

Food Preference of Rehabilitated Asiatic Black Bear cubs in Lowland Tropical Forests of Northeast India

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ABSTRACT

Observations were made on the feeding habits of Asiatic black bear (*Ursus thibetanus thibetanus*) cubs during their rehabilitation program in the lowland tropical semi-evergreen forests in Pakke Tiger Reserve, Arunachal Pradesh, India. The different food items taken by the bear cubs during their daily incursions in the forest were recorded using instantaneous group scan. While the three bear cubs (of first batch) were recorded to feed on 22 different plant parts of 19 species and 14 food items of animal origin, the remaining five cubs (of second batch) consumed 14 different plant parts of 10 different species and nine items of animal origin. Feeding frequency of plant materials was more than that of animal origin. 48 random vegetation plots were laid to ascertain the abundance of different plant species consumed by the bear cubs in the study area. 13 of the 19 plant species consumed by the cubs were found within the vegetation plots. Plant parts consumed by Asiatic black bear cubs are mostly soft mast unlike the other sub-species of Asiatic black bear (occupying the temperate ranges) where comparatively more hard mast is consumed.

Key words: Asiatic black bear, Feeding behaviour, Instantaneous group scan, Pakke Tiger reserve, Rehabilitation.

INTRODUCTION

Asiatic Black bear (*Ursus thibetanus thibetanus*) is a medium sized bear distributed in Central to South East Asia and Japan. Although studies have been carried out on its distribution and ecology, but scanty information is available on its population status throughout its distribution range. All the relevant literature on species feeding behaviour are restricted to few places in Japan (Torii, 1989; Huygens and Hayashi, 2001), some parts of China (Schaller, *et al.*, 1989; Reid *et al.*, 1991), Northern India (Schaller, 1969; Manjrekar, 1989; Saberwal, 1989), Russian Far East (Bromlei, 1973) and in Taiwan (Hwang, Garshelis and Wang, 2002). Some studies have been carried out on the feeding ecology of Asiatic black bear using different methodologies. Hwang *et al.* (2002) and Sathyakumar and Viswanath (2003) employed direct observation to have information on feeding habit of bears. Schaller (1969), Manjrekar (1989), Saberwal (1989), Hwang *et al.* (2002), Sathyakumar and Viswanath (2003) and Steinmetz *et al.* (2013), employed indirect feeding signs like feeding platform, claw mark in the food tree, scat analysis and indigenous knowledge of forest dwelling people to record the feeding habit of bears. But no study has been carried out on status and distribution of the thibetan subspecies of Asiatic Black bear in north East India and on their feeding behaviour in particular (Choudhury, 2011).

Ursids are placed under order Carnivora but except for the polar bears, all extant bear species are omnivorous, feeding mostly on plant materials, insect, fish, and mammals. They are generally large, stocky, and powerful animals. Bears teeth reflect their omnivorous habitat by lacking the carnassials common in other mammalian carnivores and having morphologically adopted flattened molar for browsing vegetation (McLellan, 1994). Ursids tend to have a comparatively longer but simple intestinal tract from other carnivores but they do not have well developed fermentation site such as rumen, caecum or elongated colon like the herbivores (Davis, 1949; Jaczewski, Gill and Kozniewski, 1960; Mealey, 1975; Mattson, 1998). Asiatic black bear have physiologically adopted for arboreal feeding. Its relatively heavy front quarters, short curved claws, is supportive for its frugivorous diet (Mattson, 1998).

The method of rehabilitation adopted during the present study is the assisted release method (Ashraf *et al.*, 2008) in which bear cubs get an opportunity to get acclimatized in the release area under guidance of rehabilitator for a period of 7-9 month. During the period of acclimatization bear cubs get an opportunity to explore the available resources and learn to encounter other animals in that area. The objective of the study is to understand the food selection of cubs of Asiatic black bear in a lowland tropical forest habitat of Arunachal Pradesh, India.

Study area

The study was conducted in the lowland tropical forest of Pakke Tiger Reserve (861.95 Km², 92°36' - 93°09' E and 26°54' - 27°16' N) in East Kameng district of Western Arunachal Pradesh (Figure 1) during 2009 to 2011 at two rehabilitation sites. General vegetation of the study site predominantly conforms to the *Assam valley Tropical semi evergreen forest 2B/C1* (Champion & Seth 1968). Vegetation characteristics of the area was documented by Datta and Rawat (2003). The area has 343 species of woody flowering plants, dominated by members of the families *Euphorbiaceae* and *Lauraceae* (Padmawathe *et al.*, 2004), and in some places mixed vegetation patches with cane and bamboo thickets are also prevalent. The forests are typically multi-storied and rich in epiphytic flora, woody lianas and climbers. The terrain is hilly, with elevations ranging from 100m to 1500m. Several tributaries of the river Kameng and Pakke flow through the Pakke Tiger reserve creating several small patches of grassland and riparian vegetation in both sides of the river bank. The first rehabilitation site (in 2009-2010) was in Khari located about 12 km North-West from Seijusa, the divisional head quarter of Pakke Tiger Reserve, which was a hilly area with several small rivulets traversing across it. Cane, palms and bamboo thickets are common in the hill slopes. *Dilena indica* and *Alpinia* sp. are common in the riverine forest, with tall grassland along the larger streams and river (Datta and Rane, 2013). The second rehabilitation site (for 2010-2011) was Doigurung, about 33 km North-West from Seijusa. The area having undulating terrain harbouring dense vegetation comprising of cane and bamboo thickets interspersed within mixed forest dominated by *Altingia excelsa* and *Terminalia* sp.

The area have tropical climate pattern, with cold weather from October to February. Rainfall follows a bimodal pattern, with south west monsoon during May to September and short raining period from December to April averaging 2500 mm (Birand and Pawar, 2004). Mean (\pm SD) maximum temperature is around 29.3°C \pm 4.2 and the mean minimum temperature, around 18.3°C \pm 4.7 (1983 to 1995, Tipi Orchid Research Centre).

Both the rehabilitation sites are situated inside the sanctuary and are well protected by the local forest administration, and thus experience very little or no anthropogenic disturbances. No human settlement is there near the acclimatization area.

METHODOLOGY

The present study offers the opportunity to observe the feeding habit of the bear cubs directly from close proximity between August 2009 to February 2010 and from November 2010 to March 2011. In the process of assisted release the bear cubs are taken to the preselected acclimatization area by one or two rehabilitators. In the course of such incursion to the forest bear cubs get acquainted with the availability of resources. The cubs select different food items from the resources available in the acclimatization area. At the beginning of the acclimatization process although supplementary food was given

to the bear cubs when they are back in the night shelter enclosure after the daily incursion (Dasgupta *et al.*, 2014), but later the cubs don't show any dependency on the supplementary food.

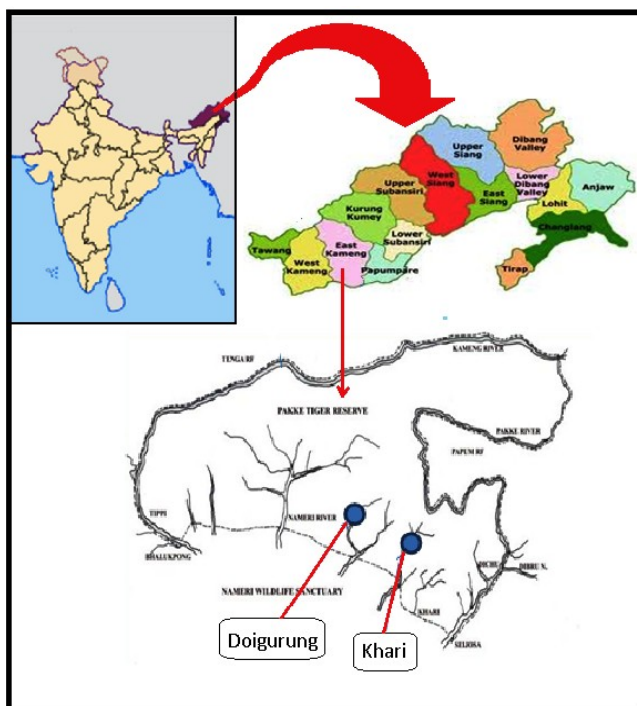


Figure 1. The rehabilitation sites in Pakke Tiger reserve, Arunachal Pradesh, India

Instantaneous group scan (Altman, 1972) was done on total 8 bear cubs (3 in 2009-2010 and 5 in 2010-2011) during the study to record the activity pattern of the cubs undergoing rehabilitation process. When the bear cubs were feeding on any plant or animal item, vernacular name of the item was recorded, and in some cases herbarium was prepared and later on identified by the plant taxonomist, and also with the help of available literature. Different food items were first separated as whether they belong to animal or plant origin. Plant food items were categorised as root, stem, fruit, leaf and flower and animal food items were further classified as of vertebrate or invertebrate origin.

The vegetation at the rehabilitation site was surveyed to know the relative abundance of different food tree species in the study area. Forty eight circular vegetation plots (n=48) each of 10 meter radii (Hilaluddin, 2008) comprising a sampling area of 314.28 square meter were laid randomly in the acclimatization site covering a total sampling area of 15085.71 square meter. Plant species having more than 20cm GBH were recorded. Presence of bamboo and cane within the plot area were also recorded. Relative abundance was calculated for all the tree species to compare the availability and utilization of different plant species foraged by the bear cubs.

RESULTS AND DISCUSSION

In year 2009-2010, a total of 22 different plant parts of 19 species and 14 different animal originated food items were taken by the bear cubs during the time of acclimatization process. Data was collected from August 2009 to February 2010 and a total of 2132 observations

were made when the bear cubs were feeding. Overall percentage of time spent on feeding plant originated food items (81.67%) was much higher than the animal originated food items (18.33%). The overall percentage of leaf, fruit, stem and shoot was 29.17%, 27.01%, 22.93% and 2.53% respectively and that of invertebrate and vertebrate were 10.13% and 8.20% (Figure 2). Among the plant food items *Dilenia indica* fruit, cane (*Calamus sp.*), *Livistona jenkinsiana* fruit, and *Alpinia sp.* (locally called “tora grass”) are the items consumed mostly depending on their availability. Insects are the major animal food consumed throughout the study period. Bear cubs were partial to dead carcass of ungulates depending on availability.

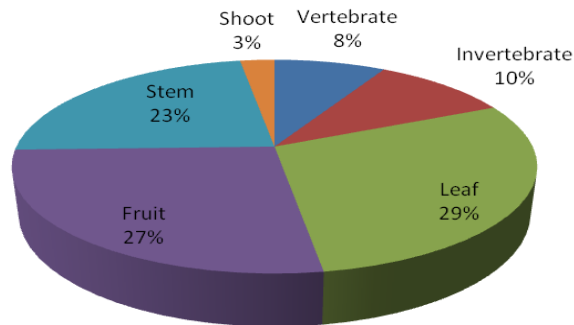


Figure 2. Percentage intake of various food items by the bear cubs (2009-2010)

In the subsequent year (i.e., 2010-2011) a total of 14 different plant food items of 11 species and 9 different animal food items was consumed by the bear cubs during the study period of November 2010 to March 2011. A total of 943 observations were made when the cubs were foraging and the overall percentage intake of the plant food item and animal originated food items were found similar to previous year (79.003% and 20.997% respectively). Major food items consumed were

Dilenia indica fruit, Bamboo shoot, parts of *Pinanga gracilis*, *Alpinia nigra* and insects. Overall percentage intake of shoot, leaf, fruit, stem and flower, was 22.79%, 39.13%, 8.69%, 6.68% and 1.69% respectively and that of invertebrate and vertebrate was 13.67% and 7.31% respectively. (Figure 3).

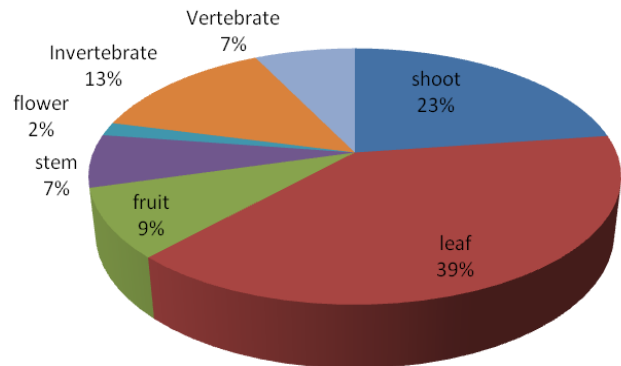


Figure 3. Percentage intake of various food items by the bear cubs (2010-2011).

Fruits of *Dilenia indica* and *Livistona jenkinsiana*, whole body part of Cane (*Calamus sp.*), Bamboo shoots and leaves of *Macaranga sp.* are the major preferred food items for the bear cubs (Fig.-4). *Alpinia sp.*, (a herb) is found mostly near the river margin area and the grass, *Thysanolaena sp.* is found in hill slopes were not recorded from any of the vegetation plot although these are mostly preferred by the bear cubs. Jamun (*Syzygium sp.*) and *Canarium sp.* although commonly occur but are not preferred as compare to other food items.

68 different species were recorded and 64 of them were identified by their local name. 13 of the 19 species feed by the bear cubs in year 2009-2010 were found inside the plot area. Feeding frequency and the frequency of availability of all the species was given in Table-1.

Table-1. Relative frequency of occurrence and feeding frequency of different food plants

Vernacular name	Scientific name	Parts consumed	feeding frequency	frequency of availability
Outenga	<i>Dilenia indica</i>	Fruits, leaf	9.53	2.44
Kadam	<i>Anthocephalus cadamba</i>	Leaf, fruits	0.57	0.305
Jamun	<i>Syzygium sp</i>	Fruits	2.12	6.727
Leteku	<i>Baccaura ramiflora</i>	Fruits	0.28	1.22
Toko	<i>Livistona jenkinsiana</i>	Fruits	15.21	0.04
Dhuna	<i>Canarium bengalense</i>	Fruits	0.68	4.28
Moleeta	<i>Macaranga sp</i>	Leaf	7.34	1.83
Ficus	<i>Ficus sp.</i>	Fruits, leaf	0.05	0.305
Ramtamul	<i>Horsfieldia Kingii</i>	Fruits	3.44	0.305
Khokon	<i>Duabanga grandiflora</i>	Leaf	0.11	0.305
Gerkhowa	<i>Pinanga gracilis</i>	Stem, fruits, leaf	2.18	3.376
Cane	<i>Calamus sp</i>	Stem, fruits	28.82	3.376
Bamboo	<i>Dendrocalamus sp</i>	Shoots, stem	3.1	1.83

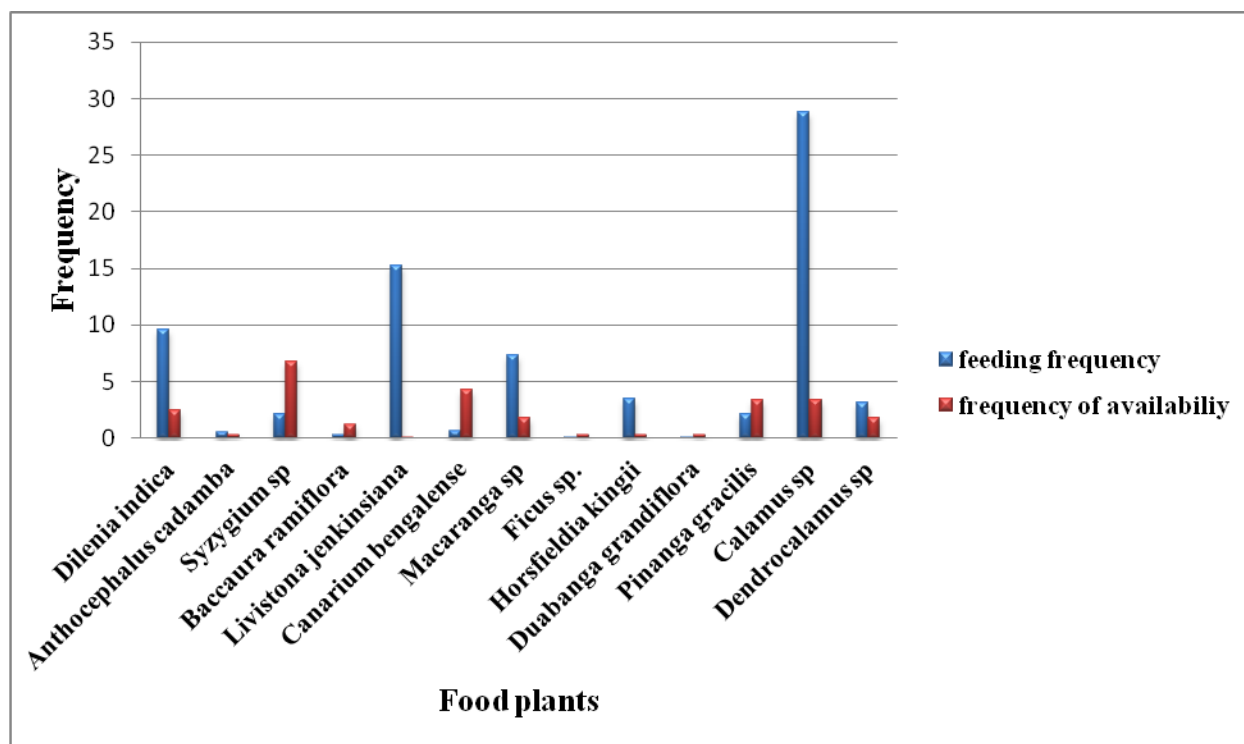


Figure 4. Relative frequency of availability and Utilization (in %) of different food plants.

Activity and life history strategy of bears varied considerably among different bear species, which is a function of their geographic distribution and multidimensional habitat use pattern (Garshelis, 2004). Activities of the animals and their adaptation also depend on changing day length, weather, food supplies, and other limiting factors (Aschoff, 1964; Halle, 2000). Most bears are omnivorous, opportunistic feeders, whose diets can vary seasonally, yearly, geographically and also with changes in habitats (Hwang *et al.*, 2002). Plant materials constitute more than 80% of the overall diet of Asiatic black bear throughout its distribution range (Hwang *et al.*, 2002). This is in conformity with the present study, as it is evident that plant materials are the major component in diet of Asiatic black bear in Pakke Tiger reserve. Most of the plant parts been consumed by the black bear cubs are soft mast, mostly leaf, fruits, and soft stems of herbs. Bamboo, palm, cane, *Alpinia nigra* and *Dilenia indica* were the major food plants that consumed. In year 2009-2010 *Livistona jenkinsiana* was one of the major food items for the bear cubs but in the next year (2010-2011) the cubs shifted their diet to other available resources as it was not fruiting. Bears were found to be partial to bamboo and cane (*Calamus sp.*) in both the study areas. But their food preference varied as per the availability of food and the habitat they use. The cubs preferred *Alpinia nigra*, mostly found near the river margin forest and swampy areas. Insects and carcasses were the major component of animal food components. Honey and bee hive were also seen to be consumed by them depending on the availability. Asiatic black bear was seen to prey upon ungulates in china and Taiwan (Hwang *et al.*, 2002), but during the present study this was not observed. The probable reason may be that they were too young. However, cubs were seen to prey upon fish and crabs from the small rivulets.

Arboreal feeding seems to be more common among Asiatic black bears in broadleaf forests (Schaller, 1969; Bromlei, 1973; Saberwal, 1989; Schaller *et al.*, 1989; Reid *et al.*, 1991). Large number of reports of this particular behaviour suggests that Asiatic black bears are more arboreal than American black bears; which may partly be explained by morphological adaptation in the structure of their feet (Pocock, 1932) as well as a greater prevalence of tree-borne fruits as opposed to bush-borne fruits in Asian forests (Hwang *et al.*, 2002). In the present study, arboreal feeding by the cubs was also seen (i.e., while feeding on *Livistona jenkinsiana* fruits or *Syzygium sp* fruits and leafs of *Macaranga sp.*). Besides arboreal feeding (23.97%), in a major proportion of observations (76.07%) bear cubs were found to feed being on ground in year 2010-2011.

Most of the dietary report of Asiatic black bear reveals that their diet shifts from soft mast in spring summer to hard mast in fall and winter (Bromlei, 1965). Eating dwarf bamboo in spring has been reported in Japan and China (Schaller *et al.*, 1989; Reid *et al.*, 1991). In Northern India also Asiatic black bear diet mostly comprise of hard mast. Schaller (1969) investigated the diet of black bears in Dachigam National Park, India during October based on scat analysis. Oak (12%), walnut (33%), and *Celtis australis* (40%) formed the major diet of black bears. Schaller also observed bears feeding on fallen oak acorns and walnuts. Majarekar (1989) reported 22 food items in diet Asiatic black bear in Dachigam National park. More than 90% (22% foliage and 72% fruit) of those were plant matter.

Some forest types produce little hard mast. American black bears inhabiting such areas have no other alternative, but to rely more on soft mast during autumn (Mattson, 1998; Vaughan, 2002). During present study, it has been observed that in the absence of hard mast like

oak, pine etc. in the low altitude area of Pakke Tiger reserve, Asiatic black bear cubs depends on soft mast mostly comprising of leaves, fruits and succulent vegetation. Bears in temperate and sub-alpine region also undergo a period of pre-denning hyperphagia (Nelson *et al.*, 1983) in which they substantially increase their intake of food. Hard mast composition in diet results in rapid weight gain, an adaptation for hibernation. In the lowland tropical forest (like the present study site) bears in general do not hibernate, and hence there is no necessity for the cubs to put on weight.

Asiatic black bear have synanthropy i.e., dependency on anthropogenic resources based on availability. When hard mast become scarce, both Asiatic and American black bears turn to less preferred, less accessible, or riskier (e.g., human-related) foods. When hard mast crops fail, they tend to rely more on green vegetation, soft mast, or agricultural crops (Eiler, Wathen and Pelton, 1989; Mc Donald *et al.*, 1994; Vaughan, 2002; Hwang *et al.*, 2002). The present study area is within the tropical range and bear cubs were seen to depend on the soft mast.

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