UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY

The California Cooperative Oceanic Fisheries Investigations (CalCOFI)

CalCOFI est. 1949

Long-term ocean observations to support sustainability & resilience

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CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

NOAA

Long Term Ocean Observations for Marine Ecosystem Monitoring: CalCOFI, the California Ocean, and Coastal Monitoring Inventory

- CalCOFI now samples quarterly
- 113 regularly sampled stations
- 16 CalCOFI stations in State waters

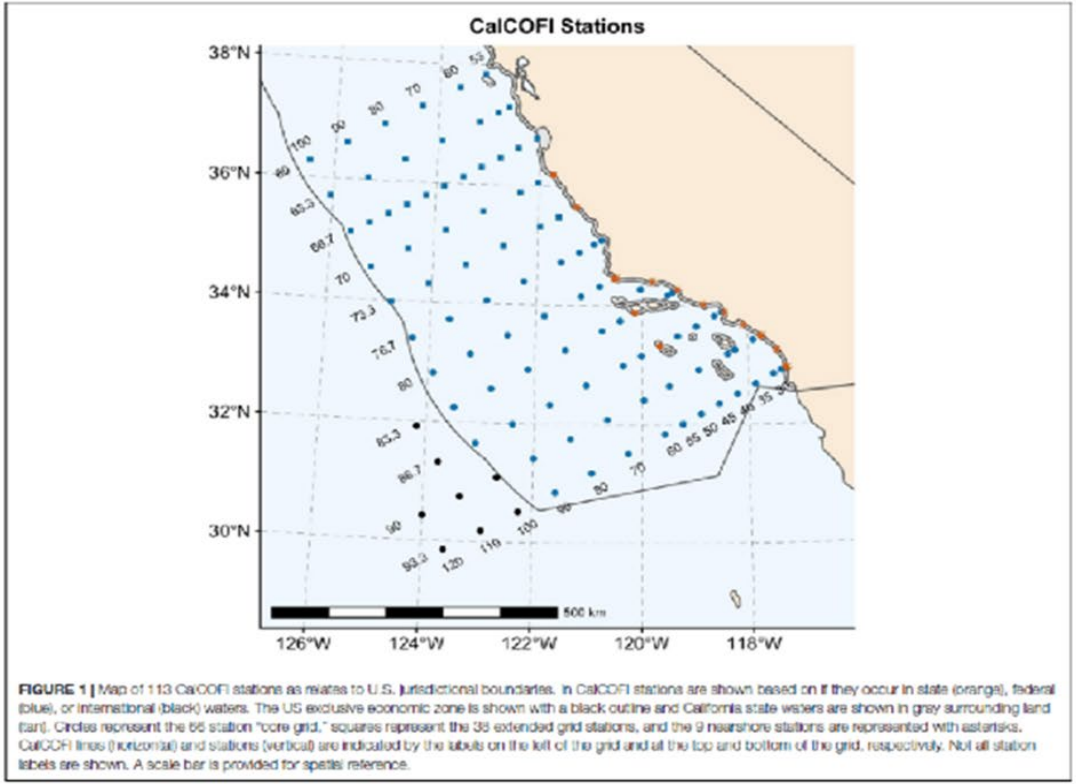


FIGURE 1 | Map of 113 CalCOFI stations as relates to U.S. jurisdictional boundaries. In CalCOFI stations are shown based on if they occur in state (orange), federal (blue), or international (black) waters. The US exclusive economic zone is shown with a black outline and California state waters are shown in gray surrounding land (tan). Circles represent the 66 station "core grid," squares represent the 38 extended grid stations, and the 9 nearshore stations are represented with asterisks. CalCOFI lines (horizontal) and stations (vertical) are indicated by the labels on the left of the grid and at the top and bottom of the grid, respectively. Not all station labels are shown. A scale bar is provided for spatial reference.

Gallo et al.2019 Frontiers in Marine Science

An ecosystem of data

- core oceanographic data (e.g. temperature, salinity, oxygen, nutrients). CTD + bottle
- emerging climate measures (e.g. pH, DIC)
- primary productivity & phytoplankton
- Bacteria & microbes
- zooplankton & invertebrate abundance - IFCB
- fish larval and egg abundance – net tows
- marine mammal and seabird observations
- eDNA – underway samples



CalCOFI Data Management and Integration (CalCOFI core data team - Erin Satterthwaite, Ben Best, Betty Huang, Ben Gire)

An example of moving towards FAIR (Findable, Accessible, Interoperable, Reusable) data. CalCOFI data management plan was developed and getting implemented - Thanks Meena Wadwha for support! All Ocean monitoring data should be FAIR.

THE INTEGRATED DATABASE

ONE DATABASE, FROM THE FIRST CRUISE TO T

77

years of sampling, since 1949

17

datasets in one database

1,008

species identified

1.3M

organism observations

336M

measurement values, from the ocean's chemistry and physics

88

kinds of measurement, each with its own page

THE FAIR VISION

77 YEARS OF OCEAN OBSERVATIONS, KEPT IN

Findable, accessible, interoperable, reusable: three steps get there.

1 INGEST

Each provider sends files in their own format. We read every one the same way and keep their answers to our questions with it.

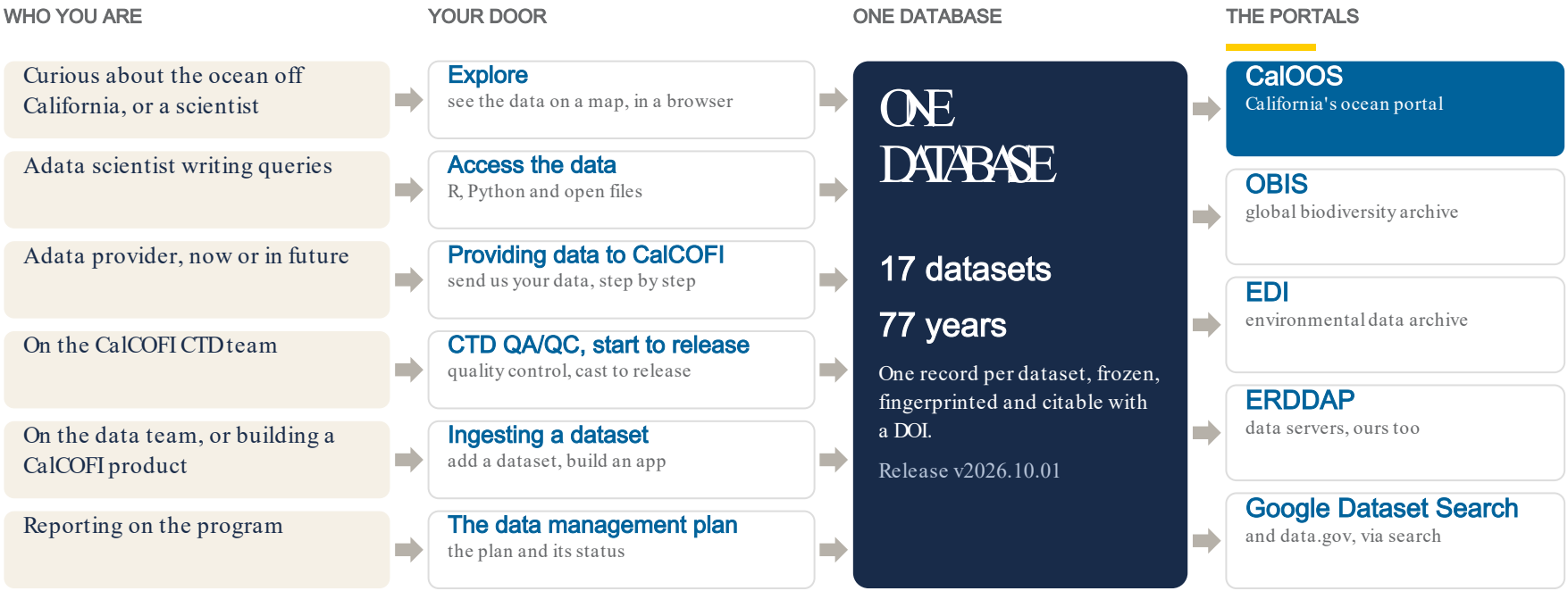
2 PUBLISH

From one record per dataset we generate everything a portal needs: the description, the citation, the DOI.

3 VISUALIZE

People open the data in a browser, or in R and Python. Everyone sees the same numbers.

CalCOFI Data For All

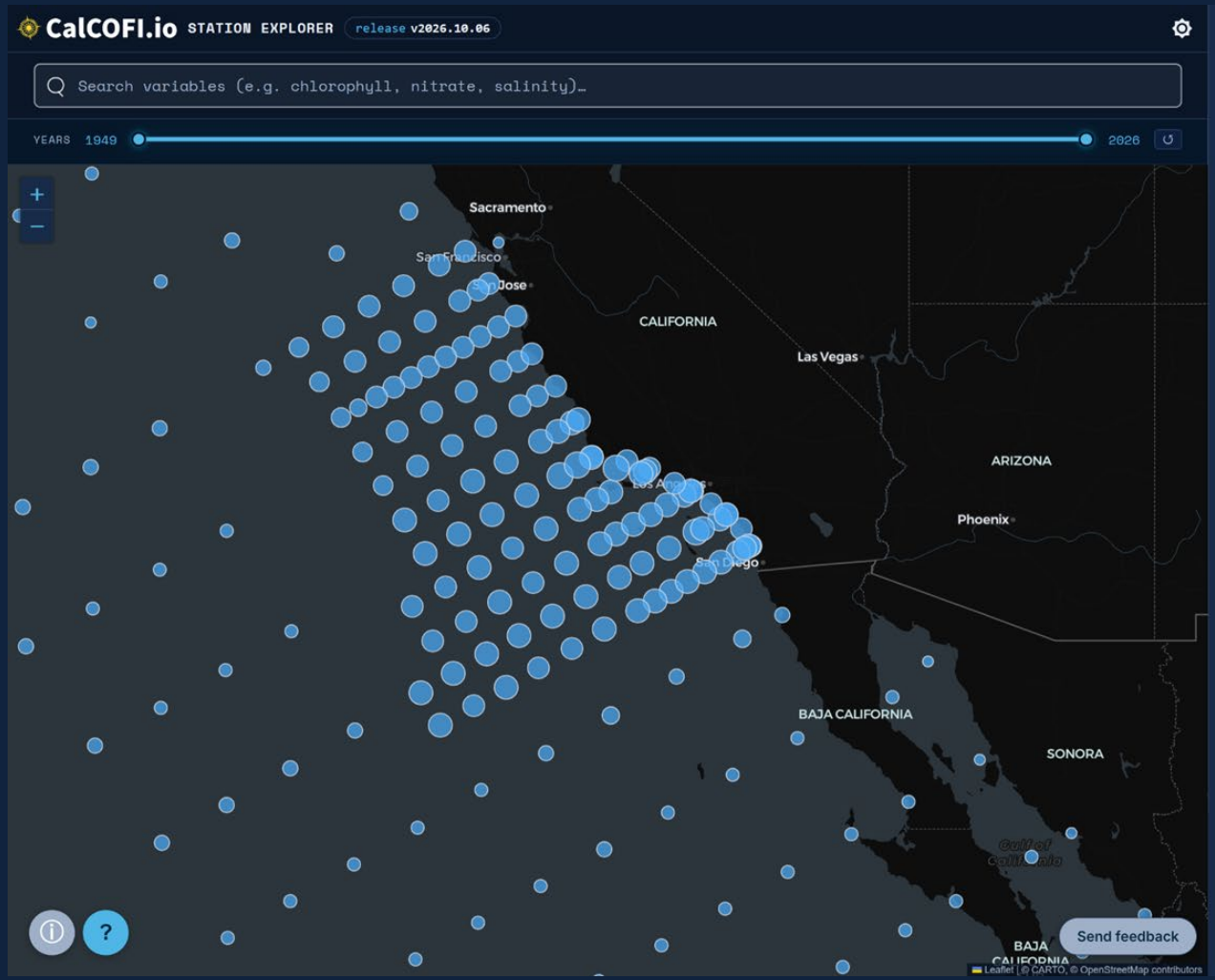


Portals link to the authoritative dataset. Nothing is copied.



CalCOFI data finder app

Curious what data have or are being collected on the CalCOFI platform?



WHAT CALCOFI MEASURES

Click a category below to see which variables it includes, or click any station on the map to see everything measured there

By Category | By Dataset

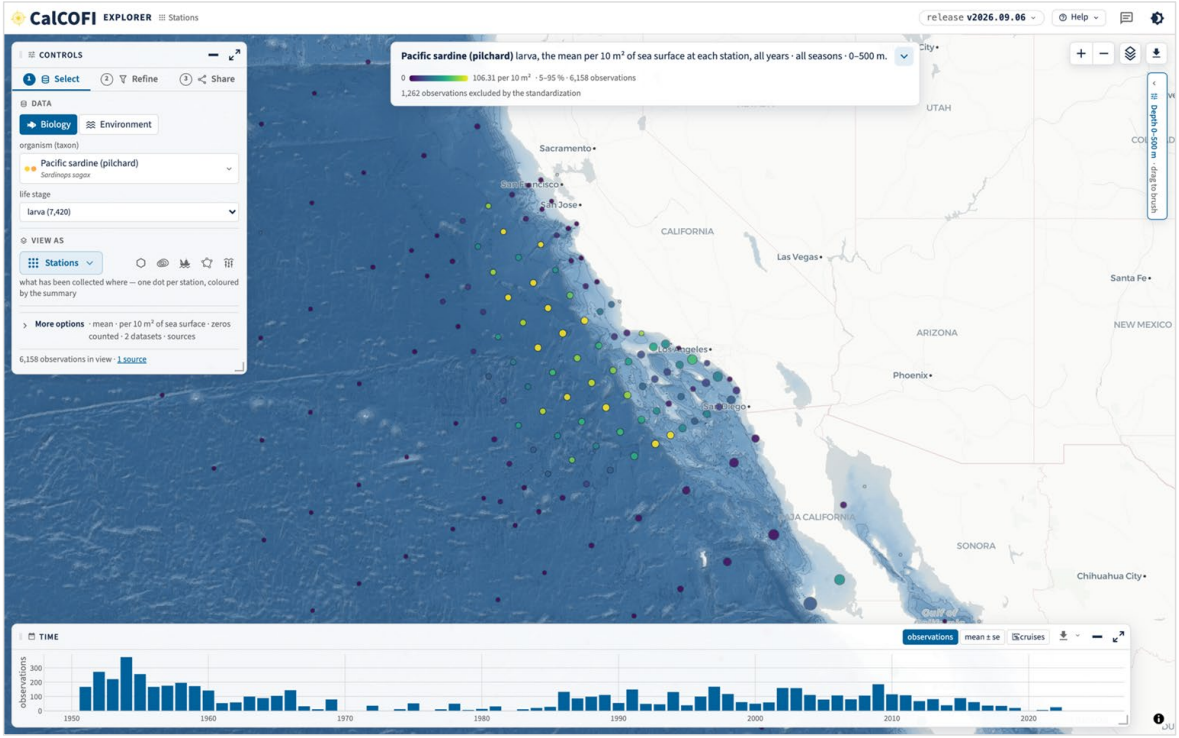
- Physical Oceanography 47 →
- Nutrients & Chemistry 7 →
- Productivity & Pigments 13 →
- Carbonate System 12 →
- Meteorology & Sea State 20 →
- Phytoplankton 301 →
- Picoplankton & Bacteria 2 →
- Zooplankton 65 →
- Euphausiids (Krill) 37 →
- Seabirds & Marine Mammals 163 →
- Mesopelagic Fish 90 →
- Fish Eggs & Larvae 1156 →

Search by: species, location, depth, season, cruise, etc.



Explore data collected on the CalCOFI platform

PICK WHAT YOU CARE ABOUT, SEE EVERY PLACE IT

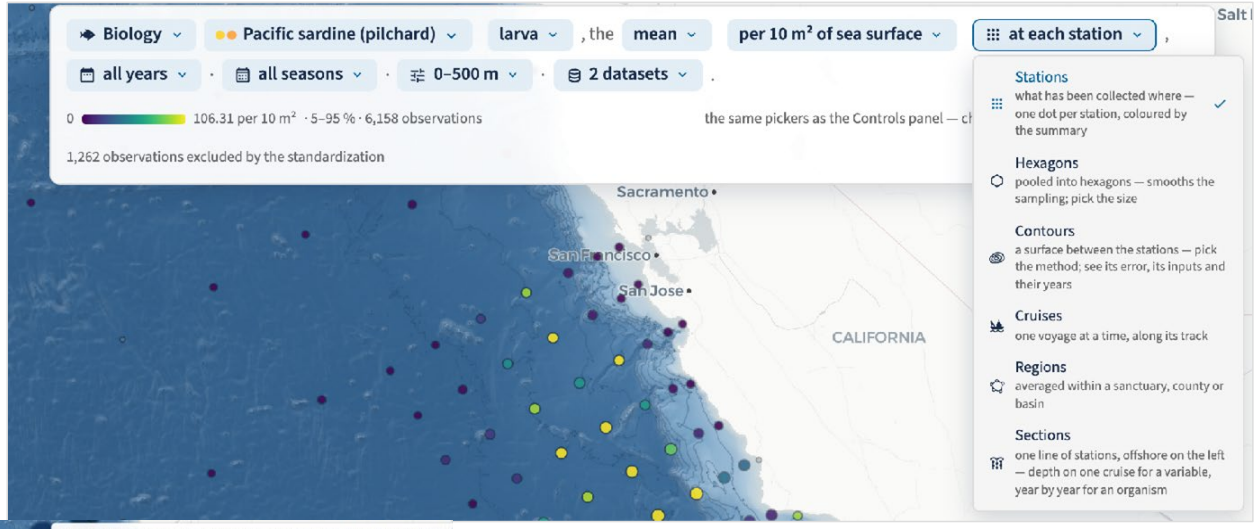


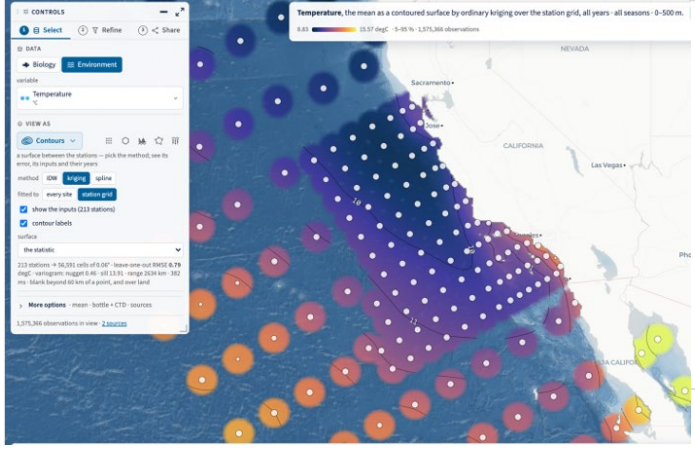
Choose an organism or a measurement. Each dot is a station where CalCOFI has looked, shaded by how much was there.

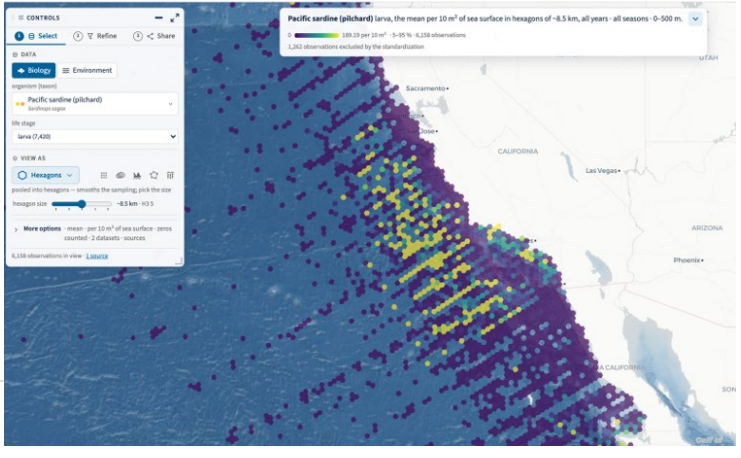
Here: Pacific sardine larvae, over all years. The bars along the bottom show when.

calcofi.io/explore

Multiple ways of looking at data: points, hexagons, contou







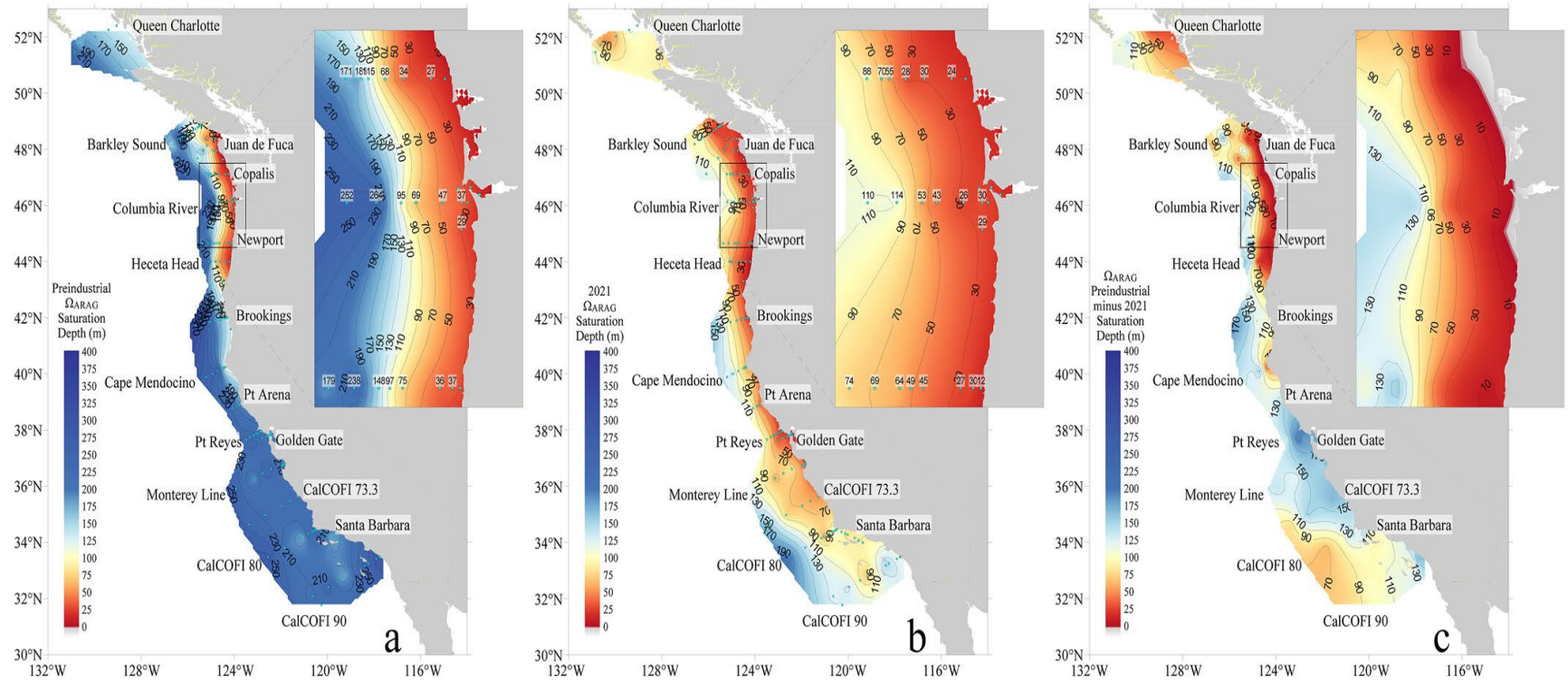
Observing the MHW and incoming El Nino – Temp anomaly



CTD Transect viewer tool

- Here we can see +1- 4°C anomalies at line 93.3 (off San Diego) even before the El Nino arrival

The Combined Effects of Ocean Acidification and Respiration on Habitat Suitability for Marine Calcifiers Along the West Coast of North America



JGR Oceans, Volume: 129, Issue: 4, First published: 12 April 2024, DOI: (10.1029/2023JC019892). Feely et al., NOAA PMEL WCOA cruise data

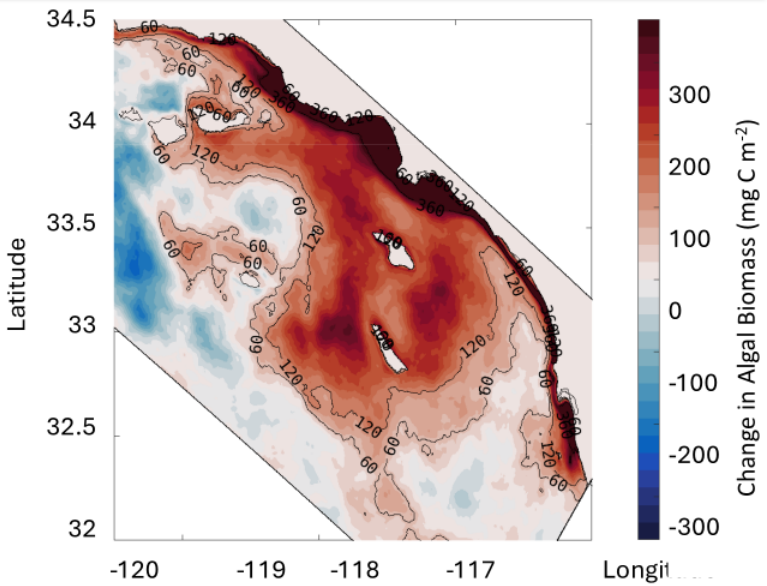
ROMS-BEC Model Output Illustrating How Land-Based Nutrients Are Exacerbating Acidification and Oxygen Loss

UCLA, PRINCETON AND SCCWRP LOOKED AT NET DIFFERENCE TO SEE HOW ALGAL PRODUCTION HAS CHANGED

5-year Mean Change in Algal Biomass

red = gain

blue = loss

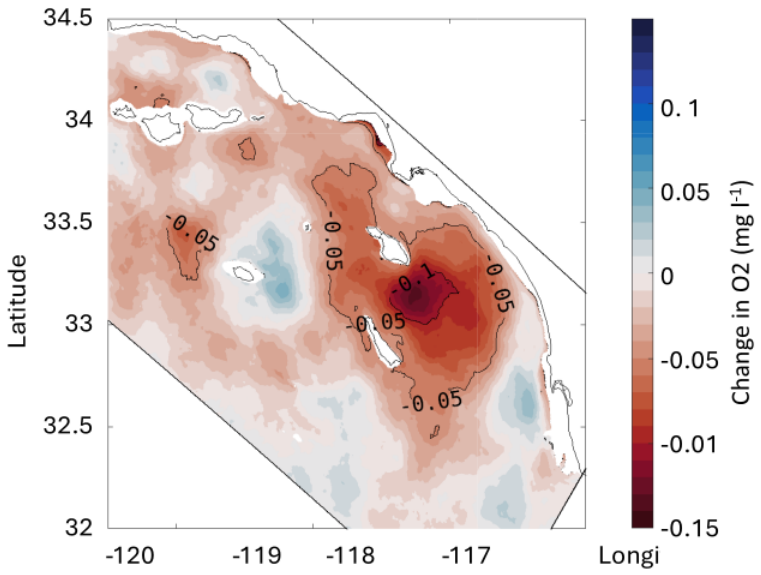


AND HOW THAT CONTRIBUTES TO A DECLINE IN OXYGEN (AND PH, NOT SHOWN)

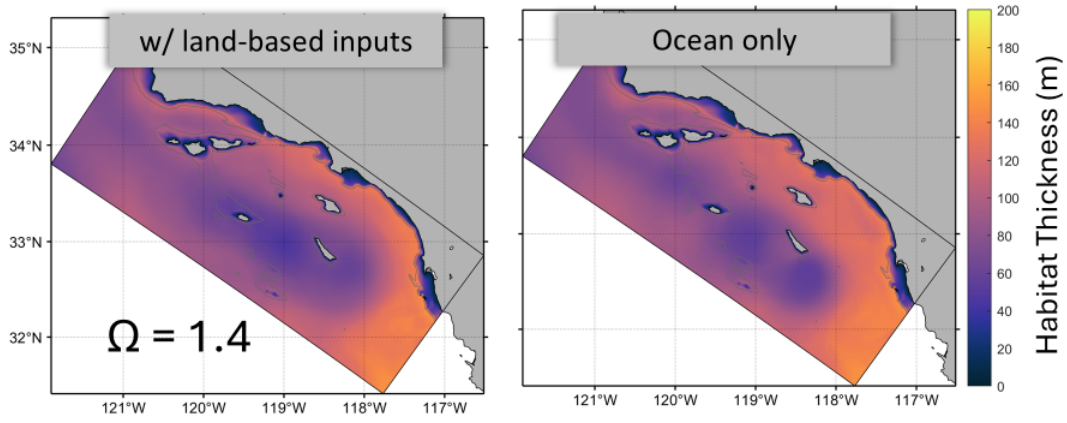
5-year Mean Change in Oxygen

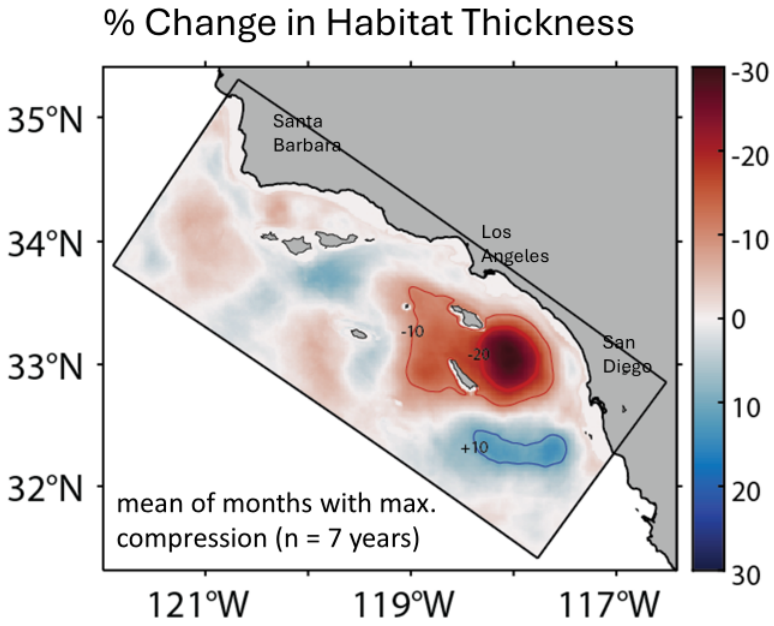
red = loss

blue = gain



Land-Based Nutrients Appear to Compress Habitat (UCLA, Princeton, SCCWRP)





- Not triggering lethal thresholds, nor sublethal thresholds for 9 months of year
- Average of 20% Habitat squeeze (up to 60% in some areas) for ~ 3 months in late summer over a quarter of Bight
- Similar findings for both pH (Aragonite Saturation) and O2 (Metabolic Index)

Uses of CalCOFI data & samples for marine management

- Fisheries & ecosystem-based management
  - Fisheries Management Plans
  - Ecosystem Status Report (PFMC),
- Climate change indicators, variability, & change
  - Annual State of the California Current Ecosystem Report (CCIEA)
  - OAH Data portal
- Offshore wind & energy
  - Site characterization & assessment activities
  - Baseline information for understanding pre-development conditions & climate variability
- Ocean use & the Blue Economy
  - Impacts of naval operations on marine mammals
- Water quality & pollution
  - Use of samples to understand DDT+ in larval fish in Southern CA
- Marine ecosystem assessments
  - NMS Conditions Reports
- Plastic pollution – samples available for microplastics analysis
- Environmental/ oceanographic context for MPAs/marine spatial planning, HABs, & nearshore processes (e.g., for estuaries and coasts)
  - Environmental context for MPA Decadal review

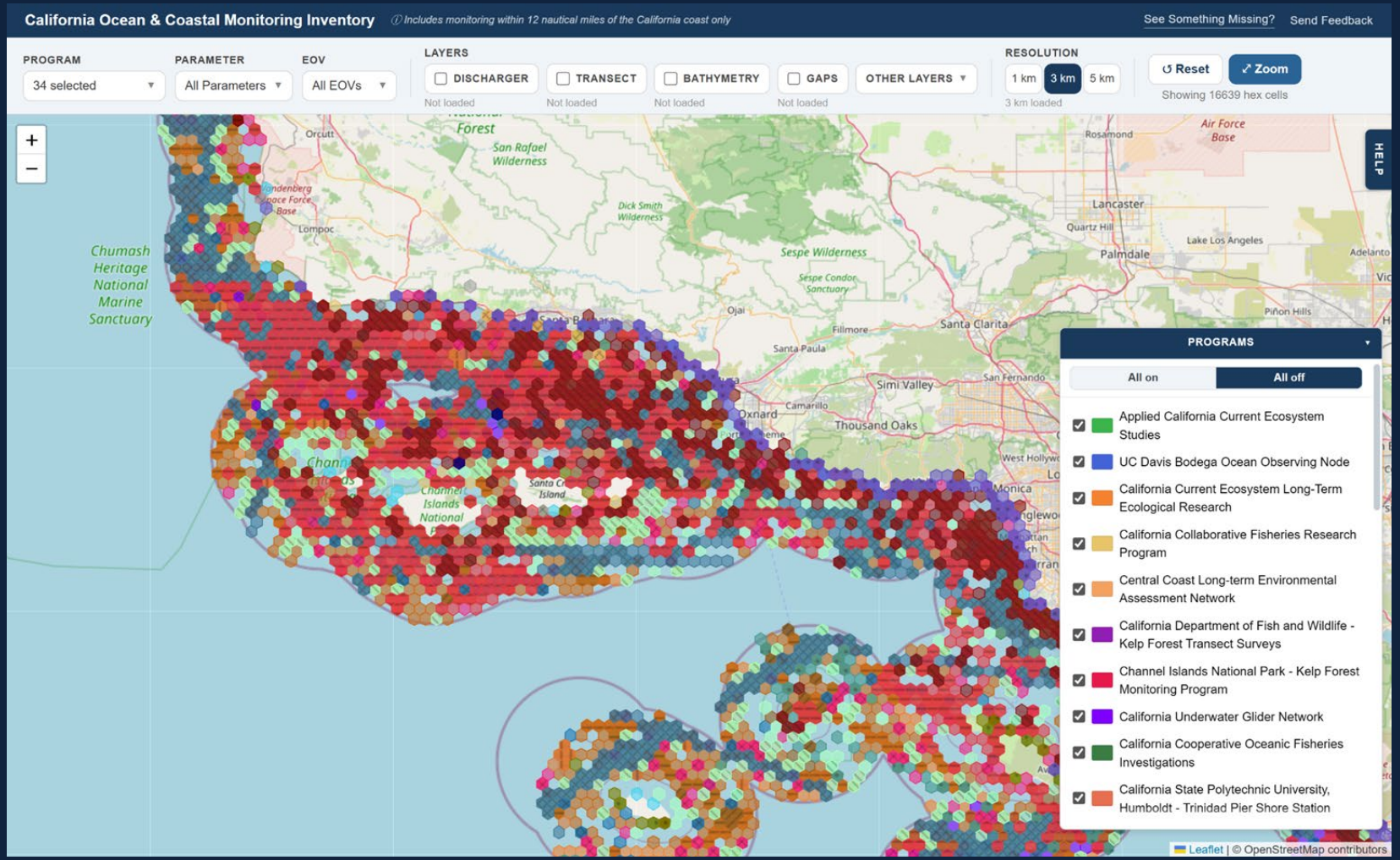






Statewide ocean **monitoring inventory** for California (UCLA IoES, CalCOFI, Betty Huang)

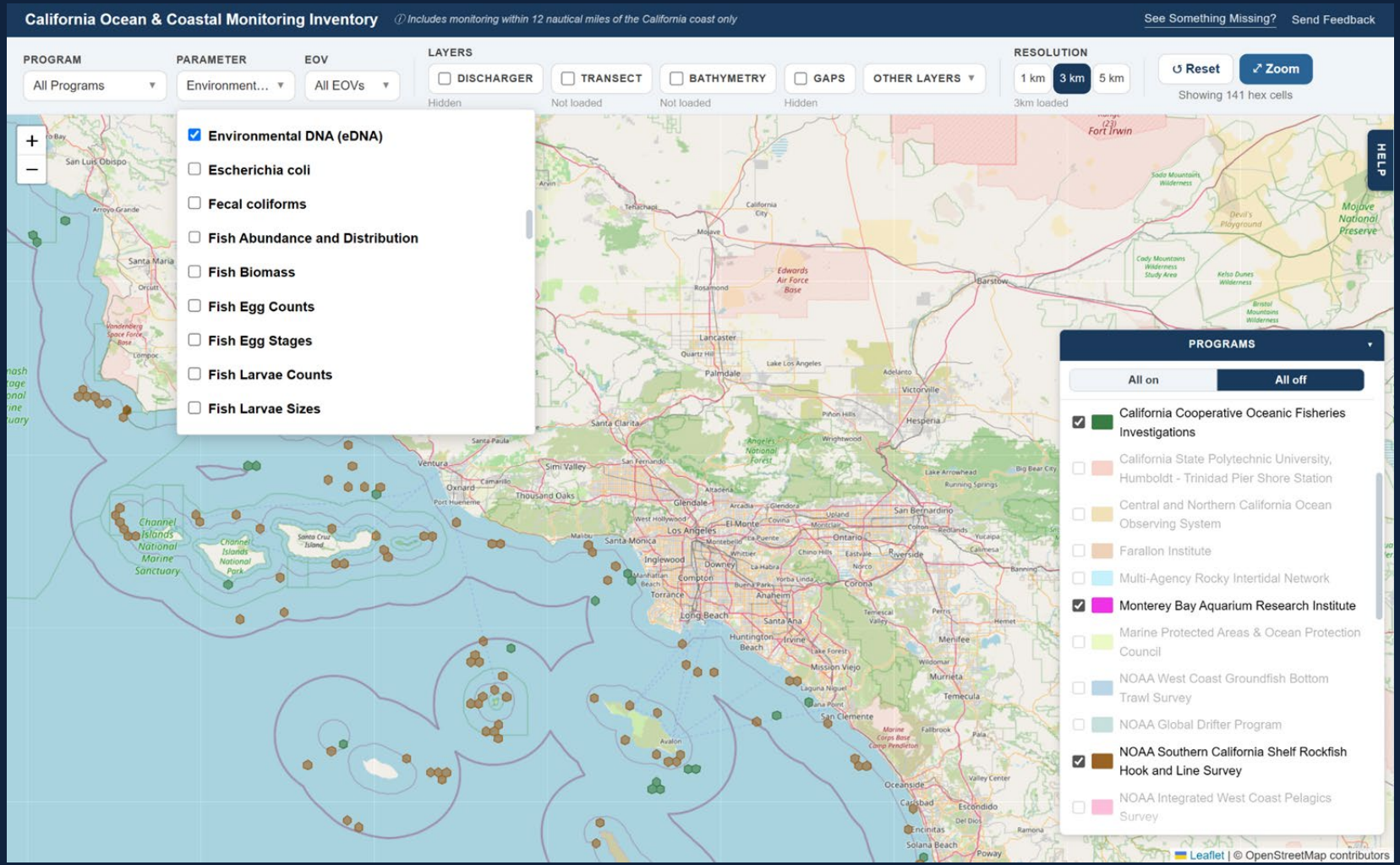
The importance of integrating monitoring databases! California needs a comprehensive ocean monitoring program built on existing monitoring programs from government, academia, NGOs, and dischargers. This inventory is a first step! The Water Quality Monitoring Council, co-chaired by SWRCB and OPC, should lead efforts to develop a model ocean monitoring program ASAP.



34
monitoring programs

25
permitted dischargers

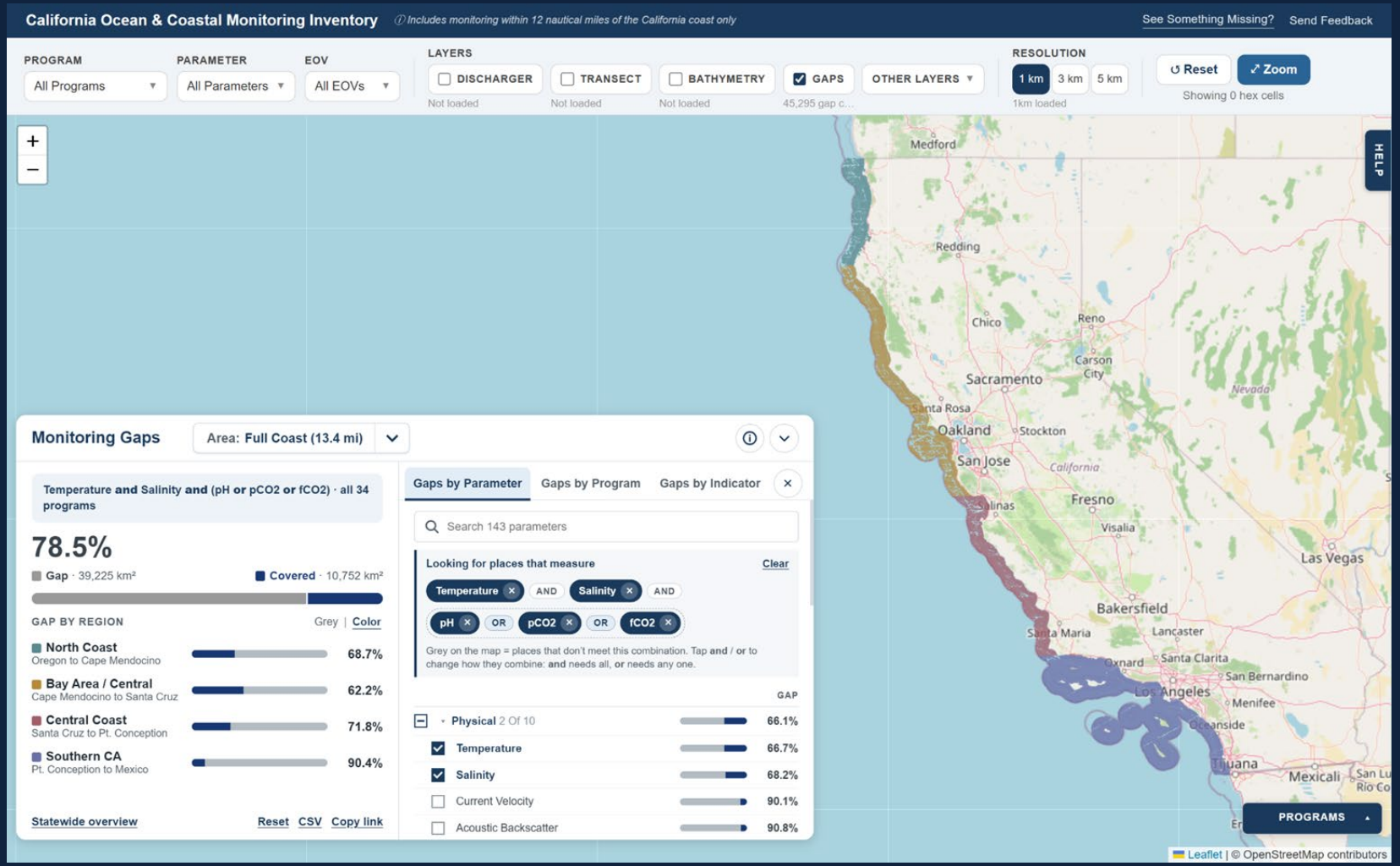
500+
parameters



34
monitoring programs

25
permitted dischargers

500+
parameters



34
monitoring programs

25
permitted dischargers

500+
parameters

ONE RECORD · A DOOR FOR EVERYONE

EXPLORE IT, CITE IT, BUILD

calcofi.io/station · see what data are collected
calcofi.io/explore · explore the data
calcofi.io/ctd -transects · slices and anomalies
calcofi.io/docs · find which door is yours
Integrated database Release v2026.10.01 doi.org/10.5281/zenodo.23085119
All apps have feedback buttons so we greatly appreciate your input!
Or email us!

CalCOFI.io

Thank you!



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