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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 km² with a maximum of 500 km² (South Africa), those of males vary from 20 to several hundred km², 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 Zhangguancailing of the Changbaishan Mountains, with no more than 7– 12 individuals estimated (Z. Wu, unpublished data).

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. Sliwa

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 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 km², 3–6 leopards were estimated. In Ha'erbaling, a narrow mountain ridge of 250 km² 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 disapeared 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

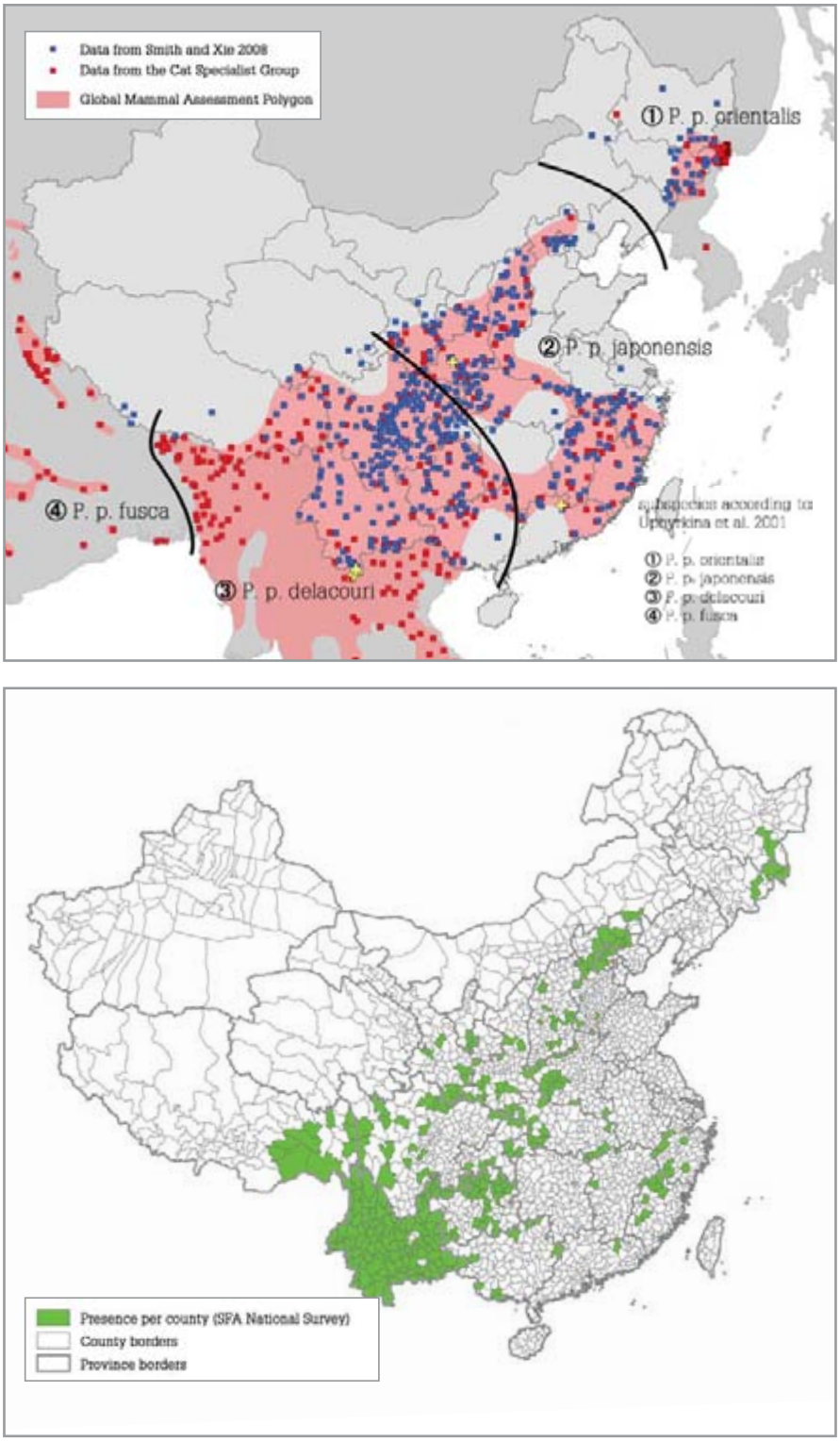

Fig. 2. Distribution of the leopard in China.

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 Zhangguancailing 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. delacouri* (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 bones used in traditional medicine after tiger 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 Heilonjiang 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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