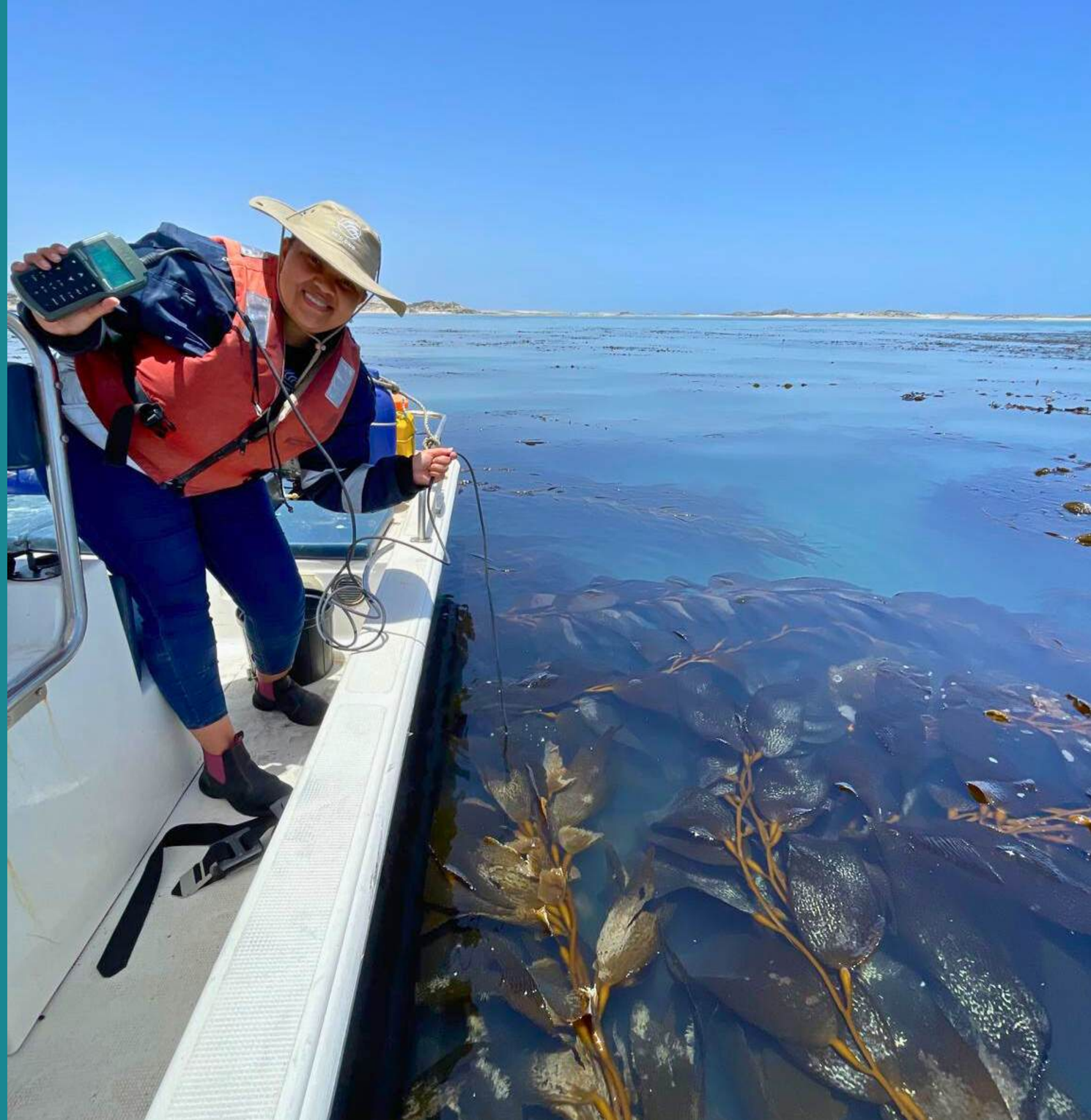
2024 Annual Report

KELP FOREST
FOUNDATION

Contents



Message from the board

Dear Supporters and Stakeholders,

Reflecting back on 2024, we are proud to share a year defined by action, impactful science, and capacity building. and we've made real progress in unlocking the potential of kelp ecosystems for climate, biodiversity, and human well-being.

Research:

- We launched a groundbreaking study with Cawthron Institute, NatureMetrics, and Sequench, using advanced metabarcoding technology to identify the unique genetic markers of giant kelp. In April, we successfully kicked off our eDNA study with these partners, marking an important step forward in kelp research.
- PhD candidate Gadaffi Liswaniso spent his internship at the King Abdullah University of Science and Technology - analyzing sediment samples taken from Namibia's deeper coast for carbon content.
- KFF Scholar Michael Mateus MSc study demonstrated the higher productivity of farmed giant kelp compared to wild counterparts. His thesis underscores the need for targeted studies on DOC variations and the development of non-destructive kelp monitoring techniques to support conservation and management.

Capacity Building:

- The Blue House Fellowship Programme welcomed its third cohort of MSc students, with Dortea, Paula, and Sakarias making strong progress in their research and training.
- A new cohort of MSc students for 2025 has been selected, focusing on nutrient dynamics in cultivated kelp ecosystems.

Ocean Education:

A variety of after-school programs were held at the Lüderitz Blue School, including participation in the Oranjemund Winter Festival and skill-building initiatives like Model United Nations and a three-day Edu-Game workshop - all focused on introducing the oceans and climate learnings to young students.

Public Awareness:

- Our presence at key global events, including the Innovation Zero Conference in London, Advancing Ocean CDR in Boston, and UN COP29 in Baku, further elevated our profile and influence.

New Partnerships & Funding:

- We received a €50,000 grant from the Global Seaweed Coalition to support MSc student Paula's Ocean Acidification project.
- Stolt-Nielsen backed our capacity-building initiatives focused on kelp forest conservation and restoration.
- Through the 1% for the Planet initiative, we secured a major donation from Cell Signaling Technology

While we celebrate these achievements, 2024 has not been without its challenges. However, our commitment to progress remains unwavering. As we look ahead, we are excited to support a new cohort of MSc students, continue advancing scientific research, and foster impactful collaborations.

To our dedicated team, partners, donors, and supporters - thank you. Your commitment and generosity continue to drive our mission forward, shaping a more sustainable future where humanity and nature thrive in harmony.

Warm regards,

Roy Budjhawan
Managing Director

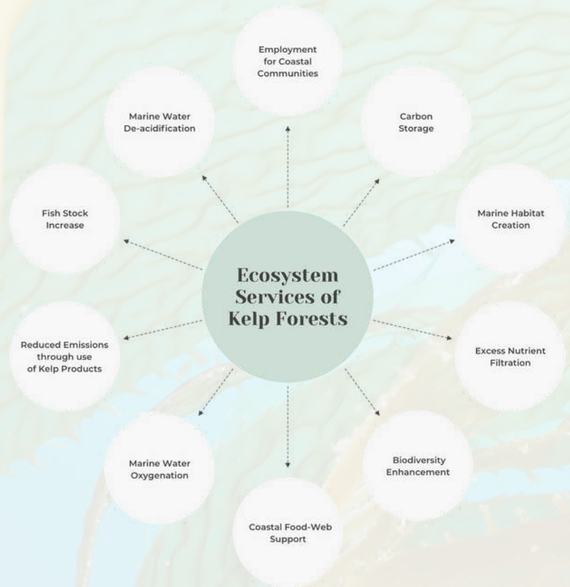
Caroline Slootweg
Board Chair

About Kelp Forest Foundation

We are a Netherlands-based nonprofit with a mission to unlock kelp as a nature-based solution to restore the health of the planet. We advance kelp science, bridging knowledge gaps by working together with research institutions, coastal communities and industry. Next to our research, we aim to inspire and support the next generation of ocean stewards through education and training.

Why kelp?

Kelp forests are among the most diverse and ecosystems in the world. Covering approximately 30% of the world's coastlines, their estimated value is up to $500 billion a year, primarily driven by the value of three ecosystem services they provide: fisheries production, nutrient cycling, and carbon removal. Kelp forests act as key marine habitats, where over 1800 species can find food and shelter. Kelp acts as an ecosystem engineer, creating a supportive habitat for marine life to thrive in.



Kelp can be processed into many high-value compounds, such as agricultural products, foods, cosmetics, nutraceutricals, packaging, and more. Despite their value, these magical underwater forests have gone largely understudied. At Kelp Forest Foundation, we research their potential in product development as well as their potential to sequester carbon, enhance biodiversity and improve water quality. By researching the value of these ecosystem services, we unlock kelp as a nature-based solution in our fight against climate change and the challenges we face as a result of human activity and pollution.

The *power* of kelp

$500 billion

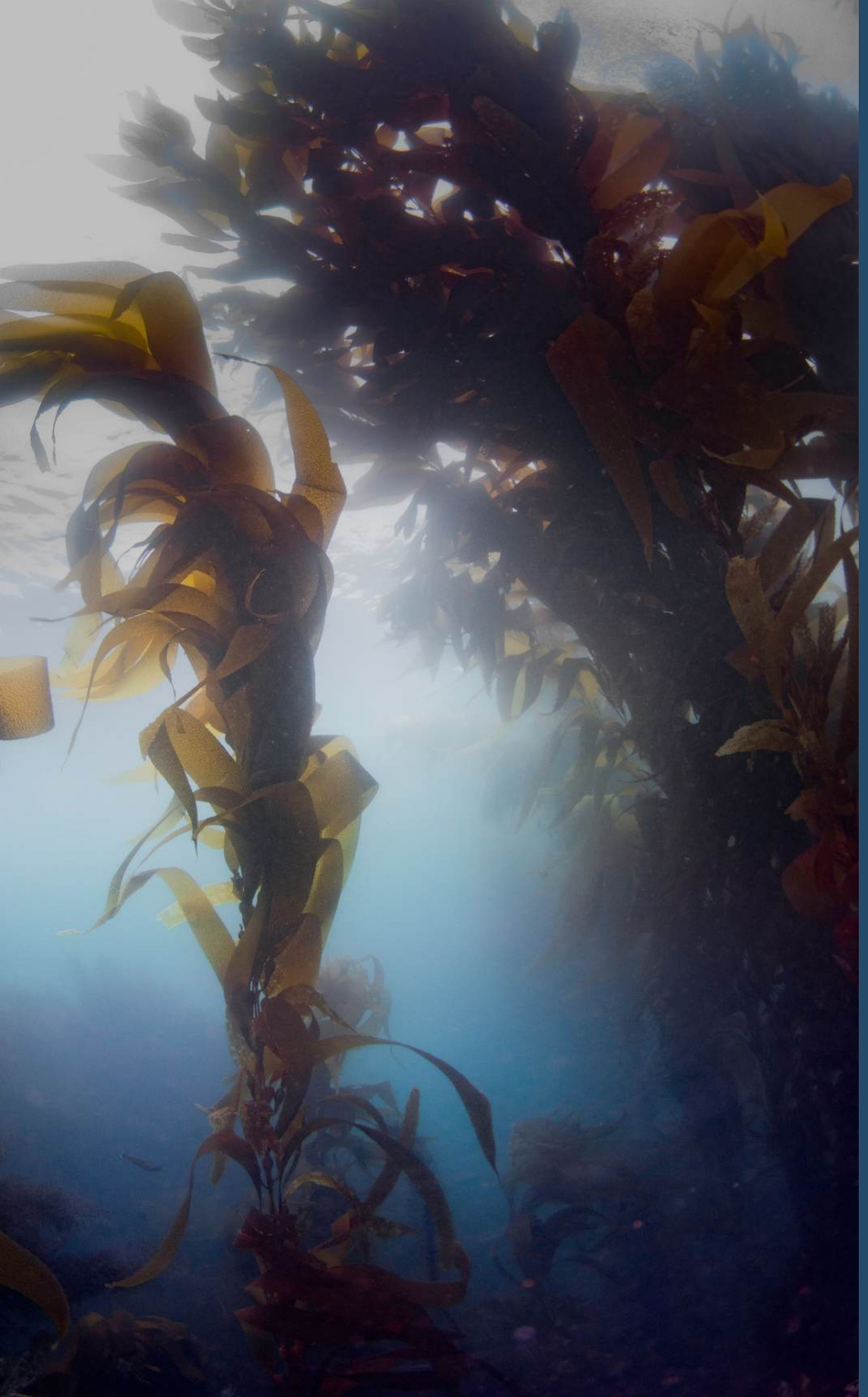
The world's kelp forests combined provide this value in ecosystem services

25%

of the world's coastlines are covered by kelp forests (in comparison, only 0.5% of the world's coastlines are coral reefs)

1000+

A single kelp forest can host over this many different marine species



How we work

In 2024, Kelp Forest Foundation introduced a revised strategy, with the clear aim to establish kelp as a nature-based solution for climate change, biodiversity loss, and social impact. Our impact is defined by three pillars that we evaluated need attention and urgency.

Pillars

Research

We advance open-access research into kelp's ecological benefits and the value of kelp-based products. Our research topics include kelp's ability to sequester carbon, enhance biodiversity, improve water quality and form a buffer against ocean acidification, and the benefits of kelp-derived products.

Restoration

Co-develop business models that enable kelp forest recovery at scale, by focusing on ecologically restorative, socially inclusive, and economically viable solutions

Value creation

Kelp can be transformed into innovative products, including sustainable packaging, textiles, food, agricultural products, and more. We're working to integrate kelp-based solutions into everyday industries.

Our actions

- Kelp Forest Foundation develops research projects with academic partners and local communities
- Through scholarships and capacity building programs, we are helping to build the next generation of ocean scientists
- We are developing the carbon credit methodology for kelp ecosystems, as well as co-developing other tools like biodiversity frameworks to assess the ecological benefits of kelp
- By co-developing business models for kelp restoration initiatives, we build lasting change in kelp recovery
- We utilize our applied research to work towards science-backed restoration approaches
- Research kelp-based products and their ecological benefits
- Spread awareness around the multitude of products that kelp can be used for

Our impact to date

ACADEMIC RESEARCH

1 1st ever ocean CDR model published

21 Research projects

23 Research partners worldwide

WE FUNDED

9 Master's students

2 PhD students

5 Postdoc researchers

AWARDS

2022 MIT SOLVE Solver

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

uplink The open innovation platform of the World Economic Forum Top Innovator

FUNDS RAISED

2,5+ Million EUR

KNOWLEDGE SHARING

31 Interviews, conferences, webinars and podcasts

7 Mentions/quotes in published reports/articles

OCEAN EDUCATION

With our funding, the Luderitz Blue School organised:

92 Ocean's Day as part of afterschool activities

77 Robotics Clubs

157 Children benefited from the clubs/program

ACHIEVEMENTS 2024

Research

Carbon sequestration

RESEARCH PROGRAM

Kelp forests are considered a potentially important natural sink for carbon, and their contribution to climate change mitigation is yet to be fully understood. As kelp forests grow on rocky bed substrates, there is little to no local burial of carbon. However, there is evidence that some of the kelp biomass is transported to deeper seafloor locations where it is sequestered in sediments. This involves complex dynamics that are difficult to measure with traditional tools and methods. At the Kelp Forest Foundation, we drive the science on these measurement methods to close the existing knowledge gaps, with the ultimate aim to develop carbon credit methodologies that can be applied within the industry and by kelp restoration initiatives.

Kelp carbon sequestration - how does it work?

Through photosynthesis, kelp absorbs carbon from its surrounding waters and stores it in its biomass. This kelp biomass will naturally break off over time, due to old age, storms, and propellor cuts. Some of this kelp biomass, containing carbon, will end up in deeper layers of the oceans, where they can be stored for extended periods of time, therefore 'locking away' the carbon and preventing it from returning to the atmosphere.

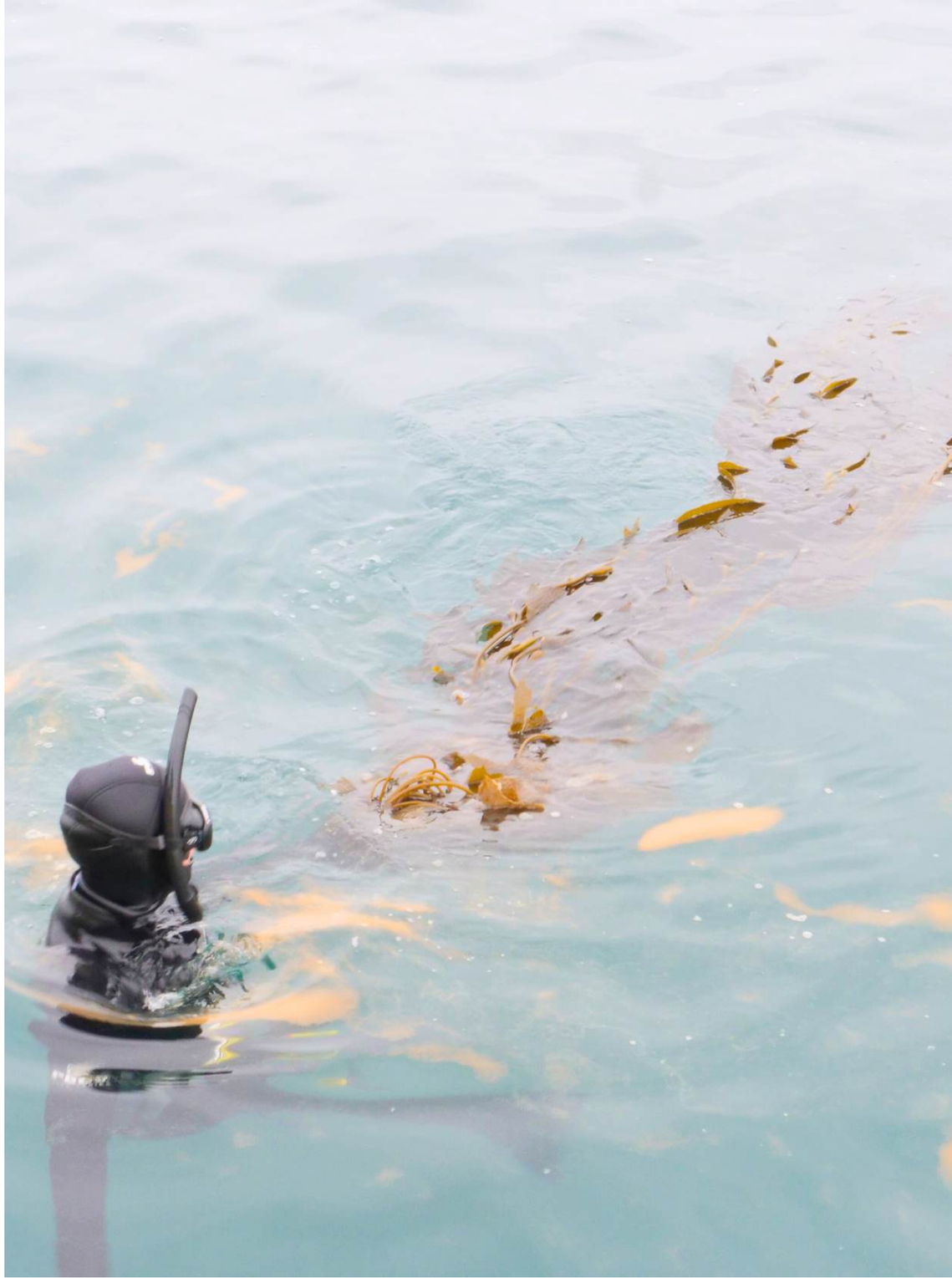
Our research programme aims to understand exactly how much, where, and for how long, kelp carbon gets sequestered, to understand their impact on climate change. Over the past years, we have initiated research projects that reveal a piece of the puzzle, by answering the following questions:

- How much carbon is temporally stored in kelp biomass?
- How much carbon is naturally exuded or lost by the kelp, and how much of it gets stored in deeper ocean sediments or waters?
- When analysing sediment samples, can kelp carbon be recognised and quantified? Do we know something about the age (and thus permanence of kelp carbon?)

Understanding kelp's carbon sequestration potential is important for nature and society. Once well understood, it can be an important, nature-based tool against climate change, and provide additional understanding of the importance of these marine ecosystems.

Accomplishments in 2024

Finding all the answers on carbon sequestration is a challenging endeavor. In 2024, we have started new collaborations, supported the development of the groundwork needed for quantifying carbon, built a strong monitoring set up for Kelp Blue's farm in Namibia, and attempted to collect deep ocean sediments ourselves. Looking ahead, the continued integration of these studies will enhance our ability to leverage kelp forests as a natural solution for carbon management and climate resilience.



Carbon sequestration & ocean acidification

2024 HIGHLIGHTS

Net Primary Production (NPP) Study

MSc. Scholar Michael Mateus concluded his studies focused on calculating the Net Primary Productivity (NPP) of cultivated kelp in Lüderitz, Namibia. Michael contributed to the knowledge of how much carbon kelp is able to capture and store in its tissue. His work included an assessment of Dissolved Organic Carbon (DOC) concentration at the kelp farm location. During his studies, Michael collected water samples across 10 stations at the kelp farm, including seawater samples, followed by randomized giant kelp samples. These were analysed at the University of Ottawa for their Dissolved Organic Carbon content, as well as the composition of the kelp samples.

Michael's study underscores the higher productivity of farmed giant kelp compared to wild counterparts, emphasizing that where the kelp is located (spatial factors) and what it's made of (compositional factors) are crucial for understanding how much dissolved organic carbon (DOC) is present in the ecosystem. Further thesis findings suggest the need for more targeted studies to understand DOC variations in marine ecosystems and recommend developing non-destructive ways to monitor kelp production to help support management and conservation worldwide.

Biomarkers of giant kelp

Our new global research initiative, in partnership with Cawthron Institute, Sequench, and NatureMetrics, investigates the carbon sequestration role that kelp plays in our oceans using cutting-edge eDNA technology. This initiative aims to identify giant kelp DNA in sediment samples (by deciphering its unique 'fingerprint'), to establish a direct link between source and sink of these kelp habitats. This important research will contribute to conservation efforts for these globally crucial kelp habitats and encourage their re-forestation.

Sediment Baseline Study

What if we could discover whether sediments along our ocean's coasts can sequester carbon? PhD student Gadaffi Liswaniso is working to quantify the baseline level of organic carbon found in the sediments along the Lüderitz coast. Assessing carbon burial rates is important because it helps us understand how much kelp-derived carbon is being stored in the ocean. Gadaffi aims to quantify the baseline level of organic carbon found in these sediments by analyzing samples from the seafloor.

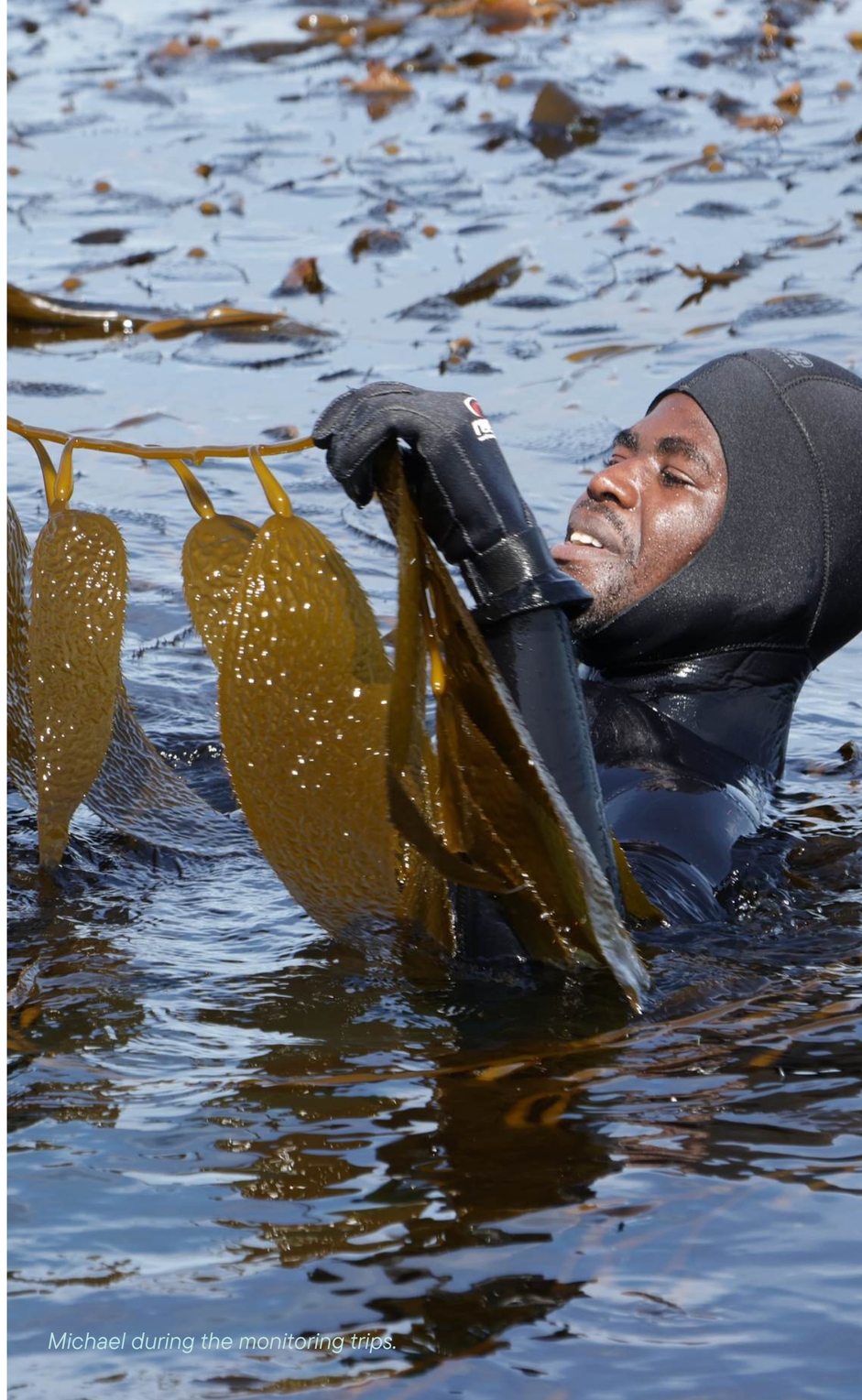
Gadaffi's research is key in helping us understand if, and how, kelp forest sediments can act as carbon sinks - potentially giving us a clearer picture of how kelp can manage carbon as part of its ecosystem services, especially in our efforts to manage climate change.

This year, he completed his internship at the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. He completed the carbon-13 (^{13}C) and Lead-210 (^{210}Pb) analysis there, returning to Namibia in December to continue working on eDNA samples for further analysis.

This research was made possible through a generous donation from The Great Island Foundation.

Kelp's buffering effect for ocean acidification

Paula Sacheus, as part of the 2024 cohort of MSc students, started her study programme in assessing the buffering effect kelp has on ocean acidification. As kelp grows rapidly, and absorbs carbon dissolved in the seawater, it helps increase pH levels, creating a favourable 'halo' of improved water quality for species to thrive.



Michael during the monitoring trips.

Biodiversity

2024 HIGHLIGHTS

Fish spawning and nursery grounds in cultivated kelp forests

MSc Scholar Sakarias Malyenge is investigating the potential of cultivated kelp forests to serve as spawning and nursery habitats for commercially important fish species. In 2024, Sakarias focused on fieldwork preparation and data collection, laying the foundation for full analysis in 2025. Early sampling revealed the presence of Scombrids, Gobies, Mullets, and Syngnathids, with juvenile lobsters (Palinuridae) more frequently observed at the cultivated site than in adjacent areas—supporting prior research on kelp-associated recruitment. Adverse weather limited lobster sampling to September, October, and December, but the data gathered already show promising patterns. With a second draft of his thesis under review, Sakarias is now entering the data processing phase, which will allow him to model seasonal and species-specific trends starting in early 2025.

Marine Benthic Organisms

MSc graduate Beata Tooleni successfully completed her thesis on the effects of farmed giant kelp on benthic macro-invertebrate communities in Shearwater Bay, Namibia. Her work assessed how cultivated kelp forests influence the abundance and composition of seafloor-dwelling species—such as worms, mollusks, and crustaceans—that serve as critical indicators of ecosystem health and water quality.

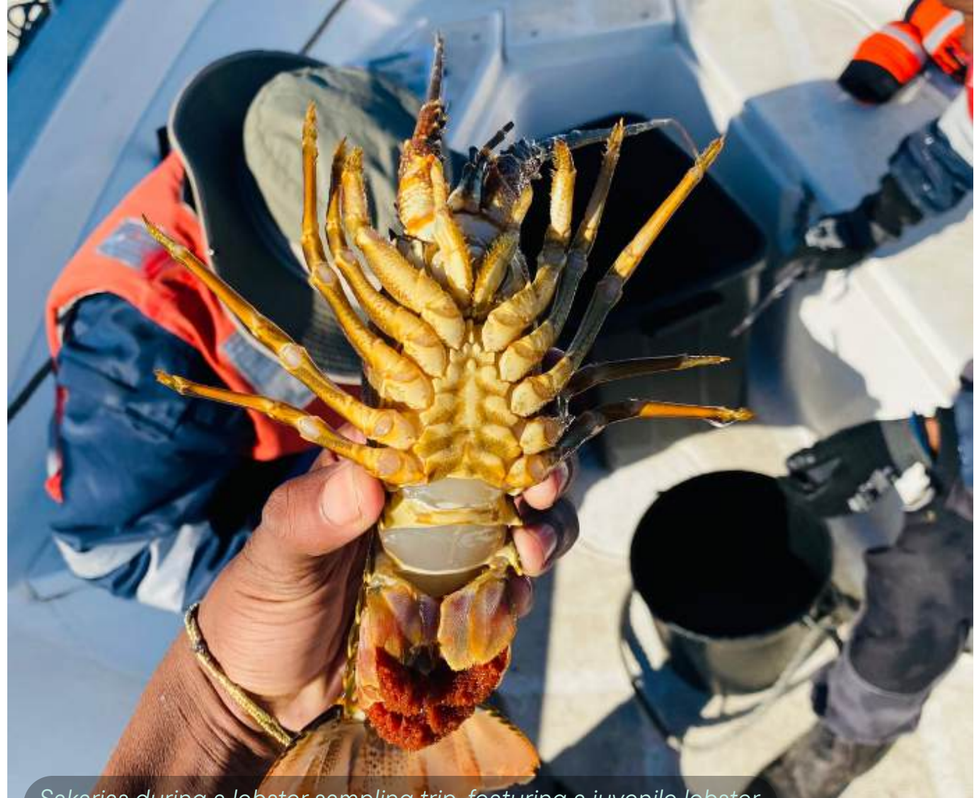
Beata's research not only demonstrated that kelp cultivation areas support diverse benthic life, but also highlighted key differences in community structure between farmed and unfarmed sites. As a newly appointed Fisheries Research Technician at the Namibian Ministry of Fisheries, Beata continues to contribute her expertise, including through guest lectures at the University of Namibia, where she shares her insights on benthic sampling and organism identification with first-year marine science students.

Fauna associated with kelp

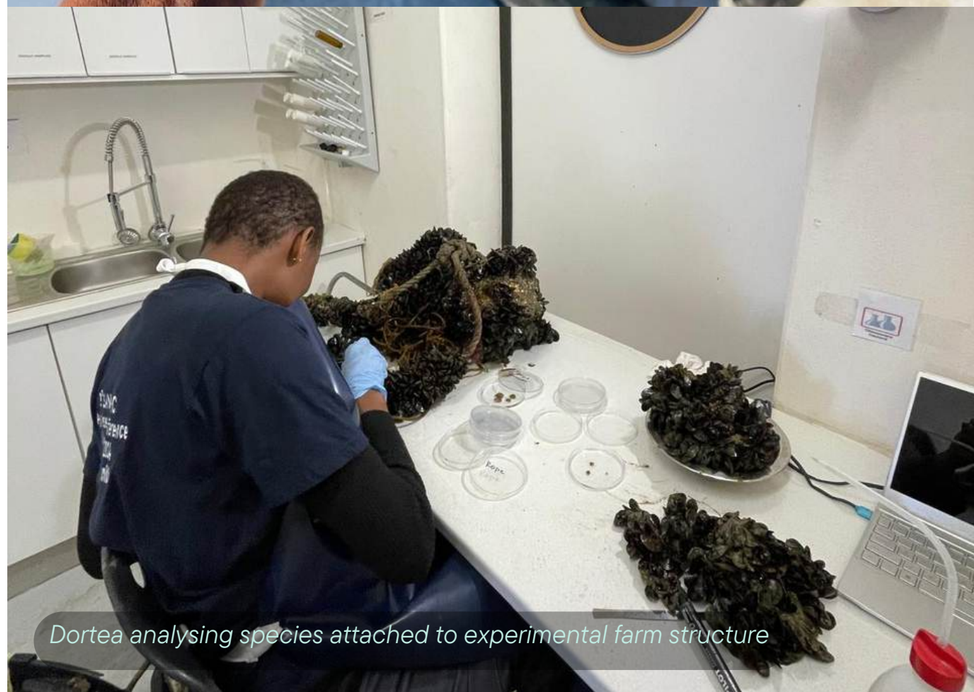
In 2024, MSc Scholar Arisha September finalized her thesis on marine fauna associated with cultivated kelp habitats. Her research bridges existing gaps in our understanding of how farmed kelp forests interact with broader trophic networks and faunal assemblages beyond benthic invertebrates. Arisha's work will inform both ecological baselining and the development of monitoring frameworks for restoration and biodiversity crediting in future kelp initiatives.

Species attaching to kelp farm structure

Dortea Hamukoto, another MSc student of the 2024 cohort, has started analyzing sessile species attached to the farm structure. Sessile species are those marine animals that attach themselves to a substrate - in this case, farm structure such as ropes and concrete - and are relatively immobile (for example mussels and shellfish). Dortea has helped deploy experimental blocks that facilitate her studies - by studying every inch of these blocks, Dortea has been able to assess the biodiversity of sessile species, contributing key information to how kelp ecosystems are structured.



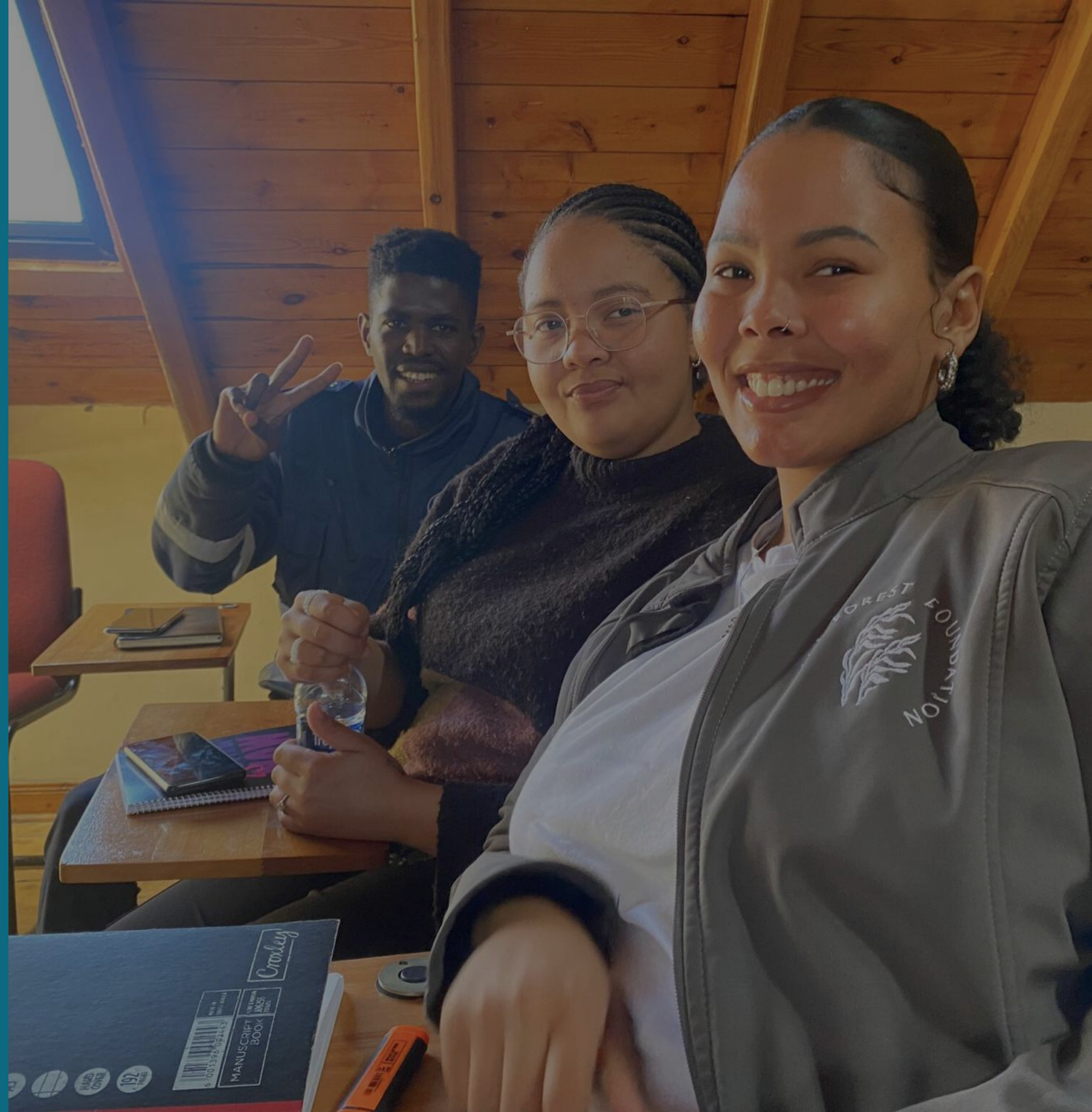
Sakarias during a lobster sampling trip, featuring a juvenile lobster.



Dortea analysing species attached to experimental farm structure

ACHIEVEMENTS 2024

Capacity Building



Essential Skills for Marine Scientists

Our Blue House Fellowship provides comprehensive skills development to students in marine science. We stimulate capacity building and outreach practical training that helps propel students to become well-rounded employees and capable marine scientists. We help them excel in their field and laboratory work by offering specialized training tailored to their research needs and future career paths.

These are the activities and events they attended in 2024

Core skills development:

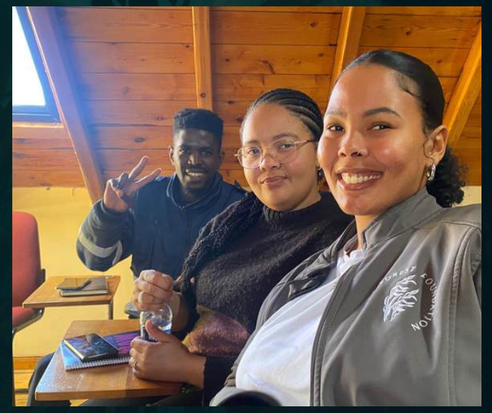
- Swimming and sea safety certification for all students
- Advanced diving courses when relevant to research focus
- Presenting their studies at international conferences (minimum 2 per student)
- Professional networking opportunities with global experts

Specialized training programs:

- Marine taxonomy and species identification
- Laboratory techniques and ISO standards
- Seabird safety and monitoring protocols
- Research vessel operation and safety
- Marine mammal entanglement prevention

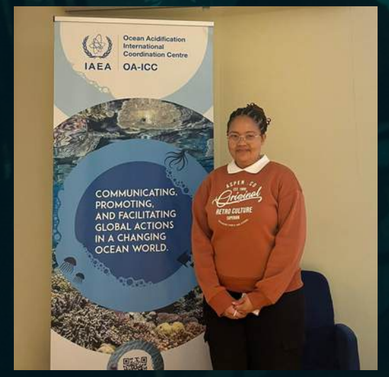
MSc. Dortea and Beata attend taxonomy workshop with Anchor Environmental Consultants

MSc. Sakarias and Beata attend the National Students Research Symposium (NCRS) in Windhoek to present their research

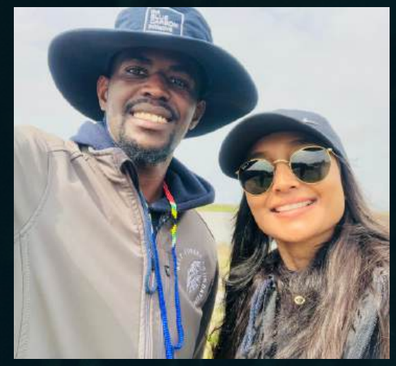


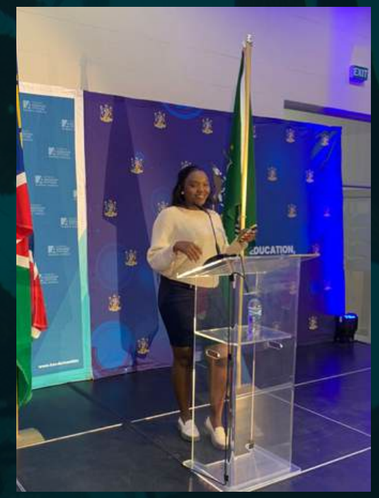
MSc. Michael presents his research at the Blue Carbon Initiative Conference in Cape Town

MSc. scholar Paula arrived in Monaco and started her Winter School on Ocean Acidification

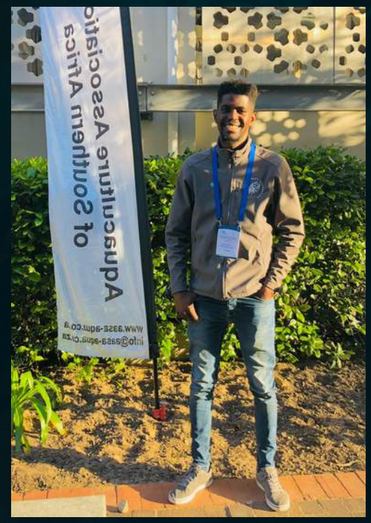


MSc. Arisha, Michael, and Paula attend Seabird First Responders Workshop





MSc. Michael attends the IBCSWG conference and the Aquaculture Association of Southern Africa conference



ACHIEVEMENTS 2024

Ocean Education

Ocean Education

As part of our Ocean Literacy and Skills Development program, we collaborate with The Lüderitz Blue School to offer extra-curricular activities that engage children in ocean education, robotics, and environmental stewardship. With student numbers growing, we expanded our programs to ensure all learners had access to hands-on experiences that foster curiosity and a connection to the marine world.

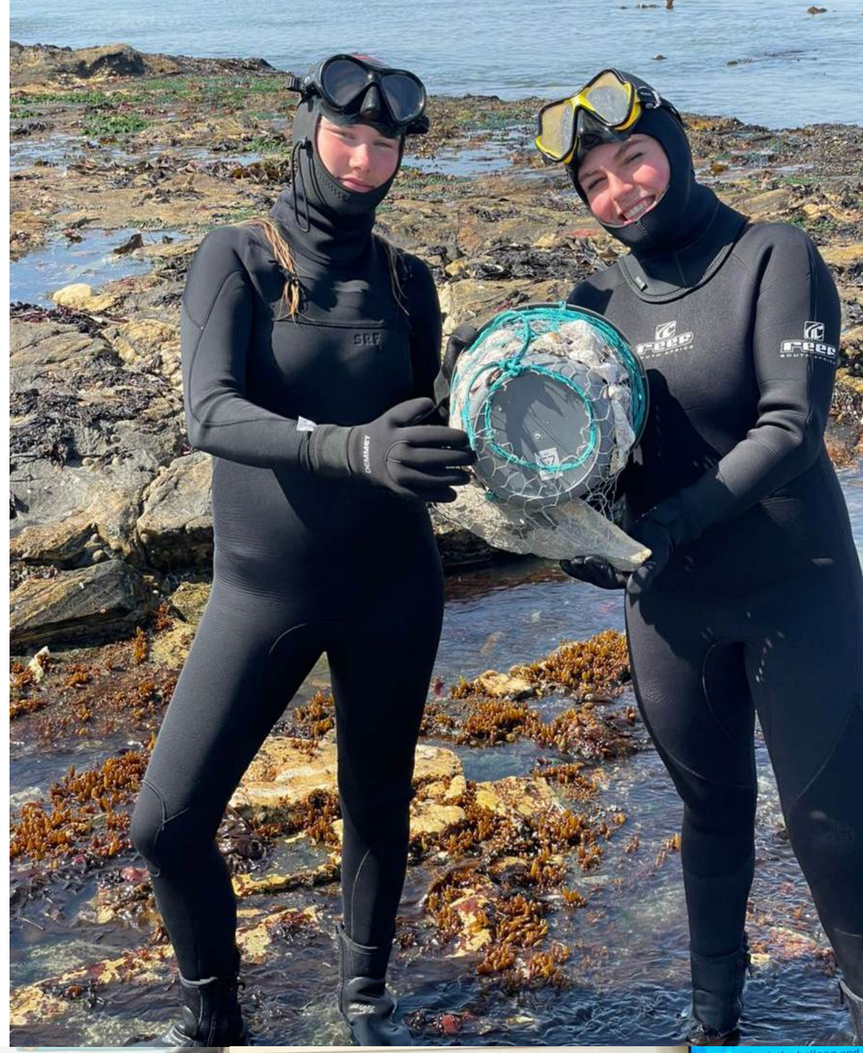
Our Strandcubs (the Ocean's Day program for children aged 8-12) enjoyed a day of surfing, explored Kelp Blue's agricultural land to learn about composting, and even led their own lessons—one student taught a class on the Basilosaurus isis, an ancient ancestor of modern whales, inspiring peers to design their own whale species.

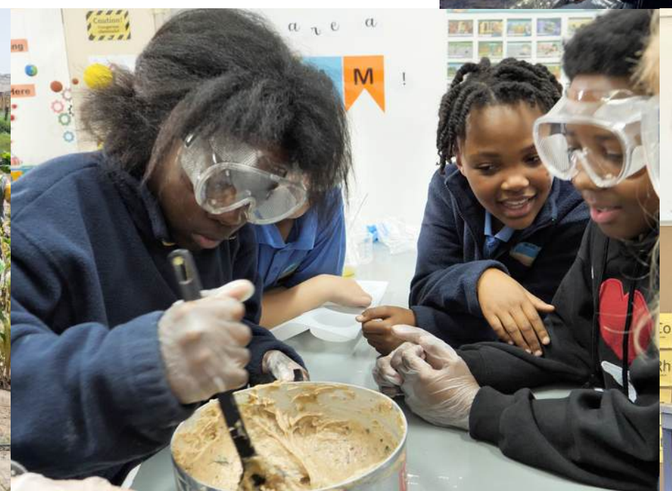
Throughout the year, students participated in a diverse range of projects and events:

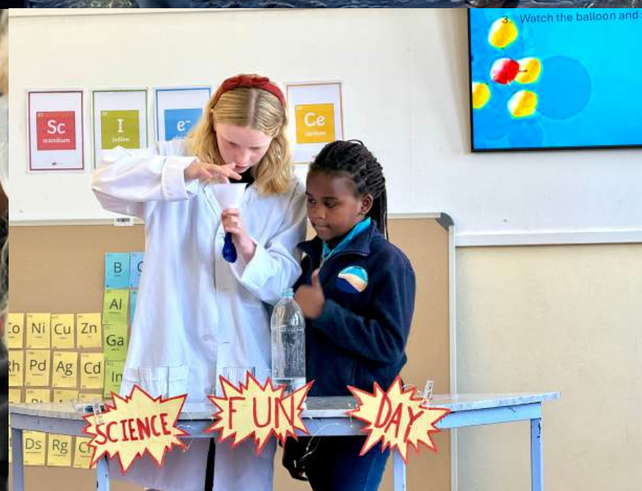
- Cultural experiences like the Oranjemund Winter Festival
- Skill-building initiatives such as a Model United Nations exercise and a three-day Edu-Game workshop
- The opening of the Lüderitz Maritime Museum, where students contributed exhibits showcasing local marine discoveries
- Astronomy Club sessions exploring the life cycle of stars with Stellarium
- Robotics Club projects, including a Mars Rover replica to celebrate Curiosity Rover's achievements
- Sailing Club excursions, taking to open waters for the first time and building seafaring skills at Agate Beach

The final months of the year brought great opportunities for students to connect with the ocean. A standout moment was a surf lesson from 26-time World Champion windsurfer Antoine Albeau, fresh off breaking his own speed record at the Lüderitz Trench during the Lüderitz Speed Challenge. The Sailing Club continued its training, with surprise coaching from legendary windsurfer Björn Dunkerbeck.

Inside the classroom, students engaged in hands-on science experiments and environmental projects, culminating in the school's first-ever production of Treasure Island—a fitting celebration of Lüderitz's maritime heritage. Through these immersive experiences, we are nurturing the next generation of ocean stewards, equipping them with the knowledge, skills, and passion to protect and preserve our marine ecosystems.







ACHIEVEMENTS 2024

Public Awareness

Public awareness

PRESENTING KELP ON A GLOBAL STAGE

Public awareness of kelp's potential is crucial for supporting industry growth and establishing kelp as a recognized nature-based solution. In 2024, the KFF team participated in conferences worldwide to share our research with industry peers, academics, and the public:

World Oceans Day
While in the Erongo region, KFF scholar Arisha and the team represented the Kelp Forest Foundation at the World Oceans Day event in Walvis Bay. They presented their research and its relationship to Giant Kelp and Kelp Blue to scholars and community members in attendance.

Congreso Futuro, Chile
Samantha Deane gave a “Ted-style” talk to over 600 people and broadcasted live on Chilean TV. At the Congreso Futuro (“Future Congress”) - the main annual scientific humanist dissemination event in the Southern hemisphere, Samantha highlighted Nature’s intelligence and the role of seaweed as a regenerative ocean-based opportunity.

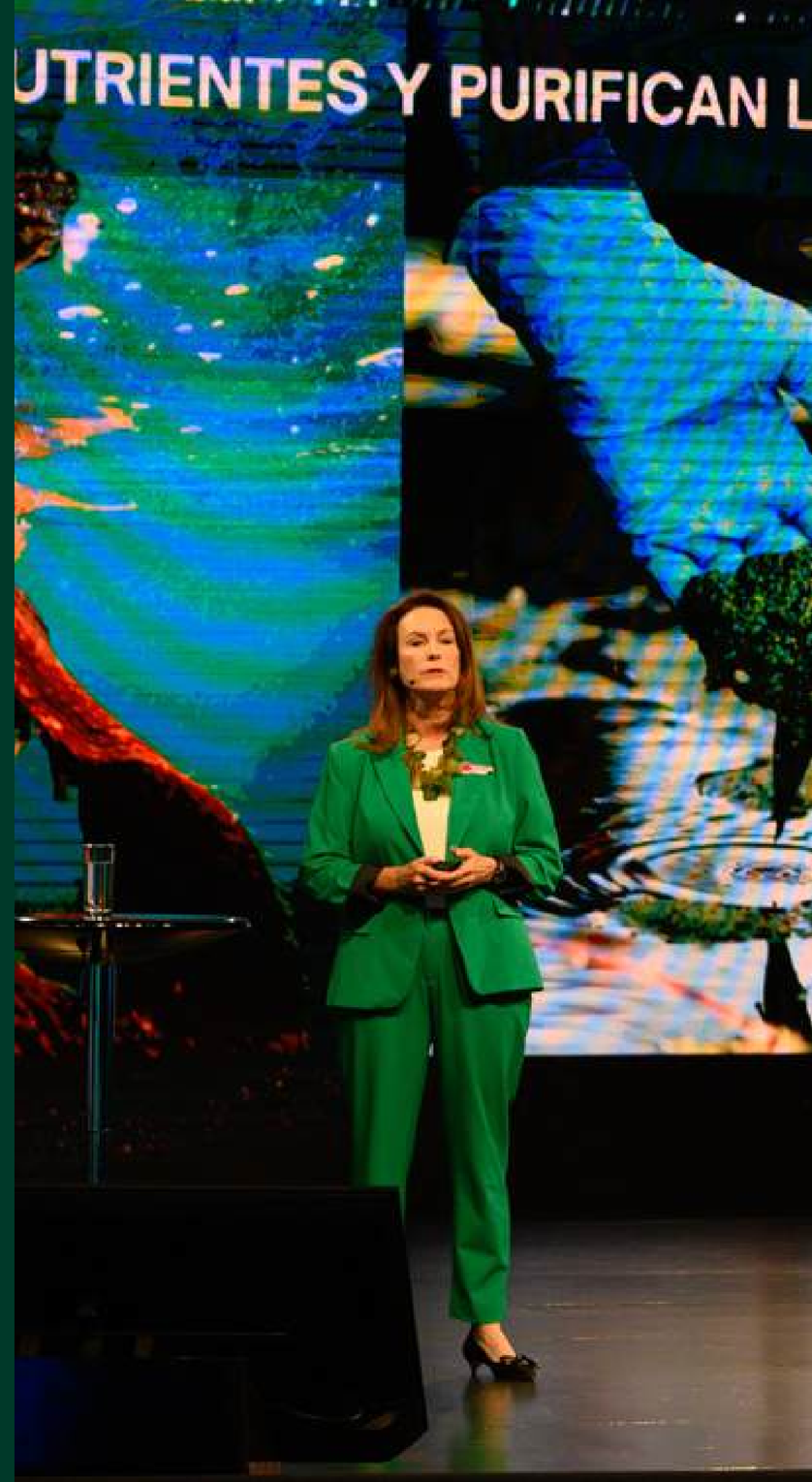
Advancing marine CDR - Boston
Program Lead Xu attended the Advancing Marine CDR in Boston to connect with stakeholders in the ocean space. Xu participated in the panel discussion, "Breaking Down Silos Between CDR Stakeholders", where they discussed closing the gap between carbon credit suppliers and takers.

MSc. Angelique presents at Global Seaweed Coalition Webinar
MSc. scholar Angelique presented her biodiversity research study at the Global Seaweed Coalition's workshop. She focused on seaweed farming and its eco system benefits and the shared collective knowledge for improving research methodologies in the field .

COP29 in Baku
Managing Director Roy Budjhawan attended COP29 in Baku, Azerbaijan to connect with ocean supporters, innovators and organisations. The conference established rules and a UN registry to facilitate and document the international trading of carbon credits and find agreements on financing measures to mitigate climate change and support developing nations' transition to sustainable energy.

Building Bridges Summit in Geneva
Roy then headed to Switzerland to attend the Building Bridges Summit, an event focused on addressing the twin climate and nature crises, widening social inequalities and the question of how to mobilize capital in unprecedented amounts to build a just, resilient, and sustainable future. This conference was an opportunity to connect with the impact finance sector, gathering public and private capital players in the same event.

YOUNGO - UN Climate Change Biodiversity Academy
Xu gave a webinar session for the UN Climate Change YOUNGO's Biodiversity Academy attendees. She was invited to share our insights at the Kelp Forest Foundation as a speaker at the Mobilizing Blue Carbon session, where she introduced participants to kelp forests, their role in supporting biodiversity, and their potential to help us mitigate climate change.



2024
IN REVIEW

Financials

Financial statement

BALANCE SHEET
(after allocation balance of income and expenses)

ASSETS			LIABILITIES		
Cash at bank	€	255.024	Current liabilities	€	8.377
Current assets	€	0	Other reserves	€	246.647
Total assets	**€**	**225.024**	**Total liabilities**	**€**	**222.218**

PROFIT AND LOSS STATEMENT

INCOME			EXPENSES		
Income from companies	€	41.378	Spend on objectives	€	241.866
Income from non-profits	€	244.915	Cost of management/admin	€	9.400
			Financial expenses	€	1.681
Total income	**€**	288.438	**Total expenses**	**€**	**252.947**
Income minus expenses	**€**	**35.491**			

Thank you to our supporters

The Kelp Forest Foundation is incredibly grateful to the following foundations and institutions for their funding support:

comon FOUNDATION

GORDON AND BETTY MOORE FOUNDATION

global seaweed coalition

J, C & R KREDIET CHARITABLE FOUNDATION

kelp blue

BLUE MARINE FOUNDATION

CLIMATE REPAIR — UNIVERSITY OF CAMBRIDGE

Great Island Foundation

Ocean Born

SOA — SUSTAINABLE OCEAN ALLIANCE

PRINCE ALBERT II OF MONACO FOUNDATION

Cell Signaling TECHNOLOGY®

Stolt-Nielsen

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