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RARE PREDATORY MAMMALS OF UZBEKISTAN: CONDITION OF POPULATIONS AND THEIR PROTECTION

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ABSTRACT
The aim of this work is to analyze the current condition of rare and endangered predatory mammals' fauna in Uzbekistan, determine the main factors threatening their populations. The paper provides with modern nature protection status and threats of each species, examines features of status of populations. Coverage of rare and endangered predatory mammal species and their population's ranges by the nature protection system of Uzbekistan was analyzed in this paper. The assessment of character and extent of anthropogenic influence on fauna of predatory mammals in the framework of Uzbekistan's natural ecosystems was given. The data processing has shown that among those most influential anthropogenic factors are: agriculture land use – 71.4% of species are affected by this factor; pasture - up to 78.6% of species. The majority of predatory mammals under examination (85.7%) were affected by poaching.

KEYWORDS: predatory mammals, range, population, anthropogenic factors, nature protection status.

INTRODUCTION

In case of changes in the habitat, predatory mst vulnerable components of ecosystems and can be treated as good indicators, reflecting an extent of anthropogenic impact and transformations in natural habitats. Predatory mammals are, above all, affected by degradations of habitats and direct destruction. The aim of this work is to analyze the current condition of rare and endangered predatory mammals' fauna in Uzbekistan, determine the main factors threatening their existence, to find out an extent of natural habitats' coverage by protected areas (PA).

Modern fauna of mammal of Uzbekistan is represented by 107 species, among which 25 belong to predators (*Carnivora* order) from 5 families and 11 genuses. Fauna of the country is distinguished by antiquity and complexity of genetic relations. Majority is represented by natural or native fauna. The biggest part of predatory mammal species is constituted by allochton species, which by natural ways penetrated the territory of Uzbekistan in different historic periods from other regions.[1] Among those species are - Corsac Fox (*Vulpes corsac*), Turkmen Caracal (*Lynx caracal michaelis*), Marbled Polecat (*Vormela peregusna*), Central Asian Otter (*Lutra lutra seistanica*), Snow Leopard (*Uncia uncia*), Striped Hyena (*Hyaena hyaena*), Jackal (*Canis aureus*), Honey Badger (*Mellivora capensis indica*). A distinct group of animals in Uzbekistan is represented by alien species, which weren't met here before. American Mink (*Mustela vison*) is one of such introducents. The species has successfully naturalized in nature, occupied a free ecologic niche and doesn't influence negatively other species.[2]

Publications on rare predatory mammals of Uzbekistan for the last 30 years contain scattered data about features of distribution, quantity on local territories, anthropogenic influence and protection condition of distinct rare species.[3-22] Complex analysis of modern condition of rare and endangered predatory mammal's fauna on the country's territory wasn't realized.

Currently, around 60% of predatory mammals are, to some extent, under the threat of extinction, some species had completely disappeared. The number of many predators haven't reached critical level yet, but continue to diminish steadily. Such species are considered to be under heightened risk of extinction in wild life and included into the Red Data Book of the Republic of Uzbekistan (UzRDB), the Red List (RL) of International Union for Conservation of Nature and Natural Resources (IUCN), Annex to Convention on International Trade in Endangered Species (CITES). As can be seen from the table 1, the most of species, with different categories of threat, belong to *Carnivora* order.

Into different categories of rare and endangered predatory mammals 14 species are included, out of which 10 species are in the Red Data Book of the Republic of Uzbekistan, 10 species - in the Red List of IUCN, 11 species - in Annex to CITES (table 1).[23,24,25] 4 globally endangered species of predatory mammals don't have national preservation status yet (table 2). Moreover, Snow Leopard is included into the in Annex I of Convention on Migratory Species (CMS).[26]

Table: 1 Predatory mammals included into the UzRDB, the Red List of IUCN, CITES Annexes in comparison to other orders of mammals and their abundance in the country

Taxon	The number of mammal species in the fauna of Uzbekistan			
	Total	**UzRDB**	**IUCN**	**CITES**
MAMMALIA	107	25 (incl. 1 subspecies)	21	17
Insectivora	5	1	-	-
Chiroptera	20	4	2	-
Carnivora	**25**	**10**	10	**11**
Perissodactyla	2	1	1	1
Artiodactyla	10	7	5	5
Rodentia	43	2	3	-
Lagomorpha	2	-	-	-

1. MATERIALS AND METHODS

To gather materials about the fauna of rare predators, standard techniques of lifetime study of mammals were applied.[27,28] Those techniques included: transect / route / foot registration of mammals; registration of character theirs activity (traces, excrements, food leftovers, burrows, digging); count of mammals' number by traces, point's count; collection of information in oral form and local public surveys. Materials from all scientific zoological collections of Uzbekistan were used this paper.[29]

To classify the main threats for predatory mammals, existing international classifications were taken as a base line - Threats Classification Scheme (Version 3.2), Threats Classification of BirdLife International, designed for the IBA- program and applied earlier in the identification and description of the Important Bird Areas (IBA) of Uzbekistan.[30] These lists were modified and adapted taking into account ecosystemic and faunistic characteristics of the country, socio-economic, climatic and geographic features of the region.[31] For the definition of anthropogenic threats' level, influencing condition of predatory mammals populations, an assessment system with marks was used. This system was designed and applied earlier, in previous researches.[32]

The analysis of rare and endangered predatory mammal species' coverage by the system of PAs is provided with help of criteria, designed for the assessment of key zoological objects. This criteria was applied even before, for the preparation of recommendations concerning expansion of protected areas system in Uzbekistan.[33]

The role of IBAs, as a part of ecologic network for predatory mammals fauna conservation, was assessed as well. In Uzbekistan, IBA-program started its work since 2005. For the last ten years, on the basis of current data, with the use of internationally recognized criteria, a network of 51 IBAs was identified. These IBAs added to the worldwide list of already existing IBA-system. The overall area of Uzbekistan's IBAs constitutes 2.230.186 hectares (4.98% of the Republics territory).[34] IBA network covers all main landscapes of the country. This article provides with data confirming that protection and control of IBA network, which constitutes relatively small share of the countries area, can ensure effective conservation of definite quantity of rare and endangered predatory mammal species.[35]

2. RESULTS AND DISCUSSION

Modern condition of rare predatory mammals (families *Canidae, Ursidae, Mustelidae, Hyaenidae u Felidae*) to higher extent depends on the level of protection and character of anthropogenic influence, which negatively affect biologic parameters of species and their habitats. Assessment of all these factors will allow to design complex measures for recovery and support of predatory mammals' populations and their habitats.

Extent to which PAs cover population ranges of predatory mammal species was estimated. It allowed to conclude which essential part of population ranges is included into PAs and whether it's enough for the preservation and recovery of large predators. As is well known, the highest effectiveness of biodiversity and its distinct components protected is reached on PAs of I-IV categories. The overall area of such territories is 2.387.809 hectares, which constitutes 22.6% of total PAs or 5.3% of the whole country's areas.

Large predators have significant ranges, which are often strongly fragmented and exceed the areas of nature reserves. Various protected species of predatory mammals use vast territories beyond the borders of nature reserves for breeding, feeding and in the process of seasonal migrations. In these cases, only an insignificant part of their ranges coincides with territorial protection (table 2).

Table: 2 Extent to which PAs cover the ranges of rare and threatened predatory mammals

Species	Nature protected status of species	Extent of coverage ranges by PAs (%)
Corsac Fox *Vulpes corsac ssp. turcmenicus*	Decreasing species	< 1%
Dhole *Cuon alpinus*	RL: EN	-
Tien Shan Brown Bear *Ursus arctos ssp. isabellinus*	UzRDB/CITES II	around 30%
Steppe or Asiatic Polecat *Mustela eversmanni*	Decreasing species	< 1%
Marbled Polecat *Vormela peregusna*	RL: VU	up to 30%, endemic subspecies outside PAs
Honey Badger *Mellivora capensis ssp. indica*	UzRDB	-
Central Asian Otter *Lutra lutra ssp. seistanica*	UzRDB/RL: NT/CITES I	around 15%
Striped Hyena *Hyaena hyaena*	UzRDB/RL:NT	around 30%
Asiatic Cheetah *Acinonyx jubatus ssp. venaticus*	UzRDB/RL: VU	extinct from the country
Jungle Cat *Felis chaus*	Decreasing species	45-50%
Sand Cat *Felis margarita*	RL: NT	< 1%
Pallas's Cat *Felis manul*	RL: NT	no data
Turkmen Caracal *Lynx caracal ssp. michaelis*	UzRDB/CITES I	around 5%
Turkestan Lynx *Lynx lynx ssp. isabellina*	UzRDB/CITES II	around 60%
North Persian leopard *Panthera pardus ssp. tulliana*	UzRDB/RL: VU	specification is required
Snow Leopard *Uncia uncia*	UzRDB/RL: EN/CITES I	around 55%
Turan Tiger *Panthera tigris ssp. virgata*	UzRDB/RL: EN	extinct subspecies round the world

Based on conducted analysis and definition of gaps in already existing PA-system, it was found out that the overall protected area of Tien Shan Brown Bear's habitat (Chatkal Mountains Biosphere Reserve, Zaamin State Mountain-wood Nature Reserve, Gissar State Mountain-wood Nature Reserve, Kitab geological Mountain-wood Nature Reserve, Ugam-Chatkal National Park and Zaamin Natural Park) constitutes around 30% of the total area populated by this species in the country. Tien Shan Brown Bear populates 7 out of 51 IBAs described and included into international network.

Tien Shan Brown Bear is widely, but sporadically, spread in mountainous regions of the West Tien Shan and Gissar-Alay. Modern condition of Bear's population in Uzbekistan doesn't cause any serious alarm. In the last years, even a tendency for population growth have been noticed. So, according to data provided counts, a Bear's number on the territory of Gissar State Mountain-wood Nature Reserve increased from 92 individuals in 1998 to 188 in 2007. On average, number of Bears in this PA is 157 individuals for 70.000 hectares.[36] According to expert estimation, the overall population of Tien Shan Brown Bear on the territory of the West Tien Shan is 250-300 individuals. On the whole, economic activities in natural habitats of the species (mountainous forest and high-mountain ecosystems, from 1500 to 3500 meters above sea level) do not have critical negative impact on its number. Bear partially avoids negative impacts of cattle grazing with help of vertical migration. Despite the ban on hunt on Bear in Uzbekistan, poaching continues to be the main limiting factor for the species. Transformation of habitats under the impact of anthropogenic factors significantly influences populations of Bear (table 3).

According to expert assessment, a coverage of Turkestan Lynx's country's range by PAs (Gissar State Mountain-wood Nature Reserve, Zaamin State Mountain-wood Nature Reserve, Chatkal Mountains Biosphere Reserve, Ugam-Chatkal National Park and Zaamin Natural Park) constitutes around 60%. Turkestan Lynx inhabits 3 IBAs, which, together with existing protected areas, supports significant part of population in the country.

Turkestan Lynx is a part mountain-forest association of large mammals, which occupy middle high zone of Gissar-Alay and the West Tien Shan. In Uzbekistan's part of the West Tien Shan Turkestan Lynx is quite rare species. The first data about records of Turkestan Lynx in the West Tien Shan was received in the beginning of 2000s. There is information that Turkestan Lynx was registered by camera traps in Bashkyzylsay and Maydantal sections of Chatkal Mountains Biosphere

Reserve and surround territory of "Shavazsay" hunting farm.[37] Low numbers of Turkestan Lynx in the West Tien Shan is given by unfavorable conditions of forage reserve in winter. Number of Tolai Hare (*Lepus tolai*) - one of the main feeding objects of Lynx - is historically very low (in contrast to Gissar-Alay). Moreover, Siberian Roe Deer (*Capreolus pygargus*) is also rare and sporadically spread in this region. Number of Chuckar (*Alectoris chukar*), which constitutes significant part of Lynx's ration, can notably diminish during severe winters due to its mass fowling by local peoples. The overall number of Turkestan Lynx in Gissar-Alay is higher. It is related to more favorable forage reserve. On the territory of Surkhan Mountain-wood Nature Reserve Lynxes number is estimated to 20-25 individuals.[20] Size of Lynxes' population in Gissar State Mountain-wood Nature Reserve was steadily increasing from 58 in 2000 to 120 in 2007. According to counts in 2011, number of Lynxes in Gissar State Mountain-wood Nature Reserve is on average 133 individuals.[21,38] The main limiting factors for the species are condition of forage reserve, forest cutting and poaching (table 3).

Currently, protected part of Snow Leopard's range in the boards of Chatkal Mountains Biosphere Reserve, Gissar and Zaamin State Mountain-wood Nature Reserves, Ugam-Chatkal National Park and Zaamin Natural Park forms 55% of specie's range in the whole country. Snow Leopard was registered on 5 IBA, which partially coincide with existing PAs. In Uzbekistan the species was always very few. Uzbekistan's part of the range is represented by borderland North-Western region of his habitat. Thanks to living in high mountains, an extent of anthropogenic threat for Snow Leopard is somewhat lower, than for other species of predators (table 3). Poaching and disturbance factor are the most tangible for Snow Leopard. However, it is necessary to take into account several indirect factors, which are also important for its existence. Firstly, it is population condition of the her principal feeding object - Siberian ibex. Modern condition of Snow Leopard is closely related to the quantity of its other feeding objects. Thus, a ban for cattle grazing in neighboring Kirgizstan of the upper Oygaing river (West Tien Shan), resulting in diminished disturbance factor, contributed to increase in the number of Long-tailed Marmot (*Marmota caudata*) - the important feeding object of Snow Leopard during training of young animals. Furthermore, number of Siberian Ibex in the basin of the Pskem river, serving for Snow Leopard as a food in spring and autumn-winter seasons, had increased during past 10 years. For Gissar-Alay Snow Leopards are registered mainly on the territory of Gissar State Mountain-wood Nature Reserve. According to data gathered by Aromov B.,[36] number of Snow Leopards in this PA is estimated to 24 individuals. The main limiting factors for Snow Leopard's population are: degradation of habitats, related to intensive cattle grazing in high mountain zone and diminishing of feeding base due to poaching. Siberian Ibex, a whole-year feeding object of Snow Leopard, is exposed to intensive poaching. Long-tailed Marmot and Menzbier's Marmot (*Marmota menzbieri*) are necessary part young Snow Leopards' ration. Both this species are also actively extracted by local shepherds.

According to expert's estimation, only 15% of Central Asian Otter's range is under territorial protection in the borders of Gissar State Mountain-wood Nature Reserve. Besides that, Otter is registered on 2 IBA, which are partially coincident with mountainous PAs. Nowadays, Otter has disappeared from many of its natural habitats. In our opinion, it doesn't populate the territory of West Tien Shan, since till today there was no reliable data regarding its finding in the region mentioned above.[39] Otter is rare in other parts of its country's range. One of the most numerous and viable otter populations is situated in the basin of the Sangardak river (southern slopes of Gissar ridge), which, together with other settlements of the species, is responsible for 90% of the whole population in the country. In line with our research in 2004, number of Central Asian Otter on distinct intervals of the Sangardak and Khondiza rivers was equal to 2-3 individuals for 1 km of the river.[40] Anthropogenic transformation on the part of habitats within range is significant. It happens particularly because of mountain rivers shoaling caused by plants cutting on the shores and nearby slopes. All this leads to decrease in the stock of river fish - the main feeding base of otter. Construction of waterside structure on the rivers is critical as well.

At the same time, widening of Otter's range is noted along Amu-Bukhara channel during the last decade. Otter is registered on the lakes of Dzheiran Ecocentre, where it already breeds, and on the Dengizkul lake, situated in 30 km from the Amu Darya river.[41] So, in distinct sites, development of irrigational network promotes expansion of Central Asian Otter on the plain territories.

Striped Hyena was always characterized by low number and only local ranges on the territory of Uzbekistan. Around 30% of the species range can be found inside the Surkhan State Mountain-wood Nature Reserve (table 2). On the Republic's territory, habitat of hyena is situated in economically active zone (300-1200 meters above sea level, riverside tugai forests and arid foothills). It inevitably leads to diminishing number of hyenas, loss of habitats and its extinction on the major part of range (upper part of Amu Darya floodplain, lower course of the Sherabad Darya river). For the last 5 years, there are several oral communications about single meets of hyena in the West Pamir-Alay, on the ridges of Kugitang and Babatag. Confirmation is required for this communications.

Arid foothills with pistachio and archa sparse growth of trees, rocks on 600-900 meters above sea level - these are all habitats of North Persian Leopard. All leopards' habitats are also situated in the zones of economic

activity. Modern condition of the species is unknown. In the beginning of 2000s, overall population of North Persian Leopard was evaluated at the level of 10 individuals.[23]

Corsac Fox and Steppe or Asiatic Polecat is typical species for arid foothills and adyry. Their ranges have significantly decreased under influence of anthropogenic factors and are almost entirely situated beyond the borders of PAs. Thus, less than 1% of their habitats are protected by existing system of PAs, and it is only on plain territories. Due to the fact that there is no PAs in adyry and foothills in Uzbekistan, the ranges of these species are to higher extent exposed to fragmentation and transformation under the influence of agricultural activities. As a positive tendency, it can be noted in the conservation plan, that these two species were registered on 8 (Corsac Fox) and 6 (Steppe Polecat) IBAs of Uzbekistan.

Corsac fox is not numerous and its distribution in Kyzylkum and Ustyurt is mosaic. In these regions corsac experiences pressures from industrial infrastructure and direct pursuit. The main factors, which determine the condition of Corsac Fox's population, are availability of typical habitats and abundance of small rodents - basic feeding objects for this animal. Taking into account, that the number of these predators reaches its minimum in the years of depressions in the number of rodents, existence of Corsac, on the background of its ranges fragmentation, is minimal.

For appropriate condition of Steppe Polecat population, there should be uncultivated steppe-like areas in foothills. Such uncultivated areas are almost inexistent on the country's territory nowadays. Distribution and population condition is historically related to the distribution of the main feeding object - Large Souslik (*Spermophilus fulvus*). Under condition of various agricultural and industrial activities, Sousliks survive only around the borders of fields, small long-fallow lots and waste areas of industrial zones. It is not possible for the Polecat to maintain fully its population on such fragmented areas. Moreover, there are high risks of pursuit from the people and domestic animals. According to our expert assessment, in Uzbekistan 50-60% of historical polecat's range is situated in the zone of agricultural and industrial activity. This fact determines it's extremely law number.[42]

Due to the fragmentation of flood plain forests (tugai), Jungle Cat is sporadically distributed. Along the Amu Darya river it practically survived only on the territories of PAs (table 2). It disappeared on the other sites of flood-lands, because of local plants cutting. As a result of diminishing habitats and spread of arid climate along Amu Darya's delta, Jungle Cat became vulnerable and decreasing species.

Sand Cat is the only representative of family Felidae in Uzbekistan, which exclusively inhabits sandy deserts and insular sands of clayey deserts. Sand Cat certainly inhabits 2 IBA. Nowadays, range of the species, which is strongly fragmented due to specific character of habitats, is practically uncovered by any of PAs. High mortality during stern winters, related to depressions in rodent's number, is typical for the species. Earlier, it was extracted in big quantities in Uzbekistan. Perhaps, these two factors contributed to decrease in Uzbekistan's population of Sand Cat. Only single finds were registered for the last two decades. Current status of the species requires additional research.

The range of the plain form of Marbled Polecat is broad enough and practically covers whole Kyzylkum desert and Ustyurt plateau. However, it is naturally fragmented, which is directly related to distribution of the main feeding object - Great Gerbil (*Rhombomys opimus*). Part of the species inhabiting foothills and semiarid landscapes can be considered as vulnerable. In these regions, intensive anthropogenic activity, loss of habitats and feeding base (particularly in Fergana valley) cause decrease in the population of Marbled Polecat. Significantly more anxious is the status of an isolated mountainous population of the species in the upper basin of Achangaran river, on the Angren plateau. It is quite big isolated habitat of big Marbled Polecat form, which is probably endemic, with its own subspecies rank. This settlement is historically related to the population of Menzbier's Marmot and Tien Shan Souslik (*Spermophilus relictus*). This alpine territory of the West Tien Shan is situated out of the PA-system. At the same time, Marbled Polecat inhabits 17 IBA and one of those is the IBA-site "Angren Plateau". Moreover, it is possible to find the Dhole there - species, for which the mountains of the North-Eastern Uzbekistan are the North-Western borders of its range.

The ranges of such rare predatory mammal species as Honey Badger and Turkmen Caracal are almost completely left outside existing PA-system. At the same time while Honey Badger was registered on 2 IBAs and Turkmen Caracal - on 3 IBAs. There were several reports about finding caracal and its traces in several regions of the country during last few years. A museum of Kyzylkum Tugai-Desert State Nature Reserve possesses a staffed animal of Turkmen caracal, found near the well in 30-35 km from Nature Reserve. Caracal was noted on the territory of Kyzylkum Tugai-Desert State Nature Reserve in 2000 and 2009.[17] Traces of Caracal were found in central and southern parts of Karakalpakian Ustyurt.[43] One Caracal was recorded on camera trap on the North-Western coast of Sarakamysh Lake (Southern Ustyurt) in 2013.[37] The main limitative factors for caracal's population in oasis zone are cultivation of lands and diminishing feeding base, while in deserts it is a pursuit from the people.

Over the whole period of zoological observations in Uzbekistan, only single meetings with Honey Badger were noted.[43,44,45] Humeral bone of Honey Badger was found in the North-West of Barsa-Kelmes depression.[46] The species is not numerous, secretive and inhabits hard-to-reach territories. That is why anthropogenic factors don't influence it very much. One of finding places, lake Sarakamysh, is a part of IBA network.

Status of the Pallas's Cat is unclear. It is a little-studied, rare species, which inhabits arid low mountains and foothills - territories which are actively used for economic purposes. Currently, it is necessary, above all, to confirm existence of Pallas's Cat on the country's territory.

As researches have shown, predatory mammals are the most vulnerable components of fauna in case of habitats changes. This vulnerability is determined by the fact that predatory mammals require quite vast and diverse territories. Also, their successful existence depends on stable condition of their feeding objects' population. In this connection, the list of anthropogenic threats for big predatory mammals is much longer, than for other species. That is why their more complicated protection requires complex approaches.

Thus, it can be concluded, that the main threats for predatory mammal fauna are decrease, fragmentation and significant transformation of natural habitats. Anthropogenic factors are dominating. They currently influence practically all natural ecosystems.

Table: 3 An extent of anthropogenic influence on rare and endangered species of predatory mammals in Uzbekistan

Species	Types of threats and extent of their influence						
	Land use	Cattle grazing	Forest cutting	Poaching	Recreation and visiting	Diminishing feeding base	Overall level of threat
Corsac Fox	3	3	0	3	3	1	13
Tien Shan Brown Bear	0	3	3	3	2	0	11
Steppe or Asiatic Polecat	3	3	0	3	1	3	13
Marbled Polecat	3	2	0	1	0	3	9
Honey Badger	0	0	0	1	1	0	2
Central Asian Otter	2	0	0	3	2	2	9
Striped Hyena	3	2	2	2	2	3	14
Jungle Cat	3	2	3	2	0	1	11
Sand Cat	3	2	0	3	0	3	11
Pallas's Cat	3	3	0	3	2	0	11
Turkmen Caracal	3	2	0	3	1	2	11
Turkestan Lynx	0	2	3	3	1	3	12
North Persian Leopard	2	2	1	3	3	3	14
Snow Leopard	0	1	0	3	2	2	9

Note: *extent of influence: 0 – no influence; 1 –weak influence; 2 – medium influence; 3 – strong influence.*

4. CONCLUSION

Analysis of anthropogenic influence on the fauna of rare and endangered predatory mammals has shown that, for the majority of them, an extent of anthropogenic impact is significantly above the average.[11-13] For Striped Hyena and North Persian Leopard this impact reaches critical levels (table 3). As a result of fragmentation and degradation of natural habitats, Turan Tiger and Asian Cheetah had disappeared from the country's territory. To higher or lower extent, the range of 71.4% of predatory mammals has fallen into the zones of intensive land use. Analysis of current condition of predatory mammal's fauna has demonstrated that the species inhabiting foothills and low mountains (Steppe Polecat, Corsac Fox, Striped Hyena, North Persian Leopard) are the most affected by anthropogenic impact. Because of involvement of new lands in agriculture, these species are crowded out to the borders of their habitats, their number decreases dramatically. Agriculture in foothills and low mountains has led to practically complete transformation of natural ecosystems, transformed them into agrocenosis. The species of arid foothills found themselves on the edge of extinction. So, agriculture is the strongest negative anthropogenic factor in low mountains.

Cattle breeding has the most powerful influence on natural ecosystems and, consequently, on fauna. 78.6% of predatory mammal species is suffering from cattle grazing.

Poaching is another factor contributing to decrease in number of predatory mammals, despite the official ban on hunt of animals included into the national Red Data Book. It affects 85.7% of species. Predators, which inhabit mountain forests and flood-plain forests along mountain rivers (Tien Shan Brown Bear, Turkestan Lynx, Jungle Cat, to lower extent - Striped Hyena), noticeably suffer from forest cutting. It should be mentioned, that recreation doesn't have substantial negative impact on predatory mammals and sometimes even improves situation. Summer camps for children,

recreational zones, sanatoriums and boarding houses are situated in mountain forest zone of practically each big gorge. Territory of these zones is excluded from agricultural activities, guarded quite well and is not influenced by the most powerful anthropogenic factor in mountains - cattle grazing. Here, artificial forest plantings prevail, but, at the same time, indigenous trees and shrub vegetation, elements of small-leaved and walnut forests are pretty often as well. Peripheral parts of these territories are desolated and have naturally wild appearance. Recreation areas, which occupy quite big territories, are visited only in summer and stay completely manless during other seasons. In this sense, recreational zones represent fragments of small-leaved, walnut forests and mid-mountain. Disturbance factor here is insignificant during the most part of the year and, thanks to this, recreational zones serve as sanctuary for the inhabitants of trees and shrub mountain zones.

Widening of PAs in plain and mountainous parts of Uzbekistan is the most promising direction for improvement of territorial protection of rare predatory mammals. Taking into account suggestions regarding the creation of new PAs,[47] which is currently included into the project "Protected areas network development program of Republic of Uzbekistan for 2014-2024", the percentage of rare predatory mammal species' ranges covered by PAs will increase significantly. In case of Tien Shan Brown Bear - for 60%, Snow Leopard - for 80%, Turkestan Lynx - up to 75%, Central Asian Otter - up to 75%, Honey Badger - up to 55%.

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