

QUARTERLY NEWSLETTER

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EDITOR'S NOTE

It gives us great pleasure to present to you the volume 14, Issue 1 of the Gujarat Institute of Desert Ecology (GUIDE) newsletter. This issue is especially noteworthy since it coincides with Wildlife Week. India observes National Wildlife Week every year from 2nd October to 8th October. The country's varied wildlife is the focus of this week's efforts to preserve and conserve it. In order to preserve threatened and endangered animal species, the idea of Wildlife Week was first presented in 1952. During this time, we celebrate the amazing biodiversity and Wildlife of our area and reaffirm our commitment to its preservation. Together, let's discover, value, and safeguard the abundant biodiversity and Wildlife that gives our area its unique character. Also, we are thrilled to publish insightful articles written by subject experts. These articles explore a range of topics and provide insightful information. We extend our heartfelt gratitude to all our contributors for sharing their knowledge and passion with us. We hope you enjoy reading this newsletter and find inspiration in the stories, activities, and insights shared within. Thank you for your continued support to the Gujarat Institute of Desert Ecology Newsletter.

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Gujarat Institute
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AN OBSERVATION OF SEA CUCUMBER FROM MODHVA BEACH, KACHCHH

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Sea Cucumber

Kingdom: Animalia

Phylum: Echinodermata

Subphylum: Echinozoa

Class: Holothuroidea, Blainville, 1834



At the sandy beach at Modhva, near Mandvi, a few specimens of sea cucumbers captured my sight. They are dead and washed ashore. The Sea cucumbers are echinoderms from the class Holothuroidea. They are marine animals with leathery skin and an elongated body containing a single, branched gonad. Sea cucumbers are found on the sea floor worldwide. They are scavengers that feed on small food items in the benthic zone, and their larvae are plankton floating in the water column. Their life cycle is too lengthy and takes several years to grow to adulthood. The sea cucumber is harvested for human consumption. Nutritionally, they contain Vitamin A, Vitamin B1 (thiamine), Vitamin B2 (riboflavin), Vitamin B3 (niacin), and minerals, especially calcium, magnesium, iron and zinc. Sea cucumber has a very neutral taste and is quite bland but will take on the flavours of the other ingredients when cooked. The appeal lies more in the texture, which is somewhat gelatinous while remaining solid, the desired consistency in Chinese gastronomy. They are prey for the crabs and fishes. Because the more sea cucumbers are harvested, the rarer and more expensive they become. Crabs, fish, turtles, and even some shark species are natural predators of sea cucumbers. The dried sea cucumber is called 'beche-de-mer', and the two species, *Holothuria scabra* and *H. spinifera*, are mainly used on the east coast of India. The sea cucumber is consumed in a variety of ways. In Japan and Korea, the gutted body wall of sea cucumber is consumed raw or pickled, and a specialized range of products. Recent research has indicated the presence of several bioactive compounds with anti-angiogenic, anticancer, anticoagulant, anti-hypertension, anti-inflammatory, antimicrobial, antioxidant, antithrombotic, antitumor, and wound healing properties.



SEA CUCUMBERS

Sea cucumbers also contain copious amounts of mucopolysaccharides, like chondroitin sulfate, which is known for reducing arthritis pain and inhibiting viruses such as herpes and is well known for HIV therapy. Thus, sea cucumbers are gaining recognition in biomedical research. In 2001, a complete ban on trade was imposed on all Holothurian species, and these species were enlisted in Schedule I of the WPA 1972, thus providing them with the highest level of legal protection under Indian law. Holothurian populations in India are under stress due to illegal and unsustainable harvests driven by the high demand in Asian markets. They can be processed by simple drying. To regulate its trade, in 2020, national legislation has been introduced. However, apart from India, no other neighbouring country has protected sea cucumbers. Appropriate fishery regulations are needed to limit the current rate of depletion of stocks. Recent research has indicated the presence of several bioactive compounds with anti-angiogenic, anticancer, anticoagulant, anti-hypertension, anti-inflammatory, antimicrobial, antioxidant, antithrombotic, antitumor, and wound healing properties. Sea cucumbers contain compounds known for reducing arthritis pain and for HIV therapy, thus, gaining recognition in biomedical research. Some branded products such as ArthiSea, SeaCuMax (arthritis medicine), and Sea Jerky are available in the market.

DOES CLIMATE CHANGE AFFECT PLANT ENDOPHYTE INTERACTION?

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Climate change has significant effects on the delicate balance of ecosystems, including the intricate relationships between plants and their microbial partners, known as endophytes. Endophytes are microorganisms that reside within the tissues of plants without causing harm. They play crucial roles in enhancing plant health, improving stress tolerance, and providing protection against pathogens. The shifting climate patterns associated with climate change can bring about various impacts on endophytes as well as the host plants with the result, the communities of endophytes may also change. Endophytes exhibit host specificity, meaning that their distribution and abundance are intricately linked to their host plants.

Climate change can exacerbate abiotic stressors such as heatwaves, droughts, and extreme weather events which in turn affect the diversity and abundance of endophytes in respond to the altered health and stress levels of their host plants. The host plants are also vulnerable to the climate related stressors, altering their physiology, growth, and susceptibility to diseases. Generally, the endophytes establish symbiotic relationships with their host plants, providing benefits such as improved nutrient uptake, stress tolerance, and defense against pathogens. However, the climate change-induced shifts in environmental conditions can disrupt these symbiotic interactions. Certain endophyte species may thrive under the new conditions while others struggle, influencing the overall dynamics of endophyte-plant interactions.

Climate change can impact the prevalence and severity of plant diseases. Some endophytes possess biocontrol properties, suppressing the growth of pathogens and reducing disease incidence in the host plants. However, alterations in environmental conditions can disrupt the delicate balance between endophytes, pathogens, and their host plants, potentially leading to changes in disease outbreaks and affecting agricultural productivity and ecosystem health. Endophytes, like other microorganisms, possess the ability to adapt and evolve in response to changing environments. Climate change acts as a selective pressure on endophyte populations, favoring those that are better suited to the altered conditions. This evolutionary process can result in changes in endophyte traits, potentially impacting their ecological roles and interactions with host plants. Understanding the impacts of climate change on endophytes is essential for maintaining plant health, ecosystem functioning, and agricultural productivity. Further research is necessary to explore the specific effects on different types of endophytes, their host plants, and the intricate dynamics within plant-microbe interactions. By delving into the world of these microbial allies, we can develop strategies to mitigate the negative consequences of climate change and preserve the crucial roles that endophytes play in our natural world. Dr. Jayanthi, G. participated as an invited speaker and delivered a talk on "Cordyceps militaris: The Fungal Gold for Sustainable Health and Development" in the webinar hosted by the Department of Botany in association with PSG CAS's Institution Innovation Council at PSG College of Arts and Science in Coimbatore on the 11th of August, 2023.

UPCOMING CONFERENCE

1) Gujarat Institute of Dessert Ecology will be hosting National Conference on Water and Environment: Challenges and Opportunities for Sustainable Development” during 18th to 20th December 2023 at Gandhinagar, Gujarat.

POWAI LAKE WATER: FIT FOR DRINKING?

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Water is the most essential commodity, and the quality of water acts as a barometer of the environmental health and well-being of human society. In the last 3 to 4 centuries, urbanization and industrialization have progressed, affecting water bodies, which are generally used for discharging domestic and industrial waste. River water pollution has an adverse effect on the environmental health and hygiene of people and the adjoining aquatic ecosystems such as estuaries, marshes and swamps. The Powai Lake is situated in Maharashtra State (19°07'48.0" N 72°54'36.00" E) which was formed by damming the tributary of the Mithi river in 1891, during the British period, which served the water needs of the nearby villages. It has an area of about 2.1 sq. km (520 acres), and the depth varies from about 3 m to 12 m. The lake's water quality has deteriorated with the development of the Mumbai city, and the industrialization later declared it unfit for human consumption due to the introduction of sewage from the human settlements in that area. The water surface was masked by aquatic weeds and the garbage dumped during festivals, plastics etc.

These materials deteriorate water quality by leaching harmful chemicals into the water. Several studies have been undertaken on the water quality of this lake, indicating the high level of BOD, COD, heavy metals and suspended matter. The main reason for contamination is the immersion of Idols made of plaster of paris, clothes, paints and colouring materials. It is essential to create awareness about the severity of the damage caused to the water quality and life form. Nevertheless, there are fishes, crocodiles, and birds utilize this lake as their habitat. The Maharashtra Angling Association has recently transformed the lake into a beautiful picnic and angling spot. The Golden Mahseer fish has been introduced in addition to the native carps, catfishes and tilapia already found in the lake. Twenty four fish species have been reported from this lake. The crocodile population has increased in the lake and there are cases of crocodile attack by the fishers. Hence, the authorities should take necessary action to restore the water quality, construct basking and nesting sites for the crocodiles, and protect the public who visit the lake for boating and angling. The water surface can be cleaned naturally by introducing water plants like lilies, lotus and similar plants.

“SWACHH SAGAR, SURAKSHIT SAGAR” INTERNATIONAL COASTAL CLEAN-UP DAY 16th SEPTEMBER 2023

BY: DR. DURGA PRASAD BEHERA

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Gujarat Institute of Desert Ecology has organized the “Swachh Sagar, Surakshit Sagar” at Mandvi Beach on the International coastal clean-up day, 16th September 2023. This cleanliness drive was conducted in collaboration with National Centre For Coastal Research, under the Ministry of Earth Sciences, Govt. of India. Dr. Prabhakar Mishra, is the National coordinator of the Marine litter program. The coastal clean drive with the slogan “clean coast safe sea” was undertaken with the joint effort of the participants from Sheth Shri Shoorji Vallabhdas Arts and Commerce College, Seth Khimji Ramdas Kanya Vidyalaya, Secure Nature an NGO from Mandvi and the researchers and scientists from GUIDE. Shri. Haresh Vinzoda, President of Mandvi Nagarpalika inaugurated the programme in which the Dr. V. Vijay Kumar, Director, GUIDE, Jyostanaben Shengani (Vice president of Nagarpalika), Vishalbhai Thakkar (Karobari Chairman of Nagarpalika), Shantilal bhai Ganatra (Shangchalak of Rastriya Swayamsevak Sangh, Mandvi), Ashokbhai Fofindi (President of Mandvi kharva Samaj), Dr. K. G. Vaishnav (Bharat Vikas parishad) and Khanji Jadeja (Seema Jagran Manch, kutch) and officials from the forest department were present. Totally 110 participants involved in the collection, sorting and weighing of the marine litter



IMAGES TAKEN DURING BEACH CLEANING

A total of 600kg of solid waste of different category were removed of which plastic items constituted 42.8% and the rest by degradable materials. This program was coordinated by Dr. Durga Prasad Behera, Scientist and Ms Pallavi Joshi, Coastal and Marine Ecology division of GUIDE. This beach clean-up drive coincides with the G20 initiative of the massive clean-up of 40 beaches across the country to raise awareness about “Swachh Sagar, Surakshit Sagar” in association with International Coastal Cleanup Day on 16th September 2023.

GHOST CRAB: A BIOINDICATOR SPECIES OF SANDY BEACHES

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Sandy beaches stand for dynamic and vulnerable ecosystems threatened by several factors, such as habitat loss, pollution, and climate change. For the preservation of the environment and the welfare of people, it is crucial to monitor the stability and health of these habitats. Sandy beaches are an excellent habitat for ghost crabs and have become important markers of the nature of the shores. They are prime candidates for bioindication because of their distinctive physiological and behavioural traits. They spend most of the day in sand burrows and are generally nocturnal, burrowing animals. They can find refuge and safety from predators and environmental hazards in these burrows. Therefore, any changes in their burrowing habits or the state of their tunnels may be a sign of the integrity of the shore. These crabs are sensitive to temperature changes, and their behaviour and dispersion are greatly influenced by temperature.



OCYPODE CERATOPHTHALMUS (PALLAS, 1772) HABITUS, FRONT VIEW MALE

Ghost crabs are ectothermic, which means that their environment controls how hot or cold they are. In reaction to temperature variations, they are known to alter their activity patterns and burrowing habits. Studying the ghost crab population's adaptation or struggle due to rising temperatures due to climate change will help us understand temperature changes along the beach ecosystems. Furthermore, ghost crabs are highly territorial and exhibit territorial behaviours. They establish and defend specific areas along the shoreline, often competing with other crabs for these territories. Changes in their territorial behaviours, such as increased aggression or shifts in the location of territories, can indicate disturbances in the beach environment. These disturbances may include human activities, such as beachfront construction, which can impact the crab's ability to establish and maintain territories. They are crucial for determining the health and integrity of sandy beach ecosystems because of their behaviours, burrowing habits, sensitivity to temperature changes, territoriality, sensitivity to pollution, and participation in nutrient cycling. They develop and protect particular territory along the shoreline, frequently vying with other crabs for these lands. Changes in their territorial behaviour, such as an increase in hostility, can indicate environmental problems or be impacted by human activities like beachside development. In addition, ghost crabs play a crucial role in the cycling of nutrients on sandy beaches. They scavenge debris and carrion, aiding in the process of decomposition and recycling nutrients. Any changes to their feeding patterns or population dynamics may have repercussions that extend throughout the entire coastal food chain. Monitoring the variations in ghost crab populations can reveal the general condition and efficiency of sandy beach ecosystems. In conclusion, due to their distinct adaptations, sensitivity to environmental changes, and ecological importance, ghost crabs have earned their status as bioindicator species of sandy beaches. Recognising the importance of ghost crabs as bioindicators, is essential to protect the sandy coastal habitats

SEAWEED FARMING AS A SUSTAINABLE LIVELIHOOD OPTION FOR FISHING COMMUNITY

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SEAWEED FARMING AT OKHA COAST



Seaweed farming has significantly grown and continues to expand globally as a sustainable livelihood for coastal community in many countries having suitable coasts and environmental conditions. Seaweed farming is one of the best livelihoods for the coastal people. In Gujarat, the Okha coast has been known for the naturally growing seaweeds, which are being harvested by the people and sold in the market. Recently, the Gujarat Institute of Desert Ecology has initiated the culture of the red seaweed *Kappaphycus alvarezii*. *Kappaphycus alvarezii* farming is being widely adopted, employing the floating bamboo raft method in which monoline are strung so that the seaweed fronds are tied on them before suspending them in the water column. Alternatively, tube nets filled with seed algal fronds are also used. The monoline culture technique of tying the seaweeds in bunches on a rope and placing them at appropriate depths in the coastal water is practised where the suitable tidal and wave conditions are available.

The floating bamboo raft's main frame consists of four 10 x 10m poles. Four bamboo poles are tied diagonally in four corners of the mainframe. Nearly 18-20 polypropylene-twisted ropes and seed materials, are tied in the raft. Around 130 -200 g of seaweed fragments are tied at a spacing of 15 cm along the length of the rope. A total of 18-20 seaweed fragments can be tied in a rope. The total seaweed seed material requirement per raft is 60-80 kg. Fish net of 4x4m size is tied at the bottom of the raft to avoid grazing by herbivores such as fishes and turtle and are secured at 1.0 to 1.5 m depth level using 15 kg anchors. After 45 days, the rafts are brought ashore, and the local women's community are employed to remove the seaweeds. The women benefit from the different activities during the culture and harvest as employees, and when involved in group farming, they earn their share from the sale of the seaweed.

FLOATING BAMBOO RAFT FRAME

THE TERRIFYING AND INCREDIBLY AWESOME SCIENCE BEHIND RED TIDES

Algal blooms or algae blooms are sudden ecological changes caused by microalgae or phytoplankton in fresh, brackish, coastal and marine waters. These tiny species (microalgae) found in water bodies grow profusely when conditions are right for them and spread over the water body's surface, causing discolourations. This is generally called as "Red Tide".

BY: DR. BALAJI PRASATH

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Algal blooms or algae blooms are sudden ecological changes caused by microalgae or phytoplankton in fresh, brackish, coastal and marine waters. These tiny species (microalgae) found in water bodies grow profusely when conditions are right for them and spread over the water body's surface, causing discolourations. This is generally called as "Red Tide". The two most dominant bloom-forming groups in the phytoplankton community worldwide are the diatom and dinoflagellate. Diatoms uptake the nutrients and grow rapidly to higher biomass, but dinoflagellates grow very slowly and intake the nutrients even from deeper layers in the seawater due to vertical migration.

Dinoflagellates appear in freshwater and seawater; under favourable conditions and under unfavourable conditions, vegetative cells fuse to form Planozygote. The exact cause of algal blooms is still unclear. However, usually, chemical-rich wastes discharged from homes and industries mix with water bodies cause algal blooms due to their chemical properties. Dense algae are green in colour, but depending on the species of algae, they can be yellow, brown, or red in colour. However, in freshwater, blooms are not always blue-green.

They can be blue and bright white green are caused by blue-green algae (cyanobacteria). Genera of bluegreen algae, such as *Anabenna* sp., *Oscillatoria* sp., *Nostoc* sp., *Microcystis* sp., *Trichodesmium* sp., play an important role in algal growth. Apart from these, other microalgae such as *Coscinodiscus* sp., *Skeletonema costatum*, *Alexandrium* sp., *Dinophysis* sp., *Noctiluca* sp., etc. also cause algal blooms. A few microalgae release toxic substances when they form in higher mass. Such algae make the water appear brown or red in colour. When marine life, including fish, eat microalgae that can produce toxins that reach those organisms and cause death, they are known as harmful algae. When humans eat fish, shrimp, and clams fed on these toxic microalgae, they are prone to deadly diseases and death. Animals like fish, cattle, seabirds and marine mammals are also impacted when toxic microalgal blooms occur.



COMMON MARINE BLOOM FORMING MICROALGAE
(SOURCE ONLINE)



SURFACE WATER DISCOLORATIONS DUE TO ALGAL
BLOOM (SOURCE ONLINE)

The algal blooms cause extensive biodiversity loss and material loss. In addition, when the algae die and settle at the bottom of the water bodies, the amount of oxygen in that place decreases or disappears completely, and the organisms, including fish, die because they are unable to breathe. Besides, when there is algae growth, the foul smell in the place affects tourism. Asphyxiation and skin diseases occur when humans bathe or swim in an infested area. Therefore, it is a real fact that this type of algal bloom will not occur if the wastes are not mixed directly into the inland waterbodies and the sea. Therefore, it is essential to protect the sea and other natural resources without polluting them and use the resources provided by nature.

ACTIVITY AND AWARENESS AS PART OF MISSION LIFE

Event organized by the Coastal and Marine Ecology Division (CMED), Gujarat Institute of Desert Ecology (GUIDE)

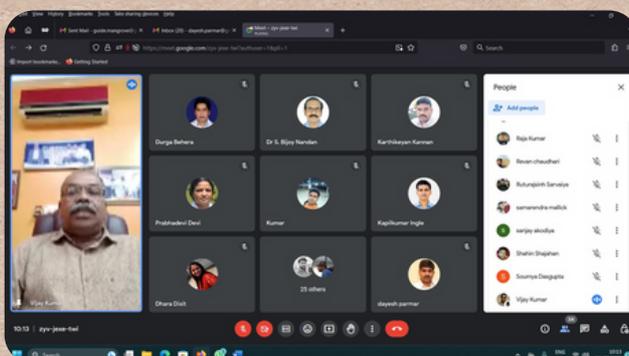
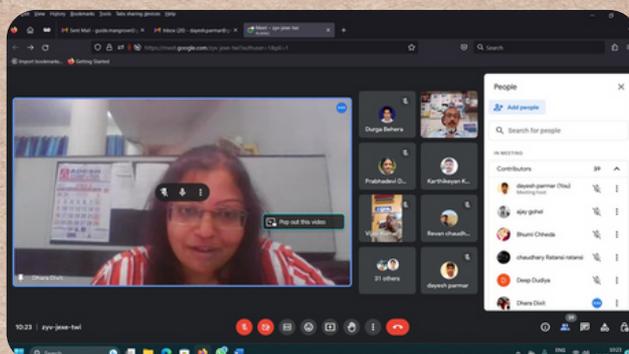
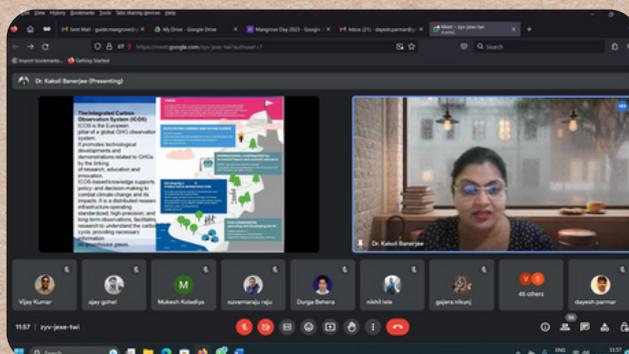
BY: DR. DHARA DIXIT

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The Government of India Initiated the Life Mission to create awareness about traditional lifestyle which are sustainable and also for reduce human foot print on earth. Earth is the only planet where air, water and other life supporting systems are in a perfect form to sustain organismal unit of life.

Webinar on World Mangrove Day, 2023

A Webinar was conducted by the Coastal and Marine Ecology Division, Gujarat Institute of Desert Ecology as a part of celebration of the World Mangrove Day on 26th July, 2023 via virtual mode. The theme of the webinar was 'Vitality of Mangrove Ecosystems - A Contemporary Approach'. The webinar was attended by the Assistant Director, Senior Scientists, Scientists, Project Scientists, Research Scholars, and technical staff of different institutes and GUIDE. The brochure containing the webinar details, program schedule and log in link and QR code was circulated on different social media platforms as well as on professional groups for maximum reach. A questionnaire containing 10 multiple choice questions was prepared to be circulated to the registered participants. The email addresses of the participants were obtained for ease in E-certificate distribution. A total of three Guest speakers (Prof. Dr. S. Bijoy Nandan from Cochin University of Science and Technology (CUSAT), Kerala, Dr. Kakoli Banerjee from Central University of Odisha, and Dr. Nehru Prabhakaran from Wildlife Institute of India, Dehradun, Uttarakhand) delivered their talks on different topics related to mangroves.



FEW IMAGES TAKEN DURING THE WEBINAR ON
WORLD MANGROVE DAY 26TH JULY 2023

The first speaker Prof. Dr. S. Bijoy Nandan delivered his talk on the topic entitled, 'Provisioning services of mangroves to the value chain for a sustainable blue carbon economy'. He highlighted the uniqueness of mangroves, distribution and diversity of flora and fauna associated with mangroves, biodiversity hotspots, blue carbon economy etc. He also talked about few new species of crabs recorded by him. He also emphasized on the importance of carbon sequestration and its association with global economy. Dr. Kakoli Banerjee delivered a talk on 'Blue carbon sink — A case study from Odisha'. Her talk focused on carbon emission and carbon sequestration potential of different coastal vegetation including seagrass, salt marsh, seaweeds, etc. She emphasized on the necessity to study phytoplankton and microbial diversity as potential carbon sinks. Dr. Nehru Prabhakaran delivered a talk on 'The interlinkages of species ecology, restoration, and management of mangroves'. He highlighted the necessity and limitations associated with mangrove restoration. He also talked about the reasons for mass mangrove destructions and failures of restoration, both naturally and manually and low survival rates. A total of 60 participants attended the webinar. The webinar was concluded with a vote of thanks by Dr. Prabha Devi (Scientific Advisor) and coordinated by Dr. Durga Prasad Behera (Scientist, CMED).

OCCURRENCE OF DUTTAPHRYNUS STOMATICUS IN THE COASTAL ENVIRONMENT, MANDVI, KACHCHH, GUJARAT

BY: DR. V. VIJAY KUMAR, DR. VAITHIANATHAN KANNAN & MR. MUKESH KOLADIYA

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IMAGE OF DUTTAPHRYNUS STOMATICUS

Abstract: Amphibians are well known as osmotically sensitive organisms due to their highly permeable skin and eggs and have mostly discounted their presence in saline environments. In June 2022, we found and recorded an amphibian, *Duttaphrynus stomaticus*, in the coastal environment of Mandvi, Kachchh, in Gujarat. This species uses the coastal dunes as its habitat for living. Salt tolerance in amphibians may not be as rare as generally assumed. The abilities of this species to adapt locally to coastal and inland saline habitats have to be studied extensively, classifying through habitats.

Amphibians are well known as osmotically sensitive organisms due to their highly permeable skin and eggs and have mostly discounted their presence in saline environments. However, scientists have repeatedly found amphibians living and breeding in various salty coastal and inland habitats since the 1800s. Despite these many observations, their presence in these habitats is still mostly ignored. Understanding the abilities and constraints of amphibian populations to adapt to salt will become more critical as humans continue to impact the world's freshwater resources through climate change, landscape modification, and pollution, and these habitats thus become increasingly stressful for amphibians. Conversely, salt tolerance in amphibians may not be as rare as generally assumed, although more work on most observed species is still needed. Our understanding of the evolutionary processes leading to this adaptation is also in its infancy (Hopkins and Brodie, 2015).

It is generally understood that amphibians breed and associate with freshwater habitats such as ponds, lakes and other small waterbodies. Many scientific studies have demonstrated that amphibians are particularly vulnerable to saline conditions at embryo, larval and adult stages. The most susceptible life stage is the embryo, which often experiences high mortality when in salt environments (Beebee, 1985; Hua and Pierce, 2013). This is because salt water disrupts the ionic and water exchange across permeable membranes. Charles Darwin, in 1872 noted that only "one Indian species" was able to tolerate salt water (Darwin, 1872; Hopkins and Brodie, 2015). However, many studies have found amphibian species that can adapt to and take saltwater habitats, especially those in coastal marshes. Since then, a range of scientific observations and studies have vastly increased our knowledge of the number of amphibians that can tolerate salt water in the natural environment. The most well-known frog to inhabit salty environments is southeast Asia's crab-eating frog (*Fejervarya cancrivora*). This unique species can live in freshwater and 75% seawater and adapt from one to the other in a matter of hours (Ren et al., 2010). It can achieve this by rapidly changing urea levels in its body tissues, which avoids excessive water loss through the skin in salty conditions (Ren et al., 2010). On 27 June 2022, we found and recorded an amphibian, *Duttaphrynus stomaticus*, in the coastal environment of Mandvi, Kachchh, in Gujarat.

This species uses the coastal dunes as its habitat for living. Salt tolerance in amphibians may not be as rare as generally assumed. The abilities of this species to adapt locally to coastal and inland saline habitats have to be studied extensively, classifying through habitats. The majority of studies which have found amphibians in saltwater habitats have recorded them from coastal areas, which get flooded predictably by seawater. The exact mechanisms behind the evolution of salt tolerance in amphibians are still under debate but may be due to several genetic variables. All amphibians have highly permeable skin, which is prone to desiccation. Most amphibians are efficient at water regulation through their skin and retaining salts by effectively transporting sodium and chlorine ions. Therefore, there may be a genetic predisposition to adapt to saltwater environments by altering ion transfer physiology across the skin. Several amphibian species tolerant of highly arid conditions can also resist salt environments. Central Europe's green toad (*Bufo viridis*) can tolerate extremely high temperatures of 40°C and withstand up to 50% body water loss (Amphibiaweb, 2018). Therefore, there is a need to understand the existing knowledge on this subject and present a possible framework for developing an evolutionary model of amphibian adaptation to saline areas based on genetic variation for salt tolerance in populations and the nature of selection events in osmotically stressful environments. However, some biologists have proposed that the ability to tolerate saline environments has evolved through a pre-adaptation to living in arid climates. However, this does not appear valid for all amphibians inhabiting salt water. The natterjack toad (*Epidalea calamita*) is known to inhabit freshwater and brackish habitats in the U.K. and across northern Europe (Beebee, 1985; Gomez-Mestre and Tejedo, 2005). On the other hand, no support is found for this hypothesis, suggesting that salt and aridity tolerance have evolved independently (Gomez-Mestre and Tejedo, 2005). They conclude that the mechanisms for resisting salt fundamentally differ in embryos and larvae compared to juveniles and adults. Therefore, amphibians who resist salt in embryonic or larval stages require unique physiology that has not evolved in arid-tolerant species (Gomez-Mestre and Tejedo, 2005). Other theories for the evolution of salt tolerance in amphibians are selection pressures from freshwater predators, forcing amphibians into new habitats or diversifying amphibians into new habitats to allow them to utilize unique prey (Hopkins and Brodie, 2015). Salinization of freshwater habitats has been cited as one factor in causing declines of Australian amphibian species, but the evidence is lacking (Kearney et al., 2012). Overall, it appears that an increasing number of amphibian species are being recognized as being able to tolerate salt water in the natural environment. However, species vary hugely in their tolerance of saltwater habitats, and our knowledge of how amphibians have adapted to saltwater is poorly understood, especially those in human-dominated habitats.

Further in-depth investigations are required to increase our understanding of the mechanisms behind the evolution of salt tolerance in amphibians and their response in a potentially changing environment.

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CASSIOPEA (UPSIDE DOWN
JELLY FISH)

PLASTIC POLLUTION

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Whenever someone asks you to carry things, what comes to mind first? A plastic bag (Polythene)? Or cloth or Jute bag? It's a plastic bag. The discovery of plastic has changed our lifestyle and became part of our daily life. Due to its characteristics like resistance to water, inert, lightweight, durable, cheaply manufactured etc. It seemed advantageous and was introduced from toothbrush to debit cards and almost everything is now made of varieties of plastic. Consumption of single-use plastic is faster, as it is widely used in grocery packaging and preserved factory food products. As we consume these foods, waste will also be generated. China is the top most in generating waste in the world, followed by the USA and India. India is generating 3.5 million tons of plastic waste annually and this amount of waste is expected to be three times by 2025. In India from a report of IISc Bangalore and Praxis global alliance Maharashtra, the states Gujarat and Tamil Nadu contribute 38% of total plastic waste. The darker side of the plastic is that it neither be destroyed nor burnt. It can stay for hundreds of years in nature as it is. It degrades the quality of the environment wherever it is present: soil, water or air.

1) Effects of plastic pollution

- Health Effects: Plastic is harmful to every living being. Mainly hormonal disruption and adverse reproductive and deformities, mental health, cancer, respiratory disorders

2) Effect on Animals and Aquatic

- Ecosystems: Consumption of polythene will result in the death of animals. Some aquatic animals like turtles also consume as it looks like Jellyfish. Due to this, many species of Turtles, Dolphin, and fish are endangered
- Recently, WHO reported microplastics in the blood and tissues of aquatic animals
- Data shows that a considerable plastic garbage hill is found in the Pacific Ocean. Unhygienic and Unaesthetic conditions arise due to the accumulation of plastics on the seashore

3) Effect on Soil:

- Nutrient depletion, groundwater contamination, degrading soil fertility.

Issues and Challenges with Plastic Waste

- A major chunk of plastic waste is of single-use plastic, which is being thrown into the waste basket directly as they are not reusable.
- Improper collection system so that about 1/4th of plastics never collected
- Dumping of waste on soil or in the ocean and uncontrolled burning
- Poor awareness about sanitation and lack of formal infrastructure
- Loopholes in legislation
- Growth of online trading, which incurs the use of enormous packaging materials

Now let's discuss some points to tackle plastic Pollution and the way forward.

- Reduce the production of plastics and develop sustainable alternatives to plastics.
- Promote the Circular Economy concept. Circular Economy depends on the reuse, repair, remanufacturing and recycling of resources to create a closed loop system.
- The government should incentivize research institutes, recyclers and collection systems.
- Streamline collection system as 1/4th of waste is not collected and promote the 3R concept.
- Educate and create awareness among people to use less plastic, especially single-use plastics.

Government Initiatives to tackle the issue:

- Introduce management rules 2016 and enforce the recent amendment concept of EPR (Extended Producer Responsibility)
- There will be responsible producers, manufacturers, Brand owners to manage, collect, and process waste.
- Some other initiatives: 1) Swachha Bharat Mission, 2) India Plastic Pact and 3) Project REPLAN

Pollution control is achievable by the strong will of citizens. Citizens have to bring behavioural change to tackle this issue. Steps taken by the government are very appreciable that help to achieve SDG Goals. But in the end, it depends on us; if we do not stop, then nature will show its anger in the form of disasters. The famous G20 quote will best suit.

"One Earth, One Family, One Future"

WORKSHOP /SEMINAR/ CONFERENCES /ATTENDED BY RESEARCHERS

1. Pallavi V. Joshi Attended the two-day International Workshop, "MARINE BIODIVERSITY MONITORING and BIOGEOGRAPHY: Emerging Trends in the Era of Data Science (MBMB- 2023)", organised by us on 8th and 9th July 2023.

2. Pallavi V. Joshi attended two days online lecture series on "Remote Operated Underwater Vehicle in Marine Environment (MARINE BIODIVERSITY)" from 31st July – 01st August 2023, organized by Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu.

3. Pallavi V. Joshi participated in Five days online faculty development programme on "Advanced tools in assessment of Marine biodiversity and pollution monitoring (ATAMBPM) Phase II from 1th to 16th September 2023.orgnized by Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu.

4. Scientific and technical staff from the GUIDE attended the talk by Dr. Asad Rahmani on "Emerging Threats To Indian Birds" on 4th September 2023, Organized by The Corbett Foundation.

5. Ratansi Chaudhary attended one day workshop on 'International Conventions on Chemicals and Waste" held at Gandhinagar on 12th September 2023, jointly organized by CSIR-NEERI and GPCB, Gandhinagar.



FEW IMAGES TAKEN DURING DR. RAHMANI'S TALK



IMAGE OF CSIR-NEERI & GPCB WORKSHOP



PAINTED STORK CAPTURED AT MANDVI

