STATUS AND DISTRIBUTION OF LEOPARDS (*Panthera pardus*) IN THE MOUNTAINS OF DAGESTAN, RUSSIA

Final report

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INTRODUCTION

Preservation of rare and threatened wildlife, especially such endangered species as the leopard (*Panthera pardus*), has been an indispensable measure to ensure a complexity of natural ecosystems. After the year 1981 when a young male leopard was shot in the Gumbetovsky Raion (District) (**Fig. 1**; Spasskaya & Saidalieva, 1983; 580 m, 42º46'225"N/ 46º40'339"E), records of this predator began to come from throughout the mountains of Dagestan (Yarovenko, 1997; Lukarevsky et al., 2007). Lack of reliable information about this big cat has been the principal obstacle for implementation of large-scale scientific research and start-up of efficient conservation in Dagestan. Among the regions of Russia's North Caucasus, only Dagestan is holding environmental conditions suitable for the leopard existence: low snow cover, rough terrain, sufficient biomass of wild ungulates and developed animal husbandry.

This project was aimed at obtaining first-hand and robust information about the leopard distribution in Dagestan to further promote research and conservation activities and raise the awareness of local people, authorities and other stakeholders.

Fig. 1. A young male leopard shot on 28 November, 1981 near the Igali and Tantari villages of the Gumbetovsky District (top left); mountainous terrain in the Gumbetovsky District (top right); a canyon where this male was harvested (bottom left) and the project author sitting over this canyon (bottom right).

The leopard is situated atop the ecological pyramid and belongs to indigenous fauna of the mountainous ecosystems of the Caucasus. As a result, its rarity or disappearance will inevitable break down the environmental balance, particularly, will lead to increase of grey wolf (*Canis lupus*) numbers which most frequently take over the spaces freed by leopards. Thus, a leopard taking 1 sheep per hunt will be substituted by a pack of wolves taking 20-30 sheep. Dissemination of such information among local people who overwhelmingly subsist on animal husbandry represents a firm ground for understanding the economic benefits from having leopards vs. wolves which terrorize shepherds and their livestock in Dagestan and elsewhere in the Caucasus. This issue is of vital importance to Dagestan where small livestock numbers exceed 4880000 heads, according to the official census of 2006.

Sufficiency of wild prey (16000-18000 eastern turs *Capra cylindricornis* and ca. 2000 bezoar goats *Capra aegagrus*) and domestic livestock ensures the optimal conditions for the leopard existence in Dagestan (Akhmedov, 1995; Nasrulaev & Akhmedov, 2000).

Historically, Dagestan highlanders have been revering the leopard for its stealth and intrepidity, but only handful of them believes in its survival in the republic. During this project, we have held numerous conversations with village chiefs, schoolchildren and regional municipalities to know more about this predator and identify the spots of most probable existence where follow-up research and conservation would be most expedient.

NATURE OF MOUNTAINOUS DAGESTAN

Topographically, mountainous Dagestan is divided into **Inner Mountainous** or **Central Dagestan** and **Highland Dagestan** (**Fig. 2**).

Inner Mountainous Dagestan represents a territory of very complicated terrain with heights from 800 to 2800 m above sea level which covers the republic's western and central parts. From the lowland part in central and eastern Dagestan it is separated by the Andiisky, Salatau, Gimrinsky, Chonkotau, Shamkkhaldag, Les and Karasyrt mountain ridges. From Highland Dagestan in the south and east it is bounded by the branches of the Bokovoy Ridge.

A common feature of Inner Mountainous Dagestan's landscapes is presence of wide xerophytic (arid) depressions receiving very little precipitation (> 350 mm/yr) because of surrounding ridges which prevent the penetration of humid air masses from the north and the Caspian Sea. Precipitation increases with elevations up to 800 mm/yr. The terrain is very precipitous and comprising an array of ridges, deep canyons, valleys and flat plateaus with almost vertical slopes. The karst formations, derivatives of weathering, denudations, screes and landslide nidi are common.

The north-western part of Inner Mountainous Dagestan is covered by forbs-cereal mountain arid grasslands and subalpine meadows. Geologically, this area is underlain by cretaceous beds, mostly limestone, so is often called Limestone Dagestan. Local climate is continental, with chilly winter (from -2.9^{o}C to -6.5^{o}C in January) and warm summer (from 16^{o}C to 21^{o}C in July). In depressions the temperature fluctuations are higher and the summers are hot.

Fig. 2. Map of terrain of Dagestan.

Limestone Dagestan is the most densely populated and man-altered part of mountainous Dagestan. Terrace agriculture with artificial irrigation is an age-old practice which has been gradually replaced by livestock grazing and haymaking. Horticulture also plays an important role. Mountain streams are used to produce hydropower.

South-eastern part of Inner Mountainous Dagestan is covered mostly by depressions and intermontane valleys and is underlain by sandstones and argillaceous slates (Sandstone-Slate Dagestan). Local climate is continental, receiving 400-1000 mm/yr of precipitation. Like in Limestone Dagestan, the common practices are terrace agriculture, animal husbandry, horticulture and haymaking.

Northern slopes of Inner Mountainous Dagestan, especially in the headwaters of the Avarskoe Koisu, Andiiskoe Koisu and Kara Koisu rivers are covered by forests of the Koch's pine (*Pinus kochiana*) and deciduous trees.

The fauna of insects, amphibians and reptiles of Inner Mountainous Dagestan is quite poor, but birds and mammals are diverse. The leopard prey species living here are the wild boar (*Sus scrofa*) and the European roe deer (*Capreolus capreolus*).

Highland Dagestan is located in the extreme south-west of the republic and is confined to the northern slopes of the Great Caucasus Ridge, occupying the heights from 2000 m upwards. The Bokovoy Ridge, an assemblage of the Snegovoy, Bogossky, Nukatl and Dultydagsky ridges which is split in the south to the Samursky and Kiabiaktepe ridges, is stretched in parallel to the Great Caucasus Ridge. The Bokovoy Ridge shapes deep canyons along which the two main rivers of mountainous Dagestan (Avarskoe Koisu and Andiiskoe Koisu) flow. The mountain peaks have glaciers and the rivers and streams form numerous waterfalls.

The principal landscapes are forests of the Koch's pine, Litvinov's birch (*Betula litwinowii*), silver birch (*B. pendula*) and Radde's birch (*B. raddeana*) with dense understory, as well as subalpine and alpine meadows and the nival zone.

Because of harsh climate, local population is scarce and subsisting almost exclusively on traditional sheep breeding on lush alpine meadows.

Highland Dagestan holds 3 local sanctuaries (Kosobsko-Kelebsky, Bezhtinsky, Charodinsky) and 1 federal sanctuary (Tlyaratinsky). A governmental decision is made to incorporate most of the Tlyaratinsky Sanctuary to the Dagestansky Reserve, as this area has been crossed every year by migrating Caucasian red deer (*Cervus elaphus maral*) and eastern turs en route to the Zakatalsky Reserve of Azerbaijan. In the winter, majority of deer and some turs live on the southern slopes of the Great Caucasus Ridge in Azerbaijan and return to Dagestan in the summer.

Local climate is strictly continental, with harsh winter and chilly summer. Precipitation is high, 1000 m/yr and more.

Harsh highland conditions limit the diversity of insects, amphibians and reptiles. Birds, especially raptors (vultures, falcons and hawks), are quite diverse. The leopard prey species are the eastern tur, bezoar goat, Caucasian red deer, chamois (*Rupicapra rupicapra*) and wild boar.

WHAT DID WE KNOW ABOUT THE LEOPARD IN DAGESTAN BEFORE THIS PROJECT?

The Great Caucasus Ridge occupies the northernmost edge of the global range of the Caucasian or Persian leopard (*Panthera pardus ciscaucasica* = *P. p. saxicolor*). In the late 19th century, this predator was quite common in the North Caucasus, but now is teetering on the very brink of extinction (Khorozyan & Abamov, 2007).

The latest information about the leopard in Dagestan was published by Yarovenko (1999). Below we present its concise version.

Dagestan differs from other regions of the North Caucasus by much longer and complicated network of mountain ridges (ridge length is 180-200 km vs. 80-100 km in central and western Great Caucasus Ridge) and abundance of wild ungulates fed upon by the leopard. The leopard staple prey species are the eastern tur and the bezoar goat (**Fig. 3**).

Prior to 1981 (**Fig. 1**), the leopard records in Dagestan were anecdotal. Most frequently, they came from the highlands of the Dultydagsky Ridge (Mts. Dultydag 4127 m, Nukatl 3903 m, Guton 3648 m) of total area 2149 m^2 and the 349-km^2 Bogossky Ridge (Mt. Adal-la-Ukhgelmeer 4151 m). These areas are hardly inaccessible and almost deprived of population. The leopard records from here came twice: in 1989 a local doctor has photographed a female leopard with two cubs while eating the prey carcass, and in 1994 a young individual who died in avalanche was found in the Kulinsky District.

Fig. 3. The eastern turs.

Most of the gleanings came from hunters and gamekeepers. For example, on 15 December 1985 several hunters and a local gamekeeper observed a leopard hunt on turs on the Shalibsky Pass (Dultydagsky Ridge). In the autumn 1993, a game warden recorded two leopards stalking in the headwaters of the Khvarshinka River, a tributary of the Andiiskoe Koisu River, on the Bogossky Ridge. In 1995, a gamekeeper of the Kulinsky District has encountered a leopard near the shot tur.

According to the 1995 report of Dagestan's Department of Game Management, up to 10 leopards were living in the republic. The main prey species were numerous turs (up to 20000 individuals) and, to a lesser extent, bezoar goats and roe deer. The tur density was 6.2 individuals/km^2 on the Dultydagsky Ridge and 6.8 individuals/km^2 on the Bogossky Ridge. Another available prey was the bezoar goat, especially on the southern slopes of the Bogossky Ridge where it numbered ca. 600 individuals or half of all population on the Great Caucasus Ridge.

By the late 1990s, deterioration of economic conditions led to sharp reduction of sheep numbers which could contribute to recovery of the tur. However, plenty of rifles in local people's hands and lawlessness curbed the tur population growth.

FIELD WORK AND ITS RESULTS

19-20 March 2008, Kurakhsky District, Ursun village. 41º43'26''N/47º38'15''E

The trekking route began in the Khpyuk village. In the headwaters and up the trail, we recorded the tracks of 5 wolves and remains of its prey, the foal. We reached the pass to the Khivsky District, then turned to the Mt. Damabashi (2891 m) and came out to the ridge directed towards the Khpyuk, Ursun and Shimikhyur villages. Total length of the route was ca. 20 km. On the saddles we found 5 wolf scats. No leopard tracks, but only those of wolves (2 tracks) and red fox (*Vulpes vulpes*, 4), were found. Local villagers reported about killing of about 100 sheep by wolves some month ago in front of the Shimikhyur village. Almost nobody heard about the leopard, but all know about the striped hyena (*Hyaena hyaena*) which occurred here 30-40 years ago. We have found out that in 1995, 4 km to the east of the Kurakh village (Kurakhsky District), a female leopard with a broken fang was shot (41º33'35''N/47º50'10''E). Now her stuffed specimen is exhibited at the museum of the Naryn-Kala Fortress in the town of Derbent (**Fig. 4**). In July 1998, a leopard was observed by a game warden from the Kurakh village.

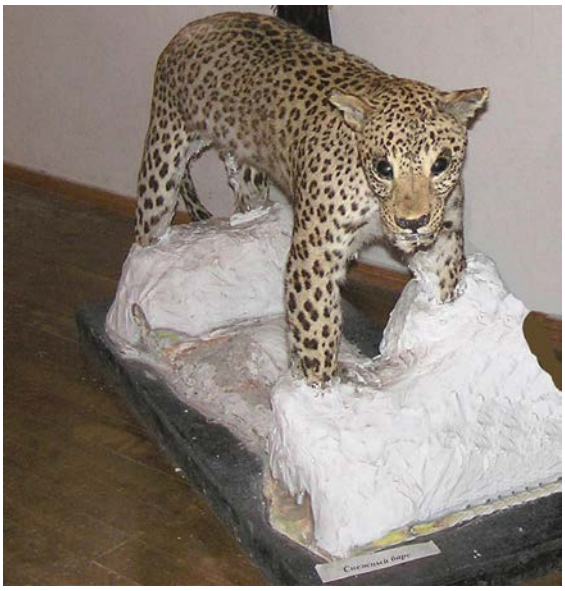

Fig. 4. Female leopard killed in 1995 near the Kurakh village.

16-18 April 2008, Kazbekovsky District. 43º07'36''N/46º41'13''E

The first trekking route (ca. 12 km) passed by the places of leopard steel-trapping and killing in 1985-1986 to the east of the Dylym village along the ridge of the length 600-700 m covered by the oak-hornbeam forest. We recorded 3 rest beds of roe deer, European hare (*Lepus europaeus*) tracks and feces, tracks and diggings of badgers (*Meles meles*) and wild boars.

The second route (18 km) stretched along the deep canyon of the Akhsu River covered by the hornbeam-oak forest with some pines. We found many old and new diggings of wild boars. Plenty of good shelters for leopards (niches and caves) were also noted. In 1989-1990, A. Emeev, chief of the Kazbekovsky Society of Hunters, tracked here a female leopard and found the sites where she killed 3-4 wild boars. As he said, that time here was living a female with 2 cubs (**Fig. 5**). Grazing livestock is abundant here in the summer.

Fig. 5. Local people who saw a leopard in 1989-1990.

The third route passed through the western part of the Kazbekovsky District on the border with Chechen Republic to the west of the Almak village. The dominating landscapes are the beech and oak forests. We found many tracks of wild boars, roe deer, hares, badgers, wolves and brown bears (*Ursus arctos*). There are some records of leopard observations in this area: in 1994 (near the Kalininaul, Bulak River, sandstone cliffs) and in the winter 2006-2007 (right bank of the Yaryk-su River and left bank of the Aktash River).

18-21 May 2008, Laksky District, Mt. Dultydag, headwaters of the Kazikumukhskoe Koisu. 42º02'N/46º58'E

The first trekking route (20 km) was hiked upstream to the right tributary, Nukkura River. Five tur groups (14, 7, 10, 22 and 78 individuals) were detected. Most turs lived on the southern and south-western slopes. We also recorded the badger, wolf and fox tracks. No signs of leopards were found, even though some gleanings known to us are originated from here. According to local gamekeepers, hunters and the elderly, in 1980 a leopard hunt on turs was observed on the Shalibsky Pass; in 2002 a leopard was detected through the binocular and its tracks were found near the Mt. Metiko (ruins of the Charovali village); in 1983-1987 and in 2005 a leopard was observed near the Burshi village; in 2004 a leopard was shot, but missed, near the Nukkura River in a valley of the Dultydag Ridge; in 2006 a leopard and its tracks were recorded in the same area.

In the subsequent 2 days we walked the routes (12 km each) towards the Shalibsky Pass and the ruins of the Charovali village. We recorded 2 groups of turs (5 and 8 individuals) and many hare tracks. No signs of leopards were found.

9-14 July 2008, Laksky District, Mt. Dultydag, headwaters of the Kazikumukhskoe Koisu. 42º02'N/46º58'E

The trekking route (24 km) was hiked upstream the Nukkura River to the pass to the Kubatl village of the Charodinsky District, then to the Charovali village. Two groups of turs were found: 2 young males, 7 females with kids and 3 adult males in one group and 5 young males in another one. A herd of ca. 60 individuals stayed on the northern slope. Vague tracks, to some degree resembling the leopard's, were found on dirt which stretched towards the deep canyon and the Shalibsky Pass (**Fig. 6**). As local hunters claim,

here they used to find the leopard tracks quite often. On the pass itself we found the tracks of 3 wolves, but no leopard signs were detected.

Fig. 6. A putative leopard track.

According to a local shepherd, in August 2002 on a summer pasture of the Unchukatl village on the left bank of the Dultychai River he, on the morning, saw a stocky light-yellow beast with short ears which attacked his sheep and mauled 4 of them (41º54'N/46º59'E). In 2008, a local shepherd reported about finding 7 dead turs. During the inspection that followed, a district gamekeeper has glimpsed 2 adult leopards with cubs which moved in a neighbouring area near the Charovali ruins towards the Shalibsky Pass.

On July 12, the weather was rainy and misty, but on the screes upstream the Charovalinka River we found many turs and their trails. To the left, among the stones, we detected a track looking like the leopard's, but without the toe prints (which are always clearly visible in this predator). The tur remains were scattered all around.

A July trip to the Karata village of the Akhvakhsky District (15 km) did not bring any results. This area is heavily affected by human activities: livestock grazing and deforestation. Many tracks of wolves, foxes, hares and roe deer were found. Cattle and sheep were grazing throughout the area.

6-7 August 2008, Charodinsky District, Shalib village.

A trekking route was hiked along the ridge from Rokhchinu to the Shalibsky Pass. The slopes are covered by the pine and birch forests. Many tracks of wild boars, wolves, roe deer and foxes were detected. A group of 5 female turs and 2 kids was recorded. Chief of local administration said that, being a hunter himself and acquainted with many local hunters, he never saw a leopard and did not hear about its occurrence in this area. Meantime, Eurasian lynx (*Lynx lynx*) were frequently harvested in local woodlands.

November 2008, Akhvakhsky District, Tsoloda village, Mt. Arjukhmeer, Ingerdakh village. 42º38'121"N/46º23' 564"E

We hiked 15 km up to the Mt. Arjukhmeer (2596 m), then descended to the canyon and came across a local hunter who, as he says, harvests up to 10 bezoar goats per annum. A month ago he saw a leopard that slipped into the grotto on the southern slope of the canyon. We surveyed this site and did not find unambiguous signs of leopard presence. On a road from the Tsoloda village we found the tracks of lynx, wolves, stone martens (*Martes foina*), hares, squirrels (*Sciurus vulgaris*) and wild boars.

10-12 January 2009, Tsoloda village. The same area.

As the same hunter said, on 5 January he saw a leopard that entered the same grotto. We walked 18 km by this shelter. Beneath it, on 4-day-old snow we recorded big rounded tracks which were too thawed and their specific origin could not be determined (**Fig. 7**). We also found many snow tracks of hares, martens, foxes, squirrels, least weasel (*Mustela nivalis*), wild boar and roe deer.

28 January 2009, Tsoloda village. The same area.

A local villager visited the alleged leopard den and found the thawed rounded snow tracks. Later on the telephone he assured that the animal had long (> 0.5 m) tail, but this impression is subjective and we think that he saw a lynx. He photographed tracks by his cell phone, but the pictures are low-quality and inappropriate for species identification. Most likely, it is a lynx.

Fig. 7. Snow tracks near the Tsoloda village.

In the same period, information has come from the Gumbetovsky District (left bank of the Andiiskoe Koisu River) about a leopard that killed 40-50 cows in the Ingishi and Tlyarata villages from September 2008 to January 2009. Also, the rumours kept spreading that this predator was tracked then by people who introduced themselves as the Makhachkala Zoo staff members. Possibly, that was an order for capture or killing.

In 2006-2007, a postgraduate zoologist from the Dagestan State University who worked in this area recorded high numbers of bezoar goats (400 observations). Most likely, this area

is a haunt for the leopard where the goats, wild boars and roe deer (not saying about domestic livestock) are abundant.

6-10 Febuary 2009, Gumbetovsky District, Tlyarata village. 42º47'646''N/46º31'684''E

Three trekking routes were hiked. According to a Tlyarata villager, he, his son and another person glimpsed a big animal alike the leopard (long tail, rounded ears, long body) in the sea buckthorn thickets (**Fig. 8**). In the meantime, locals complained about a leopard that killed 22 calves and 1 donkey and have applied to local administration with a request to resolve the problem (**Fig. 9**).

Fig. 8. The project author (rightmost) and the Tlyarata villagers who claim the leopard sighting.

Unfortunately, our surveys (10 km) did not uncover any concrete information about the leopard. A few whitish-yellow hairs found by us on buckthorn prickles could potentially belong to this predator, but neither scats nor any other confirming signs were recorded. Many snow tracks of wolves and foxes were detected. Grass cover was completely eaten away, donkey and cattle dung was scattered everywhere and a bare mandible of a cow lay beside.

On 10 October 2008, a heifer was killed on a ridge above the village, but the culprit predator is uncertain. As a local conservation inspector said, wild boars, roe deer and wolves are common out there. And, indeed, we found many wolf tracks in the thickets where, as locals testify, the leopard escaped.

The second route passed by the place where a leopard was killed in 1981 (**Fig. 1**). A local villager, who participated in that event, keeps the leopard's claw as a trophy (**Fig. 10**). The predator fell into the steel trap, dragged it 300 m up the slope, then attacked the approaching hunter and was shot dead by other hunter who came for help.

РЕСПУБЛИКА ДАГЕСТАН
АДМИНИСТРАЦИЯ МУНИЦИПАЛЬНОГО ОБРАЗОВАНИЯ
«ГУМБЕТОВСКИЙ РАЙОН»

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«28» XI 2008 г. № 06/337

Министерство природных ресурсов
и охраны окружающей среды
ГУ «Дирекция ООПТ охраны животного мира
и водных биоресурсов

С сентября месяца текущего года в общественных пастбищах сел.Тлярата в местечке «Баздо», где зеленые насаждения, обитается Кавказский снежный Барс. За один месяц снежным Барсом убиты 22 голов КРС. С просьбой о помощи в администрацию района обращались жители сел.Тлярата.

Нами, совместно с РОВД были приняты меры по выманиванию Барса с зеленого массива, но безрезультатно.

Учитывая вышеизложенное, просим Вас оказать помощь для отлова Кавказского снежного Барса, наносящий большой материальный ущерб жителям сел.Тлярата.

Глава администрации Мутаев М.

Fig. 9. Letter submitted by Tlyarata villagers to local administration with a request to resolve the problem with a leopard that killed 22 calves.

Fig. 10. Claw left from the leopard killed in 1981.

OTHER LEOPARD RECORDS IN DAGESTAN

Apart from those mentioned above, there are also other records of leopard killing and observations in Dagestan. Below we present the most reliable and recent of them.

1. Tsutinsky District. 6 April 2004. A squad of commandos observed near the Tlyarata village a leopard crossing the canyon towards the Shalib village and back near the Mt. Zhamori on the Bogossky Ridge.
2. Tsutinsky District. 1999. A sub-adult male leopard fell into the trap set for the bezoar goat 4 km to the south of the Sagada village (junction of the Mitluda and Andiiskoe Koisu rivers). We failed to find the skin. Approximately in the same place, in late November-early December 2008, a local villager and a district security officer observed 2 tur-stalking leopards. Coordinates: 42º40'33''N/46º01'01''E.

3. Rutulsky and Akhtynsky Districts. 1990. An officer of the Russian Ministry of Nature Conservation observed a leopard hunt on turs through the spotting scope on the Kiabi-aktepe Ridge.
4. Tlyaratinsky District. October 2004. A local hunter wounded a leopard during the tur hunt near the Kamilukh village. The wounded predator moved away to the Zakatalsky Reserve in Azerbaijan.
5. Tsumadinsky District. 2005-2006. Mt. Zainkort near Chechen Republic. Shepherds observed the leopard stalking sheep and turs.
6. Tlyaratinsky District. September 2004. A leopard fed upon the killed calf beneath the Kosob village.
7. Tlyaratinsky District. March-April 2003. A tur hunter watched through the binocular a leopard basking on the snow.
8. Shamilsky District. 1996-1998. A game warden of the Kosobsko-Kelebsky Sanctuary from the Khindakh village personally encountered the leopard twice near the Uchukh village.
9. Rutulsky District. August 2006. A Kuli villager with his son saw a big leopard above the tree line over the Arakul village.
10. Botlikhsky District. October-November 2007. According to local militia, on the Mt. Oslinye Ushi (42º40'33''N/46º01'01''E, 2658.2 m) commandos have killed a leopard and exported its skin to the town of Khankala in Chechen Republic. We failed to obtain any additional information about this specimen.

EASTERN TUR AS THE KEY FACTOR OF LEOPARD SURVIVAL IN DAGESTAN

As already mentioned above, sufficient biomass of eastern turs has been the key factor of leopard survival in Dagestan.

A topographic feature of Dagestan is expanded mountainous part which consists of 8 mountain ridges, each over 40 km long. These ridges and their numerous branches are cliffy and precipitous, so are capable of retaining high density of the tur population. As shown on **Fig. 11**, the highest tur density is estimated in the central highland located between the highest peaks – Mts. Guton, Nukatl, Dultydag, Alakhundag, Bazarduzi, Shalbuzag, Charyndag, Malkamud and Deavgay. The second core is located on the Bogossky Ridge (south-western Dagestan) and the third one – on the extreme south on the border with Azerbaijan (**Fig. 11**).

Winter period plays an important role in tur survival. During this season, cliffs are covered by deep snow and become inaccessible to turs themselves, so the animals have to move to the areas with winter pastures. Thus, the key factors determining the tur density in Dagestan are two:

1. Availability of protective features of terrain (cliffs and precipitous slopes, length of the main ridges) which guarantee the safety for the population
2. Availability of feeding grounds (areas and productivity of pastures, forage quality).

According to our estimates, size of the eastern tur population (adults and kids) in the summer reaches 18000 individuals.

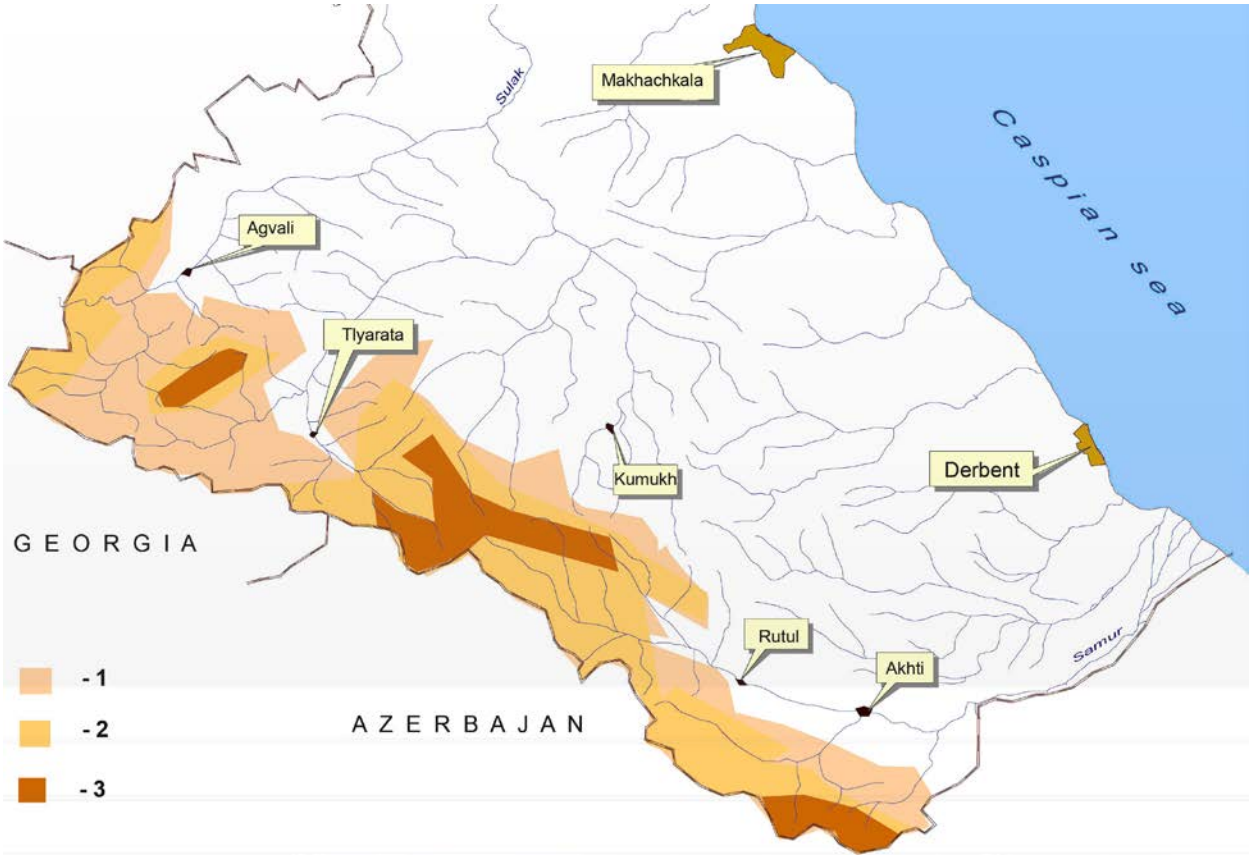

Fig. 11. Tur population density in Dagestan, with the key settlements placed in boxes. Legends: 1 – up to 3 individuals/km^2, 2 – 3-6 individuals/km^2, 3 – 6-9 indviduals/km^2.

The census results show that tur densities vary from site to site within the limits of 1.8-7.3 individuals/km^2 and the average density is 5.1 individuals/km^2. The top-density cores are confined to the 7-10 km long ridges with heights over 4000 m which are located in the Great Caucasus Ridge, Bokovoy Ridge and their branches.

CONCLUSION

The map of leopard records in Dagestan is presented in **Fig. 12**. Given these data and other information described above, the following conclusions can be made about the leopard occurrence in the republic:

1. The leopard lives in the most hardly accessible places which are most distant from human settlements.
2. The most important prerequisite for the leopard existence is sufficiency of prey, especially the eastern tur and the bezoar goat. That is why the leopard in Dagestan is recorded mostly in highlands what is unusual for this tropical species.
3. Deficiency of arboreal vegetation over Dagestan's highlands increases the chances of seeing and killing leopards by hunters and shepherds.
4. Destruction of the leopard population ensues, in most cases, from predator attacks on livestock, even though, taking into account the rarity of leopards vs. the commonness of wolves, just wolves are the culprit predators. Plenty of hardly accessible sites and secluded shelters (niches, grottos and caves in cliffy and precipitous slopes), coupled with naturally elusive behaviour of leopards, allow them to live and

remain undetected. The northern slopes of the left bank of the Andiiskoe Koisu River covered by deep forests from 1700 m upwards and located mostly in neighbouring Chechen Republic are almost deprived of human population and infrastructure and controlled by anti-terrorism state security forces. This circumstance gives the leopards a chance to survive, but drives them to move to the southern slopes with less snow and to attack domestic livestock, risking to be shot by people.

5. The leopard attacks on livestock in Dagestan are a controversial issue and the related supporting data are scarce. Even though the wild prey is abundant, some leopards prefer to kill domestic animals. What drives the predators to do that is unclear: it can be an old individual too feeble to hunt on vigilant wild ungulates, or a young individual lacking experience of hunting and preferring the easiest prey to catch, or a resident female having to live in the area with low density of wild prey. Leopards kill livestock mostly in Inner Mountainous Dagestan, but the tur remains a staple food in Highland Dagestan.

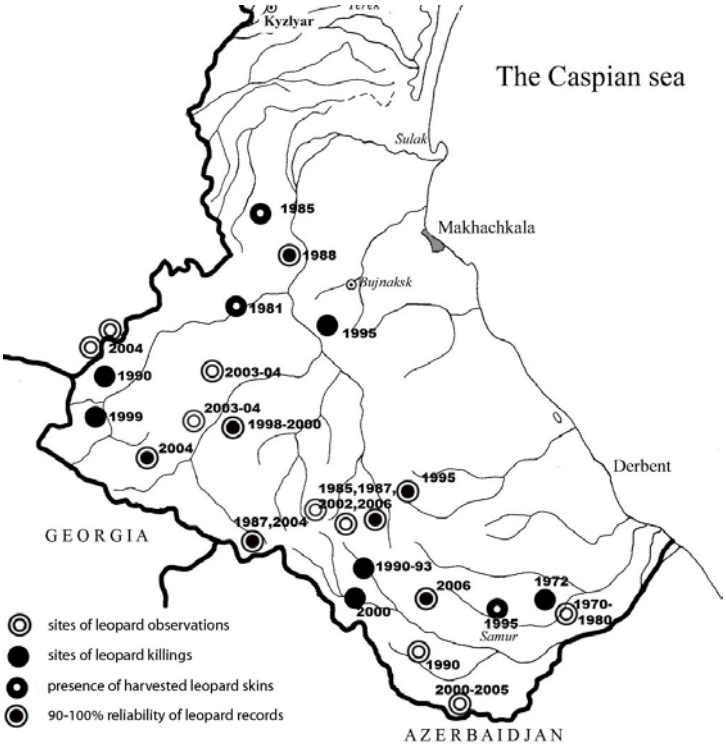

Fig. 12. Most recent leopard record sites in Dagestan.

FOLLOW-UP ACTIVITIES

We envisage that the following activities need to be implemented in Dagestan as related to the leopard:

1. Comprehensive mapping of leopard record sites, natural factors (landscapes, terrain, prey density etc.) and man-made factors (infrastructure, settlements etc.) within the key leopard areas in order to predict the leopard occurrence in the republic
2. Research of the leopard population size, distribution and sex/age structure by means of camera photo-traps

3. Awareness-raising among local people, especially hunters and shepherds, about a necessity of leopard preservation in Dagestan
4. Monitoring of leopard attacks on livestock and, if necessary, development of compensation mechanisms
5. Capacity building and motivation build-up of local conservation bodies and protectted areas.

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