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# CAT news

**Cats in China**



DEPARTMENT OF WILDLIFE CONSERVATION  
STATE FORESTRY ADMINISTRATION, P.R. CHINA

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**CAT SPECIALIST GROUP**



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Photo Sheng Li



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# Introduction

China is a land of cats. Almost a third of the 37 living cat species worldwide occur in the Peoples' Republic of China (Table 1). This richness is no surprise considering the size and the diversity of the country. China stretches over 9.6 million square kilometres, from the Turfan depression 154 metres below sea level to the peak of the Qomolangma at 8,848 metres. Ecological regions include tropical rainforest in the southeast to boreal forest in the north, grass steppe in the northeast to sand deserts in the west and high alpine zones in the southwest. And in all these distinct habitat types, we can find felid species, from the mighty tiger *Panthera tigris* in the southern and northern forests to the mysterious manul *Otocolobus manul* in the open steppe to the splendid snow leopard in the Himalayas. For some species like the snow leopard *Panthera uncia* or the clouded leopard *Neofelis nebulosa*, the Chinese part is the most significant of their global range, the Chinese mountain cat *Felis bieti* is even endemic to the country, whereas the presence of the fishing cat *Prionailurus viverrinus* is questionable (Fig. 1). China is important for the conservation of the cats, and the cats are important for nature conservation in China, because they are living symbols of China's biological and ecological diversity.

But China is also the most populated country in the world, and the cats need to share all living space with many people who have, in the course of a very old culture, brought the use of nature to perfection. Today, China is the world's fastest growing economy, and this brings new challenges, but also opportunities for the conservation of the indigenous fauna. Habitat destruction, the traditional consumptive use of cats, and the increasing fragmentation of the landscape through modern transport infrastructure are among the threats to the survival of wildlife in China. But the fast development also brings opportunities: as a

consequence of urbanisation and rural exodus, some regions, e. g. in the mountains of south China, are experiencing habitat recovery. Vast reforestation programmes help to restore the forest, new laws protect wildlife and their habitats (Lu 2010, this issue). Over 2,000 protected areas of various categories are today recognised in China, protecting 14.4–18 % of the country's land area (Smith & Xie 2008); numerous of these areas have been established since 1980, many since 1995. The increasing wealth of Chinese society not only provides more financial capacity for nature conservation projects, but it also boosts the interest of Chinese citizens in wildlife and nature conservation.

Firm conservation must stand on at least three legs: reliable information, effective legislation, and high awareness. Increased scientific and public knowledge is indeed needed for the effective conservation of the felids in China. The largest of all cats, the tiger, is an outstanding cultural symbol in China and has received attention from scientists, conservationists and the broad public for a long time (Luo 2010, this issue), and another charismatic large cat, the snow leopard, has experienced increasing interest in recent years (Riordan & Shi, this issue); but most other cat species have so far been largely ignored. There is a clear need for more surveys, better monitoring, and genuine research on cats in China.

For the project "Cats in China", the Wildlife Management Division of the Department of Wildlife Conservation of the Chinese State Forestry Administration, the National Wildlife Research and Development Center, and the IUCN/SSC Cat Specialist Group have collaborated to compile the present knowledge in order to produce a basic document on the cat species in China, with the aim of promoting more research on cats. In a workshop at the annual

**Table 1.** Cat species occurring in the PR of China and IUCN Red List categories of the respective species.

Scientific name	English name	Chinese name	IUCN Red List
<i>Catopuma temmincki</i>	Asiatic golden cat	金猫 [jin mao]	NT
<i>Felis bieti</i>	Chinese mountain cat	荒漠猫 [whong mo mao]	VU C2a(ii)
<i>Felis chaus</i>	Jungle cat	丛林猫 [cong lin mao]	LC
<i>Felis silvestris</i>	Wild cat	草原斑猫 [cao yuan ban mao], 野猫 [ye mao]	LC
<i>Lynx lynx</i>	Eurasian lynx	猞猁 [she li]	LC
<i>Neofelis nebulosa</i>	Clouded leopard	云豹 [yun bao]	VU C1+2a(i)
<i>Otocolobus manul</i>	Pallas's cat, manul	兔狲 [tu sun]	NT
<i>Panthera uncia</i>	Snow leopard	雪豹 [xue bao]	EN C1
<i>Panthera pardus</i>	Leopard	豹 [bao], 金钱豹 [jin qian bao], 文豹 [wen bao]	NT
<i>Panthera tigris</i>	Tiger	虎 [hu], 老虎 [lao hu]	EN A2bcd+4bcd; C1+2a(i)
<i>Pardofelis marmorata</i>	Marbled cat	云猫 [yun mao]	VU C1+2a(i)
<i>Prionailurus bengalensis</i>	Leopard cat	豹猫 [bao mao]	LC
<i>Prionailurus viverrinus</i>	Fishing cat	渔猫 [yue mao]	EN A2cd+4cd

congress of the Society for Conservation Biology in July 2009 in Beijing, cat experts from China and abroad have helped us to review and complete the available information. Some twenty senior and junior cat conservationists shared their experiences and opinions about the status of the 13 cat species in China. The discussion revealed that there was much enthusiasm, but, especially for the medium-sized and smaller felids, very little expert knowledge. In this Special Issue of Cat News on Cats in China, we present an overview of the state of knowledge of cats in China, in the hope of raising awareness for cat conservation in China at a national and international level and promote more baseline surveys and research. The distribution maps presented in the species accounts are based on four different sources: (1) point distribution from the China Species Information Service as presented in Smith & Xie (2008), (2) distribution polygons based on the Global Mammal Assessment (IUCN et al. 2008), (3) point distribution maps from the database of the Cat Specialist Group, and (4) raster maps produced from the county-based National Wildlife Survey performed by the State Forestry Administration from 1995 to 2005. All these datasets have their inherent methodological biases, and all may include information that is no longer valid today. Considering this, we did not try to merge these datasets, but rather present them separately, in order to help identify priority areas for further survey work.

At the SCB congress workshop in Beijing, Chinese and foreign scientists discussed cat conservation with young

Chinese colleagues and students. These young scientists have shown a great interest in ecological research on cats. Cats are beautiful and fascinating animals that can easily catch the interest and the love not only of scientists, but of a broader public, too. They are therefore ideal flagship species for the conservation of habitats and of entire ecosystems.

We hope that this issue on cats in China is the start of more cat conservation work and a fruitful cooperation between institutions and individuals dedicated to nature conservation in China. We would like to thank all scientific colleagues who helped us to realise this project, either by providing information, or as authors or reviewers of chapters of this issue of Cat News. We especially acknowledge the financial support of the Swiss-based organisations Zürcher Tierschutz, Animal Trust, and the Wildcat Club.

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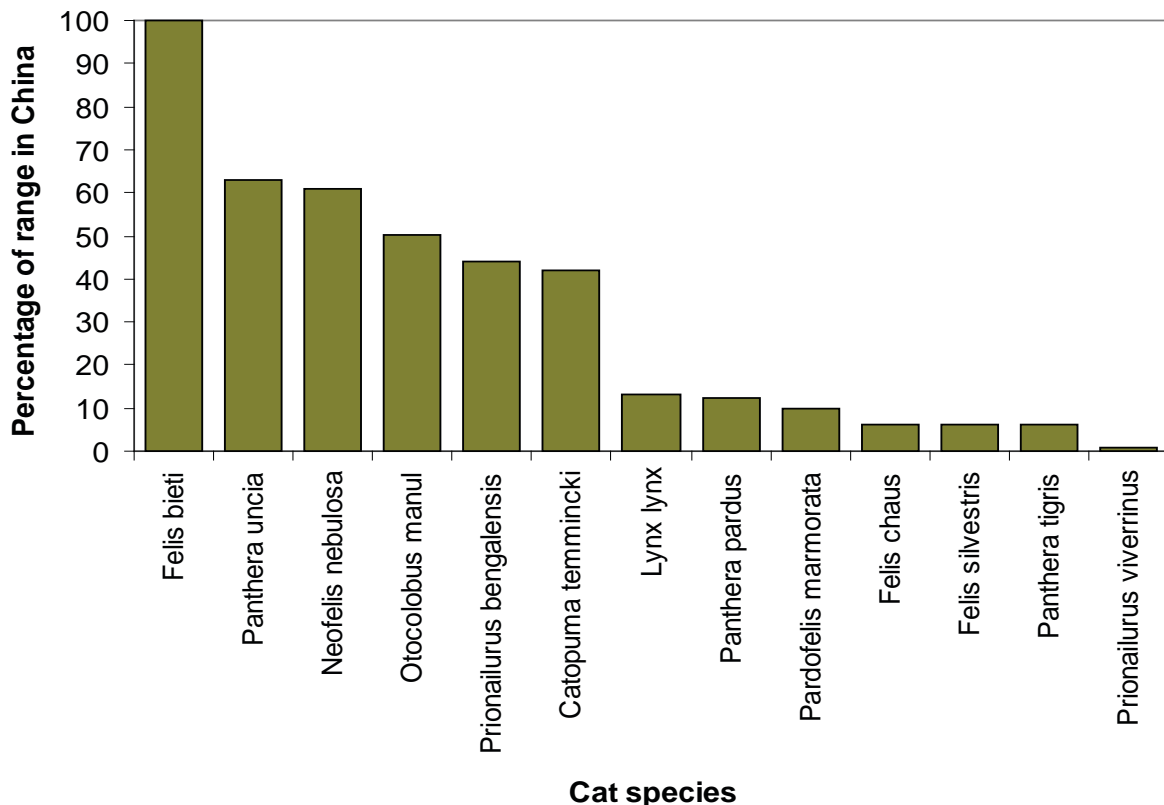
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**Fig. 1.** Chinese distribution range as percentage of the global area of cat species according to the Global Mammal Assessment (IUCN et al. 2008).

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# Legal status and conservation of cat species in China

Thirteen felid species are distributed over all three climatic zones in China: the monsoon area, arid and semi-arid area, and the high-altitude Qinghai-Tibetan Plateau. In terms of number of species and extent of distribution area, felids are numerous and widespread in China, and hence the country bears an important responsibility in cat conservation.

China is also a country with a long history of agriculture and forestry, both having a great impact on wildlife survival. From ancient time on, the distribution of cats in China has gradually shrunk from plains to mountainous lands, and over the country as a whole, habitat deterioration and destruction are common problems and have led to population declines of wild cats. In relation to the protection of wildlife and habitats, the Chinese government has promulgated some ordinances concerning wildlife protection since 1960, issued the Law of Wildlife Protection in 1988, and is now revising this law. There were various complicated situations concerning the implementation of the wildlife protection ordinances due to governmental and social attitudes and economic conditions from 1950 to mid-1980; at that time, governments at different levels had called for attacks on nature, promoting the over-use of woodlands and grasslands, and hunting fur animals etc., trying to solve quickly the country's economic difficulties and overcome poverty. This has had serious effects on wildlife protection. Wildlife has values for science, ecology, economy, and culture, and in addition, each species has a different position and function in the natural-social-economic system. The influence of those factors can directly or indirectly be reflected in the legislation and protection status of cats in China. Terrestrial wildlife resources in China belong to the forestry executive system, which is composed of the State Forestry Administration, the provincial Forestry Bureaux and the County Forestry Bureaux, and which is responsible for wildlife conservation and management. Police departments are authorized to persecute and punish poaching, illegal hunting and illegal trade in wildlife.

The establishment of nature reserves is one of the most important ways to conserve wild-

life. China's nature reserves are divided into national, provincial and county level parks, manifesting different levels of importance of the protected areas. In general, the establishment of new protected areas starts at county level and is gradually promoted to provincial and national level. The different levels of protected areas are financially supported by the respective governments.

## Large-sized cats

Large cats in China include the tiger *Panthera tigris* (with originally five subspecies occurring in the country: Amur tiger *P. t. altaica*, Indochinese tiger *P. t. corbetti*, Bengal tiger *P. t. tigris*, south China tiger *P. t. amoyensis*, and Caspian tiger *P. t. virgata*), the snow leopard *Panthera uncia*, and the leopard *Panthera pardus*.

The tiger occurs in forest and high grassy vegetation areas, and needs considerable territory to support its prey base. Therefore, there have been direct conflicts over space and prey demand between people and tigers. Historically in the light of economy and culture, the tiger is a valuable fur animal, and has an important symbolic significance, especially in Chinese traditional medicine. The tiger's close links with cultural and philosophical concepts led to over-harvesting and illegal hunting over many years in the past.

The five tiger subspecies in China can be ranked in decreasing order according to how they were affected by conflicts with agriculture and forestry. The socio-economic conflicts with local people were strongest for the South China tiger and the Caspian tiger (leading the two subspecies into such jeopardy), less prominent for the Siberian tiger, and least for the two southern subspecies, the Indochinese and the Bengal tiger, which occur in China only at the fringes of their distribution.

One of the main reasons for its decline was the tiger's conflict with agriculture and forestry. Tigers were regarded and listed as pest animals, and suffered from overhunting. Some hunters were rewarded like heroes for killing tigers in the 1950s and 1960s. In 1962, China's State Council announced the regulation of the utilization of wildlife resources, but did not then include the South China ti-



Fishing cat (Photo P. Meier)

ger. In 1973, the State Council issued a draft named Ordinance of Wildlife Resource Protection with the South China tiger ranked as a Class III protected animal. In 1988, China's State Council promulgated the Law of Wildlife Protection, which then ranked all subspecies of tiger as Class I protected animals, as the law only recognizes two classes. Class I protected animals can only be caught, hunted or traded with a special license obtained from the department of wildlife administration under the State Council. For Class II protected animals this license is issued by the relevant departments under the government of a province, autonomous region or municipality.

In the same year the Law of Wildlife Protection was promulgated, the Ministry of Agriculture of China prohibited the hunting of Amur tiger and Bengal tiger, but still allowed an annual quota of tigers to be hunted. In 1995, China issued a regulation to prohibit the trade in tiger bones in order to stop the production of Chinese traditional medicine containing tiger bone. But for South China tigers, all measures for rescuing this subspecies seemed to come too late. The academic community inside and outside China continues to discuss whether some individuals of this subspecies are still alive in the wild nowadays. At present, the numbers and ranges of the Amur, Indochinese and Bengal tigers have been established (Luo 2010, this issue). Tigers are reported from 39 natural reserves for tiger conservation at county, provincial and national level, covering a total of 20,000 km<sup>2</sup>. 15 of these reserves are at national level and were established in regions where the tiger is confirmed or reportedly still lives.

Snow leopards occur in alpine and sub-alpine mountain lands in northwest China. Fortunately, there is no competition with

agriculture, and especially no relation with traditional medicine, so these human threats are reduced. However, three factors are still critical threats to snow leopards: habitats being occupied by herders as summer pasture, poaching for pelts, and over-hunting of prey animals. As a large cat, the snow leopard has an inherently low population density, and as it has difficulties in withstanding disturbance from economic activities, it is ranked as a Class I protected species. So far there has been a lack of overall scientific information, but in part of the snow leopard's range, at least two surveys of population size and distribution have been conducted in recent years. By now there are at least 8 reserves which are said to have snow leopards.

Leopards are distributed in both the north and south parts of eastern China; they use almost the same habitat as tigers. We believe that the fate of leopards in the plains was similar to that of the tiger in past times. The leopard requires a relatively smaller space and uses much more diverse food items than the tiger, and is hardly linked to traditional medicine bone use. We think that these are the main reasons why leopards survived better than tigers. At present, a lack of suitable habitats or of sufficient prey are limiting factors for this species, but there is a general shortage of information on numbers and distribution in parts of its range. The leopard is ranked as a Class I protected species because of widespread strong economic activities (woodland and grassland transformed to crop-fields, logging, road building, mining, etc.) and scarce numbers. The leopard is found in no fewer than 20 reserves, where it is also listed as a key protected animal.

#### Medium-sized cats

The medium-sized cats of China are the lynx *Lynx lynx* and the clouded leopard *Neofelis nebulosa*.

Lynx are widely distributed in northern China and the Qinghai-Tibet Plateau. They are quite similar to leopards in their habitat and prey needs in boreal forest. The shortages of habitats and of prey are the major threats. At present the number and distribution of lynx countrywide remain unknown. Although lynx occur over a large area, there have been relatively strong socio-economic activities across their range, and so the species was ranked as a Class I protected species. At present we do not know how many natural reserves include lynx.

Clouded leopards occur almost all over southern China. Habitat loss and insufficient prey are probably the main factors restricting their population size. At present the numbers of clouded leopards countrywide as well as their regional distribution remain unknown. There are intensive socio-economic activities in the clouded leopard range, and although it covers a large area, but in limited numbers, the clouded leopard was ranked as a Class I protected species. Almost all reserves in middle and southern China are believed to host the clouded leopard as one of the main protected animals, but the exact number of these reserves remains unknown.

Because large-sized cats such as tigers and leopards are so rare nowadays, such that their role in the ecosystem has been greatly weakened, medium-sized cats can be a partial substitute for the big cats. Therefore, the protection of medium-sized cats becomes more important for maintaining ecosystem structure and function.

#### Small-sized cats

Cats of small size include the Chinese mountain cat *Felis bieti*, the wildcat *F. silvestris*, the jungle cat *F. chaus*, the manul or Pallas's cat *Otocolobus manul*, the marbled cat *Pardofelis marmorata*, the Asiatic golden cat *Catopuma temmincki*, the leopard cat *Prionailurus bengalensis*, and the fishing cat *P. viverrinus*.

The Chinese mountain cat, a species endemic to China, is found in western Sichuan and eastern Qinghai, the wildcat in the arid and semi-arid zone in northwestern China, the jungle cat in Yunnan and southern Tibet, the Pallas's cat in northern, northwestern and southwestern China, and the marbled cat in central and northwestern Yunnan. The golden cat is widely distributed in the central, southern, and southwestern parts of China and southern Tibet, the leopard cat in the eastern and northwestern parts of China and regionally on the Qinghai-Tibet Plateau, whereas the fishing cat may only still be found in Taiwan Province. All small cats except the marbled cat and leopard cat (which are not listed) are ranked as Class II protected species. Many natural reserves claim that small cats are on their list of protected animals, but they have no data on presence or population numbers.

Prominent features of small cats are that they require small spaces, move in dense cover, feed on small prey such as rodents, and occur in relatively large numbers. Tra-

ditionally, the main economic value of small cats was their fur. The main threats are habitat changes, and chemical poisons used for rodent control in agriculture, forestry and grassland. It is well known that small cats play a great role in rodent control and are indispensable in maintaining a well-sustaining ecosystem, a function to which much more attention should be paid.

In general, there is an obvious relationship between the survival status and body size of felid species: small-sized cats survive much better than medium-sized and large-sized species, and the latter are in high jeopardy. As of 2006, China has established natural reserves covering 15.16% of its total territory, notably based on the presence of Class I and II protected cats. Nevertheless, except in some areas where the number and occurrence of these species have been studied, knowledge of the accurate distribution and population size of each species is still suffering from a lack of systematic scientific data. Since 1995, China has decided to conduct a wildlife survey for Class I and II protected species countrywide every ten years, based on transect methodology. From 1995 to 2000, the first countrywide survey was completed (State Forestry Administration 2009). However, the method was not particularly appropriate for cat surveys, leaving gaps of knowledge about cats in each province. Meanwhile the local people still have a very limited awareness of conservation, and cats still suffer from occasional poaching activities. There are insufficient funds for protection and even less for regular monitoring of wild populations, both being necessary for the effective conservation and long-term survival of cats. Cat species would also benefit from increased recognition from government, academia and local communities.

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# Cat research in China

There are 55 species of terrestrial carnivores in China. Before the mainland was open to the outside world in 1978, most scientific research about wildlife emphasized morphological descriptions, geographic distributions, breeding traits, food habits, and economic values. This scholarship was consolidated into the Fauna Sinica Carnivora (Gao 1987).

Beginning in 1980 the government of China also expanded and emphasized the country's nature reserves. In 2007 the number of national and provincial reserves reached 1083 (China environment status bulletin of 2007, <http://www.mep.gov.cn/plan/zkgb/>). This large area of 136,256,849 ha (1.4 million km<sup>2</sup>) of protected land created habitat conditions suitable for the recovery of some wildlife populations. Since 1989 enforcement of China's Wildlife Conservation Law has curtailed illegal hunting and capturing of wild animals in many areas. Some carnivore populations are recovering, as evidenced by more traces, and are even causing problems in remote areas by preying on livestock (Johnson et al. 1996, Zhang 2004, Cai & Jiang 2006, Baatr et al. 2008).

Thirteen of the world's 37 wild cat species live in China. Wild cats were once hunted everywhere for their high quality fur and values in Chinese traditional medicine (Wang 1998, Sunquist & Sunquist 2002, IUCN 2010). Before the 1970's local residents were encouraged to hunt tigers and leopards as pests. But the government soon realized that unplanned harvesting would push some of these rare animals to the verge of extinction and conservation measures were put into action from the late 1970s to the present. However, due to their cryptic behavior and low population numbers, scientific research on carnivores is still rare in China. Details on population number, distribution, and status of wild cats are needed for planning effective population management and habitat conservation.

In this paper we summarize ecological studies and conservation progress of wild cats in China by reviewing and summarizing research published since 1987. We hope this paper will serve as a reference for researchers and policy makers carrying out scientific studies and designing management plans.

## Data collection procedure

Publications on Chinese wild cat ecology were found by browsing the websites of China National Knowledge Infrastructure (CNKI), Wangfang Data, and international journal database of ProQuest, IngentaConnect, Elsevier, ISI Web of knowledge, and Wiley-Blackwell. We also checked China National Library for books and research papers. Related ecological topics, habitat management, population conservation status and recovery trends were analyzed accordingly. Detailed population distribution data and status reports from some reserves were not used if we considered the data biased or not based on adequate field survey efforts.

## Results and analysis

### Taxonomy and status

According to Fauna Sinica Carnivora there are 6 genera and 13 species of wild cats in China, while Smith & Xie (2008) recognized 8 genera and 12 species of felids. The authors of the latter book consider the distribution of the fishing cat *Prionailurus viverrinus* in Taiwan to be incorrect, but, even though this does not confirm its presence in China, Wang (2003a) claims he saw a fishing cat pelt in southern Yunnan Province. The Chinese mountain cat *Felis bieti*, North-China leopard *Panthera pardus japonensis* and South China tiger *Panthera tigris amoyensis* are endemic species or subspecies to China (Wang & Xie 2004; Table 1).

All the wild living cat species were assessed as Endangered or Critically Endangered except the leopard cat *Prionailurus bengalensis* by the China Species Red List (Wang & Xie 2004; Table 1).

Among the 13 cat species tiger, snow leopard *Panthera uncia* and fishing cat are listed as Endangered, and Amur tiger *P. tigris altaica* and Amur leopard *P. p. orientalis* as Critically Endangered in the IUCN Red List (IUCN 2010). The South China tiger is suspected to be extinct in the wild and is therefore listed as Critically Endangered (Possibly Extinct in the Wild; Tilson et al. 2004, Xu et al. 2007, IUCN 2010).

### Ecological studies

Research studies on the genus *Felis* sparsely address population distribution, food hab-

its, breeding periods, habitat selection, and genetic diversity (Liu et al. 1999, Ren 2002). Taxonomic analysis by traditional and genetic methods revealed the Chinese mountain cat, the only endemic cat in China, has a distribution reduced to Qinghai and Sichuan Provinces (Liao 1988, He et al. 2004). Distribution surveys and population assessment for the jungle cat *Felis chaus*, manul *Otocolobus manul* and wildcat *Felis silvestris* were reported by Yin & Liu (1993) and Jiang et al. (2005). For marbled cat *Prionailurus marmorata* and golden cat *Catopuma temmincki*, the only reports were for distribution by Sun & Gao (1976), and Ren (2002). Most of the research on small cats focused on the leopard cat (Han et al. 1995, Luo et al. 1995, Wang et al. 1997, Bai et al. 2004, Bao et al. 2005).

For medium-sized cats there was only one report on the distribution of the clouded leopard *Neofelis nebulosa* (Yang et al. 2009) and there were two on food habits, suitable habitats and population numbers of lynx *Lynx lynx* in northwest and northeast China (Abdukadir et al. 1998, Tian et al. 2002). Our research revealed that hares and birds were the main food for lynx at a nature reserve in Inner Mongolia (Yuan 2009).

Studies on big cats have been given much attention because it is easier to find the activity traces in the field. Reports from two nature reserves in Shanxi Province revealed the number of leopards was declining and they preyed on livestock in winter when wild prey was hard to catch (Wang et al. 1995a, Qiu et al. 1998). A field survey was conducted in Henan Province and the number of leopards was estimated at 40-68 individu-



Manul (Photo M. Foggin)

**Table 1.** Species distribution and threatened status of wild cats in China.

Genus	Species	Distribution provinces*	Conservation category**	Threatened status	
				CHINA	IUCN
<i>Felis</i>	<i>silvestris</i>	XJ, GS, NX, SC, YN	II	CR	LC
	<i>bieti</i>	QH, SC	II	CR	VU
	<i>chaus</i>	YN, XZ	II	EN	LC
<i>Otocolobus</i>	<i>manul</i>	XZ, XJ, QH, GS, NMG, HeB, SC	II	EN	NT
<i>Pardofelis</i>	<i>marmorata</i>	YN	PC	CR	VU
<i>Catopuma</i>	<i>temmincki</i>	JX, ZJ, FJ, GD, GX, GZ, HuN, HuB, SC, YN, XZ, AH, HeN, S'X	II	CR	NT
<i>Prionailurus</i>	<i>bengalensis</i>	All provinces except XJ	PC	VU	LC
	<i>viverrinus</i>	TW			EN
<i>Lynx</i>	<i>lynx</i>	XJ, XZ, QH, SC, YN, GS, NMG, SX, HeB, HLJ, JL	II	EN	LC
<i>Neofelis</i>	<i>nebulosa</i>	AH, JX, ZJ, FJ, GD, GX, GZ, HuN, HuB, S'X, SC, YN, XZ, GS, TW, HeN	I	EN	VU
<i>Panthera</i>	<i>pardus</i>	XZ, YN, GZ, SC, QH, HuN, HuB, JX, FJ, GD, GX, S'X, SX, HeB, BJ, HeN, AH, HLJ, JL	I	CR	NT
	<i>tigris</i>	XZ, YN, GD, FJ, HuN, JX, HLJ, JL	I	CR	EN
	<i>uncia</i>	QH, XZ, XJ, GS, SC	I	CR	EN

\*Abbreviations stand for provinces and autonomous regions. AH for Anhui Province, BJ for Beijing, FJ for Fujian P, GD for Guangdong P, GS for Gansu P, GX for Guangxi AR, GZ for Guizhou P, HaiN for Hainan P, HeN for Henan P, HuB for Hubei P, HuN for Hunan P, JX for Jiangxi P, NMG for Inner Mongolia Autonomous Region, SC for Sichuan P, S'X for Shan'xi P, SX for Shanxi P, TW for Taiwan P, XJ for Xinjiang AR, XZ for Xizang AR, YN for Yunnan P, ZJ for Zhejiang P.

\*\*I stands for national class one key protection species, II for national class two protection, PC for provincial class.

als in the remote mountainous areas for the years 1997-1999 by Wang et al. (2001). The authors indicated habitat fragmentation and poaching were the main causes of population decline. A study on food habits on the South-China leopard *Panthera p. amoyensis* indicated that food components varied with habitat and prey resources. The main prey changed from ungulates to bamboo rodents and further diversified with declining habitat quality (Kenneth et al. 1993, Hu 1994). Field surveys indicated a decline in Amur tiger numbers from 151 in the 1970's to 20-30 in the 1980's. There were 16-22 tigers in the early 1990's but the number decreased to 12-16 tigers during the later 1990's (Hao et al. 1997). A regional survey found 9-11 tigers in Heilongjiang Province in 2004 (Wu et al. 1994, Sun et al. 2005), whereas the number was around 7-9 in Jilin province (Li et al. 2001). Predation on livestock by tiger was severe at the Hunchun nature reserve (Liu et al. 2006) which may imply this area is the main distribution range of Amur tiger in China. The Bengal tiger is only known to live at Motou, Tibet with an estimated population of 11 in 1996, but this number decreased to 4-5 due to lack of prey (Qiu et al. 1997). The problem of livestock predation was locally

severe (Zhang et al. 2002). The distribution of the Indo-Chinese tiger showed a small number of 8-11 near the border of Yunnan province and Myanmar at the end of 1990 (Hu et al. 1999). Recently researchers got several photos of this tiger subspecies at Xishuangbanna nature reserve which proved the tiger is still alive there (Feng et al. 2008). No other ecological study was conducted for these tigers. Historically the South China tiger was distributed widely from the northwest to the southwest including southern China (Xiang et al. 1987). During the 1990's there were still tracks of tigers living in Guangdong and Jiangxi provinces (Koehler 1991, Yuan et al. 1994, Wang et al. 1999), but currently there is no longer any evidence of resident tigers and they are only suspected to exist in the remote areas of Guangdong, Hunan, Jiangxi and Fujian provinces (Liu et al. 2002, Huang et al. 2003, Huang et al. 2004, Tilson et al. 2004, Liu & Peng 2005). As Tan Bangjie stated in 1982, passive protection measures to prohibit hunting are not enough to save the South China tiger, habitat rehabilitation and prey population recovery must be promoted in advance (Ma 1996). This goodwill was broken by the hunting activity to eliminate wild boars, the main prey of tiger, in Jiangxi province in

recent years ([http://news.xinhuanet.com/school/2007-11/24/content\\_7136705.htm](http://news.xinhuanet.com/school/2007-11/24/content_7136705.htm)). Studies of snow leopards have recently surged with the support of World Wildlife Fund (WWF), Wildlife Conservation Society (WCS) and other international organizations. Population density, habitat, activity patterns and food habits of snow leopard were studied in Qinghai Province and Xinjiang Autonomous Region (Liu et al. 2003, Ma et al. 2005, Xu et al. 2005, Ma et al. 2006, Xu et al. 2006a, Xu et al. 2006b, Ma et al. 2007, Janecka et al. 2008, Xu et al. 2008).

#### Habitat management

The established nature reserves supply suitable habitats for all of the wild cats. According to the China Red Data book of Endangered Animals (Wang 1998) improved management efficiency within nature reserves and better enforcement of anti-poaching laws is essential for recovery of cat populations. Since large cat populations require big territories and abundant prey, their recovery cannot be expected to occur in a short time period. The problem of livestock predation by cats increases with lack of natural prey. Meta-populations require more habitat corridors linked to re-





**Fig. 1.** Overview on the provinces of China.

serves and some nature reserves should be enlarged (Gao & Ma 1993).

### Conclusion

Because the large cats of China are the most conspicuous species and attract more attention than smaller cats, ecological research has focused on them. A lack of research funds for studying the small cats has dampened the interest of scientists in investigating their ecology. This situation must be rectified by providing funds for the application of modern research techniques such as radio telemetry, molecular identification, and camera trapping studies. Only with detailed information on distribution, food resources, population genetics, and

habitat degradation can a practical conservation plan for population recovery be implemented. This is especially important in protected areas like nature reserves and for those species that are critically endangered. We are hopeful that with more effort placed in basic ecological studies and in curtailing illegal hunting and trading, wild cat populations will be maintained or allowed to increase. With improved management wild cat populations should be able to increase to levels experienced prior to the 1970s.

### Acknowledgements

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LUO SHU-JIN<sup>1</sup>

# The status of the tiger in China

## *Panthera tigris*

The tiger *Panthera tigris* is the world's largest species of Felidae, although there is size variation across its range. There are only 3,000 to 5,000 tigers left in the wild, reduced from probably over 100,000 a century ago, due to habitat loss and fragmentation, prey base depletion, and human persecution (Dinerstein et al. 2007, IUCN 2010). The tiger's geographic range has declined by about 41% from its occurrence estimated a decade ago and now occupies only 7% of the historic range (Dinerstein et al. 1997, Dinerstein et al. 2006, Sanderson et al. 2006). The population is fragmented into 76 Tiger Conservation Landscapes – places and habitats that have the best chance of supporting viable tiger populations into the future – but no subpopulation has more than 250 mature breeding individuals (Dinerstein et al. 2006, Sanderson et al. 2006). Tigers are currently found in 13 Asian range states: Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Russia, Thailand, and Vietnam (Nowell & Jackson, 1996). They may still persist in North Korea, although there has been no recent confirmed evidence (IUCN 2010).

### Evolution and taxonomy

The earliest tiger fossils, found in northern China and Java (in Indonesia), date back to around 2 million years ago (Hemmer 1987). Yet

all living tigers are traced back to a common ancestor as recent as 72,000–108,000 years ago, as reflected by their relatively low genetic diversity (Kitchener 1999, Wentzel et al. 1999, Luo et al. 2004). This is a consequence of recent demographic reductions, probably related to the earth's largest known volcanic explosion during the Quaternary – the Toba volcano super eruption in Sumatra. The extant tigers are divided into six subspecies: Amur tiger *P. t. altaica* (Fig. 1); Indo-Chinese tiger *P. t. corbetti*; Malayan tiger *P. t. jacksoni*; Sumatran tiger *P. t. sumatrae*; Bengal tiger *P. t. tigris*; and South China tiger *P. t. amoyensis* (Mazak 1981, Luo et al. 2004). Three subspecies previously recognized on the basis of morphology are extinct: Bali tiger *P. t. balica* (Schwarz 1912), Javan tiger *P. t. sondaica* (Temminck 1844), and Caspian tiger *P. t. virgata* (Illiger 1815). Conservation of tigers in China is unique and important to tiger conservation in the world, as four of the six remaining tiger subspecies occur in the wild in China.

### Ecology and behaviour

The most important factors for tiger survival are dense vegetation cover, abundant large ungulate prey, and access to water (Sunquist et al. 1999). Tigers thrive in a variety of habitats, including tropical evergreen and moist deciduous forests of Southeast Asia,

tall grassland and deciduous forests in South Asia, mangrove forest in Sundarbans, and the mixed Korean pine/deciduous and temperate deciduous forests in the Russian Far East (Nowell & Jackson 1996, Seidensticker et al. 1999, Sunquist & Sunquist 2002). They less commonly inhabit pure coniferous forests, swamps, meadows, or alpine areas, but tracks have been found in the snow at 3,000 m in the Himalayas (Prater 1971). Tigers tend to avoid open landscapes and are almost never found in agricultural lands (Smith 1993). These habitat preferences reflect the habitat preferences of their prey, and are therefore useful in predicting suitable tiger habitat in China.

The home range of a tiger correlates with prey density, varying from as small as 20 km<sup>2</sup> for a female tiger in the Indian subcontinent where primary productivity is high, to 450 km<sup>2</sup> in northeast Asia (Smith 1993, Miquelle et al. 2006). Because tigresses are territorial, each female requires a non-overlapping range. This fact is of critical importance in determining area requirements for a population. For instance, in northeast China, in order to maintain a population of 20 breeding female tigers, approximately 8,000 km<sup>2</sup> of well-connected habitat is necessary. No reserve in northeast China covers such a large area, and thus planning for tiger recovery zones beyond the current protected areas is essential.

Male tigers have the capacity to disperse very long distances, with a record of up to 1,000 km away from source populations (Heptner & Sludskii 1992). Males make long-distance movements in search of potential mates, and will rarely settle in one location unless a female is found. The available evidence suggests that female tigers seldom disperse more than 30–40 km from their natal home range, and often inherit a portion of their mother's home range (Smith 1993, Sunquist & Sunquist 2002). Many sightings of tiger in northeast China near the border with the Russian Far East are most likely such dispersing males, and not evidence for a stable reproducing population (D. Miquelle, pers. comm.).

Female tigers normally start reproducing at between 3 and 4 years of age and males do not generally start until they are about 5 years old when they establish a territory of their own (Smith & McDougal 1991). Mating takes place at any time of year, but most frequently from late November to early April. Female tigers give birth to 2–4 cubs after a gestation of 100–104 days. The female rears the cubs alone, and they become independent at 18–28 months old. Females usually breed

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**Fig. 1.** A camera trap picture was taken of a tiger at the Xishuangbanna Nature Reserve in Yunnan, China on May 13, 2007 (Photo L. Feng & A. Zhang).

every 2–2.5 years (Mazak 1981). Although they live longer in zoos (26 years recorded), the oldest wild tiger on record was a female tiger of 17 years in Nepal (McDougal 1991).

### Prey

Tigers have a wide prey spectrum, ranging from frogs to elephant calves, but throughout their range the dominant prey are large ungulate species. Tigers' preferred prey in northeast Asia are red deer, wild boar, roe deer, and sika deer (Miquelle et al. 1996, Miquelle et al. 2006). In the South Asia region, sambar, chital, barking deer, spotted deer, red deer, hog deer, gaur, and wild pigs comprise the principal diet (Karanth & Nichols 2002). Indochinese tigers prey mainly on sambar, wild pigs, serow, and large bovids such as banteng and gaur. Adult tigers must kill the equivalent of one large ungulate per week, or about 50 large prey animals per year (Karanth et al. 2004). For females nursing cubs, the rate must be higher. If large prey species are not available, a female cannot make a sufficient number of kills to rear cubs successfully, as small prey species do not provide sufficient biomass to sustain both herself and her cubs. Thus, although tigers can survive for a short while on an assortment of smaller prey, in the long term these species form an insignificant part of the tiger's diet (Sunquist & Sunquist 2002). Assuming that a tiger removes 10–20% of the prey population per year, a single tiger requires a prey base of no fewer than 250–500 individuals within its home range in order to survive (Miquelle et al. 1996). This fact is of particular importance when considering tiger habitat recovery in China, where large ungulate populations are also in decline in many regions.

### Distribution and population dynamics

Tigers in China have been reduced to a few, scattered populations (see Fig. 2) with a total number fewer than 50, all with a highly precarious future. This dramatic drop in numbers is primarily due to habitat loss, depletion of their prey base, and human persecution (Wang 1998, Smith & Xie 2008).

#### South China tiger

The original distribution of the South China tiger *P. t. amoyensis* was from Fujian to Zhejiang province to western Sichuan (about 100°E), from the Xijiang River Basin (about 23°N) to Shanxi, Gansu and Shaanxi Province (about 35°N). It is believed there were more than 4,000 South China tigers in the country

## Panthera tigris Fact Sheet

### Names:

虎 [hu], 老虎 [lao hu]  
tiger

### Head and body length:

215-275 cm (females)  
220-330 cm (males)

### Weight:

75-167 kg (females)  
100-306 kg (males)

### Distribution in China:

formerly widely in NE, SE, C, and S China

### IUCN Red List:

Endangered A2bcd+4bcd;  
C1+2a(i) (2010)

### CITES:

Appendix I

### China Red List:

CR d

### China Key List:

Class I

### Global Population:

3,000-5,000 in the wild  
(IUCN 2010)

### Chinese Populations:

37-50 individuals, of which  
- Amur tiger *P. t. altaica*  
(northeastern China): 18-22  
- Bengal tiger *P. t. tigris*  
(Motuo county, Tibet): 8-12  
- Indochinese tiger *P. t. corbetti* (southern Yunnan province): 11-16  
- South China tiger *P. t. amoyensis* (southern China): no definite evidence  
- Caspian tiger *P. t. virgata* (Xinjiang): extinct (IUCN 2010)



Photo A. Silva

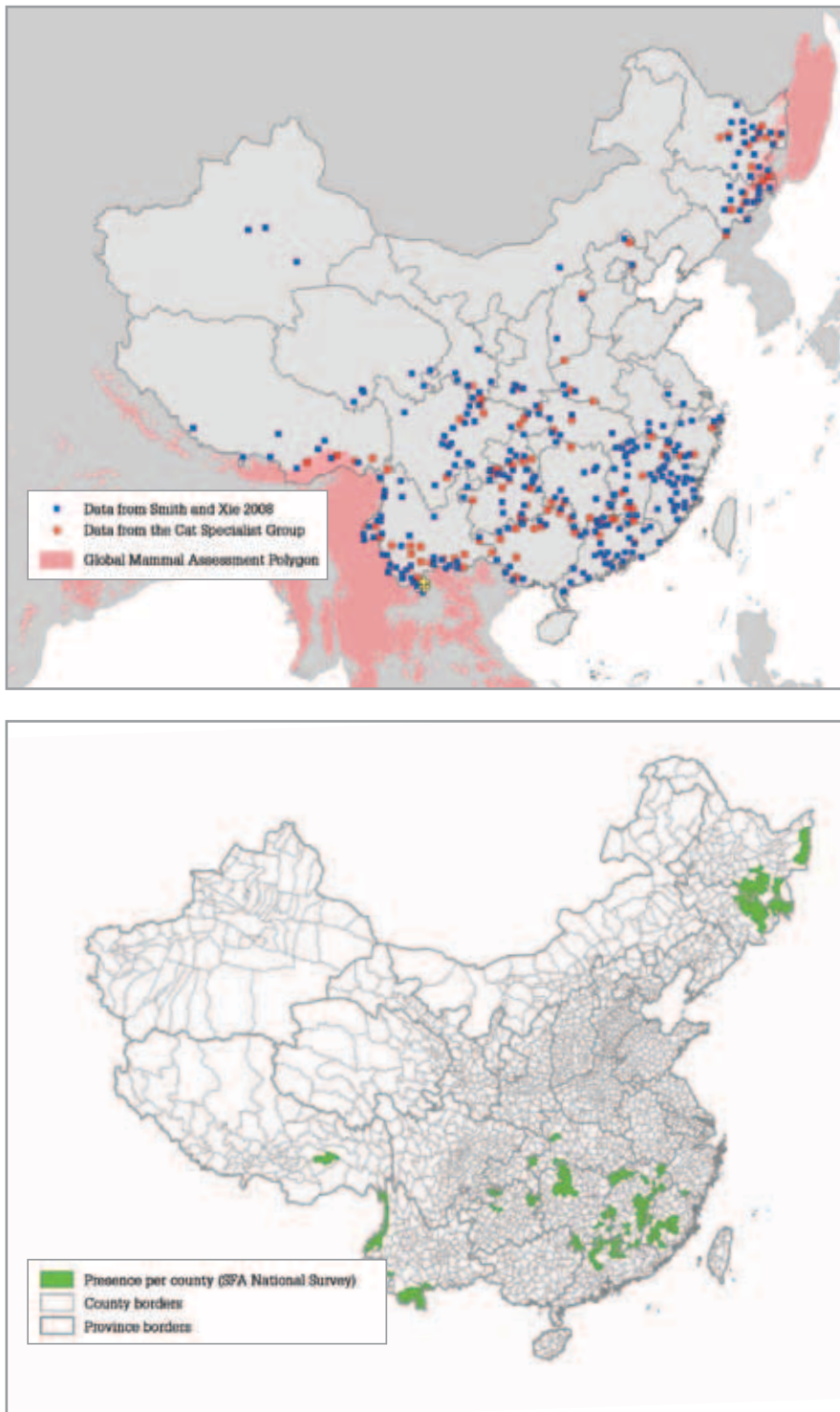
in 1949, and over 3,000 were killed during the 1950s and 1960s when they were declared pests and officially hunted down, until protection status was given in 1977 (Lu & Sheng 1986a, Ma et al. 1997, Smith & Xie 2008). The scattered surviving population is then thought to have declined to the brink of extinction with only occasional reports from the provinces of Zhejiang, Hubei, Guangdong, and Guizhou (State Forestry Administration 2009). Extensive surveys over the last 10 years have failed to find direct evidence of their existence (Tilson et al. 2004). The Government of China's State Forestry Administration announced at the 2007 International Tiger Symposium in Kathmandu, Nepal, that there is no definite evidence of the continued existence of the South China tiger in the wild (also see State Forestry Administration 2009).

#### Amur tiger

The Amur tiger *P. t. altaica* historically occurred across most forested ecosystems of northeast China. The habitat has been

decreasing for over a century since the Qing dynasty's ban on the exploitation of forests was lifted in 1870, and under Japanese occupation the forest was decimated until 1950 (Ma 1983). The tiger was widely distributed in the Daxing'anling, Xiaoxing'anling, Laoyeling, Zhangguangcailing, Wandashan, and Changbaishan mountains, but became extinct in the 1960s in the Daxinganling Mountains, in the 1970s in the Xiaoxinganling Mountains, and at the end of the 1980s in the Changbaishan Mountains (Ma et al. 1997), mainly due to hunting and primeval forest loss. In 1979, Chinese specialists estimated that there were about 150 tigers, but in 1988 it was said that the number had fallen to about 35 (Ma et al. 1997). There are now about 12–16 Amur tigers in northeast China, including 7–9 in Jilin, and 5–7 in Heilongjiang (State Forestry Administration 2009). Reports of tigers in the Laoyeling, Zhangguangcailing, and Wandashan Mountains are not uncommon, but there is no evidence indicating reproduction in any of these landscapes. The absence of persistent,





**Fig. 2.** Distribution of the tiger in China.

repeated observations of tigers in any given location suggests that there may be no resident animal in China, and all recorded observations (Li et al. 2008) may represent transient or dispersing animals from Russia where now over 400 tigers live, compared with the 20–30 in the 1940s (Miquelle et al. 2006). Since large tracts of forests and potentially suitable habitat for Amur tigers still exist throughout eastern Jilin and Heilongjiang provinces, re-colonization of previously

occupied tiger habitat in northeast China is still possible, if appropriate conservation steps across the landscape are taken.

#### *Indochinese tiger*

The Pleistocene centre of modern tiger radiation was probably in the Indochina/southern China region, which is now the range of the Indochinese tiger *P. t. corbetti* (Luo et al. 2004). The few remaining tigers in southern Yunnan on the borders to Lao PDR, Vietnam and Myan-

mar belong to this subspecies. Tigers had occurred much more frequently before the 1990s but reports from the Chinese government in the mid 1990s estimated the number of tigers in Yunnan to be 30–40 (He 1994), and in 2009, 14–20 (State Forestry Administration 2009). These tigers probably exist in Xishuangbanna (11–16 individuals) and Simao (3–4 individuals) regions, which are both adjacent to the country's borders and indicate cross-boundary individuals rather than resident tigers within China. A photo of a wild Indochinese tiger was taken in Xishuangbanna National Nature Reserve adjacent to Laos in 2007 (Feng et al. 2008; see Fig. 1). However, unlike the Amur tiger in northeast China, there is no single large source tiger population in Laos, Vietnam or Myanmar immediately bordering Yunnan. Transboundary collaboration from all the neighboring Indochinese countries will be required to maintain the survival of wild tigers in Yunnan and to facilitate the recovery of wild tigers and their habitats on all sides of the borders.

#### *Bengal tiger*

The Bengal tiger *P. t. tigris* was once distributed throughout the broadleaf forests of southern and southeastern Tibet, and western Yunnan, below an elevation of 2,500 m. Today, there is probably only one remnant population in Medog (Motuo) County, Tibet. Widespread illegal and uncontrolled hunting has greatly reduced the numbers of wild pig, takin, red goral, and muntjacs, which are the tiger's prey species (Qiu & Bleisch 1996). Losses of livestock to tigers in this region are high. One persistent livestock killer tiger was officially shot in 1996. In 1999, the Gedang Xiang (administrative unit) in Medog lost 7.8% of its cattle and 1.9% of its horses to tiger predation. Tigers in the northern hills of Arunachal, India, have become extremely scarce, which in effect isolates the small Medog population of tigers. The total number of tigers in Medog is estimated at 8–12, including 5–7 in Gedang, and they possibly represent the last resident tiger population in China (State Forestry Administration 2009).

#### **In captivity**

It is estimated that over 15,000 tigers live in captivity worldwide, three to five times more than their wild relatives (IUCN 2010, Nyhus et al. 2010). Only about 1,000 of them are managed through coordinated breeding programs among zoos that aim to preserve genetic variability that is representative of geographic

and subspecies clustering found in the wild (Luo et al. 2008). There are 64 South China tigers registered in studbooks as of 2007, all at Chinese zoos, but they are derived from six wild-caught founders with uncertain genetic ancestry and are extremely inbred (Yin 2007). There are no coordinated breeding programs for other subspecies of tigers by the Chinese Association of Zoological Gardens. The vast majority of captive tigers worldwide are not part of these managed breeding programs, most residing in roadside zoos, breeding farms, makeshift breeding facilities, circuses, and as pets (Nowell & Xu 2007, Williamson & Henry 2008). There are over 4,000 tigers living in breeding facilities in China (Xinhuanet 2006, Guo 2007, Morell 2007).

### Main threats

Tigers in China have been reduced to a few small, scattered populations, all with a dire future. Habitat loss and poaching for trade are the principal causes of a significant decline in tiger range and numbers (Dinerstein et al. 2007). Depletion of tiger prey base is the main threat to tigers in areas of otherwise suitable habitats (Karanth & Stith 1999). Maintenance and expansion of the present habitat are crucial to the tiger's future, together with recovery of prey populations and protection from illegal killing.

Tigers were shot or poisoned for livestock protection and for gain. Large numbers of tigers were killed in the 20<sup>th</sup> century in China when they were officially considered pests, and bounties were paid for their destruction. About 3,000 South China tigers were killed within 30 years until 1977 when official protected status was given (Lu & Sheng 1986a). But demand from the black market and the status of its near extinction in China continue to drive illegal poaching of tigers. Tigers have traditionally been hunted for skins, trophies, decoration, and for the use of their bones and other body parts in traditional medicines (Gratwicke et al. 2008). In recent years tiger poaching appears to have occurred or increased in several range states, apparently to smuggle skins, bones, and body parts to China (Nowell & Xu 2007).

Widespread illegal and uncontrolled hunting has greatly reduced the numbers of the tiger's primary prey. Subsistence hunting of ungulate prey by local people is now a powerful force driving the tiger's decline over large parts of its range. Also, some of the methods used for catching deer, such as snaring, can inadvertently catch and sometimes kill tigers. Studies

from tropical Asia show that it is unlikely tigers that can reproduce successfully at prey densities below 2–5 ungulates per km<sup>2</sup> (U. Karanth, pers. comm.). In northeast Asia, Amur tigers expand their home ranges to allow for the seasonal movements of a lower density ungulate prey base. They are naturally vulnerable to sharp declines in ungulate populations during severe winters (D. Miquelle, pers. comm.). In many tiger ranges, low abundance of tigers in suitable habitats usually correlates with a reduced number of large ungulate species in the region (Rabinowitz 1993).

Large tracts of contiguous habitat are essential to assure the long-term survival of wild tigers. Tigers live in 40% less habitat than they were thought to inhabit a decade ago and currently occupy only 7% of their historic range (Dinerstein et al. 2007). Severe habitat loss has occurred during the past century with the growth and spread of human populations, settlement and activities. Not only have large blocks of tiger habitat been converted to human use, but wilderness has been fragmented, creating many isolated tiger populations that are subject to genetic deterioration, disease, demographic collapse, and environmental catastrophes.

### Protection measures

The tiger is not only an ecological umbrella species, but also has an outstanding cultural significance in China. As in most of the other tiger range countries, habitat loss, overhunting, poaching, and prey depletion are the primary causes for reduction of wild tigers in China. Efforts to conserve tigers in the wild include identifying potential habitats and ecological corridors that are crucial to the survival of free-ranging tigers, developing and implementing regular monitoring systems, conducting status surveys in priority areas to monitor tiger population trends, restoring their prey base particularly the large ungulate prey species, and maintaining or even expanding the existing reserves and sanctuaries.

In the 1970s the Chinese government reversed previous regulations declaring the tiger as a pest, and fully banned the killing of wild tigers (Ma et al. 1997). In 1988, the top legislative body in China passed and began implementing since 1989 the P. R. China Law for Wildlife Conservation that lists all the subspecies of tigers in the first category of protected animals (CITES Management Authority of China 2007). The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), of which China

has been a member since 1981, prohibited international tiger trade in 1987. In 1993, the State Council of China issued the Notification on Banning the Trade in Tiger Bone and Rhino Horn, which forbade import, export, and domestic trade in tiger parts and derivatives (CITES Management Authority of China 2007). Since then, tiger bone has been removed from the list of ingredients in official Chinese pharmacopoeias. This is a commendable contribution to the conservation of wild tigers worldwide. In 2006 the Regulation for Import and Export of Endangered Species of Wildlife was enacted in China to implement CITES. To fully stop poaching and illegal trade in tiger products, it requires cooperative effort in all range countries to increase the effectiveness of implementation of conservation laws and regulations.

Large carnivores such as tigers are highly vulnerable to extinction in small and isolated reserves. Large, continuous tracts of land with sufficient prey base are the key to the long-term survival of viable tiger populations in the wild. There is a need to approach tiger conservation at a much larger scale than before. All the remaining tigers in China are near the country's borders in the northeast or southwest; thus landscape-level conservation of wilderness habitat and the recovery of large wild ungulate populations as the prey base for the tiger will be required. Close collaboration between Russia and China, and between Indo-Chinese countries and China, will be critical to ensure that natural ecological corridors exist between the countries, allowing exchange of tigers and other native wildlife. Creation of international protected areas, as well as adjacent lands in the neighboring countries will protect critical habitat and provide linkages for transboundary tiger populations.

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# The snow leopard in China

## *Panthera uncia*

The snow leopard *Panthera uncia* occurs within 12 countries across Central Asia. The secretive nature of this rare species, and the inaccessibility and harshness of the areas in which it exists have precluded accurate population assessments across their entire range. It is estimated that China contains approximately 60% of the potential habitat available to snow leopards (McCarthy & Chapron 2003). The importance of China for snow leopard conservation is an echo of the scale of the country itself. The vast size and diversity of China, together with unparalleled social and economic change, present a myriad of complexities and challenges for conservation. As an amplified clarion for the world, the complex and changing interface between people and wildlife in China demands our attention.

China is the central country of the snow leopard's global distribution. Its known range in China is over a million km<sup>2</sup>, and this area borders to all of the other eleven snow leopard range states. The significance for

the conservation of snow leopards that they primarily inhabit areas with often sensitive political boundaries is not to be underestimated. The constraints this places on developing range-wide conservation strategies and the necessity of securing high-level political dialogue make our task all the harder. Beijing Forestry University and the Wildlife Conservation Research Unit at Oxford University, together with the State Forestry Administration of China (SFA) are working to develop both national and regional action plans for the conservation of snow leopards in China, with input from experts within the Snow Leopard Network, Panthera and the Snow Leopard Trust.

### Background

Based on morphology, the snow leopard has previously been placed within its own genus *Uncia* of the Pantherinae subfamily of the Felidae (McCarthy & Chapron 2003). However, more recent molecular phylogenies (Christiansen 2008, Wei et al. 2009) have

placed the species within the *Panthera* genus: *Panthera uncia*.

Snow leopards typically occur within an elevation range of 3,000–4,500 m above sea level, although they have been recorded both above 5,500 m and below 1,000 m. They are small by “big cat” standards, weighing between 27 and 54 kg, with males tending to be larger than females. Snow leopards are adapted to rugged high altitude areas (Fig. 1), with wide feet for walking in snow and providing traction on loose surfaces, further assisted by fur on the undersides. They have small rounded ears which further minimise heat loss. Their body length is between 74 and 130 cm and their long flexible tails are the same length again, which assists with balance in rocky terrain, and the tail can be wrapped around the animal to provide additional warmth when lying still. They have long fur ranging from dark cream to smoky grey in colour, providing camouflage with darker rosettes on the body and spots on the head. The pattern of rosettes and spots is unique to each individual, thus enabling the use of camera trap methods for individual based surveys (Jackson et al. 2006, Karanth et al. 2006). The footprints of snow leopards may also provide means of individual identification (Riordan 1998).

Snow leopards are predominantly solitary, although territorial behaviour is poorly understood and adjacent ranges can overlap substantially, particularly between males and females. Home range area appears to vary greatly, probably with prey density, up to 400 km<sup>2</sup>, though recent satellite-based telemetry suggests that snow leopards' range areas may be an order of magnitude greater than this (McCarthy et al. 2005). Snow leopards mark usage areas in their ranges with scrapes, urine and faeces, often at dominant features and along travel routes. Intensification in marking behaviour coincides with breeding between late January and March. One to five cubs are born after a gestation period of 93–110 days.

Snow leopards are opportunistic predators, employing short-range hunting techniques, relying on camouflage and stealth, more suitable to the rugged mountain habitats than longer-range hunting methods. They are capable of taking large prey, up to three times their own body weight, but also show dietary plasticity, as would be expected in the harsh environments in which they exist, and will often take much smaller prey such as marmots and galliform birds. Livestock



**Fig. 1.** Snow leopard photographed in Sichuan in the Qionglai mountains in Wolong National Nature Reserve, January 2009 (Photo Li Sheng, W. McShea & Wang Dajun).



depredation occurs throughout their range, probably depending on the availability of wild prey. The relative rates of livestock depredation attributable to snow leopard remains uncertain, with sympatric carnivores such as lynx *Lynx lynx* and wolf *Canis lupus* also taking livestock but also at unknown rates. Where compensation schemes have been established for livestock depredation by snow leopards specifically, predation by sympatric carnivores may be misreported since these incidents will not be compensated, with livestock loss being wrongly attributed to snow leopards at an unknown rate. Furthermore, predation rates quantified from faecal analysis may be misleading in the absence of genetic verification, given the apparent rate of species misidentification of collected scats (Janecka et al. 2008).

#### Status and distribution

Synonyms and local names used in China are Ai Ye Bao, Cao Bao, He Ye Bao, Xue Bao.

China contains over 60% of the potential habitat available to snow leopards (see Fig. 2) and the estimated population of between 2,000 and 2,500 individuals accounts for between one-third and up to one-half of the total global population in the wild (McCarthy & Chapron 2003). Snow leopards have been reported to occupy approximately 1.1 million km<sup>2</sup> of China's fragile mountain environments (Fox 1994). Using snow leopard habitat suitability ranges from the Snow Leopard Survival Strategy (McCarthy & Chapron 2003) we estimate the area of suitable habitat for snow leopards in China to be 2.1 million km<sup>2</sup>, which is consistent with the estimated 60% of snow leopard habitat being in China. Snow leopards occur principally in the western provinces of the country: Gansu, Qinghai, Sichuan (see Fig. 1), Tibet and Xinjiang. The status of potential populations in Inner Mongolia, Ningxia, Shanxi and Yunnan are uncertain at this time. The extent of the snow leopard range in China coincides with over 10,000 km of national border adjoining 11 neighbouring snow leopard range states. Many areas of international conjunction occur at key sites for range connectivity, such as the Himalayan region (Tibet – Bhutan; Nepal; India); Karakorum and Pamirs (Xinjiang – India; Pakistan; Afghanistan; Tajikistan); and Tian Shan (Xinjiang – Tajikistan; Kyrgyzstan; Kazakhstan).

As in other part of their range, the secretive nature of snow leopards, and the inaccessibility and harshness of the areas in which they exist have hampered accurate population as-

## Panthera uncia

### Fact Sheet

#### Names:

雪豹 [xue bao]  
ounce, snow leopard

#### Head and body length:

74-130 cm

#### Tail length:

80-105 cm

#### Weight:

27-54 kg

#### Global Population:

4,080-6,590 (IUCN 2010)

#### Chinese Population:

2,000-2,500 (Smith & Xie 2008)

#### Distribution in China:

1,100,000 km<sup>2</sup>, W China

#### IUCN Red List:

Endangered C1 (2010)

#### CITES:

Appendix I

#### China Red List:

CR A1cd

#### China Key List:

Class I



Photo A. Silwa

sessments across China. Work is continuing to improve the regional and national assessments of snow leopard populations.

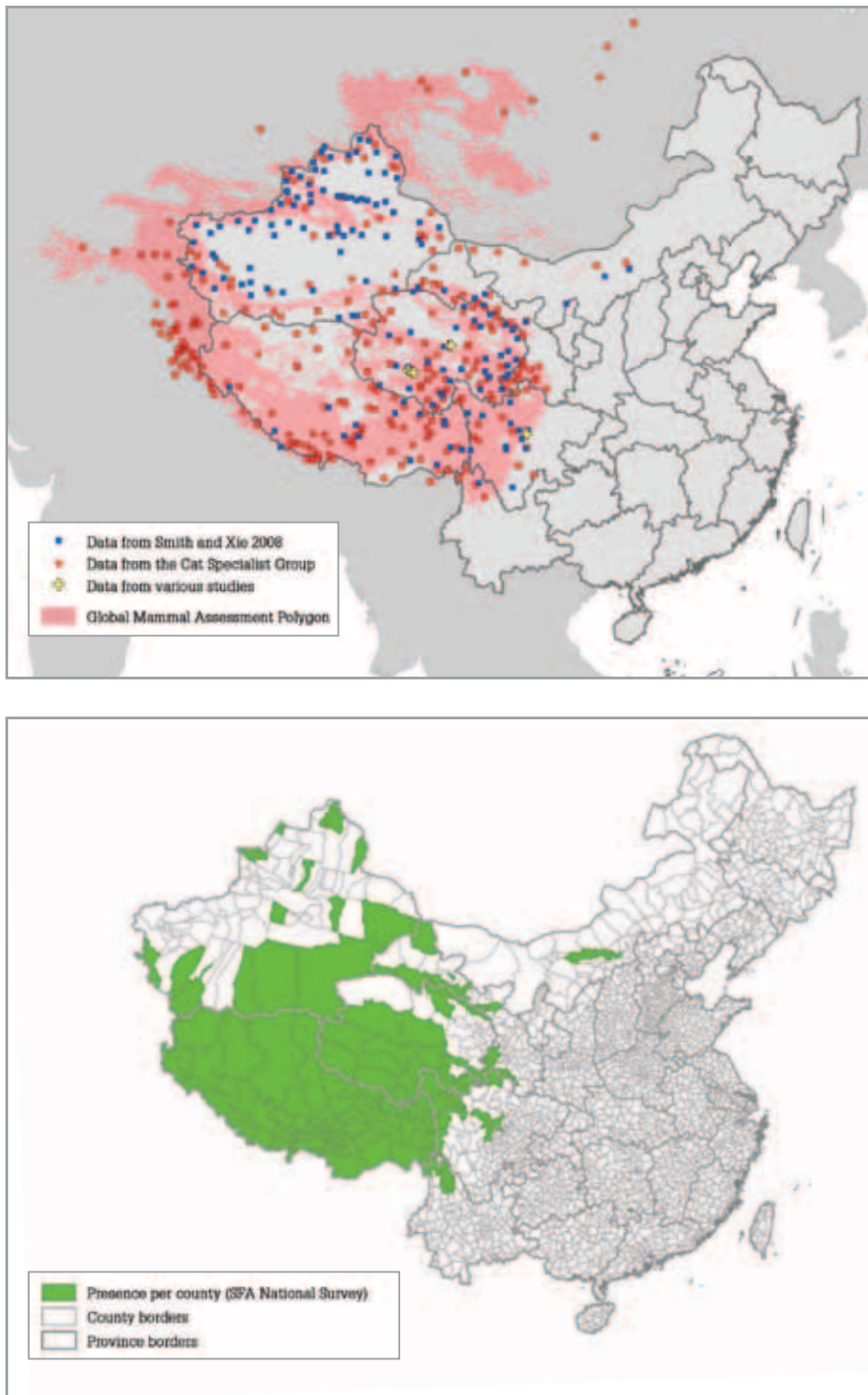
Little additional information on snow leopard populations in China has been published since the surveys of George Schaller and his team in the 1980s. At that time, snow leopard populations were assessed in the provinces of Qinghai, with an estimated 650 individuals in a range of 65,000 km<sup>2</sup>, and Gansu (Schaller et al. 1988a). Estimates were also produced for areas of Xinjiang, where approximately 750 individuals were estimated to exist within 170,000 km<sup>2</sup> of suitable habitat (Schaller et al. 1988b). In Tibet, the distribution area of the snow leopard is potentially at least twice that of Qinghai (Yang & Feng 1998) and snow leopards were found to exist sporadically across the province (Schaller 1998). From these estimates and from assessment of available habitat the population size of the snow leopard in China is estimated to be 2,000–2,500. Estimating total population size in China and elsewhere is difficult, since densities appear to vary greatly, for example one animal per 100 km<sup>2</sup> in Qinghai compared with one animal per 250 km<sup>2</sup> in Xinjiang.

In China, the amount of suitable snow leopard habitat within protected areas is 28%, higher than the overall figure of 6% calculated for the entire range by Hunter

& Jackson (1995). Of 203 reports of snow leopard occurrence in China stored on the Snow Leopard Network database, only 53 (26.1%) coincided with protected areas, significantly different from other countries where, out of a total of 1,292 snow leopard records, 606 (46.9%) occurred within protected areas (Fisher's Exact Test:  $p < 0.001$ ). The largest protected areas within the snow leopard range in China are Qiangtang Nature Reserve in Tibet and the adjoining Sanjiangyuan Nature Reserve in Qinghai, with a combined area of approximately 600,000 km<sup>2</sup>. Aerjinshan Nature Reserve in Xinjiang and Kekexili Nature Reserve in Qinghai also abut these reserves, forming a protected area complex of 740,000 km<sup>2</sup>. Of this total area, 375,300 km<sup>2</sup> (50%) is designated as suitable snow leopard habitat, with the majority of this (258,300 km<sup>2</sup>) in Qinghai. Areas of suitable habitat within protected areas are not contiguous and it is unclear how much the interstitial unsuitable habitats are impermeable to snow leopards, presenting significant obstacles to dispersal.

#### Main threats

The main threat to snow leopards is perceived to be retaliatory killing by local human communities following livestock depredation. However, livestock herding communities



**Fig. 2.** Distribution of the snow leopard in China.

in Qinghai did not view snow leopards as a major threat to their livestock (Xu et al. 2008), indicating that the severity of this threat may vary substantially across snow leopard range in China. The relative importance of this and other related threats, such as direct poaching, habitat degradation and reduced natural prey abundance is not well understood. Intuitively, one would expect snow leopard populations to be negatively correlated with intensity of human activities. Recent surveys in the Shaksgam region of Xinjiang, revealed little evidence of snow leopard activity, despite

low human population density, an absence of livestock farming and a relatively high abundance of prey (Riordan et al. in prep.). Precious few life-history data exist for snow leopard, and so unpicking the relative impacts on the survival and reproduction of this elusive cat across its range remains a matter of some speculation. Information exists at local scales; however recent telemetric work confirms suspicions that snow leopard populations function at large geographical scales and the impacts reported in any one area may not generalise linearly across the entire range.

Attention is often drawn to reports of illegal supply and sale of snow leopard body parts, particularly skins for ornamental use and bones for traditional Chinese medicine (TCM). This is a wider issue across Asia (Baker et al. 2006), contrasting traditional beliefs and values with encroaching modern Western influences. Increasing affluence among middle sectors of society, in combination with traditional beliefs, may have stimulated markets for snow leopard and other big cat body parts. China has a significant role to play in bringing an end to this trade with the support of the international community.

In general there is a lack of convergence between conservation and human development aims, not just within China but across the entire snow leopard range. Within mountain areas in Asia descriptions of places often include the terms "harsh", "inhospitable", "barren" and "unproductive", and people are often characterised as "incapable stewards" of the natural environment, as lacking sufficient intelligence and as being unable to overcome environmental constraints and survive in their own habitat (MacDonald 1998). Greater appreciation of the needs and desires of local indigenous peoples may serve to aid and harmonise conservation and development aims. Improving the accessibility of local resources for local people may be the most significant, yet often unrecognised, factor of conflicts that weaken conservation and development programmes (Cohn 1988). All stakeholders will agree on the need to see sustainable developments. However, politicised or naïve ambiguities in the definitions of key concepts around sustainability, for example between social and ecosystem sustainability (Shearman 1990) can be argued to have increased the disparity between development and conservation goals. Finding and defining common goals thus becomes essential for both conservation and human wellbeing.

### Current and future protection

There are two principal laws providing protection for snow leopards in China: the Wildlife Animal Protection Law (WAPL) of the People's Republic of China (1989) and the Enforcement Regulations for the Protection of Terrestrial Wildlife of the People's Republic of China (1992). The species is listed as a Class I protected animal under the WAPL, which means that hunting of snow leopards and trade (sale and purchase) in their products both constitute a criminal offence. Permits may be granted allowing particular listed pur-



poses, such as scientific research, domestication, breeding, or exhibition (WAPL Article 22).

The Criminal Law of the People's Republic of China, last amended in 1997, provides severe penalties for unlawful taking, killing, transporting, purchase or selling of State-protected animal species, such as the snow leopard. Depending on the severity of the crime this can result in a prison sentence of more than 10 years, a fine and the confiscation of property (H. Xu, in Theile 2003). Provinces may also adopt their own wildlife protection regulations, which may be more, but not less, stringent than the national legislation.

China's extensive national borders and major international ports at Shanghai and Guangzhou create great challenges for China's wildlife law enforcement agencies. Attempts have recently been made to develop a volunteer network to assist the China authorities, and the Chinese government has pledged further funds to fight wildlife trade as part of policy. In recent years hunting has been made illegal in several provinces across the administrative jurisdictional boundaries: Jilin (since 1996), Guangdong (2001–2003), and Liaoning (2003–2013). Other provinces, including those with snow leopard populations, have stopped hunting in wildlife conservation hot spots or during breeding seasons. Further efforts to work with international partners have been made; with China hosting key CITES regional workshops in recent years (TRAFFIC International 2006).

Key recommendations made in the Snow Leopard Survival Strategy (SLSS; McCarthy & Chapron 2003) focused on interrelated human activities. These covered such topics as grazing management, income generation, reducing poaching and trade in snow leopard parts, reducing livestock depredation by snow leopards, animal husbandry, conservation education and awareness. Significant progress has been made on some of these approaches in other countries, for example: Mongolia and Kyrgyzstan, where alternative income has been generated from handicrafts; India developed community-based ecotourism, livestock insurance schemes and corral improvements in Ladakh and Spiti; Pakistan has today community-based compensation and insurance schemes and livestock husbandry programs. Adopting examples of best practice and creating workable solutions in China is of critical importance.

Within the SLSS, snow leopard range states were also encouraged to develop their own



**Fig. 3.** Snow leopard photographed in Sichuan in the Qionglai mountains in Wolong National Nature Reserve, March 2009 (Photo Li Sheng, W. McShea & Wang Dajun).

national and regional survival strategies for snow leopards. In collaboration with the Chinese national and provincial authorities, work is continuing to develop regional and national strategies for China.

Furthermore, we encourage action to tackle the key threats to snow leopards in China, by developing fully collaborative projects, engaging policy makers, human communities in areas of concern and international partners; the aims are:

- to carry out fundamental research into the behaviour and ecology of snow leopards in China, comparing the impacts of differing human interaction across their range;
- fully and openly to investigate the magnitude and impacts of illegal trade in snow leopard body parts; this should include a detailed and dispassionate study of the use of big cat body parts in TCM and the substitutability of alternatives;
- to evaluate wide-ranging climate change impacts in mountain ecosystems, in terms of agricultural practice, wildlife populations and conservation of top predators; and

- to develop and support capacity in local communities to monitor snow leopard populations and their prey, and to provide mechanisms for managing livestock incidents objectively and fairly.

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JIM SANDERSON<sup>1</sup>, YIN YUFENG<sup>2</sup> and DRUBGYAL NAKTSANG<sup>3</sup>

## Of the only endemic cat species in China

The Chinese mountain cat – *Felis bieti*

The Chinese mountain cat *Felis bieti* is about twice the size of a large domestic cat. Adult males are larger than adult females. The coat is a nearly uniform pale yellowish brown in winter and somewhat darker in summer (Fig.1). The fur is inter-

spersed with longer, dark brown or black guard hairs. Traditional pastoralists living in the Tibetan Plateau refer to the Chinese mountain cat as the 'grass cat' because the fur is the colour of dry grass. The soft underfur is grey near the skin and brownish

at the tips. The belly fur is white with the yellowish brown underfur showing through and is marked with indistinct horizontal stripes on the sides and legs. Faint dark stripes sometimes run across the outer sides of the hind limbs, a brownish cross-band runs across on the inner side of the forelimbs and two or three washed-out transverse bands are found on the outer side of the haunches. The lower hind legs are dark brown. The ear-tips are adorned with a 2–2.5 cm long tuft of dark hairs. The tail has 5–6 dark bands, and terminates with a black tip. Long hair grows between the pads of the feet, but the pads are not covered or obscured (Sunquist & Sunquist 2002, Chen et al. 2005, Yin et al. 2007). The Chinese mountain cat is often confused with the Asian wildcat *Felis silvestris* and the domestic cat. Moreover, because the Chinese mountain cat was believed to occur in deserts (Nowell & Jackson 1996), and perhaps because the colour of the fur is light brown, the Chinese mountain cat was formerly known as the Chinese desert cat or pale desert cat. Other English names proposed are Chinese alpine steppe cat and Chinese steppe cat.

The taxonomic status is unclear. The Chinese mountain cat has commonly been regarded as a species *F. bieti*. However, Haltenorth (1953) and Corbet (1978) stated that, once more specimens became available, analysis would show the Chinese mountain cat to be a subspecies of *F. silvestris*. Recent molecular analysis of three specimens by Driscoll et al. (2007) confirms this suspicion and assigns the Latin trinomial *Felis silvestris bieti*. More recently Kitchener & Rees (2009) reconstructed the dynamic biogeography of the wildcat. These authors believe that current geographical patterns of morphological and molecular variation provide no clear support for the re-designation of the Chinese mountain cat as a subspecies of *F. silvestris*. Instead, Kitchener & Rees believe that distinctive morphology and possible sympatry with Asian wildcats support the premise that the Chinese mountain cat is a distinct species.

### Status and distribution

The Chinese mountain cat is endemic to China and has a very limited distribution (Fig. 2). Very little to no information exists regarding the status or abundance of this elusive Chinese species. Although it



**Fig. 1.** A Chinese mountain cat has been observed in Qinghai in July 2007 (top, photo Z. Ju). A young specimen has been photographed in the wild in Ruogergai county, Sichuan in 2007 (bottom, photo M. Zhang).

has been widely reported across western China, many records are unconfirmed, or have been shown to be misidentified or erroneous by He et al. (2004). These authors examined museum specimens and reports from across China and concluded that the only confirmed specimens of the Chinese mountain cat came from the eastern and north-eastern edge of the Tibetan Plateau in Qinghai and Sichuan. These two provinces account for all confirmed records of the Chinese mountain cat: eastern Qinghai (Xining, Huzhu, Huangzhong, Ledu, Minhe, Lianca, Tongren, Gonghe, Tianjun, Menyuan, Qilian, Haiyan, Gangca, Datong, Dulan, Golmud, Huangyuan, Zekog, Xinghai, Ulan, Madoi, Yushu, and Nangqen) and north-western Sichuan (Songpan, Garze, Dawu, Dege, Zamtang, Kangding, and Jiuzhaigou) (He et al. 2004, Chen et al. 2005, Yin et al. 2007). A survey conducted in the 1950s by the Chinese Academy of Sciences in Xinjiang reported sightings of Chinese mountain cats in the counties of Artux, Wuqia, Baicheng, Yanqi, Markit, Yecheng, Yutian, Qiemo, and Hami, but no specimens were collected and other specimens from Xinjiang were misidentified; reports of Chinese mountain cats from Shanxi, Shaanxi, Ningxia and on the Ordos Plateau of Inner Mongolia are also erroneous (He et al. 2004).

A dubious record from near Chengdu, Sichuan Province, claimed that the Chinese mountain cat occurs sympatrically with the giant panda *Ailuropoda melanoleuca* in montane bamboo forest. However, extensive camera trapping in panda habitat has never yielded a single photograph of a Chinese mountain cat. A second suspect record suggests that the Chinese mountain cat shares certain habitats with the golden snub-nosed monkey *Rhinopithecus roxellana*, but this species inhabits subalpine coniferous and broadleaf forest and occurs nowhere near steppe.

Most reports are from skins collected in markets or villages rather than from actual observations (Nowell & Jackson 1996, Sunquist & Sunquist 2002, Chen et al. 2005). Often the true origin of specimens or skins is unknown and thus not recorded (Nowell & Jackson 1996, He et al. 2004, Chen et al. 2005). Skins collected in one area and sold in another have led to confusion regarding the distribution and habitat of the Chinese mountain cat. Specimens such as those found in Sichuan (Tatsienlu

## Felis bieti

### Fact Sheet

#### Names:

荒漠貓 [whong mo mao]  
Chinese mountain cat  
Chinese desert cat

#### Head and body length:

60-85 cm

#### Tail length:

23-35 cm

#### Weight:

4-8 kg

#### Chinese Population:

<10,000 (IUCN 2010)

#### Distribution in China:

C China, endemic, sparsely distributed

#### IUCN Red List:

Vulnerable C2a(i) (2010)

#### CITES:

Appendix II

#### China Red List:

CR A2abc; C1 + 2a(i)

#### China Key List:

Class II



Photo: E. Kedi

and Songpan) are speculated to have come from the local area or from the borderlands of the extreme western edge of Sichuan Province or from the Tibetan Plateau (Sunquist & Sunquist 2002, Chen et al. 2005).

There are no records of occurrence in any protected areas, and there is no information regarding population trend (Wang 1990, Nowell & Jackson 1996, Yin et al. 2007, IUCN 2010).

#### Habitat

The first photographs of a wild Chinese mountain cat were taken only very recently by camera traps during light snow in May 2007 at 3570 m altitude (Yin et al. 2007; Fig. 3). Additional pictures were taken later in that year (Fig. 1). These photographs were taken in rolling grasslands and brush-covered mountains. The Chinese mountain cat occurs in high-elevation steppe grassland, alpine meadow, alpine shrubland and coniferous forest edges, between 2500 m and 5000 m elevation; it has not been confirmed in true desert or heavily forested mountains (Liao 1988, He et al. 2004, Chen et al. 2005, Yin et al. 2007). Six Chinese mountain cat burrows were located at 3000-3600 m above sea level (Tan 1991). The Chinese mountain cat copes with

extremely high and low temperatures, and moves easily through snow in a windy and seasonally inhospitable habitat (Liao 1988).

#### Ecology and behaviour

Much of the information has been gathered with the help and effort of the Xining Zoo (Nowell & Jackson 1996). The knowledge gained from interviews with local pastoralists is also useful because the Chinese mountain cat has never been the subject of an ecological study (Chen et al. 2005, Yin et al. 2007). Chinese mountain cats are mainly nocturnal and crepuscular; like most wild cats they are solitary (Tan 1991, Chen et al. 2005, Smith & Xie 2008). They rest in burrows during the day and also tend their young in burrows, typically situated on south-facing slopes in the crack between rocks, under a boulder, or in abandoned dens excavated by marmots or badgers. Except during the mating period, males and females live separately. The burrows inhabited by females tend to be deeper and more secure, with only one entrance (Liao 1988). The young animals normally emerge from the burrow in the afternoon to play and also to warm themselves on the rocks.

The reproductive season is from January to March; kittens appear in May. There are



2–4 kittens. The age of independence is between 7 and 8 months (Liao 1988). This information is probably based on observations of a single individual.

### Prey

Rodents (Chinese mole-rats *Myospalax baileyi*, voles *Microtus* spp., hamsters, *Crictulus* spp., gerbils *Meriones* spp., marmots, *Marmota* spp.) and lagomorphs (pikas *Ochotona* spp., hares *Lepus* spp.) are the main prey of the Chinese mountain cat as well as birds such as pheasants, partridges and wild pigeons (Liao 1988, Tan 1991, Nowell & Jackson 1996, Smith & Xie 2008). There are claims that the Chinese mountain cat feeds primarily on various mice species and that in winter when food is scarce, the cat often preys upon domestic fowl and wild birds (Yin et al. 2007). There are reports of Chinese mountain cats hunting mole-rats by first listening for sounds of sub-surface movements within the rat's subterranean tunnels (3–5 cm below the surface), and then digging the rats out (Liao 1988).

### In captivity

What little is known of the Chinese mountain cat in captivity comes from the collection of the Xining Zoo (Nowell & Jackson

1996). The first specimen in captivity was an adult male that was kept at the Beijing Zoo from 1974 until its death in 1978 (Sunquist & Sunquist 2002). A survey in 2000 showed that there were 8 specimens in captivity (4 at the Xining Wildlife Rescue Centre and 4 at the Xining Zoo) even though this report did not include Beijing Zoo (Garcia-Perea 2000). In 2007, the Lanzhou Zoo housed a single adult in an enclosure labelled Asiatic golden cat and only one Chinese mountain cat, a male, lived at the Beijing Zoo captive breeding facility.

### Main threats

There are two threats to the continued existence of the Chinese mountain cat populations: widespread poisoning programs, and the skin trade. Small mammal control programs using poisonous chemicals such as zinc phosphide to eradicate pikas, voles and moles from large areas are sanctioned by the government. Pikas are believed to compete for graze with domestic livestock. Between 1958 and 1978, large-scale poisoning campaigns were conducted in both Qinghai and Sichuan Provinces as well as in Gansu Province and Tibet. The program was terminated with the discovery that carnivores that preyed on pikas were also

victims of poisoning. However, smaller-scale poisonings similar in form continue in Qinghai Province throughout much of the Chinese mountain cat's range and affect both rodents and lagomorphs. Such poisoning programs cause general environmental pollution and are likely to be a human health hazard as well (Smith et al. 1990, Nowell & Jackson 1996, He et al. 2004, Chen et al. 2005).

Direct killing by local pastoralists for the skin trade and for articles of clothing and accessories is also a threat to Chinese mountain cat populations. For instance, traditional hats are made from Chinese mountain cat pelts. Locals kill Chinese mountain cats by either trapping or poisoning the cat. Depending on how often such an event occurs, local pastoralists can with patience and time extirpate a local population one individual at a time (Chen et al. 2005). Skins are sold openly in street-side shops and are commonly found in markets in Xining and southern China (Wang 1990, Nowell & Jackson 1996, Chen et al. 2005). There are no reliable figures for the number of skins in trade and most numbers were gathered through direct observation. In Sichuan Province, thirty pelts were taken in 1980. In 1986, George Schaller counted sixteen Chinese mountain cat skins for sale in the markets in Lingxia, Gansu Province, but reported that they were less common than those of Eurasian lynx (Sunquist & Sunquist 2002). Chinese mountain cat skins were found in three towns (Kangding, Tagong and Luhuo) in Ganzi Prefecture in western Sichuan Province. Local pastoralists confirmed its presence in the vicinity of several villages on the road from Kangding to Bangda village (Chen et al. 2005). Although old records are unreliable, these had led He et al. (2004) to suggest that populations such as around Kangding might well have disappeared.

The illegal fur trade might well still continue. In 1998 and 2001 around 50 skins were reported to be on sale at Songpan and Jiuzhaigou markets, even though the species is protected throughout China by laws such as the National Constitution, the China Wildlife Protection Law, the Wild Animal Protection Law, the Criminal Laws, the Forestry Law, and the Environmental Protection Law (Nowell & Jackson 1996, Li et al. 2000, He et al. 2004). The widespread and open availability of skins suggests that local law enforcement officials are either



**Fig. 2.** The limited distribution range of the Chinese mountain cat, a species endemic to China.



unaware of the law or reluctant to enforce it to stop the trade. Possible records from Qinghai suggest that Chinese mountain cats might also be crossbreeding with domestic cats (W. Bao, pers. comm.).

#### Current and future protection measures

Sanjiangyuan Reserve, Qinghai Lake Reserve and Jiuzhaigou Reserve have been created within the range of the Chinese mountain cat but most of the species' range is not protected (He et al. 2004). He et al. (2004) recommended creating new reserves where the species was not protected and upgrading its status to Category I under Chinese Wildlife Law.

With respect to poisoning control programs, research has found that pikas reach their greatest densities and cause greatest damage when rangeland has already been significantly degraded by domestic stock (Nowell & Jackson 1996), suggesting that authorities should focus their efforts on measures to prevent over-grazing. Healthy predator populations also limit pika numbers at no cost to humans; pikas are an important food source for a variety of carnivores and birds of prey including the Chinese mountain cat (Smith et al. 1990).

Already Wang (1990) recommended that a survey was needed to increase understanding of the distribution and range and to estimate the population size of the Chinese mountain cat. Political action and law enforcement is required to limit illegal hunting and trade (IUCN 2010).



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**Fig. 3.** The Chinese mountain cat was photographed for the first time in a camera-trapping session from March to July 2007 (Camera trap photos Yin Yufeng, A. Drubgyal & J. Sanderson).

BAO WEIDONG<sup>1</sup>

# Eurasian lynx in China - present status and conservation challenges

*Lynx lynx*

**Fig. 1.** Typically coloured lynx from Saihanwula nature reserve in Inner Mongolia..

The Eurasian lynx *Lynx lynx* attracts little attention from scientists despite the availability of funds due to the nation's economic expansion over the past few years. Only two research papers in Chinese were produced, addressing the distribution and food habits of the lynx in northeast provinces and in Xinjiang Autonomous Region (Abdukadir et al. 1998, Tian et al. 2002). With the recent implementation of the national policy for wildlife conservation and nature reserve construction, more and more land is coming under government protection. The habitat of most wild animals is recovering from unplanned mining, deforestation, and agricultural plantation. The local fauna shows hints of population recovery; however for most species, we still know little about their

ecological status. The distribution and population status of Eurasian lynx in China drawn mainly from scientific field surveys in nature reserves are reviewed, and some conservation problems and planning of protection mechanisms are discussed.

## Subspecies taxonomy

The taxonomic classification of the lynx has not been fully resolved. While some scientists recognize two subspecies of Eurasian lynx, *L. l. isabellinus* from Tibet and *L. l. kamensis* from the west of Sichuan Province (Field Survey Team for Tibetan Plateau of Chinese Academy 1986, Gao 1987, Wang 2003a), others consider three subspecies, *L. l. isabellinus* (including *L. l. kamensis* and *L. l. tibetanus*), *L. l. stroganovi*, and *L. l. wardi*. *L. l. wardi* is

sometimes also included into *L. l. isabellinus* (Smith & Xie 2008). Liang (1986) considered them all synonyms and recognized only one subspecies *L. l. isabellinus*. Over most of its distribution this cat is light grey brown with a layer of silver white, and the patches are pale brown or indistinct (Fig. 1, 2). This form is locally referred to as sheep lynx. Individuals from Xinjiang Autonomous Region and Tibet are deep brown with distinct patches; these cats are locally called horse lynx. However, the two colour phases may co-exist in the same area.

## Distribution

The Eurasian lynx is widely distributed from the northeast to the northwest (Fig. 3), and has been reported in the northern part of Yunnan Province of Baimaxueshan Nature Reserve (98.57°–99.21° E, 27.47°–28.36° N), according to local fauna and nature reserve reports (Wang 2003a, Wang 2003b). Specific distribution sites were confirmed by local field surveys when nature reserves were established (Wang 2003b). In northern China the Eurasian lynx is distributed only in the mountainous areas surrounding Daxinganling Mountain. The southern distribution of the Northeast is near the Mulanweichang Nature Reserve at longitude 116.51°–117.45° and latitude 41.47°–42.06°. Distribution areas include the forests in Heilongjiang and Jilin provinces and the northern part of Inner Mongolia in northeast China. It is believed that no lynx have inhabited Liaoning Province since the 1990s (Jin & Qiu 2004) while in the 1980s lynx had been seen at Huanren County in this province (Xiao 1988). In the northwest the lynx is seen almost everywhere in Ningxia, Gansu, and Qinghai provinces as well as western Inner Mongolia, Xinjiang and Xizang (Tibet) Autonomous Region. Lynx are not reported in southern China, indicating that the Eurasian lynx is a palaeartic species adapted to cold weather regions.

## Population dynamics

China conducted a national census of its wild animals in the late 1990s. The lynx population was estimated at around 27,000 animals with Ningxia Autonomous Region as a new distribution province (State Forestry Administration 2009). Additionally, two field surveys were conducted to determine the population trend. One survey covered the area of northeast Heilongjiang and Jilin provinces and the Hulunbeier League in northeastern Inner Mongolia (Tian et al. 2002). The survey was con-



ducted using transects from 1992 to 1997 and a population of  $2023 \pm 299$  lynx over an area of 200,000 km<sup>2</sup> was estimated. Within this large area the density was 2.4 animals/100 km<sup>2</sup> on the east slope of the Daxinganling Mountain with an estimated population of 1341, whereas it was 1.8/100 km<sup>2</sup> on the west slope of Daxinganling Mountain. In other places the population estimates were as follows: 286 at Xiaoxinganling Mountain, 228 around Wandashan Mountain, 168 at the shallow mountain area of the Songhuajiang Forestry Administration, and 232 on the southern portion of Changbaishan Mountain. These population assessments were based on tracks; it was assumed that one track represented one individual. However, the authors did not mention how far apart the transect lines were, and did not indicate whether the footprints were from juvenile or mature individuals. So this number may be an overestimate. The fur harvest was around 70 pieces a year from 1971 to 1975 in Heilongjiang Province (Ma 1986).

The other field survey was in Xinjiang Autonomous Region, where 1532 lynx were estimated in an area of 305,000 km<sup>2</sup> by using the density data of one lynx per 199 km<sup>2</sup> in Europe (Abdukadir et al. 1998). The authors also indicated that the suitable habitat for the lynx shrank by 50% since the 1950s. From 1955 to 1970 there were 237 pelts (around 16 per year) collected by the local fur buying company; the number dropped to 5–10 skins per year from 1970 to 1994 for unknown reasons. At Saihanwula Nature Reserve in north-eastern Inner Mongolia where I conducted a NSFC project, we found the lynx population

## Lynx lynx

### Fact Sheet

#### Names:

猞猁 [she li]  
Eurasian lynx

#### Head and body length:

80-130 cm

#### Tail length:

11-25 cm

#### Weight:

18-38 kg

#### Global Population:

>50,000 (IUCN 2010)

#### Chinese Population:

27,000 (SFA 2009)

#### Distribution in China:

everywhere but SE China

#### IUCN Red List:

Least Concern (2010)

#### CITES:

Appendix II

#### China Red List:

EN A1cd

#### China Key List:

Class II



Photo A. Abdutalip

is recovering steadily, based on footprints in the snow. In 2006 we identified 4 lynx over an area of 800 km<sup>2</sup>. In 2008 we identified between 4 and 14 lynx. We collected winter scats from different areas and gained kidney, liver, and muscle samples from a poached adult male for DNA analysis to determine the genetic background of this individual lynx.

#### Reproduction

In our field survey we also found footprints of a female lynx and her young at Saihanwula

Nature Reserve in January 2009 (unpublished data). Adult individuals spray urine around grass bases in January and February. According to interviews with reserve workers, they found 2 cubs in a litter in late May 1987, whose body length was around 40 cm and weight about 2 kg. The cubs had already opened their eyes and demonstrated attacking behaviour. The cubs were sent to the Beijing Zoo one month later. Other reports indicated that cubs were born in May and June (Gao 1987).



Fig. 2. Photograph of a lynx in Sichuan from February 2009 (Photo Que Pinjia).



### Prey

The biological data on wild lynx were obtained with the help of hunters, herdsmen, and field observation (Gao 1987). However, a systematic study is needed on this widely distributed felid species. Based on scat analysis, the lynx preys on 22 species in Xinjiang and the main diet included roe deer, hare, and blue sheep. In Tibet the prey consisted

of 37% steppe hare, 16% steppe pika, 21% birds, 9% Tibetan antelope, 7% Tibetan gazelle, 4% blue sheep, and 3% Tibetan fox in 21 scats (Liu 1999). The author Liu Wulin from the Tibetan Forestry Administration also indicated that lynx were much less numerous in areas co-occupied by grey wolf. Our scat study in Saihanwula Nature Reserve found the following prey distribution in 26 scats:

81% hare, 31% rodents, 27% birds, and 11% red and roe deer. We also found two cases of raccoon dog hair in lynx faeces; it is unknown whether this prey was hunted or scavenged. The hunting routes of lynx usually follow roe deer to their night beddings; in winter they traverse frozen streams. The lynx can leap over 2.3 m in dense shrub habitat (Fig. 4).

### In captivity

Studies on partial gene sequence analysis revealed that the lynx is phylogenetically distinct from other cat species present in China (Zheng et al. 2005). But the result of this preliminary study was different from other reports (Johnson et al. 2006). The regulatory region of the growth hormone gene was sequenced from a lynx body from Ji'nan Zoo in Shandong Province (Ma & Liu 2001). Studies were also conducted on zoo individuals for disease diagnosis and treatment (Qiu & Xiang 1982, Tian et al. 1992, Zhang et al. 1992, Li & Tang 2006, Zhao et al. 2007). One report described the morphology of the stomach and intestines of a female from Zhenzhou Zoo in Henan Province (Cheng et al. 1998). A paper addressed artificial rearing methods including feeding formula, reproduction management, and disease prevention for guidance on lynx farming from the Institute of Special Agricultural Products of the Chinese Academy of Agricultural Sciences (Wei & Zhou 1996).

### Threats and conservation

Two decades ago factors threatening the lynx included shooting, snaring, poisoning, and removing cubs from dens. Since the Wildlife Protection Law was enacted in 1988, hunting activities have been banned. Strict limits on personal firearm possession from 2000 and associated punishments reduced field hunting sharply. From 2003 to 2008, 31 lynx pelts, 27 small-bore rifles and 19 home-made Tibetan powder guns were confiscated in Qiangtang Nature Reserve in Tibet.

Poaching is presently the main threat to lynx. Poachers do not intend to snare lynx particularly, but are seeking species of high economic value such as red deer, roe deer, goral, antelope and gazelle. Snares are left in the open and present a year-round danger to all wild animals. Some of the nature reserves conduct snare removal efforts. At Hunchun nature reserve in Jilin province, volunteers collected 308 snares and traps in 6 days during December 2005; during another 4-day search in January 2008 they

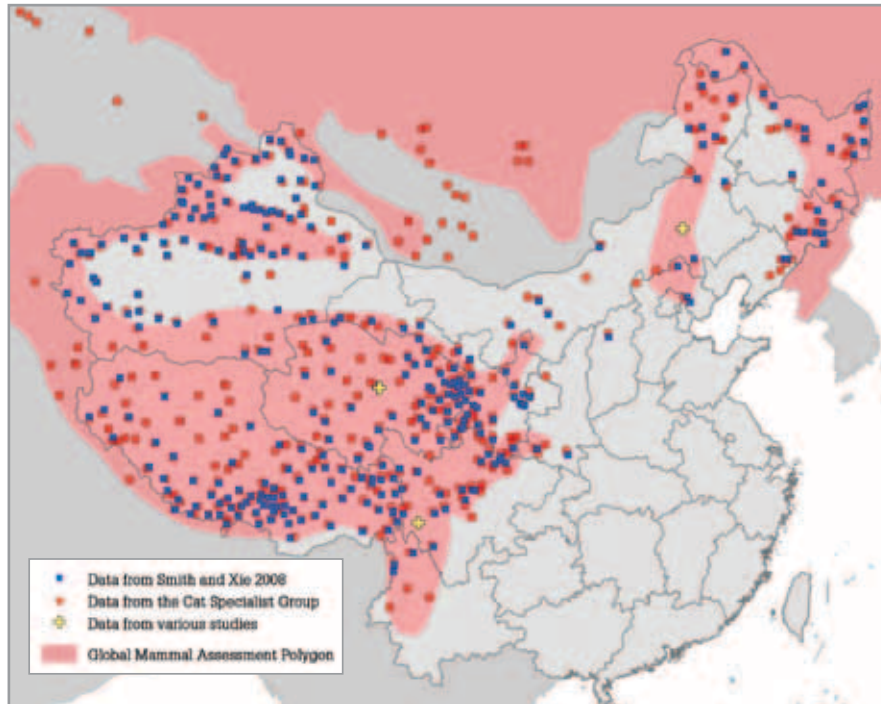


Fig. 3. Distribution of the Eurasian lynx in China.



**Fig. 4.** The leaping traces of lynx in January, Saihanwula Nature Reserve.



**Fig. 5.** Snares cleared at Saihanwula Nature Reserve, central eastern Inner Mongolia.

located and confiscated 511 snares and 3 clips. At Saihanwula Nature Reserve we conducted trap removal efforts during the winters of 2007 and 2008; over 300 snares were collected (Fig. 5). Higher penalties were imposed on 11 poachers; those snaring for hares were fined 2000 Yuan, and for deer 5000 Yuan; this is about half a year's income for local farmers. These penalties curbed poaching behaviour effectively; the footprints of lynx appeared steadily in the core protected areas during 2008. But poaching is still the primary problem for nature reserve managers.

Although the national Law of Wildlife Protection was enacted in 1988 and the provincial governments also issued management regulations, law enforcement is always complicated by Guanxi [the personalized network of relationships and connections]. The situation is more difficult in minority communities such as in western Sichuan, Tibet, and Xinjiang, where local minorities consider clothes or garment decorations from wild animal pelts to be symbols of cultural tradition and higher social dignity. Although more and more land is being set aside in nature reserves, the lynx populations within the reserves are being impacted by the fragmentation of habitat due to expansion of human activities in rural areas. Populations are becoming isolated

from one another. How inbreeding will influence genetic diversity in the long term is an open question.

The Eurasian lynx is listed as a national second class key protected species under strict protection of the Law of Wildlife Protection in China. Lynx habitat has been enlarged thanks to the implementation of the project of Wildlife Conservation and Nature Reserve Construction. The number of national grade nature reserves has expanded from 243 in 2005 to 303 in 2008. As of 2008 there are over 2500 different classified reserves in the mainland; additionally, the quality of staff, facilities, and checking stations are much improved. Some of the nature reserves have implemented monitoring programs addressing predator-prey relationships and food supply, which have helped ungulate recovery (Sun 2005). These monitoring programs revealed that takin, giant panda and mainland serow increased more than 3% at Changqing nature reserve (Yuan et al. 2003), and the provisioned feeding accelerated the blue sheep population's recovery to a state that will destroy the habitat vegetation at Helan-shan reserve (Liu & Wang 2006).

### Conclusion

Eurasian lynx is a widely distributed medium-sized felid in China. We know of the cat's bio-

logical attributes from hunters and trophies taken during hunts for pelts and traditional medicine during the 1960s. A few reports were published on disease diagnosis, feed processing and captive breeding based on zoo animals. Populations inside protected reserves are recovering thanks to law enforcement addressing poaching and the increase in reserve numbers. Detailed studies on protected populations are needed to assess species status, including the segregation of subspecies and their possible distribution in China. Genetic diversity should be included in monitoring programs to detect impacts of habitat fragmentation on genetic health.

### Acknowledgements

This paper was supported by the National Key Project of Scientific and Technical Supporting Programs Funded by Ministry of Science & Technology of China (No.2008BADB0B01) and National Natural Science Foundation of China (No. 30570305). We are grateful to Urs Breitenmoser and two reviewers for comments on early drafts of this manuscript.

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YU JINPING<sup>1</sup>

# Leopard cat

*Prionailurus bengalensis*



**Fig. 1.** During a photo trapping session in several giant panda reserves, the leopard cat was the most prevalent species. From top to bottom: Wanglang National Nature Reserve in May 2005, Xuebaoding National Nature Reserve in April 2007, Shengguozhuang Nature Reserve in August 2008 (Photos Peking University, Smithsonian National Zoo Park, World Wildlife Fund and Shanshui).

The leopard cat *Prionailurus bengalensis* is approximately the size of a domestic cat, but with longer legs. The tail is about 40–50% of the length of head and body. The ground colour can be a pale to a reddish or greyish yellow. Individuals from the north are pale silver grey, whereas those from the south are yellow, ochre or brownish. Especially northern individuals have black or rusty brown spots and blotches varying in size and covering their entire body (Fig. 1). The spots can form stripes on the neck and back. The underbelly and neck are white. The tail is spotted, with a few indistinct rings near the black tip (Yu & Wozencraft 1991, Sunquist & Sunquist 2002). Spot patterns vary greatly from one individual to the next.

## Status and distribution

The leopard cat has the broadest geographic distribution of all small Asian cats. It is found in much of Southeast Asia. Range countries include: Afghanistan, northern Pakistan (Yu & Wozencraft 1991), India (e.g. in the Arunachal Pradesh; Mishra et al. 2006), Nepal, China (Lu & Sheng 1986b, Yu & Wozencraft 1991), Korea (Nowell & Jackson 1996), Russia (e.g. in the Amur basin; Yu & Wozencraft 1991), Bhutan, Myanmar, Bangladesh, Laos, Cambodia, Vietnam, Thailand (Sunquist & Sunquist 2002), Malaysia (e.g. in the Jerangau Forest Reserve; Azlan & Sharma 2006), Singapore, Brunei Darussalam, Indonesia (IUCN 2010), Japan (Irimote and Tsushima islands; IUCN 2010), Taiwan, and the Philippines (Yu & Wozencraft 1991).

The leopard cat seems to be common across much of its range, e.g. China and Thailand (Sunquist & Suquist 2002). Leopard cat populations are stable in many areas and the species' high adaptability enables it to thrive even in altered habitats such as palm oil plantations (IUCN 2010). However, according to the IUCN Red List (2010), the species seems to be in decline in some parts of its range. Island populations are most vulnerable, but it is also said to be declining in Bangladesh, and vulnerable in India. Nowell & Jackson (1996) expressed concern about the species' status in the Russian Far East where the population is small and restricted to the Amur Region.

The leopard cat is widely distributed over China (Fig. 2) and exists probably in relatively large numbers compared to other felid species. With the exception of the deserts in the west, dry wilderness areas, and central parts of the Qinghai-Tibet Plateau, it is distributed all over the country (Lu & Sheng 1986b, Smith



& Xie 2008). In the 1990s leopard cats have even been reported from the outskirts of Beijing, where they were thought to have disappeared years ago (Nowell & Jackson 1996). However, only very few studies have really looked into the present status of the leopard cat. According to two studies in Yunnan in 2005 and in 2006-2007, leopard cats are thought to be common in both the Nangunhe National Nature Reserve and the Xishuangbanna region (L. Feng, pers. comm.). Smith & Xie (2008) distinguished 4 subspecies in China: *P. b. alleni* on Hainan Island; *P. b. bengalensis* in southwestern Guangxi, southwestern Guizhou, Sichuan, southern Tibet, and central, western and southern Yunnan; *P. b. euphilurus* in northern Anhui, Beijing, Hebei, Heilongjiang, Henan, northern Jiangsu, Jilin, Liaoning, Nei Mongol, Shandong, and Shanxi; and *P. b. chinensis* in the rest of the species' range in China. Wang et al. (1996) argued that *P. b. scripta*, found in northern Yunnan, western Sichuan, southeastern Qinghai, southern Shanxi and Gansu, Ningxia, Shaanxi, northwestern Guizhou, and eastern Tibet, should be a valid subspecies. However, this remains controversial (Smith & Xie 2008). More recent evidence even suggests that *P. b. euphilurus* is not a valid subspecies as it is too similar to *P. b. bengalensis* (IUCN 2010).

The two subspecies *P. b. bengalensis* and *P. b. chinensis* were estimated to number 1.5–2 million in China in the 1990s (Anonymous 1996a). Even though hundreds of thousands were trapped for the fur trade in the 1980s (Sunquist & Sunquist 2002), leopard cats still seem to be fairly common. But a decline in harvest in the last years of legal trapping may be an indication for over-hunting (Wang 1998). Reasons for the leopard cat's relative abundance in China compared to other cat species may include its use of a wide range of habitats, better adaptation to human settlements, and fewer large predators it has to compete with, since those are overhunted or exterminated in certain areas (Lu & Sheng 1986b).

#### Habitat

In China, the leopard cat's habitat varies widely. It occupies temperate, subtropical and tropical habitats, including primary and secondary forests, hill forests, shrubs and grasslands, but it is thought to prefer secondary forests, and forest fringes. It is less common in the arid areas of the north and northwest, as well as high mountain shrubland and highland grass habitat. It also lives in man-

## Prionailurus bengalensis

### Fact Sheet

#### Names:

豹貓 [bao mao]  
leopard cat

#### Head and body length:

36-66 cm

#### Tail length:

20-37 cm

#### Weight:

1.5-5 kg

#### Global Population:

unknown

#### Chinese Population:

unknown

#### Distribution in China:

everywhere but W China

#### IUCN Red List:

Least Concern (2008)

#### CITES:

Appendix II

#### China Red List:

VU A1acd

#### China Key List:

not listed



Photo A. Sitwa

made economic forests (e.g. rubber and tea plantations and pine forests etc.) and agricultural landscapes, and is often seen near villages (Lu & Sheng 1986b, Yu & Wozencraft 1991, Wang et al. 1996, Sunquist & Sunquist 2002, L. Feng pers. comm.).

#### Ecology and behaviour

Leopard cats are often described as nocturnal, but they can be active during the day, and peak activity varies individually. They are known to be solitary, but can also be found in pairs (Fig. 3), mostly during their mating season. Leopard cats are good climbers; Rabinowitz (1990) described them as arboreal to some extent, but resting sites are in most cases on the ground in dense cover. In the wild, birth dens have been found in hollow trees, among bushes, under overhanging rocks in small caves, under big roots, and between rocks. They are excellent swimmers, and show an affinity towards water (Yu & Wozencraft 1991, Nowell & Jackson 1996). There is no information about home range size in China, but studies made in Thailand showed home ranges of 4.1 km<sup>2</sup> for males and 2.5 km<sup>2</sup> for females in seasonal evergreen forest in south-central Thailand (Grassman 2000) and 12.4 and 14 km<sup>2</sup> for males and females respectively in north-central Thailand (Grassman et al. 2005). In the Khao Yai National Park home ranges measured

5.6 km<sup>2</sup> for males and 4.3 km<sup>2</sup> for females from March 1998 to October 1999. Austin et al. (2007) found that leopard cats used larger areas during the wet season compared to the dry season. In a study at the end of the 1980s on Iriomote Island, male leopard cats had an average home range of 2.96 km<sup>2</sup> and females of 1.75 km<sup>2</sup> (Sunquist & Sunquist 2002).

Leopard cats in the northern part of their range usually bear their young in May, but they can breed all year around in the tropical southern regions (e.g. Java). In captivity they may breed twice a year, but in the wild they probably breed only once (Lu & Sheng 1986b, Sunquist & Sunquist 2002). The litter size is 1–4, usually 2–3 kittens. Age of sexual maturity is as early as 8 months to a year in some records (Nowell & Jackson 1996), in others at 18–24 months (Yu & Wozencraft 1991). They can live up to 15 years in captivity (Nowell & Jackson 1996). Leopard cats have been known to hybridize with domestic cats and produce fertile, viable offspring (Sunquist & Sunquist 2002).

#### Prey

Small mammals, mainly rats, mice, shrews, moles and hares have been recorded as the prey of leopard cats in China, Russia, the Philippines, Java, Bangladesh, Japan, and Thailand (Nowell & Jackson 1996, Grassman 2000, Sunquist & Sunquist 2002, Grassman

et al. 2005, Austin et al. 2007). Khan (2004a) found in a study in Bangladesh mice and rats in 52.4% of 21 leopard cat scats. The cat's diet also includes primates such as langurs, other mammals such as ground and flying squirrels (Pakistan; Roberts 1977), bats, and flying foxes, as well as birds such as swallows, fowl

and other game birds (Pakistan; Roberts 1977), and possibly young ungulates such as roe deer (Heptner & Sludskii 1992) and mouse deer (India). Reptiles such as lizards and skinks, amphibians, insects, eels and other fish, crabs and occasionally carrion and herbs are also taken (Sunquist & Sunquist 2002, Smith & Xie

2008). Watanabe et al. (2003) identified 46 prey species in 156 scats on Iriomote Island. Leopard cats are also known to kill poultry and domestic fowl (Yu & Wozencraft 1991, Sunquist & Sunquist 2002).

### In captivity

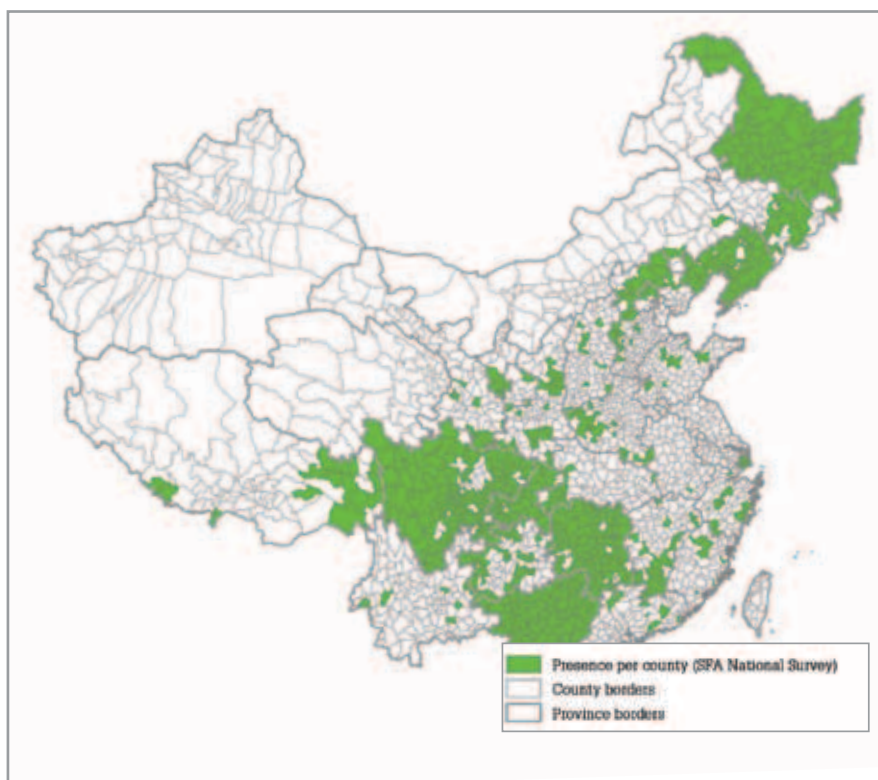
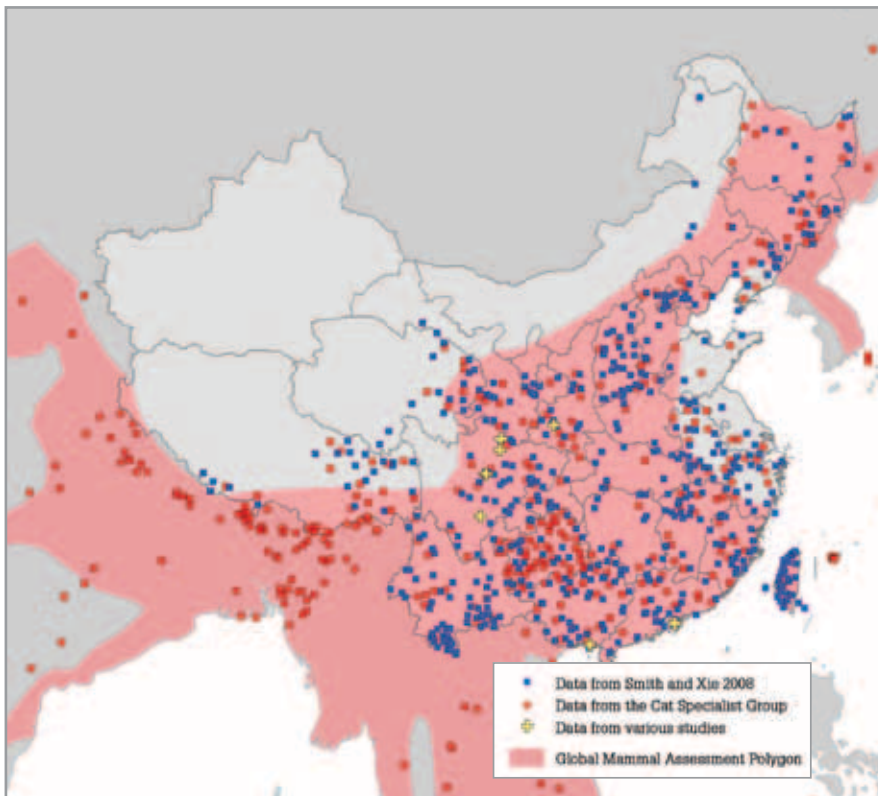
It is likely that a large but unknown number of leopard cats live in captivity in Asian and European zoos. They are regularly found in zoos, and in the pet and fur trade, but the species is not well represented in ISIS zoo collections (Sunquist & Sunquist 2002). Chinese zoos have no interest in small cats and as such only a few zoos keep or have kept leopard cats in China. The leopard cat is widely used to crossbreed with domestic cats resulting in hybrids for the pet trade.

### Main threats

In China, commercial exploitation has been heavy for the last several decades, especially in the southwest (Nowell & Jackson 1996, IUCN 2010). The earliest available harvest numbers are from 1952 and add up to around 14,000 skins from the provinces of Jiangxi, Hunan, Hubei, Henan, Guizhou, Guangxi, and Yunnan. By 1981 this number had risen to 38,000 skins for the same provinces (Johnson & Yu 1996). From the mid to the end of the 1980s over 10,000 furs were harvested annually from each of Yunnan, Guangxi, Hubei, Hunan, Jiangxi, Guizhou, and Sichuan Provinces, estimated at a total of up to 400,000 skins per year, of which 100,000 to 200,000 were exported annually. In 1985-1988 very high estimates sometimes exceeded 400,000 skins and at least half of these skins came from Yunnan and Guizhou Province alone. Many of these skins were exported to Europe until their import was banned in 1988, due to concerns over the species' status. Skins were also exported to Japan (50,000 skins in 1989), as well as surrounding regions (e.g. Nepal, Kashmir). Most of the trade was done through Chinese companies specialized in trade and probably all of the traded animals are from the wild (Yu & Wozencraft 1991).

While export numbers were still high in 1988 (nearly 200,000 skins), they started to decline from less than 100,000 skins in 1989 to 8,000 in 1992 until export was suspended in 1993 (Johnson & Yu 1996).

Major threats for this species in China in the past were over-harvesting and habitat loss with the strong deforestation during the rapid expansion of the human population (Yu & Wozencraft 1991, Johnson & Yu 1996, Nowell



**Fig. 2.** Distribution of the leopard cat in China.



& Jackson 1996, Wang et al. 1996, Sunquist & Sunquist 2002, Shepherd & Nijman 2008). Nowadays, the extent of direct persecution in form of illegal harvest and of indirect persecution through secondary poisoning of rodents is however not known. The leopard cat may profit from the rural exodus, the reforestation and the decrease in commercial harvest (see below), but there is no study available on the long-term population trends.

Outside China, small and isolated island populations are seriously threatened in the Philippines and Japan (Johnson & Yu 1996, Nowell & Jackson 1996). Broad scale habitat modification and forest clearance for agriculture and plantations are major threats across the species' range, as these habitats then lack the understory necessary for the cats' prey to survive (Sunquist & Sunquist 2002). While the leopard cat appears to be more tolerant of these disturbed areas of deforestation and habitat alteration (where it is still encountered in higher numbers, compared to other small Asian felids), it probably also undergoes higher mortality in such areas (Nowell & Jackson 1996, IUCN 2010). Leopard cats are widely viewed as poultry pests and retributational killing occurs (IUCN 2010). They are apparently eaten as a delicacy in parts of their range, and also captured alive and sold as pets, e.g. in Sumatra. Another problem is hybridization with feral domestic cats, which was observed in the wild. In North America and Europe, domestic cat breeders artificially cross pure leopard cats with a variety of domestic cats to produce hybrids sold as "bengal cat" or "safari cat". (Nishimura et al. 1999, Sunquist & Sunquist 2002, IUCN 2010).

#### Current and future protection

An international call in 1992 discouraged leopard cat fur import from China until the following conservation recommendations were implemented. These recommendations included: (1) adequate protection should be provided by provincial or national legislation, clarifying the legal status, controlling wild harvests and exports and enforcing quotas, as well as regulating international trade; (2) all inventory stockpiles should be labelled with the company name and numbers of skins as they are inventoried (not as they enter trade); (3) where trade is illegal, prohibitions should be enforced by provincial Forestry Bureaus; (4) in-depth studies of the relationship between the number of animals harvested and harvest effort (mostly in Guizhou and Yunnan)



**Fig. 3.** On rare occasions one can also find several individuals in a group. This is a mother and her young with another adult individual. The photo was taken in Wanglang National Nature Reserve in August 2004 in Sichuan (Photo PKU, NZP, WWF & Shanshui).

should be conducted; and finally (5) a viable management program for leopard cats should include enforceable harvest quotas in the provinces and field studies to gather ecological data (CITES 1992, Johnson & Yu 1996). Chinese export of leopard cat skins was suspended in April 1993. At that time, the Chinese authorities declared a stockpile of roughly 800,000 skins and said that there had been no legal taking of skins since 1989. China's CITES Management Authority stated that no export of skins or products not already held in stock was permitted until a previously announced field survey had been completed and a succeeding management program established (Yu & Wozencraft 1991, Anonymous 1992, Anonymous 1996b, Nowell & Jackson 1996). Because the systematic field survey had not been completed, after the old stockpile from the 1990s had been gradually exported to exhaustion, no export permits were issued in subsequent years. There may be limited consumption in China's domestic market, but the number should be low (perhaps a thousand or so yearly). This may indicate that the hunting pressure on the Chinese leopard cat populations has been dramatically reduced in recent years. China's massive natural forest protection campaign since 1998 may also be tremendously helpful for habitat recovery, which should be beneficial for the leopard cat. Nevertheless, until comprehensive status and trade surveys sup-

ported by population ecology studies of the leopard cat have been carried out, the status of leopard cat populations remain unclear. Such surveys should be encouraged in the future as the results will be valuable for effective conservation and possibly sustainable use of the species (Anonymous 1992).

In India, Bangladesh and Thailand the cat is on Appendix I, which bans international trade (Anonymous 1996b, IUCN 2010). The species is protected at the national level over part of its range, with hunting prohibited in Bangladesh, Cambodia, Hong Kong, India, Indonesia, Japan, Malaysia (except Sabah), Myanmar, Nepal, Pakistan, Philippines, Russia, Thailand and Taiwan, and with hunting and trade regulations in place in South Korea, Laos and Singapore (Nowell & Jackson 1996). In China the leopard cat is not listed as a national key protected species, and therefore there is no legal protection outside protected areas. As a consequence of the lack of protected status, the leopard cat was not included in the State Forestry Administration's countrywide survey (State Forestry Administration 2009). To include the species in future surveys would be a first step towards a continuous monitoring of the leopard cat populations.

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# Leopard

## *Panthera pardus*

The leopard *Panthera pardus* is the most widely distributed big cat species in the world, living in all tropical and temperate zones of Africa and Asia with the exception of open deserts. The species is considered Near Threatened in the IUCN Red List, but certain local populations have gone extinct, and two subspecies, the Arabian leopard *P. p. nimr* and the Amur leopard *P. p. orientalis* (Fig. 1) are Critically Endangered. The classification of subspecies is debated. For China alone, 17 subspecies have been described (Smith & Xie 2008), but new research has shown that such splitting is not justified. Uphyrkina et al. (2001) recognised for China *P. p. orientalis* in the northeast, *P. p. japonensis* in central-east, *P. p. delacouri* in the south, and *P. p. fusca* in the west (Fig. 2), whereas Smith & Xie (2008) considered *P. p. delacouri* synonymous with *P. p. fusca*. In China, the leopard is a Class I protected species. In 2001, the State Council approved the Overall Plan of National Wildlife Conservation and Nature Protected Area Construction Engineering, presented by the State Forestry Administration (SFA). According to this plan, tigers and leopards are among 13 especially important species for conservation and restoration.

Leopards show a considerable size variation, weighing from 30 to 90 kg. Leopards in open country tend to be larger than forest-living individuals (however, the smallest subspecies is *P. p. nimr* from the Arabian Peninsula); and those in the north and in the mountains are bigger than those in the south or lowlands. Leopards in the Himalayas are larger and have bigger

spots (Dobroruka 1964). Throughout the range, adult males are invariably larger than females (Sunquist & Sunquist 2002). The pelt colour is golden, ochre, orange-tawny to pale-red or greyish-yellow, with distinct black or dark brown spots forming rosettes on neck, shoulders, flanks, back, hips, and upper limbs. The tail is an amalgam of rosettes, spots, and rings, and the tip is black above and white below. Leopards in arid areas are paler than specimens from humid forests. Melanistic leopards are found in southern Asia including China (Pocock 1930, Sunquist & Sunquist 2002). Northern Chinese leopards have a brighter pelage, almost tawny buff (Dobroruka 1963).

### Habitat

The leopard is a highly adaptable species, able to exist in a number of very different habitats. Basically, leopards can exist in any landscape that offers sufficient prey of adequate size and good cover to stalk it (see frontispiece). They live mainly in forest habitats, but also in more arid landscapes such as savannahs, grasslands, scrubland, rocky semi-deserts, and in rugged mountains up to 5,000 m. Leopards sometimes occur in human-made habitats such as plantations and even in human settlements like the outskirts of large cities (Sunquist & Sunquist 2002).

### Ecology and behaviour

Leopards live solitarily; individuals of the same sex do not share home ranges. Male ranges overlap with one to several female ranges (Sunquist & Sunquist 2002, Simcharoen

et al. 2008). Home range sizes are not known from Asia. In Africa, home ranges of females range from 10–50 km<sup>2</sup> with a maximum of 500 km<sup>2</sup> (South Africa), those of males vary from 20 to several hundred km<sup>2</sup>, depending on the productivity of the habitat, prey availability and competitors (Marker & Dickman 2005). Reproduction is seasonal throughout the range except the tropics, but may vary greatly from place to place (from winter to the dry season in July), depending on when prey is most available to raise kittens. Litters usually consist of 2 (1–3, exceptionally up to 6) cubs. Young leopards stay with their mothers until she gives birth to the next litter. Sexual maturity in the wild is at age three, in captivity sometimes a year earlier (Sunquist & Sunquist 2002). In captivity, leopards can live up to 20 years.

### Prey

Leopards have a wide range of prey species, but they are typical ambush and stalk hunters of smaller ungulate species. They prey on musk deer, takin, goral, sambar deer, wild goat, chital and hog deer, occasionally on porcupine, hog badgers, wild pig, serow, hares, rodents, primates, birds, but also on all kinds of livestock, including dogs in the vicinity of settlements (Reid & Wang 1989, Johnson et al. 1993, Nowell & Jackson 1996). Specifically for China, leopards have been reported to feed on tufted deer and bamboo rats (Johnson et al. 1993). In Heilongjiang and Jilin, they preyed on roe deer, wild boar, red deer, sika deer, Manchurian hare, badger, and black bear (Yang et al. 1998, Sun et al. 1999).

In Asia, leopards may compete for food with other large carnivores such as hyaenas or dholes, and especially tigers (Sunquist & Sunquist 2002). Their distribution range also marginally overlaps with snow leopards (Nowell & Jackson 1996). Leopards tend to be less active, more nocturnal and more arboreal in tiger habitats and in proximity to human settlements (Z. Wu, unpublished data).

### Status and distribution

There are no reliable estimates of global population size, and the most commonly cited estimate of over 700,000 leopards in Africa (Martin & de Meulenaer 1988) is flawed (see Fact Sheet). In Asia, the leopard was originally widely distributed south of about 45°N. Across southwest and central Asia, leopard populations are small, separated and isolated; distribution and present status is however poorly known in most central Asiatic countries.



Fig. 1. Amur leopard from the Primorsky Krai, Russia (Photo D. Miquelle).

Leopards are believed to be still relatively abundant in the forests of the Indian sub-continent, through Southeast Asia and into China, although they are becoming increasingly rare outside protected areas (Nowell & Jackson 1996, IUCN 2010). In China, they are still present throughout the east, centre and south (Fig. 2). In the 1950s, national campaigns to eradicate pest animals – including tigers and leopards – had a considerable impact on the populations, mainly in the south. Based on purchased skins, 2,000–3,000 leopards were killed each year during the mid 1950s (Shoemaker 1997).

The Critically Endangered Amur leopard has been reduced to a very small population in Russia, China, and possibly North Korea. The 2007 census revealed 25–34 animals remaining in the wild (ScienceDaily, 18 April 2007). Although *P. p. orientalis* is extremely rare compared to the other subspecies, we know much more about leopards in northeastern China than about those in the rest of the country, because the Amur leopard has received much attention and has also profited from field research and conservation activities focussing on Siberian tigers (Han 2001). In the 1950s, the leopard was widely distributed over the Changbaishan, Greater Xing'an, Lesser Xing'an and Wandashan Mountains. The size of the leopard population at that time was not known, but their numbers were believed to be much higher than the 200 Siberian tigers estimated in the 1950s. By the 1970s, leopard numbers were diminished in the Greater Xing'an Mountains and almost extinct in the Lesser Xing'an Mountains (Ma 1986). In the 1980s, they had disappeared from the Lesser Xing'an Mountains and the Longgang segment of the Changbaishan Mountains, and by the end of the 1990s, leopards were found only in the Laoyeling, Dalongling, and Ha'erbaling part of Zhangguanailing of the Changbaishan Mountains, with no more than 7–12 individuals estimated (Z. Wu, unpublished data).

#### *Jilin Province*

According to records in the 1950s, the leopard was found in Hunchun, Wangqing, Antu, Yanji and Dunhua in the Yanbian Korean Autonomous Prefecture of Jilin Province, in the Ji'an, Jingyu, Liuhe and Huinan counties of Tonghua City, in the Changbai and Fusong counties of Baishan City, and in the Jiaohe, Shulan and Huadian counties of Jilin City (Zhang et al. 1997). During the late 1950s to late 1960s, the statistics of furs in the sectors of native products, supply and sales and foreign trade

## Panthera pardus Fact Sheet

#### Names:

豹 [bao], 金钱豹 [jin qian bao], 文豹 [wen bao]  
leopard

#### Head and body length:

100–191 cm

#### Tail length:

70–100 cm

#### Weight:

30–90 kg

#### Global Population:

>700,000 (IUCN 2010)

#### Chinese Population:

<4,000 (SFA 2009)

#### Distribution in China:

widely distributed in E, C  
and S China

#### IUCN Red List:

Near Threatened (2008)  
Amur leopard: Critically  
Endangered C2a(ii);D (2008)

#### CITES:

Appendix I

#### China Red List:

CR A1acd (Amur leopard)

#### China Key List:

Class I



Photo A. Sitwa

in Jilin Yanbian prefecture reported 52 leopard furs purchased in two years, indicating still rich wildlife resources. Throughout the 1970s to 1980s, information on leopards was extremely scarce. Economic wildlife zoography of southwest Changbaishan revealed that leopards were still present in Shiyidaogou, Shisandaogou, Malugou, and Baoquanshan of Changbai County, in Manjiang of Fusong County and in Dongbeicha of Hunjiang City (Anonymous 1996b). In 1975 and 1982, reports of snared leopards came from Hunchun in Yanbian Prefecture. Surveys in the Changbaishan Mountains estimated the population to be 45 leopards in 1976/77, and 30 in 1982/83 (Yang et al. 2000). The social economic survey in the early 1990s revealed 22 reports of leopards, interpreted in an expert analysis as the presence of 18 leopards. However, during the 1992–1994 wildlife survey, no leopard tracks were found in the Changbaishan Mountains (Wu & Piao 1995). The joint Sino-Russian-American expert survey in 1998 in Jilin revealed leopard presence in only two regions with not more than 4–7 animals. In Dalongling, the best remaining area, and Hunchun in Yanbian Prefecture with a total area of 3,240 km<sup>2</sup>, 3–6 leopards were estimated. In Ha'erbaling, a narrow mountain ridge of 250 km<sup>2</sup> north of

Antu County of Yanbian Prefecture, only one leopard was identified (Yang et al. 1999). In 2006, 10 years after the hunting ban of 1996, a territorial wildlife survey for Jilin did not reveal any additional area of leopard presence besides the already known leopard in southwestern Changbaishan. But the leopard occurrence in Jilin is still estimated to be 4–7 individuals (Wu et al. 2006).

#### *Heilongjiang Province*

Information about leopards in Heilongjiang Province is scarce. According to limited historical materials, there were leopards living in the Greater and Lesser Xing'an Mountains in the 1930s, but they were hardly ever seen in the 1960s. According to the Heilongjiang provincial wildlife resource survey, leopards had disappeared from the Greater Xing'an Mountains in the 1970s, and from the Lesser Xing'an Mountains in the 1980s (Ma 1986). In 1999, Heilongjiang Province collected 25 valuable records of leopards by means of questionnaires, a field trip and a wild route sampling survey. The analysis resulted in an estimation of 3–5 leopards, namely 2–3 in Suiyang, Bamiantong and Muling of the south Laoyeling Mountains, one in Linkou in the north of Zhangguangcailing, and possibly



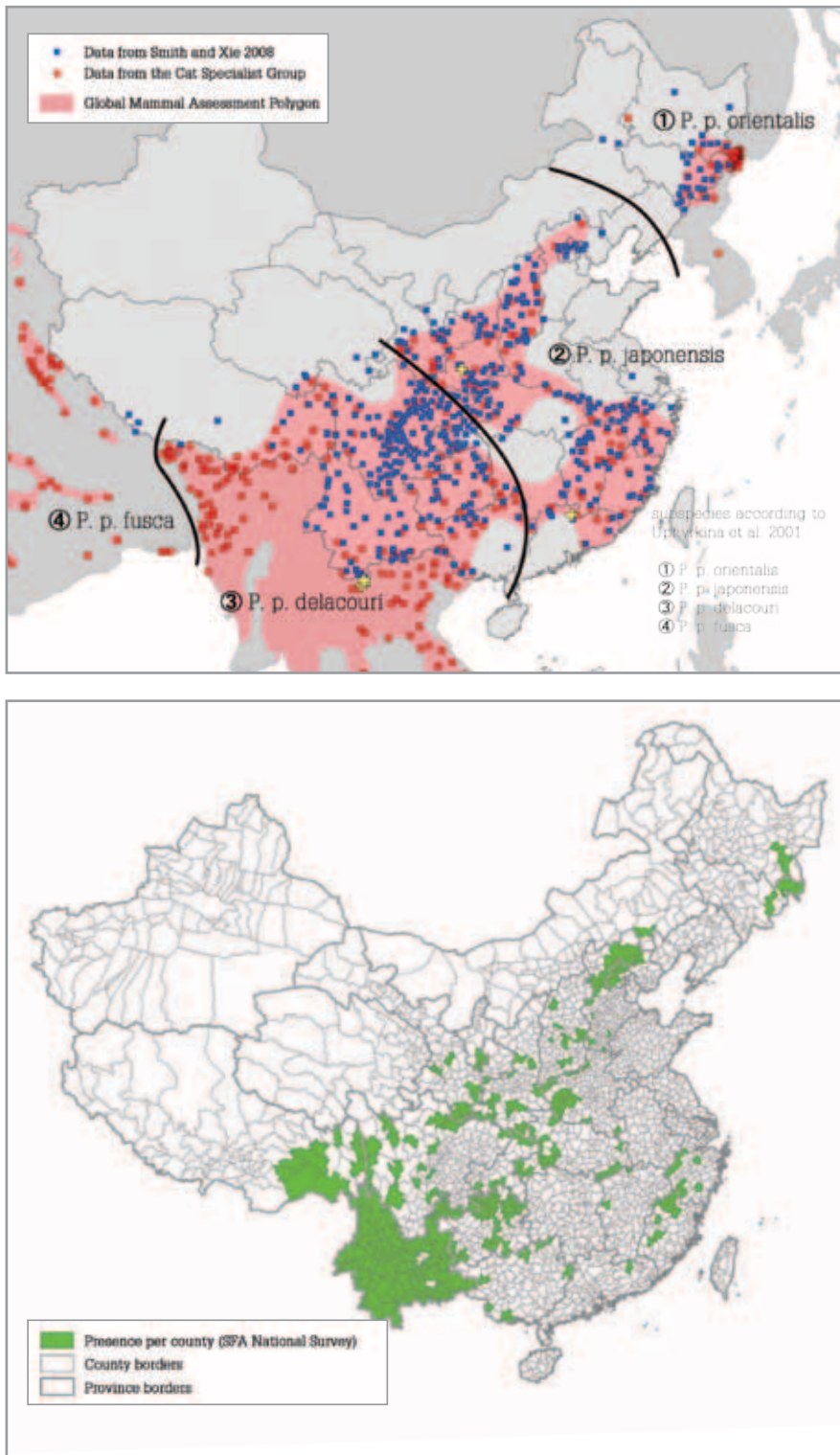


Fig. 2. Distribution of the leopard in China.

one individual in Dahailin and Dongjingcheng (Zhang et al. 2005). Since 2000, leopard tracks have been found in several cases during tiger surveys, namely in Hunchun and Wangqing (Dalongling Mountains, Jilin) and in Suiyang (Laoyeling Mountain, Heilongjiang). At the same time, supposed signs of leopards were found in the Lushuihe Forest Farm in the south Changbaishan, at Shiwudaogou river in Erdaogou, Changbai County, and north of Yalu

River, Huangnihe (south of Zhangguanailing Mountain). These surveys were carried out by local nature reserve staff and experts during routine or training surveys (Changbaishan Amur Tiger Dynamic Research; Z. Wu, unpublished data). The leopard has gained the attention of the Jilin and Heilongjiang authorities, but a conservation strategy and effective and practical actions are still lacking.

### Central and south China

Although the subspecies *P. p. japonensis* and *P. p. delacourii* (Fig. 3) in central and south China seem to be more common than the Amur leopard, no detailed information on the status of the populations is available. The general distribution area is still relatively large, stretching from the southern borders of China north to Beijing, but a county-based raster survey (Fig. 2, below) indicates that the distribution area is highly fragmented, with the exception of the Yunnan Province and the Saluën and Mekong valleys in Tibet Province. In Ningxiang, estimates were of about 10 individuals in the 1980s (Tan 1984); by 1997, leopards in Guangdong, Guangxi, Hubei, Anhui, Zhejiang, and the southern parts of Henan and Shaanxi were declared to be rare (Shoemaker 1997). The Global Mammal Assessment distribution (Fig. 2, above) seems to be too optimistic and outdated. No estimation of leopard numbers is possible, and local population trends are unknown. However, considering the reduced and fragmented distribution of the species across China, the estimation of some 10,000 leopards reported by Ma (1998) is no longer realistic. In fact, the situation of the leopard may indeed be worse even than the State Forestry Administration survey suggests.

### In captivity

Before 1997 there were approximately 50 leopards in Chinese zoos, most of them born in captivity. Many of the leopards collected for zoos originated from north-central China (Shoemaker 1997).

### Main threats

Leopards were persecuted – hunted, snared or poisoned – by locals as livestock raiders or because they were considered dangerous to people (e.g. in Hubei; Tan 1987a, WWF 1989, Li 2001). Indeed, leopards were reported to kill humans (Sunquist & Sunquist 2002). They were also hunted for furs and sometimes leopard bones had become scarce (Tan 1984, Johnson et al. 1993). Leopards were traded as live animals for circuses and zoos, but more often their furs and other body parts were sold for high prices on markets (e.g. in Beijing; Tan 1987a). Hunting leopards has been illegal since 1996, but the continued decrease of the population indicates that the persecution did not stop. Leopards also suffer from depletion of prey, especially wild ungulates, which are illegally hunted as well (Hornocker 1999, Sun et al. 1999, Han 2001). One of

the most important threats today is habitat fragmentation through logging, farming, mining, expanding settlements and traffic lines (Hötte 1999, Sun et al. 1999, Korkishko 2001). This leads to increasingly isolated small and hence vulnerable populations, which suffer from more intraspecific competition, increasing conflicts with people as a consequence of livestock predation, and eventually from inbreeding and genetic depression (Han 2001, Korkishko 2001, Li 2001).

### Assessment of the situation and future protection

Compared to other large cats such as tigers or snow leopards, leopards receive very little attention and limited funding. The notorious lack of scientifically robust and up-to-date information leads to a too optimistic assessment of the status of leopard populations or to ignoring their decline. There is a general belief that leopards are persisting well and are still widespread in south and east Asia, but this might be an erroneous assumption. In a recent essay, Singh Bindra (2010) warned that leopards in India might disappear faster than tigers. Lu et al. (2010, this issue) stated that leopards survived better than tigers in China because they require individually less space, hunt a greater variety of prey and were hardly used in TCM. But the authors stressed that there is a general shortage of information on numbers and distribution of leopards, and that today, the main threats are lack of suitable habitat and of sufficient prey. Only protected areas are believed to be safe havens for leopards. Lu et al. (2010, this issue) pointed out that leopards are key protected animals in no fewer than 20 Chinese reserves. However, even in reserves the situation of the leopard may be not as good as

assumed. Li et al. (2010) conducted extensive camera trap surveys in 11 nature reserves in south-central China. Leopards were detected in only one reserve (Changqing NR in Quinling; see frontispiece), although they show up in the official mammal lists of 10 of the sampled reserves. For no other species was the discrepancy between “expected” and “detected” so striking.

An exception from the general neglect is the Critically Endangered Amur leopard, but only in recent times (WCS 2001). There is nowadays a very close relation between leopard and tiger conservation in the Russian Far East and in China’s Heilongjiang and Jilin Provinces (Han 2001), and many of the conservation measures taken are valid for both large cats. A recovery plan has been developed for the Amur leopard; its success mainly depends on the transboundary cooperation between Russia and China, and potentially North Korea. National and regional wildlife conservation agencies, scientific institutions, and several conservation NGOs are presently implementing projects to improve awareness and mitigate conflicts, promote protected areas and their management, enforce legal protection of the predators and their prey, and advance monitoring (Han 2001). The recovery plan is based mainly on large reserves spanning the Russian-Chinese border – from reserves in Heilongjiang or Jilin to reserves in the Primorsky Krai – in order to facilitate migration of leopards across the border (Korkishko 2001, Stomatyuk 2001). Habitats in Hunchun and especially southern Hunchun (Jilin Province) provide an ecological corridor between Russia and North Korea and have been considered, to re-establish a breeding tri-country metapopulation (Anonymous 1998). On the Russian side, reintroduction programmes

using rehabilitated captive-bred leopards have been presented at a conference in Vladivostok in March 2010 (WCS 2010). The long-term success of Amur leopard conservation strongly depends on the restoration and preservation of habitat and prey south of the presently occupied range. In spring 2010, China has demarcated nine privileged zones for tiger conservation in the northeast (www.news.xinhuanet.com, 30 May 2010), which will also foster leopard conservation.

The survival of the leopard in central and south China depends on the efficient protection of the species in reserves (e.g. Jackson 1991, Johnson et al. 1993, Lu et al. 2010). These reserves – if poaching of predators and their prey is successfully suppressed – can host source leopard populations and hence build strongholds for the conservation of the species. Protected areas can however not prevent fragmentation and isolation of these inevitably small populations. The county survey map already reveals a high degree of fragmentation (Fig. 2). To ensure the survival of a viable leopard metapopulation in the long term, the connectivity of these populations must be secured through maintaining corridors across the cultivated landscape. Leopards have the capacity to live in multi-use, human dominated landscapes and even at the edge of settlements, but these areas with presumably high anthropogenic mortalities will inevitably be sink populations, which need to be fed through immigration from well-protected source populations. The first step towards improved conservation of leopards in central and south China is to improve the protection and establish efficient monitoring programmes in a number of important protected areas in the range of *P. p. japonensis* and *P. p. delacouri*. Sound monitoring will improve our understanding of the status and trends of the local populations.



**Fig. 3.** Camera trap picture of an Indo-Chinese leopard taken in October 2008 in the Xishuangbanna National Nature Reserve in Yunnan, China (Photo L. Feng & A. Zhang).

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FENG LIMIN<sup>1</sup> and EVA JUTZELER<sup>2</sup>

# Clouded leopard

## *Neofelis nebulosa*

The clouded leopard *Neofelis nebulosa* is about the size of a small leopard. Males are larger than females. The tail is nearly as long as the head and body, and the legs are short and stout, ending in broad paws. The hind legs are noticeably longer than the front legs. The cat's skull is long and low, with well-developed crests for the attachment of jaw muscles. This feature is probably related to the cat's exceptionally long canine teeth (around 4 cm; Christiansen 2006). On the cat's back and sides the background colour varies from earthy brown to dark grey to pale or rich yellowish brown, or ochre, shading to white or pale tawny on the undersides. Clouded leopard fur is instantly recognizable by its distinctive cloud-shaped markings, which have a dark rim and turn lighter towards the centre and are separated by areas of the paler ground colour. Two intermittent black stripes run down the spine to the tail base and there are six longitudinal stripes on the back. The marking patterns on the coat resemble those of the marbled cat, but the clouded leopard is much larger (Nowell & Jackson 1996, Sunquist & Sunquist 2002).

Most recently the clouded leopard has been split into two distinct species based on genetic and morphological evidence: (1) the mainland clouded leopard *Neofelis nebulosa* which, as its name indicates, is found on the mainland, as well as on large islands such as Taiwan and Hainan, and (2) the Sundaland clouded leopard *Neofelis diardi* which is found only on Borneo and Sumatra. In China only *N. nebulosa* occurs (Buckley-Beason et al. 2006, Kitchener et al. 2006, 2007, Wilting et al. 2007).

### Status and distribution

The distribution range of the clouded leopard stretches from the eastern and southern foothills of the Himalayas in Nepal (Dinerstein & Mehta 1989), through Bhutan and India (e.g. Arunachal Pradesh, Mishra et al. 2006; Sikkim; Assam), south to Myanmar, southern China, Taiwan, Vietnam, Laos, Thailand, peninsular Malaysia (e.g. in the Jerangau Forest Reserve, Mohd Azlan & Sharma 2006; in Sabah, Wilting et al. 2006) and Cambodia (Sunquist & Sunquist 2002, IUCN 2010).

The species is widely distributed in China

(Fig. 1) and has been reported to be relatively common in Jiangxi and Anhui in the past (Tan 1984). In addition, it is found south of the Yangtze (Tan 1984, Anonymous 1992), specimens have been collected in southern Fujian (American Museum of Natural History, specimen # 43104), Hubei (Zoologisches Museum Berlin, specimen # 56135) and Hainan (United States National Museum, specimen # 239907), it has been recorded in Jiangxi (Koehler 1991, Sunquist & Sunquist 2002), in central, western and southern Sichuan (Seidensticker & Eisenberg 1984), and in the Namcha Barwa region in Tibet (Qiu & Bleisch 1996). In Taiwan it is most likely extinct (Chiang 2007). Very little is known about the clouded

leopard's status in the wild, as it is elusive and lives mostly in dense vegetation. Most of the information about the species comes from incidental sightings and interviews of locals and forestry workers (Nowell & Jackson 1996). Different camera trap surveys and two radio telemetry studies have been conducted in different National Parks of Thailand (Austin & Tewes 1999, Grassman et al. 2005, Austin et al. 2007). The main threats in China for the clouded leopard are habitat degradation and illegal hunting. However, its current status in China is poorly known (IUCN 2010). Recently a rough population estimate for Southwest China based on home range size from a telemetry study in Thailand (Grassman et al. 2005) and on camera trap pictures, scat collection and sightings from 2005 to 2007, resulted in a total of 40 individuals for Xishuangbanna Nature Reserve, 20 individuals for Nan-gunhe Nature Reserve, and 10 individuals

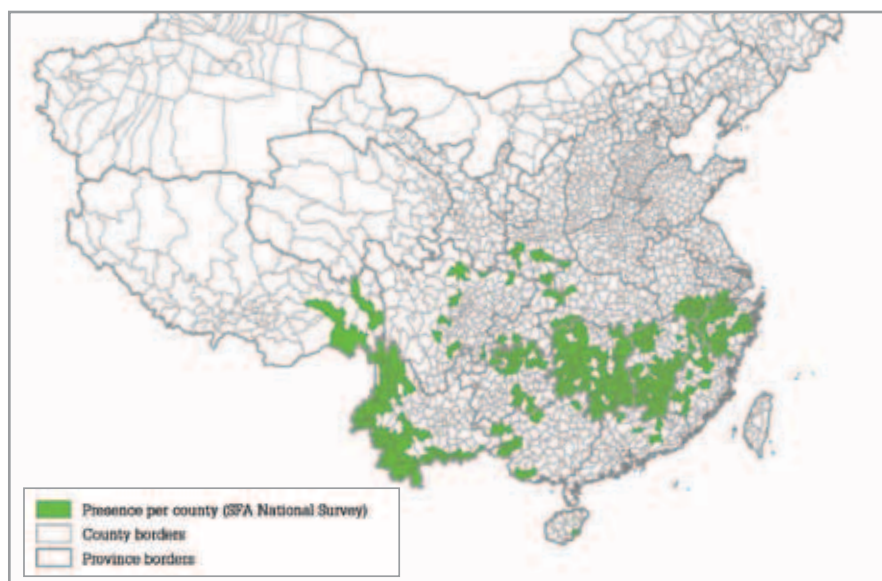
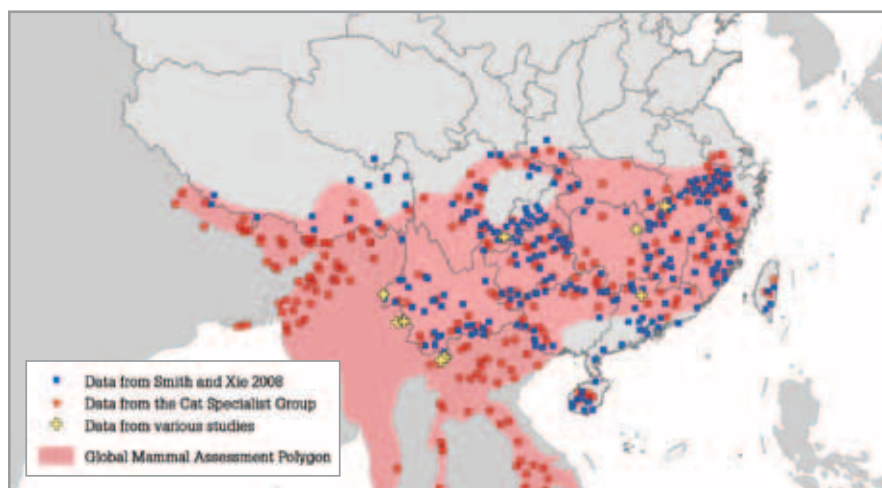


Fig. 1. Distribution of the clouded leopard in China.

for Tongbiguan Nature Reserve. These current estimates amount to a total of some 70 individuals in southern Yunnan. Although this cat has a wide range in southern China, the remaining suitable forest habitats are fragmented and isolated from each other (Nowell & Jackson 1996). Therefore it is assumed that the overall population trend is in decline (IUCN 2010).

### Habitat

It apparently occurs in a variety of forest types, but evergreen forests (Fig. 2) are usually said to form the cat's main habitat (Fletcher 2000). Compared to other felids in Southeast Asia the clouded leopard might be more confined to deeper forests (Santia-pillai 1987). In surveys in Yunnan Province in China from 2005 to 2007 (Fig. 2), clouded leopards were sighted or even photographed in tropical evergreen forest (4 individuals), hill evergreen forest (7 individuals) and mixed deciduous forest (1 individual). All individuals were recorded at an altitude of 500-1,300m. In the Himalayan foothills it has been recorded up to 1,450m (Nowell & Jackson 1996).

### Ecology and behaviour

Clouded leopards are solitary and mainly nocturnal and crepuscular hunters (Griffiths 1993, Sunquist & Sunquist 2002, Grassman et al. 2005). The clouded leopard is known for its arboreal talents even though it is unclear how arboreal they are in the wild. It can be found hunting in the treetops as well as on the ground (Grassman et al. 2005, Azlan et al. 2009). Home ranges have only been estimated in Thailand. During a study from 1997 to 1999 in the Khao Yai National Park radio-collared clouded leopards had home ranges of 39.4 km<sup>2</sup> (one female) and 42 km<sup>2</sup> (one male). Both individuals had a core area of 2.9 km<sup>2</sup> (95% fixed kernel; Austin et al. 1999, 2007). From April 2000 to February 2003, Grassman et al. (2005) radio-collared 4 individuals in Phu Khieo Wildlife Sanctuary. The home ranges (with a 95% minimum convex polygon) of two females were 25.7 km<sup>2</sup> and 22.9 km<sup>2</sup> and of two males 29.7 km<sup>2</sup> and 49.1 km<sup>2</sup>.

Reproductive data are only known from captive individuals, mostly outside China. Births have occurred from March through August, but animals having a tropical distribution often do not show a well defined reproductive season. They can have between 1 and 5 kittens, but more commonly 2 or 3 kittens are

## Neofelis nebulosa

### Fact Sheet

#### Names:

云豹 [yun bao]  
clouded leopard

#### Head and body length:

70-108 cm

#### Tail length:

55-91.5 cm

#### Weight:

16-32 kg

#### Global Population:

<10,000 (IUCN 2010)

#### Chinese Population:

unknown

#### Distribution in China:

across S China

#### IUCN Red List:

Vulnerable C1+2a(i) (2008)

#### CITES:

Appendix I

#### China Red List:

EN A1cd

#### China Key List:

Class I



Photo: A. Sitwa

born. The age of first reproduction is usually between 22 and 36 months. On average they live 11 years, but life spans up to 16 or even 17 years have been recorded in captivity. There is no report about reproduction or life history directly from China (Nowell & Jackson 1996, Sunquist & Sunquist 2002). The only data from the wild were collected by Grassman et al. (2005), who radio-tracked a pregnant female in Thailand and recorded a smaller home-range for several months after giving birth, presumably because the female was caring for her young.

### Prey

Among the recorded clouded leopard prey are mainly primates such as pig-tailed macaques, slow loris and gibbons (Thailand; Nowell & Jackson 1996, Grassman et al. 2005); and palm civets and grey leaf monkeys (Malaysia; Sunquist & Sunquist 2002); birds such as pheasants, small mammals such as squirrels, also fish as well as larger prey such as porcupines (Malaysia; Sunquist & Sunquist 2002); deer such as muntjac, and argus (Nepal; Nowell & Jackson 1996); sambar deer, barking deer and mouse deer, also wild boar and bearded pigs (Malaysia; Sunquist & Sunquist 2002); and it has been reported hunting dogs (Sunquist & Sunquist 2002). Among the prey in China, barking deer and pheasants are known (Feng et al.

2008, and unpublished data). They also reportedly prey on poultry but do not appear to eat carrion (Sunquist & Sunquist 2002).

### In captivity

Hand-reared clouded leopards are very tame, and in several countries clouded leopards have been taken as pets by private persons (A. Wilting, pers. comm.). In 1990 an European captive breeding programme was established for clouded leopards (Hughes 1991). However, clouded leopards don't easily reproduce in captivity. For instance, less than 20 percent of adult females listed in the International Clouded Leopard Studbook bred successfully (Yamada & Durrant 1989). Within the North American Species Survival Plan population breeding success is poor, and behavioural problems such as fur-plucking, tail-chewing, excessive hiding or pacing, and intersexual aggression resulting in mate killing are common (Wielebnowski et al. 2002). Artificial insemination has been suggested, but has not proven to be a successful solution so far, as the quality of the ejaculates from captive animals is poor (Fletcher 2000, Pukazhenthi et al. 2006).

### Main threats

Deforestation and converting land to agriculture or human settlements, as well as target and non-target hunting, are the principal threats. The clouded leopard is widely hunted



purposefully (mostly poisoned) for its teeth, pelt and bones for the Asian medicinal trade (Santiapillai 1987, Sunquist & Sunquist 2002, Shepherd & Nijman 2008). A study in Myanmar suggested that there is very poor law enforcement in the trade in animal parts in general (Shepherd & Nijman 2008). In south-eastern China pelts and bones are sold openly, even though the cat has protected status. Some animals are also captured for live trade (Tan 1984, Sunquist & Sunquist 2002). Other threats within China are human interference and the reduction of its prey base as the meat market increases (Wang et al. 1995b) as well as consumption by humans in local restaurants (Tan 1987b). Habitat restoration is practically non-existent and law enforcement still has to improve.

### Protection measures

The clouded leopard is included in CITES Appendix I and protected by national legislation over most of its range. Hunting is banned in

Bangladesh, Brunei, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Nepal, Taiwan, Thailand and Vietnam, and hunting regulations apply in Laos (Nowell & Jackson 1996, IUCN 2010). Because of the gun ban policy of 1998, hunting was reduced in China and hopes for a recovery of the population have risen. Additionally, even though the forest disappeared rapidly in the past several decades, a number of protected areas have currently been established and most of the remaining forest habitats in south-western China are now within these reserves. The success of anti-poaching patrols within reserves, however, has only been limited so far, because they were not sustained or frequent enough. Some environmental education of local schoolchildren and adults has taken place in order to improve public awareness of the species. A common research approach focusing on the tiger, the clouded leopard and the leopard has also been suggested, since all three species share the same habitat in some

areas. Thus, the most interesting places for surveys are tiger areas, for example within Fujian, Jiangxi and Zhengjiang Province. Camera trapping surveys have been conducted in the Nangunhe Nature Reserve in 2005 (Fig. 2) and in the Xishuangbanna Nature Reserve from 2006-2007. However, there is still a lack of basic ecological information and more surveys and research projects should be conducted.

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**Fig. 2.** From top to bottom: Evergreen broad-leaved forests are among the typical clouded leopard habitats. Camera trap pictures of a clouded leopard taken in May and June 2005 in the Nangunhe Nature Reserve in southwest Yunnan, China (Photos Beijing Normal University).



EVA JUTZELER<sup>1</sup>, XIE YAN<sup>2</sup> and KRISTINA VOGT<sup>1</sup>

# The smaller felids of China

## Pallas's cat

*Otocolobus manul*



**Fig. 1.** Manuls use rock crevices and other habitat structures to escape from predation by sympatric carnivores and birds of prey. Photos taken in April 2007 (top) and December 2006 (middle) in the Hustai Nuru buffer zone in Mongolia (Photos S. Ross). Manul photographed in October 2006 in the Sanjiangyuan National Nature Reserve in Qinghai (bottom, photo F. Böhler & Plateau Perspectives).

About the size of a domestic cat, the Pallas's cat, or manul *Otocolobus manul*, is a squat, rather short-legged felid with thick fur and a bushy tail about half the length of the body. It has a broad head; the ears are short, rounded, very wide apart and set low on the head. The general coloration is grizzled or silvery buff, although the fur of some forms is rusty red or ginger. The tail is marked with a black tip and with four to seven narrow black rings. The rest of the body is unmarked except for several dark transverse stripes on the loins and back and one or two dark horizontal stripes on the forelegs (Sunquist & Sunquist 2002). There are two subspecies in China: *O. m. manul*, and *O. m. nigripsecta* (Smith & Xie 2008).

### Status and distribution

The Pallas's cat is found throughout central Asia. The largest populations are thought to live in Mongolia and Inner Mongolia (Brown et al. 2003). On the Tibetan Plateau, it has been described as widespread but not common (Nowell & Jackson 1996). In Afghanistan, India and Pakistan, it is considered rare (Nowell & Jackson 1996). It occurs in Russia, southern Turkmenistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, Iran, Kashmir and as far west as Armenia (Belousova 1993, Sunquist & Sunquist 2002). Pallas's cats occur at altitudes ranging from 1,500 to 2,500m in the Altai mountains (B. Munkhtsog, pers. comm.) and have been reported from elevations up to 5,050m (Fox & Dorji 2007).

The manul is thought to be rare, but population size and status are largely unknown throughout its range, including China (Brown et al. 2003). Manul numbers in China are thought to have declined because of hunting and fur trade (Mallon 2002). Reports indicate that the species has been eliminated from the easternmost part of its range in China because of hunting (Nowell & Jackson 1996). However, the extent of the decline as well as illegal fur trade e.g. from Mongolia to China is unknown (Murdoch et al. 2006).

The Pallas's cat has been described in northern, western and central China (Smith & Xie 2008), in the Altai Mountains (IUCN 2010), on the Qinghai-Tibetan Plateau (Mallon 2002), and in Inner Mongolia (Nowell & Jackson 1996). It is also found in Gansu, Hebei and western Sichuan (Mallon 2002). Presumably, its range does not overlap with the Chinese mountain cat or the wildcat on the Qinghai-Tibetan Plateau (Mallon 2002). There are a few well documented sightings





**Fig. 2.** Manul habitat in the Hustai Nuru buffer zone, Mongolia, in April 2007 (top) and December 2005 (bottom). The manul is restricted to mountainous areas and ravines. Chinese habitat is likely to be similar (Photos S. Ross).

from China, e.g. in the Arjin Mountains Nature Reserve in Xinjiang in 1987, where it was reported to be commonly seen (Butler et al. 1987), on the Qinghai-Tibetan Plateau in November 2001 (Mallon 2002), and in Gertse County in the Ngari Prefecture of the Tibetan Autonomous Region in October 2009 (Fox & Dorji 2007).

### Habitat

Most information about the manul's habitat (Fig. 1,2) comes from either Mongolia or Russia. The manul is adapted to winter-cold, arid mountain environments with little rainfall, low humidity, and a wide range of temperatures (down to  $-50^{\circ}\text{C}$  in winter) (Sunquist & Sunquist 2002). It occurs in undulating alpine meadow-steppe (Mallon

2002), hilly areas, desert and semi-desert, cold grasslands, and low mountains (Sunquist & Sunquist 2002, Murdoch et al. 2006) but is absent from forested areas and lowland desert basins (Nowell & Jackson 1996). It is mostly found on south-facing slopes (Nowell & Jackson 1996). In the mountain steppe terrain of central Mongolia, the manul prefers steep, rocky hill slopes and ravine habitats. This habitat selection is likely an anti-predator strategy and is not driven by prey availability (Ross 2009). Pallas's cats appear to be most numerous where access to prey is not hindered by deep snow cover (Smith & Xie 2008). A continuous snow cover of 15-20 cm is thought to mark an ecological limit for this species (Heptner & Sludskii 1992).

### Ecology and behaviour

Manuls are solitary and primarily crepuscular (Heptner & Sludskii 1992), but can sometimes be nocturnal (Murdoch et al. 2006). In winter, they may become more diurnal (Ross 2009). They use vacated marmot dens, rock crevices, small caves, or hide under large boulders as protection from predators and adverse weather conditions (Ross 2009). In the grass and shrub steppe of central Mongolia, mean home range sizes were about  $100\text{ km}^2$  for males and  $23\text{ km}^2$  for females, which is large for such a small felid. Home ranges of males overlapped the home ranges of 2-3 females on average. Several males were found to overlap the same females, suggesting a polygamous mating system (Ross 2009). Pallas's cats come into heat in February (trans-Baikal region), and most litters are born between April and May (Nowell & Jackson 1996). In Mongolia, litter size ranges between 3 and 6 (B. Munkhtsog, pers. comm.), with a record of 8 (Heptner & Sludskii 1992). Age at sexual maturity is in some reports one year for females, but in others 2 years. A single captive animal lived for 11.5 years, but in the wild life span is estimated at 8-10 years (Nowell & Jackson 1996, Sunquist & Sunquist 2002).

### Prey

Manuls feed mainly on pikas (53,8% in Mongolia; Ross 2009) and small rodents such as voles in China or gerbils and jerboas in Mongolia (IUCN 2010). Hares, birds, more rarely marmots, carrion (Ross 2009) and during the spring months even lambs of argali sheep make up a smaller part of their diet (Reading et al. 2009).

### In captivity

Keeping manuls in zoos in China was often not successful, as the cats were comparatively short lived (1-3 years), the majority dying of digestive or respiratory problems. A total of 16 manuls were kept in the Beijing Zoo from 1951 to 1979, and in May 1979, the first breeding occurred. They have also been kept by zoos at Xining, Lanyhou, Urumqi, Tianjin, Shanghai, Harbin, etc. (Tan 1987c). In 1984, there were 4 in the Urumqi Zoo and 4 in the Beijing Zoo (Sunquist & Sunquist 2002). Current numbers are not known. In North American zoo breeding programmes, the manul breeds very poorly in captivity, with high kitten mortality (80%) primarily due to *Toxoplasma gondii* infection. This disease is much more common in captive individuals than in

wild populations, probably because the captive population is highly inbred (Swanson 1999, Brown & Munkhtsog 2000).

### Main threats

In Mongolia and China, Pallas's cats are threatened mainly through hunting and poaching (Nowell & Jackson 1996, Brown et al. 2003, Murdoch et al. 2006). The manul is a Class II protected species in China. Despite their Near Threatened status, Pallas's cats can be legally hunted for 'household purposes' in Mongolia, provided that hunters obtain a permit from local governments. However, permits are rarely obtained in rural areas and there are no regulations on number of animals hunted per permit and number of permits obtained by each hunter (Murdoch et al. 2006). Manuls are trapped and poached for their fur, for the live trade, for medicinal purposes, or as incidental bycatch in traps for other animals (IUCN 2010). From Mongolia, fur is mainly sold to Chinese traders. In both Mongolia and China, law enforcement is weak (Sunquist & Sunquist 2002, Murdoch et al. 2006) and Pallas's cat fur exports have increased since 2000 (IUCN 2010). In Mongolia, Pallas's cats are also frequently killed by domestic dogs (Ross 2009, B. Munkhtsog, pers. comm.). A major problem is destruction of their prey base, namely pika poisoning in Russia and China, where pikas are considered to be vectors of the bubonic plague and to compete with livestock for grazing (Nowell & Jackson 1996, Smith et al. 1990, Mallon 2002). Furthermore, wild individuals have died of toxoplasmosis; increasing feral domestic cat

## Otocolobus manul

### Fact Sheet

#### Names:

兔狲 [tu sun]  
Pallas's cat, manul

#### Head and body length:

45-65 cm

#### Tail length:

31-35 cm

#### Weight:

3-5 kg

#### Global Population:

<50,000 (IUCN 2002)

#### Chinese Population:

unknown

#### Distribution in China:

C, N and W China

#### IUCN Red List:

Near Threatened (2008)

#### CITES:

Appendix II

#### China Red List:

EN A1c; B1ab (i, ii, iii)

#### China Key List:

Class II



Photo A. Silva

populations may be a reservoir for diseases such as FIV (Brown et al. 2003, Troyer et al. 2005). Finally, habitat fragmentation and degradation due to overgrazing through livestock has a negative impact on the habitat of the manul (A. Barashkova, pers. comm., S. Ross, pers. comm.).

### Current and future protection

Hunting is prohibited in all range states except Mongolia (IUCN 2010). China is a signatory to CITES and hunting is prohibited without a special licence (Lu et al. 2010,

this issue). There is no specific reserve for the manul, but in the provinces where it occurs, at least 25 natural reserves for wild animals offer relative protection. Recommendations for the conservation of the Pallas's cat in Mongolia include improvement of law enforcement, reorganization of the hunting permit system, and establishment of monitoring programs in order to determine population status and harvest rates (Murdoch et al. 2006). Scientific research is needed to better understand habitat requirements and the land tenure system of the Pallas's cat (Murdoch et al. 2006). There are currently research projects on Pallas's cats in Mongolia (B. Munkhtsog, pers. comm.), in the Dauriskij Biosphere Nature Reserve (Zabaikalsky Region; O. Uphyrkina, pers. comm.) and in the Russian part of the Altai mountains (A. Barashkova, pers. comm.), but non in China. Research and monitoring programs should also be established in China, which hosts 50% of the manul's global distribution range.

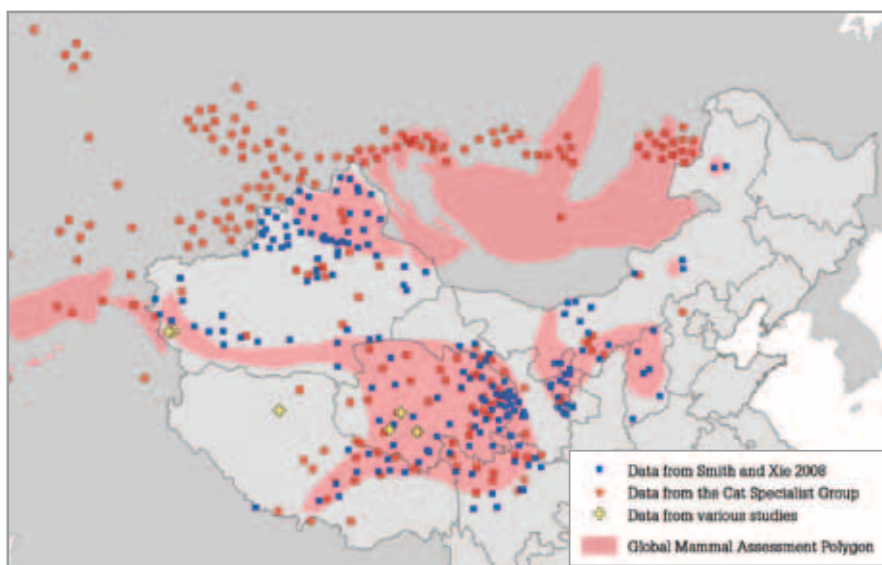


Fig. 3. The distribution of the manul in China.



# Asiatic golden cat

## *Catopuma temmincki*

The Asiatic golden cat *Catopuma temmincki* is about two to three times the size of a domestic cat and looks similar to the African golden cat *Profelis aurata*, except that the Asian species is slightly heavier and the tail is proportionately longer (Sunquist & Sunquist 2002). Males are larger than females (Nowell & Jackson 1996). The most common coloration is fox-red to gold-brown, but it can also be dark brown, pale cinnamon, bright red, or grey with occasional melanistic forms (Ghimirey & Pal 2009). The pelt is usually quite uniform in colour, but there is a morph marked with a pattern similar to that of the ocelot (Fig. 1). This morph is found all over the Asiatic golden cat's range in China, and has been reported mainly from Sichuan and Tibet (subspecies *C. t. tristis*; Nowell & Jackson 1996). During a recent camera trapping study, the ocelot morph has also been detected in Bhutan (Wang 2007). In all morphs, the head is distinctly marked with white lines bordered with black running across each cheek and from the inner corner of each eye up to the crown. There are usually broad white cheek patches running from just below the eyes to the cheeks. Stripes run along the inner sides of the legs and dark spots are found on the chest and legs. The underside of the tail is white, especially the distal third of it, while the dorsal surface is brown with a black tip (Sunquist & Sunquist 2002). There are 3 subspecies in China: *C. t. bainsei*, *C. t. dominicanorum*, and *C. t. tristis* (Smith & Xie 2008).

### Status and distribution

The Asiatic golden cat has a similar range to its close relative *Pardofelis marmorata*: from the Himalayan foothills into China and Southeast Asia (IUCN 2010). It is found in parts of northeastern India, Tibet and Nepal (Sunquist & Sunquist 2002), as well as in Bhutan, Bangladesh, Myanmar, Thailand (Nowell & Jackson 1996), Lao PDR, Cambodia, Vietnam (Duckworth et al. 2005), on the Malaysian peninsula, and in Indonesia (Sumatra) (Sunquist & Sunquist 2002). There are studies suggesting it may be less common in montane forests (Holden 2001, Mishra et al. 2006), although it has been recorded at an elevation of 3,738 m in Bhutan (Wang 2007).

Little is known about the status of the Asiatic golden cat and it is rarely seen in the wild. However, there has been a recent increase in records from camera trapping studies (Suma-

tra; J. Sanderson, pers. comm.). Some studies have found more records of Asiatic golden cats than of some other sympatric small felids, suggesting it may be more common than previously thought (IUCN 2010). Nonetheless, population numbers are thought to be decreasing throughout its range, mainly due to habitat loss through deforestation (IUCN 2010).

The species is widely distributed in central and southeastern China (Fig. 2), ranging from the southeast China lowlands up to 3,170 m in northwestern Yunnan (Smith & Xie 2008). It also occurs in Sichuan, Tibet, east of Fukien and Gansu (Qiu & Bleisch 1996, Smith & Xie 2008, Feng, pers. comm.), and according to skin harvests also in Jianxi, Fujian and Hunnan (Nowell & Jackson 1996). According to the Red Data Book for China, total population numbers in China are estimated to range between 3000 and 5000 individuals (Wang 1998). There are no actual research projects on the Asiatic golden cat in China, but the species has been caught in camera trap pictures in monitoring sessions in Sichuan and Shaanxi in 2008/2009 (Fig. 1; Li et al. 2010).

### Habitat

Asiatic golden cats are found in tropical and sub-tropical moist evergreen forest, mixed evergreen hill forest (Grassman et al. 2005) and dry deciduous forests (Nowell & Jackson 1996). They also occur in shrub land, grassland (Choudhury 2007) and open, rocky areas

(Sunquist & Sunquist 2002), and have been reported from an area of dwarf rhododendron and grassland at high elevations in Bhutan (Wang 2007).

### Ecology and behaviour

There is little known about the Asiatic golden cat's ecology and behaviour. Information from two radio-collared individuals showed diurnal and crepuscular activity patterns and suggested that the species is not primarily nocturnal as previously thought (Grassman et al. 2005). According to locals, it hunts mostly on the ground, but is a good climber. It breeds in hollow trees and burrows in the ground (Smith & Xie 2008). A study in the Phu Khieo Wildlife Sanctuary, Thailand, showed home range sizes of 47.7km<sup>2</sup> for one male and 32.6km<sup>2</sup> for one female (convex polygon 95%; Grassman et al. 2005). Home range sizes are unknown for China.

Breeding behaviour is only known from captive animals. Litters are born throughout the year. The cats usually have one single kitten, with twins occurring occasionally and triplets being rare. Females attain sexual maturity at 18 (up to 24) months and males around 24 months (Sunquist & Sunquist 2002). Captive Asiatic golden cats have been recorded to live up to 20 years (Nowell & Jackson 1996).

### Prey

A study in Malaysia showed that the Asiatic golden cat's diet was mainly composed of rodents such as rats and other murids, as well as snakes, lizards, birds and other medium-sized prey (Kawanishi & Sunquist



**Fig. 1.** There are two morphs of the Asiatic golden cat. The ocelot morph (left, Tangjiahe National Nature Reserve, Sichuan, October 2008) appears to be more common in China than the uniform morph (right, Changqing National Nature Reserve, Shaanxi, March 2009). Photos Sheng Li.

2008). Muntiac remains found in two scats of Asiatic golden cat suggest that they may be capable of hunting mammals up to the size of small deer (Grassman 1998). Asiatic golden cats are also known to prey on poultry (J. McCarthy, pers. comm.).

#### In captivity

There are few Asiatic golden cats in zoos and the species does not appear to breed very well in captivity (Brocklehurst 1997). Since 1993, there has been an European Endangered Species Program (EEP) and a European studbook, held at the Heidelberg Zoo, Germany (EAZA 2009).

#### Main threats

The main threat to the Asiatic golden cat across its range is habitat loss, as southeast Asian forests are undergoing the world's fastest regional deforestation rates (IUCN 2010). With the increase of the human population in China, more and more forests are converted into agriculture and plantations, e.g. in Sichuan and Yunnan. Even though it is on the Protected Species List in China, the Asiatic golden cat has been hunted for its meat and fur. Large skin harvests have previously come from Jiangxi (Sunquist & Sunquist 2002). In the beginning of the 80s, 30 to 100 Asiatic golden cat and corsac fox pelts were collected annually in most counties of the loess plateau of Gansu (Anonymous 1989), but current numbers are unknown. Nowell (1990) disclosed fur smuggling from the Chinese mainland to Taiwan, and Chinese buyers often purchased skins and bones from neighbouring countries such as Myanmar, where Asiatic golden cats are often heavily hunted and are likely to be threatened (Shepherd & Nijman 2008). Another reported problem is persecution because of predation on poultry (IUCN 2010, J. McCarthy, pers. comm.).

#### Current and future protection

The Asiatic golden cat is fully protected over most of its range, except in Lao PDR, where hunting is regulated, and in Bhutan, where there is no legal protection (IUCN 2010). Hunting in China was prohibited in 1988 by the Law of Wildlife Protection (Nowell & Jackson 1996). However, there is still illegal trade in pelts and bones (Shepherd & Nijman 2008, IUCN 2010) and the enforcement of national and international protection laws to prevent hunting and poaching is necessary. The most important conservation measures to ensure the survival of the species include

## Catopuma temmincki

### Fact Sheet

#### Names:

金猫 [jin mao]  
Asiatic golden cat, golden cat, Temminck's cat

#### IUCN Red List:

Near Threatened (2008)

#### CITES:

Appendix I

#### Head and body length:

71-105 cm

#### Tail length:

40-56 cm

#### Weight:

7-16 kg

#### China Red List:

CR A3cd; C2a(i)

#### China Key List:

Class II

#### Global Population:

<10,000 (IUCN 2010)

#### Chinese Population:

3,000-5,000 (Wang 1998)

#### Distribution in China:

C to SE China



Photo A. Sitwa

habitat protection and the connection of protected forest areas through corridors (Traylor-Holzer et al. 2005). Scientific studies outside China include projects in Thailand's Phu Khieo National Park, and in the lowland rainforest areas of Taman Negara in Malaysia, where some camera trapping and radio

tracking has been conducted (Grassman et al. 2005, 2006, Kawanishi & Sunquist 2008). In China, the only Asiatic golden cat camera trap pictures are bycatches from other studies (e.g. a camera trap studies in giant panda reserves in the south of Shaanxi and in Sichuan; Li et al. 2010).

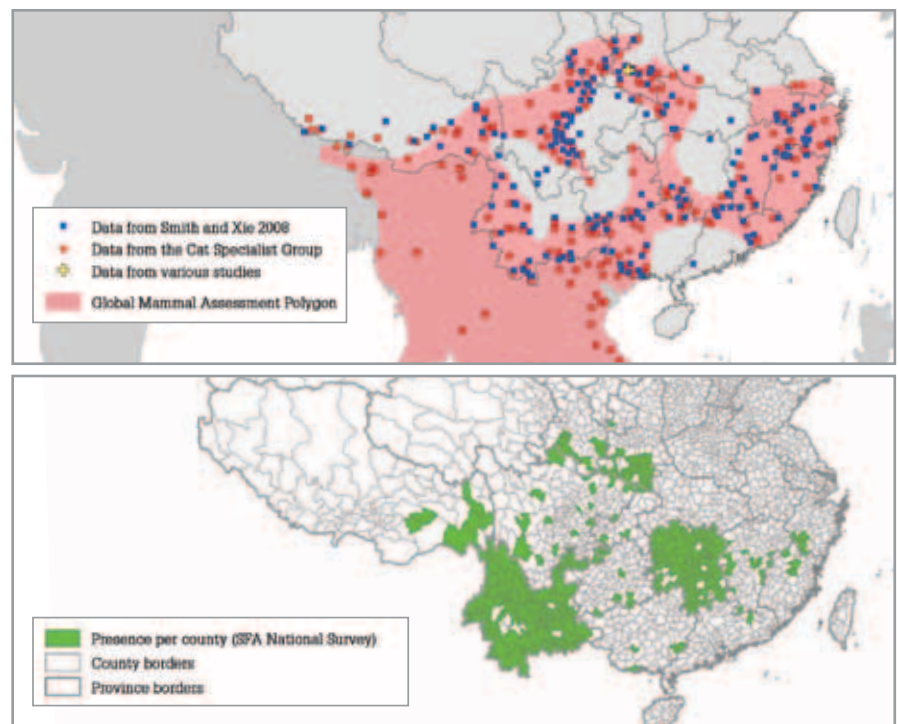


Fig. 2. Distribution of the Asiatic golden cat in China.



## Asian wildcat

*Felis silvestris ornata*



**Fig. 1.** The Asian wildcat (top) has a more brightly coloured pelage and clearer spots compared to the European wildcat (bottom), where faint spots often coalesce to a striped pattern and the fur is darker (Photos M. Bohnacker & CB-Verlag).

Wildcats of Central Asia *Felis silvestris ornata* have a light fur, ranging from greyish to sandy-yellow to reddish. They differ from other wildcat subspecies mainly in their distinct small black or red-brown spots (Fig. 1). The spots sometimes form transverse stripes or bars, especially on the legs and tail (Sunquist & Sunquist 2002). Such striped cats are most often found in the Central Asian regions east of the Tian Shan. The Asian wildcat has a long, tapering tail, always with a short black tip, and with spots at the base. The forehead has a pattern of four well-developed black bands. A small but pronounced tuft of hair up to one cm long grows from the tip of each ear. Paler forms of Asian wildcat live in drier areas and the darker, more heavily spotted and striped forms occur in more humid and wooded areas. The throat and ventral surfaces are whitish to light grey to cream, often with distinct white patches on the throat, chest and belly. Throughout its range

the Asian wildcat's coat is usually short, but the length of the fur can vary depending on the age of the animal and the season of the year. Compared to the domestic cat, Asian wildcats have relatively longer legs. Males are generally heavier than females (Nowell & Jackson 1996, Sunquist & Sunquist 2002). Some Chinese sources propose four wildcat subspecies for China: *F. s. chutuchta*, *F. s. issikulensis*, *F. s. shawiana*, and *F. s. vellerosa* (Smith & Xie 2008), but recent genetic research suggests that all these subspecies should be united under *F. s. ornata* (Driscoll et al. 2007).

Other wildcat subspecies are *F. s. silvestris* distributed in Europe and from southwestern Asia to Iran, *F. s. lybica* occurring along the eastern border of the Mediterranean Sea, in northern Africa, some Mediterranean islands, and parts of the Arabian peninsula, and *F. s. cafra* in southern Africa (IUCN 2010). The domestic cat *F. s. catus* derives from the

wildcat, originating in southwestern Asia (Driscoll et al. 2007).

### Status and distribution

The Asian wildcat occurs in Iran, Georgia, Kazakhstan, Turkmenistan, Tajikistan, Uzbekistan, Russia and Mongolia, Pakistan, eastern Afghanistan, the western plains of India and throughout northwestern China (Nowell & Jackson 1996, IUCN 2010). Where there is sufficient dense vegetation, it is reported from elevations up to 2,000-3,000 m (Heptner & Sludskii 1992).

The status Least Concern in the IUCN Red List is attributed to the species, including all subspecies of wildcats. There is no information on current status or population numbers of *F. s. ornata* for its entire range, but populations are thought to be declining (IUCN 2010).

Within China, the Asian wildcat is distributed in Xinjiang, Qinghai, Gansu, Ningxia, Shaanxi, and Inner Mongolia. Records from northern Tibet as well as Sichuan are questionable (Smith & Xie 2008; Fig. 2). Gao (1987) noted that the population may once have exceeded 10,000 individuals in northwestern China, with a density of 10/100km<sup>2</sup>. Its recent status in China is unknown, but it is assumed to be rare and, according to the China Species Red List, the population is declining (Wang 1998).

### Habitat

The Asian wildcat is most typically associated with scrub desert (Nowell & Jackson 1996, Dookia 2007). It occurs in habitats with halophytic vegetation (India, Sharma 1978; Uzbekistan, Allayarov 1963) and even inhabits extensive clay valleys with lakes and isolated rows of sandy mounds and river basins, seeking shelter in the belts of bush and reeds in close proximity to water sources (Kazakhstan, Uzbekistan; Guggisberg 1975). It frequently uses rock crevices or burrows dug by other animals (Heptner & Sludskii 1992). Asian wildcats can be found near oases, gardens, cultivated areas, and human settlements (Smith & Xie 2008, Riordan & Kun, pers. comm.). Snow depth in winter is thought to limit the northern boundaries of their distribution range (Heptner & Sludskii 1992). In China, the Asian wildcat is associated with the grasslands and arid regions of northwestern China. It is found in plains and steppe, semi-deserts and deserts, and is most often associated with shrub desert (Smith & Xie 2008). Throughout the southern foothills of the Tian Shan, it can be encountered in bushy areas and in the undergrowth of apple groves below 2,000 m (Guggisberg 1975).

### Ecology and behaviour

Little is known of the Asian wildcat's behaviour and ecology, but it is believed to be a highly territorial, solitary hunter. It is crepuscular but also frequently active during daytime (Heptner & Sludskii 1992). No information about home ranges of the Asian wildcat is available and there is no genuine information on its ecology from China.

Mating was reported in March to April and November to December (Rajasthan, India; Sharma et al. 1984), January to February (Central Asia; Allayarov 1963) and all year round (Sind, Pakistan; Roberts 1977). Sexual maturity is reached at around 10 months for females and at up to 22 months for males. Litter size is generally 3 but can range up to 5-6 (Nowell & Jackson 1996). There is no information on the average lifespan of Asian wildcats.

### Prey

Wildcats prey on a wide range of species. In China, Asian wildcats feed on small vertebrates, preferring rodents such as ground squirrels, gerbils and jerboas, which comprise 60-70% of prey as determined by frequency of occurrence. In some areas, the activity of Asian wildcats closely matches that of the Yarkand hare *Lepus yarkandensis* (Smith & Xie 2008). They also eat birds (e. g. snowcock; P. Riordan & C. Kun, pers. comm.), reptiles, and insects (15-25%; Smith & Xie 2008). Asian wildcats have also been reported to raid chicken coops in the former Soviet Union (Heptner & Sludskii 1992).

### In captivity

There is no information on how many Asian wildcats are held in zoos.

### Main threats

High human-caused mortality has been reported for all wildcat subspecies. Wildcats are killed because they prey on poultry and are considered pests (Sunquist & Sunquist

## Felis silvestris ornata

### Fact Sheet

#### Names:

草原斑貓 [cao yuan ban mao], 野猫 [ye mao]  
Asian wildcat

#### Head and body length:

55-80 cm

#### Tail length:

25-40 cm

#### Weight:

2-8 kg (males)

2-6 kg (females)

#### Global Population:

*Felis silvestris*:  
>50,000 (IUCN 2010)

#### Chinese Population:

>10,000 (Wang 1998)

#### Distribution in China:

NW China

#### IUCN Red List:

Least Concern (2009)

#### CITES:

Appendix II

#### China Red List:

CR A1a

#### China Key List:

Class II



Photo: K. Deacon

2002). In the 1980s, Asian wildcats were hunted in China and their fur was found on markets (Tan 1984), but now it is illegal to hunt and trade this species in China (IUCN 2010). Records of Asian wildcats in the fur trade have been decreasing, but the species was still found in local markets, e.g. in Kashgar in 1999 (U. Breitenmoser, pers. comm.). Surveys indicate that a small number of furs from Mongolia are illegally imported into China (Y. Xie, pers. comm.). Another threat for the Asian wildcat is habitat conversion to agricultural areas (Dookia 2007). In China, habitat loss has been mitigated to some extent by the establishment of more protected areas (Bao 2010, this issue). Wildcats can do

well in cultivated landscapes, but in these areas interbreeding with domestic cats may occur (IUCN 2010). Hybridization with domestic cats has been known to occur in Pakistan (Nowell & Jackson 1996), India (Dookia 2007), and central Asia (Driscoll et al. 2007). Nothing is known in regard to disease transmission between Asian wildcats and their domestic relatives (IUCN 2010, A. Kitchener, pers. comm.).

### Current and future protection

Even though the Asian wildcat is now fully protected across most of its range, including China, it is probably still persecuted. However, international trade in its pelt has decreased drastically (Nowell & Jackson 1996). At present, the status of the Asian wildcat in China and elsewhere is difficult to assess, since there are no recent surveys, and only incidental observations (P. Riordan & C. Kun, pers. comm.). Scientific research and regular surveys are required in order to determine the Asian wildcat's conservation status and to learn more about its ecology. Enforcement of anti-poaching laws is another important conservation action, especially in China (Bao 2010, this issue).

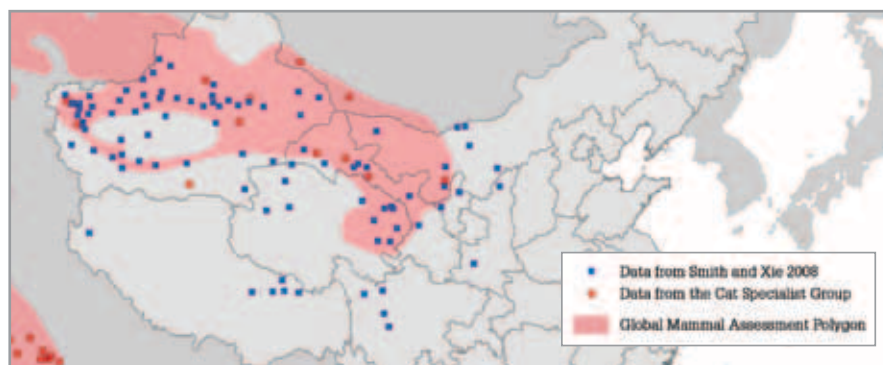


Fig. 2. The distribution of the wildcat in China.



# Jungle cat

## *Felis chaus*

Jungle cats *Felis chaus* are somewhat larger and lankier than domestic cats. Their body is relatively short while their legs are long. Adult males are significantly larger and heavier than females. There is also geographical variation in body size: cats in the east (e.g. India) are lighter than cats in the west (e.g. Israel; Mukherjee & Groves 2007). The jungle cat has a plain, almost unspotted coat, which varies from reddish or sandy brown to tawny or yellowish grey to olive (Fig. 1). The fine black tips on the guard hairs give the cat a speckled appearance. A broad dark band with an indistinct outline may be visible along the back. The throat is pale cream, and the belly is white or lighter coloured than the rest of the body. Jungle cats have spots or dark stripes on the upper fore and hind limbs and throat and two or three narrow black rings near the end of the tail (Sunquist & Sunquist 2002). The tail is black-tipped and measures only about 30-40% of the animal's head and body length. The ears have a small but distinct tuft of black hairs (which may be absent in summer). Melanistic individuals have been occasionally reported (Nowell & Jackson 1996).

### Status and distribution

The jungle cat has a wide geographic distribution, extending from Egypt along the Nile River delta, through Israel, Jordan, northern Saudi Arabia, Syria, Turkey, Iraq, and Iran to the north-western shores of the Caspian Sea and the Volga River delta, and east through Turkmenistan, Uzbekistan, Tajikistan, Kazakhstan, Afghanistan, Pakistan, Bangladesh, India, Sri

Lanka, Myanmar, Laos, Thailand, Cambodia, Vietnam, and southwestern China (Sunquist & Sunquist 2002, Duckworth et al. 2005, IUCN 2010). The species is more commonly found in lowlands but has been recorded up to 2,400 m in the Himalayas (Nowell & Jackson 1996). The jungle cat is widespread and common in parts of its range and therefore classified as Least Concern according to the IUCN Red List (IUCN 2010). It is considered common in India and was known as the most widely distributed small cat species in Pakistan and Bangladesh. In other parts of its range, however (e.g. Thailand, Indochina), it is rare and populations are declining (Duckworth et al. 2005). China represents the edge of the distribution range (Fig. 2), where the jungle cat is uncommon or even rare (Nowell & Jackson 1996). In China, the species is thought to occur in Yunnan in the Nangunhe National Nature Reserve and the Xishuangbanna region (L. Feng, pers. comm., Wang 1998), in the Giant Panda Reserves in the south of Sichuan (Seidensticker & Eisenberg 1984), on the Ordos Plateau in Inner Mongolia, in Shaanxi (Frisina et al. 2001) and in the Namcha Barwa region of south-eastern Tibet (Qiu & Bleisch 1996). Jungle cats were also reported from the South China Protected Area System of Hainan. However, most of the data from China are outdated and the presence of the species is not confirmed by hard facts. There are no recent studies on status, density or population numbers of the jungle cat. Indeed, it may no longer be common or even occurring in the provinces suggested above.

### Habitat

The jungle cat is associated with water and dense vegetation cover, especially reed swamps, marsh, and littoral and riparian habitats (Nowell & Jackson 1996). It occurs in wetlands, near oases or along river beds, which can be found in a variety of habitats, ranging from desert to grassland, shrubby woodland and deciduous dipterocarp forest (Nowell & Jackson 1996, Duckworth et al. 2005). Despite their name, jungle cats are not primarily found in tropical rainforests, although they have been reported from this habitat in Yunnan (Nowell & Jackson 1996, L. Feng, pers. comm.). They have been observed in agricultural habitats and are also found around human settlements (Nowell & Jackson 1996, Duckworth et al. 2005). In Indochina, scrub and agricultural habitats were probably occupied by jungle cats in the past, but the species is now considered to be very rare, most likely due to high hunting pressure caused by easy access to these habitats (Duckworth et al. 2005).

### Ecology and behaviour

Jungle cats are solitary and not strictly nocturnal. Anecdotal evidence suggests that they are good swimmers (Heptner & Sludskii 1992, Mendelssohn 1989). They mainly hunt on the ground and occasionally in agricultural land (Harrison & Bates 1991, Sunquist & Sunquist 2002). The jungle cat is known either to excavate its own burrows or to enlarge disused badger, fox, or porcupine dens. It is also known to use reeds, bushes or grass thickets, dense cover, canes, rock crevices, hollow tree cavities or the roots of trees or even abandoned houses as hiding, resting or breeding places (Sunquist & Sunquist 2002).



**Fig. 1.** One of the few photos of jungle cats in the wild, taken at the Sea of Galilee in Israel in 1993 (left, photo E. Bartov). More photos are taken in captivity as for example in the Assam State Zoo in India (right, photo K. Kakati).

Mating and subsequent timing of births varies latitudinally across the range; the mating season is later in colder climates. Young are born between December and June (Sunquist & Sunquist 2002). Litter size is usually reported to be around 3, but ranges between 1 and 6 kittens (Heptner & Sludskii 1992). For females, the reported age of sexual maturity varies from 9-11 months to 18 or even 30 months. One male was recorded to reach sexual maturity at 22 months (Sunquist & Sunquist 2002). Jungle cats in captivity can live up to 14 years (Nowell & Jackson 1996). Weigl (2005) even reported a maximum lifespan of 20 years. Most of the above data comes from captivity and there are no records on reproduction from China.

### Prey

The jungle cat's diet varies across its range. Its primary prey are small rodents such as rats, mice, gerbils and ground squirrels. Secondary prey items are birds, lagomorphs, porcupines, reptiles, amphibians, and fish (Sunquist & Sunquist 2002, Mukherjee et al. 2004). It also feeds on bird eggs, on fruits such as the Russian olive, and rarely on carrion (Heptner & Sludskii 1992). Predation on poultry, ducks and geese is known to occur (Sunquist & Sunquist 2002).

### In captivity

Jungle cats breed easily in captivity (Sunquist & Sunquist 2002), but there is no studbook and no species survival plan.

### Main threats

The jungle cat seems to adapt better to cultivated landscapes than many other small felid species. However, destruction of wetlands and riparian vegetation has led to population declines (Uzbekistan, Nowell & Jackson 1996; former USSR, Belousova 1993; Jordan,

## Felis chaus

### Fact Sheet

#### Names:

丛林猫 [cong lin mao]  
jungle cat, reed cat,  
swamp cat

#### Head and body length:

58-76 cm

#### Tail length:

22-27 cm

#### Weight:

5-9 kg

#### Global Population:

>50,000 (IUCN 2010)

#### Chinese Population:

unknown

#### Distribution in China:

reportedly scattered in C  
and W China

#### IUCN Red List:

Least Concern (2008)

#### CITES:

Appendix II

#### China Red List:

CR A1a

#### China Key List:

Class II



Photo: E. Bartov

Baker et al. 2003). Logging of forest habitats to favour agriculture and plantations also drives jungle cats into human-dominated landscapes, where conflicts increase (Sri Lanka, Sunquist & Sunquist 2002). In Jordan, jungle cats are threatened by retaliation killing for predation on poultry and fall victim to poisoned baits laid for wild boars and foxes (Baker et al. 2003). Non-selective snaring is believed to have caused population declines in Indochina, especially in secondary habitats easily accessible to poachers (Duckworth et al. 2005). In the past, there was a massive international trade in jungle cat skins mostly originating from India before export was

banned in 1979 (McMahan 1986). Some illegal trade still continues, e.g. in Afghanistan (Habibi 2003), Myanmar (Shepherd & Nijman 2008) and also China (Wang 1998).

### Current and future protection

In China, the jungle cat is listed as a Class II protected species and hunting is prohibited without a special licence (Lu et al. 2010, this issue). Hunting is also prohibited in Bangladesh, India, Israel, Myanmar, Afghanistan, Pakistan, Tajikistan, Thailand and Turkey (Nowell & Jackson 1996, IUCN 2010). The ecology of the jungle cat is poorly known and more surveys need to be undertaken to gain knowledge of current status and distribution (Baker et al. 2003, Duckworth et al. 2005). Conservation measures should include better protection for domestic fowl and halting of indiscriminate poisoning and trapping. The jungle cat would also benefit from improved protection of wetlands, particularly in the more arid parts of its range (IUCN 2010). Recommended conservation measures for China include surveys to determine the jungle cat's status, raising awareness of local people and an uplisting of the species into Category I of the State Key Protected Wildlife List (Wang 1998).

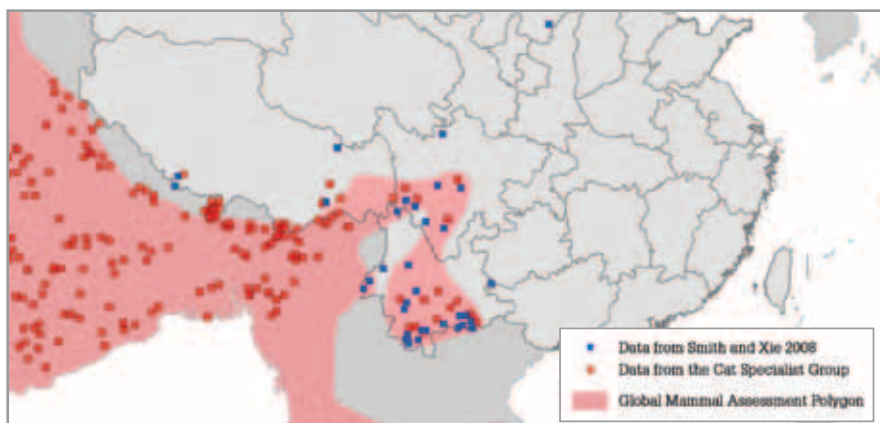


Fig. 2. Distribution of the jungle cat in China.



## Marbled cat

### *Pardofelis marmorata*

The marbled cat *Pardofelis marmorata* is about the size of a domestic cat, but it gives the impression of being more slender and elongated, mainly due to its extremely long and bushy tail, which is as long as the cat's body, and is typically held parallel to the ground (Fig. 1). This cat superficially resembles a clouded leopard in coat colour and pattern, but is much smaller and less robust-looking, with smaller and less distinct fur markings. The background colour may vary from dark grey-brown through yellowish grey to red-brown. The flanks and back are strikingly marked with large irregular, dark-edged blotches. The legs and underparts are patterned with black dots, and the tail is marked with black spots proximally, and rings distally. There are spots on the forehead and crown, which merge into narrow longitudinal stripes on the neck and irregular stripes on the back. Melanistic individuals have been reported from Sumatra (Wibisono & McCarthy 2010). Like the clouded leopard's, the marbled cat's teeth, especially the canines, are more robust and longer than those of similar sized cats, for example the leopard cat (Sunquist & Sunquist 2002, L. Grassman, pers. comm.). There are two subspecies described in China: *P. m. charltonii* and *P. m. marmorata* (Smith & Xie 2008).

#### Status and distribution

The marbled cat occurs in Nepal, Bhutan and in northern India, where it seems to be restricted to the eastern Himalayan foothills between 1,500 and 3,000 m altitude (e.g. Arunachal Pradesh; Mishra et al. 2006, Nowell & Jackson 1996). Its range stretches from Yunnan in China through Myanmar (Shepherd & Nijman 2008), Thailand (Grassman & Tewes 2000), Laos, southern and central Vietnam, into Cambodia, where it has a relatively high encounter rate (Duckworth et al. 2005). It further occurs in Brunei Darussalam, the Malay Peninsula (e.g. Jerangau Forest Reserve; Azlan & Sharma 2006), and Indonesia (Sumatra and Borneo; Povey et al. 2009, IUCN 2010). Its presence in Bangladesh is not confirmed (IUCN 2010). The first photo from a camera trap was taken in 1994 in the Huay Kha Khaeng Wildlife Reserve in Thailand (Nowell & Jackson 1996). Since then, there have been camera trap photos recorded from Sumatra, Borneo, Thailand, Malaysia, Cambodia, Laos and Vietnam (Povey et al. 2009).

There is little information on the current status of the marbled cat and very few confirmed data, as it is rarely seen or photographed in the wild compared to other sympatric felids (IUCN 2010). This has often been attributed to the arboreal nature of the species, but

could also be caused by a low abundance or its reclusiveness and occurrence in remote areas. Still the population is thought to be in decline and the species is believed to be rare and regionally endangered (IUCN 2010). There has been no information collected over the past decade in China (Wang & Xie 2009), but the cat ranks as the rarest felid species in Yunnan, where it is mainly known to occur (Wang 1998).

One specimen was collected in Yunnan in the 1970s (Nowell & Jackson 1996). In a more recent study in Yunnan from 2005 to 2006, the cat was identified by locals in the Nangunhe National Nature Reserve and in the Xishuangbanna region, but it is said to be rare (L. Feng pers. comm.). Reports of its presence in Guangxi were not confirmed (Nowell & Jackson 1996).

#### Habitat

The marbled cat is thought to be primarily associated with moist and mixed deciduous-evergreen tropical forest (Nowell & Jackson 1996). Collected specimens and skins have come from lowland tropical forest (e.g. Choudhury 1996, Mohd Azlan et al. 2007), but marbled cats also occur in hill forest (Grassman et al. 2005, J. McCarthy pers. comm.). There have also been anecdotal observations in secondary forest, in clearings and logged areas, and in swampy mangroves (Nowell & Jackson 1996). A pair of marbled cats was reported from a salt lick in Thailand's Phu Khieung National Park (Grassman & Tewes 2002).



**Fig. 1.** Camera trap picture taken in the Tabin Wildlife Reserve in Thailand in May 2009 (Photo J. Ross & A. Hearn).

### Ecology and behaviour

Very little is known of the marbled cat's behaviour, diet and ecological niche and nothing is known directly from China. It was believed to be primarily nocturnal as it was observed in Kalimantan, Borneo, between 8 and 10 pm (Yasuma & Alikodra 1990). The only radio-collared individual was a female tracked in Phu Khieo Wildlife Sanctuary in Thailand from May to June 2001. The animal was active at dusk and dawn and during the night (Grassman & Tewes 2000). However, recent camera trap photographs and sightings indicate that the species may also be active during the day (Azlan & Sharma 2006, J. McCarthy pers. comm.). The marbled cat is believed to be more arboreal than other sympatric felids (Sunquist & Sunquist 2002). The estimated home range of the radio-collared individual in Thailand was approximately 5.9 km<sup>2</sup>, but this may be an underestimate due to the small amount of data collected (Grassman et al. 2005).

All the data about the marbled cat's reproduction have been gathered from a few captive individuals. There are 1-4 kittens per litter (Nowell & Jackson 1996) and sexual maturity is attained at 21 to 22 months. In captivity, one cat lived to the age of 12 years and 3 months (Sunquist & Sunquist 2002).

### Prey

Almost nothing is known about the diet of the marbled cat and there is no genuine information from China. The cat has been seen stalking birds (Guggisberg 1975), which possibly form an important part of its diet. The stomach of one individual contained a rat. A captive individual readily ate squirrels, birds and frogs, but refused carrion (Guggisberg 1975). Predation on poultry has also been recorded (Mishra et al. 2006).

### In captivity

There are few marbled cats in captivity. Hardly any of these animals and no births are registered in the International Species Information System list (ISIS 2010).

### Main threats

Across its range, including China, the marbled cat is primarily threatened by habitat destruction through forest use and logging (Povey et al. 2009, IUCN 2010). It is thought to be sensitive to even moderate human disturbance (Sunquist & Sunquist 2002). It is probably opportunistically hunted for its meat and bones, caught as bycatch in

## Pardofelis marmorata

### Fact Sheet

#### Names:

云猫 [yun mao]  
marbled cat

#### Head and body length:

40-66 cm

#### Tail length:

45-54 cm

#### Weight:

3-8 kg

#### Global Population:

<10,000 (IUCN 2010)

#### Chinese Population:

unknown

#### Distribution in China:

C and W Yunnan

#### IUCN Red List:

Vulnerable C1+2a(i) (2008)

#### CITES:

Appendix I

#### China Red List:

CR A1c; B1ab(i, iii)

#### China Key List:

not listed



Photo: J. Ross & A. Hearn

snares, and occasionally hunted for its fur (Nowell & Jackson 1996, Povey et al. 2009). However, specimens are not commonly seen on local markets (Shepherd & Nijman 2008). In some areas, the marbled cat is also killed because of predation on poultry (Mishra et al. 2006).

### Current and future protection

The marbled cat is included in CITES Appendix I. Hunting of this species is prohibited in Bangladesh, Cambodia, India, Indonesia,

Malaysia, Myanmar, Nepal and Thailand. Hunting regulations are in place in Laos and Singapore (IUCN 2010). In China, the marbled cat was recommended to be listed in the First or Second Category of the State Protected Wildlife List (Wang 1998). However, it is not protected and a hunting ban is only effective in Yunnan (IUCN 2010). There are no current studies on the marbled cat. Further research on ecology, distribution and status of the marbled cat is urgently needed (Povey et al. 2009).



Fig. 2. The distribution of the marbled cat in China.



# Fishing cat

## *Prionailurus viverrinus*

The fishing cat *Prionailurus viverrinus* is about twice the size of a large domestic cat, but its deep-chested body and comparatively short legs make it look much bigger. The small rounded ears are set well back on its elongated face. The tail is about one-third of the head-and-body length, marked with five to six black rings and a black tip. The short, coarse fur is mouse grey or olive brown and covered with small black spots. On the face, back, and neck, spots merge into short streaks or lines. The belly is white (Fig. 1; Sunquist & Sunquist 2002).

### Status and distribution

The fishing cat has an apparently broad but discontinuous distribution in Asia (Sunquist & Sunquist 2002, Choudhury 2003). It is classified as an endangered species by the IUCN Red List because of severe population declines reported throughout much of its range over the last decade (IUCN 2010). Furthermore, an appalling lack of reliable evidence for its oc-

currence within the presumed range has become apparent.

The fishing cat is primarily found in the Terai region of the Himalayan foothills in Nepal and northeastern India (Fig. 2; Choudhury 2003, IUCN 2010), but may already be extinct in Pakistan (IUCN 2010). It appears to occur all over Sri Lanka (IUCN 2010), and it is considered widespread and locally common in Bangladesh (Khan 2004). In Myanmar, skins of fishing cats can be found in wildlife markets, and traders state they obtain skins from local hunters (Shepherd & Nijman 2008). Camera trap studies and sign surveys have confirmed the presence of fishing cats in two coastal areas of Thailand: the Thale Noi Non-Hunting Area and the Khao Sam Roi Yot National Park. However, no evidence of the species was found at Klong Saeng and Maenam Pachi Wildlife Sanctuaries (Cutter & Cutter 2009). The presence of fishing cats is not confirmed by hard facts in Laos, although at least one valid direct observation was made in the Nam Theun Extension proposed

National Protected Area in 1996 (Duckworth et al. 2010). No sign of the cat was found in Vietnam during a survey conducted by wildlife officers. However, wildlife officers admitted problems with species identification (Johnsingh & Nguyen 1995). According to a personal communication in Duckworth et al. (2005), stuffed fishing cats were found in Vietnamese taxidermists in the late nineties. The presence of fishing cats has been confirmed in northern and southwestern Cambodia (Duckworth et al. 2005, Royan 2009, Rainey & Kong 2010). However, there are no confirmed recent records from peninsular Malaysia (IUCN 2010) apart from a photograph of a fishing cat-like animal obtained in the Taman Negara National Park in 2000 (Kawanishi & Sunquist 2003). On Java, fishing cats were only recorded from coastal wetland habitats in the west of the island, and were considered to be critically endangered by Melisch et al. (1995). There is no information about the present situation of the Javan population and there are no confirmed records, neither historical nor recent, from Sumatra (Duckworth et al. 2009, Sanderson 2009).

The fishing cat is often not recognized as a Chinese species (Smith & Xie 2008). In 1986, it was reported to have probably disappeared from the western border regions of China (Karanth 1986). One record from Taiwan from 1962 (Chen 1969) is now considered to be erroneous, while two other records from Yunnan from 1996 remain unclear (Zhang et al. 1997, IUCN 2010). The existence of a stable population in China is unlikely, but there could well be fishing cats occasionally roaming into Guangxi or Yunnan near the Vietnam border (Nowell & Jackson 1996, L. Feng, pers. comm.).

### Habitat

Fishing cats are strongly associated with wetlands. Although they are widely distributed through a variety of habitat types, their occurrence tends to be highly localized (Nowell & Jackson 1996, IUCN 2010). Across their range, fishing cats occur in coastal and inland wetlands, near rivers and streams, in marsh areas, reed beds, tidal creeks and mangrove forests. They are found close to the fringes of dense vegetation, including evergreen and tropical dry forest, scrubs, and tall grass (Nowell & Jackson 1996, IUCN 2010). In Sri Lanka and Thailand, fishing cats can also be found in degraded habitats intensively used by humans (Cutter & Cutter 2009, IUCN 2010). They have been observed at elevations up to 1,525 m in the Indian Himalayas (Nowell & Jackson 1996).



**Fig. 1.** Fishing cats stalking prey (top, photo N. Buck; bottom, photo Art Wolfe).

### Ecology and behaviour

Fishing cats are believed to be solitary and mostly nocturnal, although they have also been observed during the day in Sri Lanka (Nowell & Jackson 1996, Sunquist & Sunquist 2002). They are capable of swimming long distances and have been observed to dive head first into the water after their prey or to scoop out fish with their paws (Sunquist & Sunquist 2002). Two dens have been found in the wild and both consisted of rough nests in dense patches of reeds (Sunquist & Sunquist 2002). During a study in Chitwan National Park, Nepal, the home range of a radio-collared male was measured at 16-22 km<sup>2</sup>. It overlapped the smaller ranges of several females, which used areas of 4-6 km<sup>2</sup> (Sunquist & Sunquist 2002). Mating takes place in January and February. In captivity, litter size is between 1 and 3, sometimes even 4 kittens. The age of independence is 10 months and one female became mature at 15 months. Captive fishing cats have lived up to 12 years (Nowell & Jackson 1996, Sunquist & Sunquist 2002).

### Prey

As its name implies, the fishing cat's main prey is fish, even though it also hunts birds, rodents, reptiles, insects, frogs, molluscs and crustaceans (Haque & Vijayan 1993, Sunquist & Sunquist 2002). Chital fawns are mentioned as possible prey (Sunquist & Sunquist 2002). Fishing cats have also been observed scavenging on carcasses and during one study, large amounts of grass were found in their faeces (Haque & Vijayan 1993). Furthermore, the fishing cat is known to prey on poultry (Sunquist & Sunquist 2002, Cutter & Cutter 2009, IUCN 2010). There is no information on its food habits from China.

### In captivity

Fishing cats are not common in zoos. Most are probably inbred as they originate from the same population in the Rotterdam Zoo. They

## Prionailurus viverrinus

### Fact Sheet

#### Names:

渔猫 [yue mao]  
fishing cat

#### Head and body length:

65-86 cm

#### Tail length:

25-33 cm

#### Weight:

6-15 kg

#### Global Population:

<10,000 (IUCN 2010)

#### Chinese Population:

unknown

#### Distribution in China:

unknown

#### IUCN Red List:

Endangered A2cd+4cd (2010)

#### CITES:

Appendix II

#### China Red List:

not listed

#### China Key List:

not listed



Photo: A. Sitwa

are reported to tolerate living in groups (Sunquist & Sunquist 2002).

### Main threats

The greatest threat to the fishing cat across its range is destruction of wetlands and mangrove habitats through settlement, conversion to agriculture and aquaculture, excessive hunting, and wood-cutting. The fishing cat may also be threatened by pollution of rivers through agriculture or waste water from fish farms (Cutter & Cutter 2009, IUCN 2010). The depletion of fish stocks from over-fishing is prevalent in many Asian wetland environments and is likely to be a significant threat (IUCN 2010). Fishing cats are shot or poisoned because they raid poultry sheds and are believed to kill young domestic livestock (Melisch et al. 1995, Sunquist & Sunquist 2002, Cutter & Cutter 2009).

Their pelts can still be found on wildlife markets (Shepherd & Nijman 2008). They are also caught in fish traps or in snares set for other species (Kolipaka 2006, Cutter & Cutter 2009). On Java, remaining wild populations were suspected to suffer from genetic decline because of population fragmentation (Melisch et al. 1995).

### Current and future protection

The fishing cat is protected by national legislation over most of its range. Hunting is prohibited in Bangladesh, Cambodia, China, India, Indonesia, Myanmar, Nepal, Pakistan, Sri Lanka and Thailand. There are hunting regulations in Laos. In Bhutan and Vietnam, there is no protection outside protected areas (Melisch et al. 1995, Nowell & Jackson 1996, IUCN 2010). There is an ongoing project in Thailand, which supports basic surveys, ecological research (17 radio-collared cats), and public outreach (Fishing Cat Research and Conservation Project 2009). Local wildlife authorities in Yunnan and Guansi should be made aware of the possible occurrence of the species in their provinces.

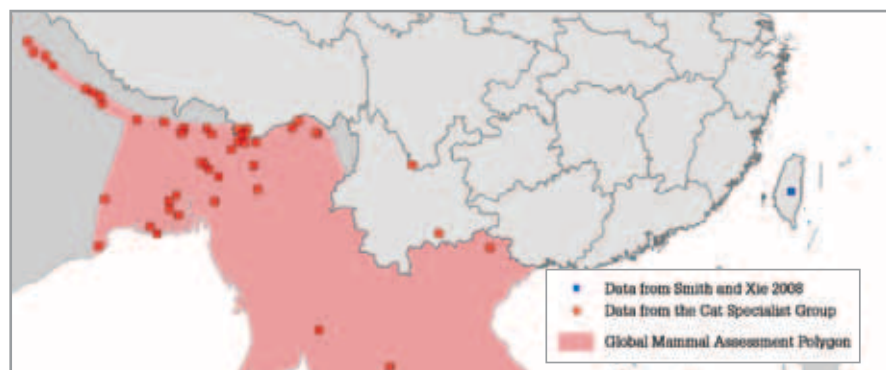


Fig. 2. The distribution of the fishing cat in China.

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