# Combining Tradition and Innovation: The Evolution of CalCOFI in Support of Ecosystem-Based Fisheries Management

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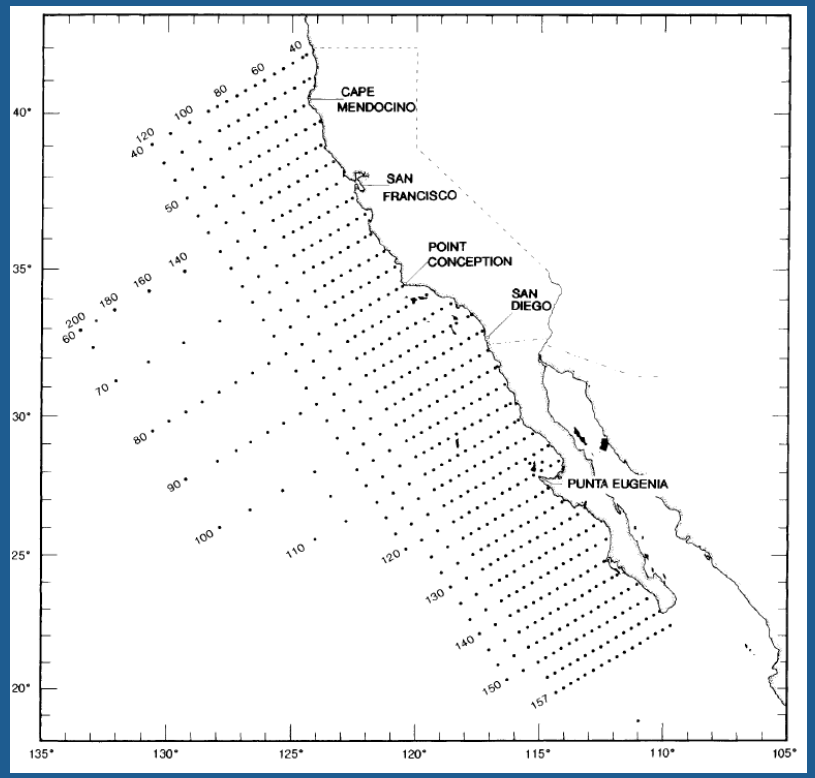
# Born from a Crisis: The 1940s Sardine Fishery Collapse

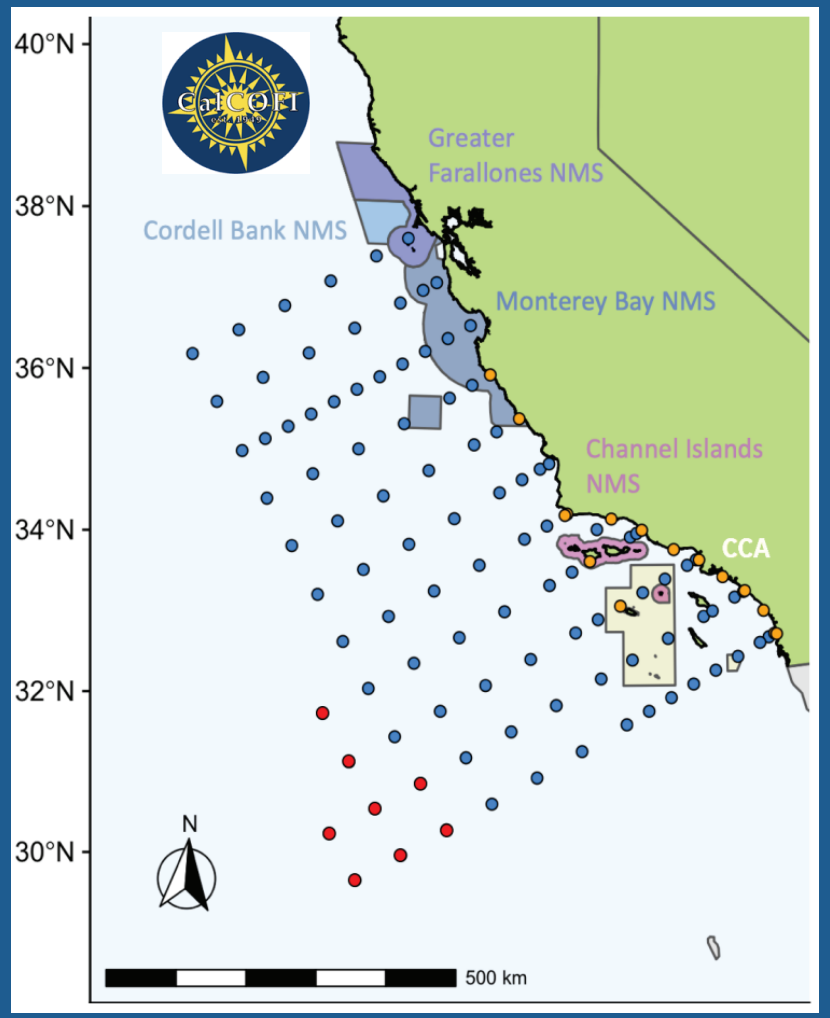




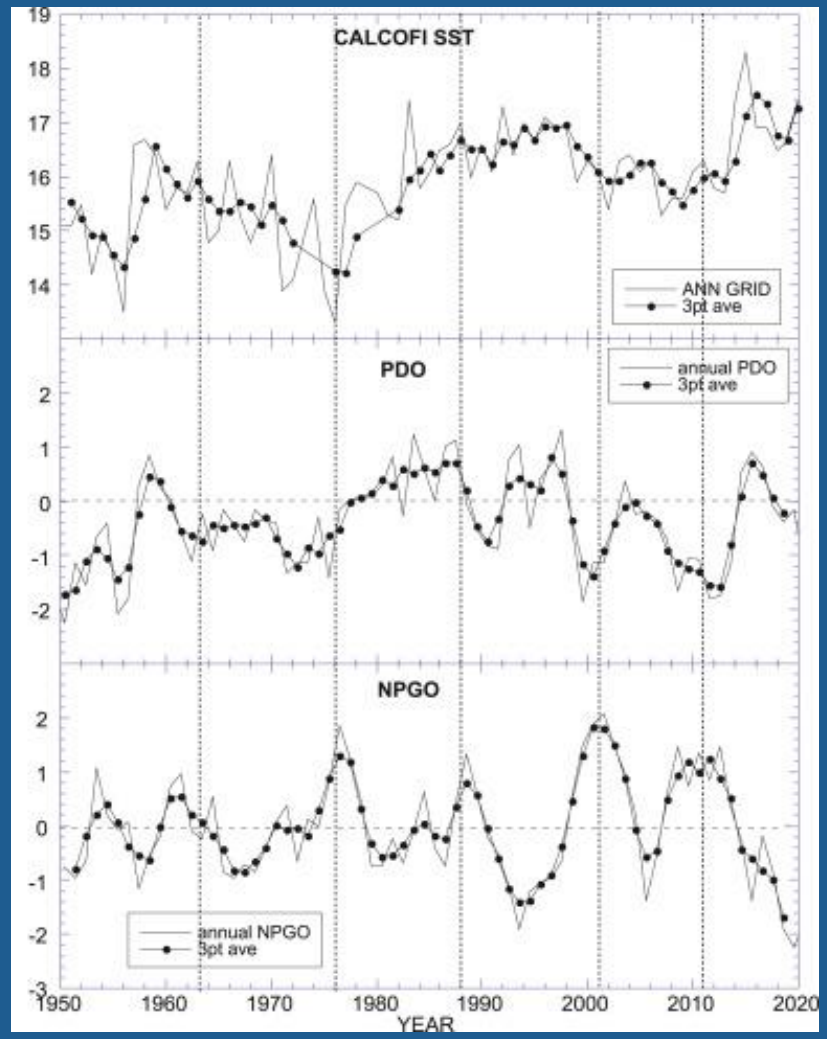

- Est. 1949 to investigate sudden collapse of the Pacific Sardine fishery
- New paradigm: from isolated fish counts to broader marine environment
- Pioneered “ecosystem approach” (early EBFM) decades before is became a standard management framework



# Building the Baseline: 75+ Years of Ocean Observation




- >7 decades of continuous, standardized data collection
- Physical, chemical, and biological observations
- Crucial framework for separating localized human impacts from multi-decadal climate cycles

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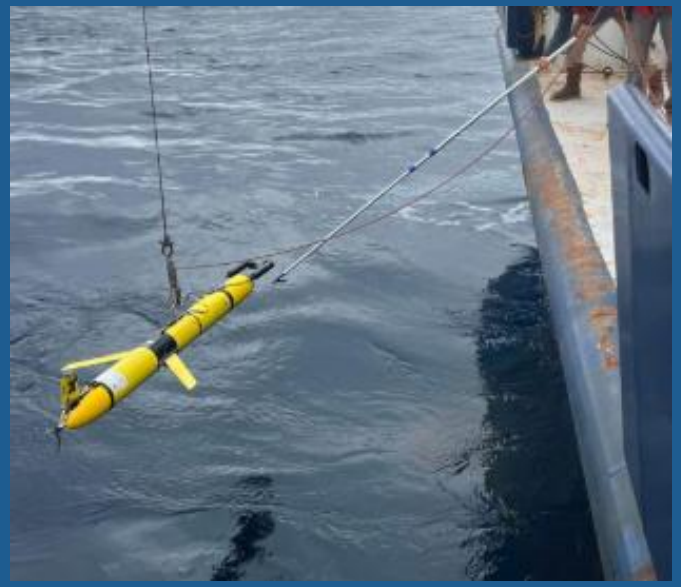
# Evolving Without Breaking Continuity



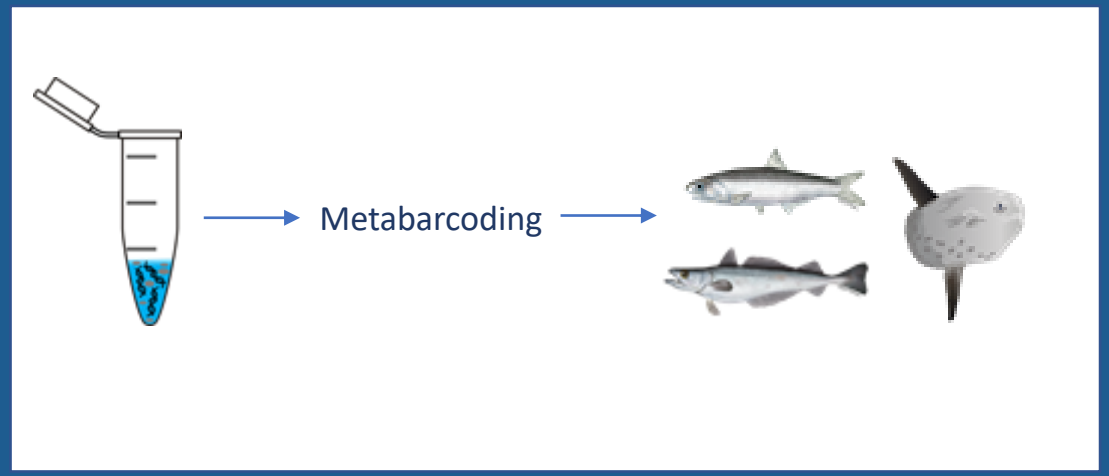


- Modern challenge: adopt cutting edge tools while preserving historical time series.
- Augmentation **NOT** Replacement
- Increased resolution





# Enhancing Biological Resolution with eDNA

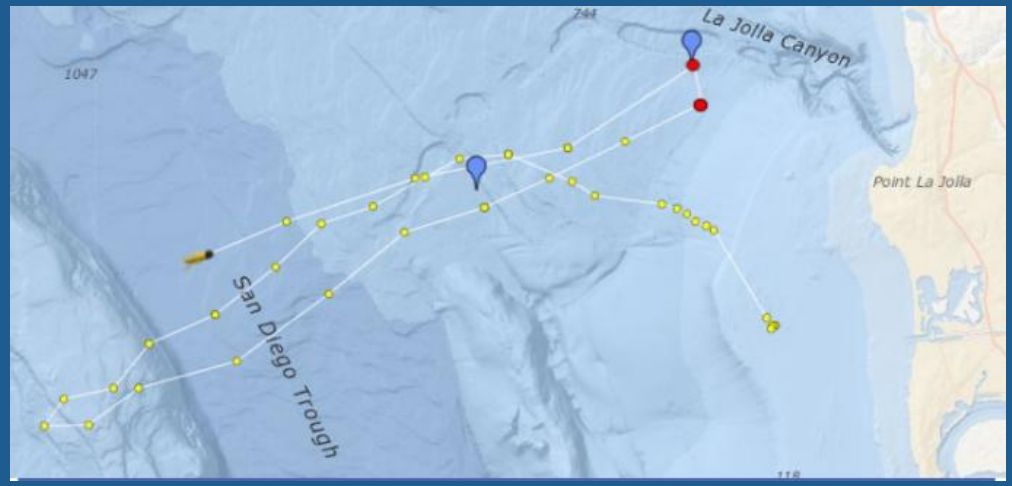



- Traditional ichthyoplankton sorting is time-intensive and can miss cryptic and low density species
- Metabarcoding is a powerful way to capture community profiles from water samples
- Whole food web insights, monitoring microbes to apex predators

# Uncrewed Observational Networks

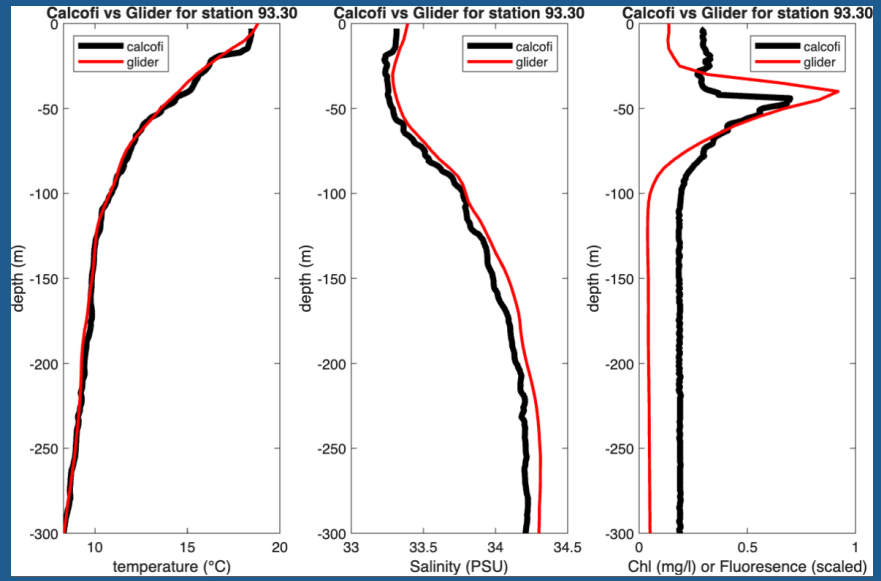
- Offsetting high ship costs with scalable, higher frequency observing platforms
- Glider observations during and between seasonal cruises
- Higher frequency physical and biological sampling along traditional CalCOFI lines
- Leveraging a 20-year baseline from the CUGN to contextualize new autonomous data streams

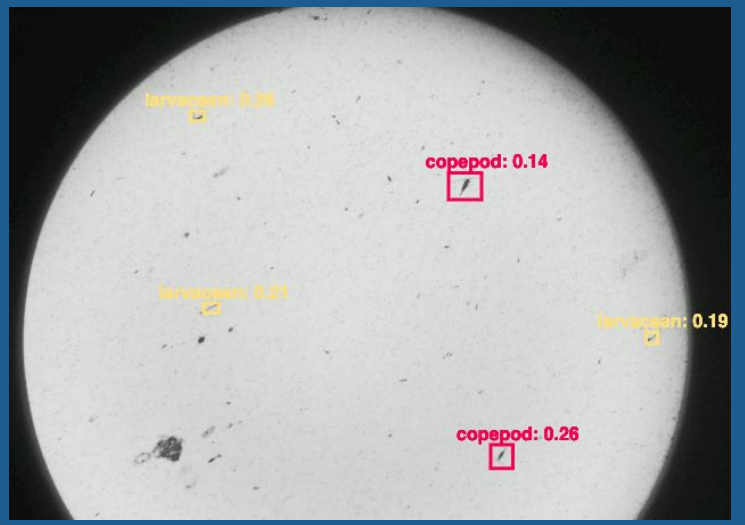






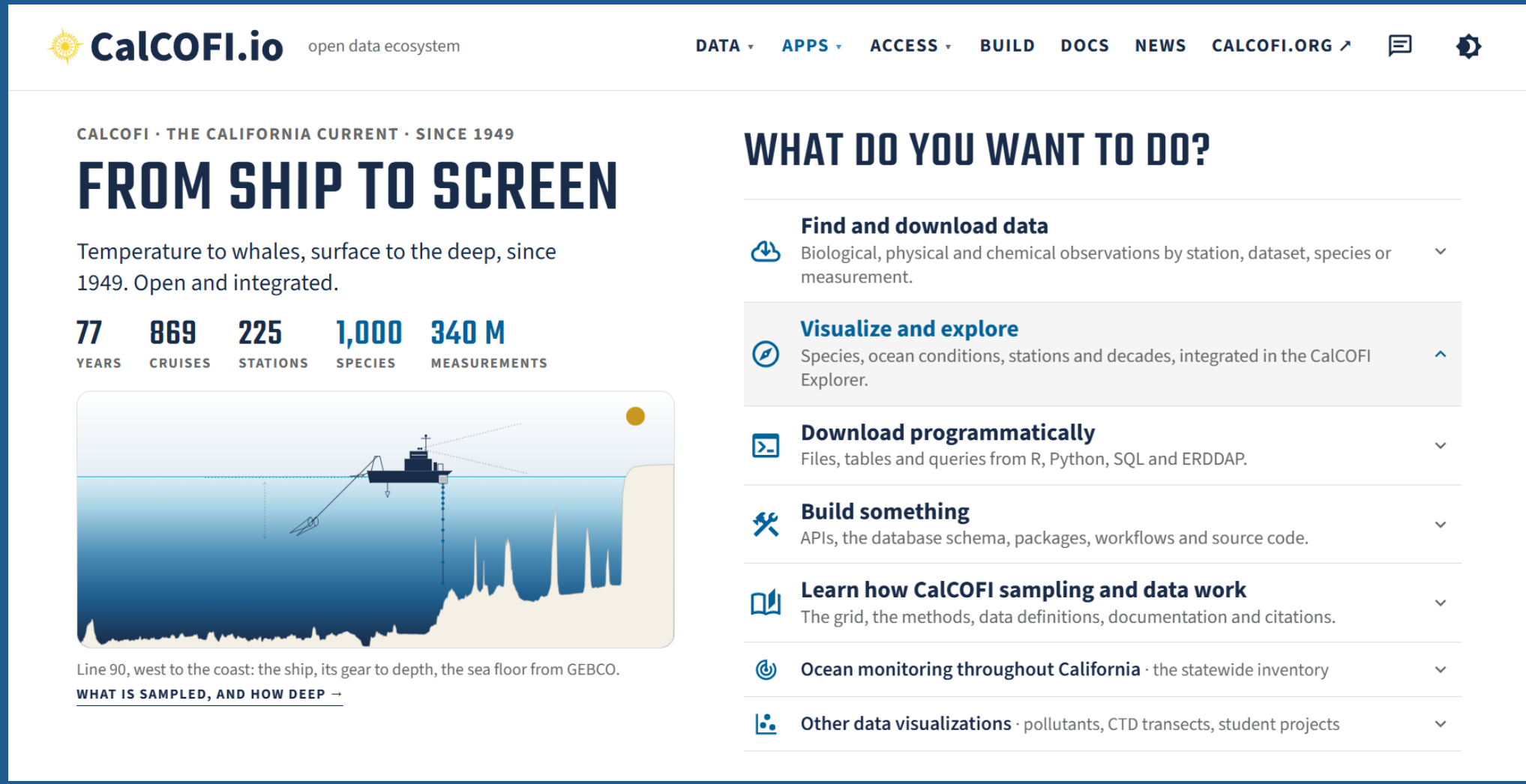
California Underwater Glider Network (CUGN)



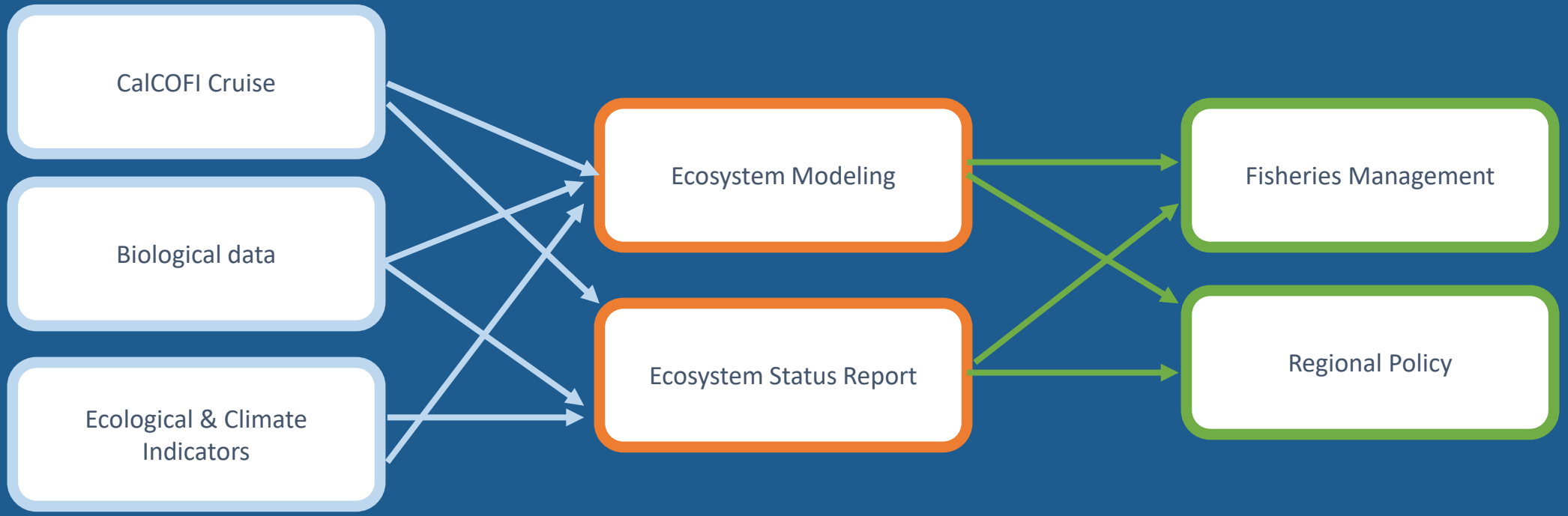



# Modernizing CalCOFI Data Practices

- Transition from datasheets to large genomic sequences and continuous sensor streams
- Cloud and AI logistics
- Committed to Findable, Accessible, Interoperable, and Reusable (FAIR) open-access data

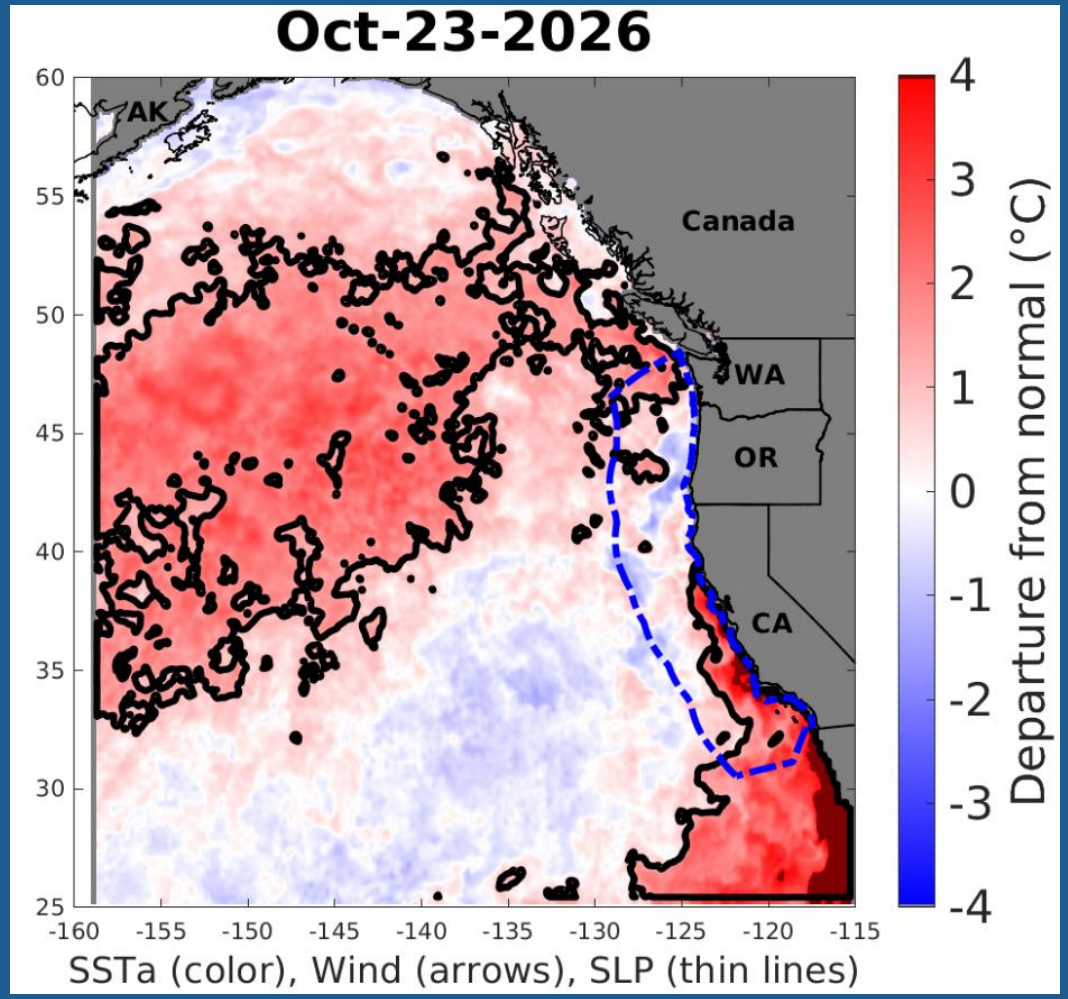


# Supporting Ecosystem Based Fisheries Management (EBFM)



# Tracking Anomalies: Marine Heatwaves

- 75+ year baseline provides clear identification of ecosystem deviations
- Multiple sampling methods to track community shifts
- Improved predictive power




California Current Marine Heatwave Tracker - Blobtracker

# Building Community & Ecosystem Resilience

**Constraining Uncertainty**

- Long-term, hi-res data reduces uncertainty

**Proactive Adaptation**

- Empowers commercial fisheries and coastal managers

**Socio-Economic Support**

- Safeguards marine resources and supports coastal blue economy stability

# The Next 75 Years: Pan-Pacific Collaboration

- Asset longevity and technological advancement enhance one another
- Deeper integrations of physical, biogeochemical, and uncrewed data streams
- PICES knowledge sharing: expanding our frameworks to build collaborative, basin-wide models across the North Pacific



# Thank You

- Grateful to the ship's crews, scientists, and technicians at NOAA, Scripps Institution of Oceanography , and the California Department of Fish and Wildlife
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