

# ZOODRIVE



## **EDITOR'S COLUMN....**

*Mid-way through editing and designing a pile of articles which I was nose deep in and with the thoughts of the zillion things that 'JUST HAD TO BE DONE'; I pulled at my hair for the very first time. This was the first of many such moments!!!! Putting a magazine together was no cake walk. I along with my editorial team members have spent sleepless nights to make this magazine stand out.*

*So here you have ZOODRIVE , the long awaited magazine of Zoology Department for the year 2021.The name of the magazine, ZOODRIVE may seem strange, but it shows the richness and diversity of wild-life in the nature. This magazine is a platform that exhibits the literary skills and innovative ideas of the students. ZOODRIVE presents the hard work and dedication of students and contribution of teachers.*

*I would like to thank all my editorial team members for helping me pull this through. These contributions have required a generous amount of time and effort. It is this willingness to share knowledge, concerns and special insights with fellow beings that has made this magazine possible.*

**Thank you all!!**

**EDITOR OF COLLEGE MAGAZINE**



## FROM PRINCIPAL'S DESK

*Raidighi College, situated by the largest mangrove of the world, strives continually towards enlightening the inhabitants of this remote, rural landscape—with the dream of spreading higher education among the needy enthusiasts belonging to the Schedule caste and tribes, mostly. A view into their daily choirs would place the matter in a more appropriate perspective. Raidighi is surrounded by a number of rivers, river-inlets and dense vegetation of the Sundarbans that nurture a large number of floras and faunas, the most beautiful and the fiercest of them being the Royal Bengal tiger, obviously. Hence, inhabiting for almost hundred years now, the people of this land live perpetually on a trapeze, with life and death on either side. 90% of the total population live below the poverty line, and they often have to put their lives at stake to secure a living – be it by fishing, or by collecting honey or by cultivating crops in these hostile, muddy lands. Despite being only 100km. away from the Eastern metropolis Kolkata, due to a weak conveyance, it has not been easy for Raidighi to get a sustained taste of the urban lifestyle and culture. Yet, it must be acknowledged that Raidighi throbs with its own unique dialect, philosophy and folk idiom.*

*The college encourages a warm and cordial relationship among the teachers and staffs, as well as between the teachers and the students. Organizing seminars, workshops, educational tours and picnics at a regular basis has made Raidighi College a place for exchanging ideas, thus, opening up new horizons. The college helps, in whatever ways it can afford, the poor farmers and their families every monsoon, in this flood-infested lowland which was once bruised by Aila, and more recently, by Amphan – the devastating cyclones. Water, woods and unique way of life—these are the things that define Raidighi, even amidst the technological boom of the twenty-first century. And as far as the question of higher education is concerned, back in the city, we endorse it; here, they still confront it. Hence, obstacles are many for Raidighi College; but we believe, even more is the possibility of a better outcome. We strive only for that.*

**Dr. Sasabindu Jana**

**Principal**

**Raidighi College**

**University of Calcutta**

## MESSAGE FROM HEAD OF THE DEPARTMENT

*It gives me great pleasure that the Department of Zoology is publishing the magazine ZOODRIVE . This gives an opportunity to students to share their ideas and thought with other students and teachers. Not only that their writings enhance their creative skills and enrich their knowledge base, the magazine also highlights their achievements which give inspiration to other students. The teachers/faculty is always there to guide them in their academic endeavors.*

*This is a pride moment for the Zoology Department that our 6<sup>th</sup> as well as last semester students have shown their potential and capabilities through this magazine.*

*Our Department have been planned numerous programmes, especially for students, department-wise and inter-disciplinary to enhance their knowledge, skills and scientific temperament.*

*We are aware that this year is very special in the sense that the whole world is suffering from pandemic, known as COVID -19. During this period of crisis, the Department has gone for on-line classes, in order to safeguard the academic interests of our dear students. The Department is making all efforts to enrich the academic caliber of the students and the faculty by creating an academic environment, increasing their capabilities and enlarging their knowledge. I wish a bright future of our students.*



**PINTU MONDAL**

**Assistant Professor**

**HOD of Zoology Department**

**Raidighi College**

**University of Calcutta**

## MESSAGE FROM FACULTY

*Teaching is an art of awakening the natural curiosity of young minds for the purpose of satisfying it afterwards. It was my cherished desire to be a dedicated teacher like my father, in a reputed College/University. Most fortunate I was, when got selected through College Service Commission and joined in this esteemed institution, Raidighi College. The students like you and administration were added feathers to the crown of my aspiration in teaching. I did serve with zeal and zest as teacher to teach you which is a pleasurable journey to me. The motto of our college is “Progress of Learning”. Students of the institute will get good education; learn discipline, communication skills through proper guidance and counseling by expert teachers to equip them to face further challenges. They are found serving good position in the society. Students of our institute always distinguished, which makes us hold our head high. In the quote of Kaviguru Rabindranath Tagore “The highest education is that which does not merely give us information but makes our life in harmony with all existence”.*

*After all, many of you have thanked me for teaching you; it seems that the course was pretty popular. I’m glad about that, but I want you know that a great semester requires great students as much as it requires great teachers. It is immensely important to acknowledge the genuine involvement of energetic management, teachers, students and parents in the novel attempt. I wish you a very good luck for all your life, may you get all your desires and get success on every single step. And I congratulate the team of semester VI for their tireless efforts that have come to fruition in the form of this magazine. I wish it all success and hope that this tradition that has been set by the current students will be carried through by the following generation of students to come.*



**Dr Ishita Samajdar**  
 Assistant Professor  
 Department of Zoology  
 Raidighi College  
 University of Calcutta



*I am quite pleased to learn about the forthcoming issue of the college magazine, ZOODRIVE . No doubt this creative endeavor will bring out an array of artistic and scientific expressions with distinct individual signatures. I do appreciate and applaud all the students of 6th semester for their successful completion of this tedious yet daunting task of putting together their thoughts and dreams into the pages.  
Good luck for the future.*

Ashrafal Alam  
SACT II Teacher



*I welcome you all to your well thinking to publish a colorful magazine from the students of 6th semester , zoology department .We have beautiful memories over these 3yrs journey . We are proud of your many achievement , various accomplishments in almost all curricular & extra- curricular activities. You have left behind a very good legacy for the juniors & incoming students to follow .  
Wish you gets lots of success in life & best of luck for bright future .*

Manjushree Das ( Saha)  
SACT II Teacher



*Success comes when you believe in yourself and trust your instincts .You will win. May you have a wonderful life, I wish you very good luck for the future and achieve all your dreams.  
I applaud the editorial team for the hard work and dedication they have invested in realizing this goal, and wish all the success for their magazine.*

Safika Sultana  
SACT II Teacher



*Nurturing creativity and inspiring innovation are two of the key elements of a successful education, and a college magazine is the perfect amalgamation of both. Hence, I am gratified to know that the students of our department is bringing out the magazine ZOODRIVE of this academic session.*

*I take this opportunity to congratulate all the students . May all our students soar high in uncharted skies and bring glory to the world and their profession with the wings of education. I wish them all success.*

SK Abul Kasem  
SACT II Teacher

# CONTENT



*INTO THE MANGROVE*



*CORAL CLOUD*



*PATH OF EVIDENCE*



*UNIQUE IN THE WILD*



*RED PANDA'S BEHAVIOUR*



*DOWN THE MEMORY LANE*

# INTO THE MANGROVE

**S**undarbans is a mangrove area in the delta formed by the confluence of the Ganges, Brahmaputra and Meghna Rivers in the Bay of Bengal. It spans from the Hooghly River in India's state of West Bengal to the Baleswar River in Bangladesh's division of Khulna.

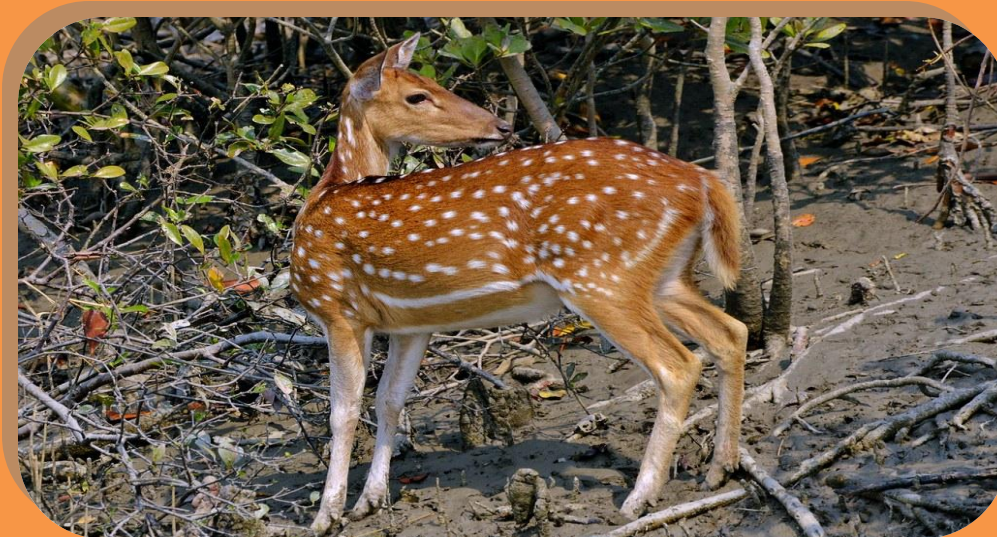
*The Sundarbans Mangroves ecoregion is the world's largest mangrove ecosystem. Named after the dominant mangrove species *Heritiera fomes*, locally known as sundari, this is the only mangrove ecoregion that harbors the Indo-Pacific region's largest predator, the tiger (*Panthera tigris*).*





## HISTORY OF FAUNAL CHANGES OVER THE LAST TWO CENTURIES :

*According to Hunter's Statistical Account of Sundarban, written in 1878, "Tigers, Leopards, Rhinoceros, Wild Buffaloes, Wild Hogs, Wild Cats, Barasinga, Spotted Deer, Hog Deer, Barking Deer, and Monkeys are the principal varieties of wild animals found in Sundarbans". However, over the last 100 years or so, due to habitat degradation and ecological changes, the faunal compositions in Indian Sundarbans have undergone changes. Some of these animals in Sundarbans became extinct during the last two centuries like Javan Rhino, Wild buffalo, Swamp deer and Barking deer.*



## PRESENT STATUS OF FAUNAL RESOURCES:

**Sundarban mangrove forest is the single largest home of the Royal Bengal Tiger (Panthera tigris).**

**Sundarban is also the only mangrove forest in the world having the tiger as its indigenous population. As per 2004 census, the tiger population in Indian Sundarban is around 274, out of which Sundarban Tiger Reserve and South 24-Parganas Forest Division have 249 Tigers and 25 tigers respectively. There are 58 species of mammals, 55 species of reptiles and around 248 bird species.**

**Sundarbans also harbors a good number of rare and globally threatened animals including Estuarine Crocodile (Crocodylus porosus), Fishing Cat (Felis viverrina), Common otter (Lutra lutra), Water Monitor lizard (Varanus salvator), Gangetic Dolphin**

**(Platinista gangetica), Snubfin dolphin (Orcella brevirostris), River Terrapin (Batagur baska), marine turtles like Olive Ridley (Lepidochelys olivacea), Green Sea Turtle (Chelonia mydas), Hawksbill Turtle (Eritmochelys imbricata). Six species of Shark and Ray, which are found here, are included in Schedule-I of Wildlife (Protection) Act. These indicate that Sundarban Reserved Forest is a natural biodiversity hot spot.**

**Other mammals comprise of Wild boars, Spotted deer, Porcupines and Rhesus macaque. Among the reptiles, the King cobra, the common cobra, Banded krait, Russells Viper comprise the community of venomous reptiles, while the Python, Chequered Kil-Back, Dhaman, Green Whip Snake and several other species constitute the non-venomous snakes.**



Asian small-clawed otter (Aonyx cinereus). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.



Gangetic Dolphin (Platanista gangetica). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.

## AVIFAUNA:

*There are 248 species of birds including a large number of migrants from the higher latitudes that visit the area in winter. It consists of Herons, Egrets, Cormorants, Storks,*

*Green Pigeons, Sand Pipers, Large and Small Spoonbills, Darters, Seagulls, Teal, Partridges, great variety of Wild Geese and Ducks.*



Brahminy Kite (*Haliastur indus*). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.



Mangrove Pitta (*Pitta megarhyncha*). Photo Credit: Dhritiman Mukherjee / Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.

## INSECTS :

*Insects abound in the forests amongst which the honey bee (*Apis dorsata* ) is a source of*

*considerable income for the poor people living in fringe areas.*



*Araneus panchganiensis*. Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.

## CETACEANS :

*Cetaceans like Snubfin (Irrawady) and Gangetic Dolphin are frequently found in the estuarine rivers, the former being more abundant. The Black Finless Porpoise (Necmeris porosus) is also found in the rivers near the estuary. The marshes and river offer asylum to the Estuarine Crocodile, one of the most endangered and the largest of crocodiles. A wide variety and assortments of fish, molluscs, crabs and prawns inhabit the estuaries. The amphibious mud-skipper fish such as Periopthalmus sp. and Boleopthalmus sp. arouse considerable interest. Also*

*foundare Whale Shark, Tiger Shark, Hammer Headed Shark, Saw fish, Guitar fish and some common edible fish e.g., Hilsa ilisha, Setipinna breviceps, Setipinna taty, Gudusia chapra etc. Among the crustaceans, commonly found are the One Armed Fiddler Crab (Uca spp) and the two species of trilobite (Tachypleus gigus and Carcinoscopus rotundicauda). The latter is also known as the Horse Shoe Crab, which is known as a living fossil and needs serious protection owing to its medicinal value and uncontrolled collection by quack doctors for commercial purpose.*



Boddart's goggle-eyed goby (*Boleopthalmus boddarti*). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.



Estuarine Crocodile (*Crocodylus porosus*). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.



Indian Tree Frog (*Polypedates maculatus*). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.

## FAUNAL DIVERSITY AT A GLANCE :

**Vertebrate Spp = 481**

**Hemichordate Spp = 1**

**Invertebrate Spp = 1104**

**Protozoan species = 106**

**Mammals = 58**

**Birds = 248**

**Reptiles = 55**



Triangular fiddler crab (*Austruca triangularis*). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.



Mangrove horseshoe crab (*Carcinoscorpius rotundicauda*). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.



Fishing cat (*Prionailurus viverrinus*). Photo Credit: Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.

## **Eight sub-species of Tiger in the world :**

### **Still surviving-**

*Bengal tiger*

*Siberian tiger*

*Indo-Chinese tiger*

*South China tiger*

*Sumatran tiger*

### **Extinct-**

*Caspian tiger*

*Javan tiger*

*Bali tiger*



A Sunderban tiger, also known as the Royal Bengal tiger. Photo by Pradeep Vyas / Contributors of the Compendium by the Zoological Survey of India, Kolkata, India.

# CORAL CLOUD

**A** coral reef is an underwater ecosystem characterized by reef-building corals. Reefs are formed of colonies of coral polyps held together by calcium carbonate. Most coral reefs are built from stony corals, whose polyps cluster in groups. Unlike sea anemones, corals secrete hard carbonate exoskeletons that support and protect the coral. Most reefs grow best in warm, shallow, clear, sunny and agitated water. Coral reefs first appeared 485 million years ago, at the dawn of the Early

Ordovician, displacing the microbial and sponge reefs of the Cambrian. Sometimes called rainforests of the sea, shallow coral reefs form some of Earth's most diverse ecosystems. They occupy less than 0.1% of the world's ocean area, about half the area of France, yet they provide a home for at least 25% of all marine species, including fish, mollusks, worms, crustaceans, echinoderms, sponges, tunicates and other cnidarians. Coral reefs flourish in ocean waters that provide few nutrients.



## TYPES OF CORAL REEFS :

Scientists generally divide coral reefs into four classes: fringing reefs, barrier reefs, atolls, and patch reefs. Fringing reefs grow near the coastline around

islands and continents. They are separated from the shore by narrow, shallow lagoons. Fringing reefs are the most common type of reef that we see.

## SOME FACTS ABOUT CORAL REEF :

1. Coral reefs protect wildlife - 'Barrier' reefs get their name because they protect shallow warm waters from the open sea.

2. Coral reefs can be divided into three types: fringing reefs, barrier reefs, and atolls.

3. Coral needs sunlight to grow- Coral needs sunlight to grow, which is why they thrive in shallow water.

4. Large reefs are thousands of years old . Large, visible reefs like the Great Barrier Reef in Australia are between 5,000 and 10,000 years old.

5. Coral reefs improve the structural integrity of the sea bed.

6. Coral reefs also promote better water quality .

7. The calm, warm waters around coral reefs mean they are an

important mating habitat for fish and other sea creatures.

8. The algae that usually covers the surface of coral isn't a plant, it's a living organism .

9. Scientists have discovered that organisms within coral reefs can be used to treat cancer and other illnesses.

10. The last of our fun facts about coral reefs concerns their vital role in managing the planet's carbon dioxide levels.





## CORAL ROCK :

*Coral rock is a marine limestone mined in the southern tip of Florida. Coral Rock has a wide*

*variety of fossilized Shell and Coral embedded in the rock.*



## THREATS OF CORAL REEF :

*Increased ocean temperatures and changing ocean chemistry are the greatest global threats to coral reef ecosystems. These threats are caused by warmer*

*atmospheric temperatures and increasing levels of carbon dioxide in sea-water. As atmospheric temperatures rise, so do sea-water temperatures.*

<p><b>10 ways to protect CORAL REEFS</b></p> <p><b>Choose sustainable seafood.</b></p>  <p>Learn how to make smart seafood choices at <a href="http://www.FishWatch.gov">www.FishWatch.gov</a>.</p>	<p><b>Corals are already a gift. Don't give them as presents.</b></p> <p>It takes corals decades or longer to create reef structures, so leave them on the reef.</p> <p><b>Long-lasting light bulbs - ARE A BRIGHT IDEA</b></p> <p>Energy efficient light bulbs reduce greenhouse gas emissions. Climate change is one of the leading threats to coral reef survival.</p> <p><b>IF YOU DIVE DON'T TOUCH.</b></p> <p>Coral reefs are alive. Stirred-up sediment can smother corals.</p> 	<p><b>CHECK SUNSCREEN ACTIVE INGREDIENTS.</b></p>  <p>Seek shade between 10 a.m. and 2 p.m., use Ultraviolet Protection Factor (UPF) sunwear, and choose sunscreens with chemicals that don't harm marine life. For more information, visit <a href="http://oceanservice.noaa.gov/sunscreen">oceanservice.noaa.gov/sunscreen</a>.</p> <p><b>BE A MARINE DEBRIS CRUSADER.</b></p> <p>In addition to picking up your own trash, carry away the trash that others have left behind.</p>
<p><b>CONSERVE WATER.</b></p>  <p>The less water you use, the less runoff and wastewater that eventually find their ways back into the ocean.</p>	<p><b>Volunteer!</b></p> <p>Volunteer in local beach or reef cleanups. If you don't live near the coast, get involved in protecting your watershed.</p> 	<p><b>Don't send chemicals into our waterways.</b></p> <p>Nutrients from excess fertilizer increases algae growth that blocks sunlight to corals.</p>  <p><b>Practice safe boating.</b></p> <p>Anchor in sandy areas away from coral and sea grasses so that the anchor and chain do not drag on nearby corals.</p>  <p><a href="http://oceanservice.noaa.gov">oceanservice.noaa.gov</a></p>

# PATH OF EVIDENCE

**A** fossil is any preserved remains, impression, or trace of any once-living thing from a past geological age. Examples include

*bones, shells, exoskeletons, stone imprints of animals or microbes, objects preserved in amber, hair, petrified wood, oil, coal, and DNA remnants.*

## ORIGIN :

*Fossils are formed when the remains of an organism are preserved in the sediment deposited at the bottom of the water column; the sediment may*

*then form a sedimentary rock by compaction over time. Most fossils are from organisms that lived in the past 600 million years.*



## FOSSILIZATION PROCESSES :

*The process of fossilization varies according to tissue type and external conditions -*

1. *Permineralization*
2. *Casts and molds*
3. *Authigenic mineralization*
4. *Replacement and recrystallization*
5. *Adpression (compression-impression)*
6. *Soft tissue, cell and molecular preservation*
7. *Carbonization and coalification*
8. *Bioimmuration*

## TYPES OF FOSSILS :

### 1. Index fossil -

*Index fossil, any animal or plant preserved in the rock record of the Earth that is characteristic of a particular span of geologic time or environment.*

### 2. Trace fossil -

*Trace fossils are those details preserved in rocks that are indirect evidence of life . Trace fossils include burrows, track marks, copolites , stromatolites ,and rhizoliths or rhizocretions .*



### 3. Transitional fossil -

*A transitional fossil is any fossilized remains of a life form that exhibits traits common to both an ancestral group and its derived descendant group. This is especially important where the descendant group is sharply differentiated by gross anatomy and mode of living from the ancestral group.*

### 4. Microfossils -

*Microfossils are the tiny remains of bacteria, protists, fungi, animals, and plants . For example, fossils of bacteria, foraminifera, diatoms, very small invertebrate shells or skeletons, pollen, and tiny bones and teeth of large vertebrates, among others, can be called microfossils. But it is an unnatural grouping.*



Microfossils about 1 mm

### 5. Chemical fossils -

*Chemical fossils or chemofossils, are chemicals found in rocks and fossil fuels (petroleum, coal, and natural gas) that provide an organic signature for ancient life. Molecular fossils and isotope ratios represent two types of chemical fossils.*

## 6. Derived, or reworked fossil -

***A derived fossil is a fossil found in rock made later than when the fossilized animal or plant died: it happens when a hard fossil is freed from a soft rock formation by erosion and redeposited in a currently forming sediment deposit. Another name for such a specimen is a reworked fossil.***



Eroded Jurassic plesiosaur vertebral centrum found in the Lower Cretaceous Faringdon Sponge Gravels in Faringdon, England. An example of a *remanié* fossil.

## 7. Wood fossil -

***Fossil wood is a type of wood that is preserved in the fossil record. Over time the wood will usually be the part of a plant that is best preserved. Fossil wood may or may not be petrified.***



Petrified wood. The internal structure of the tree and bark are maintained in the **permineralization** process.

## 8. Subfossil -

***A subfossil is a part of a dead organism that is partially, rather than fully, fossilized, as is a fossil. Subfossils of vertebrates are often found in caves or other shelters, where the remains have been preserved for thousands of years.***



A subfossil dodo skeleton

## **PSEUDOFOSILS :**

*Pseudofossils are visual patterns in rocks that are produced by geologic processes rather than biologic processes. They can easily be mistaken for real fossils. Some pseudofossils, such as geological dendrite crystals, are formed by naturally occurring fissures in the rock that get filled up by percolating minerals. Other types of pseudofossils are kidney ore (round shapes in iron ore) and moss agates, which look like moss or plant leaves.*

*An example of a pseudofossil: Manganese dendrites on a limestone bedding plane from Solnhofen.*

## **CONCLUSION :**

*Fossils of any kind are useful in "reading the rock record," meaning they help us decipher the history of the earth. They can help us determine the geologic age and environment (the paleoenvironment) in which they were deposited.*

*sedimentary rocks are the richest source of fossils. Why is this? Sedimentary rocks form from layers of sand and silt that settle to the bottom of seas and swamps. As deposits pile up, they compress older sediments below them into rock.*



# UNIQUE IN THE WILD

**S**cientists have estimated that there are 8.7 million animal species on Earth. Some of these are fierce (lions, sharks, tigers). Some are adorable (rabbits, deer, otters). And others are, well, really **WEIRD !!!** Across the globe, you'll

find unique animals that exhibit truly remarkable and bizarre features and behaviors. From a spider that shows off its amazing colors to a monkey that has a long white beard, there are many unusual animals . Here are few of them for you all -

## SPARKLEMUFFIN :

*This Australian peacock spider was discovered inside the woodland forests of Wondul National Park, near Brisbane, in 2015. Scientifically named Maratus jactatus. These colorful spiders measure just five millimeters in length and display a signature mating dance, where male spiders raise a leg to signal females.*



## PANGOLIN :

*Pangolins are the only known mammal with scales. Their habitat covers parts of Central and West Africa, India and South-east Asia. When threatened by predators, pangolins roll up into a defensive ball, protected by their armor-like coating of keratin scales. Sadly, these insectivores are one of the most illegally trafficked mammals in the world.*



## HARPY EAGLE :

*With a look that suggests a cross between a cockatoo and a bird of prey, the harpy eagle is one of the most distinct birds on the planet. Their wings can span over seven feet in width, carrying these 20-plus pound birds over the rainforests of Central and South America, where they hunt down large mammals like sloths and monkeys. Harpy eagles are threatened by habitat loss, but this bird can be seen at the The Belize Zoo, a sanctuary for native species about an hour outside of Belize City.*



## MANTIS SHRIMP :

*Mantis shrimp are ancient, fierce and more than a little weird. Various forms of mantis shrimp have been around for an estimated 400 million years, and they aren't like any other shrimp around. They are so freakishly strong that their appendages, called "clubs," can smash crab shells and bust open clams. These shrimp have incredible eyesight (they can see in two different directions at once), they strike with pinpoint accuracy.*





## **ECHIDNA :**

*Echidnas are one of only two mammals that lay eggs. Though they resemble a porcupine, echidnas are actually a distant relative of the platypus, believed to have evolved 20 to 50 million years ago from an aquatic ancestor. Echidnas forage on the forest floor for ants and termites, using their long snouts to capture prey.*



## **LYREBIRD :**

*Lyrebirds could easily win a talent show for their ability to mimic sounds in their environment. True, this trait exists in other birds, but lyrebirds take things to a whole new level. They can imitate just about any sound, including industrial equipment and power tools. Found in Australia, the birds are also known for their flamboyant mating displays.*



## **SUN BEAR :**

*Sun bears are the smallest bears in the world, with many adults weighing under 100 pounds. But what really makes them stand out is their unusually long tongues, which can measure up to nine inches. Also known as "honey bears," sun bears climb trees to find honeycomb, and their tongues come in handy when they lick out their loot. The Islands of Sumatra and Borneo are particularly good places to access their habitat.*



## PARROTFISH :

*You can find parrotfish in tropical reef environments, where they use their external teeth – which look like a beak – to break algae off rocks, coral and other hardened substrate. This ability allows them to carve out a living in places where many other species cannot survive . Parrotfish are found in the Indian and Pacific oceans; the Seychelles islands off East Africa boast a particularly sizable population.*



## RED-LIPPED BATFISH :

*This fish dwells along the ocean floor and is known for its red lips, which makes it look like it's recently devoured a bloody feast .The fish's scientific name, Ogcocephalus darwini, is a nod to Charles Darwin, who famously studied evolution while visiting the Galapagos.*



## LONG-WATTLED UMBRELLA BIRD :

*Female long-wattled umbrella birds don't look like anything special. But the males are incredible, with long wattles flabby hunks of skin, also seen on turkeys extending from their necks .They can control their wattles, retracting or extending them as desired during flight or while sitting stationary .Spot them in parts of Ecuador & throughout south-west Colombia, where they are heavily concentrated.*



## HUMMINGBIRD HAWK-MOTH :

*First described by the naturalist Carl Linnaeus, this is not your everyday moth. Not quite as cute as the poodle moth described later on this list, it is instead distinguished by its exceptional size — it's as large as a hummingbird! — and prominent reddish wings. Spot them in Scotland, Wales, Ireland and England, where it's often found feeding in gardens and woodlands.*



## PINK FAIRY ARMADILLO :

*The pink fairy armadillo, though, is quite different, with a fuzzy white underbelly and a shell with a fashionably pink hue. If you think its general appearance is cute, just wait until you learn about its size. This little armadillo is about the same size as a hamster, giving it perfect pet-like appeal. You can find the pink fairy armadillo in Central Argentina.*



## VENEZUELAN POODLE MOTH :

*Discovered in Venezuela just a few years ago, in 2009, this large moth is covered with hair that makes it resemble a poodle. Unlike a poodle, however, it has wings and is attracted to your porch light, just like any other moth. The general consensus seems to be that this is the cutest moth ever, and we wholeheartedly agree.*



## MATA MATA :

*The mata mata's bumpy turtle shell is used to hide its snake-like neck and head. It is found in the Amazon. It sits idle and rarely leaves its shallow-water environment, only really moving when the time comes to lay eggs on land.*



## HONDURAN WHITE BAT :

*Luckily, these vampire-esque albino bats are vegetarians and have no interest in causing harm. You can find them during the daytime hanging out in groups in tent-shaped leaves throughout eastern Honduras, Nicaragua, Costa Rica and Panama .Their pointed ears are yellowish and almost translucent, with a shape like an elf, and their stark white color makes them easy to spot.*



## LEAFY SEADRAGON :

*The leafy seadragon is a bit more exotic looking. Another animal from down under, the "leafy" can be found along the southern and western coasts of Australia. At about 8 to 9 inches in length, leafies look like floating seaweed, providing them excellent camouflage in the deep sea. At the moment they hatch, these sea creatures are known for being completely independent, except for when they're ready to breed.*



## PANDA ANT :

*Just as panda bears are notoriously cute, so too are panda ants. Fuzzy, with a white body and black spots, they look adorable and innocent. Panda ants are found in Chile and Argentina, and the females are actually wingless wasps. This means they pack a serious punch with their sting.*



## GLAUCUS ATLANTICUS:

*The Glaucus Atlanticus, more commonly known as the blue angel, dragon slug, blue sea slug or several other similar nicknames, is a shell-less gastropod mollusk. They float upside down and are carried along by the winds and ocean currents .This sea slug is quite small at about an inch in length and is recognizable because of the dark blue stripes on its head .The blue sea slug can swallow the venomous Portuguese man o' war by storing it in its finger-like extremities.*



## OKAPI :

*Can't decide if you'd rather see a zebra or a giraffe? Why not see an animal that looks like a cross-breed of both ?The okapi is the only living relative of the giraffe, but features the distinctive black-and-white markings of the zebra on its hindquarters and front legs. Its nickname? The "zebra giraffe," obviously .This endangered animal is leery of humans and hard to find. It lives in the Uturi Forest in the Democratic Republic of Congo, but travelers can't access this area.*



## TARANTULA HAWK :

*Most species avoid spiders, and for good reason: The predatory champions of the insect world sometimes have venom capable of taking down large mammals. The tarantula hawk, however, targets large tarantula spiders as a food source .The female tarantula hawk is actually an exceptionally large wasp, carrying its own venom that paralyzes the tarantula. She then lays her eggs in the still-living spider and buries the carcass. When the eggs hatch, the baby tarantula hawks eat the living tarantula spider as they emerge and gain strength. It's a truly terrifying experience from the perspective of the spider .Tarantula hawks can be found throughout South America and the United States, where they make the desert their home. Seeing one is undoubtedly cool, but make sure to keep your distance: They are known to sting humans.*



## DE BRAZZA'S MONKEY :

*If a big white beard signifies wisdom, then De Brazza's monkeys must be the wizards of the African plains. With their dignified beards and bushy eyebrows, these primates have a majestic look.Low-key and quiet, they live in central Africa and spend most of their time along river systems surrounded by forests. Just make sure to keep quiet and limit your movement, as this monkey is easily spooked. When spotted, it will often freeze as a defense mechanism to avoid further detection .Ethiopia, Kenya and Angola all contain populations.*



# RED PANDA'S BEHAVIOUR

## INTRODUCTION :

**E**x-situ conservation deals with the planned breeding of the species, where the ultimate goal is to reintroduce the animals in the wild. Ex-situ conservation plays key role in conservation through education, fundraising and research as well as breeding for the reintroduction into the wild (Hutchins, 1995). Red panda is a solitary and nocturnal animal which is adapted to cool and moist environment and is found in Himalayan and Hengduan mountain ranges. The red panda (*Ailurus fulgens fulgens*) is an endangered animal and is priority species of the conservation breeding programme of Central Zoo Authority, Government of India. Red panda is found in the Himalayan belt of Nepal, India, Bhutan, Myanmar and Southern China. Populations of the species are confined to isolated mountain ranges ranging in altitude between 1,500 m and

4,800 m. Status of the red panda in wild has also been a matter of great discussion and speculation for over a long period.

International Union for the Conservation of Nature and Natural Resources has reassessed the global status of red panda and placed it under the endangered category. In India too, though red panda is included under the Schedule - I of Indian Wildlife (Protection) Act 1972 and very little is known about its status in the wild. It is also listed in Appendix 1 of the Convention on International Trade for Endangered Species of wild fauna and flora (CITES). Rapid growth and expanding human population which depends on the forest for livestock grazing, timber extraction, food, fodder, fertilizer, fuel-wood are the causes for the erosion of the Himalayan forest and decrease in number of red panda in the region.

## STUDY AREA :

**Padmaja Naidu Himalayan Zoological Park (PNHZP) in Darjeeling, established in year 1958 is dedicated to the conservation of endangered Himalayan fauna. The zoo is situated in a patch of virgin forest at an altitude of 6,874 ft above sea levels. The annual rainfall in this area varies between 100 and 115 inches and the daily temperature range from nearly freezing in the winter to about 20°C in summer. Winter**

**snowfall can be quite heavy at times (about once every 3-4 years) and frosts are common. The 67 acres of the Birch Hill Forest where the zoo is located are the remnants of the original woodlands of the region. This is the only specialized zoo in the country and is internationally recognized for its conservation breeding program of red panda, snow leopard, Tibetan wolf and other highly endangered animal species of Eastern Himalayan.**





## **EX-SITU CONSERVATION BREEDING OF RED PANDA :**

*Red panda is a local animal of Darjeeling and it was housed at the park from the date of inception. Red panda being a charismatic species began to attract the attention of the outside world and the demand for the species started increasing. After the Indian Wildlife (Protection) Act, 1972 it became extremely difficult to acquire the red panda from the wild without proper permission. Conservation breeding programme of the red panda founded on 9 animals; 4 wild origin animals already living in the zoo in the early 1990s and five zoo-bred animals were acquired from Europe. Continuous behaviour monitoring and studies of the animals were conducted in captivity. Information related to the species and feeding was collected*

*from local people of the village in the vicinity of the red panda. Inputs were taken from the senior keepers of the zoo and field staffs of the national parks .The red panda is an arboreal animal hence the enrichment of the enclosure was done using dry logs and branches in order to provide extra climbing facilities . Red panda was allowed to use display arena both in day and night time since the animal is more active during dawn, dusk and night time. At least 2-3 nest boxes were placed in each enclosure because red panda shifts the cubs like cats. The improvement made in housing the red panda soon brought positive results. First successful planned birth of two red panda was recorded on 20th of June 1994.*



## **ENCLOSURES AND HOUSING FACILITIES :**

*To meet the physical, social, behavioural and physiological needs of the species careful consideration has been taken during designing and construction of the exhibits for red panda. Enclosures are designed to accommodate all the behavioural aspects of the species like scent marking, a tendency to maintain personal distance except during breeding season, the affinity to climb and hide from disturbances, natural foraging, feeding activities, breeding associated activities, young rearing behaviours , nest building and sleeping. Sufficient trees are planted inside the display arena to enable the red panda to climb and utilize all areas of the enclosure to rest or find shelter. Visual barriers like bamboo, log piles, trees, are*

*provided in the enclosures and more than three nesting boxes are provided to allow hiding and sleeping for the animal within the enclosure. These boxes are constructed of wood, covered by tin sheet from outside and are placed at different shaded and elevated location of the enclosure. The park has circular enclosure with 6-7 feet high RCC wall with an inward bend at the top. The total area of the enclosure is 2925.00 sq. m. The enclosed area is with many trees and lots of greenery. Nesting boxes have been placed at different places in the enclosure. Closed circuit televisions (CCTV) are installed in different enclosures of the park in order to record the behaviour of the species.*



## RECORD KEEPING :

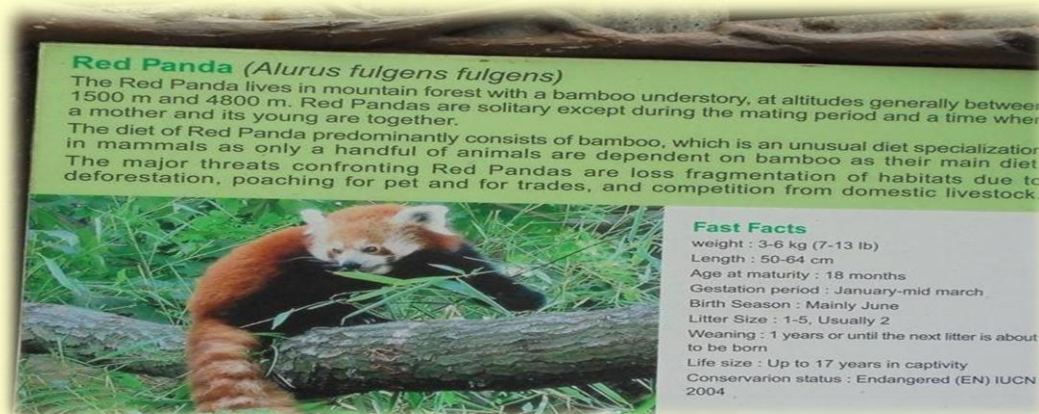
*Proper records of the animals are maintained in the park .Maintenance of keeper's diary with information on animal's behaviour, feed, enrichment, health etc are done. Feed charts are maintained regularly about the animal's feed, type of feed, feed timings and feed rejection*

*and consumption . Records are also maintained in Species360 software. Separate registers are maintained for recording temperature, humidity and amount of water obtained from the dehumidifier kept in the enclosure for keeping the humidity level in check.*

## PHYSICAL CHARACTERISTICS :

*The red panda has long, soft, reddish-brown fur on the upper parts, blackish fur on the lower parts, and a light face with tear markings and white badges similar to those of a raccoon, but each individual can have distinctive markings. Its skull is roundish with medium-sized upright ears, its nose is black, and its eyes are blackish & teeth are robust. Its long, bushy tail with six alternating transverse ochre rings provide balance and excellent camouflage in a habitat*

*with moss- and lichen-covered trees. The legs are black and short with thick fur on the soles of the paws .The red panda is specialized as a bamboo feeder with strong, curved and sharp semi-retractile claws standing inward for grasping narrow tree branches, leaves, and fruit. Like the giant panda, it has a "false thumb". When a tree head-first, the red panda rotates its ankle to control its descent, one of the few climbing species to do so.*



## **CAPTIVE DIET :**

*Proper husbandry skill and applied nutritional sciences are the most important aspects for the management of wild animals in captivity .The feed of the species in the park includes the following items- 1 piece of egg, 2 piece of banana, 200 gm of apple, 20 ml of honey, 200ml of milk, 4 kg of fresh bamboo leaves and 1000ml of water are provided to a single animal every*

*day. The feed items are changed to avoid monotony and at different state of affairs such as during breeding and sickness. Boiled water is provided to the animal both in the enclosure and off exhibit area. Record of feed and water consumption is maintained in a prepared sheet to know the quantity of intake in various seasons.*

## **CAPTIVE BREEDING OF THE SPECIES :**

*The breeding pair is chosen based on their pedigree of the animals. The pair is kept in an open enclosure prior to 2/3 months of mating i.e. in the month of October-November. Mating takes place in the month of December to mid of March. Rate of scent marking increases in both the sexes and male spent maximum time in examining the marking of the females. Mating call is heard and allogrooming are observed during the mating season. After 6 weeks of mating female becomes less active and special care is given to the pregnant female. Proper hygiene*

*is maintained in the enclosure. Continuous observations are also aided by CCTV cameras which are installed inside the cubing box to record the birth event and the events there after are done. Before parturition female is frequently seen carrying nest building materials such as leaves, grasses, and sticks for nest building. After the gestation period is 120 to 150 days which is generally too long for an animal of its size gives birth to one to four with a mode of two cubs.*

## CONCLUSION :

*The study attempted to provide ex situ status of the red panda in Padmaja Naidu Himalayan Zoological Park, Darjeeling. The red panda project being a part of the global conservation breeding species constantly requires various forms of interventions specially in the ex situ management of the species like population structure of the captive population, feeding, behaviour, enrichment and veterinary issues. Such form of*

*study provides immense input towards better and scientific management of the species ensuring successful breeding of the species. All the above works conducted and finding will help towards the better management of the species in captivity exhibiting their wild behaviour free from any form of diseases and a wider implication on the global conservation breeding programme.*



# **DOWN THE MEMORY LANE (DARJEELING EXCURSION)**



Samsung Dual Camera  
Shot by Krishnendu



Samsung Dual Camera  
Shot by Krishnendu







Samsung Dual Camera  
Shot by krishnendu



# MEMBERS OF ZOODRIVE

## Faculty

- **Prof. Pintu Mondal**
- **Dr. Ishita Samajdar**
- **Prof. SK Abul Kasem**
- **Prof. Manjushree Das (Saha)**
- **Prof. Ashraful Alam**
- **Prof. Safika Sultana**

## Students

- **Dibyendu Naskar**
- **Rakesh Pramanik**
- **Krishnendu Haldar**
- **Surajit Kayal**
- **Arpita Mondal**
- **Adarsha Paria**
- **Santanu Halder**
- **Ranajit Giri**
- **Abhisek Mondal**
- **Sayani Bhandary**