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Ocean

THE WOMB OF LIFE



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മനുഷ്യ വന്യജീവി സംഘർഷ ലഘൂകരണത്തിന്
വനം വകുപ്പിന്റെ അടിയന്തര പ്രതികരണ സംവിധാനം

സംസ്ഥാനത്ത് ഫോറസ്റ്റ് എമർജൻസി ഓപ്പറേഷൻസ് സെന്ററുകൾ
 24 മണിക്കൂറും പ്രവർത്തന സജ്ജം



തിരുവനന്തപുരം വനം ആസ്ഥാനത്ത് സ്റ്റേറ്റ് ഫോറസ്റ്റ് എമർജൻസി ഓപ്പറേഷൻസ് സെന്റർ

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വിവിധ ജില്ലകളിലെ വനം ഡിവിഷനുകൾക്കു കീഴിൽ 36 ഫോറസ്റ്റ് എമർജൻസി ഓപ്പറേഷൻസ് സെന്ററുകൾ

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Whale shark

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editorial

Kerala's coastline is a natural treasure where the sea, backwaters and estuaries come together, creating a rich habitat. Blessed by tropical conditions, Kerala experiences three distinct and reliable seasons: the monsoon rains, warm summer and a mild winter. This perfect blend of climate and geography supports incredibly healthy food chains, fostering not just abundant life but also vibrant biodiversity.

Kerala is blessed with about 580 kilometers of coastline. This narrow band is home to a magnificent array of diverse ecosystems like Estuaries, Backwaters, Mangrove Forests, Lagoons and Coral Reefs. These ecosystems are crucial and play a critical role in climate regulation, acting as key sites for carbon sequestration and contributing significantly to global oxygen production.

Oceans cover two-thirds of our planet and houses far more than just fish. They are vast, complex ecosystems full of fascinating life forms. However, many marine species face dire threats due to human activities and climate change. Kerala's coastline is no exception to this challenge. The Salt Water Crocodile, once part of our coastal ecosystem until recently, is now extinct in this region. Likewise, the majestic Whale Shark is experiencing a worrying decline in numbers here. Recognizing these threats, the Kerala Forest Department has been actively conducting awareness programs among fishing communities to promote marine conservation. The Whale Shark, protected under Schedule I of the 1972 Wildlife Protection Act, receives the highest conservation priority. Such legal protection is crucial to curb threats from unregulated fishing, accidental capture in nets and habitat degradation.

The protection of our marine ecosystems remains non-negotiable as these habitats are vital for sustaining both ecological health and local economies. It is our collective duty to safeguard these ocean resources, ensuring thriving marine biodiversity endures for generations to come.

Rajesh Raveendran IFS

Chief Editor

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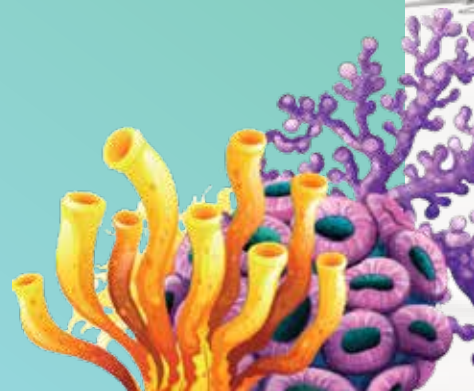
Conservation Efforts

■ Sajan John
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Safeguarding Kerala's ecological health demands the integrated conservation of diverse habitats—from the mist-laden peaks of the Western Ghats to the vast expanses of the surrounding seas. The wild elephant grazing on the montane shola grasslands and the dugong feeding on submerged seagrass meadows may never encounter each other, yet they are bound by the invisible threads of nature's biological interdependence that sustain life across ecosystems. Wildlife conservation, therefore, is not confined to forests and their inhabitants alone; it represents a far larger living continuum that embraces the oceans and their myriad life forms as well.

The Western Ghats and the surrounding seas are decisive ecosystems that shape and regulate Kerala's climate.

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Coastal and Marine Ecosystem

Integrating Ecology, Community and Conservation

The coastal region is a zone where people depend most for commerce and employment. Moreover, the coastal and marine ecosystem provides ecological services invaluable to humanity. This marine ecosystem stands as a vast storehouse of key contributions like nutrient cycling, transportation, biological resources and minerals, tourism and climate regulation.

The Western Ghats and the ocean are vital ecosystems that shape Kerala's climate. Nearly seventy percent of Kerala's land slopes towards the sea, a unique feature that impacts water cycles, climate patterns, land use, infrastructure and human settlement. The 44 rivers originating from the forests in Western Ghats flow into the sea, creating a dynamic ecosystem linking rivers, estuaries, backwaters and ocean. This energy flow strengthens Kerala's ecological sustainability. As such protecting ecosystems from the Western Ghats to the seas is crucial for the ecological well-being. Though wild elephants graze mountain grasslands and dugongs feed on underwater sea grass meadows, they never meet together. This

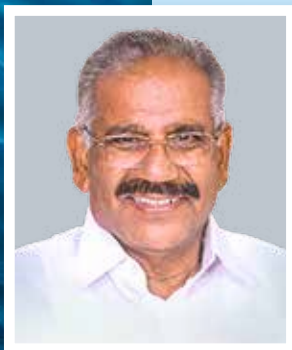
is nature's invisible biological connection that sustain them. Forest and wildlife conservation must therefore include not only forests and animals but also the seas and marine life.

Kerala boasts a coastline about 580 km. Mangrove forests can be found right on the seashore in the Andaman & Nicobar Islands. Once such mangroves were also present along Kerala's coast, as several travellers' diaries reveal. Today, mangroves in Kerala mainly thrive along backwaters and estuaries. Conservation of these mangrove forests, natural to the coastal region, is a significant initiative actively pursued by the Forest Department.

The few remaining mangrove zones in Kerala are often designated as Reserve Forests to ensure their survival through strict legal conservation.

India has 31 Marine Protected Areas (MPAs) and Kerala proudly hosts one of the most successful models: the Kadalundi-Vallikkunnu Community Reserve. This reserve is a vibrant ecosystem, abundant in mangroves and interconnected wetlands, supporting unique





A K Saseendran

Forest Minister

wildlife, especially birds that rely on these transitional habitats. Besides its vital ecological role, Kadalundi's natural beauty has made it a popular eco-tourism spot. What sets this reserve apart is its management approach. The Kadalundi Community Reserve Management Committee collaborates closely with the Forest Department in effective conservation and management of this rich biological resource.

The coastlines are the most dynamic and rapidly changing habitats on Earth today. And the beautiful shores of Kerala are certainly no exception. As people depend the most on coastlines, the protection of the marine ecosystem is a major challenge. Dugong, Whale Shark, Marine Mammals, Rays and Seahorses are protected under the Wildlife Protection Act of 1972. We simply cannot ensure their survival without the full support and active partnership

“the coastal and marine ecosystem provides ecological services invaluable to humanity. This marine ecosystem stands as a vast storehouse

of the fishing communities. The awareness campaigns spearheaded by the Forest Department are bearing fruit. The collaborative spirit shown by local fisher folk in working alongside the department to protect wildlife, including the efforts to safeguard sea turtles that come ashore to nest, is truly heartening. In conservation, the invaluable traditional knowledge of coastal communities for

marine life protection must be tapped along with ensuring their physical and economic well-being.

Ultimately, the preservation of our vital marine biodiversity requires us to move much further. The need of the hour is a strong commitment to more in-depth research and highly effective, impactful interventions across this entire coastal sector. ■



Kerala

Changing Sea and Biodiversity



Dr. A. Biju

Vice Chancellor,
Kerala University of Fisheries & Ocean Studies

Kerala's 600 kilometre coastline, stretching from Kasargode in the North to Thiruvananthapuram in South, is a geological and ecological marvel formed by the tectonic forces as well as the forces of the Arabian sea.

Millions of years ago, Kerala was part of the supercontinent Gondwana. The Indian plate broke away and moved northward, eventually colliding with Asia, leading to the formation of the Himalayas. This collision also influenced the western edge of the subcontinent leading to the formation of Kerala's coastline with the Western Ghats rising as a mountainous barrier. Rivers descending from the Western Ghats deposited sediment into the Arabian Sea, which led to the formation of sandy beaches and the distinctive backwaters formed by the interplay between sea waters and freshwater from rivers. While ancient legends often paint this coastal rise with strokes of poetry

and divine intervention, science offers a dramatic, yet equally profound explanation of shifting riverbeds, fluctuations in sea level and fundamental rise and fall of the terrain that sculpted this narrow, lush strip of green land caught between the massive Sahyadri mountains and the endless ocean.

Muziris: Kerala's Lost Port

For ages, Kerala's coast boasted no grander spot than Muziris, which is near today's Kodungallur. This vibrant coast has been elaborately said in the old Tamil Sangam poems and even in the writings of foreign historians. Traders from Rome, Greece, Arabia and China hailed Muziris as an energetic, bustling heart of commerce. They traded gold, wines and glass ware for black pepper, cardamom, pearls, sandalwood, ivory and gemstones from Kerala.

However, the golden days came to end in 1341. A flood or a cyclone or a tsunami





might have brought down the city. Because of these natural disasters, Periyar River might have changed its course and Muziris might have drowned in its impact. The dumping of silt sculpted new shores. The sludge gave birth to Vypin Island and also led to the formation of Kochi's deep harbor. This disaster is a great example how nature can rewrite history. Though Muziris vanished, Kerala's sea trade still continued with all glory. Arabs continued with their spice trade. In the 15 century, China's Admiral Zheng anchored his ship here. Europeans, especially Portuguese, Dutch and British turned the harbors into a place of global competition. Every single wave of traders and rulers, right from spice merchants



The sea has opened Kerala to engagement with cultures across the world, subtly and profoundly shaping the making of modern Kerala.

to colonial powers left behind bits of their architecture, cuisine and rich culture.

Though the towering Western Ghats carve Kerala apart from the rest of India, creating a separate ecological boundary, our roots stretch deep into the sea. This coastal bond fuels the rich bond of social and cultural diversity here. The sea opened wide, inviting a blend of cultures from distant lands that shaped modern Kerala. From the age old 'Uru' boatyards of Beypore to fish markets, the lives of coastal communities revolved around ocean's gifts. Even modern ports like Kochi and Vizhinjam



are simply continuing an age-old story, holding strong as vital links in Kerala's global connections.

The soaring Western Ghats turn Kerala into its own wild world inside India. Another interesting thing is that the ocean has been our greatest cultural ambassador. Not just opening the door, it created opportunities for us to integrate with diverse cultures from across the globe, an influence that guided the creation of the modern Kerala we see today.

When measured by international standards, Kerala, which has an average width of only about 65 kilometers, is defined as a coastline. More than just a geographical feature, the sea is an ecosystem that shapes our climate, environment and even the nutritional security of the people. However, an

“ocean has been our greatest cultural ambassador. Kerala's ecological heritage is not merely the sum of its forests, rivers, and seas—it is also the intricate interconnection that binds them together.”

average Malayali's knowledge on influence of ocean is minimal.

Western Ghats and the Ocean

Kerala's stunning natural story kicks off from the foggy heights of Western Ghats.

These peaks give birth to 41 mighty rivers

that rush westward, slicing through rugged slopes until they spill into the Arabian Sea. But they bring forth sediments, nutrients and organic elements that keep our estuaries, backwaters and coastal zones buzzing with life. Right where the river and sea meet, estuaries spring up as magical mash-up spots, where sweet freshwater mingles with salty tides making perfect homes for fish, crabs, shrimp, shellfish and birds. Spots like Vembanad



and Ashtamudi backwaters plug into this flow, acting as nurseries and feeding fishing families for generations. That same link keeps the mangroves, mudflats and sea grass thriving, forming tough natural barriers against beach washouts and wild storms. For thousands of years, these rivers helped in trade. Yet this lifeline is now burdened with filth, sand scoops, dams and land grabs. These also lead to reduced flow that means reduced nutrient inflow, which could adversely affect fish production. Changes in the distribution of these sediments can alter the health of shorelines and marine life. Kerala's ecological heritage is not merely the sum of its forests, rivers, and seas but an intricate interplay and relationship between all of them.

Marine Wealth

Kerala's marine ecosystem is extraordinarily rich and diverse. The continental shelf covers about 40,000 square kilometers. Of this 13,000 square kilometers with a zone less than 50 meters deep is highly productive. But the real complexity lies in the smaller, crucial habitats. We must understand the importance of micro-habitats created along our coast, including rocky outcrops (both on the shore and underwater),



sea grass beds, mangrove forests, and even coral life. Our state's marine biodiversity is truly immense, with an estimated 5,000 species. This includes over a thousand species of fish and crustaceans, extending all the way down to mollusks, echinoderms, plankton and microscopic organisms.

The state's rich marine life plays an important part in delivering vital ecosystem services we rely on, from sustaining our food chains to powering the economy. Seafood like sardines, mackerel, tuna, pomfret, shrimp and squid isn't just a staple but it's the backbone of the fishing industry. What makes our coastline special are the natural calm-water spots called mud banks, which crank up fish numbers like nothing else. They pop up mostly along the near-shore stretch from Kollam to Kozhikode right during the southwest monsoon.

The mud banks built by silt and organic stuff due to monsoon rains slow down heavy waves. This turns rough seas into peaceful feeding zones where fish, especially shrimp, swarm in droves, making it easy for local fishers to bring in the catch.

Driven by surface winds and currents, a powerful natural event called upwelling occurs, where cold, nutrient-rich water rises from the deep ocean. One major upwelling area is in the southeastern Arabian Sea, southwest of India. This process enriches coastal waters with nutrients, boosting fish population and creating ideal environments for their growth and reproduction. Notably, four global upwelling zones, which cover only three per cent of the ocean, supply 40 per cent of the

world's fish stock. Other important ecological features support the fish wealth, such as the Kollam Bank, rocky coastal outcrops, and the Wadge Bank near Tamil Nadu. The Wadge Bank is a biodiversity-rich submarine plateau known as one of India's most abundant fishery resources. Unique local practices like Pokkali cultivation, a traditional integrated brackish water farming method, demonstrate the delicate balance between human life and marine ecosystems. Recent biodiversity assessments by ICAR-CMFRI highlighted the rich marine life off Kerala's coast, recording 468 fish species in 2024, with over 50 new marine species reported in the last decade. This underscores the ecological significance of Kerala's coastline on a global scale.

Kerala makes up about 20 percent of India's total marine fish resources. Over the past decade, the state has seen an average of around 6.6 lakh tonnes of marine fish available each year. Kerala was among the first states to bring mechanization to fishing, turning it into a booming industry. Our fish abundant coasts along with huge international demand for shrimp drew in tons of investment, making it a real goldmine for fishers. To keep marine resources sustainable, Kerala kicked off a trawling ban back in 1987. Later, the Kerala Marine Fisheries Regulation Act came into play, laying down the law for managing and protecting ocean life responsibly.

Issues and Challenges

Kerala's total marine fish availability has generally increased in recent years, but serious challenges threaten the future of these fisheries. The efficiency of fishing is declining with fish stocks dropping and catch per unit effort (CPUE) falling, meaning more work is needed to catch fewer fish. This signals stress on the marine ecosystem. Intensive exploitation by mechanized vessels, especially targeting smaller fish species, light-



fishing, unscientific coastal construction and ongoing mangrove destruction are all raising significant ecological concerns. If these issues are not managed properly, there is a serious risk of overfishing and collapse of important marine species, threatening both biodiversity and the livelihoods depending on them.

India's seafood exports have surged impressively in recent years, surpassing the Rs 60,000 crore mark last year, but Kerala's share in this booming sector has been steadily shrinking over the past decade.

Studies show that key commercial fish in Kerala, like sharks and rays are seeing sharp decline in their populations. Overfishing and shifting marine conditions are the main culprits behind this drop. What's especially worrying is the lack of solid research on these vulnerable and protected species along the Kerala coast.

It looks like the riches from the marine resources are mostly ending up in pockets of a handful of people and big companies. This leaves ordinary fish workers, who are already barely hanging on amid climate change and other environmental woes, in even tougher spots, scraping by with

less and less. Meanwhile, ocean depletion keeps spreading, making sustainable management and smarter consumption of our marine biodiversity more urgent than ever. While taking Kerala's role in India's seafood exports, it was a whopping 40 per cent back in the 1985-90, but now it's down to just 18 per cent.

The UN has set out 17 Sustainable Development Goals (SDGs) for a sustainable future by 2030, and one of them—SDG 14—focuses mainly on conserving and sustainably using the oceans, seas and marine resources. The goals such as wiping out poverty and hunger, securing food

and nutrition, pushing sustainable farming and ensuring decent jobs and energy access are all related to ocean.

It's high time we give away the old notion that oceans are full of resources. To safeguard marine biodiversity for the future generation, long-term management plans are needed. At its core, truly understanding the sea means grasping how life underwater and life on land are totally linked. ■

“
India's seafood exports have surged impressively in recent years, surpassing the Rs 60,000 crore mark last year, but Kerala's share in this booming sector has been steadily shrinking over the past decade.”



Blue Economy



Dr. A. Biju

Vice Chancellor,
Kerala University of Fisheries & Ocean Studies

Over 40 percent of people worldwide live along coasts, relying on marine resources for food and jobs. Though Kerala is a coastal state, most of the people still don't fully know how vital the ocean is. It is here where Ocean literacy kicks off. Ocean Literacy is where how our everyday actions affect the health of the oceans and in turn how the oceans health affects our well being and survival. After all, oceans cover over 70 percent of our blue planet. The world now gives much importance to ocean-driven economies and projects. The ocean is our lifeline, a massive ecosystem holding up human survival and every other life form on Earth.

Oceans produce at least 50 per cent of the oxygen we breathe. They are also the main hub for the planet's biodiversity, sheltering most life forms. Furthermore, the sea is the primary source of protein, food and nutritional security for over a billion people worldwide. Marine ecosystems deliver a lot of services, like shielding coastlines from storms, fueling nutrient cycles, powering shipping and energy needs, supplying aquaculture, meds, minerals and boosting tourism. The oceans absorb about 30% of the carbon dioxide

that humans produce, significantly reducing the impact of global warming. By 2030, it's estimated that 40 million people will be employed in ocean-based industries.

Beyond these, this ecosystem is highly important socially because marine fisheries provide jobs for more than 200 million people, either directly or indirectly. Around 60 million people are employed in various fishing and aquaculture roles, with women making up about 14 per cent of the workforce. Interestingly, about 85 per cent of these workers are based in Asia. Women also play a vital role throughout the supply chain, especially in fish trading and processing.

India has a significant maritime presence with a coastline of 7,517 kilometers that spans nine coastal states and includes 1,382 islands. The country operates 12 major ports alongside 187 non-major ports, collectively handling about 1,400 million tons of cargo annually. Sea transport accounts for 95 percent of India's trade volume. India's Exclusive Economic Zone (EEZ) covers over two million square kilometers and is abundant in natural resources such as crude oil and natural gas. In 2023-24 fiscal, India recorded a

Blue Economy is the sustainable use of ocean resources to drive economic growth, improve livelihoods and protect the health of marine ecosystems.



record export of marine products, shipping 1,781,602 metric tons worth approximately Rs 60,524 crores, with major buyers being the US and China. According to the Central Marine Fisheries Research Institute (CMFRI), India has 3,288 marine fishing villages and 1,511 fish landing centers. The marine fisherfolk population totals around four million, coming from 864,550 families, with 61 per cent of these families below the poverty line. In Kerala, the fisherfolk population is 6,10,165 individuals across 118,937 families, where 98 per cent are traditional fishers and over half live below the poverty line.

Blue Economy

The idea of Blue Economy was first introduced in 1994, thanks to Professor Gunter Pauli at the United Nations University. He introduced it as an economic philosophy to reflect the needs of future growth and prosperity. Blue Economy is the sustainable use of ocean resources to drive economic growth, improve livelihoods and protect the health of marine ecosystems. It emphasizes conservation, sustainability and social equity, covering various sectors like fishing, renewable energy, maritime transport, coastal tourism and marine biotechnology. This concept gained increased



From the above, it is clear the economic value of the ecological services provided by how the oceans and the marine ecosystem is higher than any other ecosystem on Earth. India's coastal and marine ecosystems deliver economic benefits from vital services that outpace those of any other ecosystem on the planet. On top of that, countries worldwide, including India, see the ocean's massive potential for economic stability in sectors like fisheries, tourism, shipping, aquaculture, energy, and biotech products. That's why they're rolling out big plans to build and expand the Blue Economy.

attention after the 2012 Rio+20 Earth Summit and is guided by the United Nations Sustainable Development Goal 14, which focuses on conserving and sustainably using ocean resources. Several countries, including Australia, Brazil, the UK, the US, Russia and Norway have adopted national maritime policies reflecting the Blue Economy principles, and some, like Canada and Australia, have enacted specific legislation to support it.

The Blue Economy covers a wide range of key sectors. These include aquaculture (fishing and seaweed farming),



marine conservation, maritime biotechnology and bioprospecting, fisheries, maritime transport, coastal and marine tourism (also known as "Blue Tourism"), mineral resources such as offshore oil and gas, ocean energy like tidal and wave power, shipbuilding and repair, carbon sequestration, coastal protection, waste management, marine biodiversity, ocean development, responsible tourism, logistics and infrastructure, trade, plus biotechnology and pharmaceuticals.

The Blue Economy, with its annual value pegged at around 2.5 trillion dollar, ranks as the world's seventh-largest economy. For India, it's a vital piece of both economic and strategic planning. Even with strong commitments, we're still falling short on key fronts like safeguarding biodiversity, supporting indigenous livelihoods and pursuing sustainable growth in areas such as fishing, tourism and waste management. Tackling the Blue Economy means weaving it into a bigger plan for economic security and a lasting future for everyone. Strong policies are key to handling the oceans' geostrategic role, their status as an economic backbone, and their huge impact on climate change and biodiversity. ■

Deep Sea and Biodiversity

Deep sea holds a vast proportion of Earth's biodiversity, with most species yet to be discovered. It accounts for over 90 per cent of the Earth's biosphere by volume and is critical for ecosystem services like climate regulation (acting as a major carbon sink), fish production and nutrient cycling. Deep-sea ecosystems are also vital to the culture and well-being of many local communities and the deep seabed is recognized as part of the Common Heritage of Mankind. Crucially, detailed scientific information is lacking regarding the biology, ecology, connectivity and ecosystem services provided by many deep-sea species and habitats. Without this vital data, we cannot fully understand the risks posed by activities like deep-sea mining. Meanwhile, increasing scientific reports (from bodies like IPBES and IPCC) indicate that global biodiversity is facing an unprecedented threat of extinction. ■



Seabirds

Wings That Rule the Sea



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Seabirds are an intriguing group of birds that have evolved special traits to thrive in the marine environment. They inhabit the sea, isolated oceanic islands or coastal zones near the ocean, obtaining most of their food from marine sources. As key members of oceanic mega fauna, seabirds are apex predators situated at the top of the marine food chain. Their primary characteristic is their complete dependence on the marine ecosystem for feeding and only coming to land for breeding purposes. The seabird group exhibits remarkable diversity in size and abilities. The Arctic Tern is an exceptional traveller, making the longest migration of any animal, covering distances of approximately 70,000 kilometers annually as it migrates between the North and South Poles. The rare Galapagos Penguin, unique to the Galapagos Islands, small Leach's Storm Petrel, about 20 centimeters long, Wandering Albatross with a wingspan reaching three meters, fast-diving Gannets, reaching speeds of up to 24 meters per second, Emperor Penguin that can dive to a depth of 1,500 feet all are sea birds.

Classification

Seabirds are scientifically classified into five main orders. Among these, only

the order Procellariiformes, also called "tube-noses," is comprised entirely of seabirds, including petrels, storm petrels, shearwaters, and albatrosses. The other four orders that contribute species to the seabird group, which totals about 359 species or roughly 3.5% of all birds worldwide, are: Order Sphenisciformes (consists solely of penguins), Suliformes, Charadriiformes and Pelecaniformes. Seabirds are found throughout the world's oceans but are more numerous in the Southern Hemisphere due to the nutrient-rich currents of the Southern Ocean. The breeding grounds can vary with some penguin species breeding in Antarctic and sub-Antarctic regions, illustrating differences in seabird populations between northern and southern polar regions.



Kerala and Seabirds

In Kerala, approximately 51 species of seabirds have been recorded so far. This includes nineteen types of Terns, ten Gulls, seven kinds of Shearwaters, five species of Skuas, three types of Storm Petrels, three types of Frigatebirds, two types of Tropicbirds and two species of Boobies.

Genera such as Albatrosses and Petrels spend their entire lives exclusively over the oceans until they reach full maturity. However, some other groups, including the Gulls and Terns, only stay out in the sea while they are actively hunting for food. A few of these varieties are even more closely tied to the marine habitat found near islands or rocky outcrops. Some of these birds choose remote, uninhabited islands, unreachable rock formations or sandy banks for both their dwelling and reproduction. The Gull species, specifically, are more often observed near the coastal regions.

Habitat Characteristics

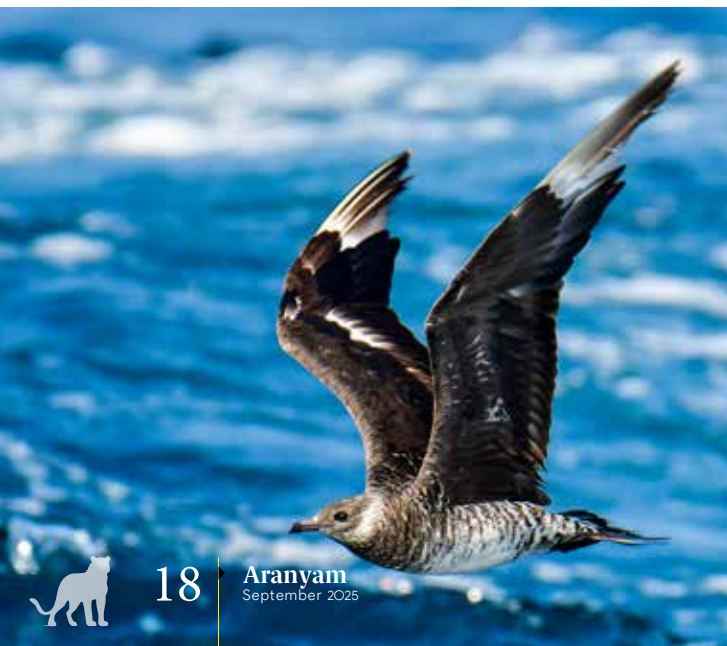
Seabirds have several specific features that allow them to both forage from the sea and survive in the marine environment. They possess body structures

perfectly adapted to thrive in the nature of the ocean. The unique aspects of their wing structure, feather makeup, distinct features of their feet and the presence of a salt gland enables them to inhabit the sea.

Most seabirds are excellent migrators. They often have to fly for long durations while searching for food. As such, these birds have long and narrow wings, which help them fly effortlessly over vast distances. Another group of seabirds, however, are masters at diving. For this purpose, they have small and robust wings. Especially in the case of penguins, their wings are like paddles, allowing them to submerge quickly and deeply. Most seabirds possess a dark or light colouration: a pattern of dark shadow on top and a lighter colour on the underside. This

type of patterning, which helps them stay hidden from both prey and predators, is called 'counter shading'. The presence of a salt gland located above the beak is one of the most unique characteristics of seabirds. These glands are crucial as they help remove excess salt from the bloodstream. The bird's kidneys are not efficient enough to regulate the salt levels in the body on

“By assessing the diversity and abundance of seabirds, we can predict the health of marine ecosystems. An increase in their numbers indicates the abundance and richness of the marine ecosystem.”



their own. The salt glands play a major role in overcoming this deficiency and controlling the overall salt content.

Foraging

Approximately eighty percent of the total seabirds feed on small fish, shrimps and zooplankton, with the remaining few species consuming food scraps and leftovers. Seabirds employ a variety of foraging methods, which are determined by prey density, food abundance and water clarity. Surface feeding is the most common behavior, achieved through strategies such as filtering, patrolling, dipping and scavenging. Diving seabirds like penguins and auks use plunge-diving and pursuit-plunging techniques to reach deep into the water in search of food, allowing them to access prey at greater depths. Gannets and boobies are known for diving from above the water surface to catch their prey. Another distinctive feeding strategy is kleptoparasitism, where some seabirds, such as skuas and frigatebirds, steal food from other birds.

Ecological Indicators

Seabirds serve as sensitive ecological indicators, reacting quickly to environmental changes and providing valuable insights into the health of marine ecosystems. Their population and diversity levels help predict the overall prosperity and richness of ocean habitats, with increases often signaling a thriving marine environment. Fluctuations in seabird numbers are closely linked to climate variability, making them effective

for studying climate change impacts. Seabirds are also crucial for monitoring marine pollution, especially micro plastics and heavy metal contamination and can indicate potential fish availability through their diet and foraging patterns. By assessing these indicators, scientists obtain primary data on ecosystem health, making seabirds indispensable for understanding and managing marine biodiversity and environmental threats.

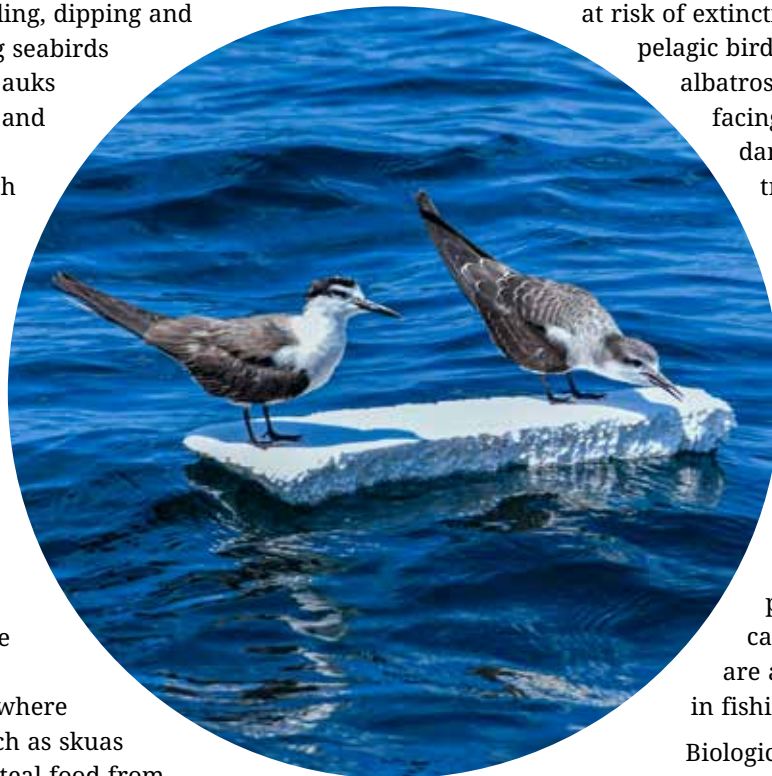
Threats

One in four seabird species is currently at risk of extinction, with pelagic birds like penguins, albatrosses, and petrels facing the greatest danger. Even traditionally stable groups such as the Charadriiformes are now showing population declines. The main threats driving this crisis are climate change, over-exploitation (overfishing), pollution, and by catch, where seabirds are accidentally caught in fishing gear.

Biological factors also play a significant role, as seabirds typically have long maturation periods and low reproductive rates, making their populations especially vulnerable to rapid environmental changes and human pressures. These combined threats highlight the urgent need for conservation efforts to protect seabirds and the marine ecosystems they inhabit.

Seabirds and Fisheries

Seabirds primarily depend on surface-dwelling fish for food, and the fishing industry targets the same species, leading



to competition for resources in Indian waters and globally. The scraps and by catch often become an important food source for seabirds, creating a complex relationship where seabirds adapt their foraging to follow fishing vessels and consume these discards. In Indian waters, fishing is conducted throughout except during trawling prohibition days, and this pattern influences seabird foraging behavior. However, reliance on discards can alter seabirds' natural foraging strategies and diet, sometimes leading to changes in their behavior and population dynamics.

Seabirds are vital for both marine biodiversity and the structure of the food web. Their rapid response to environmental changes makes them excellent indicators of ocean health,



declines in seabird populations signal broader ecosystem problems, including imbalances in the food web and the effects of threats like overfishing, pollution, and habitat loss.

reflecting large-scale ecological shifts and the impacts of human activities. As sentinel species, declines in seabird populations signal broader ecosystem problems, including imbalances in the food web and the effects of threats like overfishing, pollution, and habitat loss. Globally, research on seabirds

focuses on their diversity, population dynamics and foraging ecology, which are crucial for fisheries management and the designation of Marine Protected Areas (MPAs). However, such studies remain limited in Indian waters, especially along the western coast, highlighting a need for increased research and conservation efforts to fully understand and protect seabirds and the ecosystem services they provide. ■



Whale Shark

Conservation Efforts



Sajjan John | Sethu G

Wildlife Trust of India

The Whale Shark is quickly recognizable. They are the largest fish alive today, known for its massive size and distinctive pattern of spots and stripes. However, when compared to the Blue Whale, the difference becomes clear: the Blue Whale is actually the largest animal ever known to have existed, far surpassing the Whale Shark in both length and weight. The Blue Whale is a marine mammal, whereas the Whale Shark is a fish, making their biological classification and ecological roles quite different.

There is no doubt that the Blue Whale is the largest animal in the world, but it is not classified as a fish. Whales are mammals, meaning they give birth to live young, nurse their offspring, have lungs for breathing air and possess calcified bones. In contrast, fish like the Whale Shark reproduce by laying eggs, breathe through gills and have cartilaginous skeletons.

The Whale Shark, known locally in Kerala as 'Velludumban Sravu', 'Pulli Sravu' and 'Karumpachan', is the largest fish alive today, with a typical length of 40 to 45 feet and a weight of about 20 tons. It is the only species in its genus, making it monotypic.

The Gentle Giant

Sharks are often perceived as bloodthirsty monsters, a stereotype reinforced by old fairy tales, detective novels and especially by influential Hollywood films. Directors like Steven Spielberg and Renny Harlin have played a major role in shaping the global image of sharks as cruel and dangerous beasts. This portrayal has led to widespread fear and misconceptions, with many people imagining sharks as relentless predators capable of destroying ships and attacking humans without provocation.



But the reality is not this. Whale Sharks are extremely peaceful and pose no threat to humans or large fish. Despite their massive size, they are filter feeders, consuming only tiny organisms like plankton and small shrimp found in the ocean. Their feeding method involves opening their mouth wide to take in water, then filtering out food particles using specialized gill rakers, while letting the water pass through. Whale Sharks do not have teeth for tearing or biting, and they do not attack people. There has never been a documented case of a Whale Shark attacking a human.

Whale Sharks and Ecological Value

Whale Sharks play an important role in keeping the ocean healthy. Instead of hunting big fish, they glide through the water, filtering out tiny plankton, algae and other small organisms. By doing this, they help to control levels of these tiny life forms, which keeps the water clean and balanced for other marine creatures. Fishermen often say that when Whale Sharks are around, their nets fill up with fish.

Need to protect Whale Sharks

The Whale Shark is officially listed as an endangered species on the IUCN Red List. It was in 2016 that it was enlisted due to a global population drop of more than 50 percent over the past 75 years.

This decline happened during a period of intense global development and change, including major events like the Second World War and widespread nuclear testing, both of which had far-reaching effects on marine life.

Whale Sharks are experiencing a sharp decline due to climate change, unsustainable fishing, increased shipping, unscientific coastal construction and tourism activities. These gentle giants are slow-moving and spend most of their time near the ocean's surface, partly because of their massive size.

Their inability to dive quickly makes them vulnerable to collisions with large ships and fishing boats, which often results in injuries or fatalities.

Migratory Sharks

Whale Sharks are highly migratory animals. As national sea boundaries are not an issue for them, their safety in one country does not guarantee protection throughout their journey. In India, they are frequently sighted along the 8,000 km coastline, with the highest numbers observed off the Saurashtra coast of Gujarat between August and March. After Gujarat, they are commonly seen along the coasts of Kerala and Lakshadweep from November to May.

Satellite tracking studies, conducted by the Wildlife Trust of India, have revealed that Whale Sharks tagged on the Gujarat coast have traveled all the way to the eastern coast of Africa.

Whale Sharks and the Wildlife Trust of India

Environmental documentary filmmaker Mike Pandey is credited for including Whale Shark in the protected category in 2001. An Oscar winner for three times, his documentary, "Shores of Silence," released in 2000, exposed the mass slaughter and uncontrolled fishing of Whale Sharks in India. The film played a major role in raising awareness and influencing both national and international discussions on Whale Shark conservation.

The Wildlife Trust of India's (WTI) intervention to protect whale sharks in the country stands out as a remarkable example of conservation. Even after the species was placed under Schedule I of the Wildlife Protection Act in 2001, safeguarding these gentle giants in the ocean remained a challenge for the Forest Department and other government agencies. Only one group truly holds the key to their survival: the fishermen.



Whale Sharks are extremely peaceful and pose no threat to humans or large fish.



In 2004, WTI teamed up with the Gujarat Forest Department to launch whale shark conservation programs along the Veraval coast. The campaign was aimed at building a deep emotional bond between local fishermen and whale shark. This effort found a powerful ally in Morari Bapu, a spiritual leader and renowned storyteller from Gujarat. His words and timely involvement

that Morari Bapu cleverly used. He asked fishermen; “will you welcome and care for your daughters returning home, or will you harm them?” This heartfelt question became the soul of the whale shark conservation campaign. Since Gujarat coast is a breeding ground for whale sharks, Bapu’s message struck a deep chord with the fishing community. Over the past 21 years, this



left a lasting impression on the fishing community.

The Pregnant Daughter

In Indian culture, it’s a tradition for daughters who’ve moved to their husband’s home to return to their parents during pregnancy. It was this emotional connection

awareness has inspired fishermen along the Gujarat coast to rescue and release 976 adult whale sharks and 18 juveniles by cutting their nets and sending them back to the sea.

These conservation efforts by the local fishermen also received crucial support from the Gujarat government. The government initially sanctioned a compensation of



Rs. 25,000 for the damage of the nets during a Whale Shark rescue operation. At present, the compensation stands at Rs 50,000.

Whale Sharks off Kerala's Shores

Next to Gujarat's coast, Kerala and Lakshadweep coasts have the highest sightings of whale sharks in India. That's exactly why campaigners turned to Kerala for their next round of awareness drives after Gujarat. In the initial stage, efforts zeroed in on schools, beachfront communities and fishing ports. And this produced results as one can see that local fishermen had freed three whale sharks on their own within just two years. These fishermen were honoured at an international whale shark workshop in Gujarat.

Since 2020, the project initiated awareness campaigns in a bigger way. As part of this, Wildlife Trust of India is engaged in wide reaching awareness campaigns along the coastal stretches and other places. On International Whale Shark Day (August 30) Kerala's beaches saw campaigns like wall art, signboards pleading for these creatures' survival, marathons, cycle rallies, drawing

contests and essay writings. The project has the support from the Kerala Forest and Wildlife Department and Fisheries Department.

Fishermen in Kerala have freed 50 whale sharks back into the ocean from 2017. As these sharks are counted as fish, many believe that these come under the Fisheries Department. But as Whale Sharks are protected under Wildlife Protection Act, they come under the Forest Department. Hunting them or obstructing their peaceful existence is a punishable offense. Harming a Whale Shark is a crime that can result in a fine of at least Rs 25,000 and a prison sentence of not less than three years. India's whale shark protection with the cooperation of fishermen shows how protecting a species can turn into everyone's fight. By combining traditional knowledge with scientific research and by fostering a sense of pride and stewardship among coastal communities, these gentle giants can remain valuable members for maintaining ocean health. Sustained awareness, supportive policies and the continued intervention of fishermen will secure the Whale Shark's presence in Indian waters. ■



Monsoon Sea

The Significance



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The varied weather patterns that we see these days mostly start out as ocean-born systems. With three-quarters of Earth's surface covered in ocean, it's no surprise they have this link to the climate. Solar energy speeds things up back-and-forth between ocean and atmosphere.

From everyday sea breezes and land breezes right up to the huge monsoon that blankets massive lands and oceans, everything gets shaped by this core interplay.

The continents and ocean basins come across all sorts of weather events. Modern ocean exploration kicked off with the Challenger Expedition. The Challenger Expedition stuck mostly to the Atlantic Ocean. When the fervor of Renaissance and innovation combined with the necessities of imperialism and colonization, the gains secured by European powers, both physical and intellectual, profoundly expanded the overall scope of knowledge generation for the entire human



What makes the Indian Ocean unique from other ocean basins is the phenomenon of monsoon winds, known as trade winds.

species.

Though we started to indulge in marine life knowledge only in the late 19th century, the traditional knowledge regarding climate

is perhaps as old as the very origin of human race itself. A prominent example of this ancient understanding is the monsoon wind, which is believed to have been discovered in the early days of the Common Era.

What makes the Indian Ocean unique from other ocean basins is the phenomenon of monsoon winds, known as trade winds. The high level of moisture contained within the monsoon winds, which originate in the Southern Indian Ocean, is the reason for the extraordinary rainfall that enriches the subcontinent.

The strong push from monsoon winds heading to India's western coast creates unique water flows. First of all, the waves are driven right to the shore by the wind.



Then, the surface motion shifts downward through layers, pushing a thick, meter-deep layer of water towards the land. But once this warmer water hits the shallower coastal waters, it pulls colder water up from the bottom. (Think back to physics a bit: mixing fluids at different temperatures spreads the heat around evenly.) The seabed gently slopes off into deep ocean. As that deep water rises, it churns up sediment piles along the slope. This spreads through the whole water column, packing the region with nutrients. On the other hand, places where such processes do not happen are largely barren. This is why the open ocean, due to this nutrient scarcity, is often poor in primary production, like a "desert," and appears empty of fish.

This nutrient-packed water from the process sparks a ton of primary production. The food chain kicks off with tiny microbes called phytoplankton, the first players in line. They absorb all available light rays and much like plants on land, use chlorophyll to perform photosynthesis and gather carbon energy. The next members in the chain, zooplankton, consume this increased supply of primary energy, which is then passed on to the subsequent links, which are the larger fish.

Chākara: The Abundant Sea

This process is what really boosts fish population along our coasts, right as the southwest monsoon kicks in. But at the same time, a special event pops up in India's southwestern coastal waters. Local folks call it Chākara (Chāv + Kara, meaning 'Dead Shore'), or the 'Mud Bank'. It comes from monsoon winds, powerful currents, huge waves in tight spots and times, along with nutrient boost from upwelled sediments. This sparks massive plankton growth, drawing in all sorts of fish. What sets Chākara apart, beyond the fish bonanza, is the calm right by the shore. While monsoons usually whip

up wild waves along the coast, big patches of near shore water stay glassy and clear—often in those semi-circular zones. It shows up in Alappuzha district, from Purakkad up to Thumboli.

Modern studies with respect to Mud Banks started in the 18th century. European naval officers considered these Mud Banks influenced ships that sail near the coast. Upwelling happens all along India's west coast in monsoon season, but why does Chākara stick to spots like Purakkad and Njarackal? That sparked smart guesses, with the top one pointing to monsoon runoff from Western Ghats rivers and their coastal estuaries as the key trigger.

While the phenomenon is a general occurrence along India's western coast during the monsoon, the question of why this phenomenon remains exclusive to certain areas like Purakkad and Njarackal has led to several assumptions. The primary conclusion is that the monsoon run-off from the rivers originating in the Western Ghats and the estuaries into which these rivers empty along the coast, play a key role in its formation.

Early 20th-century studies offered key clues and ideas about what sparks mud banks. Back then, this happened mostly in four Kerala coastal spots. The big ones down south were Alappuzha and Njarackal, while the northern pair was in the Malabar region. At Alappuzha's mud banks, people have noted mud bursts shooting up from the seabed. Dead fish, wood chunks and roots floated up. It was noticed that the ocean mud was similar to the one on the land. From all this came up fresh 'sandbars' that blocked river sediments flowing free into the sea. This allowed for the slow progression of land formation, resulting in the coastal areas we see today. However,



The relationships and inter-connections between the species that are connected in a food web are indicative of the high abundance of fish in the area of Mud Banks



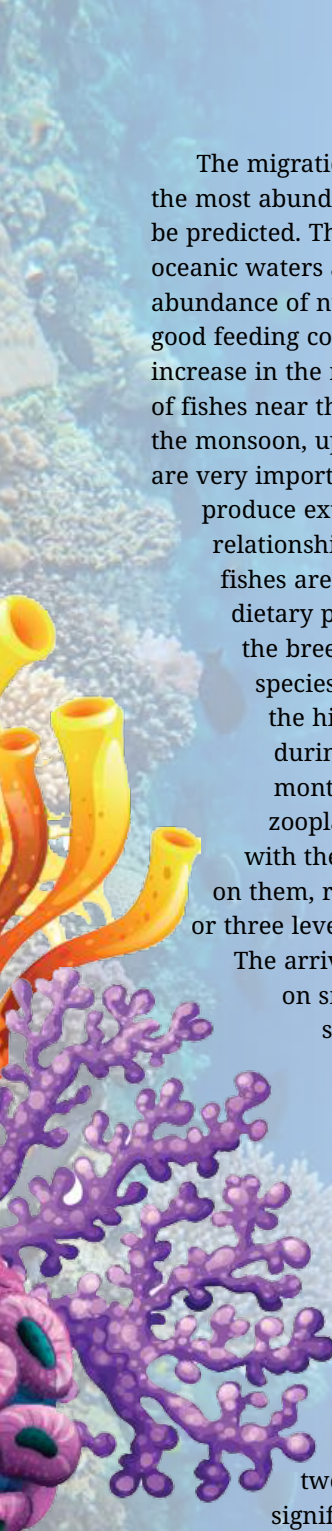
the continuous fluvial deposits accumulating in the backwater system east of these new sandbanks (which include 'Puthuveypu' or newly formed coastal land) created high hydrostatic pressure during the monsoon season. This elevated pressure forces the accumulated silt out into the sea, pushing it underneath the still-unconsolidated coastlines. Another possibility is that the mud bank phenomenon near Purakkad is due to a former river mouth and the accumulated silt. The historical fact that Purakkad was a port in ancient times lends support to this theory. A similar geological setting is believed to be the cause of the Njarakkal Chaakara, which is part of Vypin Island. Here, too, there is an extensive backwater system and other wetlands located east of the coastline. The Mud Banks in the Malabar region is also centered around estuaries. Thus, the Mud Banks, a truly unique phenomenon, is learned to be the result of combined action of geological factors created by the interaction between sea and land.

For decades, a lot of scientific studies have been conducted on the various physical and bio-chemical aspects of Mud Banks. A study along Alappuzha coast has given some knowledge of how a community

lives in the ocean after it has experienced upwelling events. It has been seen that a large concentration of phytoplankton in the waters that are very muddy will grow all the way to the surface in high concentrations due to sunlight they receive in this area and the increased primary production during the monsoon season. They are similar to plants on the land, and therefore they act as the primary producers of energy within the ocean and are consumed by zooplankton, which follow in the food chain after phytoplankton. The zooplankton from mud Banks consist of many different species and are one of the major sources of food for small or common fish species like Sardines, Mackerel and Anchovies.

The relationships and inter-connections between the species that are connected in a food web are indicative of the high abundance of fish in the area of Mud Banks. This high volume of fish is referred to as the "Chakara Catch" and consists of several species of fish including sardine, mackerel, oil sardine, anchovies, sole, catfish and mullet and several species of prawn. This ensures small-scale fishers financial and food security even during the monsoon season.





The migration of organisms toward the most abundant food sources can be predicted. The monsoon-influenced oceanic waters are an area of high abundance of nutrients. It provides very good feeding conditions, which cause an increase in the number of small species of fishes near the ocean surface. Both the monsoon, upwelling and mud banks are very important phenomena as they produce extensive environmental relationships. The above mentioned fishes are important source of dietary protein. Furthermore, the breeding of most of these species has evolved to utilize the high primary production during the monsoon months. Phytoplankton and zooplankton, in conjunction with the small fishes that feed on them, represent the first two or three levels of the food chain.

The arrival of large fish to feast on smaller fish, including sardines and mackerel expands the entire food chain, as phytoplankton and zooplankton, along with the above-mentioned fishes, are all at the bottom level of the food chain. During peak seasonal productivity in India, two of the larger and most significant groups of animals that visit along the coast of India are pelagic whales and seabirds. Evidence have got that both of these groups regularly come to the western coast of India, having migrated northward from the Southern Ocean.

With whales breeding primarily in warmer, tropical waters (including the Indian

Ocean), calves that are born in these regions enjoy a more gradual acclimatization process to the cooler polar waters and build up fat reserves (blubber) over the course of their lives. Whales primarily hunt for food in upwelling areas near the Southern Hemisphere poles, but the data compiled over the last few years indicate that they visit Indian coasts during monsoonal periods to take advantage of the increased productivity during this period. The ban of mechanized fishing along the western sea during this period provides whales with safe areas to feed.

The increase in productivity of the western coastal waters of India is illustrated by the record-high numbers of shearwaters and storm petrels occurring in the region. The seasonal upwelling of the warm waters of the Indian Ocean creates a very high productivity high zone along the coast. A variety of seabird species, either trapped by the wind or by purposefully relying on it, visits the shores here. The monsoon and the resulting upwelling phenomenon are the backbone of the production dynamics necessary for such a healthy biotic community to emerge. This process integrates the extremely diverse ecosystems, from the deep sea to the Western Ghats, allowing for the formation of a temporarily but highly productive coastal environment and its associated biological community.

The rise of temperature in the atmosphere and ocean is disrupting habitats both on land, i.e. coastal areas and in deep sea. Overall, these factors are causing animals and plants to either relocate or go extinct before they're able to adapt to the conditions. It is high time that humans take a firm decision to correct for the sake of a healthy environment.

In order for humans to play their part in managing these changes, supporting sustainable fishery practices, promoting sustainable and eco-friendly products as well as having a greater consciousness of living harmoniously with the environment and producing less waste is critical now. ■



Sharks

Guardians on the brink



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The southern coast of India is famous for its abundance of various species of marine life. Sharks are among the more than 100 types of fish that are currently recorded as having been observed in Kerala Coasts. Sharks are an example of a group of organisms that have continually lived through and evolved with changes in their environment over the past 400 million years and have established an important environmental niche for themselves. Like tigers in the forest, sharks are a keystone species that are vital to maintaining the overall health and balance of the marine ecosystem.

Sharks are typically meat-eating (carnivorous) fish and are at the top of the food chain. Their role as apex predators helps in controlling the number of other

Like tigers in the forest, sharks are a keystone species that are vital to maintaining the overall health and balance of the marine ecosystem.

fishes, which are lower on the food chain. In areas where shark population was found to be low, an increase in the number of mesopredators (mid-level predators) has been observed. This leads to an increase in the number of herbivorous fish and also to the growth of excessive algae and eventual breakdown of the overall ecosystem.

Today, sharks are one of the many species that are threatened with extinction, primarily because of over-fishing, accidental capture as by catch, habitat destruction and high demand for shark fins worldwide. It has been estimated that over 100 million sharks are killed each year.

The Whale Shark
(*Rhincodon typus*), which is
the largest fish



◀ Common thresher



in the world, migrates every year from the northwestern parts of India towards the coast of Kerala. These sharks, which are facing severe extinction threats, are frequently sighted in the relatively cooler areas of the ocean off the Kerala coast. In addition, numerous other shark species are also seen along our coast, including Tiger Sharks (*Galeocerdo cuvier*), Reef Sharks and many species belonging to the *Carcharhinus* genus, Bamboo Sharks, Cat Sharks, and Gulper Sharks. A particularly notable group known for the unique shape of their heads are the Hammerhead Sharks.

Endangered Shark Species

Sharks are an important part of marine ecology. A little less than eight percent of the fish species in Kerala are considered threatened as defined by The IUCN Red List. For example, the Pondicherry Shark (*Carcharhinus hemiodon*), the only known population of this species is in India. These are small sharks that are usually one metre long. Also critically endangered is the Indian Swellshark (*Cephaloscyllium silasi*), a deep-water fish identified off the Kollam coast. Many shark species classified as endangered have an increased risk of becoming extinct in the future and such species need greater protection. Vulnerable species have the same risk of becoming extinct but are not currently

“Many shark species classified as endangered have an increased risk of becoming extinct in the future and such species need greater protection.”

classified as endangered.

Sharks categorized as VU (Vulnerable) are those that do not currently belong to the threatened group but are likely to face the possibility of extinction in the future. The sharks in this VU category include Shortfin Mako Shark (*Isurus oxyrinchus*), Common Thresher Shark (*Alopias vulpinus*), Bigeye Thresher Shark (*Alopias superciliosus*) and Silky Shark (*Carcharhinus falciformis*).

Hammerhead Sharks

Hammerhead sharks belonging to the Sphyrnidae family stand out with their unmistakable T-shaped heads, known as cephalofoils, where eyes and nostrils sit wide apart on the sides. These are found in temperate and tropical waters.

The Great Hammerhead (*Sphyrna mokarran*) is the biggest among hammerheads. It has a nearly straight front head edge showing just a tiny central dip. These beasts average around four meters long and weigh 230 kg. The largest recorded Great Hammerhead Shark has a length of 6.1 meter and 450 kg in weight. As the world has seen over 80 per cent decline in their numbers, these have been placed in the Critically Endangered list on the IUCN Red List.

Scalloped Hammerheads (*Sphyrna lewini*)

▼ Bigeye thresher



▼



▼ Common thresher



are the most common ones seen. Their scalloped front head edge is marked by small notches. They are typically 2.5-3 meters long and weigh 80 to 100 kg. These sharks make up over 95 percent of India's hammerhead catches. Fin trade has slashed populations worldwide, earning them Critically Endangered status too on the IUCN list.

The Smooth Hammerhead Shark (*Sphyrna zygaena*) is the second largest among hammerhead shark species. What stands out most is its head's front edge, which curves smoothly without a central notch, which earns it the "Smooth" label. The Upper body tends towards dark olive or grey-brown shades. These sharks usually grow to 2.5-3.5 meters long, with weights hitting up to 400 kilograms. The record length measured five meters. Facing extinction risks, they fall into the VU category on conservation lists.

The head of the Winghead Shark (*Eusphyra blochii*) takes up almost half its full body length, forming a wing-like shape. Though the exact purpose of such a head remains unclear, experts believe it helps in smell detection and also sharpens vision. Body color is light brown to grey, marked by a high, sickle-style first dorsal fin.

These are primarily found in shallow coastal waters of the Indo-Pacific area. They

come to a length of around 1.9 meters (6.2 feet). The Red List places the Winghead Shark in the EN (Endangered) category.

Major Threats

The Central Marine Fisheries Research Institute (CMFRI) data shows that the average annual availability of hammerhead shark along India's coast was 639 tonnes during 2007-2018. However, it dropped to 290 tonnes by 2018.

Excessive fishing poses a primary danger to hammerhead sharks, especially on the narrow Bay of Bengal continental shelf

where heavy coastal operations slash local populations.

Moreover, they have a high international demand for their large fins. These are used for dishes like shark fin soup. Apart from this, juveniles are almost caught while fishing. About 77.7 per cent of Scalloped Hammerhead landings are sharks under 100 cm, caught before breeding maturity.

Unintended Catch

Fishing gear like gillnets, trawls and longlines, which are meant for other fishes, threaten hammerhead sharks most, with their wide heads prone to snagging in gillnets.

Slow Reproduction Rate

Sharks reproduce far slower than typical

“Excessive fishing poses a primary danger to hammerhead sharks, especially on the narrow Bay of Bengal continental shelf.”

▼ Scalloped hammerhead



▼ Tiger shark



fishes and mature later, marking them as K-selected species. Heavy fishing thus drives steep population drops.

Habitat Destruction

Coastal building and mangrove loss ruin hammerhead shark habitats.

Marine Pollution

Plastics, industrial waste, and chemicals poison seas, harming hammerheads through ingestion or entanglement in deadly debris.

Lack of Awareness and Enforcement Gaps

Some shark species appear on protected lists, yet fishers and the public often lack knowledge about extinction risks, conservation rules and the ecological fallout from losing them in marine systems. Fishers suffer major financial hits when sharks tangle in nets, sparking clashes between conservation goals and livelihood needs..

The enforcement of existing laws, including the Wildlife Protection Act and the ban on fin removal, is often not adequately implemented. Loopholes in the law and insufficient monitoring significantly weaken conservation efforts. ■

Wildlife (Protection) Act – 1972

The Wildlife Protection Act serves as the primary law safeguarding sharks in India. In 2001, ten shark species, including the Whale Shark (*Rhincodon typus*) was included in Schedule I for top-tier protection. Hunting and trading of species listed in Schedule I is banned from hunting and trading. The 2022 amendment expanded coverage, placing 26 shark and ray species into Schedules I and II.

A 2013 policy from the Ministry of Environment, Forest, and Climate Change outlawed shark fin removal, mandating full-body landings to curb finning. In 2015, authorities imposed a total ban on importing and exporting shark fins.

CITES Listing

India has signed the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) agreement, which regulates the global trade of endangered species. This is a measure to control international trade of sharks and also prevent their illegal smuggling.

NPOA-Sharks

The National Plan of Action for Conservation and Management of Sharks (NPOA-Sharks) is a comprehensive plan formed by the Indian government for the conservation and sustainable management of sharks. This plan has been prepared in accordance with the guidelines of the Food and Agriculture Organization (FAO). The objectives NPOA-Sharks puts forward are:

- Improving the scientific data collection concerning shark species.
- Identifying and protecting shark habitats.
- Monitoring and regulating shark fishing.
- Fostering awareness about shark conservation among fishers.
- Strengthening legal frameworks.
- Promoting international cooperation.



Human-Wildlife Co-op at Conflict times



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Marine mammals play a crucial role in maintaining the ecological balance of the oceanic ecosystem. It is estimated that out of over 120 species of marine mammals worldwide, 26 are found in India. This group includes whales, dolphins, porpoises and the Dugong. These organisms, which hold a position high up in the food chain, not only keep the populations of other species regulated but also play a key role in controlling the ocean's nutrient and carbon cycles.

The dolphin family Delphinidae comprises about 33 to 35 species, with eight species found in Kerala. These intelligent mammals, second perhaps only to humans in cognitive abilities, usually swim in groups called pods that exhibit social traits like affection, cooperation and helpfulness. Most dolphins prefer open, offshore waters. Among them, Humpback Dolphins inhabit shallow coastal

and estuarine areas, forming small groups along the coast from East Africa to Southeast Asia. The Indian Ocean Humpback Dolphin (*Sousa plumbea*) is the subspecies found along Kerala's coast. As they live near shores, these dolphins face threats like accidental fishing net capture (by catch), ship propeller injuries, pollution and noise disturbances. As a result, the Indian Ocean Humpback Dolphin is classified as endangered by the IUCN and is legally protected under Schedule-I of the Indian Wildlife (Protection) Act.

Estuaries are prime habitats for these dolphins because of plentiful food supplies, predator protection, mate availability and secure spots for rearing calves. Studies show that these dolphins are seen in

Kerala's estuaries in varying numbers. They are highly concentrated at Ashtamudi, Azheekal, Kochi and Beypore. Calves have been spotted in Azheekal, Ashtamudi and Kochi.



Their main diet includes fish and marine organisms seen along the coastal seas and estuaries. However, local fishers note that dolphins have a special liking for mullet family. Residing in coastal waters and venturing into estuaries for food brings them into regular contact with people, fostering "human-wildlife cooperation" amid shared resources and some rivalry. Examples of such reciprocity are common worldwide, including the relationship between the Honeyguide bird and human honey gatherers in Africa, and the cooperation observed between whalers and dangerous killer whales—a list that continues to grow.



As Dolphins live near shores, these dolphins face threats like accidental fishing net capture (by catch), ship propeller injuries, pollution and noise disturbances.

Cooperation between dolphins and humans continues in various global locations, including Africa, Myanmar and Chilika Lake in Odisha, India. An example for this can be seen in Southern Brazil, where Bottlenose dolphins in the Lagoa and Imbé regions collaborate closely with traditional fishermen.

The cooperation begins as dolphins enter estuaries from coastal seas. Fishermen, already stationed along the shore in water with nets ready, join with the dolphins. Together, they catch fish trapped between the dolphins and the fishermen's nets, showcasing mutual coordination.

These complex relationships persist through social learning shared between humans and dolphins. Fishermen inherit the dolphin-assisted fishing method from fathers, elders and community members, while researchers note that the dolphins' intelligence and cognitive behavior enable them to have such a cooperation. During studies, researchers have documented mother dolphins training their calves on how



to hunt. This technique is learned not only from mothers but also from other senior members and peers.

In Kerala also, such studies are going on. The University of Kerala's Department of Aquatic Biology & Fisheries is probing potential dolphin-human interactions in Kerala, building on prior work by Biju Kumar's team at Ashtamudi Estuary hinting at existing cooperative possibilities.



Moreover, research by the author's team from 2024-2025 reveals that fishermen casting nets right in front of dolphins catch notably more fish. Mullet migration, along with shallow coastal zones featuring seawalls in estuaries, supports this cooperative dynamic. Estuaries where dolphins and fishermen interact frequently stand out as prime spots for examining such reciprocal ties. ■



Estuaries are prime habitats for these dolphins because of plentiful food supplies, predator protection, mate availability and secure spots for rearing calves.



Alappuzha

Coastal Sea, Biodiversity, and Local Knowledge



Arun C.R.

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Known as ‘Venice of the East’, Alappuzha is a major coastal district in Kerala. The district with its backwaters, coastlines and unique ecosystems was formed in 1957. Though Alapuzha is Kerala's smallest coastal district, it boasts the highest population density at 1501 people per square kilometer. The district has an 82-kilometer coastline, drawing visitors to its expansive seafront, vast Vembanad Lake and paddy fields. The coastal people rely on fishing, agriculture and related work for income, with 54 fishing villages sustaining the largest community segment.

“Alappuzha, which has 54 fishing villages, relies on fishing and related activities to provide a livelihood for the majority of the people.”

Biodiversity

Alappuzha's coastline has remarkably diverse biological wealth. The study conducted by University of Kerala's Department of Aquatic Biology & Fisheries identified 417 fauna species, with molluscs like clams and oysters comprising about 44 percent. Additionally, 135 fish species frequent the local harbors, alongside crabs, prawns, jellyfish, sea snakes and sea gulls. Endangered

species such as sharks, seahorses and sea turtles also inhabit the area.

In the study, the researchers came across three seahorse species protected under



Schedule I of India's Wildlife (Protection) Act: *Hippocampus spinosissimus*, *Hippocampus trimaculatus*, and *Hippocampus kuda*. Among mammals, video footage from local fishermen confirmed the presence of critically endangered Blue Whale (*Balaenoptera musculus*). At the same time, a Bryde's Whale (*Balaenoptera brydei*) washed ashore at Azheekal beach. Vulnerable species like Blacktip Shark and Spadenose Shark in coastal waters highlight the urgent need for ongoing, vigilant monitoring of this marine area.

Alappuzha coast is also a vital habitat for endangered sea turtles. The Olive Ridley Sea Turtle specifically comes to this southern Kerala coast for nesting. The Critically Endangered Hawksbill Turtle (*Eretmochelys imbricata*) has been spotted here. A survey uncovered a Leatherback Sea Turtle (*Dermochelys coriacea*) shell has also been washed ashore, reinforcing the area's ecological significance for these vulnerable reptiles.

Issues and challenges

Alappuzha's coastal region faces major threats like erosion and sea turbulence from climate change, unchecked unscientific construction, mangrove loss and unscientific seawall. Studies show that biodiversity and traditional knowledge tie up directly to the coast's unique traits. Yet fishermen note a sharp dip in fish stock, especially fewer and smaller sardines. They have also reported habitat shifts in climate, temperature, sea levels, storm frequency and fish breeding times.

The research stresses incorporating local traditional knowledge into marine management and conservation. The study recommends conducting comprehensive surveys to facilitate the effective conservation and sustainable use of biodiversity, aligning with the goals of the Convention on Biological Diversity. By supporting community-led conservation ventures, such as the Sea Turtle Hatchery and Care Facility run by Green Roots in Thottappally, the rich natural heritage of Alappuzha's coastal waters can be protected. ■





Fishermen

Apostles of Marine Knowledge



Robert Panipilla
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To the public, the ocean appears as a grand, stunning expanse of water. But for seafarers who have worked its depths across generations and observed it closely with extreme precision and set the rhythms of their labour, the sea unfolds a wholly distinct world. Their ocean teem with reefs and rocky patches built up over ages from raised and level seabed formations. Nearly every marine family thrives in these spots. Apart from these, the sea floor holds countless biological sources. Some of these might be muddy patches and others could be sand pits. They call these specific spots by distinctive names such as Thoduvukal (touches) and Madakal (caves/shelters). Just as we on land name topographical features like forests,



The sea is a treasure trove of amazing secrets related to the biological world. The fishermen, who live in harmony with nature, have gained firsthand knowledge about their work through their experiences.

hills, mountains, rivers, and plains, the seafarers have given distinct names to the various physical characteristics of the seabed. The expertise of these sea workers is not limited to only what the eye can see in the ocean's panorama. They know the unseen seabed and its unique biodiversity better than anyone else.

The seabed is full of amazing secrets of the biological world. Deep down, the environment is always changing in strong and fast ways. After watching closely how things like ocean currents, water clarity, moving sand on the seabed, and even the wind, stars, moon, and sun, the seafarers go for the catch. They thus know exactly how to catch fish, big or small, using special ways for each one. This knowledge, passed down through many



generations is called "Kadal Arivukal" (Sea's Knowledge)

Biodiversity of Reefs

In the past, fishermen in Thiruvananthapuram used to catch large amounts of fish from the "Oolakkalli" reef near Shankhumukham in the district, which is 42 meters deep. The main fish they caught was Barracuda. When the catch slowed down at Oolakkalli, the fishermen sailed a bit north to Cherumankara reef, lying at a slightly shallower depth of 40 meters. Here, they would find an abundance of Trevally or Jack varieties. Karimpaara, Velappaara, Kozhuvappaara, Vathappaara, and the delicate Thoovu Paara are fished from here. Further west of Shankhumukham, at 56 meters below sea level, lay the famed Ship Reef. This deeper reef offered a different bounty, where fishermen got catches of Groupers, Snappers and Mootaan (Bream). Renowned for its richness, Ship Reef was a treasured fishing ground, weaving stories of the sea into the fabric of coastal life.

The rich diversity across various reefs is truly remarkable, but biodiversity goes far beyond just the fish. Interestingly, fish make up only about 28 per cent of the total marine biodiversity and some even believe it as an overestimate. From Kovalam's Ashok Beach, one can see the seafloor teeming with reefs. Within an area of just 500 square meters, there are around seven distinct reefs: Thaykappallikallu, Mulavarakallu, Karakallu, Aluvakallu, Narimeenkallu, Velakkallu and Mookkam. Each reef offers its own unique ecosystem. Thaykappallikallu, for instance, flourishes with 'Padina' seaweeds, while Mulavarakallu is adorned with delicate Snowflake Corals. Karakallu, Aluvakallu and Velakkallu are home to various shellfish like oysters and clams. Meanwhile, Narimeenkallu is abundant with vibrant sponges and ascidians. Mookkam and its neighboring rocks stand out with sturdy Hard Corals. It's hard to imagine such a diverse habitat packed into such a small stretch even on land. Adding to this natural marvel, each reef develops a unique

biological layer on its upper surfaces, making these underwater rocks living communities.

Beneath the coastal rock reefs, a bustling community of tiny creatures thrives. Brittle stars, small crabs, shrimp and a variety of sea worms all find shelter in this underwater world. When fishermen scrape oysters off these rocks, they often bring up this hidden marine life along with the shells. Moreover, these reefs are also home to another interesting group known as "associate species"—organisms that provide refuge and protection to others within their own bodies. Sponges, shrimp, brittle stars, shellfish, and tiny crabs are some of these species, weaving a complex web of coexistence beneath the waves. Looking at the sea simply as a vast expanse of water makes it difficult to truly grasp the incredible diversity of life it holds.

Muddy Depressions and its biodiversity

Just as land is divided into diverse habitats like grasslands, sacred groves, scrublands and forests, the ocean too boasts its own distinct zones. Among these, the muddy depressions or channels on the seafloor stand out as special and delicate marine ecosystems. Slightly lower than the surrounding seabed, these mud channels remain largely unknown in scientific literature but are well known to local seafarers. The depressions are fragile environments, their shape and coverage shifting with the tide of the bottom currents. When the undertow pushes sand over them, the channels disappear beneath a sandy blanket. When the current reverses, the mud basins reemerge. Off the coast of Thiruvananthapuram, between 25 and 30 meters deep, these curious mud channels appear in plenty. Earlier, bottom trawlers would sweep their nets through these regions, reaping abundant catches of Flatfish or Sole and prawns. Around the turn of the century, traditional seafarers innovated a new type of net designed especially for these muddy habitats, targeting these species with greater precision. These nets haul in an impressive catch such as flatfish, prawns, Pink Perch, Anchovies, Mantis



shrimp, assorted shells, crabs and even sea snakes. This rich knowledge, passed down through generations of seafarers, holds many untapped insights that we are still to grasp.

The nets are mostly set during the night, which means the creatures caught from the mud channels are usually nocturnal species. When mud channel fishing season kicks off around April to May in neighbouring Kanyakumari district in Tamil Nadu, it begins a little later in June or July in Thiruvananthapuram. From this pattern, it is believed that the species living in these mud channels migrate yearly from south to north. These aren't just random wanderers but are migratory species that choose these specialized pathways for migration. One important detail often overlooked in marine science research is timing. Studies of the seabed usually happen on calm days with clear water when these mud channels are covered



If we view the sea as just a large body of water, it is not as easy to understand its biodiversity as it is on land. The apostles of marine knowledge know the invisible seabed and its biodiversity characteristics better than anyone else.

by sand. As a result, these mud channels go unnoticed in scientific surveys.

The Night Scene

Though the ocean at night can hold hidden dangers, it also reveals a splendid display of life. In the dark, mysterious underwater realm, one can come across tiny bioluminescent species to a variety of fish resting motionlessly on the seabed rocks, including the deadly Stonefish with its potent venom. The fish drift in the chilly deep-sea waters in a sleepy trance, briefly opening their eyes to glance upward when hit by the beam of a torch. Some, momentarily blinded, float here and there. Equally captivating are the sea urchins and feather stars, creatures without eyes but equipped with sensitive receptors that trigger swift defensive reactions when danger approaches. All in all, the night dive unfolds a mesmerizing journey- a vibrant, magical feast for the senses beneath the waves.



Emerging Waste on Kerala Coast

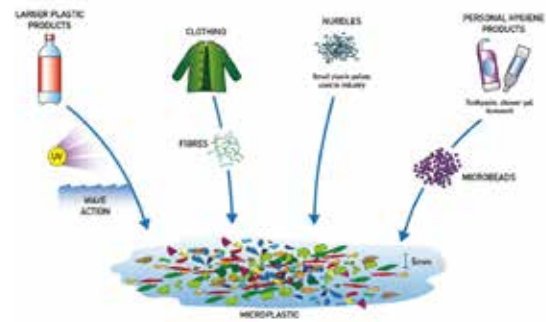


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Recent research has revealed that Emerging Contaminants (ECs), also called Chemicals of Emerging Concern (CECs), are an increasing threat to both environment and human health. These contaminants include pharmaceuticals, personal care products, micro plastics, per- and polyfluoroalkyl substances (PFAS), heavy metals, pesticides and various industrial chemicals. Kerala is an important ecological and socio-economic region, marked by dense population, rapid urban development and industries. Over the past five years, scientists have recorded a rising presence of these emerging contaminants within Kerala's coastal ecosystems, signaling urgent challenges for conservation and public health.

Micro plastics



Micro plastics, which are less than five millimeters, have become a significant source of pollution along Kerala's coastline. Research from 2020 to 2025 reveals high concentrations of micro plastics in surface waters, coastal sediments and even within



marine life. These plastics disrupt the delicate balance of marine ecosystem. They interfere with nutrient cycles, degrade habitats and threaten the symbiotic relationships within mangroves and coral reefs. Beyond their environmental impact, micro plastics also pose a hidden risk to human health, as they can enter our bodies through seafood contaminated by these pollutants.

Ground water contamination (Nitrates, Fluorides, Heavy metals)

Emerging contaminants like nitrates, fluorides and heavy metals are taking a serious toll on groundwater in Kerala's coastal regions. A 2024 study has come out with deviations in the quality of groundwater. The study found nitrates as high as 50 mg/L in areas like Alappuzha and Idukki, and fluorides reaching 1.6 mg/L in Palakkad. Microbial levels in several coastal wells also surpass World Health Organization safety thresholds. Around Kochi, industries pump heavy metals such as cadmium, copper and zinc into rivers and estuaries every day. Near the Kerala Minerals and Metals Limited in Kollam, a 2021 study found toxic metals seeping into the soil. Fluoride threatens bone and dental health, while heavy metals from these sources accumulate in ecosystems and humans alike, posing long-term dangers to both wildlife and communities.

Pharmaceuticals and personal care products

Pharmaceuticals and personal care products (PPCPs) are another major emerging concern along Kerala's coast. However, focused research on them is still limited. These substances include common antibiotics and non-steroidal anti-inflammatory drugs (NSAIDs), which have already been detected in coastal waters. Most PPCPs reach marine environment through domestic sewage, hospital effluents and discharges from aquaculture operations. A 2017 study had warned that growing urbanization and tourism in coastal cities could drive up PPCP contamination in the coming years. Once in the water, PPCPs can disrupt hormone systems in marine organisms, affecting growth, reproduction and behavior. They also contribute to antibiotic resistance in microbial communities, making infections harder to treat and posing indirect risks to human health.

Their presence in sensitive coastal zones such as estuaries and mangrove ecosystems is particularly worrying, as these areas serve as nurseries for many species and as natural buffers that support local fisheries and livelihoods.

Per- and Polyfluoroalkyl Substances

Per- and Polyfluoroalkyl Substances, commonly known as PFAS, have gained



attention worldwide as persistent environmental pollutants. These compounds are known for their ability to resist breaking down, making them especially stable and long-lasting in nature. Though dedicated research on PFAS pollution along Kerala's coastline remains scarce, the industrial zone around Kochi that releases about 57,000 cubic meters of wastewater each day, containing elevated amounts of ammonia, fluoride and hydrocarbons, strongly suggests the presence of PFAS contaminants in the region.

Sources of Emerging Contaminants

- Rapid urbanization and high population density leads to more wastewater, leaky septic tanks and higher levels of micro plastics. More worrying is that over 95 per cent of coastal homes still draw water from open wells.
- Industrial runoff from Kochi and Kollam, where factories dump heavy metals, ammonia and all sorts of chemicals straight into rivers and estuaries.
- The devastating 2018 floods led to increased pollutants like micro plastics and chemicals in coastal waters.
- In Alappuzha and Thiruvananthapuram, tourism led to a spike in plastic trash

Ecological, Social, and Economic Impacts

The presence of these contaminants is leaving a deep mark on Kerala's ecologically sensitive coastal zones, with consequences that ripple through nature, society and the economy. Biodiversity loss is already visible, especially in fragile

mangrove forests and coastal marine habitats. The normal nutrient cycle in coastal waters is being disrupted, altering how these ecosystems function and recover from stress. All these affects the livelihoods of thousands of coastal families.

Strategies, New Policy and Cutting-Edge Tech

Traditional wastewater treatment plants aren't able to clean emerging contaminants. Ozonisation, Ultraviolet (UV) Light method, Electrochemical Oxidation, Nanofiltration (NF) and Reverse Osmosis (RO) help more in contaminant removal. There is also potential in biological treatments using specific microalgae or fungal strains, as well as Anaerobic Membrane Bioreactors (AnMBRs).

Improvements in Waste Management

It is essential that municipal solid waste is processed in more scientific manner and also plastic waste, especially single use plastics- is brought down. Kerala's Suchitwa Mission is a good example of how scientific methods are used in a fruitful manner in waste processing and disposal. And for pharmaceutical waste, initiatives like nPROUD play a vital role in curbing contamination.

Smart Monitoring and Tough Rules Ahead

Bringing together Machine Learning models, GIS mapping and water quality assessments offers a powerful tool to identify and evaluate the risks from emerging contaminants. Regulatory standards for Chemicals of Emerging Concern (CECs), especially PPCPs and PFAS, should be brought in.

Monitoring and Restrictions

Continuous monitoring with Machine Learning (ML) models and GIS will help in improving the detection of emerging pollutants.



Microplastics have emerged as a major pollutant on the Kerala coast. Microplastics have the potential to affect human health through consumption of seafood.



As said regulatory standards are needed for Contaminants of Emerging Concern (CECs). The Kerala State Pollution Control Board (KSPCB) regularly does water quality assessments. Apart from this, collaborative research projects are going on with respect to the prevalence and impact of these pollutants and zeroing in on micro plastics along the Kerala coast. Studies are also underway to gauge the ecological risks tied to heavy metals in the region.

Public Awareness

Community-based campaigns, beach clean-up drives, responsible tourism ventures and the Fisheries Department's "Suchitwa Sagaram" (Clean Sea) project create awareness among the public and their involvement in bringing down pollutants.

Sustainable Practices and Fresh Ideas

To achieve lasting solutions, it is crucial to promote the use of biodegradable alternatives instead of traditional plastic items and to invest in innovative remediation technologies. These contaminants—fueled by urbanization, industrial activities and even natural disasters threaten marine ecosystems, groundwater quality and public health. While recent studies offer valuable insights, data gaps and limitations in regulatory frameworks currently hinder effective management. To tackle these complex challenges, we need integrated approaches that combine innovative treatment technologies, robust monitoring, and strong community engagement. Continuous research and decisive policy action are necessary to protect Kerala's coastal ecosystems and to ensure sustainable development. ■



Laughing Gull

A Rare Visitor in Chithari



Sreekanth C.
Birder and
Nature Photographer

We have authoritative surveys and studies conducted regularly on the avian diversity in our forests. But our knowledge about seabirds remains quite limited. Several reasons are attributed to this. A major obstacle is the difficulty and high financial cost associated with venturing far offshore to properly observe these birds. Another factor is that going out to sea during the monsoon season, when they are most likely to be sighted, is practically impossible. As such, the only viable method of observation is to monitor the seabirds that come to the coasts, estuaries and wetlands. These birds sometimes follow fishing boats as they approach the land.



When we hear the term Pelagic Birds, the first things that usually come to mind are Sea Gulls and Terns. In terms of numbers, these are the most numerous among the seabirds. However, besides these birds, the open ocean and coasts are home to a diverse range of seabirds, including Storm Petrels, Boobies, Shearwaters, Skuas and Frigate Bird. Sea gulls belong to the family Laridae. According to the Checklist of the Birds of India, fourteen species of this family are found across India. Gulls have distinctive behavior, shape and unique ways of flying and hunting and as such it is easy to recognize a gull and distinguish it from other bird groups. However, determining the exact species of gull is a much more challenging task that



requires expertise. While identifying adult birds in breeding plumage is comparatively straightforward, distinguishing between immature and juvenile gulls is particularly difficult.

In January 2024, the Laughing Gull (*Leucophaeus atricilla*) was sighted at Chithari Beach near Kanhangad in Kasaragod, marking the first-ever record of this species in all of South Asia. This bird typically breeds along the Atlantic coasts of North America, the Caribbean islands, the Gulf of California and the Pacific coast of Mexico. Occasionally, however, it has been reported in faraway places like Japan, Taiwan, Malaysia and the Philippines. As its name suggests, the sound of these birds are similar to human laughter.

Chithari estuary and beach are located approximately five

kilometers northwest of Kanhangad. As this area is relatively less crowded by tourists, one can come across large flocks of gulls, terns and migratory plovers here. A common sight here is that of large groups of gulls and terns following fishing boats. And many of them can also be seen resting on the sandbanks. On the day of the sighting, a typical large flock consisting of Brown-Headed Gulls, Black-Headed Gulls, Lesser Black-Backed Gulls, Pallas's Gulls, Slender-

Billed Gulls, Caspian Terns, Greater Crested Terns, and Lesser Crested Terns were resting on the beach beyond the stream that cuts across Chithari Beach. It would usually be difficult to spot something distinct within such a large flock of gulls from a distance. However, the Laughing Gull was noticed perhaps because it was sitting slightly separated from the other birds. Several

features made it stand out compared to



We need to understand the need to protect beaches and estuaries, such as Chithari, where migratory birds and seabirds regularly visit.



the abundant Brown-Headed Gulls nearby. It's slightly longer, downward curving bill ("drooping bill") and longer black legs made it different. Moreover, its small head had dusky streaks and the dark colouring on the back of its neck were features unfamiliar to the observer compared to other gulls seen before. The tips of its dusky-gray wings were black. The white, crescent-shaped eye-arcs on both sides of its dark eyes were clearly visible in the photographs and through the binoculars. A Brown-Headed Gull tried to peck and chase it away a couple of times. A little later, probably due to the proximity of a stray dog, the entire flock, including the new gull, moved to the sandbanks located to the south. The bird was observed at Chithari for about two hours.

While I was in the field, I only suspected it was some kind of unusual gull. After returning, I inquired about it in the 'EBird Kerala Editors' group. It was then that Jinu George, Praveen J, Chief Editor of the prominent South Asian Ornithology publication Indian Birds, and my friend Afsar

suggested that it might be a Laughing Gull. Since this was the first reported sighting in all of South Asia, its identity needed to be officially confirmed. I sent the photographs to renowned ornithologists, including Hans Larsson, John Garret and Aiden Kiley and they all verified it as a Laughing Gull.

An astonishing fact is that the area where it was found was not along any of the known migratory routes of the Laughing Gull. This only goes to show how limited our knowledge still is regarding the lives and transcontinental journeys of seabirds. At the same time, it highlights the pressing need to protect coastal areas and estuaries like Chithari, which are regularly visited by migratory and pelagic birds. One can come across empty liquor bottles and plastic waste more than you see birds in these beautiful places. How many seabirds do we find with fine nylon thread tangled in their beaks! Driving motorcycles right into the flocks of resting seabirds just to film 'reels' is a frequent sight in places like Elathoor and Muzhappilangad. ■



Human-Wildlife Conflict Mitigation Campaign

As part of the Human-Wildlife Conflict Mitigation Campaign, various activities were organized across Kerala. Help Desks and Complaint Boxes were installed in both the Grama Panchayats and Range Offices. These were set up specifically to receive complaints, applications, and suggestions related to human-wildlife conflicts.



Kattippara



Alakode



Malakkappara



Koodaranji





1. The habitat that is the world's largest Carbon Sink on Earth.
2. The largest fish in the world.
3. The world's smallest and most endangered rare marine mammal, found exclusively in the Gulf of California.
4. The fish that swims slowly and vertically, where the males give birth to the young, and which is included in Schedule I of India's Wildlife Protection Act.
5. The marine species that became extinct within just twenty-seven years (1768) of its discovery. It is also the first species to become extinct due to human interference.
6. The largest reptile among sea turtles, which is also the heaviest after the crocodile.
7. The wax-like substance produced by the digestive system of Sperm Whales, which was a crucial raw material (Fixative) for the perfume industry.
8. The reason why Sea Otters sleep on the surface of the water while holding hands (paws)
9. The largest coral reef in the world.
10. The animal with the largest tongue



Aralam



Kuttampuzha Grama Panchayath



Kottiyoor

Reni R. Pillai

Dy. Director, Wildlife Education



Answers: on page 50



School Forestry Club

Write & Win

Sacred groves are small forest patches protected by faith and tradition for generations. They are home to many rare and endangered plants. Visit a nearby Kaavu, note your experiences and observations, and write an article with suggestions to raise awareness about protecting these sacred groves.

**The best submissions
will be rewarded.**

Topic of the Month:

The sea I know

Article should be sent to:

Director,
Forestry Information Bureau
Vazhuthakkad, Thycad P.O.
Thiruvananthapuram. PIN 695014
Email: forestmediacell@gmail.com

Q&A ANSWERS

1. **Oceans**
2. **Whale Shark**
3. **Vaquita** (Listed as Critically Endangered on the IUCN Red List)
4. **Sea Horse** (Hippocampus genus). The Finnish novel Beasts of the Sea describes its fate and extinction
5. **Steller's Sea Cow**. It was found only near the Commander Islands in the Bering Sea, located between Alaska and Russia
6. **Leatherback Turtle**
7. **Ambergris**- A secretion from the digestive tract (or gall bladder) of the Sperm Whale. It floats on the sea or washes up on the shore. Today, it is mostly used in its synthetically produced form
8. The Sea Otters sleep by forming a group known as a 'Raft'. Sleeping while holding paws helps the animals stay together (preventing them from drifting apart), offers some protection from predators and helps them maintain body temperature.
9. **Great Barrier Reef**. Located off the coast of Australia, it is the world's largest structure built by living organisms.
10. **Blue Whale**. Its tongue can weigh up to four tons (roughly the weight of a mature elephant), and its length is approximately 18 feet.



പാമ്പിനെ ഭയക്കണ്ടതില്ല രക്ഷയ്ക്ക് ഇനി സർപ്പ ആപ്പ്

കണ്ടെത്തിയ പാമ്പിന്റെ ഫോട്ടോ സർപ്പ മൊബൈൽ ആപ്പിൽ അപ് ലോഡ് ചെയ്താൽ പലിശിലേന്നു നേടിയ സന്നദ്ധപ്രവർത്തകർ ഞൊടിയിടയിൽ സ്ഥലത്തെത്തി പാമ്പിനെ പിടികൂടി സുരക്ഷിതമായി നീക്കംചെയ്യും. പ്ലേ സ്റ്റോറിൽ നിന്നും ഡൗൺലോഡ് ചെയ്ത് ഉപയോഗിക്കാം. കേരള വനംവകുപ്പ് ആവിഷ്കരിച്ച് നടപ്പിലാക്കുന്ന സർപ്പ ആപ്പിന്റെ മുഴുവൻ സേവനങ്ങളും തികച്ചും സൗജന്യമാണ്. വനംവകുപ്പ് സർട്ടിഫിക്കേഷൻ നൽകിയ അംഗീകൃത റെസ്ക്യൂവർമാർ എല്ലാവരും സർപ്പയിൽ രജിസ്റ്റർ ചെയ്തിട്ടുണ്ട്. പാമ്പുകളെ സംബന്ധിച്ച സംശയനിവാരണത്തിനും സർപ്പ ആപ്പ് ഉപയോഗപ്പെടുത്താവുന്നതാണ്.

ആപ്പിന്റെ ആവശ്യകത

പാമ്പുകളും മനുഷ്യനുമായുള്ള സംഘർഷത്തിന് ചരിത്രത്തോളം പഴക്കമുണ്ട്. എല്ലാതരം ആവാസ വ്യവസ്ഥകളിലും പാമ്പുകളെ കാണപ്പെടാറുണ്ട്. എന്നാൽ കേരളത്തിൽ കാണപ്പെടുന്ന പാമ്പുകളിൽ ബഹുഭൂരിപക്ഷവും വിഷമില്ലാത്ത ഇനങ്ങളാണ്. പക്ഷെ ഭയംമൂലം മനുഷ്യൻ അശാസ്ത്രീയ മാർഗങ്ങളിലൂടെ പാമ്പിനെ പിടികൂടുന്നത് അതിന്റെ നില നിൽപ്പിന് ഭീഷണിയായി തീരുന്നുണ്ട്. ആവാസ വ്യവസ്ഥയിലെ മുഖ്യകണ്ഠിയായ പാമ്പുകളുടെ സംരക്ഷണവും വനംവകുപ്പിന്റെ ഉത്തരവാദിത്വമാണ്.

ഒരു പാമ്പിനെ അപകടകരമായ തീരിയിൽ കണ്ടെത്തിയാൽ പാമ്പിന്റെയോ കണ്ടെത്തിയ സ്ഥലത്തിന്റെയോ ഫോട്ടോ എടുത്ത് ആപ്പിൽ അപ് ലോഡ് ചെയ്യുക.

സന്ദേശ സ്ഥലത്തിന്റെ ലൊക്കേഷൻ ജി പി എസ് മുഖേന കണ്ടെത്തി റെസ്ക്യൂവർമാർ സ്ഥലത്തെത്തും.

വനംവകുപ്പ് പരിശീലനം നൽകിയ അംഗീകൃത റെസ്ക്യൂവർമാരുടെ മേൽവിലാസവും മൊബൈൽ നമ്പറും സർപ്പയിൽ ലഭ്യമാണ്.

ജനവാസ മേഖലയിൽ കാണപ്പെടുന്ന പാമ്പുകളെ സംബന്ധിക്കുന്ന എല്ലാ വിവരങ്ങളും സർപ്പയിൽ ലഭ്യമാണ്.

പാമ്പുകളെ പിടികൂടിയത് മുതൽ എല്ലാ വിവരങ്ങളും ആപ്പിൽ ലഭിക്കും.

പാമ്പിന്റെ വിഷത്തിന് ചികിത്സ ലഭിക്കുന്ന ആശുപത്രികളെ സംബന്ധിച്ച പുർണ വിവരങ്ങളും ആപ്പിൽ ലഭിക്കും.



കേരള വനം വകുപ്പ്

പാമ്പിനെ ഭയക്കണ്ടതില്ല രക്ഷയ്ക്ക് ഇനി സർപ്പ ആപ്പ്



പാമ്പുകടിയേറ്റാൽ സമീപത്ത് ആന്റിവൈനം ലഭ്യമായിട്ടുള്ള ആശുപത്രികൾ



പാമ്പിനെ അപകടകരമായി കണ്ടാലോ, അനുബന്ധ സേവനങ്ങൾക്കോ സർപ്പ വോളന്റിയരെ വിളിക്കുക



അംഗീകൃത പരിശീലനം ലഭിച്ചിട്ടുള്ള വോളന്റിയർമാരുടെ ലിസ്റ്റ്



സർപ്പ

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