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Monitoring for the Conservation of the Leopard in the Caucasus Ecoregion



Caucasus Leopard Working Group

July 2011

Findings and recommendations from the workshop on
conservation monitoring of leopards, co-predators and prey
in the Caucasus Ecoregion, Tbilisi, Georgia, 16–19 May 2011

This report summarises presentations, discussions and conclusions of the workshop for the conservation monitoring of leopards, co-predators and prey in the Caucasus Ecoregion, 16–19 May 2011, Tbilisi, Georgia.

The workshop was organised by WWF Caucasus Programme and prepared and facilitated by the IUCN/SSC Cat Specialist Group and KORA, Switzerland. Financial support was provided by WWF Caucasus Programme and the Council of Europe (Bern Convention Secretariat).

The report was edited by Urs Breitenmoser, Batur Avgan, Fridolin Zimmermann and Christine Breitenmoser-Würsten. It summarises the presentations, working group results, and discussions at the workshop.

Proposed citation:

Caucasus Leopard Working Group. 2011. Monitoring for the conservation of the leopard in the Caucasus Ecoregion. Workshop report, WWF Caucasus Programme and IUCN/SSC Cat Specialist Group, 33 pages.

Cover photo: Leopards in Kiamaki PA (Photo Reza Masoud)

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Executive Summary

1. The Persian leopard *Panthera pardus saxicolor* is the most prominent flagship species of the Caucasus Ecoregion. A *Strategy for the Conservation of the Leopard in the Caucasus Ecoregion* was developed in 2007 and is now being implemented through National Action Plans. Monitoring is an important requirement of the *Strategy* and the NAPs. A group of 31 leopard experts and wildlife researchers and conservationists met from 16–19 May 2011 in Tbilisi, Georgia, to discuss the monitoring at national and ecoregional scale. The **Goal** of the workshop was to agree on a simple and feasible plan for a monitoring scheme for leopards, co-predators and prey for the entire Caucasus Ecoregion. Specific **Objectives** were (1) review and discuss monitoring methods. (2) Review monitoring concepts and methods applied for cross-border baseline surveys and monitoring of cats. (3) Outline a practical, standardised and consistent monitoring for the conservation of the leopard in the Caucasus. (4) Define the needs for the implementation of the survey and monitoring plan.
2. Sound and reliable monitoring requires co-operation between state agencies (which have typically a legal obligation to survey wildlife populations), conservation NGOs and scientists. Crude data and rough estimations on wildlife populations are available from state institutions in all Caucasian countries, mainly from protected areas. These data are however rarely compiled in a consistent way and not compatible among the countries. NGOs and scientific institutions have tested and applied more sophisticated monitoring methods e.g. in Armenia, Georgia, Azerbaijan and Iran, but nowhere, these efforts have so far led to the establishment of a permanent and consistent monitoring scheme.
3. The start-up for a lasting and large-scale monitoring system is a Baseline Survey to gather initial information. Simple and cheap survey methods are used to screen the entire potential range and hence to compile a set of standardised and comparable information. The general approach is to collect information mainly through interrogation of the local people, especially of groups interacting with wildlife, such as hunters, livestock breeders, etc. A common protocol must be developed and adapted to local/national needs. The general resolution is 10 x 10 km, but a finer grid can be applied wherever needed. A first test run will be started in autumn 2011 in NE Turkey. Table 1 (page 12) summarises the needs for baseline information for leopard, co-predators, prey, and conflicts and attitudes in each country and suggests a time frame. The priority areas for the Baseline Survey are presented in chapter 3.3.
4. Conservation monitoring comprises the continuous surveillance of the status of target wildlife populations and the effect and efficiency of conservation or management measures. A number of methods for wildlife monitoring are available and have been applied in the Caucasus. As the best methods are also the most expensive, data from different sources and generated by various approaches need to be used. Combining data requires categorisation of information, e.g. in three steps: C1 = unchallenged data (“hard facts”), C2 = confirmed data, and C3 = unconfirmed data. Compiling and confirming data needs a network of trained people. Active monitoring methods used so far for leopard include camera-trapping (both opportunistic and systematic for capture-mark-recapture estimations), track and sign transects, and collection of excrements. Passive (opportunistic) monitoring bases on the systematic and standardised collection of information provided by local people and any informants through the monitoring network. Standardised protocols and forms are required. Only Iran has presently a system to collect and manage chance observations.
5. Monitoring of main prey species is an important part of leopard conservation. Potential prey of leopard in the Caucasus are Bezoar goat, wild sheep, wild boar, locally red deer and roe deer, and possibly hare and ground birds, and as alternative food livestock. Most Caucasian countries provide

rather exact numbers of game species, the methodological base for these estimations is however not always clear. More scientific approaches (mainly Relative Abundance Indices) have been tested in Armenia. Monitoring ungulates in mountainous terrain is difficult. Cheap methods are not reliable, and reliable methods are very costly. The general opinion of the participants was however that prey availability is not a limiting factor for the presence of leopard and that consequently monitoring of prey is not a main priority.

6. The long-term monitoring for the conservation of leopard requires a cooperation of many institutions and a sensible combination of various approaches. The principle of “stratified monitoring” (Fig. 7, page 26) should be applied, including a spatial concept (e.g. 3 levels in the Caucasus), categorisation of reports, splitting tasks and sharing data. Over a large area (the potential leopard range), only cheap and readily available data can be collected. Sophisticated methods for active monitoring should be used in well-designed reference areas. Field protocols and observation forms must be standardised across the Caucasus and then adapted to local needs and languages. In each country, a monitoring network needs to be established and trained. Table 7 (page 29) provides an overview of target groups and monitoring skills to be trained. A Field Guide or Monitoring Handbook needs to be developed as training tool and reference for the monitoring work.

7. The organisational structure for the monitoring includes (1) national networks, (2) national monitoring centres as focal points, and (3) an international Persian Leopard Network for the Caucasus. National monitoring centres should be affiliated with a well-known institution, either a GO or NGO. The centres host a database compiling all information from the monitoring, including collections of samples. The national monitoring networks consist of trained people (e.g. park staff or volunteers) equally distributed over the potential leopard range. Network members are responsible for (1) awareness raising among local people, (2) collecting and reporting chance observations, and (3) confirming reported observations as far as possible. The international network consists of a number of leopard conservation experts from all countries who need to develop a standardised monitoring approach for the whole range. The international network is also responsible for a regular compilation, assessment and publication of reports on the conservation status of the leopard in the entire ecoregion. The Network should become the ultimate authority for leopard conservation also for national governments and international institutions.

8. Concrete assignments from the workshop (to be done by the end of the year): (1) Baseline surveys in designated regions, starting with a test run in NE Turkey. (2) CMR camera trap survey of the Iranian source populations. (3) Establishment of the “Persian Leopard Network for the Caucasus”. (4) Seek endorsement from the Caucasus Biodiversity Council and strengthen the awareness for the importance of the Iranian source populations. (5) Establish national monitoring centres as focal point for the national monitoring networks. (6) Develop a monitoring field handbook.

1. Introduction

In 2002, WWF launched the conservation of the highly endangered leopard and made it the most prominent flagship species of the Caucasus Programme. In 2007, WWF invited the IUCN/SSC Cat Specialist Group and a group of specialists and country representatives developed the *Strategy for the Conservation of the Leopard in the Caucasus Ecoregion*. Objective 2 of the *Strategy* addresses the survey and monitoring of leopards and their prey populations, listing three Targets with 9 activities:

Target 2.1. Survey of leopards in the eco-region is completed by 2010.

Target 2.2. A joint, standardized monitoring system is completed and launched by 2010.

Target 2.3. A joint research programme on leopards and its wild prey is launched by 2010.

While available data on the Caucasian fauna (including all wild ungulates) were recently compiled in a review (Zazanashvili and Mallon 2009), standardised wildlife monitoring remains exceptional in the countries of the region. To discuss and advance conservation monitoring the leopard and related wildlife species, the WWF Caucasus Programme, in co-operation with the Bern Convention of the Council of Europe and the Cat Specialist Group, organised a workshop from 16–19 May 2011 in Tbilisi, Georgia, attended by 31 participants from all six Caucasian countries (Fig. 1).



Fig. 1. Participants at the workshop in Tbilisi, 16–19 May 2011.

The purpose of the event was to explain and discuss theory, applications, and organisation of techniques and procedures for the long-term conservation monitoring of the leopard, its prey species and co-predators, and to outline a long-term conservation monitoring programme for the Ecoregion. Workshop participants discussed standards for the common monitoring and their adaptations to the conditions and opportunities in each country. The workshop was organised in six blocks, summarised in chapters 2–7 of this report. All presentations, templates and forms discussed during the workshop were distributed to the participants in electronic form (Appendix II).

The **Goal** of the workshop was to agree on a simple and feasible plan for a monitoring scheme for leopards, co-predators and prey for the entire Caucasus Ecoregion.

Specific **Objectives** were (1) review and discuss monitoring methods used in the Caucasus so far. (2) Review monitoring concepts and methods applied for cross-border baseline surveys and monitoring of cats elsewhere. (3) Develop a plan for a practical, standardised and consistent monitoring for the conservation of the leopard in the Caucasus. (4) Define the needs for the implementation of the survey and monitoring plan.

2. Goals, principles and precondition for conservation monitoring in the Caucasian countries

2.1. General goals and approaches for the conservation monitoring

Conservation monitoring, in the context of this report, comprises survey and surveillance activities supporting the conservation of leopards in the Caucasus or critical resources for their survival. It hence goes beyond the immediate control of the effectiveness of the implementation of conservation measures, and includes e.g. the monitoring of prey population or human attitudes in potential recovery areas.

If monitoring is not an integral part of an action plan with a logical framework defining targets, indicators and timelines, it should nevertheless follow certain standards and use accepted criteria. A widely used framework for judging the conservation status of a species or population is the IUCN/SSC Red List assessment process (www.iucnredlist.org). It provides criteria for the evaluation of a taxon or a population and standardise lists and authority files for threats, habitats and other features that need to be standardised for being used across several countries.

The basic features to be measured for the assessment of a population are distribution, abundance and dynamics. For assessing its conservation status, we may also need to observe demography and genetics, fragmentation, habitat use, etc. To mitigate specific threats, even more detailed information may be required, e.g. mortality rates or frequency of pathogens. Most national legislations oblige the wildlife authorities to observe the status of (threatened) wildlife species. However, state institutions compile most often only very basic information (if at all). Addressing specific questions requires the incorporation of experts and the launching of research projects. Such activities are generally constraint by limited funding. Consequently, conservation monitoring also needs to be done according to a priority list and demands for a sensible cooperation between institutions and countries allowing working synergistically.

2.2. Wildlife monitoring in the Caucasian countries

The following sections provide a short overview on information available in the Caucasian countries.

AR - Armenia

Areas of leopard presence are known (Fig. 2). Population status estimates for ungulates are available (see Chapter 5.3). Information on livestock is also known for each region and community.

Annual abundance estimations of large mammals reported from protected areas are kept by the Ministry of Nature Protection (MoNP). Camera-trapping records of mammal species (including leopard) and some birds have been collected since 2002 and are currently managed by WWF Armenia. Igor Khorozyan (WWF AR) also holds databases and analysed results of the data compiled during the projects from 1999 to 2007.

Bioresources Management Agency (BMA) of MoNP is the government organization responsible for implementation of wildlife monitoring. However, except the limited efforts taken in protected areas, wildlife monitoring has not been implemented so far by the state agency.

The only active NGO so far in monitoring was WWF Armenia. It develops monitoring programs, train protected area personnel and builds local capacities for monitoring implementation. Since 2002, WWF Armenia has been monitoring leopard and prey (principally Bezoar goat and wild sheep).

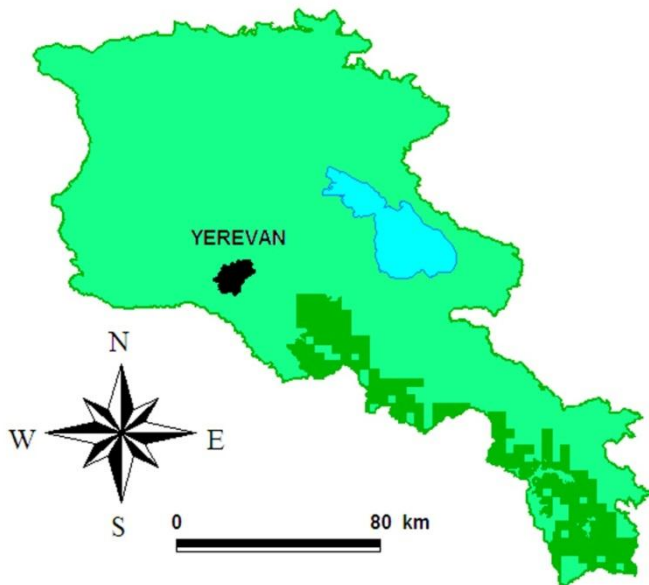


Fig. 2. Areas of leopard presence in Armenia (dark green). From: National Action Plan for Leopard (*Panthera pardus*) Conservation in Armenia. December 2008, Yerevan.

The Scientific Centre of Zoology and Hydro-Ecology is the only academic institution for wildlife research. While it collaborates with the government, WWF Armenia and other parties in wildlife monitoring, it has not been actively involved in this work yet.

Hunting is organized by an NGO named Armenian Society of Hunting but no hunting statistics are available at country level. List of game species and quotas are approved by BMA every year. Fulfilled quotas are however not reported back. Recently, 100 wolves were hunted with a 300 USD bounty per wolf. It is believed that 800–900 wolves exist in the country.

AZ - Azerbaijan

Information on numbers, distribution, threats and habitat conditions for leopard are available as well as population estimates and distribution of wild ungulates and numbers for livestock from 2002 (see Chapter 5.3).

Monitoring of wildlife (large mammals and birds) is regularly conducted by National Department on Environment Monitoring, which is attached to Ministry of Ecology and Natural Resources (MoENR). Staff from NGOs and scientific institutions also takes part in the monitoring organised by the ministry. Protected areas have their own scientific staff responsible for monitoring of wildlife. Rangers report on daily basis their records to the scientific institutions, which analyse the collected data and prepare annual reports on behalf of MoENR.

WWF Azerbaijan and the Azerbaijan Ornithological Society (AOS) take part in wildlife monitoring as NGOs. The *Deutsche Gesellschaft für international Zusammenarbeit* (GIZ, formerly GTZ) will start monitoring of biodiversity soon. Institute of Zoology and Institute of Bioresources of Nakhchivan Branch of Academy of Science are involved in monitoring. The Institute of Zoology has its own research projects in different parts of the country.

Azeri Society of Hunters controls the hunting and reports back to local controllers. Quotas are decided and licenses are issued by MoENR. There is some hunting outside the hunting reserves in the gaps between protected areas. The permits are granted by the local administrations, which also keep the poaching records and report back to national authorities every year. In Nakhchivan Autonomous Republic, there has been a moratorium on hunting since 2003.

GE - Georgia

Population size estimations and trends for wild ungulates are partially available (see Chapter 5.3). No recent proof of leopard has been found since 2009. While the Agency for Protected Areas (APA) has some statistics regarding the management of protected areas – including data on sociological attitudes and perceptions of local communities – the reliability of these statistics is questionable. PA management plans also contain site-specific biological data, but in many cases with a limited coverage. Site specific and regional reports are also available from NGOs.

APA and Biodiversity Services are the responsible GOs for wildlife monitoring but they neither have the capacity nor a close cooperation with each other. No nationwide system has been organised yet. Plans are underway to develop a monitoring program for key taxonomic groups outside the PAs. The National Biodiversity Action Plan is currently being updated. The Ministry of Environment and Natural Resources (MoENR) has worked with GIZ (*Gesellschaft für Internationale Zusammenarbeit*) to identify key groups, design practical survey and prepare monitoring methodologies and protocols. Work has begun in forming a volunteer bird monitoring group and training implemented. However, this program has been suspended, because of the recent reorganization of MoENR and lack of funds.

Within the protected areas, monitoring wildlife is the responsibility of the park administration (local APA). However, in many areas the implementation of monitoring programs is severely hampered by a lack of resources and capacity. APA and Biodiversity Services are interested in monitoring the Bezoar goat in Tushety PA, where 130 animals were counted in the 2010 census.

NACRES, Fauna & Flora International (FFI), WWF Caucasus Program Office, CAMPESTER and GCCW are the NGOs involved in wildlife monitoring. Ilia State University also has an active biological research department and Tbilisi Zoo is involved in some site-specific work. These NGOs and institutions can start the wildlife monitoring including training of GO staff. Afterwards the state agencies should take over the further work.

IR – Iran

Data on leopard sightings (mainly direct observations), human-caused leopard mortalities, livestock depredation and poaching records are compiled by the Department of Environment (DoE). Abundance estimations for wild ungulates from the 4 provinces in the Iranian Caucasus are available from the DoE (see Chapter 5.3). Within the Caucasian ecoregion, all spatial (GIS) data has already been produced and is regularly updated by DoE.

DoE is responsible for the wildlife monitoring. All leopard sightings are reported to the provincial offices of the DoE. Accordingly, leopard population has been guesstimated based on expert opinion at national and regional level. Since 2001, human-caused mortalities of the leopards have also been recorded and stored by the DoE and Iranian Cheetah Society (ICS) in a Leopard Mortality Database. It is believed that 30–50 animals are poached every year in the whole of the country. On the other hand, provincial DoE offices conduct annual census programs to count wild ungulates and report back to the central DoE. Meanwhile, the department also does occasional training for game wardens and experts to synchronize census protocols.

Besides the data on species, any attack on humans is normally reported to the provincial DoE offices and injured people usually ask for compensation to DoE. For livestock depredation, the provincial DoE offices fill in a protocol that is sent to the DoE headquarter. Convincing the government to compensate the loss is mainly dependent to local DoE authorities. Reza Masoud (East Azerbaijan DoE) is

known to compensate for leopard damage in this province. Information on wild ungulate poaching is available from confiscations, but such data likely underestimates the magnitude of poaching.

ICS, East Azerbaijan Wildlife Conservation Society and Persian Leopard Conservation Society have already been engaged in different field activities such as radio-telemetry, camera trapping, human-leopard conflict assessment and training of experts/game wardens of DoE. More Iranian experts and organisations have declared their interest to be actively involved in this programme.

RU – Russia

Information on the abundance of some ungulates (e.g. red deer, tur and chamois) is available from the Russian Caucasus, but mainly from nature reserves (over 100) and national parks (40), some of which have been monitored since 70 years.

Currently the Ministry of Environment is responsible with wildlife monitoring. Sign transects in snow or distance sampling methods are used in surveys. Red deer is counted in fall by acoustic sampling. Scientific studies are also done in PAs. All signs of medium and large mammals found are recorded by means of a specially developed software package. Annual reports summarising all this information are produced. Starting from 2011, surveys will also be carried out in sanctuaries and game reserves. Unfortunately, there is not enough staff in all PA to carry out all these surveys. The PA administration is now developing a simplified and practical method together with PA staff and researchers. In some PAs, tourists are also involved through reporting observations. However, in the Caucasus region, monitoring has been reduced because of political unrest.

TR – Turkey

Abundance estimations for few wild ungulate species are available only from game reserves and national parks. Data on distribution of large mammals exist in the form of rather outdated maps. Parts of the Turkish Caucasus have been the subject of gap analyses. These have produced, and will produce, current range maps for most large herbivores and carnivores. Those studies also produce vegetation maps, threat maps, distribution maps of other taxa, etc. Poaching records are available.

Wildlife monitoring has been mainly carried out by the General Directorate of Nature Conservation and National Parks (NCNP) within the Ministry of Environment and Forestry (MoEF). Annual counts of Bezoar goats are regularly done by the directorate at several wildlife reserves throughout the country. Less regularly, counts of chamois, red deer, mouflon, brown bear, etc. are made at selected reserves. Wild boar counts are carried out in some private or model hunting reserves. Counts of NCNP usually take place during the rutting season (September to December). In addition to ministry staff, local villagers and hunters are involved in the censuses. Sometimes the count is carried out by a university or by a private company (which is paid for). Censuses have been increased from 2000 to 2010, and a cumulative area of about 185,000 km² was counted in 785 inventories. 34,000 km² area have been surveyed alone in 2010. The results are not published, but are provided to researchers at their request. All those counts are above all made to determine annual hunting quotas. There are however serious problems with the methods applied and therefore they are not suitable for observing trends.

Several carnivores (wolf, caracal, brown bear, etc.) are known to cause livestock damage, but no compensation system exists. Wildlife is owned by the state, but when it comes to compensation, the government does not feel responsible for paying the losses.

Individual researchers have databases on records of large carnivores. Furthermore, the recent surge in camera trapping in Turkey, which is already approaching a total of 100,000 camera trap days, provides potential for additional data on species occurrence and relative density. Similarly, wildlife photographers increasingly document mammal species and share such information with others through the internet.

The North Nature Society (Kuzey Doga) based in Kars province (NE Turkey) has been carrying out baseline surveys (camera-trapping and questionnaires) on large carnivores in the Turkish Caucasus since 2009. Their intensive camera-trapping surveys on lynx will start in July 2011. Nature Society has also been carrying out projects on several species including brown bears in northern Turkey. At the universities several MSc and PhD thesis on the ecology, distribution and status of large mammals including wolves, brown bears, striped hyena, caracal, Bezoar goat and chamois have already been prepared. Nature Protection Center and Middle East Technical University jointly produced maps for several focal species associated with forests at the country scale. Scientific and Technological Research Council of Turkey (TUBITAK) has started a 3-year genetics project in 2011 on the large mammals.

While hunting is organized by the NCNP, the quotas are decided at a meeting where several NGOs, hunting associations and researchers take place. Large game is only allowed through trophy hunting and numbers are reported back. A member of the local NCNP unit attends all trophy hunts. However, the staffs of many local NCNP units are limited and usually overwhelmed with other works.

3. Baseline surveys

3.1. Aims of baseline surveys for the conservation of the leopard in the Caucasus

Baseline surveys are recommended as first step for large scale conservation programmes. Baseline surveys aim to assess the initial situation by compiling basic information from a large area but in a rather short period and with limited, but standardised effort. Information is collected with a broad approach by using simple (cheap) methods on several topics such as the presence/absence (or detection/non detection) of target species (i.e. leopard, its prey and co-predators), trends, conflicts (e.g. livestock depredation) and attitudes of local people towards the focal species. Besides this information, awareness of (protective) laws and hunting practices, livestock populations and livestock husbandry practices are collected. Baseline surveys are also perfect tools to form an association between the researchers and conservationists with local people, who are the main informants for the survey. While interviewed, locals learn about the conservation programs and can express their views and concerns and get in contact with the researchers.

3.2. Standards and needs for baseline surveys in the Caucasus

Available information on leopards, co-predators, prey and human attitudes differ between the six countries of the Caucasus Ecoregion (Table 1). In some areas – mainly in protected areas or wildlife refuges – basic information on game species is available, and in selected areas (e.g. Vashlovani NP in

Georgia), conflicts and human attitudes have been studied. However, no country has so far carried out a standardised and comprehensive survey across the potential leopard range.

The Leopard Working Group concluded that there is a need (and would be unpractical) to compile baseline information by using a standardised approach for the entire ecoregion, however with certain adaptations for each country. The general resolution will be a 10 x 10 km grid. Wherever a different resolution is needed, it should be chosen so that it can be transferred to 100 km² cells.

Table 1. Need for baseline information in the six countries of the Caucasus Ecoregion. Brackets indicate that some information is available, but not for the entire potential leopard range.

Country	Leopard	Co-predators	Prey	Conflicts & attitudes	Proposed time frame
AR	No	Yes	(Yes)	Yes	1–3 years
AZ	No	Yes	Yes	Yes	Nov 2011–May 2012
GE	Yes	Yes	Yes	(Yes)	2011–2015
IR	Yes	Yes	Yes	Yes	2 years
RU	(Yes) ¹	No	No	(Yes)	1.5 years
TR	Yes	Yes	No	(Yes)	Jul 2011–Sep 2011 ²

¹ More information outside PAs is needed.

² Pilot studies on 5000 km².

3.3. Organisation of baseline surveys in the Caucasian countries

AR – Armenia

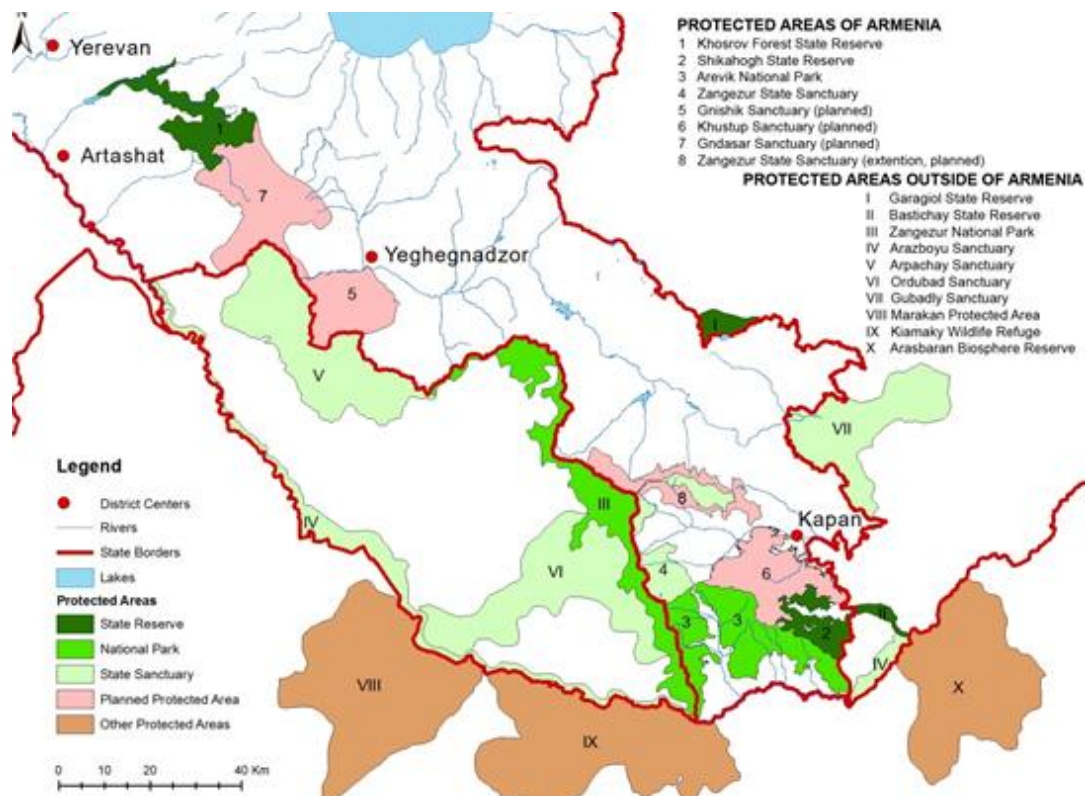


Fig. 3. Important protected area in Armenia with regard to leopard presence or recovery.

Areas for Baseline Survey: Zangezur, Bargushat, Meghri, Aiotdzor and Geghama ridges, covering an area of ca. 2900 km² in southern Armenia (Fig. 3). Grid cells should be 5 x 5 km which can be later extrapolated to 10 x 10 km grid.

Organizational aspects: Ministry of Nature Protection, WWF-Armenia, protected area administrations, Scientific Centre of Zoology and Hydroecology should involve in monitoring. Funding may come from for the surveys in protected areas by Ministry of Nature Protection, in other parts from Caucasus Nature Fund (CNF), especially for individual projects/programs.

AZ – Azerbaijan

Areas for Baseline Survey: (1) Talish Mountains, (2) Nakhchivan AR (Negramdag, Zangezur and Daralagaz Ridges), (3) Iori-Mingechaur Plateau, and (4) Greater Caucasus in NW Azerbaijan.

Organizational aspects: The survey should be done by WWF-Azerbaijan, in cooperation with the administrations of Hyrkan NP and Ilisu NR, and the Nakhchivan Institute of Bio-Resources. Funding should be provided by WWF, with additional in-kind contributions from the parks administrations.

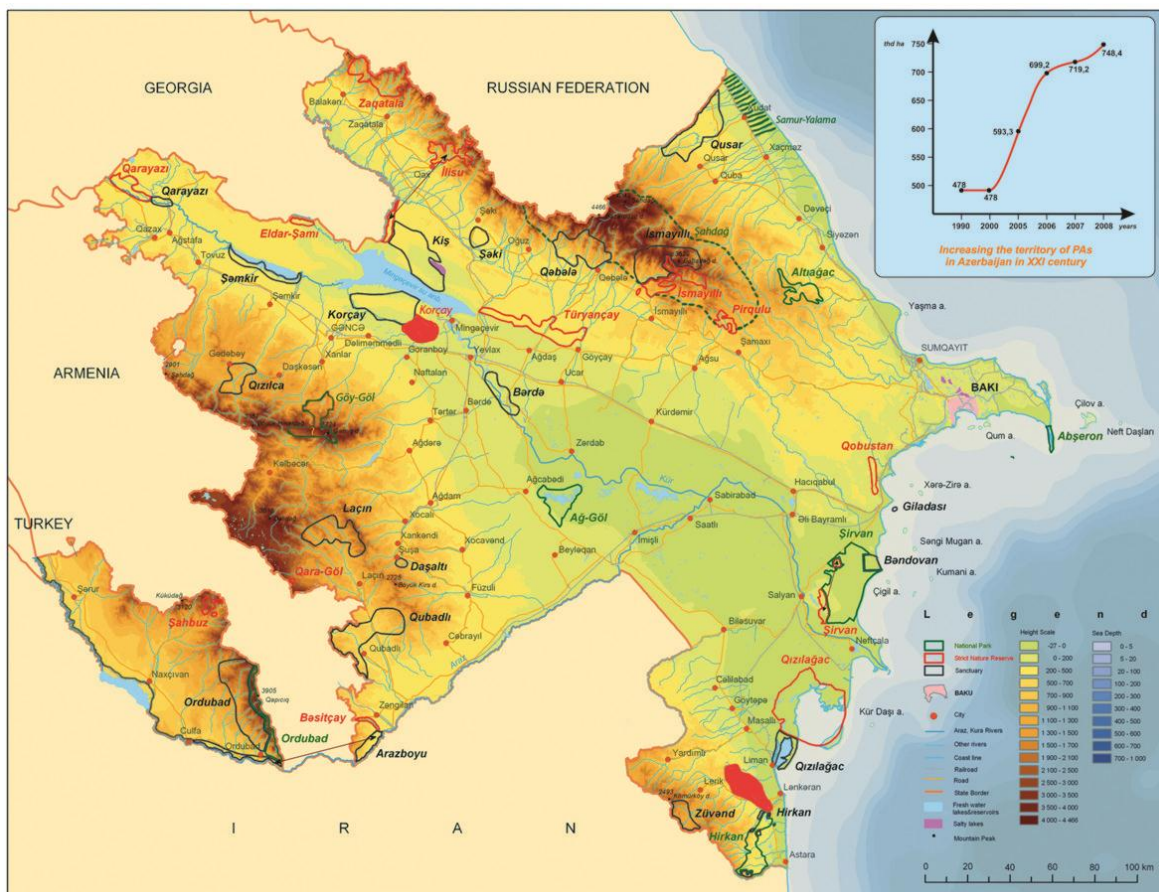


Fig. 4. Protected areas in Azerbaijan.

GE – Georgia

Areas for Baseline Survey: (1) Pshav-Khevsureti, (2) Erusheti, (3) Lagodekhi PA, (4) Vashlovani NP and (5) Tusheti NP (Fig. 5).

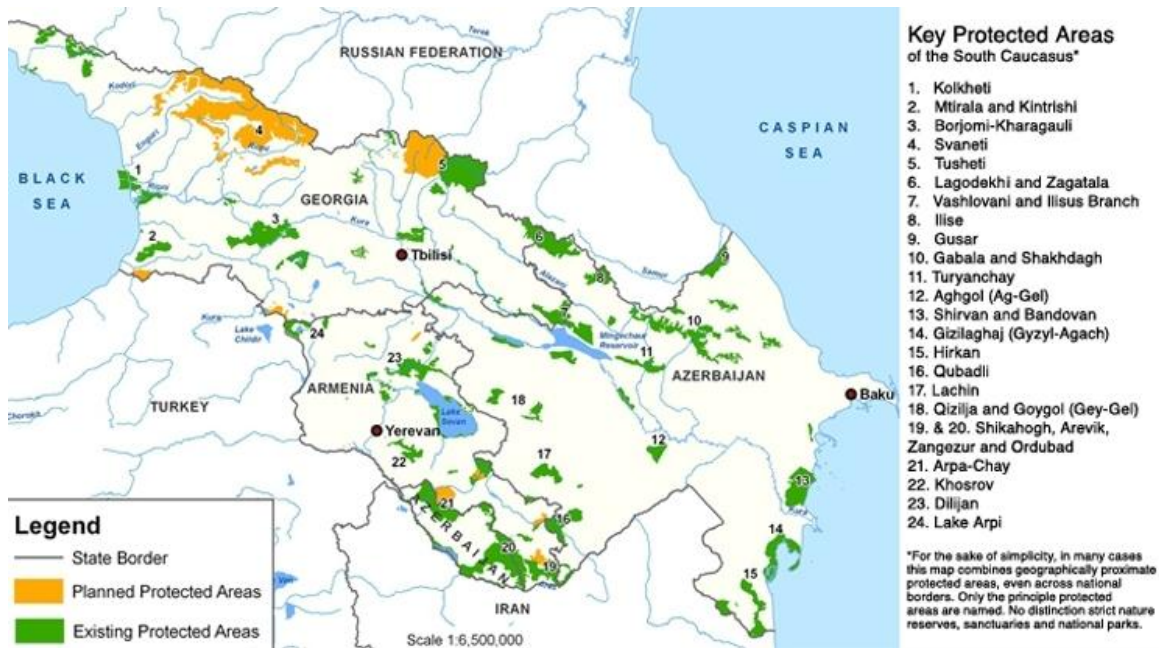


Fig. 5. Protected areas in the Georgia, Armenia and Azerbaijan.

Organisational aspects: The survey should be done by NACRES, (2) CAMPESTER, (3) Ilia State University and (4) Agency of Protected Areas (APA). Potential funding sources include international donor organizations (e.g. Caucasus Nature Fund, CNF), APA, and the National Scientific Foundation.

IR – Iran

Areas for Baseline Survey: Entire Caucasian Eco-Region in Iran (Fig. 6).

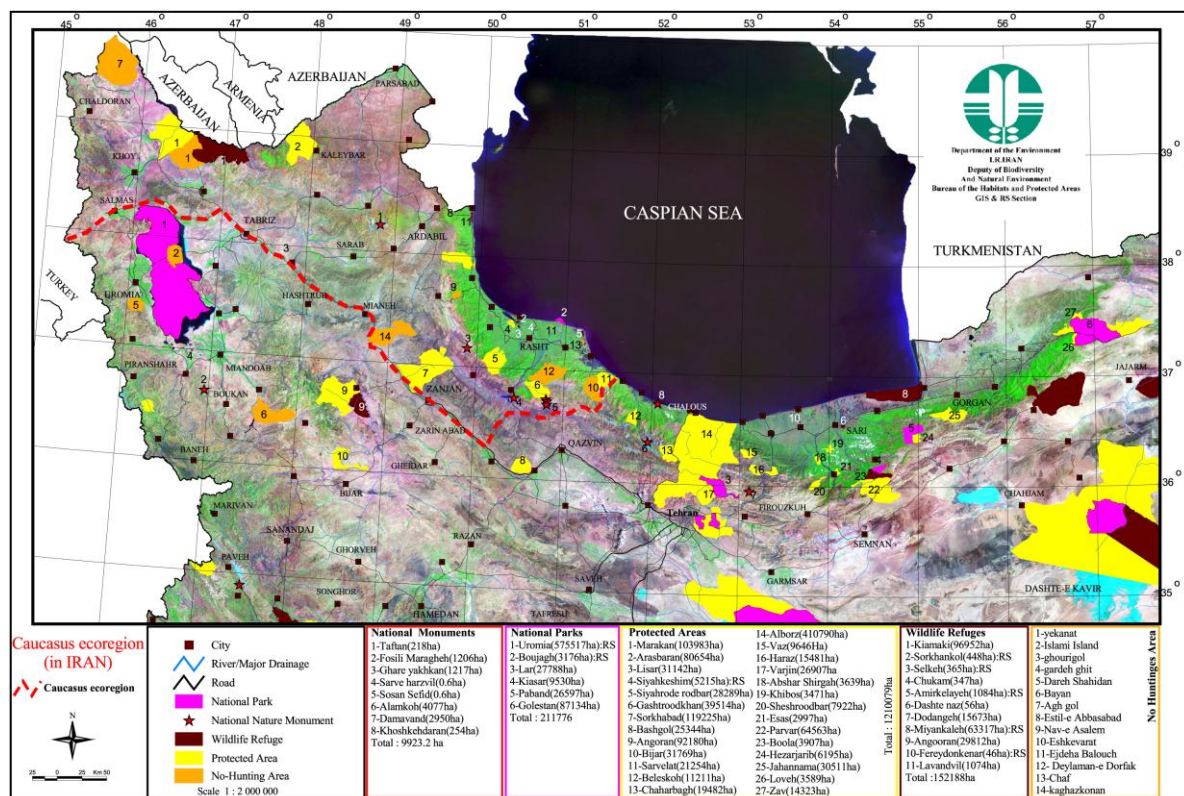


Fig. 6. Protected areas in Iran.

Organisational aspects: Institutions involved should be (1) DoE provincial offices, (2) several Iranian NGOs, and (3) universities. Funding will be provided by the DoE for training of local game wardens, but additional funds are needed for the field surveys (questionnaire survey).

RU – Russia

Areas for Baseline Survey: Surveys can be done once the leopard is released in Sochi NP under the National Recover Strategy. Until then some work can be done in Tshetshnia, Ingushetia, Dagestan, North Ossetia, and some other areas.

Organisational aspects: Local people need to carry out the work because of the difficult political situation. If people give information, their names need to be mentioned in the report. There is competition between the different clans. Before leopards are released, there will be no funding for surveys. PA and NP are united in an association, founded to implement such kind of projects. This is a good approach to find donors. If funding becomes available, staff of PA and NP receives additional income. The association can be used to find the funds, and then have different groups in different areas carry out the survey. WWF Russia can also help with funding.

TR – Turkey

Area for baseline survey: Within the Turkish Caucasus, an area of about 5000 km² is chosen for a pilot study. A 10 x 10 km grid will be used, so the grid will have 50 squares. The region is where the last evidence of leopard in Turkey was.

Organizational aspects: The baseline survey will be carried out under the leadership of the Ministry of Environment and Forestry and in close collaboration with national experts. For the pilot project, the ministry will provide the funding and the personnel (following a short training). Two people are already in the region who can participate and one vehicle is available.

4. Monitoring methods for leopards and co-predators

4.1. Qualitative and quantitative methods used

Wildlife monitoring is a regular and structured surveillance to assess the effect of measures in respect to a goal, objective or target to be reached and compared to a former status (e.g. recovery of an endangered species). It is carried out in order to (1) observe the conservation status of the target species, (2) control the effectiveness and efficiency of conservation and management interventions and (3) fulfil obligations of national legislation and international treaties.

Distribution, abundance, population trends, health/genetics and also the human attitudes towards the target species can be monitored. Goals, objectives and targets of an action plan have to be defined allowing a quantitative and/or qualitative evaluation and, through monitoring – repeated measuring of control parameters – can be adjusted if needed.

Wildlife monitoring normally bases on diverse information from different sources, and large-scale data can often only be gathered from a variety of sources. Scientific robust information and less reli-

able data should be compared (e.g. in a GIS project), but clearly separated. In order to distinguish type and sources of reports, the following categorisation of monitoring data is recommended:

Category 1 (C1): „Hard facts“: dead leopard, pictures (of known origin) and genetic samples;

Category 2 (C2): Observations confirmed by trained staff: killed wildlife or livestock, tracks, excrements, etc.;

Category 3 (C3): Unconfirmed or not confirmable observations such kills, tracks, sound and direct sightings with no additional proof.

Monitoring must be done in a partnership of GOs, NGOs, and scientists which is called the “triangle of conservation”. A network of observers and reporters needs to be established and interests groups (hunters, foresters, veterinarians, etc.) and the public must be informed.

In the monitoring-network professionals and volunteers must be trained in identifying field signs, methods and reporting. Network members should get a feedback on their work and the progress of the project. Co-ordinators are responsible for the group identity and need to communicate on a regular basis, e.g. at regular reunions.

4.2. Monitoring approaches in the Caucasus

AR – Armenia

Camera-trapping survey: Camera-trapping surveys in Armenia were established in 2002 in order to assess the status of leopard. Since then surveys have been carried out for a total of approximately 12,000 trap-nights at Khosrov Forest State Reserve, Meghri Ridge and Bargushat Ridge (Fig. 3). However, only 2 leopard photographs were taken so far.

Several camera-trap models were used, and it was found that Cuddeback Capture (Non-Typical Inc., USA) was the most effective version in terms of performance, cost and battery life. There are however also some concerns regarding the (sole) application of camera trapping: (1) Camera-trapping works fine in areas where species densities are moderate to high. With the low abundance in Armenia, it is not possible to collect sufficient number of photographs of different leopards for unambiguous identification. (2) At best, only 1–3 leopards can be photographed per Caucasian country (except Iran and maybe Nakhchivan). Estimation of leopard abundance, density or occupancy cannot be done from this data, because of the small sample size. Extreme rarity requires for long sampling period per site which violates the key assumption of population closure¹.

Comment from the discussion: Outside the source populations in northern Iran, a CMR-approach for leopard by means of camera trapping is not possible. However, each leopard picture is valuable for understanding possible dispersal patterns and movements, and identifying as many individuals as possible (minimum estimation) is important for the whole range. Camera traps should however mainly be opportunistically and at the most promising sites.

Sign surveys: From 2004 to 2007, surveys for leopard signs (scats, tracks, scrapes, scratches and prey remains) were carried out at 16 sites (2641 km²) in Khosrov Forest State Reserve, Meghri Ridge, Vayots Dzor Ridge, Zangezour Ridge and Bargushat Ridge.. A total of 1202 km was surveyed in 121 transects and 31 scats were collected. Five covariates (arid sparse forest, rough terrain, arid grassland, dirt roads and southern slopes) were used in the occupancy analysis in the software PRESENCE. After

¹ Open population modelling could be applied, too, but requires even larger sample size.

the analysis of scats (n = 31) identified by bile acids, it was found that 19 belonged to leopard, 4 to lynx, 2 to wolf and 5 were undetermined.

Conclusions from Armenian experiences with sign surveys: (1) Scats were found out to be the most available source of information about the leopard and other species in dry habitats such as in Armenia. Tracks were detected in the areas with soft substrates (clay, sand, sites near water) and generally useless for monitoring in Armenia. Scrapes seemed not very promising because they are produced in areas where densities are moderate to high, which is not the case in Caucasus outside Iran. Prey remains also occur very randomly and generally in least accessible areas (cliffs, scrubs). (2) The potential problem in working with scats is that the species can be misidentified. (3) For leopard, it is more important to conduct fewer surveys in more study areas than to conduct more surveys in fewer areas. (4) The standardized monitoring scheme looks as a set of 9 daily surveys per area = 3 daily surveys/season x 3 snowless seasons (March to November). Under this scenario, one or more detections indicate true presence and non-detection indicate true absence.

GE – Georgia

Camera-trapping surveys: NACRES and FFI have been monitoring carnivores since 2003 in Vashlovani NP by means of sign surveys, telemetry and camera-trapping. Interviews with shepherds and local people were done in the region of and between Vashlovani and Lagodekhi (Fig. 5). Radio-telemetry with rare species is difficult as they are hard to capture. So far, one bear was radio-collared in 2005. The collar of this bear broke off after 1.5 months. But with the help of FFI, 5 wolves were also radio collared but one was later killed by shepherd dogs.

A capture-mark-recapture (CMR) study was started in March 2011 to estimate the abundance of lynx population in Vashlovani NP. The study also aims to find hard evidence on the leopard presence in the area. In a grid of 2.5 km x 2.5 km, 25 camera traps stations were set and as of May 2011, 5 lynx individuals with both flanks and 5 with only one flank were photographed (Fig. 7). Wolves, jackals and jungle cats are also captured as non-target species.

Interviews with shepherds and local people have been carried out by the carnivore response team to monitor livestock loss from predators and evaluate carnivore mortality from illegal hunting/killing individuals at Vashlovani NP and its surrounding areas.



Fig. 7. Lynx photographed in a capture-mark-recapture survey of NACRES and FFI at Vashlovani NP.

IR – Iran

Opportunistic *camera-trapping* has been carried out by Reza Masoud in East Azerbaijan Province (Fig. 8). In a total of 60 km² in the Kantal Core Zone of Kiamaki PA camera traps revealed the presence of a total of 7 leopards (2 adult males and 2 adult females with 1 and 2 juveniles) in the area in a 2 years period (3 individuals were identified in the first year, 4 individuals in the second). Except one capture, no lynx was photographed in the area. This is in contrast to other countries where lynx has been photographed in relatively high rates.

Scats were also collected from the field in Sarigol NP. They were attributed visually to leopard, and prey remains were identified from a total of 180 scats. Prey species identified were wild sheep (mouflon), Afghan pika (of which abundance was decreased because of droughts) and livestock. 40 % of the leopard's diet in Alborz Mountains was found to be livestock.



Fig. 8. Leopard in Kiamaki PA (Photo R. Masoud).

4.3. Passive monitoring

Passive (opportunistic) monitoring is the standardised recording of chance observations (entire area, defined categories and common forms), central storing (database, gene bank, collection), common analysis, interpretation and reporting.

Information sources for passive monitoring can be shepherds, hunters, villagers, soldiers (more reliable), mediators are game wardens and local “volunteers” or interested persons (sometimes paid in Armenia or Azerbaijan). The information types were classified as sighting reports (directly in person or in the media including the internet), shooting reports, attacks on livestock and attacks on humans. However it was emphasised that little or no expertise exist on identification of the predators in the region and thus the predator may not be identified properly in every instance.

The records may either be documented (visual media, skins, etc. – C1 or C2) or undocumented (hearsay – C3). After initial filtering, some reports have to be followed up by visits or further contacts. It

was found that only 20 % of the records in Armenia pass the filtering process. Because everyone is not familiar with the leopard, especially in Georgia and Turkey, tail length can be used as a diagnostic. Classification of records into reliability classes (like C1, C2, C3) was so far not practiced but considered useful.

Only Iran has presently an established system to collect and keep records. Annual reports and records are put into an Excel database. A central database is considered necessary for the entire Caucasus Ecoregion and should be maintained in each country by the relevant ministry or possibly WWF. This database should be available to researchers and conservationists across the range, but exact location of the observations especially outside protected areas should be kept confidential (or be released only after a certain time).

4.4. Active monitoring

Sign transects: Systematic sign transects were established and tested by I. Khorozyan. Protocols and forms used were distributed in digital form at the workshop.

Training: As an early step in active monitoring, a basic training was considered to be important, and the target groups proposed (1) game wardens, (2) scientists and students, and (3) volunteers. During these trainings, the following topics should be addressed:

1. How to search for signs (which field protocols to use)?
2. How to register signs/observations in forms?
3. How to submit the completed forms and to whom?
4. How to interpret data? (This topic concerns only the analysts.)
5. Who is responsible for monitoring in each country? (Relevant to the network managers.)

Moreover a general and uniform manual (or guideline) has to be prepared. A first version will be prepared in English and then translated into local languages. "Monitoring of monitoring", regular common reporting and feedback to network members was also recommended in order to build and maintain motivation.

After completion of the training, so far, DoE in Iran and MoEF in Turkey promised to support volunteers and game wardens who will return collected information (under a contract) to the agencies in charge of the centralised wildlife management.

Camera-trapping: Objectives for the use of camera-traps were identified as follows: (1) leopard distribution, (2) population abundance and (3) trends. The suitability of these topics for each country is summarised in Table 2.

1. Distribution:

- a. Gather and update chance observations on the country basis to identify areas for opportunistic camera trapping.
- b. Use camera-traps to confirm presence of leopard in potential areas.
- c. Get as much as possible leopard pictures across the entire Caucasus Ecoregion to understand more on reproduction, minimum numbers, good reference pictures and possibly identification of livestock raiders.

2. Abundance and trend:

- a. CMR is the best method for abundance studies, requires however a minimum population density and size (see comments above).

- b. Iran, host of the only source populations, should conduct two pilot studies in Kiamaki (steppe-mountain) and Dorfak (forest-mountain). Other country experts should participate.
- c. Preliminary analysis of the data will be done by Iran.
- d. Optimise the analysis in a workshop for training purposes.
- e. Produce field guidelines and field manual by using all experience for further CMR studies for Persian leopard.
- f. Adjust the priority areas (future reference areas) for systematic camera trapping by considering all layers (habitat model, baseline survey, chance observations).
- g. Create a common leopard picture database.

Because some specific requirements (area size, population closure) of the CMR methodology, the monitoring has to be planned well. Moreover, funding, logistics (camera trap pool, etc.) must be discussed.

Table 2: Camera trapping goals selected by the countries according to their needs.

<i>Parameter</i>	<i>Armenia</i>	<i>Azerbaijan</i>	<i>Georgia</i>	<i>Iran</i>	<i>Russia</i>	<i>Turkey</i>
Distribution	Yes, in four areas	No need	Yes, in three areas	Just to confirm presence/absence when necessary	Yes	Just to confirm presence/absence when necessary
Abundance	Yes, in three areas	Yes, in three specific areas	No need at the moment	Yes, in five specific areas	No need at the moment	No need at the moment
Trends	Yes, in three areas	Yes, in three specific area	No need at the moment	Yes, in five specific areas	No need at the moment	No need at the moment

5. Monitoring of prey

5.1. Principles and requirements of monitoring of potential leopard prey in the Caucasus

According to Heptner and Sludskii (1972) prey of leopard in the Caucasus are wild ungulates (Bezoar goat, tur, mountain sheep, chamois, roe deer, red deer and wild boar), but also European hare, pheasant, rock partridge, Caucasian black grouse, snowcock and porcupine. New data on the globally threatened species listed were recently compiled by Zazanashvili and Mallon (2009). Where wild ungulates are not available, domestic animals – cattle, goats, horses, dogs, poultry – become important prey. Livestock was not found to be the prey of leopard in Armenia by Khorozyan and Mal-khasyan (2003), but this may be different in other countries. Mitigation measures for livestock losses depend also on the status of the predator. If a carnivore species is not endangered, the notorious livestock raiders are generally be removed. However the leopard is Critically Endangered in the Caucasus, and each individual is important. To prevent retaliation killings, compensation should be given

to livestock owners to ease their economic losses² and measures must be taken to prevent further damage.

Currently it is not known whether the presence of leopard in a certain area correlates with decrease of wild prey or increase of livestock. The general opinion of the workshop participants was that availability of wild prey is not a limiting factor for leopards. However, while some participants claimed that the prey abundance is high and should not be a problem for the recovery of leopard, some stated that feeding ecology of the leopard has to be studied before making any comments on the sufficient prey availability. Baseline surveys on potential prey are needed to collect detailed information on the livestock and prey populations. Several methods are used in such surveys from pellet counts to more robust capture-mark-recapture techniques. Each method has certain requirements which differ according to species, landscape type, area size, etc.

In the Talysh Mountains at the border between Azerbaijan and Iran, prey density is believed to be low and livestock depredation (by leopard) high. The area has recently been put under protection and wild ungulates are expected to recover. The new PA could provide a welcome opportunity for studying whether increasing wildlife abundance has an effect of the leopard.

5.2. Monitoring of ungulates in the Caucasus (case studies)

Camera-trapping and occupancy surveys in Armenia: During the camera-trapping surveys at Meghri Ridge in the 2006-2007 period, detection probability of each species were calculated, and independent photo-captures were used to estimate the Relative Abundance Index (RAI).

The results and conclusions are as follows (Khorozyan et al. 2008):

1. Bezoar goats can be surveyed and monitored equally by direct observations (n = 54) and camera-trapping (n = 76).
2. Wild boars are rarely seen, but can efficiently be camera-trapped (96 photos *versus* 2 observations).
3. Data on roe deer are too limited to assess the method, as this species is generally rare in arid forests of the Meghri Ridge.
4. Bezoar goat and wild boar are distributed all over the area (occupancy = 1), but roe deer is confined only to woodlands (occupancy = 0.61).
5. Probability of visual detection of Bezoar goats is high (0.59) compared to wild boars (0.09) and roe deer (0.31).
6. Ungulate populations in the eastern part of the Meghri Ridge are estimated as follows: 269–378 Bezoar goats, 133–211 wild boars and 6–16 roe deer.
7. Occupancy modelling provides a useful technique to estimate species. Abundance and occupancy (and hence density and biomass) from direct observations across the surveys, space and time.
8. New development of camera-trapping analyses allows counting uniformly coloured animals (such as prey) directly from photo-captures without additional modelling.
9. The linear relationship between the Relative Abundance Index and actual abundance is strong, but has very poor predictive power.

The conclusions from these experiences were:

1. Visual observations are the best method for research and monitoring of Bezoar goat and mouflon.

² Compensation can be in a different form than direct payment. There are models of alternative compensation schemes that allow better to integrate local people into conservation than just paying money for killed stock.

2. Camera-trapping works fine for Bezoar goat, wild boar and roe deer, but not for mouflon living in open habitats.
3. Occupancy modelling with single-season and multi-season PRESENCE has been a good tool to estimate ungulate numbers, density, biomass and other parameters, but careful attention should be paid to the following aspects: (a) For Bezoar goats and mouflon, selected sites should be large enough and distant from each other so that their independence can be safely assumed; (b) surveys in which animals were not detected must be inserted into the input database to avoid the inflated and unrealistic detection of 1.0.
4. In Bezoar goats and mouflon, detection probabilities should be calculated separately for males and females which are spatially and behaviourally distinct.

5.3. Available information on wild herbivores in the Caucasian countries

AR – Armenia

The prey species are monitored by the government (MoNP) and NGOs. However protected areas do not have a skilled staff for proper monitoring. Moreover, no centralised and standardised system for monitoring exists, and nobody cares about monitoring outside PAs. The potential ungulate prey species for the leopard in Armenia are Bezoar goat, wild boar, mouflon, roe deer and red deer. The status of these species is as follows:

Bezoar goat: Patchy distribution in precipitous cliffy mountains of southern Armenia. Assessed as “Vulnerable” in the IUCN Red List and in 2010 Red Data Book of Armenia. Abundance: 1000-1500 individuals.

Wild boar: Common throughout the country.

Mouflon: Exist in 2 isolated sub-populations in sub-alpine and alpine meadows of southern Armenia. Assessed as Vulnerable in the IUCN Red List and as Endangered in 2010 Red Data Book of Armenia. Abundance: < 250-300 individuals.

Roe deer: Common in forests of northern and southern Armenia. It is quite rare in limited areas of arid forests (e.g. in the Meghri Ridge where 6–16 individuals were counted). In arid forests, roe deer are confined to canyon bottoms with humid shrubs and woodlands along the rivers.

Red deer: Occasional immigrations to Northern and southern Armenia from Azerbaijan. Assessed as “Critically Endangered” in 2010 Red Data Book of Armenia.

AZ – Azerbaijan

The most common ungulate in Azerbaijan is wild boar. Bezoar goat is found in Murovdag, Shahdag, Zangezur Range and Karabag upland. In Zangezur range, the population is estimated at about 1200 animals. Mouflon is also known to occur between AR and Nakhchivan and their numbers are believed to be about 450.

Roe deer is known to be found at the forested areas of Azerbaijan. However, their numbers are unknown.

Chamois is found only in Greater Caucasus, where also about 700–800 red deer is found. Red deer was also reintroduced to Lesser Caucasus but their numbers are very low (16–20 individuals). A few individuals are known to be found in Garayazi Reserve at the border with the Gardabani Sanctuary in

Georgia. In the high mountains of the Greater Caucasus, about 12000 tur are known to exist, mainly migrating between Azerbaijan and Dagestan.

As of 2002, the number of livestock was 28.5 million in Azerbaijan.

GE – Georgia

Bezoar goat, Red deer, roe deer, tur chamois and wild boar occur in Georgia. The wild boar and roe deer populations are believed to be in stable conditions while no information exists about their present abundance. The population size of the two tur species *Capra caucasica* and *C. cylindricornis* are estimated as 500 (as of 2004) and 5000, respectively. However populations of both are decreasing. The red deer is found in three populations in the country with a total of about 600 individuals and it is believed that their numbers are slowly decreasing. Though no information is available on their numbers, the chamois is also believed to be decreasing. The Bezoar goat is the only species with a stable population which was however estimated only 160 individuals both in 2004 and 2010.

As populations of many species are declining, it may be possible that the livestock will be one of the main preys of the leopard in Georgia.

IR – Iran

Annual census is conducted every year in fall for different species by provincial DoEs for each area with the game wardens. While No information is available for the livestock numbers in the Caucasus part of Iran, the estimations of wild ungulate number are given in Table 3.

Table 3: Abundance estimations of wild ungulates in the four provinces of the Iranian Caucasus. The number for roe deer is an estimation and not based on census data.

	Gilan	Ardebil	East Azerbaijan	West Azerbaijan	Total
Bezoar goat	N/A	200	2180	270	2650
Mouflon	-	-	100	820	2050
Wild boar	N/A	N/A	N/A	N/A	N/A
Maral	<200	-	-	-	<200
Roe deer	<500	-	<100	-	<600

TR – Turkey

Annual counts are made on ungulate species by the MoEF in some 20 wildlife reserves, but reliable country-wide population sizes or demographic data are largely missing. Nevertheless, Bezoar goat, roe deer, chamois and wild boar are known to occur in the Turkish Caucasus and except chamois it is believed that their numbers are either stable or increasing. On the other hand, as a consequence of the considerable rural exodus since 1980, livestock numbers are declined (Table 4), giving potentially more room for wildlife.

Table 4: Change in livestock numbers in Turkey between 1980 and 2010. Numbers are given in millions.

	1980	2010	Decrease in ratio
Sheep	50	23	0.46
Goat	16	5	0.31
Cattle	16.5	10.5	0.63

5.4. Needs and practical organisation for an ungulate monitoring in the Caucasus

Monitoring of leopard prey species has to be organised in two steps:

1. Preliminary diet analyses of leopard. Depending on the results of these analyses, discussions need to reveal where and how to monitor the prey population and who should do it. Moreover each country should decide on people who would compile, analyse and interpret the data. The findings should be used in all decisions concerning directly or indirectly leopard conservation.
2. A training programme and manual has to be developed, and responsible persons and organisations need being appointed. This should be followed by the training of selected people in monitoring including theoretical background and troubleshooting. "Monitoring of monitoring" should be done in electronic discussion groups (Google, Yahoo) and regular meetings (twice a year) for the people involved.

5.5. Monitoring of livestock and livestock-predator conflicts

Monitoring of conflict is already done in Iran at a national level but in other countries only site-specific work done by NGOs. The main problem is without any solutions to offer collecting data is difficult. The compensation system of Iran was not accepted in other range countries because either (1) the leopard has not been involved in any livestock-predator conflict or (2) the compensation system is known to have drawbacks.

Table 5: Details of livestock-predator conflict in the range countries.

<i>Country</i>	<i>Carnivore</i>	<i>Livestock</i>	<i>Husbandry</i>	<i>Monitoring</i>	<i>Mitigation</i>
Turkey	wolf bear	sheep bees	LGDs Corrals	Some by NGOs & Universities	Electric fencing
Armenia	wolf	sheep cattle	LGDs (but No more)	Some by NGOs	Bounty (1 month)
Azerbaijan	wolf bear leopard lynx	sheep goats cattle	LGDs corrals	None	Trial compensation scheme but Not effective
Georgia	wolf	sheep cattle	LGDs corrals	Some by NGOs	GO reporting, not publicized
Iran	leopard wolf bear	sheep cattle goats bees	LGDs	Govt. reporting system	No mitigation

However, as mentioned by Gareth Goldthorpe of Fauna and Flora International, alternatives to compensation need to be discussed because it is important to assure the corridors such as in Gilan (where the situation is bad) and to keep Iran as a source. Details of livestock-predator conflict in range countries are given in Table 5.

6. Long-term conservation monitoring for the leopard in the Caucasus

6.1. Principles of stratified monitoring

It is impossible to measure everything, everywhere, at any time because it is too costly. Monitoring needs to be stratified in space, time, and in regard to methodological approaches used. The principle of stratified monitoring is that “cheap” information is collected continuously over the entire area, and “expensive”, but more reliable and convincing data is generated from time to time in specific study sites (reference areas).

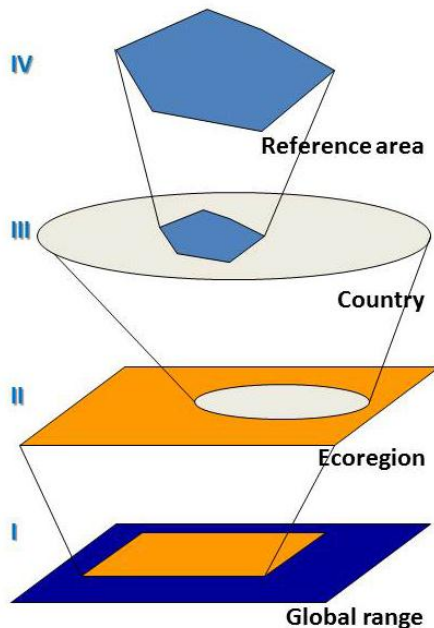


Fig. 9. Spatial concept for stratified monitoring. The levels decrease from I–IV in size of the area, but increase regarding the methodological investment. Information gained on the higher levels are used to verify and to calibrate data from lower levels.

IV – Reference area: Study site for scientifically robust methods (CMR, camera trapping, telemetry, etc.). Biological and ecological data used for calibration of “cheap” data at higher levels.

III – Country, sub-population: Chance observations, national statistics, mortalities, etc. Standardised compilation, central database, analyses, interpretation and reporting.

II – Ecoregion, meta-population: Cheap and opportunistically collected records (passive monitoring, chance observations), shared database, transboundary cooperation, regular (e.g. annual) exchange, analyses and interpretation.

I – Global distribution range of a taxon: Cheap and opportunistically collected records (passive monitoring, chance observations).

Communication and coordination is needed at all levels. Responsibilities, network management, sharing information and common presentation/reporting (group identity) needs to be organised. At the level of the global range of a taxon, the Species Survival Commission (with the respective specialist group) of IUCN is the adequate partner to compile and analyse the data according to the Red List assessment rules. This assessment is also applicable on regional level (II, sometimes III) and provides a widely accepted standard that can also be adapted for the smaller levels III and IV.

6.2. Spatial concept

The working group looking into a spatial concept discussed where to make opportunistic/systematic surveys, or extensive/intensive monitoring for the leopard, prey and co-predators. These questions were considered both for the country and ecoregion level (recommendations for reference areas below).

As it was stated in the Istanbul meeting³, Iran is the only country presently hosting source populations of leopard in the ecoregion. CMR surveys by means of camera trapping to estimate leopard abundance should be done as a priority in the most promising PAs in north-western Iran in order to

³ Special leopard day during the CBC meeting in Istanbul, 7–11 March 2011.

gain information on the status of this important source population and to have a first reference regarding the density of Persian leopard in the Caucasus Ecoregion. The areas identified as (potential) reference areas for intensive monitoring are:

Armenia: Ararat Province; Vayots Dzor Province; **Syunik Province**;

Azerbaijan: Zangezur NP, **Ordubad and Arazboyu Sanctuaries**, Nakhchivan AR; Akhar-Bakhar Section of Ilisu Reserve;

Georgia: Pshav-Khevsureti; Arusheti; Vashlovani NP; Tusheti; Lagodekhi;

Iran: Entire Caucasian region in Iran, but specifically: **Kiamaki; Arasbaran; Lisar; Dorfak; Aghdagh**

Turkey: **Coruh Vadisi Wildlife Reserve**; Vercenik Wildlife Reserve; Oltu Wildlife Reserve; Other sites selected after predictive modelling;

Russia: Daghestan; KabardiNo-balkaria.

Areas in bold are those designated for intensive methods (e.g. CMR), if an established group of leopards exists. In Iran, extensive surveys can be carried out by provincial DoE offices, mainly based on livestock depredation and leopard kills across the entire Iranian Caucasus. In other countries, where sink populations or isolated (dispersing) individuals occur, opportunistic camera-trapping and sign surveys can be carried out over large areas in promising locations. The intensive surveys may follow depending on the results of the extensive efforts. However, all surveys should not only detect the presence of leopard, but also identify real or potential corridors and barriers for their dispersal and movements.

6.3. Methods and procedures

Methods for monitoring leopard and its co-predators and prey species will differ, but moreover, methods will also need to be adapted for leopard occurrences of different status (e.g. sink or source populations, residents or transients, etc.). Systematic monitoring such as CMR and occupancy surveys by means of camera-trapping can only be applied in areas with established populations⁴ (e.g. known reproduction indicating resident females). In areas of single (transient) leopards, opportunistic sign transect surveys can be done for presence/absence (or detection/non detection) and also camera-trapping at kill sites and good wildlife passes. One reason for using camera traps⁵ across the whole Caucasus is to identify as many leopards individually as possible and to compare the pictures in order to understand the dispersal and migration patterns. Sign transects need to be defined in more detail regarding where and when to carry out. The areas which have no stable leopard populations (e.g. Tusheti, Vashlovani, Lagodekhi) need to be regularly checked even if there at the time being no observations were made.

Other methods such as sign-based occupancy surveys could be considered but these require more effort and may not be robust.

⁴ CMR technics with camera trapping can be applied in both source and sink populations, however only in areas with an established spatial structure, what is always the case if the leopards reproduce. In the workshop, we have used the term “source population” for the leopard occurrences in north-western Iran, because they are the only known area with reproduction able to provide animals that can disperse to the other areas in the Caucasus. We however do not know, whether these occurrences are demographic source (with reproductive surplus) or sink (with reproductive deficit) populations.

⁵ Another justification for continuous opportunistic use of camera traps is the high propaganda and awareness value of leopard pictures, also important for future fund-raising.

The main consideration in camera-trapping surveys was theft. This is however believed to decrease when engaging local communities into the surveys and gain insight into local “traditions” and patterns (e.g. learn which paths are used by poachers and avoid setting camera traps there).

Interview-based surveys can also be targeted at hunters or poachers, game wardens and anyone who spends significant time outdoors. Interrogations should base on a standardised (but locally adapted) protocol for semi-structured interviews. A mailing of questionnaires might be easier, but they are known to have a low and biased return rate.

Opportunistic survey methods for leopards should include co-predators and prey. Interview surveys can include questions about these taxa and can even be extended to livestock-predator conflict and husbandry traditions by including specific target groups.

Recommendation: Country leopard groups develop a monitoring plan for one year, starting at the beginning of the winter 2011/12 based on this meeting report.

6.4. Field protocols and observation forms

The following forms and respective protocols are need to organise the monitoring:

1. Observation form (sightings of predators and wild prey);
2. Leopard mortality form (including necropsy protocol);
3. Forms for reporting of tracks, scrapes, scats;
4. Sampling forms (e.g. hair, tissue, bones) including protocols for proper handling and storage;
5. Form for wild prey killed and livestock damage.

Observation and dead animal forms already exist in AZ, AR⁶, IR and RU. Moreover track form is also used in AZ. AR has also forms for sign surveys (tracks, scats, prey remains, scratches), public surveys (especially about human-wildlife conflicts) and camera-trapping. Other countries have no such forms. The existing form should be reviewed for compatibility and translated into all local/national languages. Example forms and the respective protocols need being integrated into the handbook.

6.5. Establishing and training of the monitoring networks

For establishing the country monitoring networks, the following questions were discussed:

1. What kind of training is required?
2. Who should (staff categories) be trained for practical monitoring?
3. What training units and tools/manuals are needed?
4. Who will coordinate the network in each country?

It was decided that the training has to be done at 4 levels; “basic”, “practical I” and “practical II”, and “specific”. In basic training the target group will learn how to report observations to the monitoring centres or authorities in charge. The practical training will cover identification of field signs, application of field methods, and reporting by means of specific observation forms. The specific training will include not only the aspects of practical training but also the theoretical background of the methods, data treatment, analysis and reporting (Table 7).

For training and later application in the field, a field guide/monitoring manual is needed. Training of people should be done in the field and basic equipment for these people has to be provided. The first

⁶ These forms were provided by I. Khorozyan and distributed as electronic files at the workshop.

draft of the field guide will be prepared by Gareth Goldthorpe (Fauna and Flora International) in English until end of October 2011. Country centres will later form a network and adapt the guide to a country field book. National contributors and reviewers are:

- AR – Igor Korozyan;
- AZ – Elshad Askerov;
- GE – Bejan Lortkipanidze;
- IR – Mohammad Farhadinia;
- RU – Umar Semionov;
- TR – Emre Can.

A Leopard Monitoring Centre has to be created in each country. Each centre must have a physical address, phone number, e-mail, and preferably a website. Coordination for this task will be done in

- Armenia: WWF + MoNP;
- Azerbaijan: WWF and MoE;
- Georgia: a committee (University + MoE + WWF + local NGOs);
- Iran: DoE (in partnership with NGOs);
- Russia: MoE + Association of Reserves & NP of the North Caucasus;
- Turkey: MoEF.

Table 7: Matrix indicating the groups to be trained to form a monitoring network in each country. Skills to be trained include: *Basic*: awareness, types of observation and ways of reporting; *Practical I*: active participation in passive/opportunistic monitoring in the field (assessment of observations, application of field protocols); *Practical II*: active participation in active/systematic monitoring (use of camera traps, track transects, kill assessment, etc.); *Specific*: theoretical background, data treatment and analyses.

<i>Target group</i>	<i>Basic</i>	<i>Practical I</i>	<i>Practical II</i>	<i>Specific</i>
Researchers	X	X	X	X
Locals	X	(X)		
GO/PA staff	X	X	X	
NGO field staff	X	X	X	
University students		(X)	(X)	X
Game farm staff (GE)	X	X		
Private game reserve staff (GE)	X	X	(X)	
Military staff	X	X		

7. Establishing a Caucasian Monitoring Network

7.1. Examples of international networks for cat conservation

SCALP – Status and Conservation of the Alpine Lynx Population: The Alps incorporate some 100,000 km² of suitable lynx habitat in seven countries. The reintroductions in the 1970s (in 4 of the 7 countries) were not coordinated and no surveillance or population monitoring was established. Only in 1993, an expert group across the Alps was formed in order to standardise and synchronise monitoring. Each country delegates 2–3 lynx experts to the group, managed by the SCALP coordinator, who has a 50 % job. First country-based status reports were prepared and published together in 1995, when also the first SCALP conference was held. The goals of the SCALP group are:

1. To survey the development of Alpine lynx populations and produce status reports (country based and pan-Alpine compilation);
2. To synchronize monitoring and define common standards⁷ for the compilation, analyses, interpretation and publication of monitoring results;
3. To provide expertise for GOs and NGOs and to make recommendations for the conservation and management of the Alpine lynx population.
4. To inform the authorities and the public on the conservation status of the population and further the cooperation and coordinated management at all levels.

AGA (Allianza Gato Andino) – The Andean Cat Alliance: The alliance was founded in 1999 to contribute to the knowledge and conservation of the Andean cat and its habitat in the four range countries (Argentina, Bolivia, Chile and Peru), through innovative strategies in research, conservation, community participation and support in the management of wild areas.

AGA is carrying out research (1) to determine the geographic distribution and conservation status of the species, (2) to evaluate the environmental and human variables that affect Andean cat distribution, (3) to estimate its population densities and genetic variability. AGA members conduct field surveys based on interviews with local people and subsequently implement field campaigns.

AGA conducts training programs for park guards and local people to fully engage them in wildlife monitoring. By working with local stakeholders, AGA creates permanent field teams within the individual communities closest to Andean cat habitat. These field teams generate additional and key information on Andean cats and promote conservation as an important issue within their communities. Every Andean cat research project has an educational component. The alliance coordinates education activities in each of the four range countries. Educational activities address general issues of environmental protection in the high Andean region, as well as the specific value of conserving the Andean cat. Regarding the protected areas, the prime goal of the alliance is (1) to strengthen the management of protected areas where the Andean cat is present, and (2) to promote the establishment of new protected areas and corridors. In Argentina and Chile, AGA has identified areas where protection needs be strengthened, as well as new areas that should be given protection status.

AGA has a general coordinator, country representatives (1 from each country) and four working groups with a coordinator each (conservation, education, distribution & genetics, ecology).

⁷ The SCALP group developed e.g. the categorisation of observations into 3 categories as explained in Chapter 4.1 of this report.

7.2. An international network for the Persian leopard

To grant the recovery of the Caucasian leopard population and the transboundary conservation of the species, the cooperation between the six countries sharing the Caucasus Ecoregion has to be organised and maintained. The Caucasus Biodiversity Council (CBC) is a strategic body overseeing the advance and implementation of the Ecoregional Conservation Plan, but the CBC is not dealing with practical aspects of the leopard recovery and conservation.

For the cooperation and coordination at scientific/technical level, the workshop participants decided that a specific network should be established. The network could, looking at the Snow Leopard Network (www.snowleopardnetwork.org) as a model, eventually take care of the Persian leopard (*P. p. saxicolor*) in its entire distribution range. However, for practical reason and to make it operable as soon as possible, the “Persian Leopard Network” should be first established for the Caucasus range and deal with the conservation of the leopard in the Caucasus ecoregion. Standards and guidelines developed here can then be promoted in other range counties.

To give the Network a mandate, it could be endorsed as a working group of the CBC and sign a memorandum of understanding with the IUCN/SSC Cat Specialist Group. Such an MoU would require that the Network helps with the regional assessment of the conservation status of the leopard in the Caucasus according to IUCN Red List standards, but this would be an obvious task for the Network anyway. Assignments for the Network could be:

1. Develop common standards and guidelines for the conservation monitoring of the leopard in the Caucasus (outcomes of this workshop);
2. Promote and actively advance the establishment of national monitoring centres, schemes and networks according to the agreed principles for transboundary cooperation.
3. Exchange information and findings from the national monitoring and analyse and publicise the data in a ecoregional monitoring report.
4. Define standards and develop common tools for training and field/monitoring protocols.
5. Promote the implementation of the Conservation Strategy for the leopard in the Caucasus (e.g. through the National Action Plans).
6. Promote the further research on all components of leopard conservation.
7. Help raising awareness for leopard conservation at all levels, both national and international.

The Network needs:

1. Terms of References describing the goals, organisation, affiliation, tasks and output of the Network.
2. An organisational structure: Chairperson, a certain number of members from each country, possibly sub-committees for special tasks. In order to be operational, membership should be restricted to people actively involved in leopard conservation.
3. A list of tasks and assignment and a work plan explaining the tasks of the members and the coordination and cooperation between the national and the international level.
4. A newsletter and a website.
5. A common database and rules on how to sponsor the database from information from the national monitoring databases (in order to secure both sharing of important information and the copyright and publication rights of the people who generated the data).

For concrete task and next steps see following chapter.

8. Conclusions and next steps

The leopard is a priority species for conservation in the Caucasus Ecoregion. Implementation of activities as identified in the *Strategy for the Conservation of the Leopard in the Caucasus* is however delayed. This is, among others, a consequence of lacking organisational structures and common approaches and standards. The participants of this workshop agreed to improve the cooperation on scientific and technical level. This requires progress in two directions:

1. A strong “professional network” needs to be established as a recognised authority for leopard conservation. Convincing scientific information will eventually be influential also at the political level and gain the support from the international conservation community.
2. A pan-Caucasian monitoring network requires improved national monitoring through the establishment of national monitoring centres and the implementation of common standards for monitoring, including compatible protocols and forms and training material.
3. National monitoring efforts should be synchronised in order to allow for a pan-Caucasian compilation. This requires also sharing data. The national monitoring centres will build databases and remain in full control of their respective data and information, but all data relevant for transboundary work (e.g. pictures to identify individual leopards) and an ecoregional assessment must be shared. Regular joint reporting or scientific publications are recommended to strengthen the output and international awareness.

Concrete tasks and next steps arising from this meeting are:

1. Baseline surveys on a 10 x 10 km resolution will be done in all relevant or potential leopard areas across the Caucasus. A first survey will start in NE Turkey in autumn 2011, which will also serve testing the field protocols and questionnaires that will then be used across the range.
2. A systematic capture-mark-recapture survey by means of camera trapping will be carried out in designated reference areas in NW Iran. This study will provide information on the status of the source population and test the method for further similar surveys. Start of the work depends on the availability of funding and technical equipment. A total of 120 camera trap units and batteries will be needed.
3. A “Persian Leopard Network for the Caucasus” will be formally established based on Terms of Reference. The CBC will be asked for endorsement (e.g. as a special working group or task force of the CBC) and a MoU with the IUCN/SSC Cat Specialist Group is foreseen. N. Zazanashvili will provide a list of potential network members, and U. Breitenmoser will draft an MoU which can also be used as an input for the ToR.
4. The CBC chair H. Jungius will be informed by N. Zazanashvili and U. Breitenmoser and asked to support the leopard work, e.g. with a letter to the Iranian DoE to emphasise the importance of the NE Iranian populations for the survival of the leopard in the entire Caucasus.
5. National monitoring centres will be formally established by participants of the workshop in each country. The centres will compile all data relevant for the conservation monitoring of leopards and will draft a monitoring plan for the year 2012 by 31 October 2011.
6. A field handbook for the monitoring of the leopard in the Caucasus will be developed. G. Goldthorpe will draft an English version until 31 October 2011.

References

Khorozyan I. G. and Malkhasyan A. G. 2003. Ecology of the leopard (*Panthera pardus*) in Khosrov Reserve, Armenia: Implications for conservation. Società Zoologica "La Torbiera" no 6, 41 pp.

Khorozyan I. G., Malkhasyan A.G. and Abramov A.V. 2008. Presence-absence surveys of prey and their use in predicting leopard (*Panthera pardus*) densities: a case study from Armenia. Integrative Zoology 3 (4): 322-332.

Heptner V. G. and Sludskii A. A. 1992. *Mammals of the Soviet Union: Carnivora (hyaenas and cats), Volume 2*. Smithsonian Institution Libraries and National Science Foundation.

Zazanashvili N. and Mallon D. 2009. Status and protection of globally threatened species in the Caucasus. Tbilisi: CEPF, WWF. Contour Ltd., 232 pp.

Appendix I: List of participants

Name	Organization
Armenia	
1. Mr. Karen Manvelyan	WWF Armenia Branch
2. Mr. Alexander Malkhasyan	WWF Armenia Branch
3. Mr. Igor Khorozyan	WWF Armenia Branch
4. Mr. Alen Mkrtchyan	Shikahogh State Reserve
Azerbaijan	
5. Mr. Elshad Askerov	WWF Azerbaijan Branch
6. Mr. Azerchin Muradov	Ilisu State Reserve
7. Mr. Parviz Fatullayev	Institute of Bio-resources, Nakhchyvan Branch of Azerbaijan National Academy of Sciences
8. Mr. Abbas Ismayilov	See above
Georgia	
9. Mr. Zurab Gurielidze	Tbilisi Zoo, Ilia State University, Tbilisi
10. Mr. Bejan Lortkipanidze	NGO NACRES
11. Mr. Giorgi Gorgadze	NGO NACRES
12. Mr. Giorgi Sulamanidze	Lagodekhi State Reserve
13. Mr. Lexo Gavashelishvili	Ilia State University, Tbilisi
14. Mr. Ioseb Natradze	NGO Campester
Iran	
15. Ms. Marzieh Musavi	Department of Environment (DoE)
16. Mr. Mohammadreza Masoud	DoE, East Azarbayjan
17. Mr. Saman Alinezhad	DoE, Gilan
18. Mr. Mohammad Farhadinia	Iranian Cheetah Society
Russia	
19. Mr. Umar Semionov	Leopard Breeding Centre, Sochi National Park
Turkey	
20. Mr. Hasan Emir	General Directorate of Nature Conservation and National Parks
21. Mr. C. Can Bilgin	Middle East Technical University, Ankara
22. Mr. Ozgun Emre Can	National Expert
23. Mr. Halim Diker	WWF-Turkey
Instructors and International Conservation Organizations	
24. Mr. Urs Breitenmoser	Co-Chair, IUCN/SSC Cat Specialist Group,
25. Ms. Christine Breitenmoser-Würsten	Co-Chair, IUCN/SSC Cat Specialist Group
26. Mr. Fridolin Zimmermann	KORA, Switzerland
27. Mr. Batur Avgan	KORA, Switzerland
28. Ms. Anja Wittich	IUCN Caucasus Cooperation Centre
29. Ms. Eka Kakabadze	IUCN Caucasus Cooperation Centre
30. Mr. Gareth Goldthorpe	Fauna and Flora International
31. Mr. Nugzar Zazanashvili	WWF-Caucasus

Appendix II: Hand-outs (PDFs) distributed electronically

Caucasus documents

Caucasus leopard Istanbul workshop report (7-8 March 2011)

Caucasus leopard questionnaire 2011 all countries

Caucasus_Leopard_Conservation_Strategy_1 (2007)

eCP_caucasus_05[1]

NAP Leopard ARMENIA Eng

NAP Leopard AZERBAIJAN 2010-14_En NAP Leopard GEORGIA 2010-14 Eng

Forms

Lynx_observation_form_ENG

Protocol_intensive_camera_trapping_session_en

Questionnaire_ENG

Track_survey_form_ENG

Georgia HCC Interview and questionnaire

Handbooks and Guidelines

Lynx Monitoring Guidelines

AGA_Manual_ID_carnivoros

AGA_Manual_Metodologia_Gato_Andino

Balkan lynx Field handbook English

Berzins_&_Kriloff_2008_Carnivore_guide

Checkliste_Cuddeback_capture_en

Presentations

0. Introduction & programme

1.1. IUCN Red list for status assessment

2.1. Compiling baseline knowledge for a conservation programme

2.2. Balkan lynx baseline survey

2.3. Occupancy modelling with interviews

3.1. Qualitative and quantitative monitoring of small LC populations

3.2. Opportunistic monitoring and systematic camera trapping Switzerland

3.3. Monitoring of demography health and genetics

3.4. Case study Georgia

3.5. Leopard camera-trapping_AM

3.6. Leopard sign surveys_AM

4.1. Ungulates for printing

4.2. Monitoring of wild ungulates

4.3. Prey monitoring_AM

5.1. Principles of stratified monitoring

6.1. Requirements for a joint monitoring for leopard conservation

6.2. SCALP - lynx network in the Alps

6.3 The Andean Cat Alliance

Camera-trapping practical aspects

Caucasus leopard monitoring course - summary and conclusions (97 slides)