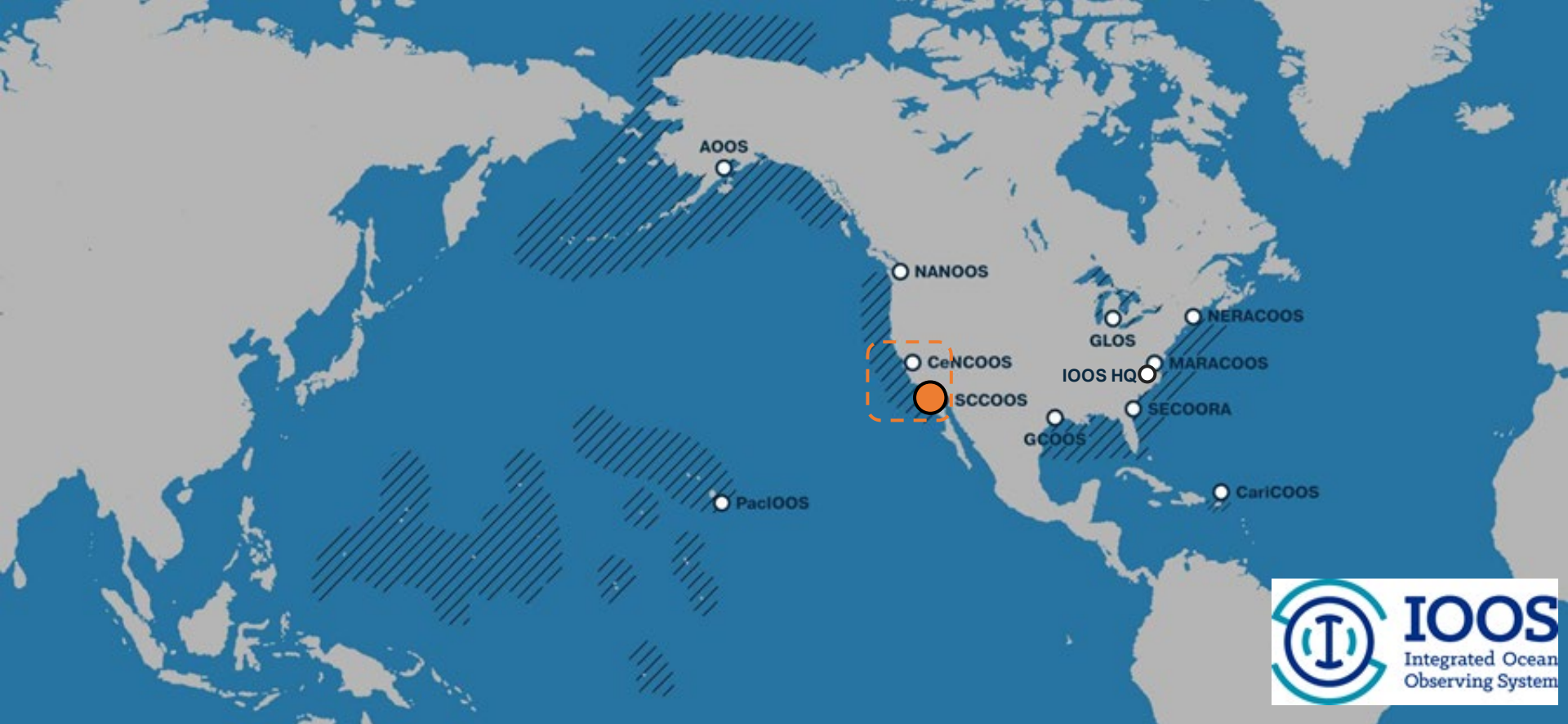




IOOS Southern California Regional Association - SCCOOS

*Dr. Clarissa Anderson, SCCOOS/CIMEAS Director
HSRP Meeting, 7 March 2024*





NOAA U.S. Integrated Ocean Observing System

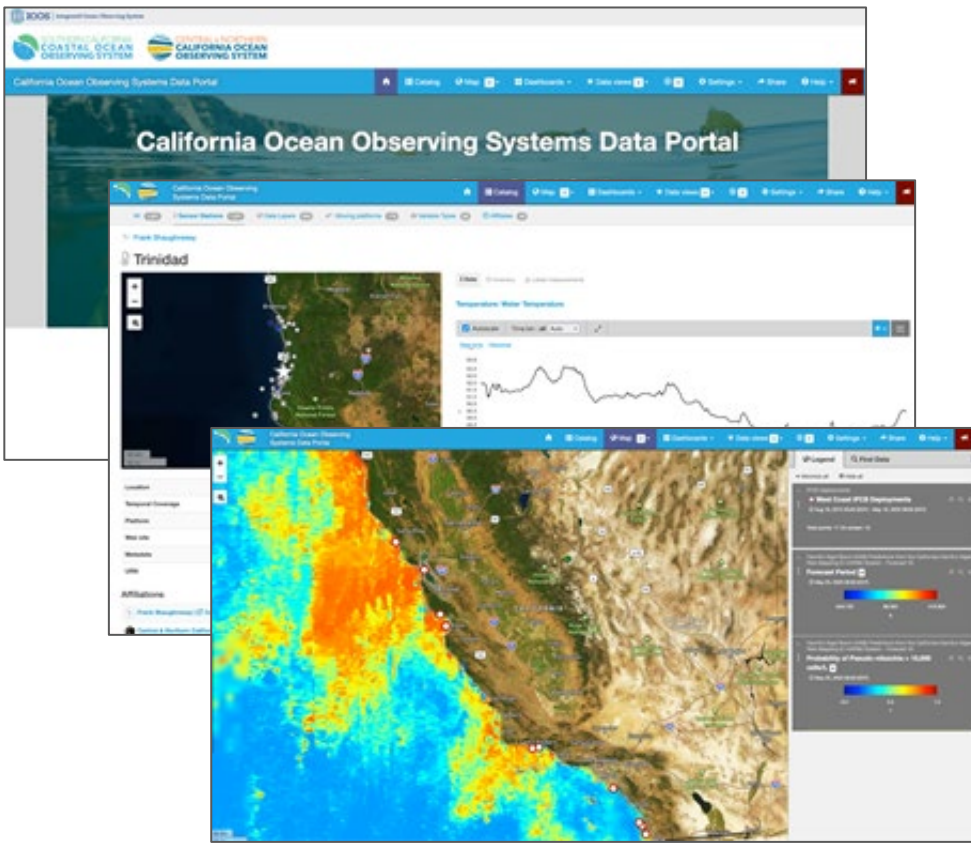
Stakeholder-driven, Science-based, & Policy Neutral



California's Ocean Observing Network

The Southern California (SCCOOS) & Central/Northern California (CeNCOOS) teams work in close partnership to build a comprehensive statewide ocean observing system.





The CalOOS Data Portal hosts over 1,900 real-time and historical datasets related to coastal information along the West Coast.

The interactive portal allows for advanced searching of the catalog, customizable insights, and curated data views for select research topics.

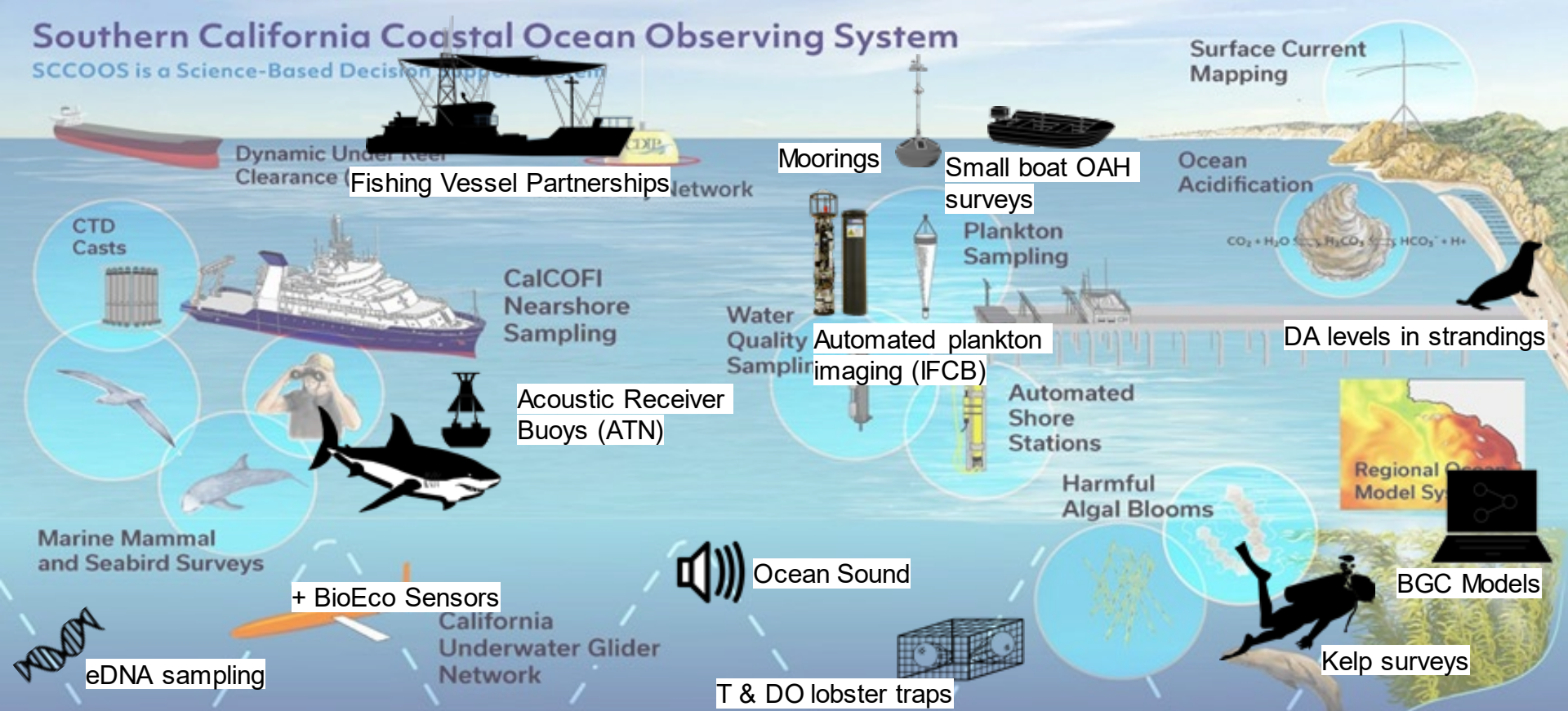
The platform has been hugely successful as a centralized hub that provides lookup, exploration, metadata, and data access.

CalOOS Data Portal - data.caloos.org

In May 2022 SCCOOS and CeNCOOS launched a joint data portal with Axiom Data Science

Southern California Coastal Ocean Observing System

SCCOOS is a Science-Based Decision Support System



Towards an End-to-End Ecosystem Observing System

Build out sensor suites on fixed and Lagrangian platforms, complemented by biological/ecological monitoring programs with an emphasis on eDNA, Animal Telemetry, & Ocean Sound



1. AltaSea at the Port of Los Angeles
2. Baja Aqua Farms
3. Birch Aquarium at Scripps
4. Bureau of Ocean Energy Management
5. California Coastal Commission
6. California Department of Fish and Wildlife, Office of Spill Prevention and Response - Thomas Cullen
7. California Department of Fish and Wildlife, Office of Spill Prevention and Response - David Lyons
8. California Department of Fish and Wildlife, Office of Spill Prevention and Response - Alice Nash
9. California Department of Fish and Wildlife, Office of Spill Prevention and Response - Corinne Gibble
10. California Environmental Protection Agency (EPA), Office of Environmental Health Hazard Assessment
11. California Natural Resources Agency, California Ocean Protection Council
12. California Ocean Science Trust
13. California Sea Grant
14. California Shore and Beach Preservation Association
15. California Wildlife Center
16. Carlsbad Aquafarm
17. Carnival Cruise Line
18. Center for Research on Educational Equity, Assessment and Teaching Excellence
19. Channel Islands Marine and Wildlife Institute
20. City of Del Mar
21. City of Imperial Beach
22. City of Los Angeles, LA Sanitation and Environment
23. City of Newport, Newport Beach Fire Department
24. City of San Diego
25. City of Santa Barbara
26. City of Santa Barbara, Santa Barbara Harbor Patrol
27. City of Santa Monica, Santa Monica Police Harbor Patrol
28. Coastal Data Information Program
29. CODAR Ocean Sensors
30. Desert Research Institute, Western Regional Climate Center
31. Elkhorn Slough National Estuarine Research Reserve
32. Heal the Bay
33. Jacobsen Pilot Service Inc.
34. Los Angeles Waterkeeper
35. Marine Animal Rescue
36. Marine Exchange of Southern California
37. Marine Mammal Care Center Los Angeles
38. Monterey Abalone Company
39. National Marine Sanctuary Foundation
40. Naval Air Weapons Station China Lake
41. NOAA, Channel Islands National Marine Sanctuary
42. NOAA, National Geodetic Survey
43. NOAA, National Marine Fisheries Service
44. NOAA, National Weather Service
45. NOAA, Office of National Marine Sanctuaries, West Coast Region
46. NOAA, Office of Response and Restoration, Emergency Response Division
47. NOAA, Southwest Fisheries Science Center
48. Ocean Discovery Institute
49. Ocean Rainforest, Inc.
50. One Health Institute and Karen Drayer Wildlife Health Center
51. Orange County Sanitation District
52. Pacific Coast Federation of Fishermen's Associations
53. Pacific Coast Shellfish Growers Association
54. Pacific Marine Mammal Center
55. Port of San Diego
56. San Diego Coastkeeper
57. San Diego County MPA Collaborative
58. San Diego Regional Water Quality Control Board
59. Santa Barbara Adventure Company
60. Scientific Research and Education Network (SciRen) San Diego
61. SeaTactics LLC
62. SeaWorld San Diego
63. Southern California Coastal Water Research Project
64. Surfrider Foundation
65. The Marine Mammal Center
66. The Ocean Foundation
67. Tijuana River National Estuarine Research Reserve
68. TMA BlueTech
69. United States Coast Guard, District Eleven
70. United States Coast Guard, Office of Search and Rescue
71. United States Sailing Team
72. University of San Diego, Environment, Health and Safety
73. University of Southern California Sea Grant Program
74. West Coast Ocean Data Portal
75. WILDCOAST
76. Wild Neighbors Database Project

Stakeholders

SCCOOS included 76 Letters of Support in our FY21-26 proposal

NOAA FY22-26 STRATEGIC GOALS



**BUILD A CLIMATE
READY NATION**

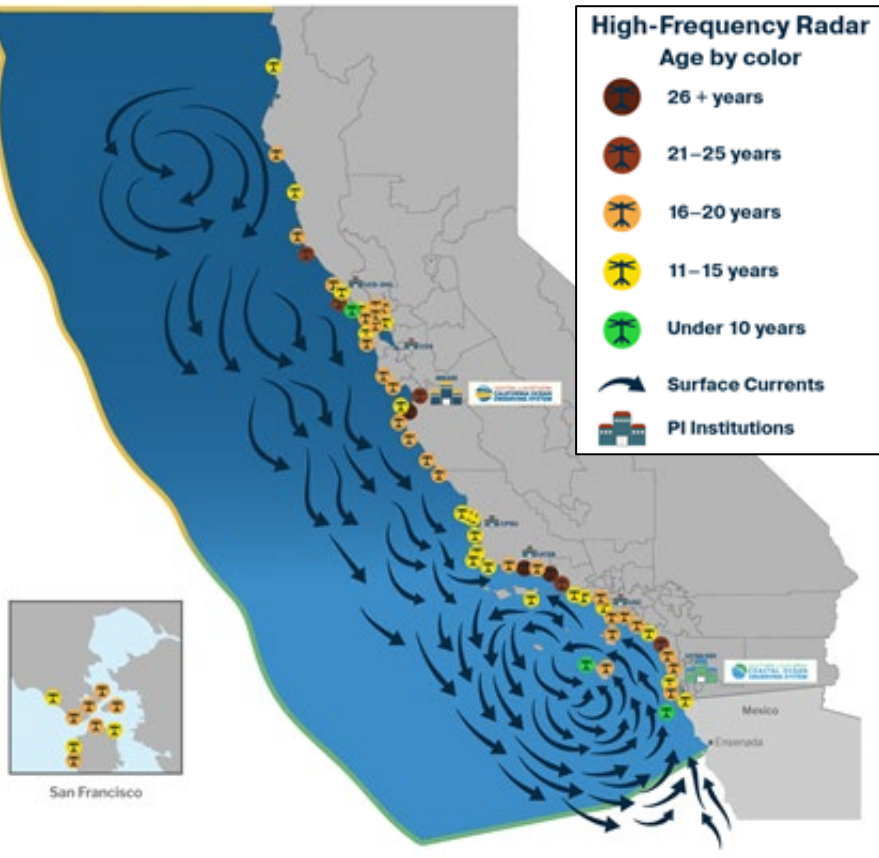


**MAKE EQUITY CENTRAL
TO NOAA'S MISSION**



**ACCELERATE GROWTH IN
AN INFORMATION-BASED
BLUE ECONOMY**

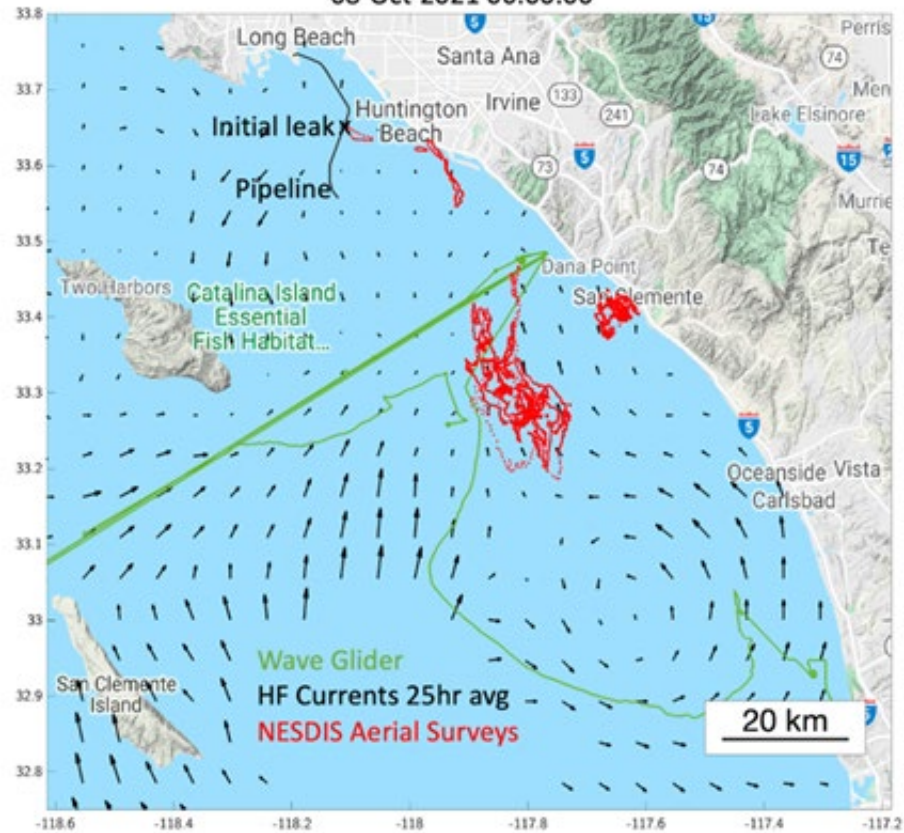
How SCCOOS Addresses NOAA's FY22-26 Strategic Goals



California Surface Current Mapping Network

Operate, sustain, and expand the California Surface Current Mapping Network to improve search and rescue mission. PIs: Terrill/Hazard (SIO), Ragan (USC), Washburn (UCSB), Walter/Robins (Cal Poly SLO)

08-Oct-2021 06:00:00



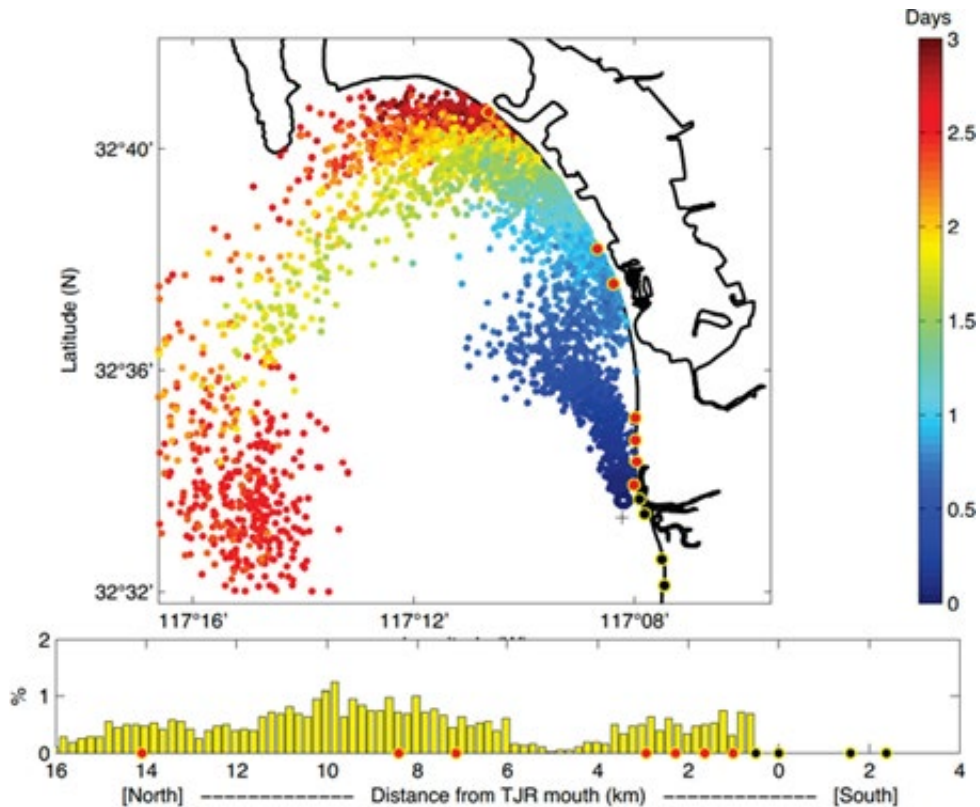
Boeing Liquid Robotics
Wave Glider - SIO

“California’s Oil Spill Prevention and Response (OSPR) team depends heavily upon offshore telemetry data from SCCOOS to guide our spill containment and clean-up operations...The importance and effectiveness of SCCOOS’ capability was most evident during the 2015 Refugio State Beach spill in Santa Barbara County and the 2021 Pipeline 000547 spill in Orange and San Diego Counties...”
—California Department of Fish and Wildlife, OSPR

California Surface Current Mapping Network

Operate, sustain, and expand the California Surface Current Mapping Network to track oil slicks and shoreline impacts. PIs: Terrill/Hazard (SIO), Ragan (USC), Washburn (UCSB), Walter/Robins (Cal Poly SLO).

Tijuana River Plume Tracker (Kim et al. 2009)

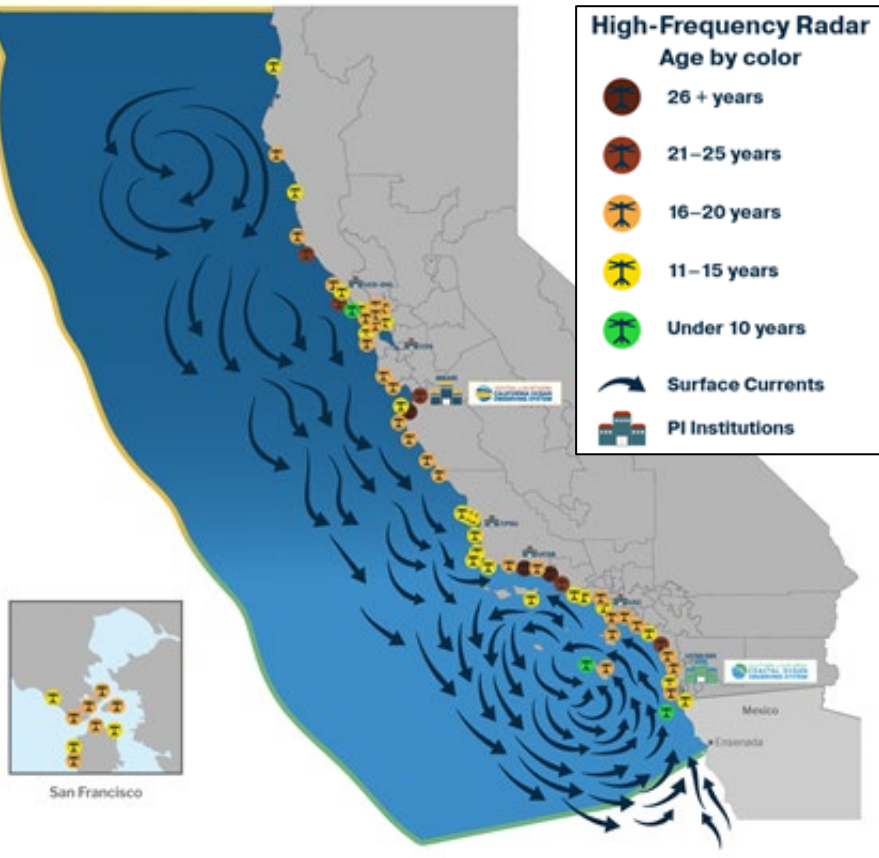


Aerial photo of Tijuana River sewage plume in Feb. 2017 when 143 million gallons of raw sewage were discharged into the Tijuana River

“The Tijuana River Plume Trajectories and HFR-derived surface currents data are used daily by the County of San Diego, Department of Environmental Health and Quality, to help inform decisions on when water quality issues originating from Mexico may be impacting our beaches...” —Romina Schiess, Environmental Health Specialist III, County of San Diego, Beach and Bay Monitoring Program”

California Surface Current Mapping Network

Operate, sustain, and expand the California Surface Current Mapping Network to support trajectory plume models for coastal monitoring. PIs: Terrill/Hazard (SIO), Ragan (USC), Washburn (UCSB), Walter/Robins (Cal Poly SLO).

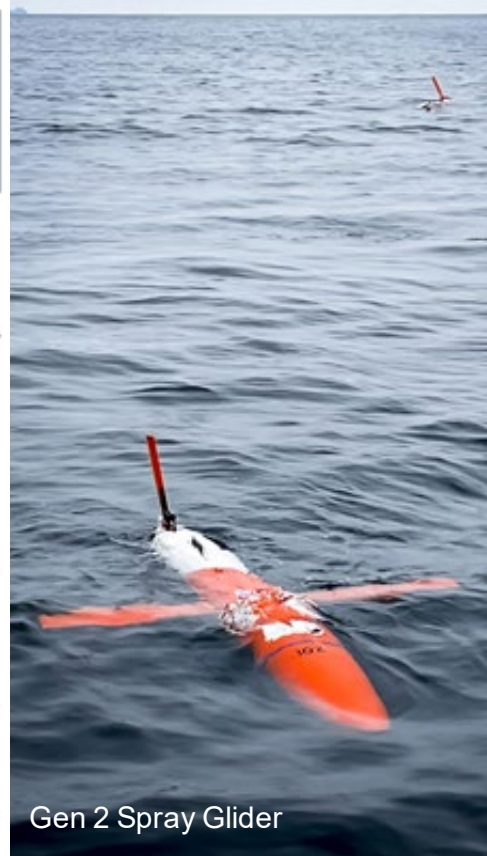


What's Next?

- Replace aging HFR equipment and infrastructure (BIL funding, IRA funding?)
- Develop new validation, data processing, and QA/QC strategies for improving accuracy of surface currents from HFR
- Offshore wind impacts to HFR network

California Surface Current Mapping Network

79% of CA HFRs are over 15 years old and 20% have exceeded the 20-year normal service life



Gen 2 Spray Glider

Variables:

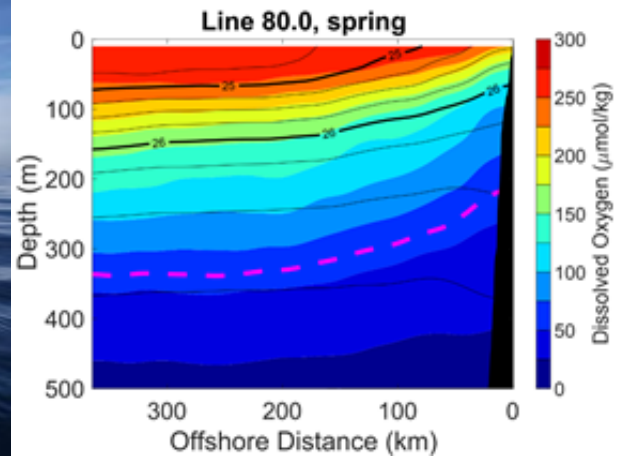
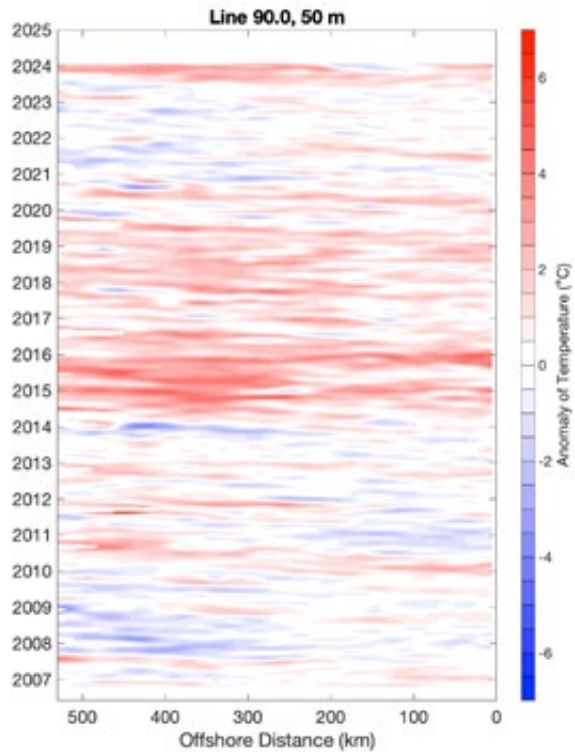
- Pressure
- Temperature
- Salinity
- Velocity
- Chlorophyll fluorescence
- Acoustic backscatter
- Dissolved oxygen
- pH (in development)



Gen 1 Spray Glider

California Underwater Glider Network

Operate, sustain, and expand the California Underwater Glider Network (CUGN) in support of a climate ready nation. Three main sustained lines since 2007 & two new lines starting in 2019. PI: Rudnick (SIO)



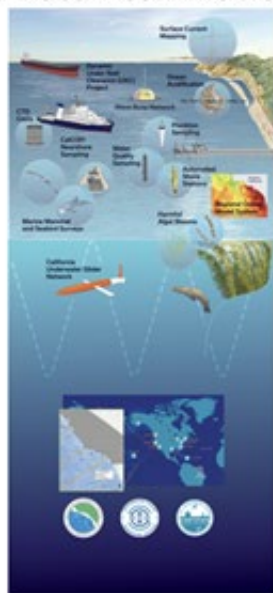
What's Next?

- Recapitalization of the glider fleet
- Add Biogeochem sensors like pH & DO sensors, environmental DNA (eDNA) technology, acoustics for zooplankton

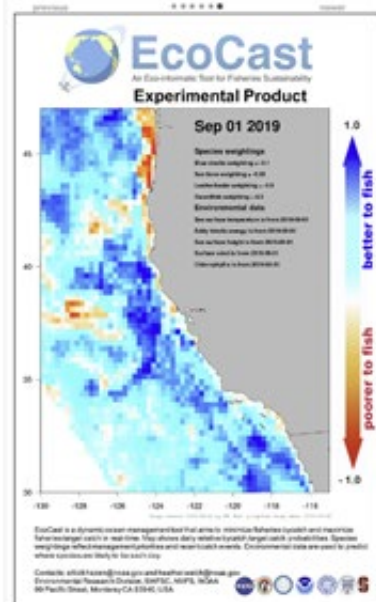
California Underwater Glider Network

Operate, sustain, and expand the California Underwater Glider Network (CUGN) in support of a climate ready nation. Three main sustained lines since 2007 & two new lines starting in 2019. PI: Rudnick (SIO)

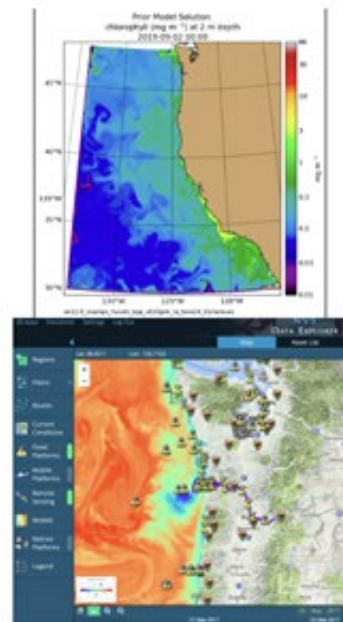
Observational Impacts in Data Assimilation



Fisheries Habitat



Ocean Acidification & Hypoxia



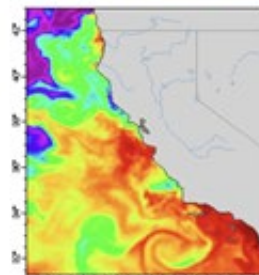
Harmful Algal Blooms

C-HARM Model (California-Harmful Algae Risk Mapping)

ERDDAP
 Earth Resources Data Access Portal

ERDDAP > griddap > Make A Graph

Dataset: The C-HARM Model: Pseudo-Nitzschia, cellular domoic acid, and particulate domoic acid probability, California and Southern Oregon coast 12-00
 Institution: UCSC, UCSD (Dataset ID: ucscfm00000000)
 Information: Summary | Columns | Fields | All Fields | Metadata | Background | Data Access Form | Files



0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
 Probability of Pseudo-Nitzschia, cellular domoic acid, and particulate domoic acid > 500 nanograms/l (1)
 C-HARM Model: Pseudo-Nitzschia, cellular domoic acid, and particulate domoic acid probability, California and Southern Oregon coast 12-00
 2019-09-01T12:00:00Z
 Data courtesy of UCSC, UCSD



IOOS West Coast Coastal Ocean Modeling Testbed

Evaluating impacts of operational NOAA West Coast Ocean Forecast System on existing /planned Ecological Forecasts





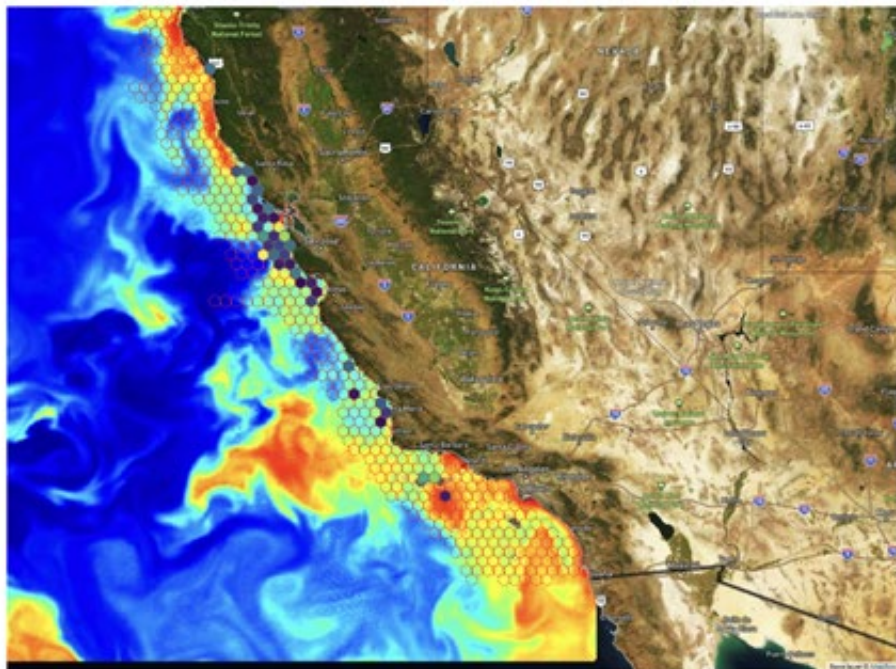
SIO/SCCOOS



Rick Stumpf
NOAA



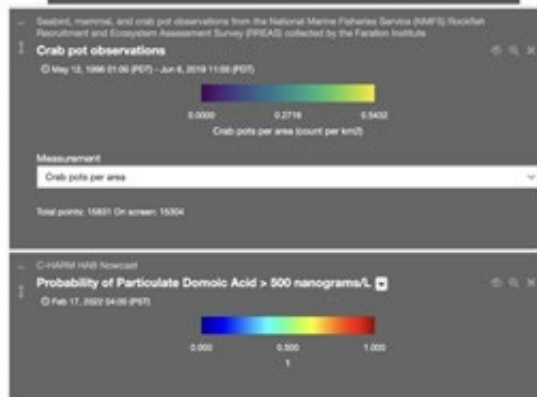
Dale
Robinson
NOAA



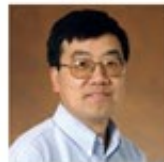
CalQOS Portal

Particulate Domoic Acid
February 2022

Crab Pot Locations Overlaid



Raphe Kudela
UCSC



Yi Chao -
Seatrex

California Harmful Algae Risk Mapping (C-HARM) System

Operational model at NOAA Coast Watch provides spatially explicit nowcasts and 1-3 day forecasts of domoic acid risk in the California Current – synthesis in CA HAB Bulletin

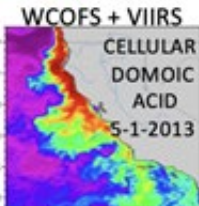
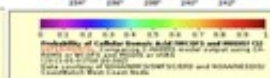
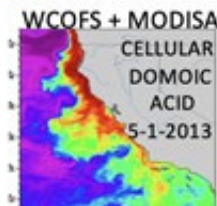
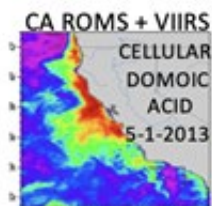
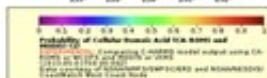
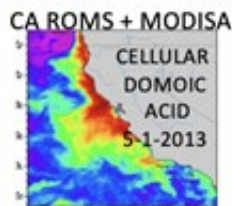




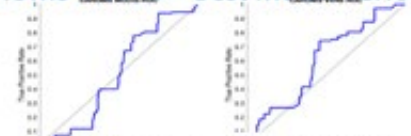
SIO/SCCOOS



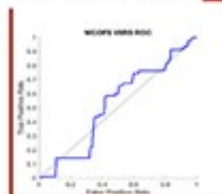
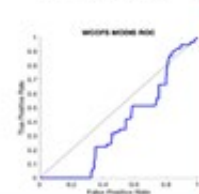
Dale Robinson, NOAA



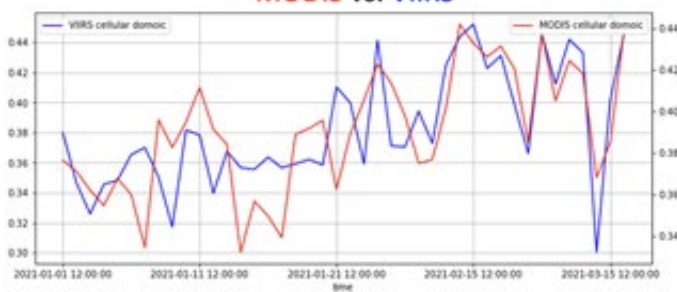
CA ROMS + VIIRS = Best Model Performance



WCOFS VIIRS ROC



Cellular Domoic Acid 2021
MODIS vs. VIIRS



Raphe Kudela
UCSC



Chris Edwards
UCSC



Development of a West Coast C-HARM with WCOFS



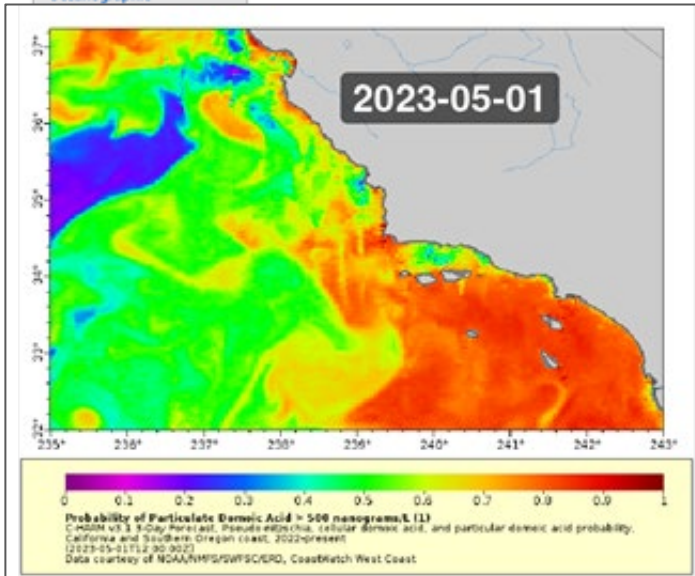
*With WCOFS backbone, could be extended to entire West Coast + PNW HAB Bulletin
Comparing the Yi Chao ROMS Classic version of C-HARM with one that uses WCOFS inputs*



Harmful Algae News

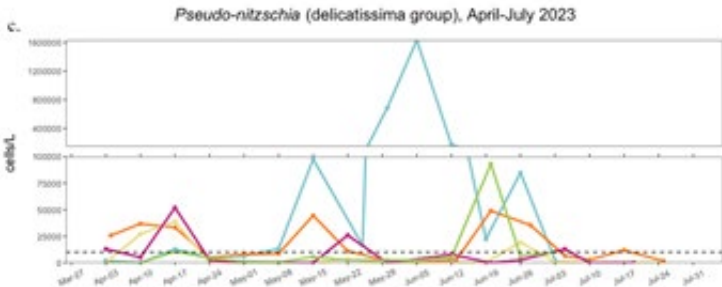
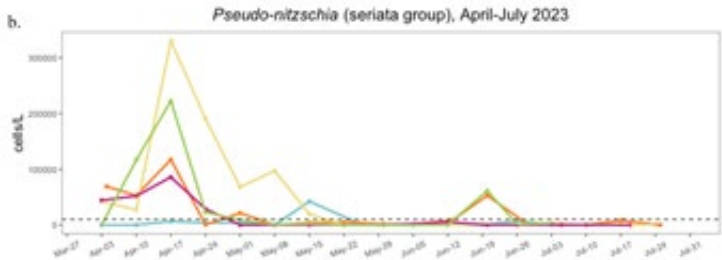
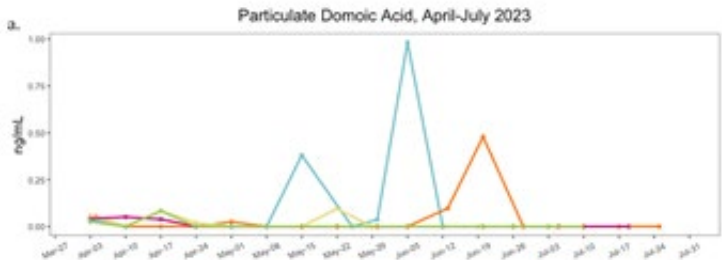
AN IOC NEWSLETTER ON TOXIC ALGAE AND ALGAL BLOOMS
No. 73 · October 2023 · <https://hab.ioc-unesco.org/>

Rapid response to a massive marine mammal stranding event associated with domoic acid poisoning in central to southern California



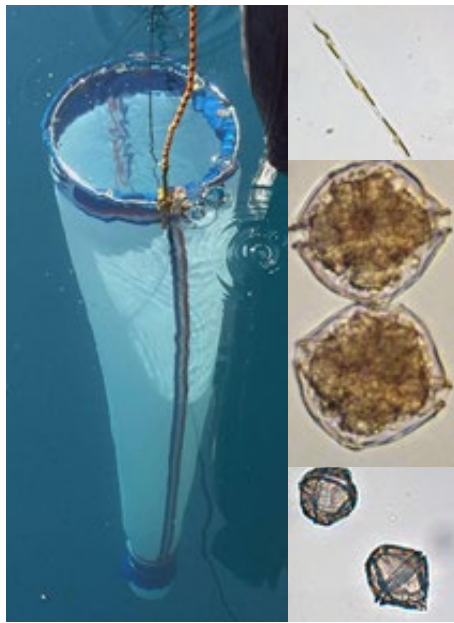
Cal-HABMAP SCCOOS Shore Stations

● Scripps Pier ● Newport Beach Pier ● Santa Monica Pier ● Stearns Wharf ● Cal Poly Pier

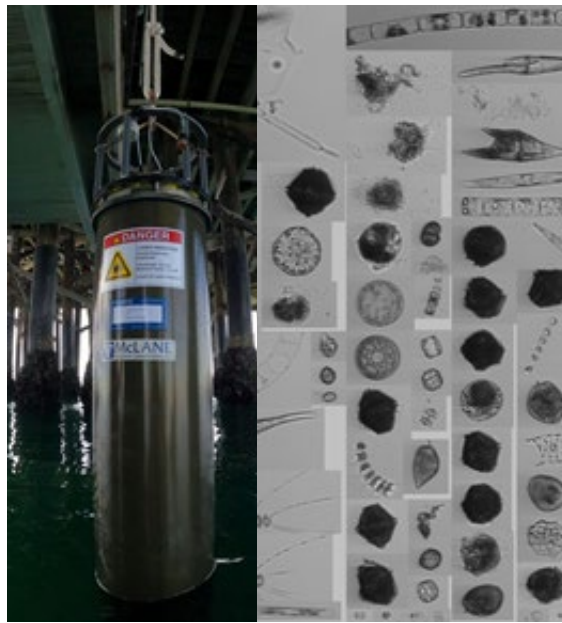


CA HABMAP: 2023 Mass Stranding Event





CA HAB Monitoring Alert Program (CalHABMAP) -
Weekly net tows & water samples since 2008



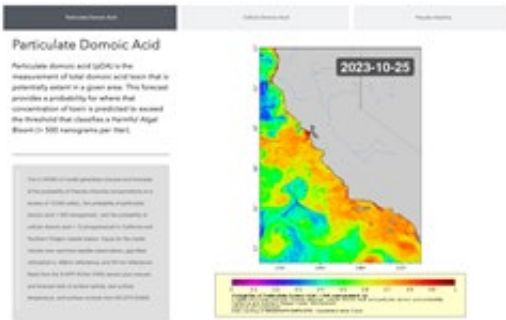
CA Imaging FlowCytobot Network (CA IFCB Network) -
Real-time automated *in situ* microscopic imaging



Harmful Algal Bloom Monitoring & Implementation of an Early Warning System

Operate, sustain, and expand HAB monitoring in support of a National HAB Observing Network. PI: Anderson/Carter (SIO), Caron (USC), Brzezinski (UCSB), Pasulka (Cal Poly SLO)

California Harmful Algae Risk Mapping (C-HARM)



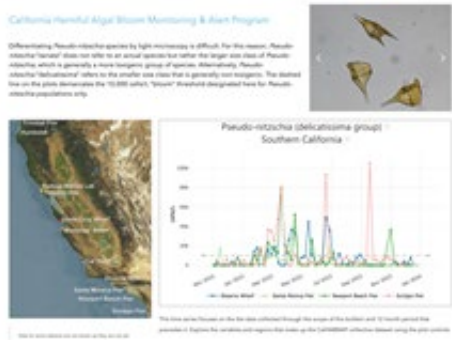
CA IFCB Network Water Sample Imagery



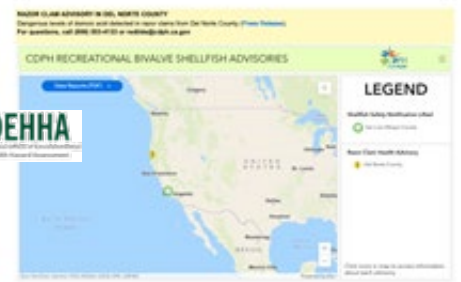
California Department of Public Health (CDPH) Phytoplankton Obs.



CA Harmful Algal Bloom Monitoring Alert Program (HABMAP) Plankton tows



Suspected DA Toxicosis Marine Mammal Strandings



CDPH & Office of Env. Health Hazard Ass. (OEHHA) Advisories

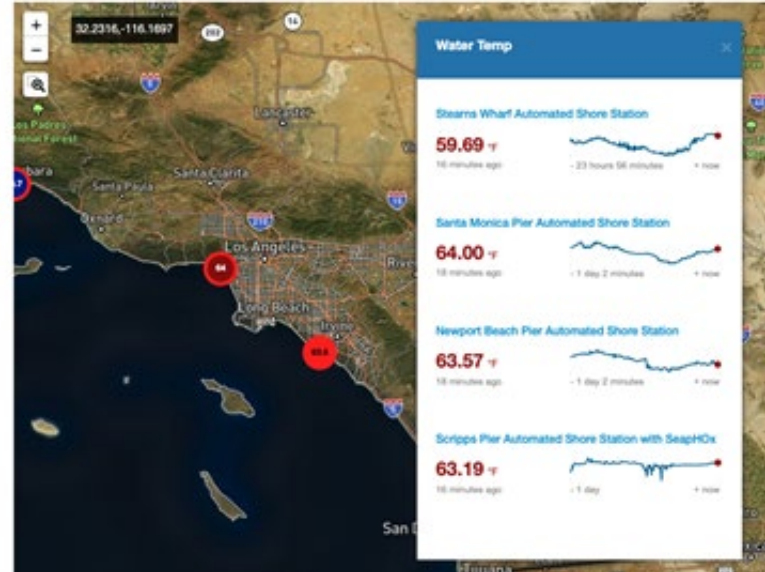
CA HAB Bulletin (v2)

sccoos.org/california-hab-bulletin - Sign up to subscribe to monthly bulletin listserv!



Parameters	Stations	Grid	Resources
Water Temp			
Salinity			
Conductivity			
Oxygen: Dissolved Oxygen Molar Concentration			
pH			
Chlorophyll			
Sea Water Density			
Sea Water Pressure			
Oxygen: Dissolved Oxygen Concentration			
Oxygen: Saturation			

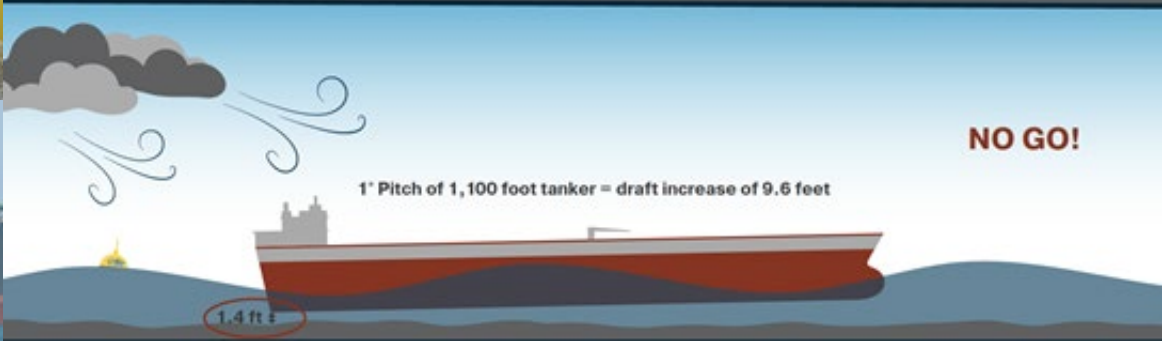
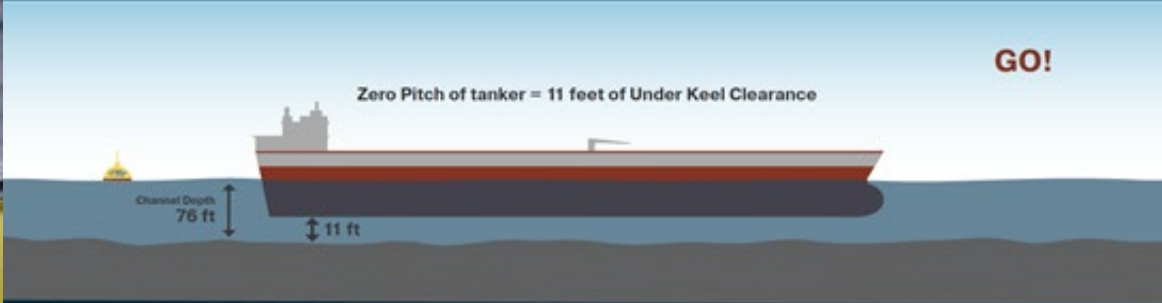
Click on the list below to see latest data.



<https://data.cabos.org/SASS Dashboard>

SCCOOS Automated Shore Stations (SASS)

Operate and sustain SASS stations in support of water quality management, HAB early warning, and public recreation. PI: Anderson/Carter (SIO), Silbiger (CSUN), Washburn (UCSB)



The data provided by SCCOOS from the Coastal Data Information Program (CDIP) buoy and wave model are critical inputs to the Under Keel Clearance Project (UKC), which continues to increase safety by reducing risks of transporting oil on the West Coast and into the Port of Long Beach. The UKC project increases efficiency by enabling tankers to meet arrival time to enter port, and to reduce emissions while enabling tankers to carry more oil per arrival. —Captain J. Kip Louitt, Executive Director, Southern California Marine Exchange

Under Keel Clearance Project

Improve local swell models at the Port of Los Angeles and Long Beach to deliver customized information to ships and harbor pilots. PI: Anderson/Behrens (SIO)

West Coast wave activity

- Active winter season with numerous storms
- Wave bulletins available at:

<http://cdip.ucsd.edu/themes/cdip?&d2=p12>

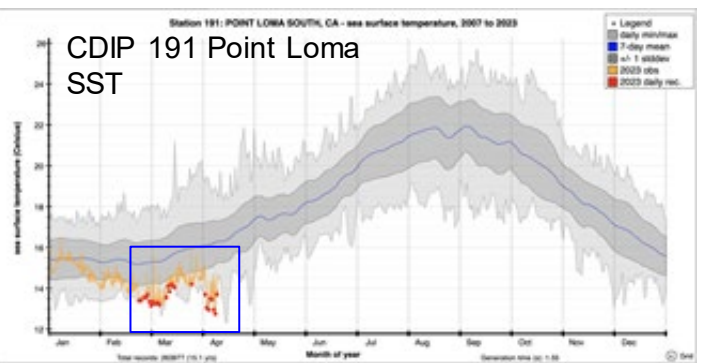
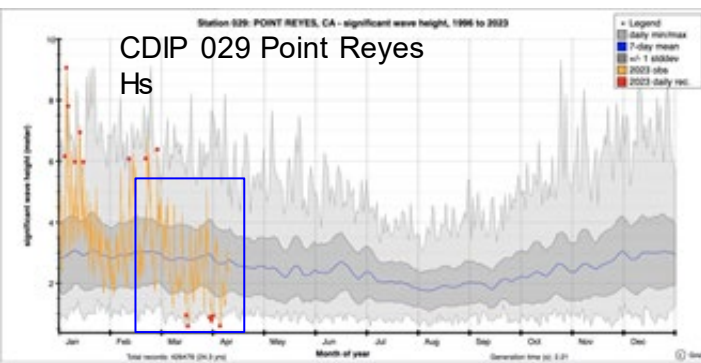
West Coast sea surface temperatures (SST)

- Stations in Southern California Bight reached near record lows; abrupt dips observed at some stations due to upwelling.
- Elsewhere, temps are closer to seasonal climate trends.

The San Diego Union-Tribune
Coldest ocean water temperature in decades recorded off San Diego County
<https://www.sandiegouniontribune.com/news/science/story/2023-04-07/coldest-ocean-water-in-decades-recorded-off-san-diego-county>

COASTAL
Frigid water temperatures recorded along San Diego's coast

WATER TEMP FORECAST
Socal Water Temp Forecast (Updated 4/10):
There's Nowhere To Go but Up, Right?
Check sea surface temperatures -- plus water temp forecast



2023 Record Low Water Temperatures in San Diego

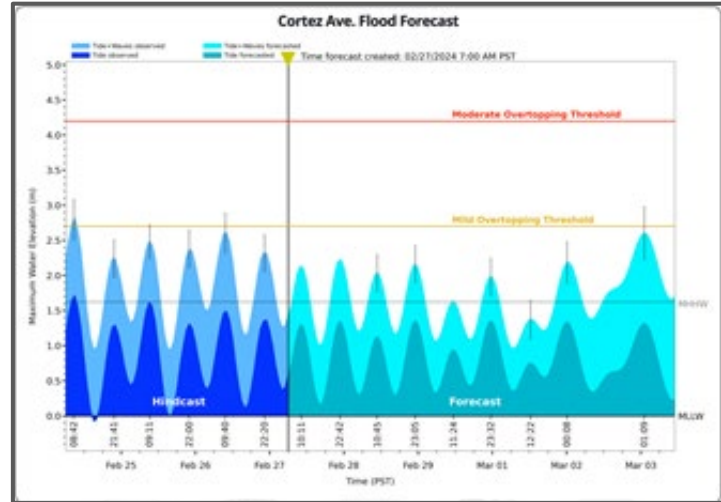
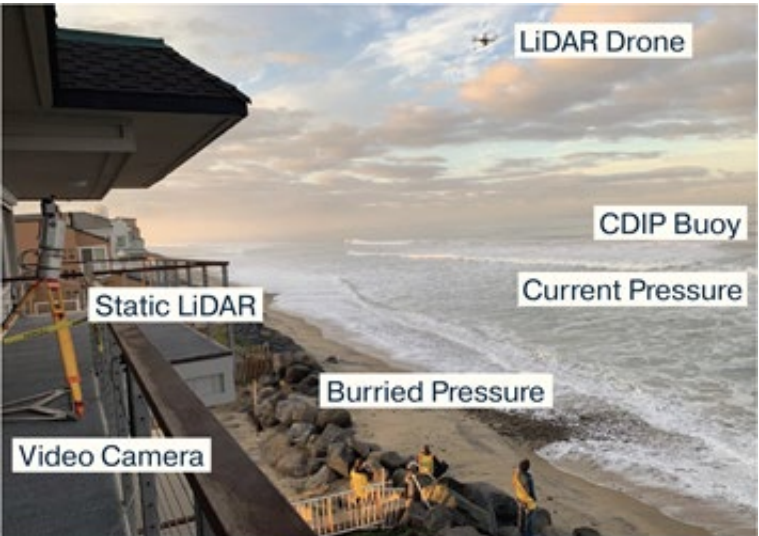
California Data Information Program (CDIP) wave buoy SST, PI: Behrens (SIO)



California Coastal Flood Network



Total Water Level Flood Forecast Model



2024-02-25
Flood forecast for Cortez Avenue, Imperial Beach. Alerts are sent to city officials and managers



California Coastal Flood Network

Combine runoff, tides, and sea level anomalies to predict Total Water Level (TWL) flood forecast models

PI: Merrifield (SIO) <https://climateadapt.ucsd.edu/imperialbeach/forecast/>



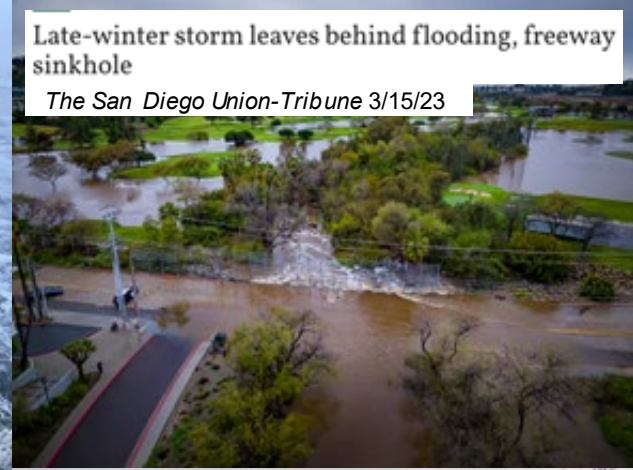
'Historic' storms make landfall in O.C.

LA Times 2/24/23



Spring Off to Rainy Start as 12th Atmospheric River Storm Reaches San Diego County

NBC San Diego 3/20/23



Late-winter storm leaves behind flooding, freeway sinkhole

The San Diego Union-Tribune 3/15/23



Flood Watch Issued for Santa Barbara County Ahead of Arrival of Atmospheric-River Storm System

Santa Barbara Independent 3/8/23



Heavy rain causes severe flooding in Ventura County

CBS News 3/15/23



In the Los Angeles Area, Snow Up High, and Flooding Down Below

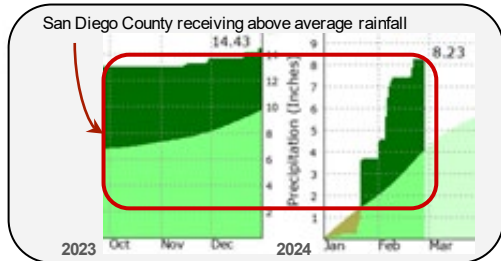
The New York Times, 2/25/23

SoCal Winter 2023 Atmospheric Rivers

California Coastal Flood Network forecasting work and analysis of recent winter conditions

More than 1,200 San Diegans still homeless after the Great Flood of 2024

It's estimated that at least 500 homes were damaged by the floodwaters on Jan. 22, and, unlike in the movies, FEMA has not flown into town to the rescue

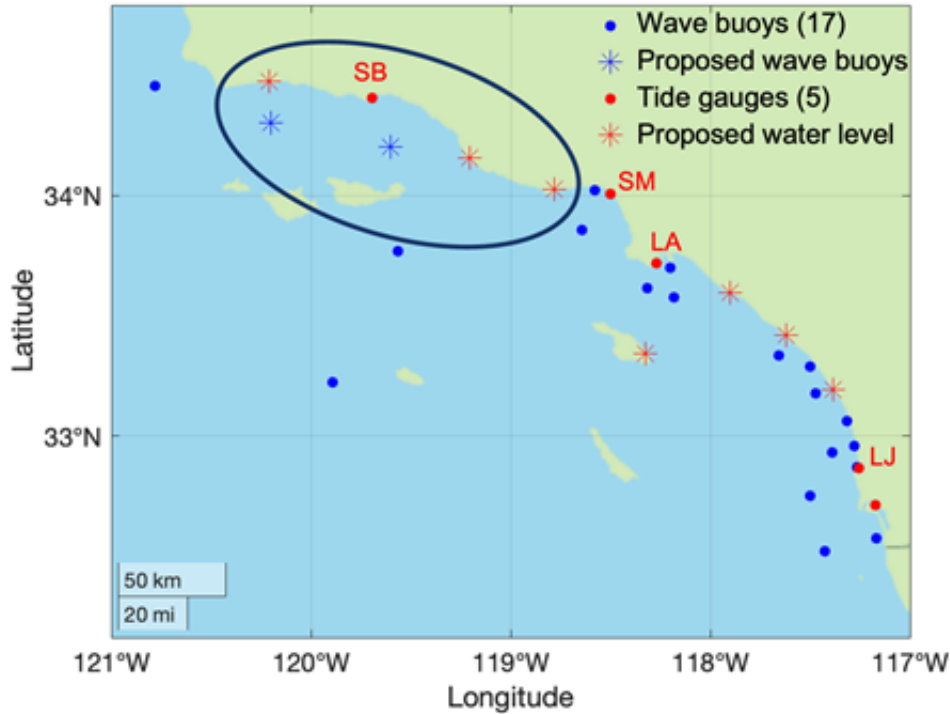


For 108 of 120 days in November through February, saw possible flood warnings issued at Imperial Beach Locations.



Winter 2024 Flooding & Rain Events, San Diego

Precipitation data: <https://www.weather.gov/sgx/cliplot>



What's Next?

- Add wave buoys in Santa Barbara Channel
- Add water level stations with water level sensors, GNSS, and web cams
- Develop push alert notifications with flood thresholds set by the user

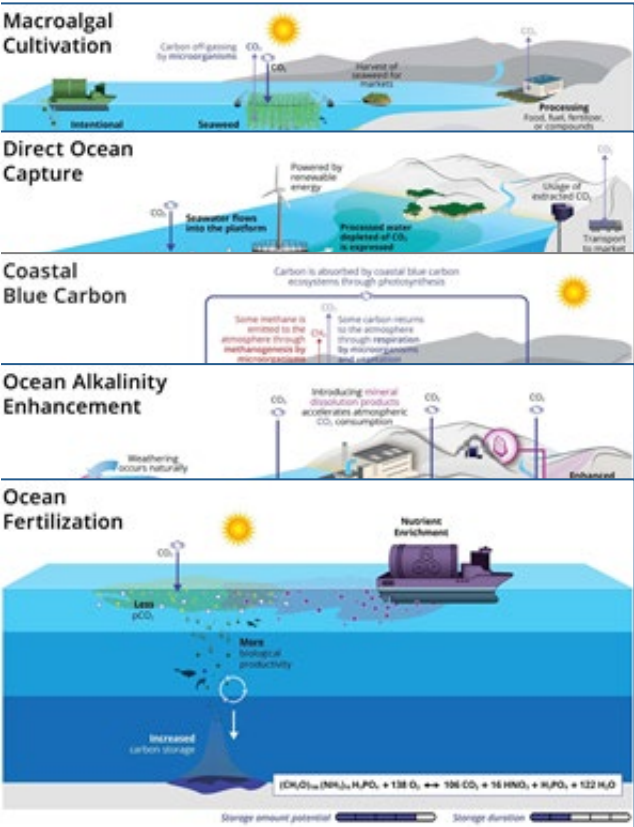
California Coastal Flood Network

PI: Merrifield (SIO)

<https://climateadapt.ucsd.edu/imperialbeach/forecast/>

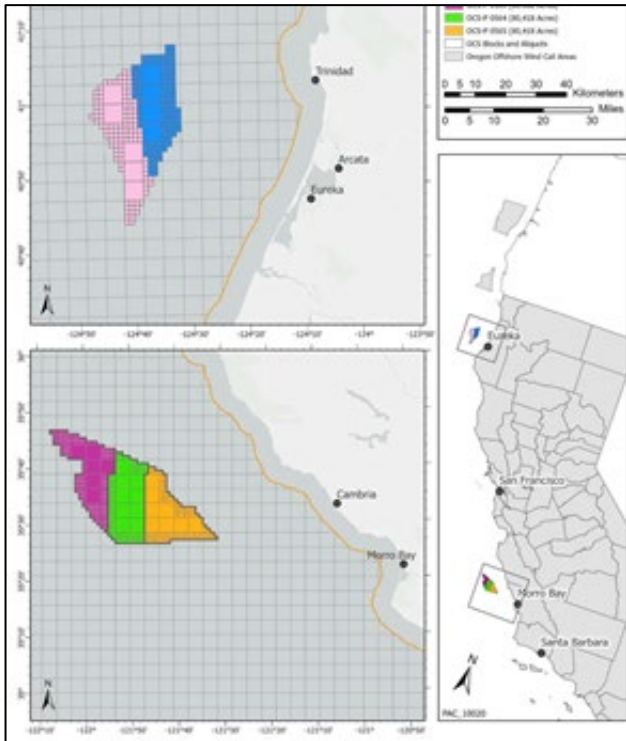
Marine Carbon Dioxide Removal

Cross et al., 2023. NOAA Carbon Dioxide Removal Research



Floating Offshore Wind

Five leases sold in December 2022



Aquaculture Opportunity Areas

Morris et al. 2021. NOAA Identified 10 sites in SoCal U.S. federal waters



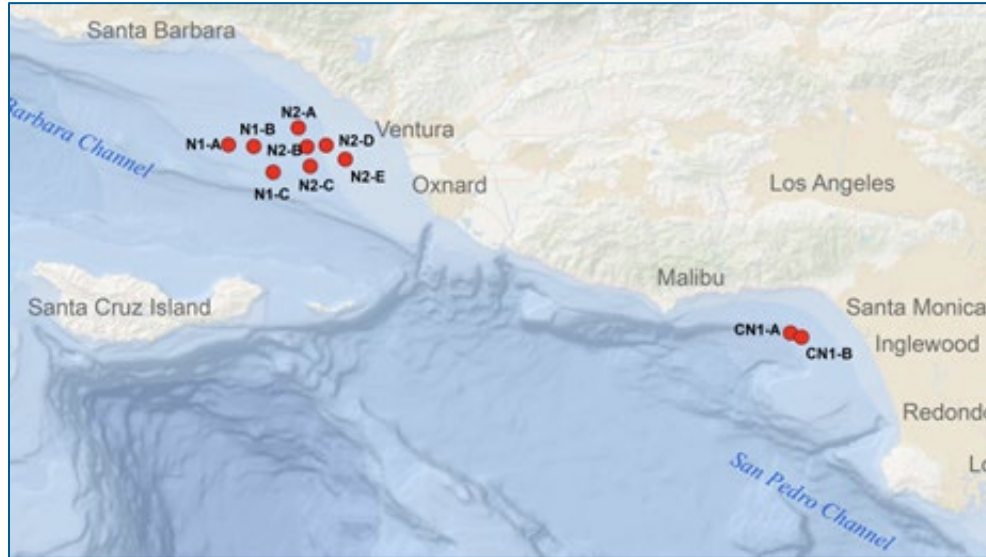
Future Initiatives



Questions?

Megan Medina – memedina@ucsd.edu





Proposed Aquaculture Opportunity Areas in U.S. federal waters of the Southern California Bight. Red circles represent the options, but do not reflect the size of the options. Morris et al. 2021.

May 2020: Presidential Executive Order 13921 Promoting American Seafood Competitiveness and Economic Growth

Aug. 2020: NOAA identified federal waters off Southern California as Aquaculture Opportunity Areas

Nov. 2021: Aquaculture Atlas Identified 10 SoCal AOA's

- 8 sites in Santa Barbara Channel
- 2 sites in Santa Monica Bay

May 2022: Notice of Intent Released for Public Comments.

Fall 2023: Draft Programmatic Environmental Impact Statement

- Led by NMFS West Coast Region with cooperating agencies: EPA R9, USCG District 11, and USACE LA

April 2024: Final Programmatic Environmental Impact Statement

Future Funding Opps. - Offshore Aquaculture

NOAA NMFS West Coast Office identified 10 Aquaculture Opportunity Areas in Southern California Bight