



BENIOFF  
OCEAN  
SCIENCE  
LABORATORY



**UC SANTA BARBARA**

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# About

The Benioff Ocean Science Laboratory (formerly the Benioff Ocean Initiative) was founded at the University of California Santa Barbara in 2016 with a generous founding gift of \$10 million from Lynne and Marc Benioff. The mission of the Laboratory is to use science and collaboration to solve the world's most pressing ocean problems and replicate those successes. Since its inception, the Benioff Ocean Science Laboratory has grown into a globally respected model for redefining the leadership role that universities should take, not only in studying ocean problems, but also in leveraging the power of science and technology to solve them.

Many of the solutions incubated at the Laboratory are built in collaboration with ocean scientists at UC Santa Barbara and experts from around the world. By bringing the best and brightest minds together, more powerful and lasting solutions can be found to our most pressing environmental problems. A number of the flagship projects carried out by the Laboratory were selected via a crowdsourced campaign where people from around the world, from Los Angeles to Mombasa, shared ideas of threats to ocean health that they wanted scientists to help solve.

The core Laboratory team is composed of marine scientists, software engineers, ocean technologists, and faculty researchers. Important contributions also come from a diverse pool of undergraduate and graduate student researchers from UC Santa Barbara and beyond.

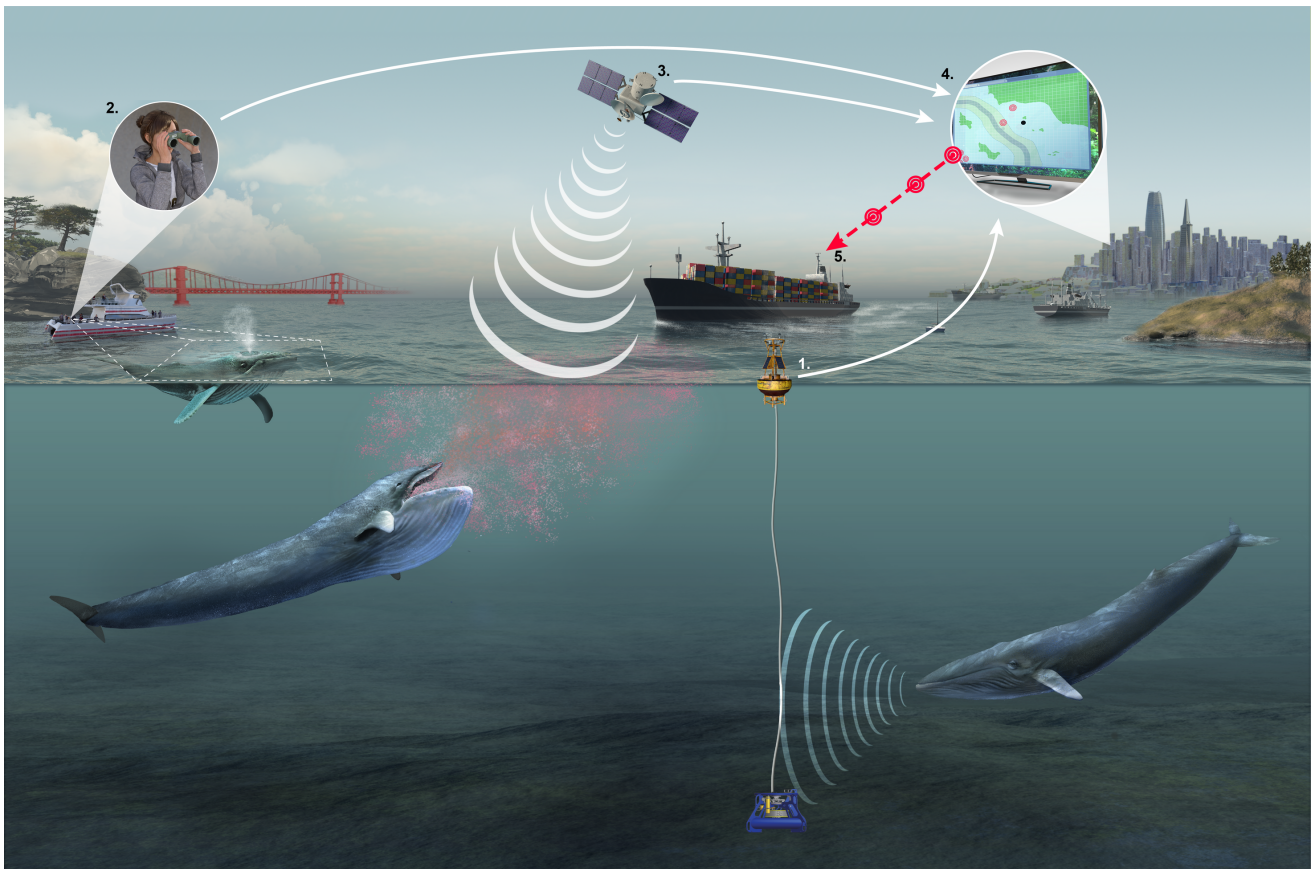
In September of 2022, Lynne and Marc Benioff made a new \$60 million gift to UC Santa Barbara to elevate and extend the mandate of the Laboratory to serve as a hub for research, learning, and innovation to improve global ocean health for another decade. A portion of this gift will allow for the renovation and renaming of one of UC Santa Barbara's marquee ocean science buildings on Campus Point. In total, the Benioffs have donated \$88 million to UC Santa Barbara to support the Laboratory, ocean outreach and diversity programs, and collaborative partnerships based on campus.

To date, the Laboratory has launched two larger flagship projects: to help reduce endangered whale deaths and to clean up plastic pollution entering the ocean. The Laboratory also has designed and deployed dozens of additional projects aimed at tangible improvements to ocean health.

# Saving Whales

The Benioff Ocean Science Laboratory's first flagship project was designed to help combat the problem of whales being killed by collisions with large ships. Whale-ship collisions are a leading threat to whale survival and population recovery. Partnering with researchers at the National Oceanographic and Atmospheric Administration (NOAA), Woods Hole Oceanographic Institution, University of Washington, UC Santa Cruz, Conserve.IO, and the Norwegian University of Science and Technology, the Laboratory funded and oversaw the construction of "Whale Safe", the Pacific's first automated whale detection system.





The system is powered by artificial intelligence, whale occurrence data, and satellite-powered “whale weather” forecasts that are integrated to help prevent ships from colliding with and killing endangered whales. In addition to sharing near real-time whale presence data, Whale Safe displays transparent shipping analytics to track vessel and company cooperation with government-issued voluntary vessel speed reduction zones that help protect endangered whales. The first Whale Safe system was piloted in the Santa Barbara Channel. Following the implementation of the Whale Safe system, more ships now slow down when whales are present and fewer whale mortalities have been detected in the immediate vicinity of the system. Following the success of the Southern California program, the Laboratory expanded Whale Safe in 2022 to operate off the coast of San Francisco to help reduce whale deaths in the Bay Area – a historic hotspot for whale-ship collisions.

A critical part of these efforts in Whale Safe includes engagement with major marine shipping companies and their retail customers to assist them to better use data derived from the program. Success of the Whale Safe program yields multiple wins for both whales and humans. By slowing ships down, there are reduced CO2 and NOx emissions, improving both environmental and community health. In addition to being ecosystem engineers, whales also prove to be beneficial for climate action, with their carbon storage contributions being equivalent to thousands of trees.

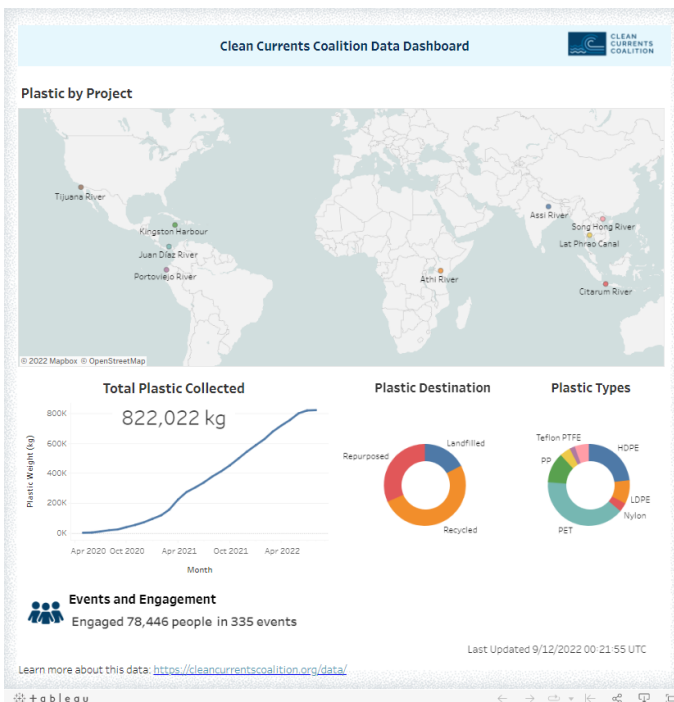
# Tackling Plastics



## Clean Currents Coalition

The second flagship project was initiated in 2019 to turn off the tap of plastic pollution entering the ocean. It is estimated that up to 300 metric tons of plastic enter the ocean from rivers every hour. To address this challenge, the Benioff Ocean Science Laboratory partnered with organizations around the world to create the “[Clean Currents Coalition](#)”, a global network of organizations piloting strategies to remove plastic waste from rivers. This project was scaled up from its original form thanks to an additional gift of \$4 million from the Benioff family, matched by a gift of \$5.5 million from The Coca-Cola Foundation. This generosity allowed the Laboratory to expand the project from one river to eight.

The eight Coalition members work both independently and in collaboration to address the problem of river plastic waste in their communities in Mexico, Panama, Ecuador, Jamaica, Kenya, Thailand, Vietnam, and Indonesia. Their primary goals are to develop, install, and operate plastic capture systems in polluted rivers and leverage the plastic captured and data collected to empower change in policy, waste management infrastructure and capacity, and consumer behavior in their communities. Together, the Coalition shares knowledge and develops lessons learned to grow their collective impact as well as promote the replication of their successes in rivers around the world.



As of August 2022, the Coalition had removed over 800,000 kg of plastic waste from rivers and is on pace to surpass 1 million kg by the end of 2022. This was achieved through the deployment of 21 plastic capture devices – ranging from barriers and traps to trash wheels and interceptors – as well as community cleanup events. In this same timeframe, the Coalition engaged nearly 80,000 people in their communities through educational events, workshops, and training about plastic waste, heightening awareness of the problem and inspiring behavior change.

The data that the Laboratory is collecting is being shared publicly on a [data dashboard](https://cleancurrentscoalition.org/data/), and will be used to inform the science of plastic waste in the environment as well as policy and business practices.

# Local Efforts

In addition to national and international efforts to address plastic pollution, the Benioff Ocean Science Laboratory also recognizes the importance of creating leadership on this issue at the local level in our own community.

In the Laboratory's hometown of Santa Barbara, the team partnered with the local chapter of the Surfrider Foundation to kick-start the Ocean Friendly Restaurants (OFR) program. The goal of the national OFR program is to reduce single-use plastics in restaurants by requiring participating businesses to take actions such as offering only reusable foodware for onsite dining and eliminating the use of expanded polystyrene. With additional support from local philanthropists, the Laboratory grew the chapter's OFR program from zero to the second highest number of restaurants (28) in the United States. During a national drive to register new restaurants in 2022, the team led the Santa Barbara chapter to tie for first place. This program also allowed the Laboratory to engage directly with UCSB graduate students, who spearheaded the project's day-to-day operations as program fellows.

In addition to this work in Santa Barbara, the Laboratory helped lead the effort on California's statewide ban on plastic bags and collaborated with environmental and [youth organizations](#) in Hawai'i to build momentum that culminated in single-use expanded polystyrene bans across the state.





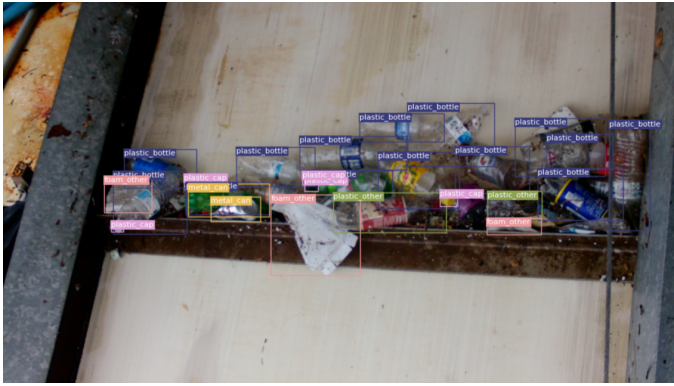
# AI for Oceans

One of the most productive elements in the portfolio of work of the Benioff Ocean Science Laboratory includes research exploring the integration of artificial intelligence (AI) into ocean problem solving.

One early implementation of AI for ocean solutions includes the launching of [SharkEye](#), an AI-powered system to track great white sharks near beaches and promote ocean safety. SharkEye represents the first service that shares shark data with the public in California (via text alerts and a website data portal), and the platform represents a first of its kind on a global scale.



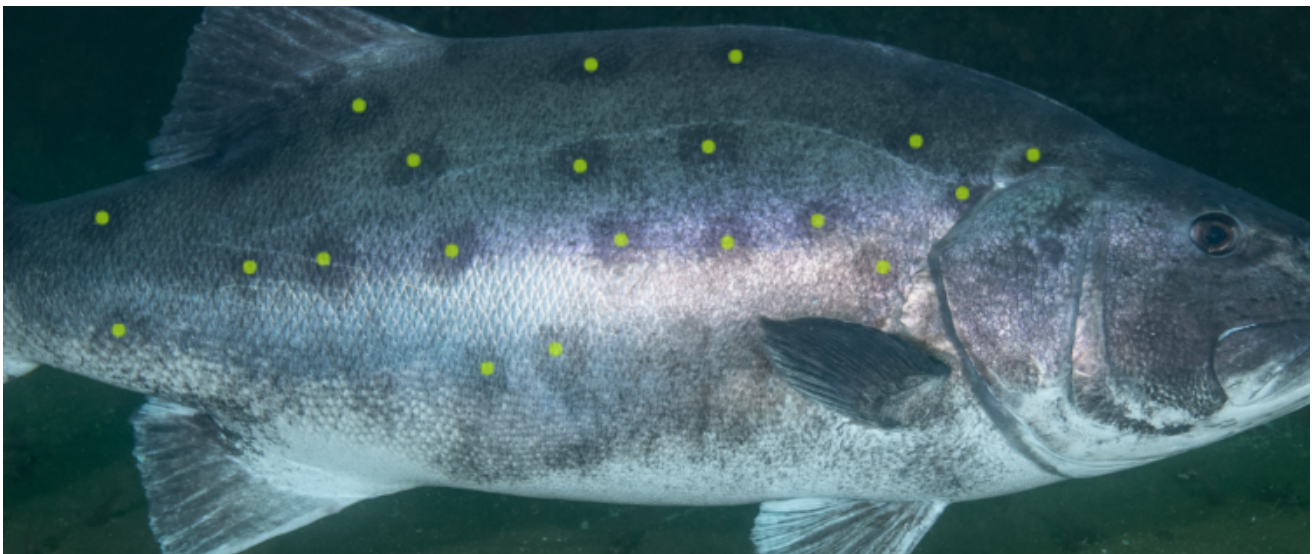
AI is also integrated into the Whale Safe system. The acoustic buoy designed by our colleagues at Woods Hole Oceanographic Institution uses an onboard algorithm to screen massive amounts of underwater sound data. The algorithm is used to identify whale calls at the species level and transmit these identifications to marine science experts for confirmation.



As an extension of the Clean Currents Coalition project, AI and computer vision models are being used on the Trash Wheels in Baltimore Harbor to identify and quantify plastics and other trash that is gobbled up by these river cleaning devices. These data will support the Waterfront Partnership of Baltimore's efforts to

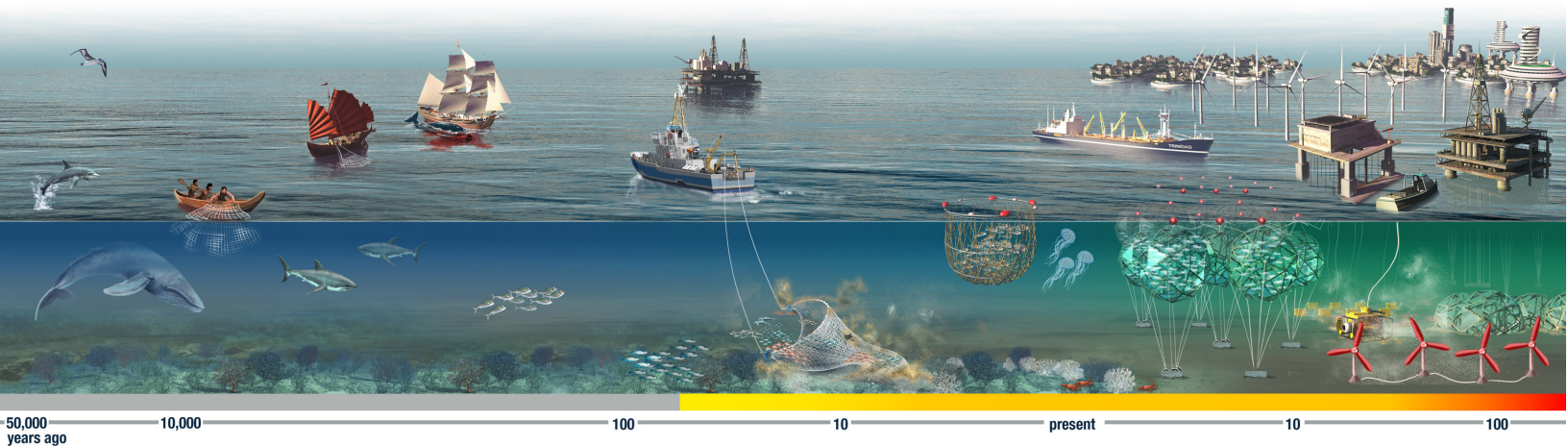
promote bans on plastic and reduce consumption of single-use plastics in the community. The model will be replicable to other plastic capture projects around the world.

The Spotting Giant Sea Bass project, which uses a computer algorithm to intelligently identify individual fish using their unique spot patterns, is helping researchers and wildlife managers understand the status of this once-overfished and now-protected species. Community divers submit photographs or videos of their encounters with giant sea bass to an online database, where the team uses the algorithm to match every encounter with a fish to an individual in our library. This produces information about the size of the population, movement patterns, and aggregation behaviors.



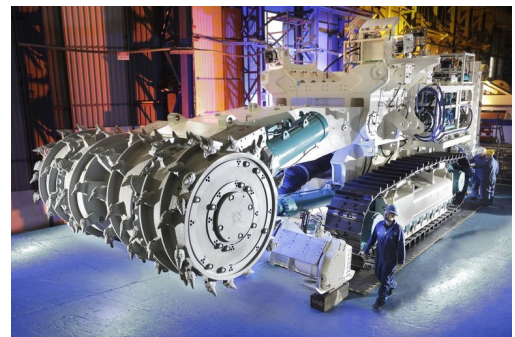
The Laboratory intends to expand their efforts in the use of AI for ocean health by soon adding an in-house AI researcher to the team, as well as make the tools open for use by other ocean problem solvers.

# Anticipating an Ocean Industrial Revolution



Unnoticed by many, a new industrial revolution is unfolding in our seas. The last several decades have seen exponential growth in new marine industries. This includes expansion of offshore oil and gas, aquaculture, marine shipping, and many other old and new industries. The Benioff Ocean Science Laboratory has maintained a focus on creating data tools and momentum to inform decision-making and planning for a busier ocean. This work is done in support of the philosophy that science can help us do more business in the ocean while also harming it less.

One specific focus of the Laboratory's work in this domain includes efforts to involve more science and more researchers in time-sensitive, ongoing conversations about whether the world should begin mining the ocean. Efforts in the Laboratory include fostering dialogue and research that can help shed more light on the environmental, financial, and social risks



associated with seabed mining. In 2016, the Laboratory launched Deep Sea Mining Watch, the first global platform to track ocean mining. This platform shares transparent information on where countries and companies intend to mine in the ocean as a means to empower more stakeholders at all levels to get involved in these conversations about the future of ocean mining

# Marine Parks

Today, only about 2.4% of our global oceans are included in strongly protected marine parks. Scientists estimate we may need to protect 30% of the ocean to ensure the future of ocean wildlife and ocean health. Marine protected areas may also serve as an important tool for building resilience in ocean ecosystems to climate change.

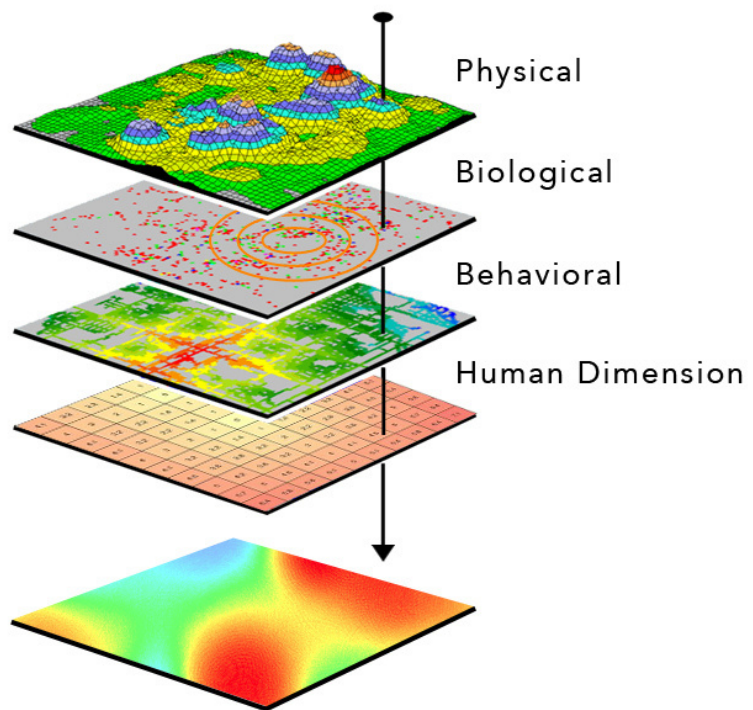
One of the early highlights of ocean action at the Benioff Ocean Science Laboratory involved helping build a scientific case for the expanded protection of the Papahānaumokuākea Marine National Monument in Hawai'i. Papahānaumokuākea today remains the world's largest fully-protected marine park.



The Laboratory also recognizes the importance of committing to sustainable long-term plans for the management of marine parks after they are created. As one example of this commitment, following the expansion of Papahānaumokuākea, the Laboratory assisted with the creation of federally-matched funds to launch research expeditions to the marine park. The funds provided scientists from Hawai'i the ability to conduct research in support of the enhanced management and enabled Native Hawaiian students to design experiments that were deployed in the Monument.

# High Seas: The Final Ocean Frontier

The high seas make up two-thirds of the world's ocean. They include a wide array of biodiversity, from commercially important and endangered bluefin tuna to sea turtles and whales. A fractured and imperfect system of governance for using resources in the shared waters of the high seas has put high seas biodiversity at risk. The United Nations is in the middle of an international effort to create a new treaty to correct these deficiencies and better protect biodiversity on the high seas for the future. Properly implemented, this treaty could become one of the most pivotal ocean political actions this century.



To help guide and support an ambitious and robust treaty, researchers at the Benioff Ocean Science Laboratory developed a standardized, data-driven strategy to identify hotspots of biodiversity potentially deserving of protection in the high seas. Results from this work were presented by Laboratory members at multiple of the United Nations high seas treaty negotiating sessions and are being developed into an easy-to-use digital decision-support tool for negotiators.

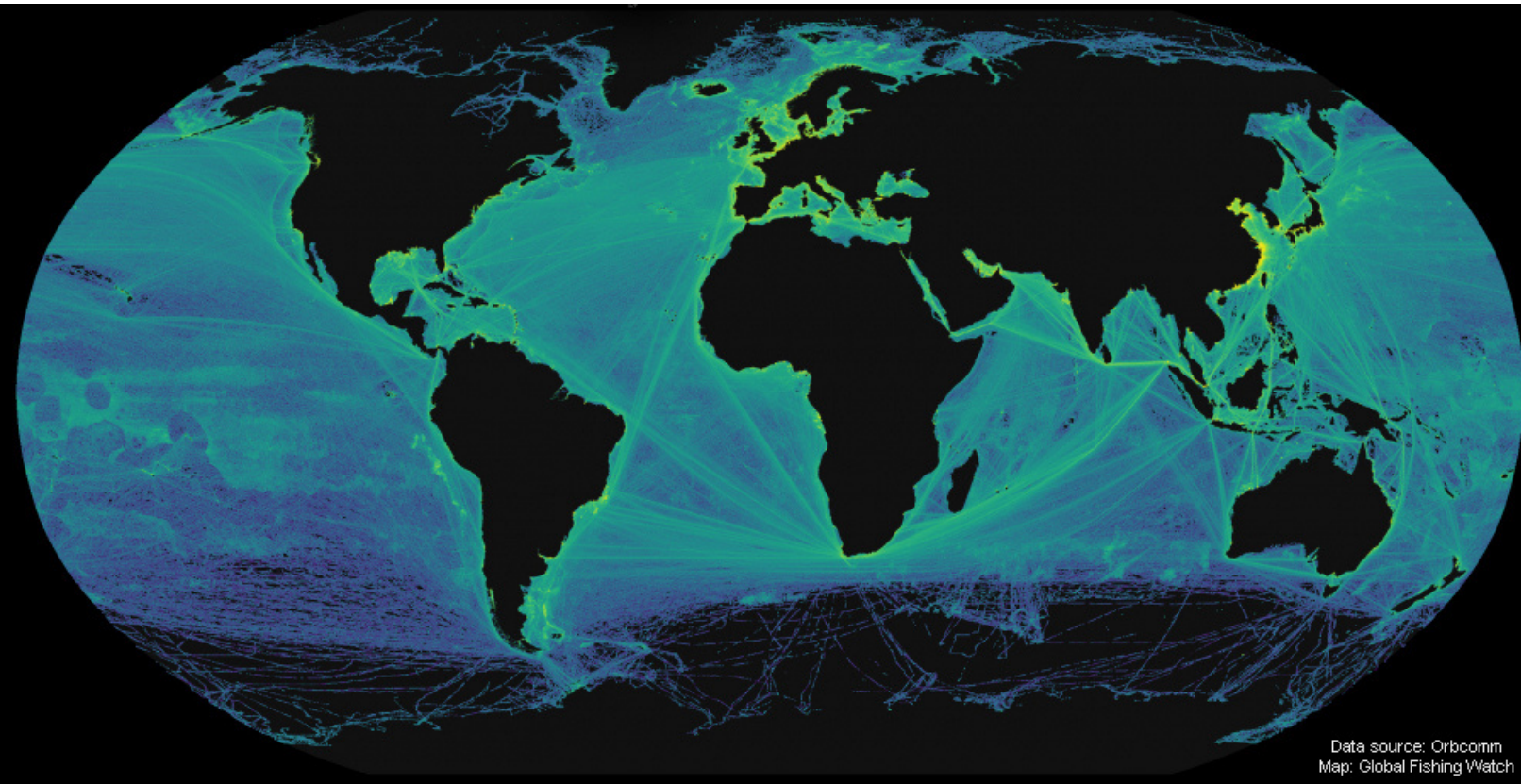
# Diversity and Community Outreach

While there is an urgent need for solutions to today's time-sensitive ocean problems, there is also an important long-term need for continuing to train and invest in emerging young ocean leaders to solve future ocean problems. Now more than ever, we need these leaders to come from diverse backgrounds to fully and effectively mobilize ocean change. A key mandate of the Benioff Ocean Science Laboratory team has been to promote diversity in ocean science and ocean solution-making. This includes providing paid internships for UCSB's diverse undergraduate community, partnering on ocean outreach and training programs with indigenous and diverse communities, and supporting research on environmental justice in the ocean.



For example, the Laboratory collaborated with Salesforce to fund and organize the training of 40 teachers in climate and ocean science from underserved schools and organized full day climate and ocean immersion field trips for 1,000 of their students. Laboratory members have organized field courses, technology and coding workshops, and training programs for Native Hawaiian students on the Big Island and Oahu. The Laboratory has also organized and helped fund ocean field courses for UCSB undergraduates from underrepresented backgrounds at Catalina Island and ocean career workshops in association with the UN Decade of Ocean Science. The Laboratory also provides funding support for students from diverse and low-income backgrounds to participate in core ocean leadership skills training opportunities (e.g., environmental film and media workshops, SCUBA diving training).

Laboratory research has also focused on creating advances in environmental justice. For instance, Laboratory scientists conducted first of its kind science illuminating how the sharing of fishing resources has become imbalanced across the planet, putting less wealthy nations at significant risk.



In the Laboratory’s next phase, there are plans to establish the “Benioff Scholars Program in Applied Marine Science”. As the name suggests, the focus area for the scholars program will be on supporting emerging and diverse researchers that are working to apply the products of their research towards fixing problems afflicting ocean health.

# World Economic Forum: Friends of Ocean Action

Collaboration is one of the fundamental principles of success of the Benioff Ocean Science Laboratory. In this spirit, the Laboratory was a founding partner in the creation of the World Economic Forum's Friends of Ocean Action. The Friends are a collective of over 70 ocean leaders in the sectors of business, technology, government, and civil society. This partnership between the World Economic Forum and the Laboratory creates opportunities in these leadership communities that are rarely available (e.g., research to business alliances) in other fora. This collaboration has given rise to numerous actions, including uplifting and teeing up opportunities for ocean action at the World Economic Forum's Annual Meeting in Davos, the infusion of more ocean science at key agenda setting policy meetings (e.g., G7, G20), and the injection of more ocean conservation goals into the environmental, social, and corporate governance (ESG) programs of leading businesses.

FRIENDS *of*  
OCEAN  
ACTION



WORLD  
ECONOMIC  
FORUM



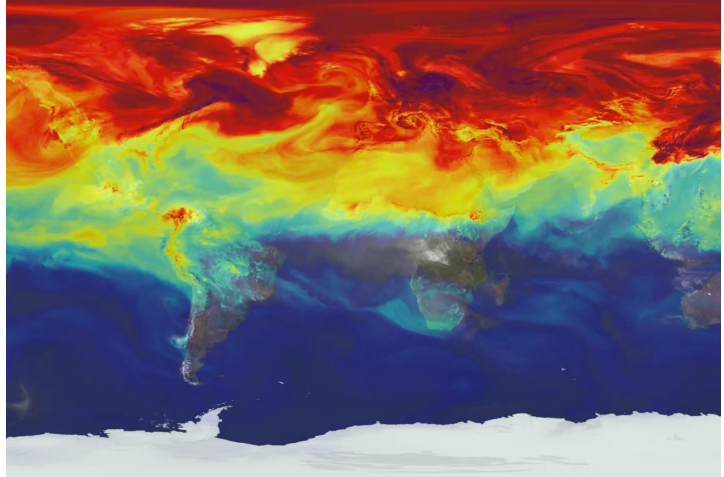
# Peer-Reviewed Research

While the focus of the Benioff Ocean Science Laboratory is to generate tangible solutions to problems facing ocean health, members of the Laboratory also generate peer-reviewed research that helps to advance and support our applied agenda. Since the inception of the Laboratory, over 50 peer-reviewed publications have been generated by team researchers. Subjects of this research vary widely and include such topics as:

1. How climate change is impacting ocean health
2. What baselines of healthy shark populations should look like to inform shark conservation
3. Why harmful fisheries subsidies reform is needed by the World Trade Organization
4. How protected areas in the ocean can promote climate resiliency
5. Strategies to use smart aquaculture to support global nutrition and biodiversity conservation
6. How new tech and data can be leveraged to improve and support the ways we govern the high seas
7. Methods for using technology to promote learning in environmental science and ocean science
8. Economic analyses of how much more endangered species are worth alive versus dead
9. What the Anthropocene is likely to mean for the ocean
10. How dolphins use and depend on protected areas

# Climate Change

Climate change is considered the top threat to ocean and planetary health by the Benioff Ocean Science Laboratory. Climate change is making the oceans hotter, more acidic, and less oxygenated. It also presents existential threats to coastal communities and peoples by imperiling the stable supply of nutrition from the ocean and increasing the risk of storm damage.



Many of the Laboratory's current projects have an ocean-climate action intersection. For example, the Whale Safe project helps reduce emissions from ships and also protects whales, which can store the amount of carbon equivalent to thousands of trees. Properly implemented protected areas can also increase the resilience of marine ecosystems to climate risks, store carbon, and provide safe stepping stones for biodiversity fleeing climate-stressed habitats.

This legacy of work will be expanded with the Laboratory's next flagship project, which will include a \$10 million investment to propel forward ocean-climate actions that will slow the advance of climate change.

# Building



As an investment in the future of ocean science on campus, \$10 million of the new Benioff gift will be used to improve research facilities in UC Santa Barbara’s Marine Biotechnology Lab Building. This 26,000 sq ft building located adjacent to the UC Santa Barbara lagoon and the Pacific Ocean has been an epicenter for the university’s marine research program for decades. The building houses marine biology-focused faculty and research labs as well as a conference room and classroom space, all with a front row view of the ocean and Channel Islands. The building has served as a longtime collision and innovation space for our ocean research leaders. This \$10 million investment in the building, supported by complementary campus funding, will provide funds needed for physical enhancements including building upgrades, laboratory renovations, and classroom updates. The Benioffs’ investment in this prime facility represents a significant boon for the ocean science research community on the UC Santa Barbara campus and adds a valued asset for the future of ocean science research on the West Coast.



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