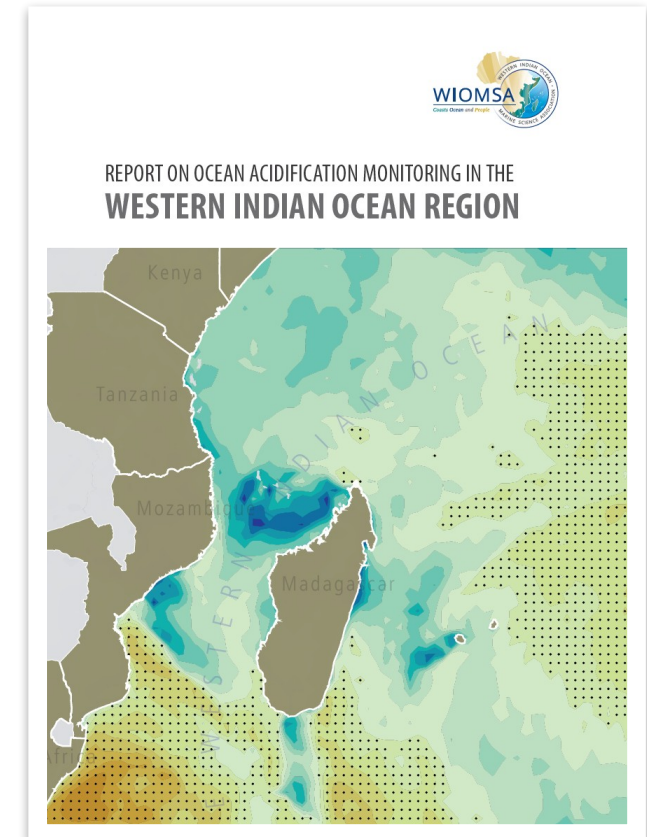


Ocean Acidification Monitoring in the Western Indian Ocean region: A Case of Tanzania

Validation workshop

27 January 2025, Dar es Salaam Tanzania



Why monitoring ocean acidification

- To understand the trends and dynamics of OA indicators (pH, DIC, TA, and pCO₂)
- To understand biodiversity shifts, therefore protect vulnerable species and habitats.
- Economic impacts of OA to coastal communities
- Adaptation and mitigation measures depends on reliable data of OA indicators (pH, DIC, TA, and pCO₂)
- Ecosystem health

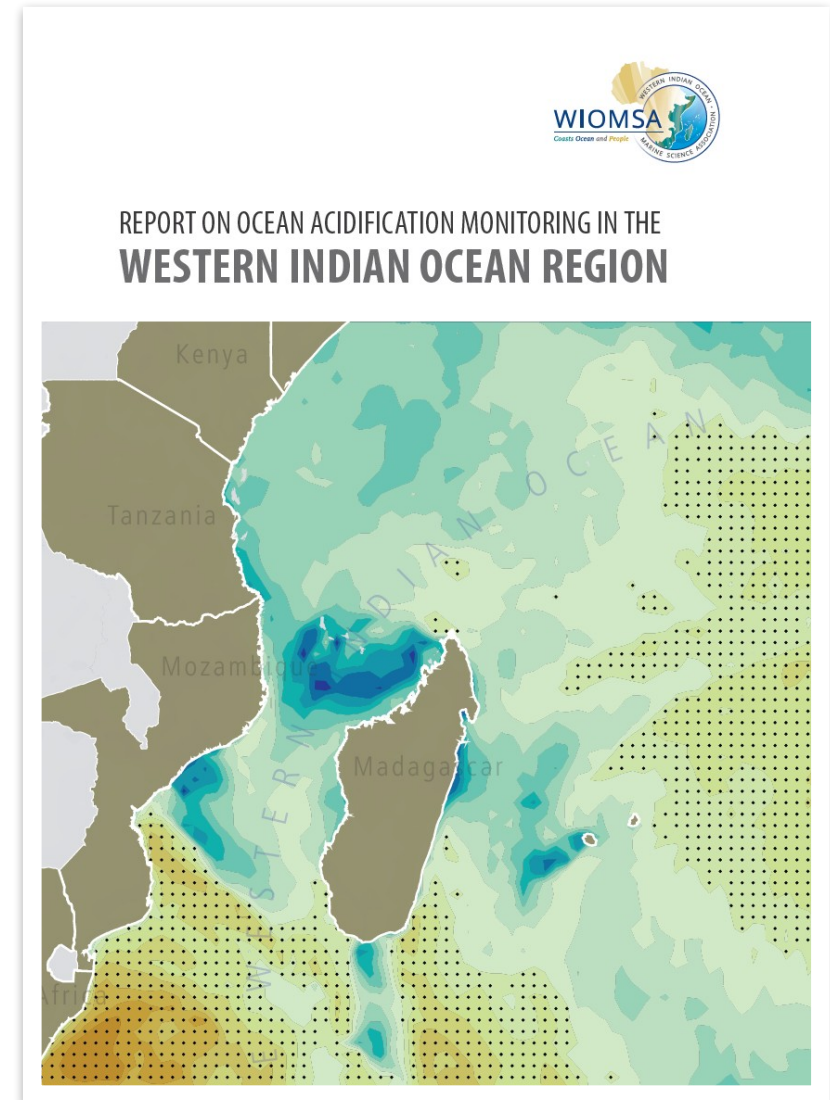
Why monitoring ocean acidification

4.57	-0.30	-0.02	1.17	-0.30	-0.24	-0.30	-0.30	-0.30	-0.17	-0.17	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.28	-0.30	-0.24	-0.30	-0.30	0.17	Abyss hard		
4.70	-0.27	-0.08	0.73	-0.27	-0.22	-0.27	-0.27	-0.27	-0.18	-0.18	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.25	-0.27	-0.20	-0.27	-0.27	0.05	Abyss soft		
2.67	0.35	0.45	0.80	0.47	-0.41	-0.35	-0.57	-0.63	-0.52	-0.48	-0.63	-0.63	-0.63	-0.63	-0.60	-0.62	-0.51	-0.58	-0.58	-0.54	0.04	-0.30	1.64	2.80	Algae bed	
0.35	1.18	-0.18	-0.18	0.55	-0.07	-0.22	-0.30	0.09	-0.68	-0.66	-0.73	-0.73	-0.71	-0.71	-0.68	-0.59	-0.55	-0.61	-0.63	-0.62	0.46	0.56	3.10	2.56	Coral reef	
4.73	-0.28	-0.14	0.20	-0.10	0.40	-0.28	-0.28	-0.28	-0.25	-0.25	-0.26	-0.25	-0.28	-0.28	-0.28	-0.28	-0.26	-0.27	-0.27	-0.23	-0.24	-0.28	-0.28	0.02	Deep pelagic	
3.79	1.85	0.36	0.25	-0.47	-0.47	-0.47	-0.47	-0.47	-0.47	-0.47	-0.47	-0.47	-0.47	-0.46	-0.47	-0.47	-0.47	-0.47	-0.43	-0.43	0.41	0.35	1.36	-0.47	Mangrove	
4.68	-0.18	-0.18	0.84	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.25	-0.26	-0.08	-0.25	-0.16	-0.26	Midwater pelagic	
3.68	0.15	1.21	0.41	-0.50	-0.44	0.05	-0.50	-0.50	-0.40	-0.39	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.48	-0.47	-0.23	-0.50	0.85	2.02	Mudflat	
4.74	0.16	-0.13	0.06	-0.04	-0.30	-0.30	-0.27	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.22	-0.22	0.10	-0.19	0.22	-0.30	Photic pelagic	
3.13	1.47	2.19	0.46	-0.60	-0.39	-0.20	-0.60	-0.60	-0.54	-0.49	-0.60	-0.60	-0.59	-0.60	-0.60	-0.60	-0.60	-0.49	-0.59	-0.60	-0.20	0.79	0.99	0.39	Salt marsh	
4.26	0.75	0.91	0.30	-0.50	-0.22	0.07	-0.50	-0.50	-0.40	-0.40	-0.50	-0.50	-0.49	-0.50	-0.50	-0.50	-0.50	-0.37	-0.48	-0.50	-0.30	0.24	0.25	0.83	Seagrass bed	
3.17	0.79	0.74	0.61	-0.54	-0.48	-0.20	-0.54	-0.54	-0.44	-0.46	-0.54	-0.54	-0.54	-0.54	-0.54	-0.54	-0.54	-0.54	-0.49	-0.54	-0.16	-0.54	1.75	2.16	Shallow hard	
0.87	1.01	0.47	0.09	0.14	0.13	-0.48	-0.40	-0.44	-0.55	-0.59	-0.67	-0.67	-0.66	-0.66	-0.66	-0.53	-0.48	-0.52	-0.49	-0.53	0.19	-0.35	3.31	2.47	Shallow soft	
-0.37	0.21	-0.37	-0.37	-0.02	-0.37	-0.33	-0.37	-0.05	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.20	-0.26	-0.03	-0.30	-0.17	-0.10	0.38	-0.28	0.58	4.64	Shelf hard
4.51	-0.22	-0.37	-0.37	0.18	0.15	-0.37	-0.37	-0.37	-0.30	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.36	-0.37	-0.27	-0.30	-0.27	-0.27	0.01	-0.31	0.45	1.10	Shelf soft
0.24	1.51	1.70	-0.20	-0.04	0.01	-0.12	-0.25	-0.48	-0.59	-0.61	-0.66	-0.66	-0.65	-0.61	-0.65	-0.55	-0.56	-0.55	-0.56	-0.58	-0.01	-0.04	3.46	1.45	Shore	
-0.52	-0.48	0.08	2.09	0.61	0.73	-0.52	-0.52	-0.42	-0.33	-0.42	-0.52	-0.52	-0.52	-0.52	-0.43	-0.46	-0.11	-0.23	-0.21	-0.17	-0.12	-0.52	0.09	3.92	Slope hard	
3.97	-0.44	0.12	1.88	-0.05	-0.07	-0.45	-0.45	-0.42	-0.28	-0.25	-0.45	-0.45	-0.45	-0.45	-0.42	-0.42	-0.13	-0.37	-0.40	-0.32	-0.22	-0.45	-0.36	1.34	Slope soft	
4.71	-0.03	-0.29	0.56	-0.09	-0.29	-0.29	-0.27	-0.29	-0.29	-0.29	-0.29	-0.29	-0.29	-0.29	-0.29	-0.29	-0.29	-0.29	-0.25	-0.25	0.09	-0.23	0.11	-0.29	Upwelling pelagic	
Sea level rise	Mariculture	Plastic litter	Temperature rise	Ship pollution	Underwater noise	Dumping	Hydrology change	Ports	Ghost fishing	Oil gas industry	Other fishing	Ship strike	Nutrient input	Piers and docks	Diving	Light pollution	Floating longline	Coastal tourism	Demersal trawl	Pelagic seine	Boating	Dredging	Algae farming	Artisanal fishing		

Why monitoring ocean acidification

Data is crucial

- Reliable
- Standardized methodology



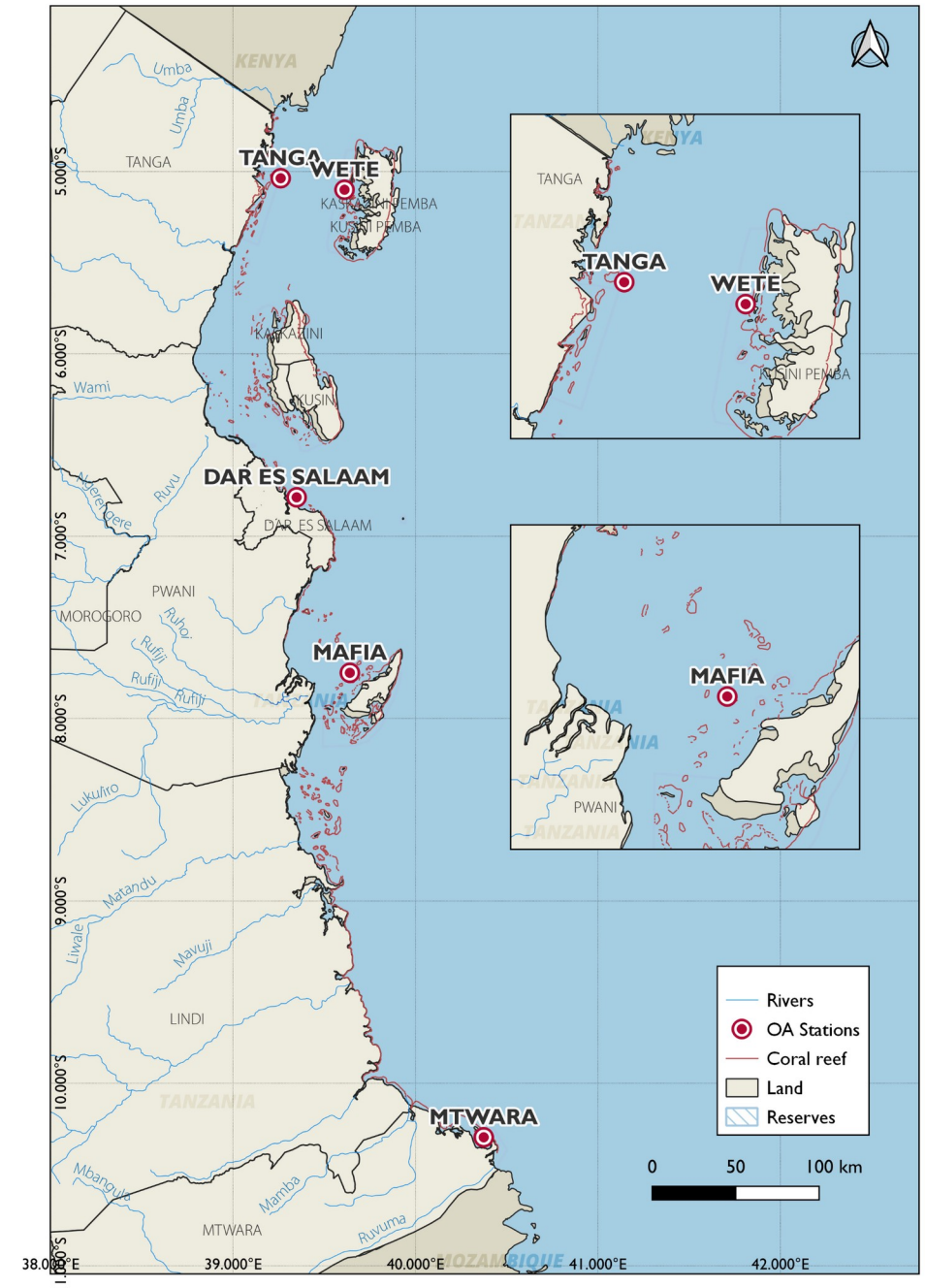
OA monitoring in Tanzania

OA monitoring stations

- The Pemba Channel (since 2022)
- Zanzibar Channel (since 2017)
- Mafia Channel (since 2024)

Next monitoring stations

- Mtwara
- Unguja



2019

2020

2021

2022

2023

2024



2019

2020

2021

2022

2023

2024

Challenge

- The monthly interval data were inadequate to establish trend and investigate dynamics of OA indicators

Solution

- Hence, in 2021, OA team decided to deploy a buoy to collect high frequency data





Road to high frequency data



● ○ REDMI NOTE 8 PRO
∞ AI QUAD CAMERA

● ○ REDMI NOTE 8 PRO
∞ AI QUAD CAMERA

2019

2020

2021

2022

2023

2024

Road to high frequency data



2019

2020

2021

2022

2023

2024

Tanga – Pemba Sea Scape



2019

2020

2021

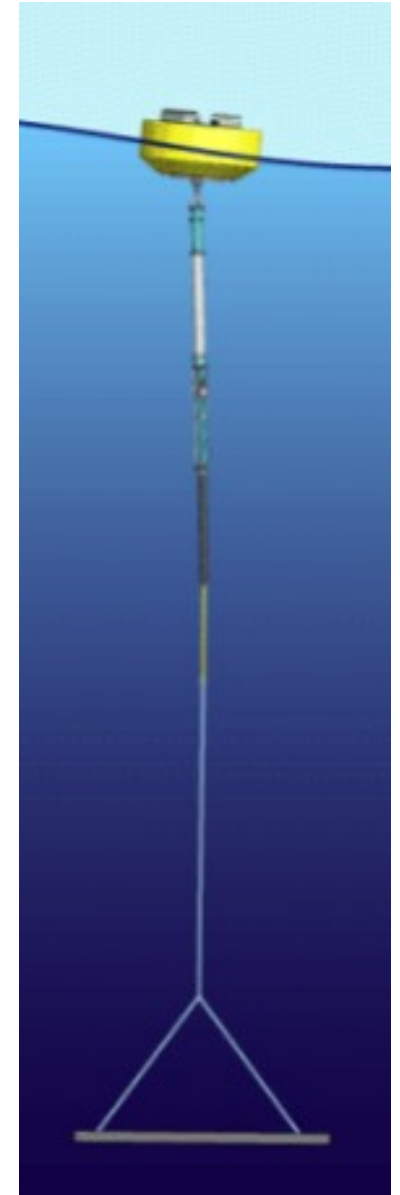
2022

2023

2024

Tanga - Pemba Sea Scape

Buoy video in Tanga



2019

2020

2021

2022

2023

2024



2019

2020

2021

2022

2023

2024

Pemba and Mafia

2019

2020

2021

2022

2023

2024

Pilot study in **Pemba**

- Trained scientists on sensor configurations



2019

2020

2021

2022

2023

2024

- Community level stakeholders' dissemination workshops



2019

2020

2021

2022

2023

2024

- High-level stakeholders' dissemination workshops



2019

2020

2021

2022

2023

2024

It documented occurrence of multiple upwelling events low level of DO, Temperature, and pH

frontiers | Frontiers in Marine Science

TYPE Original Research
PUBLISHED 08 January 2024
DOI 10.3389/fmars.2023.1286870

Check for updates

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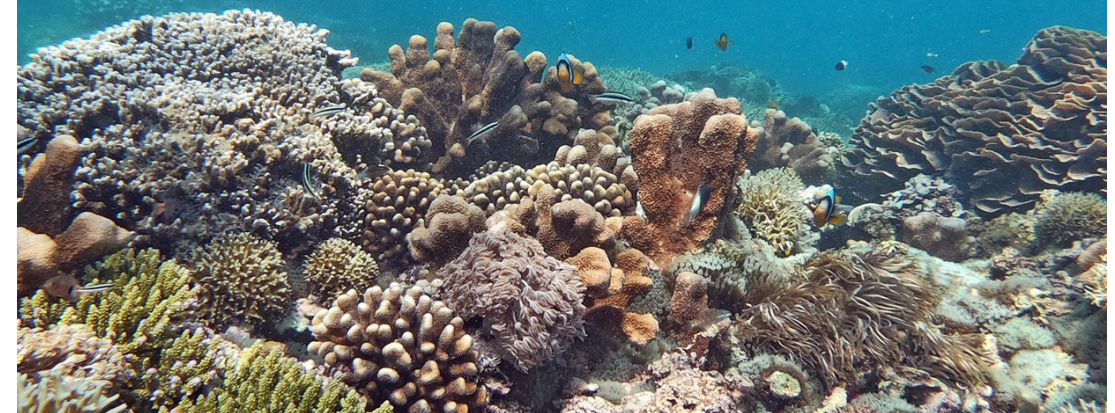
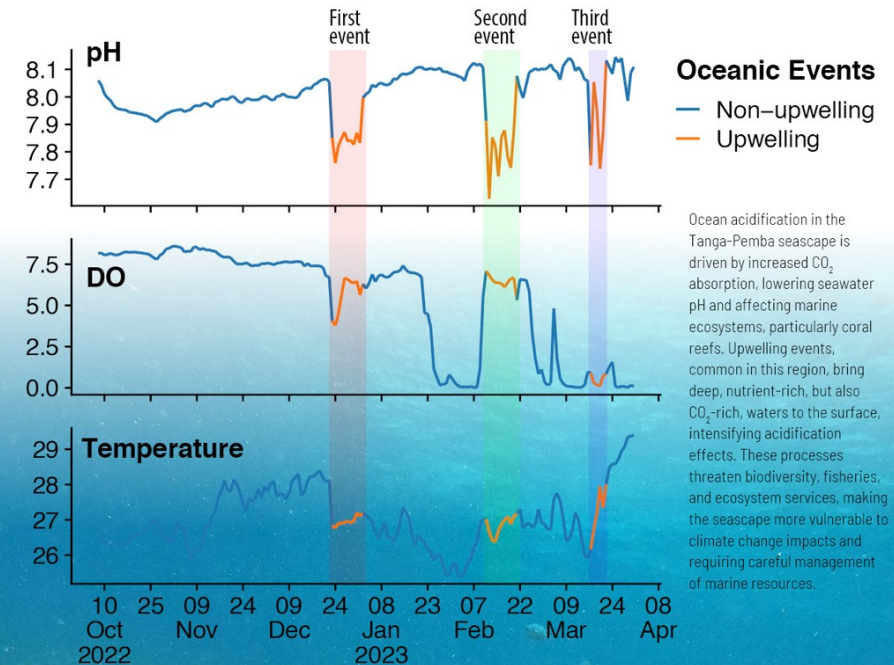
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George R, Job S, Semba M, Monga E,
Lugendo B, Tuda A and Kimirei I (2024)
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Front. Mar. Sci. 10:1286870.
doi: 10.3389/fmars.2023.1286870

High-frequency dynamics of pH, dissolved oxygen, and temperature in the coastal ecosystems of the Tanga-Pemba Seascape: implications for upwelling-enhanced ocean acidification and deoxygenation

Rushingisha George^{1*}, Samson Job², Masumbuko Semba³,
Elinasi Monga⁴, Blandina Lugendo², Arthur Omondi Tuda⁵
and Ismael Kimirei¹

¹Tanzania Fisheries Research Institute (TAFIRI), Dar es Salaam, Tanzania, ²School of Aquatic Science and Fisheries Technology (SoAF), University of Dar es Salaam, Dar es Salaam, Tanzania, ³The Nelson Mandela African Institution of Science and Technology (NM-AIST), School of Materials, Energy, Water and Environmental Sciences (MEWES), Arusha, Tanzania, ⁴International Union for Conservation of Nature (IUCN), Dar es Salaam, Tanzania, ⁵Western Indian Ocean Marine Science Association (WIOMSA), Zanzibar, Tanzania



2019

2020

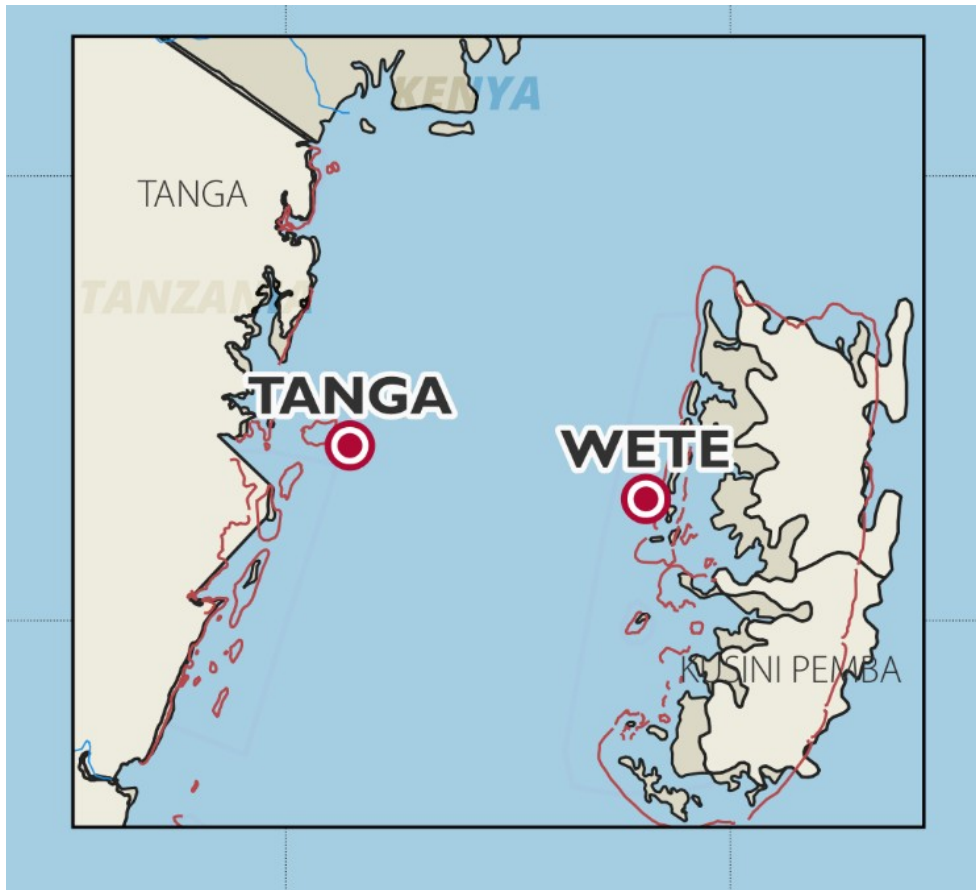
2021

2022

2023

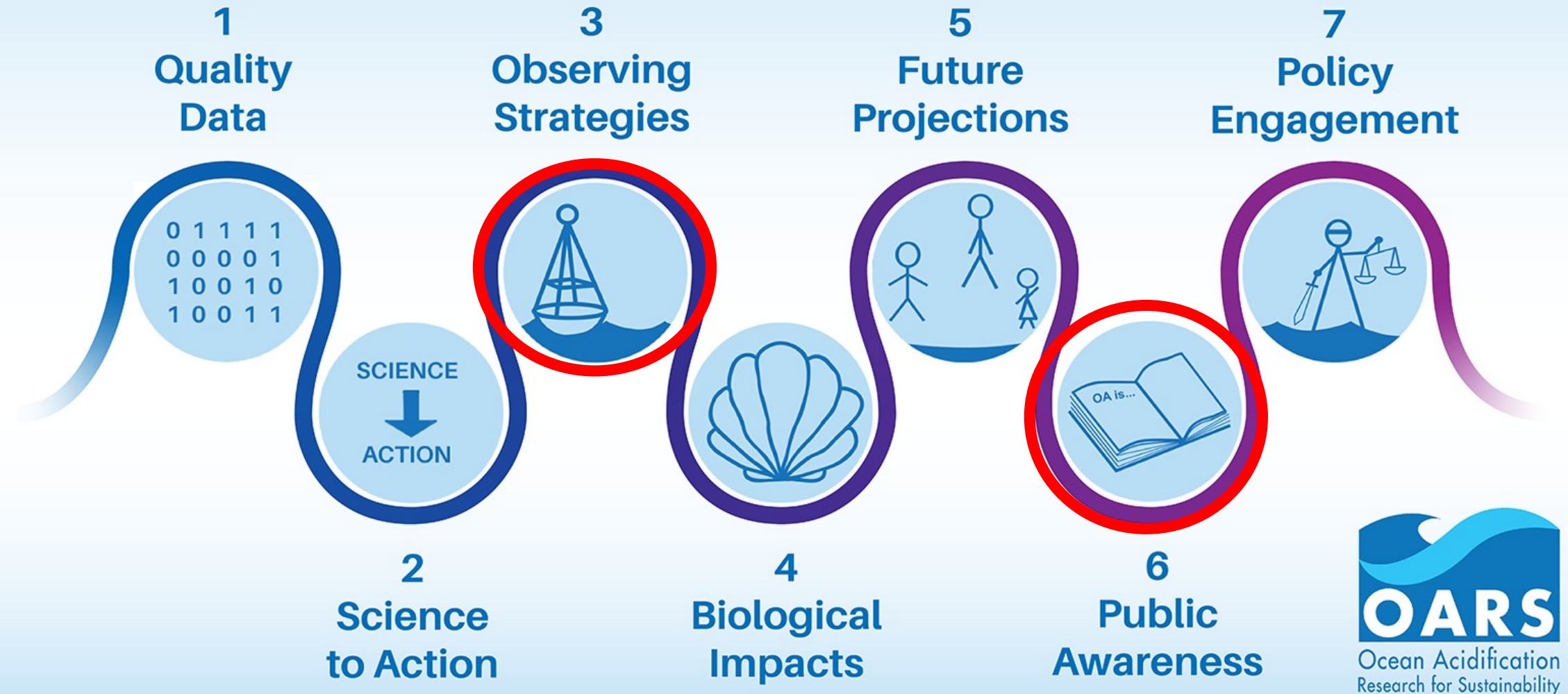
2024

Fiber - coated buoy to increase salt resistance



Tanga – Pemba Sea Scape

Targeted Outcomes



OA hub WIO

OA HUB WIO
Rushingisha, Sam, +258 82 928 5010, +27 82 ...

4/25/2024
~ Daniela added ~ Sean Porter

12/11/2024

~ Dambo Cossa +258 82 928 5010

Virtual Workshop: Designing Multiple...
WIOMSA and SCOR's Changing Ocean
blog.wiomsa.net

https://blog.wiomsa.net/2024/12/11/virtual-workshop-designing-multiple-driver-experiments/?fbclid=IwZXh0bgNhZW0CMTEAAR0jR2hUoXnRPZEef74b1rnNVgtzQ9XIZE8GRCPpQrYdIsZRovV6wlAplE_aem_vmhDCSSvRWMwqukzCOPr8Q

Hi team. Please take a look at this opportunity

Hi team. Please take a look at this opportunity

Thank you for sharing

Rushingisha George

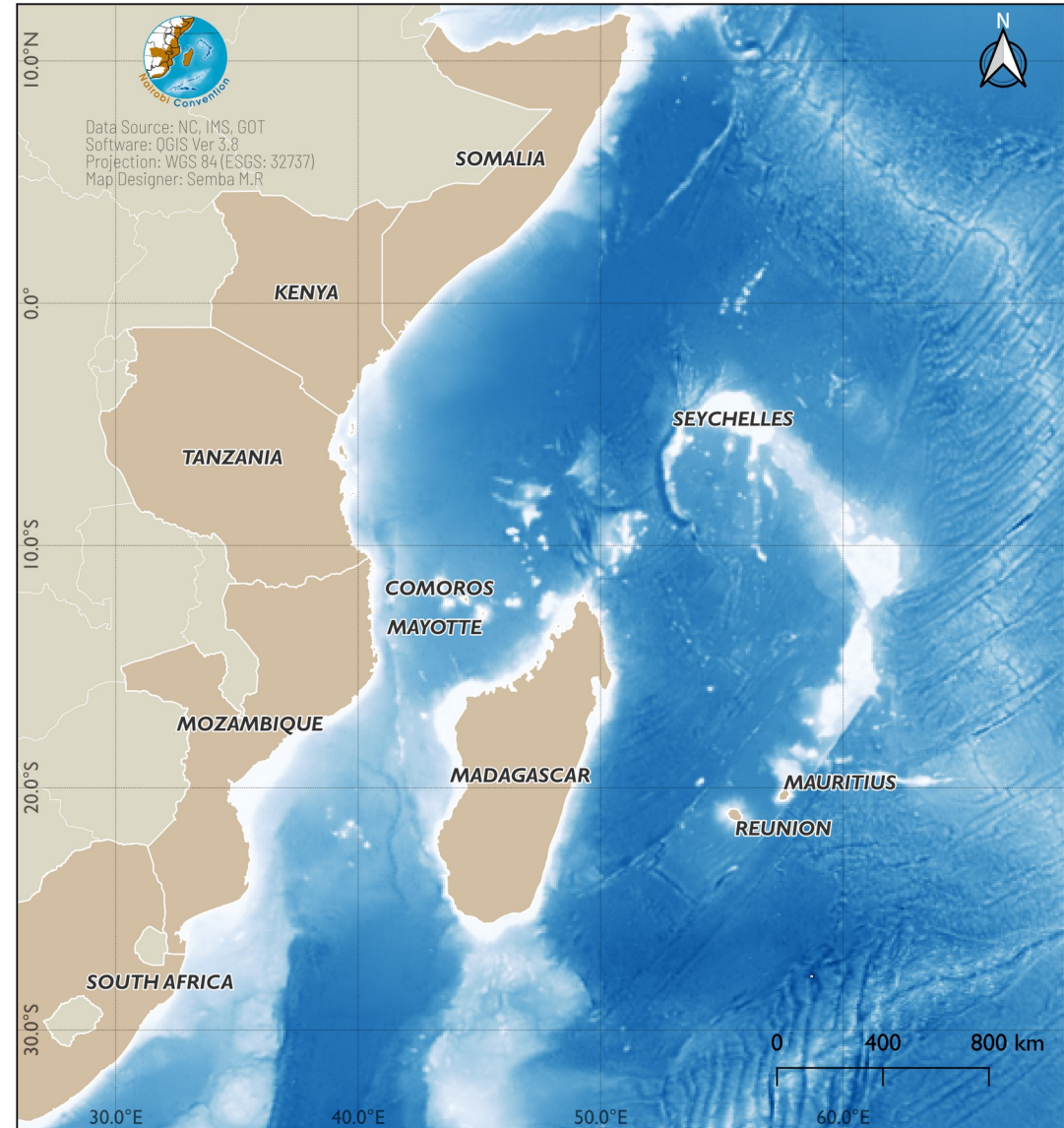
~ Dambo Cossa +258 82 928 5010

Group info

Disappearing messages Off

12 members

- Add member
- You
Hey there! I am using WhatsApp.
- Rushingisha George
Family
Group admin
- Sam Job
Nothing to fear than fear itself
Group admin
- ~ Daniela
Group admin
- ~ Dambo Cossa
Disponível
+258 82 928 5010
- ~ Sean Porter
+27 82 514 8014
- +254 726 215339
- +255 772 420 480
One Earth.
- +258 82 326 1760



FAR4 ViBE

2024

**SIDE
EVENT**

30th Oct 2024, Wed
1100H – 1400H
Room 2 – AICC

MONITORING OCEAN ACIDIFICATION IN THE TANGA-PEMBA SEASCAPE: PROGRESS, CHALLENGES AND OPPORTUNITIES



Rushingisha George



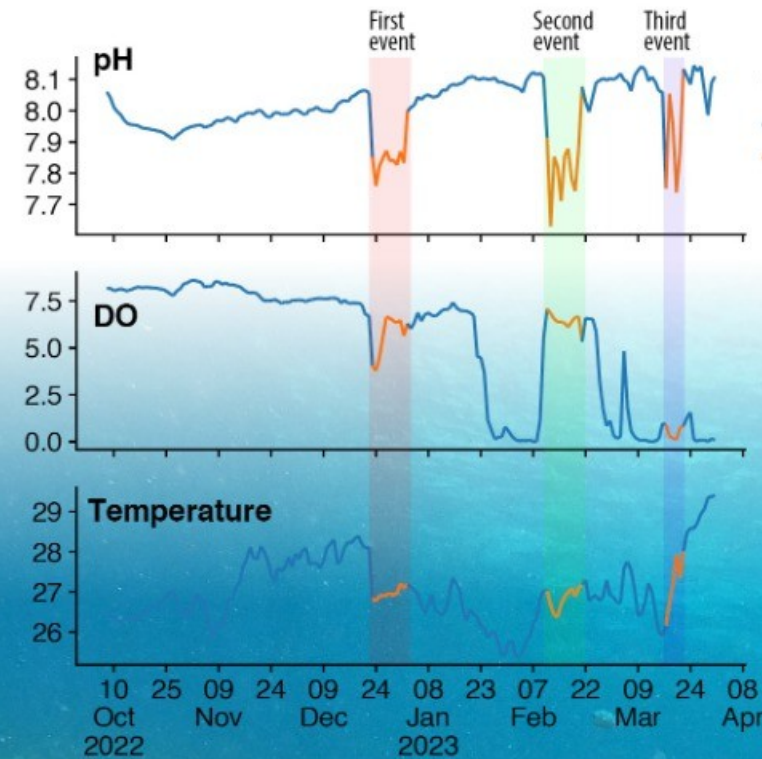
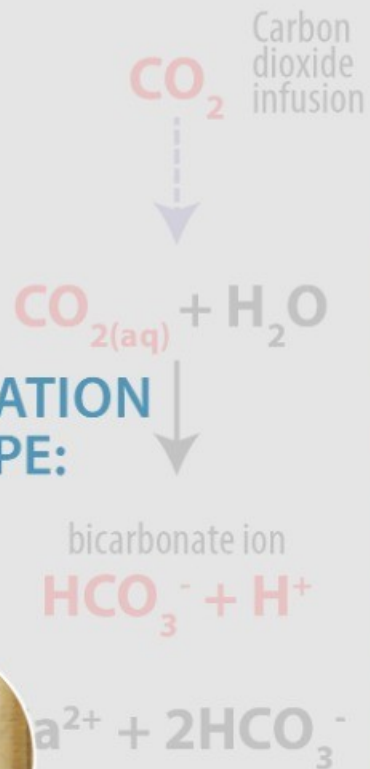
Samson Job



Masumbuko Semba



Scan to register



Oceanic Events

— Non-upwelling
— Upwelling

Ocean acidification in the Tanga-Pemba seascape is driven by increased CO₂ absorption, lowering seawater pH and affecting marine ecosystems, particularly coral reefs. Upwelling events, common in this region, bring deep, nutrient-rich, but also CO₂-rich, waters to the surface, intensifying acidification effects. These processes threaten biodiversity, fisheries, and ecosystem services, making the seascape more vulnerable to climate change impacts and requiring careful management of marine resources.





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Ocean acidification



Ahsante

