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**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,**
**PRINCIPAL BENCH, NEW DELHI**
**O.A. NO. 727/2024**

**IN THE MATTER OF:-**

**In Re:- News Item Titled "Endangered Gangetic Dolphin found in most tributaries of Ganges prompting urgent conservation".**

**INDEX**




**FILED BY**
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**M-9810625315**


16-05-2025

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI**

**O.A. NO. 727/2024**

**IN THE MATTER OF: -**

**In Re: - News Item Titled "Endangered Gangetic Dolphin found in most tributaries of Ganges prompting urgent conservation".**

**REPLY BY WAY OF AFFIDAVIT ON BEHALF OF WILD LIFE INSTITUTE OF INDIA**

That I, Shri Virendra R. Tiwari, IFS aged about 59 years presently working as Director in the Wildlife Institute of India, Dehradun, having office at Chandrabani, Dehradun do hereby solemnly affirm and declare as under: -

1. That the deponent is working as Director, Wildlife Institute of India (WII), Dehradun and is well conversant with facts of the case and as such competent to swear the present affidavit, on behalf of the WII.
2. That this reply affidavit is being filed in compliance with the direction given by this Hon'ble Tribunal by order dated 20.01.25 in the above-mentioned matter. The present original application pertains to the news item titled "Endangered Gangetic dolphins found in most tributaries of Ganga prompting urgent conservation" appearing in Mongaby- India.
3. In continuation to the reply filed on 16.01.2025, the Hon'ble Tribunal by order dt. 20.01.25 further directed to file a report giving the full particulars and the manner and methodology that was adopted for estimating the dolphin numbers in the Ganga Basin.
4. The project titled "Planning and Management for Aquatic Species Conservation and Maintenance of Ecosystem Services in the Ganga River Basin for a Clean Ganga" is funded by NMCG, MoJS. The objective of the project is to evaluate the status of biodiversity, assess riverine health, and determine the current distribution and population status of key conservation-dependent species, such as the Gangetic dolphin (*Platanista gangetica*) across the Ganga River basin. To achieve this, WII conducted extensive boat-based visual

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Date 15/5/25

encounter surveys across 22 rivers within the basin, including the mainstem Ganga River, to systematically document the distribution and population of the Gangetic dolphin.

5. **Study Duration and Data Collection**:

The Gangetic dolphin sighting occurrence in the GRB was recorded using a boat-based-visual encounter survey between 2020 and 2023. The surveys were conducted during post-monsoon (November to March) seasons (Table 1).

Table 1: River wise survey length and year of survey.

| River Name | Survey length | Survey year |
|---|---|---|
| Ganga | 2070 | 2020 |
| Yamuna | 435 | 2021 |
| Chambal | 405 | 2021 |
| Son | 500 | 2021 |
| Ghaghra | 615 | 2021 |
| Gandak | 295 | 2021 |
| Rupnarayan | 80 | 2021 |
| Kosi | 235 | 2021 |
| Gomti | 650 | 2021 |
| Ramganga | 530 | 2021 |
| Damodar | 290 | 2021 |
| Ajay | 285 | 2021 |
| Rapti | 500 | 2022 |
| Sharda | 220 | 2022 |
| Bagmati | 60 | 2022 |
| Mahananda | 230 | 2022 |
| Babai | 75 | 2022 |
| Betwa | 90 | 2023 |
| Sind | 40 | 2023 |
| Ken | 40 | 2023 |
| Kauriyala | 15 | 2023 |
| Girwa | 20 | 2023 |
| **Total length (in km)** | **7680** | |

We surveyed a total of 7680 km of the river stretches, covering 22 rivers in the Ganga basin (Table 1). The surveyed stretches were further categorised into 5 km sampling units, and each sampling unit is referred as the Biodiversity Evaluation Unit (BEU).

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The survey was carried out in daylight between 8:00 hrs to 12:00 hrs and 15:00 to 17:00 hrs in an inflatable rubber (25 hp)/country boat following thalweg (deeper part of the river) (Furstenau-Oliveira et al., 2017). The boat speed was kept constant at 6-8 km/hr in order to avoid missing any sightings of surfacing dolphins. A team of four trained observers equipped with binoculars (NIKON 8X42), GPS (GARMIN e-trex 30), depth sounder (HONDEX P7), range finder (HAWKE-Endurance LRF-1000), were stationed at the front of the boat to obtain concurrent least counts of dolphin sightings and associated habitat variables (Smith et al., 2006). In each team, three observers were responsible for looking for surfacing dolphins, and the fourth observer was responsible for recording associated habitat variables at each sighting. Habitat parameters such as channel width (m), efforts (duration of time spent in each BEU), time (time of the day), channel depth (m), water flow m3/s (cubic meters per second), river slope (degree), number of meanders (me), fishing intensity (fn), sand mining intensity (mining boats/BEU) as well as anthropogenic factors were recorded for each BEU.

6. **Population estimate:**

To minimize the possibility of repeated counting of the same individual, concurrent least counts of Gangetic dolphin sightings were derived using a combination of surfacing time intervals and behavioural cues. Gangetic dolphins typically surface at intervals of approximately 90–120 seconds. Therefore, during surveys, sightings observed within a 120-second window were treated as representing different individuals. Conversely, sightings recorded after a lapse of more than 120 seconds in the same direction were considered re-sightings of the same individual. This approach allowed for a more accurate and conservative estimation of the dolphin population by accounting for the species' natural surfacing behaviour and minimizing the risk of duplicate counts (Smith and Reeves, 2000).

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Dolphin abundance estimation using the N-mixture model to account for missing individuals: To account for missing individuals (i.e. perception bias-missed detections by the observer; availability bias-dolphins submerged and undetectable)

during the survey, we employed the N-mixture occupancy model. The N-mixture approach is used to estimate population sizes from repeated count surveys which provides a measure of abundance ($\lambda$) with the probability of detecting an individual (p).

The concurrent least counts of dolphins obtained from boat count were used to estimate the population using the N-mixture model. The total survey stretch of 7680 km was split into 307 sampling sites of 25 km spatial unit containing five BEUs of 5 km. These spatial sub-units constituted the adjacent spatial replicates to accommodate it in the occupancy framework (Searle et al. 2020). The population estimate of the Gangetic dolphin in the Ganga River Basin was 3,936 ± 763 individuals.

Dolphin abundance estimation using Correction factor $D_{cf}$ to account for missing individuals: We further derived the abundance of Gangetic dolphin using correction factors Dcf extracted from published work conducted in the rivers of the Indian subcontinent and used it as an index to compare with population estimates derived from the N-mixture model. The mean correction factor for the Gangetic dolphin was derived from various studies that have used standard mark-recapture statistical models accounting for potential duplicate sightings, perception bias (missed detections), and availability bias (dolphins submerged and undetectable) (Table 2). Correction factors (CF) account for missed individuals while conducting visual encounter surveys (Smith et al., 2006; Richman et al., 2014). The correction factor for dolphin Dcf was derived by dividing detection ($\hat{P}$) by 1 and the corrected population estimates of Gangetic dolphin were calculated by multiplying (D)cf by the total number of dolphin sightings obtained during the visual encounter survey.

Formula: ($Dcf = \sum 1/(\hat{P})$, where, (Dcf is the correction factor for Gangetic dolphin estimates and $\hat{P}$ is the detection probability.

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**Table 2:** Derived correction factor ($D_{cf}$) and $\hat{P}$ is the detection probability for Gangetic dolphin population estimates.

| Country | Rivers | Year | ($\hat{P}$) | $D_{cf}$ | Reference |
|---|---|---|---|---|---|
| Bangladesh | Sunderbans | 2002 | 0.69 | 1.45 | Smith et al., 2006 |
| Pakistan | Indus | 2001 | 0.91 | 1.10 | Braulik, 2006 |
| India | Ganga | 2007 | 0.65 | 1.55 | Bashir et al., 2010 |
| Pakistan | Indus | 2006 | 0.93 | 1.07 | Braulik et al. 2012 |
| India | Ganga | 2010 | 0.54 | 1.87 | Kelkar et al. 2010 |
| Bangladesh | Sangu&Karnaphuli | 2012 | 0.57 | 1.75 | Richman et al. 2014 |
| Nepal | Karnali | 2012 | 0.63 | 1.59 | Paudel et al.2015 |
| Nepal | Karnali | 2014 | 0.56 | 1.78 | Paudel et al.2015 |
| | **Mean** | | **0.68** | **1.52** | |

7. In the meantime, WII conducted a range-wide (Ganga and Brahmaputra basins) population estimation of the Gangetic dolphin under a project funded by the Ministry of Environment, Forest and Climate Change (MoEFCC). According to this project report, the current estimated population of dolphins is 6,324 (5,977–6,688) individuals in Ganga and Brahmaputra basins. Summary of the report is annexed as **Annexure-I**.

8. That the answering respondent will file additional reply/affidavit if required or directed by this Hon'ble Tribunal.

NOTARY Vijay Pal Singh (Advocate) District Dehra Dun Uttarakhand Reg.No.-26955/2017 Valid upto- 03-12-2029 GOVT. OF INDIA

Deponent

Verification

Verified at Dehradun on 15 April 2025 that the contents of the above reply is true and correct to the best of my knowledge and belief and nothing material has been concealed therefrom.

Deponent

This affidavit is sworn, before me by
Shri..... Virendra R. Tiwari
who is identified by Shri.....
at Dehradun on.....

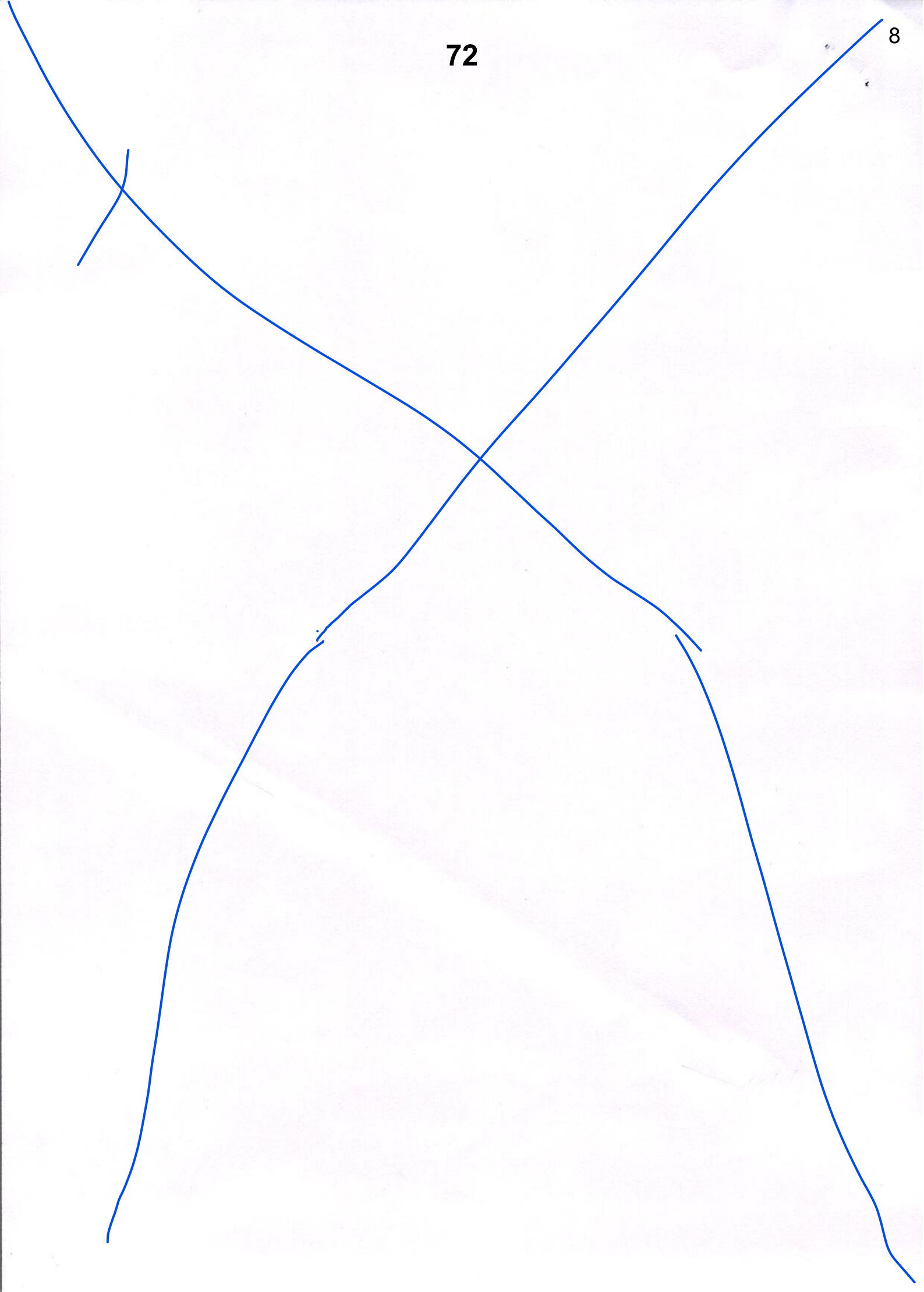
VIJAY PAL SINGH
Advocate & Notary Public
Dehra Dun (U.K.) INDIA

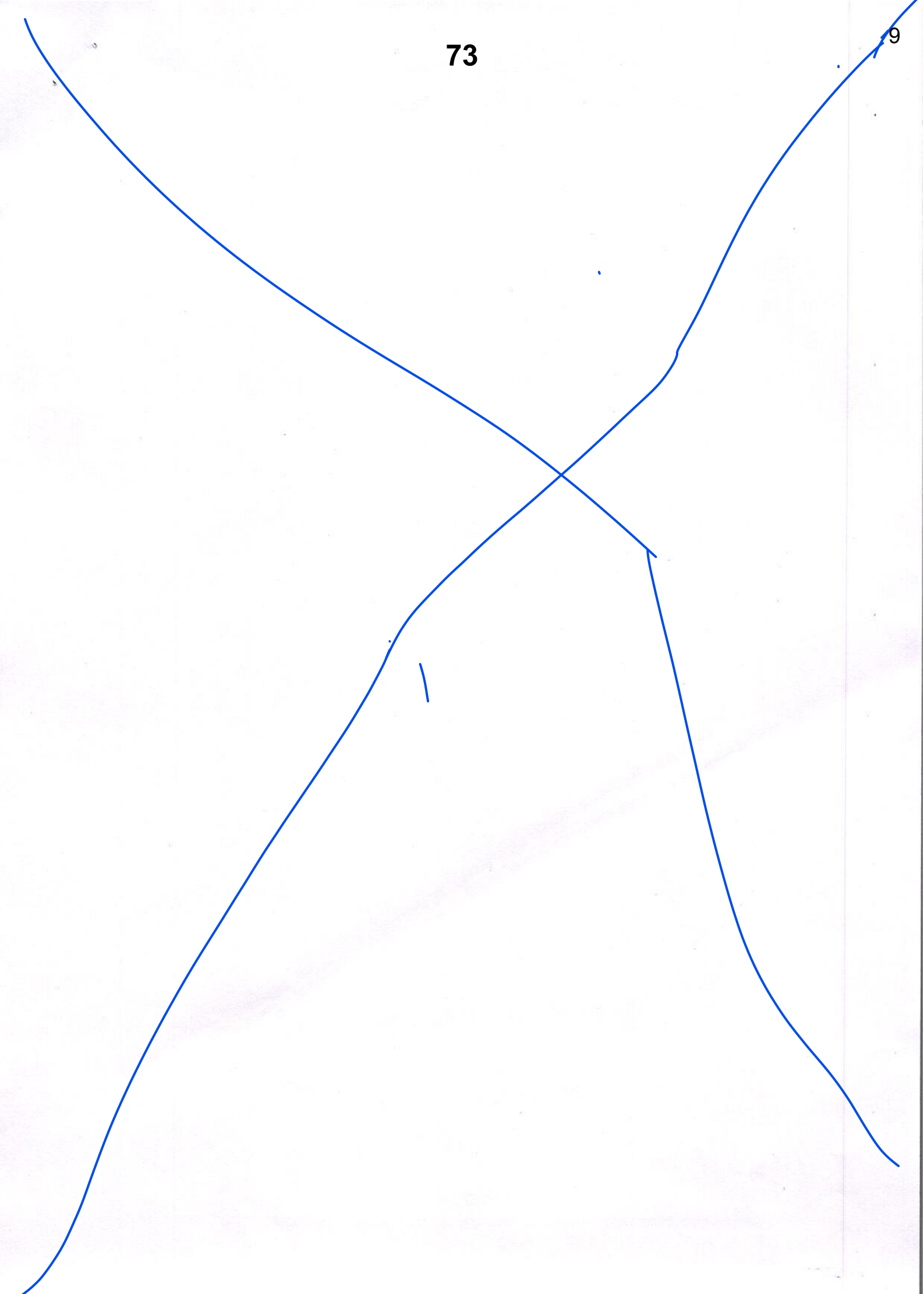
POPULATION STATUS OF

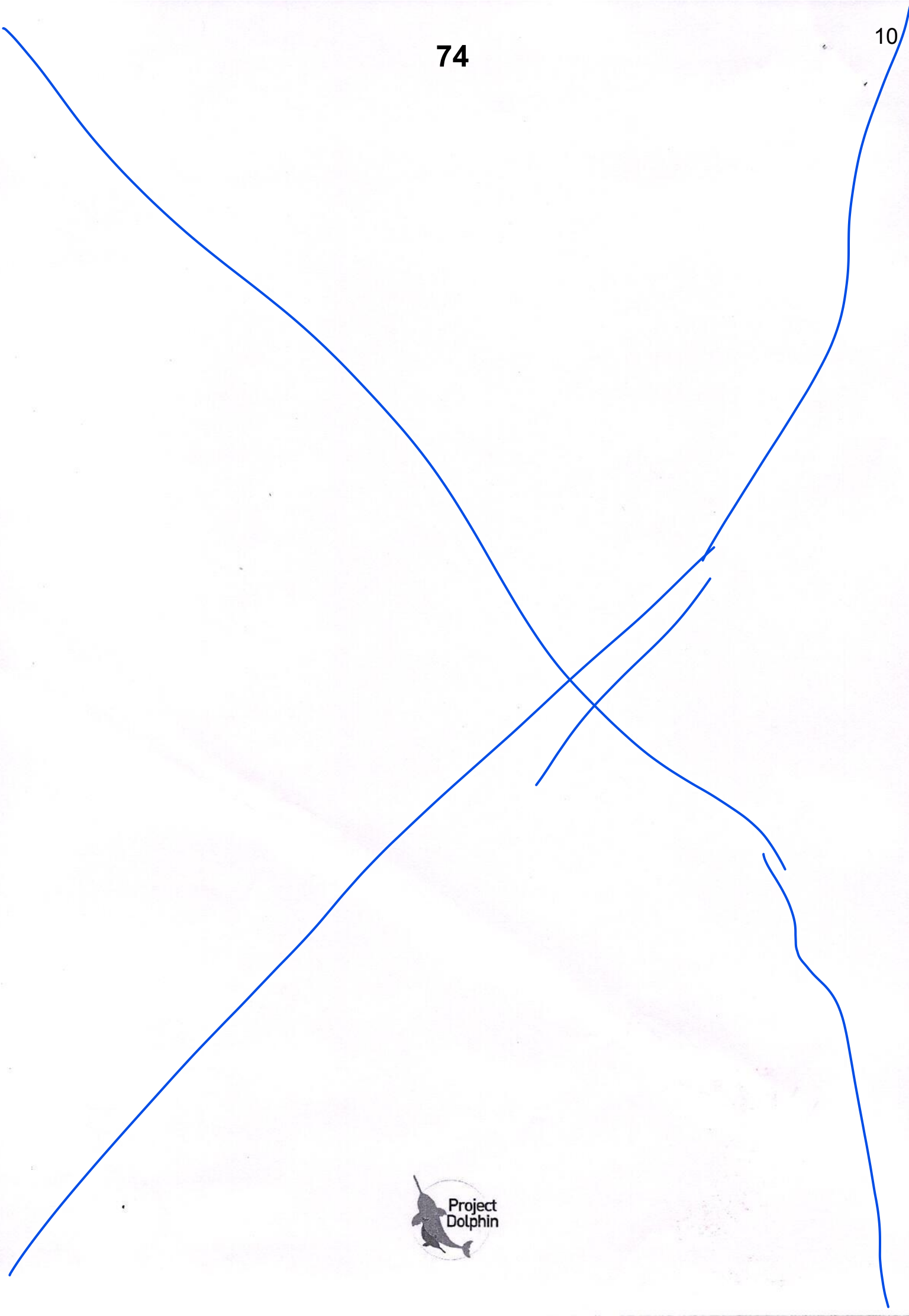
# RIVER DOLPHINS

IN INDIA

2024



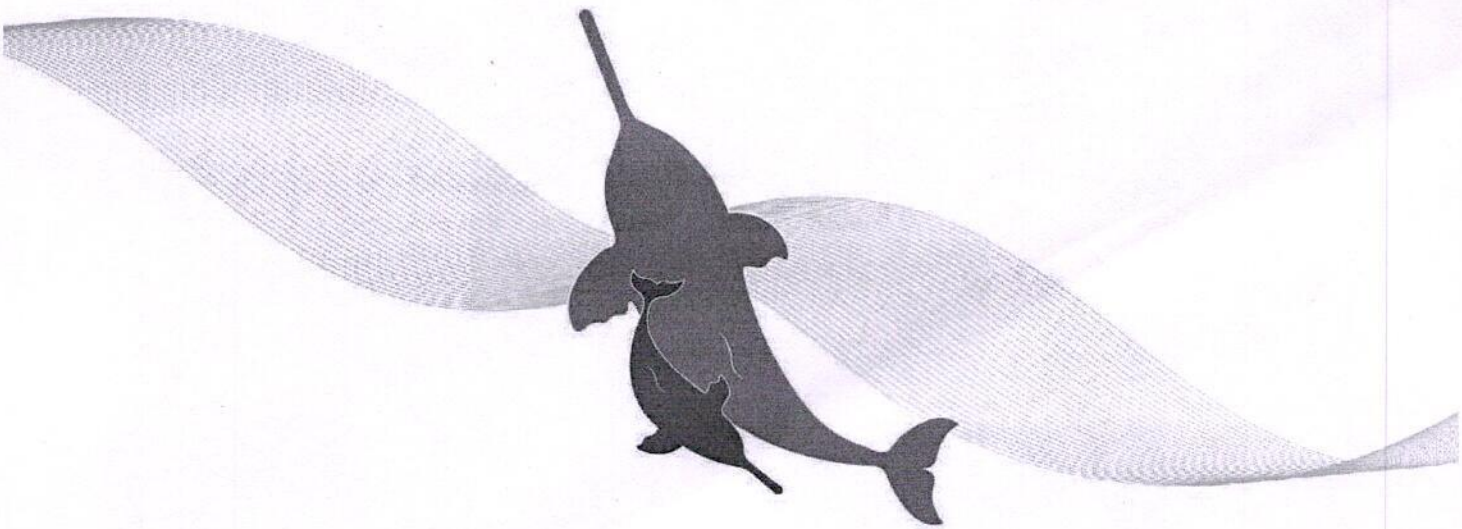




Project Dolphin

# POPULATION STATUS OF
# RIVER DOLPHINS
## IN INDIA

## 2024



**CITATION**

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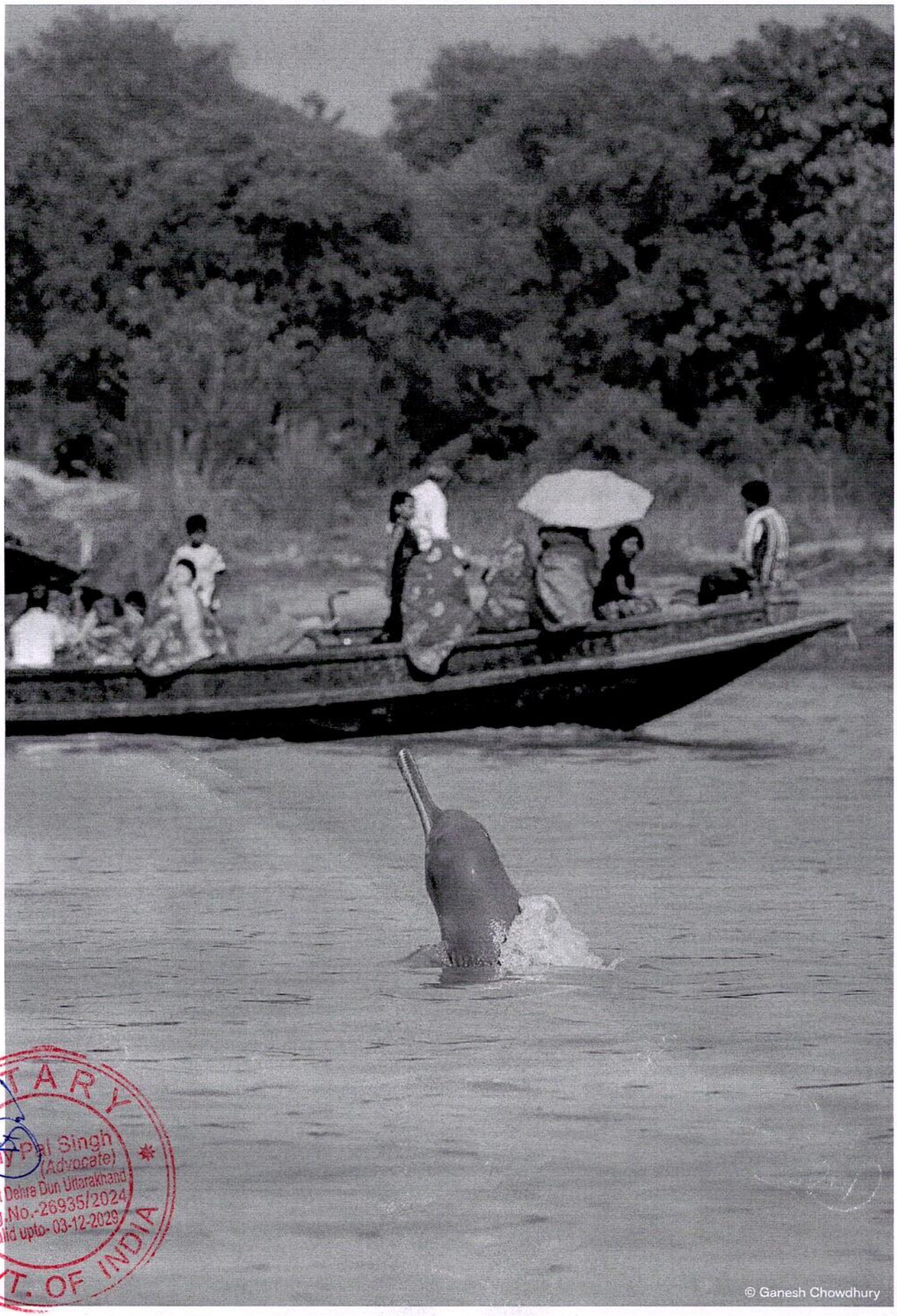



NOTARY
Vijay Pal Singh
(Advocate)
District Dehra Dun Uttarakhand
Reg.No.-26935/2024
Valid upto- 03-12-2029
GOVT. OF INDIA

सत्यमेव जयते

प्रधान मंत्री
Prime Minister

## MESSAGE

It is heartening to learn about the publication of the report titled 'Population Status of River Dolphins in India - 2024'.

Living in harmony with nature has always been an integral part of our culture. Carrying forward such a legacy is a commitment and a responsibility that we carry with a sense of commitment and pride.

Rivers and marine ecosystems have not only served as a lifeline for the people and communities, but also nurtured many aquatic species. Our rivers are home to a wide array of aquatic species including dolphins.

Our Government announced Project Dolphin to protect and increase the population of these wonderful creatures. As a government committed to scientific rigour and evidence-based decision making, an important step in this direction was the enumeration of river dolphins in India.

Guided by a spirit of inquiry, the findings of this scientific assessment to ascertain the numerical status of river dolphins and other aquatic species has yielded encouraging results.

We take immense pride in the fact that India is home to 90% of the world's Ganges river dolphins. Further, it is a tribute to the conservation efforts of local communities that three-fourths of the dolphin population lies outside protected areas.

This document is the fruit of painstaking efforts by researchers, fisherfolk, fisheries department, forest department personnel and local communities who surveyed rivers across many different states.

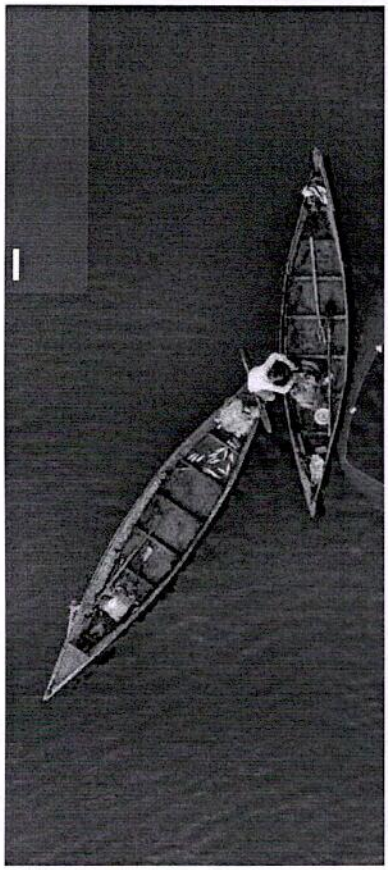
It is now important to use this momentum to involve all stakeholders and accelerate efforts to help increase the populations of our various aquatic species. These efforts will not only help aquatic species, but also support the socio-economic welfare of the marginalised communities that live near rivers.

Hearty congratulations to the Ministry of Environment, Forest and Climate Change, State Forest Departments, the Wildlife Institute of India and other organizations for bringing out this report.

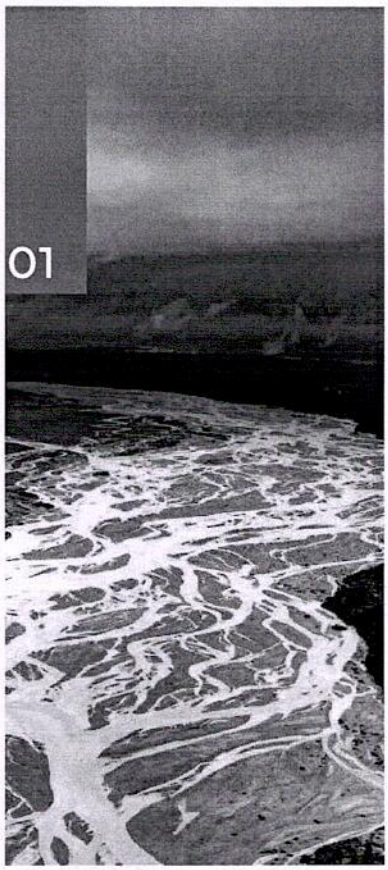
Best wishes for the ongoing efforts in Project Dolphin as well as other future endeavours in this direction.

**(Narendra Modi)**

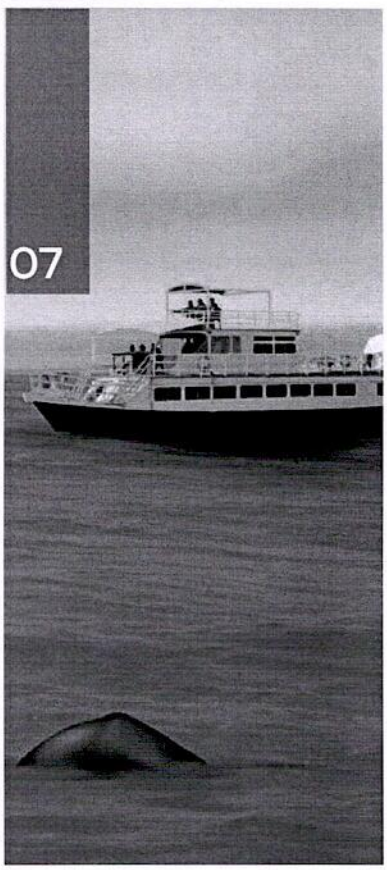
New Delhi
श्रावण 29, शक संवत् 1946
20 August, 2024

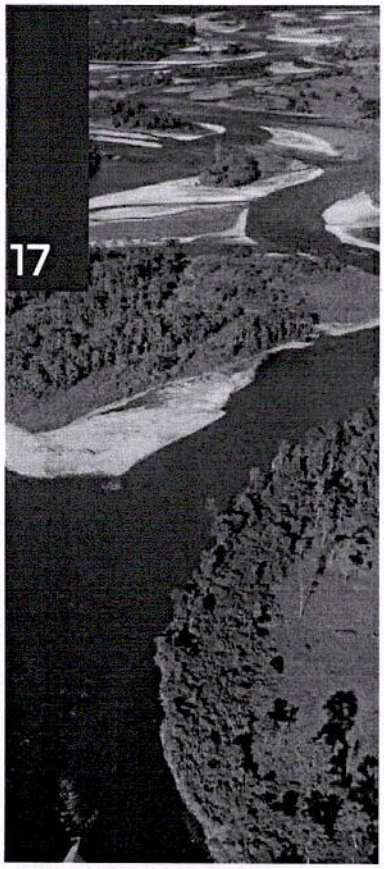




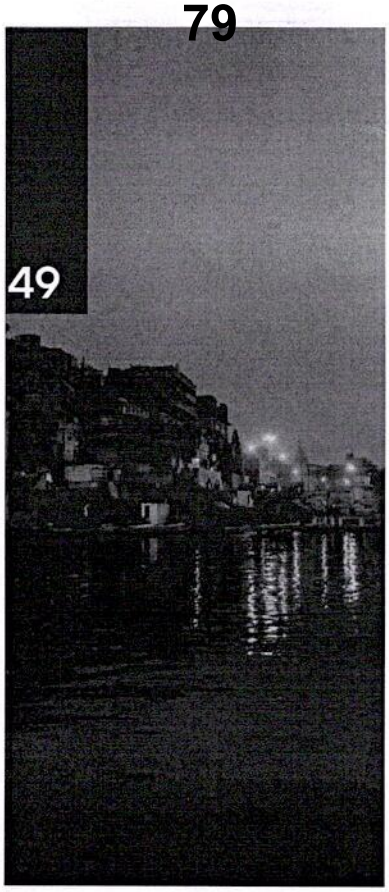





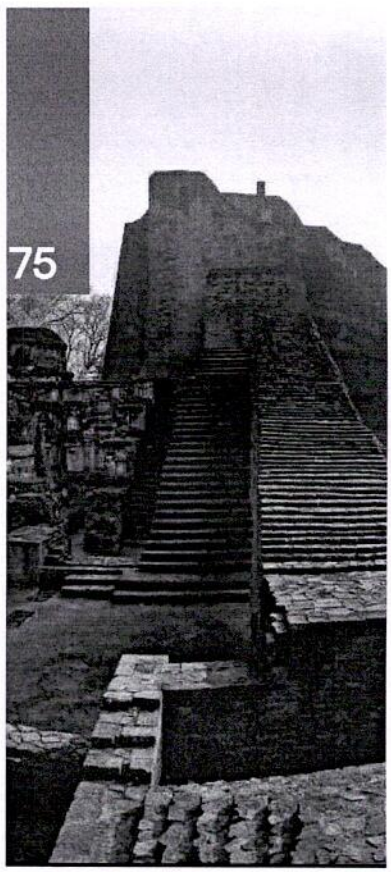





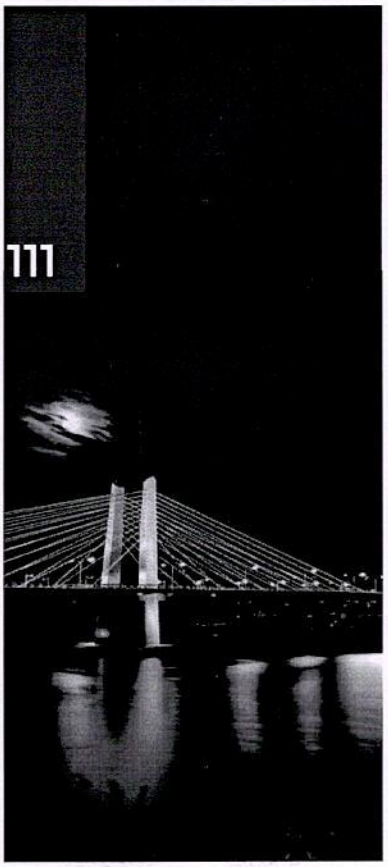


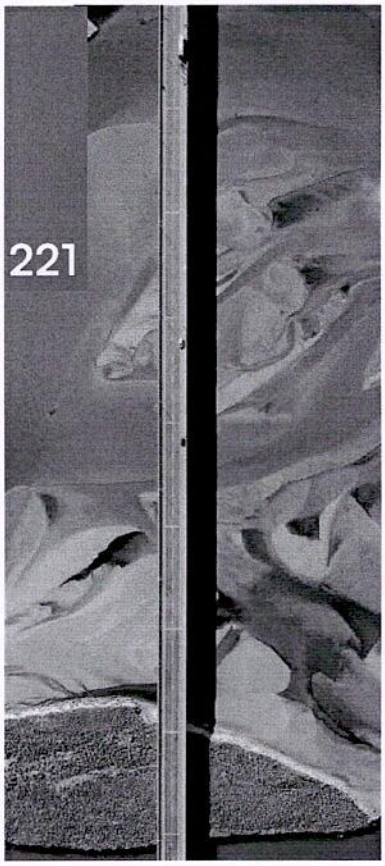


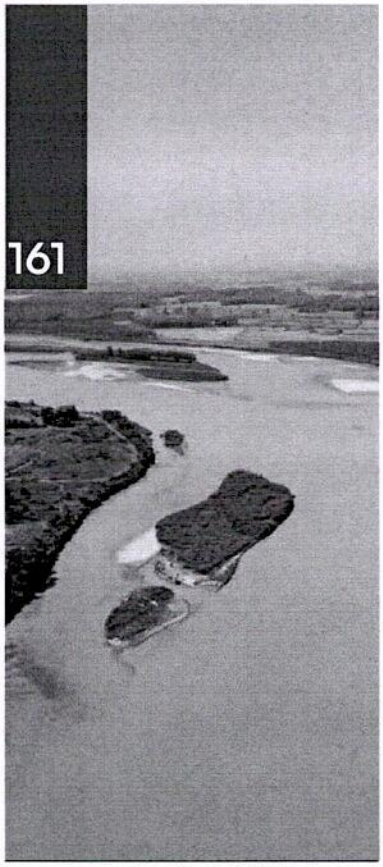







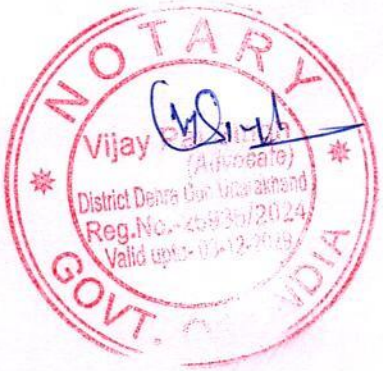













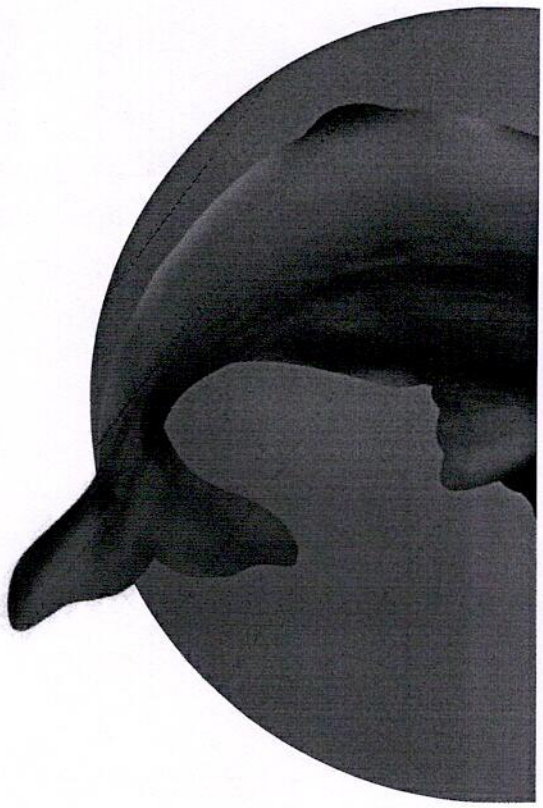
## EFFORT

Number of Rivers Surveyed

**28**

Secondary Survey For Seasonal Dolphin Presence

**30**



Man Days

**3150**

Man Hours

**18900**

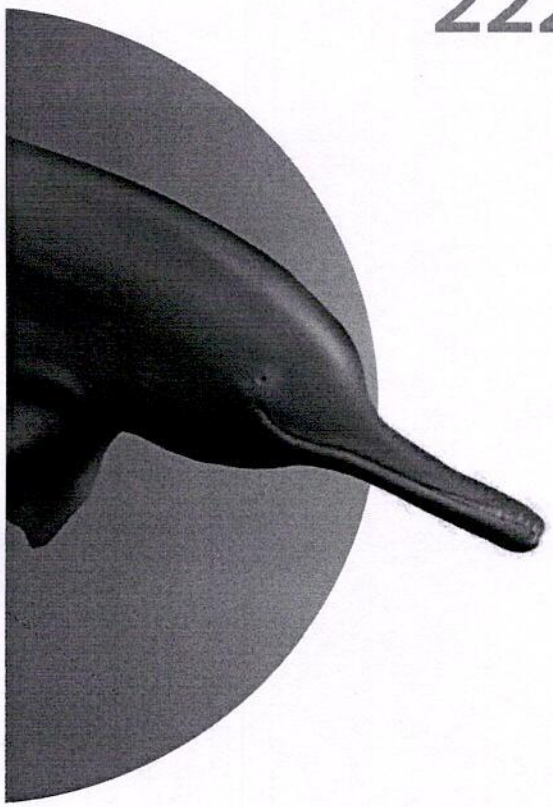
Survey

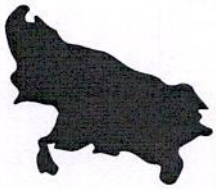
**8507 Kms**



**2021 - 23**

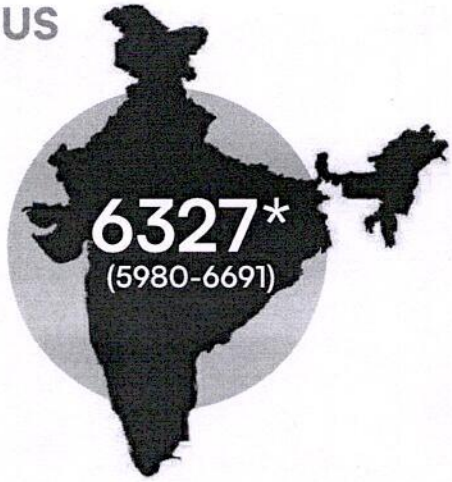
## POPULATION STATUS



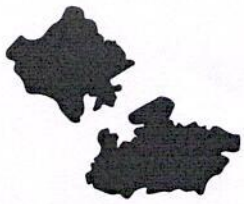


Uttar Pradesh
**2397**

Bihar
**2220**

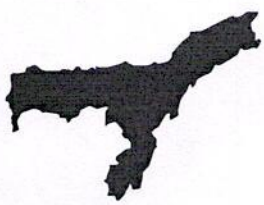



Jharkhand
**162**



Rajasthan &
Madhya Pradesh
**95**

West Bengal
**815**

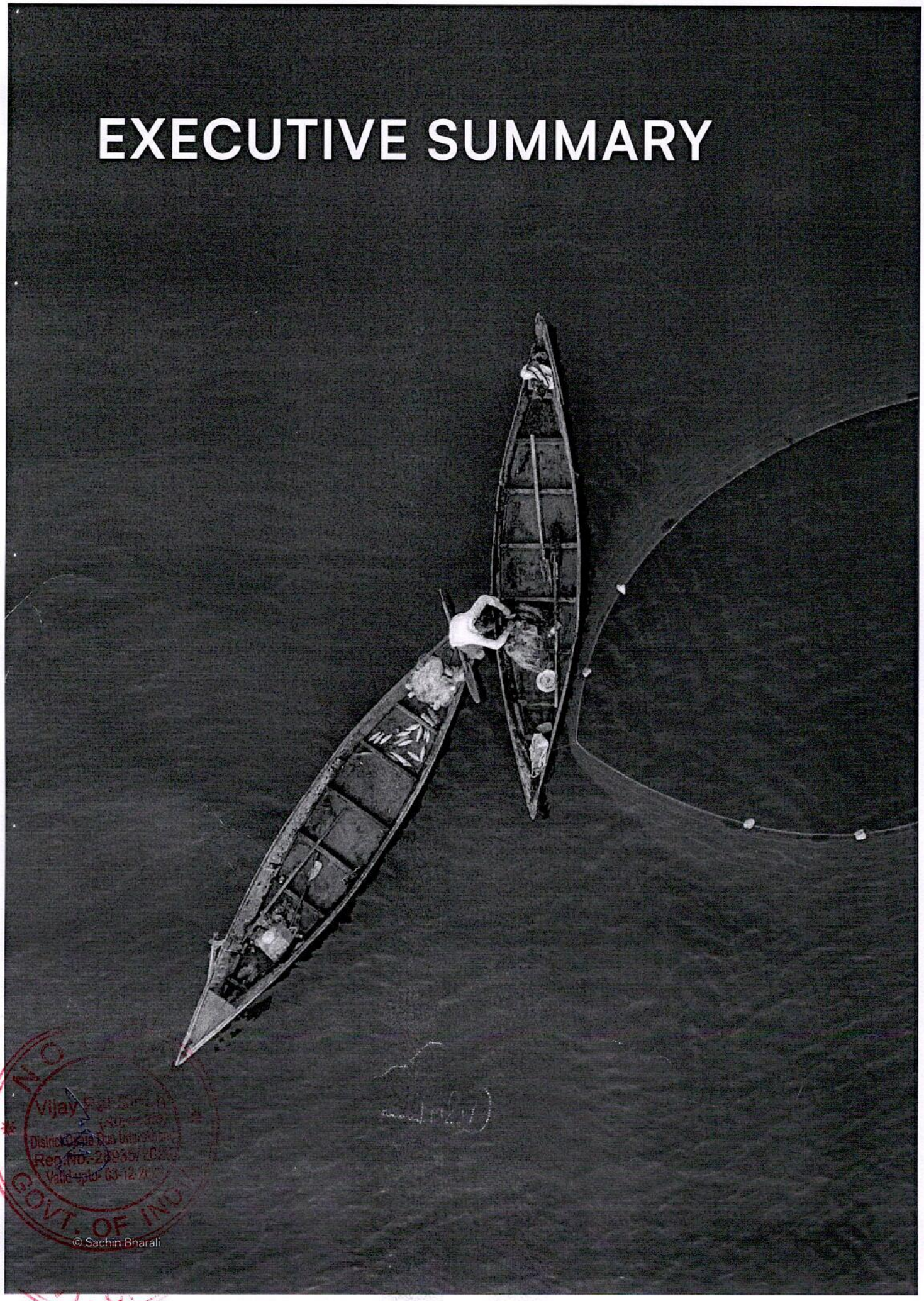


Assam
**635**

Punjab
**3***

*Number includes Indus River Dolphins.

# EXECUTIVE SUMMARY



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# EXECUTIVE SUMMARY

The ethos of Indian philosophy "Sarvam Khalvidam Brahma", emphasizes the interconnectedness of all things in the universe and the need for all-encompassing conservation efforts that prioritize the well-being of all living beings, not just humans. On 15th August 2020 Hon'ble Prime Minister Shri Narendra Modi, announced "Project Dolphin", for the conservation of Dolphins and other aquatic ecosystems. Project Dolphin aims to bring both river and marine dolphins under its conservation program, which involves a science-based, multi-pronged approach that engages stakeholders such as the forest department, fisheries department, fishermen communities, and other stakeholders to address existing conservation issues. Monitoring dolphin populations and trends is crucial for effective conservation, particularly for species like river dolphins which have a slow growth rate, and inhabit the world's most threatened habitats. Under Project Dolphin, a range-wide survey of river dolphins covering over 8000 Km, covering eight states across the Ganga and Brahmaputra rivers along with their tributaries, and the Beas river was undertaken from 2021-23. During the survey, a total of 58 rivers were covered , of which, 28 rivers were actively surveyed by boat, and 30 rivers were assessed through road surveys where the seasonal presence of the Ganges River Dolphin had historically been reported.

## Method

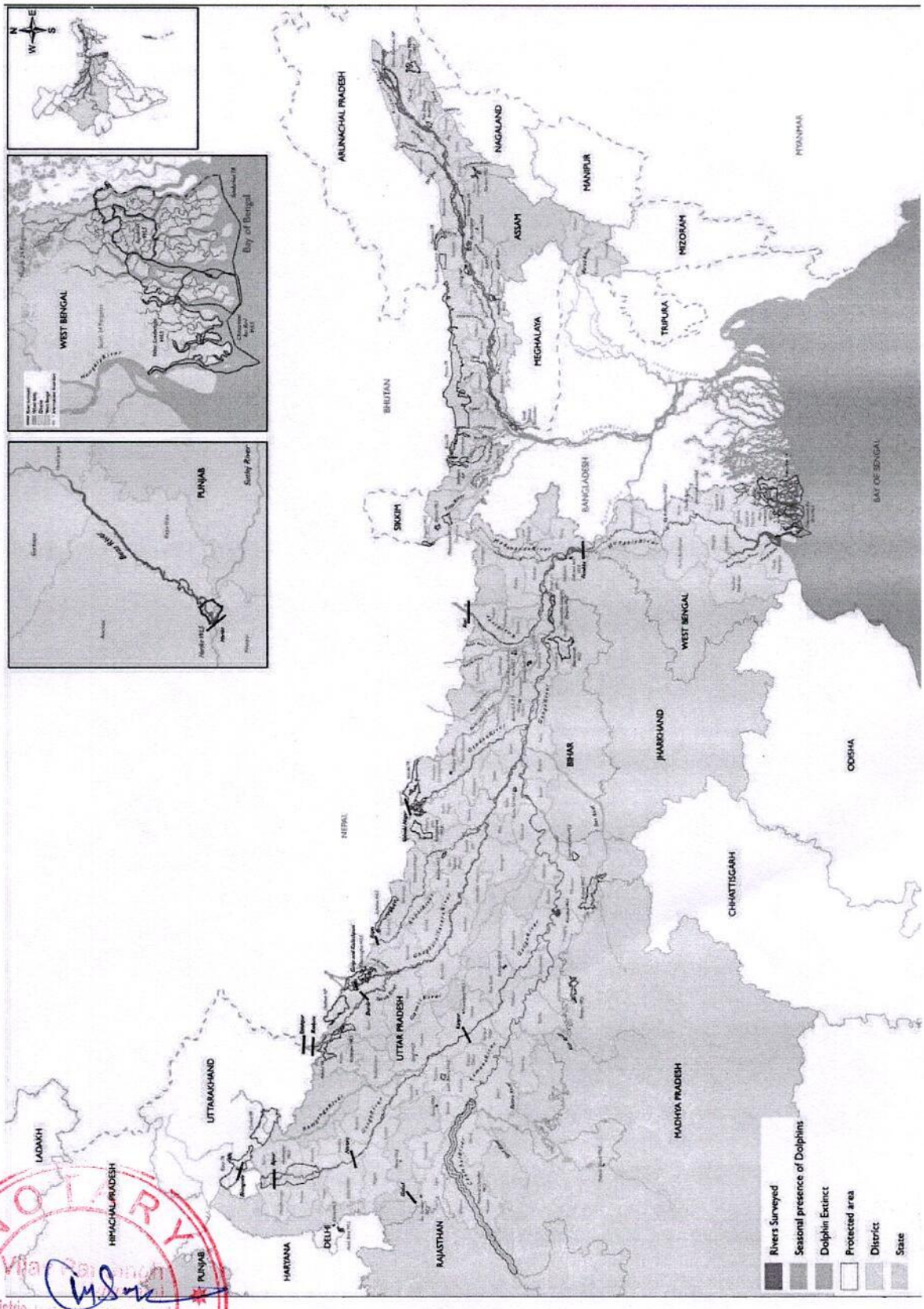
The estimation of river dolphins has always been a challenging task, given the habitat and short surfacing time of the species. The population status has largely been understood through encounter rates, and in some stretches through line transect. However, the surveyed methods have their limitations for largescale survey and monitoring. Dolphins surface only for 1.26 (±0.23) seconds and dive for 107 (± 46.8) seconds. This creates two issues, (a) not all observers are able to spot surfacing dolphins, termed as "Observer error", and (b) not all dolphins surface at the time of count i.e. dolphins are not available for counting, termed as "Availability error". To account for observer error, two independent observer teams are used, and to account for the availability error a hydrophone was dragged under water along with the survey boat which records dolphin presence underwater by recording dolphin clicks, which is used to calibrate the visual observation for unavailability. The data was collected for dolphin abundance, river habitat type, extent of anthropogenic pressure and presence of other associated aquatic fauna. Data on observations of dolphins was analyzed using Lincoln-Peterson's Chapman's corrected formula and Huggins method. The enumeration is carried out through collaboration with State Forest Departments and NGO partners. Twenty-two Training workshops were held in eight states, with a total of 455 forest department personnel trained for holistic monitoring of data collection and to prepare a cadre for future dolphin monitoring.

## Results

The data generated from the survey is used to obtain fine scale information regarding dolphin presence and status of associated fauna.

## FIGURE E.1

*Pan India Map of study area with Ganga River and its tributaries; Brahmaputra River and its tributaries; Sundarbans and Beas River*



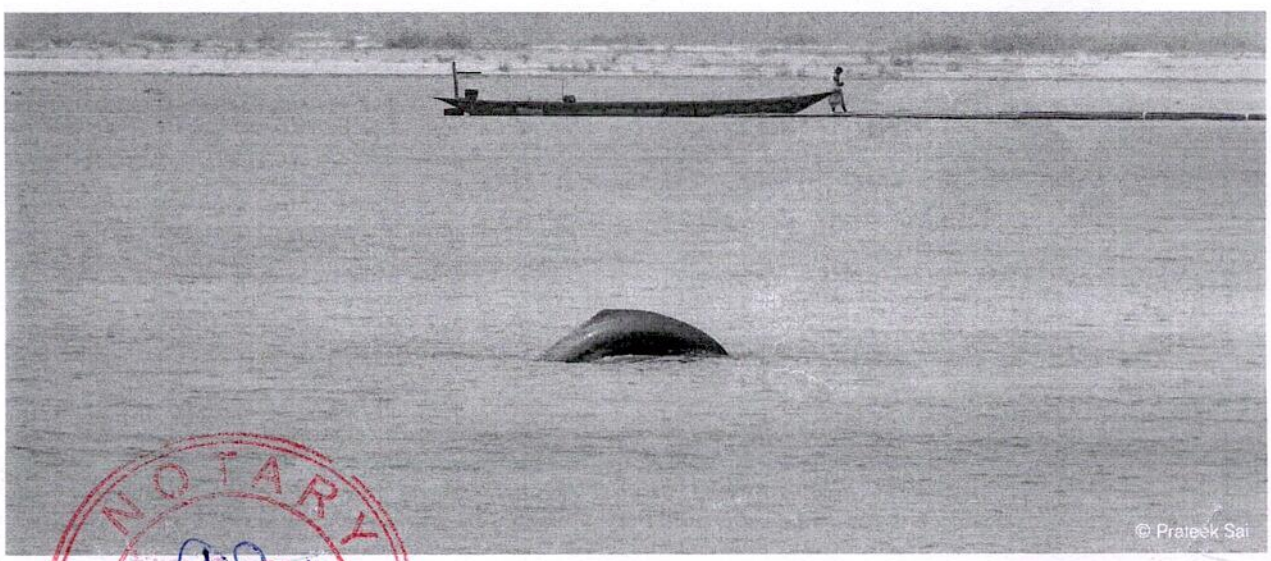
## TABLE E.1

*River-wise observer and availability corrected population estimation ($N_{OA}$) and Encounter rate ($ER_{OA}$) (per Km) of Ganges River Dolphin population In Ganga, Brahmaputra and Its tributaries along with Sundarbans, and Indus River Dolphin population in the Beas River*

**Marked km and values are those shared between two states and the dolphin population is equally distributed (half per state) between the states.*

| River | State | Stretch | Distance surveyed (in Km) | $N_{OA}$ | $E_{OA}$ |
|---|---|---|---|---|---|
| Ganga | Uttar Pradesh | Bijnor Barrage - Narora Barrage | 183 | 114 (103-125) | 0.62 |
| | | Narora Barrage - Kanpur Barrage | 366 | 50 (44-56) | 0.14 |
| | | Kanpur Barrage - Vindhyachal | 380 | 718 (681-755) | 1.89 |
| | | Vindhyachal - Chausa | 260 | 334 (320-348) | 1.29 |
| | | Chausa - Revalganj | 119* | 81 (78-85) | 0.68 |
| | Bihar | Chausa - Manihari | 590* | 1297 (1244-1351) | 2.20 |
| | Jharkhand | Manihari - Rajmahal | 59 | 162 (152-172) | 2.75 |
| | West Bengal | Rajmahal - Farakka Barrage | 41 | 48 (43-53) | 1.17 |
| | | Farakka Barrage - Diamond Harbour | 483 | 429 (408-450) | 0.89 |
| | | Diamond Harbour - Ganga Sagar | 39 | 30 (24-36) | 0.78 |
| | | Farakka Barrage - Nimtita (Indo-Bangladesh border) | 21 | 12 (11-14) | 0.62 |

| | | | | | |
|---|---|---|---|---|---|
| Chambal | Rajasthan - Madhya Pradesh | Nagar - Pinahat | 96 | 17 (13-22) | 0.18 |
| | Madhya Pradesh | Pinahat - Bhind | 99 | 78 (74-83) | 0.79 |
| | Uttar Pradesh | Pinahat - Pachnada | 146* | 203 (192-215) | 1.39 |
| Sharda | Uttar Pradesh | Mayapurighat (Lagga bagga) - Sharda - Ghaghara Confluence (Srirampurva) | 246 | 58 (50-66) | 0.24 |
| Yamuna | | Yamuna Setu (Etawah) - Sangam (Prayagraj) | 536 | 104 (96-112) | 0.20 |
| Rapti | | Rapti Barrage - Rapti - Ghaghara Confluence | 532 | 152 (143-161) | 0.29 |
| Geruwa | | Amba - Kailashpuri Dam | 17 | 14 (11-17) | 0.83 |
| Kauriala | | Kauriala Ghat - Kauriala - Geruwa Confluence | 13 | 7 (5-11) | 0.54 |
| Ghaghara | | Kailashpuri Dam - Barchuncha | 620* | 497 (472-521) | 0.80 |
| Gandak | | Bankasia - Jwalapur | 35 | 65 (56-76) | 1.86 |



| | | | | | |
|---|---|---|---|---|---|
| Mahananda | Bihar | Kishanganj Bridge - Bhaluka | 154* | 155 (143-169) | 1.00 |
| Kosi | | Kosi Barrage (near Indo-Nepal border) - Kosi -Ganga Confluence (Kursela) | 242 | 331 (317-347) | 1.37 |
| Ghaghara | | Barchuncha - Revalganj | 102* | 60 (55-66) | 0.59 |
| Gandak | | Valmikinagar Barrage - Gandak - Ganga Confluence (Patna) | 280 | 377 (359-396) | 1.35 |
| Mahananda | West Bengal | Bhaluka - Rajmahal | 51* | 64 (58-73) | 1.25 |
| Rupnarayan | | Bandar - Gadiara | 79 | 167 (160-175) | 2.11 |
| Mundeswari | | Gorurghat - Bakshi | 7 | 12 (11-13) | 1.77 |
| Bakshi canal | | Shaifon - Bakshi | 6 | 21 (20-22) | 3.61 |
| Shilabati | | Ghatal - Bandar | 6 | 17 (16-18) | 2.94 |
| Dwarakeswar | | Singhapur - Bandar | 4 | 0 | 0 |
| Torsa | | Purba Kathalbari - Jhaljhali | 55 | 1 | 0.02 |
| Kaljani | | Bhuchunjmari - Deucharia | 21 | 5 | 0.28 |
| Churni | | Ranaghat - Mangaldeep | 10 | 7 | 0.71 |
| Haldi | | Teropakhyaghat - Haldia | 19 | 0 | 0 |
| Sundarbans | | Sundarban Tiger Reserve and Sundarban Biosphere Reserve | 1524 | 2 | 0.001 |
| **Ganga** | | | **7109** | **5689 (5371-6024)** | **0.80** |

| River | State | Stretch | Distance surveyed (in Km) | $N_{OA}$ | $E_{OA}$ |
|---|---|---|---|---|---|
| Brahmaputra | Assam | Dr. Bhupen Hazarika Setu - Hatsingimari (Near Indo - Bangladesh border) | 885 | 584 (558-610) | 0.66 |
| Subansiri | | Chauldhuwaghat - Jamagurighat | 91 | 22 (20-24) | 0.25 |
| Kulsi | | Kukurmara - Nagarbera | 61 | 20 (19-21) | 0.33 |
| Beki | | Beki River Bridge (Sar-bhog) - Sonabari (Beki - Brahmaputra Confluence) | 45 | 4 | 0.10 |
| Kopili | | Chapormukh (Kolong - Kopili Confluence) - Kajoli Chowki | 91 | 5 | 0.06 |
| Barak | | Sonabari (Assam - Manipur border) - Rajartila (Indo-Bangla-desh Border | 124 | 0 | 0 |
| **Brahmaputra** | | | **1297** | **635 (606-664)** | **0.49** |
| **Ganges River Dolphin (Ganga & Brahmaputra)** | | | **8406** | **6324 (5977-6688)** | **0.75** |
| **River** | **State** | **Stretch** | **Distance surveyed (in Km)** | **$N_{OA}$** | **$E_{OA}$** |
| Beas | Punjab | Sri Hargobindpur - Harike | 101 | 3 | 0.03 |
| **Indus River Dolphin** | | | **101** | **3** | **0.03** |

EXECUTIVE SUMMARY

In Ganga, a total of 7109 Km was actively surveyed, which includes the mainstream Ganga and its tributaries: Chambal, Yamuna, Rapti, Sharda, Ghaghara, Mahananda, Kosi, Gandak, Geruwa, Rupnarayan (its tributaries-Mundeswari, Shilabati, Bakshi, Dwarakeswar), Torsa, Kaljani, Churni and, Haldi, covering the states of Uttar Pradesh, Bihar, Jharkhand, West Bengal, Madhya Pradesh and, Rajasthan. In Brahmaputra, 1297 Km of the river was surveyed including the tributaries Subansiri, Kulsi, Beki, Kopili and, Barak river in Assam and 101 Km in Beas River was surveyed for the Indus River Dolphin (Table E.1). The dolphin estimate for Ganga is 5689 (5371-6024), while 635 (606-664) dolphins were estimated in Brahmaputra, totaling to a population estimate of 6324 (5977-6688) in the surveyed rivers. While the Indus River Dolphin population was always small, six individuals were reported in 2018 (WWF-India). While 3 individuals were sighted during survey, a recent mortality of one adult female has brought the status of the current population to two individuals.

## TABLE E.2

*Ganges and Indus River Dolphin population estimates and sampling effort invested in different states for Ganga, Brahmaputra, some of their tributaries and Beas River.*

| River Stretch | Effort (Km) | $N_{OA}$ | $ER_{OA}$ |
|---|---|---|---|
| Uttar Pradesh | 3453 | 2397* (2251-2548) | 0.69 |
| Bihar | 1368 | 2220* (2118-2329) | 1.62 |
| Jharkhand | 59 | 162 (152-172) | 2.75 |
| Madhya Pradesh & Rajasthan | 195 | 95* (87-105) | 0.49 |
| West Bengal | 2366 | 815* (763-870) | 0.34 |
| Assam | 1297 | 635 (606-664) | 0.49 |
| **Ganges River Dolphins** | **8406*** | **6324 (5977-6688)** | **0.75** |

**Marked km and values are those shared between two states and the dolphin population is equally distributed (half per state) between the states, however encounter rate is calculated as per the total dolphins sighted in the stretch.*

| River Stretch | Effort (Km) | $N_{OA}$ | $ER_{OA}$ |
|---|---|---|---|
| Punjab | 101 | 3 | 0.03 |
| **Indus River Dolphins** | **101** | **3** | 0.03 |

# STATE WISE DOLPHIN DISTRIBUTION AND ABUNDANCE

## Uttar Pradesh

A total of 3453 Km was surveyed in Uttar Pradesh covering mainstream Ganga and its tributaries (Chambal, Yamuna, Rapti, Sharda, Geruwa-Kauriala, Ghaghara and part of Gandak River). The total population of Ganges River Dolphins was estimated to be 2397 (2251-2548), with an encounter rate of 0.69/Km (Table E.1 & Table E.2). The highest encounter of dolphins in this stretch was found in the 47 kilometer stretch of Bhind-Pachhnada (2.68/Km) in the Chambal River followed by Kanpur-Vindhyanchal (1.89/Km) within 380 Km. National Chambal Sanctuary, Hastinapur Wildlife Sanctuary and Katerniaghat Wildlife Sanctuary are important conservation sites (Figure E.2).

While the dolphin population between Bijnor to Narora Barrage is small and seems stable, the population between Narora to Kanpur (366 km) is almost non-existent, with an encounter rate of 0.1/Km. In Rapti, the average depth of water is 2.55±1.6 m. The low water depth may be the cause for the very sparse dolphin distribution in this river. The stretches of river where the distribution of dolphins is very sparse or even absent are termed as 'Coldspots'. In the Ganga River, such an area was present in the Farukkhabad-Kannauj which lies between the Narora Barrage and Kanpur Barrage. Similar 'coldspots' were found in the Yamuna River, from Kaushambi-Chitrakoot, in the Sharda River, in Pilibhit, and in Rapti River, from Balrampur-Siddharth Nagar (Figure E.2).

## Bihar

The total population of Ganges River Dolphins estimated in Bihar is 2220 (2118-2329), with an encounter rate of 1.62/Km. The average water depth found across the stretch, 5.96±2.9 m, is relatively higher due to several tributaries like Ghaghara, Gandak, Kosi and Son, joining Ganga in Bihar, coupled with ideal river morphology, facilitating the possibility of a higher density of dolphins. The stretch from Chausa - Manihari covering the mainstream Ganga has 1297 (1244-1351) dolphins in 590 Km (Table E.1), resulting in an encounter rate of 2.20/Km, and is amongst the country's most densely populated stretches.

There is a sizable population of Ganges River Dolphins in Bihar's tributaries, numbering 923 (874-978), with an encounter rate of 1.19/Km. In Vikramshila Gangetic Dolphin Sanctuary an encounter rate of 3.10/Km was observed. Bihar has a fairly even distribution of dolphins, with good number of dolphins found largely around the confluences of the tributaries. In mainstream Ganga, the important critical areas are Revalganj-Patna, Begusarai, Katihar-Sahibganj and Vikramshila Gangetic Dolphin Sanctuary (Figure E.2). There are no 'coldspots' in Bihar. The Ganga River flowing through Bihar also supports a relatively healthy status of associated species, with records of the Vulnerable Smooth-Coated Otter and 81 species of birds including the Endangered Greater Adjutant and Black-bellied Tern.

## Jharkhand

The 59 Km stretch of Jharkhand from Manihari to Rajmahal has a dolphin encounter rate of 2.75/Km and a population of 162 (152-172). This encounter rate of dolphins is one of the highest dolphin encounter rates in the mainstream Ganga in the country. Other than the Ganges River Dolphin, this stretch also holds a good population of birds with the presence of Vulnerable species like the Lesser Adjutant.

## Rajasthan and Madhya Pradesh

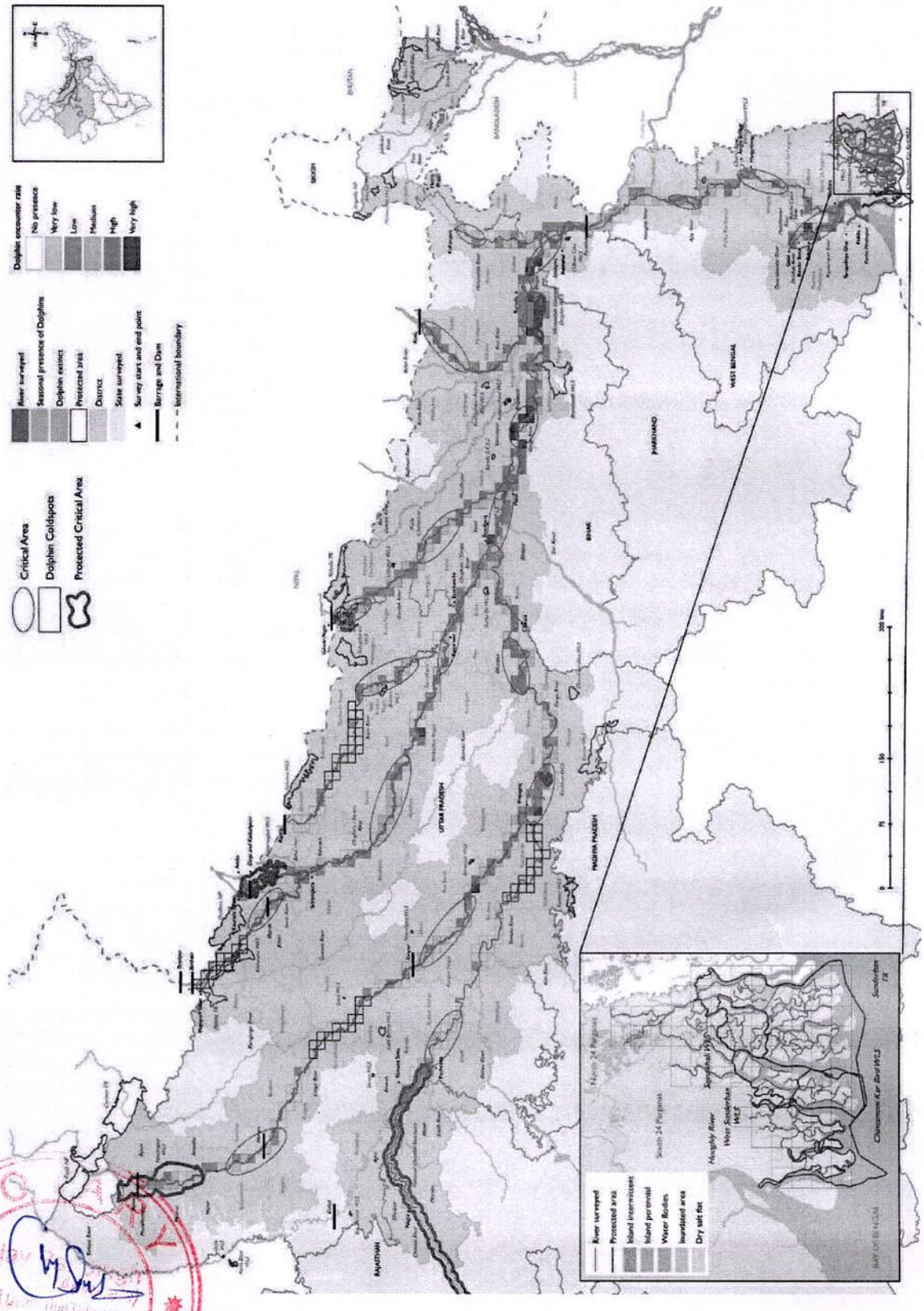
The River Chambal marks the boundary between the three states of Madhya Pradesh, Rajasthan and Uttar Pradesh. A total of 195 Km of the Chambal River, including the National Chambal Sanctuary was surveyed from Nagar to Bhind, and a total of 95 (87-105) dolphins were estimated in this stretch, with an encounter rate of 0.49/Km.

The maximum number of Indian skimmers and Gharials, were also seen in this stretch. Chambal

## FIGURE E.2

*Distribution of Ganges River Dolphin, its encounter rate and critical conservation areas in Ganga mainstream and its tributaries (Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, Rajasthan and West Bengal).*

**Marked Km are those shared between two states and the dolphin population is equally distributed (half per state) between the states.*



seems to be one of the few places which harbor a viable population of Gharials and a significant breeding population of Indian Skimmers. A total of 53 Indian Skimmers, 91 Muggers and 212 Gharials were encountered during the survey. However, this is likely to be an underestimate as the survey was not designed for these species. Other than these, the Critically Endangered Three-Striped Roofed Turtle (n=4) and a Red-crowned Roofed Turtle, and the Endangered Ganges Soft-shelled Turtle (n=5) were also recorded during the survey.

## West Bengal

Across the survey of 2366 Km in Ganga, its tributaries, the Sundarbans in West Bengal, the population of Ganges River Dolphins was estimated to be 815 (763-870), with an overall encounter rate of 0.34/Km. Dolphin encounter rate in Rajmahal-Ganga Sagar stretch was 0.72/Km and in Rupnarayan it was 2.11/Km. The most densely populated river stretch with dolphins was found to be in Bakshi Canal (6 Km) with the encounter rate of 3.61/Km, which is part of the Rupnarayan River System. The Bhagirathi River till Nabadwip is non-tidal and the stretch beyond it is tidal (Hooghly), which influences dolphin movement according to the tide. Ganges River Dolphin abundance is higher in lower reaches where the Rupnarayan meets the Hooghly and other important dolphin sites (Figure E.2).

## Assam

The Brahmaputra River, and its tributaries Subansiri, Kulsi, Beki, Kopili and Barak, with a length of 1326 Km were surveyed during the exercise. The estimated population of dolphins in this entire basin was 635 (606-664). Considering that the habitat status in this river is comparatively good, the encounter rate is low, with 0.49/Km. Barak River is identified as the coldspot in the entire state of Assam. The dolphin populations in Subansiri and Kulsi are declining (when compared with previous population estimates from Qureshi *et al.*, 2018; Qureshi *et al.*, 2020). Kaziranga and Orang Tiger Reserves and confluences of tributaries with Brahmaputra are important dolphin areas (Figure E.3).

The average depth of the mainstream Brahmaputra was 5.2 m. However, the overall water depth of the surveyed tributaries was low. The average depth of the tributaries, Subansiri, Kulsi, Kopili and Beki was 3.8 m, 1.7 m, 2.7 m and 1.7 m respectively. Ganges River Dolphins were recorded for the first time in the Kopili River during winters.

The depth, width and nature of the Brahmaputra River creates a diversity of morphological features in the river, which helps support a large variety of aquatic fauna. The River Brahmaputra sustains a significant proportion of wetlands that are crucial for migratory water fowls, as well as resident aquatic birds.

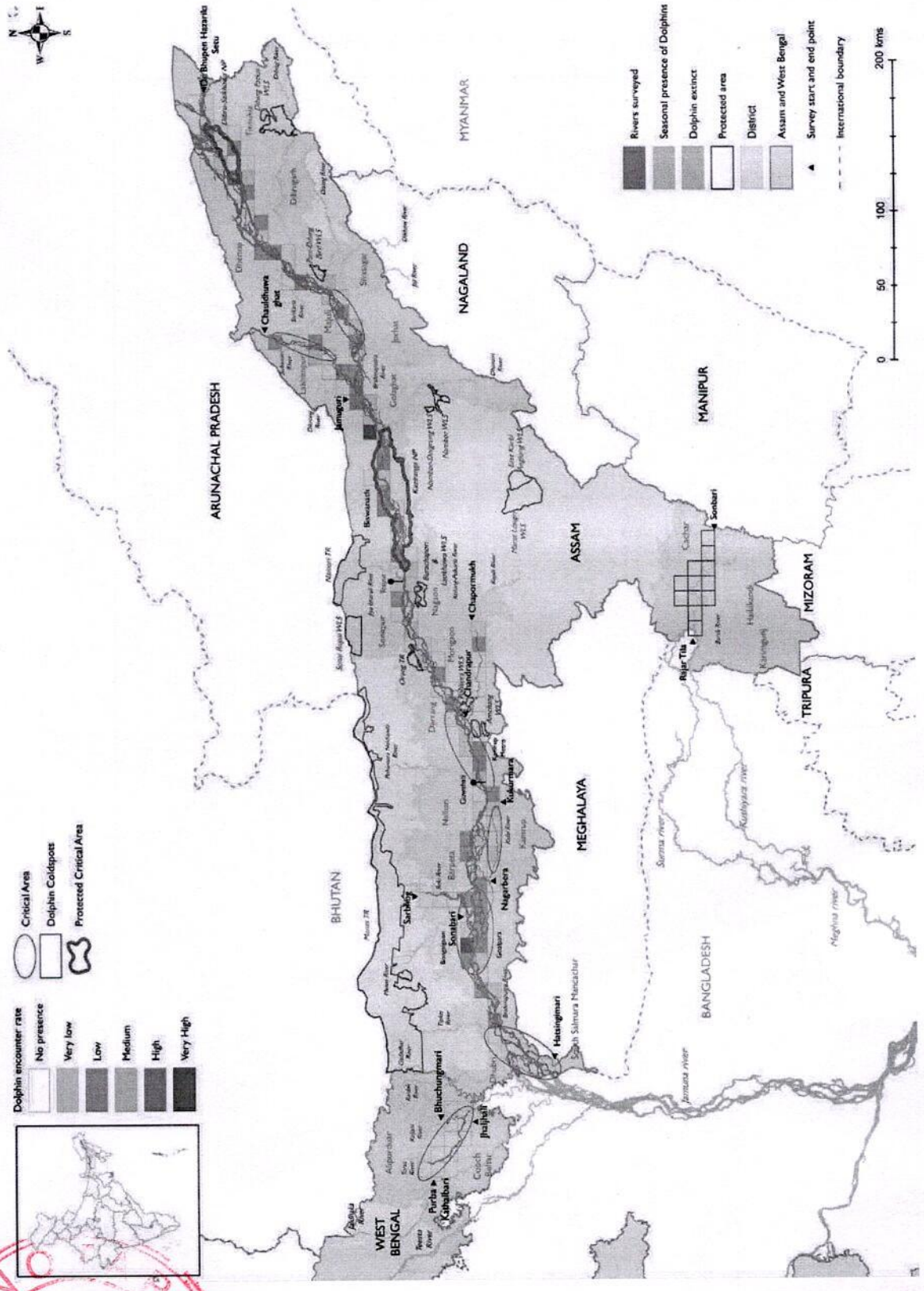
## Punjab

The Beas River in Punjab holds the only remnant population of Indus River Dolphins in India. While the Indus River Dolphins in India were thought to have been extirpated in 1960s, a remnant population was discovered in Beas in 2007. According to the previous survey by Punjab Forest Department and WWF-India, six dolphins were reported in 2018. However, the survey in 2022 recorded only three Indus River Dolphins, two adults and one neonate. Unfortunately, Punjab Forest Department reported the death of one adult female dolphin (pregnant with a calf) in March, 2024. Thus, the current population is likely to be only two individuals. The Beas conservation Reserve is an important area (Figure E.4)

Beas River has average depth of 2.2 m and width of 238 m. A total of 86 species of conservation concern were recorded during the survey, of which 78 species were of birds, two species of mammals and six species of herpetofauna.

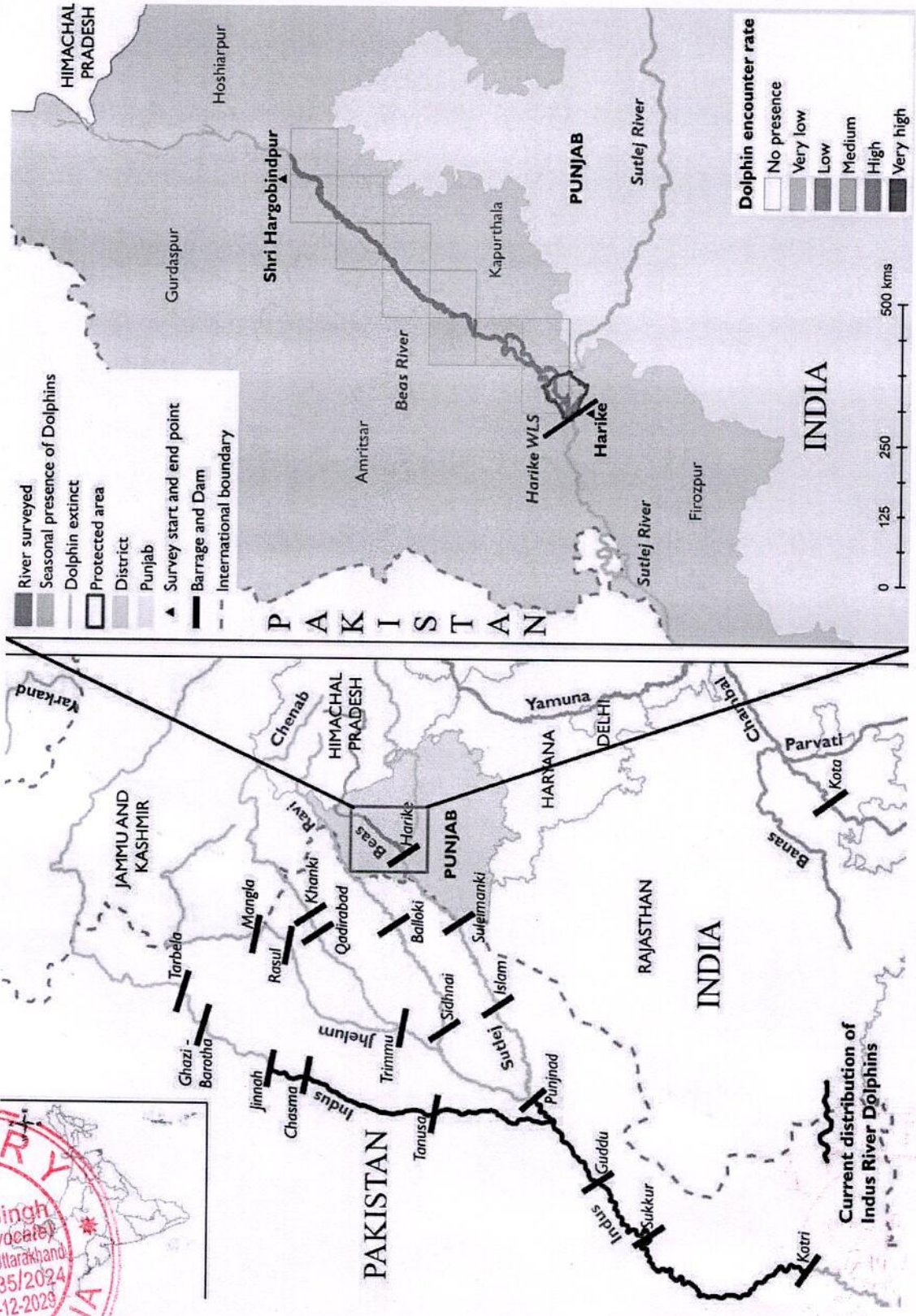
## FIGURE E.3

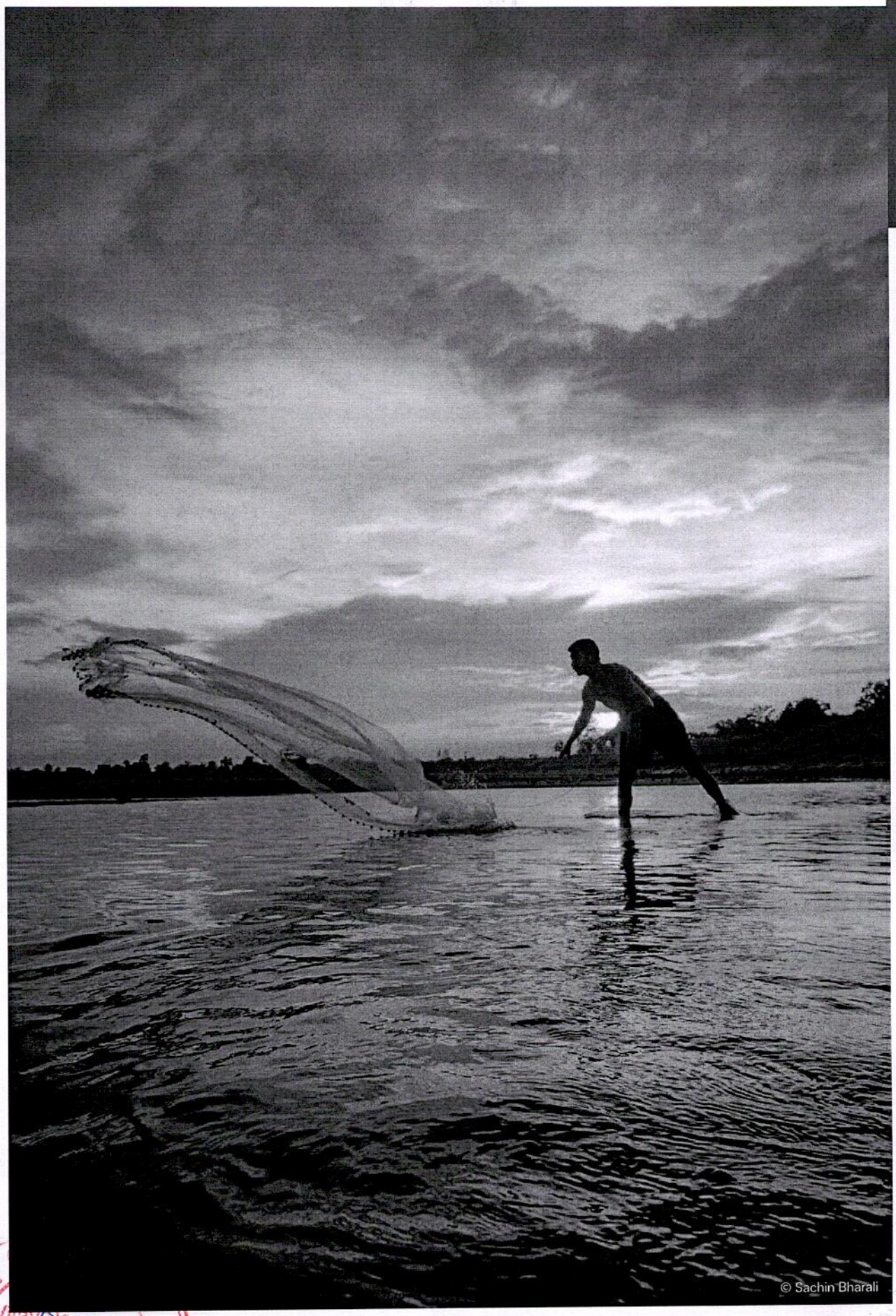
*Distribution of Ganges River Dolphin, its encounter rate and critical conservation areas in Brahmaputra mainstream, and its tributaries, Subansiri, Kulsi, Beki, Kopili and Barak River, Assam.*



## FIGURE E.4

*Distribution of Indus River Dolphin, and its encounter rate in Beas River, Punjab.*

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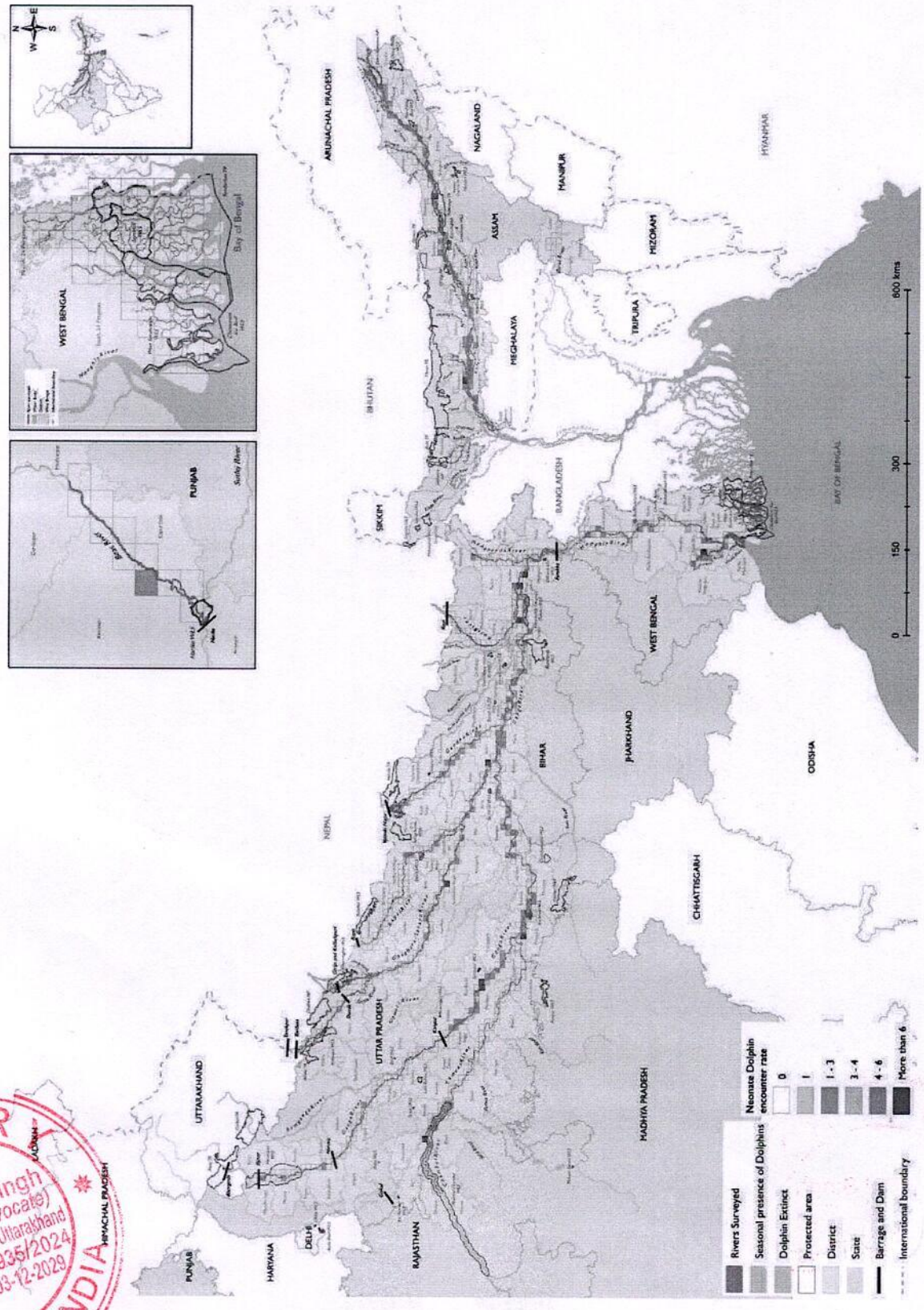
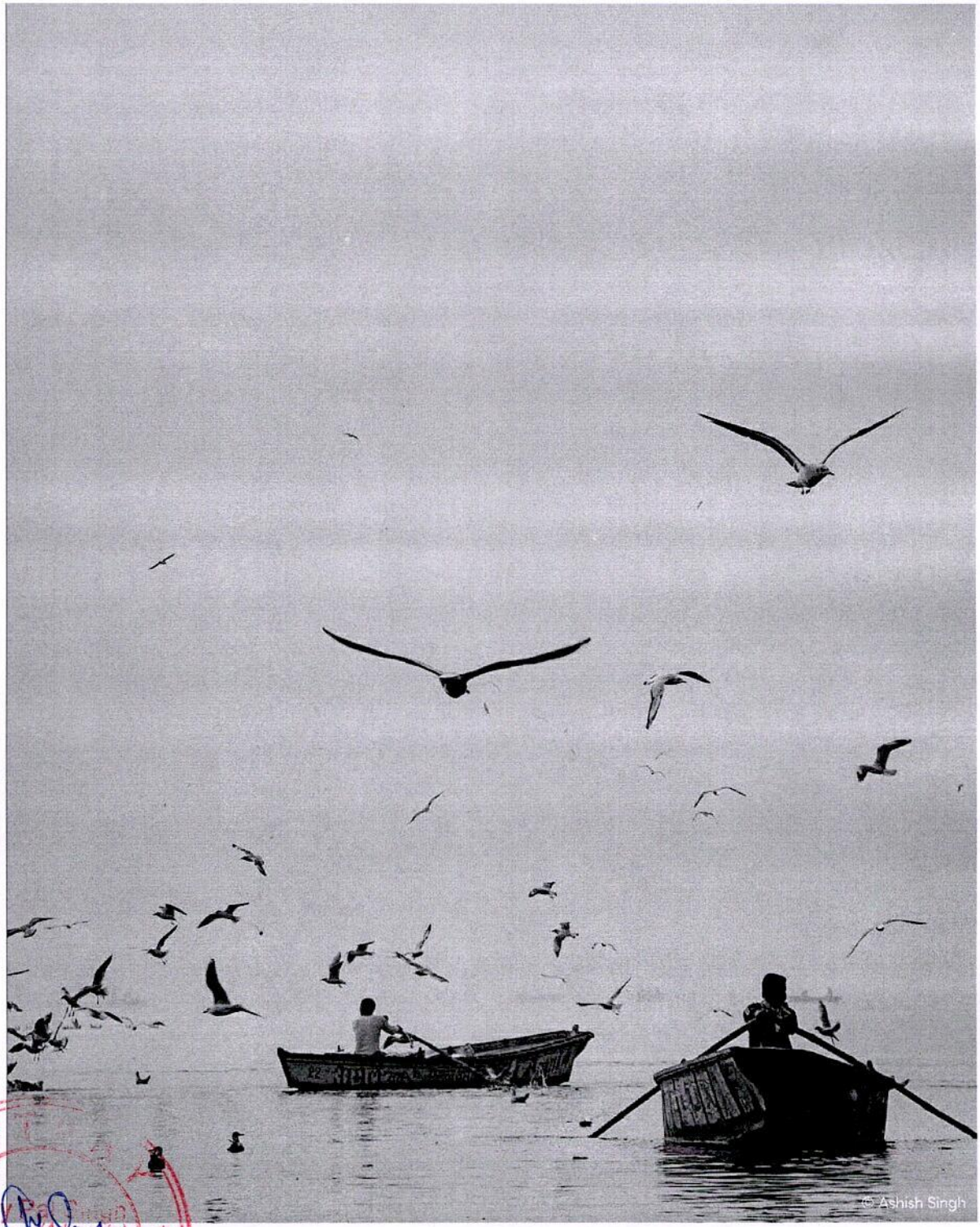
## FIGURE E.5

*Pan India distribution of Ganges and Indus River Dolphin neonates.*



## Conclusion

Under Project Dolphin, the first-ever comprehensive survey has successfully estimated the population of river dolphins across eight states. This marks one of the world's largest freshwater surveys, covering the entire range of the Ganges river dolphin in the Ganga and Brahmaputra, as well as the Indus river dolphin in the Beas river systems. The population estimate reveals 6,324 (range: 5,977-6,688) Ganges river dolphins and 3 Indus river dolphins. The results suggest that dolphins thrive in areas with sufficient water depth and minimal anthropogenic disturbances.



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