HUMAN-IMPOSED THREATS TO SUN BEARS IN BORNEO

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Abstract: The sun bear (*Helarctos malayanus*) is the least studied bear species, and little information exists on threats to its survival. Based on studies of other bear species, I hypothesized that sun bears on the island of Borneo are threatened by destruction of habitat and hunting. The results of this 3-year survey confirmed this hypothesis. More specifically it identified 4 factors that influence sun bear survival in Borneo: hunting, trade in live bears and bear parts, habitat destruction, and establishment of plantations. Survey data and background information suggest that hunting pressure on Bornean sun bears is high. Trade in bear parts is now uncommon in Kalimantan, but it was higher in the 1980s. In Sabah and Sarawak, however, trade in bear gall bladders is still common. My estimates indicate that the sun bear lost 30–60 % of its total habitat in Borneo between 1960 and 1990, mainly through logging and land conversion. Apart from the possible deleterious effects of logging and conversion on the carrying capacity of the habitat, these activities are accompanied by increasing human presence and hunting pressure. There is a lack of ecological data on sun bears, so the impact of these factors cannot be assessed. However, this study provides a clearer focus for sun bear conservation, including recommendations on research and policy matters.

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Key words: Borneo, conservation, gall bladders, *Helarctos malayanus*, hunting, Malayan sun bear, threats

The sun bear, which occurs in forests of lowland tropical southeast Asia, is the least studied of all ursids (Servheen 1989, Meijaard In Press). Very little ecological fieldwork has been conducted to investigate sun bear biology, and there have been no thorough surveys of distribution or population densities. Most of what is known about this bear species is based on research in zoos and on stories by colonial hunters of south and southeast Asia.

The lack of basic information on the species' ecology, and on factors that threaten survival, makes it difficult to assess whether the species requires protection. What we do know, however, is that bears worldwide are under pressure (Servheen 1989), and my initial assumption in this research is that the sun bear is likewise threatened in its survival. Hester (1967) listed the following factors as attributing to the reduction in numbers of the sun bear's bigger relatives, American black bears (*Ursus americanus*) and grizzly bears (*U. arctos)*: destruction of habitat, hunting by 'primitive' man, hunting by 'civilized' man, naturally low densities, humans considering bears to be pets, and a low reproductive rate. To ascertain whether sun bears in Borneo are affected by similar factors, I conducted a 3-year survey to determine the main threats to sun bear survival and the species' present distribution. Sun bear distribution has been described by Meijaard (In Press); this paper specifically addresses threats to sun bear survival in Borneo.

METHODS

I conducted this survey as part of a 3-year orang utan (*Pongo pygmaeus*) survey in Kalimantan, the Indonesian part of Borneo (Fig. 1), between 1994 and 1997. For the orang utan survey, I conducted 78 field-checks involving 208 field days in Kalimantan. In addition I spent 69 days in towns and villages for official visits and interviews. During that period I travelled almost 35,000 kilometres by various means of transportation, including transects on foot. The surveys covered all major river systems of West, Central, and East Kalimantan, all major towns in Kalimantan, and mountainous areas in Central and East Kalimantan. I also visited 7 major cities in Sabah and Sarawak, during 3 visits, which totalled 1 month.

The sun bear part of the survey consisted mostly of non-systematic interviews which always started as an informal conversation. If the informant knew about general wildlife subjects, the interviews became more specific. As the orang utan was the main focus of the survey, questions initially addressed that species, after which information was collected about other wildlife, including sun bears. Questions asked included: "What do you know about sun bears?", "Are there any bear gall bladders for sale?", and "Are there any captive sun bears in this village?" As much as possible the interviewer tried to verify information by asking other informants. Questions were asked in Indonesian, which is also understood in the Malaysian states. In villages, hunters were useful sources of information, but in general informants were chosen randomly. In cities and larger villages, I collected information by looking for likely animal trading places, such as Chinese medicine shops, market halls, and harbors. I tried to obtain proof for claims by asking to see, for instance, the remains of a killed bear, such as skins, skulls, or bear gall bladders, or signs of bear presence in the forest. The anecdotal information used in this survey provides only subjective data, and information on absence of threats to bear survival was not recorded.

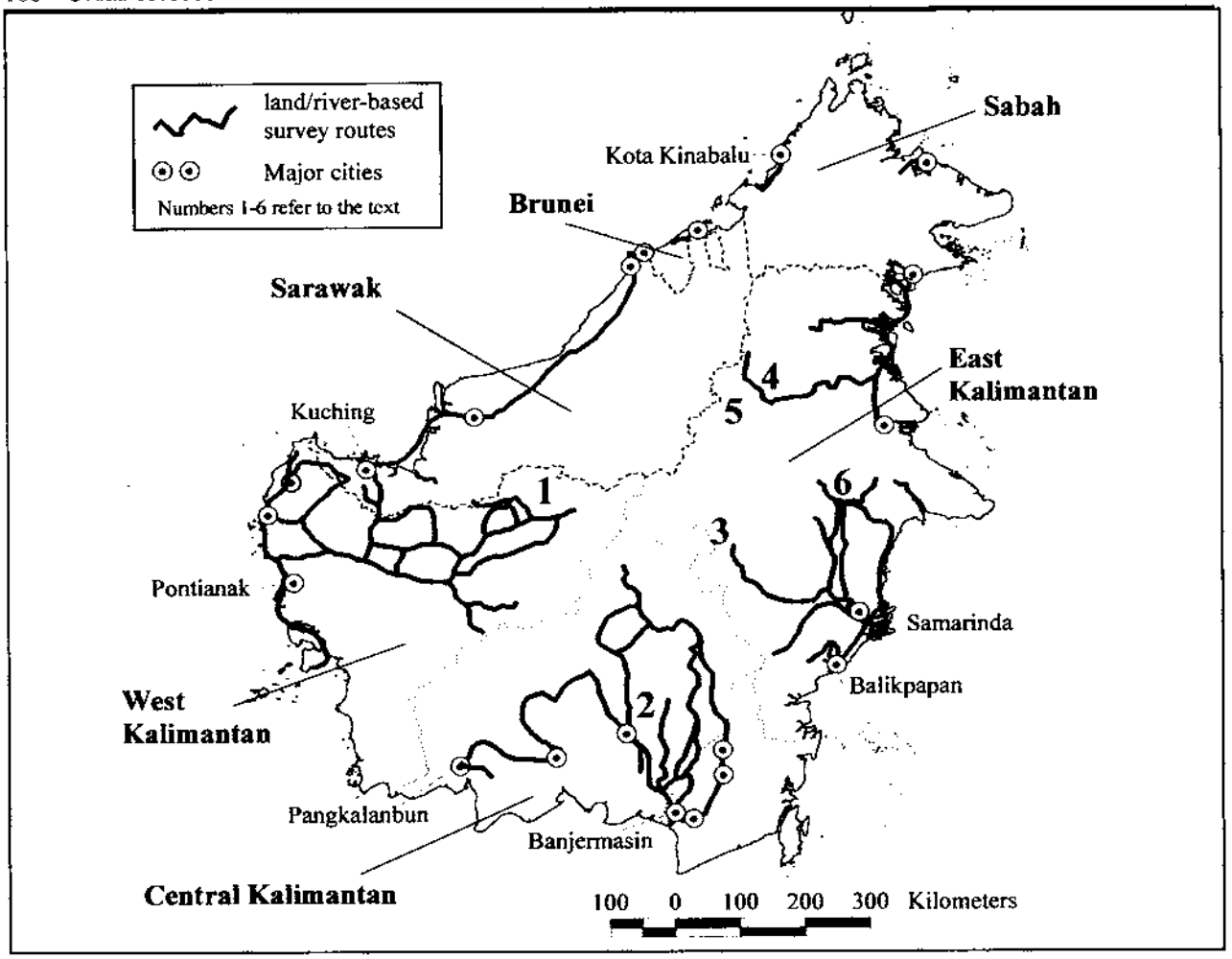

Fig. 1. The island of Borneo and the routes that were followed during the 1994–97 surveys.

RESULTS

Use and Sale of Sun Bear Parts

During the survey, 17 interviewees admitted to hunting sun bears. In addition, I found 23 skulls, 205 canine teeth, 53 claws, and 2 skins from sun bears, providing additional evidence of bear hunting (Fig. 2, Table 1). Interviewees also indicated that bears are still consumed in several areas in Kalimantan, such as the upper Kapuas area in West Kalimantan (9 in Fig. 2), the southern swamps of Central Kalimantan (7 in Fig. 2), and the upper Mahakam (1 in Fig. 2), upper Bahau, upper Kayan, and Wahau Rivers of East Kalimantan. Bears are mainly eaten by indigenous people, including the Iban, Maloh, Dayak Kenyah, Punan, and Ngadju peoples. In one case Javanese workers in a logging camp also admitted to eating bear meat. An informant in Pontianak, West Kalimantan, told me that until 1996 bear paws had been exported from Pontianak to Singapore, where they were sold for US$ 250/paw (1996).

On 2 occasions I found sun bear gall bladders for sale during the Kalimantan surveys, and I received 11 past reports of the sale of sun bear gall bladders (Table 1). Prices were said to vary from US$ 10–US$ 55/gall bladder (1996). All shop owners in Kalimantan asserted that current demand for these products was low. Use of bear gall bladders in Kalimantan seemed to be mainly restricted to Indonesians of Chinese origin and to some indigenous tribes of Kalimantan. High consumption of bear parts was reported to occur where Japanese or Korean expatriate employees of timber companies created a temporary demand.

In Sarawak and Sabah, there seemed to be a much bigger market for sun bear gall bladders than in Kalimantan. In Sarawak (Kuching, Sibu, Bintulu, and Miri), 3 of 10 traditional Chinese medicine shops showed me 9, 10, and 2 gall bladders, respectively, and 3 others were able to supply them. In the remaining shops, the assistants were more suspicious and denied the sale of bear gall bladders or were unwilling to talk. In Sabah (Kota Kinabalu and Tawau), it was more difficult to find infor-

Table 1. Locations in Borneo where bear gall bladders were sold 1994–97. Location numbers are from Fig. 2.

No.	Location	Province	Price (US$)/ bladder	Year	Source of information
1	Apo Kayan	East Kalimantan	?	1996	O'Brien[a]
2	Balikpapan	East Kalimantan	?	1996	local interview
3	Grogot	East Kalimantan	30	1996	local interview
4	Malinau	East Kalimantan	35	1996	local interview
5	Tarakan	East Kalimantan	45	1996	local interview
6	Banjermasin	South Kalimantan	55	1996	local interview
7	Banjermasin	South Kalimantan	31	1996	local interview
8	Ketapang	West Kalimantan	10/'slice'	1996	local interview
9	Lanjak	West Kalimantan	?	1996	local interview
10	Pontianak	West Kalimantan	?	1996	local interview
11	Rimba Adi Jaya Ltd.	West Kalimantan.	10	1997	local interview
12	Semitau	West Kalimantan	12	1996	local interview
13	Sintang	West Kalimantan	?	1995	local interview
14	Kota Kinabalu	Sabah	20–640	1997	local interview
15	Tawau	Sabah	80–160	1997	local interview
16	Kuching	Sarawak	65–175	1997	local interview
17	Sibu	Sarawak	40–80	1997	local interview
18	Bintulu	Sarawak	160	1997	local interview
19	Miri	Sarawak	40–80	1997	local interview

[a] T. OBrien, WCS Indonesia, Bogor, Indonesia, personal communication, 1996.

mation about sun bear gall bladders. A shop assistant showed me a gall bladder in only 1 of 12 shops visited. All other shop assistants denied the sale of gall bladders. This contradicted information from some 20 informal interviews in the street, during which interviewees asserted that gall bladders were easily bought. In all major towns in these Malaysian states it was often unclear whether the bladders were from bears or from animals like pigs. Additionally, gall bladders of other Asian bear species (Asiatic black bear [*Selenarctos thibetanus*], sloth bear [*Melursus ursinus*], and even polar bear [*U. maritimus*]) were allegedly for sale. Prices varied from US$ 20 to 175/bladder (1997) with 1 sloth bear bladder sold for US$ 640 (1993). Local interviewees also reported active trade in several border towns (Tarakan, East Kalimantan; Badau, Entikong, and Seluas, West Kalimantan) from Kalimantan into Sabah and Sarawak of both live bears and bear parts, indicating a higher demand in these Malaysian states than in Kalimantan.

I found evidence of non-consumptive use of bear parts in all areas of Kalimantan I visited. Bear parts offered for sale as souvenirs or found for decorative purposes in people's houses included canines, claws, and skins, and any of these parts incorporated in indigenous artwork. For example, sun bear skulls engraved with traditional Dayak (generic name for indigenous tribes of Borneo) designs were for sale in Samarinda, East Kalimantan, for Rupiah 250,000 (US$ 110 [1996]). Four of a group of 6 bear skulls confiscated from a souvenir and antiques shop in Samarinda were decorated elaborately with beads and skillfully engraved. The shop attendant did not know where these skulls originated, but apparently they were used by Dayak people in religious ceremonies.

The use of bear parts in traditional ceremonies was reported by R. Sözer (University of Amsterdam, the Netherlands, personal communication) in 1996. According to Sözer, a medicine man from East Kalimantan said that hollow bear canines are used as whistles to scare evil spirits during traditional ceremonies. Sözer observed this at ceremonies in East Kalimantan. I occasionally noted hollow canines when I investigated sun bear skulls; in 6 of 85 at least 1 canine was hollow.

Sun Bears as Pets

During the surveys, I saw 35 sun bears in private captivity. In addition, many more were reported to be in captivity elsewhere. Prices of live bears were relatively low in Kalimantan, ranging from US$ 15 to 250 (1996), with the highest prices in Pontianak, West Kalimantan. In Jakarta, the capital of Indonesia, bears were said to cost between US$ 500 and 750 (1995) (W. Smits, Teamleader Tropenbos Forestry Project, East Kalimantan, Indonesia, personal communication). During the surveys, I saw only 1 captive sun bear in Sarawak, but the 7 confiscated sun bears at the Semenggok Orang Utan Rehabilitation Centre in August 1996 indicated a pet trade in Sarawak.

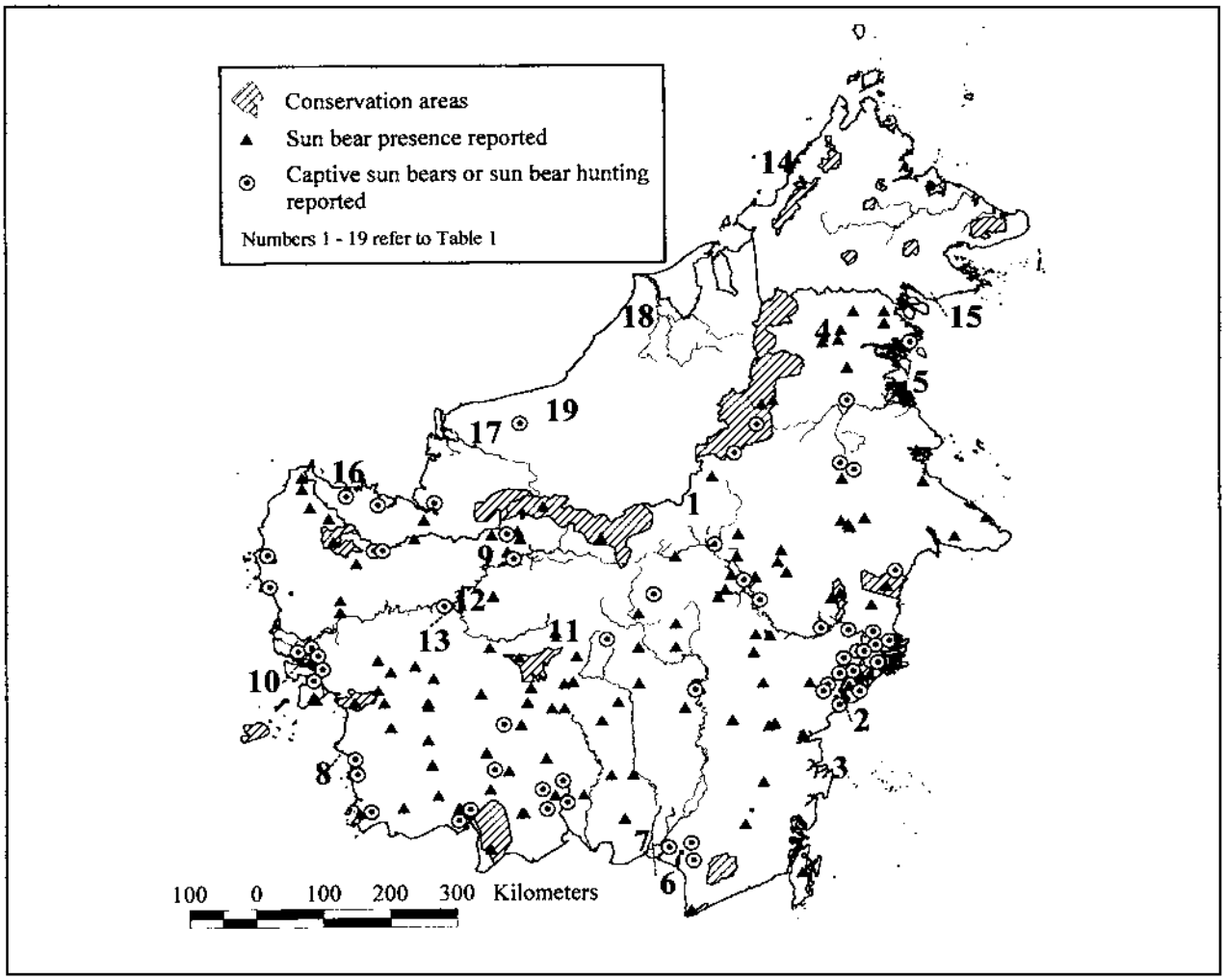

Fig. 2. The island of Borneo, the locations of the reported threats to sun bear survival, and sun bear distribution (Meijaard In Press)1994–97. The cross-hatched areas indicate officially protected areas of Borneo (from World Conservation Monitoring Centre and author's data). No data on sun bear presence are available for Sabah, Sarawak, and Brunei.

Conflicts with Humans

On 3 occasions in East Kalimantan, interviewees admitted to poisoning or shooting sun bears because of the damage they caused in snakefruit and coconut plantations. Javanese transmigrants and immigrants from Sulawesi also killed sun bears because they were dangerous animals. Almost all informants agreed sun bears were among the most dangerous animals in the forest. The general fear of sun bears was exemplified in a news report on marauding sun bears. Apparently several sun bears had forayed into 4 villages in South Sumatra. The bears were said to have preyed on more than 200 cattle (normally not a prey species of the sun bear), and "Villagers had been gripped by fear" (Jakarta Post, 14 April 1997). Closer investigation of this rumor revealed that only 1 large bear, which had taken several goats from a village, was involved. The bear was caught and shot (T. O'Brien, WCS Indonesia, Bogor, personal communication, 1996).

DISCUSSION

This survey suggests that hunting, the demand for bear parts and live bears, and conflicts with humans may threaten sun bear survival on Borneo. However, due to a lack of accurate ecological and distribution data, it is difficult to interpret how seriously sun bears are affected. What can be done is to assess the trend in these threats.

Hunting

Sun bear hunting is not a recent phenomenon on Borneo. Harrisson (1949), for instance, mentioned that

in Sarawak sun bear hides were used for decorative seating pads that men wore tied to their waists to keep dry when sitting down out of doors or at rice-wine parties. In Kalimantan, hunting of sun bears is common, despite being prohibited by law. Pfeffer (1958) confirmed this tradition in East Kalimantan. Puri (1992) noted that sun bear parts are used for various traditional purposes in the mountainous areas of East Kalimantan: ceremonial clothing, food, jewellery, medicine, protective charms, and hunting trophies.

Hunting in Sarawak was described in detail by Caldecott (1988). During a door-to-door survey, Caldecott (1988) found 74 sun bear trophies and pet sun bears in 16 long-houses (the traditional communal homes of Kalimantan) and 1 town. He considered the cultural value of bear claws and teeth in his survey area, south, central, and east Sarawak, to be important. Caldecott (1988) also found that approximately 1 bear/50 hunting families was killed each year. With an estimated 105,000 hunting families (Cleary and Eaton 1992), potential bear habitat of 93,000 km^2 (Collins et al. 1991, Meijaard In Press), and an estimated bear density of 1 bear/4 km^2 (Davies and Payne 1981), some 10% of the bear population in Sarawak was shot in 1988. Among the animals and animal groups investigated during Caldecott's survey, sun bears were most often thought to be in rapid decline; 77% of 48 long-houses surveyed in Caldecott's study areas reported a serious decline in the abundance of this species.

Bennett et al. (In Press) concluded that hunters in Sabah and Sarawak hunted sun bears and other species regardless of legal protection. Some bears are kept as pets (though that is possibly declining), while others are harvested for their claws, gall bladders and meat. In Sarawak, sun bears account for 8% of the dressed weight of wild animals killed for meat (Bennett et al. In Press).

Caldecott's (1988) interviews indicated that the sun bear is among the species most affected by hunting in Sarawak. In Kalimantan and Sabah, hunting sun bears remains common. In the past, hunting sun bears by traditional means likely had little impact on sun bear populations (Banks 1931, Witkamp 1932, Westermann 1938). However, developments in the mid-20th century, such as the introduction of firearms and outboard engines, increased hunting efficiency and allowed for longer hunting trips. In addition, the rapid opening of the interior of Borneo for logging, mining, and transmigration (Rijksen and Meijaard In Press) made inaccessible areas more accessible to hunters.

Trade in Bears and Bear Parts

We do not know to what extent hunting sun bears is fueled by a demand for bear parts. We do know that the demand was high in Kalimantan and that it is still high in Sabah and Sarawak. Custom records, for instance, show that between 1970 and 1980, 206 kilograms of bear bile was legally imported from Indonesia to South Korea alone (equalling about 7,000 dead sun bears), whereas between 1980 and 1990 legal sales had dropped to only 1 kilogram (Mills et al. 1995). This apparent drop in legal sales of Indonesian bear gall bladders seems to be supported by this survey. Many informants claimed that since the mid-1980s, trade in sun bear parts in Kalimantan decreased until, in some areas, it is almost non-existent. Whether this was because of lack of supply or lack of demand is unclear, but low availability of bear gall bladders in shops, combined with low prices in Kalimantan, suggest that low demand rather than low supply caused this market crash.

There is a clear difference in gall bladder availability in Kalimantan and in Sabah and Sarawak. In Kalimantan, 3 years of intense surveying revealed only 2 bear gall bladders, but 22 were found in Sabah and Sarawak within a month. It is interesting to note that 6 years before this survey, Mills and Servheen (1991) found 84 gall bladders in 5 of 8 shops surveyed in Sabah, as opposed to the 22 gall bladders in 4 of 20 shops found during this survey. Clearly, this could be explained by a different survey technique, but the methods described in Mills and Servheen (1991) seem similar to those in the present survey. This difference could also indicate that shop owners have become more careful about providing information on this illegal product or that the available number of gall bladders has declined.

Too little is still known of the trade in bear parts. Further data are required on the trade volume within Borneo and from Borneo to other parts of Asia before we can understand the underlying market mechanisms.

Habitat Disappearance

Forest destruction is the main threat to many species in Kalimantan (Rijksen and Meijaard In Press). The total forest area of Borneo probably exceeded 400,000 km^2 in the early 1990s (Collins et al. 1991, Directorate General of Forest Inventory and Land Use Planning [INTAG], and (Food and Agricultural Organization of the United Nations [FAO] 1996), although most of this had already been fragmented through logging and human settlement. Apart from the 15% of the land set aside for watershed protection and conservation, virtually all forest is earmarked for logging or conversion to plantations or agricultural land. According to the World Bank, deforestation in Borneo amounted to 7,000 km^2 in 1988 (Davis and Ackermann 1988). According to the Indonesian Land Resources Development Centre an estimated 112,000 km^2

in Kalimantan alone is under the impact of slash-and-burn agriculture (Rijksen and Meijaard In Press). Other data reveal that Kalimantan lost >100,000 km^2 of forest between 1984 and 1990, almost 20% of its total land area, indicating even higher deforestation rates (Regional Physical Planning Programme for Transmigration 1990). In 1996, 24% of the total state forest in Kalimantan (ironically consisting of 21% non-forest) was earmarked for complete conversion to plantations or other non-forest land, 54% for normal or limited production forest, and 14% for watershed protection (INTAG 1996).

In Sabah and Sarawak, logging intensity increased considerably during the last decade (Repetto 1988, Manser 1992). In Sabah, forest harvest almost tripled from 1,570 km^2/year in 1980 to 4,263 km^2/year in 1990. In Sarawak, forest harvest increased from 1,400 to 4,500 km^2/year (Rijksen and Meijaard In Press). In the early 1980s, virtually all of Sabah's forests were under timber concessions, and since the early 1990s, much of the logged-over forests have been converted into plantations (Rijksen and Meijaard In Press). By 1986, 86% of forested land area of Sarawak was allocated to timber concession. Only the most inaccessible forest areas in the mountain ranges and on swampy grounds remain unconverted.

Sun bears occur naturally in all lowland forest types, although densities probably vary (Witkamp 1932, Westermann 1938, Davies and Payne 1981). Under this assumption, forest exploitation data indicate that sun bear habitat in Borneo is rapidly shrinking. Despite much discrepancy between sources of forest cover data (Meijaard In Press), between 1960 and 1990 there was an estimated 30–60% reduction in suitable sun bear habitat (see for instance FAO 1987, Collins et al. 1991, Rijksen and Meijaard In Press). Such reduction may have lead to a similar decrease in the sun bear's population size. Fragmentation effects from logging and other developments may have further affected the remaining bear populations.

Ecological Effect of Logging

Beside the direct effects of logging (i.e., the disappearance of habitat), logging also indirectly affects sun bears. Some bear species do quite well in heavily logged forests because of increased light penetration and associated berry production (D. Garshelis, Minnesota Department of Natural Resources, Grand Rapids, Minnesota, USA, personal communication, 1998), but others do not. Johns (1983) concluded that animals with a specialized diet are the most seriously affected by logging in the rain forest of mainland Malaysia, but that for some opportunistic herbivores the disruption appears to be an advantage. Most adapt to a variety of habitats, and sun bears may have a temporary advantage in large amounts of dead vegetal matter and the subsequent increase in invertebrates. G. Frederiksson (Tropenbos-Kalimantan, Balikpapan, Indonesia, personal communication, 1997) reported that a considerable part of the sun bear's diet consists of these insects, although in fruiting season fruit was the preferred food (no exact data available). Joshi et al. (1995), suggested that the sloth bear, whose diet consists mainly of ants, can overcome the problems of the seasonal availability of vegetable food items such as fruit. More importantly, the sloth bear's foraging ecology allows it to subsist in a relatively small home range (Joshi et al. 1995). Theoretically, this could mean that animals with a diet consisting largely of insects may cope better with the fragmentary effects of logging. The obvious problem of assessing the sensitivity of sun bears to habitat damage is the absence of information on ecological characteristics, such as foraging dynamics and movement patterns.

Too little is known of sun bear ecology to predict the effects of various types of logging. The outcome is still uncertain: Santiapillai and Santiapillai (1996) noted that any disturbance of the forest is likely to be detrimental to sun bear populations, whereas Blouch (1984) found that sun bears in Sumatra survive well in disturbed and undisturbed areas.

Plantations

Erdbrink (1953) described the sun bear preference for palm hearts, the soft growing point of the coconut palm. This propensity likely contributed to sun bear unpopularity among plantation owners. Witkamp (1932), for instance, reported that sun bears are a real plague in some areas, especially in coconut plantations. More recently, sun bears have been mentioned as an agricultural pest in Sabah and Sarawak; plantations affected included sugar palm, sugar cane and fruit trees (Mills and Servheen 1991). Sun bears also damage oil palm plantations (C. Servheen, U.S. Fish and Wildlife Service, Missoula, Montana, USA, personal communication, 1998.). Creation of plantations for this economically important commodity could be a major threat to surrounding sun bear populations.

The reported killing of sun bears in snakefruit and coconut plantations confirms that sun bears are treated as pest species in Kalimantan's plantations. In light of the recent economic crisis in Indonesia, this is important. Currently there are 2 million hectares in plantations in Indonesia. In 1998, to address the monetary crisis, the Ministry of Agriculture announced that an additional 1.5 million hectares of plantations will be added. Indonesian environmental groups claimed that plantation

companies have already seized forested areas (Harris 1998). As the majority of these plantations will be located in lowland forests of Sumatra and Kalimantan, a considerable area of sun bear habitat will disappear (Meijaard In Press), and the sun bear persecution that was reportedly associated with plantations may add to the demise of the sun bear.

RECOMMENDATIONS

This survey identified threats to the sun bear on Borneo, but I cannot predict how seriously they affect the species. Conservation issues are complex, especially in Indonesia where pressure on natural resources is immense and where conservation authorities are ineffective in alleviating these threats. This paper cannot address all these issues, but based on this survey, I suggest the following conservation priorities for the Bornean sun bear.

Applied Research.— Study feeding ecology and behavior under different logging regimes; develop survey techniques and compare densities in different habitat types with different levels of disturbance; study the effects of hunting pressure, study hunting in plantations.

Surveys.— Survey bear distribution and density Borneo-wide; analyze trade routes and trade volume.

Policy Matters.— Promote improved conservation of the species at national and international level; develop management guidelines for sun bears in plantations.

Education and Awareness.— Design a program that shows Bornean people the value of these wild animals; address the medicinal use of bears and bear parts; address the problem of hundreds of bears in captivity.

Training.— Train conservation authorities to collect, store, and use data on bear distribution and other characteristics.

Bear Holding Facilities.— Establish bear holding centers to help law enforcement and to provide a place to collect bears. Such centers could be used for educational purposes. Hundreds of sun bear live in captivity waiting to be slaughtered when they are too old to keep as pets. These animals will not be confiscated as long as there is no suitable follow-up.

CONCLUSION

I identified 4 factors affecting the survival of Bornean sun bears: hunting, trade in bears and bear parts, habitat destruction, and establishment of plantations. The data and background information suggest that hunting pressure on Bornean sun bears is high and may be causing a decrease in the sun bear population in Sarawak. However, there are no scientific data on population trends, and hunting may still be at a sustainable level in Kalimantan. Trade in bear parts in Kalimantan is now at a low level, but apparently was higher in the 1980s. Trade in bear gall bladders appears to be more common in Sabah and Sarawak than in Kalimantan.

My estimates indicate that sun bears have lost 30–60% of their habitat in Borneo over the last 30 years, mainly through logging and land conversion. Apart from the possible deleterious effects of logging and forest conversion on the carrying capacity of the habitat, these activities are accompanied by increased human presence and hunting pressure.

Finally, because of its considerable forest area and its relatively low human population density, Borneo still harbors thousands of sun bears, and possibly the largest sun bear population in the world. The survey data suggest which factors threaten sun bear survival, but a lack of ecological data prevents me from drawing conclusions on the sun bear's conservation status. However, conservation management in Indonesia is at best minimal, and a lack of data cannot be grounds for complacency. It is beyond the scope of this paper to provide a detailed action plan for the sun bear on Borneo, but in general, future action should be aimed at applied ecological research, improved management and protection of the species, and better control and investigation of trade and hunting.

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