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Status Survey Report

Status of Blackbuck
***Antilope cervicapra* (Linnaeus, 1758)**
in Orissa

**ATINDRA MURMU, ARUN KUMAR ROY MAHATO,
SUBIR GUHA AND PHAKIR CHANDRA SAREN**



Zoological Survey of India



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INTRODUCTION

Blackbuck or Indian antelope is a medium sized animal belongs to the family Bovidae under order Artiodactyla of class Mammalia. Blackbuck lives in close proximity to the human settlement, arable land and pasture lands of Indian subcontinent. Blackbuck is an integral part of Indigenous culture of the rural community of India where ever the species occurs and is closely linked to the rural community due to traditional art, belief and culture. In recent time, blackbuck is included in the list of threatened animal as the animal is struggling for its existence.

Ecologically, they are grazers, prefer open areas and show remarkable kind of social organization and behavior. *Antilope cervicapra* (Linnaeus, 1758) is the monotypic species of the genus Antilope and belongs to the family Bovidae under Artiodactyla. The species is endemic to Indian sub-continent and distributed in some protected areas of India. Blackbuck is native to Indian subcontinent found mainly in India (except in North East India) and also in some parts of Pakistan and Nepal where they are widespread in plains and open woodlands; wet coastal areas, western deserts, and northern mountains limited their distribution. Today the blackbuck population of India is confined to areas in Punjab, Rajasthan, Haryana , Gujarat and Maharashtra with a few small pockets in Central India. There are also introduced populations in various parts of the world including numerous ranches in Texas in the United States of America.

In Orissa, the main population of blackbuck is found in about 70 villages of Buguda, Aska, Kodala Forest Ranges in Ghumasar south division and Purusottampur of Ganjam District hold most of the population of Blackbuck except few population in Konark-Balukhand Sanctuary, Puri in the state of Orissa. The population of blackbuck in recent time increased in Proposed Community Reserve for Blackbuck (PCRB), Ganjam district due to community participation and conservation measures of forests department. The Blackbucks of Balipadar-Bhetnoi area is protected religiously by the local community. An attempt has been made here to study and assess the population status, distribution and abundance of blackbuck in Orissa for its proper conservation and management in future for the continuous survival of this natural beckon in its habitat as (PCRB) is the single large habitat of blackbuck in eastern India.

REVIEW OF LITERATURE

Blackbuck is endemic to Indian sub-continent, and distributed in various grassland and open areas of India except Himalaya and northeastern states (Schaller, 1967; Prater, 1973; Nocon, 1999). The geographic variation within blackbuck species was observed by Groves (1980). A detailed review about the distribution of Blackbuck was made by Rahmani (1991). Prasad (1981) gathered information on distribution around seventies. Ranjitsinghji (1982) estimated the total Blackbuck population in India to be in the range between 22,000-24,000. Rahamani (1991) gave a rough estimate of the Blackbuck population ranging between 29,000- 38,000. The State wise distribution of lesser known populations of blackbuck in India was reviewed by Rahmani (1991). Chandra (1995) also investigated the distribution of blackbuck in India. Kar (2000) described the distribution and population of

blackbuck in Orissa. Distribution pattern, home range, territoriality and foraging behaviour of blackbuck in Balipadar-Vetnoi areas of Ganjam district, Orissa were investigated by Kar (2001). Various agonistic behaviour of blackbuck in PCRB was analyzed by Mahato *et al.* (2008). The detailed ecology, herd composition, activity pattern, social behaviour and some conservation aspect of blackbuck in PCRB were described by Mahato *et al.* (2010).

Apart from these, Habitat structure of blackbuck in Andhra Pradesh was evaluated by Prasad & Ramna Rao (1984). The population dynamics, herd structure and composition of blackbuck in Sikandra by Spillett (1966), in Jodhpur, Rajasthan by Sinha (1966) and Ghosh and Goyal (1983), in Gujarat by Sinha (1977), in Point Calimere Wildlife Sanctuary by Daniel (1967), Johnson (1975), Nair (1976) and Natarajan (1991), and Ballavpur Wildlife Sanctuary, West Bengal by Chattopadhyay and Bhattacharya (1985). Seasonal changes in the herd structure and movement of blackbuck in Madumal, Andhra Pradesh was described by Prasad (1986) and seasonal change in the herd structure and composition of Indian Blackbuck (*Antelope cervicapra*) at Pipli Deer Park in Kurukshetra District of Haryana state was recorded and analysed by Gupta & Bhardwaj (1990). Barucha & Asher (1993) observed the population structure and herd dynamic of *Antelope cervicapra* under sub-optimal habitat condition of Rehekari Blackbuck Sanctuary, Maharashtra. Shankar Raman *et al.* (1995) worked on the density, demography and the habitat utilization of blackbuck in Guindy National Park, Madras, while Sharma (1980) looked into habitat preferences and survival of the blackbuck and Srinivasulu (1999) at herd structure and habitat preference of the Blackbuck in Mahavir Harina Vanasthali, Andhra Pradesh.

The over abundant population of blackbuck causing crop damage in Haryana was reported by Chauhan and Singh (1990) and provided some solutions for the management of blackbuck. Similarly, Chandra (1997) reported the crop damage caused by Blackbuck (*Antelope cervicapra*) at Karera Great Indian Bustard Sanctuary and Manakandan & Rahmani (1998) at Rollapadu Wildlife, Andhra Pradesh and provides some possible remedial solutions. Above all blackbuck faces extinction in some areas due to habitat degradation, hunting and poaching (Oza & Gaikwad, 1973). Dry-zone afforestation is proved to be a factor influencing Blackbuck population (Ullas Karanth and Singh, 1985). Some authors like Mungall *et al.* (1981), Rao Ramna & Prasad (1982), Prasad and Ramana Rao (1985), Oza (1988), Shankar Raman *et al.* (1996), Kar (2001) and Mahato *et al.* (2010) suggested some measures from time to time for the conservation and management of blackbuck in various parts of India.

STUDY AREA

In Orissa, the population of blackbuck has been reported from two distinguished locations. The main population is found in Ganjam district which is Proposed Community Reserve and a small population is found along the sea coast of Puri district. This region falls in the jurisdiction of Balukhanda-Konark Wildlife Sanctuary. The detailed description of the two survey areas is given in two separate sub-headings below:-

I. Proposed Community Reserve for Blackbuck (PCRB)

The Proposed Community reserve for Blackbuck (PCRB), Ganjam district, Orissa, India, a semi-natural habitat around local community, lies between 19° 3½-19° 5½ N to 84° 3½-

84° 5½ E at an altitude of 150-300 m from sea level in the Eastern Ghat of peninsular India. The total area is approximately 64 sq. km. Topographically the area is undulating with elevations of scattered hills ranging an elevation from 200 to 350 m. The habitat of blackbuck is restricted towards south by Rushikulya River and north-western part by scattered hills of Eastern ghat. Baghua a tributary of river Rushikulya flows through the area in between Aska and Kodala. The large proportion of the area is under cultivation of Paddy (*Oryza sativa*), pulses include Green gram (*Phaseolus aureus*), Blackgram (*Phaseolus radiatus*) and Bengal gram (*Cicer arietinum*).

The natural vegetation of the area is tropical dry deciduous forest (Champion and Seth, 1968) and three broad habitats occur in the park: (i) Cultivated land (occupying about 60% of total study area) – characterized by the cultivated land (ii) Scrubland (occupying about 10 % of area) – the semi-open habitat is characterized by scattered vegetation (iii) Grassland (occupying about 15% of the study area). The mean annual rainfall is 1100 mm and most of the precipitation occurs due to the southwest (June-September) and northeast (October-December) monsoons and temperature of the area is ranges between 17 C to 42 C. The various seasons of this area were identified on the basis of rainfall data of 2005-2007 collected from Gopalpur Meterological Station (Orissa) are; dry season (Jan.-Mar.), summer (March-May), monsoon (June.-Sep.) and winter (Oct.-Dec.).

FLORA OF PCRB

Kar (2001) described the tree species of this area characterized by Babul (*Acacia nilotica*), Sishum (*Dulbergia sissoo*), Mahua (*Madhuca latifolia*), Siris (*Albizia Lebbek*), Tamarinda (*Tamarindus indica*), Jamun (*Syzygium cumini*), Ziziphus (*Ziziphus jujuba*), Neem (*Azardica indica*), Teak (*Tactona grandis*), Date Plam (*Phoenix dactylifera*), Palmayara palm (*Borassus flabellifer*), Mango (*Mongifera indica*), Custard apple (*Anona squamosa*), Pipal (*Ficus religiosa*), Banyan (*Ficus bengalensis*), Sal (*Shorea robusta*), Arjuna (*Terminalia arjuna*), Saij (*Terminalia alata*), Amla (*Emblica officinalis*), Jack fruit (*Artocarpus heterophyllus*), Cashew (*Anacrduium occidentale*), Coconut (*Cocos nucifera*), Bel (*Aegle marmelos*), Bomboo (*Bambosa arundinacia*) etc.

The grass layer is moderately developed and includes three species of Duba (*Cynodon dactylon*, *Cynodon plectostachyus*, *Cynodon barberi*), *Cyperus rotendus*, *Celosia argentea*, *penicum sps*, *Borreria hispida*, *Vernonia cinerea*, *Paspelum scrobiculatum*, *Fimbristylis miliacea*, *Kylinga triceps*, *Commelina benghalensis* etc. Shrub species characterizes by *Mimosa pudica*, *Cerissa spinarum*, *Bryophillum calycinum*, *Tridex procumbens*, *Ageratum conigoides*, *Eupatorium odoratum* etc.

As most of the blackbuck area is predominantly cultivated land hence the common cultivated crop species are *Oryza sativa* (paddy), *Zea mayas* (maize), *peninsetum americanum* (bajra) , *Eleusine coracana* (millet); Legumes includes Green gram (*Phaseolus aureus*), Black gram (*Phaseolus radiatus*), Pigion pea (*Cajanus cajan*), Bengal gram (*Cecir arientinum*), Ground nut (*Arachis hypogaea*), Garden pea (*Pisum sativum*) and Sweet pea (*Lathyrus odoratus*) etc. oil seeds includes Til (*Sesamum indicum*), Castor (*Ricinus communis*), Sunflower (*Halienthus anus*), Hemp (*Cannabis sativa*) economic crop includes Sugarcane (*Saccharum officinarum*),

Cotton (*Gossypium herbaceum*) and vegetables characterizes by Potato (*Solanum tuberosum*), Tomato (*Lycopersicon esculentum*), Brinjal (*Solanum melongena*), Lady's finger (*Abelmoschus esculentus*), Cabbage (*Brassica oleracea* Var. *capitata*), Carrot (*Daucus carota*), Cucumber (*Cucumis sativus*), Gourd (*Trichosanthes cucumerina*), Onion (*Allium cepa*), Radish (*Raphanus sativus*), Sweet potato (*Ipomoea batatas*), Watermelon (*Citrulus vulgaris*), Elephant foot yam (*Discorea sps.*) and Spinach (*Spinacia oleracea*) etc.

FAUNA

Some of the species of carnivore like Hyena (*Hyena hyena*), Wolf (*Canis lupus lupus*), Jackal (*Canis aureus*), Fox (*Vulpis bengalensis*), and Jungle cat (*Felis chaus*) are found in PCRB. According to some villagers, leopard (*Panthera pardus*) is also present in dense forest areas on the scattered hill surrounding PCRB (Mahato, *et al.* 2010). Two species of primate including Rhesus monkey (*Macaca mullata*) and Hanuman langur (*Semnopithecus entellus*) is recorded during the present survey.

Apart from blackbuck, no other species of antelope and deer reported from PCRB. Others mammal species like Wild boar (*Sus scrofa*), Hare (*Lepus nigricollis*), Mongoose (*Herpestes auropunctatus*), Porcupine (*Hystrix indica*), and Squirrel (*Funambulus palmarum*) are also found in these areas. Common bird species of this area including Common crow, Myna, Kingfisher, Jacanas, Peacock, Parakeet, Owl and few other species. Herpeto fauna includes Indian chameleon, Cobra, Krait and Rat snake are commonly found in PCRB.

II. Balukhanda-Konark Wildlife Sanctuary (BKWC)

Balukhanda-Konark Wildlife Sanctuary is a man made forest tract along the bay of Bengal situated between 19°-48" to 19°-55" North and 85°-51" to 86°-14" East. The altitude varies from 0 to 15 mts from mean sea level. The terrain is mostly flat, draining gently from north to south with occasional sand dunes formed by shifting sand subsequently stabilized through plantation. The sanctuary is typical representative forest patch of coastal ecosystem of eastern Indian coastal plain. The entire area is full of shifting sand dunes with alluvial patches along the rivers and on the river mouths. The average annual rain fall is around 1900 mms and temperature ranges from 15° C to 38° C in a year. The source of water in this sanctuary is the tributaries of Mahanadi i.e. Kushbhadra and Kadua flowing through the sanctuary and draining into the Bay. Being close to the sea, the water table is high and water is available even in smaller water bodies. The total geographical area of this sanctuary is 87 sq. kilometer, out of which forest land is 69.18 sq. kms. The sanctuary is close to the temple town of Puri and the archeological heritage of Konark. The sanctuary is surrounded by 59 villages with more than 45,000 populations and about 17000 heads of cattle.

The forest of this sanctuary is mainly consisting of planted trees of Casurina, cashew, eucalyptes and acasia sps. The natural vegetation of this sanctuary mainly consists of *Azardiracta indica*, *Zyziphus xylopyra*, *Diospyra embryopteris*, *Zyziphus mauritina*, *Maba buxifolia*, *Eugenia jambolana*, *Phyllophylum spinosa*, Kanta boansa, Beta, Ketki, Khirkoli etc. Mangroves are confined to river banks and consist of Keruan (*Sonertia apetala*), Harkanch (*Acanthus spp.*), Rai (*Rhizophora spp.*), Guan (*Excoecaria agallocha*) etc.

Besides blackbuck, a large population of spotted deer (*Axis axis*) is present in this sanctuary. Other major species of wildlife found in this sanctuary includes Hyena (*Hyena hyena*), Jackal (*Canis aureus*), Fox (*Vulpis bengalensis*), Jungle cat (*Felis chaus*), Fishing cat (*Felis viverina*), Monkey (*Macaca mullata*), langur (*Semnopithecus entellus*), Hare (*Lepus nigricollis*), Mongoose (*Herpestes auropunctatus*), Porcupine (*Hystrix indica*), otter (*Lutra lutra*) etc. Apart from these mammalian species 18 common bird species, 8 species of reptile and one species of amphibian found in this sanctuary.

MATERIALS AND METHOD

Direct observations were made to collect data on population status and distribution of the Blackbuck. In order to collect data on the current status and distribution of Blackbuck, field surveys were carried out in PCRB to record Blackbuck populations. In each area, Blackbuck was counted and random searches were also attempted in different grassland patches, agricultural landscape and shrub land.

All data pertaining to herd size composition were collected mainly in selected 12 villages. Other areas occupied by Blackbuck were also visited frequently to assess the population. The grassland, cultivated land and major habitat of Blackbuck were surveyed regularly through fixed routes between dawn and dusk. The areas not accessible by road network were visited on foot. All encountered Blackbuck were aged and sexed whenever possible and location and activity of each group were also recorded during the time of observation. The term "group" applies to all units of animals seen in one sighting. Five sex and age classes were distinguished. These are a) adult males, b) adult females c) sub-adult males d) sub-adult females and e) fawn (Mungall, 1978).

Data collected includes territory location, initial and final group type, group composition, female and blackbuck activity (when present), initial and final habitat type, time of day, and timed behavioral activities. For each blackbuck sighted, species, age, sex, date, group size and composition, habitat and location were observed with the help of binocular (10X25) and recorded with the help of camera (300 mm, 800 zoom) and GPS units. The number of individuals and age-sex composition of groups of blackbuck were recorded during regular block sampling as well as during walks along paths and animal trails in the habitat. Individuals were considered as members of the same group if the distance between the individual and at least one other member of the group was less than 100 m.

RESULTS AND OBSERVATION

A total of three surveys were conducted in Proposed Community Reserve for Blackbuck (PCRb) and Konark-Balukhanda Wildlife Sanctuary (KBWS) in Orissa to study the population status survey of Blackbuck. During the three surveys of PCRb in three different seasons in 2008-2009 population and social composition of blackbuck varied between the surveys. The population statistics and social composition of blackbuck recorded during three surveys to the PCRb are given in table 1.

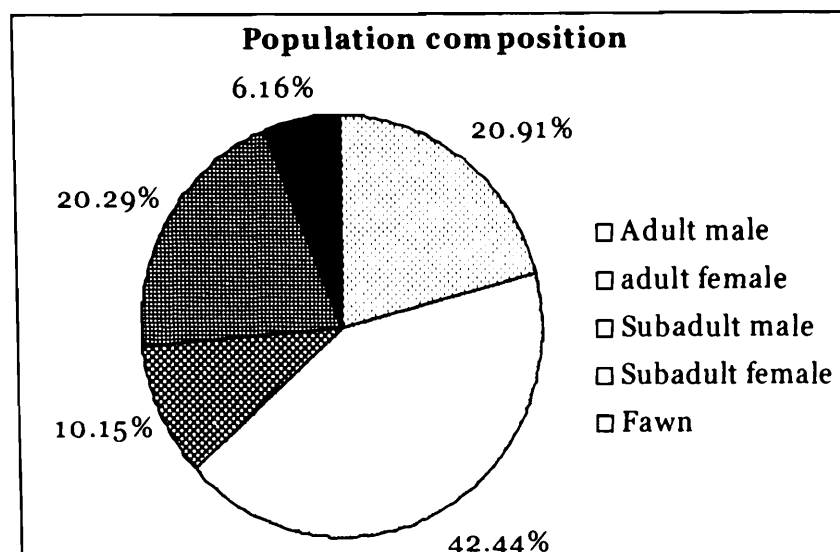


Figure 1: Showing the percentage population of different age-sex categories of individual of blackbuck at PCRB, Ganjam district, Orissa.

I. Population at PCRB

It was recorded that, the total population of blackbuck was 788 in the first survey during monsoon of 2008, 902 in second survey during summer 2009 and 852 in the last survey during winter 2009. Analysis revealed that the estimated average population of blackbuck in the PCRB was 860 ± 26 . Out of the total individuals recorded during first survey 238 individuals were males, 502 females and 48 yearlings. In the second survey, out of 902 blackbuck population 289 individuals were males, 570 females and 43 yearlings, while in the last survey out of 852 individuals 264 males, 523 females and 65 yearlings.

Table 1 - Population statistics of Blackbuck studies during three surveys conducted between years 2008-2009 at PCRB, Ganjam district, Orissa, India.

	Monsoon (2008)	Summer (2009)	Winter (2009)
Male	238	289	264
Female	502	570	523
Yearling	48	43	65
Adult male	162	191	179
Adult female	346	398	335
Sub-adult female	156	172	188
Territorial male	114	137	133
Non territorial male	124	152	131
Sub-adult individual	280	324	319
Lone individual	48	67	63
Pair of territorial male	4	7	6
Total no of herd	56	84	69
Total no of mixed herd	45	66	56
Total no of bachelor herd	11	18	13
Total population	788	902	852

Analysis of the recorded population it was found that, out of the total population in PCRB, 42.44% individuals were adult female, followed by 20.91% of individuals were adult male, 20.29% sub-adult female, 10.15% sub-adult male and rest of 6.16% individuals were fawn or yearling (figure 1).

II. Social or Herd Composition

During the three surveys in PCRB it was observed that there were 56 herds (mixed= 45 + bachelor= 11) of blackbuck in monsoon of 2008, 84 herds (mixed=66 + bachelor= 18) in summer 2009 and 69 herds (mixed= 56+ bachelor= 13) in winter 2009. Out of the 788 individuals of blackbuck recorded in monsoon of 2008, 608 individuals were found in mixed herd, 124 individuals in bachelor herd and 56 were lone individuals.

Similarly in summer 2009, 669 individuals in mixed herd, 152 in bachelor herd and 101 were recorded lone individuals while in winter 2009 about 646 animals were recorded in mixed herd, 131 in bachelor herd and rest of the individuals were lone animal (75). Out of 238 male observed in monsoon 2008, 114 individuals were territorial male. Similarly in summer 2009 and winter 2009, out of 289 male and 264 male individuals 137 and 133 individuals were territorial male respectively. It was also found that there were 4 pairs (monsoon 2008), 7 pair (summer 2009) and 6 pair (winter 2009) of adult males recorded during the surveys.

Mixed herd was composed of adult and sub-adult individuals of both sexes and fawns of blackbuck. The average social composition consisted of each adult male with 5.77 adult female, 3.24 sub-adult female and 1.12 fawns in PCRB. Similarly, with each adult female, 0.17 adult male, 0.56 sub-adult female and 0.19 fawns were recorded in the mixed herd. In an average each mixed herd of blackbuck there were 6.48 individuals of adult female, and 3.87 sub-adult female and 1.18 individuals of fawn recorded in PCRB. The age-sex composition of individuals of blackbuck recorded during three surveys of PCRB is given in table 2.

The composition of bachelor herd consists of adult and sub-adult male of different age categories. In the present study, the age categories of blackbuck were divided into 1 year old, 2 year old and more than 3 year old. In a bachelor herd, the average population of different age category individuals were recorded during the surveys was consisting of 20.39 % 1 year old male, 43.24 % 2 year old male and 36.36 % 3 year old male. The age ratio between 1 year: 2 year: 3 year male in the bachelor herd was 2.07: 4.46: 3.53.

Table 2 : Age-sex composition of the individuals and herd size of Blackbuck in different seasons at PCRB.

	Adult female	Sub-adult	Yearling	Herd size
Winter	6.44	3.61	1.25	12.42
Summer	5.56	4.2	1.13	10.12
Monsoon	7.44	3.82	1.18	14.26
Average	6.48	3.87	1.18	12.26

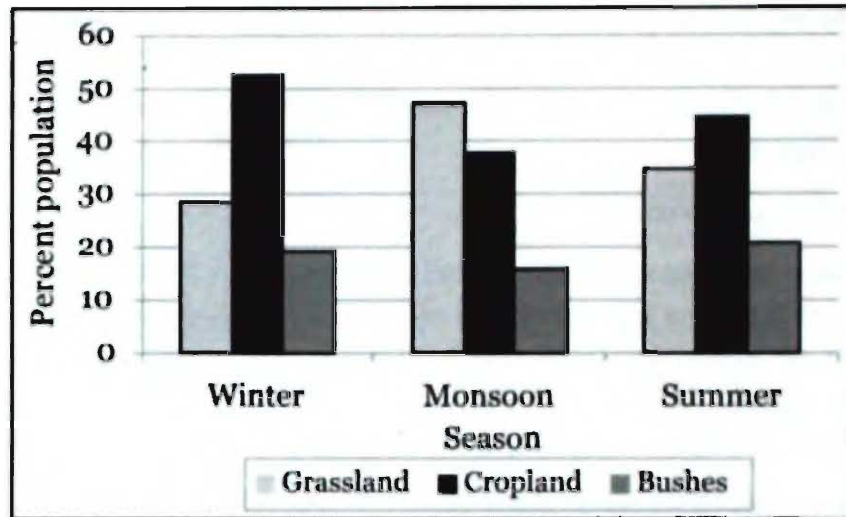


Figure 2: Showing the percentage population of Blackbuck observed in different habitat in various season at PCRB.

III. Habitat Selection or Preference

It was observed that blackbuck seasonally preferred or selected different habitat. During monsoon 46.7% of population of blackbuck was recorded in grassland, next to that 37.7% individuals were found in cropland and rests were recorded in bushy habitat. In summer 34.6% population recorded in grassland, 44.56% in cropland and 20.84% in bushy habitat, while in winter only 28.52% blackbuck recorded in grassland and most of the population (52.58%) were observed in cropland. Analysis of the above observed data; it was found that cropland (44.94%) was the most preferred habitat of blackbuck; grassland (36.6%) was next preferred habitat while bushy habitat (18.45%) was the least preferred habitat of blackbuck at PCRB (figure 2).

IV. Population composition at KBWS

Blackbuck (*Antelope cervicapra*) in KBWS locally called Bali-Harina or Kalabahutia, is a flagship species of this wildlife sanctuary. In KBWS, the total population of blackbuck recorded in three surveys in Monsoon (2008), summer (2009) and winter (2009) were 4, 7 and 6 respectively. The age-sex composition of blackbuck in KBWS was 1 adult male, 2 adult female and 1 yearling in monsoon 2008, 1 adult male, 3 adult female, 2 sub-adult female, 1 sub-adult male and 1 yearling in summer 2009 and 1 adult male, 3 adult female, 2 sub-adult female and 1 sub-adult female in winter 2009. Some more individuals of blackbuck reported through the indirect evidence by the information given by forest department people and some local people in KBWS.

DISCUSSION

The population of blackbuck in Orissa was distributed in several coastal areas like Konark, Balukhand in Puri districts and Chilika, Purusottampur, Aska, Buguda, Kodala and Balipadar in Ganjam district (Patnaik and Acharjyo, 1985). In past, blackbuck populations were distributed in Balasore, Puri, Bolangir and Kalahandi districts and some

coastal dunes of Bhitarkanika and Kujang areas (Kar, 2004). Few captive individuals of blackbuck from Nandankanan Zoological Park were also released in Bhitarkanika Wildlife Sanctuary in 1985 and 1987 but they could not survive in the new habitat and died within couple of months (Kar, 2004). Present study recorded healthy populations in the various agricultural, bushes and grasslands habitats of Ganjam district. Some indirect evidences of the survivability of blackbuck in Balukhand-Konark Wildlife Sanctuary were observed however evidences and direct sighting of blackbuck in Bhitarkanika Wildlife Sanctuary were not found.

Earlier the population of blackbuck in Orissa was recorded from time to time by various workers. Notably amongst them, Ranjitsingh (1982) found the populations of blackbuck in Orissa (700). Prasad (1982) described about 140+ populations in Orissa, while Rahmani (1990) found 485 blackbucks in Ganjam district alone. Several surveys were conducted in between 1973 to 2004 by forest department authorities, Govt. of Orissa, in Balipadar-Bhetnoi area and observed that the population of blackbuck was 523 in 1973, 485 in 1980, 551 in 1998 and 786 in 2004. During the present study, three surveys were conducted in the entire Ganjam district alone in between 2007 to 2009 and recorded 788 individuals in monsoon 2008, 902 in summer 2009 and 852 in winters 2009. As per the data of present study on the population it is found that about 860+ individuals of blackbuck were found in Ganjam district alone.

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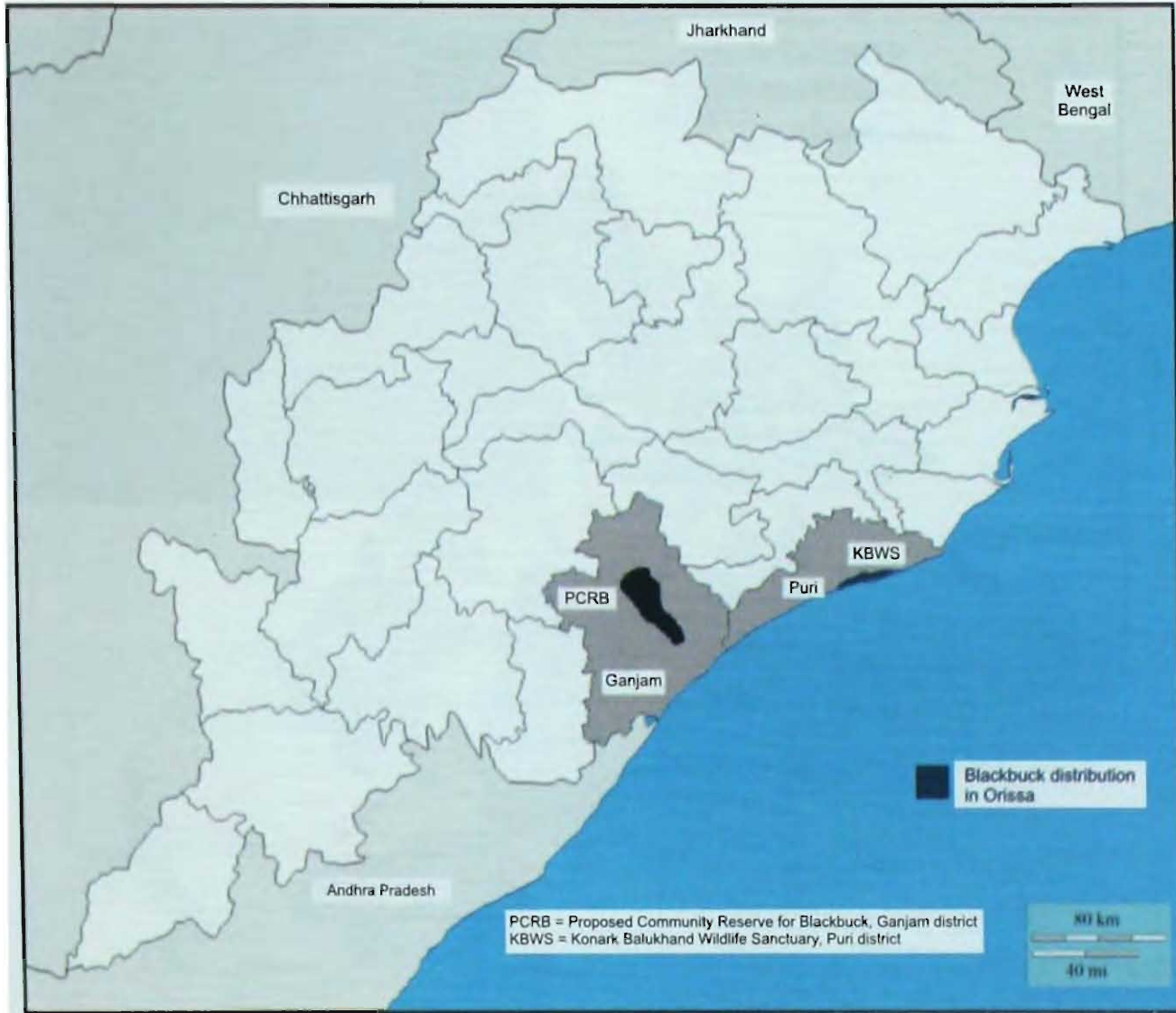
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Map showing distribution of Blackbuck in Orissa



A herd of blackbuck at Vetnoi



A herd of Blackbuck in grassland habitat



An adult male in open field



Overview of the Konark-Balukhand Sanctuary



Habitat of Balckbuck in Konark-Balukhand Sanctuary



A road inside the Konark-Balukhand Sanctuary



An adult male in grooming mode



A female and fawn in crop field



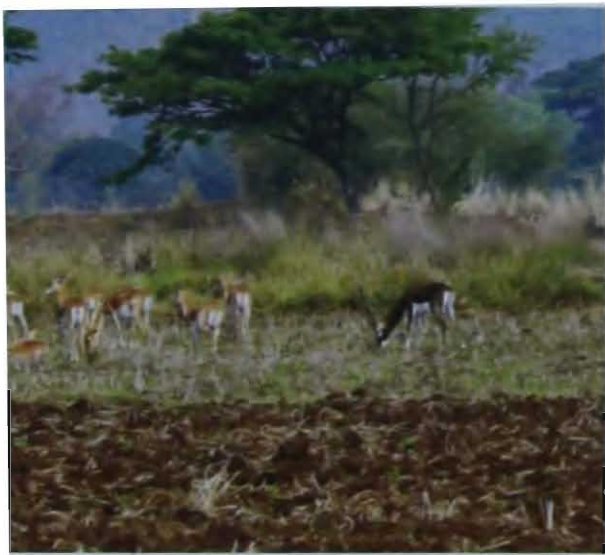
Blackbuck grazing with the domestic cattle at Vetnoi



A mixed herd in the dry grassland at Vetnoi



Territorial males in grazing mode



Herd of blackbuck in agriculture habitat



A herd of bachelor male



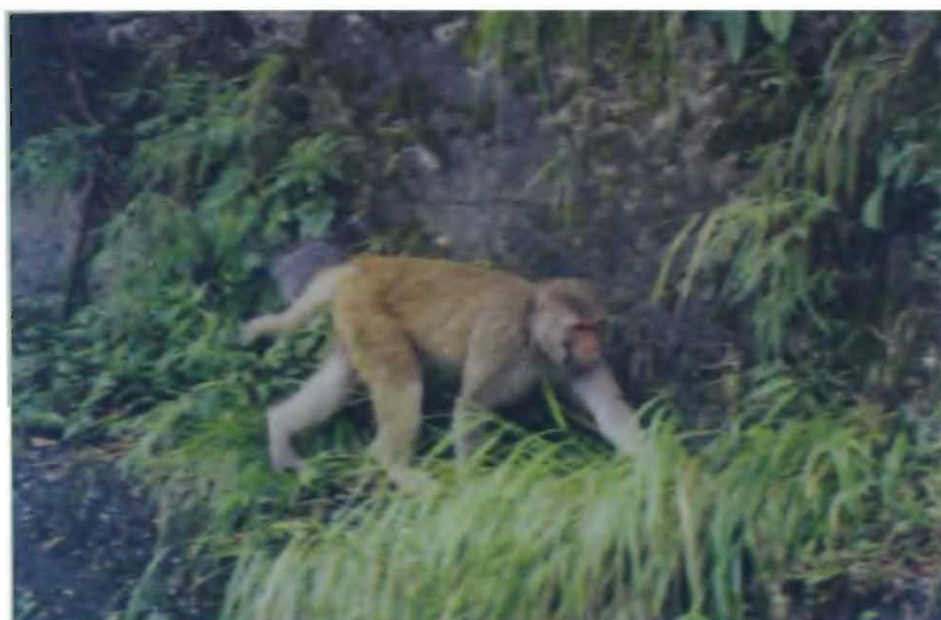
A herd of female in walking posture



A mixed herd in resting posture



A bachelor herd in scanning posture



Rhesus Monkey at Konark-Balukhnad Sanctuary