



# ASSESSMENT OF RISK FACTORS FOR HUMAN-SLOTH BEAR ENCOUNTER AND IMPACTS OF BIOTIC PRESSURES ON HABITAT USE PATTERN OF SLOTH BEAR IN DARRAH WILDLIFE SANCTUARY KOTA, RAJASTHAN

Dr. Shiba Khan and Dr. Fatima Sultana\*

Aklank College Kota, Department of Zoology

\* Professor, Department of Zoology, J. D. B. Govt. Girls PG College, Kota

Email: skhanshiba@gmail.com

**Abstract** The study was carried out in Darrah Wildlife Sanctuary from 2009-2012. Darrah Wildlife Sanctuary (DWLS) lies in the Hadoti region of Kota district in Rajasthan and lies between 24°37' to 25°2' N Latitude and 75°39' to 76°12' E Longitude. Darrah Wildlife Sanctuary comprises of 250 sq km, the area is divided into two ranges, Kolipura range and Darrah range. The climate of the sanctuary is subtropical, characterized by long and intense hot summer, with low rainfall and short but acute winter. The landscape is mostly patchy, fragmented, degraded and interspersed with crop fields and 19 human habitations the available habitat of Sloth bear (*Melursus ursinus*) was mixed forest (53%), scrub land (15.1%), open land (15.1%) land near water (11.3%) and whereas crop represented nil available habitat type. One conflict was a defensive response of the female bear along with its cubs. The study indicates that anthropogenic pressures are very high; the disposal of plastic is causing environmental damage to the park and altering feeding habits of sloth bears. If appropriate measures to reduce human pressures are not initiated, the situation may result in serious health hazard for bears. This study calls for periodic monitoring and appropriate policy interventions.

Key Words- sloth bear (*Melursus ursinus*) human habitation anthropogenic pressures, conflict

## INTRODUCTION

Sloth bear (*Melursus ursinus*) is one of the most widely distributed large mammals in India. At the same time, the sloth bear has suffered as much as other large mammals from human impacts on forested areas. The Darrah Wildlife Sanctuary, which comprises of both protected and unprotected area, harbors a sizeable population of sloth bears (n=21). The habitat available for sloth bears is highly degraded and interspersed by villages and agricultural crop fields. Due to the ongoing encroachment on the forest land and habitat degradation over the years, the status of the sloth bear is not only endangered in this area, but is also leading to a more conflicting situation. About 4.72 % of the India's geographical area is under protection for *in situ* biodiversity conservation and many wild animals are living in unprotected habitats (Garshelis et al. 1999). The impacts of biotic pressures might be less on species living in protected areas, but is believed to be high on those species living outside the protected areas in man-altered situations. The studies on assessment of biotic pressures on tiger (Mathur *et al.*, 1995), goral (Roy *et al.*, 1995) and grizzly bear (Hood and Parker, 2001) helped to map the affected habitats. In America, direct, human-caused mortality of grizzly bears was an arguable cause of population decline (Craighead and Mitchell, 1982; Brown, 1985; Servheen, 1989 and Mattson, 1990). The presence of human beings and dogs in the proximity of brown bear dens has been attributed to an increased level of aggressiveness among bears in Scandinavia (Swenson *et al.*, 1999).

The sloth bear is endemic to the Indian subcontinent and is found in India, Sri Lanka, Nepal, Bhutan, and Bangladesh. In India, sloth bears are distributed from the southern tip of the Western Ghat Mountain to the foothills of the Himalayas. Habitat degradation due to increased human population (Cowan 1972, Johnsingh 1986, Schoen 1990), diminished food resources (Murthy and Sankar 1995, Rajpurohit and Chauhan 1996), and increased poaching for its gall bladder (Laurie and Seidensticker 1977, Servheen 1990, Garshelis et al. 1999) have led to declines in sloth bear populations. Because forest areas outside parks and reserves have decreased, remaining populations of sloth bear are becoming increasingly fragmented (Garshelis et al. 1999). The sloth bear is included in Schedule I of the Indian Wildlife (Protection) Act 1972 (amended 2002) and in Appendix I of CITES. The Darrah Wildlife Sanctuary (DWLS) is in the

state of Rajasthan in India harbors a sizable population of sloth bear ( $n=16$ ) according to 2009 census and currently the population of sloth-bear ( $n=21$ ) has been increased by five more according to 2012 census at DWLS in its 250 km<sup>2</sup> area. Sloth bears are locally considered to be one of the most dangerous wild animals. Sloth bears reportedly can attack without apparent provocation (Gee 1964), and may encounter humans when they raid croplands or when people enter forests to collect non-timber forest products (NTFP; Garshelis et al. 1999). Sloth bears raid a variety of crops and occasionally scavenge on cattle carcasses (Laurie and Seidensticker 1977, Rajpurohit and Chauhan 1996, Rajpurohit and Krausman 2000). Human-sloth bear conflicts in Madhya Pradesh (which earlier included Chhattisgarh as well) have been reported from 17 forest divisions and 13 protected areas. Most of the attacks were recorded in managed forests outside protected areas (Rajpurohit and Chauhan 1996).

All over the world, human activities are severely impacting the habitat of all the eight species of bear, and in recent decades, all species have under gone dramatic decline in number and distribution. Habitat alteration, due to increasing human population to meet the increasing human population to meet the increasing demand of raw material, agricultural land and living space, and killing of bears for sports, medicinal products or other parts, protection of livestock and crops have led to the decline of the species. (Mills and Servheen 1991, Kemf et al., 1999).

In central India, sloth bear has a formidable reputation and considered one of the most fearsome of all the wild animals (Pillarissett, 1993, and Rajpurohit and Chauhan, 1996). It is highly unpredictable in attacking human beings on bumping unknowingly in forest or when mother is with cubs (Prater, 1980, and Pillarissett, 1993). It generally attacks human beings if disturbed while feeding on natural forest resources in its habitat. Though sloth bear kill fewer livestock than Asiatic black bears, in some areas of India and Burma, sloth bear are more feared than the tigers, due out their unpredictable temperament. In Madhya Pradesh, India, 48 people died and 686 people were injured in sloth bear incidents during 1989-1994 (Rajpurohit et al., 2000). One specimen, known as the sloth bear of Mysore (Kenneth 1954), was single-handedly responsible for the death of 12 people and the mutilation of 2 dozen others before being shot by Kenneth Anderson. Sloth bear defend themselves when surprised, with the majority of confrontation occurring at night. They typically charge on all fours with their head held low, before rearing on their hind legs and striking at their attackers with their claws and teeth. Also, in some parts of the range, encounters between people and sloth bears have led to numerous human injuries and many deaths (Rajpurohit and Krausman 2000, Bargali et al., 2005, Chauhan 2006). Such incidents tend to occur where people frequently use bear habitat and where the habitat has thus become severely degraded. This study was undertaken to determine the extent and level of biotic pressures and their impacts on the sloth bear, as well as to assess the status of human-bear conflicts. Findings of the study will suggest measures for bear conservation, as well as measure to reduce the human-bear conflict on a long term basis. This intensive study was conducted 2009 to 2012.

#### Study Area: Darrah Wildlife Sanctuary (DWLS)

Darrah Wildlife Sanctuary is one of the first declared Sanctuaries of independent India. Darrah sanctuary was declared “Darrah sanctuary” in the year 1955 on 7<sup>th</sup> Nov Darrah Wildlife Sanctuary (DWLS) lies in the Hadoti region of Kota district in Rajasthan. The sanctuary lies between 24°37' to 25°2' N Latitude and 75°39' to 76°12' E Longitude. Darrah Wildlife Sanctuary comprises of 250 sq km, the area is divided into two ranges, Kolipura range and Darrah range. For intensive study the area is divided into three zones; zone I (Kolipura range), zone II (Darrah range up to Railway crossing and NH-12) and zone III (Mashalpura area). The climate of the sanctuary is subtropical, characterized by long and intense hot summer, with low rainfall and short but acute winter.

Darrah Sanctuary is ecologically important as it forms a part of the largest viable tract among the fragmented forest belt of Rajasthan. The Sanctuary as name suggest ‘Darra’ means ‘passage’ is a vital part of a forest corridor that provides a link to the forests of Gandhi Sagar Sanctuary of Madhya Pradesh to the forests of Jawahar Sagar Sanctuary and Bhainsrodgarh Sanctuary of Rajasthan on one side while connecting it with Shivpuri forests of Madhya Pradesh through Shergarh Sanctuary of Baran Division, Rajasthan on the other side.

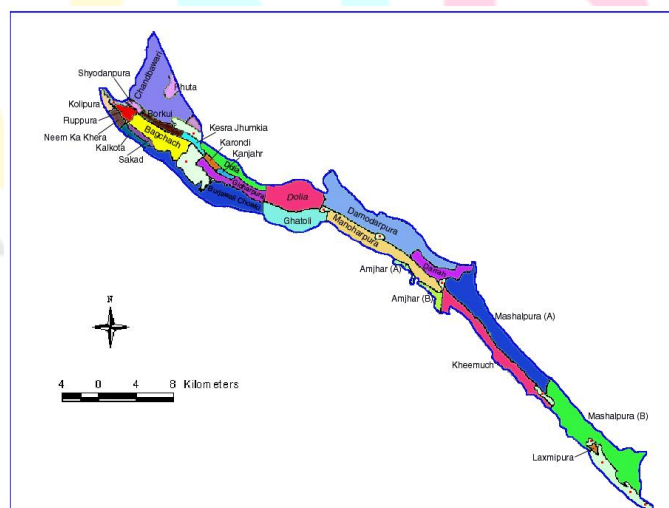


Fig 1: Map of Darrah Wildlife Sanctuary

## OBJECTIVES

- i. To quantify habitat use pattern and assess impacts of biotic pressures on bear habitat.
- ii. Assessment of risk factors for human/bear encounters

## METHODOLOGY

To quantify habitat use pattern and to assess the impact of biotic pressures on sloth bear habitats reconnaissance survey was carried out, 66 linear transects were laid out at randomly in all available habitats and land use categories by sloth bear in Darrah Forest Division. Each transect was 2 km in length and sample plots of 10 m radius at 100 m intervals were examined. Bear sign was recorded within 5 m of either side of each transect. We recorded presence or absence of bear sign, including diggings, scats, and claw marks. We also recorded information on habitat variables including terrain, vegetation type, tree and shrubs species (Cottam and Curtis 1956), number of cut and lopped (cutting of branches for fuel or fodder) trees, presence of cattle dung, and termite mounds. At the same plot, we also recorded distance to nearest water source, distance to nearest human habitation, and distance to nearest road. Terrain was divided into 4 broad categories: flat, undulating, gentle, and steeply sloped. The density of fruiting trees near villages was estimated using a plot less sampling method. Scats found at bear den and sampling plots along transects were collected. Scats were washed and food items were identified, mostly by ocular and microscopic examination. Almost all items in the sloth bear scats, including ants and termites, could be identified in the field or laboratory. In total there were 132 plots and evidence of biotic pressures such as cattle grazing (dung), lopped trees, collection of non-timber forest produce, distance from human habitation, mining, and disturbance from roads, railway tracks and other human activities were recorded in the predesigned formats. The extent of biotic pressures was categorized as nil, low, moderate, high and very high (not occupied by bears). Area statistics of each category and a map showing biotic pressures was generated in Arcview (1996). In addition to transect methods, information on biotic pressures was also collected through village surveys over a period of four years and also recording the straying of bears in the villages due to scarcity of food in DWLS.

We collected data on human–bear encounters through interviews with village survey in 2009, 2010, 2011 and 2012 and also through investigating government records and news paper writings. We confined our study on the Darrah Sanctuary which is a small portion of Mukundra hills. Interviews were used to gather data on livelihoods, bear encounters and human attitudes toward bears. Data from government records and news paper reports were used to document claimed damage and human casualties. We conducted informal meetings in public places (e.g., chaupal) and personal visits to 19 villages in Darrah Sanctuary during 2009 to 2012 to explain study objectives to local people and meetings were open to all. As baseline information for this study we used maps depicting the suitability of the study area for both bears and humans. The bear maps were used to delineate potential conflict zones at three levels: (1) the overall suitability of the region for bears (2) the key patch level, which delineates areas where bears can maintain viable populations and (3) the connectivity map delineating areas suitable that are important for bear dispersal. The human map on the other hand, was created to identify probabilities of human occurrence along the study area based on main economical activities of the region.

## OBSERVATIONS, RESULT AND DISCUSSION

**Table-1 Sloth Bear habitat use and habitat availability in Darrah Wildlife Sanctuary, Kota, Rajasthan 2009-2012**

Habitat type	Proportional availability	Plots	Plots with bear signs	Use %	Expected use%	Dug out mounds/ha	Scats/ha
Mixed forest	0.530	70	45	64.2	35.8	.109	.080
Crop field	0.053	7	0	0	100	0	0
Open land	0.151	20	4	20	80	.027	.022
Scrub	0.151	20	2	10	90	.045	.036
Land near water	0.113	15	12	80	20	.082	.056
<b>Total</b>		<b>132</b>	<b>63</b>				

### Habitat use

Data collected from the 132 sample plots indicated that the available habitat was mixed forest (53%), scrub land (15.1%), open land (15.1%) land near water (11.3%) and whereas crop represented nil available habitat type (**Table 1**). Goodness-of-fit test showed that bear use of each habitat category differed from the occurrence of habitat categories within the study area ( $\chi^2 = 15.66$ , 4 d.f,  $\alpha = 0.05$ ). Occurrence of bear sign was high in mixed forest, followed by land near water bodies, open land, scrub; agricultural fields received the nil use.

**Table-2 Terrain type used by sloth bear in DWLS**

Sl. No.	Terrain types	Total plots	Plots used by sloth bear
1	Flat land	40	30
2	Undulating land	60	55
3	Gentle slope	20	10
4	Steep slope	12	5

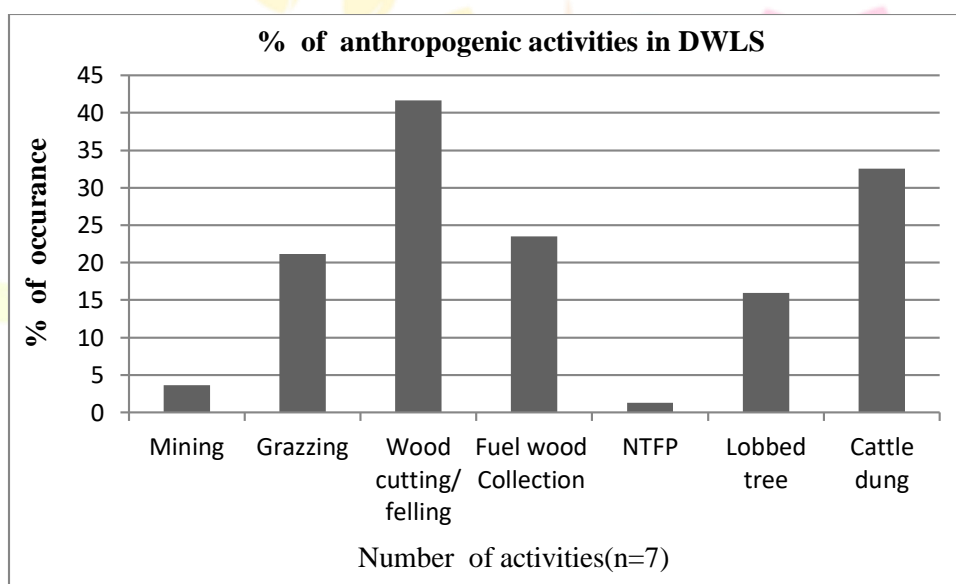
Chi-square tests indicated that bear use of each terrain category (flat, undulating, gentle and steep slope) did not differ from its proportional occurrence ( $\chi^2 = 3.38$ , 3 d.f,  $\alpha = 0.05$ ).

Termites are a common, preferred food item of sloth bears. We observed two types of termite nests: underground nests, which were difficult to detect, and prominent mounds from 20 to 500 cm in height. Although we found the greatest density of termite mounds in mixed forest and land near water, these habitats covered a large area. Average density of termite mounds across all habitat types was 7.86 mounds/ha. Along nullas and river banks, we frequently found termite mounds that had been dug out by bears. Once dug out by bears, termites were not eliminated completely; termites recovered very quickly and built their nests again. The number of diggings was greatest in mixed forest (Table 1).

During sampling survey method the habitat variables showed that bear sign was most abundant in areas at larger distances from villages and den sites, where vegetation cover and availability of food was relatively high. Habitats that were most frequently used by bears received relatively high human disturbance (e.g., cut trees, lopped trees, cattle grazing, etc).

**Table: 3. Anthropogenic activities in per hectare of land in DWLS**

Mining	Cattle grazing	Wood cutting/ felling	Lobbed tree	Cattle dung	Fuel wood collection	NTFP collection
.052	.211	.416	.159	.325	.234	.018



In Darrah Wildlife Sanctuary, in spite of the fact that there is an increasing biotic pressure, encroachment on the forest land and continuous habitat degradation, the sloth bear population is still increasing. More often sloth bear are found entering the villages and human habitations. As a result, there is a serious human-sloth bear conflict in the form of human casualty and sloth bear death in accidents. From the year 2009 till 2012, we have been collecting information on human-sloth bear conflicts through several village surveys, the nature and extent of problems of the conflicts and its circumstances in a well-designed format.

**Table-4 Summary of field activities in Darrah Wildlife Sanctuary, 2009-2012**

Activity	Year,2009-2012
Village survey	19
Villagers interviewed	100
Victim Interviewed	1

In DWLS, out of 19 villages surveyed only one case of human casualty was reported during the last four years from 2009 to 2012. A forest guard was seriously mauled by a female sloth bear at In DWLS, out of 19 villages surveyed only one case of human casualty was reported during the last four years from 2009 to 2012. A forest guard Ram Krishan was seriously mauled by a female sloth bear at Jhamra (Table 4). The female sloth-bear was passing through Jhamra with her two cubs and unfortunately at the same time the forest guard who was on duty came across the mother sloth-bear. The guard stopped to watch the activities of the sloth bear cubs. Suddenly

the female mother bear charged spontaneously from the bushes and badly injured the guard on both his thighs. The attack was perhaps a defensive act of female sloth bear in protection of her two cubs.

## RECOMMENDATION

We need to verify and updates the information on the distribution across DWLS range and develop a database on bears existing bear habited areas need to be identified and mapped.

Intensive survey should be carried out to asses the status and distribution of bear in DWLS for bear abundance and density. .A realistic sloth bear distribution range map to be prepared.

Sloth bear habitat need to be quantified and mapped on broad scale land use maps so that necessary steps could be taken by forest department to protect such habitats .Factor leading to degradation and fragmentation of sloth bear habitats should be identified range-wise in sanctuary and strategies should be developed to remove these threats. Cattle grazing, cutting and lopping should be completely banned in DWLS Sanctuary. Forest department should be restricted the collection of non timber forest product which may be bear interested from the bear areas. Villagers should be discouraged for collecting bear food items from the forest.

## ACKNOWLEDGEMENT

The author is thankful to Sh. U. M. Sahay, PCCF, Wildlife Division, Jaipur, to give the permission to carry the study in Darrah Wildlife Sanctuary. My sincere thanks to Sh. Anurag Baradwaj, CCF, Wildlife Division, Kota, to provide maps, assistance of staff and other facilities in field. I am also thankful to UGC, New Delhi to grant financial assistance to do the project.

## BIBLIOGRAPHY

- BARGALI H.S., NAIM AKHTAR, CHAUHAN N.P.S. (2005). Characteristics of sloth bear attacks and human casualties in North Bilaspur forest division Chhattisgarh, India. *Ursus* vol.16 No.2 pp. 263-267.
- BROWN, D.E. 1985. The grizzly in the Southwest Univ. Oklahoma press, Norman, pp 274.
- CHAUHAN, N.P.S., AND R.K.J. SINGH. 2006. Status and distribution of sun bears in Manipur, India. *Ursus*17:182–185.
- COTTAM G., AND J .T. CURTIS. (1956). The use of distance measures in phytosociological sampling. *Ecology*3 7:451- 460.
- COWAN, I.McT. 1972. The status and conservation of bears (Ursidae) of the world-1970. International Conference on Bear Research and Management 2:343-367.
- CRAIGHEAD, J.J. AND J. A. MITCHELL. 1982. Wild animals of North America: biology, management and economics.In J.A. Chapman and G.A. Feldhamer, eds. John Hopkins University. Press, Baltimore, MD.515-556.
- GARSHELIS, D. L., A. R. JOSHI, J. L. D. SMITH AND C. G. RICE. (1999A). Sloth bear conservation action plan. In Servheen, C. and Peyton, B. Eds., Bears: Status survey and conservation action plan. IUCN/SSC Bear and Polar Bear Specialist Groups. IUCN, Gland, Switzerland. 309.
- GARSHELIS, D.L., JOSHI, A.R., SMITH, J.L.D. & RICE, C.D. 1999b: Sloth Bear Conservation Action Plan (*Melursus ursinus*). - In: Servheen, C., Herrero, S. & Peyton,B. (Eds.); Bears: Status survey and conservation action plan. IUCN/SSC Bear and Polar Bear Specialist Groups, IUCN, Gland, Switzerland, pp. 225-240
- GEE, E.P. 1964. The wildlife of India. Collins, London, UK.
- HERRERO AND SERVHEEN, C. (1989). Monitoring of bear populations .Environmental encounters series, Council of Europe,6:39-45
- HOOD, G.A. AND K.L. PARKER. 2001. Impact of human activities on grizzly bear habitat in Jasper National Park. *Wildlife Society Bulletin*, 29 (2): 624-638.
- JOHNSINGH, A.J.T. 1986. Diversity and conservation of carnivorous mammals in India. Proceedings of the Indian Academy of Science, Bangalore, Karnataka, India.
- KEMF, E., A. WILSON, AND C. SERVHEEN1999. Bears in the Wild.1999 WWF species status report WWF for nature, gland, Switzerland.
- KENNETH, A. 1954.Nine man-Eaters and One Rouge. Pp. 251.
- LAURIE, A., AND J. SEIDENSTICKER. 1977. Behavioral ecology of the sloth bear (*Melursus ursinus*). *Journal of Zoology* (London) 182:187–204.
- MATHUR, V.B., DIXIT, N. AND A.R. SHIRISH. 1995. Spatial pattern analysis of forested landscape between Kanha tiger reserve and Achanakmar sanctuary for identification and evaluation of wildlife corridors.Report. Wildlife Institute of India, Dehradun
- MATTSON, D. J. 1990. Human impact on bear habitat use. International Conference on bear research and Management, 8: 33-56.
- MILLS, J.A., AND C. SERVHEEN. 1991. The Asian trade in bears and bear parts. TRAFFIC USA/World Wildlife Fund, Washington DC, USA.
- PATER S.H. (1980). The book of Indian animals. Third Ed. Bombay Natural History Society, Bombay.pp324.
- PILLARISSETT, A.M. 1993. Are sloth bear man marauders? Pages 41-46 in M.G. Gogate and P.J. Thorse, editors. Two decades of project tiger, Melghat (1973-1993). Melgaht Tiger Reserve, Melghat, India.
- RAJPUROHIT, K. S., AND P.R. KRAUSMAN.2000. Human-sloth bear conflicts in Madhya Pradesh, India. *Wildlife Society Bulletin* 28:393-399
- RAJPUROHIT,K.S., AND N .P.S. CHAUHAN.1996. Study of animal damage problems in and around protected areas and managed forest in India. Phase-I: Madhya Pradesh, Bihar and Orissa. Wildlife Institute of India, Dehradun, India.
- ROY, P.S., SHRISH, A.R., RAJADNYA, N., DAS. K.K.,JAIN, A. AND S. SINGH. 1995. Habitat suitability analysis of *Nemorhaedus goral* -A remote sensing and geographic information system approach. *Current Science*,69 (8): 685-691.

SANKAR, K., AND R .S. MURTHY. 1995. Assessment of bear-man conflict in North Bilaspur Forest Division, Bilaspur, Madhya Pradesh. Report, Wildlife Institute of India, Dehradun, India 393-399.

SCHOEN, J.W. 1990. Forest management and bear conservation. International Congress of Ecology 5:1-7.

SERVHEEN, C. 1990. The status and conservation of the bears of the world. International Conference on Bear Research and Management Monograph 2.

SERVHEEN, C. 1989. The management of the grizzly bear on private lands: Some problems and possible solutions pp. 195-200 in Bear/people conflict proc. Of a symposium on management strategies Northwest Territ Dept. of renew resources Yellowknife.

SERVHEEN, C., S. HERRERO, AND B. PEYTON. 1999. Status survey of the bears of the world and Global Conservation Action Plan. IUCN/SSC Bear Specialist Group, Gland, Switzerland.

SWENSON, J. E., A. JANSSON, R. RIIG, AND F. SANDEGREN. 1999. Bears and ants: myrmecophagy by brown bears in central Scandinavia. Canadian Journal of Zoology 77:551-561.

