Strengthen community engagement to conserve Ganges River Dolphin (*Platanista gangetica*) through participatory-based approach in Koshi River, Eastern, Nepal

PROJECT MID-TERM UPDATE REPORT

2, JULY 2025

The Rufford Foundation
www.rufford.org @ruffordgrants

Himalayan Nature (हिमाली प्रकृति)
Himalayan Conservation & Research Institute

Mid-Term Update Report

ACTIVITIES COMPLETED

1. **Project Approval and Research Permission**
2. **Primary field and recce visit**
3. **River Guard Training**
4. **River Dolphin Survey**
5. **Water Quality Assessment and Prey Species Survey**
   - 5.1 **Water Quality Assessment**
   - 5.2 **Prey Species (Fish) Survey**
6. **Conservation Outreach Program**
   - 6.1 **School Awareness Program**
   - 6.2 **Community Awareness Program**
7. **Development of Story Book**
   - 7.1 **Design and development of Story Book**
   - 7.2 **Desing and development of Brochure and stickers**
8. **Media Coverage**

Background

The River Dolphin conservation project funded by The Rufford Foundation and being implemented by Himalayan Nature in collaboration with Koshi Tappu Wildlife Reserve (KTWR), National Trust for Nature Conservation (NTNC), buffer zone users committee, river dependent communities, CBOs and schools, particularly at the upstream and downstream of Koshi River. The main objectives of the project are:

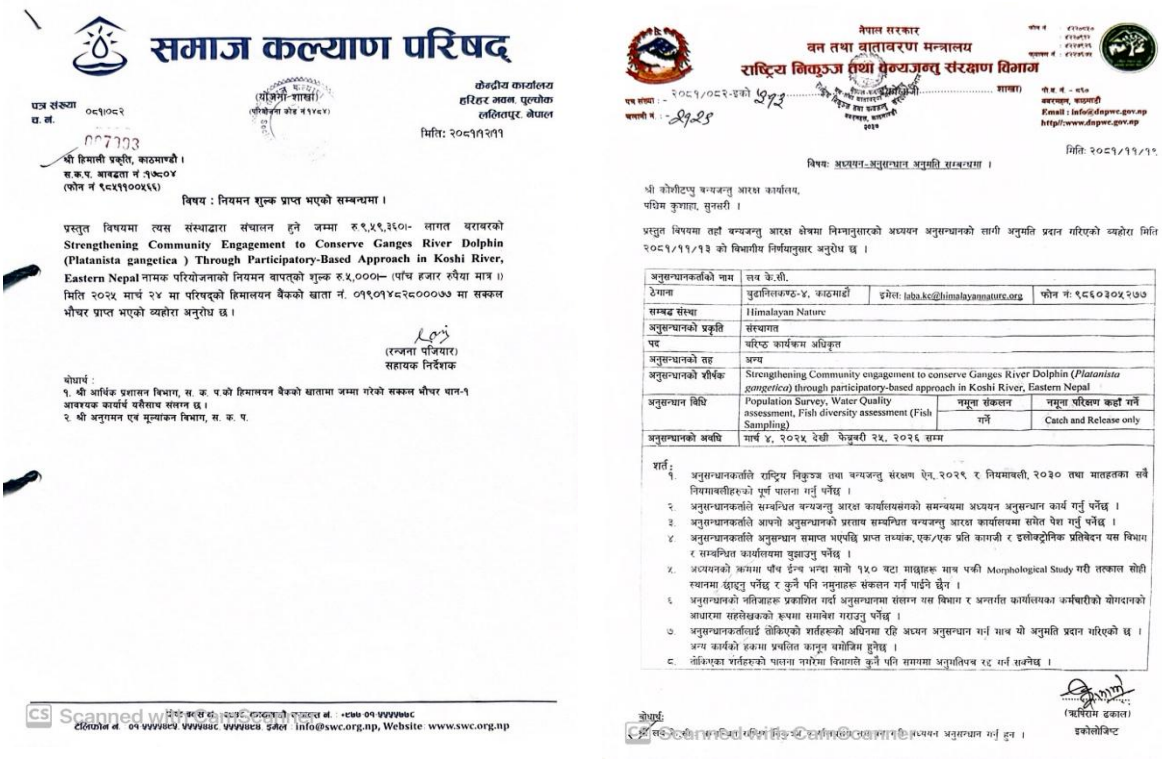
- To update data on dolphin populations and existing threats, along with assessing water quality and prey availability in the Koshi River.
- To train and mobilize 10 members from river-dependent communities as River Guards for regular monitoring and dolphin conservation efforts.
- To engage 2,000 students and 1,000 community members through participatory conservation outreach programs.

Mid-term Progress:

1. Project Approval

Prior to initiating project activities, necessary approvals were obtained from the relevant authorities. Given that the project operates within a protected area and focuses on a legally protected species under the National Parks and Wildlife Conservation Act 1973, formal authorization was required from the Department of National Parks and Wildlife Conservation (DNPWC).

Initially, a permission letter was obtained from the local government. After meeting all required criteria, project approval was granted by both the Social Welfare Council (SWC) and DNPWC. Subsequently, field-level research permission was secured from Koshi Tappu Wildlife Reserve (KTWR).



समाज कल्याण परिषद

केन्द्रीय कार्यालय
हरिहर भवन, पुल्चोक
ललितपुर, नेपाल

मिति: २०८१।१२।११

श्री हिमाली प्रकृति, काठमाण्डौं ।
स.क.प. आबद्धता नं. १७८०४
(फोन नं १८४११००४५५)

विषय : नियमन शुल्क प्राप्त भएको सम्बन्धमा ।

प्रस्तुत विषयमा त्यस संस्थाद्वारा संचालन हुने जम्मा रु.९,४९,३६०।- लागत बराबरको Strengthening Community Engagement to Conserve Ganges River Dolphin (Platanista gangetica) Through Participatory-Based Approach in Koshi River, Eastern Nepal नामक परियोजनाको नियमन बापतको शुल्क रु.५,०००।– (पाँच हजार रुपैया मात्र ।) मिति २०२४ मार्च २४ मा परिषद्को हिमालयन बैंकको खाता नं. ०१९०१४८२८०००७७ मा सकल भौचर प्राप्त भएको व्यहोरा अनुरोध छ ।

(रञ्जना पजियार)
सहायक निर्देशक

बोधार्थ :
१. श्री आर्थिक प्रशासन विभाग, स. क. प.को हिमालयन बैंकको खातामा जम्मा गरेको सकल भौचर थान-१ आवश्यक कार्यार्थ यसैसाथ संलग्न छ ।
२. श्री अनुगमन एवं मूल्यांकन विभाग, स. क. प.

Scanned with CamScanner

नेपाल सरकार
वन तथा वातावरण मन्त्रालय
राष्ट्रिय निकुञ्ज तथा वन्यजन्तु संरक्षण विभाग

मिति: २०८१/११/१९

विषय: अध्ययन-अनुसन्धान अनुमति सम्बन्धमा ।

श्री कोशीटप्पु वन्यजन्तु आरक्ष कार्यालय,
पश्चिम कुशाहा, सुनसरी ।

प्रस्तुत विषयमा तहाँ वन्यजन्तु आरक्ष क्षेत्रमा निम्नानुसारको अध्ययन अनुसन्धानको लागी अनुमति प्रदान गरिएको व्यहोरा मिति २०८१/११/१३ को विभागीय निर्णयानुसार अनुरोध छ ।

अनुसन्धानकर्ताको नाम	स्व.के.सी.		
ठेगाना	बुढानिलकण्ठ-४, काठमाडौं	इमेल: laba.kc@himalayannature.org	फोन नं: ९८६०३०५२७७
सम्बद्ध संस्था	Himalayan Nature		
अनुसन्धानको प्रकृति	संस्थागत		
पद	परिफ्ट कार्यक्रम अधिकृत		
अनुसन्धानको तह	अन्य		
अनुसन्धानको शीर्षक	Strengthening Community engagement to conserve Ganges River Dolphin (*Platanista gangetica*) through participatory-based approach in Koshi River, Eastern Nepal		
अनुसन्धान विधि	Population Survey, Water Quality assessment, Fish diversity assessment (Fish Sampling)	नमूना संकलन गर्ने	नमूना परिक्षण कहाँ गर्ने Catch and Release only
अनुसन्धानको अवधि	मार्च ४, २०२५ देखी फेब्रुअरी २५, २०२६ सम्म		

शर्त:
१. अनुसन्धानकर्ताले राष्ट्रिय निकुञ्ज तथा वन्यजन्तु संरक्षण ऐन, २०२९ र नियमावली, २०३० तथा मातहतका सबै नियमावलीहरुको पूर्ण पालना गर्नु पर्नेछ ।
२. अनुसन्धानकर्ताले सम्बन्धित वन्यजन्तु आरक्ष कार्यालयसंगको समन्वयमा अध्ययन अनुसन्धान कार्य गर्नु पर्नेछ ।
३. अनुसन्धानकर्ताले आफ्नो अनुसन्धानको प्रस्ताव सम्बन्धित वन्यजन्तु आरक्ष कार्यालयमा समेत पेश गर्नु पर्नेछ ।
४. अनुसन्धानकर्ताले अनुसन्धान समाप्त भएपछि प्राप्त तथ्यांक, एक/एक प्रति कागजी र इलोक्ट्रोनिक प्रतिवेदन यस विभाग र सम्बन्धित कार्यालयमा बुझाउनु पर्नेछ ।
५. अध्ययनको क्रममा चौंच ईन्च भन्दा सानो १५० वटा माछाहरू माथ पकी Morphological Study गरी तत्काल सोही स्थानमा छाड्नु पर्नेछ र कुनै पनि नमुनाहरू संकलन गर्न पाईने छैन ।
६. अनुसन्धानको नतिजाहरू प्रकाशित गर्दा अनुसन्धानमा संलग्न यस विभाग र अन्तर्गत कार्यालयका कर्मचारीको योगदानको आधारमा सहलेखकको रूपमा समावेश गराउनु पर्नेछ ।
७. अनुसन्धानकर्तालाई तोकिएको शर्तहरूको अधिनमा रहि अध्ययन अनुसन्धान गर्न माथ यो अनुमति प्रदान गरिएको छ । अन्य कार्यको हकमा प्रचलित कानून बमोजिम हुनेछ ।
८. तोकिएका शर्तहरूको पालना नगरेमा विभागले कुनै पनि समयमा अनुमतिपत्र रद्द गर्न सक्नेछ ।

(त्रपिराज ढकाल)
इकोलोजिष्ट

बोधार्थ:
१. सबै कोशी क्षेत्रमा रहेका निकुञ्ज तथा वन्यजन्तु आरक्ष कार्यालयहरुमा अध्ययन अनुसन्धान गर्न हुन ।

Photograph 1: Letter of approval from respective government official (Left: SWC and Right: DNPWC)

2. Primary field and recce visit

An initial field visit was carried out across key project sites in the Saptari and Udaypur districts to identify and map river-dependent communities, including fishing and farming households, as well as local schools. As outlined in the project proposal, special priority has been given to communities that were not reached in previous outreach initiatives, ensuring that our conservation efforts extend to underserved and vulnerable groups.

During the visit, we also documented the prevailing threats to the Ganges River Dolphin and the broader aquatic ecosystem, including issues such as habitat degradation, pollution, and unsustainable fishing practices. The insights gathered through this field assessment will play a vital role in shaping the content and focus of our upcoming outreach programs, allowing us to tailor conservation messaging and interventions to the specific needs and challenges of each community.

Photograph 2: Human Settlement and agricultural land nearby the Koshi River in Gobargada

3. River Guard Training

The River Guard (RG) initiative is an evolution of the Citizen Scientist model piloted under our previous Rufford Foundation-supported project. In that phase, 15 local youths and conservation enthusiasts were trained and mobilized as Citizen Scientists. They received hands-on capacity-building in dolphin ecology, survey techniques, data recording, and field equipment handling. Their active involvement in dolphin surveys, school-based awareness campaigns, and habitat monitoring activities yielded promising results. A positive outlook from this approach has been achieved, hence, we coined the River Guard concept in this project. Under this initiative, 10 individuals from fishing/river-dependent communities were selected to serve as River Guards. This approach offers multiple benefits: it ensures the consistent collection of field data, empowers local human resources, builds ownership in conservation, and generates credible, community-based knowledge that enhances scientific research. Moreover, their active involvement bridges the gap between local knowledge and professional science, cultivating curiosity, awareness, and long-term commitment to aquatic biodiversity conservation.


Photograph 3: Resource person delivering the training content during the River Guard training

A two-day intensive training program from 24–25 February 2025 completed with 10 pre-selected participants with the necessary skills and knowledge to contribute meaningfully to the project. The training aimed to integrate river-dependent/fishermen into the mainstream of dolphin and aquatic ecosystem conservation by enhancing their understanding of river dolphin ecology, threats, and monitoring techniques.

The first day focused on theoretical sessions, covering key topics such as species ecology, conservation values of River Dolphin, legal frameworks, citizen participation, and the role of communities in protecting endangered species. The sessions also introduced scientific dolphin survey methods and their significance in shaping conservation strategies. The second day emphasized practical, field-based learning. Participants received hands-on training in the use of essential survey equipment such as GPS, binoculars, digital cameras, telescopes, and water quality testing kits. Participants practiced using these tools in the field during a guided field visit to the Koshi River, where they applied theoretical knowledge to identify suitable dolphin habitats, record observations, and complete data sheets under supervision. They were encouraged to operate the equipment independently, troubleshoot challenges, and provide feedback on their experiences.


Photograph 4: River Guard trainee participating in different engaging/discussion session, interactions

To enrich the training experience, local biodiversity experts and partner conservation organizations were invited to share their practical insights and mentorship. Their guidance helped contextualize the importance of community engagement and reinforced the role of River Guards as long-term stewards of river health.

To measure the impact of the training, pre- and post-training assessments were conducted. These evaluated participants' understanding of dolphin ecology, survey techniques, prey species, and water quality monitoring. Before the training, only 5% of participants had any prior knowledge of river dolphins. Post-training, this figure increased significantly to 65%, indicating a 60% overall improvement in awareness and technical knowledge

This training not only built capacity but also laid the foundation for a long-term, locally driven conservation network. The River Guards are now equipped to contribute to research, conduct community outreach, and support regular monitoring efforts, making them vital actors in the conservation of the endangered Ganges River Dolphin and its habitat.

Photograph 5: Ten local people representing diverse sectors enrolled in Dolphin Conservation efforts as River Guard

4. River Dolphin Survey and Threat Assessment

In accordance with the planned activities, a pre-monsoon River Dolphin survey was successfully conducted from June 1–4, covering both the upper (Rajabas to Koshi Barrage) and lower (Koshi Barrage to Gobargada) sections of the Koshi River. This comprehensive field survey aimed not only to assess the current status of the endangered Ganges River Dolphin (*Platanista gangetica*) but also to document associated threats and habitat conditions essential for their survival.

To ensure robust data collection, we adopted standardized methodologies, employing both boat-based and shore-based survey techniques. The boat-based survey was involved a team of seven surveyors positioned strategically: two each at the front, middle, and rear while one served as a recorder and navigator. The survey team focused on ecologically important river features such as deep pools, meandering bends, and confluences, where dolphins are more likely to be present. During the survey, various ecological and anthropogenic parameters were recorded systematically, including habitat type, water depth, shoreline distance, sighting distance, and incidents of illegal activities.

Photograph 6: Boat-based dolphin survey performing by the team (Left: downstream and Right: Upstream of Koshi River)

Photograph 7: Team member engaged in Shore-based dolphin survey in the Koshi barrage section

Simultaneously, a shore-based survey was carried out in the Koshi Barrage area, where 12 observers were stationed at intervals of 200 meters for two consecutive days. Observers were instructed to monitor dolphin activity and human disturbances, using standardized data sheets to ensure consistency and accuracy.

Combining the results from both survey approaches, a total of 22 river dolphins were recorded, comprising 15 adults, 5 sub-adults, and 2 juveniles. All individuals were observed in the downstream section of the Koshi barrage. Despite expanded coverage and meticulous survey efforts, no dolphins were detected in the upper section of the river, consistent with finding from previous surveys.

Alongside dolphin monitoring, a comprehensive threat assessment was also carried out across both river sections. Key threats identified during previous project such as illegal fishing, habitat encroachment, and human disturbances—were again observed during this survey. However, the intensity and frequency of these threats appear to have increased. Key observations from this survey include:

- An increase in illegal fishing activities, often involving more individuals and the use of modern fishing gear.
- Agricultural expansion along the riverbanks continues to encroach on natural dolphin habitats, further contributing to habitat degradation.
- A noticeable rise in plastic pollution, particularly single-use water bottles and general waste.
- Emergence of informal waste dumping sites near dolphin habitats.

Photograph 8: Recorded illegal threats to the River Dolphin at Koshi River (Fishing, Illegal, Human encroachment, Illegal fishing gears, and agricultural waste dump at the bank of Koshi River)

Table 1: Recorded threats during the survey at the Koshi River

S.N	GPS Coordinate		Types of Threats
	Northing	Easting	
1	26.791861	87.084714	Illegal Fishing
2	26.720858	87.084714	Land Encroachment for agricultural purpose
3	26.674691	87.019989	Illegal Fishing
4	26.573336	86.949743	Illegal Fishing
5	26.6274	86.97948	Illegal Fishing
6	26.537714	86.927974	Illegal Fishing and Waste Dumping
7	26.528276	86.921758	Illegal Fishing and Human Disturbance
8	26.52566	86.921926	Land Encroachment for agricultural purpose
9	26.497554	86.909300	Land Encroachment for agricultural purpose
10	26.492808	86.904396	Land Encroachment for agricultural purpose
11	26.49971	86.90935	Illegal Fishing

The spatial distribution of recorded threats, mapped using GPS coordinates, revealed several critical hotspots of concern. These included areas with concentrated illegal fishing, land encroachment for agriculture, and zones of waste accumulation and human disturbance. These findings highlight the pressing need for integrated conservation actions that combine species monitoring, habitat protection, pollution control, and community engagement to mitigate threats and safeguard the long-term survival of the Ganges River Dolphin in the Koshi River.

5. Water Quality Assessment and Prey Species Survey

5.1. Water Quality Assessment

To collect the water sample, the previously used methodology was followed, where a total of 28 sampling point at the interval of at least 2 km was kept and water sampling was taken accordingly from Chatara Dham to Gobargada, nearby international borders to India. For the physio-chemical parameter, in-situ determination was carried out using multi-meter test kits (WagTech) which include temperature, pH, Dissolved Oxygen (DO), conductivity and Total Dissolved Solid (TDS) while for the Phosphorous, Free Co2, Potassium and Nitrate, 500 ml of water sample was collected from each sampling site at a depth of about 0.5 m.

Table 2: Different parameter of water sampled from Koshi River

	Water Quality Assessment of Koshi River (River Dolphin) _2025								
Code	Temp (°C)	pH	Electrical Conductivity (µS)	TDS (ppm)	Dissolve Oxygen (mg/L)	Phosphorous (mg/L)	Free CO2(mg/L)	Potassium (mg/L)	Nitrate (mg/L)
KR1	25.7	7.1	130	75	8.01	0.107	0.2	6.40	0.036
KR2	25.2	7.3	128	62	7.67	0.181	0.5	6.20	0.023
KR3	26.8	6.9	119	54	8.21	0.061	0.2	6.70	0.051
KR4	26.4	7.6	118	59	7.21	0.06	0.5	6.10	0.05
KR5	27.1	7.7	129	23	6.67	0.03	0.4	15.40	0.054
KR6	25.7	7.9	128	84	6.91	0.098	0.2	6.50	0.055
KR7	25.9	8	118	59	7.34	0.099	o.3	5.90	0.039
KR8	25.6	8	305	102	7.67	0.095	0.3	7.30	0.048
KR9	24.1	8.1	123	62	6.01	0.067	0.2	6.20	0.044
KR10	23.4	7.9	112	55	6.55	0.043	0.2	6.30	0.049
KR11	23.6	7.6	128	58	7.07	0.058	0.3	6.30	0.042
KR12	23.7	7.8	123	60	8.05	0.085	0.3	6.30	0.043
KR13	23.5	7.9	119	59	7.56	0.079	0.1	6.30	0.03
KR14	23.4	7.8	125	63	7.34	0.075	0.1	6.00	0.031
KR15	24.4	8	145	58	7.12	0.071	0.2	6.30	0.035
KR16	24.7	8	139	56	7.32	0.076	0.2	16.00	0.033
KR17	25.3	8	115	49	7.87	0.071	0.3	6.40	0.041
KR18	26.8	7.8	116	57	6.98	0.112	0.3	6.40	0.008
KR19	27.6	7.6	129	59	7.25	0.079	0.2	6.60	0.033
KR20	28.2	7.9	118	60	9.89	0.144	0.3	7.30	0.01
KR21	28.4	7.7	124	66	8.56	0.077	0.2	6.90	0.032
KR22	27.9	6.5	120	60	8.33	0.041	0.2	10.30	0.033
KR23	27.7	7.1	121	61	7.71	0.052	0.3	9.21	0.021
KR24	26.9	6.9	130	65	7.81	0.076	0.1	11.38	0.043
KR25	27	8.1	129	63	7.05	0.121	0.3	8.74	0.011
KR26	26.8	7.4	89	46	6.99	0.098	0.2	7.89	0.019
KR27	27.8	7.2	106	68	7.21	0.087	0.2	6.98	0.027
KR28	28	7.1	99	61	7.22	0.067	0.3	7.66	0.036

5.1.1. Water Temperature: Water temperature plays a critical role in determining the health and distribution of aquatic organisms, influencing their metabolism, growth, reproduction, and survival. An assessment was conducted across 28 sampling points (KR1–KR28) in the Koshi River to evaluate the thermal conditions of the water and their implications for aquatic biodiversity. The recorded temperatures ranged from 23.4°C (at KR10 and KR14) to 28.4°C (at KR21), with an average temperature of approximately 25.9°C. The sampling points between KR9 and KR17 generally exhibited lower water temperatures (ranging from 23.4°C to 25.3°C), while the sites from KR18 to KR28 recorded comparatively higher temperatures, some nearing or exceeding the upper threshold for aquatic life tolerance.

National standards from Nepal's MoPE indicate that temperatures above 25°C may stress cold-water species like mahseer and snow trout, while warm-water species (e.g., carps, catfish) can tolerate up to 28°C. USEPA guidelines suggest keeping water below 25°C to protect aquatic life during critical stages. Prolonged exposure above 28–30°C can lower dissolved oxygen and disrupt reproduction.

In this assessment, sampling points KR20 to KR28 recorded temperatures ranging from 27.0°C to 28.4°C, which may pose a risk of thermal stress to sensitive aquatic organisms, especially during spawning seasons. These

areas warrant closer attention due to their proximity to or exceedance of recommended temperature thresholds. On the other hand, points KR9 to KR17, with temperatures between 23.4°C and 25.3°C, fall within the preferred range for most aquatic species and represent ecologically favorable conditions. Sampling sites KR1 to KR8 and KR18 to KR19 (temperatures between 25.6°C and 27.6°C) lie in a transitional range where the impact on aquatic life will depend on species-specific thermal tolerance. In conclusion, while most parts of the KR River system remain within acceptable temperature ranges for aquatic life, certain upstream or sun-exposed segments, particularly KR20–KR28, may be experiencing elevated thermal conditions.

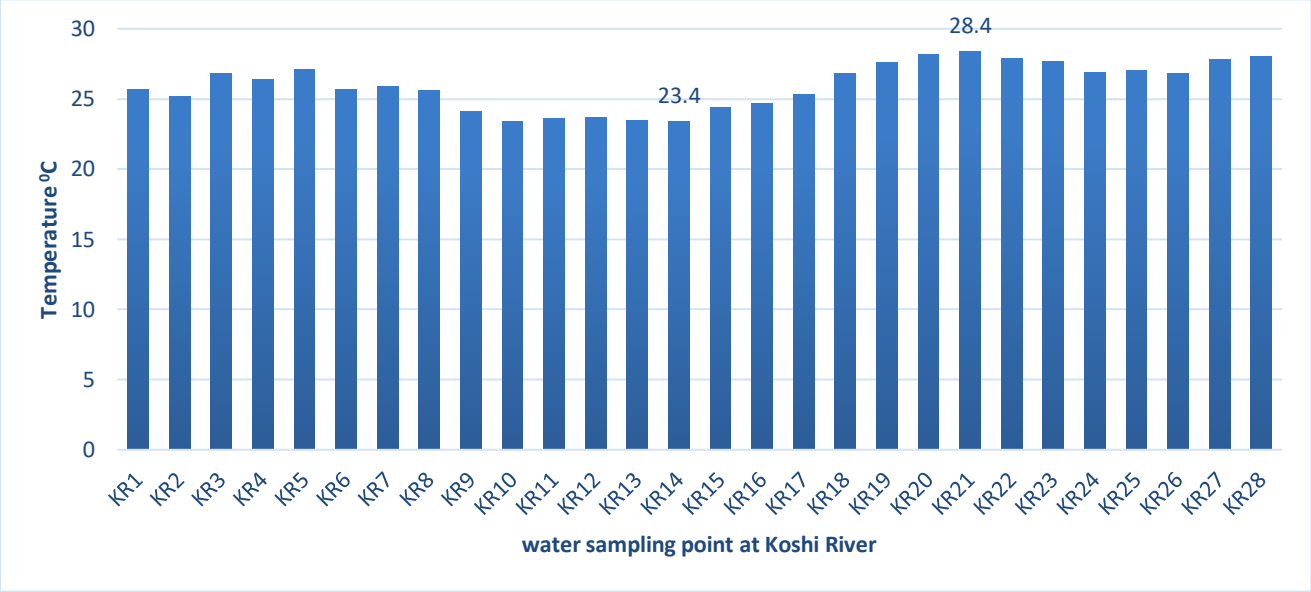


Fig 1: Graph illustrate the data of temperature sampled at 28 different sampling points of Koshi Rivers

5.1.2. pH: The pH of water is a critical parameter for aquatic ecosystems, influencing species composition, nutrient availability, and overall health of aquatic life. The pH levels across the 28 sampling points in the Koshi River range from 6.5 (at KR22) to 8.1 (at KR9 and KR25), with most values falling within the neutral to slightly alkaline range of 7.0 to 8.0. This range is generally considered optimal for supporting diverse aquatic life, including fish, macroinvertebrates, and aquatic vegetation. A balanced pH within this range helps maintain biological processes, reduces the solubility of toxic metals, and supports healthy reproductive cycles in aquatic species.

Most sampling sites, such as KR1, KR4, KR5, KR6, KR10, KR21, and KR26, KR28, reflect favorable pH conditions, indicating a stable aquatic environment. However, a few locations exhibit deviations that may highlight concern. For instance, KR22 recorded the lowest pH value of 6.5, approaching the acidic threshold. While still within the tolerable range for many species, such conditions may begin to affect sensitive organisms, especially juvenile fish and aquatic insects, and could increase the solubility of harmful metals. On the other hand, KR9 and KR25 recorded the highest pH values of 8.1. Although only slightly above the optimal range, elevated pH levels can affect species diversity over time and may increase the toxicity of substances like ammonia.

Overall, the pH profile of the Koshi is largely conducive to healthy aquatic ecosystems. Nevertheless, sites at the more acidic (KR22) and alkaline (KR9, KR25) ends should be monitored regularly to ensure that minor deviations do not lead to ecological stress or long-term habitat degradation.

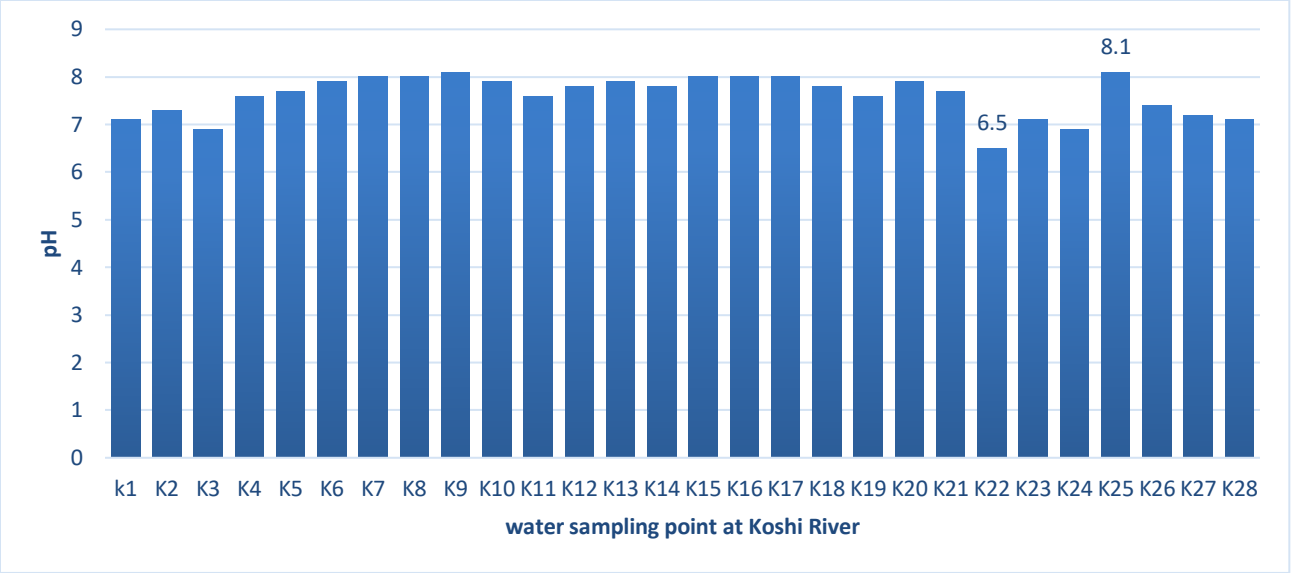


Fig 2: Graph illustrate the data of pH sampled at 28 different sampling points of Koshi Rivers

5.1.3. Electric Conductivity: Electrical conductivity (EC) is an important indicator of water quality, reflecting the concentration of dissolved ions that influence aquatic ecosystem health. In the Koshi River system, EC values across 28 sampling points ranged from 89 µS (KR26) to 305 µS (KR8), with most sites falling between 110–130 µS, indicating relatively low to moderate ion content and minimal pollution. This range generally supports a healthy aquatic environment, suitable for diverse freshwater organisms.

However, KR8 recorded an unusually high EC of 305 µS, suggesting localized input of dissolved salts or pollutants, possibly from runoff or anthropogenic activities, which may impact sensitive aquatic species. In contrast, lower EC values at KR26 (89 µS), KR28 (99 µS), and KR27 (106 µS) could indicate minimal mineral content, often associated with upstream or less-disturbed sites. While not harmful, extremely low EC may limit nutrient availability for aquatic plants and organisms. Overall, the EC profile suggests good water quality across most of the Koshi River, though sites like KR8 highlight further investigation to assess potential pollution sources.

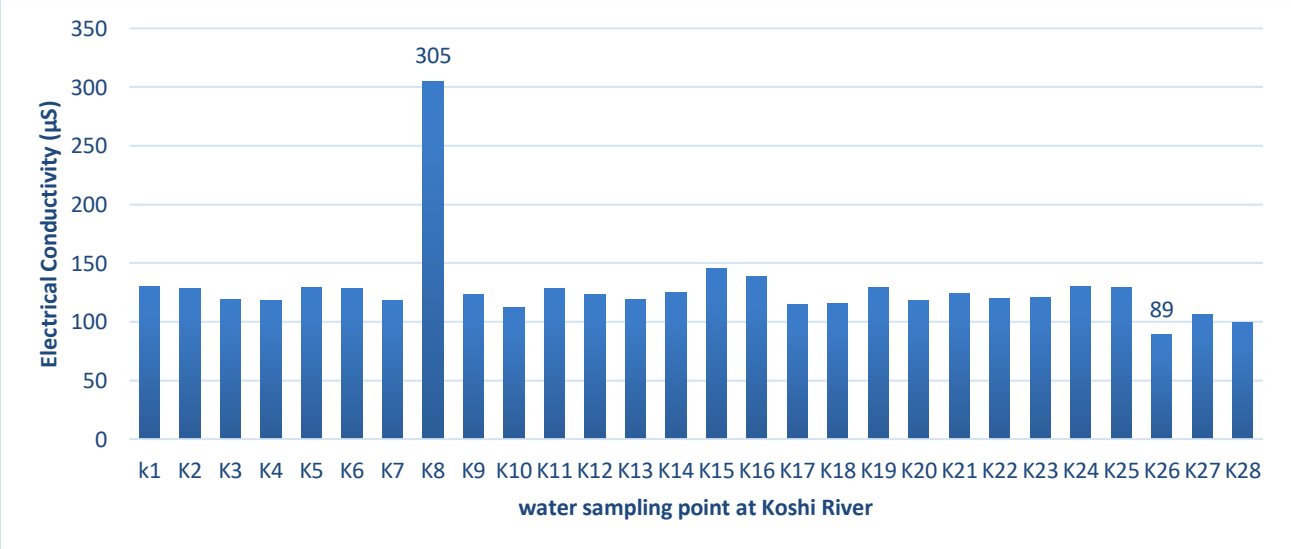


Fig 3: Graph illustrate data of electrical conductivity sampled at 28 different sampling points of Koshi Rivers

5.1.4. Total Dissolved Solids (TDS): TDS indicate the concentration of dissolved substances in water, including minerals, salts, and organic matter, which can affect aquatic life and water quality. In the Koshi River

system, TDS values across the 28 sampling points ranged from 23 ppm (KR5) to 102 ppm (K8), with most sites falling between 50–70 ppm, reflecting clean, low-mineral-content freshwater conditions suitable for aquatic organisms.

KR8 showed the highest TDS value (102 ppm), which, while still within acceptable limits for freshwater systems, may suggest localized inputs from natural or anthropogenic sources such as runoff or nearby settlements. In contrast, KR5 recorded an unusually low TDS of 23 ppm, which could indicate limited mineral availability, potentially impacting nutrient levels for aquatic flora and fauna. Overall, the TDS levels in the river are well within the tolerable range for aquatic life (<500 ppm as per most standards), suggesting good water quality throughout the system, with only minor variation that may merit localized monitoring at the extremes.

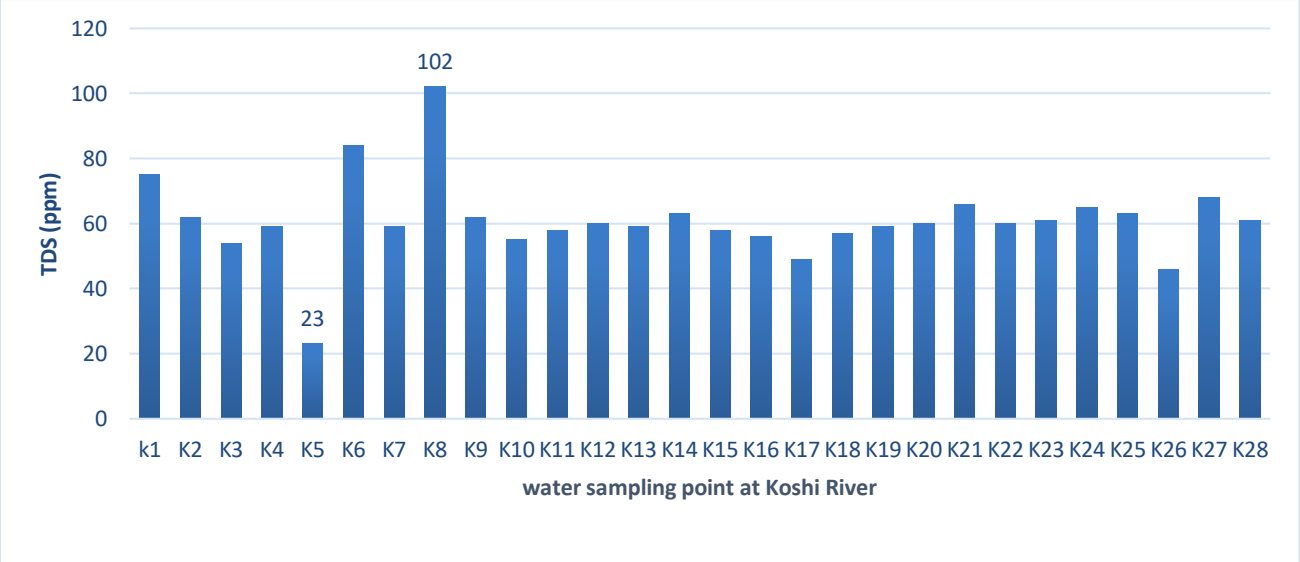


Fig 4: Graph illustrate the data of TDS sampled at 28 different sampling points of Koshi Rivers

5.1.5. Dissolved Oxygen (DO): Dissolved Oxygen is a key indicator of freshwater quality, essential for the survival of aquatic organisms. A total of 28 water samples were collected from different points (KR1 to KR28) along the Koshi River. The DO concentrations ranged from a minimum of 6.01 mg/L at point KR9 to a maximum of 9.89 mg/L at KR20, with an overall average of approximately 7.51 mg/L.

The graphical representation of the data shows relatively stable DO levels across most sampling points, with the majority falling between 7.0 and 8.0 mg/L. Notably, sampling point KR20 exhibited the highest DO concentration, likely indicating better aeration or reduced organic loading in that area. Conversely, six sampling locations; KR5, KR6, KR9, KR10, KR18, and KR26—recorded DO levels below 7.0 mg/L. While these are still above critical thresholds, they may signal localized pollution, reduced water flow, or increased organic matter, open avenue for further investigation.

When compared to national and international standards, the findings are largely encouraging. According to Nepal's environmental guidelines, DO levels above 5 mg/L are generally suitable for aquatic life, while international benchmarks such as those set by the US EPA and WHO recommend maintaining DO above 6.0–7.0 mg/L for healthy ecosystems.

However, the presence of sites with relatively low DO concentrations suggests the need for targeted actions. Further assessments should be carried out in those locations to identify potential sources of pollution, such as sewage discharge, agricultural runoff, or stagnant water zones. The use of biological indicators such as macroinvertebrates could provide additional insights into long-term ecosystem health. Enhancing riparian vegetation, reducing direct waste input, and community-based monitoring programs could also contribute to improving DO levels and sustaining ecological balance.

Overall, the Koshi River exhibits healthy DO conditions, but targeted action in low DO areas, along with seasonal monitoring, habitat restoration, and community engagement, is essential to sustain and improve ecological balance.

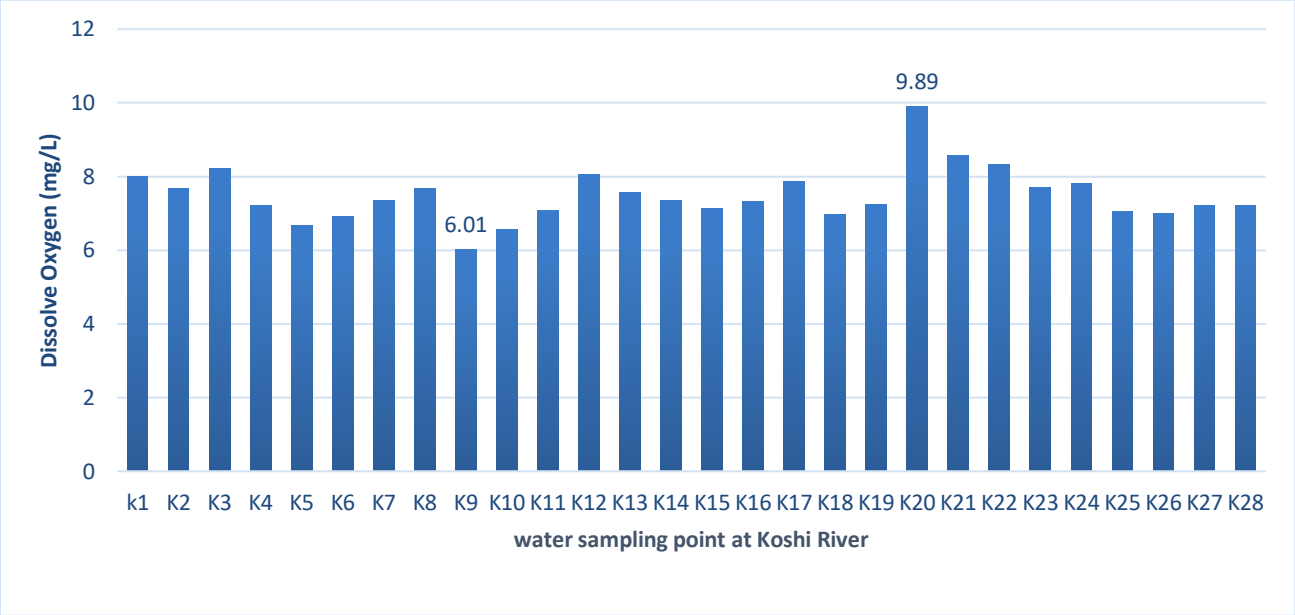


Fig 5: Graph illustrate the data of dissolved oxygen sampled at 28 different sampling points of Koshi Rivers

5.1.6. Phosphorous: The analysis of phosphorus concentrations, measured as phosphate (mg/L), across 28 sampling sites along the Koshi River reveals notable spatial variability in nutrient levels. Phosphate values ranged from approximately 0.03 mg/L at sites like KR5 and KR22 to a maximum of 0.18 mg/L at KR2, with most sites falling between 0.06 and 0.10 mg/L. Elevated concentrations were particularly evident at KR1 (0.107 mg/L), KR2 (0.18 mg/L), KR18 (~0.11 mg/L), KR21 (~0.14 mg/L), and KR25 (~0.12 mg/L), indicating potential nutrient enrichment in these areas.

While phosphorus is vital for aquatic ecosystems, elevated levels can lead to adverse effects such as eutrophication, algal blooms, and oxygen depletion. According to international and national water quality guidelines, including those from the United States Environmental Protection Agency (USEPA) and the European Union Water Framework Directive, total phosphorus should not exceed 0.05 mg/L in streams flowing into lakes and 0.1 mg/L in rivers. Although Nepal's environmental standards for phosphate in rivers are not explicitly defined, they generally align with these international benchmarks.

When compared to these thresholds, several Koshi River sites—particularly KR1, KR2, KR18, KR21, and KR25, exceed the recommended limits, suggesting localized pollution. These elevated levels are likely associated with agricultural runoff, domestic wastewater inputs, or detergent residues. Conversely, sites like KR5, KR22, and KR23, which remained below 0.05 mg/L, reflect low nutrient input and more stable ecological conditions. The variation in phosphate concentrations highlights the influence of differing land-use practices and degrees of anthropogenic impact along the river corridor.

Overall, while phosphate levels in much of the Koshi River remain within acceptable limits for sustaining aquatic life, the higher concentrations at specific sites raised flag for attention. Without management, these areas risk progressing toward nutrient overload and eutrophication. Therefore, targeted interventions such as reducing point and non-point pollution sources, encouraging sustainable agricultural practices, and enhancing wastewater treatment, are very essential. Continued monitoring, particularly alongside biological indicators, will be critical for ensuring long-term ecological health and water quality in the Koshi River system.

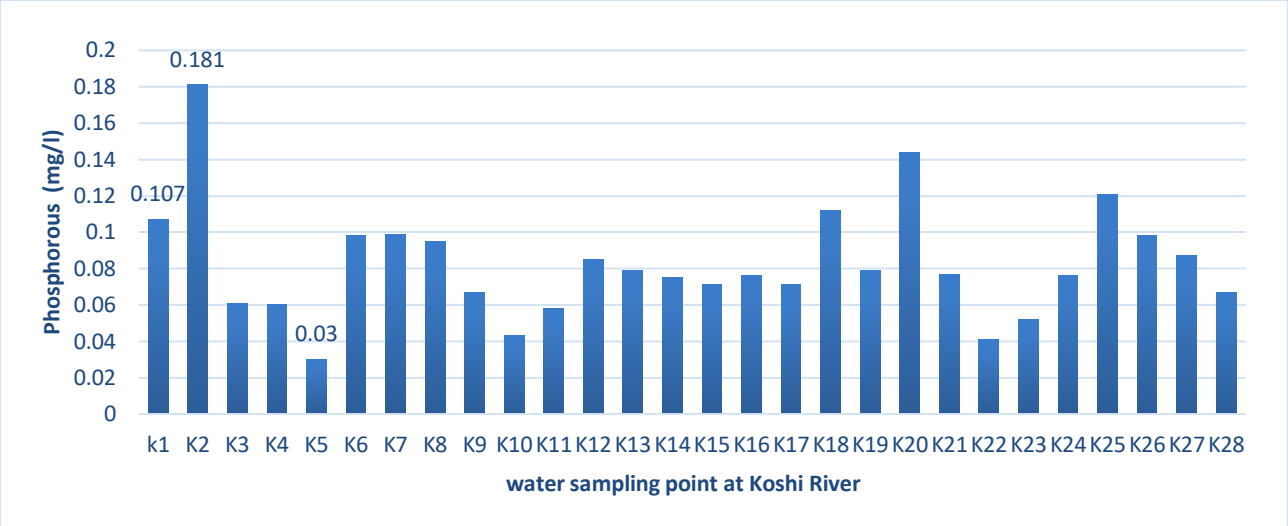


Fig 6: Graph illustrate the data of phosphorous sampled at 28 different sampling points of Koshi Rivers

Photograph 9: Research team collecting water sample from different sampling point from Koshi River

5.1.7. Free CO2: The analysis of free carbon dioxide (CO_2) concentrations across 28 sampling points along the Koshi River shows low and stable values, ranging from 0.1 mg/L to 0.5 mg/L. Most sites recorded values between 0.2 and 0.3 mg/L, with the highest concentrations observed at KR2 and KR4 (0.5 mg/L), followed by moderate levels at KR5 (0.4 mg/L). Only three sites (KR13, KR14, and KR24) showed the lowest concentration of 0.1 mg/L, suggesting minimal free CO_2 presence in these areas.

Free CO_2 in natural waters primarily results from the respiration of aquatic organisms and the decomposition of organic matter. While it is a naturally occurring component of aquatic ecosystems, elevated concentrations can lower pH and impact aquatic life, particularly sensitive fish species. According to the U.S. EPA and FAO guidelines, free CO_2 levels in freshwater ecosystems are typically safe for aquatic life when maintained below 5 mg/L. Concentrations above 10–15 mg/L can be stressful or even harmful to fish, especially when coupled with low dissolved oxygen or acidic conditions.

In comparison to these benchmarks, the recorded CO_2 values in the Koshi River are well within safe limits and pose no immediate risk to aquatic organisms. The consistently low concentrations suggest good water aeration and a healthy balance between photosynthesis and respiration processes. These findings align with the previously reported dissolved oxygen levels, reinforcing the overall favorable ecological condition of the river.

In conclusion, the free CO_2 levels in the Koshi River indicate a stable and supportive environment for aquatic life, with no signs of excess organic pollution or respiratory stress. Continued monitoring of this parameter, alongside others like dissolved oxygen and nutrient levels, will help ensure early detection of any ecological shifts and support effective river management.

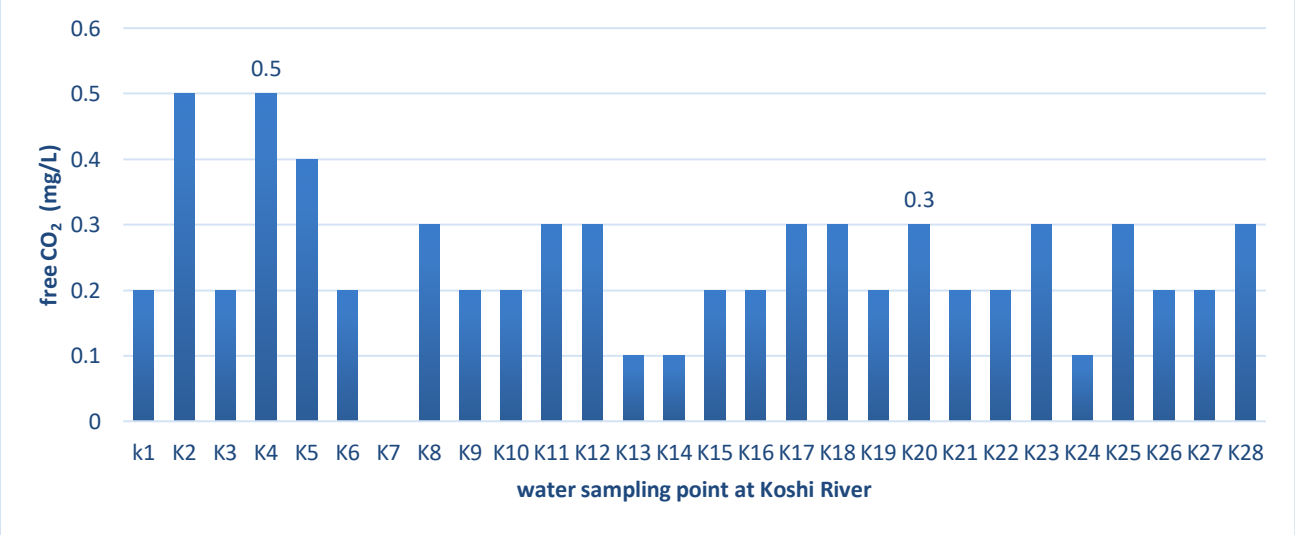


Fig 7: Graph illustrate the data of free CO_2 sampled at 28 different sampling points of Koshi Rivers

5.1.8. Potassium: The analysis of potassium concentrations across 28 sampling points in the Koshi River reveals relatively consistent levels at most sites, with notable spikes at a few locations. The majority of sampling points recorded potassium values between 6.0 and 7.5 mg/L, which falls within the typical background range for natural surface waters. However, five sites—KR5 (15.40 mg/L), KR16 (16.00 mg/L), KR22 (10.30 mg/L), KR23 (9.21 mg/L), and KR24 (11.38 mg/L), showed elevated levels, significantly higher than the rest, indicating possible localized contamination.

Potassium is an essential nutrient for plant and animal life, but in aquatic systems, excessive concentrations may signal agricultural runoff, fertilizer leaching, or effluents from domestic or industrial sources. According to international references, such as the Canadian Water Quality Guidelines and FAO irrigation water standards, potassium is not typically toxic to aquatic life at low levels and is not considered a primary pollutant. Most freshwater organisms can tolerate levels up to 20 mg/L without adverse effects. However, a rapid rise

or high input of potassium in freshwater systems may still disturb ionic balance, especially in sensitive aquatic species.

In the context of these guidelines, most of the Koshi River's potassium values are within a safe range for aquatic ecosystems. Still, the elevated levels at KR5, KR16, KR22, KR23, and KR24 suggest the need for further investigation. These outliers could be linked to fertilizer application, wastewater discharge, or runoff from agricultural lands, and their locations should be prioritized for source identification and pollution control measures.

Overall, the potassium levels in the Koshi River indicate generally good water quality, with only a few sites reflecting potential localized nutrient enrichment. Regular monitoring, especially in areas with unusually high concentrations, is recommended to prevent long-term ecological impacts and to support sustainable water resource management.

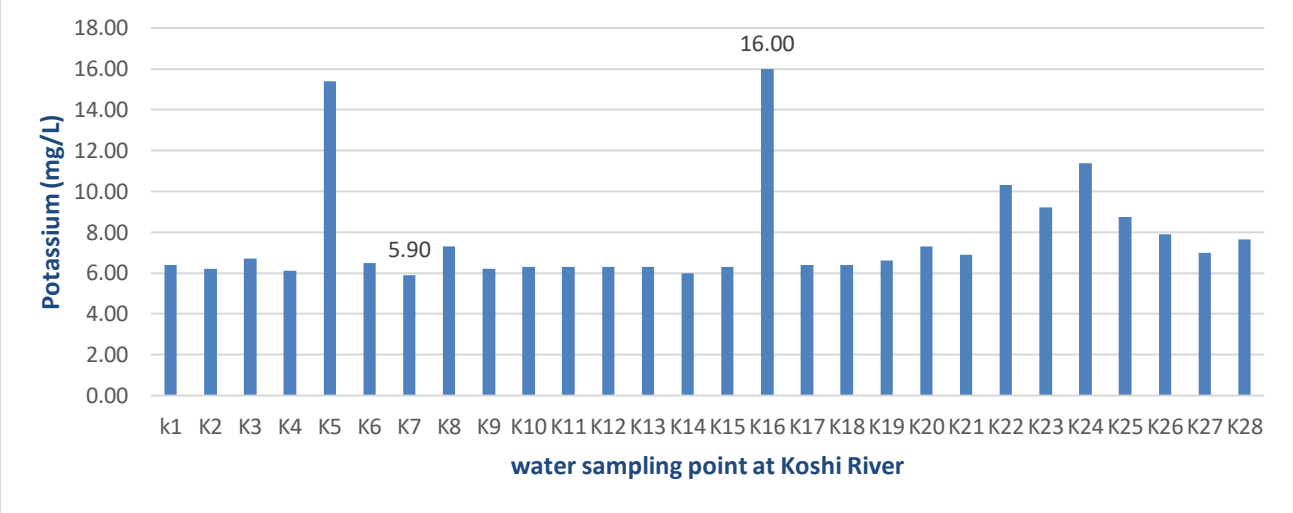


Fig 8: Graph illustrate the data of potassium sampled at 28 different sampling points of Koshi Rivers

5.1.9. Nitrate: The nitrate concentrations measured across the 28 sampling points range from a low of 0.008 mg/L (KR18) to a high of 0.055 mg/L (KR6), with most values clustering between 0.02 and 0.05 mg/L. These nitrate levels are well below both national and international guidelines for aquatic life protection. For example, the World Health Organization (WHO) and the United States Environmental Protection Agency (EPA) recommend nitrate concentrations not exceeding 10 mg/L to prevent adverse effects on aquatic organisms and human health. Additionally, the Canadian Water Quality Guidelines suggest nitrate levels under 1 mg/L as protective for the majority of aquatic life. Compared to these standards, the observed nitrate values in the field are extremely low, indicating minimal nutrient pollution and low risk of eutrophication or toxicity to aquatic ecosystems in the sampled water bodies. This suggests that the water quality regarding nitrate is well within safe limits, supporting healthy aquatic life and reflecting good watershed management or low anthropogenic impact in the sampling area.

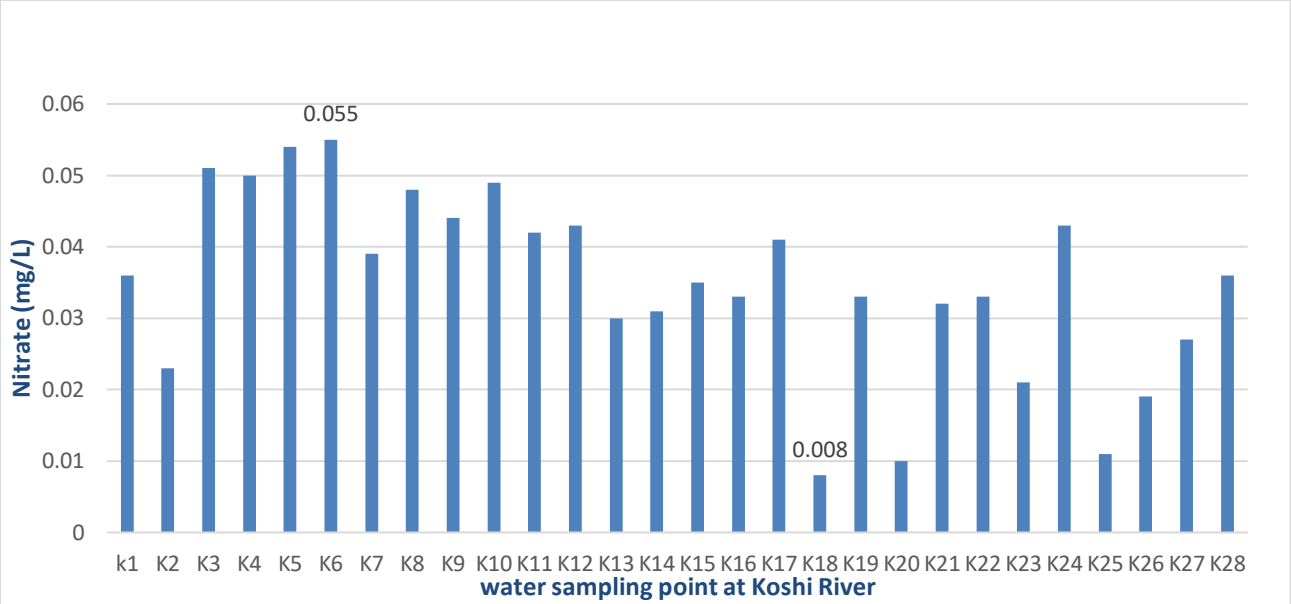


Fig 9: Graph illustrate the data of nitrate sampled at 28 different sampling points of Koshi Rivers

Photograph 10: Water sample analysis in the laboratory using flame photometer, spectrophotometer

Photograph 11: Project volunteer performing laboratory analysis of the sampled water collected from Koshi

5.2. Prey Species (Fish) Survey: As part of the prey base assessment critical to understanding dolphin ecology and informing their conservation, a fish survey was carried out along both the sections (upper and down) of the Koshi River. Given that fish constitute the primary food source for River Dolphin, assessing fish diversity and abundance provides vital insights into habitat suitability, ecological health, and potential threats to dolphin populations. The survey adopted a purposive sampling approach, wherein ten permanent sampling plots were strategically selected to represent diverse habitat types along the river stretch. Site selection was guided by ecological criteria such as variation in depth, flow regime, substrate composition, and riparian features, thereby enhancing the likelihood of capturing a wide array of fish species.

A unique and highly effective aspect of this survey was the engagement of capacitated River Guards as local resource person/fishermen where their traditional knowledge on fish and water will be an asset to the survey while possess in-depth ecological knowledge of fish fauna in Koshi River. Their familiarity with local fish names, habitat associations, and behavioral patterns significantly strengthened the efficiency and accuracy of the survey.

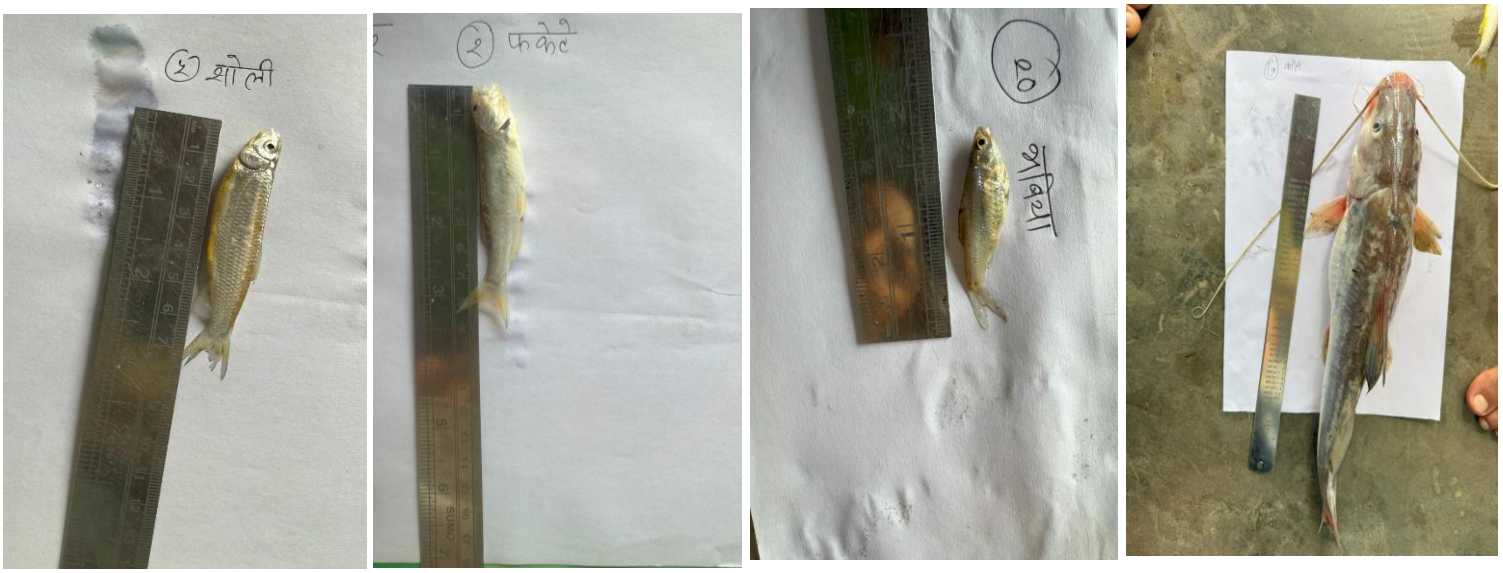
Fish sampling was conducted using a variety of locally accessible and traditional fishing methods, including gill nets (mesh size 0.1–2.5 cm), cast nets (4–7 mm), hook lines, and indigenous fish traps known as Dadiya. To maximize species detection, sampling was conducted across multiple time periods—cast nets, hook lines, and traps were deployed in the early morning and late afternoon, while gill nets were set in the evening and retrieved the following morning. Each site was surveyed for five consecutive days to ensure consistency and comparability. All fishing activities adhered to the catch-and-release protocol in compliance with the Department of National Parks and Wildlife Conservation (DNPWC) guidelines. Captured fish were quickly rinsed, photographed for morphological documentation, and released back to their habitat.

The integration of local capacity through River Guards not only improved resource efficiency but even helps to reduce the logistical costs and time but also enhanced the conservation effectiveness of the study by building community awareness and stewardship. This approach underscores the dynamic relationship between prey species availability and dolphin survival and offers a replicable model for community-engaged aquatic biodiversity monitoring that can support adaptive river conservation strategies in the long term.

Fish identification was carried out initially with assistance from local experts and was later verified using standard references, including Shrestha (1981, 1994, 2019), Jayaram (2013), and Jhingran & Talwar (1991). The survey documented a total of 35 fish species across the ten sites, highlighting the ecological richness and prey availability within the Koshi River system at the time of study. These findings are critically important for

dolphin conservation, as they provide a baseline for monitoring changes in prey abundance and help identify areas of high ecological value that may require enhanced protection.

Photograph 12: Local fishermen engaged in the prey species at different sites of Koshi River employing different fishing gears



Photograph 13: Different species of fish captured and photographed during the prey species assessment at Koshi

6. Conservation Outreach Program:

For the conservation outreach program, besides the school awareness, other activities included a community awareness program, the design of brochures and dolphin's stickers was performed to convey the conservation message among the targeted audiences.

6.1. School Awareness Program

As a part of the conservation outreach initiative, a well-structured and evidence-based awareness program was conducted across seven schools: Bhagwati Secondary School, Shree Dover English Academy, Shree Prakshapur Higher Secondary School, Shree Saptakoshi Secondary English School, Shree Sunshine Secondary English School, Shree Laxmi Primary School, and Shree Shanti Kunj Higher Secondary School. The program successfully reached a total of 539 students, aiming to raise awareness about the endangered River Dolphin, its ecological significance, and the vital role students can play in its conservation. The sessions were designed with insightful information related to dolphin, its conservation importance, roles and responsibilities of individuals in their conservation, legislation, national and international conservation practices. Presentations were delivered in Nepali for better understanding, accompanied by engaging visual materials such as posters, brochures, and a short video on River Dolphins to foster long-term memory retention. The sessions were kept interactive, with students actively participating by sharing what they learned, reinforcing their understanding and building confidence in conservation topics.

Photograph 14: Citizen Scientist from Forst Rufford Project undertaken school awareness session located nearby Koshi River and Dolphin habitat.

To assess the impact of the program, a pre- and post-assessment survey comprising 11 basic questions on River Dolphins was administered in each school. The results demonstrate a substantial improvement in students' knowledge and awareness. Initial understanding of the subject ranged between 3.90% and 7.40%, while post-program assessments showed a marked increase, with scores rising to between 64.13% and 86.72%. The average knowledge gain across all schools was an impressive 76.91%, highlighting the effectiveness of the program.

Table 3: School awareness program effectiveness

School Awareness Program-River Dolphin				
S.N	**Name**	**Pre-Assessment**	**Post-Assessment**	**Averaging**
1	Bhagwati secondary school	7.07	88.69	81.62
2	Shree Dover English Academy	5.89	87.04	81.14
3	Shree Prakashpur Higher Secondary School	3.90	90.62	86.72
4	Shree Saptakoshi Secondary English school	7.40	78.65	71.25
5	Shree Sunshine Secondary English school	4.82	75.21	70.39
6	Shree Laxmi Primary school	5.79	69.92	64.13
7	Shree Shanti Kunj Higher Secondary School	4.55	87.70	83.15
	Averaging			**76.91**

The significant improvement in knowledge reflects the project team's dedicated efforts, support from citizen scientists, and active engagement by school staff. Students expressed enthusiasm and a renewed sense of responsibility towards River Dolphin conservation. Encouragingly, many pledged to share their knowledge and contribute to local conservation efforts. This school-based outreach is a key component of a broader strategy to instill conservation values in youth and foster community-led support for freshwater biodiversity conservation.

6.2. Community Awareness Program

To foster grassroots-level conservation stewardship, a series of community awareness programs were conducted across six strategically selected settlements; Prakashpur, Urawn Tole, Khuniyadhar, Sukrabare, Dharahan Tappan, and Mushar Tole. These areas were chosen based on their proximity to river systems and their livelihood dependence on riverine resources, particularly fishing and farming communities who regularly interact with river ecosystems. A total of 375 local participants took part in these sessions, where the primary objective was to sensitize and educate river-dependent communities about the ecological significance and conservation status of the River Dolphin (*Platanista gangetica*). The awareness activities covered a wide range of topics, including:

- Ecological and environmental importance of the River Dolphin
- Current threats and conservation challenges
- National legislation and protective measures
- Community roles and responsibilities in conservation

These sessions were designed to promote local ownership and support for conservation efforts, ensuring that the knowledge imparted is both practically relevant and culturally appropriate. Given the fact that, these communities are heavily dependent on river resources for their livelihoods; particularly fishing, the program was especially relevant. By increasing local understanding, it is expected to promote more responsible resource use, community-led advocacy, and wider dissemination of conservation messages, fostering long-term support for River Dolphin conservation.

To assess the effectiveness of the awareness program, a set of 11 dolphin-related questions was used to evaluate participants' knowledge and confidence before and after the sessions.

Table 4: Effectiveness of Community Awareness Programs on River Dolphin Conservation

Community Awareness Program-River Dolphin				
S.N	**Name**	**Pre-Assessment**	**Post-Assessment**	**Averaging**
1	Prakashpur	8.16	83.22	75.05
2	Urawn Tole	9.94	88.07	78.12
3	Khuniyadhar	15.67	77.12	61.44
4	Sukrabare	7.53	82.08	74.54
5	Dharahan Tappan	15.06	84.09	69.03
6	Mushar Tole	10.68	73.86	63.18
	Averaging			**70.23**

The results show a substantial increase in knowledge, with awareness levels rising from an average of 11.17% to 81.40%, reflecting an overall improvement of 70.23 percentage points. These figures demonstrate the high effectiveness of targeted awareness campaigns. By significantly improving community understanding, the program has built a foundation for greater local participation, behavioral change, and long-term conservation impact. Overall, the community awareness program has proven to be an essential component in bridging the gap between scientific conservation goals and community-level action, fostering a shared responsibility for biodiversity protection.

Photograph 15: Community awareness program conducted at different settlement prioritizing farmer, river dependent communities of Koshi River

7. Development Educational Materials:

7.1. Design and development of Story-book

The design and development of a storybook is a key component of the outreach program, particularly tailored for school-based awareness and education initiatives. Storytelling is an effective tool to engage young minds, and the storybook aims to translate complex conservation issues into relatable narratives for students. The content of the book is deeply rooted in real-life experiences and observations from the Koshi River, with actual characters from local communities selected to enhance authenticity and connection. The storyline incorporates conservation gaps, risks, and challenges encountered during fieldwork—such as pollution, habitat degradation, and unsustainable fishing practices—making the narrative both educational and grounded in reality.

Each subject within the book has been carefully chosen to reflect the relevance and urgency of River Dolphin conservation, while fostering empathy and responsibility among students. Beyond just a story, the book provides in-depth ecological knowledge about the River Dolphin, its behavior, threats to its survival, and the role of local communities in its protection. By combining factual information with compelling storytelling, the storybook serves as a powerful educational resource to build awareness, shape attitudes, and inspire conservation action among the next generation. To get the insight of the story book follow this link: (https://drive.google.com/file/d/1qt2sdDatBg8YzeSdlDQgf6ua0Nsex7AF/view)

Photograph 16: Front and Back cover page of the story book

7.2. Design and development of brochures and stickers

Educational materials such as brochures and stickers play a vital role in enhancing the reach and impact of the awareness program by providing visually engaging and accessible information about the River Dolphin and its conservation. These materials are designed to simplify key messages—such as the ecological importance of dolphins, threats they face, and ways communities can contribute to their protection—into easily understandable formats.

Brochures offer a concise yet informative overview, while stickers serve as constant visual reminders that reinforce conservation messages in schools, homes, and public spaces. Distributed to students, community members, and visitors, these materials help visualize the broader significance of dolphin conservation, leaving a lasting impression and encouraging positive behavior change. Their portability and appeal make them effective tools for spreading awareness beyond formal sessions, ultimately helping to build a more informed and supportive community committed to protecting riverine biodiversity.

Photograph 17: As an education tools, dolphin sticker depicting conservation message has been developed (left) and sticker pasted as different office and institution at Koshi (right)

8. Media Coverage

The River Dolphin Survey 2025, conducted in collaboration with Koshi Tappu Wildlife Reserve (KTWR) and the National Trust for Nature Conservation (NTNC), received widespread national online media coverage following its official disclosure on World Environment Day, June 5. Multiple prominent media outlets featured the findings, highlighting the significance of the survey and the status of the endangered River Dolphin in the Koshi River system. The results were formally presented by the Senior Program Officer from KTWR, who emphasized key data and conservation insights gathered during the study. The event drew participation from key stakeholders, including representatives from local Community-Based Organizations (CBOs), conservation authorities, and media personnel. The media coverage not only amplified public awareness but also helped bring national attention to the ecological importance of River Dolphins, the threats they face, and the need for collaborative conservation efforts. Please find the details in the following links:

- *https://english.onlinekhabar.com/number-of-dolphins-goes-up-in-saptakoshi-river.html*
- *https://nagariknews.nagariknetwork.com/social-affairs/1478191-1749109854.html?fbclid=IwQ0xDSwKuo6hleHRuA2FlbQIxMQABHqA1nOGDxSfwpGaTme9YfVvwZ_thFkrjcpz8fMW7UTzvbUbgTxWqT706O2IO_aem_kDa81RBECtonpq5rOaNKWg*
- *https://koshipatra.com/news/2025/06/05/9494.html?fbclid=IwQ0xDSwKudZRleHRuA2FlbQIxMQABHoxnAsA8lU683H7qbh3uWG3DgtFZNVTiOTh-AtZeROu3AyJbJk-J8rsWbgAe_aem_1nzRHPQM2ChXizHAVzxbkw*

कोशीटप्पुमा बढे डल्फिन

चार दिन लगाएर गरिएको गणनामा १४ वयस्क, ५ अर्धवयस्क र २ बच्चा डल्फिन रेकर्ड भएका छन्

अर्जुन खुदी तुलसी

संकटापन्न सूचीमा रहेको डल्फिनको संख्या कोशीटप्पुमा बढेर २२ पुगेको छ। यसै साता गरिएको गणनाको कोशी नदी तथा कोशीटप्पु वन्यजन्तु आरक्ष क्षेत्रले बिहीबार नतिजा सार्वजनिक गरेको हो। १४ देखि १८ जेठसम्म भएको गणनामा १४ वयस्क, ५ अर्धवयस्क र २ बच्चा डल्फिन रेकर्ड गरिएको आरक्षका वरिष्ठ संरक्षण अधिकृत भूपेन्द्रप्रसाद यादव बताउँछन्। गत वर्ष ९९ वटा मात्र डल्फिन रेकर्ड भएको थियो।

पानीमा बस्ने डल्फिन अन्धा नभई बच्चा नै जन्माउने जीव हो।

आकारमा माछाभन्दा ठूलो भए पनि डल्फिनले माछेलाई कुनै हानि गर्दैन। 'यो मानवसँग निकै निकट र रमाउने जीव भएको हो,' संरक्षणविद् यादव भन्छन्।

भारतको गंगासागर हुँदै कोशी नदीसम्म जलचरण गर्ने यी डल्फिन सफा र गहिरो पानीमा विचरण गर्न मन पराउँछन्। पछिल्लो समय नदीमा प्लास्टिकजन्य फोहोर बढेकाले डल्फिनको संख्यामा उल्लेख वृद्धि हुन नसकेको वरिष्ठ संरक्षण अधिकृत यादवको भनाइ छ। 'नदीमा प्लास्टिक, बोतलजस्तो फोहोर धपिने गरेका छन्, त्यसले डल्फिनको आहारा र संरक्षणमा चुनौती थपिएको छ,' उनी भन्छन्।

राष्ट्रिय प्रकृति संरक्षण कोष कोशी केन्द्रका प्रमुख वीरेन्द्र गौतमका अनुसार नेपालको सप्तकोशी र कर्णाली नदीमा डल्फिन पाइने गरेको छ। नेपालमा डल्फिन सबभन्दा कम संख्यामा भएको आरक्षले जनाएको छ। आरक्षले सन् २०२२ देखि प्रत्येक वर्ष डल्फिन गणना गर्दै आएको छ।

आरक्षको तथ्यांकअनुसार २०२२ मा यहाँ १७ वटा डल्फिन थिए। २०२३ र २०२४ मा ९९ डल्फिन गणना भएका थिए।

Photograph 18: River Dolphin survey and result disclosed news featured in the national news paper

FUTURE PLANS

1. Data analysis of prey assessment
2. Preparation of GIS map of threat assessment, ecological and dolphin survey
3. Conduct remaining school and community awareness program
4. Post-monsoon dolphin survey, water quality and prey species assessment
5. Art competition and street drama