ZOO'S PRINT

Communicating Science for Conservation

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Contents

Go Gharial !

Going, going, going GONE ?

NO! **Go back to survival !**

Now it is up to you !

Go get Gharial back!

India came very close to losing its remarkable Gharial in the mid-1970s when it was discovered that their total number throughout India was about 250 animals. Wildlife biologists speak of "minimum viable population" or MVP, e.g., the lowest number at which a group of animals can survive for the long term; 250 is far below the MVP !

Furthermore, these 250 gharials were scattered within several areas which earlier comprised their range -- this is "fragmentation" which is also not good for long survival.

Ok but why worry? Aren't there so many other animals left ... lakhs of invertebrates, thousands of bats and rodents, hundreds of amphibians, other reptiles and mammals ? Yes, but

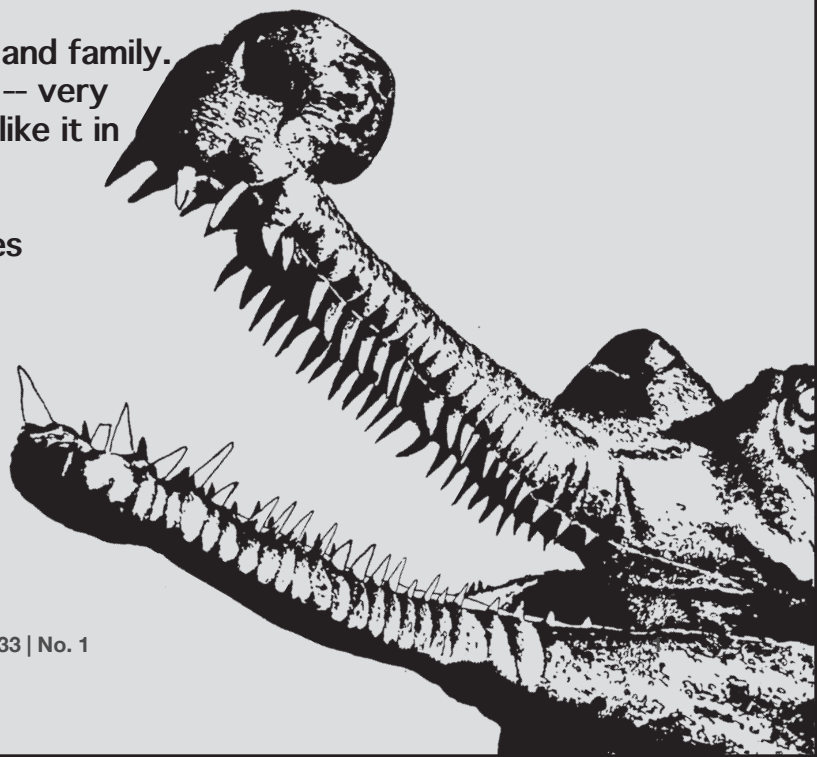
- **Gharial is unique.**

-- It is the most distinctive of living crocodilians
-- It is one of the largest living crocodilians
-- It is one of the oldest of reptiles
-- Its ancestors had a wide geographical distribution for most of the cenozoic age, crossing over to South America; it is at the centre of an evolutionary puzzle.

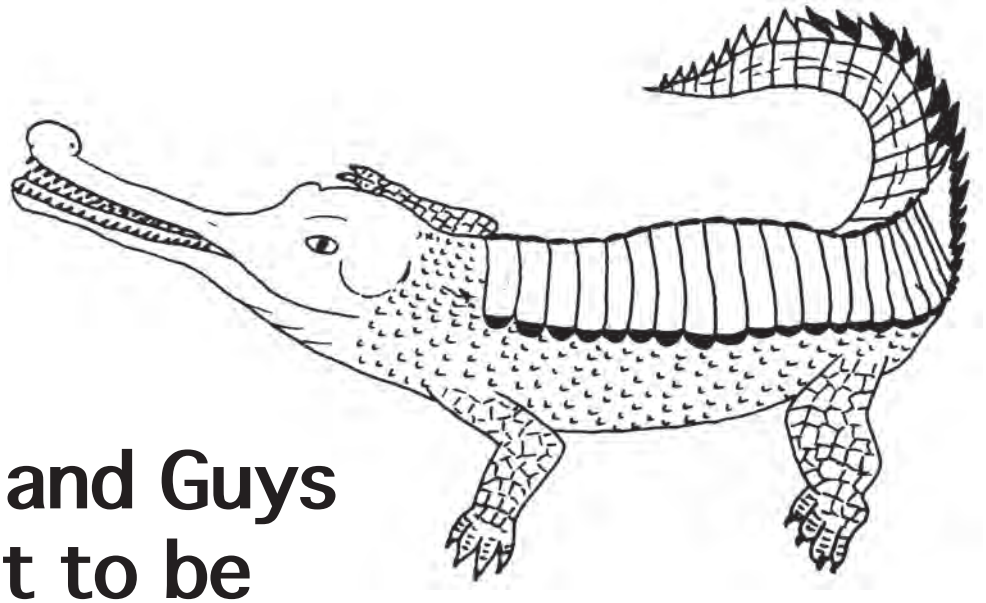
- **Gharial is monotypic in species, genus and family. That just means that it is -- zoologically -- very unique indeed. There are many animals like it in so many important aspects.**

- **Gharial is extinct in 4 of the 6 countries which made up its former range.**

Therefore, if we lose Gharial, we have lost an unique component of Indian science, natural history, history of science, evolution, ... it shouldn't happen.



Great Gharial Games



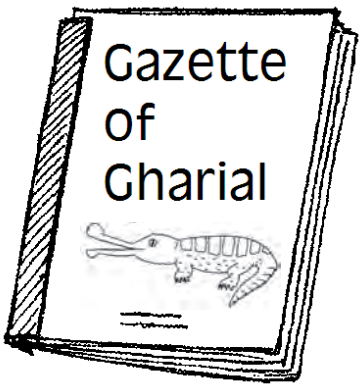
For Girls and Guys who want to be Guardians of Gharial

General info about Gharial and other Crocs

Gharial is a type of crocodile. There are three types (or families) of crocodiles Family Alligatoridae, Family Crocodilidae, and Family Gavialidae - Alligators, Crocodiles and Gharials

All crodilians are basically alike but have small differences.

All crocs are alike in these ways
- they are all reptiles - they all have scales instead of fur or feathers
- they are all carnivores - meat eaters - their preferred food is fish
- they are all amphibious and spend some time on land - they all live in warm sub-tropical and tropical waters throughout the world.



They are different in these and other ways

Different in location
- alligators are found mostly in N. America, S. America and China
- crocodiles are found in Asia, Africa, Pacilfic Islands and USA
- Gharials are found in Asia (India and Nepal)
- Gharial is now found only in the following Indian states : M.P., U.P. & Rajasthan
- It is found in Nepal (but only a few breeding adults).
- Gharial is Extinct in Pakistan, Bhutan, Bangladesh and Myanmar.

Fantastic Facts

Different in species and name

There are 21 species of crocodilians altogether
India has three species. They are called Gharial (**Gavialis gangeticus**), Indian mugger (**Crocodylus palustris**), and Estuarine crocodile (**Crocodylus porosus**)

Different in head shapes

Gharial head looks like some kind of musical instrument with a narrow snout which gets bigger at the end and has a bulb on the end in case of males.
Mugger snout is wide and almost triangular.
Estuarine crocodile snout is medium (between wide and narrow) and almost triangular.

Different in Colour

dorsal (upperside)	Gharial is olive green with dark cross bands
	Mugger is Ash or dark or yellow brown
	Saltwater crocodile is dark green-brown
Ventral (underside)	Gharial - light yellow or white
	Mugger - white
	Saltwater crocodile - white

Different in behaviour -- gentleman or gangster

Gharial is generally a gentleman. It is not aggressive and will not attack humans unless severely provoked. Mugger and Estuarine crocodiles are gangsters. They are cranky, hungry, and dangerous to man when man encroaches on their territory. Stay out of their way or pay the price.

Instructions

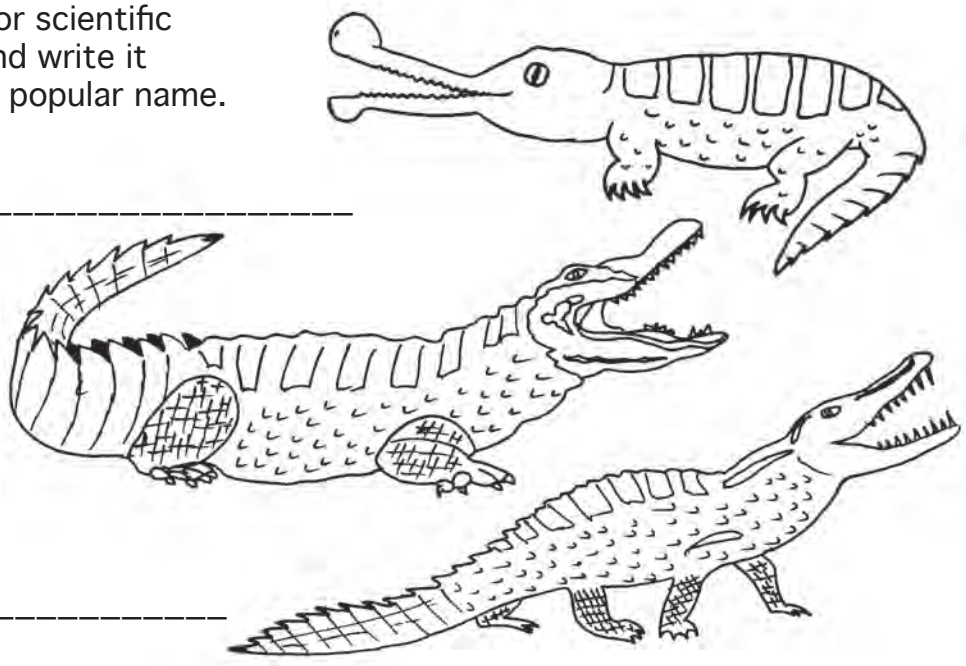
1. Colour each animal its natural colour as told on the previous page
2. Draw the animal that it likes best between its jaws
3. Find the zoological or scientific name for the animal and write it beside the common or popular name.

Gharial

_____

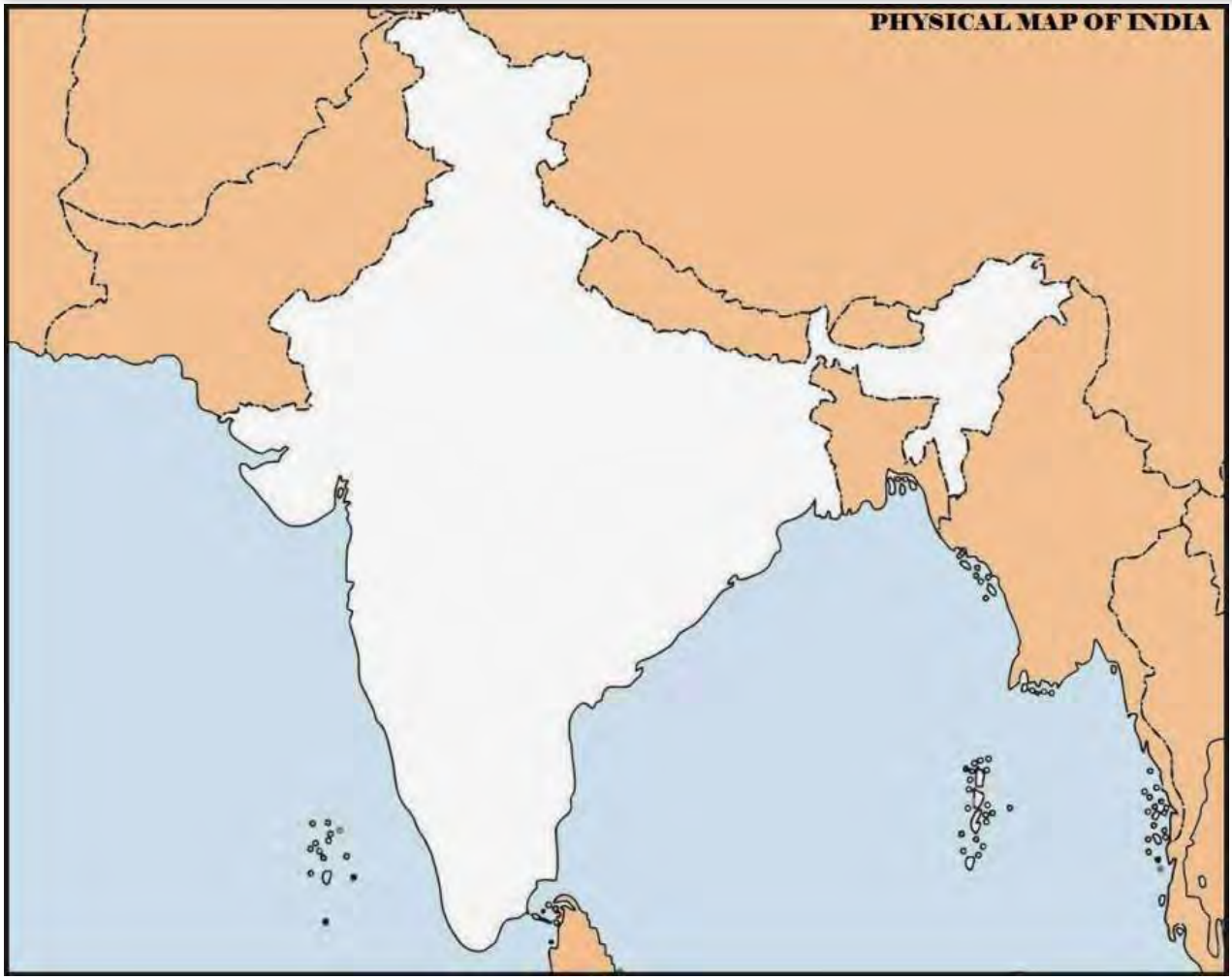
Mugger

_____



Saltwater crocodile

_____



Gharial on the map

We have told you the countries and states where gharial is found. Take your pencil or pen and draw a tiny gharial in every major area where it is found (state or country). Make a list of these names over to the right beside the numbers. Draw a line from each state and country to the correct area on the map like we have done for India.

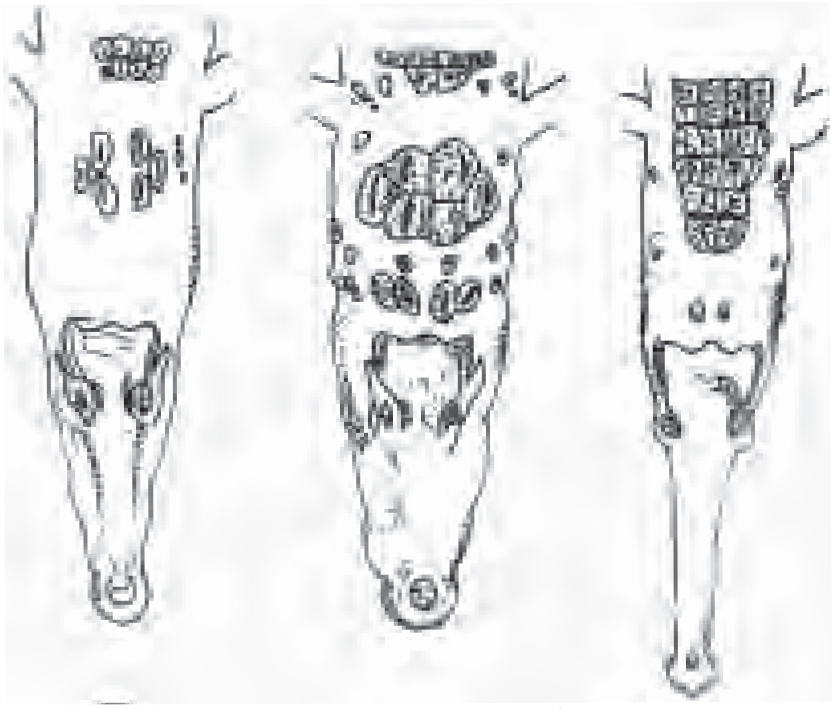
Countries having Gharial
1. India and
2.

Indian states having Gharial
1.
2.

Countries where Gharial once lived but is no more present. Draw a big "x" for Extinct
1. 3.
2. 4.

Remaining Gharial in
1. Chambal River (National Chambal Wildlife Sanctuary, Madhya Pradesh)
2. Katerniaghat Wildlife Sanctuary (Uttar Pradesh)
3. Son Gharial Wildlife Sanctuary (Madhya Pradesh)

What kinda croc ?



Adapted from L.A.K. Singh, 1999

Instructions : Elsewhere in this article the different species of Indian crocodilians have been identified by the shape of their head and nose. Review this if you want. Then ...

1. Write the common name of the species under the head in the space provided.
2. Write the zoological or scientific name along the side of the head.
3. Can you guess what zoological / scientific names are for ? Write your guess in the box below and then check the right answer which is cleverly hidden somewhere in this article.

1. _____ 2. _____ 3. _____

How is Gharial <u>different</u> from other crocodilians ? List reasons you remember before peeking on the other page.	**How is Gharial <u>like</u> other crocodilians ?** List reasons you remember before peeking on the other page.

How do we stop it ?

In the mid-70s, when it was discovered that there were only 250 gharials, an FAO funded project was set up which included finding nests, collecting eggs, hatching and rearing baby gharials for release to "safer" areas when they were old and fast enough to escape predators. Foresters were trained in monitoring and other studies. A **Crocodile Conservation Project** was started and flourished, establishing large protected areas in important crocodile areas. Over 4000 captive reared and captive bred young gharial were released, many of them in the **Chambal River** and **Chambal Gharial Sanctuary** which covered three states - Rajasthan, U. P. and Madhya Pradesh, and was one of the most important areas in saving gharial

... or so it was thought.

In January 1995 a PHVA workshop on Gharial was held in Gwalior because the various state governments were threatening to stop the release programme. The workshop reported about 1200 Gharials -- 100 adults and 75 nests -- in Chambal as the most secure and only self-sustainin population in the country at that time. Participants nontheless concluded that continued supplementation of populations was necessary for long-term survival. Two surveys in 1995-97 also indicated about 1200 gharial in the Chambal River but some bad changes in the sanctuary were emerging.

In just 7 years a crisis developed. Use of the Chambal River has increased and monitoring and protection has decreased. Surveys around 2004 reported 600 Gharials, a loss of 50% of the population in this best river in five years. Population numbers tell us a great deal about the status of species, but population loss tells more. Decline of 50% in 10 years is a very serious matter. We have a decline of 50% in five years - another decline may take us back to 250 !

India was again losing its gharial in 2004.

Status of gharial in 2012

Just two short years later, the status of Gharial in India had reduced to less than 200 again (Andrews, 2006) and less than 35 adults for Nepal (Saikia, 2012). The causes of their declining populations for the last 60 years have been inferred from literature -- overhunting, egg collection & killing by fishermen, limitation of range due to loss of riverine habitat. The geographic range of gharial has also declined from about 20,000 sq. km. to less than 3000 sq.km. in India and in Nepal from about 1000 sq. km. to less than 100 sq. km. Small population size + decline are also important : currently there are only three breeding populations in India -- Chambal River, Son River Sanctuary and Katerniaghat Wildlife Sanctuary. There is has been a 50% decline in the population from 1997 to 2006. Any of these criteria -- declining population, shrinkage of geographic range and small population size and decline -- are enough by themselves to justify upgrading the IUCN Red List category from Endangered to Critically Endangered. Gharial qualifies in all three ! Wildlife scientists, reptile specialists, crocodilian experts and gharial

researchers have been and are sounding alarm bells but nobody in the concerned governments with the power to respond seems to be listening.

Status of gharial in 2012

Just six years later, the species was reported to be present only in five separated breeding population namely Chambal river, Giwa river, Son river, Brahmaputra river in India and Rati and Narayani river in Nepal. As per current estimates the number of breeding gharials never crossed 220 (Saikia, 2012).

What about you ? Are you listening ?

Researchers are doing their part to insure that accurate information is available for gharial. That information needs to get into the hands of people who can take strong action to confront the problems and take serious action steps. Sometimes the government will listen to an audience that is not the usual activists. Young people who take an interest may be more effective than others. You are India's future after all. See next page for things legislators and officials need to do and what YOU need to do to motivate them.

Gharial Conservation alliance: http://www.gharialconservationalliance.org/

- consists of scientists, educationist, social scientists
- approach to conserve species
- involve local people in conservation and management

What legislators / government needs to do :

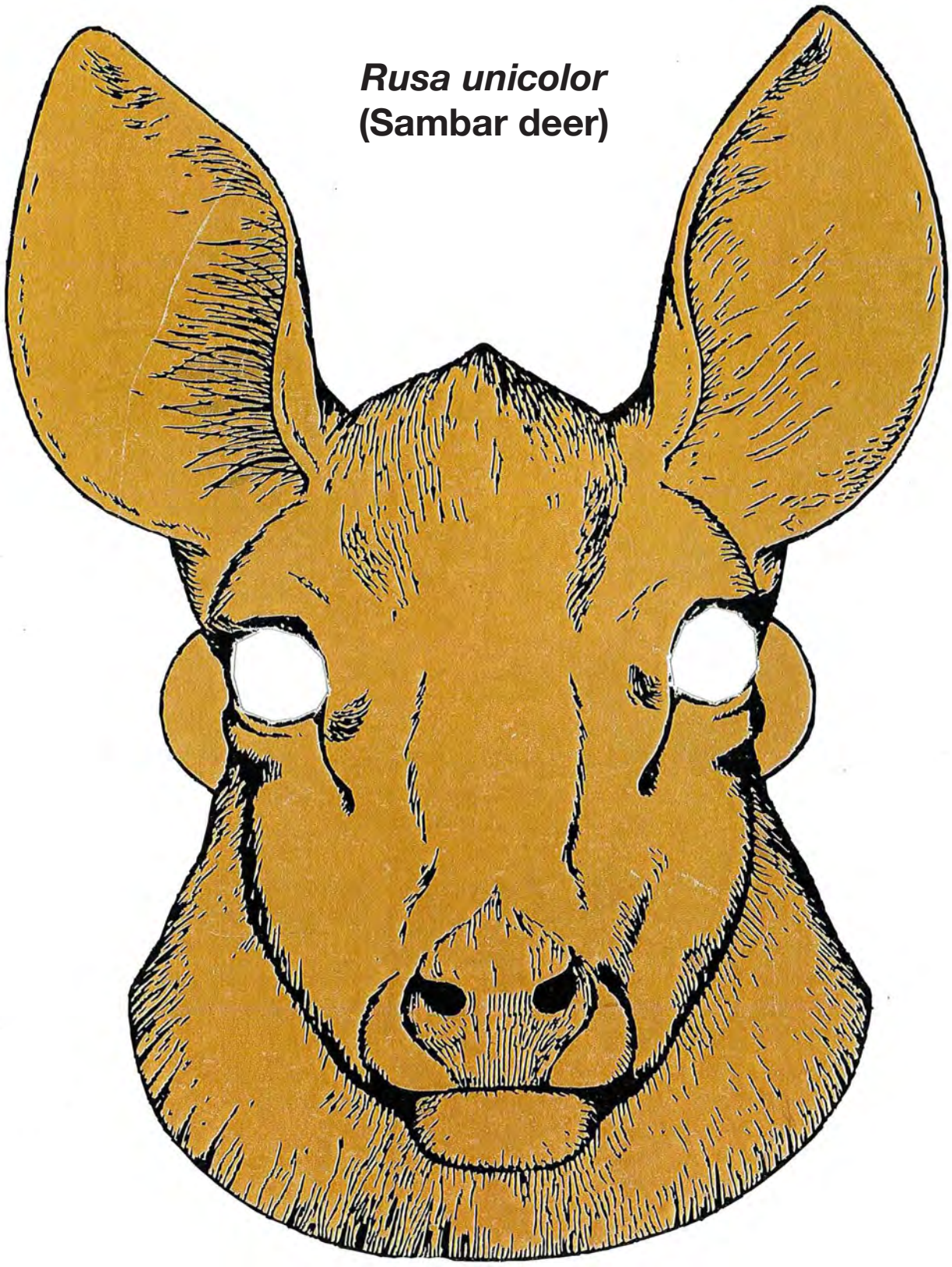
- resussitate the "grow and release" programme or similar activity so that rivers can be restocked with young gharial
- take strong action against the forces which led to the decline of gharial
- develop the will to take this action by understand the significance of permitting a unique treasure to become extinct
- deal with the illegal fishing/turtling mafia on Chambal River
- develop legislation that can be carried out and strengthen enforcement with regard to fishermen and their dangerous nets;
- create a Project Gharial for all the states formerly holding Gharial with funds for survey, monitoring, restocking, protection, community development and awareness building.

What you should do :

- learn all you can about gharial - from books, from websites, etc
- create awareness in your school, in your neighborhood, at your temple or mosque, on your cricket team, anywhere a group is gathered ...
- address government agencies with letters about gharial - organise letter writing campaigns, signature campaigns, fundraising efforts
- organise street plays and dramas in your neighbourhood. (You can write to Zoo Outreach Organisation for a Drama Kit, e.g. ideas for dramas, guidelines for dramas, masks of fishermen, river dwellers, politicians, etc.,
- Think positively ... think that we CAN save the gharial IF we believe we can and if we try.

By Sally Walker, Marimuthu, B.A. Daniel and Latha Ravikumar; Artwork by Sanjay Molur

Print this mask on a card and cut it



Collect these masks for exciting games

At the centre of his universe, Dr. Mewa Singh. An occasion to commemorate his achievements. The untiring 24x7 day and night scientist presented with a memento on the new night frog. Photo by Elakshi Molur.

Nyctibatrachus mewasinghi

New species of night frog named after Dr. Mewa Singh

Krutha, K., N. Dahanukar & S. Molur (2017). *Nyctibatrachus mewasinghi*, a new species of night frogs (Amphibia: Nyctibatrachidae) from Western Ghats of Kerala, India. *Journal of Threatened Taxa* 9(12): 10985–10997; http://doi.org/10.11609/jott.2413.9.12.10985-10997

Adding to the list of night frogs, the 36th species newly described to science has been named after the famous Dr. Mewa Singh, Professor (for life) of Psychology at Mysore University.

When I called Mewa — as I have referred to him for the last 25 years — on his mobile yesterday to break the news about the new species, his first response was so typical that I could literally see him right in front of me. "Ae, what's this?! You have immortalized me! I didn't know you were up to some mischief …", were his first words. All I could barely make out after that was his typically gruff, but almost child-like enthusiasm, expressing his joy. It took me back all the way to sometime in late 1993 when I was fairly green at ZOO and Sally and I had visited Mewa, her advice to me then, "Listen to every word Mewa has to say … gem of a guy and he makes absolute sense". The evening at the lawns of the Country Club turned out to be one of the best moments. It was then he encouraged me to work towards a PhD, but when I said I wanted to work for sometime in the field and then think of it, he kept a stern face saying "very few come back to academics after working". So, in 2002 at the South Asian primate CAMP workshop on risk assessments when I approached him of my interest to work on a PhD and wished to be his student, that was when I again heard his gruff, almost child-like enthusiasm, in encouraging me to join immediately.

It was thanks to frogs in 11th and 12th grade that I shifted my attention to biology and conservation, and I'm happy to be part of this wonderful team in describing a new species of night frog after Mewa.

Mewa Singh's Night Frog is currently known only from one location in Malabar Wildlife Sanctuary in Kerala. During the chytrid survey in the Western Ghats, Keerthi Krutha found this frog and tagged it as *Nyctibatrachus* species. Later when Neelesh Dahanukar examined and genetically screened the specimens from this location, they stood out as a distinct species from the known list of 35 night frog species.

I had the opportunity of meeting with the extremely busy Professor in his office in Mysore University on 13 January and present him with mementos honoring him on the occasion of the new species. Thank you Mewa for your ever inspiring work and attitude in life!

~Sanjay Molur

SARN
S. Asian Reptile Network

THREAT TO SNAKES

Mortality of snakes due to vehicular traffic and anthropogenic impacts in Jahangirnagar University campus, Bangladesh

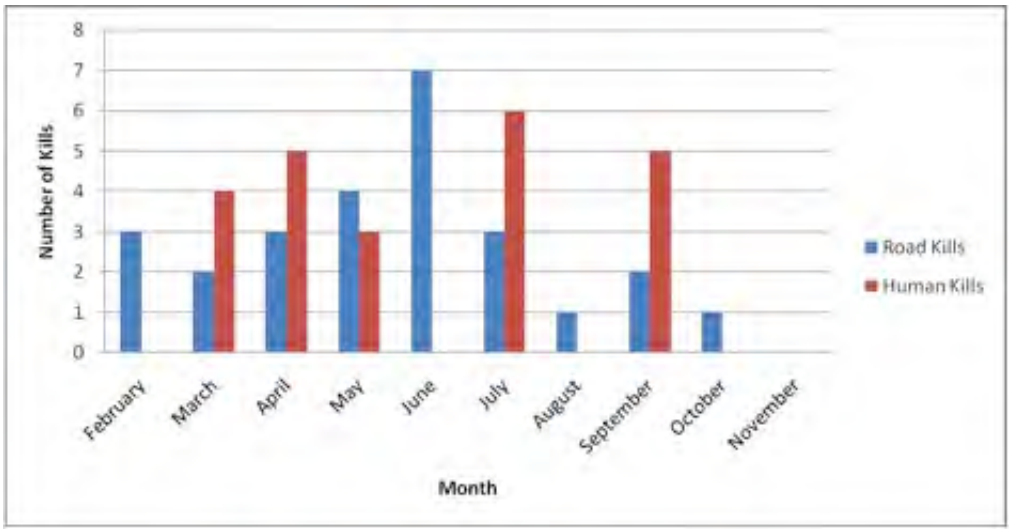
Human kill: Checkered keelback (Photo: A.K. Datta)

Mortality of animals, especially snakes due to vehicular impact is well understood and studied globally (Foster & Humphrey 1995; Groot & Hazebroek 1996; Trumbulak & Frissell 2000; Das et al. 2007; Row et al. 2007; Shwiff et al. 2007; Seshadri et al. 2009). Accidents with vehicles on road may affect populations of common and threatened species (Dhindsa et al. 1988). But mortality of snakes due to impacts of vehicular traffic and deliberate killing by human is poorly documented in Bangladesh. Although the country has so far recorded 76 species of snakes (Hasan et al. 2014) and the list is flourishing day by day. Rahman et al. (2013) carried out a survey in Lawachara National Park and its adjacent area in Bangladesh and recorded 503 road killed snakes, belonging to 30 different species. Apart from a single opportunistic observation, (Datta 2015) reported the mortality of 18 Spectacled Cobra (*Naja naja*) by students and staffs in Jahangirnagar University campus, but there is no information/data available on snake mortality due to vehicular traffic. The present study provides evidence of the impacts of vehicular traffic

and anthropogenic impacts on the snake community in the University Campus.

Study Area

The study was carried out during February 2015 to November 2015 in Jahangirnagar University Campus (23°52'76"N & 90°16'06"E), 32km north of Dhaka in central Bangladesh. The area of the campus is approximately 280 hectares and consists of natural and artificial lakes, agricultural lands, botanical gardens in and around human settlements.



Monthly variation of road kills and snakes killed by humans in study area

Originally the campus was a vast tract of 'Sal' (*Shorea robusta*) forest. The existing vegetation in this area is now of secondary character, originated from a tropical deciduous 'sal' forest community (Begum 2016). At present the campus supports 230 species of plants, 196 species of birds and 11 species of snakes (Hossain et al. 1995; Begum 2016; Kamrul Hasan pers.comm. June 2015). This is the country's only residential university with 13 student dormitory and a few more are under construction to provide residential support for about 20000 students. Every day in an average more than 20 buses, hundreds of private cars, motorbikes, and rickshaws run in and out of the campus to provide transportation facility for students, academic and administrative staffs.

Road kill: Common smooth water snake (Photo: A.K. Datta)

Methods

The roads passing through University campus

Human kill: Common wolf snake (Photo: A.K. Datta)

were divided into five segments (4.24km) for the convenient of study. The roads were systematically searched in early morning (06:00-08:00hrs) and late evening (05:00-07:00hrs) by walking slowly at least three days a week. In addition, using opportunistic sampling method, data on road kills and snakes killed by humans were also collected during incidental visits and based on the information received from other researchers, department staff and local people. The dead animals were identified up to species level, wherever possible, and removed from the road to avoid repeat count. For identification we used field guides (Daniel 2002; Hasan et. al. 2014). No snakes were preserved during the study period.

Results

Mortality of 49 snakes belonging to 7 species was recorded during the study. Of which 53.06% (n=26) were road kills and 46.94% (n=23) were killed by humans. Snakes belonging to the families Colubridae (5 species), Typhlopidae (1 species) and Elapidae (1 species) were recorded.

In case of road kills, individuals of the species Common smooth water snake

Table 1: Number of road kills and Human kills, family of the snake, common name and their scientific names

Family	Common Name	Scientific Name	Frequency (n)	
			Raod kills	Human Kills
Typhlopidae	Diard's blind snake	*Typhlops diardii*	0	2
Colubridae	Striped keelback	*Amphiesma stolata*	1	6
	Checkered keelback	*Xenochrophis piscator*	6	1
	Common smooth water snake	*Enhydris enhydris*	18	5
	Common wolf snake	*Lycodon aulicus*	1	5
	Indian rat snake	*Ptyas mucosa*	0	1
Elapidae	Spectacled cobra	*Naja naja*	0	3
Total			**26**	**23**

(*Enhydris enhydris*) were more frequently encountered (n=18) followed by Checkered keelback (*Xenochrophis piscator*) (n=6). Whilst in case of human killed, six individual of Striped keelback and five individuals of each Common wolf snake (*Lycodon aulicus*) and Common smooth water snake (*Enhydris enhydris*) were accounted.

Human kill: Common blind snake (Photo: A.K. Datta)

Monthly variation was observed for both road kill and snakes killed by humans. Highest impact of vehicular traffic was observed during June (n=7) followed by May (n=4), February April and July (n=3) respectively. Snakes that were killed by humans were found highest during the month of July (n=6) followed by April and September (n=5), March (n=4), May (n=3). No snakes were killed by humans during February, June, August, October and November. November is the only month when no mortality of snakes was observed by both incidents.

Discussion

Out of 7 species recorded in the campus, we found 4 species of snakes are due to road kills. It is worth mentioning although Common smooth water snake (*Enhydris enhydris*) and Checkered keelback (*Xenochrophis piscator*) both are water snakes but were found mostly as road kills. About 18 road kill Common smooth water snake (*Enhydris enhydris*) and 6 Checkered keelback (*Xenochrophis piscator*) were found. A study conducted by Das et al. (2007) at Kaziranga National Park, Assam, India observed very few water snakes as road kill. Another study on road mortalities of snakes in Mudumalai (Gokula 1997) shows that out of seven species of snakes, the Common vine snake (*Ahaetulla nasutus*) was the most affected (12 out of 23 snake road kills).

Common smooth water snake (*Enhydris enhydris*) is the only mildly venomous snake species found as road kill and the rest were completely non venomous. In a study Andrews & Gibbons (2005) found that venomous snakes crossing the road were more than non-venomous snakes. But here we found opposite scenario.

All the 7 snake species (total of 23) that were killed by campus dwellers are protected by Bangladesh Wildlife Act 2012 and killing of any such species is a punishable

offense. Datta (2015) reported killing of 18 Spectacled cobra (*Naja naja*) from a student dormitory of this university campus. This present findings justifies that such incidents of snake mortality is very common here. Students and staffs of this university campus may not be aware about country's Wildlife Act.

A detailed and long term study is needed to measure the anthropogenic impact and vehicular traffic on snakes as well as other animal species.

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CHINESE PANGOLIN

Sighting of Chinese Pangolin (*Manis pentadactyla*) in Valmiki Tiger Reserve, Bihar, India

Rescued specimen of Chinese Pangolin (*Manis Pentadactyla*) in Valmiki Tiger Reserve, Bihar, India (Photo: Valmiki Tiger Reserve Staff)

IUCN Red List: Critically Endangered (Challender et al., 2014)

Mammalia
[Class of Mammals]

Pholidota
[Order of scaly anteaters]

Manidae
[Family of Pangolin]

Manis pentadactyla
[Chinese Pangolin]

Species described by Linnaeus in 1758

Chinese pangolin is native to the north and north eastern States of India, including Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim and also occurs in Bangladesh, Bhutan, Nepal, Myanmar, China, Lao PDR, Taiwan, Thailand and Vietnam (Kaspal 2008; Gopi et. al., 2012; Challender et al., 2014; Thapa 2014).

This species was reported in the 1980s as common in its distributional range in India (Tikader 1983), its population is rapidly declining in its range due to habitat loss and rampant poaching for its skin, scales and meat (Challender et al., 2011; Nijman et al., 2016).

Present record of Chinese pangolin arises from Valmiki

Tiger Reserve (VTR) (27°10' 0.12" to 27°30'0.00" N; 83°49'59.8" to 84°10'0.00" E; area 901 km^2). VTR is located in West Champaran district of Bihar, India and adjacent to NE Nepal. It is contiguous with Nepal's Chitwan National Park in the north and Sohagibarwa Wildlife Sanctuary, Uttar Pradesh in the west. It represents one of the last patches of forests having the unique combination of terai-bhabar vegetation. VTR is dominated by dense sal and mixed deciduous forests (81%), open forest (6.4%), scrubland (3.5%), riverbed and waterbodies (4%), grassland (5.15%) and swampy habitat (0.1%) (Wildlife Trust of India 2012). There are ~26 villages with a population of about 22000 of local tribes and other communities, surrounding the core area.

Global Distribution:
Native: Bhutan, China, Hong Kong, India, Lao People's Democratic Republic, Myanmar, Nepal, Taiwan, Province of China, Thailand, Viet Nam

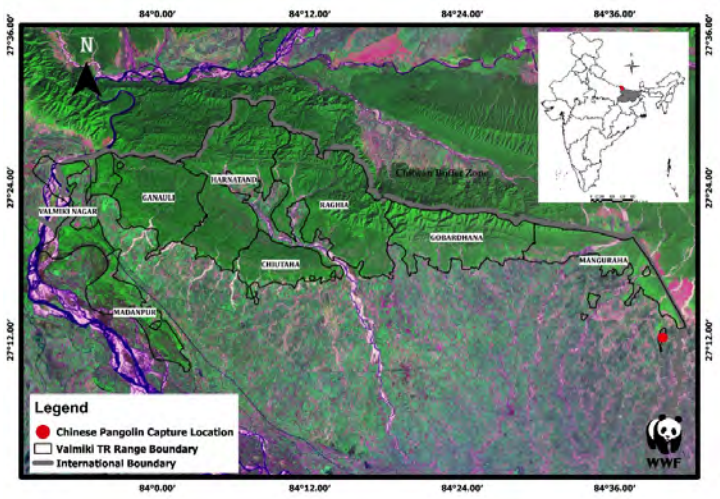
In the present case, a Chinese pangolin was encountered in eastern most part of VTR, in the possession of with a farmer in Kotwa village (27°12'12.2"N & 084°39'46.7"E) in Manguraha Range of VTR on 25 June 2015. The specimen was approximately 4-5 kg in body weight. Locally the species is known as "*Saal Machali*" and "*Bajar keet*". According to farmer and frontline staffs of Manguraha Range, the exact location of capture was an agriculture field nearby Jamuniha forest patch, nearly 2km from main forest. The major land use land cover type in and around Kotwa village is agriculture field, scrub forest and riverine habitats. Some of the villagers were even familiar with the species presence in that area (pers.comm). Interestingly, while VTR has intensively been surveyed with camera traps three time since 2012, neither Chinese nor Indian pangolins was photo captured during three consecutive camera trapping between 2013 and 2017 (Maurya & Borah 2014). However, there have been some record of this species in eastern Nepal and emphasized poaching and habitat destruction as prime factors for the decline of pangolins (Thapa 2014).

Habitat of Valmiki Tiger Reserve in the Himalayan Foothill (Photo: Kamlesh K. Maurya/WWF India)

It was difficult to establish whether pangolin was captured for meat purposes or trade purpose. The farmer himself inform about pangolin presence to forest officials of Manguraha Range of VTR. Later the animal was released back into forest of Manguraha

range. During releasing, we observed that pangolin uses their front legs for digging the burrow. The soil was pushed backward under their bodies and move it to the burrows entrance using both front and hind legs.

Local knowledge about species observed is an important source of collating information on species distribution and threats, especially for low density and secretive animals (Turvey et al., 2015). Forest front-line staff belonging to local community were able to recognize the species and also provided some morphological descriptions when pangolin photograph was shown to them. Very few were able to distinguish between Chinese & Indian pangolin, and claimed to have seen a pangolin inside forest. Front-line staff of Raghia range has claimed that a pangolin was killed by either tiger or leopard near a water stream in 2013 & 2014. In Nov 2013, two 8-9 months old tiger cubs killed a pangolin near a water hole in Manguraha Range. Pangolin was not eaten by the cubs. In 2015, Forest Department and Sashastra Seema Bal (SSB) seized some scales of *Manis* sp along with other wildlife parts in Manguraha Range indicating evidence of trade links between India and Nepal. The source of *Manis* sp scales was not clear.



Capture location of Chinese Pangolin in Valmiki Tiger Reserve, Bihar

***Manis* sp. scale was photographed in village nearby Valmiki Tiger Reserve (Photo: Kamlesh K. Maurya/WWF India)**

Local community especially *tharu & urano* revealed that pangolins are used for meat and medicinal purposes may be causing localized declines. Sighting of Chinese pangolin and survey confirmed the distribution of species in and around VTR. Further studies on population status and habitat ecology as well as traditional knowledge of the species may be useful to formulate effective conservation strategies in the future.

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Transportation of wild animals - practical approach & precaution

The zoological parks often transport wild and wild captive animals (wildomestic animals) to introduce new genes in their existing population of a species or for exchange of one species with another one. The transportation of the wild and wildomestic animals remains a great challenge for zoo staff and zoo veterinarians.

A number of literatures are available on wild animal transportation but somehow barely any of them deal with the practical approach and precautions during transportation.

Before transporting the animals following protocols should be followed:

1. The animal to be procured in exchange from other zoo or institution should be examined by the recipient zoo veterinarian before finalizing the deal.
2. The date of transport should be well decided at least one month in advance. Before finalizing the dates the recipient zoo or wildlife institute or sanctuary should also be consulted. This will help them to make arrangements and the transporting zoo will also get time to prepare itself to transport the animals.
3. The date of transport should not only be communicated to the concerned zoo but it should also be shared with the all concerned staff and officials in order to give them sufficient time to make preparations.
4. It is always better to communicate the transport dates to veterinary and/or forest institutions falling in the route for any emergency exigencies.
5. The cage in which the animal has to be transported should be repaired and should be free from sharp angle and nails. The cage should be sterilized a day before the travel date. It should be kept in mind that while coming back from the recipient zoo the animal may not be of the same species which was transported, therefore sufficient empty cages should also be taken according to the finalized exchange deal.
6. The ramp from which the cage has to be uploaded should be inspected and repaired accordingly.
7. The animal/ animals to be transported should be marked and segregated and be kept at closed place in order to make it convenient while taking inside the transport cage. After segregation the animal should be dewormed.
8. Before transporting animals, permission from concerned officers /agencies should be taken at least one month before in order to avoid last minute hiccups.
9. The transporter should be informed and truck to be used should be inspected for cage size. Too large trucks will unnecessary increase the transport cost and will send jerks to

the transporting cage and will injure the animal. However too small truck shall not be able to accommodate the large size cages and animal keepers in same trolley.

10. The vehicle to be used by the veterinarian should be serviced before long distance transports.

11. If cage is too heavy as in case of mega herbivores then a well skilled crane operator should be informed for uploading the animals.

12. It is better to take a forest guard, a keeper, a helper and a sweeper other then specified by wildlife institutions.

13. The route should be decided before transportation as bumpy roads are not advisable for animal transportation.

14. Following things should be kept ready for transportation:

i. All papers with at least three Xerox copies of each.

ii. A note pad and pen for writing expenses and other things.

iii. A hand bag to keep money and other essential things.

iv. Tarpaulin, green net, large polythene and rope to cover the trolley of the truck according to the situation.

v. Rope to fix the cage in trolley to avoid jerks.

vi. Bucket, mug and rubber pipe of 230m. Sufficient drinking water bottles (to put water in watering pot from outside the cage, bottle is also useful to drench the medicine in herbivores during emergencies), four containers of five liters filled with drinking water.

vii. Locks and keys for cage.

viii. Two drinking and feeding pots for animals.

ix. Torch.

x. Tools such as knife, pliers, hammer, screwdriver, wrenches of different size, long forceps, iron rod curved from one side to take out stale meat. Apart from this few pieces of small wires should be kept to repair the cage in emergency.

xi. Paddy husk for bedding of herbivores especially in winters, the paddy husk can be used by the attending staff for their bedding by putting a bed sheet over that.

xii. Adequate quantity of feed and water for the transporting animal should be taken care off.

xiii. Though winter transportation should be avoided but if anyhow unavoidable then proper arrangement for combating the cold shocks should be made. It will be better to keep two blowers and a 20 meter extension wire cable.

15. Veterinary drugs and equipments required during transportation:

i. Inj. Xylazine, inj. Ketamine, inj. Yohambine, inj. Diazepam,

ii. Inj. Dexamethasone, inj. Chlorpheneramine maleate, inj. Antibiotic, inj. Vitamin B

complex, inj. Analgesic, inj. Antiemetic.

iii. Buclizine syrup and negative energy balancing syrup.

iv. Povidone-iodine, antiseptic ointment, cotton, gauge, antiseptic spray.

v. Forceps, artery forceps, long forceps, BP knife, syringes of different capacity.

vi. Darts and projectile instruments.

All the arrangements should be kept ready one day before the commencement of journey. The animal usually struggles when taken inside the transport cage, hence the cage should be immediately covered by a green net and no one should be allowed to come close. Generally after some time animal calms down but if animal is regularly struggling then mild sedative may be used. While loading the animal cage the face of the animal should always be in moving direction of the carrying lorry. It should be kept in mind that the cage should not tilt while loading. Therefore it is always advisable to upload the cage through a proper ramp.

The preferred period of transport should invariably be conducive season. Too hot and too cold season should always be avoided. However, during summer journey should begin at evening while during winter day time journey should be preferred. The animal should be observed at every two hours interval by the accompanying veterinarian and vehicle should be rested time to time. However first observation should be done as early as one hour after commencement of transportation. Usually animals seldom take food while transporting them but if offered at resting period when vehicle is not moving then they start to take food and water easily. The buclizine and negative energy balancing syrups in water are practically helpful in stimulating hunger and combating negative energy balance.

While transportation the next veterinary and/or forest institutions falling in the subsequent route should be kept informed for any emergency exigencies. The officers of the transporting zoo and recipient zoo should also be kept aware of the current position of the transporting team. To make communicating so many persons at a time is very tedious. Therefore it is advisable to make a temporary group of the all concerned officers so that all of them may be communicated at once. The speed of the transporting vehicle is very important and should not exceed 60 km/hour to avoid emergency breaking. The tarpaulin covering should be opened at one or two places while resting period in order to provide fresh air to the animal.

Nowadays a number of zoological parks are using train as mode of transport. Animal transportation by train is more convenient as chances of jerks and emergency breaking are less. It also saves time by many folds. While using railway as mode of transport every preparation should be kept ready as per schedule given by rail authority

and there should not be any compromise in punctuality. Animal transport by railways requires more man power as loading and unloading is usually not assisted by rail authorities. Apart from this all the feeding material and drugs should be stored in sufficient quantity as usually these things are never available on railway platforms.

After reaching the destination the animal should be examined in the cage by the officers of the both transporting and recipient zoo and it should be released as soon as possible in its new enclosure. Before commencing the return journey the accompanying staff should be given at least one full day rest and the same protocol should be followed.

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Announcement

"Nature Conservation in a Time of Change"
Conference of Society for Conservation Biology - Asia Section
In Collaboration with
Amity Institute of Forestry & Wildlife, Amity University, Noida

Dates: March 19 & 20, 2018
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LONG-BILLED VULTURES

Additional new breeding site of Long-billed vultures (*Gyps indicus*) in Moyar Valley, Tamil Nadu, Southern India

Long-billed vulture

IUCN Red List: Critically Endangered A2bce+4bce ver 3.1 (Birdlife International, 2017)

Aves
[Class of Birds]

Accipitriformes
[Order of the diurnal birds of prey]

Accipitridae
[Family of birds of prey]

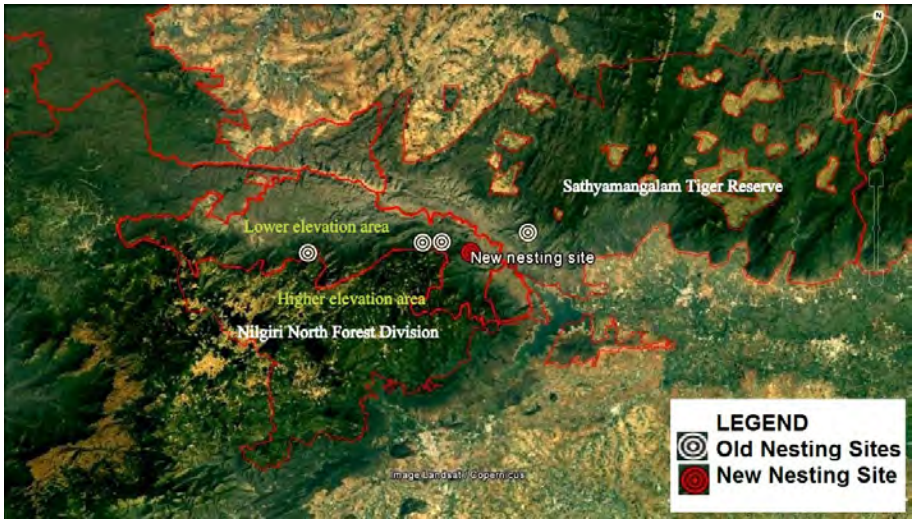
Gyps indicus
[Long-billed vulture]

Species described by Scopoli in 1786

The Long-billed vulture *Gyps indicus* is one of the three native, resident *Gyps* species in India. Long-billed vulture breeds in south-east Pakistan and Peninsular India south of the Gangetic plan, north to Delhi, east through Madhya Pradesh, south to Nilgiris (Collar et al., 2001; Risebrough 2004; Rasmussen & Anderton 2005; Venkitachalam & Senthilnathan 2015). The species is classified as Critically Endangered (BirdLife International, 2017) because of catastrophic decline of 90-98% in the population of *Gyps* species due to diclofenac poisoning (Gilbert et al., 2006; Green et al., 2004). Long-billed vultures nest almost exclusively in colonies on cliffs and ruins, although in areas, where cliffs are absent, they have been recorded nesting in trees in Kolayat Tehsil of Bikaner, Rajasthan. (Rasmussen & Anderton 2005; Khatri, 2015). Here we present

an additional new breeding site record for Long-billed vultures in Moyar valley, Tamil Nadu, Southern India.

The Moyar Valley is located between 11.70^0 N, 76.59^{0}E and 11.47^{0}N, 77.14^{0}E . The Nilgiri plateau is to its southeast, Thalamalai plateau to the northeast, and Mudumalai Tiger Reserve to the west. The approximate length of the valley is 50 km falling within the TN and Karnataka states. The distinctiveness of the landscape is the connection with the Western and Eastern Ghats, considered as the Global Biosphere Hotspot of the world. Elevation of the area ranges from 209 to 1950 m.



Showing old and new Long-billed vulture nesting locations in the Moyar Valley, Tamil Nadu

Global Distribution: South-east Pakistan and peninsular India south of the Gangetic plain, north to Delhi, east through Madhya Pradesh, south to the Nilgiris and occasionnaly further south (Collar et al., 2001)

Long-billed vulture nests were searched at dusk and dawn. Once the occurrences were confirmed and the surrounding nearest rocky cliffs was examined in the Nilgiri Eastern Slopes Range of Nilgiri North Forest Division in Moyar Valley. The moment was observed using a telescope (29 X) and a binocular (52 X 10). Nest search was carried out during the drier months of October to May, wherever the movement was frequently observed on the rocky cliffs. On 12th October 2016

New nesting site of Long-billed vulture in Moyar Valley, Tamil Nadu

we are recorded a pair of Long-billed vulture soaring on the hill slopes in Kallampalayam areas of Nilgiri North Forest Division in Moyar Valley (11.53149^0 N & 76.96922^0 E, elevation 746m). We targeted that pair and keenly monitored the pair activities. On observation a vulture landed the rocky cavity that we are intensively monitoring. Further monitoring was carried out to confirm the breeding activities of Long-billed vulture in the rocky cliff. On 23 April 2017, Long-billed vulture juvenile flying activities were observed on the rocky cliff to confirm the successful breeding of the pair in that rocky cliff. Stotrabhashyam et al (2015) recoded six nesting sites of Long-billed vulture in India including two nesting sites in Tami Nadu and Venkitachalam & Senthilnathan (2015) recorded that a total of four breeding sites of Long-billed vulture in Nilgiri North Forest Division and Sathyamangalam Tiger Reserve in Moyar Valley. The present nesting site is an additional new breeding site of Long-billed vulture in Moyar valley.

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An assessment of threats to the bird populations in Ousteri wetland, Puducherry, India

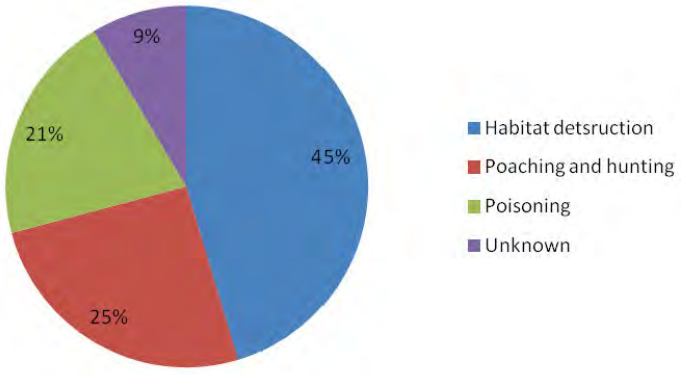
Freshwater wetlands are good breeding and foraging grounds for numerous resident and migratory water birds. Several lesser-known species such as Greater flamingos *Phoenicopterus ruber*, Spot-billed pelicans *Pelecanus philippensis*, and Painted storks *Mycteria leucocephala* were recorded in these wetlands. India is one of the global hotspots for birds, with over 1263 bird species (12% of world species) (Jayapal and Pittie 2016). Aquatic ecosystems are critical components of our environment. In fact, long term monitoring of wetlands is essential to conserve flora and fauna of these wetlands. In addition to being essential contributors to biodiversity and ecological productivity, wetlands also provide a variety of ecosystem services to human populations (Poff et al. 2002). In view of their environmental, ecological and conservation values, some of the wetlands in the world are protected as national parks and world heritage Sites. Few wetlands are known to cater to tourists for recreational purposes, fishing, hunting, boating and aesthetic retreats. The revenue generated from such tourism activity would benefit both the wetlands as well as the local communities depending on it.

The importance of local freshwater ecosystem for conservation can only be understood by knowing the structure of the bird community of that region (Kattan and Franco 2004). Regular monitoring and assessment of threats for the wetland bird population provides valuable information about the ecological health of that wetland. Periodic bird monitoring programmes can be a vital tool in developing awareness on the conservation value the wetland among local communities who depend on this wetland for their livelihood. The Diverse prey base attracts a large number of water birds from Europe, Siberia, Asian countries and other parts of the nation. These birds spend use Ousteri wetland as a wintering ground roosting on the natural vegetation (Davidar, 2011). Even though, there are considerable number of studies on the bird diversity of Ousteri (Abbasi, 2008; Padmavathy et.al 2010; Davidar, 2011; Murugesan et.al 2013), there were none carried out so far on the assessment of threats to the avian population of Ousteri. So keeping in view the need for such study, we carried out systematic field surveys during April 2012 to March 2014 for assessing threats to the avian fauna.

Study area description

The Ousteri wetland is situated between 11^{0}56'35.68"N & 79^{0}44'48.35"E 10 km from north of Puducherry. It is a interstate fresh water wetland spread over 1.48 sq km in Puducherry region and 3.72 sq km in both Puducherry and Tamil Nadu (Abbasi 1997; CMAPC, 2011). Ousteri wetland has been identified as an important wetland of Asia by the International Union for Conservation of Nature and Natural Resources IUCN and identified as a wetland of national importance under the national wetland conservation programme of the Ministry of Environment, Forest and Climate Change (MoEFCC) and has also been declared one of the 93 significant wetlands in Asia by the Asian Wetland Bureau (The Hindu, July 19, 2017). The lake has also been declared as a bird sanctuary by the Government of Puducherry in 2008. Maximum and minimum temperatures in the study region vary between 31.6^{0}C and 18.7^{0}C. Mean annual rainfall in the study area is 1354 mm with 55 mean no of rainy days (Murugesan et.al 2013).

The Ousteri wetland provides varied habitats for a various range of resident and migratory birds with 480 plant species (Comprehensive Management Action Plan for Conservation of Oussudu Sanctuary, Puducherry, 2011) marshy plant growth, riparian vegetations, various channels with scattered trees, bushy vegetation and surrounding fertile agricultural areas. The predominating vegetation of the sanctuary is typically the dry deciduous type. Common tree species are Neem *Azardirachta indica*, Jujub *Zizyphus jujuba*, *Borasus flabellifer*, Indian banyan *Ficus benghalensis*, Peepal tree *Ficus religiosa*, Khejiri *Prosopis cineraria* and Mesquite *Prosopis juliflora* and planted North Indian rosewood *Dalbergia sissoo*. The dominant deciduous shrub species are *Capparis brevispina*, *Calotropis procera*, *Alhagi maurorum* and *Xanthium strumarium*, Parthenium, *Amaranthus spinosus*, *Chenopodium ambrosiodes*. The herb species are *Achyranthes aspera*, Malvastrum sp. and *Boerhavia diffusa* are the prominent weeds in the study area. The predominant vegetation of the sanctuary is typically the dry deciduous type. Aquatic plants in the lake are *Hydrilla* sp., *Typha* sp., *Cyperus* sp., *Azolla* sp. etc. Besides the macrophytic plants such as water hyacinth *Eichhornia crassipes* lily *Nymphaea alba*, lotus *Nelumbo nucifera*, reeds *Phragmites australis* and cattails *Typha angustifolia* provide major habitat for Common coots (Eurasian



Various threats to bird population in Ousteri wetland

Table 1. Bird species recorded from the Ousteri wetland, Puducherry

No	Family	Common Name	Species Name	IUCN Category	Feeding habit	Abundance
1	Ardeidae	Cattle egret	*Bubulcus ibis*	LC	Carnivore	C
2		Purple heron	*Ardea purpurea*	LC	Carnivore	C
3		Grey heron	*Ardea cinerea*	LC	Carnivore	C
4		Large egret	*Casmerodius albus*	LC	Carnivore	C
5		Medium egret	*Mesophoyx intermedia*	LC	Carnivore	C
6		Little egret	*Egretta garzetta*	LC	Carnivore	C
7		Indian pond heron	*Ardeola grayii*	LC	Carnivore	C
8	Accipitridae	Shikra	*Accipiter badius*	LC	Carnivore	IR
9		Black-shouldered kite	*Elanus caeruleus*	LC	Carnivore	C
10		Black kite	*Milvus migrans*	LC	Carnivore	C
11		Eurasian sparrow hawk	*Accipiter nisus*	LC	Carnivore	FC
12		Brahminy kite	*Haliastur indus*	LC	Carnivore	UC
13	Alcedinidae	Lesser Pied kingfisher	*Ceryle rudis*	LC	Carnivore	FC
14		Small blue kingfisher	*Alcedo atthis*	LC	Carnivore	C
15		Stork-billed kingfisher	*Halcyon capensis*	LC	Carnivore	C
16		White breasted kingfisher	*Halcyon smyrnensis*	LC	Carnivore	C
17	Alaudidae	Singing bush-lark	*Mirafra cantillans*	LC	Omnivore	C
18	Apodidae	Palm swift	*Cypsiurus parvuns*	LC	Carnivore	FC
19	Anhingidae	Oriental darter	*Anhinga melanogaster*	NT	Carnivore	FC
20	Anatidae	Eurasian wigeon	*Anas penelope*	LC	Carnivore	FC
21		Northern pintail	*Anas acuta*	LC	Carnivore	C
22		Garganey duck	*Anas querquedula*	LC	Herbivore	UC
23		Spot-billed duck	*Anas poecilorhyncha*	LC	Herbivore	UC
24		Common teal	*Anas crecca*	LC	Herbivore	UC
25	Ciconiidae	Painted stork	*Mycteria leucocephala*	NT	Carnivore	UC
26		Asian open-billed stork	*Anastomus oscitans*	LC	Carnivore	UC
27	Charadriidae	Little ringed plover	*Charadrius dubius*	LC	Carnivore	C
28		Little stint	*Calidris minuta*	LC	Carnivore	C
29		Redwattled lapwing	*Vanellus indicus*	LC	Carnivore	C
30		Yellow wattled-lapwing	*Vanellus malarbaricus*	LC	Carnivore	C
31	Columbidae	Blue rock pigeon	*Columba livia*	LC	Herbivore	C
32		Spotted dove	*Streptopelica chinensis*	LC	Herbivore	C
33		Eurasian collared-dove	*Streptopelia decaocto*	LC	Herbivore	C
34		Black-bellied sandgrouse	*Pterocles orientalis*	LC	Herbivore	C

No	Family	Common Name	Species Name	IUCN Category	Feeding habit	Abundance
35	Cuculidae	Common cuckoo	*Cuculus canorus*	LC	Carnivore	C
36		Pied cuckoo (Pied crested cuckoo, Jaccobian cuckoo)	*Clamator jacobinus*	LC	Carnivore	C
37		Greater coucal	*Surniculus cuckoo*	LC	Carnivore	C
38	Corvidae	House crow	*Corvus splendens*	LC	Omnivore	C
39		Indian treepie	*Dendrocitta vagabunda*	LC	Omnivore	C
40	Coraciidae	Indian roller	*Coracias benghalensis*	LC	Carnivore	C
41	Dicruridae	Black drongo	*Dicrurus macrocercus*	LC	Omnivore	C
42	Estrildidae	Black-headed munia (Tricoloured munia)	*Lonchura malaca*	LC	Herbivore	FC
43	Hirundinidae	Wire-tailed swallow	*Hirunda smithii*	LC	Carnivore	FC
44	Jaccanidae	Pheasant-tailed jacana	*Hydrophasianus chirurgus Wagler*	LC	Omnivore	C
45	Motacillidae	Paddyfield pipit	*Anthus rufulus*	LC	Omnivore	C
46		Yellow wagtail	*Motacilla flava*	LC	Carnivore	UC
47	Muscicapidae	Asian brown flycatcher	*Muscicapa dauurica*	LC	Carnivore	C
48		Asian paradise-flycatcher	*Terpsiphone paradisi*	LC	Carnivore	C
49	Meropidae	Green bee-eater	*Merops oriantalis*	LC	Carnivore	C
50		Blue-tailed bee-eater	*Merops phillipinus*	LC	Carnivore	UC
51	Nectariniidae	Purple sunbird	*Nectarinia asiatica*	LC	Omnivore	C
52		Little spider-hunter	*Arachnothera longiro-stris*	LC	Omnivore	C
53	Oriolidae	Eurasian golden-oriole	*Oriolus oriolus*	LC	Omnivore	R
54	Phylloscopidae	Common babbler	*Turdoides caudatus*	LC	Omnivore	R
55		Magpie robin	*Copsychus saularis*	LC	Omnivore	C
56		Common tailor bird	*Orthotomus sutorius*	LC	Omnivore	UC
57		White-headed babbler	*Turdoides affinis*	LC	Omnivore	C
58	Passerinae	Common lesser white-throat	*Sylvia curucca*	LC	Carnivore	C
59	Phalacrocoracidae	Little cormorant	*Phalacrocorax niger*	LC	Carnivore	C
60	Passeridae	House sparrow	*Passer domesticus*	LC	Omnivore	C
61	Pycnonotidae	Red-vented bulbul	*Pycnonotus cafer*	LC	Omnivore	C
62		White-throated bulbul	*Alophoixus flaveolus*	LC	Omnivore	C
63	Podicipitidae	Little grebe	*Tachybaptus ruficollis*	LC	Carnivore	C
64	Pelecanidae	Spot-billed pelican	*Pelecanus philippensis*	NT	Carnivore	R
65	Psittacidae	Rose-ringed parakeet	*Psittacula krameri*	LC	Herbivore	C
66	Picidae	Common golden-backed woodpecker	*Dinopium javanenese*	LC	Carnivore	UC

No	Family	Common Name	Species Name	IUCN Category	Feeding habit	Abundance
67	Rallidae	Common coot	*Fulica atra*	LC	Omnivore	C
68		White-breasted waterhen	*Amaurornis phoenicurus*	LC	Omnivore	C
69	Recurvirostridae	Black-winged stilt	*Himantopus himantopus*	LC	Carnivore	C
70	Scolopaciade	Common sandpiper	*Actitis hypoleucos*	LC	Carnivore	C
71		Common greenshank	*Tringa nebularia*	LC	Carnivore	UC
72		Marsh sandpiper	*Tringa stagnatilis*	LC	Carnivore	C
73	Sturnidae	Common myna	*Acridotheres tristis*	LC	Carnivore	C
74		Brahminiy starling	*Sturnus pagodarum*	LC	Omnivore	UC
75	Strigidae	Spotted owlet	*Athene brama*	LC	Carnivore	R
76	Acrocephalidae	Blyth's reed warbler	*Acrocephalus dumetorum*	LC	Carnivore	C
77	Leiotrichidae	Laughingthrush	*Garrulax delesserti*	LC	Omnivore	UC
78		Oriental magpie-robin	*Copsychus saularis*	LC	Omnivore	C
79	Upupidae	Hoopoe	*Upupa epops*	LC	Carnivore	C
80	Phoenicopteridae	Greater flamingo	*Phoenicopterus ruber*	LC	Omnivore	R
81	Glariolidae	Glareola pratincola	*Glareola pratincola*	LC	Carnivore	UC
82	Threskiornithidae	Black-headed Ibis	*Threskiornis melanocephalus*	NT	Carnivore	R
83		Eurasian spoonbill	*Platalea leucorodia*	LC	Omnivore	UC
84		Glossy ibis	*Plegadis falcinellus*	LC	Carnivore	R
85	Phasianidae	Grey francolin	*Francolinus pondicerianus*	LC	Omnivore	C
86	Cisticolidae	Plain prinia	*Prinia sylvatica*	LC	Carnivore	C
87	Ploceidae	Baya weaver	*Ploceus philippinus*	LC	Omnivore	C

LC: Least Concern, NT: Near Threatened, NT: Not Evaluated, C: Common, R: Rare, UC: Uncommon, FC: Fairley Common

coot) *Fulica atra*, Indian spot-billed duck *Anas poecilorhyncha*, common migrant such as Common teal (Eurasian Teal) *Anas crecca*, Little stint *Calidris minuta*, Common greenshank *Tringa nebularia* and Marsh sandpiper *Tringa stagnatilis* and Common moorhen (Eurasian Moorhen) *Gallinula chloropus* .

Methods

The survey was conducted in all the seasons from 2012 to 2014. Regular transect walking was made on fixed paths through the study area. We recorded birds while walking on a predetermined path in the study area. The birds were observed during the morning and evening hours of their activity with binoculars. However, opportunistic records were also made during other time, 10 am to 4pm periods of the daytime. Birds picked up were put down along with habitat type, season, and frequency of sightings of a peculiar

Plate 1.

a) Black-winged stilt b) Lesser pied kingfisher c) Greater flamingo d) Painted stork e) Spotted dove f) Eurasian spoonbill g) Spotted owlet

species. Pictures were taken whenever possible with digital camera Canon (model SX500IS). Identification of birds was done using field guides (Thirumalai and Krishnan 2005; Daniel 2012; Prasad 2014; Shah et.al, 2016), and only those species with confirmed identity are reported in this paper. The checklist was prepared using standard common and scientific names of the birds following Davidar, (2011), Salim Ali revised by Daniel, 2012, Inskipp Carol, 2011, and Ali et.al 2013). The status of the recorded bird species was established on the basis of frequency of sightings following Kumar and Gupta (2009) as common recorded 9–10 times out of 10 visits, fairly common recorded 6–8 times out of 10 visits, uncommon recorded 3–5 times out of 10 visits, and rare recorded 0–2 times out of 10 visits. Feeding guilds were classified on the basis of direct observations and available literature (Ali and Ripley 1987). The conservation status of the bird species was categorised according to IUCN Red List data. Data on threat factors were assessed by direct observation and personal interviews with local people and local informal fish market visits. We used direct observation method to identify the various threats to bird's population both the native and migratory birds and their habitats, while observations and informal discussions

were made with local fisher folks, cattle herders, farmers and poachers to collect the data on various bird habitat destructions in the lake. We have made frequent surveys during the breeding season from October to February from 2012 to 2014. In our analysis we classified the various threats to bird populations as: (1) habitat degradation (2) hunting and poaching (3) poisoning and (5) unknown

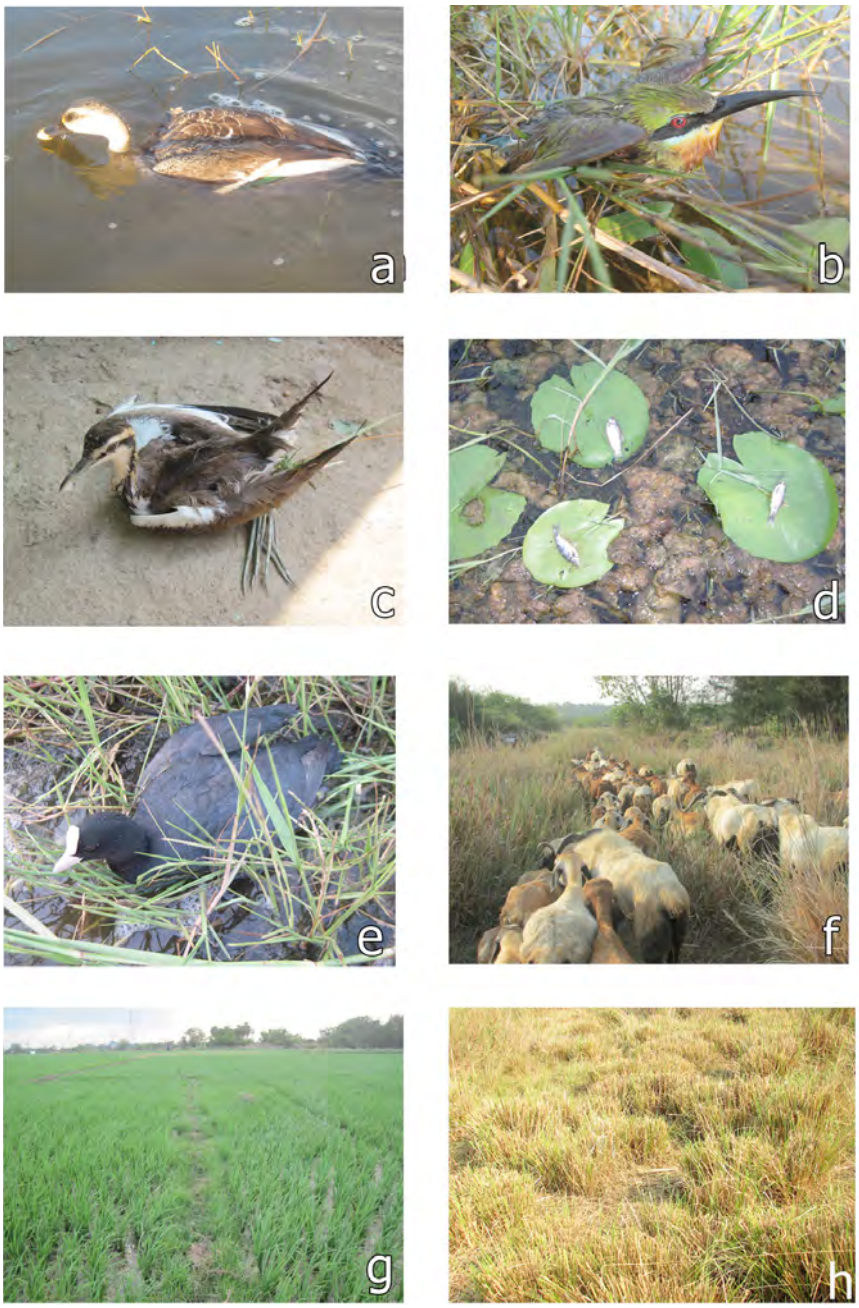
Results

Ninety three wetland birds belonging to 51 families were recorded (Plate 1 and 2) from the Ousteri wetland during 2012 to 2014, of which 4 species are under Near Threatened category (NT) such as Black-headed Ibis *Threskiornis melanocephalus*, Spot billed pelican *Pelecanus philippensis*, Oriental darter *Anhinga melanogaster* and Painted stork *Mycteria leucocephala* and 87 species categorised as Least Concern (LC) category, The checklist of recorded bird species along with their abundance, residential, feeding habit and conservation status are presented in Table 1. The family Ardeidae represented by 6 species, dominated the wetland bird community of the study region. The composition of birds in major feeding habit in the study area

Plate 2.

i) Oriental magpie-robin j) Indian roller k) Little cormorant l) Common greenshank m) Open-billed stork n) Cattle egret o) Paddyfield pipit p) Blue-tailed Bee-eater

Plate 3.



Threats-Poisoning: a) Spot-billed duck b) Green bee-eater c) Pheasant-tailed jacana d) Fish e) Common coot, Other Threats: f. Excessive grazing g. Agricultural activities h. Excessive harvesting of reed

showed that the carnivore was the most common with 54 (58 %) species, followed by Omnivore 31 (33%), and Herbivore 8 (9%). The wetland birds are heterogeneous in their feeding habits (Ali and Ripley 1987). Wetland birds are using different habitats for feeding and breeding purposes within the ecosystem. The summer visitors, namely Black-headed Munia *Lonchura malacca* and Ashy-crowned Sparrow-lark *Eremopterix griseus* were spotted during summer seasons from April to July. The winter migratory birds such as Darter *Anhinga melanogaster,* Northern pintail *Anas acuta* Western yellow wagtail *Motacilla flava* and Blue-tailed bee-eater *Merops philippinus* appeared at the wetland from mid October and stayed up to April. The peak of winter population of migratory birds was observed during the months of October to February. In the present study, irrigated agricultural fields surrounding the sanctuary, with scattered trees, extensive reed growth, water lily, cattails species, riparian vegetation and open grasslands probably provided shelter and suitable foraging grounds for the wetland birds. This habitat by supporting different food sources like fish, crustaceans,

invertebrates, water plants and plankton further adds to the diversity of wetland birds (Basavarajappa 2006). The earlier studies conducted by Bassouvalingam et.al (2012) have reported 41 bird species, Davidar (2011) 121 species, CMAP, (2011) 166 and Murugesan et.al (2013) have reported 166 bird species in Ousteri wetland.

Larger bird species such as Greater flamingos *Phoenicopterus ruber*, Eurasian spoonbill *Platalea leucorodia*, Asian painted stork *Mycteria leucocephala* and Spot-billed pelican *Pelecanus philippensis* are arrived during the month of August and departure by only in the month of November in 2014, these populations of larger birds was found to be high in the month of October. During the 2 years period a total number of 714 birds' species were found dead (Table 2). The greatest number of threats 324 (45%) was due to habitat destruction, which was counted with destroyed nests on the degraded, ploughed and irrigated lands. The second most threats was hunting and poaching 182 (25%) (Plate 3). In an informal discussions with the poachers during birds threats survey Carbofuran (furadon) poisoning is the third most threats to the bird population 147 (21%) the poachers insert insecticides (Furadan) in the abdominal cavity of freshwater snails targeting for egrets, and herons, mixing poison (Furadon) with lily flower seeds targeting for coots and ducks. The poisoned molluscs and lily seeds spread the vicinity of the lake and on the floating leaves of aquatic plants such as white waterlily *Nymphaeae alba*, Blue waterlily *Nymphaea capensis* and lotus *Nelumbo nucifera*. Birds consume these poisoned molluscs, freshwater crabs and seeds, become lethargic, saliva frost in beaks and ultimately unconscious and becoming easy prey to the poachers. The poachers revive them putting water drops in the bird's mouth (Srivastava and Srivastava, 2012). The unknown reason was found 61 (9%). Most of the threats were taken place during winter season as the season attracts more migratory birds in the lake.

Habitat loss causes the destruction of natural flora in which many resident and migratory birds are dependant for example reeds are extensively utilized for thatching purposes, Kans grass *Saccharum spontaneum* are mainly used for thatching and fencing purposes by the local villagers. The weaver birds (*Ploceus philippinus*) are being gravely affected and threatened by human activities with habitat loss. According to recent survey conducted by revenue department of Tamil Nadu in its Ousteri wetland jurisdiction was estimated that 150 acres of land belongs to Kadaperikuppam Village, 700 acres of land is belongs to Poothurai Village and 70 acres of land area are belongs to Perambai Village of these total 920 acres of land, around 70 acres of land are encroached for agricultural purpose by Kadaperikuppam and Poothurai Villagers which is calculated 7.6% of land being reduced the bird area in the Ousteri wetland. Carbofuran also known as furadan

which is widely applied as an agricultural pesticide is being used to kill birds by mixing with snails, fish and crabs targeting larger migratory birds, during the threats survey there were around 216 combined many kind of bird species found dead due to poisoning. The pesticide is mixed with lily and lotus flower pollen grains targeting Common coots *Fulica atra*, Cormorants *Phalacrocorax niger* and Spot-billed ducks *Anas poecilorhyncha* these kind of poisoning killed around 125 common coots. Illegal hunting and poaching further reduced bird populations in Ousteri wetland, because the hunting targets are often on migratory birds mainly by the local tribal due to its high demand for trade the present study found that 162 bird species were killed by poachers of these, Painted stork 12 and Asian open-billed stork around 7 were found killed. Egg collection by cattle herders and local people are some extent disturbance to ground nesting bird population within the sanctuary particularly during the breeding seasons of ground nesting birds. Intensive farming such as tillering, irrigation has had particularly damaging effects on ground-nesting birds.

Discussion

Grassland birds are most vulnerable due to flooding, fires, overgrazing, and invasion by exotic vegetation. Before the announcement of the Ousteri wetland as a bird sanctuary, it had its natural water stream during the rainy season; and was drained partially or in full during summer season. As a consequence, there was open grassland and the reefs flourished well. The native ground nesting birds such as skylarks, paddy field pipits, sand groves, doves and lapwings largely used these lands as feeding and breeding grounds. After the announcement of the Ousteri wetland as a bird sanctuary in the year of 2008, the Government of Puducherry has completely stopped the water for recreation, tourism and conservation purposes. This has caused the grasslands to be entirely submerged under water, as a result of which the ground nesting birds migrated to the surrounding abandoned agricultural areas when these agricultural areas are ready for second term cultivation in April–May, this results in the demolition of ground nesting birds' nests due to the summer ploughing and irrigation. A study conducted by Alexandar (2012) has estimated that due to the agricultural practices within the lake there were around 79 nests: nest with eggs, 34; hatchlings 8 were destroyed due to the second-term of paddy cultivation.

The bird population of Ousteri wetland ecosystem is under serious threats due to anthropogenic activities resulting in habitat loss, agricultural encroachments, hunting and poaching, poisoning and weed infestation (Davidar, 2011; Jhunjhunwala 1998; Islam and

Rahmani 2006; CMAP, 2011 and Alexandar, 2012). The modus operandi of the poachers is to trap the birds by mixing poisonous substance in fish and grains on the sprawling lake (The Hindu, July 19, 2017). The lake attracts its bird population are mainly due Kaliveli lake in Villupuram district and Odiyur lake in Kanchipuram districts had gone bone dry owing to severe drought and only a few lakes such as the Ousteri wetland contained (The Hindu, July 19, 2017). Ousteri wetland depends for its water sources from its catchment for 75%; the remaining 25% comes from diversion channels fed by the waters of Penaiyar river Suthukeny canal (Davidar, 2011). Some of the natural canals in the catchment area are blocked by Industries and agricultural lands; rejuvenation of all the tributary canals to the Ousteri wetland will increase water sources. Migratory birds are particularly vulnerable to hunting and poaching (CMAP, 2011) during winter season and this must be checked regularly until the breeding season is over. Ousteri wetland is rich in water birds, more species can be expected from the lake catchment including nearby lakes, ponds and paddy fields. So a detailed bird survey needs to be conducted in winter, summer and monsoon seasons in the entire lake catchment to prepare a comprehensive checklist.

Our results suggest that habitat loss is dominant threat to birds in Ousteri wetland, followed by poaching and poisoning. Fishing activity is a major threat to the bird population in Ousteri wetland. Unsustainable fishing activities are prevalent around the lake. The diversity of fish species in the lake attracts people for fishing. Around 15 fish species were recorded in Ousteri wetland (Alexandar and Siva Sankar, 2013). Fishing activity using nylon fishing nets not only killing of water birds such as pelicans, coots, and darters also has led to the killing of water snakes (Alexander, 2010 and CMAP, 2011). Akin to these, fishing cause direct disturbance to birds due to reduced availability of fish species, for which several avian species visit the lake. 36 piscivorous species (especially 21 heronry species) were observed visiting the lake for foraging due to the availability of diversified fish species (CMAP, 2011). These birds especially the heronry species visit the lake for foraging and breeding, and several of them would be threatened if fishing activities were not controlled or regulated. macrophytic plants such as *Hydrilla verticillata*, Lotus (*Nelumbo nucifera*), Pink lily and White liliy (*Nymphaea sp*), Eichornia crassipis and *Najas minor* are mainly reducing bird's habitat and food sources.

Increasing real estate business and sprawling of human settlements around the lake generates large quantum of solid wastes thereby, creating problems related to their disposal. In India, it is a common practice to deem wetlands or marshes as wastelands and use them as dump yards for untreated raw sewage and solid wastes. This practice of solid waste dumping in wetlands leads to fall in ecological and conservation value, species

Table 2 List of threats to the bird population in Ousteri wetland

S. No.	Species Name	Number of Species found dead	Month	Causes to Death
1	Cattle egret	63	September, October	Hunting and poaching
2	Common teal	11	November	Poisoning
3	Spot-billed duck	32	October, November and December	Poisoning
4	Painted stork	12	August, September	Hunting and poaching
5	Red-wattled lapwing	54	April, May	Habitat destruction
6	Pheasant-tailed jacana	30	November	Hunting and poaching
7	Small bee-eater	11	November	Unknown
8	Little cormorant	74	November	Poisoning
9	Little grebe	24	November	Hunting and poaching
10	Spot billed pelican	2	November	Poisoning
11	Little cormorant	31	November	Unknown
12	Common coot	125	October, November and December	Poisoning
13	Asian open-billed stork	7	October	Hunting and poaching
14	Oriental white-ibis	14	October	Poisoning
15	White-breasted waterhen	22	November	Hunting and poaching
16	Common moorhen	32	November	Poisoning
17	Paddyfield pipit	81	April, May	Habitat destruction
18	Sand plover	37	April, May	Habitat destruction
19	Weaver bird	52	October, November and December	Habitat destruction

richness or species distribution of the system / area. Apart from swallowing / shrinking of the wetland, dumping municipal wastes can seriously effects the water bodies by releasing noxious chemicals during decomposition. The heavy organic contents in municipal wastes degrade slowly and release acidic and toxic leachates for many years. The Ousteri wetland is not much an exception to this, as we could see large quantities of solid wastes in and around the lake embankment during the present survey. Solid waste dumped in different parts of the wetland is a major environmental, public health threat, and a management issue. Waste water discharges from industries, commercial establishments, institutions and domestic sectors into the lake are deteriorating the water quality and ecosystem health (CMAP, 2011)

The presence of agricultural fields around the lake contributes significant amounts of N, P, K and pesticides through run-off. The wetland is presumed to receive loads of agricultural pesticides from paddy crops cultivated in its border villages. Heavy metals and several pesticides, as an outcome of application of agrochemicals in nearby agriculture

fields, can get accumulated through the trophic levels (macrophytes, fish etc.) in the wetland ecosystem and may ultimately affect the apex of the food chain, i.e. birds. Wetlands located in agricultural landscapes are particularly affected by agrochemicals (Azeez et al 2007 and Prusty et al 2007). Presently, Ousteri wetland is one of the locations in the Puducherry region that draws considerable number of tourists both nature lovers and commercial tourists. One of the major impacts of tourism is generation of solid waste near the lake banks and littering of the area. The survey team has noticed dumping and/or throwing of food packets, polythene bags and other solid waste into the lake.

In considering these threats to bird population, the wetland needs to be jointly patrolled by both Tamil Nadu and Puducherry Forest officials to minimize disturbance, in particular during the breeding season. Conservation education and awareness programmes are essential for local farmers in order to practice organic farming, students, fishing community and visitors to the lake. The present study suggest that the micro catchments and more suitable plantations in the marginal areas and removal of excessive aquatic weeds would be a relief to bird populations during the summer season and this ecosystem will be suitable place for breeding ground for migratory birds.

The Tamil Nadu Government on August 11, 2014 declared Ousteri wetland as the 15th bird sanctuary (The Times of India Aug 11, 2014). The efforts taken by the Puducherry government to promote the lake since 2008, did not yield the desired results as major part of the lake was located in Villupuram District of Tamil Nadu, which did not declare Ousteri wetland as a sanctuary which leads poaching and poisoning of birds was rampant and the number of migratory birds came down drastically. Despite the decision taken by the Government of Tamil Nadu, the Ousteri wetland has come into completely protected, hence the encroachments, poaching and poisoning of bird population must be stopped.

The sanctuary has no watchtowers and large expanse of unfenced areas has enabled poachers to make their way into the sanctuary for poaching. There has been a rise incidence of any patrolling inside the sanctuary. The boat operations should be stopped during breeding seasons or at least restrict near to the birds nesting sensitive islands.

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The Arabian Wonder Gecko Conservation Planning Workshop

The first Wonder Gecko Conservation Action Planning workshop was held on 13-14 December 2017 in Abu Dhabi, UAE at Hotel Mercure on Jabal Hafeet mountain. It involved stakeholders from the various range emirates of the United Arab Emirates (UAE). The principle aim of this workshop was to assemble all the concerned agencies and experts on the Wonder Gecko to conduct a workshop at a national level and draft a Conservation Action Plan that will guide conservation activities of the species over several years. The workshop was attended by 40 people and facilitated by Dr. Sanjay Molur of the Conservation Planning Specialist Group - South Asia Regional Resource Centre.The IUCN Red List assessment of the species status in the UAE set the tone for the workshop. The information pulled together from various experts on the species from the UAE laid the foundation for a revised assessment of the population as compared to the Least Concern status of the overall species on the Asian mainland. The UAE population was considered a phylogenetically distinct unit and the genetic studies

Pritipal Soorae, the organizer, his colleagues from EAD and Sanjay Molur

Working Groups

conducted by Spanish collaborators supported this move. Several brief presentations by experts from the different emirates updated the known status of the species and the influence of human development acting on its distribution and populations within UAE were established.The participants worked in several workings groups including the Vision & Mission group, Research group, Conservation group and Education group. Within the context of conservation issues such as reintroduction, strategies and other relevant topics including the discussions and strategies of development were discussed. Policy and mainstreaming of the Wonder Gecko in the government development plans were discussed as part of the Education group. The report is underway and will be published soon. The Environment Agency of Abu Dhabi was the main organizer of the workshop.

UNITED ARAB EMIRATES MINISTRY OF CLIMATE CHANGE & ENVIRONMENT

هيئة البيئة - أبوظبي Environment Agency - ABU DHABI

CONSERVATION PLANNING SPECIALIST GROUP Changing the Future for Wildlife

بلدية دبي DUBAI MUNICIPALITY

Hands-on Training for the cause of Wildlife Conservation

Participants engaged in specimen collection during field session

The main focus of the biodiversity and wildlife education was to create knowledge, interest and necessary skills to solve various biodiversity problems with reference to the local as well as global context. In order to develop the biodiversity perception among students, local masses the action oriented biodiversity education methods were promoted and identified in our past trainings such as active classroom sessions, hands-on activities, experiential education, and field exposures that are vital to accomplish sustainable biodiversity and wildlife knowledge and motivate to protect and conserve biodiversity and wildlife.

For the experimental education as well as hands on practices, the Institute for Wildlife Sciences, ONGC Centre for Advanced Studies, University of Lucknow has started a series of hands on trainings on various topics on wildlife and biodiversity conservation. In the same context institute has successfully organized two Hands on Trainings on Basic Course in Butterfly Identification and Taxonomy (30 November – 2 December 2017) and three days training on Wildlife Journalism (28 December - 30 December 2017) in collaboration with Department of Forests and Wildlife, Uttar Pradesh, Biodiversity and Wildlife Conservation Lab, Department of Zoology, University of Lucknow and Butterfly Research Centre, Bhimtal, Turtle Survival Alliance-Foundation India, U.P. State Biodiversity Board and Institute of Mass communication in Science & technology, University of Lucknow.

Hands on practice about the flattening and curation of butterflies during technical session

Hands on Trainings on Basic Course in Butterfly Identification and Taxonomy

Total of 15 participants from different Indian states like Bihar, Gujarat, Delhi, Madhya Pradesh and Nepal took part in. During the three days training programme various informative lectures and practical sessions were completed. On the very first day of the training, our resource person, Peter Smetacek, Director of Butterfly Research Centre, Bhimtal started with the talk on “History of Butterfly study in India”, how names are given to butterflies and finally the curation of specimens. A lecture on, how to photograph the butterflies has also been given by the expert. On the second day the experts handled the sessions on collection of specimens, the taxonomy, nomenclature and how to distinguish families of butterflies and finally about the curation of butterflies. On the third day it started with collection of specimens and followed by a talk on how to preserve the specimens by Mr. Peter Smetacek. At the end, all the participants were presented with participation certificate and a butterfly mug.

Training on Wildlife Journalism

Journalism refers to the production and distribution of reports on the interaction of events, facts, ideas and their compilation in the form of news and that ultimately impacts the society to at least some degree. Nature Journalism is a vital means of communicating important environmental issues and making the natural world more accessible to the public. Just like a perfectly captured wildlife photograph, a beautifully crafted piece of nature writing can be thrilling to

Participants engaging in story writing during story or news telling session

create or behold. Wildlife journalism is a very vital means of communicating important environmental issues and making the natural world more accessible to the public.

A total number of 35 participants from throughout U.P. attended this three days training. The aim of this training was share knowledge about conservation of wildlife, skill development and the placement of the students. During the training participants learnt how to write an article, blog, children stories, and discovery news and also how to tell, explain their news or story in print as well as electronic media. A brief knowledge about wildlife and biodiversity such as the vultures and their conservation, biodiversity laws, traditional knowledge and bio resource policies, aquatic biodiversity and wildlife trade, wetlands biodiversity and ecology, wildlife laws, human and animal conflict and Project Tiger, nuances in wildlife - biodiversity writing for mass media have also been taught by various experts from media and forests as well as wildlife field. Group activities and hands on news or blog writing were accomplished by participants and read their ideas and views in front of common mass and experts.

Participants of Wildlife Journalism Training

The whole training was very informative and communicative knowledge shared by experts Rupak De, Shailendra Singh, Sanjeeva Nayaka, L.B. Chaudhary, Somesh Gupta, Sanjay Pandey, Deo Kant Pandey, Prashant Pandey, Neeraj Srivastava and well organized by Amita Kanaujia with the help of Research Scholars Adesh Kumar, Shivangi Mishra, Daya Shanker Sharma, Ankit Sinha, Ruby Yadav and with technical assistance by Amir and Deepti and Savita & Rakesh. It will prove very beneficial for the better opportunities and skill development for the students opting Wildlife Sciences and Journalism as their career.

Submitted by: Amita Kanaujia, Wildlife Conservation Lab, Department of Zoology, University of Lucknow, Lucknow and Adesh Kumar, Institute of Wildlife Sciences, ONGC Center for Advanced Studies, University of Lucknow, Lucknow, Uttar Pradesh. Email: kanaujia.amita@gmail.com

Wildlife Week celebrations at Tata Steel Zoological Park, Jamshedpur, Jharkhand

Wildlife Week was celebrated at the Tata Steel Zoological Park from 2-8 October 2017 on the theme "Sustainable Tourism for Development" and "Prakriti Paryawaran aur Hum". It was formally inaugurated by Chief Guest Biren R Bhuta, Vice-president and in the presence of Guest of Honour, Rishad M Chinoy, Secretary, Tata Steel Zoological Society. Then the Chief Guest presented Best Eco Club Teacher Award 2016-17 to the winner Sangita Sarkar from NML K.P.S, Jamshedpur, runner-up award to Rajalakshmi Sahu from Belpahar English High School, Jharsugoda, Orissa and the special recommendation award to Yogita Singh JUSCO School Kadma.

Inaugural function

Prabhat Pheri

On the first day, Prabhat Pheri was flagged off by Mr. Sanjeet Kumar, Treasurer Tata Steel Zoological Society, where 210 students and zoo staffs went an awareness rally to spread the message of need of biodiversity conservation.

Inter-school essay competition results were declared and awarded with prizes. The topic were " ईको-टूरज़िम और इसके फायदे वन्यजीवों के संरक्षण लिए I" and "Ecotourism and its benefits to wildlife conservation".

A total number of 109 students represented from 20 schools. On the second day, debate competition on the topic. "क्या?ईको-टूरज़िम प्रकृतसंरक्षण का हस्सिा है I" Is Ecotourism is part of conservation" was

Participants of on the spot painting competition

Winners of fancy dress competition

organized. There were 81 participants from 19 schools took part. The event was sponsored by Inner Wheel Club of Jamshedpur, ZEST and judged by Mrs. Herpreet Kaur and Nibha Mishra.

On the third day inter school quiz competition was organized. There were 80 participants from 18 schools who took part, which was conducted by Subhodeep Sarkar. The questions for the ten rounds of the quiz included topics such as national parks and sanctuaries, ecology and wildlife conservation and others. On the fourth day a fancy dress competition for children was organized. There were 231 participants from 21 schools who took part. On the final day, an on-the-spot painting competition was organized in association with Jamshedpur School of Art. A total of 435 students from 40 schools participated. Followed by the closing ceremony was held in which Chief Guest Asish Mathur, MD, JUSCO, presented awards to the winners of the on the spot painting competition. Through the various events, the zoo reached a total number of 1147 students and 40 education institutions during the wildlife week.

Seema Rani, Biologist cum Education Officer along with education team members, Monalisha Banerjee, EA, Pratap Singh Gill, Shefali Das and zoo volunteers Iram Khan, Vinay Kumar Pandey and Joya Khan, coordinated the events very effective.

Submitted by Dr. Seema Rani. Email: cmarani00@rediffmail.com.

WWF-India's FrogFest 2018 - Conservation Awareness through Art

WWF-India launched FrogFest in January this year to raise conservation awareness of amphibians, one of the most endangered groups of animals. Currently roughly one third of all amphibians across the globe are threatened with extinction. Most of the current threats are human generated. Civil society and decision-makers urgently need awareness regarding this alarming fact, since Frogs are vital to our food security and health – they prey on agricultural pests and vectors thereby reducing vector-borne diseases. They are valuable ecosystem indicators – their permeable skin and dual lifestyle, aquatic and terrestrial, makes them extremely sensitive to changes in water, soil and air quality. Frogs are also an important part of scientific research and their chemical secretions are the basis of numerous key drugs produced by the pharmaceutical industry.

FrogFest is a celebration of Frogs in Art and Nature. The Festival includes a pop-up museum of over 400 frog artefacts

Playing a giant Save the Frogs Board game

FrogFest Exhibition

collected from across the globe in a variety of materials, shapes and sizes. Also on display are various frog-themed artworks, both tribal and modern-style paintings. The collection is owned by Seema Bhatt and the exhibition is curated by Aditya Arya and Mamata Pandya. Amphibian photographs have been generously shared by S.D. Biju, Gururaja, K.V. and others. The Exhibition that opened on the 15th of January will continue till the end of April 2018. Information panels educate the audience about frogs, their role in nature as an important link in the food chain – as predators and a prey species, their diversity in terms of size, colour, shape and their wonderful adaptations. The panels also talk about frogs in various cultures. In most Asian cultures frogs were considered a good omen – their calls predicted rain which brought wealth and prosperity. India has one of the only known frog temples, and frog weddings were thought to bring rain. In Egypt the frog represented fertility and was symbolized by the frog-goddess

Heket. In modern culture Kermit the Frog is a popular Sesame Street Character. To build atmosphere at the exhibition, frog-calls recordings by Gubbi Labs, Karnataka, fill the air at the venue.

WWF-India has deputed trained volunteers to guide visitors and explain the contents of the panels in detail for the duration of the festival. In addition WWF has organized other interesting events to engage the public and increase awareness and curiosity about amphibians – there will be illustrated talks by experts, Films about frogs, Frog-themed tribal art workshops, origami and nature trails. WWF has reached out to schools, colleges and corporate houses to visit the FrogFest to build awareness

Drawing Frogs - Gond Art

for these important but often overlooked animals. An inspirational Amphibian Conservation talk by Kerry Kriger, Founder and Executive Director of Save the Frogs! USA has been planned in January, which will be followed by 'A day with Frogs' lead by noted herpetologist S.D. Biju in February, and possibly one by Gururaja, K.V..

From 2000 onwards scientists have described over 1,500 new species of amphibians, with at least 10% of these being discovered in India. Biju himself has made several important new frog discoveries, including many 'lost' species being rediscovered, some after over a hundred years.

The Western Ghats-Sri Lanka region and the Northeastern part of India are some of the leading biodiversity hotspots for new amphibian discoveries.
Frogfest is a call-out to all art and nature-lovers to appreciate the beauty and diversity of the world of frogs who perform valuable ecosystem services – unnoticed and unappreciated. It is imperative that critical amphibian habitats are protected, the use of pesticides reduced, and harvesting of wild frogs for classroom dissection, medical tests and research, human food and the pet trade stopped. Currently one of the biggest conservation challenges facing amphibian scientists is a remedy to curb the spread of Chytrid fungus, which is the major threat to frog populations worldwide.

Submitted by Ms. Payal Narain, WWF-India, Environment Education Division, New Delhi-110003. Email: pnarain@wwfindia.net

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.

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