BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEW DELHI

O.A. NO. 1158 OF 2024

IN THE MATTER OF

ORIGINAL APPLICATION NO. 1158/2024 REGISTERED ON THE BASIS OF THE NEWS ITEM TITLED "INDUS RIVER DOLPHINS IN TROUBLED WATERS"

Versus

CENTRAL POLLUTION CONTROL BOARD AND OTHERS. ..... RESPONDENTS

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Dharminder Sharma. IFS.
Chief Wildlife Warden.
Punjab.

THROUGH
TALHA ABDUL RAHMAN
D.A.G., STATE OF PUNJAB
D-6, FF, NIZAMUDDIN WEST, NEW DELHI 110013

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CENTRAL POLLUTION CONTROL BOARD AND OTHERS. ..... RESPONDENTS

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REPLY BY WAY OF SHORT AFFIDAVIT OF DHARMINDER SHARMA, IFS, CHIEF WILDLIFE WARDEN, PUNJAB, ON BEHALF OF RESPONDENT NO.7, IN COMPLIANCE OF THE ORDER DATED 12.09.2024.

===

The Respondent above named, most Respectfully Showeth;

I, the above named, deponent, do hereby solemnly affirm and declare as under:-

1. That the above said matter is pending adjudication before this Hon'ble Tribunal and is now fixed for 03.01.2025.

2. That the answering deponent impleaded as Respondent no.7 vide order dated 12.09.2024.

3. That through the instant Original Application, taken up suo motu, by this Hon'ble Court, as per the order dated 12.09.2024, the main object was considered *qua* the decrease of population of Indus River dolphins in the

NOTARY Jitendra Kumar Regd. No. 8283 Chandigarh Expiry Date 15.09.2025 GOVT. OF INDIA

Beas River Conservation Reserve (Beas River) with those in the Indus River is unlikely due to physical barriers like barrages and dry rivers. It was further noticed that the Beas River dolphins face significant challenges, including entanglement in fishing gear, water pollution, and difficulties escaping through the Harike Barrage and the specific habitat needs of these dolphins are not fully understood, but they likely prefer high-volume pools, which may be diminishing due to hydrological changes. It was further observed that the main threats include water availability and pollution, worsened by upstream hydropower projects causing fluctuating water levels. It was further observed that the Beas River population is critically small, making their survival highly vulnerable.

4. That it is respectfully submitted that the Wildlife wing of the Department of Forests and Wildlife Preservation (hereafter called the department, Punjab) in collaboration with various government departments and conservation partners, has been actively engaged in the protection and conservation of the Indus River dolphin (*Platanista minor*) in the Harike Wildlife Sanctuary and Beas River Conservation Reserve. The Respondent No.7 remains committed to addressing the concerns raised in the news item, **"Indus River Dolphins in Troubled Waters"** and shall abide by any farther orders passed by this Hon'ble Court. The steps already

taken by this department for the conservation of the Indus River Dolphin and its habitat, for assistance of this Hon'ble Court are set out below:

i) The concerns raised regarding the declining population of the Indus River dolphin in the Beas River are valid and are recognized as a critical issue by the answering respondent. The answering respondent acknowledged the significant threats to the species, including habitat degradation, water pollution, and the challenges posed by upstream hydropower projects. The Department also recognizes the potential disconnection between the Beas River population and the main Indus River population.

ii) That in fact the habitat of the Indus River Dolphin in Punjab, specifically the Beas River Conservation Reserve (Beas River), has been officially designated as a Conservation Reserve under the Wildlife Protection Act, 1972 **vide notification no.34/13/2017-Ft-5/1052756/1 dated 29.08.2017. A true copy of vide notification no.34/13/2017-Ft-5/1052756/1 dated 29.08.2017 is annexed as Annexure R-1.**The site was also declared as a RAMSAR site. A true copy of the RAMSAR certificate is at **Annexure R-2**. This critical step aims to safeguard the unique and fragile ecosystem that supports the survival of this endangered species. The declaration of the Beas River as a protected area underscores the Punjab Government's

commitment to conserving the dolphin habitat, mitigating potential threats, and fostering biodiversity conservation. By securing this stretch of the river, efforts are directed by the Department towards maintaining ecological integrity, enhancing habitat quality, and promoting awareness and sustainable practices to ensure the long-term survival of the Indus River Dolphin.

iii) It is also respectfully stated that the Indus River Dolphin is also declared as a State Aquatic Animal vide **notification number: 34/10/2019-Ft5/1171 dated 08.03.2019.** A true copy of notification number: 34/10/2019-Ft5/1171 dated 08.03.2019 is annexed as **Annexure R-3.** Declaring the Indus River Dolphin as the State Aquatic Animal has significantly enhanced conservation efforts for the species. In response to a request from this department to the Ministry of Environment, Forest and Climate Change (MoEFCC), the Indus River Dolphin has been officially included in Schedule I of the amended Wildlife Protection Act, 1972. This inclusion provides the species with the highest level of protection under the Act, prohibiting hunting, poaching, and illegal trade, while also ensuring stricter regulations to protect its natural habitat.

iv) There is continuous monitoring and surveys conducted by this department in collaboration with WWF India, to monitor the population of Indus River dolphins and their habitats. The data

NOTARY Virender Kumar, Regn. No. 8285 Chandigarh Expiry Date 15.09.202 GOVT. OF

gathered from these surveys provides valuable insights into population trends and dolphin health. The manuscript titled "A review of the status, threats and management priorities of a remnant population of Indus River Dolphins in the Beas River, India" is annexed as **Annexure R-4.** It is stated that the article published in Mongabay on 15.08.2024, appears to be based on this Review Article received for publication on 03.08.2024.

v) The Wildlife Division Ferozepur has conducted numerous awareness campaigns aimed at local communities, especially for farmers and those involved in fishing activities. Since the discovery of the Indus River Dolphins in 2007, along with the WWF-India, this department has been engaging riparian communities along the Beas-Harike ecosystem to foster stewardship and enhance their role in conserving riverine and wetland ecosystems. As part of these efforts, mitar drives were launched to mobilize community participation and instill a sense of ownership and responsibility toward the health of their rivers and wetlands. Over the years, more than 2,500 Mitras have been enrolled through training and awareness camps focused on river health assessment in Harike Beas ecosystem.

A series of events and activities were conducted on regular basis to raise awareness and engage the community in conservation efforts.

On 02/02/2023, World Environment Day was observed with a field visit to Harike Wildlife Sanctuary, where 89 students from 9 schools participated. On 17/03/2023, WWF-India and this department hosted an exhibition in Harike, attended by 131 farmers and community members. International Biodiversity Day was celebrated on 22/05/2023 at Shri Guru Hargobind National Modern School Harike and Karmuwala village, reaching a total of 51 people, including students and farmers, with a focus on biodiversity conservation and the protection of species like the Indus River Dolphin and Gharial. World Turtle Day was marked on 23/05/2023 in Gharka village, with 16 participants raising awareness about turtle conservation. Another World Environment Day celebration took place on 05/06/2023 at Harike Wildlife Sanctuary, with 33 students and 6 teachers from Sarabjit Memorial Public School. During Wildlife Week on 05/10/2023, 68 students and 2 teachers participated in a wildlife conservation event at Shri Guru Hargobind National Modern School Harike. The Save Wetlands Campaign on 14/10/2023 included a cleanliness drive in Village Gharka, with 25 community members taking part. In June 2024, World Environment Day was celebrated both in Karmuwala and at the Interpretation Centre Harike, engaging 60 community members and students. On 07/09/2024, cycles were distributed to 12 Dolphin and Beas Mitras.

The Swachhata Hi Seva campaign on 08/09/2024 in Gharka saw the participation of 40 community members in a cleanliness drive. On 04/12/2024 and 16/12/2024, Harike Wetland Mitras meetings were held in Churria and Sudhia, where 32 community members participated in wetland health assessment activities. A true copy of the pictures of awareness camping are annexed at **Annexure R-**5.

vi) The answering Respondent has also worked closely with stakeholder departments, including the Irrigation and Fisheries Department, to reduce potential conflicts between human activities and dolphin conservation. It is worth mentioning here that the State Wildlife Board, Punjab has banned fishing within the boundaries of Beas Conservation Reserve in its meeting held on 20.07.2023. A true copy of the decision (Minutes of the meeting of Punjab State Wildlife Board held on 20.07.23 under the Chairmanship of the Hon'ble Chief Minister, Punjab) is annexed at **Annexure R6.**

vii) In partnership with World Wide Fund for Nature India, the Wildlife Division Ferozepur has implemented conservation initiatives such as water schools and community-based monitoring programs like mitars drives. A true copy of the Pictures of these programs are at **Annexure R-7**. These initiatives have helped raise awareness and gather critical data, enabling us to take informed actions for the protection of dolphins.

viii) The role of the Bhakra Beas Management Board and Water Resources Department (Irrigation Department), Punjab is critical in the management of water release and flow in the Beas River Conservation Reserve. The Department has been proactively working alongside these departments to regulate water levels and ensure that fluctuations are minimized to reduce their impact on the dolphin habitat. The Working Group for Environmental Flows (E-Flows) concerning the Beas River was constituted vide Punjab Government notification No.34/13/2017/FT-5/1301112/1 dated 21.08.2018. (**Annexure R-8**). This group is mandated with comprehensively studying all facets of the Beas River Ecosystem and formulating a framework for maintaining environmental flows within the Beas River and Harike. This initiative aims to preserve the River Beas and Harike's ecological integrity and safeguard its aquatic life.

ix) The answering Respondent has also acknowledged the threat posed by water pollution to the health of the dolphins. In this regard, the answering respondent are working with the Punjab Pollution Control Board to monitor and regulate water quality in the Beas River Conservation Reserve and Harike Wildlife Sanctuary, in order to take efforts for ensuring suitable water quality for the aquatic biodiversity. Additionally, regular clean-up drives and

NOTARY GOVT. OF INDIA Jitender Kumar Regd. No. 4262 Chandigarh Expiry Date 15.09.2025

community-led river bank initiatives are being organized to reduce solid waste entering the river. Photographs are at **Annexure R-9**

x) The department has submitted a proposal for the conservation of the Indus River dolphin and its habitat to Ministry of Environment, Forest and Climate Change, Government of India vide letter no.9121 dated 05.02.2024 and the funding for the same is under the consideration of Government of India (**Annexure R-10**)

Hence, the present reply, submitted by way of a short affidavit, may kindly be taken on record in compliance with the aforementioned order and our department remains open to further suggestions and directions and is willing to collaborate on additional measures as directed by the Hon'ble Tribunal.

Deponent

Dharminder Sharma, IFS.
Chief Wildlife Warden,
Punjab.

Verification

Verified that the contents of para no.1 to 4 of this affidavit by way of reply are true and correct to the best of my knowledge and as per the information

derived from the official record. No part of it is false and nothing relevant has been concealed therein.

Verified at S.A.S Nagar

Deponent

Dharminder Sharma, IFS,
Chief Wildlife Warden,
Punjab.

I identify the deponent who has signed/Thumb marked in my presence.
Signature

NOTARY PUBLIC
Jitendra Kumar
- 1 JAN 2025
Chandigarh (U.T.)
GOVT. OF INDIA

287

ATTESTED & IDENTIFIED
NOTARY CHANDIGARH

- 1 JAN 2025

Annexure-R1

Government of Punjab
Department of Forests and Wildlife Preservation
(Forest Branch)

NOTIFICATION

No. 34/13/2017-Ft-5/1052756/1 Chandigarh, dated the 29/8/2017

Whereas the Government of Punjab is of the opinion that due to its ecological, floral and faunal significance for the purpose of protecting, propagating and developing wildlife and aquatic fauna and its environment, the area mentioned in the following schedule should be declared as **Beas River Conservation Reserve.**

Now, therefore, in exercise of powers conferred under Section 36-A of the Wildlife (Protection) Act, 1972, the Governor of Punjab is pleased to declare the area of River Beas from 52 Head Talwara to Harike Barrage as "Conservation Reserve" from the date of issue of this notification. . The provisions of sub section (2) of Sector 18, Sub Section (2), (3) and (4) of section 27, Section 30,32 and clauses (b) and (c) of Section 33 of the Wildlife (Protection) Act, 1972 as amended from time to time shall also apply to the Conservation Reserve being notified. Detail of Area is given as under: -

"River Beas with all its water channels from 52 Head Talwara to Harike Barrage including all Government areas in River Beas.

Himmat Singh
Special Chief Secretary, Government of Punjab
Department of Forests and Wildlife Preservation

Endst. No.34/13/2017-Ft-5/1052756/2-9 Chandigarh, dated the 29/8/2017

A copy is forwarded to the following for information and further necessary action: -

1. Principal Chief Conservator of Forests (HoFF), Punjab.
2. Principal Chief Conservator of Forests (HAG+) and Chief Wildlife Warden, Punjab.
3. All Chief Conservator of Forests/Conservator of Forests, Punjab.
4. Divisional Forests Officer (Territorial), Amritsar, Jalandhar, Ferozepur, Gurdaspur, Pathankot and Hoshiarur
5. Divisional Forests Officer (Wildlife), Ferozepur, Pathankot and Hoshiapur
6. Deputy Commissioner, Amritsar, Kapurthala, Ferozepur, Gurdaspur and Hoshiarpur.
7. Senior Superintendent of Police, Amritsar, Kapurthala, Ferozepur, Gurdaspur and Hoshiarpur.
8. A copy with a spare copy of the notification is forwarded to the Controller, Printing & Stationery, Punjab for publication the same in Government gazette **(through Nodal Officer, o/o Principal Chief Conservator of Forests, Mohali.)**

Additional Secretary, Government of Punjab
Department of Forests and Wildlife Preservation

True Copy

Superintendent
O/o PCCF (HAG+)
and CWLW, Punjab,
S.A.S. Nagar

Annexure-R2
12

Ramsar

This is to certify that

Beas Conservation Reserve

has been designated as a

Wetland of International Importance

and has been included in the
List of Wetlands of International Importance
established by Article 2.1 of the Convention.
This is site No. 2406

Date of designation: 21 September 2019

Martha Rojas Urrego
Secretary General
Convention on Wetlands

True Copy

Superintendent
O/o PCCF (HAG+)
and CWLW, Punjab,
S.A.S. Nagar

13

Annexure-R3

Government of Punjab
Department of Forests and Wildlife Preservation
(Forest Branch)

ਅਨੁਲੱਗ - 9

NOTIFICATION

No. 34/10/2019-Ft.5/1173 Chandigarh, the dated 08/03/2019

Subject: Declaration of Indus River Dolphin (*Platanista gangetica minor*) as State Aquatic Animal of Punjab.

In pursuance to the recommendations made by the Punjab State Board for Wildlife in its 2nd meeting held on 1.2.2019 under the chairmanship of Hon'ble Chief Minister, Punjab, Indus River Dolphin (*Platanista gangetica minor*) is hereby declared as "State Aquatic Animal" of State of Punjab.

This issues with the approval of Chief Minister, Punjab.

Dr. Roshan Sunkaria
Additional Chief Secretary
Financial Commissioner, Govt. of Punjab
Department of Forests and Wildlife Preservation.

Endst No. 34/10/2019-Ft.5/1174 Chandigarh, dated: 08/03/2019

A copy is forwarded to the followings for information and necessary action:

1. Principal Secretary/Chief Minister, Punjab.
2. Private Secretary/Forest Minister, Punjab.
3. Chief Secretary, Punjab.
4. All Additional Chief Secretary/Principal Secretary/Secretary to Government of Punjab/Commissioner of Divisions.
5. All Head of Departments, Punjab.
6. Director General of Police, Punjab.
7. Principal Chief Conservator of Forests (HoFF), Punjab.
8. Principal Chief Conservator of Forests (Wildlife), Punjab.
9. Chief Wildlife Warden, All States/UTs.
10. All Members of Punjab State Board for Wildlife
11. All Members of Punjab State Wetlands Authority.
12. All Chief Conservator of Forests/Conservator of Forests, Punjab.
13. All Deputy Commissioners and Senior Superintendents of Police of Punjab State.

A copy with a spare copy of the notification is forwarded to the Controller, Printing & Stationery, Punjab for publication the same in Government gazette.

Additional Secretary, Govt. of Punjab
Department of Forests and Wildlife Preservation.

o/c

True Copy

Superintendent
O/o PCCF (HoFF)
and CWLW, Punjab,
S.A.S. Nagar

Annexure-R4 19

Received: 3 August 2023 | Revised: 9 December 2023 | Accepted: 31 December 2023

DOI: 10.1002/aqc.4087

WILEY

REVIEW ARTICLE

A review of the status, threats and management priorities of a remnant population of Indus River dolphins in the Beas River, India

Gill Braulik[1,2†] | Gitanjali Kanwar[1†] | Asghar Nawab[1,3*] | Mohammad Shahnawaz Khan[1] | Sandeep K. Behera[4] | Basanta Rajkumar[5]

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[5]Chief Conservator of Forests, Department of Forest & Wildlife Preservation, Government of Punjab, Nagar, India

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Email: gkanwar@wwfindia.net

Funding information
Nokia Foundation; WWF International; Nokia Corporation, Finland; DCB Bank; WWF

Abstract

1. The Indus River dolphin (*Platanista minor*) is a severely threatened species of freshwater dolphin that occurs only in the lower Indus River system of Pakistan and India. The dolphin's range has declined by 80% since the 1870s, and total species abundance is estimated as approximately 2000 individuals.
2. In 2007, a remnant population of Indus dolphins was discovered above Harike Barrage, in the Beas River in India, 600 km away from all other individuals of its species. This paper provides an overview of the conservation status of Indus dolphins in the Beas River, details the threats they face, and suggests priorities for their conservation and management.
3. Between 2011 and 2022, 40 dolphin direct count surveys were conducted. Indus dolphins occur only in the lower third of the Beas River and reported counts have been from one to eight individuals. The data do not indicate an increase in abundance, and instead suggest a potential decrease; however, sightings of calves continue to be reported annually indicating reproduction is still taking place.
4. Threats to the Beas River dolphin population include accidental entanglement in fishing gear, pollution, escapement downstream of Harike barrage, altered and depleted river flow regimes' and the effects of a very small population size. Urgent conservation measures are essential if this small, but important satellite population is to persist.
5. Recommended management actions include the complete removal of fishing nets from dolphin habitat, reducing pollution, ensuring adequate river discharge to sustain aquatic ecology including dolphins, evaluating and monitoring dolphin movement through Harike barrage and into canals, and engaging riverside communities to protect dolphins. In addition, the possibility of conservation translocations to supplement this population with individuals from larger healthy populations elsewhere in the range of the species should be explored.

* Asghar Nawab is a former employee of WWF.

† Gill Braulik and Gitanjali Kanwar contributed equally to the work and are joint first authors.

KEYWORDS

aquatic mammals, dams, endangered species, environmental flow, extinction risk, fragmented habitat, freshwater ecosystems, regulated rivers, river dolphins, small populations

1 | INTRODUCTION

All cetacean species and populations that occur in rivers are threatened with extinction (Braulik et al., 2023). Freshwater cetaceans are habitat specialists with restricted distributions, and the rivers in which they occur are extensively used, modified and degraded by humans. Water infrastructure, including dams, diversions, embankments and dredging are affecting most freshwater cetaceans, with the result that populations are becoming increasingly fragmented and, being generally small, fragmented populations are at increased danger of extinction (Araújo & Wang, 2015; Braulik et al., 2014; Pavanato et al., 2016; Samad, Kelkar & Krishnaswamy, 2022; Smith & Reeves, 2000a). Irrigation dams and water diversions have been most extensively developed in the Indus River system in Pakistan, and this has had large negative impacts on the Indus River dolphin (*Platanista minor*), an obligate freshwater cetacean endemic to that river system (Braulik et al., 2014; Reeves, Chaudhry & Khalid, 1991). A total of 17 irrigation barrages (diversion dams) have been constructed throughout the former 3500-km range of the Indus River dolphin, fragmenting its habitat into short stretches, and the concomitant diversion of water into canals has left the downstream reaches of many river sections virtually, or completely, dry (Anderson, 1879; Braulik et al., 2014). As a result, Indus dolphins have undergone a range decline of approximately 80% over the last 150 years (Reeves, Chaudhry & Khalid, 1991). At present 99% of the species occurs in three sub-populations separated by barrages in about 690 km of the Indus mainstem in Pakistan (Braulik et al., 2015) (Figure 1). The entire Indus River dolphin species is estimated to number fewer than 2000 individuals and is listed as Endangered on the IUCN Red List (Aisha et al., 2017; Braulik et al., 2022). The species is subject to a number of threats including reduced river discharge owing to irrigation diversions, melting Himalayan glaciers and climate heating related changes in rainfall, canal entrapment, entanglement in fishing gear and agricultural, domestic and industrial pollution (Braulik et al., 2015). Efforts to prioritize cetacean species and populations according to endangerment and conservation priority consistently place the Indus River dolphin very close to the top of the list (Taylor et al., 2020).

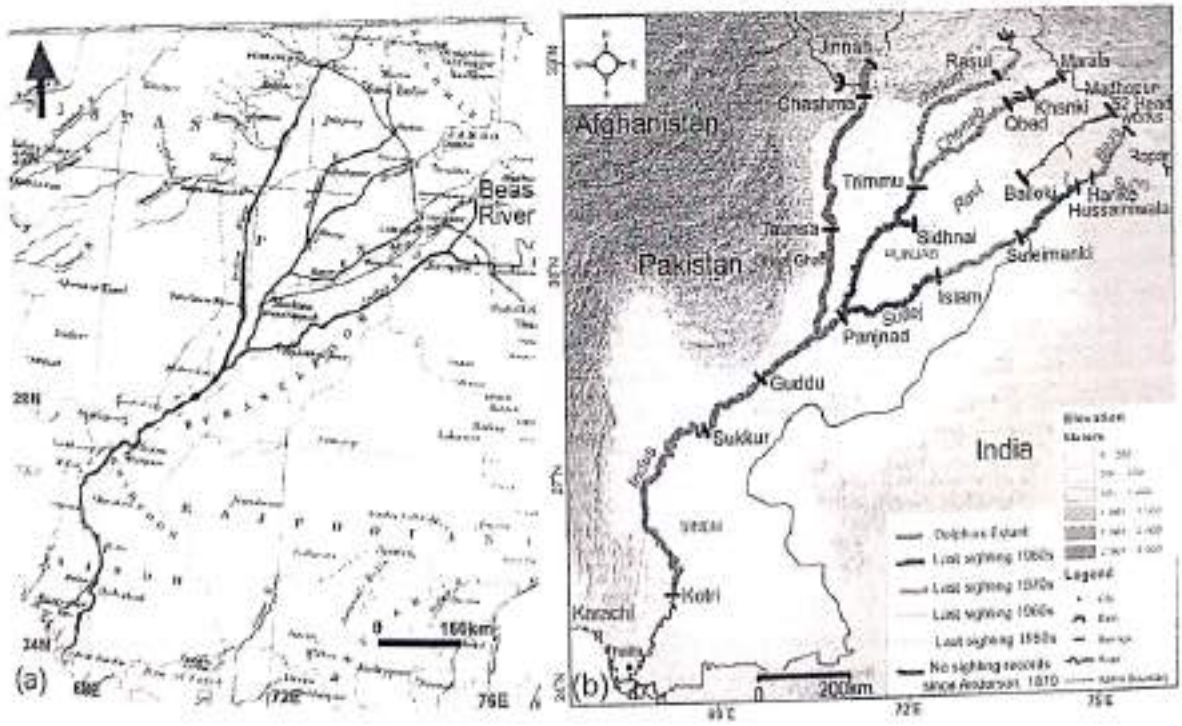

FIGURE 1 (a) the range of the Indus River dolphin in the 1870s documented by Anderson (1879). (b) The range of the Indus River dolphin and its pattern of decline by 2022 (replicated from Braulik et al., 2014). Note: The Beas River is in the top right-hand corner of both maps.

Until 2007 it was believed that Indus River dolphins were found only in the mainstem of the Indus River and were endemic to Pakistan (Braulik, 2006; Reeves & Leatherwood, 1994). Then in December 2007, a dolphin was sighted and photographed (by BRK) in the Beas River, near Harike barrage in India (Figure 1). A subsequent survey sighted a group of five dolphins in the village of Karmowala where local people confirmed that they saw dolphins regularly (Behera, Nawab & Rajkumar, 2008). Communities stated that their local name for the dolphin was "bhulan" which is the same name used for Indus River dolphins throughout their range in Pakistan. The Beas River is a small upstream tributary of the Indus River. It joins the Sutlej River near Harike, then crosses the international border into Pakistan and eventually joins the Indus mainstem above Guddu Barrage (Figure 1). There is no connection, either now, or for the past several thousand years, between the Beas River and the Ganges River system and therefore it is infeasible that the dolphins were Ganges River dolphins because there is no aquatic route for their dispersal or colonization from the Ganges into the Beas River (Clift et al., 2012). It was concluded that the dolphins in the Beas River were a previously undiscovered population of Indus River dolphins (Behera, Nawab & Rajkumar, 2008).

The Indus River dolphin population in the Beas River is isolated in a short section of river between Harike Barrage and Pong dam, and it is located more than 600 km from all other members of the species (Behera, Nawab & Rajkumar, 2008; Braulik et al., 2014). It is the only sub-population of Indus dolphins that is not in the Indus mainstem and that is not in Pakistan. As such, this remnant satellite population is important as it is the last population that persists in upstream habitat, in a small river, at the periphery of its range, and it may harbour important genetic diversity, and be subject to different threats from those affecting animals in the Indus mainstem. Remnant populations of many threatened species persist in isolation where there are pockets of good habitat or isolated refuge from threats, and these can be important insurance populations for species conservation (Ferguson, Bergerud & Ferguson, 1988; Grant, Curry & Grant, 2000).

This article reviews the status of Indus River dolphins in the Beas River, describes the threats they face and suggests priorities for conservation of this small but important population. The conservation challenges and management interventions described are relevant to conserving small, fragmented populations in many other habitats, and are especially relevant to the world's freshwater dolphins, as the rapid onset of hydropower dam construction in most river systems mean that small, fragmented river dolphin populations in heavily used rivers are becoming more and more common.

2 | METHODS

For the purpose of this review, we compiled and summarized all available published current and historical scientific papers from international and south Asian journals, unpublished reports, as well as newspaper and magazine articles in English, Hindi or Punjabi that relate to Indus dolphins in the Beas River.

3 | ECOLOGY OF THE BEAS RIVER

The Beas River is the smallest of the five rivers of Punjab that are the major tributaries of the Indus River (Figure 1). The river leaves the Himalayas and enters the plains near to Talwara in Hoshiarpur district of Indian Punjab State and then flows for approximately 200 km before its confluence with the Sutlej River just above Harike Barrage (Figure 2). The Chakki Khad River, which enters on the right bank at Mirthal, and Kali Bein which enters on the left bank upstream of Harike are the only notable tributaries of the Beas River on the plains. There are two major hydropower dams on the River in Himachal Pradesh: Pandoh dam and Pong dam and two barrages in Punjab: 52 Headworks and Harike Headworks (Figure 2). At Pandoh dam, water from the Beas is diverted into the Sutlej River through the Beas-Sutlej link canal, and at 52 Headworks water is diverted for irrigation and hydropower generation via the Shah Nehar canal (also known as Mukerian Hydel channel). Owing to upstream diversions, the Beas River is dewatered downstream of 52 Headworks until Mirthal, the site of the Chakki Khad River confluence and the place that the Ravi-Beas link canal re-joins the river. The Beas River finally regains substantial flow at Terkiana where water from the Shah Nehar canal re-joins the river, and thereafter, river flow is unrestricted until Harike Headworks.

The Beas River is primarily sand-bedded, although there are some gravel and cobble bars between 52 Headworks and Terkiana, and the main channel is broad, between 100 m and 900 m in width during monsoons. The average depth of the river is low, ranging from about 1.5–3.5 m during the dry season, rising by several metres during the monsoon floods (Kanwar, Khan & Pant, 2013). On average, snowmelt contributes approximately 35% to Beas River annual discharge (Kumar, Singh & Singh, 2010). As with most Himalayan fed rivers, discharge is vastly greater during the summer snowmelt and monsoon months of July to September than during the lean period of November to April. During the 3-year period from January 2009 to December 2011 the mean monthly inflow to Harike Barrage was between 200 and 425 $m^3 s^{-1}$ (7000 to 15,000 cusecs) in the dry season, rising to around 1400 $m^3 s^{-1}$ (50,000 cusecs) in the monsoon (WWF-India, 2016). The need for power generation takes priority over maintaining a consistent flow, and discharge can vary dramatically during a single day. The large number of tube wells accessing groundwater in most parts of Punjab mean that dry-season base flows for the Beas is likely to depend on surface inflows rather than aquifer contributions (Krishan et al., 2021). Owing to water diversions reducing discharge during the low-water season, and reduction of the magnitude of the summer floods, the Beas River has been gradually becoming narrower over time, which has led to encroachment by people into the floodplain. Analysis of satellite images taken of Harike wetland in mid-October 1989, 2000 and 2010 showed that over the past 21 years, the wetland has shrunk by 13% as a result of conversion of wetland to agricultural and barren land (Makwana & Thukral, 2014).

Several large towns, including Talwara, Mukerian, Dasuya, Tanda, Beas and Goindwal are present on the banks of the Beas River. There

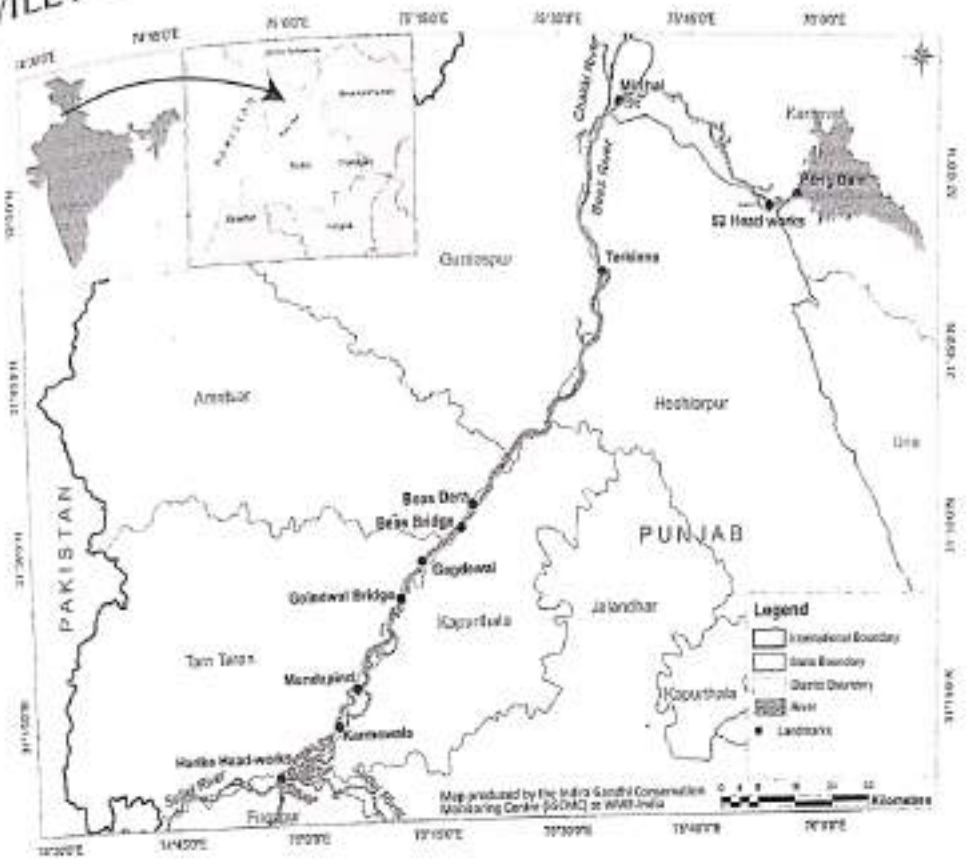

FIGURE 2 Map of the lower Beas River, India.

are at least 14 outfalls to the river that discharge effluents from paper and sugar distillery industries and untreated municipal waste from the towns (Nawab, Kanwar & Khan, 2012). The water quality in the Beas is classified by the Punjab Pollution Control Board as Class A after it leaves Pong dam, meaning it is suitable for drinking, and it remains so until it reaches Mukerian town where the water quality drops to Class C/B which means water can be drunk after treatment and disinfection. Water quality improves slightly in the lower reaches of the river rising to Class B ('good') (Source: Punjab Pollution Control Board). The Sutlej River has very low flow and extremely high concentrations of heavy metals, organic pollution and nutrients owing to toxic industrial pollution from Ludhiana; it is not fit for human consumption and is almost biologically dead in some reaches (Jindal & Sharma, 2011; Kaur et al., 2017; Nawab, Kanwar & Khan, 2012).

Harike wetland is a Ramsar site that covers an area of about 41 km^2, comprising the confluence of the Beas and Sutlej Rivers, and the Harike Barrage head pond. Smooth-coated otter (*Lutrogale perspicillata*) listed as Vulnerable and declining on the IUCN Red List occurs in the Beas (Khoo et al., 2021), and seven species of freshwater turtle (Indian softshell, Indian flapshell, narrow-headed softshell, spotted pond, crowned river, brown roofed and red-crowned roof turtles) also occur (WWF-India, 2018). Hog deer (*Axis porcinus*) are associated with swampy areas adjacent to the river, while reports of the occurrence of blue bull (*Boselaphus tragocamelus*) and wild pig (*Sus scrofa*) are largely from the agricultural fields and adjoining forest landscapes. More than 500 species of bird have been reported from the Beas-Sutlej area, and Harike hosts tens of thousands of water fowl, especially during migration periods (Dhami, 2018; Kanwar, Khan & Pant, 2013; Kanwar & Mishra, 2022). Ninety-four gharial (*Gavialis gangeticus*), Critically Endangered on the IUCN Red List, have been reintroduced to the Beas River, near Gagrewal, since 2017 (Kanwar, Kumar & Mishra, 2022).

In August 2017, the entire 185 km stretch of the Beas River from 52 Headworks to Harike Headworks was declared the Beas Conservation Reserve under the Wildlife Protection Act, 1972. Since declaration of the new reserve, commercial fishing and all sand mining from the river bed are now prohibited.

4 | STATUS OF DOLPHINS IN THE BEAS RIVER

4.1 | Historical distribution and abundance

The Beas River was clearly depicted as part of the range of the Indus dolphin on the species distribution map produced by John Anderson (Anderson, 1879) (Figure 1). Indus River dolphins were also documented to occur in the Beas River in the 1840s, when it was noted that 'before its junction with the Sutlej, the Beas is frequented with porpoises' (Anon., 1846). However, at the time of its re-discovery in 2007, there had been no documented Indus dolphin sightings in the Beas River, or anywhere else in India, since the 1870s.

a period of approximately 130 years. The Beas River is close to the periphery of the species' range and, compared with other rivers in the Indus system inhabited by dolphins, it is a small shallow river with low discharge. Therefore, even more than 150 years ago, before the barrage network was completed, it is likely that the Beas River never supported large numbers of Indus dolphins (Braulik et al., 2015).

It would have been impossible for dolphins to have colonized the Beas River from downstream by moving through the current irrigation barrages, because there are hundreds of kilometres of dry river (as a result of diversions) between Harike Barrage and the Indus River, and moving through barrage gates during the monsoon floods would be highly improbable owing to the gradient and water velocity (Braulik et al., 2014) (Figure 1). The dolphins in the Beas River were first isolated above Hussainiwala/Ferozepur Barrage when it was completed in 1927, and then were further isolated above the Harike Barrage (located only 30 km upstream) when its construction was completed in 1953 (see locations of these barrages in Figure 1). Thus, the dolphins have been isolated for a period of approximately 95 years (Behera, Nawab & Rajkumar, 2008; Braulik et al., 2014; WWF-India and Department of Forests, 2018). There is only limited information on Indus dolphin life history, but generation time is estimated at around 18 years (Braulik et al., 2022) so dolphins have been isolated in the Beas River for about five generations.

4.2 | Present distribution and abundance

Following the discovery of dolphins in the Beas River in 2007, community interviews were conducted along the length of the Ravi, Sutlej and Beas rivers to check that there were no additional undiscovered Indus River dolphin populations in India. During 2010 and 2011, 104 interviews were conducted with members of riparian communities along 470 km of the banks of the three rivers, using open-ended questionnaires and colour photographs of dolphins for reference. Results confirmed that dolphins were only present in Harike wildlife sanctuary and downstream of Beas Dera on the Beas River, and dolphins were absent from the Ravi and Sutlej Rivers (WWF-India, 2018) (Figure 2).

Since 2011, dolphin monitoring surveys have been conducted by a collaborative team from WWF-India and the Department of Forests and Wildlife Preservation, Punjab (DFWP) and 40 direct count surveys of dolphins have been conducted (Figure 3 and Table 1). Surveys used a rigid-hulled inflatable boat with three forward facing observers, moving downstream at a survey speed of 5–8 km h^{-1}. Resulting dolphin counts have ranged from zero to five, and generally were between two and four individuals (Figure 3). Calves were sighted in all years that surveys were conducted (WWF-India, 2018). A count of eight individuals was recorded from the river bank in April

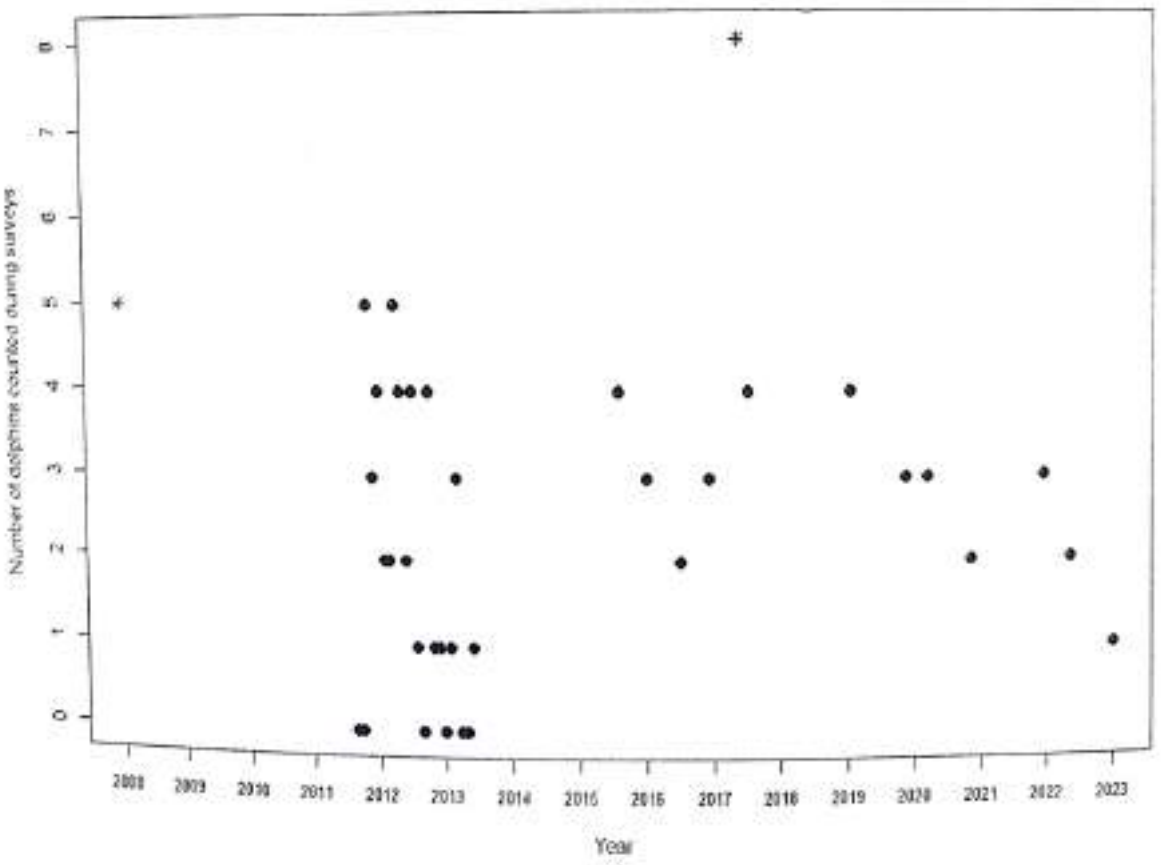

FIGURE 3 The number of Indus River dolphins counted during surveys of the Beas River, India from 2007 to 2022 (Table 1). * denotes counts made from the river bank that are not directly comparable with those from vessel-based surveys because of the different methods used.

TABLE 1 Indus River dolphin count data from the Beas River.

Year	Season	Start date	End date	Start location	End location	Number of observers, Forward + Rear	Survey speed (km/h)	Total distance surveyed (km)	Number of dolphins counted
2007	Winter	20-Dec-07	22-Dec-07	52 Headworks	Harike	N/A	N/A	N/A	5
2011	Summer	27-Apr-11	28-Apr-11	Beas Bridge	Harike	3	6–8	70	0
2011	Summer	22-May-11	23-May-11	Beas Bridge	Harike	3	6–8	69	0
2011	Summer	15-Jun-11	17-Jun-11	Beas Bridge	Harike	3	6–8	70	0
2011	Summer	28-Jul-11	29-Jul-11	Beas Bridge	Harike	3	6–8	70	0
2011	Summer	23-Aug-11	25-Aug-11	Beas Bridge	Harike	3	6–8	70	0
2011	Summer	25-Sep-11	25-Sep-11	Beas Bridge	Harike	3	6–8	70	0
2011	Winter	30-Oct-11	31-Oct-11	Beas Bridge	Harike	3	6–8	71	5
2011	Winter	28-Nov-11	29-Nov-11	Beas Bridge	Harike	3	6–8	71	3
2011	Winter	24-Dec-11	25-Dec-11	Beas Bridge	Harike	3	6–8	70	4
2012	Winter	27-Jan-12	28-Jan-12	Beas Bridge	Harike	3	6–8	70	2
2012	Winter	17-Feb-12	18-Feb-12	Beas Bridge	Harike	3	6–8	72	2
2012	Winter	18-Mar-12	19-Mar-12	Beas Bridge	Harike	3	6–8	72	5
2012	Summer	24-Apr-12	25-Apr-12	Beas Bridge	Harike	3	6–8	70	4
2012	Summer	24-May-12	25-May-12	Beas Bridge	Harike	3	6–8	70	2
2012	Summer	21-Jun-12	22-Jun-12	Beas Bridge	Harike	3	6–8	70	4
2012	Summer	30-Jul-12	31-Jul-12	Beas Bridge	Harike	3	6–8	70	1
2012	Summer	29-Aug-12	31-Aug-12	Beas Bridge	Harike	3	6–8	70	0
2012	Summer	29-Sep-12	30-Sep-12	Beas Bridge	Harike	3	6–8	70	4
2012	Winter	18-Oct-12	19-Oct-12	Beas Bridge	Harike	3	6–8	70	1
2012	Winter	25-Nov-12	26-Nov-12	Beas Bridge	Harike	3	6–8	70	1
2012	Winter	28-Dec-12	29-Dec-12	Beas Bridge	Harike	3	6–8	70	0
2013	Winter	27-Jan-13	28-Jan-13	Beas Bridge	Harike	3	6–8	69	1
2013	Winter	25-Feb-13	26-Feb-13	Beas Bridge	Harike	3	6–8	70	3
2013	Winter	26-Mar-13	27-Mar-13	Beas Bridge	Harike	3	6–8	70	0
2013	Summer	25-Apr-13	26-Apr-13	Beas Bridge	Harike	3	6–8	70	0
2013	Summer	21-May-13	22-May-13	Beas Bridge	Harike	3	6–8	70	1
2015	Summer	04-Jul-15	06-Jul-15	Beas Dhera	Harike	3 + 1	5–6	80	4
2015	Winter	02-Dec-15	04-Dec-15	Beas Dhera	Harike	3 + 1	5–6	80	3
2016	Summer	05-Jun-16	07-Jun-16	Beas Dhera	Harike	3 + 1	5–6	80	2
2016	Winter	16-Nov-16	19-Nov-16	Beas Dhera	Harike	3 + 1	5–6	80	3
2017*	Summer	07-Apr-17	07-Apr-17	Beas Dhera	Harike	8	N/A	80	8
2017	Summer	08-Jun-17	12-Jun-17	52 Headworks	Harike	3 + 1	5–6	185	4
2018	Winter	30-Nov-18	2-Dec-18	52 Headworks	Harike	3 + 1	5–6	185	4
2019	Winter	14-Oct-19	16-Oct-19	Terkiana	Harike	3 + 1	5–6	125	3
2020	Winter	22-02-20	25-02-20	Terkiana	Harike	3 + 1	5–6	125	3
2020	Winter	18-10-20	21-10-20	Beas Dhera	Harike	3 + 1	5–6	80	2
2021	Winter	28-11-21	02-12-21	Terkiana	Harike	3 + 1	6–8	125	3
2022	Summer	01-04-22	04-04-22	Terkiana	Harike	3 + 1	5–6	125	2
2022	Winter	27-11-22	01-12-22	Beas Dhera	Harike	3 + 1	5–6	80	1

*Surveys were conducted on foot, by using a vehicle to access the river bank and by boat.

2017 when the river was drained and counts were made of dolphins that were concentrated into the only deep pools of the river that remained at that exceptional time. Direct counts do not account for dolphins that are missed either because of perception bias (e.g., dolphins were at the surface in view but were missed by observers), or availability bias (e.g., dolphins were missed because

...ins were underwater and therefore were not available to be detected by observers) and counts are therefore negatively biased by unknown amounts (Smith & Reeves, 2000b). The dolphin counts recorded on the Beas River therefore represent a minimum dolphin population abundance, and not an absolute abundance, which may be higher by a small amount.

To be able to use the dolphin count data as an index to detect trends in abundance over time there needs to have been strong consistency in the methods used throughout the period sampled. Although the survey methods on the Beas have been similar, it is not certain that they were rigorously applied. In view of the need to be consistent and generate comparable datasets, and especially given the small number of animals, variability in the counts generated, and lack of confidence intervals for the counts, interpretation of the data to infer trends should be made extremely cautiously to avoid making erroneous conclusions (type 1 or type 2 errors) (Gerrodette, 1987; Taylor & Gerrodette, 1993). During several surveys in 2011 and 2012, five individual dolphins were recorded. During surveys conducted between 2013 and 2018, the highest dolphin count documented was four individuals. Since 2018, the recorded count has never exceeded three dolphins. These count data suggest (although not definitively), a potential decline in the dolphin population over time (Figure 3). Statistical methods for estimating or predicting population trends that incorporate information on habitat change have been used for some cetaceans, but are often unlikely to detect early signs of population decline before a critical level is reached (Boyd & Punt, 2021; Huang et al., 2012) and with counts as small as those on the Beas River, modelling of trends in abundance is not likely to provide very accurate results.

Dolphin sighting locations since 2015 (no dolphin locations are available for surveys before that date) shows that dolphins are found principally downstream of Beas town; sightings upstream of Beas town are rare (Khan & Pant, 2014; Nawab, Kanwar & Khan, 2012). There are two hotspots of dolphin occurrence separated by approximately 15 km: the first area is in the vicinity of Verowal and Gagrewal and the second further downstream near Karmowala and Munclapind (Figures 2 and 4). Of the two hotspots, Karmowala and Munclapind is the mostly frequently used by the dolphin. Since 2018, there has been only one dolphin sighting in the Verowal and Gagrewal hotspot, suggesting that this habitat is no longer used as frequently, and a possible decline or shift in range has occurred (Figure 4).

It is important to note, for clarity, that there is a previously published abundance estimate of 35 ± 19 Indus dolphins in the Beas River, that was generated using distance sampling methods from multiple surveys that directly counted one to six animals (Khan, 2016). As discussed by many authors (Braulik et al., 2012; Richman et al., 2014; Smith & Reeves, 2000b), distance sampling is extremely challenging to apply to dolphins in South Asian rivers because almost all the model assumptions are violated. Distance sampling involves calculation of the effective strip width, which is the area for which density, and then abundance is determined (Buckland et al., 2001). The width of South Asian rivers changes constantly over space and time, and if care is not taken when measuring angle and distance to dolphins from the normally winding transect line, it is possible, as happened with the analysis by Khan (2016), for the model to substantially over-estimate effective strip width such that it is considerably wider than the river itself, thereby resulting in an overestimate of abundance. Distance sampling assumes that the dolphins are distributed randomly in the study area and with respect to the transect line, but in a shallow river like the Beas, both the dolphins and the survey boat are concentrated into the deepest channel which is the only navigable part of the river. As a consequence, density on the trackline will be higher than elsewhere in the study area, and failure to account for this by (for example) habitat stratification such as that applied by Zhao et al. (2008) on the Yangtze River, is also likely to lead to an over-estimate of abundance. The lack of consideration of these violations means that 35 individuals is a large over-estimate of dolphin abundance in the Beas River and should not be used as the basis for management or monitoring.

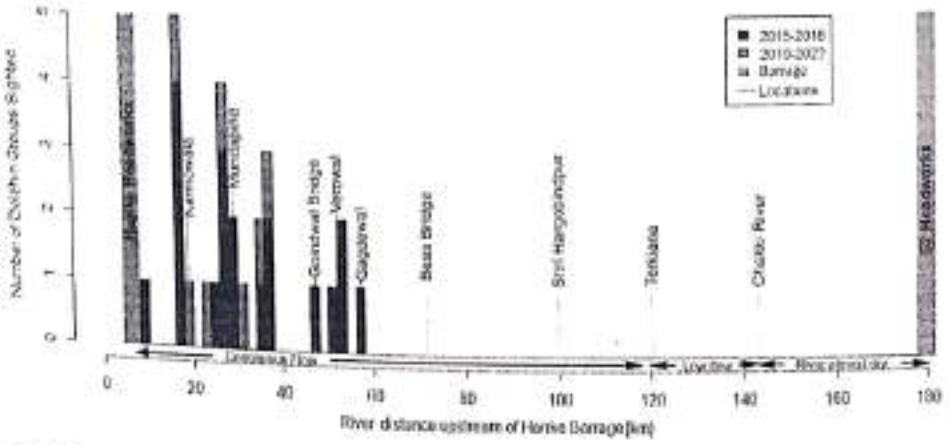

FIGURE 4 The number and distribution of Indus River dolphin groups sighted during surveys between Harike Headworks and 52 Headworks conducted between 2015 and 2022 (12 surveys, and 26 sightings) illustrating the portions of the habitat regularly used by dolphins, and areas where dolphins are absent.

5 | THREATS TO DOLPHINS IN THE BEAS RIVER

5.1 | Habitat fragmentation by dams

There is no possibility at present of the dolphin population in the Beas River becoming reconnected with dolphin populations that remain in the Indus River as there are numerous barrages and dry rivers that separate them, so they are, and will remain, completely isolated. Reconstruction of the historical pattern of range decline for the Indus dolphin showed that upstream populations such as that in the Beas River are the most vulnerable to extinction, disappearing more quickly after isolation above a barrage than those downstream (Aisha et al., 2017; Braulik et al., 2014). Modelled predictions based on the historical temporal and spatial pattern of range decline, showed that Indus dolphins are most likely to disappear in the future from locations with low river discharge located close to the range periphery, which is exactly the conditions in the Beas River (Braulik et al., 2014). Barrages isolate dolphins into small habitat fragments, prevent dispersal of dolphins to other areas, prevent seasonal migration, or movements to avoid environmental extremes (either extreme drought or extreme flood conditions). Small habitat fragments can only support small populations, and these are likely to be less resilient to change and more prone to extinction (Purvis et al., 2000; Quinn & Hastings, 1987; Schaffer & Samson, 1985).

5.2 | Small populations

The dolphin population in the Beas River is precariously small, and at present is likely to number fewer than six individuals. Small populations are vulnerable both to inbreeding depression and the impact of random environmental or demographic events (Purvis, Jones & Mace, 2000; Reed, 2004; Schaffer & Samson, 1985). The Indus dolphin has one of the lowest indices of mitochondrial genetic diversity of all cetaceans (Braulik et al., 2015), and as the Beas River population has been isolated from gene flow for the past 90+ years we predict that the population will have become even more genetically depauperate as a result of permanently small numbers of breeding individuals, inbreeding, genetic drift and the absence of genetic input from immigration (Brook et al., 2002; Grant, Curry & Grant, 2000).

5.3 | Hydrological alterations

There has been considerable anthropogenic hydrological changes on the Beas; the river is virtually dewatered between 52 Headworks and the Chakki Khad confluence, and this 30 km of river is therefore no longer dolphin habitat. The summer flood pulse that maintains the channel and floodplain, and is the spawning trigger for many aquatic species, has been depleted by upstream diversions and dam impoundments, as have lean-season flows. There are considerable daily fluctuations in discharge, especially where the canals rejoin the Beas around Terkiana, caused by highly variable releases from Pong hydropower dam. Extreme fluctuations in discharge associated with variable releases linked to hydropower generation have a number of environmental impacts including flushing invertebrates and fish downstream, reduced benthic invertebrate species richness and biomass, stranding of fish, and reduced fish spawning and rearing success (Bunn & Arthington, 2002; Young, Cech & Thompson, 2011). It is probable that the lack of dolphin sightings in the middle and upper reaches of the Beas River, above Beas town, may result from the reduced and highly variable daily flows in these locations.

In 2017 and 2018 there were two catastrophic environmental crises on the Beas River. Starting on 25 March, 2017 the Department of Irrigation, Punjab undertook desilting maintenance works on Harike Barrage to increase the water holding capacity of the headpond. To facilitate this, the release of water from Pong dam was stopped completely for 25 days.[5] The Beas River ceased to flow and only pools remained. Harike wetland, a Ramsar site, was reduced to a marsh (Figure 5). There was major mortality of aquatic organisms, and many tonnes of fish died. River dolphins and fish were confined to isolated deep pools, which were then subjected to intense fishing pressure. The following year a second severe event occurred on 24–25 March 2018, when water releases from Pong dam were drastically reduced from 340 to 57 $m^3 s^{-1}$ (12,000 to 2000 cusecs). The river was barely flowing for several days, the width, depth and velocity of the channel were severely reduced, exposing much of the river bed and fishing effort and pollutants were concentrated in the remaining pools. Despite the severity of these catastrophic environmental events, no dolphin mortalities were reported during or immediately afterwards, although it is possible that they occurred but were unreported or undetected.

Mombiarch et al. (2021) predicted extinction risk levels for this dolphin population under different best and worst case scenarios of climate change and threat, and showed that the frequency of low flows released from Pong dam may increase under some future climate change scenarios. This is likely to cause significant adverse effects on the dolphin population in the Beas; thus, establishment of ecologically informed reservoir releases is necessary to enhance the probability of dolphin survival.

5.4 | Fisheries bycatch

The total prohibition on commercial fishing that accompanied the designation of the new Beas Conservation Reserve in 2017 has substantially reduced the risk from fishing intensity and bycatch but small numbers (several tens) of subsistence fishers from six to eight villages continue to fish. During dolphin surveys conducted in 2018, after the commercial fishing ban, only a single deployed fishing net was observed within the entire 120 km from Terkiana to Harike, in opposed to surveys in 2010 which reported large numbers of nets especially around Beas town (Khan & Pant, 2014; Nawab, Kanwar &

[5] https://timesofindia.indiatimes.com/city/chandigarh/intensive-hunt-on-for-missing-indus-dolphin/articleshow/73005263.cms

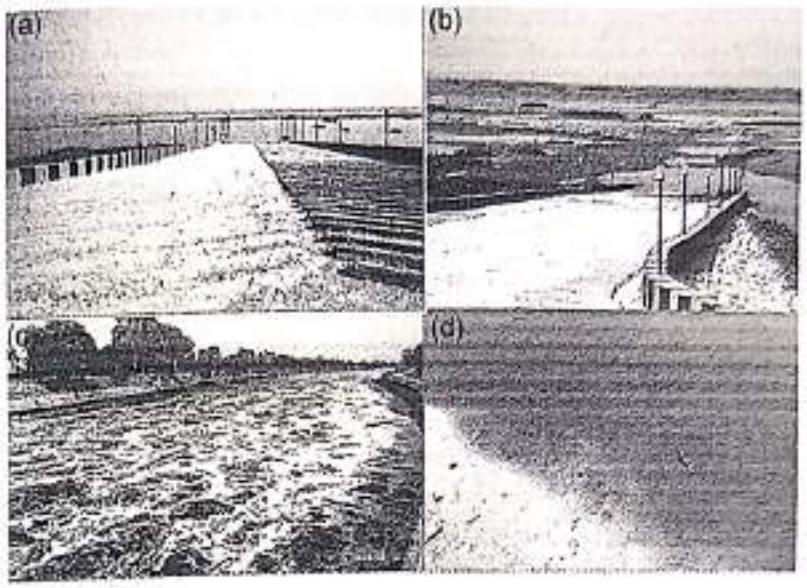

FIGURE 5 (a and b) View of the Beas River from the left marginal bund above Harike Barrage before and during dewatering of the river in March 2017. (c and d) Red river water following Beas River molasses spill in 2018. Photo credit: Gitanjali Kanwar.

Khan, 2012). Through an extensive network of recently engaged riparian community members, known as 'dolphin mitras', informal information has been gathered regarding the mortality of dolphins in recent years. These informal interactions indicated that at least two dolphins, including a sub-adult and a calf, died recently, probably caused by entanglement in fishing nets. To avoid potential legal action under the Wildlife Protection Act, 1972, which imposes fines or imprisonment for their killing, the carcasses of the dolphins were disposed of rapidly. One gharial from the reintroduced population in the Beas Conservation Reserve died by entanglement in fishing gear in 2019, suggesting that bycatch risk, although reduced significantly, is not eliminated.

Mortality in fishing nets is the largest threat to cetaceans globally, with estimates of a minimum of 300,000 animals dying per year (Read, Drinker & Northridge, 2006). Fisheries bycatch was one of the main factors involved in the extinction of the Yangtze River dolphin (*Lipotes vexillifer*) and is also pushing many other cetacean populations towards extinction (Brownell et al., 2019; Northridge et al., 2017; Read, Drinker & Northridge, 2006). River dolphins and fishers tend to utilize the same areas of rivers, and it was shown in the Ganga River that as flow declined dolphins remained in their preferred deep pool habitat but there was an increased overlap with fisheries (Kelkar et al., 2010; Samad, Kelkar & Krishnaswamy, 2022). It is very likely that bycatch was a significant threat to dolphins in the Beas River before the fishing ban, when fishing was more widespread and intense and often involved migrant labourers from other parts of India. Fisher interviews in Punjab have not obtained any suggestion that dolphin meat or oil is used now or in the past.

5.5 | Pollution

There are continuous effluent discharges from sugar and paper mills to the river, run off from irrigated agricultural fields containing organochlorines, as well as untreated sewage outfalls. Pollutant loads are lower in the Beas River than the highly toxic neighbouring Sutlej River but it is still likely that animals are exposed to moderate levels of contaminants that might be sufficient to have health impacts (Reijnders et al., 2018).

On 16 and 17 May 2018, there was a massive spill of more than 75,000 kilolitres of molasses into the Beas River from the Chadha sugar mills located near the village of Kiri Afgana, approximately 10 km west of Tarkiana, in Gurdaspur District of Punjab.[2] The molasses turned the river red and made the water highly acidic and deoxygenated for more than 120 km downstream for at least 3 days (Figure 5). At least 31 t of fish were killed by the event, as well as freshwater turtles, amphibians and many other aquatic species. Sugar mill effluents have very high biological and chemical oxygen demand, and high levels of hydrochloric acid, sulphur dioxide and heavy metals (Qureshi et al., 2015; Salequzzaman et al., 2008). Dead fishes were collected by the riparian communities and were sold in the market and eaten. No dead dolphins were recovered after this event; however, it is still possible that animals died that were not discovered. Despite this, there is concern about the long-term impacts of the molasses spill on the dolphins and on the rest of the river ecosystem, including the possibility of chronic health effects associated with a potentially reduced and contaminated prey-base.

5.6 | River bed mining

Removal of river cobbles and sand from the banks, bed and floodplain occurs in many places along the course of the Beas River. This will eventually change the pattern of erosion, lower the river bed and alter

[2]https://timesofindia.indiatimes.com/city/amritsar/molasses-leakage-kills-thousands-of-fishes/articleshow/64209879.cms.

the morphology, hydrology and biological environment of the river which changes and disturbs the habitat and prey available for dolphins (Pusmri et al., 2014).

5.7 | Movement through barrages and into canals

There is increasing evidence that Indus and Ganges River dolphins move through barrage gates at certain times of the year (Braulik et al., 2015). This was definitively documented when a radio-tagged Indus dolphin moved through Sukkur Barrage in Pakistan three times in the space of a week (Tonay et al., 2009). In addition, in Sindh province in Pakistan and in Uttar Pradesh state in India (and possibly other places), large numbers of dolphins become trapped in irrigation canals after passing through canal regulator gates, which are similar in structure and function to barrage gates (Aisha et al., 2017; Singh et al., 2023). Despite extensive monitoring downstream of Harike by community members, no dolphins have been reported moving through the barrage, or in the river downstream. The river flow downstream is seriously depleted and if animals did pass through, perhaps when gates are open during the monsoon floods, they would be lost to the Beas River dolphin population forever and would probably die quickly because of a lack of water. There are no records of dolphins entering the canals that originate at Harike Barrage, but it is possible this occurs occasionally but has been undetected. The loss of only small numbers of animals through the barrage or into canals could easily be sufficient to result in the extirpation of this very small population.

6 | MANAGEMENT AND RESEARCH PRIORITIES

Indus River dolphins are recognized as a priority species by the Indian Federal and Provincial Governments, and as such there is a commitment to their conservation. However, the Beas dolphin population is so small that the loss of even one individual could be sufficient to prevent population recovery or to contribute to its extirpation. In such a situation every single individual counts. For the dolphin population to persist, or to begin to recover, there needs to be zero mortality from human related causes. The following conservation and research interventions describe an approach with that ultimate aim. The proposed actions need multi-stakeholder participation and a strategy that includes habitat management, research, monitoring, advocacy and environmental education.

6.1 | Fisheries bycatch

Efforts to mitigate fisheries bycatch and protect dolphins are continuing in the Beas River, but the complexity of the issue remains together with challenges in finding solutions. It is probable that accidental entanglement in gillnets from subsistence fishers is the greatest threat to the remaining Indus dolphins. To improve the chances of population persistence it is imperative that all fishing with gillnets is prevented from the core dolphin habitat, the 50 km stretch of the River Beas, starting from Goindwal Sahib to Harike Wildlife Sanctuary. Given the vulnerability of the dolphin population, creating fishing free zones in the high-use habitat is important, but removing livelihoods for local communities would require solutions such as alternative income options. Working with fishers to explore solutions and find options for using methods that are less harmful to dolphins, such as deploying nets away from the main channel, trialling deterrent devices such as pingers, not leaving nets unattended for long periods, and releasing animals that become entangled is important. Public awareness and education also contribute to the conservation of dolphins and there is a need to raise awareness continually among fishing communities along the Beas River and engage them in finding solutions that balance both ecological and economic needs. However, with so few dolphins remaining the solutions and action needs to be taken with the highest urgency.

6.2 | Environmental flows

The series of events in which the Beas River stopped flowing completely (2017) and was reduced to only about 50 $m^3 s^{-1}$ (2000 cusecs) (2018) created an ecological crisis that must not be repeated. Although there is extensive debate about how much discharge needs to be maintained in managed rivers for river dolphins to be able to survive, the determination of this figure requires extensive habitat modelling and dolphin behavioural studies over many years, and for such a small population may be virtually impossible to determine with confidence. However, it is clear that extremely low flows below 60 $m^3 s^{-1}$ (2000 cusecs) such as occurred in 2018, are insufficient to support dolphins and discharge this low needs to be avoided at all costs. Hydrological and extinction risk modelling conducted by Momblanch et al. (2021) showed that more than twice this amount is the minimum amount of water that would need to be released from Pong dam to ensure habitat availability in the Beas under all future climate change scenarios. A comprehensive, multi-disciplinary effort initiated by the Punjab Government is under way to provide scientifically based guidance to irrigation managers on the levels of discharge required to sustain a healthy Beas River ecosystem, and subsequent application of those recommendations is essential.

6.3 | Habitat

There is a lack of information on which features of the habitat are important for the dolphins in the Beas and why dolphins persistently occur in the same stretches of river. It is likely that, similar to elsewhere in their range, the dolphins are selecting pools with high volume especially when flow is limited during the low water season (Braulik et al., 2012). However, hydrological alterations that disproportionately affect the upper reaches may also be reducing

available habitat and limiting which habitat can be used. Increasing understanding of river hydrology and morphology throughout the river would help to show why certain habitat is not used at present and also which habitat features dolphins are using and why.

6.4 | Pollution control

River dolphins are likely to be exposed to some of the highest pollution levels of all cetaceans, because many rivers run through highly populated and industrialized areas of the developing world and receive numerous untreated discharges. However, rivers have limited dilution capacity, and, as in the case for the Beas River, the dolphins have limited options available to them to move away from polluted areas. At high levels, many heavy metals and organochlorines can cause adverse health problems including impaired reproduction and increased susceptibility to disease (Reijnders et al., 2018). Reducing the industrial pollutant discharge into the Beas is central to a future recovery plan for Indus dolphin and, most importantly, averting repeated catastrophic spills that have the capacity to wipe out the entire population in a single event is essential. The dolphins are exposed to extreme pollution in the Sutlej River because it discharges into Harike wetland. If the Sutlej were to be rejuvenated into a healthy river, it could be recolonized by dolphins from the Beas which would then have more than twice the currently available habitat.

6.5 | Canal and barrage monitoring

Evidence from other areas suggests that dolphins may enter canals or pass through Harike Barrage. It is essential, therefore, that there is regular monitoring of the canals and the river downstream of the barrage to detect any trapped animals so that they can be rescued and returned to the main population.

6.6 | Future population monitoring strategy

Continued monitoring of the dolphin population is important to provide an indication of population trends, to show changes in distribution and to monitor the presence of calves. Given the extremely small number of animals present, estimating abundance with confidence is challenging. This difficulty is enhanced because photo-identification of individuals based on unique marks on dorsal fins, which is applied to many other dolphin species, is not possible for Indus dolphins, as they have only a very small dorsal nub, and surface too briefly and unpredictably to be able to obtain good quality photographs (Braulik et al., 2015). It is therefore recommended that in addition to continuing direct counts, tandem surveys (Braulik et al., 2012) or paired visual and acoustic surveys (Richman et al., 2014), should be conducted to estimate abundance with a measure of precision. It is important to note that double platform surveys have also been used effectively to survey Ganges River dolphins (Kelkar et al., 2010; Smith et al., 2006), but the Beas River is relatively small and shallow, navigable only by small vessels, so this survey approach is likely to be practically challenging to implement in this location because boats are too small to accomodate two teams that could survey independently.

6.7 | Mortality monitoring

The conduct of necropsies on dead animals by a trained veterinarian can provide a wealth of information on health, contaminant levels, reproductive status and threats (Moore, Simeone & Brownell, 2018). However, with no freshly dead dolphins from the Beas River, this avenue of information acquisition has not been available to date. Given the small size of the dolphin population, the number of mortalities will inevitably be very small. It is a priority when working with communities to stress the importance of reporting mortalities so that maximum scientific use can be made from these rare events. Even only one genetic sample from a single stranded individual could yield insight as to how vulnerable this small group of animals is to inbreeding depression (Morin et al., 2020).

6.8 | Community-based conservation

Indus dolphins in the Beas River occur with high frequency in short, relatively accessible, stretches of river near to villages and there is the potential for those villages to become the custodians of the dolphin. With support and education, it is becoming possible to empower local communities to be responsible for monitoring their local pools, recording dolphin presence and absence on a daily basis and watching for, and reporting, problems. Recent awareness-raising activities in 30 riparian villages have created 16 'dolphin mitras' (meaning 'dolphin friends') for monitoring, education and awareness of the recently released gharial into the Beas together with conservation of river dolphins because both are present in the same section of the river, are exposed to many of the same threats, and benefited by similar actions. Sightings are compiled and shared with local government wildlife departments. Reflecting its relatively high local profile, in February 2019 the Indus dolphin was made the State Aquatic Animal of Punjab which has brought much needed local and regional focus to the population.

6.9 | Conservation translocation

Supplementing the dolphin population in the Beas River in India, with new individuals translocated from larger, healthy populations from elsewhere in the species range (in Pakistan), could really change the outlook for this small remnant group of animals and is an important management option to consider. The addition of even a small number of carefully selected mature individuals might be sufficient to allow the population to begin to recover. For example, if the Beas dolphins are severely inbred, which seems probable, conservation translocations might result in genetic rescue of the population

...nham, 2015; Ralls et al., 2018). The Indus dolphin populations in Pakistan appear to be increasing in abundance (Aisha et al., 2017) and could probably sustain a small number of individuals being made available for conservation translocations, and, importantly, Indus dolphins are regularly available with fairly low risk because of annual rescues of animals that have become trapped in irrigation canals. Before considering translocation, a number of important steps would need to be fulfilled. It would be necessary to test translocations over short distances within Pakistan, gain experience, perfect the methodology and monitor survival of individuals in habitat known to be viable for dolphins. A very careful scrutiny of the threats, habitat quality and safeguarding measures in the Beas River would be required prior to any translocation, an understanding of the factors that have caused the decline of dolphin in the Beas is needed, and all major threats such as fishing and the environmental catastrophes that occurred in the recent past, be reliably eliminated.

7 | CONCLUSIONS

The presence of Indus dolphins in the Beas River, India, is remarkable as Indus dolphins have disappeared from so much of their nearby historical habitat. The first 15 years of work from discovery of dolphins in the Beas River until the present have focused primarily on understanding the size and distribution of this important, isolated, river dolphin population as well as on documenting and managing threats. The limited information on population size generated to date demonstrates that the remaining population is critically small, and that almost certainly it is not increasing and it may well be declining. The fact that dolphins have persisted for almost 100 years in such a short section of quite marginal habitat is unexpected, and demonstrates considerable resilience; however, such small numbers of remaining individuals inevitably raise concerns and questions about future viability. Regular sightings of calves since 2012, and the presence of a very small calf observed in June 2022, shows that mature males and females are still present, and although reproduction continues to occur, despite the high level of concern, all hope of recovery is not lost. The development of a government-led Indus dolphin conservation strategy, the declaration of the Beas River as a Conservation Reserve, recent strengthening of legal protection to the dolphins and restrictions on commercial fishing and sand mining, are major accomplishments and significant positive steps that have helped consolidate action and remove important threats from dolphin habitat. Of highest priority are focused efforts to ensure the complete removal of gillnets from dolphin habitat, as well as action to prevent a recurrence of the environmental catastrophes that occurred on the river in 2017 and 2018 that seriously jeopardized the future of this precarious dolphin population. An ecosystem approach to management of the habitat is essential, and interventions on behalf of the dolphins will also have a positive impact on the reintroduced gharial, otters, water birds and other components of the Beas ecosystem.

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BRK was one of the first to discover the dolphins. SKB led the team that confirmed the species identification. SKB, AN, SK and GK conducted the fieldwork. GB, and GK analysed the data. GB and GK designed and wrote the article, and all authors reviewed and edited it. Suresh Babu, Director of River Basins and Water Policy, WWF-India initiated this entire manuscript, reviewed the manuscript multiple times, and made a valuable contribution. Sincere thanks to Mr. R.K. Luna, Mr Gurbaz Singh, Mr. Dhirendran Singh, Dr. Kuldip Kumar, Mr. R.K.Mishra, Mr. Vidya Bhushan Kumar all former Chief Wildlife Wardens of Punjab, and Mr. Dharminder Sharma, Chief Wildlife Warden, for extensive support for this work since its inception. Mr. Ravi Singh, Secretary General & CEO and Ms. Sejal Worah, Programme Director, both with WWF-India provided valuable guidance and support for the project. We acknowledge former Director of Freshwater and Wetlands at WWF-India, Parikshit Gautam, for his role in starting this work. We greatly appreciate the guidance of Dr B. C. Chaudhury and Neeraj Gupta. Dr. G. Areendran and Krishna Raj developed Figure 2. We acknowledge funding received from the Nokia Corporation, Finland, DCB Bank and WWF. Helpful reviews were provided by Gianna Minton and Barbara Taylor as well as one anonymous reviewer.

CONFLICT OF INTEREST

The authors have no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in the supporting information of this article.

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Annexure-R5 28

Attested

Superintendent
O/o PCCF (HAG+)
and CWLW, Punjab,
S.A.S. Nagar

30
Annexure-R6

Minutes of the meeting of Punjab State Wildlife Board held on 20.07.2023 under the Chairmanship of the Hon'ble Chief Minister, Punjab at his office room.

The meeting of Punjab State Wildlife Board was held on 20.07.2023 under the chairmanship of Hon'ble Chief Minister, Punjab. The list of participants is placed at **Annexure-I**.

At the outset, Financial Commissioner (Forests) welcomed the Chief Minister, Punjab and other members of Board. Then, the Financial Commissioner informed that the last meeting of The Punjab State Wildlife Board was held on 01.02.2019.

Financial Commissioner (Forests) presented the agenda of the meeting before the board as follows:

Item No: 3.1 **Minutes of the meeting of the Punjab State Wildlife Board held on 1.2.2019.**

Financial Commissioner (Forests) informed that the minutes of the last meeting of State Board for Wildlife was held on 1.2.2019. The minutes were circulated to all the members and no comments were received from them. Hence, the minutes stand confirmed.

Item No: 3.2 **Fixing of Quorum of the State Board for Wildlife**

Financial Commissioner (Forests) informed the Board that for the smooth running of wildlife activities in the state, the State Wildlife Board has been constituted by the State Government as per Section 6 of the Wildlife (Protection) Act, 1972 vide Notification No. 33/01/2022/FH-5/2342 dated 2.6.2022. As per Section 7 of the said Act, the State Wildlife Board is empowered to regulate the quorum including the functioning of the Board.

In view of above, the Board was requested to fix the quorum of State Board for Wildlife including Chairman/Vice-Chairman and any other seven members.

After deliberation, Board approved the above proposal.

Item No: 3.3 Constitution of Standing Committee of State Board for Wildlife.

Financial Commissioner (Forests) informed that the Wild Life (Protection) Act, 1972 has been amended recently in 2022 and amendments have come into force from 1st April 2023 and under Section 6A of the Wildlife (Protection) amendment Act, 2022, a provision has been made to constitute a Standing Committee of State Board for Wildlife.

In light of the above, Board was requested to constitute a Standing Committee. After deliberation of the proposal, approval was given to constitute Standing committee comprising of Vice Chairman, Member Secretary and five other members.

Item no: 3.4 Delegating the powers of the State Board for Wildlife.

Financial Commissioner (Forests) informed that for effective management of Wildlife activities, immediate approval of State Board for Wildlife is required for certain developmental activities which are to be carried out in Conservation Reserves and Community Reserves. As many issues are of urgent nature requiring immediate decision and may remain pending due to non-meeting of the State Board for Wildlife. The Hon'ble Board was informed that under Section 6A(1) of the Wildlife (Protection) Amendment Act 2022, the State Board for Wildlife is empowered to delegate its duties and powers to the Standing Committee (under Hon'ble Cabinet Minister, Forest and Wildlife Preservation).

Keeping in view the above, the Board was requested that the matters of urgent nature which require immediate consideration/ approval of State Board for Wildlife, should be delegated to the Standing Committee for considering and approving the same.

After deliberation, the Board approved the above proposal.

Item No: 3.5 **Regarding giving approval regarding various projects to be conducted by the National Highways Authority of India in the state.**

Item No:3.5.1 **Delhi-Amritsar-Katra Expressway – Junction of Jalandhar-Kapurthala Road to Khojewal Village near Amritsar-Mehta Shri Hargobindpur Junction Tank Km 319+400 to Km 362+420 Bharatmala Project in Punjab State under EPC Mode –Regarding approval of GAD (General Arrangement Drawing) submitted for construction of major bridge at km 354+698 on river Beas.**

The Board was informed by the Financial Commissioner (Forests) that from km 135+056 to 397+712 km of Delhi-Katra Expressway which includes green field connectivity to Amritsar (starting at km 306+000 of Delhi-Katra Expressway and ending at Amritsar-Ajnala Road NH354 for a total length of 99 km) to Punjab section, National Highways Authority of India, PIU, Ludhiana needed permission for construction of four bridges in Beas river Conservation Reserve and Kali Bein Conservation Reserve as part of development. Following the approval of Ludhiana's project proposal by the State Board for Wildlife, as per the recommendations given by the Standing Committee of the National Board for Wildlife, the Wildlife Mitigation Plan was approved by the Office of the Chief Wildlife Warden. But now the National Highways Authority of India has sought permission to change the span arrangement while submitting the general arrangement drawing. Now they want to make the span arrangement 22×37.5=825 meters instead of 8×100=800 meters.

In this regard, the Board was informed by the Chief Wildlife Warden, Punjab that as per the guidelines of the Government of India, the approval for the projects to be carried out in Conservation Reserve is no longer required to be considered by the Standing Committee of the National Board for Wildlife because the State Government has been authorized

After deliberation, Board approved the proposed span arrangement as per General Arrangement Drawing regarding change of span as submitted by National Highways Authority of India.

Item No: 3.5.2 Bridge over river Beas for widening and improvement of existing 2 lane to 4 lane from Ghuman (Ch: 54+000) to Pandori village (Ch:85+500) section of NH-503A in Punjab State

The Board was informed by Financial Commissioner (Forests) that Project NH503A from Ghuman (Ch: 54+000) to Pandori village (Ch:85+500) section for widening and improving existing 2 lanes to 4 lanes and relates to construction of bridge over existing NH-44 proposed Tanda Bypass in Punjab State (design length 2.350 km to end of Tanda Hoshiarpur Road Proposed project passes through Gurdaspur and Hoshiarpur districts in Punjab State. Total length of proposed project is 33.85 km and the proposed alignment is passing through the Beas River Conservation Reserve (Ch: 66-918 to Ch: 67-617) in Hoshiarpur District of Punjab State.

Since this project is passing through the Conservation Reserve, according to the guidelines of the Government of India, the approval for the project to be carried out in Conservation Reserve is no longer required to be considered by the Standing Committee of the National Board for Wildlife because the State Government has been authorized.

After considering the above proposal, Board approved this project.

Item No: 3.6 Concrete Lining of Kotli Distributary RD 8850-11800 (900 m) and Kakrala Minor RD 0-6000 (1829.20 m) – Construction of Head Regulator of Kakrala Minor in Bir Dosanjh Wildlife Sanctuary, Nabha, Patiala.

Financial Commissioner (Forests) informed the Board that concrete lining of Kotli Distributory with 10% enhanced capacity from RD 8850-11800 (900 Mtr.), Kakrala Minor RD 0-

6000 (1829.20 Mtr.) – construction of Head regulator of Kakrala Minor in Bir Dosanjh Wildlife Sanctuary including project proposal regarding Wildlife Mitigation-cum-Conservation Plan of ₹26.52 lakh has been submitted. The Board was informed by the Chief Wildlife Warden, Punjab that the project being inside the Bir Bhadson Wildlife Sanctuary, as per the guidelines of the Government of India, Ministry of Forests and Environment, New Delhi dated 19.12.2012, the proposal is required to be sent to Standing Committee of National Board for Wildlife after getting approval from the State Board for Wildlife.

Agreeing to this proposal, Board approved to send this project proposal to the Standing Committee of National Board for Wildlife.

Item No: 3.7 Regarding granting permission to hunt wild animals within the Air Force Station.

The Board was informed by the Financial Commissioner (Forests) that the notification for issuing hunting permits at Air Force Stations to prevent damage to aircraft, equipment and employees of Air Force by wild boars and Blue Bulls has been issued.

It was brought to the notice of the Board that this is only for the information of the board. So board members took notice of it.

Item No: 3.8 Regarding limited hunting of wild animals.

The Board was informed by the Chief Wildlife Warden, Punjab that the Divisional Forest Officers and Sub-Divisional Officers (Civil) were authorized by various notifications to issue the permit for the limited hunting of wild animals (Wild boar and Blue bull) in the state to prevent devastation of farmers' crops. This limited hunting policy is applicable in the entire state except Abohar and Fazilka. But now, it has come to the notice of the Forest and Wildlife Protection Department that illegal hunting of wild animals is being done by these hunters under the guise of this permit and two such cases have come to light in Ropar Wildlife Division where two poachers killed two leopards by guns even though the land of these hunters is not even close to this

area. Apart from this, in another case, barking deer and wild boar were hunted inside the forest area by these hunters.

The Inspector General of Police (Crime), Punjab requested that a training to the Police Department regarding the Wildlife (Protection) Act should be given to educate them regarding wildlife crime issues & latest amendments to the Act. In this regard, Chief Wildlife Warden, Punjab assured that this training to the police department will be given in near future.

After consideration by the Board, the following proposed conditions were approved:

Series No:	Prior Conditions	Proposed Conditions
1.	Permit for limited hunting to the aggrieved farmer or the hunter authorized by him.	The permit for limited hunting should be given only to the aggrieved farmer suffering from loss of crops and not to any other person or hunter.
2.	The hunted animal can be taken by the hunter for his own use.	The hunted animal will be the Government property and not of the hunter.
3.	Use 7mm caliber rifle or .12 bore gun for hunting.	Use of only .315 bore for hunting shall be permitted.

Item No: 3.9 Regarding ban on fishing.

It was brought to the notice of the Board by the Chief Wildlife Warden, Punjab that the plan for release of gharials in Beas Conservation Reserve was drawn up in the year 2017 under which 94 gharials have been released in three phases and based on the breeding status, it may be necessary to release more gharials by the department in future. Along with this, the Indus Dolphin, Otter and Turtles are also found in the Beas River, which are listed in Schedule 1 of the Wildlife (Protection) Act, 1972 and are in the endangered list. Apart from this, the Indus River Dolphin has also been given the status of State Aquatic Animal by the State Government.

The Board was informed that under the Beas river rejuvenation program, fish seedlings have also been released in it. Commercial fishing will not only create an imbalance in aquatic biodiversity but will also endanger dolphins and other aquatic life as their chances of getting caught in fishing nets will increase. Apart from this, the Board was informed that if any

schedule-1 animal gets caught in nets etc. then it will be a violation of the Wildlife (Protection) Act. The Board was also informed that fishing with fishing lines in the tributaries by local communities for livelihood shall continue as such.

After considering the above situation, the Board agreed to permanently ban fishing within the boundaries of Beas Conservation Reserve and also instructed that the Wildlife Department will not stop fishing beyond the Beas Conservation Reserve boundary.

The meeting ended with thanks to the Chairman and the members by the Chief Wildlife Warden.

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Annexure-1

A meeting of the Punjab State Wildlife Board was held in his office room on 20.07.2023 at 1.15 PM under the chairmanship of Hon'ble Chief Minister, Punjab. The following officers participated in this meeting.

1. Sh. Lal Chand Kataruchak, Minister of Forests and Wildlife Preservation, Punjab.
2. Sh. Vikas Garg, IAS, Financial Commissioner, Government of Punjab, Department Forest and Wildlife Conservation Department.
3. Sh. Raman Kant Mishra, IFS, Principal Chief Conservator of Forests (HoFF), Punjab.
4. Sh. Dharminder Sharma, IFS, Chief Wildlife Warden, Punjab.
5. Sh. Gursharan Singh Sandhu, IPS, Inspector General of Police (Crime), Punjab.
6. Mrs. Pratima Srivastava, IFS, Chief Conservator of Forests (Wildlife), Punjab.
7. Mrs. Amrit Singh, IAS, Managing Director, Punjab Tourism Development Corporation.
8. Dr. Gursharan Jeet Singh, Joint Director, Animal Husbandry Department, Punjab.
9. Shri Jasveer Singh, Director, Animal Husbandry Department, Punjab.

True Copy

Superintendent
O/o PCCF (HAG+)
and CWLW, Punjab,
S.A.S. Nagar

Annexure-R7

Attested

Superintendent
O/o PCCF (HAG+)
and CWLW, Punjab,
S.A.S. Nagar

Annexure-R3

Government of Punjab
Department of Forests and Wildlife Preservation
(Forest Branch)

NOTIFICATION

No. 34/13/2017-FT-5/ 13011/21 Chandigarh, dated the 21/8/2017

The Governor of Punjab is pleased to constitute the Environmental Flows Working Group with following composition:

1	Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden, Punjab	Chairman
2	Director and Warden, Department of Fisheries, Punjab	Member
3	Director, Agriculture, Punjab	Member
4	Chief Engineer, Irrigation, Punjab	Member
5	Chief Engineer, BBMB, Punjab	Member
6	Chief Engineer, Department of Water Resources, Punjab	Member
7	Director, Remote Sensing, P.A.U., Ludhiana	Member
8	Director, Rivers, Wetlands & Water Policy, WWF-India	Member
9	Mrs. Gitanjali Kanwar, Senior Project Officer, WWF-India	Member
10	Chief Conservator of Forests (Wildlife), Punjab	Member Secretary

The mandate of the Group is to study all aspects associated with Beas River Ecosystem and to develop a framework for maintaining environmental flows in the river to maintain its ecological integrity and ensure security of its aquatic life within a period of one year from the date of notification.

Dr. Roshan Sunkaria, IAS
Financial Commissioner, Govt. of Punjab,
Department of Forests and Wildlife Preservation.

Endst No. 34/13/2017-FT-5/ 13011121, Chandigarh dated 21/8/2017

A copy is sent to the followings for information and further necessary action:-

1. Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden, Punjab.
2. Director and Warden, Department of Fisheries, Punjab.
3. Director, Agriculture, Punjab.
4. Chief Engineer, Irrigation, Punjab.
5. Chief Engineer, BBMB, Punjab.
6. Chief Engineer, Department of Water Resources, Punjab.
7. Director, Remote Sensing, P.A.U., Ludhiana.
8. Director, Rivers, Wetlands & Water Policy, WWF-India.
9. Mrs. Gitanjali Kanwar, Senior Project Officer, WWF-India.
10. Chief Conservator of Forests (Wildlife), Punjab.

Additional Secretary, Govt. of Punjab,
Department of Forests and Wildlife Preservation.

True Copy
Superintendent
O/o PCCF (HoFF)
and CWLW, Punjab,
S.A.S. Nagar

Attested
Superintendent
O/o [illegible]
and [illegible] Punjab,
S.A.S. Nagar

Annexure-R1
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Government of Punjab
Department of Forests and Wildlife Preservation
O/o Chief wildlife Warden, Punjab
Forest Complex, Sector 68, S.A.S. Nagar.
(E-mail: cwlwpunjab@gmail.com)

No: 9121

To Additional Director General of Forests (Wildlife)
Government of India,
Ministry of Environment, Forests and Climate Change,
6th Floor, Vayu Wing, Indira Paryavaran Bhawan,
Ali Ganj, Jor Bagh Road, New Delhi-110003

Dated: 05.02.2024

Sub: Indus River Dolphin Project Proposal and APO Under Centrally Sponsored Scheme "Development of Wildlife habitats"

Reference: Conference call meeting held on 21.07.2023 with ADGF, MoEF&CC and CWLW Punjab.

As decided in the conference call meeting held on 21.07.2023 under the chairmanship of the Additional Director General of Forests (wildlife) and Director wildlife Preservation, MoEF&CC regarding above mentioned subject, please find enclosed herewith a Project Proposal and APO as per guidelines issued by MoEF&CC regarding "Conservation of the Indus River Dolphin (*Platanista gangetica minor*) in the Beas River Conservation Reserve and the Harike Wildlife Sanctuary, Punjab" for your kind information and further necessary action.
Encl. As above.

Chief Wildlife Warden o/c
Punjab. S.A.S. Nagar.
Dated: 05.02.2024

End.No. 9122

A Copy to forword Principal Chief Conservator of Forests(HoFF) Punjab S.A.S Nagar for Information and necessary action.
Encl. As above.

Chief Wildlife Warden o/c
Punjab. S.A.S. Nagar.
2/2/2024

True Copy

Superintendent
O/o PCCF (HoFF),
and CWLW, Punjab,
S.A.S. Nagar

Annexure - R11

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Item No. 07 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 1158/2024

News Item titled "Indus river dolphins in troubled waters" appearing in Mongabay dated 15.08.2024

Date of hearing: 12.09.2024

CORAM: **HON'BLE MR. JUSTICE PRAKASH SHRIVASTAVA, CHAIRPERSON**
HON'BLE MR. JUSTICE ARUN KUMAR TYAGI, JUDICIAL MEMBER
HON'BLE DR. A. SENTHIL VEL, EXPERT MEMBER

ORDER

1. This Original Application is registered *suo-motu* on the basis of the news item titled "Indus river dolphins in troubled waters" appearing in Mongabay dated 15.08.2024.

2. The matter relates to the decrease in the habitat of Indus river dolphins. As per the article, the Indus river dolphin *(Platanista minor)* is a critically endangered freshwater dolphin species found only in the lower Indus river system in Pakistan and India. Since the 1870s, its habitat has decreased by 80% due to irrigation barrages, leaving around 2,000 individuals today.

3. The article states that in 2007, a small isolated population of dolphins was discovered in the Beas River in India, about 600 kilometers from their main habitat. This population is crucial for genetic diversity. The article states that that as apex predators, the Indus river dolphins shape the population dynamics of fish and other aquatic species. They are crucial for sustaining the overall health of the river system. Furthermore, the dolphins face threats from habitat degradation and other challenges.

4. The article further explains that as per recent data, fewer than 10 dolphins, primarily located in the lower third of the river are left. Recent surveys (2011-2022) also show counts ranging from one to eight individuals, with annual calf sightings indicating ongoing reproduction. However, the overall population size has been consistently low raising concerns about habitat usage and range shifts.

5. The article highlights that reconnecting the small population of Indus River dolphins in the Beas River with those in the Indus River is unlikely due to physical barriers like barrages and dry rivers. The Beas River dolphins face significant challenges, including entanglement in fishing gear, water pollution, and difficulties escaping through the Harike Barrage. The specific habitat needs of these dolphins are not fully understood, but they likely prefer high-volume pools, which may be diminishing due to hydrological changes. The main threats include water availability and pollution, worsened by upstream hydropower projects causing fluctuating water levels. The Beas River population is critically small, making their survival highly vulnerable.

6. The above news item indicates violation of the provisions of the Water (Prevention and Control of Pollution) Act, 1974, Biological Diversity Act, 2002 and the Environment (Protection) Act, 1986.

7. The news item raises substantial issue relating to compliance of the environmental norms and implementation of the provisions of scheduled enactment.

8. Power of the Tribunal to take up the matter *suo-motu* has been recognized by the Hon'ble Supreme Court in the matter of *"Municipal Corporation of Greater Mumbai vs. Ankita Sinha & Ors." reported in 2021 SCC Online SC 897.*

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9. Hence, we implead following as respondents in this matter:

(i) Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi-110032

(ii) Ministry of Environment, Forest and Climate Change, Through its Member Secretary, Integrated Regional Office, Gandhi Nagar, A-Wing – 407 & 409, Aranya Bhawan, Near CH-3 Circle, Sector-10A, Gandhi Nagar – 382010

(iii) National Mission for Clean Ganga, Through its Director General, NMCG, I Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi- 110002

(iv) Ministry of Jal Shakti, Through its Secretary, 6th Floor Cabin, Shram Shakti Bhawan, Rafi Marg, New Delhi – 110001

(v) Wildlife Institute of India, Through its Director, Wildlife Institute of India, Post Box # 18, Chandrabani, Dehradun 248 001 Uttarakhand

(vi) Chief Wildlife Warden, Himachal Pradesh, Forest Department (Wildlife Wing), Talland Shimla, HP-171001

(vii) Chief wildlife Warden, Punjab, Chief Wildlife Warden, Govt. of Punjab, Tower No. 2 IInd Floor, Forest Complex Sec-68 Mohali-160068

10. Issue notice to the above respondents for filing their response/reply by way of affidavit at least one week before the next date of hearing through e-filing. If any respondent directly files the reply without routing it through his advocate then the said respondent will remain virtually present to assist the Tribunal.

11. List on 03.01.2025

Prakash Shrivastava, CP

Arun Kumar Tyagi, JM

Dr. A. Senthil Vel, EM

September 12, 2024
Original Application No. 1158/2024
AS..

True Copy

Superintendent
O/o PCS (HAG+)
and [illegible], Punjab,
S.A.S. Nagar