

2Q QUARTER PROGRESS REPORT

2022



KELP FOREST
FOUNDATION



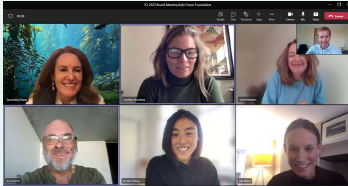
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Q2 HIGHLIGHTS

April

Samantha presented at the University of Namibia (UNAM)



1Q Board Meeting

May

Chuancheng Fu and Dr. Ke Li to support post-doctoral research



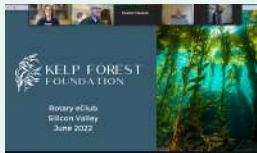
Kelp Blue Documentary trailer filming started

Macrocystis growing at Kelp Blue test site



June

Samantha presented at Rotary eClub



MIT Solve: KFF + Kelp Blue + reNature are Finalists



KFF/Kelp Blue submitted concept note to Gold Standard



UNAM supervisors visited Lüderitz



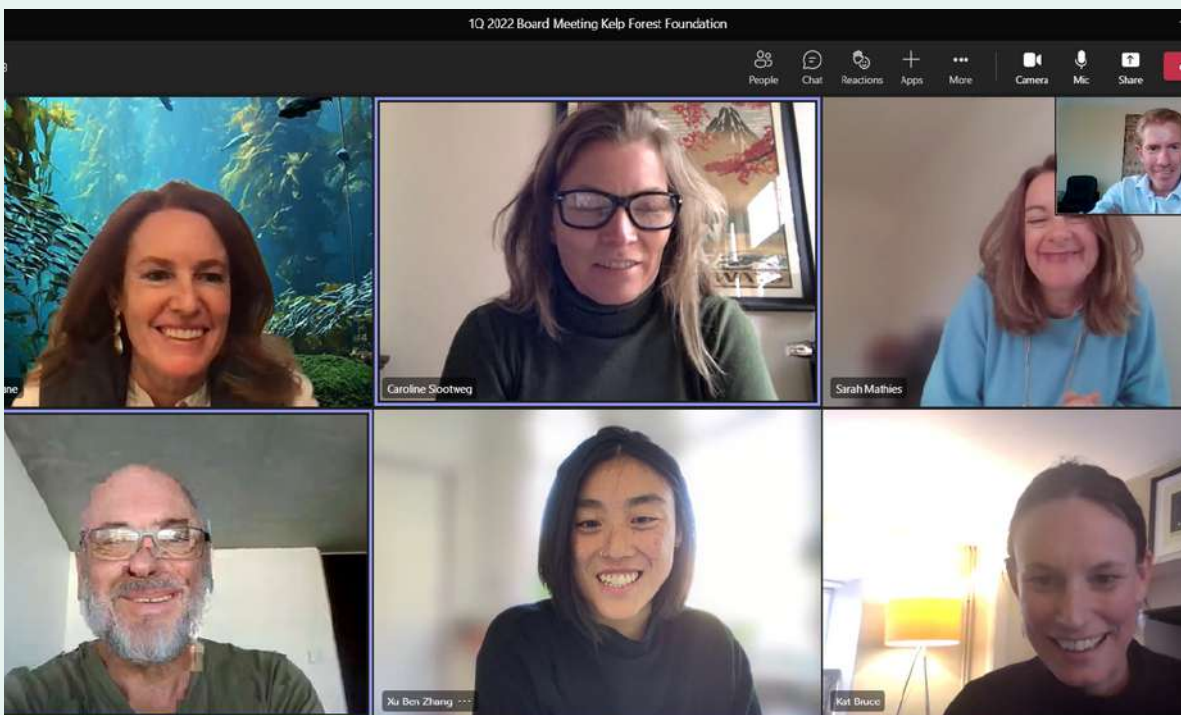
Samantha attended UN Ocean Decade Conference, Lisbon



BOARD MEETING

1Q 2022

Kelp Forest Foundation held its first quarter board meeting online where new board members, Dr Kat Bruce and Sarah Mathies were introduced. Kat is the founder of NatureMetrics, and brings an innovative mindset, a passion for biodiversity and an adventurous attitude to KFF. Sarah leads the Sector Funds team of British International Investment. With over 20 years of investing experience in private equity and development finance in emerging markets she will help us have a sound financial oversight and effective strategic planning. Our new KFF project manager, Xu Ben Zhang, was also presented to the board.



Clockwise: Samantha Deane, (MD, Caroline Sloomweg (Board Chair), Sarah Mathies (Board Member), Daniel Hooft (Board Member), Kat Bruce (Board Member), Xu Ben Zhang (Project Manager), Tim Flannery (Board Member).

RESEARCH PROGRESS

Carbon sequestration

During an online meeting, we gathered with scientific experts to discuss the next steps in the kelp carbon sequestration research. The meeting was attended by Dr. John Taylor, Dr. Carlos Duarte, Dr. Kat Bruce, Dr. Tim Flannery, and Dr. Chuancheng Fu. We discussed how the research on kelp carbon sequestration can be accelerated, and we explored options for collecting samples, information and knowledge that will support the (baseline) study of kelp sequestration in sediments.



Dr. Carlos M. Duarte, Distinguished Professor in Marine Science, has agreed to lead our "kelp carbon sequestration in sediments" research project. KFF will support 5% of his time contributed via the Institute for Abundant Oceans. KFF will be supporting 50% of the cost of Dr Chuangcheng Fu's post-doc position at KAUST. Dr Fu will work under Prof. Duarte.

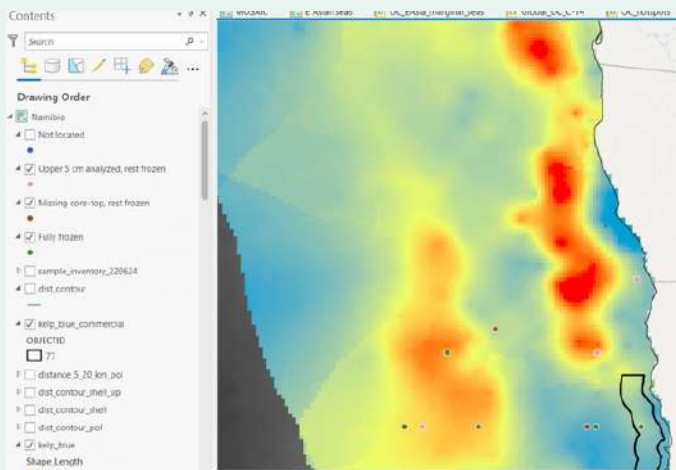
OCEANS-2050

Institute for
Abundant Oceans

RESEARCH PROGRESS

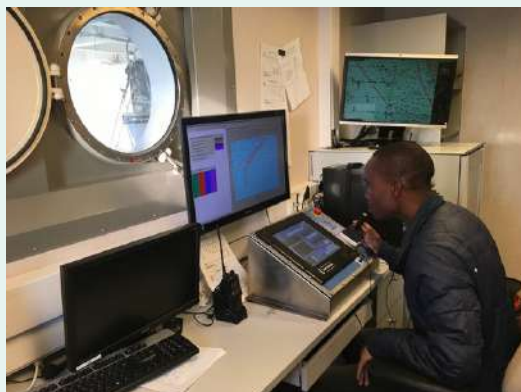
Carbon & acidification

Coring samples for sediment analysis



One of the outcomes of the research discussion with the scientific experts was that ETH Zürich has performed extensive coring in the ocean floor near Lüderitz in the past. It was suggested during this discussion that KFF contacts ETH Zürich to request access to these frozen cores preserved in a way that can help us analyse for eDNA and lipids. KFF has contacted Sarah Paradis from ETH Zürich, and it is agreed that the relevant preserved cores will be divided. Some will be sent to NatureMetrics, and other sections will be frozen or dried and stored at KAUST/Utrecht University/Atomic Agency for further analysis.

Acidification study



Richard Bellerby from NIVA (left) has agreed to mentor Protasius Mutjida (right), KFF's research student who is carrying out the biogeochemistry baseline study, as part of the GOAN programme/Ocean Foundation on ocean acidification.

RESEARCH PROGRESS

New research students



Fauna biodiversity baseline

Elizabeth Petrus, currently a Senior Fisheries Research Technician at the Namibian Ministry of Fisheries and Marine Resources, will be joining KFF and the Kelp Blue monitoring team in Lüderitz to carry out the fauna biodiversity baseline study. She will do so by monitoring the water quality at the pilot site. Elizabeth will be replacing Priskilla who was initially selected to carry out this study.

Ocean modelling system

Dr. Ke Li is a physical oceanographer who will be joining Dr. John Taylor and his modelling team at University of Cambridge. This post-doctoral position was made possible thanks to the contribution by the Gordon and Betty Moore Foundation. Ke Li, with his strong background in fundamental fluid dynamics and computational and applied mathematics, will be an invaluable addition to the Cambridge team, which, together with our foundation, is looking to create a modelling system to assess the carbon sequestration potential of offshore cultivated giant kelp. Ke Li earned his PhD in physical oceanography at IFREMER in France and his Master in Mechanical Engineering at University of New Hampshire.



Carbon sequestration

Dr. Chuancheng Fu is a postdoctoral fellow at the Red Sea Research Center (King Abdullah University of Science and Technology). Chuancheng will support the research on blue carbon processes with Carlos Duarte, focusing on the cycling and storage of organic carbon in coastal vegetated habitats.

Dr Fu has a strong background in soil organic carbon stocks, biogeographic distributions, burial and preservation from China's coastal zone, with an emphasis on the vegetated coastal habitats. Chuancheng holds a PhD in Environmental Science from the Chinese Academy of Sciences and a Master in Soil Science from the Nanjing Agricultural University. KFF will support 50% of his post-doc salary.



RESEARCH PROGRESS

New tools

Tilt sensors

Kelp Forest Foundation has purchased two Tilt current sensors to measure water velocity at the Kelp Blue site. This is key to understanding the direction of the kelp detritus path and helps us focus our sediments research within the likely kelp carbon depo-centres within that pathway.



Products

TCM-1 Tilt Current Meter



The TCM-1 tilt current meter is ideal for measuring water velocity from inland to the edge of the continental shelf. The simple design and lower cost of the TCM-1 make it feasible to measure current in many locations simultaneously.

The core of the TCM-1 is the [MAT-1 Data Logger](#). The MAT-1 data logger was designed for NOAA and is ideally suited as the "brains" of a tilt current meter.

The TCM-1 is field configurable for either low or high current range by simply adding or removing a calibrated ballast. Housed rugged PVC, with no external sensors, the TCM-1 is easy to deploy and recover. The built-in data logger includes a USB communication interface,

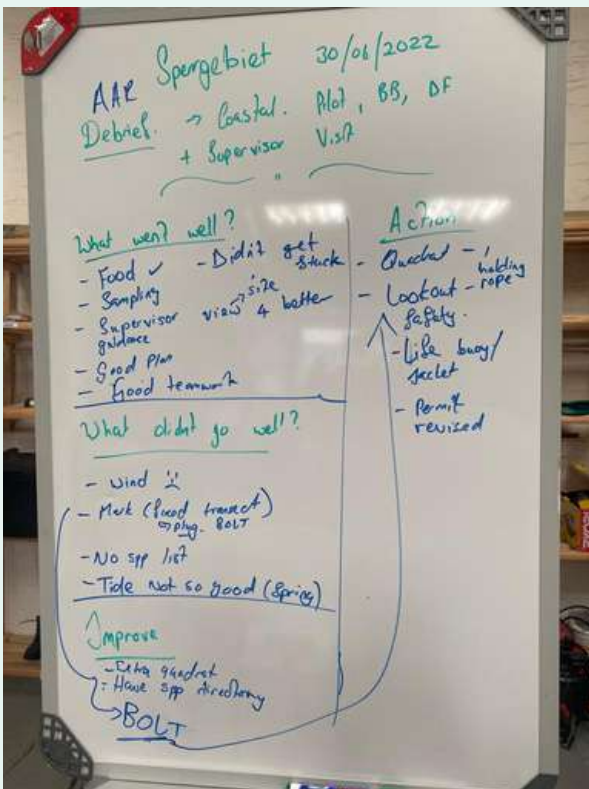
a microSD flash memory card, and a long-life lithium battery.

RESEARCH PROGRESS

MSc supervisor visiting students

The KFF-sponsored MSc students received their supervisors from UNAM (University of Namibia) for a visit in the last week of June. KFF paid for the supervisors' travel, accommodation and meals during their visit. The students updated their supervisors with their results and progress so far. Trips were taken to the Sperrgebiet (an area south of Luderitz) for coastal monitoring and for them to view the monitoring sites. The supervisors also visited the Kelp Blue test site, where the first kelp growing pilot is situated. The students shared their sampling techniques and plan with the supervisors for feedback and evaluation.

With the feedback and input from the supervisors, the students can continue to carry out the monitoring work that will provide us with a baseline of the biodiversity and geochemistry of the ecosystems.



RESEARCH PROGRESS

New: Benefits of kelp products

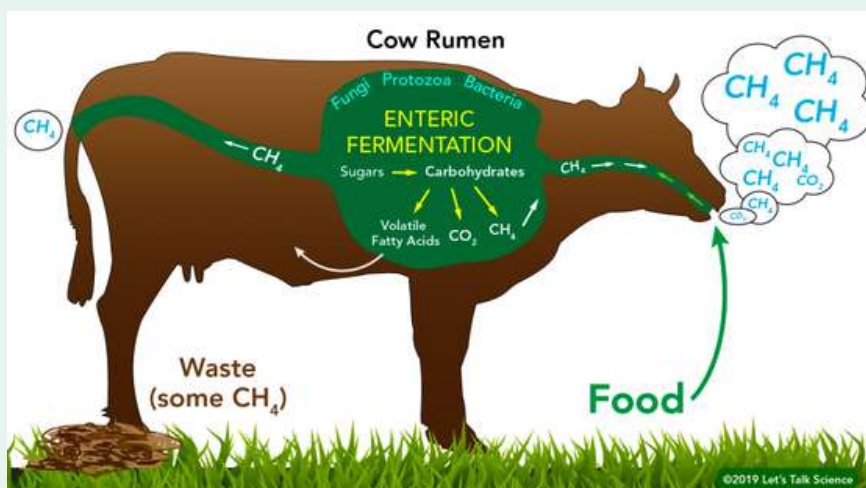
Brown seaweed to reduce cattle methane emissions and improve animal health

KFF is collaborating with Queen's University Belfast to understand the potential of brown seaweed and kelp to reduce the methane emissions from cattle and to improve animal health.

Cows and other ruminants, like goat and sheep, have multiple compartments in their stomachs to help them digest food. In one of these compartments, microbes help the animals break down plant matter, and in this process called enteric fermentation, methane is produced. Methane emissions contribute significantly to the greenhouse effect and global warming.

Researchers found that replacing a small portion (around 3%) of a cow's diet with red seaweed can help reduce methane emissions up to 80%. While red seaweed grows abundantly in warm waters, it might contain higher levels of bromoform, which is known to be ozone layer depleting. Brown seaweed such as *Macrocystis* has lower levels of bromoform and contains active compounds such as phlorotannins that can improve immunity and are anti-bacterial.

KFF and Kelp Blue are working together with Queen's University Belfast to better understand the potential of brown macroalgae to help reduce methane emissions from ruminants. Kelp Blue has sent dried *Macrocystis pyrifera* to the university for further analysis. The research study is partially a collaboration with UK Supermarket Morrisons and its network of British beef farmers who will facilitate farm trials. The other part of the project will focus on monitoring the effects of seaweed in the diet of cattle, and assess the nutritional value of a variety of brown seaweeds, their effects on animal productivity and meat quality.



RESEARCH PROGRESS

New: Chemical Composition of *Macrocystis*/kelp

KFF, together with Kelp Blue, is starting a research project with the National University of Science and Technology (NUST) to better understand the composition of *Macrocystis pyrifera* and other local kelps found in and near the coast of Luderitz, Namibia.

An initial analysis was performed earlier this year to assess the sugar concentrations (glucose, xylose, galactose, arabinose, mannas and glycerol) that can be found in *Macrocystis*. Understanding the composition of giant kelp is important for the development of the kelp products.

Kelp Blue and KFF are working closely with Erastus Tobias, a biotechnologist and student at NUST. We collect and send to NUST seaweed samples along the Luderitz coast, to be evaluated by Erastus in the lab. Erastus will aim to analyse the macronutrients and micronutrients in the kelp; determine the heavy metals constituents and then evaluate the potentials of the outcomes of this research .



Erastus Tobias



NUST
NATIONAL UNIVERSITY
OF SCIENCES & TECHNOLOGY

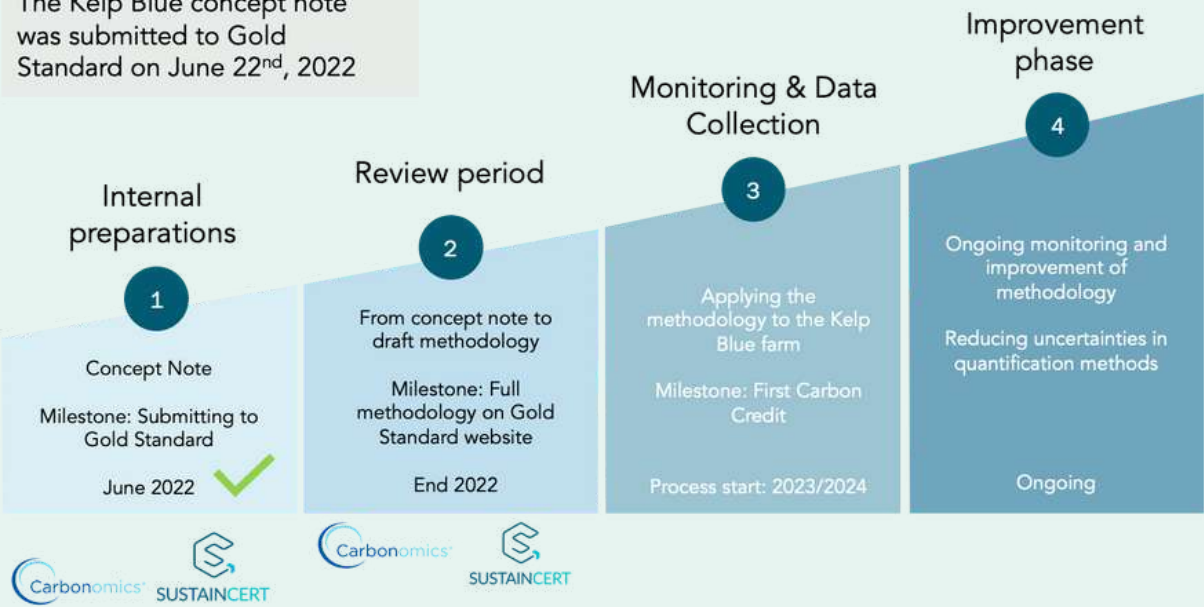


Protasius Mutjida delivering a cool box to Erastus Tobias in Windhoek. The chilled box contained kelp samples collected from the Luderitz coastline for analysis at NUST.

CARBON CREDIT METHODOLOGY

Concept note

The Kelp Blue concept note was submitted to Gold Standard on June 22nd, 2022



KFF has worked together with Kelp Blue and Carbonomics to complete the Concept Note that has been submitted to the Gold Standard methodology for verification of carbon credits and offsets. The concept note, which proposes a quantification methodology for carbon sequestration by offshore cultivated macroalgae, will be reviewed by the Gold Standard technical team to assess the concept's viability to develop into a verified standard for carbon credits.

Submitting the concept note is the first part of the process towards formal verification of the carbon sequestration potential of offshore cultivated seaweed.



KELP NEWS

Growth



Giant kelp growth after 4 weeks



Giant kelp growth after 6 weeks



Giant kelp growth after 8 weeks



Giant kelp growth after 11 weeks



AWARENESS

Documentary Trailer

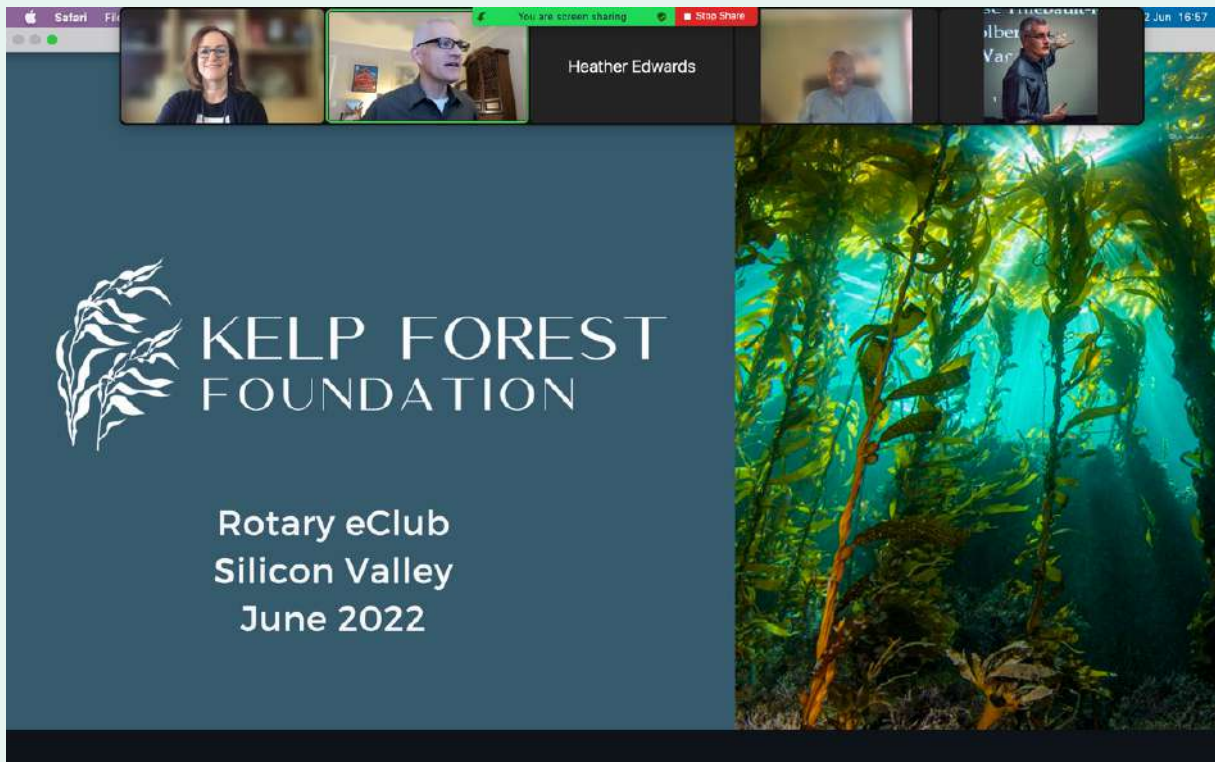


Serena Davies, Series Director and Producer at BBC (known for the documentary *Climate Change: The Facts with David Attenborough*), visited Lüderitz together with her team to film a documentary trailer that spotlights Kelp Blue and the team.

The crew has captured the story of Kelp Blue and its mission to cultivate a giant kelp forest offshore. The goal of the trailer is to increase global awareness of the potential of giant kelp to sequester carbon, boost biodiversity, and the benefits of kelp products. It follows the ups and downs of an entrepreneurial team that does not put profits before planet and is trying to prove that cultivation offshore and at scale is a viable solution to mitigate climate change. KFF has financed the production of the trailer.

AWARENESS

Conferences & presentations (1/2)



Samantha spoke to Rushton Hurley of Rotary eClub of Silicon Valley about the power of cultivated kelp forests to combat climate change and diversity loss. Samantha also spoke about the innovation that is occurring in the whole value chain, from hatchery and offshore cultivation to employing biorefinery processing methods to create exciting new products whilst minimising waste.

Samantha highlighted, however, that in order to really unlock the sector, we need to keep investing in ocean tech as well as in innovative techniques for monitoring, cultivation and harvesting. Current technologies are still very expensive, not user-friendly, and not always robust enough for offshore saline conditions.

AWARENESS

Conferences & presentations (2/2)



United Nations



UN Ocean Conference
Lisbon, Portugal



Left: Samantha with Dorothee Herr (Manager Oceans and Climate change, IUCN)
Middle: Samantha with Lisa Boulton, Nestlé

Samantha attended the UN Ocean Conference hosted in Lisbon, Portugal this year. The overall theme of the Conference was “Scaling up ocean action based on science and innovation for the implementation of Goal 14: stocktaking, partnerships and solutions”, with the aim to unlock ocean-based solutions to address some of the most defining issues of our time, from climate change to income equality.

OCEAN EDUCATION

Key in all the steps



Part of our foundation’s mission is to develop talent locally, reduce the capacity gap and promote the sustainable wellbeing of the community where we operate.

Above are the ten students we are sponsoring to take part of Cosdec Benguela training courses in Luderitz: Adonis, Hashiyana, Beukes, Yisa, Fransisku, Humphries, Nettie, Orren, Pienaar and Shilipipo. We are happy that we are able to contribute to the development of these important skill sets.

Cosdec Benguela provides focused, practical skills training that incorporate business skills, entrepreneurship and life skills and relates the training programs to opportunities in the local economy in terms of demand for goods and services. The main aim is to assist young people find employment in the local economy either in the formal or informal sector. The training provided at the centre is competency-based and the courses focus on the basic skills that an employer expects of an entry level worker. COSDEC Benguela was established in 2009 and aims to target and market courses to the unemployed youth and women.

OCEAN EDUCATION

Key in all the steps



Ocean related extra-curricular with the Luderitz Blue School

KFF supports extra-curricular activities run with the Luderitz Blue School. These activities have the aim to build the next generation of ocean custodians and to provide them with the knowledge, skills and capacity they need to protect the oceans. The extra-curricular activities include identifying and understanding marine species, knot tying and rope skills, chart and map reading and navigation, beach clean ups, orienteering, making and sailing rafts, rowing and boat maintenance

Benguela Robotics Lab

The Benguela Robotics Lab is set up by KFF to ignite curiosity about robotics and programming and inspire an interest in STEM (Science, Technology, Engineering and Math) careers. The curriculum focuses on the use of sensors and remote operated vehicles in ocean engineering and coastal environmental monitoring

OCEAN EDUCATION

Tidal Pool



Left: The students that will design the tidal pool
Right: Two examples of tidal pools

Six students from two universities (TU Delft Netherlands and NUST Namibia) have arrived in Luderitz to start designing the tidal pool on the coast of Luderitz. KFF is paying for the students' flight and accommodation and is raising funds for the construction of the tidal pool.

Between 5-10 children drown in Luderitz every year due to a lack of swimming competency and life-saving resources at public beaches. The tidal pool will be a place where water will be left behind when the ocean recedes at low tide, providing a safe space to run swimming and life-saving lessons. Children can swim safely under supervision of lifeguards, professional swimming/swimming competitions can be held, and the place will be available for recreational activities.

These students will together design the tidal pool in Luderitz:

Noa M Elbers
Bernice van der Kooij
Nadine van Westerop
Jeremy Trotereau

Amenenge Shatilwe
Raja W. Kambazemb



CAPACITY BUILDING

Regional Research Graduate Network in Oceanography (RGNO)



KFF sponsored two of our MSc students, Protasius Mutjida and Angelique Dodds, to attend the Regional Research Graduate Network in Oceanography (RGNO) programme organised by University of Namibia's Sam Nujoma Campus, Namibia's National Marine Information, Research Center (Nat MIRC) and Kurt Hanselmann of ETH Zürich.

The programme covered a mix of research themes presented as workshops and talks by experts, lectures with tutorials and the students' own efforts: paper presentations, experimental design, practical field and laboratory work, writing research proposals and designing posters of their own work during the RGNO.

This workshop focused on oceanographic topics and it was aimed at inspiring participants to advance scientific research in ocean ecosystems in an exploratory way. Hands-on work on the MIRABILIS research vessel at sea (such as sediment coring as seen on the bottom-left photo), instruction in the classroom and work in the laboratory made RGNO Research Discovery Camps a unique experience for Protasius and Angelique. By working across disciplinary fields and initiating partnerships with scientists from internationally leading research institutions, the RGNO offered opportunities to collaborate in interdisciplinary research projects with guidance and supervision by active scientists.

AWARDS

MIT Solve



reNature.



kelp blue

KFF has been selected as finalist, out of over 1,100 applications across 117 countries, of the Solve - MIT 2022 Global Challenge. We teamed up with reNature and Kelp Blue, to showcase the use of kelp biostimulants within regenerative agriculture as an important way to decrease dependence on chemical fertilizers, improve the health of our food system and the agricultural sector's carbon footprint.

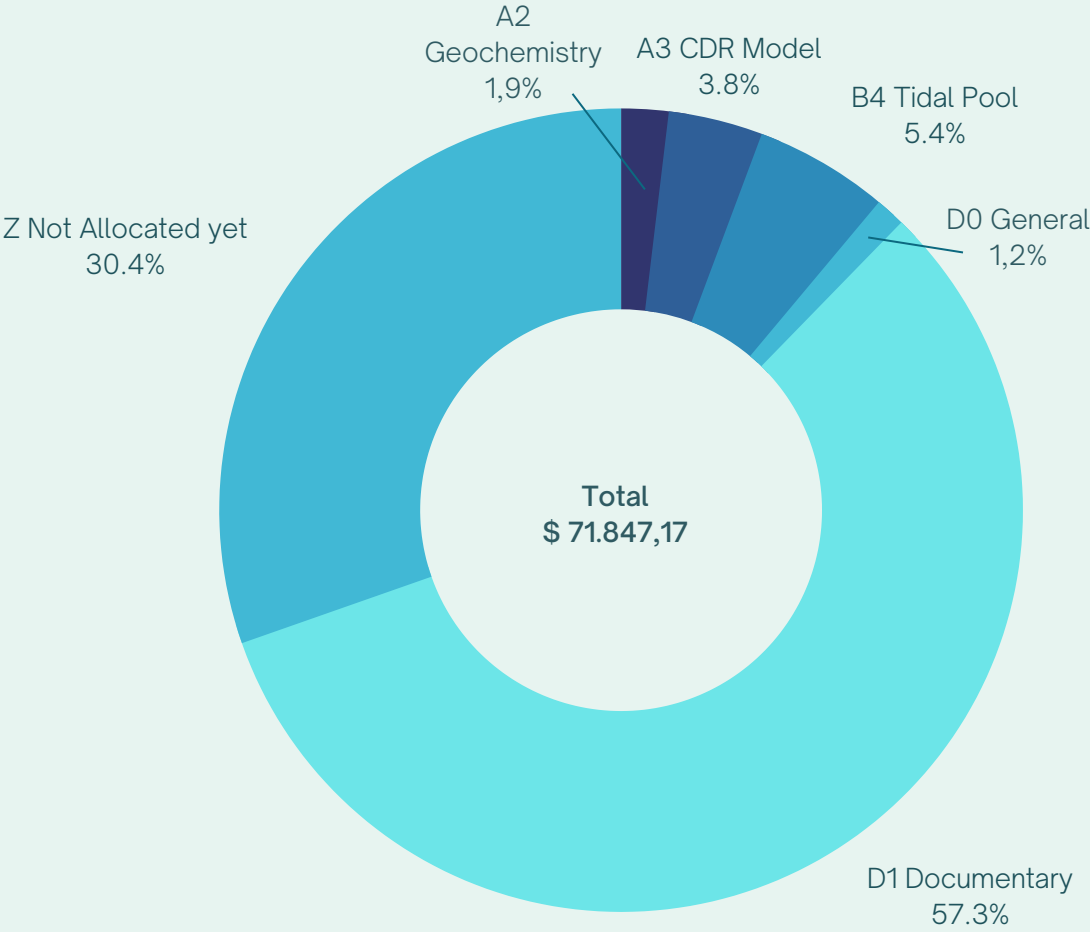
FINANCIALS

Q2 expenses

Cost Allocation	Value	Group total
A Research		\$ 4.037,54
A0 General	0	
A1 Biodiversity	0	
A2 Geochemistry	\$ 1.342,76	
A3 CDR Model	\$ 2.694,78	
A4 Sediments	0	
A5 Biostimulants	0	
B Education/Social Engagement		\$ 3.867,60
B0 General	0	
B1 Ocean education	0	
B2 Capacity building	0	
B3 AR/VR	0	
B4 Tidal Pool	\$ 3.867,60	
C Seed bank		0
D Public Awareness		\$ 42.075,79
D0 General	\$ 852,23	
D1 Documentary	\$ 41.223,56	
Z Not allocated yet		\$ 21.866,24
Total		\$ 71.847,17

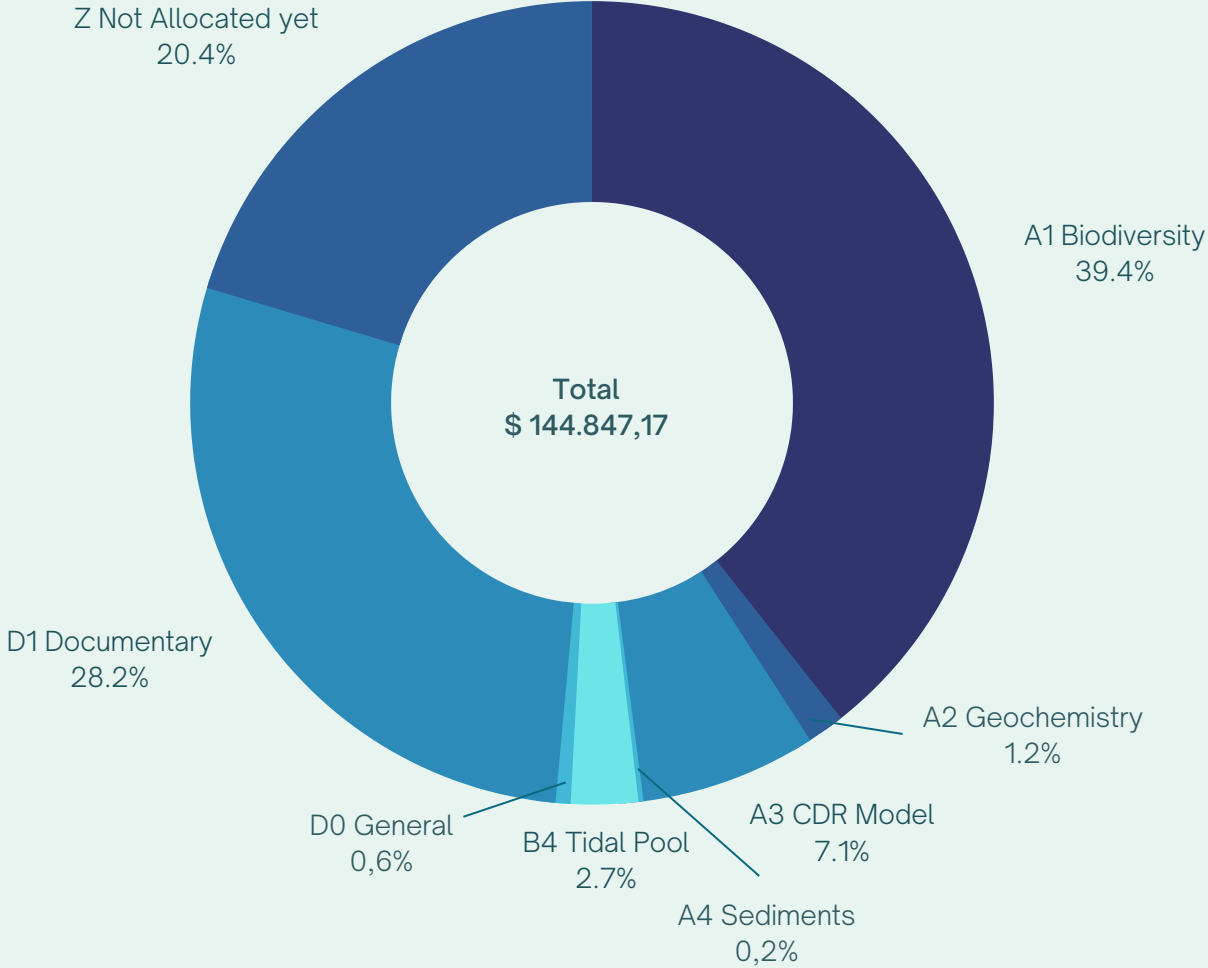
FINANCIALS

Q2 expenses



FINANCIALS

2022 expenses (Q1 + Q2)



This report was compiled by: Xu Ben Zhang, Project Manager, Kelp Forest Foundation



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