



Food and Agriculture  
Organization of the  
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DEPARTMENT OF  
FISHERIES



Pradhan Mantri  
Matsya Sampada Yojana  
(PMMSY)



# CLIMATE CHANGE AND FISHERIES

Through the Eyes of Artists



**BOBP**

Bay of Bengal Programme  
Inter-Governmental Organisation

*In association with*

Art  
Cube  
Gallery





Shri Parshottam Rupala, Minister of Fisheries and Dr. Abhilaksh Likhi, IAS, Secretary, Ministry of Fisheries, Animal Husbandry & Dairying, Govt of India with Waves of Art Team





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**Dr. S Jayaraj**  
Co-ordinator  
Waves of Art Programme



BOBP-IGO, 2023 Climate Change and Fisheries - Through the Eyes of Artists, Bay of Bengal Programme Inter-Governmental Organisation, p68.

The sketches in this series included those drawn during the 'International Conclave on Mainstreaming Climate Change into International Fisheries Governance: Case of Regional Fisheries Bodies in the Indo-Pacific Region' held in Mahabalipuram, India from 16-19 October 2023. The event was convened by Food and Agriculture Organization of the United Nations and hosted by Department of Fisheries, Government of India.

We thank Dr. R. Soundararajan and Dr. Sri Hari for their assistance in drafting the descriptions for the art works.

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Design: BOBP Design Factory, [bobpdesignfactory@gmail.com](mailto:bobpdesignfactory@gmail.com)

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*Note: The art works in this publication may be used for non-commercial purposes with due credit.*





परशोत्तम रुपाला  
**Parshottam Rupala**



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मत्स्यपालन, पशुपालन एवं डेयरी  
भारत सरकार  
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Minister  
Fisheries, Animal Husbandry & Dairying  
Government of India  
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## Message

Climate change, a phenomenon that knows no borders, poses an increasingly profound challenge to our marine ecosystems. Warming waters, acidification, rising sea levels, and extreme weather events are but a few of the disruptions threatening the delicate balance of life beneath the oceans. These changes have far-reaching consequences for the livelihoods of fishermen, coastal communities, and marine life. It is crucial that we understand and address the impact of climate change on our oceans.

Art has the extraordinary ability to capture the essence of complex issues and make them accessible to all. Through the skilled hands and creative minds of artists, we can witness the transformation of our oceans and the struggles and triumphs of those who depend on them. The art presented within these pages will serve as a visual narrative, illustrating the effects of climate change on our fisheries, the stories of resilience, and the call for action.

"Waves of Art Series," a collaborative effort between the Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO), professional artists, and art enthusiasts, has consistently been a source of inspiration and a bridge between the world of fisheries and the broader society. "Waves of Art" has showcased the remarkable connection between art and the oceans, reminding us that the beauty, challenges, and resilience of our marine ecosystems are interwoven with our daily lives. Through this artistic journey, one can explore the intricate relationship between climate change and fisheries and join us in the urgent task of preserving our oceans and ensuring a sustainable future for all. I wish that BOBP-IGO's unwavering dedication and creative spirit continue to be invaluable to protecting the oceans and the livelihoods they sustain.

  
(Parshottam Rupala)



Painting by Padmashri Dr. Thotatharrani



# Message

I am delighted to share my enthusiasm for BOBP-IGO's latest initiative, "Waves of Art" – a creative endeavor that celebrates the convergence of art and sketching with themes deeply rooted in the sea, fishing, and the lives of fishermen.

**"Waves of Art Series - 4"** showcases the mesmerizing art works produced during the **International Conclave on Mainstreaming Climate Change into International Fisheries Governance: Case of Regional Fisheries Bodies in the Indo-Pacific Region** held in Mahabalipuram, India from 16-19 October 2023. This edition of the Waves of Art underlines the critical connection between climate change and the sustainability of our fisheries, shedding light on the challenges that we are facing at a global level.

I am excited to note that the Waves of Art series has also garnered recognition from numerous scientists actively engaged in fisheries and ocean-related research. Important institutions such as the Food and Agriculture Organization of United Nations (FAO) proposed to use the artworks in their publications, making a global impact and reaching larger and diverse audience.

As the Chair of the Governing Council of BOBP-IGO, I extend my heartfelt appreciation to all those who have contributed to the monumental success of this initiative. Together, we are cultivating a profound understanding of the intricate relationship between climate change and our fisheries, serving as an inspiration for positive change and sustainability in this vital domain.

Warm regards,

**Adam Ziyad**

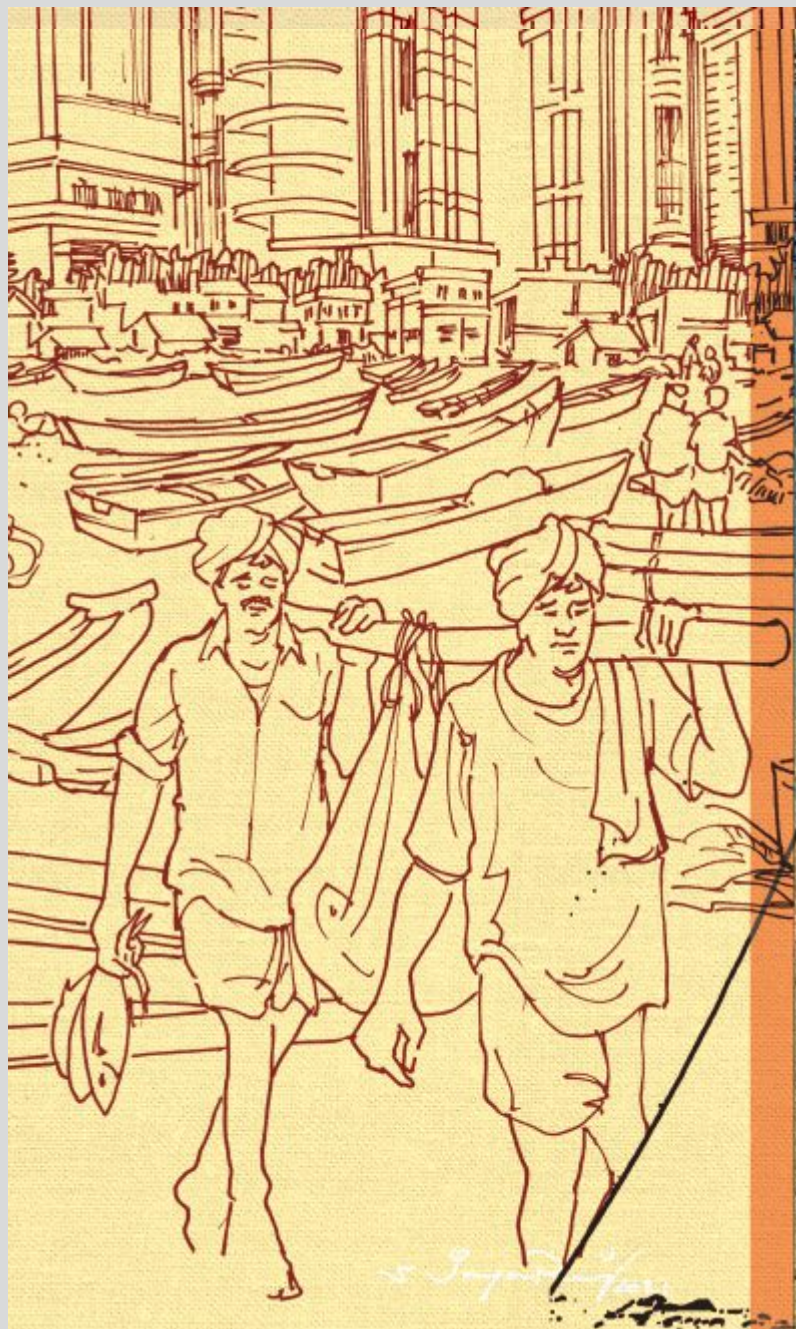


**Adam Ziyad**

Director General (Fisheries), Maldives &  
Chair, Governing Council, BOBP-IGO









## Climate Resilient Fisheries Management



**Dr. Tarub Bahri**

*Fishery Resources Officer  
FAO*

The Earth's warming climate is affecting our oceans, as revealed by reports of the Intergovernmental Panel on Climate Change (IPCC) and the Special Report on Ocean and Cryosphere (SROCC) indicating that over 90% of the extra heat caused by global warming is stored in the ocean. This phenomenon is inducing significant changes in the distribution and abundance of fish, posing challenges for the sustainable management of fisheries. Particularly vulnerable are Exclusive Economic Zones (EEZs) in Asia, where 86% of fished species face high or critical climate risks, followed by North America (77%), Oceania (73%), and Africa (71%). In high-seas regions, notably the Indian (56%) and North Pacific (42%) oceans, substantial proportions of species face high or critical risk, while the Arctic (1%) and North Atlantic (12%) oceans demonstrate lower risk levels.

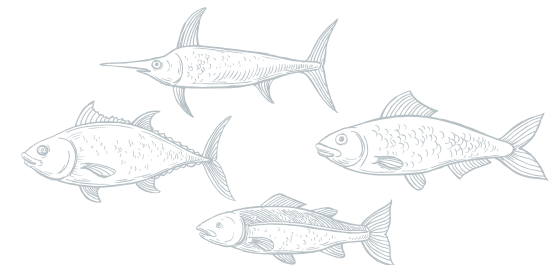
As a consequence of the ocean's warming, the maximum catch potential has decreased by 4.1% in the past 80 years and is anticipated to decline further, potentially by up to 12% by 2050. This poses a significant challenge as it implies a potential inability to meet the growing demand for seafood. Addressing these pressing issues requires concerted efforts and proactive actions in key areas.

### Key Areas of Action:

- **Deepen the Understanding and Formulate Policies:** Enhance our understanding of how climate change impacts fisheries and resorts to develop adaptive strategies. This knowledge is crucial for crafting effective policies that address the evolving challenges.

- **Community-Centric Adaptation Projects:** Collaborate with governments to initiate projects in fishing communities aimed at building resilience to climate change. These projects could encompass disaster preparedness and the promotion of environmentally friendly fishing practices.
- **Incorporate Fisheries in Climate Discussions:** When countries engage in discussions about climate change, it is imperative to include fisheries-related climate solutions. Collaboration with organizations such as the Regional Fishery Bodies (RFBs) and the United Nations is essential for devising comprehensive plans that safeguard our fisheries.

To confront these challenges head-on, the Food and Agriculture Organization (FAO) has introduced an adaptation toolbox featuring tools and methods to assist countries in adapting their fisheries. This adaptation toolbox provides a set of measures that can guide effectively the integration of fisheries and aquaculture into the formulation and implementation of National Adaptation Plans (NAPs). Complementing FAO's existing efforts, the "Addressing Fisheries and Aquaculture in National Adaptation Plans Supplement" offers valuable technical guidance, contributing to a holistic approach to addressing climate change impacts on our fisheries.





















**Ajeesh K A**

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The rapid warming of the Indian Ocean, sea-level rise, increased frequency of cyclones, and their associated impacts, such as the vulnerability of fish stocks and disruptions in fish food sources like plankton, have been great challenges to predict and find technological solutions. These environmental changes have caused loss of working days for fishers. The depletion of resources affects livelihoods of resource-poor fishers in Kerala. The adverse climate changes disrupt the traditional fishing calendar exacerbating the challenges faced by coastal communities.

*Boats in the estuary with  
reduced tidal flow*





*Disappointing returns to artisanal fishers: A day of insufficient catches from the sea*





*Anchored boat in the creek due to reduced fishing days caused by extreme weather events*





*Mechanised boats anchored in the Kochi creek, Kerala; A showcase of excess fishing capacity*





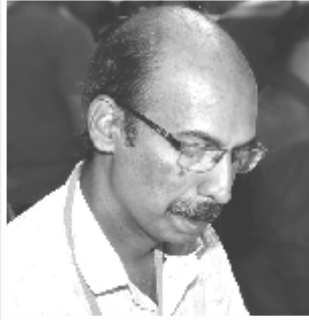
*Fishers repairing traditional boats as maintenance and in the face of climate vulnerability*





*The need to explore alternative fishing methods to replace the carbon-emitting trawling method*





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Artisanal fishing is vital for supporting livelihoods and food security needs in coastal nations. The sector's effectiveness relies not only on the economic efficiency of fishing fleets but also on the evolving productivity and distribution of target species due to the rapid effects of climate change in the oceans. These changes have already resulted in abrupt reductions in many resources, prolonged declines in production, higher prices for fish products, worsening the problem of excess fishing capacity to catch more fish.

*A Fisher beaching his boat after a fishing trip*





*Fishers preparing for a sea venture with high hopes of a bountiful catch*





*Fishers removing fish from the gill net*





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Rising seas impact every coast with flooding, storm surges, king tides, and tsunamis. They affect productivity of coastal ecosystems. Sea-level rise cause significant effect of climate change. High projected rates of future sea-level rise have captured the attention of the world, particularly, in countries located in low-lying areas and small islands. Their land areas would be decreased due to inundation and coastal erosion and a large proportion of their population may be forced to migrate to other countries.

*Plastic waste is flooding  
our oceans*





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In the midst of a rapidly changing climate, fisherwomen have emerged as resilient and adaptable figures within their fishing communities. These remarkable individuals, who often form the backbone of their fisherfolk families, play a crucial role in ensuring the survival and sustainability of their traditional way of life. Facing the challenges of warming oceans, shifting fish populations, and increasingly frequent extreme weather events, these women have become adept at diversifying their roles as vendors and providers.

*Impact of lean fishing season on  
supply, catch, price, and the fisheries  
market chain*





*Vendors with scarce catch and raised prices, hoping for a better market*





*A fish vendor under the hot sun waiting for buyers*





*Fisher hauling a cast net with a lot of plastics*





*Fisher preparing the net for the upcoming fishing season*





Boat returning without much catch





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In India, women find themselves particularly reliant on natural resources for their survival, and the repercussions of climate change are increasingly evident in the marine ecosystems throughout the country. The most severe manifestations of climate change are observed in the depletion of vital resources, a surge in natural disasters, shifts in aquaculture practices and loss of critical habitats and species.

*Cheriyal scroll painting of Telangana depicting the importance of women in fisheries*





Painting depicts the significant contribution of women in the fish marketing sector in developing countries





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Oceans play a crucial role in climate dynamics, as they circulate 83% of the global carbon cycle and absorb 93% of the excess heat generated by greenhouse gas emissions since the 1970s. This alarming trend is likely to exacerbate as ocean temperatures may rise by 1-4°C by 2100, posing challenges to sustainably manage fish stocks. Innovative approaches are needed for sustainable fishing. But, finding consensus between the fishing industry and governments across international boundaries can be arduous due to indifference.

*Fishing boats berthed at  
harbour after extended  
fishing period*





*Fishers return to the shore with a few large size fish*



# CLIMATE CHANGE IMPACTS ON FISHERIES AND AQUACULTURE

THE HINDU CHENNAI  
THURSDAY 28 JULY 2016

## WARMING OCEANS THE CAUSE FOR INTENSE CYCLONES?

Story has found that the expansion of Indo-Pacific warm

### What is Madden Julian Oscillation?

The MJO is characterised by a band of rain clouds moving eastward over the tropics. It regulates tropical cyclones, the monsoons, and the El Niño cycle, and contributes to severe weather events over Asia, Australia, Africa, Europe and the Americas.

### What is a warm pool?

The Tropical Warm Pool or Indo-Pacific Warm Pool is a mass of ocean water located in the western Pacific Ocean and eastern Indian Ocean which consistently exhibits the highest

SEKHARNA CHAITANYA Chennai

While the Northeast monsoon, which is the lifeline for Tamil Nadu, becoming erratic? Are we witnessing an increase in the number of tropical cyclones in the Andamans, Lakshadweep and extreme rainfall events? A new study reveals that the Indo-Pacific Ocean is warming rapidly and there is a 'near two-fold' expansion of warm pool covering most parts of Bay of Bengal, which is affecting climatic patterns.

The study led by Roy Mathew Kell of the Indian Institute of Tropical Meteorology and published in the journal

warm pool - The temperatures of the warm pool study has found that the expansion of this warm pool forced the Madden-Julian Oscillation (MJO) and its fluctuation in the weather.

The increase in carbon emissions has been causing rapid warming and expansion of this warm pool in the recent decades. "The warm pool expanded to become double size, from  $2.2 \times 10^7 \text{ km}^2$  in 1900-1980 to  $4.2 \times 10^7 \text{ km}^2$  in 1981-2018," says the rate of expansion.

2023

Rising sea surface temperatures and other climate-related changes are leading to lower catches for fishers





*Inland fishers hit hard by climate change as rivers and reservoirs dry up in hot weather and poor water flow*





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Mangroves are regularly referred to as a “nature-based solution” — a term often used in reference to tackling the climate crisis. One of mangroves' biggest strengths lies in their ability to capture and store carbon. Mangroves also generate indirect income for communities. These trees and their vast root systems serve as a protective shelter for vulnerable young marine life as they grow and mature, including juvenile sharks, grouper, and parrotfish that then swim out to coral reefs once they've grown large enough.

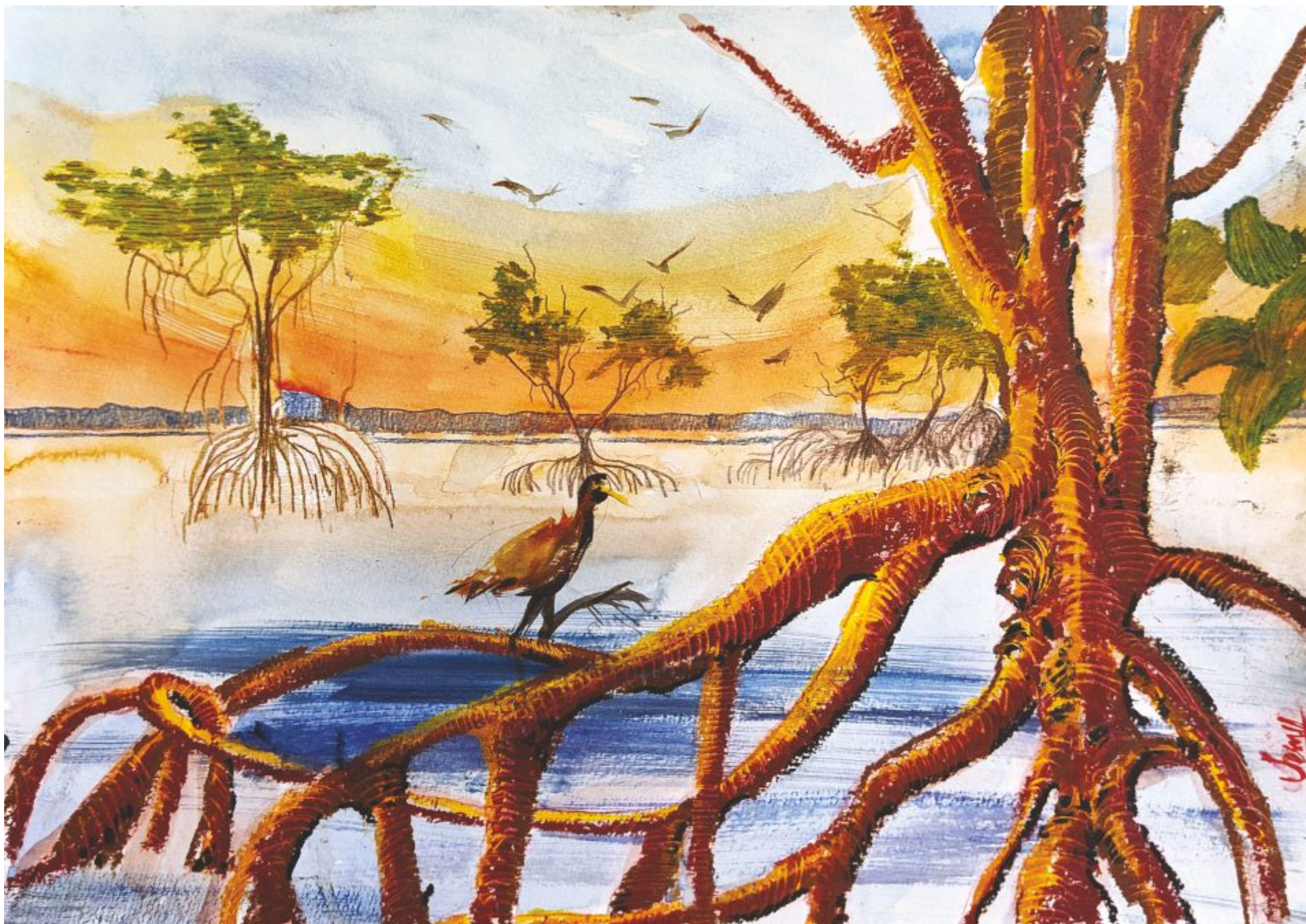
*Fishers returning to the creek after  
a day at sea*





*Artisanal fishers scouting the waters at dusk in search of fish for catch*





*Mangroves are allies of humans in the fight against climate change*





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Climate change can have a wide-ranging impact on fisheries and fishing communities. These impacts are significant for women in the fishing industry on the east and west coasts of India, pushing them away from traditional occupations and increasing their economic burden as they are required to contribute more to household incomes. To supplement their income, fishermen also engage in activities like raising goats and domestic fowls.

*Fishers carry fresh catch to take to the market*









*Fish vendors sorting small size fishes on the beach*





*Fishers congregate near the shoreline as part of a traditional ritual for a safe fishing trip and better catches*





Plastics collected by fishers are being stored on the beach. Fishers act as key players in removing plastics.





Customers in a bargain with fish vendors





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The fishing industry, particularly trawlers, not only depletes marine life but also exacerbates climate change by emitting substantial greenhouse gases through fuel consumption and contributing to ocean acidification, ecosystem disruption, and the release of stored carbon. These combined effects make the ocean more vulnerable to climate change and less capable of mitigating its impacts, highlighting the urgent need for transitioning to sustainable fishing practices.

*Traditional fishing boats on  
Kerala's rocky beaches*





*Fisher pulling the artisanal fishing boat ashore for beaching*





*Birds waiting for the tide to recede and feed on exposed crabs and worms*





Boat repairs: Gillnetters' maintenance services during seasonal fishing ban





Fishers repairing the net in the shores of Kerala





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Climate change has significant implications for tropical cyclones, amplifying their intensity and altering their patterns. As global temperatures rise, the warming of ocean waters provides more energy for tropical cyclones, potentially leading to an increase in their intensity. Additionally, climate change may influence atmospheric circulation patterns, affecting the tracks and trajectories of tropical cyclones.

*A storm surge pushes boats inland and inundates buildings on the coast*



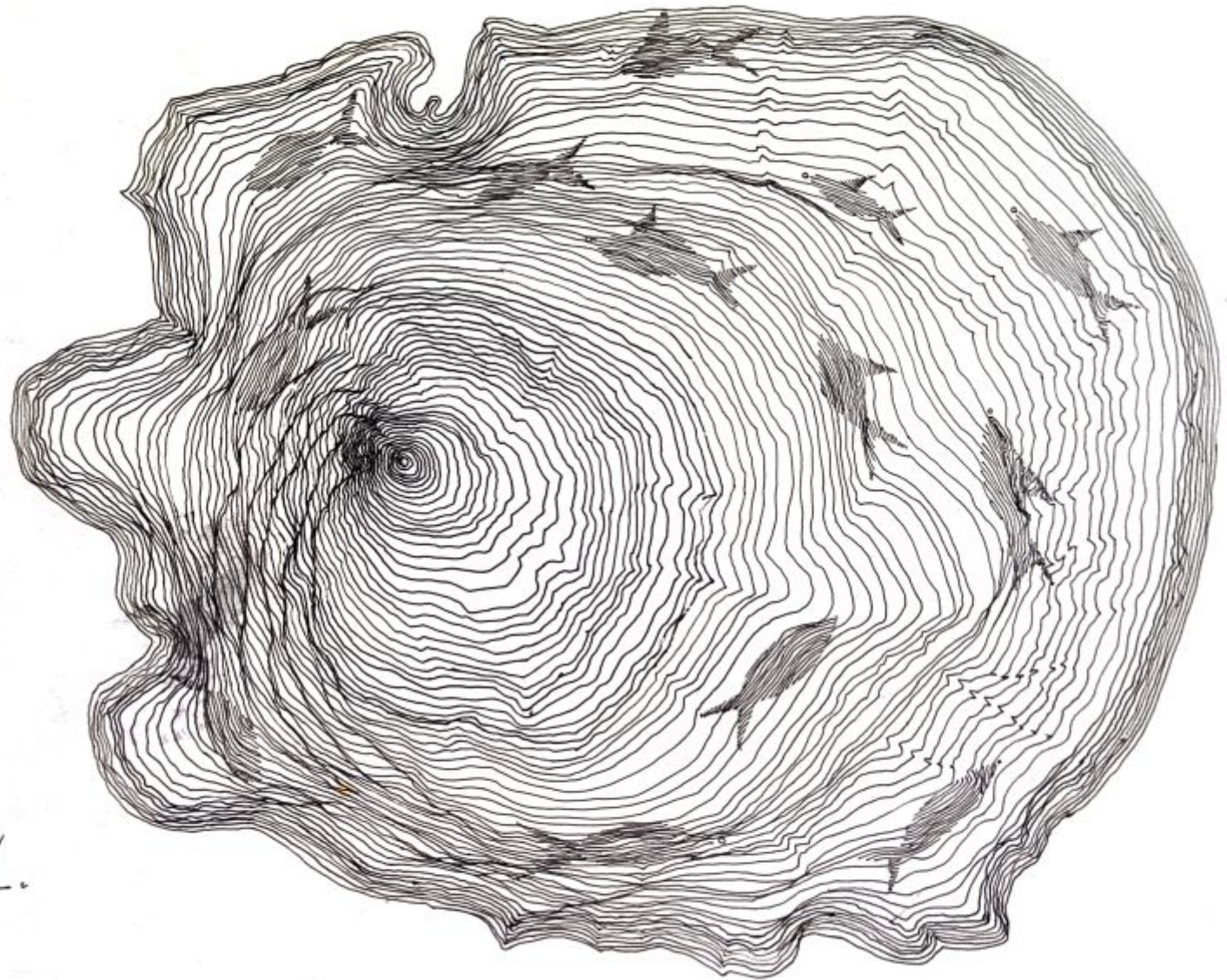


*Boats remain idle during the fishing ban season*





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Flooding of global rivers worsen riverine plastic pollution. Flood-risk areas become sites of high plastic mobilisation. There are several negative effects of frequent and severe precipitation events, increased pollution and nutrient runoff into the water, sediment load increase, and eutrophication. These inputs may worsen fish habitat quality. Steadily rising ocean temperatures are forcing fish to abandon their historic territories and move to cooler waters. The harmful effects of climate change may force fish to relocate, and sensitive ecosystems can suffer.

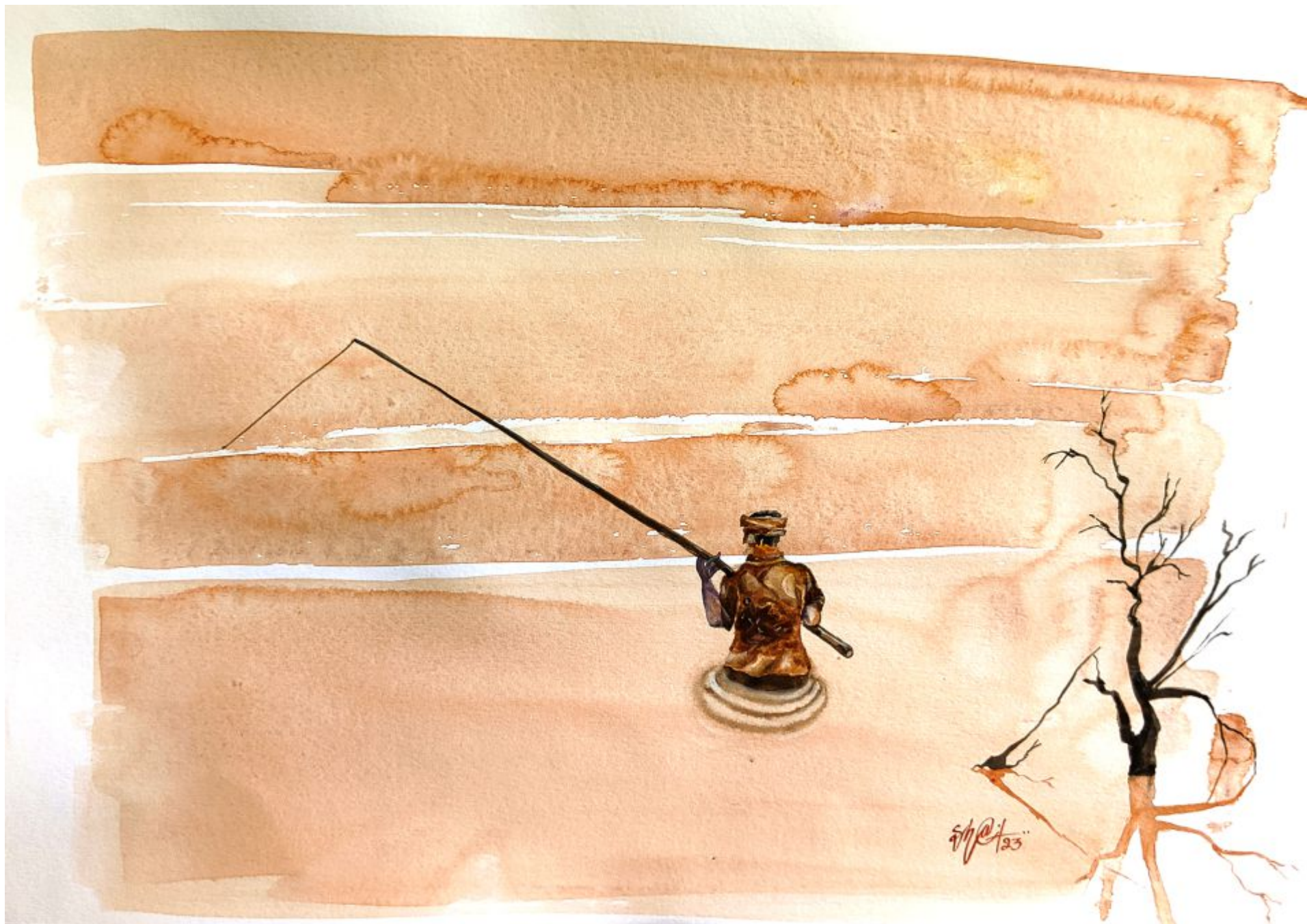
*Fishes migrate in response  
to seasonal temperature  
changes in the sea*





Art depicting the increased marine heat waves and its effect on fishes





Catching fish in the tranquil creek surrounded by mangroves





*Catching plastic instead of fish is a growing concern for fisher*





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Fisheries are affected by climate change in many ways: marine aquatic ecosystems are affected by rising ocean temperatures, ocean acidification and ocean deoxygenation, while freshwater ecosystems are impacted by changes in water temperature, water flow, and fish habitat loss. The effect of sea level rise affects coastal fishing communities significantly and water use in freshwater fisheries and aquaculture.

*Climate change affects the commercial fisheries*





*Empowering fisher women: A top-view glimpse of the catch as they carry fishes for sale*





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*Whale breaching*

Among marine megafauna, mammals fulfill key and irreplaceable ecological roles in the ocean, and the collapse of their populations may, therefore, have irreversible consequences for ecosystem functioning and services. The impacts from climate change increase and continue to affect many species and habitats. Keeping whale populations alive and thriving is crucial to combating climate change, but they are being negatively affected by rising sea temperatures.





*Carangids abound: A bounty in the artisanal fishing haul*





*Fisherfolk family returning home with their catches amidst climate challenges*





*Fishers hauling catches off the south-west coast of India amidst shifting seas*





*Climate-friendly transport as fish vendors pedal towards the metropolitan market*





*Fishers cruising through rising waves*





*Artists' participation in making thematic paintings, depicting the climate change impacts on fisheries and fishers' livelihoods.*



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**WAVES** of Art...  
Series 4





**Dr B Dakshayani**  
Co- Founder  
Art Cube Gallery LLP

**Mission:** Art Cube Gallery's mission is to use art as a catalyst for positive societal change. We showcase art from emerging and renowned artists through our virtual portal, fostering exposure for underrepresented artists. We aim to engage the community in cultural discussions and learning by collaborating with prominent voices in the arts. Our "art for all" initiative takes art to the streets, allowing people to express themselves through various art forms.

**Vision:** Our gallery celebrates creativity and addresses social causes by involving philanthropic artists in global virtual fundraisers. We aim to bring joy and awareness to a society marked by inequalities and challenges. Understanding the arts and artists will help individuals appreciate nuances, build bridges, foster relationships, and promote positivity in humanity.

**Dr. B Dakshayani**

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The Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO), set up in 2003, was evolved from the erstwhile Bay of Bengal Programme of the Food and Agriculture Organization of the United Nations (FAO) founded in 1979. The current member countries of the Organisation are Bangladesh, India, Maldives and Sri Lanka.

The BOBP-IGO is a Regional Fisheries Advisory Body (RFAB), which serves as the think tank for the member countries on transboundary and contemporary regional issues concerning fisheries management, biodiversity and ecosystem conservation, pollution management, livelihood and occupational safety. The IGO assists its member countries in achieving UN Decadal Targets for fisheries management, ecosystem conservation and sustainable development in the region through research-based policy advocacy, need-based capacity development and extensive community engagement programs.

BOBP-IGO is a member of the Regional Fisheries Body Secretariats' Network (RSN), coordinated by the FAO.

## Our Team



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**Global Fisheries Conference-2023**  
21-22 November  
Gujarat Science City, Ahmedabad, Gujarat, India

#### Program Highlights

Global Networking Opportunities  
Exhibitions / Technology Demonstration (National / International)  
Technical Session



### Release of Waves of Art Series 3

BOBP's Social Art Publication on Gender Released by Kerala Governor.

Shri Parshottam Rupala, Minister of Fisheries, Animal Husbandry and Dairying, Govt of India released the Waves of Art-3 publication on the occasion of the inauguration of the International Fisheries Conclave held at Mahabalipuram on 17th October. This artistic publication comprises sketches contributed by eminent subject-matter specialists and artists from Chennai and Kochi during the International Symposium on 'Innovations in Fishing Technologies for Sustainable and Resilient Fisheries' held in Kochi during February 2023.

<https://www.bobpigo.org/publications/Waves%20of%20Art%203.pdf>





Food and Agriculture  
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The Food and Agriculture Organization (FAO) is a specialized agency of the United Nations that leads international efforts to defeat hunger. FAO's goal is to achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives. With 195 members - 194 countries and the European Union, FAO works in over 130 countries worldwide.



**BOBP**

## Bay of Bengal Programme Inter-Governmental Organisation

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