

NATURE TRAIL

**Chennai Young
Naturalists' Network**

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Highlights

- ▶ **Mangrove Forests**
- ▶ **Interview:** Abhishek Jamalabad
- ▶ **Wedge Clams and Olive Sea Snails**

NATURE TRAIL

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Nature Trail is published triannually in the months of January, May and September. It is a free e-Magazine by the Chennai Young Naturalists' Network that can be viewed on our website.

Our Mission- To reach a broad spectrum of readers and ignite curiosity and scientific thinking towards the natural world, while also promoting young naturalists to develop a variety of skill sets.



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About the Editor: Nanditha Ram Satagopan is a nature enthusiast who believes that nature is her first home. A 3rd year chemical engineering student from SSN College of Engineering, Chennai, she is an avid birder. A jovial and adventurous person, Nanditha loves to trek and is always up for a walk by the beach.

Dear Readers,

I hope you and your close ones are safe and well during this difficult time. With the entire city under lockdown, when visiting the local grocery store is in itself a daunting task, we hope this edition gives you a momentary breather.

This edition's theme revolves around intertidal life. Chennai is known for its vast beaches and long coasts. However, the teeming life they host is often overlooked and we hope this edition helps throw light on some of the most intriguing creatures that inhabit this riveting habitat. Our coastline comprises a diversity of habitats like mangroves, sandy shores, mudflats and rocky patches.

The magazine includes a range of articles on the unique ecosystems and fauna that thrive on these magical areas of confluence. The next time you visit the beach, you know what to look for! Having given a fresh perspective, Nature Trail hopes that people begin to view our beaches as something more than just a place for sandcastles and cotton candy. I wish you all good health and safety, especially during these tough times.

--Nanditha Ram Satagopan, Content Editor

About the Chennai Young Naturalists' Network

The Chennai Young Naturalists' Network aims to provide a platform for young naturalists to interact with peers interested in wildlife and to explore various applications of a variety of skills. The hope is to help them grow not only in aspects connected to observation in the field but also to give them the opportunity to explore various career options. Meanwhile, we also aim to conduct outreach and educational events to help increase awareness and improve participation of the public in citizen science and other nature-related activities.



Front Cover -

Red Ghost Crab (*Ocypode macrocera*): Rohith Srinivasan

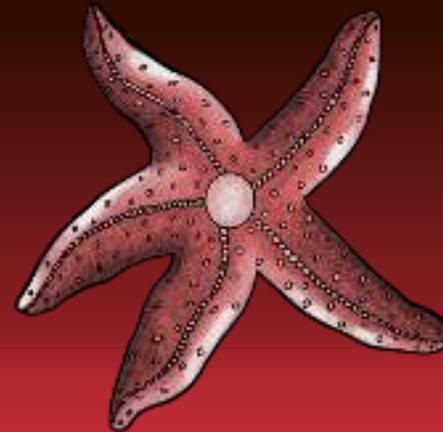
Back Cover -

Mottled Lightfoot Crab (*Grapsus albolineatus*): Mahathi Narayanaswamy

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Recent Events,

Vikas Madhav Nagarajan

On the 1st of April 2021, a public walk was organised by the Chennai Young Naturalists' Network along the Pattinapakkam beach, towards the Adyar Estuary. Eighteen people attended the walk, which commenced at 4 PM. Social distancing and other COVID safety measures were kept in place - the group was split into two teams to ensure that public safety was not compromised. The objective of the walk was to encourage citizen science and educate the participants on the diversity of the Chennai coast. The coast was covered in shells with the Cuneate Wedge Clam being the most common species. Other common bivalves seen were the Brown Mussel, *Anadara sp.*, *Sunetta scripta* and *Mactra sp.* Among gastropods, the commonly seen species included Duplicate Turritella, Rapana Whelk, Murex Snails and *Tonna dolium*. Uncommon species of gastropods such as *Semicassis canaliculata* and *Margistrombus marginatus* were also observed. A pretty purple crab, *Galene bispinosa*, was also seen during the walk, along with a range of other crustaceans such as the Indonesian Mole Crab, Horn-eyed Ghost Crab, Long-legged Hermit Crab and *Diogenes sp.*

Vikas Madhav Nagarajan is a 4th year student at SSN College of Engineering.



Brown Mussel-
Picture Credits: Vikas Madhav Nagarajan.



Galene bispinosa-
Picture Credits: Vikas Madhav Nagarajan.



Tower Shell-
Picture Credits: Aswathi Asokan.



Sunburst Carrier Shell-
Picture Credits: Vikas Madhav Nagarajan.



The participants of the public walk at the shore-
Picture Credits: Kavya G. V.



Cardites bicolor-
Picture Credits: Kavya G. V.



Nassaria sp.-
Picture Credits: Mahathi Narayanaswamy.



Sunset Siliqua- Picture Credits: *Rohith Srinivasan.*



Red Ghost Crab- Picture Credits: *Mahathi Narayanaswamy.*



Fusinus foreceps- Picture Credits: *Rohith Srinivasan.*



White Hammer Oyster-
Picture Credits: *Mahathi Narayanaswamy.*



Sunetta scripta-
Picture Credits: *Mahathi Narayanaswamy.*



Bronze Mabuya- Picture Credits: *Mahathi Narayanaswamy.*



Lollipop Crab- Picture Credits: *Vikas Madhav Nagarajan.*



Hermit Crab- Picture Credits: *Aswathi Asokan.*

Recent Observations,

The Editorial Team

The second wave of the pandemic has forced us to stay locked up at home, away from nature and all the outdoor spots we love. However, between waves, there were a few months when beaches were still open and there weren't as many restrictions on travel as there are now. Some interesting observations made by our members during this period include the Lollipop Crab, Bronze Mabuya and Eastern Yellow Wagtail. Hopefully, the second wave subsides soon, allowing nature walks to resume.



Eastern Yellow Wagtail-
Picture Credits: *Vikas Madhav Nagarajan.*

My GBBC

Experience, Sridevi P.

Birds are intelligent creatures that seem to know their way around the world. Even in this fast-paced world, we come upon so many species of birds everyday and yet, most of us turn a blind eye to them, failing to appreciate the different forms of life around us. I've always been fascinated by birds. Back when I was in school, my knowledge on birding was inadequate. However, I watched birds avidly whenever I got the time. Nowadays, I come out every morning to my balcony to take a quick scan of my surroundings and watch birds for a while to brighten my day. At any given point in time, one can find House Crows, Large-billed Crows, Feral Pigeons, Asian Koels, Common Tailorbirds and Black Kites at my house. I'm an amateur birder, and it wasn't until I joined college that I started birding extensively. My birding journey is still in its infancy and I hope to broaden my horizons and morph into a skillful birder.

For this year's Great Backyard Bird Count (GBBC) I uploaded many checklists to eBird; although my enthusiasm was marginally dampened by my non-participation in this year's

Campus Bird Count (CBC), due to the pandemic-related restrictions.

The following are some species I observed during the GBBC:

The Common Myna, also known as the Indian Myna, is a passerine found virtually everywhere. It is rather small, brown-bodied, and its head is black with discrete yellow patches surrounding the eyes. They are mostly seen perched on tree branches, sometimes sallying out from their perches to reach another spot, usually in pairs. They are known for a repertoire of calls that fool us into thinking they are a different species when in fact, they're not.

The Common Tailorbird is a small bird with an olive-green dorsum and a white vent. The crown is cantaloupe-coloured. The tail is usually pointed upwards. Tailorbirds are the real deal. They are effortlessly cute and are well-known for their constant chirping and twittering. I see them frequent a tree right outside my apartment and have never seen them perched for more than a couple of seconds. One bird flies into a tree first, as if to check whether the coast is clear, and soon after, the other members of the group follow its lead. They completely blend in with their surroundings. It is the constant twittering that gives them away. At the crack of dawn, they come by my kitchen window and peck at the glass.



Black Kite- Picture Credits: *Mahathi Narayanaswamy.*



Common Tailorbird- Picture Credits: *Siddharth Srinivasan.*

The House Crow is a medium-sized bird. The body is entirely black while the head is slaty black. It is omnivorous, feeding on a wide variety of insects, berries, nuts, etc. Crows are ubiquitous. They are often seen flying in flocks haphazardly or perched atop telephone wires, lamp posts, parapets, clotheslines, rafters, and the like. Crows get rather clamorous and wreak havoc at dusk. They fly frantically from one tree to another. They also try to caw other birds away which is presumably a way of marking their territory. Sometimes they get roguish and go hog-wild on each other. Oddly enough, as an ephemeral observation, I once saw a crow consorting with an Indian Flying Fox.

The Rose-ringed Parakeet is a brilliant green-bodied bird. The tail is slender and pointy. True to its name, the adult male has a distinctive neck with a rose-coloured ring. They are boisterous and well-known for their squawking. Parakeets are usually seen in tree hollows and branches. They squeak intermittently while flying across the sky. They are usually seen flying in groups of 3 or more and can be easily identified by their distinct, pointy tails.

The Black Kite, a raptor, is a passably big bird. The body is dark brown in colour and it can be easily identified by its forked tail. They can be seen soaring high in the sky, circling a particular

region. They swoop down from the sky to perch on rooftops and cellphone towers, where they are typically spotted, to take a short break from flying. They have a peculiar screeching call.

Shikra, White-throated Kingfisher and Black-crowned Night Heron are also encountered at my place from time to time. The Asian Koel is a cuckoo that exhibits sexual dimorphism. They are generally known for belting out euphonious songs at dawn.

Birdwatching is a great way to decompress oneself. Taking a break from the real world and entering the dynamic avian world is just what the doctor ordered. I essentially resorted to birdwatching to take my mind off things that had me pretty shaken up. What started as a means of escapism has now turned into a healthy obsession. The cathartic experience of birding helps me greatly with my stress management. Birds never cease to intrigue me! I could bird all day long and yet my enthusiasm for birding would never subside. Events like GBBC & CBC are aimed at piquing an interest in birding among people. These events are a great start on the road to birdwatching for birders in the making. Each checklist uploaded to eBird contributes greatly towards ornithological research and conservation.

Sridevi P. is a 2nd year Zoology student at Stella Maris College, Chennai.



Rose-ringed Parakeet- Picture Credits: *Smriti Mahesh.*



Indian Flying Fox- Picture Credits: *Shivani Manivannan.*

Acorn Barnacles,

Claudia Pinheiro

The Giant Acorn Barnacle (*Balanus nubilus*) is a hermaphroditic crustacean that is found in shallow water regions close to the foreshore. They are largely found in clumps attached to surfaces of rocks or pilings. They can also be seen growing on organisms like whales, crabs and sea turtles. They are the largest species of barnacle with a diameter of 6 inches and a height of up to 12 inches.

HABITAT AND DISTRIBUTION:

Giant Acorn Barnacles (*Balanus nubilus*) are found in clusters atop rocks and other such substrates near seashores, giving them a reef-like appearance. Often, these Barnacles grow stacked on top of each other. They are found in the northeast Pacific regions (southern Alaska - Baja California).

However, other species belonging to *Balanidae* are commonly seen in India.

Commonly seen Acorn Barnacles found in India and their distribution:

1. Titan Acorn Barnacle (*Megabalanus coccopoma*): It is native to Pacific coasts of Central and South America but is also distributed in other parts of the world.
2. Reticulated Barnacle (*Amphibalanus reticulatus*): It was first recorded from southern Japan and is native to the Indo-Pacific region. Through shipping, it has been introduced to regions like the tropical and subtropical waters of the Eastern Pacific, both sides of the Atlantic, and the Eastern Mediterranean. In India, it is normally encountered



Chthamalus antennatus - Picture Credits: Nanditha Ram Satagopan .

near harbours and in deeper water driftwoods.

3. Striped Barnacle (*Amphibalanus amphitrite*): It is distributed in most of the warm and temperate seas of the world. Fossils of the species have been recorded from the Indian Ocean. This is, by far, the most common species from Chennai, seen in brackish water as well as in coastal water.

Two other Barnacles commonly seen are those belonging to the Genus *Lepas* and Genus *Tetraclitella*. *Tetraclitella sp. initially* look similar to acorn barnacles, but they can be told apart by their wider aperture and aggregation styles. In Chennai, they are commonly found along the Kovalam Creek.

Acorn Barnacles

Balanidae

TAXONOMY

Kingdom: Animalia
Phylum: Arthropoda
Class: Maxillopoda
Order: Sessilia
Family: Balanidae

Goose Barnacles: They are native to the eastern Atlantic. They can be found along the coast from France to Morocco, the Canary Islands and the Cape Verde Islands. In India, the two most commonly occurring species are *Lepas anserifera* and *L. indica*. In Chennai, you can come across them on driftwood that washes onto the shores.

FEEDING:

Acorn barnacles are filter feeders that use their feet to collect food from the water. During feeding, flashes of yellow and purple can be seen when the organism opens its operculum. They extend their cirri when there is a water flow and close their shells when there is no flow. Their feeding rate changes according to the water current; the cirri are extended out for longer when there is a high flow and shorter when the flow is less. Young individuals feed at a faster rate than older ones.

REPRODUCTION:

Fertilization is internal. Through a process called sperm casting, males release their sperms into the water. These sperms are collected and used by females to fertilise their eggs. The organism is a hermaphrodite and both self-fertilization and cross-fertilization are observed. They brood eggs for weeks before they turn into their nautilus stage. Then, they moult into the Cypris stage, a phase where they feed on plankton and develop into sessile adults, wherein the shells are calcified.

ROLE IN ECOSYSTEM:

The empty cases of these organisms provide shelter for other organisms like fish, octopuses and crabs. Species of fish associated with barnacle shells are Sailfin Blenny, Sailfin Signal Blenny, Combtooth Blenny and Ocular Blenny. Some fish also use these shells to deposit their eggs. Barnacles keep plankton population under check by feeding on them. They are in turn preyed on by species like whelks, starfish and mussels.

Claudia Pinheiro is a 3rd Year Zoology student at Stella Maris College, Chennai.



Megabalanus sp. - Picture Credits: Yuvan Aves.



Lepas anserifera and *L.indicus*- Picture Credits: Vikas Madhav Nagarajan.

Horn-eyed Ghost Crab,

Mahima Nair

A trip to the beach is never complete without seeing crabs running along the coast. The most common species of crab found along the Chennai coast is the Horn-eyed Ghost Crab. These land pirates and scavengers are highly important to any coastal ecosystem and have been explored in this article.

BEHAVIOUR:

Native to the Indian Ocean, *Ocypode brevicornis* is a species of trapezoid-shaped large ghost crab with elongated eye-stalks. There is also a visible size difference between their two claws. The inner surface of the larger claw features stridulating ridges with which sound is produced. These stridulating ridges are an important feature that differentiates this species from another. *O. brevicornis* has ridges on its dorsal carapace called tubercles. There are 23 to 28 rows of tubercles.

They are primarily nocturnal. The adults are often brown and bright yellow. These crabs mainly reside in the intertidal zones of sandy beaches in deep burrows. They forage mostly at night and don't return to the same burrow the next day since they may travel up to 300 m every night. At the slightest hint of danger, they swiftly dart to their burrows or hurl themselves into the sea.

The males of *O. brevicornis* exhibit significant territorial displays. They perform display dances on the approach of another crab and the dance continues until the other crab retreats from their territory. These crabs



Picture Credits: Nanditha Ram Satagopan.

are acoustic communicators, making rasping noises with their claws and rubbing their hairy legs together to produce noise.

These crabs camouflage well with their sandy homes, blending into the sandy beaches and dunes. They have the ability to change the colour of their bodies to blend into their habitat for a prolonged period of time – morphological change of colour. This is done by adjusting the dispersal of pigments that are present within their chromatophores. These crabs have special chambers for breathing and these chambers are kept moist at all times by frequent trips to the water to wet the gills. They don't stay in the water for a long time due to the risk of drowning.

Horn-eyed Ghost Crab

(*Ocypode brevicornis*)

TAXONOMY

Kingdom: Animalia
Phylum: Arthropoda
Class: Malacostraca
Order: Decapoda
Suborder: Brachyura
Family: Ocypodidae
Genus: Ocypode



Picture Credits: *Yuvan Aves.*



Picture Credits: *Mahathi Narayanaswamy.*

LIFECYCLE:

The female crab produces around 45,000 eggs which are carried in the abdomen and hatched into the sea after approximately 30 days, where they develop as planktonic marine larvae.

LIFESPAN:

Ghost crabs live for 3 years. These crabs mate throughout the year, mostly in the vicinity of the male's burrow.

DIET:

Ghost crabs are known for their storage of food. Being both predators and scavengers, they are generalists, commonly found foraging at night, feeding on vegetation, detritus or preying on sand fleas (a major part of their diets), sea turtle eggs and hatchlings, carrion and molluscs. These crabs are crucial to the ecosystem because they aid in the transfer of

energy from organic detritus and other small animals to predators.

PREDATORS:

In order to avoid being eaten by seagulls and other shorebirds, these crabs are nocturnal. They are preyed upon by crows and sometimes by rats and dogs. Fisherfolk are also known to collect them for food. They face risks from plastic pollution as well. Plastic becomes a major physical barrier- crabs can get entangled in plastic debris. It is also observed that an increase in microplastic fibres in beaches has increased the adult mortality rate, decreased the time period of holding viable eggs and affected embryonic development rates. There are various other toxicological effects as well. The ingestion of plastics may lead to suffocation and starvation.

ECOLOGICAL SIGNIFICANCE:

Ghost crabs are observed to be helpful in assessing the impact of human activity on beach ecosystems. Depending on human activity, trampling and habitat modifications, the population density of these crabs change. They are also cleaners of our beaches, acting as the vultures of our coasts.

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Mahima Nair is a physiotherapist at MIOT, Chennai.

Ghost Nets,

Shivani Manivannan

One of the most mesmerising scenes to watch from the shore is that of fisherfolk casting their nets across the water. Originally made of rope, fishing nets have evolved since the 1960s and are now made of nylon as it is stronger and cheaper. Nylon is a thermoplastic that does not decompose easily. 'Ghost Nets' refers to any fishing gear discarded by fisherfolk and set adrift in the vast oceans. Almost invisible underwater, they are often undetectable by sight or sonar. This makes ghost nets the most harmful form of marine debris.

Trawl nets used by the large-scale commercial fishing industry account for a major portion of the global ghost nets percentage. Artisanal fisherfolk use traditional nets like the shore-seine, gill nets, purse-seine and throw nets which do not contribute as much. Intentional discarding of nets by fisherfolk is not the only reason for the creation of ghost nets. Other factors like weather and interaction of gear with underwater obstructions can also lead to them getting lost at sea.

These nets do not decompose but break down into millions of smaller pieces of plastic, which are ingested by fish. These fish are, in turn, eaten by bigger animals and humans, resulting in the biomagnification of the plastics, thus poisoning the entire food chain.

In the Indian Ocean, because of the strong oceanic currents, most ghost nets travel to small island nations like the Maldives and disrupt the fragile ecosystem around these archipelagos. Ghost nets also make up 46% of the Great Pacific Garbage Patch, a large patch of human waste in the middle of the Pacific Ocean.



Picture Credits: Yuvan Aves.



Murex sp. trapped in a ghost net- Picture Credits: Yuvan Aves.

Approximately 6,40,000 to 8,00,000 tonnes of gear is abandoned in our oceans each year. These nets restrict movement, cause injuries and kill thousands of marine creatures. They also obstruct marine mammals and birds from rising to the surface for air. Creatures that get entangled often suffocate, starve and drown.

Marine species which are most affected by ghost nets in the Indian Ocean are the Olive Ridley Sea Turtles, muricid gastropods like Murex, crustaceans like the Common Moon Crab and cephalopods like *Amphioctopus aegina*. Across the globe, many other organisms such as several species of sharks including the Dusky Shark, Great White Shark, Whale Shark and Great Hammerhead Shark are affected.

Mitigation Plan

The crisis of ghost nets can be solved by replacing nylon fishing nets with biodegradable fishing nets made of strong, salt-water resistant materials like coconut fibre or coir. But adapting to biodegradable nets poses challenges as they may not be economical for all and will only be preferred by countries that have access to the required raw materials. Along with making the transition to biodegradable nets, spreading awareness among fisherfolk and educating them on the correct methods of net disposal and recycling can help mitigate the problem to a large extent.

Shivani Manivannan is a 9th grade student at P. S. Senior Secondary School.



Removing trapped animals from the ghost net- Picture Credits: *Mahathi Narayanaswamy*.



Dardanus crassimanus that was rescued from a ghost net along with its shell - Picture Credits: *Mahathi Narayanaswamy*.

Grey Mangrove (*Avicennia marina*)-
Picture Credits: Rohith Srinivasan.

Mangrove Forests- The Sentinels of the Shore,

Rohith Srinivasan

Mangroves are the forests of our coasts. Normally associated with river mouths, these ecosystems provide important ecosystem services to humans in the form of food, freshwater, fuel, fibre, pharmaceuticals, genetic resources, ornamental resources, socio-cultural function and biological diversity. They act as important nurseries for a variety of crustaceans and fish and are known to mitigate the effects of natural calamities such as tsunamis and severe cyclonic storms. In this article, Rohith Srinivasan takes us on a journey through this fascinating ecosystem that graces the coasts of India.

Mangrove biomes comprise true mangroves and mangrove-associate species that exhibit extraordinary root and leaf morphologies which are adaptations suited to life in muddy, saline and anaerobic conditions. These roots and leaves are specially designed for gas exchange, salt excretion and physical support. They grow in deeper water; their intricate root tentacles make it hard to identify where one tree ends and another one begins. These roots have countless tentacles that help in gas exchange. Rhizophora's dense, arching, barnacle-covered prop roots suspend the trees above mud and water, making the trees appear to be standing on stilts. The entangled stilt roots act as breeding, spawning and feeding grounds for a diversity of fish, crabs and prawn. *Avicennia* and *Heritiera*, two genera of mangroves known from India, have shallow spreading long pneumatophore roots that grow vertically up from the ground. *Avicennia marina*, a species that occurs in India (including in Chennai), has muddy snorkel roots that help in passive oxygen diffusion. These beds of arrows in the ocean are major foraging grounds of the tidal forests. The genus *Acanthus*, which is also known to occur in India, has spiny holly leaves that grow in scattered small bushes. They have adapted to excrete excess salt through their leaves, which is removed by wind or rain.

Saline soil with little oxygen is a hostile environment for most seeds to germinate in.

Mangroves are viviparous. Propagules are attached to the parents during the embryonic stages and once mature, they fall directly into the soil during low tides and start developing roots. However, during high tides, the mangrove propagules fall into the water, get dispersed along with the tides and spread to form new mangrove habitats.

As the tides rise, the mangrove roots get submerged and find themselves in an oxygen deficient environment. The mangrove habitat appears to be asleep, there is low activity around it. Mudskippers climb the mangrove trees and camouflage with the bark, Saltwater Crocodiles disappear into the water and birds fly away to return when low tides arrive. But as we look at the life among the mangrove roots, we see the tides bringing in a diverse variety of fish and shrimp to feed in the protection provided by the mangroves, on the algae found on the roots and the fallen foliage around, turning the soft muddy land into a rich fishing ground during high tides. As soon as the tides become low, a plethora of intertidal species emerge and inhabit the mangroves from the roots to the canopy. Fisherfolk and locals walk among the mangrove forests and tidal flats to collect clams, crabs, shellfish and shrimp. Black-capped Kingfishers, Cinnamon Bitterns, Striated Herons and Pacific Golden Plovers forage around these dense mangroves. Ring-legged Fiddler Crabs and Motley Fiddler Crabs congregate around the *Avicennia marina*'s snorkel roots to scavenge

on the soggy fertile mud. As the wind currents rise around the mangroves, Brahminy Kites and White-bellied Sea Eagles soar above the tidal forest and swarms of Marsh Bluetail Damselfly glide through the mangrove roots.



Motley Fiddler Crab-
Picture Credits: *Mahathi Narayanaswamy*.



Boddart's Blue-spotted Mudskipper-
Picture Credits: *Vikas Madhav Nagarajan*.



Black-capped Kingfisher- Picture Credits: *Melvin Jaison.*



Mangrove pods- Picture Credits: *Mahathi Narayanaswamy.*



An edible mangrove-associate- Picture Credits: *Mahathi Narayanaswamy.*

There are close to 35 true mangrove species and nearly 69 mangrove-associate species found in India. The mangrove forests are distributed all along the Indian peninsula with the eastern coast having dense old-growth mangrove forests- from the Sundarbans in West Bengal with one of the largest mangrove forests in the world to Bhitarkanika in Odisha, Coringa In Andhra Pradesh, Pondicherry, Pichavaram and the Gulf of Mannar in Tamil Nadu. The western coast has few dense mangrove forests and more open mangroves starting from Kandal Kaatukal in Kerala to Uppinakudru in Karnataka, Chorao Island in Goa, Mahim and Gorai creek in Maharashtra and Gulf of Kutch in Gujarat. The Andaman and Nicobar islands as well as the Lakshadweep Island have large tracts of dense old-growth mangrove forests. In Chennai, we find mangroves at Ennore, along the Adyar Creek, and near Kovalam.

The mangrove's intricate root systems slow down tides, trap sediments, nutrients and organic matter and retain water, holding the fertile soil in place, thereby stabilising and modifying shorelines and battling erosion. They filter nitrogen, phosphorus and other toxins and pollutants from rivers and streams that enter the ocean and prevent seawater from encroaching into inland waterways, thus protecting freshwater reserves. Mangrove forests act as a refuge and nursery for a plethora of crab, shrimp and fish. They, for centuries, have played a critical role in supporting fisherfolk and locals for food, shelter and livelihoods. They provide firewood, honey and wood for building boats and houses. Mangrove forests absorb and store carbon from the atmosphere and use it to build their leaves, roots and branches. Once the leaf foliage falls and trees die, they sink to the seafloor and carbon gets buried in the seabed, forming blue carbon. Mangrove forests absorb influxes of water daily and can cope with flooding during storms. Thickets of old-growth mangrove forests and tidal flats create a buffer zone that protects the land and local communities from destructive cyclones, tsunamis, natural disasters and calamities arising from the oceans.

Rohith Srinivasan is a 1st year Biological and Life Sciences student at Ahmedabad University.



Pichavaram- Picture Credits: *Vikas Madhav Nagarajan.*



Salt Water Crocodile- Picture Credits: *Vikas Madhav Nagarajan.*



Osprey with Fish Kill- Picture Credits: *Vikas Madhav Nagarajan.*



Wedge Clams and Olive Sea Snails,

Yuvan Aves

Cuneate Wedge Clams on Besant Nagar Beach.

Low tide sea. Ghost crabs scurry to take cover in the waves. Washed up driftwood is twice as heavy with a tessellation of Goose barnacles - travel stamps of a vagabond branch. Yuvan Aves talks about his experience at the Neelankarai beach, Chennai as he looks for the ocean's dispatches before heading to a student's home nearby for music class.

As one walks away from the public beach, the scene of the intertidal abruptly changes. When each incoming wave bounces beyond the tideline, a colony of Cuneate Wedge Clams (*Donax cuneatus*) pops out of the sand in unison. Each is a pair of shells packing featureless protoplasm. A hard calcium sandwich of white cloudy jelly. They pull out their two siphons to filter feed off the water, and when the wave retreats, they quickly bury back into the sand with their spade-like muscular foot. If you dug with both hands and shovelled up a chunk of wet beach sand, it would have not less than a dozen clams in it. These are creatures of the intertidal, adapted entirely for the land-sea edge. Fisherfolk call them "*Matti*" here and come at low-tide sometimes to collect them. They are not commercially sold, but are pried open, smoked, and eaten at home.

The clams are in trouble if they don't flip themselves over and hurry to bury into the ground before the wetness of the wave recedes. The next wave might fling the bivalve out onto the beach, where it might dry out and die. Crows and Egrets also haunt the

shoreline, picking off late diggers. The birds try to grab them by their jelly limbs before they can shut themselves. A clam clammed shut is to a crow, what a coconut is to a hungry dog. I've seen crows sometimes carry closed clams away from the water, wait, wait, lose patience, and fly back to the tides again. But the ones caught are shaken out and slurped down. A pair of hinged, open shells are left shining on the beach. Over time they become sand again.

Among the clams lives another intertidal creature. It looks like a large nacreous bullet oozing out muscle. It also emerges out of the sand as the tide falls. Its tracks on the shore are distinct little trenches as if they were drawn by fingers, as it doesn't dig but simply walks into the sand at an angle. The Olive Sea Snail (*Oliva oliva*) is carnivorous, and lives buried amidst its prey, hunting them only above ground. An unburied snail uses the lapse between waves to feel around for an exposed clam. If it does find one, it wraps its large muscular foot onto the appendages of the clam, which squirts water and fights to shut itself. Slime gropes slime, squirming together creating a whirlpool of wet silt. The snail tries to drag the bivalve into the sand before the next wave hits them. But more often than not, an incoming wave tosses them apart and the Olive searches for a morsel all over again during the next wave-intermission. And so life unfolds at the intertidal under incessant uncertainty.

The Olive Sea Snail is commonly known as "*Kovanchi*" among the fisherfolk, a name

alluding to its similarity in shape to a "*Kovakkai*" (Ivy Gourd). On Chennai's coast, you find them in different colours – from several morphs of white to ivory to sandal to grey-black. There's an interesting study in the Journal of Molluscan Studies on how the colours of intertidal gastropods are temperature dependent. The darker coloured ones absorb more heat through their shells and are at greater risk of drying out than the lighter coloured ones. On these beaches, white Olives are the most common, though in places where the silt varies you find other colour morphs. But as Chennai's summers get warmer and warmer each year, it will imply a fading away of its biodiversity, not in the least on its dynamic coast.

In the whole of India, this part of the South Eastern shoreline has the smallest tidal range. About 4 – 5 feet is the vertical difference between high tide and low tide. Two arms' length, literally. And this dense ecological drama – involving donax clams, Olive Sea Snails, ghost crabs, purse crabs, mole crabs, Ribbon Bullia, lugworms, hermit crabs, periwinkles, whelks, shorebirds and so many other creatures – occur on this lean, meagre strip of sand appearing and vanishing between the tidelines.

All photos featured in this article are sourced from Yuvan Aves.

Yuvan Aves is a naturalist, educator, writer and activist.



Clam collection by local fisherfolk.



Cuneate Wedge Clam.



Olive Sea Snail feeding on Cuneate Wedge Clam.



Olive Sea Snail.



Tawny Hermit Crab-
Picture Credit: Nanditha Ram Satagopan.

Target Taxon:

The hermit crab *Clibanarius rhabdodactylus*, is a rare species of hermit crab. This crab belongs to the superfamily Paguroidea of order Decapoda. It is distributed on the rocky intertidal habitats of Japan, the Philippines and the Saurashtra coast of Gujarat, India. The ecology of this hermit crab is not well-studied which is why this study forms an attempt to understand their ecology better along the Saurashtra coast's rocky shores.

Special Behaviour of Hermit Crabs:

To protect their soft abdomen, hermit crabs occupy empty shells of snails and slugs or remove the original occupants. The morphological variables (shape, size and weight) of hermit crabs and the shell's architecture impact the selection process of the crabs. Moreover, social networking isn't restricted to humans on phones alone- these hermit crabs use social networking and avail the nicest possible houses for themselves. When they see a new shell, they form a line based on height and whichever crab fits the best into a shell will occupy it, while the

Paper Abstract: HOUSE HUNTING BY HERMIT CRABS, Anooja A

Title: Shell utilization pattern of the Hermit crab *Clibanarius rhabdodactylus* (Forest, 1953) on rocky shores of the Saurashtra coast, Gujarat State, India

Author: Pooja R Patel, Krupal J Patel, Kauresh D Vachhrajania and Jigneshkumar N Trivedi.

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In the Animal Kingdom, making and moving into a new home is planned in earnest. We scrutinise brightness, number of rooms, price, number of occupants and location- before we shift into a new home. Similarly, the hermit crab has a few unique boxes to tick before it selects its portable home- Gastropod shells! This paper abstract talks about the patterns seen in the planning of the hermit crabs to utilize the shells.

smaller crabs get the shells that are left behind.

Hermit Crabs and Shells:

For egg incubation and shelter from predators, large and heavy shells provide space and protection. The downside is that the crabs lose energy from travelling and reduce their reproductive success by carrying heavy shells. On the other hand, they need to constantly look for bigger shells as they grow in size. Shell usage depends on the availability of shells. All in all, the shells influence the hermit crab's fitness.

How the study was conducted:

The hermit crab *Clibanarius rhabdodactylus*, was observed in the rocky intertidal zone on the Saurashtra coast of the Gujarat coastline. It was found in larger numbers near rock crevices and shallow tide pools, and specimens were hand-picked randomly during low tide. Then, each hermit crab was classified based on its shield length (the chitinous shell covering the cephalothorax), sex and weight. Their gastropod shells were identified to the species level and 5 traits were measured: the total length of the shell, shell aperture length, the opening of the shell (which is parallel to the shell's length), shell aperture width and the maximum length of the shell's opening perpendicular to aperture length.

For measuring the aforementioned traits, different tools were used. Hermit crab weight was measured using a digital scale. Vernier callipers, an instrument for measuring very small sizes, were used to measure the distance between the midpoint of the rostrum (the "nose") and the posterior margin of the shield. The "architecture" of the gastropod shell was also measured using a vernier callipers. Before weighing the dry weight of the shells, they were dried inside a laboratory oven for 24 hours at 60°C.

Statistical analysis was done to see which traits of the gastropod shell showed a significant connection to the morphometric values of the hermit crab. The first tool used was regression analysis to find if any relationship existed. Then analysis was done for variations in mean values of shield length of different sexes of hermit crab using a one-way ANOVA at a 5% significance level. One-way ANOVA, or Analysis of variance, is used when there are three or more groups of data to understand if there is any significant relationship between the dependent and the independent variables. The rate of occupation of shell species was calculated in percentages. To compare the rate of occupation of different shell species, the Chi-square test (χ^2) was used at a 5% significance level.

Findings:

The male hermit crabs were larger than females. The highest occupied Gastropod shell belonged to the species *Cerithium caeruleum*, followed by *Lunella coronata*, *Turbo bruneus* and *Polia undosa*. The other remaining gastropod shells were utilised 15.2% of the time. All the sexes occupied *Cerithium caeruleum's* shell maximally. The second most preferred shell for male hermit crabs was *Lunella coronata*, and

for females, it was *Tenguella granulata*.

The shield length of *C. rhabdodactylus* and the morphological traits of the gastropod shells showed a moderate relationship. Among the morphological traits, the gastropod shell length and its dry weight showed a relatively robust connection. There was no link of the weight of the hermit crab with the gastropod's shell aperture length and width.

Discussion:

It was found that apart from *Clibanarius rhabdodactylus*, on which this study was done, other hermit crab species like *C. antillensis*, *C. zebra*, *C. erythropus* and *C. vittatus* occupied a lesser variety of gastropod species' shells. The gastropod shell species shows a good connection with the shield length and the weight of hermit crab. Similar results were shown with other hermit crab species like *Paguristes tortugae*, *C. erythropus* and *Pargurus exilis*. The competition for optimal shells increased when the hermit crabs became larger. Protection with relation to courtship, guarding the egg mass, desiccation, predation, cannibalism, intraspecific fights and interspecific fights was provided by larger and more robust shells. With different sexes of the hermit crabs, shell utilization is strongly affected by

the crab's size, reproductive status, energy expenditure and growth of each individual. The first explanation on the ecology of *C. rhabdodactylus* inhabiting the rocky Saurashtra coast was done in this study. The hermit crab utilises different species of gastropods' shells which is not random, as mentioned in the findings of the paper. The study also identifies further areas of interest like intertidal distribution, seasonal variation in shell utilization patterns and population ecology that are required to give better insights into the ecology of hermit crabs like *C. rhabdodactylus*. Understanding the ecology of different intertidal species can help in the conservation of shores and intertidal areas, and mitigate the risks of climate change and global warming.

Patel, P. R., Patel, K. J., Vachhrajani, K. D., & Trivedi, J. N. (2020). Shell utilization pattern of the Hermit crab *Clibanarius rhabdodactylus* Forest, 1953 on rocky shores of the Saurashtra coast, Gujarat State, India. *Journal of Animal Diversity*, 2(4), 33-43. <https://doi.org/10.29252/JAD.2020.2.4.3>. Online ISSN 2676-685X.

Anooja A is a 3rd year Zoology student at Stella Maris College, Chennai.

Shore Walks and Fisherfolk Talks- Interview with Abhishek Jamalabad,

Mahathi Narayanaswamy and Kaavya Praveen



MLOM walk organised by Abhishek and his team.

Tell us a little about yourself. What do you do currently and how did you get into this field?

My interest in wildlife started early on and during my studies, I began taking decisions towards studying zoology, eventually arriving at where I am today.

While pursuing my bachelor's degree in Zoology, I wasn't particularly into marine biology but got intrigued by it as it was the one thing that seemed interesting which I hardly knew anything about. I finally finished my master's degree in Marine Biology, after which I did internships in various fields for two years. I explored a myriad of projects such as reef surveys, a few fishery projects through ecological, biological and social surveys, and marine mammal surveys, the last of which ended up being my main focus. My most recent work has been with Marine Life of Mumbai (MLOM), which aims to build a community around exploring marine life. I switched jobs in the middle and was working with the World Wide Fund for Nature (WWF) in Goa for two years, where I continued the kind of intertidal community work I started with MLOM. From then on, I have become increasingly involved with outreach, despite my initial focus on research.

I currently work with the Coastal Conservation Foundation (CCF), an organisation that was started by some of us who put in a lot of time with MLOM. It is an offshoot of the same, but today takes care of most of MLOM's management. MLOM conducts monthly shore walks and outreach for free and CCF handles additional work that we have started taking on recently.

Can you tell us a little about Marine Life of Mumbai (MLOM)?

MLOM started and developed organically. We did not have a specific aim except to popularise the marine life that occurs along the Mumbai coast. When we began, among the three co-founders, Siddhart, Pradeep and myself, only Pradeep had

explored the marine life of Mumbai. We planned to get people to explore the shores with us and not with an expert guiding the walk. With time, people began to join and contribute to our team by managing social media, writing, doing artwork and so on. A relatively recent component of MLOM is our iNaturalist project, which we created around 3 years ago.

MLOM is a completely non-funded organisation. All the services we provide, from our social media to the brochures on our website are made by volunteers, free of cost.

Your work has been largely centred around the Karwar coast. From your experience, what makes the Karwar coast unique?

I have done a large part of my work there as I completed my master's degree at Karnataka University's marine biology centre in Karwar. This made me familiar with its biodiversity, helping me with the initial parts of my research. Karwar is an ideal place to study marine biology as it hosts various marine habitats. It has access to shallow coral reefs, coastal islands and the Kali river estuary, which has one of the most diverse mangrove forests along the western coast of India. It hosts fascinating, unusual intertidal zones, interesting fishery scenes and a rich diversity of marine mammals. My research was made easier by connecting with the local fisherfolk and other researchers in the area. This resulted in me working on marine mammals there for two years after my course.

Could you explain why there is such a drastic change in the diversity of intertidal life seen on the eastern and western coasts of India?

The Arabian Sea and the Bay of Bengal have very disconnected ocean currents. Marine and intertidal life depend on these ocean currents for the dispersal of their larvae or eggs, thus influencing their distribution patterns. The circulation of the Bay of Bengal



Bryde's Whale.



Shore Seine on the Karwar Coast.

and the Arabian sea do not meet anywhere except towards the tip of the peninsula where some intermixing takes place. These dispersal patterns are one of the main reasons the biodiversity is that different.

There are not many intertidal and marine life observers in coastal cities. How can people be encouraged to observe life in these habitats?

As part of MLOM, we initiated shore walks for the public to explore intertidal life with us by showing them a handful of things that we had seen. We had nearly no resource persons and pitched this as a topic that no one knew much about to gather public interest in it and get people involved. Over time, many participants who were interested in seeing another side of Bombay city started educating themselves using books and websites that we recommended, and started playing a role in organising and conducting walks.

Unlike sandy shores, an advantage with rocky shores is that when you walk on the rocks you inevitably

start seeing creatures on them. Sandy shores are more challenging since organisms are hidden, and a cursory look would reveal only things like shells. However, if you wait, you will see interesting crabs, worms, sea snails and other creatures. If you go at night, you may find an entirely different set of creatures turning up. Sandy beaches also have a lot of intertidal and subtidal diversity that make up the very interesting fisheries bycatch in this habitat, such as the creatures pulled up by shore seines (even though this may not be the ideal way to see wildlife). Even though most people visiting sandy shores may not have seen the organisms found there, this incentive to explore further can be used to get people interested.

Which taxa do you enjoy observing the most and what is your most memorable experience with it? Also, is there a species you haven't seen yet and would like to work with in the future? What are your favourite sampling sites?

I have worked for a long time with dolphins, particularly with the

Indian Ocean Humpback Dolphin, and the time I have spent with them makes them rather special. Also, I find invertebrates a lot more fascinating than vertebrates and am very interested in marine worms, among other invertebrates. I am fascinated by the interactions between invertebrates, especially intertidal species.

I have enjoyed every location I've worked at, especially Netrani Island, located around 24 kilometres off the coast of Karnataka. There is a coral reef around the island which is a fantastic example of a very disturbed reef that lives on despite heavy fishing activity, tourism, bomb-testing by the Indian Navy, and the occasional oil spill. When you dive there, it is obvious that it is a disturbed reef, even though it teems with life. I enjoy working at Karwar since there is a variety of habitats and a wondrous diversity of marine wildlife there. Mumbai also has splendid diversity considering the human disturbance faced by the shores which is something the people at MLOM and several researchers agree on.

Could you tell us a bit about your

work with fisherfolk and any observations by them on specific behaviour in cetaceans?

The first independent project I worked on was on the interaction between Humpback Dolphins and fisheries. A few fishermen would take me out on their boats. Sometimes I would spend 5-6 days with them at sea. I observed dolphins while they caught fish. With time, I learnt a lot from them and became involved in working with fishermen. This association soon became a major part of my work.

I would have informal chats with them, talking about various species, and they would share their experiences with me. They would occasionally see Killer Whales, huge pods of over a hundred dolphins and I would note down such observations. Coming to the Bryde's whales, the fishermen described an odd behaviour exhibited by the whales. I initially dismissed it as something they might have imagined but nearly a year later, there were reports of the same behaviour by a researcher from Thailand. Soon after, this was

observed across the world - it was a specialised behaviour called trap-feeding, and it was just starting to be observed in Bryde's whales. After this, I began including fisherfolk knowledge in my studies a lot more.

How has your participation in citizen science helped in conservation efforts?

I was mainly involved with MLOM and the fisherfolk even though the observations of the latter are not labelled "citizen science". MLOM has predominantly been about public awareness. We have also collected a lot of data but outreach and awareness have been our larger goal and success. We believe that the lack of conservation of coastal areas is due to the public being unaware of these places as important habitats that host so much biodiversity. Getting people involved is an important step because we believe that unless people have a personal connection to a place, they will not step up to protect it simply because others are asking them to. My citizen science initiative with the fisherfolk involves a flow of information from them to us. Unlike MLOM where we are trying to create awareness, we use fisherfolk data to get information from the open sea after ensuring that the data is reliable. Conservation of marine creatures is a major challenge since we do not have baseline data and defining distribution boundaries in the ocean is extremely difficult as it is such a vast and dynamic habitat. The existing data is based on dead animals that wash up, or short term studies by researchers. However, fisherfolk work in the open seas regularly and observe

life in the ocean year-round and valuable data can be obtained from them. Most fisherfolk love sharing biodiversity information and enjoy working with us on this with the right approach.

Are there educational requirements to be a marine biologist? Are there institutions whose programmes you would recommend for interested people?

If you want to become a qualified marine biologist it would be ideal to take the biology path, despite a couple of organisations that do not require the same. Institutions that offer post-graduate courses in Marine Biology typically require a Bachelor's in a Biology related stream. The courses are broad and cover various areas including fisheries, microbiology, biotechnology, marine ecology and taxonomy. The broad range of courses they offer was something that I found to be very useful as I think I would have had a rather narrow view of marine ecology otherwise.

There are a few people in MLOM who have started doing some research on marine biology without a degree. I encourage people to do that if they are interested and do not hold a degree in biology.

Identification of intertidal Life, especially bivalves and gastropods is a very tough and tedious task? What resources do you recommend for those interested in looking at the intertidal life of India?

There is a book called Marine Life of India by

Boman Framji Chhapgar. Unfortunately, it is now out of print and difficult to find. It is not a field guide but is a perfect introduction to marine life nonetheless. I do not recommend field guides for the marine life of India since it is almost impossible to cover all our biodiversity in a single field guide. I recommend following a broad approach of identification, starting with the phylum and



Dorid Sea Slug (Dorididae).



False Flowerpot Coral.

Karwar Coast.

trying to identify the organism up to species level through various steps, although it may not be possible to identify everything to species level.

Coming to blogs, Australia and Southeast Asia have very good blogs and museum websites with a plethora of information. With marine life, there are constant developments in the field which makes iNaturalist one of the best resources, as it is updated constantly. Apart from this there are several resources to understand various other marine processes such as tides, currents, ocean chemistry, etc.

All photos featured in this article are sourced from Abhishek Jamalabad.

Mahathi Narayanswamy is a 1st year Physics student at Azim Premji University.

Kaavya Praveen is a class 9 student.



PONDICHERRY UNIVERSITY, E. Nivethigha

PONDICHERRY UNIVERSITY

Location- Main campus is in Pondicherry, with affiliated campuses situated at other locations

Established in- 1985

Website- www.pondiuni.edu.in



Pondicherry University is one of India's Central Universities. It was established in 1985 in Puducherry and has over 100 affiliated colleges offering various courses in Arts, Engineering, Science and Commerce.

Courses offered in Marine Biology:

Pondicherry University offers PG and PhD courses in Marine Biology under the Department of Marine Biology and Oceanography at their Port Blair campus in the Andaman and Nicobar Islands.

Eligibility:

A prerequisite for the course is a bachelor's degree in Zoology, Biotechnology, Fisheries and Aquaculture, Microbiology, Botany or Biochemistry with a minimum of 55% marks. Candidates are exempted from the entrance examination if they have qualified in the

National Eligibility Test (NET), Junior Research Fellowship, UGC/CSIR or UGC Rajiv Gandhi Fellowship for SC/ST, or the DBT-INSPIRE programmes.

Admission:

Admissions are conducted via their official website, www.pondiuni.edu.in. An entrance test conducted by the university is the gateway to most of their programmes. Both Indian and International students can apply for courses offered by the University.

The admission process for the master's course in Marine Biology is carried out at the Pondicherry University main campus, after which the students will proceed to the Port Blair campus for course work on the same.

Scholarships:

Students for the master's program in Marine Biology are admitted based on their rank in the entrance exam, and all successful applicants are offered a studentship of Rs. 1000 per month as long as they have 70% attendance. The governments of various states provide a National Scholarship of Rs. 750/- per month to candidates belonging to the SC/ST/OBC communities. The top 20% of students in each PG degree programme are eligible for a Merit-Cum-Means Scholarship (MCM). This scholarship is based on both, the academic achievement in each semester (SGPA), and the parental income of the student. To be eligible for this scholarship, the

parents' net annual income should not cross Rs. 2,50,000.

Research and Associations:

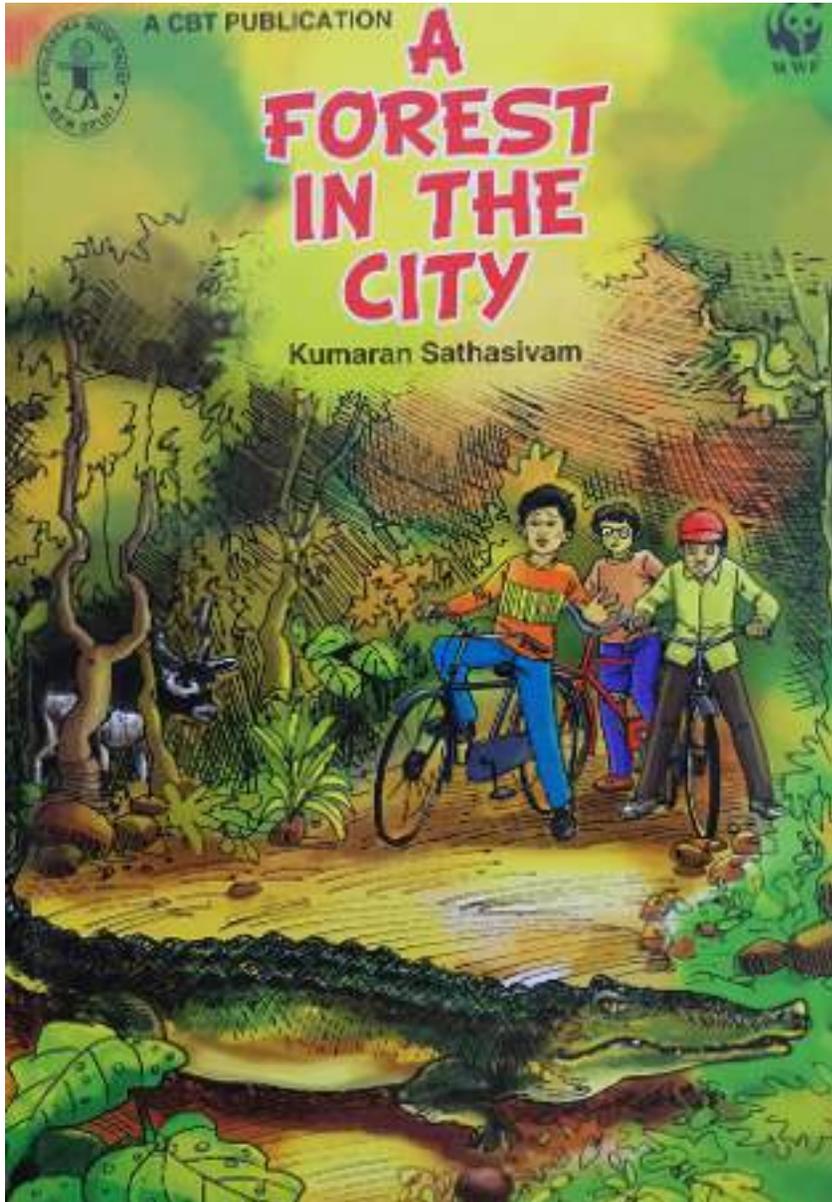
This institution works in close collaboration with the Zoological Survey of India (ZSI) and other institutions of national importance like the Indian National Centre for Ocean Information Services (INCOIS) and National Institute of Ocean Technology (NIOT). They conduct several research projects and studies in various areas such as those listed below:

1. Taxonomy and barcoding of marine fishes
2. Coral reef monitoring and carbon sequestration
3. Marine bioactive compounds and their characterization
4. Marine microbial processes and marine natural products
5. Coastal biodiversity assessment and their conservation
6. Ecomorphology and stock assessment
7. Marine benthic ecology and taxonomy
8. Diversity and distribution of plankton
9. Marine microphytobenthos and their ecological relationship
10. Fishery biology

E. Nivethigha is a 3rd year Zoology student at Stella Maris College, Chennai.

Book Review:

A Forest in the City, Ekadh Ranganathan



A Forest in the City

Author- Kumaran Sathasivam

Kumaran Sathasivam is a graduate of IIT Madras, an avid naturalist, teacher and author who has published his work in reputed publications such as the 'Journal of the Bombay Natural History Society' and 'Blackbuck'. He also received a fellowship from Duke University where he studied marine mammals, after which he published the 'Marine Mammals of India' field guide, the first comprehensive guide of its kind in the country.

Genre- Non-fiction and Nature

Pages- 80

As the world develops rapidly, biodiversity thriving close to urban spaces often gets overlooked despite its importance and abundance. This book review by Ekadh Ranganathan on "A Forest in the City" sheds light on the book's exploration of the immense natural wealth of IIT Madras and its adjoining areas, despite being located in the middle of a bustling metropolis.

Summary:

"A Forest in the City" does not follow a typical chronological structure. Rather, each chapter focuses on a particular habitat or taxon found in IIT-M and proceeds to recount the experiences of the student trio of Joseph, Venkatesh and the author, Kumaran, as they explore an area or observe a key species. From rescuing a blackbuck fawn to revealing the inhabitants of 'Darkest Africa', this book uncovers all there is to know about the biodiversity around us through the lens of an enthusiastic naturalist and his friends.



Picture Credits: Mahathi Narayanaswamy.

Evaluation of Content:

The book's greatest feat is undoubtedly the child-like innocence with which the author builds a mesmerising world out of a place that would seem rather mundane and ordinary to most. Although there is no conventional plot, the story plays out like a 'Famous Five' adventure of youngsters exploring an undiscovered world and revealing its secrets. Chapter titles like 'The Welsh Marshes' and 'The Blackbuck Plains' keep the reader curious and invested in the content to follow. In order to create such a fascinating world, there is a heavy emphasis on visual imagery and figurative language that transport the reader directly to a new habitat in IIT-M, complete with an array of wildlife to explore. Although world-building is the first aspect that sticks out about each area described in the book, the author also constantly dishes out a treasure trove of information about each species described, from feeding habits to the times of the year they are most prevalent in the habitat. The book can almost be used as a field manual for IIT-M and its surrounding areas with information on what habitats to visit for particular species, the behaviour of the animals and prior human-animal interactions.

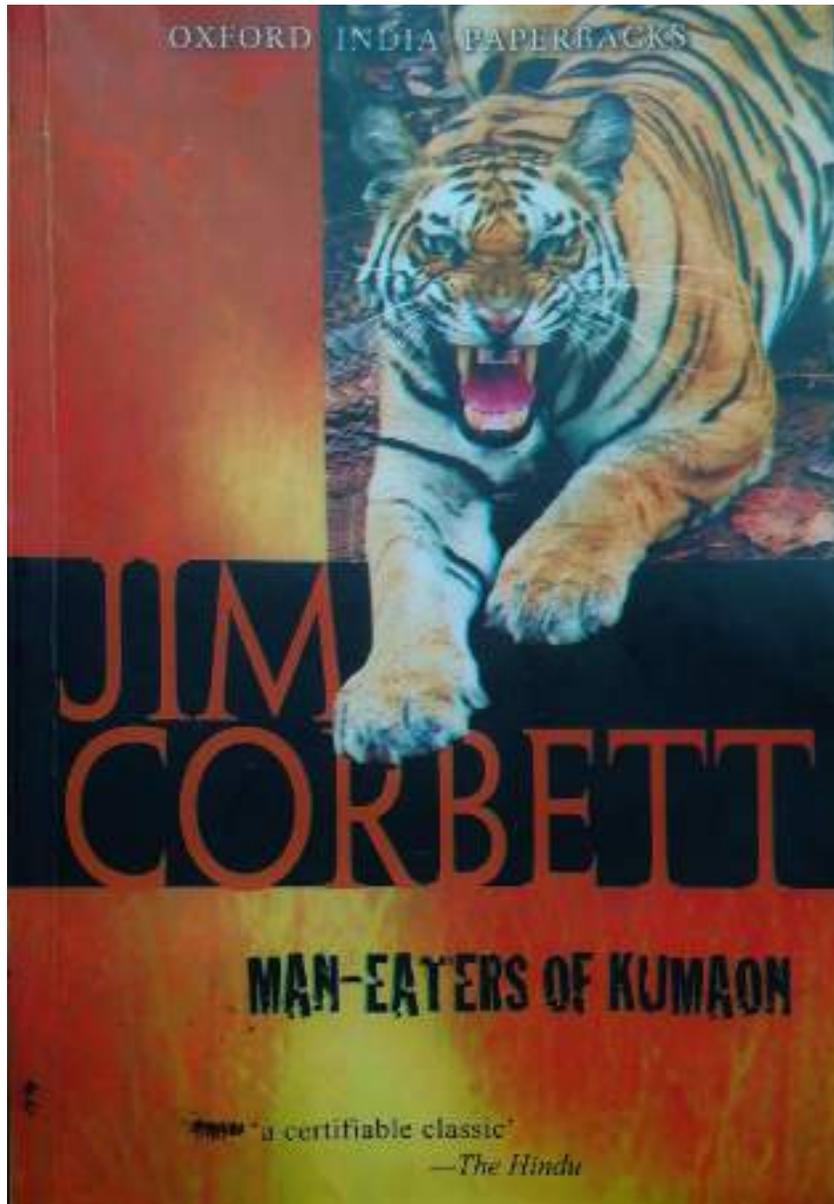
Opinions and Recommendation:

Despite being only 80-pages long, it is a comprehensive book that ticks almost every box when it comes to readability and information provided about this little patch of forest in Chennai. The content covered in the book can be understood and appreciated by all age groups; thus, I would recommend this memoir to anyone looking for a guide to the animals of IIT-M, or even to anybody interested in a series of vignettes about urban wildlife.

Ekadh Ranganathan is a 2nd year student at Hong Kong University of Science and Technology.

Book Review:

Man-eaters of Kumaon, Smriti Mahesh



Man-eaters of Kumaon

Author- Jim Corbett

Jim Corbett was a hunter and naturalist of British descent. Born and brought up in Nainital, Uttarakhand, he nurtured a passion for the wild from a young age, exploring the forests around Kaladhungi to become a skilled tracker over time. A colonel in the British Indian Army, he was often asked to hunt down man-eaters that menaced villages in present day Uttar Pradesh and Uttarakhand. He authored five books recounting his experiences in the jungles and among the people of India as well as a short piece set in Kenya where he spent his retirement.

Genre- Non-fiction and Nature

Pages- 226

The issue of man-animal conflict continues to be a major concern in the field of conservation today. This review by Smriti Mahesh on the book "Man-eaters of Kumaon" highlights the ever-relevant nature of this issue as the author, Jim Corbett, tackles it nearly a century ago in pre-independent India.

Summary:

"Man-eaters of Kumaon" is a book by Jim Corbett that covers some of his most memorable experiences in pursuit of man-eating tigers that terrorised villages in Northern India, from the Chowgarh man-eater, to the man-eating tigress of Thak, the last he ever took down. Corbett's writing is sprinkled with a few anecdotes from his time in the hills described with a tinge of humour, as well as recollections of his dog, Robin, his faithful companion on several hunts.



Royal Bengal Tiger-
Picture Credits: Smriti Mahesh.

Evaluation of Content:

This compilation of harrowing tales from the wild, set in the early 1900s, highlights the reasons for the lack of an easy solution for the ever-relevant issue of man-animal conflict. Despite being a sportsman commissioned to hunt man-eaters himself, Jim Corbett places heavy emphasis on the deep reverence and admiration he has for these big cats. While he validates the fear and apprehension of the tormented villagers towards these tigers, he continually stresses on the fact that tigers do not actively hunt humans unless driven to by wounds or old age. His respect for all things alive becomes evident as one reads of his readiness to put himself in a position of discomfort or harm in order to hunt down dangerous animals combined with his unwillingness to take down an animal without giving it a fighting chance.

Opinions and Recommendation:

In a world where sportsmen are regarded as banes of conservation, stories from a time when the words 'sportsman' and 'conservationist' could describe the same person offer a fresh perspective on the issue and highlight the massive change our forests have undergone over the past century. This book was my first introduction to the complexities of the relationship between humans and animals and it changed the way I perceived several problems of man-animal conflict, painting them as nuanced issues with a fair bit of grey area. It allowed me to empathise not only with those fear-struck people whose livelihoods were inextricably linked with the jungle, but also with the fearsome tiger that was forced to hunt unnatural prey. I would recommend this book as a must-read for those passionate about the natural world as it nurtures a sincere appreciation of the intricate nature of conservation issues.

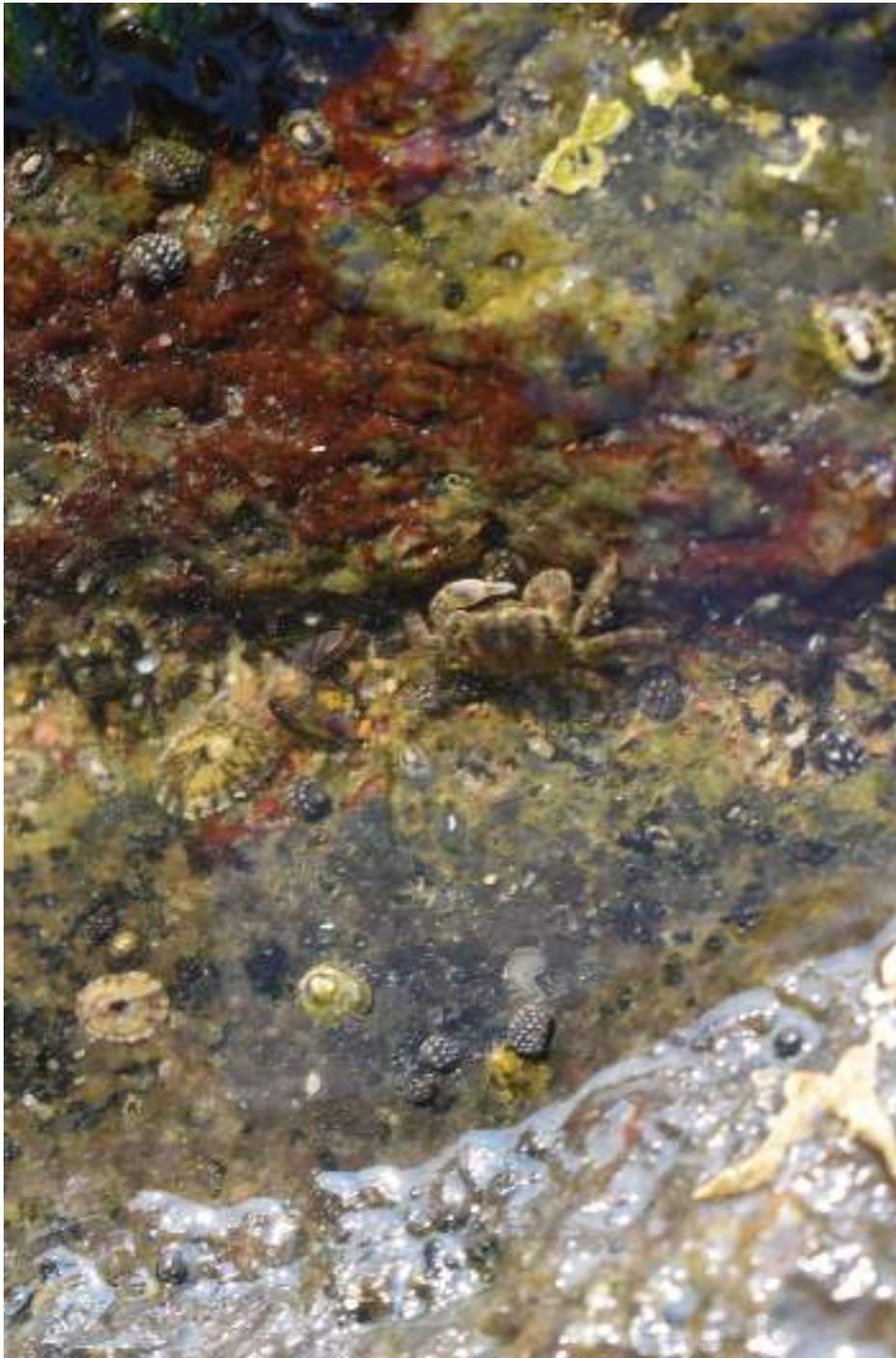
Smriti Mahesh is a 1st year student at IISER Thiruvananthapuram.

A close-up photograph of a rocky surface covered in a dense colony of green Zoanthus sansibaricus polychaete worms. The worms are small, cylindrical, and have a bright green color with darker, almost black, spots on their sides. They are arranged in a somewhat regular pattern, with many small, circular openings visible. The background is a mix of brown and grey rock, with some larger, more complex structures like sponges or other marine life visible in the upper right corner.

Zoanthus sansibaricus- Picture Credits: Yuvan Aves.

Tidepooling, Nanditha Ram Satagopan

Along the Indian coast, many rocky habitats tend to entrap sea water along with some marine life during tidal cycles. This ecosystem gives us a peek into the vast marine diversity of the location. Read on to find out more about the creatures you can expect to see in a tidepool and some tips on how to observe them better.



Tide Pool at Kovalam (TN)- Picture Credits: *Nanditha Ram Satagopan*.

Tides are the natural rise and fall of ocean levels caused by the gravitational pull of the Moon and the Sun, combined with the rotational movement of the Earth. The tidal levels of the sea fluctuate throughout the day and night. These rhythmic patterns of the sea give rise to vertical zonation of the coastal region into supratidal, intertidal and subtidal zones.

The intertidal zone is the area where the ocean and land meet, and any of these regions primarily consists of three major types of shores- sandy, muddy and/or rocky shores. Sandy shores are composed of loose sandy soil that has accumulated through the years and is constantly shifting due to the wind, wave and ocean currents. Muddy shores are found in regions where the sea is calm and there is much less wave action. Rocky shores on the other hand consist of boulders and rocks that remain largely stationary over time. Present in the highly fluctuating intertidal zone, rocky shores are home to a range of species. The different zones within the intertidal host different kinds of species which are dependent on their nature of movement and ability to withstand abiotic stresses. One can often easily sight large sessile clusters of barnacles, limpets, mussels, oysters and green algae stuck on the surfaces. Sit patiently and watch as the lapping waves reveal starfish, gastropods and colourful crabs shying out of their hiding spots.

On these rock structures, the occurrence of tide pools is quite frequent. Tidepools are shallow catchments of seawater that are formed as a result of changes in tidal levels. Seawater gets trapped in crevices and indentations on the solid rock surface during the low tide. These seemingly empty pools of water are home to a plethora of organisms. Interestingly, the composition of these tidal pools keeps changing with every cycle of the tide. Every high tide brings its own bounty of life to replenish the rock crevices. This constant shift of tide ensures that water does not become stagnant, while replenishing oxygen and reducing abiotic stresses like temperature, nutrition content and salinity. On observation in close quarters, one can witness marine gastropods (sea snails), mussels, clams,

chitons, crabs, water fleas, isopods and flatworms. If lucky, larger tide pools present near shallow waters may contain bright and colourful sea anemones. Every tide pool is self-sustaining and thrives as a micro-ecosystem of its own. Observing a tide pool can be compared to catching a fleeting glimpse of life in the ocean. Moreover, these isolated habitats provide breeding grounds for various species of arthropods and molluscs. Owing to the presence of teeming life in these pools, they serve as foraging patches for several shorebirds.

Since it's not advisable to remove an organism from its habitat, it is essential for one to carry a camera with them to capture pictures that can later be used for identification purposes. A simple hack is to use a phone placed inside an air-tight plastic cover to photograph underwater images. The best time to go tide pool watching is during the low tide and preferably during the day, taking into account the safety factor. There are several places along the East Coast Road in Chennai, like the Kovalam beach, that one can visit for a peaceful tide pooling session. A few places have large and flat rocks laid there after the tsunami of 2004 - these are good tidepool stations. Though tide pooling is a relatively unexplored hobby, the activity is a good stress-buster, especially for people who love to spend time near the ocean.

Precautions:

- Wear proper footwear to help prevent slipping and falling.
- It is not safe to pick up crabs or other organisms with bare hands. Not only might it affect the micro-ecosystem, the sting of some species can be poisonous.
- Check the tide timings and always visit tidepooling sites during the low tide time. It is safer since the sea level is at its lowest

and chances of spotting organisms are higher.

- Do not, under any circumstance, remove or displace a creature from its original habitat. This disrupts the habitat and causes stress to the organism.
- Tread carefully on rocky shores so as not to trample any organism.
- Do not litter the area. If you find any piece of trash, pick it up since these habitats are very fragile.
- Remember, you take back nothing but memories and leave nothing but footprints. Do not collect shells as these are homes for hermit crabs looking for protection.

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I Spy, Aditya Ramakrishnan

Try to spot the creature in this picture, foraging along Kovalam Beach one hot afternoon.

Aditya Ramakrishnan is a 1st year student at Shiv Nadar University, Greater Noida.



Crossword, Saroj Lakshmy U.

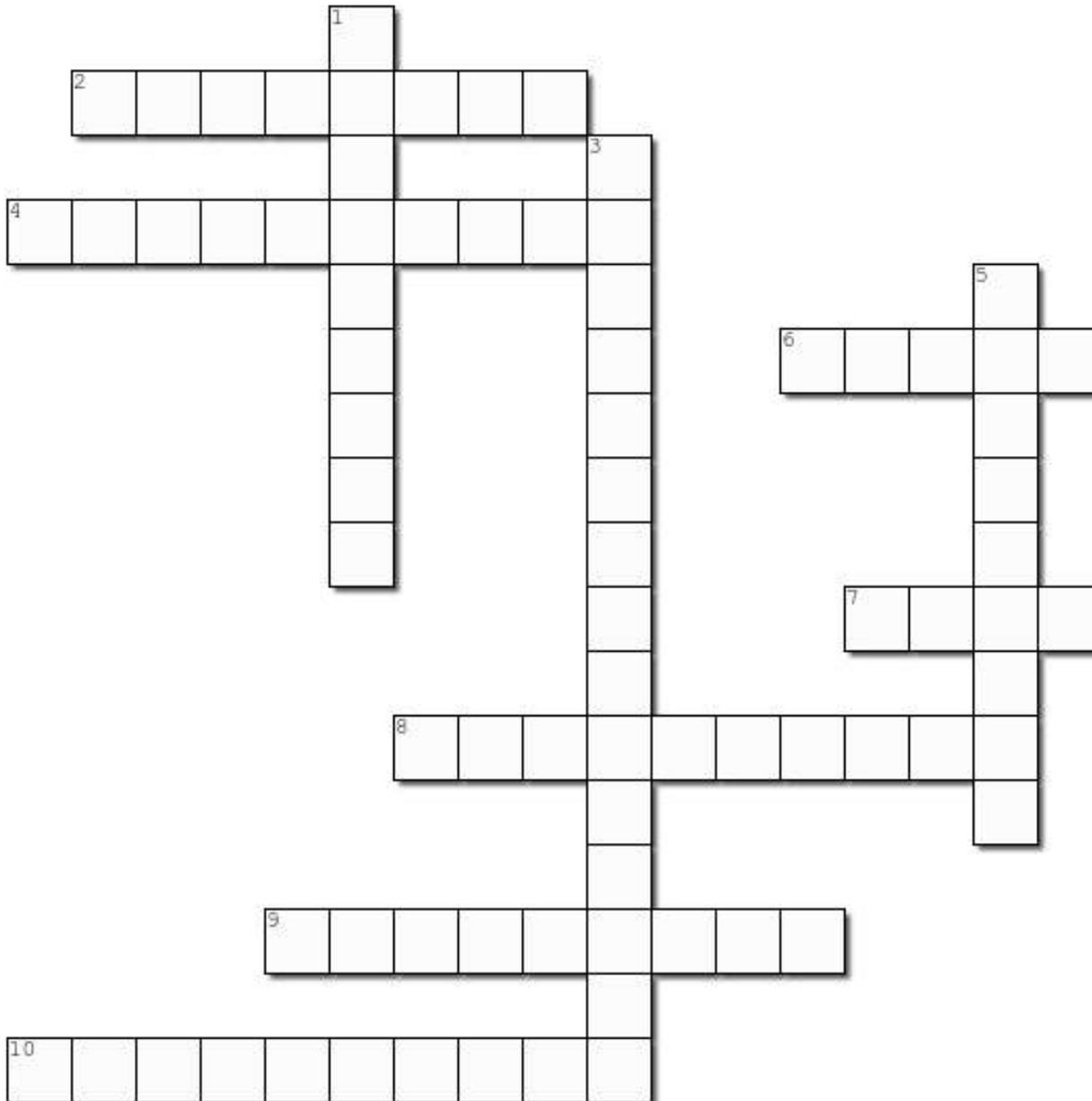
Across

2. The wet area of the shore where the ocean meets between high tide and the continental shelf (8)
4. Cnidarian with stinging cells found in the intertidal zone (3,7)
6. Common spiny shell found on shores, often seen entangled in ghost nets (5)
7. Important scavenger of the shores that is often seen scurrying around beaches (4)
8. Hydrozoan commonly found on beaches which has a blue disc and long tentacles on its circumference (4,6)
9. Type of coastal pollution often caused by accidents involving tankers (3,6)
10. Mangroves keep a check on these (5,5)

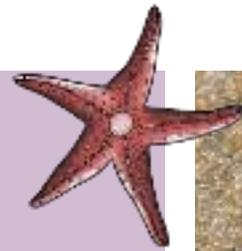
Down

1. The part of a shore between high and low water marks. This is also the name of an estate located on the southern end of the world's longest beach (9)
3. A spherical translucent bioluminescent ctenophore commonly found on shores across the world (3,12)
5. Benthic invertebrates that live in both marine and freshwater environments (9)

Saroj Lakshmy U. is a 3rd year student at Stella Maris College, Chennai.



Answers



Crossword:

(Hyphens and spaces not included in crossword)

1. Foreshore
2. Littoral
3. Sea gooseberries
4. Sea anemone
5. Meiofauna
6. Murex
7. Crab
8. Blue button
9. Oil spills
10. Storm waves

I Spy:



Sea Gooseberry- Picture Credits: *Mahathi Narayanaswamy.*



Blue Button- Picture Credits: *Mahathi Narayanaswamy.*

