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Title	Asiatic wild cat (Felis silvestris ornata) is no more a 'Least Concern' species in Xinjiang, China
Author(s)	Abdukadir, Ablimit; Khan, Babar; Masuda, Ryuichi et al.
Citation	Pakistan Journal of Wildlife, 1(2), 57-63
Issue Date	2010
Doc URL	https://hdl.handle.net/2115/49688
Type	journal article
File Information	Issue 2 Article 4[1].pdf

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Asiatic wild cat (*Felis silvestris ornata*) is no more a 'Least Concern' species in Xinjiang, China

Ablimit Abdukadir[1], Babar Khan[1], Ryuichi Masuda[2] and Satoshi Ohdachi[3]

[1]Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, China
[2]Faculty of Molecular Phylogenetics, Hokkaido University, Sapporo 060, Japan
[3]Institute of Low Temperature Science, Hokkaido University, Sapporo 060, Japan

ABSTRACT: Asiatic wild cat, *Felis silvestris ornata,* once regarded as least concern is declining rapidly in its natural habitat in the Xinjiang desert region of China mainly because of excessive hunting for pelt trade followed by shrinkage of its habitat due to cultivation, oil and gas exploration and excessive use of pesticides. Prior to 1950, it was the most abundant felid in Xingjian dwelling along all major river basin systems and Taklimakan desert but later it got confined to three regions of southern Xinjiang only viz., Bayingolin Mongol Autonomous Oblast, Aksu and Hotan. Despite several expeditions, correct distribution and status of this illusive cat was unknown. This review article is an update on current status, distribution, ecological behavior, conservation and habitat characteristics of Asiatic wild cat in Xinjiang arid region of China. Specimen collected from various parts of Xinjiang exhibit varied phenotypic characters. It has protruding morphological features like many other desert animals. It has dense and soft hairs on the forelimb pads like other felids but rarely behaves nocturnally, adjusting its movement with seasonal variation and food availability. Tarim hare, *Lepus yarkandensis,* is the primary source of food followed by gerbil, jerboa, birds, fish and lizards. Literature and the statistics both reveal that it's remnant population is declining fast limiting it to only a few fragmented habitats in the lower reaches of Hotan, Yarkand, Tarim, Qarqan, Niya and Keriya river basins, rendering it no more a least concern species at least in China. Therefore, adequate policy decisions and concrete conservation actions are required to halt and eventually reverse the declining population of the cat and its deteriorating habitat in Xinjiang.

Keywords: Asiatic wild cat, conservation, ecology, phenotypic characters, spotted steppe cat, Tarim river,

INTRODUCTION

Twenty three species of small cats have been reported to exist worldwide (Jackson *et al*., 1994; Yiqing *et al*., 1990; Yaoting *et al*., 1987), quite often regarded as the geographic-relic-species, being comparatively primitive types and wild ancestors of domestic cats (Gao *et al*., 1987; *Xia et al*., 1988). Grizmek (1975) and Jackson *et al*. (1994) divided wild cats into three different forms; European wild cat (*Felis silvestris silvestris*), African wild cat (*Felis silvestris lybica*) and Asiatic Wild cat (*Felis silvestris ornata*) which seems to be more a division of subspecies. Very clearly, the European wild cat is distributed throughout Europe except for the northern regions; the African wild cat is distributed in all African countries and south-western Asia; the Asiatic wild cat (local name in China is wild cat, Rustic cat, Local cat, Spotted forest cat, Spotted steppe cat, European Wild cat, hereafter abbreviated as "wild cat") is distributed in central and western Asia (Allen 1936; Ellerman *et al*., 1951; Walker 1984; Gao *et al*., 1987; Jackson *et al*., 1984). In China, the wild cat originally was also distributed in the Xinjiang Uygur Autonomous Region, with a rare presence in Gansu and Ninxia provinces northward. In the Xinjiang Uygur Autonomous Region. This cat is mostly found in the desert areas of Tarim River Basin, southern part of Xinjiang with occasional sightings in Turpan Basin (Gao *et al*., 1987; Shou *et al*., 1962; Qian *et al*., 1965; Sheng *et al*., 1985; Sheng, 1992; Liang, 1986; Xia *et al*., 1988; Gu and Gao, 1991; Ablimit *et al*., 1994, 1998). The presence of this wild cat in China has also been reported by Qian *et al*., (1965), Yaoting *et al*., (1987) and Yonglie (1983).

During early 1960s, the Chinese Academy of Sciences supported a field expedition to investigate wildlife of the southern Xinjiang and Yarkan (Sache) county, Kashigar (Kashi) of south-western fringe and Lop-nor lake region, Qarkilik (Ruoqiang) county, Qarqan (Qiemo) county of the south-eastern fringe of Tarim Basin, which are the major areas inhabited by the wild cat. A special scientific project continued recording observations on the wild cat till the early 1990s. The IUCN/SSC Cat Specialist Group meeting held in Beijing (1992) funded the project titled "Status Survey and Conservation of Lynx and other

*Corresponding author: babarwwf@gmail.com
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small cats in Xinjiang, China", designed and listed as the 80th project of IUCN/SSC "Wild Cat Conservation Action Plan". From 1994 - 1996, a group of experts from the Xinjiang Institute of Ecology and Geography (XIEG) and Chinese Academy of Sciences (CAS) conducted a study on five Felid species in the Xinjiang, with financial support from the Chinese National Natural Sciences Foundation and systematic field data were obtained on large scale distribution, ecology, habitat conditions, behavior, population estimation and protection status of the wild cat. In 1996 XIEG CAS and the Hokkaido University of Japan joined hands to study the eco-biology and phylogenetics of wild cats in different areas of Xinjiang. Meanwhile, wild cat observational work in about 500 km^2 area of its typical habitat in the lower reaches of Qarqan River Basin was also conducted (Ablimit et al., 1995, 1996).

Despite tremendous multi-year field research conducted by various researchers, information of latest status and correct distribution of illusive cat in Xinjiang until the recent past was still a question for many. This article is a comprehensive review of the previous work with the latest overview on current status, distribution and eco-behavioral characteristics of the wild cat. The paper also elaborates on the cat's pelt trade as an emerging conservation concern in Xinjiang arid region–the limited remaining habitat of wild cat in China.

METHODOLOGY

The review is mainly based on the findings of the CAS, IUCN/SSC and CNNSF led research missions fielded to explore biodiversity of Xinjiang from time to time coupled with the latest studies by the CAS - HUJ researchers' findings on eco-biology and phylogenetics of wild cats in Xinjiang. (Gao, 1987; Shou *et al*., 1962; Qian *et al*., 1965; Sheng *et al*., 1985; Sheng, 1992; Liang, 1986; Xia *et al*., 1988; Gu and Gao, 1991; Ablimit *et al*., 1994, 1998). Field data on pelt trade were analyzed by using Minitab version 13 (Hampton, 1994) descriptive statistics whereas simple averages, percentages, graphs and tables were made using MS Excel 2007 (McCullough & Heiser, 2008).

RESULTS AND DISCUSSIONS

Status

Studies on co-existence of wild cat with its closer relative, the domestic cat in the extremely arid environment (inland arid zone), its evolution, original period and degree, and position and affects on fragile ecosystem and biological diversity, XIEG CAS and the Hokkaido University of Japan conducted periodic field investigations during August-September 1996, October-November 1998 and, for short intervals from 1999 to 2006. Our study endorses the previous findings to confirm the distribution of the wild cat in Tarim and Turpan basins of Xinjiang (Fig.1). The subspecies is Least Concern with declining population trend in its entire range. In China, it is a Class II animal with CR A1a status in Chinese Red List.

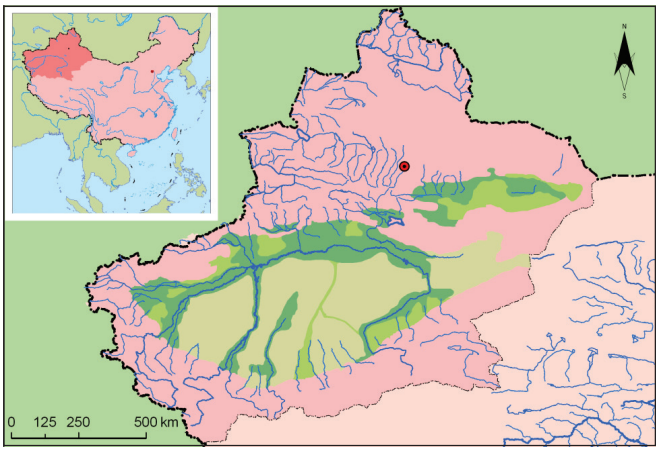

Fig. 1: Map of study area showing distribution of wild cat, High ■ low ■

Morphology

In general body appearance, the wild cat is very similar to domestic cat, apart from being comparatively stout and stronger; having no prominent distinguishing features, it is hard to differentiate male from the female; mean body weight for adult is about 3.6 – 4.1 kg; mean body length 68.3 – 70.2 cm; and tail length is 26.0 – 36.0 cm (Fig. 2 a & b). Five samples collected from Tarim and Turpan basins exhibited different appearances. Individuals from various parts of Assai area had light brown to deep grey hairs on their body. Hairs on dorsal visible parts were deep grey (Turpan), deep brown (Aksu and Awat) and light brown (female from Hotan). The hair color of upper to lower flanks was light grey sandy to white, mostly with deep brown or light black densely covered irregular spots and stripes; tuff bunches of the ears were deep brown whereas frown ears were sharp black to brown; tail was sharp black and brushy and abdominal parts were the same; white colored, like the lower front parts of the body, including stomach and bowls (Fig. 2a,b,c). Skull was shorter and quick quadrangled, which could be associated with the magnitude of hear-puff bones and intensively convex eye sockets. In addition to the upper split teeth it had relatively larger interior good sharp teeth (Gao, 1987). Like other desert animals, wild cat had protruding morphological features like protective coloration (sand color) with small brown and dark points and black lined spots (Fig. 2d). The forelimb pads were covered with dense and soft hair that help avoid burning on sand in hot summers enhancing their adaptability to varying thermo geographical climatic conditions during day and night.

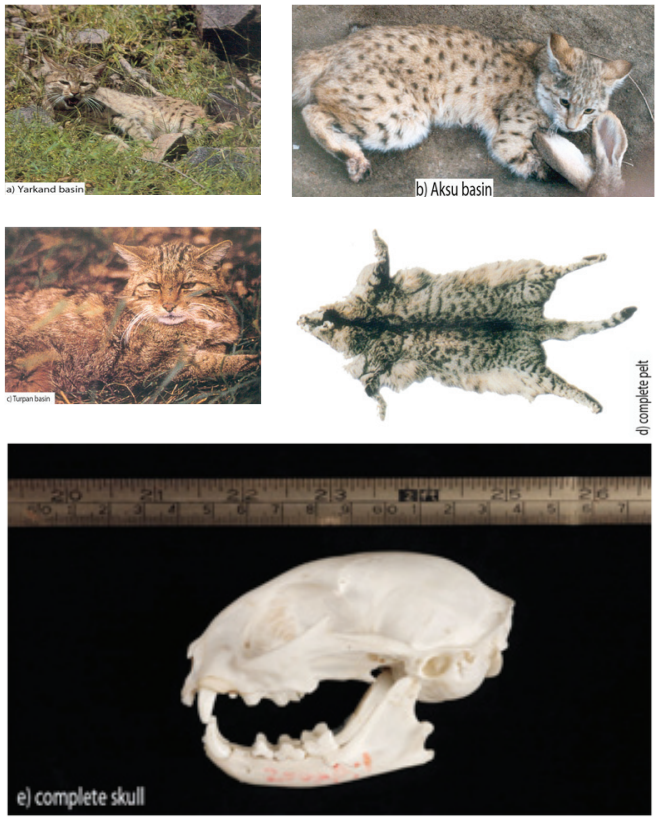

Fig. 2: Specimens collected from;
a) Yarkand basin b) Aksu basin
c) Turpan basin d) Complete pelt
e) Complete skull (photos: Ablimit)

Habitat and distribution

As large scale distribution area of wild cat, the Tarim Basin is situated amidst the southern slope of Tian Shan and the northern slope of Kunlun-Altun mountains, spreading over 500,000 km^2; 1400 km long (EW) and 500 km wide (NS). The Taklimakan desert (330,000 km^2); biggest of its kind in China and second largest shifting sand desert of the world, at an average altitude of 900-1200 m. ASL, constitutes the central part of the basin, wherein wild cat's distribution is extended over 210,000 km^2. The geo-morphological relief of the wild cat's distribution range is the highest in the north-western part and the lowest in the northern part including Turpan Basin and surrounding Lop-nor lake area. Tarim Basin has an arid, sand-stormy climate with high contrasting temperatures between day and night. Mean annual rainfall ranges between 10 - 60 mm per annum, quantity of light and heat of sunshine is adequate, mean annual temperature remains around 10^{0}C, non-frost period extends up to 200 days, during summer the ground temperature may reach up to 50 - 60^{0}C.

Another small but typical topographic distribution area of wild cat is Turpan Basin, though situated in between eastern Tian Shan, Kumtag and Qoltag mountains; it is easily distinguishable from Tarim basin. The Turpan Basin encompasses a total area of 50,000 km^2, wherein, Wild cat distribution range is spread over 20,000 km^2. Ranging from 154 m below sea level to 500m a.s.l., Turpan basin reveals typical continental inland warm-temperate desert climate with mean highest temperature ascending up to 47^{0}C, depicting no variations at night time. General features of Turpan basin include an onset of early spring, hotter and extended summer and shorter autumn days. Mean annual temperature ranges between 12.1 - 14.9^{0}C, reaching up to 44^{0}C during peak summer. Annual rainfall is 20 – 45mm; non-frost period extends from 190-230 days (Xinjiang Annual Report, 2007 & 2008; map of Xinjiang, 1995; Ablimit *et al*., 1998).

Tarim River system is the famous feature of Tarim basin in Central-Asian inlands, comprising numerous rivers and lakes. Banks and off-shore land look like oasis (green belt) and cultivated desert landscape (around Taklimakan desert). Both the oasis and old wetlands along river beds have halophytic plant communities with dominating species like *Phragmites communis*, *Tamarix sp., Populus diversifolia*, *Alhagi sp*., *Nitraria schoberi*, *Glycyrrhiza sp*. *Trachomitum lancifolium* etc. These are variedly distributed in different belts of the Tarim Basin, that can be divided into farmland-oasis-desert, grassland-semi-desert and desert with a flood pan. Except cultivated areas, whole of the landscape offers ideal habitat conditions to wild cat. Areas from upper to middle reaches of almost all rivers do not offer favorable conditions for distribution of wild cat, mainly because of having different landscapes with absence of favorable features like hard soil, cobbles, stone desert, along with the presence of human settlements and associated activities such as cultivation etc.

The Yarkan hare or Tarim hare, *Lepus yarkandensis* / *tarimensis* live sympatrically with wild cat. Moreover, the area outside Tarim Basin, above 2000m ASL, including cobble desert, stone desert, egg-stone desert and mountain-grasslands or slopes, in the lower reaches fall into the distribution range of Chinese Mountain cat (Desert cat) *Felis bieti* whereas, the high hilly areas are inhibited by Pallas's cat, *Felis manul.*

Turpan Basin distribution area exhibiting typical sand desert ecology, with Saxaoul bushes and Tamarix species offer ideal habitat to wild cat. Hence in Xinjiang, three small cats of Felidae (*Felis silvestris ornata, Felis manul* and *Felis bieti*) often very closely but clearly replace each other (Ablimit *et al*., 1996, 1998).

Ecology and behavior

Unlike other species of the Felidae, wild cat very rarely behaves nocturnally as its feeding time and food range mostly depends upon seasonal variations and richness of food resources. In summer, its feeding activities

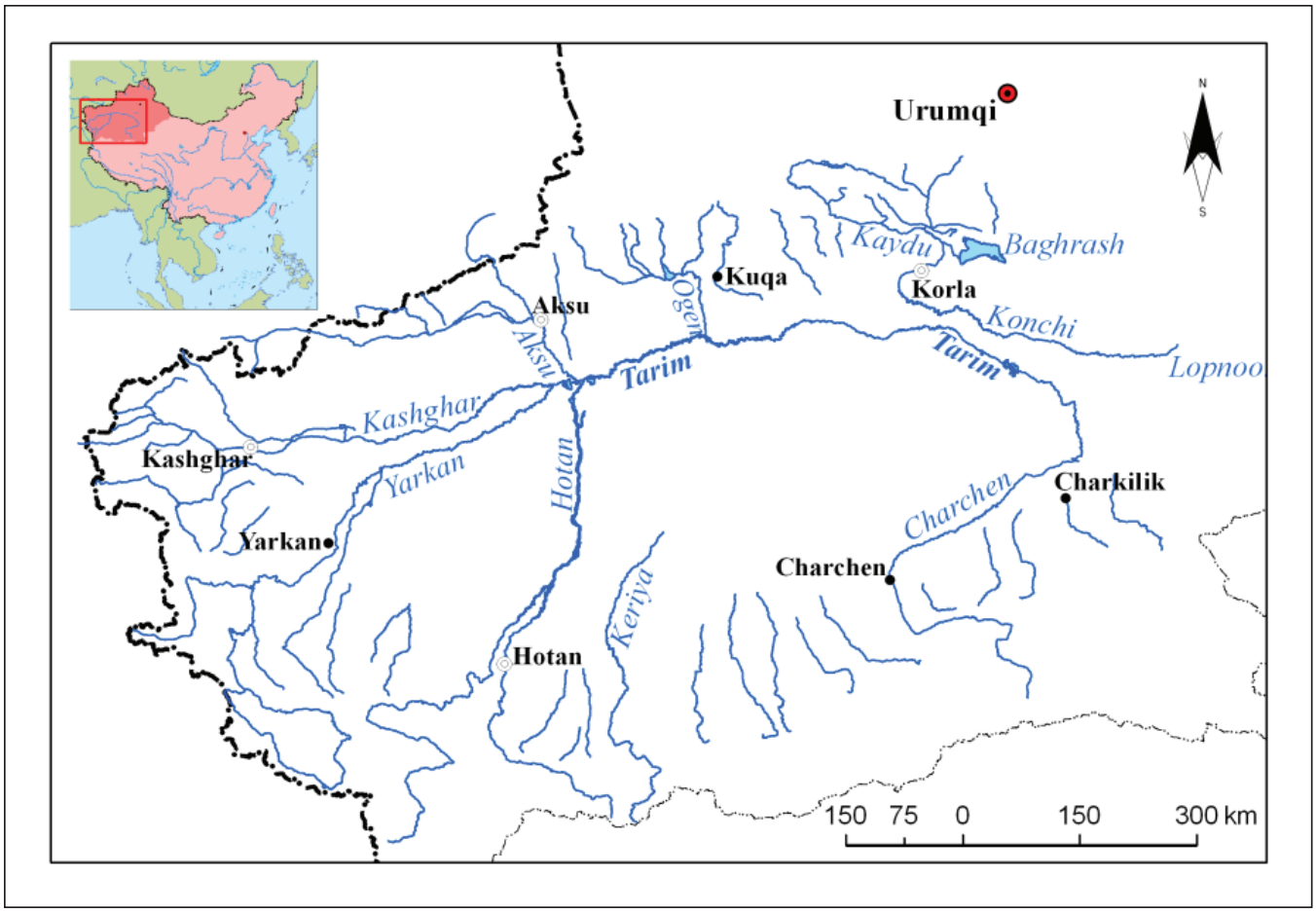

Fig. 3: Map of Tarim River System, Xinjiang, China

coincide with that of Tarim hare, which constitutes preferred diet of the cat. Depending upon the prevailing geographical and environment conditions of Tarim basin and its food objects in lieu of Tarim hare's daily-life activities, frequencies and appropriate habits, wild cat adjusts its feeding activity normally from dawn to dusk. Otherwise, adversarial competition amongst its natural enemies *i.e.,* Red fox, *Vulpes vulpes*, Domestic cat, *Felis catus* and Common eagle, *Accipter gentiles* may increase, particularly during mid September to mid November, resulting into human activities (Ablimit *et al*., 1998). Wild cat often does not move outside in day time during winter. Though snow is not stored up in the cat's distribution area but it takes rest in cavity nests and hides itself of harsh winter and cold days (Gao, 1987; Shou 1962; Abilimit *et al*., 1998).

As reported by local people for almost four years *viz.,* 1994, 1995, 1996 and 2008, Trim hare's population has declined for unknown reasons, leaving less food for the cat. Resultantly, the cat has been found loitering around residential areas, attacking poultry birds and small pet animals, and even searching waste-food. Numerous incidents of wild cat attacking old poultry have been reported from residential areas of Tatirang of Qarqan (Qiemo) and Washshari of Qarkilik (Ruoqiang) county during the study period (Ablimit *et al*., 1996, 1998, 2006).

Wild cat often concentrates around both new and old oasis and lower reaches of Branch Rivers, of two-shore sides, to conveniently fulfill its food and shelter requirements, irrespective of whether Tarim River is flooded or dry. Sometimes, it dwells on high and large *Populus* trees, especially on "half-living and half-dead" trees or hollow tree trunks. It also prefers *Tamarix sp*. bushes (for wrapping itself) and sand dunes along river beds. Saline soil with hard earth bed and vegetation less desert environs comprising of halophytic landscapes are not a preferred habitat of the wild cat. Ideally, Wild cat inhabits abandoned residential or coquettish areas like "Yardang" (meaning "an ancient wind or rain eroded landscape" in Uyghur language). In Turpan distribution area, wild cat inhabits older residential sites such as the dense Saxaoul bushes and earthen holes of the *Karaiz* wells. However, whatsoever is the distribution area, wild cat dwells in abandoned plough (uncultivated land), sandy soils of the wastelands and cultivated lands in close proximity as they offer abundant prey and plenty of food supplies. For wild cats, opportunity

to get food depends not only on their hunting habits, capability and shelter condition, but also on their access to prey and feed density in terms of food abundance, richness, distribution and frequency of the intensive activity (Xia and Gao, 1998; Ablimit *et al*., 1988; 2006). During 1994-1996 & 2006 (winter) and 2008 (summer), we observed wild cat habitat conditions, selection and use, in the lower reaches of Qarqan and Yarkan River valleys (in a total area of about 1000 km^2), with a special focus on its prominent habits; its feed hunting activities, scent marks and target prey objects. Furthermore, we collected its droppings, night-soil, end-feed remains; bite remains, and remains of stomach and intestines from carcasses for analysis. Besides several attempts of lure for catching alive, we visited farmers, herdsmen and local hunters to look for the possibility of collecting any rodents. Our particular emphasis during this study was to scrutinize the cat's eating habits by inspecting the remains of devoured prey; rodents and birds in its droppings.

Diet composition

Results of the feed item analysis (Fig. 4) revealed that the cat's primary prey was the Tarim hare (*Lepus yarkandensis/tarimensis)* followed by Gerbil (*Meriones meridianus),* Jerboa (*Euchoretes naso)*, poultry and small birds, fish Jerboas (*Cardiocranius sp*.), Agamid lizards and sand lizard (*Phrymocephalus sp*.) (Ablimit *et al*., 1996, 1998; Gao, 1987). Densely haired foot pads in wild cat help it to avoid burning on sand in hot summers, and reduce the noise while approaching its prey as well. Track of the wild cat being irregular and shallow can easily be distinguished from the deep and regular tracks of hares on sand. In summer, Wild cat activity continues for about 12 hours, from 6-7 o'clock in the evening till 8-9 o'clock next day morning, depending on the prevailing weather conditions. In wind storm and cool weather conditions, the cat, sometimes, changes its activity. Since Tarim hare reproduces twice in summer, so during the mating season, the cat mainly catches Gerbils, Jerboas and some sand lizards (investigated and analyzed results on density is 58.8%, 35.4% and 5.8%, respectively) to feed on, while during the other periods from February-May and September-November, it usually feeds on Tarim hare. Breeding starts in November - December and continues till February and the estrous period continues till a successful fertilization. Wild cat reproduces once in a year, usually from April - September (May is the peak time), depending upon the prevailing temperature; pregnancy period lasts for 60 days, produces 2-3 kitten, the first kitten appears in black (Ablimit *et. al*., 1987, Gao, 1987).

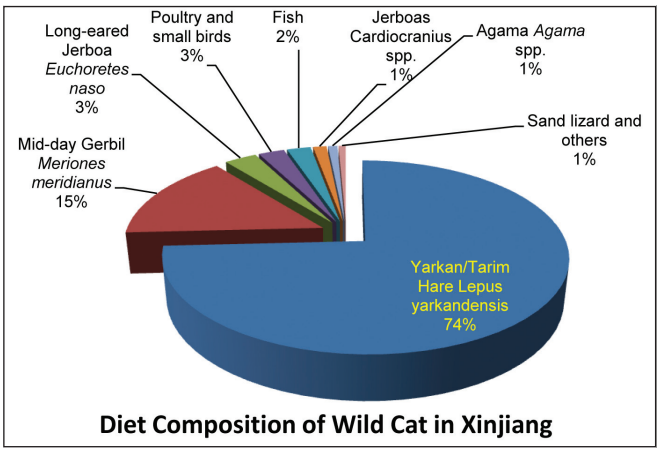

Fig. 4: Components of different prey objects of Wild Cat in Xinjiang, Tarim Basin

Pelt trade dynamics

Before 1950s, wild cat was the most abundant member of Felidae, common and widely occurring in the southern Xinjiang primeval densely in naturally occurring bushes of the desert and oasis and along all reaches of the key river systems (Qian *et al*., 1965; Gao 1987; Ablimit *et al*., 1998). As per our investigations, based upon an extensive empirical analysis; three regions of the southern Xinjiang viz., Bayingolin Mongol Autonomous Oblast, Aksu and Hotan constituting 16 counties, had been important Wild cat distribution areas for about 40 years, 1955 – 1994. wild cat was traditionally hunted for skin both by foreign and local hunters/traders. About 22,353 pelts out of the total 120,000 were collected by foreign traders from natives in the local and national markets (Table 1).

Table 1: Pelt trade dynamics during the last 40 years in three prefectures of southern Xinjiang, China

Year	Bayingolin	Aksu	Hotan	Mean	Median	Maximum	Minimum
1955 - 1959	35	0	5678	1904.333	35	5678	0
1960 - 1964	7	0	3253	1086.667	7	3253	0
1965 - 1969	2432	0	1769	1400.333	1769	2432	0
1970 - 1974	1638	0	1049	895.6667	1049	1638	0
1975 - 1979	1672	0	753	808.3333	753	1672	0
1980 - 1984	1687	0	389	692	389	1687	0
1985 - 1989	1107	210	240	519	240	1107	210
1990 - 1994	45	206	180	143.6667	180	206	45

Excessive hunting of the cat for pelt trade and habitat degradation by anthropogenic interferences coupled with the so called political movements such as “Big leap Forward”, “Weeding out four harmful animals” (meant to eliminate crows, sparrows, rats and flies), “Giving rise to cultivate land and open up wastelands”, “Intensive use of chemicals for controlling harmful insects and rats to protect crops” etc. severely affected the cat population in its original distribution range. Its ecological habitat was severely destroyed by human activities, disrupting its food chains, primarily due to unplanned hunting, which brought the species to abnormal circles. From late 1960s to early 1990s, wild cat fur supply in the local markets also decreased (Fig. 5) following a sharp decline in its population (Ablimit *et al*., 1998). Solitary populations of the Wild cat from certain areas of Tarim Basin and Lop-nor also vanished following the Xinjiang tiger *Panthera tigris lewcoqi* during late 1950s (Gao 1987; Qian *et al*., 1965; Hedin, 1935; Gu and Gao 1986; Ablimit *et al*., 1986).

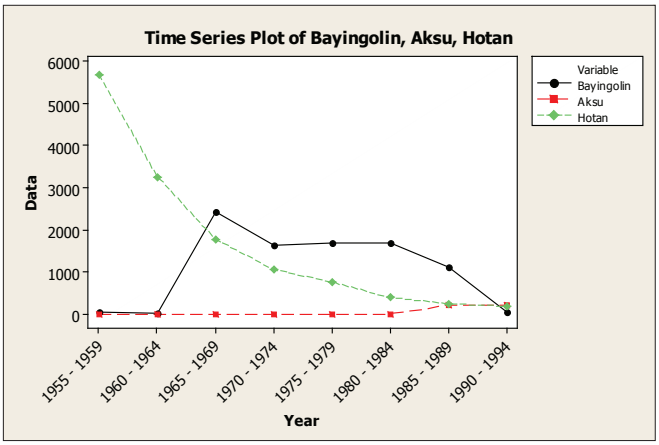

Fig. 5: Trend of wild cat pelt collection and trade in southern Xinjiang, China

Sharp decline in wild cat population can be attributed to excessive hunting for its pelt trade followed by habitat encroachment due to expansion of cultivated lands and natural resources exploitation at a gargantuan magnitude to meet the ever increasing food and never ending needs of the exploding human population in its distribution area. Although illicit hunting of cat has apparently declined but its pelts can still be seen in the old Kashigar markets.

It is impossible to relocate the wild cat tracks in out-skirts of some towns and counties, villages and at least 30-50 km off the cultivated lands, oasis or desert outer reaches, which were, once, the original distribution areas and known to have fairly good populations of the cat. Pelt trade has been at peak from Hotan in late fifties (5678) till early sixties (3253) but has gradually declined (180) by mid nineties. Bayingolin had the second largest market of cat pelts (1906) till late seventies (808) while Aksu pelts were traded increasingly from Aksu (mean 52 SD 96.29) during nineties (Table 2).

CONCLUSION

At present, only a few fragmented distribution areas, like flood plains, populous belts and green corridors in the lower reaches of Hotan, Yarkan, Tarim, Niya and Keriya, and Qarqan Rivers still serve as safe habitats for the wild cat within its original distribution range. Otherwise, several prior habitats; especially nearby new and old urban development zones, have become fragile and insecure places for the cat and its prey, the Tarim hare. Remaining small and fragmented population of the wild cat is fast declining in China probably due to acute shortage and scarcity of food, particularly during autumn and winter. The cat having no other options for survival, often intrudes into the rural residential areas and adjacent farmlands for food like domestic birds and small ruminants and so is killed ruthlessly. Although it has been listed as “Protected Wildlife of National Importance in China” under category II, guaranteeing its protection and seemingly decreased fur trade in the local markets of Hotan, Kashqar and Bayingolin compared to that of wolves, foxes, marmots, and rabbits. The threat still continues in most of areas of its dense distribution range. Rising human habitation near the new economically high-tide developing regions of Xinjiang perhaps due to extensive oil and natural gas exploration has caused the degradation of the last patches of its natural habitat. In order to impede and eventually reverse the deterioration of its natural habitat, formulation of appropriate policy actions is suggested that could foster effective protection of this elusive species in its original distribution range in the Xinjiang arid region of China.

Table 2: Descriptive statistics of the pelt trade in Xinjiang, China

	N	Minimum	Maximum	Mean	Std. Deviation
Bayingolin	8	7.00	2432.00	1077.8750	939.10694
Aksu	8	.00	210.00	52.0000	96.29122
Hotan	8	180.00	5678.00	1663.8750	1916.54246
Valid N (listwise)	8				

ACKNOWLEDGEMENTS

This work is an ultimate result of the financial aid provided by the State Education, Science, Culture and Sport Department of Japan and the research collaboration between Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences. The Department of Foreign Affairs of Xinjiang, Xinjiang Institute of Ecology & Geography CAS, Forest Bureau of Xinjiang and officials of the local Xinjiang government are thankfully acknowledged for their support, cooperation and hospitality. Special thanks are to the Natural Science Foundation of China for providing financial support *via CNSF Grant No. 31071947*, for this study. We also like to thank Prof. N. Ohtaishi of Hokkaido University of Japan; Urs Breitenmoser of IUCN, Prof. Peter Vogel of the Universite de Lausanne, Suisse, Tom Mc Carthey and Rana T. Bayrakci of SLN/SLT for their participation in the field expeditions, information sharing, support and encouragement throughout the study.

REFERENCES

Ablimit, A., Defu, H., Bari, R. and Mammat, A. 1993. Distribution and status of small and middle Wild Cats (Felidae inland), Xinjiang. *Acta Zoologica Arid Inland*. **1**:48-50.

Ablimit, A. and Bekenov, A. B. 1993. General situation of Wild Cats (Felidae) in Kazakhstan. *Acta Zoologica Arid Inland*. **1**:46-47.

Ablimit, A. and Halik, M. 1988. Some dynamic materials of several cats on the north slope of Kunlun Mountain during the past 30 years. *Acta Theriologica Sinica*. **2**:155-156.

Ablimit, A., Defu, H., Mammat, A. and Bari R. 1996. A systematic investigation and study on Asiatic Wild Cat's (*Felis silvestris ornata*) eco-biological features and abundance in Tarim Basin of Xinjiang, China. *Arid Zone Research*, **4**:11-20.

Ablimit, A., Defu, H., Mammat, A., Bari, R. and Osman, T. 1998. Distribution, abundance and conservation strategies for Eurasian Lynx (*Lynx lynx*) in Xinjiang, China. *Arid Zone Research*. **3**:38-40.

Ablimit, A. and Mammat, A. 1995. The protected wildlife of national importance in the Xinjiang. *Arid Zone Research*. **3**:7-11

Allen, G. M. 1938. The mammals of China and Mongolia. National History of Central Asia 11(1):312-489.

Ellerman, J. R. and Morrison-Scott, R. C. S. 1951. Checklist of Palearctic and Indian Mammals. British National History Museum, London.

Gao, Y. 1987. FAUNA SINICA: Mammalia, Vol 8: Carnivora. China Scientific Press.

Gu, J. and Gao, X. 1991. Animal fauna and Zoo-geography of Eastern Kunlun-Altun Mountains. "Studies on the Animals in Xinjiang". China Scientific Press, pp 30-43.

Hampton, R. E. 1994. Introductory Biological Statistics. Waveland press Inc., Long Grove, IL. pp. 233.

Hedin, S. A.1898. Through Asia. London, 1:1-63.

Nowell, C and Jackson, P. 1994. Wild Cats - Status survey and conservation action plan. Switzerland. pp. 12-16.

Jutzeler, E. Xie, Y. and Vogt, K. 2010. Asian wildcat (*Felis silvestris ornata*). *Cat News* Special Issue 5 autumn 2010. pp 42-43.

Liang, C (editor). 1986. Wildlife of Xinjiang. China forestry publishing house. Beijing (in Chinese).

Lin, Y. 1985. The mammals from Mt. Tomor Feng in Tianshan. Xinjiang. People's Publishing House, Beijing, pp 1-19.

Qian, Y., Zhang, J. et al. 1965. Birds and mammals of Southern Xinjiang. China Scientific Press. pp 169-172.

Shou, Z. H. 1962. Economical animal fauna of China (Mammals). China scientific press.

Yiqing, M. and Yong, M. 1990. On the protection status of cats (Felidae). *Wildl. of China*. 4:7-9.