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Condition of the Leopard Population in the Caucasus

Key words: Nearer Asian/Caucasian Leopard, *Panthera pardus ciscaucasica,* distribution, habitat, prey species, other predators, Armenia, Georgia, Azerbaijan

Introduction

The report represents the results obtained during the field expeditions conducted in Armenia, Azerbaijan and Georgia in August-September 2001. This is the first stage of survey carried out within the framework of WWF program for leopard conservation in the Caucasus Ecoregion. Taking part in the expedition were:

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Grachik Hazaryan, independent expert (Armenia),
Elshad Askerov, scientist, Institute of Zoology of the Azer. Acad. of Sciences (Azerbaijan),
Tariel Guseinali ogli Talybov, Azer. Acad. of Sciences (Azerbaijan),
Babahan Rahmanov, local community representative (Azerbaijan),
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Gocha Dzabushanuri, local community representative (Georgia).

In spite of the fame and „wide popularity" of the large cat representatives, it is obvious that they were not sufficiently studied due to some objective reasons. This is first of all caused by the fact that the study of different sides of ecology and behaviour of large cats are attended by great difficulties. Strongly expressed secretiveness, great cautiousness, large areas of their habitats and high mobility distinguish species of these animals. Besides, the population density of these animals as a rule is low, which makes field research even more difficult. This is true in the case of the Amur tiger and the Far East leopard – species that are traditionally under intensive research. But this, to a greater extent, can be applied to the Nearer Asian leopard, species, which for the whole history of research activities on the territory of the former Soviet Union has never been studied specially. Other works, famous in the literature, are more of bizarre character, subject for interesting notes and information, and not for specially planned projects.

Most probably, it is connected with the fact that the study of various sides of biology of this animal is fraught by number of additional difficulties caused by the high-mountainous distribution of this species.

Such important aspects of the leopard biology as structure of the area, diet (particularly degree of food specification and inclusion of domestic animals), population structure, ability for distribution and many others are virtually unstudied. It is the extreme lack of knowledge, which jeopardizes implementation of a successful program for conservation of the species in the region. Insufficient study of current area frustrates purposeful activities on the organization of protected areas network.

The preliminary results have shown that the existing system of protected areas are far from perfection and in some cases does not meet the least requirements of the leopard conservation in the Caucasus, while the key districts have been fallen out from the protected area system. No less important are the spectra of the leopard diet. Principally important for a long-term survival of the species is the question of leopard attacks on livestock and other aspects of conflicts between leopard and man.

For the development of environmental network of protected areas of different status from the leopard conservation viewpoint, study of its distribution and structure of the habitat areas is of paramount importance. It is impossible to establish an effective protected areas network of the ecoregion without detailed knowledge in this sphere.

One of the important tasks, which have a great practical sense, is allotting areas with high local density, population nucleus where sustainable breeding takes place. There are many other aspects of research, which are of great significance for the leopard conservation; however, even the issues already mentioned above refer to the urgent necessity for a wider survey of the leopard in the ecoregion.

Material, timeframe and methodology of survey

The research in Armenia was conducted from July 25 to August 10, in Azerbaijan from August 15 to September 6 and in Georgia from September 15-23 2001. The weather conditions in August 2001 were rather unfavourable for conducting field research due to the extremely dry ground and high temperature, which complicated the work. During the most part of the season the temperature was high (on the average +35 C^0 and during the intervals it fluctuated from +32 to 40 C^0). In Georgia the work was conducted from September 15 to 23 and from the viewpoint of temperature regime it was much more favourable: from +5 to +20 C^0, however, daily fog complicated the work by limiting observation range and generally was dangerous for continuing the selected rout. On the other side, humidity of the soil was quite satisfactory for discovering traces of viability left by the greater part of the animals.

The basic materials are collected on pedestrian routs, during which such traces of leopard viability as scratches, excrements, urine, traces of paws and trace chain, traces of claws on the trees and stones have been recorded. Besides the materials referring directly to the leopard, significant information on the conditions of wild ungulate population and large predators has been gathered.

Materials showing the human impact on the leopard population and other species of mammals (attachment 4) has been gathered during the meeting with different walks of population: hunters, shepherds, local population. During these meetings number of skins of leopard, lynx and bear have been observed and photographed. The materials attesting the cases of leopard killing have been gathered (attachment 5).

During the expedition 32 survey routs have been organised. Among them: in Armenia the following routs have been surveyed: 3 districts in Khosrov Nature Reserve, Gindasar mountains, spurs of Zangezur and Bargushat ranges. 14 routs with the total length of 190 km have been conducted. In Azerbaijan 2 areas have been studied: Talysh mountains (Zuvand plateau, upper reaches of the river Bandasar) in south-western part of the country and southern part of Zangezur range (Nakhichevan autonomy). 11 routs with total length of 129 km have been conducted. On the Greater Caucasus range in Georgia small area bordering Ingushetia (Russian Federation) have been surveyed upper reaches of the river Assa. 7 routs with total length of 100 km have been conducted.

As a main method – tracking method – traditionally applied by the Soviet School for surveying the animal tracks, has been used, plus some peculiarities, obtained during the long-term re-

search in Nearer Asia in the process of survey*1 of vast areas, leopard habitats in Turkmenistan, snow-leopard in Altai-Sayan ecoregion, etc.

Survey of the area envisages:

- Cartographic analyses, as a result of which possible routes are selected and planned, including the greater part of the region biotops, both of well preserved and strongly altered by human impact.
- ***Survey proper***. In the field the routes, selected on the map in order to include different biotops and to evenly cover the area by routes, are corrected.

On the basis of working experience with leopards, it has been partly established that for migration, marking and orientation, the animals prefer definite forms of the relief. It is these peculiarities of behavior that were considered when choosing the routs. Weather conditions, strong wind, fog, rain, have been always considered when identifying „freshness" of the traces. This permitted to define the „age" of the traces, which also served as a criterion for defining the frequency of the leopard presence in the area.

The reliable signs of the leopard presence are scratches and excrements, which are left by animals on the ground near tracks on the crest of watersheds and in the bottom of the gorge. Contrary to the footprints, scratches and excrements are preserved much longer, therefore, it makes it possible to define frequency of the leopard presence in this or that area.

The leopard is very flexible in choosing individual areas. Border, size and configuration of the leopard habitat is defined by number of complex factors, circumstances, including number and existence of food basis and shelter. Usually the area is located in the basin of one or more rivers, in keeping with the area of the basin. The borders of the area coincide with natural topographic borders of the territory. According to the long-term survey in Turkmenistan, areas of the individuals of different sex, including females with kittens, amounts to 15-30 thousand ha. Besides, hunters' routes and areas of permanent migration are constantly used by predators for years. These peculiarities allowed to correctly plan, select and lay the searching routes.

„Thickness" and longitude of the routes depended on the habitat areas. Meaning of this parameters have been defined conditionally, by considering the existence and number of basic preys, according to observation, data of other researchers, or poll results. Usually, the habitats were crossed by 2-3 routes with total length of 30-50 km, which envisaged the survey of two-three crests of watershed, tracks in the bottom of the gorge, etc. Distance between the routes was not less than 3 - 5 km. Distance to the next route depended on the materials obtained at the previous routes. If the detailed data were required for identification of the individuals, additional routes have been laid, where it was possible to collect lacking information.

Obtaining field materials was not connected with definite seasons, while survey was timed to autumn-spring, when level of precipitation is the highest. The most optimal times were end of October to the beginning of December and the end of February by the mid April. In winter survey was conducted in those days when the surface of the ground did not freeze.

For the animal identification methodology of K.G. Abramov (1961) has been applied, proposed for recording Amur tiger, as well as the methodology for recording the leopard in Turkmenistan, where the weather conditions and the landscape are more or less similar.

Since the objective of the survey was to evaluate suitability of the habitat and viability of the leopard groups, study was not targeted at gender and age identification of the individuals.

*1 Survey of the area envisages:

- Cartographic analyses, as a result of which possible routs are selected and planned, including the greater part of the region's biotops, both of well preserved and strongly altered by human impact.
- ***Survey proper***. In the field the routs, selected on the map in order to include different biotops and to evenly cover the area by routs, are corrected. On the basis of working experience with leopards, it has been partly established that for migration, marking and orientation, the animals prefer definite forms of the relief. It is these peculiarities of behavior that have been considered while choosing the routs. It is clear that during the work with each species definite approaches are required which are very rarely uniform. For instance, while studying the leopard distribution the routs, which include mountain ridges dominating over the area as well as gorges with well-trodden permanent paths of the ungulates, should be chosen.

Moreover, it was extremely difficult to conduct the above work in the given period. It was very important to identify the leopard traces from the traces of viability of other animals (bear, lynx, wolf, hyena – species, traces of which was most probable to encounter).

Gender and age peculiarities of the paw traces of the leopard are quite important. More distinct, reliable and the least changeable element of the trace, like in case of tiger and snow leopard (MATYUSHKIN & YUDAKOV 1974, MATYUSHKIN & KOSHKAREV 1990) – is the footprint of the pads or „heels". Besides, for defining individuals, footprints of the pads of only front paws have been measured, by considering the fact that the footprints of the front and hind paws strongly differ both in size and configuration (footprints of the hind paws are smaller in size and are longish). Width of the pad of the adult male varies between 8,0 - 9,5 cm, and only once the traces of male leopard, whose width of the front paw heel was 10,5 cm, was encountered (17.02.1985), with the length of the tread more than 85 cm (usually length of the tread of the large male does not exceed 60 -75 cm).

Width of the pad of adult female leopards varies between 6,0 -7,5 cm, but more often the footprints as wide as 7,0 - 7,5 cm, with the length of the step from 40 - 60 cm (often 48 - 55 cm) are found. Size of the pads of the young individuals, starting independent life, is from 5,0 to 7,0 cm, more often 5,5 - 6,5 cm, with the tread length (38 - 48 cm).

Gender differences are noticed with other subspecies of the leopard, as well as with tiger, jaguar and other large cats (MATYUSHKIN & YUDAKOV1974, MCDOUGAL 1977, SCHALLER & CRAWSHAW 1980, RATHORE et al. 1983, PIKUNOV & KORKISHKO 1992).

More possible mistake in identification of traces of this or that individual is possible to make when comparing the traces of young males and females. Size of the footprint of this category of animals overlap, however, the footprints of the males are more „widespread", length of the heel is bigger, therefore, general size of the footprint is larger, than in case of female leopards. In dubious cases animals' behavior should be taken into account. Contrary to the adult females, young males do not mark the area, or their marking activity is weak. Here, the mistake could be made only in that case if the resident female has little kittens (at this period her marking activity decreases to the minimum), or at that period when young males start revealing signs of dominating over the area and the resident female is in the estrus.

True criteria for identifying the sex is the existence of kittens with the female leopard. The leopard footprints with the width of the heel from 8,0 to 9,5 m belongs to males, female footprints and non-productive individuals fluctuates between 6,0 to 7,5 sm.

In Middle Asia, out of large cats only Turkestan lynx could be found in the same biotops where the leopard inhabits, e.g. in the area of Kugitang and Dashtidjum range. The same areas could be overlapped by the leopard and the snow leopard. Size of the „heel" of the adult male lynx, living in Middle Asia do not exceed 5,0 - 5,5 sm. Leopard's kittens with such size of the footprints are still accompanied by females, therefore, it is easy to avoid mistakes while identification.

Size of the footprints of the young leopards, who can or attempt to hunt independently, but have not separated from their mothers yet, flactuates between 4,5 - 5,5 cm, i.e. size of their footprints overlap with the size of lynx footprints. Tracking method determines to find out to which species it belongs, since the behavior of the leopard and the lynx strongly differ from each other. Hunting lynx often „deviates" from the route, it surveys shrubs, stony screes, it dedicates more time to observation of the rabbit's footprints. Leopard's route is more direct.

Footprints of the lynx is smaller than of the leopard independently moving. Besides, length and width of toes of lynx and leopard differ from each other. Footprints of the lynx's toes are oblong. However, when the animal steps in one and the same place, especially in the snow as deep as 5 cm, footprints of front and hind paws coincide, therefore in such circumstances it is difficult to identify species footprint.

Correct identification of species is possible through the results of tracking. Young leopards, contrary to the adult lynxes virtually do not mark the area. Scratches of lynx differ from the scratches of the leopard. Lynxes only scratch the surface of the ground or snow, while the leopards make deep scratches, on the areas of which holes and hills are left. Leopards seldom

spray the urine, and the object of urination is more often ledge of the rock, vertical objects or the tree trunks. Contrary to the leopards, male lynxes more often mark the bushes or stones. Urine spots of the leopard are acrid and look like the spots of the domestic cats, while smell-spot of the leopard is rather weak, reminding the smell of musk.

In all cases character of substratum have been taken into consideration, since one and the same individual leaves footprints of the paws of different sizes, (varies between 0,5-1,0 cm) depending on the character of the ground and its dampness. For example, in February 1985, during the tracking of young female leopard, with the front paw as wide as 7,5 cm, larger footprints (8,5 cm) were noticed and they were taken for the footprints of the adult male leopard. Passing 10-15 steps more, footprints were encountered, which were „reduced", their size changing in keeping with the character of the ground and its dampness. Size of the footprints also depends on pace. It is possible to identify footprints of this or that individual more precisely when observing the whole chain of footprints. The sole footprint is fit for identification of the footprint on the even areas with smooth top layer of the ground when the animal walks.

Results

Traces of leopard viability in the Caucasus have been recorded in three mountainous regions: in Talysh, Khosrov mountains and Zangezur range (on the part of Armenia and Nakhichevan). Greater number of signs of the leopard existence has been observed in Talysh Mountains and in southern part of Zangezur range.

In Talysh Mountains, traces of leopard have been recorded in perennial, broad-leaved forest from 700 to 1500 m above sea level. Here only six scratches and excrements have been found. Excrements and scratches discovered have been left on the ground at various times, which proves that the leopard has been using this area for not less than 3-5 months. It means that leopard permanently lives in this region. Excrements and scratches were found in the areas typical for the leopard marking: – areas with good views on locality, on the main paths or in their proximity.

Another habitat of the leopard in the Lesser Caucasus is Khosrov Nature Reserve Gindasar Mountains. This is a small territory and traces of leopard viability is the evidence for the extinction of this group, but still being remained at the expense of high number of bezoar goat in some of the gorges and relatively lower presence of man in the mountains. On the other hand, it is the rare animals, migrating from south of Zangezur range, that supports this group, where according to the poll results and the material obtained, the leopard is encountered quite frequently both on the territory of Armenia and Nakhichevan.

In Khosrov only one trace of the front paw of the kitten leopard has been found, which was impossible to identify due to the dry ground and thickets around it; down on the slope and up to the crest mainly the excrements of the lynx have been recorded and only 2 strongly mineralised excrements belonged to the leopard. In the mentioned area lynx is encountered quite frequently and at some places, like Khosrov gorge, number of the lynx is even high, however, it is possible that greater part of viability traces belong to the lynx and not to the leopard.

Mountain chain, connecting mountains of Khosrov Nature Reserve and Zangezur range, like Aiadzor range (Nuravank gorge) – is a good refuge for the leopard in densely populated by man areas. Here population density reaches 80-100 men per km^2. However, only Gindasar massif is the entire area, which could be of interest from the viewpoint of large mammals conservation, since there are no major constructions on more than 25-30 thousand ha, and the man with his cattle appears here only in summer time and has been gradually dominating here only during the last years. From this point of view, this area calls for urgent conservation.

Other territories of this region are exclusively represented by corridors: down along the rivers there are villages in close proximity to each other with highly developed agriculture, and up on the plateau the areas are completely occupied by cattle as pastures. Therefore, separate slopes of gorges, inaccessible to man and correspondingly to sheep and cow, are left to the leopard and all other large mammals as bezoar goat, wild boar, roe deer, lynx, bear, etc.

To the south leopard habitat occupies Aiadzor range, located in Armenia and Nakhichevan.

This district has not been studied specially due to the short-term survey, but one route conducted in the Nuravank gorge and the poll results obtained, enables to ascertain its importance as the transit district – ecological corridor between Khosrov and Zangezur. There is lots of information of local population proving encounters with the leopard.

Zangezur range is outpost of the leopard conservation in the Caucasus. Analyses of the literature data, poll results, and survey data show that Zangezur range has great significance in leopard conservation in the region – in the Lesser Caucasus. This importance is determined by arid climatic conditions (absence of the stable snow cover) and inaccessible, ineffective for agriculture relief, which „makes leopard less noticeable". On this area, like on the part of Armenia and Nakhichevan, though it is studied less thoroughly, signs of leopard existence is relatively much (excrements, scratches). Indirect sign of the leopard existence here is regular attacks on domestic animals, which is not recorded anywhere else in the region more practically. Besides, number of bezoar goats is relatively high in the region. This is a reliable sign of the leopard existence. Even in the areas with high number of wild ungulates, main preys, though not frequent but some attacks on cattle is still observed. More often attacks on cattle take place in the lower part of the mountain, where the density of wild ungulates is low and the animals are induced to hunt „lighter" prey. Besides, young non-territorial animals – „group of risk", often occupy this part of the habitat.

On the Greater Caucasus range, though direct signs of leopard existence has not been recorded there, its existence is proved by the data provided by hunters and their reliable tales. Man, who has not seen leopard before, does not know that the leopard contrary to lynx, is acting directly on the territory. On the other hand, in spring 2001, 50-100 km to the north of the studied area in Chechnya on the border of Georgia (Tusheti) female leopard with two kittens was killed. Fortunately, kittens are now alive and are in the Novorosiisk zoo (confidential). In western part of the Greater Caucasus in the Caucasus Strict Nature Reserve in June 2001, I. Chestin took photos of large footprint of the cat on the pass at 2050 m above sea level. Judging from the size, though the footprint was left on the wet clay and not very fresh, i.e. a bit washed away, it could be assumed that the footprint belongs to the leopard. In 2000 the leopard has been noticed at the same place by the reserve staff. A. Kudaktin recorded leopard traces in 1996 in the Caucasus Nature Reserve as well (Kudaktin, personal information).

All the above data suggests that somewhere in the Great Caucasus viable group of leopards are concentrated. While analysing different information on the leopard encounters, the conditions of wild ungulate population and first of all goats (tur, bezoar), wild boar and roe deer, such group could have been concentrated at the junction of borders of south-west Dagestan, south of Chechnya, south-east of Ingushetia, north-west of Azerbaijan, north of Georgia. Observed areas in Khevsureti in upper reaches of the river Assa are rather favourable habitats for the leopard.

Habitat of the leopard

As V.G. Geptner and A.A. Sludsky write (Geptner & Sludski 1972) on the Great Caucasus leopard lives in subalpine meadows, deciduous and mixed forests and thickets, and as a rule, he appears in rocky and stony areas. The main condition determining leopard's habitat is high number of bezoar goats, tur, roe deer, chamois, deer and wild boar and less snowy areas in winter. According to the information provided by local population, in winter in Khevsureti leopard was noticed at 2400-2600 m above sea level.

Leopard habitat is quite diverse on the Lesser Caucasus. On the one hand, these are rocky non-forested gorges (Zangezur range, especially south-western slopes); on the other – steppe areas and arid woodlands on strongly segmented slopes, where wild ungulates (bezoar goat and wild boar) have survived (Khosrov reserve and partly Bargushat range, etc.). Here the leopard and its traces of viability were recorded on the mountain foothills at 600-800 m above sea level to 3600-3800 m (Gazangedag mountain). In Talysh in the river Bandasar basin leopard is found in upper reaches of large gorges, wooded by deciduous broad-leaved forests (maple, beech, hornbeam, linden, oak, hazel nut etc.). Here leopard's traces are found in the areas with

good views of the territory (watershed ranges and their crests), in the areas where wild boars and roe deer are abundant. According to the hunters information indicator of roe deer density is about 10-15 individuals per 1000 ha, and according to Kuliev's information wild boar density is approximately 100 individuals per 1000 ha (KULIEV, 2000).

Like in other parts of the species distribution area, leopard distribution does not depend on the heights above sea level, but is defined by character of the relief, vegetation, existence of the food basis and absence of disturbance. It is probable that the limiting factor is the height of the snow cover, inducing leopard to move to less snowy slopes and areas. In Talysh, where the understorey is well developed, in snowy winters roe deer do not migrate, but stay and feed directly from under the snow, thus creating developed system of trenches. Babakhan Rakhmanov informed, that they had once met 8 animals in this way.

Evaluation of the condition of ungulates – prey species for Leopard

In the Southern Lesser Caucasus among the ungulates the bezoar goat, wild boar and roe deer are the most significant prey species for the leopard. In Greater Caucasus Range main pray species are/were: in eastern part: bezoar goat, wild boar and roe deer; in the western part: turs, wild boar, red deer and roe deer.

Bezoar goat – *Capra aegagrus* L.

Since the bezoar goat is practically the main and mostly preferable (where the distribution areas of these species coincide) prey species for the leopard, the detailed analysis of its current condition has been conducted.

Three isolated areas limit current distribution of bezoar goat in Caucasus Isthmus: eastern part of the Greater Caucasus and the central and eastern parts of the Southern Lesser Caucasus. In Greater Caucasus they inhabit in highlands of Alazani, Arguni and Gerdiman-chai i.e. in dry and forestless part of mountainous country (VERESHCHAGIN, 1959). But VERESHCHAGIN's supposition is partially right, because at present bezoar goat is widely distributed in forest belts of strongly segmented gorges. Very often it is difficult to observe bezoar goats because of their „way of forest life"; they come out to open slopes only in twilight. Bezoar goat usually lives in highlands of Avarsky Koisu, on the territory of the settlement of Giadan, Kidero, Chorda, Takhoba. Here it inhabits in pine and beech forests.

In Lesser Caucasus it was distributed on much wider area. In south-western part bezoar goat lived in fir-tree forests in highlands of Chorokhi, in some parts of Ajara-Imereti mountain range, in western spurs of Trialeti (Borjomi region) and in south-eastern part of Armenia upland. On Shakhdag range bezoar goats usually live in the districts of Kadabeck and Kayasket, in the highlands of Shamqor, near the peak Kashkar (3379 m a.s.l.), on mountain Kiapaz, over the lake Gek-Gel and under the peak Mrovdag (3740 m a.s.l.) (VERESHCHAGIN, 1959; DAL, 1951); in the southern part they occur in Karabagh upland, in the districts of Lachinsk and Kelbadjar (KULIEV, 2000).

In Nakhichevani bezoar goats lived in 1947 in isolated peaks with semi-desert vegetation of Alidjadaga and Iliandaga near the settlements – Abrakunis, Boianur and Khanagi (VERESHCHAGIN, 1959).

In the central and southern parts of Armenia uplands bezoar goat occurs on rocky mountains from the Azat river valley up to Bargushat, Zangezur, Megri ranges. In the northern part they are distributed up to the southern ranges of Pambak and Varden (DAL, 1948). More often they are observed on Urts and Aiadzor ranges, as well as on nearby rocky mountains.

Quite recently separate area of the bezoar goat distribution has been the Talysh Mountains on the territory of Zuvand plateau (near Mount Kumerkei), however at present they do not inhabit there. According to the information provided by the hunters they are rarely noticed on the Shandankalasi Mountain.

Data on distribution and abundance of bezoar goats in the studied area are given in the table 1.

One of the important conclusions is that in a number of districts of the studied area bezoar goat is quite rare and cautious animal and it is not easy to notice it even in a long distance. Moreover, in some of the areas, where the

Table 1 Data on visual records of bezoar goats

Date	Route	Number of groups, individuals	Abundance of footprints, tracks, excrements
27.07.01	Kepikend Kakavabet-Tapchan-Ela-Khazaradzor	3+3+2+2+7+4+3=24	Numerous
28.07.01	Cordon Kepikend, up to the river Azat, along the slopes there are small loops.	4+2+5+11+2+1=25	Numerous
29.07.01	Cave-grotto in the middle part of the river Azat-up to the river, to the crossroad up to the left slope.	2+1+2+2+5+3+3+5+2+2 +10=37	Numerous
30.07.01	Cave-grotto in the middle part of the river Azat, to the crossroad, up to the left slope transition in the gorge Khosrov.	0	Usual
30.07.01	Gorge Khosrov, left slope, up to the ridge.	0	Rare
31.07.01	Gorge Khosrov, meadow-steppe, river Azat.	0	Usual
02.08.01	Settlement Erni - gorge Nuravank (slope of the gorge)	1+3+5+6+2=17	Usual
03.08.01	Settlement Kapan, gorge Darmezuchai (spur of the Bargushat range)	1+3+6=10	Usual
04.08.01	Gorge Dermezuchai (spur of the Bargushat range), left ridge.	0	Usual
06.01.01	Valley of the river Ereni, afflux of the Arni, mountain Tekegelgeren.	0	Rare
07.08.01	Settlement Ekhegnadzor, border, corridor between Nakhichevan and Khosrov mountains.	0	Rare
07.08.01	Gorge Vartanez, mountains Gindasar.	0	Usual
31.08.01	Ketam	11+18+3+3+25+11	Numerous
01.09.01	Kilit	17+10+15+20	Numerous
02.09.01	Belyav	0	Single
03.09.01	Kazangeldag	12+26+33+3+6+15	Numerous
04.09.01	Mountains Dirnissadag and Kaplanyvasi	0	Rare
05.09.01	Darosham district (river Alindzhachai mouth)	0	Rare
06.09.01	Ilindag	0	Single

routes have been laid, neither bezoar goat nor their footprints and tracks have been found.
In table 1, in a column „number of groups and individuals" number of animals per group is given. When during a day's route a number of groups is seen it is indicated with a sign „+".
In a column „abundance of footprints, tracks, excrements" five conditional categories are given:

sporadic: 1-2 footprints are either found or known according to questionnaire data;

single: during a day's route not more than 5 footprints and excrements are found, trails are either single or there are no trails at all;

rare: 6-10 footprints, excrements, trails are found, but they do not create the network;

usual: more than 10 footprints and excrements are found as a rule, tracks are distinctly seen and in some places create the network;

numerous: footprints are found practically everywhere; system of trails are well developed.

Bezoar goat – is the most preferable, but not an essential prey species for the leopard, however its distribution is wider than distribution area of prey species; that is why the leopard might be of usual occurrence there, where the bezoar goat is either rare or absent at all, while wild boar or roe deer could be found quite frequently. e.g. in Talysh leopard's main prey species is wild boar.

Wild boar – *Sus scrofa L.*

Wild boar is distributed practically all over the Caucasus and Southern Lesser Caucasus. It is not found only in some areas of upper part of the Greater Caucasus, where its occurrence is limited because of high snow cover in winter and poor food basis, but from time to time even there its occurrence could be quite usual in lower parts of mountains.
The limited factor might be also strongly developed agriculture in the districts with high density of population.
In the studied area in the most parts of the territory wild boar is quite common. It is numerous in the most parts of Khosrov Reserve area, in Talish and on the area of Bargushat range, in North Caucasus bordering Georgia and Ingushetia.
According to the data provided by hunters wild boar is found everywhere, in conflict zones on the border of Armenia and Azerbaijan, as well as on the border of Iran, mostly in the Araks river plain, due to which it provides a safe food basis for the leopard in the transit zone.

Roe deer – *Capreolus capreolus* L.

Though previously roe deer was distributed practically in all broad-leaved forests of middle mountain belt, at present it is practically rare animal, common only in some places.
In the studied area on the territory of Bargushat range, where roe deer is relatively rare, single footprints and little groups with 2-3 roe deer have been recorded. Usually it is found in the middle mountain belt in the south-western part of Talish.
Here its footprints have been observed in the gorges and have been found practically everywhere in the belt from 500 to 1500 m above sea level.
In the Greater Caucasus, in the studied area on the territory of the upper reaches of the river Assa single footprints of roe deer have been found. According to the data provided by the local hunters roe deer is occurred quite frequently on the border of Ingushetia.

Tur – *Capra cylindricornis* Blyth

In the studied area Dagestanian Tur is found only in the river Assa basin. Here it is observed in the middle and upper mountain belts. It lives on forest slopes of gorges with strongly segmented relief, where it hides in niche and under the crown of trees.

Chamois – *Rupicapra rupicapra* L.

In the studied area chamois has been recorded only in the Greater Caucasus, where they have been found almost in all routes. It is rarely observed at some places; and they are quite common in the places which are far from the populated areas.

Table 2 Data on visual records of Turs

Date	Route	Number of individuals group	Abundance of traces, tracks, excrements
17.09.01	Settlement Amga, down to the river, up to the slopes, on the ridge and back.		Usual
18.09.01	Settlement Amga, river Assa, down to the river, up to the slope.		Usual
19.09.01	River Assa, up to the river, up to the left slope.	3+5+7+2	Usual
20.09.01	River Assa, up to the river, up to the right tributary, up to the right ridge.	3+5	Usual
22.09.01	River Assa, up to the left tributary to the settlement Amga, up to the ridge, northern of the settlement.	1+2+2	Usual

Red deer – *Cervus elaphus* L.

In the past when red deer were quite common all over the Caucasus, they were main prey species for the leopard. At present in the studied area red deer has not been found at all.

Evaluation of the conditions of the large predator mammals' population

During the survey of the conditions of the leopard population, valuable information on the conditions of such animals as lynx, wolf, bear, hyena, has been obtained. Since the routes have been targeted at the leopard study, traces of its viability and its diet, the collected materials on other predators are more of opportunistic character.

To get the complete picture it is necessary to conduct special survey by applying specific methodology, approach and planning of fieldwork on each concrete species.

Lynx – *Lynx lynx* L.

In the studied area traces of lynx viability have been noticed almost in all districts. In the Khosrov Nature Reserve lynx traces have been observed in the Garni, Khosrov gorge, on the mountain Kiashishdag. According to the distribution of separate excrements and excrements collected places, number of lynx could be estimated as 10-12 individuals. Judging from the number of trace viability, lynx habitat is quite favorable in the Khosrov gorge. According to the distribution and the number of excrement collected places it could be assumed that no less than two adult females with kittens live here. In other areas lynx is less common, but it is encountered almost everywhere on the reserve area.

According to the excrement content, its main prey is grey hare, though it also hunts bezoar goats, different species of birds, rodents, etc. It is noteworthy that in some cases it is easy to take footprints of lynx, especially of large lynx, for the leopard's footprints.

Excrements collected places and separate excrements and scratches of the lynx are also noticed in the mountain massif of Gyndasar, on the slopes of the Arpy and Nuravank gorges. Number of lynx is relatively more in the district of the city Kapan on the Bargushat range and probably in Khustup.

Usually the lynx inhabits in Talish, but traces of its viability were observed only in south-western part of these mountains and there were no traces in Zuvand hollow, where number of its basic prey - grey hare is numerous. Its absence in this area could be explained by hard anthropogenic impact, absence of woody plants, serving as a shelter, as well as direct stalking.
Another district with high density of the lynx is the basin of the river Assa on the Greater Caucasus. According to the number of trace viability, number of lynx is fewer, than in the Khosrov reserve, but here they are more evenly distributed. In the Khosrov reserve number of lynx is much in juniper woodland and relatively few in broad-leaved woodland, while on the Greater Caucasus its distribution is connected with alternation of strongly segmented rocky slopes and the slopes with somewhat soft relief covered by pine forest and broad-leaved trees. In this connection habitat of lynx and leopard is similar.
According to the excrements content here the main prey of the lynx is tur and chamois, while the remnants of the grey hare are very few.

Bear – *Ursus arctos* L.

In the studied area bear is distributed almost everywhere. It is more usual and common in the Khosrov reserve, on the mountain Gyndasar, on the Bargushat range. In other districts of Armenia bear is not observed rather frequently.
During the fruit ripening, greater part of bears are concentrated in the lower belt of mountains and from here they descend to the orchards (apples, pears, apricot). This is attested by the excrements content and the broken branches. In the area of the mountain Gyndasar, Vartanez ruins, at night bears come down along the road to the populated area. In 7.08.2001 on the road footprints of 10 animals of different ages who visited orchards during one night, have been recorded.
In Talish bear is found seldom but its encounter is also common, though the traces of its viability are observed not so frequently as in Armenia. In the Greater Caucasus in the upper reaches of the river Assa traces of bear viability are found almost everywhere. This may be connected with meagre food basis during the period of survey.

Wolf – *Canis lupus* L.

Wolf is the most common, and at some places numerous species of large predator mammals in the region.
In the Khosrov reserve it is distributed in the upper mountain belt – meadow-steppes, where greater part of cattle is concentrated in summer. Such distribution of wolf is typical to the studied area in Armenia. During this period greater part of excrements contained wool, bone remnants of domestic animals. In the area of mountain Gyndasar, according to the information provided by the local population wolf attacked the cattle twice in one week.
In Azerbaijan in the studied area of Talish the traces of wolf viability have been recorded mainly in the Zuvad hollow. In the forest zone of Talish wolf has not been found. Here the wolf excrements contained wool and bone remnants of the rabbit and small amount of wool and bone remnants of domestic animals.
On the Greater Caucasus, according to the information provided by G. Jabushanuri, here wolves appeared quite recently - during the last 3-5 years. Their traces have been noticed almost everywhere along the river Assa up to the pass. During the survey wolves have killed 2 calves in two days.

Hyena – *Hyaena hyaena* L.

In the studied area hyena proved to be the less common species of large mammals. Traces of its viability have not been observed. In some areas of Khosrov reserve, south Armenia and Nakhichevan the habitat is quite favorable. Rakmanov Babakan has informed that in 2000 hyena has been recorded in the Zuvad hollow in Talish. In order to find out present condition of hyena population it is necessary to use special methodology for seeking dens.

Discussion

Out of all surveyed areas, greater number of mountain goats has been found in Garni gorge along the river Azat, in the Nuravank gorge and in the Gazangeldag mountain area. However, except Gazangeldag mountain area, traces of leopard viability were the least in the allotted

groups in spite of more thorough survey of this area. Traces of leopard viability found in the Khosrov Nature Reserve prove the existence of separate non-territorial animals. However, it could be assumed that on the studied area of the Khosrov Nature Reserve only one female with kittens or young, non-reproductive individuals inhabit (female leopards with small kittens and young individuals which virtually do not mark the area). On the basis of gathered materials it could be assumed, that on the studied area of the Khosrov nature reserve adult territorial individuals have not been recorded in the concrete period of time. For comparison it could be mentioned that more than 10-15 different marking elements* have been recorded at the same route on the similar area in Turkmenistan. However, signs of territorial leopards have not been found in these districts.

To the south of Armenia bordering Nakhichevan, as a result of inter-state Armenia-Azerbaijan conflict, no-man's-land was created at 1,5 km width. On the one hand this circumstance facilitates conservation of large mammals, but on the other – it concentrates serious and dangerous for wild animals weapon, which is used without much thinking and for „peaceful" purposes, i.e. for killing prey and if there is any possibility, for killing the leopard.

Total number of the leopards in the study area of the Lesser Caucasus is as follows:

In **Armenia**: 5-8 leopards. Among them:
- Khosrov Nature Reserve Gindasar mountains: 2 - 3;
- Bargushat-Megrini mountains: 3-5.

In **Azerbaijan**: 10-12. Among them:
- Talysh mountains: 2-3;
- Nakhichevan: Zangezur range: set. Ordubad – Gazangeldag mountains: 4-5 leopards.

Armenia-Nakhichevan: Aitsdzori range: 2-3 animals.

The number of leopards in the conflict zone of the district of mountainous Karabakh is estimated as 5 - 7 leopards according to the data provided by hunters. Therefore, the total number of leopards in the Lesser Caucasus is estimated as 18 - 23 leopards.

It is rather difficult to estimate number of leopard in the Great Caucasus. This will require additional, more thorough survey because of complex relief and tense situation. Now it could be assumed that these surveys should cover some areas in Dagestan, northern part of Georgia and Azerbaijan and also the detailed study of the Caucasus Nature Reserve.

As it has been already described marking activity of the leopard is of complex character. Its main forms are scratches, excrements, urination and scratching vertical surfaces. Scratches and excrements have been defined. Character of scratch distribution is typical. Most of them have been recorded on the crests of ranges, often in the saddles near large stones and rocks. Long distances along the bottom of the gorge have been passed, however, none of the scratches or other signs of the leopard existence there have been identified. Leopard excrements were also found on crests of watersheds. It is interesting that in some cases on the areas where the remnants of relatively fresh excrements have been found the earlier ones were also observed (remnants of bones of mineralised mass etc.), which refers to the tough spatial regulation and conservation of the system of leopard marking. In the Caucasus, as well as in other parts of the mountain areas the leopard preferably migrates on the crests of the watersheds.

More significant conclusion from the material is – relatively low marking activity of the leopard in this region, which refers to low population density. Such regularity of marking behaviour can be also applied to the Nearer Asian leopard in Turkmenistan – the lower the number of population density is, the weaker is the marking

* Elements of communication system have various functional significance in the districts with different population density. In the areas where animal density is high, e.g. in Siunt-Khasardagski range, marking activity occurs more often, which could be explained by high probability of penetrating of the animals of the same sex as the owner of the area is, into the borders of the individual areas, since the discovering of traces of the same sex makes the owner highly excited. In such situations functional importance of communication system is to regulate territorial interaction, In the areas were number of leopard is extremely low, the necessity of regulating territorial interactions is not very important, therefore, applying communication system is mainly oriented to attracting individuals of opposite sex.

activities of the animals (LUKAREVSKY, 1988). However, these data are conditional, since the selection is not very big and the work has been conducted in less favourable season for these purposes. Therefore, in order to ensure leopard survival in the Caucasus, it is necessary to take steps for ensuring the stability of the leopard population, i.e. to halt the decline of leopard number and splitting up the population in small groups. The examples of Far East sub-species and leopard in Turkmenistan illustrates the decline of the leopard number, which brings to splitting up population into small groups, shrinking of the area at the expense of disappearance of separate groups, which is followed by extinction.

Correspondingly, the activities should envisage the measures on the population stability, which calls for urgent steps for ensuring leopard conservation and objects of its diet. This requires strengthening of governmental sub-divisions (anti-poaching inspections, nature reserves, district governmental sub-divisions for nature protection etc.).

In order to restore the lost groups and to provide survival of individuals it is necessary to envisage the existence and functioning of ecological corridors, as well as satisfactory network of protected areas (nature reserves, national parks, sanctuaries, forest reserves, etc.), and for sustainable survival of the species in the region, it is necessary to take steps on implementation of the program of sustainable development of the local communities.

Socio-economic view on the problem of the leopard conservation in the Caucasus

Hard economic crisis all countries of the Caucasus have been experiencing for the last decade, has also affected the research area of the region. One of the important aspects is too low wages or no wages at all. In many districts of Armenia, Nakhichevan and Talysh most of the population do not get salaries and pensions for a year and for the longer periods. The lack of money makes the population earn money by any means or get useful products. One of the spheres, offering such possibilities is hunting and collecting wild plants (Armenia, Khosrov Nature Reserve). According to the preliminary impressions hunting in Armenia, Azerbaijan and Georgia is virtually uncontrolled. First of all it concerns hunting ungulates, which suffer from strong impact. This has led to the fact that, in many regions the population density of ungulates is rather low, especially of bezoar goats, Caucasian tur, wild boar and roe deer, a traditional and valuable prey of local hunters. At the same time these species in the Caucasus region are main preys for the leopard. Strong hunting impact on bezoar goat and tur and their low population density is one of the main reasons causing the decline of the leopard population in the region.

On the other hand, habitat of the leopard densely populated by man leads to the frequent encounter of man and animal. In winter virtually no traces of the leopard remain unnoticed by people, and more often they are found and killed.

The system of agriculture and livestock raising in Armenia and Azerbaijan (main branch of agricultural activities in these countries) are the main reasons causing impact on the leopard. Most of the livestock, once owned by the state is now in private possession. It is livestock and agricultural products that are the main source for food products and the means of subsistence for the most part of population (except the city population). Most probably the total number of livestock in the Republic has not changed greatly, while agricultural structure has been significantly changed. With the transition to private farming herd of small horned cattle has declined, i.e. the average number of animals in the flock has decreased, but the number of flocks has increased. These relatively small flocks are evenly distributed on the Caucasus territory, using winter and summer pastures and traditional routs between them. Al the above mentioned leads to the fact that there are several families of shepherds with their cattle virtually in every gorge. Besides, shepherds have guns in every summer shelter. This leads to the strong human impact, first of all in connection with the poaching and significant factor of disturbance. On the other hand, the potential prey – cows and sheep are near leopard habitat. Since the number of wild species of ungulates is small on the territory of Armenia, Azerbaijan and Georgia, existence of domestic animals in the immediate

Table 3 Data on the encounters and leopard slaughter in south Armenia

#	Time of slaughter	Place of slaughter	Sex	Age	Notes
1	03.1972	Eranos range	male	3-4	the animal is noticed but most probably killed
2	07.1974	Vicinities of the village Artashat	female	4	
3	07.1974	Vicinities of the village Artashat	kitten		
4	07.1974	Vicinities of the village Artashat	kitten		
5	11.1979	District Egkhegnadzor	male	5	
6	09.1981	Khosrov, Keshishdag	-	-	encounter
7	06.1978	Crossroads Khosrovkhend	male	5	the animal is noticed but most probably killed
8	01.1989	District Egkhegnadzor, Mozrov, Noravan range	male	?	see below
9	01.1989	District Egkhegnadzor, Mozrov, Noravan range	female	?	female and male during the period of estrus
10	08.1990	Village Aladjaz	female	Ad	female and male during the period of estrus
11	08.1990	Village Aladjaz	male	Ad	female and male during the period of estrus
12	10.1991	District Egkhegnadzor, church Spitakavor	female	1	killed
13	05.1994	[redacted] Azerbayan	female	Ad	female and male during the period of estrus
14	05.1994	[redacted] Azerbaijan	male	Ad	female and male during the period of estrus
15	07.1995	[redacted] Azerbaijan	female	Ad	female and male during the period of estrus
16	07.1995	[redacted] Azerbaijan	male	Ad	female and male during the period of estrus
17	11.1996	Khosrov Garni site	?	Juv	traces
18	02.1997	Khosrov, Keshishdag	?	Ad	
19	10.1998	Khosrov, Tapchanela site	male	5	killed
20	2000	Khosrov Tapchanela site	male	5	killed
21	1999	Khosrov, Keshishdag site	male	Ad	killed
22	10.1999	Vicinities Kapan	1male, 3 young		observed at the same place during a week
23	1998	Vicinities of Megri	male	<5	killed
24	1999	Khosrov, Kerpikend site	Female (?)	Ad	traces
25	05.1998	Khosrov Tapchanela site		Ad	roaring from 22:00 to 24:00
26	09.1998	Khosrov, Kerpikend site		Ad	roaring during two hours
27	01.2001	Khosrov, gorge Davagez		Ad	traces

proximity of the leopard habitat increases the food basis, simultaneously bringing about the conflict with man. The situation, favouring leopard's attack on cattle is probably rather widely spread on the territory of Nakhichevan. Cases of such attacks have frequently been mentioned in the interviews with the local population of Nakhichevan.

According to the poll results in the village Ordubad, mountains of Gazangeldag and many other places, for the last two years at least two leopards were killed and one was injured when they attempted to attack the cattle. Attacks on domestic animals are one of the reasons of hostility and the conflict between local population of south Nakhichevan and the leopard.

For most of the hunters in the Caucasus leopard is a desirable trophy, however, the hunters, having killed the leopard, speak of their great love for this animal, that no one will ever shoot this cat. In fact, meeting with the leopard leaves deep emotional aftermath in the man's heart, but equipped with the rifles and an instinct of hunting which is stronger than that of a predator, people shoot from a safe distance.

Talks with „new Caucasians" have proved that leopard's skin, spread at their feet, is the prestigious nick-nack – an object of pride. According to the poll results, from 1 to 3-4 leopards are killed every year.

It had happened so that the leopard habitat coincides with the state borders, or quite contrary, state borders of many nations lie through the best habitats of leopard in Nearer Asia, Far East as well as Caucasus. Socio-economic crisis resulted in political crisis, which has grown into interstate military conflicts, which in its turn has been followed by great number of weapons used for killing large mammals in „peaceful" times.

This problem, during the absence of state service for nature protection, threatens the conservation of large mammals of the region. This is one of the main reasons which calls for urgent financial-technical support of any nature protection structures.

Table 4 Data on encounters and leopard slaughter in Azerbaijan

#	Time slaughter	Place slaughter	Sex	Age	Notes
1	1972	mountainous Karabakh, Shushi	-	Ad	killed
2	1980	Nakhichevan	-	Ad	killed
3	2000	Nakhichevan, Kotam	-	Ad	killed at the border of Iran
4	1998-99	mountain Soug	Kitten (?)	Ad	encountered
5	1998-99	Gazangeldag	-	Ad	killed
6	2000	Gazangeldag	-	-	encountered
7	1990	Dirnisdag, Kaplanuvasi site	-	Ad	killed
8	2000	Dirnisdag, Kaplanuvasi site	-	Ad	killed
9	2000-2001	Darridag, south Ilandaga	-	?	regular encounters
10	1998		male	Ad	killed
11	1998			Ad	bit and scratched hunter
12	2000	Bandasar	?	Ad	leopard killed but it seriously injured one of the two hunters
Besides the above information at least 3 cases of the leopard slaughter are known in Talysh					

P.S. at least 3 killed leopards are added to this list:

1. Autumn 1992-93-94 – the skin has been photographed and the sizes are as follows:
   length from the tip of the nose to the root of the tail – 154 cm;
   length of the tail – 82cm
   most probably – female, killed in Khosrov.
2. 26.11.1996 – adult male, killed near Kaphan;
   length from the tip of the nose to the root of the tail – 180cm;
   length of the tail – 103 cm.
3. Autumn 2000 – (spur of the Bargushat range) – 1 female, adult – trapped and shot, fact is reliable, since the police took part in it and the case was closed as it was recorded as self-defence.

Proposal for leopard conservation in mountainous and sub-tropical forests of South-western part of Azerbaijan

Studied area is located on 38 degrees and 25 sec and 39 degrees and 10 sec north. To the west and south it borders with Iran and to the east is washed by the Caspian Sea.

The region has been inhabited by man form historic times, but remained underdeveloped and uncultivated due to the peculiar coastal climate (high humidity), thus causing number of sanitary-epidemiological difficulties (high rate of malaria infection, causing high death rate of population). Therefore, in old times people used to settle in upper and middle mountain belts. The region started to develop rapidly only for the last 50-70 years. This explains why mountain ecosystems, at some places – virgin forests, have been preserved.

Coastal and middle zones, freed from forest and used for agricultural purposes, are more intensively and densely settled. E.g. in Zuvadski hollow on the area of about 120 km^2, more than 20 populated districts with 3-5 to 200-250 houses are located. Khutorski type of settlement allows utilising almost all „corners" fit for residence. Forest zone, less utilised 15-20 years ago is now getting densely populated. Khutora is growing into large settlements. Coastal mountainous zone is now growing and widening so that the settlements adjoin each other, making vast populated centre. Lack of heating results in significant cuttings of the unique forest. First of all subtropic ecosystems – community of „iron" trees suffer from it. Therefore, zone of „freed" forests is gradually widening, which grows into an „ugly" anthropogenic community.

However, at present areas of virgin forests are still preserved in the region. It is noteworthy, that the animal world here remains as it was many centuries ago. Only tiger, noble deer and bezoar goat have disappeared from this region. Such large mammals as bear, roe deer, wild boar occur everywhere in the forest zone of the region. Talish is one of the few areas where such rare species as lynx and Nearer Asia Leopard[1] still live.

In Talish traces of leopard viability have been recorded only in the extreme south-western part of the region at the area of about 10 thousand ha. Infrequent traces of its viability attests rarity of the animal itself, however, the type of the traces indicates that they were left by territorial, residential animal and not of those penetrating from somewhere. Areas of leopard habitat are large and cover both Azerbaijanian and Iranian territories.

The character of using the area by leopard is rather complicated and completely unstudied in the conditions of Talish. Poll data, attesting deep snow cover in the upper and middle mountain belt, enables to ascertain that the leopard might migrate following wild boars, roe deer and porcupines – main preys for the leopard.

Deep and vast snow cover is the limiting factor, which restricts migration, especially of young animals. The leopard avoids deep snow covers and generally prefers to migrate in the areas which are freed from snow, therefore it can be under the rocks for days in anticipation of thaw. But when the snow cover lies during the whole winter, animals are extremely vulnerable. According to the information provided by people more or less linked with mountains and

1 In Azerbaijan Nearer Asian leopard lives in Nakhichevan, where it is extremely rare and is found only at the border of Armenia.

hunting, each encountered trace of the leopard is noticed and almost all leopards are „turned into carpets" by the end of winter.
Therefore, the main problem of conservation of the unique cat is to guarantee protection for at least four winter months (from November to February).

Conclusions for leopard conservation

Traditionally best form of wildlife conservation is ecosystem and in general – nature reserve, however, surveyed area is too densely populated by man which may result in lots of unfavourable consequences; therefore, other form of conservation should be considered – „Talish National Park". This will facilitate to preserve the customs and habits of local population and the whole biodiversity.
However, in order to achieve the objective: „conservation of biodiversity and customs and habits of local population" it is necessary to decide number of urgent tasks:

1. To define the park borders in the nature.
2. To conduct zoning of the park.
3. To grant the force of law to the Talish National Park
4. To guarantee observation of the conditions.

Traditionally local population is mainly occupied by cattle-breeding, agriculture, bee-keeping, gathering of wild plants (nuts, strawberries, etc). They are heated by wood.
At present those people who live in the populated areas in the mountains are in harmony with nature and in order to preserve this balance it is necessary to conserve current conditions, i.e. to introduce moratorium for widening agricultural activities: construction of the houses, increasing number of cattle, restrict road construction, riding on horses only.
Zoning of the area:
The whole territory of the Astara national forest (about 37 thousand ha, approx. 10-15 thousand ha of which should be under the reserve regime) should be included in the national park area.

Before any kind of nature conservation structure will be established, it would be desirable to allot at least 2-3 staff units, which on the legitimate basis could guarantee the leopard conservation in the nearest winter months.

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