



STATUS OF TIGERS & PREY BASE IN AMRABAD TIGER RESERVE 2021

(WILDLIFE CENSUS REPORT)





Porcupine



Chinkara



Preface

Conservation of landscapes with its flora and fauna is very crucial for the survival of human kind.

Tiger reserves in India are doing the same i.e. conservation of landscapes and Amrabad Tiger Reserve (ATR) , a part of Nallamala Hills Landscape is in the forefront in Conserving the Nature with its flora and fauna.

Managers of Tiger reserves always wanted to know answers for certain questions like What are the trends in the tiger population in the reserve? Where the tigers are moving and where they are totally absent? Which new areas have they colonized? What is the quality of the habitat, prey availability, and other characteristics of these areas? How often do tigers move between Nagarjuna Sagar Srisailem Tiger Reserve and Amrabad Tiger Reserve.?

Answers to these questions are important for the Field Director for planning and implementing conservation management for tigers and their habitats.

By conducting regular annual wildlife census using different methods, prescribed by the NTCA and the Wildlife Institute of India, Dehradun, Line Transect method of estimation of population density for Wild ungulates and Phase -IV estimation protocol for Tiger population estimation, we may get some answers to the above questions. Annual census of Wild animals is very important for Tiger Reserves for proper management and to make necessary changes in the Management Plan of the Tiger Reserve.

I hope, having understood the importance of the ungulate census and Tiger census, all the staff of the Amrabad Tiger Reserve, would regularly take up this exercise annually with utmost sincerity, seriousness and accuracy.

I express my gratitude to Smt. Shobha IFS, Prl. Chief Conservator of Forests & HOFF and Chief Wildlife Warden, Telangana for her constant guidance and encouragement and I extend my sincere Thanks to Dr. Sidhanand Kukreti, IFS., Addl. PCCF (WL) and Sri Shankaran, OSD (Wildlife) for their quick positive response & guidance in many issues pertaining to ATR.

I express my sincere Thanks to Sri S.P Yadav IFS., ADG & Member Secretary, NTCA and Sri N.S. Murali, IG, South Zone, NTCA for their cooperation guidance and encouragement.

Thanks a bunch to my young team of DFOs and FDOs- Sri G. Kishta Goud, DFO, Nagarkurnool, Sri Sivala Rambabu, IFS, DFO, Nalgonda, Sri Rajashekar Petla, IFS, FDO, Achampet, Sri Rohith Gopidi, IFS, FDO, Amrabad and Sri Sarveshwar, FDO, Nagarjunasagar. All the Biologists who became resource persons for imparting training to the staff for the census exercise, Sri Mahender, Biologist for Mouse Deer Project, Sri Ravikanth (ATR-Monitoring) and Sri Bapu Reddy, Biologist from our long time associated Tiger Conservation NGO, HyTioCo's . My thanks are to all the staff regular, out sourcing employees involved in the census program. Finally, I thank my GIS lab in charge Sri Bhasha, DPO and Sri Krishna Rao, Sri Shashikanth, Sri Shekhar, Mamatha & Srikanth for their sincere efforts.

- B. Srinivas, IFS.,

Chief Conservator of Forests & Field Director,
Amrabad Tiger Reserve, Achampet.



Nilgai



Jackal



Chowsingha



Palm civet

STATUS OF TIGERS IN AMRABAD TIGER RESERVE-2021

1. INTRODUCTION

Tiger (*Panthera tigris*) is our national animal, it is the largest member of the Felidae (cat) family. It has thick reddish coat with white belly and white and black tails. Their heads, bodies, tails and limbs have narrow black, brown or gray stripes and a white spot on ears. It is a majestic creature, an important apex predator with distinctive stripes and solitary in nature and they represent a keystone species necessary for ecosystem to survive. Role of tigers as a top predator is vital in regulating and perpetuating ecological processes.

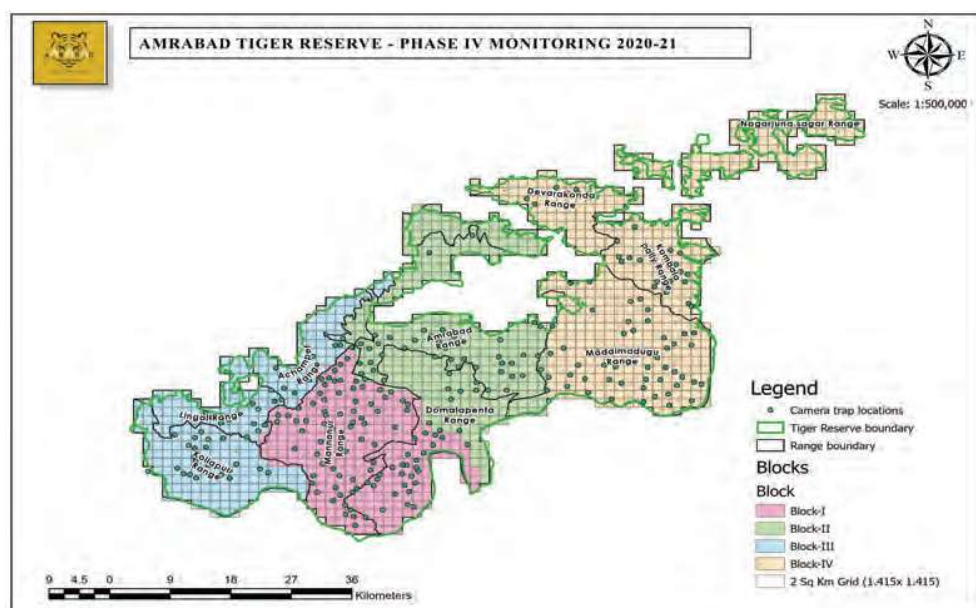
In India, tigers inhabit a wide range of habitats from high mountains, mangrove swamps, tall grasslands, to dry and moist deciduous forests, as well as evergreen and shola forests. Tiger needs a large undisturbed tracts of habitat with good forest cover with ample prey base to maintain long-term viable populations; thus acting as an umbrella species for a majority of eco regions in the Indian sub-continent.

Intensive monitoring of tiger source populations in tiger reserves and protected areas in each tiger landscape complex is being done through Phase-IV exercise, duly deploying Camera traps in 2 Sq.Kms grids in Tiger Reserve area. And

maintenance of a centralized photo-database of tigers is being done at NTCA obtained from camera traps deployed across all tiger reserves. Routine management-oriented monitoring, which, inter alia, comprises of regular monitoring of tiger signs at beat level, which can potentially be integrated with monitoring of law enforcement and patrolling. (NTCA Phase IV Protocol).

Amrabad Tiger Reserve is situated in the Nallamala hills of Eastern Ghats landscape of Nagarkurnool and Nalgonda districts of Telangana. It is located at the geo-coordinates: 79°.40' N, 160°.70' E and 78°.48' N, 160°.21' E (North) and 78°.73' N, 160°.00' E and 79°.42' N, 160°.58' E (South). The Reserve extends till Mahabubnagar and Nalgonda districts and is about 150 km south of Hyderabad on the Northern bank of Krishna River. The core zone covers a total area of 2166.37 km² and the Reserve has a buffer area of 445.02 km².

The Amrabad Tiger Reserve is home to highest population of Tigers in Telangana. The tiger Reserve has hilly mountains with deep valleys and gorges forms the catchment of River Krishna. The reserve was notified as a Wildlife Sanctuary in the year 1983 and after bifurcation from united Andhra Pradesh in 2014, it was declared as Amrabad Tiger Reserve.



2. METHODS

Phase IV Tiger monitoring protocol:

- Phase IV monitoring has been conducted in 9 Ranges out of 11 Ranges of Amrabad Tiger Reserve, which is divided into three blocks. First block comprises, Domalapenta and Mannanur Ranges, second block comprises Amrabad and Mannanur Ranges and third block comprises Achampet, Lingal, Kolhapur, Kambalapally and Devarakonda Ranges (Table1).
- Sign survey is a prime work to know the tiger occupancy using indirect evidence like, scat, pugmark, scrape mark and rake mark in the 2 km² grids
- The total of 276 grids were selected in Amrabad Tiger Reserve, each grid has unique ID number given by NTCA (see Map)
- In each grid double sided camera traps were deployed
- For each Camera trap location interval is 0.8 km to 2 km

- And the total of 552 camera traps have been monitored about 45 days
- Two to three times data has been downloaded from each camera

3. DATA ANALYSIS

- No two tigers have the same Stripes. Like human fingerprints, their stripe patterns are unique to each individual.
- After segregation of all tiger images, marked and identified individual tigers by using stripe pattern.
- And each individual tiger image is compared with existing Database









4. RESULTS

During Phase IV monitoring, a total of 14 individual tigers were recorded, among these 5 tigers are male, 7 tigers are females and 2 tigers are un-classified. 10 tigers are matched with existing Database, and 4 Tigers are recorded first time in this current year (Picture 1).

Table 1: List of Camera traps deployed in Amrabad Tiger Reserve during Phase IV monitoring, 2021

Sl. No	Block ID	Name of the Block	Division	Range	No. of Camera trap locations	No. of Camera traps deployed	Period
1	I	AMRA-BLOCK I	Amrabad	Domalapenta	43	86	16 Mar 2021-10 May 2021
2	I	AMRA-BLOCK I	Amrabad	Mannanur	67	134	16 Mar 2021-10 May 2021
3	II	AMRA BLOCK-II	Amrabad	Amrabad	41	82	30 Dec 2020--20 Feb 2021
4	II	AMRA BLOCK-II	Amrabad	Maddimadugu	50	100	30 Dec 2020--20 Feb 2021
5	III	AMRA BLOCK III	Achampet	Achampet	11	22	23 Mar 2021-30 May 2021
6	III	AMRA BLOCK III	Achampet	Lingal	14	28	23 Mar 2021-30 May 2021
7	III	AMRA BLOCK III	Achampet	Kolhapur	24	48	23 Mar 2021-30 May 2021
8	III	AMRA BLOCK III	Nagarjunasagar	Kambalapally	20	40	23 Mar 2021-30 May 2021
9	III	AMRA BLOCK III	Nagarjunasagar	Devarakonda	6	12	23 Mar 2021-30 May 2021
Total	3 Blocks	3 Blocks	3 Divisions	9 Ranges	276	552	5 months

Picture 1 : Digital Database of 14 Individual Tigers recorded and Identified in Amrabad Tiger Reserve-2020-21

Tiger Id.	Right Flank	Left Flank
ATR-M-4		
ATR-F-6		
ATR-F-7		
ATR-F-11	 <small>6/14/2018 5:38 AM</small>	 <small>4/27/2021 3:03 AM AC C 029</small>

ATR-F-12



ATR-M-13



ATR-F-18



ATR-M-19



ATR-M-22



ATR-M-23



ATR-F-24



ATR_25



ATR-F-26		
ATR_-27		No Left flank

Note: Amrabad Tiger Reserve is giving Identity Numbers to individual Tigers since 2017



Brown headed Barbet



Indian Courser

POPULATION DENSITY ESTIMATION OF WILD UNGULATES IN AMRABAD TIGER RESERVE DURING 2021

I. INTRODUCTION

Estimating population density of animal species, more specifically the mammalian species that attract conservation interest (Krishnan, 1972; Ramachandran, et al., 1986), is a basic information needed for wild animal conservation and population management. In the past, studies on population size were mostly relied on total count method, which is known for inherent problems like double counting, missing of sightings that resulted in low precision and accuracy of estimates. Since 1990 the use of line-transect direct sighting methods, a technique developed to overcome many of the disadvantages of total count method, yielded statically robust, precise and accurate estimates. However, in tropical forests estimating the animal density using line transect method is also difficult owing to poor visibility and low density of some species resulting in inadequate sample size to obtain statistical precision.

Scientific data on population size is essential to understand the population trend in comparison with data from past. However, the lack of published scientific data collected using the standard methods in the past is one of the major drawbacks in understanding the trend of the populations. Additionally, most studies on population in the past focusing largely on estimating the population size or densities, failed to account for other important aspects of population demography viz. age structure, sex ratio, etc. Knowledge of the age structure of population is essential for investigating trends in natality, recruitment, mortality, reproductive status and other life history parameters (Lindeque 1991; Stearns 1992) and also for managing species in the long-run (Fiedler and Kareiva, 1998).

The age structure of population expressed as the distribution of the number of individuals in

each age group reflects not only the net fecundity and mortality schedules of a population (Lindeque, 1991), but can also be used as an indicator of population increase. Needless to say, that estimating population size or structure with reasonable accuracy and precision is the very first step in this direction and interpreting the results beyond this point has more implications for management of the species concerned.

Objectives

- Estimate the population size of using line-transect distance sampling method in Amrabad Tiger Reserve
- To know the water availability and utilization of water by Wild animals at all water bodies during summer in the Amrabad Tiger Reserve (in & around the protected area)
- Suggest measures to improve the long-term survival and effective monitoring of these prey species in Amrabad Tiger Reserve

II. METHODOLOGY

Study Area: Amrabad Tiger Reserve is situated in the Nallamala hills of Eastern Ghats landscape of Nagarkunool and Nalgonda districts of Telangana. It is located at the geo-coordinates: 790.40' N, 160.70' E and 780.48' N, 160.21' E (North) and 780.73' N, 160.00' E and 790.42' N, 160.58' E (South). The Reserve is about 150 km south Hyderabad on the Southern bank of Krishna River. The core covers a total area of 2166.37 km² and has a buffer area of 445.02 km².

Area coverage: The present population estimate covered the entire Amrabad Tiger Reserve, area about 2611.4 sq. km

Study Species: The present exercise considering need for minimum sample to estimate reliable population density of prey species like Sambar, Spotted deer, Neelgai and Wild pig etc., in Amrabad tiger Reserve, Telangana

Planning of Event: Sri. B. Srinivas, IFS, Chief Conservator of Forests & Field Director, Amrabad Tiger Reserve, coordinated the census and Sri. Kista Goud, Deputy Conservator of Forests, District Forest Officer, Nagarkurnool District, Sri. Rambabu, IFS, District Forest Officer, Nalgonda, Sri. Rajashekar P. IFS, Forest Divisional Officer, Achampet Division, Sri. Rohit G. IFS, Forest Divisional Officer, Amrabad Division, Sri. Sarveshwar, ACF, Forest Divisional Officer, Nagarjunasagar Division have organized the census work, with the assistance of all Forest Range Officers of Amrabad Tiger Reserve and the exercise was carried out with active technical support by a research team (Mr. M. Ravikanth, Research Biologist, Mr. D. Mahender Reddy, Biologist and Mr. Bapu Reddy, Research officer, HyTiCoS).

The field surveys to assess the population estimate of Wild animals was planned for a period of two days from 17th to 18th April, 2021. Before conducting census training program conducted for staff from Forest Beat Officers to Forest Range Officers at all divisions by research team and provided data sheets to staff.

Study Methods:

I. Line transect method: Line transect direct sighting method (Burnham et al., 1980) has been widely accepted as the standard scientific method to estimate the density of mammals and birds and has been used to estimate population density of mammals in India. Thus, it was decided to use the line transect direct sighting method. We marked a total of 185 transects that represented the different habitats available in the Tiger Reserve, with 2 km transects (for more details about transects see Annexure I) (Map 2).

As line transect method requires a minimum of 40 sightings to arrive at reliable density estimation, existing 185 transects were surveyed one time for 2 survey days (i.e., 17th & 18th April, 2021), one time each during morning (between 06:00 and 09:00)

II. Water hole census: We conducted all wild animal census at water bodies in and periphery of the Tiger Reserve. Covered at least one water body from each beat. The total of 181 water bodies were surveyed in one day (i.e., 16th April, 2021), for twelve hours duration from 6:00 AM to 6:00 PM. The field teams consisted of two members; they have recorded each observation in given data sheet (Annexure II) (Map 3).

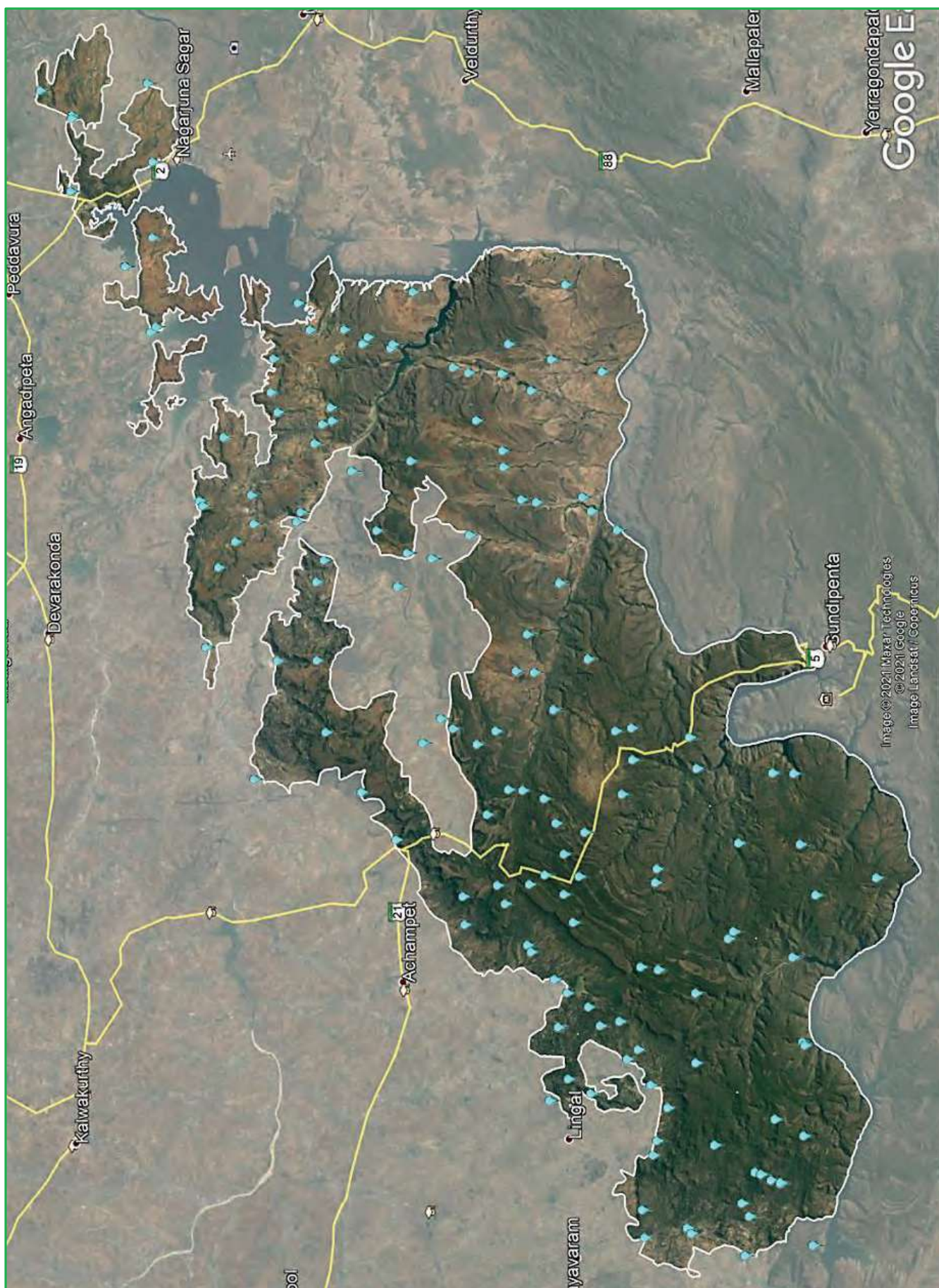
Data Collection:

Line transect method: Field teams consisted of two members in each, started the transect surveys at a fixed time i.e 6.00 AM. On each sighting of the any Wild animal/s, the observers have estimated the Perpendicular distance and recorded geo-coordinates. Besides, the observers have also recorded the group size and group composition of the target species. Up on each sighting of group of wild animals, every individual's age (adult and fawn) and sex (male and female) were recorded based on their morphological appearance. (Data sheet. Annexure III)

Water hole Census: Survey team members have reached before 6:00 AM and selected hide place nearby water body and recorded the observations without making noise. The observers have recorded each observation, time of arrival, group size, sex, duration of animals spent at water hole and other activities. And the survey team also recorded indirect evidences of wild animals. (Data sheet. Annexure IV)



Map 2: Map showing the line transects in Amrabad Tiger Reserve, April 2021



Map 3: Map showing the Water hole points in Amrabad Tiger Reserve, April 2021

Data Analysis of Line Transect Method:

Population Size: In total, the survey of 185 transects with 1 temporal replicate (two days) totaling 740 km distance yielded 760 sightings of 1)Nilgai (141), 2) Sambar (178), 3) Spotted deer (305), 4) Four-horned antelope (25), 5) Wild pig (111) & 6) Common langur (94). Using the transect data, density was estimated following distance-sampling techniques employing the software DISTANCE (Version 7.3, Buckland et al., 2004; Thomas et al., 2005). Distance sampling methods relax the assumption that all individuals must be detected, this approach estimates the detection probability by the measuring the tendency of animal detection, which is based on the assumption that detection probabilities decrease with increasing perpendicular distance from the line. Detection probability or detectability is a methodological aspect, a component of animal count in distance sampling, which can be defined as the ability to detect a species available in a survey area, covering a particular sampling effort. Distance sampling allow us to estimate the population corrected for imperfect count or account for an estimate of the animals missed. Hence, in a survey when one reliably estimates the detection probability, the population size estimated from that survey can be considered as precise and reliable compared to other techniques that do not consider detectability.

We estimated the group and individual density of the study species and their Standard Error (SE) were estimated, evaluating the three different models of detection probability, viz. uniform, half-normal and hazard-rate with combination of three different series adjustment terms viz. cosine, simple polynomial and hermite polynomials. The combination includes detection probability uniform with cosine series adjustment, uniform with simple polynomial and uniform with Hermite polynomial and similar combinations for half-normal and hazard-rate. From nine different combinations of analyses, the best model of density estimate was selected separately for each species using the minimum Akaike Information Criteria (AIC) ($\Delta AIC = 0-2$), as the standard model selection procedure. (Table 2)

Population structure: It has been emphasized that a population's age structure is important to understand the sociality, reproduction, recruitment, and survival, thus suggesting its importance on the population dynamics (Coulson et al. 2001; Gaillard et al. 2001, 2003). That is because different age-sex classes have inherently different patterns of social organization, survival and reproductive potentials and therefore a population's performance will necessarily vary with its age-sex composition. The present study collected the data on population size following age-sex classification based on direct sighting of 5 herbivorous species. (Table 3 and Graph 1)

On every sighting of target species, each individual was age-sexed into a given age-sex class (Adult male, Adult female, Young & Un classified) following the characteristics of the coat colour and shoulder height of various age-sex classes of the species. The collected data were analyzed to obtain the age structure: percentage of adults, sub-adults and fawn in the population, sex ratio: the male to female ratio at adult and fawn and fecundity: number of fawns per adult female during the survey time. Since differentiating the sex for fawn is not possible, the sex ratio for the fawn assumed to be equal, as sex ratio at birth is equal among polygynous species (Trivers and Willard, 1973).

Water hole Census: The water bodies are categorized such as natural spring, natural stream, natural chelima, River, check dam, Percolation tank, Water tank (Pond & lake), Solar PT and Saucer pits. And grouped each type of water body and estimated total count of each species.

III. OBSERVATIONS AND RESULTS

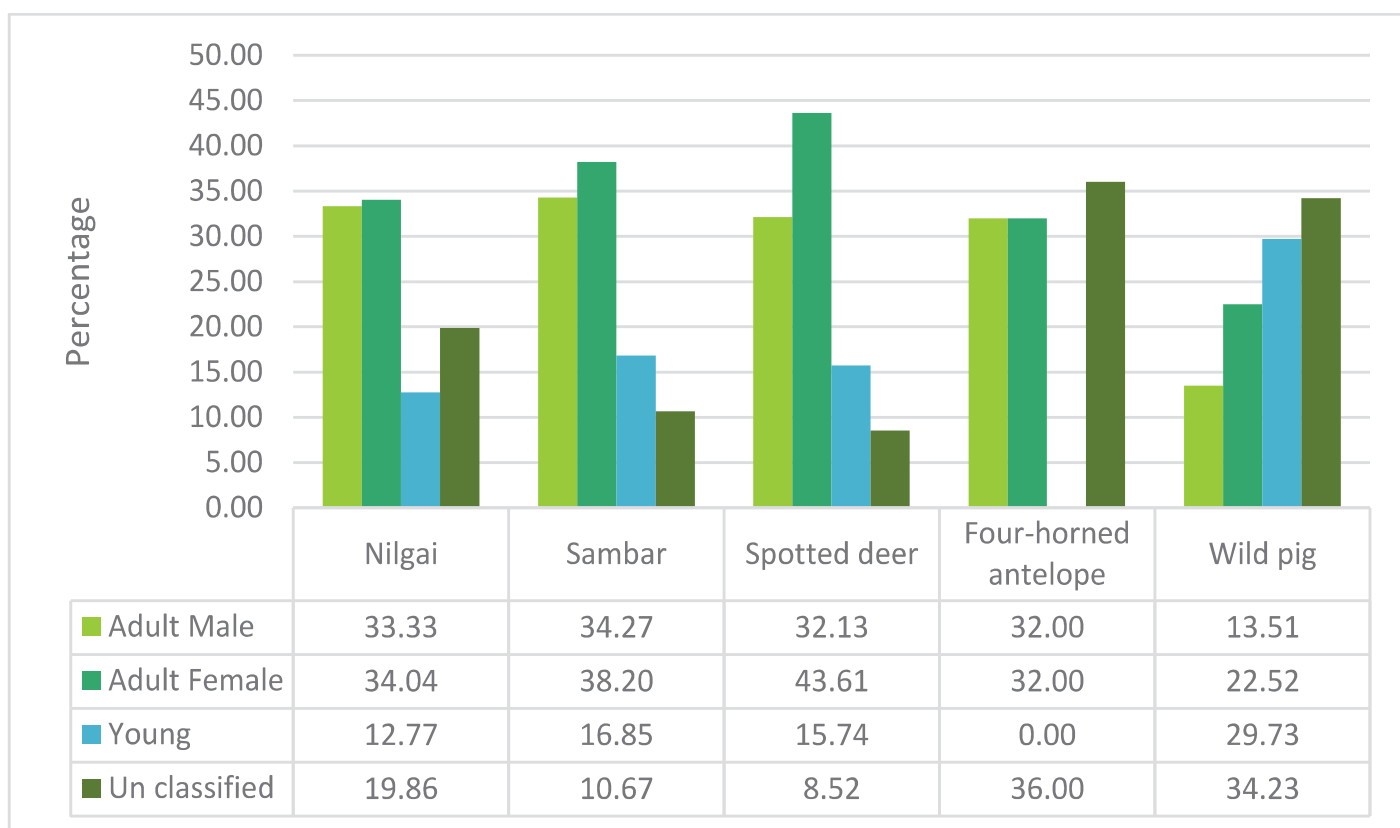
Table 2: Density estimate of Nilgai, Sambar, Chital, Four-horned antelope, Wild pig & Common langur in Amrabad Tiger Reserve, Telangana, and using line transect direct sighting method and distance sampling analysis (Values with \pm are mean and standard error).

Parameters	Nilgai	Sambar	Chital (Spotted deer)	Four-horned antelope	Wild pig	Common langur
No. of transects	185	185	185	185	185	185
Effort (l/km)	740.0	740.0	740.0	740.0	740.0	740.0
Number of group detection (n)	72	79	73	16	51	20
Key function model	Half-Normal	Half-Normal	Half-Normal	Half-Normal	Half-Normal	Half-Normal
Key adjustment	Simple Polynomial	Simple Polynomial	Simple Polynomial	Simple Polynomial	Simple Polynomial	Simple Polynomial
Detection probability	0.80 ± 0.88	0.66 ± 0.64	0.68 ± 0.76	0.74 ± 0.15	0.55 ± 0.61	0.64 ± 0.11
Effective strip width (m)	80.43 ± 8.89	79.36 ± 7.75	81.87 ± 9.22	80.73 ± 16.81	61.05 ± 6.78	77.3 ± 14.27
Encounter rate of group/km (n/l)	0.97	0.10	0.98	0.21	0.68	0.27
Encounter rate % Coefficient Variation (CV)	10.59	9.99	10.50	24.49	13.02	21.78
Mean group size	2.23 ± 0.19	2.69 ± 0.23	4.73 ± 0.40	1.68 ± 0.28	3.84 ± 0.46	7.15 ± 1.34
Group density/km ²	0.60 ± 0.92	0.67 ± 0.93	0.60 ± 0.92	0.13 ± 0.43	0.56 ± 0.96	0.17 ± 0.49
Group density % CV	15.31	13.97	15.40	32.16	17.12	28.47
Group density 95%CI	0.44 - 0.81	0.51 - 0.88	0.44 - 0.81	0.71 - 0.25	0.40 - 0.78	0.99 - 0.30
Individual density/km ²	1.41 ± 0.24	1.65 ± 0.27	2.4 ± 0.44	0.22 ± 0.79	2.41 ± 0.54	1.37 ± 0.52
Individual density % CV	17.47	16.50	18.69	35.83	22.48	37.87
Individual density 95%CI	1.00 - 1.98	1.20 - 2.28	1.65 - 3.44	0.11 - 0.44	1.55 - 3.74	0.66 - 2.85
AIC (ΔAIC)	662.16 (0.00)	745.81 (0.00)	691.11 (0.00)	150.61 (0.00)	464.13 (0.00)	189.98 (0.00)

Population structure

Table 3: Population size of Nilgai (n=141), Sambar (n=178), Chital (n=305), Four-horned antelope (n=25) & Wild pig (n=111) during line transect direct sightings in Amrabad Tiger Reserve, Telangana

Parameters	Nilgai	Sambar	Chital	Four-horned antelope	Wild pig
Percentage of adults in the population	34.04	34.26	32.13	32.00	13.5
Percentage of fawn in the population	12.76	16.85	15.73	0	29.72
Sex ratio (Male: Female)	1:1.02	1:1.11	1:1.35	1:1	1:1.66
Fecundity (Young/ adult female)	0.37	0.44	0.36	0	1.32



Graph 1: Showing the age-sex composition of Nilgai, Sambar, Chital (Spotted deer), Four-horned antelope & Wild pig recorded during population estimate

The total 22 species have been direct sighted during line transect, which includes mammals, avian fauna and reptiles. (Table 4)

IV. DISCUSSION AND CONCLUSION

Though the study has come out of a scientific data on population size and structure, the findings are based on a short-term assessment. As discussed above, precision in population size estimate could improve with sample size and hence the estimate would be more reliable. Similarly, in the case of population size assessment, long-term data and analysis incorporating mortality data would shed more light on the population trend of the study species. Therefore, a continued effort of similar exercise on biannual basis is suggested by this study.

V. LACUNAE IN THE PRESENT EXERCISE & RECOMMENDATIONS

Population size data: Although the present exercise using line-transect direct sighting method

yielded more detailed scientific details on the population size, there is still scope for further improvement to obtain reliable estimates. In this context, the following measures are suggested.

- i. Need for more temporal replicates of the transects: The line transect direct sighting method requires adequate sample size to yield reliable results and obtaining adequate sample size depends on various factors like visibility, target species density, number of spatial and temporal replicates etc. However, visibility and animal species density are the inherent characteristics of the area and one cannot change these aspects. The spatial and temporal replicates can be planned in such a way that maximize sample size and improve accuracy and precision. We have sampled the 185 transects two times within span of two days. The analysis will be more robust and accurate with increased sampling. Therefore, going by the encounter rates obtained in the

Table 4: List of animals direct sighted during line transect survey in Amrabad Tiger Reserve, April, 2021

Sl No.	Class	Species	Scientific name	IUCN status	Adult Male	Adult Female	Young	Un classified	Total count
1	Aves	Grey jungle fowl	Gallus sonneratii	Least Concern	9	11		2	22
2	Aves	Indian Peafowl	Pavo cristatus	Least Concern	81	95	4	26	206
3	Mammals	Black buck	Antelope cervicapra	Near Threatened	3	8			11
4	Mammals	Indian hare	Lepus nigricollis	Least Concern	2		5	83	90
5	Mammals	Chinkara	Gazella bennettii	Least Concern	1	2			3
6	Mammals	Four-horned antelope	Tetracerus quadricornis	Vulnerable	8	8		9	25
7	Mammals	Indian Giant Squirrel	Ratufa indica	Least Concern				3	3
8	Mammals	Common langur	Semnopithecus entellus	Least Concern	15	4	59	16	94
9	Mammals	Indian Crested Porcupine	Hystrix indica	Least Concern	1			3	4
10	Mammals	Jungle Cat	Felis chaus	Least Concern	1			2	3
11	Mammals	Leopard	Panthera pardus	Vulnerable	1			2	3
12	Mammals	Indian grey mongoose	Herpestes edwardsi	Least Concern			2	2	4
13	Mammals	Nilgai	Boselaphus tragocamelus	Least Concern	47	48	18	28	141
14	Mammals	Rhesus macaque	Macaca mulatta	Least Concern			8	4	12
15	Mammals	Sambar	Rusa unicolor	Vulnerable	61	68	30	19	178
16	Mammals	Sloth bear	Melursus ursinus	Vulnerable	4	3	4	14	25
17	Mammals	Wolf	Canis lupus	Least Concern				2	2
18	Mammals	Chital (Spotted deer)	Axis axis	Least Concern	98	133	48	26	305
19	Mammals	Wild Dog	Cuon alpinus	Endangered	3	3		4	10
20	Mammals	Wild pig	Sus scrofa	Least Concern	15	25	33	38	111
21	Reptiles	Bengal monitor Lizard	Varanus bengalensis	Least Concern				3	3
22	Reptiles	Indian star tortoise	Geochelone elegans	Critically Endangered				1	1

present exercise, a minimum of two such efforts annually, would be more appropriate. We decided that the Amrabad Tiger Reserve shall carry out a long-term monitoring of the population estimate so as to estimate the population more reliably.

- ii. Need for a second survey: As the current survey report is based on a sample size of 16 sightings of Four-horned antelope and 20 sightings of Common langur, which are less than the minimum suggested (40), a second survey would further strengthen the scientific quality of the current report.

Population structure data fine tuning: The population structure data, in the present exercise, obtained only during the line transect sampling. However, considering conditions/assumptions of the line transect direct sighting method, it won't be possible or appropriate to obtain age-sex composition details for all the sightings recorded in line transect.

Need for more detailed age-sex classification: Detailed age-sex classification needs to be followed for accurate estimate of age structure, fecundity rate and reproductive performance of the population etc. Such sampling should also include breeding season of the species.

WATER HOLE CENSUS

Water is very essential especially during summer herbivores need more water when compared to winter and rainy season. During the water hole census as many as 43 species recorded in Amrabad Tiger Reserve, which includes 17 Mammals, 25 Aves and 1 reptile. Pertinent to note that three (3) domestic cattle varieties (Cattle, Sheep & Goat) were recorded during monitoring of each water body. The water hole census showing the highest species richness (n=43) and no. of individuals, highest count of 482 individuals of Spotted deer was observed. And all major herbivores have been recorded during census, such as Nilgai, Sambar, Chital, Wild pig, Four-horned antelope and Chinkara. (Table 5)

From the table and graph it is evident that maximum Wild animal species are using water holes in early morning hours i.e. 6:00 AM-9:00 AM and again in the evening hours i.e. 4:00 PM and 6:00 PM.

Coming to utility of water hole by important prey basis in Amrabad Tiger Reserve is as follows;

- i. Spotted deer species is using water holes throughout the day but maximum number of animals recovered early in the morning 6:00 AM to 7:00 AM and again 5:00 PM to 6:00 PM in the evening with less number of animals using the water holes from 12:00 PM to 3:00 PM.
- ii. Second important prey species that is Sambar, Sambar is also visiting water holes from morning 6:00 AM to 10:00 AM and again 3:00 PM to 6:00 PM with sporadic visits by some animals from 10:00 AM to 3:00 PM.
- iii. Nilgai is also visiting maximum in early morning 6:00 AM to 9:00 AM and 4:00 PM to 6:00 PM however it is found that some groups particularly visiting water holes between 11:00 AM to 2:00 PM.
- iv. Another important prey basis is Wild pig in ATR is using during all hours, however the concentration is morning from 6:00 AM to 9:00 AM and it has gone down up to 5:00 PM again the heavy concentration of Wild pig using water holes during 5:00 PM to 6:00 PM.
- v. Grey langurs are using water holes in ATR throughout the day, but however it can be divided in three phases; morning 6:00 AM to 8:00 AM, afternoon 11:00 AM to 1:00 PM and 5:00 PM to 6:00 PM, during the other period concentration is less.

Table 5. Total number of wild and domestic herbivore species counted during the census in and periphery of the Tiger Reserve**(n = the number of 12 hour counts at each waterhole)**

Sl. No	Class	Species	Natural spring (n=11)	Natural stream (n=58)	Natural chelima (n=17)	Wild animal water drinking point @ River (n=20)	Water tank (n=17)	Percolation tank (n=11)	Check dam (n=2)	Solar PT (n=8)	Saucer pit (n=37)	Total
1	Mammals	Wild dog	20	17		10	3	13		4	11	78
2	Mammals	Small indian fox				4						4
3	Mammals	Sloth bear		4	1		2	1		1	4	13
4	Mammals	Nilgai	6	39	5	4	4	3			24	85
5	Mammals	Sambar	34	58	13	19	3	26	1	1	24	179
6	Mammals	Chital (Spotted deer)	40	52	29	6	94	137	2	61	61	482
7	Mammals	Four-horned antelope		4	3	2	2	2			1	14
8	Mammals	Chinkara		2								2
9	Mammals	Wild Pig	21	40	7	13	18	13	8	28	62	210
10	Mammals	Rhesus Macaque	50				1				2	53
11	Mammals	Common langur	4	59	8	28		62	26		75	262
12	Mammals	Three striped Squirrel		2							2	4
13	Mammals	Indian Gaint Squirrel	2	2	3							7
14	Mammals	Black-naped hare	1		1	6		1	1	1	6	17
15	Mammals	Grey Mongoose	2	4	4						6	16
16	Mammals	Indian smooth-coated otter		2		1						3
17	Mammals	Jungle cat									2	2
18	Aves	Black bellied Tern					1					1
19	Aves	Little Egret		38		12	60					110
20	Aves	Black Drongo		2	1							3
21	Aves	Blue rock Pigeon		5								5

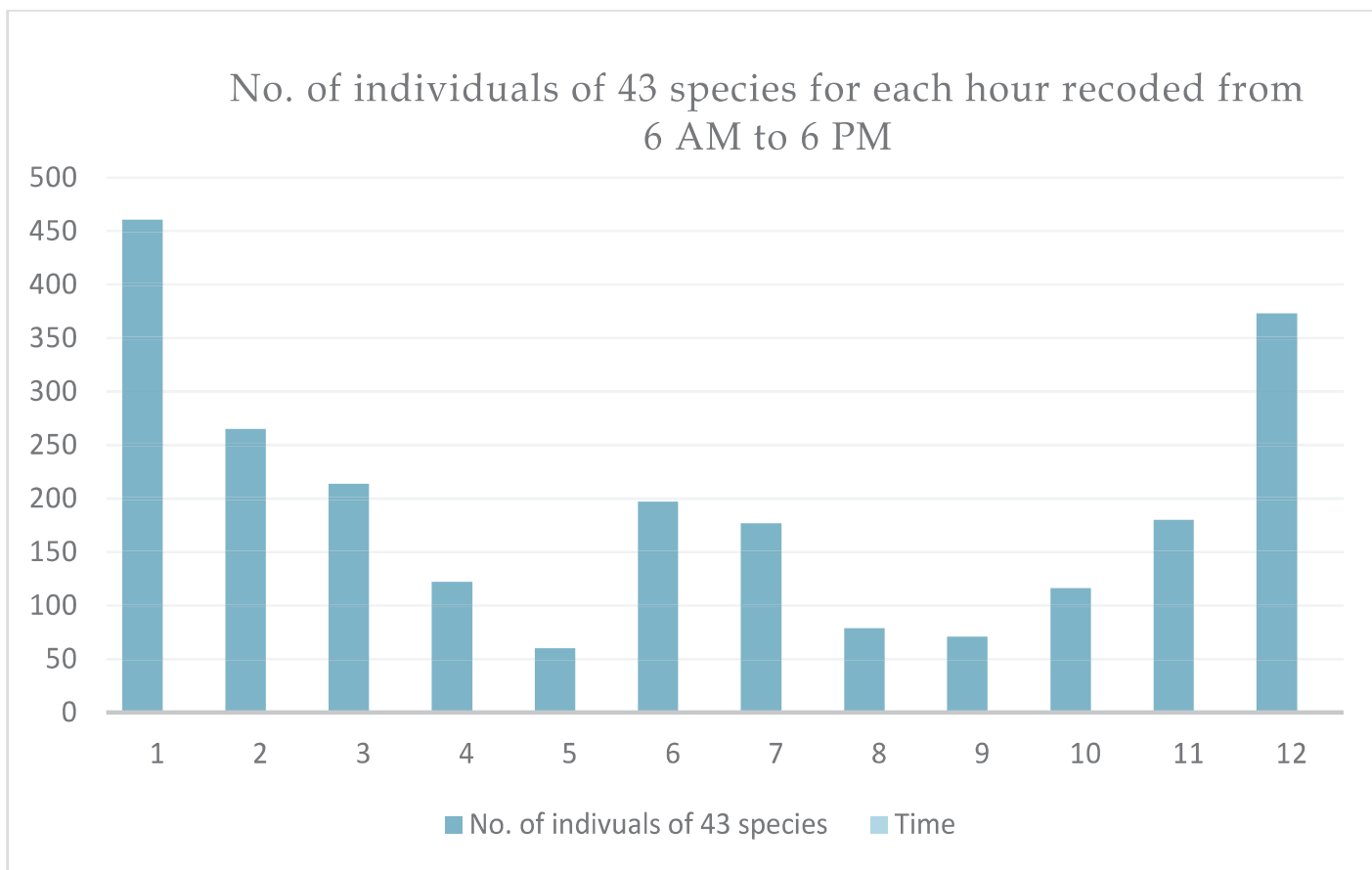
22	Aves	Broad billed crow							15									15
23	Aves	Common babbler				7												7
24	Aves	Common Myna										8				14		22
25	Aves	Jungle Owllet	1															1
26	Aves	Brown Fish Owl		2	1													3
27	Aves	Crested serpent Eagle							1	2								5
28	Aves	Changeable Hawk Eagle	1															1
29	Aves	Brahminy Kite							2									2
30	Aves	Oriental Honey buzzard							2									2
31	Aves	Golden backed wood pecker			2													2
32	Aves	Grey francolin		58				17					3		13			91
33	Aves	Grey jungle fowl	2	4					2			8	4		21			41
34	Aves	Indian peafowl	9	37	14		31		27	20	14	8			61			221
35	Aves	Paradise Flycatcher																0
36	Aves	Pond heron							45									45
37	Aves	Red-naped Ibis							3									3
38	Aves	Indian roller							1									1
39	Aves	Rose-ringed parakeet		5	22				4									31
40	Aves	White throated Kingfisher		1														1
41	Aves	Woolly necked Stork							2									2
42	Aves	Yellow throated Sparrow													9			9
43	Reptiles	Snake								1								1
44	Sheep	Sheep							140									140
45	Goat	Goats							74									74
46	Cattle	Cattle							30									30

Table 6: WATER HOLE CENSUS-UTILITY OF WATER HOLE BY DIFFERENT SPECIES IN AMRABAD TIGER RESERVE APRIL 2021

Sl No.	Class	Species	6-7 1 hour	7-8 2 hour	8-9 3 hour	9-10 4 hour	10-11 5 hour	11-12 6 hour	12-13 7 hour	13-14 8 hour	14-15 9 hour	15-16 10 hour	16-17 11 hour	17-18 12 hour
1	Mammals	Black-naped hare	2	1	3	1	1	3			1			5
2	Mammals	Chinkara		2										
3	Mammals	Four-horned antelope	3		8	2					4			
4	Mammals	Gray langur	36	60	13	15	8	19	26	14	8	12	6	45
5	Mammals	Grey mongoose	1	2	4		1			4			1	3
6	Mammals	Indian gaint Squirrel				3			1				1	2
7	Mammals	Indian smooth-coated otter	1	2										
8	Mammals	Jungle cat		1						1				
9	Mammals	Nilgai	26	15	6	3	3	7		9	2	3	5	7
10	Mammals	Rhesus macaque	2							1		5		45
11	Mammals	Sambar	37	25	18	3		1	5	4	2	5	9	67
12	Mammals	Sloth bear	1		1	5	3					1		2
13	Mammals	Smal indian fox	3					1						
14	Mammals	Spotted deer	90	39	45	39	21	38	8	15	14	71	35	76
15	Mammals	Three striped squirrel			2								2	
16	Mammals	Wild dog	17	25	6			10	5	1		10		4
17	Mammals	Wild pig	54	9	77	16	15	22	10	9	13	2	1	24
18	Aves	Black bellied tern	1											
19	Aves	Black drongo		2			1							
20	Aves	Brahminy kite			1									
21	Aves	Broad billed crow	15											
22	Aves	Brown fish owl				2					1			

[illegible]

No. of individuals of 43 species	461	265	214	122	60	197	177	79	71	116	180	373
Time	6-7 hour	7-8 hour	8-9 hour	9-10 hour	10-11 hour	11-12 hour	12-1 hour	1-2 hour	2-3 hour	3-4 hour	4-5 hour	5-6 hour



Graph 2: Showing the No. of individuals of 43 species for each hour from 6:00 AM to 6:00 PM



National Bird Peafowl



Rusty Spotted Cat

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Field Director, Amrabad Tiger Reserve*



Crested Hawk Eagle



Leopard (Panther)



Brown fish Owl



Mongoose



Small Indian Civet Cat



Ungulates Nilgai



Sloth Bear

Annexure III:

Annexure III: Datasheet for Line transect method														
LINE TRANSECT DATA SHEET														
Transect ID: _____ Observer(s): _____														
Date: / / 2021 Start time: _____ End time: _____														
Forest Division: _____ Range: _____ Beat: _____														
Terrain of transect: _____ Transect forest type: _____ Transect Bearing: _____														
Weather: Sunny/Cloudy/Rain Transect length: _____ km														
Transect Geo-coordinates: Starting point _____ Ending point _____														
Sl No.	Time	Latitude	Longitude	Species*	Male	Female	Young	Total	Angular Sighting distance (m)	Walk bearing	Animal bearing	Perpendicular Distance (m)	Activity	Direction of movement
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														

Annexure IV: Data sheet for Water hole census

Water hole Census

Observer(s):

Date: 16 /04 /2021 Start time: End time:

Forest Division: Range: Beat:

Type of water body: Available of water_____ Water clarity

Weather: Sunny/Cloudy/Rain

Geo-coordinates:

Indirect evidences of animals at water body

Sl No.	Start Time	End time	Duration (minutes)	Species*	Male	Fe-male	Young	Un classi-fied	Total	Activ-ity	Other obser-vations
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											



Spotted Deer- State Animal



Wild Dogs - Dhole



Wild Pig



Indian Fox



Ratel (Honey Badger)



Jungle Cat



WILDLIFE CENSUS REPORT

MAY 2021



**Office of the Chief Conservator of Forests &
Field Director Amrabad Tiger Reserve
Achampet Forest Complex**