to increasing disturbance. Some earlier known bat colonies are reported to have vanished in all the countries of the region, with declinein number observed in other colonies. Animals die of pesticide poisoning and as a result of insect loss after feeding areas are treated with insecticides.

Protection Status

Status under the IUCN Red List: VU. In 1996, the status was defined as vulnerable (VU A2c) according to 1994 IUCN Red List categories (version 2.3).

- Armenia: Not protected;
- Azerbaijan: Not included in the Red Data Book; habitats protected under Bern Convention (Appendix II);
- Georgia: Not included into the Red List; protected under EUROBATS;
- Russia: Included in the Red Data Book under category 2 - 'Reducing in number';
- Regional status by expert evaluation: 'Endangered' (EN).

Biological Assessment

The geographic range of *M. emarginatus* is highly fragmented. A part of the range stretches from Western Europe through the Mediterranean and southern part of Central Europe to the western coast of the Black Sea. Other parts are located in the Caucasus, south of Asia Minor and Near East, in Central Asia and Indochina (Burma and Malaysia). Isolated occurrences have been reported from North-West Africa. This species is found in Transcarpathia, Crimea and southern Kazakhstan. It populates a large range of lowland landscapes, from semi-deserts to light forests and up to the mountain forest at 1800 meters a.s.l. The bats colonize natural and man-made underground sites and buildings. In the Caucasus, the Geoffrey's Bat has been found in 5 spots in Armenia, in 8 spots in Azerbaijan (Rakhmatulina 2005), in 22 spots in Georgia (Bukhnikashvili et al. 2008), and 17 spots in Russia. The majority of findings are single animals or very small colonies. In western Georgia and in Lenkoran the bat lives in warm and dry places, in forests located on the karst terrain with highly drained soil. In Russia, the Geoffrey's Bat is found in a very restricted area in the Krasnodar Area and farther to the east up to Kabardino-Balkaria.

The species is considered as rare, yet it occasionally makes up rather big nursery colonies, as confirmed by a colony that used to roost in Lenkoran (Azerbaijan) and comprised 1200 bats but now disappeared (Rakhmatulina 2005). In Western Georgia, there was colony of 1500 individuals in village Nakalakevi (Kozhurina, Fhilchagov 1999). Normally nursery colonies of the Geoffrey's Bat consist of several dozens to 3-4 hundreds of individuals co-roosting with horseshoe bats and mainly with the Greater Horseshoe Bat (*Rhinolophus ferrumequinum*). Though there may be no horseshoe bats in roosts colonized by many individuals of the Geoffrey's Bat (Rakhmatulina 2005). Female bats usually have one cub at a time, in late June – early July, in the

midst of the tourist season. The species is associated with large caves and man-made underground shelters. Little is known about their wintering sites. Little data are available about the species ecology. The species is best described by I. K. Rakhmatulina (2005).

Colonies in easy-to-access large roosts for the reproduction and hibernation periods make the Geoffrey's Bats vulnerable to disturbance. Moreover, the bats often fall victims of senseless extermination, as roosts in large underground vaults and historical buildings attract visitors for tourism and recreation and are used by man for economic activities. The status of this species is quite alarming in the countries of the Southern Caucasus where are known no more than 4-5 large colonies.

The following factors could have an essential impact on the species in all the countries:

- Destruction of roosts;
- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Increased number of cave visitors;
- Microclimate change in roosts due to the global climate change or anthropogenic impact on the environment around the roosts;
- Pesticide flushing from fields into reservoirs leading to animal poisoning through food and water (trophic transfer);

Certain negative impact may result from:

- Design change and reconstruction of buildings (leaving no place for bats).
- Increased number of visitors and greater use of cultic facilities and old buildings; long-term impact of noise and vibration from building and industry either within or around the roosts;
- Pesticide use in agriculture and forestry and water pollution (agricultural runoff, industrial and domestic wastewater) leading to insect loss and resultant reduction in food supplies;
- Construction of line structures (transmission lines, roads, etc);
- Human change of vegetative cover structure leading to destruction and deterioration of natural habitats, and in particular, expansion of agricultural lands at the expense of natural landscapes;
- Changed reservoir productivity because of changes in hydrological regime.

Actions taken for the species conservation in the Caucasus

In Azerbaijan , Georgia and Russia some natural habitats are included in protected areas, yet not subject to special protection.

Recommendations for Conservation

- Include the species in the Red Data Books of Armenia and Azerbaijan as vulnerable species – VU. In Red List of Georgia as Endangered (EN) (See Table 3. National, Regional and Global Status of Caucasus Chiroptera by IUCN categories);
- Estimate the number of populations in the Caucasus, and define precisely the size of known sub-populations.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Monitor the status of the species populations in the Caucasus. (1.1.3, 1.1.4)
- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Establish PAs in areas of Key-habitats for batsfor habitat protection (1.2.3)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Take action to harmonize coexistence of bats and men (3.2.3, 3.3.4)
- Involve population in bat conservation (6.1.4).

The Schaub's myotis – *Myotis schaubi*

Threats

The species occurs sporadically within a very limited area. Its biotope preferences and ecology remain unclear. Destruction of any colony may bring grave consequences for the bat population in the region.

Protection status

Status under the IUCN Red List: EN. In 2000, the status of *Myotis schaubi* was defined as endangered (EN B1+2c, C2a, D) according to 1994 IUCN Red List categories (version 2.3).

- Armenia: Included in the Red Data Book (1987) as Natterer's bat (subspecies – Arax bat) as a species in the USSR found only in Armenia and Republic of Nakhchyvan (previously, the species was considered as a subspecies of the Natterer's bat);
- Azerbaijan: Not protected, not included in Annex II to the Bern Convention;
- Georgia: Not found on the territory of Georgia;
- Russia: Not found on the territory of Russia;
- Regional status by expert evaluation: Data Deficient (DD).

Biological Assessment

The geographic range of *M. schaubi* is located in Armenia, southwest Iranand Azerbaijan and covers the basins of the Arax and Arpi rivers. In the Caucasus, the Schaub's myotis has been reported in the southwest of the Lesser Caucasus: in southern Armenia. The bat populates arid and semi-arid mountain landscapes. The species is very scarce, which makes it difficult to study its distribution and biology. There are no data available about population dynamics, nor about factors promoting growth or reduction in number. *M. schaubi* is known to roost in small groups of the same sex (2-6 individuals), in ruined buildings or in churches, in basements, grottos, under the tree rind, or in rock crevices. The bat winters in caves. No groups mixed with other species have been reported to date. A. Kuzyakin (Kuzyakin 1950) caught 12 female bats on June 26 1946, which is the largest number of the bats caught at a time so far. In 2000-2007, there were three findings of *Myotis schaubi* in Armenia:

- In the vicinity of village Zaritap (district of Ekhegnadzor)
- In the Zvar Monastery (district of Megri)
- Close to village Tandzik (district of Armavir)

As the Schaub's myotis almost never occurs in resident houses, no serious conflicts with house owners have been reported.

By expert evaluation, the following factors could have an essential impact on the species habitats:

- Roost destruction by man or roost deterioration (for instance, microclimate change in roosts) due to human change of environment.
- Deterioration of food supplies due to changes in vegetation and water reservoirs caused by man or natural factors (i.e. resulting from the climate change).

Certain negative impact may result from:

- Destruction of woodland belts.
- Use of watercourse shores for industrial zones and recreation;
- Pesticide use in agriculture and forestry, and water and air pollution with toxic waste and industrial and transport emissions, resulting in insect loss and hence, leading to insect loss and resultant reduction in food supplies.
- Human change of vegetative cover structure leading to destruction and deterioration of natural habitats, and in particular, expansion of agricultural lands at the expense of natural landscapes;

Actions on protection of the species taken in the Caucasian region

Though the Schaub's myotis has been protected by law in Armenia since the 1980s, practically no measures have been taken to conserve the species or its habitats. The primary reason accounting for the species survival is the small number of bats in clusters, which limits chances for losing a large number of individuals at once, and decreases the impact that conflicts with man might have on the overall species population.

Recommendations for Conservation

- In general, study the species biology, measure the size and spread of known populations, specify habitat use, study the species diet and identify factors affecting the number of forage species.

- In Armenia, the status and distribution area of M. *schaubi* should be evaluated precisely, threats and their background factors identified, and the taxonomic status evaluated.
- In Azerbaijan, actions should be focused at tracing *Myotis schaubi* in Nakhchyvan, as there is a high chance that the species also populates the territory between the areas in Iran and Armenia where it is found.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:
- Identify areas important for the species survival (1.1.1)
- Protect bat colonies in buildings (1.4.1 - 1.4.4)

The Giant Noctule – *Nyctalus lasiopterus*

Threats

Forest fragmentation and reduction of habitat area; reduction in the number of summer and transit roosts, caused by felling of old hollow trees in forests and parks; disturbance in wintering roosts.

Protection Status

Status under the IUCN Red List: NT. In 1996, the status was defined as LR/nt according to 1994 IUCN Red List categories (version 2.3).
- Armenia: Not protected;
- Azerbaijan: Not included in the Red Data Book; habitats protected under Bern Convention (Appendix II);
- Georgia: Protected under EUROBATS;
- Russia: Included in the Red Data Book under category 3, 'Rare'; also included in the Red Data Book of the Krasnodar Area under category '3' – Rare;
- Regional status by expert evaluation: Data Deficient (DD).

Biological Assessment

The global geographic range of the species covers North-West Africa, north of the continental Europe up to Moscow (Ognev 1931) and Nizhniy Novgorod districts (Kuzyakin 1950) in Russia and farther to the east up to the Volga basin, the Caucasus and Iran. One finding is reported on the Usturt plateau, Kazakhstan.

The Giant Noctule is primarily found in broad-leaved and mixed forests. The species is also found in occasional transit roosts in steppes and semi-deserts. In most part of the area, the Giant Noctule is a migratory species, which breeds to the south from the 50th parallel. Exact wintering roosts are unknown. Potentially bats reproducing in summer in European Russia winter in Southern Europe and in the Caucasus. However, a young animal found in the vicinity of Sochi (Tsytsulina, 1998) suggests that some female bats have their offspring in the Caucasus.

The species range in the Caucasus is yet to be specified. There are 8 known spots in Russia, in the Northern Caucasus, and another 3 spots in Georgia. The Giant Noctule is not found in Armenia or Azerbaijan. The species biology is not studied sufficiently. Nursery colonies consisting of several female bats (occasionally more than 10 bats), usually roost in hollows of deciduous trees. Normally, the bat has one cub at the end of June. In summer, male bats live separately, with part of them possibly remaining in the wintering roosts. During the periods of reproduction and migration, the bats are most often found in colonies of the common noctule (*Nyctalus noctula)*. No wintering roosts of the Giant Noctule are found in the Caucasus. In other parts of the area, the bat winters in tree hollows (Schober, Grimmberger 1989). The Giant Noctule finds it prey high above trees or on open landscapes over forest edges and water surface.

The Giant Noctule is an arboreal species. Both nursery colonies and hibernating clusters are found in tree hollows. Presumably, the areas with a lot of hollow trees are essential for the species well-being. Wherever found, the species is scarce.

It is difficult to discover their roosts, so the Giant Noctule is not exposed to direct extermination. Yet old hollow trees are cut out selectively in course of improvement felling, sanitary felling or logging, thus decreasing the value of natural habitats for this species in lactation or hibernation periods and most likely contributing to the loss of the animals. Continuous shrinking areas under deciduous woods, use of pesticides and insecticides, and changes in composition and number of forage insects due to agricultural developments might pose more threats to populations of the Giant Noctule.

By expert evaluation, the following factors could have an essential impact on the species in Georgian and the Russian Caucasus:

- Felling of hollow trees;
- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Forest fires;
- Certain negative impact may result from:
- Pesticide use in agriculture and forestry, and runof into fresh water bodies leading to insect loss and resultant reduction in food supplies.

Actions to be taken to protect the species in the Caucasian region
No actions taken.

Recommendations for Conservation

- Conduct State environmental examination and EIA for any projects in forest areas where known habitats of the species are located.
- Ensure efficient regional coordination of expert groups to study and conserve the species in the Caucasus.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Take measures for bat conservation in forests and parks (1.3.1 - 1.3.3),
- Specially label trees colonized by bats (1.4.8)
- Compensate for felling trees colonized by bats by providing tree houses of a relevant design (1.4.9)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities: N/A.

Scientific targets:

- Identify migration paths, location of transit and permanent roosts
- Study the species diet and identify factors affecting the number of forage species.
- Collect data on potential impact of the global climate change on the population, including possible change of migratory behaviour.

The European Barbastelle – *Barbastella barbastellus*

Threats

Forest fragmentation and reduction of habitat areas; reduction in the number of summer and transit roosts, caused by felling of old hollow trees in forests and parks; disturbance in underground roosts in the hibernation period.

Protection Status

Status under the IUCN Red List: VU. In 1996, the status was defined as vulnerable (VU A2c) according to 1994 IUCN Red List categories (version 2.3).

- Armenia: Not protected;
- Azerbaijan: Not included in the Red Data Book; habitats protected under Bern Convention (Appendix II);
- Georgia: Protected under EUROBATS;
- Russia: Not included in the Red Data Book of Russia, but included in the Red Data Books of Adygei, Kabardino-Balkaria, Stavropol, and Krasnodar Areas; in the Krasnodar Red Data Book classified under category '2' – Vulnerable;
- Regional status by expert evaluation: 'Vulnerable' (VU).

Biological Assessment

The global geographic range of the European Barbastelle covers Morocco in Africa, the whole area of Western and Central Europe, southern part of Eastern Europe, south of the British Isles and the Scandinavian Peninsula, the Crimea and the Caucasus. The European Barbastelle populates woodland areas of the Greater and

Lesser Caucasus. In Armenia the bat has been incidentally found in 4 spots, in Azerbaijan there are 15 spots where the bat is found (Rakhmatulina 2000), in Georgia in 11 spots and in Russia in 48 spots.

Being a resident species, the European Barbastelle is closely related to mountain and lowland forests. In Azerbaijan, the species was reported at up to 1500 meters a.s.l. (Rakhmatulina 2000). Reproducing female bats form nursery colonies. Male bats and non-reproducing female bats roost solitarily, or rarely in small groups. During the daytime, these solitary animals hide in tree hollows, in crevices and under roofs. No nursery colonies of this bat have been found in the Caucasus so far. In Azerbaijan, pregnant female bats can be seen in spring (Rakhmatulina 2005). In Europe, nursery colonies comprise about 10-20 female bats (sometimes up to 100) and roost under loosened rind, slot-like tree hollows and in crevices in man-made structures. As normally nursery colonies frequently change their roosts, availability of a lot of old and dead trees is a precondition for choosing a roost.

Reproduction of the bats has not been studied in the Caucasus. In other regions, female bats usually have one, rarely two cubs in late June – early July.

Summer roosts are associated to karst areas, where winter roosts of this species are also found. The Barbastelle winters in cold and dry caves, grottos and underground sites, or in crevices and possibly tree hollows. In large roosts, the bats often sit on horizontal shelves or hang from oblique walls (Rydell, Bogdanowicz 1997; Nowak 1999). Two largest winter colonies in the geographic area of the species have been found in the Russian Caucasus, in the caves Canyon and Maiskaya, with 7 thousand and 2 thousand individuals respectively (Gazaryan 2000). These colonies are most vulnerable to disturbance.

The Barbastelle feeds on insects without the hard dermal investments: moths, caddis fly, mosquitoes, etc. It finds it prey along the vegetation boundaries over the forest paths, orchards, vineyards, or near separate groups of trees.

Major threats for the European Barbastelle include: shrinkage of the habitat areas, continuing felling of forests, habitat deterioration resulting from loss of old hollow trees cut out selectively during improvement felling, sanitary felling or logging. In the hibernation period, the bats are disturbed by uncontrolled visits of people to the roosts, modernization and use of caves for tourism.

By expert evaluation, the following factors could have an essential impact on the species in all the countries:

- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Forest fires;
- Pesticide use in agriculture and forestry leading to pesticide runoff from fields into water reservoirs;
- Human change of vegetative cover structure leading to destruction and deterioration of natural habitats, and in particular, expansion of agricultural lands at the expense of natural landscapes;
- Changed reservoir productivity because of changes in hydrological regime;
- Lights at roost entrances and in feeding areas;
- Long-term impact of noise and vibration from building and industry either within or around the roosts;
- Microclimate change in roosts due to the global climate change.

Certain negative impact may result from:

- Deterioration of food supplies due to changes in vegetation and water reservoirs caused by man or natural factors (i.e. resulting from the climate change).
- Water pollution (agricultural runoff, industrial and domestic wastewater) leading to insect loss;
- Climate change resulting in roost loss.

Actions to protect the species taken in the Caucasian region

In Russia, Azerbaijan and Georgia, natural habitats of the species are protected in many protected areas, yet no special measures are taken for the species conservation.

Recommendations for Conservation

- Include the species in the Red Data Books of Armenia, Azerbaijan, and Russia, and of constituents of the Russian Federation where the species habitats are found (e.g. Republics of Karachay-Cherkessia, Northern Ossetia-Alania, Chechnya, Ingushetia, and Daghestan)
- Make an inventory underground wintering roosts; and create PAs in areas of Barbastelle agregations for conserving key habitats and wintering areas of major colonies.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Take measures to protect bats in forests and parks (1.3.1-1.3.3)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Take action to harmonize coexistence of bats and men (3.3.4)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Take actions to mitigate consequences of the global climate change (5.1.1)

Long-term purposes require actions to be taken within 15-20 years of the Plan activities:

- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)

Scientific targets:

- Annually monitor key species habitats;
- Study habitat use by means of radio telemetry
- Study the species diet and identify factors affecting the number of forage species.

The Eastern Barbastelle – *Barbastella leucomelas*

Threats

Colonies of the Eastern Barbastelle in underground roosts are vulnerable due to more frequent use of underground spaces and increasing number of cave visitors. The species is rare, so extermination of any colony may bring grave consequences for the species population in the region.

Protection Status

Status under the IUCN Red List: *LC*. In 1996, the status was defined as LR/lc according to 1994 IUCN Red List categories (version 2.3).

- Armenia: Included in the Red Data Book (1987) as a species found in 'Armenia – the Western boundary of the geographic range; scarce';
- Azerbaijan: Not included in the Red Data Book; habitats protected under Bern Convention (Appendix II);
- Georgia: Not found on the territory of Georgia nor included in the Georgian Red List;
- Russia: Not protected;
- Regional status by expert evaluation: 'Data Deficient' (DD).

Biological Assessment

The geographic range of the species covers Asia Minor and Central Asia, South Caucasus, Near East, Iran, Afghanistan, the Pamirs, north of Pakistan and India (Koopman 1994; Khabilov 1992, 2003), on slopes of the Himalayas, in western China. There is evidence of the species occurrence in northern regions of Ethiopia, the Sinai Peninsula, Taiwan, Indochina and Japan (Bates, Harrison 1997). Globally, the species populates various landscapes from deserts to tropical forests, submountain and mountain areas at 2500 meters above the sea level.

In the Caucasus, the Eastern Barbastelle is mainly found in the southeastern areas (up to 44 degrees north latitude). There are two known spots in Daghestan, Russia (Amirkhanov 1980), 9 spots in Armenia (Dahl 1954; Yavruyan 1974), 8 spots in Azerbaijan (Rakhmatulina 2005). The species is not found in Georgia, yet it occurs at the Georgian border with both Armenia (Yavruyan 1974, 1991) and Azerbaijan (Rakhmatulina 2005), which allows for the possibility of discovering it on the Georgian territory as well (Natradze et al. 2003; Bukhnikashvili et al. 2005). The bat has most been found in the Lesser Caucasus, at 600 -1600 meters above sea-level. *Barbastella leucomelas* typically occurs in arid landscapes and is rarely reported in the zone of mountain forests and meadows (Rakhmatulina 1999). It is a resident species, not migrating for long distances; and is found both in summer and winter. Everywhere it is reported to occur in small numbers. Most likely, the small number of the species is due to small number of populations within the area. The bats never form any large accumulations; and the number of bats per roost rarely exceeds 10 individuals.

The bats mainly roost underground (karst and loessial caves, tunnels), rarely also roosting in attics (Satunin 1915). Female bats of reproductive age form nursery colonies in caves. The Eastern Barbastelle is observed to frequently change their roosts, so only areas with a lot of dry underground spaces are fit for roosting. Male and female bats not participating in reproduction most often found as solitary individuals, rarely in small groups. From spring to fall, animals of different sexes roost separately, though share roosts in winter. In roost, the

animals hang one by one, at a certain distance from each other. In loessial underground roosts, the Eastern Barbastelle is most frequently found together with the Greater Horseshoe Bat (*Rhinolophus ferrumequinum*), rarely with the Geoffrey's bat (*Myotis emarginatus*), and occasionally with the Mediterranean Horseshoe Bat (*Rh. euryale),* the Lesser Mouse-Eared Bat *(Myotis blythii)* and the Common Bent-Winged Bat (*Miniopterus schreibersii*). For wintering, the Barbastelle chooses dry caves, grottos and artificial underground sites. These colonies are especially vulnerable to disturbance (Rakhmatulina 2005).

The species biology is not studied sufficiently. Female bats have one offspring in mid-June. The bats fly out at twilight to prey on flying insects, at a small height. They feed on insects without the hard dermal investments, including moths, dipterans, etc.

This cave-dwelling species is rare throughout its area and everywhere small in number. Ecology of *Barbastella leucomelas* is relatively well studied in Tajikistan (Khabilov, 1992). According to this author, the Eastern Barbastelle is typically strongly attained to its underground roosts, and frequent visits to the roosts have negative impact on these animals. Disturbance in roosts is the primary reason of reduction in the number of this species.

Taking into account that in the Caucasus, *Barbastella leucomelas* roosts in various underground spaces mostly located in dry areas (semi-deserts, foothills and mountainous steppes), anthropogenic transformation of these landscapes does not have any significant impact on this species. Entomofauna of these landscapes and existing agrocoenosis there have not been subject to any significant change for the last few decades.

By expert evaluation, the following factors could have an essential impact on the species in all the countries:

- Pesticide use in agriculture;
- Microclimate change in roosts due to the global climate change;

Certain negative impact may result from:

- Deterioration of food supplies due to changes in vegetation and water reservoirs caused by man or natural factors (i.e. resulting from the climate change).
- Climate change resulting in loss of roosts: destruction of dry loessial and clay caves.

Action on protection of the species taken in the Caucasian region

Though the Eastern Barbastelle is included in the Red Data Book of Armenia, no effective measures have been undertaken since the 1980s to protect either the species or its habitats. The primary reason accounting for the species survival is the small number of its clusters, which decreases chances for conflicts with men.

It is planned to include the species in the 2nd edition the Red Data Book of Azerbaijan.

Recommendations for Conservation

- Include the species in the Red Data Books of Azerbaijan and Russia, also of constituents of the Russian Federation where the bat habitats are found (i.e. the Republic of Daghestan).
- Make an inventory of underground wintering roosts; and create PAs in areas of concentration of the Eastern Barbastelle;
- Ensure efficient regional coordination of activities to study and conserve the species in the Caucasus.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Scientific targets include:

- Specify the population status, dynamics of the species number and spread;
- Annually monitor the species in key habitats;
- Study the species diet and identify factors affecting the number of forage species.

The Common Bent-Winged Bat – *Miniopterus schreibersii*

Threats

Colonies of the Common Bent-Winged Bat in underground and overground roosts are vulnerable due to increasing disturbance. Because of their small size and strong metabolism, the Common Bent-Winged Bat quickly dies from poisoning with pesticides; also if insects vanish from feeding areas treated with insecticides, especially during the bat reproduction period; or if frequently awakened from hibernation by roost visitors. With the decreasing number of roosts in all countries of the region, some earlier known colonies are reported to have vanished, and declinein number is observed in other colonies.

Protection Status

Status under the IUCN Red List: *LC*. In 2004, the status was defined as LC according to 2004 IUCN Red List categories (version 3.1). Previously, in 1996, the status was defined as 'Lower Risk/Near Threatened' – LR/nt.

- Armenia: Included into the Red Data Book (1987) as 'included in the Red Data Book of the USSR';
- Azerbaijan: Included in the Red Data Book of Azerbaijan as 'A scarce species with restricted range'; habitats protected under Bern Convention (Appendix II);
- Georgia: Not included in the Red List; protected under EUROBATS;
- Russia: Included into the Red Data Book under category 1 - 'Endangered';
- Regional status by expert evaluation: 'Endangered' (EN).

Biological Assessment

In the broad sense, *Miniopterus schreibersii* populates most of the tropical and subtropical regions of the Old World – Southwestern Europe, Southern Asia, Africa, Australia and islands of Ceylon, Java, Sumatra, Kalimantan, Sulawesi, New Guinea, Philippines, spreading over to the Solomon Islands in the east and the Japanese islands and the border between Northern Korea and Russia in the north (Mitchell-Jones et al. 1999). However, some papers suggest that the species has a number of very similar twin-species (Appleton et al. 2004; Tian et al. 2004). According to this viewpoint, *Miniopterus schreibersii*, in strict sense, probably is not so widespread. Its geographic range covers Northern Africa, European regions adjacent to the Mediterranean, foothills of the Carpathian mountains and the Caucasus, southern Crimea, and Asia Minor. The bats found in the South Caucasus belong to *Miniopterus schreibersii pallidus* (Rakhmatulina 2005). The same form occurs in the mountains of Elbrus and Kopetdag, on the Iranian Plateau, and perhaps somewhere to the south of Pamirs meets with other species of supraspecific complex populating southern slopes of the Himalayas.

The Common Bent-Winged Bat forms colonies of several hundred thousands of individuals. The bat density in colonies reaches 2000 individuals per square meter. In temperate zones of the Palearctic, the Bent-Winged Bat migrates between nursery roosts in summer and wintering roosts. In France, they have been reported to have flown for a distance of up to 550 km. Most populations use transit caves during migrations. Female bats are strongly attained to their place of birth and reproduction (philopatric), so that a colony usually vanishes if the roost is destructed. Little is known about the behaviour of male bats in summer and their migration (Hutson et al. 2001).

In the Caucasus, the species is not equally distributed. In Armenia 5 spots are known (Yavruyan et al. 1990), in Azerbaijan, it occurs only in 4 spots in the Lesser Caucasus (Rakhmatulina 2005, and Rakhmatulina new findings in Nakhchyvan). In Georgia, the species mainly populates the ridges of the Greater Caucasus, and has been found in 31 spots (Bukhnikashvili et al. 2004, and Bukhnikashvili new data). In Russia, there are 55 spots where the bat has been found, all of them in the Western Caucasus (Gazaryan 1999, Gazaryan new data).

The species is almost eurytopic in the Caucasus: it is found in steppes, semi-steppes and xerophytes zones, also in mountain and subtropical forests. In the west of the Caucasus part of the range, many caves are located in the forest zone, but unfortunately the forest is being mercilessly used, and forest felling and thinning results in microclimate change in caves. In Georgia and Russia, the bat has been mostly found in forests in the range from 0 to 2000 meters above the sea level, whereas in Azerbaijan the findings have been reported in the area of semi-steppes and upland xerophytes, at 1000-1600 meters a.s.l.

The biology of *Miniopterus schreibersii* has been studied quite sufficiently in the Caucasus. The most complete data are available about the population roosting in the cave of Azykh (Vorovan cave) in Nagorny Karabakh in summer and in the Kilit cave in Ordubad region, the Nakhchyvan AR, in winter (Rakhmatulina 1980, 1989, 2005). The Kilit cave has been known since the end of the 20th century (Satunin 1915). Fossil remains in the Paleolithic strata suggest that both caves have been colonized by bent-winged bats at least since the Middle Pleistocene (Gajiev, Aliev 1966, 1969).

In the Caucasus, the bent-winged bat migrates seasonally between roosts. The bats mainly roost in various underground caves, usually in cool and humid caves with 80-100% air humidity, and rarely in ancient

stone buildings. In Eastern Georgia, a colony of many thousand bats roosted in the Mtskheta Cathedral (Satunin 1915; Papava 1949).

The bats form colonies of thousands of individuals together with the horseshoe bats and the Lesser Mouse-Eared Bat (*Myotis blythii*), usually dominating in number. High density in colonies results in high rates of infection with ectoparasites (Rakhmatulina 2005). Nursery colonies in the Caucasus include several dozens to tens of thousands of individuals. Female bats usually have offspring in late June – early July, in the midst of the tourist season, when people visit caves and historical sites. Female bats give birth to one, rarely two cubs at a time.

Nursery and wintering colonies are usually located in easily accessible and large roosts, which make the common bent-winged bat susceptible to disturbance. As the bats usually hang densely, openly and rather visibly, they sometimes fall victims of senserless extermination. Large underground sites and historical buildings colonized by bats frequently attract visitors for tourism and recreation, and are more and more frequently used by man. The number of bats in known colonies found in second half of the 20th century has reduced significantly (Perov 1980, Rakhmatulina 1989, Gazaryan 1999), and some colonies have vanished. Thus, colonies in Mtskheta and David Gareji have disappeared in Georgia. In Russia, a nursery colony in cave Svetlaya that included about 10 thousand bats vanished in early 1980s (Kazakov et al. 1980, Panyutin et al. 2001). A wintering colony of 2,5 thousand individuals disappeared from Vorontsovskaya cave after a new underground route was constructed and operated there. Similar reasons resulted in disappearance of colonies in caves Bol'shaya Kazachebrodskaya, Navalishenskaya, Pervomayskaya, Agurskaya, (the Devil's Hole), Takhira (Witches), Krasnoaleksandrovskaya (S.Gazaryan, unpublished data).

The bent-winged bats feed on small flying insects such as moths and small dipterans. They prey on open arid landscapes and over woods. Because of their physiology, the species can hardly bear lack of food in warm seasons and hence prefers foothills with mosaic habitats and high variety and number of potential prey (Panyutin 1983).

Capable of flying very fast (70 km/h), the bats fly several kilometres from their roosts looking for feeding areas. (Kuzyakin 1950)

Because of their small size and strong metabolism as well as and the need to maintain body temperature, many bats can die at once if frequently awakened during hibernation by numerous roost visitors; they also easily die of pesticide poisoning, loss of insects after treatment of feeding areas with insecticides, especially during the bat reproduction period (Red Data Book of Russia, 2001).

The following factors could have an essential impact on the species in all the countries:

- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts;
- Microclimate change in roosts due to the global climate change;

Certain negative impact may result from:

- Increased number of visitors and greater use of cultic facilities and old buildings; long-term impact of noise and vibration from building and industry either within or around the roosts;
- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Pesticide use in agriculture and forestry and water pollution (agricultural runoff, industrial and domestic wastewater) leading to insect loss and resultant reduction in food supplies;

Actions taken for the species conservation in the Caucasus

Though the common bent-winged bat has been protected by law in all the Caucasus countries since 1978 as a species included in the USSR Red Data Book, practically no steps have taken protect either the species or its habitats. Some roosts are located in PAs, yet are not subject to special protection. Insufficiency of taken measures is confirmed by significant reduction in the number of individuals in known colonies found in second half of the 20th century (Perov 1980, Rakhmatulina 1989, Gazaryan 1999), and disappearance of some colonies.

In Armenia, a grating was installed at the entrance to Mozrov cave to protect the bats colony there.

Recommendations for Conservation

- Include the species in the Red List of Georgia (See Table 3. National, Regional and Global Status of Caucasus Chiroptera by IUCN categories);
- Ensure efficient regional coordination of expert groups to study and protect the species in the Caucasus.

Actions recommended in the «Bats Conservation Action Plan for the Caucasus» are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Monitor the status of the species populations in the Caucasus. (1.1.3, 1.1.4)
- Strengthen bat conservation in PAs (1.2.1, 1.2.2, 1.2.4)
- Establish PAs in areas of Key-habitats for batsfor habitat protection (1.2.3)
- Strengthen protection of underground roosts (1.4.4 - 1.4.7)
- Adopt procedures for regulating economic activities of owners and users of buildings/sites colonized by bats (6.2.3)
- Take actions to mitigate consequences of the global climate change (5.1.1)

Medium-term purposes require actions to be taken during the first 10 years of Plan activities:

- Take action to harmonize coexistence of bats and men (3.2.3, 3.3.4)
- Involve population in bat conservation (6.1.4)

Scientific targets:

- Monitor nursery colonies and wintering populations and measure the population reproduction rate.
- Study the diet and feeding needs of the Miniopterus schreibersii and identify factors affecting the number of the forage species for developing land use policy and practice favourable for the species.

Free Tailed Bat – *Tadarida teniotis*

Threats

The species is not found in the Caucasus. In other parts of the distribution area, main threats include cold winters and disturbance in colonies. The species is rare; extermination of any colony may bring grave consequences for the population in the region.

Protection Status

Status under the IUCN Red List: LC. In 1996, the status was defined as LR/lc according to 1994 IUCN Red List categories (version 2.3).

- Armenia: Included in the Red Data Book (1987) as 'Included in the Red Data Book of the USSR';
- Azerbaijan: Included in the Red Data Book of Azerbaijan as 'Extremely rare species with restricted range'; habitats protected under Bern Convention (Appendix II);
- Georgia: Not found on the territory of Georgia nor included in the Red List; protected under EUROBATS;
- Russia: Not protected;
- Regional status by expert evaluation: 'Data Deficient' (DD).

Biological Assessment

The global geographic range of the species covers the north of the Mediterranean, including southern slopes of the Alps, all islands and the Iberian Peninsula, the Apennines, the Balkan Peninsula and Asia Minor, eastern coast of the Mediterranean sea and spreads farther to the Caucasus, up to Elbrus, Kopet Dagh and the Pamirs in Central Asia. Separate spots are reported in the Arabian Peninsula and southern Iran.

For the first time this species was discovered on the territory of Nagorny Karabakh, in 1938. In Shusha gorge (Nagorny Karabakh), the Free Tailed Bat was first discovered by N. Gubarev and then found by A. Kuzyakin in 1939 (Rakhmatulina 2005). In Armenia 5 spots are reported: in the surroundings of villages Yenokavan, Papanino, Berd and Movses (Mosesgekh) in the Taush marz, and village Khndzoresk in the Syunik marz (Yavruyan 1974; Yavruyan, Safaryan 1975; Yavruyan, Arutyunyan 1999;). Altogether, there are 6 spots found in the Lesser Caucasus. In Georgia, signals typical for the Free Tailed Bat were registered annually near villages Bakurianis Andeziti, Sakire, Mzetamze, in Borjomi region during detection of feeding bats by means of ultrasonic bat detectors in 2004-2008, yet the animals themselves were never found (Bukhnikashvili et al. new data). In Russia, the species has been observed in 2 spots in the Greater Caucasus: near Kislovodsk, in the Stavropol Area (Korneev, Marisova 1950) and in the river Cherek-Bezengiysky valley, in Kabardino-Balkaria (Tembotov, Shabaev 1962).

The species populates open arid landscapes such as Alpine meadows, steppes and semi-deserts. In Armenia and Georgia, it is found in mountain river gorges, in the mixed forest zone. Typically, the bats are found in places near cliffs, deep gorges and precipices. In the Kyrgyz republic, the species is reported to roost in high mountains, up to 3100 meters above sea-level, while in the Caucasus it is found in the range of 1500 to 2000 meters a.s.l.

Tadarida teniotis roosts in crevices, cracks in stone structures, under loosened rind (Yavruyan, Safaryan 1975). One and the same animal may simultaneously use shelter in roosts located at a long distance (6,5-15,5 km) from each other (Arlettaz et al. 2000). Small colonies of the Free Tailed Bat, ranging from 5-50 female bats to

rarely more than one hundred, usually roost in vertical crevices in rocks, or in cracks of ceilings of large grottos. (http://zmmu.msu.ru/bats/rusbats/tten.html; Lanza, Agnelli).

The species biology is not studied in the Caucasus. According to information from the other parts of the geographic range, female bats usually have one offspring in June (Red Data Book of the USSR 1978). Looking for aggregations of food species, the Free Tailed Bats fly for long distances: in Europe, they are reported to have covered distances from 20 to 100 km (Arlettaz et al. 2000; Marques et al. 2004; Lanza, Agnelli). The species is very sensitive to strong colds (Arlettaz et al. 2000). No cases of the Free Tailed Bat wintering in the Caucasus have been ever reported.

At the northern border of its range in the Caucasus, the Free Tailed Bat obviously depends on availability of suitable roosts. Most of the roosts are located in areas that men cannot access, so that the colonies there may be disturbed only incidentally. However, the rarity and lack of information on this species in the Caucasus makes it necessary to protect every individual found in the region.

By expert evaluation, the following factors could have an essential impact on the species in all the countries:

- Deterioration of natural habitats due to anthropogenic change of the environment around the roosts and in feeding areas and flyways;
- Microclimate change in roosts due to the global climate change, and roost loss due to climate change.

Certain negative impact may result from:

- Human change of vegetative cover structure leading to destruction and deterioration of natural habitats;
- Pesticide use in agriculture and forestry and water pollution (agricultural runoff, industrial and domestic wastewater) leading to insect loss and resultant reduction in food supplies;
- Pesticide runoff from fields into fresh water bodies leading to animal poisoning through food and water;

Actions taken for the species conservation in the Caucasus

In all the Caucasus countries the Free Tailed Bat has been protected since 1978, as a species included into the Red Data Book of the USSR, yet practically no steps have been taken to protect either the species or its habitats.

Recommendations for Conservation

- Ensure efficient regional coordination of expert groups to study the species in the Caucasus;
- Identify areas populated and used by *Tadarida teniotis* in order to ensure efficient protection of habitats.

Actions recommended in the **«Bats Conservation Action Plan for the Caucasus»** are grouped below and referred to respective actions in the Action Plan in brackets.

First priority purposes should be achieved through the most urgent actions to be taken during the first 5 years of the Plan activities:

- Identify and notify to the official authorities areas important for the species survival (1.1.1, 1.1.2).

Medium-term purposes require actions to be taken during the first 10 years of Plan activities: currently N/A.

Scientific targets:

- Study habitat use by means of radio telemetry;
- Study the species diet and identify factors the number of the forage species.

CONCLUDING REMARKS

Further Action

Administrative

- Submit the Regional «Bats Conservation Action Plan for the Caucasus» to the Caucasus Regional Council for Biodiversity Conservation, WWF regional offices (WWF Caucasus, WWF Russian Caucasus), IUCN/SSC experts, UNEP/EUROBATS Advisory Committee, IUCN Programme Office for the South Caucasus and IUCN office for Russian and CIS countries;
- Project participants to prepare and publish National Action Plans for Bat Conservation in the national languages;
- Submit National Action Plans for Bat Conservation to relevant authorities in each country.

Practical Protection

- Continue working with volunteers involved in the development of the Action Plan and CEPF Project.
- Conduct awareness raising campaigns with population groups that can have an impact on colonies of protected bat species.
- Use any opportunity to protect bat colonies and key habitats from human destruction by installing grate fences at cave entrances, counsel builders and priests about any problems with bats living in buildings.

Bat research in the Caucasus

- Set up a Caucasian Bat Conservation Group, to coordinate research and activities of the Bat Monitoring Network for the Caucasus (Regional Bat Monitoring Network).
- Continue studies of the biology and ecology of the Caucasian bats.

Foresight – Key Expectations

The Authors have the following expectations:

- All countries of the Caucasus would adopt this Action Plan as the basis for developing national strategies for bat conservation and would integrate it in the National Biodiversity Conservation Strategies and Action Plans;
- Countries of the Caucasus that have not yet affiliated with EUROBATS (The Agreement on the Conservation of Populations of European Bats) and the Bern Convention (The Convention on the Conservation of European Wildlife and Natural Habitats), would accede to these;
- Activities of the Caucasian Bat Conservation Group and the Regional Bat Monitoring Network (Bat Monitoring Network for the Caucasus) established when developing the Action Plan would be recognized by national authorities and supported by scientific and conservation communities in the countries and beyond the Caucasus region;
- Volunteer groups of the Regional Bat Monitoring Network would be capable of efficiently protecting most important roost and habitats;
- The Goal of the Action Plan would be achieved before extinction of any bat species in the Caucasus.

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ANEXES

Annex 1

List of Bats Occurred in the Caucasus

Order: *Chiroptera* Blumenbach, 1779
Family: *Rhinolophidae* Gray, 1825
Genus *Rhinolophus* Lacepede, 1799
1. *Rhinolophus ferrumequinum* Schreber, 1774 – Greater Horseshoe Bat.
Synonyms Synonyms: *Vespertilio ferrum-equinum* Shreber, 1774; *Vespertilio hippocrepis* Schrank, 1789; *Rhinolophus unihastatus* E. Geoffroy, 1813; *Rhinolophus ferrumequinum proximus* Andersen, 1905; *Rhinolophus ferrumequinum colchicus* Satunin, 1912; *Rhinolophus ferrumequinum irani* Cheesman, 1921.
2. *Rhinolophus hipposideros* Bechstein, 1800 – Lesser Horseshoe Bat.
Synonyms: *Vespertilio ferrum-equinum minor* Kerr, 1792; *Vespertilio hipposideros* Bechstein, 1800; *Vespertilio hippocrepis* Hermann, 1804; *Rhinolophus bihastatus* E. Geoffroy 1813.
3. *Rhinolophus blasii* Peters, 1866 - Blasius' Horseshoe Bat.
Synonyms: *Rhinolophus clivosus* Blasius, 1857; *Rhinolophus blasii* Peters, 1866; *Rhinolophus blasiusi* Trouessart, 1910.
4. *Rhinolophus euryale* Blasius, 1853 - Mediterranean Horseshoe Bat.
Synonyms: *Rhinolophus euryale* Blasius, 1853; *Rhinolophus euryale nordmani* Satunin, 1912.
5. *Rhinolophus mehelyi* Matschie, 1901 - Mehely's Horseshoe Bat.
Synonyms: *Rhinolophus mehelyi* Matschie, 1901; *Rhinolophus euryale mehelyi* 1910.

Family: *Mollossidae* Gervais, 1856.
Genus *Tadarida* Rafinesque, 1814.
6. *Tadarida teniotis* Rafinesque, 1814 – European Free-tailed Bat.
Synonyms: *Cefalotes teniotis* Rafinesque, 1814; *Nyctinomus teniotis*

Family: *Vespertilionidae* Gray, 1821
Genus *Myotis* Kaup, 1829
7. *Myotis (M.) blythii* (Thomes, 1857) - Lesser Mouse-Eared Bat.
Synonyms: *Vespertilio blythii* Thomes, 1857; *Vespertilio oxygnathus* Monticelli, 1885;
Myotis myotis omari Thomas, 1906.
8. *Myotis (P.) bechsteinii* Kuhl, 1817 - Bechstein's Bat.
Synonyms: *Vespertilio bechsteinii* Kuhl, 1817.
9. *Myotis (I.) nattereri* Kuhl, 1817 - Natterer's Bat.
Synonyms: *Vespertilio nattereri* Kuhl, 1817; *Vespertilio nattereri tschuliensis* Kuzyakin, 1935.
10. *Myotis (I.) schaubi* Kormos, 1934 – Schaub's Myotis.
Synonyms: *Myotis nattereri araxenus* Dahl, 1947.
11. *Myotis (I.) emarginatus* E. Geoffroy, 1806 - Geoffroy's Bat.
Synonyms: *Vespertilio emarginatus* E. Geoffroy, 1806; *Vespertilio ciliatus* Blasius, 1857; *Myotis lanaceus saturatus* Kuzyakin, 1934.
12. *Myotis (S.) mystacinus* (Kuhl, 1817) - Whiskered Bat.
Synonyms: *Vespertilio mystacinus* Kuhl, 1817.
13. *Myotis (S.) aurascens* Kuzyakin, 1935 - Steppe whiskered bat
Synonyms: *Myotis mystacinus aurascens* Kuzyakin, 1935; ?*bulgaricus* Heinrich, 1936; *popovi* Strelkov, 1983; *mongolicus* Kruskop, Borissenko, 1996.
14. *Myotis (S.) hajastanicus* Argyropulo, 1939 – Armenian whiskered bat.
Synonyms: *Myotis mystacinus hajastanicus* Argyropulo, 1939.
15. *Myotis (S.) brandti* Eversmann, 1845 - Brandt's Bat.
Synonyms: *Vespertilio brandtii* Eversmann, 1845.
Subgenus *Leuconoe* Boie, 1830.
16. *Myotis (L.) dasycneme* (Boie, 1825) – Pond bat.
Synonyms: *Vespertilio mystacinus* Boie, 1823; *Vespertilio dasycneme* Boie, 1825.
17. *Myotis (L.) daubentonii* (Kuhl, 1817) - Daubenton's (Water) bat.
Synonyms: *Vespertilio daubentonii* Kuhl, 1817; *Vespertilio volgensis* Eversmann, 1840

Genus *Barbastella* Gray, 1821
18. *Barbastella barbastellus* Schreber, 1774 – Western Barbastelle.

Synonyms: *Vespertilio barbastellus* Schreber, 1774; *Barbastella communis* Grai, 1838; *Synotus barbastellus*
19. *Barbastella leucomelas* Cretzschmar, 1826 – Asian Barbastelle.
Synonyms: *Vespertilio leucomelas* Cretzschmar, 1826; *Synotus darjelingensis* Dobson, 1875; *Barbastella barbastellus caspicus* Satunin, 1909.

Genus *Plecotus* E. Geoffroy, 1818
20. *Plecotus auritus* Linnaeus, 1758 - Brown Long-eared Bat.
Synonyms: *Vespertilio auritus* Linnaeus, 1758; *Macrotus europaeus* Leach, 1816; *Plecotus auritus* E. Geoffroy, 1818; *Plecotus brevimanus* L. Jenyns 1828.
21. *Plecotus macrobullaris* Kuzyakin, 1965 - .
Synonyms: *Vespertilio auritus austriacus* Fischer, 1829; *Plecotus auritus wardi* Thomas, 1911; *Plecotus austriacus macrobullaris* Kuzyakin, 1965

Genus *Pipistrellus* Kaup, 1829
22. *Pipistrellus pipistrellus* Schreber, 1774 – Common Pipistrelle, Common Bat.
Synonyms: *Vespertilio pipistrellus* Schreber, 1774; *Vespertilio lacteus* Temmink, 1840; *Vespertilio typus* Bonaparte, 1845.
23. *Pipistrellus pygmaeus* Leach, 1825 - Pygmy Pipistrelle
Synonyms: *Vespertilio pygmaeus* Leach, 1825; *Vespertilio mediterraneus* Cabrera, 1904
24. *Pipistrellus nathusii* Keyserling et Blasius, 1839 - Nathusius' Pipistrelle.
Synonyms: *Vespertilio abramus* Dobson, 1878.
25. *Pipistrellus kuhlii* Kuhl, 1817 - Kuhl's Pipistrelle, Flitter-Mouse.
Synonyms: *Vespertilio kuhlii* Kuhl, 1817; *Pipistrellus lepidus* Blyth, 1845.

Genus *Hypsugo* Kolenati, 1856
26. *Hypsugo savii* Bonaparte, 1837 - Savi's Pipistrelle.
Synonyms: *Vespertilio savii* Bonaparte, 1837; *Vespertilio agilis* Fatio, 1872; *Vesperugo (Vesperus) caucasicus* Satunin, 1901.

Genus *Nyctalus* Bowdich, 1825
27. *Nyctalus lasiopterus* Schreber, 1780 – Greater (Giant) Noctule Bat.
Synonyms: *Vespertilio lasiopterus* Schreber, 1780; *Nyctalus siculus* Palumbo, 1868.
28. *Nyctalus noctula* Schreber, 1774 – Noctule Bat (Common Noctule).
Synonyms: *Vespertilio noctula* Schreber, 1774; *Vespertilio proterus* Kuhl, 1818;
29. *Nyctalus leisleri* Kuhl, 1817 - Lesser Noctule (Leisler's) Bat.
Synonyms: *Vespertilio leisleri* Kuhl, 1817; *Vespertilio dasykarpos* Kuhl, 1818

Genus *Eptesicus* Rafinesque, 1820
30. *Eptesicus (A.) nilssoni* Keyserling et Blasius, 1839 - Northern Bat.
Synonyms: *Vespertilio kuhlii* Nilsson, 1836; *Vespertilio borealis* Nilsson, 1838;
31. *Eptesicus (A.) bobrinskoi* Kuzyakin, 1935 – Bobrinski's Bat.
Synonyms: *Vespertilio nasutus bobrinskii* Kuzyakin, 1935
32. *Eptesicus (E.) serotinus* Schreber, 1774 – Serotine, House Bat.
Synonyms: *Vespertilio serotinus* Schreber, 1774; *Vespertilio serotine* Muller, 1776.
33. *Eptesicus (E.) bottae* (Peters, 1869) - Botta's Serotine.
Synonyms: *Vespertilio ognevi* Bobrinskoy, 1918; *Vespertilio sodalis ognevi* Bobrinskoy, 1925

Genus *Vespertilio* Linnaeus, 1758
34. *Vespertilio murinus* Linnaeus, 1758 – Parti-coloured (Frosted) Bat.
Synonyms: *Vespertilio discolor* Kuhl, 1819

Genus *Miniopterus* Bonaparte, 1837
35. *Miniopterus schreibersii* Kuhl, 1817 - Long-Winged (Schreiber's) Bat.
Synonyms: *Vespertilio schreibersii* Kuhl, 1817

Annex 2

Armenia – Threats Matrix by Species

1 – Most critical threats **2 – Critical threats** **3 – Less critical threats** **0 – No impact on the species**	*Rh. ferrumequinum*	*Rh .hipposideros*	*Rhinolophus euryale*	*Rhinolophus mehelyi*	*Myotis blythii*	*Myotis bechsteinii*	*Myotis dasycneme*	*Myotis emarginatus*	*Myotis schaubi*	*Nyctalus lasiopterus*	*B. barbastellus*	*B. leucomelas*	*Miniopterus schreibersii*	*Tadarida teniotis*
Destruction and Deterioration of Habitats														
Roost destruction by man (including felling of hollow trees)	1	1	1	2	2			1	1		1	1	1	2
Roost deterioration because of human change of environment	2	2	2	2	2			2	1		1	3	2	1
Design change and reconstruction of buildings (leaving no place for bats)	3	3	0	0	3			3	0		3	1	2	0
Fires	0	0	0	0	3			2	2		1	0	2	1
In feeding areas and flyways														
Destruction of forest belts	3	3	0	0	3			2	2		2	3	2	1
Use of watercourse shores for industrial zones and recreation	0	0	3	2	3			2	2		3	3	3	2
Construction of line structures (transmission lines, roads, etc)	0	0	0	3	3			3	2		0	0	0	2
Lack of Forage														
Human change of vegetative cover structure	3	3	2	2	2			2	2		2	3	2	2
Expansion of agricultural lands at the expense of natural landscapes – increasing areas of fields and rangeland	3	3	3	2	3			3	2		2	3	3	2
Pesticide use in agriculture and forestry	2	2	2	2	3			2	2		1	2	2	2
Water pollution leading to insect loss (agricultural runoff, industrial and domestic wastewater)	2	3	2	2	3			3	2		2	2	2	2
Changed reservoir productivity because of changes in hydrological regime	3	3	2	3	3			3	2		2	3	3	2
Impact of climate change and human activity on the status (number) of invertebrate species wintering in roosts (caves, tree hollows, antics, etc) together with bats	2	3	2	3	3			3	0		0	3	3	2
Disturbance factors: *In roosts*														
Increased number of cave visitors	1	1	1	1	2			2	2		2	2	1	0
Increased number of visitors and greater use of cultic facilities and old buildings	2	3	1	1	2			2	2		2	2	1	3
Long-term impact of noise and vibration from building and industry	2	3	2	0	3			1	2		2	2	2	2
Outside roosts: Lights	2	2	2	2	3			3	2		2	3	2	2
Noise and vibration	0	0	0	0	3			3	2		2	2	2	2
Environmental Pollution – bat poisoning by food and water (via the food chain)														
Pesticide runoff from fields into fresh water bodies leading to forage loss	3	3	2	2	3			2	2		2	2	2	2
Pesticide use in agriculture and forestry (and accumulating in insects)	3	3	3	3	3			2	2		2	2	2	1
Water and air pollution by toxic wastes and emissions from industries and transport	3	3	3	3	3			3	2		3	3	3	2
Climate change														
Climate change decreasing species performance (by increasing mortality and decreasing birthrates)	2	1	1	2	1			1	2		2	2	1	1

Microclimate change in roosts making them unfit for roosting	1	1	1	1	1			1	1		1	1	1	1
Vegetation and reservoir changes deteriorating forage resources	3	2	2	2	1			1	1		1	2	1	1
Climate change leading to roost loss	2	2	2	2	3			2	3		3	2	2	1

Azerbaijan – Threats Matrix by Species

1 – Most critical threats **2 – Critical threats** **3 – Less critical threats** **0 – No impact on the species**	*Rh. ferrumequinum*	*Rh .hipposideros*	*Rhinolophus euryale*	*Rhinolophus mehelyi*	*Myotis blythii*	*Myotis bechsteinii*	*Myotis dasycneme*	*Myotis emarginatus*	*Myotis schaubi*	*Nyctalus lasiopterus*	*B. barbastellus*	*B. leucomelas*	*Miniopterus schreibersii*	*Tadarida teniotis*
Destruction and Deterioration of Habitats														
Roost destruction by man (including felling of hollow trees)	1	1		3	2	1		1			1	1	3	3
Roost deterioration because of human change of environment	2	2		2	2	2		1			1	1	1	1
Design change and reconstruction of buildings (leaving no place for bats)	2	2		2	2	2		1			1	2	3	3
Fires	3	2		3	3	3		2			2	2	2	0
In feeding areas and flyways	2	2		2	2	1		1			1	3	2	0
Destruction of forest belts	2	2		2	2	1		1			1	3	3	0
Use of watercourse shores for industrial zones and recreation	2	2		2	2	1		1			1	2	3	0
Construction of line structures (transmission lines, roads, etc)	2	2		3	2	1		1			1	1	2	0
Lack of Forage														
Human change of vegetative cover structure	1	2		1	1	1		1			1	1	1	1
Expansion of agricultural lands at the expense of natural landscapes – increasing areas of fields and rangeland	1	2		1	1	1		1			1	1	1	1
Pesticide use in agriculture and forestry	1	1		1	1	1		1			1	2	2	0
Water pollution leading to insect loss (agricultural runoff, industrial and domestic wastewater)	1	1		3	2	1		1			1	2	2	0
Changed reservoir productivity because of changes in hydrological regime	2	2		2	2	1		1			1	2	3	0
Impact of climate change and human activity on the status (number) of invertebrate species wintering in roosts (caves, tree hollows, antics, etc) together with bats	2	1		1	1	1		1			1	1	1	0
Disturbance factors: *In roosts*														
Increased number of cave visitors	2	2		1	1	0		1			2	1	1	0
Increased number of visitors and greater use of cultic facilities and old buildings	2	1		1	1	1		1			2	2	2	0
Long-term impact of noise and vibration from building and industry	2	2		2	2	2		2			2	3	2	0
Outside roosts: Lights	3	3		0	0	2		2			2	3	3	0
Noise and vibration	2	2		0	0	2		2			2	2	3	0
Environmental Pollution – bat poisoning by food and water (via the food chain)														
Pesticide runoff from fields into fresh water bodies leading to forage loss	2	2		2	2	1		1			1	1	2	0
Pesticide use in agriculture and forestry (and accumulating in insects)	2	2		2	2	1		1			1	2	1	0
Water and air pollution by toxic wastes and emissions	2	2		2	2	2		2			2	2	2	0

from industries and transport														
Climate change														
Climate change decreasing species performance (by increasing mortality and decreasing birthrates)	2	2		1	1	1		1			1	1	1	0
Microclimate change in roosts making them unfit for roosting	2	2		2	2	2		2			2	2	2	0
Vegetation and reservoir changes deteriorating forage resources	2	1		1	1	1		1			1	2	2	0
Climate change leading to roost loss	2	2		3	2	1		1			1	2	3	0

Georgia – Threats Matrix by Species

1 – Most critical threats **2 – Critical threats** **3 – Less critical threats** **0 – No impact on the species**	*Rh. ferrumequinum*	*Rh .hipposideros*	*Rhinolophus euryale*	*Rhinolophus mehelyi*	*Myotis blythii*	*Myotis bechsteinii*	*Myotis dasycneme*	*Myotis emarginatus*	*Myotis schaubi*	*Nyctalus lasiopterus*	*B. barbastellus*	*B. leucomelas*	*Miniopterus schreibersii*	*Tadarida teniotis*
Destruction and Deterioration of Habitats														
Roost destruction by man (including felling of hollow trees)	1	1	1	1	1	1		1		1	1		1	
Roost deterioration because of human change of environment	1	1	1	1	1	1		1		1	1		1	
Design change and reconstruction of buildings (leaving no place for bats)	2	2	3	3	2	3		2		3	2		3	
Fires	3	2	3	3	2	2		3		1	1		3	
In feeding areas and flyways	1	1	1	1	1	1		1		1	1		1	
Destruction of forest belts	2	1	2	2	3	3		2		1	2		2	
Use of watercourse shores for industrial zones and recreation	3	3	3	3	3	3		2		3	2		3	
Construction of line structures (transmission lines, roads, etc)	3	3	3	3	3	3		3		3	3		3	
Lack of Forage														
Human change of vegetative cover structure	2	2	2	2	3	2		3		3	2		2	
Expansion of agricultural lands at the expense of natural landscapes – increasing areas of fields and rangeland	2	2	2	2	2	2		2		2	2		2	
Pesticide use in agriculture and forestry	1	1	1	2	1	1		2		2	1		1	
Water pollution leading to insect loss (agricultural runoff, industrial and domestic wastewater)	1	2	2	2	2	2		1		2	1		2	
Changed reservoir productivity because of changes in hydrological regime	2	2	2	2	2	1		1		2	1		1	
Impact of climate change and human activity on the status (number) of invertebrate species wintering in roosts (caves, tree hollows, antics, etc) together with bats	1	1	1	1	1	1		1		1	1		1	
Disturbance factors: *In roosts*														
Increased number of cave visitors	1	2	1	1	1	2		1		3	2		2	
Increased number of visitors and greater use of cultic facilities and old buildings	3	3	3	3	2	2		2		3	2		2	
Long-term impact of noise and vibration from building and industry	1	1	1	3	1	3		1		2	1		1	
Outside roosts: Lights	2	3	2	3	2	3		3		3	2		2	
Noise and vibration	1	1	1	1	1	2		1		3	2		1	
Environmental Pollution – bat poisoning by food and water (via the food chain)														
Pesticide runoff from fields into fresh water bodies	1	1	1	1	1	1		1		1	1		1	

leading to forage loss														
Pesticide use in agriculture and forestry (and accumulating in insects)	1	1	1	1	1	1		1		1	1		1	
Water and air pollution by toxic wastes and emissions from industries and transport	3	3	3	3	3	3		3		3	3		3	
Climate change														
Climate change decreasing species performance (by increasing mortality and decreasing birthrates)	1	1	1	1	1	1		1		1	1		1	
Microclimate change in roosts making them unfit for roosting	1	1	1	1	1	1		1		2	1		1	
Vegetation and reservoir changes deteriorating forage resources	1	1	1	1	1	1		1		1	1		1	
Climate change leading to roost loss	2	2	2	2	2	2		2		2	2		2	

Russia – Threats Matrix by Species

1 – Most critical threats **2 – Critical threats** **3 – Less critical threats** **0 – No impact on the species**	*Rh. ferrumequinum*	*Rh .hipposideros*	*Rhinolophus euryale*	*Rhinolophus mehelyi*	*Myotis blythii*	*Myotis bechsteinii*	*Myotis dasycneme*	*Myotis emarginatus*	*Myotis schaubi*	*Nyctalus lasiopterus*	*B. barbastellus*	*B. leucomelas*	*Miniopterus schreibersii*	*Tadarida teniotis*
Destruction and Deterioration of Habitats														
Roost destruction by man (including felling of hollow trees)	1	1	1	1	1	1		1		1	1	3	1	3
Roost deterioration because of human change of environment	1	1	1	1	3	1		2		2	1	3	2	3
Design change and reconstruction of buildings (leaving no place for bats)	2	1	2	2	1	2		2		3	2		3	3
Fires	3	3	3	3	3	1		3		1	1	3	3	3
In feeding areas and flyways														
Destruction of forest belts	3	3	3	3	3	3		3		3	3	3	3	3
Use of watercourse shores for industrial zones and recreation	3	3	3	3	3	2		3		3	2	3	3	3
Construction of line structures (transmission lines, roads, etc)	2	2	2	3	2	1		1		3	1	3	3	3
Lack of Forage														
Human change of vegetative cover structure	1	1	1	3	2	1		1		3	1	3	3	3
Expansion of agricultural lands at the expense of natural landscapes – increasing areas of fields and rangeland	2	2	2	2	3	1		1		2	1	3	3	3
Pesticide use in agriculture and forestry	3	3	3	3	3	3		3		3	3	3	3	3
Water pollution leading to insect loss (agricultural runoff, industrial and domestic wastewater)	3	3	3	3	3	3		3		3	3	3	3	3
Changed reservoir productivity because of changes in hydrological regime	3	3	3	3	3	3		3		3	3	3	3	3
Impact of climate change and human activity on the status (number) of invertebrate species wintering in roosts (caves, tree hollows, antics, etc) together with bats	3	3	3	3	3	3		3		3	3	3	3	3
Disturbance factors: *In roosts*														
Increased number of cave visitors	1	1	1	1	1	2		1		3	1	3	1	3
Increased number of visitors and greater use of cultic facilities and old buildings	2	1	2	2	1	2		2		3	3	3	3	3
Long-term impact of noise and vibration from building and industry	3	3	3	3	3	3		3		3	3	3	3	3
Outside roosts: Lights	2	1	2	2	1	1		1		3	1	3	3	3

Noise and vibration	3	3	3	3	3	2		3		3	3	3	3	3
Environmental Pollution – bat poisoning by food and water (via the food chain)														
Pesticide runoff from fields into fresh water bodies leading to forage loss	3	3	3	3	3	3		3		3	3	3	3	3
Pesticide use in agriculture and forestry (and accumulating in insects)	3	3	3	3	3	3		3		3	3	3	3	3
Water and air pollution by toxic wastes and emissions from industries and transport	3	3	3	3	3	3		3		3	3	3	3	3
Climate change														
Climate change decreasing species performance (by increasing mortality and decreasing birthrates)	1	1	1	1	1	1		1		1	1	1	1	1
Microclimate change in roosts making them unfit for roosting	1	1	1	1	1	1		1		1	1	1	1	1
Vegetation and reservoir changes deteriorating forage resources	3	3	3	3	3	2		3		3	3	2	3	3
Climate change leading to roost loss	2	2	2	2	2	2		2		3	2	2	2	2

Annex 3

Logical Framework of the Action Plan

Logical Framework (Log Frame) is an approach widely used in meetings (symposia) to improve joint work. The Log Frame approach permits cooperation in identifying visions and goals in the course of the problem analysis and decision-making, which are then entered into a matrix of 'objectives, purposes and actions'). The sequence of steps to develop an action plan can be as follows:

Vison is a picture or a status condition in far perspective that could be achieved in best possible circumstances, an idealized image of the desired and feasible future condition, to which the Action Plan authors and implementers are striving; a goal that is achievable in a long-term perspective, e.g. in the following ~25 - 50 years (Rumisen 2004; Miasoedov 2005).

Goal is a large-scale the object of one's endeavours, something to be achieved strategically for getting closer to the Vision. A Goal should be something feasible, and the time period of achieving the Goal should be identified. For instance, it should be a specific goal achievable in 15-25 years.

Objectives: There are usually several objectives (steps) to attain on the way towards achieving the Goal that take into account the situation in the country, available experience and opportunities. Implementation of objectives is usually scheduled within 10-15 years. After an objective is achieved, a new one should be identified and implementation of the subsequent objective may start.

Purposes are stages of attaining Objectives or major directions of the work specifying actions necessary to achieve the Objectives. Purposes are usually planned for a period of about 5 years.

Actions are activities necessary to achieving the purposes and implemented as parallel or consecutive efforts within a period from a year to three years.

Problem analysis, identification of Threats, Gaps, and Enabling Conditions for successful implementation of the Vision are components of the Log Frame approach.

Identification of the *Vision* and *Goal* as well as identification of *Threats* permit further determination of *Objectives, Purposes* and *Actions.*

After the problem analysis, meeting participants formulate specific *Objectives* permitting to overcome the *Threats* and achieve the *Goal* on the way towards the *Vision.* Usually these Objectives are distributed between several key organizational levels or directions, such as protection of certain populations or key habitats of some species, improving of the legal framework, working with population and representatives of business, etc. Some more general *Goals* such as raising public awareness and capacity building can refer to different levels.

Annex 4

Gazetteer

Armenia

Place name	Key habitats	Coordinates	Key species	Remarks
North-East part of Armenia. Gorges of rivers Debet, Agstav and Bldanchay in vicinities of villages Shnokh and Shamlug, slopes of mountain Lalvar.	Cave Shamir	44,7125 41,1758	*Rhinolophus ferrumequinum* – Mid-size colony *Myotis blythii* *Barbastella leucomelas* *Miniopterus schreibersii*	The Shamir cave is a main component of the complex consisting from of tens natural and artificial caves.
Arenguni and Sevan mountain ridges in the basin of the lake Sevan in vicinities of villages Shorzha, Tsapatakh, Krasnoselsk, Shishkaya, Vardenis, Lichk.	Cave Karmir	45,4853 40,4178	*Myotis blythii* – Mid-size colony *Rhinolophus ferrumequinum,* *Myotis bechsteinii,* *Barbastella leucomelas.*	Underground sites at 1850-2000m from sea level. High species diversity -10 species.
	9 grottos and 4 caves on Lake Sevan coast.	45,3239 40,2253		
Caves in the Armavir district	Metsamor Cave	44,1092 40,1361	*Rhinolophus ferrumequinum* – Mid-size colony *Rhinolophus mehelyi* – Small colony *Myotis blythii* – Small colony *Miniopterus schreibersii* – Small colony	Cave Karmir Blur is situated in the Yerevan and therefore are under high anthropogenic pressure. In the past, the colony of the *Rhinolophus mehelyi* was large, now number of animals drastically declines.
	Cave Karmir Blur	44,501 40,1746		
Khosrov strict nature reserve and slopes descending to riv. Araks in Ararat valley.	Deciduous forest; caves PP and Wild Goat	44,9036 40,0558	*Rhinolophus ferrumequinum,* *Myotis blythii*	High species diversity. There are few caves on the territory of the nature reserve. *Rhinolophus ferrumequinum, Myotis blythii* and other species have roosts in caves.
The Vorotan gorge, north and west slopes of the Vayotsdzor and Zangezur ridges descending to the river Arpa; Noravan gorge.	Cave Mageli Zaga	45,2067 39,7236	*Rhinolophus ferrumequinum* – Mid-size colony *Rhinolophus hipposideros* – Single individuals *Rhinolophus euryale* – Mid-size colony *Rhinolophus mehelyi* – Single individuals *Miniopterus schreibersii* – Small colony	High species diversity – 10 species. Many cave and quite developed forest on some sites of area.
	Cave Banali	45,2111 39,7025	*Rhinolophus euryale* – Small colony	
	Cave Rind	45,1863 39,7656	*Rhinolophus ferrumequinum* – Large colony	
	Cave Chaikend	45,5589 39,6933	*Rhinolophus euryale* – Large colony *Rhinolophus hipposideros* – Small colony	
	Cave Waterfall	45,6741 39,8402	*Myotis bechsteinii* – Single individuals	

Place name	Key habitats	Coordinates	Key species	Remarks
Eastern slopes of the Zangezur ridge, Syunik upland, Megri ridge from the Kafan city to the Iranian border.	Khndzoresk cave city, temple ruins.	46,4342 39,5121	*Rhinolophus ferrumequinum* – Small colony *Barbastella leucomelas* – Mid-size colony *Myotis blythii* - Small colony *Miniopterus schreibersii* - Small colony	
	Cave Tatev	46,2434 393817	*Rhinolophus euryale* – Single individuals *Barbastella leucomelas* – Mid-size colony	
	Labyrinth Khustup-Katar	46,3319 39,1197	*Rhinolophus ferrumequinum* – Large colony *Rhinolophus euryale* – Large colony	

Azerbaijan

Place name	Key habitats	Coordinates	Key species	Remarks
Nakhchevan Autonomic Republic. Vicinities of the Nakhchevan city; spurs of the mountain ridges Daralagoz and Zangezur in districts Shakhbuz and Ordubad	Cave Sirab	45,5330 39,3167	*Myotis blythii* *Miniopterus schreibersii* – Small mixed colony *Rhinolophus hipposideros* – Single individuals	Number declining of all species and extinction of *Rhinolophus mehelyi* are noted in the Sirab cave. High species diversity – 12 species.
	Adit in vicinities of vil. Kaliaki	45,9670 38,9833	*Rhinolophus ferrumequinum* – Small colony *Rhinolophus mehelyi* – Small colony	
	Cave Yarasa Yuvasi	45,8330 39,0667	*Myotis blythii* *Miniopterus schreibersii* – Mixed mid-size colony	
Slopes of the Great Caucasus Ridge: From Belokan-Zakatala massive till Samur-Divichi lowlands.	Vicinities of Zagatala strict nature reserve, vil. Gabizdarya, deciduous forest, adits.	46,6670 41,6833. 46,6170 41,7000	*Rhinolophus hipposideros* – Small and mid-size colonies.	High species diversity – 22 species.
	Ogruz district, deciduous forest in vicinities of vil. Dzhalud and church.	47,4330 41,0833	*Rhinolophus ferrumequinum* – Mid-size colony. *Rhinolophus euryale* – Large colony	
	Gabala district, deciduous forest in vicinities of villages Bunut and Khazrya and church.	47,9670 40,9000	*Rhinolophus hipposideros* – Small colony *Myotis blythii* – Individuals *Myotis bechsteinii* – Small colony	
	Caspian sea coast, deciduous forest close to villages Nabran' and Yalama 2.	48,6170 41,8167	*Barbastella barbastellus* – Identified by bat detector	
Vicinities of the Mingechavir reservoir.	Loess caves on Bozdag ridge	47,0000 40,7881. 47,0000 40,7933	*Rhinolophus ferrumequinum* – Small colony *Myotis emarginatus* - Mid-size colony	High species diversity – 16 species. Temporary caves without fixed coordinates. They are permanently destroyed and again appear in a result of ongoing erosion of soil

Place name	Key habitats	Coordinates	Key species	Remarks
				and ground.
Hirkan National Park and its vicinities within Lenkoran, Astara and Lerik districts	Vicinities of villages Borchaly and Bilyasar, deciduous forest.	48,6170 38,6500. 48,3170 38,2833	*Rhinolophus ferrumequinum* *Rhinolophus hipposideros* *Myotis emarginatus* *Barbastella barbastellus*	High species diversity – 16 species.
	Vicinities of villages Siov and Dilmadi, deciduous forest.	48,6830 38,6167. 48,6500 38,4500	*Barbastella barbastellus*	
	Vicinities of village Tangherud, deciduous forest.	48,6670 38,5000	*Barbastella barbastellus*	

Georgia

Place Name	Important Areas	Coordinates	Key species	Remarks
Racha and Lechkhumi ridge, Central and Southern part with spurs. Ajameti Strict Natural Reserve.	Gogolati cave and mixed forest in canyon of the river Sharaula	42,9108 42,5218	*Rhinolophus ferrumequinum* – Single individuals *Rhinolophus hipposideros* – Single individuals *Rhinolophus euryale* – Mid-size colony *Myotis blythii* – Single individuals *Miniopterus schreibersii* – Small colony *Barbastella barbastellus* – Single individuals *Myotis emarginatus* – Single individuals	High species diversity– 13 species in canyon of the river Sharaula.
	Sakishore cave, fir forest, with deciduous margin	43,1581 42,4428	*Rhinolophus ferrumequinum* – Single individuals *Rhinolophus hipposideros* – Small colony *Miniopterus schreibersii* – The largest colony in Georgia	High species diversity – 8 species despite of the coniferous (fir) forest.
	Kidobana cave, fir forest, with deciduous margin	43,146 42,434	*Rhinolophus hipposideros* – Small colony *Myotis blythii* – Single individuals *Myotis emarginatus* – Single individuals	
	Tsutskhvati VII cave, decidious forest	42,8514 42,3244	*Rhinolophus hipposideros* – Mid-size colony *Rhinolophus euryale* – Greatest colony in the Caucasus *Myotis blythii* – Small colony *Miniopterus schreibersii* – Small colony	The cave Tsutskhvati VII is one of 12 caves of the cave complex “Tsutskhvati”. Other caves of this complex are poorly studied .

Place Name	Important Areas	Coordinates	Key species	Remarks
	Sachinkia cave	42,8514 42,3244	*Rhinolophus ferrumequinum* – Single individuals *Rhinolophus hipposideros* – small colony *Rhinolophus euryale* – Mid-size colony *Miniopterus schreibersii* – Single individuals	Cave complex of the river Sadzalikhevi (Sachinkia, Tsilto IV and others) consist of tens of the caves situated on the territory of 169 km^2 (approximately 13x13 km). All bat aggregations on this area can be considered as a single whole - one large and valuable group.
	Tsilto IV cave	42.2471 43.3185	*Rhinolophus ferrumequinum* – Single individuals *Rhinolophus hipposideros* – Small colony *Rhinolophus euryale* – Single individuals *Myotis blythii* – Single individuals	
	Village Kumistavi, Kumistavi (Tskaltubo II) cave, decidious forest margin	42.2505 43.3084	*Rhinolophus ferrumequinum* – Single individuals *Rhinolophus hipposideros* – Single individuals *Rhinolophus euryale* – Single individuals *Myotis blythii* – Single individuals *Miniopterus schreibersii* – Single individuals	In addition, there is large mixed colony in the middle part of the cave, which is situated at a height of 20-25 meters, but actual number of animals in this colony is unknown, because of its inaccessibility.
	Village Kumistavi, Ghliana cave, deciduous forest margin	42.3631 42.6076	*Rhinolophus ferrumequinum* – Large colony *Rhinolophus euryale* – Large colony *Myotis blythii* – Large colony *Miniopterus schreibersii* – Large mixed colony with different estimations 5000-7000 individuals	High species diversity – 10 species. Cave Ghliana is connected to the cave Kumistavi. The cave Kumistavi is used for tourism, therefore bats flit often from this cave to the cave Ghliana. The sporadic colony of *Myotis emarginatus* is noted in this cave.
Karst mountain Urta on the Colchis lowland	Okhvameshkari I-III caves	41,8541 42,3637	*Rhinolophus ferrumequinum* – Small colony *Rhinolophus euryale* – Mid-size colony *Myotis blythii* – Single individuals	In addition, in the caves Urta and Oghveumi are known large mixed colonies of bats with numbers of several thousands.
Ajara foothills, deciduous forest, from river Kintrishi gorge up to the gorge of the river Machakhela (including Kintrish reserve, Mtirala National Park and Batumi botanical garden)	Village Acharisaghmarti – river Machakhela gorge at merge river Skurdidi; deciduous forest, old fortification structure	41,7987 41,5164	*Rhinolophus ferrumequinum* – Single individuals *Rhinolophus hipposideros* – Single individuals	High species diversity – not less than 8 species everywhere, in vicinities of village Chakvistavi - 13 species. Large colonies – unknown. A few small underground sites.
	Cape Mtsvane Kontskhi, Batumi boranical garden, decidious forest, tunnel.	41,7081 41,6931. 41,7220 41,7014	*Rhinolophus ferrumequinum* – Single individuals *Rhinolophus hipposideros* – Mid-size colony Myotis blythii – Single individuals	
	Vicinity of village Chakvistavi, river Chakvistskali gorge at merge river Bzonitsa, river Lamparadze's Tskali, place between villages Chakvistavi and Khala; deciduous forest, small grotto	41,8225 41,6965. 41,8300 41,6911. 41,8507 41,6645	*Rhinolophus ferrumequinum* – Small colony *Rhinolophus hipposideros* – Single individuals *Rhinolophus euryale* – Single individuals *Myotis blythii* – Single individuals *Myotis emarginatus* – Single individuals *Nyctalus lasiopterus* – Single individuals *Miniopterus schreibersii* – Single individuals	

Place Name	Important Areas	Coordinates	Key species	Remarks
Borjomi-Kharagauli national park	Borjomi reserve	41,83644 43,36491	*Rhinolophus ferrumequinum* *Rhinolophus hipposideros* *Myotis blythii* *Myotis bechsteinii* *Myotis emarginatus* *Barbastella barbastellus* *Nyctalus lasiopterus*	High species diversity – 17 species at the territory of the reserve and in surroundings.
	Vicinities of villages Zvare, Moliti and Nunisi; deciduous wood, small river	43,4077 41,9514. 43,3847 41,9840	*Rhinolophus hipposideros* *Myotis blythii* *Myotis emarginatus* *Barbastella barbastellus*	High species diversity – 13 species.
Trialeti ridge	Western part of Trialeti ridge; Vicinities of villages Bakurianis Andeziti, Tsikhisjvari and Sakire.	43,4811 41,7335. 43,4288 41,7156. 43,2870 41,7273	*Myotis blythii* *Nyctalus lasiopterus*	High species diversity– 15 species. There is high anthropogenic pressure on the forest and number decline is reported. *Tadarida teniotis* was identified at this territory by bat detector.
	Central part of Trialeti ridge; river Tana gorge (Ateni gorge), village Bobnevi	41.8964 44.0452	*Rhinolophus ferrumequinum* *Myotis blythii* *Myotis emarginatus*	High diversity of species - 9 species.
	Eastern part of Trialeti ridge; Tbilisi and its vicinities, Lake Kus Tba, river Samarkhakhevi	41.6870 44.8110. 41.6995 44.7524	*Rhinolophus ferrumequinum* – Single individuals *Rhinolophus hipposideros* – Small colony *Rhinolophus euryale* – Large colony *Myotis blythii* *Myotis emarginatus* *Barbastella barbastellus* *Miniopterus schreibersii* – Single individuals	High species diversity– 13 species. For a long time the number decreasing is reported.
Central part of river Khrami from villages Tsurtavi till city Tsalka (Cave complexes: Nakhiduri I-III, Tavgurgala, Muguti, Zurtaketi, gorges of rivers Chivchavi, Aslanka, Chochiani, Dashbash canyon)	Nakhiduri I, derivates of deciduous forest, canyon, caves	44,6877 41,4879	*Rhinolophus ferrumequinum,* *Myotis blythii,* *Myotis emarginatus,* *Nyctalus lasiopterus*	High species diversity– 10 species.
	River Chivchavi, deciduous forest, small canyon, caves	44,4848 41,5120. 44,4308 41,5353	*Rhinolophus ferrumequinum* *Myotis blythii* *M. emarginatus* *Nyctalus lasiopterus*	High species diversity– 15 species.
	Lake Cherepanovskoe – Small artificial lake, around of the lake there is deciduous forest	44,3729 41,5723	*Rhinolophus ferrumequinum* *Rhinolophus hipposideros* *Nyctalus lasiopterus* *Barbastella barbastellus*	High species diversity– 12 species.

Place Name	Important Areas	Coordinates	Key species	Remarks
	Canyon Dashbash, deciduous forest, caves	44,1339 41,5845	*Rhinolophus ferrumequinum* *Myotis blythii* *Myotis emarginatus*	High species diversity– 9 species.
River Aragvi gorge	Forests in the river Aragvi gorge, adits and not finished tunnel close to Barisakho	44,9239 42,5076. 44,9285 42,5136	*Rhinolophus hipposideros* – Single individuals *Myotis blythii* – Mid-size colony *Myotis emarginatus* – Single individuals *Barbastella barbastellus* – Single individuals	High species diversity– 7 species.
Lagodekhi reserve	River Ninoskhevi	46,2444 41,8308	*Barbastella barbastellus* – Single individuals	High species diversity – 13 species.
	River Matsimi	46,3544 41,8213	*Barbastella barbastellus* – Single individuals	
	City Lagodekhi	41.8373 46.2769	*Rhinolophus hipposideros* – Single individuals *Nyctalus lasiopterus*	
West and Central part of Iori plateau named ”Gareji Country”, Artificial cave complexes.	David Gareja – caves temporary stream, filed, badlands.	41.4597 45.3614	*Rhinolophus ferrumequinum* – Large colony *Rhinolophus hipposideros* *Myotis blythii* *Myotis emarginatus* – Mid-size colony	High species diversity– 8 species.
	Dodos Rqa – caves, small storage reservoir in the west (2km) of Dodos Rqa.	41,4768 45,8026	*Rhinolophus ferrumequinum* – Large colony *Rhinolophus hipposideros* – Single individuals *Myotis blythii* – Small colony *Myotis emarginatus*	High species diversity– 8 species.
	Natlismcemeli – caves, filed	41.4917 45.2938	*Myotis blythii* – Mid-size colony	
	Tetri Senakebi – caves, storage reservoir, field	41.5361 45.2572	*Rhinolophus ferrumequinum* – Large colony *Myotis blythii* – Small colony *Myotis emarginatus* – Mid-size colony	High species diversity– 9 species.
	Sabereebi – caves, temporal stream, separate trees in the rocks, field.	41.4607 45.6033	*Rhinolophus hipposideros* *Myotis blythii* *Myotis emarginatus* *Nyctalus lasiopterus*	High species diversity– 9 species.
Riparian forest on the rivers Kura, Alazani and Iori	River Kura – Gardabani sanctuary	41,3781 45,0797	*Rhinolophus ferrumequinum* – Mid-size colony *Rhinolophus hipposideros* – Small colony *Myotis blythii* – Small numbers	High species diversity– 7 species.
	River Alazani – forest named Chiauri, Alazani hunting farm.	41.6094 46.2706	*Rhinolophus hipposideros* – Small colony	High species diversity – 6 species fixed definitely and some more species were observed but not yet identified.
	River Iori – Riparian forest close to the Cave complex Sabereebi.	41.4440 45.6602	*Rhinolophus ferrumequinum* *Rhinolophus mehelyi* *Myotis blythii* *Myotis emarginatus*	High species diversity – 10 species.

Place Name	Important Areas	Coordinates	Key species	Remarks
	River Iori – Riparian forest in the North-west of Kurbaba pass (Batori ridge)	41,3514 45,8026	*Rhinolophus ferrumequinum*	High species diversity– 9 species.
	River Iori – Korughi sanctuary	41.654592 45.436966	*Rhinolophus ferrumequinum* – Small colony *Rhinolophus hipposideros*	High species diversity– 8 species.

Russian Federation

Place Name	Key Habitats	Coordinates	Key Species	Remarks
Black sea coast and foothills of southern slopes of the Great Caucasus, Sochi National Park	Vil. Malyi Utrish, abounded building	37,4667 44,7000. 37,4500 44,7000	*Myotis bechsteinii* – Small colonies	Abounded building and garage in the vil. Malyi Utrish, where *Myotis bechsteinii* was found are located close to park and forest. In the caves Pervomaiskaya, Ubikhskaya and Vorontsovskaya, also in other caves which are located in Sochi National Park and its vicinities the bat species number are decreasing. The urgent measures are needed to improve situation.
	Cave Pervomaiskaya	39,9000 43,5667	*Rhinolophus ferrumequinum* – Small numbers *Rhinolophus hipposideros* – Small numbers *Miniopterus schreibersii* – Small colony	
	Cave Ubikhskaya	39,7000 43,7667	*Rhinolophus hipposideros* – Small numbers	
	Cave Vorontsovskaya	39,9500 43,6333	*Rhinolophus hipposideros* – Small numbers	
	Mountain Gebeus, forest and riparian forest of river Teshebs, grotto	38,6333 44,3833	*Myotis bechsteinii* – Small colony *Myotis emarginatus* – Small colony with young's	
	Matsesta settlement, cave Chortova Nora and flood-land of the river Agura.	39,8500 43,5500	*Rhinolophus hipposideros* – Small numbers *Myotis blythii* – Small numbers *Rhinolophus ferrumequinum* – Small colony *Miniopterus schreibersii* – Small colony *Rhinolophus euryale* – Small colony	
Northern slopes of the Great Caucasus from river Ili basin to river Belaya basin.	Bolshaya Phanagoriiskaya cave	38,9833 44,4667	*Rhinolophus ferrumequinum* – Small numbers *Rhinolophus hipposideros* – Mid-size colony *Rhinolophus euryale* – Single individuals *Myotis blythii* – Small colony *Myotis bechsteinii* – Small colony *Myotis emarginatus* – Single individuals	In the cave Canyon is largest wintering colony of *Barbastella barbastellus* in the world. High species diversity – 8 species on river Kurdjips
	Cave Nozma	41,5000 44,0667	*Rhinolophus ferrumequinum* – Small numbers *Myotis blythii* – Small numbers *Miniopterus schreibersii* – Large colony	

Place Name	Key Habitats	Coordinates	Key Species	Remarks
	Cave Chernorenskaya	40,9667 44,2000	*Rhinolophus ferrumequinum* – Small colony *Rhinolophus hipposideros* – Small colony *Miniopterus schreibersii* – Large colony	
	Cave Canyon	39,7500 44,1500	*Rhinolophus hipposideros* – Small numbers *Myotis blythii* – Small numbers *Barbastella barbastellus* – Small colony	
	Cave Ared	39,9000 44,2000	*Rhinolophus ferrumequinum* – Mid-size colony *Myotis blythii* – Small numbers *Myotis emarginatus* – Small colony *Miniopterus schreibersii* – Large colony	
	River Kudjips side in Guamskyi gorge, Riparian forest of riv. Kudjips in vil. Krasnyi Daghestan vicinities.	39,9167 44,2167. 39,9667 44,3333	*Rhinolophus ferrumequinum* – Small numbers *Rhinolophus hipposideros* – Small numbers *Myotis blythii* – Small numbers *Barbastella barbastellus* — Small numbers	
	Vil. Derbent vicinities, adit.	38,5000 44,7667	Rhinolophus ferrumequinum – Large colony Rhinolophus hipposideros – Mid-size colony Myotis blythii – Small numbers *Barbastella barbastellus* – Small colony	
State Nature Reserve Kavkazskyi, Skirda ridge spurs.	Chernorechie cordon of reserve Kavkazskyi, cave Babailovskaya	40,5667 43,9167	*Myotis blythii* – Mid-size colony *Barbastella barbastellus* – Small numbers	High species diversity – 10 species.
	Chernorechie cordon of reserve Kavkazskyi, Cave Spyashchaya Krasavitsa	40,5500 43,9167	*Rhinolophus ferrumequinum* – Small numbers *Rhinolophus hipposideros* – Small numbers *Myotis blythii* – Small numbers *Miniopterus schreibersii* – Large colony	
Skalistyi ridge spurs between riv. Bolshaya Laba, Malaya Laba, Urup, Kuban, Kuma, Ardon and Fiagon valleys.	Cave Gunkina I	40,8833 44,1667	*Barbastella barbastellus* – Small colony	High species diversity – 13 species on the spurs of the Skalistyi ridge .
	Cave Gunkina II	40,9000 44,1500	*Barbastella barbastellus* – Small colony	
	Cave Gunkina IV	40,9167 44,1500	*Rhinolophus ferrumequinum* – Small colony *Myotis blythii* – Small numbers *Rhinolophus hipposideros* – Small numbers *Barbastella barbastellus* – Small numbers *Miniopterus schreibersii* – Small numbers	
	Stanitsa Akhmetovskaya, Popov cave	41,1000 44,1333	*Rhinolophus ferrumequinum* – Mid-size colony *Myotis blythii* – Small numbers	

Place Name	Key Habitats	Coordinates	Key Species	Remarks
	Cave Svetlaya	40,9000 44,1833	*Barbastella barbastellus* – Small numbers *Rhinolophus ferrumequinum* – Small numbers *Rhinolophus hipposideros* – Small numbers *Miniopterus schreibersii* – Small colony	
	Cave Dedova Yama	40,7667 44,1667	*Barbastella barbastellus* – Small numbers *Rhinolophus ferrumequinum* – Mid-size colony *Rhinolophus hipposideros* – Small numbers *Miniopterus schreibersii* – Small numbers *Myotis blythii* – Small numbers	
	Cave Zakholod	40,7667 44,1833	*Rhinolophus hipposideros* – Small numbers	
	Cave Zubashchenko	40,5167 44,2333	*Miniopterus schreibersii* – Large colony	
	Caves Besleneevskaya I and 2	40,1833 44,2167	*Rhinolophus ferrumequinum* – Small colony *Rhinolophus hipposideros* – Small numbers *Miniopterus schreibersii* – Small numbers *Myotis blythii* – Single individuals	
	North Osetia, cave Shubi-Nikhaskaya, river Ardon basin.	44,2000 42,9333	*Rhinolophus ferrumequinum* – Small numbers *Rhinolophus hipposideros* – Small numbers *Myotis blythii* – One of the largest colonies in the Caucasus. *Barbastella barbastellus* – Small numbers	
	Karachaevo-Cherkesia, stanitsa Pregradnaya, cave Samorodnaia	41,5333 44,0333	*Rhinolophus ferrumequinum* – Small colony *Myotis blythii* – Mid-size colony *Miniopterus schreibersii* – Small numbers	
River Nalchik valley between vil. Belaia Rechka and city Nalchik (Riparian forests of rivers Nalchik, Cherek, Cherek Bezengiysky, Cherek Khulamsky and Chegem)	Vil. Belaia Rechka, caves in the tract (urochishche) Uyanotup	43,4000 43,3667	*Rhinolophus ferrumequinum* – Small numbers *Rhinolophus hipposideros* – Small numbers *Myotis blythii* – Mid-size colony *Barbastella barbastellus* – Small numbers	High species diversity – 8 species
Daghestan, Chonkatau ridge in Tabasaran district	Karabudakhkenskaya cave	47,5333 42,6667	*Myotis blythii* – one of the largest colonies in the Caucasus. *Rhinolophus mehelyi* – Small colony *Rhinolophus ferrumequinum* – Small numbers	
	Forest site « Berkubinskaya lesnaya dacha	48,4000 41,6667	*Myotis bechsteinii* – Small numbers *Myotis blythii* – Small numbers	

Annex 5

Table 6 Assessment of Needs and Possibilities for Implementing Actions by Country

	1 – most urgent (within the first 5 years); **2 – to implement within 10 years;** **3 – to implement within 15-20 years**	**For most countries**	Armenia	Azerbaijan	Georgia	Russia
1	1.1.1 Make an inventory of bat roosts and colonies	**1**	1	1	2	1
2	1.1.2 Have Key-habitats for batsand colonies registered by the State	**2**	2	2	2	3
3	1.1.3 Develop and publish guidelines for bat monitoring	**1**	1	1	1	1
4	1.1.4 Develop and provide with resources networks of monitoring specialists in each country	**2**	1	2	2	2
5	1.2.1 Change existing PA management plans to meet the needs for bat protection	**2**	2	1	2	2
6	1.2.2 Incorporate special actions for bat protection in new PA management plans	**1**	1	1	1	1
7	1.2.3 Initiate creation of a PA for identified key habitats	**1**	1	1	1	1
8	1.2.4 Develop guidelines for bat conservation for PA managers	**1**	1	1	1	1
9	1.3.1 Develop guidelines for bat conservation in forests and parks	**1**	1	1	1	1
10	1.3.2 Incorporate recommendations for bat conservation in national forest use plans	**2**	2	2	2	2
11	1.3.3 Involve Chiroptera experts in planning economic activities in forests and parks	**1**	2	1	2	1
12	1.4.1 Inform local authorities and historical/cultural heritage site management about the presence of bat colonies within their area and/or site	**2**	1	2	2	2
13	1.4.2 Give a special status to buildings colonized by bats	**3**	3	3	3	3
14	1.4.3 Prior to destruction or reconstruction of a buildings colonized by bats, prepare artificial alternative bat shelters meeting the needs of the species in the colony	**3**	3	3	3	3
15	1.4.4 Develop guidelines for bat colonies protection in buildings	**1**	1	1	1	1
16	1.4.5 Inform relevant authorities about the presence of underground bat roosts in areas they are responsible for	**2**	2	2	2	2
17	1.4.6 Give a special status to underground bat roosts	**3**	3	3	3	3
18	1.4.7 Protect entrances of (i.e. mechanically limit access to) underground bat roosts	**2**	2	2	2	2
19	1.4.8 Develop guidelines for bat colonies protection in underground roosts	**1**	1	1	1	1
20	1.4.9 Specially label trees colonized by bats	**3**	2	3	3	3
21	1.4.10 Compensate for felling trees colonized by bats, if necessary, by providing a tree house of a relevant design	**3**	3	3	3	3
22	2.1.1 Study the diet of vulnerable bat species	**3**	3	3	3	3
23	2.1.2 Identify factors influencing the number of insects that are the main food for bats	**3**	3	3	3	3
24	2.2.1 Develop guidelines on Sustainable Use of Agricultural Lands to conserve natural vegetative cover around plantations	**3**	3	3	3	3
25	2.2.2 Disseminate the sustainable land use guidelines in the area of agriculture	**3**	3	3	3	3
26	2.2.3 Consider the guidelines for agricultural land use planning	**3**	3	3	3	3
27	2.2.4 Hold consultations with expert-zoologists for agricultural land use planning	**1**	1	1	1	1
28	2.3.1 Support implementation of international conventions limiting pesticide use in our countries	**1**	1	1	1	2
29	2.3.2 Recommend establishing treatment facilities in populated areas and strengthen control over discharge of industrial and domestic waste	**2**	2	2	2	3
30	3.1.1 Identify roost most susceptible to disturbance, and have them registered by state authorities	**2**	2	2	2	2
31	3.1.2 Where necessary, establish specially designed protection structures	**2**	2	2	2	2
32	3.2.1 Develop management plans (regulations) for roost use	**2**	2	2	2	2

33	3.2.2 Inform owners and users about the need for special agreements and consultations for conducting any kind of works in bat roosts	**2**	2	2	2	1
34	3.2.3 Develop methods not interfering with bat presence and human activity in cultic structures	**2**	2	1	1	**3**
35	3.3.1 Conduct Bat Impact Evaluation as part of economic activity planning	**2**	2	2	2	1
36	3.3.2 Regulate building terms to minimize impact on bats	**2**	2	1	2	2
37	3.3.3 When possible, use noiseless and vibration-free technologies	**2**	2	2	2	2
38	3.3.4 Never install artificial lights at roost entrances, feeding areas and flyways	**1**	1	2	1	1
39	4.1.1 Identify potential impacts of pollution on bat populations	**3**	3	3	3	3
40	4.1.2 Identify least harmful pesticides, optimum terms and conditions of their use	**3**	3	3	3	3
41	4.1.3 Develop guidelines to minimize pollution impact on bat populations	**3**	3	3	3	3
42	4.1.4 Make the guidelines known to the public and authorities	**3**	3	3	3	3
43	4.1.5 Introduce state and public monitoring of environmental pollution	**1**	1	1	1	1
44	4.2.1 Support implementation of international conventions limiting pesticide use in our countries	**1**	1	1	1	1
45	4.2.2 Recommend establishing treatment facilities in populated areas and Strengthen control over discharge of industrial and domestic waste	**2**	2	2	2	2
46	5.1.1 Analyse potential consequences of the global climate change on Caucasian bats	**2**	2	2	2	2
47	5.2.1 Develop measures to mitigate the climate change consequences	**2**	2	2	2	2
48	5.2.2 Protect Bat roosts from the potential climate change consequences	**2**	3	2	3	2
49	6.1.1 Identify target population groups having an impact on bats (speleologists, rangers, teachers, tourists, government officials)	**1**	1	1	1	1
50	6.1.2 Develop training materials and train specialists for working with target groups	**2**	1	2	2	2
51	6.1.3 Conduct educational campaigns and trainings for target groups	**2**	1	2	2	2
52	6.1.4 Set up a networks of volunteers in key habitats	**3**	1	2	3	3
53	6.1.5 Advocate in media for conscientious attitude to bats, and condemn cases of vandalism	**1**	1	1	1	1
54	6.2.1 Analyse and identify gaps in the national legislations	**1**	1	1	1	1
55	6.2.2 Initiate relevant draft laws and amendments to the national legislations	**1**	1	1	1	1
56	6.2.3 Adopt procedures for regulating economic activities of owners and users of buildings/sites occupied by bats	**2**	2	2	2	2
57	6.2.4 Continue the process of affiliating to key conservation conventions and agreements	**1**	1	1	1	1
58	6.2.5 Promote implementation of national commitments under signed international conventions	**1**	1	1	1	1

Table 7. Assessment of Action Efficiency for Target Species Conservation

1 – most urgent (within the first 5 years); 2 – to implement within 10 years; 3 – to implement within 15-20 years	***For most countries***	*Rh. ferrumequinum*	*Rh .hipposideros*	*Rhinolophus euryale*	*Rhinolophus mehelyi*	*Myotis blythii*	*Myotis bechsteinii*	*Myotis dasycneme*	*Myotis emarginatus*	*Myotis schaubi*	*Nyctalus lasiopterus*	*Barbastella barbastellus*	*Barbastella leucomelas*	*Miniopterus schreibersii*	*Tadarida teniotis*	***Number of species requiring the action***
1.1.1 Make an inventory of bat roosts and colonies	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
1.1.2 Have Kay habitats for bats and colonies registered by the State	1	1	1	1	1	1	1	-	1	-	-	1	1	1	1	11
1.1.3 Develop and publish guidelines for bat monitoring	1	1	1	1	1	1		-	1	-	-			1	-	7
1.1.4 Develop and provide with resources networks of monitoring specialists in each country	1	1	1	1	1	1		-	1	-	-			1	-	7
1.2.1 Change existing PA management plans to meet the needs for bat protection	1	1	1	1	1	1	2	-	1	-	-	1	1	1	-	10
1.2.2 Incorporate special actions for bat protection in new PA management plans	1	1	1	1	1	1	2	-	1	-	-	1	1	1	-	10
1.2.3 Initiate creation of a PA for identified key habitats	1	1	1	1	1	1	1	-	1	-	-	1	1	1	-	10
1.2.4 Develop guidelines for bat conservation for PA managers	1	1	1	1	1	1	2	-	1	-	-	2	1	1	-	10
1.3.1 Develop guidelines for bat conservation in forests and parks	1	-	2	-	-	-	1	-	-	-	1	1	-	-	-	4
1.3.2 Incorporate recommendations for bat conservation in national forest use plans and rules	1	-	2	-	-	-	1	-	-	-	1	1	-	-	-	4
1.3.3 Involve Chiroptera experts in planning economic activities in forests and parks	1	-	2	-	-	-	1	-	-	-	1	1	-	-	-	4
1.4.1 Inform local authorities and historical/cultural heritage site management about the presence of bat colonies within their area and/or site	1	1	1	1	-	1	-	1	1	1	-	-	1	1	-	9
1.4.2 Give a special status to buildings colonized by bats	1	1	1	1	-	1	-	1	1	1	-	-	1	1	-	9
1.4.3 Prior to destruction or reconstruction of a buildings colonized by bats, prepare artificial alternative bat shelters meeting the needs of the species in the colony	2	-	2	-	-	-	-	?	-	?	?	-	-	-	-	1
1.4.4 Develop guidelines for bat colonies protection in buildings	1	1	1	-	-	1	-	1	1	1	-	1	-	1	-	8
1.4.5 Inform relevant authorities about the presence of underground bat roosts in areas they are responsible for	1	1	2	1	1	1	-	-	1	-	-	1	1	1	-	9
1.4.6 Give a special status to underground bat roosts	1	1	1	1	1	1	2	-	1	-	-	1	1	1	-	10
1.4.7 Protect entrances of (i.e. mechanically limit access to) underground bat roosts	1	1	1	1	1	1	2	-	1	-	-	1	1	1	-	10
1.4.8 Develop guidelines for bat colonies protection in underground roosts	1	1	1	1	1	1	2	-	1	-	-	1	1	1	-	10
1.4.9 Specially label trees colonized by bats	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
1.4.10 Compensate for felling trees colonized by bats, if necessary, by providing a tree house of a relevant design	1	-	-	-	-	-	1	-	-	-	1	1	-	-	-	3
2.1.1 Study the diet of vulnerable bat species	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10
2.1.2 Identify factors influencing the number of	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10

insects that are the main food for bats																	
2.2.1 Develop guidelines on Sustainable Use of Agricultural Lands to conserve natural vegetative cover around plantations	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
2.2.2 Disseminate the sustainable land use guidelines in the area of agriculture	3	3	3	3	3	3	-	-	3	-	-	-	3	3	-	8
2.2.3 Consider the guidelines for agricultural land use planning	3	3	3	3	3	3	-	-	3	-	-	-	3	3	-	8
2.2.4 Hold consultations with expert-zoologists for agricultural land use planning	3	3	3	3	3	3	-	-	3	-	-	-	3	3	-	8
2.3.1 Support implementation of international conventions limiting pesticide use in our countries	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
2.3.2 Recommend establishing treatment facilities in populated areas and Strengthen control over discharge of industrial and domestic waste	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
3.1.1 Identify roost most susceptible to disturbance, and have them registered by state authorities	1	1	1	1	1	1	-	-	1	-	-	1	1	1	-	9
3.1.2 Where necessary, establish specially designed protection structures	1	1	1	1	1	1	-	-	1	-	-	1	1	1	-	9
3.2.1 Develop management plans (regulations) for roost use	1	1	1	1	1	1	-	-	1	-	-	1	1	1	-	9
3.2.2 Inform owners and users about the need for special agreements and consultations for conducting any kind of works in bat roosts	1	1	1	1	1	1	1	-	1	-	-	1	1	1	-	10
3.2.3 Develop methods not interfering with bat presence and human activity in cultic structures	2	2	2	2	2	2	-	-	2	-	-	-	2	2	-	8
3.3.1 Conduct Bat Impact Evaluation as part of economic activity planning	1	1	1	1	1	1	1	-	1	-	-	1	1	1	-	10
3.3.2 Regulate building terms to minimize impact on bats	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10
3.3.3 When possible, use noiseless and vibration-free technologies	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10
3.3.4 Never install artificial lights at roost entrances, feeding areas and flyways	2	2	2	2	2	2	1	-	2	-	-	1	-	2	-	8
4.1.1 Identify potential impacts of pollution on bat populations	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
4.1.2 Identify least harmful pesticides, optimum terms and conditions of their use	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
4.1.3 Develop guidelines to minimize pollution impact on bat populations	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
4.1.4 Make the guidelines known to the public and authorities	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
4.1.5 Introduce state and public monitoring of environmental pollution	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
4.2.1 Support implementation of international conventions limiting pesticide use in our countries	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
4.2.2 Recommend establishing treatment facilities in populated areas and Strengthen control over discharge of industrial and domestic waste	3	3	3	3	3	3	3	-	3	-	-	3	3	3	-	10
5.1.1 Analyse potential consequences of the global climate change on Caucasian bats	1	1	1	1	1	1	2	-	1	-	-	2	1	1	-	10
5.2.1 Develop measures to mitigate the climate change consequences	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10
5.2.2 Protect Bat roosts from the potential climate change consequences	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10
6.1.1 Identify target population groups having an impact on bats (speleologists, rangers, teachers, tourists, government officials)	1	1	1	1	1	1	1	-	1	-	-	1	1	1	-	10
6.1.2 Develop training materials and train specialists for working with target groups	1	1	1	1	1	1	1	-	1	-	-	1	1	1	-	10

6.1.3 Conduct educational campaigns and trainings for target groups	1	1	1	1	1	1	1	-	1	-	-	1	1	1	-	10
6.1.4 Set up a networks of volunteers in key habitats	2	2	2	2	2	2	-	-	2	-	-	-	-	2	-	7
6.1.5 Advocate in media for conscientious attitude to bats, and condemn cases of vandalism	1	1	1	1	1	1	1	-	1	-	-	1	1	1	-	10
6.2.1 Analyse and identify gaps in the national legislations	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10
6.2.2 Initiate relevant draft laws and amendments to the national legislations	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10
6.2.3 Adopt procedures for regulating economic activities of owners and users of buildings/sites occupied by bats	1	1	1	1	1	1	3	-	1	-	-	3	1	1	-	10
6.2.4 Continue the process of affiliating to key conservation conventions and agreements	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10
6.2.5 Promote implementation of national commitments under signed international conventions	2	2	2	2	2	2	2	-	2	-	-	2	2	2	-	10

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