

Sloth Bear Conservation Action Plan

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IUCN Category: Vulnerable, A2cd **CITES Listing:** Appendix I

Scientific Names: *Melursus ursinus* (occasionally *Ursus ursinus*); *Melursus ursinus ursinus* in India, Nepal, Bhutan, and Bangladesh; *Melursus ursinus inornatus* in Sri Lanka

Common Names: sloth bear; Northern India and Nepal: *bhalu*; India: *rinch*, *reech*, *richwa*, *asval*, *karadi*, *puni karadi*, *elugu bunti*; Sri Lanka: *walaha* (male), *walahinna* (female), *karadi*; Bhutan: *doni*; Bangladesh: *bhaluk*

Introduction

Physical description: Sloth bears have a distinctively long shaggy coat, with no underfur. The hair is especially long around the neck and the back of the head (hair length up to 15cm). It is the only bear with long hair on its ears. Sloth bears are typically black, although brown or reddish individuals have been observed (Brander 1982; Phillips 1984), as have albinos (Bharos 1988). Like sun bears and Asiatic black bears, sloth bears have a broad, white chest

blaze, but unlike these other species, their muzzle is whitish. They have long (6–8cm), slightly curved, ivory-colored front claws, for digging, and shorter claws in the rear. The front feet are turned inward, also probably an adaptation for digging. They have a broad palate, protrusible lips, and they lack the upper two middle incisors, all specializations for eating ants and termites. Weights vary by area and by sex. Adult males generally weigh 80–145kg, and adult females weigh 55–95kg. However, a 192kg male and a 124kg female have been reported (Brander 1982).



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LEFT: Sloth bear (*Melursus ursinus*) in a tree, showing characteristic white muzzle and chest blaze. Sloth bears climb trees mainly to obtain honey from beehives. Otherwise, they spend little time in trees.

BELOW: Front teeth of a sloth bear showing the gap where the upper incisors are missing, presumably an adaptation for sucking in termites and ants. The large canines may aid in defense against other large predators, like tigers and leopards.



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Reproduction: Sloth bears typically breed during June–July, and cubs are born during November–January (Jacobi 1975; Laurie and Seidensticker 1977; Iswariah 1984; Joshi 1996), after a period of delayed implantation (Puschmann *et al.* 1977). However, breeding and birthing may occur at other times of the year (Laurie and Seidensticker 1977; Gopal 1991). Phillips (1984) indicated that there was no conspicuous breeding season in Sri Lanka, although Norris (1969) thought that young cubs were most prevalent during August and September, suggesting most births occurring in mid-summer and breeding during the winter. If true, this would be exactly opposite of the predominant pattern observed elsewhere.

Cubs are born in protected dens (e.g., excavated holes or natural hollows). Females remain in dens for 2–3 months, and during this period rarely come out to eat (Jacobi 1975; Joshi 1996). A litter size of two is most common (Laurie and Seidensticker 1977; Phillips 1984; Gopal 1991; Joshi 1996); litters of one have been observed, although some may represent two cub litters with early mortality (Joshi 1996). Litters of three are rare (Norris 1969; Brander 1982; Heath and Mellon 1983; Iswariah 1984), possibly because three cubs cannot ride well on the mother’s back. Cubs are routinely carried on the mother’s back from the time they leave the den until they are about nine months old (Heath and Mellon 1983; Joshi 1996). Cubs can climb trees to feed (e.g., on honey or fruits), but do not use trees as a means of escape. Carrying by mothers seems to be the main defense for cubs against attacks by other predators, such as tigers and leopards (Laurie and Seidensticker 1977; Gopal 1991), and also against attacks from other bears.

Cubs stay with their mothers for 1.5 or two years, splitting up just before the breeding season (Joshi 1996).

Thus, females breed at either two or three year intervals. Females may breed first when four years old, but do not necessarily produce cubs following their first breeding season.

Social behavior: Detailed information on social behavior of sloth bears is available only for Royal Chitwan NP (Laurie and Seidensticker 1977; Joshi 1996). Extensive home range overlap (mean home range size = 9 and 14km² for females and males, respectively, in Chitwan) and nonaggressive behaviors toward other bears indicate that, in this area at least, they are not territorial. However, they have been observed to mark trees with their teeth and claws, a behavior that may be linked to social spacing. Temporal avoidance may be more pronounced than spatial avoidance. Females with cubs and subadults of both sexes are rarely active at night, whereas adult males and lone adult females are at least as active at night as during the day. The shift to diurnal activity by females with cubs and subadults may be related to avoidance of nocturnal predators as well as potentially aggressive encounters with other bears; intra-specific killing of juveniles has been observed (Joshi 1996).

During the breeding season, groups of 3–4 males congregate near estrus females. All may breed, apparently in rank order, as the same order of breeding may occur among the same group of males with different females. Aggressive behavior among males appears to be uncommon, although serious and even fatal injuries from fighting sometimes occur (Joshi 1996). Large canines (in both sexes), relative to their body size and to other bears of equal size, may be a defense against aggressive interactions with conspecifics and/or between sloth bears and other predators. Sloth bears rely on their aggressive



Den of a sloth bear dug into the bank of a dry riverbed. Dens are used only by cub-bearing females. In Royal Chitwan National Park, Nepal, parturient females entered dens in early-mid November, came out periodically to feed beginning in late December or early January (after cubs were born), and exited dens in mid-January (Joshi 1996). Bears also sometimes rested in dens during other times of year.

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Table 12.1. Comparison of diets of sloth bears based on composition of scats from national parks (NP) and wildlife sanctuaries (WS) in Nepal and India.

Location	Time of year	n scats	% Composition			Reference
			Insects	Fruits	Other	
Nepal						
Royal Chitwan NP 1990–1993	Year-round	627	83	14	3	Joshi <i>et al.</i> in press
	Fruiting season	249	58	38	4	Joshi <i>et al.</i> in press
	Nonfruiting season	378	95	2	3	Joshi <i>et al.</i> in press
Royal Chitwan NP 1973–1975	Year-round	139	52	42	7	Laurie and Seidensticker 1977
India						
Kanha NP (Central India)	Year-round	92	39	61	0	Schaller 1967
Bandipur NP (South India)	Year-round	95	53	37	10	Johnsingh 1981
Mudumalai WS (South India)	Fruiting season	350	8	90	2	Baskaran 1990
Mundanthurai WS (South India)	Nonfruiting season	111	75	25	1	Gokula <i>et al.</i> 1995

nature in interactions with large dangerous species like tigers, leopards, elephants, and rhinoceros. This disposition also makes them a danger to people.

Aside from the breeding season, sloth bears have been observed in brief, generally passive aggregations (up to 5–7 individuals of mixed sex-age classes). In some instances individuals were congregated near a dense clump of fruit or flowers (Prater 1971; Brander 1982; Baskaran 1990), whereas in other cases a concentrated food source was not apparent (Joshi 1996). More stable associations have been observed among pairs of subadults (siblings independent of the mother as well as unrelated individuals) (Laurie and Seidensticker 1977; Iswariah 1984; Joshi 1996). These associations, which may persist for several weeks to over a year, may function as defensive coalitions against other sloth bears and predators. Some evidence exists that subadults may be excluded from prime habitats and forced to occupy less favorable areas (Joshi 1996).

Habitat preferences: Sloth bears inhabit a wide variety of habitats, including grasslands, thorn scrub, sal (*Shorea robusta*) forest and moist evergreen forest. Current information about their use of habitat is scant. Consequently, generalizations about habitat use must be considered provisional, pending further detailed and widespread studies.

In Royal Chitwan NP, Nepal, sloth bears preferred alluvial grasslands during the dry season, apparently because of a high density of termites, their principal prey during this season (Joshi *et al.* 1995; Joshi *et al.* in press). However, during the wet season, males moved to upland sal forest (Laurie and Seidensticker 1977; Sunquist 1982; Joshi *et al.* 1995). Fruiting corresponded with the wet season, but diets of sloth bears that moved to the uplands did not contain more fruit than those that remained in the lowlands (Joshi *et al.* in press). The shift to the uplands by some sloth bears appeared to facilitate foraging on termites, which was difficult in the flooded lowlands, whereas the

shift back to the lowlands occurred when soils dried, possibly hampering the excavation of termite colonies in the uplands (Davidar 1983).

Studies in India indicated a lower reliance on termites and other insects, and a greater reliance on fruits than in Chitwan, probably due to a longer fruiting season further south (Schaller 1967; Johnsingh 1981; Iswariah 1984; Baskaran 1990; Gopal 1991; Gokula *et al.* 1995) (Table 12.1). Extensive grasslands in Chitwan also seemed to promote a diet more reliant on ants and their larvae (Joshi *et al.* in press). In Parambikulam WS, Kerala (southern India), just as in Chitwan, sloth bear sign was more common in grasslands than in deciduous forest (which had more sign than evergreen forest or plantations) (Balakrishnan and Easa 1986). In nearby Mudumalai WS, Tamil Nadu, fruits composed >90% of the diet and most sloth bear sign was found in dry deciduous tall grass forest (compared to deciduous forests with shorter and less-dense grasses) (Baskaran 1990). The dry deciduous forest in this area had greater fruit abundance, more cover, and less human disturbance than other habitats. A thorn (*Acacia* spp.) forest at Mudumalai had the greatest abundance of termite mounds, but sloth bears were likely deterred from this area by heavy grazing of livestock and other human use. A survey across the lowlands of Nepal indicated that sloth bears were either absent or occurred at low densities in areas with high human use, despite high termite densities (Joshi *et al.* unpublished data). That is, habitat quality may be related as much to human disturbance as to the abundance of food.

General distribution

Sloth bears are restricted to the Indian subcontinent: India, Sri Lanka, Nepal, Bhutan, and Bangladesh. At the turn of the century, sloth bears were found throughout Sri Lanka, but due to wide scale conversion of upland forests

to coffee and tea, they are now found only in the northern and eastern lowlands (Phillips 1984; Santiapillai and Santiapillai 1990; C. Santiapillai *in litt.* 1994). The most current range map for Sri Lanka (Figure 12.1), however, includes areas where forests are highly degraded or absent (IUCN, WCMC database), and where bears probably no longer occur. In India, sloth bears have a patchy distribution corresponding with remaining forest cover; they are absent in the high mountains of Himachal Pradesh and Jammu and Kashmir, the northwestern deserts of Rajasthan, and a broad non-forested swath in the south (Figure 12.1). Northward they extend through the lowlands of Nepal and into the Siwalik Hills; the population in Nepal is no longer continuous with that of India. Eastward, the range stretches through southern Bhutan, and into the Indian states of Assam, Manipur, and Arunachal Pradesh. Some sloth bears may still exist in remnant, mixed-evergreen forests of the Chittagong and Sylhet regions of

eastern Bangladesh, but by the early 1970s they had been extirpated from the sal forests of central Bangladesh (Khan 1982, 1984; R. Khan *in litt.* to C. Servheen 1988). There is no data indicating that sloth bears ever occurred as far east as present day Myanmar, although it is not clear what would have prevented their spread there from the adjoining portion of southeastern Bangladesh.

Populations and status

New IUCN criteria for categorizing species by degree of threat rely on estimates of abundance (total numbers and rate of decline), distribution (total occupied area and degree of fragmentation), and probability of extinction (IUCN 1996). Under these criteria, the sloth bear is listed as Vulnerable (IUCN 1996), although much of these data are not available for sloth bears, and it is questionable



Figure 12.1. Estimated sloth bear (*Melursus ursinus*) range in India, Bangladesh, Bhutan, and Sri Lanka.

whether “ballpark” guesses are of any value. Protected areas with sloth bears encompass 56,000km² (45,000 in India, 2,400 in Nepal, 5,800 in Sri Lanka, 3,000km² in Bhutan), and the range outside the protected areas may be 200–300,000km². The total world population of sloth bears is probably between 10,000 and 25,000, but good estimates of abundance, even for small areas, are lacking, so an overall estimate for the species, given present information, is virtually meaningless. There are also no good estimates of rates of population change, and in most areas even trends in population size are unknown. Respondents to a 1993–94 survey by the authors indicated that the prospect for persistence of sloth bears in India is fair (not good, not poor), due to continued habitat loss and degradation. Most sloth bear populations outside protected areas are likely decreasing. The same appears to be true for Nepal (Joshi *et al.* unpubl. data) and Sri Lanka (Santiapillai and Santiapillai 1990). The status of sloth bears in Bangladesh is precarious at best, if they even still exist there (Khan 1982, 1984; R. Khan *in litt.* to C. Servheen 1988); protected areas are still heavily encroached upon by people, due to high human density and underfunded, understaffed forest departments (Chivers 1986). The outlook for this species in Bhutan appears to be more promising, due to a commitment to its protection by the Royal government; they appear to be fairly common in protected areas along the southern border and are likely present in adjacent forests (S. Langchuk, head Nature Conservation Section, Forestry Services Division, Gasa *in litt.*, 1994; T.S. Namgyal, WWF pers. comm. 1996). In general, it is difficult to assess the overall status of this species across its range, due to a paucity of information on abundance and distribution, especially outside the protected areas.

Status and management of the sloth bear in India

Historic range and current distribution

Historically the range of sloth bears in India extended, virtually uninterrupted, from the southern tip north to the border with Nepal and east to the Myanmar border. They did not inhabit the desert along the border with Pakistan or the mountainous areas of the far north. Sloth bears were once so common throughout the Indian peninsula that they could be speared from horseback (Brander 1982). Due to overhunting, populations began to decline by the late 1800s, as rail lines increased access to previously remote areas (Gilbert 1896). During the 1940s and 1950s, many naturalists began to notice a sharp decrease in sloth bear sightings, as well as a decrease in performing bears on the streets (Seshadri 1969; Krishnan 1972; Singh 1973). This decline was related to loss of forest habitat, which was

instigated by the British in the 1800s, and continued at a particularly rapid rate after Indian independence in 1947.

Sloth bears are the most widespread species of bear in India (Figure 12.1). Along the northern part of this range they overlap the range of the Asiatic black bear. These two species coexist in some national parks and wildlife sanctuaries, such as Corbett, Jaldapara, and Kaziranga. In eastern India, in the hills south of the Brahmaputra River (states of Assam, Manipur, and Mizoram) they also overlap the westernmost range of the sun bear (Higgins 1932; Gee 1967). In fact, sloth bears, Asiatic black bears, and sun bears all coexist in parts of this area (Choudhury 1993; S.D. Roy *in litt.* 1996), the only places in the world occupied by three species of bears. Sloth bears are not sympatric with brown bears, which live in the highlands of Himachal Pradesh and Jammu and Kashmir. Sloth bears are basically a lowland species, although they are found in the Siwaliks, low hills bordering the outer range of the Himalayas from Punjab to Arunachal Pradesh; however, they are no longer found as far west as Punjab.

Status

Jaffeson (1975) made the first real attempt to assess the nationwide status of sloth bears. He surveyed 20 forest officers and wildlife wardens from five Indian states (although half of the responses were from Tamil Nadu). Nine respondents estimated sloth bear numbers in their areas. Totalling these yielded 487 sloth bears on 8,067km², or a rough average density of 6 bears/100km². Individual density estimates ranged from 40/100km² in Mudumalai WS to 3/100km² in Kanha NP. A regression equation, taking into account human density in the vicinity (which, curiously, was positively related to bear density) was then used to extrapolate sloth bear density throughout the 260–290,000km² of forested range to produce a total estimated population of 7,300–8,000 sloth bears in India. Most respondents (67%) indicated that numbers were declining; 20% thought sloth bear populations in their area were stable.

We conducted a similar survey during 1993–94. We interviewed five Indian Forest Service officers at a tiger workshop in New Delhi and mailed 41 questionnaires to officials from throughout India, of which seven were completed (sources listed in Table 12.2). Data from this survey were combined with information from the Wildlife Institute of India’s National Wildlife Database, the India Proposal to CITES (1989), and various printed sources to generate a list of parks and reserves occupied by sloth bears (Table 12.2; electronic database [Lotus file] available from authors). The quality of the information in this database thus varies from that obtained directly from our interviews and questionnaires (some first-hand, some second-hand), to a government document and database

Table 12.2. Indian National Parks (NP) and Wildlife Sanctuaries (WS) (including Tiger Reserves) with sloth bears, based on 1980–96 data. Population and density estimates are less exact than they appear (see text).

Protected area	State	Area (km ²)	Population estimate	Bears/100km ²	Source(s) ^a
1 Anaimalai WS	TNA	842			2a,4d
2 Anshi NP	KAR	250	rare		1a
3 Arabithittu WS	KAR	14			4b
4 Badalkhol WS	MPR	104			1g
5 Bandh Baratha WS	RAJ	192			4b
6 Bandhavgarh NP	MPR	448			1gi,2a,4a
7 Bandipur NP	KAR	874	32	4	1ai,2ab,4cd
8 Bannerghatta NP	KAR	104	rare		1a,4ac
9 Barnawapara WS	MPR	245			4b
10 Bassi WS	RAJ	150	rare		1b
11 Bhadra WS	KAR	492	common		1a,4c
12 Bhagwan Mahavir NP – Molem WS	GOA	362			4ab
13 Bhairamgarh WS	MPR	139	common		2a
14 Bhensrodgarh WS	RAJ	229			4a
15 Bhimbandh WS	BIH	682			4ab
16 Bilgiri R. Temple WS	KAR	540	common		1a,4c
17 Bor WS	MAH	61			4c
18 Brahmagiri WS	KAR	181			4c
19 Buxa Tiger Reserve	WBL	759			2a,4a
20 Chandaka WS	ORI	176			2a,4c
21 Chandoli WS	MAH	309			4b
22 Chandra prabha WS	MPR	78			4cd
23 Chandrapur WS	ORI	109			2a
24 Chendurang WS	KER	100			4b
25 Chimnony WS	KER	90			4b
26 Chinnar WS	KER	90	rare		1d,4b
27 Corbett NP	UPR	1,400	27	5	1gm,2ab,4cd
28 Cotigao WS	GOA	105			1e,4a
29 Dalma WS	BIH	193	40	21	1i,4c
30 Dampha WS	MIZ	340			1h
31 Dandeli WS	KAR	843	common		1ae,4c
32 Darrah WS	RAJ	266	18	7	1b,2b,4a
33 Dudhwa NP	UPR	490	80	16	2ab,4acd
34 Eturnagaram WS	APR	803			3d,4ad
35 Fossil NP	MPR	0.3			2a
36 Gautala WS	MAH	261			4b
37 Gautaum Budha WS	BIH	260			4ab
38 Gorumara WS	WBL	9			4b
39 Hazaribagh WS	BIH	186			2a,4d
40 Idukki WS	KER	70	extirpated		1dki,4ac
41 Indravati NP	MPR	1,258	87	7	1gi,2ab,4a
42 Itanagar WS	ARU	141			2a
43 Jaldapara WS	WBL	116	10	9	1ih,2a,4d
44 Jawahar Sagar WS	RAJ	100	23	23	1b
45 Jessore WS	GUJ	181	225	124	2ab,3c,4ab
46 Kalakad-Mundanthurai WS	TNA	900	common		1km,2b,4ab
47 Kanger Valley NP	MPR	200			2a
48 Kanha NP	MPR	940	70	7	1gi,2a,4cd
49 Karlapat WS	ORI	255			2a,4b
50 Katepurna WS	MAH	74			4b
51 Kawal WS	APR	893			2a,4ac
52 Kaziranga NP	ASS	430			1fh,2a,4d
53 Keibul-Lamjao NP	MAN	40			1h
54 Kela Devi WS	RAJ	676	82	12	1b,2ab
55 Khalasuni WS	ORI	116			4c
56 Kheoni WS	MPR	123			2a
57 Kinnersani WS	APR	635			2a,4ac
58 Kinwat WS	MAH	138			2a,4c
59 Kishanpur WS	UPR	227			4c

Table 12.2 ... continued. Indian National Parks (NP) and Wildlife Sanctuaries (WS) (including Tiger Reserves) with sloth bears, based on 1980–96 data. Population and density estimates are less exact than they appear (see text).

Protected area	State	Area (km ²)	Population estimate	Bears/100km ²	Source(s) ^a
60 Koderma WS	BIH	178			4bc
61 Kotagarh WS	ORI	400			2a,4b
62 Kumbhalgarh WS	RAJ	578	105	18	1bj,2ab,4ad
63 Lanjamadagu Siwar. WS	APR	30			2a,4c
64 Manas NP	ASS	391			1h,2a
65 Melghat WS	MAH	1,620	common		1m,2a,4cd
66 Melkote Temple WS	KAR	50			4bc
67 Mookambika WS	KAR	247			4ab
68 Mount Abu WS	RAJ	289	20	7	1bj,2b,4a
69 Mudumalai WS	TNA	321	common		1em,2a,4acd
70 Murlen WS	MIZ	45			1h
71 Nagarahole NP	KAR	643	common		1ae,2a,4cd
72 Nagarjunasagar (S) WS	APR	1,347	300	22	2ab,3d,4ac
73 Nagzira WS	MAH	153			4bc
74 Namdafa WS	ARU	1,985			4c
75 National Chambal WS	MPR	320			1g,2a
76 Nawegaon NP	MAH	134			2a,4c
77 Neora NP	WBL	88			4b
78 Neyyar WS	KER	128	rare		1dm
79 Nugu WS	KAR	30			4c
80 Pachmari WS	MPR	462			2a
81 Painganga WS	MAH	325			4b
82 Pakhal WS	APR	878			2a,3d
83 Pakhui WS	ARU	862			4ab
84 Palamau WS	BIH	748	46	6	1i,2ab,4d
85 Panna NP	MPR	543	common		1gm,2a,4a
86 Panpatha WS	MPR	246			4b
87 Papikonda WS	APR	590			4b
88 Parambikulam WS	KER	285	common		1dk,4c
89 Pench NP	MAH	257			4c
90 Pench NP	MPR	293	rare		1c,2a,4a
91 Peppara WS	KER	53			4b
92 Periyar WS	KER	777	common		1dk,2a,4c
93 Pocharam WS	APR	136			3d,4b
94 Pranhita WS	APR	136			2a,3d,4a
95 Rajaji NP	UPR	820			4ac
96 Rajgir WS	BIH	36			4b
97 Ramgarh Vishdhari WS	RAJ	301	3	1	1b,2a
98 Ranthambore NP	RAJ	392	57	15	1b,2ab,4ad
99 Ratanmahal WS	GUJ	56	43	77	2b,3c,4b
100 Ratapani WS	MPR	689			4b
101 Sardarpur WS	MPR	348			4b
102 Satpura NP	MPR	524			1g,2a
103 Sawai Man Singh WS	RAJ	103			4b
104 Sharavathi WS	KAR	431			4abc
105 Shettyhalli WS	KAR	396	common		1a,4c
106 Shivpuri NP	MPR	156			4cd
107 Shoolpaneswar WS	GUJ	608	35	6	2ab,3c,4b
108 Silent Valley WS	KER	90	50	56	1d,3a
109 Simlipal NP	ORI	846			2a
110 Singhori WS	MPR	288			1g
111 Someshwara WS	KAR	845			1e,4c
112 Sonai-Rupai WS	ASS	175			4c
113 Tadoba NP	MAH	117	35	30	2a,3b,4cd
114 Tamor Pingla WS	MPR	609			4b
115 Todgarh Rawali WS	RAJ	495	40	8	1b
116 Topchanchi WS	BIH	12			4b
117 Udanti WS	MPR	248			2a

Table 12.2 ... continued. Indian National Parks (NP) and Wildlife Sanctuaries (WS) (including Tiger Reserves) with sloth bears, based on 1980–96 data. Population and density estimates are less exact than they appear (see text).

Protected area	State	Area (km ²)	Population estimate	Bears/100km ²	Source(s) ^a
118 Valmiki NP	BIH	336			2a,4a
119 Van Vihar WS	RAJ	60	20	33	1b,2a
120 Wynaad WS	KER	344	common		1d,2a,4a
121 Yawal WS	MAH	178			4b
Total		45,290	mean	22	
			median	12	

^a Sources

- Information obtained from completed questionnaires (1993) and/or interviews with some participants of a 1993 tiger workshop in New Delhi:
 - Appayya, M.K., Chief Conservator of Forest, Bangalore, Karnataka
 - Bhandari, R.S., Chief Wildlife Warden, Van Bhawan, Vanikipath, Jaipur, Rajasthan
 - Dongaonkar, K.R., Director, Pench National Park, Seoni, Madhya Pradesh
 - Easa, P.S., Head, Division of Wildlife Biology, Kerala Forest Institute, Peechi, Kerala
 - Karanth, U., Center for Wildlife Studies, Kevempu Nagar, Mysore
 - Mathur, Wildlife Institute of India, Dehradun
 - Pabla, H.S., Joint Director, Wildlife Institute of India, Dehradun, Uttar Pradesh
 - Roy, S.D., 209 Masjid Moth, New Delhi
 - Sathyendra, C., Project Officer, WWF-India, Data Center for Natural Resources, Bangalore
 - Sharma, I.K., Ecologist. Bhagwati Bhavan, Jodhpur, Rajasthan
 - Shrivastav, K.K.
 - Johnsingh, A.J.T., Joint Director, Wildlife Institute of India, Dehradun, Uttar Pradesh
- Official government documents and databases:
 - Wildlife Institute of India: National Wildlife Database (confirmed locations only)
 - India Proposal to CITES (1989)
- Technical papers (with bears mentioned peripherally):
 - Balakrishnan (1984)
 - Choudhary (1987)
 - Java (1991)
 - Krishna Raju *et al.* (1987)
- Handbooks:
 - Israel and Sinclair (1987)
 - Negi (1991)
 - Saharia (1982)
 - Seshadri (1986)

(for which the source of the data are not indicated, but the standards for incorporation are probably high), to printed materials ranging from peer-reviewed publications (none directly concerning sloth bears), to handbooks about parks and reserves of India (where the information might be out-dated, misinterpreted, or assumed). The database presented here includes 120 reportedly occupied protected areas of which 42 (35%) were gleaned solely from handbooks and the remainder from more solid sources.

Survey respondents indicated that sizable numbers of sloth bears also exist outside many of the protected areas. We used a 1996 WCMC database of forest cover of India (based on visual interpretation of Thematic Mapper satellite data) to create a map of “hypothesized” sloth bear range, which we overlaid with points representing occupied protected areas (from Table 12.2) (Figure 12.1; electronic database [ArcView file] available from authors). This range map undoubtedly has major inaccuracies, as some of the forest may be incorrectly mapped, sloth bears may be absent from large parts of the remaining forest (due to poaching or degradation of the understory), and bears may inhabit some unforested areas (e.g., grass-covered,

rugged hills near Bangalore) (U. Karanth, Center for Wildlife Studies, Kuvempu Nagar, Mysore, *in litt.* 1993). Despite these problems, we feel that this map is a better depiction of current sloth bear distribution than would be represented by a single block of contiguous range encompassing the extreme locations.

Several estimates of sloth bear abundance in protected areas have been generated, all from results of surveys of bear sign. The difficulties associated with converting prevalence of sign or sightings to estimates of abundance, especially for a species like a sloth bear, are well known (Wesley 1977; Saharia 1980). However, such estimates are routinely made in several Indian parks and wildlife sanctuaries, and the same procedures have been used in Sri Lanka. An example may be instructive for assessing the value of such estimates. Eisenberg and Lockhart (1972) conducted a reconnaissance of Wilpattu NP in Sri Lanka. Sloth bears were encountered 24 times in a 583km² search area. Assuming no sloth bears were seen twice, Jaffeson (1975) converted these data to a density of 4 bears/100km². However, from Eisenberg and Lockhart’s (1972) report, it is clear that at least five of the sightings were of the same

female with a cub (for which they plotted the home range), and another 12 sightings clustered in a small area also may have represented a single individual. Nevertheless, using these data, Eisenberg (*in litt.*, cited in Cowan 1972) estimated a crude density of five bears/100km². Santiapillai and Santiapillai (1990) then extrapolated this density estimate (and that of Laurie and Seidensticker [1977], who used the same approach in Royal Chitwan NP, Nepal) to all protected areas in Sri Lanka to obtain an estimate of 300–600 sloth bears nationwide.

With these caveats in mind, we compiled recent (1980–94) population estimates (and calculated corresponding densities) for various parks and sanctuaries in India, mainly to investigate the perceived degree of variation among areas. Two sanctuaries in Gujarat that were established especially for sloth bears had the highest reported densities (77–124 bears/100km²). These were comparable to densities estimated from mark-recapture/resight data on radio-collared sloth bears in preferred habitat in Royal Chitwan NP, Nepal (Joshi 1996). Most other density estimates were about an order of magnitude less. The median density (which is more appropriate than the mean, due to the skewed distribution) for 23 protected areas was 12 bears/100km², which is about half the average estimated density for all of Chitwan, but twice the average density estimated from Jaffesson's (1975) survey. Applying this median density to the 45,000km² of parks and reserves with sloth bears yields a population estimate of about 5,000 sloth bears within protected areas. However, we estimate that there are >250,000km² of potential sloth bear range outside the protected areas. We do not know how much of this area is occupied by sloth bears, nor can we make defensible estimates of sloth bear density in this area; thus it is not possible to produce a meaningful population estimate for all of India. If the density outside the protected areas is the same as inside, the total Indian population of sloth bears would be >30,000. The only density estimate that we are aware of for an area outside a park or sanctuary is that of Iswariah (1984), who conducted a study in Ramnagaram Taluk, Karnataka, where sloth bears subsist in a "few rocky pockets of scrub" intermixed with cultivated crops and plantations. Even in this relatively poor habitat she estimated a density of 12 bears/100km², the same as the median of the estimates from the various protected areas. Nevertheless, it is probably reasonable to assume that over the entire range, sloth bear density is somewhat less outside than inside the protected areas. If outside density averages half the estimated median of the protected areas, the total sloth bear population in India would be near 20,000. If it is a tenth, the total population would be about 8,000. These values may bracket the actual population, although our intent is not to pose an estimate, but rather to emphasize the large degree of variation and uncertainty in these numbers.

Legal status

Sloth bears are completely protected under Schedule I of the Indian Wildlife Protection Act of 1972 (as amended in 1986). They cannot be hunted, but can be killed in self defense or in special circumstances where they have caused damage. All trade and export is illegal. Sloth bears are listed under Appendix I of CITES.

Population threats

Sloth bear populations in India appear to be significantly threatened by poaching. Gall bladders and other parts from poached bears are typically exported to Singapore, Bangkok, Hong Kong, or other intermediary ports, and eventually to Japan, South Korea, or Taiwan. Respondents to our survey indicated that poaching was unimportant. However, based on records obtained by TRAFFIC (Japan), parts from an estimated 700–1,500 bears per year were shipped from India to Japan during the late 1970s through the 1980s (Servheen 1990), and the Wildlife Protection Society of India (New Delhi *in litt.* 1996) found that poaching and trade in sloth bear parts is still "fairly common in the hills of the northern States of Uttar Pradesh, Himachal Pradesh and West Bengal, and the central State of Madhya Pradesh." S.D. Roy (New Delhi *in litt.* 1996) indicated that local villagers as well as transgressors from Myanmar also routinely poach bears in eastern India (Mizoram, Manipur, Tripura, and Assam). Some poaching is a result of superstitious beliefs, rather than for sale of parts (A.J.T. Johnsingh, Joint Director of the Wildlife Institute of India, Dehra Dun, Uttar Pradesh, *in litt.* 1996)

Other threats include the capture of live bears (mainly cubs, after the mother is killed) and some killing of nuisance bears. Like the trade in parts, the extent of these activities varies regionally. H.S. Pabla (Joint Director of the Wildlife Institute of India, Dehra Dun, Uttar Pradesh, *in litt.* 1993) indicated that capture of sloth bears for street shows is still a concern in Madhya Pradesh. Likewise, the Wildlife Protection Society of India (*in litt.* 1996) reported a "thriving business in captive street entertainment bears" in a heavy tourist area of Uttar Pradesh, as well as some export of live sloth bears to Pakistan for bear baiting (fights with dogs). There are no records of how many sloth bears are killed as nuisances, although Johnsingh (*in litt.* 1996) indicated that the total is probably low. Crop depredations vary from virtually none to moderate, or even severe in parts of Karnataka (M.K. Appayya, Chief Conservator of Forests, Bangalore, *in litt.* 1993) and Rajasthan (I.K. Sharma, ecologist, Bhagwati Bhavan, Jhodpur, *in litt.* 1993), where sloth bears seek out honeycombs and fruit trees.

Habitat threats

Loss of forested areas outside parks and reserves poses a major threat to sloth bears because it causes population fragmentation, thereby leaving small, nonviable populations within the parks. A high degree of dispersion among protected areas with sloth bears is evident (Figure 12.1). Furthermore, habitat degradation outside the parks, caused by overgrazing, overharvest of forest products (cutting timber, lopping branches, collecting fruits and honey), establishment of monoculture plantations (e.g., tea, rubber, teak, eucalyptus), expansion of agricultural areas, and settlement of refugees, diminishes natural food supplies for sloth bears and may result in reduced reproduction. Poor food supplies also may increase the likelihood of sloth bears seeking human-related foods, like sugarcane and peanuts, outside the forest, where they become more vulnerable to being killed as a nuisance.

Ramnagaram Taluk (50km southwest of Bangalore City, Karnataka) provides an example of the consequences of habitat degradation. This area was once famous among shikaris for a large population of sloth bears. However, the natural forests have degraded into scrub, with scant food supplies for bears. As a result, sloth bears have become more reliant on cultivated crops, which now compose 50% of their diet (Iswariah 1984). Bear damage to crops incurs a substantial loss to villagers, who attempt to scare the bears away by building machans in their fields and maintaining nightly watches. Because of their dependence on crops in proximity to humans, sloth bears seem to have become more nocturnal, making it more dangerous for people to enter their fields at night, and incidence of maulings have increased. This, in turn, has caused local people to fear and dislike sloth bears, prompting greater killing of crop-raiding individuals. Bears were recently extirpated from one small wildlife sanctuary (Idukki, Table 12.2), apparently due to habitat degradation (P. S. Easa, Division of Wildlife Biology, Kerala Forest Institute, Peechi, Kerala, *in litt.* 1993). Some replanting of forests has occurred, but in states like Karnataka, Gujarat, and Haryana, these “forest farms” are comprised overwhelmingly of eucalyptus (Gadgil and Guha 1992), which is of little value to sloth bears or other wildlife.

Management

Three sanctuaries in Gujarat have been established specifically to protect sloth bears along the western edge of their range: Jessore, Ratanmahal (also called Rajanmal), and Shoolpaneshwar (also called Dumkhal) sloth bear sanctuaries (Java 1991; India Proposal to CITES 1989). Sloth bears are also protected by a series of parks and reserves that were established as part of Project Tiger, which was initiated in 1972. Some notable tiger sanctuaries

that also harbor sloth bears include Corbett and Ranthambore, along the northwestern edge of the sloth bear’s range; Kahna, near the center of the range; Buxa, in West Bengal; Manas, in neighboring Assam (and also in Bhutan); Bandipur, part of a cluster of reserves in the southern part of the country; and Periyar, a reserve surrounded by high human density near the southern tip of the peninsula. Aside from the protection afforded by these various parks and reserves, there is little direct management for sloth bears.

Human-bear interactions

Sloth bears are known for their aggressiveness, both towards humans and towards other large mammals. They seem to avoid human contact, when possible, but may encounter humans when they are enticed into croplands or when people enter the forest. Sloth bears seem to have a low tolerance toward people when they inadvertently meet. Many old accounts of Indian wildlife lore describe incidents of maulings by sloth bears. Krishna Raju *et al.* (1987) indicated that there are still 20–30 maulings by sloth bears each year in the Indian state of Andhra Pradesh. Phillips (1984) commented that sloth bears are second only to rogue elephants as the most feared animal among jungle-villagers of Sri Lanka. Fear of sloth bears makes it difficult to stimulate support for measures to maintain nearby bear populations.

Public education needs

Education should emphasize the importance of maintaining entire forest ecosystems of which sloth bears and other large mammals are a part. Charismatic megafauna like tigers, rhinos, and elephants naturally garner the most attention. In developing a conservation ethic that protects these species against habitat degradation and poaching, sloth bears will gain protection as well. However, sloth bear conservation should not just be incidental to conservation strategies designed for other species. Sloth bear biology is in many ways unique, because of their peculiar predilection for ant and termite-eating (myrmecophagy), and this uniqueness could be a focal point for interesting classroom lessons and television programs about habitat needs and conservation.

Specific conservation recommendations

Mapping

1. Expand and update information on the distribution of sloth bears across their range. We obtained evidence of the presence of sloth bears in a large number of protected

areas, but our sources of information were often based on secondary information or past knowledge. It is likely that we missed some areas and possibly included some areas where sloth bears are no longer present. We obtained little information on protected areas where sloth bears formerly occurred but have since been extirpated. We also obtained little information about the presence or absence of sloth bears in forested areas outside reserves. Thus, the range map presented here is very general, and of little use in monitoring range expansion or shrinkage. An updated range map should have a corresponding database (e.g. Table 12.2) that includes information (i.e. metadata) about the date and source of all location points where sloth bears were recorded to be present or absent.

2. Map sloth bear distribution in relation to forest cover and boundaries of protected areas, and thereby delineate discrete population units. These larger population units, rather than individual reserves, should be the basis of management. The size and separation of these management units will dictate conservation strategies, such as the inclusion of additional protected areas, corridors between areas, or buffer zones around areas.
3. Compile information on land use and land conditions for areas outside reserves to determine the potential to support viable sloth bear populations. Sloth bears occur on sparsely-forested hills outside reserves in southwestern India, and probably other hilly, remote areas as well (U. Karanth *in litt.* 1993; I. Sharma *in litt.* 1993). These areas may serve as corridors between population centers, and/or as sites that may attract dispersers or seasonal migrants. The use of these areas, both by sloth bears and by people, needs greater study to assess their importance in maintaining sloth bear populations.

Monitoring abundance

1. Develop and implement a more reliable and consistent means of assessing relative sloth bear densities across their range. Estimates of sloth bear numbers are available for a number of protected areas (Table 12.2), but they are of dubious quality and usefulness because there is no evidence that sign and sightings can be reliably converted to estimates of abundance. Unsubstantiated abundance estimates provide a false sense of assurance in population assessment, and may confer little or no warning for populations in jeopardy. A standardized, quantitative *index*, such as transect routes to measure density of sloth bear sign (e.g., holes in termite colonies), would be far more useful in comparing relative abundance across areas and years. This kind of labor-intensive monitoring program may not be feasible in all areas (although it was recently accomplished for the whole state of Kerala) (Easa

in litt. 1993). However, we suggest that monitoring abundance is probably less important than mapping sloth bear distribution and identifying and dealing with site-specific threats to their existence.

Habitat improvement

1. Promote community-based forestry projects. As forested lands outside the reserves continue to shrink and decline in quality due to human activities, more land needs to be protected. Less than 10% of the land area of India is under good forest cover (Poffenberger 1994), and <5% is contained within parks and reserves (WCMC 1992). However, establishment of more parks is not the primary means by which to conserve sizable chunks of habitat for sloth bears. In India, as in many other places, more lands potentially inhabitable for a variety of wildlife species exist beyond the boundaries of current reserves, and regeneration of forests in these areas may be at least as critical to species survival as protection within reserves (Western 1989). Parks and reserves can act as core areas for populations within larger ecosystems in which humans and multiple-use lands are critical elements (Grumbine 1994). Establishment of more parks often entails a trade-off, as displacement of local people may cause resentment not only toward the government officials responsible for the action, but also for the whole conservation concept. It is now well understood that an effort to provide for the resource needs of local people is an essential component of a successful conservation strategy (Poffenberger 1990; Western *et al.* 1994).

Community-based forestry programs could significantly expand habitat for sloth bears. This approach is new to India. Colonial forest policies of the last century were upheld after Indian independence. The national forest policy of 1952 reinforced the right of the state, not the local community, to control management and protection of forested land (Gadgil and Guha 1992). Recently, however, policies in states in eastern peninsula India (e.g., West Bengal, Bihar, Orissa) have changed to allow a new emergence of community forestry practices. The success of one community-based forestry project in Orissa was marked by the recent sighting of a sloth bear (Poffenberger 1994). Numerous villages in this part of India have been involved in patrolling and protecting hundreds of thousands of hectares of degraded sal forest, and the results, in terms of forest regeneration, have been remarkable. Moreover, this community-based approach might stimulate an atmosphere whereby local disdain for those who poach community-owned forestry products serves to protect all forest resources, including resident wildlife (i.e. community-based anti-poaching activities). The benefits of this community-based approach to maintaining ecosystem integrity thus extends well beyond sloth

bears. However, state and national support for these activities (including joint management policies providing local empowerment) are essential for their success (Poffenberger 1994).

Human-bear interactions

1. Establish a database documenting incidents of sloth bear-human conflict. Trends in bear-human problems (especially crop depredations and maulings) may reflect the condition of adjacent forested areas (i.e. its ability to support bears). Moreover, if conflicts between sloth bears and people increase, local support for bear conservation measures, like poaching patrols and community forestry programs, will decrease. Currently, data on nuisance activity and bear-inflicted injuries are based mainly on anecdotal information from a small number of areas. A more quantitative system of recording is needed.
2. Recognize that poaching of sloth bears is a critical problem deserving more attention. Trade records indicate that bears in India are still being poached in significant numbers. Although the level of poaching (i.e. number taken in any one area) is probably low, small populations, like those of many protected areas (Table 12.2) (and in the forests outside these areas) are vulnerable to eventual extirpation. Low-level poaching is difficult to detect and control, as evidenced from the lack of knowledge of poaching activities by respondents to our survey. Documentation of the extent of poaching may be obtained from trade reports, although these probably yield considerable underestimates. Nevertheless, it is important to recognize that poaching occurs and is likely to seriously impact sloth bear populations, despite being locally undetectable over the short term. Reduction in poaching will require greater enforcement efforts as well as an educational program to gain community support for anti-poaching endeavors.

Status and management of the sloth bear in Nepal

Historic range and current distribution

Sloth bears formerly ranged across the full length of the Nepal Terai, continuous with their range in India. Historically, this area was sparsely inhabited by Tharus, an indigenous group of people that were resistant to malaria. However, with the advent of malaria control in 1954, and prompted by the government's resettling program, many hill people from central Nepal abandoned their terraced slopes to clear the arable, flat land of the Terai. As they did, much of the forest was cleared, and with that, sloth bears were relegated to a narrower and

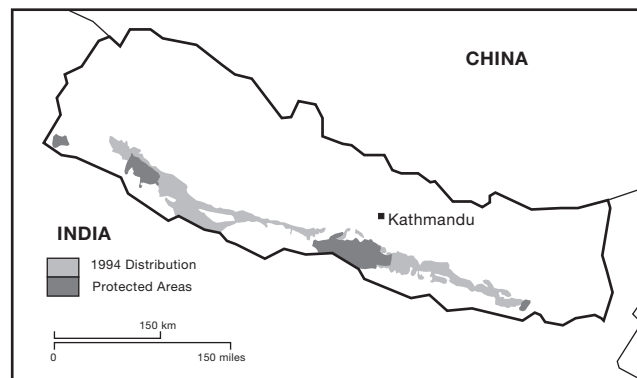


Figure 12.2. Sloth bear (*Melursus ursinus*) range in Nepal, based on data collected by the authors during a 1993–94 survey across the Terai. A map showing forested areas, generated from satellite data and produced by the National Remote Sensing Center of Nepal, was used to outline the area encompassing the points where bears were documented to occur during our field survey.

narrower strip of remnant forest, which has become progressively more degraded. From the early 1960s to the early 1980s, the human population of the Terai nearly tripled and about half the forest, especially along major rivers, was converted to agriculture (Gurung 1984; Ghimire 1992).

Sloth bear range in Nepal is limited mainly to the Terai, the southern strip of lowland forest and grasslands bordering India. However, the connection with India is now broken by uninhabitable agricultural lands. Northward sloth bears range into the Siwalik Hills, which rise to 750–1,500m. There is no information indicating how high in the Siwaliks sloth bears reach, but in Sri Lanka sloth bears have been observed at elevations of 1,200m (Phillips 1984) and in the Western Ghats of India up to 2,000m (Johnsingh *in litt.* 1996).

Three areas with sloth bears have been protected: Royal Chitwan NP and the adjacent Parsa WR (total 1431km²), located near the center of the sloth bear's range, and Royal Bardia NP (968km²), near the western edge of the bear's present range (Figure 12.2). During 1990–94 we conducted an intensive study of sloth bears in Chitwan. In the dry season, when sloth bears concentrated in the alluvial grasslands (Joshi *et al.* 1995), density (based on mark-recapture/resight of radio-marked individuals) exceeded 70 bears/100km² (Joshi 1996). Laurie and Seidensticker (1977) estimated a density of 50 bears/100km² in roughly the same area in 1974. However, 70% of the park is upland, dominated by sal forest, and used by sloth bears mainly during the wet season. Thus, overall density for the park is lower. Joshi (1996) estimated a parkwide population of 200–250 sloth bears, or about 25 bears/100km². This estimate is substantially higher than Laurie and Seidensticker's (1977) parkwide estimate of 55 bears (10/100km²); the difference, though, is due to methodology

not population change. A high density of sloth bears in Chitwan is apparent from a high prevalence of diggings in termite mounds.

Status

During 1993–94, the authors conducted a survey across the entire length of the Nepal Terai to assess the distribution and relative abundance of sloth bears. We outlined the potential range (forested areas) using a map produced by the National Remote Sensing Center, Nepal, which was based on 1984 Thematic Mapper satellite data. Then we interviewed villagers residing in or near forested areas, and if they indicated that bears were present in the area, we conducted transects to verify and quantify sloth bear sign. Our data indicated that the range is continuous from Chitwan west to Bardia (Figure 12.2). However, in many stretches where the forest has been eliminated or highly degraded in the lowlands, sloth bears remain only in the Siwalik Hills, where human use has been far less. Asiatic black bears live in the higher elevation range north of the Siwaliks (Mahabharat Lekh or Middle Hills), which are separated from the Siwaliks in places by dun valleys of the inner Terai. As far as we could determine, there is little or no overlap between sloth bears and black bears in Nepal.

In all areas across the Terai, sloth bear density (assessed from sign) appears to be much lower than in Royal Chitwan NP. However, sightings of sloth bears with cubs as well as our observation of a den with a female and cubs

indicated that reproduction still occurs outside the park. Sloth bear density is also conspicuously lower in Royal Bardia NP than in Chitwan, possibly because Bardia does not contain extensive alluvial grasslands like Chitwan. Evidence of sloth bears dwindles west of Bardia, and we found no indication that they exist in Royal Suklaphanta WR, at the western edge of the Terai; sloth bears occurred in Suklaphanta until at least 1977 (Spillet and Tamang 1967; C. Rice pers. observ.). East of Chitwan sloth bear range extends up to just short of Kosi Tappu Wildlife Reserve (Figure 12.2). These data are insufficient to provide a population estimate for the country, especially because we could not adequately survey the Siwalik Hills, which, based on interviews with villagers, seemed to harbor the greatest numbers of sloth bears outside the protected areas. However, given the stark contrast between densities in and out of Chitwan, and the fragmentation and narrowness of the remaining range, totaling roughly 17,000km², it seems doubtful that the population exceeds 1,000 sloth bears, and may be <500.

Legal status

The National Parks and Wildlife Conservation Act 2029 protects Asiatic black bears but not sloth bears. Sloth bears can be legally killed to protect people or property. Hunting is legal, with a license, but very few sloth bears are hunted. Villagers that were interviewed during our survey of the Terai were aware of only one incident of known legal hunting in the recent past.



Sloth bear in Suklaphanta Wildlife Reserve at the western edge of the Nepal Terai, December, 1976. A survey of this reserve by the authors in 1994 revealed that sloth bears have since been extirpated, apparently resulting from poaching. Grasslands in the reserve are burned annually. This photograph was taken shortly after burning and harvesting of the grass. Such burning is necessary to maintain this habitat, which in Royal Chitwan National Park supports a high density of sloth bears.

C. Rice

Population threats

Loss of habitat and increasing human use of remaining habitat appear to be the greatest population threats to sloth bears in Nepal. Some poaching also occurs, although its severity is difficult to ascertain. On 12 of 42 interviews that we conducted across the Terai, villagers indicated some knowledge of poaching in the area (although not necessarily of bears); 18 indicated no poaching, and the remainder did not know. Very few people were aware of a market for bear parts. Outside Chitwan, low bear densities may not attract poachers. However, given such sparse numbers, even a low level of poaching could be highly detrimental to population viability. Moreover, with recently increased poaching of rhinos and tigers in both Chitwan and Bardia, sloth bears in these areas are also subject to greater risk. Mills and Servheen (1991) were told by merchants in Kathmandu that bear gall was available in villages around Chitwan, although this could not be confirmed. However, trade records indicate that during 1990–93, Nepal was the second-largest source of gall bladders (about 25 bears/year) for South Korea (Mills 1995). Some of these gall bladders were certainly from Asiatic black bears (which are preferred by the recipients), but it is likely that trade in sloth bear parts also occurs, especially given that until recently, CITES prohibitions on trade of parts of sloth bears was much less restrictive than for Asiatic black bears.

Habitat threats

Much of the remaining forest in the Terai is severely degraded from grazing, cutting, lopping, and other human activities. Bears are absent from these areas, and in many stretches have been relegated to the hills bordering the lowlands. People gathering wood, fodder, mushrooms, and such in the hills occasionally encounter sloth bears, but human use of the hills is far less intense than in the lowlands. Some large patches of remnant forest in the lowlands have high densities of termite mounds, seemingly sufficient to sustain sloth bears, but in most of these areas we found no evidence of bears, and surmised that they had been driven off by heavy human activity. Likewise, habitat appears suitable at both the eastern and western ends of the Terai, but sloth bears are absent. A low level of poaching combined with the apparent intolerance of sloth bears to high human use of the forest may have caused their local extirpation.

Management

Protected areas with sloth bears (Chitwan/Parsa and Bardia) exist today because of their former status as hunting reserves.

For over a hundred years (1846–1950), when Nepal was ruled by Rana prime ministers, the ruling class guarded these areas for lavish hunts, often involving royalty from India and Europe. Although these hunts were spaced at intervals of several years, the kill was often enormous. During the last large hunt in Chitwan during 1938–39, 15 sloth bears were killed (incidentally to 120 tigers). The size of this harvest probably reflects the high density of sloth bears that existed there (as well as the efficiency and size of the hunting party). In order to preserve the wildlife of Chitwan, especially rhinos and tigers, it was designated as Nepal's first National Park in 1973. In doing so, many of the people that had settled there were forced to move. Similarly, Bardia was made a wildlife reserve in 1976, and reclassified as a National Park in 1988.

There are five protected areas in the Terai: Royal Chitwan NP, adjoining Parsa WR, Royal Bardia NP, Suklaphanta WR, and Kosi Tappu WR. However, sloth bears currently exist only in Chitwan, Parsa, and Bardia. There is no specific management for sloth bears, but in these three parks and reserves they receive greater protection from habitat degradation and poaching than outside. Moreover, there is active habitat management in Chitwan that may be beneficial to sloth bears. For centuries local Tharu people burned and cut grasses for building materials. A few years after establishment of the park this practice was permitted again, although under certain constraints (i.e., specific dates, no vehicles or bullock carts, and a small fee). This yearly disturbance not only maintains the grasslands and encourages new growth for grazing herbivores (Mishra 1982), but may enhance habitat conditions for termites, and hence sloth bears; this is speculative, as data are not available, but the sloth bears' preference for the grasslands, apparently due to a high abundance of termites, is evident (Joshi *et al.* 1995; Joshi *et al.* in press).

Human-bear interactions

Bears occasionally raided crops (maize, potatoes, yams, guavas, mangos, and pawpaws) in cultivated fields adjacent to Chitwan during the mid-1970s, just after it was designated a national park (Laurie and Seidensticker 1977). At the time, a large number of people and their 20,000+ head of cattle had just been removed from the new park (Mishra and Jeffries 1991). Now, 20 years later, sloth bears rarely leave the park to raid crops (although several other species do) (Joshi *et al.* 1995). One explanation is that the habitat in the park has recovered from previous human exploitation to the extent that it now provides sloth bears with adequate food (termites, ants and various fruits), and they are no longer tempted to supplement their diet with human-related foods (Joshi *et al.* in press). Additionally, contact between sloth bears and people inside the current park may have

been more frequent before restrictions on human use of this area were imposed, so in the past, bears may have been more accustomed to people and thus less wary of venturing into their fields. Presently, sloth bears in Chitwan may encounter occasional park visitors, but large numbers of people enter the park only during the brief period in January and February when villagers burn and cut grass. During this annual grass harvest, several maulings by sloth bears have occurred.

We also heard reports of maulings in areas outside the park. Three residents of one village in western Nepal were mauled by sloth bears during the past 6–10 years, and in a village in eastern Nepal a man was recently killed by a sloth bear. These incidents occurred in the forest after people apparently stumbled across a bear. We found no evidence, in any village, that sloth bears raided crops or that people encountered sloth bears other than in the forest.

Public education needs

Royal Chitwan NP, the site of the first major study of sloth bears, could serve as the cornerstone for lessons in conservation to school children in Nepal. The history of the park provides a prime case not only for the necessity of protecting forest habitats in order to ensure the survival of some of the world's most magnificent species of wildlife, but also for highlighting the benefits to people in protecting and managing valuable resources like the alluvial grasslands. Moreover, the uniqueness of sloth bears, related to their feeding on ants and termites, make them a powerful example not only of how animals adapt to and exploit their environment, but also of how reliance on specific foods and habitat types makes them vulnerable to extirpation. It is important to emphasize that these bears do not kill livestock, and rarely damage crops, when provided adequate habitat with good supplies of natural food. Conservation education should be developed around the theme of maintaining large forest ecosystems that protect many species and simultaneously provide benefits to local people (Grumbine 1994).

Specific conservation recommendations

Mapping

Collect data on distribution of sloth bears in the hills along the northern edge of the Terai. We found that sloth bears were absent in large expanses of the Terai, but local people informed us, and we subsequently verified with direct evidence, that they still inhabit the Siwalik Hills. These hills are steep, dry, and much less conducive to growing crops, and thus have a lower human density than the Terai, which explains the continued presence of sloth bears there. However, it is uncertain whether the sloth

bears that presently live in the Siwaliks represent a viable population that would persist. In this case, the status of sloth bears in Nepal is much more tenuous, as the range in the lowlands is very fragmented.

Monitoring abundance

Periodically resurvey the range to monitor changes in population status. Standardized transects to quantify sloth bear diggings for termites can be used to compare areas and to assess changes in abundance over time. These transects could be established in a few key places throughout the range, and conducted at recurrent intervals. Additionally, interviews with local villagers would be helpful in verifying the presence or absence (especially the recent disappearance) of bears in an area.

Habitat improvement

Restore habitat through community-based forestry projects. Remaining blocks of unprotected forest are heavily used by local people, and it seems probable that this continued use, combined with low-level poaching, is causing gradual declines in sloth bear numbers. Chitwan, Parsa, and Bardia can act as population centers within larger ecosystems of multiple-use lands. However, it is likely that no additional reserves will be established. Thus, it is necessary to focus on land-use outside these protected areas. Before the Forest Nationalization Act of 1957, forests were viewed as a common community resource. After the act, these forests were declared government property, but because these lands could not be adequately protected and because individuals had no stake in their protection, they were overexploited. Moreover, the government resettlement program in the Terai directly led to clearing or severe degradation of forested lands. However, a national forestry plan was reformulated in 1976 and again in 1989, allowing, and even encouraging community-owned forests.

Community forestry programs, wherein local people learn the value of planting and protecting trees, could expand habitat for sloth bears, and could also reduce poaching. As villagers guard their community-owned forests from wood poachers, their vigilance might also serve as a deterrent against poaching of wildlife. The strength of this approach is that it is instigated from the bottom up (i.e., people do it because it benefits them, rather than because it is mandated), but it also must be supported from the top down (Poffenberger 1990; Western *et al.* 1994). A significant obstacle, which requires top-down policy, is the large number of landless people in the Terai. Only through land tenure can people be expected to undertake land improvement (Ghimire 1992).

Human-bear interactions

Investigate and instigate more protection against poaching. Wildlife officials in Nepal are already aware of poaching-

related problems with a number of wildlife species, most notably rhinos and tigers, but seem not to recognize a problem with sloth bears. Our survey indicated that although poaching is not prevalent, its occurrence is probably sufficient to affect population viability. Poaching was probably responsible for the extirpation of sloth bears from Suklaphanta WR within the past 20 years, and if it can decimate a population in a protected area, then it can certainly depress and eventually eliminate sloth bears in a

number of other, more vulnerable places throughout the range. This problem will not be solved easily, as anti-poaching efforts are not adequate even to protect the parks, no less the lands outside the parks. Community support will be necessary, and an active educational program, in schools and in local communities, is needed to garner such support. If the apparent poaching situation near Suklaphanta can be controlled, it might be feasible to eventually restore the sloth bear population there through reintroduction.