

VOL 1 | NOVEMBER 2023

THE POD

NEWSLETTER OF THE MARINE MAMMAL CONSORTIUM OF INDIA



EDITORIAL

Learning to whistle

Rohan Arthur and Anant Pande

Few things compare to the sheer exhilaration of a dolphin pod. It rides the bow of your boat with the insolent ease of an adolescent gang. It sails past you on your dive, occasionally cocking an inquisitive eye in your direction, or giving you a meaningful whistle. What strikes you as you watch a pod forming, is how single-minded in purpose it seems to be, and yet how playful. And then, as quickly as it forms, it disperses, with whistles and tail slaps, each of its members off to explore on its own, safe in the knowledge that the pod will reconvene the next time there is a bow to ride or an earnest researcher to distract underwater.

There is wisdom in the dolphin pod that is well worth drawing from. Working on marine mammals and aquatic ecosystems in South Asian waters can often be a brutally isolating experience. We work in intellectual and infrastructural silos. We are hemmed in by institutional mandates, labyrinthine bureaucracies and Faustian bargains with granting agencies. We have a hard time reconciling the work we do with the needs and priorities of the local communities we work with. We struggle with neo-colonial legacies of conservation and research as we battle entrenched patronising attitudes in scientific publishing and parachute science. And we do ourselves no favours with our own petty jostling for territory and agency as we navigate a maze of egos and grandstanding. It is, you have to admit, not an ideal environment for creative research and meaningful conservation to flourish. The Marine Mammal Consortium of India is a modest attempt to shift this environment towards something that resembles more the social structures of the animals we study and love. Our hope is that the consortium will take on the form of a fission-fusion group, sharing ideas and stories, coming together with joint purpose, exploring collaborations, and learning together to advance the cause of marine science and conservation in South Asian waters.

There is a lot of new thinking emerging of the power of such coalitions. Learning networks are informal or semi-formal groups that come together with a common broad purpose. Their principal aim is to exchange knowledge, but they can become a platform for creative sharing and doing. Whether it is a group of indigenous communities trying to revive traditional resource use practices or a collection of local businesses exploring opportunities together, learning networks are proving to be a great way to dynamically come together over a common cause. Essential to making them work are a shared vision and language, trust and mutual respect, and sufficient interaction between its partners - all components that contribute to building the social capital of the group. Critically, learning networks need to find the right balance between ownership and control, regulation and freedom. Structure it too strongly, and it becomes a rigid formal organisation, with all the problems of hierarchy and power that limit the creative flow of knowledge and its ability to adapt. Too loose, and it runs the risk of drifting in purpose or fizzing away. A well-functioning network will focus on strong nodes and respectful modes of interaction rather than leadership structures and power relations. It will have a distributed sense of belonging, and a regular reassertion of shared purpose.

Can the MMCOI become such a learning network - a dynamic pod of marine scientists and practitioners sharing and doing together? That depends on each of us. Learning, as we know, is something we have to learn to do. It is something that gets better with practice. And it is best done together, drawing on collective experience, open discussion and joint exploration. We have an opportunity here to reach across our boundaries and create a unique space for interaction and growth, bound by a collective enchantment for the sea. For this to happen, we need to each make the consortium our own, and contribute towards the shape it takes. We hope that this newsletter becomes a space of shared learning, and we look to you for ways in which we can make it more interactive, meaningful and playful.

Welcome to The Pod.

You know how to whistle, don't you?

The Marine Mammal Consortium of India

Manas Manjrekar and Muralidharan M

The Indian coastline and off-shore waters of India harbour many marine mammals including dolphins, porpoises, whales and dugongs. Over the last two decades, marine mammal research in India has picked up significantly and today many government and non-government organisations are engaged in marine mammal research activities which are driving marine mammal conservation in the country.

As the coastal and off-shore waters of India form a contiguous habitat across the coastal states of the country, there is a need for communication and information sharing between the various agencies and stakeholders engaged in marine mammal research and conservation across the country. This will allow the various stakeholders to plan their research and conservation activities through a holistic approach to marine mammal conservation and can lead to regional collaborations among stakeholders in adjacent states which will be extremely beneficial for all parties.

The Marine Mammal Consortium of India (MMCOI), is an informal body of

managers, researchers, policymakers, and conservation practitioners, acting as a platform for data sharing across groups working on marine mammal and marine science topics ranging from behaviour, population dynamics to human dimensions, economics, policy and conservation.

The first MMCOI workshop is being held at Bengaluru on 5-6 November 2023 where representatives from government as well as non-governmental institutions will share broad national marine policies, followed by updates on efforts to assess and manage marine ecosystems. It will also include early-career professionals and student project updates related to marine mammal research and conservation in India.

The MMCOI hopes to establish a dedicated platform across which increased information and data sharing may take place across various stakeholders involved in marine mammal research and conservation which may then lead to better planning of conservation programs for the marine mammals in the country.



OPINION

Perspectives on Marine Mammal Research in India

Mridula Srinivasan

Today, the field of marine mammal science has evolved into a quantitatively rigorous and technologically advanced discipline. We can track animal movements both vertically and horizontally in the water column for short periods using non-invasive suction cup tags and, for certain marine mammals, for longer periods using long-term satellite tags – all equipped with multiple sensors. We can listen for cetacean vocalisations to determine occurrence patterns, seasonal and intra-annual distribution shifts, and analyse call variations through strategically deployed sound recording devices at different water depths and spatial separation. Additionally, we can assess population structure, evolutionary lineages, health, and body condition using 'Omics, photogrammetry, and health assessment tools. An emerging and fast-growing area of interest involves the use of uncrewed systems (e.g., Hexacopters, gliders, Automated Underwater Vehicles) in conjunction with Artificial Intelligence/Machine Learning to gather non-invasive high-resolution imagery/video, as well as biological and environmental samples. With the advent of technology and improved visual, acoustics, and remote sensing tools, we have witnessed a concomitant rise in data collected of variable quality. Vast amounts of data are needed to address the complex ecological problems threatening marine mammal populations globally. Consequently, today's marine mammal scientists are a diverse group, including quantitative ecologists, statisticians, bioinformaticists, systems modellers, engineers, sociologists, and economists. They work together to assess trade-offs between conservation and economic development and the sustainability of coastal communities. However, technological applications only matter when there is a clear fundamental question to be answered.

So, where does India fit into today's marine mammal research landscape? The good news is that in the last decade or so, there has been an increase in students and researchers expressing interest in and pursuing marine mammal research in different coastal areas of India.

Some students are even seeking advanced degrees in the United States, Australia, and the United Kingdom. Research in India primarily focuses on fisheries interactions with cetaceans (e.g., Irrawaddy dolphins, Indo-Pacific humpback dolphins), understanding the coastal distribution and occurrence of specific marine mammal species, and conducting socio-economic studies and community outreach to elicit and understand the knowledge and perceptions of affected fishing communities. One of the most exciting and transformative studies is being conducted on Ganges river dolphins and their habitat. Researchers in the area are comprehensively investigating the interplay between ecological factors, human interventions, communities, and ecosystem changes. In summary, there are pockets of excellence involving advanced ecological studies in India's fledgling marine mammal research programs, often intertwined with descriptive studies. However, even descriptive studies are more impactful if they test well-constructed hypotheses rooted in theory.

What lies ahead for marine mammal research in India? Two critical factors are essential for marine mammal science to reach its full potential in India. The first is a cultural shift, where marine mammal science is viewed as any other rigorous scientific discipline. This entails asking tough questions, employing rigorous techniques, conducting sustained studies, interpreting results while acknowledging uncertainties and biases, and disseminating results in scientific forums and peer-reviewed journals. Research activities need to be detailed and of high quality for management purposes. Researchers must also share scientific data freely and widely to encourage collaboration and replicate results. This applies to both government entities and researchers conducting marine mammal research in India. It is insufficient to merely report marine mammal sightings and strandings; there must be a scientific effort to publish results by synthesising information to discern patterns, assess trends and impacts at species or population levels.

The second essential factor is fostering diversity in the research enterprise. Marine mammal science is not limited to biologists alone. The field grapples with complex marine conservation issues that demand multidisciplinary approaches to ask critical questions and develop creative and economical solutions. Therefore, the field must attract engineers, wildlife ecologists, economists, geneticists, acousticians, modellers,

computer scientists, and statisticians, among other talents. Fortunately, India has an abundant supply of diverse talents, and there is no requirement to have a marine science background. But schools and universities must broaden their curriculums, and researchers should collaborate with colleagues outside their realm of expertise.

Based on some of the articles published in the past year, the future of marine mammal research in India looks promising. As institutional engagement improves, i.e., resources, research, and policy needs are widely shared, and as more diverse students enter the field, marine mammal research in India is poised for revitalisation.

FROM THE GALLEYS

Songs of the endangered

Arabian Sea humpback whales are genetically distinct from other populations and are resident in the north western Indian Ocean. While records from India are restricted largely to strandings, local ecological knowledge and opportunistic sightings, work conducted off Oman suggests that the west coast of India constitutes part of a migratory route for this species. In a more thorough attempt to document these whales, D'Souza, Bopardikar, Sutaria and Klinck conducted passive acoustic monitoring from December 2019 off Netrani Island, Karnataka. This work reveals individual call units, phrases and themes, often unique to populations, thereby initiating a repository that could further research on these ocean sentinels immeasurably.

The authors deployed a bottom-mounted SoundTrap at Netrani, where the species was recorded opportunistically in previous years. While the setup was active over two and a half months, the study yielded 83 half-hour recordings with humpback vocalisations. D'Souza et al identified 39,767 individual call units which they classified into 11 distinct types. The sequence of these types in a recording makes a phrase, which repeats variably to form a theme. Different themes in combination are considered one song. The study identified eight unique phrases that formed two dominant themes, in addition to a few rare ones.



This paper paves the way for others interested in being serenaded by whale songs. These can shed light on population statuses, connectivity and even highlight potential regions of conservation interest. The authors make a clarion call for long-term monitoring, without which credible information allowing more nuanced analyses and comparisons will remain unavailable. Finally but most importantly, the authors indicate that such work will only benefit from widespread collaborations, given that their work was backed by the enthusiasm of the Karnataka State Forest Department and direct contributions from several donors and conservation practitioners.

The global pandemic: disastrous for one species, potentially promising for others

Between 2020 and 2022, the world came to a standstill; COVID-19 had spread to nearly every country, ravaging communities across the globe. The nationally mandated lockdown in India, however, was likely a boon for the country's national

aquatic mammal and the riverine system it inhabits. In this paper, Bhattacharyya and Bhowmick link the decline in human activities over the pandemic to a healthier Gangetic system, and the subsequent return of the Ganges river dolphin to previously uninhabitable tracts.

Platanista gangetica is highly sensitive to latent environmental conditions. Being blind, they rely solely on SONAR to communicate and navigate life within the sediment-rich Ganges system. Over the past decades, physical and noise pollution in India's northern rivers have caused local migrations from areas they once inhabited to the few remaining stretches of suitable habitat. This study, however, found that during the lockdowns, fewer human activities caused a small improvement in the Ganges water quality, marked by an increase in dissolved oxygen, and decrease in biological oxygen demand and total coliform levels. Other studies confirm likely results - the first recordings of *P. gangetica* in rivers like the Chambal and around Katarniaghat for the first time in several years. Moreover, the presence of calves indicated healthy population growth.

Much work has been done over the past few decades to help conserve this species. However, the authors suggest that more efforts need to be concentrated in a sustained manner to prevent the extinction of this endangered species.

Kinkini ongil: a brief report on spinner dolphins in Tamil Nadu

In this article, Newport summarises key details about the spinner dolphin in Tamil Nadu, ranging from their broad characteristics to threats and mitigation strategies. These dolphins, distinguished by their tricolour grayscale are adept swimmers, often reaching 37 km/h and displaying visually stunning aerial acrobatics. Found globally in the tropics and sub-tropics, these dolphins feed on a range of fish and invertebrates. A relatively social bunch, spinners are known to sometimes associate with pods of other species. While this is listed as a species of 'Least Concern' by the IUCN, a plethora of factors challenge their survival in the anthropocene.

As with several other cetaceans, spinners are threatened foremost by fisheries interactions - a combination of poor gear selectivity and shared fish resources causes incidental bycatch. Other human-linked challenges include habitat degradation as an unfortunate side effect of state-wide coastal development, and vessel noise pollution that can confound and disorient these animals, hampering their ability to search for prey and avoid predators.

The author concludes by tabling five broad strategies for successful conservation - sound fisheries management, developing a protected area network, regulating dolphin tourism, bridging data gaps and effective outreach programmes.



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Citizen Science Initiative Rediscovered Locally Extinct Dugongs

For years, dugongs were thought to be locally extinct in Little Andaman, largely attributed to the devastating 2004 Indian Ocean tsunami. This event triggered an increase in sedimentation rates and the accumulation of debris on the seafloor,



leading to the decimation of seagrass meadows — a vital food source for dugongs. However, anecdotal evidence from 2019 to 2021 has confirmed dugong presence in the area. Thanks to monitoring work conducted by Gole et al. in collaboration with a diverse array of stakeholders, including resident fishers, the Indian Navy, Indian Coast Guard, Andaman and Nicobar Forest Department, and SCUBA divers, this study spanned four years from 2017 to 2022, revealing 63 sightings of dugong herds.

The research also yielded unprecedented sightings of dugongs in previously unrecorded locations, such as the Jarawa Tribal Reserve, North Sentinel Island, Middle Andaman, and South Andaman. The paper also records a rare sighting of a dugong in its reproductive phase near Shaheed Dweep, making it among the very first in Indian waters.

The herds sighted exhibited varying sizes, ranging from 3 to 13 individuals, with smaller groups being more commonly observed. Nearly half of all the sightings featured herds with calves. Interestingly, adults consistently occupied the group's periphery, possibly safeguarding vulnerable calves at the centre.

These discoveries offer fresh hope for the conservation of this remarkable marine species in the Andaman and Nicobar Islands and also reinforce the power of involving stakeholders in monitoring programs, as they are cost-effective and can cover a much larger seascape.

The taxonomic mystery of the Indian Ocean's Blue Whales

Being one of the most common cetaceans found in the Indian Ocean, Blue Whale populations in the region remain among the least studied.

The Blue Whale population around Sri Lanka and Indian waters have been a topic of recent debate regarding their classification as a distinct subspecies, *Balaenoptera musculus indica*. This stems from their non-migratory behaviour, similar to that of the pygmy blue whale *B.m. breviceauda*, and certain morphological and behavioural traits that hint at a connection to Antarctic blue whales of the subspecies *B. m. intermedia*. These findings suggest that *B. m. indica* may represent an entirely different or intermediate subspecies of Blue Whale.

An analysis of sightings and stranding records from the past 30 years by Ilankakoon & Sathasivam emphasises the need for a taxonomic evaluation of the regional population. It also highlights the gaps in our current knowledge about this population. The analysis reveals seasonal patterns in whale sightings and strandings, with the period from February to April being the optimal time for sightings.

Presence of Ganges River Dolphins in Bihar's Mahananda River confirmed

The Mahananda river is a trans-boundary river that flows through Bangladesh and the Indian states of Bihar & West Bengal. It originates from the Himalayas near Chimli and is one of the largest tributaries of the Ganges river. Aside from these interesting geographical features, an unlikely inhabitant was recently documented, which holds significance as a positive indicator of the riverine ecosystem's health.

In 2021, Choudhary et al. conducted a survey in a 3-kilometre downstream stretch of the Mahananda river near Marua village from January to December. A total of 64 Ganges River Dolphins were observed, with the highest number of sightings being seven from the months of July to September.

The Mahananda river appears to be an attractive foraging ground for these dolphins, possibly because of the rich biodiversity of small fish. However, reports from locals indicate that the population of these dolphins is starting to dwindle, highlighting the urgency of conducting a systematic survey in the region to support timely conservation efforts.



A promising tool for clear Dolphin Whistle Analysis

The development of Passive Acoustic Recorders has seen a new flourishing in cetacean research, with several groups employing them in the subcontinent in recent years. However, analysing this data is far from straightforward. A common problem is separating cetacean sounds from other anthropogenic sounds in the water. When attached to a mooring, the sound of the attaching shackle can itself mask cetacean sounds. Research conducted by the National Institute of Ocean Technology from November 2018 to November 2019 on dolphin whistle types has confirmed the effectiveness of a new method for removing shackle noise contamination from audio samples taken underwater.

Mahanty et al. conducted an acoustic monitoring survey using the Ocean Moored Buoy Network in the Northern Indian Ocean (OMNI). They analysed ambient noise records collected during spring (April - June) in deep waters near the Lakshadweep Islands. They observed that dolphin whistle noises were significantly obscured by unwanted shackle noise in the background. To address this issue, they employed a method to clean the audio samples called Wavelet Threshold Denoising, followed by a subtraction technique. This approach proved highly effective in enhancing the identification of various dolphin whistles and confirming six major whistle types in the frequency range of approximately 4 to 16 kHz. The method holds great promise for its application in studying vocalisations from other cetaceans.

India's first Dugong Conservation Reserve is underway

Critical dugong habitats, primarily situated in Palk Bay and the Gulf of Mannar in Tamil Nadu, provide a home to arguably the largest dugong population in the country. Palk Bay, with its unique and diverse ecosystem, acts as a haven not only for dugongs but also for seahorses, sea turtles, and various marine species. The bay features a wide variety of seagrass species, essential for dugong survival.

The Dugong Recovery Program, funded by India's Compensatory Afforestation Fund Management and Planning Authority (CAMPA) and overseen by Wildlife Institute of India (WII) since 2015, has effectively reduced dugong poaching in the region. Due to frequent sightings, WII and the Tamil Nadu state forest department jointly proposed a Dugong Conservation Reserve in North Palk Bay, Tamil Nadu, in 2020. This reserve would permit traditional fishing alongside active community involvement in reserve management, while also promoting alternative livelihoods to alleviate fishing pressure on the habitat.

As a result, the establishment of the conservation reserve holds great potential in sustaining a viable dugong population, preventing the local extinction of this species.

Balancing tourism and conservation in Asia's largest brackish water lagoon

Chilika Lake boasts the largest concentration of Irrawaddy dolphins in India, estimated at 162 individuals. Consequently, since 1989, it has become a tourist attraction for observing these magnificent mammals. This development has significantly benefited local communities, supporting the livelihoods of both fishing and non-fishing communities through tourism in Satapada, a small town located along the outer channel of Chilika. However, dolphin-based tourism has become unsustainable due to its impact on the lagoon habitat of the species.

This is primarily a result of the rampant movement of motorboats and the limited awareness within local communities regarding the critical conservation status and fragility of the ecosystem that is home to the Irrawaddy dolphins. Thoughtfully designed ecotourism initiatives will contribute to a greater understanding of the habitat and foster positive attitudes among the local residents.

Research conducted by Acharyya et al. suggests multiple approaches to address this, including ensuring the integrity of the Irrawaddy dolphin habitat, optimising resource utilisation, improving service quality, and developing the necessary infrastructure to support a sustainable ecotourism model in the lagoon.

A call to incorporate Ganges River Dolphin Habitats into Protected Zones

A recent study by Rai et al. investigated the habitats of Ganges river dolphins. They used species distribution models and data about environmental factors, like climate, water quality, geography, and human activity, to pinpoint areas where these dolphins thrive along the Ganges-Brahmaputra-Meghna and Karnaphuli-Sangu river systems.

Their research identified approximately 7,945 square kilometres of prime river habitat for Ganges river dolphins. Astonishingly, almost 93% of this habitat is not located in protected areas. Given the vulnerable status of these dolphins, it is crucial to take immediate action to protect these hotspots, a move that would greatly improve conservation efforts in the coming years. The findings published in their paper provide a solid foundation for planning conservation measures and expanding protected areas along river segments.

Specifically, their research reveals that the southern and eastern regions of the Ganges-Brahmaputra-Meghna basin are the most suitable habitats for Ganges river dolphins and should be a top priority for protection.

Dugong strandings in the Gulf of Kutch indicate species distribution

The research conducted by Hatkar et al. delves into the stranding record of dugongs in the Gulf of Kutch region (GoK) between 1877 and 2022. Their findings encompass 29 instances of dugong strandings, with no apparent correlation among these incidents. Moreover, the reasons behind these strandings largely remain a mystery, though potential factors such as bycatch and ghost nets in seagrass meadows have been considered as possible causes.

Stranding records are a useful way to monitor marine mammal distribution, abundance, and status, and are highly resource-efficient. The stranding data were

obtained from secondary literature, published reports, and local informants who were part of a citizen science initiative called the 'Friends of Dugong network.'

The majority of strandings were discovered in Beyt Dwarka with ten individuals, and Poshitra with five. The authors identify these regions as a hotspot of dugong conservation due to the presence of rich seagrass resources and minimal human presence.



Tape Grass flowering phases described in the Andaman Islands

The seagrass meadows of Vijay Nagar (Swaraj Dweep) in the Andaman Islands have been observed to feature six seagrass species. Among these species, *Enhalus acoroides*, commonly known as Tape Grass, predominates, primarily inhabiting the high-mid tide regions along the coast. Therefore, a comprehensive understanding of its growth patterns and reproductive cycles is essential for the conservation and well-being of these vital marine populations.

In January 2021, Gole et al. documented various stages of development in both the male and female flowers of *E. acoroides*, including the female inflorescence bud, female flower at anthesis, male inflorescence, fertilised flowers, and more.

An intriguing discovery among others was a mass bloom of male flowers trapped in seagrass blades, floating on the surface of the high tide zone. Soon after, a male spathe with a barren spadix was observed, indicating the release of the male flowers as a mechanism of pollination.

Analysing the presence of microplastics in the Indian Ocean

Microplastics (MPs) are divided into two categories: primary MPs, which are released directly into the environment through manufactured products like cosmetics, medicine coatings, and toothpaste; and secondary MPs, which are indirectly generated when larger plastic items break down due to mechanical processes such as wave currents, exposure to ultraviolet radiation, wind action, and microbial activity.

Thathsarani et al.'s review article provides a comprehensive overview of microplastic contamination in the Indian Ocean. It highlights significant knowledge gaps and potential sources of MP pollution in the aforementioned region, which include unsustainable development projects, river discharges, residential activities, and commercial fisheries-related processes near harbours.

Various sample types, including water, beach sand, deep-sea sediment, and marine organism tissues, were analysed to study MP contamination. The eastern Indian Ocean appears to be a hotspot of MP pollution, where the majority of deep-sea sediment and ocean water samples showed the presence of microplastics in the form of granules, fibres, and fragments, ranging from 100 to 500 μm and 38 to 6,330 μm in size, respectively.

Oceanic symphonies under the sea

Humans are largely a visual species - and it is without doubt that this has biased our development of tools in the fields of research and conservation. Soundscapes, on the other hand, offer a robust framework for passive monitoring under the ocean where direct human intervention is logistically restricted. An emerging field with several developments over the last decade, Soundscape Oceanography offers several benefits, including a glimpse into species occurrences, ecosystem composition and interactions with anthropogenic noise. The authors of this paper, Dr. Panicker and Dr. Stafford, chose to deploy two passive acoustic recorders off the outer reef region of the Kavaratti atoll in the Lakshadweep islands to characterise key sound sources within the region.

This study, conducted between January and October 2019, reveals a rich and complex symphony of choruses. The authors identified three major ensembles – a dusk fish chorus, a midnight chorus (possibly produced by lanternfish), and a night chorus of snapping shrimp. Interestingly, both the dusk fish and midnight choruses dropped as salinity increased while the snapping shrimp ‘sang’ more at lower wind speeds. As with many oceanic patterns, lunar phases also had a key role in determining these choral fluctuations, with the dusk fish chorus peaking at the full and waning phases and the other two over the new moon.

This database and the resultant findings will inevitably shed light on potential changes over the years to come, with climate change and other anthropogenic stressors jeopardising populations of the 14 marine mammals recorded in the area to date.

ARTICLE IN-FOCUS

Spatio-temporal analysis identifies marine mammal stranding hotspots along the Indian coastline

Sohini Dudhat



An animal ending up dead or alive on shore is known as ‘stranding’. Studying strandings is a cost-effective way to understand risks at sea (pollution, bycatch). A dead stranded animal ending up on shore is a complex interplay of mortality and oceanographic factors which drive the dead carcass to the shore. Long-term data can provide insights into changes in trends over the years, helping understand the state of ocean health.

Marine mammals strandings are often reported from various locations in India but no assessment was conducted to investigate the details. To find patterns over the years and seasons, and geographical variations in strandings, we collated all published and openly available literature available in the country on marine mammals and pooled them into a common database. We ended up collecting over 1600 records of marine mammal sightings, strandings, hunting and accidental entanglements that occurred over a period of 268 years.

We divided the Indian coastline into 50 km sections to visualise stranding rates. The highest rate of strandings were found at Rameswaram, Tuticorin, Mumbai, Kozhikode. Certain sections of the coast (such as Andhra Pradesh, Odisha) show low rates indicating less reporting. We found a consistent rise in strandings reported after 2005, and the highest stranding frequency in the last 3 years. A notable rise in strandings of baleen whales, dolphins, and porpoises over both the east and west coast was observed with the onset of monsoons.

The highlight of this study was the use of Emerging Hotspot Analysis which transformed the simple data of location and date into four types of stranding hotspots. Some parts of the coast are 'new hotspots'- meaning they have become significant in recent years, and some as 'consistent hotspots' – meaning they have been significant for over a decade. We recommend focusing on these hotspots for active stranding response and carcass management.

This study is a good starting point to understand the potential of using the data gleaned from stranded animals. Literature across the globe suggests a high potential for stranding data being used for identifying threats to marine mammal populations. For a country like India, with high species diversity and a vast coastline, stranding hotspot identification is critical in identifying and prioritising conservation actions. In the end, the study recommends to integrate stranding hotspot identification with a framework to guide the implementation of the Marine Megafauna Stranding Management Guidelines in India.

IN THE FIELD

Sameeha Pathan



© Sameeha Pathan

Working in the field of conservation science means you have to deal with the unseen; no, not God, but we'll get there by the end. I have been studying habitats of a critically endangered population of dugongs on the GoK. This population is so small that despite spending six years on field, I have only ever sighted them thrice. As if that wasn't a challenge in itself, my delusional youth made me write a bunch of research questions addressing topography, quality, and habitat preferences of this -direct-observation-evading population.

Surprisingly, like a big fat chunk of breadcrumbs for me to follow, dugongs leave behind furrows of foraging trails (picture below). During the low-tide period, my job is to walk till I have mapped out how far did they feed in an area, if there was a calf feeding too (indicated by a narrow trail), what seagrass species are they feeding

on, sample forage, catch my breath, sample forage, all the while marking the trail locations.

Now scaling sandy reefs for this seems fun, and it is. I always remember to steal a glance at the naïve volunteers who seemed so gleeful working on a reef-top. But the real horror and volunteer vanishing work began when I started finding foraging areas on mud-flats. An important tip for those ever wanting to work at tidally-influenced habitats—Tidal charts can only help you pick the place to work at, not survive it. We were sailing our way to work at an area which my boat crew and I were confident was a deep-water seagrass hot-spot. However, in less than fifty metres with a fateful drag that our dinghy made as its keel touched the ground; like most of my plans, it got stranded.

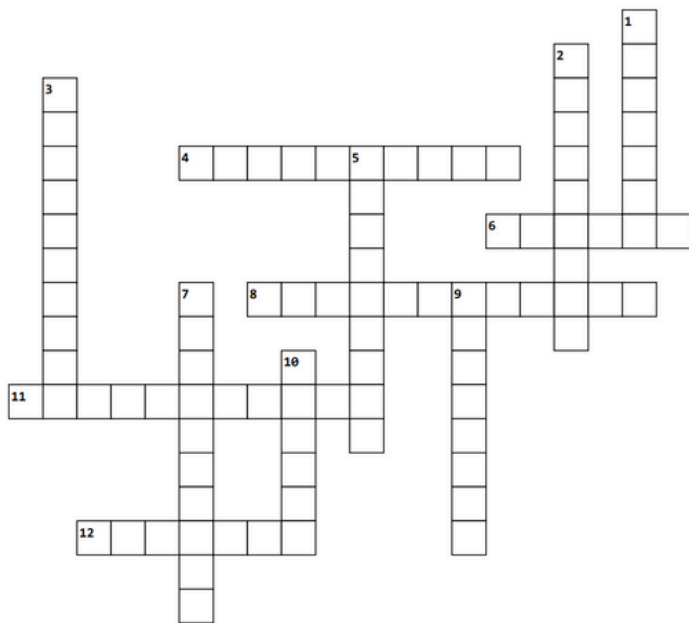


Before my panic became transparent, I faked a quality most conservation biologists have aced- optimism of grotesque level. I got off the boat and started walking. With one foot of murky water still left to recede, I could not see but could feel the seagrasses snap beneath my feet. I gave a thumbs up to my boat crew and kept walking all the while marking seagrass present points on the GPS. Within ten minutes all water had receded and dread settled. My team of two and I had walked onto a mud island which was completely surrounded by a serpentine deep tidal channel. We resumed our work after alerting the crew member on the dinghy. Walking on clayey mud became slightly taxing for me as I pulled out one foot out of the muck, the other one had already sunk in deep.

Moving from one foraging trail to another, my confident strut very quickly morphed into a neurotic quadrupedal crawl. My lovely field mentor Mr. Babbar on the other hand was so quick and light on his feet, we call him bagula, which means heron in Gujarati. He has always walked the mud-flats with his hands behind his back. I was about to learn that mud-flats with tidal channels sink faster than the ones without them. Using my PVC quadrat as a crutch I crawled to sample a point near the channel, I realised that the ground was sinking. I looked left, then right, and towards Babbar uncle who nodded wordlessly, confirming that the tide had turned. We had overstayed our welcome. All we had to do now is to try and make it to the dinghy.....which was around 400 metres away. There was no way I could have crawled that far. We hollered at the boat-crew on a dinghy who was fast asleep. With the water rising fast,

We resorted to screaming for help. He woke up with a startle and very calmly started the dingy. He moved around the channel and used bamboo to anchor the dinghy near us. After that day, I have made it a point to always have an escape plane for when the tides turn. It may be a small dune or reef to climb onto. Also, I try not to work till the tides flood an area. Despite these challenges, I understand my privilege to be able to follow foraging trails that the animals leave behind to understand their secret life in the Gulf. It requires tenacity, I have been told, but then so is studying the unseen.

POD-WORD

**Across**

4. When whales poke their heads out of the water vertically, to assess surroundings
6. This is the state animal of Andaman and Nicobar Islands
8. Most marine mammals navigate using _____
11. This dolphin has different types that are sometimes argued to be distinct species
12. Baleen is made up of _____

Down

1. Killer whales belong to the same family as these marine mammals
2. Highly valuable whale vomit
3. A wax obtained from the head of certain whales
5. _____ resemble dolphins but are rounder, smaller, and lack a prominent "beak"
7. Moby Dick, and also the largest toothed whale
9. The study of dolphins, whales, and porpoises
10. A humpback whale's filter-feeding system

EDITORIAL TEAM

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Podword answers: 1 - dolphin; 2 - ambergris; 3 - spermaceti; 4 - spyhopping; 5 - porpoise; 6 - dugongs; 7 - sperm whale; 8 - echolocation; 9 - cetology; 10 - baleen; 11 - keratin; 12 - baleen.

REFERENCES

1. D'Souza, M. L., Bopardikar, I., Sutaria, D., & Klinck, H. (2023). Arabian Sea Humpback Whale (*Megaptera novaeangliae*) Singing Activity off Netrani Island, India. *Aquatic Mammals*, 49(3), 223-235.
2. Bhattacharyya, S., & Bhowmick, A. (2023). Lockdown impact on dolphins as an aquatic health indicator and maintenance of sustainable Gangetic ecosystem: An overview. *Journal of Applied and Natural Science*, 15(2), 594-601.
3. Newport, K.J. (2023). Man-Made Threats to Spinner Dolphins (*Stenella Longirostris*) in the Tamil Nadu Coast, India. 5. 194-196. 10.30654/JVMS.10021.
4. Gole, S., Prajapati, S., Prabakaran, N., Johnson, J. A., & Sivakumar, K. (2023). Herd Size Dynamics and Observations on the Natural History of Dugongs (*Dugong dugon*) in the Andaman Islands, India. *Aquatic Mammals*, 49(1).
5. Ilangakoon, A. D., & Sathasivam, K. (2012). The need for taxonomic investigations on Northern Indian Ocean blue whales (*Balaenoptera musculus*): implications of year-round occurrence off Sri Lanka and India. *J. Cetacean Res. Manage.*, 12(2), 195-202.
6. Choudhary, D & Prasad, Suday & Bhushan, Mani. (2023). Bhola Paswan Shastri Agricultural college, (BAU, Sabour) Purnea, Bihar -854302 Int. 10. 46-55.
7. Mahanty, M. M., Cheenankandy, S. M., Latha, G., Raghuraman, G., & Venkatesan, R. (2023). Acoustic Identification of Dolphin Whistle Types in Deep Waters of Arabian Sea Using Wavelet Threshold Denoising Approach. *Archives of Acoustics*, 48.
8. Powell, J. & Alvarez-Aleman, A. (2023). India's first Dugong conservation reserve notified in Palk Bay, Tamil Nadu: bringing hope for extinction-prone dugongs. *Sirenews* no.77
9. Acharyya, T., Sudatta, B. P., Das, D. B., Srichandan, S., Baliarsingh, S. K., Raulo, S., ... & Bhat, I. (2023). Irrawaddy dolphin in Asia's largest brackish water lagoon: A perspective from SWOT and sentiment analysis for sustainable ecotourism. *Environmental Development*, 46, 100863.
10. Rai, A., Bashir, T., Lagunes-Díaz, E. G., & Shrestha, B. (2023). Modeling Ganges river dolphin distribution and prioritizing areas for efficient conservation planning-a range-wide assessment. *Ecological Modelling*, 481, 110362.
11. Hatkar, P., Patel, S., Pathan, S., Kuppusamy, S., Vachhrajani, K., Prabakaran, N., & Johnson, J. (2023). Review of stranding records of megaherbivore the Dugong (*Dugong dugon*, müller, 1776) in the Gulf of Kutch, India-an implication to the conservation of marine mammals in Gujarat. *Journal of Survey in Fisheries Sciences*, 62-77.
12. Gole, S., Kuppusamy, S., Das, H., & Johnson, J. A. (2023). Flowering and fruiting of Tape Seagrass *Enhalus acoroides* (Lf) Royle from the Andaman Islands: observations from inflorescence buds to dehiscent fruits. *Journal of Threatened Taxa*, 15(1), 22494-22500.
13. Thathsarani, N., Rajakaruna, R., & Jayawardena, U. (2023). Microplastic pollution in the Indian Ocean: Passageways and the contamination of the open ocean and its marine environment. *Toxicology Advances*, 5(2), 9.
14. Panicker, D., & Stafford, K. M. (2023). Temporal variability of a soundscape near a mid-oceanic atoll in the northern Indian ocean. *Progress in Oceanography*, 214, 103033.
15. Dudhat, S., Pande, A., Nair, A., Mondal, I., Srinivasan, M., & Sivakumar, K. (2022). Spatio-temporal analysis identifies marine mammal stranding hotspots along the Indian coastline. *Scientific Reports*, 12(1), 4128.



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