বনবীথি

বন্যপ্রাণ সংখ্যা, ডিসেম্বর - ২০১৮

BANABITHI

Wildlife Issue, December-2018

বনবিভাগ, পশ্চিমবঙ্গ সরকার

সম্পাদকমন্ডলী

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বিন্যাস ও অলংকরণ
তাপস দাশ, মুখ্য বনপাল
বনবিভাগ, পশ্চিমবঙ্গ সরকার কর্তৃক প্রাকাশিত

সূচীপত্র

Photograph : Sumit Kumar Ghosh

সম্পাদকীয়

অরণ্য, বন্যপ্রাণ ও জীববৈচিত্র্য প্রকৃতির অনন্য অবদান, বনপ্রাণ সংরক্ষণের বার্তা সকলের কাছে পৌঁছে দিতে বন্যপ্রাণ দিবস ২০১৮ উপলক্ষ্যে বনবীথির এই বিশেষ সংখ্যার আত্মপ্রকাশ। বিষয় ভাবনাকে কেন্দ্র করে, নবীন ও প্রবীন লেখকদের লেখা ও ছবি বন্যপ্রাণ সংরক্ষণের উদ্দেশ্যে নিবেদিত, বৃহত্তর জনমানসে সচেতনতা সৃষ্টির এই প্রয়াস সকলের কাছে সমাদৃত হবে আশা রাখি।

সম্পাদক

Pleione Orchid
Pleione praecox

Photograph : Tapas Das, IFS

মমতা ব্যানার্জী
মমতা বैनर्जी
ممتا بنرجی
Mamata Banerjee

মুখ্যমন্ত্রী, পশ্চিমবঙ্গ
मुख्यमंत्री, पश्चिम बंगाल
وزیراعلیٰ مغربی بنگال
CHIEF MINISTER, WEST BENGAL

২০ ডিসেম্বর, ২০১৮

বন্যপ্রাণ দিবস ২০১৮ উপলক্ষে বার্তা

সারা রাজ্য জুড়ে **বন্যপ্রাণ দিবস ২০১৮**, পালনের সূচনা হবে আগামী ৩০ ডিসেম্বর, ২০১৮। এই উপলক্ষে আলিপুরদুয়ার জেলার দমনপুরে আয়োজন করা হয়েছে রাজ্যস্তরের অনুষ্ঠান।

জীব-বৈচিত্র্যে পরিপূর্ণ আমাদের রাজ্য পশ্চিমবঙ্গ। একাধিক কর্মসূচীর মাধ্যমে এই অপূর্ব জীব বৈচিত্র্য রক্ষণে আমাদের সরকার কাজ করে চলেছে।

বন্যপ্রাণ বিষয়ে সচেতনতা সৃষ্টির মাধ্যমে, রাজ্যব্যাপী বন্যপ্রাণ সংরক্ষণের এই প্রচেষ্টার সার্বিক সাফল্য কামনা করি। এই উপলক্ষে বনবিভাগের সকলস্তরের আধিকারিক ও কর্মীদের জানাই আন্তরিক অভিনন্দন ও শুভেচ্ছা।

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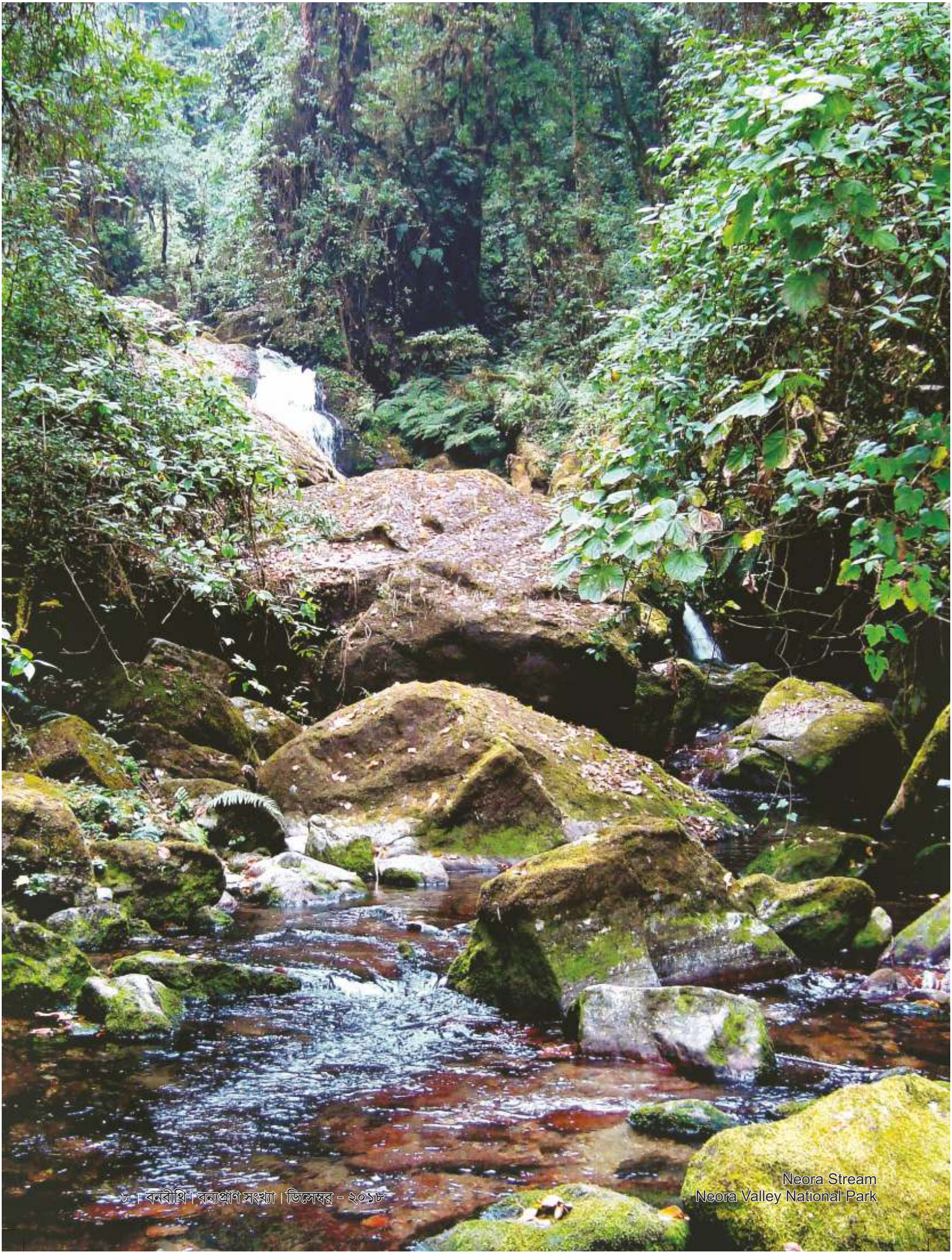

Neora Stream
Neora Valley National Park

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বিনয় কৃষ্ণ বর্মন
ভারপ্রাপ্ত মন্ত্রী
বনবিভাগ
পশ্চিমবঙ্গ সরকার
অরণ্য ভবন, দ্বিতীয় তল, ব্লক - এল, এ,- ১০এ
সেক্টার-৩, সল্টলেক সিটি,
কলকাতা-৭০০১০৬
টেলি ঃ ২৩৩৫-৮০৮০, ফ্যাক্স ঃ ২৩৩৫-৪০২৮

বন্যপ্রাণ দিবস-২০১৮

বনমন্ত্রীর আবেদন

উত্তরে সুউচ্চ হিমালয় থেকে, দক্ষিণে সাগর বেলা, পশ্চিমের রাঢ় বাংলা ও পূর্বের জলাভূমি পর্যন্ত বিস্তৃত আমাদের রাজ্য পশ্চিমবঙ্গ বন্যপ্রাণ ও জীববৈচিত্র্যে অত্যন্ত সমৃদ্ধ। পার্বত্য বাস্তুতন্ত্রে রেডপান্ডা থেকে সমতলের হরিন, গন্ডার, হাতি, বাইসন, সুন্দরবনের বাঘ এবং অজস্র প্রজাতির পাখি এইসব মিলে জীববৈচিত্র্যের সুন্দর সমাহার।

জনবহুল এই রাজ্যের মানুষ ও বন্যপ্রাণীর শান্তিপূর্ণ সহাবস্থান সারা দেশে দৃষ্টান্ত স্বরূপ। সংরক্ষিত বনাঞ্চল এবং তার বাইরের বাস্তুতন্ত্রে এমন কি জলাভূমি জীববৈচিত্র্যের সংরক্ষণে পশ্চিমবঙ্গ সরকারের বনবিভাগ সদা সচেষ্ট। বন্যপ্রাণ সংরক্ষণ বিষয়ে জনমনে সচেতনতা সৃষ্টি ও বৃদ্ধির উদ্দেশ্যে আগামী ৩০ ডিসেম্বর ২০১৮ রাজ্যব্যাপী পালিত হবে বন্যপ্রাণ দিবস ২০১৮। এই উপলক্ষে রাজ্যস্তরের অনুষ্ঠানটি হবে আলিপুরদুয়ার জেলার দমনপুরে।

যৌথ বনপরিচালনায় মানুষকে সঙ্গে নিয়ে বনদপ্তরের প্রচেষ্টায় আমাদের রাজ্যে বন্যপ্রাণের সংখ্যা উল্লেখযোগ্য ভাবে বৃদ্ধি পেয়েছে, ক্ষেত্র বিশেষে মানুষ ও বন্যপ্রাণের সংঘাত নিরসনে বনবিভাগ সদা তৎপর।

বন্যপ্রাণ দিবস উপলক্ষে প্রকাশিত হচ্ছে বনবিথী পত্রিকার বন্যপ্রাণ দিবস সংখ্যা-উদ্দেশ্য জনমানষে বন্যপ্রাণ সংরক্ষণ সচেতনতা সৃষ্টি। বন্যপ্রাণ সংরক্ষণের এই কর্মসূচীর সার্বিক সাফল্য কামনা করে, সবার কাছে আবেদন জানাই বন্যপ্রাণ সংরক্ষণে সামিল হওয়ার।

বিনয় কৃষ্ণ বর্মন

(বিনয় কৃষ্ণ বর্মন)
বনমন্ত্রী
পশ্চিমবঙ্গ সরকার

কলকাতা
২৪ শে ডিসেম্বর

Tail of Thorn

Novojit De, WBFS

In the mid of 2014, while preparing for West Bengal Forest Service examination, I came across a news that shocked me a lot. It was about mass poaching of Indian Spine-Tailed Lizard in Jaisalmer district of Rajasthan. The picture associated with the news was a ghastly scene.The heap of dead lizards piled up in front of the arrested poachers made me to feel dejected about our fast diminishing wildlife. At that time, I did not have enough knowledgeabout this creature.

In March 2018, during our West India tour as a part of the State Forest Service training program,I got the opportunity to visit the Desert National Park in Jaisalmer and were lucky enough to have closure look of one individual of that camouflaging lizard and that disturbing news of 2014 suddenly flashed in front of my eyes.

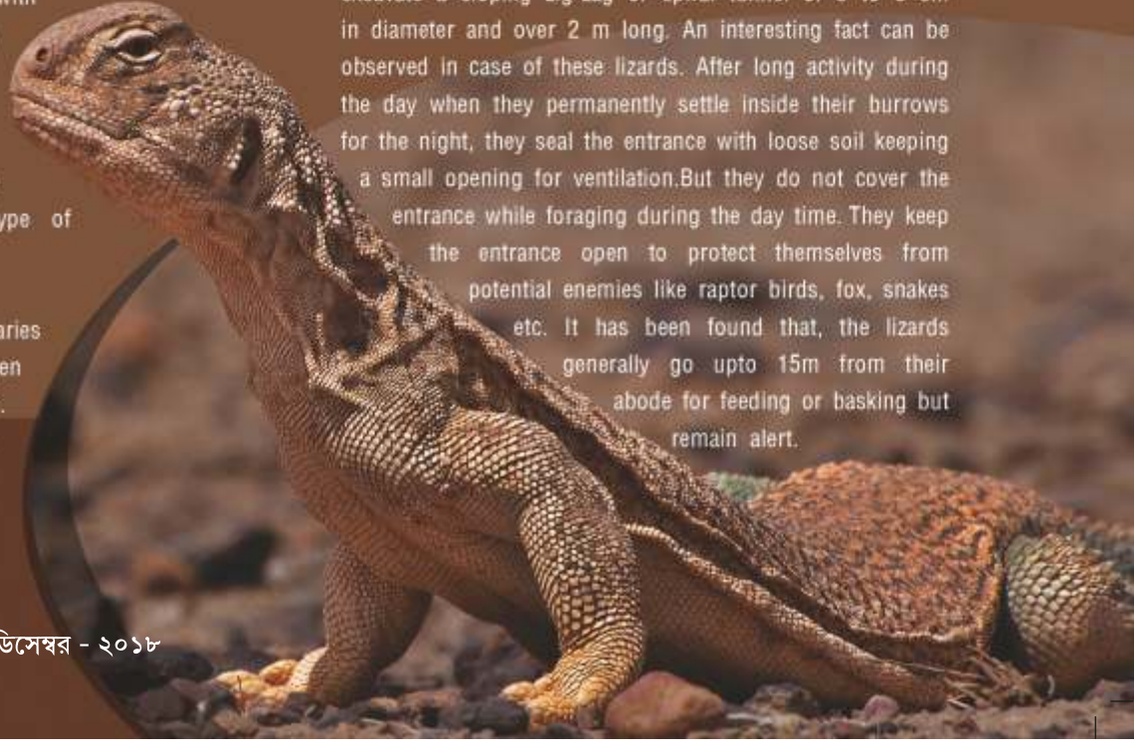
Spine-tailed lizard has a round and blunt head with a flat snout. It is usually yellowish brown, sandy or olive in colour. It may have black spots and vermiculation and a distinctive black spot on the front side of the thigh. This body colour helps them to remain blended with the surroundings to avoid predators. It is very difficult to spot a lizard lying on the surface when it remains still. It has a dorso-ventrally flattened body with wrinkled skin. Its tail is full of spiny scales with larger spines on the sides which give the lizard its common name. The tail is bluish-grey to sand-coloured depending on the type of locality in which it lives.

The colour of the lizards varies and darker colours are seen during the colder seasons. Diurnal changes in body colouration can also be observed in these lizards.

In the morning, when the lizards come out of their burrow the body colour appeared to be light brown, but it turns to dark brown in half an hour to one, which remains for a considerable period of time and after which the colour starts fading. Before being active, the tail is light brown in colour, but soon it develops a tinge of blue colour along the spines and thigh by the time body colour changes to dark brown.

Indian Spine-Tailed Lizard or Hardwicke's spiny-tailed lizard belongs to the family Agamidae and genus Saraa. The species name hardwickii commemorates British naturalist Thomas Hardwicke who first illustrated this animal. Locally they are known as 'Sanda'; 'Sap-sindha' or 'Sandho'. There are three species under the genus Saraa, among which Saraa hardwickii is the only one that can be found in India. They inhabit in the arid zones of northwestern India in the Thar Desert of Rajasthan and Gujarat. Apart from that they can also be found in some other parts, especially the dry regions of Uttar Pradesh and Madhya Pradesh. The reptile can also be found in some parts of Pakistan and Afghanistan.

These are burrowing animals and live in burrows which has a semicircular opening for entry. They generally excavate a sloping zig-zag or spiral tunnel of 6 to 8 cm in diameter and over 2 m long. An interesting fact can be observed in case of these lizards. After long activity during the day when they permanently settle inside their burrows for the night, they seal the entrance with loose soil keeping a small opening for ventilation.But they do not cover the entrance while foraging during the day time. They keep the entrance open to protect themselves from potential enemies like raptor birds, fox, snakes etc. It has been found that, the lizards generally go upto 15m from their abode for feeding or basking but remain alert.



They run very fast, and slides back to their respective burrows on the slightest sign of danger,mainly from predators. During rain they completely seal their burrows with tight soil to prevent entry of water and remain inside. They close the opening by a vigorous movement of their tail throwing soil towards the mouth of the hole. After the end of the rain spell, they clean their tunnel with the help of their tail again replacing the wet soil by dry soil from inside. These lizards are highly territorial and protect their territories from others by fighting with the intruders belonging to the same species. They maintain a safe distance of half to one meter between them while feeding together. If they come close, they start chasing each other. While fighting or in an alarmed state, their tail tip remains curvedand upwards. However, during running in an alarmed state, the tail remains above the ground.

Hardwicke's spiny-tailed lizard is often found living in colonies, sometimes on the outskirts of villages. It prefers elevated patches of land for burrowing to avoid monsoon water level. Because of disturbances and hazards coming from human settlements they usually avoid the vicinity of the villages.

It is a solitary burrow-dweller. However, it has been reported that newly hatched babies stay with their mother for some time. They show parental care to their babies and protect them from predators or from the member of the same species. These are mainly herbivorous animals, adults strictly feed on plant parts even though there are plenty of insects around. However, the juveniles and sub-adults take insects as a part of the diet along with the plants. Juveniles spend a maximum amount of time feeding only on insects such as beetles, soil mites including velvet mites, spiders, grasshoppers, moths and caterpillars. From the scientific analyses of the pellets, it has been found that, insect parts were present only in 4% pellets of adults, their quantity being negligible (1-2 %) as compared to plant material which is 98-99 %. In pellets of sub-adults and juveniles, plant parts as well as insects were observed. A few (8%) of their pellets had insect remains alone, while in other pellets a considerable amount (about 30-70 %) of plant materials were observed.

This clearly shows that at the very beginning of their life they are mainly omnivorous but with age they gradually become more dependent on plant parts. This species is diurnal in nature and their activity is either bimodal or unimodal depending on the weather condition. In normal sunny days they show bimodal behaviour and in cloudy days they become unimodal in nature.

In normal sunny days the peak activity was found to be between 08.00-10.00 hr. and they continue their morning activity till noon, though only a few lizards remain active after the noon. They again start their afternoon activity at about 17.00hr. which continues till 19.00hr. During the rain they remain inside their sealed burrow.

Indian Spine-Tailed lizard plays an important role in desert ecosystem. It is a potential prey for many raptor birds, desert fox, snakes etc.During the monsoon, this lizard leaves its burrow and comes out to feed on tender shoots of grass, at which time it falls prey to raptors and other predators. But the main threat to this lizard is commercial exploitation for its meat, skin and oil. Its meat is a delicacy for the nomadic tribal people of this area and the fat stored in the tail portion is considered to have a great medicinal value and for this reason, this lizard is often illegally hunted and sold in various parts of India and

Pakistan for folk medicine. These lizards are on the verge of extinction due to rampant poaching. It is mainly used to produce aphrodisiac, commonly known as 'Sandaa oil'. This species is threatened due to illegal trading and habitat destruction. However, due to a lack of proper information on this species it has been considered as Data Deficient nationally. That's why it is lesser known and due to lack of awareness, people are nonchalant in case of saving these poor creatures. However, in many area various research team and NGOs are working to protect and to create awareness among the people. We can hope that this marvelous example of adaptation in xerophytic condition will remain safe in nature.

Source used:

1) Wikipedia
2) Ecological observations on the Indian Spiny-tailed Lizard Saarahardwickii (Gray, 1827) (Reptilia: Squamata: Agamidae) in Tal Chhapar Wildlife Sanc tuary, Rajasthan, India,Sanjay K. Das, Sumit Dookia, Kalpana Das & SushilK. Dutta

Winter Migration of Pelican
Photograph : Tapas Das, IFS

Feathers on the edge

Tapas Das, IFS
Chief Conservator of Forests

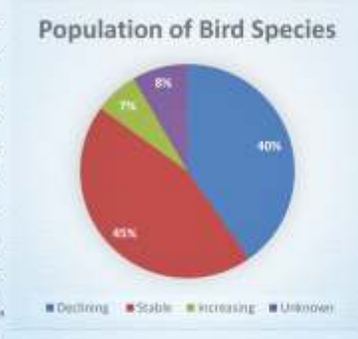
Perhaps we are the last generation to see sparrows building nests in ventilators of houses. Perhaps we are the last generation to see hundred vultures soaring in the sky. Perhaps we are the last generation to spot buttonquails in our villages. We are the last generation who have witnessed Bengal florican in Bengal soil, who have seen the greater adjutant storks flocking around dumping grounds.

We are the first generation that has a clear picture of the value of nature and the alarming situation we are facing. We may also be the last generation that can start mending. We all have a role to play in minimising the loss of nature but the clock is ticking. Between now and 2020 we have a unique opportunity to take necessary steps to review targets on biodiversity, climate and sustainable development for a positive future for nature and people.

Nature conservation agenda is not only about conserving the large mammals like tigers, pandas, whales, Rhinos, lions and all the amazing diversity of life we love and cherish on Earth. Its bigger than that. Our day-to-day life, health and livelihoods depend on a healthy planet. There cannot be a healthy, happy and prosperous future for people on a planet with a destabilized climate, polluted oceans and rivers, degraded land and denuded forests, all stripped of biodiversity, the web of life that sustains us all.Due to climate change, a growing threat, the main factors of biodiversity decline continue to be the overexploitation of species, agriculture and land conversion. Indeed, a recent assessment found that only a quarter of land on Earth is substantively free of the impacts of human activities. This is projected to decline to just one-tenth by 2050. This ongoing degradation has multifarious impacts on species, their habitats and the ecosystem.

Birds are one of the best known and most highly valued elements of the natural world, comprising more than eleven thousanddifferent species, an extraordinary variety, ranging from hummingbirds to ostriches,from penguins to eagles. Each species isunique, in its appearance, in its habits andin where it is found. Some occur in hugenumbers and others may be a handful only. Some spendtheir entire lives in an area whereas some migrate thousands of kilometers. Our birds are in crisis.

The Decline



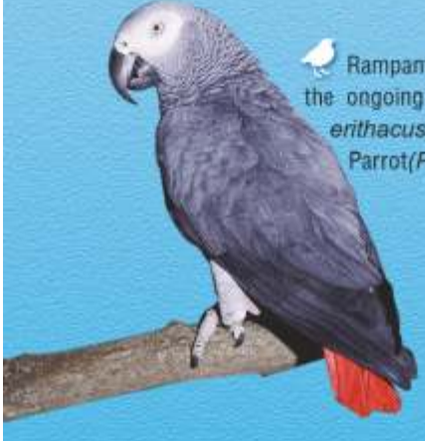
Analysis of the IUCN Red List shows that there has been a steady and continuing deterioration in the status of the worlds birds since the first comprehensive assessment in 1988. Highly threatened species continue to go extinct, while formerly common and widespread species are in sharp decline. At least 40% of bird species worldwide (3,967) have declining populations, compared with 44% that are stable (4,393), 7% that are increasing (653) and 8% with unknown trends (823).Some species currently categorised as Critically Endangered may actually already be extinct, but cannot bedesignated as such until we are certain: 22 species are therefore categorised as Critically Endangered(Possibly Extinct). Thus, as many as 183 species may have been lost in the last 500 years.

Extinctions are continuing, with three species thought to have been lost since 2000. The last known wild Spix's Macaw ,*Cyanopsitta spixii* (CR,Possibly Extinct in the Wild) disappeared in Brazil towards the end of 2000, the last two wild Hawaiian Crows, *Corvus hawaiiensis*(EW) disappeared in June 2002, and the last known Poo-uli, *Melamprosops phaeosoma* (CR, Possibly Extinct), also from Hawaii, died in captivity in November 2004.

It is now widely acknowledged that we are in the midst of a mass extinction event, the situation is alarming. As of the 2017 update, 1,469 bird species (13% of the total, or one in eight) are globally threatened with extinction.

Until recently, Yellow-breasted Bunting *(Emberiza aureola)* was one of Eurasias most abundant bird species, breeding from Finland to Japan. However, since 1980, its population has declined by 90%, its range has contracted eastwards by 5,000 km, and the species is now considered Critically Endangered.

European Turtle-dove *(Streptopelia turtur)* was once a familiar migrant to Europe, Central Asia and the Middle East from the Sahel zone of Africa. Because of habitat loss and hunting, the species is now declining across its range, especially in Western Europe, and has recently beenup listed to Vulnerable.



Rampant over exploitation also lies behind the ongoing decline of Grey Parrot *(Psittacus erithacus)* and its sister species, Timneh Parrot*(P. timneh)*.

Snowy Owl *(Bubo scandiacus)* is surely one of the most widely recognised birds in the world. It occurs in the Arctic tundra of the Northern Hemisphere and is experiencing a rapid decline, most likely connected to climate change, and has recently been up listed to Vulnerable.

In the marinerealm, the depletion of fish through over fishing and climate change has caused rapid declines in widespread and much-loved seabirds such as Atlantic Puffin *(Fratercula arctica)*and Black-legged Kittiwake *(Rissa tridactyla)*, both are now considered Vulnerable to extinction.

Why Birds are declining

Habitat destruction and expansion of agriculture, is one of the greatest causes. Use of neurotoxic insecticides known as neonicotinoids have a detrmental impact on farmland birds.

Nearly two-thirds of bird species in the tropics live in forests. The destruction of more than seven million hectares of forest each year, due to demand for timber, paper and biofuels is the second cause.

Increased hunting pressure and trapping for cage-bird trade has immense impacts on bird population decline..

Seabird bycatch with gillnets is an issue which have affected the greatest number of seabird species.

Nearly one quarter of bird species so far studied have already been negatively affected by climate change.

Scottish Natural Heritage, the ironically named killers of native wildlife, recently hit the headlines for issuing licenses to kill protected Ravens. But it has emerged that they have also been sanctioning the culling of other native - and protected - species. The shocking figures include the issuing of 30 licenses to kill Cormorants and another to exterminate 'an indefinite number of Swifts for public health/air safety'. Other licenses were issued to kill Robins and Swallows while the list also includes House Sparrows, Starlings, Gannets, Kestrels and Grey Partridge to name a few.

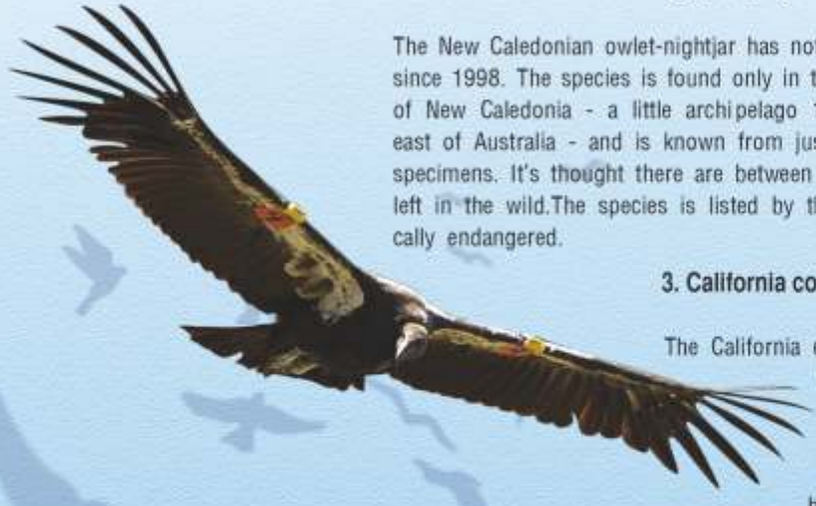
The Most Endangered Birds in the World

1. Giant ibis *(Thaumatibis gigantea)*

The giant ibis has been declared the most endangered and evolutionarily distinctive bird in the world. It is estimated that just over 100 breeding pairs are left in the wild. Relentless deforestation, droughts, and hunting have together contributed to this species rapid decline.

2. New Caledonian owlet-nightjar *(Aegotheles savesi)*

The New Caledonian owlet-nightjar has not been seen alive since 1998. The species is found only in the humid forests of New Caledonia - a little archipelago 1,210 km to the east of Australia - and is known from just two preserved specimens. It's thought there are between 1 and 49 adults left in the wild.The species is listed by the IUCN as critically endangered.



3. California condor *(Gymnogyps californianus)*

The California condor is a New World vulture, the largest North American land bird. This condor became extinct in the wild in 1987. It is the only surviving member of the genus Gymnogyps.The reasons for decline has been pinned to its low output of offspring, poaching, lead poisoning, and habitat destruction. According to a study published in 2012, the leading cause of mortality in young condors is eating trash

4. Kakapo *(Strigops habroptilus)*

The gorgeous and endangered kakapo,also called owl parrot is from New Zealand. As of August 2018, the total known adult population is 148 living individuals. Fossil records indicate that in pre-Polynesian times, the kakapo was New Zealand's third most common bird and it was widespread on all three main islands. However,the kakapo population in New Zealand has declined massively since arrival of humans in the area.

5. Kagu *(Rhynochetos jubatus)*

Known as 'the ghost of the forest'in New Caledonia, the ash-white, almost flightless kagu is the only living representative of the family Rhynochetidae. Relentlessly picking them off by introduced dogs, cats, and pigs and Habitat loss has led to the species' steep decline over the last 20 years.

6. Bengal florican *(Houbaropsis bengalensis)*
Native to the grasslands and open forest in the foothills of Himalayas of North Bengal of India, the Bengal florican is the only member of the genus Houbaropsis. It's thought that there are currently fewer than 1,000 adults left in the wild.

7. Forest owlet *(Heteroglaux blewitti)*
The forest owlet a critically endangered species has been reduced to a tiny, fragmented population in central India, which remains threatened by the ongoing loss of deciduous forest in the area. For over a century, the species was assumed to be extinct, until it was rediscovered in 1997 in Maharashtra by American ornithologist, Pamela Rasmussen. The population is estimated at between 70 and 400 individuals.

8. Philippine eagle *(Pithecophaga jefferyi)*
The Philippine eagle is the largest eagle in the world, in terms of length. Found only in the Philippines, and each breeding pair requires a range up to 40 square kilometres to adequately feed and rear their offspring, which makes it particularly vulnerable to deforestation. It's thought that the wild population currently stands at around 180 to 500 mature adults.

9. Sumatran ground-cuckoo *(Carpococcyx viridis)*
This striking little bird hails from the thick, humid rainforests of southern Sumatra. It keeps to the forest floor, where its dull green, brown, and black plumage works as fantastic camouflage, unlike the bright ring of turquoise, blue and magenta that orbits its eyes. It's known from just eight specimens, and it's thought that there are just 70 to 400 individuals left in the wild.

10. Christmas Island frigatebird *(Fregata andrewsi)*
The Christmas Island frigatebird belong to the Fregatidae family of birds that boast the largest wingspan to body weight ratio in the world, which means it can stay happily aloft for more than a week at a time without rest. This critically endangered native Australian species is currently sitting at an estimate of 2400 to 4800 adults left in the wild.

Indian Birds on The Verge of Extinction

Avifauna of India includes around 1314 species of birds,which are endemic, introduced and accidentally occurs in India, unfortunately eighty-two species of Indian birds are globally threatened or locally extinct. Indian birds listed as critically endangered are actually going extinct without the notice of mankind. On fine morning these excellent feathered creatures will not figure in the nature.

Pink-headed Duck *(Rhodonessa caryophyllacea)*
The bird was last recorded in the wild in 1949. There was a recent sighting (2004) and credible local reports (2005) from N Myanmar. It was a local resident on Gangetic Plain from Central Uttar Pradesh, South to East Orrisa and East to West Assam, Bangladesh, Manipur Valley and Myanmar.This large diving duck thought to extinct now declared as critically endangered rather than extinct.The reason for its disappearance was probably habitat destruction.

Indian Vulture *(Gyps indicus)*
Indian vulture is one of the 9 species of vultures found living in India. This species of vulture breeds mainly on cliffs and trees of Rajasthan. The current population is around 30000 mature individuals.

White-Rumped Vulture *(Gyps bengalensis)*
The white-rumped vulture is a typical, medium-sized vulture, with an unfeathered head and neck, very broad wings, and short tail feathers. These vultures were very common in the Gangetic plains and commonest of all the vultures of India, but now considered rare and thinly distributed with a population of less than 1,000 individuals.

Sociable Lapwing *(Vanellus gregarius)*
Sociable Lapwing species is listed as critically endangered because of its population has undergone a rapid reduction. It is one of the rarest and most threatened of all birds that live in India. This population is expected to decline by 80% in the next decade.

Spoon-Billed Sandpiper *(Calidris pygmaea)*
Spoon-billed sandpiper is one of the small wader birds found in India,listed as critically endangered because of an extremely small population. Two factors responsible for the Spoon-billed Sandpipers population decline are, the elimination of migratory stopover habitat, particularly in the Yellow Sea region, and subsistence hunting on the wintering grounds. Current population is less than 500 individuals.

Great Indian Bustard *(Ardeotis nigriceps)*
The Great Indian Bustard is one of the largest and heaviest flying bird found in India. Indian bustard is critically endangered by hunting and loss of its habitat. As low as 150 individuals were estimated to survive in 2018.

Jerdons Courser *(Rhinoptilus bitorquatus)*
It is a nocturnal bird species, endemic to India. This courser bird lives in extremely limited geographical range, found locally in the Eastern Ghats of Andhra Pradesh.This bird was known only from a few historical records and was thought to be extinct until its rediscovery in 1986. Population estimates for the bird range from between 50 and 249.

Siberian Crane
(Leucogeranus leucogeranus)
Siberian Crane is a unique among all the other cranes species from Gruidae family and the third most endangered crane species in the world. Habitat loss, especially due to changing hydrology caused by water diversions and conversion of wetlands, illegal take including hunting, trapping and poisoning, pollution and environmental contamination are the main reasons of decreasing population. Current population is nearing 4000 individuals.

Himalayan Quail *(Ophrysia superciliosa)*
Himalayan Quail is the rarest bird of India, belonging to the pheasant family. The bird found only in the western Himalayas in Uttarakhand, north-west India.It was last reported in 1876 and is feared extinct. The last verifiable record was in 1876 near the hill station of Mussoorie. Last population estimate was less than 50 individuals.

White-Belled Heron *(Ardea Insignis)*
White bellied Heron also known as the Imperial Heron is one of the extremely rare species of bird found in India. This large heron is found in the wetlands forests in the foothills of the eastern Himalayas and in the part of the Namdapha Tiger Reserve in Arunachal Pradesh. Attacks on birds and their eggs by predators have been a major cause in their reduction. There are only 200 individuals left in the entire world.

Baers Pochard *(Aythya baeri)*
Baers Pochard is a duck species, breeds around lakes with rich aquatic vegetation in Indian Subcontinent. This medium size brown duck is belonging to the family Anatidae and classified as critically endangered in India. It is thought that wetland destruction and over-harvesting of both birds and eggs are the key reasons for its decline. The population of matured individuals is limited to 700 only.

Red Headed Vulture *(Sarcogyps calvus)*
Also known as the Asian King Vulture is one of the few species of large vultures found in India. It is found in a variety of habitats of deciduous forests and foothills and river valleys in the Indian Subcontinent.The likely cause of this massive loss is the consumption of livestock treated with the veterinary drug diclofenac. Present population size ranges from 2500 9999.

Conservation Proposals

- Cut trees only when absolutely necessary.
- Communities and agricultural areas to allow migration corridors.
- Stop poaching and hunting of birds through strict laws and rules.
- Avoid using pesticides and herbicides.
- Avoid using poisons to kill rodents. These poisons kill everything the pest and the entire food chain related to the pest. Instead, use traps for rodent control because these dont poison the environ ment.
- Always dispose of trash properly.
- Captive breeding, or ex-situ conservation, may be used to save species from extinction.
- Reintroductions of captive bred populations can occur to replenish wild populations liable to be extinct.
- Awareness activities to be taken up to preach importance of birds.

"People think of extinctions and think of the dodo but analysis shows that extinctions are continuing and accelerating everyday"

Humans regard animals as worthy of protection only when they are on the verge of extinction.

Paul Craig Roberts

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How the Peacock lost its colour

Dr. Nick Doley
Veterinary Officer, Bengal Safari

Aditya Mitra
Biologist, Bengal Safari

The Peacock is an exquisite bird. Never did a bird have more of a right to display its vanity. The peacock is extraordinary with its vivid colours and uniquely shaped feathers. This bird parades its beauty and extravagant feathers. The white peacock is just as lovely in beauty. Its feathers and appearance is nearly exactly the same as its colourful counterpart, except its feathers are white. The white peacock fans out its white train to display its feathers, revealing a cloud of white magnificence. The all white colour of a peacock is a trait of beauty among a species of beautiful birds.

As a child I have always been fascinated by the grandeur of the white peafowls at Alipore Zoo. The magical exuberance of their train never failed to enthral me. I was suddenly introduced to a new term called "albino" . White tigers, lions, peacocks all were supposedly albinos. Not until 2017, almost 18 years later, when Bengal Safari received a pair of "albino" peacocks from Alipore Zoo in an animal exchange program that I got to know that a phenomenon called leucism and not albinism was responsible for the white colouration of these majestic birds. A white version of an animal can be found in nearly any species, but the white Peacock is not an albino contrary to popular belief.

How leucism is different from albinism ?

Inherited colour defects, such as albinism and leucism, are well known in several animal species. In birds, leucism is distinguished by complete lack of melanin in some or all feathers, without colour changing in naked parts of the body such as eyes, beak and legs (Buckley 1982). In some cases, leucistic birds can show decreased pigmentation in the beak, legs and in some parts of the eye, although it differs from an albino because it shows dark pupil, once pigments in the rear part of the eyeball are present (Van Grouw 2006). The presence of pure white feathers over a large portion of the bird's head, in areas where typical birds have coloured feathers, is apparently a common form of leucism previously observed in some species of Troglodytidae, Furnariidae, Rhinocryptidae, Thraupidae, Turdidae, Emberizidae & Parulidae (Kratter & Nice 2001, Nemesio 2001, Piacentini 2001, Krabbe & Schulenberg 2003, Kroodsma & Brewer 2005, Hosner & Lebbin 2006, Lebbin Et Al. 2007, Cestari & Costa 2007, Goncalves Jr Et Al. 2008, Franz & Fleck 2009). The causes of leucism are often attributed to the expression of mutant alleles (Bensch Et Al. 2000) or deviations of gene expression which disrupt the pigmentation at feather development (Moller & Mousseau 2001).

Alternatively, such cases may result from physiological disturbance (Phillips 1954). The proximate cause of albinism is a hereditary trait due to a single autosomal recessive gene that causes the lack of activity of the enzyme tyrosinase, a key component of the pathway leading to the formation of melanin (Gronskov Et Al. 2007). Albinism is defined by the complete loss of all pigments in plumage and other body parts, resulting in birds with white plumage and a lack of pigment in their eyes, beak, skin, legs and feet (Hosner & Lebbin 2006). Reduction of melanin in the eyes results in reduced visual acuity (Gronskov Et Al. 2007). However, in cases of leucism the eyesight is normal (Van Grouw 2006).

Ostentation of leucistic peafowls

Brief insight

Peacocks are native to India. When the British Empire conquered India they spread peafowl all over Europe and America. That is when the noticeable colour white began to appear in peafowl. It has been speculated that a few white peafowl bred naturally in India. It is unknown if white peacocks appeared before the British discovered them, but the first known white colour variation appeared in 1830. They are now bred for the white colour in captivity.

The white peacock is not different than the peacocks. Its not a species of peacock; it is a special peacock that has been born all white, due to a genetic variation. White feathers depend on which genes are dominant and which are recessive.

There are, in the literature, cases of many specimens of birds with white plumage erroneously classified as incomplete or partial albinos (Gross 1965, Oliveira 1983, Coelho & Alves 1991, Moller & Mousseau 2001, Dowding & Gummer 2003, Gonzalez-Acuna 2004) but which are really cases of leucism. Since melanin is present in some parts of the body, the terms partial or incomplete albinism is not appropriate (Buckley1982, Nemesio 1998, 1999, 2001, Van Grouw 2006).Buckley (1982) suggests that the white morphs in polymorphic species may have resulted from leucism, which also could be responsible for the origin of the white monomorphic species like the egrets.

It is thought that the absence of pigmentation results in low life expectancy, since these individuals would be more exposed to predation and to intraspecific conflict (Holt Et Al. 1995). In the case of albinism, those effects would be more severe and, therefore, it would be sporadically found in nature.The absence of pigmentation would increase the chances of being predated and there is a greater tendency for malignant skin tumours. There are also eye diseases associated with albinism that reduce visual acuity and therefore make it difficult to locate prey and predators (Gronskovl Et Al. 2007).

The occurrence of leucistic birds in natural populations rarely exceeds 1% (Sage 1963, Santos 1981, Bensch Et Al. 2000). One of the consequences of leucism, the reduction of life span due to intraspecific conflict, is mostly observed for species living in flocks (Harris 1983, Withgott & Mcmahon 1993).

Chicks are born yellow with white wings, and become entirely white as they mature. If white peacocks are bred to white peahens all of their chicks will be white. Generally, if white peafowl is bred with coloured peacocks there is a variety of colours in the chicks.

The clutch of a peahen is 3 to 6 eggs. A peahen will incubate them for nearly a month before they hatch. Chicks can fly short distances only 3 days after they are hatched. From January to March peahens create nest on the ground and perch on the treetops. Peafowl are omnivores; they eat plant parts, insects, flower petals, seed heads as well as amphibians.

Peacocks have extravagant trains. In the case of the white peacock the trains are a dazzling white. Peacocks grow their showy trains at age three. The average length of a Peacock is six feet long, their tail making sixty percent of its body weight. A Peacocks train can measure four to five feet long, longer than the rest of their bodies. Each tail feather has an eyespot. The tail feathers of the train fan out to create quite a display.

Leucistic (Male)

Peacocks fan out these feathers to present to females during mating season. The white display is just as impressive as its colourful counterparts. Peacocks molt around January and lose their trains, but they quickly re-grow by June. The females do not have a train. The males display of their train includes rattling and wing shaking, in an effort to impress females. It is the dance of the peacock that determines which peacock is preferred by peahens. The ones with the most impressive trains get picked out by females. This is no doubt the reason, Peacocks evolved with such noticeably lovely trains.

Peacocks are striking in their beauty. If a bird enthusiast wishes to admire a member of this species, the White Peacock is stunning in its white colour.

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My Experiences in

INTELLIGENCE NETWORK IN JALDAPARA NATIONAL PARK

Bimal Debnath WBFS
Assistant Wildlife Warden

In my service tenure in Jaldapara National Park as Assistant Wildlife Warden, I went through the ups & down in question of poaching of mega-herbivores cum pride animal of the state RHINO . I felt to express my experiences in this matter. In this period of my service I got the full support from my all superior officers and from all my Team Jaldapara mates. Making of Team Jaldapara is a separate chapter. Todayssubject is making intelligence network in Jaldapara. The subject is so elaborate and narrative that it can not be expressed in few pages. Yet I do attempt for a bit benefit of my colleagues who are working in field.

STEPS TO MAKE INTELLIGENCE NETWORK

1. To know the modus of operandi of the Forest Offences.
2. To collect the knowledge about the other offences in the area.
3. To identify Who can be the sources?
4. To collected information from source.
5. To identify the suspected offenders.
6. Examination of the information and sort listing of information.
7. Coordination with other agencies if required.
8. Surveillance over the suspected offender.
9. Courage to do Operation as per examined information.
10. Interrogation of accused.
11. Implementation of Acts and preparation of case.

TO KNOW THE MODUS OF OPERANDI OF FOREST OFFENCE

- By knowing type of Offences: Poaching, Felling, Poisoning etc
- By knowing the tool used in offences: Fire Arms, Type of fire arms, Bows and Arrows, Nets, Traps, Chemical immobilization etc
- By knowing the character of Offence: Open, Secret etc.
- By knowing Time of offences.
- By knowing the duration of committing the offences.
- By knowing the marketing of collected Forest produce.
- By knowing the extend of involvement of people & politics in the Offence.
- By knowing the money flow in the Offence

TO COLLECT INFORMATION ABOUT THE OTHER OFFENCES IN THE AREA

- By consulting offences recorded in Police Satiation
- By consulting offences recorded in Customs
- By consulting offences recorded in Panchayats

WHO CAN BE THE SOURCES

- Staffs
- Interested Person
- Needy Person
- Obelized person
- Motivated Person
- Greedy person
- Offenders

TO COLLECT INFORMATION FROM SOURCE

Is local staff can be a source? if yes, then how? Information can be collected either by making Relation or by investigation.

If No, then What? we must make source and information can be collect by following process.

- By paying remuneration.
- By using of emotional attachment.
- By giving temptation.
- By allowing Forest Offences. (This is the worst attempt. Some of staff attempt it, what must be forbidden)
- By using forest dependency.
- By establishing that you are serious in protection. (it is most vital)

Indian Hog Deer *(Axis porcinus)*
Photograph : Bimal Debnath

- By attending unknown phone calls.
- By establishing your dominance in the area in execution of source information.
- By not revealing the source.
- By keeping strong control over the source. Time and patience.

- By scrutinization of Information received.
- By monitoring daily routine of suspect.
- By monitoring economic development of suspect.
- By monitoring associates of suspect.
- By monitoring life style of suspect.
- By screening marital and extra-marital association of suspect.

EXAMINATION OF INFORMATION AND SORT LISTING

- Many information will be received.
- By matching the information with the offences committing in the area.
- By doing cross checked of the information received,with other departments.
- By keeping in custody &safe guarding of some important information.
- By sharing some information with other agencies and taking input from them.
- By identifying of the links of information.
- By identifying of epicentre of information, particularly a suspect.

COORDINATION WITH OTHER AGENCIES

- By holding frequent formal and non-formal meeting.
- By sharing suspects records.
- By sharing phone number.
- By collecting CDR and CAF.

SURVEILLANCE OVER THE SUSPECTED OFFENDER

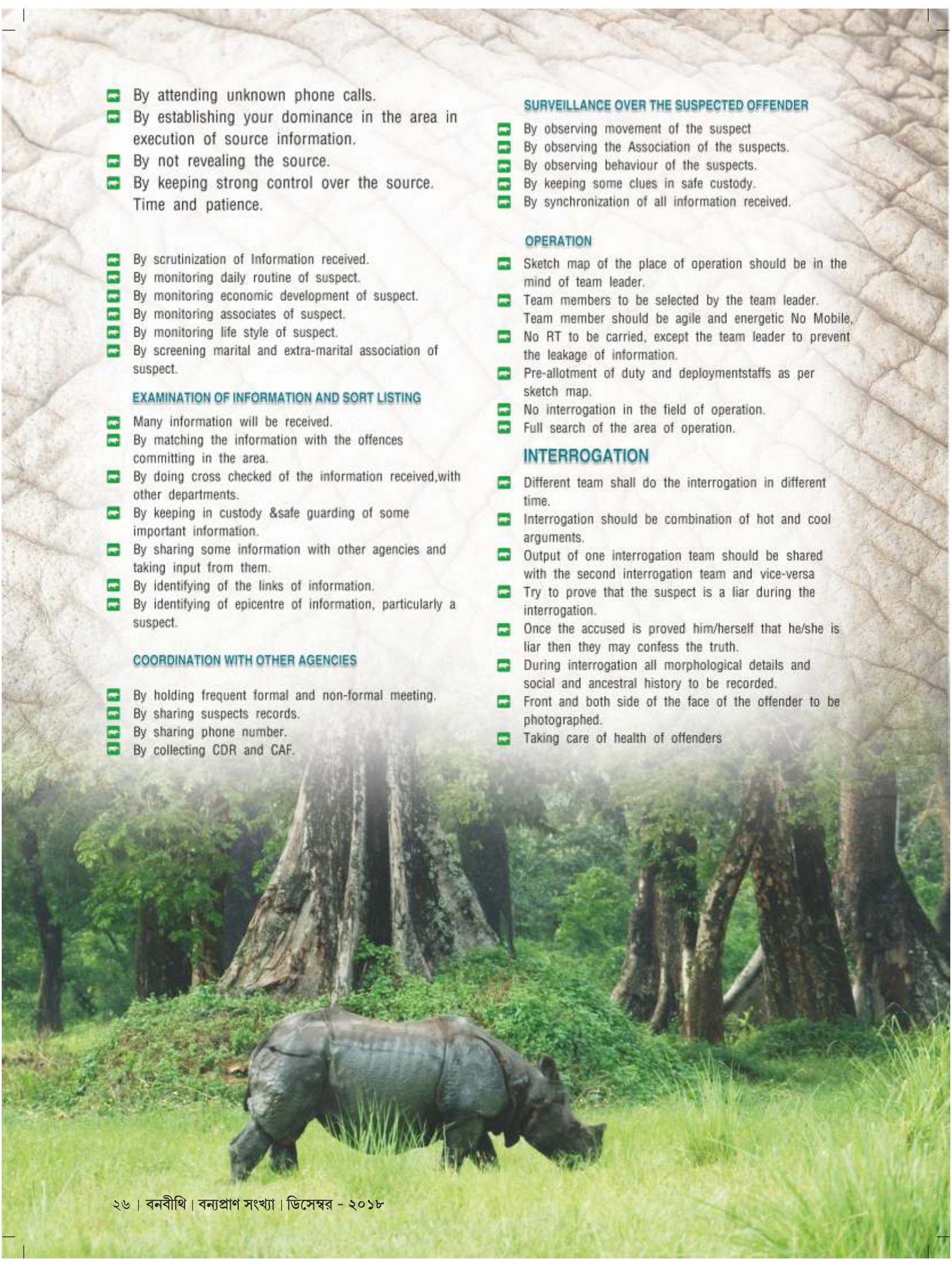
- By observing movement of the suspect
- By observing the Association of the suspects.
- By observing behaviour of the suspects.
- By keeping some clues in safe custody.
- By synchronization of all information received.

OPERATION

- Sketch map of the place of operation should be in the mind of team leader.
- Team members to be selected by the team leader. Team member should be agile and energetic No Mobile,
- No RT to be carried, except the team leader to prevent the leakage of information.
- Pre-allotment of duty and deploymentstaffs as per sketch map.
- No interrogation in the field of operation.
- Full search of the area of operation.

INTERROGATION

- Different team shall do the interrogation in different time.
- Interrogation should be combination of hot and cool arguments.
- Output of one interrogation team should be shared with the second interrogation team and vice-versa
- Try to prove that the suspect is a liar during the interrogation.
- Once the accused is proved him/herself that he/she is liar then they may confess the truth.
- During interrogation all morphological details and social and ancestral history to be recorded.
- Front and both side of the face of the offender to be photographed.
- Taking care of health of offenders



IMPLEMENTATION OF ACTS AND PREPARATION OF CASE

- Offenders to be forwarded to the Magistrate within 24 hours
- During seizure, seizure witness should be as per the choice of the seizing officer, it will help the trial procedure latter on.
- Proper sections to be mentioned in the forwarding. Forwarding should not be elaborative.
- EO/IO must believe that the investigation or enquiry of the offence, can not be completed by 24 hours, the ER/IO must take the offender in remand vide section 167 of The Code of Criminal Procedure 1973. No one should be afraid of taking the offender in remand. Sanctioned remand period, itself indicate the intension of EO/IO and the grievousness of the offences.
- All investigation to be completed and POR must be submitted before the expiry of 60day.
  As the forest criminals maintain very low profile and may be of different state and nation, once the are released from jail custody, it is very difficult to bring back themin the court. So, at the time of submitting POR, prayer for custody trial of the case should be submitted.
- Till the charge is framed in the court, the EO/IO and all witness should sit together and should discussed the case and the proceedings of the case in court. In this way the witness shall remain ready for examination. Some the discussion can be accompanied by law professionals and superior officers for better results. Yes, by doing this, we got the following success.

Case – 1

- Criminal: Chattar Miya, S/o- Badiurjamal Miya, Village Natunpara, Jaldapara PS Alipurduar District Alipurduar
- CR Case No 173/16 Dated: 15-02-2016
- Convicted within a Record time of 8 months.Punishment Awarded 3 Years imprisonment with Rs.3,000/- fine. In default of payment of fine shall have to undergo further SI for 6 Months. Dated of conviction: 27-10-2016

Case – 2

- Criminals are:
  SriMowriaNarzary SO/- Late KatiramNarzary, Vill: Pathanbari, PO; Rani pur,PS: Rani Kata, Dist: Chirang
- Nikhil Basumatari SO/- Late Karuna BasumatariVill: 2 No Salbari,PO: Rani pur, PS: Ramakhata, Dist: Chirang
- Sri BimonIslary SO/- JellalslaryVill: Datkari, PO: Devshri, PS: Rani Kat, Dist: Chirang
- CR Case No 332/16 Dated: 14-12-2016
- Convicted within a Record time of 6 months. Punishment Awarded 3 Years imprisonment with Rs. 3,000/- fine. In default of payment of fine shall have to undergo further SI for 2 Months.
  Date of conviction: 01-06-2017

Case – 3

Criminal:

- Jorge Soren of Bamanpara, Satali, Nakadala, Kalchini, Alipurduar
- CR Case No 622/15 Dated: 30-10-2015
- Convicted within a Record time of 8 months. Punishment Awarded 5 Years imprisonment with Rs. 20,000/- fine. In default of payment of fine shall have to undergo further SI for 12 Months.
  Dated of conviction: 04-09-2017

Case – 4

Criminals are:

- RikochNarjari, Age - 28 Years (approx.) S/O- RabichanNarjari Village: Abharupara PO- Badaitari, Paschim Salkumar PS: Falakata Dist: Alipurduar, WB
- SwanthanGuite, Age 26 Years (approx.) S/O Late KampteGuite , Imphal, Manipur
- Sri Suresh Karjee , Age 40 (approx.) S/O RenthaKarjee Village: Abharupara PO- Badaitari, Paschim Salkumar PS: Falakata Dist: Alipurduar.

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  Sri Suresh Karjee, Age 40 (approx.) S/O RenthaKarjee Village: Abharupara PO- Badaitari, Paschim Salkumar PS: Falakata Dist: Alipurduar.

- CR Case No 196/16 Dated: 30-05-2016

- Convicted within a Record time of 8 months. Punishment Awarded 3 Years imprisonment with Rs. 10,000/- fine. In default of payment of fine shall have to undergo further SI for 2 Months,
  Date of conviction: 05-06-2017

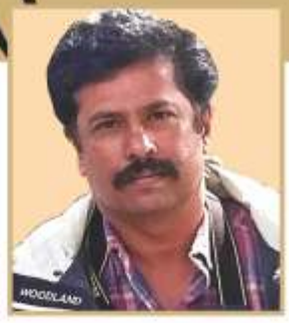
Case – 5

- Criminals are:
  Lachu Rava, Male 24 Years, C/O- AgenRava, Vill Rava Basti, Uttar Mendabari, Kalchini, Alipuruduar
  Subal Rava, Male 42 Years, C/O- Lt. NarenRava, Vill Bong Basti, Dakshin Mendabari, Kalchini, Alipuruduar
  Arjun Rava, Male 26 Years, C/O- Chandra Rava, Vill Bong Basti, Dakshin Mendabari, Kalchini, Alipuruduar
  Sanjoy Rava, Male 26 Years, C/O- LopeshwarRava, Vill Rava Basti, Uttar Mendabari, Kalchini, Alipuruduar
  Sunil Nazinary SO/- Haren Narzinary Vill.Satali Nakadala PS. Kalchini, Alipurduar.

- CR Case No: 841/16, Dated: 19-10-2016, POR No: 22/JPS Dated: 18-10-16

- Convicted within 17 months. Punishment Awarded 5 Years imprisonment with Rs. 20,000/- fine. In default of payment of fine shall have to undergo further imprisonment for 12 Months. Dated of conviction: 19-03-2018

Nylon Net fencing reduces Tiger Straying in Sundarban Tiger Reserve



Nilanjaan Mallick,IFS
Chief Conservator of Forests

Sundarban is the largest mangrove forest in the world with high biodiversity value.This is the only mangrove forest in the world where tigers are found. Tigers of Sundarban forest are known for their ferocity ,man eating behavior and peculiar habit of straying into human habitation.This particular behavior of the Sundarban tiger is the main reason of conflict with the local inhabitants. People living in the vicinity of forest are heavily dependent on forest for livelihood .This is a major problem in Sundarban Tiger Reserve and specific measures are taken to control this .The present article describe the cause, type, mitigation strategies of tiger straying and successes to control it. Creation of nylon net fencing all along the village forest interface has been a major step taken for the Sundarban Tiger Reserve (STR) management in reducing the straying and management of conflict.

Introduction :

Sundarban, the largest delta in the world,consist of 10,200 sq km of mangrove Forest ,spread over India and Bangladesh . Sundarban Tiger Reserve (STR) withj a total area of 2585 sq km is located in the southern-most part of the state West Bengal in the districts North and South 24-Parganas. It lies between latitude $21^0 31'$& $22^0 31'$ North and Longitude $88^0 10'$& $89^0 51'$ East. STR is bounded by fringe villages along the northern boundary, Bay of Bengal on the South, territorial division South 24-Parganas on the West and Bangladesh on the East separated by Raimangal, Kalindi and Harinbhanga rivers.

Human animal conflict has existed in Sundarban way before the actual declaration of the Tiger Reserve. Though there have been incidences of conflict with different animals like snakes, crocodiles and tigers it is conflict relating to the tigers which has always been in focus for most of the time. The roots of the conflict lie in the original settlement of the area when the mangroves teeming with wild animals were cut down for settlement of humans. This policy started at the time of the Mughals also continued during the British era with an aim of increasing revenue for the Government. Most of the conflicts recorded then were due to resident tigers which attacked humans and very often killed during the process of land clearing. So much was the depredation that the British issued permits for killing of tiger straying into village/settlements.

It is worth mentioning here that STRs only north western boundary has an interface with 25 fringe villages which are densely populated with human and livestock.

The straying of tiger into the fringe villages outside the mangrove forest has been a very common phenomenon in the Sundarban Tiger Reserve. It is main reason for conflict with the local villagers who dislike the entry of the animal into the human habitation on the forest fringes. It has been seen that in the last 10 years apart from one occasion i.e. in the year 2005 where a girl who came face to face with the tiger and was injured and later succumbed to her injuries, there have been no case of tiger killing humans in the village areas. The animosity of the villagers stems from the fact that many a times during such forays the tiger kills livestock which results in economic loss to the villagers besides creation of fear psychosis in the area. The people also attack the animal because they are penalizedby the field staff for theft/illegal activities like collection of fish, timber and small wood from the prohibited areas. So, the people take opportunity to assault the staff and at times even killing of the strayed animal. The last such incidence was in the year 2001 where the villagers prevented the forest staff from reaching the spot where the tiger had strayed out in Pakhirala area and they killed the animal. POR was lodge against the culprits and at present the case is sub-judicein court.

Reasons have been attributed to the straying phenomenon

1. Tigers in Sundarbans stray into the neighboring villages because they are situated in the reclaimed forest land and in some places the boundary between the forest and agriculture land is no longer distinct with either silting up of the river channel separating (as in case of Arbesi 1 forest bordering Samshernagar, Kalitala) them or the village side mudflat being covered by mangrove trees and resembling a forest area (as in case of Rajat jubilee). In the former case the tiger can easily walk across the river to catch the easy prey of cattle and goat just across the forest separated by hardly 6-10 feet.

2. Tigresses sometimes come out of the forest to give birth inside the paddy field to possibly avoid danger from other males.

3. An old aged, diseased and disabled tiger like the ones with broken tooth is another cause of straying because it is difficult to hunt the prey in the forest with such disabilities and they find it easy to prey on domestic cattle.

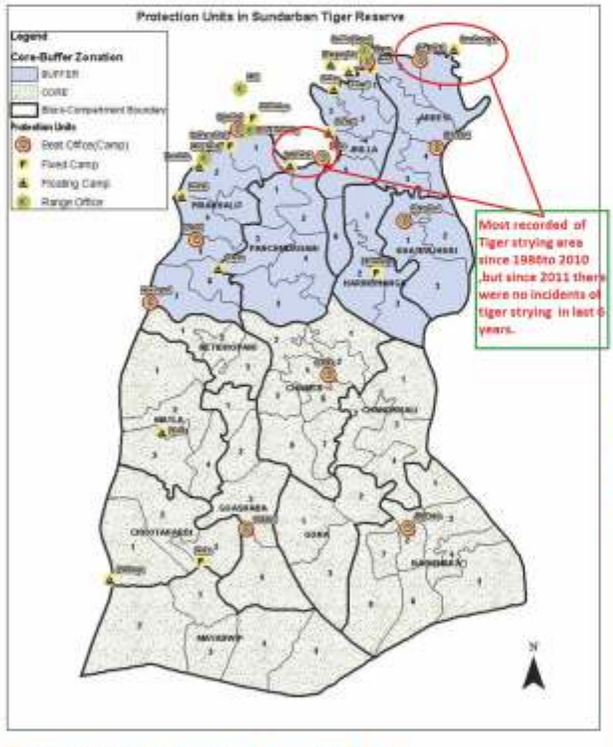
4. Many a times transients and sub adults looking to establish territory also stray out possibly driven out by the dominant males.

5. A number of people also attribute the tiger straying to insufficient prey base However, thisis not backed by any scientific evidence.

Type of straying

(i)Temporary Straying:-
Many times it becomes possible for the staff and local villagers to drive the tiger back to the forest by using drums, crackers, fire etc. Sometimes tiger also goes back to the forest on its own. These straying incidents are termed as Temporary Straying , where in case of any repeated phenomenon, trap cage with live bait is being used to trap the tiger and then relocate the same in their wilderness

(ii) In Permanent Straying:- the tiger takes refuge in a cattle shed or inside any village hut, when tranquilization is the only resort to rescue the animal



Constraints of rescuing a strayed tiger

(a) The entire north western boundary of STR is surrounded by the villages which form clusters and islands and the area is crisis crossed by small and big rivers /creeks and communication is very difficult, compounded by tides, which makes the transportation of animal very difficult, too.
(b) The population density is very high in the fringe villages and they cultivate rain fed single crop in the field mostly. As the tiger commonly attack their cattle and attack them during honey/ fish/ crab collection, so, on retaliation villagers attack the strayed tiger and kill it, sometime, even by poisoning.

(c) The people also attack the animal because they are sometimes annoyed with the staff because staffs penalize them for theft/ illegal activities like collection of fish, timber, and firewood. So the people take opportunity by killing the strayed tiger in the village itself and assaulting the staff as revenge.

(d) The success of capture and release also depend on the area where the strayed tiger ultimately moved into. If the strayed tiger is far from the rivers etc then the transportation of the animal as well as the staff becomes very difficult.

(e) Chemical immobilization requires high technical expertise, precision, courage, patience and decision making ability. Although regular trainings are organised for selected staff for tranquilization, still performing in a mobbed area often poses difficulties.

Mitigation Strategies with respect to Tiger Straying

To reduce the reaction time in any permanent tiger straying situation, following action protocol is suggested

(i) Displaying of contact numbers of local Police, other concerned Administrative Officials, local public representative, Panchayet Pradhan/ member at Range , Beat office and other convenient public places so that message can be send timely as well as contacted properly for mob controlling and other necessary actions.

(ii) A speed boat to be kept always in ready condition so that the Quick Response Team (QRT) may act immediately.

(iii) Tranquilization equipment, translocation cages etc to be kept ready along with tiger guard and other necessary tools like nylon net, crackers, flame torch, arms and ammunitions, helmet etc for the Tiger Straying Combat Force (TSCF).

(iv) The Veterinary Surgeon and at least one staff who are trained in tranquilization and the speed boat driver should be always ready to act impromptu. In case of allowing leave, this issue has to be taken care of.

(v) Time to time group meeting in the villages to generate public awareness, eco- development works etc help a lot in getting information and co- operation from the villagers during tiger straying and rescuing of the animal.

(vi) To mitigate the tiger straying a thought of mechanical barrier was came out in field level by obstructing the rout of tiger from where it strayed in the villages. Therefore, the concept of fencing along the forest villages interface was developed and interestingly it worksas a psychological barrier rather than a mechanical barrier.


Nylon Net fencing

Nylon Net fencing

Initially the boundaries of the vulnerable forest areas along the river was fenced by vegetative cover i.e. Ceriops-Excoecaria combination tide with nylon rope. but Ceriops Excoecaria fencing is not encouraged presently because it requires heavy toll of vegetation cutting.Then, mechanical methods by nylon net fencing using Avicenna posts along the forest fringe have been then found to be very effective.Both these fencings last about three years. But this practices has been stop because it also requires heavy tool of vegetation cutting . To avoid vegetation cutting it was proposed to gradual changing of Avicenna post to bamboo post on soft soil and RCC post on hard ground. The height of the fencing initially was 6-8 ft butobservations reveal that tiger starts negotiating the 8ft high fence by jumping over the sameUse of RCC and bamboo post can also help to erect the fencing at a height of 10 12 ft. The normal mesh size remains 4 X 4 to avoid any strangulation of wild animal like deer. The net is made of 4mm,3-strand IP-PPPARA yellow Nylon rope.


Combination of Goran stick and nylon net fence

Goran stick fence

At present, total 96 km. long nylon net fencing has been erected in villages interface area and it is needless to mention that it is very effective to control straying out of tiger in fringe villages as well as entry of cattle even human being from villages to the forests.

Due to saline soil, corrosive nature and every 6 hours interval high and ebb tide both nylon net fences as well as Bamboo post, which act as a support get damaged frequently. In order to make it more effective regular checking of nylon net fencing is done starting from lower-level staff to Dy Field Director and damaged portion is being changed.

Fencing Checking Protocol:

A protocol for maintenance of the nylon-net fencing has been designed with an aim of carrying out thorough checking and proper maintenance. The Protocol includes involvement of local stakeholders in JFMC members also along with forest staff.

A Fencing Register will be kept in each station and records will be kept in accordance to the parameters given below

S no.	Rank	Frequency	Remarks
1	Concerned Forest Guard	Daily	He will take at least one concerned FPC/EDC Member and both will jointly sign in Fencing checking Register.
2	Concerned Beat Officer	Weekly once	He will take the Joint Convenor of concerned FPC/EDC Member and both will jointly sign in Fencing checking Register.
3	Concerned Range Officer	Once in 15 days	He will take the Concerned Forest Guard or Beat Officer along with and will report to DFD, STR in detail as well as will mention in fencing checking Register.
4	Asstt. Field Director/STR	Once in a month	They will check the fencing in the field to verify that the same has been maintained properly.
5	Dy. Field Director/STR	Once in six weeks	He will check the fencing in the field to verify that the same has been maintained properly.

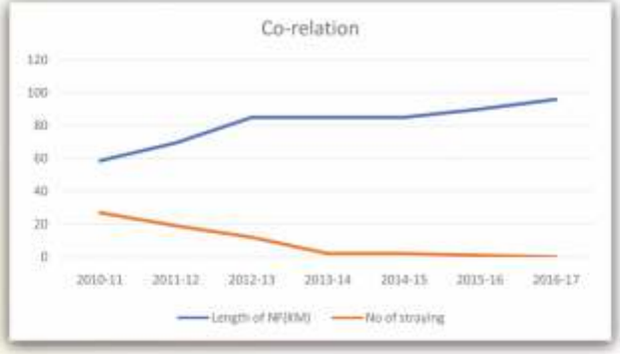

Nylon net fencing checking register

Graphical description of Tiger straying incidence in Sundarban Tiger Reserve in last 20years

year	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
No of tiger straying	18	3	5	10	6	8	24	22	17	4	8

year	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
No of tiger straying	8	14	14	21	27	17	12	2	2	1	0

Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Length of NF(KM)	58.5	69.5	85	85	85	90	96
No of straying	27	19	12	2	2	1	0



Result and Discussion :-

A careful analysis of the observation and data of last 20 years show a trends of ups and down in Tiger strying in Sundaraban Tiger Reserve. But it is clear that since (2010-11) there is a trends of reduction of tiger stryaing whene at least 50% fringe boundary area was covered with Nylon net fence. There is also sharp decline of tiger strying since (2013-14)when almost all the fringe boundary was covered by Nylon net fencingand maintained regularly.

Benifits of nylon net fencing :-

Its reduced the tiger stryaing in the villages as a reasult fear and revenge about the tiger is came down and conducive enviornment for exicvuting different Eco developmemtal activities in JFMC area is increased.

Maintains of nylon net fencing requires lot of labours and most of the labours are engaged from diffrernt JFMC area that way income generation to the local pepole also done.

Nylon net fencing also prevent the entry of carcasses of domestic animal from the villages site to the forest.

Conclusion:

Over the years human tiger conflict in STR has been due to straying of tiger into the human habitation and killing of livestock by them. This situation was the main reason behind the age-old mistrust and animosity of people living in the fringe of STR.

As we all know that the co-operation and participation of locals is a pre-requisite for conservation of natural habitats including Tiger Reserve. Steps were taken to ensure this during last two decades .Successful Management of human tiger conflicts in STR is one of the major objective of Conservation plans.

Creation of nylon net fencing has been reality effective in reducing the number of straying and truly controlling the conflicts. This article has shown the effectiveness of this particular mechanism which is undoubtedly one of the most important innovative idea being used in the field of conflict management.

Photograph : P.K Pandit,IFS

CHEETAH

WHAT AN INCREDIBLE SIGHTING AT KRUGER NATIONAL PARK

Dwiparna Kumar Datta, WBFS
Divisional Forest Officer

@ Dwiparna Kr.Datta

In November 2017 I visited the Kruger National Park along with others Officials of Forest Department and stayed at Southern African Wildlife College, Kruger National Park, South Africa. It was a wonderful time at Kruger National Park for a period 16 days Programme (11th November to 26th November 2017) . On this particular trip I had been lucky enough to see many Wild Animals & Birds. Also I hadn't been lucky enough to see any Rhino in Wild in nature. After the Rhino, Leopards etc, Cheetah is my favourite animal which I never been seen in earlier.

On the first day of touring in the Kruger National Park I have seen a few nos. of open safari vehicle were standing on the road. The driver and tourists of other vehicle were looking in a long distance towards the forest and whispering about Cheetah. But I along with our team members could not clearly sighted the cheetah from a long distance and could clearly visible only using camera and binocular. I tried desperately to see what they were looking at but could not see anything.

Then the driver of our vehicle pointed a cheetah about a distance of about half kms apart from our vehicle and there was a movement in the bushes. Then I used my camera and taking a huge nos. of photograph on the particular spot. Latter on which searching the photos in camera I would find a nice photograph of Cheetah which I never seen in my life. What an exciting to my trip on that particular date. I do not think I will ever experience that again.

It has been estimated that in the Kruger National Park there are only 120 member of Cheetah and it is continued as critically endangered.

Therefore at HESC, there are facilities for Cheetah breeding and this centre has done some promising results.

After increasing the Cheetah by captive breeding, the young generations are trained the hunt in captivity and after hunting training, successful young Cheetahs are left in the Wild condition and they are watched by using radio caller tracking system. This center receiving substantial amount of donation for their purpose.

@ Dwiparna Kr.Datta

Now a days the nos. of Cheetah decreasing day after day at Kruger National Park, South Africa and no more Cheetah in Asia, for the conservation of endangered species in South Africa a nos. steps taken by their Administration, in which Hoedspruit endangered species center concentrates on the conservation of rare, endangered Animals with emphasis on the Cheetah.

The Hoedspruit endangered species center (HESC) is focused on education of trainers. Students and the general public in conservation and conservation activities, eco-tourism , the release and establishment of captive bred Cheetahs back into the Wild and the treatment and rehabilitation of Wild Animals.

The HESC has establish ed itself one of the leading private research and breeding facilities for endangered species in the Country governed by a progressive and modern management approach, it concerns itself the with the breeding and maintenance of several endangered indigenous Wildlife species in Southern Africa and a nos. of Cheetah has already been released from this centre to Kruger National Park.

Cashew nut apple
(Anacardium occidentale)

Photograph : Tapas Das, IFS

Forest Resource Assessment

"Management is doing things right, leadership is doing the right things" - Peter Drucker

Sajal Kumar Sarkar, WBFS
Asst. Divisional Forest Officer

National Working Plan Code, 2014 dwells extensively upon multiple technical aspects of forest management planning process such as, biodiversity conservation, enhancement of forest productivity together with establishment of regeneration to improve forest health and vitality as per ecological and silvicultural requirements of the species, soil and water conservation, climate change, progressively increasing the growing stock and carbon sequestration potential, REDD+, joint forestry management, applications of modern technologies for resource mapping, broadening the scope of forestry research, extension of management planning for trees outside forests (TOF), integration of forestry planning with overall development planning of the district concerned, thorough and close analysis of past systems of management, improvement and regulation of hydrological regime, sustainable yield of forest produce, maintenance and enhancement of ecosystem services including ecotourism, peoples involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people, albeit with simultaneous implementation of Indian Forest Act, Wildlife (Protection)Act, Forest Conservation Act, Biological Diversity Act, PESA Act and Forest Rights Act. All these entail that the specific composition and the structure of forests must harmonize with the environment of the locality.

All these technical jargons, when spelt out together, sound pretty much awesome. After reading the code, a young working plan officer, aspiring to write a good working plan for a chosen forest tract covering all important aspect of good forest management, must wonder wherefrom to start his or her work. There are certain aspects of management, which are complementary in nature, which means improving one factor will automatically improve another factor. For example, increasing the growing stock can also serve the purpose of a climate change mitigation measure. Some aspect of management may supplement the other aspect. As an example, we can say that if forest management planning is integrated with the development planning of the district in which the forest area falls, then some of the works of afforestation, community development works etc. can be undertaken as a part of the developmental works of the districts.Then there are certain other aspects, which are contradictory in nature. e.g. if an area is frequented by Elephants and there is a need to raise some fodder plantations there as a habitat improvement measure, then that can only be done by compromising with the production aspect of that part of the forest.

It transpires then, that all aspects of forest management cannot work together for every single patch of forest lying in a particular tract, for which a working plan is sought. Before taking up the work of writing a working plan, it is necessary therefore, to map the forests of the entire tract, on the basis of several criteria, such as condition and composition of forests, ecological and environmental significance, extent of dependence of local people on it, surroundings (whether near or adjacent to a river or national highway or a protected area or lying in a very inaccessible area), past practices and result thereof, availability of labour etc. (In NWPC-2014, Grid Based Sampling has been suggested for doing various kind of survey, which can be quite useful and appropriate for doing these exercises.)

Once these exercises are carried out meticulously, it will guide us in two ways. Firstly, it will tell us, what are the possible working circles that can be formed, to cover all aspect management on the basis of ground realities (and not on the basis of a theoretical model). Secondly, it will also tell us, which particular forest patch is to be included in which working circle/circles. These exercises are collectively referred to in the NWPC-2104 as Forest Resource Assessment (FRA in short). We now take a look at what NWPC-2014 has to say about FRA.

"Assessment of forest resources is an essential and integral component of the forest management planning. On the basis of this assessment, past performance is evaluated and future management will be prescribed. In forest crops one has to identify multi-dimensional populations with various parameters and attributes." –NWPC-2014.

Accordingly, the Code stipulates that assessment of forests to be made encompassing the following broad aspects of forest management, viz-

1) Maintenance, Conservation and Enhancement of Biodiversity:

Forest composition and distribution, plant species diversity, status of biodiversity conservation of forests, status of species prone to over exploitation, conservation of genetic resources, fauna and their habitats, threats and challenges to wildlife, protection and management of fauna;

2) Maintenance and Enhancement of Forest Health and Vitality:

Status of regeneration, area affected by forest fires, area damaged by natural calamities, area protected from grazing, lopping practices, area infested by invasive weed species in forests, Incidences of pest and diseases, forest degradation and its drivers;

3) Conservation and Maintenance of Soil and Water Resources:

Assessment of excess runoff from discharge zone and conservation measures for soil, groundwater, and soil moisture. Area treated under soil and water conservation measures, duration of water flow in the selected seasonal streams, wetlands in forest areas, water level in the wells in the vicinity (up to 5km) of forest area, status of aquifers;

4) Maintenance and Enhancement of Forest Resource Productivity:

Growing stock of wood / bamboo, increment in volume of identified timber species, efforts towards enhancement of forest productivity through quality plantation activities, carbon stock, carbon sequestration and mitigation;

Optimization of Forest Resource Utilization: Recorded removal of timber, fuel wood, bamboo/ rattans, and locally important NTFPs including MAPs, demand and supply of timber and important non-timber forest produce, removal of fodder, valuation of the products :

NWPC-2104 coded a number of surveys to be carried out to assess the conditions and suitability of different forest patches for different uses. Major types of surveys are as follows:-

1) GROWING STOCK ESTIMATION
2) ASSESSMENT OF NON-TIMBER FOREST PRODUCTS
3) BIODIVERISTY ASSESSMENT
4) ASSESSMENT OF REGENERATION STATUS
5) PLANTATION SURVEY AND ASSESSMENT
6) ASSESSMENT OF BAMBOO/RATTAN
7) SOIL SURVEY AND ASSESSMENT
8) SOCIO-ECONOMIC SURVEY AND ASSESSMENT
9) ASSESSMENT OF WILDLIFE HABITATS AND SPECIES
10) ASSESSMENT OF TREES OUTSIDE FOREST (TOF)

Detailed methodologies and various kinds of forms to be used for carrying out the above surveys are thoroughly given in the Code, and therefore will not be discussed here. The objective of this brief article is to discuss various organizational hurdles, which the WPO may have to face, while undertaking these assessment works, and also to discuss some remedies thereof.

In the lists of surveys mentioned here, a well trained or experienced forester must have observed that, barring three or four surveys such as growing stock estimation, assessment of regeneration, plantation survey and assessment or soil survey, remaining other surveys were not used, when working plans were written in the past say some fifty or sixty years ago. So there is no doubt that the mere volume of assessment works has multiplied to a great extent. But that is not the end of the story. Assessment of forests on production aspect is always much easier that other surveys such as biodiversity status survey, wildlife habitat survey, population estimations exercises or socio-economic surveys. For example, if the growing stock of a particular stand is measured after ten years, it will suffice to assess the growing stock for the entire period, intermediate variations, if any, can be ignored. This is not so with other type of surveys. For example, population of a certain medicinal herb or shrub species may get completely wiped out within a couple of years, or for that matter, population of a particular wildlife species may drastically decline well before the WPO takes up his assessment work.

Inclusion of and adherence to a large number of uses of forests, within the ambit of modern forest management, calls for a continuous assessment process and involvement of multiple stakeholders both within and outside the forest department. It is also felt that the style and format of writing working plans are quite archaic and need to be updated to a standard, conforming to the present day requirement. This is certainly not an easy task to do, given the constraints within which the existing institutional framework operates. Some of these constraints are discussed here.

There was a time when working plans were written on the mere consideration of production forestry (with specific focus on timber production). Our colonial masters of the past had created a very competent group of foresters to manage forests with wonderful skill and intellectual prowess, to bring out the optimal timber outturn, while maintaining the yield sustainability. They used to view forest as crop and had the profound mastery of the skill of narrating a standing crop in purely descriptive terms and such description were meticulously recorded. These were the field notes of territorial forest officers of the past, while making extensive field tours for prolonged duration. These field notes or tour notes were of immense value for writing subsequent working plans.

Writing such field notes is no longer in practice. No field officer of our time has the luxury of spending long hours walking through a forest tract and taking notes. It is not that field officers of present generations are less intelligent or less hardworking than those field officers who worked some hundred years back, but their minds are pre-occupied with some such considerations, which prevents them from carrying field notebooks, while making brief field visits. These matters were not known to generations of foresters who worked some hundred or fifty years ago.

For example, a present day DFO may have to give a considerable thought about those influential persons of the locality whom he needs to be intimate with and who are the persons from whom he has to keep a safe distance. Or, for that matter, a DFO of our generation may well have to ponder over how not to place an allotment of fund to a certain range, as the ranger placed there may not be able to carry out the work properly. These are nave considerations; but these cannot be ignored altogether in present working environment.

The absence of such field notes makes the work of WPO all the more difficult. Further, the present day WPO require notes not only from his or her territorial counterpart but also from other stakeholders as well. For example, DFOs of various wings, working to look after different aspect of management such as DFOs of Silviculture, NTFP, Social Forestry, Soil Conservation, Wildlife, Forest Corporation, Monitoring, all of them required to frequently communicate with DFO territorial and DFO Working plan (horizontal or lateral communication within the organization). Each of them can undertake assessment works in their assigned field, and can give valuable input to both the DFO territorial and the WPO. Then there are NGOs, representatives of local governments, district administration, line departments, subject experts, local educational institutions, timber and NTFP, MAP trader groups, other resource dependent communities- all of them can provide valuable input and suggestions to both the forest management planners and executors in equal measure (this, of course, require outside or peripheral communications).

Under the present institutional set-up, there is very little scope for lateral or peripheral communications. Imperial government of the past, when they had established forest department in India, they knew for sure, that they are going to exploit the natural resources of this country, and their intension of establishment of a forest department in India was, by no means, a benevolent act. They had created a forestry organization, which was self-sufficient, self contained, authoritarian and based upon the medieval feudalistic principles. The present forestry organization in India inherits that colonial legacy and still carries those self contained feudalistic culture. Each territorial division is a separate Kingdom of a sort and sharing of information with others, is thought of as a serious infringement of Sovereignty of that particular Kingdom.

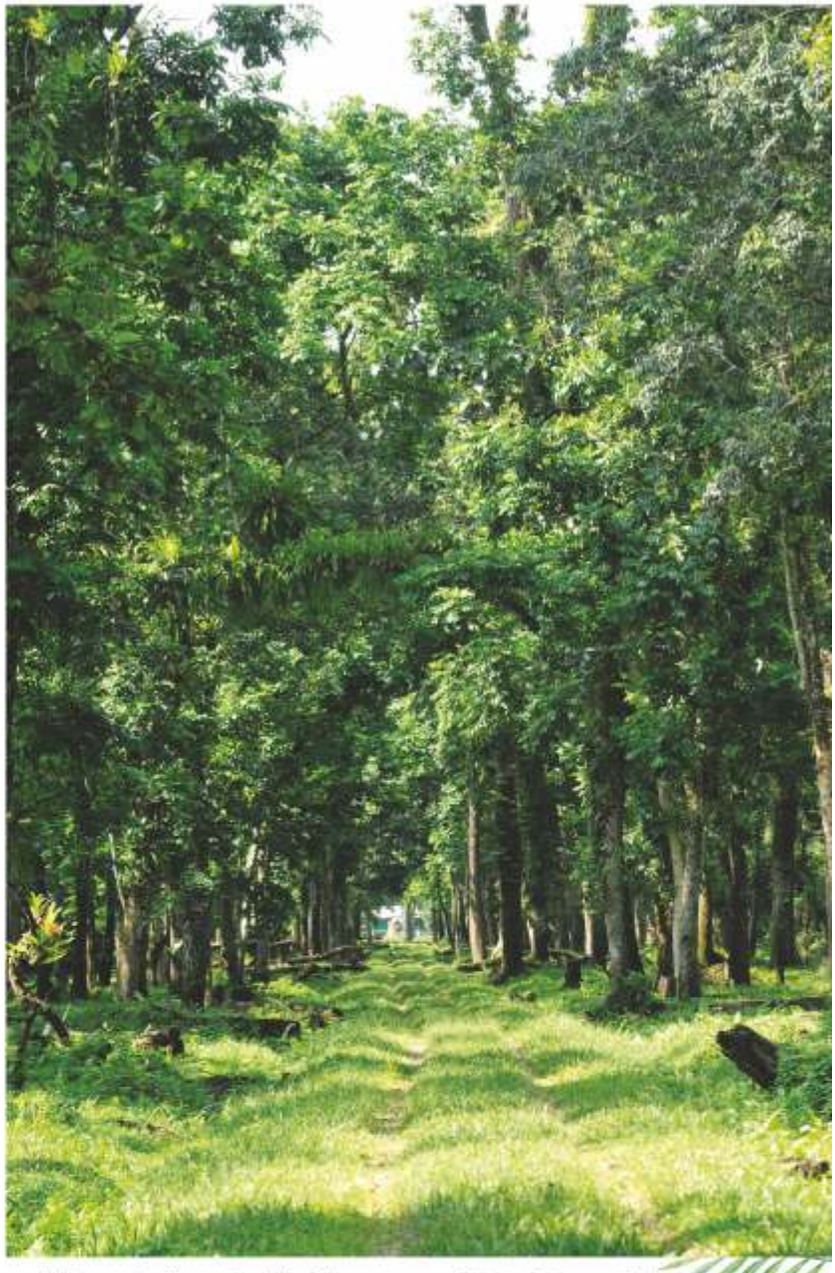
There is hardly any possibility that DFOs NTFP, Siliviculture or Soil Conservation will be allowed to crisscross a territory of another Kingdom for taking notes. There lies an irony to note a particular human nature, we can easily ignore the good quality of others (such as writing extensive field notes), but take no time to follow the bad qualities of others (such as enjoying the monarchy of a Kingdom). But there are other reasons as well, which have made writing field note a rare occurrence.

The Government of India Act, 1935, enacted, among many other important reforms in governance, that the subject of forest be given to the provincial governments (Provincial Governors from 1935 onwards were to be advised by a councilors of Indian ministers elected by general elections, a step (or a pretention?) towards partial devolution of power to Indian hands), as it was no longer felt to continue with a highly centralized forest administration. From 1935 onwards, and up to 1966, recruitments to the upper echelon of forest hierarchy were made by the concerned Provincial Governments. This practice was continued till up to 1966, thereafter, recruitments were made to the newly constituted Indian Forest Service (IFS or IFoS). These Provincial officers and early IFS officers suffered a lot of stagnation, as there was not much scope for upward movement. Most of the officers had to work for twenty years or more as Divisional Forest Officer as there was (in West Bengal context) only a few posts of Conservators and only one post of Conservator General or Chief Conservator. With a very limited scope for career advancement, Indian Forest Service lagged way behind other two All India Services. Successive review of IFS cadres during later period however, created a number of posts in the upper echelon of the hierarchy of forest administration, thereby creating parity with other All India Services, which brought in two positive outcomes. Firstly, Indian Forest Service became more attractive to the young talents of India, and more and more talented persons joined the service. Secondly, the Head of the Forest Directorate as well as the Heads of other specialized wings of the Forest Department could now afford to avail the services of a good number of experienced staff officers, who now can be engaged in some specialized area of policy formulations.

Creation of posts in such specialized fields as Finance, HRD, Marketing, Project Management, Planning and Research etc. also gave the Forest Directorate a sort of Corporate demaenour. However, while the organizational structure went corporate at Forest Directorate Headquarters, the organizational structure and work culture at field level units such as Range, Division, Circles did not evolve much from their 19th Century configurations. Moreover, the operational efficiency of these units decayed with time for a variety of reasons such as general downsizing of Governments, intermittent stoppage of recruitment owing to financial resource crunch of the Government, inaccurate recruitment planning and staff deployment, erosion of discipline due to unregulated trade unionism, increase in workload and lack of specialization, ill heath and untimely death of field staffs, and high attrition rate at the level of Forest Rangers and Deputy Rangers.All these have resulted in a serious mismatch between the abilities at the level of control and supervision and at the level of executions. This serious mismatch within the organization has created a perfect chaos.

To facilitate the understanding of the nature of this chaos, a thought experiment is devised here. Let us assume for a while, that the following staff officers of the Forest Directorate Headquarters, viz, Miss. A (HRD), Miss. B (Finance), Mr C (Special Development Project), Mr D (Wildlife Planning and Research) and Miss E (Marketing & Publicity), were all entrusted with task of preparing reports, one each for their respective assigned area of specializations, at any given point of time. Each of them, issued letters addressed to all the Circle Heads asking for information in certain format, and copies of those letters were also sent to all the Divisional Offices for information and necessary action. Now in each and every Government offices, there is an internal processing of communication. These internal processing requires some time, let us describe this time as Internal Processing Time, or IPT in short. IPT depends upon a variety of factors, such as the presence or absence of sufficient number of ministerial staffs (dealing assistants, dispatch clerks, office peons), the efficiency and promptness of ministerial staffs, presence or absence of the officer concerned (on account of official tour, leave, meetings etc.). IPT varies from office to office and also from time to time. Depending upon the IPT of different offices at different times, letters issued by staff officers Miss A to Miss E, will reach to various Circle and Divisional offices at different point of time. It may so happen that a particular Divisional office received the HRD letter forwarded by concerned Circle office much earlier than receiving the original letter directly from the HRD section, or vice versa.

Once a particular letter is received by a particular Division, either directly or via Circle office, the Division will take time to act upon that letter depending upon its own IPT. Some Divisions furnish prompt reply to the information sought. In some Divisions, files containing requisite information will be found missing, so the letter will be transmitted downward to various range offices under its control. Some Divisions will simply forget after filing the



letter and will remain blissfully unaware of its existence until one or more reminder comes. Similar things will happen at various Circle offices depending upon their respective IPTs.

Meanwhile, receipt of one or two replies from a Division or a Circle office will remind the HRD Head or the Finance Head that most of the subordinate offices have not furnished reply to the letter issued by her. She will then start issuing reminders, one after another. Some more replies will be thrown in. After repeating the process a number of times, most of the replies will be received excepting for one or two rogue Divisions. Information from such Divisions will then be collected by directly calling the concerned Divisional forest officer over phone.

The above thought experiment considers only five letters from five staff officers. If all the letters from all the staff officers are considered together, then one can easily imagine the extent of cacophony generated or abuses of prints or bytes are caused by this chaos.

Then there are meetings, attending touring officers, constant bombardment of deputations by staff associations, some dismal, untimely occurrences in the field. Working lives of most forest officers engaged in various field offices mostly revolve around these weird jugglery of endless communications, meetings, protocols or similar other absurdities. Where is the time then to marvel at the burgeoning biodiversity of forests of their respective control, or to get themselves acquainted with the behavior of Elephant or Rhino, or to lament over the poverty of their JFMC members?

each of its delivery boy with a handheld android device and also with necessary training input to use that device.

Being parts of an agency of the Government, we may not like much, at least outwardly, to compare us with a multinational corporate giant like Amazon, in spite of our deepest longings cherished at some secret corner of our heart, for the glamourous lifestyles, that the corporate world seemingly offers. Therefore, some examples of radical transformations in some organizations similar to that of ours are cited here. Introduction of online reservation system

Well, the good news is that we live in an age, where there are sufficient technologies available, which can be used to eliminate or greatly reduce this organizational chaos. Let us take the example of Amazon delivery boy, who, while delivering the consignment to the customer, receives the customers signature on the touch screen of his handheld device. As soon as he completes the transaction, consignment delivery, location and payment receipt data are immediately fed in the MIS (Management Information System) of the Company. This data now can be accessed and used anytime, anywhere and by anybody authorized to use the Amazon Company MIS. There is no need to receive record, compile and transmit information at multiple levels. The Executive Head of Operations, sitting at the Headquarters of Amazon-India, can, at any point of time, generate and analyze reports such as total number delivery completed, total revenue generated, percentage of delayed delivery etc. He or she can also find out probable areas, where Amazons business can expand, and may make strategies accordingly, without wasting time in issuing reminders. This wonderful thing has been made possible as because Amazon Company has taken the trouble of providing

by the Indian Railways (a bureaucratic organization almost as old as the Forest Department is) and the introduction of Core Banking system by the State Bank of India (a Public Sector Company) are some such examples.

If the availability of technological edge is good news, then, several bad news are also there. The most significant bad news is that, there is very little public attention to our works. We frequently lament about the lack of public appreciation for our good and hard works. We are also fortunate, that our bad works are not drawing public attention either.

In case of Indian railways, unless they maintain a certain level of operational efficiency, there will be several train accidents each day, creating a huge public resentment and mass upheaval. Railways therefore, always under pressure to maintain a requisite level of operational efficiency and evolved continuously to meet the demand of an exploding population. How many people are troubled by the failures of certain plantations raised by us? How many people are concerned about the fact that there is acute shortage of ground staffs in the Forest Department to do the multifarious

job of forest protection, regeneration, survey and assessment works, ensuring community participation, creating public awareness, regulate tree felling activities in non forest areas, to man the wildlife squads or quick response teams etc.?

There is one area of course, where our activity (or inactivity) generates some sorts of noises. That is Human-Wildlife Conflict. Our activity in response to such conflict is limited to paying compensation, driving Elephants or capturing a Gaur or a Leopard. If some noise is generated by some of our inactivity, less activity or an activity demanded by a section of the populace which is beyond our means, then it is our frontline staffs, who will be manhandled, our very own corporate sector will not feel much of the heat. People, who are generally affected by the Human Wildlife Conflict, are the rustic villagers, poor farmers or some tea garden labourers. It is highly unlikely that some High Court judge, eminent lawyer, academic or top notch bureaucrat will be affected by this conservation conundrum. No wonder then, that we will never get to hear such question, as to why we should have a technically sound forest department with a full-fledged wildlife wing, when they cannot manage their forests and wildlife population in such a way that there is a lesser chance of wild lives coming out of forests? Payment of compensation can very well be made by the BDOs, ARD department have more technical knowhow to capture animals, we cannot rely much on these activities alone, to justify our existence.

The second bad news is an internal resistance to change. In every organization there are always a certain section of people, who feel comfortable with the prevailing condition and who may also derive certain benefits by maintaining the status-quo. Invariably, they are the most influential section in the organization, and strongly oppose, either directly or by acting behind the curtain, any attempt to change. And it is not usually possible to overpower them, unless there is some strong external or internal influence for that change. In case forest department, such strong influences are very difficult to come by.

The third bad news is lack of political will. In a living democracy, the voice of the majority rules, voice of the minority remains suppressed. And in case forest department, the very subject we administer, such as trees, shrubs, herbs, Elephant, Tiger etc. do not have any voice at all! And if there are few forest and wildlife lovers, who sometimes raise voice, tend to derive more benefit from us, than the quantum of political will they generate!

Under such a scenario, it becomes reasonably clear that it will take sufficiently long time, before we attain operational efficiency to the fullest measure, so that our territorial field officers again get sufficient time to stay inside forest for long hours, and carry with them ten different field books to write elaborate notes on ten different aspect of forest management. Meanwhile, we need to find an alternative methodology to do Forest Resource Assessment Work and provide some inputs to the WPO as envisaged by the NPWC-2014.

NPWC-2104, however, already made some provisions for providing reliable inputs to the WPO.

The most important input is to come from the territorial wing, in a concise form, in what is termed as Preliminary Working Plan Report (PWPR). The responsibility of writing this PWPR is given to In-Charge of the concerned territorial Circle. Circle-in Charge will have to initiate the PWPR, two and half year before the expiry of the current Working Plan, by directing the concerned territorial DFO to make field visit and prepare notes (again those scary notes!) for various working circles. The territorial DFO has to complete these notes within a period of two months.These notes will briefly review the results of management during the past years and point out whether the general system of management is satisfactory or not and then suggest any necessary change for improvement. After that, the territorial Circle in-charge will hold consultation with local peoples forum, JFM committees, village Panchayats and forest development agency (FDA) about the expectations of people dependent on forest. He/She will then write the PWPR on the basis of the preliminary notes submitted by the DFO concerned.While doing so, he/she will also try to accommodate the aspirations of various stakeholder groups as far as possible to the extent that they are compatible with the technical feasibility of sustainable management of forests. The work of writing PWPR is also to be completed within a period of two months.

The NWPC-2014 has also described what will be the content of the PWPR and how it should be written. It appears that PWPR will be sort of mini working plan in which the entire blue print of future operations will be recorded.

This PWPR will then be reviewed by a Standing Consultative Committee functioning under the Chairmanship of the Principal Chief Conservator of Forests and Head of Forest Force of the concerned state. The Standing Consultative Committee comprises of members, who are the senior most officers of the Forest Directorate and its various wings, subject experts from ICFRE and FSI, and representative of MOEF&CC, Government of India. It is understood that the Standing Consultative Committee will not make any field visit (which has already been done by the field officers), but will deliberate upon different technical aspects of modern forest management. After making necessary changes (if required), the Standing Consultative Committee will then approve the PWPR.

The WPO will then undertake the work of writing the Working Plan on the basis of this approved PWPR. But before that he/she will have to complete all the pain-stacking surveys as described in the Code. Now the WPO is faced with two distinct challenges, one is operational and the other is administrative. The WPO is certain to realize that he/she is not having sufficient skilled man power to complete various survey exercises all by himself/herself. This is the operational hurdle. However if the WPO somehow manages to complete all the survey, and finds that the results of various survey require him/her to write the Working Plan in different way, than that suggested by the PWPR, he/she will not be able to do that, as because, the PWPR has already

been approved by a high level committee. An alternative method of providing input to the WPO is therefore, needed to be devised.

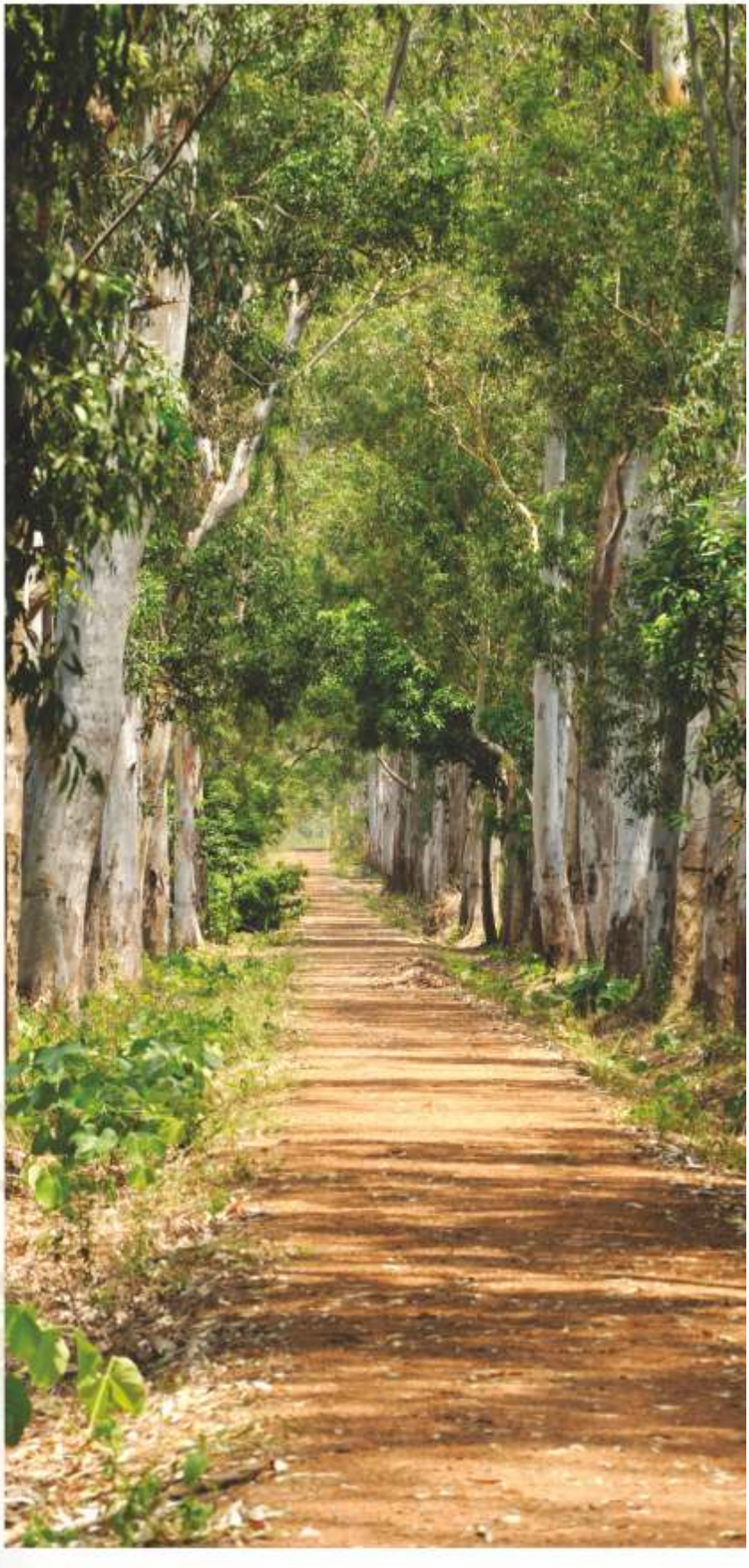
From the discussions made this far, it stands amply clear that the NWPC-2014 writers, while making projections for formulation of Working Plan preparation guidelines, relied mostly on the territorial DFO, territorial CF/CCF and the WPO, as the sole authorities available for shaping/writing working plans. This is quite natural, as the territorial and working plan wings are the two oldest and well known wings of Forest Department. Further, the code writers might have thought that the organizational fabric of various State Forest Departments varies from one Indian state to another, and as such they have not incorporated any other officers in the Working Plan writing exercise, in order to maintain uniformity in prescription.

But we can improvise here a little, to do the work in a different and efficient way. Firstly, we can form a Forest Resource Assessment Committee at least three years prior to the expiry of the current plan, under the Chairmanship of the concerned territorial Circle and comprising of members such as DFOs of territorial, wildlife, NTFP, monitoring, social forestry, soil conservation, forest corporation and silviculture divisions, all of which Divisions have a stake on the management of forests of a particular working plan area. Some subject experts (nominated by suitable authorities), District Planning Officer, representatives of the Panchayet and Rural Development Department, ARD Department etc. may also be made members of the committee.
These committee members will then divide the survey works among themselves depending upon their area of specialization. A tentative division of such work is given in the following table (it can be divided in a different way also, if the committee so decides):-

Sl No	Type of Survey	Survey to carried out by
1.	BIODIVERISTY ASSESSMENT	Biodiversity Expert from an Institution of repute.
2.	GROWING STOCK ESTIMATION	Working Plan Division.
3.	ASSESSMENT OF NON-TIMBER FOREST PRODUCTS (INCLUDING MAPs)	NTFP Division.
4.	ASSESSMENT OF REGENERATION STATUS	Monitoring Division.
5.	PLANTATION SURVEY AND ASSESSMENT	Monitoring Division.
6.	ASSESSMENT OF BAMBOO/RATTAN	NTFP Division.
7.	SOIL SURVEY AND ASSESSMENT	Soil Conservation/Silviculture Division.
8.	SOCIO-ECONOMIC SURVEY AND ASSESSMENT	Panchayet and Rural Development Department in collaboration with Territorial Division.
9.	ASSESSMENT OF WILDLIFE HABITATS AND SPECIES	Wildlife Division.
10.	ASSESSMENT OF TREES OUTSIDE FOREST (TOF)	Territorial, Social Forestry and Forest Corporation Divisions.

This committee will review the progress of works of its members from time to time, and members will share information and provide assistance to each other wherever necessary. After completion of the assessment exercise within a period of one year, the committee will sit again and analyze the performance of various working circles during past periods and record these analyses in the minutes of their meetings. The committee will also hold discussions with various stake holder groups, and their opinions will also be incorporated in the minutes. A much pragmatic and useful PWPR, then, can be written on the basis of these minutes.

This can help the WPO to write a modern Working Plan which will no longer be dull, insipid, unpalatable theoretical documents (mostly copied texts of earlier plans) that we were in the habit of writing hitherto only to gather dust at some remote office corner.



Capturing Carbon footprint of DFO Office complex of Bankura

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Abstract

An indicator of climate performance i.e Carbon Footprint helps in identifying the major sources of GHG emission and potential areas of improvements. Increasing greenhouse gas concentration in the atmosphere is perturbing the environment to cause grievous global warming and associated consequences. Following the rule that only measurable is manageable, mensuration of greenhouse gas intensiveness of different products, bodies, and processes is going on worldwide, expressed as their carbon footprints. Carbon footprint is the total sum of Green House Gas(GHG) emissions caused by an organization, event, products or person. The methodologies for carbon footprint calculations are still evolving and it is emerging as an important tool for greenhouse gas management. Standards of greenhouse gas accounting are the common resources used in footprint calculations, although there is no mandatory provision of footprint verification.Carbon foot printing is intended to be a tool to guide the relevant emission cuts and verifications,its standardization at international level are therefore necessary. In the context of greatly expanding sub national climate efforts, research on carbon footprint accounting at organizational level is timely and necessary to facilitate the establishment of local climate strategies.

Keywords: Carbon footprint, Direct emissions, Embodied emissions, Greenhouse gases, Carbon Dioxide.

Introduction

With growing concern over climate change globally, emission control of Greenhouse Gases (GHGs) has been put on the agenda of both developed and developing countries. Despite the great difficulty in achieving sufficient agreement in international climate negotiation, cities have realized that they can actually proceed faster than the international climate negotiation with more flexible ways of corporation. Actions are taken at sub-national levels to mitigate climate change. Presently, Global Warming has became one of the most prominent issues based by world Community at local, National & Global level. The obvious effect of global warming is the increase in temperatures around the world. Mostly increasing GHG emission is one of the primary cause of global warming. Therefore steps should be taken to reduce GHG emissions. The valuable first step towards the emission reduction and understanding disaster risk in quantifying the GHG emissions due to various human activities.

Similarly Carbon foot printing has been introduced as a fall to guide the relevant emissions cuts and verifications that will facilitate the understanding of the risk of global warming at the very first stage

Recently Carbon footprint has emerged as a widely used concept in general public on responsibility and abatement action against global warming. It can be defined as a measurement of total GHG emissions caused by an individual, an organization, event on product and expressed as CO2 equivalent. An organizational Carbon footprint in the the GHG emissions from all the activities of the organization, including energy in building, industrial process and vehicles. CFP analysis will provide the organization with a comprehensive GHG inventory, allowing it to identify and target reductions from its major emission sources. Therefore, calculating an organizations Carbon footprint can be an effectivetool for ongoing energy and environmental management policy. Therefore, main objective of the study is to calculate the CFP of a Divisional Forest Office complex to quantify the GHG emission in line with the global warming and suggest suitable methods for reducing their CFP.

Methodology

Study Area

The study area mainly comprises of Divisional Forest Office of Bankura (South) Division and Bankura (North) Division. This is located at latitude $23^0 14' 02.2''$ North and longitude $87^0 03' 46.3''$ East. It coordinate forest resources of 1193 JFMC through participate, sustainable and well planned development process of 110894.35 ha area and uplifts the standard of living of these people. This organization works on different aspects like forest administration, felling operation, plantation, propagation, issuance of Permit, Renewal of licensee, issuance of certificate, forest land administration and other development programme.

Assessment of CFP

Carbon footprint of an organization is assessed using four basic steps.

(1) By setting the organizational boundary (study area)
(2) Setting operational boundary (study area)
(3) Collection of data (Surveying the Premises, Searching Documents, Observing the Activities of Staffs &Visitors, Questionnaire).
(4) Calculation of emissions using appropriate emissions factors.

Establishment of Organizational boundary

In this studuy, the organizational boundary was set including emission sources and acrtivities of all units into CO2 inventory. Since all operations are owened by this office, the organization boundary in the same.

Establishment of Opertional boundary

The opertional boundary involves identifying emissions associated with its opertions, catagorizing them as direct and indirect emissions. There are different aspects of estimation of greenbase Gas emissions. Such as:-

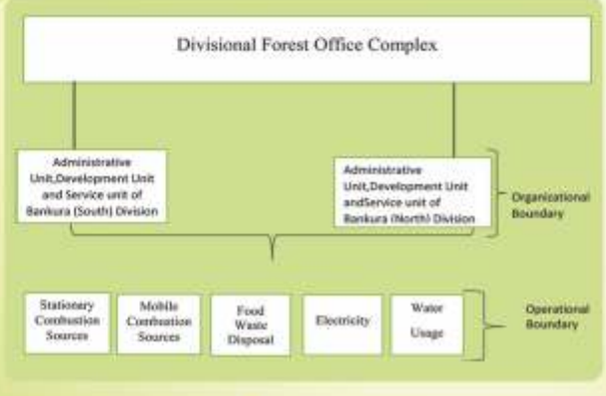
(1) Direct GHG emissions occurred different sources owned by office like Generator, Vehicle, Waste disposal, LPG usage.
(2) GHG emissions from the generation of pure based electricity consumed by office.
(3) Emissions that are derived from the sources that is not owned by office such as water usage.

Data collection

Activity data were collected from all activities within the defined boundaries for one year period. Commuting data were collected from all employee of this office.

Calculation of Carbon footprint

CFP of each emission sources and activities were calculated in kg CO2/year by multi plying activity data with EF.



Result and Discussion:

Total CFP of the Organization

The recent study illustrate the total CFP of this Organization is 230.10 tonnesCO2 emission/year. The details of estimation is as follows-

(I) Total Carbon footprint from consumption of electricity in division office complex of Bankura in a year-37227x2=74454kwh.
1kwh=0.85 kg CO2 emission (Default Value)
Total CO2 emissionper year= 74454 x 0.85= 63285.90 kg=63.29 tonnes.

(II) Total Carbon footprint from consumption of petrol by staffs of Division Office complex of Bankura-3000ltr. x 2.3kg CO2/ltr. x 12 month(Default Value)
=82800 kg = 82.80 tonnes.

(III) Total Carbon footprint from consumption of Diesel by Staffs of Division Office complex of Bankura = 1000 ltr. /month x 2.7 kg CO2/ltr. x 12 month (Default value) = 32400 kg = 32.40 tonnes.

(IV) Total Carbon emission from fresh/raw food items-

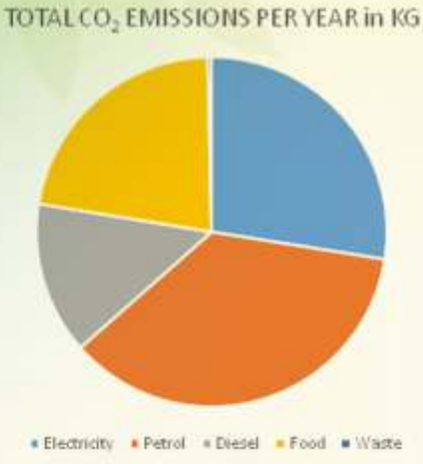
Items	Quantity used per day	Per month	CO_2 each/kg	Total
Chicken	1 kg	30	3.5	105
Eggs	5 pcs	150	1.95	292.5
Fruits	20 pcs	600	5.5	3300
Paneer	0.5 kg	15	805	127.5
Vegetables	15 kg	450	0.2 (Potato)	90
Total CO_2 emission per month				3915 kg. or 3.915 tonnes
Total CO_2 emission per year = 3.915 x 12				46.98 tonnes

(V) Total Carbon emission from packaged food items-

Item	Quantity used per month	CO_2 eq	Total
Juice Pack (1 ltr.)	120	295 g/250 ml	141.6 kg
Chips	200	0.75 g/100 g	150 kg
Cigarette	3000	10 g/cigarette	30 kg
Total CO_2 emission per month			321.6 kg or 0.321 tonnes
Total CO_2 emission per year = 0.321 x 12			3.852 tonnes

(VI).(a) Carbon emission from waste from complex per day is 10 kg (Mostly Biodegradable).
[Left over, Un-useable veg parts, Paper napkins, Paper cups]
(b) Waste from rooms- 5 kg/ day
(c) Total plastic waste- 2 kg /day (Polythenes, Poly wrappers).
Overall GHG emission (in CO2 eq) per year 17 x 0.125 kg/kg x 365=777.45 kg = 0.78 tonnes.

Source	Emissions
Electricity	63285.90 kg.
Petrol	82800 kg.
Diesel	32400 kg.
Food	50832 kg.
Waste	777.45 kg.
TotalCO_2 emission per year	230095.35 kg=230.10 tonnes



Total Staffs in Division Office complex is 100 (Approx.). Per capita CO2 emission= 230.10/100 tonnes= 2.30 tonnes Whereas Indian average is 1.5 tonnes and World average is 4 tonnes.

Limitation of this study

(1) Time and technical limitation.
(2) Some activities of staffs were not included. Such as Tour, other travels, sports, field duties.
(3) Default values of many food items are not available.
(4) Still all the major activities and sources were not included in this study.

Carbon Offsetting

(1) Human factor
  (a) Avoid rampant consumerism.
(2) Transportation:-
  (a)Use of energy efficient full for transportation.
  (b) Use of vehicle adhering to emission norms.
  (c) Purchase vehicle with competitive mileage and fuel efficiency.
  (d) In correct use of public transport facilities.
  (e) Car pooling can be encouraged.
  (f) Ensure proper inflation of vehicle tyres.
  (g) Use of bicycles can be encouraged.
  (h) Use unleaded petrol in vehicles.
  (i) Reduce use of petroleum products.
(3) Electricity
  (a) Use off Switch, rather than the standby mode.
  (b) Switch off fans and lights when not in use.
  (c) Use LEDs instead of Conventional light sources.
  (d) Check for germ tags before purchases goods.
  (e) Minimal use of ACs.
  (f) Keep equipments in power saver mode.
  (g) Use Solar light in campus.
(4) Solid Waste:-
  (a) Avoid wasting paper.
  (b) Avoid duumping of paper waste.
  (c) Recycling of waste.
  (d) Reuse resources whenever possible.
  (e) Adopt proper waste management technique.
(5) Building:
  (a) 30% germ area should be included in building plan mandatorily
  (b) Avoid cutting down tress.
(6) Production & Consumption of food:
  (a) dont waste food items.
  (b) Avoid wastage.
  (c) Use local & seasonal fruits & vegetables.
  (d) Reduce use of non-veg food.
  (e) Encourage use of organic food.

Conclusion

Total Carbon footprint of Division Office complex of Bankura is found to be230.10 tonnes. Indirect emission in current study shows the highest CFP. Hence, knowledge of this carbon footprints may assist organizations to persueemission mitigation project not just within the organization but also across indirect emission activities. Moreover as the highest CFP represent the mobile combustion due to employee commuting and other transportation, reduction strategies should be highly focused on this area. Whereas electricity consumption shows a considerable contribution to the total CFP, this organization can invest energy efficient technologies to reduce CFP of organization ultimately achieving the national good by reducing carbon emission.

Acknowledgement

I wouldlike to thank specially to Shri Subhasish Paul (ADFO-I), Shri Somnath Choudhury (ADFO-II), Staffs of the Bankura (South) Division and Bankura (North) Division for bestowing information to calculate CFP of Divisional Office complex of Bankura.

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A review of Water Supply by
Senchal Wildlife Sanctuary
the water source of Darjeeling

Dharmdeo Rai, IFS
Divisional Forest Officer

Water is the most abundant material and one of the most important substance for the survival of the life on the planet earth and so it is considered important and in recent years water scarcity led by various reasons has earned it a lot of respect also. To save water and use it judiciously has earned a lot of hype and started a lot of program for the same, though the situation is becoming worse day by day in general. However, on the brighter side there are a lot of cases where dried rivers, streams, lakes and ponds have been revived by the proper planning and hard work.This action of rejuvenation of water bodies was actually a reaction, a panic reaction to the grave situation created yielding to a pleasant result. The question is can we identify the waterbodies which are at different level of risk and then start the remedial measures with community involvement.After all it is not necessary to start it when it has crossed the threshold. There are even rivers/streams that are in very good condition providing a lifeline to few villages individually and a few towns collectively. Can we do something so that these rivers don't reach the same fate and rather remain ever flowing as they are now?

This write up is an attempt to enumerate and elaborate the status of the such streams in the Senchal Wildlife Sanctuary (SWLS) and then to provide certain submissions for maintaining their ever youth. To begin with it will be apt to say that the SWLS is the main water source for the beautiful town of Darjeeling, also known as Queen of the Hills and provides the city an unparalleled beauty. Be it serene forests of Chatakpur, a drive through Old Military Road or the mesmerizing sun rise from the Tiger Hill, each and every place is unique and tells its own different beautiful story. Mark Twain visited Darjeeling in 1986 and impressed with the beauty of the place he wrote- "***...the one land all men desire to see, and having seen once, by even a glimpse, would not give that glimpse for the shows of all the rest of the globe combined***" .

An attempt has been made to list all the streams (locally refered as "JHORA") with GPS reading at some points and brief report on their present and past status. Major disturbing factors are also given. Services by these jhoras are also mentioned with details of villages.

Table showing details of streams and jhoras flowing through SWLS

Sl No	Name	Source crosses	Past Status	Current Status	Water source for
1	Darey Khola	Chattakpur	HP	MP	Eco hut Chattakpur
2	Kopibari Khola	Chattakpur	-	Less	Chattakpur FV
3	Panik hola	Chattakpur	HP	LP	Chattakpur FV
4	Thingre khola	Chattakpur	HP	LP	Chattakpur FV
5	Manipuri khola	Paschim	HP	Low	Meets Bataseykhola
6	Jorepull khola	Bara Senchal	HP	Low	Meets RambhiKhola
7	Chyar-chyare khola	Paschim	HP	MP	Rajahatta village
8	Batasey khola	Paschim	HP	HP	Salesian college, Gorabari people, U.J.Hatta
9	Kur-kure khola	Paschim	MP	LP	GolkothiSonada
10	Thal - thaley	Paschim	HP	MP	Upper Johnson Hatta, Sonada town
11	Dukpini khola	Sonada	HP	MP	Sonada Town
12	Khong khola	Sonada	HP	HP	Nayabusty, Sonada town & Darjeeling town
13	Bhadrasey khola	Sonada	P	M	Meet DukpiniKhola, Beat Office/qtrs.
14	Tindurey khola	Sonada	HP	LP	Ratomati, Nayabusty, Sonada petrol pump
15	Top khola	Sonada	HP	LP	Nayabusty, Sonada town, meets with Tindureykhola
16	Gurd khola	Sonada	HP	MP	Petrol pump, Prashanti gram, 11th Mile area of Sonada
17	Ekkaish (21) Tanki	Catchment II	HP	HP	11th Mile area of Sonada
18	Jore khola	Sonada	HP	HP	Meets with BalasunKhola, SSB, Lebong Army Cantonment, Darjeeling
19	Bangla khola	Sonada	HP	HP	Rungbull, Sidhaline, Bangla dara area people
20	8th Mile khola 1	Gorabari Rinchintong	HP	HP	Rajahatta village, 8th mile Gorabari people
21	8th Mile khola 2	Gorabari Rinchintong	HP	HP	Rajahatta, Tingharey (Ringtong TE), 4 GI pipe towards Kurseong
22	Filter khola	Rungbull	LP	LP	Not in use
23	14th mile khola	Rungbull	HP	HP	Not in use
24	Mahadev jhora	Rungbull	LP	LP	Not in use
25	Kolman jhora	Rungbull	S	S	Eklayghar area villagers
26	Pukka pul khola	Rungbull	HP	HP	Darjeeling town
27	Kopchepul khola	Rungbull	S	S	Not in use
28	Satthipul khola	Rungbull	S	S	Not in use
29	Gurasey jhora	Rungbull	S	S	Not in use
30	Loxing jhora	Rungbull	S	S	Not in use
31	Tirterey jhora	Rungbull	S	S	Not in use
32	Seti Khola	Senchal Pasture	S	S	Nil
33	Dherainkhola	Senchal Pasture	HP	HP	Darjeeling town
34	Beach khola	Senchal Pasture	S	S	Darjeeling town
35	Chyadareypulkhola	Senchal Pasture	S	S	
36	GLP khola	Senchal Pasture	HP	HP	Meets with Rungdungkhola
37	Rai Sab khola	Senchal Pasture	LP	LP	
38	Sanuhitti	Senchal Pasture	LP	LP	Nil . not used frequently
39	Sample khola	Rangiroom	P	P	NIL
40	Thulo khola	Rangiroom	P	P	Beat office, qtrs, 3rd Mile FV peoples
41	Sukhe khola	Rangiroom	S	S	NIL
42	Kath pul khola	Rangiroom	P	P	NIL
43	Dhungre khola	Rangiroom	P	P	NIL
44	Topkey khola	Rangiroom	S	S	3rd Mile FV during monsoon
45	Sethi khola	Setikhola extension	S	S	Nil

Sl No	Name	Source crosses	Past Status	Current Status	Water source for
46	Baghitti khola	Rungdung .	P	P	Nil
47	Bich khola	Rungdung .	P	P	Darjeeling
48	Sano hitti khola	Rungdung .	P	P	Nil
49	Rungdung khola	Rungdung .	P	P	DherainKhola meets Rungdungkhola
50	Thulo Khola	Dawaipani	S	HD	Bhutia busty bitch gawn
51	Angeri Khola	do	P	PD	Unused
52	SetoMatay Jhora	do	S	D	do
53	Paaha khola	do	S	D	do
54	Bhajanay Khola	do	S	D	do
55	Guyay Khola	do	S	D	Bhutia busty
56	Kumar Jhora	do	S	Sm	unused
57	Dairy Khola	do	S & P	S & P	Yankhu village
58	Bandaray Khola	do	GS P	P	Subandhura village
59	Devi Khola	do	P	P	do
60	Dhubeni Jhora	do	Sm P	Sm P	Naya Busty
61	Rungdung khola	do	S & P	S & P	Flows between Forest & tea garden
62	6th mile Jhora	Topkeydara	P	HD	Naya Busty
63	JhorGodam Jhora	do	S	D	Unused
64	Paani House Jhora	do	P	HD	6th Mile bazaar
65	Laal Hitty Jhora	do	S	D	Road side use
66	Gora paanikhanay	do	S	D	Naya busty
67	Panni Dara	do	P	PD	Unused
68	Mile Jhora	do	P	PD	Unused
69	BhotayBasnay Jhora	Rampuria	LP	LP	Rampura FV
70	Amar Jhora	do	LP	HD	Unused
71	Lakpa Khola	do	LP	Sm	do
72	Thulo Khola	do	P	P	Rampuria FV
73	Ashary Jhora	do	Sm P	Sm	RmpKhas villager
74	Charcharay-1	do	Sm P	Sm	Unused
75	Charcharay-2	do	Sm & P	Sm & S	do
76	Charchary-3	do	Sm P	Sm P	do
77	Tharo Jhora	do	D	S	do
78	Adha mile jhora	do	Sm P	P & S	Lama hatta
79	Turning jhora	do	P & S	Sm P	unused
80	Golai Jhora	do	Sm P	S	Uttar Rampuriakhas
81	Pttn. Jhora	do	D	P & S	unused
82	Sim khola	do	P & S	P & S	unused
83	Charcharay jhora	do	P & S	P & S	Goes to Dj. territorial forest
84	Chat jhora	do	P & S	P & S	Road side use
85	Nursery jhora	do	Sm & S	Sm & S	Flows to Darj. Territorial forest
86	Kali Khola	Simkuna	S & P	P	Unused
87	Thulo Khola	Simkuna	P	P	do
88	MirgaLarayko Khola	Simkuna	P	S & P	do
89	Guiea Khola	Simkuna	S & P	S & P	do
90	Khaptay khola	Simkuna	S & P	S and P	Takdah forest Teesta valley village.
91	Diary Khola	Simkuna	P	P	LalungRanju valley
92	Sitaram Jhora-1	Gaddikhana	LP	Sp	Transport by vehicle to Darjeeling town.
93	Sitaram Jhora-2	do	LP	Sp	Road side use
94	Mustay Khola	do	LP	PD	Transport by vehicle to Darjeeling town.
95	Dur Khola	Rambi	LP	D	Unsued
96	Rambi Khola-1	Bara Senchal	LP	PD	Used by PHE deptt.
97	Joor Pool Jhora	do	LP	D	Unsued
98	Garage Khola	do	LP	HD	Used by PHE &Rambi FV

Sl. No	Name	Source crosses	Past Status	Current Status	Water source for
99	Tintalay Khola-1	do	LP	HD	Unsued
100	Tintalay Khola -2	do	LP	LP	Supply to PHE deptt. Darj
101	School Ghar Khola	do	Sm	Sm P	Unused
102	Subidar Khola	Gaddikhana	P	P	3rd Mile, Simkuna
103	Mali Dhara Jhora	Bara Senchal	P	P	Rambi
104	Chharchhary khola	Bara Senchal	P	P	Do
105	Chayan Dara Khola	Bara Senchal	P	P	Unused
106	Ghur Khola	Rambi	Sm P	Sm P	Do
107	Rambi Khola-1	Bara Senchal	P	P	Supply to PHE deptt. Darj
108	Rambi Khola-2	Bara Senchal	P	P	Unused
109	Chang Khola	Reshep-8	S	D	Reshep
110	Paaha khola	do	LP	HD	Reshep
111	Pairo Khola	Reshep	P	P	Passes to Mangpoo govt. Pltn.
112	Kesh Bdr. Jhora	Reshep	S	S	do
113	Gurungni Jhora	Reshep	P	P	do
114	Madalay Jhora	Reshep	P	P	do
115	Reshep Jhora	Reshep	S	Sm & S	do
116	Rambi Khola	Reshep	GS (P)	P	do
117	Numberi Khola	Rambi	GS (P)	GS	do
118	Charchary Khola	Rambi	P	GS	do
119	Door Khola No.2	Gaddikhana	P	GS	do
120	Kami Jhora	Gaddikhana	P	Sm & P	do
121	Mandir khola	Gaddikhana	P	P	do
122	Ranju Jhora	Gaddikhana	S	S	Ranju Valley
123	Laxmi Jhora	Gaddikhana	P/Sm	P	Passes to Mangpoo govt. Pltn.
124	RC Jhora	Gaddikhana	P	P	Do
125	Khaptay Khola	Gaddikhana	P	P	Zoo, 3rd Mile village
126	Kali Khola	Gaddikhana	P	P	Tanki Busty, Darj. 3rdMile Simkuna.
127	2.5 km Jhora	Gaddikhana	P	Sm P	Goes to Simkuna
128	3 km Jhora	Gaddikhana	P	Sm P	do
129	Katusay Jhora	Gaddikhana	P	Sm P	do
130	Sanu Kali Khola	Gaddikhana	P	Sm P	do

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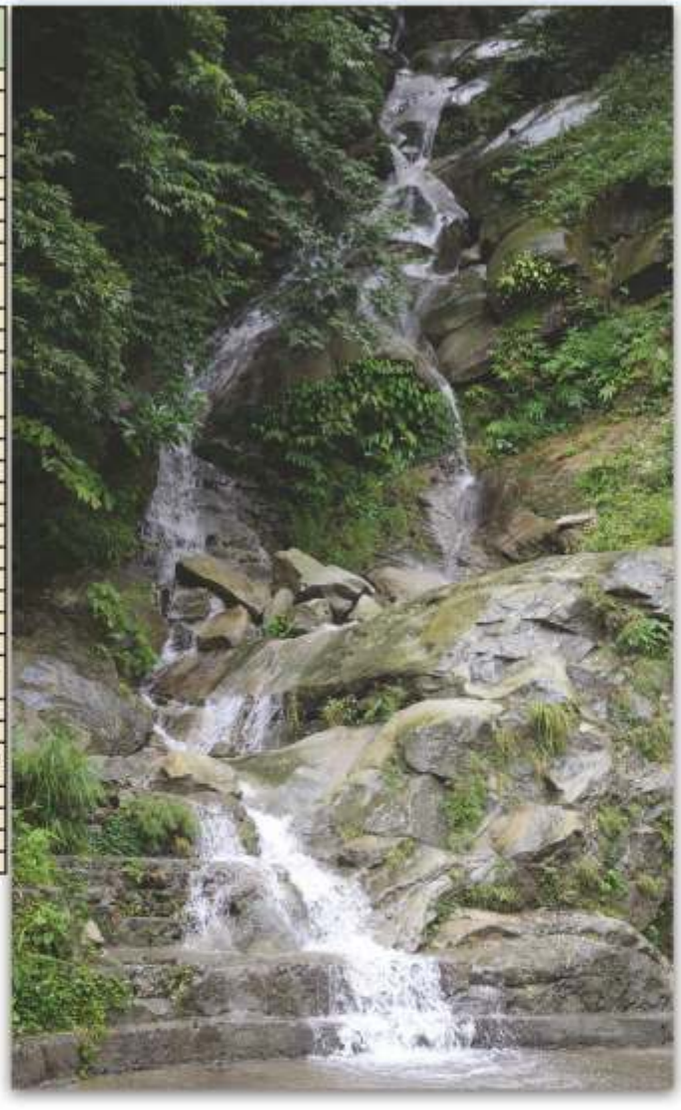
HP	High Perennial
MP	Medium Perennial
LP	Low Perennial
L	Low
S	Seasonal
P	Perennial
D	Dry

PD	Partly Dry
HD	Half Dry
Sm	Small
Sp	Seepage
B	Big
GS	Good Source



Present status and analysis

From table above it is very obvious that in the past many streams have dried up and many perennial streams have turned seasonal. If the trend continues more streams will join this group. In coming future, it will pose a serious threat to the water supply of Darjeeling town and neighbouring area. Presently a lot of water is being supplied in the town by water tankers who collect it from free-flowing streams and carry it to hotels and homes for their use. If local people, living around these streams feel the threat of scarcity of water, they then may resist such supply of water leading to a conflict scenario. Hence it is very important to maintain the status of the streams so that they may provide everlasting water supply.

Reasons of drying of streams

Many reasons have been attributed to the drying of the water streams of which a few are listed below

- Degradation of Vegetation in the feeding area(watershed) of stream

As all rain water from neighbouring areas flow to the stream through the vegetation, any loss of vegetation speeds up this process making faster flow (run off) and less retention and hence seasonal streams. It also reduces seepage of water in the soil which then further percolates down and becomes available through the stream. This degradation may be caused by deforestation, forest fire, plantation of exotic species, land slide etc.

8th Mile Jhora Choked with garbage

Choking of Streams

Many streams have been seen choked by a lot of urban garbage of which plastic is predominant component. This makes the flow impossible causing biological and functional death of the streams.

Climate Change

Climate Change has changed the rain fall and rain pattern. Many places have received a huge quantity of rainfall in a very short span of time leading to inundation for some period but later on these places face water crisis. Erratic rainfall may also cause drying of the streams.

Way Ahead

There is an urgent need of revival of dried streams and reversal of trend where streams are losing their water capacity in terms of quantity and time. In the hills, almost all water based needs are met up by water from these streams. A scientific approach mixed with local traditional methods and knowledge supported by local need may do wonders. To revive a stream, it should be assisted in natural way so that it may regain its flow. A holistic approach is needed as improving only one area would not work, e.g.- vegetative works without mechanical work. Any intervention must be planned keeping in mind the geohydrological details. The main steps may be listed as-

Detailed Data Base of Streams and Jhoras

A detailed database including runoff, catchment area, layout of the entire unit, rainfall pattern- quantity and distribution over the year are very important aspects in deciding the remedial measures

Proper SWD system for towns and villages

Without proper solid waste disposal system, garbage from towns and villages find its way to the nearest streams specially in the hill areas. Hence a proper SWD is very necessary for the success of the program.

Social groups and suitable awareness programs

Mass awareness is very essential so that streams are not used as a garbage dumping ground. Making of local Water User Groups and giving them responsibility of protection of such dumping in the streams may be very helpful. Scarcity of future potable water, if explained properly, may be a good motivation for such groups. As often seen women go to collect water from these streams they must be involved in such groups.

Prevention of Soil erosion

Often soil erosion leads to blockage of streams. It may be temporary or sometimes it can change the course of flow of the stream. At different levels of slopes, it should be stopped by using a proper combination of the mechanical and vegetative methods.

Detailed path of 8th mile Jhora

Other traditional methods

There are many time tested methods and ways of life that have been very helpful in maintaining the flow of streams. Making of smaller rock check dams leads to slowing of the water flow, more water retention and better distribution of water along the streams. Likewise, many techniques may be used for such results.

It must be kept in mind that all of these approaches to be used simultaneously otherwise it would not succeed. Similarly, it is not a onetime process, rather above listed points to be used to maintain the flow for ever. Otherwise seeing the climate change, growth of population and tourists, growth of hotels in town and home stays in villages it may be assumed that a lot of pressure is there over this natural resource and it may lead to rapid depletion of the same. Such situation may lead to conflict over this resource. I am very hopeful if different streams and jhoras of Darjeeling and adjoining hill areas are treated in above mentioned holistic way it will be very useful in coming future to avoid any scarcity of water both in terms of quality and quantity.

No Water. No Life. No Blue. No Green. – *Sylvia Earle*

Ruby-eyed Green Pit viper
(Cryptelytrops rubeus)

Photograph : Tapas Das, IFS

Common Herpetofaunal Diversity

in and around

The steel city Durgapur, West Bengal.

Milan Kanti Mandal,WBFS
Divisional Forest Officer

Author:
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The dream city of Dr. Bidhan Chandra Roy (former and second chief minister of West Bengal) was founded in late 1950s was named after a famous zamindar Durgaprasad- Durgapur. Located around the banks of river Damodar (23.55N, 87.32E), one of the countrys proud metropolitan stands as 77th most populated city of India and is the second largest city in west Bengal in terms of both area (154.20 sq.km.) and population. Having its immense importance in industries (especially steel) and coal mines, the city is also known as the Steel City. Apart from its economic and social significances, being situated on an ecotonic region at the juncture of chotanagpur plateau and gangatic plains, the city wombs the importance of holding a rich and diverse biodiversity.

Though neglected, feared and contempt by many, the unenlightened community of ecosystem- the herpetofaunas has an immense importance and a greater role to play in this nature. Thus, to conclude the effect of any community to its environment, one needs to explore the diversity of the guild. Hence, based upon some scientific, legal and useful techniques, a fair image of the commonly found herpetofaunal diversity has been portrayed here.

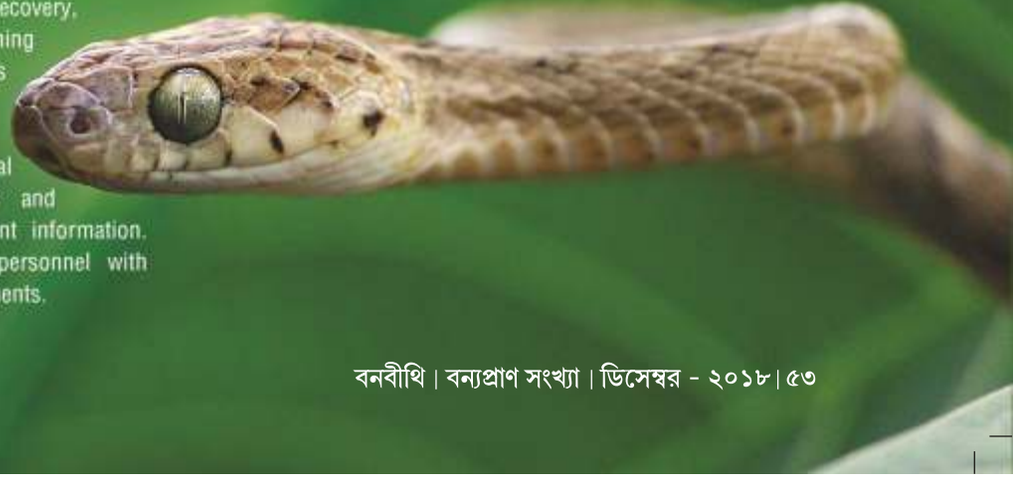
Study Site : The greener parts of Durgapur (District- Paschim Bardhaman), i.e. the places having maximum forest coverage or else atleast having a significant habitat speciality along with human habitats adjoining forests, patches, dense gardens and/or plantations. Though most parts of the city is still a virgin land and yet to be explored in near future.

Method : The study findings has been collected based upon mainly two methods-

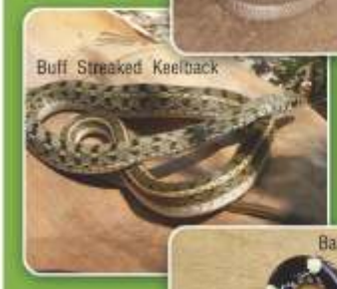
(i) Rescue recovery and (ii) planned intense field surveys (transact method, direct encounter, linear observation, call pursue, roadkill analysis, etc.). For rescue recovery, the data has been collected as per maintaining the rescue calls from various needy persons in various localities of Durgapur.While for the survey, scheduled day and night observations and exploration were pursued by professional team.In both the cases, the observations and findings were noted along with other relevant information. And all the works were done by trained personnel with proper safety techniques using useful equipments.

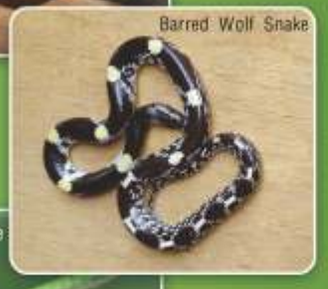
Amphibia

SL NO.	COMMON NAME	SCIENTIFIC NAME	LOCAL NAME	IUCN STATUS
		Family- Bufonidae		
1	Common Indian Toad	*Duttaphrynus melanostictus*	Kuno Bang	LC
2	Indus Valley Toad	*Duttaphrynus stomaticus*	Kuno Bang	LC
		Family- Dicroglossidae		
2	Indian Bull Frog	*Hoplobatrachus tigerinus*	Sona Bang	LC
3	Skittering Frog	*Euphlyctis cyanophlyctis*	Charchuire Bang	LC
4	Indian Pond Frog	*Euphlyctis hexadactylus*	Jar Bang	LC
5	Indian Cricket Frog	*Fejervarya limnocharis*	China Bang	LC
6	Jerdon's bull frog	*Hoplobatrachus tigerinus*	-	LC
		Family- Microhylidae		
7	Painted Frog	*Uperodon taprobanicus*	Vepu Bang	LC
8	Greater Balloon Frog	*Uperodon globulosus*	-	LC
9	Marbled Narrow mouthed Frog	*Uperodon variegatus*	-	LC
10	Ornate Narrow mouthed Frog	*Microhyla ornata*	Kath bang	LC
		Family- Rhacophoridae		
11	Common Tree Frog	*Polypedates maculatus*	Gecho Bang	LC



SL NO.	COMMON NAME	SCIENTIFIC NAME	LOCAL NAME	IUCN STATUS
Reptile				
		Family-Chelonidae		
1	Indian Pond Terrapin	*Melanochelys trijuga*	Kachim	NT
		Family-Gekkonidae		
2	Northern House Gecko	*Hemidactylus flaviviridis*	Tiktiki	NE
3	Southern House Gecko	*Hemidactylus frenatus*	Tiktiki	LC
		Family-Agamidae		
4	Common Garden Lizard	*Calotes versicolor*	Girgiti	LC
5	Fan Throated Lizard	*Sitana ponticeriana*	-	LC
		Family-Scincidae		
6	Keeled Indian Mabuya	*Eutropis carinata*	Anjaani	LC
7	White Spotted Supple Skink	*Lygosoma albopunctata*	Sanper masi	DD
		Family-Varanidae		
8	Bengal Monitor Lizard	*Varanus bengalensis*	Go-sanp	LC
9	Yellow Monitor	*Varanus flavescens*	Go-sanp	LC
		Family-Chamaeleonidae		
10	Indian Chaemeleon	*Chamaeleo zeylanicus*	Bohurupi	LC
		Family-Typhloidae		
11	Brahminy Worm Snake	*Indotyplops brahminus*	Telenga	NE
12	Beaked Worm Snake	*Grypotyplops acutus*	Talia	LC
13	Diard's Worm Snake	*Typhlops diardii*	Telenga	NE
		Family-Boidae		
14	Common Sand Boa	*Gongylophis conicus*	Tutur, bali bora	NE
15	Red Sand Boa	*Eryx johnii*	Lal bali bora	NE
		Family-Pythonidae		
16	Indian Rock Python	*Python molurus*	Ajogar, moyal	NE
		Family- Colubridae		
17	Common Wolf Snake	*Lycodon aulicus*	Ghor-chiti	NE
18	Barred Wolf Snake	*Lycodon striatus*	chiti	NE
19	Common Rat Snake	*Ptyas mucosa*	Dharas, dhaman	NE
20	Banded Racer	*Argyrogena fasciolata*	Khet-mete	NE
21	Common Kukri Snake	*Oligodon arnensis*	Udoykal	NE
22	Common Indian Bronzeback	*Dendrelaphis tristis*	Bentachra	NE
23	Common Cat Snake	*Boiga trigonata*	Biral-chokho	LC
24	Asian Vine Snake	*Ahaetulla nasuta*	Laudoga	NE
25	Ornate Flying Snake	*Chrysopelea ornata*	Kalnagini	NE
26	Buffstriped Keelback	*Amphiesma stolatum*	Hele	NE
27	Checkered Keelback	*Xenochrophis piscator*	Joldhora	NE
28	Olive Keelback	*Atretium schistosum*	Kerul	LC
29	Common Smooth scaled Water Snake	*Enhydris enhydris*	Metuli	LC
		Family-Elapidae		
30	Spectacled Cobra ●	*Naja naja*	Gokhro	LC
31	Monocellate Cobra ●	*Naja kaouthia*	Keute	LC
32	Common Krait ●	*Bungarus caerulus*	Kalach,domnachiti	NE
33	Banded Krait ●	*Bungarus fasciatus*	Sankhamuti	LC
		Family-Viperidae		
34	Russell's Viper ●	*Daboia russelii*	Chandrabora	NE





Olive keelback

NE Not Evaluated,
LC Least Concerned,
DD Data Deficient.
● Venomous snake species

Result

With the encounter of an astonishing number of about 11 amphibian species and 34 reptilian species, it clearly shows the ecological importance of the locality. With maximum number of Russells Viper, Spectacled Cobra, Rat Snake, Indian Toad, Skittering Frog and Cricket frog observation, it can be assumed that the mentioned species has higher individual counts, thus pooling their high population frequency.

Conclusion

It is still tougher than anything else to understand the way how the nature works. With each day passing by the science and its attributes are evolving and advancing incredibly thus making things beyond our capability to foretell the coming scopes. Hence, many questions have still been laid unanswered and its on us to find the facts. With more observations and study we get to know more about things and with more knowledge we get to unveil the nature of interactions between biological components. Hence, the present study intrigues and paves the pathway for future detailed studies for understanding the herpetofauna and it should be us carrying out more works in recent future to simplify the answers hence raised.

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Picture courtesy-

Milan Kanti Mandal, Amit Kumar Dey, Debayan Gayen, Saurav Dey, Debasish Majumdar, Sagar Adhurya.

Impact of JFM Support Activities on Protection of Forest & Wildlife

Nilratan Panda,WBFS
Divisional Forest Officer

During the last few decades, especially in South West Bengal, Forest is mostly managed by the JFM System. An important part of the system is to develop the JFM villages through different schemes under the Forest Department. Accordingly, many schemes even apart from regular State Plan funds are spend/ planned to spend for the development of fringe people/villages. Many developmental activities like overall community development, providing/creating benefits for some small group or even sometimes individual benefits are also targeted.

Thus a large quantity of Govt. Money associated with Human Resources of the Department is employed for the same. In turn the department expect motivated & pro active participation of the JFMC members in the protection of Forests & Wildlife. If the same is in expected level, then the whole system will eventually maintain the balance. On the contrary, the system will fail in long run.

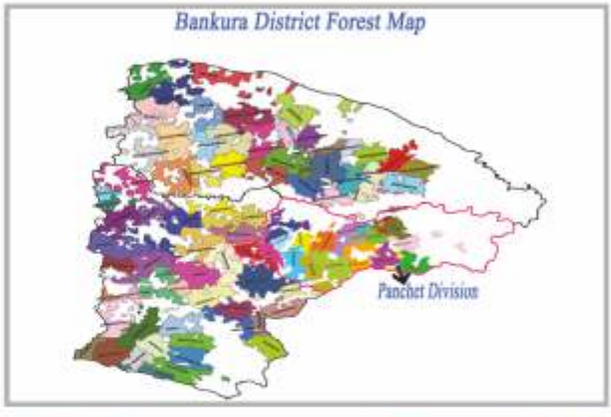
Thus this is the high time to retrospect the whole procedure or system. This is not a cynic operation but to find out whether any slight change/modification may results in some better output. The modification may be of different type. It may be of the quantum of activities, may be the type of activities which is always a site/locality specific since the demand or utility of some infrastructure is always may not be of same use irrespective of the locality, community, religion. Thus these factors may be incorporated beforehand during the time of planning. Thus this introspection will lead to better planning and eventually the main intention of the department will be served better. Thus this topic is very much relevant at the present context.

Basic or salient features of the system

- JFM System was initiated in the early nineties of the last century.
- Since then it is one of the most important tool in pro tection of Forest & Wildlife especially in South West Bengal.
- Other protection tools like Intense Forest Patrolling/initiation of Legal proceedings etc. has gone to the backstage.
- Present system of international Forest management is also tending towards Community Forestry & hence no Reverse Journey can be expected.
- A substantial budgetary allotment along with Human Resources (all level of staffs time & energy) is spent towards the maintenance of the system.
- The system is purely based on Give & Take Policy at least from the perspective of the JFMC Members by & large. Accordingly regular assessment is required for sustainability of the system.
- The Inputs which are provided to the JFMC Members include sharing of Usufructuary benefits (Presently 40% of the net sale proceed after final harvesting in South West Bengal), Free collection of certain materials from Forests, Free grazing rights for the cattle belongs to the JFMC Members (without damaging Forests & as per the Resolution), Generation of Mandays round the year with priority, executing JFM Support Activities.
- In turn, Forest Department expects support for protec tion of Forest & Wildlife in direct & indirect ways.

Areas of Working:

This study will primarily be focussed within the territorial jurisdiction of Panchet Division since a handsome number of JFMCs (231 Nos.) are registered in the Division in well diversified manner in terms of geographical area, caste, religion etc. To incorporate local variations the study can be extended to the entire Bankura District covering the territorial jurisdiction of Bankura (North) & Bankura (South) Division. Even To incorporate large/wide variation, Divisions of Western Circle, South West Circle & South East Circle may also be considered/ covered with the consent of the Competent Authority so as to make the study applicable /feasible for the Entire South West Bengal.




Roaster for protection duty by JFMC Members

Modalities:

1. **Collection of basic data:** This is very important to assess the present scenario & setting up the baseline parameters. The data will include the basic survey of the JFMCs by way of Interaction with the JFMCs & all level of Forest Staffs & other stake holders. The data may include JFM Support Activities undertaken in the last decade in differ ent JFMCs as follows:

I. Basic infrastructural facilities:
i) Construction of community Hall
ii) Construction of community shed, market shed etc.
iii) Extension of school building
iv) Excavation/renovation of Pond/ED
v) Supplying school furnitures etc.


Construction of Community Hall


Construction of Community Shed

II. Improvement of basic facilities:
i) Creation/maintenance of rural connectivity
ii) Construction/maintenance of small span bridge or culvert or causeway
iii) Providing drinking water facilities

III. Improvement/development of livelihood support activities:
i) Sinking of S/P for irrigation facilities
ii) Arrangement for pisiculture, goatery, piggery etc.
iii) Supplying agricultural inputs like paddy thrasher, pump set etc.
iv) Providing livelihood support by assisting in Sal Plate Making & other rural trading through micro financing.


Drinking Water Facility

Irrigation facility for JFMC Members

Village Road Maintenance

IV. Miscellaneous:

i) Development of cultural activities

ii) Support for their rituals

Construction of Shed for rural cultural functions

2. Periodic Assessment of the impact of those JFM Support Activities on the protection of Forest & Wildlife from the initiation of JFM System based on available records. This may be correlated with the basic data like change in Forest Cover(available from the report of the FSI in this regard) in the respective areas for the period, illicit felling, encroachment of forest land & recovery of the same, poaching of wildlife vis-¯-vis rescue of wildlife etc.

3. Finally parameters/indicators will have to be finalized for the assessment to arrive at a conclusion to facilitate the future decision making on planning for JFM Support Activity.

A format for collection of basic data from the JFMCs covering the above points is given below:

তথ্য ও প্রতিক্রিয়া ফর্ম

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১. যৌথ বন পরিচালন কমিটির নাম :-

* বিট -

* রেঞ্জ -

২. সদস্য সংখ্যা : -

ক) অ) হিন্দু - আ) মুসলিম -

খ) অ) সাধারন - আ) তফসিলি জাতি - ই) তফসিলি উপজাতি -

৩. সদস্যদের গড় অর্থনৈতিক অবস্থা :- (' ✓ ' দিন)

ভালো / মাঝারি / খারাপ

৪. সদস্যদের জীবিকা (সাধারনত) :-

.....

.....

৫. সদস্যদের নিজস্ব চাষযোগ্য জমি আছে (সাধারনত) :- (' ✓ ' দিন)

হ্যাঁ / না

৬. বিগত দশবছরে (১০) বনদপ্তরের পক্ষ থেকে যে সমস্ত উন্নয়ন মূলক কাজ করা হয়েছে :-

ক) পরিকাঠামোগত উন্নয়ন -

কাজের বিবরণ	সংখ্যা	খরচ	বছর

খ) জীবিকা নির্বাহে সহায়তা -

কাজের বিবরণ	সংখ্যা	খরচ	বছর

গ) ব্যক্তিগত সুবিধা প্রদান -

সুবিধা বিবরণ	সংখ্যা	খরচ	বছর

ঘ) অন্যান্য -

সুবিধা বিবরণ	সংখ্যা	খরচ	বছর

৭. বিগত দশবছরে বনভূমির অবস্থা :- (' ✓ ' দিন)

উর্ধমুখী / একইরকম / নিম্নমুখী

৮. বিগত দশবছরে বনসম্পদের অবস্থা :- (' ✓ ' দিন)

উর্ধমুখী / একইরকম / নিম্নমুখী

৯. বিগত দশবছরে বনভূমি অবক্ষয় :- (' ✔ ' দিন)

বেড়েছে / একইরকম আছে / কমেছে

১০ পরিচালন কমিটির সদস্যদের সামগ্রিক মূল্যায়ন :-

ক) উন্নয়ন মূলক কাজকর্ম -
সন্তোষজনক/সন্তোষজনক নয় (না হলে তার বিস্তৃত বিবরন)

খ) বন, বন্যপ্রাণের সামগ্রিক অবস্থান -
সন্তোষজনক/সন্তোষজনক নয় (না হলে তার বিস্তৃত বিবরন)

গ) উন্নয়ন মূলক কাজকর্মের প্রভাব বন ও বন্যপ্রাণের সংরক্ষনের উপর - (' ✔ ' দিন)

প্রত্যক্ষ এবং অধিক / পরোক্ষ এবং অল্প / কোন প্রভাব নেই

১১. ভবিষ্যতের উন্নয়ন মূলক কাজকর্ম নির্ধারন :-

* সামগ্রিক পরিবর্তন প্রয়োজন (ব্যাখ্যা ও বিস্তৃত বিবরন সহ)-

* সামান্য পরিবর্তন প্রয়োজন (ব্যাখ্যা সহ) -

* কোন পরিবর্তন প্রয়োজন নেই -

১২. সংশ্লিষ্ট বিট অফিসার এবং রেঞ্জ অফিসারের মন্তব্য (বন ও বন্যপ্রাণ সংরক্ষনে উন্নয়নমূলক কাজকর্মের প্রভাব) :-

স্বাক্ষর
যৌথ বনপরিচালন কমিটির
যুগ্ম আহ্বায়ক বা তার পক্ষে

স্বাক্ষর
বিট অফিসার

স্বাক্ষর
রেঞ্জ অফিসার

Outcome of the study:

1. Assessment of the present situation on the basis of the analysis of the data.
2. Observation of the trend of the impact of JFM Support Activities on the protection of Forest & Wildlife in the last decade whether positive or negative.
3. Taking Final Decision on the following issues:

i) Activities to be selected for JFM Support Activity in the upcoming days.
ii) Quantity Vs Extent: Whether the activities to be concen trated or extended both area wise & quantity wise.
iii) Effect of locality/community/other issues like wildlife dep redation in selection of JFM Support Activity.
iv) Importance of Beat/Range/Division level long term Plan & convergence with other Departments in the District Level & requirement of necessaryregulation/ guide lines from the highest level.

Thus the study results can help to retrospect the entire scenario & taking decision on future planning for the JFM Support Activities in the entire south West Bengal. The study can also help in formulation of a perspective plan for the entire south West Bengal for JFM Support Activities can thus eliminate the need of regular/ periodic collection of information for APO for the same instead the perspective plan with very minor addition/alteration can be use for taking up the decision on those works finalization. It will reduce the time for formulation of work plan, create uniformity of works in respect of the state & eliminate local biasness etc.

NURSERY MANAGEMENT OF ORNAMENTAL plants

Prabir Chatterjee
Horticulturist

Nursery is a place where seedlings, cuttings and grafts are raised with care before transplanting.

Advantage of raising seedlings in nursery

1. It is very convenient to look after the tender seedlings.
2. It is easy to protect the seedlings from pests and diseases.
3. Economy of land usage (duration in the main field is reduced).
4. Valuable and very small seeds can be raised effectively without any wastage.
5. Uniform crop stand in the main field can be maintained by selecting healthy, uniform and vigorous seedlings in the nursery itself.

Preparation of nursery

Selection of site

1. The nursery area should be nearer to the water source
2. Generally, the location should be partially shaded i.e. under the trees. If not, artificial shade is to be provided
3. It should be well protected from animals
4. Proper drainage facilities should be provided.

Selection of soil

A medium textured, loam (or) sand loam soil is preferred. Soil should be rich in organic matter. Soil depth should be preferably by 15-25 cm.

Types of nursery bed

a) Flat bed
b) Raised nursery bed

Preparation of raised nursery bed

Selected soil should be worked well to break the clods. Weeds, stones and stubbles should be removed. Height of the raised bed should be 10-15 cm with a width of 1m and length may be according to the requirement and conveniences. Two parts of fine red earth, one part of sand and one part of FYM can be incorporated to each bed to improve aeration and fertility of the soil. Before preparing the bed, the soil should be drenched wit 4 % formaldehyde or 0.3 % copper oxy chloride to kill the pathogenic spores in the soil.

Advantage of raised nursery bed

Water movement will be uniform and drainage of excess water is possible (In the case of flat bed water moves from one end to the other and there is possibility of washing away of seeds).

Germination percentage of seeds is normally high. Operations like weeding and plant protection measures are easy.

Media for propagating nursery plants

Several materials and combination of different materials are available are media for germinating seeds and rooting cuttings. A good propagating medium should possess the following characters.

1. It must be firm and dense to hold the cuttings or seeds in place during rooting or germination.
2. It must possess sufficient moisture retaining capacity.
3. It must be sufficiently porous to permit excess water to drain away and to admit proper aeration.
4. It must be free from weed seeds, nematodes and pathogens.

Soil mixture

This is the most commonly employed medium for pot plants. It usually consists of Good earth, well decomposed cattle manure, leaf mold, river sand and also charcoal in some cases. Soil mixture commonly used for propagation is

Good earth	2 parts
FYM/Leaf mould	1 part
Sand	1 part

Sand

It is the most satisfactory medium for rooting of cuttings.

Peat

It consists of the remains of aquatic marsh, bog or swamp vegetation which has been preserved under water in a partially decomposed state. When such peat is derived from sphagnum, hypnum or other mosses, it is known as peat moss. it is used in mixture after breaking them and moistened.

Sphagnum moss

Commercial sphagnum moss is the dehydrated young residue or living portion of acid-bog plants in the genus Sphagnum such as S. papilliosum, S. capillacem and S. palustre. it is generally collected from the tree trunks of the forest species in south Indian hills above 1500m above M.S.L. during rainy period. It is relatively sterile, light in weigh and has a very high water-holding capacity. It is the commonly used medium in air layering.

Vermiculite

It is very light in weight and able to absorb large quantities of water. This can be used as a rooting medium for air layering and also in pots for raising certain plants.

Container for propagation and growing young plants

Earthen pots

They are made of burnt porous clay in various sizes to provide requisite amount of soil and root space to different kinds and sizes of plants. They have straight sides and are made wider at the top than at the bottom to hold the greatest bulk of compost where the feeding roots are and also to facilitate easy removal of soil, intact with roots (ball of earth) at the time of planting or repotting. In our county, tube pots of varying sizes are used as follows.

Tube pot sizes	Height (cm)	Diameter (cm)	Cost per pot (Rs.)
Tube pot	20	13	15.00
¼ size pot	18	22	15.00
½ size pot	20	27	30.00
¾ size pot	25	32	50.00
Full size pot	35	35	65.00
Tub size pots	35	50	90.00

Seed pan and seed boxes

Seeds pans are shallow earthen pots about 10 cm high and 35 cm in diameter at the top. They have one large hole for drainage in the centre or 3 holes at equidistant from each other. Seed boxes are made of wood, 40 cm wide and 60 cm long and 10 cm deep, with 6-8 properly spaced holes drilled in the bottom.

Against each of the holes is placed a crock with its concave side down. Some large pieces of crock are put over it and also by the side of this crock, some coarse sand 2 or 3 handfuls are sprinkled on the crock pieces forming a thin layer to prevent fine soil from clogging the drainage. Over this, required soil mixture is added. Very delicate kinds of seeds like Cineraria, Begonia, etc. are best sown in these containers.

Polythene bags

Small polythene bags with holes punched in the bottom for drainage and filled with a porous rooting medium are used for propagation of cuttings like Jasmines, Duranta, Crotons etc. in the mist chamber. Sometimes, young seedlings which are raised in the nursery are subsequently transplanted in these polythene bags and kept there till they attain required growth for transplanting them to the main field (Papaya, Curry leaf etc.).

Plastic pots

Plastic pots, round and square are used to keep mostly indoor plants. They are reusable, light weight, non-porous and they require only little storage space

Tools and implements for nursery work

Rose can/water can	:	This is used for watering the nursery. Fine spray of water should be used for watering nursery of small sized seeds
Digging fork	:	This has prongs of 20 cm long fitted to a wooden handle. This is used for uprooting plants, rooted cuttings, harvesting of tubers etc., without damaging the root system or tubers.
Shovel	:	This is a curved steel plate attached to a wooden handle and used for transferring soil, manure etc.
Garden rake	:	This is used for leveling lands and collecting weeds. The rake consists of a number of nail like projections from a crow bar provided with long handle
Hand trowel	:	This is used as a small tool for making holes for planting seedlings and small plants. This is also useful for removing surface weeds in nursery beds
Secateur	:	This is used for cutting small shoots to regulate shoot growth in fruit trees
Budding or Grafting knife	:	This knife is used for budding and grafting. This has two blades in which one is with ivory edge used for lifting the bark in budding operation.

Potting Purposes for which plants are potted are

1. Preparing plants for sale such as rooted cuttings of grapes
2. Growing plants for decoration like crotons
3. Growing plants for experimental studies like pot -culture studies
4. For using plants as rootstocks in certain grafting methods as in inarching of mango.

Pot mixture or potting compost

It is essential for potting of plants. The pot mixture is prepared by suing various ingredients. The proportion of pot mixtures will vary with different kinds of plants.

1. An ideal pot mixture should have an open structure, which allows good drainage and holds sufficient moisture for plant growth and permits excess waster to drain away.
2. Should supply adequate nutrient to the plants during all stages of growth.
3. Should be free from all harmful organisms and toxic minerals and light in weight.

Potting procedure

1. Wet the seedbed before lifting plants. Life with a ball of earth with as much of the root system intact, as possible. Do not pullout seedlings in the hot sun. Do not allow roots or the soil around the roots to dry.
2. Fill up pots by putting some crocks first, then a layer of sand (5-8 cm) and finally pot mixture (8-10 cm).
3. Place the plant with the ball of earth in the centre upon the layer of pot mixture (Place on one side of pots in the case of root stock plants used in inarching)
4. Put pot mixture around the ball of earth, press as you fill up and level off, leaving one inch head space at top. Do not press over the ball of earth. It will break and damage the roots.
5. Set the stem of plant at the same height as it was in the seed bed
6. Immerse pot with plant in a tub of water gently and keep inside water till air bubbles cease to come out. Remove and place the pot under shade of trees.

Repotting : Repotting is done for changing the soil medium for pot bound plants.

Pot bound condition : When the potted plants are grown for more than one season or one year in pot, the root very soon become a tangled mass and exhaust all the nutrient in the limited soil, besides being circumscribed in the limited place. This stage is known as pot bound condition.

Repotting procedure

1. It is better to west the potted plant 24 hours earlier to facilitate repotting (removal of plant from pot)
2. The technique to remove the plant with a ball')f each intact is to keep the right hand palm over the soil, allowing the stem of the plant in between the first fingers and turn the pot upside down holding the pot at the bottom with the left hand and gently knocking the rim of the pot on the edge of table or any other hard surface or even on the bottom edge of another inverted pot. The ball of earth comes out of the pot. If for any reason, it fails to come out, break the pot knocking the sides with a stone or fork and free the soil from it.
3. Examine the roots, cut neatly with a secateur, the decayed, dead and dried or twisted roots. Reduce the size of the ball of earth around the roots.
4. Place the plant in the new pot at the same height at which it was in the old pot. Fill up pot with fresh pot mixture and immerse in water.

General

1. The initial reaction after potting and repotting is wilting. The transpiration loss has to be checked to help plants revive. Hence keep freshly potted plants under shade and "pot water daily".
2. After about ten days under shade, the plants should be gradually exposed to sun by keeping them for some hours under sun and then putting them under shade. The period of exposure can be increased every week until finally the plants can be kept in the open. This process is called "hardening".

Chital-*(Axis axis)*
Photograph : Mrinmoy Dutta Roy

Cultivation of Patchouli as intercrop

Kaushik Banerjee,WBFS
Divisional Forest Officer

Past History

- During the year 2006 NTFP Division raised Patchouli Plantation at Taipu and Sukna.
- Plantation damaged due to lack of maintenance.
- Yield record not maintained.
- Cuttings material were brought from NEDFC Ltd., R&D Centre, Khetri, Kamrup, Assam.

Object of the project:

- Cultivation, processing and marketing of Patchouli oil.
- Involving FPCs in cultivation of Patchouli plant as inter crop of plantation for economic growth.
- Better utilization of land through cultivation of Patchouli.
- To create mandays as well as upliftment of socio-economic status of the fringe areas people.
- To earn Govt. revenue.
- To establish good relationship between Forest staff and villagers this will help to protect the forest.

Commercial Importance of Patchouli

- Patchouli oil is an essential ingredient and used as a 'base' material in perfumery industry.
- There is no synthetic substitute for Patchouli oil.
- Increase its value and demand in the perfumery market.
- In India consumption up to about 300 tonnes per annum, but production is below 50 MT. so country im ports from Indonesia.

WHAT IS PATCHOULI?

- Patchouli(Pogostemon Cablin) is a perennial bushy herb, belongs to lamiaceae family with erect stems reaching around 75 cm. in height and bearing small, pale pink-white flowers.
- The name Patchouli is said to be derived from the an cient Tamil words Patchai"and Ellai"meaning Green leaf.

Habitat

- Native to South-East Asia i.e. tropical region and is now extensively cultivated in India, China, Indonesia etc.

Patchouli

Propagation at Nursery by vegetative method

- Cuttings are prepared in the morning or afternoon period.
- Apical and branch twig of 10-15cm long with 4-5 nodes is cut away from healthy mother plants.
- Cut ends are dipped in IBA hormone solution of 1000-PPm strength (1 g per litre water gives 1000PPm). The cuttings should be dipped for 5-7 sec onds and spread 10 minutes for drying.

Rooting media

- An ideal rooting medium can be prepared by mixing 50 parts of riverbed sand + 50 parts of soil, mixing with fungicide.

Hardening of seedlings

- Hardening of the seedlings is necessary before planting.
- By gradual reduction in water supply and removing shade from about 7-10 days ahead of planting.

Time of planting

- March May followed by September October, considered ideal.
- 35 to 45 days old cuttings should be planted.
- Avoid planting during winter(Dec-Jan) and high rainfall period (July-August).
- Planting in wet soil during July-August shows poor growth due to temporary anaerobic condition.

Spacing

- As the plantation will be raised as intercrop in territorial plantation, the spacing will be 2m X 0.6m. For 1(One) Hact. Plantation requires- 8,333 seedlings.

Planting

- Grows well in warm to tropical climates.
- 1000 m to 2000 m elevation, 23c to 28c.
- Annul rainfall range 2200mm to 2800mm.
- Grows best on sunny position.
- Grows best in well drained loamy soil, Ph range 6-6.5.

- Poly bag seedlings can be transplanted to the field.
- Planting pit size 30cm X 30 cm X 30 cm at a spacing of 2m X 0.6m.

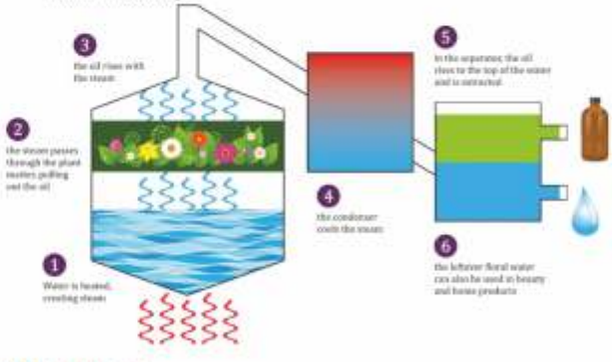
No. of application	Days after planting	Urea (kg)	K_2O(kg)	No. of Harvest
1st	45	55	-	-
2nd	90-100	55	30	1st harvest
3rd	135-145	55	-	2nd harvest
4th	170-180	55	-	3rd and 4th harvest

Detopping / Tipping

- Tips should be removed after 20-30 days of planting to encourage early branching.
- This can also be done at the time of planting.
- Cutting back the main stem leaving 3-4 nodes above ground surface at 45-60 days of planting is done en abling branching from lower sides of the crown. This will give a bushy architect of the plant.

Cultural practices

- Compaction of surface soil particularly around root zone is avoided.
- This is achieved by racking with dry land weeding twice or thrice followed by one hand weeding.
- Apply of urea with soil is done during racking and hand weeding.



Harvesting

- At 90-100 days after planting the first regular harvest ing is done by cutting selected matured branches only.
- Branches should be about 70-90 days old showing signs of maturity as 1 - 2 lower leaves turning yel lowish.
- Mature branches bear 6 7 pairs of leaves. In 1st harvest the main branch should be cut back above 3 4 nodes from base for re-growth.
- Harvesting of mature branches is encouraging the new shoots from lower side of each branch.
- In selected harvesting the plant is not getting enough stress and normal metabolic functions continue throughout the growing period.

Drying of leaves/ Curing

- The fresh herbs should be spread for curing in thin layers on a hard platform under shed for 7 10 days.
- The thickness of the herb should not be more than 2 inches.
- Turning at least once in a day is necessary to avoid fer mentation.
- Drying should be uniform for better oil yield.
- The fresh and dry ratio of herb is 5.5: 1 at around 12% moisture.

Storing of dried leaves

The dry leaves should be packed tightly in gunny bags and stored at least for 3 months in a well ventilated room without touching the ground.

Distillation

Shade dried, cured leaves are subjected to steam distilla tion.

The distillation unit consists of a boiler, distillation steel condenser and receiver.

The duration of distillation varies from 12 16 hours. Prolonged distillation gives higher yield and better qual ity of oil.

Oil recovery and oil yield

On an average a recovery of 3.0 to 3.5 % is obtained which varies largely on drying procedure, leave : stem ratio and curing.

Drying and storage of oil

Immediately after the distillation, all free waters is re moved by treating with anhydrous sodium sulphate @ 20 30 g per litre and stirring the content vigorously. Left for 4 5 hours and filtered purified oil.

Stored in a clean aluminum containers.

Year	No. of plant	No. of harvesting	Dried leaves in qntl.	Yield in litre
1st	8,333	3	14	38
2nd	8,333	4	18	49
3rd	8,333	4	18	49
Total-				136

Pests & Diseases

The following are the common insects- pests and dieas es found in Patchouli farming-

- **Insects- pests : Root knot nematode**
  Control measure : Furadone @ 20kg per hect. should be applied for effective control.
- **Diseases: Leaf blight**
  Control measure : Application of 2(Two) sprays of Dithane Z-78 0.5% at one month interval is recommend ed to control the leaf blight diseases.
- **Leaf eating caterpillar:** Spraying with 0.5% Dimethoate or Melathion at 15 days interval is effective.

Uses of Patchouli oil

- It is being mainly used in perfumes, soaps and tobacco products.
- Patchouli leaves are being used to make an herbal tea.
- Patchouli helps soothing inflammation.
- Patchouli oil has great Anti-septic properties.
- Patchouli oil works as a great astringent.
- Patchouli oil helps in healing cuts and wounds quickly.
- Patchouli oil has great deodorant properties.
- Patchouli oil helps in losing weight.
- Patchouli oil works as a fungicide and insecticide.

Cost analysis:

Year	Nursery cost	Plts. cost	Maint. Cost of plts.	Material cost	Harvesting cost	Distillation cost	Packaging cost	Total (in Rs.)
1st	70000	107205	-	5000	7350 (3 times cutting)	9000	7600	206155
2nd	-	-	64500	5000	9800 (4 times cutting)	12000	8000	99300
3rd	-	-	64500	5000	9800 (4 times cutting)	12000	8000	99300
Total cost for 3 (Three) years-								404755

(Rupees Four Lakh Four Thousand Seven Hundred Fifty Five)only.

Cost benefit:

Total expenditure in three years = Rs. 404755.00
Oil production in three years = 136 litre
Market price of Patchouli oil = Rs. 6000.00/lt
Cost of 136 litre = Rs.816000.00
Net profit in three years =
(Rs.8,16,000.00- Rs. 4,04,755.00) = Rs. 4,11,245.00
Or say, Rs. 4,00,000.00

Source of seedlings/ cuttings:

Initially to start the plantation project the seedlings/ cuttings will be brought from North-Eastern Development Finance Corporation Ltd., R & D Center, Khetri, Kamrup, Assam-782403.

Research items:

- Best propagation method either from vegetative propagation or from seed.
- Application of different root promoting hormone like IAA, IBA, NAA, Surotex etc. in different percentage of solutions and PPm to find out the best results for vegetative propagation.
- To find out best rooting medium.
- To find out the best doses of fertilizer to obtain maximum harvest.
- To find out optimum yield of oil by distillation(Green leaves and dried leaves).
- To find out the best yield of oil by changing of time duration of curing/ drying of harvested material.

SOME MORE NURSERY PICTURES OF PATCHOULI (Pogostemon cablin)

Patchouli cuttings

Potted cutting of Patchouli at Nursery

Cuttings being planted in rooting media

Maintenance work at Nursery

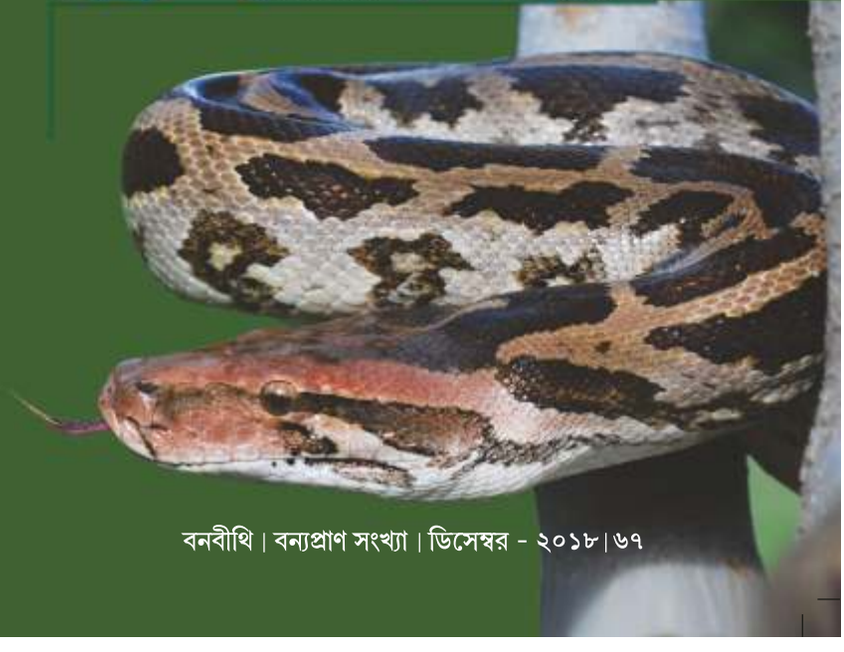
ল্যান্ড অফ পাইথন

(Land of Python)

দীনবন্ধু বিশ্বাস (শিক্ষক)
অজয়পুর হাইস্কুল, বীরভূম

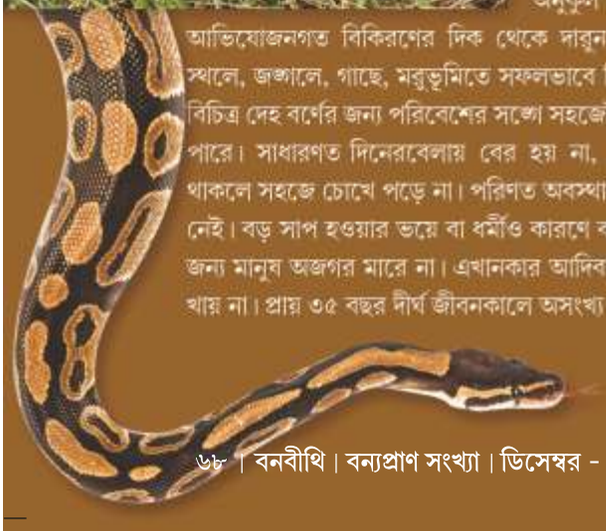
বাণের জলে ভেসে এসছে অজগর, বীড়ভূমের করমশাল গ্রামে। ২০০৮ সালের ৭ সেপ্টেম্বর, এই প্রথম আমি অজগর উদ্ধার করতে যাই। গিয়ে সাপটি না পেলেও জানতে পারি অজগরটি বিক্রির চেষ্টা চলছে। এর পরিণাম যে জেল জরিমানা এটা বলে আমি সিউড়ি বন দপ্তরে চলে আসি। প্রায় সঙ্গে সঙ্গে অজগরটি নিয়ে গ্রামের লোকজন বন দপ্তরে পৌঁছায়। সাপটিকে অনুকূল পরিবেশে পুনর্বাসন দেওয়া হয়।

আমি এখনও পর্যন্ত প্রায় ১৬-১৭টি অজগর উদ্ধার করেছি। প্রতিটা ক্ষেত্রেই শুনেছি এই সাপগুলি বর্ষার সময় ম্যাসাঞ্জোর থেকে বন্যার জলে ভেসে আসে। বীরভূম জেলার প্রায় সকলেরই এই মত। এমনকি বন দপ্তরের কর্মীরাও এটাই জেনে আসছে। আমিও তাই বিশ্বাস করতাম। যার ফলে উদ্ধার করা কয়েকটি অজগরকে তার আদি বাসস্থান ম্যাসাঞ্জোর পাহাড়ে পুনর্বাসন দেওয়া হয়। পরবর্তীকালে এই প্রচলিত বিশ্বাস আমার কাছে ভুল বলে মনে হতে থাকে। আমি বন দপ্তরের সহযোগিতায় বীরভূম জেলার বর্ধমান, ঝাড়খণ্ড সীমান্ত এলাকা থেকেও অজগর উদ্ধার করেছি। যেমন আলিগড়, রাজনগর, খয়রাশোল, ইলামবাজার, সিউড়ি, মহঃ বাজার প্রভৃতি এলাকা থেকে। উদ্ধার হওয়া সাপগুলি ৬-৭ ফুটের মধ্যে, ওজন ৬-১২ কেজি মত। স্ত্রী ও পুরুষ সাপ প্রায় সমান হারে উদ্ধার হয়। একটি ক্ষেত্র বাদে সবকটিকে সুস্থ স্বাভাবিক অবস্থায় উদ্ধার করি। এর থেকে আমি নিশ্চিত হই, যে এরা বাণের জলে ভেসে আসে, তা ঠিক নয়। আবার বন্যার সময় ছাড়াও সেপ্টেম্বর থেকে ফেব্রুয়ারি মাসে বেশি অজগর উদ্ধার হয়।



বিগত দু-তিন বছরে সবচেয়ে বেশি আজগর উদ্ধার হয়। ময়ূরাক্ষী ও অন্যান্য নদীর পাড়ের গ্রাম থেকে। বিশেষ করে ধান্যগ্রাম, খটঙ্গা, তিলপাড় ব্যারাজ, লম্বধরপুর, করমশাল, বক্রেশ্বর তাপবিদ্যুৎকেন্দ্র, মাঝি গ্রাম, নগরী, দুমুনি ও আমজোলা পাহাড়ী গ্রাম থেকে। অজগর উদ্ধার ও পুনর্বাসন করতে গিয়ে জানতে পারি এই সব এলাকায় অজগর প্রায়ই দেখা যাচ্ছে। বনকর্মী ও এলাকাবাসীরা ঐ দাবি করেন। বিশেষ করে আমজোলা পাহাড়ী, ভুরাবাঁধ, গিরাজপুর, খটঙ্গা, ধান্যগ্রাম, তুলসিবুনা, ফুলবাগান,কানশুলি, বড়শাল, কাদেরীগঞ্জ, ভান্ডিবন, তারাপুর, লম্বধরপুর, বড়াম, দুমুনি। নরসিংহপুর গ্রামে এদের দেখা যাচ্ছে। শীতকালে ময়ূরাক্ষী নদীর চরে অজগরকে রোদ পোহাতেও দেখা যায়। এখানকার কয়েকটি গ্রামের হাঁস, ছাগল ও ভেড়ার বাচ্চা নিখোঁজ হবার ঘটনা ঘটে। খটঙ্গা গ্রামে অজগরকে ভেড়ার বাচ্চা ধরতে দেখা যায়।

এই এলাকায় অজগর বৃদ্ধির কারণ খাদ্যের প্রাচুর্য ও অনুকূল বাসস্থান। অজগর আভিযোজনগত বিকিরণের দিক থেকে দারুন সফল। এরা জলে, স্থলে, জঙ্গলে, গাছে, মরুভূমিতে সফলভাবে বিচরণ করতে পারে। বিচিত্র দেহ বর্ণের জন্য পরিবেশের সঙ্গে সহজেই আত্মগোপন করতে পারে। সাধারণত দিনেরবেলায় বের হয় না, তাই অধিক সংখ্যায় থাকলে সহজে চোখে পড়ে না। পরিণত অবস্থায় এদের কোনো শত্রু নেই। বড় সাপ হওয়ার ভয়ে বা ধর্মীও কারণে বা সচেতনার প্রচারের জন্য মানুষ অজগর মারে না। এখানকার আদিবাসী জনজাতি অজগর খায় না। প্রায় ৩৫ বছর দীর্ঘ জীবনকালে অসংখ্য ডিম পাড়ে।



একবারে গড়ে প্রায় ২৫-৩০ টা বন দপ্তর ও বন্যজীব অপরাধ নিয়ন্ত্রণ ব্যুরো সক্রিয় থাকায় অজগর পাচার ও খেলা দেখানো প্রায় বন্ধ। মাছ ধরার জাল, এদের অকাল মৃত্যুর কারণ। বিগত ১০ বছরে বীরভূমে ৬টি অজগরের মৃত্যু হয়েছে, তার মধ্যে চারটি মাছ ধরার জালে আটকে।

অরণ্য ধ্বংস ও অবৈধ কারবারের জন্য সারা ভারতবর্ষে এদের সংখ্যা কমে আসছে, সেখানে বীরভূমে এদের সংখ্যা বৃদ্ধি অবশ্যই আনন্দের। তবে অত্যধিক বৃদ্ধিতে পরিবেশ ভারসাম্য হারাতে পারে। ব্যপক হারে বাড়তে থাকলে অদূর ভবিষ্যতে খাদ্যের সন্ধানে লোকালয়ে চলে আসবে। মানুষেরা পোষা গৃহপালিত প্রাণী শিকারের জন্য, অজগর ও মানুষের সংঘাত হতে পারে। ময়ূরাক্ষী নদীর পাড়ের আদিবাসী মানুষের মতো এলাকায় শিয়াল, খরগোস, গোসাপ আগের চেয়ে অনেক কমে গেছে। বিশেষ করে কাঠবেড়ালির মতো দেখতে, লেজের ডগায় একগুচ্ছ লোমযুক্ত ইঁদুর আর দেখা যায় না। যাদের বছর তিনেক আগেও ময়ূরাক্ষী নদীর পাড়ের শরের ঝোপে ব্যাপক হারে দেখা যেতো।

২০১৮ সালের জুন মাসের ৪ তারিখে অলীগড়ের শালের জঙ্গল থেকে পরিত্যক্ত, অসুরক্ষিত নষ্ট হতে বসা অজগরের ডিম উদ্ধার করি। সুরক্ষিতভাবে রাখায় ডিম থেকে দুটি বাচ্চা বের হয়। শিশু অজগর দুটিকে বনদপ্তরের সহযোগিতায় পুনর্বাসন দেওয়া হয়। এই ঘটনার পর আমি সম্পূর্ণ নিশ্চিত হই "বীরভূম অজগরের আদি বাসভূমি" (Land of Python)। এরা বাইরের জলে ভেসে আসেনি, আগেও ছিল, বর্তমানে পরিবেশ সবদিক থেকে অনুকূল হওয়ায় এদের সংখ্যা বাড়ছে এবং পার্শ্ববর্তী এলাকায় ছড়িয়ে পড়ছে।

Carrying Capacity of Indian One-Horned Rhinoceros in Jaldapara and Gorumara National Parks

depending on their Territory Marking with Territory Marking Fluid (TMF)/Pheromones

Anjan Guha WBFS
Divisional Forest Officer

Pheromones :

Chemical Messenger in the Animal World

Pheromones are known to play an important role in the chemical communication of the individuals in the Animal World starting from the lower group of Invertebrates to the highest form of vertebrates the mammals.Pheromones help in maintaining the fitness, mate choice, mate selection, sexual maturation, successful fertilization, kin recognition, maternal infant bonding, dominance hierarchy, aggression, aggregation and many other aspects of the social organization in the living world. They can be of various types such as aggregation, alarm, epidiectic, releaser, primer, territorial, trail, sex pheromomes and so on. It is usually the habit of many wild mammals to mark their territory through different markings and also by using the marking fluid which contains different chemical messenger molecules.

Duars :

The Natural Treasure Casket of West Bengal

The Dooars or Duars lie in the North East of West Bengal at the foothills of the Himalayas and stretches over from the Teesta River in the West, extending uptoDhanshiri river in Assam in the East. The un-ending stretch of green in the Duarscriss-crossed by the river Teesta and her tributaries like Torsa, Jaldhaka, Raydak and many other rivers coming down from the Himalayas makes it an abode of diverse and innumerable flora and fauna.

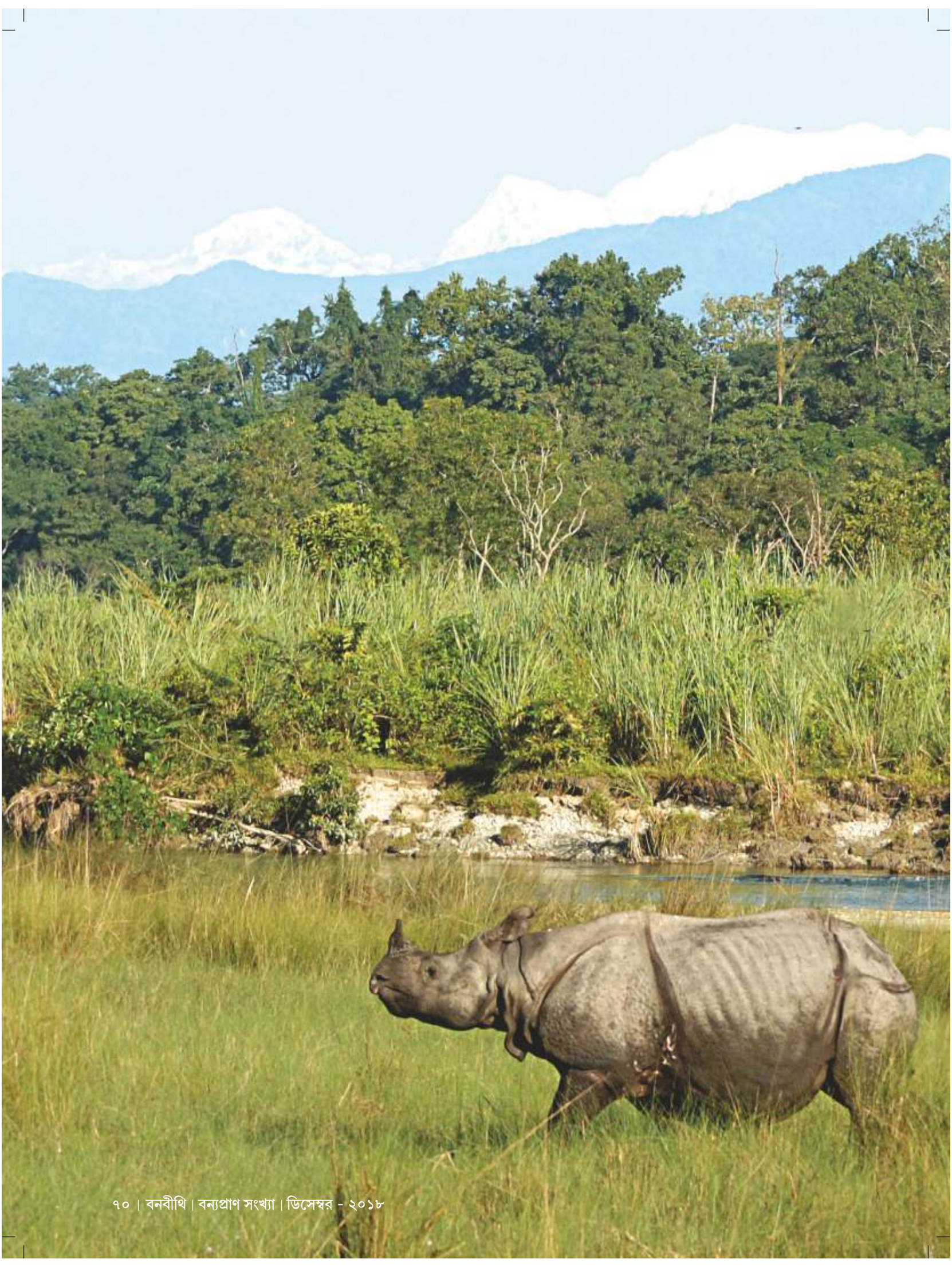
The Indian rhinoceros *(Rhinoceros unicornis)* in Jaldapara and Gorumara National Park in Duars

One-horned Rhinoceros *(Rhinoceros unicornis)* is a species which ornamentalises the wildlife treasure of Bengal.They are abundantly found in the Jaldapara and Gorumara National Parks in the Duars in North Bengal and is the Flagship species of this region. Jaldapara National Park is the second largest home for the great Indian one-horned Rhinoceros. Workers like Banerjee, 1993; Das et al, 2003; Pandit et al, 2004 recognized the Riverine Forests, Sal Forests, Wet Mixed Forests, Semi-evergreen Forests, Wet Mixed Forests, Semi-evergreen Forests, Evergreen Forests, Riverine Grasslands, Savannah Grasslands, Open low lying Herbland, Hydrophytic vegetation etc in these areas. But the most preferred habitat for the Rhinos here are the Savannah Grasslands which provides them maximum fodder and shelter. The last 10 years data reveal that the population size of the Rhinos is showing an increasing trend but the area in which they are residing has remained the same over the years.

Territory Marking by the Rhinos

The Rhinos primarily mark their areas by scraping their large feet across the ground. They also break large or small foliage and the bulls mark their areas with their pungent urine and faeces. With time, the question arises whether the territory occupied by each Rhino has remained the same or it has shrunk over the time due to the increasing abundance of Rhinos.

Rhinos in Grasslands of Jaldapara and Gorumara National Parks



Kanchenjungha in the backdrop of Gorumara National Park
Photograph : Tapas Das, IFS

In Jaldapara National Park the Rhino population size increased from 125 to 200 in the last 10 years whereas in GorumaraNational Park the Rhino population size has inflated from 30 to 50 in the last decade. The most important issue in wildlife management in these areas is whether the increasing number of Rhinos here are still within the carrying capacity and the available resources are adequate for the increasing population or not. Constraints in available habitat is always a serious problem to the growth of almost any existing escalating population.

Fodder plants of the Rhinos

Among the recorded Rhino fodders, grasses available mainly in open and grassland vegetations are most preferred ones. They are growing in enormous quality and are supplying major bulk of the food for Rhinos.Some of the most preferred fodder plants for Rhino are plants belonging to Zingiberaceae like Alpinia nigraand Poaceae like ***Arundinella bengalensis, Arundo donax, Axonopus compressus, Cymbopogon jwarancusa, Imperata cylindrica, Saccharum arundinaceum, Saccharum bengalense*** etc.Some plants belonging to the Family Mimoeaceae, Euphorbiaceae, Cyperaceae, Sterculiaceae are also important fodder plants for Rhinos.There should be area-wise proper management of the preferred fodder plants for the Rhinos depending on their concentration in different areas.

Goals to achieve

The constituents of the Territoriality Marking Fluid (TMF) should be identified. Based on the marking of the areas by Rhinos with TMF, the actual area occupied by a Rhino can be assessed. Over the years whether there has been any change in the area occupied by individual Rhinos is to be judged and whether this area occupied by individual Rhinos is optimum is also an important issue that should be looked into minutely. It is also the need of the hour to assess whether the increasing number of Rhinos is within the carrying capacity of these areas or not. Moreover proper management of the resources is of great importance for a inflating Rhino population. Proper resource management is the need of the hour for the sustainability of such a huge population of Rhinos. Re-vitalization of the degraded forest areas and increase in the forest area has to be accomplished from the Managerial point of view after a thorough study of the total area and its resources and introduction of modern management practices is the need of the hour that can be helpful for maintaining the carrying capacity of Rhinos in these areas.

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সাপের কামড় এবং তার চিকিৎসা

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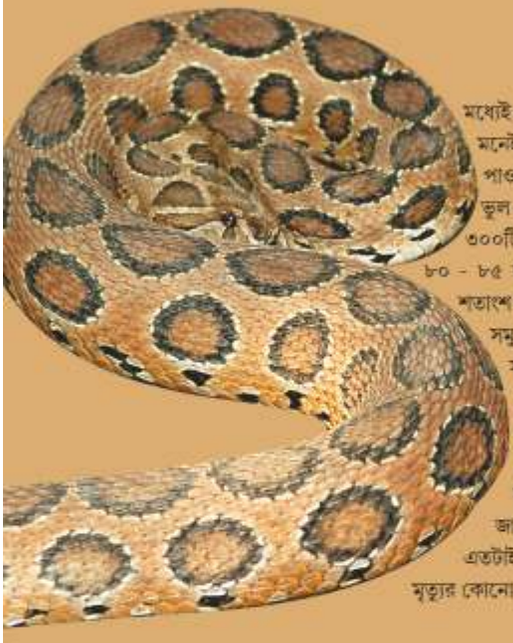


প্রায় সকলের মধ্যেই একটা ধারণা আছে যে, সাপের কামড় মানেই মৃত্যু। অর্থাৎ চিকিৎসার কোনো সময় পাওয়া যায় না। ধারণাটি কিন্তু একদমই ভুল। আমাদের দেশ ভারতবর্ষে কমবেশি ৩০০টি প্রজাতির সাপ রয়েছে এর মধ্যে ৮০ - ৮৫ শতাংশ সাপ নির্বিষ। এই ২০ - ১৫ শতাংশ সাপের মধ্যে অধিকাংশই আবার গভীর সমুদ্রে বাস করে। সামুদ্রিক সাপের প্রায় সকলেই তীব্র বিষধর। এদের মধ্যে একটি সাপ তার নাম জলকোরাল (Hook-Nosed See Snake)। মাঝে মধ্যেই সুন্দরবনের নদীতে মৎস্যজীবিদের জালে ধরা পড়ে। এই সামুদ্রিক সাপগুলো এতটাই নিরীহ প্রকৃতির যে এদের কামড়ে মৃত্যুর কোনো তথ্যই ভারতবর্ষে নেই।

আমাদের পরিবেশে থাকা সাপগুলোর মধ্যে কালাচ, গোখরো, কেউটে, চন্দ্রবোড়া, শাখামুটি, শঙ্খচুড়, গেছোবোড়া ও ফুড়সা এই আটটি বিষধর সাপ আমাদের নজরে আসে এবং এদের মধ্যে প্রথম চারটি সাপই মূলত পশ্চিমবঙ্গে সর্প দংশনে মৃত্যুর প্রধান কারণ। এদের মধ্যে

১) শাখামুটি (Banded Krait) লুপ্তপ্রায় প্রজাতির এবং এতটাই শান্ত স্বভাবের যে এর কামড়ে কেউ মারা গেছে তার কোনো তথ্য পশ্চিমবঙ্গে নেই।

২) শঙ্খচুড় (King Cobra) মূলত বাদাবনের গভীরে বসবাস করে, সেই কারণে সচরাচর মানুষের সংস্পর্শে না আসায় দংশনের ঘটনা প্রায় ঘটে না বললেই চলে।

৩) ফুড়সা (Saw Scaled Viper) পশ্চিমবঙ্গে খুবই কম নজরে আসে। পশ্চিমবঙ্গে ফুড়সার কামড়ের কোনো তথ্য নেই। আর

৪) গেছো বোড়া (Pope's Pit Viper) কিছু সুন্দরবনের বাদাবনে ও উত্তরবঙ্গে পাওয়া যায়। মাঝে মধ্যেই এর কামড়ের তথ্য পাওয়া কিন্তু এরা ক্ষীণ বিষযুক্ত হওয়ায় মানুষের মৃত্যু ঘটে না।

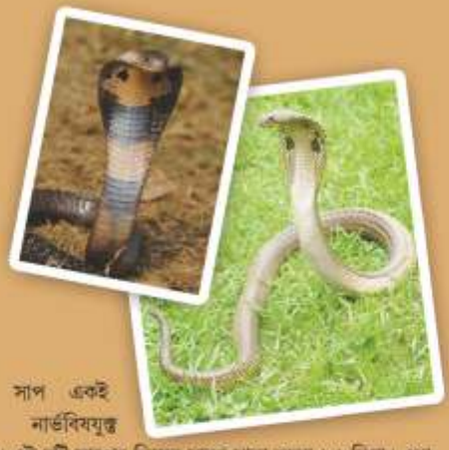
বেশি সমস্যা হয় কালাচ, গোখরো, কেউটে ও চন্দ্রবোড়ার দ্বারা। যদিও এর জন্য দায়ী আমরাই, কারণ আমরাই দিনের পর দিন জঙ্গল কেটে, বনভূমি ধ্বংসের মাধ্যমে, জলাশয় ভরাটের মাধ্যমে, জমিতে অতিরিক্তত পরিমাণে কীটনাশক ব্যবহারের মাধ্যমে সাপেদের বাসস্থান এবং অস্তিত্ব ধ্বংস করছি। এর ফলে নিরুপায় হয়ে খাদ্য ও বাসস্থানের সন্ধানে এরা আমাদের বাসস্থানের কাছাকাছি চলে আসছে।

যেহেতু কালাচ, গোখরো, কেউটে ও চন্দ্রবোড়া এই চারটি সাপই মূলত পশ্চিমবঙ্গে সর্প দংশনে মৃত্যুর প্রধান কারন তাই এদের সম্পর্কে একটু বিস্তারিত আলোচনা করা হলো।

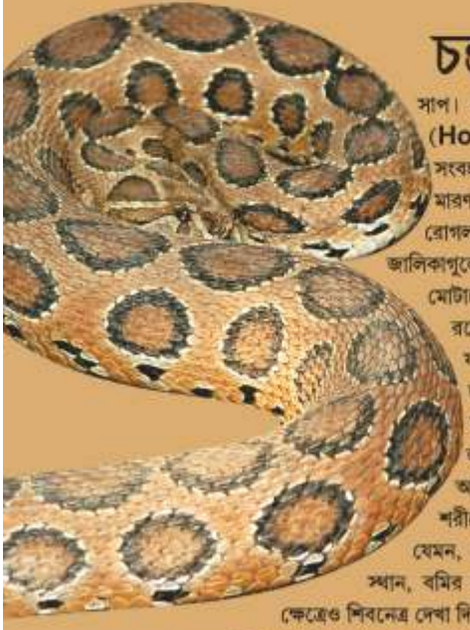
কালাচ

অতি রহস্যময় সাপ। এটি একটি রাতচড়া, ফনাহীন, নার্ভবিষযুক্ত (Neurotoxic) সাপ। এর বিষ স্নায়ুতন্ত্রে আঘাত করে। এই সাপের বিষের মারণ মাত্রা হলো ১ মিগ্রা। এরা সাধারণত ইটের পাঁজা, উইয়ের ঢিপি, ইদুঁরের গর্ত, পরিত্যক্ত বাড়ি, মাটির বাড়ি, চাষের জমি ইত্যাদি জায়গায় পাওয়া যায়। এদের রং কালো, বাদামী, ধুসর কালো বা গাড়ো কালো রঙের সঙ্গে নেলচে আভা। এদের ঘাড়ের কিছুটা পর থেকে লেজ পর্যন্ত সরু সরু সাদা দাগ এককভাবে বা জোড়া জোড়া দেখা যায়। এর বিষদাঁত অত্যন্ত ছোটো। এরা অনেক সময় বিছানা বা বালিশ - কাঁথার মধ্যে বা গোটানো মাদুরের মধ্যে টিকটিকি ও ছোট পোকা মাকড় শিকার করতে ঢুকে পরে। কালাচ কামড়ালে কামড়ের স্থানে কোনো ব্যথা বা জ্বালা হয় না। দাঁতের চিহ্ন পর্যন্ত খুঁজে পাওয়া যায় না। মানুষ বুঝতেই পারে না যে তাকে সাপে কামড়িয়েছে। তবে পেটে অসহ্য ব্যাথা বা কোমড়ে বা গাঁটে গাঁটে বা গলায় ব্যথা পরিলক্ষিত হতে পারে। আবার কিছু কিছু ক্ষেত্রে এই ব্যাথাও পরিলক্ষিত হয় না, শুধু থাকে দুর্বলতা ও ঝিমুনি ভাব সঙ্গে গলা শুকিয়ে আসছে এমনভাব। সুন্দরবন অঞ্চলে সাপের কামড়ে মৃত্যুর প্রধান কারণ হলো এই কালাচ। তবে কি ভাবে বোঝা যাবে? কালাচ কামড়ালে যেটা মূল লক্ষণ সেটা হলো "শিবনেত্র" অর্থাৎ চোখের পাতা পড়ে আসা। রুগী ঠিক মতো চোখ খুলে তাকাতে পারবে না। দেরি হয়ে গেলে ও বাচ্ছাদের ক্ষেত্রে শ্বাসকষ্ট দেখা দেয়। তবে এই শিবনেত্র যে সঙ্গে সঙ্গেই দেখা দেবে এমনটিও নয়। ৩৬ ঘন্টা পরে শিবনেত্র দেখা দিয়েছে এমন তথ্যও মেডিকেল কলেজে আছে। যদি এমন হয় যে কোন একজন সুস্থ মানুষের মধ্য রাতে বা ভোর রাতে হঠাৎ পেটে ব্যাথায় ঘুম ভেঙ্গে গেল কিন্তু তার কোনো কারণ খুঁজে পাওয়া যাচ্ছে না এবং তার সাথে যদি উপরের লক্ষণগুলোর মধ্যে কোনটিও থেকে থাকে তবে সেটা কালাচের কামড় হতেও পারে। তাই কোনো রকম সন্দেহ হলে দেরি না করে কোনো কাছাকাছি সরকারি হাসপাতালে নিয়ে যাওয়াটাই বুদ্ধিমানের কাজ।

গোখরো ও কেউটে



এই দুটি সাপ একই গোষ্ঠীর। ফনাধর, নার্ভবিষযুক্ত (Neurotoxin) সাপ। এই দুটি সাপের বিষের মারণ মাত্রা হলো ১৫ মিগ্রা। এরা দিনে ও রাতে উভয় বেলাই সজাগ থাকে। বিশেষ করে রাতে এবং ভোর ভোর সময়ে এদের গতিবিধি লক্ষ্য করা যায়। এদের বিষও স্নায়ুতন্ত্রে আঘাত করে। এরা সাধারণত চাষের জমি, পুরানো বাড়ি, ইঁদুরের গর্ত, ধানের গোলা এবং জলাশয়ের আশেপাশে (বিশেষ করে কেউটে) পাওয়া যায়। গোখরোর রং কালচে বা কালচে বাদামী বা হালকা বাদামী হয়। ফনাতে একটি U আকৃতির চিহ্ন দেখা যায়। কেউটের রং কালো বা করতে বাদামী রঙের শরীরের উপর হলুদ রঙের সরু আড়াআড়ি দাগ লেজ পর্যন্ত দেখা যায়। কেউটের ফনা ছোটো এবং ফনার পিছনে একটি প্রায় চোখের মতো চিহ্ন থাকে। তবে উভয় সাপেরই ফনার চিহ্ন পরিবর্তনশীল। এই দুটি সাপ কামড়ালে সহজেই বোঝা যায় কারণ ক্ষতস্থানে দাঁতের চিহ্ন পাওয়া যায় তার সঙ্গে খুব ব্যাথা হয় এবং ক্ষতস্থান ক্রমাগত ফুলতে থাকে তাছাড়া কামড়ের জায়গার আশেপাশের রং কালচে হয়ে যেতে পারে এবং ফোসকা পড়ে যেতে পারে। রুগী যন্ত্রণায় ছটফট করবে। নাকি সুরে কথা বলতে পারে। চোখে দ্বৈতদৃষ্টি সৃষ্টি হতে পারে এবং ৩০ মিনিটের মধ্যে রুগী ঝিমিয়ে পড়তে পারে। এই ক্ষেত্রেও শিবনেত্র দেখা যায়।



চন্দ্রবোড়া

মারাত্মক একটি সাপ। এটি একটি ফনাহীন ও রক্ত ধ্বংসকারী (Homotoxin) বিষযুক্ত সাপ। এর বিষ রক্ত সংবহনতন্ত্রে আঘাত করে। এই সাপের বিষের মারণ মাত্রা হলো ৪২ মিগ্রা। তবে কিছুটা স্নায়ুবিক রোগলক্ষণও দেখা যায়। এই সাপের বিষ রক্তের জালিকাগুলোকে নষ্ট করে দেয়। এদের শরীর বেশ মোটাসোটা হয় এবং বাদামী বা হলদে বাদামী রঙের শরীরের উপর গোল গোল চিহ্ন দেখা যায়। কামড়ানোর পর কামড়ের স্থানের দাঁতের চিহ্ন দেখতে পাওয়া যায়। রুগী জ্বালা-যন্ত্রণায় ছটফট করে। কামড়ের জায়গায় রং চটে যেতে পারে বা লালচে হয়ে আশেপাশে ফোসকা পরে যেতে পারে। শরীরের বিভিন্ন স্থান থেকে রক্ত ক্ষরণ হয়। যেমন, চোখ, দাঁতের মাড়ি, পুরানো কোনো ক্ষত স্থান, বমির সঙ্গে এমনকি মূত্রের সঙ্গে। চন্দ্রবোড়ার ক্ষেত্রেও শিবনেত্র দেখা দিতে পারে। বাসস্থান প্রায় একই রকম। তবে এরা একটু তুলনামূলক শুষ্ক জায়গায় থাকতে ভালোবাসে। এরা বিরক্ত হলে প্রেসার কুকারের সিটির মতো আওয়াজ করে।

চিকিৎসা

প্রথমেই জেনে রাখুন কোনো সাপের কামড়েই সাথে সাথে মারা যায় না। যথেষ্ট সময় পাওয়া যায় হাসপাতালে পৌঁছে চিকিৎসা করবার জন্য। আর দেশে প্রায় ৯০ শতাংশ ক্ষেত্রে নির্বিষ ঘটে এবং অধিকাংশ ক্ষেত্রে মানুষ আতঙ্কে হৃদরোগে আক্রান্ত হয়ে মারা যায়। যে সাপই কামড়াক না কেন কামড়ের ১০০ মিনিটের সরকারি হাসপাতালে নিয়ে যেতে হবে এবং বিষধর সাপের ক্ষেত্রে যদি ১০০ মিনিটের মধ্যে যদি ১০০ ml Anti Snake Venom Serum রুগীর শরীরের প্রবেশ করানো যায় তাহলে ১০০ শতাংশ নিশ্চিত করে বলা যায় যে রুগী ১০০ সুস্থ হবে। শুধু কোনো রকম দেরি না করে কামড়ের সঙ্গে সঙ্গেই সরকারি হাসপাতালে নিয়ে যেতে হবে। মনে রাখবেন সাপে কামড়ের চিকিৎসা গ্রামের একটি ছোট স্বাস্থ্যকেন্দ্র যেখানে ডাক্তারবাবুরা রাত্রি বেলাও চিকিৎসা প্রদান করেন, সেখানেই ভালো ভাবে করা সম্ভব। এর জন্য কোনো সুপার স্পেশালিটি হাসপাতাল দরকার নেই। কাছের হাসপাতালেই নিয়ে যাবেন। কারণ প্রতিটি মিনিট খুবই গুরুত্বপূর্ণ (১০০ মিনিট খুবই গুরুত্বপূর্ণ)। আর একটা কথা, যদি রুগীকে হাসপাতাল থেকে অন্য হাসপাতালে দরকার অনুযায়ী প্রেরণ করতে হয় তাহলে অবশ্যই জেনে নেবেন যে, প্রথম ১০০ ml AVS দেওয়া হয়েছে কিনা। কারণ এটা সরকারি নির্দেশ যে ১০০ ml AVS না দিয়ে কোনো রুগীকে অন্যত্র প্রেরণ করা যাবে না তা সে যতই সঙ্কটজনক অবস্থা হোক না কেন।

একটা কথা জেনে রাখা দরকার যে, সাপের কামড়ের চিকিৎসা শুধুমাত্র রোগ লক্ষণের উপর ভিত্তি করেই হয়, তাই কামড়ানোর পর সাপ মারতে বা খুঁজতে গিয়ে বা কোনো রকম রাসায়নিকের ব্যবহার করতে গিয়ে বা গরম কিছু খাওয়াতে গিয়ে এমনকি বাঁধন দিতে গিয়ে সময় নষ্ট করবেন না। কারণ বাঁধন দিয়ে বিষ আটকানো যায় না, উল্টো ক্ষতি হতে পারে বিশেষ করে চন্দ্রবোড়া কামড়ালে।

তাই আতঙ্কিত হবেন না, যে কোন অজানা কামড় বা সাপের কামড়ের রুগীকে তাড়াতাড়ি বাইক বা অন্য কোনো গাড়ি করে সরকারি হাসপাতালে নিয়ে যান। কারণ বিশেষ করে কালাচের কামড়ের ক্ষেত্রে রোগী অধিকাংশ ক্ষেত্রে বলতেই পারবেনা যে তাকে সাপে কামড়িয়েছে কিনা। কোনো ওঝা বা গুণীনের কাছে রোগীকে নিয়ে যাবেন না। শুধুমাত্র আধুনিক বিজ্ঞানসম্মত চিকিৎসার মাধ্যমেই সর্প দংশনে মৃত্যুর হার কমানো সম্ভব।

নর্থ সেন্টিনেল আইল্যান্ড
এক রহস্যময় দ্বীপ

পার্থ দেবনাথ
বনাঞ্চল আধিকারিক

সৃষ্টির উষালগ্নে ইতিহাসের পাতায় আদিম জনজাতির কথা আমরা প্রত্যেকেই পড়েছি। আদিম জনজাতির জীবনযাত্রা, শিকার পদ ধতি, পশুরূপ হিংস্র ব্যবহার প্রাচীন ইতিহাসের এইসব রচনা বর্তমান পাঠককুলকে রোমাঞ্চ ও উদ্দীপনায় ভরিয়ে তোলে। শিহরিত পাঠকগন আজও সেইসব প্রাগৈতিহাসিক বন্য, বর্বর উপজাতির কথা স্মরণ ও কল্পনা করে রোমাঞ্চ তথা অ্যাডভেঞ্চারে অবগাহন করেন। হয়ত স্বপ্নে বা কল্পনার ডানায় ভর করে আপনি দেখলেন গ্যালিভার্স ট্রাভেলসের গল্পের মতো আপনিও একটি অজানা দ্বীপে এসে পৌঁছেছেন এবং চারিপাশ থেকে বন্য, বর্বর আদিম জনজাতি তীরবর্ষনে উদ্যতপ্রায়। ভাবছেন এটা নিছকই কল্পনা, বাস্তবের সাথে এর মিল সম্পূর্ণরূপে অভাবনীয়। তবে বলি বর্তমান প্রযুক্তি, কম্পিউটার ও ইন্টারনেটের যুগেও এখনো এমন কিছু মানুষ সেই প্রাচীন বর্বরতা, শিকার ও পশুরূপ আচরণকে জীবনযাত্রার পাথেয় করে বেঁচে আছে ভীষণই আশ্চর্যজনকভাবে। নিছক কল্পনাপ্রসূত বলে প্রতীয়মান হলেও এটাই সত্যি যে একবিংশ শতাব্দীতেও পৃথিবীতে এমন কিছু জায়গা আছে যেখানে আপনি চাইলেও যেতে পারবেন না। সভ্যজগতের পদচিহ্ন তেমন একটা সেখানে পড়ে না। আর পড়লেও সেখান থেকে ফিরে আসাটা সম্ভব হয়না। তেমনই একটি স্থান নর্থ সেন্টিনেল দ্বীপ।

বঙ্গোপসাগরে অবস্থিত আন্দামান দ্বীপপুঞ্জের অন্তর্গত একটি দ্বীপ হল নর্থ সেন্টিনেল আইল্যান্ড। এই দ্বীপে মানুষ থাকে ঠিকই।

এখানে সেন্টিনেলী নামক এক প্রাচীন উপজাতির বসবাস। এই জাতি প্রায় ষাট হাজার বছরেরও পুরানো দক্ষিণ এশীয় জনগোষ্ঠীর একটি আদিম জনজাতি। এই দ্বীপের অতুলনীয় সৌন্দর্য যে কাউকে ভীষণভাবে আকর্ষণ করবে। ম্যানগ্রোভ অরণ্য পরিবেষ্ঠিত, প্রবালপ্রাচীরাবৃত, বালুকাময় তটভূমি - জীববৈচিত্রে পরিপূর্ণ ঘন বনভূমি ও বন্যপ্রাণ সবকিছুই হয়ত আপনাকে দ্বীপটিতে ভ্রমনে আকৃষ্ট করবে। কিন্তু এই প্রাকৃতিক সৌন্দর্য কেউ উপভোগ করতে পারবে না। কারণ এই আদিম উপজাতি অন্য কোন মানুষের সংসর্গ একেবারেই পছন্দ করেনা। বহিরাগতদের উপর আক্রমণাত্মক মনোভাবের জন্য সেন্টিনেলীরা বিশেষভাবে পরিচিত। এখানকার উপজাতিরা বাইরের জগত সম্পর্কে অসচেতন। বর্তমান আধুনিক যুগেও আধুনিকতার ছোঁয়া তারা পায়নি। আধুনিক সভ্যজগতের সাথে কোনও যোগাযোগই তারা করতে চায় না। তাই এই দ্বীপের মানুষদের ভাষা, ধর্মানুষ্ঠান, জীবনযাত্রা সকলই গোটা বিশ্বের কাছে অজানা। সেন্টিনেলী জাতি প্রধানত একটি শিকার নির্ভর জাতি। তারা তাদের বেঁচে থাকার জন্য প্রয়োজনীয় উপকরণ - শিকার, মাছ ধরা ও বন্য লতা পাতার মাধ্যমে পুরণ করে থাকে। এখন পর্যন্ত এদের কৃষিকাজ ও আগুনের ব্যবহারের প্রমাণ পাওয়া যায় না। এখন পর্যন্ত সঠিকভাবে সেন্টিনেলীদের জনসংখ্যার পরিসংখ্যান পাওয়া যায়নি। ধারণা অনুযায়ী জনসংখ্যা সর্বনিম্ন ৩৯ থেকে ২৫০ এবং সর্বোচ্চ ৫০০ পর্যন্ত।

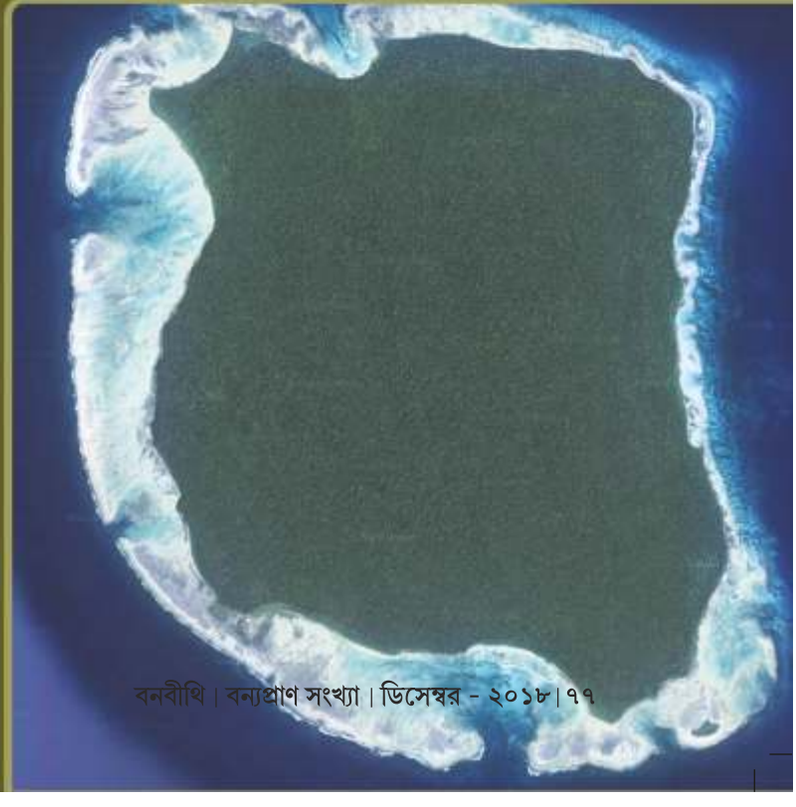
২০০১ সালে পরিচালিত ভারতের জনপরিসংখ্যানে ৩৯ জন পৃথক ব্যক্তির উপস্থিতি রেকর্ড করা হয়, যাদের মধ্যে ২১ জন পুরুষ ও ১৮ জন নারী। নিরাপত্তাজনিত কারণে পরিসংখ্যানটি প্রয়োজনের চেয়েও বেশী দূর থেকে পরিচালনা করা হয়েছিল।। সুতরাং স্বাভাবিকভাবেই এত বড় দ্বীপের সঠিক জনপরিসংখ্যান করা সম্ভবপর হয়ে ওঠেনি। সেন্টিনেলীদের কাছে ৭২ বর্গকিমির (১৮০০০ একর) আয়তনের দ্বীপটিই যেন পৃথিবী। ভৌগলিক অবস্থানের দিকে লক্ষ্য রাখলে দেখা যায় এই রহস্যাবৃত দ্বীপটি পোর্টব্লেয়ার থেকে ৫০ কিমি পশ্চিমে ১১.৫৫৭ উঃ অক্ষাংশ ও ৯২.২৪১ পূঃ দ্রাঘিমাংশে বঙ্গোপসাগরের উপর অবস্থান করছে। চারিদিক প্রবালপ্রাচীর পরিবেষ্ঠিত ও সম্পূর্ণ দ্বীপটি ঘন অরণ্যের আবরণে ঢাকা। দ্বীপটির কোনও স্থানে সর্বোচ্চ উচ্চতা ১২২ মিটার পর্যন্তও রয়েছে। নর্থ সেন্টিনেল দ্বীপটি ভারতের কেন্দ্রশাসিত অঞ্চল আন্দামান ও নিকোবর দ্বীপপুঞ্জের একটি একটি অংশ হিসাবে শাসিত হয়, কিন্তু এই দ্বীপের আদিবাসীরা তাদের সকল বিষয়ে স্বাধীনতা ভোগ করে। এখানকার আদিবাসীরা এতটাই ভয়ানক ও আক্রমনাত্মক যে এই উপজাতিটিকে পাষাণকালের জনজাতি বলা হয়। কয়েকটি রিপোর্টে এই জনজাতিটিকে পৃথিবীর সবচেয়ে ভয়ানক ও অজানা জনজাতি আখ্যা দেওয়া হয়েছে।

সভ্যতার বিস্তারে এই দ্বীপটি করায়ত্ত করতে প্রচেষ্টাও কম করা হয়নি। সেটি ইতিহাসের পাতার দিকে পর্যবেক্ষন করলেই বোঝা যাবে। তার আভাস পাওয়া যায় মার্কোপোলোর একটি লেখায় এই দ্বীপের উল্লেখ থেকে যদিও আদৌ তিনি ওই দ্বীপে নেমেছিলেন কিনা তা নিয়ে ইতিহাসবিদদের মধ্যে ধন্দ আছে। উল্লেখ্য কুট জাতি হিসাবে পরিচিত ব্রিটিশদের ইস্ট ইন্ডিয়া কোম্পানীর নৃতত্ত্ববিদ এম.ভি. পোর্টম্যানের নেতৃত্বে একটি দল ১৮৮০ সালে ওই দ্বীপটিতে যান। তাদের উদ্দেশ্য ছিল ভাল খাবার দাবার পরিবেশ দিয়ে সেন্টিনেলীদের মন জয় করে দ্বীপের দখল নেওয়া। উক্ত উদ্দেশ্যসাধনের প্রাক্কালে তারা কয়েকজন অধিবাসীকে অপহরণ করে সভ্য জগতে নিয়ে আসেন। বন্ধুত্ব স্থাপনের পরিবর্তে এই প্রৌঢ় দম্পতি ও চার শিশুকে তুলে আনা হয় পরীক্ষা নিরীক্ষার মাধ্যমে আধুনিক সমাজের সাথে মেলবন্ধনের জন্যে।

কিন্তু ব্রিটিশদের এই প্রচেষ্টা গোড়াতেই শেষ হয়ে যায়। কারণ অপহৃত দ্বীপবাসীরা কিছুদিনের মধ্যেই মারা যায়। এর কারণ হিসাবে ধারণা করা যায় তাদের দুর্বল রোগ প্রতিরোধ ক্ষমতা। সভ্যজগত থেকে অনেককাল দূরে থাকার জন্য ধারণা করা হয় সর্দি-কাশির মত সাধারন রোগেও এরা মারা যেতে পারে। ব্রিটিশদের এই অভিযান ও অপহৃত দ্বীপবাসীর এই মৃত্যুই সেন্টিনেলীদের প্রতিশোধস্পৃহার আগুনকে ব্যপকভাবে প্রজ্জ্বলন করে। এর ফলে একদিকে যেমন ব্রিটিশদের উদ্দেশ্য ও স্বার্থ চরিতার্থ হয়নি, অন্যদিকে সেন্টিনেলীদের সাথে পুনর্বার সংযোগস্থাপন প্রায় অসম্ভব হয়ে পড়ে। ১৯৬৭ সাল থেকে পোর্টব্লেয়ারে অবস্থিত ভারতীয় কর্তৃপক্ষ সেন্টিনেলীদের সাথে পুনর্বার যোগাযোগের জন্য বেশ কিছু পদক্ষেপ নিয়ে আসছে। নৃতাত্ত্বিক ও ভারতের ট্রাইবাল ওয়েলফেয়ার ম্যানেজমেন্টের মহাপরিচালক টি. এন. পন্ডিতের নেতৃত্বে সেন্টিনেলীদের সাথে যোগাযোগ স্থাপনের উদ্দেশ্যে বেশ কিছু অভিযান পরিচালনা করা হয়। এসব অভিযানে তাদেরকে উপহার হিসাবে সমুদ্র সৈকতে নারকেল ছড়িয়ে বন্ধুত্ব স্থাপনের চেষ্টা করা হয়। এই প্রচেষ্টার মধ্য দিয়ে সেন্টিনেল দ্বীপের আদিবাসীদের বহিরাগতদের সম্পর্কে সৃষ্ট হিংস্র মনোভাব দূর করার চেষ্টা করা হয়। বেশ কিছু সময়ের জন্য ধারণা করা হয়েছিল অভিযানগুলি ফলপ্রসু হচ্ছে, কিন্তু ১৯৯০ এর দশকে বহিরাগতদের সাথে দক্ষিণ ও মধ্য আন্দামান দ্বীপপুঞ্জের বসবাসরত জারওয়া জনগোষ্ঠীর ওপর পরিচালিত একইরকম অভিযানে সৃষ্ট বেশ কিছু ধারাবাহিক আক্রমনে কিছু মানুষ প্রাণ হারায়। এছাড়া নতুন রোগ বিস্তারের আশঙ্কা দেখা দেওয়ায় অভিযানগুলি বন্ধ হয়ে যায়।

সেন্টিনেলীদের আক্রমনাত্বক মনোভাব প্রায়শই ইতিহাসের ঘটনাবলীতে সাক্ষী থেকেছে। ১৯৭৫ সালে ন্যাশানাল জিওগ্রাফির একজনও পরিচালক একটা তথ্যচিত্র বানানোর উদ্দেশ্যে এই দ্বীপে গিয়েছিলেন। কিন্তু হিংস্র উপজাতিটি তার পায়ে বিষাক্ত তীর ছুঁড়ে তাকে মারাত্মভাবে আহত করে। ১৮৬৭ সালের শেষভাগে ভারতীয় বানিজ্যিক জাহাজ নীলেভ এস দ্বীপের কাছে প্রবালপ্রাচীরে আটকে পড়ে। ১০৬ জন যাত্রী ও নাবিক এই দ্বীপে অবতরন করলে সেন্টিনেলীদের আক্রমনের মুখে পরেন। অবশেষে রয়েল নেভির টীম এই দলটিকে উদ্ধারে অবতীর্ন হয় ও সকলে প্রাণে বেঁচে ফেরেন। ১৯৯১ সালে ভারত সরকার পুনরায় তাদের সাথে সন্ধি করার চেষ্টা করে। কিন্তু ১৯৯৬ সালে তারা পরোক্ষ ভাবে জানিয়ে দেয় যে তারা বাইরের পৃথিবীর কারও সাথে যোগাযোগ রাখতে চায় না। তারপর থেকে সেন্টিনেলীরা নির্বিঘ্ন জীবনে ফিরে যায়। পরে ২০০৮ সালের ভয়াবহ ভূমিকম্প ও সুনামীতে দ্বীপের ব্যাপক ক্ষতিসাধন হয়। সেন্টিনাল দ্বীপবাসীরা বেঁচে আছে কিনা ও সংশ্লিষ্ট সুনামীতে দ্বীপের কতটা ক্ষতি হয়েছে, এই তথ্য সংগ্রহের জন্যে ভারত সরকার এই দ্বীপে হেলিকপ্টার পাঠালে তারা তীরবর্ষনের সাথে স্বাগত জানিয়ে জানান দেয় যে তারা বেঁচে আছে। অবশেষে তাদের বিরক্ত না কদ্দরার সিদ্ধান্ত নেয় ভারত সরকার। ২০০৬ সালে আন্দামান দ্বীপের দুইজন জেলে সেন্টিনেল দ্বীপের কাছাকাছি মাছ ধরতে যায়। রাতেরবেলা অতিরিক্ত মদ্যপানে আসক্ত হয়ে ঘুমিয়ে পড়লে সমুদ্রস্রোতে ভেসে তারা সেন্টিনেল আইল্যান্ডের সৈকতে উপনীত হয়। এই আদিম জনজাতিরা দুজনকেই নৃশংসভাবে হত্য করে। ভারতীয় কোস্টগার্ড জেলেদের লাশ উদ্ধারে হেলিকপ্টার পাঠালে দ্বীপবাসীরা অভ্যাস অনুযায়ী তীর ছুঁড়তে থাকে হেলিকপ্টারের উদ্দেশ্যে। উদ্ধারকার্যে আসা হেলিকপ্টারের পাখার ঘূর্ণনে সৃষ্ট প্রবল বাতাসের তোড়ে অল্পগভীর কবরের মাটি সরে গিয়ে ঐ দুজন জেলের মৃতদেহ দেখা যায়। পরিস্থিতির প্রতিকূলতাকে অনুধাবন করে কোস্টগার্ডের কর্মীরা লাশ উদ্ধার না করেই ফিরে আসে। এরপর থেকে নিরাপত্তাজনিত কারণে ও সতর্কমূলক ব্যবস্থা গ্রহণের অংশ হিসাবে ভারত সরকার দ্বারা ঐ দ্বীপ এবং তার চারিপাশে ৩ নটিক্যাল মাইল পর্যন্ত সীমানা এক্সক্লুসন জোন হিসাবে নিষিদ্ধ ঘোষিত হয়।

রহস্যেভরা এই পৃথিবীতে বারমুডা ট্রায়াঙ্গোলের রহস্য যেমন উদ ধার করা যায়নি, তেমনই একবিংশ শতকেও নর্থ সেন্টিনেল আইল্যান্ডের রহস্যও গভীর ধোঁয়াশায় আচ্ছন্ন। ভয়াবহ সুনামীর পরেও সমুদ্র পরিবেষ্ঠিত এই দ্বীপের অধিবাসীরা কীভাবে প্রাণে বেঁচে গেল, তা সত্যিই প্রশ্নচিহ্নের সম্মুখীন বলে প্রতীয়মান। এছাড়া বিভিন্ন সময়ে দুর্ঘটনাগ্রস্থ হেলিকপ্টারে ছোঁড়া তীরের আকার দেখেও ধারণা করা যায় সেন্টিনেলীরা মাছ শিকার, আত্ম রক্ষা, আক্রমণের জন্য এক এক রকমের তীরের ফলা ব্যবহার করত। এতে তাদের দক্ষতা প্রশংসারই আবেদন রাখে। যুগের বিবর্তনে বিভিন্ন অসভ্য, নগ্ন, নরখাদকেরাও সভ্যজগতের আলোতে এসে উন্নততর জীবনযাত্রায় অভ্যস্ত হলেও, সেন্টিনেলীরা কেন নিজেদের এত বছরের পরেও পাদপ্রদীপের অন্তরালে রাখতে সচেস্ট হচ্ছে, তা যথেস্ট প্রশ্নচিহ্নের অবকাশ রাখছে। সেটিনালীরা সত্যিই কি সভ্যজগতের সংস্পর্শে আসতে চায় না, না এই দ্বীপে এমন কোনো অজানা প্রাকৃতিক মহার্ঘ সম্পদ রয়েছে, যা তারা বিহিবিশ্বে জানান দিতে চায় না এখনও পর্যন্ত এই রহস্যের উন্মোচন হয়নি। বিভিন্ন সময়ে পাঠানো ড্রোনের সাহায্যে কিছু অস্পস্ট ছবি তোলার চেস্টা চললেও, সেন্টিনেলীরা ড্রোনকেও তীরবর্ষণে ধ্বংস করতে উদ্যাত হত। যাই হোক প্রায় বারো বছর পরে নতুন করে রহস্য উদঘাটনের চেস্টা ও নতুন করে অভিযাত্রীদের মৃত্যুর খবর নেই। ভারত সরকারের সমস্ত প্রচেস্টাকে ব্যর্থতায় পর্যবসিত করে সেন্টিনেলীরা হয়ত স্বস্তিতে আদিম সংস্কৃতিতে ব্যস্ত হয়ে পড়েছে। অদূর ভবিষ্যতে অ্যাডভেঞ্চারে পরিপূর্ণ কেউ বা কারা বিভিতিভূষণ বন্দ্যোপাধ্যায়ের চাঁদের পাহাড় গল্পের দুঃসাহসী ট্রাভেলার তথা নায়ক শংকরের মতোই নর্থ সেন্টিনেল আইল্যান্ডের রহস্যের পর্দাফাঁস করবে, সেই আশাতেই গোটা ভারত তথা পৃথিবী অপেক্ষমান। একমাত্র সময়ই ভবিষ্যতের এই রহস্য উদঘাটনের ইতিবৃত্তের সাক্ষী থাকবে। ততদিন পর্যন্ত না হয় আমাদের সুন্দর কল্পনাতেই বাঁচুক অ্যাডভেঞ্চার ও রহস্যে পরিপূণ নর্থ সেন্টিনেল আইল্যান্ড।



Winter Wren
(Troglodytes hiemalis)
Photograph : Ujjal Ghosh, IFS

Swatch of no Ground

গাইবী আওয়াজ

মিতা সিংহ
পরিবেশ প্রেমী

সুন্দরবনের নেতিধোপানীর এ্যাকোমোডেসন বোটের ছাদে গোল হয়ে বসে আমরা ক'জন। এসেছি বনবিবি পুজোয় আমন্ত্রিত হয়ে। জ্যোৎস্নার প্লাবনে জমাটি আড্ডায় আমরা দু'জন আর এখানকার বনকর্মীরা। নানান কথায় বুঁদ হয়ে থাকার মাঝেই বোটম্যান অর্জুন হঠাৎ সোজা হয়ে বসে উত্তেজিত ভাবে উপরে তর্জনী তুলে বলল ঐ! ঐ!

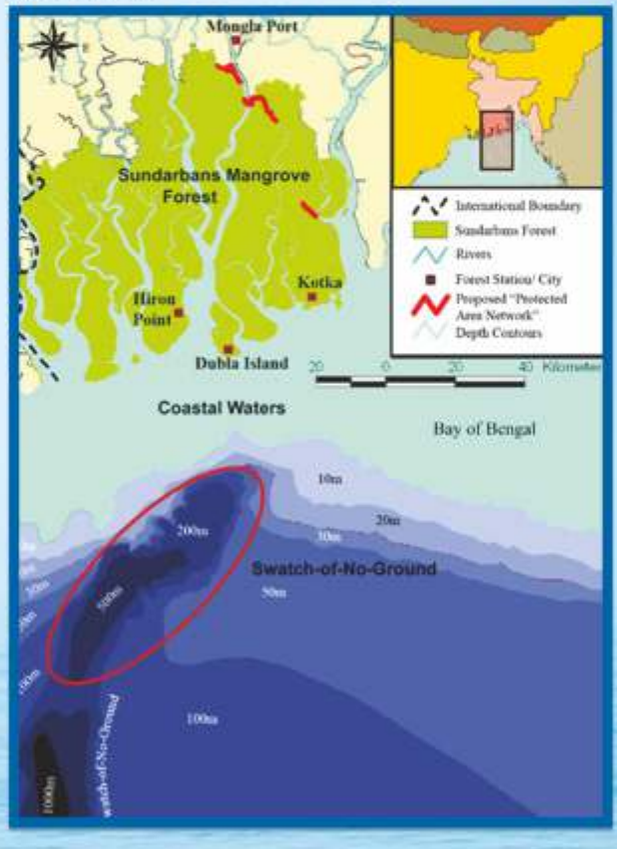
ফরেস্ট গার্ড গোবিন্দ বলে উঠল, কি ঐ? ঐ?
এবার আমরাও শুনলাম আওয়াজটা। গুম্ গুম্, গুম্
গোবিন্দ বলল, এখান থেকে সুমুদ্র মাত্র সাত ঘন্টার বোট রাস্তা,
ওখান থেকেই বোধহয় আসছে শব্দটা।

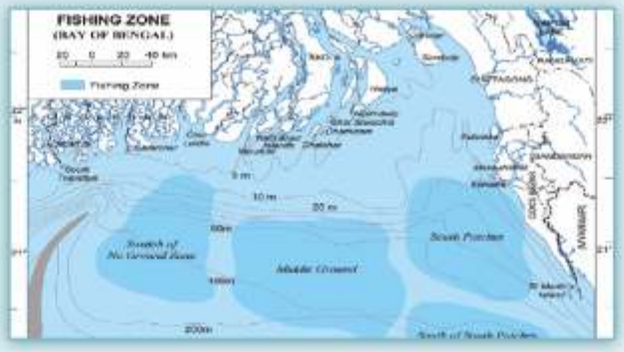
পুজো উপলক্ষ্যে কাজে আসা এক গ্রামবাসী বলল, পটকা বা বোম ফুটতেচে কোথাও। বহুদিন পরে আবার শব্দটা শুনে কেমন আনমনা হয়ে পড়েছিলাম। চটক ভেঙ্গে ওদের সম্ভাব্য সঠিক কারণটা বলতে শুরু করলাম — অতলস্পর্শী খাদের (Swatch of no Ground) কথা। শব্দটা সেখান থেকেই আসে। সুন্দরবনের দক্ষিণে সাগরের প্রায় ৩০ কিলোমিটার দূরে আছে এক অতল খাদ, অতিরিক্ত জলস্ফীতি আর তীব্র ঘূর্ণন বা জল পাক খাবার কারণেই এই শব্দ তৈরি হচ্ছে।

প্রথম এই শব্দ সম্পর্কে উল্লেখ করেন জে. ফার্গুসন। Quarterly Journal of the Geographical Society, ১৮৬৩ তে তিনি উল্লেখ করেন, 'এই উপকূল সমুদ্র স্রোত পূর্ব-পশ্চিম দিক থেকে বিপরীতমুখি হবার কারণে উপকূলের প্রায় মধ্যবর্তী স্থানের সামান্য পূর্ব ঘেঁষে একটা হচ্ছে। সবগুলো মোহনা নিঃসৃত পলি সমৃদ্ধ জলরাশি ঐ আবর্ত অভিমুখে ধাবিত হচ্ছে। ফলস্বরূপ পলি সঞ্চারণে গঠিত দ্বীপমণ্ডলীর প্রস্তভাগের অভিমুখ সব ঐ আবর্তের দিকেই।'

অর্থাৎ আবর্তের পশ্চিমের দ্বীপগুলির অভিমুখ পূর্ব দিকে আর পূর্ব দিকের দ্বীপগুলির অভিমুখ পশ্চিম দিকে। আর এই আবর্তের তলদেশস্থিত অতলস্পর্শী এক সমুদ্র খাতের অবস্থিতি এবং তার দক্ষিণবাহী স্রোতই এর কারণ।

এ'টি গঙ্গা ব্রহ্মপুত্র ব-দ্বীপের পশ্চিমে অবস্থিত খাত আকৃতির সামুদ্রিক অববাহিকা বা গিরিখাত, যা বঙ্গোপসাগরের মহীসোপানকে কৌণিকভাবে অতিক্রম করেছে। এই খাতকে গঙ্গা খাত হিসাবেও উল্লেখ করা হয়।



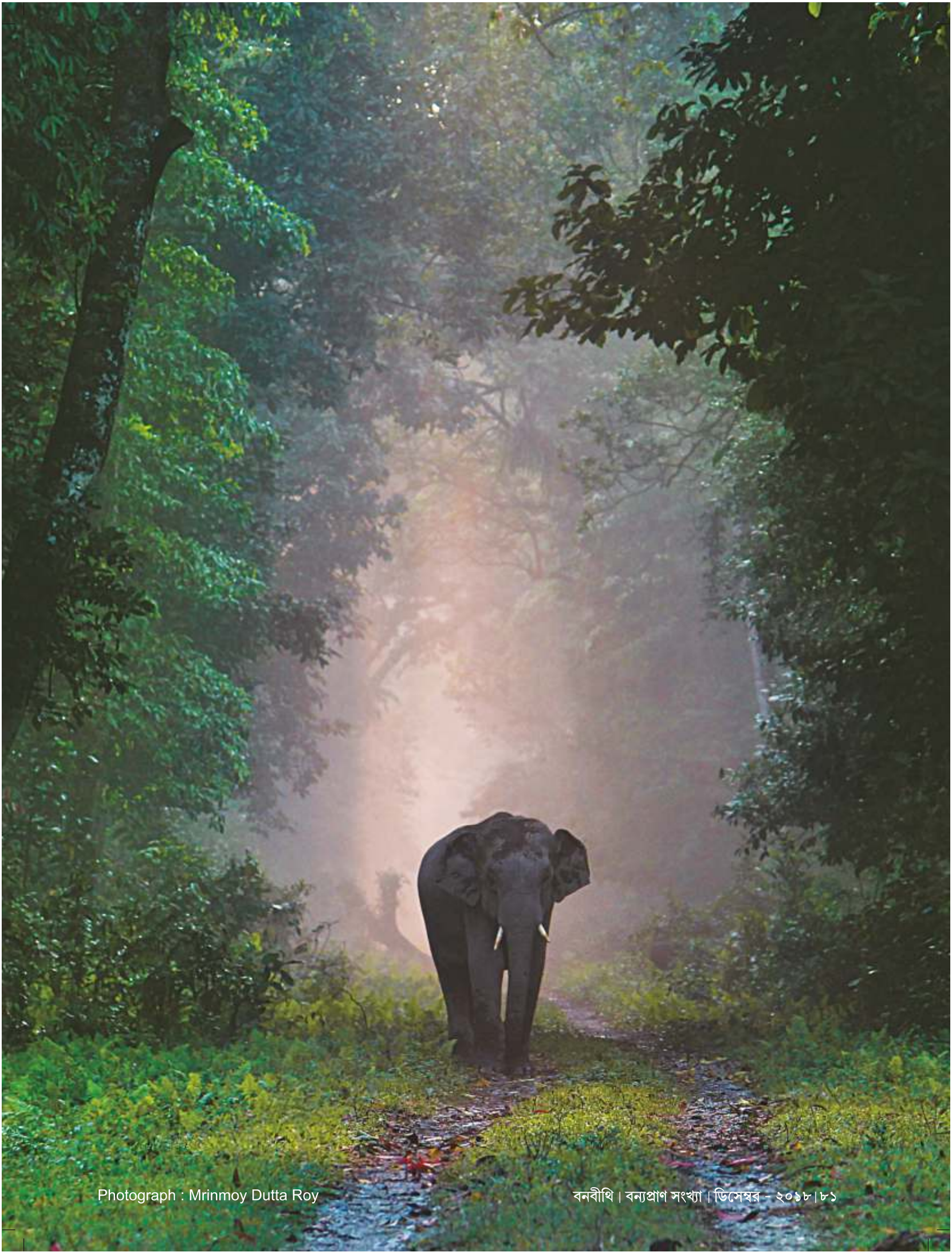


উপকূলের প্রায় ৩০ কিমি দক্ষিণে সমুদ্রের বুকে এই আবর্তের তলদেশে আছে এই অতি গভীর খাত, যাকে বলা হয়েছে 'সোয়াচ্ অব নো গ্রাউন্ড'। দক্ষিণ থেকে উত্তর দিকে সামান্য হেলে তাকা এই খাতের অবস্থান উত্তর দিকে ২১° ২৫´ উঃ অক্ষ্যাংশ, ৮৮° ৩৬´ পূঃ দ্রাঘিমাংশ এবং দক্ষিণদিকে ১৯° উঃ অক্ষ্যাংশ, ৮৯° পূঃ দ্রাঘিমাংশ। লম্বায় প্রায় ৩০০ কিমি এবং গড়ে ২৫ কিমি চওড়া এই খাতের গভীরতা নিয়ে আর. ডি. ওল্ডহ্যাম, Manual of Geological of India-Calcutta, ১৮৯৩ তে বলেছেন 'এই অরণ্যাঞ্চলের মধ্যবর্তী স্থানের দক্ষিণে সাগরের অভ্যন্তরে একটি গভীর খাত বর্তমান। খাতের আশেপাশের জলের গভীরতা ৫ থেকে ১০ ফ্যাদম, হঠাৎ করে এই খাতে জলের গভীরতা ২০০ থেকে ৩০০ ফ্যাদম হয়ে গেছে।' এই খাত ধরেই সাগরের বুকে জমা হওয়া পলি সমুদ্র স্রোতে আরও গভীরে চলে যাচ্ছে।

আজ থেকে ৫০-৫৫ বছর আগেও বর্ষাকালে সুন্দরবনের পূর্ব-দক্ষিণে সাগরের বুক থেকে কখনো গভীর রাতে এক জলদ গম্ভীর শব্দ শোনা যেত। যে শব্দকে সুন্দবনের হিন্দুরা বলত, লঙ্কায় রাবণ রাজার রাজ প্রাসাদের তোরণদ্বার খুলছে, আর মুসলমানরা বলত, ইমামের যুদ্ধ প্রস্তুতির কামানের শব্দ। সতীশ চন্দ্র মিত্রের 'যশোদা খুলনার ইতিহাস' বইতে এর উল্লেখ পাই। তাঁর লেখায় পেলাম বাংলার মাঝি মল্লারা এই শব্দকে বরিশালের কামান, ইংরেজরা বরিশাল গান (Barisal Gun) নামে অভিহিত করত। আর বরিশালের সাধারণ মানুষেরা এই শব্দকে 'গাইবী আওয়াজ' বা 'দৈব শব্দ' বলে মনে করেন।

এমনই এক শব্দ শুনবার সৌভাগ্য হয়, মার্চ ২৯, ২০১৬ সন্ধ্যা ৭-৭.৩০ নাগাদ। তখন ঝড়খালির বাড়িতে আমাদের অবস্থান। পশ্চিম-দক্ষিণ দিকে বহু দূর থেকে গুরু গম্ভীর তোপধ্বনির মত কখনো একক বা কখনো জোড়া শব্দ সামান্য ব্যবধানে ক্রমান্বয়ে ভেসে আসছিল। আকাশ তখন মেঘাচ্ছন্ন, ঐ কোণ থেকে জোরালো বাতাস ও কালো মেঘ ছেয়ে আসছিল। কিছুদিন পর আবার তেমনই শুনেছি ১৩ এপ্রিল ও ১৪ অগাস্ট মেঘলা রাতে। বলা চলে অমাবস্যা, পূর্ণিমায় বৃষ্টি ও মেঘলা দিনে কোটালের সর্ব্বোচ্চ জলস্ফীতির সময় মাঝে মধ্যে এ শব্দ শোনা যায়। জানি না এই শব্দের উৎস হুগলি নদীর মোহনার ১৪০ কিলোমিটার দক্ষিণে তৈরি হওয়া স্বল্প দৈর্ঘ্যের ঐ খাত কিনা।

আরও দু'টি বিখ্যাত এমন ব-দ্বীপমুখি খাত দেখতে পাওয়া যায়। সিন্ধু নদের মোহনার অদূরে সিন্ধু খাত, মিসিসিপি ব-দ্বীপের পশ্চিমে মিসিসিপি খাত।



Photograph : Mrinmoy Dutta Roy

The tale of Lalgarh Tiger

WHEN NATURE LOST TO MANKIND

Bikasranjan Chakrabarti
WBFS (Retd.)

Introduction

As a part of our Fundamental Duties according to the Article 51A under the Constitution of India, It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers, wildlife and to have compassion for living creatures. Major man animal conflicts including the migration of wild elephants and depredation caused by wild elephants in South Bengal in the regions of Paschim Medinipur, Jhargram, Bankura and Purulia Districts are very common burning issues in each and every year and the situations are managed by the forest staff by the help of administration, involving local Forest protection committees (FPCs), local villagers and other stake holders. The faunas and floras in these areas are generally managed by the concerning Territorial Divisions, Range and Beat with the help of Joint Forest Management committees (JFMCs) including FPC and local people in the areas. Besides in case of Lalgarh tiger, in spite of taking different efforts by the concerning forest officials and staff with the help of wildlife experts, JFMCs, local villagers and others regarding the protection of Lalgarh tiger unfortunately could not save the tiger in these regions. We saw humans, but no humanity. The animal had the right to live in nature but we lost him on 13th April, 2018 a natures heir wild big cat, a full grown adult male Royal Bengal Tiger Panthera tigris tigris Schedule-I most endangered animal due to human cruelty about 20 km away from Lalgarh at Baghghora forest of Chandra Range under Medinipur Division in the district of Paschim Medinipur.

Flora and fauna of red lateritic tracts of South Bengal

Major Forest flora types is Northern Tropical Dry Deciduous Forests (NTDDF) or, Dry Penninsular Sal Forest (DPSF), Forest type: 5B / C1c & distributed over the districts of Jhargram, Paschim Medinipur, Bankura and Purulia. The principal forest tree species in the red lateritic tract of the districts are Sal (Shorea robusta), Peasal (Pterocarpus marsupium), Kend (Diospyros melanoxylon), Mahul (Madhuca longifolia)), Kusum (Schleichera oleosa), Haldu (Haldina cordifolia), Asan (Terminalia tomentosa), Bahera (Terminalia bellirica), Rahara (Soyamida febrifuga), Dhaw (Anogeissus latifolia) and Parashi (Cleistanthus collinus) etc. The types of forest cover in the districts are fragmented forests, protection of Sal coppice and its associates, plantation of Sal with associates, plantation of Akashmoni (Acacia auriculiformis), Patash (Eucalyptus sp.) etc and having different Canopy Density Classes (CDC) such as very dense forest (VDF, CD >70%), moderately dense forest (MDF, CD 40 to 70%), open forest (OF, CD 10 to 40%) and along with blanks, degraded and poor quality forest lands, where viable rootstock / stumps less than 200 per ha (VRS or STM < 200 / ha) etc. Forests in some areas are mostly patches and intercepted with habitation, roads, agriculture field and non-forest land. The forest is also having different floor species, medicinal flora and forest resources. Forest management is generally based on the Participatory Forest Management (PFM) and forest protection and development through the Joint Forest Management (JFM).Besides forest floras different wild faunas are also found in forests in these districts such as wild boar, deer, pangolins, python, monitor lizards, porcupines, hare, wolf, fox, squirrels etc and having different avifauna like ducks, storks, snips, teals, owls, etc. are increasingly being reported. Venomous snakes like cobra, krait, and banded krait and Russell vipers are also found in forests. Moreover each and every year migratory wild elephants around 140 -150 numbers from Dalma Wildlife Sanctuary in the state of Jharkhand are entering in the state of West Bengal and visiting in the districts of Jhargram,

Paschim Medinipur, Bankura and Purulia of South Bengal covering very large area and extend to further north and east in recent years. Sometimes they are prolonged staying in these areas about 8 to 10 months and causes severe damages. Some of them become resident in the region. Not only migratory Dalma herd, there are also Mayurjharna herd and including residential wild elephants about 50 60 causes severe depredation and increases human-elephant conflicts. Apart from the other wild animals, it is said that about 60 - 70 years ago tigers were also found in Lalgarh forests according to the opinion of some local elder villagers although there have been no such records in the past century in this regard. In the recent past during March-April 2018 a tiger was found in Lalgarh forest of Paschim Medinipur district and its adjoining forests but the tiger could not be saved due to unfortunate cruel incidents and man-animal conflict.

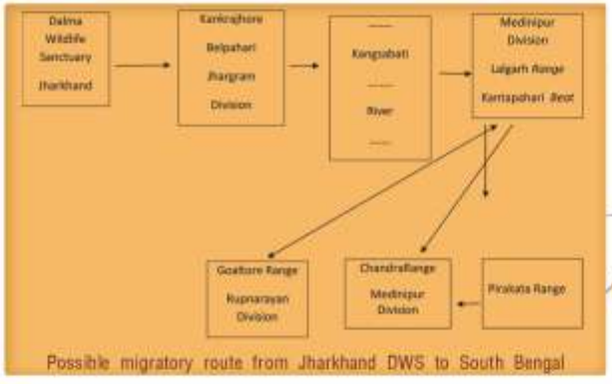
Threat and human-animal conflict

Wilderness and biodiversity is disappearing gradually from the earth planet. In recent years, the most urgent threat to wild fauna is loss of habitats, degradation / fragmentation of forests, lack of food and shelter, illegal trade, losing their migratory routes, corridors, lack of people awareness etc. and as a result human-animal conflict (HAC) has rose to an alarming position. To mitigate the problems proper measures and prompt action are to be needed in planned manner and in proper way.

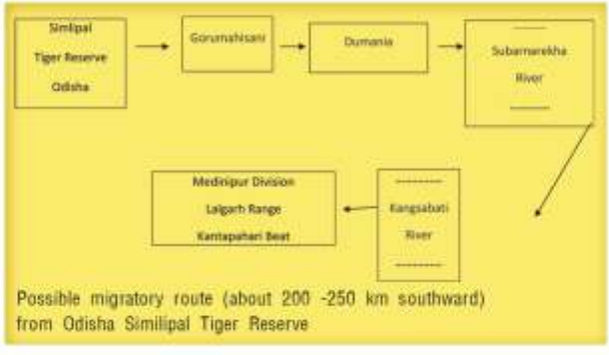
Brief review about the Lalgarh tiger

(i) It is said that the possible presence of a tiger was first reported from Lalgarh at the end of January 31, 2018 and the presence of tigers pugmarks was first noticed in Lalgargh forest in early February 2018.

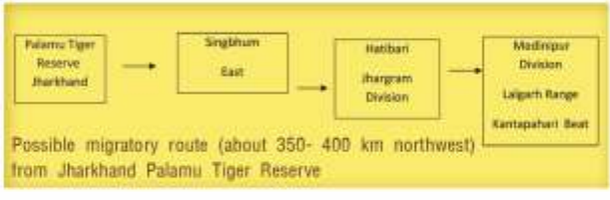
(ii) Territorial wild animals like the tiger is a wide ranging animal and they can cover many distances primarily to find mates and prey and also searching their safe territory etc. About the origins of the Lalgarh tiger it was assumed that the tiger might had come to Lalgarh forest of South Bengal from the neighbouring tiger habitat either from the Simlipal Tiger Reserve in Odisha or from Jharkhand Palamu Tiger Reserve or from Dalma Wildlife Sanctuary as follows.



Possible migratory route from Jharkhand DWS to South Bengal

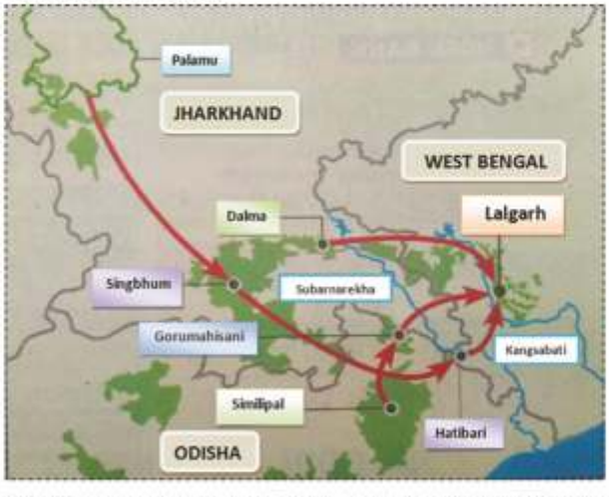


Possible migratory route (about 200 -250 km southward) from Odisha Similipal Tiger Reserve



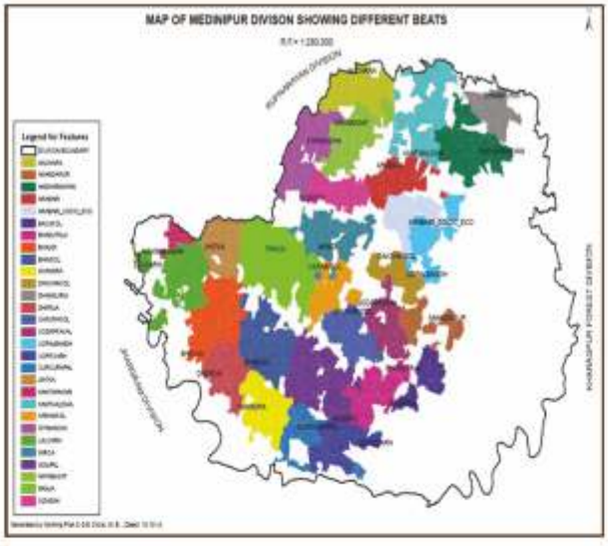
Possible migratory route (about 350- 400 km northwest) from Jharkhand Palamu Tiger Reserve

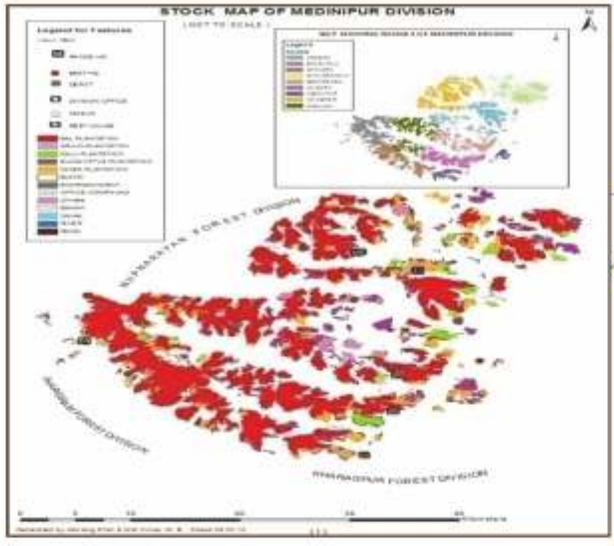
Possible Route Map



(iii)The forest department took several steps which are briefed below.

On February 27, 2018 seven camera traps had been installed by the Medinipur Forest Division with the help of Wildlife Wing, WB and WWF-India at various locations of the forest to confirm the presence of tiger in the forest. The tiger was first spotted through photographed on March 2, 2018 by way of getting four images of a full grown adult male Royal Bengal tiger was captured in the early hours of March 2, 2018 by one of the cameras installed in Melkheria forest in the Kantapahari Beat, Lalgarh Range under Medinipur Forest Division in the Paschim Medinipur district.





(iv) It was also found and reported that the Royal Bengal tiger had been roaming time to time around a 30 - 40 sq km swathe of forests stretching across Jhargram, Paschim Medinipur and Bankura districts Junglemahal areas for the past about one and a half months since at the end of January 31 to April 12, 2018 and during these periods tiger pugmarks was noticed in different field sites inside the forest areas at Jhargram, Lalgarh, Madhupur, Amlia, Melkheria, Kamrangi, Chandra, Bagghara, Jirapara, Goaltore, Salboni, Sarenga, Bankura etc.

(v) Modern technology oriented the unmanned aerial vehicle Drone was also used on 08.03.2018 in tracking the movement of tiger and help to locate its movement position in field and in the forest of susceptible areas.

(vi) Raising awareness generation activities among the local people about the conservation and importance of wildlife in nature were also expedited by the local forest officials by means of different ways and were tried to dissuading the people not to do hunting wild animals and save them.

(vii) The forest personnel had placed trap cages in different areas of the forest where the tiger was located. Along with staff and others a team of tranquillization experts from the Sunderbans was also deployed there to rescue the tiger but unfortunately the tiger could not capture it alive.

(viii) It is an irony of fate that the tiger had to lose its life on 13th April, 2018 at Baghghora forest in hunting festivals by a group of tribal or villagers in the area along with an aggressive mob of some inhumans came from different areas those were involved in brutally killing the tiger. A very sad unpleasant incident had happened, most undesirable and was not expected. It was not possible to save the tiger in living condition from such brutal incident. In spite of taking different efforts by forest officials and staff it was unfortunately failed to spread awareness among the people regarding complete assuring the protection of the tiger, all efforts were in vain and we lost an important endangered animal Royal Bengal tiger. The carcass was recovered by the forest officials and staff and its post-mortem was done after maintaining the formalities. FIR was lodged to the local Police Station by the local forest administration. Offenders should be arrested and severe punishment needs to them those were directly or indirectly involved in killing the tiger.

Problems / Constraints of Management in these zones

Major problems of management are

- Forests in these zones are a Territorial Division.
- Fragmented forests.
- Loss of habitats.
- Forests intercepted with habitation, roads, and agricul turefield and non-forest land.
- Forest fringe human populations and their dwelling houses are very near to forests.
- Cattle and livestock grazing problems in the forests.
- There is no wildlife division in the area where the incident happened.
- Shortage of staff both field and office level.
- Shortage of protection personnel.
- Staff not wildlife trained or not fully oriented for wildlife protection.
- Impact of biotic and abiotic pressures.
- Conflict: Man-Elephant, Man-Tiger etc.
- Lack of peoples inner awareness.
- Illegal trade of wildlife products etc.

Suggestions

- Map should be prepared for the area where the exis tence of tiger was found by the help of modern tech nologies like GPS, GIS etc.
- Protection and regular patrolling measures should be accelerated and to be ensured.
- Formation of Monitoring Committee (MC) involving special trained wildlife officials.
- Curbing Man-animal conflicts.
- Bulk Short Message Service (SMS) for alert to local population, villagers and administration.
- Use of modern technology such as Drone, Retrofitted wildlife squad vehicle (Airavata), trap camera, binocular and night vision camera etc.
- Necessary training of field staff and hold training pro grammes about conservation of wildlife, protection and related issues.
- Imparting training for wildlife managers, JFMCs members,local villagers, forest fringe population, handlers
- Frequent coordination meetings should be called among people in affected and problematic areas.
- Along with field staff a full flagged veterinary unit, tran quillization experts and wildlife experts should also be deployed in susceptible area for duty.
- Capture and rehabilitation of the animal as per needs and after maintaining the formalities.
- Strict application of relevant Acts and Rules against hunting of wild animals, Law and Order etc.
- Coordination among the Law enforcement agencies and others.
- Integrated afforestation and construction of water harvest ing structures for water and soil conservation measures should be increased for improvement of habitats as well as generation of man-day.
- Other development works and supporting activities should also be increased in this area.
- Development of scientific management planning for con servation and an adaptive management with integrated long term approach.
- Special task force (STF) should be alert for duty in 24x7 as per exigency of the situation in the area.
- Provide also Banya Pran Sathi Prakalpa in this zone, if permissible.
- Establishment of Intelligence Network and rewards.
- All illegal hunting of wild animals in the forest as well as outside forest to be treated as environmental and wildlife crime.
- Thinking about whether the wild life hunting festival to be banned.

Awareness Programme on Conservation of Wildlife

Conclusion

The story of a Lalgarh tiger cannot be ended, it teaches more lessons. Dont cage us, dont kill us, and dont poach us; Acts humane way, live and let live. It is also necessary to review the whole situations, past and current management practices and learning from the latest incident; future management plans are to be prepared accordingly and its application, appropriate measures and joint efforts are to be needed from all levels regarding the protection of wildlife and sustainable management of forests and biodiversity. Integrated efforts, proper protection and effective measures and increasing more public relations and raising more continuous awareness generation programme in this regard should be taken and to be ensured to take proper steps with adequate attention to protect and improve the natural environment including forests, wildlife, forest resources and to have compassion the living creatures so that these types of killing or death incident not happen in the future.In this connection all sorts of effective preventives and protection measures of forests, wildlife and biodiversity should be taken properly without any delay by the help of administration, involving local bodies / institutions, line deptts.; active participation of people from different levels, JFMCs, forest fringe population, local villagers, Govt. and Non-Govt. organizations and other stakeholders with proper protective and conservation measures and proper monitoring on ground.

Save Green See Dream Save Tigers

Considering different aspects and reviewing the whole situation the working plan prescriptions of the concerning divisions in respect of wild life management overlapping working circle (WLMOWC) should also be up dated.Moreover we should not forget that Royal Bengal tiger (Panthera tigris tigris) is the National Animal of India, a symbol of wilderness, a keystone species and their presence in the forest is an indicator of the well being of the ecosystem and plays pivotal role in ecological balance as a top predator which is at the apex of the food chain and keeps the population of wild ungulates in check or to control natural prey populations and thus maintaining the balance between prey herbivores and the vegetation thereby. So their proper protection and conservation is urgently required. Protecting tigers, forests, wildlife and their habitats helps to provide benefits for thousands of other animals of different species and millions of people and to maintain the ecological balance. All living creatures in nature have an equal right to existence and to live on earth. So if we think that we are trying to save our tiger population of India then we are also trying to save our human population of India as well as in the world. Save tigers, Save humans, Save environment.

Role of Pheromones in mitigating Man-Animal Conflict in Sundarbans

Anjan Guha WBFS
Divisional Forest Officer

Pheromones: A Chemical Magic in the Animal World

Pheromones (also sometimes called as ecto-hormones) are 5 to 20 carbon molecules that act as chemical signal between the members of the same species and elicit a particular behavioural or physiological change. Pheromones help in maintaining the fitness, mate choice, mate selection, sexual maturation, successful fertilization, kin recognition, maternal infant bonding, dominance hierarchy, aggression, aggregation and many other aspects of the social organization in the living world. They can be of various types such as aggregation, alarm, epidiectic, releaser, primer, territorial, trail, sex pheromomes and so on. In insects pheromones are being reported to be produced from Nasonovs gland, Venom gland, Richards gland, Tergal gland, Dufours gland and glands on the midgut, hindgut, pygidium, rectum, sternum, and hind tibia etc. Salivary glands, glands associated with the eye, lungs, trachea, liver, gall bladder, bile duct, portion of the small intestine, kidney, ureter, bladder, urethra, male and female accessory gland, rectum and anal sac could be the possible odour sources in mammals. The pheromone after being released into the environment diffuses through the air or water (Wyatt, 2003). Pheromones in future have the potency to be better utilized by man for wildlife management

Sundarbans: A Natural Wonder

Sundarbans is considered as one of the natural wonders of the world located in the delta region of West Bengal in India and Bangladesh. The Sundarbans has a high biodiversity value. It is tidally inundated twice a day. It consists of the worlds largest coastal mangrove forest and still remains a mystery to mankind. Sundarban flora is characterized by the copious presence of sundari, gewa, goran and keora and is known for its wide range of fauna including the Royal Bengal tiger, estuarine crocodile, Indian python, deer, Rhesus monkeys, approximately 260 bird species and many more. Sundarban also sustains a huge human population and the mangrove forest provides raw materials like timber, fuel wood, honey, beeswax, fish, crustacean and mollusc resources for their livelihood. Thus in Sundarbans there is inter-dependence on one hand and competition and conflict on the other hand between the different species varying over a wide range from Invertebrates like insects to Flagship species of these forests, the Royal Bengal Tigers to human beings as they are all occupying the same habitat and depending on the same resources for their livelihood. The region is concentrated mainly with people who are dependant on various types of forest and non-forest based NTFPs for their livelihood. This is mainly because of the salinity of the soil, which prevents agricultural crops to grow. NTFPs and other various income generation opportunities provided by nature in this region need further integrated planning for sustaining the livelihood of the local communities.

Honey

An important non-wood Forest product of Sundarbans

Honey is considered as one of the important non-wood forest product of Sundarbans. Honey hunting from the honey bee colonies has been practiced for centuries in these mangrove forests. The honey of the Sundarban is a noteworthy feature of this geographical area. Mawalis (local people of Sundarbans) traditionally depend on the forest honey and wax which are collected from these mangrove forests for their lives and livelihood. Usually the honey collection starts from the Bengali month Chaitra (April) and the Mawalis collect a pass from the Forest Department to enter the forests to collect the honey. There are three kinds of bees in Sundarbans but among them the Giant bees *Apis dorsata* comparatively makes more hives and honey. It is said that the honey from these hives are the best honey of Sundarbans. They make smaller hives and have higher foraging populations.

Duet between Honey and Pheromones: Future of Honey Collection in Sundarbans

A lot of research work has been done on *Apis mellifera* which is now known to possess complex pheromonal communication systems found in nature, possessing 15 known glands that produce an array of pheromones (Slessor et al. 2005). It is the need of the hour to reveal the pheromonal components of *Apis dorsata* elaborately and utilize them for establishing apiary in Sundarbans which is not successful here till date. This could restrict the movement of mawalis inside the forests which automatically could reduce the direct man-tiger conflict inside the forests and change the profession of the mawalis from honey collectors in the forests to bee-keepers in the apiary. Honey by standardizing apiculture using *Apis dorsata* has to be emphasized more emphatically.

Apis dorsata Apis mellifera

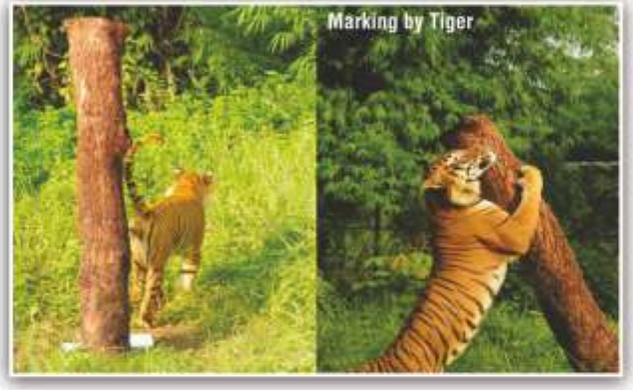
TIGERS..The pride of Sundarbans

The Royal Bengal Tigers of Sundarbans is the pride of Bengal. They are majestic and largest cat species, self-sufficient and courageous predators and know how to adapt with the different environmental conditions. But the tiger populations in different parts of the world are facing immense threats. In this context it may be discussed that the most threatening problem for the Sundarban tigers is the man-tiger conflict. Sundarbans is a land of islands and both tiger and human populations thrive or co-exist here in neighbouring islands.

Tiger and Pheromone Research: The need of the Hour

Research for many long years have revealed that the tigers mark their territory using marking fluid (MF) and thus communicate with the other tigers chemically to not to enter their zone of influence. Chemical characterization of territorial marking fluid of male Royal Bengal tigers have been done (Burger et al. 2008). It consists of a mixture of urine and a small quantity of lipid material that may act as controlled release carrier for volatile constituents. But in Sundarbans scenario with islands tidally inundated twice a day MF usually gets washed away. So the movement of tigers crossing their boundary to human habitation is very common and this leads to the acute problem of man-tiger conflict. So more research work on the pheromones of the tigers present in the marking fluid may lead to some solution to minimize man-tiger conflict by restricting their movement within their territory using chemical compounds from marking fluid. Moreover if a trained dog can recognize the pheromones of a tiger then they may be used for detecting a straying tiger. So there is a wide scope of minimizing the man-tiger conflict here if the pheromone study can be done on the different animals in the wilderness of Sundarbans.

Tiger Release after Rescue in Sundarbans



Marking by Tiger

Conclusion

Pheromone research is popular throughout the world for many long years but its practical use in the wildlife management is very rare. It is the need of the hour to implement the various aspects of Pheromone Research in the Wildlife Management which can lead to a better handling of the wildlife in nature.

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Beauty beyond imagination

A Travel Diary

Ishita Sarkar,Student

I am still in hangover; still in my dreams I am seeing Jungles. Dooars, as you all know is located along the foothills of Eastern Himalayas in the North-East of West Bengal. It is the gateway to Bhutan, which constituted the plain of Darjeeling, whole of Jalpaiguri District and Upper part of Coochbehar District. National Parks, Wildlife Sanctuaries and Tea Gardens are the best things to watch in Dooars. Today I am going to share my fascinating, thrilling travelling experiences with you through my travel diary. I used Google map as Real Time Navigator in my whole journey.

13th October.....Destination Buxa Tiger Reserve:

After reaching Siliguri, we started our journey for Buxa Tiger Reserve through NH-17 and NH-317.It was late at night, almost over 10.30 P.M. and the car was running very fast through Buxa Tiger Reserve and no one else except the darkness of the mysterious forest was accompanying us. Ultimately we arrived at Buxa Valley Resort, located inside the forest at Santalabari area, a small village deep inside Buxa Tiger reserve, this is the starting point for Buxa fort (most important of the eleven routes into Bhutan, which once was used for detainees during freedom movement of India) trek. The resort is surrounded on three sides by forest and on one side is the road that connects Rajabhatkhawa with Santalabari. The location of Buxa valley resort is at the meeting point of hills with the plains. The land has just started rising but the climb here is not yet steep. The different cottages and the rooms are located on several steps on the rising land. On one end of the resort there is a watchtower aimed at facilitating wildlife viewing by its guests. Buxa Tiger Reserve on the other hand is rich with bio-diversity and has a great collection of rare orchids and medicinal plants.

14th October..... Destination Coochbehar Rajbari Madanmohan Mandir and Jayanti

Next day morning we started our journey for Coochbehar Rajbari at the very morning. Suddenly we heard a sound that resembles the chiming of a bell and it was coming from the forest of Buxa Tiger Reserve. It was Ghanti Poka (local name in Bengali), an unknown insect. We offered our puja at an ancient temple dedicated to Lord Shiva, known as the Baneshwar temple, situated at a distance of about 10 km north of Coochbehar town. The temple has a Shiva lingam 10 feet below the plinth level. The pond beside the temple has many turtles, which are considered as the devotees of lord Shiva.

After offering our puja we visited the famous Rajbari of Coochbehar, established in 1887 by Raja Nripendra Narayan Bhup Bahadur.The whole palace was made with red bricks inspired by the design of Buckingham Palace.At present the palace has been turned into a museum where traveler can learn about the history of the royal family that once ruled the land of Coochbehar and also about the Rajbanshi, local tribes like-Gorkha, Lepcha etc. and their livelihood.


Baneshwar Temple

The palace and its garden is well mainted by the Archeological Survey of India. At last we visited the famous Madanmohan Mandir, founded by Maharaja Nripendra Narayan. Madan Mohan temple is a four-cornered construction with a dome built above the cornice of the four rooms side-by-side and facing south. Deity of Madan Mohan is in the central room over which the dome rests like a white lotus. Ma Anandamoyee, Ma Bhabani and other deities are also worshiped here. Madan Mohan is the main attraction of Madan Mohan temple. In the central room of the temple on silver clad chowdola (four-stand cradle) there are two idols - Bara Madan Mohan and Chhoto Madan Mohan.

15th October.....Destination Phuentsholing

It is the town of Bhutan which adjoins the town Jaigaon of India and shows perfect balance between traditional and modern culture accompanied by beautiful landscapes. Bhutan Gate, Karbandi Monastery etc. are most sought after destinations for tourists. Cross border trade is the main factor of its good economical condition. After visiting Phuentshoilng and having lunch we started our jungle safari in Jaldapara (famous for one horned Rhino) in the afternoon. We were very fortunate enough to see wild Rhinoceros, Bysons, and Peacocks etc. during our safari.


Coochbihar Palace


Phuentsholing


Jayanti FRH


Hollong Glade

Jayanti.....The Traveler's Paradise

After returning to Buxa Tiger Reserve we started our next journey for Jayanti in the afternoon. Jayanti,a picturesque forest village which forms natural border with Bhutan hills located along the Jayanti river.Though the river is dry,but its white bed filled with pebbles,swift flowing narrow river,fringe forest along the Bhutan hills altogether forms a beauty which is very soothing to the eye than our monotonous city life.The picture perfect Forest Rest House situated beside the Jayanti River was our resting place for the beautiful moonlit night.

16th October.....Destination Raimatong

Raimatong is another famous tourist spot for scenic beauty. Passing through Hasimara, Hamiltonganj and tea gardens like Kalchini, Chuapara and crossing white river bed we finally arrived at Raimatang Picnic Spot. There is also a Forest Rest House on the top of a hill. In the afternoon we had gone for elephant safari in Dhupjhora Elephant Camp through the deep forest.


Raimatang Forest Rest House


Coffee Plant


Bindu Barrage


Rubber Plantation

17th October.....Destination Murti,Bindu,Jhalong, Samsing,Suntalekhola and Rocky Island

We reached Murti town situated on the bank of river Murti on 17th October. Swift flowing river with pebbles all around is the main attraction of Murti. On the way to Murti we suddenly saw a Wild Elephant on the National Highway (beside Gorumara National Park), which was very thrilling experience.

Bindu and Jhalong

Both the hill stations of Kalimpong are famous for their scenic beauty and mesmerizing landscapes. Bindu is especially famous for its barrage on Jaldhaka River separating India and Bhutan.On the way to Bindu we saw different kind of step plantations. Also we saw Rubber, Coffee and other plantations on the slope of the hill.

Samsing, Suntalekhola and Rocky Island

Samsing is famous for its beautiful tea garden, where green tea leaves, grey mountains in the back and the blue sky together forms a picturesque landscape .Suntalekhola is famous for its hanging bridge. The Chirping of birds, serene beauty of nature and the atmosphere altogether makes a fairyland. On the other hand Rocky island is famous for its

18th October..... The Bengal Safari and the Day to return home

Ultimately the day came when we had to return home and we were feeling blue. All of a suuden we became excited to do safari in the famous Bengal Safari in Siliguri and forgot that it was our last day of the tour. We saw Deer, Peacock and ultimately the Tiger. There were also Bird Aviaries trail (7 nos) and Reptile (Gharial, Crocodile) ponds. After doing safari we finished our planned tour and returned home on 19th October, 2018.

But, still now I cannot forget the street foods especially momo and the delicious dishes of the resorts and the serene beauty of Duars and Hills.

Once upon a time Willam Shakespeare said One touch of nature makes the whole world kin .

A brief history of

TIGER

the most charismatic animal in the World

Prasanta Kr. Pandit, IFS
Chief Conservator of Forests

Introduction

Countless seals, figurines, vases, temple ornaments and paintings from the early civilizations in Asia depict tigers. Even before the Indo-Aryans arrived in the Indus Valley, the Harappa Civilization of the Bronze Age was using the image of a tiger on its seals. The first Moghuls and the early Chinese and Indonesian rulers also revered tigers. The Pharaohs and Romans imported them for gladiatorial contests or as a public spectacle. Tiger hunting became the sports of Kings and remained so for several thousand years.

Few living mammals have become creatures myth in the minds of man to as great extent as has the tiger. Its large size, nocturnal habits, solitary nature and elusiveness, soaped with its reputation as the embodiment of devilish cruelty of halte and savagery incarnate. It is an eminently adaptable animal readily changing its habit to conform with the prevailing condition.

Ellenman and Morrison Scott (1951) recognize sub species of tiger while *Panthera tigris tigris* occurs throughout India and Indochina. *P.t. virgata* around the Caspian and Aral seas, *P.t. longipinnis* in Manchuria, *P.t. amoyensis* in south

China. In addition some authors (Jarvis,1965) retain sub species name for the Sumatran, Javan and Balinese tigers (*P.t. sumatrae, sondaica, balica*). The physical differences between sub species which have been described by Pascock (1929) are slight. The tigers of the frigid north are large, long coated and pale in colour, there is a gradual reduction in size and length of coat as well as a depending of colour towards the south, so that the island races are noticeably small dark and short haired.

Description

The tiger is the largest existing member of the Felidae and like most other in the family adapted for stalking its pray rather than running it down. It has a little elongated body, a short neck, and a compact head with a relatively short muzzle snout that contains a formidable set of canine teeth. The legs are stout and of moderate length, the forelimbs being more muscular than hind limbs and the broad paws are armed with retractile claws.A well fed tiger is by no means a slim figure but on the contrary it is exceedingly bulky broad in the shoulders with an extraordinary girth of limbs especially in the fore arm and wrist (Baker, 1890).

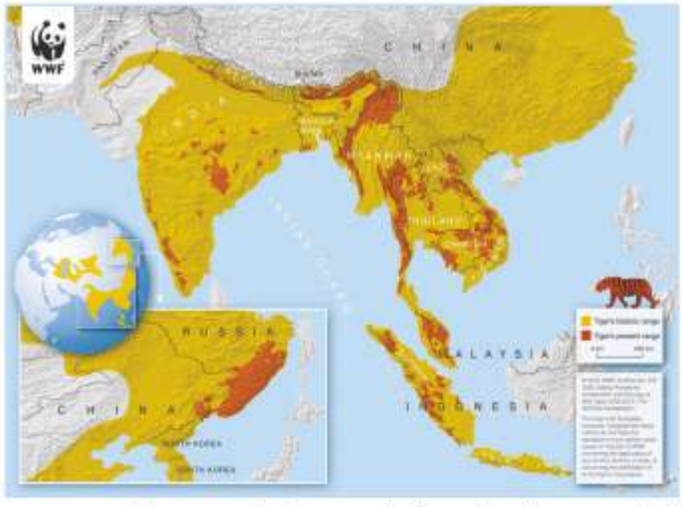
Males are considerable longer and heavier than females. The average total length including the tail of a male generally 9 feet (6 feet body and 3 feet tail) and females are 6 to 12 inches shorter than male. The average weight of tiger varies from 100 to 175 kgs. Females are slightly lighter than male.

The colour of the tigers pelage varies from orange red to tawny yellow, broken with a series of transverse black stripes of varying length and width. The cheeks, throat, abdomen and the insides of the ears and legs are white. The back of the gears is black with a conspicuous white spot in the centre. The stripe pattern varies considerably among tigers. The black markings in the patch of white hair above each eye are found to be so distinctive that individuals could readily be distinguished by them.

Distribution and Status

The geographical distributions of the tiger once spanned some six thousand miles (6000 miles) of Asia from Mount Aravat in Eastern Turkey and the Caspian Sea of the sea of Okhotsk in Russian Manchuria. In the Western part of their range the animals (*P.t. virgata*) occurred in northern Afghanistan and Iran and in to the USSR, their northern boundary being Lake Balkhask and the Arab and Caspian seas. Tigers were formerly found throughout China from the Attai Mountains and the boarders of Mongolia eastward to the south and east China seas, including Hongkong and northern in to Chinese Manchuria but hunting and deforestation have almost eliminated the species in that country.

the Arab and Caspian seas. Tigers were formerly found throughout China from the Attai Mountains and the boarders of Mongolia eastward to the south and east China seas, including Hongkong and northern in to Chinese Manchuria but hunting and deforestation have almost eliminated the species in that country. Tigers were also distributed in Japan, Vietnam, China, Burma, Thailand, Singapore, and Sumatra. Presently tiger range countries are India, Bangladesh, Nepal, Bhutan, Myanmar, Thailand, LAO PDR, Vietnam, China, Russia, Cambodia, Malaysia, and Indonesia.



The wide geographical distribution of the tiger implies a great adaptability to different environmental conditions and needed the only requisites for its survival appear to be some form of vegetative cover, a water supply, and sufficient prey. In the western part of the range, it inhabited the marshes and reed beds of the low lands upward through the cork and tamarisk forest an altitude of 8000 feet.

The tiger is found in all major forest types of India-thorn, dry and moist deciduous, semi evergreen and evergreen. It also occurs in the mangrove swamps of the Sundarbans in West Bengal and Bangladesh, where it swims from Inland and Island (Pocock,1939). The animal appears to be equally at home among the tall grasses of the Kaziranga, a type of habitat which has now largely disappeared in India. In Western Ghats tigers ascent to an altitude 7000-8000 feet, where they inhabited a grassland scrub forest mosaic. Most of the tigers present below 4000 feet altitudes but Nepal, West Bengal and Sikkim they are found at 11,000 to 13,000 feet also.

India is home to 70 percent of tigers in the world. In 2006, there were 1,411 tigers which increased to1,706 in 2010 and 2,226 in 2014. The total number of wild tigers has risen to 3,890 in 2016 according to World Wildlife Fund and Global Tiger Forum.

Ranges

The total range encompassed by the travels of the tigress during the year of observation was about 40 Sq km that of the male appeared to be somewhat larger, perhaps as much as 50 sq km. A number of factors, including the sex of the animal, its reproductive state and availability of food, undoubtedly influence the range. A male can shared his range with females but not with other males. A male drives another male from his territory but tolerates transients.

A female in oestrous travels widely and is sometimes followed by several males (Powel, 1957). It was also recorded of moving 5 males and one female in the same area. Such aggregations probably include a resistant male, transient males and a number of males from adjoining ranges through which the tigress has passed. Most transient tigress moved through the area during the cool and hot seasons but inspite of an abundant food supply, they failed to remain there. Tigers move little during the monsoon.

When a tiger become old and fat he usually settles down in some locality where beef and water are plentiful and sometimes lives on amicable terms with the villagers, killing a cow or bullock about once in 4 to 5 days. Some tiger and tigress lives together for about 5 to 7 years.

In addition to the resident tigers, there is a segment of the population that seems to lack established ranges. Some of the un-established animals are probably young adults which having reached maturity are moving away from the area of their birth in to unoccupied terrain. Others may be adults unable to establish a range in the limited habitat available to them. And still others are tigresses in heat which probably have left an established range somewhere to roam widely. Thus tigers exhibit a wide variety of land tenure patterns from exclusive use of an area that seems to be defended against others to peaceful showing of ranges to lack of established ranges depending on the sex, physiological condition and perhaps individual inclination of the animals involved.

It was recorded that life of one tiger which had his home base in a hollow tree (Corbett,1957) and another tiger is very strongly attached to his permanent quarters and uses their as his base for his foraging expedition (Baze,1957).

Social organisation & interaction between adults

The tiger is usually pictured as an unsociable animal living a solitary life in its jungle realm. The well known Chinese proverb One hill cannot shelter two tigers appears to have been taken literally. One often meets a tiger and a tigress in company, they kill an animal together and camp a few days near each other, but they soon part again.

The social interactions of adult tigers can best be understood when considered separately in the contexts of hunting, mating and feeding at a kill. Hunting in tigers is essentially a solitary activity in contrast to the communal hunting and stalking sometimes practised by lions. Tigers associate of course when mating. The male undoubtedly mates with whatever oestrous females, resident or transient are found within his range. Sometimes several males are attracted by the calls and scent frail of oestrous tigresses, fighting between the males on such occasions is the frequent outcome. The basically solitary habits of the tiger are shared by most members of the Felidae exception being the lion.

Communication

Tigers use a number of different sounds and gestures to communicate with each other when they are together in addition, because of their nocturnal and solitary habits, they require other means of communication which will enable them to find and keep in contact with each other as they roam across their large communal range.

Scent and Visual Signals

Male and female tigers mark their range primarily by spraying scent and by marking their faces conspicuous. As a tiger walks along, it pauses at intervals, swivels its hindquarters around to face some object like a tree or bush, and with lightly elevated rump and almost vertically raised tail, squirts a single set of fluid. The liquid shoots upward at an angle of about 30 degree, hitting the vegetation 3-4 feet above ground.

Much of it consists of a clear, pale yellow liquid, apparently urine. Several clumps of a granular, whitish precipitate use in it. Observations of a scent marking male showed that the fluid was ejected casually from the penis. Tiger urine by itself however did not have a particularly strong odour, whereas this fluid smelled very musky, readily discernible to the human nose at a distance of 10-15 feet. The white precipitate was apparently a secretion from the anal glands which are also found in the house cat. The scent adhered to the vegetation for a long time. One of the grass still smelled pungent after one week; on the tree trunk the scent persisted for 3-4 weeks, except when it rained heavily.

The scent serves a number of possible functions

- It could enable tigers to follow each other in the forest using the odour astrial marks
- It could delineate the extent of the range indicating to others that the terrain is occupied, which may attract or repel the visitor according to the circumstances.
- It could communicate specific information to others using the range such as the identity of the individual, the amount of time that has elapsed since it passed and in case of tigresses whether or not she is in heat
- Neighbouring tiger can identify each other also know figures in the area are coming in to conditions of mating. The tiger makes no attempt to cover its faces.

The role of olfaction in the communication between tigers provides an interesting sidelight on a hotly debated issue among hunters. The fact that the tiger uses scent as a means of signalling certainly indicates that it powers of olfaction are good.

Claw marks on trees are another visual signal of possible communicating value.

Vocalizations

Tigers vocalize infrequently. A number of different calls, probably comprising most sound in the animal vocal repertoire

Tigers are unable to sound at ease. When tigers approach each other in a friendly fashion, they often utter a gentle puffing sound by expelling air in rapidly repeated gets through the nostrils.

The vocalization has been reported in a number of specific circumstances:-

- By a captive while ejecting urine (Boswell, 1957)
- Just after a tiger had relieved nature (Champion, 1927)
- While walking near kill (Powell, 1957)
- Just before approaching kill (Anderson, 1954)
- When disturbed at kill by man (Brander 1923)
- On seeing a man sitting in a tree. (Perry, 1964)
- By a male accompanied by a female, when noting a person
- climb a tree in the distance (Lewis, 1940)
- When shot at or disturbed on the kill (Pollock, 1896)
- When approaching a kill already occupied by another tiger.
- By a male tiger in response to roar of a tigress at a kill about a quarter mile away.
- By a male tiger when approached by a cub as he lay 20 feet from kill.

Grunting

A tigress with small cubs often emits a number of soft to rasping grunts growly ur-ur-ur or bru-bm-bm apparently a sound which stimulate the young to follow her.

Meowing

Cub about 6 weeks old, meowed softly when its mother and siblings moved from sight, the call apparently indicating distress.

Woofing

A startled tiger emits a woof according to the some authors.

Moaning and Roaring

A muffled moaning and groaning a-a-a-m-m, u-u-u-u is produced if the tiger fail to open its mouth when calling or does so only partially. This vocalization of low intensity is audible for only a few hundred feet to about a quarter mile. The roar is a resonant and rolling a-a-a-a-a or a-o-o-o-h produced by expelling the air through the open mouth while progressively closing in the volume of this two toned sound is quite starting and impressive when heard at close range, carrying a great distance in the stillness of the night as far as 3 kms(Powel,1959).

Growling (congruing sound) snarling (barking the teeth) & hissing (prolonged sound)

Tigers growl, snarl, hiss and spit when threatening each other as well as when reaching to man. At a higher level of intensity the tiger opens its mouth while growling to produce a snarling sound.

Coughing roar

Attacking tigers emits is a short, loud, coughing roar,apparently an indication of anger. After considerable growling and snarling, a tiger sometimes coughed once at another animal in a dispute at a kill. When shot or fighting with each other, tigers are said to roar with rage , from all accounts sound of greater intensity and duration than the coughing roar.

Postures and gestures

The tiger, like the house cat, expresses friendliness by rubbing its face, neck and occasionally the whole side of its body against the head, neck and shoulder of another tiger. Sometimes the interaction is brief a mere touch of cheeks, but at other times the animal moves its body gently and sinuously against the other, its tail rose vertically or almost so. Sexually receptive cats present in a similar fashion. Cats frequently rubbed themselves against their mother especially when she returned after a brief absence or when they approached her at a kill.

Tigers behave aggressively in a number of distinct ways and their gestures are frequently accompanied by vocalizations. In a threatening gesture of low intensity the animal wrinkle its nose and forehead, alternately bares and covers its canine teeth and lays the ear back somewhat. The backward movement of the ears is often the first indication that an aggressive action is imminent. An expression of moderate to high intensity includes a partially to wholly open mouth with canine exposed, flattened ears, and much growling and snarling as the cat faces the opponent. The movement of the tail also express the emotion of the animal, varying from a slight twittering at the tip during a tense situation to violent lashing up and down when highly excited.

Mating

On gradually becoming accustomed to the male, the tigress touches his long, stiff vibrissae and if she hears a snort prusten in reply she rapidly relaxes a good deal of her caution. In a few minutes she lies down on her back and begins to wave he paws. The male tiger gazes at her in a surely manner. During mating the female holds her back upward, and the tiger with a roar like thunder, seizes her neck without piercing the skin with the teeth. Such love scenes are repeated many dozen times a day for 5 to 7 days. The number of daily mating is high. There is a record 17 mating in one single day between a male and one female in Bengal. Copulation is short, does not last over 15-20 seconds at the most with the male letting out a tremendous roar as it reaches climax. Almost at the same time, the male has to get quickly out of the way, as females turn around in a flash to take a swipe at the male.

Reproduction

The courtship of tigers is not always successful because of the initially aggressive reaction of the tigers. If she is ready to commutate the tiger seizes hereby the nape of the neck.

The age at which tigers reach sexual maturity at the age of 2 to 5 years. The Felidae appear to be seasonally poly-oestrous in the tropics. The interval between the midpoints of 3 consecutive oestrous periods in one tigress varied from 45 to 55 days and the average length of receptivity during 14 oestrous periods was 71 days. The tiger of India has no definite mating and birth seasons. Mating in Indochina as well as in southern part of India is said to be most common in November and April where as Malaya is most common month of mating is November and March. The Manchurian tigers mates only from December to February. The gestation period of tiger has been given as 98 to 109 days. The size of litter varies from 1-7.

Tigers have a high reproduction potential. In Zoos where the cubs are usually removed from the mother at birth one litter / year is common. A free living tigress that loss her cubs in some mishap in thus potentially able to have a new litter within about 5 months. Oestrus is in most instances held in abeyance while the tiger has her cubs. Cubs are largely dependent on the mother for about 2 years in the wild. The maximum longevity of tiger in Zoo condition is about 20 years, an age which is probably not exceeded in the wild.

Behaviour of Female and Young

During the period the cubs grew from the size of setter dogs still fully dependent on their mother up to the age of 6 months. The tigress secretes her new born cubs in a den, usually a cave or rock overhang, among dense reeds and bushes or in some other protected site. The weight of new born cub varies from 1.5 -2.5 kg some time also up to 4.0 kgs. One cub in the first litter opened its eye on the 9th day after birth the, 2nd on the 11th day, the 3rd not until the 17th day. Some time cubs born with fully open eyes. The tigresses provide the young with meat, taking food to the den. Small cubs are fed on regurgitated meat. At the age of 16 months the male cub is capable of killing their prey almost as expertly as mother. He had been hunting on his own then for about 5 months. The female cubs, on the other hand use quite inefficient, apparently because they still depended on the mother to provide them with food, and had little experience in killing prey alone. When the cubs are self sufficient they are then separated from their family.

Food Habits and Hunting, Killing and Feeding Behaviour

Food Habit : The tiger preys on whatever animals it can catch including birds, reptiles, amphibians, fishes and even some invertebrates, but mammals in particular hoofed one make up the bulk of its diet. In India most common wild prey consists chital, sambar, barasingha, deer (hog + barking), nilgai, pig, monkey and gaur. Rhinoceros calves and wild buffalo are taken in where available. They also eat horses, donkeys, camels, goat, moose, musk deer, pig, sheep, local domestic pigs, cattle, sloth bear, black bear and even elephant calf. The heavily armoured Indian Rhino has no fear of tigers but the calves are sometimes taken.

- Tigers and leopards appear to avoid each other. It has been found that leopards tend to be abundant where tigers are scarce and vice versa.

- Other food items of tigers are lizards, snakes, turtles, crocodiles, frogs and fish. Post mortem of a dead tiger in Sundarbans partly undigested body of a King cobra and monocled cobra was found in stomach.

- Sundarbans tigers frequently consume crab and fish as food.

- Packs of wild dogs sometimes kill a tiger but only after losing half their numbers.

- On average a tiger kills large animals only once or twice a week and may get for quite long period with litter to sustain it but minor snacks.

- The tiger is said to be eat the spiny durian fruit in south East Asia and Cedar nut in Far East. If a Tiger is hungry he will at least eat grass.

- The tigers are dependent on water not only for quenching their thirst but also for bathing. They often partially submerged to escape the flies.

- Although man is the most easily obtainable source of food throughout the tigers range, tiger for unknown reason rarely eaten. Those tigresses that have turned to man for part or all of their nourishment probably picked up the habit for one of several reasons.

- In Sundarbans in land tiger is the king but in water there is a record of killing tiger by crocodile when crossing the river or creek by swimming.

Man Eating Habit of Tigers

i) They use unable to catch their usual prey because of some disability such as gunshot wound or porcupine quills in the paws and face
ii) They lacked other food in the area.
iii) They killed a man inadvertently, tested the meat, and apparently found it to their liking.
iv) They acquired the habit from their mother.
v) They first scavenged on unburied human corpses, latter transferring their attention to looking prey.

Man eating tigers have occurred throughout the species, geographic range. The swamp forest of the Sundarbans in one of the very few remaining places in India where tigers kill people for food when people move inside forests.The victim of man eaters are mostly honey collector who go about in reach of honey combs in a very small party. Other victims are Crab collector and fisherman when they landed in tigers territory. But they rarely enter in to the village and killed human beings. In last 20 years there is only one record of killing a girl inside a village of Samsernagar.

Hunting and Stalking (track secretly)

Tigers hunt primarily at night between dusk and dawn, a time when the wild hoofed animal are most active too. They usually rest between mid morning and mid afternoon, although an animal sometime hunts throughout the day after what appears to have been an unsuccessful night. The tigers were seen hunting or moving a total of 79 times between dawn and dusk all but 21% of the instances being before 8 am and after 4 pm.

A tigers usual method of hunting is to walk throughout range in search of prey. A tiger is search of prey moves over a considerable amount of terrain in the course of one night. It varies from 1km to 60-70 kms.

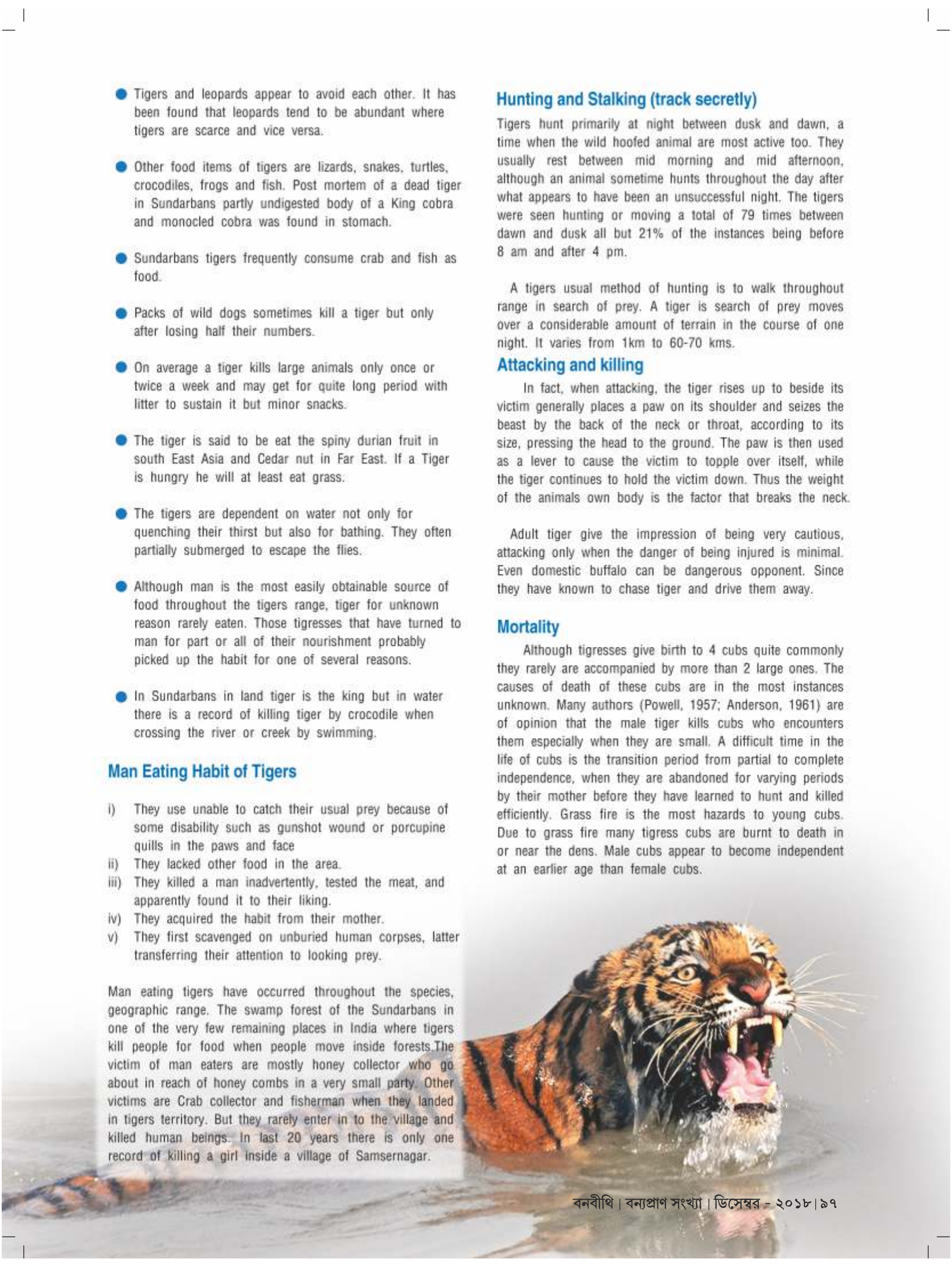
Attacking and killing

In fact, when attacking, the tiger rises up to beside its victim generally places a paw on its shoulder and seizes the beast by the back of the neck or throat, according to its size, pressing the head to the ground. The paw is then used as a lever to cause the victim to topple over itself, while the tiger continues to hold the victim down. Thus the weight of the animals own body is the factor that breaks the neck.

Adult tiger give the impression of being very cautious, attacking only when the danger of being injured is minimal. Even domestic buffalo can be dangerous opponent. Since they have known to chase tiger and drive them away.

Mortality

Although tigresses give birth to 4 cubs quite commonly they rarely are accompanied by more than 2 large ones. The causes of death of these cubs are in the most instances unknown. Many authors (Powell, 1957; Anderson, 1961) are of opinion that the male tiger kills cubs who encounters them especially when they are small. A difficult time in the life of cubs is the transition period from partial to complete independence, when they are abandoned for varying periods by their mother before they have learned to hunt and killed efficiently. Grass fire is the most hazards to young cubs. Due to grass fire many tigress cubs are burnt to death in or near the dens. Male cubs appear to become independent at an earlier age than female cubs.



Adult tigers are die as a result of having been shot speared, snared, or poisoned by man than through any other cause.

The Indian wild dog - a canid has been known to fight with tigers and even to kill them (Cannell, 1944).

Diseases

Disease does not appear to be a prominent cause of death in tigers. The tick *Hyalomma kumari* has been reported from a tiger in Assam. Two species of custoda use found in faeces at Kanha-*Taenia pisiformis* and *Diphyllobothrium erinacei*. The tiger has probably become infected with the latter species by eating frog. One specimen of *Moniezia benedeni* a parasite of cows, was collected from a drooping beside a cow kill, the worm had apparently passed through the digestive tract of the tiger. The oriental lung fluke *Paragonimus westermani* is also a parasite of tiger which kill the tiger. Man is the important definite host of that fluke as are cat, dog, goat, pig etc. The first intermediate host of this fluke is a snail and the second intermediate host is a fresh water crab or crayfish

Behaviour at the Kill

After the prey has been killed the tiger usually drags or carries it to a suitable place preferably into a thicket near water. Since much of the prey mainly attacked along ravines with cover readily available so most animals not taken far from the kill site. A tiger is exceedingly strong and large kills such as a 200 to 250 kgs buffalo, which 3 men find difficult to move, are readily pulled for several hundred feet by the cat. The cat usually grasps the prey by the neck and drags the dead body between its fore legs or along the side of its body. Tigress carried a domestic bull slung across his back with one hoof trailing along the wet ground. Small pieces of meat are lifted off the ground and carried in the mouth. The tiger begins to feed regardless of the time of day, as soon as it has moved the carcass to a suitable locality. Sometime tigress first ate for several minutes on her fresh kill and then departed to fetch her cubs. When the kill is a domestic cow or buffalo, the tiger began to eat at the rump in all the instances observed, although it sometimes started at the neck if another tiger had already occupied the preferred place at the hind quarters. Some time they began to eat the head of a pig rather than the hind part. The tigers canine teeth are highly efficient cutting tools, parting the skin of victim like scissors, with a combination of cutting, pulling and tearing the cat rapidly bolts down the meat, skin and viscera. A feeding tiger either lies, crouches, stands, sits, or rests on its elbows with the rump elevated. The fore paws are little used when eating large prey, although small pieces of meat may be held down with a paw while the cat tears at them. Bones are sometimes gnawed on while propped between the pads of the fore paws.

Tiger frequently attack Indian porcupines a powerful animal weighing up to 15 kgs and are injured or even eventually killed by the spines which are driven out into their faces or chests when the porcupine suddenly backs in to its pursuer.

A tiger eats steadily but rarely for more than one hour before stopping and resting a while. After a few minutes to several hours of resting, wandering around, drinking and other activities the tiger returns to the kills and eats some more. A tiger seems to require about 1 to 2 hours of feeding to become satiated (causing digest).

A hungry tiger can consume a huge amount of food, readily eating the hindquarters of a kill during the first night, much of the forequarters during the second night and the remaining meat during the 3rd and 4th nights. It is estimated that tiger can eat 15 kg to more than 45 kg per meal.

The tiger usually eats up its prey so completely that almost nothing remains for the scavengers. The skin except on the head and lower part of the legs is ingested together with the meat. Occasionally a tiger leaving the digestive tract uneaten near the kill site, but in most instances the stomach and intestines although not their vegetal contents were consumed. Bones are also swallowed particularly soft one of young animals. The most feeding takes place at night but brief snacks may be had at any time of the day. Since the tiger usually rests near the kill, its presence keeps away all but a few crows can moves around. If the scavenging birds attempts to feed the kill tiger may rush at them to chase them away. Tigers frequently hide their kill or cover it with debris, leaves, grass, and other materials, especially if they leave its vicinity. They are relatively inactive during the daylight hours, usually resting on its side, belly, or back in a shady spot or even partially submerged in a pool when it is hot. They are often quite restless until mid morning as it meanders around the kill with seeming aimlessness.

Response to man

The tigers reputation for savagery appears to be largely based on its potential to do harm and on the fact that under certain circumstances, such as when shot and only wounded, it may attack and kill the careless hunter. The fear inspired by the few individual who turn to man eating has also contributed to the belief that tigers attack without provocation. The tigers are generally so shy and avoid man so assiduously that they are rarely seen. The tigers are obviously more nervous during the day, approaching the kill cautiously and retreating with little provocation.

White tiger

The origin of white tiger on show in zoos is particularly interesting. In 1951 white male cub was trapped in Rawa Forest in India and kept as a curiosity by local Maharajah. Later it was mated to a normally coloured tigress, which in time produces 3 normal Litters from this size. A female from the 2nd Litter was then mated to its father, the white tiger, and in 1958 it gave birth to white cubs. They are not albinos (which would have pink eyes) but what scientists call successive mutants . Their stripe is dark brown on a whitish background and then they have blush eyes. In Nandankanan Zoo of Bhubaneswar of Odisha state have few white tigers.

Tiger and ecology of forest

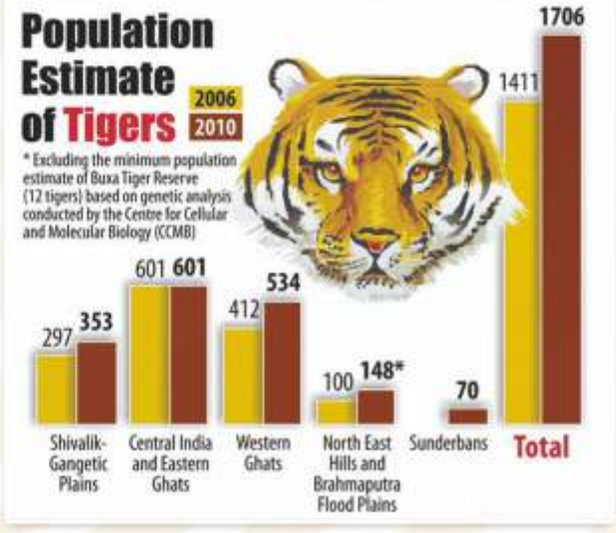
Tigers have swimming property; it is the dominant predator of Asia, at the apex of its ecological pyramid. It has an important role in helping to control the population of various wild herbivore especially deer and wild pigs. Significantly in the regions where tigers have been exterminated in India, native villagers are now suffering heavy loses of crops from the inevitable population explosion of deer and pigs.

Then IUCN scientists have already calculated that in order to maintain a viable breeding stock for an indefinite period, a minimum contiguous population of 300 tigers is required. Others believe that 200 would be sufficient. In the Indian Subcontinent only the Sunderbans Reserves in India and Bangladesh have this capability.Obviously tigers of the surviving races must not intermixed.

The causes of downfall of the Tiger

1) By hunting
2) By poisoning on carcass.
3) By trapping
4) Destruction of the Tigers habitat.
5) Fragmented forests
6) Insufficient number of predators.

In 1930 it was believed that there were still at least 100000 tigers of the 8 races in various parts of Asia. Before independence the number of tigers was 40,000 in India but now it is 2226.



Some efforts to save tigers

In 1969 the international union for the conservation of Nature and Natural Resources (IUCN) held it international congress in New Delhi to emphasis the protection of Indian Tigers. Central Government then took immediate action to give them effective protection. The Indian Govt. responded first by instructing all the state governments to make local provisions for protecting tigers and latter by passing legislation banning all tiger hunting. In 1973 Project Tiger was launched and several tiger ranges forests were declared as Tiger Reserve to ensure proper protection of tigers and to increase their number. Now in India there are 50 numbers of Tiger Reserves which supports 2226 tiger (2014). All the Tiger Reserves are controlled by National Tiger Conservation Authority and they provide huge fund for the proper management of tiger in India.

Many National and International level NGOs are also providing fund for protection of Tiger.

Main stake holders for survivality of tigers are fringe villagers. Until and unless their socioeconomic conditions are improved and sensitised properly it is not possible for survival of tiger. Fringe villagers of majority of tiger ranging areas are very poor, highly dependent on forest based natural resources and have very little scope of alternative livelihood. So to improve their socioeconomic condition as well as reduce the dependency on forest based natural resources several need based, priority basis ecodevelopment activities are undertaken on Government and other levels.

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Some interesting information about Indian tiger at a glance

Scientific name	: *Panthera tigris tigris*
Class	: Mammalia
Order	: Carnivora
Family	: Felidae
Diet	: Flesh
Weight of young	: 2 – 3 ½ kg at birth.

	Average	Maximum
Length	2.89 m	3.22 m
Height	90 c m	1.10 m
Weight	<100 kgs	130kg

Averagely daily intake	: 20 kg meat.
Method of hunting	: By breaking neck joint or when prey is big by strangulation.
Speed at which it charges upon prey	: 60 Km / hour maximum
Capacity to remain without food	: 15 days.
And without water	: 8 days.
Mating Season	: December to March.
Gestation Period	: 15 weeks.
Litter size	: 2-3, maximum is 7
Period of association with their mother	: 1 to 2 years
Average Life span	: 20 – 25 years.

লবণাম্বু উদ্ভিদ অরণ্য সুন্দরবন

Animesh Sinha

হুগলি নদীর মোহনা থেকে সমুদ্র উপকুল বেয়ে পূর্ব দিকে বলেশ্বর নদী মোহনা পর্যন্ত প্রায় ২০০ কিলোমিটার বিস্তৃত আর সমুদ্র থেকে উত্তরে গড় ৭০ কিলোমিটার জুড়ে যে বনরাজি গত শতাব্দীর প্রথম দিকেও ছিল তা এক বিশেষ বৈশিষ্ট্যের অধিকারী। এই বনানীর উদ্ভিদ সাধারণ উদ্ভিদকুল সম্পূর্ণ আলাদা বৈশিষ্ট্য। লবণাম্বু এই উদ্ভিদ শ্রেণীর মূল আবাসভূমি সমুদ্রের নোনা জল-মাটি সমৃদ্ধ এলাকা। আর সেই এলাকায় যদি সামান্যতম মিষ্টি জল প্রবাহের ছোঁয়া থাকে তবে এই বনানীর স্বর্গ ভূমি হয়ে ওঠে সেই বনভূমি। সুন্দরবনের ব-দ্বীপভূমি তাই সম্পূর্ণ আদর্শ এক ক্ষেত্র লবণাম্বু উদ্ভিদ অরণ্য গড়ে ওঠার জন্য।

সুন্দরবনে লবণাম্বু উদ্ভিদ এল কোথা থেকে

সুন্দরবনে লবণাম্বু উদ্ভিদের বিস্তার সংক্রান্ত আলোচনায় স্বাভাবিকভাবে প্রয়োজন হয় এই উদ্ভিদের উৎপত্তি ও বিশ্বজুড়ে তার ছড়িয়ে পড়ার ইতিহাস এবং বিশেষ এই এলাকায় তার এমত বিস্তারের কারণগুলির খোঁজ করা।

লবণাম্বু উদ্ভিদের উৎপত্তি ও ভৌগলিক বিন্যাসের (Geographic Distribution) গবেষণা ও বিশ্লেষণে জানা গেছে, ইন্দো-মালয় অঞ্চলের সমুদ্র উপকূলবর্তী এলাকায় লবণাম্বু উদ্ভিদের প্রথম উৎপত্তি এবং পরে প্রবল ক্ষমতাশালী সমুদ্র স্রোতের টানে এই অঞ্চলের পশ্চিমাংশে ভারত ও পূর্ব আফ্রিকায় এ উদ্ভিদ বনবিস্তার ঘটায়। লবণাম্বু উদ্ভিদের ফসিল পরীক্ষায় দেখা যায় 'খড়ি মাটি' বা Creataceous সৃষ্টির যুগে, প্রায় শতাধিক মিলিয়ন বছর আগে ইন্দো-মালয় অঞ্চল থেকে লবণাম্বু উদ্ভিদের বিশ্ব পরিক্রমা ও বনবিস্তারের শুরু। আর এ কাজে মুখ্য ভূমিকা নিয়েছে সমুদ্র স্রোত। প্রথম পর্যায়ে ভারত ও পূর্ব আফ্রিকার সমুদ্র তটে লবণাম্বু উদ্ভিদের ইতস্ততঃ এবং বিক্ষিপ্তভাবে কিছু কলোনী গড়ে ওঠে। আবার সমুদ্র স্রোতের বিপরীত টানে কলোনী বিস্তার ঘটে আমেরিকা, ক্যারিবিয়ান দ্বীপপুঞ্জেও। কিছু পরে দক্ষিণে অস্ট্রেলিয়া, নিউজিল্যান্ড এবং দক্ষিণ প্রশান্ত মহাসাগরে। ছড়িয়ে পড়ে সারা বিশ্বে।

পরম বিস্ময়কর এ উদ্ভিদ-বীজের জীবনী শক্তি। দীর্ঘ সাগর-মহাসাগর পাড়ি দিয়েও নবজন্মে এরা সদা তৎপর। এখানে উল্লেখ করা প্রয়োজন, জোয়ার ভাঁটা বিধৌত এই উদ্ভিদের বীজ অন্য উদ্ভিদের মত পুষ্ট ও পরিপক্ক হয়ে ভূমিতে খসে পড়লে তা জোয়ারের জলে বা ভাঁটার টানে সাগর, মহাসাগরে ভেসে যাবার সমূহ সম্ভাবনা থাকে। তাই প্রকৃতি এ সমস্যার সমাধান করেছে সুন্দরভাবেই। বীজের অঙ্কুরোদম কান্ডটি ঘটে যায় গাছের উপরেই। যাতে পতিত বীজ ভূমি স্পর্শ করেই প্রথিত করতে পারে তার শিকড়, আঁকড়ে ধরতে পারে মাটি। আবার ভেসে যাওয়া বীজের মধ্যে এমনও দেখা গেছে, কিছু কিছু উদ্ভিদের বীজ এই অঙ্কুরোদগম অবস্থাতেও জলে ভেসে যেতে পারে বৎসরাধীক কাল ধরে সাগরপারে মাটির খোঁজে।

ভারত মহাসাগর থেকে ভারতের পূর্ব-পশ্চিম দুই প্রান্তে বঙ্গোপসাগর ও আরব সাগর ধরে ছড়িয়ে পড়েছিল এই উদ্ভিদের বীজ। উপকূল প্রান্ত ছুঁয়ে ছুঁয়ে সুবিধামত জায়গায় শিকড় গেড়েছে লবণাম্বু উদ্ভিদ। ভারতের সমগ্র পশ্চিম উপকূল জুড়ে তার নিদর্শন ছড়িয়ে আছে।

আর পূর্ব উপকূল জুড়ে বীজ বপন করতে করতে বঙ্গোসাগরের উত্তর প্রান্তে এসে ঘটে গেল এক বিপ্লব। বিখ্যাত দুই নদনদী, ব্রহ্মপুত্র ও গঙ্গার দীর্ঘ যাত্রা পথে বয়ে আনা বিপুল পরিমাণ পলি সমুদ্রে বিলীন হবার পথে তাদের অসংখ্য শাখা প্রশাখার বেষ্টনে পলি জড়ো করে সমুদ্র বুকে গড়ে তুলেছে এক সুবৃহৎ ব-দ্বীপমণ্ডলী। উত্তর-দক্ষিণবাহী মিষ্টি জলের প্রবাহ পলিকে ঠেলে নিয়ে চলেছে সমুদ্রপানে আবার সাগর জোয়ারের তীব্র চাপে মোহনামুখে জড়ো হওয়া পলি সরে যেতে থাকে উত্তরদিকে। ভাঁটার প্রবাহ চাপের তুলনায় জোয়ারের চাপ বেশি বলে জন্ম নিতে থাকা দ্বীপটি 'ব'-এর আকার নিতে থাকে, আর জোয়ারের চাপ বেশি হবার কারণে দ্বীপের দক্ষিণ অংশ চাপা বা চ্যাপ্টা হয়ে যায়, উত্তর প্রান্ত কোণাকৃতি হয়ে 'ব' আকার ধারণ করে। প্রথম পর্বে তাই জোয়ারে ভেসে আসা বীজ সমূহ মোহনা দিয়ে উত্তর বরাবর ঢুকে পড়ে ভেসে যায় আরও উত্তরে, আরও ব্যাপকভাবে। ভাঁটায় ফেরার পথে কোণাকৃত ব-দ্বীপের ক্রমশঃ স্ফীত হওয়া দক্ষিণমুখি গায়ে মাটি ছুঁয়ে ফেলা বীজ জন্ম দেয় নতুন উদ্ভিদের। প্রকৃতির লীলা খেলায় ঘন সন্নিহিত হয়ে ওঠে এ উদ্ভিদ অরণ্য। মাকড়সার জালের মত উত্তর থেকে দক্ষিণে ছড়িয়ে থাকা খাল, খাঁড়ি, দোয়ানি, ভারাণী আর নদী জড়িয়ে থাকা দ্বীপভূমিগুলিকে সমুদ্রের জোয়ারের স্রোতে ভেসে আসা এই উদ্ভিদের বীজ ভূমির স্পর্শ পেয়ে মুহূর্তকালেই প্রথিত করেছে তার শিকড়। মোহনা থেকে উত্তরদিকে ক্রমশঃ বন বিস্তার ঘটে গেছে। প্রসঙ্গক্রমে আরও বলা চলে, গঙ্গা-ব্রহ্মপুত্র বাহিত বিপুল মিষ্টি জলরাশি তাদের বিস্তার করা শাখা প্রশাখার মাধ্যমে প্রবাহিত হয়ে বিলীন হয়েছে সাগর বুকে। এর মধ্যে আবার কিছু বিশেষ প্রজাতীর লবণাম্বু উদ্ভিদ আছে যারা তীব্র লবণাক্ততায় সঠিকভাবে বেড়ে উঠতে পারে না। প্রয়োজন হয় তাদের সামান্য হলেও মিষ্টি জলের ছোঁওয়া। তারা এই দ্বীপাভ্যন্তরে গঙ্গা-ব্রহ্মপুত্রের মিষ্টি জলের স্পর্শে পূর্ণ বিকশিত হয়েছে একদা, যেমন সুন্দরী গাছ। কিন্তু আজ মানুষের অবিমিশ্রকারিতায় সুন্দরবনের তৃষ্ণা নিবারণের জন্য গঙ্গা নদীর বিন্দুমাত্র মিষ্টি জলের কোটা অবশিষ্ট নেই। সে কোটা কেবল বন্দর নামক উন্নয়নের জন্য, বন্দরে জাহাজ চলাচলের উপযোগী গভীরতা বা নাব্যতা রক্ষার জন্যই সংরক্ষিত। তাই মিষ্টি জলের অভাবে সুন্দরী নামের বিখ্যাত এই গাছটি চিহ্নিহ্ন হয়ে যেতে বসেছে, নজর নেই দেশ পরিচালনকারীদের।

লবণাম্বু উদ্ভিদের অন্যতম বৈশিষ্ট্য তার শিকড়ের বিন্যাস

লবণাম্বু উদ্ভিদের মাটি দিনে দু'বার জোয়ার-ভাঁটায় প্লাবিত হয়। তীব্র স্রোতের টানকে সামাল দিতে তার শিকড়ের বিন্যাসে তাই দেখা যায় বিশেষ বৈশিষ্ট। কখনো কান্ড থেকে বের হওয়া ঠেস মূল বা শিকড় থেকে লম্বভাবে সরশয্যার মত বেরিয়ে আসা শ্বাসমূল pneumatophores, Greek : pneuma = 'air' or 'breath' : phoros = 'bearer of' মাটিকে শক্ত করে ধরে রাখে স্রোসের তীব্র টান থেকে যাতে ভূমিচ্যুত না হতে হয়, আবার ভূমিক্ষয় বা ভাঙ্গন প্রতিরোধের সহায়ক এস শ্বাসমূল। পাশাপাশি জলের লবণাক্ত ও ঘনত্ব বেশি হওয়ায় বাতাস থেকে অক্সিজেন গ্রহণে সাহায্য করে।

বিশ্ব জুড়ে ৩৩৪ প্রজাতির লবণাম্বু উদ্ভিদ থাকলেও সুন্দরবনের পরিবেশ পরিস্থিতিতে টিকে আছে ১০৫টি প্রজাতির উদ্ভিদ। তার মধ্যে ২৫টি প্রজাতির true mangroves species; ৩০টি প্রজাতির mangrove associated species; ৩৭টি প্রজাতির back mangrove species; ৬টি প্রজাতির beach flora এবং ৭টি প্রজাতির parasites, epiphytes and mistletoes।

সুন্দরবনে লবণাম্বু উদ্ভিদের আপাত শ্রেণী বিন্যাস

সুন্দরবনের জলে লবণের মাত্রা ক্রমবর্দ্ধমান হওয়ায় জল-মাটির লবণাক্ত সহন ক্ষমতা অনুযায়ী বিভিন্ন উদ্ভিদের স্বাস্থ্য - সমৃদ্ধি ও অস্তিত্ব নির্ভর করচে তার মানিয়ে নেবার Adaptation ক্ষমতার উপর। এখানকার অরণ্যভূমিতে উদ্ভিদের লক্ষণীয় বিন্যাস বিভাজন মূলতঃ ২ রকমের। প্রধানতঃ মিশ্র বনরাজির বিন্যাস Mixed vegetation এবং ছোট ছোট অংশে নির্দিষ্ট কোন উদ্ভিদের আধিপত্য Domination। সমুদ্র বা বড় নদীর ভাঙ্গন ধারানো অরণ্যকুল বা জেগে ওঠা চর সমৃদ্ধ কুল, মাঝারি চওড়া খাল বা নদীকুল অথবা ছোট ছোট খাঁড়ি, খাল, দোয়ানি, ভারাণীকুলের মাটির চরিত্র অনুযায়ী বিভিন্ন রকম উদ্ভিদের উপস্থিতি লক্ষ্য করা যায়। এছাড়াও গাছের বহিরাঙ্গ এবং কিছু চারিত্রিক বৈশিষ্ট্য অনুযায়ী সুন্দরবনের অরণ্য নিরীক্ষণ করে এখানকার মূল বা প্রধান উদ্ভিদকে ৮টি প্রধান ভাগে ভাগ করা যায়।

১। সাধারণ বা ধূসর উদ্ভিদ শক্ত কাষ্ঠল, দীর্ঘ উচ্চতার বৃক্ষ শ্রেণীর উদ্ভিদ। মিশ্র বনরাজির অন্তর্গত এই শ্রেণীর উদ্ভিদ জলপ্রান্ত থেকে জঙ্গলের গভীর পর্যন্ত বিস্তৃত।

বাইন (Avicennia) প্রজাতি — কালো বাইন (A.marina), সাদা বাইন (A.alba), জাত বাইন (Avicennia officinalis)। ক্যাওড়া (Sonneratia) প্রজাতি — টক ক্যাওড়া (S.apetala), চাক ক্যাওড়া বা ওড়া (S.caseolaris), জাত ক্যাওড়া (S. griffithii)

২। নদী উদ্ভিদ সাধারণতঃ নদী, খাল, খাঁড়ি ইত্যাদির প্রতিনিয়ত জোয়ার-ভাঁটা বিধৌত নরম পলি বা কাদা মাটিতে স্বল্প উচ্চতার এই উদ্ভিদ ঘন সন্নিবদ্ধভাবে বিরাজ করে।

খলসি (Aegiceras) প্রজাতি — খালসি (Aegiceras corniculatum)।
কৃপা (Lumnitzera) প্রজাতি — কৃপা (L. racemosa)।

৩। দুধি উদ্ভিদ তুলনায় নরম কাষ্ঠল, হাল্কা এবং এর আঠা দুধের মত। আঠা চোখ এবং ত্বকের পক্ষে ক্ষতিকারক।

গেঁওয়া (Excoecaria) প্রজাতি — গেঁওয়া (Excoecaria agalocha)।


Derris trifoliata


A marina


Excoecaria agallocha


Phoenix paludosa


Aegiceras corniculatum


Bruguiera gymnorrhiza

৪। লাল উদ্ভিদ শক্ত ও দীর্ঘ আঁশযুক্ত কান্ঠল উদ্ভিদ। গর্জন ও বকুল চর সন্নিহিত এরাকায় বেশি দেখা যায়।
ধুঁধুল (Xylocarpus) প্রজাতি — ধুঁধুল (*Xylocarpus granatum*), পসুর (X. molucensis)। সুন্দরী (Heritiera) প্রজাতি — সুন্দরী (*Heritiera fomes*)। গরাণ (*Ceriops*) প্রজাতি — ঝামটি গরাণ (*C. decandra*), জেলে গরাণ (*C. zippeliana*), মঠ গরাণ (*C. tagal*)। গর্জন (Rhizophora) প্রজাতি — গর্জন (*R. mucronata*), গর্জন (*R. apiculata*) কাঁকড়া (Bruguera) প্রজাতি — কাঁকড়া (*B. gymnorhiza*) বাঁদুরে কাঁকড়া (*B. sexangula*) বকুল (*B. parviflora*) সোনা বকুল (*B. cylindrica*)।

৫। খেজুর বা পাম উদ্ভিদ জল প্রান্তের উঁচু ভূমিতে হেঁতাল আর নিমজ্জিত কাদা মাটিতে গোলপাতা জন্মায়।
হেঁতাল (Phonix) প্রজাতি — হেঁতাল (*P. paludosa*)।
গোলপাতা (Nypa) প্রজাতি — গোলপাতা (*Nypa fruticans*)।

৬। ঝোপ জঙ্গলের উঁচু প্রান্তে, যেখানে জোয়ারের জল প্রতিনিয়ত পৌঁছায় না সেখানেই এদের আধিক্য।
গিরে শাক (Suaeda) প্রজাতি — নোনা গিরে (S. nudiflora) প্রজাতি — যদু পালং (S. australis) হুদো (Sesuvium) প্রজাতি — হুদো (S. portulacastrum)

৭। ঘাস নিয়ত জোয়ার বিধৌত ভূমিতে এদের উপস্থিতি।
ধানী ঘাস (Proteresia) প্রজাতি — ধানী ঘাস (Proteresia coarctata)।

৮। লতা উঁচু ভূমিতে বিশেষ করে গেঁওয়া আধিক্য ভূমিতে এরা জন্মায় ও লতিয়ে ওঠে।
কালি লতা (Derris) প্রজাতি — কালি লতা (D. trifoliata)। পান লতা (D. indica)। দুধি লতা (Finlaysonia) প্রজাতি — দুধি লতা (Finlaysonia obovata)। নাটা (Caesalpenia) প্রজাতি — নাটা (Caesalpenia crista)।

1st Annual Biodiversity Assessment of

Neora Valley National Park

Prof.Silanjan Bhattacharya
WB State University

Sri Ujjal Ghosh, IFS,
Chief Conservator of Forests

INTRODUCTION

Neora Valley National Park is probably one of the best wilderness area of our country. The National Park enjoys the distinction of being situated over one of the oldest reserve forest in India. The compact tract of forest is mostly virgin in nature because of its unique topography comprising of the hills which rise up abruptly from the piedmonts increasing northwards and having a mosaic of micro topographic units. Neora Valley National Park (NVNP) is situated in the Kalimpong District, West Bengal spread over an area of 159.78 km2 notified in 1986 is one of the richest biological zones in the entire Northeast. The land of elegant Red Panda in the pristine undisturbed natural habitat with rugged inaccessible hilly terrain and rich diverse flora and fauna together make the park an important wilderness zone.

The forest in Neora Valley has such a luxurious growth that even sunlight finds it difficult to touch the ground. Much of the park is still inaccessible making it an adventurous place for the nature lovers & trekkers who can take the challenge to explore the still-unknown terrain in the Kalimpong hills. The park reaches up to an elevation of 3140 mt (10300 ft) at Rachela, the highest point of Neora Valley National park, which borders Sikkim and Bhutan.

The very first objective as stated in the DRAFT National Forest Policy 2018 of our country is the 'maintenance of environmental stability and conservation of biodiversity through preservation and conservation of natural forests.' The strategy to achieve the above goal has also been written in the DRAFT National Forest Policy 2018 as

"Biodiversity Conservation.

Natural forests are rich repositories of biodiversity in the country. The following steps will be taken for the conservation of the biodiversity in the natural forests.

(i)Biodiversity of the forest areas of the country will be surveyed and documented systematically, and sites having exceptional taxonomic and ecological value will be conserved. Legal and administrative measures for protection of biodiversity against bio-piracy will be taken, in sync with National Biodiversity Act.

(ii) Modern techniques of ex-situ conservation will be promoted for the preservation of Relic, Endangered and Threatened (RET) species.

Considering the above mandate as a guideline we planned to conduct series of biodiversity assessment programmes of PAs of North Bengal over a period of next Five years. The first such attempt was made in Neora Valley National Park and assessing the biodiversity richness of such a pristine and inaccessible wilderness area was indeed a tough task. This kind of field exercise have been taken up for the first time by Wildlife North circle, West Bengal keeping the following objectives in mind.

OBJECTIVES

- To identify different floristic composition of NVNP specially the added area including orchids, wild flora, medicinal herbs, trees etc.
- To identify different fauna of NVNP including lesser known groups like Snakes & Lizards, Spiders, Butterfly & Moths, Dragonfly & Damselfly as well as mammals.
- To prepare and upgrade checklist of Trees, Ferns, Wild flower, Orchids, Mammals, Avifauna, Harpetofauna, Insects etc.
- To impart training to frontline staff in identifying different bio-diversity elements.
- Documentation on biodiversity richness of NVNP

Chestnut Bellied Nuthatch
(Sitta cinnamoventris)

Photograph : Ujjal Ghosh, IFS

THE FOREST TYPES

According to Champion and Seth (1935), forest types are Neora Valley National Park, are as following.

i) Eastern Himalaya Moist mixed deciduous forest (3C/C- 3b)
ii) Sub Himalaya Secondary Wet mixed Forest (2B/2S-3).
iii) Eastern Himalaya Sub tropical Wet Hill forest of Northern Sub Tropical. Broad leaved Hill Sub group(8B/C 1).
iv) Eastern Himalaya West Temperate Forest of montane Wet Temperate Sub group - (11/B/C1).
v) Eastern Himalaya Subalpine Forest (Brich-Rhododendran-(14/C-2).

LOCATIONS OF CAMPS

Two of the camps were set up in Lower Neora Range covering an altitude of 500 mt to 1500 mt whereas the other one was at Upper Neora Range covering an altitudinal range of 1800mt to 2200 mt.

- Doley camp, NVNP -
  N 27°04'14.51" , E 88°42'34.36, Altitude: 2025mt
- Asholay camp, NVNP-
  N 27°00'46.3 , E 88°46'29.4 , Altitude: 686mt
- Mochuki camp, NVNP-
  N 27°01'36.48 , E 88°47'10.05 , Altitude: 1170mt

METHODOLOGY OF BIODIVERSITY ASSESSMENT

The observations were mostly ad libitum and 'scan a block', i.e. intensive search in all the potential habitats for a target group of the fauna or flora in a patches of forests by the field experts for that group included in the survey team.
Encounter frequencies with different species during the surveys at different camp sites as experienced by the field team members were scaled from 0 to 3 in a hierarchical fashion to reflect the apparent abundance of each species in the surveyed locations, they are being 0 = not encountered, 1 = rarely encountered, 2 = common and 3 = highly abundant. No specimen was collected to respect the permission restrictions, but digital photography was done in abundance to document the species and its variations as and when possible. This has allowed confirmation of the field identification of a species at leisure with identification resources back in Kolkata.
All species or morpho-species (when a specimen could be noted as a distinct species visually but its species nomenclature could not be confirmed yet) reported, are directly observed in the field. Secondary information regarding the species of snakes, lizards and amphibians, the ones which are difficult to sight in this time of the year, were collected by interacting with the local forest staff and people from fringe villages.

RESULTS AND DISCUSSIONS

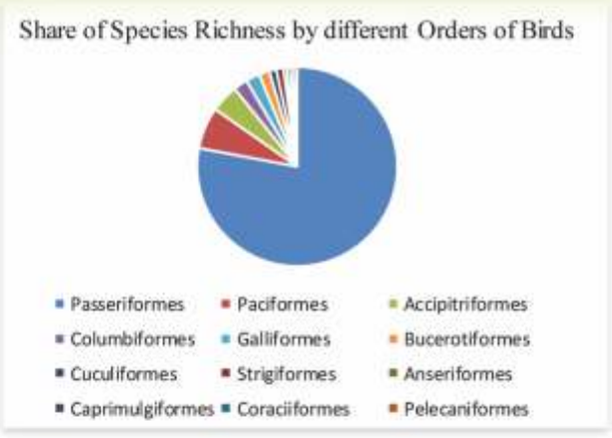
AVIFAUNA

ORDERS OF BIRDS RECORDED = 12
BIRD FAMILIES RECORDED = 46
BIRD GENERA RECORDED = 122
BIRD SPECIES RECORDED = 177


Gold-naped Finch (Female)

Altitudinal distributions of Bird Species Richness in NVNP

- Bird Species recorded only in Lower Neora = 27
- Bird Species recorded only in Middle Neora = 10
- Bird Species recorded only in upper Neora = 42
- Bird Species recorded in Lower and Middle Neora but not in Upper Neora = 36
- Bird Species recorded in all three Neora altitude zones = 46
- Bird Species recorded in Lower and Upper Neora but not in Middle Neora = 3
- Bird Species recorded in Middle and Upper Neora but not in Lower Neora = 11



HERPETOFAUNA

REPTILES REPORTED AT DIFFERENT ALTITUDINAL LEVELS IN NVNP (0 = NOT ENCOUNTERED, 1 = RARELY ENCOUNTERED, 2 = COMMON AND 3 = HIGHLY ABUNDANT)

Sl. No.	Genus	Species	Family	Common Name	Zonation Abundance		
					Lower	Middle	Upper
1	Lycodon	fasciatus	Colubridae	Banded Wolf Snake	1	0	0
2	Calotes	versicolor	Agamidae	Common Garden Lizard	0	2	0
3	Japalura	variegata	Agamidae	Variegated Mountain Lizard	1	0	0
4	Cyrtodactylus	cf. khasiensis	Gekkonidae	Khasi hill bent toed gecko	2	0	0
5	Hemidactylus	platyurus	Gekkonidae	Flat tailed house gecko	0	2	0
6	Asymblepharus	sikkimensis	Scincidae	Sikkim Ground Skink	1	1	1
7	Eutopis	Unidentified	Scincidae	Grass Skink	0	1	0

FROGS AND TOADS REPORTED AT DIFFERENT ALTITUDINAL LEVELS IN NVNP (0 = NOT ENCOUNTERED, 1 = RARELY ENCOUNTERED, 2 = COMMON AND 3 = HIGHLY ABUNDANT)

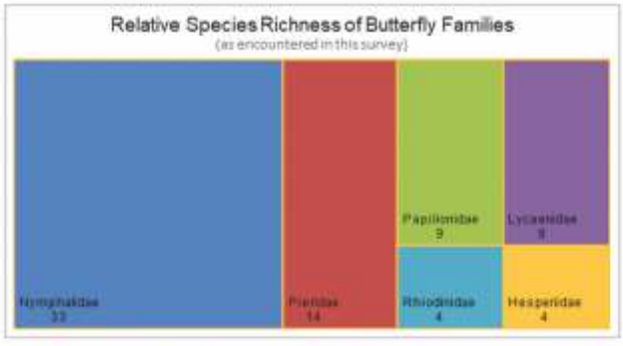
Hoplobatrachus crassus

Sl. No.	Genus	Species	Family	Common Name	Zonation Abundance		
					Lower	Middle	Upper
1	Amolops	Unidentified	Ranidae	Cascade Frog	3	0	0
2	Amolops	cf. gerbillus	Ranidae	Gerbil Stream Frog	3	0	0
3	Hoplobatracus	crassus	Dicroglossidae	Jerdon's Bull Frog	0	1	0
4	Philautus	Unidentified	Rhacophoridae	Shrub Frog	0	1	0
5	Megophrys	Unidentified	Megophryidae	Horned frog	0	0	1
6	Duttaphrynus	melanostictus	Bufonidae	Common Indian Toad	1	0	0
7	Duttaphrynus	himalayanus	Bufonidae	Himalayan Toad	0	0	1

Duttaphrynus himalayanus

Duttaphrynus melanostictus

BUTTERFLIES



Interestingly, no butterfly recorded at the higher altitude

DIPTERA

Remarkable documentations of diversity have been made in this survey, of the tiny two winged insects,- the dipterans, thanks to the expertise of one the significant team members, Dr. S K Sinha.

DIPTERAN SPECIES DIVERSITY RECORDED IN NVNP

Status	No. of Species
First time record from India	1
First time record from West Bengal	14
Genus recorded from West Bengal but species unidentified	17
Species recorded from other parts of West Bengal	19
Could not be identified fully except by common group names	24
Total Species recorded	75

All the 75 species of dipterans recorded during this first survey camp of NVNP could be the first ever record from NVNP, thanks to the fact that NVNP was probably never explored for this group of insects before.

ODONATA

Non-favourable season and climates, inaccessible water sources appears to be the major reasons for the record of only seven species of Odonates, a group which are linked to aquatic and arboreal food chains at different developmental stages of the same life,

Different Odonates recorded in NVNP

(0 = not encountered, 1 = rarely encountered, 2 = common and 3 = highly abundant)

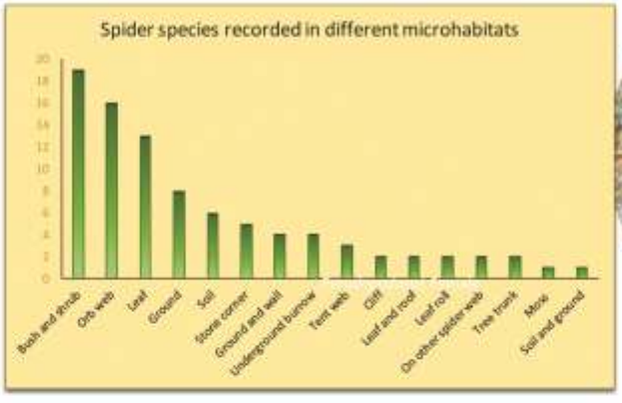
Sl.	Genus	Species	Family	Common Name	Zonation Abundance			Stage
					Low	Mid	Up	
1	Neurothemis	fulvia	Libellulidae	Fulvous Forest Skimmer	1	0	0	Adult
2	Neurothemis	intermedia	Libellulidae	Intermediate Skimmer	1	0	0	Adult
3	Palpopleura	sexmaculata	Libellulidae	Blue-tailed Yellow Skimmer	1	0	0	Adult
4	Vestalis	gracilis	Calopterygidae	Clear winged Forest Glory	1	0	0	Adult
5	Unknown	Unknown	Chlorogomphidae	Torrent Hawk	1	0	0	Larva
6	Unknown	Unknown	Gomphidae	Clubtail	1	0	0	Larva
7	Unknown	Unknown	Unknown	Damselfly	0	0	1	Larva

Other insects

During this survey, only 77 species of insects belonging to 54families of insects (along with 4 which could not be identified even at family level!), excluding Dipterans, Butterflies and Odonates, could be recorded giving just a glimpse of the insect diversity of this hitherto least explored NP in the state. Given the fact that insects are the greatest diverse group on earth and beetles alone outnumber others heavily and the present record of more than 5500 species of insects reported so far (following ZSI), this could be consider as a gross underestimate.

SPIDERS

Spiders are often good indicators of different terrestrial ecosystems playing predators in the lower biomass food chains and being prey to birds, lizards, birds etc. Spider fauna of Darjeeling Hills has not yet been studied in a comprehensive manner, and Neora Valley National Park is one of most unexplored area in this district as well as in our country. Perhaps this spider assessment is the first time attempt in NVNP.



PLANT DIVERSITY

Taxonomic diversity of Plants documented in NVNP

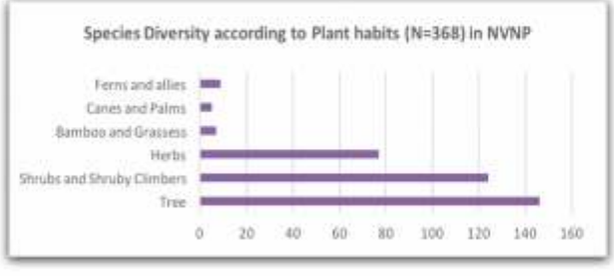
Number of Families	108
Number of Genera	266
Number of Species	364
Number of subspecies	1
Number of Varieties	3

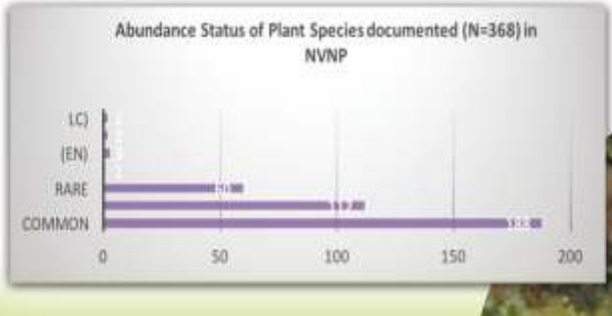
Species Diversity according to Plant habits(N=368) in NVNP

Tree	146
Shrubs and Shruby Climbers	124
Herbs	77
Bamboo and Grassess	7
Canes and Palms	5
Ferns and allies	9

Abundance Status of Plant Species documented (N=368) in NVNP

Common	188
Less Common	112
Rare	60
Critically Endangered(CR))	1
Endanger(EN)	3
Vulnerable(VU)	2
Least Concerned(LC)	2





ORCHIDACEAE

Total 53 Orchid species are recorded during the 10 days field survey (3rd to 13th March 2018)at three locations at different altitudinal levels in NVNP. Out of these,45 are epiphytic and the rest 8 species are terrestrial. Field availability status of these species are also documented that suggests18 as rare, 2 as common, 15 as sparse, 4 being frequent and 6 are threatened among the epiphytic species. Among the 8 terrestrial Orchids, 1 is sparse, 4 are rare and 3 are threatened.

CONCLUSIONS

An attempt of its first kind in the region, the first biodiversity camp at the NVNP has been restricted to three localities representing three altitudinal forest ecosystems in this region of a biodiversity hot spot, namely the Eastern Himalayas. The wild habitats in the region are supposedly best preserved owing to the tough terrains and stricter protection regime.

Despite the survey time duration at each of the three sites are far from being enough and weathers being hostile for field surveys, the different faunal and floral groups surveyed are quite indicative of biodiversity. They are, namely, Birds, Reptiles including snakes and lizards, Amphibians- frogs and toads, Butterflies, Odonates, Dipterans, other insects like Beetles, Bugs, etc., Plants including trees, shrubs and climbers, herbs. A special effort was given for Orchids, a precious biodiversity resource of the NVNP.

A total of 1024 speciesfrom 8 faunal groups, namely, Birds (177), Reptiles (7), Amphibians (7), Butterflies (72), Dipterans (75), Odonates (7), other Insects (77) and Spiders (90), have been sighted directly and recorded after preliminary identifications.

The very low recording of Reptilian, Amphibian and Odonate diversity is of course due to the climatic and seasonal factors, both being hostile to them during the survey period. The interview and discussion based survey in the fringe villages for secondary information on snakes look promising and useful for sharing information and good gestures between the WBFD team and local people.

The Field Survey Team

Sl	Name	Field	Organization
1	Dr Suvra Kanti Sinha	Diptera	Sonamukhi College, Bankura
2	Sri Ayan Mandal	Archinids (Spider)	Burdwan University
3	Sri Prasenjit Dawn	Odonata (Dragonfly/Damselfly)	Naturemate's Nature Club
4	Dr Soumya Sarkar	Amphibian	Naturemate's Nature Club
5	Dr Parthasarathi Ghose	Avifauna, Mammals	WWF
6	Sri Deependra Sunar	Field Botany, Taxonomy	WWF
7	Sri D B Basnet	Field Botany, Taxonomy	Forest Dept
8	Sri Anirban Chowdhury	Harpetofauna	Naturemate's Nature Club
9	Sri Apurba Chakraborty	Avifauna	Prakriti Sansad
10	Sri Animesh Bose	Naturilist	HNAF, Siliguri
11	Miss Sarika Baidya	Butterfly, Host plants	Naturemate's Nature Club
12	Dr Rajendra Yonzone	Orchid	Kalimpong
13	Dr Nakul Chetri	Naturalist	ICIMOD
14	Dr Pranab Debnath	Coleoptera	BCKV, Nadia
15	Sri Rakesh Pashi	Coleoptera	BCKV, Nadia

Forest Officers attended the camp

Sl	Name	Designation	Present place of posting
1	Sri Ujjal Ghosh, IFS	CCF, Wildlife North	Jalpaiguri
2	Sri Bidyut Sarkar, IFS	DFO, Silviculture, North	Siliguri
3	Miss Nisha Goswami, IFS	DFO, Gorumara WL Division	Jalpaiguri
4	Sri Badal Debnath, WBFS	ADFO, Gorumara WL Division	Jalpaiguri
5	Sri Raju Sarkar, WBFS	ADFO, Gorumara WL Division	Jalpaiguri
6	Sri S S Giri, FR	Range Officer, Lower Neora Range	Samsing
7	Smt Sujata Gurung, FR	Range Officer, Upper Neora Range	Lava

Frontline staff participated in the camp

Sl	Name	Designation	Present place of posting
1	Sri Paitan Mahat	CDL	Samsing HQ
2	Sri Biru Subba	FG	Bhotekharka camp
3	Sri Boby Bhujel	CDL	Gogune camp
4	Sri Joseph Lepcha	CDL	Lava HQ
5	Sri Rupen Lepcha	CDL	Samsing HQ
6	Sri Amit Kr Tamang	CDL	Lava HQ
7	Sri Yak Tshering Lepcha	FG	Lava HQ
8	Sri Kumar Bhujel	CDL	Ashaley camp
9	Sri Dhankumar Gurung	CDL	Lava HQ
10	Sri Ajit Rai	CDL	Choudaferi camp

J F M C's
of Pundibari range of Coochbehar Division
A Case study on its operation and legal issues

Shashanka Kr. Nag WBLS
Law Officer

Biman Kr. Biswas, WBFS
Divisional Forest Officer

West Bengal is the pioneer state in India in initiating the Joint Forest Management. Joint Forest Management is basically a tool which marks the partnerships in forest movement , protection and development involving both the state forest departments and local communities. This movement had its genesis at Arabari District in the Paschim Medinipur District of West Bengal in the 1970s.

Patlakhawa Forest under the Pundibari Range in the division of Coochbehar was well known for its Rhino habitat. However, with the passage of time the species has been exterminated and has become extinct. Reintroduction of the species at the said Pundibari Range through JFMC is an attempt to establish the Rhino species in its old habitat thereby conserving biodiversity and preserving the gene pool and fragile ecosystem.

Thus, 4(four) JFMCs were created at

(i) Chatsingimari,
(ii) Singimaripachanirpar,
(iii) Khagribari and
(iv) Rasomati.

Total members of these 4(four) JFMCs are 1021 out of which 37.6% belong to the Schedule Caste and 4% belong to the Sechedule Tribe Community. Majority of such population is poor, marginal farmers and land less labourers. In the recent years the significant quantum of input under the Rural Infrastructure Development Fund(RIDF), Central Sector Schemes (CSS), National Afforestation Programme (NAP) & FDA Scheme were provided. This has helped in the better participation of the local people in the management of forests which in turn resulted in the reduction of forests offences relating to tree felling, poaching, fuel wood collection etc.

The first meeting of the JFMCs regarding the reintroduction of Rhino in Patlakhawa Forest Area took place in presence of local gram Pradhan, member of local Gram Panchayat, Sabhapati- Panchayat Samity, Karmadakhya-Bon-O-Bhumi Sanksar Sthayee Samity, members of JFMC along with the staffs of Forest Department on 09.08.2017 and 10.08.2017 at Rasomati, Khagribari and Chatsingimari and Singimaripachanirpar respectively.

The following topics were discussed at the meeting:

(i) Objective of Rhino reintroduction in Patlakhawa
(ii) Problems and solution of present changing
(iii) Future prospect of livelihood and income generation of local peoples
(iv) Development of Infrastructure
(v) Control of grazing, fishing and collection of firewood.

Thereafter, the Government of West Bengal approved the Rhino reintroduction project and subsequently a meeting was organised by the Range Officer, Pundibari Range with prior instruction of the Divisional Forest Officer, Coochbehar Division with local Pradhan of Gram Panchayat, Sabhapati-Panchayat Samity, Karmadakhya- Bon-O-Bhumi Sanksar Sthayee Samity, along with the staffs of the forest department and its officers. Two prime decisions were taken in the said meeting, namely:

(i) A fresh and new Annual General Meeting (AGM) should be organized before the implementation of the Rhino Reintroduction Project for selection of new Executive Committee Members from 4(four) JFMCs.
(ii) The newly selected Executive Committee Members will take active participation in the implementation of Project work.

Annual General Meeting of the 4(four) JFMCs were held as stated below:

NAME OF JFMC	DATE OF AGM	TOTAL MEMBER PRESENT	% OF VOTE BY RAISING MAJORITY	NO OF ELECTED MEMBERS
1)Singimari/Pachanirpar	20.11.17	500	100%	25
2)Chat Singimari	21.11.17	477	100%	25
3)Rasomati	22.11.17	218	53%(1st list)47%(2nd list)	20
4)Khagribari	23.11.17	388	80%(1st list)/8.5% (2nd list)/43 people leave without voting	25

Meanwhile, all of a sudden a writ petition being no. 31403(W) of 2017 was filed by one Sri Jitendra Sarkar &Anr.vs State of West Bengal & Others at the Honble High Court, Kolkata at constitutional writ jurisdiction, against the newly formed Khagribari JFMC. On 23.11.17 the Annual General Meeting of the Khagribari JFMC was held with one of the agenda being the election of the Executive Committee Members of Khagribari JFMC under Patlakhawa Gram Panchayet,Coochbehar.

The petitioner in his writ petition challenged the election of the said Executive Committee of Khagribari JFMC. The petitioner further alleged that the formation of the Executive Committee of Khagribari was unconstitutional and unlawful and was not formed in pursuance of the Order passed by the Principal Chief Conservator of Forest and Head of Forest Force, West Bengal being No. 05/MISC/2017 dated 16.01.2017. The petitioner also prayed before the Honble High Court for the dissolution of such Executive Committee as it was also not formed on an unanimous consensus.

However, such Writ Petition was dismissed by the High Court on merit. The Learned Court held that, interalia

``.....The so called objection of the petitioners does not relate to the manner in which the voting was conducted in the annual general meeting. On the plea that the direction contained in the writing dated 16.01.2017 is for the purpose of ensuring a transparent and smooth electing an executive committee, the presiding officer of the annual general meeting had drawn attention of the entire body and members present in the annual general meeting about the two panels and had requested members to signify their consent in respect of either of the two panels. Essentially they had two panels to vote.312 had members supported one of the panels in the annual general meeting.

In such circumstances, the constitution of the committee cannot be faulted at least under Article 226 of the Constitution of India.

In such circumstances there being no merit in the present writ petition, **W.P.No 31403(W) of 2017** is dismissed.

Therefore, from the above facts and circumstances it is very much evident that the JFMCs in Coochbehar, West Bengal is functioning very smoothly and effectively. Continuous efforts are being made by the members of the JFMCs, Forest Officials and local bodies in the preservation and protection of the vast forest areas. Conservation of biodiversity and the fragile ecosystem are the primary objectives of the JFMCs. The Committees have also taken significant strides in bringing the active participation of the local people for the development of the Forestry in West Bengal.

The above case study is the vindication of our efforts in implementing Joint Forest Management in the State of West Bengal. This is probably the first and the only case where the Honble High Court has given judgement confirming our system of implementing Joint Forest Management in the State.

Sundarban Biosphere Reserve

Dr.R.P. Saini, IFS
Managing Director, WBFDC Ltd.

Key Messages/Lessons learnt

- Sustainable biodiversity conservation over 4262sq.km ofSBR which is one of the world network of Biosphere Reserve.
- School children are the brand ambassador of Sundarban Biosphere Reserve
- Constitution and sustenance of poor fringe people to shoulder the responsibility of biodiversity conservation and livelihood improvement through Eco development measures.
- The forest of the Sundarban Biosphere Reserve sustains high level of plant and animal diversity and endemism including threatened and endangered species.
- Creation of Nylon Net Fencing to mitigate tiger straying and hence avoid human tiger conflict.
- E-patrol/ smart patrolling was introduced in Sundarban Biosphere Reserve in the year of 2015-16 and all over SBR was completely covered by E-patrolling within the year of 2016-17.

Sundarban Biosphere Reserve description

Sundarban is the largest intertidal delta in the world and harbours the largest mangrove vegetation.The area lies between $21^0 30` - 22^0 45`$ North latitude and $88^0 66` - 89^0 5`$ East longitude, consisting of a group of 54 islands, innumerable rivers, rivulets, creeks and mangrove forests.

In the year 2001, UNESCO recognized Sundarban as World Network of Biosphere Reserve under its Man and Biosphere programme.It was identified as Ramsar Site (a wetland of international importance). For its unique biodiversity, UNESCO had declared Sundarban National Park as a World Heritage Site in 1987. Sundarban is the only mangrove forest in the world, which is the home of tigers and having the highest population of tigers in the world.

The Sundarban mangrove forest supports 334 species of plants, 44 species of fishes, 8 species of amphibians, 53 species of reptiles, 315 species of birds, 49 species of mammals. Sundarbans highly productive ecosystem acts as a natural fish nursery; mangrove acts as a natural shield against the fury of cyclonic storm and prevents erosion due to tidal action and checks atmospheric pollution. Finally, millions of people depend on Sundarban ecosystem for their livelihood and sustenance through fishing,collection of honey, fuel wood and timber.

Sundarban under South 24 Parganas district

BR challenges

- Inaccessible terrain
- Sustainability of participatory biodiversity conservation
- Mainstreaming biodiversity conservation
- Impact on Global Warming and climate change
- Human tiger conflict
- High level of dependency of local people on SBR for their livelihood.

Initiatives/Actions on Sundarban Biosphere Reserve

Awareness programme through school children

Different schools in collaboration with Sundarban Biosphere Reserve Directorate has arranged many school field trips and excursion to educate them about the importance of such extensive floral and faunal diversity and to keep free from plastic pollution in Sundarbans.

Figure- School children awareness programme

Mangrove and Biodiversity Conservation

Mangroves are monitored regularly and as there are many initiatives taken by the forest department, Government of West Bengal like plantation programmes to increase the mangrove areas.

Figure- Mangrove ecosystem and plantation site

Nylon Net Fencing

The boundaries of the vulnerable forest areas along the river was fenced by vegetative cover i.e. Ceriops- Excoecaria combination tide with Nylon Net Fencing using Avicenna posts along the forest fringe have been then found to be very effective.

A protocol for maintenance of the nylon-net fencing has been designed with an aim of carrying out thorough checking and proper maintenance. The Protocol includes involvement of local stakeholders in JFMC members also along with forest staff.

Figure- Setting up of Nylon Net Fencing

E- Patrolling

E-patrol/ smart patrolling was introduced in Sundarban Biosphere Reserve in the year of 2015-16 and all over SBR was completely covered by E-patrolling within the year of 2016-17.

In this new system,each and every camp has been given a smart phone with a mobile application namely Hejje (written in Java language) installed on it for monitoring and patrolling purpose. With this software/application the front-end staffs are recording their every possible activity like patrolling, fence checking, night patrols, offence detections, wildlife sightings etc.

Figure E- Patrol Map of National Park West Range

Joint Forest Management Committee and Self Help Group

- To reduce the dependency of the villagers on forest and river for eking out their livelihood and thereby reducing pressure on nature.
- To develop options of alternative livelihood
- To upgrade the knowledge and skill of the villagers for optimal utilization of their available resources.
- To empower the villagers technologically, socially and economically.

Figure- Self help group participating in various training programmes.

Developmental activities

To have healthy people and Forest Management, the following self-employments activities are implemented by:-

- Fishing
- Goatery
- Apiculture
- Duckery and Poultry Farming
- Mushroom Cultivation
- Prawn Cultivation
- Training for handicraft work

Income generation

Participants who have received goatary training during 2015, have already earned about Rs. 40,000/- to 60,000/- by selling the goats. Few participants who have received 20 chicks after Training on Backyard Poultry Farming, have become successful in producing added 30 chicks from those earlier 20 chicks and earned a Rs. 10,000/- to Rs. 20,00/- approx. All the new participants who have received training on Duckery and food processing between 2016-2017, have not yet started earning, but they are expecting to earn Rs. 10,000/- to Rs. 15,000/- on yearly basis.

Infrastructure Facilities

- Many roads, Community hall, Housing structure has been constructed.
- Setting up of Tubewell and Irrigation Canals.
- Setting up of Solar pannels and street light using solar energy.
- Setting up of Pond water treatment plant.

This is done by the forest department so that the people of Sundarban opt for alternative livelihood options so that overall forest can be conserved and human-animal conflict can be avoided.

References

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Acknowledgements

- Forest Department, Government of West Bengal.

Application of Tree Transplanting Techniques in Birbhum Division

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Introduction

Transplanting is the term used to describe the digging and replanting of trees from one location to a new location. Due to the wide extent and morphology of tree root system, transplanting of trees usually involves substantial removal of roots. A decision to transplant a tree should be based on a balancing consideration of its conditions, size, species, conservation status, amenity value, suitability for transplanting, environmental and cultural factors, functional and engineering consideration and cost effectiveness.

Need for tree transplanting

During the implementation of development projects like road widening, railway line, water related projects, mining power plant project, etc., the people, politicians, media, conservationists, environmentalists, judiciary etc., take cognizance of the fact that the trees are being cut without giving a second thought. They also ask, whether such of these trees can be saved? Since their concern is genuine, we need to address such concerns by educating them with the technicalities involved in dealing with these live specimens. Under such circumstances, the transplanting technique can be of some help for selected species depending on the factors as detailed above.

Ecological benefits of transplanting a tree

The ecological benefits from well established transplanted tree entering into new locations are many, like

- Continued Carbon sequestration
- Continued Oxygen supply
- Continued pollution abatement
- Continued sheltering of wild fauna
- Soil stabilization, storm water interception
  Aesthetic value, etc.

Planning

Planning for tree transplanting the decision making process requires a systematic approach. The following plans should be taken for transplanting a tree:

- A tree survey on the trees should be conducted to obtain required information.
- Proposal to transplant trees should be properly planned and implemented to ensure that sufficient space to accommodate the existing tree and its future growth, and adequate time for preparation of transplanting are available.
- Priority should be given to transplant the affected trees to other permanent locations within the project site where appropriate.
- Determining factors for transplanting The decision to transplant a tree should be a balancing act considering the following factors

1. General health, form and structure of the tree,
2. Size of root ball/quality of root system,
3. Size of trees,
4. Species and conservation status of a tree,
5. Availability and suitability of a receptor site,
6. Time for preparation,
7. Maintenance party,
8. Access to the existing and receptor locations and trans portation,
9. Site constraints,
10. Cost effectiveness

Safety Precautions

Tree transplanting, like other tree management works, should be conducted in a controlled and safe manner. Workers who are involved in transplanting trees should be given adequate instruction and supervision to ensure that tasks are completed in a safe manner. The site shall be inspected for possible hazards prior to beginning any transplanting procedure.

Transplanting operations

Tools and equipment - All tools and equipments should be appropriate to the operations and prepared in advance. Digging and root pruning tools shall be sharp and clean. Mechanical digging and root pruning equipments shall be operated according to manufacturers instructions and specifications. Lifting cables, chains, straps and slings shall be inspected and used according to manufacturers instructions and specifications.

Timing of transplanting

In tropical areas, rainy season is considered as optimal time for transplanting. In general, summer is not a common transplanting season as evaporation rate is high. The risks of inclement weather and typhoons will also affect the work progress.

Preparation of root ball

Root pruning is sometimes required before transplanting. The root system of a woodland or open grown tree will normally be widespread. The root ball size varies depending on species, habit, location and specific attributes which shall be as large as practicable to maximise the potential of survival during and after transplanting. In general, the root ball diameter to tree diameter ranges from 8:1 to 10:1 according to international standards. The root ball size should be of a diameter and depth to encompass enough of the root system as necessary for establishment.

Stage Digging Process

Stage Digging

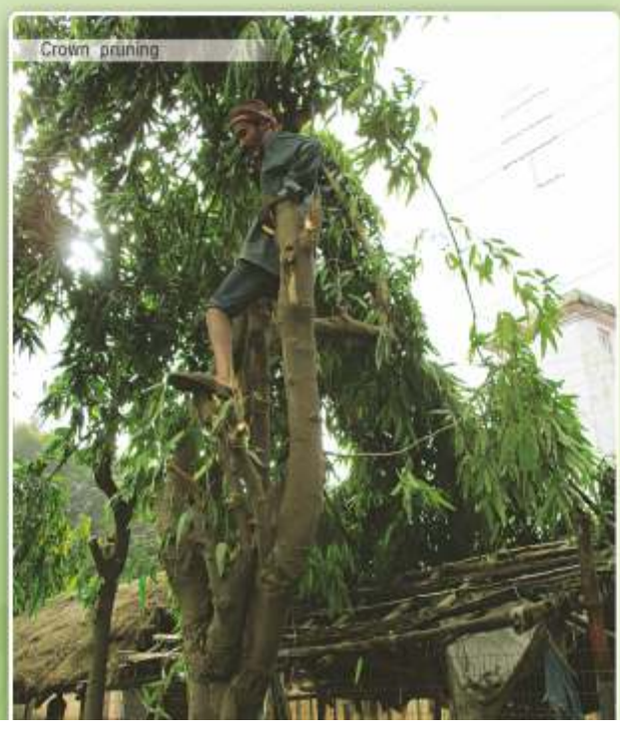
Stage digging can be carried out in following four stages:

a) 1st stage Dig a stage on the outside of the marked cir cumference in only two opposing segments.
b) 2nd stage After a period of not less than 1month since the 1st root pruning, dig a stage on the outside of the marked circumference in the adjacent two opposing seg ments.
c) 3rd stage After another period of not less than 1month since the 2nd root pruning, dig a stage on the outside of the marked circumference, in the remaining two opposing segments.
d) 4th stage After a further period of not less than 1month since the 3rd pruning, prepare the root ball and cut the underside of the root ball.

The excavated trench shall be back filed with amended soil mix with growth hormones. Cuts must be clean to avoid tearing or breaking the roots.

Crown pruning

Pruning of tree crown during transplanting may not be necessarily beneficial to the tree. Crown cleaning however can be carried out to remove unhealthy, damaged, dead and crossed branches.



Crown pruning

Pre – lifting operations

Before uplifting, the outer edge of the previously dug tranches shall be loosened from the surrounding soil, and the root ball can be shaped with taper on the side, slanting inward toward the base. Damp hessian is places on the side and across the tip of the ball and pinned.

Temporary support of trees before lifting

A tree after root pruning may not be having extensive root support. So a temporary support need before final lifting of the tree.

Lifting and handling of root-balled trees

Lifting and handling of root-balled trees

The root ball should be properly wrapped before lifting. Lifting should be done directly by using lifting machine.

Preparation of receptor site

In general, the depth of the planting hole not exceed the depth of the root ball and the sides of the planting hole should be scarified. The planting hole width should follow international practice at a minimum of 1.5 times the diameter of the root ball to suit the location.

Planting

Tree should preferably be placed in the same orientation from which they originated. All root ball supporting should be removed. Crown wrappings and fastening used to tie in the branches for transport should be removed. Damaged branches during transit should be properly pruned. When finally set, the top surface of the root ball should not be below the surrounding soil. The backfill soil should be tamped firmly around the base to stabilised a tree, rest of the soil should be tamped only lightly. Tree should be secured in position. Immediately following planting, a soil saucer can be formed on the soil surface around the edge of the root ball circumferences to permit rain or irrigation water to be retained and slowly infiltrate into the root ball perimeter.

Planting

Post Planting Care

Watering needs to be done frequently depending on the season, type of soil, drainage and water quality. But, proper drainage has to be ensured and mulching will help a lot. Plant protection measures can be taken depending on the pest, disease, in consultation with the plant scientists. Apply dung paste or neem paste to thee abrasions or injured portions. Fertilizers and nutritional supplements can be given to enhance its establishment. The transplanted tree needs to be observed on a daily basis.

Tree transplanting attempts in Birbhum Division

In Birbhum Division 36 nos. trees were identified for transplanting. All of these trees were causing danger to life and property due to its location. List of trees identified for transplanting in Birbhum Division is as given below

Tree Number	Location	Species	BHG (M)
1	Division Office Complex	Debdaru (*Polyalthia longifolia*)	0.68
2	Division Office Complex	Debdaru (*Polyalthia longifolia*)	0.78
3	Division Office Complex	Debdaru (*Polyalthia longifolia*)	0.35
4	Division Office Complex	Debdaru (*Polyalthia longifolia*)	0.75
5	Suri Range Complex, Chhora	Teak (*Tectona grandis*)	0.70
6	Suri Range Complex, Chhora	Mehgini (*Swietenia macrophylla*)	0.85
7	Suri Range Complex, Chhora	Sirish (*Albizia lebbeck*)	1.00
8	Suri Range Complex, Chhora	Neem (*Azadirachta indica*)	0.80
9	Suri Range Complex, Chhora	Piyasal (*Pterocarpus marsupium*)	1.15
10	Suri Range Complex, Chhora	Chalta (*Dillenia indica*)	0.70
11	Suri Range Complex, Chhora	Jam (*Syzygium cumini*)	0.70
12	Suri Range Complex, Chhora	Krishnachura (*Delonix regia*)	1.10
13	Chhora Beat Complex	Ailanthus (*Ailanthus triphysa*)	2.10
14	Chhora Beat Complex	Kanthal (*Artocarpus heterophyllus*)	1.18
15	Chhora Beat Complex	Pakur (*Ficus exasperata*)	1.50
16	Chhora Beat Complex	Teak (*Tectona grandis*)	1.15
17	Chandrapur Beat Complex	Sissoo (*Dalbergia sissoo*)	0.66
18	Chandrapur Beat Complex	Sissoo (*Dalbergia sissoo*)	0.78
19	Chandrapur Beat Complex	Setisal (*Dalbergia latifolia*)	0.95
20	Chandrapur Beat Complex	Tentul (*Tamarindus indica*)	0.65
21	Chandrapur Beat Complex	Teak (*Tectona grandis*)	0.70
22	Chandrapur Beat Complex	Teak (*Tectona grandis*)	0.55
23	Chandrapur Beat Complex	Teak (*Tectona grandis*)	0.70
24	Chandrapur Beat Complex	Teak (*Tectona grandis*)	0.45
25	Chandrapur Beat Complex	Teak (*Tectona grandis*)	0.53
26	Chandrapur Beat Complex	Teak (*Tectona grandis*)	0.90
27	Chandrapur Beat Complex	Eucalyptus sps.	1.55
28	Chandrapur Beat Complex	Eucalyptus sps.	1.00
29	Chandrapur Beat Complex	Eucalyptus sps.	1.00
30	Chandrapur Beat Complex	Eucalyptus sps.	0.53
31	Chandrapur Beat Complex	Eucalyptus sps.	1.00
32	Chandrapur Beat Complex	Eucalyptus sps.	1.10
33	Chandrapur Beat Complex	Eucalyptus sps.	0.70
34	Chandrapur Beat Complex	Eucalyptus sps.	1.18
35	Rajnagar Range Complex	Teak (*Tectona grandis*)	1.20
36	ADFO Bungalow Complex	Ber (*Ziziphus mauritiana*)	0.95

Photograph : Tapas Das, IFS

লাভলি

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আমি তখন বরলামপুর রেঞ্জে। বললামপুর রেঞ্জে পুরুলিয়া বিভাগের অধীনে। বলরামপুরে রেঞ্জের সীমানায় ঝাঁড়খন্ড রাজ্য। এখান থেকে জামশেদপুর, চান্ডিল, বাগমুন্ডী, অযোধ্যা যাওয়া যায়। শান্ত ছোট্ট শহর। বলরামপুরের রেল স্টেশনের নাম বরাভূম। লাক্ষা শিল্পের জন্য বিখ্যাত। প্রায় দেড়শত বা তার বেশী লাক্ষা তৈরী করার কারখানা এখানে আছে। ভারতবর্ষে লাক্ষাতে যে বৈদেশিক মুদ্রা আয় হয় তার প্রথম দশের মধ্যে বলরামপুরের কোন না কোন শিল্পপতি থাকে। যেহেতু লাক্ষা তৈরীর জ্বালানী কাঠকয়লা আর কাঠ কয়লা বেশীর ভাগ আসে অযোধ্যা পাহাড় থেকে। দুর্গম পাহাড়ের কোন ঘন জঙ্গল কেটে স্থানীয় কিছু ব্যবসায়ী পাহাড়ে তৈরী করে কাঠ কয়লা তৈরীর ভাটি। শয়ে শয়ে হেক্টর জঙ্গল প্রতি বছর এর জন্য বংশকারীরা কাটে। সস্তায় সেই কাঠ কয়লা চলে আসে লাক্ষা ব্যবসায়ীদের হাতে। এতে ব্যবসা ফুলে-ফেঁপে ওঠে। আমি প্রতি বছর রুটিন করে পঞ্চাশ-ষাট জন লোক-লস্কর কর্মচারী নিয়ে দুর্গম ঐ সব জায়গায় পায়ে হেঁটে উঠতাম। লক্ষ্য ঐসব অবৈধ ভাটি ভাঙ্গা। প্রায় দশ-বারো ঘন্টা লাগত। এখন সেটা স্বপ্ন। সেই কারণে আমাদের সঙ্গে কাটকয়লা ব্যবসায়ীদের শত্রুতাই বেশী ছিল। ১৯৯৪ থেকে ১৯৯৯ এই প্রায় পাঁচ বছরে একবারই এক শিল্পপতি ভারতবর্ষে তৃতীয় বৈদেশিক মুদ্রা আয় করার আনন্দে এক পার্টিতে গিয়েছিলাম। এলাহি সে ব্যাপার-স্যাপার। অমন নানান ভুড়ি ভোজের আয়োজনের অনুষ্ঠানে এর আগে কোনদিন যাইনি।

একসময় রাজারা, জমিদারেরা, ঠিকাদারেরা হাতি পুষত। নিজেদের নানা কাজে, যুদ্ধে, অনুষ্ঠানে হাতি তাদের বিরাট ভূমিকা পালন করত। কখনও মোটা মোটা গাছের লগ বহন করত, কখনও ভারী ভারী দ্রব্য নিয়ে যেত, কখনও নানা অনুষ্ঠানে তাদের সাজিয়ে গুছিয়ে নিয়ে যাওয়া হত। হাতি পোষা ছিল ধনবানদের একটা শখও। তখন এত বনভূমির সংকোচন, বন বংশ আর বনজ সম্পদের এমন করুণ অবস্থা ছিল না। গহন, গভীর এবং নানান বনজ সম্পদে পূর্ন বনাঞ্চলে বন্য জন্তুদের পর্যাপ্ত খাবার মিলত। হাতি ধরা বা পোষার এত বিধিনিষেধ ছিল না। কিন্তু বর্তমানে বন্য জন্তুদের অবস্থা খুব খারাপ। হাতি লুপ্তপ্রায় প্রাণীর তফশিলি-১ এর অন্তর্ভুক্ত লুপ্তপ্রায় প্রাণী। এদের উপযুক্ত কর্তৃপক্ষের যথাযত লিখিত অনুমোদন ছাড়া মারা, ধরা বন্যপ্রাণী ১৯৭২ আইন অনুসারে অ-জামিনযুক্ত অপরাধ।

শোনপুর মেলায় ত্রিশ-চল্লিশ বছর আগেও জমজমাট ছিল হাতি বিক্রির জন্য। বিভিন্ন রাজ্যের বন দপ্তরের আধিকারিকের ব্যবসায়ীরা, হাতির মালিকেরা হাতি কেনা-বেচাতে মিলিত হতেন। ভারতবর্ষের ব্যবসায়ী শুধু নয় পাশাপাশি দেশ যেমন নেপাল, ভুটান, বাংলাদেশ সহ অনেক দেশের অনেকেই এখানে আসে ঐ মেলায়।

এক-একটি হাতি প্রায় তিন লক্ষ থেকে এক কোটি টাকায় সওদা হয়। যারা হাতি পোষেন, যারা পোষা হাতির বাচ্চা পালন করেন, যারা বন থেকে হাতি ধরে পোষ মানান বা যারা হাতি বিক্রি করতে ইচ্ছুক সবাই এখানে প্রতি বছর আসেন। এখনও এই মেলা হয় তবে তবে তার সেই জৌলুস ফিকে হয়ে গেছে। এখন হাতি পোষা প্রচুর ব্যয় সাপেক্ষ আর নানান আইনের গেরো।

কিছুদিন আগে বলরামপুর থেকে পুরুলিয়া যাবার পথে দেখলাম একটি স্ত্রী হাতিকে নিয়ে দোকানে, বাজারে হাতির মাহুত ভিক্ষে চাইছে। বেশ কয়েক বছর এদের দেখিনি। বুদ্ধেশ্বরকে বললাম, এরা কোথা থেকে এসেছে জানো?

বুধু বলল, কি জানি স্যার। তবে উত্তরপ্রদেশ বা ঐ দিক থেকে এসেছে। কৌতুহল মেটানোর জন্য বললাম, তুমি খবর নেবে তো ওরা কোথায় আস্তানা গেড়েছে।

হাতিকে যারা নিয়ন্ত্রন করে পোষ মানায়, নানা প্রশিক্ষণ দেয় তাদের মাহুত বলা হয়। আবার নানা সংকেত কাজ ইত্যাদির প্রশিক্ষণ যারা দেয় তাদের কান্দি বলে। মাহুত হাতির সর্বক্ষণের সঙ্গী। তার নানান ইশারায় হাতি বুঝতে পারে কি কাজ করতে হবে। বেয়াদপি করলে মাহুত তার হাতে ছুঁচালো দন্ড বা লাঠি দিয়ে জানান দেয় ভুল হচ্ছে। বুনো জন্তুকে পোষ মানানো তাকে প্রশিক্ষণ দিয়ে নানা কাজে লাগানোর কাজ সহজসাধ্য নয়। দিনের বেশীরভাগ সময় তার সঙ্গে কাটাতে হয়, তার দেখভাল করতে হয়, তাকে মর্জি বুঝতে হয়। এ কাজ করতে হলে সাহস দরকার। দরকার বন্য প্রাণীর মন, তর রুচি, তার আচরণ খুঁটিয়ে খুঁটিয়ে লক্ষ্য করা। এবং অভিজ্ঞ কারো কাছে অর্থাৎ কান্দির কাছে প্রশিক্ষণ নেওয়া। বন্য প্রাণী বন্য হলে কি হবে ওরা অনেক কিছু আকার-ইঙ্গিত শব্দে বা আচরণে বুঝতে পারে।

সারা ভারতবর্ষে বর্তমানে কয়েকজন মাত্র হাতি রাখে, তাদের পোষ মানায় এবং নানান কাজে লাগায়। এরা আবার ঐ হাতিদের মধ্যে মিলনে সৃষ্ট বাচ্চাদের লালন-পালন করে। এই বাচ্চা হাতির বয়স দুই-তিন বছর হলে মাহুতদের হাতে প্রশিক্ষণ শুরু করে। এই সব ছোট প্রশিক্ষণ প্রাপ্ত হাতিদের শোনপুর মেলায় নিয়ে আসে বিক্রির জন্য। এদের এটাই ব্যবসা। তবে দিন দিন এই কাজে তাদের উৎসাহ হারাচ্ছে। জ্ঞানের উন্নতির সঙ্গে সঙ্গে প্রশিক্ষণ প্রাপ্ত পোষা হাতিদের সংখ্যা কমছে। আর কিছু বছর পর বুনো হাতি হয়ত আর দেখতেই পাব না। তারা বাস্তুতন্ত্রের তাগিদে বুনো জন্তুর তকমা ঝেড়ে ফেলে ছিঁচকে চোরের মত আচরণ করবে। রাতের অন্ধকারে চুপি-চুপি কারও ধান, কারও ভুট্টা, সবজি খাবে, নষ্ট করবে। তাড়া করলেই পালাবে। প্রয়োজনে তেড়ে আসবে মানুষের দিকে। বন বিভাগে বেশ কিছু অভয়ারণ্যে, জাতীয় উদ্যানে, চিড়িয়াখানায় বা নির্দিষ্ট কোন জায়গায় দল ছুট বুনো হাতি বা আহত কোন বুনো হাতি অথবা রোগগ্রস্থ বুনো হাতিদের পোষ মানানোর জন্য ব্যবস্থা আছে। সারা বছর ধরে এখানে নানান বনাঞ্চল থেকে দল হাতিদের ছেড়ে চলে যাওয়া কোন বাচ্চা বা আহত হয়ে যাওয়া কোন হাতি এখানে আনা হয়। পোষ মানা এই সব বুনো হাতি আর বনে ফিরতে চায় না। জোর করে তাদের বনে ছেড়ে দিলে তারা জৈবিক কাজ অর্থাৎ লড়াই করে খাবার সংগ্রহ করা অন্য বুনো হাতিদের সঙ্গে সংগ্রাম করার কাজ করতে পারে না।

ঐ পোষা হাতিটির ব্যাপারে কাজের চাপে একেবারে ভুলে গিয়েছিলাম। হঠাৎ একদিন হলধর এসে বলল, স্যার শুনেছেন?

জিজ্ঞাসা করলাম, কি?

ও বলল, বলরামপুরে যে হাতিটা দেখেছিলেন সেটা ইছাডি গ্রামে আছে। ওখানে ওরা তাঁবু গেড়েছে।

বললাম, ঠিক আছে। আজই আমরা ওখানে যাব, ওদের সঙ্গে একটু কথা বলতে হবে। বন্য জন্তু সম্বন্ধে কৌতূহল প্রায় সবার। সে জন্তু যদি আবার হিংস্র হয়। দুপুরেই ইছাডি গ্রামে গেলাম হাতি নিয়ে আসা ঐ লোকটির কাছে। ছোট্ট তাঁবু। হলধর গিয়ে ওকে ডেকে আনল।

সামনে এসে হাত জোড় করে বলল, নমস্তে স্যার। বললাম, নমস্কার। আপনার নাম কি?

- রমেশ যাদব।
- কোথা থেকে আসছেন?
- উত্তরপ্রদেশ থেকে?
- বারানসীর কাছে।
- আপনি কি হাতির মালিক?
- না বাবু। হাতির মালিক উমেশ বাবু। ওনার চারটি হাতি আছে। আমি এ হাতির মাহুত আছি।
- উত্তরপ্রদেশ থেকে এদিকে কেন এসেছো।

- বাবু হাতির খোরাক অনেক আছে। ঘরে সে-বসে হাতিকে খাওয়ানো প্রচুর খরচ আছে। তাই প্রতি বছর তিন-চার মাস বাইরে বেরোতে হয়।

জিজ্ঞেস করলাম, এই তিন মাসে কত আয় হয়?

ও বলল, কোন ঠিক নেই বাবু। তবে কোন রকম সারা বছরের খাবারের খোরাকি হয়ে যায়। বাবু এত বড় জন্তুটার খোরাকি আগে চাই। ওদের জঙ্গালের পাতা, ফল সব সময় ভাল লাগে না। তাছাড়া জঙ্গালেও তেমন কিছু পাওয়া যায় না। এই মানুষেরা যা দেয় তাতে ওর আমাদের পেট চলে যায়।

- কত বছর এই লাইনে আছ?

একটু চিন্তা করে বলল, সেই ছোট্ট বয়স থেকে বাবু। বাবার হাত ধরে এ লাইনে আসা। সেই যে ছোটবেলা থেকে এ লাইনে এসেছি আর অন্য কোথাও যাইনি। এই জন্তুদের কাজ ভাল লেগে গেল। কিছুক্ষণ চিন্তা করে বললাম, তোমরা বুনো হাতিদের কোনদিন পেয়েছো?

রমেশ চোখ কপালে তুলে বলল, আরে রাম রাম। একবার বিহারে কোন একটা জঙ্গালের পাশ দিয়ে যাচ্ছি, দিনের বেলা। আমার হাতিটা মেয়েছেলে ছিল। ব্যাস!

কোথা কোথা থেকে একটা পুরুষ হাতি ওর দিকে এমন ভাবে তেড়ে এল আমি হাতি ছেড়ে দৌড়। বরাত জোরে সে যাত্রা বেঁচে গেছি। আমার হাতি যুবতী ছিল। সে ওর প্রেমে এমন পাগল হয়ে পড়ল যে আমাকে সে চিনতে পারে না। সেই বছরটা বহুত কষ্ট গেছে বাবু। ওই জন্য জঙ্গালের ধারে হাতি নিয়ে আর যাই না।

জিজ্ঞেসা করলাম, তোমরা হাতিদের ট্রেনিং দাও? ও বলল, একবার একটা হাতির বাচ্চার ট্রেনিং হয়েছিল। ও বাবু অন্য লোক দিয়েছিল। আমি জানি না। কথা শুনে বুঝলাম ট্রেনিং ব্যাপারে ও কিছু জানে না। আসলে হাতিকে যে কোন বয়সেই ট্রেনিং দেওয়া যায়। তবে তিন বছর থেকে বারো বছর বয়সই আদর্শ প্রশিক্ষণ দেবার সময়। খাঁচাতে আটকে ছোট বাচ্চাদের রাখা হয় এবং ধীরে-ধীরে তাদের নানান পদ্ধতিতে প্রশিক্ষণ দেওয়া হয়। একটু বড় হাতিদের একটা ফাঁকা জায়গার চারিদিকে হাতি না টপকাতে পারে এমন গর্ত করে বা চারিদিকে বন্য প্রাণী আটকানো বৈদ্যুতিক তারের বেড়া দিয়ে রাখা হয়। বেশী বয়স হাতিদের পায়ে লোহার শেকল দিয়ে বেঁধে রেখে ধীরে ধীরে শান্ত করে প্রশিক্ষণ দেওয়া হয়। এই প্রশিক্ষণ দুই থেকে দুই থেকে তিন বছর লাগতে পারে।

বললাম, হাতি তোমরা রাখ কেন? বলল, পূর্ব পুরুষেরা এই কাজ করে এসেছে, আমরা ছাড়তে পারছি না। আগে হাতির তবু চাহিদা ছিল। এখন আর নেই। ওই বড়লোকদের নানা অনুষ্ঠান যেমন বিয়ে, পূজা, অন্নপ্রাশন ... এ সবে আমাদের ডাক পড়ে। ডাক পড়ে ছোট-ছোট অনুষ্ঠানে। এতেই চলে যায়। আর কি কাজই বা করব? তাছাড়া বাবু হাতি পোষা একটা নেশা। এ নেশা যাদের নেই তাদের এই নেশার কারণ বোঝানো যাবে না। ও আমার সন্তানের মত। আমার মেয়ে ওর নাম রেখেছে লাভলি। ওই আমাদের বাঁচিয়ে রেখেছে। আমি ওকে নিজের ছেলের মত ভালবাসি।

জিজ্ঞেস করলাম, তোমার এই হাতির বয়স কত? ও বলল, পনেরো-ষোল বছর মত হবে। সেই ছোট্ট থেকে ও আমার কাছে আছে। ওর যখন জন্ম হয় তখন ছিল একশত কুড়ি কেজি। প্রতিদিন প্রায় এক কেজি করে ওর ওজন বাড়ছিল। তখন ওর উচ্চতা ছিল প্রায় তিন ফুট। প্রায় আধ ঘন্টা মত ও দাঁড়াতে পারছিল না। তারপর মায়ের সেবায় ও উঠে দাঁড়ায়।

আসলে হাতিদের বাচ্চা হবার পর এটাই দেখা যায়। স্ত্রী হাতি গর্ভ ধারণ করার শুরু সময় নয় থেকে বারো বছর। পাঁচ বছর অন্তর-অন্তর গর্ভধারন হতে পারে। প্রায় সাতান্ন-আটান্ন বছর বয়স অবধি স্ত্রী হাতি গর্ভ ধারণে সক্ষম। আর হাতি প্রায় সত্তর বছর বয়স অবধি বেঁচে থাকতে পারে।

বললাম, কবে ঘর ছেড়েছো?

ও বলল, বাবু চল্লিশ দিন মত হবে।

- বাড়ীতে কে আছে?

- বাড়ীতে বৌ আর দুই বেটি। একজনের বয়স চোদ্দ আর একজনের বয়স দশ। দুই জনেই স্কুলে পড়াশুনা করছে। বহু দিন ওদের দেখিনি। আমাকে ছাড়াই ওরা দিন কাটাচ্ছে। এত কষ্ট করেছি ওদের জন্য। আমি টাকা নিয়ে গেলে তবে ওদের পেটে ভাত জুটবে। এ ছাড়া আমার আর কিছু নেই।

রমেশের কথা শুনতে- শুনতে রবীন্দ্রনাথ ঠাকুরের কাবলিওয়ালা গল্পের কথা মনে পড়ে গেল। অন্যমনস্কভাবে ওর দিকে তাকিয়ে রইলাম। কিছুক্ষণ পর রমেশ বলল, বাবু চা খাবেন?

বললাম, না থাক। পরে একদিন আসব। কাল কোথায় যাবে?

সামনের দিকে আঙুল দেখিয়ে বলল, এ রাস্তা ধরে সোজা।

বললাম, বাঘমুন্ডী, ঝালদা?

রমেশ মাথা নাড়িয়ে সম্মতি জানাল। হলধরের এ সব ভাল লাগছিল না। ও অনেকক্ষণ উস্-খুস্ করছিল। বলল, স্যার চলুন এবার, অনেকক্ষণ হল।

সূর্য পশ্চিম দিগন্তে হেলে পড়ছে। পড়ন্ত সূর্যের দিকে তাকিয়ে অনেক চিন্তা খেলে যাচ্ছে আমার। পেটের দায়ে একদিন বনের এ কাজে এসেছিলাম। অন্ধকার, নিরালা, নির্জন বনে কাজ করতে গিয়ে হাঁপিয়ে পড়েছিলাম, দম বন্ধ হয়ে যাচ্ছিল। বার-বার মনে হয়েছিল এ চাকরী আমার জন্য নয়। শহরে মানুষ আমি, এই লোকালয়হীন, যোগাযোগহীন, নিঃস্তব্ধ-নিরালা ঘন অন্ধকারে এ কাজ করা আমার পক্ষে শাস্তিদায়ক। কিন্তু এই ভাবেই জীবনের মূল্যবান তিরিশটা বছর পেরিয়ে গেল। কত জায়গা ঘুরলাম কত বিচিত্র মানুষ, মানুষরূপী জন্তু আর নীরব প্রকৃতির আর্তনাদ দেখলাম। নিজের মনে করে প্রকৃতির জন্য কিছু করার চেষ্টা করলাম। পেটের টানে এসেছিলাম বনের কাজ করতে তারপর ধীরে ধীরে কখন প্রকৃতির ভালোবাসার বাঁধনে জড়িয়ে পড়লাম। আজ রমেশকে দেখে সেই কথাই বার-বার মনে পড়ছে।

আগে রমেশের মত অনেক মাহুত দেখতাম বছরের একটা সময় পোষা হাতি নিয়ে তারা আসত। বাজারে-বাড়ীতে হাটে ভিক্ষে চাইত। আমরা ভয়ার্ত অবাক দৃষ্টিতে বনের দৈত্যকে দেখতাম। লক্ষ্য করতাম বিশাল চেহারার ঐ প্রাণীটাকে তার পিঠের উপর বসে থাকত একজন। ইশারায় সে তার মাংসল লম্বা শুড় দিয়ে টাকা-পয়সা তুলে দিত মাহুতের হাতে। আর খাবার দিলে শুড় দুলিয়ে মুখে পড়ত। মাহুতের ইশারায় মাথা নাড়ত, বেজে উঠল গলার ঘন্টা। এখন তাদের খুব কম দেখা যায়। সার্কাসে ও নানান খেলা দেখানোর সুবাদে তাদের দু-চোখ ভরে দেখতাম। দেখতাম মাস্টারের কথায় তারা কি সুন্দর ভাবে আমাদের খেলা দেখাচ্ছে। ঐ হাতিগুলো দিনের বেলা খাবার সংগ্রহে বেরোতে দেখতাম। এখন পোষা হাতিও কম দেখা যায়। যে ভাবে দিন দিন বন ধ্বংস হচ্ছে, বনভূমি দখল হচ্ছে বা নানান সম্প্রদায়ের মানুষদের আইন করে বনভূমি বিলিয়ে দেওয়া হচ্ছে তার ফল অচিরেই ফলবে। হয়ত একদিন আমাদের নিষ্ঠুরতা আর স্বার্থের কারণে বিরাট বিপুল দেহের প্রকৃতির অমূল্য এ সম্পদ হারিয়ে যাবে। যেমন করে আমরা হারিয়েছি অনেক কিছু। প্রায় একশত তিরিশ কেজি নানন ধরণের দৈনিক খাবার আর দুশো লিটার জলের অভাবে এক-একটি হাতি পাগলের মত ছটফট করবে। একজন প্রকৃতিপ্রেমী হয়ে এ আমাদের লজ্জা।

হলধরের ক্রমাগত ঠেলায় ফিরে যাবার জন্য ব্যস্ত হয়ে পড়লাম। রমেশকে বললাম, ঠিক আছে আসছি। পরে আবার দেখা হবে।

রবেশ হাত জোড় করে বলল, নমস্কার বাবু। আবার সময় হলে আসবেন। আপনাদের মত বাবুরা আমাদের কাছে ঝামেলা না হলে আসে না। আপনারা সব বড় অফিসার। আপনি এসেছেন এ আমার

ভাগ্য। আসলে স্যার আপনারাই আমাদের কষ্ট, এই লাভলির কষ্ট বুঝতে পারেন। এই জন্যই আপনারা আসলে ভাল লাগে।

আমাদের সুখ-দুঃখের কথা জানানোর একজন লোক পাওয়া যায়।

বললাম, ঠিক আছে। লাভলিকে ভাল করে দেখবেন ও যাতে সুস্থ থাকে।

- হ্যাঁ বাবু। ওই তো আমার সব। ওকে আমার দেখতেই হবে। ওর জন্যই বাবু খেয়ে পড়ে আছি। ওর জন্য এতটা পথ প্রতি বছর আসি।

ওই রমেশের সঙ্গে শেষ দেখা। কাজের নানান ধরণের চাপে রমেশের কথা ভুলে গিয়েছিলাম।

হঠাৎ একদিন শুনলাম জয়পুরে একটা সাংঘাতিক দুর্ঘটনা হয়েছে। কোন এক পোষা হাতি তার মাহুতকে নৃশংস ভাবে খুন করেছে। বুকটা ছ্যাৎ করে কেঁপে উঠল। মনে মনে ভাবলাম এ রমেশ নয় তো? অনেক ঘটনাই তো সারাদিন, সারা বছর ঘটে। তার কটি আমাদের হৃদয় স্পর্শ করে? শুধু নিজের কারো কিছু ঘটনা ঘটলে আমরা ব্যথিত হই। অনেক হৃদয় বিদারক ঘটনা জীবনে ঘটে সেগুলিতে ব্যথিত হলেও তার রেশ বিচলিত করে না। কিন্তু রমেশের সঙ্গে একদিনের পরিচয়ে তার পান্ডুর মুখ এক গাল দাড়ি, কাঁচা-পাকা ছোট ছোট অবিন্যস্ত চুল, গোল গোল চোখ - সেই মুখটা এই সংবাদে বার বার চোখের সামনে ভেসে উঠছে। কেন জানিনা ওর প্রতি একটা সহানুভূতি মনের মধ্যে জায়গা করে নিয়েছে। ঐ ঘটনা শোনার পর থেকে মনটা টান টান ব্যাথায় পরিপূর্ণ হয়ে রইল।

বলরামপুর থেকে জয়পুর প্রায় ষাট কিলোমিটার। বলরামপুর থেকে পুরুলিয়া পয়ত্রিশ কিলোমিটার এবং পুরুলিয়া থেকে জয়পুর পঁচিশ কিলোমিটার। মনের মধ্যে খচখচানি দূর করতে পরদিন সকাল সকাল বেরিয়ে পড়লাম জয়পুরের উদ্দেশ্যে।

যেখানে ঘটনাটা হয়েছে সেখানে পৌঁছাতেই দেখি লোকে লোকারন্য। অনেক পুলিশ। আমাকে দেখে বাচ্চু এগিয়ে এল। বাচ্চু জয়পুর রেঞ্জের বনরক্ষী। আমার পরিচিত। চোখেমুখে ওর আতঙ্ক। জিজ্ঞেস করলাম, হাতিটা কোথায়?

ও বলল, আসুন আমার সঙ্গে। কাউকে সামনে যেতে দেওয়া হচ্ছে না।

কিছুটা গিয়ে দেখলাম জয়পুর হাইস্কুলের দেওয়াল ঘেসে হাতি দাঁড়িয়ে। পেছনের দুটো পা লোহার শেকল দিয়ে বাঁধা। ভাল করে অনেকক্ষণ দেখার পর মনে পড়ল এটাই রমেশের হাতি। তবে কি রমেশকে তার প্রিয় সঙ্গী, তার ছেলে খুন করেছে? বাচ্চুকে জিজ্ঞেস করলাম, কি করে ঘটনাটা ঘটল?

বাচ্চু বলল, ঘটনার ঘন্টা খানেক পর আমি এসেছি। লোকমুখে যা শুনেছি সেটা এ রকম — হাতি আর তার মাহুত গত পরশু ভিক্ষে করে স্কুলের মাঠের পাশে সন্ধ্যেবেলা তাঁবু গাড়ে। সারাদিন মাহুতেরা হাতির এক পায়ে শেকল বেঁধে ভিক্ষে করে। সন্ধ্যেবেলায় ওরা কোন এক জায়গায় বিশ্রাম নেয়। সেই রকমই মাহুত তার হাতির পেছনের দু-পায়ে শেকল বেঁধে রেখে বিশ্রাম নিচ্ছিল। সকাল বেলা মাহুত যখন ভিক্ষে করতে বেরোনোর জন্য পেছনের পায়ের শেকল খুলতে গিয়েছিল হঠাৎ হাতিটা ক্ষেপে যায়। ওর বিশাল পা দিয়ে মাহুতের একটা পা চেপে ধরে আর একটা কে শুড় দিয়ে টেনে দু'ভাগে ভাগ করে দেয়। তারপর পা দিয়ে মাথাটা থেঁতলে দেয়। মাহুত ঘটনাস্থলেই মারা যায়। হাতি শেকল বাঁধা অবস্থায় লাফিয়ে লাফিয়ে পাগলের মত কিছুটা ছুটে যায়। কিছুক্ষণ পর ও আবার ফিরে আসে। প্রচন্ড ক্ষোভে চিৎকার করে তারপর মাহুতের গোটা শরীর পা দিয়ে, শুড় দিয়ে নৃশংস ভাবে খন্ড-খন্ড করতে থাকে।গ্রামের লোকজন রেঞ্জ অফিসে খবর দিলে আমরা আসি। এখন সবাইকে সতর্ক করছি আর বড় সাহেবকে খবর দিয়েছি ঘুমপাড়ানি গুলি ছোড়ার লোকজন আনার।

এইরকম মর্মান্তিক ঘটনা এর আগে কোন পোষা হাতি তার মাহুতকে করেছে বলে শুনিনি। বাচ্চু বলল, যদি দুটো পাবাঁধা না থাকত কি হত কি জানি। আমরা কলা গাছ, কলাপাতা সব দিয়েছি কিন্তু ও কিছু খাচ্ছে না। গতকাল ঐ ঘটনার পর থেকে চুপ করে দাঁড়িয়ে আছে।

জিজ্ঞেস করলাম, ওর সঙ্গে কেউ ছিল না?

বাচ্চু বলল, ঠিক জানি না। তবে আর একজন মাহুত সঙ্গে ছিল। সেও ভিক্ষে করতে বেরিয়ে সন্ধ্যের সময় তার হাতি নিয়ে নাকি একটু দূরে ছিল। কথা থামিয়ে জিজ্ঞেস করলাম, দুটো হাতি কি পুরুষ ছিল?

বাচ্চু বলল, না। যেটা তার মাহুতকে মেরেছে সেটি পুরুষ। পাশে যেটি ছিল সেটি স্ত্রী। বললাম, এই কারণেই মনে হচ্ছে হাতি এমন কান্ড করেছে।

ও বলল, কেন?

আমি বললাম, পুরুষ হাতি বারো-তেরো বছর পর থেকে যৌবনত্ব পায়। তার বছরের কোন সময় শরীর গরম হয়ে গেলে মহিলার সঙ্গ পাবার জন্য পাগল হয়ে যায়। একে পুরুষ হাতির মস্তি বলে। এই সময়টা বিপজ্জনক। হাতি পাগলের মত আচরণ করে। ওর কানের পাশ দিয়ে দুর্গন্ধযুক্ত চটচটে আঠার মত রস বেরোতে থাকে। মাহুতেরা ওটা শুরুতেই বুঝে যায়। তখন খাবারের সঙ্গে ওষুধ, জরি-বুটি মিশিয়ে তাকে শান্ত করে। কিন্তু এক্ষেত্রে স্ত্রী হাতিটি পাশে থাকায় মাহুত বুঝতে পারে নি। মনে হচ্ছে একারণেই ঘটনাটা হয়েছে। স্ত্রী হাতি, তার মাহুত কোথায়?

বাচ্চু বলল, ঘটনাটা ঘটার পর থেকে ওরা পালিয়েছে। মনে মনে ভাবলাম এটা রমেশ নয় তো? কিন্তু নিশ্চিত হতে পারছি না। বাচ্চুকে জিজ্ঞেস করলাম, যে মারা গেল তার নাম জানতে পেরেছো?

না। তবে ওর লোকজনকে খবর দেওয়া হয়েছে। এ এক আচ্ছা ঝামেলায় পড়লাম। বনের হাতি সামাল দেওয়াই মুস্কিল। তার উপর পোষা হাতির ঝামেলা। দুই দিন স্কুল বন্ধ। আশে-পাশে যত গ্রাম আছে সব পাগলা হাতি দেখার জন্য ছুটে আসছে। সবাই হাতিকে সামনে থেকে দেখতে চায়। পুলিশ আছে বলে রক্ষা। গতকাল দিনে-রাতে পুলিশ ছিল।

দূর থেকে দেখলাম হাতিটাকে। দেখে বেঝার উপায় নেই এটাই সেই হাতি। চুপ করে একটা গাছের ছায়ায় দাঁড়িয়ে। যেন কত শান্ত।

অফিসের কিছু কাজ ছিল কিন্তু এখান থেকে যেতে ইচ্ছে করছে না। চুপ-চাপ গাছের ছায়ায় বসে আছি। বাচ্চু বলল,ঘুম পাড়ানী বন্দুক নিয়ে লোকজন এখুনি এসে পড়বে। সন্ধ্যের আগেই ওকে বেঁধে ফেলব।

কিছুক্ষণ বাদেই খবর এল আমাদের লোকজন চলে এসেছে। ওরা আসতেই অপেক্ষামান উদগ্রীব জনতার ঠেলাঠেলি শুরু হয়ে গেল। মাইক্রোফোন হাতে সবাইকে সতর্ক করতে বলা হল, হাতি যে কোনসময়, যে কোন দিকে দৌড়াতে পারে। আপনারা দূরে দূরে, ফাঁকা জায়গায় থাকুন। যাতে কোন বিপদ না হয়। আমাদের কাজ করতে দিন। আপনারা .....। দু-এক জায়গায় পুলিশের কয়েক ঘা বেত জনগণের পিঠে পড়ল। চিৎকার, চেচামেচি, ঠেলাঠেলি সে এক ভয়ঙ্কর দৃশ্য।

শিকারীরা দক্ষ। কেউ কিছু ভাল করে বোঝার আগে ঘুম পাড়ানির গুলিতে কাবু করে দিল হাতিটাকে। তারপর সামনের দুই পায়ে, পেছনের দুই পায়ে লোহার শক্ত চেন দিয়ে পাশে চারটে লোহার খুঁটির সঙ্গে বেঁধে ফেলল।

ডাক্তারবাবু শিকারীর সঙ্গে ছিলেন। হাতি বেঁধে ফেলার পর হাতির সামনে গেলাম। ডাক্তারবাবু হাতি দেখে বললেন, হাতির মস্তি হয়েছিল।

কানের পাশে দেখিয়ে বলল, ঐ দেখুন রস বেরোনোর দাগ। এই সময়টা সাবধানে রাখতে হয়। হাতির মাহুতেরা সব জানে তবু কেন সাবধান হল না? কেনই বা ওকে ওষুধ দিয়ে শান্ত করলা না, কে জানে? সাবধানতার মাশুল দিতে হল মাহুতকে। ভাগ্য ভাল লোহার চেন দুই পায়ে একসঙ্গে বাঁধা ছিল। নইলে কি যে ঘটনা ঘটত ভাবলেই ভয় হয়। যাক আল্লের উপর দিয়ে গেছে। আর ভয় নেই। দুই দিনের মধ্যে হাতি পুরো স্বাভাবিক হয়ে যাবে।

এর মধ্যে হাতি মালিকের লোকজন চলে এসেছে। জয়পুর রেঞ্জের রেঞ্জ অফিসার বুদ্ধদেব মন্ডল। আমার ভাইয়ের মত। আমার সহকর্মী, কর্মজীবনে আমার চেয়ে তিন বছরের ছোট। বুদ্ধদেব হাতির কাগজপত্র সব খুটিয়ে খুটিয়ে পরীক্ষা করে বলল, ঠিক আছে। দুই দিনের মধ্যে হাতি সুস্থ হয়ে গেলে এখান থেকে নিয়ে যাবেন। একেবারে এদিকে আসবেন না। যতসব উটকো ঝামেলা। বুনো হাতি সামলাতে হিমসিম খাচ্ছি তার ওপর পোষা হাতি।

আমাকে বললো, যার হাতি সে নেই অথচ আমরা দুই দিন ধরে নাজেহাল হয়ে যাচ্ছি। কলাগাছ, পাতাসহ খাবার সংগ্রহ, ডাক্তারবাবু, পুলিশ হাসপাতাল, লোক-লস্কর ও দুইদিনে জীবনটা কয়লা করে দিল।

আমার সব কথা ছাপিয়ে শুধু রমেশের কথা মনে পড়ছে। এটা রমেশের হাতি নয়তো? আমার দুর্বলতা পাছে প্রকাশ পায় সেটা চেপে রাখতে চুপ করে রইলাম। সর্বক্ষণ মনের ভেতরটা খচ্-খচ্ করে ওর মুখ খানা ভেসে উঠতে লাগল। ওর বৌ, ওর মেয়ের শোকগ্রস্ত কাল্পনিক মুখ বুকের ভেতর তোলপাড় করে তুলল।

একদিন পর হাতির মালিক পরিচয় দিয়ে বুদ্ধদেবকে বলল, স্যার আমি হাতির মালিক। নাম উমেশ যাদব।

বুদ্ধদেব জিজ্ঞেস করল, যে মারা গেল, সেই মাহুতের নাম কি?

- ওর নাম রমেশ .....।

ওর কথাটা শেষ হবার আগেই আমি আর্তনাদ করে বলে উঠলাম, রমেশ যাদব। বাড়ী উত্তর প্রদেশে। মালিক বলল, হ্যাঁ। স্যার। আপনি চেনেন স্যার? বুকের ভেতর কান্না চেপে কোন রকমে বললাম, হ্যাঁ চিনি। কয়েকদিন আগে ওর সঙ্গে পরিচয় হয়েছিল। অনেক কথা হয়েছে। ইস! এত জলদি .....।

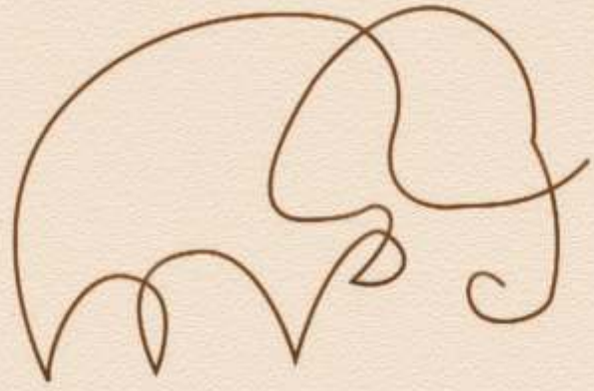
- স্যার, ওর কপালে এটাই লেখা ছিল স্যার। এতদিনের পুরোনো মাহুত স্যার। বড্ড ভালবাসত স্যার। ও না থাকলে খেত না। রাগ দেখাত। রমেশ নাম রেখেছিল লাভলি। খুব ভালবাসত। কিন্তু কেন যে এমন ঘটনা ঘটল ভগবান জানেন। ওর স্যার আমার ....। কথা শেষ হল না, হাঁটু গেড়ে আমার পায়ের কাছে বসে পড়ল। আমার পা ধরে হাউ মাউ করে কাঁদতে লাগল।

ওর কান্না দেখে আমার বুকের ভেতর ঝড় তুলে চোখ ফেটে জল বেরিয়ে এল। চেপে রাখার চেষ্টা করে পারলাম না। দু-চোখ বেয়ে রমেশের প্রতি কষ্টের ব্যথার অনুভূতি জল হয়ে বেরিয়ে এল।

উমেশ কাঁদতে কাঁদতে বলল, স্যার। আমার কথা বিশ্বাস করছেন না। আসুন স্যার আমার সঙ্গে। বলে আমার হাত ধরে টানতে টানতে পাগলের মত লাভলীর কাছে নিয়ে এল। ওর আকুল আহ্বানে আমি সাড়া না দিয়ে পারলাম না। উমেশ দে-হাতী হিন্দি ভাষায় লাভলীকে উদ্দেশ্য করে বলল, লাভলী। তুই উ কেয়া কিয়া? তুহার বাবাকো মার দিয়া? কিউ? কিউ কিয়্যা হ্যা? লাভলী শুড়টাকে জোরে জোরে নাড়িয়ে অদ্ভুত শব্দ করতে লাগল। আমি ভয় পেয়ে সরে এলাম। তারপর পেছনের দু-পা মুড়ে শুড় নামিয়ে অপরাধীর মত বসল, দেখলাম ওর দু-চোখ দিয়ে ঝরঝর করে জল গড়িয়ে পড়ছে। ও গোঙ্গাচ্ছে আর কাঁদছে। ওর চোখ দিয়ে ঝর ঝর করে জল পড়তে লাগল।

ঝাঁপসা দৃষ্টিতে প্রকৃতির আশ্চর্য সৃষ্টি লাভলির দিকে তাকিয়ে ওর প্রতি সহানুভূতি আর রমেশকে খুন করার জন্য অপরাধী কাঠগোড়ায় দাঁড় করিয়ে শাস্তি দেবার দ্বন্দ্ব আমাকে পাগল করে দিল। শরীরটা খারাপ লাগতে শুরু করল, ওখানেই বসে পড়লাম।

এত বছর পরেও লাভলীর সেই বুক ফাটা স্বজন হারানোর কান্না এখনও সময়-সময় পোষা হাতি দেখলেই মনে পড়ে। মনে পড়ে মানুষ-জন্তুর ভালবাসার সেই অমর ঘটনা। যা আমাকে শিহরিত করে।



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