ZOO'S PRINT

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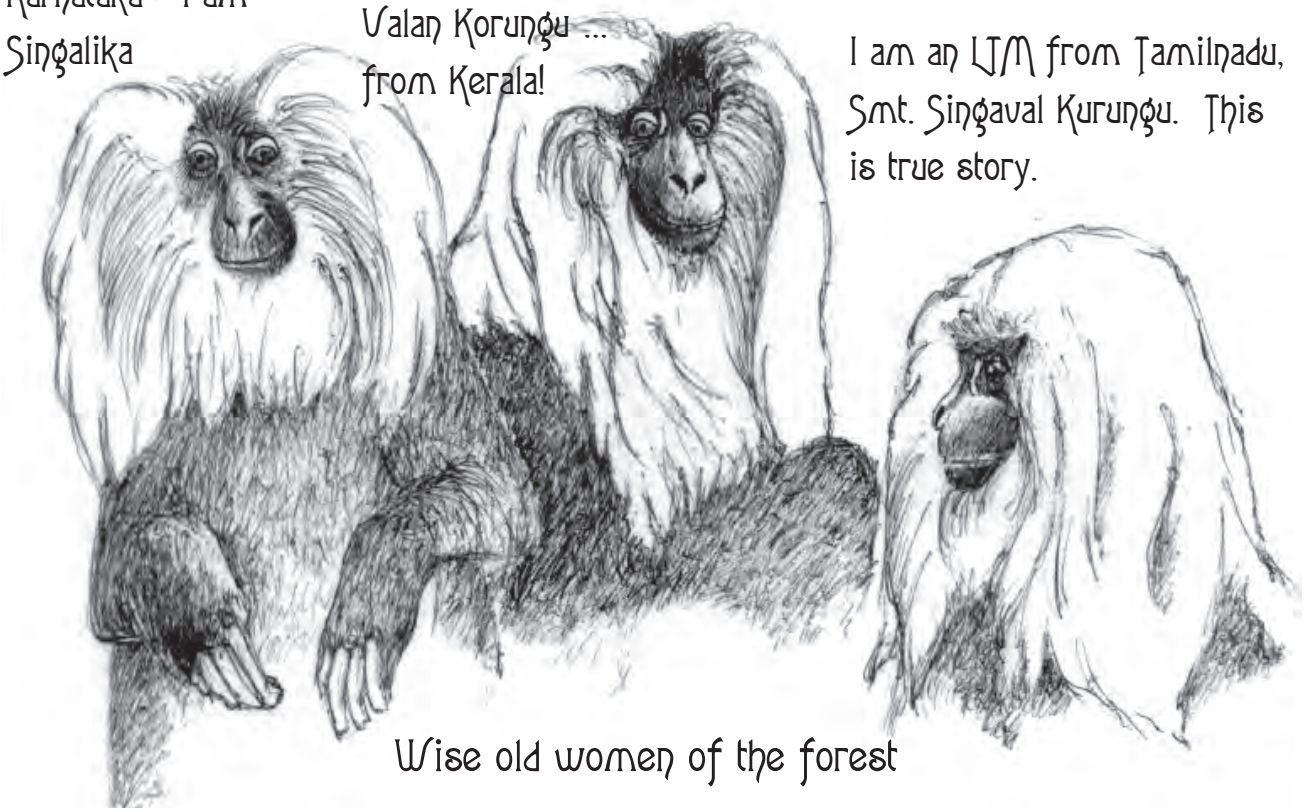
The Lion-tailed Macaque and the Tiger



Wise old women of the forest

I am sooooo sick !

. . . howled a young and arrogant Lion-tailed Macque who went by name of Yaaltm (pronounced Yall-tum)

"Pray tell ! What is bothering you, Yaaltm ?" exclaimed the Wise and Elder LTM by the name of Weltm (prounounced Well-tum)

"I am sick, sick, sick AND tired of tigers getting credit for every little thing in our rainforest ! Tigers do their share," said Yaaltm, "but we LTMs have our own

culture, biology, history, role, problems and threats". "AND we are a unique species, not subspecies, and found only in three Indian states !"

Despite the fact that he was old and wise, Weltm also felt the same. So he suggested to Yaaltm that they write a book together on the topic that tortured them, so that the world would know this injustice. Yaaltm agreed.

And this is what the two friends wrote.

"The firstmost thing to know about Lion-tailed Macaques is that we are INDIAN, -- from southern India," wrote the agitated friends.

"We are not like Tigers, that come from all over Asia with 8 different kinds (subspecies). We are pure Indian -- no furr-in LTMs !"

We ltm, the wiser, mused : 'Three of those 8 kinds of tigers are extinct !' He wondered how an animal could just disappear. "... we are found only in southern India in the Western Ghats ...a world famous 'hot spot'. There is a word for that -- the word is 'endemic' meaning restricted to a particular area. LTMs are endemic to the Western Ghats. That means we are found no where else ... in India, in Asia, or in the whole wide world, but only in a very small, narrow strip of Southern India"

Our LTM Natural History

"We, the Lion-tailed Macaque (Macaca silenus) were named Simea silenus in 1758 by Dr. Linnaeus and Simea ferox in 1792 by Dr. Shaw! In 1975 Dr. J. Fooden gave us the name we have today. Sir Francis Buchanan-Hamilton studied our forefathers in about

1805. He commissioned them to be painted from life for the first time for a 'Indian Natural History Project' which kept a menagerie (small zoo) about 30 miles from Calcutta in Barrackpore Park. The 'little zoo in the park' lasted until 1888 when all the animals were transferred to the then new Calcutta Zoo."

LTM & Tigers -- Rainforest species?

"Tigers and LTMs are associated with rain forests," said Yaaltm, "but what is a rainforest anyway ?" Weltm explained," A rainforest is a forest with lots of rain, usually throughout the year."

Yaaltm exclaimed, "That's where most of us are from but some of us are forced to live in a tea estate where we can't 'fly' through the treetop canopy to get from place to place.

We have to walk on the ground, like an ordinary mortal !! And my cousins have been killed by dogs ... just because of this. In fact all the forests where LTMs live may face the same fate". "That is quite true, Yaaltm, there are only a few goodrainforests left for us -- Silent Valley is one -- but how long will it last ?

If we are running out of rainforest, the tigers must be also! Could this be one reason why those tigers in South East Asia went extinct?"

LTM Problems !

Yaaltm and Weltum made a list of common LTM & tiger threats and problems . . .
The two friends began to notice more similarities than differences between tigers and LTMs.

Problems	Tiger	Lion-tailed Macaque
1. Habitat - Shrinking	Y	Y
People moving in	Y	Y
Habitat Damage	Y	Y
Loss of fruiting trees		Y
Loss of Canopy (tree tops that provide pathways for us)		Y
Livestock grazing	Y	
Firewood collection	Y	
Deforestation	Y	Y
2. Threats		
Roads	Y	Y
Dams	Y	Y
Powerlines	Y	Y
Fragmentation	Y	Y
Agriculture	Y	Y
Mining	Y	Y
Trapping	Y	Y
Loss of prey (deer, wildboar)	Y	
3. Trade		
Hunting for meat or body parts	Y	Y
Hunting for medicine	Y	Y
Hunting for body parts	Y	Y
Trapping to keep as pets		Y
Trapping for public display		Y
Trapping for use by fortune tellers		Y

Fragmentation

Yaaltm and Weltm also studied range maps. They exclaimed "Our families (populations) are split apart (fragmented) without any 'corridors' or roads to reach one another. Tigers have the same problem even though they live all over India. We LTMs have 49

populations (families) in as many places, but each family might as well live on the moon, or a remote island ...we can't find other families. We can't visit or breed. We are forced to breed with our close relativesî.

Weltm continued, ìt is the same with tigers. There are many populations in many localities throughout India but only a few are connected by a safe pathway to an unrelated tiger!

Tigers also can't meet new tigers, so -> no new mates, so -> breeding with family members, so -> genetic weakness, so -> loss of fitness, so individuals and populations die out, so -> Extinction Humans have to work hard to change this!î Cried Weltm

Status of LTMs

2008 Red List Category & Criteria:
Endangered C2a(i) ver 3.1

Status of Tigers

2015 Red List Category & Criteria:
Endangered A2abcd; C1 ver 3.1

IUCN is an organisation that identifies species in threat through a publication called Red List of Threatened Species

CITES -- Convention
International Trade in Endangered Species of animals and plants. It is signed by the government of many countries in the world

"Dear me!" said Yaaltm and Weltm, "even the IUCN Red List Status is the same. Could it be that we have misunderstood the tiger ?" "Woo woo !" said Weltm, "Tigers have a hard time too, donít they Yaaltm ?" They dooo! They dooo! I never knew!" said Yaaltm. "They are very much like me and yooooo!"

"What can we do to help all the animals in the forest?" asked Weltm. "We are all in this together!" Yaaltm said, "Let's stop being angry with tigers and work together to help all save our lifeboat - this great forest. Lets hope this message reaches many people so they will be more protective of our common future !" Protect, conserve and love Tigers, LTMs & all the other animals and the forests !

by Sally Walker, Payal Molur, B.G. Mridula, Sanjay Molur and Latha G. Ravikumar; Artwork by Arnab Roy

USFWS sponsored capacity building training programme on wildlife conservation monitoring

B.A. Daniel

Zoo Outreach Organization in collaboration with Society for Wildlife Interface and Forest Training (SWIFT), Tamil Nadu Forest Department, Tamil Nadu Forestry Training college and VANAM conducted five-day training programme for the 2017 batch of foresters of the Tamil Nadu Forest department. The programme was conducted at Tamil Nadu Forestry Training College, Vaigai, Theni district from 11-14 July 2017 and about 120 personnel took part in the training of which 38 of them were women candidates and the highlight

Introduction to the training by Daniel

is that this is the first time the TN forest department is employing women personnel for the post and hence this training take special mention. The programme was fully sponsored by USFWS.

The forest frontline staff are the cutting edge of the forestry hierarchy who are in constant touch with the people whose needs are met from the nature. They are instrumental in the implementation of the forest related rules, regulations, conservation and development activities. The frontline staff assists the forest department by providing basic data from the field while doing daily patrolling, monitoring and observations. This field level data has great significance as wrongly collected data can exaggerate and mislead the managers while planning conservation programmes. The efficiency and effectiveness of the State forest department hence depends much on the performance level of these personnel. Hence training is a strategic

Women trainees using GPS

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Classroom interaction

requirement for forest frontline staff and hence training for these staff who serve in Protected areas.

This kind of trainings requires long term planning. Dr. V.K. Melkani, Principle Chief Conservator of Forests, and Dr Krishnakumar, PCCF, Head, Division of Wildlife encouraged a lot by suggesting importing topics and to frame the syllabus. They also helped us to identify the venue for the workshop and thus TNFA was approached. The then Chairman and Executive Director of Society for Wildlife Interface and Forestry Training SWIFT, Dr. Rajeev K. Srivastava agreed to take up this programme through the society. K.K. Kaushal, CCF and Additional Director, TNFA extended all assistance to conduct this programme with the support of Dr Jayachandran, Ranger and in-charge of TNFTC, Vaigai.

The training, though it was officially started on the 11 July with an informal inauguration, the participants gathered on the previous day for registration and orientation for the training. After registration the author, the coordinator of the training programme, gave the background of the programme and also an introduction to biodiversity, species status, causes of human animal conflict with particular reference to tiger and elephants, mitigation measures and the role of forest frontline staff in effective species and habitat conservation. Icebreaking activities were also conducted. They were also explained about the aims of the training and went through the entire syllabus of the training.

Dr. Peter Prem Chakravarthy, Annamalai Tiger Reserve, Mr. Thangaraj Paneer

Peter Prem setting up Camera trap

Selvam, Anamalai Tiger Reserve, Dr. Ramakrishnan, Assistant Progessor, Wildlife Biology unit, Government Arts and Science college, Ooty, Dr. S. Paulraj, Director, Chennai Snake Park Trust, Mr. R. Marimuthu, ZOO, Dr. Rajakumar, Horonary Wildlife Warden, Theni, Dr. Kalaivanan, Veterinary Officer, Theni District, Mr. G.V. Ramesh Kumar, Senior Editor, Thinamalar, Madurai, Dr. Jayachandran, Ranger, TNFTC Vaigai acted as tutors for the training and they were introduced.

Most of the topics in the training planned and covered were mainly to address the issues related to human-animal conflict and to improve protection of tiger and elephants and its habitats and thus the training had both classroom and field exercises incorporating basics of conservation biology, research methodology, causes and mitigation measure of human animal conflict with special reference to elephants and tiger, wildlife laws, crimes communication and education. During the training sufficient practice on the use of modern research

GPS, compass, photo documentation, mapping and camera traps were also taught. As an incentive the participants received reading materials and tool kits that they can use in their daily routine.

The entire content of the course has 12 units that includes, use of basic field survey equipment, making field observations and taking notes, describing wild habitats, wildlife patrol and monitoring, staff health and hygiene, tiger and elephant estimation techniques, wildlife protection and management of Protected areas, Wildlife law and enforcement, animal handling and care, human

Group Photo: Trainess and Trainers

elephant conflict, elephant corridors, and conservation management.

In addition to theory and practical sessions they were assigned group projects to complete before the end of the training period. The projects include, boundary marking using GPS and GIS maps, design and create waterhole and photo documentation of flora of the campus. Project guidelines were given to them and a mentor was assigned for each group to assist with the projects. Each participant got an opportunity to practice and contribute for the project since they were given sufficient field equipment such as GPS, camera and binoculars to use during field projects. At the end of the project a representative from each group gave the project results and the out come. In total the plant documentation group made a checklist of 165 plants / trees from the campus, boundary marking group learned how to track and mark boundary in a map and calculate the area, and the waterhole team practically learned how to design and construct a waterhole in a jungle and the resource requirements.

A typical day of the training day started at six O'clock with two-hour project time. Each group will continue to work with their project and report to the mentor. The morning classroom session will start at 9 am that has both classroom and field exercises. Most of the afternoons were utilized for practical sessions where in they learned to use instruments like GPS, binoculars, compass, range finders and camera traps. Special events such as folklore and wildlife conservation, snake catching, practical

Jayachandran, Ranger, guiding to create a waterhole

journalism were organized that went up to 7 pm. Since the training was a residential programme, both the trainers and trainees got sufficient time to spend time together in the campus.

At the end of the training each participant received a certificate bearing the logo of USFWS and collaborators and a set of field kits having a back pack, rain coat and pants, a long range torch, water bottle, permanently printed instructions about do's and don'ts in Human Elephant Conflict areas and a t-shirt. The equipment used for the training was left with the training centre for their use and future training. The author takes this opportunity to thank USFWS for providing financial support to run the project, and the officials of Tamil nadu forest Department, SWIFT, NGOs for their support. The effort put by the resource persons requires special mention here since this is teamwork. Cooperation extended by the trainees is commendable.

Human-animal conflict Training

Ice breaker activity

World Pangolin Day 2018 celebrated by ZOO

Rengasamy Marimuthu

World Pangolin Day is celebrated on the third Saturday in February every year and this time it is the seventh annual day. It is an occasion for pangolin conservationists to join together in raising awareness about these unique mammals and their conservation. They are the most trafficked wild animal in the world.

The author demonstrates the usage of Pangolin education materials

Tying the wrist band and taking a pangolin conservation oath

To honour the day, Zoo Outreach Organization in association with Tulsi Trust celebrated at Children Motivational Centre Theethipalayam, Coimbatore on 17 February 2018. About 50 students of 11-14 years participated in the event.

The author gave a presentation on pangolins which tells about the kinds of pangolins in the world, Indian pangolin species, morphology, their behaviour, threats such

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as habitat loss and illegal wildlife trade. They are trafficked because of their scales, meat and blood which are extensively used in Traditional Chinese Medicine TCM. He also mentioned history and importance about the World Pangolin Day and as an individual how the student community can be part of this species conservation. After the presentation, the students were given time for interaction.

Students on a street rally for pangolin conservation pangolin mask and placard

Subsequently, the Pangolin education materials sponsored by Mohamed Bin Zayed Species Conservation Fund were given to the students. The education materials comprises of a wrist band (*Rakhi*), sticker, placard, mask and a booklet. The students were asked to go through the materials one by one. Then couple of student volunteers were asked to read the boolket loud and most of the informations covered in the presentation this again reinforce the messages. Next the students were asked to tie the wrist band to their friends hands and took a oath “Save Pangolins”. Later they wore the mask and holding the placard and went round a street rally at the village shouting the slogan “Save Pangolins from Illegal Wildlife Trade”. The rally attracted the villagers attention. With this the programme came to an end with light refreshments.

My sincere thanks to Mr. Thiyagarajan, Programme Manager, Mr. Nagaraj, Coordinator of Tulsi Trust for arranging the programme, Mr. Arul Jagadish of ZOO and Mr. M. Sathish Kumar, student volunteer for their help.

BLANFORD'S RAT

New distribution records of Blanford's Rat *Madromys blanfordi* (Thomas, 1881) from Gujarat state, Western India

White-tailed Wood Rat (*Madromys blanfordi*) sighted from Vansda National Park

IUCN Red List:
Least Concern
(Molur & Nameer 2016)

Class : Mammals

Order : Rodentia

Family : Muridae

Madromys blanfordi
[White-tailed Wood Rat]

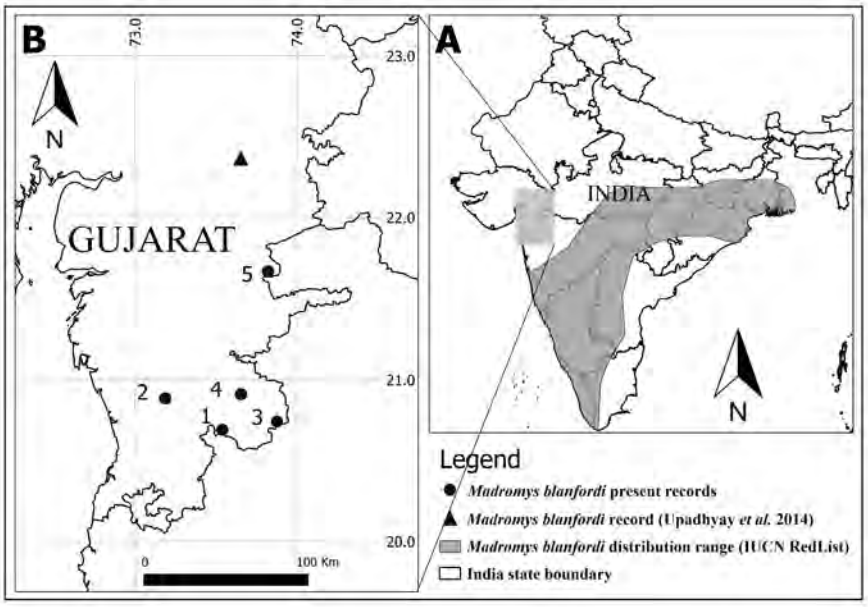
Species described by
Thomas in 1881

Blanford's Rat or White-tailed Wood Rat, *Madromys blanfordi* (Thomas, 1881) is an endemic South Asian rodent, widely distributed in India, Bangladesh and Sri Lanka (Molur et al. 2005). This rodent is fairly common in evergreen forests and fragments in Southern Western Ghats (Chadrasekhar-Rao and Sunquist 1996; Shankar 1998), also known to occur in tropical and subtropical dry deciduous and scrub forests, moist deciduous and evergreen forests of Peninsular India. It is nocturnal, terrestrial, sometimes fossorial species; it is seen in rocky areas, caves, crevices, tree hollows and sub-terrenean habitats. In southern India, it lives mostly in forest, but also in the more open parts of Mysore; it has colonized scrub jungle, whilst

further north in Madhya Pradesh, it lives among rocks on bare hill sides. In forests, this rat is to a great extent arboreal. In open treeless country it makes home in caves or under rocks and bushes (Molur et al. 2005).

Global Distribution:
Native: Bangladesh, India, Sri Lanka

The species has distinguished physical characteristics among other rodents and widely distributed in South Asia, the occurrence of this species has been well documented from Peninsular India south of Gujarat. In India the species is known to occur from the states- Andhra Pradesh, Goa, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Kerala and West Bengal (Srinivasulu & Srinivasulu 2012); in Bangladesh from Sathira, and in Sri Lanka from Southern and Eastern Province (Molur & Nameer 2008). Recently, the species has been recorded from Jambughoda Wildlife Sanctuary, Gujarat, India (Upadhyay et al. 2014), which was the first record of this species from the state of Gujarat.



A. Shaded area indicates the distribution range of *M. blanfordi.* B. black circles indicate the new locations of *M. blanfordi* (1.Vansda National Park, 2. Bodwank village, 3. Chinchali Village, 4. Purna Wildlife Sanctuary, 5. Shoolpaneshwar Wildlife Sanctuary), and black triangle indicates the location observed by Upadhyay et al. (2014, Jambudhoda Wildlife Sanctuary)

Our recent opportunistic surveys in south eastern Gujarat, has yielded additional locality records for this species. Here we present our own observations and five new distribution records of *M. blanfordi* from parts of Gujarat state.

Vansda National Park, Navsari, Gujarat.

On 30th July 2015 at 23:32hrs, we observed a rodent on the tree at about the height 15 ft in the premises of Kilad Nature Education Campsite (20^{0}45'13.68"N & 73^{0}29'14.33"E). We photographed it and observed that the relatively longer tail with brown colored of three quarters of its length, but the terminal portion is clothed with longer white hairs. Its soft long fur was grey brown above and white on the underside. These physical features

White-tailed Wood Rat (*Madromys blanfordi*) near a tree hole of a *Madhuca indica* at Purna Wildlife Sanctuary

are characteristic of *Madromys blanfordi* (Blanford's Madromys or White-tailed Wood Rat) (Agrawal 2000; Musser and Carleton in Wilson and Reeder, 2005; Prater 2005). The entire forest area of the Vansda National Park is of the 3B/C2 Southern moist mixed deciduous forest, 5/E 9 dry bamboo brakes, 5/1S1 tropical riverine forest (Champion & Seth 1968).

Bodwank Village, Navsari, Gujarat.

On 20th November 2015, during a night trail at around 21:30hrs, two of us (H.P. and V.N.) observed a *M. blanfordi* foraging in the teak plantation near Bodwank village (20°53'5.66"N & 73°11'12.09"E). Disturbed from our movements, it swiftly started climbing on a nearby teak tree and disappeared in a tree hole at around 20 ft. This region is predominantly an agricultural landscape with very few forest patches remaining.

Chinchali Village, Dang, Gujarat.

During the Dang Vulture Census on 2nd March 2016, the first author observed a rodent at 22:32hrs near Chinchali village (20°44'30.40"N & 73°52'40.94"E), which was foraging in leaf litter. On close inspection, it was identified as *M. blanfordi.* This village is situated at Gujarat – Maharashtra border with open, almost treeless country, patchy 3B/C2 southern moist mixed deciduous forests and hilly sides (Champion & Seth 1968).

Purna Wildlife Sanctuary, Dang, Gujarat.

On 22nd October 2016 at around 21:48hrs, while returning to the Mahal eco-tourism site (20°54'39.91"N & 73°39'19.60"E), we observed *M. blanfordi* crossing the road and went to a tree hole of a *Madhuca indica.* Champion and Seth in 1966 had categorized the forest area of Purna Wildlife Sanctuary in two main categories south Indian moist deciduous forests and southern dry deciduous forest.

Shoolpaneshwar Wildlife Sanctuary, Gujarat.

On 5th November 2016 at 20:46hrs, we observed a *M. blanfordi* at Ninai water-fall (21°40'0.01"N & 73°49'19.99"E). An adult of *M. blanfordi* was foraging on the steps near the water fall and retreated in the bushes when approached. Forest of Shoolpaneshwar Wildlife Sanctuary is classified as 3B/C1b moist teak forests, 3B/C1c southern moist mixed deciduous forest, 5/DS1 dry deciduous scrub, 5/E9 dry bamboo brakes, 5/1S1 dry tropical riverine forest (Champion & Seth 1968).

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A preliminary report on reptiles of Khirasara *Vidi*, Rajkot District, Gujarat, India

There is growing evidence about the rich herpetofaunal diversity of India. Among the herpetofauna reported, 518 species of reptiles (Aengals et al. 2011) were higher in India as compared to 314 species of amphibians (Dinesh et al. 2011). There are recorded 112 reptilian species in Gujarat state, including 61 species of snakes (Desai 2017), 39 species of lizards (Patankar et al. 2014), 11 species of turtles (Vyas 2015) and 1 crocodile species. There are 34 reptiles and 8 amphibians species recorded in Rajkot district (Singh & Tatu 1999; Vyas 2000; Ardesana et al. 2017).

Study Area

The Khirasara *vidi* is located at (22^{0}12'N & 70^{0}39'E) near Khirasara village, in Lodhika taluka, Rajkot district, Gujarat, India. The open thorny scrub forest with graminoid ground cover, commonly referred to as tropical scrubland savanna, which gradually changes to dry savanna in the process of continuous degradation known locally as "*Vidi*" is a major habitat of Saurashtra peninsula of Western India (Jadav 2010). An area of *Vidi* is more than 450 hectares and supports rich diversity of grassland. It is one of the wide spread savanna grassland in this region. The *Vidi* was declared as reserved forest by government of Gujarat in 1971. *Vidi* is provide ecological niche for community like Striped Hyena (*Hyaena hyaena*), Golden Jackal (*Canis aureus*), Indian Fox (*Vulpes bengalensis*), Jungle Cat (*Felis chaus*), Blue Bull (*Boselaphus tragocamelus*), Wild Boar (*Sus scrofa*), Porcupine (*Hystrix indica*), Harriers (*Circus* sp.), Kestrel (*Falco* sp.), Eagle Owl (*Bubo* sp.), Francolins (*Francolinus* sp.), Quails (*Cotumix* sp.), Larks (*Galerida* sp.) etc.

Methodology

The study was carried out from January 2013 to December 2015. Reptiles encountered and recorded during extensive field trips by random survey including direct sighting, roadkills. The survey was conducted randomly in total 90 day & night. Time was after immediate sunrise to 10am and 5pm to two hour after sunset, so as to cover diurnal as well as nocturnal species. We have used of relevant literature for identification of species (Sharma 1982; Editor-Director 2000; Daniel 2002; Das 2002; Murthy 2010; Vyas 2011; Patankar et al. 2014). Thorough searches were made in all the seasons and all the possible habitats. During the study, species have been documented with the photographs when possible. The status of each species was observed in three categories on the basis of species encountered or sighted. The category values were: rare (1-5), Uncommon (6-15), common (greater than 15).

Results and Observation

We have recorded total 20 species of reptiles (Table 1), among of 12 species of 5 snake families (Boidae, Pythonidae, Colubridae, Elapidae and Viperidae), 7 species of 4 lizard families (Agamidae, Gekkonidae, Scincidae, Varanidae) and *Lissemys punctata* in Khirasara *Vidi*. According to IUCN criteria most of species are Least Concern.

Indian Flapshell Turtle (*Lissemys punctata*) was commonly seen in Lake of Khirasara *Vidi* near Chibhda village.

Garden Lizard (*Calotes versicolor*) and Spiny-headed Fan-throated Lizard, *Sitana spinaecephalus* (Deepak et al. 2016) were observed commonly and were seen on rocks, plants, roadside, etc. Indian Monitor Lizard (*Varanus bengalensis*) was uncommonly spotted in all habitats. Among of the geckos, three species were found in study area. Two species were identified as Northern House Gecko (*Hemidactylus flaviviridis*)which was commonly observed on wall of construction and Termite Hill Gecko (*H. triedrus*) which was uncommonly spotted between fissure of rocks, barrow and on trail. Third specimen seems to be *Hemidactylus* sp.. This unidentified gecko species is the found in behind the temple of *Vidi*. On examination, the specimens looked like *Hemidactylus brookii* species but recently four species of geckos are described from India within the *H.brookii* complex. It needs further detailed study for identification, especially DNA fingerprinting (Vyas 2011). Keeled Grass Snake Skink (*Eutropis carinata*) was spotted in grass. In recent past, there was record of Indian Spiny-tailed Lizard (*Saara hardwickii*) both side of Balsar-Vagudad road in 2006, after that this species hasn't seen because of habitat fragmentation. Due to this habitat fragmentation, there are many species near extinction globally.

Rough-tailed Sand Boa (*Gongylophis conicus*) was commonly seen on trail and roadkill. There was one rescue record of Indian Rock Python (*Python molurus*) in temple compound near Khirasara village, Kalawad road in 2013 (Ardesana et al. 2017). Among serpents *Colubridae* family members were dominating and most of them were terrestrial, Checkered Keelback (*Xenochrophis piscator*) was seen occasionally in water habitat. Oriental Rat Snake (*Ptyas mucosa*) was commonly spotted on trail and shrub area near check dam in the study area throughout. Indian Wolf Snake (*Lycodon aulicus*) was seen near Forest chowki in Khirasara *Vidi*. Common Trinket (*Coelognathus helena*) was seen adjoining agriculture field. Black-headed Snake (*Sibynophis subpunctatus*) was found with roadkill near Khirasara village on Kalavad road in 27th August, 2013. Earlier, the species was reported from various parts of Gujarat, including Dangs, South Gujarat (Daniel & Shall 1963), Vadodara, Bhavanagar (Vyas 1986) and further Desai (2017) mentioned distribution of the species is scattered in Gujarat. However the species is not reported from Rajkot district (Sharma 1982; Singh & Tatu 1999; Vyas 2000). Thus present record of *S. subpanucatus* from Khirasar *vidi* is first record from the Rajkot District. Banded Kukri (*Oligodon arnesis*) and Streaked Kukri (*O. taeniolatus*) were uncommonly seen on trails.

Only three venomous species, Spectacled Cobra (*Naja naja*), Indian Krait

Table 1: A preliminary list of Reptiles of Khirasara *Vidi*

Sno	Family	Scientific name	Common English name	Status in study area	WPA status	IUCN status
1	Trionychidae	*Lissemys punctata*	Indian Flapshell Turtle	C	I	LC
2	Agamidae	*Calotes versicolor*	Indian Garden Lizard	C	NA	NA
3		*Sitana spinaecephalus*	Spiny-headed Fan-throated Lizard	C	NA	LC
4	Gekkonidae	*Hemidactylus* sp.	Unidentified Gecko	C	NA	NA
5		*Hemidactylus flaviviridis*	Northern House Gecko	C	NA	NA
6		*Hemidactylus triedrus*	Termite Hill Gecko	UN	NA	NA
7	Scincidae	*Eutropis carinata*	Keeled Grass Skink	R	NA	LC
8	Varanidae	*Varanus bengalensis*	Indian Monitor Lizard	UN	I	LC
9	Boidae	*Gongylophis conicus*	Rough-tailed Sand Boa	C	IV	LC
10	Pythonidae	*Python molurus*	Indian Rock Python	R	I	NA
11	Colubridae	*Coelognathus helena*	Trinket Snake	C	IV	LC
12		*Ptyas mucosa*	Oriental Rat Snake	C	II	LC
13		*Oligodon taeniolatus*	Streaked Kukri Snake	UN	IV	LC
14		*Oligodon arnensis*	Banded Kukri	UN	IV	LC
15		*Lycodon aulicus*	Indian Wolf Snake	UN	IV	LC
16		*Sibynophis subpunctatus*	Black-headed Snake	R	IV	LC
17		*Xenochrophis piscator*	Checkered Keelback	UN	II	LC
18	Elapidae	*Bungarus caeruleus*	Indian Krait	R	IV	LC
19		*Naja naja*	Spectacled Cobra	C	II	NA
20	Viperidae	*Echis carinatus*	Saw-scaled Viper	C	IV	LC

C = Common, UN = Uncommon, R = Rare, LC = Least Concern, NA = Not available.

(*Bungaruscaeruleus*) and Saw-scaled Viper (*Echis carinatus*) were recorded from the study area. Spectacled Cobra (*Naja naja*) was seen throughout study area and there was observed also chemosensory searching (prey trailing) behaviour near temple (*Mamano Khijado*) in centre of study area at 16:40hrs in 18th September, 2015. Indian Krait (*Bungarus caeruleus*) was recorded on trail during night. Saw-scaled Viper (*Echis carinatus*) was seen on roadkill, under rock, on branch of shrub.

Threats

Khirasara reserve *Vidi* is near to Metoda GIDC industrial zone and Rajkot city. Rajkot is fastest growing city. There is extensive habitat fragmentation by new constructions for city development and industries (Ardesana et al. 2017). Khirasara *Vidi* habitat is destructing due to anthropogenic pressure like encroachment by small religious constructions, fast spreading of *cassia tora* which is widely spread in north-west part of *Vidi* and continuously proliferate, *Lantana camara* and *Prosopis juliflora* which are scattered inside *Vidi* respectively.

Till the second half of the twentieth century, Vidis in Saurashtra were continuous

Reptiles of Khirasara Vidi

Indian Flap-shelled Turtle (*Lissemys punctata*)

Indian Garden Lizard (*Calotes versicolor*)

Spiny-headed Fan-throated Lizard (*Sitana spinaecephalus*)

Unidentified Gecko (*Hemidactylus* sp.)

Northern House Gecko (*Hemidactylus flaviviridis*)

Termite Hill Gecko (*Hemidactylus triedrus*)

Keeled Grass Snake Skink (*Eutropis carinata*)

Indian Spiny-tailed Lizard (*Saara hardwickii*)

Indian Monitor Lizard (*Varanus bengalensis*)

Rough-tailed Sand Boa (*Gongylophis conicus*)

Trinket Snake (*Coelognathus helena*)

Oriental Rat Snake (*Ptyas mucosa*)

Streaked Kukri Snake (*Oligodon taeniolatus*)

Banded Kukri Snake (*Oligodon arnensis*)

Indian Wolf Snake (*Lycodon aulicus*)

Black-headed Snake (*Sibynophis subpunctatus*)

Checkered Keelback (*Xenochrophis piscator*)

Indian Krait (*Bungarus caeruleus*)

Spectacled Cobra (*Naja naja*)

Saw-scaled Viper (*Echis carinatus*)

and rich in grass cover. Expansion of agriculture, invention of *Prosopis,* human habitation and industries brought a major change in land use pattern making present development unsustainable and induced fragmentation which resulted in patchy distribution of grasslands of the region as observed today (Singh 2001; Jadav 2010; Mehta 2014).

Highway is pass very close to Khirasara *Vidi*, so number of roadkills of species like Southern Coucal (*Centropus sinensis parroti*), Common Indian Toad (*Duttaphrynus melanosticutus*), Indian Hedgehog (*Paraechinus micropus*), Grey Mongoose (*Herpestes edwardsii*), Golden Jackal (*Canis aureus*), Indian Hare (*Lepus nigricollis*), Five-striped Squirrel (*Funambulus* sp.), Unidentified species of rats, frogs, babbler, insects and as above mentioned reptilian species during our study period.

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STOUT SAND SNAKE

Note on occurrence of Stout Sand Snake *Psammophis longifrons* Boulenger 1896 from Surat and Bharuch District, Gujarat

***Psammophis longifrons* from Ankleshwar, Bharuch District**

IUCN Red List: Least Concern (Srinivasulu et al. 2013)

Reptilia
[Class of Reptiles]

Squamata
[Order of Scaled Reptiles]

Psammophiidae
[Family of Psammophis genus

Psammophis longifrons
[Stout Sand Snake]

Species described by Boulenger in 1890

India is having four species of reptiles belonging to genus *Psammophis* viz., , *Psammophis leithii* (Gunther, 1869), *Psammophis condanurus* (Merren, 1820), *Psammophis longifrons (*Boulenger 1896) and *Psammophis schokri* (Forskal, 1775). Out of this four species *P. longifrons* is known from very few localities (Visvanathan et al. 2017). Stout Sand Snake *P. longifrons* was described by Boulenger in 1896. These snakes have smooth scales, elongated head, and large eyes with round pupil. The head is broader than neck. Dorsal scales of this snakes are pale brown with black edges. While the ventral scales are white or cream.

In 2016 volunteers of Nature Club Surat (NGO working on wildlife rescue, rehabilitation & conservation) reported six specimens (Table 1) of Stout Sand Snake *Psammophis longifrons* from various localities of Surat and Bharuch. Four specimens were observed during day time between 10.00 to 16.00 hrs and

two specimens were observed in night time at 21.08 & 22.40 hrs, from various habitats. Two specimens were observed during field survey while rest of them were rescued. All snakes were released at the same place from where they were found after taking morphometric data and photographs (Table 2). Most of the specimens were observed defensive while rescue and biting the rescuer continuously. Specimens mention below were identified on the basis of available literature. (Smith 1943; Whitaker & Captain 2004).

Global Distribution:
Native: India (Daman, Gujarat, Maharashtra (Srinivasulu et al. 2013)

They are known to live in various habitat like agricultural field, coastal pain, scrub land, dry arid zone, human habitation etc. (indiansnakes.org). Recently tail autotomy behaviour was observed in this species (Vyas & Patel 2013). This snake comes under Schedule IV of Wildlife Protection Act, 1972 & at lower risk to Near Threatened by IUCN (Molur & Walker, 1998).

As per current records it is reported from Thane, Damanganga, Bulsar, Panch Mahal (Smith, 1943); Kamrej of Surat District (Vyas, 1987); Thane, Damanganga, Nagpur, Valsad, Panchmahals (Whitaker & Captain, 2004); unknown locality from Madhya Pradesh (Chandra & Gajbe, 2005); Amravati & Melghat, Maharashtra (Nande & Deshmukh, 2007); Ujjain, Madhya Pradesh (Ingle, 2009); Buldhana, Maharashtra (Joshi, 2011); Hoshangabad (Kumbhar et al., 2012); Chikhli of Navsari District, Valsad (Vyas & Patel, 2013); Shikaripur of Shimoga District (Premkumar & Sharma, 2017); & *Boduppal & Hayathnagar, Telangana (Visavanthan et al., 2017)*.

Table 1: Details of Stout Sand Snake *Psammophis longifrons* reported from Surat & Bharuch District

No.	Date	Location	Coordinates	Rescued by/ 0bserved by	Dominant Habitat	Remarks	Specimen examined
1	6 July, 2016	Kadakia College, Ankleshwar, Bharuch	21°38'8.71"N 72°58'51.30"E	Hardipsinh Vansia	Human habitation	Rescued & Released	Yes
2	11 August, 2016	Asharma, Surat	21°27'22.81"N 73°3'54.25"E	Kaushal Mody	Scrub land	Snake in moulting stage found on high vegetation in night	No
3	27 August, 2016	Asharma, Surat	21°27'27.74"N 73°3'51.47"E	Virdattsinh Desai	Fallow field	Snake crossing road during night	No
4	15 September, 2016	Ankleshwar, Bharuch	21°37'34.75"N 73°0'53.42"E	Tarun Patel	Human habitation	Rescued & Released	Yes
5	19 September, 2016	Sai Vatika, Ankleshwar, Bharuch	21°35'27.97"N 73°2'3.80"E	Hardipsinh Vansia	Human habitation	Rescued & Released	Yes
6	18 November, 2016	Nilkanthnagar, Valia, Bharuh	21°34'31.53"N 73°9'8.27"E	Hardipsinh Vansia	Human habitation	Rescued & Released	Yes

Table 2: Scales & measurement (in cm) detail of 4 specimens of the Stout Sand Snake *Psammophis longifrons*

	Specimen 1	Specimen 4	Specimen 5	Specimen 6
Body Length =SVL+TL	60.6+17.3= 77.9	73+21.5 = 94.5	90.1+42.6=132.7	82.5+27.7=110.2
Supra labials (touching eye)	8 (4th& 5th)	8 (4th& 5th)	8 (4th& 5th)	8 (4th& 5th)
Preocular	1	1	1	1
Postocular	2	2	2	2
Temporals	2+3	2+3	2+3	2+3
Loreal	1 (long)	1 (long)	1 (long)	1 (long)
Lower Labials	10	9	9	9
Scale rows	17:17:13	17:17:13	17:17:13	17:17:13
Ventrals	166	163	168	166
Caudals (divided)	84*	87*	80*	91*
Anals	2	2	2	2
Sex	Not determined	Not determined	Not determined	Not determined

*** Number of scales not counted accurately present on end/tip of tail because of small in size, SVL, snout to vent length; TL, total body length (snout to tip of tail length).**

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FISH MINT PLANT

Successful cultivation of Fish Mint Plant, *Houttuynia cordata* Thunb., in low altitudinal plain in West Bengal

Luxuriant growth of *Houttuynia cordata*, Scale bar = 1cm. (Inset) Magnified view of an inflorescence

IUCN Red List:
Not Evaluated

Plantae
(Plant Kingdom)

Tracheophyta
(Phylum of Vascular plants)

Piperales
(Order of dicotyledonous flowering plants)

Saururaceae
(Family of Lizard's tail plant)

Houttuynia cordata
(Fish Mint Plant)

Species described by Carl Peter Thunberg in 1783

Houttuynia cordata Thunb. (Saururiaceae), a monotypic genus, exists in two chemotypes- the Japanese chemotype producing orange smell and the Chinese chemotype producing smell like raw fish (Bora et al., 1999). Leaves of these plants are used as medicine for treatment of dysentery, gonorrhea, eye troubles and haemorrhoids. Root extract of the plant is used as diuretic (Singh et al., 1996). *H. cordata* is also used as detoxicant, anti-inflammatory (Lu et al., 2006) and antipyretic in traditional medicinal practices of Assam and China (Bora et al., 1999). Plant extract is also used as oral therapeutic agent for the treatment of athlete's foot (Rastogi, 1991). It has also been pointed out that possibility of using *H. cordata* for AIDS management because water extract of leaves inhibit reverse transcriptase-

protease activity (Rao, 2000). A detail review of the pharmacological activities of this plant is discussed in recent years (Kumar et al., 2014).

In general, this species is reported from Himachal Pradesh of India to south west China and Japan. It is also found in Myanmar and in South East Asia at an altitude of 1500-2400m (Polunin & Stainton, 1997). In India, *H. cordata* is reported from Himachal Pradesh to Sikkim, Assam, Khasi Hills and Manipur at an altitudinal range of 300-2000m (Rastogi, 1991).

H. cordata of Chinese chemotype was found near a vendor selling nursery plants in Balurghat of Dakshin Dinajpur district in West Bengal, India. This district lies between 26^{0}35'15" and 26^{0}10'15"N latitude & 89^{0}30" and 87^{0}48'37"E longitude and is situated in the north of West Bengal at an altitude of 25m. The temperature of the region reaches up to 40-42^{0}C in summer and comes down to 5-6^{0}C in winter. Annual rainfall is 1700mm. Occasional shower in winter is not uncommon (Chakraborty et al., 2012).

Identification of this plant is very easy because of its raw fish smell and small betel leaf like foliage appearance. Locally this plant is known as *māchh māchhindā* and this herb attains a height of approximately 30cm. In June, 2007 a mature plant was collected and this was planted in a flat and shallow earthen pot containing sandy soil - a characteristic soil type of this region and successfully cultivated. Since the plant prefers damp condition, plants were placed under diffused sunlight and water was sprayed regularly. During winter all the plants without producing any flower dry out and ultimately die off leaving its root stock from which new saplings emerge. During April, 2008 among forty plants of *H. cordata* only four inflorescences were produced by four different individuals. The plant produced a distinct cylindrical spike (inflorescence) composed of very small green flowers with an involucre of four large white elliptic petal like bracts at its base. All the plants having inflorescences set fruits as usual. These plants are acclimatised so well that they regenerated and maintained vegetative growth year after year using their root stocks.

To grow and nurture *H. cordata* through its vegetative mode is possible on low altitudinal plain land at Balurghat of Dakshin Dinajpur district, West Bengal. Researchers and institutions should develop modern scientific technology for evaluating proper pharmacological use of this species, which can be easily maintained and raised in plain lands.

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WHISKERED TERN

Sighting of Whiskered Tern *Chlidonias hybrida* (Pallas, 1811) in Son *Beel*, Assam

A frontal view of the Whiskered Tern in flight (Photo: M. Miraj Hussain)

IUCN Red List: Least Concern (Birdlife International, 2018)

Class: Aves

Order: Charadriiformes

Family: Laridae

Chlidonias hybrida [Whiskered Tern]

Species described by Pallas in 1811

Son *Beel* (92^{0}27.00'E & 24^{0}40.00'N), the largest fresh water tectonic lake (*beel*) in Karimganj district of Assam and an Important Bird and Biodiversity Area (IBA) (Islam and Rahmani 2004), is rich in aquatic and avian diversity. The total area of the *beel* is 1500 ha. However, during lean seasons it gets reduced to small fragments of total not more than 500 ha. (Birdlife International 2016).

On 20 April 2016, at around 13:07hrs. we saw an uncommon bird flying over sub-merged paddy field at the outer edges of the *beel* near Debodwar (24^{0}43'4.89"N & 92^{0}26'15.76"E). After careful observation, we concluded it as Whiskered Tern (*Chlidonias hybrida*) by looking at its plumage, bill structure and head pattern, apart from its other morphological features (Plates 1 & 2) (Ali & Ripley 1987, Grimmett *et al.* 2013). The bird was seen to be in its breeding plumage with white cheeks contrast with black cap and grey underparts. The bird was seen swooping and pecking in the water. Once it swooped on a domestic duck attacking on its head. We saw it for two minutes until it flew away.

Sighting location of Whiskered Tern (*Chlidonias hybrida*) in Son *Beel*, Assam

Whikered Tern (*Chlidonias hybrida*), breeds in Kashmir and erratically in North India, however, it is widespread during winters (Grimmett et al. 2013). It can be differentiated from White-winged Tern by larger bill, grey rump concolorous with back and tail, and different head pattern (Ali & Ripley, 1987). The current IUCN status of this bird is Least Concern and population trend is to be considered stable (Birdlife International 2018). However, the current status of this tern in Assam is considered as resident, winter visitor and common (Choudhury 2000).

Global Distribution:
Native: Afghanistan; Albania; Algeria; Angola; Armenia; Australia; Austria; Azerbaijan; Bahrain; Bangladesh; Belarus; Benin; Bosnia and Herzegovina; Botswana; Brunei Darussalam; Bulgaria; Cambodia; Central African Republic; Chad; China; Côte d'Ivoire; Croatia; Cyprus; Czech Republic; Egypt; Equatorial Guinea; Ethiopia; France; Gambia; Germany; Ghana; Greece; Guam; Guinea; Guinea-Bissau; Hong Kong; Hungary; India; Indonesia; Iran, Islamic Republic of; Iraq; Israel; Italy; Japan; Jordan; Kazakhstan; Kenya; Korea, Republic of; Kuwait; Lao People's Democratic Republic; Latvia; Lebanon; Liberia; Libya; Lithuania; Macedonia, the former Yugoslav Republic of; Madagascar; Malawi; Malaysia; Mali; Mauritania; Micronesia, Federated States of ; Moldova; Mongolia; Montenegro; Morocco; Mozambique; Myanmar; Namibia; Nepal; Niger; Nigeria; Northern Mariana Islands; Oman; Pakistan; Palau; Palestinian Territory, Occupied; Papua New Guinea; Philippines; Poland; Portugal; Qatar; Romania; Russian Federation (Central Asian Russia, Eastern Asian Russia, European Russia); Saudi Arabia; Senegal; Serbia; Sierra Leone; Singapore; Slovakia; Somalia; South Africa; South Sudan; Spain; Sri Lanka; Sudan; Swaziland; Switzerland; Syrian Arab Republic; Taiwan, Province of China; Tajikistan; Tanzania, United Republic of; Thailand; Timor-Leste; Togo; Tunisia; Turkey; Turkmenistan; Uganda; Ukraine; United Arab Emirates; Uzbekistan; Viet Nam; Western Sahara; Yemen; Zambia; Zimbabwe

Vagrant: Barbados; Belgium; Burkina Faso; Burundi; Cameroon; Cape Verde; Christmas Island; Congo, The Democratic Republic of the; Denmark; Djibouti; Eritrea; Finland; Gibraltar; Iceland; Ireland; Lesotho; Luxembourg; Maldives; Malta; New Zealand; Norway; Rwanda; Seychelles; Sweden; United Kingdom; United States

A total of 89 species of birds have been reported in and around this Son *Beel* (Chakravarty et al. 2015); however, Whiskered Tern was not included in the list. We have gathered 52 sighting records of this species in Assam since 1949 from secondary sources (Table 1). According to Choudhury (2000) this species is commonly distributed in Assam. Because of its Least Concern status and commonness, this species might not have been given importance to be recorded, hence the

A lateral view of the Whiskered Tern in flight (Photo: M. Miraj Hussain)

Table 1: Sightings of Whiskered Tern in Assam from 1949 onwards (chronological order)

S. No.	Date of Sighting	Locations	Sighted by	No. of individuals sighted	References
1	10-12-1949	Palasbari Kamrup, Assam	Walter N. Koelz	1 (male)	www.vertnet.org accessed on 17-11-2016
2	11-12-1949	Palasbari Kamrup, Assam	Walter N. Koelz	1 (female)	www.vertnet.org accessed on 17-11-2016
3	12-12-1949	Palasbari Kamrup, Assam	Walter N. Koelz	1 (female)	www.vertnet.org accessed on 17-11-2016
4	13-12-1949	Palasbari Kamrup, Assam	Walter N. Koelz	2 (females)	www.vertnet.org accessed on 17-11-2016
5	15-12-1949	Palasbari Kamrup, Assam	Walter N. Koelz	1 (male), 1 (female)	www.vertnet.org accessed on 17-11-2016
6	22-05-1950	Palasbari Kamrup, Assam	Walter N. Koelz	1 (male), 1 (female)	www.vertnet.org accessed on 17-11-2016
7	25-05-1950	Palasbari Kamrup, Assam	Walter N. Koelz	1 (male)	www.vertnet.org accessed on 17-11-2016
8	11-03-1951	Palasbari Kamrup, Assam	Walter N. Koelz	1 (female)	www.vertnet.org accessed on 17-11-2016
9	10-05-1953	Palasbari Kamrup, Assam	Walter N. Koelz	1 (male)	www.vertnet.org accessed on 17-11-2016
10	9th March 1987- 16th Feb. 1988	Sibsagar, Assam	Anwaruddin Choudhury	Not mentioned	Forktail Vol. 6 (1991): 35-42
11	1994	Dibru-Saikhowa National Park, Assam	Anwaruddin Choudhury	Not mentioned	Indian Birds Vol. 2 No. 4 (July-August 2006)
12	1995	Deepar Beel Wildlife Sanctuary, Assam	Barman *et al.* 1995	Not mentioned	PAVO Vol.33 (182): 25-40
13	1999	Kaziranga National Park, Assam	M. Baruah & P. Sharma	Not mentioned	Forktail Vol. 15 (1999): 47-60
14	24-02-2004	Kaziranga National Park, Golaghat	John Allcock	-	www.ebird.org accessed on 07-04-2017
15	25-02-2004	Kaziranga National Park, Golaghat	John Allcock	-	www.ebird.org accessed on 07-04-2017
16	February 2007	Dheer Beel, Assam	Sinha *et al.* 2015	1	Indian Birds 10 (3 & 4)
17	13-05-2010	Deepor Beel, Guwahati	Migrant Watch	50	www.ebird.org accessed on 07-04-2017
18	10-06-2010	Sakuli Beel, Jorhat	Migrant Watch Group	200	www.ebird.org accessed on 07-04-2017
19	11-08-2011	Sakuli Beel, Jorhat	Migrant Watch Group	200	www.ebird.org accessed on 07-04-2017
20	24-04-2013	Kaziranga National Park, Golaghat	Gerlinde Taurer & Christoph Moning	10	www.ebird.org accessed on 07-04-2017
21	18-11-2013	Zoo cum Botanical Garden, Guwahati	Forest Venkat	-	www.ebird.org accessed on 07-04-2017
22	19-11-2013	Zoo cum Botanical Garden, Guwahati	Forest Venkat	-	www.ebird.org accessed on 07-04-2017
23	20-11-2013	Guwahati, Kamrup	Forest Venkat	-	www.ebird.org accessed on 07-04-2017
24	21-11-2013	Guwahati, Kamrup	Forest Venkat	-	www.ebird.org accessed on 07-04-2017
25	22-11-2013	Pobitora Wildlife Sactuary, Morigaon	Forest Venkat	-	www.ebird.org accessed on 07-04-2017
26	23-11-2013	Darrang	Forest Venkat	3	www.ebird.org accessed on 07-04-2017

S. No.	Date of Sighting	Locations	Sighted by	No. of individuals sighted	References
27	25-11-2013	Nimati Ghat, Jorhat	Forest Venkat	12 (approx.)	www.ebird.org accessed on 07-04-2017
28	16-02-2014	Maguri Beel, Tinisukia	Arnab Bora	1	www.ebird.org accessed on 07-04-2017
29	29-04-2014	Tezpur	Jan Smith	5	www.ebird.org accessed on 05-05-2017
30	16-11-2014	Nameri, Nagaon	Mihir Joshi	1	www.ebird.org accessed on 07-04-2017
31	17-02-2015	Maguri Beel, Tinisukia	Maitreya Sukumar, Shashank Dalvi	2	www.ebird.org accessed on 07-04-2017
32	10-04-2015	Guwahati	Alfred Raab	-	www.ebird.org accessed on 07-04-2017
33	14-04-2015	Nabagraha, Guwahati	Ann Crawford	-	www.ebird.org accessed on 07-04-2017
34	15-04-2015	Nabagraha, Guwahati	Ann Crawford	-	www.ebird.org accessed on 07-04-2017
35	25-04-2015	Maguri Beel, Tinisukia	Bng Liocichlas (Group Account), Vinay Das, Sachin Shurpali, Dipu Karuthedathu, Praveen J	2	www.ebird.org accessed on 07-04-2017
36	03-05-2015	Tezpur	Andre Weiss	18	www.ebird.org accessed on 07-04-2017
37	09-05-2015	Deepor Beel, Guwahati	Somoyita Sur, Geetha Venkatraman & Jaydev Mandal	50	www.ebird.org accessed on 07-04-2017
38	01-04-2016	Maguri Beel, Tinisukia	Chetna Sharma, Geeta Goswami, Saurabh Sawant	30	www.ebird.org accessed on 07-04-2017
39	01-04-2016	Maguri Beel, Tinisukia	Chetna Sharma	-	www.ebird.org accessed on 07-04-2017
40	01-04-2016	Maguri Beel, Tinisukia	Taksh Sangwan	4	www.ebird.org accessed on 07-04-2017
41	01-04-2016	Maguri Beel, Assam	Taksh Sangwan	Not mentioned	www.ebird.org accessed on 07-12-2016
42	02-04-2016	Maguri Beel, Tinisukia	Chetna Sharma, Geeta Goswami, Saurabh Sawant	-	www.ebird.org accessed on 07-04-2017
43	02-04-2016	Maguri Beel, Tinisukia	Chetna Sharma	-	www.ebird.org accessed on 07-04-2017
44	13-04-2016	Deepor Beel, Guwahati	Somoyita Sur	30 (breeding plumage)	www.ebird.org accessed on 07-04-2017
45	11-05-2016	Deepor Beel, Guwahati	Somoyita Sur	15	www.ebird.org accessed on 07-04-2017
46	03-07-2016	Pobitora Wildlife Sactuary, Morigaon	Dhurba Saikia	1	www.ebird.org accessed on 07-04-2017
47	03-07-2016	Pobitora Wildlife Sanctuary, Assam	Dhruba Saikia	Not mentioned	www.ebird.org accessed on 07-12-2016
48	26-03-2017	Kaziranga National Park, Golaghat	Frank Antram	1	www.ebird.org accessed on 05-05-2017
49	27-03-2017	Maguri Beel, Tinisukia	Pankaj Lad	1	www.ebird.org accessed on 05-05-2017
50	29-04-2017	Deepor Beel, Guwahati	Hemant Kirola	8	www.ebird.org accessed on 05-05-2017

S. No.	Date of Sighting	Locations	Sighted by	No. of individuals sighted	References
51	10-05-2017	Avian Park, Cinnamara, Jorhat	Miraj Hussain	10	*Pers. Obs.*
52	-	Manas National Park, Assam	Anwaruddin Choudhury	Not mentioned	http://manasnationalpark.co.in/pdf/birds.pdf accessed on 07-12-2016

less record. However, Barua and Sharma (1999) and Choudhury (2006) have mentioned that the species is uncommon in Kaziranga and Dibru-Saikhowa National Parks in Brahmaputra Valley. Except for Sakuli Beel, Jorhat, where Migrant Watch Group recorded 200 individuals, in all other records, the number of bird was small (Table 1). Being a winter visitor, the presence of this species should not be ignored. Hence this is necessary to know if the species is ignored by birdwatchers elsewhere in Assam, or in recent times, this species has not been sighted in large numbers.

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Diversity and Conservation status of Avifauna in Ramnagar Forest division, Corbett Landscape, Uttarakhand, India

Black Stork (Juvenile) spotted in the Dabka River of Ramnagar Forest Division

Introduction

Birds are key indicators for assessing the status of ecosystem quality (Taper et al., 1995; Gregory et al., 2003) and their assemblage structure is affected by changes in habitat either due to natural or anthropogenic disturbances (Duguay et al., 2000; Weakland et al., 2002; Rahayuninagsih et al., 2007). The change in vegetation composition has an impact on birds in terms of their food, water and cover and its extent which consequently affect the diversity, abundance and distribution of birds (Gregory et al., 2003; Clawges et al., 2008; Rajpar & Zakaria, 2011). Avian species shows a direct response to different vegetation structure (MacArthur & MacArthur 1961), and their diversity increases with quality of vegetation composition (Wiens 1995). Moreover, avian community structure also affects the vegetation structure as large numbers of tree species are dependent on the seed dispersal services provided by frugivores (Strauss & Irwin 2004; Chatterjee &

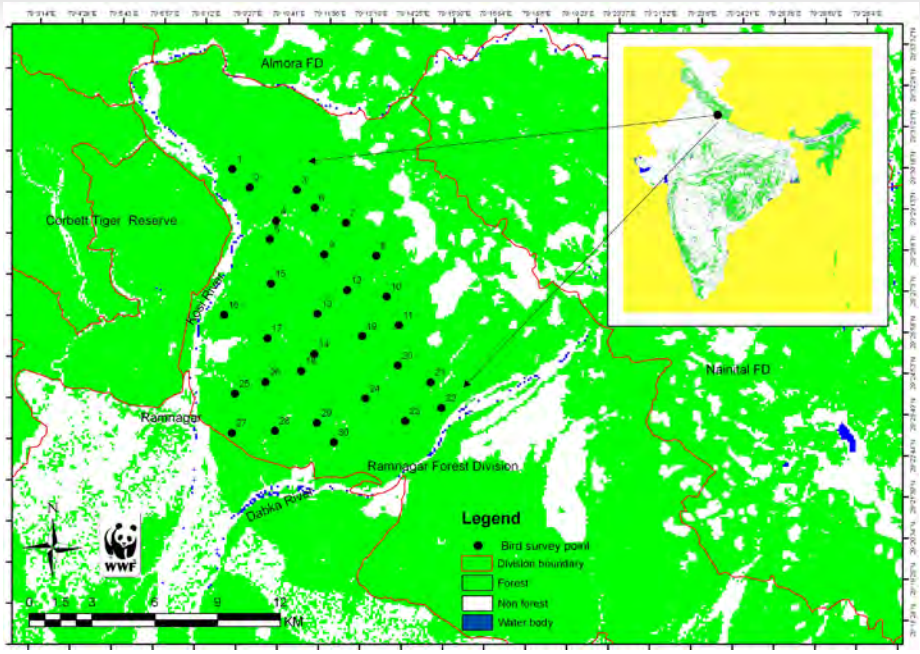
Basu 2015). The Corbett Tiger Reserve including the adjoining landscape provides unique habitat for various endangered species including tiger and elephant as keystone species. The population of these large mammals depends on the habitat quality, sufficient food and water availability as well as the protection cover. These habitat parameters also ensure survival of other mammalian, avian and insect species. As a result of this, approximately 40% of avian species found in India, are observed in the landscape (Dhakate et al., 2008). However, change in habitat composition as a consequence of anthropogenic and natural disturbances, such as habitat fragmentation, illicit felling, grazing, forest fire and other developmental activities have been observed in the region. These factors influence the existing habitat quality, and have a direct impact on species abundance and diversity as well. A long check list of birds was published from the Corbett TR (Dhakate et al., 2008) but in the adjoining territorial forests, priority of the forest officials are mainly forestry oriented while management and conservation of wild animals and birds remains a secondary responsibility unlike it is in protected areas. Therefore, present study was conducted in the Ramnagar Forest Division, to understand avian community structure with the help of data collected while visiting the forests primarily for the monitoring of tiger and its prey species. Present study was carried out in a short duration and aimed to encourage scientific community to come up with a detailed study on avifauna of the territorial forests of the Corbett landscape, where different kinds of habitat support a large number of avifauna in addition to charismatic tigers.

Materials and Methods

2.1 Study area

Ramnagar Forest Division is situated in the Terai Arc Landscape (TAL) of Uttarakhand state of India. The forest division is located between 29^{0}25'46" N & 79^{0}08'58" E, with an elevational range from 385m asl to 1550m asl. The division is spread over five forest ranges with a total area of about 12000 ha. The territorial forest division is adjoining to the Corbett Tiger Reserve at the western side, Terai West forest division in the South-western side and Terai Central Forest division in the southern part. It also shares territorial boundaries with Almora and Nainital forest division in the northern side. The Ramnagar forest division serve as a transition zone between the Terai and mountain forest ecosystem, and thus important for wildlife movement in between of these two habitat. The area receive an average annual rainfall of 2100mm and temperature varies from 15^{0}C to 42^{0}C.

The forest division is dominated with plant species such as *Shorea robusta, Terminalia alata, Syzygium cumini, Dalbergia sissoo, Madhuca* spp., *Bauhinia variegata,*



Map depicting the study area and sampling sites

Mallotus philippensis, Melia spp., *Acacia* spp., *Zizyphus* spp., *Butea monosperma, Ficus* spp. and plantations of *Tectona grandis, Eucalyptus* spp., and some *indigenous* spp. such as *Broussonetia papyrifera* and *Trewia nudiflora* (Anwar et al., 2014). Some of the common weeds present in the division are *Pogostemon* spp., *Justicia adhatoda, Senna tora, Parthenium* spp., *Lantana camara* and *Ipomoea* spp. The forest division and its surrounding forms a mosaic of various habitat types including woodland, riverine forest, grassland, agricultural field, water bodies as ponds and ditches including seasonal streams. River Kosi and Dabka including their tributaries are major habitats for riverine birds and waterfowls, both the resident and migratory species. Intensive study area lies between these two Rivers (Kosi & Dabka) passing through the forests of Ramnagar division and are perennial source of water to the mammals and Avifauna of the division.

2.2 Methodology

The survey for avifauna was conducted in winter season (November 2013-January 2014), during the regular monitoring of camera traps, deployed for photo-capturing tigers. Points for data collection were located in the woodland, grassland, seasonal streams (Riverine habitat) and plantations. The streams act as work transition zone between two forest stands and open grasslands act as a corridor between two woodlands for the wildlife movement. A grid size of 4 sq.km. was considered, to accommodate a point in each grid for data collection. These locations were spaced 1.5 to 2 km apart from each other. All these locations were considered as vantage for the present bird survey in the Ramnagar forest division. Birds were recorded through point count (fixed) distance sampling method (Bibby et al., 2000). An observation time of 10 minutes at each point was invested to record sightings of the birds. The species were recorded only which

Birds species recorded in Ramnagar forest division, Uttarakhand during November 2010 to January 2011

Family	Scientific Name	Common Name	Status	Status (IUCN)	IWPA Schedule	Guild
Accipitridae	*Milvus migrans*	Black Kite	R	LC	IV	Carnivorous
	Sarcogyps calvus	Red-headed Vulture	R	CR	IV	Carnivorous
	Spilornis cheela	Crested Serpent Eagle	R	LC	IV	Carnivorous
	Spizaetus cirrhatus	Changeable Hawk Eagle	R	LC	IV	Carnivorous
Anatidae	*Tadorna ferruginea*	Ruddy Shelduck	WV	LC	IV	Omnivorous
Anhingidae	*Anhinga melanogaster*	Darter	R	LC	IV	Carnivorous
Ardeidae	*Casmerodius albus*	Great Egret	R	LC	IV	Carnivorous
	Ardeola grayii	Indian Pond Heron	R	LC	IV	Carnivorous
	Egretta garzetta	Little Egret	R	LC	IV	Carnivorous
Bucerotidae	*Ocyceros birostris*	Indian Grey Hornbill	R	LC	IV	Frugivorous
	Anthracoceros albirostris	Oriental Pied Hornbill	R	LC	IV	Frugivorous
	Buceros bicornis	Great Hornbill	R	NT	IV	Frugivorous
Campephagidae	*Pericrocotus flammeus*	Scarlet Minivet	R	LC	IV	Insectivorous
	Pericrocotus cinnamomeus	Small Minivet	R	LC	IV	Insectivorous
	Tephrodornis pondicerianus	Common Woodshrike	R	LC	IV	Insectivorous
	Corcina macei	Large Cuckooshrike	R	LC	IV	Insectivorous
Certhiidae	*Certhia himalayana*	Bar-tailed Tree-creeper	WV	LC	IV	Insectivorous
Cerylidae	*Megaceryle lugubris*	Crested Kingfisher	R	LC	IV	Carnivorous
	Ceryle rudis	Pied Kingfisher	R	LC	IV	Carnivorous
Cettiidae	*Tesia castaneocoronata*	Chestnut-headed Tesia	R	LC	IV	Insectivorous
Charadriidae	*Vanellus indicus*	Red-wattled Lapwing	R	LC	IV	Insectivorous
Cisticolidae	*Prinia socialis*	Ashy Prinia	R	LC	IV	Insectivorous
	Cisticola juncidis	Zitting Cisticola	R	LC	IV	Insectivorous
	Prinia criniger	Striated Prinia	R	LC	IV	Insectivorous
Columbidae	*Columba livia*	Rock Pigeon	R	LC	IV	Granivorous
	Streptopelia chinensis	Spotted Dove	R	LC	IV	Granivorous
	Chalcophaps indica	Emerald Dove	R	LC	IV	Granivorous
Coraciidae	*Coracias benghalensis*	Indian Roller	R	LC	IV	Carnivorous
Corvidae	*Dendrocitta vagabunda*	Rufous Treepie	R	LC	IV	Frugivorous
	Cissa chinensis	Common Green Magpie	R	LC	IV	Carnivorous
	Urocissa erythrorhyncha	Red-billed Blue Magpie	R	LC	IV	Carnivorous
	Corvus macrorhynchos	Large-billed Crow	R	LC	IV	Carnivorous
	Dendrocitta formosae	Grey Treepie	R	LC	IV	Frugivorous
Cuculidae	*Centropus sinensis*	Greater Coucal	R	LC	IV	Omnivorous

Family	Scientific Name	Common Name	Status	Status (IUCN)	IWPA Schedule	Guild
Dicruridae	*Dicrurus macrocercus*	Black Drongo	R	LC	IV	Insectivorous
	Dicrurus remifer	Lesser Racket-tailed Drongo	R	LC	IV	Insectivorous
	Dicrurus hottentottus	Spangled Drongo	R	LC	IV	Insectivorous
	Dicrurus leucophaeus	Ashy Drongo	WV	LC	IV	Insectivorous
	Dicrurus carrulescens	White-bellied Drongo	R	LC	IV	Insectivorous
Emberizidae	*Melophus lathami*	Crested Bunting	W/S	LC	IV	Insectivorous
Estrildidae	*Lonchura punctulata*	Scaly-breasted Munia	R	LC	IV	Granivorous
Falcinidae	*Microhierax caerulescens*	Collared Falconet	WV	LC	IV	Carnivorous
Halcyonidae	*Halcyon smyrnensis*	White-throated Kingfisher	R	LC	IV	Carnivorous
	Halcyon capensis	Stork-billed Kingfisher	R	LC	IV	Carnivorous
Hirundinidae	*Hirundo rustica*	Barn Swallow	WV	LC	IV	Insectivorous
Ibidorhynchidae	*Lbidorhyncha struthersii*	Ibis Bill	R	LC	IV	Carnivorous
Lanniidae	*Lanius Schach*	Long-tailed Shrike	R	LC	IV	Omnivorous
Leiothrichidae	*Garrulax leucolphus*	White-crested Laughing Thrush	R	LC	IV	Insectivorous
	Turdoides striatus	Jungle Babbler	R	LC	IV	Insectivorous
Megalaimidae	*Megalaima haemacephala*	Coppersmith Barbet	R	LC	IV	Frugivorous
	Megalaima zeylanica	Brown-headed Barbet	R	LC	IV	Frugivorous
	Megalaima asiatica	Blue-throated Barbet	R	LC	IV	Frugivorous
Meropidae	*Merops orientalis*	Green Bee-eater	R	LC	IV	Insectivorous
	Nyctyornis athertoni	Blue-bearded Bee-eater	R	LC	IV	Insectivorous
Motacillidae	*Motacilla maderaspatensis*	White-browed Wagtail	R	LC	IV	Insectivorous
	Motacilla flava	Yellow Wagtail	WV	LC	IV	Insectivorous
	Motacilla cinerea	Grey Wagtail	WV	LC	IV	Insectivorous
	Motacilla alba	White Wagtail	WV	LC	IV	Insectivorous
Muscicapidae	*Myophonus caeruleus*	Blue Whistling Thrush	R	LC	IV	Insectivorous
	Copsychus malabaricus	White-rumped Shama	R	LC	IV	Insectivorous
	Saxicoloides fulicata	Indian Robin	R	LC	IV	Insectivorous
	Chaimarrornis leucocephalus	White-capped Water Redstart	R	LC	IV	Insectivorous
	Rhyacornis fuliginosus	Plumbeous Water Redstart	R	LC	IV	Insectivorous
	Phoenicurus frontalis	Blue-fronted Redstart	WV	LC	IV	Insectivorous
	Saxicol ferrer	Grey Bushchat	R	LC	IV	Insectivorous
	Saxicola caprata	Pied Bushchat	R	LC	IV	Insectivorous
	Luscinia pectoralis	White-tailed Rubythroat	WV	LC	IV	Insectivorous
	Niltava sundara	Rufous-bellied Niltava	R	LC	IV	Insectivorous
	Ficedula strophiata	Rufous-gorgeted Flycatcher	R	LC	IV	Insectivorous
	Niltava macgrigoriae	Small Niltava	WV	LC	IV	Insectivorous
	Ficedula tricolor	Slaty-blue Flycatcher	W/S	LC	IV	Insectivorous
Nectariniidae	*Nectarinia asiatica*	Purple Sunbird	R	LC	IV	Nectarivorous

Family	Scientific Name	Common Name	Status	Status (IUCN)	IWPA Schedule	Guild
Oriolini	*Oriolus traillii*	Maroon Oriole	R	LC	IV	Omnivorous
	Oriolus xanthornus	Black-hooded Oriole	R	LC	IV	Omnivorous
Paridae	*Parus major*	Great tit	R	LC	IV	Insectivorous
Pellorneidae	*Pellorneum ruficeps*	Puff-throated Babbler	R	LC	IV	Insectivorous
Phalacrocoracidae	*Phalacrocorax niger*	Little Cormorant	R	LC	IV	Carnivorous
	Phalacrocorax carbo	Great Cormorant	R	LC	IV	Carnivorous
Phasianidae	*Francolinus pondicerianus*	Gray Francolin	R	LC	IV	Omnivorous
	Gallus gallus	Red Jungle Fowl	R	LC	IV	Omnivorous
	Lophura leucomelanos	Kalij Pheasant	R	LC	IV	Omnivorous
	Pavo cristatus	Indian Peafowl	R	LC	IV	Omnivorous
Phylloscopidae	*Seicercus xanthoschistos*	Grey-hooded Warbler	R	LC	IV	Insectivorous
	Phylloscopus humei	Hume's Warbler	WV	LC	IV	Insectivorous
	Seicercus burkii	Golden-spectacled Warbler	R	LC	IV	Insectivorous
Picidae	*Picus canus*	Grey-headed Woodpecker	R	LC	IV	Insectivorous
	Chrysocolaptes lucidus	Greater Flameback	R	LC	IV	Insectivorous
	Picus flavinucha	Greater Yellownape	R	LC	IV	Insectivorous
	Dinopium benghalense	Black-rumped Flameback	R	LC	IV	Insectivorous
	Dendrocopos canicapillus	Grey-capped Pygmy Woodpecker	R	LC	IV	Insectivorous
	Picus xanthopygaeus	Streak-throated Woodpecker	R	LC	IV	Insectivorous
Psittaculidae	*Psittacula krameri*	Rose-ringed Parakeet	R	LC	IV	Granivorous
	Psittacula cyanocephala	Plum-headed Parakeet	R	LC	IV	Granivorous
	Psittacula eupatria	Alexandrine Parakeet	R	NT	IV	Granivorous
Pycnonotidae	*Hemixos flavala*	Ashy Bulbul	R	LC	IV	Frugivorous
	Pycnonotus leucogenys	Himalayan Bulbul	R	LC	IV	Frugivorous
	Pycnonotus cafer	Red-vented Bulbul	R	LC	IV	Frugivorous
	Pycnonotus melanicterus	Black-crested Bulbul	R	LC	IV	Frugivorous
Rallidae	*Amaurornis phoenicurus*	White-breasted Waterhen	R	LC	IV	Omnivorous
Rhipiduridae	*Rhipidura aureola*	White-browed Fantail	R	LC	IV	Insectivorous
Saxicolinae	*Cercomela fusca*	Brown Rockchat	R	LC	IV	Insectivorous
	Saxicola torquata	Common Stonechat	WV	LC	IV	Insectivorous
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	WV	LC	IV	Insectivorous
Sittidae	*Sitta castanea*	Chestnut-bellied Nuthatch	R	LC	IV	Insectivorous
	Sitta frontalis	Velvet-fronted Nuthatch	R	LC	IV	Insectivorous
	Sitta leucopsis	White-tailed Nuthatch	R	LC	IV	Insectivorous
Stenostiridae	*Culicicapa ceylonensis*	Grey-headed Canary Flycatcher	WV	LC	IV	Insectivorous
	Rhipidura hypoxantha	Yellow-bellied Fantail	WV	LC	IV	Insectivorous

Family	Scientific Name	Common Name	Status	Status (IUCN)	IWPA Schedule	Guild
Strigidae	*Ketupa zeylonensis*	Brown Fish Owl	R	LC	IV	Carnivorous
	Athene brama	Spotted Owlet	R	LC	IV	Carnivorous
	Glaucidium radiatum	Jungle Owlet	R	LC	IV	Carnivorous
Sturnidae	*Acridotheres tristis*	Common Myna	R	LC	IV	Granivorous
	Sturnus vulgaris	Asian Pied Starling	R	LC	IV	Granivorous
Tephrodornithidae	*Hemipus picatus*	Bar-winged Flycatcher-shrike	R	LC	IV	Insectivorous
Tichodormadidae	*Tichodroma muraria*	Wall Creeper	WV	LC	IV	Insectivorous
Timaliidae	*Stachyris pyrrhops*	Black-chinned Babbler	R	LC	IV	Insectivorous
Turdidae	*Copsychus saularis*	Oriental Magpie Robin	R	LC	IV	Insectivorous
	Monticola Solitarius	Blue Rock Thrush	WV	LC	IV	Insectivorous
Upupidae	*Upupa epops*	Common Hoopoe	R	LC	IV	Insectivorous
Zosteropidae	*Zosterops palpebrosus*	Oriental White-eye	R	LC	IV	Insectivorous
	Orthotomus sutorius	Common Tailorbird	R	LC	IV	Insectivorous

R - Resident, WV - Winter Visitor, S/W - Partial visitor in both Summer and Winter, LC - Least Concern, NT - Near Threatened, CR - Critically Endangered

were observed in a radius of up to 150 m from the center point. The birds were identified through Grimmett et al., 2011 and the species were assigned to a feeding guild following Wells, 1999 and Wells, 2007. The survey was conducted during time period of 08:00 to 16:30 hrs and species presence was further analyzed as per the survey hour. The time periods during which no birds were encountered or point counts were not undertaken, have been excluded for the survey analysis and results.

3. Results and Discussion

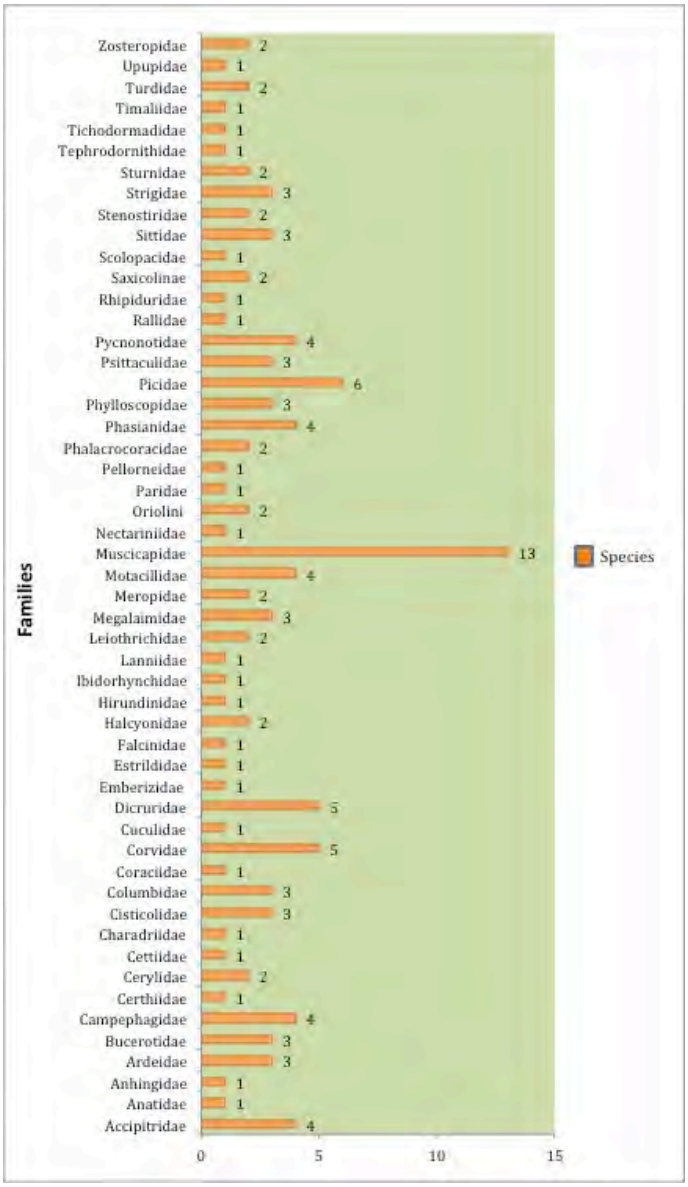
3.1 Avian diversity

A total of 121 bird species belonging to 52 families were recorded during the survey. Out of these species 101 were identified as Resident (R), 18 species as Winter Visitor (WV) and 2 species as partial visitor during both the Summer and Winter season (S/W) in the area. Some of these winter migrants breed in Central Europe such as Black Stork and migrate with their juveniles. Maximum members were represented by family Muscicipadae (13 species) followed by Picidae (6 species) and Corvidae and Dicruridae (5 species each). Among the other recorded families, five families were represented with 4 species each, nine families with 3 species each and ten families with 2 species each. The remaining 25 families were represented with only one species in each. The record of 121 species during a single season indicates habitat quality and diversity in the forest division. It is evident that variation in vegetation structure influence species distribution (MacArthur et al., 1962; Karr

& Roth, 1971; Pearman 2002) within a habitat. The landscape with more than one habitat types provides additional opportunities to diverse avian assemblages (Karr & Roth 1971). These habitat characteristics are important to support diverse avifauna and to reduce the habitat restriction of a particular bird species.

3.2 Avian community structure as per feeding guild

Among the recorded 121 species, 55% (66 species) were insectivorous, 19% (23) were carnivorous, 10% were frugivorous, 8% were omnivorous, 7% were granivorous and 1% nectarivorous according to their feeding habit. The presence of large number of insectivore bird community indicates that the area consists rich insect diversity as well as less human disturbances such as forest fire consequences (Gregory et al., 2001).



Number of species recorded in each family

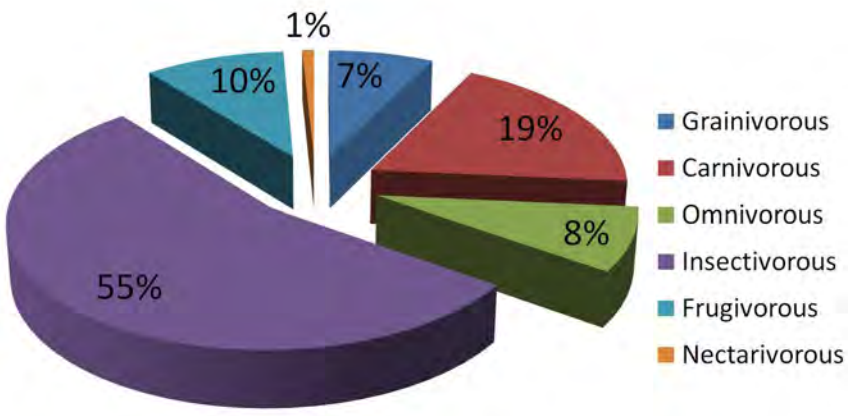
The study finding is comparable with earlier studies that have found a positive relationship between the abundance of insectivores and relatively undisturbed or less disturbed habitat, and the abundance of carnivores and granivores significantly higher in relatively disturbed or modified environments (Fujioka & Yoshida 2001; Lombardini et al., 2001; Chettri et al., 2005; Zakaria et al., 2005; Azman et al., 2011). However, the presence of carnivorous species in the study area which is primarily influenced with the availability of food sources, indicates the abundance of their prey. Prey base such as small birds, lizards, snakes, rats, snails, leeches, are among the food sources for carnivores in the area. Furthermore, control on forest fire or a very few forest fire incidents have taken place in the area over the years. As a result it provide conditions to proliferate insect diversity which further supports bird species preying on them (Tim 2014).

The presence of water birds especially the ducks was recorded in the upstream of Kosi River and its tributaries, indicates suitable foraging grounds in the forest division, addition to the Kosi barrage.

3.3 Conservation status

Among the recorded species a total of 118 species are listed as Least Concern (LC) while one species (Red-headed Vulture) as Critically Endangered (CR) and two species (Great Hornbill and Alexandrine Parakeet) as Near Threatened (NT) in the IUCN Red List 2015. In terms of Indian Wildlife Protection Act (IWPA, 1972), all species are listed under Schedule IV.

Two prominent Protected Areas (PAs) of the Uttarakhand in the Terai-bhabar of Himalayan foothills, namely Corbett Tiger Reserve (CTR) and Rajaji Tiger Reserve (RTR) are declared Important Bird Areas (Rahmani & Islam, 2004). In both the PAs avifaunal checklists have been prepared and 549 species in CTR (Sharma et al., 2003) and 312 species of birds in RTR (Pandey et al., 1994) were recorded. Influence of adjoining diverse ecosystem can be seen on similar habitats especially in terms of bird community structure (Matlock & Edwards 2006). Moreover, adequate habitat protection measures influence the species diversity and abundance. The recorded species in present study are about 22% of the birds recorded in CTR by Sharma et al., 2003. The presence of Red-headed Vulture in the forest division is also significant for the survival of globally threatened species and its conservation planning. However, no records of two more globally threatened resident raptor species (White-rumped Vulture and Slender-billed Vulture) was a serious issues of concern and indicates the poor recovery of the species after mass extinction during 1990s and early 2000s. For the recovery of these two species of vultures in the Ramnagar division, an action plan needs to be incorporated in the working plans of the division. Furthermore, a detailed investigation including all the season is necessary to enhance the understanding on avian diversity including habitat preference by various specialized bird species in the



Percentage of bird species as per their feedling guild

Ramnagar forest division.

Conclusion

Ramnagar forest division has received adequate protection after monitoring studies proved occurrence of viable population of the tigers in the division. In addition to this, large number of migratory birds especially in winters arrived in the landscape for foraging due to its unique habitats characteristics. Riverine and wetland habitat such as perennial rivers, seasonal water streams, ponds and an irrigation barrage on the Kosi river, are among the suitable habitats for water and riverine birds. The Ramnagar forest division has received adequate protection under tiger conservation programme within the Corbett Landscape, however, increasing anthropogenic pressure such as non-regulated tourism, malpractices of fishing (use of dynamite, chemicals, live wire, etc.) and increasing tourism infrastructure chain are being the issues of concern. These issues have severe consequences on biological diversity of area including the avifaunal abundance. Moreover, drying of natural water resources due to variability in climatic condition over the years increases the species vulnerability. Appropriate measures such as control on fishing, promoting responsible tourism, regulation on mining and regular monitoring on practices damaging the ecosystem are needs to be undertaken to restore the habitat quality. Education and outreach activities such as bird watching events to aware the school children and people on importance of bird communities, would be crucial for conserving the habitat and avian diversity in the landscape.

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Enriching Lives - Improving the well being of Captive Animals - Dr. Brij Kishor Gupta

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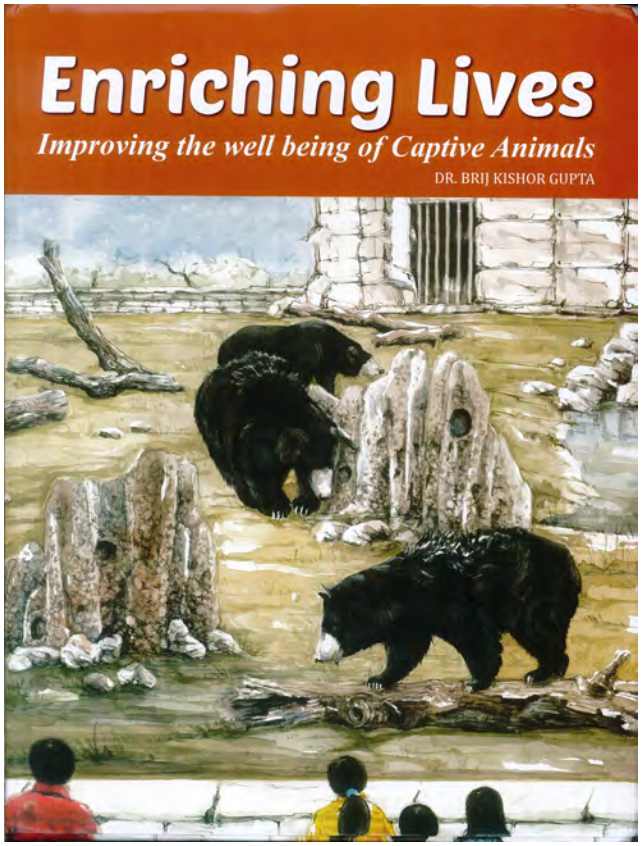
'Enriching Lives' by Dr. Brij Kishor Gupta is an excellent publication and very timely as the zoo community and others who are keeping wild animals have no such comprehensive book so far other than the one published by the Wildlife Institute of India. The author has provided practical tips for environment enrichment for most groups of species with ample illustrations and photographs. The book has also tried to suggest easily available and inexpensive materials to see that the animals feel at home in a very limited space of the zoo or captive animal facilities like rescue centers without looking too much out of place and blend well with the architecture and landscape of modern enclosures. When used in different zoos in India and abroad this will certainly help the animals to exhibit their natural trait instead of stereo-typed behaviour. The suggested methods shall make the animals happy and improve their quality of life and longevity. However some materials and equipments which are artificial in nature and stand out against the near natural back drop and placement of meat in gunny bags and other artificial artifacts that may be ingested by the animals should have been avoided. In case of nocturnal animals, pangolins and small reptiles some provision of sunlight for a part of the day or on a part of enclosure can be a great enrichment. For the animals of higher reaches exhibited in hill zoos the designing of exhibit should take the aspect of the site in to consideration for maximum sunlight during winter months. The book contains enrichment ideas for the animal houses (night shelters)



too besides the safety considerations while providing different types of enrichments. Chapter-I is quite informative and can help managers to decide on their own enrichment ideas. The author has been able to put together many relevant references which can stimulate many enrichment ideas other than those indicated in this book. Most photographs used in the book are from Indian zoos and hence certain good enrichment practices are already in use and if they are replicated in other places with suitable modification they can certainly help improve the quality of life of most zoo animals. Overall it is an excellent book and very useful publication for the zoos in India.

World Crocodile Day 2017 celebration at National Chambal Sanctuary in Rajasthan

World Crocodile Day is a global awareness campaign to highlight the plight of endangered crocodiles and alligators around the world. It is celebrated on 17 June every year.

Nature Education and Service Society (Baran, Rajasthan), Society for Conservation of Historical Ecological Resources (Kota, Rajasthan) and National Chambal Sanctuary (NCS), Rajasthan jointly observed the day.

The day's programme was officially inaugurated by S.N. Saraswat, Forest Range Officer, Keshoraipatan, NCS. During his welcome address Saraswat hinted that this was the first time in the history of NCS the day was celebrated here. Further he said that the real conservation is incomplete without the involvement of riparian community with their suport only the forest department curb illegal activities in this area.

Talk on crocodiles

Field visit to Jamuniya Island

Hari Mohan Meena welcomed all the experts and participants. He explained about the programme agenda which includes talks by experts on crocodiles and followed by field visit to Jamuniya Island which is located on NCS. Moreover he shared information about crocodilians to the participants. There are 24 crocodile species in the world which inhabits range of aquatic ecosystem, out of them four species are Critically Endangered and three are Vulnerable (IUCN 2017).

Field training on crocodile nest searching

A mugger sighted during field visit

Three crocodile species are found in India, two of them living in freshwater ecosystem and one in the marine. They are Saltwater Crocodile (*Crocodylus porosus*), Mugger Crocodile (*Crocodylus palustris)* and Gharial (*Gavialis gangeticus*). In National Chambal Sanctuary, two crocodilian species Mugger and Gharial are found.

In second session in evening, the participants were taken to Jamuniya Island. Here field training was given on how to search for crocodile nesting site and what type of precautions are needed during nest search. Further he shared some information from his research studies done from 2013-till date. There are 22 Gharials are present in 143km stretch between Keshoraipatan to Pali in 2017. But during his masters degree research done from K. Patan to Pali Bridge he sighted 49 Gharial (3 hatchlings, 5 yearlings, 13 juveniles, sub adult 13 and adults 15) and 32 Mugger Crocodile (1 hatchling, 9 juveniles, 17 sub-adult and 5 adults). He also recorded conflict between human and crocodile which maximum occurs in April-June, the main reason is crocodiles nesting season.

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Budding birders of Sundarvan

At Godhavi - observation of heronry to learn about breeding in birds

Birdwatching is a recreational activity and can progress to be a great contribution for citizen science. Encouraging children in birdwatching will help them develop passion towards nature appreciation. Now a days, children spend lot of time in watching televisions and playing video/mobile games. The outdoor exposure will provide good physical and mental health. So, time spent outdoor for useful hobby such as birdwatching make the children engaged in useful activity, which helps them grow healthy.

Fifteen students from Mahatma Gandhi International School (MGIS), Ahmedabad, joined in the “Budding Birders of Sundarvan” for 2017-18. Joona Sheel, the teacher in-charge of the programme is dedicated to mould these students as keen bird watchers.

This annual programme has four different sessions. Students were introduced to the world of birds through an interactive powerpoint presentation in the first session. Topics such as origin, general features, diversity, food and feeding, breeding, conservation issues, beak and feet adaptation, interesting facts, importance of birdwatching, etiquettes of birdwatching and introducing the common birds of this region were covered. Later, students were taken around to observe birds in the school premises.

A visit was made to the heronry in Godhavi to observe breeding activities of birds on 2 September 2017. Students were very excited seeing this colonial breeding phenomena of different birds such as Asian Openbill, Indian Cormorants, Night Herons, Black-headed Ibis and different species of egrets. Information such as tree species used for nesting, tree

height, nest height, number of nest on each tree, distance of nest tree from road, human habitation and water bodies, etc were collected for further discussion. “Birds of Peninsular India” – packet guide was distributed to all the students as resource material. Students tried their hand, identifying birds seen in this site. Introduction on nesting and various types of nests were explained to them before reaching the spot.

The third activity was carried out at Sundarvan Nature Discovery Centre on 17 January 2018. Nest making activity, using different waste materials was taught. A birdwatching session was also conducted for them at the premises. Students were encouraged to submit their bird list in online portal such as ebird.org to contribute to the citizen science.

Observation of Sarus Crane family on the way to Pariej

The enthusiastic group gathered at Sundarvan early morning of 10 February 2018 for a bird watching trip to Pariej. A group of two adults and juvenile Sarus Cranes was the major attraction before reaching this fantastic birding site of Gujarat. A small squadron of Dalmatian Pelicans welcomed us in Pariej. The children were excited to see magical colours of Purple Moorhen, Bronze-winged Jacan and White-throated Kingfisher through spottingscpoe. A white morphed Paradise Fly-catcher with long tail was entertaining these budding birders by hopping here and there to capture flies for quite some time. The children could view over 50 birds including Caspian Tern and Small Pratincole. They were totally in to the birding by viewing them thoroughly, noting down the bird names, capturing them through lenses and asking questions to clarify their doubts. Joona told me that they have few more activities at school to sustain this interest among these kids and to pass this energy to other students. I strongly believe that this programme will have major impact to shape some future naturalists.

Acknowledgements: Sincere thanks to IDEA WILD for generously providing us a spottingscope and binoculars to use in such programmes and also thanking the management of MGIS for choosing us to carry out this activity for them.

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"Wetlands for a sustainable urban future" on World Wetlands Day

The theme for World Wetlands Day for 2 February 2018 was **"Wetlands for a sustainable urban future."** With the increasing urban sprawl, the city wetlands have been encroached to meet the increasing demand for land.

The aim of the programme was to create awareness amongst the students, to make them understand that urban wetlands make cities liveable by reducing floods, replenishing drinking water, filtering waste, improving water and air quality, promoting human well-being, enabling people to earn a living and many more. The inventiveness to involve the students was undertaken from 1st to 10th February.

During these 10 days, various activities in school were carried out followed by field trips. Contests and competitions raised awareness and knowledge about World Wetlands Day and the mission of the organization. A very simple yet incredibly effective

Students learning about the waterbirds from posters and banners

Students watching the birds during the field trip to reservoirs

contest for the students was to write the Hindi or local names of 10 water birds that they have seen, read or heard about. It was not astonishing to find that most of the students ended up in writing 6-7 names only. This activity was a self realizing experience for them. After this the students were provided with posters and banners that had the photographs of water birds and their names in Hindi and English. The students noted down the names in their note books

and they also identified a number of birds that they often saw but didn't know their names. The students were also provided with the colour-in poster designed by the Ramsar Convention on Wetlands as in their outreach material. The students coloured the posters and learnt about the urban wetlands and their role in sustainable livelihood.

The participants were felicitated for their efforts so as to encourage others to come closer to nature. They were provided with flyers on World Wetlands Day in Hindi, the local language. The field trips provided first-hand experience with physical sites and resources in the nearby water reservoirs. It provided the participants the opportunity to directly engage in watching the biodiversity of the wetlands. On 9 February, Bird Watching Day was also celebrated with the Forest Department, Jhansi Division.

The activities for the students were same as for World Wetlands Day. The students from orphanage were also involved. For many of them it was their first experience to watch out the migratory birds. The school staffs were very active and took the initiatives to help in arranging the field trips for the students. Paryavaran Jeev Seva Sansthan, Gonda and Society for Scientific Research, Barabanki and Sarthak Pragati Prayas Sansthan, Jhansi, collaborated in the program.

Students enjoying the field trips

Posters coloured by the students

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ZOO'S PRINT

Communicating science for conservation

ZOO's PRINT Publication Guidelines

We welcome articles from the conservation community of all SAARC countries, including Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka and other tropical countries if relevant to SAARC countries' problems and potential.

Type — Articles of semi-scientific or technical nature. News, notes, announcements of interest to conservation community and personal opinion pieces.

Feature articles — articles of a conjectural nature — opinions, theoretical, subjective.

Case reports: case studies or notes, short factual reports and descriptions.

News and announcements — short items of news or announcements of interest to zoo and wildlife community

Cartoons, puzzles, crossword and stories

Subject matter: Captive breeding, (wild) animal husbandry and management, wildlife management, field notes, conservation biology, population dynamics, population genetics, conservation education and interpretation, wild animal welfare, conservation of flora, natural history and history of zoos. Articles on rare breeds of domestic animals are also considered.

Source: Zoos, breeding facilities, holding facilities, rescue centres, research institutes, wildlife departments, wildlife protected areas, bioparks, conservation centres, botanic gardens, museums, universities, etc. Individuals interested in conservation with information and opinions to share can submit articles ZOOS' PRINT magazine.

Manuscript requirements
Articles should by typed into a Word format and emailed to zooreach@zooreach.org. Avoid indents, all caps or any other fancy typesetting. You may send photos, illustrations, tables.

Articles which should contain citations should follow this guideline: a bibliography organized alphabetically and containing all details referred in the following style: surname, initial(s), year, title of the article, name of journal, volume, number, pages.

Editorial details
Articles will be edited without consultation unless previously requested by the authors in writing. Authors should inform editors if the article has been published or submitted elsewhere for publication.

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ZOOs' PRINT magazine is informal and newsy as opposed to a scientific publication. ZOOS' PRINT magazine sometimes includes semi-scientific and technical articles which are reviewed only for factual errors, not peer-reviewed.

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