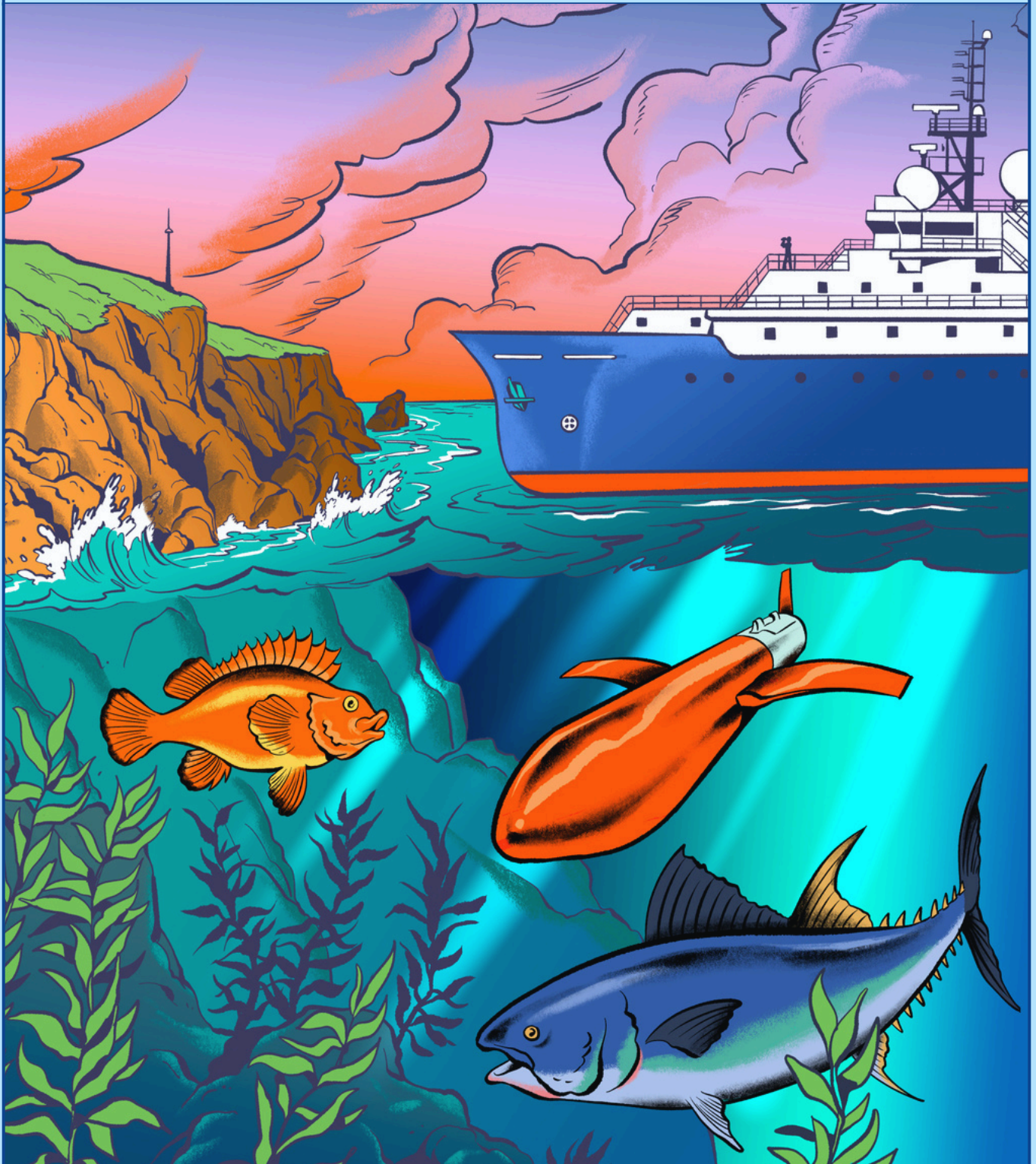




CONFERENCE SUMMARY REPORT

MAY 14-16, 2024
SAN DIEGO, CA





Report Overview

1	Conference Highlights Executive summary, conclusions, recommendations, & agenda
8	Conference Materials – Day 1 May 14, 2024 Presentation summaries, highlights, & resources
19	Conference Materials – Day 2 May 15, 2024 Presentation summaries, highlights, & resources
29	Conference Materials – Day 3 May 16, 2024 Presentation summaries, highlights, & resources
35	Poster + Exhibit Booth Session Presentation information & resources
39	In-Person Participant List List of conference attendees

Conference materials



[Google Photo Album](#)



[Conference Handbook](#)

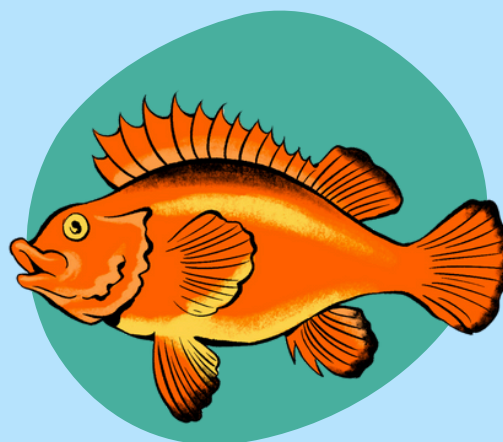


[Conference Website](#)

Includes detailed agenda + abstracts



Social Media: **#OOCA2024**



Conference Poster + Logo designed by **Maxwell Pepper** | maxwellpepper@gmail.com

Conference Photography by **Fred Bahr** & **Danielle Muller**

Conference Report designed by **Makenna Martin**

Suggested Citation

Medina, M., E.V. Satterthwaite, A. Harper, M.M. Martin, D. Muller, C. Anderson, H. Ruhl, B. Semmens, R. Swalethorp, N. Bowlin, A. Thompson, E. Weber, B. Brady, J. Coates. 2024. Ocean Observing in California: Celebrate the Past, Showcase the Present, Envision the Future Summary Report. San Diego, CA, United States.

Sponsors

Gigabyte Sponsors



SOUTHERN CALIFORNIA
COASTAL OCEAN
OBSERVING SYSTEM



CENTRAL & NORTHERN
CALIFORNIA OCEAN
OBSERVING SYSTEM

UC San Diego



SCRIPPS INSTITUTION OF
OCEANOGRAPHY

Megabyte Sponsors



IOOS
Integrated Ocean
Observing System

Kilobyte Sponsors



Committees

Leadership Committee

Megan Medina, SCCOOS/SIO

Alex Harper, CeNCOOS/CPH

Erin Satterthwaite, CalCOFI/SIO

Danielle Muller, SCCOOS/SIO

Planning Committee

Clarissa Anderson, SCCOOS/SIO

Henry Ruhl, CeNCOOS/MBARI

Brice Semmens, SIO

Rasmus Swalethorp, SIO

Noelle Bowlin, SWFSC

Andrew Thompson, SWFSC

Ed Weber, SWFSC

Briana Brady, CDFW

Julia Coates, CDFW

Table of Contents

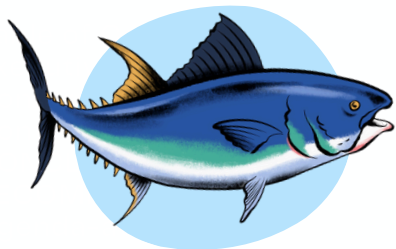


Table of Contents	iii
Executive Summary	1
Conference Objectives & Attendees	2
Conference Highlights	3
CONCLUSIONS	4
RECOMMENDATIONS	5
Agenda-at-a-Glance	7
Tuesday, May 14, 2024	8
WELCOME and OVERVIEW	8
KEYNOTE: Paloma Aguirre, Mayor of Imperial Beach	8
PLENARY: History of CalCOFI and CalOOS	8
PLENARY: State of the California Current	10
SESSION 1: Sustained Ocean Observing Programs in California	11
SESSION 2: California Current System Dynamics	12
SESSION 3: OAH, HAB, and Water Quality	13
PANEL: California Current System Dynamics Knowledge to Action Pipeline	14
PANEL: OAH, HAB, and Water Quality Knowledge to Action Pipeline	16
Wednesday, May 15, 2024	19
WELCOME	19
KEYNOTE: Jack Gilbert, Scripps Institution of Oceanography	19
PLENARY: State of California Ocean Observing Systems	19
PLENARY: State of California Fisheries	21
SESSION 4: Fisheries, Ecosystem Assessments, & Sustainable Marine Resource Management	22
SESSION 5: Coastal Resilience	23
SESSION 6: Fisheries, Ecosystem Assessments, & Sustainable Marine Resource Management	24
SESSION 7: OAH, HAB, and Water Quality	25
PANEL: Building a More Diverse And Equitable Observing System	26
Anniversary Reception	28
Thursday, May 16, 2024	29
PLENARY: Ocean Observations in Support of A Climate Ready Nation	29
SESSION 8: Ocean Solutions and the Blue Economy	30
SESSION 9: California Current System Dynamics	31
PANEL: Future Vision	32
Closing Remarks	34
Acknowledgments	34
POSTER + EXHIBIT BOOTH SESSIONS	35
California Current System Dynamics	35
Coastal Resilience	36
Ocean Acidification & Hypoxia, Harmful Algal Blooms, & Water Quality	36
Fisheries, Ecosystem Assessments, & Sustainable Marine Resource Management	37
In-Person Participant List	39
Conference Poster	42

Executive Summary

The joint conference **Ocean Observing in California: Celebrate the Past, Showcase the Present, and Envision the Future**, hosted by **Central and Northern California Ocean Observing System (CeNCOOS)**, **Southern California Coastal Ocean Observing System (SCCOOS)**, and the **California Cooperative Oceanic Fisheries Investigations (CalCOFI)** took place from May 14–16, 2024 at the Catamaran Resort Hotel and Spa in Mission Bay, San Diego, CA. The event aimed to celebrate, honor, and commemorate sustained ocean observing in California, marking CalCOFI's 75th anniversary and the 20th anniversary for SCCOOS and CeNCOOS. Attendees shared ideas and latest observations on the state and dynamics of the California Current, showcased success stories bridging science and society, and reinvigorated relationships across the ocean community.

The first-of-its-kind conference blended the traditional CalCOFI community (i.e. fishery oceanographers) with the CalOOS community and brought together 250 ocean professionals from across California (214) and included geographic representation from the U.S. West Coast (10), Mexico (13), and other states (9). Participants represented diverse sectors and provided multi-disciplinary expertise, including marine scientists, early-career ocean professionals (ECOPs), maritime industries (i.e. Offshore Wind, ports and harbors, fisheries and shellfisheries), and maritime enthusiasts resulting in the assembly of hundreds of unique organizations and dozens of knowledge producers/users to share, learn, and build a collaborative vision for future ocean prosperity.

The meeting provided a platform for meaningful collaboration and improved coordination for future ocean observing, sustainable blue economy initiatives, and equitable coastal communities. Speakers highlighted effective collaborations, shared the latest findings on the California Current, and discussed opportunities for collaboration and innovative solutions in areas such as the Blue Economy and equitable service delivery through observing systems. Presentations covered advancements in technology and information delivery in ocean observing systems, including sampling platforms, data collection and analysis methods, biodiversity sensor technologies, and data management and visualization tools. The event encouraged submissions exploring the diversification and co-design of ocean observing systems with local community members, Tribes, and industry partners. Presenters delved into the structure, functioning, and dynamics of the California Current Ecosystem and explored strategies to diversify the ocean observing community and co-design solutions to address climate challenges. The conference featured keynotes, plenaries, contributed talks, panels, posters, exhibit booths, and discussions to celebrate achievements, share knowledge, and envision the future of ocean observing, with support from 19 various sponsors (page ii).



Conference Objectives & Attendees

Conference Objectives

- 1** Celebrate, honor, and commemorate sustained ocean observing in California CalCOFI's 75th anniversary + 20th anniversary for SCCOOS and CeNCOOS!
- 2** Share ideas and latest observations on the state and dynamics of the California Current.
- 3** Showcase success stories between scientists and data users.
- 4** Build and maintain relationships across the ocean community.
- 5** Stimulate meaningful coordination to foster future ocean observing, sustainable blue economy initiatives, & cultivate an equitable ocean community.

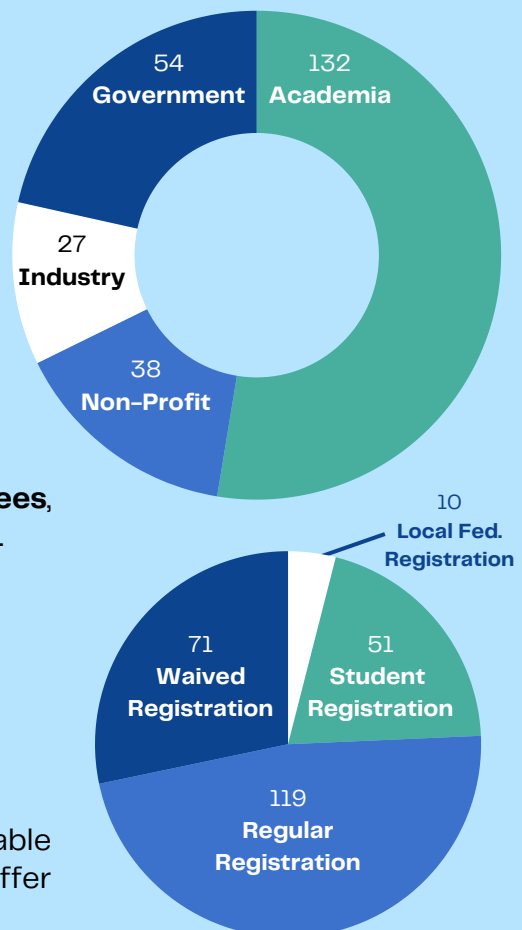
Conference Attendees

CeNCOOS, SCCOOS, and CalCOFI engage with diverse stakeholders across federal, state, local, and Tribal governments, academic institutions, non-profits, and industry partners. More than half of the conference in-person attendees were from academia and 22% government, 15% nonprofits, and 11% industry partners. Many of our California state employees were unable to attend due to a statewide travel ban unless identified as mission critical due to California budget constraints.

The conference included **250 in-person attendees**, including 57 students and 15 colleagues from Mexico.

- 250 in-person attendees
- 2 Keynotes
- 10 Plenaries
- 51 Presenters
- 21 Panelists
- 68 Posters and Table Displays
- 17 Sponsors

Thanks to our generous sponsors (page ii), we were able to waive over 70 attendee registration fees and offer over 50 students reduced registrations.



Conference Highlights



Networking + Collaboration Opportunities

Participants reconnected with friends, colleagues, made new connections and exchanged ideas, inspiring future research and collaborations across disciplines and institutions.

Knowledge Exchange + Learning

Attendees discovered relevant new tools and technologies, including advances in observation technologies, data analysis techniques, and insights into new datasets for research.



Collaborative Forum + Community-Building

The conference was a platform for researchers, policymakers, & data end-users to collectively address challenges & opportunities in ocean observing, enhancing collaboration, understanding, & promoting unity within the community.

Inclusivity + Community Engagement

The conference emphasized inclusion in co-designing observing systems, involving local communities, Tribes, and industry partners.



Tangible Outcomes

The event facilitated outcomes including: identifying opportunities for funding, understanding end-user needs, and building partnerships.

Main Conclusions



Long-term, high-quality marine ecosystem data are essential for understanding environmental changes and evaluating the impacts of offshore industries

These data provide critical insights into trends, the effects of pollutants, climate change, and public health threats. Advances in autonomous and ecosystem observation technologies have significantly improved monitoring and prediction of oceanic conditions, enhancing our understanding of coastal ecosystems.

This knowledge supports informed decision-making in marine resource management. Robust ocean observing systems are indispensable for effective development of offshore industries (e.g., offshore wind and aquaculture), enabling the monitoring of environmental impacts and optimizing industry site selection.



Ocean observations are essential to decision-making and transitioning to a sustainable blue economy

Effective ocean observing plays a critical role for resource managers across ocean-related sectors like fisheries management, offshore wind development, water treatment facilities, marine mammal centers, ship-based operations, and aquaculture.



Co-designed, inclusive observing systems are essential for effective ocean monitoring and management.

Involving local communities, Tribes, industry partners, decision-makers, and researchers in collaborative efforts not only enhances our understanding of marine ecosystems, but also ensures that observing systems remain relevant, effective, and beneficial to all people involved.

Promoting inclusion across diverse groups, including inland communities and underrepresented populations, is essential for advancing ocean science and stewardship, fostering equitable access to resources and opportunities through accessible data, community partnerships, and inclusive workforce initiatives. Collaboration among scientists, government agencies, and communities optimizes the availability of resources and expertise and is crucial to ensure that insights gained are relevant and actionable, enhancing our capacity to address complex challenges in ocean science and conservation.



Technological innovations play a pivotal role in advancing ocean observing systems

Advancements in technologies like high-frequency radar, underwater gliders, environmental DNA, autonomous vehicles, and artificial intelligence underscore their critical importance to collecting high-resolution, real-time data that significantly enhance our understanding of marine ecosystems and can complement existing ship-based sampling efforts.

Recommendations

1

Sustain and enhance long-term monitoring efforts through coordination and collaboration

Continuous and comprehensive data collection requires investment and support for existing ocean observing infrastructure while integrating and expanding upon current datasets and programs. We must identify the existing components of the system and fill gaps, as needed. Real-time data are crucial for sustainable marine industries, while long-term observations help identify emerging environmental issues, understand trends, contextualize impacts on ocean ecosystems, facilitate scientific discovery, and inform policy decisions.

2

Understand the ecological and social impacts of offshore development

Detailed studies on ecological and social impacts of offshore industries (such as wind farms) on marine life and fisheries are necessary to inform sustainable, balanced policy and management decisions. Understanding these impacts allows stakeholders to develop strategies to mitigate impacts, promoting the health and prosperity of both marine ecosystems and local communities.

3

Maintain momentum and collaboration

Conference momentum can be maintained through cooperative efforts such as interim meetings, focused workshops, collaborative proposals, and inclusive communication strategies. Regular engagement and collaboration among diverse stakeholders, including the broader ocean observing community, is crucial for sustained progress in ocean observation initiatives, continued stakeholder engagement, and the advancement of ocean science.

4

Strengthen stakeholder, community, and Tribal engagement

Encourage regular communication and collaboration across industry, academia, government, Tribes, non-profits, and philanthropic organizations to develop effective and inclusive ocean observing systems. Actively involve local communities, Tribes, non-profits, government, and industry partners in the design and implementation of these systems to ensure they are effective, relevant, and address local needs and priorities. Include Traditional Ecological Knowledge and support Tribally led science to foster a holistic understanding of marine ecosystems and their dynamics.

5

Foster equity and inclusion in ocean observing efforts

Developing and supporting programs that promote equity and inclusion in ocean observing and research is essential. This includes making data accessible to diverse audiences, creating equitable training opportunities, and engaging communities through meaningful partnerships and participatory approaches. Engaging diverse communities, including inland populations, in ocean science through educational outreach and technological advancements ensures widespread participation and stewardship in ocean conservation efforts.

Recommendations

6

Focus on climate resilience and the sustainable Blue Economy

Ocean observing systems should support climate resilience and the development of the sustainable Blue Economy. Prioritizing initiatives that address climate challenges, promote sustainable use of marine resources, and ensure the long-term health of our living marine ecosystems is necessary. Additionally, adaptive management strategies, such as those for fisheries, can help address the impacts of climate change.

7

Invest in technological innovations

Deploying and further developing advanced technologies for crewed and autonomous observations and data management and analysis is vital. Supporting overlap studies between large research vessels and other smaller platforms such as small boats, buoys, moorings, shore stations, gliders and other autonomous platforms in areas where ship accessibility may become limited due to additional offshore development is recommended. Leveraging Artificial Intelligence and machine learning tools can streamline the processing and analysis of ocean data, enhancing the ability to monitor and respond to changes in marine ecosystems. Continued support for the development and deployment of advanced ocean observing technologies will enhance data collection capabilities, improve observation accuracy, and facilitate real-time monitoring.

These recommendations emerged from the discussions, presentations, and collaborations within the conference.



Agenda at-a-glance

Conference Overview

Tuesday, May 14, 2024		Wednesday, May 15, 2024		Thursday, May 16, 2024	
Welcome + Keynote Address		Welcome + Keynote Address		SESSION 8 Ocean Solutions and the Blue Economy	SESSION 9 California Current System Dynamics
PLENARY History of CalCOFI and CalOOS		PLENARY State of California Ocean Observing Systems			
PLENARY State of the California Current		PLENARY State of California Fisheries			
SESSION 1 Sustained Ocean Observing Program in California		SESSION 4 Fisheries, Ecosystem Assessments, & Sustainable Marine Resource Management	SESSION 5 Coastal Resilience	PLENARY Ocean Observations in Support of a Climate Ready Nation	
				PANEL Future Vision	
Lunch + Networking		Lunch + Networking		Lunch + Networking	
SESSION 2 California Current System Dynamics	SESSION 3 OAH, HAB, & Water Quality	SESSION 6 Fisheries, Ecosystem Assessments, & Sustainable Marine Resource Management	SESSION 7 OAH, HAB, & Water Quality	Optional Roundtables + side meetings <ul style="list-style-type: none">Leveraging Ocean Observing for Coastal Resilience in the San Diego – Baja California Binational Region RoundtableWest Coast Ocean Biomolecular Observing Network MeetingOffshore Wind in California Discussion	
PANEL CA Current System Dynamics Knowledge to Action Pipeline	PANEL OAH, HAB, & Water Quality Knowledge to Action Pipeline	PANEL Building a More Diverse and Equitable Ocean Observing System			
Afternoon Networking Break		Afternoon Networking Break			
POSTERS + EXHIBIT BOOTHS		SCCOOS, CeNCOOS, + CalCOFI ANNIVERSARY RECEPTION			

Please see the [printed agenda](#) for more details.

Day 1 - Tuesday, May 14, 2024

Welcome + Overview ([slides](#))

Megan Medina, Southern California Coastal Ocean Observing System,
Deputy Director | memedina@ucsd.edu



Keynote

Paloma Aguirre, Mayor of Imperial Beach

Mayor Paloma Aguirre opened her keynote by sharing her journey – from being born in San Francisco, raised in Mexico, earning an MAS at UCSD Scripps, and serving as a Knauss Fellow with Senator Cory Booker. Returning to California, she ran for office after a major local spill and wildlife die-offs highlighted poor water quality. She discussed how this poor water quality leads to extended beach closures and program cancellations.

Mayor Aguirre emphasized ocean observing as a lifeline, providing real-time data and forecasting for better planning and mitigation. She highlighted the Tijuana River plume tracker, which demonstrated the need for infrastructure upgrades, and mentioned a \$140 million commitment by the Mexican government to upgrade a sewage plant by September 2024. She also noted ongoing monitoring programs with sensors on both sides of the border, stressing the importance of collaboration and data in improving coastal water quality.

Plenary

History of CalCOFI + CalOOS: California's Ocean
Observing Events, People, Timing, Opportunities

Toby Garfield, NOAA – retired

Eric Terrill, SIO – Director of Marine Physical Laboratory

Toby Garfield, retired NOAA SWFSC Environmental Research Division Director and former CeNCOOS PI and Founder, and Eric Terrill, SCCOOS PI and Founder, provided an overview of the evolution and importance of ocean observing in California. They shared key historical events, influential figures, and the current state of ocean monitoring, illustrating its critical role in managing and preserving California's coastal and marine environments.

Toby began the talk by describing the collapse of the California sardine fishery in the mid-1940s, a pivotal event that highlighted the need for systematic ocean observation. This crisis led to the establishment of the California Cooperative Oceanic Fisheries Investigations (CalCOFI), driven by the pioneering work of Oscar Elton Sette, U.S. Bureau of Fisheries and considered the forefather of CalCOFI. Sette's career trajectory shifted dramatically when an exploratory trawl inspired him to change his career path from entomology to fisheries, demonstrating the importance of mentorship and hands-on experience in sparking interest in ocean sciences. Sette embraced the idea that understanding fisheries required a holistic approach, considering the entire ecosystem. He organized three large ecosystem-based programs, one in California (a precursor to CalCOFI), one on the East Coast of the US, and one in Hawaii. However, only the one in California survived (as the CalCOFI program), likely due to California's unique position as a single large state, effective state-federal collaboration, academic support, and the program's ability to incorporate sampling advances. CalCOFI's sampling grid has also become a foundational element for many other programs.

(continued on the following page)



Day 1 - Tuesday, May 14, 2024

Plenary

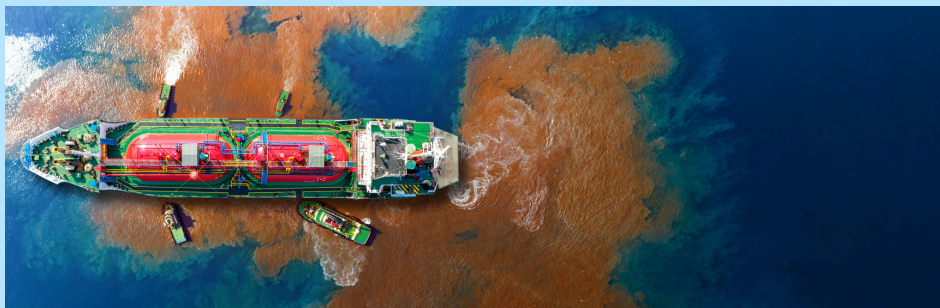
History of CalCOFI + CalOOS: California's Ocean Observing Events, People, Timing, Opportunities (continued)

Eric Terrill provided insights into ocean observing advancements in the early 2000s. He highlighted programs like the Gulf of Maine Ocean Observing System (GoMOOS) Buoy Program and the ONR Autonomous Ocean Sampling Network (AOSN) in Monterey Bay, alongside the longstanding California Manual Shore Station Program, which boasts a 108-year record with 18 volunteer-run stations measuring salinity and temperature daily. The sardine fishery is notably the only federally managed stock with an environmentally based harvest policy, relying on a three-year sea surface temperature (SST) average from Scripps Pier.



He also discussed the significant contributions of Dick Seymour in wave data collection and the evolving role of ocean managers around 2000. The National Ocean Research Leadership Council (NORLC), endorsed by Congress, played a pivotal role in promoting ocean learning. With about 20 million people living within 50 miles of California's coast, the state has a higher beach usage than the other 49 states combined, with beach tourism generating over \$10 billion annually. Heal the Bay's Beach Report Card and the Schiff et al. 2000 paper on the costs of marine monitoring programs underscored the economic importance of coastal health. The Central Bight Cooperative Program and two voter-approved propositions (40 and 50) in 2002 provided \$5.8 billion for water quality issues, leading to the establishment of the Coastal Ocean Circulation Monitoring Program (COCMP). This \$21 million initiative birthed SCCOOS and CeNCOOS (formerly Central California Ocean Observing System, but is now Central and Northern California), enabling real-time data posting and product development.

Significant oil spills, such as the 1969 Santa Barbara spill (which helped start Earth Day), the 2007 Cosco Busan spill in San Francisco, and the 2010 Deepwater Horizon disaster, highlighted the necessity of timely and accurate data for effective environmental response. The establishment of the Integrated Ocean Observing System (IOOS) at the federal level around 2009/2010 further emphasized this need. The upcoming 70th Eastern Pacific Ocean Conference (EPOC) in September 2024 marks a milestone in this ongoing journey. Toby and Eric's talk highlighted the critical role of continuous and collaborative observation efforts in ensuring the health and resilience of California's marine ecosystems.



Day 1 - Tuesday, May 14, 2024

Plenary

State of the California Current in 2023:
Niño baby!

Andrew Thompson, NOAA – Research Biologist
Rasmus Swalethorp, SIO – Associate Project Scientist

The 2023–2024 period marked a transition year in the Eastern Pacific, shifting from La Niña conditions in the first half of 2023 to a moderate El Niño event that persisted into 2024. This El Niño, while notable for its persistence and coastal intrusion into California, was milder than past events. Upwelling maintained average cumulative levels, albeit with regional variations

This relative normalcy in upwelling seemingly supported healthy zooplankton and fish populations, especially in southern regions, where record-high zooplankton biomass fueled above-average fish larval populations, notably for anchovy and market squid. Interestingly though, 2023 was not a favorable year for krill populations. This productivity likely benefited seabirds, sea lions, and whales which had average to high abundances or reproductive success. Notably, a high abundance of humpback whales was observed early in the year, followed by a decrease as El Niño conditions intensified, coinciding with a surge in long-beaked common dolphins, likely due to warmer temperatures, and a significant presence of their warm-water predators, eastern Pacific killer whales. Overall, this transitional year, marked by a shift from La Niña to El Niño conditions, shaped the marine ecosystem, highlighting the interconnectedness of oceanographic conditions and marine life within the California Current System. ([slides](#))



Sustained Ocean Observing Programs in California



Chad Whelan, Ocean Sensors, Ltd – CEO | chad@codar.com
Ongoing and Future Development of the West Coast High Frequency Radar Network ([slides](#))

- The West Coast High Frequency Radar Network has evolved over 20 years to be a valuable resource of ocean observations for operational and scientific purposes.
- Novel products and applications are currently in development and future development collaborations and inspiration are being sought.



Daniel Rudnick, Scripps Institution of Oceanography – Professor | drudnick@ucsd.edu

The 2023–2024 El Niño in the California Current System as Observed by the California Underwater Glider Network ([slides](#))

- Having observed three El Niños with the California Underwater Glider network, the main message is that every El Niño is different.

Linsey Sala, Scripps Institution of Oceanography – Scientist | lsala@ucsd.edu

Back 75 Years to Envision the Future: A Dive into the Archives to Celebrate the CalCOFI Collaboration ([slides](#))

- By highlighting the research and stories produced by maintaining CalCOFI's archived samples, we hope to showcase the value of its materials for future studies of the California Current ecosystem and celebrate the perseverance this program's people have demonstrated through time.



Reinhard (Ron) Flick, Scripps Institution of Oceanography – Research Associate | rflick@ucsd.edu

SIO Shore Stations Program, A Century of Temperature and Salinity Measurements in California ([slides](#))

- The SIO Shore Stations Program beginning in 1916 exemplifies the value of uniformly collected long-term data sets for quantifying oceanic and regional climate change that is not available by any other means.



John Largier, Bodega Marine Laboratory, UC Davis – Distinguished Professor | jlargier@ucdavis.edu

Marine Research Stations as a Critical Component of Ocean Observing Systems ([slides](#))

- Marine research stations offer an unrealized opportunity as nodes that can enhance the output and impact of ocean observing systems.

Day 1 | Session 2

California Current System Dynamics



Christopher Edwards, UC Santa Cruz – Professor | cedwards@ucsc.edu
A Review Of The UCSC Modeling Capabilities in Support of California Ocean Observing ([slides](#))

- We review significant developments in modeling of the California Current at the University of California Santa Cruz that have capitalized on the extensive data collected by the California Ocean Observing System.

Eric Bjorkstedt, NOAA, Southwest Fisheries Science Center – Research Fisheries Biologist | eric.bjorkstedt@noaa.gov

Between Two Capes: Insights From 16 Years Of Observations Along The Trinidad Head Line ([slides](#))

- Observations along the Trinidad Head Line show the response of coastal ecosystems to climate forcing off northern California, informing our understanding of the California Current Ecosystem and advancing ecosystem-based management of regional resources.

Andrew Leising, NOAA Southwest Fisheries Science Center – Research Oceanographer | andrew.leising@noaa.gov

From Observations To Management: Lessons Learned From The CCIEA ESR ([slides](#))

- Maps are often the best way to convey information in a form that management can readily understand and digest.
- Matching the timing of observations to key ecosystem events is key to understanding and conveying ecosystem status.

Katherine Barbeau, Scripps Institution of Oceanography – Professor | kbarbeau@ucsd.edu

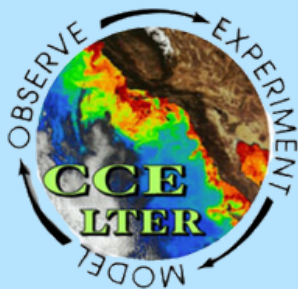
The California Current Ecosystem Long Term Ecological Research Project: Ecosystem Controls and Multiple Stressors in a Coastal Upwelling System ([slides](#))

- The California Current Ecosystem Long Term Ecological Research project partners with CalCOFI to study ecosystem change in the California Current upwelling region.

Meredith Elliott, Point Blue Conservation Science – Principal Scientist | melliott@pointblue.org

The Applied California Current Ecosystem Studies (ACCESS): 20 years of research and monitoring of the marine ecosystem in north-central California ([slides](#))

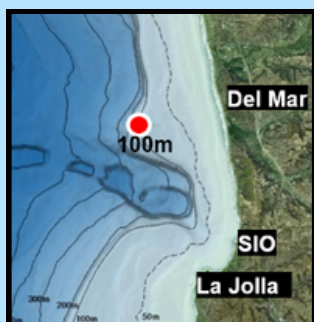
- The Applied California Current Ecosystem Studies Program monitors physical and biological indicators of the marine ecosystem in north-central California to inform resource managers, policy makers, and conservation partners. Data are available in the California Integrated Ocean Observing System (CalIOOS) Data Portal.
- The Applied California Current Ecosystem Studies Program welcomes new collaborations.



Day 1 | Session 3

OAH, HAB, and Water Quality

Facilitator **Alex Harper**, CeNCOOS/CalPoly Humboldt – Deputy Director | alex.harper@humboldt.edu



Uwe Send, Scripps Institution of Oceanography – Professor | usend@ucsd.edu

Legacy and Future Role of the Del Mar Mooring ([slides](#))

- The Del Mar mooring has become a reference time series node in Southern California.
- The Del Mar mooring has served as a technology demonstration site, and is now spawning an array of diverse real-time moorings supporting an array of applications.

Helena C. Frazao, Scripps Institution of Oceanography – Postdoctoral Scholar | hvieirafracao@ucsd.edu

Ocean Acidification in the Southern California Current System: insights into 17 Years of Continuous Observations ([slides](#))

- The Southern California Current system is highly dynamic, and continuous high-resolution measurements are needed to better understand ocean acidification.
- More low-pH events are being detected, and their preconditions and extensions must be assessed.

Taylor Wirth, Scripps Institution of Oceanography – Graduate Student | twirth@ucsd.edu

Advancing pH Monitoring: Self-Calibrating SeapHOx Enhances Reliability and Accessibility of pH Measurements ([slides](#))

- The Self-Calibrating SeapHOx (SCS) significantly improves the accuracy of near real-time pH measurements, automating calibration processes and enhancing data quality without the need for manual field sampling, thereby enabling better accessibility and reliability of coastal monitoring data.
- A two-year proof of concept conducted at Scripps Pier has paved the way for the installation of another SCS at a second shore station location to be done in 2024.

Yuichiro Takeshita, Monterey Bay Aquarium Research Institute – Scientist | yui@mbari.org

pH Sensors on Underwater Gliders in the CA Current System ([slides](#))

- Two Spray underwater gliders equipped with pH sensors have been successfully operated at Monterey Bay Aquarium Research Institute over the past 5 years.
- The development of Spray2 gliders and the NanoFET pH sensor will enable glider-based pH observations along the California Current System.
- We have secured funding to start phasing in pH sensors into the California Underwater Glider Network over the next several years

Fayçal Kessouri, Southern California Coastal Water Research Project / UC Los Angeles – Senior Scientist | faycalk@sccwrp.org

Quantifying Uncertainty in Ocean Model Predictions of Eutrophication ([slides](#))

- A high-resolution model was developed for Southern California coasts to investigate drivers of coastal eutrophication to support management decisions.
- Results show the effectiveness of the method to isolate anthropogenic signals from uncertainties, and prospective approaches are presented.



Day 1 | Panel

California Current System Dynamics Knowledge to Action Pipeline



**“Ocean observing
for us
is everything”**

- Dick Ogg

Panelists

Moderator: **Liz Whiteman**, Ocean Science Trust –
Executive Director | liz.whiteman@oceansciencetrust.org

- **Jennifer Brown**, Monterey Bay National Marine Sanctuary – Ecosystem Scientist | jennifer.brown@noaa.gov
- **Captain Kip Loutitt**, Marine Exchange of Southern California – Executive Director | klouttit@mxsocal.org
- **Corey Niles**, WA Department of Fish and Wildlife/Pacific Fishery Management Council – Coastal Marine Policy Lead | corey.niles@dfw.wa.gov
- **Bruce Steele**, Fisherman | winfieldfarmerbruce@gmail.com
- **Dick Ogg**, Fisherman | dickandlaurieogg@sbcglobal.net

Summary

The panelists' perspectives underscored a vision for ocean observing as foundational to addressing diverse challenges and opportunities in marine management. The panelists' insights highlight the importance of integrating traditional knowledge with modern technologies, fostering collaborative partnerships, and prioritizing comprehensive data collection to inform proactive management strategies amidst evolving environmental and societal dynamics. The panelists answered individual questions as well as the questions below.

Panel Questions

Question 1: What does ocean observing mean to you? And when do you turn to it?

Question 2: What do you hope ocean observing will do for you in the future?

Question 3: Do you foresee any specific challenges or opportunities?

Six themes emerged from these three questions and following panel discussion.
(see following page)

Day 1 | Panel

California Current System Dynamics Knowledge to Action Pipeline (continued)

Six themes emerged from the panel questions and following discussion:

1

Understanding Human–Ocean Connections + Impacts of Change

- Jennifer Brown emphasized the need to understand the multifaceted ways humans interact with marine environments by developing holistic management strategies.
- Bruce Steele expressed concerns about changes in ocean conditions and the development of new technologies and practices impact both the marine environment as well as humans and industry.

2

Fishers as Essential Observers

- Bruce Steele and Dick Ogg emphasized the importance of fishers' first-hand observations during daily routines (weather patterns, water temps, currents, etc.), providing valuable data that can enhance our understanding.
- To encourage fishers to share knowledge, it is important to implement safeguards to protect fishers from liability.

3

Ocean Observations Enhance Maritime Safety + Efficiency

- Captain Kip Loutitt emphasized the critical role of ocean observing in improving maritime safety and efficiency.
- There is a need for more accurate data, particularly in fog forecasting & navigation, to mitigate risks associated with larger ships navigating in constrained waterways.

4

Adaptive Ecosystem Management & Climate Resilience

- Corey Niles discussed how ocean observing supports ecosystem assessments and climate resilience efforts within fisheries management.
- Jennifer Brown highlighted the importance of integrating new technologies with existing data enhances understanding of marine sanctuary impacts, management practices, & strengthen community connections.

5

Community Science, Engagement, & Predictive Modeling

- Jennifer Brown discussed the importance of integrating traditional and new technologies to understand human–ocean interactions.
- Community science initiatives, like beach walker data collection or fisher applications, help understand human–ocean interactions. Improved data collection/sharing can help respond to environmental changes, informed decision-making and predictive modeling capabilities.

6

Collaborations in Knowledge Sharing & Marine Management

- Corey Niles and Dick Ogg discussed the need for iterative processes and better collaboration between fishermen, scientists, and other stakeholders help address challenges and leverage opportunities.
- Building trust and effective communication is crucial for successful collaboration, data sharing, and to ensure that policies are grounded in real-world experiences.

Day 1 | Panel

OAH, HAB, and Water Quality Knowledge to Action Pipeline



New Tool
California Ocean
Acidification &
Hypoxia Portal
OAH.CalOOS.org

Panelists

Moderator: **Steve Weisberg**, Southern California Coastal Water Research Project – Executive Director | steview@sccwrp.org

- **Laura Terriquez**, Orange County Sanitation District – Scientist | lterriquez@ocsan.gov
- **Mark Gold**, National Resources Defence Council – Director of Water Scarcity Solutions | mgold@nrdc.org
- **Terry Sawyer**, Hog Island Oyster Company – Owner | terry@hogislandoysters.com
- **Alissa Demming**, Pacific Marine Mammal Center – VP of Conservation Medicine + Science | ademing@pacificmmc.org

Summary

Ocean Acidification and Hypoxia (OAH) is a global phenomenon that poses local concerns. The State of California, and in partnership with Oregon and Washington, has led the way on progressive action and response to OAH. This effort involves action from local water resource managers, natural resource managers, and even shellfish growers, all helping to monitor, understand the risks, and develop mitigation strategies related to OAH. Examples of management actions include the development of near-shore water quality models and indicators. These developments have led to improved understanding of multiple stressors in the Southern California Bight, and particularly the effects of point-source nutrient pollution on coastal and ocean acidification.

However, more work is needed to detect and combat the onset of OAH along the California coast. Ocean carbon experts are working in lockstep with managers to develop new tools, including the [California OAH Portal](https://OAH.CalOOS.org), to enhance OA resilience. Five discussion questions were explored, summarized on the following page.

Day 1 | Panel

OAH, HAB, and Water Quality Knowledge to Action Pipeline (continued)

Five questions generated substantial discussion from the panel (see previous page)

1

How you use data from monitoring/observing systems? What would you like to see them do better?

Terry Sawyer discussed how ocean data is incorporated into everyday decision-making running a business growing oysters and clams:

- Collaborating with researchers in academia for ~10 years has provided access to real-time information to make business decisions.
- Partnership is helpful for interpreting data; estuarine systems are complex and can be difficult to interpret; partnership between researchers and technical experts is key to translate data into actionable information.
- Shellfish growers are interested in information related to shell building (e.g. ocean acidification, temperature) but also diseases and heat stress.
- Aquaculture farms provide valuable infrastructure, partnership and use case, but they need consistent support, maintenance, and implementation of new, easier-to-use technologies.

Laura Terriquez oversees wastewater discharge from 2.6M people:

- Uses data to conduct monthly surveys from around the outfall site.
- Uses OOS data (sourced via Glider and the Newport Pier shore station) for spatial and temporal context and comparison.
- Nutrient data from HABMAP and HFR surface currents used for permitting and reporting.

Mark Gold from the Natural Resources Defense Council, explores science-informed policy-making:

- Through his work on OAH topics at UCLA, he understands how observations are critical for model validation.
- Progress is being achieved through agency priority setting at OPC and SWRCB – one of their top priorities is OAH. Some of the state effort has resulted in CeNCOOS becoming an OAH data hub for managers to use into a centralized portal.
- HAB monitoring funded by OPC used to manage fisheries. But concerns are growing about state funding on this issue. When budgets are tight, monitoring is the first thing that gets cut.
- Needs better monitoring of MPAs to assess their effectiveness and would like to implement an eDNA monitoring program.

Alissa Deming, Pacific Marine Mammal Center, is using SCCOOS to predict marine mammal strandings (using the C-HARM model) and monitoring (e.g. during blob event):

- Monitoring environmental conditions is key to understanding ecological extreme events. For example, the high cancer rates in Southern Cal due to DDT and Grey whale mortality event due to sea ice melting (disrupting the availability of their food that grows on the ice).
- A centralized stranding demographics in a database being developed. Once the program is established, they will coordinate with OOSes.
- Prematurely born marine mammals happening now along the coast happening w/ die offs of pelicans.

2

Why is it so difficult for non-research/science communities to participate in data collection?

Terry Sawyer described how industry folks are busy running the business; Physically running pumps and intakes.

- As hosts of the instruments, better training is needed, along with more consistent filtering.

Laura Terriquez explained that Orange County Sanitation District had to downgrade OAH mooring to make it easier to deploy and operate.

- The mooring had broken away, but the mooring and anchor have since been modified and are working well.
- Continual operation is a matter of co-designing and continual evolution.

Day 1 | Panel

OAH, HAB, and Water Quality Knowledge to Action Pipeline (continued)

Five questions generated substantial discussion from the panel (see previous page)

3

Big changes in investment often follow environmental disasters. How can scientists better deliver scientific understanding/needs to policymakers?

Mark Gold highlighted resources for offshore wind development as a unique opportunity in the coming years:

- Offshore wind efforts are still relatively small-scale, the scale of investment needs to be articulated through climate urgency messaging. Sometimes it's a matter of who's the best lobbyist.
- The state makes an effort to connect with researchers, but it's a two way street. NGOs can help facilitate government-researcher interactions. OST is working on this.
- It is important for researchers to think about potential policy implications and how to describe their science outcomes in ways that policy-makers can understand.

4

What are the monitoring needs for marine mammal stranding centers?

Alissa Deming, from the Pacific Marine Mammal Center, voiced the need for collaboration to better integrate the marine mammal stranding data and the OOSes, particularly around HABs.

- There is a need for improved real-time communication. Often there are different schedules of sampling sources when HABs are occurring, so it is important to be able to communicate with the different entities of HAB researchers when marine mammal strandings are happening.
- Communication and C-HARM provides data in real time but other HAB data is less accessible.
- There is a need for understanding what's happening within the ecosystem (e.g. are anchovies in the top of the water column, is that what's driving the mortalities we are seeing?).
- Marine mammals are the bio-loggers of the sea and can be better utilized in marine monitoring.

5

What is the one, main request from the observing systems?

Laura Terriquez explained the need for assistance with data analysis.

Terry Sawyer discussed the need for more durable instruments.

Alissa Deming requested improved data communication and for the inclusion of marine mammal data into OOS portals.

Mark Gold highlighted the need for statewide physical, chemical, and biological data and more data products.



Day 2 – Wednesday, May 15, 2024

Welcome

Erin Satterthwaite, California Sea Grant, SIO – CalCOFI Program Coordinator |
esatterthwaite@ucsd.edu



Keynote

Jack Gilbert

SIO – Deputy Director

Jack Gilbert, the new deputy director at the Scripps Institution of Oceanography (SIO), highlighted key long-term observation systems and ecological modeling projects founded at SIO like the Keeling Curve and the Argo network of ocean temperature floats. He emphasized the importance of continuous monitoring, illustrated by long-term data on ocean salinity and temperature since World War I and projects like CalCOFI, which started in 1949 to study sardine and anchovy population cycles.

He stressed that ongoing monitoring is crucial for identifying and understanding environmental problems. For example, long-term data are invaluable for understanding trends and the impact of pollutants like DDT and microplastics, as well as public health threats such as bacterial infections from seafood. He also highlighted the role of SCCOOS (Southern California Coastal Ocean Observing System) in detecting harmful algal blooms and predicting pathogen presence in coastal waters, crucial for public health and safety. He concluded with the message that collaboration and cross-disciplinary efforts are key to the success of these programs and wished everyone a successful continuation of their efforts.

Plenary

State of California Ocean Observing
Systems: SCCOOS & CeNCOOS

Clarissa Anderson, SCCOOS – Director

Henry Ruhl, CeNCOOS – Director

CeNCOOS and SCCOOS are the IOOS Regional Associations of California with a shared ocean vision of a healthy and prosperous California coastal ocean powered by information solutions. CeNCOOS and SCCOOS sustain a world-leading observational capabilities that includes observation and prediction of physics, biogeochemistry, and biological and ecosystem conditions of California's coastal ocean environment.

Expanding on over two decades of regionally-driven leadership and leveraged state-federal investment, CeNCOOS and SCCOOS continue to hone and improve delivery of ocean information to support and their ever-expanding stakeholder base across all sectors with 75 letters of support in their FY21-26 five year award proposal. Key system advancements include in the delivery of Harmful Algal Bloom monitoring, prediction and response, including through longstanding partnerships among state, federal and non-profit entities working in lockstep to predict, document, and assess toxic events, their dynamics, and occurrence in the foodweb.
(continued on following page)



Day 2 - Wednesday, May 15, 2024

Plenary

State of California Ocean Observing Systems: SCCOOS & CeNCOOS (continued)



Technical advancements, particularly in autonomous, biological and ecosystem observation, allows the California Ocean Observing Systems to more fully realize the potential of ocean data by delivering actionable knowledge of our coastal ecosystems, including place-based management tools, enabling informed decision-making to better manage coastal resources for future generations. Through Inflation and Reduction Act and Bipartisan Infrastructure Law funding, CeNCOOS and SCCOOS will harden and modernize their flagship programs, improve model delivery and data products, expand the California Coastal Flood Network, and advance Equitable Service Delivery by ensuring access for underserved communities using Justice, Equity, Diversity, and Inclusive practices – promoting recruiting, training, and retaining students from underserved frontline community in Earth and Ocean Sciences.

CeNCOOS and SCCOOS are collaborating with the IOOS Regional Associations to better meet the needs of a “Climate Ready Nation” by investing in pan-regional and national programs. These include: the Ocean Sound Observing Network, Harmful Algal Bloom Observing Network, Animal Telemetry Network, and Ocean Biomolecular Observing Network. Additionally, CeNCOOS and SCCOOS are highly-leveraged programs supported by federal, state, and private projects. Current project include: the state and federally-funded Southern California DDT Ocean Dumpsite Characterization and Monitoring project, the NASA-funded Validating PACE Ocean Color, Biogeochemistry, NPP, and Phytoplankton Metrics project (with the CalCOFI Program), the Ocean Protection Council funded Integrated Early Warning System, the California Sea Grant funded OAH Portal, a privately-funded Synchro collaboration to synchronize technology evolution for industry, ocean science, and conservation, among others. ([slides](#))



A surfer rides a wave off Scripps Pier during the historic 2020 red tide, sampled by SCCOOS. (Photo: Michael Latz)

Day 2 - Wednesday, May 15, 2024

Plenary

State of the California Fisheries

Julia Coates, CDFW – Senior Environmental Scientist +
Allison Dedrick, CDFW – Senior Environmental Scientist

During the State of California Fisheries presentation by Julia Coates and Allison Dedrick from the California Department of Fish & Wildlife, they discussed the impact of climate change on species available for targeting by commercial fisheries. They highlighted increased variability, species decline, range shifts, and new opportunities as possible fishery outcomes resulting from climate change.

The presentation also focused on adaptation strategies through a portfolio of target species and posed motivating questions about the composition of species landed in California commercial fisheries over the past 70 years and the evidence of portfolio switching among species at various levels. They discussed the historical summary of landings at the level of the whole state, down to individual ports and at the level of vessels, highlighting switching among stocks, new opportunities, depletion, and specialization (i.e. decrease in the number of species landed). They noted that changes in management and the structure of fishery permitting rules can drive the volume and species diversity of landings. The presentation concluded with a discussion on preparing for the future by managing current fisheries sustainably, balancing sustainability and flexibility, and seeking early detection of new fishing opportunities through ocean observing programs. They also introduced the Experimental Fisheries Program (EFP) under the California Fisheries Innovation Act, which aims to support projects focused on new fishing targets or areas, testing of new gears, and CDFW involvement. Finally, they provided contact information for further inquiries. The Q&A session explored the effects of economics and other factors on the patterns observed in the presentation. ([slides](#))



Photo: Derek Stein, CDFW

Day 2 | Session 4

Fisheries, Ecosystem Assessments, & Sustainable Marine Resource Management



Elliott Hazen, NOAA, Southwest Fisheries Science Center – Research Ecologist | elliott.hazen@noaa.gov

From Scales to Whales: A Case Study of Ecological Models for Use in Management ([slides](#))

- Combining nowcasts, forecasts, and projections of marine ecological relationships can help us manage ocean resources at multiple scales, similar to how NOAA provides information on the weather.



Paige Hoel, UC Los Angeles – Doctoral Student | paigehoel@atmos.ucla.edu

The Blob, the Kelp, and Us ([slides](#))

- During the marine heat wave of 2014–2016 kelp forests experienced massive die offs in the Southern California Bight due to elevated temperatures and reduced nutrients.
- We locate regions where anthropogenic nutrients could have benefitted kelp forests and then examine this relationship specifically in Marine Protected Areas.



Mark Morales, UC Santa Cruz, Postdoctoral Scholar | mamamora@ucsc.edu

Biophysical Drivers of Recruitment Dynamics Associated with Historical ENSO Events in the California Current

- Multiple mechanisms can determine recruitment success and the relative influence of recruitment drivers depend on environmental conditions.
- Food limitation determines recruitment strength during La Niña events while transport limitation dominates during El Niño events.



Dan Costa, UC Santa Cruz – Professor | costa@ucsc.edu

Response of Upper Trophic Levels in Response to the Changes in the North Pacific and California Current ([slides](#))

- Marine mammals are providing insights into how the North Pacific is changing.

Chris Lowe, CSU Long Beach – Professor + Shark Lab Director | chris.lowe@csulb.edu

Monitoring White Sharks for Public Safety ([slides](#))

- White shark monitoring relative to environmental conditions are being used to predict shark aggregation formation and dispersal.

Day 2 | Session 5

Coastal Resilience

Facilitator: **Megan Medina**, SIO/SCCOOS – Deputy Director | memedina@ucsd.edu

Mark Merrifield, Scripps Institution of Oceanography – Professor | mamerrifield@ucsd.edu

Considerations for Predicting Extreme Water Levels along the California Coast ([slides](#))

- Components needed to predict extreme water levels on a regional scale are considered.

Dave Martin, City of Santa Cruz – Environmental Compliance Inspector | dmartin@santacruzca.gov

Quantifying Potential Pollutant Discharge in the Near Shore Central Coast ([slides](#))

- A practical method for observing oceanic wastewater discharge plumes and quantifying ocean outfall structure damage using rhodamine dye and detectors in public service is presented.
- Understanding this damage and resulting wastewater discharge plumes is required by the Regional Board.

Rob Bochenek, Axiom Data Science, A Tetra Tech Company – President | rob@axiomalaska.com

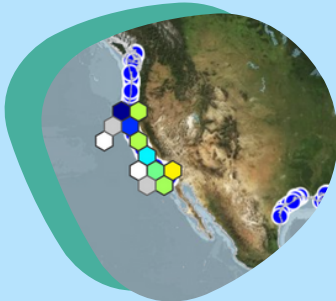
Cyberinfrastructure's Role in California Ocean Observing ([slides](#))

- Cyberinfrastructure plays a pivotal role in enabling convergence research by integrating advanced computational tools with diverse data streams. This synergy fosters interdisciplinary collaborations aimed at solving complex societal challenges through innovative technological approaches.
- Axiom works by leveraging applications, systems, and hardware across all partners and projects, thus standardizing systems, interfaces, and user experiences across all partners buffering against risk and potential instability.

Laura Engeman, Scripps Institution of Oceanography – Coastal Climate Resilience Specialist | lengeman@ucsd.edu

Community – Academic Collaborations To Improve Coastal Resilience ([slides](#))

- Observations are integral to coastal resilience planning, monitoring, and adaptive management. Local communities are interested in investing in historic and ongoing trends in beach-cliff erosion, flood event frequency and intensity, and storm response and recovery.
- Academic-community partnerships are valuable for assessing the effectiveness of experimental coastal adaptation. To build meaningful relationships with the community, provide early career training, share data, and integrate socio-economic values for risk tolerance.



Day 2 | Session 6 Fisheries, Ecosystem Assessments, & Sustainable Marine Resource Management

Facilitator: **Rasmus Swalethorp**, CalCOFI-SIO – Director of Ship Operations | rswalethorp@ucsd.edu



Benjamin Ruttenberg, California Polytechnic State University, San Luis Obispo – Director of the Center for Coastal Marine Sciences | bruttenb@calpoly.edu

MPAs, Fishing, and Ocean Climate: Exploring MPA Impacts on Fish Community Responses to Climate Perturbations in California using Collaborative Fisheries Research ([slides](#))

- The California Collaborative Fisheries Research Program is a model of cooperation between scientists and anglers.
- This long-term monitoring program has provided important insights on Marine Protected Area dynamics and how protection from fishing may influence how fish communities recover from climatic perturbations.



Chelsea Bowers-Doerning, CSU Fullerton – Graduate Student | chelseabowers10@gmail.com

Ingestion and Assimilation of Microplastics by Pacific Sardines (*Sardinops Sagax*), within the Southern California Bight ([slides](#))

- Wild-caught Pacific Sardines in the Southern California Bight ingest and assimilate microplastics into their muscle and liver tissues, indicating significant contamination levels compared to similar studies.

Francisco Chavez, Monterey Bay Aquarium Research Institute – Senior Scientist | chfr@mbari.org

Observing Life in the Central California Current using Environmental DNA ([slides](#))

- This presentation emphasizes the added value that Environmental DNA (eDNA) information provides to the understanding of the biodiversity in the Central California Current and how it varies over space and time.



Zachary Gold, NOAA, Pacific Marine Environmental Laboratory – Research Lead of Ocean Molecular Ecology Program | zachary.gold@noaa.gov

Archived DNA Reveals Marine Heatwave-associated Shifts in Fish and Zooplankton Assemblages ([slides](#))

- We demonstrate that Environmental DNA (eDNA) approaches can reconstruct CalCOFI zooplankton assemblages and enable us to fill a critical missing component of zooplankton biomonitoring in the CCLME by producing a nearly three-decade long climate-grade zooplankton time series.



Trevor Ruiz, California Polytechnic State University, San Luis Obispo – Assistant Professor | truiz01@calpoly.edu

Using eDNA to Identify Ecological Indicators Associated with Marine Mammal Abundances: An Example of Student-Centered Collaborative Research at the Intersection of Marine Science & Data Science ([slides](#))

- Collaborative and data-driven research in marine science can simultaneously address novel research questions and lead to innovation in methods of data analysis while creating valuable opportunities for students across disciplines.

Day 2 | Session 7

OAH, HAB, and Water Quality



Drew Lucas, Scripps Institution of Oceanography – Associate Professor | ajlucas@ucsd.edu

Dinoflagellate Vertical Migration Fuels an Intense Red Tide ([slides](#))

- Dinoflagellate vertical migration is responsible for the exceptionally high biomass of the red tide forming *Lingulodinium polyedra* during harmful algal bloom conditions.

Kasia Kenitz, Scripps Institution of Oceanography – Research Scientist | kkenitz@ucsd.edu

An Early Warning System for Harmful Algal Bloom Events in California ([slides](#))

- California Imaging Flow Cytobot Network to increase state's capacity for high resolution monitoring and generation early HAB alerts to enable rapid response and better decision-making
- Data collected every 30 minutes, made available online and processed in real time, and made available to stakeholders in a comprehensible graphical interface (HAB Dashboard) through HAB Data Assembly Center (HABDAC)
- HAB Dashboard displays IFCB-derived concentration time series at customizable resolutions, incorporates educational elements and metadata related to image classification.

Marco Sandoval Belmar, UC Los Angeles – Graduate Student | marcsandovalb@g.ucla.edu

Mysteries of Domoic Acid: Unraveling Regional Patterns of Pseudo-nitzschia Harmful Algal Blooms along the California Coast ([slides](#))

- Understanding regional differences in environmental drivers of Pseudo-nitzschia harmful algal blooms along the U.S. West Coast is crucial for predicting domoic acid outbreaks and mitigating their ecological and human health impacts.

Jayme Smith, Southern California Coastal Water Research Project – Senior Scientist | jaymes@sccwrp.org

Moving Toward Prediction of Domoic Acid Related Stranding Events of California Sea Lions in Southern California ([slides](#))

- Southern California experiences domoic acid producing harmful algal blooms routinely, which have severe impacts on marine mammal populations in the region.
- We have conducted several analyses with the goal of developing approaches to forecast marine mammal impacts from these events including identifying risk relationships between domoic acid concentrations at routine, pier-based monitoring stations and California Sea Lions

Ana Filipa Vieira, Center for Scientific Research and Higher Education of Ensenada – Graduate Student | anafilipa.vieira12@gmail.com

Market Squid: A Potential Domoic Acid Exposure Vector for the California Sea Lion ([slides](#))

- Market squid was the major prey identified in the stomach contents of a cluster of stranded California Sea Lions.
- Domoic acid detected in CA Sea Lion feces, gastric fluid, and ingested squid remnants implicate Market Squid as a potential domoic acid vector.



Day 2 | Panel

Building a More Diverse + Equitable Observing System; Diverse Engagement & Equitable Service Delivery



Panelists

Moderator: **John Hansen**, West Coast Ocean Alliance, Director | john@westcoastoceanalliance.org

- **Jules Jackson**, Coastal Defenders, Founder | JacksonJules@gmail.com
- **Rocio Lozano-Knowlton**, MERITO Foundation, Executive Director and Founder | ruizrc@cicese.mx
- **Dijanna Figueroa**, Bridge Builders Foundation, STEM Director | dijanna@gmail.com
- **Theresa Talley**, California Sea Grant, Coastal Specialist | tstalley@ucsd.edu

Summary

The panel titled, "Building a more diverse and equitable ocean observing system" focused on the multifaceted concept of equity within the context of ocean observations. The speakers emphasized the importance of the term "equity" and acknowledged its varied interpretations and lenses. Overall, the panelists highlighted the importance of equity and inclusivity in ocean sciences and related fields. They emphasized creating environments and initiatives that empower diverse communities, ensure fair access to resources and opportunities, and promote collaboration to address global challenges. They also highlighted the need for building trust, providing accessible education and data, and engaging communities meaningfully through workforce development.

Each panelist shared their perspective on equity, highlighting the significance of such discussions in their work and the value of fostering diversity and inclusivity within ocean observing systems, summarized below.

Equity in ocean sciences

Dijanna advocated for creating an equitable, just, inclusive, and belonging environment in ocean sciences. They emphasized the need to create space for diverse voices and perspectives to contribute meaningfully. Dijanna defined equity as creating conditions where all individuals could thrive rather than treating everyone equally.

Equity in data accessibility

Rocio focused on equity in ocean observation data, stressing the importance of making data accessible and understandable to diverse audiences. They highlighted the need to tailor data to meet the specific needs of various groups (e.g., farmworkers, science teachers, etc.) ensuring community ownership and relevance of the data.

What does equity mean to you?

Equity in workforce development

Theresa discussed equity in workforce development, citing initiatives like apprenticeship programs and aquaculture training. Creating equitable & accessible training opportunities fosters job opportunities for all. Promoting community and belonging among participants enhances efficacy and integration into their fields.

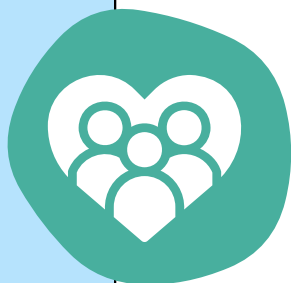
Inclusivity and collaboration

Jules proposed enhancing inclusivity using audience interaction and participatory formats in presentations. They raised awareness about equity in grant applications funding processes. Transparency, inclusivity, and collaborative action is critical to address critical issues like climate change. Aligning professional responsibility with personal values can foster genuine commitment to equity and inclusivity in work practices.

Day 2 | Panel

Building a More Diverse + Equitable Observing System; Diverse Engagement & Equitable Service Delivery (continued)

The second half of the panel included individual questions and Question & Answer session with the audience. Three main themes emerged from this discussion, including:



1. Community partnerships as key to creating equitable spaces

Dijanna emphasized the critical role of community partnership and trust-building in creating equitable spaces for learning and engagement in ocean sciences. They highlighted successful collaborations with institutions like Scripps Institution of Oceanography and Minority-Serving Institutions (MSIs), underscoring the importance of cultural competency and effective communication to overcome historical barriers and foster inclusive programs.

2. Accessible data, experiential learning and workforce development

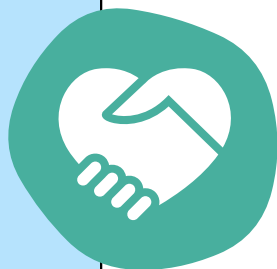
Rocio and Theresa highlighted the complementary aspects of enhancing accessibility and engagement in ocean sciences. Rocio emphasized the challenge of translating scientific data into actionable insights for communities, advocating for tailored experiential learning approaches. They underscored the importance of assessing audience needs to promote ocean literacy and career interest among multicultural youth from low-income backgrounds.

Theresa focused on innovative workforce development strategies, such as the commercial fishing apprenticeship program. They emphasized the value of equipping individuals with diverse vocational skills and fostering community and efficacy within marine industries. Theresa highlighted the role of hands-on learning and mentorship in building confidence and engagement among participants, contributing to a skilled and inclusive marine workforce.



3. Meaningful engagement with indigenous communities and Tribal governments

Jules provided insights into meaningful engagement with tribal governments and indigenous communities. They underscored the historical context and challenges faced by indigenous nations in policy discussions and project planning. Jules advocated for genuine collaboration from project inception, emphasizing respect for indigenous knowledge systems and the importance of mutual understanding and partnership in addressing community-specific issues.



Jules Jackson, Coastal Defenders,
introduced to the audience how to send waves of love.

Day 2 | Evening Celebration Anniversary Reception

Welcome

Kristen Yarinick, IOOS Association,
Director | kristen@ioosassociation.org

CalCOFI Remarks

George Watters, NOAA SWFSC, Antarctic
Ecosystem Research Division, Director |
george.watters@noaa.gov

SCCOOS Remarks

Julie Thomas, CDIP/SCCOOS Former
Director (retired) | jot@cdip.ucsd.edu

CeNCOOS Remarks

Francisco Chavez, MBARI, Senior
Scientist | chfr@mbari.org



Summary

The conference's anniversary reception featured remarks from esteemed speakers commemorating 75 years of the CalCOFI program and 20 years of the IOOS Regional Associations, CeNCOOS and SCCOOS, followed by a dinner and opportunities for dancing and socializing. Jules Jackson was announced as the winner of the RBR raffle, securing a paddleboard. The event provided a lively atmosphere for networking and celebrating achievements in the ocean observing community.



Day 3 - Thursday, May 16, 2024

Welcome

Alex Harper, Central and Northern California Ocean Observing System / California Polytechnic State University, Humboldt

Opening Remarks

Gerhard Kuska, MARACOOS

Plenary

Ocean Observations in Support of A Climate Ready Nation: Monitoring Priorities for a Resilience California
Staci Lewis, Ocean PC MPA – Program Manager



Staci Lewis, shared monitoring priorities for a “Climate-Ready California”, providing an overview of the Ocean Protection Council (OPC), its mission, and strategic goals. The focus was on the California Marine Protected Area (MPA) Network, highlighting OPC's role in MPA policy and research. Staci discussed the establishment and expansion of the MPA network, funding allocations for MPA ecological monitoring, and the importance of adaptive management in MPA management decisions. Staci also touched upon California's 30 by 30 initiative aimed at conserving 30% of lands and waters by 2030. She outlined the pathways identified to achieve this goal, emphasizing the need for adaptive management and collaboration with tribes and sanctuaries.

Additionally, she emphasized the importance of enhancing ocean acidification and hypoxia monitoring networks, along with the launch of the Central Data Repository. Staci also shared information on the development of the California Ocean and Coastal Report Card, in collaboration with the Ocean Science Trust (OST), which will utilize scientific indicators based on high-quality monitoring data. Staci concluded by emphasizing the need for robust monitoring data to support resilience in California and expressed enthusiasm for collaboration in advancing this vision. ([slides](#))

Plenary

Ocean Observations for a Climate Ready Nation:
Service Delivery to Meet Community Resilience Needs
Carl Gouldman, NOAA U.S. Integrated Ocean Observing System, Director

Carl Gouldman, IOOS Director, highlighted the benefits of the creation of IOOS within NOAA for long-term ocean observations. Carl explored the future of ocean observations and climate change solutions through technological advances, service delivery, and community engagement. He discussed the unique role and promising opportunities for observing systems in California in the context of delivering data and services tailored to regional decision-support and community needs through co-development. This includes the integration of regional observing systems within a national framework, downscaling the national vision and strategy for integrated ocean observing to California, and adding value to observing programs amid diverse interests and activities. Carl also mentioned the expansion of partnerships with US companies, such as through technology workshops, to address societal challenges. Lastly, Carl highlighted how IOOS will improve coastal resilience service delivery and blue economy accelerators through Inflation Reduction Act funding. ([slides](#))



“Walk in the door with open ears - not an open mouth”
- Carl Gouldman

Day 3 | Session 8

Ocean Solutions and the Blue Economy

Facilitator: **Erin Satterthwaite**, CalCOFI/CA Sea Grant/SIO | esatterthwaite@ucsd.edu

Don Kent, Hubbs–SeaWorld Research Institute – President & CEO | dkent@hswri.org

The Role of Ocean Observing in Developing Marine Aquaculture ([slides](#))

- Small tracts of open ocean can grow a significant portion of our animal protein needs, enabling us to reap the Blue Economy benefits of marine farming to sustain coastal communities and minimize impacts to global warming

Helen Killeen, Farallon Institute – Postdoctoral Researcher | hkilleen@faralloninstitute.org

The Winds Of Change: Using CalCOFI Data To Predict Seasonal Shifts In Seabird Community Relationships with Planned Offshore Wind Development ([slides](#))

- Seasonal models of species distributions are useful for measuring how exposure risk changes across the year for California's nearshore and offshore seabird communities.
- Seabird vulnerability to offshore wind development is also species-specific and trait-mediated, but more research is needed on these topics. CalCOFI and similar survey efforts offer unique opportunities to evaluate indirect impacts of wind energy on seabird via environmental and lower trophic level responses to development.

Kaustubha Raghukumar, Integral Consulting Inc. – Senior Scientist | kraghukumar@integral-corp.com

Projected Cross-Shore Changes in Upwelling Induced by Wind Farm Development Along the California Coast ([slides](#))

- Offshore wind farm development can potentially alter the cross-shore structure of upwelling circulation.
- More measurements and model validation are needed in and around wind energy areas.

Jay Staton, CA Department of Fish & Wildlife – Environmental Scientist | jay.staton@wildlife.ca.gov

Offshore Wind Potential Impact to Fisheries & Spatial Planning Efforts ([slides](#))

- The role of CDFW is to provide biological expertise, the best available data for commercial and recreational fishing analysis, and to facilitate communication and engagement between fishing communities and the appropriate agencies.
- Four potential impacts of offshore wind development on fisheries were explored: (1) displacement of fishing effort; (2) increase sea travel distance and time to avoid OSW infrastructure and activities; (3) increased port congestion; and (4) disruption to long-term fisheries surveys. The California Offshore Wind Energy Fisheries Working Group is tasked with developing a statewide strategy to avoid, minimize, and mitigate impacts to commercial, recreational, and tribal fisheries.

Kakani Katija, Ocean Visions AI – Program Manager | kakani@mbari.org

Ocean Vision AI: Accelerating The Analysis of Ocean Visual Data Using Artificial Intelligence and Broad Community Engagement

- Growing the complex, interconnected blue economy requires understanding its impact on the ocean life. Collecting visual data is increasingly recognized as a preferred, and scalable, method for monitoring ocean life.
- Ocean Vision AI is a groundbreaking new platform that streamlines access to AI and machine learning tools to accelerate the analysis of ocean visual data. The OVAI mission is to accelerate observations of life in the ocean using artificial intelligence, which will enable effective marine stewardship and sustainable growth of the Blue Economy



Day 3 | Session 9

California Current System Dynamics

Facilitator: **Ed Weber**, NOAA SFSC – Research Fish Biologist | ed.weber@noaa.gov

Arina Favilla, UC Santa Cruz/National Institute of Polar Research – Postdoctoral Researcher | afavilla@ucsc.edu

Leveraging Animal Collaborations to Obtain More Fine-Scale Dissolved Oxygen Measurements in the Eastern North Pacific ([slides](#))

- Deep-diving seals can provide fine-scale measurements of dissolved oxygen in the California Current as well as across the Northeast Pacific, expanding oceanographic datasets and improving monitoring of ocean deoxygenation in a region of major concern.

Jerome Guet, UC Los Angeles – Assistant Researcher | jguet@atmos.ucla.edu
Fish From Space: Spatiotemporal Dynamics of Mid-Trophic Levels Revealed by Remote Sensing and In-Situ Acoustic Data Fusion ([slides](#))

- Data fusion of remote sensing and acoustic observation can inform regional differences in the dominant environmental drivers of mid-trophic level organisms' dynamics in the California Current. It especially indicates regional differences in dominant drivers of inter-annual variability.

Mark Ohman, Scripps Institution of Oceanography – Distinguished Professor | mohman@ucsd.edu

A Multi-Scale Perspective on Zooplankton Dynamics of the CCE: from Zooglider to 7-1/2 Decades Of CalCOFI ([slides](#))

- The zooplankton of the California Current Ecosystem provide vital insights into climate change and climate variability.
- Future investigations must include both autonomous sensing and shipboard sampling of the holozooplankton.

Dan Robinette, Point Blue Conservation Science – Senior Scientist | drobinette@pointblue.org

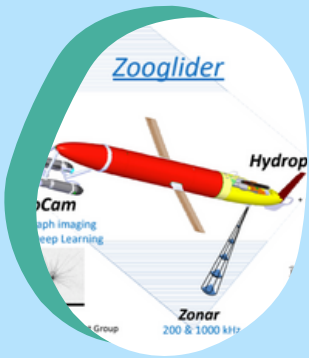
The California Least Tern (*Sterna Antillarum Browni*) as an Indicator of Nearshore Habitat Health in the Southern CA Current System ([slides](#))

- The California least tern is a valuable indicator of nearshore habitat health within the southern California Current System.
- We recommend including least tern breeding metrics in assessments like NOAA's Integrated Ecosystem Assessment and the State of the California Current Report.

Michaela Alksne, Scripps Institution of Oceanography – Graduate Student | m1alksne@ucsd.edu

Big Whales and Big Data: Developing An Automated Approach for Detection and Classification of Baleen Whale Calls on CalCOFI Sonobuoy Recordings ([slides](#))

- The study develops a machine learning model for identifying baleen whale calls in CalCOFI data, achieving high precision for blue whale calls.
- This work is the first step in a larger effort to study blue and fin whale distribution throughout the Southern California Bight.



Day 3 | Panel Future Vision



Panelists

Moderator: **Noelle Bowlin**, NOAA, Southwest Fisheries Science Center – CalCOFI Program Lead | noelle.bowlin@noaa.gov

- **Alice Kojima-Clarke**, Bureau of Ocean Energy Management – Presidential Management Fellow | Alice.Kojima@boem.gov
- **Luke Gardner**, California Sea Grant – Research Faculty | lgardner@ucsd.edu
- **Jack Barth**, Oregon State University – Executive Director of Marine Studies Initiative | jack.barth@oregonstate.edu
- **Michelle Fogarty**, Equinor – Environmental Survey Manager | mfog@equinor.com

Summary

The "Future Vision" panel convened experts from diverse sectors to discuss their perspectives on shaping the future of ocean observing. The speakers brought insights from their respective fields, emphasizing innovative approaches and collaborative strategies to enhance ocean observations for science, management, and sustainable practices. The panel discussions illuminated key themes essential for advancing ocean observing capabilities. They emphasized the critical need for data-driven approaches in regulatory processes, improved communication among stakeholders for enhanced transparency and efficiency, inclusivity in accessing and utilizing ocean data, and the integration of innovative technologies to meet evolving scientific demands.

What do you envision for the future of ocean observation?



Advancing sustainability and regulation through ocean observing

Luke Gardner and Michelle Fogarty highlighted the crucial role of ocean observations in promoting sustainable practices and regulatory decisions. Luke focused on the need for pre-permitting ocean data to guide environmentally sound aquaculture in California. Meanwhile, Michelle emphasized strategic data collection for offshore wind projects, essential for meeting regulatory standards and operational requirements. Alice Kojima-Clarke advocated for improved communication to enhance efficiency in ocean leasing processes, aiming to support sustainable practices and management.

Broadening engagement and diversity in ocean science

Jack Barth advocated for broadened participation in ocean sciences, including those inland. He emphasized the importance of attracting individuals concerned about ocean-related issues like climate change and storms, regardless of their coastal proximity. Barth envisioned technological advancements, such as AI, as tools to democratize access to ocean science, making it more inclusive and accessible. He highlighted the need to foster stewardship and involvement among people with diverse backgrounds to effectively advance ocean observation efforts. Alice complemented these ideas, promoting broader engagement among stakeholders through inclusive networking events and face-to-face interactions. Her approach aimed to enhance diversity in participation and ensure that decision-making processes benefited from a wider range of perspectives, contributing to more inclusive and robust outcomes in ocean science and management.



Day 3 | Panel Future Vision

What tool(s) do you need to bring your vision of the future to fruition?

Communication and coordination

Alice underscored the necessity of improved communication and coordination between those who collect observational data and those who use them. She emphasized the value of frequent conversations and networking events to leverage overlapping priorities of different players, enhance cost sharing and transparency, and avoid redundant efforts. Face-to-face interactions and follow-up discussions were crucial, as Alice believed they fostered collaboration and drove progress.



Baseline monitoring data for aquaculture permitting

Luke emphasized the critical role of baseline monitoring data in streamlining the aquaculture permitting process. He stressed the importance of readily available information on site selection and environmental conditions to reduce time and costs associated with lease applications. Luke advocated for enhanced resolution and localization of ocean observations tailored to meet regulatory needs. Real-time monitoring, according to Luke, enhances decision-making processes and ensures the efficiency and success of aquaculture operations.

“We need knowledge brokers”

- Alice Kojima-Clarke

Inclusivity and broadened access

Jack advocated for broadening the scale of interaction and inclusivity in accessing ocean data. He emphasized the importance of global communication efforts such as the UN Decade of Ocean Science for Sustainable Development and collaborative centers. Jack proposed equipping fishing vessels with low-cost, user-friendly sensors to enhance data collection capabilities. He supported integrating high-tech tools with inexpensive sensors to democratize access to ocean data, aiming for wider distribution and enhanced engagement.

Innovative technologies and collaboration

Michelle emphasized need for new tools and technologies to enhance ocean data collection/monitoring. She recommended utilizing autonomous vehicles (e.g., AUVs/ gliders) for efficient data gathering without constant human intervention and using automated image analysis to enhance data processing capabilities. She stressed the role of dedicated facilitators to coordinate diverse stakeholders, drawing from successful models (e.g., Regional Wildlife Science Collaborative, Responsible Offshore Science Alliance). She advocated for improved coordination among federal and state agencies, research institutions, industry, & NGOs to ensure focused collaboration and sustainable solutions in ocean science.

Day 3 - Thursday, May 16, 2024

Closing Remarks

Brice Semmens, Scripps Institution of Oceanography

Brice Semmens, in his recap of the conference, outlined its objectives ranging from sharing cutting-edge observations to fostering collaborations and community relationships. He shared the state of the California current, highlighting persistent warm ocean conditions and the intriguing absence of sardines alongside high anchovy populations. He also discussed the impact of DDT and the focus on the blue economy, stressing the importance of collaboration between scientists and data users in understanding the dynamic ecosystem. Brice underscored the complexity of the California current ecosystem and the necessity for comprehensive observations to navigate future challenges effectively.



Brice emphasized the need for coordinated future ocean observing efforts, emphasizing the importance of distilling vast data into actionable insights and maintaining historical context. He urged against reinventing the wheel and advocated for leveraging existing monitoring programs. Additionally, Brice stressed the importance of an inclusive ocean community, highlighting the value of diverse perspectives. He emphasized grounding new technologies in historical data for validation and calibration. Lastly, Brice expressed gratitude to all conference participants, volunteers, sponsors, and organizers for their contributions.

Acknowledgements

We are grateful to the Leadership Committee and Planning Committee for months of conference preparation. We gratefully acknowledge the generosity of our sponsors without which this conference would not have been possible. Our sincere appreciation to our esteemed keynote and plenary speakers, moderators, and panelists for their insightful and thought-provoking presentations shared generously with our ocean observing community. Thank you to our volunteers who helped set up and oversee the registration booth as well as take scrupulous notes. We also want to acknowledge and apologize for the multitude of technical issues experienced online; we will ensure future OOCA conferences are held at a venue with optimal hybrid A/V capabilities. Lastly, thank you to all the participants for their input and interactions, which contributed to making the Ocean Observing in California conference a celebration of past, current, and future partnerships.

The summary report was prepared by Megan Medina, Alex Harper, Erin Satterthwaite, and Makenna Martin, with contributions, reviews, and support from Clarissa Anderson, Henry Ruhl, Brice Semmens, Rasmus Swaethorp, Noelle Bowlin, Andrew Thomas, Ed Weber, Briana Brady, and Julia Coates. This report provides a summary of the conference highlights, recommendations, speaker presentations, and events.

Funding Acknowledgements

SCCOOS, CeNCOOS, and CalCOFI would like to acknowledge the awards that supported the research and outreach efforts involved in this conference.

- **SCCOOS**: NOAA/IOOS – Award NA21NOS0120088-T1-01
- **CeNCOOS**: NOAA/IOOS – Award NA21NOS0120090
- **CalCOFI**: NOAA/Sea Grant – Awards NA20OAR4320278; NA20OAR4170; NA22OAR4170106

Poster & Exhibit Booth Sessions

Presenting author(s) denoted in bold font

California Current System Dynamics

1. **Alice Kojima**, Bureau of Ocean Energy Management | Towards a Future of Environmental Monitoring for Offshore Wind
2. **Andrew Weber**, Geopaths Internship: SIO | Importance of Accurate Time of Day Adjustments for Long-term Sea Surface Temperature Data
3. **Angeles Rios**, SIO | Exploring Baird's Beaked Whale Presence in the North Pacific Through Long-Term Passive Acoustic Monitoring
4. **Anh Pham**, UCLA | A Data Compilation of Ocean Dissolved Iron & Organic Ligands Measurements in the CA Current
5. Anna Effinger (**Moira Decima**), SIO | Zooplankton Grazing in the CA Current Ecosystem
6. **Benjamin Werb**, MBARI | Estimating Gross Primary Production and its Relationship to Light from Diel Measurements of Oxygen and Ph from Underwater Gliders
7. **Clara Schoenbeck**, SIO | Cuvier's Beaked Whale Presence Relative to Vertical and Temporal Variability of Oceanographic Conditions in the Southern California Bight
8. **De'Marcus Robinson**, UCLA | Spatial Distribution and Temporal Variability of Oxygen in the Santa Barbara Basin
9. **Flora Coden**, SIO | Plenty of Fish in the Molecular Sea: Testing eDNA for Teleost Biomonitoring Applications
10. **Frederick Bahr**, CeNOOS/MBARI Analysis of the Inshore CA Current System off Central CA using Naval Oceanographic Office Survey Data from 1997 to 2002
11. **Jennifer Patterson Sevadjian**, SIO | Improving FAIR and Open Access to Observations from the CA Underwater Glider Network
12. **John (Jack) Barth**, OSU | Gliding Along the Trinidad Head Line in North CA, 2014-Present
13. **Jose Gomez-Valdes**, Centro de Investigacion Cientifica y de Educacion | Characterization of the Thermohaline Structures Associated with The Mixed Layer in the Southern CA Current System
14. **Laura Bliss**, West Coast Ocean Data Portal | Partnering with the West Coast Ocean Alliance and West Coast Ocean Data Portal using IOOS data to inform regional ocean health priorities
15. **Libe Washburn**, UCSB | Anomalous Warming in Near-Shore Waters of the Southern CA Bight as Observed by the SCCOOS Automated Shore Station (SASS) Network
16. **Matthias Lankhorst**, SIO | Mooring-Based Observations of the CA Current, Undercurrent, and Upwelling Regimes off Southern CA
17. **Meredith Elliott**, Point Blue Conservation Science | The Applied CA Current Ecosystem Studies (ACCESS)
18. **Michaela Alksne**, SIO and Justin Kim, Kaitlyn Lee, Luis Barajas, Ryan Lee, Samuel Guimte, Yoobin Won, UC Santa Barbara | An Interactive Viewing Tool for Marine Mammal Monitoring Data
19. **Nathali Cordero Quiros**, Ensenada Center for Scientific Research and Higher Education | Future Mesoscale Variability of the CA Current System Under a Changing Climate
20. **Nicholas Rome**, NANOOS | NANOOS's Efforts for Ocean Data Accessibility in the PNW and Northern CA
21. **Richard Brokaw**, UCSB | Mechanisms Driving Advective Nutrient Fluxes and Net Primary Productivity in the Santa Barbara Channel
22. **Riley Hale**, SIO | Physical and Microbial Models Predict Net Trophic Status of the Near-Shore Southern CA Bight Ecosystem
23. **Shailja Gangrade**, SIO | Salinity Predicts Maximum Potential Phytoplankton Biomass and Community Structure in the CA Current System
24. **Shannon Perry**, SIO | Microbial Phosphorus Cycling Over Time at the Ellen Browning Scripps Memorial Pier within the Southern CA Bight
25. **Verena Hormann**, SIO | Observations from Lagrangian Drifters in the CA Current System
26. **Yessica Contreras**, Center for Scientific Research and Higher Education at Ensenada | Anthropogenic Carbon Invasion in the Southern CA Current Surface Waters

Poster & Exhibit Booth Sessions

Coastal Resilience

1. **Annie Bodel**, Port of San Diego | Collaborative Approach(es) to Natural Resources Management in San Diego Bay
2. **Dante Capone**, SIO | Shore Station Monitoring to Explore Coastal Ecosystem Response to California Wildfires
3. **Eliza Thomas**, SIO | Understanding the Impacts of Floating Offshore Wind Developments in CA: a Geospatial Analysis of Information Gaps in Baseline Monitoring
4. **James Behrens**, CDIP/SIO | The Coastal Data Information Program: 50 Years of Measuring and Modeling the Waves

Ocean Acidification & Hypoxia, Harmful Algal Blooms, and Water Quality

1. **Adriana Gonzalez-Silvera**, UBC | Long-Term Monitoring of Phytoplankton, Nutrients and Alkalinity off Baja CA
2. **Adriana Gonzalez-Silvera**, UBC | Light Absorption Properties of Dinoflagellate Blooms in Todos Santos Bay, Mexico (Northeast Pacific Ocean)
3. **Anya Stajner**, SIO | Aragonite-Shelled Pelagic Gastropod Community Composition in the Southern CA Current
4. **Barbara Javor**, NOAA, SFSC | Monitoring Effects of Harmful Algal Blooms on Zooplankton Grazers
5. **Eva Scrivner**, SDSU | Spectral Characterization of Wastewater-Seawater Dilutions from the Tijuana River
6. **Hazel Veteto**, GeoPaths Internship: SIO and Mira Costa College | Investigating Differences in Phytoplankton and Chlorophyll during Warm and Cold Years
7. **Holly Bowers**, UC Davis, Moss Landing Marine Laboratories | Validating the Aquasens imaging platform to Expand Networked Cell Detection Capabilities
8. **Jacob Partida**, CSPU Humboldt + **Eric Bjorkstedt**, NOAA SFSC | Trinidad Head Ocean Observing Node
9. Karen McLaughlin (**Martha Sutula**), Southern CA Coastal Water Research Project Monitoring Biological Impacts of Ocean Acidification: Lessons from the U.S. West Coast
10. **Kayla Martin**, SIO | Data Quality Control and Assurance of Oceanographic Sensors as Part of the SCCOOS Automated Shore Stations Program
11. **Luke Miller**, SDSU Coastal and Marine Institute | Habitat Heartbeats: Tracking Behavioral and Physiological Responses of Oysters and Mussels to Water Quality Conditions in San Diego Estuaries
12. Makrom Shatila (**Scott Jenkins**), Michael Baker International | AUV Plume Dispersion Assessments of Ocean Outfalls
13. **Steffaney Wood**, SIO Environmental detection of Pseudo-nitzschia spp. and Domoic Acid Biosynthesis in the Santa Barbara Channel, 2019-2023
14. **Stephanie Jaeger**, City of San Diego | Seasonal Patterns and Ranges of Variability in Low Dissolved Oxygen and pH Conditions in the San Diego Region
15. **Terence O'Brien**, SIO | Long-term Bio-AOptical and Radiometric Time Series from Moorings in Southern CA

Poster & Exhibit Booth Sessions

Fisheries, Ecosystem Assessments, & Sustainable Marine Resource Management

1. **Alexandra Curtis**, NOAA, SFSC | SLIDERS: Harnessing CA Sea Lions as the Furry, Pooping Gliders of the Southern CA Bight Since 1981
2. **Anastasia Kunz**, California Marine Sanctuary Foundation | The West Coast Ocean Sound Observation Network
3. **Ann Bowles**, Hubbs-SeaWorld Research Institute | Ocean Observing at the Point of Contact: Reflections on Observing Marine Life Interactions with Human-Made Objects in the Ocean
4. **Anne Simonis**, NOAA, SFSC | Adrift in the CA Current: Clustered Drifting Recorders Describe Spatial Variation in Soundscapes And Marine Mammal Presence within Offshore Wind Energy Areas along the US West Coast
5. **Avik Ghosh, Christopher L. Crutchfield, & Kyle Hu**, SIO | FishSense Lite - An In-situ Camera and Laser-based Fish Length Measurement System
6. **Danielle Haulsee**, Hubbs-SeaWorld Research Institute | Towards Coordinating an Ecosystem Services Observation Network in the CA Current
7. **Erica Jarvis Mason**, NOAA, SFSC | Environment-Driven Trends in Fish Larval Abundance Predict Fishery Recruitment in Two Temperate Reef Congeners
8. **Erica Kinsel, Michael Montgomery, & Nina Jekel**, UCSB | CA Fishers' Perceptions of El Niño: A Participatory Approach
9. **Gammon Koval**, Farallon Institute | From Environment to Seabirds: Farallon Institute Data Products
10. Gerardo Aceves-Medina (**Sylvia Jiménez Rosenberg**), Instituto Politécnico Nacional CICIMAR | Ichthyoplankton Species Richness along 40 years of Research in the Mexican Pacific
11. Jaime Jahncke (**Meredith Elliott**), Point Blue Conservation Science | Safeguarding the Future: Rallying Support for Point Blue's Farallon Islands Research Amid Funding Threats
12. **Kathryn Chen**, SIO | Current Trends in Ichthyoplankton Phenology in the CA Current Ecosystem
13. **Kimberly Stauffer**, UC Davis | Examination of Age Class Niche Variation of Broadnose Sevengill Shark (*Notorynchus cepedianus*) in San Francisco Bay Through Stable Isotope Analysis
14. **Marina Frants**, SIO | Application Programming Interface (API) for Integrated CalCOFI Data Retrieval
15. Miram Gleiber, University of Alberta (**Stephen Bogard**, NOAA SWFSC) | The Pelagic Species Trait Database: An Open Data Resource to Support Trait-based Ocean Research
16. **Nastassia Patin**, SIO | eDNA Four Ways: An Intercalibration Experiment of Sampling and Processing Methods for eDNA Collection on CalCOFI
17. Michael Johns (**Merideth Elliott**), Point Blue Conservation Science | Status and Trends of Marine Bird Populations at the Farallon Islands National Wildlife Refuge, CA
18. Peter Warzybok (**Merideth Elliott**), Point Blue Conservation Science | Status and Trends Of Pinniped Populations at the Farallon Islands National Wildlife Refuge, CA
19. **Holly Woytak**, Fugro | Benefits of Collaborating with Private Industry - Building Towards Marine and Coastal Environmental Solutions Along the CA Coast
20. **Vanessa Scott**, SIO | Accelerating Innovative Ocean Solutions to Grow the Sustainable Blue Economy

In Person Participant List (251)

- Adriana Gonzalez-Silvera, University of Baja California
- Adriana Le Compte, Southern California Coastal Water Research Project
- Alberto Sanchez, Senator Laphonza Butler Office
- Alex Harper, Central and Northern California Ocean Observing System/Cal Poly Humboldt
- Alexandra Curtis, NOAA, Southwest Fisheries Science Center
- Alice Kojima-Clarke, Bureau of Ocean Energy Management
- Allison Dedrick, California Department of Fish and Wildlife
- Ally Pasulka, California Polytechnic State University, San Luis Obispo
- Alma Carolina, Woods Hole Oceanographic Institution
- Amber Briesach, University of California, Santa Barbara
- Ana Filipa Vieira, Center for Scientific Research and Higher Education of Ensenada
- Ana Sofia, Scripps Institution of Oceanography
- Anastasia Kunz, California Marine Sanctuary Foundation
- Andrew Barton, Scripps Institution of Oceanography
- Andrew Leising, NOAA, Southwest Fisheries Science Center
- Andrew Thompson, NOAA, Southwest Fisheries Science Center
- Andrew Weber, GeoPaths Internship: Scripps Institution of Oceanography and MiraCosta College
- Angeles Rios, Scripps Institution of Oceanography
- Anh Pham, University of California, Los Angeles
- Ann Bowles, Hubbs-SeaWorld Research Institute
- Anne Simonis, NOAA, Southwest Fisheries Science Center
- Annie Bodell, Port of San Diego
- Anya Stajner, Scripps Institution of Oceanography
- Ardyel Lim, Senator Steve Padilla Office
- Arina Favilla, University of California, Santa Cruz
- Audrey Bard, Equinor Wind US
- Avik Ghosh, Scripps Institution of Oceanography
- Barbara Javor, NOAA, Southwest Fisheries Science Center
- Ben Holt, NASA, Jet Propulsion Laboratory
- Benjamin Ruttenberg, California Polytechnic State University, San Luis Obispo
- Benjamin Versteeg, University of California, Santa Barbara
- Benjamin Werb, Monterey Bay Aquarium Research Institute
- Bradley Rahrer, City of Santa Barbara
- Brice Semmens, Scripps Institution of Oceanography
- Brittany Lockhart, UC San Diego
- Brock Rosenthal, Ocean Innovations
- Bruce Steele, Fisherman
- Canon Purdy, Scripps Institution of Oceanography
- Captain Kip Loutitt, Marine Exchange of Southern California
- Carl Gouldman, NOAA, U.S. Integrated Ocean Observing System
- Carl Nettleton, OpenOceans Global
- Carlene Burton, Scripps Institution of Oceanography
- Carlos Hernandez, Center for Scientific Research and Higher Education of Ensenada
- Cassie Wilson, UCar
- Chad Whelan, CODAR Ocean Sensors, Ltd
- Chelsea Bowers-Doerning, Port of San Diego
- Chris Castillo, Scripps Institution of Oceanography
- Chris Edwards, University of California, Santa Cruz
- Chris Kontoes, Del Mar Oceanographic, LLC
- Chris Lowe, California State University Long Beach
- Christopher L. Crutchfield, Scripps Institution of Oceanography
- Clara Schoenbeck, Scripps Institution of Oceanography
- Clarissa Anderson, Southern California Coastal Ocean Observing System/Scripps Institution of Oceanography
- Cole Reed, State Senate Pro Tem Emeritus Toni Atkins
- Colleen Petrik, Scripps Institution of Oceanography
- Corey Niles, Washington Department of Fish and Wildlife
- Cory Hom-Weaver, NOAA, Southwest Fisheries Science Center
- Dan Costa, University of California, Santa Cruz
- Dan Robinette, Point Blue Conservation Science
- Daniel Nelson, RBR
- Daniel Rudnick, Scripps Institution of Oceanography
- Danielle Haulsee, Hubbs-SeaWorld Research Institute
- Danielle Lipski, NOAA, Cordell Bank National Marine Sanctuary
- Danielle Muller, Southern California Coastal Ocean Observing System/Scripps Institution of Oceanography
- Dante Capone, Scripps Institution of Oceanography
- Dave Martin, City of Santa Cruz
- De'Marcus Robinson, University of California, Los Angeles
- Dean Pentcheff, Natural History Museum of LA

In Person Participant List (251)

- Diane Pleschner-Steele, California Wetfish Producers Association - C-CAN
- Dick Ogg, Fisherman
- Dijanna Figueroa , Bridge Builders LA
- Dominique Kone, California Ocean Science Trust
- Don Kent, Hubbs-SeaWorld Research Institute
- Dra. Sylvia P. A. Jiménez Rosenberg, Instituto Politécnico Nacional, Interdisciplinary Center for Marine Sciences
- Drew Lucas, Scripps Institution of Oceanography
- Eadie Demarcus, Scripps Institution of Oceanography
- Ed Weber, NOAA, Southwest Fisheries Science Center
- Edward Saade, Integral Corp Associate
- Elena Beckhaus, Scripps Institution of Oceanography
- Eliza Thomas, Scripps Institution of Oceanography
- Elliott Hazen, NOAA, Southwest Fisheries Science Center
- Emily Bockman, California Polytechnic State University, San Luis Obispo
- Eric Bjorkstedt, NOAA, Southwest Fisheries Science Center
- Eric Terrill , Scripps Institution of Oceanography
- Erica Jarvis Mason, NOAA, Southwest Fisheries Science Center
- Erica Kinsel, University of California, Santa Barbara
- Erin Satterthwaite , California Sea Grant/Scripps Institution of Oceanography
- Eva Scrivner, San Diego State University
- Faycal Kessouri, Southern California Coastal Water Research Project / University of California Los Angeles
- Flora Coden, Scripps Institution of Oceanography
- Francisco Chavez, Monterey Bay Aquarium Research Institute
- Fred Bahr, Central and Northern California Ocean Observing System/Monterey Bay Aquarium Research Institute
- Gammon Koval, Farallon Institute
- George Robertson, Orange County Sanitation District - retired
- George Watters, NOAA, Southwest Fisheries Science Center
- Gerhard Kuska, Mid-Atlantic Regional Association Coastal Ocean Observing System/University of Delaware
- Greg Murphy, Fugro
- Greg Paul, City of Santa Barbara
- Hazel Veteto, GeoPaths Internship: Scripps Institution of Oceanography and MiraCosta College
- Helen Killeen, Farallon Institute
- Helena C. Frazao, Scripps Institution of Oceanography
- Henry Ruhl, Central and Northern California Ocean Observing System/Monterey Bay Aquarium Research Institute
- Holly Bowers, Moss Landing Marine Laboratories
- Holly Woytak , Fugro
- Hope Hahn, University of California, Santa Barbara
- Ian Brunjes, Southern California Coastal Ocean Observing System/Scripps Institution of Oceanography
- Ian Clampett, Scripps Institution of Oceanography
- Iwen Su, Axiom Data Science
- Jack Gilbert, Scripps Institution of Oceanography
- Jack Pan, Ocean Motion Technologies, Inc. /NASA Jet Propulsion Laboratory
- James (Jim) Behrens, Coastal Data Information Program, Scripps Institution of Oceanography, UC San Diego
- Javier Vivanco Ocampo, Baja Aquafarms
- Jay Stanton , California Department of Fish and Wildlife
- Jayme Smith, Southern California Coastal Water Research Project
- Jeff Dorman, Farallon Institute
- Jennifer Brown, NOAA, Monterey Bay & Channel Islands National Marine Sanctuaries
- Jennifer Dupont, Equinor Wind US, LLC
- Jennifer Patterson Sevadjan, Scripps Institution of Oceanography
- Jerome Guet, University of California, Los Angeles
- Jim Todd, NOAA, Global Ocean Monitoring and Observing
- Jochen Klinke, Sea-Bird Scientific
- John (Jack) Barth, Oregon State University, Marine Studies Initiative
- John Carter, Flow Amigos de Bolsa Chica
- John Hansen, West Coast Ocean Alliance
- John Largier, Bodega Marine Lab, UC Davis
- Jordan Snyder, University of California, Santa Barbara
- Jose Gomez-Valdes, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, Baja California, Mexico
- Juan Carlos Herguera, Center for Scientific Research and Higher Education of Ensenada
- Jules Jackson, Coastal Defenders
- Julia Coates, California Department of Fish and Wildlife
- Julie Dinasquet, Scripps Institution of Oceanography
- Julie Thomas, Scripps Institution of Oceanography (retired)

In Person Participant List (251)

- Justin Kim, University of California, Santa Barbara
- Kaitlyn Lee, University of California, Santa Barbara
- Kakani Katija, Monterey Bay Aquarium Research Institute
- Kasia Kenitz, Southern California Coastal Ocean Observing System/Scripps Institution of Oceanography
- Kate Becker, University of California, Santa Barbara
- Katherine Barbeau, Scripps Institution of Oceanography
- Kathleen Ritzman, Scripps Institution of Oceanography
- Kathryn Chen, Scripps Institution of Oceanography
- Katrina Boyd, Scripps Institution of Oceanography
- Kaustubha Raghukumar, Integral Consulting Inc.
- Kayla Martin, Scripps Institution of Oceanography
- Kelsey Vogel, Scripps Institution of Oceanography
- Kimberly Stauffer, University of California, Davis
- Kristen Koch, NOAA, Southwest Fisheries Science Center
- Kristen Yarincik, IOOS Association
- Kyle Hu, Scripps Institution of Oceanography
- Laura Bliss, West Coast Ocean Data Portal
- Laura Engeman, Scripps Institution of Oceanography
- Laura Terriquez, Orange County Sanitation District
- Leslie Rosenfeld, Retired
- Libe Washburn, University of California, Santa Barbara
- Linsey Sala, Scripps Institution of Oceanography
- Liz Ferguson, Ocean Science Analytics
- Liz Whiteman, Ocean Science Trust
- Lucia Ordonez Gauger, Vineyard Offshore
- Luis Barajas, University of California, Santa Barbara
- Luke Gardner, Monterey Bay Seaweeds
- Luke Irza, Scripps Institution of Oceanography
- Luke Miller, San Diego State University
- Luna Herschenfeld-Catalan, University of California, Santa Barbara
- Lydia Ladah, Center for Scientific Research and Higher Education of Ensenada
- Lynn DeWitt, NOAA, Southwest Fisheries Science Center
- Makrom Shatila, Michael Baker International
- Marco Sandoval Belmar, University of California, Los Angeles
- Margaret Pilaro, Pacific Coast Shellfish Growers Association
- Maria Luiza Ferreira, University of Chicago
- Maria Murray, NOAA, U.S. Integrated Ocean Observing System
- Mariah Kallhoff, Assemblymember Tasha Boerner Office
- Marina Frants, Scripps Institution of Oceanography
- Marine LeBrec, Central and Northern California Ocean Observing System/Monterey Bay Aquarium Research Institute
- Mark Gold, Natural Resources Defense Council
- Mark Merrifield, Scripps Institution of Oceanography
- Mark Morales, University of California, Santa Cruz
- Mark Ohman, Scripps Institution of Oceanography
- Martha Sutula, Southern California Coastal Water Research Project
- Martin Enrique Hernandez Rivas, Centro Interdisciplinario de Ciencias Marinas IPN
- Mary Miller, Exploratorium
- Matthias Lankhorst, Scripps Institution of Oceanography
- Maxim Batalin, Lucendi, Inc.
- Mayor Paloma Aguirre, City of Imperial Beach
- Megan McKinzie, Animal Telemetry Network/Monterey Bay Aquarium Research Institute
- Megan Medina, Southern California Coastal Ocean Observing System/Scripps Institution of Oceanography
- Melissa Carter, Scripps Institution of Oceanography
- Meliza Lyn Le Alvarado, California Sea Grant/Scripps Institution of Oceanography
- Meredith Elliott, Point Blue Conservation Science
- Michael Montgomery, University of California, Santa Barbara
- Michaela Alksne, Scripps Institution of Oceanography
- Michelle Fogarty, Equinor Wind US, LLC
- Minerva Padilla Villa, Scripps Institution of Oceanography
- Nastassia Patin, Scripps Institution of Oceanography
- Nathali Cordero Quiros, Center for Scientific Research and Higher Education of Ensenada
- Nicholas Buenviaje, CalTRANS
- Nicholas Rome, Northwest Association of Networked Ocean Observing Systems
- Nina Jekel, University of California, Santa Barbara
- Noah Ben-Aderet, CDFW, Office of Spill Prevention and Response
- Noelle Bowlin, NOAA, Southwest Fisheries Science Center
- Paige Hoel, University of California, Los Angeles
- Rachel Holser, University of California, Santa Cruz
- Rachel Mahler, Golden State Wind
- Rachel Pound, Scripps Institution of Oceanography
- Rasmus Swalethorp, Scripps Institution of Oceanography
- Reece Allen, CalTRANS

In Person Participant List (251)

- Regina Wetzer, Natural History Museum of LA County
- Reinhard Flick, Scripps Institution of Oceanography
- Ricky Brokaw, University of California, Santa Barbara
- Riley Hale, Scripps Institution of Oceanography
- Riley Smith, CDFW, OSPR
- Robert Bochenek, Axiom Data Science
- Robin Gartman, City of San Diego, Ocean Monitoring Program
- Rocío Lozano-Knowlton, MERITO Foundation
- Rocío Ruiz-Cooley, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, Baja California, Mexico
- Roger Hewitt, NOAA, Southwest Fisheries Science Center
- Rose Cardoza, Orange County Sanitation District
- Ryan Freedman, NOAA, Channel Islands National Marine Sanctuary
- Ryan Yee, University of California, Santa Barbara
- Sam Lopez, Flow Amigos de Bolsa Chica
- Samuel Guimte, University of California, Santa Barbara
- Scott Jenkins, Michael Baker International
- Shailja Gangrade, Scripps Institution of Oceanography
- Shannon Perry, Scripps Institution of Oceanography
- Shauna Oh, California Sea Grant/Scripps Institution of Oceanography
- Shonna Dovel, Scripps Institution of Oceanography
- Staci Lewis, Ocean Protection Council
- Steffaney Wood, Scripps Institution of Oceanography
- Stephanie Jaeger, City of San Diego
- Stephen Bograd, NOAA, Southwest Fisheries Science Center
- Steve Weisberg, Southern California Coastal Water Research Project
- Susan Theroux, Southern California Coastal Water Research Project
- Sylvia Jimenez R, CICIMAR-IPN
- Tammy Russell, Scripps Institution of Oceanography
- Taylor Wirth, Scripps Institution of Oceanography
- Terence O'Brien, Scripps Institution of Oceanography
- Terry Sawyer, Hog Island Oyster Company
- Theresa Talley, California Sea Grant/Scripps Institution of Oceanography
- Thomas Lawton, Senator Steve Padilla Office
- Thomas Parker, Los Angeles County Sanitation District
- Toby Garfield, NOAA, Southwest Fisheries Science Center
- Tom Fougere, McLane Research Laboratories
- Trevor Ruiz, California Polytechnic State University, San Luis Obispo
- Uwe Send, Scripps Institution of Oceanography
- Vanessa Scott, Scripps Institution of Oceanography
- Verena Hormann, Scripps Institution of Oceanography
- Vince Jelsema, Sea-Bird Scientific
- Wayne Perryman, NOAA, Southwest Fisheries Science Center (retired)
- William Watson, NOAA, Southwest Fisheries Science Center
- Yessica Vanessa Contreras Pacheco, Center for Scientific Research and Higher Education of Ensenada
- Yoobin Won, University of California, Santa Barbara
- Yui Takeshita, Monterey Bay Aquarium Research Institute
- Zachary Gold, NOAA, Pacific Marine Environmental Laboratory



MAY 14-16, 2024
SAN DIEGO, CA

Conference Poster

Designed by Maxwell Pepper | maxwellpepper@gmail.com

