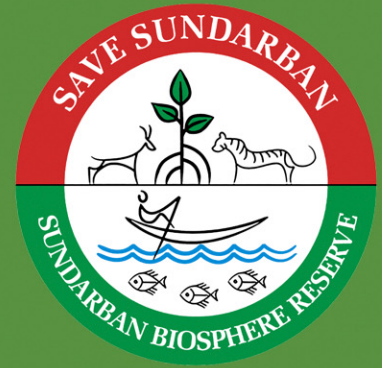# Population Assessment & Habitat Ecology Study of Saltwater Crocodiles in Sundarbans
2025

**Sundarban Biosphere Reserve
Department of Forests
Government of West Bengal**

SUNDARBAN BIOSPHERE RESERVE

The 2025 study on the Population Assessment and Habitat Ecology of Saltwater Crocodiles in the Sundarbans aims to evaluate the current status and distribution of Crocodylus porosus within the Sundarban Biosphere Reserve. Conducted by the Department of Forests, Government of West Bengal, this initiative focuses on understanding population trends, habitat preferences, breeding patterns, and threats to the species in this unique estuarine ecosystem.

Through systematic surveys, GPS mapping, and habitat characterization, the study provides critical insights for conservation planning. It supports the long-term goal of preserving biodiversity and maintaining ecological balance in one of the world's most fragile and dynamic mangrove landscapes.

বিরবাহা হাঁসদা
রাষ্ট্রমন্ত্রী (স্বাধীন দায়িত্বপ্রাপ্ত)
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The Sundarbans—an ever-changing mosaic of tidal rivers, mangrove forests, and intertidal flats—showcases nature's remarkable resilience. As both a UNESCO World Heritage Site and a Ramsar wetland, it shelters extraordinary biodiversity, with the saltwater crocodile as one of its most charismatic apex predators.

West Bengal's first crocodile population survey took place in 2012. Last year, we repeated and expanded that effort, pairing the count with habitat assessments to understand how these reptiles are coping with rising salinity, climate variability, and other ecological shifts. The news is encouraging: saltwater crocodile numbers continue to rise, even as local communities rely on the Sundarbans' natural resources. This success story highlights West Bengal's coexistence model, where people and wildlife thrive side by side.

This report is the result of tireless work by field staff, researchers, and forest officers who braved challenging conditions to gather and analyse the data. Their dedication deepens our understanding of crocodile ecology and guides adaptive management of this fragile habitat. In an era of environmental uncertainty, the insights in this second edition will help shape future conservation decisions, habitat-restoration projects, and further research.

I extend my heartfelt thanks to everyone involved—your commitment keeps the Sundarbans and its remarkable wildlife flourishing.

29th, July, 2025
Aranya Bhavan, Salt Lake - 700106

BIRBAHA HANSDA
Minister of State (Independent Charge)
Department of Forests
Government of West Bengal

Foreword

The Sundarbans, a UNESCO World Heritage Site and Ramsar Wetland of International Importance, continues to stand as one of the world's most extraordinary natural treasures. Its vast expanse of mangrove forests, winding rivers, and tidal flats harbors an unparalleled diversity of life, with the saltwater crocodile reigning as a apex aquatic predator species in this delicate ecosystem.

Building upon the foundational insights of the first study, this second edition presents an updated and expanded assessment of the saltwater crocodile population and their habitat in the Sundarbans. Conducted during 2024-25, this comprehensive study employs advanced methodologies and refined ecological analyses to provide a clearer understanding of population trends, habitat health, and the persistent challenges posed by climate change and anthropogenic pressures.

The findings of this report are critical in shaping adaptive conservation strategies, ensuring that both the crocodiles and their habitat remain resilient in the face of evolving environmental threats. The meticulous efforts of the research teams have yielded invaluable data, deepening our knowledge of crocodile behavior, distribution, and the ecological dynamics that sustain them.

I extend my deepest appreciation to the officers, researchers, and field staff whose unwavering commitment and expertise made this study possible. Their dedication not only advances scientific understanding but also reinforces our collective responsibility to safeguard the Sundarbans for future generations.

This second edition serves as an essential resource for policymakers, conservationists, and researchers, offering evidence-based guidance to protect this iconic species and its fragile ecosystem. May it inspire continued collaboration and innovation in the pursuit of sustainable conservation practices.

Principal Secretary & PCCF & HoFF
West Bengal Forest Department

Acknowledgement

The Sundarbans, spanning the delta formed by the Ganges, Brahmaputra, and Meghna rivers, is a vital mangrove ecosystem of global importance. Its intricate network of waterways and mangrove roots supports diverse species, including the Saltwater Crocodile (*Crocodylus porosus*), an apex predator and key indicator of ecosystem health.

The present study, conducted in 2024–25, builds on the previous year's efforts with improved methodology and broader coverage. Over nine days, 23 survey teams systematically covered 1,168 kilometers of creeks—representing over 65% of the reserve's navigable and most preferred waterways, as identified in the earlier survey. The teams recorded direct and indirect evidence of crocodile presence, along with environmental parameters such as salinity, water temperature, creek width, and bank slope.

The data were analyzed to provide updated population estimates and insights into habitat preferences and distribution. These findings form a scientific basis for conservation planning and targeted actions to protect the species and its habitat amid climate and human-induced threats.

We acknowledge the officers, field staff and researchers whose dedication under challenging conditions made this study possible. Their contributions have significantly enhanced our understanding of crocodile ecology in the Sundarbans.

Special thanks are extended to the Principal Chief Conservator of Forests & Head of Forest Force, and the Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden for their guidance and continued support, which were crucial to the success of this initiative.

This report aims to inform future research and policy efforts to ensure the long-term conservation of the saltwater crocodile and the ecological integrity of the Sundarbans.

Chief Conservator of Forests & Field Director
Sundarban Tiger Reserve

Content

Summary

Saltwater crocodiles are one of the apex predators in the Sundarban landscape and they play an important role in maintaining the health of the aquatic ecosystem. Saltwater crocodiles are an important indicator species of the health of the aquatic ecosystem. The conservation of aquatic ecosystems is important to conserve the overall biodiversity of the region apart from supporting the fringe population which depends on fishing and crab collection for their livelihood.

A detailed population assessment exercise was planned and conducted during the months between December 2024 to February 2025 to assess the population status of the saltwater crocodiles in Indian Sundarbans and to increase the understanding of the habitat ecology of the species. This exercise is in continuation of the previous year's exercise with the necessary modifications and additions. The exercise captured the direct and indirect sighting data of saltwater crocodiles, salinity, surface water and ambient temperature for basking, creek widths and other parameters like slope of the banks and vegetation.

The exercise was conducted for 3 months i.e 3 days in each of the 3 months covering the whole transect length in Sundarbans. The days of the exercise were finalized using the neap phase dates of the moon and forecasted temperature range. The transect length was also increased in comparison to the previous exercise (2023-24) covering all the most probable creeks for sighting the saltwater crocodiles as per the conclusion of the previous study. The inferences and learnings from the previous years exercise was used to fine tune the methodology and transects so as to get more statistically significant data for further analysis.

The exercise was successful in capturing the requisite data for a comprehensive analysis of the population and the habitat ecology parameters of Saltwater crocodiles in Indian Sundarbans.

Analysis of the data shows the number of saltwater crocodiles in Sundarbans has increased in comparison to

the previous exercise that was held in 2012 and 2024. Total direct sighting along the transect length of **1168** kilometers was **213** for the whole of Sundarban Biosphere Reserve (SBR). The estimated number of saltwater crocodiles in Indian Sundarbans is between a minimum of **220 up to 242**.

The encounter rate of saltwater crocodiles in the Sundarbans is around 0.18 per kilometer i.e around one saltwater crocodile per 5.5 kilometers of transect. It was found that the saltwater crocodiles in Sundarbans preferred high tide creek width between 10-130 meters with a median around 90 metres. Saltwater crocodiles in Sundarbans prefer a salinity range

between 10-23 PPT. Preferred ambient temperature for basking is between 20-30⬚ in the winter months.

It is recommended that the assessment exercise may be continued for the next 2 years to understand the population trends, population dynamics and to further the knowledge of habitat ecology. The study should also include a survey of the nesting sites.

This report delves into the details of the exercise, the methodology used, analysis and results.

01. Saltwater Crocodiles

Saltwater Crocodile (Crocodylus porosus), also known as estuarine crocodile, lives in saline and brackish mangrove swamps, deltas, lagoons, and lower stretches of rivers. The saltwater crocodile is a formidable and opportunistic hyper-carnivorous apex predator. Most prey are ambushed and then drowned or swallowed whole. It is important to note that this apex predator plays a vital role in keeping the lotic ecosystem clean by eating the carcass and other wild remains in the water.

The saltwater crocodile is the largest of all crocodilians, and the largest reptile in the world. The species has a relatively large head, with a pair of ridges that run from the eye along the centre of the snout. Adults are generally dark in colour, with lighter tan or grey areas, and dark bands and stripes on the lower flanks. The underside is creamy yellow to white, becoming greyer along the tail.

The juvenile is usually pale tan, with black stripes and spots on the body and tail, which gradually fade with age, although never disappear entirely. Female saltwater crocodiles are smaller in size than their male counterparts, normally reaching a maximum length of 2.5 to 3 m. With its long, powerful tail, webbed hind feet, and long, powerful jaws, the saltwater crocodile is a superbly adapted aquatic predator.

As in all crocodilians, the eyes, ears and nostrils are located on top of the head, allowing the crocodile to remain almost totally submerged when lying in water, helping to conceal it from potential prey, while a special valve at the back of the throat allows the mouth to be opened underwater without water entering the throat.

The saltwater crocodile is considered to be more aquatic than most crocodilians, and is less heavily armored along the back and neck.

Prey base : Saltwater crocodiles have a variety of prey. Juveniles are restricted to small insects, amphibians, reptiles, crustaceans, and small fish. Adults feed on crabs, turtles, snakes, birds, buffalo, wild boar, and monkeys. The broad-spectrum food habits of the species range from apex predators such as sharks to diverse

freshwater and marine fishes including pelagic species to reptiles, birds and mammals to even invertebrates such as the crustaceans (e.g. crabs).

Distribution in the World : From India's east coast across Southeast Asia and the Sundaic region to northern Australia and Micronesia.

Distribution in India : Mangroves of Bhitarkanika and Sunderbans, Mahanadi Delta, and in the swamplands in Odisha and West Bengal (including rivers), other coastal areas of the Andaman and Nicobar Islands in India.

Nesting Season in India : May to August

02. Conservation efforts for saltwater crocodiles in Sundarbans

Sundarban is the one of the largest deltaic regions of the world and encompasses over hundreds of islands (105) crisscrossed by a maze of innumerable rivers, rivulets, and creeks. The name 'Sundarban' means "beautiful forest" and it is believed to be derived from a mangrove tree species 'Sundari' (Heritiera fomes). The Indian Sundarban is the southernmost part of the estuarine delta formed by the River Ganges and Brahmaputra, bordering the Bay of Bengal. The Dampier-Hodges line separates the Sundarbans from the rest of West Bengal.

Sundarban Biosphere Reserve is the second largest Biosphere Reserve in India. For its unique and fragile ecosystem, it is declared as UNESCO World Heritage Site and its a Ramsar site of International importance.

To revive the wild population of Saltwater crocodile in Sundarbans and to maintain the aquatic ecological balance of Sundarban Ecosystem, the Bhagabatpur Crocodile Project under 24 Parganas (South) Division was started in 1976. This conservation breeding facility helped in nesting, incubation and raising the hatchlings and juveniles. In order to restore the number of Crocodiles in the territorial waters of Sundarbans, the hatchlings after reaching a certain size class were released in the wild.

The conservation efforts had resulted in an increasing number of saltwater crocodiles in the wild and it was recorded in the Saltwater crocodile estimation exercise that was taken up in the year 2012. In order to ensure the sustainable increase in the population of the saltwater crocodiles in Sundarbans, the project continued till 2022 during which 577 individuals were released in the wild.

To assess the population trend of saltwater crocodiles in Sundarbans and to study the habitat ecology of the species a special exercise was planned and executed in 2024. The details of the exercise are explained in the upcoming pages.

03. Threats for Conservation of the species

Habitat related threats:

Globally the habitat degradation is the biggest threat to the saltwater crocodiles as many rivers have seen reduced water inflow due to building of dams, altering the course of rivers etc resulting in shrinkage of the area of the habitat and degrading the quality of the remaining habitat. Apart from this, noxious water pollutants and sewage released into the water ecosystems and coastal waters also threaten the survival of the species. Excessive fishing and the resulting interaction with humans results in conflicts which also threaten the species.

In Sundarbans, apart from the reduced freshwater flow, increase in salinity, erosion of nesting sites and progressive siltation resulting in choking of smaller streams is leading to degradation of habitat.

Poaching and Wildlife Trade:

Globally saltwater crocodiles are being illegally poached and trafficked for their lucrative skin, meats, eggs, snouts, and bones in medicinal and cosmetic industries.The other major threat is saltwater crocodiles becoming bycatch in the fishing gears. However these threats are not found to occur in Sundarbans. No incident of poaching of saltwater crocodiles has been reported in the past two decades.

Climate Change and the resultant threats:

The aquatic ecosystem in Sundarbans is subjected to a lot of challenges in the form of increasing salinity, increasing temperatures on a global level and change in the pH level due to erratic rainfall. Increasing sea levels reduce the nesting habitats available for the saltwater crocodiles which prefer nesting sites which are not influenced by tides. Apart from this, the increasing temperatures and erratic rainfall patterns may also have an impact on the incubation of the eggs of the species in the longer run as sex of the reptile individuals depends on the incubation temperature.

IUCN Red list: Least Concerned (LC) species

WPA : Schedule I of Indian Wildlife (Protection) Act, 1972.

CITES : Appendix I

04. Objectives of the Exercise

01 To assess and estimate the population of saltwater crocodiles

02 To study and understand the basic habitat ecology of the species

03 To propose future courses of action and interventions as required for conservation of saltwater crocodiles.

05. Methodology

Population estimation and habitat ecology study of the saltwater crocodile in the Sundarban Biosphere Reserve (SBR) was done by collection of data through individual count by direct daytime sighting using boat-transect method and the required abiotic ecological data in the said transects covering 70% of total creek length of Sundarbans.

Transects

Boat transects (average length- 20 kms) maps were prepared by using Google Earth Pro covering all the primary, secondary and tertiary creeks and rivulets that are easily accessible and are potential crocodile basking sites in the Sundarban biosphere Reserve. The transects maps are attached in Annexure I.

From the detailed analysis of the data from the previous exercise regarding the creek width to the sighting of Saltwater crocodiles, it was clear that the Saltwater Crocodiles preferred the creeks with a high tide creek width range of 20 to 130 metres. Considering this, the transects were modified for this year's exercise including all the creeks where there is a high probability of sighting a crocodile. Hence the total transect length has increased from 955 km to 1168 km.

Dates and timing of the exercise

Dates of the exercise were chosen by thorough study of the advanced tide charts. Middle of the neap tide phase of the lunar cycle and favourable tide conditions (low tide) between 9am to 3pm during the day are considered ideal for direct sighting. Dates of the exercise were chosen as per the lunar cycle in the middle of the neap tide days and favourable tide conditions (low tide) during between 9 am to 3 pm. From last year's experience of cloudy and rainy weather during the 2 days the exercise was planned, the methodology was modified and data was collected during three months of the winter season (December, January and February). The transects were covered in 3 days in each of the 3 months and the data was collected.

Data Collection

The following data was collected along the transects in 2 sheets for data collection (Form A & Form B) as provided in the Annexure II.

Species related data:
- Direct sighting
  - Age class - Adult, Juvenile, Hatchling
  - Length of the individual
  - Time of sighting
  - GPS location
  - Creek width
  - Salinity at the location of sighting
  - Temperature - Ambient and Surface water
  - Slope of the bank
  - Vegetation profile of the site
- Indirect Sighting
  - Along with the above details - Pawmark (except for Length of the individual)

Abiotic Parameters data (for every 1 km in the transect):

- Temperature - Ambient and Surface water
- Salinity

Team Composition

Each team was composed of
- 1 team leader (Range Officer/ Beat Officer);
- 2 field staff;

The team composition was relaxed as per availability of the staff. Division wise team composition is attached as Annexure III.

Each team was provided with an estimation kit (i.e. transect maps, GPS, thermometer, refractometer, range finder, notebook, pen/pencil, survey datasheets and sample falcons for water collection). Each team was provided with prior training to use the equipment (Annexure IV).

Training

On 19th November, 2024 a hands-on training of the crocodile estimation in Sundarban Landscape was given to the staff of wildlife divisions STR and South 24 Pgs. Shri S. Jones Justin IFS, Deputy Field Director, STR trained the staff about the data collection protocol. Data collection was extensive including salinity, temperature (ambient air and Surface water), distance, type of habitat, Direct sighting length of crocodiles that were sighted and signs of indirect sighting.

This was done to ensure that the vagaries of weather have little impact on the data collection and also to improve the statistical significance of the data that will be used for analysis . Care was taken so that there is no bias or double counting in the statistical data due to such change of dates. The different ranges followed the same time frame. The field survey timetable is as follows:

Range	DEC, 2024			JAN, 2025			FEB,2025			
	08-Dec	09-Dec	10-Dec	08-Jan	09-Jan	10-Jan	03-Jan	04-Jan	05-Jan	06-Jan
NP EAST	1	1	0	1	1	0	0	1	1	0
NP WEST	1	1	0	1	1	0	0	1	1	0
SWLS	1	1	1	1	1	0	1	1	1	0
BHT	1	1	0	1	1	1		1	1	1

Matrix of the Survey schedule. (here, 1= sampling done on that day, 0= no sampling)

06. Result and Analysis

The data that has been recorded during the exercise has been subjected to a lot of analysis to derive the preferred habitat for saltwater crocodiles in Sundarbans along with the estimation of the population in Indian Sundarbans.

Habitat Ecology - Creek width Analysis :

The analysis of the data regarding the direct sighting and corresponding creek width provides us with important information about the habitat preferences of the saltwater crocodiles.

The following graph depicts the sighting frequency vs creekwidth, wherein creek widths have been taken in 100 metres interval.

Sighting frequency vs. Creek Width (100 m interval)
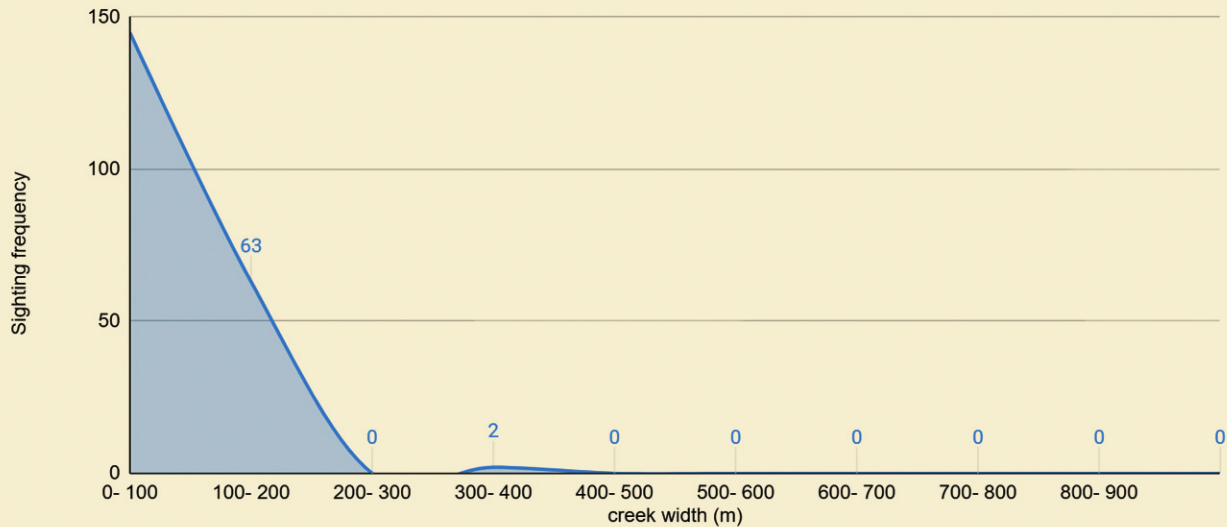
Figure 01 : Graph showing the Direct Sighting frequency with respect to the Creek width (100 metre interval)

It is apparent that the frequency of direct sighting reduces drastically in the creeks and rivers having a width larger than 200 metres.

When the frequency of direct sighting is plotted with respect to creekwidth in the interval of 10 metres, the following graph is obtained.

Sighting Frequency vs. Creek Width (m)
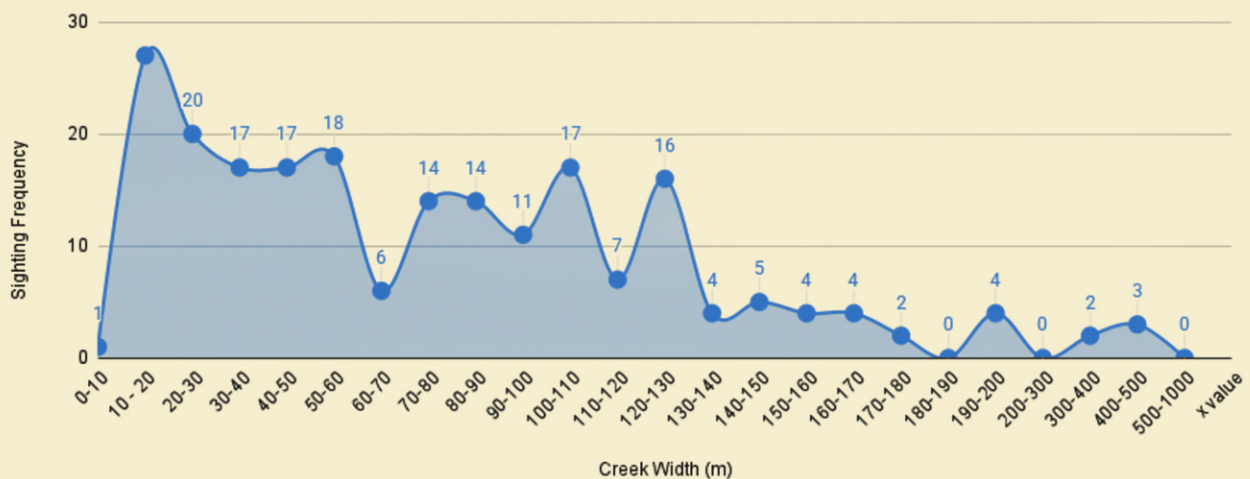
Figure 02 : Graph showing the Direct Sighting frequency with respect to the Creek width (in 10 metres interval)

Mode: 130 meters   Median: 70 meters
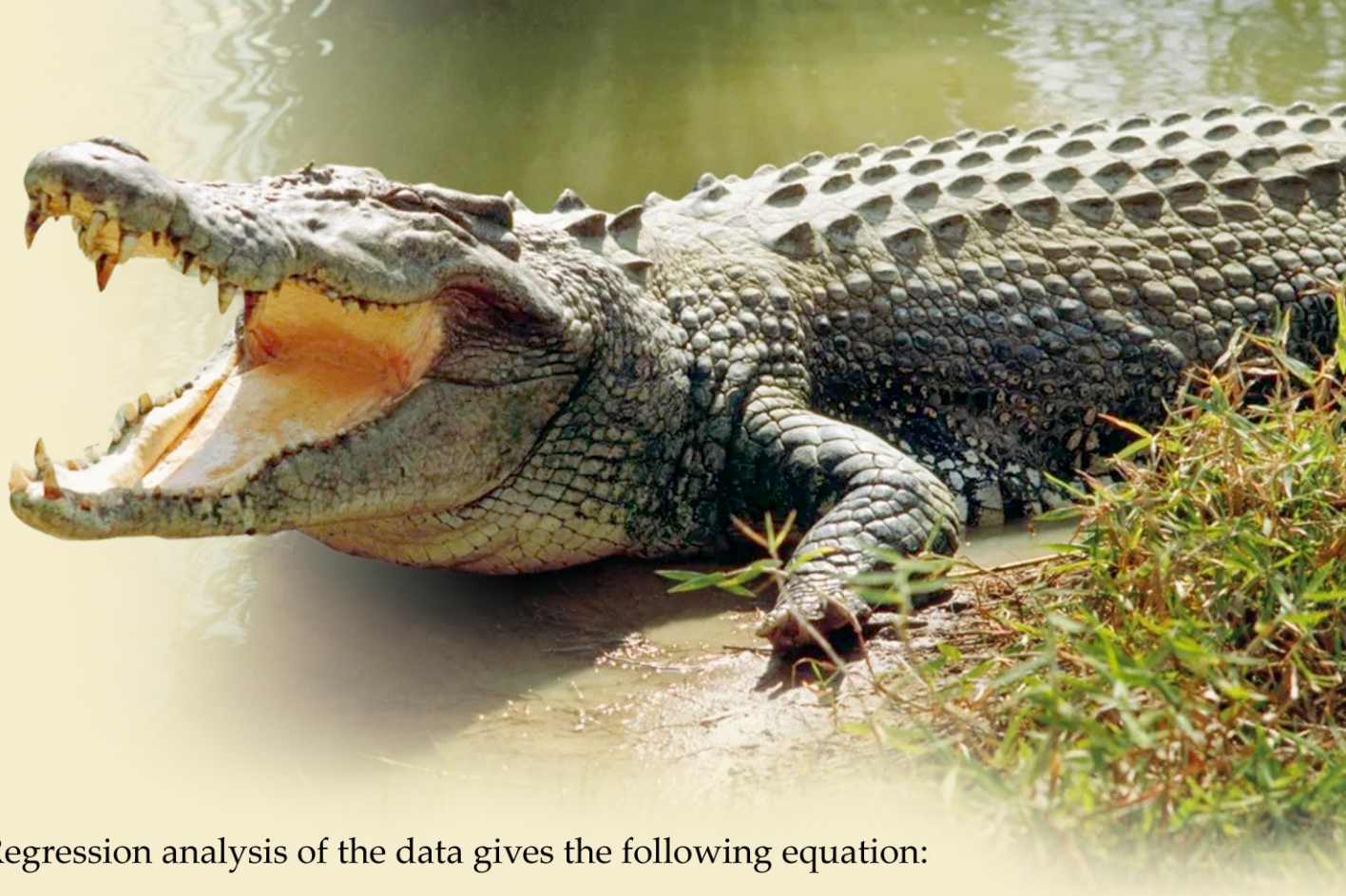
Regression analysis of the data gives the following equation:

$$\text{Sighting(S)} = 0.0265\,(x) + 1.32$$
$$(\text{where, } x = \text{creek width})$$

Coefficient of Determination
$$SE = 0.27$$
$$R\,sq = 89\% \; (\alpha = 0.05)$$

The regression analysis shows that the number of sightings becomes almost negligible in creeks and rivers having width beyond 300 meters. While the median creek width class is 80-90 meters, the data shows that saltwater crocodiles prefer creeks that are wide from 20 meters to 180 meters (Figure 02). It can be inferred that the preferred habitat for saltwater crocodiles in the Sundarbans are creeks and rivers having width less than 180 metres.

This result corresponds well and substantiates the inferences derived from the previous exercise. Hence it can be conclusively said that in Indian Sundarbans, the creeks and rivers whose high tide width is below 180 metres are the most preferred habitats for the crocodiles. More study needs to be done to understand the other habitat parameters like the profile, depth, benthic characteristics etc and prey preference and their availability in such creeks and rivers to further understand the ecological needs of the species in these creeks and rivers.

Sighting Frequency vs Creek Width (Line Fit Plot)

$y = 0.0265x$
$R^2 = 0.8958$

Y Sighting Frequency

Predicted Y Sighting Frequency

Linear (Predicted Y Sighting Frequency)
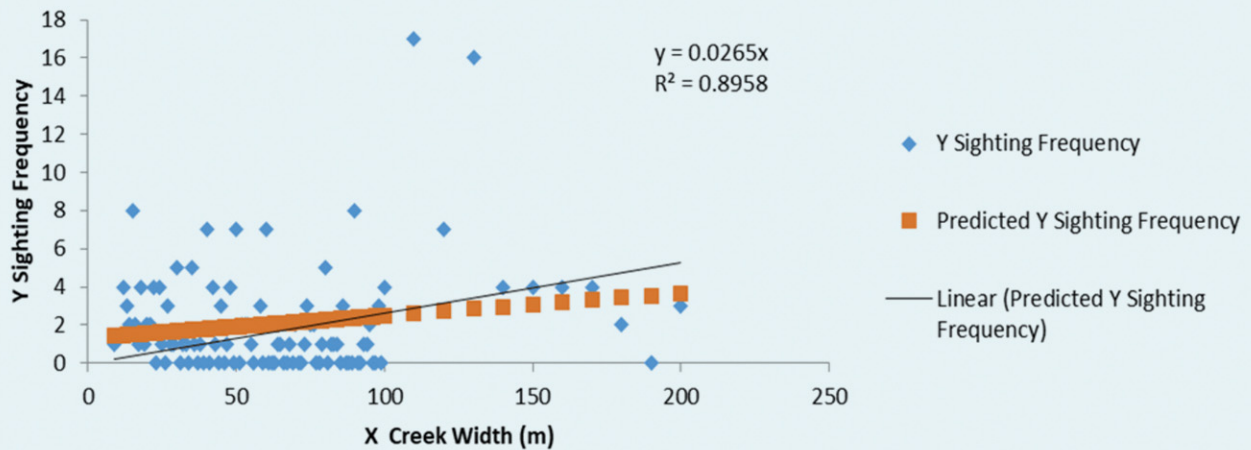
Figure 03 : Projected line fit plot (from linear regression) depicts the highest clustering of dataset between 20m- 180m creek width.

Habitat Ecology - Salinity Analysis :

Analysis of the sighting frequency data alongside the corresponding salinity profile of the surface water reveals a lot about the salinity preference of saltwater crocodiles in Sundarbans.

Saltwater crocodiles in Sundarbans are tolerant to a wide range of salinity extending from 10 PPT (Parts Per Thousand) to 23 PPT. Mode of the values is around 20 PPT (similar to the observation in 2024 estimation*), while the median is at 15 PPT. The preferred salinity range is between 9-23 PPT, based on three months data.
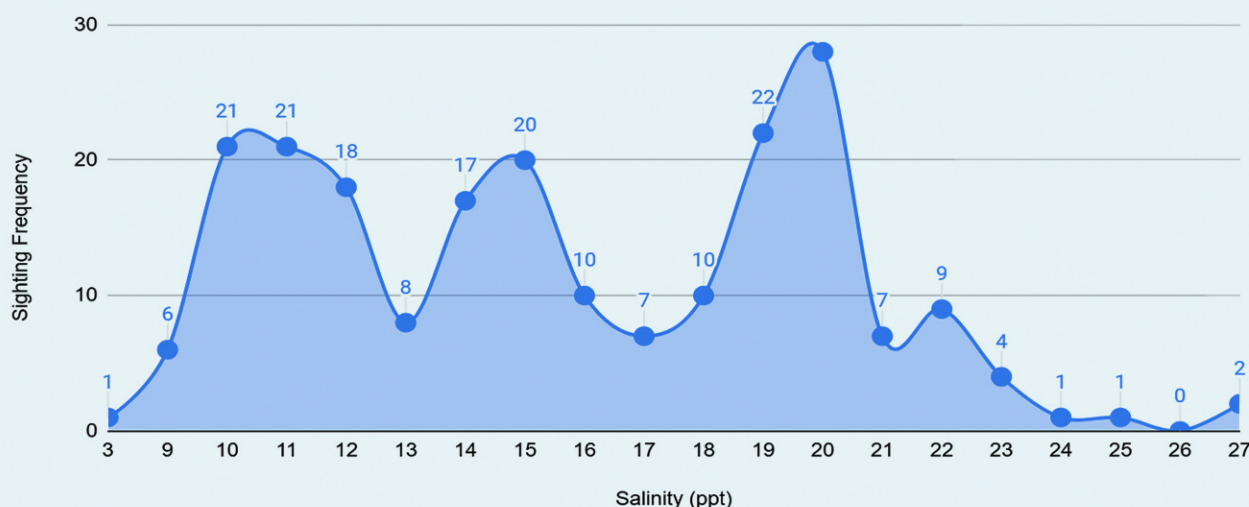
Figure 04 : Graph showing the Direct Sighting frequency with respect to corresponding salinity

Mode: 20 PPT*   Median: 15 PPT

The data shows that increasing salinity may reduce the suitable habitat for saltwater crocodiles in the Sundarbans landscape.

An important observation to be noted is that the median is 15 PPT which is lower than the 19 PPT recorded in the previous study. A direct comparison of the two calculations cannot be done as the readings from the previous exercise is only from the month of January while this year's exercise includes 3 months data.

However, a direct comparison of the data from January this year can be done with the data from last year. Analysis of the data (Annexure V) shows that the mode is identical (20) and the median shifts by 2 points to 17. A closer analysis

of the data shows that the salinity recorded in the tracts during January 2025 has been on average 3.64 PPT (Standard Deviation) less than the salinity recorded in January 2024 in the same tracts. The reason for such change in salinity is beyond the scope of the study.

There is a need to study the seasonal variation of salinity and the corresponding distribution pattern of crocodiles to establish a clear and conclusive relationship. However it is clear that the saltwater crocodiles prefer a defined range of salinity which is 9-23 PPT during the winter season.

Habitat Ecology - Ambient & Water Surface Temperature Analysis :

Water Surface Temperature (WST) and Ambient Air Temperature(AAT) readings were recorded all along the tracks and also specifically at the site of sighting.

A statistically significant relationship was found between WST and AAT in the study period using the two-tailed Pearson Correlation matrix which is depicted below. Since the water has higher specific heat capacity than air the relative change in temperature of WST is less in comparison with AAT but the change in temperature of WST has clear correlation with the change in AAT.

	water surface temp (℃)	ambient air temperature (℃)
water surface temp (℃)	1	.418**
ambient air temperature (℃)	.418**	1
** Correlation is significant at the 0.01 level (2-tailed).		

Analysis of sighting frequency data with respect to the corresponding AAT and WST data reveals an interesting observation. Whenever the temperature difference between WST and AAT is equal to or more than 2.67° Celsius the sighting frequency increases. The crocodiles are sensitive to temperature changes to a narrow range of 2-2.5° Celsius with respect to the WST and AAT and utilise the same for their thermoregulation.

Analysis of the AAT to the frequency of sightings gives a range of temperature that is preferred for basking by the species during the winter season. The following graph depicts the relation between sighting frequency and ambient temperature.

Sighting Frequency vs. Ambient temperature (deg C)
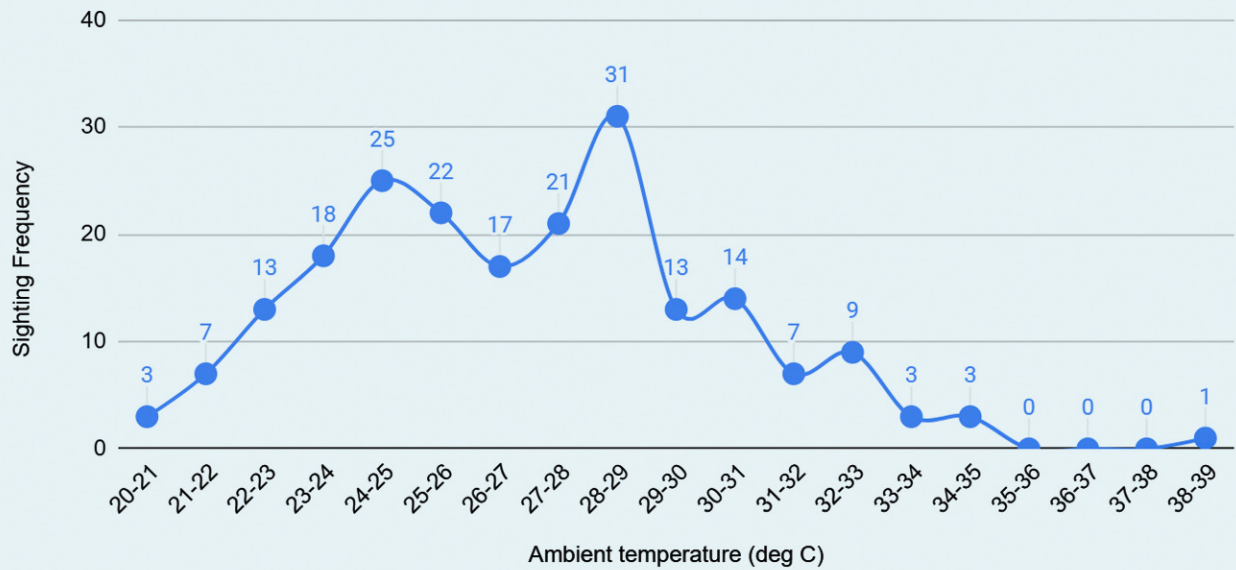
Figure 05 : Graph showing the Direct Sighting frequency with respect to corresponding Ambient Temperature of the location

Median: 27.2^{0}C   Mode: 28.7^{0}C

It is apparent that the preferred ambient temperature range for basking in Sundarbans is between 20°- 35° Celsius.

Hence it can be stated that the preferred ambient temperature range for basking in Sundarbans is 20°- 35° Celsius, during the study period. The regression data shows (Figure 06, R sq =0.675, α = 0.05) that Crocodiles start basking when the temperature exceeds 22.5° Celsius which is consistent with the findings from the previous year's study.

However the median temperature has shifted to 27.2° Celsius in comparison to last year's finding of 23.5° Celsius. This is expected as this year's study spread across 3 months having a wide range of temperature. The median temperature of 27.2° Celsius is derived from a more statistically significant data. Hence, Sighting of crocodiles basking will start at around 22.5° Celsius and it peaks when the AAT is 27.2° Celsius during the winter months in Sundarbans. This is more pronounced if the difference between the WST and AAT is more than 2.5° Celsius during any given time.

However the duration and timing of basking is also affected by the tide levels and the acquired body temperature of the animal.
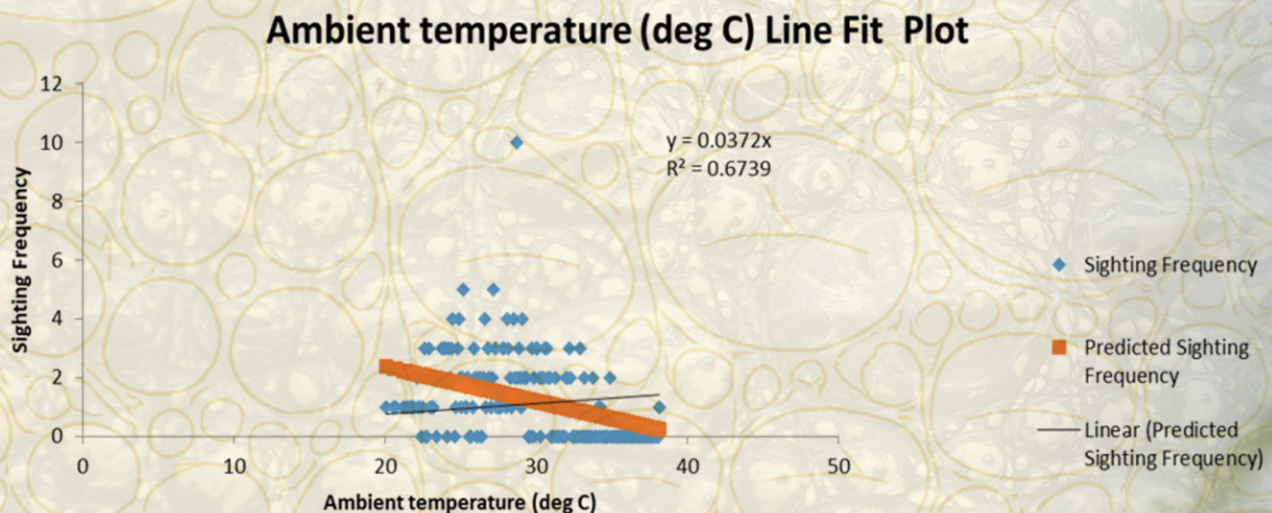
Figure 06 : Projected line fit plot (from linear regression) depicts the clustering of the dataset.

Direct and Indirect Sighting Analysis :

The data from the direct and indirect sighting during the exercise is depicted range wise in the following table.

Ranges	NPE	NPW	SWLS	BHT	Matla	Raidighi	Ramganga	Namkhana	Bhagabatpur	Total
Direct Sighting	29	27	43	09	20	47	36	02	00	213
Indirect Sighting	50	07	30	11	01	89	02	0	00	190
Range wise cumulative	79	34	73	20	21	136	38	02	00	403
Division wise Total sighting details										
Sundarban Tiger Reserve (Total)		206		South 24 Parganas (Total)					197	
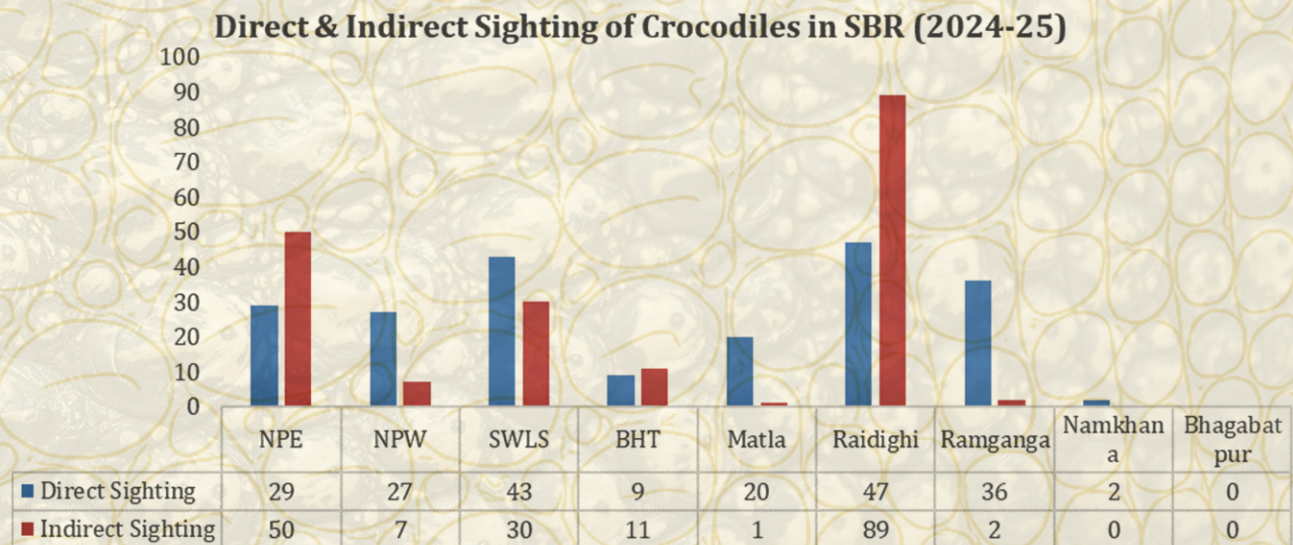
Figure 07. Direct and Indirect Sightings of Crocodiles in SBR graphical representation.
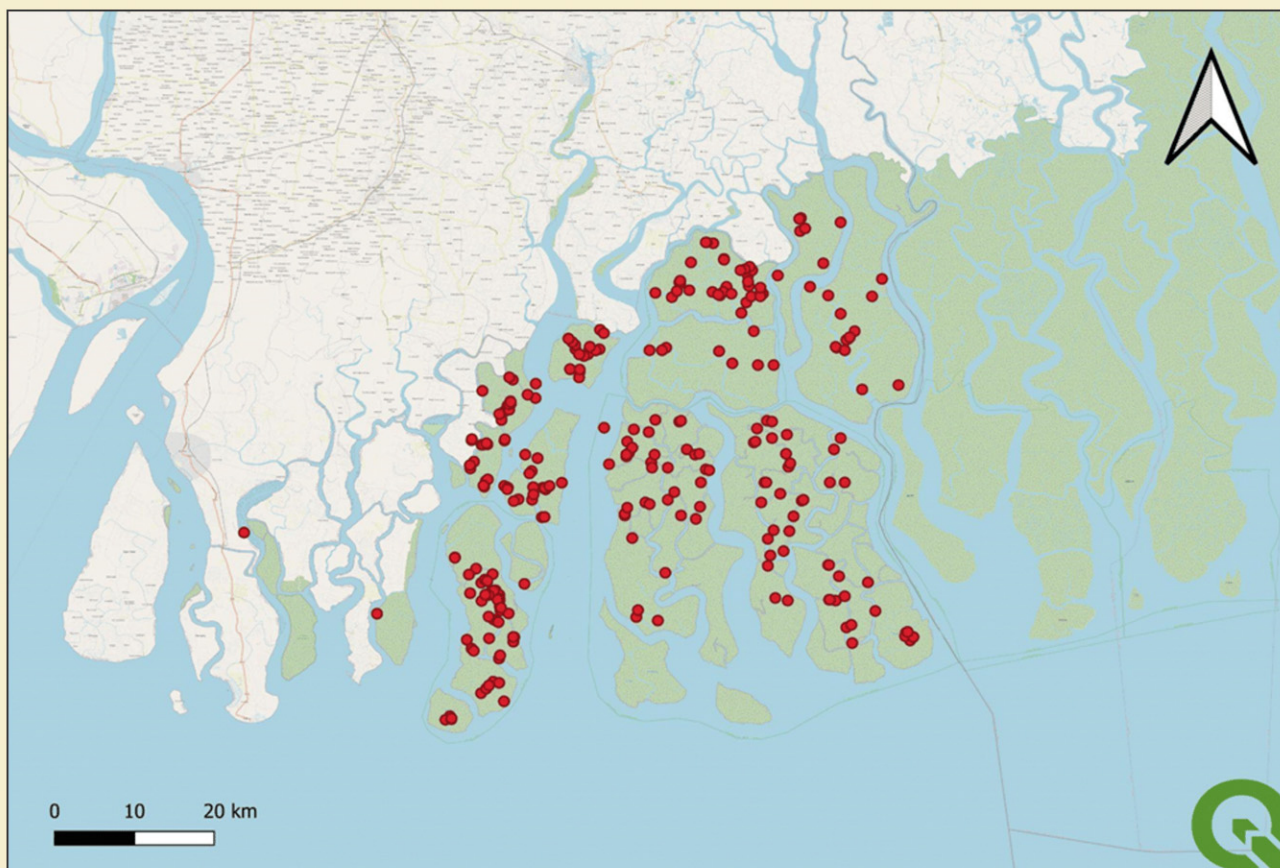
Figure 08 . Map showing the Locations where direct sighting of Saltwater crocodiles were recorded - Spatial distribution of the saltwater crocodiles in Sundarbans.

Population Estimation :

Out of the 1800 kilometers length of creeks in Sundarban Biosphere Reserve, the exercise covered around 1168 kilometers which is more than 64% of the total creek length of significance (High Tide width till 200 metres) in the forested areas. The creek width analysis with respect to the frequency of direct sighting which is discussed in detail reveals that there is a clear preference for a certain range of creek width by the saltwater crocodiles.

A regression analysis (till the data of significance) of the Direct sighting frequency data with respect to the creek width and the kilometer surveyed in that particular creek width gives the following regression equation.

Sighting(S) = 14.17+ (-0.063) (w)+ 0.05 (km)

Coefficient of Determination
SE= 5.5
R sq = 52% (α = 0.05)

Applying this regression equation for the remaining unsurveyed creek lengths within the preferred creek width range, the estimated population of crocodiles in Sundarban Biosphere Reserve is as follows.

Sightings in SBR	Estimated Population of Saltwater Crocodiles in SBR	
	Maximum	Minimum
213	242	220

The estimated population of saltwater crocodiles in Sundarban Biosphere Reserve is thus a minimum of 220 crocodiles and a maximum of 242 crocodiles. (uncovered creek data attached as Annexure VI). This estimation largely corresponds with the last year's estimated number of 204 (minimum) and 234 (maximum). The estimated numbers derived this year can be projected with a higher degree of confidence due to the extensive and rigorous nature of data collection and the increase in the time period.

Though the numbers show a slight increase in the population of salt water crocodiles, it is impossible to infer the same as the data collection time period was different. However a similar exercise in the coming year will give a clear trend in the population of Saltwater crocodiles in Sundarban Biosphere Reserve.

Encounter Rate :

Encounter rate gives the number of sightings per kilometer transect. It is calculated by dividing the number of sightings recorded by the total kilometers surveyed in the exercise. It is important to note that since the crocodiles are highly territorial animals, the indirect sightings are also used for the calculation of the encounter rate. All the indirect sightings that are closer than 500 meters to a nearby direct sighting were eliminated as crocodiles generally are recorded to move not more than 300-400 meters in a day during winter.

Encounter Rate = (Number of Sightings) / (Total kms surveyed)

	Sundarban Tiger Reserve (108/753)	South 24 Parganas (105/415)	Sundarban Biosphere Reserve (213/1168)
Encounter Rate per Kilometer	**0.143** i.e 1 Saltwater Crocodile per 6.9 kms	**0.253** i.e 1 Saltwater Crocodile per 3.95 kms	**0.18** i.e 1 Saltwater Crocodile per 5.5 kms

Size Class Analysis of the Population:

The direct sighting data along with the length of the saltwater crocodiles (Size Class Analysis) that was recorded has given various insights into the demography and age structure of the population that was sighted. Though the hatchlings and juveniles are hard to sight as they are very shy and go underwater even at the slightest disturbance in the water or on land.

Based on Direct Sighting, 2024-25

Range Id/ Code	Range Name	Adult (> 240 cm)	Juvenile (>90-<180cm)	Hatchling* (<50 cm)
1	NP East	17	12	04
2	NP West	24	3	01
3	Sajnekhali WLS	20	23	04
4	Basirhat	7	2	00
5	Matla	8	12	00
6	Raidighi	30	17	05
7	Ramganga	18	18	09
8	Namkhana	1	1	00
9	Bhagabatpur	0	0	00
	Total	125	88	23

It is important to note that in the previous estimation exercise (2024), the size class analysis showed 71 adults, 41 juveniles and 2 hatchlings. In comparison there is an increase in the number of all the demographic classes specifically in the hatchling class. This is an encouraging sign as sighting of hatchlings is very rare and difficult in the terrain of Sundarbans.

Direct Sightings of Crocodiles in Camera Trapping Exercise, 2024-25

In the last Financial year 2024-25, trap cameras were installed inside the mangroves and in the National Park East Range of STR, several photographs of the crocodiles were captured especially during the night. Some of such trapped images are shown here. The dates of capture of the images also correspond to the dates in which the lure and trap cameras were installed. This shows that Saltwater crocodiles use their olfactory sense to read the olfactory signals from far off distances in an attempt to hunt for prey.

Analysis of these images and the corresponding locations in the field shows specific vegetation types like Hental (Phoenix paludosa), Garan (Ceriops tagal) and Gnewa (Excoecaria agallocha).

(Trap Id: C011B, NP East Range, Chamta 5 Compartment, Boro Dhutra Varani Khal, Nearest Creek width- 44.5 m)

(Trap Id: C022B, NP East Range, Chamta 7 Compartment, Boro Duani Khal, Nearest Creek width- 18.0 m)

Analysis of the crocodile straying data in Sundarban region :

Saltwater Crocodiles nest in the upper reaches of the estuarine delta where there is ample amount of freshwater and the land is not subjected to regular inundation. This adaptation is to maintain the required temperatures for the successful incubation of the eggs. Once the eggs hatch the mother crocodile takes care of the hatchlings for about 4-6 months and then the hatchlings disperse into the saline regions of the estuarine deltas or seas.

Based on the data (Annexure VII), it can be inferred that the majority of crocodile rescues in the Sundarban Tiger Reserve and the Sundarban Biosphere Reserve occur during May and June, which coincides with the nesting season. Additionally, most of the rescued crocodiles are female.

This pattern suggests that suitable nesting habitats in the forested islands of Sundarbans are becoming increasingly scarce, likely forcing nesting females into fringe or human-inhabited areas, thereby increasing human-wildlife interactions and the need for rescue operations. This may be due to several factors including climate change induced factors like increasing sea level in sundarbans, warming of estuarine water, increasing salinity and anthropogenic factors like disturbance due to movement of vessels or the natural factors like erosion and accretion in different islands.

07. Recommendations and Conclusion

The 2024–25 estimation exercise has provided valuable insights into the population status and habitat ecology of the saltwater crocodile in the Sundarban Biosphere Reserve. With direct sightings indicating a marginal increase in population compared to previous years, the study underscores both progress in conservation and the need for continued vigilance. The encounter rate, size class structure, salinity tolerance, preferred creek width, and basking temperature range all contribute to a clearer understanding of species ecology in this unique landscape.

Upon analysis of the data, especially the data related to rescue of crocodiles and the hatchlings sighting, it appears that the nesting and thereby incubation and hatching is to be monitored thoroughly in order to ensure that breeding is not affected in the population.

The following actions are recommended for further understanding of the status of the species and sustainable conservation in the long run.

1. Continuation of Population estimation exercise:

It is recommended that the three (3) year study covering estimation of the population (on yearly basis), habitat status, threats due to climate change (increasing temperature, salinity, impact on nesting sites, dissolved oxygen, pH etc) and impact of anthropogenic pressures be continued to make informed decisions regarding the efforts and interventions that are required for the conservation of the species in the long run.

The data collected from the next 2 years will give a clear trend in the population status and vulnerabilities regarding the breeding and nesting of crocodiles in Sundarbans.

Month	Dates	Transects	Remarks
Early December	2 Dates may be selected as per tide conditions - Banks are exposed (low tide) during most part of the day from 9am to 3pm	Normal Patrolling duty may be done along the Transect lines during the dates by staff.	Data Collection will be done for all the 3 months, Collated and analysed to arrive at an average sighting rate per transect and subsequently creek width
Early January			
Early February			

2. Survey of nesting sites & interventions to ensure sustainable nesting

The size class analysis of the data also shows that the population demography is skewed towards the adults. This needs to be studied further.

Nesting surveys are important to ensure that the population is breeding and the population is stable in the ecosystem. Saltwater crocodiles usually start nesting in the early May and continue till late August. Their average incubation time period is 80 - 90 Days.

It is evident that patches of the *Nypa fruticans, Phoenix paludosa* are a potential place for roosting and nesting sites of the saltwater crocodiles as they usually occur in regions of higher elevation where tide water may not reach during most of the year. From the camera trap photographs, in some moderate sloped banks adult crocodiles are also found with Garan (*Ceriops sp.*) vegetation. Field surveys can identify such locations with potential nesting sites for the saltwater crocodiles.

In order to locate the existing nesting sites and to map the potential nesting sites in Sundarbans region a survey for 2 years (2025-26 to 2026-27) shall be conducted in the following timeline-

Dates	Transects & Data to be collected	Remarks
15th May 15th June 15th July 15th August	Patrolling along the high banks (inside forest areas), foot patrolling along the high banks and embankments (along the inhabited islands) **Data to be collected:** GPS, Vegetation, clutch size, Land level	Data Collection shall be done for all the 4 months, Collated and analysed to prepare a map for the nesting sites in Sundarbans and their threat levels with respect to human disturbances, sea level change and other climate related events, erosion and accretion etc
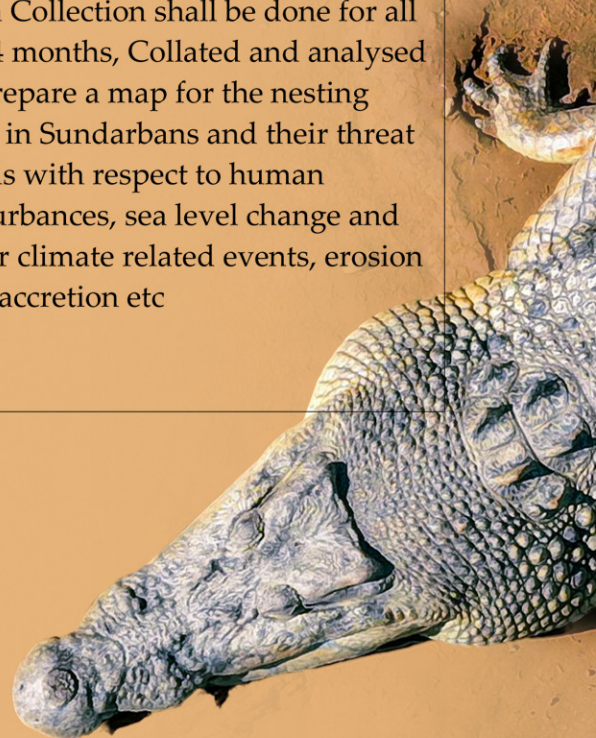
The study should focus on the following parameters

A. Identification of Key Nesting sites in the Protected areas

There is an immediate need to identify and map all the possible and potential nesting habitats - high lying mounds, chotoks and vegetative areas in the forested islands that need extensive protection and management so as to have sustainable breeding and nesting of crocodiles in Sundarbans.

B. Habitat Management - Restore degraded nesting areas

Once the key nesting sites are identified, an effort shall be made to map the probable nesting sites and maintain such sites by way of creation of mounds, planting preferred vegetation and ensuring minimal human disturbance in the area.

On creation of such sites, constant monitoring should be taken up so as to record, understand the impacts of such interventions and modify

the strategy that fits best to enable sustainable nesting of saltwater crocodiles in protected areas in Sundarbans.

C. Community Awareness, Involvement & rescue protocols

The recent trends in crocodile rescue suggests that the female crocodiles try to nest near the freshwater ponds in the human inhabited islands. Experience from the past shows that once such nesting is done, removal of the eggs from the site and artificially incubating the eggs does not deliver good survival rates. Hence, there is a need to develop community awareness about the species for incentivising reporting and options should be explored to incubate such eggs either in-situ by creating holding enclosures and providing food or develop methods and protocols for rescue, transport and artificial incubation.

A systematic and science-based conservation approach is essential to sustain and enhance the crocodile population in the Sundarbans. The continuation of this structured monitoring program, coupled with habitat management, community involvement, and focused research, will serve as the cornerstone for long-term conservation and ecological integrity of the estuarine ecosystem.

Annexure I

Transect maps of SBR

Fig i. National Park East (NPE) Range, STR

Fig ii. National Park (West) Range, STR

Fig iii. Sajnekhali WLS Range, STR

Fig iv. Basirhat (BHT) Range, STR

Fig v: Matla Range transects

Fig vi: Raidighi Range transects

Fig vii: Ramganga Range transect

Fig viii: Bhagabatpur & Namkhana
Range transects

Annexure II

FORM-A

Team No:..

PRIMARY DATA REGARDING CROCODILE ESTIMATION 2024

DIRECT SIGHTING RECORDS

Circle/Division. :........................... Transect No.: .... Start Point (GPS) & Time: ....

Range: .... Date : .... End Point (GPS) & Time: ....

Beat : ....

Sl. No	Direct Sighting			Time	G.P.S Location (D-M-S)		Length (Feet)	Water Surface Temperature	Ambient Air Temperature	Water Salinity	Slope of River/Creek Bank & Blank/With Vegetation(Please √ any one)						Direct Sighting of any other wildlife & No
	Adult	Juvenile	Hatchling		LAT (N)	LONG (E)					Gentle (G)		Moderate (M)		Steep (S)		
											Blank	Veg.	Blank	Veg.	Blank	Veg.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12	(13)	(14)	(15)	(16)	(17)	(18)

....

Name of the Team Leader & Signature

Name of the Team Members:

Form-B: INDIRECT SIGHTING

S. No.	Sighting Side(L/R)	River Bank Slope Type		Time	GPS Location (D-M-S)		Pugmark/ Slide fresh	Pugmark/ Slide old	Condition of tide	Disturbance observed in creek(Y/N)	Remarks
		Gentle	Steep		LAT(N)	LONG (E)					
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Km	Temp (Deg Celsius)	Salinity (ppt)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

Km	Temp (Deg Celsius)	Salinity (ppt)
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

Annexure III

Team Composition of Sundarban Tiger Reserve Division

Sl. No.	Range	Team No.	Name of the team members	Remarks
1	SWLS	Team- I	1. Ranjit Halder DR/Fr.	Team Leader
			2. Susanta Das, FG	
			3. Subhajit Gayen, BNS	
		Team-II	1. Sourav Biswas, DR/Fr.	Team Leader
			2. Rajib Naskar, FG	
			3. Partha Halder, FG	
			4. Sukumar Sardar, BNS	
		Team- III	1. Abhishek Dey DR/Fr.	Team Leader
			2. Chiranjit Biswas F.G.	
			3. Parimal Mandal, AS	
2	Basirhat	Team -I	1. Anupam Das, DR/Fr	Team Leader
			2. Santosh Kumar Sardar, DR/Fr	
			3. Debajyoti Das, FG	
		Team-II	1. Swapan Bera, FG	Team Leader
			2. Swapan Bakshi, Majhi	
			3. Sunil Nath, FG	
			4.Sunil Mondal, BS	
		Team-III	1. Samir Das, FG	Team Leader
			2. Brahma Sarkar, Aranya Sathi	
			3. Biswajit Dalapati, FG	

3	NP(E)	Team-I	1. Shiladitya Acharyya, FR	Team Leader
			2. Debnath Mandal, F.G.	
			3. Mantu Das, DR/Fr	
			4. Sushanta Halder, DL	
		Team-II	1. Dinabandhu Bar, FG	Team Leader
			2. Subrata Nath, AS	
			3. Surajit Saha, Banasahayak	
		Team-III	1. Madan Mohan Das, DR/Fr	Team Leader
			2. Gunadhar Gayen, BS	
			3. Pinaki Mandal, DL	
		Team-IV	1. Ashoke Kumar Baur, FG	Team Leader
			Buddadeb Dalapati BM	
			3. Sachindranath Mondal, BM	
4	NP(W)	Team-I	1. Masum Ali, DR/Fr	Team Leader
			2. Dibyendu Pramanik, FG	
			3. Paran Gayen, AS	
		Team-II	1. Goutam Dhali, DR/Fr	Team Leader
			2. Baidyanath Hansda FG	
			3. Suman Podder, FG	
			4. Ranjit Sarkar BM	
		Team-III	1. Sumit Kumar Ghosh, FR	Team Leader
			2. Niranjan Giri, FG	
		Team-IV	1. Amar Kar, FR(T)	Team Leader
			2. Samarendranath Ghosh, FG	
			3. Santu Joddar, Forest Volunteer	

Team Composition of South 24 Parganas Division

Sl. No.	Range	Team	Name of the Team Member	Remark
1.	Ramganga	Team-I	1. Sanjay Bala, FG	Team Leader
			2. Debraj Jana, BSK	
			3. Mehesus Rahaman, BSK	
		Team-II	1. Debabrata Pramanik, DR/Fr.	Team Leader
			2. Kartick Naskar, FG	
			3. Sadananda Rauth, BSK	
			4. Ajit Kumar Bera, BSK	
		Team-III	1. Tapas Kumar Maity, DR/Fr.	Team Leader
			2. Sujit Nayek, AS	
			3. Rupam Shee, BSK	
			4. Anup Kumar Kayal, BSK	
2.	Raidighi	Team-I	1. Sanat Kumar Deb, DR/Fr.	Team Leader
			2. Lalit Mridha, FG	
			3. Avijit Maity, AS	
		Team-II	1. Sukamal Chakrabarty, FG	Team Leader
			2. Pijush Kanti Das, DL	
			3. Dayal Khan, AS	
		Team-III	1. Khokon Sardar, BS	Team Leader
			2. Prabir Mondal, AS	
			3. Amalesh Das, AS	
3.	Matla	Team-I	1. Krishnapada Mondal, DR/Fr.	Team Leader
			2. Soumyadeep Kumar, RA	
			3. Sourav Biswas, FG	
			4. Anupam Kayal, BNS	

4.	Bhagabatpur	Team-I	1. Sanatan Sardar, FG	Team Leader
			2. Debasis Jana, BSK	
			3. Utpal Sarkar, AS	
			4. Gurupada Mondal, AS	
			5. Soumik Das, BNS	
5.	Namkhana	Team-I	1. Bijan Sapui, DR/Fr.	Team Leader
			2. Pranay Raha, FG	
			3. Arijit Das, BSK	
			4. Arpan Kumar Das, BSK	

Annexure IV

Equipments

RANGE FINDER
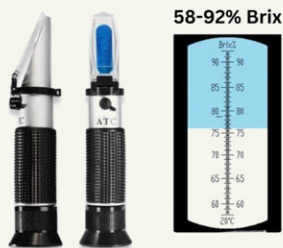
REFRACTOMETER

WATER SAMPLE VIALS

DIGITAL THERMOMETER

GPS

Annexure V

Sl.	RANGE	Team No/Id	Transect No./ Id	Water salinity (ppt) Jan 2024	Water salinity (ppt) Jan 2025	Difference between two years salinity
1	**NP EAST**	NE-1	NE-1 SP1-T1	19	20	-1
2	**NP EAST**	NE-1	NE-1 SP1-T1	21	19	2
3	**NP EAST**	NE-1	NE-1 SP2-T2	21	20	1
4	**NP EAST**	NE-1	NE-1 SP2-T2	22	20	2
5	**NP EAST**	NE-1	NE-1SP-1 RO-T3	22	20	2
6	**NP EAST**	NE-1	NE-1SP-1 RO-T4	22	19	3
7	**NP EAST**	NE-1	NE-1SP-1 RO-T4	19	16	3
8	**NP EAST**	NE-2	T5	18	19	-1
9	**NP EAST**	NE-3	T7	25	20	5
10	**NP EAST**	NE-3	T8	24	20	4
11	**NP EAST**	NE-4	T9	25	22	3
12	**NP WEST**	NW-1	T-11	23	18	5
13	**NP WEST**		T-11	24	17	7
14	**NP WEST**		T 12	24	19	5
15	**NP WEST**	NW-1	T-12	25	21	4
16	**NP WEST**		T-12	22	19	3
17	**NP WEST**	NW-2	T 13	22	14	8
18	**NP WEST**		T 13	25	18	7
19	**NP WEST**	NW-2	T 14	19	14	5
20	**NP WEST**		T 14	21	14	7
21	**NP WEST**		T 14	21	14	7
22	**NP WEST**		T 14	22	14	8
23	**NP WEST**	NW-3	T 15	22	16	6
24	**NP WEST**		T 15	22	16	6
25	**NP WEST**		T 15	15	14	1
26	**NP WEST**		T 16	16	14	2
27	**NP WEST**	NW-4	T 17	19	20	-1
28	**NP WEST**	NW-4	T 17	20	20	0

29	NP WEST		T 17	15	14	1
30	SWLS	T-2	T-1	20	16	4
31	SWLS	T-2	T-1	17.2	21	-3.8
32	SWLS	T-2	T-1	20	15	5
33	SWLS	T-2	2	18.2	15	3.2
34	SWLS	T-2	T-3	18.4	23	-4.6
35	SWLS	T-3-A	T-3	17.5	19	-1.5
36	SWLS	T-3-A	T-3	17.3	21	-3.7
37	SWLS	T-3-A	T-3	17.5	20	-2.5
38	SWLS	T-3-A	T-3	19.1	20	-0.9
39	SWLS	T-3-A	T-3	20	20	0
40	SWLS	T-3-A	T-3	20	20	0
41	SWLS	T-3-A	T-3	19	19	0
42	SWLS	T-3-A	T-3	23	20	3
43	SWLS	T-3	T-3-A	22	15	7
44	SWLS	T-3	T-3-A	20	16	4
45	SWLS	T-3	T-3-A	17.2	15	2.2
46	SWLS	T-3	T-3-A	17.1	18	-0.9
47	SWLS	T-1	T-3-A	18.2	15	3.2
48	SWLS	T-3	T-3-A	18.4	23	-4.6
49	SWLS	T-3	T-3-A	17.5	20	-2.5
50	SWLS	T-3	T-3-A	20	19	1
51	SWLS	T-3	T-3-A	17.5	20	-2.5
52	SWLS	T-3	T-3-A	20	21	-1
53	SWLS	T-3	T-3-A	20.2	19	1.2
54	SWLS	T-3	T-3-A	20.5	18	2.5
55	SWLS	T-3	T-3-A	15	18	-3
56	SWLS	T-3	T-3-A	23	17	6
57	SWLS	T-3	T-3-A	22	19	3
58	SWLS	T-1	T-3-A	18	19	-1
59	SWLS	T-1	T-3-A	20	19	1
60	SWLS	T-1	T-3-A	18	19	-1
61	SWLS	T-1	T-3-A	17	19	-2

62	**BHT**	BHT-A	BHT A2	19	18	1
63	**BHT**	BHT-B	BHT B1	19	12	7
64	**BHT**	BHT-C	BHT C2	16	15	1
65	**BHT**	BHT-C	BHT C2	11	15	-4
66	**BHT**	BHT-C	BHT C2	12	14	-2
67	MATLA	1	MT-1	18	12	6
68	MATLA		MT-1	22	12	10
69	RAIDIGHI	1	RD-I	18	22	-4
70	RAIDIGHI	1	RD-II	17	15	2
71	RAIDIGHI		RD-II	15	12	3
72	RAIDIGHI		RD-II	14	15	-1
73	RAIDIGHI		RD-III	20	27	-7
74	RAIDIGHI		RD-III	20	20.5	-0.5
75	RAIDIGHI		RD-IV	20	20	0
76	RAIDIGHI		RD-IV	20	20	0
77	RAIDIGHI	3	RD-V	18	11	7
78	RAIDIGHI		RD-V	17	11	6
79	RAIDIGHI		RD-V	16	11	5
80	RAIDIGHI	3	RD-VI	15	12	3
81	RAIDIGHI		RD-VI	18	12	6
82	RAIDIGHI		RD-VI	14	12	2
83	RAIDIGHI		RD-VI	16	12	4
84	RAMGANGA	1	RG-I	16	10.15	5.85
85	RAMGANGA		RG III	18	10.16	7.84
86	RAMGANGA		RG III	15	10.18	4.82
87	RAMGANGA		RG III	20	10.17	9.83
88	RAMGANGA	2	RG-IV	14	10.18	3.82
89	RAMGANGA		RG-IV	15	10.19	4.81
90	RAMGANGA		RG-IV	17	9	8
91	RAMGANGA		RG-IV	16	9	7
92	RAMGANGA		RG-IV	18	10	8
93	RAMGANGA		RG-IV	16	11	5
94	RAMGANGA	3	RG-V	20	17	3

95	RAMGANGA	3	RG-VI	15	12	3
96	RAMGANGA		RG-VI	18	10.7	7.3
97	RAMGANGA		RG-VI	17	13	4
98	NAMKHANA	1	NMT 1	15	16	-1
99	NAMKHANA	1	NMT 1	20	20	0
100	BHAGABATPUR					0
median				19	17	SD= 3.6461
mode				20	20	SE= 0.364

Annexure VI

Creek width, Kilometers Surveyed and Frequency of Direct Sighting

Creek width in meters	Kilometers Surveyed	Sighting frequency	Uncovered distance in corresponding Creek width
0-10	0	0	
10-20	183	6	247.38
20-30	54	7	54.646
30-40	65	10	19.625
40-50	85	6	48.611
50-60	17	7	0.95
60-70	65	8	6.67
70-80	5	3	0
80-90	98	11	0
90-100	25	7	0
100-110	51	4	0
110-120	66	7	3.86
120-130	30	5	0
130-140	136	3	0
140-150	3	2	0
150-160	8	2	0
160-170	0	3	0
170-180	13	0	0
180-190	10	1	0
190-200	41	0	0

Annexure VII

Saltwater Crocodile Rescue Data - Sundarban Tiger Reserve

Year	Date	Location		Age (year)	Sex	Remarks
		Village Name	Gram Panchayat			
2022	06.06.2022	Bijoynagar	Bali 2	3	Female	
	13.05.2022	Sonagaon	Gosaba	17 to 18	Female	
	07.06.2022			12	Female	
2023	21.05.2023	Manmatha Nagar	Bali 2	10 to 12	Female	
	17.06.2023	Pathan khali	Shambhu Nagar	08 to 10	Female	
	22.05.2023			15-17	Female	
2024	21.05.2024	Mondalpara	Gobindapur	15-17	Female	
	13.06.2024	Gosaba , NPE				17 Eggs collected only 1 hatched at SWLS details
	19.09.2024					1 hatched at Sajnekhali
2025	07.05.2025	Bijoynagar	Bali 2	10-11	Female	
	29.05.2025	Birajmoni	Bali 2	7-8	Female	

Saltwater Crocodile Rescue Data – South 24 Parganas Division

Year	Date	Location		Age (year)	Sex	Remarks
		Village Name	Gram Panchayat			
2022-23	24.05.2022	Rajnagar, Satmile Bazar		6	Female	
	19.08.2022	Bhagabatpur RF area	Patharpratima			Hatchling
	19.09.2022	Jharkhali				Hatchling
	26.09.2022	Jharkhali				Hatchling
	15.10.2022	Kankandighi	Kankandighi	20	Female	
	24.10.2022	Jharkhali				Hatchling
	26.10.2022	Jharkhali				Hatchling
	17.02.2023	Jharkhai- No. 3				Hatchling
	24.02.2023	Sridharnagar, L-Plot		35-36	Male	
	27.02.2023	Bhagabatpur nursery				Unknown
	14.03.2023	Bhagabatpur village				sub- adult
	16.03.2023	Bhagabatpur village			Female	
	25.03.2023	Panchamer Bazar , Dholahat			Female	
2023-24	03.04.2023	Bhagabatpur beat area				
	08.04.2023	Bhagabatpur beat area				
	09.04.2023	Sridharnagar Dinda para, Gobardhanpur Coastal				sub- adult
	23.04.2023	Brajaballavpur				
	07.05.2023	Namkhana range area				
	18.05.2023	Upendranagar, Majherghat	Sridharnagar		female	
	20.05.2023	Jharkhai- No. 3				

Year	Date	Location		Age (year)	Sex	Remarks
		Village Name	Gram Panchayat			
	01.06.2023	Bhagabatpur range area				4 hatchlings
	23.06.2023	Dakshin Shibganj, Patharpratima				
	24.06.2023	Dakshin Shibgunj, Patharpratima				
	31.07.2023	Bhagabatpur	Patharpratima			Juvenile
	01.08.2023	Sonakhali Sikaripara				
	23.08.2023	Fatikpur			female	
	28.08.2023	Bhagankhali	Basanti			
	29.08.2023	Sitarampur, G-plot		9- 10	1 female	and 2 hatchlings
	30.08.2023	Sitarampur, G-plot				
	01.09.2023	Sitarampur, G-plot				
	02.09.2023	G-Plot, PS-Gobardhanpur Coastal				crocodile hatchling -2 nos.
	04.09.2023	G-Plot, PS-Gobardhanpur Coastal				
	05.09.2023	G-Plot, PS-Gobardhanpur Coastal				
	16.09.2023	Shivnagar	Banashaymanagar	30-35	male	
	23.09.2023	Brajaballavpur			Juvenile	
	02.10.2023	Jharkhali-3 no	Basanti		Juvenile	
	27.10.2023	Techno- India, Basanti	Basanti			
	10.11.2023	Jharkhali-2			Juvenile	
	28.11.2023	Sitarampur			Hatchling	
	03.03.2024	Banamali Khal, Sadar More village side				

Year	Date	Location		Age (year)	Sex	Remarks
		Village Name	Gram Panchayat			
	15.03.2024	Bhagabatpur Crcodile Project area			Hatchling	
2024-25	02.05.2024	Krishnadaspur Colony Ghat , G-Plot				
	12.05.2024	Sitarampur, G-Plot				
	25.05.2024	Jharkhai- No. 3				
	10.06.2024	Jharkhai- No. 3				
	25.06.2024	Masjidbati, Basanti				
	21.08.2024	Jharkhali Coastal			Hatchling	
	31.08.2024	Jharkhai- No. 1			Hatchling	
	04.09.2024	Kalinagar Das para, Namkhana	Ramkrishna nagar			
	06.09.2024	Jharkhai- No. 2			Hatchling	
	11.09.2024	L-Plot, Sridharnagar, Sueesh Ghat		3		
	17.09.2024	Sahidnagar, Jharkhali coastal			Hatchling	
	29.10.2024	Dakshin Gopalnagar, Patharpratima				
	20.11.2024	Jagaddal riverside, L-Plot, Patharpratima				
	29.12.2024	Jharkhai- No. 3				
	08.03.2025	South Gopalnagar, Patharpratima				
	09.03.2025	Rakhaskhali , near Bhagabatpur				
	24.03.2025	Bagdanga Bazar , Mousuni Island				
2025-26	25.04.2025	Kshetramohanpur, Patharpratima				