Summary of the First Two Days' Activities of Sundarban Field Work (BES 23)

Day 1: KHULNA UNIVERSITY SOIL ARCHIVE

Day 1 formally began with our arrival at Khulna University Following a speech by Professor Dr. Sanaul Islam, BES-23 batch visited the underground Soil Archive. The curator and Professor Islam discussed the archive's purpose and key features. It functions mainly as a soil sample archive. Over 1875 samples from 5 distinct zones of Bangladesh has been collected and stored in the archive. It contains information on various physical and chemical parameters of the soil. The interactive lecture reinforced our basics while broadening our understanding. Formation of soil, structure, and methods of sampling were discussed alongside the fertility and maturity of soil in relation to its geography. Red, oxidized soil is more mature. However, they are rare in Bangladesh, which is dominantly deltaic. The GBM river system shapes most Bangladeshi soils, making them young and grey. The visit ended with a discussion on the country's rapid loss of cultivable land.

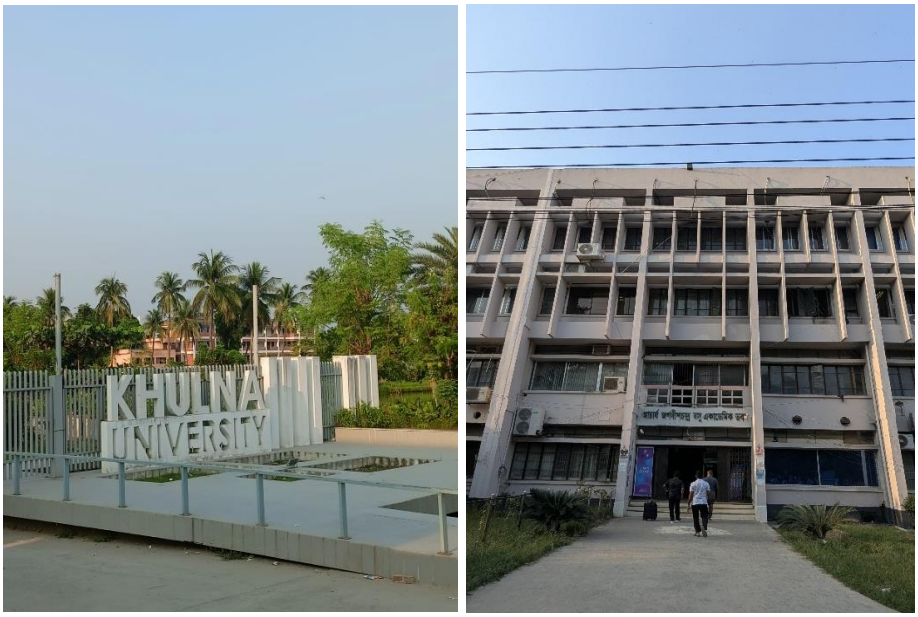


Fig: Khulna University

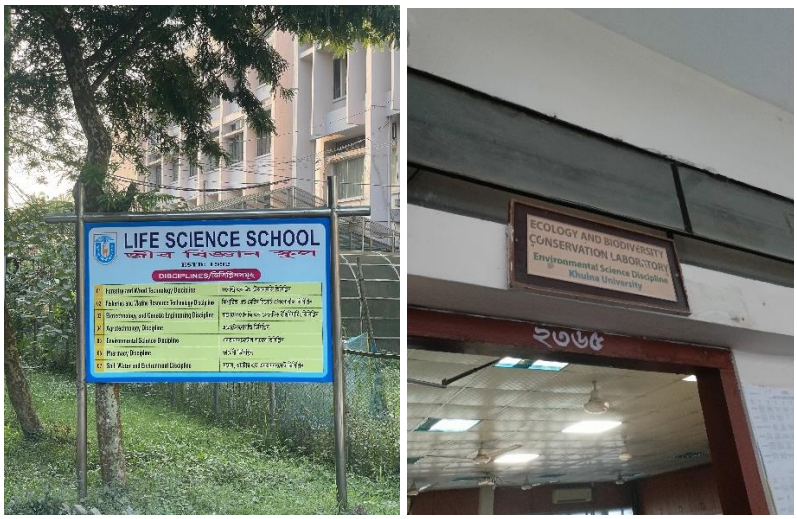


Fig: Laboratory of Environmental Science Discipline

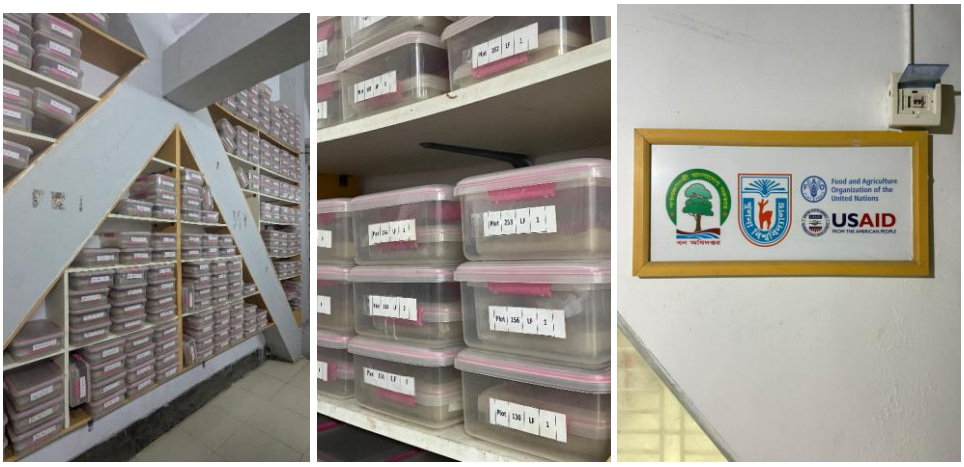


Fig: Underground soil archive of Khulna University

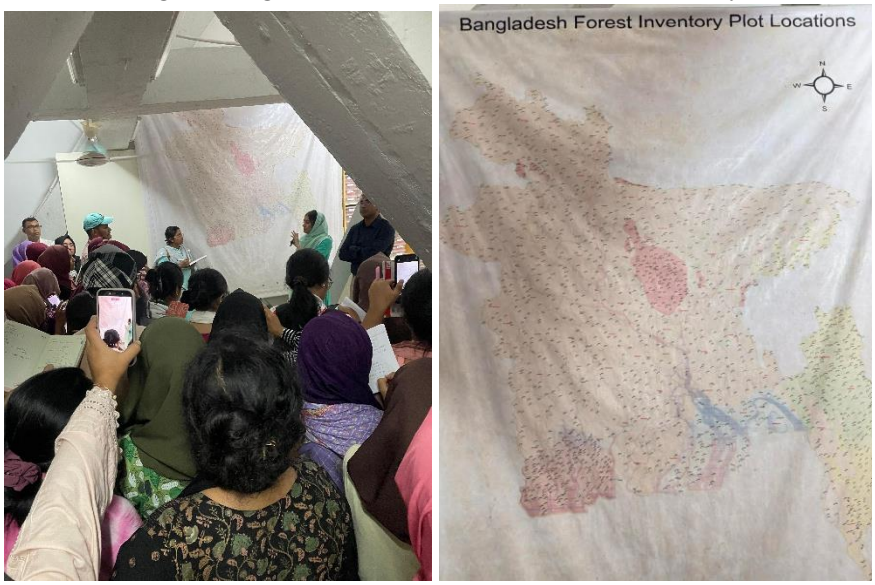


Fig: Briefing in the soil archive

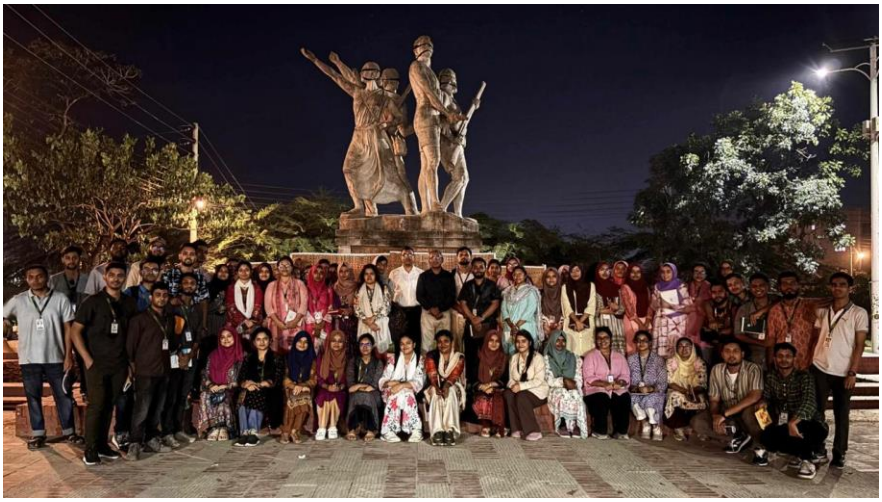


Fig: Group photo of BES-23 with Professor Dr. Sanaul Islam and our respected chairman, faculties

Day 2: ANDARMANIK ECO TOURISM SPOT & KATKA OFFICE PARA

Day 2 began at Andarmanik with field expert Professor Dr. Harun Sir. He guided and briefed us throughout the trail. Andarmanik is a zone of low to medium salinity. As such more vegetation and more top storied plants were observed. The dominance of Sundari *(Heritiera fomes)* trees was noticeable which thrives here despite low salinity resistance. Other plant species commonly seen were Gewa *(Excoecaria agallocha)*, Keora *(Sonneratia apetala)*, Tiger fern *(Acrostichum aureum L.),* Orchids and Hetal *(Phoenix paludosa)*. Common fauna seen were red crabs and Mudskippers. The students learned about the common mangrove plants and their adaptive traits to survive in the muddy, saline and waterlogged Sundarbans. Pneumatophores enable breathing, and buttress roots provide stability in soft, muddy soil. Mangrove leaves often have cuticles to reduce water loss, while some species excrete excess salt. To overcome salinity-limited germination, many mangroves exhibit viviparous gemination, where seeds germinate on the parent plant.

Similar patterns were seen at Katka Officepara, our second site for the day. It serves as one of the entry-points to the Sundarbans East Wildlife Sanctuary. Katka is ideal for research and education because its diverse mangrove ecosystems and protected wildlife habitats offer direct, field-based learning on ecology, conservation, and environmental change. There, we learned about the ecological zonation of the Sundarbans and the underlying reasons behind variable levels of salinity. Salinity varied east to west of the Sundarbans depending on freshwater inflow from rivers such as the Baleshwar and Passur. Due to significant salinity, only tolerant plants were found in Katka. Students observed dead seeds of Sundari trees, which failed to germinate due to salinity. Katka also serves as a kella, a raised land providing wildlife refuge. Proof of this was the presence of herds of deer and monkeys throughout the trail. Our second day ended with newfound appreciation for the adaptative traits and ecosystem resilience of the flora and fauna of Sundarbans.

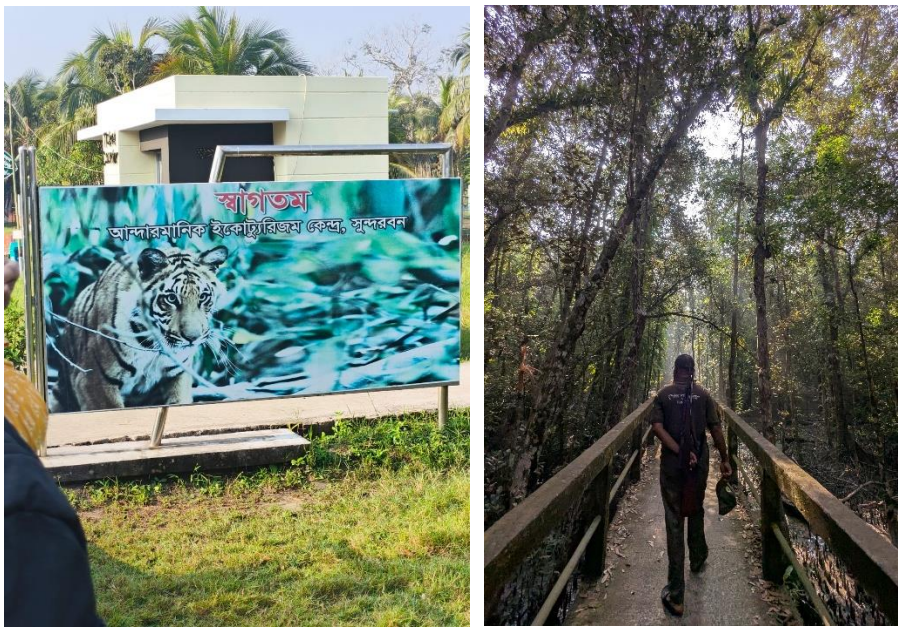


Fig: Andarmanik Eco Tourism Center

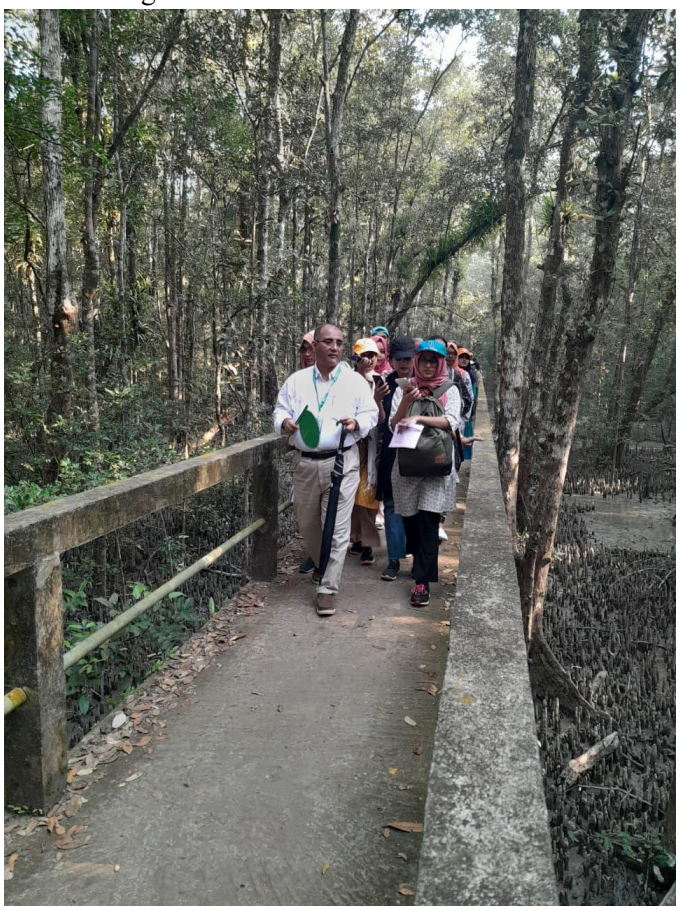


Fig: Briefing at the Andarmanik trail by Professor Dr. Harun Sir

Fig: Orchids and Tiger Fern

Fig: Sundri tree with its unique colored leaves

Fig: Buttress roots and pneumatophores

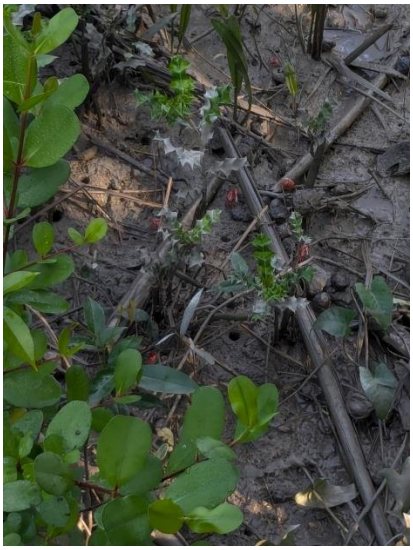
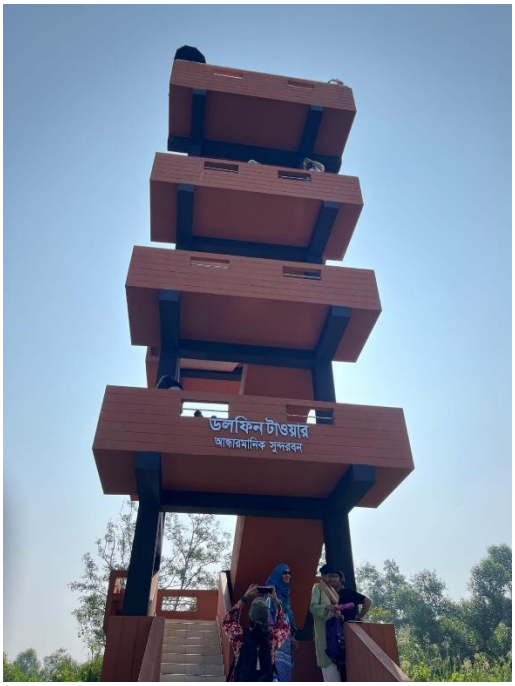


Fig: Abundance of red crabs



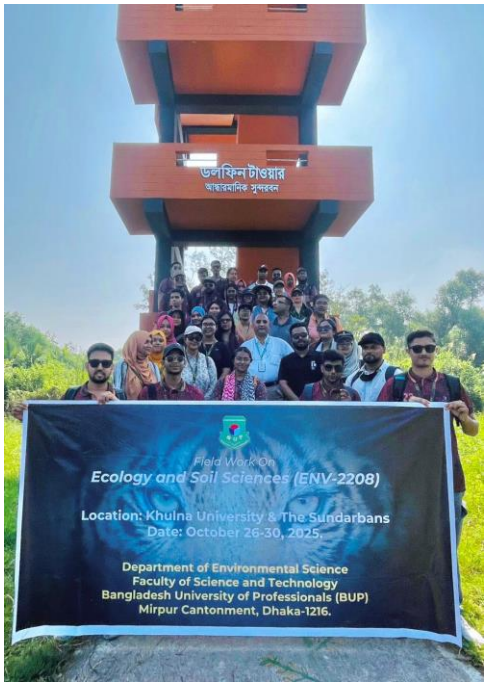
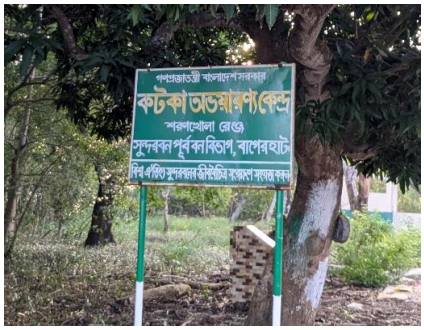


Fig: Group photo in the Dolphin Tower, Andarmanik



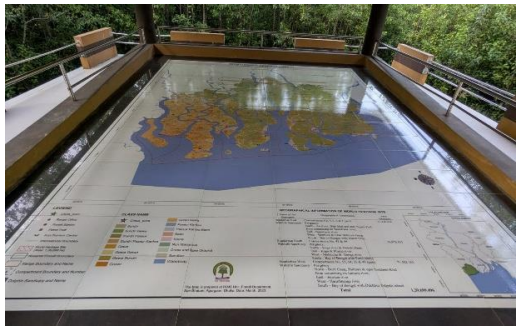


Fig: Kotka Wildlife Sanctuary, Shoronkhola Range

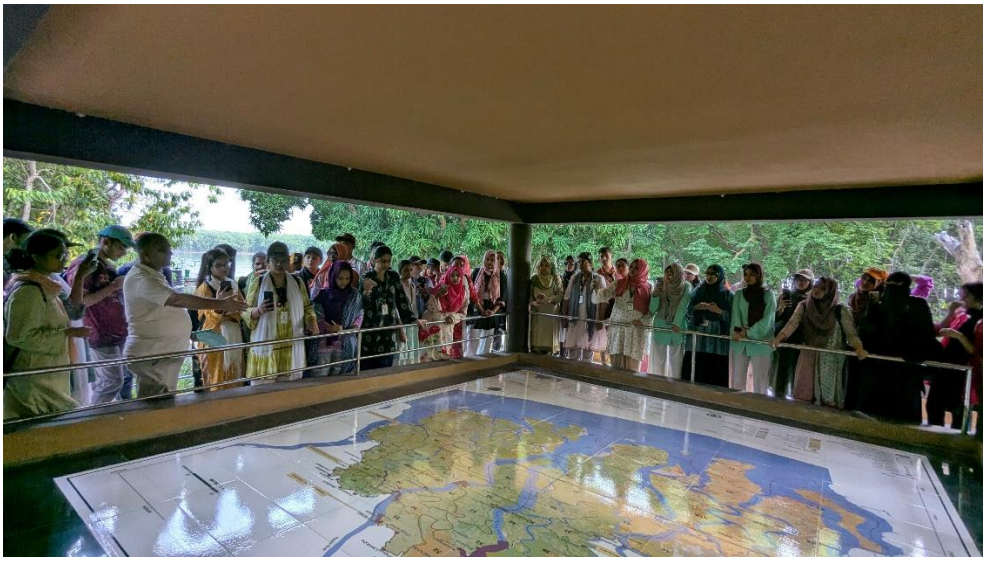


Fig: Briefing by Professor DR. Harun Sir in the Kotka Office Para

Fig: Dead Sundri seeds due to salinity stress

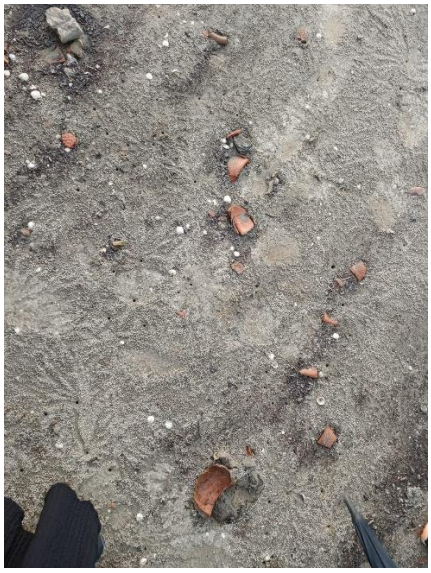


Fig: Clay pots embedded in soil due to previous salt farming activities

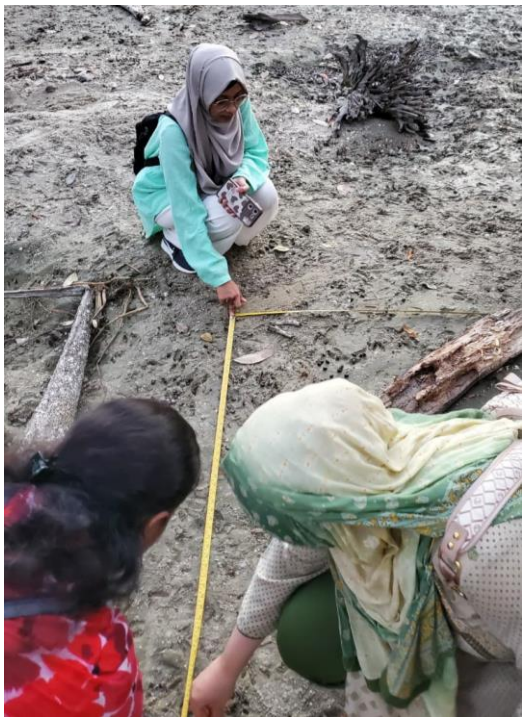


Fig: Measuring species density per quadrant

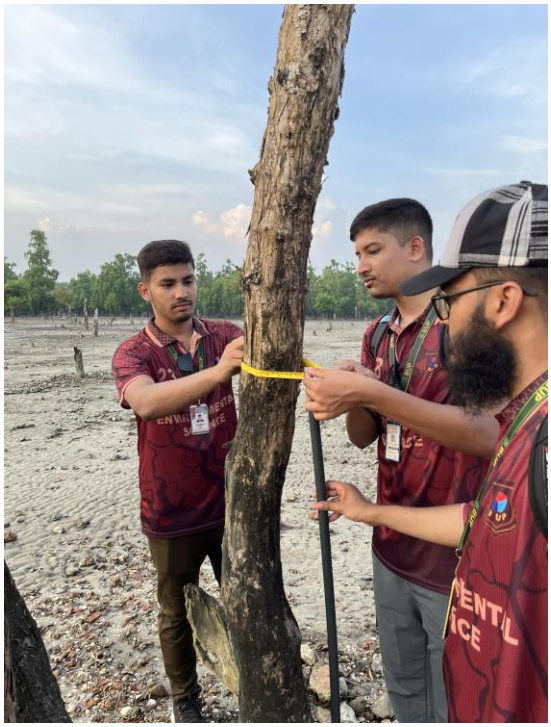


Fig: Measuring the Diameter at the breast height of a tree

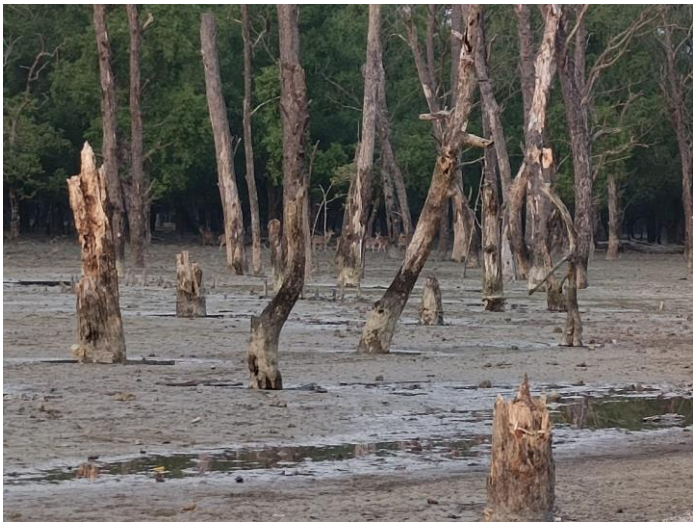


Fig: Cyclone affected trees in the Kotka wildlife sanctuary

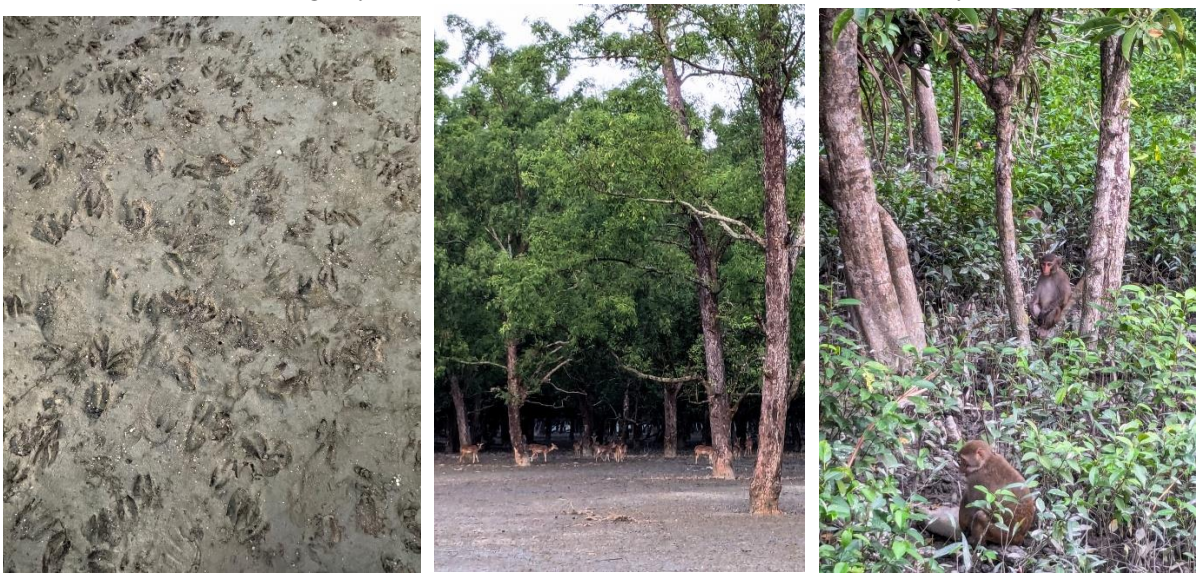


Fig: Fauna of the Kotka Wildlife Sanctuary (Deer, Monkeys)

October 28, 2025 : Coastal Ecotones, Wildlife Sanctuaries & Associated Anthropogenic Influence.

The third day of the field work at the Sundarbans was dedicated to the observation of the transitional interface between the mangrove forest and the Bay of Bengal, focusing on coastal dynamics, biodiversity observation, and the impact of human activity across the three distinct ecotones: Jamtola Sea Beach, Kochikhali, and Dimer Char.

Jamtola Sea Beach: Situated in the Kotka region, Jamtola sea beach is ecologically significant for its transition from the dense mangrove forest into the marine intertidal zone, characterized by deposits of black, silty sand and a medium to high saline zone (mesohaline). The name ‘Jamtola’ is derived from the large number of small and large Jam (black cherry) trees in the area. Tiger fern (*Nephrolepis exaltata*), where tigers camouflage to hide and a freshwater pond for wildlife use were observed. A high dominance of Gewa (*Excoecaria agallocha*), Keora (*Sonneratia apetala*), Sundari (*Heritiera fomes*) and Keya (*Pandanus odorifer*) alongside two parasitic vines, Kalialata (thin) and Gilalata (thick), that cover and harm other trees were observed. The influence of rainfall was noted by the growth of freshwater plants. ‘Deer ground activities zones’—small, repeated pathways created by grazing deer herds—and Chankata trails on the ground were visible. Numerous crab holes and dense demersed spider webs were recorded, highlighting their essential function in soil oxygenation and insect population control, maintaining ecological balance. A critical observation was the extensive presence of plastic pollution by tourist dumping or tidal activity across the area, underscoring a major environmental challenge.

Kochikhali: Located within the Sundarbans East Wildlife Sanctuary, Kochikhali is known for its high concentration of the Royal Bengal Tiger (*Panthera tigris tigris*); thereby, often referred to as 'Tiger Point.' The core observation here was ‘Tiger Kella’ (fort), an artificial & man made natural embankment, specifically constructed for saving wildlife after the cyclone Amphan, allowing them to take shelter during disasters. The area also features a large freshwater pond for wildlife. The landscape is dominated by Gewa (*Excoecaria agallocha*), Keora (*Sonneratia apetala*) and Passur (*Carallia brachiata*), with an open meadow and tidal creeks (*khals*) hosting crocodiles, deer, lizards, and diverse bird species.

Dimer Char: The final location of the day was Dimer Char, a tidal island shaped like an Egg Island. Its ecological significance lies in the primary succession stages of plant colonization, with the observation of dense Kashban (Kans grass) suggesting recent stabilization and potentially less saline conditions. Dimer Char acts as an important resting and feeding ground for large herds of Spotted Deer (*Axis axis*).

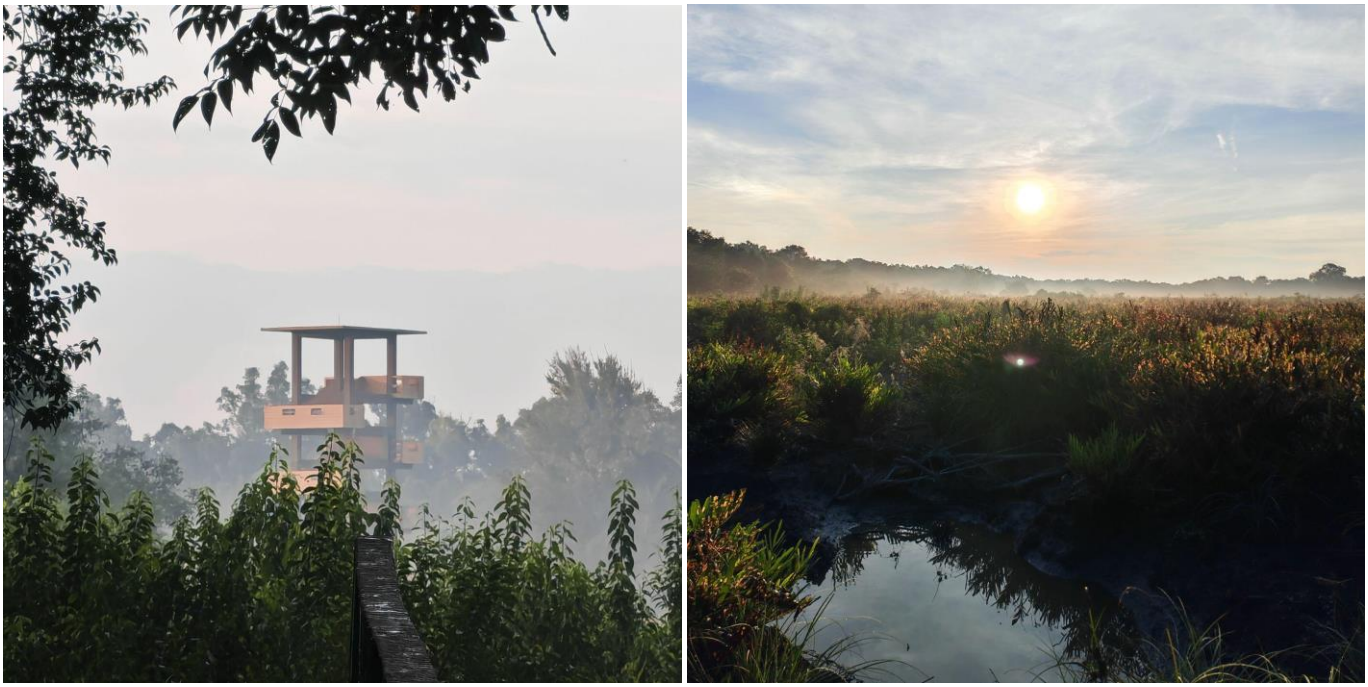


Figure: The watch-tower and meadow of Jamtola, Katka.

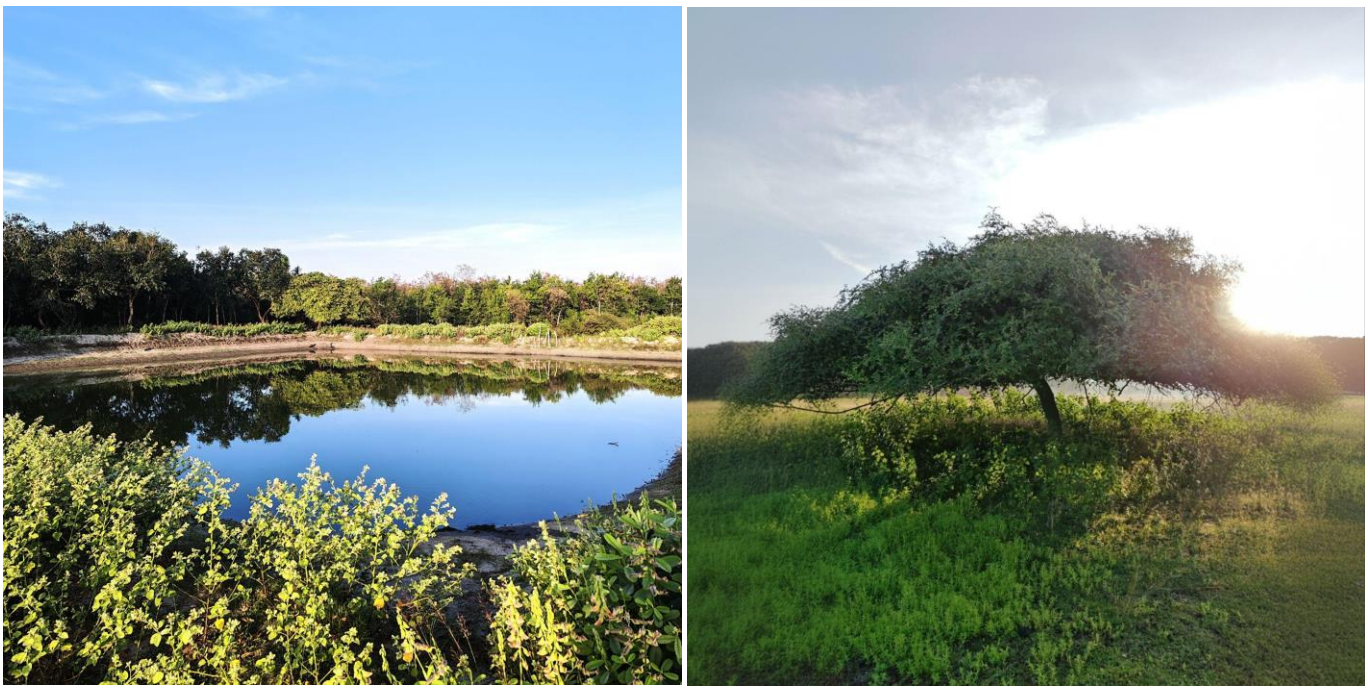


Figure: Freshwater pond and Kul tree featuring deer cuts, Jamtola, Katka.

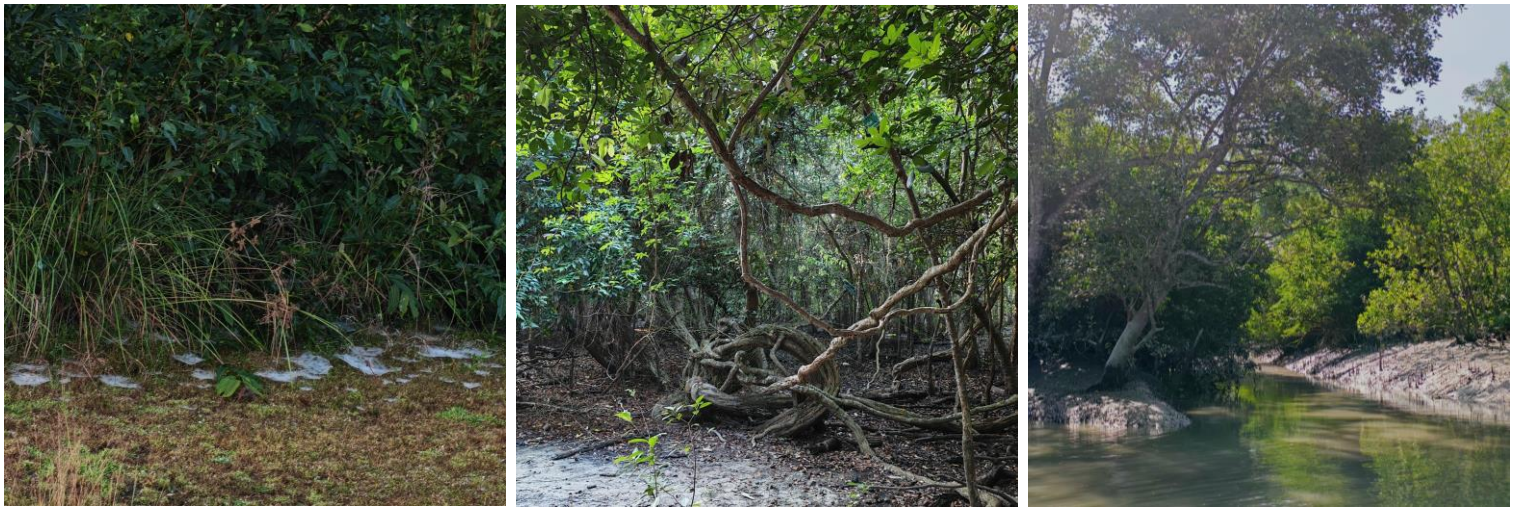


Figure: Spiderwebs on forest land, lianas and canal en route, Jamtola, Katka.

Figure: Flora and fauna of Jamtola, Katka.

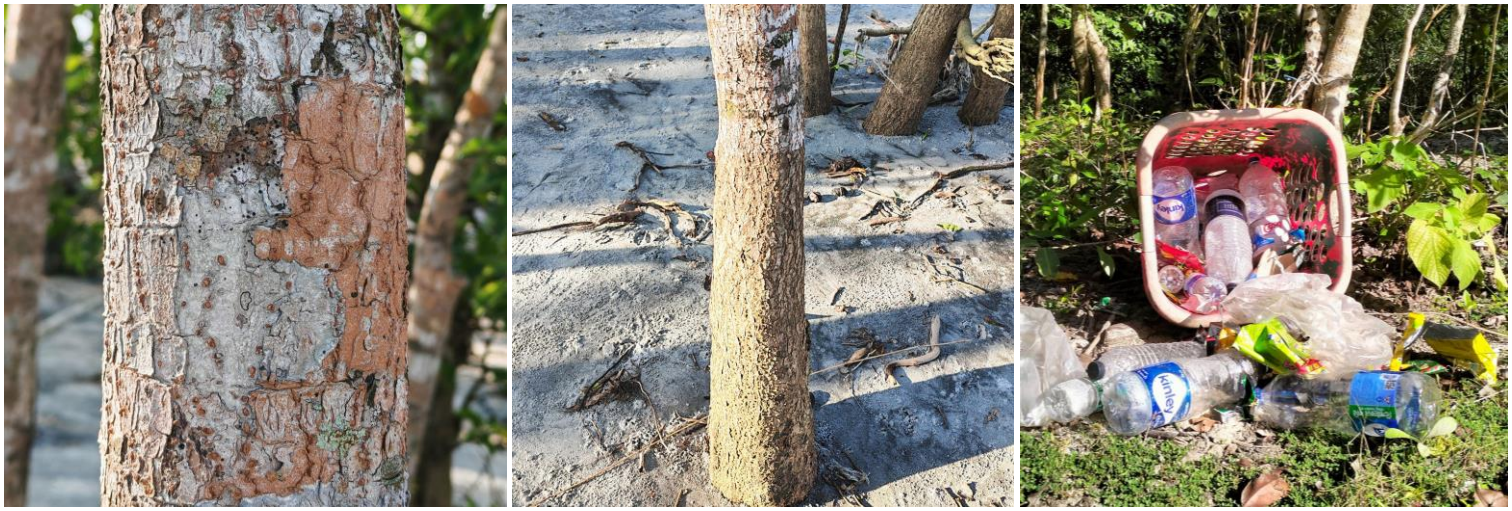


Figure: Microbial infestation on Keora bark, tidal mark on bark and plastic pollution, Jamtola, Katka.

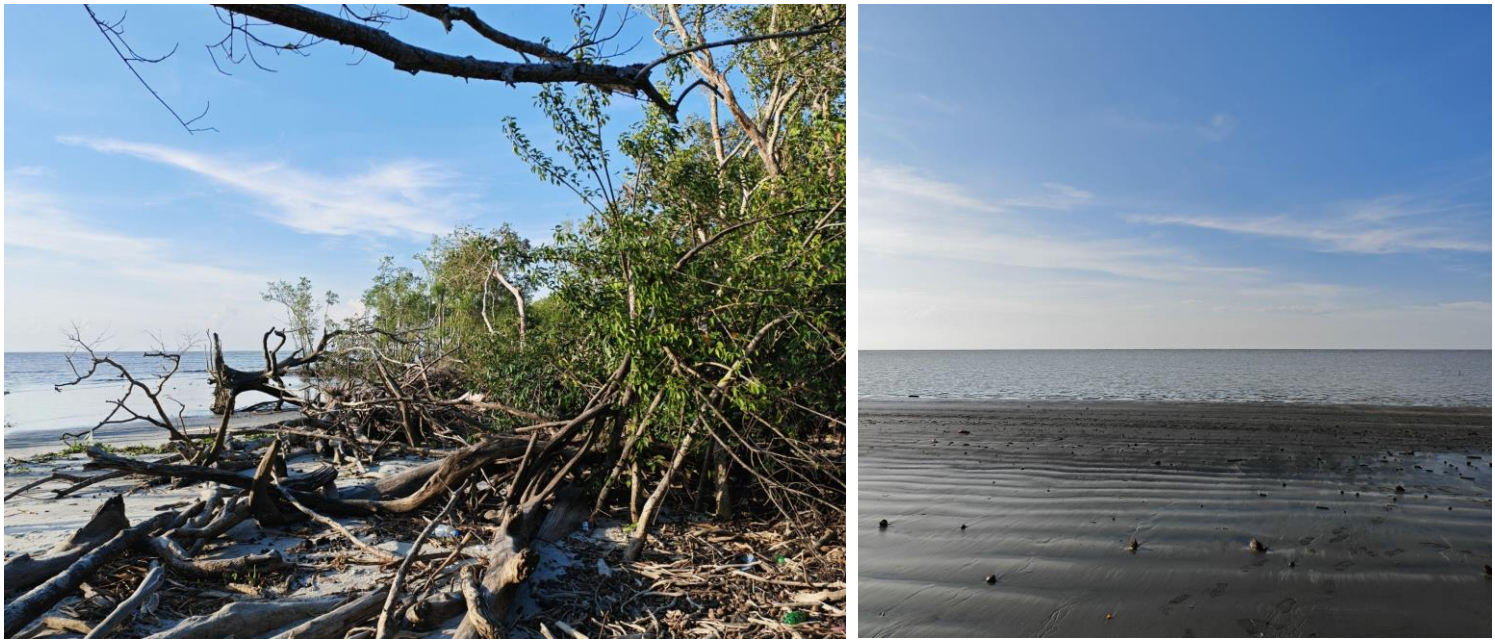
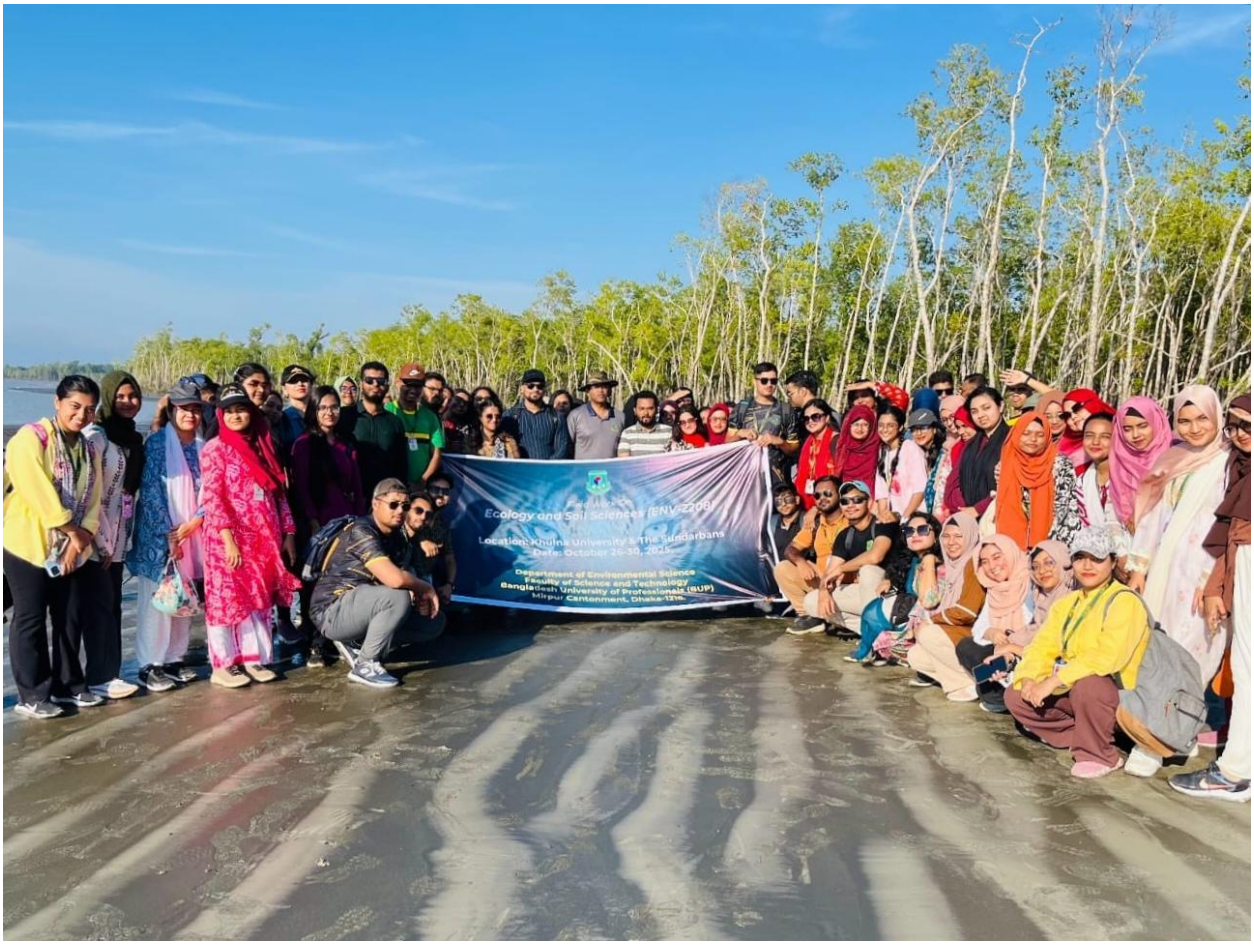


Figure: Effect of Sidr and Aila on the sea beach of Jamtola, Katka.



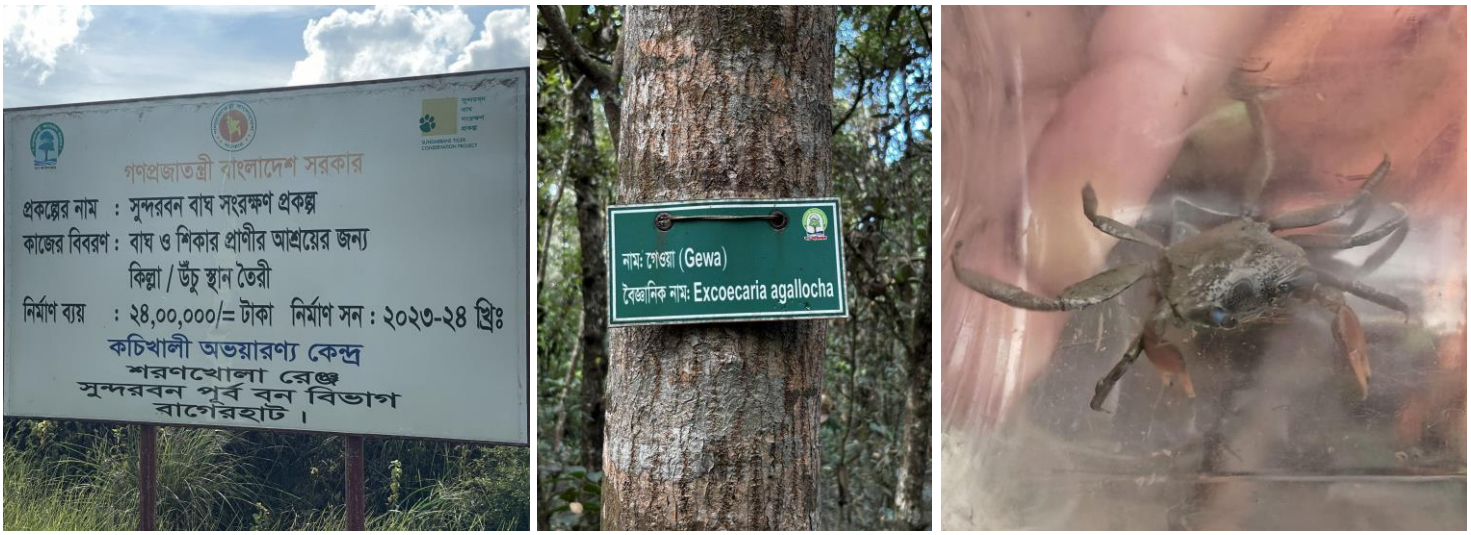
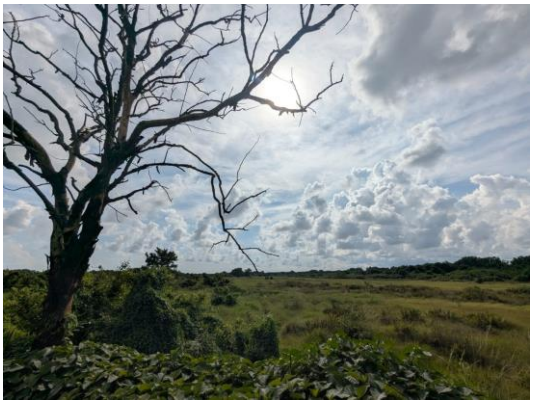


Figure: Kella for tigers and wildlife protection, dominant flora and fauna, Kachikhali, Sundarbans.



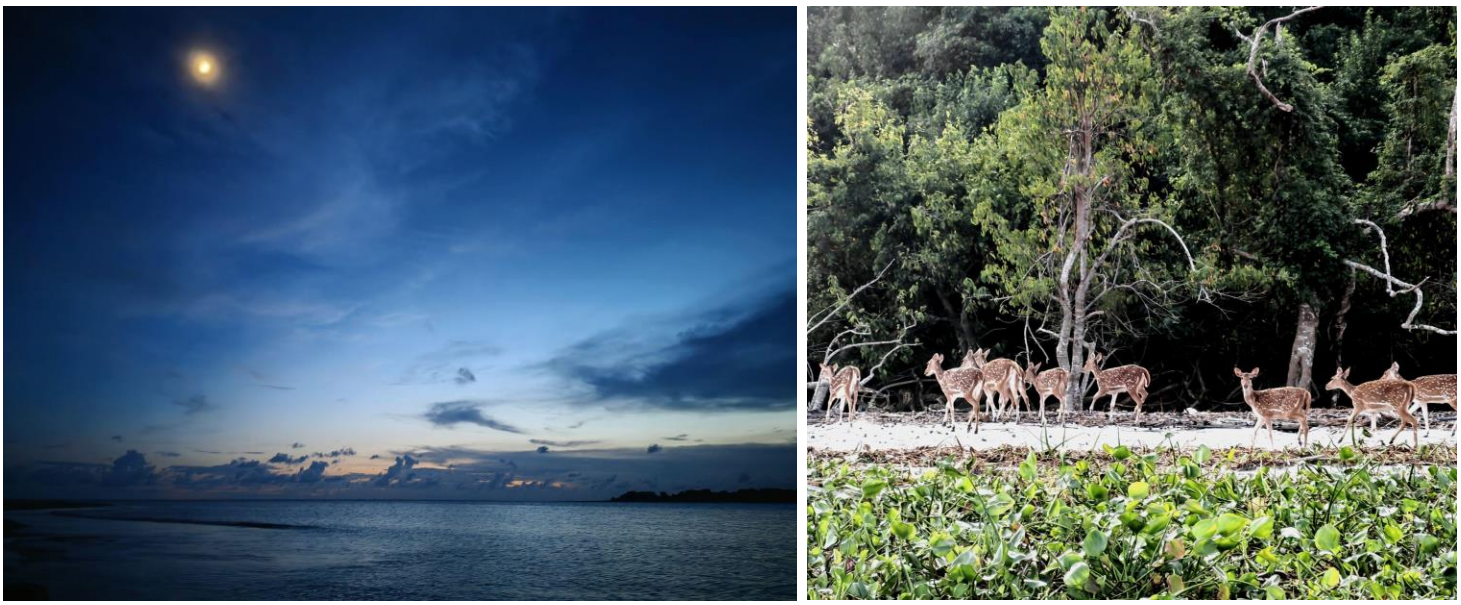


Figure: Dimer char and fauna en route, Sundarbans.

October 29, 2025 : Inland Mangrove, Zoological Hotspots & Conservation Centers.

The fourth day of the Sundarbans field work focused inland to two major monitoring and conservation sites: the Harbaria Eco Tourism center and the Karamjol Wildlife Center. Here, documentation was conducted on the botanical communities, critical zoological populations and the impact of salinity on the mangrove health.

Harbaria Eco-tourism Center

Located deeper within the forest in the Chandpai Range beside the Pashur River, Harbaria Eco Tourism site's primary focus was the local mangrove community, where three dominant species were identified: Kakra (*Bruguiera gymnorrhiza*), Sundari (*Heritiera fomes*), and Jhama (*Avicennia officinalis*). Observations of the Kakra trees highlighted crucial adaptations to the polyhaline zone that is characteristic of the anoxic environment, which included thick, waxy cuticles on leaves for minimizing water loss and viviparous reproduction in seedlings. A significant concern was the 'Top-Dying disease' affecting the *Sundari* population, the occurrence of which can be trongly linked to the increased salinity conditions that inhibits water and nutrient uptake, leading to the dieback of foliage and twings from the top of the treeand progressing to lower branches with time. Visible change in the height of the trees and overall canopy was observed with changing salinity, with plants of this zone being shorter in height. The presence of a dedicated Gewa seedling zone and Non-Timber Forest Products such as Golpata were recorded. Lastly, the intertidal zone and the discovery of pugmarks of the Royal Bengal Tiger was seen in majority, alongside footprints of Spotted Deer and Monkeys (*Macaca mulatta*), indicating significant terrestrial faunal movement.

Karamjol Eco-tourism Center

The last location of the field work was the Karamjol Wildlife Center, also known as the gateway of the great Sundarbans. Observations here demonstrated a correlation of low-saline areas leading to maximum tree height and biomass, while high-saline areas exhibited stunted growth. The country's only Government Crocodile Breeding Center (temperature-dependent sex determination) was located here and the presence of three permanently residing Estuarine Crocodiles (*Crocodylus porosus*) were confirmed. The location nurtured Spotted Deer and Monkeys as well. In a glass case, the map of the Sundarbans with eggs of crocodiles and tracking protocols for differentiating sexes of the Bengal Tiger was shown by male print being rectangular and female print being square. Lastly, the Ganges River Dolphin (*Platanista gangetica*), classified as Endangered and locally struggling with plastic pollution and reduced freshwater flow, was observed, along with sightings of two types of deer.

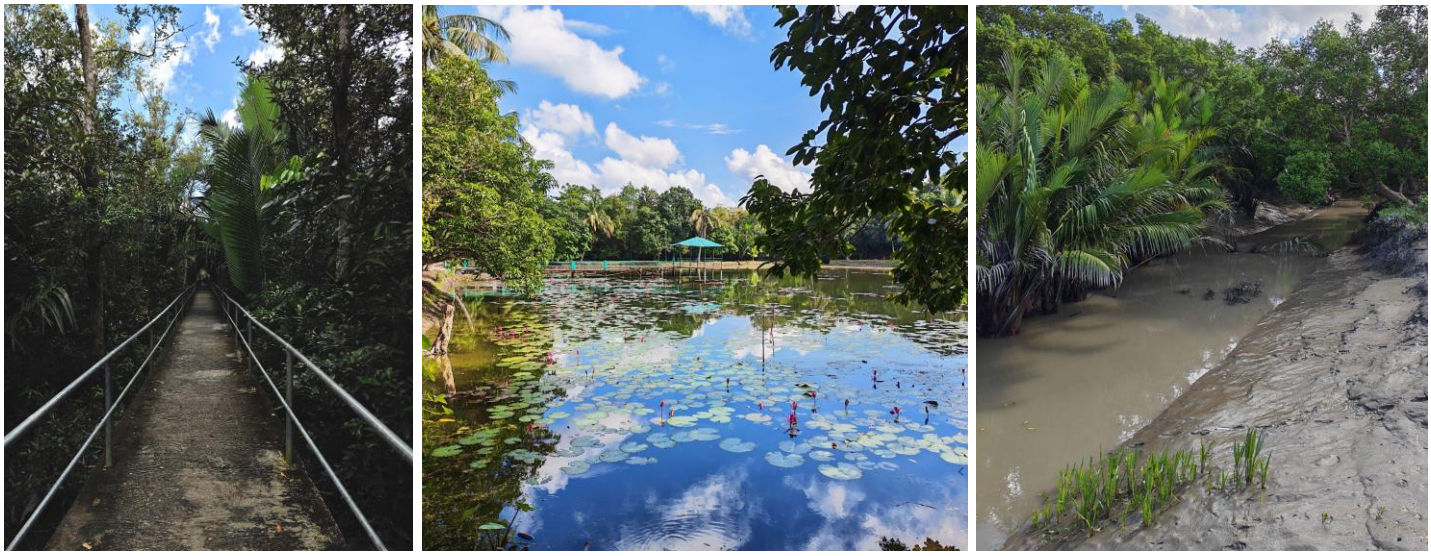


Figure: Forest trail, freshwater pond and tidal creek, Harbaria, Sundarbans.

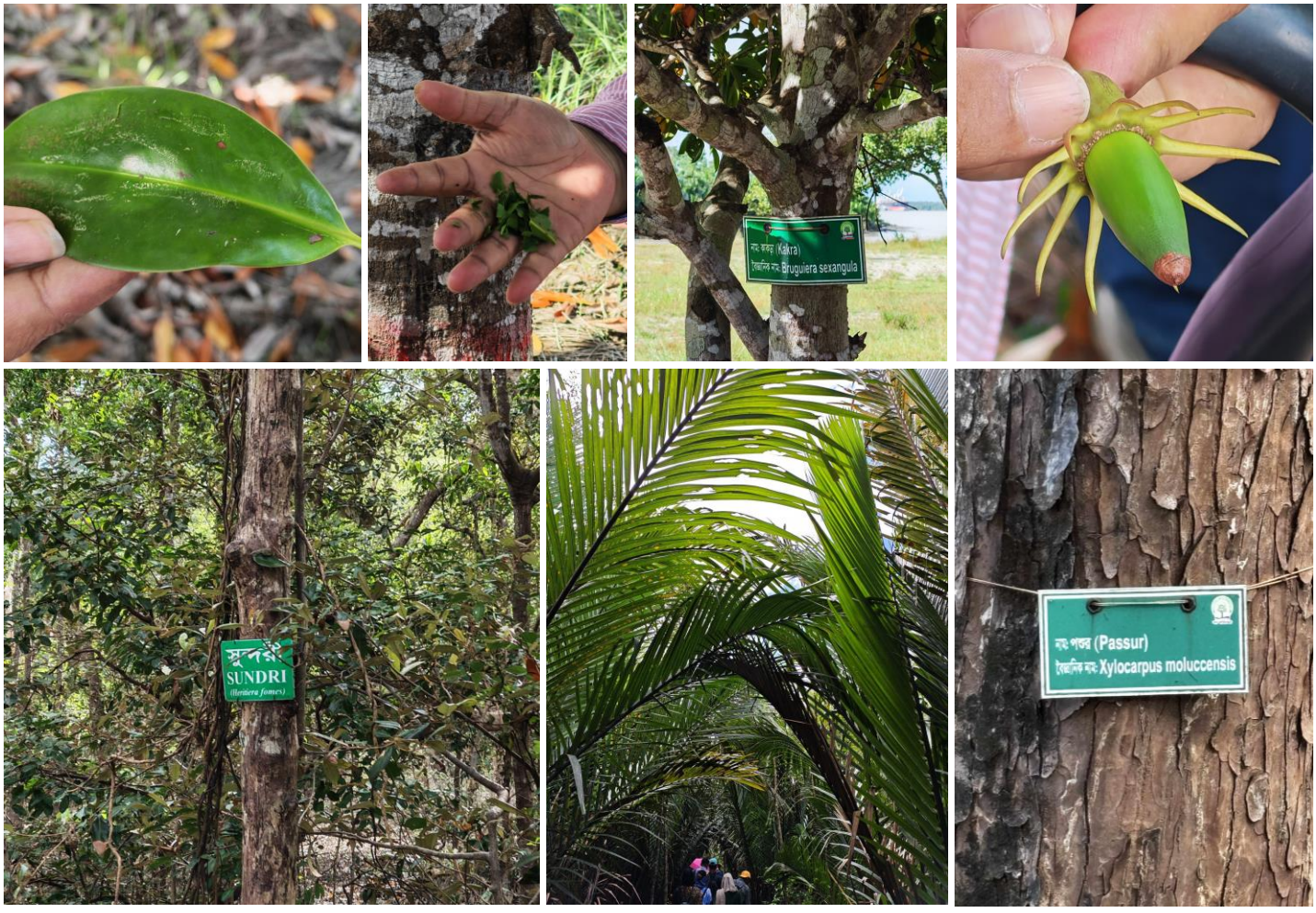


Figure: Flora, Harbaria, Sundarbans.

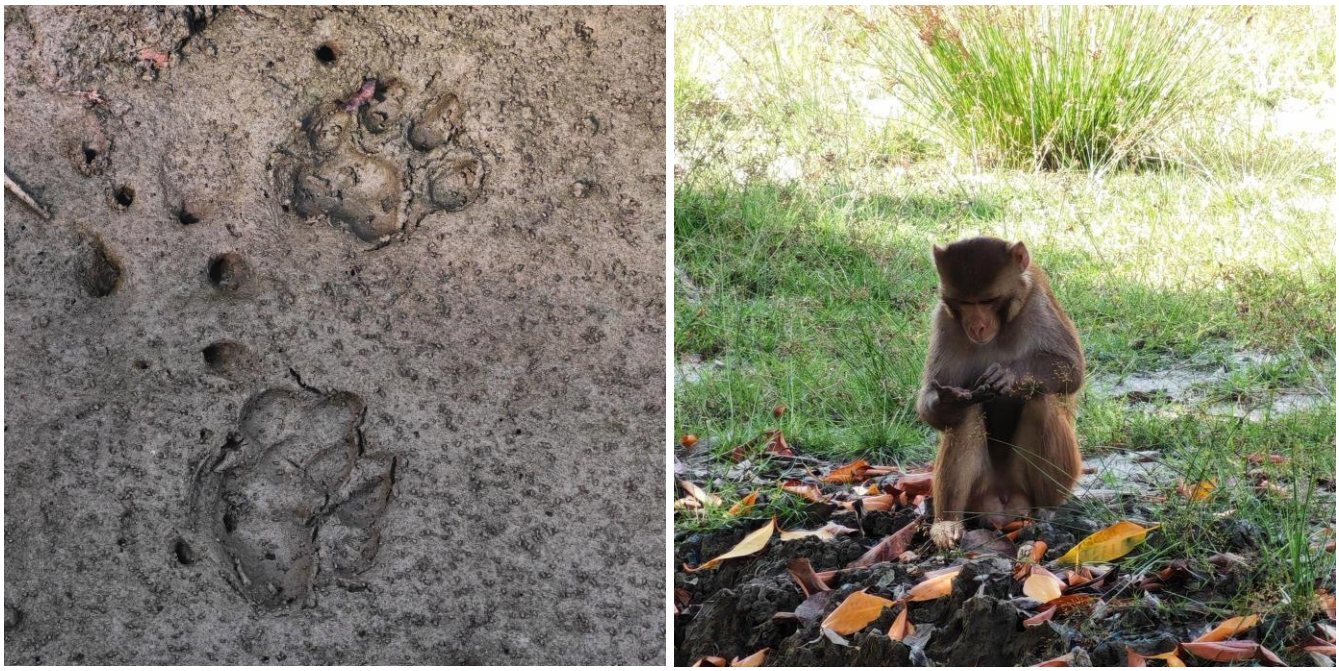
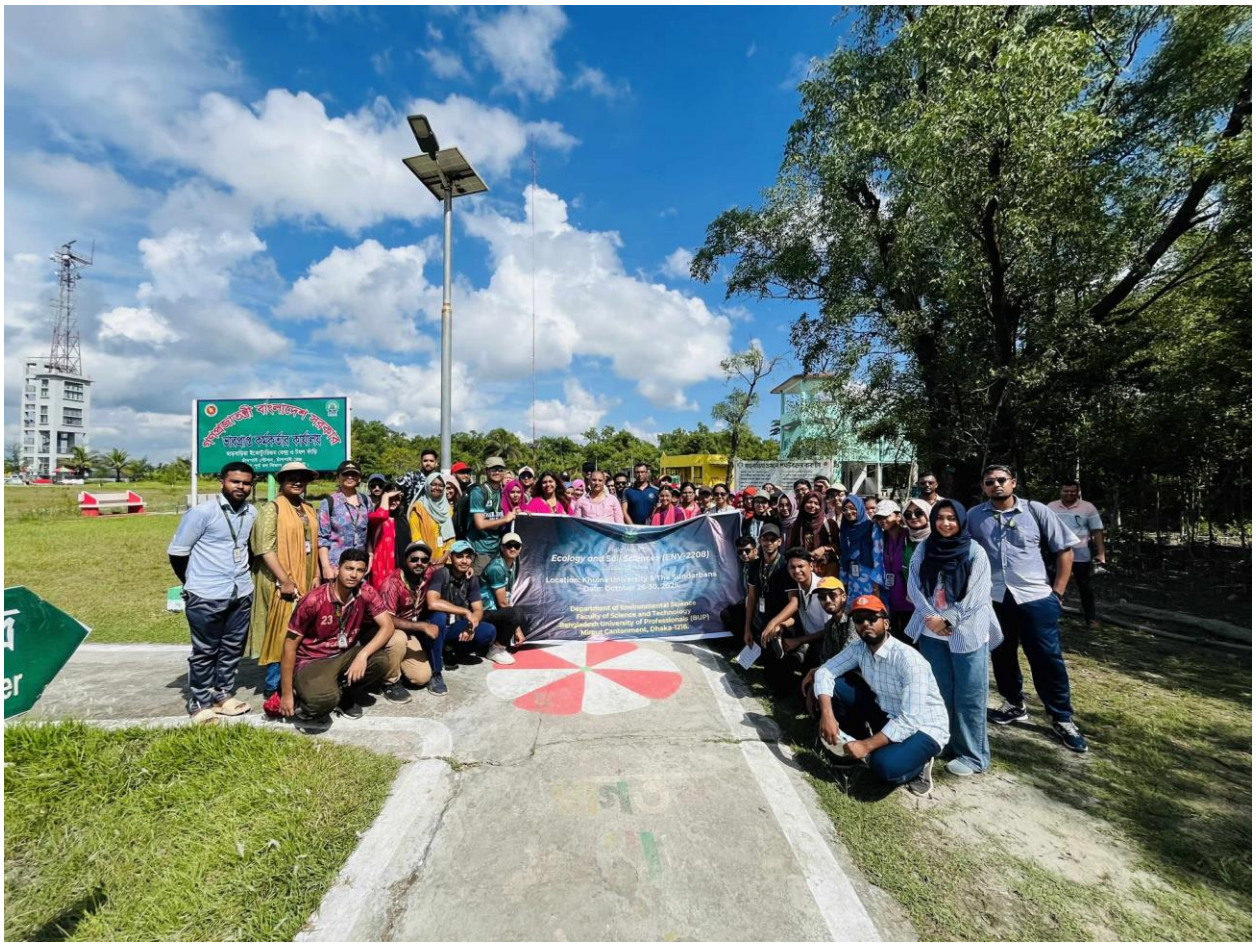


Figure: Pugmarks of the Royal Bengal Tiger and fauna, Harbaria, Sundarbans.



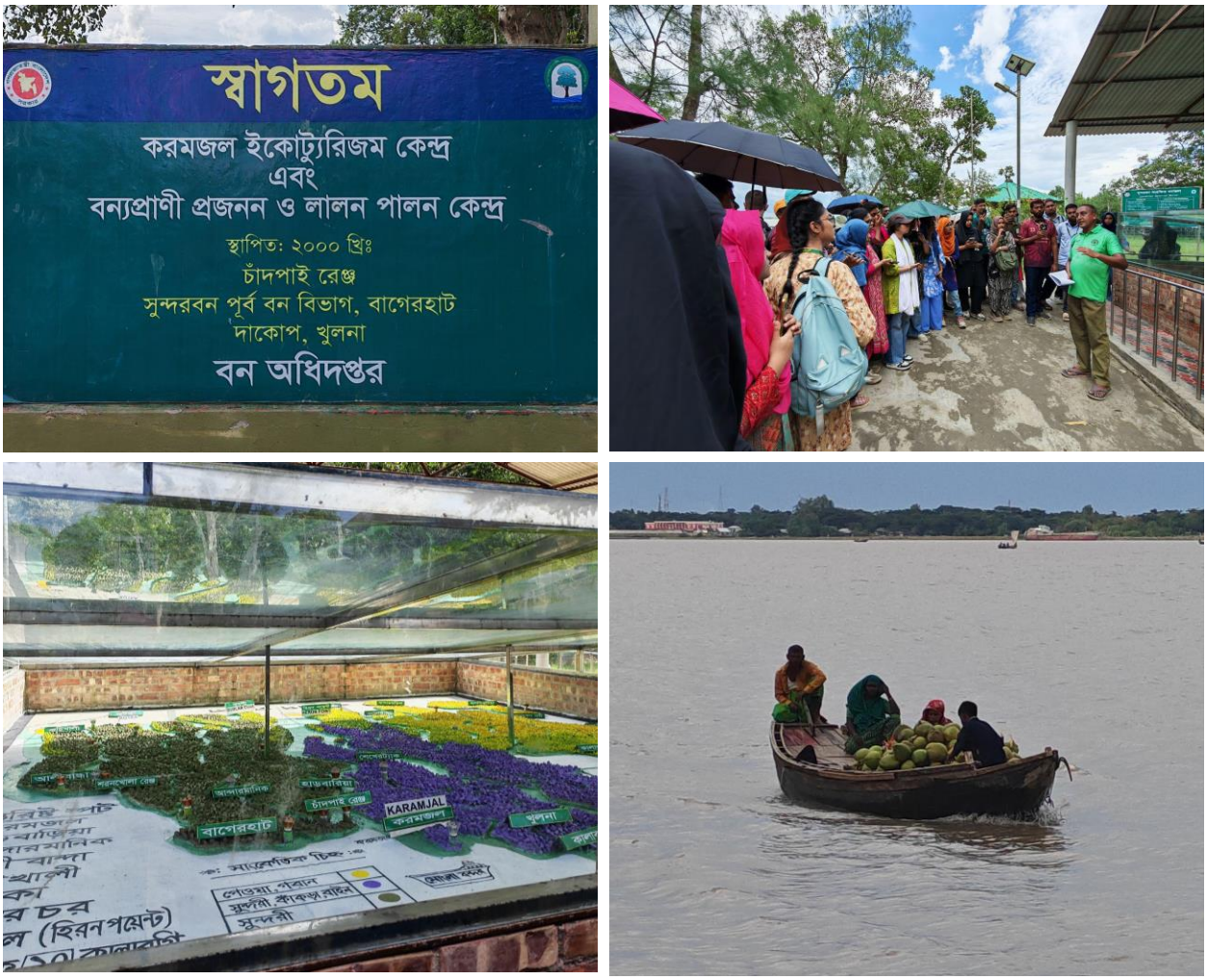


Figure: Landmarks, map, economy of Karamjal Eco-tourism Center, Sundarbans.

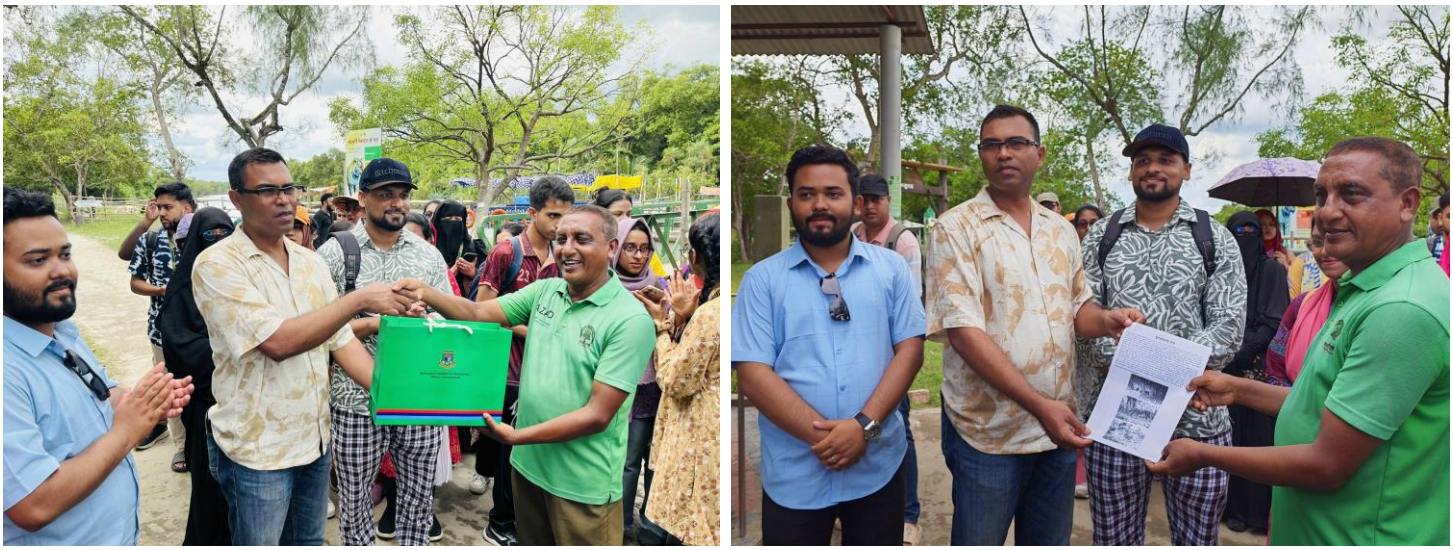


Figure: Souvenir exchange ceremony at Karamjal Eco-tourism Center, Sundarbans.

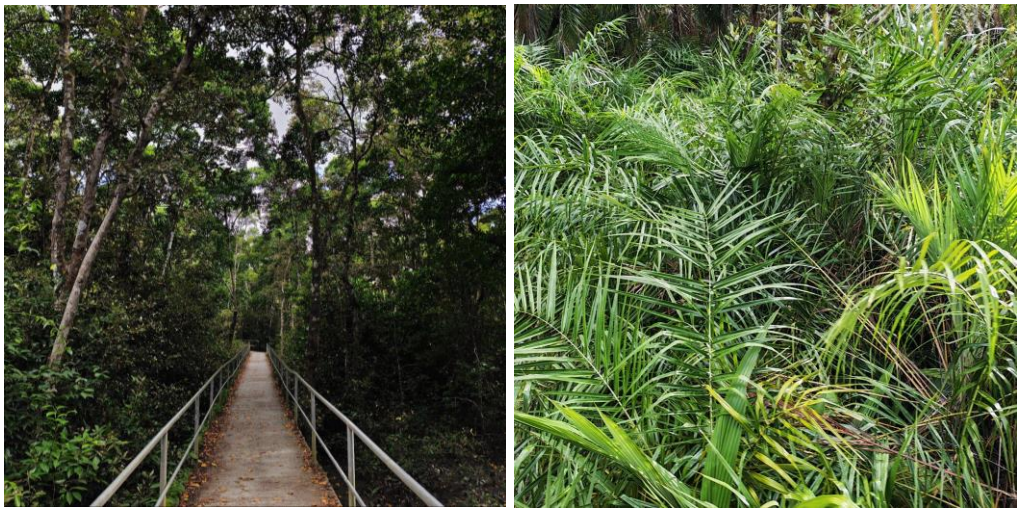


Figure: Trail and fauna, Karamjal Eco-tourism Center, Sundarbans.

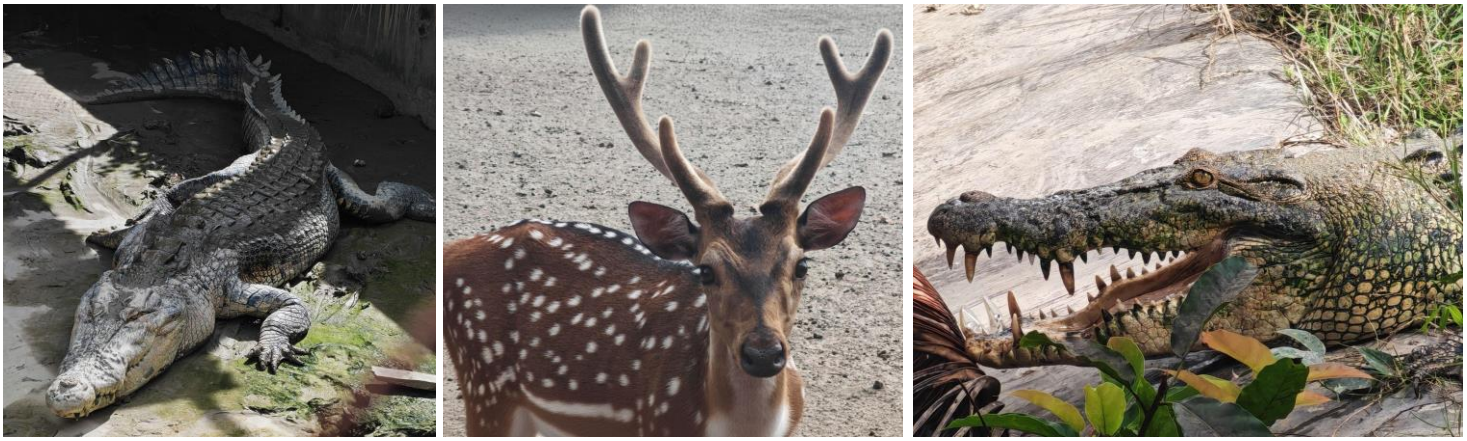


Figure: Fauna, breeding center, Karamjal Eco-tourism Center, Sundarbans.