



Survey of the Four-horned Antelope in South India

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Survey of the Four-horned Antelope in South India (October 2008 to June 2009)

(Team: Suresh Jones, Diya Paul, the Late Pradeep Kumar and Joshi Jayakumar)

Summary:

With almost 100 species globally, antelopes achieve an exceptionally high diversity compared to most other groups of medium to large-sized mammals. The living antelope species represent the continuation of a major and relatively recent evolutionary heritage and are among the most successful groups of large herbivores that have ever existed on Earth.

The Four-horned antelope (*Tetracerus quadricornis* Blainville, 1816) is endemic to the Indian Sub-continent and is classified as 'Vulnerable' (C2a(i)) in the IUCN Redlist. Within the country, the species is protected under Schedule-I of the Wildlife Protection Act (1972) of India, where about 95% of its global population is known to occur. However, the current distributional patterns of this low-density species are largely unknown and conservation efforts are hampered by the lack of information on species–habitat relationships. Our Team undertook the survey to assess the ecological status, habitat use and the immediate local threats to the species in the forests of the Eastern Ghats in south India. The results were expected to provide information on aspects of habitat requirement, habitat use and insights into the immediate local threats that would aid in the preparation of a habitat management plan for the area.

We found that the Four-horned antelope has a preference for hills with open scrub and grassy patches with sparse trees where fire is almost a recurring feature. Some of the food plants of the antelope are fire-hardy species and the intermittent fire seems to maintain the vegetation structure and composition and also aid in the growth of the grass *Cymbopogon coloratus*, where the antelopes are known to shelter. The natural predators of the antelopes in the surveyed area are the Leopard (*Panthera pardus*) and the Indian Wild dog (*Cuon alpinus*). The major threats are found to be anthropogenic and yet, the antelope is able to tolerate competition from the livestock for food and water resources.

Our team perceives the immediate need to initiate discussions with the local villagers to address the issues threatening the survival of this species and also undertake conservation awareness programs. We also identify

the need for detailed studies on the feeding and breeding ecology of the antelope and larger sampling before attempting to prepare a habitat management plan, and it is also important to document and monitor the incidence and frequency of fire, the spread of invasive weeds, changes in habitat occupancy and phenology of the food plants for many of these events could also be sensitive to climatic variations and change.


Introduction

The survey area is the semi-arid uplands of western Chittoor district in Andhra Pradesh in South India and is part of the lower Eastern Ghats. The Forests are classified as Southern Tropical Mixed Dry Deciduous and Southern Tropical Thorn Forests (Champion, H.G. and Seth, S.K.(1968) and support relatively high diversity of flora and fauna, some of which are of high conservation value. The vegetation is characterized by species of high drought-resistance. This area is part of an elephant corridor and of larger landscape connectivity between two major bio-geographic regions of the



peninsula, the Eastern and the Western Ghats. The area is rocky and undulating, ranging in altitude from 600 m to 1100 m. The survey area is located at the southeastern edge of the known distribution range of the Four-horned Antelope. The little information available on its ecology in spite of the conservation significance of this antelope was the primary reasons for our team to undertake a status survey of this 'Vulnerable' species in order to understand its habitat use and document the immediate threats affecting its survival in this area. More detailed studies in future are expected to provide insight into its ecology which would enable in the preparation of a habitat management plan for this area.

Description of the Species

<i>Taxonomy</i>	<i>Physical Characteristics</i>	<i>Distribution Range</i>
Phylum: Chordata Class: Mammalia Order: Artiodactyla Family: Bovidae Sub-family: Bovinae Tribe: Boselaphini Genus: <i>Tetracerus</i> Species: <i>quadricornis</i>	Height at Shoulder: 55-60 cm. Length: 80-110 cm Weight: 20-22 Kg. Tail length: 10-15 cm. Horns: Posterior pair: 80-100 mm Anterior pair: 25-38 mm	

Four-horned Antelopes are unique, being the only Bovid with four horns and are the last survivors of a form very similar to that of the ancestors of the entire sub-family. They are primitive in both physical and behavioral characteristics. The absence of rings on horns which are keeled in the front distinguish them from the true antelopes. They have a pair of well-developed glands between the false hooves of the hind legs, but their use is unknown. The secretions from the glands in front of the eyes are used for marking. Preferring browsing to grazing, they require specific vegetation composition for foraging comprising chiefly of fruit/flower bearing plants. The four-horned antelope is a selective browser that can also be given a separate class of a 'nibbler' (Rahmani, A.R. and Sharma, K, 2003). Usually solitary in nature, they are also found in small groups of 2 to 3 individuals. They prefer hiding and taking refuge to fleeing and it is this tendency of the animal that explains to an extent their extensive use of forested areas and thickets within open savannahs. They are also known to frequent water and are never seen far from it. The four-horned antelope defecates on middens and visits them with variable frequencies. 'Middens' are points of communicating age/sex/territory and sexual status (oestrus) and when encountered, necessitate defecation and are used by both adults and fawns (Sharma, K. et al 2005). Defecation and urination on middens, and marking by pre-orbital glands are the two evident modes of maintaining territories. Gestation period is of eight and a half months and usually one or two young are born. Fawns are barely able to walk for a few days after birth and are kept hidden. Considering its uniqueness and endemism in Indian sub-continent, more scientific research is required on this

animal with emphasis on its evolution, behavior, mortality, population viability, habitat selection and relationship with sympatric species (Sharma, K. and Rahmani, A.R. 2003).

Methods

The total extent of the survey area is about 15,000 ha situated along the north-eastern boundary of the Madanapalle Forest Range in Chittoor (West) Division in Andhra Pradesh. This undulating landscape is mostly rocky with granite outcrops and red sandy soils that are poor in nutrients. The altitudinal range of the survey area is between 600m and 1074 m, and mean relative humidity



45%, and temperature is 28°C. On an average, the place receives about 700 mm rainfall during the year and the vegetation is either dry-deciduous type or thorny scrub. The survey area is also part of an established elephant corridor and is located between two Protected Areas. This region is important from the biogeographic point of view as it is part of landscape connectivity between the Eastern and Western Ghats while the latter is a Biodiversity Hotspot.

At a local scale, the chain of hills in the survey area act as habitat corridors and stepping stones facilitating faunal movement especially during the dry summer months. This project is an outcome of the Rapid Survey and Assessment of Biodiversity undertaken in the region during 2006, from which several species of high conservation significance were identified. It was also found from the assessment that the forests currently being surveyed have the highest density of the Four-horned antelope in spite of the area being subject to severe biotic pressures. As very little information is available on the ecology of this antelope, our team chose to undertake a long-term study of the species and use the results for developing a conservation and management plan.

Aim

The main aim of this project was to obtain data on the density, distribution and status of the Four-horned antelope with a special focus on documenting the habitat preference and use, and identifying the local threats.




Objectives

- Surveying potential habitats for the occurrence of the Four-horned antelope (*Tetracerus quadricornis*) in select Reserve Forests of the Madanapalle Range in Chittoor (West) Forest Division, Andhra Pradesh.
- Assessing the relative abundance of the antelope in the survey area.
- Relating the presence/ absence of the species to various habitat features.
- Identifying the immediate local threats to the survival of the Four-horned antelope.
- Publishing the findings of the study and preparing a species conservation and management plan for future implementation.

Objective 1: *Surveying potential habitats for the occurrence of the Four-horned Antelope (Tetracerus quadricornis) in select Reserve Forests of the Madanapalle Range in Chittoor (West) Forest Division, Andhra Pradesh.*

A team of six individuals carried out the survey in a Reserve Forest block of 15,000 ha in the Chittoor (West) Forest Division from October 2008 to June 2009. The survey area was chosen after obtaining preliminary information on the historical presence of the antelope in the area after consultations with the local villagers. Information on habitat type such as Dry Deciduous, Open or Dense Scrub, Grassland was recorded. Additionally qualitative habitat features such as terrain, slope, soil type, presence, nature and intensity of anthropogenic pressure were also noted. Quantitative information on vegetation (including trees, shrubs and grasses) was recorded for a 20 m radius around the midden. Information on vegetation like average height, presence of invasive weeds, availability of and proximity to water, distance from human settlements, incidence of fire and evidence of other fauna were also noted.

A total transect length of 189 km was covered over 240 hours of survey in a period of 9 months across the summer, monsoon and winter seasons. We also obtained photographs of the habitat characteristics and indirect evidence of the presence of the species and also recorded GPS coordinates of locations, especially the ‘middens’. These GPS coordinates of the indirect sightings were then plotted on a digital map to identify patterns of distribution in relation to the topography, areas affected by fire, and proximity to water. Information on habitat type such as Dry Deciduous, Open or Dense Scrub, Grassland was recorded. Additionally qualitative habitat features such as terrain, slope, soil type, presence, nature and intensity of anthropogenic pressure were also noted. Quantitative information on vegetation (including trees, shrubs and grasses) was recorded for a 20 m radius around the midden. Vegetation information on trees, shrubs and grasses and their average height, presence of invasive weeds, availability of and proximity to water, distance from human settlements, incidence of fire and evidence of other fauna) were recorded.

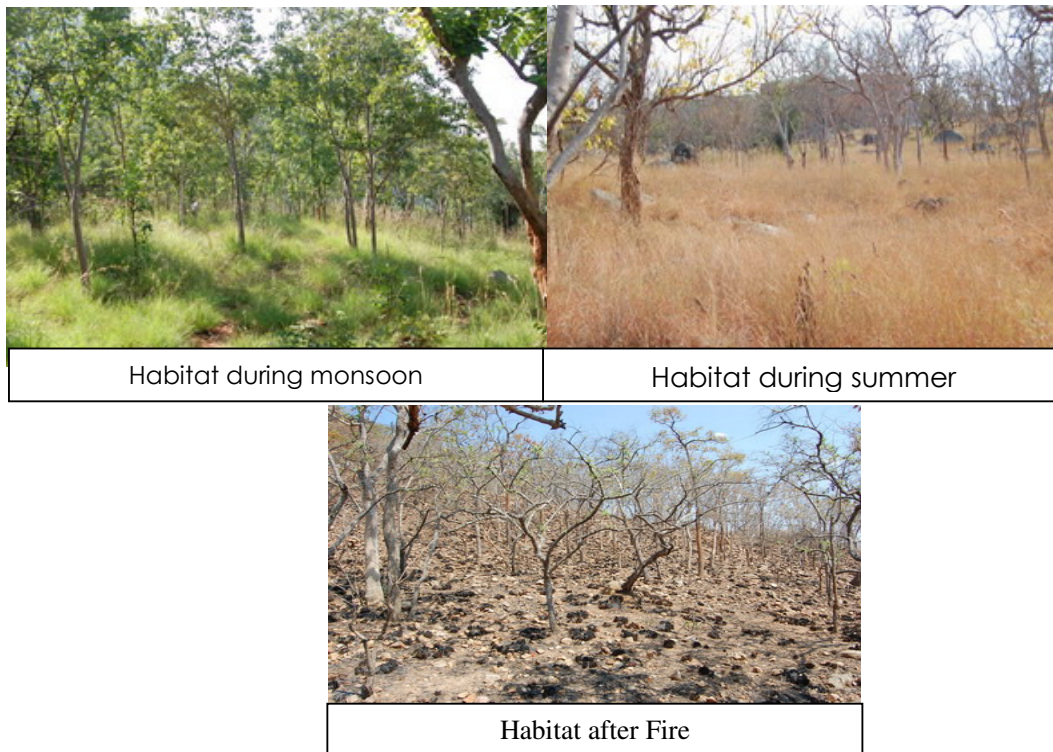
		
Typical habitat of the antelope with the midden in the foreground	The Track of the Four-horned antelope	The Midden of the Four-horned antelope

Objective 2: *Assessing the relative abundance of the antelope in the survey area.*

We categorised the survey area into two parts. 1) The Noorukuppalakonda and Tarigonda Reserve Forests together were considered as one with an area of about 8,000 ha. This group of forests is subjected to relatively more anthropogenic pressures as there are more habitations around these forests. 2)Tavalam Reserve Forest is about 7000 ha. in area with relatively less disturbance as there are fewer habitations around this forest.

Both the forests are similar in topography and have similar vegetation and are subjected to fire almost every year. Because of the other anthropogenic disturbances being heavier in the first, we assumed that

the density of the Four-horned Antelope would be higher in the second group, i.e. the Tavalam Reserve Forest.



Objective 3: *Relating the presence/ absence of the species to various habitat features (like macro and micro habitats, their shape, size, structure, biotic pressures, altitude, vegetation, availability of water, etc.)*

The physical characteristics of the habitat were compared between places with and without indirect evidence of the presence of the antelope. Factors compared include incidence of fire within 1 year prior to the survey, type of substrate, altitude, vegetation structure and composition, visibility, height of grass, proximity to water, intensity of anthropogenic pressure, presence of invasive weeds like *Lantana camara* and *Pterolobium indicum*, identified food plants like *Zizyphus spp.*, *Randia dumetorum*, intensity of pressure from livestock, etc.

Objective 4: *Identifying the immediate local threats to the survival of the Four-horned antelope.*

During the survey, anthropogenic disturbances were documented and it was found that the biggest threats are hunting and brewing. It was found that local villagers are hunting the antelope mostly for consumption with illegal muzzle-loading guns and also by snaring them. The antelopes are known to frequent water and most of the waterholes are seasonal. The hunters set up hides or snares near the permanent waterholes

in summer and wait in pursuit of the animal. This also prevents the animals from approaching water. Apart from hunting, illicit brewing at waterholes and thereby contaminating the water with waste is a deterrent to the antelopes from approaching water.



Waterhole Contaminated with waste after brewing



Hide of the antelope left behind in the forest by the hunters.

Objective 5: *Publishing the findings of the study and preparing a species conservation and management plan for future implementation.*

The results from this survey helped the Team present "Fire Influences Habitat Preference of the 'Vulnerable' Four-horned Antelope" at the 23rd International Congress for Conservation Biology at Beijing in July 2009. This presentation was aimed at inviting more inputs and discussions from experts that would help in planning the management of the habitat vis-à-vis the fire regime in an unprotected forest. In spite of acquiring data to support the fact that the antelopes have a preference for areas that are periodically subjected to burning, our team decided to expand the surveyed during the next phase of the project to get more data before attempting to draft a management plan.

Awareness of Biodiversity and Conservation among local communities.

We intended to have three presentations to the local communities and other local stake-holders on the findings of the survey. The fact that deliberate burning of the Reserve Forests is prohibited and punishable according to the State Forest Laws made the team decide that it is too early to discuss the positive influence of this illegal activity on the habitat at this stage of the project. In stead, we conducted a random survey of local village communities during September and October 2009 to understand their

awareness about biodiversity and conservation. The results are expected to provide baseline information, which would help the team to evaluate the impact of future conservation activities with the communities.

Results and Discussion

The typical habitat of the antelope comprised of small trees and open scrub with tall grass on the hill slopes and plateaus with relatively good visibility where fire is a recurring phenomenon. The most common trees in the areas where the antelopes are present include *Anogeissus latifolia*, *Terminalia tomentosa*, *Diospyros Montana* and *Dalbergia paniculata*. The most common shrubs are *Randia dumetorum*, *Chomelia asiatica*, *Dichrostachys cinerea* and *Dodonea viscosa*. During the survey, our team identified 76 middens and of these, 70 (92%) were found in areas that were burnt within 1 year prior to the survey. All the middens were found in an altitudinal range of 625 to 980 m, in flat areas where chances of middens being washed off with rain were minimal. The average height of vegetation within 20 m radius from the midden was found to be 7.5 m for trees, 3 m for shrubs and 0.6 m for grasses. We also found in some areas that the antelopes regularly visited the middens for defecation in spite of complete absence of green grass, herbs or shrubs due to fire that occurred a few days before the survey. Absence of scrub and lower branches of trees was a striking similarity between the locations of the middens. Most of the flora found in these burnt areas is fire-hardy species and some of them comprised of the food plants of the antelope like *Zizyphus aenoplia*, *Z. xylopyrus*, *Z. mauritiana*, *Gardenia gummifera* and *Randia dumetorum*, *Pterolobium indicum*, etc. *Cymbopogon coloratus*, also known as 'Thatching Grass' was found in abundance in these areas. Although this is not the food plant of the antelope, it provides good cover and during summer when the grass is dry, as the color blends well with the summer coat of the antelope. Probably such areas are chosen for shelter as they can provide camouflage and protection from predators. In spite of the presence of natural predators like the Leopard *Panthera pardus* and the Asian Wild Dog *Cuon alpinus*, we did not find any evidence of predation on the antelope. We found that the Wild Dogs pursued and hunted the Spotted Deer *Axis axis* at the foot hills and plains but not the Four-horned antelope at higher reaches. This could be due to the fact that the

antelopes are mostly found to be taking shelter in dense scrub or hiding in tall grass and are active only during the nights. In 32 out of 76 midden sites, we found the presence of *Lantana camara* and *Pterolobium indicum*, in mild to moderate density. We also found that while the antelopes feed on the fruits and tender shoots of *P. indicum*, they seem to avoid areas where there is dense growth of *Lantana camara*. The substrate in places where we found the evidence is mostly dry or gravelly. Although they seem to tolerate competition for food and water resources from other livestock, they avoid areas frequented by humans. While there was preference for feeding in areas like hill slopes and plains, the middens were mostly found in flat areas. It was also evident that the antelopes are visiting the middens in places where there is complete absence of green fodder due to fire.

The average height of trees, shrubs, and grasses within 20 m radius from the middens were 7.5, 3 and 0.6 m respectively. This implies that fire is probably responsible for maintaining the vegetation structure and composition that is conducive to the antelope. At places where they had sheltered, like in tall grass or in tree shade during the hot hours, we found that they had ruminated seeds of plants like *Zizyphus xylopyrus*.



From discussions with the local villagers, we found that the antelopes lead more or less sedentary lives confined to small areas within the surveyed area and this has not changed for many decades.

Future Course of Action:

We intend to undertake detailed study on the feeding and breeding biology of the Four-horned Antelope in select habitats from the currently surveyed area. More information on habitat use, population estimates in relation to incidence of fire and the ecology of the food plants would be obtained before preparing a habitat management plan for the area. Since the surveyed forests are not part of a Protected Area, the use of the forest resources by the local communities is likely to continue in future and so also the practice of burning by the local communities. Monitoring the incidence and frequency of fire and the occupancy of habitat by the antelope would be undertaken in the next phase of the project along with monitoring the spread of *Lantana camara* and changes in vegetation composition. The phenology of the food plants in order to gauge the impact of climate change on the habitat and the ability of the antelope to adapt to these changes. Discussions with communities need to be undertaken immediately to address the issues of hunting and breeding. The survey area is also prone to recurring droughts which sometimes extend to a few years when scarcity of water becomes a pressing issue. During the survey, we found a number of man-made water-harvesting structures within the forests that are many years old. Most of them are heavily silted and the storage capacity is drastically reduced. De-silting of these small waterbodies as a habitat-improvement measure will certainly help the species by making water available for an extended period during summer. Involving the local communities in this activity would also help in bringing them face-to-face with the situations affecting the antelope. We also intend to undertake conservation awareness activities with the local communities including nearby schools in future.

Acknowledgements

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Appendix 1

Data Form for the Survey of the Four-horned Antelope

Transect No:

Date:	Name of the Forest Range:	Name of R.F./Beat:
Altitude	Latitude	Longitude
Macro habitat	Micro habitat	Terrain
Slope (Gentle/ Moderate/ Steep)	Soil Type (Sandy/ Loamy/ Clayey/Gravelly)	
Livestock Use: Browsing/ Dung)	Absent/ Mild/ Moderate/ Heavy	Grazing/
Cutting/ Lopping (Y/ N) (Y/N)	Fire(Y/ N)	Hunting:
Brewing (Y/N)	Any other:	
Water: (Y/N)	Standing/ Running	Seasonal/ Perennial
Nearest Human Settlement	_____ Km	
Most Common Trees:	1.	2. 3.
Avg. Height (in m):		
Most Common Shrubs:	1.	2. 3.
Avg. Height (in m):		
Grass (Open/ Sparse/ Thick) >4 Ft	Height: <12 inches	1-2 ft 2-4 ft
Weeds: 1. <i>Lantana</i> 2. <i>Pterolobium</i>	Absent/ Sparse/ Moderate/ Dense Absent/ Sparse/ Moderate/ Dense	

Species Info (Please Check)
Midden

Direct Sighting

Tracks

(Nos. & time)

Start Time:

End Time:

Start Location:

End Location:

Other Faunal Evidence:

Transect Length:

Remarks:

Biologist:

Team:

Respondent/s:

Appendix 2

FINANCIAL STATEMENT		
Particulars	Total Budget (in USD)	Amount Spent (in USD)
Project Preparation		
Communications (Telephone/Internet/Postage)	25	25
Printing Journal articles/ materials	25	25
Visas and Permits*	300	0
Reconnaissance	25	25
Medical Supplies/ First Aid	15	24
Scientific/Field Equipment, Supplies*	580	0
Photographic Equipment	100	93
Camping Equipment*	465	0
Maps	10	10
Fuel	15	15
Project Implementation		
Insurance*	600	0
Food expenses	650	678
Transportation	260	1132
Stipend/ Wages	3360	3349
Post-project Expenses		
Administration	100	72
Report production and result dissemination	250	233
Others*	150	140
Total	6930	5821
* Less:		
1. Visa expenses, 300 USD*		
2. Sci. Equipment, 580 USD*		
3. Camping Equipment, 465 USD*	1345	0

Net Total	5585	5821
1 USD = 43 INR		

Appendix 3

Explanatory Notes for Financial Statement

Visas and Permits:

The amount budgeted under this head is not shown under ‘Amount Spent’ as the expenses were met by CLP.

Scientific and Camping Equipment:

The equipment under the heads ‘Scientific/ Field equipment and supplies’ and ‘Camping equipment’ were provided by Idea Wild through CLP and therefore not shown under ‘Amount Spent’.

Insurance:

The amount budgeted for ‘Insurance’ was not utilized for the purpose. The reason being the demise of one of the team members (Pradeep Kumar) following which, the team was left without a two-wheeler for field trips. Another team member (Manesh Mani) did not join the team for personal reasons and thereby, the team was left without the two bikes for making field visits. There was no option but to hire a jeep for field visits and the additional amount required was utilized from the ‘Insurance’ account head. The survey team voluntarily decided to carry out the work uninsured.

Others:

Under the Post-project activities, it was stated that the results from the survey would be disseminated to the local communities. One of the major findings of the survey was that fire has a positive influence on the habitat preference of the Four-horned Antelope. These fires in the survey area are deliberately started by the local communities, which is an offence under the A.P. Forest Laws. Concerned that discussing this finding might encourage the villagers to indulge in this act that is legally forbidden, the team decided to undertake a random survey of the same communities with a questionnaire interview to assess their attitude towards, and awareness of biodiversity and conservation. This was done as the data would help the team in planning awareness campaigns and also serve as baseline information for future evaluation of the impact of such campaigns. Hence, the funds under the budget head ‘Others’ were utilized for conducting the questionnaire interviews.
