

### A MESSAGE FROM OUR PRESIDENT

More than 20 years ago, my father founded the Khaled bin Sultan Living Oceans Foundation to protect, preserve, and restore the health of our oceans. We have made great strides in that time, but we always knew that to achieve this grand and noble mission, we cannot work alone.

My father, Prince Khaled bin Sultan, instilled in me a great love and respect of the oceans, but also a deep sense of responsibility to protect the coral reefs and conserve these fragile ecosystems so that we can continue to explore and enjoy them for generations to come. It is his passion and legacy that I carry with me today as President of the foundation that bears his name.

Throughout the years, my love for marine conservation has been met with the heartbreaking reality of deteriorating reefs around the world. Many of the vibrant reefs I once marveled at while SCUBA diving now pale in comparison to what they once were. The statistics are alarming: we have lost over half of our coral reefs, and at least one-third of our mangrove forests and seagrass meadows in my lifetime alone. The consequences of this loss extend far beyond the realm of the marine environment, and they have profound implications on the lives and livelihoods of billions of people.

In a world where the challenges facing our oceans are complex and multifaceted, we work across boarders and political boundaries to forge alliances and design sustainable solutions that benefit both the environment and the communities that depend upon them. This approach has always been the cornerstone of our work, which is guided by our motto, "Science Without Borders®."

Since the foundation was first established, we have recognized that our work can only be effective if it aligns with the needs and aspirations of the communities we serve. We have strived to build bridges, to foster collaboration, and to work hand-in-hand with coastal communities to conserve coral reefs and mangrove forests around the world. We use cutting-edge scientific research, outreach, and education to provide people with science-based solutions they can use to protect and restore ocean health.

By empowering individuals, we empower societies, creating a ripple effect that echoes far beyond the boundaries of any single project. It is through this collective effort that we can usher in a future where our oceans thrive, our communities prosper, and the delicate balance of life is preserved for generations to come.

Join us, and let us work together towards healthy oceans for all.

Her Royal Highness Princess Hala bint Khaled bin Sultan

President of the Khaled bin Sultan Living Oceans Foundation

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# **SCIENCE**

The Khaled bin Sultan Living Oceans Foundation's (KSLOF's) science team had a successful year capitalizing on the large Global Reef Expedition (GRE) dataset as we continued to share our knowledge and findings with the international science and coral conservation communities.

## PILOT STUDY OF THE REEFS IN BEQA LAGOON

Earlier this year, the foundation's science team joined the Pacific Blue Foundation, an NGO based in Suva, Fiji, on the first monitoring pilot study in Bega using diver surveys focused on the collection of imagery as a costeffective monitoring technique for rapidly measuring the state of coral reefs at larger scales. The first test sites are in Beqa Lagoon near the Rukua Village, which has several traditional protection areas. These areas have historically been managed locally by community members to help keep fishing pressure and coral reef damage to a minimum. However, there have not been sufficient monitoring protocols to evaluate how these managed areas are faring. The foundation will continue to analyze data from the field mission with the hopes for further data collection in 2024. The Rukua village case study is aligned to the United Nations Sustainable Development Goal 14 - Life Below Water and is also an important component of the foundation's UN Ocean Decade Project, Science Without Borders®: Conserving the Tropics. This program works closely with communities in small island nations and least developed states to protect them and manage their coral reefs and connected marine ecosystems. The program is addressing a critical need to sustainably protect and manage these ecosystems, especially in lowlying coastal areas that greatly depend on the ocean for coastal protection and their overall livelihoods.

## AUTOMATING CORAL REEF TRANSECT ANALYSIS

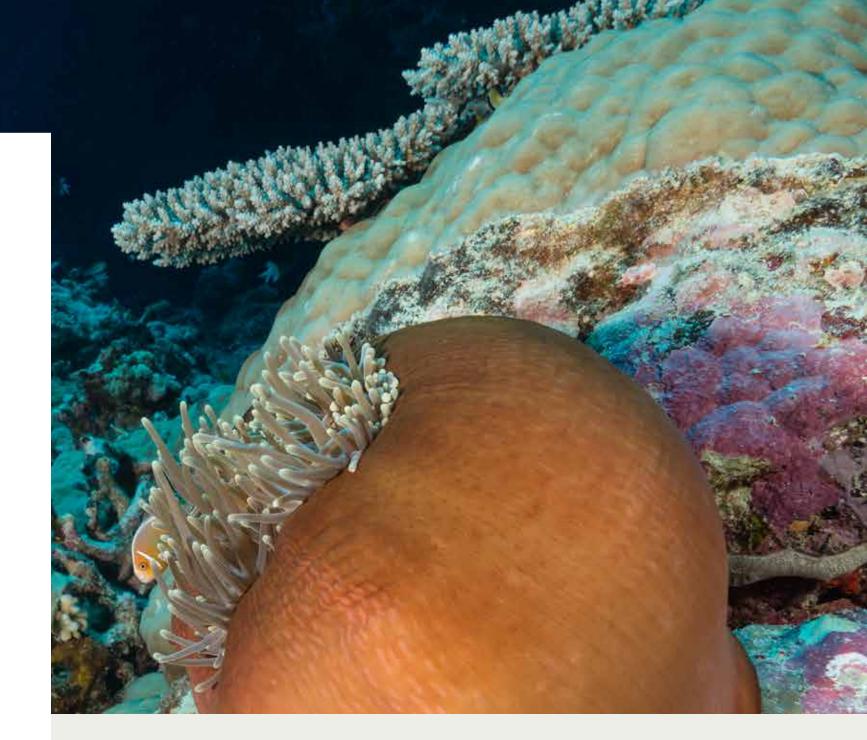
With a new set of images to be analyzed by CoralNet (a free cloud-based annotation tool) from the Beqa Lagoon Pilot study this past year, KSLOF, Pacific Blue Foundation, and Scripps Oceanographic Institute are working in tandem to further train the neural network software to

**KSLOF** continues to work with partners to **survey** and **map coral reefs** and assess their **health**.

ensure accuracy and efficiency. Our intention of building upon the robustness of the CoralNet machine learning platform is to enable local indigenous communities to assess the state of their reefs cheaply and easily. The streamlining of in-water survey protocols and data postprocessing to develop a more accurate and cost-effective method for coral reef monitoring is the goal of this research.

## GLOBAL CORAL REEF MONITORING REPORT

The foundation was asked to contribute data from the Global Reef Expedition and be an author on the Status of Coral Reefs of the World report. This report is the flagship product of the Global Coral Reef Monitoring Network (GCRMN), which aims to provide the best scientific information on the status and trends of coral reef ecosystems for their conservation and management. The GCRMN is a global network of scientists, managers, and organizations that monitor the condition of coral reefs throughout the world. This global dataset will span more than 40 years, from 1978 to 2022, and will consist of almost 2 million observations from more than 12,000 sites in 73 reef-bearing countries around the world. To help kickstart this project, the Internal Coral Reef Initiative and the country of Sweden sponsored an authorship workshop in Auckland, New Zealand. There, the foundation was able to exchange ideas with other scientists as well as create a roadmap for the work to be accomplished in 2024 for the Status of Coral Reefs of the World report.





### HUNGA TONGA-HUNGA HA'APAI VOLCANIC ERUPTION

The Hunga Tonga-Hunga Ha'apai volcanic eruption in 2022 was one of the strongest seismic events in history. The foundation swiftly responded to the tsunami event in Tonga by leveraging existing KSLOF data with observations of the volcanic eruption and computer modeling to understand this once-in-a-century event. A peer-reviewed paper was published with the University of Miami, NASA, the University of Auckland, and KSLOF in the journal <u>Science</u>. <u>Advances</u>. Tsunamis are a catastrophic by-product of volcanic eruptions and pose a great threat to coral reefs. It was discovered that the complex shallow bathymetry of the area acted as a low-velocity wave trap, likely saving thousands of lives on land. This work was covered by covered by the Washington Post, the Guardian, and Nature, among many other media outlets.

[2]

## SCIENCE

## LAU SEASCAPE PLANNING AND PACIFIC ISLANDS CONFERENCE

The Living Oceans Foundation was invited to speak at two events in Fiji this year. The first, the Lau Seascape Initiative (LSI), was held in Suva, Fiji's capital city. At the meeting, we discussed the local, regional, and global context for the status of the Lau reefs and what new technologies and methods KSLOF is helping refine for sustainable coral reef management. The second event was the United Nations Pacific Islands Conference on Ocean Science and Ocean Management in Nadi, Fiji. The conference brought together international scientists, conservationists, and community leaders to address the issues affecting the Pacific Islands. The foundation presented past findings from the Global Reef Expedition as well as our UN Ocean Decade Project, Science Without Borders®: Conserving the Tropics. The opportunity to participate in both of these events highlights the importance of the foundation's commitment to sciencebased solutions through the lens of traditional knowledge and key stakeholder involvement.

## CORAL REEF BIODIVERSITY FROM REMOTE SENSING

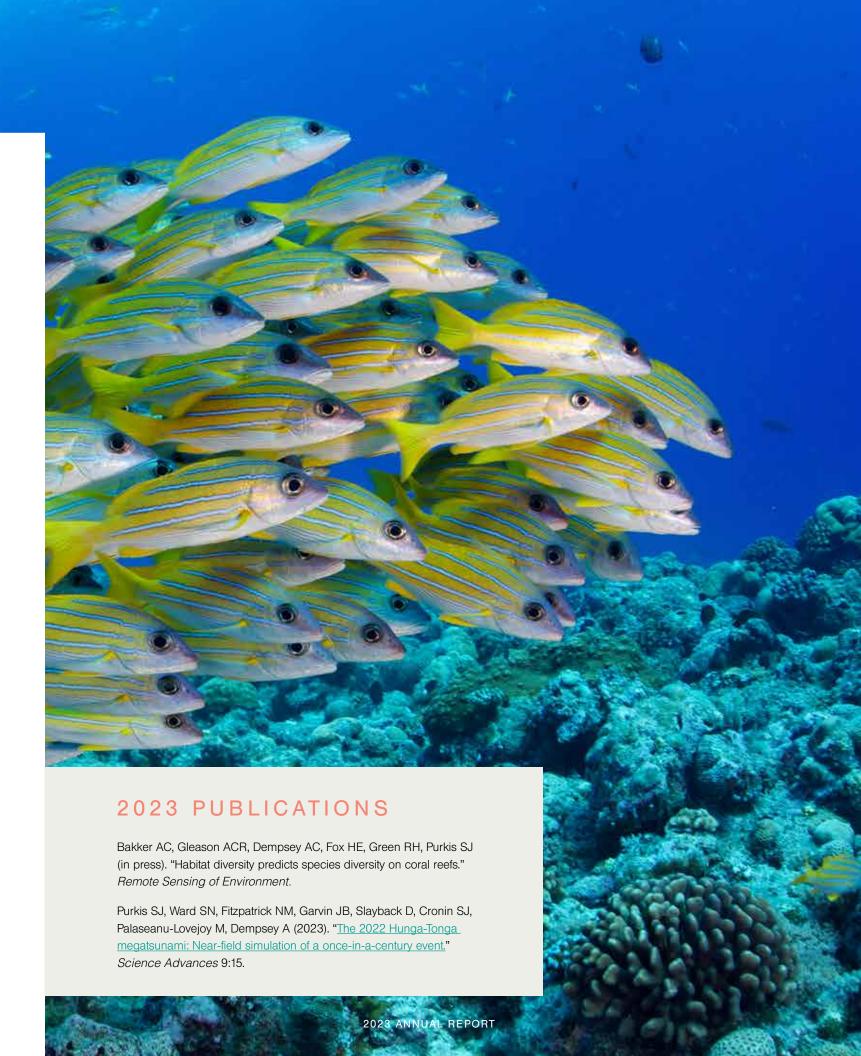
Our partners at the University of Miami (UM) utilized the foundation's Global Reef Expedition field dataset to build a model that can predict coral cover and other metrics of coral reef health using open-source satellite data. The culmination of this work was the PhD defense of Anna Bakker at the end of 2023. Anna's work explores how remote sensing can be utilized as a practical and scalable resource with which to take traditional point-count SCUBA diver surveys of reef health and biodiversity and extrapolate them across the reef. Her defense chapters covered different types of remote sensing: 1) biophysical and socioenvironmental drivers, 2) habitat heterogeneity, and 3) spectral diversity. The spatial relationships between biophysical drivers, habitat maps, and satellite imagery can help provide clear guidance for managers who rely on this modeled data to make conservation decisions. Many congratulations to Anna; the foundation appreciates all the work she has completed for the legacy of the Global Reef Expedition and its immensely valuable dataset.

### CORAL REEF HEALTH INDEX

Throughout 2023, the foundation continued to work with our partners at the University of Miami on a project that processes sediment samples collected on the Global Reef Expedition to assess the long-term health of coral reefs. This project, Protist Prophets - Foraminifera as Global Bioindicators for Past and Present Coral Reef Health, is funded by the National Science Foundation. By identifying the types of benthic foraminifera present in the sand surrounding coral reefs, scientists can get an idea of what the conditions were like in the reef over time. By examining samples collected from different types of reefs in locations around the world, we will eventually be able to use this method to assess the long-term health of any tropical coral reef. This past year, the UM Team identified foraminifera genera for all samples collected on the GRE from the Caribbean (Jamaica, The Bahamas, Colombia, and Navassa), Tonga, and New Caledonia. This comprises 33% of the Global Reef Expedition shallow water global dataset. Currently, a publication is being drafted to answer whether foraminifera can be used to identify occurrences of past algal shifts.

## HELPING NASA MAP ALL THE CORAL REEFS IN THE WORLD

The foundation continues to capitalize on the signed Space Act Agreement with NASA. This agreement gave NASA access to all the foundation's coral reef maps from the Global Reef Expedition. NASA's NeMO-Net neural network system uses a combination of satellite imagery and next-generation underwater imaging technology to create detailed maps of coral reefs. The KSLOF GRE data is being extensively used in this global habitat mapping model. The preliminary results were presented this fall at the 2023 American Geophysical Union (AGU) conference. This meeting is the most influential event in the world that is dedicated to the advancement of Earth and space science. Now, there are six publications being drafted from this work, with the largest impact article heavily citing the work completed by KSLOF. The foundation and its partners at NASA eagerly await the final results that will be forthcoming in the new year.



# **OUTREACH**

This year, the Living Oceans Foundation focused on presenting our work at international conferences, sharing our knowledge of ocean health and conservation, and engaging the international conservation community to tackle some of the biggest issues threatening coral reefs. Along the way, we formed new partnerships with likeminded organizations and worked across borders and scientific disciplines to improve the health of our oceans.

### 3RD FOUNDATIONS DIALOGUE

In June, the Living Oceans Foundation participated in the Third Foundations Dialogue Meeting in Monaco, coming together with other marine foundations from around the world to address the major challenges facing our oceans. Organized by the Intergovernmental Oceanographic Commission of UNESCO, the Foundations Dialogue Group provides a platform for the philanthropic community to collaborate and work together to move the needle towards ocean conservation. At the meeting, we discussed how we can align our efforts to achieve the bold ambitions of the United Nations Ocean Decade for Sustainable Development ('Ocean Decade'), and how the philanthropic community can come together to co-design the 'science we need for the ocean we want.'

Our President, HRH Princess Hala, spoke at the opening session of the meeting about the importance of working hand-in-hand with coastal communities to co-design sustainable solutions that benefit both the environment and

2021 United Nations Decade of Ocean Science for Sustainable Development

the communities that depend upon it. Shortly thereafter, the foundation signed a cooperative agreement with our host, the Prince Albert II of Monaco Foundation, pledging to work together to safeguard ocean health.

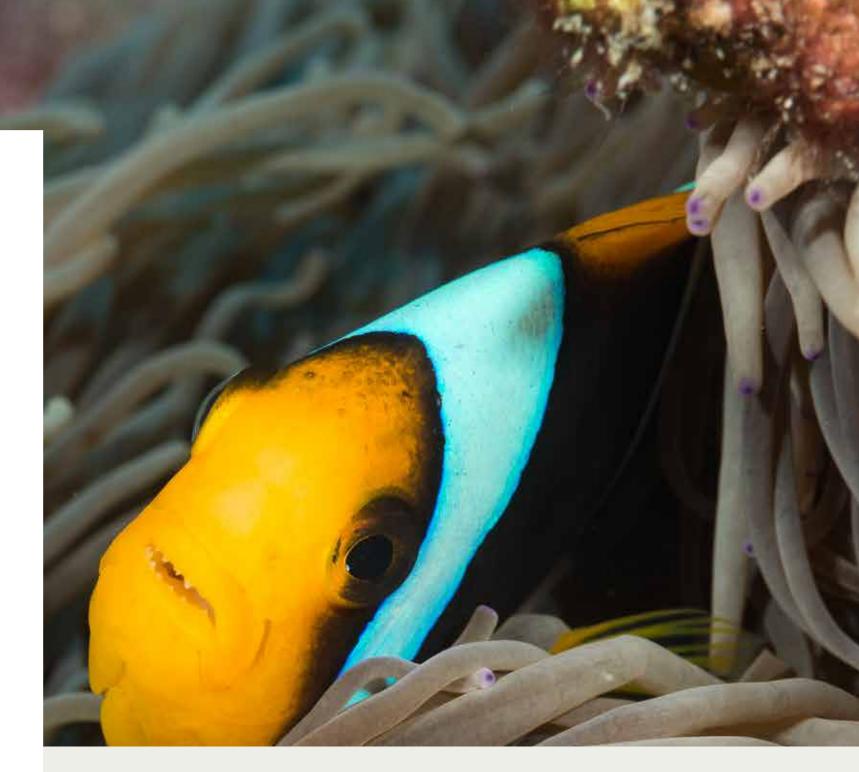
The foundation also participated in several special sessions at the meeting focused on leveraging the latest science and communications for ocean conservation. We also held in-depth discussions on how we can ensure our projects are equitable and support local capacity building, especially when working in small island nations and least-developed countries.

### THE MONACO STATEMENT

KSLOF was proud to be one of 23 philanthropic organizations that signed on to The Monaco Statement. This joint Statement, launched on the sidelines of the 2023 Sustainable Development Goals (SDG) Summit in New York City, seeks to raise awareness of the need to increase investment in ocean science to support sustainable development. Members of the Foundations Dialogue released the Statement to affirm their commitment to invest in transformative ocean science. It recognizes the central role of the ocean in human health, safety, and well-being, and encourages the philanthropic community to increase their support of marine science and conservation.

### MOOREA INNOVATION HUB

The University of California Berkeley's Gump Research Station hosted a workshop that brought together over 30 experts from around the world to inform the creation of an 'Innovation Hub' on the French Polynesian Island of Moorea that will help to bridge the gap between research and the people it ultimately serves. Participants included an eclectic mix of scientists, funders, nonprofit organizations, traditional leaders, and local community members, all united by a shared passion for combining science and outreach for conservation. The foundation attended and shared our knowledge of involving communities in marine science and conservation through accessible, low-cost tools. We also shared our ideas about what the Innovation Hub could be and how it could be structured to benefit both the people and the marine environment of Moorea.





### IUCN MAGAZINE

This year, the Living Oceans Foundation joined forces with the International Union for Conservation of Nature (IUCN) to help them launch a groundbreaking new member magazine, 'Unite for Nature.' This publication embodies the shared vision of IUCN and its members to work collectively towards a just world that values and preserves nature. The foundation plays a pivotal role in this venture as a member of the magazine's editorial board. The magazine celebrates the accomplishments of the IUCN community and highlights success stories, ongoing initiatives, and plans for the future of conservation. The first issue of this magazine launched in September 2023, and will continue to be published bi-annually in three languages – English, French, and Spanish – ensuring accessibility to a global audience.

[6] 2023 ANNUAL REPORT

## OUTREACH

#### COP28

For the first time, the Khaled bin Sultan Living Oceans Foundation participated in the United Nations annual climate conference. The 28th annual Conference of the Parties (COP28) was hosted by the UAE and held at Expo City in Dubai in December 2023. This conference is the highest decision-making process on climate issues in the world. It brought together over 70,000 delegates, heads of state, world leaders, and environmental leaders to address the issue of climate change on a global scale.

KSLOF was honored to participate in several events at COP28 this year to discuss the role of philanthropy in ocean conservation, the value of international collaboration across borders and research disciplines, and the importance of preserving global biodiversity through coral reef conservation and restoration.

These talks included:

Safeguarding Our Planet: Biodiversity,
 Climate, and One Health, hosted by AEON
 Collective, where HRH Princess Hala discussed the importance of conservation as not only an environmental priority but a cornerstone for sustainable development, economic stability, and social well-being.

COP28 UAE

- Role of private foundations in empowering stakeholders for global ocean agenda, where our friends at the Sasakawa Peace invited us to speak about how private foundations can help facilitate effective marine conservation collaboration in the Indo-Pacific and Africa regions.
- The launch of the Coral Reef Breakthrough, an international initiative that aims to prevent further loss of coral by doubling coral reef protected areas, accelerating restoration, and securing investments to fund coral reef conservation.
- Ocean Decade 2030: Science & Partnerships for Climate Action Through the Ocean Decade initiated a call for strong engagement in the UN Ocean Decade to accelerate the generation and uptake of ocean knowledge for climate action.
- Ocean Decade Foundations Dialogue: Ocean
   & Climate Action, discussed the successes and challenges of the UN Ocean Decade program and the role the Foundations Dialogue plays in aiding ocean science and conservation.
- DAFQA ('Splash' in Arabic), hosted by our partners at the Prince Albert II of Monaco Foundation, this event explored the intersection of ocean health and climate change.
- From Pledges to Action for Corals, HRH
   Princess Hala talked about the foundation's
   success in facilitating international cooperation for
   coral reef conservation at this event hosted by our
   partners at the Coral Research and Development
   Accelerator Platform (CORDAP).

The foundation was incredibly excited to be participating in such a landmark event. Not only did this event help to strengthen our relationships with our current partners, but it also helped us forge new international collaborations that are leading the fight for coral reef conservation.





### UNITED NATIONS SDG SUMMIT

In September 2023, the foundation participated in two events at the United Nations Sustainable Development Goals (SDG) Summit in New York City. The foundation attended the "Seas the Day" event, which celebrated and created a networking opportunity for philanthropic engagement in the Ocean Decade. The event created a forum for philanthropic organizations to discuss upcoming projects, and provided a perfect opportunity for the Foundations Dialogue to release the Monaco Statement. The foundation also participated in the launching of a strategic collaboration between the Small Island Developing States (SIDS) Coalition for Nature and The Ocean Decade Alliance. This high-level event at the Explorers Club was co-chaired by HE Mr. Wavel Ramkalawan, President of the Republic of Seychelles, and HSH Prince Albert II of Monaco. At this event, the foundation signed a memorandum of understanding with The Great Barrier Reef Foundation, pledging to work together to enhance ocean knowledge and capacity development in support of coral reef conservation in SIDS in the South Pacific.

# **EDUCATION**

### SCIENCE WITHOUT BORDERS® CHALLENGE

The Science Without Borders® Challenge was developed to get students and teachers around the world more involved and interested in ocean conservation through art. This annual international contest inspires students to be creative while using their artwork to promote public awareness of the need to preserve, protect, and restore the world's oceans and aquatic resources, contributing to the overarching motto of the foundation—Science Without Borders®.

This year, the foundation completed its 11th annual Science Without Borders® Challenge. The theme for this year's Challenge was "The Sixth Extinction." Emphasizing the urgency of protecting our oceans, the foundation motivated young artists to elevate awareness about endangered marine species. Students responded by crafting artwork that showcases the beauty and significance of marine species teetering on the brink of extinction.

The Challenge is judged in two categories, one for students ages 11-14, and another for students ages 15-19. Overall, the foundation received 1,200 submissions from 67 different countries. This was the first time the foundation received submissions from students in Azerbaijan, the British Indian Ocean Territory, Croatia, the Dominican Republic, Ecuador, Georgia, Lebanon, Malta, Portugal, and Spain.

Yanjun Mao, a 14-year-old student from China, won first place in the 11-14 age category with his artwork, "The Sea Bears Witness to Everything." His artwork of the endangered hawksbill sea turtle serves as a

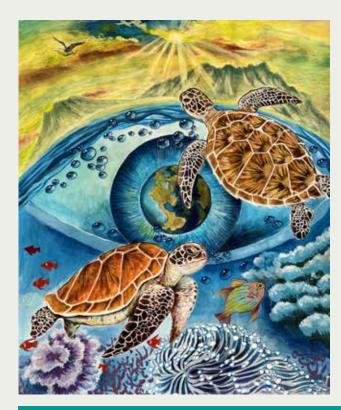
powerful commentary on the ocean's silent witness to the historical struggles of these turtles and the tragic impact of human actions. Through his participation in the contest, Yanjun gained a profound appreciation for the ocean's crucial role in our lives and the shared responsibility to nurture the environment. Inspired by this experience, he now says, "I am willing to work for the protection of the ocean."

Securing first place in the 15-19 age category, Boram Shim, a 16-year-old resident of Norwood, New Jersey, impressed judges with her remarkable piece titled "We Are Next." This captivating artwork skillfully portrays many endangered marine species, including the critically endangered vaquita porpoise. Boram's thought-provoking approach illustrates the historical narrative of animal extinction. Her message is that our continued harm to the environment may lead to our own extinction, paralleling the fate of mammoths, ammonites, and dinosaurs. Expressing deep concern for the vaquita porpoise, with only around 10 individuals remaining, Shim channeled her passion for their survival into her artwork, stating, "Learning about their imminent extinction truly devastated me."

This competition introduced students around the world to the plight of marine endangered species, shedding light on the reasons behind the endangered status of these remarkable organisms on the brink of extinction. Each of the first-place winners received a \$500 scholarship from the Khaled bin Sultan Living Oceans Foundation to help them continue to pursue their interests in art and ocean conservation.

Science Without Borders® is the motto of the Khaled bin Sultan Living Oceans Foundation.

### First Place, ages 11-14:



"THE SEA BEARS WITNESS TO EVERYTHING"

by Yanjun Mao Age 14 China

### First Place, ages 15-19:

#### "WE ARE NEXT"

by Boram Shim Age 16 New Jersey, USA



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# EDUCATION

## MANGROVE EDUCATION & RESTORATION

Our <u>Mangrove Education and Restoration</u> program is a two-year immersive, experiential education program that engages high school students and teachers in the Caribbean to learn about, restore, and monitor mangroves through project-based learning.

After a three-year break due to Hurricane Dorian and the subsequent challenges posed by COVID-19, the foundation was thrilled to reinstate the <u>Bahamas Awareness of Mangroves (B.A.M.)</u> program this year. Partnering with Friends of the Environment in Abaco, the foundation implemented the B.A.M. program at Forest Heights Academy and Patrick J. Bethel High School.

Meanwhile, our <u>Jamaica Awareness of Mangrove</u> in Nature (J.A.M.I.N.) program continues to run in collaboration with the Alligator Head Foundation and the University of the West Indies Discovery Bay Marine Lab. Students and teachers from Port Antonio, William Knibb Memorial, and Happy Grove High Schools actively participated once again in the J.A.M.I.N. program.

This year, Saskia Schmöle, a graduate student at the University of Bremen, studied the effectiveness of this program for her master's research, and found that

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students in the J.A.M.I.N. program not only learned about mangroves, but also retained and built on it throughout each phase. By the end of the first year, participants demonstrated a heightened awareness of the benefits of mangroves and the threats to this valuable ecosystem. Saskia is currently working on publishing her research in an environmental education journal, contributing valuable insights to the field.

### **OCEAN LITERACY**

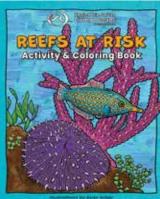
As the academic year kicked off, the foundation introduced impactful educational materials for teachers to incorporate into their classes.

With support from the University of Miami's UMverse, the foundation launched its first virtual reality (VR) application called <u>Virtual Reef Expedition</u>. Developed in partnership with the University of Miami and Xennial Digital, this cutting-edge technology immerses students in an interactive learning experience, discovering the three main types of coral reefs and the zonation patterns that define each reef type.

The foundation is also working with UM to develop an educator's guide called "Little Creatures with a Big Message," with support from a grant from the National Science Foundation. This curriculum aims to enhance STEAM (science, technology, engineering, art, and math) education and increase minority participation in STEAM fields. Students will engage in activities utilizing scientific data from UM, focusing on tiny, microscopic creatures known as foraminifera to prioritize coral reefs for conservation. Next year, these educational resources will be vetted with students and teachers and shared with classrooms around the world.

We also migrated our <u>Mangrove Detectives</u> program to the foundation's website this year. Developed in collaboration with Dr. Ryann Rossi and funded by the National Geographic Society, this citizen science initiative aims to foster STEAM skills in students while actively contributing to scientific research. Educators can now discover resources for conducting two hands-on scientific investigations on our website.





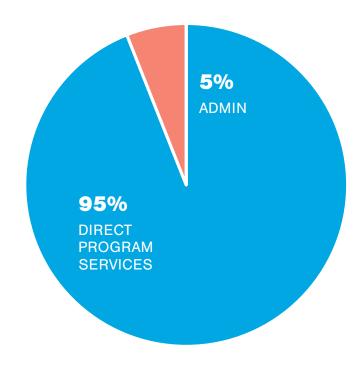
### REEFS AT RISK COLORING BOOK

Thanks to the generous support of the Jerome S. & Grace H. Murray Foundation, we developed the "Reefs at Risk Activity & Coloring Book." Designed for elementary and middle school students, the book guides learners through interactive activities, thought-provoking questions, and captivating coloring pages. Developed in collaboration with the talented artist, Ryan Sobel, the book's first section focuses on coral bleaching. As an ongoing project, additional sections detailing various threats to coral reefs will be added as they are completed. Through this resource, the foundation aims to educate youth about the challenges facing coral reefs in our rapidly changing world.

# **FUNDING**

### HOW WE SPEND OUR FUNDING

The Living Oceans Foundation spends the vast majority of our funding on programs and very little on overhead.



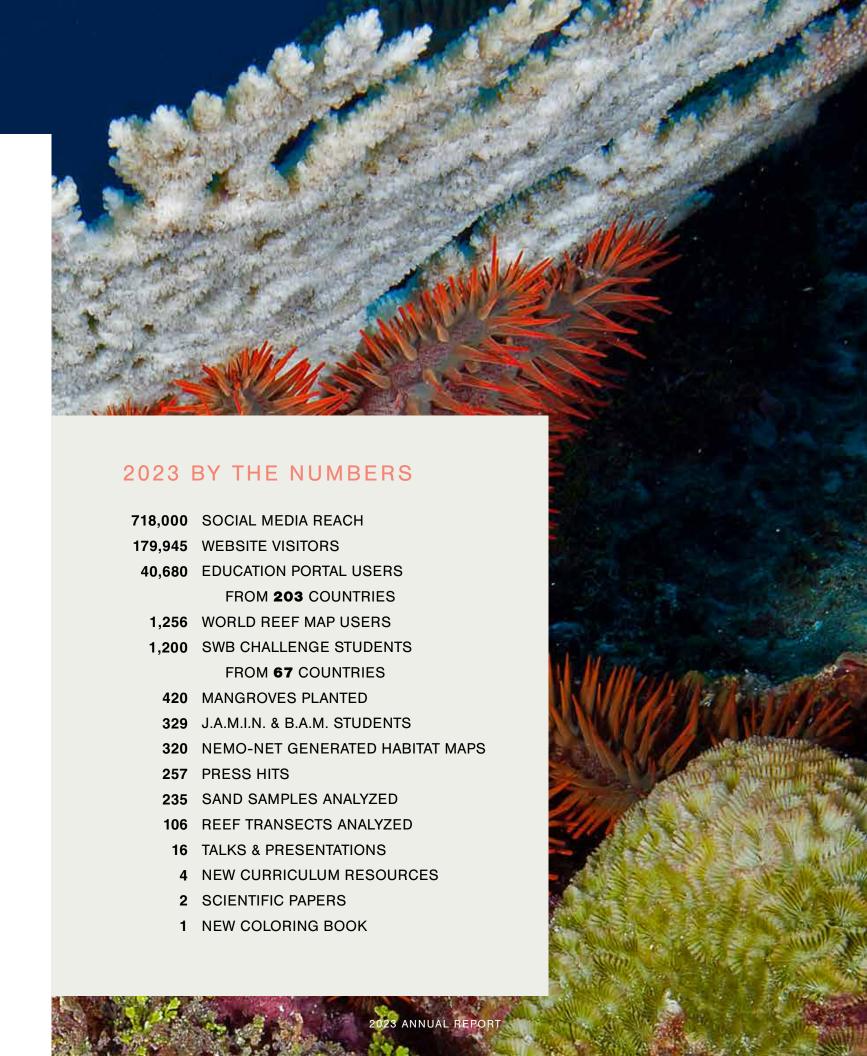
### MANY THANKS TO OUR DONORS

HRH PRINCE KHALED BIN SULTAN
HRH PRINCESS HALA BINT KHALED BIN SULTAN
JEROME S. & GRACE H. MURRAY FOUNDATION
THE NATIONAL SCIENCE FOUNDATION
CELINE YANG
ALEXANDER ZHANG

### JOIN US

At the Khaled bin Sultan Living Oceans Foundation, we believe that by working together, we can make a difference. With our experience conducting field research and designing education and outreach programs, we combine our passion with deep knowledge to save our oceans. Help us meet the challenge of our generation.

Join us in our efforts to preserve, protect, and restore our living oceans —before it's too late.



# **BOARD & STAFF**

### **BOARD OF DIRECTORS**



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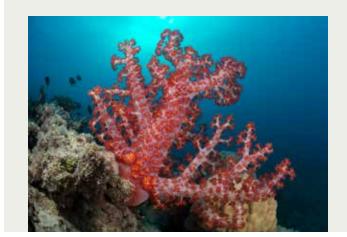
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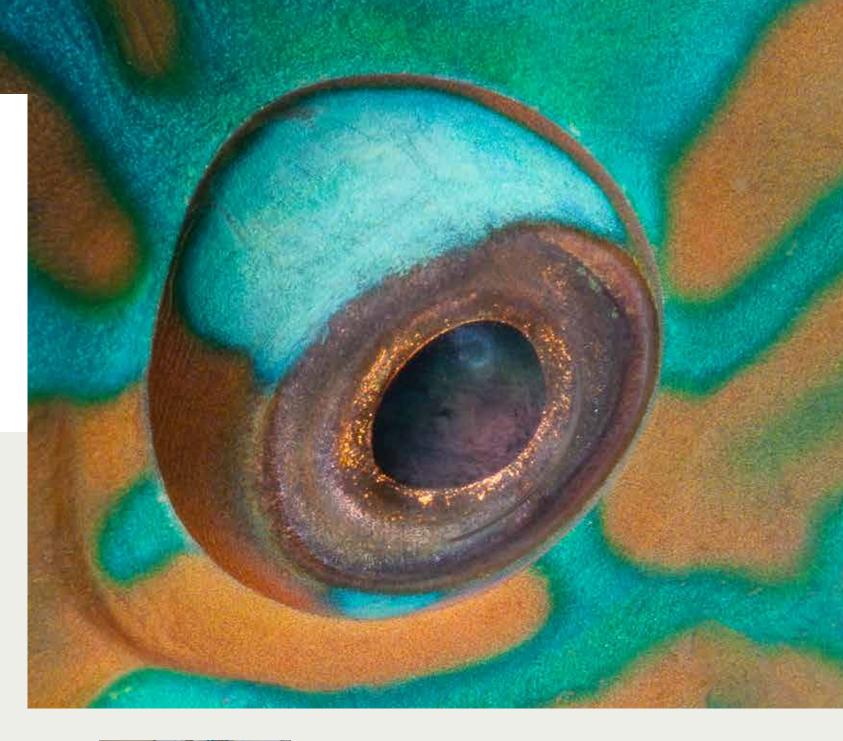
LIZ THOMPSON

Chief Communications Officer

SAM PURKIS

Chief Scientist







### THANK YOU FOR YOUR SERVICE

After a very long and fruitful career, Professor Abuzinada retired from the foundation's Board of Directors in 2023. The Khaled bin Sultan Living Oceans Foundation would like to proufoundly thank Professor Abuzinada for over twenty years of exemplary service on our Board. He has been a driving force behind our mission from the very beginning, and his contributions to the foundation have been invaluable. Thank you for everything you have done for the foundation over the years, Professor Abuzinada. We wouldn't have been able to accomplish all we have done without your sage advice and wisdom. We wish you a long and happy retirement.

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