



WILDLIFE SOS

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**Two Decade Review
(1997 - 2017)**



Volume - 01

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– TWO DECADE REVIEW

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INDEX	PAGE NUMBER
Founders Note	i
Foreword	ii
Acknowledgements	iii
Contents	iv
I) Article Title Index	iv a
II) Publication based Index	iv b*

* Refer Page No: 340



NOTE FROM THE CO-FOUNDERS

From 1995 to 2009, Wildlife SOS rescued 628 dancing bears from the streets of India – forever drawing the curtain on the brutal and environmentally disastrous tradition of dancing bears in India that had been systematically decimating wild populations of India's bears for over 400 years. Since then, we have continued to rescue bears from poachers and man-animal conflict situations that still threaten the species.

Our work with the bears, spanning well over 20 years, has given us the immense privilege of working hands-on with, observing and studying these incredible and fascinating ursines more closely than many have been able to in the wild, exposing us to a vast repertoire of previously inaccessible veterinary and behavioural knowledge and allowing us a deeper understanding of the species. The variety of work that the Wildlife SOS team has been involved in has spanned dental surgery, behavioural research, cub-rearing, nutrition, enrichment, geriatric care and the diagnosis and management of a host of diseases. This wonderfully long and insightful journey has been a challenging, yet eye-opening learning experience and allowed us unforeseen insights into the ethology, management and care of these fascinating animals.

It is with immense pride that we put forth this compendium – a labour of love and learning, and the result of two decades of incomparable experience, living, working with and getting to know this unique species, the Sloth Bear.

Kartick Satyanarayan
Co-founder & CEO
Wildlife SOS

Geeta Seshamani
Co-founder & Secretary
Wildlife SOS



भारतीय पशु पोषण एवं शरीर क्रिया विज्ञान संस्थान
आडुगोडी, बैंगलूरु - 560 030

ICAR - National Institute of Animal Nutrition and Physiology
Adugodi, Bengaluru - 560 030



❖ Sardar Patel Outstanding ICAR Institution Award 2012 ❖

डा. राघवेन्द्र भट्टा
निदेशक

Dr. Raghavendra Bhatta

M.V.Sc., Ph.D., Postdoctorate (Japan)

DIRECTOR

FOREWORD

I am happy to introduce this compendium of Veterinary Research compiled and published by Wildlife SOS. It is not often in our country that wildlife veterinary research is given the importance or the support that it deserved and I'm delighted that Wildlife SOS has taken this initiative. This can be inferred from the very fact that Wildlife SOS veterinarians actively present their research papers at important wildlife veterinary conferences in India.

This compendium deals with studies relating to wide range of subjects including anatomy, physiology, clinical medicine, surgery, anaesthesiology, pathology etc. Some of the case studies that have been published are very informative. They can be effective guide to young wildlife veterinarians when they encounter similar cases. Although this compendium discusses cases pertaining to many species, it is exhaustive with regard to sloth bears and elephants. Therefore, I believe it will be a valuable handbook for veterinarians across the world, who are associated with sloth bears and elephants.

Another noteworthy aspect of this effort is the collaborative nature of the study. The work have been carried out through active collaboration with premier research institutions such as the Indian Veterinary Research Institute (IVRI), Karnataka Veterinary, Animal and Fisheries Sciences University (KVAFSU), Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Indian Institute of Science (IISc), Bangalore Bannerghatta Biological Park (BBP) etc. which have been supported by Wildlife SOS. Students pursuing their post graduation or Ph.D. degree are showing keen interest to work with Wildlife SOS primarily due to the large sample size of animals that the organisation cares for and secondly the guidance from experienced senior wildlife veterinarians Dr Arun A Sha and Dr. S. Ilayaraja.

I look forward to the next volume of research studies that Wildlife SOS brings out and hope that they continue to expand their footprint across wildlife veterinary research.

RAGHAVENDRA BHATTA

ACKNOWLEDGEMENTS

Compiling this book was a great teamwork especially with my colleagues at Bannerghatta Bear Rescue Centre who supported immensely. I wish to extend my sincere gratitude to the Co-founders of Wildlife SOS, Mrs. Geeta Seshamani and Mr. Kartick Satyanarayan for their tireless support and contribution to Wildlife Rescue, Rehabilitation and Welfare.

I would like to thank Dr. Ilayaraja and Mr. Vishnu Kumar for their constant cooperation. A special thanks to Ms. Srimathi Sriharshan for following up the editing on a day to day basis. The biggest debt of knowledge I owe, is to the animal care staff during the work period.

I express my heartfelt thankfulness to the entire Wildlife SOS team and in particular all the veterinarians and biologists who worked with us during the course of these publications.

Happy Reading!!



(Attur Shanmugam Arun)

IV) CONTENTS

IV a) ARTICLE TITLE INDEX

ARTICLE NUMBER	YEAR PUBLISHED	TITLE OF RESEARCH ARTICLE	PAGE NO
1.	1997	Dancing bears of India	1
2.	2005	Paraphimosis-induced balanoposthitis in a wild caught captive Sloth bear (<i>Melursus ursinus</i>).	56
3.	2005	Karyotypic profile of Indian Sloth bears (<i>Melursus ursinus</i>)	59
4.	2005	Rabies in captive Sloth bears (<i>Melursus ursinus</i>)	61
5.	2006	Candidiasis in a rescued Sloth bear cub (<i>Melursus ursinus</i>)	62
6.	2006	Canine tooth extraction in a rescued captive Sloth bear (<i>Melursus ursinus</i>)	63
7.	2007	Acute renal failure in a Siberian tiger	64
8.	2007	Management of gunshot wound in a Sloth bear (<i>Melursus ursinus</i>) - a case report,	65
9.	2007	Incidence and management of periapical abscess due to chronic infection of canine teeth in Sloth bears (<i>Melursus ursinus</i>)	66
10.	2007	Auricular Haematoma in Rescued Dancing Sloth bear (<i>Melursus ursinus</i>)	67
11.	2007	Hematology and serum chemistry of Sloth bears (<i>Melursus ursinus ursinus</i>) from two locations in the Indian Peninsula	68
12.	2007	Hand raising captive Sloth bear cubs	70
13.	2007	Health issues in captive Sloth bears in Indian Sanctuaries: Gigantiform Cementoma and Unilateral Scrotal Hernia	71
14.	2008	Taeniid Infestation in rescued Sloth bears (<i>Melursus ursinus</i>)	72
15.	2008	Castration of rescued Sloth bears (<i>Melursus ursinus</i>)	73
16.	2008	Comparative growth rates in hand & mother raised Sloth bear (<i>Melursus ursinus</i>) cubs	77
17.	2008	Hematology of Sloth bears (<i>Melursus ursinus ursinus</i>) from two locations in India.	81

18.	2008	Study on prevalence of Tuberculosis in rescued captive Sloth bears (<i>Melursus ursinus</i>)	99
19.	2008	Comparative growth rate of Sloth bear (<i>Melursus ursinus</i>) cubs in captivity	102
20.	2008	Comparison of two anaesthetics for chemical immobilization of Himalayan Black bears (<i>Selenarctos thibetanus</i>)	103
21.	2008	Incidence of cataract in rescued dancing Sloth bears (<i>Melursus ursinus</i>)	104
22.	2008	Lampas in a rescued dancing Sloth bear (<i>Melursus ursinus</i>) – a case report	105
23.	2008	Onychectomy in captive Sloth bear (<i>Melursus ursinus</i>) - a case report	106
24.	2008	Importance of regular fecal sample analysis in captive wild animals	107
25.	2008	Diagnosis of <i>Mycobacterium bovis</i> in captive Sloth bears (<i>Melursus ursinus</i>) by polymerase chain reaction.	108
26.	2008	Malignant melanoma in a captive Lioness (<i>Panthera leo</i>) - a case study	109
27.	2008	Spindle cell carcinoma in a rescued Lion (<i>Panthera leo</i>)	110
28.	2008	Serological survey of Leptospirosis in rescued captive Sloth bears (<i>Melursus ursinus</i>)	111
29.	2008	Development and status of assisted reproductive technologies for the conservation of threatened and endangered species	112
30.	2008	Foraging for Dung Beetles: A Tasty Treat	128
31.	2009	A report of mandibular brachygnyathism in a rescued dancing Sloth bear (<i>Melursus ursinus</i>).	131
32.	2010	Telazol as balanced anaesthesia in Asiatic black bear	132
33.	2010	Hand rearing of Striped Hyena cub (<i>Hyaena hyaena</i>) in a captive facility	134

34.	2010	Chemical immobilization of rescued captive Sloth bears (<i>Melursus ursinus</i>) with tiletamine hydrochloride and zolazepam hydrochloride (Zoletil®) in India	135
35.	2010	Management of unstable femoral fracture and extensive burn injuries in a wild Sloth bear (<i>Melursus ursinus</i>)	136
36.	2010	Vasectomy in a Sloth bear (<i>Melursus ursinus</i>)	137
37.	2010	Case of metastatic adenocarcinoma in a rescued Sloth bear (<i>Melursus ursinus</i>)	138
38.	2010	Chololithiasis in a Sloth bear (<i>Melursus ursinus</i>) – a case report	139
39.	2010	Importance of Intra oral dental radiography in a Sloth bear (<i>Melursus ursinus</i>)	140
40.	2010	Hyperadrenocorticism (Cushing's disease) in a rescued Sloth bear (<i>Melursus ursinus</i>) - a case report	141
41.	2010	Hand rearing of orphaned wild Leopard cubs (<i>Panthera pardus</i>) in captivity	142
42.	2010	Habituation to Environmental Enrichment in captive Sloth bears- Effect on Stereotypies	143
43.	2011	Effects of body weight and season on serum lipid concentrations in Sloth bears (<i>Melursus ursinus ursinus</i>)	159
44.	2011	Transportation of live Sloth bears (<i>Melursus ursinus</i>)	179
45.	2011	Case reports of gastroesophageal reflux disease (GERD) in Sloth bears (<i>Melursus ursinus</i>)	184
46.	2011	Renal ischemic tubular necrosis in a Spectacled cobra (<i>Naja naja</i>) - a case report	185
47.	2011	Propofol as general anaesthesia in Sloth bears - a report	186
48.	2011	Case report of tubercular lymphadenitis in rescued captive sloth bear	187
49.	2011	Benign dermatofibroma in a rescued Asiatic elephant a case report	188
50.	2011	Pain management in rescued captive Sloth bears	189
51.	2011	Amputation of forelimb in one-month old Leopard	190

52.	2011	Occurrence of Cholangiocarcinoma in rescued Sloth bear a case report	191
53.	2011	Tuberculosis in a Lion – a case report	192
54.	2011	Histopathological findings in mycobacterium tuberculosis infected captive Sloth bears (<i>Melursus ursinus</i>) - half a decade review	193
55.	2011	A case of seminoma in a rescued Sloth bear (<i>Melursus ursinus</i>)	194
56.	2011	Molecular prevalence and characterization of <i>Hepatozoon ursi</i> infection in Indian Sloth bears (<i>Melursus ursinus</i>)	195
57.	2011	Management of idiopathic epilepsy in a Sloth bear (<i>Melursus ursinus</i>)	203
58.	2011	Dental extraction in a White Tiger (<i>Panthera tigris</i>)	204
59.	2012	Captive management in headstarting Turtles: A Veterinarian's perspective	205
60.	2012	A study on estrous cycle behaviour of female Sloth bears (<i>Melursus ursinus ursinus</i>) in captivity	209
61.	2012	Health problems observed in rescued Snakes around India and their medical management	210
62.	2012	Strain identification of Mycobacterium tuberculosis complex isolates from rescued Sloth bears (<i>Melursus ursinus</i>) in southern India	214
63.	2012	Ocular capillary haemangioma in a rescued Sloth bear (<i>Melursus ursinus</i>) - a case report	215
64.	2012	Incidence of Trichobezoar (Hairball) in captive Sloth bear and its successful treatment - a case report	217
65.	2012	Management of an injured and debilitated rescued Asian elephant (<i>Elephas maximus maximus</i>) in a rescue centre	219
66.	2012	Poaching of Sloth bear cubs and Impact of Canine removal. in cubs and adult dancing Sloth bears by the Kalandar Community- A detailed study	220

67.	2012	Removing dancing bears from the streets and rehabilitation of Kalandar communities in India to reduce the poaching of Sloth bear cubs	221
68.	2012	Behavioral response of Sloth bear (<i>Melursus ursinus</i>) to Chital (<i>Axis axis</i>) in a mixed species exhibit	222
69.	2012	A case study of successful alternative livelihoods for a Kalandar community in Bhopal state.	223
70.	2012	Sloth bear Attack on humans, desirable avoidance behaviour and human-bear conflict mitigation efforts	224
71.	2012	Solar Electric Fences as a successful ex-situ management tool to manage large captive Sloth bear populations in large forested enclosures	225
72.	2013	Tie over bandage technique in treating injury in Sloth bears (<i>Melursus ursinus ursinus</i>) - A case report	226
73.	2013	Perforation injury in pharyngeal region of a captive Tiger - a case report	227
74.	2013	Ovarohysterectomy with luteal cyst and leiomyoma of a Lioness with pyometra	228
75.	2013	A case report of multiple metatarsal fractures in a wild Panther	229
76.	2013	Sampling technique for disease diagnosis with reference to <i>Mycobacterium tuberculosis</i> in a large population of rescued dancing Sloth bears	230
77.	2013	Feline pan leukopenia in a Tiger cub	231
78.	2013	Pyometra with uterine rupture in a rescued Lioness (<i>Panthera leo</i>)	232
79.	2013	An incidence of benign fibro epithelial polyp in a rescued dancing Sloth bear (<i>Melursus ursinus</i>)	235
80.	2013	Dystocia in a Rhesus Macaque (<i>Macaca mulatta</i>) and its successful management	239
81.	2013	Occurrence of Toe nail abscess in captive Elephant (<i>Elephas maximus</i>) and its successful management	243
82.	2013	Management of a deep acute abscess in a rescued wild Sloth bear (<i>Melursus ursinus ursinus</i>) - a case report	246

83.	2013	Successful management of a snare wound in a Common Palm Civet cat (<i>Paradoxurus hermaphroditus</i>).	249
84.	2013	Obstipation induced urinary incontinence in captive Sloth bear (<i>Melursus ursinus</i>) - a case report	252
85.	2013	Infectious canine hepatitis in rescued captive Sloth bears (<i>Melursus ursinus</i>)- an overview	256
86.	2013	Therapeutic fracture management of a wild rescued Sloth bear cub (<i>Melursus ursinus</i>)	264
87.	2013	Bacterial inter digital pyoderma in a Sumatran tiger (<i>Panthera tigris sumatrae</i>)	265
88.	2013	Bovine tuberculosis diagnosis by IGRAs and rapid testing using TB specific novel protein in cattle farms and wildlife.	268
89.	2014	Report on inspection of captive Elephants (<i>Elephas maximus</i>) in Jaipur, Rajasthan	269
90.	2014	Report on the welfare & veterinary status of captive Elephants (<i>Elephas maximus</i>) at Punnathur Kotta, Guruvayur Devaswom Board, Thrissur, Kerala	269
91.	2014	Evaluation of diagnostic test for ante-mortem tuberculosis screening in captive Sloth bears (<i>Melursus ursinus</i>)	270
92.	2014	Benign growth in oropharynx region in a captive Sloth bear (<i>Melursus ursinus</i>)	272
93.	2014	A case of lymphoid leukemia in a rescued dancing Sloth bear	276
94.	2014	Crop-Raiding Bears in Lao PDR	286
95.	2014	Onychectomy of a captive male Indian Leopard (<i>Panthera pardus</i>)	305
96.	2014	Successful surgical management of retained airgun pellets in rescueRhesus macaque	309
97.	2014	Comparison of antagonistic effect of Tolazoline hydrochloride and Yohimbine in Rhesus macaque	314
98.	2014	Use of Diazepam an anxiolytic in Sloth bears	321
99.	2015	Wild TB Sero-diagnosis-specific point of care test kit	324

100.	2015	Management of knee joint swelling induced lameness in an Asiatic Elephant; use of therapeutic ultrasound as a pain management tool along with the routine treatment	325
101.	2015	Vulval abscess and its successful treatment in a captive Sloth bear (<i>Melursus ursinus</i>)	334

Art - 01. THE DANCING BEARS OF INDIA

GEETA SESHAMANI AND KARTICK SATYANARAYAN
CO - FOUNDERS, WILDLIFE SOS



Objectives

The investigators were concerned:

To establish the number of bears actually being owned / handled by a specific group, thereby allowing us to estimate the number of dancing bears in captivity in eight states of India.

To assess the number of Kalandhar settlements in existence, their location in these states, rough population counts, and how many people still depended on the dancing bear for sustenance.

To study the dancing bear in relation to its owner / trainer, by observing it in the villages where it is kept in domestic surroundings, by recording its behaviour, diet, and habits in captivity, and to determine areas of deprivation, active cruelty and ill treatment; both during the training process and during its life as a dancing bear.

To understand the socio-economic conditions of the bear owner / trainer, their reasons for being in this profession, whether they are open to any mode of rehabilitation and could be encouraged to give up this trade / means of earning a livelihood.

To study the history of bear dancing in India and the myths and stories that surround the bear in Indian villages and small towns. To assess the importance and relationship of the bear to the other animals used by the Kalandar for his living.

To find out the source of the bear cubs, the process of capturing and selling the bear cubs; the extent of injury, death and trauma to the animals involved. To investigate methods of transportation and trade.

To investigate the impact of cub capture on the wild population of bear species and the increasing confrontation between the bear and man in the wild. To investigate any possible links between this trade and other peripheral trades for pelts or bear parts.

To study the efficacy of state and national Laws as they exist on paper and as they are actually implemented, regarding the poaching of the cubs, the method of licensing which permits purchase, transportation and the dancing of the cubs.

To suggest methods of controlling this profession, preventing the entry of new cubs into the market, and providing plans for rehabilitation keeping in mind the fate of the bear and its owner / trainer.

Methods and Materials

Separate questionnaires for the hunters / traders, and bear owners / trainers were devised. The questionnaires were administered face to face using the native language Hindustani with adequate Urdu words to put the interviewee at ease, in North India. In Karnataka, Kannada and Hindi were used. The investigators also interviewed a cross section of concerned people; those who owned a bear at present, those who have owned bears in the past but may not have a bear now; those involved in training and dancing, medicating and treating the animals, and those who pierce the nose, cut the claws and pull out the teeth. The investigators also observed the bear being danced in villages, along the tourist routes and while at rest in their homes. They interviewed the audiences, Indian and foreign, rural and city, and discussed the implications of trapping cubs with them. Their attitudes to the training and dancing of the bear was assessed. The investigators also interviewed Adivasis and the tribals actively involved in the hunting and poaching; as also those who did the buying and selling and transporting and witnessed several such transactions. Various officials connected with the Zoo Conservation projects, Wild Life and the Forest Department were interviewed, along with forest rangers and guards.

With the assistance of the Kalandhars, the clan that has been training and dancing bears traditionally for over 300 - 400 years in India, a route was set up "mapping" 29 villages belonging to their clan in four North Indian states, namely Rajasthan, Uttar Pradesh, Haryana, and Delhi. A map showing the route is appended in the Appendices. Similarly a route was set up "mapping" 7 villages belonging to the Kalandars in Karnataka, South India. These 36 villages were visited by the investigators and 146 questionnaires were administered in their huts where the interaction of man and bear could also be observed; over 40 more people were questioned, and a large quantity of descriptive data was collected from the discussions that ensued.

The North Indian villages visited during this investigation were selected keeping in mind the homogeneity and cohesiveness of the clan; the fact that they marry, settle, and bring up their families within this circle, and although the Kalandhars

have migrated to other States of Karnataka, Gujarat and Maharashtra, this particular sub-group in North India has kept to itself. Some of these settlements are also often very old and well established. The investigators set up one route through Karnataka where the Kalandar community has established itself only over the last 40-50 years, in order to compare and contrast any changes in handling, diet, treatment of the captive animal, and to discover new sources for the supply of bear cubs, new trading centres/markets, or information on other settlements of Kalandhars in South India.

While in Phase I of the project the Kalandar villages were visited, in Phase II the investigators accompanied the Kalandar purchasers on a cub-purchasing trip and administered questionnaires to the traders and hunters. A route was set up with the assistance of the Kalandars and modes of capture and transportation were studied, along with a study of the prices the cubs commanded from source to their final destination. The mortality rates during capture, transportation and consequent changes of owners, was also studied, along with an analysis on why the average villager is indifferent to the capture of these cubs; and why the authorities find it difficult to apprehend the poacher and trader.

Introduction - North India

(States of Uttar Pradesh, Haryana, Rajasthan & Delhi)

1.1 Geography

These four States stretch across the North West through the centre of the Indian sub- continent, with the Great Thar desert marking it at the western end, with relatively easy access to Pakistan. The forest covered foothills and mountains of the Himalayas border these States in the North and the thick forest ranges of Madhya Pradesh fringe the Southern end. The mountainous state of Nepal shares its borders with Uttar Pradesh and towards the eastern end lies Bihar with easy access to Bangla Desh.

Nearly 60% of Uttar Pradesh is mountainous, the rest, lowlands, which are a part of the Indo-gangetic plains. Rajasthan is 60% scrubland and desert, with the Aravalli ranges dominating the South-Western half and the ravines of Chambal occupying the South-East. Haryana is divided into the sub-Himalayan terrain and fertile Indo-gangetic plains. Only the South-West of Haryana is dry, sandy, and barren. Delhi has completely lost its forest cover and the surrounding villages, which till five years ago were a continuum with Haryana's green agricultural belt. These have been appropriated for construction of farm houses, factories and building complexes.

1.2 Climate

The climate varies considerably through this terrain although all these States share extremes of heat and cold. Rajasthan has a general arid desert climate with scanty rainfall during the northern monsoons and some of the dry regions receive less than 100mm annually. Haryana has extremely cold winters and extremely hot dry summers, with two well marked seasons of rainfall from June to September and December to February. Delhi has extreme heat and cold with scanty rainfall and a polluted smog ridden pall hangs over it throughout the year. Uttar Pradesh has a range of temperatures with extreme freezing colds during most of the year in the mountains of Kumaon and Garhwal, and moist heat in the plains, along the Ganges. The Northern Monsoon ensures heavy rainfall throughout during the months of July, August and September.

1.3 Population

The population in Uttar Pradesh was estimated in 1991 as 139.1 million and it ranks first in density of population with density averages that exceeds 470 km² in places. Distribution of the population is determined by the topography, the mountains being sparsely populated, and the concentration being on the major cities of the state as well as along the Ganges.

A State as large as Rajasthan has less population than Delhi or Uttar Pradesh being only 44 million with density averages of 129 km². Delhi has 11.4 million with a density average of 6,195 km²; and Haryana has 16.5 million with a density count of 372 km², according to census estimates in 1991. In Uttar Pradesh the rural population is 65% while the urban population has boomed to an insupportable 35%, while in Rajasthan 80% of the population is rural and only 20% is urban. In Haryana 75% of the population is rural and 25% concentration is in cities; while in Delhi urban population is 90%. The Literacy rates also vary with 44% literacy in U.P. and 38% in Rajasthan, while Haryana has a 56% literacy rate and Delhi 77%.

Introduction - South India (State of Karnataka)

1.1 Geography:

Karnataka is the eighth largest state in India both in area and population. Situated on the western edge of the Deccan Plateau, the Arabian Sea flanks it on the west. The States of Maharashtra and Goa are its neighbours on the North, with Tamilnadu and Kerala in the South. Physiographically Karnataka is a coastal region with large plains, irrigated by a large number of rivers and with a relatively thick forest cover. The Bandipur, Wynad and Nagerhole sanctuaries have recently been threatened by large scale timber operations and poaching activities.

1.2 Climate:

The climate is mild sub-tropical, and because of the elevation of the entire state along the Deccan plateau it has no noticeable extremes of hot or cold. Humid along the coast it receives heavy monsoon rains from June to September and lighter rains in December.

1.3 Population:

It's population of 44 million (1991 census) is spread out over an area of 191 sq.km. with a density of 234 persons per km². The urban population is 31% but the economy continues to be mainly agrarian. The literacy rate is 56%.

Bear species found in India

Himalayan Brown Bear: *Ursus arctos Linnacus*, 1758;

(In Kalandar language the Sunhera Bhalu

Description: Himalayan brown bears are variable in colour and generally appear a sandy or reddish-brown from a distance. Their pelage is long and tends to be matted with dense underwool. The ears are small and rounded and the lips are noticeably protrusible and mobile. The second pre- molar is generally absent. The females are smaller and lighter in build. Adult males vary from 1.5m up to 2.2m in body length, while females vary from 1.37m to 1.83m. The tail in adult specimens is approximately 7.6cm long.

Biology: Brown bears feed on insects, small crustaceans, alpine bulbs and roots of plants, shoots of young grasses, domestic goats, sheep, and voles (Alitcola species. Brown bears feed actively from 1-2 hours before sunrise and again for several hours in the late afternoon and evening. They are nocturnal, and their sense of smell is acutely developed and believed to be their principal means of finding food.

Adult bears normally go into hibernation at the end of October and emerge around the following March or April. They excavate their own hibernating lair or den under a large boulder or between the roots of a stunted tree, or they may utilise a natural cavern. Hibernation appears to be intermittent, with the animal occasionally waking up and becoming active. Mating occurs in the spring and early summer, and the females give birth to cubs during their winter hibernation. The gestation period is from 180-250 days.

The cubs, generally two in number, are blind and weigh no more than one pound at birth. They are covered with short, silky, rather dark brown hair. Born in January, the cubs stay in the lair with their mother until she first emerges from hibernation in late April, and will remain with their mother for two to three years. Females are believed to breed first at the age of five years.

Distribution and Status: The Himalayan brown bear is generally restricted to alpine meadow and sub-alpine scrub zones above the tree-line in the northern mountain regions of India having Dachigam and Kashmir as its limits. The brown bear is uncommon in India and is considered rare. According to Dr. A.J.T. Singh, (Wildlife Institute of India, letter to Servheen, 1988,) the brown bear was sighted just twice during a 9 month Snow Leopard survey in the Jammu and Kashmir States. Hence status of population is unknown. International trade in these bears, or their parts, is banned under CITES (Convention on International Trade in Endangered Species) and by the Wildlife Protection Act in India.

Asiatic Black Bear: *Selenarctos thibetanus* G. Cuvier, 1823.

(Himalayan Black Bear) (In Kalandar language Kocheela Reech)

Description: The Himalayan black bear has dense, shiny, black fur. However, there is no under- wool in this species. They have a ruff of extra-long coarse hairs on the cheeks and on each side of the neck. There is a conspicuous creamy yellow V extending from the sternum up to the armpits (axillae of fore limbs). The rest of the body is jet black, except for the muzzle which is reddish brown. There are four pre-molars present in the upper jaw. The round ears are set wide apart on the crown with the tips bearing quite a long fringe of hair. The claws on the fore-feet are horny and black in colour. They are shorter, more sharply curved, and are better adapted to different food preferences and to assist in tree climbing. The tail is just a stump measuring from 75-100mm. The fore-paws tend to be turned inwards when walking and are very powerfully developed. Males grow larger in size than females. An adult male may measure up to 1.80m in length. Adult females are about 30cm shorter.

Biology: Himalayan black bears climb trees freely, and are fond of acorns from the Hollyhock (*Quercus balut*) and *Quercus dilatata*. They feed extensively on mulberries (*Morus alba*) and apricots, rose hips (*Rosa webbiana*), insects and small crustacea, mushrooms, grass, and goat or sheep carrion. They have an uncertain temper and are likely to attack human beings if suddenly disturbed. The Himalayan black bears also feed on fruits of Ber (*Zizyphus* Russian Olive *nummularia*), and on lizards and insects. Mating is believed to take place in October with the young being born in February while the female is still hibernating in her winter lair. Two young are produced which are very small and blind at birth. They stay with their mother throughout the summer and the next two years. The Himalayan black bear generally goes into hibernation in winter. The other Asiatic black bears do not always undergo prolonged or deep hibernation and will emerge to forage even during the winter months. When fighting or attacking, these bears make swipes with their fore paws and can inflict terrible injuries with their claws. Their sense of smell is acutely developed and is largely relied upon in detecting food or danger. If they encounter a human or any suspicious object they generally approach closer in order to pick up and identify the scent.

Distribution and status: The habitat of the Himalayan black bear is Himalayan moist, temperate forests, and it does not ascend above the permanent tree-line into alpine regions. The Himalayan black bear and its sub-species are protected by The Wildlife Protection Act in India. However according to Dr A.J.T. Johnsingh (Wildlife Institute of India, letter to Servheen, 1988) sightings of the Himalayan Black Bear are common only in the Dachigam National Park, in Jammu and Kashmir State, and according to Dr. B. Bhushan (letter to Servheen, 1988) the Himalayan Black Bear was reported seen from only 2 of the 67 national parks and sanctuaries. This lends credence then to the doubts entertained by Traffic International, that the huge quantities of gall bladders supplied from India may be from the Sloth bear, and not from the Himalayan Black Bear, since their numbers are so low.

The Sloth bear - *Melursus ursinus*

(The Kalandars simply call it Reech)

Description: The average height at the shoulders is 2'2" to 2'9". The average length is 4'6" to 5'6". Males grow larger in size than females and a male up on its hind legs can measure 5'-6'. The weight varies between 128 -145 kg in males and 85 -110 kg in females. The Sloth Bear has a shaggy and long-haired rough coat, which prevents angry ants and termites from reaching its skin. The long coat keeps it warm for like other ant-eating mammals it has a low metabolic rate. It has a mobile and relatively long snout. It has a yellow or white V extending from the sternum to the armpits, not as broad or conspicuous as the Himalayan Black Bears. The species peculiar appearance is related to its feeding habits, to the fact it is "myrmecophagous", in other words it eats ants and termites.(David Garshelis, George Nobbe, Wildlife Conservation) . The Sloth Bear's three inch ivory coloured claws are eminently suitable for digging up beetles and termite nests. Its loose lips and long snout, together with a concave palate, gives the animal extra sucking power. Its front two upper incisors are missing allowing it to draw in insects through the gap.

To prevent ingesting dirt along with the ants the bear pushes against the hole it has dug, closing the flaps of its nose pad before sucking its meal. This is also responsible for the hoarse sucking snuffle it makes. On each of the forepaws is an extended pad on the outside, which allows it to grasp things better and scale trees when it is after honey from the bee hives. Sloth Bears annually range in a smaller area than other bears; typically a female will range about 3 miles and males about four to five miles, (Dr. Anup Joshi, Chitwan Sanctuary, Interview with George Nobbe, Wildlife Conservation). However Dr, Vasanthi Iswariah in a study of sloth bears in Karnataka, 1985, speaks of the bears ranging between ten and fifteen kilometers in one night for food. While the Himalayan Black Bear hibernates in winter the Sloth Bear does not need to and is merely a little lethargic which suits the Kalandar very well. The Sloth bear is almost nocturnal in its habits due to the pressures of human habitation inside protected forest areas and sanctuaries.

Biology: Much of its diet consists of fruits, such as the Ber, Jambul, bael, Banyan wild figs, lantana, jackfruit, mangoes, mahua and mulberries. Its main insect foods are ants and termites, large dung beetles and longicorn beetles. Attracted to corn, sugarcane, maize and date palms, they may raid farmers' crops making them the target of the farmer's ire. Cases have been recorded of their addiction to toddy and country liquor in Orissa and Himachal Pradesh. Although by and large Dr Anup Joshi records in the article mentioned earlier, the Sloth bear avoids going near man and his settlements, throughout the Indian States there are growing reports of violent confrontations between villagers and the Sloth bear, with attacks on cattle and women, (Dr Shankar, Wildlife Institute of India, Dehradun). Dr. Vasanthi Iswariah in a study of Sloth bears in Karnataka, 1984, also highlights the increasing frequency of attacks by bears on villagers because of degraded habitat which sends the bears into the sugarcane and groundnut crops.

Mating takes place in the hot season which varies in the different States between April to August. The gestation period is approximately 6 months and the cubs are born anywhere between late November and end February so that the cubs are caught by the trappers / hunters approximately from end-December to end February and reach the bear cub markets around this period. Sloth bears rarely have more than two cubs and often spend up to two years caring for them. They are extremely possessive and angry mothers and will go right up to trappers / hunters and confront them, while trying fiercely to protect their young (Dr Anup Joshi, Chitwan National Park, interview with George Nobbe, Wildlife Conservation). In the 146 Kalandar questionnaires administered by the investigators, to the question what was the chief danger in capturing the cubs, the Kalandar responded (98%): the ferocity of the defending mother bear.

David Garshelis, (interviewed by George Nobbe in "The Shaggy Bear", Wildlife Conservation, 1990,) points out the Sloth Bear is more susceptible to over-exploitation because it has a low reproductive rate, reaching sexual maturity relatively later than other bears. Hence this relentless trapping of the cubs, sometimes involving the killing of the mother bear, does not portend any good for its future.

Their average life in the wild is between 30 - 35 years but in captivity according to most authorities they could average 20 years. However our questionnaires revealed that more than 60% of the bears were less than ten years old; and another 30% were between the ages 10 and 14 years old; and only 10% were above 15 years old. We found no bear above that age. Hence the age and life expectancy of the captive dancing bear is perhaps a lot shorter than previously conjectured.

Distribution and Status: The Sloth Bear once ranged through all the forests of the Indian sub- continent, South of the Himalayas. It was possible to find them in all the States of India and in almost all the sanctuaries and national parks. The central, tropical, deciduous forests appear to be its optimal habitat, as in Karnataka, Madhya Pradesh and parts of Orissa, and also the once heavily forested border between Nepal and India. Wildlife Sanctuaries and National Parks still report the presence of sloth bears, albeit in decreased numbers. In 1989 it was proposed to CITES to put the Sloth Bear on the Appendix I List. It appears as a Schedule I animal in the Wildlife Protection Act, 1972, of India. In a 1982 "survey" of unknown authorship cited in the New York Times, 5 July 1988, and quoted by Servheen in a paper entitled "The Status and Conservation of the Bears of the World", presented in 1989 at a conference on Bear Research and Management, Canada, it is conjectured that over 10,000 sloth bears still exist in India. However the information currently available on numbers and distribution is highly debated. Indian Wildlife government officials and the Forest departments typically deny any large scale poaching or capturing; and insist the Sloth bear's gall bladder is "of no value" hence it does not feature in the trade of bear parts. Consequently they put the numbers of sloth bears in the wild quite high, almost double that figure. However according to Wildlife researchers working on other projects, circumstances such as habitat alteration, forest-cover destruction, encroaching industries and towns, the intrusions by villagers into forest reserves, have decreased their numbers rapidly. Hence they hold, a more conservative and lower figure of approximately 8,000 sloth bears, would be more accurate. Richard C. Jaffeson, Senior Environmental planner, Maryland, has been studying the Sloth Bear since 1975, and at a meeting of American Geographers in April 1976, he concluded in his paper, that

"8,500 to 7,300 Sloth bears (estimated) in India and Sri Lanka; population trends towards the thinly distributed with a range density index of one Sloth Bear per 6.4 square miles." He pointed out that India's forested covers were fast decreasing and that unless additional conservation measures were brought about the Sloth Bear would suffer due to "increasing habitat encroachment" and Servheen in the paper quoted above, adds due to "population insularisation." "Trade in any part of the Sloth Bear is forbidden by national laws in India. However Traffic Japan, a branch of WWF, reported 681 kg of dried sloth bear gall bladders entered Japan from India between 1978 to 1988. The bladders were used for traditional medicine to cure liver, stomach, and intestinal complaints. According to this report, quoted again by Servheen, (1988,) the import was from India via Singapore.

Servheen concludes if one takes the mean average weight of each gall bladder to be 85gms then this figure represents approximately 8,011 dead bears to 12,000 dead bears over a ten year period. In other words, he concludes, annually at least 728 to 1500 sloth bears are killed.(Status and Conservation of World bears, Servheen p7, 1988.) Similarly in a Traffic Network Report, "The Bear Facts", edited by J.A. Mills *et al*, South Korea imported bear bile during 1970-1993 to the tune of 4,136 kg, and India ranks third on the list of twenty two suppliers. Obviously this is in contravention of CITES and although it is illegal to export bear parts, and bears are protected by Indian Wildlife laws, the trade continues.

The status of the sloth bear therefore has been extremely difficult to pin down because of the lack of information about the bear, both in the wild and in captivity. The researchers, through the questionnaire administered to the Kalandars, have tried to estimate the number of new cubs entering the villages studied (altogether 36) and the number that enter the markets / trading points visited (altogether 11) in one season. The statistics arrived at are largely based on descriptive data volunteered by the Kalandars, the traders and poachers, and the investigators own factual verification / observations.

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4. Community: Kalandar.

4.1 Socio-Economic Status:

The Kalandars belong to the OBC category i.e. they are included in the category of OTHER BACKWARD TRIBES by the Government of India, along with the Adivasis, forest tribals, and all those communities which make their living from the forest and its resources, or work with animals as entertainers. It implies the government has recognised their economically deprived status and that they have in a way become displaced in the present development of this country and special assistance is to be rendered to them through government schemes. However the government has failed to plan any schemes of housing or land ownership, nor provided this community with employment or even the basic necessities of clean water, sanitation, and simple medical aid and primary education. The Kalandars by and large have not bothered to register themselves with the Government offices because of their lack of faith in the government's commitment to give them their "rights". However this attitude is changing and over the one and a half years of the investigators interaction with this community, a new aggressiveness has permeated them, significantly co-joined to their belief that the old traditional methods of earning will not suffice and they need to find new sources of employment and sustenance. Any rehabilitation scheme stands a good chance of success because of the current economic stresses and deprivations of the Kalandar community.

4.2 Origins and Sub - Divisions: The Kalandar Community were originally Muslim gypsies with a highly nomadic life style, moving from place to place with their tents and animals.

They earned a living from a large number of performing animals, for example, monkeys, bears, fighting roosters and pigeons, and kept others as pets to display to their audience such as civet cats, owls, falcons, and partridges. This mastery over animals created an appropriate awe when they tried to sell medicines and talismans as cures for illnesses, or tried to hold their audiences' attention during the performance of magic tricks and acrobatic stunts. To a large extent the Kalandars of Karnataka still keep to this highly nomadic life and we found they moved every few days to a new camping ground, often walking 20-30 miles a day, moving far more frequently than their Northern counterparts. They still use light tents to live in, cook in the open and carry their poultry and goats and other animals with them as they move from village to village. By contrast the Northern Kalandar prefers to move between his own settlements and kith and kin even when on the road. Over the years the Kalandar community became more stratified and those dancing the monkeys came to be called "madaris". They mastered the art of playing the tabla like instrument called the "Damru" and exclusively danced the monkeys in the village or town. Yet another category was that of the "Bazigars" who fascinated the crowds with their rope climbing, trapeze walking and gymnastics. The "Katputlis" made puppets and performed puppet shows. The "Jadugars" performed only magic tricks depending on the sleight of hand and never used any animal during their performance. The Kalandar who owned, trained and danced bears considers himself to be the true "Masth Kalandar". They are still given a great deal of respect in the village as their potential to earn is considered to be more, as well as the bear ranks higher as an animal of mystique and worth than the other animals reared by this community. Each community used to maintain its separate identities, and never interchanged professions, or intermarried, or shared work or festivities with each other. However this has begun to change and our survey showed many bear owners had, over the last five years, sought alternate means of employment to earn a living, thus blurring these so called "caste" distinctions.

4.3 Alternative Employment Avenues:

Over the last 5-8 years, many of the bear-dancing Kalandars have only been able to afford monkeys and dance them for a livelihood. So too many of the Kalandars have moved over to magic tricks, card, rope and handkerchief tricks,

to earn a living, as the use of an animal in their performances brought them more police and municipality harassment than earnings. So too while Kalandar families still insist one family member dance a bear, since it has been the family profession for several generations, other family members take up jobs outside the village although they stay in close touch with their community. Many of them work today as unskilled labour on factory and housing sites, others weave baskets of bamboo, or make metal wire bird cages, or work as scrap dealers and in workshops repairing vessels and buckets. In one village the Kalandars had begun small businesses in semi-precious stones, making astrological rings and lockets, talismans and amulets. In several villages the Kalandars had hired handcarts for which they paid a rental of Rs 20 per month and eked out a living selling seasonal vegetables and fruits. Yet others have become truck drivers or apprenticed themselves as mechanics at motor repair shops. It is significant that in the last 5-10 years the preferred method of safely transporting cubs purchased at bear markets and near "Dangs" or forests has been through friendly truck drivers, according to the Kalandars, and this friendly network also facilitates their travelling through North India and Karnataka, and allows them to dance their bears in far-off cities of Jammu and Kashmir, Nepal and the North-East.

Community Life:

The Kalandars spend most of their time eking out a precarious livelihood and rearing large families, on an average consisting of 10 - 12 members. They have a tight network of social and marital relationships and the villages we visited were held together with bonds of marriage and kinship. Their loyalty to one of their clan surpasses all fear of laws or the government. Initially they suspect any member from the outside world and are slow to give respect or trust to outsiders. Their society is democratic and lives by simple rules. They elect a Panch or Choudhary and he represents them in all meetings of the Panchayat, where all the heads of the villages gather to sort out quarrels or problems. Each village thus sent its Panch to give their point of view in any clan gathering or Panchayat, such as the large meeting we attended on 4/8/96 at BV4. At this meeting it was instructive to see the simple commonsense and fairness with which discussions were conducted and decisions arrived at by a simple consensus.

All the heads of the 29 villages of North India that we were to visit were present. The investigators had to prove they could be trusted not to expose the entire ring of villages and endanger their livelihood, before we were allowed to continue. So too marriages and divorces are regulated through the panchayat, property disputes and all quarrels are settled through a meeting of the panchayat. A meeting can be convened rapidly through word of mouth using the network of buses and trucks on the highway. The decision of the panchayat is never challenged and any rebellion leads to social ostracism.

Some of the villages we visited dated as far back as 200 years on the outskirts of Kanpur and Lucknow while the ones at Agra claimed to be 250 years old. One of their largest settlements outside Jaipur was a mere 75 years old. A sense of history pervades and the village elders orally pass down the tales connected with the founding of their settlement. Thus the BV 7 contained 325 members of about 35-40 families, and they traced their settlement directly to the Kalandars of Panipat, and they came here 7 "Takiyas" (generations ago. Four brothers migrated with their families and multiplied. The village is also famous for its wrestlers, such as Dada Darbari and Mallu Pahalwan, and its hunters, such as Makhan Roshan. They pride themselves on the strength of their mud houses and their roofs made of "sapera" (snake grass. They had constructed a cement tank to hold water and hired a school teacher for Rs 400 a month to teach their children the Koran; this rated as "progress" in a Kalandar village.

BV19 and BV24 were similarly traced to ancient grants of land by the mughal kings to their court entertainers. BV24 was founded 250 years ago by Wajid Ali Badshah and papers are still available with their Panch to prove this. The village had 1500 members of about 65-70 families. A few of the settlements such as BV12, BV20, BV5, BV30 were merely tents stretching out over a barren unoccupied field. In Karnataka only two such large well established settlements above 50 years old have been traced, with a population of over 750 members; and a total of about 65 "licensed" bears exist in the State. (Srinath, WWF, Bangalore. However very few of the Kalandars actually own their own land even in the older established villages, and their mud huts and tents grow up

around one or two of the richer clan members who actually have papers to show land ownership, and who construct their houses on higher ground using stone or brick.

By and large the villages examined had only 20% permanent housing; 50% lived in mud houses which needed to be rebuilt after every monsoon, and 30% lived in tents made of bamboos with tarpaulin or plastic sheets as roofing. Large parts of all the villages were underwater, and mosquitoes bred freely. Malaria, conjunctivitis and other eye infections, chronic malnutrition and potbellied rickety children was the norm in all the villages. Those close to the cities still did not seem to have any clinic or first aid centre near them. The further off the villages were from urban areas the cleaner and healthier were the inhabitants and their income / diet was more likely to be supplemented by goat and poultry reared by them.

By and large their villages have no sewage systems and no running water and only in two cases had they "borrowed" electricity from overhead wires. The passages between the homes were unpaved and under water. Only one village had a well with brackish water and one had a tank to store rain water in. The Kalandars had to request water from neighbouring settlements. By and large no medical aid was available for the people as well as the animals and they relied on themselves for treatment. All but three villages had a Madrasah near them where the children could learn the Koran but government schools providing secular education were close to only four villages. The girls are not educated or sent to school. Most of the older Kalandars above the age of 30 yrs had 2-3 years of religious education but no secular education.

The younger generation often had 3-5 years in a government school but the high degree of unemployment amongst the youth (almost 95%) discouraged them from studying further. Amongst all the villages visited, only two Kalandars had done their Masters degree and after several years of futile search for government employment, one had begun his own welding unit, while another had become a "Hakim" or rural doctor. Five others had completed high school and were idle at home being now untrained for their traditional trades.

Village Structure and habitat:

A typical Kalandar village is well set back from the national highways or main roads and generally camouflaged by dense, thorny, tree growth or scrub. In urban areas it is usually hidden behind the worst slums or in the peripheries of the town, with the path leading to it being narrow and winding. Should a police raid be conducted this gives them time to exit, as the warning reaches them before the officers. Usually the village has a set of paths behind to assist such escapes with or without their animals. In BV29 on September 20, a raid was conducted by the DFO, Chandigarh, with 8 police officers. The other communities sympathise with the Kalandars, so warning reached them minutes before the officers. Twenty bears with their owners escaped by using the roofs of their houses as exit paths which led to a narrow path at the back of the settlement.

Their villages also use the dried branches of the Kikar tree, which has large thorns and heavy leafing, and droops close to the ground, as fencing between houses and to create enclosures for their bears. The bears are well hidden behind piled up dried scrub and kikar branches. Sometimes, as in BV13 ,where over 31 bears were examined by the investigators and the Kalandars often had upto 45 bears, large pits are dug among the low hanging kikars and the bears are safely staked in the pits. The curious passerby does not detect the pits; one only sees level stretches of flat marshy land and heavy kikar growth. In V1 the bears are simply kept in the chicken coops which are large woven baskets with a dia. of 4-5 feet and can easily accommodate bear cubs. One sees the hens pecking around and inside and only close investigation reveals a cub. It is important to note that these techniques of camouflage are needed nearer the city of Delhi or the main cities of Haryana, Rajasthan and Punjab, where raids are common and harassment is expected.

There has been an increase in this over the last five years according to the Kalandars. In most of rural Rajasthan and parts of Uttar Pradesh and Karnataka, states where the Kalandars are not troubled too much, the atmosphere is more relaxed and the bears are kept closer to the homes, in front yards, and on platforms in the central meeting place area, or comfortably reclining under trees and under the rope-strung charpoys of the owners, along with the goats, monkeys, partridges etc. Counting the bear stakes accompanied with the typical shallow depressions dug by the bear to make itself comfortable, became one way of checking on the number of bears in a village, although leeway has to be kept for the fact that the bears are made to change position 2-3 times during the day according to the position of the sun.

There is usually a clearing for village meetings next to the house of the Panch ; if there is a hand pump or well in that village, that too can be found here; and the entire area around each house is paved with a mixture of cow dung and mud that works as an antiseptic and hygienic flooring; even those who are in tents keep the interior clean by paving the floor with this mixture. Their cooking areas are outside the huts, so too the family cooking vessels are stored outside, large baked earthenware pitchers hold their store of drinking water, and large 3' feet high mud pitchers are made to store grain and rice. Cow dung pats and dry twigs and branches collected by the children constitute their fuel. Role of the bear in Kalandar Economy: Owning a bear definitely continues to be a source of pride and holds significance for the Kalandar. In spite of the fact that the cost of a bear cub under three months was anywhere between Rs 3000 and Rs 5000; the cost of a slightly older cub varied between Rs 6000 to Rs 8000; and the cost of a fully trained adult bear ranged between Rs 15000 to Rs 25000 there is still active buying and selling, despite signs of obvious poverty. The Kalandar claims to "borrow" this money and incur heavy debts to buy a bear but our questionnaires reveal a high percentage of trade between the Kalandar and the middlemen at the bear

markets as well as between the Kalandars themselves, mainly because of the high mortality rate of the sloth bear in captivity, particularly in the first three years of its life. Most of the Kalandars, about 83%, have been dancing bears in their family for 5-7 generations. However only 10% had visited the forests / capture areas to actually buy their bears and even less had witnessed the trapping process. These were significantly from the older group of Kalandars, above 50 years of age. The younger generation confessed to not having any forest survival skills and no experience of witnessing the trapping of cubs done by the tribals.

A dancing Bear works on an average 6 hours a day according to the Kalandar, but on festivals, at village fairs and at marriages, or to celebrate the birth of a child, a dancing bear could spend 10 hours a day catering to the crowds. According to the Kalandar the bear becomes extremely irritable by evening and it is difficult to control without giving it, its evening meal. Thus they too prefer to give the bear some rest in the day and particularly during the evening after its feed.

The earnings from a bear average Rs 2000 to Rs 3000 per month during the good seasons which in North India are the winter months when foreign tourists visit and hotels and Kalakaar trusts arrange large shows. In BV4 for example five bears are on monthly employment with government hotels, 3- 6 km away from their settlement, and they spend three hours in the morning and four to five hours in the evening, entertaining the hotel guests. So too BV10 , BV13 and BV16 had as their chief income, large shows organised in major tourist cities by hotels, both private and government run. Their income falls to Rs 1000 to Rs 1500 per month when they have to rely on a rural audience. However the dancing bear owner relies heavily on his rural audience for donated rice, wheat and other lentils and seasonal vegetables.

Bear dancing: Historical background

The Myth of the Bear and its powers:

The Dancing bears date back , according to the Kalandars, to the 16th century. They claim to be the descendants of Multanis or Pakhtoons and claim to originate from the mountainous areas beyond Pakistan. Panipat and Dhimri were two of their oldest sites in India but today no Kalandar stays in those two places. They were richly patronised by the Rajput Kings and the Mughal emperors who enjoyed watching the bears dance and particularly liked wrestling events between men and bears. The villagers, irrespective of caste and religion, have since the beginning of the tradition, respected the Bear as the Protector of little children and a defence against spirits and ghosts.

The Kalandars use the religious text of the Ramayana to add to the mythical dimension of the bear. The Bear tribe assisted Lord Rama in his search for Sita when she was kidnapped by King Ravana. This reference gives the bear a special status and it is regarded as an animal of power and strength, one that can frighten away evil spirits, keep a child free of nightmares, cure certain psychological ailments, exorcise spirits from possessed individuals and grant blessings of good health and peace particularly to little children. Anyone wearing an amulet containing the hair of a bear or a bear claw, was protected from envy or "nazar" i.e. the evil eye. Therefore on birthdays, festivals, naming ceremonies of the child, or when a child has been ailing for a while and has not responded to medicines, the bearman is summoned with his bear. The child is put on the bear's back and walked around, or a hair of the bear is tied on him for protection, or a talisman with a claw is purchased.

The rural audiences:

For the rural audience, even today, this aspect of the bear - its being able to cure illnesses and frighten off spirits - is by far more important than any tricks it can perform.

It is only the urban audience or the foreign tourist who wants to watch a bear "dance" or is entertained by its "tricks". Throughout the investigation, after observing almost 45 bears dance, we noted the dancing bear hardly ever "dances". It is trained to rise on its hind legs, sway its head from side to side, lie down on its back, give a paw in handshake, or sit.

There is not much variation on this except when a child or the owner "wrestles" with the bear. The "wrestling" consists of grappling with the bear and invariably the animal is trained to merely clasp the owner or child. Sometimes two bears or more will rise on their hind legs and with forepaws touching, move in a circle. Foreign tourists and children are fond of sitting astride the bear and "riding" it for a few minutes.

In conclusion, the immediate cruelty or abuse of the animal does not lie in the actual "dancing", but in all the other aspects of the trade : for example, in the actual capturing, transporting and training process; in the fact that it spends long hours in heat, dust, and noise, waiting for clients / an audience to gather, and in an urban environment vehicular fumes and the pollution aggravate the dancing bear's distress and injure the bear's health considerably.

One typical method of earning is by standing along the well travelled tourist roads and highways. The bearmen stand in groups and flag down the cars passing by and put up a quick display of a few steps, collect a baksheesh for allowing photographs, and the tourist moves on. Typically in an hour they collect between Rs 50 and Rs 75. The rest of the time, while waiting for a client to stop, the bears are given a slack 8' to 9' of rope, which allows to them to dig for ants, beetles and termites under logs and bushes along the roads and thus supplement their diet. This happier state of affairs does not last for the Bear

when it enters a city for dancing. The Kalandars admitted the bear has to be kept on a very short rope, to prevent any accidents to the audience, the bear's feeding is very irregular, and the bear is more stressed out due to the crowds pressing around him which the Kalandar admits unnerves the bear.

The various audiences were questioned by the investigators to assess public awareness of the trauma involved in this trade for the animal. 90% of the rural audience responded it was not cruel to the bear and some added it gave "pleasure" to the bear to be fed and petted by the crowds. The city audience were a little more aware and 73% felt it was not cruel to the bear to be danced but 27% felt the capture / training might be stressful for the bear. The foreign tourists, about 40%, felt the bear dance was cruel, that the bears looked tired or miserable, and 5% aggressively wanted the dancing bear banned; while 55% felt it added colour to Indian life; or it was "picturesque", or it was an art form perhaps to be kept alive. Both the urban audience and the foreign tourists interviewed felt in a country this "poor" the Bear man cannot be faulted for trying to earn a living whichever way he can.

Training of the Bear Cub

Training Methods:

From the Survey Questionnaire administered to the Kalandar community, by and large the preference is for the Kalandar owner to train his dancing bear himself. However the three trainers interviewed stressed that their services are often needed along with the owners efforts. Only the Kalandars train bears.

Rearing and Maintenance of the Bear cub Ownership:

Administration of the questionnaire revealed that 66% of the Kalandars presently dancing bears had actually reared it themselves from a cub. 30% had acquired semi-trained juvenile bears or already trained adults from fellow Kalandars, who sell at times of domestic crisis but usually always to a fellow Kalandar or through a middleman who is again a Kalandar. Only 4% on the questionnaire mentioned that they had sold a bear to a travelling circus because of its old age or to private collectors who wanted to keep it as a "pet".

The Kalandar felt it was optimal the bear cub be raised, fed, trained and danced by the owner himself, specially during the initial training period of 6 months to a year; the age of the cub being between 4 to 6 months when the training begins. However it is often not possible for the same member of the family to take the bear out for dancing / earning and several family members participated in dancing and walking the bear after the initial training period was over. Village elders are often asked to help in breaking in the cub.

At BV4, BV7 and BV8, three village elders who acted as trainers were interviewed. Only one of them still danced a bear. The other two had retired and helped train the cubs brought to their village. They received payment in cash or kind from the fellow Kalandar for this service.

The investigators found a direct relationship between the Kalandar's confidence in handling his bear and the age at which the bear cub had been acquired. If the Kalandar had single-handedly raised the cub as we found to be the case at one of the largest settlements, BV13, the bear does not suffer the same degree of abuse through the rest of its life.

The reasons are simple: the Kalandar does not then tie him down with a very short rope, or pull with unnecessary force on the dancing rope nor does he need intimidation with the stick or hitting with an iron chain; nor does he use hunger as a method of control throughout the bear's life. Being familiar with the cub's habits from the beginning, the family and the bear handler develop a better working relationship. It is rare for a Kalandar to own more than one adult bear whether he intends to dance it or sell it a little later. Eight families were encountered that owned a cub and an adult or a juvenile and an adult; and only one family in the entire survey period owned four adult bears. In two cases a Kalandar took the bear for dancing in order to pay off a debt he owed the actual owner of the bear. We gathered this can happen quite often in the Kalandar community not because the actual bear owner is too rich and is "hiring" someone to dance his bear but because one kalandar owes the other money (borrowed during a domestic emergency) and this is one way the debt can be paid off.

Maintenance and feeding:

The bear cub usually reaches the village traumatised and dehydrated. Initially the cub is kept close to its owner in a basket or under a coop and brought out only for feeding. After a couple of weeks it is tied by a rope, to a bamboo pole, close to other cubs, and fed a wheat gruel along with its milk. The Kalandar claims to add jaggery to this feed to fatten the cub and win its confidence. It takes fifteen to twenty days the Kalandar claims for the new cubs to accept this relationship and begin eating well. The mortality rate can be high at this stage.

During one of visits the investigators released the cubs from the bamboo posts to observe their behaviour. They were playful and didn't stray far from where they were tied. Their play consisted of a variety of vocalisations as they indulged in mock attacks and wrestled with each other. But the Kalandars evinced no interest in leaving the cubs free to exercise themselves and to explore their surroundings. Considering the cub in the wild accompanies his mother and explores his world around this age, this continuous tethering of cubs by a short rope throughout the day and night is a cruelty difficult to evaluate or quantify. So too they are deprived of all the warmth, touch and company of an adult (mother) bear and it is no wonder the cubs are continuously mewling / whining and tugging at their ropes; or in desperation they go up and down the bamboo poles to which they find themselves tethered. They are left free only when they are opened for their feed.

The Kalandar claims feeding a cub costs between Rs 20 to Rs 30 per day and the costs rise steadily till the adult bear costs them between Rs75 and Rs 110 per day. Some Kalandars claim to feed Chana Ata, i.e. powdered gram with the milk to the cub, yet others claim to add soft fruits, but the investigators found no signs of this in any of the villages visited. By and large in North India milk and wheat porridge is fed to the cub; and in the South, Ragi porridge and milk is fed till the cub is about six months of age.

After six months of age the cub is fed twice a day, with large Rotis (baked breads made out of wheat flour) mixed in milk ,in North India. In South India they are fed steamed Ragi balls and milk twice a day. Twice a year when the season changes from hot to cold and cold to hot, the bear is fed several kilos of Ghee (clarified fat) about a kilo each morning for 7-8 days, which the Kalandar claims “deworms” it, “cleans its stomach” and prepares it for the change of season. To prepare the bear for the colder months in the North, similarly kg of jaggery (molasses) is fed to the bear each day, for about 8-10 days. This the Kalandar claims builds up the bears’ resistance to infections, probably by building up the fatty deposits. Although the Kalandars are well aware of the natural diet of the bear there is no attempt at feeding the bears in a more balanced fashion; the Kalandar logic being the animal is no longer “wild” and has to be given a “human” diet, The heaviest concentrations of dancing bears were in BV7 and BV13. Here the bears on an average recorded longer life spans; when physically examined they had glossier coats and were larger in size and heavier. Significantly both the villages had large tracts of open space with plenty of trees and scrubby undergrowth with large termite mounds and ant hills and the bears had access to this. In these villages the bears were kept on long twenty feet ropes that allowed them to grub about in the soil for their favourite food. This addition to their diet significantly improved their health. Secondly these bear men were closer to the highways and could attract a large tourist trade; or earn by entertaining at hotels where a programme would be arranged for eg. at festivals. This was another factor which contributed to their better health, as undue stress while walking long distances was avoided. Thirdly most of the bears in these two villages had been reared as cubs by the same owner who was still dancing them or a member of the immediate family was handling them. The bears had not suffered frequent changes of owners / handlers. All these factors contributed to their better health and maintenance and the owners enjoyed a closer relationship with their animals. By and large the bears were groomed meticulously by the Kalandars if the expected route to be taken was one frequented by foreign tourists or they had been given a contract by hotel

proprietors to sit at fixed spots for their guests. Thus the bears of BV4, BV7 and BV8 and BV11 were even shampooed and combed, as tourists enjoyed physically stroking and handling the bears. When on the road or dancing before rural and small town Indian audiences the bears were often coated in mud and suffered cuts on their foot pads and suffered an unexplained eye discharge. The bears also walked longer distances, their feeding was often disrupted and rest timings became irregular and they were treated more roughly as rural audiences often teased and provoked the animal. So the Kalandar is extra vigilant to ensure that no member of the public gets scratched or attacked by his bear and he consequently treats his bear more abusively.

The staking of the bears when at rest varied. In 70% of the cases observed, the rope taken through the nose was attached to a chain/rope which could be as short as three or four feet. The position is one of acute discomfort and the bear cannot turn or stand up to sharpen its claws on a tree or lie at full length. In about 80% of the cases observed the bear had dug a shallow depression and rain water had filled it up, so that the bear stood defensively hunched up near its stake for long periods of time or curled up on the soggy ground resigned to its fate. Although the Kalandar claimed to change the bear's resting site thrice a day, we rarely found them that concerned. In some villages the bears are surrounded by cut branches of the thorny kikar tree which protects it from dogs and acts as camouflage from the idle, curious passerby.

Nose Piercing:

The cub suffers trauma when it is pushed and pulled by the children of the village in an attempt to break it in and get it used to being handled by men.

However its first ordeal by pain is when the nose is pierced and a thick rope inserted through the cheek tissue and removed from its mouth. This is the first nose piercing when the rope and needle is pulled through the top of the cheek and out through the mouth. A second nose piercing is done after another four

months when the cub's snout is larger and the cartilage of the upper palate is stronger to withstand a thicker rope. This time the rope is pulled out through either the right or left nostril. Often the bear paws itself repeatedly or tugs at the rope in a bid to escape the pain and tears the inflamed tissues. In such cases the kalandar repeats the nose piercing at another site on the snout. It is quite common to see several scars on the snouts of the adult / juvenile bears.

Although the Kalandars in a few villages claimed to go to a veterinarian for the nose piercings and insisted local anesthesia was used and painkillers given after, this was a tutored reply given at the start of the investigation. In all the questionnaires administered after the investigators had won their trust, 96% replied the bear cub's nose was pierced by a village elder or an experienced owner in the village itself, with a large iron needle about 6.5 inches in length. It was only in the second year of investigations that the researchers could witness the first nose piercing. The crude iron needle such as is used to sew mattresses and sackcloth, is heated in a coal fire and plunged in with a group of men holding the squealing cub tight. The site of the nose piercing was invariably infected in all the 17 cases we observed when the questionnaire was being administered. All cubs observed since then have also been found to have infected pus filled nose piercings with the muzzle swollen and distorted, sometimes up to four months after the first piercing. The cub would then have to suffer a second nose piercing before the first was healed, compounding his agony. It is significant that this is the optimal training period as the cub will walk and rear up on its hind legs mainly because of the agony it suffers when the rope is tugged.

No medication was being applied to the muzzle till the investigators donated antibiotic ointments and fly-repelling creams. The Kalandar puts "Sarsoo oil" to ease the pain and soften the tissues but it is a sweet oil and attracts flies. Although simple Ayurvedic indigenous ointments are available and can prevent infection, the Kalandar does not use this information, preferring to do what his forefathers always did.

In Karnataka a Brass ring was put into the nose of the bear and then a chain or a rope attached. This practice was only noticed in the bears examined in the

South. If the measurement of the muzzle was done carelessly often the snout of the bear remained compressed and distorted as the ring was smaller than needed. Secondly a very cruel mode of control was to insert the bearman's stick into the ring and twist it a little, thereby causing the animal a great deal of pain; thirdly more than one rope can be attached to the brass ring, if the bear is of bad temperament and facilitate control of the bear.

Of the 97 adult bears the investigators examined, about 40% still had their original nose hole. The others bore scars to show torn cartilage and large cuts, distorted muzzles, several openings in the nose indicating re-piercing. The trainers explained that a recalcitrant or ill tempered adult bear would have to be re-pierced in a bid to tame him with pain and control him. Others explained that simply with age and wear and tear, it becomes necessary to redo the holes. Only one percent of the interviewed Kalandars were willing to forego the nose piercing and experiment with using a leather muzzle and/or harness on the bear. No Kalandar was willing to accept that a bear could be controlled without a nose rope. They were however willing to learn the names of medicines that would lessen the infections.

Removal of the Canine teeth:

The cub has small black canines as part of its milk teeth and it is between the 8th and 10th month that the adult canines appear and are removed. This is done with no anesthesia and again an iron rod is hammered in, with a blunt wooden pestle, and the tooth dislodged with force. The use of a pliers - like instrument, resembling kitchen tongs made of iron, is sometimes used. The Kalandars deny any injuries take place to the sensitive muzzle of the sloth bear or that the long lips are torn or injured, during this process.

The cubs (17) and juveniles (7) examined by us while administering questionnaires, either still had their milk canines or had already had them removed so that only the cavity left behind in the mouth could be observed. We have not been able to witness a canine removal first hand but have examined the cubs soon after the canines have been knocked out and the distress and physical trauma to the cub was apparent. The teeth are used for talismans and

amulets and command a good price. However the Kalandar claims he removes them for the safety of his family, the public, and the crowds that gather around the dancing bear and not for its monetary value. However the investigators noted several juveniles with their canines intact. These were to be removed later when the teeth were larger and had more value as amulets; thereby being a more painful experience for the animals.

Trimming of Claws:

By and large the cutting of the claws takes place twice a year during Diwali and during Holi; or during spring and autumn so to say, according to the Kalandars. However it was observed that only 20% of the bears had one or two claws removed at the very base. Pulling out of claws is not a practice among the Kalandars and the investigators did not come across any case of claws being pulled out. However among the claws on sale some showed bone and a large part of the phalange attached. According to the Kalandars these were removed from a dead Sloth bear, by an owner who was desperate for money or had a family crisis to handle as once again violating the body of the dead bear was against their "religion."

In case of a good enough price paid by a client who urgently needs the claw as a talisman or by foreign buyers who pay well, the Kalandar supplies it without qualms, out of season. The claws are cut using brass or iron Sarotas (betel nut crackers) . At several of the villages when the owner and trainer or other bear owners surrounded the bear to demonstrate a point to the investigators, the unrest and fear of the animal was very evident. The Kalandars explained the bears fear the group is going to cut its nails or change its nose rope both of which were obviously traumatic memories for the adult bear. Although safety was quoted as the reason for clipping the nails, and the comfort of the bear while walking on the paved roads was the second reason given for trimming its claws, profit was certainly the strongest incentive, as bear claws were in great demand by the bear audiences, whether rural, urban, or foreign. Hence the Kalandars trim the claws seasonally and do not remove them (by pulling out) as they provide recurring income.

Diseases and Treatment:

According to the Kalandar the cub or juvenile bear suffers no illness beyond a form of epileptic fits which attack it before the age of three years. Should the bear survive beyond this age it usually lives out its normal life span till thirty years. However as said earlier, our questionnaires elicited the information that the oldest bears were approximately 15-16 years of age and only 10% reached this age. However wildlife field workers conjecture the cause of death in the bears is often respiratory congestion, and two cases of post-mortem conducted in Karnataka, Bangalore, by Mr Srinath of the WWF revealed tuberculosis as the cause of death. However no documentation has been done in this area nor have any scientific studies been undertaken on this subject.

Only 10% of the Kalandars questioned had visited a veterinary doctor to consult about an illness of their bear; almost unanimously they preferred to go to a village elder for treatment. This "epileptic fit" is characterised by the bear becoming dull and listless for a few days; his face swells up and he refuses food; then suddenly he convulses and falls down usually to never recover. The Kalandars are very fatalistic about this illness. Zoo authorities hazarded a diagnosis: acute worm infection followed by a cardiac arrest. The investigators did not see any animal with these symptoms. A request has been made to bring the bear in for a post-mortem should any such death take place in the villages visited.

However the investigators did see two adult bears that were very sick and after showing symptoms of respiratory congestion they passed away. Three cubs handled by the investigators died of severe gastro-enteric symptoms. We were told a large number of cubs, almost 60 - 70% of those purchased died of similar symptoms. We conclude poor unhygienic feeding after acquiring the cubs is responsible for this high mortality rate. Respiratory and intestinal infections seem to be responsible for most of the deaths.

Mortality Rates:

The questionnaire revealed that the cubs have a high mortality rate at the market itself; approximately two cubs out of ten succumb to the shock of separation from the mother and simply "fade" away according to the Kalandars. The Kalandar trader or middleman who handles the purchasing for their fellow Kalandars reports that the initial trauma of the capture tended to increase the death rate but could not hazard the percentage of cub deaths. Should the cubs survive, transportation takes its toll as the cubs are carried long distances in gunny sacking; or put into fruit baskets covered with leaves / fruits; or packed with hay in crates. The preferred mode of transport is trucks which obligingly carry the Kalandars through the length of this country. Today travelling by train has become a hazard the Kalandars claim, as the authorities and fellow passengers often object or ask too many questions should they recognize the animal. Again transportation entails a twenty to forty percent loss in cubs.

Should the cub reach the village and its owner safely, the first fifteen days are critical as it must accept the Kalandar owner and begin eating. The Kalandars conjecture 1-2 cubs out of 15-20 brought to a village each season die at this stage of handling. In the second year of the study the investigators had an opportunity to countercheck these statistics. In BV7 and BV8, 21 cubs were received. Over a period of three months the investigators observed three deaths of cubs due to respiratory and intestinal disorders. At the end of this three month period when the cubs were approximately five months old, the investigators found only five cubs continued to be with the Kalandars in these two villages. The investigators were told the cubs had all "died". This either leaves us staring at an extremely low survival rate close to only 24 % as in this particular case or the cubs had been sold through a route as yet not known to the investigators.

Although the Kalandars almost uniformly insisted their training methods produce no trauma with consequent fatalities, they do agree that the percentage of bears lost in the first year can be as high as 40%, with improved chances of the bear

cub surviving as it becomes a juvenile. If the bear survives its third year without succumbing to “epileptic fits” the Kalandar feels it usually lives on for 15-20 years more.

It is estimated from the Kalandar questionnaires then, that on an average the larger villages (BV7, BV8, BV15, BV 21, BV24,) receive at least 15-20 cubs each season and these are distributed to the smaller Kalandar settlements. A settlement as large as BV13 could receive up to 25 - 30 bear cubs in a season. In Karnataka on an average 9 -11 cubs are needed to replace those lost each year among the 63 families licensed to dance bears, (Srinath, WWF). In this small sampling of Kalandar settlements, it is estimated that approximately 115 cubs reach the 36 villages each season. Of these in the first six months over fifty percent are lost to disease, trauma and poor feeding.

Since there is no valid licensing system at present in India, and since no statistics are available of poached bears / cubs with the wildlife functionaries, the estimated population of dancing bears is being conservatively calculated from the administration of the Survey Questionnaire given to the Kalandar. It must be noted that the present sub-group examined in North India and in Karnataka has indicated that almost as many more Kalandar settlements exist through the States of Orissa, Bihar, Gujarat, Maharashtra, Tamilnadu and Punjab. This significantly increases the number of captured cubs per season.

The investigators were not able to trace any formal school for training of cubs. Several of the villages such as BV4, BV7, BV8, enjoy the reputation of having good owner-trainers. The training takes 6 months to two years to complete and the bear cubs are usually 4-6 months old when the training commences. Although the Kalandar claims it is the first fifteen days when he feeds the cub himself and keeps it all the time in his company that cements a man-bear bond; and that bond the Kalandar claims is the basis for successful training, in reality the training process begins with the nose piercing of the cub. Once the rope is put through the tender nose the cub will do anything to protect itself from the pain caused by the tugging of the rope. At first the cub is "walked" behind the owner in circles and the period of time is increased till it is "walking" several hours a day, obediently, without pulling or misbehaving. The Kalandar claims the cub does this because of its intimacy with the owner but in reality the incentive is pain. To avoid the lacerations to its nose tissue it follows the owner. Next the cub is taught to rise on its hind legs and stay there or "dance" from one foot to the other.

Again this is done by the trainer twisting the rope, simultaneously pulling it up, so that the squealing cub quickly pulls itself up to reduce the pressure on its muzzle. The stick is hit on its foot and it automatically lifts it to avoid the blow; eventually the tapping of the stick on the ground is enough to make it move from one foot to the other. Often it claws at its nose too and in this manner it automatically learns to rise and pat its nose when the stick is waved before it. stick and the rope were mainly used together to train the animal; fear of the stick and pain from the nose - rope discipline the cub. The few commands thrown in are merely its generic name said in a stern tone.

The investigators noticed in the three training sessions they attended that the Blows from the stick teach it to shake his head, lift its paws in the air, lie down and shake its hips. A light tap on the painfully swollen nose will teach it to "fold" its paws in a "namaste".

The Kalandar claims their training is based on the bear cub's dependency on them as surrogate mothers. This is impossible to accept. 7% emphasized the creation of a bond between the owner and the bear was as valid as the one between man and dog; and it was observed that perhaps in 30% of the cases examined an affectionate bond did exist between the adult bears and their owners. This in no way detracts from the utter callousness of the nose piercing, the tethering and the use of the stick and rope, which are their training tools.

By and large the training is done with this logic in the Kalandar's mind that the bear is a large, heavy and powerful animal; and unless it fears its owner and is disciplined frequently, it will be out of control. During this investigation we observed the bears being hit across the face with ropes and the bearman's stick. We also saw fresh nose re-piercing done to bears merely so that the renewal of pain could assist control of ill tempered bears.

Kalandars claim to feed cereals, fruits, honey and jaggery to their bears during the training, but in actuality right through the investigation we only saw Wheat Rotis being fed, even the milk they claim to give adults was not seen. So too in the South, steamed Ragi balls without the milk were fed. To the question why the diet could not be improved, the experienced elders, the Kalandars involved in the training, as well as the three trainers replied, that a "natural" diet would "excite" the bear; that their forefathers gave it the food of a man rather than the animal's own diet, so that it could learn to live with men more easily. In short, food and hunger, are also the Kalandar's methods of control.

The entire process of buying a cub, transporting it, collecting permits from the police and municipalities, feeding and training a cub for its first one year, costs

the Kalandar approximately Rs 25,000.00 according to them. Hence a good-natured, well trained animal costs around that amount if it has to be resold as a juvenile.

Injuries and Deaths during the Training process:

During this investigation the Survey Questionnaire revealed a large number of Kalandars are also injured in the process of training and dancing their bears. A few stories circulate in each village of how a bear turns on its master and uses its claws to good effect. However only 5% of the bears examined actually showed a fierce temperament. Although the Kalandars had tales to tell of the ferocity of the female and her irritability when she is on heat, the bears which had wounded their owners were both males and females.

At least 30% of the bears examined bore scars of injuries and wounds around their face and muzzle or had injuries on their paw pads and ears. Although the Kalandars at first denied any bear dies in the training process and that any bear remains untrained and is recalcitrant, the Questionnaires revealed at least 20% cubs succumbed to the stress of the training process if not more. At least another 20% cannot be trained and are probably sold to circuses or travelling menageries although this information comes to us from the survey of circuses conducted by another NGO; and the Kalandars by and large insisted they sell only to another Kalandar so that the bear can adjust easily.

The disposal of the dead bear, assuming a small percentage die of old age, and the majority due to injuries and illnesses, continues to be a grey area. According to the Survey Questionnaire, without exception the Kalandars state they bury the dead animal without using / selling any of its parts. The three carcasses we dug up and examined in Orissa had teeth, claws and pelt intact. The investigators were not shown any burial grounds although the Kalandars spoke of the "holiness" of the bear which has to be buried with the same rituals as a man is buried. The elders specially spoke of the power of the bear's pelt and how each part of the bear was full of healing powers. To the question whether these could be utilised, now that the animal was dead, the Kalandars professed deep dismay

and said their bears are buried untouched. However the investigators were also told that they often cut or remove the claws from the dead bear or removed hair for amulets before the body is buried. No evidence could be found presently of a trade in other parts of the bear.

The Dancing Bear on the road.

Physical Hazards during road performances to bear and owner:

The Kalandar travels 8 to 9 months of the year and comes back to his village and community during the Festivals of Moharram and Ramzan and at Diwali as the firecrackers and celebrations disturb their bears a great deal. If the Kalandar villages are close to tourist frequented sights, the bear is not walked great distances during the three - four tourist months of winter. However the rest of the year the Kalandar walks through villages and towns, covering as much as 20-30 kilometers on foot and by hitching rides with truck drivers who charge Rs 25 to Rs 100 per ride.

The Kalandars travel during summers to Nepal, Jammu and Kashmir and Himachal Pradesh and the higher, cooler regions of Uttar Pradesh. During the winters they stay in the plains of the States of Uttar Pradesh, Haryana, Punjab, Delhi and Rajasthan. Thus all the borders of India are easily accessible to them. The physical strain on the man and bear is considerable during these walks and there are no fixed resting points for the Kalandars as they wander. Usually they travel in small groups and in the last five years the Kalandars of North India take great care not to get separated from clan members on the road due to increasing harassment from the forest officials and policemen.

In Karnataka the climate is equitable and the Kalandar is even more nomadic by nature, walking through the provinces in the State, touching on one place only once a year. Their main villages are very much in the interior of the State and the whole community meets for Moharram and Id. They rest two months in the year at the time of these festivals. Here too the Kalandar walks or hitches rides with friendly truck drivers for a nominal price. The authorities are much more relaxed about licensing and regulations in the South and hence the Kalandars of Karnataka were not that perturbed about being harassed by policemen, forest

officials, animal welfare workers or municipal authorities. Throughout Karnataka there is still enough open space, large fields and camping grounds that can be used by the Kalandars for camping. By contrast, the Kalandars of North India find confrontation with authorities, such as the police, the municipalities, forest officers and wildlife welfare workers is increasing.

Kalandars on the road in North India also face droughts, floods, rains, extreme heat and cold. During the last five years escalating costs of living have meant the normally generous villager is more niggardly about giving them wheat, maize, corn and lentils as their earnings. During the first year of this investigation it was noted the monsoons and copious floods had ruined all seasonal crops and hence the Kalandars had received very little of the cereals needed.

So too the increased seizures of bears by forest authorities, has meant the Kalandars travel less and more cautiously, off the beaten paths of large cities and towns, and consequently their earnings are less than before. There is no form of medical aid for man or bear on the road and in the last nine months there has been an increase in road accidents, heightening the Kalandars' insecurity. While administering the questionnaire it was seen that the owners of all the bears out dancing chose short routes, bringing them back home in a fortnight, unlike their earlier practice of continuously roaming for months before returning home.

The routes chosen:

These are determined by the earning potential and vary according to temple celebrations, festivals, village fairs, and market days along a certain route. While administering this questionnaire and moving with the Kalandars their popularity during the festival of Raksha Bandhan could be observed. Each observed bear and owner worked at least 12 hours on that day without a break, and the Kalandars selling hair amulets and claw talismans were in great demand. The Kalandars unerringly waited near the temples most popular with the public or at markets where the crowds would come. The next day they moved on to a village animal market and thence to a wholesale market where harvested grains were coming in to be sold. In this brief interaction the investigators noted the

increased stress on the bears which did not react well to crowds pressing in on them, as well as their distress due to the missing meals, and total absence of water and rest. However in the next two days the Kalandars and their bears had relatively few customers and did not make much income.

Licensing and the Law.

Wildlife Protection Act, 1972, (with amendments.) This Act is a national law and is applicable to all States except Jammu and Kashmir. State governments may not amend or change this national law. The Wildlife Protection Act, 1972, was designed “to afford protection to certain species of wildlife as were from time to time included in the various Schedules of the Act.” According to Chapter V of this Act, if any animal listed on Schedule I or II, is held captive by any individual, it should first be declared to the Chief Wildlife Warden under Section 41.1. The Chief Wildlife Warden may “for the purposes of Sec.40, issue a certificate of ownership in such form as maybe prescribed, to any person who is, in his opinion, in lawful possession of any wild animal....” However Section 43 regulates the transfer of the animal and says such a Certificate may be given on the condition the captive animal is neither sold nor gifted nor used to make into animal articles, or trophies. It also forbids the transfer of the animal from State to State without the previously acquired permission of the Chief wildlife warden. Each time the animal changes hands “a fresh certificate of ownership “ has to be executed. So too Sec.44 refers to those dealing in animals and says a dealer’s license is needed before he trades in animals. Also the law makes provision for the fact that no license may be granted unless the Chief Wildlife Warden or authorized officer has studied “the implication which the grant of such a license would have on the status of wildlife...” Lastly the license will be “valid for one year from the date of its grant; not be transferable; and be renewable for a period not exceeding one year at a time.” Under the law as stated in Chapter V, the person holding captive a Schedule I animal can be imprisoned or / and fined; the animal can be seized and removed from his possession; “cancellation of license or permit” shall be in addition to the above punishments.

Over the last one and a half years of this investigation eight such seizures had taken place along the route the investigators had visited. The affected Kalandars were interviewed and questionnaires administered. In all but two cases the bears were kept in zoos and died within a few months of being confiscated. The two bears were returned to their owners. One continues to live at Jaipur Zoo under distressingly miserable conditions. These episodes have made the Kalandar question the validity of a law which discriminates against their use of the bear in an age old tradition: but still permits circuses, private menageries and zoos to keep these animals in worse conditions and without any strict policing. It must also be emphasized that in spite of the existence of these laws the capture and trade of bears as well as other forms of wildlife goes on at well known animal markets and fairs in India.

The Kalandars for a long time plied their trade without licenses although the Law making it mandatory for them to have a license was passed in 1972. The licenses issued to the Kalandars and examined by us numbered close to 115. By and large, they were all dated between 1979 to 1992. No licenses were to be issued after 1992 allowing the acquisition / possession of a dancing bear. The Himalayan Black Bear, the Sun Bear, and the Sloth Bear have all been placed on Schedule 1 as highly vulnerable species. Any trade in their parts is forbidden. Any buying and selling of them for entertainment and for use as private pets is forbidden. Hence the issue of fresh Licenses to the Kalandars to dance these bears was also forbidden. Neither were renewals granted for old Licenses previously issued. The Kalandars continue to dance the bears on their old licenses although renewal has not been granted after 1992.

State Laws / Municipality / Forest Officers/ Police:

Sample licenses have been attached in the Appendices. It will be noted that the Kalandar not only gets a letter / permit to dance his bear from the Assistant Conservator of Forests, but also applies to the municipality of the city / town he resides in, to the effect that he can use that animal to entertain and keep as a pet, and that it would in no way injure the health of the public. So too he has to register himself at the nearest police station where he receives a character certificate and a permit to dance his bear. In some States a forest officer can give these certificates. It is on the strength of these permits issued by local authorities that the Kalandar is still able to dance his bears.

The Kalandar estimates he spends Rs 3000 approximately, in unrecorded payments, in order to get his permits. There is no uniform format to the license. After examining over 115 licenses given by Assistant Conservators from over eight cities, one observes that each license is worded differently. Some licenses state the physical description of the bear, others specify the licensee cannot sell the animal or use its parts when dead.

The license issued by certain other States specify that the animal has to be fed, medicated and maintained with care or the licensee is liable to be prosecuted. Others quote the Wildlife Act Sec.40 but include no details of the animal for which the license was issued. Sometimes the license issued for a bear also permits the licensee to "entertain or dance" monkeys and "keep Deer etc." as "pets". There is no proper record with the functionaries who issued these licenses and therefore no estimate could be made of how many licenses have actually been issued over the last 24 years since this Wildlife Act came into force and for how many animals.

Confrontation between Bear owner and the Law:

The Kalandars are illiterate and without any formal schooling. As such the Survey Questionnaire revealed that the Kalandars were not aware of the Wildlife Act and the withdrawal of licenses, till 1993, when they were suddenly refused renewals of their licenses in certain States. Since then the harassment from the police and the municipality has increased because the Kalandars find they now have to pay higher amounts to renew their permits and escape from the clutches of the police and the forest department when caught on the road or in towns, while dancing their bears.

Interestingly, if a Kalandar settlement had a strong head / panch he could appeal to the local authorities and get renewed permits for his Kalandars to dance their bears within a designated area. This was the case with BV19, BV23 and BV24. In two other settlements influential businessmen and Owners of local hotels had requested the local authorities to permit a certain number of Kalandars to perform at their hotels to entertain their guests. This form of patronage also

worked well but there was no way by which the Kalandar could avail of such protection while on the road. The Survey Questionnaire revealed that this increased policing by the forest officials, the police, and members of animal welfare organizations had severely cut into the Kalandar 's earnings. From the cross sampling provided by the questionnaires, the Kalandars are aggressively hostile to a Law which they see as depriving them of a livelihood. This anger is aggravated by the insensitivity of a government which has failed to provide any of the basic human necessities to a reserved OBC group. They are open to any rehabilitation programme which replaces their earnings through their animals in a consistent and reliable fashion. Since the beginning of this two year long study the Kalandars have mobilised themselves into a highly aggressive and articulate group. They have formed their own society; learnt to use the press for effective exposure of their poverty; they led their clan on a mammoth Rally well covered by the media, where they presented the then Prime Minister, Mr. Deve Gowda with a petition requesting he give them alternate means of livelihood before he snatched their bears away. They have learnt to hire lawyers to fight their cases in court when bears are confiscated. It must be emphasized the Kalandar is willing to change his profession if he receives some practical solution to his problems of unemployment, lack of housing and water, schooling and medical aid.

Bear Capture methods:

The Hunter / Trader questionnaire was administered in Phase II of the project. The investigators accompanied a small group of Kalandars when they went on a cub purchasing trip during the season, (November to mid March. For a complete understanding of the plight of the Sloth Bear in India today, it was vital that the local populace, the tribals, the forest guards and wildlife authorities also be interviewed and their attitudes to this trade be assessed. They were questioned for additional information on trade routes, bear markets, transportation methods, and in order to gain information on the degree of abuse involved at each stage.

The Survey Questionnaire given to the Kalandars had provided some data about methods of capturing cubs and the attitudes of the local people to the cruelties involved in this trapping. The Survey estimated that 80% of the Kalandars interviewed had never visited the bear capture areas or involved themselves in the actual trapping or hunting of the cubs. Their role was only to train and dance the bears. The remaining 20% usually in the older age group had gone to the "dangs" or forests for purchasing bear cubs. As such their knowledge of the capture methods is hearsay in most cases.

However by accompanying them on one such trip allowed the investigators, to meet the tribals, such as Gonds and Bhils, who are involved in the actual trapping, and talk to them. There was no question of administering questionnaires to them.

A few of the Forest tribes or adivasis are the poachers. They have lived all their lives in the jungles and are adept at studying animal signs and tracks. They are aware of bear behaviour and get alerted to a female in heat. Once such a female is identified they keep track of her movements and behaviour patterns through mating / pregnancy and finally until the female bear drops her cubs.

Being adept at jungle lore they are able to identify the den / cave the pregnant female is using currently. She does emerge from the cave after about two or three weeks to forage for food for a few hours in the night or in the early hours of dawn. The tribals keep a constant check on this female and her routine foraging period. They ideally prefer to remove the cubs when the cubs are 3-5 weeks old. A small group of 6-7 poachers camp on a ledge overhanging the bear's denning cave; or seek a vantage point from where they can observe her without her sensing their presence. They wait till she leaves her cave usually between late dusk and dawn for about two to four hours. When the mother is out a few members jump down and gather dry leaf litter in a heap at the entrance of the cave. This heap is designed to be in the way of the female bear on her return path to her cave.

This heap is set fire to and while the fire is burning two other members enter the cave, after checking the cave is free of danger as the mother often returns by another possible entrance sensing a threat to her cubs. This check consists of throwing a few rocks into the cave. The result of this check could be silence in which case it is safe to enter the cave, or an angry animal charging out at them, in which case their skill at climbing trees would come in handy.

They enter the cave with a flaming torch (wooden handle wrapped with a rag soaked in kerosene). This helps them find their way around the cave in the dark. Sloth bears usually choose caves for delivering the cubs with extreme care. Caves with two or more rooms are preferred, especially in areas of competition from other predators like hyenas, leopards etc which could prey on the young cubs. The inner most room is generally like a well and deep enough to make access difficult. She herself goes through a great deal of discomfort to reach the cubs. This is to ensure that the cubs do not stray out of the cave or away from their den, while the mother is foraging for food. This makes the poaching of the cubs an even more Herculean task. The above process i.e. poaching is completed at record speed, as they are too scared of the wrath of the returning mother. Two members of the poaching team are constantly on the look out. Once the cubs are found and brought out of the caves, in a gunny sack, they are again transported to the next destination, which would be the Kalandar customer camping on the edge of the forest or an animal dealer procuring the animals for a zoo / circus; or “private dealers for foreigners”.

The Kalandar Survey revealed the biggest danger during trapping cubs is the Sloth bear Mother herself with her ferocious tendency to protect her young (Dr. Shankar, Wildlife Institute, Dehradun). This was confirmed by the tribal trappers. If it is possible to enter the den when the mother is foraging and throw a gunny sack over the cubs and carry them away then that is done. While the Kalandars had stated the mother bear is distracted by guns being shot overhead or firecrackers, this information seemed dubious because the possession of firearms and firecrackers in sanctuaries and national parks is a very serious offence, and the trapping of cubs could also involve at times, the killing of the mother bear and disposal of her carcass.

Upon questioning the forest tribes we were told they avoid such tactics because they do not wish to draw the attention of the forest guards; secondly where bear cub poaching is specifically concerned, the Sloth Bear seems a short-sighted animal and it attacks only when too close to a human being it has surprised, out of fear and shock. It prefers to avoid encounters with humans therefore they too prefer to avoid confronting the female sloth bear. In our dialogue with the trappers and tribals, they emphasized that a higher percentage of bear - man encounters are now taking place because of a steady increasing encroachment into the reserved forests by human activities (timber felling) . Poaching however contributes to this disturbance in no small measure.

In numerous States, (U.P. and Himachal for example,) farmers are allowed to carry firearms and frequent raids on the crops by a bear leads to the farmer shooting the animal and keeping the pelt or selling it to a local trader. If later any cubs are found, Kalandars wandering in that area are informed and the cub is purchased by them. This is yet another way in which cubs enter the market but again no detailed studies are available in this area.

Sources / Locations:

The forested areas of Uttar Pradesh specially near the border of Nepal, the forested areas of Orissa, Madhya Pradesh and Karnataka are suspected areas of Capture. Members of the Bhil and Gond tribes; and branches of the Saharia tribe exist in each state who not only excel at trapping but are very quick in reaching their customer.

Transportation / Estimated number of cubs:

The preferred mode of transportation for bringing the cub from the capture area to the market is on foot. The Adivasi tribal never moves far from the forest edges. The cubs are carried to the waiting customer in gunny sacks, cloth bags, cane baskets, singly or in pairs. The cubs during this purchasing trip were 4-5 weeks old. The investigators moved to seven locations each about 5-8 kilometers from each other, purchasing the cubs. During this period the Kalandars camped outside the peripheries of the forest but took care to shift

camp frequently. At each point several Kalandars enter the jungle to inform the tribals of their need for cubs. We were fortunate to purchase the cubs in a short time otherwise the Kalandars could need up to two or three months to complete their purchases.

At two points we met Kalandars from Bihar, Orissa, Jhansi and Varanasi who were also purchasing cubs. These were brought to them by middlemen / traders who had already made the initial purchase. The trader too moves by road to his main market / selling points. This meeting was arranged in an open field and the investigators were invited to join in the bargaining. The cubs were skillfully camouflaged in wooden crates filled with hay. Otherwise the Kalandars, buyers and sellers camped in the open air with their womenfolk and children. The cubs were displayed to the buyers who also fed them and handled them to check their health. At another point we stopped to question a small group of Kalandar families who had a more permanent settlement near the forest. They apparently purchased cubs only to resell them to other Kalandars and they had one huge golden Sloth Bear which they kept as a pet and several dancing bears. The investigators, along with the accompanying Kalandars used buses and autorickshaws, tongas and tractors during this part of the travelling or simply walked.

After the purchasing the Kalandars transport the cubs in any box, basket, or container which can seem like a piece of travelling baggage, often tied with cloth outside. They rarely attempt to feed the cubs en route for fear of detection. Our group packed the cubs into fruit crates and covered them with hay. The heat thereby generated in the box was high and the cubs were quite limp and dehydrated by the time we arrived at Delhi. At no point did anyone check our baggage. On the two day return journey the cubs were fed only on the insistence of the investigators. Although the cubs mewled loudly on being touched and sucked at the milk bottle with sufficient noise, the apathetic fellow passengers assumed we were carrying pups and gave us no trouble.

Several of the Kalandars take the precaution to drug the cubs with "opium" or "Affim" so that the cubs do not feel hungry and squeal during transportation to

far off places. The group of Kalandars we accompanied purchased six cubs, of which two died en route; a third succumbed to the stress and handling 24 hours later. Three went on to the Kalandar village but one more died within a week of arrival from continuous diarrhea. Only two survived transportation.

Reselling and trading:

As the cubs move to the Kalandar settlements the price of the cubs rise. Thus a cub which at source cost Rs 200 to Rs 600 (depending on sex, weight, and health) could be traded several times with the cost doubling at each change of hand. Traders at the various open air markets sold cubs for Rs 2000 to Rs 3000. The same cubs at a village outside Delhi cost Rs 6000 and three months later cost Rs 8000. At the end of ten or eleven months a young well grown bear costs Rs 12,000. A large amount of income is thus derived by Kalandar families simply from selling and reselling the cubs. The poorer Kalandar who has lost his bear and needs to buy another comes directly to the "dangs" or forests to avoid paying a higher price at the "markets".

The Bear Markets:

These are indicated on maps attached in the Appendices. Very little information is available on the population dynamics of the Sloth Bear in India. While the Kalandar questionnaire revealed that almost all the bear men felt there had been a depletion in the number of bears, and a lesser number of bear cubs have come into the market over the last five years, a further study of the markets during several peak seasons would yield further factual data. This is again an area which has never been methodically studied.

Local Attitudes:

The Survey revealed 80% of the local populace are indifferent to the trapping and trading in bears. 10% positively liked the idea of this "nuisance" being taken care of and only another 10% were against the capture of the cubs specially since it could involve killing the mother bear or depriving it of a chance to rear its young. This 10% of the populace had not initiated any strong protests against the cruelties involved in the capture and transportation of bear cubs.

Impact of Poaching on the wild Sloth bear population:

Depletion of the wild Sloth Bear population: In view of the fact a sloth bear produces her litter of two cubs (on an average) only once in two or two and a half years and very often human intrusion can cause her to kill her own cubs, the Sloth Bear numbers are reducing quite fast. This slow reproductive rate of the Sloth Bear has important consequences in view of the uncontrolled poaching currently taking place.

Increased man-bear conflicts: As we have mentioned earlier it is no coincidence that areas of heavy poaching are also marked by more savage and frequent man-bear conflicts.

Reasons for easy poaching:

The reasons have been listed below:

The government policy of allowing tribal settlements / villages to remain inside the core forest areas, sanctuaries, and national parks. This creates a situation which allows bear - man encounters. The subject is one which is currently generating a great deal of heat and discussion in India; namely a large school of thought would like to preserve tribal culture and their ancient knowledge eg. Of medicines and herbs and the investigators fully support this.

However the investigators also found an increasing commercialization of values amongst the tribals and this coupled with the conviction that the forest resources are theirs by traditional right is leading to an unhealthy situation. Our questioning of the tribals only affirmed that they did not feel poaching upset any ecological balances; they seemed sceptical that sloth bears and cubs could be endangered; the rapid depletion of a species was only viewed as a loss of income. The holistic respectful attitude one expects from a tribal culture that depends on the forest for a living, wasn't there.

Perhaps our investigation brought to the forefront only those engaged in poaching and trapping and hence is a biased statement. However the investigators still strongly feel settlements / villages / even those belonging to tribals, if allowed to exist inside the core forest areas do create problems. Fuel collection, cattle grazing, honey collection, fruit, flowers and leaves collection

(which varies from state to state..) will go on. During our study, eleven villages in / around three forested areas were visited. These villages were chosen because several of the villagers had been victims of bear attacks. These encounters most of the time took place because the villager was in the forested areas, either cycling through, or hunting game, but he was where he shouldn't have been.

The sloth bear taken by surprise has been known to run away, but if the human is just too close it rears up on its hind legs and slashes with its claws. Most of the injuries examined by us were by the bear mauling the villager with its claws and biting it around the head region. Certain of the exploitative tribals find supplying the young of wild animals or birds (not only sloth bear cubs), a lucrative trade. In view of the fact the government has a protectionist policy towards the tribals it would perhaps concretize the government's intentions if practical vocational training was given to these tribes and jobs be provided to them. Another small example, cooking gas be provided free of cost or at nominal cost to prevent fuel forays into the forest. However in view of the ground realities one cannot fault the tribals for continuing with their old practices.

At a few villages outside the MP forest areas, solar energy had been utilised to help the villagers cook and light their lamps. Apparently a storm knocked out some of the solar panels and since then no government agency has repaired / replaced the panels and the villagers are back to entering the forests to collect firewood. This serves as one example of why and how poaching becomes easy revenue and secondly explains why the tribal gives little credence to any official statements of assistance. When the protected tribals become suppliers to consumers outside, their existence inside protected areas starts endangering the very existence of the protected areas themselves.

Poor infrastructure of the Forest Dept. and inadequate government support at the grass roots level to their forest patrolling staff. The Indian government has at all times considered Wildlife and its protection a low priority area. It is only in the last decade that scientific studies have been encouraged highlighting the

incredibly rapid habitat destruction and large scale poaching that has been systematically creating problems. Dedicated Indian conservationists either suffer from the red tape of State and Central bureaucracy; from inadequate funding; inefficient use of existing funds; vested political interests that override conservation concerns; lack of a powerful forum or platform where action can ride on information. More than that, time and again our survey revealed the forest guards are insufficiently paid, insufficiently armed or clad, insufficiently supplied vehicles and radio equipment; in short they are asked to do a superhuman task under the most archaic conditions with the most obsolete tools. This is a fair ground for the sowing of seeds of corruption.

Last but not least, there has been very limited education of the public in the value of preserving our forest and animal wealth. It is not enough to target school children with ecological studies; they are not currently the source of our problems and we may not leave them a future to exercise their guardianship. The education of the rural and uneducated masses has to begin; not merely to eradicate the superstitions associated with the curative value of a hair of the sloth bear but on larger issues of being a customer for any kind of wildlife trade.

Conclusion

The Dancing Bear in India has a long tradition and was a popular form of entertainment for many years but today it is a dying occupation with no future and this has to be recognised by the Kalandars. It involves barbaric modes of capture and cruel methods of training and controlling an animal that was never meant to be domesticated. The demand for Sloth Bear Cubs for the Dancing Bear Trade is definitely reducing the population of Sloth Bears in the wild as well as contributing to the growing problem of aggressive man-bear encounters in areas of heavy poaching.

Over a single season Kalandars could buy and trade over 115 bear cubs to be trained for dancing or for selling and to replace those lost in the previous year to illness, old age and accidents. This in turn implies a large number of adult breeding female sloth bears have been disturbed or killed in order to obtain these cubs. It is a depletion of wildlife resources India cannot afford.

The methods of training the bear cub are inhumane and lead to prolonged agony over 12 months for the young cub. The vicious practice of nose piercing, the trauma of nail clipping and dietary deprivation, and the use of a stick and rope to inflict pain on the animal during training cannot be condoned. The stress and pain the dancing bear endures on the road amidst traffic and pollution when danced in cities and towns, is condemnable. When young children see the bear dance in markets, at fairs and festivals, they often tease and poke the animal, seeing it as an object of fun and entertainment. The dignity and beauty the animal has in the wild is lost, and the child is educated instead in insensitivity and a lack of concern for the wildlife around him. The Wildlife Protection Act clearly states that the capture, transportation and selling or buying of a Schedule I animal is forbidden. The Prevention of Cruelty to Animals Act clearly condemns the training methods as cruel and inhumane. Utilising both these laws the tradition of the Dancing Bear of India should be phased out and the trade urgently needs to be stopped at its source i.e. the forest itself where the animal is first hunted and caught.

The investigators also concluded there has been a steady decline in the numbers of bears being owned and danced by the Kalandars. The reasons were several. The increasing pace of life and variety of entertainment available, (Television, radio, cinema), has made the dancing bear lose its entertainment value. The rising costs of maintaining this large animal has also discouraged many Kalandar families from pursuing this trade. The introduction of stringent amendments to the Wildlife Laws which prevented the renewal of licenses to dance bears and prevented the acquisition of new cubs has opened the way to increased harassment from the forest officials and police officers. The Kalandar is thus ready to accept any alternate professions that guarantee a livelihood.

The investigators concluded the Kalandars (under 30 age group) would like another safer and securer mode of earning a living. The older Kalandars are still fiercely attached to their traditions and suggested a “theatre” be founded for the Kalandar arts where they could use the bears in their possession to “stage shows”. However the Kalandar youth largely unemployed (age group 18 - 25)

had already taken their decision and were neither dancing bears nor monkeys. The Kalandar community is open to any programme for rehabilitation provided they have faith in the organization or authority running the programme. About 48 million forest dwellers live in India, within or in the vicinity of forests, forests that represent a means of survival and livelihood to them. (Mark Poffenberger and KC Malhotra, "Population and forest resource dependency" Poffenberger and Malhotra emphasize the tribals resentment at being denied access to reserved forests and that this resentment increases should a wild animal (eg the Sloth Bear harm them or their crops. The investigators however do not find a correlation between this resentment and the active poaching of not only bear cubs but other wildlife as a means of sustenance. Utilisation of forest resources for survival by tribals, unfortunately, often becomes unregulated or unsustainable exploitation of forest resources.

Recommendations

To solve the problem of Dancing Bears in India requires a well considered pragmatic approach. The community that dances the bear needs to be rehabilitated along with the animal. The Kalandar should be given vocational training and taught other trades to replace this mode of earning. The community has indicated a willingness to change, and would like the government to assist them by supplying their basic needs for water, medical aid and employment. The Kalandars have received OBC status but the government has failed to give them any form of assistance.

The Wildlife Protection Act was suddenly enforced in 1992 and the Kalandars were not granted any more licenses to dance bears which gave a collective shock to the Kalandar community. This was compounded by the Law insisting that licenses previously issued were "withdrawn", in the sense, it did not give the Kalandars permission to dance the bears they already owned. This then renders the Kalandar homeless and without any means of supporting his family. The indiscriminate seizure of dancing bears will only lead to further alienation of the Kalandars who are a large community living in abject poverty and disease. It will have the consequence of increasing pressures on poaching as the Kalandar with no alternate means of support will either purchase more cubs and hide them better from enforcement agencies, thus depleting the wild Sloth bear population

still further; or he will turn to wider use of the other species of wild animals of which he has adequate knowledge. We ideally recommend a programme that gives the Kalandar time to find other means of livelihood while still dancing the bears which are already trained and in his possession. In a country where unemployment, even educated unemployment is high, finding jobs is not easy and the government's assistance will be strongly required.

The Kalandar has to be educated that this "entertainment" is based on depriving a wild animal of a chance to lead a free and full life in its natural habitat. We would therefore strongly suggest a gradual and intelligent phasing out of the Dancing Bear tradition. The Kalandar panchayat should be informed that they have been given limited time to dance the bears in their possession and that any acquisition of new cubs would lead to strong law enforcement. We suggest the Kalandar be explained that they are being allowed to dance their bears only on the condition there be no further acquisition of bear cubs.

We suggest the Law be strictly enforced in the matter of Poaching, buying and selling of Bears. We suggest that strong punitive measures be taken against any Kalandar who acquires new cubs or assists in the sale or trade of cubs. Contravention of this will lead to the immediate confiscation of the Kalandar's present animal(s) and his license to dance bears. In this manner the Bear Dancing trade can be phased out. This will also prevent further poaching of the cubs from the already depleted wild population. The government agencies such as the forest department must be given adequate support, in terms of funds and equipment, to enforce the law and carry out effective protection of the forest resources and wildlife.

We also recommend we register the estimated 1000 - 1200 dancing bears of India within a certain period of one year. We recommend the Kalandar be allowed to dance his bear only if it is registered. Registration of bears can be easily accomplished by tattooing or by other methods available. This will give us as accurate a picture as possible of the number of Sloth Bears in captivity.

Once registered, these animals could be regularly monitored through agencies / NGOs that could give medical aid and treat the animals if unwell or injured. This would allow us to deliver a warning or eventually confiscate an animal that shows signs of neglect or persistent ill treatment.

WSOS will design and construct a “Care for Life Bear Rescue Home” on an appropriate piece of land given by the Ministry of Environment and Forests through any State government / Conservator of Forests. This will help us to house confiscated bear cubs, old and ill animals, and those taken away because of ill treatment by the owner.

WSOS is also willing to train husbandry and veterinary staff in the day to day management of this facility. Some Kalandars could be gainfully employed in the construction and management of the bear sanctuary.

WSOS will also collaborate with the Ministry and NGOs in launching a public awareness and education campaign to help eradicate the superstitions associated with the amulets / talismans made of bear hair, claws and teeth. The Indian public should be aware of the trauma of cub capture and transportation; and of the reality which lies behind the training of the animal.

The Wildlife Protection Act of India 1972 has adequate provision for penalising the poaching and trading community. These Laws must be strictly enforced to prevent the flourishing of animal markets and thus make it progressively difficult for the cub to reach the Kalandar or any other customer for the Sloth Bear. The tribal poacher, like the Kalandar, has to be educated and vocationally trained, so that they can earn a living by some other means. Education, Rehabilitation and Legislation need to go hand in hand to solve the issue of the Dancing Bears in India.

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Art – 02: PARAPHIMOSIS-INDUCED BALANOPOSTHITIS IN A WILD CAUGHT CAPTIVE SLOTH BEAR (*Melursus ursinus*)

Arun A Sha, Kajal Kumar Jadav and S Ilayaraja

Wildlife Veterinary Officer, Agra Bear Rescue Facility Wildlife SOS
Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra Uttar
Pradesh 282001, India.
E-mail: arun@wildlifesos.org

The Sloth Bear (*Melursus ursinus*) belongs to the family Ursidae and is endemic to the Indian subcontinent (Garshelis *et al* 1999). Though reports exist on clinical conditions encountered in Sloth Bear (Gosselm & Kramer, 1984, Rajan *et al.*, 1990; Harbola & Arora, 1994, Mehrotra *et al.*, 1999), there is no information on reproductive conditions or disorders observed in them. Paraphimosis is the inability to pull the retracted prepuce over the glans penis (Fenner, 2000; Venugopalan, 2000) while Balanoposthitis is the inflammatory condition of both glans penis and the prepuce (Sastry & Rama Rao, 2001). We report here for the first time a clinical case of balanoposthitis resulting due to paraphimosis in a captive Sloth Bear and its successful medical intervention.

An adult male Sloth Bear (Name: Jammu, microchip no: 985120014956112) at the Agra Bear Rescue Facility was found to exhibit symptoms of difficulty in urination, difficulty in walking and preference to stay in dorsal recumbency or to assume a “dog-sitting” posture. On Physical examination, following chemical immobilization with injection Xylazine Hydrochloride 2mg/kg body weight and injection Ketamine Hydrochloride 5mg/kg body weight (Total body weight 122kgs), was observed that the glans penis was enlarged due to inflammation and could not be withdrawn into the prepuce. Further examination revealed edema of the penis and prepuce and exudation from the prepuce cavity. Self-afflicted wound marks were also noticed in the surrounding area.

The debris around the affected area was removed manually with a pair of forceps and the inflamed area was washed with a mild antiseptic solution (Povidone iodine). As no adhesions were observed, the glans was gently slid into the prepuce cavity after trimming the hair surrounding the area. A topical antibacterial Metronidazole was instilled along with the systemic administration of a broad-spectrum antibiotic injection Gentamicin and a non-steroidal anti-inflammatory agent injection Meloxicam for five days. To reduce the edema in the inguinal area, magnesium sulphate-glycerin paste was applied externally. The animal made an

uneventful recovery without any recurrence of the condition. Clinical affections of the urogenital tract have been observed in Polar Bears (Kuntze, 1984, Stamper *et al.*, 1999) and in American Black Bears (Dubar *et al.*, 1996). To our knowledge, this is the first clinical report of a balanoposthitis resulting from paraphimosis in a Sloth Bear. Traumatic etiology is suspected for this particular case. Information about clinical conditions of wild animals is important for their management and breeding in captivity or in rescue facilities. The Agra Bear Rescue facility is one of its kinds, which currently houses 199 Indian Sloth Bears and is involved in effective management of rescued Sloth Bears.

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Art – 03. KARYOTYPIC PROFILE OF INDIAN SLOTH BEARS (*Melursus ursinus*)

Jadav KK, Arun A Sha, Ilayaraja S

Centre for the conservation and rehabilitation of bears, Agra Bear Rescue Facility,
Uttar Pradesh, India.

The display of chromosomes at the stage of cell division, mitosis, and their banding patterns constitute karyotype of a species (Ref. 1). The number of chromosomes for any species for any species is specific and important for cytogeneticists. They use karyotypic alterations to detect chromosome abnormalities associated with inherited defects or with certain types of cancer that arise through the rearrangement of chromosomes in somatic cells and in establishment evolutionary relationship.

Sloth bear (*Melursus ursinus*) is an endangered species on the IUCN red list and protected under Schedule I of the Indian Wildlife Protection Act 1972. The habitat of the sloth bear which was once peninsular is equally endangered and is now fragmented into pockets. The species itself is under threat, causes of decline being poaching of bear cubs for dancing bear trade, bear baiting, poaching of adult bears for parts, habitat destruction etc (Ref Report on Dancing Bears of India by Geeta Seshamani & Kartick Satyanarayan 1997). Agra Bear Rescue Facility was established as a conservation measure to address the poaching of bear cubs carried out in the garb of dancing bears. ABRF houses presently a total of 77 sloth bears (wild caught) rescued from precisely this trade.

Hard (1968) was the first author to study the chromosomes a female sloth bear; he found $2n=74$. The comparative karyotypes of the Malayan sun bear, and some "related species", have recently been studied in some detail by Tian et al. (2004). As previous investigators, they found all Ursidae (except the South American spectacled bear with $2n=52$) to possess 74 chromosomes, as was also published by Nash & O'Brien, 1987 and Nash et al., 1998). The present study being carried out in ABRF involves the setting up karyotypic profile of individual sloth bears housed in the facility, taking into account various parameters of comparison with other species of bears and specific banding patterns of individual chromosomes. The study will help to evaluate the shaping of unique history of seemingly random genetic events, acted on by selection pressures in the nature. There are instances of Hybrids amongst bears, and at maturity, they are mostly fertile (Kowalska, 1969 and

Wurster-Hill & Bush, 1980). The sloth bear was listed to have made hybrids with a Malayan sun bear in Tokyo, and with an Asiatic black bear (*Selenarctos thibetanus*) (Gray, 1972; Asakura, 1969; Scherren, 1907). The study will be able to establish, and evaluate the gene pool of the wild caught rescued (sloth bears) individuals housed presently in the ABRF and investigate aberrations in the gene pool if any. This will be first study of its kind in India which will reflect the selection pressures in the nature and the direction of genetic drift.

ACKNOWLEDGEMENT

Authors are thankful to Kartick Satyanarayan, Co-Founder Chairman, Geeta Seshamani, Secretary, Wildlife SOS (R) and Deputy Conservator Of Forest National Chambal Sanctuary Project, Uttar Pradesh Forest Department, Uttar Pradesh, India for their cooperation and for providing the necessary facilities to conduct this study.

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Art - 04. RABIES IN CAPTIVE SLOTH BEARS (*Melursus ursinus*)

Kajal Kumar Jadav, Arun A Sha, Ilayaraja S

Wildlife Veterinary Officers, Wildlife SOS, Agra Bear Rescue Facility,
Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh, INDIA - 282 001

ABSTRACT:

Rabies is an acute viral disease of the animal belonging to the families of Canidae, Felidae etc, and most warm-blooded animals. It has an incubation period varying from 7 days to several month (Fowler M., 2003) Rabies is caused by Lyssavirus (George, 1994). The disease presents a complex epidemiological picture of urban Sylvatic cyclic and transmission to human beings. (George M Baer *et al*, 1991). The authors discuss detailed case histories of rabies in captive sloth bears (*Melursus ursinus*) and were implemented to control its outbreak. The Sloth bear is regarded as an endangered species, a Schedule I animal (Indian Wildlife Protection Act, 1972) and has been entered in the CITES red book. Most wild caught and rescued dancing sloth bears during the period of study had maggoted wounds on their nostrils which had been pierced by gypsies to pass a rope through which they could restrain and dance the bears. Rabies in sloth bears is characterized by labored respiration, distress, pale mucous membrane, and Inability to ingest food, vomiting of undigested food materials and off fed indicating the dumb form of the disease in most cases. The study reveals the epidemiological pattern of rabies in both urban and suburban areas of India involving dancing bears in particular and other species including the human being in general. Reports on acute diseases in sloth bears will be of immense help to various zoos and animal shelters all over the country who are working towards protection against these dreaded diseases.

ACKNOWLEDGEMENT:

Authors are thankful to Kartick Satyanarayan, Co-Founder Chairman, Geeta Seshamani, Secretary, Wildlife SOS (R) and Deputy Conservator of Forest National Chambal Sanctuary Project, Uttar Pradesh Forest Department, Uttar Pradesh, India for their cooperation and for providing the necessary facilities which made us possible to make this article.

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Art – 05. CANDIDIASIS IN A RESCUED SLOTH BEAR CUB

(Melursus ursinus)

Arun A Sha, Kajal Kumar Jadav, S Ilayaraja and Rajeshwari

Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh.

ABSTRACT:

One-month-old female sloth bear cub was rescued by Uttar Pradesh Forest Department and was handed over to Agra Bear Rescue Facility, Wildlife SOS. The cub was kept at the cub rearing center of the facility. After three days the cub exhibited the symptoms of dullness, passed green color stool and turbid urine. The stool and urine sample were subjected to culture examination and both samples showed the presence of E.coli, Staphylococcus, Salmonella, Shigella, and Klebsiella, but the urine sample culture showed soft and glistening white colonies of Candida species in Sabouraud Dextrose Agar. The colonies were stained with Gram staining and were examined under the microscope; the yeast cell with germ tube was noticed. The ABST in Muller Hinton Agar showed highly sensitive for Chloramphenicol and Fluconazole. The first line of treatment was started with Chloramphenicol but no response. And the second line of treatment was started with Fluconazole after confirming candidiasis by germ tube formation test. The cub started showing the improvement from the very next day and completely recovered after 7 days and became active, passed normal urine and stool.

Art – 06. CANINE TOOTH EXTRACTION IN A RESCUED CAPTIVE SLOTH BEAR
(*Melursus ursinus*)

S Ilayaraja, Arun A Sha and Kajal Kumar Jadav

Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham,
Agra, Uttar Pradesh.

ABSTRACT:

An 8 year old, female dancing sloth bear, weighing approximately 120 kgs was rescued by Forest Department, Uttar Pradesh and rehabilitated in Agra Bear Rescue Facility. The bear was kept in the quarantine as per Central Zoo Authority protocol. During the quarantine, the bear exhibited the symptoms of inappetence, halitosis, excessive salivation and severe gingivitis. For close examination, the bear was immobilized with Xylazine and Ketamine with an antimuscarinic spasmolytic Atropine sulfate. The oral examination revealed a maggot wound on the upper right canine with severe gingivitis and stomatitis. The maggots were removed after inserting turpentine impregnated gauze and the wound was debrided. The loose and badly broken canine tooth was extracted with the help of tooth extraction forceps and luxator. The sharp edges of the dental cavity were smoothened with the help of dental bur. The dental cavity and the gums were cleaned and irrigated with Chlorhexidine and sutured. Post-operatively the bear was given Benzathine penicillin intramuscular injection once in a day for 5 days along with injections Meloxicam and Belamyl. The bear started taking food from the second day after treatment and completely recovered after the fifth day of the treatment.

Art – 07. ACUTE RENAL FAILURE IN A SIBERIAN TIGER (*Panthera tigris tigris*)

A Sha Arun¹, G K Vishwanath² and Rupa Satish³

¹ Wildlife Veterinary Officer, Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Bannerghatta, Bangalore, Karnataka, India;

² Assistant Director, Veterinary Service, Bangalore, Karnataka, India;

³ Veterinarian, Bannerghatta Biological Park, Bannerghatta, Bangalore, Karnataka.

ABSTRACT:

We describe here a case of an acute onset of renal failure in an 18-year-old male Siberian tiger. Prior to diagnosis through serology, the only clinical sign witnessed was a drastic reduction in food intake. There was no change in water intake for the first three days after presentation of this clinical sign. Serum chemistry profiling performed during this period showed elevated blood urea nitrogen and creatinine levels. At the time of sampling, the tiger appeared physically healthy (determined by body temperature, hydration, heart/respiration rate, and a detailed external physical examination) and had normal behavioral responses. Daily supportive fluid therapy was administered to the animal. However, continuous lack of feed intake for over 20 days led to signs of wasting, sunken eyeballs, emaciation and appearance of a rough fur coat. Feces were scanty, hard and dark. In addition to presenting a detailed clinical picture, we discuss renal physiology in the Siberian tiger in context and veterinary therapy options for managing cases of renal failure. We also place this case in perspective to incidences of renal failures in other felids with particular attention to etiology, clinical signs, and diagnosis of renal diseases.

Art - 08. MANAGEMENT OF GUNSHOT WOUND IN A SLOTH BEAR (*Melursus ursinus*) - A CASE REPORT

A Sha Arun¹, M Jai Anandh¹, Alok Das², R K Samantaray² and Indramani Nath³

¹Wildlife SOS, Bannerghatta Bear Rescue Center, BBP, Bangalore;

²Nandankanan Zoological Park, Bhubaneswar, Orissa;

³Department of Surgery Anesthesiology & Radiology, Orissa Veterinary College.

ABSTRACT:

Gunshot wounds are epidemic in humans, especially in the urban environment. Often these injuries are caused by low-velocity handguns. There are only a few reports in wild animals. Though bullets from low-velocity guns are producing minor injury it may end fatally when the projectiles enter into the vital organs. Gait abnormality may also be encountered by damaging the neurovascular tissue and stability of osseous tissue. Since gunshot injuries are always contaminated, it might promote infection. Lead eluted from these projectiles has the potential to cause periarticular fibrosis and even lead poisoning. Handgun injuries can be managed conservatively but the proper understanding of the fundamentals of wounding mechanism and diagnostic approach will help in the treatment approach. Since low-velocity gunshot wound treatment in wild animal is a rare and special circumstance, the purpose of this article is to view an approach to the care of gunshot wound in a wild species. Sloth bears are endangered species and are protected under Schedule 1 of the Indian Wildlife (Protection) Act 1972. In addition, no protocol for diagnosis and treatment of a gunshot wound have been reported in sloth bears, we hope that this article will be immensely valuable for the vets engaged in the wildlife conservation activities. Soft tissue wound of hind limb engaged in a sloth bear by a missile was discussed here to reveal the fundamental understanding in the diagnosis and treatment of low-velocity gunshot wound in the sloth bear based on the authors experience in Nandankanan Zoological Park, Orissa, India.

Art - 09. INCIDENCE AND MANAGEMENT OF PERIEPICAL ABSCESS DUE TO CHRONIC INFECTION OF CANINE TEETH IN SLOTH BEARS (*Melursus ursinus*)

Arun A Sha, Kajal Kumar Jadav, Ilayaraja S

Agra Bear Rescue Facility, Wildlife SOS, Sur Sarovar Bird Sanctuary, Keetham,
Agra-282 001 (UP)

ABSTRACT:

We report here the clinical cases of periapical abscess in rescued dancing sloth bears and its successful medical and surgical intervention. The adult male sloth bears (Chotu and Tikku) at the Agra Bear Rescue Facility were found to exhibit symptoms of difficulty in consuming food and chewing, likes to drink only water, swelling on the ventral aspect of lower jaw; sero-sanguineous fluid draining from that, halitosis, salivation, dull and depressed. After anesthetizing the bear with Xylazine and Ketamine and maintained with halothane gas anesthetic, we observed that the lower (right) canine was broken and foul smelling with decayed necrotic materials lodged inside the infected root canal. The periapical abscess was confirmed after radiography of the affected canine by using occlusal oral x-ray film size 4. It was decided to remove the affected canine by open (surgical) extraction technique. The traumatic condition caused by the Kalandars because they break the canines brutally in order to avoid biting while they make the bears perform is considered as the etiology for this particular case.

**Art – 10. AURICULAR HAEMATOMA IN RESCUED DANCING SLOTH BEAR
(*Melursus ursinus*)**

Kajal Kumar Jadav, Arun A Sha and S Ilayaraja
Agra Bear Rescue Facility, Wildlife SOS, Sur Sarovar Bird Sanctuary, Keetham,
Agra-282001 (UP)

ABSTRACT:

This communication reports the cases of auricular hematoma in two captive Sloth bears (*Melursus ursinus*) at Agra Bear Rescue Facility and their successful surgical intervention. Sloth bears have moderately sized erected ears covered with thick coat of hair around the pinna. So, detailed physical examinations were performed after anesthetizing the bears. Surgical intervention was undertaken with the objective to eliminate the source of irritation, drain the hematoma and to maintain apposition of the skin and the conchal cartilage for sufficient time to prevent recurrence along with other medications. Healing was uneventful and complete healing was attained within two weeks in both the bears.

**Art – 11. HEMATOLOGY AND SERUM CHEMISTRY OF SLOTH BEARS
(*Melursus ursinus ursinus*) FROM TWO LOCATIONS IN THE INDIAN PENINSULA**

**Attur Arun Shanmugam¹, Kajal Kumar Jadav², Selvaraj
Ilayaraja² and Vimal Selvaraj³**

¹Bannerghatta Bear Rescue Center, BB Park, Bannerghatta, Bangalore

²Center for the Conservation and Rehabilitation of Bears, Agra Bear Rescue Facility

³Baker Institute for Animal Health, College of Veterinary Medicine, Cornell University,
USA

ABSTRACT:

Standard hematologic and serum chemistry parameters were determined from 122 sloth bears (*Melursus ursinus ursinus*) at the Sur Sarovar Bird Sanctuary, Uttar Pradesh, India (77°45'E;27°0'N), and the Bannerghatta National Park, Karnataka, India (12°48'N;77°34'E) from March 2003 to July 2003. These two protected areas within the habitat range for sloth bears have distinct climatic conditions; this provided an opportunity to not only study physiological blood parameters in native environments but also compare the effect of overall climatic conditions on these parameters. We primarily analyzed the influence of age, sex, season and body weight on the different parameters. Cubs (<1 year) combined from both locations had a lower erythrocyte count and a higher leukocyte count compared to adult/SL adult bears (>1 year). A sexually dimorphic difference in leukocyte count was identified in adult sub-ad bears where females had higher counts than males. This difference was a result of higher number of circulating neutrophils in female bears. Platelet counts were also higher in females compared males. Female bears also had higher creatinine levels compared to males and ALP was higher males compared to females; however, when compared within each location, these were true only for 1 bear at Sur Sarovar. On comparing the different seasons, leukocyte counts were higher in Winter compared to summer and Monsoon, again due to a higher neutrophil count. Seasonal differences were not detected for any of the serum chemistry parameters. When analyzed based on location, erythrocyte and leukocyte counts were higher in adult/sub-adult bears at Bannerghatta which was at a high elevation with fairly steady temperature and humidity recordings throughout the year compared to Sur Sarovar that had hotter arid

summers and colder winters. Mean ESRs were significantly delayed in Sur Sarovar compared to Bannerghatta. Serum creatinine levels were higher in Bannerghatta camp than to Sur Sarovar. However, the individual ratios of urea to creatinine were not different between the two locations and a seasonal variation was not observed indicating continual food availability and a steady biochemical state unlike the hibernating bears. In this study we have obtained mean values to serve as a reference for this species in their native habitat. This report will be useful to develop and evaluate health profiles of sloth bears under various ecological conditions.

Keywords: sloth bear, blood, hematology, serum chemistry, serology,
Melursus ursinus, India

Art – 12. HAND RAISING CAPTIVE SLOTH BEAR CUBS

Arun A Sha¹, Kajal Kumar Jadav², Selvaraj Ilayaraja² and Vimal Selvaraj³

¹Bannerghatta Bear Rescue Center, BB Park, Bannerghatta, Bangalore

²Center for the Conservation and Rehabilitation of Bears, Agra Bear Rescue Facility

³Baker Institute for Animal Health, College of Veterinary Medicine, Cornell University.

ABSTRACT:

Through Wildlife SOS (WSOS) anti-poaching busts, WSOS has rescued many cubs before they can be sold on the black market. Once they are rescued, they are shipped to one of the WSOS sloth bear sanctuaries to be raised. WSOS has developed technique that WSOS has had success with over the last five years. WSOS has successfully raised six cubs in 2003, eight in 2004, nine in 2005, four in 2006 and twelve in 2007 for a total of 39 cubs. Different feeding schedules and procedures were used for different ages and different body weights of the cubs. Antibiotic and anti-fungal additives were mixed in their feed. WSOS has had great success in raising happy healthy sloth bears through this method. This same method may have application for motherless sloth bear cubs which end up in zoos or other facilities.

BIOGRAPHICAL NOTES

Arun A Sha is currently the head veterinarian for Wildlife SOS at the Bannerghatta Sloth Bear Rescue Center. He has many years of experience with treating rescued "dancing bears" and with providing on-going enrichment for the bears at four different sanctuaries. He oversees the rearing of sloth bear cubs that are seized from anti-poaching raids. Arun Sha is also involved with treating and re-releasing injured moon bears in the foothills of northern India and works closely with forest officials on bear conservation issues.

For details of projects and publications

1. Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Bannerghatta, Bangalore- 560 058, Karnataka, India.
2. Center for the Conservation and Rehabilitation of Bears, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra - 282 007, Uttar Pradesh, India.

Art – 13. HEALTH ISSUES IN CAPTIVE SLOTH BEARS IN INDIAN SANCTUARIES: GIGANTIFORM CEMENTOMA AND UNILATERAL SCROTAL HERNIAS

Arun A Sha¹, Kajal Kumar Jadav², Selvaraj Illayaraja² and Vimal Selvaraj³

¹Bannerghatta Bear Rescue Center, BB Park, Bannerghatta, Bangalore

²Center for the Conservation and Rehabilitation of Bears, Agra Bear Rescue Facility

³Baker Institute for Animal Health, College of Veterinary Medicine, Cornell University

ABSTRACT:

Very few cases of Gigantiform cementoma, a rare lesion found in the jaw, have been encountered in bears. Cementoma occurs as a benign fibro-cemento-osseous lesion around the apices of vital teeth causes severe dis-figurement of the jaws. A cementoma was found in a wild-caught rescued dancing sloth bear (*Melursus ursinus*) in Agra Bear Rescue facility, Agra, India. The upper right canine was extracted using a surgical technique. A mucoperiosteal flap was raised from the medial aspect of right upper canine to distal second premolar. Then the buccal bone was removed. The histopathological examination of the incised mass revealed the hyperplastic squamous lining of the epithelium had chronic inflammation. Scrotal hernias are indirect hernias that result from a defect in the vaginal ring, due to either congenital or an acquired cause, allowing abdominal contents to protrude into the vaginal process along-side the contents of the spermatic cord. In this case, one uncastrated male rescued dancing sloth bear approximately aged 10 years showed the symptoms of sudden vomition and lethargy. The bear didn't sit but would put his head and fore quarter down on the ground instead. The detailed physical examination revealed unilateral swelling of the right scrotal sac. During examination it was observed that the cord-like portion extended from the inguinal ring to the caudal aspect of the scrotum, clearly indicating a unilateral scrotal hernia. Before surgical reduction of a hernia could be accomplished, the bear collapsed on the table. A post-mortem confirmed that 37cms of the necrosed large intestine loop were herniated inside the scrotal sac. Except for the severe scrotal inflammation, the other vital organs showed no lesions. The death was attributed to an acute septicemia and the etiology of a hernia remained unknown.

BIOGRAPHICAL NOTES

Arun is currently the head veterinarian for Wildlife SOS at the Bannerghatta Sloth Bear Rescue Center. Karnataka, India.

Art - 14. TAENIID INFESTATION IN RESCUED SLOTH BEARS (*Melursus ursinus*)

A Sha Arun*, P.R. Prathiush, B.R.Harish, Swati Bamne, Rishi Kesavan, Placid E D'Souza[#] and C. Renuka Prasad

*Wildlife SOS, Bannerghatta Biological Park, Bangalore.

Wild Animal Disease Diagnostic Laboratory, IAH&VB, KVAFSU, Bangalore-560024,

Professor cum Director, CAS, Department of Parasitology, Veterinary College, Bangalore.

ABSTRACT:

Sloth bear (*Melursus ursinus*) belonging to the family Ursidae and is endemic to the Indian subcontinent (Garshelis et al.,1999) is also protected under schedule I of the Indian Wildlife Protection Act,1972 and considered vulnerable by the International Union for the Conservation of Nature and Natural Resources (IUCN). This article describes the prevalence of Taeniosis in rescued dancing sloth bears in captivity. Thirty-six fecal samples from rescued sloth bear belonging to the Bannerghatta Bear Rescue Centre were brought to the Wild Animal Disease Diagnostic Laboratory, IAH&VB, Bannerghatta, Bangalore for examination of internal parasitic load. Fecal samples were processed by Sedimentation and Flotation techniques. Sixteen samples on Sedimentation and Twenty samples on Floatation were found to be positive for Taeniid eggs. Treatment was given with combination of Praziquantel, Pyrantel pamoate and Fenbendazole orally as tablet form. Subsequently the bears started excreting gravid segments of adult live worm in feces, and the same has been identified morphologically as *Taenia hydatigenia* species. This is in conclusion with the earlier reports of *Taenia hydatigenia* in American Black Bear and *Taenia krabbei* in both American Black and Brown Bear (Rogers L L & Rojers S M.,1976).

Art – 15. CASTRATION OF RESCUED SLOTH BEARS (*Melursus ursinus*)

Arun A Sha¹, M. Jai Anandh¹ and Dilip Kumar Das*

¹Wildlife Veterinary Officer, Bannerghatta Bear Rescue Center, BBP, Bangalore

*Veterinarian, "Bannerghatta Biological Park, Bangalore.

Introduction:

Castration in domestic animals particularly dogs and cats are very commonly practiced but the same in wild animals are considered very important and rarely reported. Castration is practiced in zoological setups, especially in deer, antelopes, lions, and monkeys which breed prolifically in captivity. Similarly rescue centers housing bears, hybrid lions face the problem of over population. This can be overcome by taking measures to control their breeding. Though immune contraceptive vaccination has been used for genuine reasons in wildlife, presently surgical procedure is the most practical method used to control the reproduction as well as undesirable sexual behavior in the above-referred species. In pets, castration is indicated for reproduction control, to modify the behavioral patterns and also for some of the disease conditions. Inter-male aggression and infighting are observed as a common problem in sloth bears. Boothe (1994) stated that behavioral problems can be overcome by castration. Ledecky *et al.* (2003) practiced castration in brown bears in Slovakian Kavecany-Kosice zoo.

By this study, we are attempting to standardize the castration technique in sloth bears. This is to control the behavioral problems and to prevent the population as the National Zoo policy of India is against captive breeding in rescued wild animals.

Materials and Methods:

The surgical operation to sterilize the male sloth bears was conducted in Bannerghatta Biological Park, Bangalore, Karnataka. For this, 8 adult male sloth bears were selected that have the habit of infighting. The descending of testicles into the scrotum was normal in all bears. They were determined to be healthy by physical examination, complete blood count, and serum chemistry profile. Animals were fasted 12 hours before the anesthesia. All animals were anesthetized with Xylazine (Ilium xylazil-100, Helpo health products, Pune) and Ketamine (Rekita, Resurgence, India) at the dose rate of 2mg/kg and 5 mg/kg respectively. Atropine

(Atropine sulphate, Morvel laboratories, Mehsane) was used @ 0.025mg/kg as a preanesthetic agent. The drugs were injected at biceps femoris muscle by blowpipe technique.

The testicles were removed by open pre-scrotal technique. The animal was positioned on its dorsal recumbency. The hair surrounding the scrotal sac and thigh was shaved and the site was scrubbed with iodophor compound. Surgical area was draped excluding the scrotum. Pressure was applied to advance and oppose on testicle towards pre-scrotal skin. Skin incision was made along the median raphe. The length of the incision is around 4cm deepening through the spermatic fascia and tunica albuginea exposed testicular parenchyma. Then the testicles were separated from the tunica vaginalis by applying traction. Ligations were applied separately on vascular cord and on ductus deferens, encircling ligature were applied through spermatic cord by using 2-0 absorbable suture (Chromic catgut). Ductus deferens and vascular cord were transected above the ligature. The cord was replaced in the tunic. Then simple continuous suture was applied to close the tunic, chromic catgut 2-0 was used. Skin was opposed and closed by applying simple interrupted suture on subcuticular and on dermal tissue.

Post-operative care

All the castrated animals were kept inside the den for 5 days. During this period Enrofloxacin (Bayrocin, Bayer) tablets and Meloxicam bolus (Melonex, Intas) was given with the food. The suture site was sprayed with weak iodine solution after animal was restrained in the squeeze cage. The floor of the den was dusted with turmeric powder. After 5 days, animals were allowed to free ranging area. Except two animals, suture site was healed normally in all the animals after 5 days. In the other two one has mild inflammatory reaction, which took 2 more days to heal. Another one developed postoperative hematoma and was treated with heparin (Thrombophob, Cadila health care limited) topically; seratiopeptidase tablets (Bidanzen, Biddle sawyer) and got cured in a week.

Discussion

Sterilization of animals remains the most practical method available to control the overpopulation of pets. There are lot many non-surgical contraceptive measures are available for the pet animals but not without side effects (Knol and Egberink- Alink). Though use of anti-fertility vaccines is becoming popular even in wild animals (Grandy and Rutberg, 2002; Bertschinger *et al.* 2001), but their consistency is yet to be proved in the field condition. Over population will be a definite problem in the rescue centers dealing with large species like sloth bears. This can be easily overcome by simple separation of the sexes. But inter male aggression is a common problem in sloth bears. More over sloth bears are solitary animals. However, in rescue centers it is unavoidable to keep more number of animals in a comparatively small territorial area. In males testosterone was reported as a reason for aggression (Katherine Simpson, 2001; Singnoret, 1976). Leydig cells in the testis secreted testosterone; hence removal of testicles will bring down the level of testosterone (Katherine Simpson, 2001; Joon- Ki Kim *et al.*, 2004). Several authors (Knol and Egberink-Alink, 1989; Nielson *et al.*, 1997; Katherine Simpson, 2001) stated that castration brings down the male aggression.

Since sloth bears were considered vulnerable by IUCN providing proper care to them is very important. By reducing the aggression of sloth bears by castration, will definitely facilitate the management and health care aspects of rescue centers taking care of this endangered Schedule I species. Though castration is a surgical intervention, strict adherence to sound surgical technique and aseptically measures will reduce the complication (Howe, 2006). In this study pre-approach of canine castration described by Therasa fossum (1997) was followed successfully. There is no specific anesthetic method for castration (Joon-ki Kim *et al.* 2004), we followed the anesthetic regime of Page (1986) with satisfactory result. Ledecky *et al.*(2003) performed castration in brown bears by on scrotal method. But by this study we standardize the procedure of castration in sloth bear successfully with less complication. Further study is needed to observe the changes in their behavior after castration.

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Art – 16. COMPARATIVE GROWTH RATES IN HAND & MOTHER RAISED SLOTH BEAR (*Melursus ursinus*) CUBS

Arun A Sha, Kajal Kumar Jadav & Ilayaraja S.

Wildlife Veterinary Officers, Wildlife SOS, Bear Rescue Centre, Bannerghatta Biological Park, Bangalore, Karnataka (India)
Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Agra, U.P. (India)

ABSTRACT:

This study includes two groups of Sloth bear (*Melursus ursinus*) cubs in which five rescued cubs were hand-reared with the combination of kitten milk replacer and infant milk substitute (Lactogen) and two cubs were born in captivity and raised by their own mother bear. Since there is no published data for the milk composition of the sloth bear, the study was initiated. Body weight of both cub groups has been taken in regular interval once in 10 days and plotted in graphical form. The graphical representation indicated that there is not much variation between the hand-reared cubs and the mother-reared cubs. Then the milk supplement and the feeding schedule has been made as a protocol which was applied successfully to hand rear another 18 sloth bear cubs which were rescued in the following two years without any mortality. In fact, the body weight of the hand-reared young ones is more than the mother-reared young ones. Still, there is a need for further data and studied and studies in hand-reared young ones up to five years until they attain maturity.

INTRODUCTION:

Sloth bears (*Melursus ursinus*) are endemic to the Indian sub-continent and reproductive studies are not yet established. The cubs were sufficiently strong to grip or be carried on the mother's back to and from her feeding grounds. Cubs live with her for 2 to 3 years till they attain maturity. When sloth bears are poached from the forest in order to be trained as dancing bears, they are extremely young (less than 2 months of their age). Many of these cubs die in the first few months after their separation from their mother. Once after rescued from the poachers, they have to be hand-reared in captivity. Wildlife SOS has been successful in hand rearing the rescued sloth bear cubs (six cubs in 2003, eight in 2004, nine in 2005, four in 2006, cubs and twelve in 2007 for a total of 39 cubs).

The present study was aimed to establish ideal milk substitute and feeding schedule for sloth bear cubs in captivity. And also to establish an ideal protocol for the sloth bear cub rearing in captivity like Handling, Environment, Hygiene, Enrichments, Health-check, Medications and precaution.

Materials and Methods:

Five hand reared Sloth bear cubs were fed with human baby milk substitute (Lactogen I, II & III) supplemented with kitten milk replacer mixed in specific proportions six times in 24 hours for the first 20 days. Antibiotics and anti-fungal additives were mixed in their feed. Vitamin and minerals were given to the cubs after feeding once in a day. These cubs were individually weighed once in 10 day's intervals.

Captive-born cubs: An unusual incident of birth of two sloth bear cubs was encountered in captivity which facilitated the comparison between the hand and mother reared cubs based on their body weight taken in a regular interval once in 10 days. The mother and captive born cubs were isolated and the cubs were nourished exclusively by their mother. Special feeding pattern was followed for the lactating mother. The captive born young ones were separated from their mother by giving little honey with minimum stress and body weight were taken quickly by using an electronic weighing balance. Hand reared cubs were weighed similarly.

Table 1 a: Scaling of weights (kg) of hand raised sloth bear cubs

Date/ Cubs	05.12.07 (1Monthold)	15.12.07	25.12.07	04.01.08	15.01.08	07.02.08	20.02.08	02.04.08
Cub 1 Chamundi	1.20	1.4	2.2	3.0	4.5	8.0	8.5	10.5
Cub 2 Durga	1.5	1.66	2.33	3.0	5.5	10	10.5	13
Cub 3 Kusha	1.40	1.57	2.38	3.2	4.0	6.0	6.75	9.4
Cub 4 Lava	1.65	1.78	2.4	3.1	4.0	6.3	6.75	9.5
Cub 5 Aruni	1.00	1.13	2.4	3.6	4.0	5.2	7.15	9.55

Table 1 b: Scaling of weights (kg) of mother raised sloth bear cubs

Table 1 (1m.old)	05.12.07	15.12.07	25.12.07	04.01.08	15.01.08	07.02.08	20.02.08	02.04.08
Cub A	2.200	2.700	3.400	4.100	5.200	6.200	8.150	16.200
Cub B	2.300	2.850	3.460	4.250	5.300	6.300	8.350	16.600

Table 2: Milk feeding schedule prescribed during first to third week of cubs

Name	Chamundi	Durga	Kusha	Lava	Aruni
1st Week Fed/Day	770 ml	280 ml	740 ml	590 ml	770 ml
2nd Week Fed/ Day	840 ml	850 ml	620 ml	300 ml	840 ml
3rd Week Fed/ Day	870 ml	860 ml	680 ml	400 ml	880 ml

Proper sanitary measures were taken to prevent any contamination from being carried in to the cub's room from enclosures of adult bears. Only the vet and one keeper were allowed to enter the cubs room during specific hours. Foot baths were placed in front of the room. Persons entering the cubs room had to change their clothing in the changing room. All the feeding utensils were sterilized both chemically (Chlorine tablets) and with steam sterilization.

Discussion & Conclusion:

During the period of 60 days, a keeper acts as a surrogate mother and takes care of the cubs. Before every feeding, each cub was stimulated for urination and defecation by stroking a soft cloth on the lower abdomen and genitals. As the cubs were growing, specific changes were made in their diet and enrichment tools were provided, temperature of 37 degree Celsius and humidity of 45 to 55 percent were maintained inside the dark cave environment. A CCTV camera was installed to observe the cubs from a distance. Strict husbandry practices were followed for the cub rearing section. The weight gain in every week was

monitored and recorded. Different feeding schedules and procedure were applied for different age groups and body weight cubs. Human baby milk (Lactogen I&II) supplemented with Soya protein and kitten milk powder was mixed in specific proportions to feed the cubs six times in 24 hours for the first 20 days. Antibiotic, antifungal additives were mixed in their feed. Multi Vitamin drops were given orally to the cubs after feeding.

The weight gain in every week was monitored and recorded. As the cubs were growing, specific changes were made in their diet and enrichment tools were provided. Clinical conditions like Candidiasis, mesenteric abscess, pyloric stenosis, leptospirosis were encountered during the rearing of the cubs.

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Art – 17. HEMATOLOGY OF SLOTH BEARS (*Melursus ursinus ursinus*) FROM TWO LOCATIONS IN INDIA

Arun Attur Shanmugam¹ Jadav Kajal Kumar² Illayaraja Selvaraj² and Vimal Selvaraj³

¹Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Wildlife SOS, Bannerghatta, Bangalore 560 083, Karnataka, India;

²Center for the Conservation and Rehabilitation of Bears, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra 282 007, Uttar Pradesh, India;

³Baker Institute for Animal Health, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853, US

ABSTRACT:

Standard hematology parameters were determined for 122 sloth bears (*Melursus ursinus ursinus*) at the Sur Sarovar Bird Sanctuary, Uttar Pradesh, India (27°0'N;77°45'E), and the Bannerghatta Biological Park, Karnataka, India (12°48'N; 77°34'E) from March 2003 to July 2006. These two native sloth bear habitats have different climatic conditions and provided an opportunity to examine the effect of climate on the physiologic hematology values of these bears. We primarily analyzed the influence of age, sex, season, and body weight on the different hematology parameters. Several values were significantly different in sloth bear cubs (>1yr) when compared to adult and sub-adult bears (>1yr). The Cubs had a lower erythrocyte count, hemoglobin concentration, packed cell volume (PCV), and mean cell hemoglobin (MCV) values when compared to adult and sub adult bears. The cubs also had higher leukocyte counts, due to higher circulating neutrophils, as compared to adult and sub adult bears. Within sub adult and adult bears, we also identified a sexually di-morphic difference in leukocyte count in adult and sub adult bears, wherein female bears had higher counts than males. This difference was the result of a significantly higher number of circulating neutrophils in female bears. Platelet counts were also higher in females as compared to males. On comparing different seasons, leukocyte counts were higher in winter as compared to the summer and monsoon seasons. When compared based on location, erythrocyte counts were higher in sub adult and adult bears at Bannerghatta, which was at a higher altitude than Sur Sarovar. Within sub adult and adult bears, we did not find any significant influence of age or body weight on the different hematologic parameters.

In this study, we have obtained mean hematologic values for sloth bears in their native habitat to serve as a reference for this species. This report will be useful to develop and evaluate health profiles of sloth bears under various ecological conditions.

Keywords: Blood, hematology, India, *Melursus ursinus ursinus*, sloth bear.

Hematology, essential for assessing health in both captive and wild animal populations, has been studied for several species in the bear family (Ursidae). Most of these studies have been done for American black bears (*Ursus americanus*; Svhila et al., 1955; Youatt and Erickson, 1958; Hellgren et al., 1993), American brown bears (grizzly; *Ursus arctos horribilis*; Cattet et al., 2003a; 2003b) and European brown bears (*Ursus arctos arctos*; Seal et al., 1967; Kusak et al., 2005). Factors influencing the hematologic parameters in some of these species have also been studied based on nutritional condition (Gau and Case, 1999), seasonal patterns of metabolism (Erickson and Youatt, 1961; DelGiudice et al., 1991; Hissa et al., 1994; Kusak et al., 2005), and the effect of immobilizing drugs (Bush et al., 1980; Cattet et al., 2003b; Kusak et al., 2005). However, there have been no defined studies evaluating hematologic values for the sloth bear (*Melursus ursinus*).

Sloth bears inhabit the tropical and subtropical regions of the Indian subcontinent and are distributed from the foothills of the Himalayas to the southern end of the Western Ghats mountain range in India, as well as in the island of Sri Lanka (Prater, 1965). In these regions, two subspecies are present, *Melursus ursinus ursinus* distributed across the Indian peninsula, and the short haired and relatively smaller *Melursus ursinus inornatus* seen only in Sri Lanka (Pocock 1933). Around 5-7 million yr ago, the ancestor of sloth bears was the first to diverge from the sun (*Helarctos malayanus*), American black, Asiatic black (*Ursus thibetanus*), brown, and polar (*Ursus maritimus*) bears in the ursine phylogenetic tree (Zhang and Ryder, 1993, 1994; Talbot and Shields, 1996; Yu et al., 2004). Ursavus, the ancestral taxon, was strictly carnivorous (Martin, 1989), and phylogenetic analyses suggest that the extant sloth bears arose by rapid radiation events leading to a divergence that transformed a generalized carnivore to an ecomorph (Waits et al., 1999).

Despite long periods of evolution- by separation, sloth bears have retained their carnivore morphology but have developed unique physiologic adaptations to live in tropical/subtropic climes, with substantial reliance on frugivory (feeding on fruits) and myrmecophagy (feeding on ants and termites) (Pocock, 1933; Laurie and Seidensticker, 1977; Gokula *et al.*, 1995; Bargali *et al.*, 2004). Earlier studies on bear ecology have accurately predicted this development to be due to competitive pressure and temporal patterning of resource availability in the habitat (Jaffeson, 1975; Laurie and Seidensticker, 1977). As a result, these medium-sized bears, in contrast to other ursids, have developed several characteristics common to other myrmecophagous mammals. These characteristics include a more nocturnal activity pattern (Sunquist, 1982; Yoganand *et al.*, 2005), extended parental behavior (Laurie and Seidensticker, 1977), and smaller home ranges (Sunquist, 1982; Joshi *et al.*, 1995). Due to such adaptations, sloth bears have metabolic differences compared to other species of bears. They have been shown to have an overall lower metabolic rate compared to brown and polar bears, and torpor (winter sleep) is unheard of in sloth bears (McNab, 1992). One study during the second half of the twentieth century estimated approximately 7,600 sloth bears occupying the Indian Peninsula (Jaffeson, 1975). Although more continuous throughout this range at that time, habitat loss and fragmentation due to expanding human habitation and agriculture have destabilized this population that now occurs only in isolated pockets (Garshelis *et al.*, 1999). Further deterioration of these habitat pockets is evidenced by an increase in the number of human-bear conflicts in the encroached buffer regions (Rajpurohit and Krausman, 2000; Bargali *et al.*, 2005). A recent report detecting the unusual presence of sloth bear hair in tiger scat (Biswas and Sankar, 2002) suggests an imbalance in the food chain due to scarcity of prey-base for tigers, underscoring the pressure on the ecosystem as a whole in these areas (Akhtar *et al.*, 2004, 2006). Beyond these issues, the use of bear gall bladder in traditional medicine and illegal trade of cubs for training and exhibition as "dancing bears" have greatly accelerated their population decline. Sloth bears were classified as vulnerable in the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species in 1990 (IUCN, 1990) and are protected under Schedule I of The Indian Wildlife (Protection) Act (IWPA), 1972 (IWPA, 1972). Although a recent survey has not been conducted, studies on some of

these disturbed and fragmented ranges showed inadequate resources to support self-sustaining sloth bear populations (Akhtar *et al.*, 2004; Yoganand *et al.*, 2005). Despite the need for conservation and rescue efforts for sloth bears, limited information is available regarding sloth bear biology, including physiologic reference data. The dissimilarities in sloth bear physiology, when compared to other ursids evident from their morphologic appearance (Pocock, 1933), feeding behavior (Gokula *et al.*, 1995; Joshi *et al.*, 1997), and physiologic state (McNab, 1992), warrants studies for better understanding and improved veterinary care and management of sloth bear populations. The only published material showing some sloth bear hematology values was in relation to the effect of dissociative anesthetics on bears; this study included sloth bears at the National Zoological Park, Smithsonian Institution, Washington, D.C. (Bush *et al.*, 1980). Therefore, we carried out this study to: 1) determine hematology reference values for sloth bears at two locations within their native habitat; 2) determine if there were any differences due to age, sex, season, body weight, and location; and 3) compare values of these parameters to existing data on other ursids. Wild, orphaned, and rescued and rehabilitated sloth bears, under free ranging or semi captive conditions, were utilized for this study: 84 bears at the Center for the Conservation and Rehabilitation of Bears, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh, India (27°0'N; 77°45'E) and 38 bears at the Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Bannerghatta, Bangalore, Kamataka, India (12°48'N; 77°34'E). Both these locations are within the recorded habitat range for this species. At both facilities, bears were maintained on an enriched native diet of local seasonal fruits and grains. Age of the bears was obtained from animal records. Ages ranged from 6 months to 20 yr, and for the purposes of this study, bears were classified as cubs (\leq yr) or adults and sub adults (>1 yr). Cubs were analyzed separately and were not included in the general comparisons elaborated below. Sub adult (>1 yr to ≤ 3 yr) and adult (>3 yr) bears were not significantly different in body weight and were therefore evaluated together for all analysis except for those based on age. Rescued bears used for this study were introduced into the facility at least 8 months before sampling. All bears sampled appeared physically healthy, with normal behavioral responses, and were clinically healthy during examination at the time of sampling (as determined by body temperature, hydration, heart/respiration rate, and a detailed external physical examination).

Further- more, all bears utilized in this study were also pre-tested for exposure to diseases enzootic in these regions and for intestinal parasites; they were mostly parasite-free intestinally and were found negative for hepatitis B, rabies, tuberculosis, and leptospirosis. Blood samples were collected throughout the year from March 2003 to July 2006, thus covering the three major seasons in India; summer (1 April through 31 May), monsoon (1 June through 31 October), and winter (1 November through 31 March). Each bear was sampled only once for this study. Bears were immobilized using a ketamine-xylazine combination (Page, 1986); ketamine hydrochloride (5 mg/kg body weight; Ketamil®, Troy Laboratories Pty Ltd., Smithfield, NSW, Australia) and xylazine hydro- chloride (Xylazil®, 2 mg/kg body weight; Troy Laboratories Pty Ltd.). A premedication of atropine sulfate (Atrosite®, 0.025 mg/kg body weight; Troy Laboratories Pty Ltd.) was administered approximately 30 min prior to immobilization. These drugs were administered using a blowgun on unsuspecting bears, thus causing minimal excitation during the procedure. Blood was collected from the jugular vein within 10 min after immobilization using a 20-gauge sterile hypodermic needle in Vacutainers (Becton Dickinson, Franklin Lakes, New Jersey, USA), with and without ethylene diamine tetraacetic acid for hematology and serology, respectively. Samples were immediately stored on cool packs at 4-8 C and transported from both field locations to the laboratory at the Agra Bear Rescue Facility (Keetham, Agra). Standard hematology parameters such as erythrocyte count, leukocyte count, platelet count, hemoglobin, packed cell volume (PCV), erythrocyte sedimentation rate (ESR), mean cell volume (MCV), mean cell hemoglobin (MCH), and mean cell hemoglobin concentration (MCHC) were analyzed for each sample within 24hr of collection using a hematology analyzer (Medsource Ozone Biomedicals Pvt. Ltd., Faridabad, India). Blood smears were made and stained using Wright- Giemsa stain. Differential counts evaluating the percentage of each cell type in the smear were done under oil immersion using a light microscope. Absolute differential leukocyte counts were determined by multiplying relative percentages with the total leukocyte count. Data from sub adult and adult bears were categorized and analyzed based on: 1) sex (male versus female); 2) location (Sur Sarovar versus Bannerghatta); and 3) season (summer, monsoon and winter). Sloth bear cubs were analyzed separately, and comparisons were made to the grouped sub adult and adult bears. The sex ratios at Sur Sarovar and Bannerghatta

were taken into consideration while comparing the two locations. Statistical analyses were performed using JMP 6.0.2 software (SAS Institute, Cary, North Carolina, USA). The distribution for each variable was evaluated before and after categorization. Each distribution was tested for normality using the normal probability plot and the Shapiro-Wilk statistic. Outliers were only a rare occurrence and were not removed from any of the analyses. Basic statistics including mean, median, standard deviation, and 25% and 75% quartiles were determined for each variable. For normally distributed variables, a 95% confidence interval for means was calculated. Homogeneity of variance for each variable was tested using the Levene's test for equality of variances. For variables satisfying the assumptions of normality and homogeneity of variance, comparisons were made either using a 2- sample t-test (two groups) or by using a one-way analysis of variance (ANOVA; >two groups). If significant P values occurred in the ANOVA, specific between-group differences were evaluated using the post hoc Tukey-Kramer test. For data violating the assumptions of normality and homogeneity of variance, a Kruskal-Wallis one-way ANOVA was performed. Potential effects of age or body weight on the different parameters were also investigated; simple bivariate plots were constructed and the fit for a regression model was tested for each parameter. For all the above statistics, values of $P < 0.05$ were considered significant.

The majority of bears sampled were adults ($n = 100$). Adult and sub-adult ($n = 10$) bears were evaluated together for all comparisons except for age. Bear cubs ($n = 12$) were analyzed separately. The overall sex ratio of adult and sub-adult bears from both Sur Sarovar ($n = 75$) and Bannerghatta ($n = 35$) locations was 1.2 (60 males; 50 females). The sex ratios within each location were 1.5 (45 males; 30 females) at Sur Sarovar and 0.75 (15 males; 20 females) at Bannerghatta. For the sloth bear cubs sampled in this study, the sex ratio was 1:1 (six males; six females). Samplings were randomly distributed during the 3 yr of this study. Analysis of seasonal effects was performed on grouped data for summer ($n = 48$), monsoon ($n = 50$), and winter ($n = 12$). There was a significant difference between the average male and female body weights (males: 93.2 ± 22.0 kg; females: 83.2 ± 22.1 kg; $P = 0.02$). However, the difference between male and female body weight did not reach statistical significance when comparisons were made within the Sur Sarovar &

TABLE 1. Hematology values for sloth bears, *Melursus ursinus ursinus*, combined and categorized based on sex.

Parameters ^a (units)	Bears combined ^b			Adult/sub-adult males ^c			Adult/sub-adult females ^d		
	n	Mean (median)±SD	95% CI or [25- 75% quartiles]	n	Mean (median)±SD	n	Mean (median)±SD	n	Mean (median)±SD
Erythrocytes ($10^{12}/l$)	92	5.7 (5.7)±1.1	5.5-5.9	49	5.5 (5.6)±1.1	44	5.9 (5.9)±1.0		
Leukoocytes ($10^9/l$)	107	12.9 (12.0)±4.0	12.1-13.6	59	12.1 ^{e,f,g} (11.3)±3.7	49	13.8 ^{f,g} (13.2)±4.2		
Neutrophils ($10^9/l$)	107	8.6 (7.6)±3.6	8.0-9.3	59	8.0 ^{f,g} (6.8)±3.7	49	9.5 ^{f,g} (8.9)±3.3		
Lymphocytes ($10^9/l$)	107	2.9 (2.8)±1.3	2.6-3.1	59	2.9 (2.9)±1.0	49	2.9 (2.5)±1.6		
Monocytes ($10^9/l$)	107	0.3 (0.2)±0.2	0.3-0.4	59	0.3 (0.2)±0.2	49	0.3 (0.2)±0.3		
Eosinophils ($10^9/l$)	107	0.9 (0.7)±0.9	0.8-1.1	59	0.9 (0.6)±0.8	49	1.0 (0.8)±0.9		
Basophils ($10^9/l$) ^e	119	0.006 (0.0)±0.03	[0.0-0.0]	59	0.005 (0.0)±0.03	49	0.006 (0.0)±0.04		
Platelets ($10^{11}/l$)	58	4.3 (4.3)±1.3	4.0-4.6	33	4.0 ^{f,g,h} (4.2)±1.2	25	4.7 ^{f,g,h} (4.6)±1.4		
Hemoglobin (gm %)	106	14.5 (14.5)±1.8	14.1-14.8	59	14.4 (14.4)±2.0	48	14.5 (14.6)±1.9		
PCV (%)	106	41.9 (43.9)±11.3	39.7-44.1	59	41.5 (43.5)±12.5	48	42.0 (44.2)±10.2		
ESR (mm, 60 min) ^e	84	30.5 (18.0)±31.8	[8.0-41.8] 91	44	27.0 (17.0)±26.9	41	33.6 (20.0)±36.4		
MCV (fl)	79.4	(79.4)±12.8	76.7-82.1	91	82.6 ^{f,g} (82.5)±13.3	43	75.0 ^{f,g} (76.3)±11.8		
MCH (pg)	25.6	(26.5)±3.1	24.9-26.2	91	26.2 ^{f,g} (27.1)±3.0	43	24.7 ^{f,g} (25.5)±3.3		
MCHC (gm %)	32.1 (33.3)±3.7	31.3-32.9	49	31.9 (33.3)±2.6	43	32.3 (33.3)±4.6			

^a PCV = packed cell volume; ESR = erythrocyte sedimentation rate; MCV = mean cell volume; MCH = mean cell hemoglobin; MCHC = mean cell hemoglobin concentration.

^b Adults/sub-adults combined (mean body weight±SD): 88.7±22.5 kg.

^c Adult/sub-adult males (mean body weight±SD): 93.3±21.9 kg.

^d Adult/sub-adult females (mean body weight±SD): 83.2±22.1 kg.

^e Data for this parameter were not normally distributed.

^f Significantly different from the opposite sex ($P<0.05$).

^g Parameter significantly different from the opposite sex within the Sarovar location ($P<0.05$).

^h Parameter significantly different from the opposite sex within the Bannerghatta location ($P<0.05$).

None of the other differential leukocyte counts were different between male and female bears. Although unexplained, the higher neutrophil counts in female bears appeared to be similar to that reported for humans (Bain and England, 1975). A reciprocal sexually dimorphic difference in neutrophil count has been reported in brown bears, wherein males had a higher neutrophil count compared to females (Kusak *et al.*, 2005). Female sloth bears also had a higher platelet count compared to male bears in this study ($P=0.03$). Similar differences in platelet counts between the sexes have been reported for humans (Bain, 1985). A recent study exploring platelet function in mice has shown that there are also sexually dimorphic functional differences, where platelets derived from females were more responsive to stimuli than those derived from males (Leng *et al.*, 2004). The involvement of estradiol in triggering proplatelet formation (Nagata *et al.*, 2003) and platelet potentiation (Moro *et al.*, 2005) have also been reported.

Several of the hematology values in sloth bears cubs were significantly different from the adult and sub-adult bears (Table 2). The cubs had a lower erythrocyte count compared to adult and sub-adult bears ($P<0.01$). This was also reflected in the measures of hemoglobin concentration, PCV, MCV, and MCH, all of which were significantly decreased in the cubs ($P<0.01$ for all). Lower values for these erythrocyte parameters in cubs could be indicative of plasma expansion associated with rapid development and body growing in neonates, thereby exceeding the rate of red blood cell production. Similar observations have been reported for other neonatal mammals in several other studies (Bryden and Lim, 1969; Boily *et al.* 2006). The lower hemoglobin, PCV, MCV, and MCH, compared to sub-adult and adult bears, indicated that the cubs may evidence microcytic anemia during the rapid growing phase; this is similar to a report on black bear cubs (Matula *et al.*, 1980). Previous studies on brown bears have also noted that young bears had a lower erythrocyte, hematocrit, and hemoglobin value when compared to older bears (Pearson and Halloran, 1972). Cubs also had higher neutrophil and lower eosinophil numbers ($P<0.01$ and $P=0.02$, respectively) and overall a higher leukocyte count ($P=0.04$) as compared to adult and sub-adult bears.

TABLE 2. Hematology values for Sloth bear cubs.

Parameters ^a (units)	n	Mean (median)±SD	Cubs ≤12 months ^b 95% CT or [25-75% quartiles]
Erythrocytes ($10^{12}/l$)	12	4.8 ^d (4.7)±0.8	4.3-5.4
Leukocytes ($10^9/l$)	12	15.2 ^d (15.5)±3.2	13.1-17.2
Neutrophils ($10^9/l$)	12	12.1 ^d (14.5)±3.1	10.1-14.0
Lymphocytes ($10^9/l$)	12	2.3 (2.1)±1.2	1.6-3.1
Monocytes ($10^9/l$)	12	0.2 (0.2)±0.1	0.2-0.3
Eosinophils ($10^9/l$)	12	0.6 ^d (0.6)±0.4	0.3-0.8
Basophils ($10^9/l$) ^c	12	0.01 (0.0)±0.03	[0.0-0.0]
Platelets ($10^{11}/l$)	9	5.5 (5.8)±1.8	4.0 6.9
Hemoglobin (gm%)	12	11.3 ^d (10.7)±2.7	9.5-13.0
PCV(%)	12	33.6 ^d (33.5)±6.5	29.5-37.7
ESR (mm, 60 min) ^c	12	43.0 (22.5)±43.1	[11.3-90.8]
MCV (fl) ^c	12	70.1 ^d (73.2)±7.9	[66.8-75.1]
MCH(pg)	12	22.8 ^d (23.4)±2.7	21.2-24.6
MCHC (gm%) ^c	12	32.3 (33.1)±6.1	[31.7--33.6]

^a PCV = packed cell volume; ESR = erythrocyte sedimentation rate; MCV = mean cell volume; MCH = mean cell hemoglobin; MCHC = mean cell hemoglobin concentration.

^b Cubs (mean body weight±SD): 23.5±6.7 kg.

^c Data for this parameter were not normally distributed.

^d Significantly different from adult bears ($P<0.05$).

This indicates a potential physiologic leukocytosis due to higher activity in cubs compared to adult bears (Swenson, 1984). The two locations where samples were collected from sloth bears had differences in the seasonal variations of temperature and humidity. In Bannerghatta, which is at a higher altitude (920 m), the temperature and humidity values averaged 27°C(20-32 °C) and ~60% respectively in summer, 24°C(20-29°C) and ~77% in monsoon, and 22°C (15-28°C) and ~62% in winter. In Sur Sarovar, which is at a lower altitude (168 m), these values were 29°C (22-39°C) and ~14% in summer, 28°C(20-39°C) and ~60% in monsoon, and 14°C(6-27°C) and ~59% in winter (Source: The Weather Underground, Inc., Ann Arbor, Michigan, USA, www.wunderground.com; values recorded in 2005-2006). Comparing bears between these two regions, we found some significant differences in hematologic values (Table 3). Erythrocyte counts and MCHC were higher in bears at Bannerghatta compared to bears at Sur Sarovar ($P<0.01$ for both values). However, PCV, MCV, and MCH values were all low, significantly lower in bears at Bannerghatta compared to bears at Sur Sarovar location ($P<0.01$ for all). The erythrocyte count, hemoglobin, and associated parameters were those that have been previously reported to change in concurrence with changes in altitude, relative atmospheric oxygen concentration, environmental temperature, and other climatic factors (Sealander, 1964; Swenson, 1984).

TABLE 3. Effect of geographical location and season on hematology in sloth bears.

Parameters ^a (units)	Location ^b			Season ^c								
	Sur Sarovar		Bannerghatta	Monsoon			Summer			Winter		
	n	Mean±SD	n	Mean±SD	n	Mean±SD	n	Mean±SD	n	Mean±SD	n	Mean±SD
Erythrocytes ($10^{12}/l$)	58	5.4 ^e ±0.9	34	6.2 ^f ±1.2	44	5.7±0.7	38	5.9±1.4	10	5.2±0.8		
Leukoocytes ($10^9/l$)	73	12.1 ^e ±3.4	34	14.5 ^f ±4.8	48	12.5 ^g ±3.3	48	12.4 ^g ±4.2	11	16.2 ^h ±4.7		
Neutrophils ($10^9/l$)	73	7.8 ^e ±3.0	34	10.5 ^f ±4.1	48	8.0 ^g ±2.5	48	8.4 ^g ±3.6	11	12.2 ^h ±5.3		
Lymphocytes ($10^9/l$)	73	2.9±1.1	34	3.0±1.6	48	3.0±1.2	48	2.8±1.3	11	2.8±1.4		
Monocytes ($10^9/l$)	73	0.3 ^e ±0.2	34	0.4 ^f ±0.3	48	0.4±0.3	48	0.3±0.2	11	0.4±0.3		
Eosinophils ($10^9/l$)	73	1.2 ^e ±0.9	34	0.4 ^f ±0.5	48	1.0±1.0	48	1.0±0.7	11	0.6±0.8		
Basophils ($10^{11}/l$) ^d	73	0.0 ^e ±0.0	34	0.02 ^f ±0.06	48	0.01±0.1	48	0.0±0.0	11	0.0±0.0		
Platelets ($10^{11}/l$) ⁱ	58	4.3±1.3	0	—	26	4.5 ^g ±1.0	28	3.8 ^g ±1.2	4	6.3 ^h ±1.8		
Hemoglobin (gm %)	73	14.6±1.7	33	14.2±2.0	47	14.3 ^g h±1.7	48	15.0 ^h ±1.7	11	13.3g±2.0		
PCV (%)	73	44.7±6.3	33	33.1 ⁱ ±15.1	47	38.5 ^g ±12.7	48	47.0 ^h ±6.6	11	34.4 ^g ±12.9		
ESR (mm, 60 min) ^d	58	35.7 ^e ±33.2	26	18.8 ^f ±25.5	38	37.8±34.7	38	21.4±26.7	8	39.1±32.6		
MCV (fl)	58	85.3 ^e ±9.6	33	69.0 ^f ±11.1	43	77.1±10.9	38	83.0±14.9	10	75.7±9.2		
MCH (pg)	58	26.7 ^e ±1.4	33	23.5 ^f ±4.1	43	25.4±2.9	38	25.9±3.4	10	25.1±2.7		
MCHC (gm %)	58	31.1 ^e ±4.3	33	33.8 ^f ±0.9	43	32.3±4.8	38	31.5±2.6	10	33.1±1.8		

^a PCV = packed cell volume; ESR = erythrocyte sedimentation rate; MCV = mean cell volume; MCH = mean cell hemoglobin; MCHC = mean cell hemoglobin concentration.

^b Age and body weights of adult/sub-adult bears compared were not significantly different between the two locations ($P<0.05$); Male:Female ratio for the two locations were 1.5 for Sur Sarovar and 0.75 for Bannerghatta.

^c Age and body weights of adult/sub-adult bears compared were not significantly different between the three seasons ($P<0.05$).

^d Data for this parameter were not normally distributed.

^{e,f} Significantly different between Sur Sarovar and Bannerghatta locations ($P<0.05$).

^{g,h} Tukey-Kramer comparisons for each parameter between the three seasons (indicated only for parameters showing significant differences; $P<0.05$).

ⁱ Comparisons for this parameter are not robust due to insufficient statistical power.

Although the bears at Bannerghatta (at a higher altitude) had a higher mean erythrocyte count and MCHC compared to the bears located at Sur Sarovar, the associated lower PCV, MCV, and hemoglobin values in these bears suggest that their erythrocytes were relatively microcytic when compared to the bears at Sur Sarovar. The ESR as determined for 60 min was significantly delayed in bears at Sur Sarovar as compared to bears at Bannerghatta ($P=0.01$). Leukocyte counts were higher in bears at Bannerghatta compared to the bears at Sur Sarovar ($P<0.01$). The Bannerghatta bears also had a higher number of circulating neutrophils ($P<0.01$) and monocytes ($P=0.02$) compared to the bears at Sur Sarovar, whereas bears located at Sur Sarovar had an increased number of eosinophils ($P<0.01$) compared to bears at Bannerghatta. This higher eosinophil count potentially suggests the prevalence of specific allergens or certain subtle parasitisms in the Sur Sarovar region. The difference in sex ratio partially explained the higher leukocyte and neutrophil counts in bears at Bannerghatta; however, comparisons of the same sexes between the two locations were not significantly different.

Analysis of data collected from the different seasons showed no significant differences in cell counts between bear sampled during either the monsoon or summer seasons. However, bears sampled in winter showed a significantly increased leukocyte count compared to bears sampled during the monsoon ($P<0.01$) and summer ($P<0.01$) seasons. This increase was again associated with a higher neutrophil count in bears sampled during both the monsoon ($P<0.01$) and summer ($P<0.01$) seasons. Although increases in leukocyte counts, especially neutrophils, can be associated with inflammatory reactions to potential pathogens or parasites (Swenson, 1984), the higher values seen during winter in this study were not accompanied by an incidence of clinical disease in any of the animals. Because segmented- and band-neutrophils were not differentiated in this dataset, this finding is hard to interpret. Hemoglobin concentrations were significantly higher during summer when compared to winter months ($P<0.01$), but both these values were not significantly different from the monsoon season.

Although the increase seen in erythrocyte counts in summer was not significantly different from the other seasons, PCV was significantly elevated during summer as compared to monsoon ($P<0.01$) and winter ($P<0.01$). No significant influences of age or body weight on the different hematologic parameters were detected within the adult and sub-adult bear populations.

In this study, we have generated haematology reference values for the sloth bear within its native habitat. We have also examined the effect of age, sex, season, and two geographical locations on these parameters. The significant differences seen in sloth bear cubs in comparison to adult bears, as well as the sexually dimorphic differences, emphasize the clinical importance of using age- and sex-associated reference values. The large sample size for each parameter measured in this study minimized the influence of unavoidable variables such as capture and handling stress (Cattet *et al.*, 2003b; Kusak *et al.*, 2005). Finally, altitude, climatic conditions, habitat quality, and the nutritional status of animals (Hellgren *et al.*, 1993; Gau and Case, 1999) most likely contributed to some of the differences recorded between sloth bears located at the Bannerghatta and Sur Sarovar locations. We greatly appreciate the support of K. Satyanarayan and G. Seshamani of the Wildlife SOS who made these studies possible. Financial support for this study was provided by: The International Animal Rescue, UK; One Voice, France; and Free the Bears, Australia. We thank the animal care staff at Wildlife SOS; the staff at Sur Sarovar Bird Sanctuary, Uttar Pradesh, India; and the staff at Bannerghatta Biological Park, Karnataka, India, for all their assistance during the period of this work. We also thank A. M. de Mestre, College of Veterinary Medicine, Cornell University, USA, and F. Hollinshead, Matamata Veterinary Services Ltd., New Zealand, for critically reviewing and commenting on the manuscript.

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Art – 18. STUDY ON PREVALENCE OF TUBERCULOSIS IN RESCUED CAPTIVE SLOTH BEARS (*Melursus ursinus*)

R Rishikesavan*, Arun A Sha¹, B M Chandranaiik, K Basavarajappa, P Giridhar and C Renukaprasad

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Bangalore, Karnataka, India.

*Wild Animal Disease Diagnostic Laboratory, Institute of Animal Health and Veterinary Biologicals, Hebbal, Bangalore-560 024

ABSTRACT:

Prevalence of tuberculosis in 25 rescued captive sloth bears (*Melursus ursinus*) was studied, using standard Ziehl Neelsen staining method for demonstrating Mycobacterium organisms. Eight animals were identified as positive and their hematological values were suggestive of tuberculosis. Among that six died and their post-mortem lesions were caseated nodules on an entire lung.

Keywords: Haematological values, Mycobacterium, sloth bears (*Melursus ursinus*).

Tuberculosis in wild and captive animals is a very important zoonotic disease of public health and economic significance. Limited studies on tuberculosis in wild animals have been reported in India (Laud, 1936-37, Sreenivas Gowda et al., 1983, Das and Jayarao, 1986). The present communication reports occurrence of tuberculosis in rescued captive sloth bears (*Melursus ursinus*) using standard Ziehl Neelsen staining method for identifying Mycobacterium spp.

The study was conducted in twenty-five captive sloth bears aged between 10-15 years maintained in the bear rescue centre, Bannerghatta Biological Park, Bangalore. Nasal discharges of all twenty-five animals were subjected to Ziehl Neelsen staining. Sputum and nasal swabs were collected aseptically from all the animals along with the whole blood with EDTA for analyzing the hematological values. The nasal sputum and nasal swabs were smeared on sterile clean glass slides and were stained with Ziehl Neelsen as described by Coles (1986). The hematological values were analyzed as per the procedures outlined by Benjamin (1998). Twenty five nasal sputum smears were examined by direct microscopic examination, eight animals were identified as positive for the presence of Mycobacterium spp. which appeared as bundles of clear pink stained curved bacilli.

The blood picture examination from these affected animals revealed leucocytosis with neutrophilia suggestive of tuberculosis (Fowler and Miller, 2003). The blood parameter values of positive animals are presented in Table 1. All the eight positive animals were quarantined in separate pen and treatment was given. Six of them died over a period of one month of testing. The clinical symptoms as anorexia, persistent cough, weakness and progressive loss of weight were observed before death. Similar signs have been reported in sloth bear that had died due to tuberculosis by Sreenivas Gowda et al. (1983) and Harish et al. (2003).

Table 1. Haematological values of tuberculosis positive sloth bears (*Melursus ursinus*).

S.No	Name of the bear	Total WBC ($\times 10^3/\mu\text{l}$)	Differential count (%)				
			N	L	M	B	E
1.	Deepika	22.34	82	12	3	0	3
2.	Rani	24.65	85	11	3	0	1
3.	Vasudev	18.56	82	13	2	0	3
4.	Jambavathi	19.14	86	10	3	0	1
5.	Saroja	23.25	78	18	2	0	2
6.	Raju	21.09	87	10	2	0	1

WBC- White blood cells, N- Neutrophils, L- Lymphocytes, M-Monocytes, B- Basophils. E- Eosinophils

Post mortem examination of these dead bears revealed fully infected lung with caseated nodules on entire lung and thoracic cavity. On opening the tubercle, yellowish pus was observed. Impression smears from the cut surfaces of lung also had clear enormous bundles of pink stained *Mycobacterium spp.* on Ziehl Neelsen staining. Himalayan black bear (*Selenarctos thibetanus*) and Sloth bear (*Melursus ursinus*) in captivity were found to be highly susceptible to tuberculosis (Arora, 2003). Specific early diagnosis of tuberculosis in most of the wild animal species is always difficult, due to non-availability of modern diagnostic techniques like serological tests and radiography or ultrasound examinations in most parks. Moreover, owing to the prolonged incubation period of the disease, specific diagnosis using these tests are not feasible to undertake in every case (Arora, 2003). It may also involve life risk for both handlers and bears. So, demonstration of *Mycobacterium spp.* by Ziehl Neelsen staining is a valuable and easy method of diagnosis of tuberculosis

Since tuberculosis can be transmitted from human to animals and vice versa, immense care needs to be taken for the keepers by means of wearing protective masks, gloves and mandatory use of disinfectants. Periodical testing of animal attendants should be made mandatory to avoid further spread of infection from infected bears to humans.

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Art – 19. COMPARATIVE GROWTH RATE OF SLOTH BEAR (*Melursus ursinus*) CUBS IN CAPTIVITY

Arun A Sha, Kajal Kumar Jadav, Ilayaraja S

Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Center,
Bannerghatta Biological Park, Bangalore, Karnataka, India.

ABSTRACT:

This study includes two groups of Sloth Bear Cubs of which five rescued cubs were hand-reared with the combination of kitten milk replacer and infant milk substitute (Lactogen) and two cubs were born in captivity and raised by their own mother bear. Since there is no published data for the milk composition of the sloth bear, the study was initiated. Body weight of both the cub groups has been taken in a regular interval once in 10 days and plotted in a graphical form. The graphical representation indicated that there is no much variation between the hand-reared cubs and mother-reared cubs. Then the milk supplement and feeding schedules have been made as a protocol which was applied successfully to hand rear another 18 sloth bear cubs which were rescued in following two years without any mortality. In fact, the body weight of the hand-reared young ones is more than mother-reared young ones. Still, there is a need for further data and studies in hand-reared young ones up to five years until they attain maturity.

**Art – 20. COMPARISON OF TWO ANESTHETICS FOR CHEMICAL
IMMOBILIZATION OF HIMALAYAN BLACK BEAR (*Selenarctos thibetanus*)**

Arun A Sha¹, Kajal Kumar Jadav², Ilayaraja S², Veeraselvam M², Rajesh N²

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore, Karnataka, India.

²Wildlife Veterinary Officer, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh, India.

ABSTRACT:

Four Himalayan black bears were chemically immobilized. Two of them were immobilized with the combination of Tiletamine HCl and Zolazepam HCl (4mg/kg b. wt) and other two bears were immobilized with the combination of Xylazine HCl (2mg/kg b.wt) and Ketamine HCl (5mg/kg bwt) in two different locations and observations were compared. Immobilization with Tiletamine HCl and Zolazepam HCl resulted in rapid induction with extended recovery time; no side effect like vomition and retching symptoms were noticed during the induction period. The combination of Xylazine HCl and Ketamine HCl resulted in extended induction time with shorter recovery time when compared to the combination of Tiletamine HCl and Zolazepam HCl. No consistent changes were observed in respiratory rate, heart rate and body temperature in both anesthetics except in induction and recovery time.

Art - 21. INCIDENCE OF CATARACT IN RESCUED DANCING SLOTH BEARS
(*Melursus ursinus*)

Arun A Sha¹, Kajal Kumar Jadav², Ilayaraja S²

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore, Karnataka.

²Wildlife Veterinary Officer, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh, India.

ABSTRACT:

More than 15% of the wild-caught rescued dancing Sloth bears have got both unilateral and bilateral lesions of keratitis and cataract due to various causes like man-made trauma by pulling nylon rope which used to pass from the nose ring to neck over the eye, malnutrition, and Vitamin A deficiency. Unilateral cases of corneal ulcer combined with keratitis are mostly due to the traumatic origin. Many cases of early keratitis have been successfully treated by administering Vitamin A tablets supplemented orally as well as injectables along with cleaning of the eyes with clean plain water. Most commonly the young, middle age group bears will show improvement quickly, whereas the old age group bears more than 25 years will end up in complete blindness. So it is important to improve the diet of the rescued dancing sloth bears with the properly balanced diet with compulsory feed supplement like liver tonics & Vitamin A supplement is a must when they are cubs and juvenile age group.

**Art – 22. LAMPAS IN A RESCUED DANCING SLOTH BEAR
(*Melursus ursinus*) – A CASE REPORT**

Arun A Sha¹, Kajal Kumar Jadav², Ilayaraja S², Veeraselvam M², Rajesh N V²

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Centre,
Bannerghatta Biological Park, Bangalore, Karnataka, India.

²Wildlife Veterinary Officer, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar
Bird Sanctuary, Keetham, Agra.

ABSTRACT:

A male rescued dancing sloth bear aged about 20 years, microchip number 95800000549732 at Bannerghatta Bear Rescue Centre of Wildlife SOS, inside Bannerghatta Biological Park had a history of improper feed intake of porridge for three days. Then the bear was tranquilized with injection Xylazine Hydrochloride and injection Ketamine Hydrochloride at the dose rate of 2 mg per kilogram body weight and 5 mg per kilogram body weight respectively by using blowpipe. The detailed examination was carried out on oral cavity and found inflammation of hard palate on the upper jaw. The mucous membrane of the hard palate was dried, partially necrosed and peeled out. The necrosed tissue was trimmed off using the surgical blade and was rinsed and cleaned with Chlorhexidine mouth-wash for 3 to 4 times. Glycerin was applied topically as an emollient. A course of parenteral antibiotic along with B-complex was given. The oral supplement of Vitamin A was given for a week along with morning feed to enhance the healing process. After the week of treatment, the bear was completely normal and started taking food.

**Art – 23.ONYCECTOMY IN CAPTIVE SLOTH BEAR (*Melursus ursinus*)
- A CASE REPORT**

Ilayaraja S, M Veeraselvam, Arun A Sha, K K Jadav, V Divya, N V Rajesh
Agra Bear Rescue Facility, Keetham, Agra.

ABSTRACT:

Onychectomy is the resection of the claw from the toe, always an option for severely injured or broken claws. A rescued dancing male Sloth Bear aged 10 years in Agra Bear Rescue Facility, showed symptoms of limping and unable to bear the weight. Physical examination was conducted following chemical immobilization with Ketamine 5mg/kg and Xylazine 2mg/kg body weight, revealed that the Bear had broken claw in its right foreleg, 2nd to medial digit. The Bear was intubated and maintained with inhalant volatile anesthetic isoflurane. The bear was aseptically prepared for surgery and an incision was made of the shape of tennis racket around the affected claw and the claw was resected at the 2nd interphalangeal joint. Since the animal showed the post-operative complications like lameness and swelling, a course of antibiotic, anti-inflammatory and the topical medication was continued for 14 days until the complete healing of the incision wound, then the Bear was released in the socialization enclosure and observed normal gait and posture. The primary differences in doing surgery on a bear versus dog are related to exposure of surgical site and to after care. This has been concluded that the claw fracture warranted immediate veterinary care.

Art – 24. IMPORTANCE OF REGULAR FECAL SAMPLE ANALYSIS IN CAPTIVE WILD ANIMALS.

V Divya, Arun A Sha, M Veeraselvam

Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore, Karnataka.

ABSTRACT:

Large populations of captive wild animals are exposed to many parasitic diseases, particularly helminthic infection, can frequently be a major problem, causing even mortality in captive animals. Inadequate information of parasites of zoo animals is a major limiting factor in many zoos. The regular fecal sample analysis was performed on rescued sloth bears of Bannerghatta Biological Park, Bangalore. The result revealed that 78.3% of bears were harboring helminthic infections. Among all the bears, cestode infection (89.3%) was present significantly. Other infections such as Strongyle sp. (6.3%). Ascarid sp (4.2%) and mixed infection (4.2%) were also observed by examination by fecal sedimentation technique. This suggested treating the infected animals with proper anthelmintics and which pave the way for effective management perspective in this rescue centre. So, this hypothesis concluded that the regular programme of fecal sample analysis in all zoos leads to the effective diagnosis of parasitic infection and hence improve the effectiveness of treatment with suitable anthelmintics and also helps to provide proper control measures.

**Art – 25. DIAGNOSIS OF *Mycobacterium bovis* IN CAPTIVE SLOTH BEARS
(*Melursus ursinus*) BY POLYMERASE CHAIN REACTION**

M. Veeraselvam*, N V Rajesh*, R Sridhar, Arun A Sha*, K K Jadav*,
S Ilayaraja*, V Divya***

Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Center,
Bannerghatta Biological Park, Bangalore, Karnataka, India.

**Associate Professor, Department Of Wildlife Science, Madras Veterinary College.

ABSTRACT:

Diagnosis of Mycobacterial infection is paramount important from the public health perspective since treatment and control measures are very significant, particularly in captive wild animals. In this diagnostic study of *Mycobacterium bovis* infection in sloth bears (*Melursus ursinus*), polymerase chain reaction (PCR) had been used with the primer sequence of pncA-8 (5'-GGTTGGGT GGCCGCGGTCAG-3') and pncA-11(5'- GCTTGCAGCGAGCGCTCCA-3') that were specific for *M. bovis* pncA gene. Forty-two fresh fecal samples were collected randomly from the apparently healthy sloth bears maintained at Bannerghatta Bear Rescue Centre, Wildlife SOS, Bangalore, Karnataka. The DNA extraction procedure was done as per the manufacture's protocol and further subjected to amplification. The amplification profile includes respectively: initial heating of the samples for 5 minutes at 94°C, 35 cycles of denaturation for 1 minute at 94°C, annealing 55°C for 1 minute, primer extension at 72°C for 1 minute, and final elongation step for 10 minutes at 72°C. The amplified product size of 744bp when electrophoresed in 1.5% agarose gel was found to be positive for *Mycobacterium bovis* in 5 samples. A positive control of *Mycobacterium bovis* DNA procured from Tuberculosis Research Centre and a negative control from a healthy bovine sample was used. These results demonstrated that PCR test will increase the effectiveness of laboratory diagnosis to detect and identifying the *Mycobacterium bovis* in captive wild animals.

**Art – 26. MALIGNANT MELANOMA IN A CAPTIVE LIONESS (*Panthera leo*)
- A CASE STUDY**

R Rishi Kesavan, Arun A Sha¹, Roopa Satish, B M Chandranak, Swati
Bamne, P Giridhar and C Renukaparasad

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Center.
Wild Animal Disease Diagnostic Laboratory Institute of Animal Health and
Veterinary Biologicals Hebbal, Bangalore - 560 024

ABSTRACT:

A 23 year old rescued captive lioness kept at Bannerghatta Biological Park, Bangalore had material collected from a tumor which was subjected to the histopathological examination that was suggestive of malignant melanoma. The animal died at a later date. The post-mortem examination revealed numerous black color hard tumor masses on the surface of the lung. The tissues from the multiple wart-like growths on pinna of the ear, shoulder and thigh regions. Progressive growth was noticed from these nodules, later getting infected with discoloration of the skin as black in color on right side shoulder region. The animal was given antibiotic treatment with the standard antibiotic sensitivity test done at Wild Animal Disease Diagnostic laboratory, Bannerghatta Biological Park, Bangalore. Biopsy tumor on histopathological examination was confirmed once again as malignant melanoma.

Art – 27. SPINDLE CELL CARCINOMA IN A RESCUED LION (*Panthera leo*)

R Rishi Kesavan, P R Prathiush, **ArunA Sha¹**, Roopa Satish, B M Chandranai, S Jaykumar, P Giridhar and C Renukaprasad

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Center.
Wild Animal Disease Diagnostic Laboratory Institute of Animal Health and
Veterinary Biologicals Hebbal, Bangalore - 560 024.

ABSTRACT:

Spindle cell carcinoma (SpCC) is also known as sarcomatoid carcinoma and is a rare malignant aggressive tumor with little response to treatment. An 18year old rescued captive lioness kept at Bannerghatta Biological Park, Bangalore had fibromatous growth on left hind limb at the metacarpal region. Tumor growth was removed by surgical excision and recurred later. Biopsy material collected from tumor and subjected to the histopathological examination which suggestive of spindle cell carcinoma. The hind limb later getting infected and was amputated. The animal died at later date. The post-mortem examination revealed numerous tumor masses on the entire lung, heart, and spleen. The tissues from the tumor on histopathological examination was confirmed once again as spindle cell carcinoma.

Art – 28. SEROLOGICAL SURVEY OF LEPTOSPIROSIS IN RESCUED CAPTIVE SLOTH BEARS (*Melursus ursinus*)

M Veeraselvam, N V Rajesh, R Sridhar, M G Jayathangaraj, T M A Senthil Kumar¹,
Arun Attur Shamugam² and V Divya²

²Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Center,
Department of Wildlife Science, Madras Veterinary College Chennai – 600 007

ABSTRACT:

Serological survey of fifteen captive sloth bears (*Melursus ursinus*) from Bear Rescue Transit Facility, Hyderabad, India, was conducted for antibodies against leptospirosis using the battery of 12 *Leptospira interrogans* serovars *Icterohaemorrhagiae*, *Canicola*, *Grippotyphosa*, *Hebdomadis*, *Pomona*, *Australis*, *Pyrogenes*, *Tarassovi*, *Ballum*, *Javanica*, *Australis*, and *Hardjo*. The leptospiral cultures of 5-8 days old, having the concentration of ~2X10⁸ leptospires/ml were used in microscopic agglutination test (MAT). The prevalence of *Leptospira interrogans* serovar *Pomona* antibodies in two seras with titre value of 1:200 and the *Leptospira interrogans* serovar *Pyrogenes* antibodies in two seras with titre value of 1: 100; no titre value to *Icterohaemorrhagiae*, *Canicola*, *Grippotyphosa*, *Hebdomadis*, *Australis*, *Tarassovi*, *Ballum*, *Javanica*, *Australis*, and *Hardjo* were recorded. Positive titers to serovars *Pomona* and *Pyrogenes* indicated exposure to *Leptospira* in these animals. The sloth bears in this survey were rescued from gypsies where they were living in close proximity to stray dogs and infected cattle. However, the rescued sloth bears were not exhibiting any visible symptoms of leptospirosis, isolation of the organism was required to confirm the disease.

Art – 29. DEVELOPMENT AND STATUS OF ASSISTED REPRODUCTIVE TECHNOLOGIES FOR THE CONSERVATION OF THREATENED AND ENDANGERED SPECIES

Arun A Shanmugam¹ and Vimal Selvaraj²

¹Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Wildlife SOS®,
Bannerghatta, Bangalore- Karnataka, India.

²Department of Cell Biology and Human Anatomy, University of California at Davis,
Sacramento, CA 95817, USA.

Reproduction is key to the success and survival of any animal species. In a world in which wildlife are increasingly threatened by man-made factors including habitat destruction, climate change, and environmental pollution, biodiversity has already declined at an alarming rate. It has become imperative that species threatened in the wild require help via habitat restoration and assisted means of reproduction for sustenance. However, this priority continues to stay low as the need for land and resources for the rapidly expanding human population increases. Therefore, there has been little impetus or financial support for research to understand the basic physiology of wildlife species native to India. With existing difficulties in preserving wildlife habitat, we currently face a challenge in assisted reproduction to help sustain these species. This article reviews reproductive technologies with an emphasis on emerging methods that provide hope for future wildlife conservation efforts.

Introduction

In the last 50 years, substantial progress has been made in our understanding of reproductive physiology and gamete biology. Most of these developments have happened in commercial sectors of livestock breeding and experimental modeling of reproduction in laboratory animals. In livestock, developments in sperm cryopreservation and artificial insemination has allowed the rapid dissemination of germplasm from desired sires increasing animal productivity and in some cases disease resistance. In laboratory animals, the development of specific gene knockouts and other transgenic animals has accelerated studies and offered detailed mechanisms of applied molecular physiology in gamete function, fertilization, implantation and embryo development. It is now the job of conservation biologists and veterinarians to take relevant parts of this information and use it in assisted reproductive strategies for threatened and endangered species.

According to the IUCN Red list of Threatened Species released this October (IUCN, 2008), 659 species just in India have been categorized as threatened in the wild. Of these, the top category is plants with 246 threatened species indicating the degree of habitat destruction. Of the Indian mammals, staggering 96 species are threatened calling for immediate conservation measures to sustain these animals. Although the fundamentals of reproduction appear to be similar for most species, physiological differences from species to species make it very difficult to translate technologies developed for livestock or laboratory animals to wildlife species (Pukazhenth and Wildt, 2004). Therefore, most conservation strategies should start with the study of reproductive physiology in these animals. At the Wildlife SOS®, we have recently initiated studies on reproductive physiology of the sloth bear (one of the 96 threatened species) as a plan for future assisted reproduction. In the practice of assisted reproduction for wildlife conservation, producing more numbers is just one part of the strategy. Breeding also has to take into account animal genetics and pedigree for preserving the genetic diversity of each species. Therefore, at the Wildlife SOS®, we are planning to launch a global survey of captive sloth bear germplasm available for breeding. Unfortunately for most of the threatened species, only a handful of animals exist, making the existing gene diversity already small for these species. This would result in inbreeding and an extreme genetic homogeneity in the population making these animals poorly equipped to adapt to environmental changes (Hutchins and Wiese, 1991). Therefore, efforts to preserve germplasm must from both the thriving and threatened species be started immediately. This article reviews reproductive technologies developed over the years and their relevance and impact on conservation biology. It also places emphasis on emerging technologies that may have a role in future strategies of assisted reproduction.

Comparative Reproductive Physiology

The fundamental requirement of any assisted reproduction program is the understanding of reproductive physiology of the species in question. Differences in reproductive physiology have made the translation of assisted reproductive strategies developed for domestic or laboratory animals to wildlife species challenging. The study of reproductive physiology in any species would require detailed observations on social and reproductive behaviors and periodic collection of blood

to estimate circulating hormone levels to evaluate gonadal function and regulation of the hypothalamo-pituitary-axis (Pukazhenth and Wildt, 2004). In females this is particularly important to evaluate the estrus cycle and time of ovulation. In males it is required for estimating the age of sexual maturity and dominance. Another facet in the diversity of reproduction patterns is the seasonal breeder that is fertile for only part of the year; in these animals, photoperiods control hormonal patterns and reproductive cycles (Lehman *et al.*, 1997). Therefore, for these species timing of assisted reproduction will be vital for success. In addition to hormones, females of some species require induction by stimuli from the male in order to ovulate. An example for these induced ovulators includes the black bear, a discovery that was made not too long ago (Boone *et al.*, 2004). Domestic cats, tigers and lions are better-established examples of induced ovulators. Therefore, even before attempting assisted reproduction in a particular species, one needs to have complete understanding of its reproductive physiology.

Studying and understanding reproductive physiology in exotic species has proven extremely difficult and in most cases, it requires patience and perseverance. In contrast to domestic species, from our experience in sloth bears, it is impossible to attempt repeated blood collection for hormone analysis. This holds true for most wildlife species. Moreover, immobilization can be used only sporadically and would involve unnecessary stress to the animal, which in turn could affect hormonal profiles. The mainstream development of a technique discovered more than half a century ago (Miller and Turner, 1955) has made non-invasive studies possible today. Analysis of metabolites of steroid hormones excreted in the feces and urine provided a means to estimate hormone levels with a delay but without the need for handling the animal. Fecal steroid analysis has provided key information for developing assisted reproduction programs and has been used to understand the reproductive physiology of numerous wildlife species including cheetah (Brown *et al.*, 1996), red panda (Spanner *et al.*, 1997), white-tailed deer (Kapke *et al.*, 1999), African elephant (Brown, 2000; Stead *et al.*, 2000), sunbear (Onuma *et al.*, 2001; Onuma *et al.*, 2002; Schwarzenberger *et al.*, 2004), Sika deer (Hamasaki *et al.*, 2001), red deer (Huber *et al.*, 2003), bison (Mooring *et al.*, 2004), right whales (Rolland *et al.*, 2005), brown bear (Ishikawa *et al.*, 2002; Ishikawa *et al.*, 2003), spectacled bear, giant panda (Dehnhard *et al.*, 2006), lynx (Goritz *et al.*, 2006; Jewgenow *et al.*, 2006b), leopards (Moreira *et al.*, 2001; de Haas van Dorsser *et al.*, 2007), and guinea pigs (Bauer *et al.*, 2008).

Moreover, hormonal monitoring using this technique to coordinate insemination and ovulation has proven invaluable in elephants (Brown, 2000). Another important application for fecal steroid analysis is in infertility diagnosis. A prevalent problem in most zoos is the failure of reproduction in captive species. Evaluating reproductive cycles could provide a prognosis for reproductive success in specific animals. In addition to disclosing reproductive problems, monitoring fecal corticosteroids in these captive animals could provide information about their stress level. This information could be used to provide habitat modifications and enrichments to decrease adrenal activity. Moreover, information obtained from captive wildlife species will be invaluable for *in situ* conservation efforts in the wild as well (White *et al.*, 1995).

Artificial Insemination

In most conservation programs involving captive breeding, artificial insemination (AI) is usually the first and practical approach. AI can be used as an assisted means of propagation when (1) there is poor success in natural breeding, (2) controlled genetic management of a population is required, (3) captive pairs are not compatible for breeding, (4) the female is at a different location and sperm can be transported. AI was first considered as an easy method to fix all reproduction problems. However, with successive failed attempts in several species the importance of knowledge of specific physiological parameters was brought to realization [For review see (Wildt *et al.*, 2001)].

Despite these hurdles, AI remains an effective technique and has been used for conservation practices in several species. However, one needs to know the reproductive physiology for the female of the species: the estrus cycle, timing of ovulation, type of ovulation (spontaneous or induced). This is important to monitor the ovarian cycle and introduce sperm in utero in the peri-ovulatory period. Today, with molecular knowledge of sperm function and improved cryopreservation methods (discussed below), AI has become a powerful genetic management tool. It has played a key role in bringing back the cheetah from almost extinction and has progressively helped sustenance in several species (Wildt *et al.*, 2001). It has proven to be a practical and convenient method to import new germplasm from wild populations into zoos (Wildt *et al.*, 1997). However, there are a few specific limitations due to certain anatomical features or idiosyncrasy. They are both in collection of sperm from the male and intrauterine delivery in the female. In males, sperm is normally collected

using electro ejaculation after immobilization or anesthesia. Although most animals are amenable to this manipulation, difficulties exist, some species for example the rhinoceros and certain great apes (Pukazhenthi and Wildt, 2004). In females, however, the problem arises with sperm deposition and subsequent transport. In soine species, variability in success has been suggested to be due to anesthetic restraints that reduce uterine contractions that are required for sperm transport (Pukazhenthi and Wildt, 2004). However, AI has been successful even in species like elephants with extremely long reproductive tracts (Brown *et al.*, 2004). There is a growing list of successful AI programs in wildlife conservation. Cryopreservation and banking of semen has substantially increased the potential of this approach for wildlife-assisted reproduction.

Gamete and Embryo Cryopreservation

Cryopreservation of germplasm and embryos is done for storage, transport and dissemination. Imagine transporting wild animals to different zoological park for breeding as opposed to frozen material. Moreover, cryopreserved repositories called Genome Resource Banks (GRBs) provide a substantially wider choice of genetic material for AI programs. Computational modeling of the efficacy of GRBs has shown that it can be a crucial player for maintaining genetic diversity (Hamal *et al.*, 2002). In India, although attempts have been made in the past, there is no comprehensive ORB storing germplasm from the rich diversity of indigenous species. Therefore cryopreservation success for several species in India remains unknown.

Biophysical aspects of sperm preservation have been intensively investigated in several species to achieve the maximum post-thaw motility. This body of work has revealed that there are stark differences in freezing medium requirements between sperm from different species. However, methods used for cattle seem to be applicable to wild bovids and cervids (Monfort *et al.*, 1993; Holt *et al.*, 1996; Roth *et al.*, 1999; Karunakaran *et al.*, 2007). Carnivore sperm have proven difficult to cryopreserve and means to improve freezing in felids and canids remains an area of active research (Pukazhenthi and Wildt, 2004; Pukazhenthi *et al.*, 2007). A wealth of information is already available regarding specific cryopreservation protocols for several species. However, information for several threatened species native to the Indian subcontinent seems to be lacking, for example, there is not even evidence for semen collection in sloth bears despite its naming as a threatened species in 1990.

Therefore, this is an area that will be a first step in organizing a conservation initiative for native species in India. Despite similar potential to cryopreserved sperm, very few studies have been conducted on oocyte cryopreservation in wildlife species. Although this technique has been perfected for humans (Tao and Del Valle, 2008) and to some extent bovid (Massip, 2003), it remains in a nascent stage for most other species. This is mainly because difficulties associated with collecting oocytes make it appear as a non-practical approach for conservation purposes. However development in this area will prove to Irnvc the same potential as cryopreserved sperm and can help bank genetic material from animals that die due to various reasons in captivity. On the other hand, embryo cryopreservation is a step up from gametes and allows the preservation of a full genetic complement. This technique has been optimized in domestic animals including bovids (Lonergan, 2007), felids (Dresser *et al.*, 1988), and humans (Yousry *et al.*, 2008). Therefore, we are in a position to utilize this technology in the same family members in the wild. However, at the current state, the use of embryos is not developed enough for use as a conservation tool.

In vitro Fertilization and Embryo Transfer Currently, no wildlife species are managed via in vitro fertilization (IVF) and/or embryo transfer.(ET) (Pukazhenth and Wildt, 2004). ET has been successfully performed for several wildlife species with known reproductive physiology. IVF coupled to ET has been successful in several species including black bears (Boone *et al.*, 1999); gorillas (Pope *et al.*, 1997), felids (Pope, 2000) and bovids (Liang *et al.*, 2007). One possibility that raised a lot of interest about ET is that domestic animals could serve as surrogate hosts to wild embryos. This resulted in several trials in the 1980s with a series of failures (Fernandez-Arias *et al.*, 1999; Hammer *et al.*, 2001; Oppenheim *et al.*, 2001). Interesting examples of successful trials include a gaur born from a Holstein cow (Dresser, 1985) and a bongo born to an eland cow (Pope and Loskutoff, 1999). Although IVF and ET are both complex techniques requiring species-specific knowledge and expertise, information gained from developing these technologies for threatened species will definitely take use closer to the conservation goal. Moreover, successful IVF and ET will be vital for the success of the emerging technologies described below.

Emerging Technologies

Natural breeding is definitely the preferred method for propagation of species followed by AI. However, when free-ranging populations decline and reach a point where they cannot self-sustain due to both habitat and genetic reasons, scientists need to seek methods to generate more of these "critically endangered" species in a non-natural way (Pukazhenth *et al.*, 2006). They provide alternative means to recover gametes for use in assisted reproduction, or use somatic cells directly to derive embryos. These technologies have opened new possibilities for use of banked genetic resources and compel the need to cryopreserve all possible materials from multiple animals for each species. This would ensure that quality animal resources would be available when these technologies are perfected; it could even take us to the extent of re-raising extinct species in the future.

Reproductive Cloning: Nuclear transfer, also known as cloning is a technique whereby genetic duplicates of animals are made by transferring DNA to an enucleated oocyte of the species and developing an identical offspring (Wilmut *et al.*, 1997). In a simplistic sense, it is one of the ways of increasing animal numbers within a population. In a molecular view, DNA from a terminally differentiated cell when transferred into an oocyte undergoes epigenetic "reprogramming" with cues from the oocyte cytoplasm, which eventually alters its methylation status and modifies chromatin to express a different set of genes and enter a more pluripotent state (Kono, 1997; Dinnyes *et al.*, 2008). Although it has been more than a decade since the first cloning report in sheep, current success rates in well studied mammals remains to be very low with only 0.1 - 5% of embryos resulting in live birth (Wakayama, 2007). Moreover, there is a very high incidence of developmental abnormalities due to inefficient reprogramming and imprinting of the nuclear DNA (Hill *et al.*, 1999; De Sousa *et al.*, 2001; Renard *et al.*, 2002). In addition to this, production of genetic clones would result in the rapid loss of much needed genetic diversity in these wild populations. Therefore, the practical use of this technique, even after we completely understand the physiological differences in the different wildlife species, may not prove extensively useful for sustainable conservation efforts.

Although my statements seem completely negative about reproductive cloning, I believe that when perfected, it will definitely prove to be a powerful tool to propagate animals on the brink of extinction. Currently, efforts can be made to help or supplement a self-sustaining species before it reaches a critical point via cloning;

multiple individuals can be cloned, then allowed to mature and breed naturally (Holt *et al.*, 2004). This would reduce the probability of losing genetic diversity due to this technology and could serve as a conservation support measure. However, as a statistical prediction, this approach can be successfully implemented only for poly-ovulatory, litter-bearing species (Holt *et al.*, 2004). Despite the odds, a hopelessly optimistic project to clone the Asiatic Lion and Cheetahs has been started in India at the Laboratory for Conservation of Endangered Species. Irrespective of this objective, I believe scientific advancements will be made during these studies. In the conservation front, there is a huge need for reproductive biology to design experiments to understand the molecular mechanisms driving epigenetic reprogramming during nuclear transfer. This would help develop means to control and manipulate these changes and improve the rate of cloning success for subsequent use in conservation strategies.

Spermatogonial Stem Cell Transplantation: Spermatogonial stem cell transplantation (SSCT) is a technique that involves the transfer of spermatogonial stem cells (SSCs) from one animal to another, thereby enabling the recipient to produce sperm that contains genetics of the donor. This technology first known from work on the mouse (Brinster and Zimmermann, 1994) has subsequently been expanded to rat (Zhang *et al.*, 2003), boar (Honaramooz *et al.*, 2002a), goat (Honaramooz *et al.*, 2003), bull (Izadyar *et al.*, 2003), cynomolgus monkey (Schlatt *et al.*, 2002a) and wild birds (Kang *et al.*, 2008). Progress has also been made to optimize this technique for cats (Kim *et al.*, 2006). Species-specific optimization forms a large part of developing this technique. First, it involves the collection of either enriched SCCs or mixed germ cells from the donor testes. This is performed by a two-step enzymatic digestion procedure that is modified for each species. Second, delivery of the cells into the lumen of the seminiferous tubules of the recipient by retrograde injection via either the efferent ducts or the rete testis. From the lumen, the SCCs are required to migrate to the stem cell "niche" along the basement membrane of the seminiferous tubule. Therefore, recipient preparation by depleting the endogenous SCCs either by irradiation or chemical means (busulfan) is vital to provide access to the SSC niche. The recipients subsequently require recovery to allow several cycles of spermatogenesis to complete before collection to confirm the genetic origin of the gametes produced. This technique usually yields proportions of both donor and recipient sperm that would require further characterization.

From the conservation standpoint, there has been substantial emphasis on this technique to recover SSCs and produce sperm from animals that die in captivity due to various reasons. Using this technique, there is also potential for generating sperm from neonatal animals that die due to poor parenting, a common problem existing in zoological parks worldwide. It is particularly important for these pre-pubertal animals because they die without contributing to the genetic diversity of their population. However, for easy access of recipients, wildlife donors would definitely require xenogeneic domestic/lab animals for recipients. Few studies have examined such xenogeneic SSCT. These have used the mouse as a host to produce rat (Clouthier *et al.*, 1996), rabbit (Dobrinski *et al.*, 1999), dog (Dobrinski *et al.*, 1999), baboon (Nagano *et al.*, 2001), boar, bull and stallion sperm (Dobrinski *et al.*, 2000). It is well known from these studies that increases in phylogenetic distance increases incompatibility and lowers the success rate. Therefore, for endangered species, this technique will be best performed with a phylogenetically related domesticated species. For example: domestic cats can be used as recipients for wild cats like lions and tigers. However, performing these techniques require infrastructure and specialized expertise that need to be developed for each species independently. With current rates of developments, the application of this approach to threatened and endangered species could be possible in the near future.

Xenografting: An additional technique designed to exploit gametes from both testis and ovarian tissues from recently deceased animals is tissue xenografting. This involves the surgical placement of 1- 2 mm³ sized tissue pieces subcutaneously or under the kidney capsule of castrated immunodeficient mice. In this technique first developed in the early 90s, the recipient mouse acts as a biological incubator for testes or ovarian pieces allowing them to develop and produce gametes. Being immunodeficient, these mice do not reject the tissue graft but supports them with angiogenesis and a fibrous capsule formation.

In testis grafts, because these mice are castrated and have low testosterone levels, the Leydig cells in the graft start generating testosterone promoting graft growth and spermatogenesis. It should be noted that the intricate three-dimensional architecture is required for spermatogenesis and it can not be replicated under *in vitro* culture conditions. After the initial study in mouse (Honaramooz *et al.*, 2002b), this means of gamete production has been experimented for several species including the hamster (Schlatt *et al.*, 2002b), marmoset (Schlatt *et al.*, 2002b),

pig (Honaramooz *et al.*, 2002a), goat (Honaramooz *et al.*, 2002b), rabbit (Shinohara *et al.*, 2002), bull (Oatley *et al.*, 2005), and cat (Snedaker *et al.*, 2004; Kim *et al.*, 2007). From all these studies it has become clear that only pre-pubertal animals are capable of spermatogenesis in recipient mice for reasons that are not entirely understood and also that there is acceleration of testicular maturation. (Honaramooz *et al.*, 2004) which is of immense benefit when working with species that take several years to attain sexual maturity. However, sperm produced by this technique does not undergo the normal epididymal maturation and is not functionally mature. Therefore, it can only be for ICS and subsequent embryo transfer. Studies grafting ovarian tissue have been performed in sheep (Gosden *et al.*, 1994), elephant (Gunasena *et al.*, 1998), dog (Metcalfe *et al.*, 2001), wombat (Wolvekamp *et al.*, 2001), mouse (Snow *et al.*, 2002), pig (Kaneko *et al.*, 2003), cat (Bosch *et al.*, 2004), rhesus macaque (Lee *et al.*, 2004) and wallaby (Paris *et al.*, 2004). It is possible to achieve mature oocytes from all of these species using this technique. The benefits of ovarian tissue xenografting are similar to those mentioned for the testis.

An added advantage of xenografting techniques is that testis or ovarian tissue can be carefully preserved when available and grafted when required for generating gametes. Such cryopreservation already been successful in several species (Lee *et al.*, 2004; Paris *et al.*, 2004). Therefore, it will be very portant to start cryopreserving gonadal tissues in zoological parks in India; so when these techniques come routinely accessible, we would have diverse genetic material for use in assisted reproduction.

Fertility Control and Contraception

"Converse to expansion of animal number, population control is an important facet in most conservation plans. For the maintenance of a healthy ecosystem and in-situ conservation of species diversity, sometimes it becomes necessary to control population growth of certain species (Holland, 1999). The relative abundance of different mammalian species has been documented to fluctuate in the wild; this is due to several factors including the availability of different food materials. However, an imbalance occurs when for example, one particular food type that supports only a handful of species remains abundant for a long period of time making this species dominant "pests" and consequently

threatening the survival of other endemic species. Alternatively, the introduction of a non-native species to an ecosystem that lives on a previously unutilized/underutilized resource may result in rapid expansion this "invading" species to; prevail over others. We are beginning to see more and more of food-related imbalances in the ecosystem as we face threats of climate change and influences of increasing anthropogenic activities in the environment. One well-known example of this in India is the unbridled expansion of macaques overgrowing the limit of national parks (Pirta *et al.*, 1996). We currently face a serious problem to contain these macaque populations that have invaded urban areas and increased man-animal conflicts in the affected regions. There are several other expanding species that are a concern in the different pockets of ecosystems in India (Sekhar, 1998) and needless to say the population of feral dogs, cats and rodents worldwide. Effect on the human population due to these imbalances has resulted in crop and livestock depredation by this wildlife. Although, these species sometimes include ones in the IUCN threatened list, the overall impact of this to the common man and his livelihood leads to the erosion of conservation ethics. Therefore, population control is a critical issue that troubles wildlife officials worldwide. Although several techniques have been developed for population control in the laboratory, translation of these efforts to practical use in wild animal populations has almost always posed problems and raised concerns of behavioral and immunogenetic issues resulting in a limited use of these techniques (Cooper and Larsen, 2006). In India, "traditional" approaches of separating the sexes and surgical intervention by castration/spaying remain the major practices for contraception in captivity. However, these become impractical for a large-scale requirement in free-ranging wildlife. This section reviews some of the technologies that can be of potential use in contraception of certain wildlife species.

Steroids/Hormones: Early research on fertility control in wildlife has centered on the use of synthetic steroids, estrogens, or progestins. This work that started in the 1970s was focused on fertility control for the white tailed deer (Matschke, 1977; Matschke, 1980; DeNicola *et al.*, 1997). However, none of these studies led to a population management strategy in the wild; the main reasons being short-term efficacy requiring repeated dosing and the persistence of steroids resulting in potential hazardous effects on predatory species (Holland, 1999). Under captive conditions where repeated dosing is possible, subcutaneous implants of Melengestrol acetate and levonorgestrel continue to be popular means of contraception for several species (Jewgenow *et al.*, 2006a).

However, these treatments have met with contraindications in certain species (Munson *et al.*, 2002) and have often times produced variable and inconsistent responses in several others. Therefore, when the concept of immuno-contraceptives was introduced, most research focus on fertility control shifted to identifying specific antigens for immune- mediated fertility control. Immuno-contraceptive vaccines: The strategy for immuno-contraception is the development of vaccines against self-antigens present in sperm, eggs or reproductive hormones to prevent either the production of gametes, fertilization or successful gestation. The first experiments that showed success were conducted by vaccination against human chorionic gonadotropin or follicle stimulating hormone in primates (Talwar and Gaur, 1987; Talwar *et al.*, 1992). Subsequently, experiments using this same strategy were performed in other species with equivalent antigens (Miller *et al.*, 1997). Research focus subsequently shifted to antigens present in the zona pellucida of the oocyte in females (Gupta *et al.*, 1997) and components of spermatozoa in males (Diekman and Herr, 1997). In published trials, several species have been immunized with porcine zona pellucida vaccine [reviewed in (Kirkpatrick *et al.*, 1996; Hardy and Braid, 2007)]. In the individual studies, although a 100% efficacy was not reached, it still proves to be the most potent approach as a population control strategy for wildlife (Holland, 1999). More recently, the use of viral vectors to express specific zona pellucida antigens have been shown to be more efficacious (Hardy, 2007). Also, the use of transgenic or virus infected plants as a low-cost method to produce immuno-contraceptive vaccines is in development (Smith *et al.*, 1997). In males, the sheer numbers of sperm generated of which only one is required for fertilization to occur has made it challenging for most immuno-contraceptive approaches. However, several labs continue to pursue prospective candidates (Asquith *et al.*, 2006; Grignardet *et al.*, 2007; Naz and Aleem, 2007).

Although none of these developments have made it to a final commercially available form, immuno-contraception remains the approach that holds the highest benefits for contraception in the wild. In addition to efficacy of the vaccine itself, it should be noted that there would be a need to couple this with a dissemination system to target specific species in the wild. Specific research in these areas shows that these dissemination strategies may vary depending on the target and the ecosystem (Bradley *et al.*, 1997; Delsink *et al.*, 2007).

Conclusions

Adversely affecting all biodiversity and conservation efforts are humans and their activities. With the human population expanding and increasing its occupation of this planet, wildlife habitats are being fragmented and many species have reached a point of no return failing to sustain their populations in the wild. Wildlife species driven to live in isolated pockets of ecosystem are rapidly headed towards extinction. In addition to habitat destruction, pollutants in the environment have reached the most pristine of ecosystems on earth today. Man-made endocrine disruptors in the environment globally affect reproductive potentials in all life forms. As a cumulative result, biodiversity has already declined at an alarming rate; whatever is left is now being threatened by climate change. Even after a century of research in reproduction, progress has been very limited and we still do not understand the physiology of most of the threatened and endangered species. However, new technologies of assisted reproduction offer a modicum of hope that we may be able to sustain wild ecosystems and assist at least a handful of species today. Knowledge of these technologies also underscores the importance of preservation and resource banking today as they may help these species in the future.

We thank our colleagues Dr. V. Divya at the Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Karnataka, India and Dr.S. Illayaraja, Dr. K. K. Jadav and Dr. N.V. Rajesh at the Center for Conservation and Rehabilitation of Bears, Sur Sarovar Bird Sanctuary, Uttar Pradesh, India for conducting discussions on this topic. We also extend our thanks to Kartick Satyanarayan and Geeta Seshamani of the WildlifeSOS who constantly encourage conservation activities in our organization.

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Art - 30. FORAGING FOR DUNG BEETLES: A TASTY TREAT

Thomas Sharp, Kartick Satyanarayan, Geeta Seshamani
Wildlife SOS

Within the thorny scrub, deciduous jungles of the state of Karnataka, in southern India, a visitor may occasionally notice within a disturbed forest floor a broken dark object; dung balls, roughly the size of a baseball, lying cracked open in the recently dug dirt. But who, or what, is doing the cracking, and why? Wildlife SOS has been working to preserve sloth bear habitat that borders the Benekal Reserve Forest. This land is not far from the first sanctuary to have been declared for sloth bears in India, the Daroji Sloth Bear Sanctuary, founded on July 10, 1994. The area is also near the famous ruins of the Vijayanagar Kingdom, where the scars of historical battles that took place on the Deccan plateau can still be seen.

The forests in and around the Benekal Reserve are interspersed by huge rocky granite outcrops, with pockets of schist and gneiss and bands of dolorite and quartzite. The geographical features of the area, specifically the boulders and caves, are used by many wildlife species found in the area, including sloth bears (*Melursus ursinus*), leopards (*Panthera pardus*), peninsular Indian wolves (*Canis lupus pallipes*), jackals (*Canis aureos*), stripped hyenas (*Hyaena hyaena*), Indian pangolins (*Manis crassicaudata*), and Indian porcupines (*Hystrix indica*), as well as a large variety of bird life, including the red-listed, yellow-throated bulbul (*Pycnonotus xantholaemus*). It is within these relatively dry, scrubby areas that an interesting foraging behavior by sloth bears upon dung beetle larva has been noticed.

Sloth bears have a greatly varied diet, and although they are myrmecophageous (specifically adapted to feed on insects, especially termites and ants) they also feed on fruits, other plant matter and groundnuts (Joshi *et. al.* 1997, Bargali *et. al.* 2004). They will also eat carrion, and occasionally small mammals, amphibians or reptiles. Like other bear species but unlike other myrmecophagous mammals, they can adapt their diet to changing food conditions (Joshi *et. al.* 1997). This ability to adapt their diet to the surrounding area may be exaggerated in sloth bears as they are found in a large variety of habitat types which includes everything from scrub jungle to rainforest to wet evergreen forest to open prairie.

Previous studies have documented that sloth bears eat longicorn beetles and dung beetles (Bargali *et al.* 2004; Baskaran *et al.* 1997), but none have documented specific foraging behavior associated with these beetles or their larva. Dung beetles are present throughout the sub-continent of India and can be split into two basic groups based on their breeding behaviors: the “Tunnelers” and the “Rollers.” The Tunnelers make tunnels directly under a dung pat. The Rollers gather dung into a ball, roll it to a new location, and lay an egg in it. Some species of Rollers prop up the dung balls in vegetation, while other species bury them in the ground, roughly 10 cm deep. The species that bury the dung balls in the ground seem to be of particular interest to sloth bears.

It turns out that these buried, larva-filled dung balls are quite the delicacy to sloth bears, who will actively forage for them. Throughout the scrub forests of Karnataka, the unmistakable sloth bear sign - the long, trailedd dirt diggings and sloth bear prints - will often contain a cracked-open dung ball (see photo). Exactly how the bears locate the dung balls under the earth is not known, though their keen sense of smell likely plays a role. Once the dung balls are located, the bears use their long, powerful claws to dig up them up. The ball is then cracked open and the contents eaten. How important dung beetle larvae are to the sloth bear's diet is unknown. It would be particularly difficult to quantify in a formal study because the soft tissue of these larva likely would not be recognizable in bear scat. It is also not known if the importance of this food source varies with the seasons or other ecological cycles.

Further research on this type of foraging behavior could provide additional important information on sloth bear ecology in these rocky deciduous scrub jungles.



Sloth Bear Sign: long, trailed dirt diggings and sloth bear print

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Art – 31. A REPORT OF MANDIBULAR BRACHYGNATHISM IN A RESCUED DANCING SLOTH BEAR (*Melursus ursinus*)

Arun A Sha, Ilayaraja S, K K Jadav, M Veeraselvam, N V Rajesh and V Divya
Wildlife Veterinary Officers, Bear Rescue Facility, Wildlife SOS, India

ABSTRACT:

A mandibular brachygnathism often called "over-shot" occurs when the mandibular is shorter than normal. In this article, a rescued female dancing sloth bear (*Melursus ursinus*) aged approximately 24 years, microchip number 95800000519950 was found to have mandibular brachygnathism and the bear found it difficult to eat from the usual ground level bowl feeding. Then she was given food in an elevated platform and she started taking proper food. The bear was anesthetized and subjected for mandibular radiography examination to rule out the traumatic cause. The radiography revealed that the cause could be from congenital teratology. The teeth were mal-occluded in the entire lower jaw, like the upper incisors are rostral to the lower incisors. The canines were broken by the street performers, so no comparisons were made possible. The mandibular pre-molars were caudally displaced relative to the mandibular pre-molars.

Art - 32. TELAZOL AS BALANCED ANAESTHESIA IN ASIATIC BLACK BEAR

Arun A Sha¹ , V Srinivas, K K Jadav¹, Ilayaraja and Rajesh¹
Indira Gandhi Zoological Park, Vishakapatnam, Andhra Pradesh, India.
(Received: 20-11-2007; Accepted: 27-03-2009)

Tiletamine hydrochloride is an analogue of Ketamine and as a 1:1 combination with Zolazepam hydrochloride, a Pyrazolodiazapene known as Zoletil or Telazol is used. This combination of drugs shows dose-related property of dissociative anesthetics, sedative, and hypnotic properties. This study report on the various stages of immobilization and successful recovery of an adult male Asiatic black bear (*Selenarctos thibetanus*), using Telazol for general clinical examination.

Materials and Methods:

An adult male, 21-year-old Asiatic black bear (*Selenarctos thibetanus*), weighing 180 kg was immobilized for general clinical examination and to rule out any infectious causes. The animal was maintained at Vishakapatnam Zoo, Andhra Pradesh has a history of in-appetance and subcutaneous edema in both hind legs and preputial swelling. The animal was dull and depressed for one week. Food and water were withheld, for 12 hours before anesthesia. The animal was darted and immobilized using blowpipe method. Atropine sulphate was given at 4.5ml as a single dose, in combination with Tiletamine hydrochloride and Zolazepam hydrochloride (Telazol) at the dose rate of 4mg/kg body weight intramuscularly for induction and the second dose at 1mg/kg body weight i/m for maintenance. The animal was immobilized and was in its lateral recumbency. The body temperature was 32°C. The heart rate of the animal was 64 heartbeats per minute. The induction occurred after 15 minutes. Ultrasound examination of the thoracic, abdominal and pelvic cavity was carried out to rule out specific organ abnormalities, blood and ascetic fluid were collected for laboratory examination.

Boever (1 983) reported Tiletamine hydrochloride and Zolazepam hydrochloride in a 1:1 combination was useful for restraint and minor surgical procedures when administered at the dose rate of 4. 9 mg/kg body weight. The onset of induction was reported to be within 5 to10 minutes when administered intramuscularly. The half-life of Tiletamine hydrochloride was 66.9 ± 241 . minutes and was prolonged by the concurrent use of sedatives like Diazepam or Zolazepam (McKenzie, foe. cit).

Clinical effects usually disappear within 60 to 90 minutes (Fowler, 1986). After 63 minutes, the animal started showing the recovery symptoms of ear twitching, lip and head movement and tried to stand on its fore legs. In the present study, Tiletamine hydrochloride and Zolazepam hydrochloride (Telazol) was used at 4 mg/kg body weight, intramuscularly as initial dose and 1 mg/kg body weight, intramuscularly for maintenance dose was found to be sufficient for immobilization of adult Asiatic black bear (*Selenarctos thibetanus*), without any untoward effects. However higher dose rate may be necessary for immobilizing bigger, more agile and excited Ursids. Cattet *et al.*, (2003) and Onuma (2003) described on the successful use of Tiletamine hydrochloride and Zolazepam hydrochloride combination in Polar bears and Sun bears respectively for immobilization. Kreeger *et al.*, 1990 reported combination of Tiletamine hydrochloride and Zolaezapam hydrochloride achieved quick inductions and acceptable recovery items in red foxes (*Vulpes vulpes*) and appeared to be a good drug combination in this species. This was in accordance to the present study with the same combination of drugs in Asiatic black bear (*Selenarctos thibetanus*) with good drug effect and a slow, smooth and reliable recovery.

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Art – 33. HAND REARING OF STRIPED HYENA CUB (*Hyaena hyaena*) IN A CAPTIVE FACILITY

**Baiju Raj M V, Preerna Sharma, A Sha Arun, N K Janoo, Geeta Seshamani,
Kartick Satyanarayan,
Wildlife SOS, Agra.**

ABSTRACT:

The Striped Hyena (*Hyaena hyaena*) is an omnivorous mammal of the family Hyaenidae. Adult Striped Hyenas are largely scavengers, but will also eat small animals, fruit, and insects. Hand-rearing of a wild animal cub is a challenging task for caretakers in the rescue facility or zoos. A 10 to 15 day old female hyena cub named "Hyeni" weighed 1 kilogram was received on 14th April 2009 having the history of abandoned by her mother and found near Khari River in Akola Thesil in Agra. The Forest Department, Agra division handed over the cub to the captive facility for treatment and care. It has a long, bushy tail which is black and white in color, with long, coarse hair. Four toes with short, blunt, non-retractable claws are present on the feet and having the dental formula of 3/3, 1/1, 4/3, 1 /1. The cub was fed warm milk in feeding bottle with an interval of 1 hour with maximum hygienic measures. The cub was kept in the wooden box with hot water bag to keep the temperature optimum. The detailed discussion was made about the feeding of the baby hyena, like 12 times in 1st 15 days, next 15 days frequency of feeding was 10 times a day. After 1 month the feeding was reduced 9 times a day then to 6 and now the feeding is fixed for 5 times a day. Feed- (milk- egg- boiled chicken- fruits- biscuits) feed supplement- (Calcium protein, nutrients, and vitamin syrup) Treatment - routine de-worming, rid bath, vaccination of DHLPPi, Liver tonics, Digestive syrups and Gripe water. The study for proposed releasing site is being carried out and subsequent conditioning of the sub-adult before being radio-collared and soft release.

**Art – 34. CHEMICAL IMMOBILIZATION OF RESCUED CAPTIVE SLOTH BEARS
(*Melursus ursinus*) WITH TILETAMINE HYDROCHLORIDE AND
ZOLAZEPAM HYDROCHLORIDE (ZOLETIL®) IN INDIA**

**Arun Attur Shanmugam¹, Kajal Kumar Jadav², Ilayaraja Selvaraj² and N V
Rajesh²**

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore, Karnataka, India.

²Center for the Conservation and Rehabilitation of Bears, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh, India.

ABSTRACT:

The combination of tiletamine hydrochloride and zolazepam hydrochloride (Zoletil®) has been used on many species of wild mammals. In the present study, a 1:1 mixture of Zoletil® at the dose rate of 4 mg/kg was used in 8 rescued captive sloth bear cubs (*Melursus ursinus*) in Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore, India. Statistical analysis were interpreted in this study and the mean +/- SD for the induction time, recovery time, respiratory rate, pulse rate, heart rate, SPO₂ and temperature in Fahrenheit was collected. The mean induction time was taken as the adoption of lateral recumbency was 6.3+/-1.7 min (mean+/-SD). The mean recovery time was taken as the time between the inductions and until the time that the bear was sitting in the trap was 104.6 +/-17.3 min (mean+/-SD). Similarly the mean +/-SD for respiratory rate, pulse rate, heart rate, SPO₂ and temperature were 24.3+/-6.7, 127.3+/-12.1, 119.8 +/-11.2, 96.4+/-2.0 and 100.3+/-1.7 respectively. Preliminary results indicated that the cubs did not suffer respiratory and cardiac depression and were able to thermo-regulate while immobilized. The cubs could be handled safely while under the effects of the drug. However, the drug did not appear to provide good analgesia at the dose tested. In general, the study stated that immobilization with Zoletil® was characterized by a short induction time, low volume, reliable and predictable immobilization, early, smoother recovery, poor analgesia, wide margin of safety, good muscle relaxation and relatively safe in handling for field personnel and the bear cubs under anesthesia.

Art – 35. MANAGEMENT OF UNSTABLE FEMORAL FRACTURE AND EXTENSIVE BURN INJURIES IN A WILD SLOTH BEAR (*Melurursus ursinus*)

Ayyappan S, B Justin William, C Sreekumar, N Kalaivanan, **Sha A Arun**,
Sankar and R. Suresh Kumar

Department of Vet Surgery and Radiology, Madras Veterinary College, Chennai-7

ABSTRACT:

A male wild sloth bear (*Melurursus ursinus*) approximately 15-month-old was rescued after a fall from an electric pole and referred to the Elephant camp at Mudumalai wildlife sanctuary for follow up and treatment one-week post-injury. The animal was non-weight bearing on its left hind limb and had extensive wounds involving the facial region. The animal was pre-medicated with Atropine sulphate at a dose of 0.025mg/kg b.wt intramuscularly and sedated with xylazine at a dose of 5mg/kg intramuscularly using a blowpipe and transferred to an operation theatre facility. A continuous intravenous line was established and general anesthesia was maintained with a second dose of xylazine at a dose of 1mg/kg b.wt intramuscularly and ketamine 2mg/kg b.wt intravenously as regular boluses as and when required. Clinical examination revealed extensive burns with necrotic tissue involving the entire femoral region, a 4 inch long lacerated wound in the right fore paw and a 6 inch long open necrotic wound in the medial aspect of the left forearm exposing the muscles and tendons. The right eye had a traumatic descemetocele. An examination of the left hind limb indicated an unstable left femoral fracture. The prognosis of the case was unfavorable. The wounds were debrided, flushed thoroughly with lukewarm ringers lactate and dilute povidone iodine, muscles layers closed using tension relieving sutures and skin opposed as per standard procedure, dressed with sterile povidone iodine and bandaged. The right eye was extirpated, packed with sterile gauze and bandage. Plain radiography of the left femoral region indicated an unstable transverse fracture of the femur. The femoral fracture was subjected to open reduction and internal fixation using a 10h 3.5mm locking compression plate using standard AO/ASIF principles. The animal was provided cage rest. Post-operative care was done as per routine protocol. However, the animal was extremely aggressive and had a tendency to self-mutilate the wounds frequently. Despite intensive care and treatment, the condition progressively worsened and the animal died during the third week of treatment.

Art – 36. VASECTOMY IN A SLOTH BEAR (*Melursus ursinus*)

Arun A Sha¹, Divya¹, Kajal Kumar Jadav², S Ilayaraja²

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore, Karnataka, India.

²Wildlife Veterinary Officer, Wildlife SOS, Agra Bear Rescue Facility, Agra.

ABSTRACT:

Sloth bear (*Melursus ursinus*) belongs to the family Ursidae and is endemic to the Indian subcontinent (Garshelis *et al.*, 1999). Rescue and rehabilitation centres are not to breed the animals as per Central Zoo Authority guidelines (Ref page 21 of the blue book). It recommends birth control measures of such animals and vasectomy has been adopted as a successful procedure in sloth bears to arrest unwanted birth. The procedure involved anesthesia of the bear with injection Xylazine (2mg/kg b.wt) and injection Ketamine (5mg/kgb.wt) intramuscularly & a pre-scrotal single incision. The surgical procedure is discussed in this article. A course of antibiotic along with supportive therapy ensured complete healing of the surgical wound. The resected portion of the vas deferens was subjected to histological examination and found testicular tissue with seminiferous tubules containing Sertoli cells and germ cells at all the level of maturation including mature spermatozoa. The interstitium showed occasional clusters of Leydig cells and the tissue was confirmed as vas deferens.

Art – 37. CASE OF METASTATIC ADENOCARCINOMA IN A RESCUED SLOTH BEAR (*Melursus ursinus*)

Ilayaraja S¹, Arun A Sha², Kajal Kumar Jadav¹

¹Wildlife Veterinary Officer, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh, India

²Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Bangalore, Karnataka, India

ABSTRACT:

A male bear named Jammu aged 15 years was reported to be limping on its right forelimb for the past 20 days. Antibiotic cefotaxime at the dose rate of 25mg/kg body weight and local infrared therapy was given for six days. Later the bear showed symptoms of vomition and frothy secretion from the mouth. However, no respiratory distress was observed. Subsequently, the bear became recumbent and died on the 7th day. A complete necropsy was performed, and tumor masses of varying sizes were found in all the vital organs. Histopathology of lung, liver, spleen, and kidney revealed multiple foci of well-differentiated adenocarcinomas. The gross and histopathology lesions are discussed in detail.

Art – 39. IMPORTANCE OF INTRA ORAL DENTAL RADIOGRAPHY IN A SLOTH BEAR (*Melursus ursinus*)

Arun A Sha¹, Kajal Kumar Jadav² and S Ilayaraja²

¹Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue Center, Bannerghatta Biological Park, Bangalore, Karnataka, India.

²Wildlife Veterinary Officer, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh, India

ABSTRACT:

Radiography is a vital diagnostic aid in veterinary dentistry. Most of the periodontium and root can only be visualized by dental radiography. In this article, the authors described their practical experience of taking dental radiography. Most of the problems like broken teeth i.e canines and incisors were noticed in rescued dancing sloth bears as a result of its ill-treatment. Owners of these bears will fully be knocked out the canines in these performing bears for their safety. This barbaric practice in 2 to 5 months old bear cubs leads to root abscess, exposed pulp, nerve damage, tooth fracture, caries, bone pathology, neoplastic conditions, all pulpal and periapical problems. Such problems can be easily discovered by dental radiography and subsequent treatment. Radiography machines usually have a fixed kV of 50-70 and a fixed mA of 8-10, the exposure time will be assigned with the help of an electronic timer. The ideal film for bears is Occlusal (5 x 7cm) preferably D speed ultra intraoral films. We got better results using the bisecting angle technique to minimize distortion during the procedure of taking the teeth in the upper jaw and the mandibular incisors and canines. The detailed procedure of preparation of the bear, equipment, placing and orientation of the film, exposure time and settings, chair-side processing of the exposed dental radiography films and making the diagnosis is discussed.

Art – 40. HYPERADRENOCORTICISM (CUSHING'S DISEASE) IN A RESCUED SLOTH BEAR (*Melursus ursinus*): A CASE REPORT

Arun Attur Shanmugam, Yaduraj Khadpekar and Mahadev Lamani
Wildlife Veterinary Officers, Wildlife SOS, Bannerghatta Bear Rescue Center,
Bannerghatta Biological Park, Bangalore, Karnataka, India.

ABSTRACT:

Hyperadrenocorticism or Cushing's disease has been frequently reported in domestic animals such as horses and various breeds of dogs. However, the reports of this endocrine disorder in wildlife are very rare. This paper reports the occurrence of Cushing's Disease in a rescued sloth bear (*Melursus ursinus*) at Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore, India. Sloth bears, once found throughout the forests of central and south India, now remain only in few scattered habitats. They are protected under Schedule 1 of Indian Wildlife (Protection) Act, 1972 and are categorized as Vulnerable in the Red List of IUCN, 2007. During January 2009, an adult 10 year old male sloth bear at the centre was observed to have developed hyperphagia along with the abdominal enlargement and progressive lateral symmetrical alopecia on the trunk. From the clinical symptoms and few differential diagnostic tests like skin scraping to rule out mange and other fungal infections, it was tentatively diagnosed as Cushing's disease. Due to the practical difficulties and unavailability of other drugs of choice, the bear was treated with oral Ketoconazole@ 10 mg/kg body weight twice a day for 20 days. This treatment was found to be effective as the animal showed improvement during and after the course of the treatment. The symptoms were observed to be ceased completely within 20 days of initiation of the treatment.

Art – 41. HAND REARING OF ORPHANED WILD LEOPARD CUBS
(*Panthera pardus*) **IN CAPTIVITY**

Karabi Deka and Arun Attur Shanmugam
Wildlife SOS, Manikdoh Leopard Rescue Centre, Maharashtra, India

ABSTRACT:

Hand rearing of wild carnivores like tiger or leopard is one of the most challenging and specialized aspects of wildlife management and rehabilitation. Hand reared cubs may develop behavioral problems if not handled properly. These cubs undergo very rapid development and growth, therefore correct handling, nutrition and facilities are critically important. Two leopard cubs, one male and one female, were found in a sugarcane field of Manegaon village at Nashik, Maharashtra, India. The cubs were rescued by the forest department and brought to the Manikdoh Leopard Rescue Centre (MLRC) inherited by Wildlife SOS. The male cub, named Michael, weighed 2 kg, while the female cub, named Joan, weighed 1.9 kg when they were brought on 6th May 2008 to MLRC. Upon arrival, the cubs were stabilized first, allowed to settle down and acclimatized to their new environment and checked for general health condition. Two pairs of deciduous canines and three pairs of incisors were present in both the cubs. They were fed initially with cows milk thrice daily (9 AM, 12 PM & 3 PM) and chicken twice daily (11 AM & 5 PM). 250 gm of minced chicken was fed to both the cubs in two equally divided half. Vitamins and mineral supplements were administered for both the cubs. The morphometry of the cubs taken at the time of arrival and then again after 2 months showed considerable changes. Observations made on behavior, growth in terms of morphometry, body weight, hygiene, health condition, housing, feeding schedule, monitoring and record keeping are discussed in this article.

Art – 42. HABITUATION TO ENVIRONMENTAL ENRICHMENT IN CAPTIVE SLOTH BEARS - EFFECT ON STEREOTYPES

Claes Anderson,¹**Attur Shanmugam Arun,**²and Per Jensen¹ *

¹IFM Biology, Division of Zoology, Linkoping University, Linkoping, Sweden

²Wildlife SOS, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bannerghatta, Bangalore, Karnataka, India

ABSTRACT:

The benefits to captive animals of environmental enrichment (EE) are widely recognized. Few studies have, however, studied how to maximise the effect of EE. One issue with EE programs seems to be habituation to the enrichment device. To study the effect of habituation to EE, 14 captive sloth bears (*Melursus ursinus*) were subjected to two different EE treatments. Treatment one presented EE (logs with honey containing holes) for five consecutive days, whereas treatment two presented EE on intermittent days for five days. Intermittent presentations tended to reduce habituation toward the EE. Both consecutive and intermittent presentations significantly reduced stereotypies; however, the consecutive presentations had a longer-lasting effect. Explorative behaviors increased in both treatments, consistent with earlier findings that EE increase levels of natural behaviors. Other behaviors were unaffected by the EE presentations. The results show that intermittent presentation of EE objects may secure the interest of the animals, but continuous access to enrichment may be more efficient in reducing stereotypies in the long run.

Keywords: animal welfare; extrinsic reinforcer; sloth bears (*Melursus ursinus*)

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INTRODUCTION

Bears in captivity are considered to be notorious performers of stereotypies [Swaisgood and Shepherdson, 2005]. For example, it has been observed that 60% of all Polar bears (*Ursus maritimus*) in UK zoos perform stereotypic behaviors [Carlstead *et al.*, 1991]. Whilst foraging is one of the most prominent behaviors in wild bears occupying most of their daily time [Carlstead *et al.*, 1991], feeding routines in captivity can strongly alter the time budget. Normal feeding in captivity [Carlstead *et al.*, 1991; Vickery and Mason, 2004] (as well as in this study) consists of one to three meals per day served in a bowl, and feeding time at each meal may be as low as 5-10 min. This may create two problems: first, a large amount of "free-time" for the bears and, second, a lack of opportunity for exhibiting sufficient amounts of normal foraging behavior. According to Mason [1991], both may be associated with the development of abnormal behaviors, such as stereotypies.

High levels of stereotypies in captivity are well known in Indian captive sloth bears (*Melursus ursinus*) with a history as "dancing bears" [Grandia *et al.*, 2001]. The Indian tradition of "dancing bears" involves the bears being separated from their mothers at a young age. Many bears get their canines removed for the keepers' safety and, when living and dancing with their keeper on the streets, they are fitted with a metal ring in their nose for the keepers' control of the animal. This may, presumably, cause a great deal of pain, which has been considered one important factor in the development of stereotypies [Swaisgood and Shepherdson, 2005]. Thanks to the efforts of animal welfare organizations, many dancing bears are rescued from their performance lives and moved to sanctuaries where they are kept in environments which may be relatively barren, lacking proper furnishing for environmental stimuli [Montaudouin and Le Pape, 2005]. The animals in these captive environments often maintain high levels of stereotypies throughout their lives [Grandia *et al.*, 2001]. In order to decrease the levels of stereotypies, environmental enrichment (EE) can be used. The benefits gained by implementing EE are widely recognised; for example, reducing injurious behaviors and stereotypies, and enhancing the expression of behavioral patterns resembling those seen in the wild [Young, 2003; Zonderland *et al.*, 2008]. Although EE can be costly in terms of time, resources, and increased work load for animal keepers [Newberry, 1995; Tarou and Bashaw, 2007], very little research has

been focused on how to maximize the effects of EE. A few studies have discussed and empirically assessed the effectiveness of different types of EE presentations [e.g. Celli *et al.*, 2003; Van de Weerd *i.*, 2003], but much research needs to be done in order to fully understand how EE can be implemented to its full extent. One of the major practical problems with prolonged EE presentations is habituation, which is a decrease in responsiveness of the animals toward a repeatedly presented stimulus [Murphy *et al.*, 2003]. Extrinsic reinforcing enrichments that offer an external reward, such as finding food, generally seem to have a longer-lasting effect than intrinsic reinforcers, which are only rewarded through the performance of the behavior itself. Ings *et al.* [1997] found that the behavioral responses to a scattered feeding enrichment for more than 30 consecutive days only showed a decrease of approximately 20% from day one until day 30 in captive bush dogs (*Speothos venaticus*). Murphy *et al.* [2003] have stated that the response to an EE may recover if the EE item is withheld for a period of time, also suggested by Carlstead (1996) and Cannon and McSweeney [1998]. When Renner *et al.* [2000] reintroduced EE after 14 days in New World monkeys, the response had spontaneously recovered to similar levels as during the first introduction. Leaving time laps between presentations may thus strengthen the reinforcer while allowing the same EE to maintain high rates of expressions of the induced behaviors.

Such effects can also be accounted for by principles of conditioned behavior. Extinction of behaviors may be caused by a complete consumption of the extrinsic reinforcer over a longer period of time, only to be reinstated on the return of the reinforcer [Tarou and Bashaw 2007]. Leaving gaps between EE presentations may presumably also cause contrast effects. Reintroducing the EE device after withholding it for a period may cause an increased level of response to the same level of reinforcer as earlier presented (positive contrast) [Murphy *et al.*, 2003].

The aim of this study was to examine whether there are means to increase effectiveness in EE by reducing the frequency of presentations, and the effects this procedure would have on other behaviors, primarily on stereotypies. We predicted that introduction of EE would decrease the levels of stereotypies and that presenting the EE only every second day would be even more efficient. We also predicted that when the bears were subjected to daily presentation of EE, they would show a

habituation in their responses toward the enrichment objects, whereas intermittent enrichment would lead to less habituation.

MATERIALS AND METHODS

Animals and Housing Conditions

The study was performed at Bannerghatta Bear Rescue Centre (BBRC), located within Bannerghatta National Park in Karnataka State in south India, during July-November 2007. BBRC houses approximately 60 confiscated former dancing sloth bears (*M. ursinus*). Fourteen of these bears, seven males and seven females were included in this study, were all kept in the same enclosure. All males were castrated. The age of the bears ranged from approximately 2 to 18 years (the exact ages were not possible to ascertain).

The enclosure for the 14 bears in the study was approximately 1,300 m² and contained four climbing structures, two water holes, a den, and some trees and bushes. The ground was covered mainly with soil, small patches of grass, and the enclosure was surrounded by a 2 m high electrical fence.

The bears were fed three times a day. In the morning (10:00) and evening (17:30) feed, 7 kg of Ragi porridge (morning) and Jowar porridge (evening) was offered to each bear in a feeding den. At mid-day (12:30), 2kg fruit per bear were scattered in the enclosure and no record was kept of any individual bear feeding. The bears in the enclosure were earlier familiar with different kinds of enrichment, such as wobble trees, scent enrichment. However, before the baseline observation, the bears were deprived of all kinds of enrichment for 10 days.

Environmental Enrichment

For this study, honey logs, which the animals were not earlier familiar with, were provided as EE. Each log was approximately 100 cm x 15-20 cm (weighing 15-18 kg), designed, in accordance with those used in a study by Carlstead *et al.* [1991], and chosen owing to their proven success in occupying bears in their study [1991]. Four three-armed wells were drilled around the circumference of the log so that they met in the middle. Each log contained four such wells 20 cm apart, starting 20 cm from each side. When the logs were introduced into the enclosure, each log was filled with approximately 200g of honey. The 12 holes on each log were then closed with wooden plugs.

Seven logs were used in this study for the 14 bears, thus, one log for two bears on an average. The number of honey logs was assumed to be sufficient not to create territorial responses and aggression, as has been seen in other species when EE created defendable resources [Nevison *et al.*, 1999; Nijman and Heuts, 2000; Young, 2003]. Before the study, the bears were allowed to familiarize with the baited honey logs for three consecutive days to reduce the novelty effect [Young, 2003] that could otherwise have affected the data.

Experimental Procedure

Baseline data were collected according to the observation scheme for five days, repeated three times, before the first introduction of EE. Two different EE treatments, consecutive and intermittent, were applied with a baseline period inbetween. Consecutive EE consisted of introducing the logs for five days in a row, whereas intermittent treatment consisted of introducing the logs on days 1, 3, and 5. Behavior was monitored on all five days of a treatment period. Immediately after a five-day EE period, the behavior of the bears was monitored for another 6-10 days when they did not have access to any EE, before a new treatment was started. The treatments were applied in alteration, starting with consecutive EE and followed by intermittent EE (Fig. 1). As recommended by Saudargas and Drummer [1996], both baselines and the two enrichment treatments were repeated three times to enhance statistical power as well as reducing the effects of random measurement error [Martin and Bateson, 1993]. On days when the animals did not have access to honey logs, 100g of honey was added into each bear's feed bowl for the evening feed.

Behavioral Recording

Before any data collection, 14 days were spent with preliminary observations of the animals to get a general impression of behaviors, activity patterns, and practical considerations for the study. Based on these observations, the behaviors were defined into 20 categories in the ethogram (Table 1). These 20 categories were later merged into six different classes for further analysis.

Behavioral recordings were obtained between 15:00-17:30 during each day of the study. The daily timing of the observation was chosen for two reasons. First, as described in the literature [Landrigan *et al.*, 2001; Wechsler, 1991], stereotypies tend

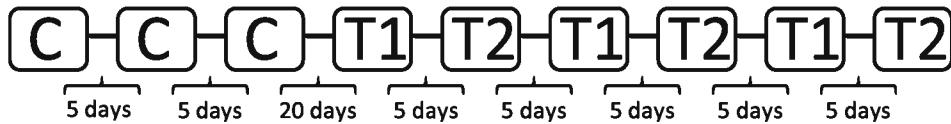


Fig. 1. Time line showing the experimental procedure of the study.

TABLE 1. Ethogram (modified after Forthman and Bakeman, 1992; Vickery and Mason, 2004)

1. Active	
1.1 Social interactions	
Aggression	Bear standing bipedal facing another bear, shouting and pushing the other bear with paws
Non-aggression	Bear embraces or sniffs another bear
1.2 Explorative behaviors	
Enrichment	Sniffing or consuming honey in the enrichment honey log.
Exploring	Lifting and rotating of the log
Exploring objects	Sniffing or digging in the ground
Vigilance	Sniffing objects in the enclosure, such as grass, twigs.
1.3 Other active behavior	Ground excluded
Climbing	Observing the surrounding area or other bears
Foraging	Stands or locomotes above ground level in tree or on climbing structure
Locomotion	Consuming food or liquid item
Scratching	Quadrupedal walk, bipedal walk or quadrupedal run
	Rubbing the body with its paws or rubbing the body against a structure, such as a wall or a tree
2. Passive	
Laying	Body is not supported by the legs and positioned on the ground ventrally, laterally, or dorsally
Sitting	Body is supported by hind legs, upper body in the air. Alternative leaning against wall or a tree
3. Abnormal/stereotypies	
Self biting	Bear bites part of body such as arm, paw
Forepaw hopping	Bear is jumping up and down with its forepaws while rear legs are still on the ground
Masturbation	Sucking genitalia, often accompanied by a humming sound
Pacing	Bear walks the same straight path repetitively, with turning points at the same location each time. Three successive identical repetitions were set as the criteria for pacing
Sway	Standing with all legs on the ground, moving head from left to right, with or without a small side step with either front or hind legs
Paw sucking	Repetitive sucking of a body area, often accompanied by a “humming” vocalization
4. Other	
Not visible	Out of sight or behavior not possible to identify
Observer interaction	Trying to reach or approach the observer

observations. Second, bears' dens were open during mid-day in case of rain, hot sun, which might cause inconsistent data samples, if large number of bears would have been out of sight during periods of the observations. During those days when honey logs were offered, the logs were introduced 10 min before data collection commenced and removed each evening. The observation point was located 2.7 m above ground on the roof of one of the feeding buildings.

Behavioral data were collected every 2 min, using a combination of scan sampling and instantaneous sampling. A beeper indicated every 2 min interval, and at the beep, the behavior of each bear was noted on a check sheet, always scanning the group in the same order.

Statistical Analysis

Scan sampling yielded 75 data points of behavioral sampling from each bear on each of the total 75 days, representing three replicated treatments for each individual. For the statistical analysis, behavioral data were calculated as a mean per day for each of the bears and for each of the treatments (baseline, continuous presentation, intermittent presentation). All data were tested for normality and similar variance, and were found to be suitable for parametric analysis. For analysing differences between the treatments, one-way repeated measures ANOVA was used for statistical analyses, with treatment as repeated and sex as between subject variables, using SPSS 14.0. Sphericity was assumed in all tests. For post hoc tests and tests of normality and similar variance, Minitab 15 was used. For the post hoc tests, a paired t-test was used. Although the bears were not truly independent replicates, because they were all in one group, we treated them as such in the analysis. This has been considered justified by a few reasons. First, the bears were able to be regularly out of sight from each other. Second, the behaviors observed and, in particular, the stereotypies showed no obvious indication of being affected by other individuals in the enclosure based on the preliminary observations. The social behaviors must, however, be treated with some care, being highly nonindependent. In this report, data are presented as mean values \pm SEM. For all tests, the level of a statistical significance was set to $P<0.05$.

RESULTS

When the EE was introduced for five consecutive days, enrichment exploration decreased significantly ($F_{(4,48)} = 10.393$, $P < 0.001$). The decreasing trend was strongest in the first few days. There was no effect of sex on the results ($F_{(1,12)} = 0.793$, $P = 0.391$). The post hoc tests showed that exploration on day one and two differed significantly from the three remaining days. Day one differed from day three ($T_{(1)} = 4.37$, $P = 0.001$), day four ($T_{(13)} = 4.60$, $P = 0.001$), and day five ($T_{(13)} = 4.87$, $P = 0.000$). Day two differed from day three ($T_{(13)} = 2.33$, $P = 0.037$), day four ($T_{(13)} = 2.59$, $P = 0.022$), and day five ($T_{(13)} = 2.76$, $P = 0.016$). During the last three days, there was only a trend for a difference ($T_{(13)} = 1.90$, $P = 0.80$).

In intermittent EE treatment, there was a significant effect of day on enrichment exploration ($F_{(2,24)} = 10.514$, $P = 0.001$). Again, there was no effect of sex on the results ($F_{(1,12)} = 0.430$, $P = 0.525$). The post hoc tests showed no difference between day one and day three, but both were significantly different from day five ($T_{(13)} = 3.71$, $P = 0.003$ and $T_{(13)} = 3.90$, $P = 0.002$, respectively).

In a comparison between the two treatments (Fig. 2), there were no differences in the frequency of enrichment exploration between treatments, either on day one ($T_{(13)} = 1.42$, $P = 0.178$) or on day five ($T_{(13)} = 1.42$, $P = 0.180$). There was, however, a significant difference on day three ($T_{(13)} = 3.70$, $P = 0.003$). Comparing the second day of introduced EE in both treatments, i.e. day two in consecutive EE and day three in intermittent EE, there was also a significant difference ($T_{(13)} = 3.0$, $P = 0.010$). There was no significant difference on the third day of introduced EE, i.e. day three in consecutive EE and day five in intermittent EE.

There was a significant effect of treatment on the frequency of stereotypic behaviors ($F_{(4,48)} = 5.115$, $P = 0.002$; Fig. 3). There was also an effect of sex on the result, in that females had in general a higher level of stereotypies ($F_{(1,12)} = 4.249$, Control Consecutive Consecutive Intermittent Intermittent enrichment post).

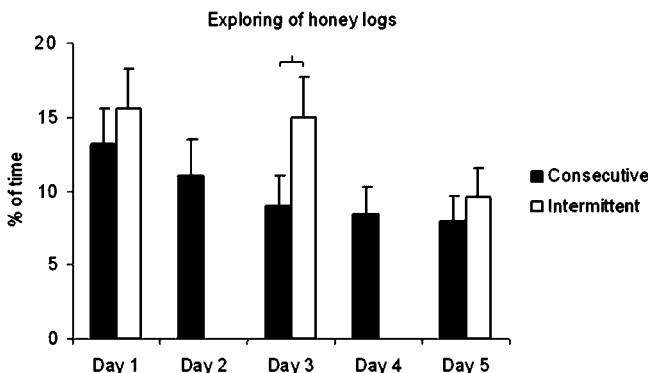


Fig. 2. Percent of time spent exploring the EE in the two treatments for each of the treatment days. Data are presented as mean \pm SEM; $N = 14$. Hanger represents a significant difference ($P < 0.05$).

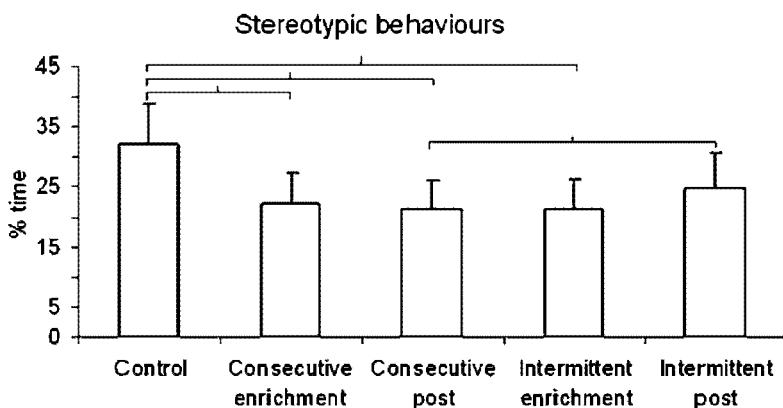


Fig. 3. Percent of time spent performing stereotypic behaviors in the different treatments. Data are presented as mean \pm SEM; $N = 14$. Hanger represents a significant difference ($P < 0.05$). ($P = 0.062$).

The post hoc tests showed that the frequency of stereotypies in the control period was significantly higher than all the other treatments, except post-enrichment in the intermittent EE treatment. There was also a significant difference between the post-enrichment levels of the two treatments ($T_{(13)} = 2.73$, $P = 0.017$).

EE had a significant effect on general explorative behaviors, which was more frequent in both EE treatments than in the control periods. ($F = 4.457$, $P < 0.001$; Fig. 4). There was also an effect of sex on general exploration ($F_{(1,12)} = 9.019$, $P = 0.011$), where females in general showed a lower level of explorative behaviors toward the surroundings. None of the three groups "passive behaviors," "social behaviors," or "other active behavior" was significantly affected by EE.

DISCUSSION

Our results showed that presenting EE to captive sloth bears every second day can achieve similar behavioral effects as presenting the EE every day, in terms of reduced levels of stereotypies. Leaving gap days in between EE presentations tended to cause a spontaneous recovery in the responsiveness toward the honey logs, as we predicted.

Regardless of the mode of introduction, EE significantly reduced the levels of stereotypies. The reduction was, however, relatively small compared with earlier studies. Carlstead *et al.* [1991] managed to reduce stereotypies by approximately 80%, by presenting honey logs similar to those used in this study. Their study, however, only consisted of three subjects from three different Ursus species. This study may be more representative for sloth bears, because we studied a relatively large number of individuals in the same settings and with a similar background.

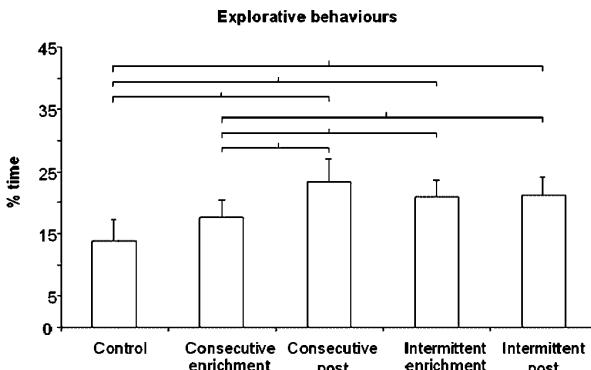


Fig. 4. Percent of time spent on explorative behaviors in the different treatments. Data are presented as mean \pm SEM; N 5 14. Hanger represents a significant difference (Po0.05).

Once stereotypic behaviors have been established, they can become emancipated from their original causation, thus becoming independent from their original causal factors and difficult to reduce [Mason, 1991]. The bears, in this study, had been housed by BBRC for a great variety of time, and it is quite possible that the long period in captivity had made the stereotypies more difficult to reduce. Stereotypies may also be a result of earlier experiences, not related to the present captivity situation [Swaisgood and Shepherdson, 2005; Wiepkema and Koolhaas, 1993]. As the bears in our study were all confiscated dancing bears, there is a chance that an earlier treatment may have been an important component causing the stereotypies. It was, however, impossible to assess earlier experiences of the animals.

Similar levels of stereotypies in the two treatments may indicate that there was a positive effect of the gap days in intermittent EE. During intermittent EE, honey logs were only presented 60% of the time compared with consecutive EE. This agrees with findings of Cannon and McSweeney [1998]. They showed that withholding the EE item on short breaks recovered the interest toward the EE device. In our study, both treatments significantly reduced stereotypies and the effect was apparent even after the EE was removed, indicating that both modes of presentation of EE were efficient in this respect.

In this study, male bears showed less stereotypies than females. It has been suggested that females that do not interact with males in the same housing may be an underlying motivation for the development of stereotypies in male bears [Fischbacher and Schmid 1999], as social deprivation has been suggested to cause stereotypies [Lewis *et al.* 2006]. Fischbacher and Schmid's [1999] suggestion was,

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however, based on results with one non-castrated male. In this study, all male bears were castrated, which may have affected the levels of stereotypies. It is, however, difficult to assess the impact of castration, as the motivational background for stereotypies is poorly understood [Vickery and Mason 2004].

The honey logs tended to cause an increase in general explorative behaviors in both treatments. Earlier studies have shown that EE in bears causes an increase in explorative behaviors [Fischbacher and Schmid, 1999; Grandia *et al.*, 2001]. Our results are generally in agreement with this. The difference between the treatments may be owing to explorative behaviors being directed toward the environment on days when EE was withheld in the intermittent EE treatment.

Passive, social, and other active behaviors were not significantly affected by the EE treatments. This agrees with results found by Fischbacher and Schmid [1999], who showed that altering feeding routines in spectacled bears could increase explorative behaviors with no effect on any other behaviors.

There is a general belief [Carlstead *et al.*, 1991; Young, 2003,etc.] that a time budget in captivity similar to that seen in the wild may indicate improved welfare. Members of Ursidae usually spend the majority of their time foraging [Carlstead *et al.*, 1991], but we are not aware of any published data on time budgets for sloth bears in the wild. However, we consider it likely that the reduced stereotypies and the accompanied increase in explorative behavior is an indication of an improved welfare caused by the introduction of EE.

This study showed that habituation in responsiveness toward EE occurred in both treatments. In consecutive EE, there was a decrease in EE exploration over the first two days, in accordance with Ings *et al.* [1997] who showed that introducing wood-pile feeders in bush dogs, for more than 30 consecutive days, only decreased the responsiveness by approximately 20% over the period. The relatively small decrease in the honey logs' efficiency to occupy the bears, in this study, may be explained by the fact that an attractive food reward was part of the enrichment, which is often assumed to increase the long-term attractiveness of EE [Ings *et al.*, 1997].

The similar level of exploration toward the EE on day one and day three in intermittent EE indicates a recovery in responsiveness following the gap days. It has earlier been shown that both short [15 min; Cannon and McSweeney, 1998] and long (14 days) breaks [Renner *et al.*, 2000] can cause similar recovery, with some significant species differences.

In conclusion, intermittent EE presentations for captive sloth bears may be a means of maintaining responsiveness toward the EE for an extended time. Both consecutive and intermittent EE reduced stereo-types, although consecutive EE might have had a more durable effect following the removal of EE. The reduction of stereo-types and the increase in explorative behaviors in both treatments may suggest that effectively presented EE can enhance the welfare of captive sloth bears.

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Art – 43. EFFECTS OF BODY WEIGHT AND SEASON ON SERUM LIPID CONCENTRATIONS IN SLOTH BEARS (*Melursus ursinus ursinus*)

Arun Attur Shanmugam, M.V.Sc., Jadav Kajal Kumar, M.V.Sc., Ilayaraja Selvaraj, B.V.Sc., and Vimal Selvaraj, B.V.Sc., M.S., Ph.D.

ABSTRACT:

Serum lipid levels were measured in 66 healthy sloth bears (*Melursus ursinus ursinus*) living under semi-captive conditions with access to natural food resources in the Bannerghatta Biological Park (Karnataka, India), a portion of their native habitat range in the Indian peninsula. Total cholesterol, triglycerides, high-density lipoprotein (HDL) cholesterol, and low-density lipoprotein cholesterol levels were analyzed. The effects of age, body weight, and season on these lipid parameters were statistically evaluated. There were no correlations between age and any of the serum lipid parameters analyzed. Positive correlations of body weight to both triglyceride and HDL cholesterol levels in these bears were identified. In addition, seasonal trends in physiological serum lipid values, potentially due to variations in the sloth bear diet, were identified. Serum triglyceride levels were higher during post-monsoon season and cholesterol levels were higher during winter compared to other seasons. Serum lipid values obtained from sloth bears in this study were also compared to previously published data on other members of the family Ursidae. This is the first report of serum lipid values as a reference for sloth bears. These values can be used as sensitive predictors of overall health and nutritional status to aid in the captive management and feeding of these bears.

Key words: cholesterol, triglycerides, lipid, metabolism, nutrition, sloth bear.

INTRODUCTION

The balance between nutrition and physical activity has significant effects on the maintenance of health or progression of disease in all mammalia species including ursids. In ursids that are maintained in captivity, especially those with a specialized diet in the wild, the risks of nutritional imbalance, and in several cases hyper-nutrition, are a constant concern.²¹ Therefore, for their successful conservation and propagation, it is important to develop biological indices of nutrition to assess the feeding status and health of captive bears.

Few studies have examined circulating nutritional indices of bears, with most of them being preliminary reports. These investigations have provided valuable data for polar bear,^{16,39,51} brown bears,^{16,30,51} black bears,^{22,28,38} sun bears,^{16,51} and spectacled bears.^{16,51} However, there have been no studies evaluating serum nutritional indices for sloth bears.

Melursus ursinus ursinus is one of the two subspecies of the sloth bears distributed throughout the Indian peninsula.^{46,47} The other subspecies *Melursus ursinus inornatus*, is found only in the island of Sri Lanka.^{46,47} Sloth bears were classified as vulnerable in the 1990 IUCN Red List of Threatened Species³² and are protected under Schedule I of The Indian Wildlife Protection Act,1972.²⁷ Despite in-situ conservation efforts, habitat loss due to anthropogenic pressure on land resources has brought about significant declines in sloth bear population across India. Currently distributed only in sheer pockets of fragmented habitats, their status remains highly insecure in the wild.⁵⁸ Compared to other bears, sloth bears have a highly specialized diet in the wild. Their unique feeding ecology, which substantially relies on frugivory (feeding on fruits) and myrmecophagy (feeding on ants and termites), has been well documented in several studies.^{6,17,25,26,34,37,44,54} This specialized feeding behavior and evolutionary separation, which developed due to competitive pressure and resource availability in the habitat,³⁷ have led sloth bears to acquire characteristics similar to the other myrmecopagous mammals. Compared to other ursids, they have an overall metabolic rate,⁴¹ higher nocturnal activity,^{55,57} smaller home ranges,^{34,37,55} and extended parental behavior,³⁷ all being characteristics of myrmecopagous mammals.

More-over, sloth bears do not exhibit seasonal torpor as seen in some other ursids.⁴¹ In captivity, the sloth bears receive a "typical" bear diet that does not generally mimic the natural food habitats of free-ranging bears.¹⁴ In most cases, feeding is mainly dictated by what has traditionally been convenient and economical in the locality.

For sloth bears in particular, this has led to certain cases where the zoo diet appeared to cause or promote specific disease pathologies. An example for this is the unusually high incidence of hepatobiliary neoplasms in sloth bears kept in captivity.³ This has been directly linked to either a fat-rich bear diet that can predispose these bears to bile duct cancer or to a lack of ingredients, such as propolis from beeswax, in the captive bear diet. Therefore, serum lipid levels in semi-captive sloth bears in their native habitat range were examined. It is believed that the reference serum lipid values obtained from this study will be useful for sloth bear health monitoring and to optimize feeding programs in zoological parks.

MATERIALS AND METHODS

Wild and rescued sloth bears, under semi- captive conditions at the Bannerghatta Bear Rescue Center at the Bannerghatta Biological Park, Karnataka, India (12°48'N; 77°34' E), were sampled for this study. At this facility, bears were provided a native diet of local seasonal fruits, including papaya and watermelons, and grains including finger millet and sorghum. In the foraging areas, they also had numerous native fruit trees and access to ant and termite mounds. Blood was collected from 66 adult bears (40 males and 26 non-pregnant females) during routine physical examinations from June 2006 to July 2008. Each bear was sampled only once for this study. All bears sampled appeared physically healthy, with normal behavioral responses, and were clinically healthy during examination at the time of sampling (determined by body temperature, hydration , heart respiration rate, a detailed external physical examination, a complete blood count, serum biochemistry, and a medical history of at least 2 yr). Furthermore, prior to this study, bears had been tested for exposure to diseases enzootic in these regions and were found negative for hepatitis B, rabies, tuberculosis, and leptospirosis.

Sloth bears were immobilized using a ketamine- xylazine combination ⁴⁵ in the early hours of the morning after with-holding food overnight; the combination was ketamine hydrochloride (5mg/ kg body weight; Ketamil®, Troy Laboratories Pty Ltd., Smithfield, New South Wales 2164, Australia) and xylazine hydrochloride (Xylazil®, 2 mg/kg body weight; Troy Laboratories Pty Ltd.). A premedication of atropine sulfate (Atrosite 0.025 mg/kg body weight -Troy laboratories Pvt Ltd).

To analyze seasonal changes in serum lipid values, samples collected were temporally segregated into the four major seasons in south India [summer March-June; monsoon July-September; post- monsoon October-December; winter January-February]. Data were analyzed by one-way analysis of variance (ANOVA) followed by pair-wise post hoc comparisons using the Tukey-Kramer method. Distributions of age and body weight between the seasons were also parametrically compared to evaluate the fidelity of interpretation for the seasonal lipid data. For all the above statistics, values of $P < 0.05$ were considered significant.

RESULTS:

Total cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol were measured in serum collected from 66 sloth bears in this study. Body weights and age of the bears sampled were $74.4 + 20.7$ kg (mean + SD) and $7.3 + 4.5$ years, respectively. Although the age range was rather broad, its distribution was similar between male ($n = 40$) and female ($n = 26$) bears.

The mean body weight of male bears ($80.3 + 20.3$ kg) was significantly higher than the mean for female bears ($65.3 + 18.0$ kg; $P = 0.0033$). Mean values of the different serum lipid parameters measured in this study are listed in Table 1; data are organized as combined values for this species and separately for male and female bears. These tabulated data serve as a physiological reference for sloth bears. Data for each parameter satisfied criteria of normality and homogeneity of variance.

Statistical comparisons between sexes showed that mean HDL cholesterol values were significantly different between male and female bears (Table 1). Regression analysis showed that the age of sloth bears did not have an effect on serum lipid values (triglycerides: $R = 0.1984$, $P = 0.1160$; cholesterol: $R = 0.0252$, $P = 0.8409$; HDL cholesterol: $R = 0.0696$, $P = 0.5785$; LDL cholesterol: $R = 0.0258$, $P = 0.8394$). However, bodyweight of these sloth bears showed significant fits for a linear regression model for two of the lipid parameters evaluated (Fig. 1).

Triglyceride and HDL cholesterol levels showed significant but moderate positive correlations with body weight of sloth bears ($R = 0.3285$, $P = 0.0081$ and $R = 0.3841$, $P = 0.0015$ respectively; Fig. 1A, C). These trends in triglyceride and HDL

cholesterol levels were also significant when values from male bears were evaluated separately (triglycerides: $R = 0.4019$, $P=0.0124$; HDL cholesterol: $R = 0.4009$, $P = 0.0103$). However, this trend in female bears, when analyzed separately, was not significant (triglycerides: $R = 0.1523$, $P = 0.04575$; HDL cholesterol: $R= 0.0115$, $P= 0.9554$). Although there was a general positive trend, values of total cholesterol ($R= 0.2392$; $P = 0.0531$) and LDL cholesterol ($R = 0.2303$; $P = 0.0671$) did not show a significant correlation with bodyweight of these bears (Fig. 1B, D).

Seasonal trends in serum lipid values were observed when data were organized based on summer ($n = 19$), monsoon ($n = 19$), post monsoon ($n = 16$), and winter ($n = 12$). There were no significant differences in the distribution of age, sex, and body weight between the four seasons. Mean serum triglyceride levels were significantly different between the seasons ($P = 0.0422$; Fig. 2A). Pair-wise comparisons showed that triglyceride levels during monsoon were significantly lower than the post-monsoon season ($P = 0.0048$). However, both these mean values were not significantly different from summer and winter seasons. Mean serum cholesterol levels were also different between the seasons ($P = 0.0007$; Fig. 2B). Cholesterol levels recorded in winter were significantly higher than levels recorded in summer, monsoon, and post-monsoon seasons ($P = 0.0440$, $P < 0.0001$, and $P = 0.0019$, respectively). In addition, the mean cholesterol level recorded in summer was significantly higher than the value in monsoon season ($P = 0.0200$). Mean serum HDL cholesterol levels also showed seasonal differences ($P = 0.0113$; Fig. 2C). HDL cholesterol levels recorded in winter were significantly higher than in monsoon and postmonsoon seasons ($P = 0.0092$ and $P = 0.0059$, respectively). HDL cholesterol levels in summer were not different from winter and monsoon but were significantly higher than in post-monsoon season ($P = 0.0345$). Mean serum LDL cholesterol levels also followed a seasonal trend ($P < 0.0001$; Fig. 20). LDL cholesterol level were significantly higher for both summer and winter compared to monsoon and post-monsoon seasons ($P = 0.0021$ and $P = 0.0147$, respectively, for summer; $P < 0.0001$ and $P= 0.0004$, respectively, for winter).

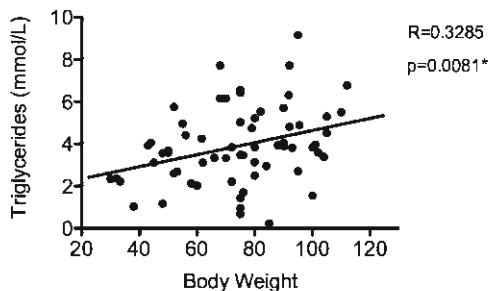
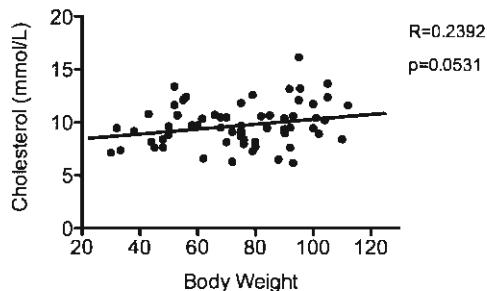
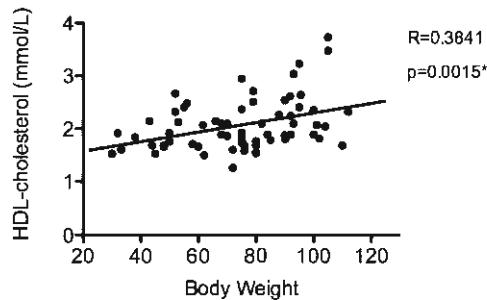
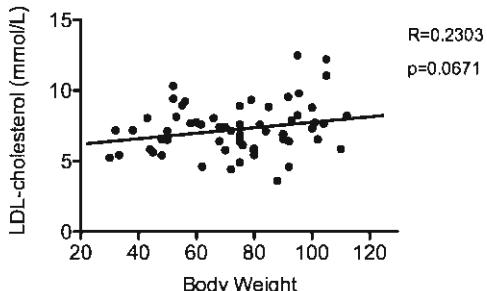
A**B****C****D**

Figure 1. Relationship between body weight and serum lipid concentrations in sloth bears. Individual data points for: A. triglycerides, B. cholesterol, C. HDL cholesterol, and D. LDL cholesterol were visualized based on bodyweight of the sloth bear in scatter plots. Linear regression models were fit to the data scatter plots, and the correlation (R) between bodyweight and the different lipid parameters was estimated. The goodness of fit for this model was tested using the F statistic. Triglycerides and HDL cholesterol values showed a significant positive correlation to increases in body weight of sloth bears ($R \approx 0.3285$, $P \approx 0.0081^*$ and $R \approx 0.3841$, $P \approx 0.0015^*$, respectively). There were no significant correlations for total cholesterol and LDL cholesterol values to body weight in these bears ($R \approx 0.2392$, $P \approx 0.0531$ and $R \approx 0.2303$, $P \approx 0.0671$, respectively).

Figure 1. Relationship between body weight and serum lipid concentrations in sloth bears. Individual data points for: A. triglycerides, B. cholesterol, C. HDL cholesterol, and D. LDL cholesterol were visualized based on bodyweight of the sloth bear in scatter plots. Linear regression models were fit to the data scatter plots, and the correlation (R) between bodyweight and the different lipid parameters was estimated. The goodness of fit for this model was tested using the F statistic. Triglycerides and HDL cholesterol values showed a significant positive correlation to increases in body weight of sloth bears ($R = 0.3285$, $P = 0.0081^*$ and $R = 0.3841$, $P = 0.0015^*$, respectively). There were no significant correlations for total cholesterol and LDL cholesterol values to body weight in these bears ($R = 0.2392$, $P = 0.0531$ and $R = 0.2303$, $P = 0.0671$, respectively).

Research and conservation efforts at the Wildlife SOS® Bannerghatta Biological Park, Karnataka, India have focused on improving health and captive management conditions for sloth bears. Physiological hematology parameters to aid in evaluation of sloth bear health under various ecological conditions was previously reported.⁵² In this current study, circulating lipid levels in these bears are reported. Sloth bears have a specialized diet in the wild with a large proportion of feeding relying on frugivory and myrmecophagy.^{6,25,37,46} In captivity, dietary components in the routine feeding of sloth bears are known to be drastically different between zoological parks around the world.¹⁴ In most cases, the diet is made up of easily available and economical seasonal foods indigenous to each specific location. Therefore, it is important to balance nutritional components in the sloth bear diet to meet its daily requirements and to mimic its diet in the wild. In this study, we were provided with unique opportunity to study sloth bears maintained in a semi-captive condition within their native habitat range and given access to natural food resources in the foraging areas. However, these sloth bears were not entirely free-ranging, and their foraging was significantly supplemented with local fruits and grains in their enclosures.

Lipid absorption from the diet and metabolism are represented in the circulating blood. Different lipoproteins transport these lipids in the blood.⁵⁶ Chylomicrons transport triglycerides from the small intestine to adipose and muscle tissue and dietary cholesterol to the liver. LDLs shuttle cholesterol to peripheral tissues based on metabolic requirement.

Table 1. Mean serum lipid concentrations in sloth bears, *Melursus ursinus ursinus*, combined and categorized based on sex.

Parameters (mmol/L)	Bears combined ^a			Male ^b		Female ^c		<i>t</i> -test ^d P-value
	<i>n</i>	Mean (median) \pm SD	95% CI	<i>n</i>	Mean \pm SD	<i>n</i>	Mean \pm SD	
Triglycerides	64	3.89 (3.83) \pm 1.8	3.44 – 4.35	38	4.13 \pm 1.7	26	3.53 \pm 2.0	0.2019
Total cholesterol	66	9.71 (9.46) \pm 2.0	9.21 – 10.2	40	9.81 \pm 2.4	26	9.54 \pm 1.3	0.6044
HDL-cholesterol	66	2.06 (1.90) \pm 0.5	1.94 – 2.18	40	2.19 \pm 0.6	26	1.87 \pm 0.3	0.0088*
LDL-cholesterol	64	7.24 (7.13) \pm 1.8	6.81 – 7.69	38	7.32 \pm 2.1	26	7.15 \pm 1.1	0.7064

^a Adults combined (mean body weight \pm SD): 76.38 \pm 18.9 kg.

^b Adult males (mean body weight \pm SD): 80.3 \pm 20.3 kg.

^c Adult females (mean body weight \pm SD): 65.3 \pm 18.0 kg.

^d Comparing values between males and females.

* Indicates significance.

HDLs are involved in the reverse transport of cholesterol in excess of tissue requirements back to the liver for storage, excretion or redistribution. Therefore, serum levels of triglycerides and cholesterol may reflect not only lipid nutritional status but also predisposition to obesity, diabetes mellitus, acute pancreatitis, and heart disease, as reported for domestic dogs.⁵³ Several studies have reported serum lipid values for other ursid species (summarized in Table 2). Comparing results from sloth bears to published data on other ursids show that serum levels of triglycerides were higher in sloth bears than the intervals reported for brown bears (*Ursus arctos*),^{11,16,51} black bears (*Ursus americanus*)²² polar bears (*Ursus maritimus*),^{16,51} and sun bears (*Ursus malayanus*).^{16,51} However, triglyceride levels reported for spectacled bears (*Ursus ornatus*)^{16,51} were even higher than intervals recorded for sloth bears in this study. Total cholesterol levels of sloth bears in this study were again higher than intervals reported for brown bears,^{11,16,51} black bears,²² and sun bears.^{16,51} Serum total cholesterol levels in polar bears^{16,39,51} and spectacled bears^{16,5} were either approaching or comparable to intervals measured for sloth bears in this study.

relatively recent studies by Crissey *et al.*¹⁶ and Frank *et al.*²² have described HDL and LDL cholesterol values for brown bears, black bears, polar bears, spectacled bears, and sun bears using a similar methodology as that used in this study for sloth bears (Table 2). Comparing HDL cholesterol to other ursids, it was determined that values for sloth bears were lower than that recorded for polar bears,¹⁶ sun bears,¹⁶ and black bears²² but were similar to values recorded for brown bears¹⁶ and spectacled bears.¹⁶ Values of LDL cholesterol in sloth bears were comparable to levels recorded in polar bears¹⁶ and spectacled bears¹⁶ but were higher than levels in black bears,²² brown bears,⁶ and sun bears.¹⁶ The serum triglyceride concentration measured in this study was similar to the mean value (value SD; 3.8 + 1.0 mmol/ L)³¹ recorded for sloth bears in the International Species Information System (ISIS) database. However, serum total cholesterol concentration measured in this study was higher than the mean value (6.01 +1.2 mmol/ L)³¹ recorded in the ISIS database. This difference could be due to dietary differences between the zoological parks from which ISIS values were obtained. Dramatic differences in cholesterol and triglyceride values between zoological parks have been shown for American black bears.²² Therefore, the larger sample size, location, and native diet of healthy animals sampled for this study makes it compelling that serum cholesterol levels in sloth bears could actually be higher, and comparable, to levels observed in polar bears^{16,39,51} and spectacled bears.^{16,51} The ISIS database did not contain information on the serum HDL and LDL cholesterol values for sloth bears. The positive correlation between body weight and serum cholesterol levels has been indicated in several studies in humans.^{6,49} In addition, higher concentrations of serum cholesterol have been reported in heavier adult black bears.^{40,50} In sloth bears, the increasing trend of total cholesterol did not reach statistical significance. However, HDL cholesterol values showed a significant but moderate positive correlation with body weight. Moreover, a sexually dimorphic difference with a higher mean HDL cholesterol value in males compared to females appeared to agree with this correlation because mean body weights of male bears were significantly higher than those of female bears. Elevated HDL cholesterol levels are considered protective against development of atherosclerosis.^{48,49} In humans, low levels of HDL cholesterol are sensitive predictors of coronary heart disease.⁷ LDL cholesterol, on the other hand, promotes atherogenesis when present in excess.¹⁸

Sloth bears did not show a significant correlation between serum levels of LDL cholesterol and body weight. Similar to HDL cholesterol, previous studies in humans have correlated serum triglyceride levels with body mass.^{1,49} In black bears, higher concentrations of serum triglycerides have been recorded in heavier bears.^{40,50} In this study, sloth bears showed a similar trend of an increase in serum triglycerides with an increase in bodyweight. This suggests that there could either be increased calorie intake or diminished physical activity in heavier bears compared to lighter bears, as both these characteristics can affect serum triglyceride concentration. It has also been suggested that differences in serum lipids could be due to an age-related variation in the bear diet^{40,50} however, observations made during this study do not substantially support this contention.

Seasonal patterns in serum lipid levels have been reported for hibernating bears (both captive and free-ranging). Serum cholesterol levels are known to increase during denning in black bears.^{23,28,29} Serum triglyceride levels were also elevated in autumn and early hibernation in black bears.²⁹ As an indication that these changes are due to metabolic fluctuations, it has been reported that these trends in serum lipids, although depressed to a certain degree, are also seen in the black bear populations of Florida and Mexico, which rarely hibernate unless pregnant.²⁸ Sloth bears do not exhibit torpor and, therefore, little is known of their seasonal metabolic changes.¹ Moreover, there is no available information on seasonal metabolic trends in other ursid species that do not hibernate like spectacled bears and sun bears. The temporal seasonal variation in serum lipid levels seen in this study could be, at least in part, due to variation in nutritive quality and variety of sloth bear foods in the habitat. For example, a sharp fall in termite biomass occurs during the monsoon, with the highest abundance during the dry seasons,⁸ and there is abundant availability of fleshy fruits only during the post-monsoon season.⁴² However, intake of supplemental feed by these bears in their enclosures did not change with different seasons. With limited knowledge of sloth bear physiology, it remains difficult to interpret these seasonal serum lipid values with confidence. Therefore, investigations on temporal changes in sloth bear metabolism will be required before the full implications of these observations can be developed. In captive management, specific pathologies resulting from hyperlipidemia have been reported in species like felids⁴ and canids;¹⁰ however, there are no such reports on ursids. This could suggest that this genus is capable of adapting to high

dietary fat intake without any adverse metabolic consequences, or it could just be due to the dearth of studies on bears. Although it has been suggested that the high incidence of hepatobiliary carcinomas in sloth bears could be due to high fat diets,^{3,4} the study reporting this statistic did not examine serum lipid levels in the affected bears. It is very plausible that the lack of other elements in the captive diet could have predisposed for this specific carcinoma; for example, propolis from beeswax in the diet is known to inhibit carcino-genesis in laboratory animals.^{3,5} Moreover, the results of this current study demonstrate that sloth bears do have higher baseline values of serum lipids compared to several ursid species (Table 2). Cases of hepatobiliary carcinomas at either the Bannerghatta Bear Rescue Center in Bangalore or the Center for the Conservation and Rehabilitation of Bears in Agra (together, both facilities house approximately 345 sloth bears) have not been reported. This finding could be due to their semi-captive management with foraging areas in the national park that provide access to nutritional elements unavailable to captive bears. Although this study reports HDL and LDL cholesterol values in sloth bears, there are methodological concerns similar to those in studies on other species of bears.⁶ The estimation of HDL cholesterol in this study was performed using conditions established for human serum that have been reported to be reliable for felid, equid, and bovid sera.⁶ However, a complexity such as different fractions of HDL cholesterol that exist in some species like canids is not considered by this approach.⁹ Therefore, this method may not fully describe the true diversity of HDL and LDL cholesterol in sloth bears. Moreover, it should also be noted that the Friedewald formula^{9 24} to estimate LDL cholesterol was determined using values from human sera validated for <4.5 mmol/L of triglycerides.³³ Although triglycerides levels in this study are < 4.5 mmol/L, LDL cholesterol estimates using this formula may be relative, and not precise, for sloth bears. A specific conversion equation for members of the family Ursidae remains to be computed. Despite these concerns, values reported in this study and for other bears¹⁶ using the same methods remain valuable for diagnostic and management purposes. In summary, circulating lipid concentrations in healthy, semi-captive sloth bears maintained in their native habitat ranges were evaluated. Serum triglyceride and HDL cholesterol concentrations showed a positive correlation with bodyweight increases in these animals. Seasonal trends in serum lipid values highlight changes in either feeding habits or food availability during the different seasons and, perhaps, metabolic patterns of sloth bear physiology. Mean values for triglycerides, total cholesterol,

HDL cholesterol, and LDL cholesterol obtained in this study will serve as a valuable reference for health assessment and nutritional status evaluations of sloth bears in zoos around the world.

Table 2. Published values for serum lipids in various ursid species.

Bear species	n	Statistic	Triglycerides (mmol/L)	Total		LDL-cholesterol (mmol/L)	Reference
				cholesterol (mmol/L)	HDL-cholesterol (mmol/L)		
Brown bear (<i>Ursus arctos</i>)	2	Mean	1.57	4.9	2.1	0.9	4
	29-35	Mean \pm SEM	2.21 \pm 0.1	5.2 \pm 0.2	ND ^a	ND	38
Black bear (<i>Ursus americanus</i>)	47-50	Mean \pm SEM	1.93 \pm 0.1	5.9 \pm 0.2	ND	ND	3
	4	Mean \pm SD	1.17 \pm 0.3	4.4 \pm 0.9	2.7 \pm 0.4	0.5 \pm 0.2	8
Polar bear (<i>Ursus maritimus</i>)	3	Mean \pm SD	2.44 \pm 0.2	5.9 \pm 0.2	3.1 \pm 0.3	1.6 \pm 0.3	8
	1	Value	2.94	5.7	ND	ND	3
Sun bear (<i>Ursus malayanus</i>)	5-6	Mean \pm SEM	2.91 \pm 0.5	8.9 \pm 0.8	5.8 \pm 0.4	6.8 \pm 1.5	4
	1	Value	1.65	1.6	ND	ND	3
Spectacled bear (<i>Ursus ornatus</i>)	5	Mean \pm SEM	2.00 \pm 0.1	5.6 \pm 0.6	3.1 \pm 0.4	3.9 \pm 0.6	4
	2	Mean	8.06	9.1	ND	ND	3
Spectacled bear (<i>Ursus ornatus</i>)	6	Mean \pm SEM	12.49 \pm 0.2	9.7 \pm 0.4	2.5 \pm 0.3	6.4 \pm 0.3	4
	19	Mean \pm SEM	ND	8.3 \pm 0.7	ND	ND	20

^a ND, not determined.

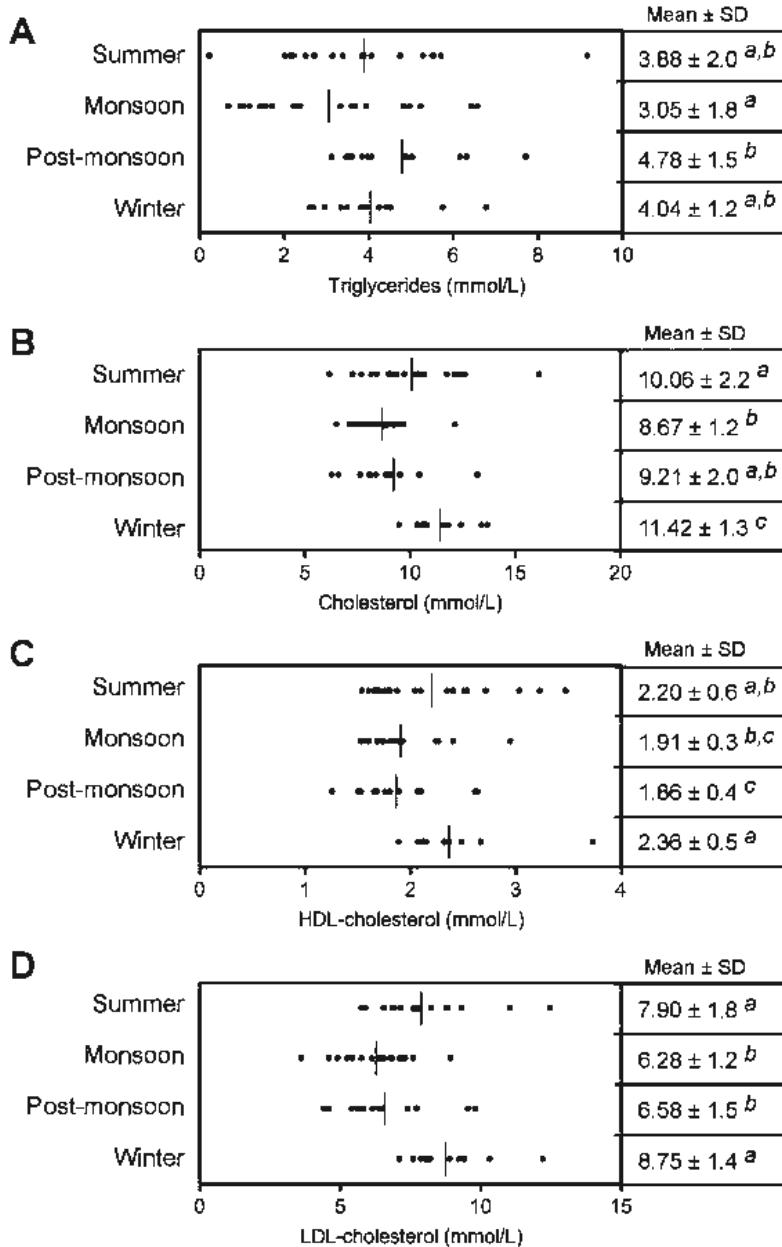


Figure 2. Relationship between season and serum lipid concentrations in sloth bears. Serum levels of: A. triglycerides, B. cholesterol, C. HDL cholesterol, and D. LDL cholesterol in sloth bears were compared during the different seasons: (1) summer, (2) monsoon, (3) postmonsoon, and (4) winter. Data are represented as both aligned dot plots to show the distribution, with a vertical line through the mean of data points, and as numeric values of mean \pm SD for each season. A one-way analysis of variance for every serum lipid parameter showed significant seasonal differences in the lipid levels of these bears. Pair-wise post hoc comparisons using the Tukey-Kramer method are indicated by superscripts; values with different superscript alphabets differ significantly ($P < 0.05$)

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muscular-exertion may result in damage to locomotor, respiratory, or heart muscles, resulting in 'white muscle disease' or capture myopathy. At times the situation may be so stressful that the animal dies immediately of shock. On the other hand, the animal may show no immediate signs of the stress but may later succumb to an infection as a secondary result of the stress. Animals that have been unduly stressed during capture usually die during transportation, especially if transported over a long distance. This may not be a reflection of the quality of the transport operation.

Extremes Temperature

Temperatures must be kept in mind at all times during the capture, loading, and transportation. As a thumb rule the conditions most favorable for capture are also best suited for transportation. Both capture and trasportaion should be avoided during the hot summer unless it is an emergency. In that case hyperthermia or over-heating can be a serious problem, but can be prevented by using properly ventilated vehicles or crates and by loading the correct number of animals in a mass crate. A crate left in the sun and a breakdown of the vehicle during the daytime in the summer can have disastrous results. Exposure to very low temperatures can be serious, often resulting in hypothermia and death. Alternatively, pneumonia may develop which may lead to mortality after release. Hypothermia can be prevented by using sufficient bedding during transportation, and by planning transportation times and routes.

Physical Injuries

Injuries may be caused by the capture process, but usually occur during loading and transportation. Excessive trauma may be caused by using incorrectly designed crates or vehicles, or by animals fighting during transportation.

SOME BASIC PRINCIPLES FOLLOWED FOR THE TRANSPORTATION OPERATION

Keeping the road as mode of transportation the following steps were suggested based on experience, although the transportation technique used to be a species specific one, certain basic principles to be followed in transportation of any wild animal such as,

i) Preparation before transportation

Preconditioning of animals: (Boma training in case of herbivores) or Crate training,

mode of transport like by air, by road or by sea. Based on road transport, the major categories are

Short travel (<100 Kms or <5 hrs)

Long travel (>100 kms to 500 kms or <24 hrs)

Very long travel (>500 kms or > 24 hrs)

According to the length of travel, the bears need to be preconditioned by keeping them in a transport cage for 10 to 15 minutes twice in a day for couple of days. If the animal is reluctant to get into the transport cage, then the tranquilisation procedure should be followed and the bear should be placed inside the transport cage 8 to 12 hours before the departure day of the transportation. An optimum size of the transportation cage would be 4'6" L X 3' W X 3' H, this would be the best for bears of various age (above 2 yrs) and body weight (40 kgs upto 200 kgs). For bears the transportation cage should have the feeding passage on the bottom side of the sliding door, so that en route feeding and watering of the bear would be easily taken care off. Accompanying veterinarian with necessary veterinary drug kit should be made ready in addition to the documentation part of the animal and vehicle.

ii) Target animal

Apart from species characterization, specific individual animal's behavior, mode of transportation, time of transportation, degree of restraint required for the transportation of captive wild animal/s like Zoo animals or of Free ranging wild animal/s should be taken into account. In case of Sloth bears, individual crate approach is advisable than mass transportation approach. Behavioral characteristic like male used to be dominant, Mother bear should be shifted along with cubs with minimal handling etc. Though it is necessary to cover the crates in both captive and wild caught animals, it is must to give extra calm environment to the non captive wild animals for stress free travel and ventilation.

The use of tranquilizers remains an area of uncertainty. Currently there is no scientific data to support both use and non use of tranquilizers claim: the success of the operation often depends more on the style and ability of the transporter than on drugs or other technological solutions. Both short- and long-acting tranquilizers are used extensively to facilitate the transportation of aggressive animals. Tranquilizers can also reduce the stress levels of the

transported animal, and can thereby improve success rates and reduce mortality during and after transportation. The dose rate of 2 mg/ Kg b.wt Xylazine and Ketamine @5 mg/Kg.b.wt is ideal. In case of heavily injured animals, the maintenance dose of 0.5 mg/Kg.b.wt Xylazine and 2 mg/Kg.b.wt of Ketamine can be used whenever the bear shows the symptom of recovery, to avoid self injuries or aggressive behavior due to stress and pain during transportation. Remote injection using a pole syringe or distance projectile also eliminates some of the stress associated with injection.

Selection of crate & loading

In addition to the size, sex and age of the wild animal, knowing the basic behavior pattern of the animal is of immense importance in designing a transportation crate or cage. Confinement in a crate or vehicle after capture results in additional stress for the animal. This may be particularly severe if the crate or vehicle is not of proper design or construction, or if the animals continually attempt to escape. The size and strength of the crate must be appropriate for the animal to be transported in addition to a good locking mechanism. Too large a crate is often as bad as a crate that is too small. Padding on the sides and grass or sand bedding on the floor of the crate should facilitate less damage on the extremities of the bear as well as the claw and canine damage also to retain its footing even on rough roads. The floor must allow drainage of urine or spilt water.

The ventilation of the crate must be good to prevent overheating, accumulation of ammonia on very long trips, at the same time ventilation must be controllable. Ventilation openings should not encourage escape attempts and should, allow flow of air vertically as well as horizontally in the crate. Doors should be of the top sliding type with the mechanism of such a nature that it cannot jam. There should always be more than one door to facilitate access and to facilitate release. Once animals have been in a crate for a while they feel secure in the confined space, and are often reluctant to leave through a single door that is suddenly opened.

The loading of captured animals must be done as quickly and as quietly as possible to prevent further stress. Animals should be loaded in the early morning and transported during the day in the cold winter months and night transportation is often resorted to in summer to avoid excessively high temperatures. Shouting during loading only serves to confuse and stress wild animals and serves no useful purpose. Depart as soon as the animals are loaded.

Selection of vehicle and route

The selection of the vehicle should be appropriate based on the number of animal which are moved, the size of the vehicle should be fair enough to hold multiple cages with free air movement and space to access individual cages for feeding, cleaning and treatment. The selection of route should be very important to avoid bad roads and heavy traffic. Negotiation should be done between well connected high ways with short distance of very bad roads.

ENROUTE:

According to the length of travel the feeding should be done in between but the watering of animal is must irrespective of travel length unless if it is a sedated animal. Even fairly tamed animals will not eat or drink when deprived of freedom of movement, and their health will be affected adversely if they are transported in this state for prolonged periods. In general feeding and watering is usually only necessary on very long (>24 hour) trips. But we practice once in 6 to 8 hours the bear should be fed with fresh fruits and drinking water. During the short halt the bear should be checked for injuries like damages in claws and canines.

The key points are: Avoid brake or accelerate sharply; Travel slowly on rough roads; Take maximum care of obstacles that cause the vehicle to rock from side to side; Stops should be made away from areas of noise or high activity. If injections must be administered en route this must be done away from crowds of people. Stops should be as brief and infrequent as possible. Animals tend to settle down once the vehicle is moving, and unnecessary stops disturb the animals. Two drivers should be used for long journeys to ensure a rapid, uninterrupted trip, and to avoid problems with driver fatigue. Change drivers every eight hours or every 400 kms.

FEW "DON'TS" OF TRANSPORTATION OPERATION

Do not waste time en route.

Do not permit people other than the handlers to climb on to or around crates containing animals.

Do not allow animals, particularly tranquilized ones, to lie down for too long in a crate.

Art – 45. CASE REPORTS OF GASTROESOPHAGEAL REFLUX DISEASE (GERD) IN SLOTH BEARS (*Melursus ursinus*)

Arun A Sha* and Yaduraj R K*

*Wildlife Veterinary Officer, Wildlife SOS®, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore 560 083

ABSTRACT:

Sloth bear (*Melursus ursinus*) belongs to the family Ursidae and is endemic to the Indian subcontinent (Garshelis *et al.*, 1999). Though reports exist on clinical conditions encountered in sloth bears (Gosselin and Kramer, 1984; Rajan *et al.*, 1990; Harbola and Arora, 1994; Mehrotra *et al.*, 1999), there is no report or information on gastroesophageal reflux disease observed in sloth bears. Two captive sloth bears named Silky & Shankar of Wildlife SOS, Bannerghatta Bear Rescue Centre showed the symptom of Gastroesophageal reflux combined with forceful regurgitation of food along with raw blood after ten minutes of eating each meal for a period of seven days. Since the bleeding was ruled out from epistaxis and heat stroke, the bear is suspected of GERD. Then the symptomatic treatment of oral Enteric Coated Pantoprazole Sodium and Domperidone SR Capsule (GR8 - OD) was administered once daily for a period of 6 weeks 30 minutes before feeding. From the day three of the administration of the drug, the bear showed improvement and stopped bleeding and regurgitation. It is concluded that the inhibitions of gastric acid secretion and pro-kinetic gastrointestinal agents to prevent reflux have an important role to play in the management of GERD. Further study on the same was initiated to rule out the cause and diagnostic procedure.

**Art – 46. RENAL ISCHEMIC TUBULAR NECROSIS IN A SPECTACLED COBRA
(*Naja naja*)-A CASE REPORT**

Arun A Sha* and Yaduraj R K*

Wildlife Veterinary Officer, Wildlife SOS®, Bannerghatta Bear Rescue Centre,
Bannerghatta Biological Park, Bangalore 560 083, Karnataka

ABSTRACT:

The Indian Cobra or Spectacled Cobra (*Naja naja*) is a species of venomous snake belongs to family Elapidae. It is one of the big four commonly found throughout Indian Subcontinent. It is protected under Schedule II, Part II of Indian Wildlife (Protection) Act, 1972. During January 2010, an adult female Spectacled Cobra was found dead inside the Bannerghatta National Park, Bangalore. The cobra weighed 1.4 kgs and had a lot of physical lumps and bumps throughout the length of the body (66.6 inches/1.691 meters) and the carcass was having chronic vertebral column damage which leads to the crooked appearance in general. There was also a swelling at the cardiac region (12 inches from the tip of the head). The swelling was recorded as 5.8 inches than the average girth of 4.3 inches. No external injury was found. A detailed post-mortem examination was conducted and the tissue samples with lesions were subjected to the histopathological examination. The parenchyma of the right kidney was found to have changes suggestive of Ischemic Acute tubular necrosis. The myocardium was showing organizing thrombus, the large coronary vessel with features of beginning coagulation necrosis. Also, a parasite was seen in the large bile ducts of the liver with histiocytic reaction and cholestasis suggesting the possibility of liver fluke infestation.

Art – 47. PROPOFOL AS GENERAL ANAESTHESIA IN SLOTH BEARS - A CASE REPORT

Sha Arun A, S Ilayaraja, A G Niraimozhi and Yaduraj
Wildlife Veterinary Officer, Bear Rescue Centre, Wildlife SOS, Bangalore-83

ABSTRACT:

An adult, injured paralytic, male wild Sloth bear (*Melursus ursinus*), was rescued and brought to Bannerghatta Bear Rescue Centre of Wildlife SOS. Since the bear was weak, dehydrated with major self-mutilated wounds, the bear had to be immobilized for complete clinical examination of the hind leg injuries and to rule out spinal cord injuries and exposed bone infections. Food and water were withheld, 12 hours before anesthesia. The animal was immobilized with the help of Injection Xylazine (@2mg/kg b.wt) and injection Ketamine (@5mg/kg b.wt) using blowpipe method. After induction, Propofol was used as a general anesthetic. Propofol is a short-acting injectable hypnotic sedative and an alkyl phenol derivative. Propofol is highly protein bound, metabolized in the liver and excreted in urine. It causes CNS depression by enhancing GABA activity in the brain and decreasing the brain metabolic rate. Because of its rapid recovery and lack of arrhythmogenic effect makes it an excellent alternative agent. The bear was weighing around 65-70 kg. Propofol at the dose rate of 0.2 mg/kg/minute was used for maintenance along with the fluids for complete physical examination and wound dressing. The vital signs and parameters remained normal throughout the course of administration of Propofol. Both induction and recovery were smooth and satisfactory.

Art – 48. CASE REPORT OF TUBERCULAR LYMPHADENITIS IN RESCUED CAPTIVE SLOTH BEAR

Ilayaraja S, Arun A Sha, K K Jadav, Jayakrishnan and E Vijayaragavan

Wildlife Veterinary Officer, Bear Rescue Centre, Wildlife SOS.

ABSTRACT:

Tubercular lymphadenitis is a common manifestation of extra-pulmonary tuberculosis. It may be part of extra-pulmonary tuberculosis or it may be the exclusive involvement confined to a particular group of lymph nodes. A female sloth bear aged 14 years was having the history of vomition immediately after having food, bilateral nasal discharge, inappetance and got treated symptomatically (Omeprazole, Inj.Cefixime, and Inj. Meloxicam) for 5 days. After a month, the same bear was showing the symptom of limping on its left forelimb and intermittent inappetance. The detailed physical examination of the bear was carried out after darting (Inj. Xylazine@2mg/kg b.wt and Ketamine@5mg/kg b.wt) and revealed a ruptured abscess on her axillary region of both the legs. The abscess was completely drained and dressed. After complete healing of the abscess, the same reoccurred after 42 days with sero-sanguineous discharge from the right axillary region. The detailed physical examination was repeated after tranquilizing the bear and the same line of treatment was repeated. The bear started losing the body weight and died on the 56th day. The detailed postmortem examination revealed that congestion of trachea, lungs and severe nodular growth in both the lungs. Both subscapular /axillary lymph nodes were inflamed and swollen. On histopathological examination of the lymph node revealed necrotic tissue, epithelioid cell granuloma and reactive lymphoid follicles suggesting Tubercular lymphadenitis. Demonstration of lung and lymph nodes impression smears in Ziehl-Neelsen stain revealed the presence of acid-fast bacteria.

**Art – 49. BENIGN DERMATOFIBROMA IN A RESCUED ASIATIC ELEPHANT
-A CASE REPORT**

Ilayaraja S, Arun A Sha, Jayakrishnan, E Vijayaragavan and A G Niraimozhi
Wildlife Veterinary Officer, Elephant Rescue Centre, Wildlife SOS

ABSTRACT:

A rescued adult cow Asiatic elephant aged around 51 years, housed in Elephant Rescue and Rehabilitation Centre, Farrah, Mathura, Uttar Pradesh by Wildlife SOS & Forests department, showed the symptoms of limping followed by progressive whitish growth on her left lateral aspect of the forelimb just above the toenail. The growth grew till 9*7*4* inch in size was highly vasculated but cold to touch. The tissue sample was collected, subjected to histopathological and antibiogram examination and the result revealed no cancerous tissue. The growth was diagnosed as dermatofibroma and the culture sensitivity test revealed the presence of Coagulase and Staphylococcal organisms. Injection Ceftriaxone with Sulbactum @ 10mg/kg b.wt and Meloxicam @ 0.25mg/kg b.wt was given intravenously for 15 days. Copper sulphate was applied with gentle pressure on the growth after cleaning with Metronidazole and povidone iodine solution (10:1) daily till complete sloughing. The growth was suppressed from 7th day onwards and sloughed completely on the 34th day. Further, the broad-spectrum topical ointment was continued after dressing with antiseptics for quick healing.

Art - 50. PAIN MANAGEMENT IN SLOTH BEAR

Arun A Sha, Jayakrishnan, E Vijayaragavan and A G Niraimozhi
Wildlife Veterinary Officer, Elephant Rescue Centre, Wildlife SOS

ABSTRACT:

Sloth bears (*Melursus ursinus*) belongs to the family Ursidae. They have long lower lip, "U" or "V" shaped white hairs in the chest. Wildlife SOS is a conservation agency involved in rescue and rehabilitation of "Dancing bears". The following observations were done in the Sloth Bear rehabilitation facilities run by Wildlife SOS. NSAIDs used to treat chronic pain and inflammation, exert action by inhibition of isoenzymes Cyclo-Oxygenase1(COX) and COX-2.NSAIDs found to suppress both the COX enzymes, leading to disturbance in homeostasis and contraindicated in renal or hepatic insufficiency, dehydration, and hypotension. Opioids are either natural or synthetic; exert Morphine like effects by acting on, μ receptors in central nervous system (CNS) and in periphery. Opioids are the most effective among all analgesic medications, due to their property of reversibility especially in emergencies. However, Opioids may cause CNS and respiratory depression, stimulate Chemoreceptor Trigger Zone (CTZ). Opioids can be combined with benzodiazepines for effective pain management. Tramadol is an opioid analgesic, which possess weak μ receptor antagonist activity, nor-epinephrine and Serotonin re-uptake inhibition. Tramadol with a dose rate of 2-4 mg/kg bid is well tolerated in Sloth bears.

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Art – 51. AMPUTATION OF FORELIMB IN ONE MONTH OLD LEOPARD

Kuruvilla J., B.C. Chittiappa, V.T. Shilpa, **Arun A Sha and A.A. Das**
Veterinary Officer, Bannerghatta Biological Park, Bangalore – 83

ABSTRACT:

A young female leopard of one month age belonging to Bannerghatta Biological Park was found severely injured by another adult female leopard. On clinical examination, it was found that the left forelimb of the cub was severely damaged at the middle of radius and ulna. The region was cleaned with antiseptic and skin was sutured after infiltrating locally with Lignocaine 2% but due to broken edges of the bone the suture did not keep well in position. So it was decided to surgically remove the broken bone to facilitate healing. The limb was surgically amputated at the level of elbow joint under general anaesthesia using atropine, xylazine and ketamine. 2% Lignocaine was locally infiltrated before amputation at the site of incision. All the vital parameters being monitored regularly were found to be normal. Infected tissues were cleaned and trimmed off and the wounds were made fresh. The wound was closed with subcutaneous and horizontal mattress sutures using catgut and silk respectively. Antibiotic therapy was continued using Ceftriaxone at the paediatric dose rate for 7 days.

Art – 52. OCCURRENCE OF CHOLANGIOPANCREATIC CANCER IN RESCUED SLOTH BEAR A CASE REPORT

Ilayaraja S, Arun A Sha, K.K. Jadav, Jayakrishnan and E Vijayaragavan
Wildlife Veterinary Officer, Bear Rescue Centre, Wildlife SOS

ABSTRACT:

Intrahepatic Cholangio carcinomas are the bile duct cancers, which can start in the bile ducts within the liver or they can start in the bile ducts outside of the liver which are then known as extra hepatic cholangio carcinomas. One adult female sloth bear, 10 years old in the bear rescue facility showed the symptoms of in-appetance with foul smelling diarrhoea and mucoid blackish brown faeces. Symptomatic treatment with Inj Biotrim, Inj Ranitidine and Inj B complex was given for 5 days but there was not much noticeable improvement. So the bear was subjected to detailed clinical examination. After tranquilization, ultra-sonography was performed which revealed the presence of hard mass and early ascites in abdominal cavity. All visible mucous membranes were icteric. Symptomatic treatment was started but the condition deteriorated, and the bear became completely anorectic. The bear died on the 10th day after the detailed clinical examination. The post-mortem examination revealed, severely icteric abdominal cavity, filled with amber color fluid, shrunken intestines and tightly adhered with stomach. Gallbladder was associated with tumor mass and the liver lobes showed multiple nodules. The histopathological examination of tumor mass revealed cholangio carcinoma.

Art – 53: TUBERCULOSIS IN A LION- A CASE REPORT

Prashanth M K , B C Chittiappa, V T Shilpa and **Arun A Sha**

Institute of Wildlife Veterinary Research

Doddaaluvana, Somvarpet Taluk,, Kodagu District

ABSTRACT:

A 26 year old male lion was found dead in the morning in the rescue centre at Bannerghatta Biological Park (BBP) Bangalore. The animal was apparently healthy in the previous evening with no symptoms of any diseases. On necropsy, numerous whitish raised nodules or tubercles were found in the pleural cavity and serosa of thoracic cavity. Lungs consisted of cysts, with fibrotic changes and large number of nodules indicating tuberculosis.

**Art – 54. HISTOPATHOLOGICAL FINDINGS IN MYCOBACTERIUM
TUBERCULOSIS INFECTED CAPTIVE SLOTH BEARS (*Melursus ursinus*)
- HALF A DECADE REVIEW**

Arun A Sha, S Ilayaraja, A G Nirai Mozhi, Jayakrishnan and K Yaduraj
Wildlife Veterinary Officers, Bear Rescue Centre, Wildlife SOS

ABSTRACT:

Tuberculosis is a cause of significant morbidity and mortality in both domestic and wild animals worldwide. Diagnosis of tuberculosis in any wildlife is challenging especially in the Sloth bears, the authors experienced many false negative cases with more than one laboratory diagnostic methods. In this article, more than half a decade (2006 to 2011) reviews of deaths in rescued Dancing Sloth bears (*Melursus ursinus*) at Bannerghatta Bear Rescue and Rehabilitation Centre of Wildlife SOS in Bannerghatta Biological Park, which were confirmed by Ziehl-Neelsen staining revealed multiple histopathological findings. Though there are no apparent symptoms of the disease, but we observed symptoms which include inappetance, rapid loss of body weight, with no discharge from the natural orifice. So the histopathological findings are of much important and this will become an effective tool, if we start exploring the possibilities of organ biopsy from suspected animals. The total numbers of mortality were 15 (8:7). The histopathology finding of lungs showed loss of normal tissue parenchyma and were replaced with infiltrating mononuclear cells consisting of plasma cells, macrophages with fibrous connective tissue proliferation, caseation and necrosis. Also alveolar spaces were filled with dense suppurative fibrino-purulent exudates. Hepatocytes showed degenerative changes with bile duct proliferation, acute congestion of vessels and sequestration of red blood corpuscles (RBCs) in lobular spaces. Heart showed complete disruption of myofibres and inter-fibrillar RBC pockets. Histopathology of the spleen revealed fibrous tissue proliferation and haemorrhages throughout the parenchyma. Lymph nodes showed patchy fibrosis and hyalinization.

Art – 55. A CASE OF SEMINOMA IN A RESCUED SLOTH BEAR
(Melursus ursinus)

Ilayaraja S , Arun A Sha, Jayakrishnan and Vijayaragavan
Wildlife Veterinary Officers, Bear Rescue Centre, Wildlife SOS

ABSTRACT:

An adult, castrated male Sloth bear aged around 15 yrs showed the symptoms of anorexia, muscle wasting and passing diarrheic faeces in Agra Bear Rescue Facility of Wildlife SOS. The symptomatic treatments did not yield any improvement. The bear had gradually gone to lateral recumbency. The blood sample and sputum were subjected to laboratory analysis. Serum biochemistry revealed AST 103 U/L and ALT 04 U/L. The PCR test was negative for Tuberculosis. The bear died after three days. The detailed post-mortem examination revealed sever adhesion of lung lobes and a calcified mass in thoracic cavity which made difficult to demarcate the lung lobes. The tissue sample was subjected to histopathological examination and it revealed germ cell tumor or seminoma. The authors described the occurrence and histopathology of seminoma in this particular case.

**Art – 56. MOLECULAR PREVALENCE AND CHARACTERIZATION OF
Hepatozoon ursi INFECTION IN INDIAN SLOTH BEARS (*Melursus ursinus*)**

Rahul Mohanchandra Pawar^a, A Poornachandar^a, **Attur Shanmugam Arun^b,**

Santhanam Manikandan^a, Sisinthy Shivajia^a,

^aLaboratory for Conservation of Endangered Species, Centre for Cellular and Molecular Biology, Uppal Road, Hyderabad 500007, India

^bWildlife SOS Bannerghatta Bear Rescue Centre, Bangalore, India

ABSTRACT:

Hepatozoon species are parasites that infect a wide variety of domestic and wild animals. The objective of the study was to detect the occurrence of *Hepatozoon ursi* in Indian sloth bears and to characterize the parasite based on phylogenetic analysis of the partial 18S rRNA gene sequence. Hepatozoon infection could be detected in 38 (70%) out of fifty-four blood samples of Indian sloth bears (captive and wild), suggestive of high prevalence of Hepatozoon infection in Indian sloth bears. Sequencing of partial 18S rRNA gene of the positive samples and BLAST analysis indicated that the nearest phylogenetic neighbour was *H. ursi* with which they exhibited 99-100% similarity. Additionally, Hepatozoon sp. isolated from wild sloth bears of India were identical to those in captive sloth bears and phylogenetically related to *H. ursi* reported from Japanese black bears from Japan. To our knowledge, this is the first report on the molecular characterization of *H. ursi* infection in Indian sloth bears.

1. Introduction

Hepatozoonosis is a parasitic disease caused by protozoans affiliated to the genus *Hepatozoon* (phylum Apicomplexa, suborder Adeleorina, family Hepatozoidae), which infect a wide variety of mammals, birds, reptiles, and amphibian hosts. Vertebrates, intermediate hosts of *Hepatozoon*, are infected through ingestion of hematophagous arthropods, such as ticks, which are its definitive hosts and contains sporulated oocysts (Baneth *et al.*, 1998). Schizogony occurs in various organs of the intermediate vertebrate hosts, and merozoites invade leukocytes (in the case of *Hepatozoon* species that infect mammals or birds) and become gamonts (Smith, 1996). There is also a possibility that infection may occur by predation (Smith, 1996). The objective of this study was to investigate whether the Indian sloth bear are infected with a *Hepatozoon* species and then to identify the species based on phylogenetic analysis of the partial 18S rRNA gene sequence. This is the first report of *Hepatozoon ursi* infection in Indian sloth bears (*Melursus ursinus*).

The sloth bear inhabits India, Sri Lanka, Nepal, Bhutan and Bangladesh. In India, it ranges from the foothills of the Himalayas to the southern tip of the Western Ghats. The International Union for Conservation of Nature (IUCN) 2008 Red List of Threatened Species (IUCN 2008) lists Indian sloth bear as vulnerable. However, in India, the Indian sloth bear has been listed as a Schedule I (meaning it is endangered) animal of the Indian Wildlife Protection Act, 1972, because of a serious threat to its survival in the wild due to poaching, trade and loss of habitat.

2. Materials and Methods

Blood samples were collected from captive and free ranging sloth bears (Table 1 between 2007 and 2010. The captive animals were from three different sloth bear rescue facilities located at Agra (Uttar Pradesh, Bhopal (Madhya Pradesh) and Bangalore (Karnataka) in India, run and managed by a non-profit organization, Wildlife SOS.

Table 1
Details of blood samples collected from Indian sloth bears from rescue centres and free ranging animals.

Geographic area from where samples were collected	Captive/free-ranging animal	Number of blood samples collected	Samples positive for <i>Hepatozoon ursi</i> infection by PCR
Agra sloth bears rescue centre, Wildlife SOS, Uttar Pradesh	Captive	21	15
Bhopal sloth bears rescue centre, Wildlife SOS, Uttar Pradesh	Captive	4	2
Bangalore sloth bears rescue centre, Wildlife SOS, Uttar Pradesh	Captive	25	18
Man-animal conflicts cases	Free ranging	4	3

Blood from free ranging wild sloth bears were collected at the time of man-animal conflicts where rescue and relocation of animals were carried out (Table 1). Blood samples were also collected when animals were anesthetized for different purposes like minor surgeries, dental operations etc. A total of fifty-four blood samples were collected in EDTA containing vacutte vials (BO, Franklin Lakes, NJ, USA). All the samples were frozen at -20 °C until use. DNA was extracted from the frozen blood samples by using the standard proteinase K/ phenol:chloroform protocol of Sambrook *et al.* (1989). DNA was dissolved in TE (10 mM Tris-HCL, 1.0 mM EDTA, pH 8.0) buffer and stored at -20 °C until use.

As described by Criado-Fornelio *et al.* (2003) universal Babesia-Theileria-Hepatozoon primers (BTH-1F, 5'-CCTGMGARACGGCTACCACATCT and BTH-IR, 5'- TTGCGACCATACTCCCCCA-3',) for 18S rRNA gene were used for the detection of Hepatozoon sp. in the DNA samples by polymerase chain reaction (PCR). PCR amplification was performed essentially as described by Criado-Fornelio *et al.* (2003) using Expand High Fidelity PCR enzyme mix (2.5 U for 25 µl; Roche, Basel, Switzerland). The PCR products were gel purified using a PureLink quick gel extraction kit (Invitrogen, Carlsbad, CA, USA) and sequenced using BigDye Terminator and ABI 3700 (Applied Biosystem, Foster, CA, USA) genetic analyser. For accuracy, both the strands were sequenced using primers BTH-F I and BTH-1R, aligned using Autoassembler software (Applied Biosystem, Foster, CA, USA) and subjected to the basic local alignment search tool (BLAST) sequence similarity search (NCBI, <http://blast.ncbi.nlm.nih.gov/Blast.cgi>) to identify the nearest phylogenetic neighbour.

Subsequently, the partial 18S rRNA gene sequences from this study and similar sequences from the database were aligned using CLUSTAL X (Thompson et al., 1997) and used to construct phylogenetic trees by Neighbour-joining method, Maximum parsimony and UPGMA (Kumar et al., 2008) with *Plasmodium vivax* as an out-group. For evaluation of the robustness of tree topologies bootstrap analysis was performed based on 1000 resamplings using MEGA 4.1 program (Kumar et al., 2008).

3. Results and Discussion

DNA from the Hepatozoon (suspected) infected Indian sloth bears following PCR using universal PCR primers (BTH-F1 and BTH-R1) yielded a single amplified product of about 730 bp. From the 54 samples of Indian sloth bears (captive and wild), 38 (70%) (Table 1) were positive by PCR. Sequencing of this product and BLAST analysis indicated that the amplicon was similar to a partial 18S rRNA gene sequence and the nearest phylogenetic neighbour was *H. ursi* isolated from Japanese black bears (EU041717, EU041718), with which they exhibited 99-100% similarity. Phylogenetic trees constructed either by Neighbour- joining, Maximum parsimony or UPGMA methods using the partial 18S rRNA gene sequences (625 nucleotides) from this study along with sequences of 18 Hepatozoon isolates from 9 different species of animals downloaded from the GenBank database (Fig. 1) exhibited three major clades (A-C) representing *H. ursi*, *H. felis* and *H. canis* with a robust bootstrap value in all the three phylogenetic trees (Fig. 1). All the sequences of isolates from Indian captive sloth bears (HQ829429, HQ829430, HQ829431, HQ829432, HQ829433, HQ829434 and HQ829435) and free-ranging wild sloth bears (HQ829436 and HQ829437) formed a robust cluster with Japanese black bears (EU041717 and EU041718) and *H. ursi*.

Considering the high prevalence (70%) of *H. ursi* infection in rescued Indian sloth bears maintained at three different geographical locations in India and in free ranging wild sloth bears it would appear that *H. ursi* may be one of the common parasites in Indian sloth bears. It was earlier reported by Kubo et al. (2008) that in Japanese black bears 100% of the animals were infected (44/44 animals).

In contrast, Hepatozoon species have not been reported in American black bears (*Ursus americanus*) in the United States (Crum *et al.*, 1978) or in European brown bears (*Ursus arctos*) in Sweden (Morner *et al.*, 2005).

Earlier reports demonstrated that Hepatozoon infections in wildlife are normally subclinical (McCully *et al.*, 1975; Mercer *et al.*, 1988; Averbeck *et al.*, 1990; Kocan *et al.*, 2000; Metzger *et al.*, 2008; East *et al.*, 2008; Andre *et al.*, 2010). Indeed, all Hepatozoon infected animals in this study were also asymptomatic. However, infection with Hepatozoon sp. in young wild canids has been occasionally associated with the presence of clinical disease in coyotes (Kocan *et al.* 2000; Garret *et al.*, 2005) and mortality in hyenas (East *et al.*, 2008). The concomitant infection of viral or bacterial origin potentially weakens the animal immune system and in such immune-compromised animals Hepatozoon sp. may be a potential pathogen and an opportunistic parasite (Davis *et al.*, 1978; Baneth *et al.*, 1998; Kubo *et al.*, 2006). More studies on the transmission, and the pathogenesis of the infection in Indian sloth bear should be conducted.

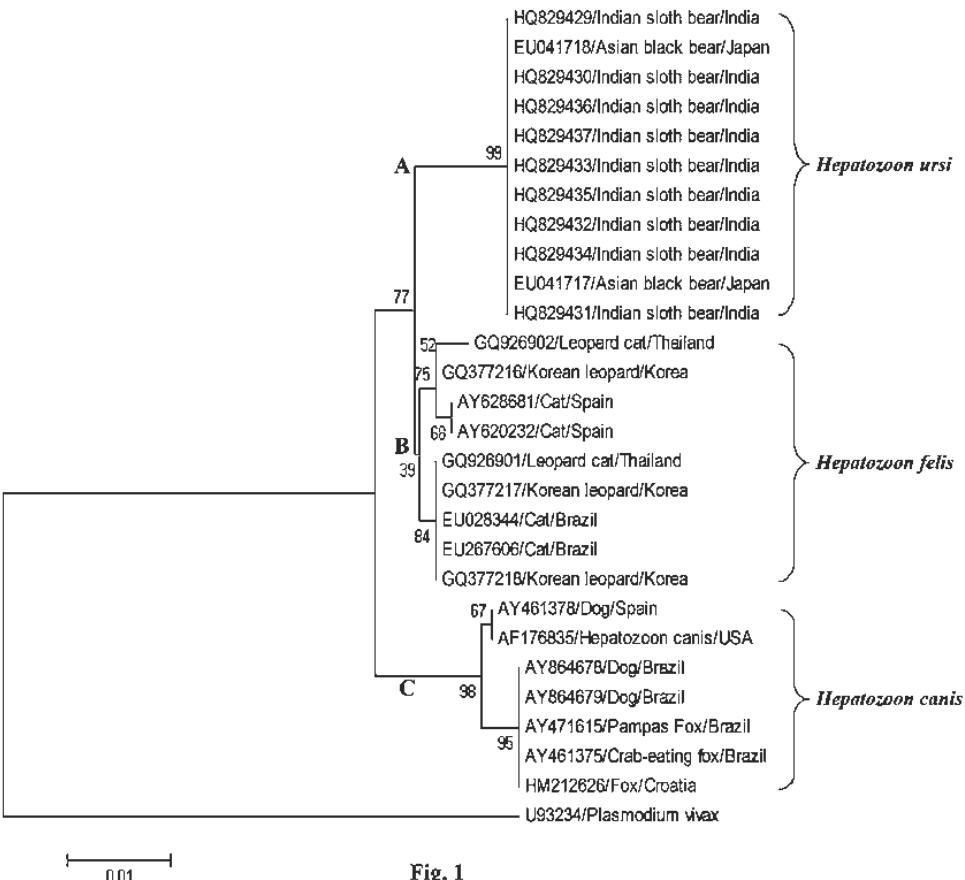


Fig. 1

Fig. 1. Phylogenetic analysis of the *Hepatozoon* sp. partial 18S rRNA gene sequence amplified from the blood of Indian captive and free-ranging bears using primers BTH-F1 and BTH-R1. The phylogenetic tree was constructed using partial 18S rRNA gene sequence corresponding to a nucleotides common to all the sequences obtained in the study and retrieved from the database. 18S rRNA gene sequence of *Plasmodium vivax* out-group. Bootstrap values are shown at the nodes. Jukes-cantor algorithms were utilized, and phylogenetic trees were constructed by Neighbour-joining method using MEGA 4.1 program.

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Art – 57. MANAGEMENT OF IDIOPATHIC EPILEPSY IN A SLOTH BEAR
(*Melursus ursinus*)

Jadav K, A Gupta and P Nigam
Van Vihar Rescue Facility, Wildlife S.O.S., VVNP, Bhopal,
Madhya Pradesh, India

ABSTRACT:

A 9 year old captive female sloth bear (*Melursus ursinus*) exhibited four spells of epileptic seizures lasting from one to a maximum of three minutes over a period of 8 months during November 2008. The seizure was exhibited initially after a gap of 6 months and subsequently on two occasions at monthly interval. The sequence of events during seizure spell included pushing of the bowl during feeding followed by violent fall either laterally or dorsally and severe jerking of the whole body. Additionally, whining, gnashing of teeth, and stiffening of limbs were noticed. In the ictal stage, tachypnoea, frothy discharge from the mouth and exhaustion were noticed. This was followed by regaining posture and initiation of feeding. No veterinary interventions were carried out as the bear regained normalcy following the spell of seizure.

The complete blood profile, urine analysis, coprological examination for endoparasites and detailed clinical examination of the bear did not reveal any abnormality. To rule out neoplasia, cyst or any abnormality in brain, helical axial scanning of the head was performed on multi-detector computed tomography following chemical immobilization however no structural defects could be appreciated. Though no specific event could be initially attributed to signs of pre-ictus, however, review of management practices revealed association of spells of seizures with evening feeding.

The management included change in the feeding pattern, presentation and the ingredient in the evening diet along with food enrichment of enclosure to enhance activity and movement of the animal. No supplementation of anti-epileptic drug was done. The bear did not exhibit seizures following altered practices for more than 18 months and has been surviving without showing any signs of altered behavior.

Art – 58. DENTAL EXTRACTION IN A WHITE TIGER (*Panthera tigris*)

Gupta A, S Ilayaraja, A Mishra, K Jadav and J S Chauhan
Van Vihar National Park Bhopal, Madhya Pradesh, India.

ABSTRACT:

A 13 year old male white tiger at Van Vihar National Park, Bhopal, and M.P. was presented with a history of anorexia, lethargy and purulent discharge from the lower mandible. Animal was immobilized using a combination of xylazine hydrochloride and ketamine hydrochloride in the ratio of 1:1 for closer examination of mouth. Marked gingivitis, halitosis, purulent discharge from the base of left cracked canine and patent mandibular sinus could be appreciated. Hemato-biochemical profile revealed marked leucocytosis (26800/ μ l), elevated bilirubin (0.7 mg%), elevated aspartate amino transferase (90.6 IU/L), alanine amino transferase (130.9 IU/L) and alkaline phosphatase (55 IU/L). Conservative approach using broad spectrum antibiotic (Meropenem @ 8.5 mg/kg body weight), anti-inflammatory (Meloxicam @ 0.2 mg/kg body weight), and other supportive drugs for a period of five days showed slight improvement in food intake though the mandibular sinus still persisted with purulent discharge. The tiger was again immobilized after 30 days of initial exploration. The affected tooth was extracted by raising muco-periosteal flap from the distal aspect to medial aspect of canine tooth using periosteal elevator. A luxator was used to cut the periodontal ligament to loosen the infected tooth base. A high speed dental drill was used to remove the alveolar bone and subsequently the gingival sutured. Animal was maintained on antibiotics and supportive therapy for a period of five days following which marked improvement in wound healing and food intake was noticed. The wound showed complete healing by seven days. The present study aims to document various procedures practiced for dental extraction in white tiger.

Art – 59. CAPTIVE MANAGEMENT IN HEADSTARTING TURTLES: A VETERINARIAN'S PERSPECTIVE

Khadpekar YR, Dr.^a, Sirsi Shashwat^b, Tripathi Ashutosh^b, Singh Shailendra^b

^aWildlife SOS, Agra Bear Rescue Facility, India,

^bTSA/MCBT Indian Turtle Conservation Programme, India.

Introduction

Head-starting is an active protection/conservation strategy that was originally applied to sea-turtles, and involves rearing of hatchlings to a size class that would be less prone to predation. This concept has been applied to freshwater turtles and tortoises in recent times. Turtle survival Alliance (TSA) in collaboration with Madras Crocodile Bank Trust (MCBT) and San Diego Zoo's Institute of Conservation and Research has been operating three head starting facilities in northern India to recover two sympatric species of endangered Batagur, a large riverine turtle species and a soft shell turtle species of genus Chitra. As the captivity period at these facilities extends up to five years, the health management of this captive stock becomes a veterinarians' responsibility. At such projects, all the factors have to be planned on population level rather than individual level. Meanwhile, it is important to always keep in mind that these turtles are supposed to go back to the wild, especially while handling the management aspects such as nutrition. The following communication shares the authors' experiences while taking care of the turtle juveniles at captive head-starting facilities.

Background

The three head-starting facilities, namely Garhaita Turtle Conservation Centre (GTRC), Kukrail Gharial and Turtle Rehabilitation Centre (KGTRC) and Deori Eco-centre are currently head-starting three different species of turtles. GTRC and Deori Eco-centre have been acting as head-starting facilities for the turtles in the Chambal River area while KGTRC functions as head-starting and rehabilitation centre for turtle species in turtle conservation priority areas in North India such as Chambal River and Tarai region.

The species that are being head-started in these three centres include,

Red-crowned Roof Turtle (*Batagur kachuga*)

Three-striped Roof Turtle (*Batagur dhongoka*) and

Narrow Headed Softshell Turtle (*Chitra indica*)

A YH c Xg' UbX'A UHfJUg

The turtle eggs are collected from the wild, transported and then incubated and hatched at the hatchery at the centre. The hatchlings are tagged and released in the different ponds at the centre.

Health screening

Due to the large number of turtles, it is generally not possible to screen each and every individual. However, the hatchlings/juveniles are examined visually at regular intervals for any signs of illness or abnormalities such as weakness, lethargy, shell deformities, vision and buoyancy. These regular checks also help to access the general health of the turtle population in the pond. The turtles showing any abnormalities are isolated immediately for intensive care and treatment.

Major health concerns

In North India, where the facilities are based, winter is extreme, temperatures going down to 1°C at times. It is made more difficult by the thick fog during most of the daylight hours. This gives the turtles very less opportunity to bask resulting in the disturbances in calcium and vitamin D3 metabolism leading to Metabolic Bone Disease. Generally, this is indicated by the thin and soft shells, lethargy and weakness. Hypovitaminosis A is another problem we have observed at these facilities. The symptoms seen in affected turtles were poor vision and swollen eyeballs. Gastro-intestinal infections are also encountered especially during winters.

Diagnosis and treatment

The diagnosis of any ailment is generally done by the close external physical examination. Considering the field conditions and other technical difficulties, we have found it sufficient, quick and efficient enough method. However, whenever possible, we do the laboratory blood analysis and radiography to support our diagnosis. The sick turtles are immediately transferred to the isolation pond for intensive care and close observation. Severely affected and weak individuals are transferred to small tubs with separate heat sources. Turtles showing the signs of Metabolic Bone Disease are given intramuscular injections of Calcium Gluconate (Calcium Sandoz@ 10%, Novartis Pharmaceuticals, Mumbai, India) @ 100mg/kg body weight. The injections are repeated every 7 days upto three weeks. The proportion of calcium rich food items with optimum Ca:P ratio is increased in the diet regime. Individuals having swollen eyes and vision related problems are injected with Vitamin A (Vitamin A, Virbac Animal Health Pvt. Ltd., Mumbai, India) @ 2000 IU/kg body weight by subcutaneous route. They are also provided with the food items rich in Vitamin A.

The infections are treated with Ciprofloxacin (Tab. Ciprodac 250, Cadila, Pharmaceuticals Limited, Samba, India) orally 10 mg/kg body weight every 48 hours for up to 2 weeks. The sick turtles in the isolation pond are provided with extra basking platforms to increase the opportunity for every individual to bask in available natural sunlight. During winters, the pond enclosures are covered with the thick plastic sheets during night to avoid cold winds blowing in. Thus, the ambient temperature inside the enclosure is maintained higher than the outside temperature.

Management practices

To maintain hygiene, the ponds are emptied every 4 days and the biofilm and algal layers on the walls are scrubbed off vigorously. It is followed by washing the ponds with mild Potassium Permanganate solution and rinsing it off with normal water before filling it again. Waste food is removed from the ponds after 24 hours of feeding with the help of aquarium skimmers. We have found stone slabs and sand platforms to be most effective as basking platforms. Both these materials keep warm for some time even after the sunlight hours thus providing the turtles with more basking time. The stone slabs are also used by turtles as hiding places while basking. One large protein meal consisting of minnows and vegetable matter that includes radish, mustard and *Ipomea aquatica* is provided on a weekly basis with the hatchlings being provided additional supplement of dry dog food during summer. During winter, only one large protein meal of dry dog food and vegetable matter is provided in order to conform lower metabolic rates and energy requirements. We also feed them with the aquatic vegetation from the local rivers whenever possible. This is very important as these turtles are to be released in the natural habitat at later stage of the project.

Discussion

The most critical periods of monitoring at these facilities are during winters. As mentioned above, there is very less sunlight combined with very low temperatures during winter months, causing various health problems and sometimes mortality in the captive stock. It is thus very important to try to keep the enclosure temperature in the thermoactivity range of the turtles. This we try to achieve through different means such as covering the enclosures with transparent plastic sheets with heat sources installed inside, changing the cold water with warmer water or just adding enough amount of warm water in the pond as frequently as possible.

The turtles need to be under constant observation for any signs of illness considering they are quite prone to infections during extreme winter, due to compromised immune response. Any sick individual is isolated immediately and given intensive care and treatment.

Maintaining a fixed diet regime is always a challenge due to unsteady supply of some food items. We try not to imprint the turtles with captive food habits, which adds to difficulties.

We also hope to develop advanced and more streamlined diagnostic systems for early detection and control of health problems. At the end, we have to make sure that the turtles we are releasing back in the nature are fit and ready to go!

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Art - 60. A STUDY ON ESTROUS CYCLE BEHAVIOUR OF FEMALE SLOTH BEARS (*Melursus ursinus ursinus*) IN CAPTIVITY

**Baiju Raj M V, Geeta Seshamani, Prerna Sharma, Kartick Satyanarayan,
Thomas Sharp**

Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Agra, India.

ABSTRACT:

This study was conducted in Wildlife SOS Agra Bear Rescue Facility which is one of the world's largest Sloth Bear (*Melursus ursinus ursinus*) facility for rescued performing/dancing bears. The main objective was to study the behavioral changes and to provide natural habitat in captivity. This study was mainly concentrated on the behavioral changes in female bears during their estrous cycle. The human imprint had made these bears in a state where they were neither wild nor domestic. The environmental factors related to the season can also exert effects on the estrus of the Captive domesticated animals (Galina and Arthur, 1990; Penninton *et al.*, 1985). The data is collected from 2009 to 2011. Mating generally takes place between May and July and the cubs are born between November and January (Jacobi 1975, Laurie and Seidensticker 1977, Joshi *et al.*, 1999. Yoganand K. Unpubl. data). 100 plus bears from 14 enclosures were selected and different parameters were recorded from April to July. The first and foremost affecting parameter recorded was diet. 70% of the female bears' diet was reduced < half from their normal and in comparison with male bears. In Estrous, bleeding was from 7-12 days in average, but the vulva swelling was seen from 15 to 20 days. Weight of the bears was recorded Pre-estrous, estrous and post-estrous. Both male and female weight was compared and recorded for the study. Weight loss was recorded in females during estrous compared to pre-estrous and post estrous. > 60% of the aggressive female bears were showing docile behavior, the infighting and aggressive behavior was recorded high in the enclosure with more females than equal sex ratio enclosures. Mating, mounting behaviour with natural loud noise was also shown by most of the female bears in the facility and was the positive sign of the favourable natural condition of large enclosure. The bears were found more active and ranging in night during this period and is the successful result of change in their behavior from a tortured, domesticated bear to an animal with wild instincts in a favourable condition.

Art – 61. HEALTH PROBLEMS OBSERVED IN RESCUED SNAKES AROUND INDIA AND THEIR MEDICAL MANAGEMENT

Khadpekar YR, Dr Arun A Sha, Dr Ilayaraja S,
Wildlife SOS, India

Introduction:

India, with a diverse range of habitats, has a wide variety of non-venomous and venomous species of snakes. There are believed to be over 270 species of snakes in India. Out of which, 157 have been well recorded (Whitaker R, Captain A, 2004). Many of them are very commonly found in close proximity to human habitations. With increasing urbanization and habitat loss, there are a large number of snakes that get caught up into dangerous situations and need to be safely rescued. Snake charming, is another snake conservation issue in India. Many times, the snakes are rescued from these snake charmers. These snakes have been kept illegally and in very poor conditions.

While dealing with such rescued snakes as a veterinarian, the authors have come across some medical problems that are encountered frequently. Most of them were human induced, but few were thought to have happened during the processes of nature. Snakes rescued from snake charmers are also found to have a typical set of health issues. This paper attempts to describe few such cases and the treatment regimes followed with available medical facilities.

Materials and Methods:

As keeping snakes as pets is not allowed in India, all the snakes mentioned had been caught during the rescue calls. Most of them were caught near or in the human habitations and were brought to the authors by rescuers on observing some abnormality or injury on the snake. Few snakes were also confiscated from the snake charmers and later examined and treated by the authors.

The snakes with the minor injuries were given first aid and released back in the natural habitat as soon as possible. The ones with the severe injuries or ailments were examined, anesthetized, treated as per the need and kept under care till complete recovery.

The most commonly rescued and treated snakes are Indian Rock Python (*Python molurus molurus*), Indian Rat Snake (*Ptyas mucosa*), Common Sand Boa (*Gongylophis conicus*), Red Sand Boa (*Eryx johnii*), Spectacled Cobra (*Naja naja*), Common Krait (*Bungarus caeruleus*) and Russell's Viper (*Daboia russelii*).

Case I

A Russell's viper was found stuck on a glue pad used for pest control, in a factory. It was found to be dehydrated, weak and lethargic. The snake was kept under care for 6 days after rescue. The body was wiped everyday twice with the Isopropyl Alcohol (Ciprit, Agrawal Drugs Pvt. Limited, Haridwar, India) to get rid of the glue. Also, the snake was given 10 ml of Dextrose Normal Saline (Claris Lifesciences Ltd., Ahmedabad, India) subcutaneously every 48 hours for rehydration. After the glue had come off completely and the snake had gained enough strength again, it was released in the natural habitat.

Case II

A rescued Russell's viper was brought to the author with an edematous swelling on the left side of head and neck. On further enquiry with the rescuer, it was noticed that the snake was rescued while sitting in a thorny bush area. Thus, it was suspected that some injury from a thorn might have caused the swelling. The snake was kept under care for 10 days with a course of Inj. Meloxicam (Inj. Melonex™, Intas Pharmaceuticals, Ahmedabad, India) 0.5 mg subcutaneously on alternate days. The snake was kept in an empty, half covered fish tank so as to give enough opportunity to bask in natural sunlight. The swelling subsided completely on 11th day. The snake was released back in the natural habitat.

Case III

A Red Sand boa was rescued from a construction site with severe cut injuries on the face and neck region. The snake was anesthetized with Inj. Ketamine (Ketamin® 50, Thermis Medicare Limited, Haridwar, India) @20mg/kg body weight by intramuscular route. Simple continuous sutures were placed through subcutaneous tissue and skin to close the wounds using absorbable Coated Braided Polyglycolic Acid sutures of 2-0 size (Relyon PGA, Meo Hospital Aids Pvt. Ltd., Hubli, India). Inj. Enrofloxacin (Fortivir, Virbac Animal Health India Pvt. Ltd., Mumbai,

India)@10mg/kg body weight and Inj. Meloxicam (Inj. Melonex™, Intas Pharmaceuticals, Ahmedabad, India) @ 0.2 mg/kg body weight were given subcutaneously to provide analgesia and avoid secondary infections. The injections were repeated for next 3 days along with the dressing of the wounds with 5% Povidine Iodine (Biodine, Skymap Pharmaceuticals, Roorkee, India). However, the snake died on the day 4 of treatment.

Case IV

An adult Indian Rock Python was brought to the authors with severe injuries on the neck. The snake was stuck in a fishing net and the injuries happened when the villagers tried to pull him out of it. The wound was cleaned with 10% solution of 5% Povidine Iodine (Biodine, Skymap Pharmaceuticals, Roorkee, India) in Inj. Metronidazole 0.5% (Metris®, Claris Lifesciences Ltd., Ahmedabad, India). Inj. Enrofloxacin (Roflox, Novartis India Limited, Mumbai, India)@10 mg/kg body weight and Inj. Meloxicam (Inj. Melonex™, Intas Pharmaceuticals, Ahmedabad, India) @ 0.2 mg/kg body weight were given subcutaneously to provide analgesia and avoid secondary infections. The snake was kept under care for 2 days with daily dressing of the wound. It died on the third day.

Case V

A spectacled cobra was seized from a snake charmer and brought to the authors for health check-up. The snake was dull, weak and mildly dehydrated. On inspection of the oral cavity, it was observed that both the fangs were removed along with the venom glands, which is a common practice among snake charmers. Mild swelling and congestion was observed at the site of cuts. The cobra was given 12 ml of Dextrose Normal Saline (Claris Lifesciences Ltd., Ahmedabad, India) subcutaneously and was kept under observation under a heat source. The snake is under care currently and is responding to treatment.

Case VI

An adult Indian Rock Python was rescued with severe oedema in lower jaw and neck region. Oral cavity was also found to be severely oedematous with swollen tongue and wind pipe. A clear fluid came out on puncture and aspiration on the swelling site. The fluid, when subjected to bacterial culture analysis, was found to be sterile.

Oral cavity was cleaned with diluted Chlorhexidine mouth wash (Hexidine®, ICPA Health Products Limited, Ankleshwar, India) followed by application of a paste mixture of Boric Acid (Vasco Drug Laboratories, Agra, India) in Glycerine (Eleesa G-Sol, Agrawal Drugs Pvt. Limited, Haridwar, India). Inj. Enrofloxacin (Roflox, Novartis India Limited, Mumbai, India) @10 mg/kg body weight was given by intramuscular route to avoid secondary infection. Tab. Seratiopeptidase 10mg (Seriwok - 10, Wockhardt Limited, Mumbai, India) was given orally on alternate days as an anti-inflammatory. Oedema fluid was drained through a needle prick. The python died on 14th day during treatment course.

Discussion:

The most common medical problem with rescued snakes in India is different injuries caused by people while trying to remove or kill the snake. Snakes at construction sites often get injured from the tools such as metal shovels or machinery like JCBs being used. Snakes confiscated from snake charmers, in general, are severely dehydrated, weak and in very poor health condition. Stomatitis is very common, especially in venomous snakes like cobras, due to crude methods of removing the fangs and venom glands. Gastrointestinal disturbances are also observed due to ingestion of milk. Reptile medicine in India is still in primary stages. Many medicines widely used in reptiles in other countries are not available or expensive in India and the advanced technologies are difficult and expensive to access. Thus, the treatment approach in snakes is generally symptomatic. We do our best with the available medicines, resources and literature.

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Art – 62. STRAIN IDENTIFICATION OF MYCOBACTERIUM TUBERCULOSIS COMPLEX ISOLATES FROM RESCUED SLOTH BEARS (*Melursus ursinus*) IN SOUTHERN INDIA

Abraham D Cork S C, Alex PC Venugopal K P, Sha Arun A, Madhavilatha G K, Anusree B S Mundayoor S

ABSTRACT:

Caseous nodules were observed in the lung tissue of eight captive Sloth Bears (*Melursus ursinus*) during post-mortem examinations at a rescue shelter in Southern India. Mediastinal and mesenteric lymph nodes also held caseous lesions suggestive of tuberculosis infection. All of the nearly 100 sloth bears at the shelter were rescued from street performance across India. Histopathology of affected organs revealed acid-fast bacilli or granulomas in the affected organs. Lung and lymph node samples subsequently showed growth of mycobacteria when cultured on Lowenstein-Jensen medium. The clinical presentation, gross or histopathology findings and preliminary culture results did not determine the *Mycobacterium tuberculosis* complex organism causing infection. Further investigation was needed to determine the likely source of infection and help suggest appropriate risk mitigation measures. A single-tube tetraplex polymerase chain reaction (T-PCR) confirmed the presence of *Mycobacterium tuberculosis* in eight culture isolates obtained from different adult animals. Strain typing of the isolates was performed by the restriction fragment length polymorphism (RFLP) by IS6110 and mycobacterial interspersed repeat unit (MIRU)-variable number tandem repeat (VNTR). DNA fingerprints of the eight isolates did not show evidence for identical strains causing infection in the bears, but the isolates reflected the strains identified in the human population. Absence of typical clinical signs and lack of reliable ante-mortem diagnostic tests for confirmatory diagnosis of tuberculosis causes significant difficulty in identifying infected animals. Keepers attending the rescued animals were also screened for tuberculosis infection. This paper outlines the diagnostic challenges and conservation implications of tuberculosis spill-over in captive wild animals.

Art – 63. OCULAR CAPILLARY HAEMANGIOMA IN A RESCUED SLOTH BEAR (*Melursus ursinus*) - A CASE REPORT

Ilayaraja S, Arun A Sha, Yaduraj Khadpekar
Veterinary Officer, Wildlife SOS, India

Introduction:

Haemangioma is a benign, abnormally dense collection of dilated small blood vessels that may occur in the skin or internal organs. In humans, hemangiomas may be present at the time of birth or may develop shortly after. They mostly resolve on their own by 5 to 10 years of age but some may take several years to disappear. In animals, sporadic cases have been reported in cattle, horse, sheep, dog, swine and fowl. However, it is very rarely reported in wild animals and especially bears except for a case of Cutaneous Haemangioma in a Giant Panda (*Ailuropoda melanoleuca*). Here we describe a case of Ocular Capillary Haemangioma in an adult rescued mate Sloth Bear (*Melursus ursinus*).

Materials and Methods:

A rescued adult male dancing bear on admission, showed severe lacrimation from the left eye and was scratching the eye frequently. On close observation, the conjunctiva of the affected eye was found to be congested with a swelling on the upper eyelid. The eye was washed with normal saline and topical antibiotic and anti-inflammatory drops were applied for 5 days, without any improvement.

Results:

On the 7th day, a red coloured mass was observed to be emerging from the affected eye from behind the upper eyelid hindering the bear's vision from that eye. The animal was tranquilized and closely inspected. The mass was found to be oval shaped with 1.5 cm length and 1 cm width, erythematous and emerging from the cornea. A surgery was conducted excising the mass from the eyeball. Capillary bleeding was controlled using an electric cauterizer. The bear was treated with a course of oral antibiotics, anti-inflammatory and Vitamin A supplements for next 5 days. Antibiotic eye drops were applied for 5 days.

Discussion:

On subjecting the mass to histopathological examination using H&E stain, it was found to be a Capillary Haemangioma. It was suspected to have caused by the constant irritation to cornea by the rope passing over the eye and thus rubbing on it frequently during the street performances of the bear. It is also possible that an injury to eye due to indiscriminate beating of the animal by the gypsies during training or performance might have caused the condition.

Keywords: Capillary Haemangioma, Sloth bear (*Melursus ursinus*).

Art – 64. INCIDENCE OF TRICHOBEZOAR (HAIRBALL) IN CAPTIVE SLOTH BEAR AND ITS SUCCESSFUL TREATMENT- A CASE REPORT

**Ilayaraja S, Arun A Sha, Yaduraj Khadpekar Veterinary Officer,
Wildlife SOS, India**

Introduction:

A bezoar is a ball of swallowed foreign material that collects in the stomach and fails to pass through the intestines. Chewing on or eating hair or fuzzy material can lead to the formation of a bezoar. A hairball is a small collection of hair or fur formed in the stomach of animals that is occasionally vomited out when it becomes too big. Hairballs are primarily a tight elongated cylinder of packed fur, but may include bits of other elements such as swallowed food. Cats are especially prone to hairball formation, since they groom themselves by licking their fur, and thereby ingest it. Rabbits are also prone to hairballs. Cattle are also known to accumulate hairballs, but as they do not vomit, these are found usually after death. Hair balls in the alimentary tract of captive wild animals are not common and unless of large size are apparently unimportant (Fox. H, 1924).

Materials and Methods:

One rescued adult (12 Years old) male bear at Agra Bear Rescue Facility (ABRF) started showing the symptom of diarrhoea, vomiting and got treated with Inj. Biotrim 5 ml, i/m, Inj. Ranitidine @ 0.5 mg/kg and Odasetran @ 0.2 mg orally for 3 days as the bear was suspected to be suffering from enteritis. However, the animal started showing abdominal discomfort, constipation, reduced appetite and preferred to rest in dorsal recumbency most of the time. The animal was isolated and given 20 ml of laxative (Cremaffin) orally and was provided free access to drinking water mixed with oral re-hydration salts. On 5th day morning we found a tuft of hair about one foot long, in feces in the den.

Results and Discussion:

On sixth day onwards the animal became active and started taking food normally. No further abdominal discomfort and straining was noticed while defecation.

The formation of trichobezoar is probably a normal physiological process in sloth bears because of their peculiar habit of licking among themselves (A.T.Rao and L.N. Achariyo). However, in this case it might be the development of stereotypic behaviour like trichophagia, trichotillomania and pica due to the ill treatment by Kalandar gypsies that were using this bear for illegal street performance.

Keywords: Trichobezoar, Sloth Bear, Trichophagia

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Art – 65. MANAGEMENT OF AN INJURED AND DEBILITATED RESCUED ASIAN ELEPHANT (*Elephas maximus maximus*) IN A RESCUE CENTRE

Geeta sehamani¹, Kartick Satyanarayan¹, Ilayaraja. S², Arun A. Sha², Yaduraj Khadpekar, Baiju raj, M.V³

¹Co-founders; Wildlife SOS, India,

²Veterinary Officer; Wildlife SOS, India

³Biologist; Wildlife SOS, India

Introduction:

The Elephant Rescue Center (ERC) is a unique lifetime care facility run by an NGO Wildlife SOS, India for rescued injured, debilitated and abused captive Asian Elephants (*Elephas maximus maximus*). The facility currently houses and takes care of six rescued elephants.

Materials and Methods:

An injured and debilitated adult male captive elephant was rescued and brought to the facility in November 2010. The elephant had met with a vehicle accident causing severe injuries all over the body. On close examination the elephant was observed to be blind in both eyes. The toenails and cuticle in all four feet were severely overgrown and damaged. Both stifle joints had large swellings about 60 cm in circumference thus making it difficult for the elephant to sit. From the history of the elephant, the swellings were diagnosed as Hygromas i.e acquired or false abnormal bursae usually between skin and bony prominences as a result of repetitive use, trauma or infection. They were found to be hard and painful on palpation. An open cut wound was present along the dorsal midline on the back. Abscesses were observed on both sides of hip region and the left ear pinna. On blood analysis the elephant was found to be anaemic and mineral deficient.

Intensive treatment and management strategies were adopted for next three months for the rapid recovery of the elephant. The wounds and abscesses were dressed and treated twice a day. Green fodder along with cooked concentrate feed was provided. Mineral supplements were provided through the feed. The overgrown toenails were trimmed slowly over the period of a few weeks. Non-invasive methods such as hot water fomentation and application of turpentine liniment were adopted to control and reduce the hygroma.

Results:

The wounds showed rapid recovery and were completely healed after 3 months. Abscesses took longer but healed over 6 months period. Hygromas reduced to less than half the size in 6 months. The elephant showed good improvement in overall body condition with good hydration status and body weight.

Art – 66. POACHING OF SLOTH BEAR CUBS AND IMPACT OF CANINE REMOVAL IN CUBS AND ADULT DANCING SLOTH BEARS BY THE KALANDAR COMMUNITY- A DETAILED STUDY

Arun A Sha, Ilayaraja S, Kartick Satyanarayan, Geeta Seshamani, Baiju Raj M V, Yaduraj Khadpekar
Wildlife SOS, D 210 Defense Colony, New Delhi, India

ABSTRACT:

Sloth bears have an omnivorous diet which requires active use of canines as well as wide foraging ability. Bears caught from the wild for forced street performances (such as 'dancing') exhibit reduced ability to forage for food.

Wildlife SOS is a non-profit organization working in India in collaboration with international conservation organisations to halt the indiscriminate removal, illegal harvesting and poaching of sloth bear cubs from the wild across several states in India. The efforts of this coalition resulted in the rescue and rehabilitation of over 550 Sloth bears across India from members of the Kalandar community who were using these bears for street performances. Wildlife SOS confiscated and rescued 82 (46: 36) wild Sloth bear cubs from various part of the country (2002 - 2012). Out of these 82 sloth bear cubs, 51 cubs (71 %) were observed with all four canines brutally broken. The reasons were careless handling and trade of canine teeth in the illegal market. Only 31 bear cubs out of 82 (39 %) were observed with unbroken canines.

A similar study was conducted with adult dancing sloth bears with Wildlife SOS. Out of 567 rescued bears, 524 bears (92.5 %) had severe injuries in all four canines with gum and skull pathology. As a consequence, all 524 bears need dental interventions like endodontic treatments or extraction procedures, which the authors are carrying out. The authors experienced the alterations and differences in behaviour of the bears with and without canine teeth. The authors emphasize that permanent canine teeth damage makes a major impact on overall bear health and affects the release potential of these bears in the wild.

**Art – 67. REMOVING DACNING BEARS FROM THE STREETS AND
REHABILITATION OF KALANDAR COMMUNITIES IN INDA TO REDUCE
POACHING OF SLOTH BEAR CUBS**

**¹Geeta Seshamani, ¹Kartick Satyanarayan, ¹Baiju Raj M V , Matt Hunt², Alan
Knight², Arun A Sha¹, Ilayaraja S¹**

¹Wildlife SOS, D210 Defense Colony, New Delhi,India.

²Free the Bears, Cambodia

ABSTRACT:

The practice of dancing bears across India augmented through illegal poaching of Sloth bear by the nomadic Kalandar community has been depleting the wild population of Sloth bears in India. The barbaric and illegal practice of making bears 'dance' (also referred to as 'dancing bears') has been going on for about 400 years and was identified by Wildlife SOS as the root cause threatening the wild Sloth bear population in India. Wildlife SOS's objective was to holistically approach the issue through community participation by engaging with the Kalandar community through dialogue and various alternative livelihood options. Wildlife SOS worked with the Kalandar community from 1998 until 2002 to create a communication platform and build trust that resulted involuntary surrender of dancing bears in 2002 by the Kalandar community. The Kalandar families that surrendered their Sloth bears voluntarily received encouragement through rehabilitation packages. From December 2002 to December 2009, a total of 600 Sloth bears were surrendered by Kalandar individuals and communities across India to four Sloth Bear Rehabilitation Centers across India, established by Wildlife SOS in collaboration with various state forest departments. The rehabilitation of the community through women empowerment projects, alternative livelihood programs and education incentives for the children were carried out and implemented through collaboration with a number of international partners , most notably International Animal Rescue (UK), Free the Bears (Australia), One Voice (France) and the Ford Foundation. The holistic approach of dialogue and offering alternate livelihoods for ending the hereditary but illegal bear-dancing, trade, as opposed to a coercive penalising approach, has resulted in a sustainable 'and amenable conclusion benefiting both local communities as well as sloth bear conservation.

Art – 68. BEHAVIOURAL RESPONSE OF SLOTH BEAR (*Melursus ursinus*) TO CHITAL (*Axis axis*) IN A MIXED SPECIES EXHIBIT

Kajal Jadav¹, Arun A Sha², Ilayaraja S², Parag Nigam³, A B Srivastava¹

¹Centre for Wildlife Forensic & Health, MPPCVV, Jabalpur, MP

²Wildlife SOS, D210 Defense Colony, New Delhi, India

³Wildlife Institute of India, P O. Box #18 Chandarbani, Dehradun, Uttarakhand, India

ABSTRACT:

A two year study was undertaken with the aim to provide naturalistic environment to the rescued dancing sloth bears (*Melursus ursinus*) by housing them in a mixed species exhibit along with free ranging chital (*Axis axis*) at Van Vihar National Park Zoo, Bhopal, Madhya Pradesh between 2008 to 2010. Six sloth bears (1 female and 5 castrated male) with extracted canines were housed in an enclosure measuring 8.5 hectares that was already holding 40 free ranging chital and the responses of sloth bears to chital presence were studied. An ethogram consisting of mutually exclusive interspecies interactive behaviours (unidirectional interactions of sloth bear with chital) limited to aggressive, submissive and no response was prepared based on observations when both the species were visible together.

The study revealed that sloth bears were non-responsive to chital presence in 91.1% of total recordings; however aggressive and submissive behaviour was observed in 6.5% and 2.3% of recordings respectively. Both aggressive and submissive behaviours in bears were observed primarily during feeding hours and when dominant stag was present. Chital foraged on bear scat having undigested material and also on leftover feed. The study revealed minimal interaction between these species thereby opening option for keeping multiple species together however with preconditions. The mixed species enclosure elicited a positive visitor perception as evinced by the greater duration spent by visitors at the enclosure as compared to single species exhibit holding sloth bears.

Based on the observations, mixed species exhibits can represent an important and promising option to approximate natural conditions in captivity by way of increasing the complexity of the enclosure and addressing the enrichment needs. The paper is an attempt to document the behavioural observations in a mixed-species exhibit shared by sloth bears and chital.

Art – 69. A CASE STUDY OF SUCCESSFUL ALTERNATIVE LIVELIHOODS FOR A KALANDAR COMMUNITY IN BHOPAL STATE.

Geeta Seshamani¹, Kartick Satyanarayan¹, Baiju Raj M V, Matt Hunt², Alan Knight¹, Arun A Sha¹, Prerna Sharma¹

¹Wildlife SOS, D210 Defense Colony, New Delhi, India,

²Free the Bears, Cambodia

ABSTRACT:

This study outlines a diverse range of successful alternative livelihoods provided for rehabilitation of the Kalandar community of Gandi Basti, Bhopal state, after the surrender of their performing Sloth Bears. Bears were voluntarily surrendered to the Wildlife SOS Van Vihar Bear Rescue Facility following advocacy in collaboration with the Madhya Pradesh Forest Department. The objective of this study, ongoing since 2006, was to monitor the ability of the community to sustain their alternative livelihoods provided by Wildlife SOS in order to eradicate the practice of dancing bears trade. The Kalandar community is traditionally very orthodox, rarely investing in children's education or allowing female community members to leave the village. Initially the survey assessed involvement of adult male and female community members, revealing that 90% of women showed entrepreneurial skills and a willingness to work hard in order to improve their lives. Wildlife SOS's work to improve Kalandar children's education commenced in 2006 with just one child from a village of 125 families, by 2007 the community engaged with this programme allowing more than 50 students to be enrolled in school, and by 2008 more than 100 students were receiving education support.

Female community members interested in tailoring but not allowed to leave the village were given training in a tailoring school established within the village, allowing more than 25 girls to develop incomes. Other successful alternative livelihoods included grocery and confectionery shops, crockery sales, auto-rickshaws and various micro-enterprises to fill niches within the village. Support from Wildlife SOS brought about a remarkable change in the age for marriage, ensuring that girls were not forced into marriage before the age of 18. Amongst male community members, employment at the bear rescue centre was another notable success for this project.

Art – 70. SLOTH BEAR ATTACK ON HUMANS, DESIRABLE AVOIDANCE BEHAVIOR AND HUMAN-BEAR CONFLICT MITIGATION EFFORTS

**Arun A Sha¹, K Satyanarayan¹, G Seshamani¹, S Kottur¹, Usham Singh¹,
Thomas Sharp¹**

¹ Wildlife SOS, D210 Defense Colony, New Delhi, India

ABSTRACT:

Sloth bears as a species have known to be aggressive and the cause for an increasing number of bear attacks on humans. In the central Indian state of Madhya Pradesh alone, sloth bear attacks accounted for the deaths of 48 people and the injuring of 686 others between the years 1989 and 1994.

Sloth bears are known to be unpredictable and given to charge easily when surprised by humans. This paper discusses various sloth attack bear attack circumstances gathered through a study conducted by the authors through direct interaction with sloth bear attack victims. Medical reports of sloth bear attack victims, direct interviews, eye witness description have been analyzed in this paper to draw up and decipher sloth bear attack behaviour while designing desirable specific desirable avoidance behaviour to ward off such attacks.

The authors have worked extensively on bear ecology and behaviour and have documented incidences of sloth bear attacks on humans and categorized the various circumstances and micro - environment that forms a catalyst to cause attack reactions from wild sloth bears. The paper also discusses various efforts designed by the Wildlife SOS team at mitigating sloth bear-human conflict in Karnataka while highlighting ones that were successful in the field. The paper also discusses in depth attacks by female sloth bears with cubs and field of tolerance that exists around these bears with data gathered over several years.

**Art – 71. SOLAR ELECTRIC FENCES AS A SUCCESSFUL EX-SITU
MANAGEMENT TOOL TO MANAGE LARGE CAPTIVE SLOTH BEAR
POPULATIONS IN LARGE FORESTED ENCLOSURES**

**Arun.A.Sha, Ilayaraja S , Kartick Satyanarayan, Geeta Seshamani, Baiju Raj M V,
Kiran C M**
Wildlife SOS, D210 Defense Colony, New Delhi, India.

ABSTRACT:

Managing Sloth Bears in ex-situ situations in large enclosures has been a challenge for wildlife rescue centers and other ex situ captive facilities. The ability of sloth bears to climb, dig and maneuver out of standard enclosures has prevented facilities from creating large naturalistic enclosures for this species. The full conservation education impact of this species and the evolutionary importance of this species in the wild can only be conveyed if

- a) the sloth bears are housed in large forested enclosures to encourage them to display natural behaviour similar to the bears in the wild
- b) the sloth bears can be contained effectively eradicating escape situations
- c) a non-intrusive and aesthetic barrier able to permit scientific observations, behavioural research and permit documentation of the same
- d) permit rapid intervention in the event a specific individual needs to be extricated from the enclosure for veterinary or other procedures.

Several designs using Solar Power Fence Systems were tested to create the ideal design to address these issues. Eight varying designs of Solar Fences with varying configurations were calibrated through a series of field trials at the Wildlife SOS Agra Sloth Bear Conservation, Rescue and Research Facility (also called Agra Bear Rescue Facility) since 2002 through establishing test installations of socialization fences for sloth bears to create a species specific design to contain sloth bears successfully in large forested enclosures. Field Trials were similarly carried out at Wildlife SOS Bannerghatta Sloth Bear Rescue Center since 2005.

Art – 72. TIE – OVER BANDAGE TECHNIQUE IN TREATING INFIGHTING INJURY IN SLOTH BEAR (*Melursus ursinus ursinus*) - A CASE REPORT

Arun A Sha and A G Niraimozhi

Bannerghatta Bear Rescue Centre Bannerghatta Biological Park Bangalore – 560083

ABSTRACT:

A female Sloth Bear (*Melursus ursinus ursinus*) was bitten on the back in infighting with a male Sloth Bear. The female bear was calmed down and topical dressing was carried out for two days and on third day, the bear was tranquilized. Close observation by using exploratory incisions, and it revealed the presence of foul-smelling exudates and tissue decomposition. Hence, surgical debridement was carried out and the dead tissues, exudates were removed. Since the wound was on the back (dorsal area between Lumba-sacral joint and base of tail) regular bandaging was not possible, hence, tie-over bandage technique was adopted. Tie-over bandage technique is adopted when there is a large surface area wound (i.e., abdomen, thorax, back, eek) or wounds in 'difficult-to-bandage' areas (i.e., tail, perineum, head, para-prepucial and proximal extremities} and other areas which may not be amenable to routine bandaging techniques. In this technique, several #0 or #1 monofilament non-absorbable suture loops are placed in the skin on theriphery of the wound (360° around the wound). Appropriate wound covering materials are placed in the woundbed. Several lengths of $\frac{1}{4}$ inch or $\frac{1}{2}$ inch umbilical tape are passed through the loops of suture over the covered wound and through the suture loop on the opposite side of the wound. The wound which was 9 inches of circumference has reduced to 2 inches within a period of 150 days with immense healing. The detailed full length surgical procedure was recorded for scientific documentation.

Art – 73. PERFORATION INJURY IN PHARYNGEAL REGION OF A CAPTIVE TIGER - A CASE REPORT

M T Basavanagowda, B C Chittiappa and **Arun A Sha**
Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park,
Bangalore – 560083

ABSTRACT:

A 9 year old male tiger in Bannerghatta Biological Park showed the symptoms of small opening in the cervical part of the esophageal region of neck. This was associated with drooling of mucous, later confirmed as saliva. The tiger was tranquilized by using Xylazine (1mg/kg body weight) and Ketamine (3.5mg/kg body weight). The entire neck and the oral cavity were subjected to detailed examination which revealed mild inflammation in and around the opening with no evidence of bleeding or bone involvement. A blunt forceps was introduced into the opening and further examination of the oral cavity revealed an opening into the pharyngeal region. The perforating wound was obliterated using simple interrupted sutures using monofilament polyglactin 2-0 using the external side of the opening. A course of Ceftriaxone was used parenterally for a week. Only soft food like (muscle mass, liver) was fed for the entire week to avoid postoperative complications. The tiger recovered uneventfully after a week. This perforation could be the result of a sharp fragment of bone in the meat fed due to infighting with other animals.

Art – 74. OVAROHYSTERECTOMY WITH LUTEAL CYST AND LEIOMYOMA OF A LIONESS WITH PYOMETRA

Arun A Sha, M T Basavanagowda and B C Chittiappa
Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park,
Bangalore – 560083

ABSTRACT:

A 14 year old lioness of about 200 kg body weight having the history of chronic pyometra was subjected to ovari-hysterectomy. The lioness was subjected to general anesthesia by using injection Xylazine (0.75 mg/kg body weight) and injection Ketamine (2.5 mg/kg body weight) as intramuscularly by hand held syringe. After complete sedation, the lioness was shifted to operation table and a ventral midline incision was used to perform the pan ovari-hysterectomy. The ligation and internal sutures were placed with polyglactin 910, No. 1 and the skin was opposed with Nylon 1-0. The lioness was subjected to a course of antibiotic therapy with Ceftriaxone parenterally. Both gross and microscopic lesions of ovary revealed cyst on corpus luteum. A moderate mass on the body of the uterus on extra luminal side revealed leiomyoma on histopathology. The lioness went on to make an uneventful recovery.

Art - 75. A CASE REPORT OF MULTIPLE METATARSAL FRACTURES IN A WILD PANTHER

C S Sujay, B C Chittiappa, **Arun A Sha**, B N Nagaraj, K Sanath, M Karthik and N Jaisingh

Bannerghatta Biological Park, Bannerghatta, Bangalore, Karnataka

ABSTRACT:

A wild female panther, aged about 2 years weighing about 45kgs was rescued from a 40 feet deep dry wide well in a village from Tumkur forest division. The animal had fallen into the well chasing a cat for its prey. It was brought to Zoo Hospital, Bannerghatta Biological park for treatment. Close physical observation after tranquilizing it with Xylazine 70 mg and Ketamine 180 mg using a dart air gun revealed swelling of left hind metatarsal region (half the size more than the normal) and crepitation was felt on palpation. The animal was then shifted to Veterinary College Bangalore and then subjected to C-Arm radiographic imaging. This showed complete over-riding fracture of metatarsal 1, 2, 3 and 4. This procedure was carried out under general anesthesia using a jab stick to deliver the drugs (Xylazine 50 mg and Ketamine 150 mg intramuscularly). Under Ketamine maintenance using 50 mg, intra-medulillary pinning was done. Post-operative care for 5 days was followed using Ceftrixone 1000 mg intramuscular, Meloxicam 10mg S.Q.(for 3 days) with restricted movement and rest was followed. Surgical wound was left open and daily dressing using neomycin powder and turmeric powder was done. The K-wire inserted was intact, surgical wound healed progressively.

**Art – 76. SAMPLING TECHNIQUE FOR DISEASE DIAGNOSIS WITH
REFERENCE TO *Mycobacterium tuberculosis* IN A LARGE POPULATION OF
RESCUED DANCING SLOTH BEARS**

C Renukaprasad, Arun A Sha, C M Kiran, S Rahul, Amol, Ilayaraja and
Shylaja

Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore

ABSTRACT:

In a large population of rescued dancing sloth bears at the Bannerghatta Bear Rescue Centre, governed by Wildlife SOS in collaboration with Karnataka Forests department, the authors encountered high mortality due to pulmonary tuberculosis. This population of rescued dancing sloth bears during the illegal custody by nomadic tribes, were exposed to severe stress agents like trauma, various physical and psychological illness, malnourishment etc, and hence making them easily susceptible to various diseases like tuberculosis, a re-emerging disease in animals and humans. Sloth bears, being asymptomatic carriers, did not show pathognomonic symptoms like coughing and mucous discharge from nostril and hence clinical diagnosis of disease during early stage in the population is challenging. In this context, accurate sample collection method like lung wash technique to collect sputum directly from trachea and lungs, tracheal swab and smear, blood samples, fecal sample, etc. and respective diagnostic procedures are significant to reduce mortality rate in the said population. An elaborate discussion of these sampling techniques for early diagnosis of tuberculosis in sloth bear of disease and therapeutic management is done in this article.

Art – 77. FELINE PAN LEUKOPENIA IN A TIGER CUB

C S Sujay, Arun A Sha and B C Chittiappa
Bannerghatta Biological Park Bannerghatta, Bangalore, Karnataka

ABSTRACT:

A three month old non vaccinated tigress cub of tigress Menaka weighing about 25 kg housed in Rescue Center of Bannerghatta Biological Park was observed to be dull and passing severe yellowish watery diarrhea. The condition further worsened to dysentery, vomition, dehydration (about 8%), rectal temperature was 98°F to 101.3°F and the cub was anorectic. Blood sample collected on second day revealed leucopenia (4500 cells per μ l), decreased platelet count (152 cells per μ l), BWN: 103.5 mg/dl and hypoproteinaemia (5 g/dl). Stool samples were tested with ubio quickVETTM kit (meant for Canine Parvo Virus Ag Rapid Test Kit) and were found negative. Treatment was carried out initially for bacterial/protozoal enteritis using Sulphatrimethaxone and Trimethoprim combination (Injection Oriprim™) @ 15 mg/kg twice daily, Dependal-M™ (Metronidazole and Furazolidone combination) @ 10 mg/kg twice daily. After the blood analysis, it was tentatively diagnosed as Feline pan Leukopenia based on hematological findings and Ceftriaxone 20 mg/kg intravenous twice daily was started to prevent secondary bacterial infection along with supportive treatment. The cub was handled manually by animal keepers of Bannerghatta Biological Park during the course of treatment. After a struggle of overcoming death for 11 days, the cub finally started eating boneless chicken, eggs, beef chima with supplementation syrups mixed in it. Secondary wounds caused due to repeated intravenous therapy were resolved using Thrombophob™ gel, inflaming ointment and regular dressing. The cub is now active and healthy and successfully reunited with her mother.

Art – 78: PYOMETRA WITH UTERINE RUPTURE IN A RESCUED LIONESS (*Panthera leo*)

R Rishikesavan¹, Arun A Sha², B M Chandranai, P Giridhar and C Renuka Prasad

¹Wild Animal Disease Diagnostic Laboratory, Institute of Animal Health and Veterinary Biologicals, Hebbal, Bangalore - 560 024.

²Wildlife Veterinary Officer, Wildlife SOS

A few clinical reports are available on infertility in wild animals compared to other domestic animals. However, several infectious agents are involved with the female reproductive tract disorders of the lioness (Rao and Acharjyo, 1995). The present communication describes a case study of pyometra due to *Escherichia coli* in a lioness (*Panthera leo*) at Bannerghatta Biological Park, Bangalore, it was open type infertility and ended up in closed pyometra and peritonitis due to uterine rupture.

Materials and Method

A 16 years old rescued female lion (*Panthera leo*) kept at rescue centre, Bannerghatta Biological Park, Bangalore was brought for treatment at Wild Animal Disease Diagnostic Laboratory (WADDL), Bannerghatta Biological Park, just before death, with the history of sudden symptoms of falling down, peddling of limbs and lateral recumbency. The animal had a past history of chronic recurrent open pyometra since two years and was treated successfully with antibiotics, based on antibiotic sensitivity tests done at this laboratory. Six months after treatment, the animal did not show any symptom of pyometra, but on routine blood analysis giving evidence of pyometra. The Hematological values were analysed as per the procedure described by Benjamin (1998). Few days before death, distended abdomen was observed, surgery was planned for hysterectomy but before stabilizing the animal to tolerate surgical intervention she died suddenly.

Results and Discussion

On post-mortem examination, the entire peritoneum was seen adhering to the internal organs and about 10-12 lit of pus was accumulated in the abdominal cavity. Omentum and intestinal loops were found adhered with the anterior surface of uterine horns. The ventral portion of uterus and central part of body of the uterus

had circular, fibrosed, necrotic perforations. Entire uterine mucosa was necrosed. The pus in the uterus was collected in sterile containers for culture examination which showed growth of colonies of *Escherichia coli*, later confirmed by the standard biochemical (IMVC), morphological and sugar fermentation tests (Carter *et al.*, 1995). The blood profile revealed leucocytosis (Total WBC count: 27,500/ μ l) with neutrophilia (Kenney *et al.*, 1987) and (Potter *et al.*, 1991) reported leucocytosis and neutrophilia as common findings in felines with pyometra. Histopathological examination of the uterus revealed numerous inflammatory cells predominantly neutrophils, lymphocytes and plasma cells. Connective tissue proliferation and several vascular disruptions were observed. Secretory glands were empty and appeared to be vacuolated. Focal necrotic lesions were present. These findings were suggestive of bacterial infection. Several organisms have been reported to be the cause of pyometra in lioness viz., *E.coli*, Streptococcus, Staphylococcus, Salmonella and Mycoplasma. However, *E.coli* is the predominant organism for causing pyometra (Robert, 1989). The lioness possibly acquired the organism from the ano-vaginal route, as *E.coli* is the commensal organism in the intestinal tract and also a wide range of aerobic and anaerobic bacterial species have been identified as normal flora in the feline vagina and may be the source of ascending infections (Clemetson and Ward, 1990).

Summary

A captive female lion (*Panthera leo*) kept at Rescue Centre, Bannerghatta Biological Park, Bangalore, was affected with severe pyometra, resulting in uterine rupture, peritonitis and death. The causative organism for the pyometra was identified as *E. coli*. Post-mortem lesions and histopathological findings have been described.

Acknowledgement

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Art – 79: AN INCIDENCE OF BENIGN FIBRO EPITHELIAL POLYP IN A RESCUED DANCING SLOTH BEAR (*Melursus ursinus*)

Ilayaraja S*, A Sha Arun*, Yaduraj Khadpekar, Sanio Johnson****

*Senior Wildlife Veterinary Officer, Wildlife SOS India,

**Junior Wildlife Veterinary Officer, Wildlife SOS India.

Introduction:

Fibro epithelial polyps or hypertrophied anal papillae are essentially skin tags that project up from the dentate line and the junction between the skin and the epithelial lining of the anus. They are usually small in size, but sometimes they become enlarged, causing unexpected medical conditions. Fibro epithelial polyps of the anus, also known as hypertrophied anal papillae, are lesions that have attracted little attention in both medical and veterinary literature. Gozalo *et al.* (1998) found ureteral fibroepithelial polyp in an owl monkey (*Aotus nancymae*), but no such information found in Ursidae. A fibro epithelial polyp, which was present in the perianal region of a dancing sloth bear (*Melursus ursinus*), was successfully excised surgically which relieved the bear from irritation from the same. This is the first report of a fibro epithelial polyp in this species to the best of the author's knowledge.

Case Report:

A fourteen year old, female, rescued dancing sloth bear (*Melursus ursinus*) housed at Agra Bear Rescue Facility, Uttar Pradesh, India (27°0'N; 77°45'E), weighing 110kgs, showed difficulty during defecation and achieving dog sitting posture although the bear was otherwise active and healthy. So, the bear was isolated in the feeding and retiring den for close observation which revealed a small pedunculated mass hanging from the peri-anal region.

The animal was tranquilized for detailed clinical examination using a Ketamine-Xylazine combination; Ketamine hydrochloride (5mg/kg body weight; Ketamil®, Troy laboratories Pvt Ltd., Smithfield, NSW, Australia) and Xylazine Hydrochloride (Xylazil®, 2mg/kg body weight; Troy laboratories Pvt Ltd.) as described by Page (1986). The vital parameters were recorded as the temperature being 31°C. Heartrate 54 beats/minute and the respiratory rate 20 breaths/minute. Blood sample was collected for hematology and serum biochemistry. The mass was uneventfully removed by local excision as per the standard procedure. The wound

edges opposed with simple interrupted suture with absorbable 2-0 Polyglycolic acid suture material, the wound healed completely on the 10th day. Tissue samples were fixed in 10% neutral buffered formalin and processed routinely for histopathological examination. Hematology revealed no abnormalities except a moderate eosinophilia and an adequate platelet count (Arun *et al.*, 2008). The histopathological examination of the resected specimen showed hyperkeratotic acanthotic squamous epithelium with overlying fibro-collagenous tissue suggesting a benign fibro epithelial polyp. Fibro epithelial polyps of the anus, also referred to as hypertrophied anal papillae, are structures formed by the hyperplasia of the connective tissue in the vicinity of the anal columns. They are usually relatively small in size and asymptomatic (Vu *et al.*, 1998). They are enlarged, benign, polypoid projections of the anal squamous epithelium and the sub epithelial connective tissue (Gupta, 2005). Enlargement of anal papillae is thought to be due to hyperplastic response of the modified ectoderm to chronic irritation, injury or infection. Following repeated inflammatory episodes, they can hypertrophy into the rectum and be confused with adenomatous polyps. They are usually small in size, asymptomatic and can be regarded as normal anatomic variations (Galanis *et al.*, 2009). Most anal papillae are 2-5mm at their greatest dimension, although they rarely exceed 2cm. Enlargement of fibro epithelial polyp to more than 3cm in diameter is rare, and it is therefore necessary to differentiate such lesions from malignant tumors including leiomyosarcoma, anorectal carcinoma and malignant lymphoma. Hypertrophied anal papillae are liable to trauma during the passage of stools and may become inflamed. Furthermore, they produce symptoms by projecting at the anal orifice during defecation strongly simulating a rectal prolapse. Pruritus, foreign body sensation, mucus discharge, sense of incomplete evacuation and discomfort while sitting are the prevailing symptoms with this condition. The location of a smooth mass just inside the anal verge should suggest the possibility of a fibro epithelial polyp, especially in a patient with a history of chronic anal irritation (Galanis *et al.*, 2009). Grossly, fibro epithelial polyps usually present as long slender projection with a smooth surface arising from a common base. Viewed microscopically, the lesions are composed of fibro vascular stroma emerging from the submucosa covered with a single layer of normal transitional epithelium without papillary formation (Franco *et al.*, 1988). A fibro epithelial polyp can be easily distinguished from adenomatous polyp by several distinctive characteristics: (1) its mucosa is whitish

compared with the reddish appearance of an adenomatous polyp, (2) the 'stalk' of a hypertrophied anal papilla originates from the squamous side of the dentate line, (3) closure of the biopsy forceps on a fibro epithelial polyp results in pain, (Heiken et al, 1984) and (4) biopsy of these structures always demonstrates squamous epithelium. The differential diagnosis should always include internal hemorrhoids, rectal polyp, anal carcinoma and submucosal anorectal tumor (Hizawa et al, 2001). Groisman and Polak-Charcon (1998) studied the histological, immunohistochemical and ultrastructural features of a series of 40 fibro epithelial polyps of the anus and concluded that fibro epithelial polyps of the anus are benign lesions characterized by the presence of mono nucleated and multi-nucleated, sometimes atypical CD34+ stromal cells showing fibroblastic and myofibroblastic differentiation (Sakai and Matsukuma, 2002). They also suggested that polyps that are harboring atypical cells are those of large size. The morphological resemblance between these lesions and normal anal mucosa supports the hypothesis that fibro epithelial polyps may represent a reactive hyperplasia of the sub epithelial connective tissue of the anal mucosa. Mast cell infiltration by means of their fibrogenic, fibrolytic and angiogenic activities, may play an important role in the pathogenesis of these structures.

Summary

Occurrence of Non-cancerous fibro -epithelial growth at peri-anal region in a rescued captive Sloth bear and its successful treatment was discussed.

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Art - 80. DYSTOCIA IN A RHESUS MACAQUE (*Macaca mulata*) AND ITS SUCCESSFUL MANAGEMENT

Ilayaraja, S.¹, Arun A. Sha¹, Yaduraj Khadpekar², Sanio Johnson² and Niraj Dahe²

¹Senior Wildlife Veterinary Officer, Wildlife SOS, India,

²Junior Wildlife Veterinary Officer, Wildlife SOS, India

Introduction

Rhesus macaques (*Macaca mulatta*) are arboreal as well as terrestrial free-living monkeys. *Macaca mulatta* lives in a wide range of habitats, and shows a great deal of adaptability. Some populations live in flatlands, while others, in northern India and Pakistan, live in the Himalayas at elevations up to 3,000 m. In addition to living in the wilderness, some populations of *Macaca mulatta* have become accustomed to living alongside humans. Occasionally, small groups can be found living in the densely populated urban areas of northern India. Groups of rhesus monkeys that become used to living in areas occupied by people usually search out other human-populated areas if people attempt to relocate them away from civilization (Parker, 1990; Nowak, 1991). Unlike many primate species, the estrus cycle of *Macaca mulatta* is not accompanied by major changes in the female's genital region. There is only minor swelling and redness around the genital area. Females reach reproductive maturity at 2.5 to 3 years of age (Nowak; 1991). The breeding season varies widely amongst populations. Populations that live in areas where the winters are cold, mate in the fall so that the young are born in the spring. *Macaca mulatta* that live where seasonal changes are less pronounced have less well-defined mating seasons. The gestation period is around 180 days (Price *et al.*, 1999) and almost all pregnancies results in birth of a single young. When kept under uniform conditions in captivity, females maintain a steady etsrus cycle of 26 to 28 days. They are receptive to copulation for between 8 and 11 days during that cycle (Datta, 1988; Parker 1990; Nowak, 1991). Although rhesus monkeys show mate preferences, in general they are highly promiscuous.

Case Report

As reported by the local villagers, 8-10 year old female Rhesus macaque weighing about 11 kg observed with having a distended abdomen and profuse vulval discharge was rescued. In the anesthetic management in non-human primates done by Harrison *et al.* (1982), Ketamine was used for immobilizing the pregnant monkey, and the anesthesia was maintained with a mixture of 60% nitrous oxide, oxygen and 0.23 to 1% of halothane, with a total flood of 1 liter per minute. In the present case, anesthesia was induced by giving Ketamine hydrochloride intramuscularly (Gonder *et. al.*, 1980) (Ketamil®, 8 mg/kg body weight; Troy laboratories Pvt Ltd., Smithfield, NSW, Australia) and Xylazine hydrochloride intramuscularly (Xylazil®, 2.5 mg/kg body weight; Troy laboratories Pvt Ltd) (Popilskis and Kohn, 1997) (Fig.1). Anesthetic drugs were injected after manually restraining the animal (Fowler, 1995) Then, the general anesthesia was achieved with 1% isoflurane (Evers *et. al.*, 2003) (Isotroy®, Troikaa Laboratories, Gujarat, India) (Fig. 2). In fetal surgery, the pregnant monkeys and their fetuses experience pain and stress; both generate hemodynamic changes that could provoke hypoxia, acidosis, hypotension and brain damage, that could kill the fetus or the mother. That is why an adequate anesthetic and analgesic management is important (Alfonso *et al.*, 2010). Ultrasonography evaluation indicated that the fetus was dead, evident by absence of fetal heart beat and also the fetal movement could not be detected through the abdominal wall (Fig. 3). Radiography indicated the presentation of the fetus to be anterior. (Fig. 4). The decision was made to deliver the fetus by Caesarian section. A midline abdominal incision through the Linea Alba (Venugopalan, 2002) was made preparatory to exteriorizing the uterus and delivering the fetus (Fig. 5). Inspection of the uterus revealed a 375 g, dead partially putrefied male fetus. The putrefied fetus and all the debris inside the uterus were removed (Fig.6). The interior of the uterus was washed with Metronidazole solution (Metronidazole Injection LP., Parenteral Drugs India Ltd; Indore, India). The incision on the uterus was closed with absorbable braided polyglycolic acid suture No: 2,-0 (RelyonPGA®, MCo Hospital Aids Pvt. Ltd, Hubli, India) in Cushions followed by Lembert's suture pattern (Venugopalan, 2002). The muscle layers were opposed layer by layer in simple continuous fashion and skin in simple interrupted manner. An intravenous 22" Butterfly catheter (Scalp Vein Set, Romsons®, Romsons Scientific and Surgical Industries Pvt. Ltd) was placed in the cephalic vein, and a lukewarm 5%

glucose solution, 150 ml, was administered during a period of 90 minutes. One hundred ml of a lukewarm 0.9% sodium chloride solution was administered during the surgical time and postoperative. Heart rates, respiratory rates and temperature were monitored manually. The normal temperature of a pregnant Rhesus monkey is 36 to 40°C (Johnson, 1994). The temperature of the monkey was recorded to be 39° C; temperature was regulated through stand lamp (Harrison *et al.*, 1982). Immediate recovery from surgery was uneventful. The animal underwent a course of antibiotic, Ceftriaxone Sodium (Safevet Forte®, Dosch Pharmaceuticals Pvt Ltd, Mumbai, India) for 5 days (Lisa *et al.*, 2009) and recovered successfully without any clinical complication. The animal was released on 15th day.

Summary

As reported by the local villagers, around 8-10 year old female Rhesus macaque (*Macaca mulatta*) weighing about 11 kg observed with having a distended abdomen and profuse vulval discharge, was rescued. Anesthesia was achieved by using a combination of xylazine (@2.5 mg/kg body weight) and ketamine@ 8 mg/kg body weight intramuscularly (Popilskis and Kohn, 1997). Ultrasonography revealed presence of dead fetus in the abdomen. Radiograph of the abdomen revealed anterior presentation of the fetus. Caesarean section was performed to deliver the dead fetus using general anesthesia.

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Art – 81. OCCURANCE OF TOENAIL ABSCESS IN CAPTIVE ELEPHANT (*Elephas maximus*) AND ITS SUCCESSFUL MANAGEMENT

Ilayaraja, S¹, Arun A. Sha¹ and Yaduraj Khadpekar²:

¹Senior Veterinary Officers, Wildlife SOS, India.

²Junior Veterinary Officer, Wildlife SOS, India.

Introduction

Abscess is an abnormal cavity containing pus. The cavity is formed in tissues, due to local suppurative inflammation because of the invading organism or foreign body. Kay (2003) observed foot affection more in domestic elephant than free ranging wild elephant. In captivity, Asian elephants (*Elephas maximus*) are more prone for toenail abscess if periodical foot care is not provided properly when compared to African elephants (*Loxodonta africana*) (Singh *et al*, 2010). Possibility for the occurrence of toenail abscess is more in musth elephants because of their aggressiveness and not obeying to the command of the mahout and heavy chaining in limbs makes it difficult to achieve the foot care and proper cleaning of the tethering area. Infection of the nails appears to be more frequent on the forefeet. The infection commonly begins between the sole and nail bed. Infection may start in cracks or crevices providing an anaerobic environment for growth of anaerobic microorganisms. A bull elephant in musth is dangerous and should be handled only from behind a protective barrier (Fowler, 1993). In this report we have documented a case of toenail abscess in a captive Tusker bull(*Elephas maximus*) and its successful management.

Case report

A 30 year old Tusker bull (*Elephas maximus*) which was under chained in all four limbs in a concrete floor for a month to overcome the aggressive musth condition; started showing the symptoms of swelling at the 2nd median toenail bed (onychia) with discoloured cuticle, inflamed skin (paronychia) on his right forelimb after recovery from musth. A horizontal crack was noticed in the nail with black tract. Pain evinced on palpation thus caused limping while walking and thick pus oozed out while applying pressure at the junction between the nail and cuticle. The culture examination of the pus revealed presence of *Pseudomonas propuse* and the Antibiotic sensitivity test by Kirby-Bauer Method revealed Cefotaxime is more sensitive (<25mm).

The affected toenail was trimmed, cleaned and washed with Boric acid solution. Epsom salt (225 gms in 2 litters of water) foot bath was given for 30 minutes (Csuti *et al.*, 2001) twice daily for a week along with antibiotics (Injection Cefotaxime @ 4 mg/kg Bwt) intramuscularly for 5 days and anti-inflammatory (Injection Melonex®-30 ml) intramuscularly for 5 days (Tiwari and Kashyap, 2011). Limping completely stopped, however the local swelling at toenail bed persisted after 5 days. So, decision was made to continue only topical treatment along with vitamin-mineral supplement till complete healing and leave the animal in specially designed enclosure with hard and soft mud floor without hobbling the limbs after the treatment. The toenail swelling probably as abscess was again washed with boric acid solution, then Lactated Ringers solution was used as a mechanical cleanser (Fowler and Mikota, 2006) to drain the abscess and counter dressing done with silversulfadiazine cream (Fowler and Mikota, 2006) daily twice along with supplementation of vitamin C-500 mg and mineral mixture (Vm all-P) 100 gm orally with food for achieving complete healing. On 30th day the local swelling started reducing and no pus came out while palpation and detachment of nail from the cuticle was also noticed. On 40th day onwards new nail growth pushing the old cracked nail from the apex was noticeable and the complete healing was achieved by 90th day.

Summary

Predisposing factors that may lead to foot diseases in captive elephants include lack of exercise, lack of regular foot care and inspection, nail and sole overgrowth and lack of trimming, inappropriate enclosure surfaces (hard, unyielding substrates contribute to the development of foot problems, for example by trauma and by lack of opportunity for digging, constant direct contact with dirty and wet surfaces in which pathogens can proliferate, malnutrition, excess feeding/insufficient exercise leading to overweight elephants which put more stress on their feet, arthritis and inherited poor foot structure (Fowler, 1993; Csuti *et al.*, 2001). In captivity, cases of abscesses may be related to disruption of the internal blood supply of the foot (Csuti *et al.*, 2001). Elephant urinates 5-10 time in 24 hours and total urine volume may be 25-30 litters (Benedict, 1936) and defecate 12-20 times per 24 hours, typically passes 5-8boli/ defecation (Cheeran, 2002). So, clean, dry and soft tethering site with proper drainage and proper periodical foot care along with good nutritional diet

with proper drainage and proper periodical foot care along with good nutritional diet with mild exercise is most important to prevent the foot problems in captive elephants (*Elephas maximus*).

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Art – 82. MANAGEMENT OF A DEEP ACUTE ABSCESS IN A RESCUED WILD SLOTH BEAR (*Melursus ursinus ursinus*) - A CASE REPORT

Arun.A.Sha^{1*}, Nagaraj² , Ilayaraja³, Linto Antony⁴ and Harikrishnan C⁴

¹Director, Research and Veterinary Operations, Wildlife SOS, Bannerghatta Bear Rescue centre, ²Consultant, Zoo Authority of Karnataka, ³Senior Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue centre, ⁴Wildlife Veterinary Officer, Wildlife SOS, Bannerghatta Bear Rescue centre

Introduction

An abscess is an abnormal cavity containing pus. The cavity is formed in tissues, due to local suppurative inflammation. Deep abscess developing under thick layers of tissue (like fascia, muscle) give raise to local clinical reaction (Venugopal, 1986).

Case report

An 8 year old female wild sloth bear, rescued from a human animal conflict situation, started showing reluctance in fruit intake which was included in the normal diet of the bear under captivity. The next day the bear was showing symptoms of pain on left hind leg. On close examination edema of the left hind leg was noticed. The bear was administered Meloxicam @ 0.45 mg/kg body weight per orally (Melonex bolus). The food intake reduced gradually and after two days the bear became off feed. On further observation, edema of both hind legs and a wound on the posterio-medial aspect of the left hind leg was noticed. The bear, which had a history of tranquilization ten days before, was discovered to be walking normally with no noticeable gait abnormality.

The bear, weighing 110kgs, was tranquilized on the next day itself using Xylazine- Ketamine combination at a dose rate of 2mg/kg and 5mg/kg respectively. Blowpipe method was used for the medicine administration. A total dose of 300mg Xylazine Hydrochloride (Ilium Xylazil-100b) and 750mg Ketamine Hydrochloride (Ketamilb) was used for the complete sedation and the maintenance of anesthesia. The anesthetics were given in divided doses during a period of 60 mins.

Observations revealed an open abscess, having a size of about 7cm length and 5cm width, on the posterio-medial aspect of the thigh region in the left hind leg. Tissue debris could be noticed on the wound edges. The entire abscess region was exposed by extending the cavity up to 15cm length towards the dorsal aspect of the thigh. Since the

depended part of the abscess had an opening, all the purulent discharge was found to be drained out leaving some smear of pus on the wounded area. all the vital parameters, respiratory rate (16/min), temperature (97.8°F) and heart rate (32/min), were found to be within the normal range. The hematology of the bear showed an increased leukocyte count and on differential count the granulocyte percentage was above 90% indicating a bacterial infection and inflammation. Antibiogram report (IAH & VB, Bannerghatta Biological Park) showed sensitivity (S) only to Gentamicin. All other tested drugs were resistant (R).

Whole wound area was closed with 1 in 1000 solution of Potassium Permanganate and Povidone iodine solution (Cipladine Povidone Iodine Solutionc). Remaining pus and tissue debris were removed from the wound edges. The cavity was then packed with a seton dipped in povidone iodine solution. The external wound area was then applied topically with dressing powder (Neosporin powderd). Gentamicin (Gentamycine) at the dose rate of 4mg/kg body weight, Meloxicam (Melonexa) at the dose rate of 0.2 mg/kg body weight, injections were given subcutaneously and Chlorehpheneramine maleate (Zeete) 0.45mg/Kg body weight, Multivitamin (Tribiveta) injections were given intramuscularly. Antibiotic and anti-inflammatory injections were continued for the next nine days and were given intramuscularly by blowpipe method. Antibiotic injection was stopped after ten days but anti-inflammatory medicine (Meloxicam) was continued for the next ten more days along with oral vitamin (Limcee tabsf -Vitamin C tabs) and mineral (Haem up syrupg) supplements. The animal started to consume fruits from the next day of the treatment. After five days of the treatment, animal started to take food normally but in less quantities and the feeding pattern was erratic. The erratic feeding pattern continued for the next seventeen days; thereafter it became normal and regular with normal quantity of food and fruits intake. After three days of treatment edema of the hindlegs reduced and completely disappeared on tenth day. The seton was retained in the wound cavity for forty eight hours after that it fell off. The wound area was completely healed after one month. After the wound healing no abnormality could be observed in the gait of the animal and the animal was completely recovered.

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Art – 83. SUCCESSFUL MANAGEMENT OF A SNARE WOUND IN A COMMON PALM CIVET CAT (*Paradoxurus hermaphroditus*)

Ilayaraja S¹, Arun A Sha¹, Sanio Jonhson², Yaduraj Khadpekar² and Niraj Dahe²

¹Senior Veterinary Officer, Wildlife SOS, India. ²Junior veterinary Officer, Wildlife SOS, India.

Introduction

Snares - wire nooses set to catch wild animals - have been in use for a great many years. Typically they are used as a means of killing foxes or rabbits. They are usually placed over the entrances of rabbit burrows or fox earths, or along runs or pathways thought to be used by the target species. The aim is to catch the victims around the neck, so that they die through strangulation or by dislocation of the neck. Some snares, however, feature a mechanism which stops the noose from closing too tightly but paralyzing the victim's movement and causing severe pain and injury. Poachers normally fix snares inside forests during dusk and come back the next day. Small reptiles such as monitor lizards, mammals such as Malabar giant squirrel, Black- naped hare, porcupine, wild pig, mouse deer; barking deer, spotted deer (cheetal), sambar deer, Palm civet, Small Indian civet, pangolin, jungle cat, leopard cat, leopard and even tiger cubs could be caught using such snares. Sometimes traditional farmers may use snares to trap rats, which remove grains ready for harvest that may accidentally trap some other wild rodents or reptiles when they are approaching the field while searching for their prey. In this report we discuss a snare wire wound on the abdomen of a common palm civet and its successful management. According to IUCN Red List status and Indian Wildlife (Protection) Act, 1972, they are placed in Lower risk and Schedule II respectively.

Case Report

A common Palm Civet Cat (*Paradoxurus hermaphroditus*) weighing 1.2 kg, severely injured on the abdomen by a snare wire as stated by local villagers, was presented to wildlife hospital at Agra Bear Rescue Facility, Uttar Pradesh, India (27° 0'N; 77° 45'E). The animal was sedated using a ketamine-xylazine combination, ketamine hydrochloride (10 mg/kg body weight; Ketamil®, Troy laboratories Pty Ltd., Smithfield, NSW, Australia) and

xylazine hydrochloride (Xylazil®, 1-2 mg/kg body weight; Troy laboratories Pty Ltd.) (Denver, 2003). The wound was cleaned with liquid povidone iodine and the necrotic tissues were removed by excising. The wound edges were made fresh and apposed using absorbable braided polyglycolic acid suture No: 2-0 (Relyon PGA®, MCo Hospital Aids Pvt. Ltd, Hubli, India) by horizontal mattress pattern (Venugopalan, 2002) followed by subcuticular suture. The animal was parenterally administered with anti-inflammatory drug (Inj Meloxicam @ 0.25 mg/kg body weight) and antibiotics (Inj Enrofloxacin@ 2mg/kg body weight) (Smith, 2010). The surgical wound was dressed with antiseptic powder. The animal was kept in cage and had a hassle-free recovery. The antibiotic course was completed for 7 days and the animal exhibited wound healing. The animal was released in a small enclosure covered with mesh to observe its activity and behavior pattern to judge its survivability in the wild. The normal appetite and activity of the animal indicated good prognosis. The wound healed completely after 25 days and the animal was released back into the natural habitat on 35th day. Common Palm Civets occur in a range of habitats up to 2400 m, including evergreen and deciduous forests (both primary and secondary), plantations, and around human dwellings and settlements. They are mainly frugivorous, but also eat small vertebrates and invertebrates (Jennings and Veron, 2009). They are solitary, nocturnal, and largely arboreal, spending day in trees and sometimes in buildings (Jennings and Veron, 2009). The civet produces a musk (also called civet) highly valued as a fragrance and stabilizing agent for perfume. Both male and female civets produce the strong-smelling secretion, which is produced by the civet's perineal glands. It is harvested by either killing the animal or removing the glands, or by scraping the secretions from the glands of a live animal. The latter is the preferred method today. In some parts of its range, Asian palm civets are hunted for bush meat and the pet trade. In southern China, it is extensively hunted and trapped. Dead individuals were found with local tribes in Coimbatore, Tamil Nadu and Agra, Uttar Pradesh in India between 1998 and 2003, where it is killed for its meat (Duckworth *et al.*, 2008). The oil extracted from small pieces of the meat kept in linseed oil in a closed earthen pot and regularly sunned is used indigenously as a cure for scabies (Singh, 1982).

Summary

Successful management of a snare wound in a Palm Civet Cat (*Paradoxurus hermaphroditus*) was discussed.

Acknowledgements

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Art - 84. OBSTIPATION INDUCED URINARY INCONTINENCE IN A CAPTIVE SLOTH BEAR (*Melursus ursinus*) - A CASE REPORT

**Ilayaraja, S¹, Arun A. Sha¹, Yaduraj Khadpekar², Sanio Jonhson²
and Niraj Dahe²**

¹Senior veterinary Officer, ²Junior veterinary Officer, Wildlife SOS

Introduction

Disorder of micturition can result from any dysfunction in urine storage or voiding which may be neurological or non - neurological in origin. Urinary incontinence is the failure of voluntary control of the urethral sphincter, with constant or intermittent unconscious passage of urine. Incontinent animals may leave a pool of urine where they have been lying or may dribble urine while walking (Aiello and Mays, 1998). Obstipation is a condition of intractable constipation in which the colon and rectum become so impacted with excessively hard feces that defecation cannot occur (Fenner, 2000). In this article we document a case of Obstipation induced urinary incontinence in a captive sloth bear and its successful treatment.

Case report

A 5 year old male sloth bear which was rescued and housed in Agra Bear Rescue Facility under semi-captive conditions showed symptom of in-appetance and passing yellow colour pungent urine with straining. The bear was treated with liver extract and B-complex injection and was kept under observation in den. On 2nd day onwards constipation and difficulties in urination were exhibited by frequent tenesmus (Nelson and Couto, 1999), dribbling of urine and the animal always preferred to rest in dorsal recumbancy. Decision was made to tranquilize the bear with injections xylazine and ketamine for proper clinical and radiographic examination as we were suspecting some injury on spinal cord /pelvic bone or urolithiasis. Radiographic examination of pelvic region did not reveal any fracture on the pelvic bone or sacrum and there was no evidence of urolithiasis. However, highly impacted fecal mass in the ano-rectum and colon was noticed. Examination by palpation of the anal opening confirmed the presence of hard dry impacted fecal material. Anal mucosa was noticed to be congested. The impacted fecal mass inside the anal passage was gently reduced by removing the fecal material

from the middle of the impacted mass by using small forceps in order to avoid any further damage to the anal and rectal mucosa and then big sized forceps was used to evacuate the fecal material further from the rectum and facilitate the passage by applying lukewarm normal saline 1.5 litres with 30ml of liquid paraffin as an enema (Fenner, 2000). 500gms of fecal material was evacuated from the ano-rectal passage. The bear was re-hydrated with 1 litre of RL and 1 litre of DNS through intravenous route. After 30 minutes of enema, the animal passed feces along with enema fluid and passed urine with normal color. Injection antibiotic (Inj-Biotrim 5ml) and Anti-inflammatory (Melonex power 4ml) were given intramuscularly after shifting the animal into den for recovery. The caretaker was advised to provide only soft fruits and liquid diet to the bear for 2 days. The detail serum biochemistry (Table 1) and haematology (Table 2) analysis was done and interpreted as per the standard developed by Arun *et al.* (2008) and Fowler and Miller (2008) respectively. Haemogram did not reveal any marked abnormality except Neutrophilia.

The treatment course continued for 5 days in order to avoid proctitis due to secondary bacterial infection. Calcium dobesilate 500 mg (Dobesil capsule) was given orally twice a day for 3 days with honey as bleeding was noticed while passing feces (Patel *et al.*, 2013). On 3rd day onwards, the animal started taking food normally and no abnormality was noticed while passing urine as well as feces.

Examination of the impacted fecal material revealed partially digested Bengal gram (Channa), coconut pieces and groundnuts with shells. It is suspected that the animal consumed the above mentioned food item more at the time of enrichment feeding than other animals leading to indigestion and rectal impaction followed by constipation. Pressure induced on the bladder due to impaction in the rectum led to urinary incontinence.

Summary

An incidence of urinary incontinent due to severe rectal impaction (obstipation) in a rescued captive sloth bear at 'Agra Bear Rescue Facility' and its successful treatment was documented in this article.

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Table 1: Serum Biochemistry values

Test name	Value	Unit
SGOT	75	U/L
SGPT	17	U/L
Serum Alkaline phosphatase	16	U/L
BUN	5.6-	mg%
Serum creatinine	1.4	mg%
Blood Urea	1.2	mg%
Serum Uric Acid	1.0	mg%
Serum Cholesterol	222	mg%
Serum bilirubin	0.1	mg%
Total protein	7.2	gm%
LDH	906	U/L

Table 2: Hematology values

Test name	Value	Unit
HB	17.3	g/dl
TLC	7700	Per mm ³
Neutrophils	94	%
Lymphocyte	04	%
Eosinophils	00	%
Monocyte	02	%
RBC	6.16	Millions/mm ³
PCV	45.3	%
MHC	28.1	pg
MCV	73.5	fL
MHCH	38.2	g/dl
Platelet Count	302000	Per Cumm

Art – 85. INFECTIOUS CANINE HEPATITIS IN RESCUED CAPTIVE SLOTH BEARS (*Melursus ursinus*) - AN OVERVIEW

Ilayaraja S¹ , Arun A Sha¹ , Sanio Jonhson, Yaduraj Khadpekar², Niraj Dahe¹ and K K Jadav³

¹Senior Veterinary Officer, ²Junior Veterinary Officer, Wildlife SOS

³Assistant professor, Centre for Wildlife Forensic and Health, NDVSU, Jabalpur.

Introduction

Infectious canine hepatitis (ICH) is a highly contagious viral disease causing acute liver infection in dogs caused by canine adenovirus type 1 (CAV-1). CAV-1 is related to but distinct from CAV-2 that causes infectious trachea-bronchitis (kennel cough) in dogs (Stephen and Sherding, 2005). CAV-2 is potentially pathogenic for raccoons (*Procyon lotor*) (Hamir *et al.*, 1992 & Jamison *et al.*, 1973). All canidae are susceptible for CAV-1 especially foxes, wolves, coyotes, skunks and bears (Fraser, 1986). In fox, CAV-1 manifestation (Fox Encephalitis), is observed predominantly with neurological signs. Incubation period of CAV-1 is 4-7 days (Ettinger and Feldman, 199.S). Prevalence of ICH in grizzly bears (*Ursus arctos*) from Alaska was recorded during the period of 1973-1987 (Zarnke and Evans, 1989). Canine adenoviral antibodies have been detected in hedgehogs, (Shortridge and Belyavin; 1973). Antibodies to canine adenovirus were detected in 8% of 38 American black bears (*Ursus americanus*), 0% of 36 grizzly bears (*Ursus arctos* - Brown bear) and 17% of 60 Polar bear (*Ursus maritimus*) in Canada, in samples collected during 1994-2001 (Philippa *et al.*, 2004). In Greece, a captive 10 year old European Brown bear (*Ursus arctos*) died after showing canine infectious hepatitis-like clinical signs and necropsy findings ten months post vaccination. (Kritsepi *et al.*, 1996). In Europe, the disease has been reported in vaccinated Brown bears (*Ursus arctos*) (Fowler and Miller, 2003). Infectious canine hepatitis reported in red foxes (*Vulpes vulpes*) in the United Kingdom (Thompson *et al.*, 2010), Wolf (*Canis lupus*) (Stephenson *et al.*, 1982 and Pursell *et al.*, 1983), Striped skunk (*Mephitis mephitis*) (Alexander *et al.*, 1972) and in an Eurasian River Otter (*Lutra lutra*) in Korea (Park *et al.*, 2007). But there is no such detail evidence recorded in sloth bears except the report done on by Singh *et al.*(2010).

Sloth bears inhabit the tropical and subtropical regions of the Indian subcontinent and are distributed from the foothills of the Himalayas to the Southern end of the Western Ghats mountain range in India, as well as in the island of Sri Lanka (Prater, 1965). In these regions, two subspecies are present, *Melursus ursinus ursinus* distributed across the Indian peninsula. The short-haired relatively smaller *Melursus ursinus inornatus* seen only in Sri Lanka (Pocock, 1933). Sloth Bears are mainly poached and raised for street performance by the Kalandar community in India. Agra Bear Rescue Facility is a life time care facility for the conservation and rehabilitation of Sloth Bears, established by an NGO, "Wildlife SOS" in Sur Sarovar Bird Sanctuary, Keetham, Agra, Uttar Pradesh, India (27°0'N;77°45'E) in the year 2002 to rehabilitate the dancing bear population in India. In this article, we have discussed the mortality pattern of rescued dancing Sloth bears (*Melursus ursinus*) due to Infectious Canine Hepatitis (ICH) with the symptoms and lesion recorded since past six years (2007 to 2013).

Materials and Methods

The study was conducted in Agra Bear Rescue Facility, world's largest rescue facility where over 386 rescued bears have been rehabilitated in the past ten years and maintained in semi-captive conditions on an enriched native diet of local seasonal fruits and grains. Observations were recorded from a total mortality of 142 bears in last ten years due to various reasons such as senility, rabies, meningitis, snake bites, tuberculosis, infectious canine hepatitis and neoplasm etc, out of which only 29 bear deaths could be attributed to ICH, is being described in this paper. The mortality patterns of bears due to ICH were distributed on the basis of sex, age and season. The symptoms observed before death, along with duration of illness were recorded for each animal. Complete necropsies were performed on each bears and gross lesions were photographed and recorded. Representative samples were taken from all organs and fixed in buffered 10% Formalin. The formalin fixed tissue samples were sent to Wildlife Referral Centre in Indian Veterinary Research Institute.

Results and Discussion

The CAV-1 infection in sloth bears manifested in per acute form with clinical signs of sudden illness- convulsion, respiratory distress and death within 10 to 20 minutes. In all the cases, bears were apparently healthy with no history of inappetance, anorexia, and normal excretion. In few acute cases mild shivering to staggering gait, congested eyes, mild swelling of nasal flaps, pinpoint reddish lesion in lips and gums, vomiting, passing brownish black mucoid feces, hyperthermia (40-42°C), intermittent convulsion and hyper excitability, grunting noise and death within 6-8 hours were observed. Elevated Clotting time was observed in all such cases. In rare chronic cases, initial convulsion led to comatose condition, facial swelling, paralysis of limbs, intermittent fever and brownish -black diarrhoea leading to death within 10 - 14 days; bears didn't respond to symptomatic treatment. Infectious canine hepatitis has been reported as a naturally occurring disease in *Ursus americanus* - American black bears on one occasion. Ataxia, excessive salivation, vomiting, paddling of the legs, nystagmus (Pursell *et al.*, 1983) diarrhoea, signs of abdominal pain such as adopting the foetal position (Collins *et al.*, 1984), anorexia, lethargy, hind limb ataxia, seizures and paralysis (Fowler and Miller, 2003 & Kritsepi *et al.*, 1996) were recorded in American black bears (*Ursus americanus*). Sloth bears also showed the similar symptoms as in American black bears (*Ursus americanus*) and death occurred within 12-24 hours of the first clinical signs.

In Post-mortem examination, invariably all animal showed lesion of pin point haemorrhagic lesion in buccal mucosa (Fig A), liver discoloured and mottled with sharp edges (Fig1 B), severe congestion in the stomach, intestines and kidney (Fig 1 C). Peritoneal lymph nodes were swollen and petechial haemorrhages were observed in the peritoneum (Fig1 D), meningitis with cerebral haemorrhages (Fig 1 E). Laboratory investigation revealed intranuclear inclusion bodies in 17 samples out of 29 samples. Age, Sex and month wise distribution pattern of mortality have been illustrated in Table 1, and have been graphically compared in Fig.2 A, B; C. There is no sexual predisposition, but incidence is more in sub - adult and adult sloth bears below 10 years of age (Fig 2 B). The disease occurrence is more in summer when compared to winter and high level of mortalities has been recorded during the month of March to May. ICH is a contagious and lethal disease. The disease is characterized clinically by its rapidly fatal progression (Whetstone *et al.*, 1988).

CAV-1 is both endotheliotropic and hepatotropic. Infection spreads through urine, feces, saliva, probably via the oropharynx. The virus may be shed in urine for six months or more following recovery (John *et al.*, 1981 and Fraser, 1986). So, mortality among old stocks of bears could be explained which were otherwise initially suspected to be disease free. CAV-1 is destroyed in the environment by steam cleaning and quaternary ammonium compounds. Otherwise, the virus can survive in the environment for months in the right conditions (Ettinger and Feldman, 1995). Our experience is, together with immediate isolation of the individual animal, strict and frequent disinfection of enclosure, cages and dens with Broad spectrum disinfectant is very important for control of morbidity and mortality in captive bears due to ICH. Long term supplementations of palliative treatments with immunomodulators, haematinic and vitamin-C was included in the control measures and protocols to reduce the mortality rate. Vaccination is another strategy which is being introduced to the captive sloth bears to control ICH in Agra Bear Rescue Facility. However, different authorities vary in their interpretations of which diseases bears are truly susceptible to and which diseases they should be vaccinated against (Schoemaker *et al.*, 2006). Vaccination against this disease may be considered (Kleiman *et al.*, 1996), if there is any possibility of bears coming into contact with domestic or stray dogs, for example after translocation or release (Woodford, 2001). Vaccination is not required, if bears are unlikely to come into contact with canids (Fowler and Miller, 2003). Vaccination should not be needed in areas where the disease in dogs is properly controlled (Partridge, 1992). Annual vaccination with killed vaccines against leptospirosis (*Leptospira* bacterin - Cl killed vaccine) and canine adenovirus-2 killed vaccine has been recommended (Bittle, 1993). Combined killed vaccines against Leptospirosis and Infectious Canine Hepatitis are available and have been inoculated in bears with at least two doses four weeks apart, with a booster after six months and then yearly (Partridge, 1992) in one enclosure to rule out vaccine failure.

Summary

Incidents of ICH in rescued captive Sloth bears have been recorded. The mortality pattern, symptoms and lesions learned have been explained in the paper. The preventive and control measures adopted at Agra Bear Rescue Facility have been discussed in detail.

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Table1: Detail mortality pattern of Sloth bears due to ICH

Year	Sr No:	Date of Death	Age (Years)	Sex	Male Total	Female Total
2007	1	16.12.07	7	M	9	2
	2	06.03.07	3	M		
	3	08.03.07	3	M		
	4	11.03.07	7	M		
	5	16.03.07	7	M		
	6	12.04.07	6	M		
	7	18.04.07	6	F		
	8	13.05.07	9	F		
	9	26.08.07	2	M		
	10	04.09.07	2.5	M		
	11	17.10.07	7	M		
2008	1	23.04.08	8	F	1	3
	2	02.05.08	8	M		
	3	11.05.08	8	F		
	4	14.07.08	8	F		
2009	1	27.01.09	1.5	M		
	2	07.02.09	1.5	F		
	3	10.02.09	1.5	M		
	4	12.04.09	9	M		
	5	24.04.09	6	F		
	6	26.04.09	10	M		
	7	18.09.09	10	M		
2010	1	11.04.10	10	M		
	2	14.04.10	10	M		
	3	21.10.10	10	M		
	1	12.02.13	13	M		
2013	2	17.02.13	17	M		
	3	28.02.13	5	F		
	4	02.05.13	14	M		

Art - 86. THERAPEUTIC FRACTURE OF A WILD RESCUED SLOTH BEAR CUB
(*Melursus ursinus*)

Ranganath L¹, Arun A Sha², Harikrishnan C³, Linto Antony³

¹Prof & Head, Dept of Surgery, Bangalore, ²Director, Research and Veterinary Operations, Wildlife Veterinary Officers, Wildlife SOS, Bannerghatta Bear Rescue Centre

ABSTRACT:

An adult wild female sloth bear with two male cubs were rescued from a conflict situation in the state of Karnataka and few months after the rescue operation, one of the cubs aged 1.5 years was showing limping and abnormal gait. On observation, swelling of the left forearm was noticed. Animal was primarily treated with meloxicam @ 0.3mg/kg (Melonex bolus, Intas) orally, unresponsiveness led to radiographic examination under xylazine (Ilium Xylazil 100,100mg/ml, Troy laboratories, Australia) and ketamine (Ketamil 100mg/ml, Troy laboratories, Australia) anesthesia @ 2mg/kg and 5mg/kg respectively which revealed complete multiple fracture on mid-shaft region of radius. Since the cub could not be separated from its dam, the intact ulna could serve as an internal splint and it was decided to do therapeutic management with calcium, vitamins, mineral supplements (Calshakthi, Calshakthi Platina, Intas Pharmaceuticals) and liver tonics (Livotas, Intas Pharmaceuticals). Complete gait improvements were observed after 70 days. Radiographic examination on 112th day under xylazine-ketamine anesthesia revealed complete calcification and remodeling at the fracture site. Blood samples collected showed normal haematological and biochemical values. Animal gained normal gait and activity after treatment.

Art – 87. BACTERIAL INTER-DIGITAL PYODERMA IN A SUMATRAN TIGER
(*Panthera tigris sumatrae*)

Arun A Sha*, Linto Antony* and Ilayaraja S*

*Wildlife Veterinary Officer, Wildlife SOS®, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Bangalore 560083, Karnataka, India;

ABSTRACT:

The Sumatran tiger (*Panthera tigris sumatrae*) is a rare tiger subspecies that inhabits the Indonesian island of Sumatra. It was classified as critically endangered by IUCN in 2008 as the population was estimated at 441 to 679 individuals, with no subpopulation larger than 50 individuals and showing a declining trend (Linkie, M., Wibisono, H.T., Martyr, D.J. and Sunarto, S. 2008). A fifteen year old Sumatran Tiger was showing the symptoms of a discharging wound on the right hind leg inter digital space. Clinical examination revealed an opening of the wound through which the discharge oozed out. The samples of the discharge were collected and culturing and Antibiogram were carried out. On culturing, *Staphylococcus aureus* was isolated and the condition was diagnosed as bacterial pyoderma. The animal was then treated with sensitive antibiotic drug. After a period of proper veterinary care and treatment the animal was cured satisfactorily.

Key words: Antibiogram; Antibiotic; Culture; Isolation; Pyoderma

Introduction

Skin infections occur when the surface integrity of the skin has been broken, the skin has become macerated by chronic exposure to the moisture, normal bacterial flora have been altered, circulation has been impaired, or immunocompetency has been compromised (Ellen C.Codner, Karen Helton Rhodes, 2002). Pyoderma is the term applied to a pyogenic bacterial infection of the skin. It can be primary or secondary, superficial or deep and is recognized clinically in several distinct syndromes (George H.Muller and Robert W.Kirk, 1969).



Fig.1:Interdigital Pyoderma

Clinical history and Diagnosis

A fifteen year old Sumatran Tiger (*Panthera tigris sumatrae*) was showing symptoms of wound on the inter digital space of the right hind leg. Though the animal has got a feeding cubicle where the floor was made by cement, it has got a very big open area with the natural substrate on the ground to avoid constant dampness and other possible contamination. There was mild pus discharge from the wound. Samples were collected from discharge using sterile swabs. On close examination it was found that the discharge was oozing out through an external opening on the skin of inter digital space. The collected samples were sent to the laboratory (IAH&VB) for culture and antibiogram. *Staphylococcus aureus* was isolated in culture and showed moderate sensitivity (SS) to antibiotics such as Amoxycillin clavulanate, Galifloxacin and Ciprofloxacin and sensitive to Amikacin and Norfloxacin. Based on history, clinical examination and lab results the diagnosis was made as bacterial pyoderma.

Treatment and Result

Inter digital space wound was washed with fluid metronidazole and povidone iodine after complete drainage of the discharge. Cleaned the area and then applied broad spectrum antibiotic dusting powder (Spectrazole) topically. Amoxicillin clavulanate 1250mg (two 625mg tablets) was given twice daily for 9 days orally with beef meat. The topical application of antibiotic powder was continued for 15 days twice daily. The animal was responded to the treatment positively. After 5 days of treatment no pus discharge could be observed and the wound healing was in progress. Oral

medicines and the dressing continued for the advised period in order to avoid the recurrence of the condition.

Discussion

Superficial pyoderma usually involves the trunk, extent of lesion may be obscured by the hair coat. Deep pyoderma often affects the chin, bridge of the nose, pressure points and feet (Karen helton Rhodes, 2002). Inter digital pyoderma is usually associated with Staphylococci and appears as pustules and draining fistulous tract between the toes of one or all four feet (George H.Muller, Robert W.Kirk, 1969). Primary pathogenic organisms are capable of tissue invasion and creating disease. They are usually Coagulase-positive Staphylococci(*S.intermedius*, *S.aureus*, *S.hyicus*) (Stephen J. Ettinger, Edward C. Feldman, 2005).

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Art – 88. BOVINE TUBERCULOSIS DIAGNOSIS BY IGRAs AND RAPID TESTING USING TB SPECIFIC NOVEL PROTEIN IN CATTLE FARMS AND WILDLIFE.

Maroudam V¹, Chitra K¹, Mohanasubramanian B¹, Kannan P², Arun A Sha³, Rathnagiri P⁴, Raman M¹, Dhinakar Raj G¹

¹Translational Research Platform for Veterinary Biologicals (TRPVB), A partnership program of Department of Biotechnology (DBT) and Tamil Nadu Veterinary and Animal Sciences University (TANUAS), Chennai, Tamil Nadu, India

²National Institute for Research in Tuberculosis formally TRC, Chetpet, Chennai

³Wildlife SOS, an Indian Registered Non Governmental Organization, New Delhi,

⁴Genomx Molecular Diagnostics (P) Ltd, Kukatpally, Hyderabad, AP, India

ABSTRACT:

Bovine tuberculosis (BTB) is a chronic bacterial disease that causes huge economic losses in livestock industry. The infection can spread to humans and other animals from infected cattle with socioeconomic, public health and trade implications. The problems associated with the skin testing using crude Protein Purified Derivative (PPD) had driven the quest for discovery of new BTB diagnostic assays such as interferon gamma release assays (IGRAs) and point of care (POC) rapid tests. In the present study BTB monitoring was performed in four cattle farms (n=120) by IG RAs. Early Secretory Antigenic Target (ESAT)-6 and culture Filtrate Protein (CFP)-10 are specific towards virulent mycobacteria and extensively used in IGRAs that helps to discriminate between vaccinated, non-tuberculosis, tuberculosis infection. In the present BTB specific diagnostic proteins ESAT-6: CFP-10 was produced and used to stimulate the cattle blood samples in-vitro for IGRAs. The IGRAs results positive animals were further confirmed by spoligotyping using nasal swabs and milk samples. We found that the IGRAs using recombinant ESAT-6: CFP-10 fusion protein, showed higher specificity and sensitivity in detecting BTB in Indian cattle farms. Alternately, serological methods are easy, rapid, economical and well suited for herd screening and recommended for wild life. Thus, in the present study POC rapid diagnostic kit was developed using defined TB specific recombinant proteins and two PPDs (bovine and avian PPD) to study the seroprevalence of TB in wild slothbear (n=33). The results indicated that ESAT-6: CFP-I O protein is a serodominant and could be used for TB screening in wild sloth bear. Thus, the present study showed IGRAs and POC rapid test shall be used for the laboratory diagnostic assay and herd screening methods, respectively.

Key Words: BTB; IGRAs; rapid test kit; ESAT-6: CFP-10; spoligotyping

Art - 89: REPORT ON INSPECTION OF CAPTIVE ELEPHANTS
(Elephas maximus) IN JAIPUR

¹Dr Rajeev T S, ²Geeta Seshamani, ³Dr Manilal Valliyate, ⁴Dr Arun A Sha

⁵Dr Yaduraj K, ⁶Abhishek R, ⁷Sunil Havaldar

¹Assistant Professor and Project Leader, Centre of Elephant Studies, College of Veterinary and Animal Sciences, Kerala.

²Co-founder, Wildlife SOS.

³Director of Veterinary Affairs, PETA, India.

⁴Director of Research and Veterinary Operations, Wildlife SOS. ⁵Senior Veterinary Officer, Wildlife SOS.

⁶Researcher, PETA India and Honorary Animal Welfare Officer (HAWO), AWBI. ⁷Senior Animal Welfare Officer, Animal Rahat and HAWO, AWBI.

Complete report as PDF will be made available on email request.

Art - 90. A REPORT ON THE WELFARE & VETERINARY STATUS OF CAPTIVE ELEPHANTS (*Elephas maximus*) AT PUNNATHUR KOTTA GURUVAYUR DEVASWOM BOARD, THRISSUR, KERALA

¹Dr Arun A Sha, ²Suparna Bakshi Ganguly

¹Director, Research and Veterinary Operations, Wildlife SOS.

²(Hon) Secretary & Co-Founder, Trustee Compassion Unlimited Plus Action

<http://cupabangalore.org/wp-content/uploads/2016/07GuruvayurTemple-Ele-Evaluation-2014.pdf>

Submitted to Animal Welfare Board of India.

**Art – 91. EVALUATION OF DIAGNOSTIC TESTS FOR ANTE-MORTEM
TUBERCULOSIS SCREENING IN CAPTIVE SLOTH BEARS**
(*Melursus ursinus*)

Arun Attur Shanmugam, MSc¹, David Abraham, MSc², Ilayaraja Selvaraj, BVS³, Yaduraj Khadpekar, MSc⁴, Anusree, S. B., MSc⁵, Alex, P.C., PhD⁶ and Sathish Mundayoor PhD⁷

¹Director, Research and Veterinary Operations;

^{3,4}Senior Veterinary Officer, Wildlife SOS, Bannerghatta, Bangalore 560083, Karnataka, India; ²Veterinary Surgeon, Kerala State Animal Husbandry Department,

Greendale, Fathima Nagar, Thrissur 680005, Kerala, India; ⁶Professor and Head, Department of Clinical Veterinary Medicine, Kerala Veterinary and Animal Sciences University, Thrissur 680651, Kerala, India; ⁵Research Assistant; ⁷Dean & Scientist G, Mycobacterium Research Group, Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram 695014, Kerala, India.

ABSTRACT:

Confirmatory ante-mortem diagnosis of tuberculosis in wild animals remains a difficult proposition for zoo veterinarians.² As in the case of many other wild species, there is critical lack of accredited tests for tuberculosis screening in sloth bears (*Melursus ursinus*). Isolation and identification of the *Mycobacterium tuberculosis/bovis* by culture is the gold standard for tuberculosis diagnosis in any species. Methods utilizing cell-mediated immune response as well as humoral antibody response have been tried in several wild species. However, the diagnostic sensitivity and specificity of these ante-mortem tests, accredited for use in humans, are unknown in wild species. We evaluated various available techniques and methods for ante-mortem tuberculosis screening in 14 sloth bears. During post-mortem examination, *M. tuberculosis* was isolated and identified by culture from the 14 carcasses, in nodules in lung parenchyma. The culture results were compared with ante-mortem test results (chest radiography, routine blood analysis³, tuberculin skin test, acid-fast staining of tracheal smears, culture and nucleic acid amplification of lung wash, QuantiFERON-TB Gold®, STAT-PAK® and DPP Vet Assay®). None of the ante-mortem tests gave positive results in all the 14 cases, but some tests seem to show better correlation with culture than others. Tuberculosis in captive sloth bears represents a typical case of spillover infection resulting from human cohabitation.¹ Ascertaining the diagnostic sensitivity and specificity of the various ante-mortem tuberculosis screening tests will help in the early diagnosis and treatment monitoring of this chronic disease in this endangered species.

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Shanmugam Arun Attur, *et al.* 2008. Hematology of sloth bears (*Melursus ursinus ursinus*) from two locations in India, J. Wild. Dis. 44(2): 509-518.

Art – 92. BENIGN GROWTH IN OROPHARYNX REGION IN SLOTH BEAR (*Melursus ursinus*)

S. Ilayaraja¹, Arun A. Sha¹, Yaduraj Khadpekar² and Niraj Dahe²

¹Senior veterinary Officer, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Agra. Uttar Pradesh 282007, India ²Junior Veterinary Officer, Wildlife SOS, Agra Bear Rescue Facility, Sur Sarovar Bird Sanctuary, Agra. Uttar Pradesh 282007, India

Agra Bear Rescue facility is one of its kinds, which currently houses 241 Indian Sloth Bears and is involved in effective management of rescued Sloth Bears. An abnormal mass growth was observed in the oropharynx region of a rescued female sloth bear during intubation for gas anesthesia. The growth was removed surgically and subjected to histological examination. The mass was found to be composed of respiratory lining epithelium and squamous epithelium. There was marked oedema and fibrin deposition in sub-epithelium. There was mild lymphocytic infiltrate. Neoplastic lesion were not seen thus suggesting non cancerous/benign growth. The animal recovered well, no abnormality or recurrence of growth was noticed. Animal remains active and is having food normally

Key words: Benign growth, Oropharynx, Respiratory lining epithelium. Sloth bear, Squamous epithelium.

Introduction

Any tissue or organ showing abnormality on oral cavity may be due to inflammatory swelling or over growth or tissue. The overgrowth in throat may be benign or malignant in nature or it might be goitre, tonsillitis or neoplasm associated with oesophagus or respiratory tract. Though report exist on clinical conditions encountered in Sloth Bear (Gosselin & Kramer 1984; Ranjan *et al.*, 1990; Harbola and Arora, 1994; Mehrotra *et al.*, 1999; Arun *et al.*, 2005) there were growth in oropharynx in ursids, especially sloth bear. The authors are thus making an effort to document the benign (non cancerous) growth and its successful treatment in a rescued dancing sloth bear (*Melursus ursinus*).

Methodology

An adult female Sloth Bear was rescued on 08.01.10 from a street performer. The bear was unilaterally blind (left eye) on arrival itself. After successful quarantine we housed the bear with others in a separate enclosure. The animal was apparently healthy, active and adapted well to the enclosure surroundings and other fellow bears. There was no marked abnormality noticed except the unilateral blindness to the left eyes due to severe corneal opacity. An effort was made on 10.05.11, to do complete ophthalmic examination by a veterinary eye expert and perform cataract surgery in order to bring back her vision of left eye.

The bear was tranquilized with Injection Xylazine @ 2mg/kg body weight and Injection Ketamine @ 5mg/kg body weight (Page 1986) after estimating the body weight to be 90 kg. After complete sedation we shifted the bear to operation theatre and provided general inhalation anaesthesia with isoflurane. While fixing the Endo tracheal tube (ET). Difficulties were noticed due to a soft growth (Fig. I) which was hindering its passage.

Fig. I: Showing soft growth in oropharynx region



However, the ET was passed in trachea even though with difficulty, after gently surpassing the growth and the animal was maintained under isoflurane general anaesthesia, and the vital parameters were observed throughout the procedure. The detailed ophthalmic examination revealed complete retinal detachment and atrophy of the ophthalmic nerve and blood vessels which was limiting the scope for cataract surgery. So cataract surgery was not performed. After extubation, animal recovered well without any difficulties. An elective surgery was carried out on 12.5.11 for removing the tissue growth in oropharynx. The mass (5x2x1 cm) excised from the oropharynx under isoflurane general anaesthesia was sent for detailed histopathological examination. The post operative care was provided with Injection cefotaxime 1 gm twice a day, meloxicam 0.5 mg/kg body weight twice a day for five days with vitamin C tablets @ 500mg once in day for five days.

Results

Detailed histopathological examination of a section of the excised tissue showed part of respiratory lining epithelium and part of squamous epithelium (Fig 2).

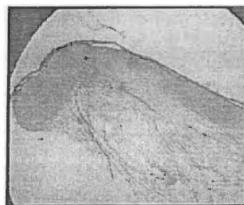


Fig. 2: Part of respiratory lining epithelium and part of squamous epithelium (10X)

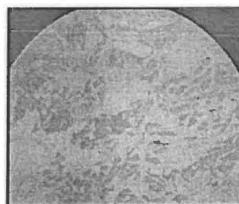


Fig. 3: Oedema and fibrin deposition in sub-epithelium (10 X)

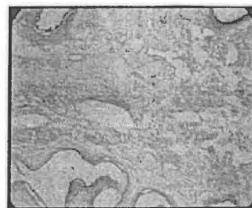


Fig. 4: Oedema and fibrin deposition in subcpithclium (40 X)

There was mild lymphocytic infiltrate. Neoplastic lesions were not seen thus suggesting non-cancerous/benign growth. The animal recovered well, no abnormality or recurrence of growth was noticed. Animal remains active and is having food normally.

ART - 93. A CASE OF LYMPHOID LEUKEMIA IN A RESCUED DANCING SLOTH BEAR (*Melursus ursinus*)

S. Ilayaraja¹, Arun A Sha², Yaduraj Khadpekar³ and Sanio Johnson³

¹Senior Veterinary Officer, Wildlife SOS, India.

²Director- Research of Veterinary Operations, Wildlife SOS, India

³Veterinary offficer, Wildlife SOS, India.

ABSTRACT:

Leukemia characterized by proliferation of lymphoblasts is described from a rescued dancing sloth bear (*Melursus ursinus*). A 12 year old male sloth bear (*Melursus ursinus*) in Agra Bear Rescue Facility showed the symptoms like anorexia, lethargy, dehydration limping of hindleg. The animal was isolated in the retiring den and treated symptomatically with antibiotic, vitamin B complex, methyl prednisolone acetate and 7 Liters of isotonic fluid (DNS 0.9 & 5%) The animal was tranquilized for detailed clinical examination and treatment. The initial clinical examination revealed Leucocytosis and moderate blast like cells were found in blood smear. After a few (10th day) days the second clinical examination of animal showed high number of lymphoid blast cells in blood smear. Then chemotherapy was initiated with Imatinib Mesylate (Cheryl A. 2009) but the condition of the animal went on deteriorating and later it succumbed to the disease. The post-mortem examination revealed enlargement of lymph nodes, spleen and liver. Histopathologically, the liver section revealed severe degeneration of hepatocytes and swollen hepatocytes with pale cytoplasm. The portal areas were heavily infiltrated by large blast form of lymphocytes. The lymphoblasts also infiltrated the parenchyma focally. The lymph node section showed lymphoid hyperplasia with blast like lymphocytes having hyperchromatic nuclei. The normal lymphoid follicular structures were replaced by diffuse sheet of lymphoblasts. The femur bone marrow section was severely infiltrated with lymphoblast cells. Finally, this case was concluded as lymphoid leukemia and this was the first leukemia report from this species to the best of the author's knowledge.

Introduction

Lymphoid leukemia is an overabundance of neoplastic white blood cells (lymphocytes) into the peripheral blood. These lymphocytes generally develop from the bone marrow but sometimes they develop in the spleen as well. There are mainly 2 types of lymphoid leukemia - acute lymphoid leukemia and chronic lymphoid leukemia. Acute lymphoid leukemia is highly proliferative in nature. It originates in the bone marrow and metastizes to spleen, liver, bloodstream, nervous system, bone, lymph nodes and the gastrointestinal tract. Chronic lymphoid leukemia impairs the bone marrow and results in the under production of other blood cells that are required for combating inflammations, allergies and infections. Although elevation of lymphocytes is the most important indicator for lymphoid leukemia, the low number of white blood cells in the initial stages makes the diagnostic process extremely difficult. The clinical signs may include anemia thrombocytopenia (relatively few platelets in blood) and neutropenia (presence of abnormally low number of a type of white blood cells called neutrophils). Chronic lymphoid leukemia on the other hand is less proliferative (Vegad 2007).

Acute lymphoid leukemia may include anorexia, weight loss, polyuria, polydipsia and lethargy. But in case of chronic lymphoid leukemia, the symptoms may be absent although some dog owners have reported of lethargy and decreased appetite. Mild lymphadenopathy and splenomegaly may also be noted. Information regarding leukemia in wild animal is limited with some reports such as granulocytic leukemia in a viper (*Bitis nasicornis*), lymphoblastic leukemia in the Timber rattle snake (*Crotalus horridus*) (Harshbarger,1973); Myelogenous leukemia in a turtle (*Pelomedusa subruta*) (Harshbarger,1975)

Lymphoblastic leukemia in an India monitor lizard (*Varanus bengalensis*) (Harshbarger, 1976); myeloproliferative disease in the turtle (*Pseudemys elegans*) (Frye and Carney, 1972); leukemic malignant lymphoma in death adder (*Acanthophis antarcticus*) (Griner, 1975); myelogenous leukemia in a turtle and lymphocytic leukemia in 2 snakes (Langenberg *et al.*, 1983); acute lymphatic leukemia in a boa constrictor (*Constrictor constrictor*) (Schilliger, 2011); Leukemia in desert spiny lizard (*Sceloporus magister*) (Goldberg and Holshuh, 1991); lymphocytic leukemia in captive Dhole (*Cuon alpinus*) (scala *et al.*, 2013); Acute lymphoblastic leukemia in a juvenile southern black rhinoceros

(*Diceros bicornis minor*) (Radcliffe *et al.*, 2000); T-Cell Chronic Lymphocytic leukemia in a Double Yellow-headed Amazon Parrot (*Amazona ochrocephala oratrix*) (Osofsky 2011); lymphoid neoplasia in Egyptian spiny-tailed lizards (*Uromastyx aegyptius*) (Gyimesi *et al.*, 2005); Leukemia in a Bearded Dragon (*Pogona vitticeps*) (Jankowski *et al.*, 2011).

Case History

A 12 year old male sloth bear (*Melursus ursinus*) in Agra Bear Rescue Facility, Uttar Pradesh, India (27°0'N; 77°45'E), weighing 120 kg was showing symptoms of anorexia, lethargy, dehydration and limping of hindleg. The animal was isolated in the retiring den and was treated symptomatically with Vitamin B complex (Cyanocal®-16, 4ml. Ozone pharmaceuticals, Amigaon, Guwahati, India), methyl prednisoloneacetate (Depo-medrol®, 0.8mg/kg., Pfizer manufacturing, Belgium Nv, Rijksweg, Belgium) and 7 litres of isotonic fluids (DNS 0.9 & 5% 9®, 70ml/kg, Parenteral drugs(India) Limited, Indore, Madhya Pradesh) was infused into the bear to improve the hydration status but no improvement could be noticed. The animal was tranquilized for detailed clinical examination using a ketamine-xylazine combination; ketamine hydrochloride (5mg/kg body weight; Ketamil®, Troy laboratories Pty Ltd., Smithfield, NSW, Australia) and xylazine hydrochloride (Xylazil®, 2mg/kg body weight; Troy laboratories Pty Ltd, Smithfield, NSW, Australia). These drugs were administered using a blow pipe on an unsuspecting bear, thus causing animal excitation during the procedure. The clinical examination revealed body temperature of 36.9°C, heart rate 50/ min, respiration rate 32/minute and hematology parameters (Table 1) were interpreted based on standards formulated by Arun *et al.*, 2008).

Table 1

Haemoglobin	12.4 GM%
Total leucocyte count	50000/cumm
Neutrophils	10%
Lymphocytes	12%
Eosinophils	00%
Monocytes	00%
Blast cells	78%
Platelet count	22000 per cu mm
Red Blood Cell Count	4.58 millions/cm m
MCV	74.5 FL
MHC	27.1 PG
MHCH	36.4 G/DL
PCV	34.1%
Serum Calcium	4.3mEq/L
Serum Phosphate	5.7 mg/dl
Serum chloride	80 mmol/L
Blood Sugar Random	104mg%
SGOT/AST	45U/L
SPGT/ALT	10U/L
Total protein	7.9 gm%
Albumin	3.1 gm%
Globulin	4.8 gm%
BUN	5.6 mg%
Serum Creatinine	1.2mg%
LDH	494 U/L

Leucocytosis and moderate blast like cells were found in blood smear. Abdominal Ultrasound scanning and radiography did not reveal any abnormality. Oral Rehydration Solution (Troyte ®, 10.9 g BID. Troika Pharmaceuticals, Thol, Gujarat, India) was provided in drinking water to correct dehydration. Infra-red fomentation was performed twice daily for ten minutes on both the hind limbs. Later, after a few days (10th day) the second clinical examination of the animal showed high number of lymphoid cells in blood smear (Table 2).

Table 2

Haemoglobin	11GM%
TLC	49200/cu mm
Neutrophils	18%
Lymphocytes	02%
Eosinophils	00%
Monocytes	00%
Blast cells	70%
Myelocytes	06%
Meta-Myelocytes	04%
Platelet count	12000/ cu mm
RBC	4.08 millions/ cm m
MCV	73.3FL
MCH	27PG
MCHC	36.8G/DL
PVC/Hct	29.9%
ESR	52MM/last hr.
SGOT	165U/L
SGPT	23U/L
Blood urea nitrogen	13 mg%
Serum Creatinine	1.3 mg%
Blood Urea	28 mg%
Serum uric acid	0.7 mg%
Total protein	7.5 mg%
Albumin	3.1 mg%
Globulin	4.4 mg%
Alkaline phosphatase	4 U/L
Serum Calcium	4.3mEq/L
Serum Phosphorus	6.4 mg/dl
LDH	731 U/L
Serum Chloride	97mmol/L
Blood Sugar random	106 mg%
Serum Bilirubin Total	0.3 mg%
Conjugated (Direct)	0.1 mg%
Unconjugated (Indirect)	0.2 mg%

Then the chemotherapy was initiated with Imatinib Mesylate (total dose 400mg) (Cheryl A., 2009) but the condition of the animal went on deteriorating which later succumbed to the disease.

Results and discussion

The post-mortem examination of sloth bear showed very weak condition and the mucous membrane was pale. Internal examination revealed enlargement of lymph nodes and spleen and liver. The histopathological examination of lung section showed severe engorgement of capillaries (Plate 1).



Plate 1: Lungs; Intra alveolar hemorrhage

The bronchiolar lining epithelial cells showed variable degree of proliferation. The Liver section revealed severe degeneration of hepatocytes. The hepatocytes were swollen and their cytoplasm was pale and finely granular. The sinusoids were compressed. The portal areas were heavily infiltrated by large blast form of lymphocytes (Plate 2).

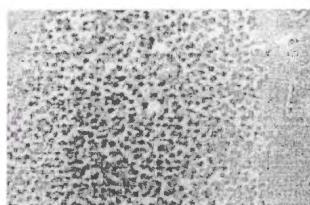
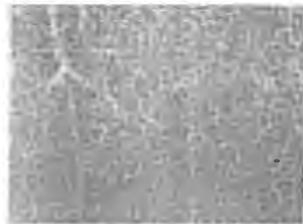


Plate 2: Liver; Deposits of leukemic cells at the portal

The lymphohlasts also infiltrated the parenchyma focally. The nuclei in good number of infiltrated cells were enlarged and hyperchromatic. The kidney section did not reveal significant pathological alterations. The lymph node section showed lymphoid hyperplasia with blast like lymphocytes having hyperchromatic nuclei (Plate 3).

Plate 3: Lymph nodes infiltrated by blast Cells



The normal lymphoid follicular structures were replaced by diffuse sheet of lymphohlasts. The spleen section showed almost normal appearance except red pulp congestion and some degree of hemosiderosis (Plate 4 & 5).

Plate 4: spleen: congested and hemosiderin deposition

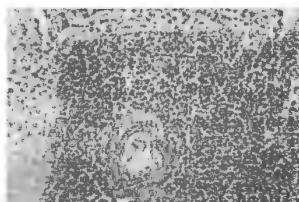
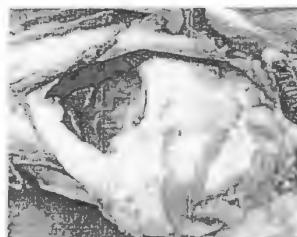
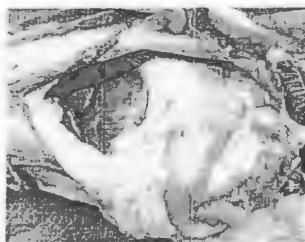


Plate 5: Splenomegaly





The femur bone marrow was severely infiltrated with blast cells (Plate 6).

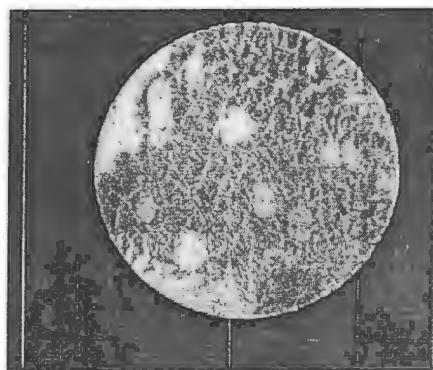


Plate 6: Bone marrow packed with blast cells

This case of lymphoid leukemia in a sloth bear is similar to acute lymphocytic leukemia in dog and humans. Leukemia, however, is not always associated with leucocytosis. In fact, in some cases leukopenia may occur as is common in Lymphoma (Vegad, 2007). Blast cells and myelocytes could be identified from the blood. In case with circulating blasts, additional testing is often required for further classification of the cells, as lymphoblasts, myeloblasts and undifferentiated blasts have a similar morphologic appearance (Gail Mason *et al.*, 2013). Bleeding secondary to thrombocytopenia is characteristic of the clinical course of acute lymphoblastic leukemia (Robbins *et al.*, 1981) The post-mortem examination of present case showed enlarged mesenteric lymph nodes and spleenomegaly. In man, spleenomegaly is common in acute lymphocytic leukemia (Robbins *et al.*, Ramaswamy. 2002) Due to the immature appearance of the invasive cells, the leukemia would probably best be described as acute. Acute leukemias are rapidly fatal in untreated patients.

Acute leukemias are characterized by the presence of mostly immature (blast)cells in the blood and haemopoietic tissues and relatively shorter clinical course. In humans, more than 30% blast cells in the bone marrow are sufficient for the diagnosis of acute myeloid leukemia (AML). But no such information is available in veterinary literatures (Vegad 2007).

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Art - 94. CROP RAIDING BEARS IN LAO PDR

¹LORRAINE SCOTSON, ²THOMAS SHARP

¹Free the Bears, P.O. Box 723, Phnom Penh, Cambodia Kongsgeng Vannachomchan, Dept. of Biology, National University of Laos, Vientiane, Lao PDR

²Wildlife SOS, 406 E. 300 S 302, Salt Lake City, UT 84111, USA; and SWCA, 257 E 200 South, Suite 200, Salt Lake City, UT 84111, USA

ABSTRACT:

Human–bear conflicts may contribute to population declines of Asiatic black bears (*Ursus thibetanus*) and sun bears (*Helarctos malayanus*) in Southeast Asia. We investigated crop-raiding behaviors by bears and responses from affected farmers in and around a protected area in northern Lao PDR during August–October 2011. We interviewed farmers and made visual inspections of raided fields in 6 villages. Villagers reported that more crops were lost to bears than to all other wildlife species combined. Commercial and local sweet corn fields were the most commonly damaged. Perceived crop damage by bears varied widely among villages (11–39% of total area) and individual farmers (1–90%). Farmers' estimates of the extent of bear crop damage were higher than our estimates of the same fields. Although farmers reported Asiatic black bears as more common crop-raiders than sun bears, this assessment is suspect, because bears were reported to raid fields exclusively at night. Locals used a wide range of mainly ineffective methods to deter bears from crops. Clearing paths around crop fields was most common (approx. 90% of farmers). Few farmers admitted using snares to remove offending bears, because this is illegal. However, the collective evidence indicates that snaring does occur, and farmers would gain more by killing and selling bears for their parts than by protecting their fields from bear damage. This may explain the unexpected finding that most farmers (approx. 90%) said they liked bears in the area, and did not report damage to authorities. Consequently, they may not be motivated to try or maintain new deterrent techniques. © 2014 The Wildlife Society.

KEY WORDS Asiatic black bear, conservation, corn damage, crop-raiding, *Helarctos malayanus*, human–bear conflict, poaching, sun bear, *Ursus thibetanus*.

Bears come into conflict with humans on every continent that bears occur, typically through crop raiding, livestock depredation, human attacks, and damage to human property (Goldstein 2002; Herrero 2002; Bargali *et al.* 2004, Fredriksson 2005, Dyck 2006, Dharaiya and Ratnayake 2009). In Southeast Asia, habitat loss, illegal hunting and trade are serious threats to the conservation of Asiatic black bears (*Ursus thibetanus*) and sun bears (*Helarctos malayanus*), and these threats may be compounded by human–bear conflicts. Forested areas are decreasing steadily because of agricultural clearance and logging (Sodhi *et al.* 2004). Many forests of mainland Southeast Asia have been all but emptied of bears because of over-hunting (Nguyen 2006). Bears are hunted commercially for their parts, especially the gall bladder and paws. Bear cubs are used for stocking commercial bile extraction facilities (Foley *et al.* 2011). Reduced area and quality of natural habitats prompt bears to supplement their diet with anthropogenic food sources, such as orchards or crop fields, where they are more vulnerable to being killed by farmers to mitigate damage and also to sell body parts (Liu *et al.* 2011). Moreover, persistent damage to crops or other human property may instigate retribution against bears in general (Parvaiz 2009). Whereas studies have documented increased motivation by some local people to retaliate against problem bears, the extent of conflict-induced killing and its effect on bear populations remain poorly understood (Maddrey and Pelton 1995, Garshelis *et al.* 1999, Wang *et al.* 2006, Charoo *et al.* 2011). In Lao PDR, Asiatic black bears and sun bears occur sympatrically throughout the country (Scotson 2010, 2012, 2013). Lao PDR still holds great potential for bears because it retains large expanses of potential bear habitat, with nearly half of the country under forest cover (Duckworth *et al.* 1999; Nooren and Claridge 2001; Vongkhamheng and Johnson 2009; Scotson 2010, 2012). However, hunting appears to be on the rise, as surrounding countries deplete their own bear populations and turn to Lao PDR, exploiting its lax in-country protective legislation and weak law enforcement (L. Scotson, unpublished data). There is little documentation of crop-raiding by bears in this country, or other any country in Southeast Asia (Duckworth *et al.* 1999). In this study we sought to gain a better understanding of how human–bear conflicts in Lao PDR, specifically crop raiding, relate to bear conservation. Our objectives were to 1) identify factors influencing bear crop-raiding, and the species of bear more likely to engage in this behavior; 2) quantify the value

of crops damaged by bears; and 3) document and assess existing methods of mitigation, including killing of bears. From these data we hoped to generate recommendations for future management actions that could help both people and bear.

STUDY AREA

Nam Et Phou Louey (NEPL) National Protected Area (NPA), located in the mountainous northeast of Lao PDR, bordered Vietnam and overlapped the provinces of Luang Prabang, Oudomxai, and Xieng Khouang. The NEPL NPA encompassed 5,959 km² of semi-evergreen and mixed deciduous forest, interspersed by stands of dry evergreen and upper montane forest. Secondary forest, agricultural lands, and anthropogenic grasslands were distributed patchily throughout. Steep, mountainous terrain ranged in elevation from 400 m to 2,257 m. For management purposes, the NPA was divided into a core zone (3,000 km²) and buffer zone (2,959 km²; Fig. 1). In the core zone, wildlife and habitats were fully protected; only patrol staff or persons with written permission from the head of the NEPL were allowed to enter. In the buffer zone, villagers living within the boundaries and along the border could collect Non-Timber Forest Products, cut trees for building houses (with written permission), and fish and hunt certain species, with certain restrictions (Forestry Law no. 13/NA, 9 Nov 2005). The Lao government, with assistance from the Wildlife Conservation Society, managed the NEPL NPA by implementing wildlife-monitoring systems, patrolling to prevent poaching and illegal logging, and raising public awareness through conservation education programs. There were 98 villages of varying ethnicity in and around the reserve. Commonly cultivated crops in these villages included rice, pumpkin, potato, sesame, cucumber, and 2 varieties of sweet-corn—"commercial" and "local." Commercial corn was grown for international export, whereas local corn was grown for local consumption by humans and livestock. Annual temperatures ranged from 5°C (Dec–Feb) to 30°C (Apr–Jul) and average annual rainfall was 1,400–1,800 mm (Johnson *et al.* 2006). Climate was tropical monsoon with a hot wet season during late-April–early September and a cold dry season during the rest of the year.

METHODS

We focused on 5 target villages: Hoy Piang, Kon Ngu, Sopka, Muang Gao, and Hoy Tuen. We selected villages based on the high number of reports of bear crop-raiding documented during interview surveys in 14 NEPL villages in 2010 (Scotson 2010). We subsequently switched Hoy Tuen with Phonsong (located next to Hoy Tuen) because we discovered that although Hoy Tuen reported significant bear crop-raiding during the 2010 survey, it had not experienced these issues since relocating next to a road in the early 1990s. We conducted the study during August–October 2011 (which encompasses the peak bear crop-raiding season). We conducted in-depth interviews with approximately 10 local people/village that had previously been affected by bear crop-raiding; we spent 7 days in each area. A social gathering was held at the start of each visit, at which time village heads and local farmers were invited to an informal meal and familiarized with the study's objectives. We also identified suitable interviewees during this gathering (i.e., those thought to have previously experienced bear and/or wildlife damage to crops). We conducted semiformal interviews with 1 or 2 farmers/day using a standardized questionnaire. We asked farmers about the types and quantity of their own crops that were raided (by bears and other wildlife), time of year, perceived annual trends in raiding intensity, and methods used to deter bears and other wildlife from entering fields. We asked whether farmers knew what species of bears were responsible for crop raiding and how they could tell (i.e., via direct sighting, tracks, or general impression). We asked about personal perceptions of bears including the status of bear populations, attitudes toward bear conservation and to bears living near villages, reasons for lethal control, perceived drivers of crop-raiding, and desirable long-term management solutions. We made opportunistic visual assessments of crop fields recently (within <2 weeks) raided by bears using a standardized form to record date and location of the conflict, type of crops raided, area and estimated value of crops lost (by use of a 10-m measuring tape), stage of growth, and quality of crops. Before we visited raided fields, farmers were asked for their perceived estimate of the value of crop damage and then the survey team made an independent assessment upon visual inspection. Bear crop-raiding was distinguished from other wildlife by the characteristic behavior of bears trampling and pulling together stalks in large patches. We also searched for other evidence such as tracks, scats and bite marks on corn stalks. We noted location of fields in relation to the forest edge.

We recorded the map locations of crop-raiding events within crop fields, and location of villages, using a Garmin GPS map 76Cx GPS unit (Olathe, KS). With Arc GIS (ver.9.2), we measured distance from the field to the nearest village, forest edge, and NPA core zone.

RESULTS

Crop-Raiding by Bears and Other Wildlife

We interviewed 49 farmers in 5 villages who were affected by wildlife-related crop-raiding. Common crop-raiding species were Asiatic black bears and sun bears and wild pigs (*Sus scrofa*; both species reported by 98% of respondents), rats (87%), monkeys (sp. Unknown, 35%), and porcupines (*Hystrix brachyura*, 25%). Other wildlife—such as birds (sp. Unknown) and deer (*Muntiacus* and *Rusa unicolor*)—were occasionally reported, but far less commonly. In 2011, commercial and local sweet corn crops were most heavily affected by wildlife crop-raiding (reported by 51% and 47% of respondents, respectively), followed by pumpkin (35%), rice (33%), potato (2%), and sesame (2%). In all villages, more crops were reported lost due to bears than to all other species combined (Fig. 2). Hoy Piang experienced the highest level of crop damage, with approximately 50% of crops lost, 40% of which respondents attributed to bears (Fig. 2). Amount of wildlife crop damage varied widely among villages, accounting for loss of 4–41% of annual income (although only one village was >10%; Table 1). Individuals within villages had highly variable amounts of corn damage (Table 2). One person lost their entire crop to wildlife (90% due to bears); whereas, some people from the same village reported almost no damage (0–5%).

Local Perceptions of Bears

During village interview surveys, when asked which bear species damaged their crops, 59% of farmers said Asiatic black bears, 6% said sun bears, 27% said both, and 8% said they could not tell. Farmers had usually not observed bears directly and generally based their answers on intuition, though sometimes they based it on the size of tracks observed in fields. During our visual assessments of raided crop fields, when we asked farmers what bear species was responsible, most farmers could not identify to bear species (60%); however, those that did only specified Asiatic black bears (40%). The majority of respondents (89%) claimed to like bears occurring close to their village, despite the threat of crop damage. Most (68%) felt

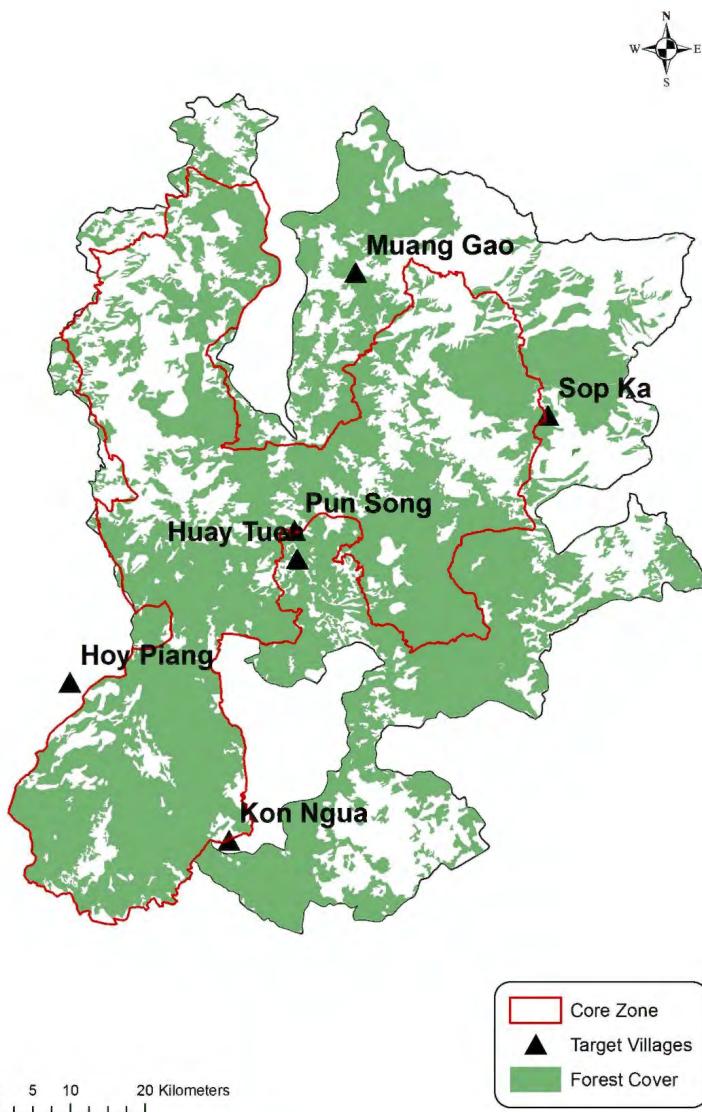


Figure 1. Nam Et Phou Louey National Protected Area Lao PDR and the 6 villages in which we conducted interview surveys during August–October, 2011. Forest (in green) is dominated by semi-evergreen, but also mixed deciduous, secondary, and bamboo-dominated forest.

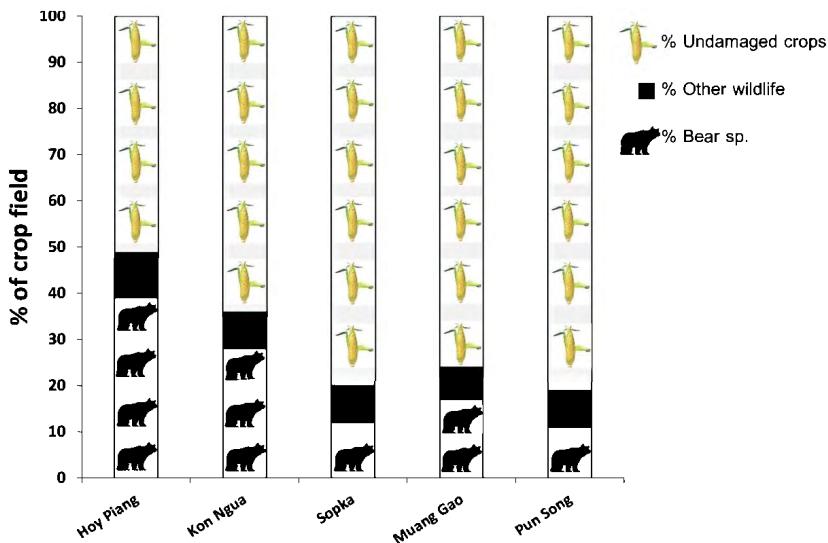


Figure 2. Perceived average area of crops damaged during 2011 by bears and other wildlife in 5 villages in Nam Et Phou Louey National Protected Area, Lao PDR. Bars represent the total amount of crops in each village (100%) and coded areas represent the average percent of crops undamaged and that lost each year to bears and other wildlife.

that populations were decreasing, although none would or could estimate how many bears were potentially killed each year. However, respondents (n 49) indicated that sale of bear parts was the principal reason for killing bears (89%), followed by protection of humans and crop fields (11%).

Local Mitigation Methods

Interviewees reported a wide range of local methods to deter bears and other wildlife from crop fields (Table 3). The variety of reported methods differed among villages; Pun- song and Sopka had the lowest variety of methods (4 and 5, respectively) and Hoy Piang and Kon Ngu had the largest (8 and 10, respectively). The most common method, reported in all villages by the majority of respondents, was to clear a path around fields. Paths were typically no more than 2 m wide and sometimes used in combination with items containing non-natural scents, such as plastic string and old clothes. Human guarding of fields was thought to be the most effective method to deter bears, but was not commonly used because it required substantial effort (Fig.3) The most elaborate method, the bamboo water shoot (Fig 4 and Table 3), was used in 4 of the 5 villages but perceived as not effective for deterring bears (Fig 3). Only 6% of interviewees (3 of 49) in 3 of the 5 villages admitted to using snares, and those who did so indicated that this method was one of the most effective at controlling crop-raiding.

Table 1. Survey effort, income, and perceived wildlife-related crop damage based on interviews in 5 villages in northern Lao PDR in 2011.

Village name	No. of interviewees	⌘ annual income (converted to US\$)	Corn	Rice	Pumpkin	Perceived x value of wildlife crop damage	Perceived % loss of annual income
Hoy Piang	10	\$360	\$80	\$20	\$50	\$150	41.7
Kon Ngu	10	\$620	\$50	0	0	\$50	8.1
Sopka	10	\$590	\$40	0	0	\$40	6.8
Muang Gao	9	\$1,100	\$40	0	0	\$40	3.6
Phonsong	7	\$1,230	\$90	\$40	0	\$130	10.6

Table 2. Perceived amount of corn damage in 2011 due to bears and other wildlife in 5 villages in Nam Et Phou Louey National Protected Area, Lao PDR.

Village ^a	Corn damage by bears		Corn damage by all wildlife	
	x- loss (%)	Range (%)	x- loss (%)	Range (%)
Hoy Piang	39	15–90	49	17–100
Kon Ngua	28	1–74	36	1–75
Sopka	12	2–36	20	0–70
Muang	17	10–25	24	13–50
Gao Phonsong	11	2–34	20	4–50

^a 9–10 respondents/village.

Visual Field Assessment

We examined 29 fields that were raided by bears and reported by farmers in 2011. All bear crop raiding events occurred during August and September. Raided crop fields (93% corn, 7% rice and pumpkin) were 1-12 km from the nearest village (n=29, mean = 3.4km, SD = 3.2), an average of 2.4 km from the core zone of the NPA (n=25, SD= 1.6). Damaged crop fields were often adjacent to secondary forest or semi-evergreen forest. Respondents reported that all raided crops were of medium or good quality, and were either ripening (74%) or ripe (22%). Farmers reported that all bear-crop raiding events occurred at night typically from 0200 hours to 0500 hours (based on general feeling and not direct sighting of bears).

We measured the amount of damage due to bears in 11 fields. In other fields that we visually inspected, (n=18), the crop damage occurred in patches that could not be measures accurately from the ground. Farmers estimates of the value of lost crops tended to be higher than ours (n=10, mean = 61% higher, range = 17-80%). In one unusual case, a farmer's estimate was 133% lower than ours.

DISCUSSION

Crop-Raiding in Nam Et Phou Louey National Protected Area

Although bears are known to raid crops, especially corn fields, we were surprised to find that they were responsible for more crop damage in northern Lao PDR than any other species of wildlife. In fact, the perceived financial loss from crops damaged by bears exceeded that of all other wildlife species combined. Whereas wild pigs are common crop raiders in southern Asia (Wang *et al.* 2006, Linkie *et al.* 2007), and were reported in corn fields in NEPL as frequently as bears, they reportedly did less damage. Bears often trample and pull down corn stalks in large patches (Maddrey and Pelton 1995), so the damage (loss) may appear to be much greater.

The earliest records of bear crop-raiding in Lao PDR are from the late 1980s and early 1990s in Savannakhet and Luang Prabang Provinces (Duckworth *et al.* 1999). Since then, our focused investigations of bears have revealed that crop raiding is common in many parts of the country, although it was not documented in any formal way. Farmers reported that both commercial and local varieties of corn were targeted by bears at the same frequency, but commercial corn, which generates income, represented a larger financial loss. Farmers reported that both species of bears were involved in crop-raiding, but they tended to think that Asiatic black bears did so more frequently. This information may not be reliable, though, as bears were rarely seen, and farmers are unlikely to be able to differentiate the 2 species from tracks and other sign. In Scotson (2010), a higher incidence of sign identified as Asiatic black bear than of sun bear suggested that this species is more abundant in NEPL NPA.

Increasing human populations, with accompanying habitat disturbance and loss, and increases in agriculture, are considered the chief reasons for rising conflicts between humans and elephants (*Elephas maximus*) in Asia (Hedges *et al.* 2005, Varma *et al.* 2008). The same is likely true for human–bear conflicts. Human populations in Lao PDR are increasing nationally at an annual rate of 2.1% (2.2% in the provinces containing NEPL; <http://www.nsc.gov.la>, accessed 25 Dec 2012).

Table 3. Local farmers' non-lethal methods for wildlife crop-raiding mitigation in Nam Et Phou Louey National Protected Area, Lao PDR, 2011.

Method	Description
Tree cutting	Cutting trees and branches and placing them around the field perimeter. Positions are moved every so often so as to create something different
Setting snares	Wire loop snares set around the field perimeter in order to trap incoming wildlife
Human guard	A human sleeps in a hut at the field through the night
Path around field	A narrow footpath is cut around the field
Plastic, colored string	Plastic colored string is tied around the perimeter of the field
Defecate–urinate around field	Humans periodically urinate and defecate around the perimeter of the field
Bamboo water shoot	Hollow bamboo tube is placed on a pivot by a water source. As the water fills up the tube the bamboo falls and hits a stone beneath making a loud tapping sound. As the water is released the bamboo rises up again to refill with water and repeat the process over and over (Fig. 4)
Scare crow	Sticks in a cross with clothing draped around. Similar to western scarecrows used in crop field
Wind chime	A cow bell hung from a rope with a small bamboo matt attached in order to catch the wind and make the bell ring (Fig. 4)
Light fires	Fires are lit around the field perimeter. Bamboo can be placed in the fire which explode periodically and make loud bangs
Engine oil on cloth	Cloth is soaked in engine oil and hung around the field
Clothes soap on cloth	Clothes detergent rubbed on cloth and hung around the field
Body soap on cloth	Body soap rubbed on cloth and hung around the field

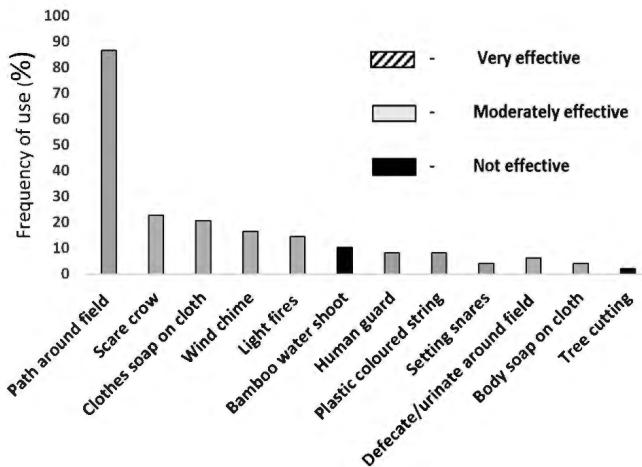


Figure 3. Frequency of use of local, non-lethal, crop-raiding mitigation methods by farmers in 5 villages in Nam Et Phou Louey National Protected Area, Lao PDR. We conducted interview surveys during August–October, 2011. Farmers (n = 49) rated the perceived effectiveness of each method in deterring bears on a scale of 1–3: 1 = not effective, 2 = moderately effective, 3 = very effective.

An additional concern for NEPL is that the commercial corn industry is also growing, because of the financial incentives offered by Vietnamese trading companies.

In NEPL, crop raiding may be influenced by the food availability in nearby forest. In other parts of Asia, movements of Asiatic black bears were closely connected to fruit abundance (Saberwal 1989, Hwang and Garshelis 2007, Ngoprasert et al. 2011, Steinmetz et al. 2011). In our study site, the peak crop-raiding season coincides with the peak fruiting season, so bears are probably not feeding on crops because of a paucity of natural food, although data on annual natural food availability are unavailable. Farmers report a wide variation in crop-raiding intensity between villages and individual farmers. Hoy Tuan (originally a study village but switched for Phonsong) had not experienced crop raiding since the 1990s when the village was relocated from inside the core zone, in an area directly adjacent to primary forest, to an area not adjacent to primary forest but rather located next to a main road.



Figure 4. Local methods of deterring bears and other wildlife from entering crop fields in Nam Et Phou Louey National Protected Area, Lao PDR. Left: A bamboo water shoot. Right: A wind chime.

We observed that raided crop fields were often adjacent to the forest edge, and surmised that bears feeding in rich fruit patches during the day might be drawn into nearby fields at night. It follows that fields adjacent to these patches would be more affected than fields further away. Human–bear conflicts have also been positively correlated with bear density in North America (Clark *et al.* 1991, Herrero *et al.* 2011). No data are available on bear population trends in NEPL. However, based on the density of bear sign in the forest, NEPL hosts a relatively high bear population compared with other sites in Lao PDR and Southeast Asia with a similar habitat type; the Nam Kan and Xe Pian NPAs in Lao PDR, Ratanakiri Province, Cambodia and Cat Tien National Park, Vietnam (Scotson 2010, 2012, 2013).

A Conflict of Interest:

NPA Management Versus Rural Communities A quandary facing protected area managers in developing countries is the task of protecting species, some of which have the potential to impose significant negative costs to local people with low incomes (Nepal and Weber 1995, Dickman *et al.* 2011). In NEPL, the majority of farmers reported incomes well below the national average of \$1,260 (converted to US currency; Table 1; <http://www.nsc.gov.la/>, accessed 12 Dec 2012). Increased species protection afforded by the protected area, and therefore potentially increasing wildlife populations, may result in more wildlife-related damage, and hence more negative perceptions of wildlife and the protected area by

local people (Choden and Namgay 1996, Wang *et al.* 2006). Although farmers may perceive more damage than actually occurs (Gabrey *et al.* 1993, Maddrey and Pelton 1995, Garshelis *et al.* 1999b, this study), their response relates to these perceptions, not necessarily to reality. High perceived financial losses could fuel negative attitudes and resentment toward conservation initiatives by the NEPL NPA management authorities (Choden and Namgay 1996, Treves *et al.* 2006, Wang *et al.* 2006).

Incentive to hunt bears in Nepal

Farmers tried a host of non-lethal mitigation methods to reduce crop-raiding by bears, but with little success. As a result, they are probably more likely to turn to lethal means, which not only removes the offending animal (presumably), but also provides compensation for their losses in terms of the value of the dead animal. In this region, up to 59% of total meat intake was wildlife (Johnson *et al.* 2010). Moreover, bear parts have particularly high value, which has been rapidly increasing over the past decade (Livingstone and Shepherd 2014). In NEPL, the paws from an adult bear sell for up to US\$100/kg, a gall bladder for >US\$600, and a single live cub can fetch up to US\$3,500 (Scotson 2010; L. Scotson, Department of Forest Inspection, Bokeo, personal observation). As such, snaring a bear could generate >3 times a farmer's annual income, and more than the value of single cornfield. This kind of financial incentive might explain why farmers' attitudes toward having bears around were much more positive than would be surmised from the amount of damage they cause.

We were unable to assess how often farmers killed or attempted to kill bears because they were not likely to truthfully report such illegal activities to us. A villager in SopKa village informed us that setting foot-hold cable snares around crop fields to trap wildlife, including bears, was commonplace in his village, and that farmers were reluctant to report crop damage because of the lucrative nature of trapping and selling parts from crop-raiding species. We also fortuitously learned of, and witnessed, a crop-raiding bear that was trapped in a snare set by a cornfield near Luang Namtha Capital (Hunt and Scotson 2011).

MANAGEMENT IMPLICATIONS

Nam Et Phou Louey management authorities provide no assistance for farmers to mitigate wildlife crop-raiding. The application of mitigation methods in Lao PDR, like many places, is restricted by finances, materials, and technical capabilities (Treves and Karanth 2003, Treves *et al.* 2006). Whereas local farmers in NEPL employ a variety of methods to deter bears and other wildlife from crop-fields, none appear to be very effective. Electric fencing, which is an effective deterrent against crop-raiding bears in other countries (Huygens and Hayashi 1999, Clark *et al.* 2005), is presently unavailable to farmers in this area. Compensation is a popular idea among local people, but to defray the cost in a country where government authorities have a very limited budget, the program might have to be offered as an insurance plan, where locals pay something in advance (Madhusudan 2003, Goldstein *et al.* 2006); unfortunately, this idea has little appeal around NEPL (Johnson *et al.* 2006). A challenge in the next phase of this work is to identify effective mitigation methods that are low-tech, low-cost, and self-sustaining, and to fit these methods within the socioeconomic constraints of the NEPL rural community and management authority. A particular concern in solving this problem is that it appears to be more lucrative for farmers not to deter bears from their fields because the bear parts are worth much more than the whole field of corn. Hence, even if farmers could be provided fencing and other deterrents, they may not choose to use it or maintain it properly. Solving the conflict problem thus also requires solving the problem related to the trade in bear parts, making this an extremely complex issue.

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**Art – 95.ONYCHECTOMY OF A CAPTIVE MALE INDIAN
LEOPARD (*Panthera pardus*)**

Arun. A. Sha.*, C. Harikrishnan and Linto Antony****

*Director - Research and Veterinary Operations, **Wildlife Veterinary Officer,
Wildlife SOS, BBRC, Bannerghatta Biological Park, Bangalore.

ABSTRACT:

Onychectomy is the surgical removal of claw. A male adult captive leopard aged around 14 years showed limping, abnormal gait and oozing of discharges from the leg front paw region. With an estimated body weight of 65kg, leopard was subjected to immobilization with Medetomidine Ketamine (as Ketamine hydrochloride) combination@ 0.07 mg/kg and 3 mg/kg respectively. Physical examination revealed a maggot wound on its left fore paw around the overgrown medial claw which was inflicted due to onychocryptosis. Standard maggot wound dressing procedure was carried out. The eroded tissue surrounding the medial claw made it vulnerable to abrasion and cracks and it was decided to extract the affected claw by excisional method. Sutured with polyglycolic acid absorbable suture (3-0) in simple interrupted pattern leaving a small gap for the draining of fluids. Administered 1.5ml Doramectin (Dectomax 1%) injection intramuscularly, single shot 5ml Enrofloxacin and 6.5ml Tolfenamic acid subcutaneously. Topical application of exoheal spray (herbal) was continued for 10 days. Animal gained normal gait and activity within two weeks and made an uneventful recovery.

Introduction

Onychectomy is the surgical removal of claws. In captivity large felines often suffer from claw problems as they are subjected to overgrowth and can interfere with reaction and normal functioning of claw. (Fowler,1999)(Prater,2005) This case report describes onychocryptotic (ingrown claw) medial claw in left fore paw of a male adult captive leopard which inflicted a maggot wound and its successful treatment and management by onychectomy.

Materials and Methods

A male adult leopard aged 14 years under captivity at Mini Zoo, Bellary, Karnataka was showing symptoms of limping, abnormal gait and oozing of discharges from the left front paw region. With an estimated bodyweight of 65kg, leopard was subjected to immobilization with medetomidine (Medetor, 1 mg/ml, Chanella)-ketamine (Ketamil 100mg/ml, Troy Laboratories P Limited, Australia) combination @ 0.07mg/kg and 3mg/kg respectively in a single dart injection by distant projectile (Dan Inject - no:9 124MOD JM). (Fig. I)



Fig.1 Animal after darting

Physical examination revealed a maggot wound on its left fore paw around the overgrown medial claw inflicted by onychocryptosis (ingrown claws shown in Fig2).



Fig.2 Onychocryptotic medial claw with myiasis

Standard wounding dressing procedure was carried out with turpentine oil and povidine iodine. The eroded tissue surrounding the claw made it vulnerable to abrasions and cracks and it was decided to do surgical removal of affected medial claw of the same paw. Incisions were made posteriorly to reach past ungula crest, severed the tendon and ligament to disarticulate the claw. The claw was carefully removed with ease since the tissue surrounding it was partially fed by maggots. (Fig3).



Fig.3 Onychectomy The wound area was closed with polyglycolic acid absorbable suture (3-0) in simple interrupted pattern leaving a small gap for draining of fluids.

Fig.4 Wound suturing

Administered 1.5ml doramectin intramuscularly (Dectomax1% injection, Pfizer), single shot 5ml enrofloxacin (Flobacc SA 10% injection, Intas Pharmaceuticals) and 6.5 ml Tolfenamic acid (Maxxtol 40 mg/ml, Intas Pharmaceuticals) subcutaneously for aiding the healing process. Topical application of exoheal (Herbal spray of Intas Pharmaceuticals Ltd, India) spray was continued for 10 days.

Result and Discussion

Wound healed completely and the animal gained normal gait and activity within two weeks. The claws of carnivores are highly specialized nails used in food gathering, climbing and defence. The third phalanx is flattened from side to side and the nail is wrapped around the top and sides of the bone. Ungual crest of distal phalanx is a peculiar feature of claw which arises from the base of distal phalanx and envelopes the proximal end of the horny shell. The claw grows both linearly from proliferation of horn at the ungula process and in thickness from the stratum germinativum on the inner surface of the horny claw and result in laminar structure in an overgrown claw.



Fig.5 Dressed wound after the procedure

It can be concluded that some facilities for nail scratching should be provided for large felines undercaptivity or regular nail trimming should be carried out to avoid claw problems. Certain facilities like strata, wooden poles should be provided to them to exhibit normal behaviour and can also act a hiding place and complete concrete flooring should be avoided.

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Art – 96: SUCCESSFUL SURGICAL MANAGEMENT OF RETAINED AIRGUN PELLETS IN RESCUED RHESUS MACAQUE (*Macaca mulatta*)

Ilayaraja S¹, MV Sharma² and Arun A Sha³

¹Senior Veterinary Officer, ²Junior veterinary Officer, ³Director Veterinary & Research, Wildlife SOS, India.

INTRODUCTION:

Rhesus Macaque is an unthreatened and is a Schedule II, Part I wild animal in the Indian Wildlife (Protection Act. Rhesus macaques (*Macaca mulatta*) are both arboreal as well as terrestrial free living monkeys. *Macaca mulatta* lives in a wide range of habitats, and shows a great deal of adaptability. In addition to living in the wilderness, some populations of *Macaca mulatta* have become accustomed to living alongside humans. Occasionally, small groups can be found living in the densely populated urban areas of northern India. Groups of rhesus monkeys that become used to living in areas occupied by people usually search out other human-populated areas if people attempt to relocate them away from civilization (Nowak, 1991; Parker, 1990. Females reach reproductive maturity at 2.5 to 3 years of age (Nowak, 1991. The gestation period is around 180 days (Price *et al.* 1999 and almost all pregnancies results in birth of a single young thus leads to continuous increase in population and leads to macaque- human conflict throughout India. So due to lack of awareness, the local residents adopt different kinds of activity to get rid of macaque from the human residential colonies. The gunshot wounds have been reported in various domestic, pet as well as wild animals (Fullington and Otto, 1997; Pavletic and Trout, 2006; Nath *et al.*, 2007; and Shrivastava *et al.*, 2011. Here, we reported the case of retained air gunshot pellets in female Rhesus Macaque and its surgical management.

CASE REPORT:

Case 1

A medium size (4kg free range female Rhesus Macaque was rescued from Agra District of Uttar Pradesh. The animal was severely emaciated and debilitated in condition. Physical examination of animal revealed hard foreign body under the skin and partially embedded in the muscle but no open wound noticed. The detail radiographic examination further revealed that the foreign was an air gun pellet lodged under the skin on the left lateral aspect of the body (Figure 1 which was

easily felt with fingers from outside of the skin. On deep examination of the skin there was entry point of the bullet which was healed. It seems to be a case of bullet hit about one month or more back as entry wound was completely healed with a minor scar on the entrance site. It was decided for surgical removal of the bullet examination. The animal was anesthetized by using ketamine hydrochloride intramuscularly (8 mg/kg body weight; Ketamil®, Troy laboratories Pty Ltd., Smithfield, NSW, Australia) and xylazine hydrochloride intramuscularly (Xylazil®, 2.5 mg/kg body weight; Troy laboratories Pty Ltd) (Popilskis *et al.*, 1997). Anesthetic drugs were injected after manually restraining the animal (Fowler, 1995).. After anesthesia animal was placed in lateral recumbency on a surgical table. Hair was clipped liberally shaving of the surgical site was done. Small incision of around 1cm was made just above the gunshot pellet area of the skin and bullet was seen clearly attached with the muscle of the rib area. It was extracted out with the help of forceps (Figure 2) and size of the bullet was measured with the help of vernier caliper and it was measured to be 5 x 8 mm. The animal was kept on antibiotic and anti-inflammatory for 3 days. Animal was kept under observation and fed fruits and vegetables for 15 more days. Animal recovered very well and gained 1 kg body weight.

Case 2

The adult female monkey was 5 kg body weight, severe debilitated in condition with hind quarters paralysis and multiple bite injury with bleeding. The local public witnessed that the monkey got bitten by the stray dogs. All the wounds were addressed properly and dressed. The radiographic examination revealed multiple retained air gun pellets different parts of the body. (Figure 3) Since the animal has multiple bite wounds and retained air gun pellets in the body the animal died due to traumatic shock however all necessary pain management and re-hydration had been done. So no surgical attempt was carried out to eliminate the retained pellets.

DISCUSSION:

All the air gun pellets were made by using lead. So these retained lead pellets can cause chronic lead poisoning if not removed from the body of victims. In this present case the animal may got the shot few month back ,so the lodged pellet induced pain may affected the normal locomotion of the animal and chronic lead poisoning may

also cause further deterioration of the animal thus leads to sever debilitation of the animal health and they becomes easy prey for the stray dogs. In many places peoples started using this type of air gun just as a threat and make animal get away from the residential colonies but some time unfortunately the pellets get lodged on the animal body if the shooting range is close.

Change in blood lead concentration up to 1 year after a gunshot wound with a retained bullet was reported by Mc Quirter JL *et al* (2004 in human patients. Lead arthropathy and lead poisoning due to retained bullets also reported by different authors in human patients (W C Peh &W R Reinus (1995, R Cavalieri-Costa *et al*(1994The conflict between wild life and human beings are mainly with large carnivores and this conflict has cause a great threat for wild animals as well as their habitats (Gittleman *et al.*, 2001.Since Wildlife SOS (NGO involving conservation activities as well as considering the animal welfare;started creating awareness among the local Agra residents and discouraging the using of air guns and implementing conflict mitigation measures.

SUMMARY:

Two female Rhesus Macaque was rescued from Agra District of Uttar Pradesh in India. Case 1; with severely emaciated and debilitated condition with retained air gun pellet at the left lateral aspect of the body was surgically removed successfully under anesthesia with xylazine and ketamine. Case 2; animal has multiple bite wounds and retained air gun pellets in the body the animal died due to traumatic shock however all necessary pain management and re-hydration had been done, so unable to do surgical attempt to eliminate the retained air gun pellets.

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Fig.1 Figure showing Gunshot bullet



Fig.2 Removal of retained Air-gun pellet.



Fig.3 Multiple retained Air-gun pellets

Art – 97. COMPARISON OF ANTAGONISTIC EFFECT OF TOLAZOLINE HYDROCHLORIDE AND YOHIMBINE IN RHESUS MACAQUE

Manoharmayum Vikramjit Sharma¹, Arun A Sha², Ilayaraja Selvaraj³ and Yaduraj Kadpekar⁴

¹Veterinary Officer, Agra Bear Rescue Facility, Wildlife SOS., ²Director - Research and Veterinary Operations, Wildlife SOS., ³Senior Veterinary Officer, Agra Bear Rescue Facility, Wildlife SOS., ⁴Senior Veterinary Officer, Agra Bear Rescue Facility, Wildlife.

Introduction

Rhesus macaque (*Macaca mulatta*) is one of the best-known species of Old world monkey. It is listed as least concern in the IUCN Red List of Threatened Species in view of its wide distribution, presumed large population, and its tolerance of a broad range of habitats - native to South, Central, and Southeast Asia. In the recent years, increasing population of Rhesus macaques has given rise to increasing human-primate conflicts. There have been regular complaints from the public about cases of monkeys biting people as well as them creating in the city and obstructing the residents from going about their daily routine. Hence, there was an imminent need to counter the growing monkey population in a scientific and humane manner, along with spreading awareness amongst the public by educating them about avoidance, behavior and proper garbage management to reduce conflicts.

Xylazine HCl has been used successfully with ketamine HCl to immobilize white-tailed deer (*Odocoileus virginianus*) (Mech *et al.*, 1985) and moose (*Alces alces*) (Garner and Addison, 1994). Ketamine hydrochloride (KH) and xylazine hydrochloride (XH) have been used in combination (KH-XH) to safely immobilize bears (Addison and Kolenosky, 1979; Lee *et al.*, 1981; Lynch *et al.*, 1982; Schweinsburg *et al.*, 1982). Tolazoline HCl is an alpha adrenergic antagonist used to reverse xylazine HCl in domestic sheep (Toutain *et al.*, 1982; Zingoni *et al.*, 1982), cattle (Ruckebusch and Toutain, 1984), dogs (Tranquilli *et al.*, 1984), white-tailed deer (*Odocoileus virginianus*) Kreeger *et al.*, 1986a), gray wolves (Kreeger *et al.*, 1986b) and desert mule deer (Delgiudice *et al.*, 1989). Use of YOH to antagonize KET and/or XYL immobilization of wild species has increased substantially in recent years (Jessup *et al.*, 1983; Hsu and Schulaw, 1984; Jacobson and Kollias, 1984; Jacobson *et al.*, 1985; Jessup *et al.*, 1985; Mech *et al.*, 1985; Ramsay *et al.*, 1985; Remecker and Olson, 1985; Kreeger and Seal, 1986).

This study was done as a part of 'Human Primate Conflict Mitigation' by Wildlife SOS in collaboration with Agra development authority which aims at combating the increasing monkey menace issue in Agra. Twenty-eight Rhesus macaques were captured from different location in Agra. Out of twenty-eight macaques, fourteen females and fourteen males with more than 5 kg body weight was taken for this study. The macaques were singularly immobilized with xylazine (2mg/kg body weight) and ketamine (6mg/kg body weight) for sterilization. The sterilization was done by using laparoscopic (key hole) surgical technique. The anesthesia was maintained by gaseous anaesthesia with 2% of isoflurane. The surgery was performed smoothly without any complication. After surgery, each macaque was given a Tattoo code after which reversal was given. Fourteen macaques were given Yohimbine (7M: 7F) at the rate of 0.125mg/kg body weight manufactured by Bayer with presentation of 10ml containing 2mg/ml and fourteen macaques (7M: 7F) were given Tolazoline hydrochloride at the rate 4mg/kg manufactured by Lloyd with presentation 100ml containing 100mg/ml body weight . Time of arousal was recorded for each and every macaque under study. The monkeys recovered without any complications under the watchful eye and were released upon the following day in their areas. T-test was used for Statistical analyses. Statistical significance was determined at $P<0.05$.

The mean induction time was 6.10 ± 1.66 (Mean \pm S.D) for all the macaques and no comparison was made for induction between male and female. Time of arousal for all the thirty macaque are given along with tattoo code used in Table 1 and 2. T -test was used for statistical analysis. The t- test value was found out to be 0.21874 which is more than $P< 0.05$. This signifies that there is no significance difference between the yohimbine and tolazoline hydrochloride even though there was less time recorded for tolazoline. The t-test for male and female for using tolazoline hydrochloride is 0.095698 which is more than $P<0.0$ which signifies there is no significance difference between male and female. The t-test for male and female for using yohimbine is 0.8481104 which is more than $P< 0.05$ which signifies that there is no significance difference between male and female when yohimbine was used.

From the above study it is seen that tolazoline hydrochloride has lesser arousal time as compared to yohimbine although there is no significant difference. But several factors may affect arousal time. Yohimbine and tolazoline hydrochloride

has long been used as antagonist for xylazine. However, yohimbine was used to antagonize the ketamine effect which failed (Lynch and Line, 1985). We did not find any reference for using tolazoline hydrochloride or yohimbine for antagonizing the affect of xylazine in Rhesus macaque. The reversal of the xylazine can be done with any of the two drug i.e tolazoline hydrochloride or yohimbine. However, tolazoline hydrochloride reversed the effect of Xylazine more rapidly than yohimbine.

Table 1: Arousal time for 14 macaques when Yohimbine was used

Serial Number	Tattoo Code	Sex	Arousal time in minutes
1	SN11/01	M	33.41
2	SN11/03	M	12
3	SN11/04	M	7
4	SN11/06	M	14
5	SN11/10	M	3.56
6	SN11/11	M	38
7	RM3/13	M	19
8	SN11/07	F	7
9	SN11/08	F	45
10	SN11/9	F	2.29
11	SN11/12	F	23
12	SN11/13	F	33
13	RM3/I0	F	0.416
14	RM3/14	F	5
	NUMBER OF OBSERVATIONS		14
	AVERAGE		17.334
	STANDARD DEVIATION		14.77725142

Table 2: Arousal time for 16 macaques when Tolazoline hydrochloride was used.

Serial Number	Tattoo Code	Sex	Arousal time in minutes
1	SN11/18	M	0.933
2	RM3/16	M	48
3	MG1/01	M	9.55
4	MG102	M	7.19
5	MG1/09	M	19.11
6	MG1/10	M	28
7	BG4/01	M	5.31
8	RM3/17	F	2.29
9	MG1/04	F	2.07
10	MG1/06	F	4
11	BG4/06	F	3.2
12	MG1/08	F	3.13
13	MG1/11	F	14
14	MG1/13	F	2.24
	NUMBER OF OBSERVATIONS		14
	AVERAGE		10.6445
	STANDARD DEVIATION		13.25914914

Summary

We believe that our research finding has significance for the anesthetic management of Rhesus macaque for sterilization or any other surgical procedure. We found that both Tolazoline hydrochloride and yohimbine can be used for reversal of xylazine. The sterilization of macaque has been successful and in future same drugs can be used for reversal of xylazine in any place. We conclude that sterilization of macaque should be done as macaque is creating nuisance and havoc due to large population so that their population can be reduced.

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Art - 98. USE OF DIAZEPAM AS AN ANXIOLYTIC IN SLOTH BEARS (*Melursus ursinus*)

A.Sha.Arun, Vibha Raghuram*, Susan Varghese and Nithin K

Wildlife Veterinary Officers, Wildlife SOS, Bannerghatta Bear Rescue Centre,
Bannerghatta Biological Park, Bangalore -560083

* Corresponding author, vibha@wildlifesos.org

Introduction:

Sloth bears in captivity are chemically immobilized for a variety of reasons. It varies from immobilization for a major/minor surgery, research, to sample collection for routine health check up. Sloth bears are usually chemically immobilized with general anesthetics like Xylazine and Ketamine hydrochloride. These drugs have a good induction time. However, ketamine produces dissociative state of anesthesia. The recovery may not always be smooth and some animals may show signs of tremors associated with Ketamine due to muscle hypertonicity (BSAVA Small Animal Formulary, 2011). Diazepam is a benzodiazepine, used as a short-term sedative in companion animal veterinary practice. Diazepam belongs to long acting benzodiazepine class of pre anesthetic. It is used as a mild tranquilizer. The subcortical levels of the CNS are depressed by diazepam producing anxiolytic, sedative, skeletal muscle relaxant and anticonvulsant effects (Plumb, 1994). The drug is slowly (slower than oral) and incompletely absorbed following intramuscular administration. It has a high lipid solubility, which facilitates its oral absorption and rapid central effects. It has a serum half life of 2.5-3.2 hours (Plumb, 1994). The effect of diazepam alone as an immobilizing drug has not been studied in sloth bears before.

Materials and Methods:

Four adult sloth bears that were rescued and rehabilitated at Wildlife SOS, Bannerghatta Bear Recue Centre, Bangalore were administered with Diazepam at four different occasions for minor non-invasive veterinary procedures like shifting, weighing, dental examination, morphometry, ultrasonography, ophthalmic examination and sample collection. The drug was administered intravenously in two cases, intramuscularly in two other cases. The drug administrations were made after thorough sterilization of the selected injection site. Positively conditioned sloth bears were voluntarily administered intravenous diazepam via the cephalic vein by using

18G Intravenous catheter. Intramuscular administration was done in the caudal thigh region by hand with 18G needle with the animal in a squeeze cage. Diazepam is available in the trade name of Calmpose® with the presentation of 5mg/ml.

Results and Discussions:

Two adult male and two adult female sloth bears aged about 17, 15, 9 and 7 years respectively were immobilised for shifting, weighing, dental examination, morphometry, ultrasonographic and sample collection using Diazepam. Diazepam was administered intravenously in two cases, intramuscularly in two cases in four different occasions. The desired effect of drowsiness and incoordination was observed within the first 15 minutes and complete immobilization was achieved within 30 minutes of the slow intravenous administration of diazepam at the dose rate of 0.5mg/kg body weight. However, the duration of time taken for complete immobilization of two adult bear following intramuscular administration of Diazepam @ 2mg/kg body weight was about 60 minutes. The full dose was given at intervals of 15 minutes between each divided dose of the whole dose intramuscularly. The sample collection, shifting of the bears and the other procedures underwent smoothly in all the cases. The bears recovered in an average time of 2.5-3 hours from the time of induction. The heart rate, respiratory rate and rectal temperature during the time of immobilization were recorded within the normal ranges (Table 1). However, rapid induction and recovery was seen when diazepam was administered by intravenous route as compared to intramuscular route.

The recovery time in all four cases was on an average 2.5 - 3 hours. The result of immobilization was good. No additional diazepam was administered throughout the procedure. The recovery was smooth and satisfactory. No ill effects of anxiolytics like drowsiness and dizziness were observed after complete recovery.

Summary:

Diazepam can be safely and effectively used for the short time tranquilization and immobilization of captive sloth bears. Minor procedures like shifting, weighing, sample collection, morphometry, dental examination, nail trimming, minor wound dressing, Ophthalmic examinations etc can all be safely achieved with diazepam. It is safe in geriatric Sloth bears and cost effective. Slow intravenous administration has

a better induction time compared to intramuscular administration. However, care should be exercised while using diazepam in patients with already known history of CNS depression, respiratory depression, severe muscle weakness or hepatic impairment.

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Small Animal Formulary, 7th edition, British Small Animal Veterinary Association, pg 98

Veterinary Drug Handbook, 2nd edition, Donald C. Plumb, Pharm.D., pg 178

Animal Name	Age (years)	Sex	Route of administration of Diazepam	Rectal Temperature (°F)	Respiratory rate/ minute	Heart rate/minute	Duration of sedation (hours)
Gokul	15	Male	Intravenous	101.2 ± 1	10 ± 2	56 ± 2	2.6
Gubbi	17	Female	Intravenous	101.5 ± 1	18 ± 2	50 ± 2	2.5
Kabali	07	Male	Intramuscular	96.3 ± 2	08 ± 2	48 ± 2	3.1
Durga	09	Female	Intamuscular	99.1 ± 2	12 ± 2	52± 2	3.0

Art – 99. WILD TB SERO-DIAGNOSIS- SPECIFIC POINT OF CARE TEST KIT

Maroudam.V¹, Venkataraman.K¹ Chitra.K¹, Mohanasubramanian B¹ Arun A Sha²
Rathnagiri. P³, Thirumurugan. R⁴, Vordermeier.M⁵ Dhinakar Raj.G¹

Principal Investigator, DBT-BBSRC FADH project on TB control Scientist, TRPVB -A
DBT-TANUVAS Partnership Programme 2nd floor CUL Building, Madhavaram Milk
colony, Chennai- 51

ABSTRACT:

Tuberculosis due to *Mycobacterium tuberculosis* complex (MTC) in captive and free ranging wild animals is an important disease and not studied in detail globally. The problems associated with practicing routine skin testing using crude Protein Purified Derivative (PPD) and gold standard culture testing in wild animals had driven the quest for discovery of rapid point of care (POC) TB diagnostics. The lack of TB diagnostics for most of wild species and the absence of an effective vaccine make it currently impossible to contain and control TB. Thus, the Rapid POC is serology based which are rapid, economical and well suited for wild life TB control and prevalence studies. Wild animals are variably exposed to environmental non-pathogenic *Mycobacterium* species which have high degree of cross reacting antibodies. Therefore, there is a need for highly specific rapid POC diagnostic kit to identify pathogenic TB. Thus, the present invention of POC rapid diagnostic kit was developed using defined TB specific fusion proteins of Early Secretory Antigenic Target (ESAT)-6 and Culture Filtrate Protein (CFP)-10 and two PPDs (bovine and avian PPD) of *Mycobacteria*. This improved POC sero diagnostics facilities the detection of antibodies to pathogenic as well as non-pathogenic mycobacteria. Thus, in the present study Rapid POC for TB diagnostics developed using novel combination of pathogenic TB specific defined antigens and two PPDs of pathogenic *Mycobacteria* and non-pathogenic TB respectively. The developed POC rapid kit tested for its performance in sloth bear samples (n=76), elephants samples (n=15), Cervidae samples (n=13), big cats (n=17) and others (n=5). The developed Rapid POC for TB diagnostics was validated in OIE World TB reference lab AHVLA, UK using their reference sera samples. The results indicated that the kit had 94% sensitivity and 92% specificity.

Keywords: Rapid test; POC; Wild TB diagnostics; Tuberculosis; WildTB alert™ kit

Art – 100. MANAGEMENT OF KNEE JOINT SWELLING INDUCED LAMENESS IN AN ASIATIC ELEPHANT; USE OF THERAPEUTIC ULTRASOUNDS AS A PAIN MANAGEMENT TOOL ALONG WITH THE ROUTINE TREATMENT

Ilayaraja Selvaraj¹, Arun A Sha² and Yaduraj Khadpekar¹

¹Senior Veterinary Officer, Wildlife SOS, India. ²Director Veterinary & Research, Wildlife SOS.

ABSTRACT:

One of the adult bull elephant which was rescued and brought to our 'Elephant Conservation Care Centre' at Mathura showed symptoms of limping in right leg and mild swelling noticed on knee joints as well as fetlock joint. The symptomatic treatment was provided but no improvement was noticed, the swelling at the knee joint further increased in size. Hence the animal showing severe lameness and reluctance to move, the attempt was made to collect the fluid for microbiological and antibiotic sensitivity test and drained the fluid from the edematous swelling by applying trochar & canula. However, 300 ml of clean watery fluid evacuated from the swelling, not much improvement noticed. The culture report also did not reveal any bacterial infection. After hemato-biochemical analysis the treatment decided with therapeutic ultrasound aided physiotherapy with dose of 3 MHz, continuous, with the intensity of 2 W/cm² for 15 minutes after applying liquid paraffin as a conducting medium. After the sonation Iodine ointment with Methyl Salicylate and Di-Methyl sulfoxide (DMSO) mixed past applied on swelling. The therapy was followed twice daily for 10 days. From second day onwards, the animal started responding to the treatment. The mahout advised to make the elephant walk slowly by Positive Reinforcement Training Techniques (Laule *et al*) to provide mild exercise. The physiotherapy stopped after 10th day and advised to continue the topical application and exercise till complete healing. The swelling and limping reduced on 15th day.

Keywords: Asian elephant, Knee joint, Limping, Physiotherapy, Therapeutic ultrasound.

INTRODUCTION:

Asian elephant can be trained to perform tricks as well as to haul heavy loads of logs. A large bull typically weighs 6 tons and is 10 feet high at the shoulder. An elephant in good health has soft, almost black skin which is felt hard and erect at the

touch. The mucous membranes of the mouth and tongue are bright pink without any dark patches. The eyes are bright and clear. There is slight moistness above and around the nails of feet (due to high density of sweat glands). This must not be confused with offensive exudate which accompanies laminitis. The animal is continually in motion, either moving about or swinging its trunk and tail and flapping its ears. It eats well and sleeps from 2 to 4 hours during night (usually 11 pm to 3 am). It is to be noted that an elephant like a horse which can sleep while standing. The normal body temperature of an elephant is 97.4 – 99°F. Any temperature above or below this must be regarded as evidence of illness [3,13,22]. The average healthy elephant defecates about once every hour, usually dropping from 4 to 11 boluses, each weighing about 1 kg. Frequent groaning is an indication of pain [3,22]. The average amount of urine discharged at a time is about 5.5 liters. The normal urine is straw-colored and without any obnoxious or distinctive odor. The elephants are very susceptible to sunstroke or heatstroke. They can tolerate cold far better than direct sunlight and heat [3,22]. A wide variety of fruit and vegetables, fodders, hay and sugarcane generally constitute the daily diet of the ration which is generally offered 5 times a day. At least 60 grams of common salt should be fed daily to each animal. Vitamins and mineral supplements (180-200 grams) should be provided on daily basis [3, 22]. When animal is not in musth or suffering from a very painful complaint, the elephant is an easy animal to treat, provided it has been trained to obey orders. At the word of command, the animal will lie down on the ground and remain motionless while wounds are being dressed or injection is given [3,22]. Hobbles and chains are used for controlling elephants of uncertain temperament and males thought to be coming in musth. However, chaining may lead to degenerative joint disease due to restricted movement of the animal. In standing elephants, the angle between femur and tibia, which is close to 180°, differs to the half-bent posture in most mammals. A similar 'extended' knee posture occurs only in the bipedal humans [28]. Elephants should not be forced to stand on ground or cement soiled by their urine; whenever possible, dry straw should be provided as bedding. The feet should be examined regularly for any sign of inflammation of the sensitive tissue under the sole and nails, for any necrosis of the horny layer and for any excess exudates above the nails. Degenerative joint disease and Foot problems are common in captive elephants, resulting from poor hygiene and inadequate exercise [8]. In elephants of greater age, the knee joint is affected frequently by osteoarthritis, degenerative joint disease or arthrosis [9,10,11].

The kinematic patterns of the graviportal hindlimb in elephants are more similar to those in humans than to those in cursorial quadrupeds [28]. Therapeutic ultrasound (US) is a physical agent modality that has been used in hand clinics for the management of various musculoskeletal injuries for over 50 years [17, 24]. The use of ultrasound energy as a form of therapy was first suggested by wood & Loomis in human beings [29]. Ultrasound has since been used to treat a wide variety of disorders, from skin wounds to malignant tumors [19, 30] and is thought to accelerate tissue repair and help with pain reduction via its thermal and non-thermal effects [12,17,20,24,27]. The tissue response to non-thermal ultrasound includes acceleration of tissue healing through cavitation and its associated effects, while the responses to thermal ultrasound include increases in tissue temperature at superficial and deep levels such as tendons, ligaments, joint capsules, and fascia without overheating underlying fat [1, 23]. Therapeutic ultrasound is one of the most common treatments used in the management of soft tissue lesion, which constitute the majority of rheumatic complaints [24]. The evidence on physiological effects of ultrasound on both sensory and vascular functions in humans was reported by Shaik *et al* [23]. But such reports are rare in veterinary especially in wildlife medicine. In this article we documented the successful use of therapeutic ultrasound along with the medication for treatment and management of sever painful edematous swelling at the knee joint and associated lameness in a recently rescued bull elephant from the poor husbandry background.

Materials and Methods

One adult bull elephant (Age 50 years, Body weight 3350 kg) was rescued and brought to our 'Elephant Conservation Care Center' (ECCC) with poor history of nutrition and husbandry background. The preliminary examination revealed debilitated and emaciated body with developing abscess on left shoulder region and swelling on both the hind limbs. Limping was evident in the right hind limb and severe pain was evinced on the right knee on palpation. However, the animal was housed in cool dry soft floor and provide necessary treatment with turpentine linament, hot fomentation and also application of hygroscopic mixture (Epsom salt with glycerin) on the swelling and anti-inflammatory (meloxicam & serratiopeptidase) tablet provide orally with food there is no marked improvement noticed. After few weeks, the animal condition deteriorated suddenly where he went off feed,

regurgitated food, had in- coordinated gait and the knee joint swelling also increased (6.8 feet in circumference) the body temperature was measure from freshly voided fecal bolus also below normal (hypothermia)^[8]. The Immediate treatment was taken to overcome the situation by shifting the elephant in to covered enclosure and wrapping of the animal with warm winter blankets (Figure 1), exposed to halogen lights and born-fire as a heat source to keep warm.



Fig 1: Elephant covered with winter coat and recording body temperature from fecal bolus

Owing to further enlargement of the edematous swelling and pain the animal was reluctant to move and unable to bear the weight and the swelling gradually spread to inguinal region and reached prepuce. So decision was made to aspiration of fluid from the joint in order to reduce the pressure as well as for the culture analysis of the fluid (Figure 2). The fluid was clear and watery in consistency and 400 ml of fluid collected first day, but no improvement noticed.



Fig 2: Severe swelling at knee joint and evacuating fluid by using trochar and cannula

Therapeutic ultrasound aided physiotherapy treatment decided with dose of 3 MHz, continuous, 2 W/cm² for 15 minutes after applying liquid paraffin as a conducting medium (Figure 3). The transducer was gently moved over the swelling in a circling



Fig 3: Elephant receiving physiotherapy with therapeutic ultrasound

manner in order to spread the thermal effect uniformly and to avoid overheating of any focused area. After the sonation Iodine ointment with Methyl Salicylate and Di-Methyl sulfoxide (DMSO) mixed paste applied on swelling. The therapy was followed twice daily for 10 days. The mahout advised to make the elephant walk slowly by Positive Reinforcement Training Techniques to provide mild exercise [15]. The physiotherapy stopped after 10th day and advised to continue the topical application and exercise till complete healing.

Result and Discussion

The bacterial culture not revealed any bacterial growth, thus confirmed the fluid is sterile and not infected with bacteria and swelling due to mechanical injury. The animal started response to the treatment from the second day onwards (Figure 4), the swelling started reduced gradually on inguinal and prepuce, on 5th day 40% of the swelling reduced around the knee joint and showed marked improvement in weight bearing and walking. On 10th day 90% of the swelling reduced and the complete reduction in swelling and walking without lameness noticed on 15th day.



Fig 4: Gradual reduction in the swelling

Ultrasound demonstrates the ability to evoke a broad range of therapeutically beneficial effects which may provide safe and effective applications in the management of osteoarthritis^[25]. Both continuous and pulsed ultrasound are thought to show non-thermal effects and accelerate tissue repair ^[4,14,16,26], while continuous ultrasound is thought to add additional therapeutic effects due to heating ^[5,18]. Maintenance of the equilibrium between biological function and resistance to compression seems to be crucial in the elephant knee joint cartilage. Any disturbance that interferes with this equilibrium appears to lead to arthritic alterations, as particularly seen in captive elephants ^[7]. Infectious agents are also strongly suspected as causes of degenerative joint disease in elephants; of these, *Mycoplasma* is of foremost concern^[2]. Treatment of degenerative joint disease can include warm-water hosing of the affected joints or application of rubefacient liniments to promote circulation, aspirin given in a dosage of 6.50-13gm/500 kg body weight two or three times per day, and anti-inflammatory drugs ^[8]. Schmidt reported that use of DMSO for treating swelling and inflammatory condition in elephant^[22].

Conclusion

The knee joint swelling is the pain full condition in elephant, so any mild injury may leads to sever problem to this mega herbivores. Hence it needs to be treated with caution without any delay. The therapeutic ultrasound aided physiotherapy can be used as a pain management tool along with the routine anti-inflammatory medication to get the desired effect at the earliest.

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Art - 101: VULVAL ABSCESS AND ITS SUCCESSFUL TREATMENT IN A CAPTIVE SLOTH BEAR (*Melursus ursinus*)

Ilayaraja Selvaraj¹, Arun A Sha³, Yaduraj Khadpekar¹ and Niraj Dahe²

¹Senior Veterinary Officer, Wildlife SOS, India. ²Junior veterinary Officer, Wildlife SOS, India. ³Director Veterinary & Research, Wildlife SOS.

ABSTRACT:

In Agra Bear Rescue Facility, an adult female bear showed severe reddening with bulged vulva even after completion of estrus period and also exhibited difficulties in sitting in dog sitting posture, in passing urine and a cautious walk. The detailed clinical examination was performed after tranquilization of the bear with xylazine and ketamine. The examination of the right side vulval lip showed an abscess and further confirmed that there was no prolapse of either the vagina or the uterus. The pus was drained aseptically to send for bacterial culture and antibiotic sensitivity test. Surgical management for the abscess was undertaken. The culture examination revealed coagulase positive *staphylococcus*. Based on the antibiotic sensitivity test, the bear was treated with Amoxycillin - clavulanic acid tablets and anti-inflammatory medication. The post-operative recovery was good, and the animal was released out of observation after two weeks.

Keywords: ABST, Abscess, Sloth bear, *Staphylococcus*, and Vulval lip.

1. Introduction

The sloth bear (*Melursus ursinus*) belongs to family Ursidae and is endemic to the Indian subcontinent. The adult female sloth bears in the Indian subcontinent come into estrous between the months of May- July and exhibit the estrous sign with typical enlargement of vulval lips (figure1). In human beings the vaginal flora is maintained by the lactobacilli and it plays important protective and probiotic role to prevent vaginal infection by producing antagonizing compounds [15]. Though several clinical conditions in sloth bears, such as carcinoma, fibroep helial polyp in peri-anal region, Enterotoxaemia, pasteurellosis and balanoposthitis have been recorded by different authors [1, 6, 7, 8, 10, 14], there is no information on reproductive conditions/disorders observed in female sloth bears.

An abscess is an enclosed collection of liquefied tissue, known as pus, somewhere in the Body. It is the result of the body's defensive reaction to foreign material^[19]. The present report describes the clinical case of vulval abscess in an adult female rescued sloth bear and isolation of coagulase positive staphylococcus organism from the pus culture and the treatment for same as per the antibiotic sensitivity test.

2. Materials and Methods

An adult female sloth bear (Name-Chingari; Microchip Number 958000000526267; Age 13 years; Body weight 100 Kg) at Agra Bear Rescue Facility was found with a severe reddish bulge below the tail, difficulty in urination, difficulty in sitting (dog sitting posture) and cautious walking. The animal was tranquilized for detailed clinical examination using a ketamine-xylazine combination [12]; ketamine hydrochloride 5 mg/kg body weight (Ketamil®, Troy laboratories Pty Ltd., Smithfield, NSW, Australia) and xylazine hydrochloride 2 mg/kg body weight (Xylazil®, Troy laboratories Pty Ltd.). The vital parameters were recorded, the temperature being 38.7 °C, heart rate - 70 beats per minute and the respiratory rate 12 per minute. The blood sample was obtained from jugular vein puncture and was sent for a detailed hematological and biochemical analysis. The examination of the external genitalia revealed sever reddish soft swelling with fluid on the right vulval lip (figure 2) suggesting abscess. Gentle probing of vaginal canal performed by inserting the index finger after lubrication to ensure there is no abnormality such as vaginal or uterine prolapsed and vaginal neoplasias such as fibromas or leiomyomas [4].

The pus sample from the abscess recollected aseptically by aspiration with syringe (figure 3) and collected in sterile container with swab and sent for microbiological examination and antibiotic sensitivity test. The abscess was further drained surgically by making a small incision on the dependent part of the abscess [19] (figure 4) and around 75 ml of pus from the abscess cavity was evacuated. The abscess cavity was further flushed with antiseptic solution (Povidone iodine & Metranidazole) and dressed with fly repellent ointments.



Fig 1: Enlarged vulval lips in estrous condition in sloth bear



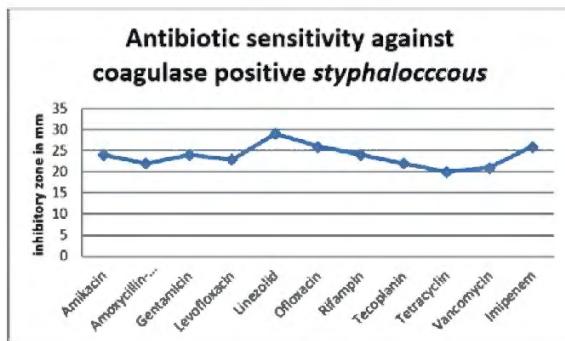
Fig 2: Severe reddish soft swelling on the right side vulval lip



Fig 3: A septic collection of pus from the abscess for microbiological analysis.



Fig 4: Surgical darning of access



3. Results

The color and consistency of the pus seemed to be that of septic pus [19]. Hence the condition was confirmed as a localized abscess in vulval lip. The microbiological examination by bacterial culture method revealed presence of coagulase positive *staphylococcus* organisms. The antibiotic sensitivity test revealed more sensitivity to Amikacin, Amoxycillin- Clavulanic acid, Gentamicin, Levofloxacin, Linezolid, Ofloxacin, Rifampin, Tecoplanin, Tetracyclin, Vancomycin and Imipenem, while it was resistant to Azithromycin, Ceftriaxone, Chloramphenicol, clindamycin, fosfomycin, fusidic acid, Ertapenem, Kanamycin, Lincomycin, Oxacilin, Pristinomycin, Penicillin-G, Sulfamethoxazole, Ticarcillin-Clavulonic acid, Tobramycin, Tigecycline. Hematological examination revealed mild elevation in neutrophils 85%, low lymphocytic count and a mild elevation in the platelet count. Serum biochemical examination revealed high LDH.

Treatment and discussion

The animal was kept inside the den for further observation and postoperative care. The treatment provided with Amoxycillin-clavulanic acid (Antibiotic) tablet orally twice daily with food along with anti-inflammatory tablet for seven days and topical dressing was done with ofloxacin liquid by spraying from the distance till complete healing. The complete healing was recognized on 13th day and the animal was released in to the enclosure on 14th day. Hematomas (which contains coagulated blood and serum) and cysts also cause a similar type of swelling. Hence the differential diagnosis is more important. To confirm differential diagnosis, exploratory puncture may be made to find out the nature of the content. If the abscess is not drained properly and treated with suitable antibiotic it will lead to the condition called "antibioma" in which there will be fibrosis around the abscess cavity and fluids in it may get absorbed, making the pus inspissated^[19]. The result obtained by microbiological examination by bacterial culture method revealed the presence of coagulase positive *staphylococcus* organisms which are sensitive to Amikacin, Amoxycillin-Clavulanic acid, Gentamicin, Levofloxacin, Linezolid, Ofloxacin, Rifampin, Tecoplanin, Tetracyclin, Vancomycin and Imipenem. These finding were in agreement with that of Nwankwo and Nasiru who found that Amikacin, Amoxycillin- Clavulanic acid, Gentamicin, Levofloxacin, Ofloxacin, Tetracyclin, and were sensitive against coagulase positive *staphylococcus* [11]. *Staphylococci* species produce various toxin including coagulase, fibronolysins, hyalurunidase, hemolysins (alfa, beta, gamma, delta), and enterotoxins, among others. Pyogenic infection of various organs and tissues particularly of the skin, mammary glands, lungs, joints, and uterus caused by *staphylococci* are seen on occasion in almost all species of animals. *S. aureus* is a hemolytic, coagulase positive organism that can cause a variety of purulent inflammatory diseases.

An animals *S. aureus* is associated with purulent lesions of the skin (Pyoderma, furunculosis, impetigo), which on occasion may become disseminated [17]. Suppuration is usually caused by pyogenic bacteria like streptococci, staphylococci, *Pseudomonas aeruginosa*, *E. coli* and some irritants such as turpentine, calomel and croton oil also can cause suppuration [19]. Chachra et. al., reported Microbial identification, its antibiogram and therapeutic interventions in an elephant with multiple abscesses [3]. Vulvar abscess caused by *Bacteroides* sp. in dog reported by Sato [16]. Perirectal abscess in horse were reported by Torkelson [18]. Papapetropoulos et. al., reported the pathogenic role of *Staphylococcus lugdunensis* and the importance of identifying coagulase-negative staphylococci to species level [13]. Kilpatrick et al., reported vulvar abscess with cellulitis and its surgical management and also stated that Methicillin-resistant *Staphylococcus aureus* (MRSA) was the most common isolate from vulval abscesses [9]. Brook & Frazier reported the microbiology of perirectal abscesses in human patients².

5. Conclusion

Although there are sterile abscess, most abscess are caused by infection thus causing accumulation of pus in the affected region. Abscesses commonly develop after a bite, scratches, or when objects like thorns penetrate the skin and the skin heals over. Proper treatment with suitable antibiotic is recommended after culture and antibiotic sensitivity to overcome the condition. Unless the abscess is treated properly with suitable antibiotic the skin will heal over again and abscess will redevelop. So periodical examination of external genitalia is more important, especially at the time of breeding seasons.

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IV b) PUBLICATION BASED INDEX

ARTICLE NO	YEAR PUBLISHED	PUBLISHED IN	Published as Poster / Report / FLA / ABT	PAGE NUMBER
1.	1997	Report submitted to Govt of India	Report	
2.	2005	Zoos' Print Journal, 20(9): 1997	FLA	
3.	2005	Presented at sixteenth international conference on bear research and management held at Italy, pp 83.	Poster	
4.	2005	1st Scientific Meeting of the Asian Zoo and Wildlife Medicine 2005 held at Bangkok, pp51.	ABT	
5.	2006	Presented at International Conference on Advanced Veterinary Practice in Medicine and Surgery at Madras Veterinary College, Chennai, pp86.	Poster	
6.	2006	Presented at International Conference on Advanced Veterinary Practice in Medicine and Surgery at Madras Veterinary College, Chennai, pp86.	Poster	
7.	2007	Oral presentation at International Congress on "Advances in Zoo and Wild Animal Health and Management" held at Jammu, pp76.	ABT	
8.	2007	Oral presentation at International Congress on "Advances in Zoo and Wild Animal Health and Management" held at Jammu,pp170.	ABT	
9.	2007	Oral presentation at International Congress on "Advances in Zoo and Wild Animal Health and Management" held at Jammu,pp171.	ABT	
10.	2007	Oral presentation at International Congress on "Advances in Zoo and Wild Animal Health and Management" held at Jammu,pp171.	ABT	
11.	2007	Presentation in 18th International Conference on Bear Research and Management, held at Mexico, pp80.	Poster	
12.	2007	BIERZS 2007, Bear Information Exchange for Rehabilitators, Zoos & Sanctuaries held at Pomona, CA,	ABT	
13.	2007	BIERZS 2007, Bear Information Exchange for Rehabilitators, Zoos & Sanctuaries held at Pomona, CA	ABT	
14.	2008	Oral presentation at National seminar on Advances in Management and Diseases of wild animals held at Bangalore Veterinary College, pp 14	ABT	

15.	2008	Indian Wildlife Year Book (An Official Publication of AIZ&WV) Volume 5 & 6, 2006 & 07, pp 69-71	FLA	
16.	2008	Indian Wildlife Year Book, (An Official Publication of AIZ&WV) Volume 7, 2008, pp 4 -6.	FLA	
17.	2008	Journal of Wildlife Diseases, 44(2), 2008, pp 509-518	FLA	
18.	2008	J.Vet.Pub.Health., 2008, 6 (1), pp53-54	FLA	
19.	2008	Oral presentation at National seminar on Advances in Management and Diseases of wild animals held at Bangalore Veterinary College, pp14.	ABT	
20.	2008	Oral presentation at National seminar on Advances in Management and Diseases of wild animals held at Bangalore Veterinary College,pp63.	ABT	
21.	2008	Oral presentation at National seminar on Advances in Management and Diseases of wild animals held at Bangalore Veterinary College,pp41.	ABT	
22.	2008	Oral presentation at National seminar on Advances in Management and Diseases of wild animals held at Bangalore Veterinary College,pp36.	ABT	
23.	2008	Oral presentation at National seminar on Advances in Management and Diseases of wild animals held at Bangalore Veterinary College,pp68.	ABT	
24.	2008	Oral presentation at National seminar on Advances in Management and Diseases of wild animals held at Bangalore Veterinary College,pp19.	ABT	
25.	2008	Oral presentation at National seminar on Advances in Management and Diseases of wild animals held at Bangalore Veterinary College,pp22.	ABT	
26.	2008	Oral presentation in International Conference on emerging infectious diseases of animals and Biotechnological Applications, held at Madras Veterinary College, Chennai, pp75.	ABT	
27.	2008	Oral presentation in International Conference on emerging infectious diseases of animals and Biotechnological Applications, held at Madras Veterinary College, Chennai, pp78.	ABT	
28.	2008	Oral presentation in International Conference on emerging infectious diseases of animals and Biotechnological Applications, held at Madras Veterinary College, Chennai, pp95.	ABT	

29.	2008	Lead paper presented in National Symposium on "Recent Trends and Future Strategies for improved Reproduction of Livestock, Companion and Wild Animals" held at Veterinary College, Bangalore pp:148-162.	FLA	
30.	2008	International Bear News, Vol:17, No:2, pp:21-22.	FLA	
31.	2009	Oral presentation in International Summit on Advancing Veterinary Medical Care: Challenges & Strategies" held at Madras Veterinary College, Chennai, pp141.	ABT	
32.	2010	Ind Vet. J., February 2010; 87: pp193 - 194	FLA	
33.	2010	Oral presentation in the International Conference on "Wildlife Conservation, Health & Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai, pp27.	ABT	
34.	2010	Oral presentation in the International Conference on "Wildlife Conservation, Health & Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai, pp69.	ABT	
35.	2010	Oral presentation in the International Conference on "Wildlife Conservation, Health & Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai, pp79.	ABT	
36.	2010	Oral presentation in the International Conference on "Wildlife Conservation, Health & Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai, pp82-83.	ABT	
37.	2010	Oral presentation in the International Conference on "Wildlife Conservation, Health & Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai, pp99-100.	ABT	
38.	2010	Oral presentation in the International Conference on "Wildlife Conservation, Health & Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai, pp103.	ABT	
39.	2010	Oral presentation in the International Conference on "Wildlife Conservation, Health & Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai, pp128-129.	ABT	
40.	2010	Oral presentation in the International Conference on "Wildlife Conservation, Health	ABT	

		& Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai,pp141.		
41.	2010	Presented in the International Conference on "Wildlife Conservation, Health & Disease Management – A Post Millennium Approach" held at Madras Veterinary College. Chennai, pp144.	Poster	
42.	2010	Zoo Biology 29, pp705-714.	FLA	
43.	2011	Journal of Zoo and Wildlife Medicine 42(3), pp 373–381.	FLA	
44.	2011	National Workshop for Zoo Veterinarians on "Protocol for the veterinary care and safety of wild animals during transportation with special reference to deer species" by CZA and TANUVAS, Chennai,pp36-38.	FLA	
45.	2011	National seminar on Wildlife pathology & Workshop on diagnostic oncology, III South Zone Conference, held at College of Veterinary & Animal Sciences, Kerala Veterinary & Animal Sciences University, Pookot, Wayanad, Kerala, pp16.	ABT	
46.	2011	National seminar on Wildlife pathology & Workshop on diagnostic oncology, III South Zone Conference, held at College of Veterinary & Animal Sciences, Kerala Veterinary & Animal Sciences University, Pookot, Wayanad, Kerala, pp15.	ABT	
47.	2011	National Congress on Wildlife Health & Forensics & Annual convention of Association of Indian Zoo & Wildlife Veterinarians held at Centre for Wildlife Forensic & Health, Jabalpur (M.P), pp54.	ABT	
48.	2011	National Congress on Wildlife Health & Forensics & Annual convention of Association of Indian Zoo & Wildlife Veterinarians held at Centre for Wildlife Forensic & Health, Jabalpur (M.P), pp18.	ABT	
49.	2011	National Congress on Wildlife Health & Forensics & Annual convention of Association of Indian Zoo & Wildlife Veterinarians held at Centre for Wildlife Forensic & Health, Jabalpur (M.P), pp20.	ABT	
50.	2011	National Congress on Wildlife Health & Forensics & Annual convention of Association of Indian Zoo & Wildlife Veterinarians held at Centre for Wildlife Forensic & Health, Jabalpur (M.P).	ABT	

51.	2011	National Congress on Wildlife Health & Forensics & Annual convention of Association of Indian Zoo & Wildlife Veterinarians held at Centre for Wildlife Forensic & Health, Jabalpur (M.P), pp56.	ABT	
52.	2011	National Congress on Wildlife Health & Forensics & Annual convention of Association of Indian Zoo & Wildlife Veterinarians held at Centre for Wildlife Forensic & Health, Jabalpur (M.P), pp120.	ABT	
53.	2011	Presentation in National Congress on Wildlife Health & Forensics & Annual convention of Association of Indian Zoo & Wildlife Veterinarians held at Centre for WL Forensic & Health, Jabalpur, pp126.	Poster	
54.	2011	National Symposium on Innovative Research Approaches for Diagnostic Pathology, held on 29th & 30th December 2011, at Madras Veterinary College, Chennai.	ABT	
55.	2011	National Symposium on Innovative Research Approaches for Diagnostic Pathology, held on 29th & 30th December 2011, at Madras Veterinary College, Chennai, pp158.	ABT	
56.	2011	Veterinary Parasitology. 182 (2011) pp329–332.	FLA	
57.	2011	National Congress on Wildlife Health and Forensics 15-16 September, 2011 MPPCVV, Jabalpur (M.P.), pp61.	ABT	
58.	2012	Presentation in National Congress on Wildlife Health & Forensics & Annual convention of Association of Indian Zoo & Wildlife Veterinarians held at Centre for WL Forensic & Health, Jabalpur.	ABT	
59.	2012	International Conference on Reptile and Amphibian Medicine, held on 13th – 15th 2012, Palazzo Trecchi – Cremona, Italy.	ABT	
60.	2012	International Association for Bear Research & Management, 2012	ABT	
61.	2012	International Conference on Reptile and Amphibian Medicine, held on 13th – 15th 2012, Palazzo Trecchi – Cremona, Italy,	FLA	
62.	2012	Oral presentation at International Wildlife Tuberculosis Conference, held at Skukuza, Kruger National Park, South Africa, pp37.	ABT	
63.	2012	Oral presentation at The Asian Society for Zoo and Wildlife Medicine/Conservation Congress 2012 held on 10-12 Oct 2012 at Bangkok, Thailand, pp 30.	ABT	

64.	2012	Oral presentation at The Asian Society for Zoo and Wildlife Medicine/Conservation Congress 2012 held on 10-12 Oct 2012 at Bangkok, Thailand, pp30.	ABT	
65.	2012	Oral presentation at The Asian Society for Zoo and Wildlife Medicine/Conservation Congress 2012, held on 10-12 Oct 2012 at Bangkok, Thailand, pp33.	ABT	
66.	2012	Post conference booklet after presentation in the 21st International Conference on Bear Research and Management held at New Delhi, India on 26 – 30 November 2012.	ABT	
67.	2012	21st International Conference on Bear Research and Management held at New Delhi, India on 26 – 30 November 2012, pp 120.	ABT	
68.	2012	21st International Conference on Bear Research and Management held at New Delhi, India on 26 – 30 November 2012, pp 184.	ABT	
69.	2012	21st International Conference on Bear Research and Management held at New Delhi, India on 26 – 30 November 2012, pp 196.	ABT	
70.	2012	21st International Conference on Bear Research and Management held at New Delhi, India on 26 – 30 November 2012, pp227.	ABT	
71.	2012	21st International Conference on Bear Research and Management held at New Delhi, India on 26 – 30 November 2012, pp237.	ABT	
72.	2013	Proceedings of National symposium on Newer approaches in welfare and health management of captive and free ranging wild animals held at Bhubaneswar, India on 19-21 April 2013, pp111.	ABT	
73.	2013	Proceedings of National symposium on Newer approaches in welfare and health management of captive and free ranging wild animals held at Bhubaneswar, India on 19-21 April 2013, pp113.	ABT	
74.	2013	Proceedings of National symposium on Newer approaches in welfare and health management of captive and free ranging wild animals held at Bhubaneswar, India on 19-21 April 2013, pp114.	ABT	
75.	2013	Proceedings of National symposium on Newer approaches in welfare and health	ABT	

		management of captive and free ranging wild animals held at Bhubaneswar, India on 19-21 April 2013, pp116.		
76.	2013	Proceedings of National symposium on Newer approaches in welfare and health management of captive and free ranging wild animals held at Bhubaneswar, India on 19-21 April 2013, pp161.	ABT	
77.	2013	Proceedings of National symposium on Newer approaches in welfare and health management of captive and free ranging wild animals held at Bhubaneswar, India on 19-21 April 2013, pp169.	ABT	
78.	2013	Indian Vet. Journal. August 2013. 90(8): pp88-89	FLA	
79.	2013	Indian Wildlife Year Book Vol. 11-12, pp61-66.	FLA	
80.	2013	Indian Wildlife Year Book Vol. 11-12, pp85-88.	FLA	
81.	2013	Indian Wildlife Year Book Vol. 11-12, pp90-92.	FLA	
82.	2013	Indian Wildlife Year Book Vol. 11-12, pp96-97.	FLA	
83.	2013	Indian Wildlife Year Book Vol. 11-12, pp98-100.	FLA	
84.	2013	Indian Wildlife Year Book Vol. 11-12, pp147-149.	FLA	
85.	2013	Indian Wildlife Year Book Vol. 11-12, pp154-160.	FLA	
86.	2013	XXXVII Annual Congress of Indian Society for Veterinary Surgery & National Symposium on surgery, held at Mannuthy, Thrissur, Kerala, India on 06-08 November 2013	ABT	
87.	2013	Intas Polivet (2013) Vol.14(II), pp407-408	FLA	
88.	2013	International Symposium on Livestock Diseases affecting Livelihood Options and Global trade - Strategies and Solutions, pp135.	ABT	
89.	2014	Report submitted to Animal Welfare Board of India, MoEF on March 2014.	Report	
90.	2014	Report submitted to Animal Welfare Board of India, MoEF on August 2014.	Report	
91.	2014	Presented at American Association of Zoo Veterinarians, USA.	Poster	
92.	2014	Volume 2 and Issue 2 of Shanlax, International Journal of Vet Science, pp25-27.	ABT	
93.	2014	Volume 2 and Issue 2 of Shanlax, International Journal of Vet Science, pp28-33.	FLA	

94.	2014	Wildlife Society Bulletin 38(4), pp 783-790.	FLA	
95.	2014	Volume 1 and Issue 3 of Shanlax International Journals, pp41-43.	FLA	
96.	2014	Indian Wildlife Yearbook, Vol 13 & 14, pp60.	FLA	
97.	2014	Indian Wildlife Yearbook, Vol 13 & 14, pp76-81.	FLA	
98.	2014	Indian Wildlife Yearbook, Vol 13 & 14.	FLA	
99.	2015	Reproduction and Welfare of Endangered Animals in Conservation Breeding. Jan 28-30, 2015 held at CCMB, Hyderabad, pp21.	ABT	
100.	2015	International Journal of Applied Research 2015: 1(8), pp327-330	FLA	
101.	2015	International Journal of Applied Research 2015: 1(7), pp447-449	FLA	

Abbreviations:

FLA - Full Length Article

ABT - Abstract

Editior's Note:

If any of the articles which were published by any of the Wildlife SOS team during their working period with us, is found missing, please intimate the publication department of Wildlife SOS and it will be carried in the next volume.

About Wildlife SOS



WILDLIFE SOS is a conservation non-profit, initially set up with the aim of rescuing and rehabilitating wildlife in distress in India. Today, Wildlife SOS runs over 40 active conservation projects across the country including ones that mitigate human-wildlife conflict, promote biodiversity and habitat protection, along with sustainable rehabilitation of erstwhile poaching communities and awareness, and training to field staff and affected communities.



Conservation Research

In addition to the above, Wildlife SOS runs research projects across the country on a variety of subjects including veterinary medicine, surgical procedures, behavioural studies etc.



Know More

Website: www.wildlifesos.org

Email: info@wildlifesos.org

Facebook: facebook.com/wildlifesosindia

Twitter: twitter.com/WildlifeSOS

Instagram: [@WildlifeSOS](https://Instagram:@WildlifeSOS)

Antipoaching Operations



The Wildlife SOS anti-poaching unit Forest Watch works by way of a large and complex network of informers who gather critical intelligence on wildlife criminals and the illegal trade of endangered wild animals and their body parts. whenever necessary, Wildlife SOS initiates legal action against poachers, wildlife smugglers and persons involved in the illegal trafficking of captive elephants, live sloth bears, animal skins and other contraband.

Wildlife SOS also offers legal support to the Forest Department, police and other law enforcement agencies to tackle wildlife crime.



Dancing Bear Rescue Project



Wildlife SOS is credited with the ending of the barbaric dancing bear trade that had plagued the country and depleted wild sloth bear populations for over 400 years, through its Dancing Bear Rescue Program that saw the rescue and rehabilitation of over 620 sloth bears from the trade and the rehabilitation of the Kalandar community that depended on the bears for their livelihood.

Wildlife SOS currently runs four rehabilitation centres for sloth bears in collaboration with state Forest Departments, that provide lifetime care for sloth bears rescued from the dancing bear trade, and also act as rehabilitation and veterinary care centres for bears rescued from poaching and situations of human-wildlife conflict.

1. Agra Bear Rescue Facility, Uttar Pradesh
2. Bannerghatta Bear Rescue Centre, Karnataka
3. Van Vihar Bear Rescue Centre, Madhya Pradesh
4. Purulia Bear Rescue Centre Centre, West Bengal



Sustainable Livelihoods

In keeping with the organization's holistic approach to conservation, Wildlife SOS provides alternative sustainable livelihoods to erstwhile poaching communities through seed funds, skill training, and education programs.

Elephant Rescue & Rehabilitation



The organisation also rescues and rehabilitates illegally owned elephants from conditions of captive abuse, rehabilitating them at their centres that serve as models of humane and scientific management of elephants fully equipped with hydrotherapy pools, state-of-the-art veterinary care, an active enrichment program and specially designed target training walls.



Wildlife SOS runs two such elephant rescue, rehabilitation and conservation centres in India:

1. The Elephant Conservation and Care Centre, Mathura, Uttar Pradesh
2. The Elephant Rescue Centre, Ban Santour, Haryana



Man-Animal Conflict Mitigation



Wildlife SOS' man-animal conflict mitigation program works closely with affected local communities in Junnar, Maharashtra, to tackle the growing problem of leopard conflict through rescues, awareness programs for the locals and training for forest staff.

A similar project in Kashmir deals with the issue of conflict with Asiatic Black Bears. In Chhattisgarh, the Wildlife SOS team is working to mitigate human-elephant conflict. In Bannerghatta, the team plays a vital role in rescuing and caring for sloth bears and other wildlife that falls victim to man-animal conflict.



24 hr Rescue Helplines



Wildlife SOS also tackles human-wildlife conflict in urban areas through 24hr wildlife rescue helplines for wildlife in distress in three major cities – Delhi NCT, Vadodara and Agra, that rescue and provide critical care to animals that fall victim to such conflict.



Awareness Programs



In order to create a more sustainable change, Wildlife SOS runs awareness programs for local people that are affected by the wildlife that they share their landscapes with, to sensitize them to the importance of their natural heritage and the safest ways for them to coexist with wildlife.



Training Programs

Wildlife SOS also runs training programs and workshops for frontline staff of the Forest Department and Law Enforcement, as well as people occupied in wild animal rescue or care with the aim of better equipping such individuals through shared knowledge and practical demonstrations. Such workshops over a wide range of topics including wildlife law, conflict mitigation protocol, veterinary care and management and care of rescued wildlife.



Visit & Volunteer

As part of its efforts to raise awareness, Wildlife SOS runs an active Visit and Volunteer Program at its sloth bear and elephant rescue centres that give people a chance to learn more about these species and the humane, scientific care being provided to them, as well be a part of the process of caring for the animals.

