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Fig.1: Red panda habitat in the Kangchendzonga landscape of the border triangle Sikkim, West Bengal and Nepal – mixed fir and rhododendron forest at 4,000 m asl.

(Photo: Axel Gebauer)

# Sikkim - under the sign of the red panda

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Fig.2: Red panda in the coat of arms of the Sikkim Forest Department.

(Photo: Axel Gebauer)

Only a few years ago, the red panda, or lesser panda has been declared the “state animal” of Sikkim (see Fig. 2). The small state in northeastern India thereby wants to show that conservation of its unique wildlife is ranking high on its political agenda. This study on the current status of the red panda in Sikkim underlines the urgency of such developments.

The first published use of the name “red panda” and the naming credit go back to Frédéric Cuvier (Cuvier, 1825). The actual “discovery” for science, however, was made by the English general Thomas Hardwicke, who wrote his manuscript already in 1821 in Darjeeling, but who only published it two years after Cuvier (HARDWICKE, 1827). Cuvier gave the “most handsome mammal on Earth”, as he called it later on, the name panda, probably referring to the animal’s preference for bamboo (MORRIS & MORRIS, 1982). “Panda” is derived from the Nepalese word “ponya” and means bamboo eater. Apart from bamboo, the red panda’s diet also includes roots, acorns, berries, fruit, lichen and sometimes even smaller mammals, bird eggs and young birds. The taxonomic name chosen by Cuvier was Ailurus fulgens, which means “cat with shining fur”. Its Chinese name Hun-ho means firefox, referring to the animal’s mostly shining red fur (see Fig. 3).

Fig.3: Red panda in the Zoo of Gangtok, the state capital of Sikkim.
(Photo: Axel Gebauer)

## Classification and distribution

For a long time, the taxonomic classification of the red panda was unclear. Until the end of the 20th century, due to morphologic resemblances, it was considered a sister taxon of the giant panda or a relative of the bears, of the procyonids (racoons and allies), of the mustelids or a monotype within thea Arctoidea superfamily of the carnivora (summary in FLYNN et al., 2000). By now, genetic research has shown that it is the only representative of a family of its own, the so-called Ailuridae (cat bears) (FLYNN & NEDBAL, 1998, FLYNN et al., 2005).

The two sub-species of the red panda can be found in the Himalaya and its northeastern border mountain ranges (see Fig. 4). The western limit of distribution is in the Annapurna region in Nepal; eastwards, Ailurus can even be found in the Qingling Mountains in the Chinese province of Shaanxi (WANG et al., 2008). The distribution can be described as disjoint (ibid.). The nominotypic taxon (*A. f. fulgens*) can be found in the mountain forests of Nepal, northeastern India, Bhutan and northern Burma in altitudes between 1,500 and 4,800 metres (YONZON et al., 1997, CHOUDHURY, 2001, PRADHAN et al., 2001; WILLIAMS, 2004). In the eastern Himalaya, Ailurus seems to prefer altitudes between 2,800 and 3,100 metres (PRADHAN et al., 2001). CHOUDHURY (2001) reported of a disjoint distribution area in the much lower mountains of the Indian state of Meghalaya. The main area of distribution of the eastern sub-species (A. f. styani) lies in the south-western Chinese provinces of Sichuan and Yunnan as well as in the Tibetan Autonomous Region (WEI et al., 1999).

## Threat and conservation status

There are no reliable population numbers available. In India, the cat bear's population is estimated to be of 5,000 to 6,000 individuals. For China, zoologists estimate populations of between 6,000 and 7,000 individuals (CHOUDURY, 2001). These estimates are probably too optimistic. The IUCN Red List classifies the species as "vulnerable" and estimates the total population to be of less than 10,000 fecund individuals (WANG et al., 2008). During the last 50 years, populations have probably been reduced by 40% due to loss of habitat, poaching and trading (WEI et al., 1999). Therefore, as of


Fig.4: Distribution of Ailurus fulgens (modified from WANG et al., 2009).

Fig.5: Kangchenjunga viewed from Maenam Wildlife Sanctuary.
(Photo: Axel Gebauer)

1975 the red panda has already been listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), since 1995 even on its Annex I, thus making any international commercial trade illegal. In all of its range countries, hunting for the red panda is strictly forbidden.

## Sikkim and its natural habitat

Sikkim is the second smallest Indian state and is located on the southern flank of the world's highest mountain range, the Himalaya. Surrounded by Nepal, China and Bhutan, Sikkim covers a surface of 7,096 km². It measures roughly 100 km from north to south and roughly 60 km from east to west. Almost a third of the country's surface is permanently covered with snow and ice. Sikkim's landscape is marked by vast differences in altitude and thus different climate zones. The relief ascends from 228 m in the subtropical valley of the river Teesta to an altitude of more than 8,000 m with alpine climate. The third highest mountain of the world, the Kangchenjunga (8,585 m), is situated on the border between Sikkim and Nepal (see Fig. 5).

Fig.6: Red pandas were even sighted in the surroundings of Gangtok, state capital of Sikkim (Fambong Lho Wildlife Sanctuary and zoo premises in Bulbuley).

(Photo: Axel Gebauer)

Fig.7: The warm and humid climate of Sikkim leads to an extremely rich flora. A total of 362 ferns and allies, 36 rhododendron, 11 oak and 23 bamboo species grow in its overcast and foggy valleys.

(Photo: Axel Gebauer)

The average temperature in the capital Gangtok (1,800 m above sea level) varies from 25°C to 28°C in summer and from 5°C to 15°C in winter (see Fig. 6). Corresponding to its relief, permanent frost is frequent in parts of the country with higher altitude. The relative humidity of the air is between 77% in December and 92% in July with an annual average of roughly 82% (point of reference: Gangtok). Precipitations in Sikkim range from 2,000 mm to 5,000 mm with an annual average of 3,000 mm (see Fig. 7), which favours the growth of several types of orchids (see Fig. 8). During the summer months, from June to September, Sikkim is under the influence of the south-western monsoon, causing torrential rains coming from the southern roofs of the Himalaya. Almost half of Sikkim's surface is covered by forests. The prevalent forest types are the tropically-moist deciduous forests, subtropical, montanely temperate and subalpine forests (see Fig. 9). Higher regions also feature alpine tundra.

Detailed information on the geographical classification and protected areas in Sikkim can be found in GANGULA-LACHUNGPA et al. (2007).

For a long time, the numerous passes in the north of Sikkim were used as carrier routes for the trade of goods from the southern Himalaya to Tibet and China (OLSCHAK, 1965). At an altitude of 4,500 m above sea level, the Nathu La was a pass route of the legendary Silk Road and a typical trade

Fig.8: One of the 523 orchids of Sikkim (LUCKSOM, 2007): the epi- or lipophytic *Pleione humilis.*

(Photos: Axel Gebauer)

Fig.9: One of the typical ferns in the red panda habitat: *Dicranopteris* sp. (syn. *Gleichenia*), whose fronds grow up to three meters long.

route between India and Tibet. However, the previously independent small kingdom was a very secluded country, into which only few travellers found entry (MEYER & MEYER, 2006). After the previously flourishing timber trade already abated during the British protectorate, it came almost entirely to a halt after the armed conflict between India and China in 1962. The almost 350-years-old history of the old kingdom of Sikkim ended on May 16, 1975 with the inclusion of Sikkim as federal state into the Indian Union. This slowed international goods trade via Sikkim further down, since administrative and strategic issues gained a higher priority on the political agenda.

**WWF surveys, the TRAFFIC programme and ex-situ species conservation**

With financial support of the German Zoo Association (VDZ) and in cooperation with the Forests, Environment & Wildlife Management Department (FEWMD) of the Government of Sikkim, the WWF initiated a study in 2006 aiming at the description and evaluation of the potential areas of distribution and the population status of the red pand in Sikkim. For this purpose, a land usage classification was carried out at first in order to make qualified remarks on the potentially available habitats of the red panda. Furthermore, biological field surveys were made to gain information on the habitat requirements and abundance of the cat bears. Finally, in February 2007 a first analysis of the population and habitat status and of the survival chances of the red panda was made in cooperation with the Blijdorp Zoo in Rotterdam (The Netherlands) and the IUCN during a pre-PHVA (Population and Habitat Viability Assessment) workshop (see Fig. 10) in Gangtok (GHOSE, 2007). At the same time, TRAFFIC, the wildlife trade monitoring network, a joint programme of the WWF and the IUCN, has programmes running in India and China. In the case of protected species such as the red panda, TRAFFIC's main focus lies on the support of illegal trade controls.

***a) Remote sensing***

For the creation of a land usage classification of Sikkim, satellite images from February 16, 2002 taken by the Indian Remote Sensing Satellite (IRS-1C) with a spatial resolution of 23 metres were used. Using highly sensitive GPS receivers, our team recorded ground control points (GCP) for all land usage types. Land usage class types were created according to ROY & TOMAR (2000) using supervised classification with the software package ERDAS Imagine (Version 8.5), based on the signatures of the recorded GCPs. Thus, it was possible to depict the degree of forest canopy as a qualitative characteristic of the ecological status of the red panda's habitat. Forests with a canopy cover of more than 40% were characterized as intact forests (see Fig. 11). Degraded forests were characterized by a canopy of between 5% and 40% (see Fig. 12). Scrublands and fallow lands feature a canopy of less than 5%.

In order to avoid the mixing of different vegetation zones, the forest areas were first divided into four elevation zones, using the altitude model: (i) 1,500 – 2,000 m, (ii) 2,000 – 2,500 m, (iii) 2,500 – 3,000 m, (iv) > 3,000m. The oak and conifer forests, prevalent in the habitat of the red panda, could be

Fig.10: During a pre-PHVA workshop in Gangtok in February 2007 the latest data about biology, distribution and threats for the red panda were exchanged. CBSG staff Sanjay Molur and Kristin Leus during their lecture. (Photo: Axel Gebauer)

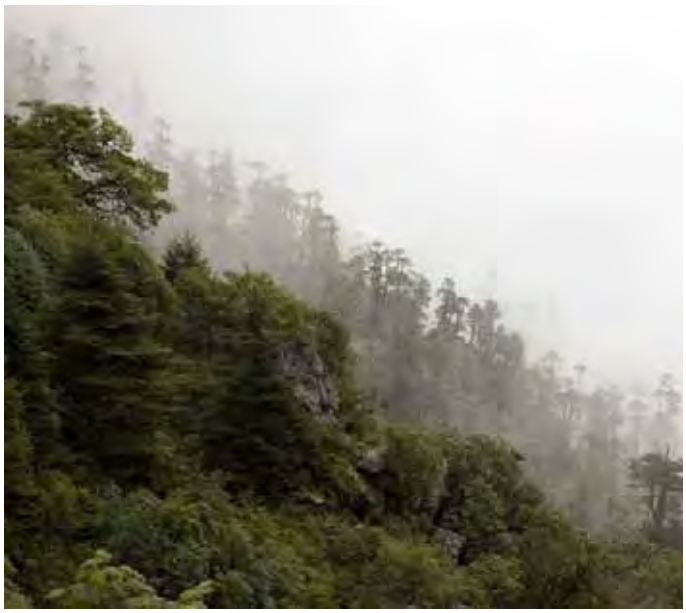

Fig.11: Intact habitat of red panda in Pangolakha Wildlife Sanctuary ca. 3,000 m asl: mixed conifer forest with rhododendron, oaks, spruce and firs and a species-rich undergrowth.
(Photo: Axel Gebauer)

Fig 12: Degraded forest near Gangtok (Bulbuley) ca. 1,800 m asl with sporadic sightings of wild red pandas. *Cryptomeria japonica*, a timber tree introduced by the British 140 years ago is growing next to autochthonous saplings. From a modern conservation point of view, this conifer must now be seen as an invasive alien species.

(Photo: Axel Gebauer)

Fig 13: Staff of WWF, of the local Eco Development Committee and of the FEWMD during field studies in Pangolakha Wildife Sanctuary (squatting from left: Basant Kumar Sharma, Pawan Subba, Chenga Buthia and DFO Karma Legshey).

(Photo: Axel Gebauer)

differentiated using the infrared band of the IRS-1C. This re-classification based on the altitude and remote sensing was enhanced by the so-called supervised classification. This is based on the localization of the pixel characteristics of known test areas on the satellite image. Using a classification algorithm, additional surfaces with the same pixel characteristics were detected. The data was transferred to a geographic information system (ArcGIS 9.3), the surface calculation function of which allowed the quantification of the shares of the land usage class types.

The results of the land usage classification show that 25% of Sikkim's land surface is not covered with forests. An additional 29% is permanently covered with snow and ice. The forest canopy of Sikkim thus is at 46%, equivalent to roughly 3,262 km² (ENVIS CENTRE SIKKIM, 2007). A bit more than 4% of the surface with forests lies within the protected area network.

The results of the earlier and present biological fields surveys (see below) lead to the assumption that the potential habitat of the red panda in Sikkim stretches along the altitude level from 1,700 m to 3,700 m above sea level. Surface calculations for this altitude level result in an area of 1,341 km², equivalent to almost 19% of Sikkim's total surface. A bit more than three quarters (1,017 km²) of this area are covered by oak forests, 3.8% (51 km²) by mixed conifer forests and 20.2% (273 km²) by conifer forests. Evergreen oak forests characterize the altitude level from 1,700 m to 2,800 m, mostly with species of the genus' *Quercus*, *Castonopsis* and *Michelia*. The altitude level from 2,800 to 3,100 m is dominated by Tsuga dumosa, Quercus pachyphylla and increasingly also by conifers, which is why the zone is classified as mixed conifer forests. The altitude level from 3,100 m to 3,700 m is characterized by Larix griffithiana, Abies densa, Juniperus recurva and Picea smithiana.

The evaluation of the satellite images showed that about 49% of the potential habitat of the red panda in Sikkim consists of mostly open and degraded vegetation types. About half (507 km²) of the oak forests in Sikkim are degraded, and almost 30% (15 km²) of the mixed conifer forests constitute open forest formations. The percentage of conifer forests with an open canopy is even higher at almost 60% (162 km²). However, conifer forests in this climate zone often do not form dense canopies. 135 km² of the conifer forests can be classified as degraded. The areas favoured by red pandas usually include dense forests with high canopy (PRADHAN et al., 2001). The percentage of this forest type in Sikkim, however, only corresponds to a surface of 51% (684 km²), with dense oak forests forming the largest part with 78.5%. Almost a quarter of the cat bear's habitat lies within protected areas.

***b) Field surveys***

In cooperation with the FEWMD (see Fig. 13), biological field surveys were carried out in four protected areas (Barsey Rhododendron Sanctuary, Pangolakha Wildlife Sanctuary, Kyongnosla Alpine Sanctuary and Fambong Lho Wildlife Sanctuary) from May 2007 to January 2009 (SHRESTA & GHOSE, 2009). The survey among the local inhabitants was to give a first hint on whether red pandas were known to live in the respective region or had lived there in the past, and which factors were threatening the populations. In order to investigate the red panda populations, transects were created every 400 metres of altitude. Difficult

Fig 14: Chenga Buthia must climb like a red panda to reach the species' latrines in 30 m tall oak trees. This is one of the few unambiguous methods for definite evidence of red pandas.

(Photo: Axel Gebauer)

Fig 15: Typical latrine in a moss covered fork of a rhododendron tree.
(Photo: Axel Gebauer)

terrain had to be bypassed via existing paths or tracks. The transects along the altitude gradients were examined for signs of red pandas, such as direct sightings, scratch marks or scat droppings (see Fig. 14). Furthermore, randomly selected areas in different vegetation zones were regularly checked for latrines.

Using this method described in PRADHAN et al. (2001), the number of scat droppings during a specified time of examination produces an index, which can be used for the quantification of the relative frequency of the species in question in the examined area (see Fig. 15). During the sightings of red pandas or in case of indirect indications to their occurrence, the following parameters were determined: altitude above sea level, distance to human settlements, forest type, prevalent tree and bamboo species, downhill gradient and distance to nearest water source. Based on this data, it was possible to identify basic requirements of the red panda to the available habitat. Among other things, it was discovered during the field surveys that the animals also access the open ranges near forest borders to eat the flowers of the Sikkim knotweed (*Polygonum molle*) (see Fig. 16). Direct sightings of red pandas were very sporadic (see Fig. 17).

The numbers of groups of scat droppings in the examined protected areas are listed in Table 1. Only in the Dzongchen area of the Pangolakha Wildlife Sanctuary, in an area of 8.1 km², it was possible, due to intensive

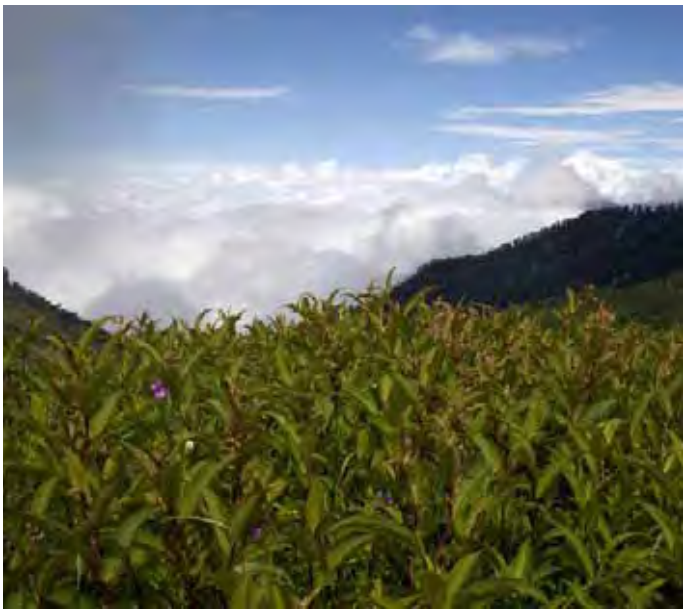

Fig 16: Recently discovered food plant of red pandas: Sikkim knotweed (*Polygonum molle*), Pangolakha Wildlife Sanctuary, 3,500 m asl.

(Photo: Axel Gebauer)

Fig 17: Sightings of red pandas in the wild are rare, because the animals are often sleeping well camouflaged and motionless during the day on horizontal moss covered branches high up in trees - in the centre of this photograph in a fir *Abies densa*. (Photo: Axel Gebauer)

| Protected area | Area in km$^2$ | Height asl in m | Survey period | Abundance of red pandas | No. of groups of scat droppings per hour |
|---|---|---|---|---|---|
| Barsey Rhododendron Sanctuary | 104 | 1.600 - 3.600 | May 2007 | confirmed | 0.20 |
| Pangolakha Wildlife Sanctuary | 128 | 1.300 - 4.000 | January to April 2008; December 2008 to January 2009 | confirmed | 0.22<br>0.516* |
| Kyongnosla Alpine Sanctuary | 31 | 3.048 - 3.960 | March 2008 | confirmed | 0.214 |
| Fambong Lho Wildlife Sanctuary | 52 | 1.280 - 2.652 | June and September 2007 | not confirmed | - |

Table 1: Overview of protected areas in Sikkim that were surveyed for the abundance of red pandas. *This value was recorded during the survey period from December 2008 to January 2009.

research, to estimate the population density to be of 1 ad. individual/2.7 km² (see Table 2). This value roughly corresponds to the estimated population density of the red panda in the Langtang National Park in Nepal, indicated by YONZON & HUNTER (1991) with 1 adult individual/2.9 km². PRADHAN et al. (2001) however assume a higher population density (1 ad. individual/1.67 km²) in the Singhalila National Park in Darjeeling. Since there are currently no population data of sufficient quality available for Sikkim, the estimate for the Pangolakha Wildlife Sanctuary and the two literature sources mentioned above were used for the calculation of a 95% margin of confidence for the estimated average value (see Table 2). With the assumption of normal random variables, a confidence interval of 1 ad. individual/2.42 + 0.61 km² was calculated for the population density of the red panda. Based on the habitat analysis, it was now possible to calculate the population of the red panda in Sikkim. The surface of habitat suited for the red panda in Sikkim was indicated with 684 km². With the assumption that the red panda only lives in ecologically intact forests with a relatively dense canopy, the total population in Sikkim is between 225 and 378 ad. indivi-duals, including a probability of error of 5%.

***c) TRAFFIC's work against illegal wildlife trade***

In cooperation with all forest department, police, border police, customs, and other similar forest management and law enforcement agencies and authorities concerned by illegal wildlife trade, TRAFFIC elaborated an action plan to support those governmental organizations along with the WWF in effective wildlife conservation (see Fig. 19). The result of a workshop (TRAFFIC INDIA, 2007) was the assessment that governmental institutions are often left alone with the implementation of such laws and are frequently lacking the technical and analytic means to adequately face poaching and smuggling. Furthermore, the lack of efficient cooperation among the government agencies, significant knowledge gaps and different prioritization were also noted as areas in need for improvement and capacity building.

***d) Ex-situ species conservation***

There are three zoological gardens in the north-eastern Indian distribution range of the red panda. Although the state of Arunachal Pradesh probably has the largest wild populations of the species, there are no red pandas to be found at the zoo of the capital Ithanagar. Just a few years ago, colleagues of the Himalayan Zoological Park Bulbuley in Gangtok, which opened in 1991, have started to engage in the conservation of the species. Sikkim's only zoo is predestined for the keeping of red pandas, since it is the heraldic animal of the Ministry of Forestry in Sikkim, of which the zoo is a part (see Fig. 20). In summer 2009, eight individuals were living at the zoo, including two animals from the wild, brought to the zoo as foundlings. In June and July 2009 each, one young animal was born, the mothers of which

| Area | Density (mature individuals / km$^2$) | Source |
|---|---|---|
| Langtang National Park, Nepal | 1 / 2.9 | YONZON & HUNTER, 1991 |
| Singhalila National Park, India | 1 / 1.67 | PRADHAN et al., 2001 |
| Pangolakha Wildlife Sanctuary, India | 1 / 2.7 | Surveys conducted by authors |
| Sikkim, India | 1 / 2.42 $\pm$ 0.61 | Estimation by authors |

Table 2: Red panda density in selected protected areas as well as estimate for Sikkim, including the 95% confidence interval.

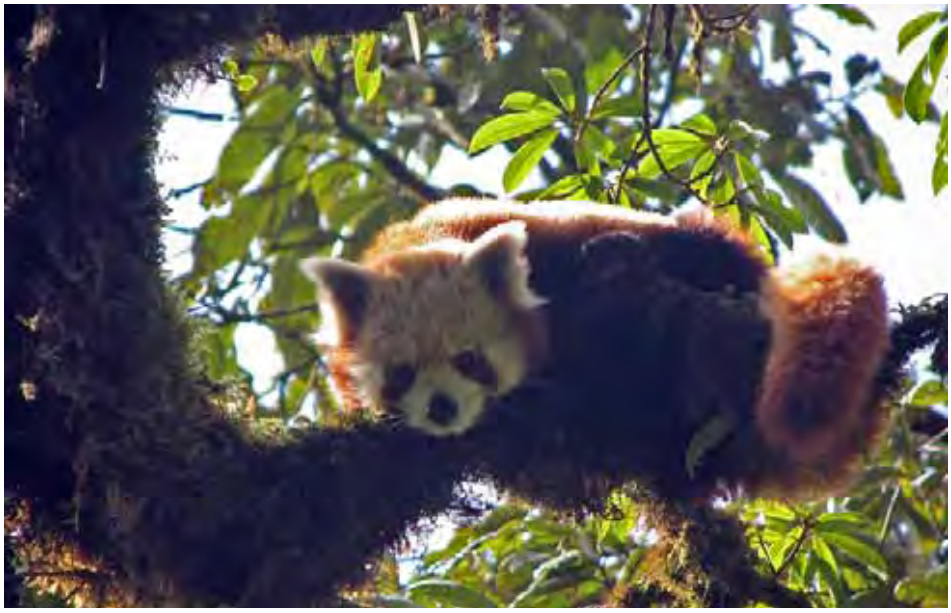

Fig 18: The project field staff had several sightings of red pandas in the wild by now. Here an animal in Pangolakha Wildlife Sanctuary. (Photo:Basant Kumar Sharma)

live in separate compounds without public access. In total, the zoo so far has 30 compounds, some of them quite large and semi-natural. These compounds are located next to each other at the edge of the zoo, which still has a large development potential with a total surface of 205 ha. The area, which has been reforested, is about 3 km outside of Gangtok at an altitude of 1,780 m above sea level. During the winter months, wild red pandas were seen within the zoo perimeters on several occasions. Those are probably animals that fled their regular habitat because of bad weather conditions (snowfall) and came to the lower regions.

The Padmaja Naidu Himalayan Zoological Park of Darjeeling has the most extensive experience with the keeping and breeding of red pandas (see Fig. 21). The park was founded back in 1958. Since 1993, it has been subject to the Ministry of Environment/Forestry of the state of West Bengal. The zoo keeps 30 exclusively autochthonous animal species (22 mammals, 7 birds and 1 amphibian) on a surface of 28 ha. A separate area contains special breeding compounds for snow leopards and red pandas. For both species, the park has successful conservation breeding programmes running for several years now. The Indian studbook for red pandas is managed by the Darjeeling zoo. About 20 red pandas have been living there and giving birth to offspring on a regular basis since 1994 (see Fig. 22). On several occasions since 2003, several conservation-bred animals were released into the wild. Of these, one released female (wearing a collar with a tracking device) has produced offspring. The film "Cherub of the Mist" (BEDI & BEDI, 2006) contains impressive images of the zoo's activities, the release and the life of the red pandas in the Singhalila National Park on the border between India and Nepal.

Apart from the zoos in the distribution area of the red panda, numerous zoological gardens around the world contribute to captive breeding programmes for this species. A total of 759 cat bears are registered in the current international studbook in 249 institutions (GLATSTON, 2008). This population is an important reserve for the wild population (GLATSTON & LEUS, 2005). Regional studbooks for the red panda are kept in the following regions: North America, China – both sub-species (A.f. fulgens and A.f. styani); Europe, Australia, South Africa, India – nominotypic taxon (A.f. fulgens); and Japan – (A.f. styani).


Fig 19: TRAFFIC and WWF organize capacity building workshops to support police, army, border police, customs and forest officers in their battle against illegal wildlife trade.
(Photo: WWF India, Sikkim Programme Office)

Fig 20: Entrance gate of Himalayan Zoological Park Bulbuley in Gangtok.

(Photo: Axel Gebauer)


Fig 21: The symbol of Padmaja Naidu Himalayan Zoological Park in Darjeeling.
(Photo: Axel Gebauer)

**Discussion**

Within the scope of the land usage classification described above, the potential red panda habitat in Sikkim was calculated to be of 1,341 km². CHOUDHURY (2001) indicates the potential habitat to be of 1,700 km², but this number results from a different data basis. The significant difference of 657 km² between potential (1,341 km²) and actual (684 km²) habitat is obviously the result of strong anthropogenic reshaping of the red panda's distribution area. The opening of forest areas for agricultural purposes and the growing demand for fire wood have taken their toll in some areas and, among other reasons, constantly reinforce the pressure on the forestal resources. Since 1971, the population of Sikkim has more than doubled from 210,000 inhabitants to 541,000 inhabitants in 2001 (GOVERNMENT OF INDIA, 2001). Since 29% of the country's surface is permanently covered with snow and ice, the settlement areas concentrate on areas below the alpine zone, overlapping in part with the red panda's area of occurrence. In the above mentioned period, the population density has therefore increased from 30 to 76 inhabitants per km² (ibid). Furthermore, Sikkim is becoming more and more open to national and international tourism. Between 1980 and 2005, the number of annual visitors increased from 1,000 to 250,000 (MAHAPATRA, 1998; GOVERNMENT OF SIKKIM, 2006). Though tourism currently focuses on the urban regions, the government increasingly encourages nature tourism, seeing it as a motor for the development of the state (GOVERMENT OF SIKKIM, 2006). With growing tourist numbers, the demand for fire wood for cooking and heating grows as well. The desired economic expansion of the tourism sector thus inevitably increases the pressure on the forest.

Though the Government of Sikkim has already prohibited the felling of living trees in forest reserves outside socio-economic development zones, the enforcement of the national law from official sides is rather lax. In addition to that, wood pasture of domestic cattle in the forest reserves was a common practice in the past. This resulted in a loss of quality for the red panda habitat in mountainous regions between 1,500 and 4,000 m altitude. Overgrazing impairs the growth of certain bamboo species, which constitute an important basic food resource for the red panda (YONZON & HUNTER, 1991). This may be a major reason why Ailurus has disappeared from large parts of its expected area of occurrence in Sikkim. More recent information however indicates that the official prohibition of wood pasture is now being enforced (TAMBE et al., 2005).

Another difference to the research made by CHOUDHURY (2001) is that our field surveys could not confirm the existence of the red panda in the Fam-

Fig 22: A red panda in a naturalistic enclosure at the zoo in Darjeeling.
(Photo: Axel Gebauer)

Fig 23: The newly opened border pass (top center) between India and China, viewed from Fambong Lho Wildlife Sanctuary. (Photo: Axel Gebauer)

bong Lho Wildlife Sanctuary. This raises the question whether poaching has once again become more significant. Since the opening of the border pass Nathu La for the transport of goods to China on July 6, 2006, Sikkim, due to its bottleneck position between Nepal and Bhutan, assumes the function of an economic corridor for the central and eastern states of India to China. Wildlife species are explicitly excluded from the trade via this pass as the Indian government only acknowledges seven transfer places for wild plants and animals and their products (GOVERNMENT OF INDIA, 2007), but a large part of the sub-continents' goods exported to China will soon go via the pass Nathu La (see Fig. 23). The pass lies roughly in the middle of the shortest route from Kolkata to Lhasa, which is only 550 km away from the border. The trade, so desired by the economy, is however currently limited to natural products, curiously enough reminding of the days of the Silk Road: Indian merchants are allowed to trade 29 types of goods, including textiles, tea, rice and barley as well as spices and herbs for medical purposes. Chinese merchants can offer 15 groups of goods, including horses, goats, sheep, yak hair, goat leather, wool and crude silk (ANON., 2006).

The trade opening, however, has undesired side effects: Sikkim and neighbouring West Bengal have become one of India's hotspots for the illegal trade in threatened animals and plants. Despite the beauty of the landscape and Sikkim's efforts to advance tourism, this surely is a dubious reputation the Himalayan province would like to have avoided (ANON., 2008a,b). The Chinese economic upswing had negative side effects for endangered species as well: From the late 1990s to 2005, the annual horse-racing festival at Litang (Kham, Sichuan) again showed hundreds of Tibetans demonstrating their new wealth. Suddenly, traditions that were thought to be part of cultural history archives could be seen again: Fur caps ornamented with tiger or leopard skin, chubas (jackets) and gaiters ornamented with furs of red pandas, Eurasian otter or smooth-coated otter saw a revival that was thought of as impossible. Several examples from neighbouring Nepal show cases of smuggling from remote Nepal-China border regions where no Nepalese government officials are stationed. A typical case was the confiscation of red panda fur parts in 2005 from a Nepalese merchant by police officials of the Tibet Autonomous Region at the Gola La in the Kangchenjunga region (pers. inf. CHAPAGAIN, September 6, 2006). Public appeals, however, were followed, so that the wearing of such traditional clothes was outlawed in Qinghai, Sichuan and the Tibet Autonomous Region the same year (pers. inf. BANKS, August 15, 2008).

Trade in its fur was the reason for the inclusion of the red panda on the Appendices of CITES already at the coming into effect of the convention in 1975. The species was first listed in Appendix II, allowing for a strictly regulated trade only. After a successful application of the Netherlands at the ninth Conference of the Parties of CITES in November 1994 in Fort Lauderdale, USA, the cat bear was included in Appendix I. This prohibits any commercial trade and only allows exceptions for scientific purposes, such as the exchange of animals among zoos participating in conservation breeding programmes. But these exceptions can also be misused, as shown by some dubious commercial trading activities with living red pandas between Malaysian and Chinese zoos (O'CONNELL-RODWELL & PARRY-JONES, 2002). The regulations of Appendix I for the red panda came into force on 16th February 1995.

It is of course important to identify the reasons for a use of and the resulting trade with a wildlife species. In this context, it has to be said that the red panda, as opposed to other animals (big cats, bears, larger ungulates, elephants, primates) is not considered a threat to cattle or humans, nor causing pasture or land use conflicts. According to GLATSTON (1994) and experience made by the WWF in India and Nepal, there are no known human-wildlife conflicts caused by red pandas. The wild populations of the red pandas, however, are very vulnerable to indirect disturbances of their habitat by overgrazing and hunting, especially if traps and dogs are used for the hunt (GHOSE, 2005 - 2009).

Traditionally, hunting of the cat bears was rather uncommon. A use of red pandas is documented by Tibetans and the ethnic minority group of the Yi (see Fig. 24). In all cases, the pelts are used for the production of hats and coats (pers. Inf. FUWEN WEI & ZHANG ZEJUN, Chinese Academy of Sciences, September 6, 2006). Only in July 2009, a new, previously entirely unknown record became known , when a traveller reported of red pandas offered as food in the Pearl River region in Zhongshan, province Guangdong, China (in litt. DEL CASTILLO, July 20, 2009). According to this information, the animals were kept in cages of the restaurant – a common practice of offering fresh game meat in Guangdong. Nonetheless, the red panda is subject to total protection in China. The offering and buying of furs and other parts of the animals, including the offering of red panda as food, is strictly forbidden according to Chinese law. The commercial breeding of red pandas in China is so far unknown (in litt. XU HONGFA, TRAFFIC East Asia China, July 22, 2009).

**Conclusions**

The distribution area of the red panda in India covers 12,500 to 25,000 km² (CHOUDHURY, 2001). Although only a maximum of 10 percent of the potential red panda's habitat lies in Sikkim, this Indian state is an important ecologic stepping stone, connecting the main areas of distribution of the nominotypic taxon A. f. fulgens in Arunachal Pradesh and Bhutan with the areas of occurrence in Nepal. But it is the economic development and the rapid growth of the human population in Sikkim that might threaten the habitat of the red panda increasingly. Since it will probably not be possible to extend the existing protected area network to the distribution areas of the red panda, nature conservation should focus on measures to halt the further degradation and anthropogenic reshaping of the habitat. One measure is the better and more stringent implementation of current forest management and conservation laws. A good sign in this context is that the state-wide regulation of the use of forest products has already started. Furthermore, the tourism sector should be regulated in such way that local tour and hotel operators in the medium term use gas and petroleum instead of wood as combustive. In the long term, however, the red panda habitats will only have a future if the energy supply in Sikkim changes fundamentally and firewood is replaced by alternative sources of energy.

Fig 24: Potential illegal cross border trade poses a problem for red pandas from India, too: in the southern Chinese Province Yunnan furs of red pandas are still used today for hats, worn by Tibetan men and women of the Yi minority in the Jade Dragon Mountains north of Lijiang.
(Photo: Peter Oxford)

Since the re-opening of a trade route for goods to China, Sikkim comes into the focus of illegal wildlife trade. It is not only the red panda that is affected by potential smuggling and poaching but a whole series of other endangered animal and plant species of Sikkim, including the leopard (Panthera pardus), the snow leopard (Panthera uncia), the musk deer (Moschus chrysogaster, M. leucogaster and M. fuscus), the Eurasian otter (Lutra lutra), the Himalayan black bear (Ursus thibetanus), rare woods, medical plants and even endemic butterflies and beetles. In addition to that, tiger and rhinoceros parts are being smuggled from neighbouring provinces in the south of Sikkim. The general problem here is the lack of motivation of border and customs officials to check travellers and exported goods upon their departure from India and Nepal. Based on the results of the

workshop in March 2007, TRAFFIC focuses on the collaboration with and capacity building within the responsible authorities (TRAFFIC INDIA, 2007). On the Indian side, this includes federal and state forest departments, custom, federal police, Indo-Tibetan border police, the Indian army and paramilitary units. Since May 2007, two-day workshops for the target groups with a special focus on the handling of nature conservation laws and related laws as well as on the identification of the threatened species and their parts and products have been held in Gangtok, Darjeeling and Siliguri in cooperation with the Sikkim State Forest Department (DUTTA, 2007; SHRESTA & GHOSE, 2009). TRAFFIC will continue working with the relevant authorities on the capacity building for improved species conservation measures in the Himalaya region.

Unfortunately, breeding successes for red pandas in the zoos have been retrograde in recent years globally (GLATSTON, 2008). According to a recent study (ZIDAR, 2008) this is mainly due to the fact that many zoos do not sufficiently observe the keeping recommendations (GLATSTON, 1989). The obviously dramatic decline of the wild populations should alert the zoo community to reinforce efforts for a sustainable ex-situ conservation breeding of red pandas.

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**Abstract**

The status of the red panda (Ailurus fulgens) in the wild is largely unknown. In 2006, the WWF in collaboration with the Department of Forest, Environment and Wildlife Management of the Government of Sikkim initiated a project with the aim to assess the species' habitat requirements and abundance in Sikkim, India. Results of the study lead to the conclusion that Sikkim hosts 1,341 km2 of potentially suitable red panda habitat, although 49% of the area is characterised by open forest canopy and presumably not used by the species. Estimates of red panda numbers in Sikkim range from 225 to 378 mature individuals. Forest degradation is caused by human population growth, overgrazing and the growing demand for fuel wood, combined with a lack of proper forest law enforcement. TRAFFIC, the wildlife trade monitoring network, simultaneously investigated trade routes and the wildlife law enforcement system in the Eastern Himalayas. The recent re-opening of trade routes to China put Sikkim in the focus of illegal trade of threatened species from the wild. Concerted conservation actions are required to halt further degradation of red panda habitat and to improve the efficiency of the wildlife law enforcement system. Furthermore, the international zoo community may play an important role in mitigating the decline of the red panda in the wild by means of ex situ conservation breeding programmes.

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