



Southern California Marine Institute

ANNUAL REPORT

— 2022 - 2023 —



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MISSION

The mission of the Southern California Marine Institute (SCMI) is to foster marine research and education, focusing on urban impacts of the greater Los Angeles region on the coastal ocean. We seek to improve scientific understanding and the development of solutions that will enable coastal waters and watersheds to thrive, adapt and become resilient to ongoing environmental stressors.

ABOUT US

SCMI is a consortium representing a strategic alliance of 24 major universities, colleges, and foundations in Southern California. This includes nine universities from the California State University system representing the Ocean Studies Institute: Channel Islands, Dominguez Hills, Fullerton, Long Beach, Los Angeles, Northridge, Pomona, San Bernardino, and San Marcos. SCMI also comprises the combined marine resources of the University of Southern California, Wrigley Institute for Environmental Studies, University of California Los Angeles, Occidental College, Los Angeles Community College District, The Bay Foundation, NOAA National Marine Fisheries Service West Coast Region, and the California Science Center Foundation.

The consortium structure of SCMI allows us to engage in specialized marine research that would not otherwise be possible through independent organizations, and to maximize the use of resources as well as collaborate on projects. SCMI is in the heart of the Port of Los Angeles on Terminal Island. Our facility is a full-functioning marine research institute equipped with offices, laboratories, classrooms, a seawater filtration system, machine and wood shops, state-of-the-art dive locker and a warehouse. There is ample docking space for small boats from various universities and organizations, as well as the research vessel R/V Yellowfin.

DIRECTOR'S MESSAGE

Another exciting year has passed at SCMI! In our post-pandemic operations, it has become clear that marine sciences and education are more important than ever. As a result, we have observed an overall increase in facility and vessel use. The R/V Yellowfin is still the workhorse of the region providing an unparalleled educational experience for students. The boat schedule fills up - book your cruises early! As a research platform, the R/V Yellowfin provides a unique and affordable tool for accessing the Southern California Bight. It is the only vessel of its size that can core the bottom of the Santa Catalina Channel and is being used extensively by our UCSB partners to study the legacy contamination of DDT in the region. The ongoing upgrades to the facility and wharfs continue to support an increasing amount of research for our consortium members. Restoration and enhancement projects by the Bay Foundation, the Vantuna Research Group and their partners continue to expand and elevate our presence in the region. In addition to our traditional research and education mission, our boating and diving safety classes are booked solid. Safety is our number one priority. We are looking forward to another great year, hope to see you down here soon!



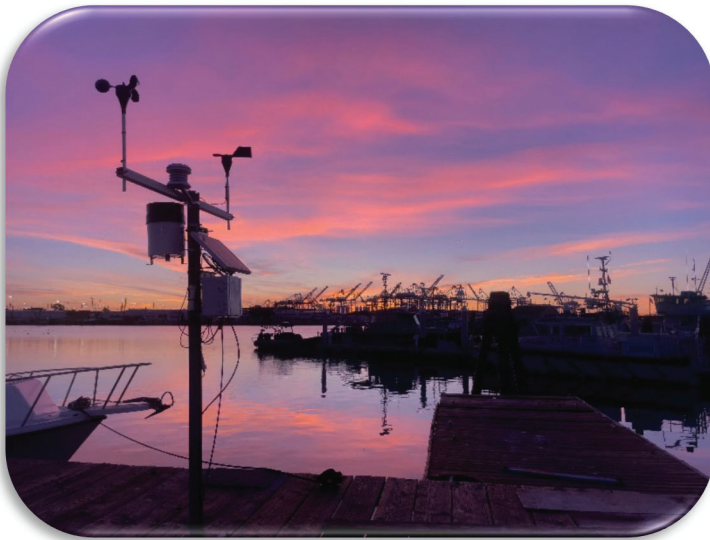
INTRODUCTION

The Southern California Marine Institute (SCMI) had a remarkable period of growth over the past year as we continued our commitment to fostering marine research and education. We are delighted to report SCMI received the Port of Los Angeles Community Investment Grant to build the shoreside station monitoring program which provides real-time water quality and climate data. SCMI served as a hub for groundbreaking research endeavors throughout the year. The Palos Verdes Reef project and Bureau of Ocean Energy Management (BOEM) Environmental Status of Artificial Structures Study continue to grow into multi-institutional collaborations and help fulfill our commitment to fostering collaboration, advancing knowledge, and preserving marine ecosystems. In collaboration with Vesta, a research group focusing on CO₂ sequestration through coastal enhanced weathering, we provided laboratory space, fostering innovative studies. The Bay Foundation's Abalone Lab continues to thrive, bolstering abalone populations and contributing to the restoration of rocky reef ecosystems. Additionally, SCMI facilitated impactful research with institutions such as USC Earth Sciences, University of California Santa Barbara, and WSP. We continue to make improvements to our laboratories and vessels to better serve our members' research needs. The R/V Yellowfin underwent our regular haul out and is in peak shape for a fully booked fall semester. As we reflect on the achievements of the past year, SCMI stands poised for an even more promising future. Our commitment to advancing marine research and education remains steadfast, driven by the collective passion and dedication of our members, partners, and the broader scientific community.

WHAT'S NEW?

Port Observing Shore Station Element | Real-Time Monitoring Station

Installed in the heart of Fish Harbor, our Port Observing Shore Station Element (POSSE) is a real-time monitoring station in the Port of Los Angeles Fish Harbor to support research and education at local southern California schools, colleges, and universities. The POSSE monitors water quality and climate patterns in the Port of Los Angeles and provides time series data valuable to understanding water quality and climate trends in the future.



A DATABANK FOR THE FUTURE

The POSSE was generously funded by the Port of Los Angeles Community Investment Grant Program. The POSSE directly benefits the Harbor Department/Tidelands Public trust by providing real-time water quality and climate data in the Port of Los Angeles for marine-related scientific studies at all education levels. Integrating several data sets combined with outreach will sustain and advance an end-to-end, regional coastal ocean observing system aligned to highlight the environmental conditions of the Port of Los Angeles. These elements will provide foundational observing, data capabilities to serve as a resource for preserving and predicting to support preparedness to changing environmental conditions, thus enabling resiliency of the Port of Los Angeles. This growing databank provides the community with the first opportunity to analyze changes over time in our coastal habitat.



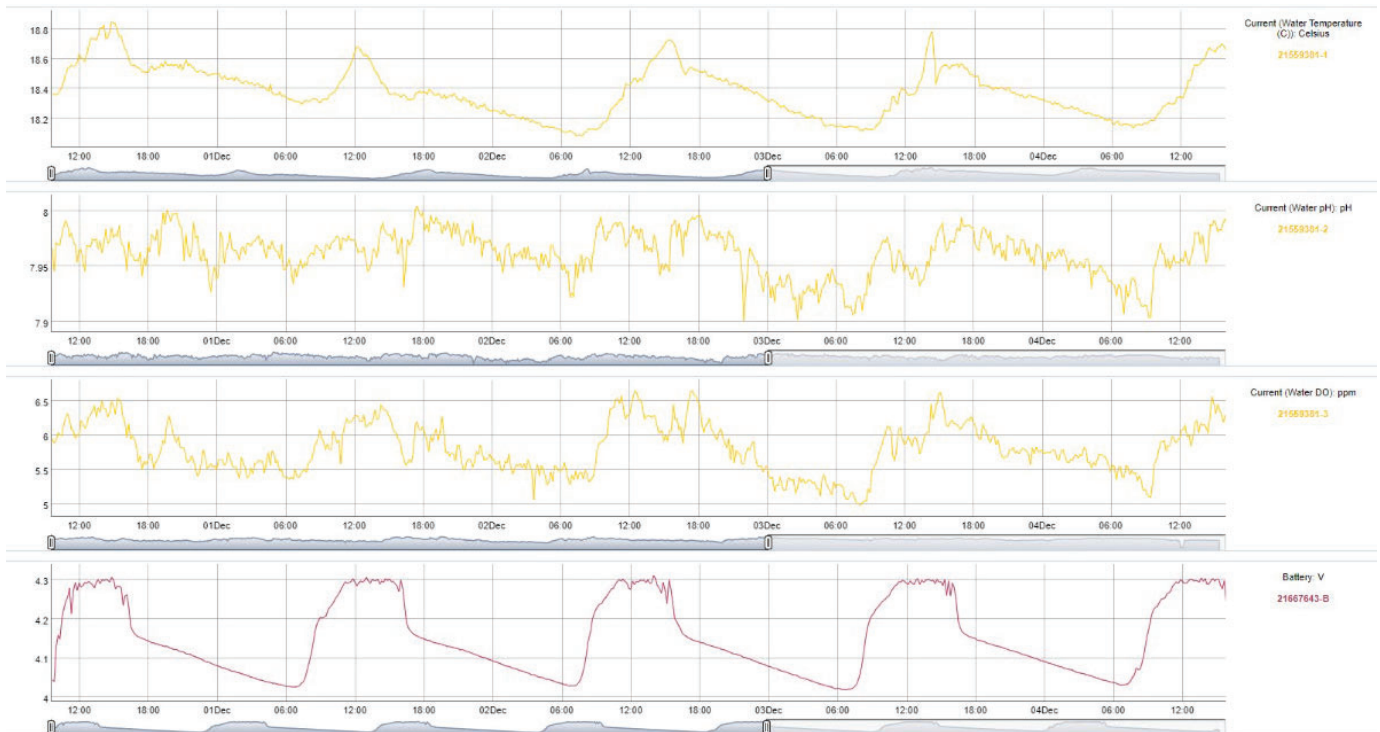
Additionally, through involvement with the SCMI POSSE, program participants will achieve applicable career skills in marine sciences, technology, and coastal management. Armed with this skillset participants will be on a path towards caretaking our marine environment's future.

REAL-TIME DATA AT YOUR FINGERTIPS

The program installed a fixed monitoring station at SCMI's marine lab and dock in the Port of Los Angeles Fish Harbor. This station streams automated real-time water quality and climate data.



Our Port Observing Shore Station Element (POSSE) is equipped with a team of sensors, both above and below the surface. Above, this suite of sensors collects climate data measuring air temperature, relative humidity, wind direction, wind speed. Below, our sensors collect water temperature, dissolved oxygen, and pH. We look forward to adding more sensors in the future.

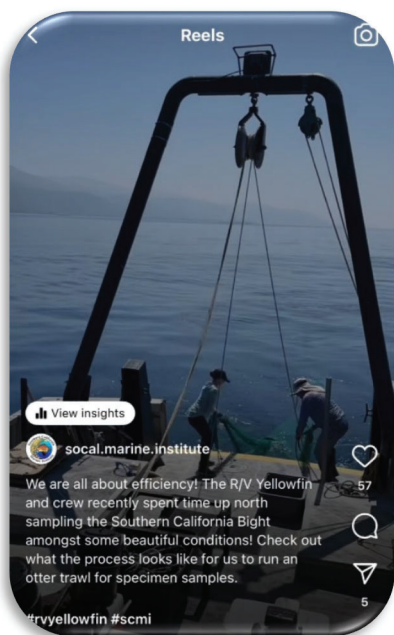




SCMI Social Media | Engagement

Our efforts to communicate with and educate the public have vastly improved using Instagram as a platform. This creative and engaging way of connecting with our audience has allowed us to highlight the wonders of marine life in southern California, the advanced technologies utilized in marine science, and diverse research occurring off our coast.

Through eye-catching visual content and informative captions, we have been able to showcase eastern pacific biodiversity aiming to foster a greater understanding and appreciation for our local ecosystem.

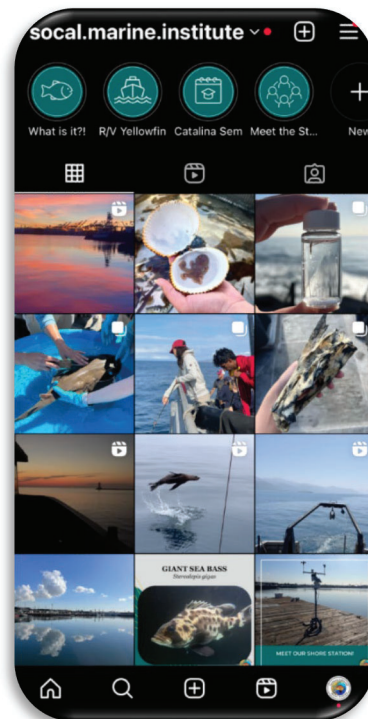


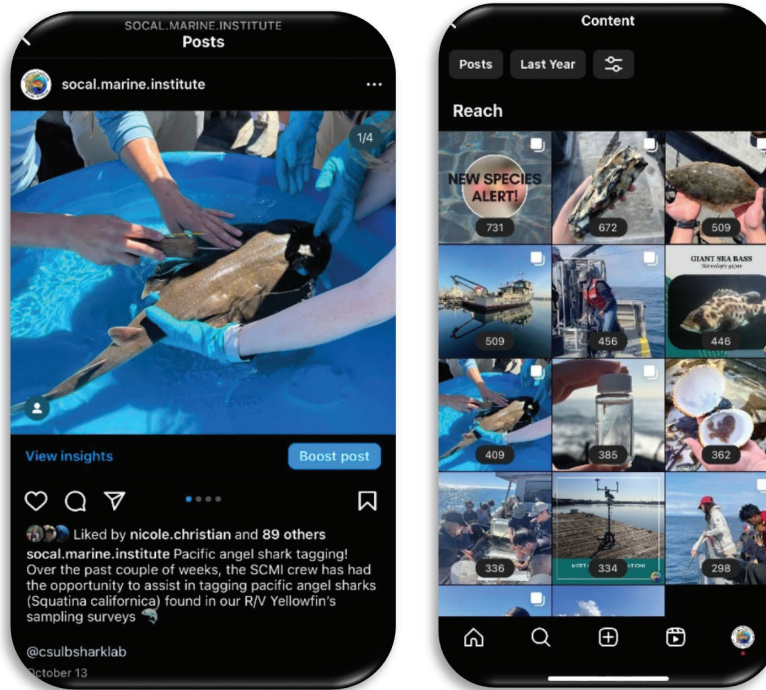
Furthermore, we have taken the opportunity to share insights into the cutting-edge technologies used by our research partners, allowing our audience to gain a glimpse of innovative tools used to explore the marine world. By highlighting, we hope this will spark interest in continued use of our resources.

Through our regular updates and interactive posts, we have successfully reached an average of 10,000 people each month. Our “What is it Wednesday?” feature is quite popular with our Insta-followers.

We are pleased to report that since our revamp, our social media following has increased another 8% this year. As we move forward, we stay committed to utilizing social media to remind our audience that we are available to help them achieve their research and educational goals while educating them remotely in the process.

Our Instagram can be reached here: [SCMI Instagram Profile](#)





SERVICE GOALS

Infrastructure Improvements

SCMI strives to advance our mission by maintaining and optimizing physical resources and environments. The number one priority for our facilities is to create and support a clean, safe environment for member institutions, researchers, staff, and students to learn and engage. We continually improve upon top industry practices to support the goal of providing the best possible services while also maintaining the best cost model. Securing our campus was top on the punch list. We rejuvenated our perimeter fencing and gates to ensure fluid operation and re-secured the overhead barbed deterrents.

Continuing this year, we moved forward with a push to decommission supplies left behind by ‘PIs of the past’ in several laboratories with our process of sorting, eliminating, and relocating. Items of potential use for future projects were relocated to deep storage and labeled for simple retrieval when a new project arises. With this organizational process, more usable space is established. Freeing up those laboratories for researchers to move in!

Upgrades continued for several laboratories and offices. Seven spaces (Office #103/#104/#204/#203/#207 and Laboratory #210/#212/#213) received new water and corrosion resistant window shades. These shades will continue to be implemented until all windows are upgraded.

Additionally, the communications hatch on the southwest corner of the 820 lot, finally had the cover replaced by AT&T, relieving a much-needed safety concern.



OSI | AAUS Research Dive and Boating Program

Dive Operations: We currently have 91 (74 active) Scientific Divers on our roster, logging 2330 dives for the period 6/1/2022 – 6/1/2023. One AAUS Scientific Diver course was conducted in July. The Winter AAUS course, held in January, was nearly canceled due to weather. A total of twelve new divers received training, the cohorts were formed of candidates from CSUN, CSULB, and Occidental College.



Boat Operations: The California Department of Fish and Wildlife renewed their contract for training of their personnel, and we have begun discussions with the California State Parks as well. We conducted two MOTCs for OSI during the summer of 2022 for a total of 12 participants. The cohorts were formed of candidates from CSUN, CSULB, and Occidental College. We conducted one MOTC for CDFW for a total of 6 participants. In April of 2023, two MOTCs were conducted for CDFW, for a total of twelve participants. The first of two scheduled Spring MOTCs for OSI was cancelled – there were no applications submitted. The second session only had two CSU participants, and one SCMI staff member. Two courses were conducted for CDFW in May, for a total of 12 participants.



EDUCATIONAL GOALS

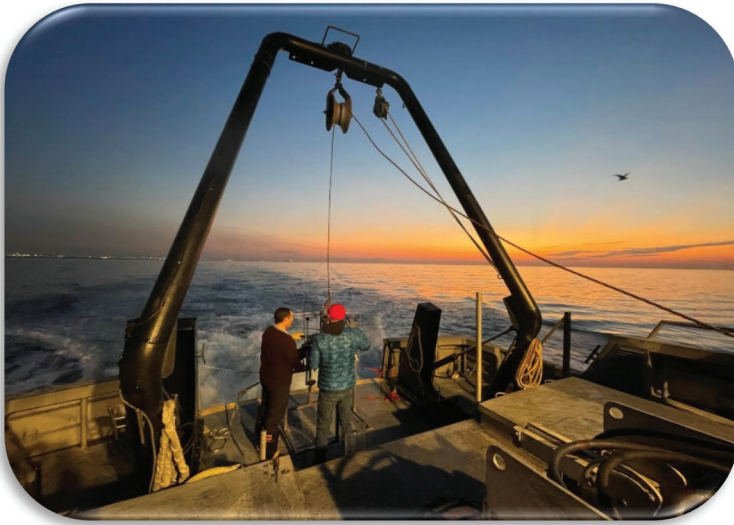
CSU Marine Biology Semester on Catalina Island

The Catalina Semester provides a unique opportunity for CSU students to experience hands-on marine biology and guide them to careers in marine science. The 15-week program is based at the Wrigley Marine Science Center (WMSC), located on Santa Catalina Island, 26 miles from Los Angeles, CA. In a significant milestone, the CSU Marine Biology Semester on Catalina Island resumed its operations in Fall 2022 after a hiatus caused by the COVID-19 pandemic. Eighteen promising students from four CSU campuses were accepted into the program, marking a return to immersive marine education experiences. The Fall 2023 semester is currently underway and being instructed by CSULB professors Dr. Bengt Allen, Dr. Darren Johnson, and Dr. Christopher Janousek.

Demonstration R/V Yellowfin Cruises

Our Yellowfin demonstration cruises continued to be a cornerstone of our educational initiatives. These cruises served as invaluable resources, allowing students to engage in hands-on marine science experiences. Guided by our skilled Captain, Vessel Engineer, and Demonstration Techs, students had the opportunity to work with real-world equipment and techniques, including VanVeen grabs, plankton tows, biological dredges, otter trawls, and handheld CTD devices. Following a hiatus caused by the challenges of COVID-19, we were thrilled to resume these cruises, offering an immersive learning environment to college and university students.





RESEARCH GOALS

In the pursuit of our mission to support marine research, SCMI played a pivotal role in facilitating a wide array of innovative projects throughout the year. Our commitment to fostering collaboration and providing resources, expertise, and vessel support continued to drive impactful research endeavors in Southern California's marine ecosystems. SCMI supported researchers from various member and non-member institutions, including the University of Southern California, Occidental College, California State University, Northridge, Long Beach, Pomona, and Los Angeles, The Bay Foundation, WSP and, the Port of Los Angeles. By offering vessel support, equipment, and expertise, SCMI enabled these researchers to conduct essential studies, contributing to our collective understanding of marine environments and their preservation.

The Bay Foundation Abalone Lab

The Bay Foundation (TBF) has gladly been an SCMI consortium member for over 8 years. SCMI's facilities and location have allowed TBF to continue culturing and propagating abalone, while simultaneously providing accessibility for kelp forest and eelgrass restoration efforts. They are grateful for the resources and support that SCMI has provided over the years. The Bay Foundation was featured as a Partner in the Spotlight in NOAA Fisheries Recovering Threatened and Endangered Species FY 2021-2022 Report to Congress.

TBF's abalone restoration project aims to implement a multifaceted approach to restoring and developing abalone populations, and ultimately rocky reef habitats, throughout Santa Monica Bay and greater coastal waters. TBF maintains two abalone aquaculture facilities at SCMI where they advance research on captive and wild abalone husbandry, spawning, and larval cultivation techniques. Since 2019, TBF and project

partners (CDFW, NOAA, Paua Marine Research Group, UC Davis Bodega Bay Marine Lab, and the Aquarium of the Pacific) have outplanted over 5,000 federally endangered white abalone to the rocky reefs of Palos Verdes. Additionally, over 3,500 red abalone have been outplanted to these same reefs with another 7,000+ red and white abalone outplanted to the coastal waters of Point Loma in San Diego.

Moving forward, TBF and project partners will continue to perform scheduled biannual outplanting and monitoring events, helping to inform the success of the project and the recovery of the species. In just this year alone, in Spring and Fall 2023, TBF and project partners have outplanted an additional 2,000 endangered white abalone to the reefs of Palos Verdes and Point Loma. TBF and project partners hope to expand white abalone restoration efforts to more remote areas, like the Channel Islands, and additional nearshore reefs in the near future.

Figure 1. New abalone outplant module, POD (Protective Outplanting Device) attached to concrete base with a TLC (timelapse camera) focused on the POD to study abalone movement and predation post-outplant. Commercially available 15L SEAPA oyster baskets modified with a plastic insert to allow abalone to adhere to a flat surface, with door at one end that can be propped open to allow abalone to be released into the natural reef.

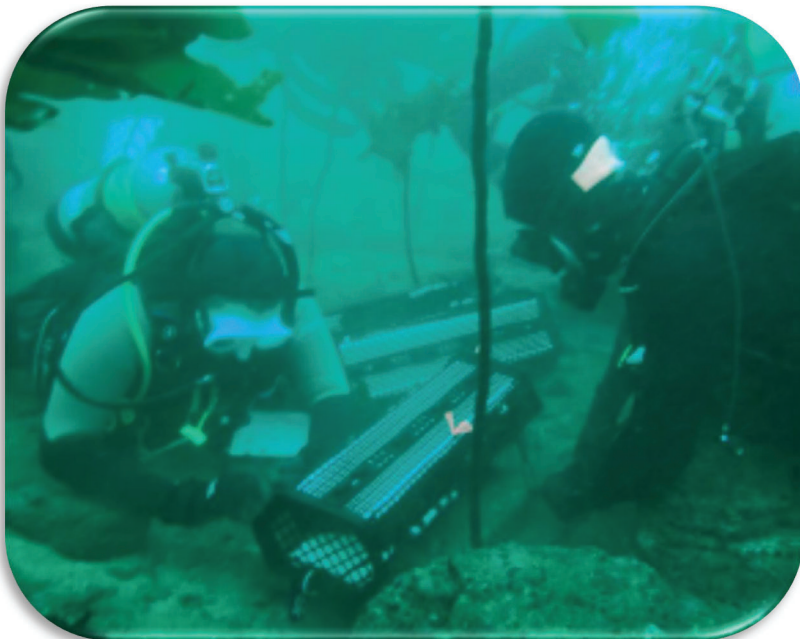
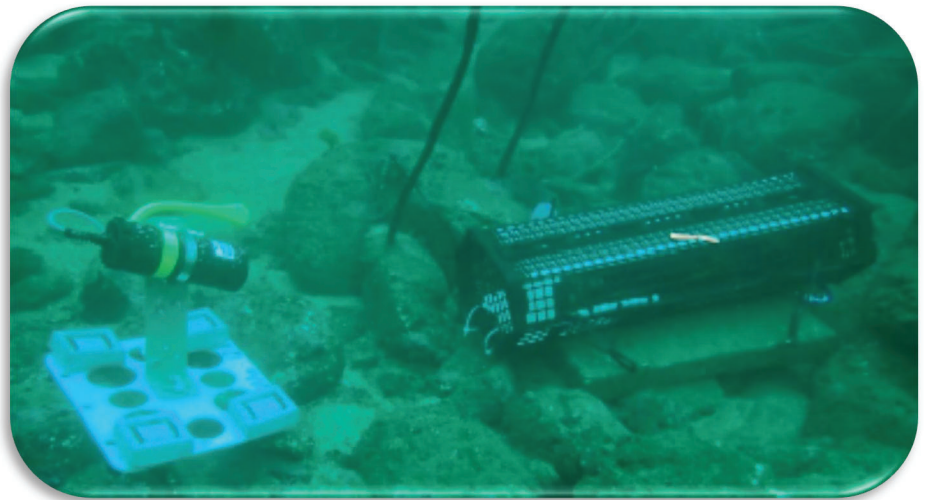


Figure 2. TBF Divers are working to deploy PODs to concrete bases throughout the experimental reef off Palos Verdes.



Figure 3. Diver surveying a BART (Baby Abalone Recruitment Trap) 24 hours after stocking with abalone (left). Photo of *H. sorenseni* inside BART PVC pipe tube 24 hours after outplant (right).



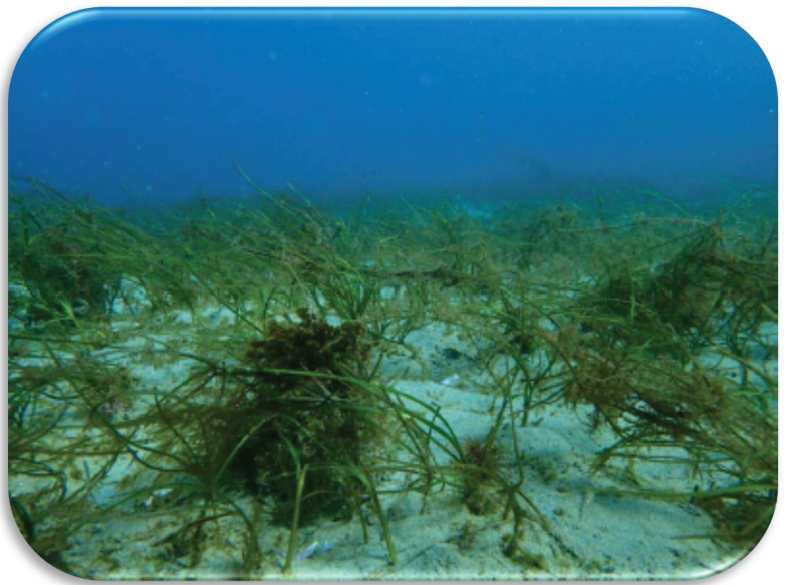
Figure 1: Photo of transplanted *Z. marina* at Button Shell Beach Cove one-month post-restoration

Eelgrass Restoration

Eelgrass (*Zostera* spp.) is a marine flowering plant that is an economically and ecologically valuable marine habitat found in temperate regions throughout the world. It provides rearing habitat for juvenile fishes, filters nutrients, and reduces erosion, among myriad other functions. Eelgrass beds are highly productive systems, and the complex structure of seagrasses compared to unvegetated sediments enhances biodiversity. Unfortunately, eelgrass beds are typically found near the coastline, and such, are more vulnerable to harmful impacts by human activities and climate change as well as natural disturbances, including wave action and light limitation. It is within this context that TBF transplanted *Zostera marina* to Button Shell Beach Cove on the leeward side of Catalina Island. Using applied methods from previously

successful eelgrass transplants, TBF transplanted 8,400 turions to a 1,400 m² project area. This Catalina Island Eelgrass Restoration Project hopes to produce strategic partnerships, address key data gaps pertaining to offshore eelgrass beds, create ecologically significant habitat, and inform the efficacy of scalable eelgrass restoration efforts.

Figure 2: Photo of transplanted *Z. marina* at Button Shell Beach Cove seven months post-restoration



Kelp Forest Restoration

TBF's Palos Verdes Kelp Forest Restoration

project aims to enhance the subtidal habitat of Palos Verdes by mitigation of purple sea urchins (*Strongylocentrotus purpuratus*) to historically natural population densities. The project targets rocky reef habitat once abundant with giant kelp (*Macrocystis pyrifera*) that has shifted or begun shifting to a barren state by unstable urchin populations. The project is implemented with support from Vantuna Research Group, commercial sea urchin anglers, and support from volunteer scientific divers. Restoration and monitoring activities have been conducted in kelp reference, restoration, and barren sites since July 2013. These restoration and monitoring activities include pre-restoration UPC and urchin density surveys, urchin culling, post-restoration urchin density surveys, and CRANE habitat monitoring. To date over 60 acres of reef has been restored, with an observed increase in red urchin gonad biomass, an increase in community diversity, and a significant increase in kelp canopy within restored sites.

Current efforts are focused on the restoration of Point Fermin and Underwater Arch Cove where purple urchin barrens currently persist. TBF divers have begun setting up 30m by 30m restoration blocks within both sites and will conduct pre-restoration UPC and urchin density surveys. Once this data is collected, commercial anglers and volunteer scientific divers help to systematically cull purple urchins in these blocks to a target density of 2 per square meter. Subsequent post-restoration urchin density surveys will be conducted to confirm an adequate reduction in the assigned areas.

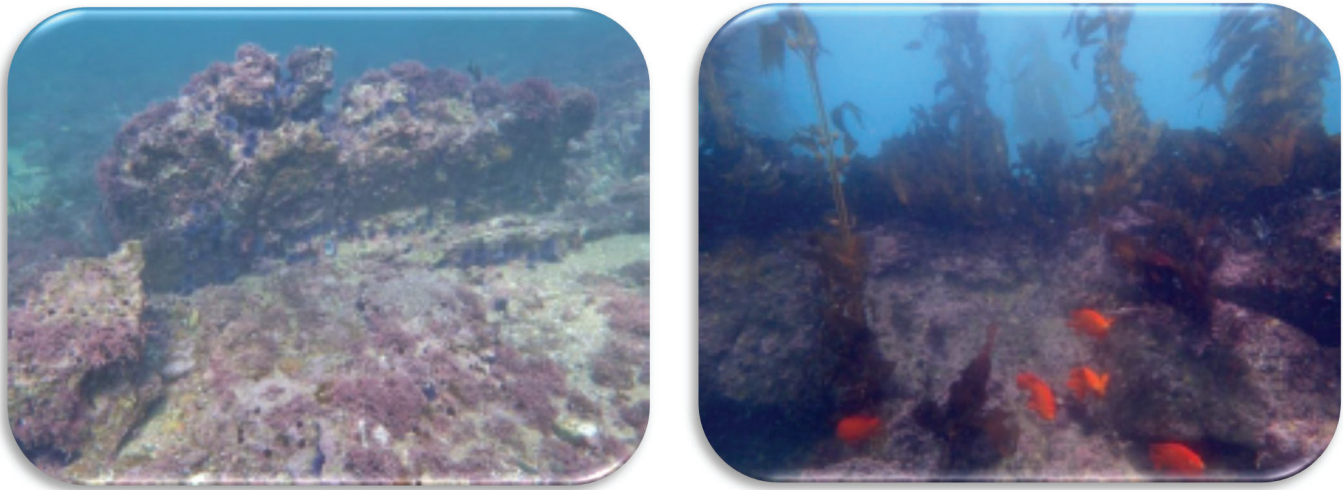


Figure 6: White's Point pre-restoration on 2/7/2020 (left) and White's Point post-restoration 8/31/2020 (right) at roughly the same photo point.

Vesta | Coastal Enhanced Weathering Project

Vesta is a mission-driven company and research organization that seeks to employ a method called coastal carbon capture to combat the accumulation of excess atmospheric carbon dioxide. Coastal carbon capture harnesses the power of the oceans to accelerate the Earth's natural long-term carbon dioxide removal process (the carbonate-silicate cycle) and enhances coastal resilience. This method entails adding the natural mineral olivine, milled down to beach-compatible sand, to coastal protection projects. There, it gradually dissolves in the seawater, reducing ocean acidity and removing carbon dioxide from the atmosphere. Vesta's mission is to further the science of Coastal Carbon Capture and galvanize global deployment to safely remove billions of tons carbon dioxide from the atmosphere.

At SCMI, Vesta has continued to conduct reactor experiments to continue refining and improving a mechanistic understanding of the complex biogeochemical reactions in olivine amendments of marine sediments. These experiments have also provided critical insights into deployment strategies and in the development of customized hardware to detect carbon capture. This year, Vesta scientists also installed at SCMI highly precise laboratory instrumentation to analyze vital carbonate chemistry parameters from experiments and pilot sites across the country. Vesta's research mission continues to thrive immensely from the incredible support and expertise of SCMI and its staff.

University of California Santa Barbara | DDT Mapping

The Department of Earth Science at University of California, Santa Barbara (UCSB) led by Dave Valentine Ph.D., faculty member in the Department of Earth Science and the Marine Science Institute at UCSB; Jacob Schmidt Ph.D. student, Interdepartmental Graduate Program in Marine Science; Mong Sin Christine Wu, post-doctoral scholar; and Hailie Kittner, master's student, greatly enjoyed our time aboard R/V Yellowfin this year. The fantastic captain and crew helped us collect almost 350 sediment cores at 70 stations in San Pedro Basin over the past eleven months, surpassing our expectations. Our field sampling efforts are being used to map DDT and related compounds across the basin to identify hotspots where large volumes of DDT manufacturing waste were once disposed of into the deep ocean. Even though DDT has not been manufactured in the US for over 50 years, low sedimentation rates in San Pedro Basin mean that highly concentrated sediments are within the top 5-10 cm of the sediment. Our research is helping to understand if transport processes push DDT and related compounds towards the sediment-water interface and continue to make the compounds bioavailable. We are concerned about the lasting impacts that DDT and related compounds have had on local ecosystems, affecting bald eagles, sea lions, condors, dolphins, and more. Our sampling campaign aboard the R/V Yellowfin will provide much needed data for understanding future ecological impacts locally and in considering potential remediation strategies. Interested readers can find several Los Angeles Times articles on the project, with more results expected soon.



University of Southern California | Geological Pore Water Study

We are using the Yellowfin to visit locations between Los Angeles and Catalina and deploy a sediment and sediment pore water collection device.



We built a novel pore water collection device that is deployed as part of the Multi-corer, typically deployed just to collect mud. We do more, we collect mud but also place a blade-shaped device into the mud and suck out pore waters (interstitial water) from different depths. With this water, with colleagues from Caltech, we are investigating how much, if any of the DDT degradation products are soluble enough to appear in the pore water. This is a huge question because most of the DDT and products are insoluble, which means they stick to particles and stay in the mud. But if some of them are soluble, then these products could move

through the pore water and eventually come back out of the mud into the ocean water. We are planning more trips to more locations, having just completed a test trip to Whites Point in August.

Palos Verdes Reef Restoration Project

Drone Observation

The Palos Verdes Reef Restoration Project, completed in 2020, continues to thrive as a multi-institutional collaboration. SCMI's drone observation efforts have allowed for detailed monitoring of the reef's progress, while researchers from various universities delve into spatial dynamics of kelp forests, fish habitat use patterns, and innovative environmental studies utilizing remote sensing and eDNA techniques. This collaborative endeavor exemplifies the power of collective research efforts in marine conservation.



Winter brought some hefty storms. Drone footage documented devastating effects of these storms on the natural reef structure, resulting in the depletion of giant kelp (*Macrocystis pyrifera*) populations. In stark contrast, drone footage offers a glimpse of hope as the adjacent artificial reef installation displays a robust kelp canopy post storm.



Environmental Status of Artificial Structures Offshore California BOEM Grant

SCMI received a substantial grant from the Bureau of Ocean Energy Management (BOEM) to conduct a comprehensive study on the environmental status of artificial structures off California's coasts. Led by Occidental College's Vantuna Research Group and Cal Poly Pomona, this study aims to generate crucial environmental criteria for evaluating potential artificial reefs. By understanding the complex relationships between local factors and artificial structures, the study informs future conservation efforts and ecological preservation.

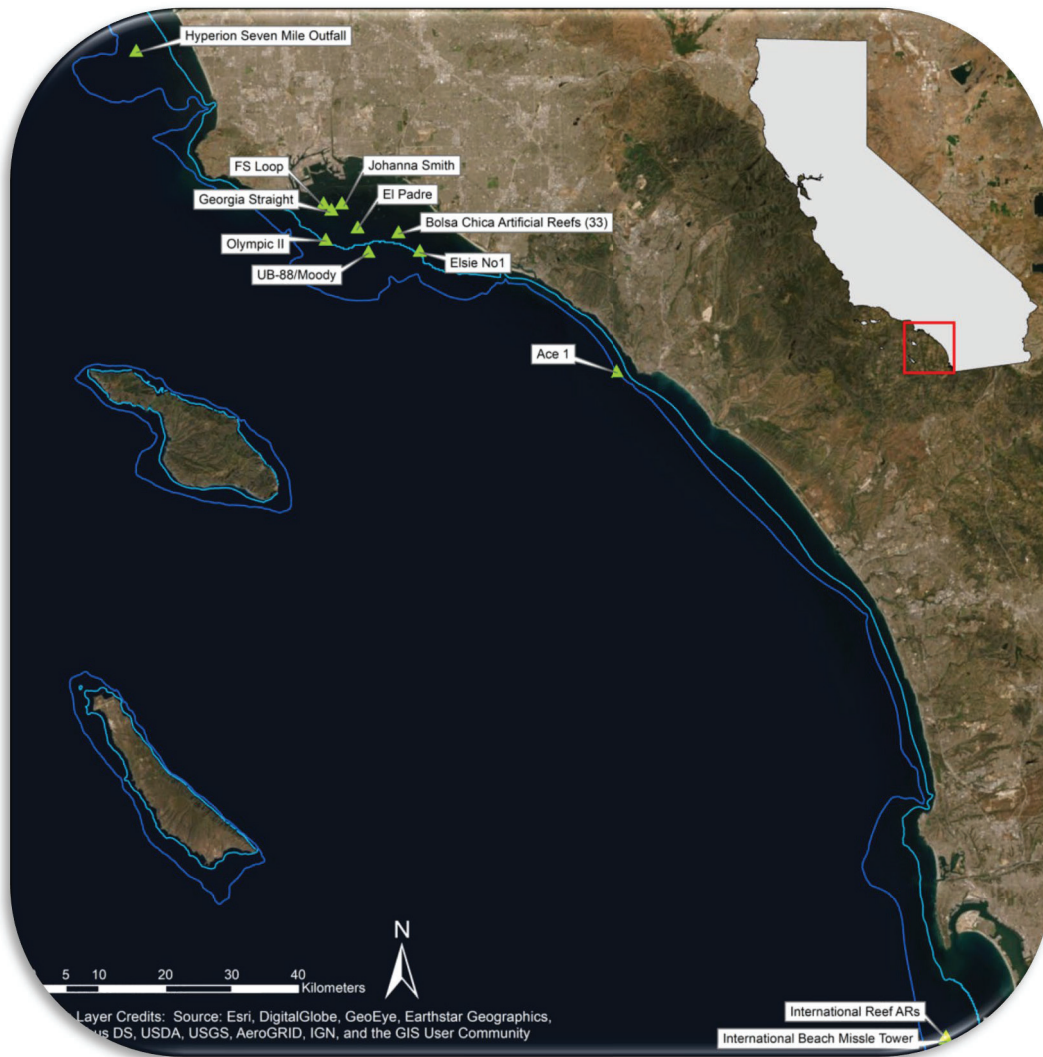


Figure 1. Map of proposed artificial reefs and shipwrecks in the Southern California Planning Area at depths appropriate for comparative studies with existing oil and gas infrastructure. Light blue line indicates the -30m isobath (max depth for diving) and dark blue line indicates the -100 m isobath (max depth for BlueROV2).

VESSEL USE

R/V Yellowfin Usage by Institutions Update

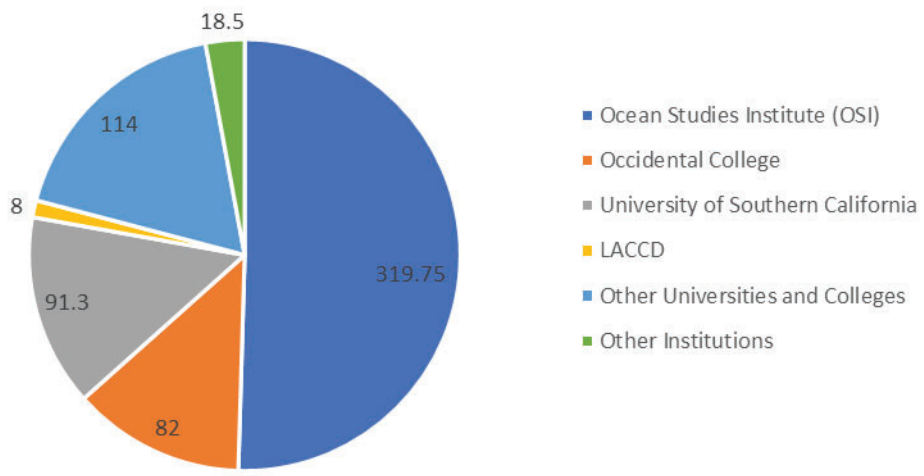
This year, the R/V Yellowfin logged approximately 633 hours of vessel use for a total of 124 cruises. We saw an increase in the trips consisting of a combination of class laboratories, graduate and university research, and contracted research. SCMI met our goal to continue increasing vessel usage among SCMI member institutions and to broaden vessel usage to other institutions and disciplines. We saw a 40% increase in the number of students attending field trips and conducting research aboard the R/V Yellowfin.



Institute Name	Total No. of Students	Total No. of Facility/Researchers	Total Hours of Vessel Use	Total No. of Cruises
Ocean Studies Institute (OSI)	1074	75	319.75	63
Occidental College	204	17	82	16
University of Southern California	90	14	91.3	13
LACCD	22	2	8	2
Other Universities and Colleges	511	33	114	28
Other Institutions	0	9	18.5	2
Yearly Total	1901	150	633.55	124



R/V Yellowfin Vessel Use
Total Hours
2022-2023



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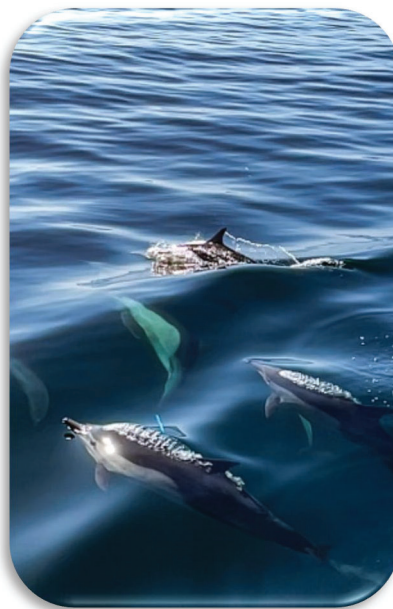
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