

# ZOO'S PRINT

Communicating science for conservation



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## Bycatch of sea snakes from Surwada Beach, Gujarat, India

Marine debris, such as discarded or ghost nets, poses significant risks to wildlife, habitats, and human safety (Patel et al. 2022). Among the various threats to marine fauna worldwide, commercial fishing stands out, largely due to the indiscriminate capture of non-target organisms, commonly referred to as 'bycatch' (Kumar & Deepthi 2006; Worm et al. 2006).

Usually, fishermen look for selling the bycatch in the market but due to regulatory and economic reasons, they often discard these bycatch items and return them back to the sea, usually dead or injured marine life (Catchpole et al. 2007). The impact of bycatch on marine ecosystems has become one of the foremost conservations concerns



Photographic record of net entangled *Hydrophis schistosus* Daudin, 1803 from Surwada Beach, Gujarat, India. © Aadit Patel.



Photographic record of dead entangled sea snakes, *Hydrophis platurus* Linnaeus, 1766 from Surwada Beach, Gujarat, India. © Aadit Patel.

globally (Harrington et al. 2005).

Coastal fisheries face ongoing challenges regarding bycatch, particularly for species with long lifespans and low reproductive rates, including marine mammals, sea birds, and sharks. Bycatch can disrupt marine biodiversity by affecting top predators, reducing populations of various species. Sea snakes are occasionally caught as bycatch in tropical trawl fisheries in India (Boopendranath et al. 2008). They inhabit tropical and subtropical waters across the Indian and Pacific oceans. Found in shallow waters near coasts, islands, river mouths, and sometimes even in rivers up to 100 miles inland.

Sea snakes face various threats from human activities, including bycatch, directed fisheries, habitat degradation, and pollution. Much of our current knowledge about sea snakes comes from their incidental capture in fisheries (Udyawer et al. 2023). Additionally, they are exploited for their meat, skin, and internal organs in many regions, and while they are not



currently protected under CITES, international trade in them is sometimes reported (Livingstone 2009).

On 20 July 2022 at 1600 h from Surwada Beach (20.5700 N & 72.8954 E), Gujarat, large number of dead sea snakes were observed lying trapped in damaged fishing nets during a field visit by the first author. Based on the morphological features, they were identified as *Hydrophis platurus* (Linnaeus, 1766). Interestingly, on re-visiting the site after a few days interval, many live sea snakes were observed. On close observation, they were found to be *Hydrophis schistosus* (Daudin, 1803). Previous instances of net-entangled terrestrial snakes and sea snakes have been reported from Gujarat (Patel et al. 2022, 2023).

These are several types of stationary nets made of nylon material, viz., u-net, drag net, gill net, and line net which are deployed around 10 km from the shore, the fishermen only collect and bring the catch back to shore and not the nets.

Some snake species are commonly found in bycatch such as *H. cyanocinctus* Daudin, 1803, *H. curtus* Shaw, 1802, *H. schistosus* Daudin, 1803, *H. caerulescens* Shaw, 1802; however *H. platurus* Linnaeus, 1766 is rare. When they remove the catch from nets, they release most of the bycatch like sea snakes, turtles, and dolphins. From our observed record of sea snakes that were found in the coastal area they were accidentally dislocated as bycatch during regular fishing activities and most of the bycatch were discarded while separating them from the actual marine catch in the sea, thus

we could not clearly estimate the total count of sea snakes that might have got trapped in the nets.

The threats posed by the high amount of fishery activities associated with bycatch is a risk to many organisms including sea snakes which get entangled in these nets and are washed off ashore while fishing and often die due to injury. In this area, while fishing is being practiced, no proper strategies are being applied to limit the damage to non-target species ultimately acting as a potential source of danger to the coastal wildlife including sea snakes which are found regularly entangled in nets.

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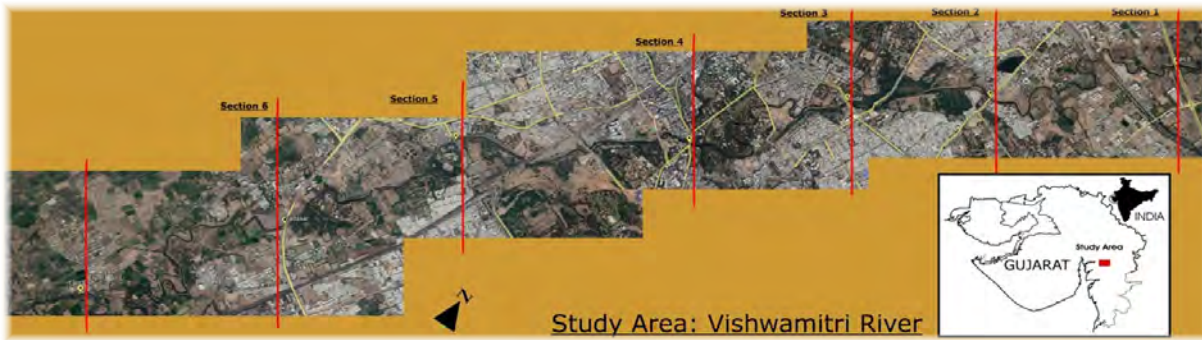
## Banyan City becomes Makara City: My City, Motto and Marsh Crocodile

The role of rivers as lifelines in the history of human civilization is unequivocally true. Civilizations have flourished and perished along the banks of different rivers across the continents. This habitable blue-green planet that we call home, means much more than rivers simply being natural sources of fresh water. Though water is one of the fundamental precursors of life on Earth, it remains increasingly challenging for any life form to sustain or thrive without clean and non-polluted fresh water.

Today, we find ourselves in this detrimentally extractive state of existence, where rivers are subjected to continuous contamination, irreversible damage, and steady degeneration. As humans, we are bound to make mistakes and learn from them, making us all, to some extent, imperfect and evolving. Nonetheless, we share this planet with millions of life forms, all of which deserve a chance to survive, grow, and live a peaceful life. As a result of our anthropocentric view of growth and development cultivated over the centuries, we have eventually conditioned ourselves to complicate life, making every day more

challenging and chaotic. In doing so, we have disturbed the order and balance of nature, exacerbating the loss of life, ease, and diversity. Life of not just humans, but collectively the life of this planet, everything non-human, encompassing all forms of life and the systems that sustain them. Even so, nature has ways of restoring its order and balance, almost like rules and regulations, the natural law as we understand it. In isolation, though a singular human lifespan is trivial compared to the age and history of Earth, the aggregate of man's presence across countless generations has significantly affected and interfered with the laws of nature. Time and again, we lose, and nature wins.

On this note, I present an anecdote about the Vishwamitri River. Vishwamitri is a small 200km long (approx.) non-perennial river. This rain-fed river originates from the Pavagadh Hills and flows westwards to meet the Gulf of Khambhat. In between, Vishwamitri flows across Vadodara's densely populated urban city. This city and its surroundings lie in urban pockets, home to a few hundred Marsh Crocodiles *Crocodylus palustris* (Vyas 2010, 2012).



The aerial view of the Vishwamitri River flowing through the urban city of Vadodara.

Tracing back, Vadodara was once the capital of the princely state of Gaekwads, later anglicized as Baroda during the colonial era. Before the Gaekwads, Vadodara was known as Chandravati under the reign of Chanda of the Dodiya Rajput dynasty. Historically, the city was renamed from time to time, with shifts in power and control. Post-independence, with democracy heralding

the formation of modern India, the city then came to be known by its current name, i.e., Vadodara, or the Banyan *Ficus benghalensis* City. With rapid urbanisation and industrialisation, the demographics of Vadodara changed faster than ever. As Vadodara continued to grow as an urban centre, the demand for housing and land grew exceedingly. The growing demand for housing

and the institutionalisation of the real estate industry subsequently translated into a large-scale deforestation drive. The banyan groves, which once reflected Vadodara’s identity, were lost in no time. Most of the banyan groves and wilderness pockets disappeared within a few decades. Like many other contemporary cities of similar fabric and scale, the quest for cosmopolitanism and modern identity resulted in a near-complete erasure of Vadodara’s indigeneity, heritage, and unique identity.



An illustration of rescuers with rescued adult mugger from the urban city of Vadodara. © Hemant Vadhvana.

The city embraced a new identity of being an industrial and student city. Alongside industries followed tech parks and the suburbs. It saw a steady rise in the influx of diverse settlers from near and far. With all three elements of land, sky, and water now being shared across the maximum strength of human



**The river diversity with half a dozen muggers basking on the banks of Vishwamitri River. © Rakesh Vadhvana.**

presence Vadodara has ever witnessed, the conflict crawled regardless. Once a beautiful cultural capital and Gaekwad's legacy, it changes faster than ever. It is now a bustling metropolis, imitating global trends, seeking modernity, and chasing development. A permanent address to different societies, traditions, and cultures. It is not just the land that undergoes urbanization; the sky and the waters also transform. In ways in which a countryside river compares to a cleaner, natural, and generous version, in contrast to its urban segment, Vishwamitri changes as it travels from the rural to the suburban and the urban. Parts of Vishwamitri that cut across the city have murky, black, frothy waters polluted with industrial and medical waste, and debris.

The river ecology, along with its interface, changes unrecognizably (Shah 2024). The river's calm waters have become muddy, erratic, and problematic (Vyas 2010). The depths are being manipulated as and where needs arise. The monsoon, historically romanticised and cherished,

has become a nightmare for the citizens, to the extent that the municipal corporation must survey and repair the entire city at the end of every summer. A few inches of rain quickly floods most of the city and almost all the suburbs. The river differs from being the harbinger of life to a dreadful force of nature.

The same riverside that defines the architecture and approach to all the city's historical monuments, once the most coveted parcels of land, and now fall in the most overlooked flood zones. Citywide evacuations, rescues, and rehabilitation occur invariably, testing the resilience of Vadodara's citizens. It is peculiar how the river



**The victim of a large 4-m-long mugger after the fatal attack in the rural area by locals of Vadodara. © Pravin Maharaj.**

### Box 1: Saga of Mugger Flourished at Vadodara

Today, wildlife conflict is a common issue on the earth, but there are a few pockets where man and wild animals live in proximity without harm or each other adjusting their existence. We call this a coexistence life. Such coexistence is a big hope for the survival of each other.

Here, I will emphasise the unique and ideal correlation between giant carnivorous reptiles and modern men who co-exist in Vadodara, Gujarat's highly populated urban city. The urban city of Vadodara is a grown modern industrial hub with the essence of traditional Marathi cultures and the last remnants of Gaikwadi monarchies. The river is an abode of much wildlife, including over 400 different sizes of mugger crocodiles *Crocodylus palustris*, including juveniles, subadults and adults over three meters. Such an ideal example of the co-existence of men & muggers is gratitude to locals who live in the city and love the mugger crocodiles. This unique example of the co-existence of big carnivores and men credit goes to over a half dozen non-government organisations and two dozen of its volunteers and staff of the state forest department, who work 24x7 to rescue muggers from human habitation and also, serve volunteering awareness programmes to cities and surrounding of rural villages.

Undoubtedly, such good numbers of muggers survive within human vicinity. Still, the proximity of muggers and human settlements also creates some interaction between both, either positive or negative. There were 441 various sizes of muggers surviving in the city area of Vishwamitri River, as per the last official mugger census in 2020. However, every year, numerous muggers are being rescued from urban areas of the city and translocated with the involvement of various NGOs and staff of the State Forest Department. The forest department rescue registered data indicated that a total of 119 and 225 muggers were rescued in 2021 and 2022, respectively. Unfortunately, 20 muggers were found dead, including five muggers on a road and railway accident. This small and dense population of muggers survives in the kernel of Vadodara, Gujarat, and is a notable example of crocodylian conservation and man-mugger concordance. The preservation of this population now lies in the hands of the residents of Vadodara City and various local government agencies, including the State Forest Department, Urban Development Authority, and Municipal Corporation, Vadodara. The interaction between crocodiles and men in Gujarat State is usual and has a long cultural history. Gujarat is the place where people believed in worshipping crocodiles as 'Mogra Dev' and believed it to be the vehicle of Goddess 'Khodiyar Mata' and 'Namami Devi Narmade.' These are a few of the best examples in the state, where a mugger and man are found in the same vicinity and tolerate each other's presence, but Vadodara City is noteworthy.

looks and behaves, although all 'Barodians' (dwellers of Baroda) identify themselves as mindful and attached to river Vishwamitri. The wildlife rescue data maintained by the local forest department shows alarming numbers of wildlife rescues from human settlement areas, including snakes and crocodiles every year. Over a hundred volunteers from various non-government organizations voluntarily provide wildlife rescue services round the clock. According to the official data, over a thousand snakes (Vyas 2013) and an average of over six dozen different-sized mugger crocodiles are

rescued from the city every year (Vyas 2012). In the early eighties, the city's silent night is broken by the howling of Golden Jackals *Canis aureus* and screaming by nocturnal birds like owls and owlets. The day rises with open empty skies with dotted designs of flights of White-rumped Vultures *Gyps bengalensis* and many other birds, but by the end of the century, the above pictures changed. The sound of automobiles and vehicles breaks the city's silent night, and the darkness is filled with artificial neon lighting. The city's days begin with polluted skies, vultures vanish from the skies of



Vadodara, and jackals leave the abode of the riverside forest. However, such environmental changes could not be accepted by jackals and vultures. Still, silent, secretive animals like muggers could accept changes and flourish in the river's waters. Slowly, muggers took charge of these urban scavengers and showed survival abilities in such situations.

Now, Banyan City has been identified as the home of abundant mugger crocodiles. Muggers, the apex predators of freshwater ecosystems, have adapted to the city with urbanized survival mechanisms, feeding on carcasses and scavenging predominantly. True to the nature of a city, where every citizen has a job to carry out, muggers have adopted the role of converting. Muggers now break down meaty waste by picking dead matter off the river banks.

The natural habitat of Golden Jackals, White-rumped Vultures, and non-scavenging bird species like a Red-whiskered Bulbul *Pycnonotus jocosus* disappeared from the city (Vyas 2006), alongside riverine undergrowth and scrub forests. Traditionally, scavenging species of urban wildlife have gone locally extinct from these localities, leaving more significant accumulations of disposal to the crocodiles' share. Other species, including the Hanuman Langur *Semnopithecus entellus*, flourish and reside in close proximity. All these good numbers of Hanuman Langur survive as subsidized species on the vegetable foods that humans leave as garbage. Over one dozen langur bite cases and electrocuted injured langurs are found in the city, as per forest officials. However, the natural scavengers' duty is replaced by monkeys acting as veg and muggers acting as non-veg scavengers in the

absence of Golden Jackals (omnivores) and vultures (scavengers). The loss of riverside natural habitat and the disappearance of natural scavengers from in and around Vadodara City indicate drastic changes within the human-dominated landscape area. Still, nature is always ready to balance to meet requirements. Here, nature is so obligatory to add new scavenger species within the site. The urban population of muggers has been growing steadily. And yet, the conflict is inevitable. There is constant territorial tension between humans and muggers, reclaiming their habitats and place in the city. While humans dominate the lands, muggers maintain control over the waters. In Vadodara, this interspecies tug of war is now commonplace.

Directly and indirectly, human-crocodile interactions have increased too. They resulted in frequent encounters and sometimes conflicts (Vyas & Stevenson 2017; Pooley 2022). Occasionally, the humans, and other times the muggers suffer (Vyas 2019). There have been a few incidents where crocodiles were found road-killed or botched under trains while crossing railway tracks (Vyas & Vasava 2019). Moreover, an interstate network of Narmada irrigation canals provides convenient access, like a highway for the muggers travelling from one water body to another in search of stable water levels, territorial dominance, and fresh-food security (Vyas et al. 2023). Essentially, Barodians include both humans and muggers cohabiting in the city.

This coexistence presents a unique anecdote, one of the many subchapters of a city's history where cultures rise and fall along the river banks. While both species thrive and coexist,



Vadodara's identity is synonymous with a 'Mugger City.' Vadodara is thus an acute case of man's coexistence with urban wildlife. Not just Vadodara but the whole of India has been exemplary, where animals and humans live in accord without harming each other. Having spent almost four decades in the city as a citizen of Vadodara, I present this symbolic account of the symbiotic existence between man and muggers based on first-hand observations and experiences.

However, I'd not overlook or dismiss the current reality where this harmony has been interrupted occasionally, leading to a dilemma and uncertainty. There have been records whereby muggers attacked, and humans lost their lives. If not fatal, there are several cases where the victim has a permanent disability (Pooley 2022). There are also ample instances where people attacked the muggers. Sometimes, out of revenge, some people have injured the crocodiles and killed them too, and other times, destroyed their nests or habitats. Such incidents characterize a negative reflection of wildlife conservation within urban areas. Attitudes and incidences like these threaten the delicate coexistence of humans and wildlife in dense urban environments.

After spending around four decades in the city, I think of Vadodara as my 'Karma Bhoomi' (place of duty). Hence, I refer to M3 ( $M^3$ ) as three Ms, for myself, my city, and the muggers. But there is an iteration, another M, that I'd like to add to the M3 connotation: the mantra of trust, the motto of coexistence between man and muggers.

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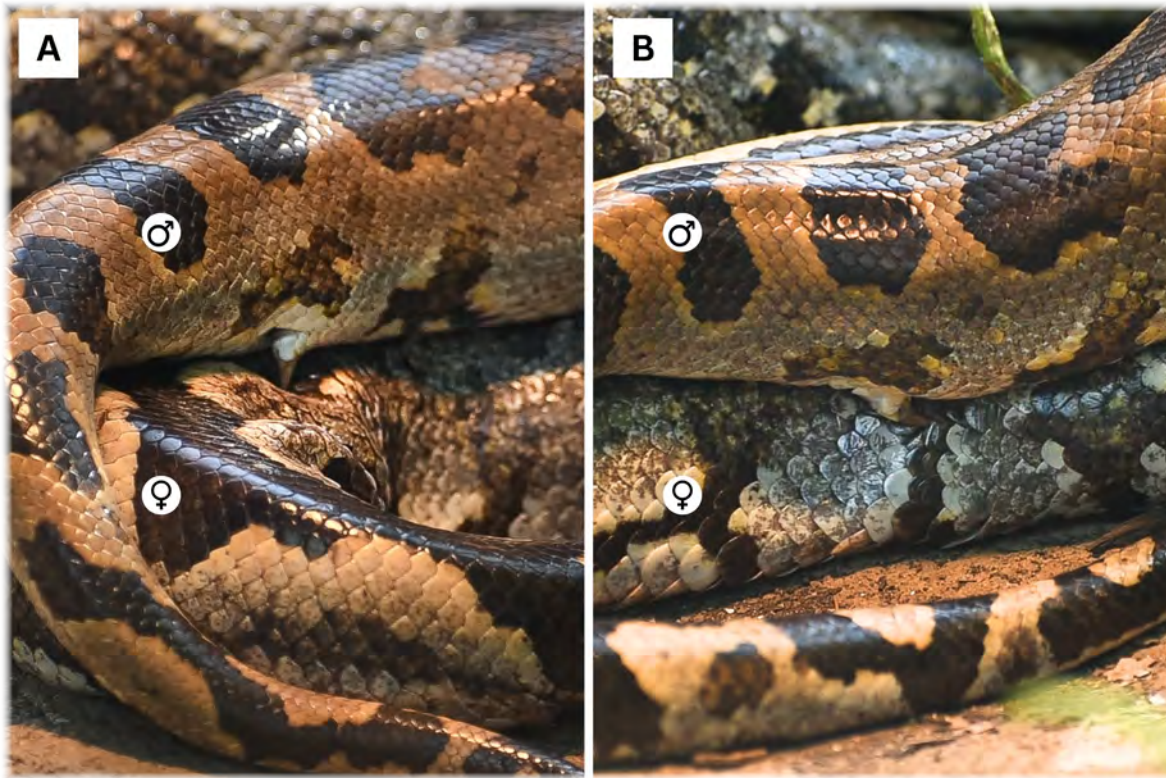
## Insights into the use of pelvic spur in mating behavior of Indian Rock Python

Early species of snakes within the Alethinophidia clade exhibit pelvic spurs, a trait believed to be ancestral. These spurs are usually more pronounced in males and are equipped with muscles, nerves, and blood vessels, enabling them to move independently (Hoge 1947; Carpenter et al. 1978). They play pivotal roles in combat, courtship, and mating within the Boidae and Pythonidae families, underscoring their evolutionary significance (Stickel & Stickel 1946; Carpenter et al. 1978; Slip & Shine 1988). The use of pelvic spur for mating and combat is well recognized in Red-tailed Boa (Anzai et al. 2023), Burmese Python (Gillingham & Chambers 1982), and Diamond Python (Slip & Shine 1988). Our study highlights the significance and provide detail insights into the utilization of pelvic spurs in Indian Rock Python.

The Indian Rock Python *Python molurus*, distinguished by its robust build and distinct dark blotched pattern, is a large ovoviviparous snake prevalent across the Indian Subcontinent. However, detailed insights into the reproduction and captive management of this species are

limited (Vyas 2002). Both sexes possess pelvic spurs located adjacent to the anal scale, with males typically showcasing larger spurs. These spurs, thought to be vestiges of hind limbs, are utilized actively in a range of behaviours, notably in mating, highlighting their evolutionary roots (Vyas 1996; Babar et al. 2019).

We observed pelvic spur usage during mating in Indian Rock Python at Sardar Patel Zoological Park, Ekta Nagar, Gujarat. The zoo houses a small group of four pythons (one male and three females) for exhibition purposes. The male python is 1.55 m (5.11 ft) long, while the female pythons measure 1.95 m (6.4 ft), 2.38 m (7.8 ft), and 2.47 m (8.10 ft), respectively. On 2 February 2024, we documented the male python engaging in mating behaviour, notably using its spurs to stimulate one of the females. In the observed behaviour, the male utilized its pelvic spurs in a manner that significantly influenced the positioning and receptivity of the female during mating. The interaction involved the male applying his spurs against the female's body, not with gentle rubbing but through



**A**—Male Indian Rock Python poking his spurs on dorsal part of the female’s body to stimulate her. © Vaibhav Kansara.

**B**—Male Indian Rock Python using spur on the lateral side of the female’s body for positioning her. © Vaibhav Kansara.

**Table: Courtship behaviour observations of Indian Rock Pythons.**

Observation no.	Date	Start time	Description of display
1	02.ii.24	1200 h	Male began to rub the sides of the females’ bodies with his spurs.
2	02.ii.24	1400 h	Male began to climb onto female’s backs and align his body with her. Afterward, the male began to rub its spurs on the sides of the female’s body, going from posterior to anterior. At roughly about 1430 h, the female constrained her body and moved to the area of the enclosure with the densest vegetation after shifting positions in response to the spur’s movement and touch.
3	08.ii.24	1030 h	The male stimulated the female by rubbing against her and using his spurs close to the cloaca.
4	08.ii.24	1100 h	Female appeared receptive, remaining still and allowing the male to approach and engage in courtship behaviours without aggression or resistance
5	08.ii.24	1130 h	The male slowly stopped rubbing his spur around the female’s body, and they slowly moved apart.
6	10.ii.24	1530 h	The female displayed non-receptive behaviour by continuously vibrating her body and tail. This behaviour continued for around half an hour.
7	11.ii.24	0930 h	The male stimulated the female by rubbing against her and using his spurs close to the cloaca.



more forceful poking actions. This behaviour, reminiscent of finger-walking but executed with the spurs, serves to provoke a reaction from the female, likely due to discomfort or pain caused by the spurs' sharpness. The male's actions appear strategically designed to coax the female into repositioning her body into a posture more conducive to copulation (Shine 1994; Aubret et al. 2002).

Given the considerable size disparity often observed between female and male Indian Rock Pythons with females being substantially larger, it is plausible that this behaviour has evolved as a male strategy to navigate the challenges of mating with larger females. The variation in spur size between males and females, with males typically possessing larger spurs, further supports the idea of sexual dimorphism arising from reproductive strategies (Hoge 1947; Slip & Shine 1988).

Our observations during the breeding season emphasize the significance of pelvic spurs in reproductive behaviour and offer detailed insights into their utilization in Indian Rock Pythons. Additional research is required to fully understand the functional roles of pelvic spurs in snake courtship and mating behaviours.

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## First report of the termite *Odontotermes obesus* near Madan Kamdev Temple, Assam



*Odontotermes obesus*. © Nitul Ali.

Madan Kamdev Temple (26.3195 N & 91.7420 E) in Assam is a famous archaeological site that contains a group of temples with distinctive sculptures, offering an insight into the state's prehistoric society. It is situated on Dewangiri Hill, near Baihata Chariali, in Kamrup District. The terrain surrounding the temple area, along with its nearby villages, is divided into hills,

plains, and low-lying areas. This well-known location is abundant in culture as well as biodiversity (Mehjebin & Ali 2024).

*Odontotermes obesus* is a type of termite that is a member of the isopteran order of insects, and it constructs its nests under the soil. It is one of the major termite species that has been

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Nest of *Odontotermes obesus*. © Nitul Ali.

identified as residents in Assam (Saikia et al. 2024). On May 2024, *Odontotermes obesus* was spotted for the first time at Madan Kamdev Temple area.

## Materials and method:

For identification of the correct species, soldiers and worker members were collected and brought to the laboratory using the method of Pearce (1997). The taxonomic keys of Roonwal & Chhotani (1989) and Chhotani (1997) were used to accomplish the identification process. During identification, the samples were examined under a binocular microscope by placing them on little glass

dishes with 70–80 % ethyl alcohol, and various parts were measured with the help of an ocular micrometer.

*Odontotermes obesus* has 16–17 antennal segments; the third segment is the shortest of the 17 segments.

They contain falciform mandibles with a length of approximately 0.75–1.03 mm. The length and width of the postmentum are 0.74 mm and 0.48 mm, respectively. The anterior lobe of the species is semicircular, while the pronotum is saddle-shaped with variably notched ends (width: 0.80–1.07 mm, length: 0.5–0.65 mm) (Zaman et al. 2022).



The study site. Source: QGIS Software version 3.16.

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Bugs R All is a newsletter of the Invertebrate Conservation and Information Network of South Asia (ICINSA)



## Breeding of Indian Spotted Eagle and some new bird records for Shuklaphanta National Park, Nepal

Shuklaphanta National Park (ShNP) 28.7965 to 29.0471 N & 80.1565 to 80.3653 E; 175–1,300 m) is located in the lowlands of far-western Nepal. The park has a total area of 305 km<sup>2</sup> and an additional buffer zone of 243.5 km<sup>2</sup>. There are records of 459 avian species in the park (Poudyal & Chaudhary 2019; Poudyal et al. 2022). The objective of this paper is to record and provide information about five new avian species, and document the first confirmed breeding record of Indian Spotted Eagle *Clanga hastata* in ShNP.



Desert Wheatear. © Dev Raj Joshi.

### Desert Wheatear *Oenanthe deserti* (Temminck, 1825)

On 4 April 2023, at around 1230 h, a single Desert Wheatear was sighted and photographed in the southern part of the park (28.8134 N; 80.1632 E; 178

m) while perched on a branch of *Tripidium bengalense* in Shuklaphanta grassland. The Desert Wheatear is a scarce summer visitor to Nepal's Trans-Himalayan region, and it is also an infrequent passage migrant (Inskipp et al. 2016).

### Grey-bellied Cuckoo

#### *Cacomantis passerinus* (Vahl, 1797)

On 12 December 2022, a Grey-bellied Cuckoo was observed and photographed in the north-eastern part of the park in Hirapur (28.9568 N; 80.3387 E; 217 m), perched on the *S. robusta* branch.

The surrounding habitat is a mixture of grassland and



Grey-bellied Cuckoo. © Dev Raj Joshi.



Common Woodpigeon. © Dev Raj Joshi.

forest, primarily consisting of *Shorea robusta*, *Mallotus nudiflorus*, *Imperata cylindrica*, and Sano Tapre *Senna tora*, an invasive plant species. The species is commonly observed in certain protected areas, but it is scarce in other locations (Inskipp et al. 2016), mainly reported between late April and August from the Terai up to 1,400 m and rare up to 2,135 m (Inskipp & Inskipp 1991).

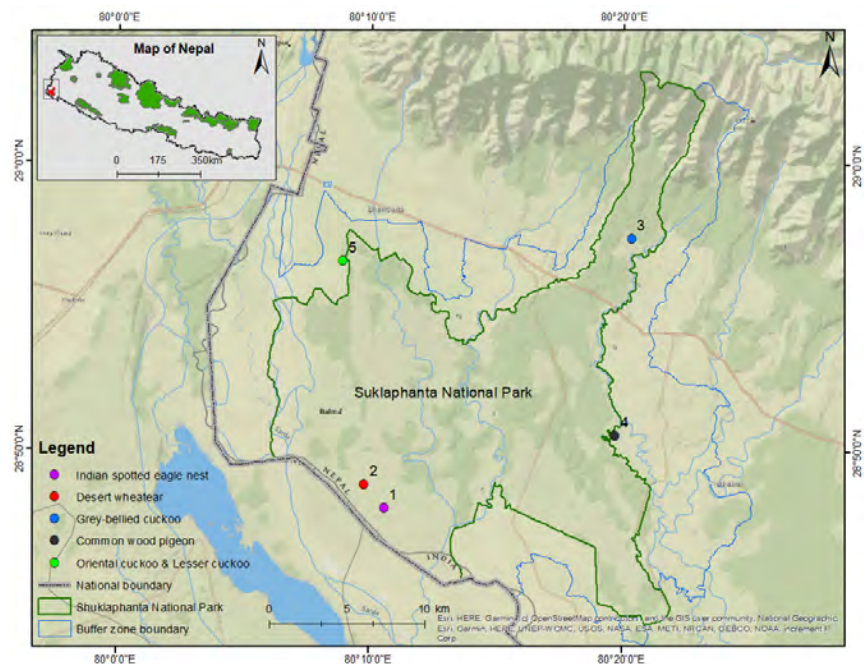
### Common Wood-Pigeon *Columba palumbus* (Hodgson, 1837)

An unusually high number of approximately 1,500 Common Wood-Pigeons were recorded on 6 January 2023, at 1400 h. The birds were observed perched on branches of Sal trees near Tara Tal (28.8429 N; 80.3285 E: 180 m). The surrounding habitat is forest predominantly dominated by Sal *Shorea robusta* trees. Since 1990, the species has been observed in more locations

than before, which is possibly due to improved coverage (Inskipp et al. 2016). The bird is a rare winter visitor to Annapurna Conservation Area (Inskipp & Inskipp 2003), a vagrant to Chitwan National Park (Giri & Chaudhary 2005), and a vagrant to Koshi Tappu Wildlife Reserve (Baral 2005).

### Himalayan Cuckoo *Cuculus saturatus* (Blyth, 1843)

At least one Himalayan Cuckoo was heard calling several times early in the morning, at least for an hour (from 0530 to nearly 0630 h) on 2 May 2023 in the Majhgaon area. The voice of the bird is unmistakable, as described in (Grimmett et al. 2016;



Map of ShNP showing the locations of new bird species recorded and the nest of the Indian Spotted Eagle.

eBird 2021). The elevation at Majhgaon is 192 m and the area has mixed Sal forest. The Himalayan Cuckoo is a common summer visitor to most of Nepal's protected areas within the usual range of altitude, viz., between 1525–3355 m (Inskipp et al. 2016).

This species has been previously recorded in lowlands, viz., Chitwan National Park and Koshi Tappu Wildlife Reserve (Inskipp et al. 2016). The bird recorded was probably on passage to a higher altitude but stopped at ShNP due to the disturbance caused by rainfall on the night of May 1.

### **Lesser Cuckoo *Cuculus poliocephalus* (Latham, 1790)**

One Lesser Cuckoo was heard calling nearly a dozen times early in the morning (0500 h) on 3 May 2023 in Majhgaon area. The voice of the bird is unmistakable, as described in (Grimmett et al. 2016; eBird 2021).

The Lesser Cuckoo is a fairly common summer visitor to some of Nepal's protected areas and frequent or uncommon elsewhere (Inskipp et al. 2016). Unlike the



Indian Spotted Eagle Nest. © Dev Raj Joshi.

Himalayan Cuckoo, this species has not previously been recorded in the lowlands. The bird recorded was probably on passage to a higher altitude but stopped at ShNP due to the incessant rainfall on 1–2 May.

### **Photo evidence of Indian Spotted Eagle *Clanga hastata* nest**

On 7 April 2023, a pair of Indian Spotted Eagle was observed in their nest placed on a Simal *Bombax ceiba* tree in Shuklaphanta grassland

(28.7998 N; 80.17630 E: 232 m). Until now, no record of the nest has been reported from ShNP. The Indian Spotted Eagle is listed as Vulnerable (VU) in the IUCN Red List categories (IUCN 2022). It was observed in May 1998 in ShNP (Baral 1998). However, we have photographic evidence of the nest.

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## First record of Falcated Duck from Lakhimpur District, Assam, India

The Falcated Duck or Falcated Teal *Mareca falcata* has a large range, with an estimated global extent of occurrence of 1,000,000–10,000,000 km<sup>2</sup> (390,000–3,860,000 sq mi) (BirdLife International 2024). Its breeding distribution ranges from southeast Siberia to Kamchatka, Mongolia (Call et al. 2019), northeastern China and northern Japan, and the birds migrate to winter mainly in southern Japan, South Korea, eastern China, and India (Carboneras & Kirwan 2020).

Situated in the Lakhimpur District of Assam in northeastern India, Satajan is a small wetland, located between 27.2115–27.2068 N and 94.0520–94.0523 E and at an altitude of 94 m. The mean annual rainfall of the district is 300 cm and experiences 31°C and 7°C maximum and minimum temperature, respectively, in the district (NWAA 2010). Satajan is home to many flora and fauna including seasonal, migratory and resident birds. A total of 87 species of birds were recorded



Falcated Duck *Mareca falcata* at Satajan Wetland. © Lakhijyoti Saikia.

from this wetland in a survey in the years 2021 and 2022 (Bhaduri et al. 2022).

A number of sightings of the Falcated Duck have been recorded from Assam. On 12 January 2021, it was spotted in Potiya Sarala Beel of Jorhat

District of Assam (eBird 2021). Another group of Falcated Ducks were spotted in Maguri Beel (Maguri Wetland) near Dibru-Saikhowa National Park and Biosphere Reserve of Tinisukia District of Assam on 13 January 2023 (eBird 2021).

We went to the Satajan wetland on 6 January 2024 for a weekly birding expedition. At 1707 h, we observed five unfamiliar ducks swimming in the center of a flock of Indian Spot-billed Ducks *Anas poecilorhyncha* almost in the middle (slightly towards the northeastern side) of the wetland. We took photographs of the duck with a DSLR camera (Nikon D3400, 70–300 mm lens). We observed the duck with a binocular (Nikon Prostaff P3 8X30) for several minutes. The birds had bottle-green head, a dark bill and elongated black-grey tertials. It had also black-bordered yellow patch at the sides of the vents.

For identification, we used available literature (Grimmette et al. 2011; Grewal et al. 2016) and for updated nomenclature, we used avibase. bsc-eco.org (the World Bird Database) and merlin.allaboutbirds.org. Finally, we were able to identify it as male Falcated Duck.

The Falcated Duck has not been recorded till now from Satajan. This is the first citation of this species, not only for Satajan Wetland, but also for the district of Lakhimpur, Assam, India.

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## Colour aberrations in Black-headed Ibis

Black-headed Ibis *Threskiornis melanocephalus* (Latham, 1790) belongs to the family Threskiornithidae and is categorized as 'Near Threatened' under the IUCN Red List (BirdLife International 2024).

It is a large, white-water bird with a prominent bare black head and neck, a long, down-curved black bill and its tail bears grey ornamental feathers, both the male and female Black-headed Ibis (BHI) are similar in size and appearance. Bare patches under the wings turn a brighter red colour during breeding (Ali & Ripley 1987; Hancock et al. 1992; Matheu & del Hoyo 1992).

Colour aberrations are common among organisms. These aberrations can be heritable (due to genetic mutation) or non-heritable (due to disease, nutritional deficiency, trauma, and environmental pollution) (van Grouw 2013). The six commonest heritable colour aberrations are, albinism, leucism, brown, dilution, ino,



Black-headed Ibis with a red neck pattern. © Anil Kumar Sharma.

and melanism (Mahabal et al. 2016). Melanism is a condition in which an organism displays a darker morphology overall or in some areas (partial melanism) as a result of more melanin or its asymmetrical distribution (van Grouw 2013).

During the study, we observed the birds from a distance of 50–60 m by hiding ourselves

without disturbing them and by following all the guidelines (Barve et al. 2020).

From 2019 till date, AKS has observed the breeding colony of BHI regularly at the Nehru Talai heronry 25.3572 N & 74.6386 E, in Bhilwara, Rajasthan, India. During this period, BHI with two different colour aberrations were



Partially melanistic adult Black-headed Ibis. © Anil Kumar Sharma.

observed. In the first case, at 0832 h on 08 April 2019, the AKS spotted a BHI with a red neck pattern. It was completely white, but has red-coloured spots on its hindneck as well as reddish on its femur and tibiotarsus regions of the legs. He took several photographs of this interesting individual. The red colour was due to the deposition of pigment on the skin.

In the second case, at 0900h on 29 June 2022, AKS saw a partially melanistic adult BHI. It was completely white, but had many blackish spots on the feathers of its back and

belly. No other physical or behavioural abnormality in this individual was observed.

A birdwatcher (A. Rajaram pers. comm.) saw red colouring on the hindneck in July 2003 but he did not describe it. This characteristic was observed in other members of the same genus like Malagasy Sacred Ibis *Threskiornis bernieri* and Australian White Ibis *Threskiornis molucca* but not in *T. melanocephalus* (Slater et al. 1986).

A mysterious character was recorded in BHI *Threskiornis melanocephalus* during the

breeding season (Senma & Acharya 2009). In India, breeding colonies of BHI have red patches on the hindneck (Kannan et al. 2010).

We checked all the images of Black-headed Ibis, published on the [www.eBird.org](http://www.eBird.org) website. Surprisingly, only 05 images of BHI with red neck patch and many images of abnormal morphology are available on this website without any description. We have already analysed the impact of these abnormal morphologies on their breeding success (Sharma & Tripathi 2023). In this article, we have described the cause of these colour aberrations because no one has described it on this website.

### Conclusion

These kinds of colour aberrations are originated due to abnormal embryonic development (mutation).

In birds, a little work has been done, earlier on the impact of such aberrations on breeding success. Further genetic analysis is suggested for “DNA barcoding method” which can detect such genetic changes in Black-headed Ibis.

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## Predation of a Bluethroat by an Isabelline Shrike

Village Sajrana (30.3390 N & 74.1207 E) about 15km from Fazilka, Punjab, India, has a mini wetland formed due to water logging. A large number of migratory birds visit here every year. On 15 January 2023, a routine birding visit to Sajrana was underway since 0900 h. At about 1200 h, as it was decided to pack-up, some activity was noted in the roadside thorny bushes.

An Isabelline Shrike *Lanius isabellinus* was seen on a thorny branch with a kill which was thought to be a rodent. A quick look through the camera showed that the prey was a small bird. A few shots were taken hurriedly. It was decided to make a video also, but before the camera mode could be changed, the Shrike took its kill from the thorn on which it was impaled and flew away. From examination of the photos, it turned out that the small bird was a Bluethroat *Luscinia svecica*.

Shrikes are highly opportunistic feeders, preying on the most easily available victims (Harris & Franklin 2000). Specifically,



Isabelline Shrike holding the dead Bluethroat. © Swarn Singh.



Isabelline Shrike impaling the dead Bluethroat. © Swarn Singh.

for Isabelline Shrike, food consists mostly of insects, particularly beetles and grasshoppers; other invertebrates such as spiders and snails are taken too (Lefranc & Worfolk 1997).

Small vertebrates are also taken all the year round. Birds are regularly caught on migration and in the winter quarters; among the most frequent victims are wagtails *Motacilla* sp. and warblers *Phylloscopus* sp. Other vertebrates found in the diet include: lizards, amphibians and even fish. As per Harris & Franklin (2000), the food of Isabelline Shrike comprises of arthropods and small vertebrates. They also mention the predation on (bird) chicks in non-breeding grounds. King (2017) has given detailed description of the hunting technique of an Isabelline Shrike with several photographs taken while it was attempting to predate upon a Northern Wheatear.

However, from India, we found only one published instance of an Isabelline Shrike predated on a small bird. An Isabelline Shrike was photographed while preying on a Pipit (*Anthus* sp.) in Little Rann of Kachchh, Gujarat on 29 November 2015 (Patel & Maheria 2016). Thus, the present observation of the killing of a Bluethroat is an addition to the list of birds that are part of the food of Isabelline Shrike.

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# A distributional record of Sacred Grove Bush Frog from Chota Nagpur Plateau, Jharkhand

Amphibians play a vital role in maintaining ecological balance as they are closely associated with terrestrial and aquatic ecosystems. Further, the amphibians are considered as a climatic indicator species globally and their depletion can drastically alter the populations of other organisms. A total of 8,700 species of amphibians are known from around the world (Frost 2024) of which 454 species are reported from India (Dinesh et al. 2024).

The states of Jharkhand and Bihar have highlighted in few sporadic expeditions and have documented a total of 14 species of anurans belonging to eight genera and one family (Annandale & Rao 1918; Venkateswarlu & Murthy 1972; Inger & Dutta 1986; Sarkar 1991). Thus, I believe the state of Jharkhand is considerably underrepresented when it comes to anuran studies. Having said this, herein, I present the first distributional record of an endemic, rare and ‘Critically Endangered’ frog *Raorchestes sanctisilvaticus* (Das & Chanda, 1997) from



*Raorchestes sanctisilvaticus*: A & C—Dorsal view | B & D—Ventral view of the specimen. © Rahul Kumar.

the Dalma Wildlife Sanctuary (DWS) in Jharkhand.

The tropical regions of Asia and Africa are home to over 300 species belonging to family Rhacophoridae (Biju et al. 2010). Sacred Grove Bush Frog *Raorchestes sanctisilvaticus* (Das & Chanda, 1997) was originally described as *Philautus sanctisilvaticus* but later, the nomenclatural name was changed to *Raorchestes sanctisilvaticus* (Mirza et

al. 2019). *R. sanctisilvaticus* originally described from the Kapildhara Falls, Amarkantak of Jabalpur District, Madhya Pradesh in central India based on three specimens by Chanda (1997). *R. sanctisilvaticus* is distributed across the northern part of Eastern Ghats and Deccan Peninsula from Orissa (Frost 2024) and south-east of Madhya Pradesh (Das & Chanda 1997; Venkataraman et al. 2013). Moreover, the distribution status indicated



Forest and the macrohabitats where observations were made during the study in the Dalma Wildlife Sanctuary, Jharkhand. © Rahul Kumar.

by Mirza et al. (2019) that the species is quite common and abundant throughout the Deccan Peninsula and northern Eastern Ghats and the conservation status of *R. sanctisilvaticus* listed as 'Critically Endangered' under IUCN Red List category (Das et al. 2004).

The current study was conducted in the DWS, which is located in Jamshedpur District of Jharkhand that possess thick forest and mountain ranges. The Dalma Wildlife Sanctuary which lies between 22.775–22.950 N and 86.054–86.442 E, covers over an area of 193.5 km<sup>2</sup>. The forest of DWS

comes under the category of dry peninsular sal forest and shows properties of northern dry mixed deciduous forest (Champion & Seth 1968). It has an average elevation of 914 m.

The sanctuary shares borders with Purulia District of West Bengal. The present study also adopted visual encounter survey (VES) method followed by Veith et al. (2004) to detect the herpetofaunal diversity in all micro habitats within the study area and the time frame followed after sunset (1800–2100 h), at night (2200 h), and before dusk (1600–1700 h) and sometimes in the morning hours. Species were recorded with parameters such as humidity, temperature, and elevation.

While investigating the herpetofauna of the DWS with survey party of Gangetic Plain Regional Centre, Patna of Zoological Survey of India, I came across an unusual dark-coloured small frog under loose soil and near the bushes of Pinderabera Forest rest house (22.8947 N & 86.1971 E; 687.1 m) on 22 June 2017.



The frog was photographed and the species identification was done with the help of literature. Further, morphometry taken for the species comparison as follows snout-vent length (SVL) was taken to the nearest 0.1mm using a digital caliper: SVL 19 mm. On-site humidity was measured at 87%. The species was confirmed based on the morphological characters and keys and also with assistance of expertise. *R. sanctisilvaticus* has a wider short head than long, robust body small sized in the rhacophorid and with a narrow waist, roof of the head is flattened, large eyes with a distinct supra tympanic fold that extends through the posterior corner of the eye and passing over the tympanum to the rictus near the forelimb attachment and the tympanum is small and concealed (Venkataraman et al. 2013). The dorsum is dark brownish without any pattern but forehead is slightly darker than the rest of the body, throat and abdominal region is light brown and grey and underside of thighs is covered with large and flattened tubercles.

The tips of fingers dilated into large, rounded and flattened disks with circum-marginal grooves, webbing on the fourth toe up to basal subarticular tubercles on the inner side and to the distal subarticular tubercle on the outer side (Das & Chanda 1997; Venkataraman et al. 2013). While VES survey along with *Raorchestes sanctisilvaticus* the other species like the Marbled Toad *Duttaphrynus stomaticus*, Common Asian Toad *Duttaphrynus melanostictus*, Skittering Frog *Euphlyctis cyanophlyctis*, Indian Bullfrog *Hoplobatrachus tigerinus*, Asian Cricket Frog *Fejervarya limnocharis*, Assam Tree Frog *Chirixalus simus*,

Pierre's Wart Frog *Minervarya pierrei*, Jerdons Bullfrog *Hoplobatrachus crassus*, Ornate Narrow-mouthed Frog *Microhyla ornata*, Indian Burrowing Frog *Spaerotheca breviceps* and Common Indian Treefrog *Polypedates maculatus* were frequently observed.

The major threats of *Raorchestes sanctisilvaticus* are habitat destruction and fragmentation. Having said this, *R. sanctisilvaticus* is considered to be significantly rare, and Critically Endangered. Therefore, the species requires more conservation attention from governmental policymakers and other non-governmental conservation agencies to protect such species more effectively. Further, macro and micro habitat destruction, deforestation, pollution and unregulated tourism are all threatening the wildlife sanctuary (Verma 2011).

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## Dholes in the vicinity of Bhimashankar Wildlife Sanctuary, Maharashtra after 189 years: first photographic record

The Dhole, or the Indian Wild Dog *Cuon alpinus* (Pallas, 1811), is of the order Carnivora and family Canidae. It is a social carnivore that lives in packs. It is widely distributed and native to India (Kamler et al. 2015). The Dhole is basically a terrestrial animal, preferring to live in different types of dense forests interspersed with open woodland. It needs shade from the sun, suitable prey species, and water to drink or lie in, a thing Dholes frequently do in hot weather (Prater 2005).

It is known to occur in the northern and eastern parts of Maharashtra State (Pradhan & Talmale 2012). It has also been reported in camera trap surveys from the Wai region, Sahyadri Tiger Reserve, and Radhanagari Wildlife Sanctuary in the state of Maharashtra (Punjabi et al. 2017).

While returning from Ahupe Devrai (Sacred Groves), a part of Bhimashankar Wildlife



A Dhole *Cuon alpinus* pair in the vicinity of Bhimashankar Wildlife Sanctuary, Pune, Maharashtra. ©Umesh Vaghela.

Sanctuary, on 2 October 2023, at 1625 h, we sighted a pair of Dholes in open woodland with grassy meadows and a small waterhole in Tirpad area (19.1640 N & 73.6524 E), Maharashtra. I immediately

took photographs with my mobile camera for record purposes and further study. We observed that the pair was wandering around, and one of the Dholes defecated in the open.

We observed with the help of binoculars that the pair possessed a straight, bushy black-tipped tail and a rust-reddish coat on its dorsum. Its body size was definitely smaller than that of a wolf, and it lacked arching brows and an elevated forehead. It had short legs, a thick muzzle, and its short ears were rounded. We confirmed it as a Dhole (Menon 2009; Pradhan & Talmale 2012). We also confirmed its identity with mammalogist Dr. S.S. Talmale, Zoological Survey of India.

On a perusal of the literature, it was revealed that there is no previous scientific record of Dhole in Bhimashankar Wildlife Sanctuary (Pradhan & Talmale 2009). The recent IUCN Red List assessment shows Bhimashankar as part of the distribution range of the Dhole (Kamler et al. 2015). Sykes (1834) noted that the tribal inhabitants of Bhimashankar were 'quite aware of the existence of packs of Indian wild dogs', confirming their presence almost two centuries ago. However, the species is now locally extirpated (Punjabi pers. obs.), and there are no recent confirmed records (published or verbal) of the Dhole from Bhimashankar Wildlife Sanctuary (Punjabi et al. 2017).

After 189 years, this is the first photographic record confirming the occurrence of the Dhole in the vicinity of Bhimashankar Wildlife Sanctuary (part of northwestern Ghat), Pune, Maharashtra. Further extensive surveys are recommended to determine its existence and population status in the sanctuary area.

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# Exploring chemical immobilization: a case study on the Himalayan Marmot using Ketamine-Xylazine anaesthesia in Ladakh, India

The Himalayan Marmot *Marmota himalayana* (Hodgson, 1841) is one of the 15 globally recognized marmot species found in the alpine and sub-alpine regions of Trans-Himalaya and lives in colonies of up to 30 individuals (Armitage 2013). It inhabits the Himalayan mountain ranges, including regions in Nepal, Tibet (China), Pakistan, and various parts of India such as Ladakh, Himachal Pradesh, Uttarakhand, Arunachal Pradesh, and Sikkim (Chaudhary et al. 2017; Chetia & Chatakonda 2023). The elevation gradient for Himalayan Marmot ranges 3500–5200 m (Chaudhary et al. 2017; Nikol'skii & Ulak 1841). The Himalayan Marmot displays a range in head-body length from 47–67 cm and a tail length of 12–15 cm, while typically weighing between 4–9 kg on average (Thorington et al. 2012).

The Himalayan Marmot is recognized as an ecosystem engineer due to its burrowing activity, which has a significant impact on the fertility of the soil and the diversity of plants within mountainous ecosystems (Aryal et al. 2015; Chaudhary et al. 2017). Burrows are categorized based on their functions into three main types: hibernation burrows, summer-living burrows, and temporary burrows (Wang & Hou 2021). Abandoned or even live burrows can be used by other carnivores. For example, Siberian

Marmot burrows have been observed to be used by Corsacs *Vulpes corsac* with both corsacs and marmots emerging within two minutes of each other (Murdoch et al. 2009). Marmots are significant prey for wolves, foxes and large raptors forming an important part of the food chain (Aryal et al. 2015; Wang & Hou 2021).

The Himalayan Marmot, despite its crucial role in the ecosystem, remains one of the most understudied species in the region (Chaudhary et al. 2017). There is limited information available regarding its ecological significance, behaviour, dietary habits, and the potential consequences of climate change on this particular species (Aryal et al. 2015; Nikol'skii & Ulak 1841). It is classified as a 'Least Concern' species according to IUCN Red List (Shrestha 2016). They hibernate during the winter season for usually six months (Oct–March) and are active during the summer season (April–September) (Chen et al. 2023).

This note reports the first successful chemical immobilization of an adult female Himalayan Marmot *Marmota himalayana* with a weight of 5.15 kg. The Himalayan Marmot was captured chemically at Khaspang, Leh for an ongoing radio telemetry study by the Wildlife Institute of India and the Department of Wildlife Protection, Leh, UT-Ladakh.

After selecting the adult animal in a field in Khaspang, Leh, the animal was chemically immobilized estimating a body weight of 4 kg using a combination of ketamine (KETAMINA, 100mg/ml, Biowet Pulawy, Poland) and xylazine (100 mg/ml; XylaMed, 50 ml, Bimeda, Cambridge, Ontario) at a dose rate of 50 mg/kg and 5 mg/kg body weight, respectively. The drug was remotely delivered employing a 3.0 ml dart with a plain needle [N1520 needle, (1.5 mm x 20 mm)] in a daninject JM model dart gun from a distance of 10 m over the right quadriceps muscle.

Drug induction time was calculated from the time of darting to sternal recumbency. Physiological parameters such as respiration rate based on the visual movement of the belly, body temperature based on rectal temperature and heart rate by chest auscultation were assessed based on per minute just after complete induction and approaching the animal. Yohimbine (20 mg/ml; YOHIMBE, 20 ml, Equimed USA) at dose rates of 0.125 mg/kg body weight was used for drug reversal following the completion of necessary procedures.

### Results

The induction took place after three minutes of administering the Ketamine-Xylazine mixture with respiration rate (60/minute), heart rate (135/minute), body temperature (36.6°C) and eye open position along with minimal salivation and no response to stimuli showing excellent analgesia. The animal did not show any signs of respiratory depression, hyperthermia and

profuse salivation. The animal was found healthy with no external injury on visual health assessment and a radio collar was placed as per standard procedure. The actual weight of the Himalayan Marmot was found to be 5.15 kg. Thus, the actual dose received by the animal was (Ketamine @38.83 mg/kg body weight and Xylazine @3.88 mg/kg body weight). The total immobilization time was 40 minutes and then reversal was injected by hand with a disposable syringe.

The first sign of recovery was noticed within 15 minutes of administering the reversal, and the animal exhibited drug reversal within 45 minutes of administering the reversal injection. The whole capture time was of 85 minutes from the administration of the Ketamine and Xylazine combination till its complete revival. The animal was released back after the reversal was complete. Overall recovery was progressive and smooth.

### Discussion

Radio telemetry plays a crucial role in wildlife conservation by providing researchers with valuable insights into animal behaviour, movement dynamics such as migratory routes and stop-over sites, habitat usage such as home range and territory as well as threat monitoring of animals (Gutema 2015). It involves attaching radio transmitters to animals and tracking their movements remotely using specialized receivers and antennas. Along with other conservation implication studies, rescue operations and disease treatment, radio telemetry studies require capturing of animals. Various capture

procedures can be stressful and cause fear leading to eventual death (Ebedes et al. 1989).

Chemical immobilization of a wild animal is considered a safe and effective strategy as it causes minimal stress (Neilson 1999).

There are no recorded studies on the chemical capture of Himalayan Marmot. The drug combination of Ketamine and Xylazine mixture used during this incident to capture the Himalayan Marmot was found to be effective at a dose rate of 38.83mg/kg body weight for Ketamine and 3.88 mg/kg body weight for Xylazine. The drug dose used in this study to immobilize a Himalayan marmot is lower than the combinations of Ketamine and Xylazine used for Alpine Marmot *Marmota marmota* (Beiglbock & Zenker 2003).

It is important to acknowledge the limitations of a study, especially when it involves a small sample size and does not account for various factors. In the case of the drug combination study with the Himalayan Marmot, it appears that the research is based on the experience with a single individual and lacks consideration for factors such as variations within sub-populations, forage availability, sex differences, subspecies variations, weather conditions, and different drug combinations.

A larger sample size would indeed be advantageous in making the results more rigorous and insightful. With a larger sample size, researchers can obtain a more representative understanding of how the drug combination affects Himalayan Marmots as

a whole. However, conducting subsequent studies with larger sample sizes and accounting for relevant variables would be crucial for a comprehensive understanding of the drug combination's effects on Himalayan Marmots.

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# Conservation of horseshoe crabs programme in coastal district of Baleswar, Odisha, India

## Horseshoe crabs in Odisha

Horseshoe crabs are marine chelicerate arthropods of the family Limulidae and the only living members of the order Xiphosuraspita. Despite their name, they are not true crabs but are more closely related to spiders and scorpions. They belong to the taxonomic class Merostomata. Two species are known to be alive today in India, which are Mangrove Horseshoe Crab *Carcinoscorpius rotundicauda* and Indian Horseshoe Crab *Tachypleus gigas* both of which are found in Odisha. Odisha is their largest habitat in India.

## Mangrove Horseshoe Crab

*Carcinoscorpius rotundicauda*  
IUCN: Data Deficient; CITES:



Volunteers Surveying Fisherfolk Livelihoods to Understand Challenges and Opportunities for Sustainable Growth

Not listed; WPA: Schedule II.  
Habitat: Shallow waters with soft, sandy bottoms or extensive mud flats.  
Diet: Insect larvae, small fish, oligochaetes, small crabs and thin-shelled bivalves.  
Threats: Habitat loss, damage

by invasive species and pollution.

## Indian Horseshoe Crab

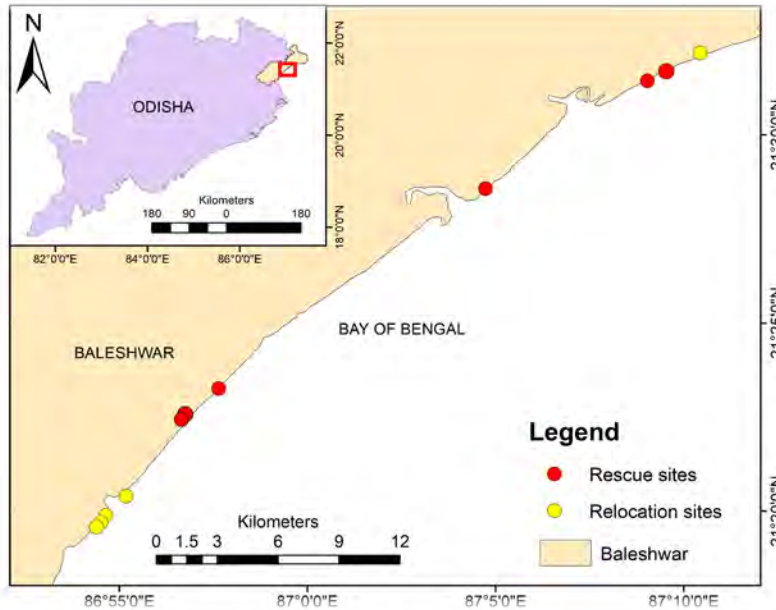
*Tachypleus gigas*  
IUCN: Data Deficient; CITES: Not listed; WPA: Schedule II.  
Habitat: Seagrass meadows, sandy and muddy shores at depths to 40 meters.  
Diet: Algae, marine worms, clams and other molluscs and dead fish.  
Threats: Habitat loss, pollution, fishing nets, motorboats and trawlers.

## Significance of Horseshoe Crabs in ecosystem

Their ecological function is to lay millions of eggs on beaches to feed shorebirds,



Demonstrating Techniques to Rescue Entangled Horseshoe Crabs by professionals.



**Rescue and relocation sites at Baleswar, Odisha July 2023 – December 2023.**

fish and other wildlife. By scavenging and feeding on decaying matter, they contribute to nutrient cycling in coastal areas, helping to maintain the cleanliness and balance of the ecosystem. Horseshoe crabs are considered indicators of estuarine health. Their presence or absence in a particular area can provide valuable insights into the overall condition of the ecosystem.

The use of horseshoe crab blood in biomedical research contributes to public health and safety. Their large hard shell serves as a microhabitat for many other species such as sponges, mud crabs, mussels, and snails.

The project includes variety of fieldwork, surveys, awareness programmes, community sensitisation, rapport building, volunteer training, beach cleaning drives and much more. The project focuses on the rescue and relocation of horseshoe crabs so that the species can be located in a no-fishing zone where they have habitable surroundings. The conservation efforts

over the past eight months have been both challenging and rewarding. The whole project started with the first community awareness event in 2023, where the team conducted an awareness programme for the local fishermen community at Union High School, Dublagadi involving the local community and youth in these activities fostering a sense of environmental responsibility and community pride.

Horseshoe crabs are one of the oldest living fossils. Because of underlying threats, their numbers are declining day by day, for which the team needed to adapt certain methodologies to protect them. The methodologies were implemented by the team for the conservation of the species: community awareness programme, hands-on training programme for the volunteers,



**Community sensitization program on horseshoe crab at a local high school.**

beach cleaning drive, survey, rescue and relocation of horseshoe crab, capacity building training programme and school and colleges awareness programmes.

The team embarked on a mission to rescue and relocate the horseshoe crabs from various seashores along the coast. The rescued crabs were numbered around 483 and were safely transported to a carefully chosen location near the sea for better survival. A total of 133 live horseshoe crabs were rescued out of 4,000 and relocated to Hanskara. The rescued horseshoe crabs, numbering 208, were saved from Kasafal and Parikhi and relocated to Inchudi. Furthermore, our team rescued 142 horseshoe crabs from Chandipur and Dagra and relocated them to Dublagadi, where the survivability of the species is high. The efforts contribute significantly to the long-term survival of the horseshoe crab population, ensuring their continued presence in natural habitats.

### Major highlights and achievements

1. Community awareness: Targeting local fishermen and students at Union High School in Dublagadi. This event aimed to foster environmental responsibility and community pride.
2. Surveys: Conducted to gauge local perceptions and raise awareness about the ecological significance of horseshoe crabs. Monthly reports were generated to track the situation, revealing that 40.7% of fishermen were leaving crabs in ghost nets to die.
3. Volunteer training: Thirty volunteers received hands-on training on rescuing horseshoe crabs, including cutting ghost nets and proper handling techniques.
4. Beach cleaning drives: Conducted at Kasafal

and Chandipur, collecting 280 kg of garbage. Another drive removed 430 ghost nets and 260 kg of plastic.

5. Rescue operations: A total of 483 crabs were relocated to safer areas.
6. Awareness programmes: Included wall paintings in Gudupahi and the launch of a conservation camp, attended by notable officials.

### Impact and future directions

1. Capacity building: Engaged over 70 participants through various programmes.
2. School and college initiatives: Effectively educated and involved students in conservation efforts.
3. Community campaigns: Enhanced local understanding and participation in conservation activities.
4. Long-term goals: Focus on sustained initiatives to preserve ecological balance and ensure the well-being of horseshoe crabs in their natural habitats.

### Acknowledgements

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# ZOO'S PRINT

## Communicating science for conservation

### ZOO'S PRINT Publication Guidelines

We welcome articles from the conservation community of all SAARC countries, including Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka and other tropical countries if relevant to SAARC countries' problems and potential.

**Type** — Articles of semi-scientific or technical nature. News, notes, announcements of interest to conservation community and personal opinion pieces.

**Feature articles** — articles of a conjectural nature — opinions, theoretical, subjective.

**Case reports:** case studies or notes, short factual reports and descriptions.

**News and announcements** — short items of news or announcements of interest to zoo and wildlife community

### Cartoons, puzzles, crossword and stories

**Subject matter:** Captive breeding, (wild) animal husbandry and management, wildlife management, field notes, conservation biology, population dynamics, population genetics, conservation education and interpretation, wild animal welfare, conservation of flora, natural history and history of zoos. Articles on rare breeds of domestic animals are also considered.

**Source:** Zoos, breeding facilities, holding facilities, rescue centres, research institutes, wildlife departments, wildlife protected areas, bioparks, conservation centres, botanic gardens, museums, universities, etc. Individuals interested in conservation with information and opinions to share can submit articles ZOOS' PRINT magazine.

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Articles should be typed into a Word document with no more than 800 words of text and 10 key References (Tables, Images with copyright information, and Videos are encouraged) and emailed to [zp@zooreach.org](mailto:zp@zooreach.org). Include the names of one or two potential reviewers when submitting a publication.

Articles which should contain citations should follow this guideline: a bibliography organized alphabetically and containing all details referred in the following style: surname, initial(s), year, title of the article, name of journal, volume, number, pages.

### Editorial details

Articles will be edited without consultation unless previously requested by the authors in writing. Authors should inform editors if the article has been published or submitted elsewhere for publication.

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