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FISHERIES**

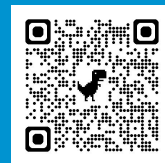
National Academies of Sciences
Committee Meeting 3

NDAF FY2023 - SEC. 11319. (a) Study on Impacts on Shipping and
Commercial, Tribal, and Recreational Fisheries From Development of
Renewable Energy on the West Coast
April 22, 2025

Evaluating potential interactions between fisheries and new offshore ocean-use sectors

NOAA's California Current
Integrated Ecosystem Assessment Team

presented by Kelly Andrews, Northwest Fisheries Science Center



Today's Discussion

1. California Current Ecosystem 101
2. Planning tools to identify, avoid and minimize negative interactions
3. Static versus dynamic perceptions of interactions/impacts
4. Data gaps and uncertainty



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California Current Ecosystem



Department of Commerce | National Oceanic and Atmospheric Administration

National Marine Fisheries Service



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INTEGRATED SOCIO-ECOLOGICAL SYSTEM OF THE CALIFORNIA CURRENT

FOCAL ECOSYSTEM COMPONENTS

Ecological Integrity
Diversity, Seabirds, Marine mammals, Salmon, Forage species, Groundfish, Species interactions

Human Wellbeing
Conditions, Connections, Capabilities (e.g., safety, community, livelihood)

MEDIATING COMPONENTS

Habitat
Marine, Estuarine, Freshwater

Human Activities
(e.g., fishing, farming, mining, recreation, research, education, activism, restoration, management)

Local Social Systems
(e.g., laws, policies, economies, institutions, social networks, hierarchies, cultural values, built environment)

DRIVERS AND PRESSURES

Climate & Ocean Drivers
(e.g., climate, ocean upwelling)

Social Drivers
(e.g., population growth and settlement patterns, national and global economic and political systems, historical legacies, dominant cultural values, and class systems)

2024-25 CCIEA Ecosystem Status Report Highlights



KEY TAKEAWAYS FROM 2024

Strong El Niño in winter/spring 2024 gave to delayed but very robust upwelling and productive coastal conditions

Abundant winter/spring snowpack for much of the West; most regions exit 'severe' drought designation with improving streamflow trends

Diverse prey communities with regional patches of high productivity

Mixed Ecological Signals

Spring upwelling was delayed, but resumed with favorable conditions which held MHW offshore

Zooplankton responded quickly to spring upwelling after El Niño

Abundant diverse forage, especially anchovies and pelagic juvenile rockfish, in surveys and top predator diets

Positive expectations for 2025 Columbia Chinook returns; better outmigration conditions for CA salmon smolts

Coastwide total revenue increased by 3% from 2023. Crab landings a bright spot in commercial catch and revenue

Unfavorable Conditions & Risk Factors

Another top-10 marine heatwave (MHW)

Emerging drought conditions in late 2024; Devastating fires in coastal areas

HABs impacted marine life, human health, and fisheries

Increasing trend in humpback whale entanglement reports

Closure of CA salmon fishery; Declining catches for most sectors, most notably Pacific whiting

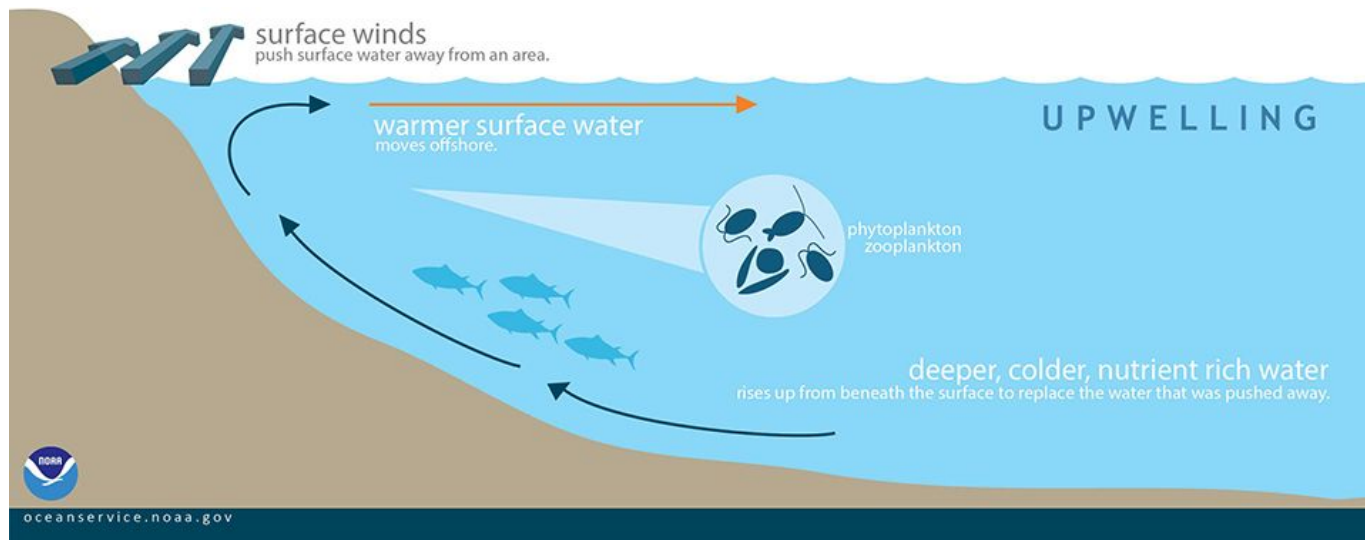
Shifting human wellbeing metrics for fishing reliant communities: OR & WA



Interactive
infographic

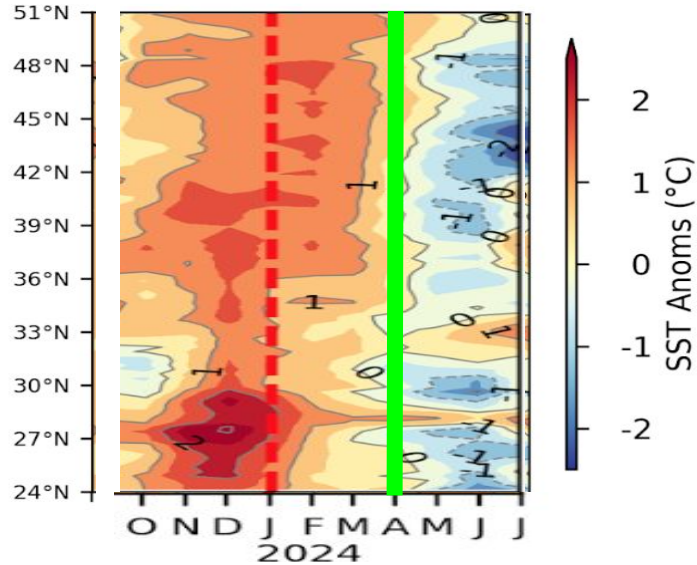


Seasonal upwelling is a key driver of productivity in the CCE

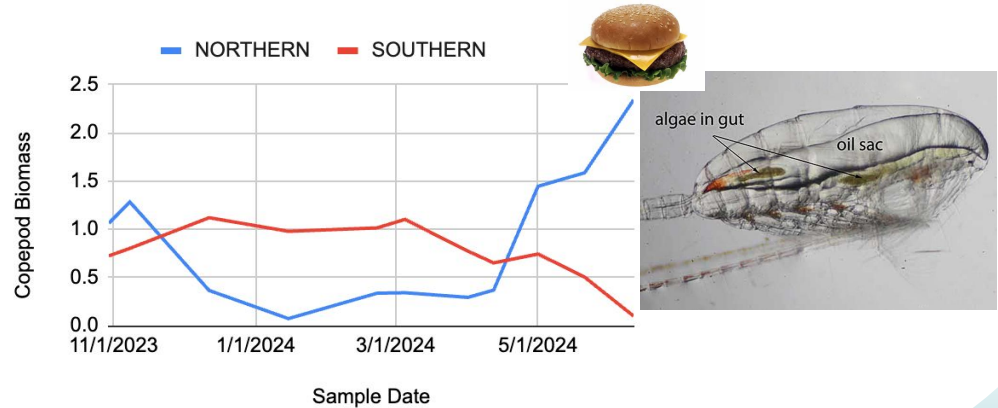


Physics to phood example...

In 2024, strong upwelling occurred after rapid decay of El Niño



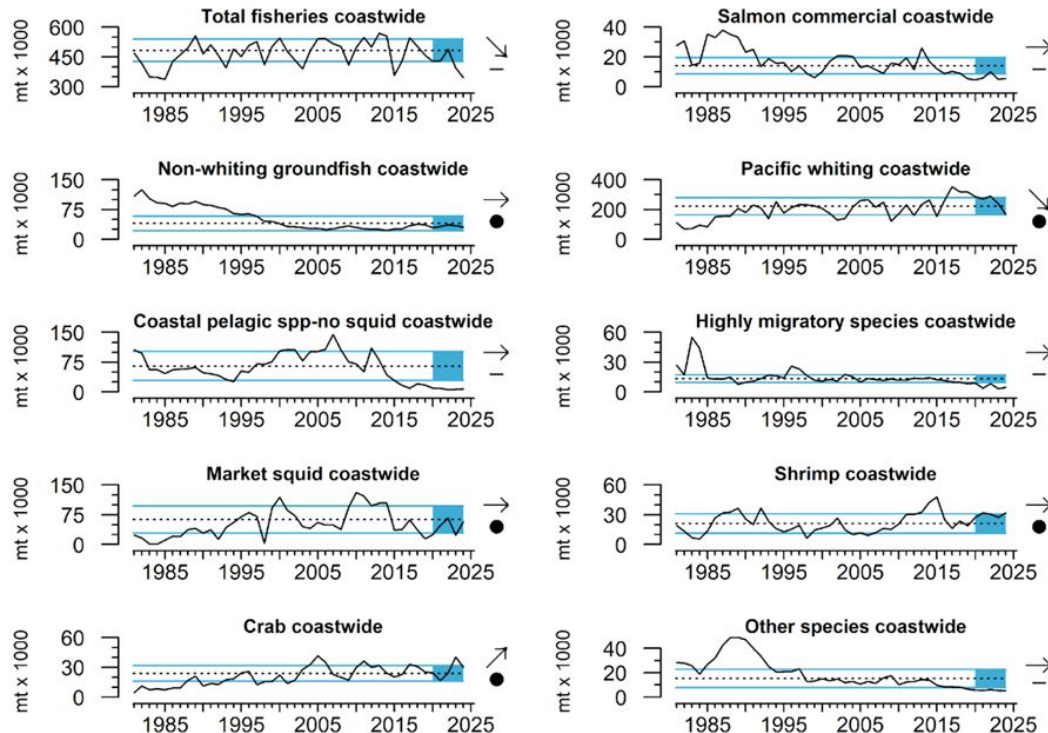
Rapid (positive) biological response



Fisheries supported by the CCE



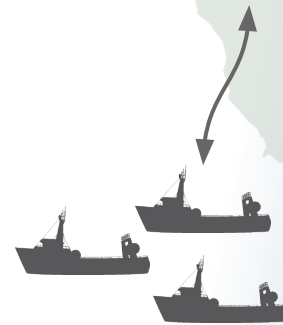
- Annual landings from West Coast commercial fisheries across management groups
- Revenue, fisheries participation networks, vulnerability and diversification indices in CCIEA report



Ecosystem considerations for OSE



Port
development,
social systems,
economics &
culture



fisheries



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Ecosystem considerations for OSE



marine renewable
energy areas



Port
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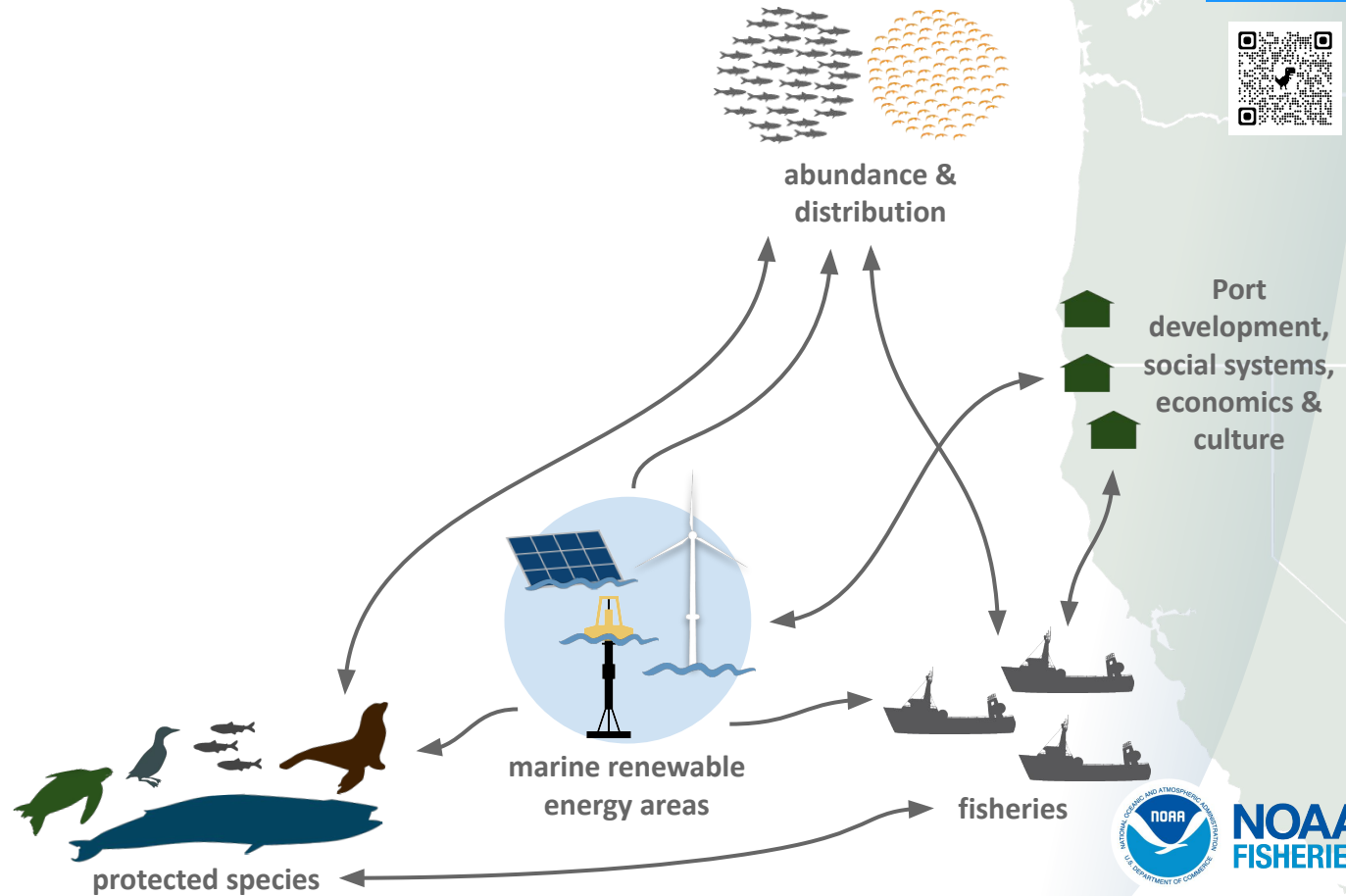


fisheries

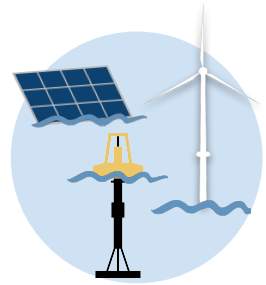


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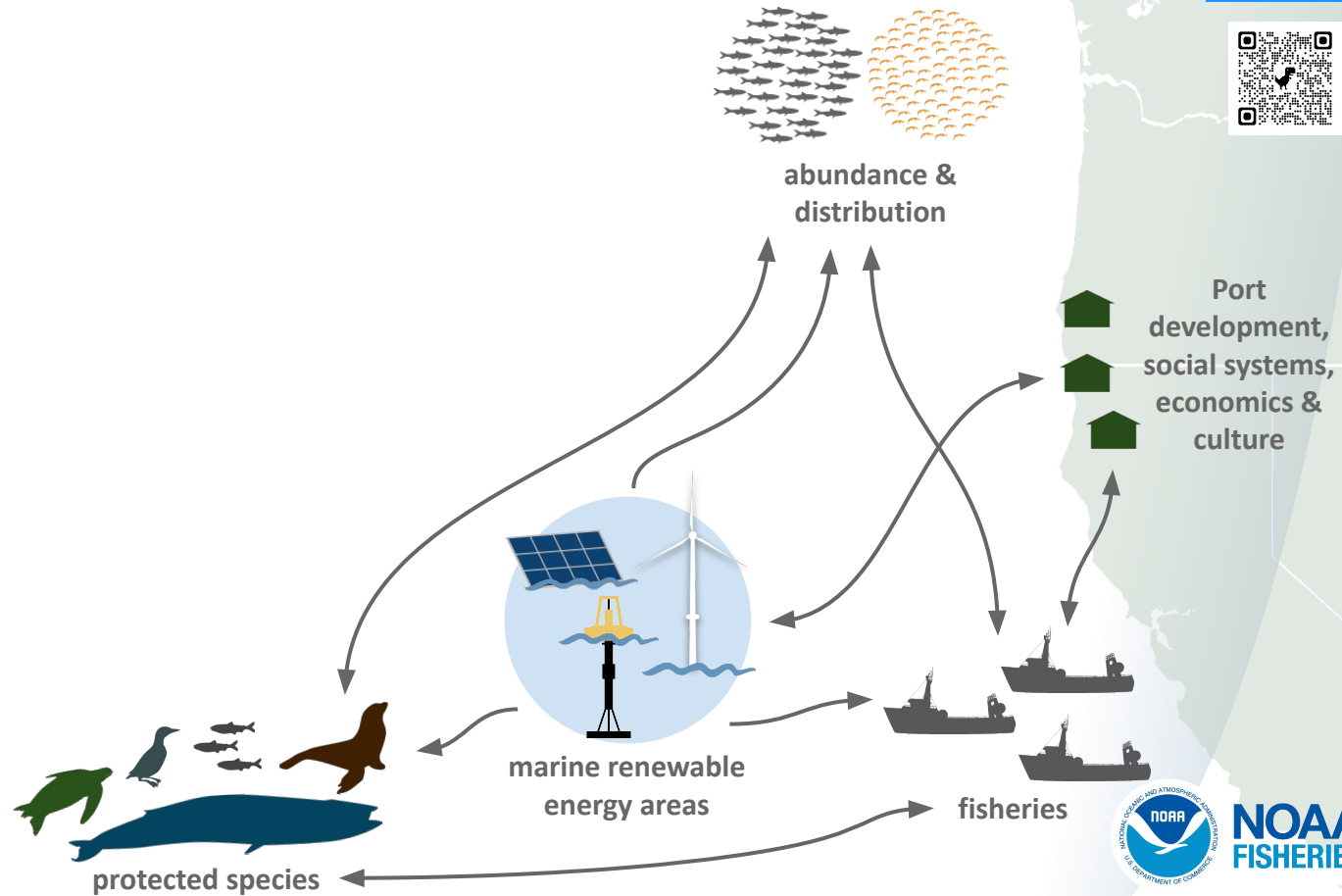
Ecosystem considerations for OSE



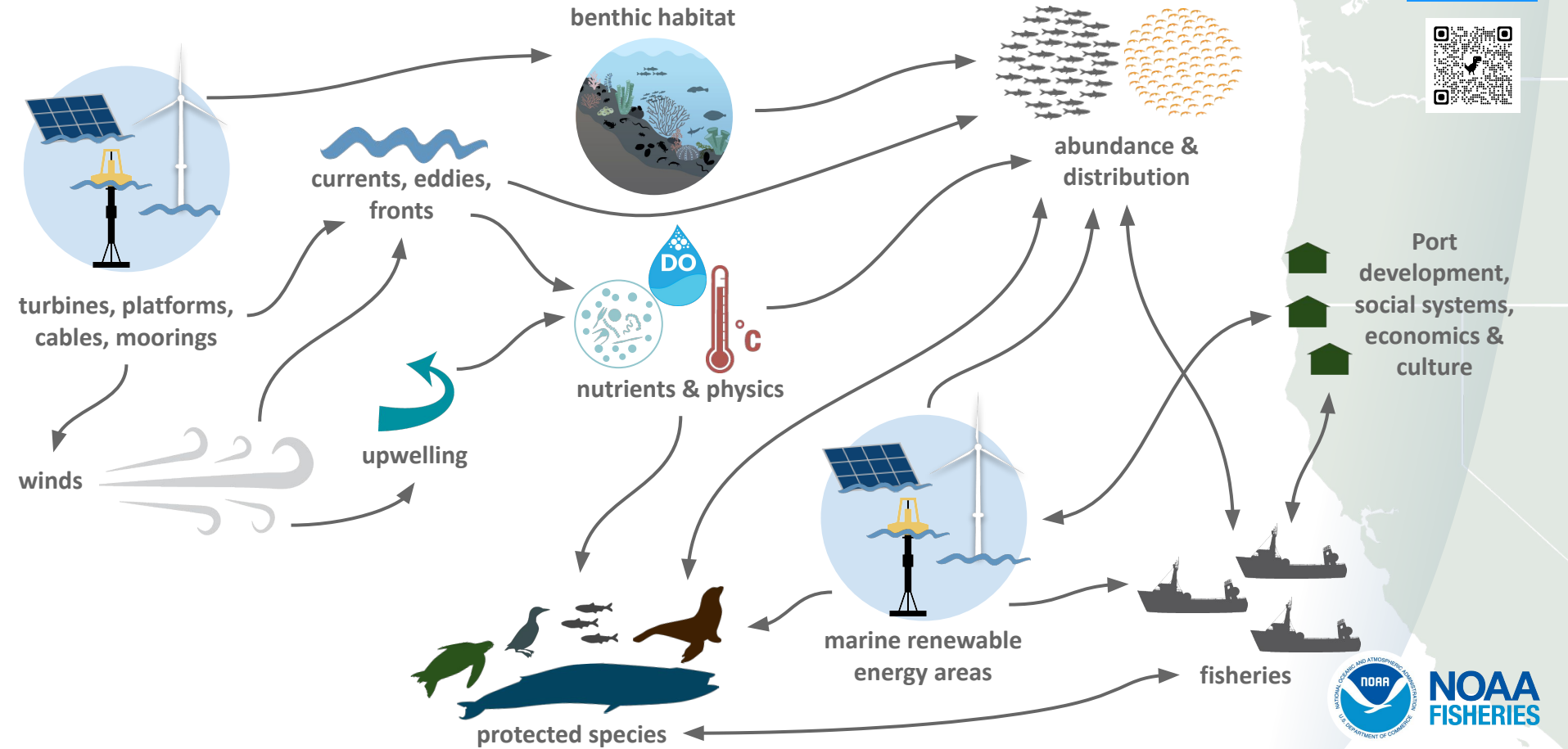
Ecosystem considerations for OSE

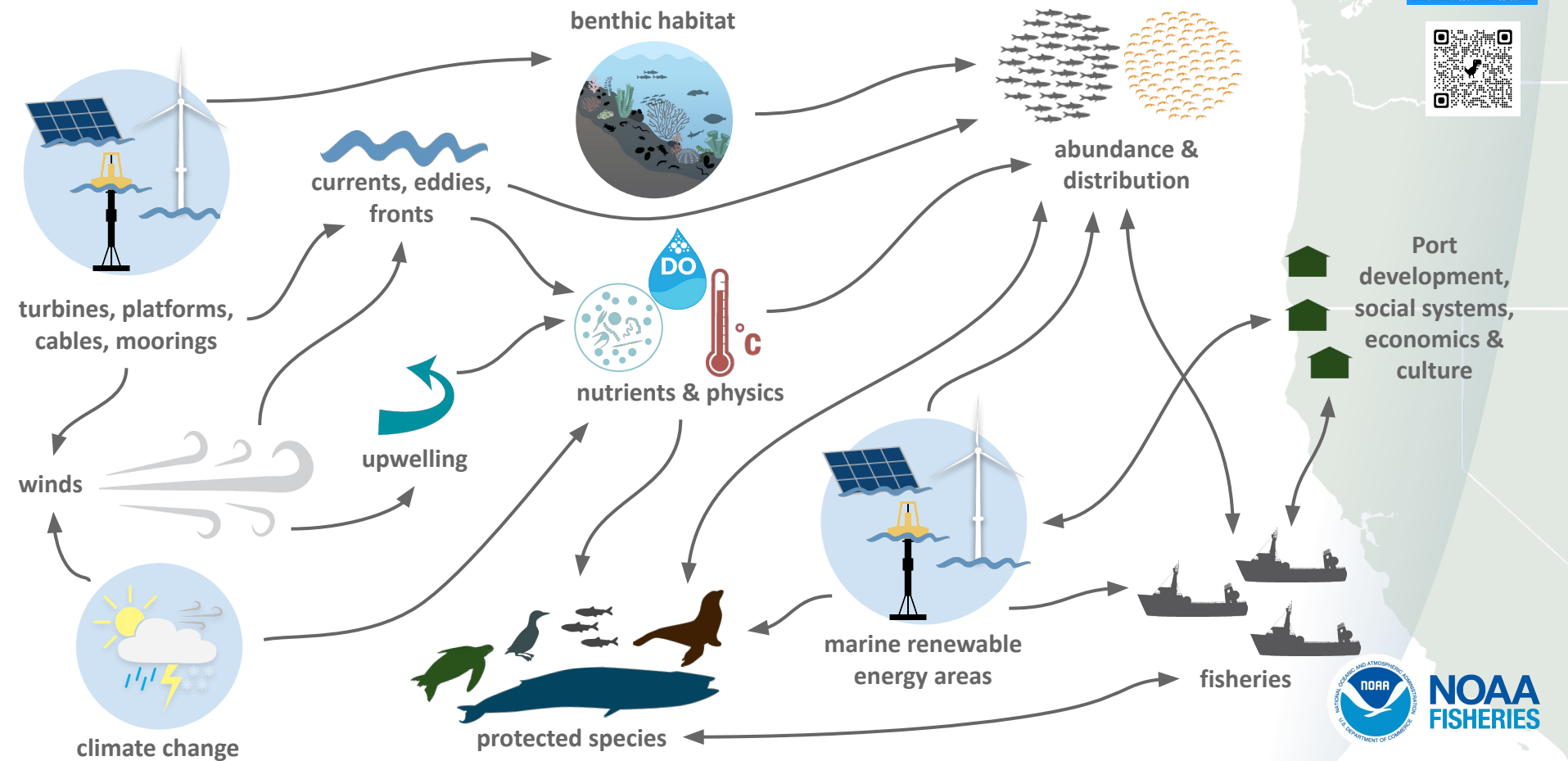


turbines, platforms,
cables, moorings



Ecosystem considerations for OSE



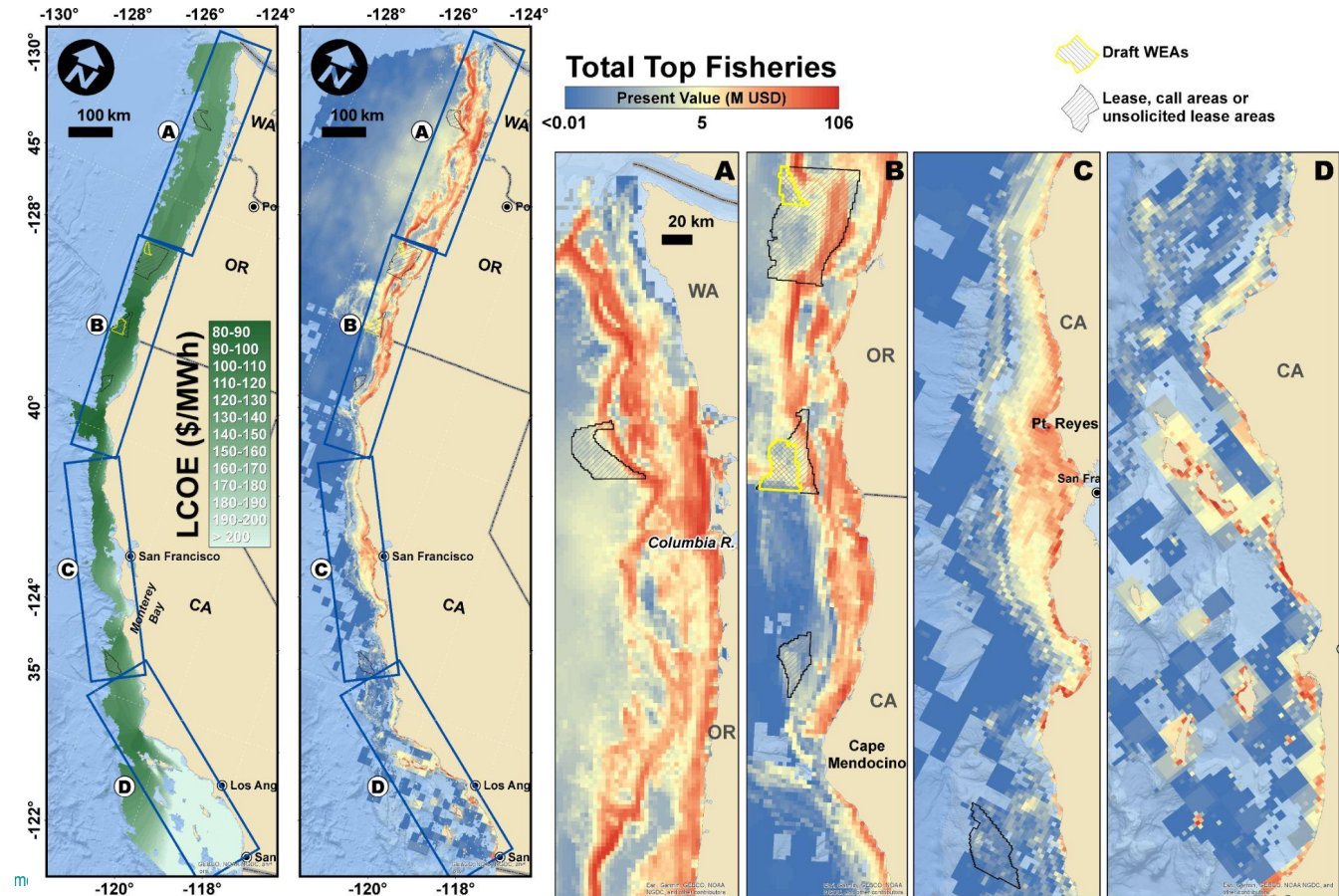


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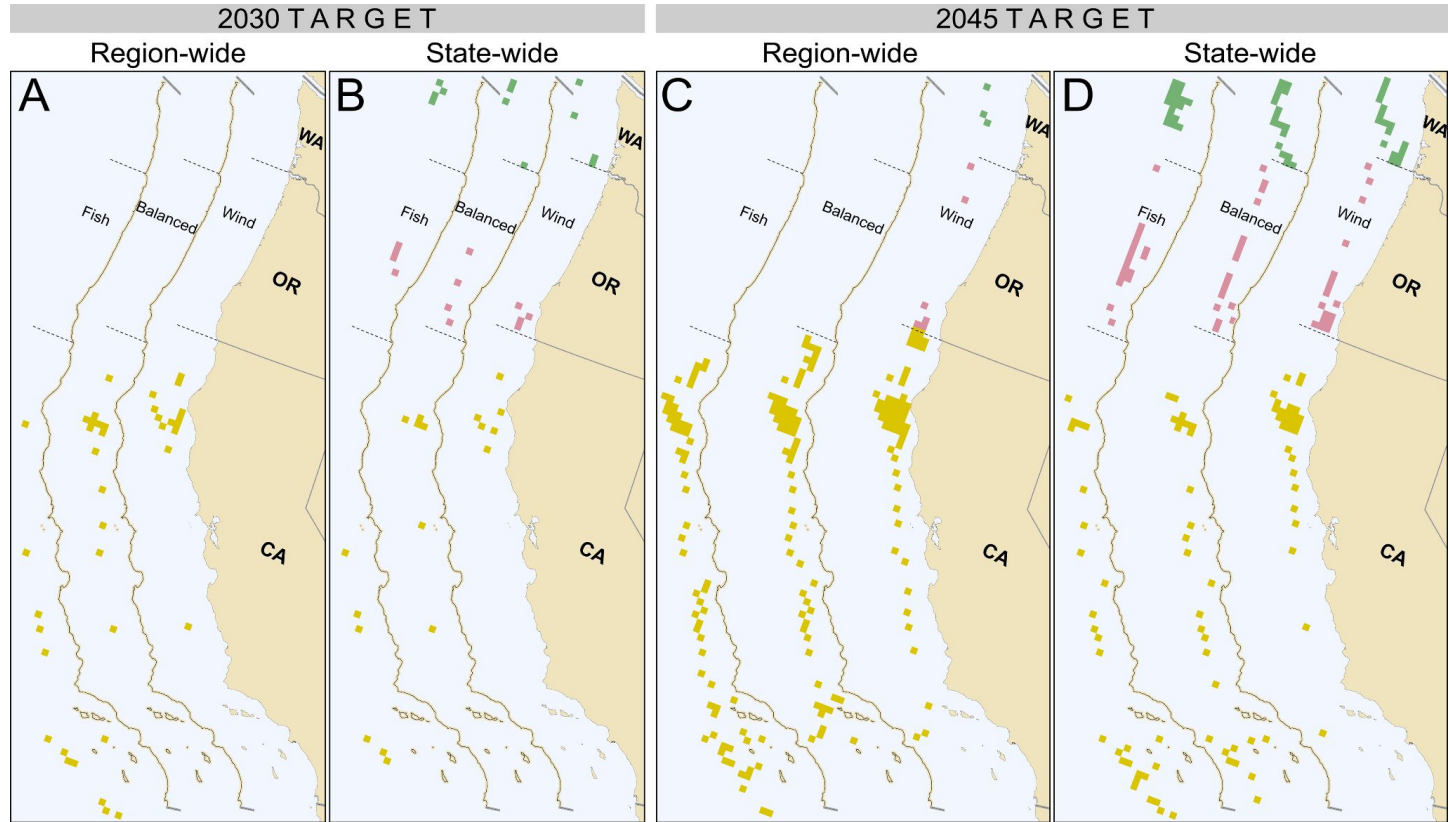
Planning tools to identify, avoid and minimize negative interactions between OSE and fisheries

Identifying spatial tradeoffs in the ocean

- Coastwide & State-by-State strategies
- Fish-centric, Balanced, and OSW-centric goals
- Levelized Cost of Energy for OSW
- Present value of top 8 fisheries species across all gear types

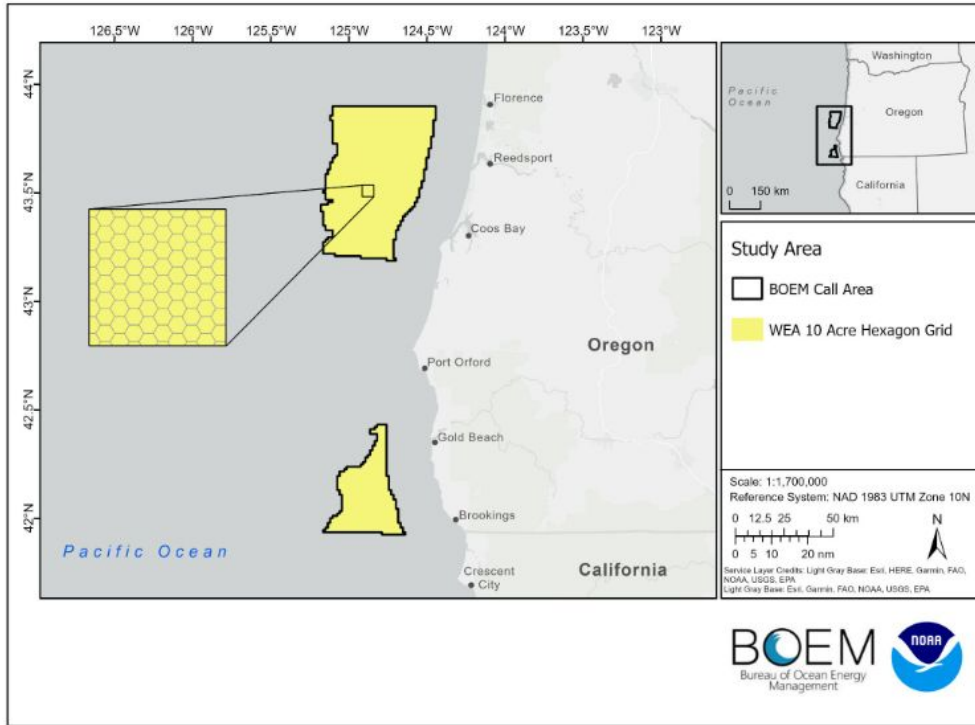


Identifying spatial tradeoffs in the ocean



Identifying spatial tradeoffs in the ocean

- Within preliminary planning area strategies



Submodels

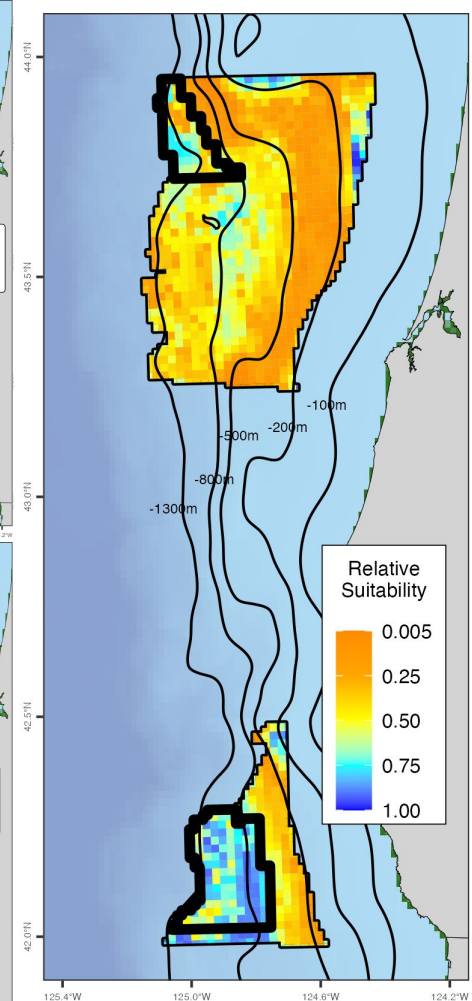
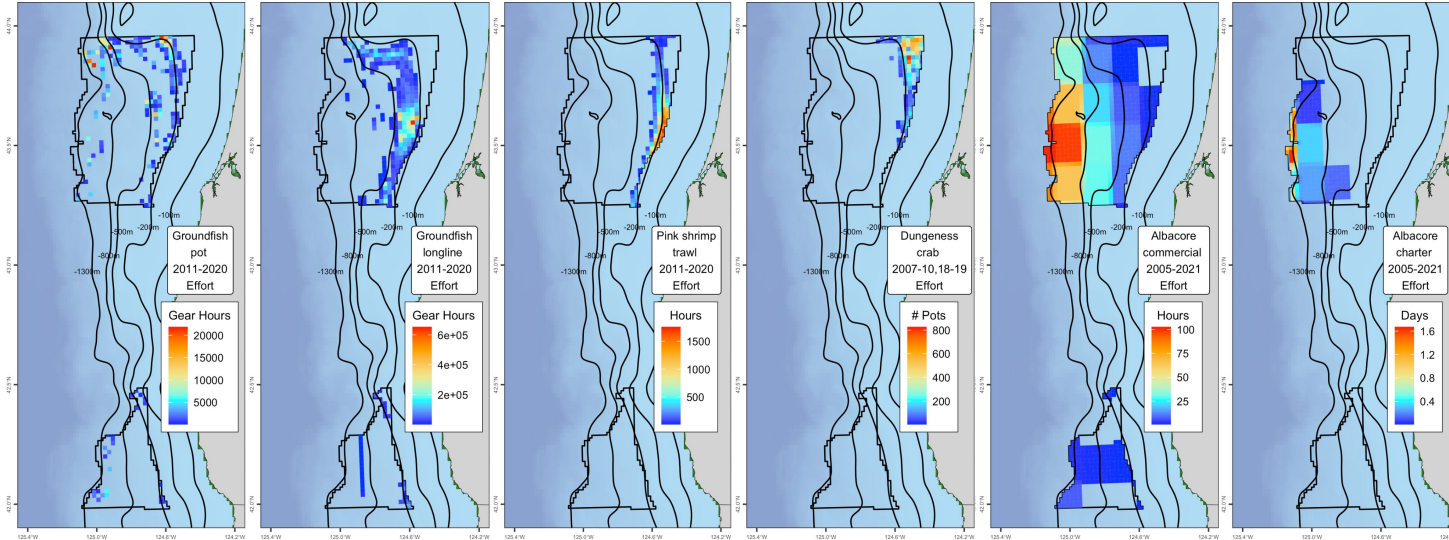


Carlton et al. 2024 BOEM



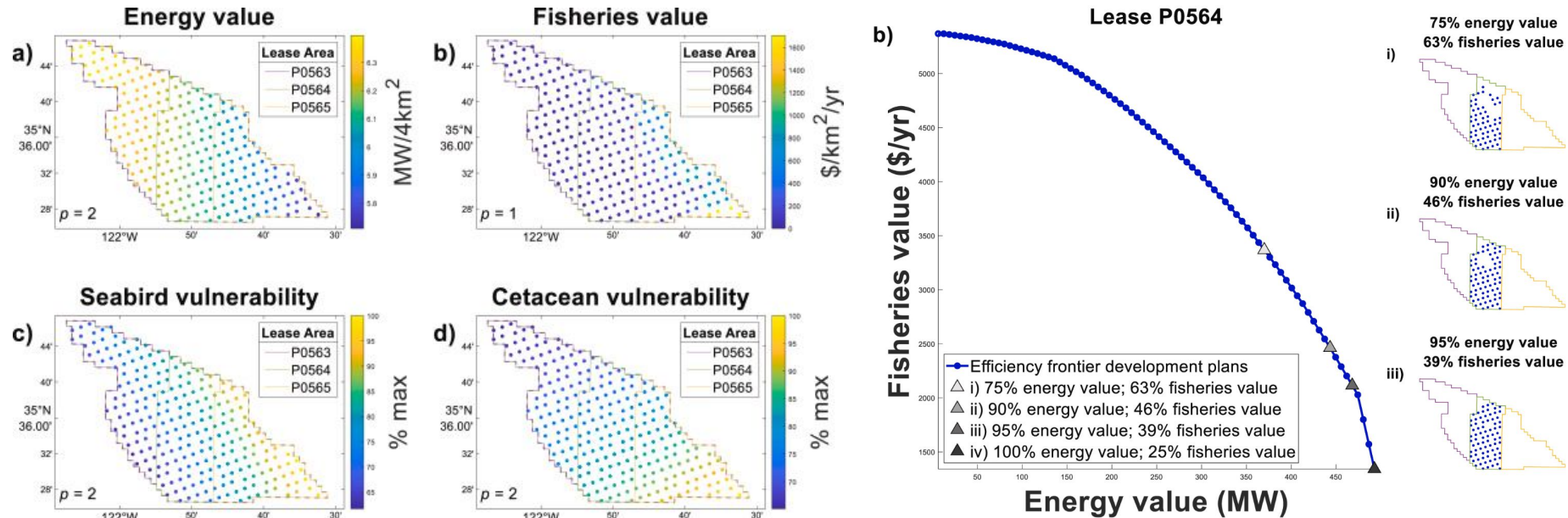
Identifying spatial tradeoffs in the ocean

- We provided data/analysis to NCCOS/BOEM suitability model for preliminary Oregon Call Areas



Identifying spatial tradeoffs in the ocean

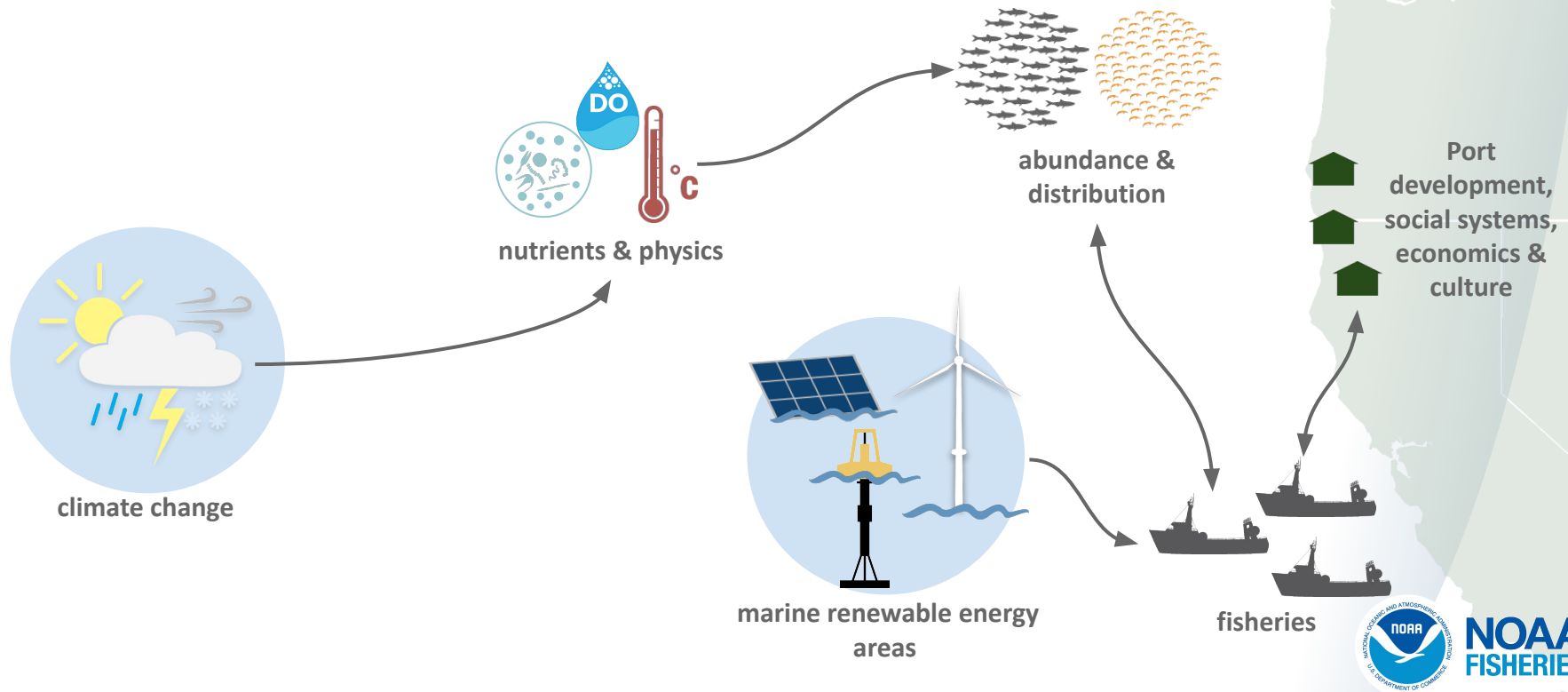
- Within final designated areas strategies



White et al. 2024 Environmental Development

Static versus dynamic perceptions of interactions

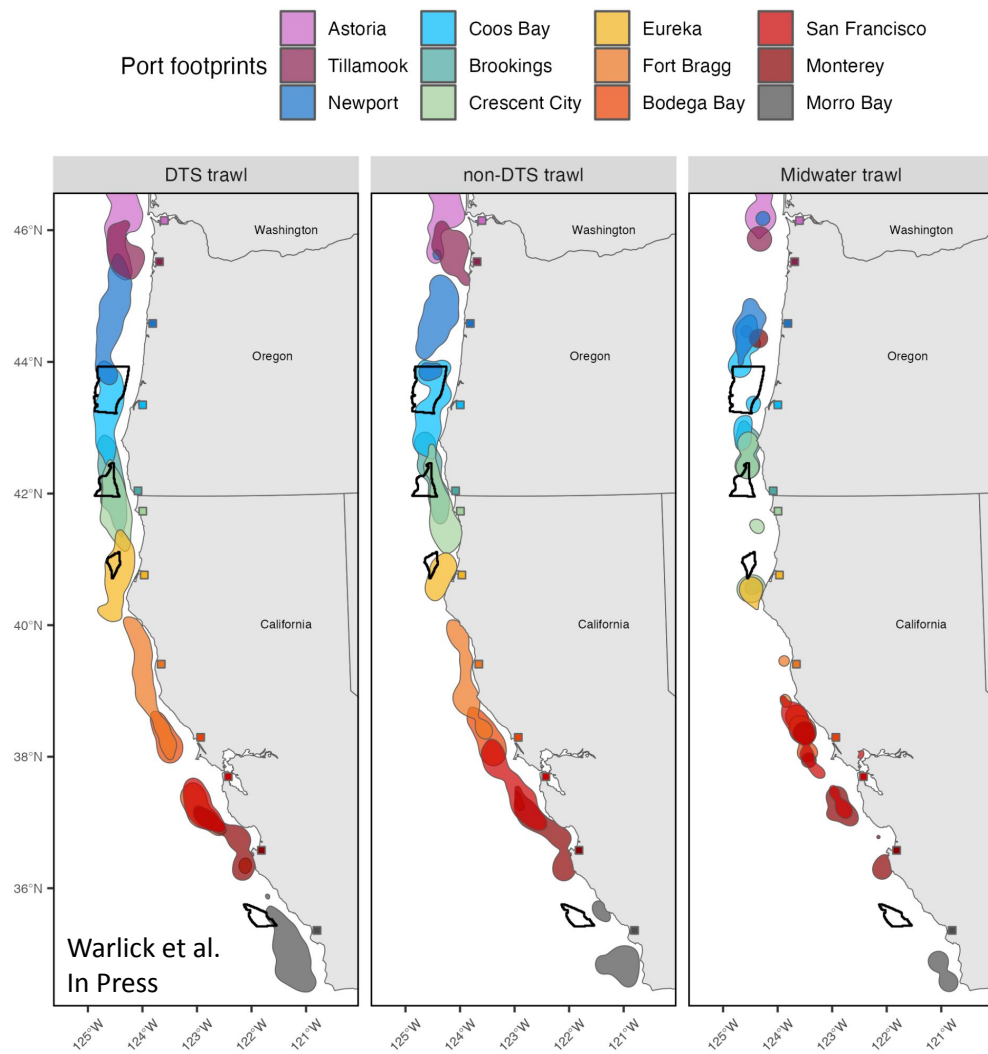
How might shifts in species distribution affect our perception of interactions?



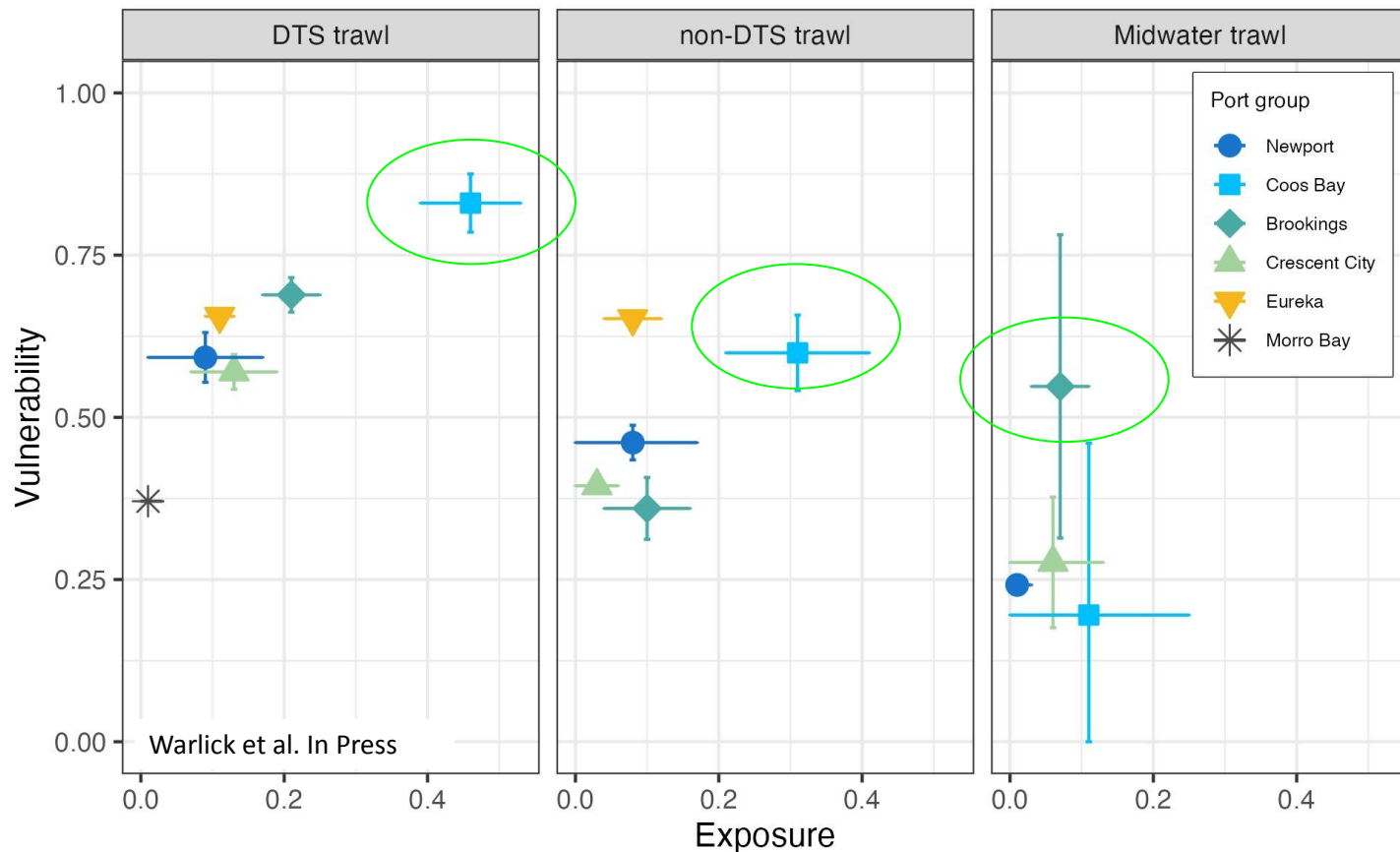
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Fisheries footprints

- Groundfish trawl fishing grounds 1994 – 2020
 - DTS groundfish bottom trawl (Dover sole, Thornyheads, Sablefish)
 - non-DTS groundfish bottom trawl
 - Midwater trawl rockfish



Historical risk of displacement from OSE areas

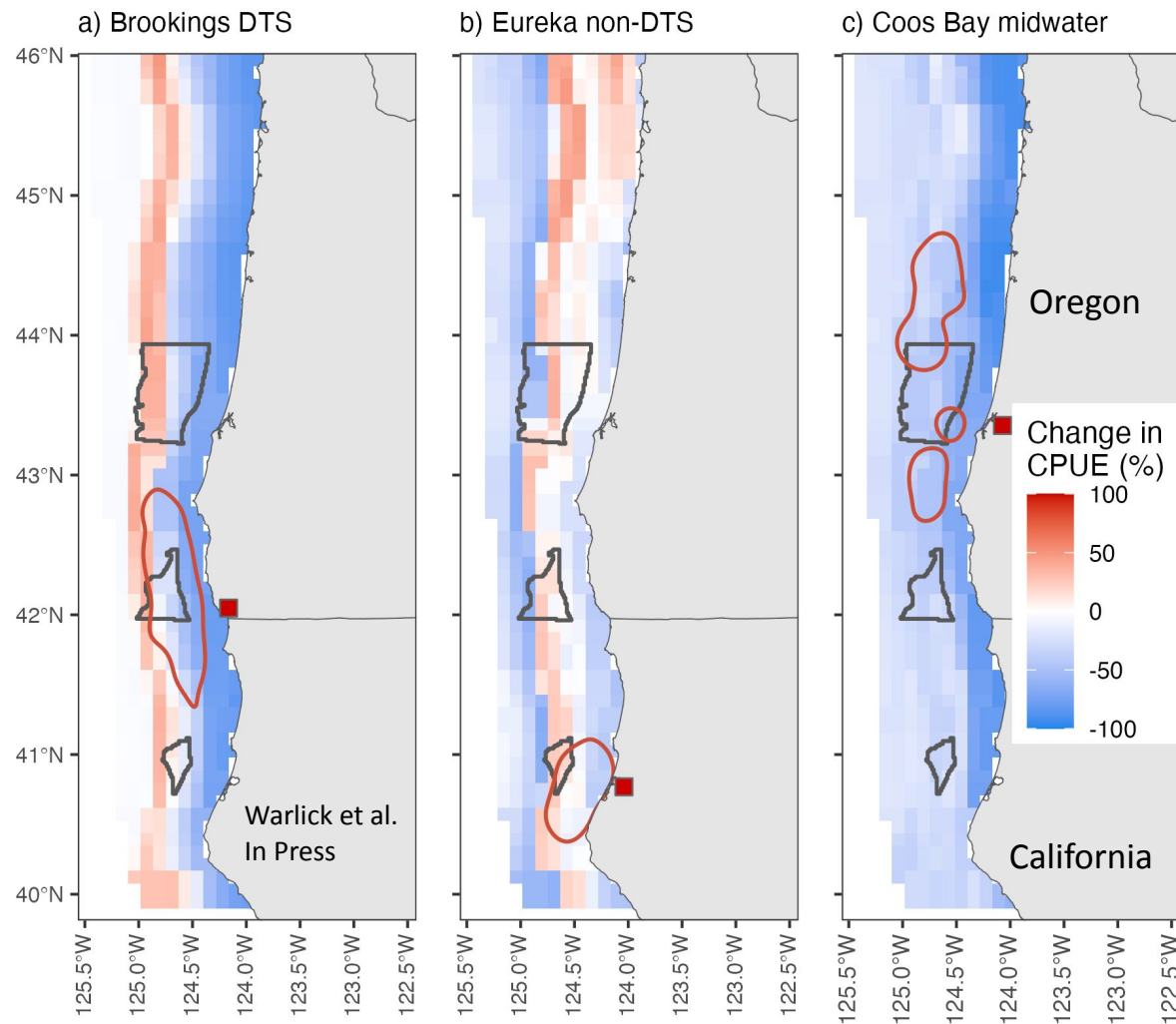


Exposure =
proportion of
footprints
overlapping
OSEAs

Vulnerability =
how easily a
fishery might
be affected

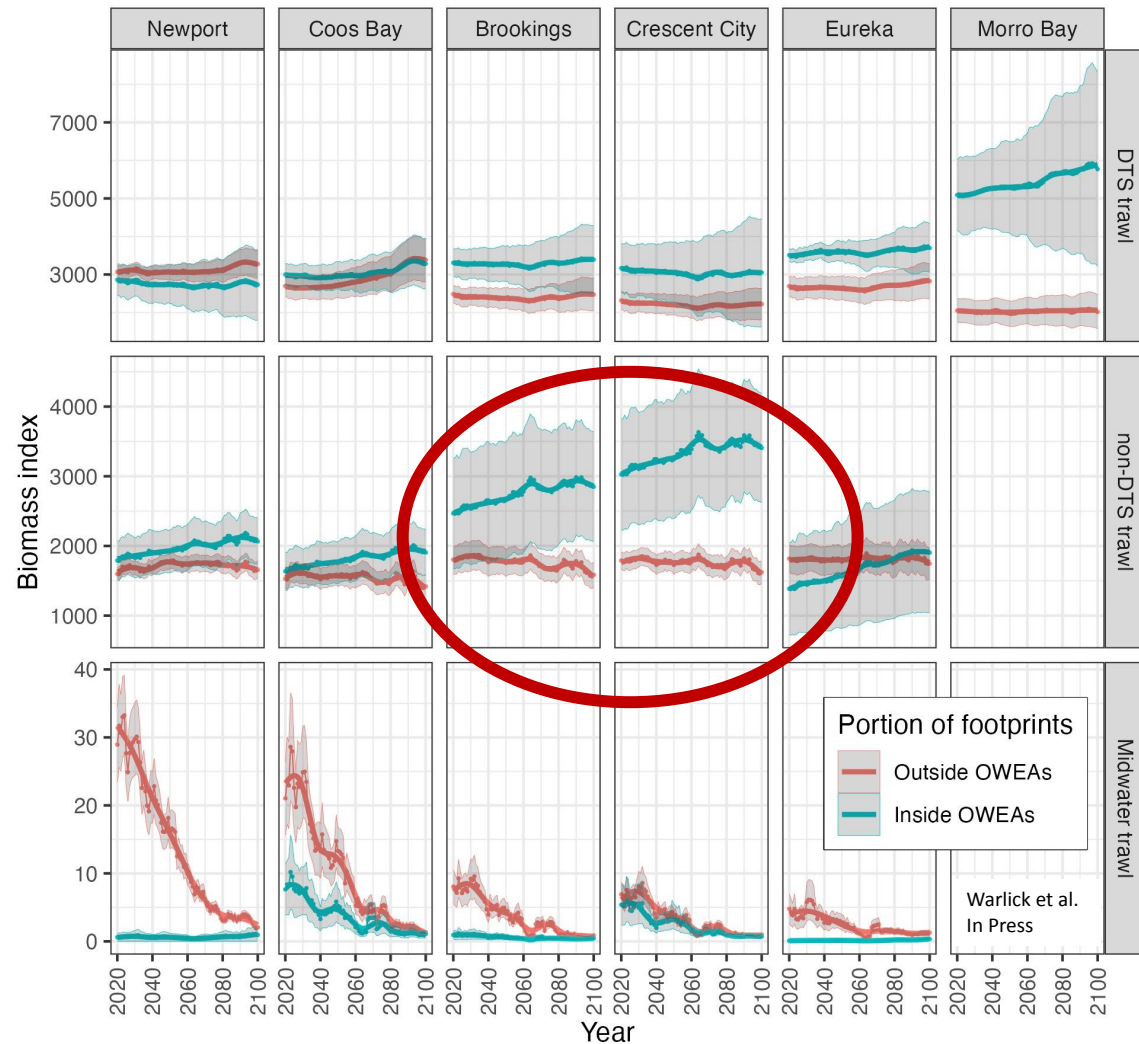
Target species distribution shifts

- Distributional shifts in target species (Liu et al. 2023)
- % change in CPUE from 2020 to the 2050-2100 average
- Shifts vary with target species

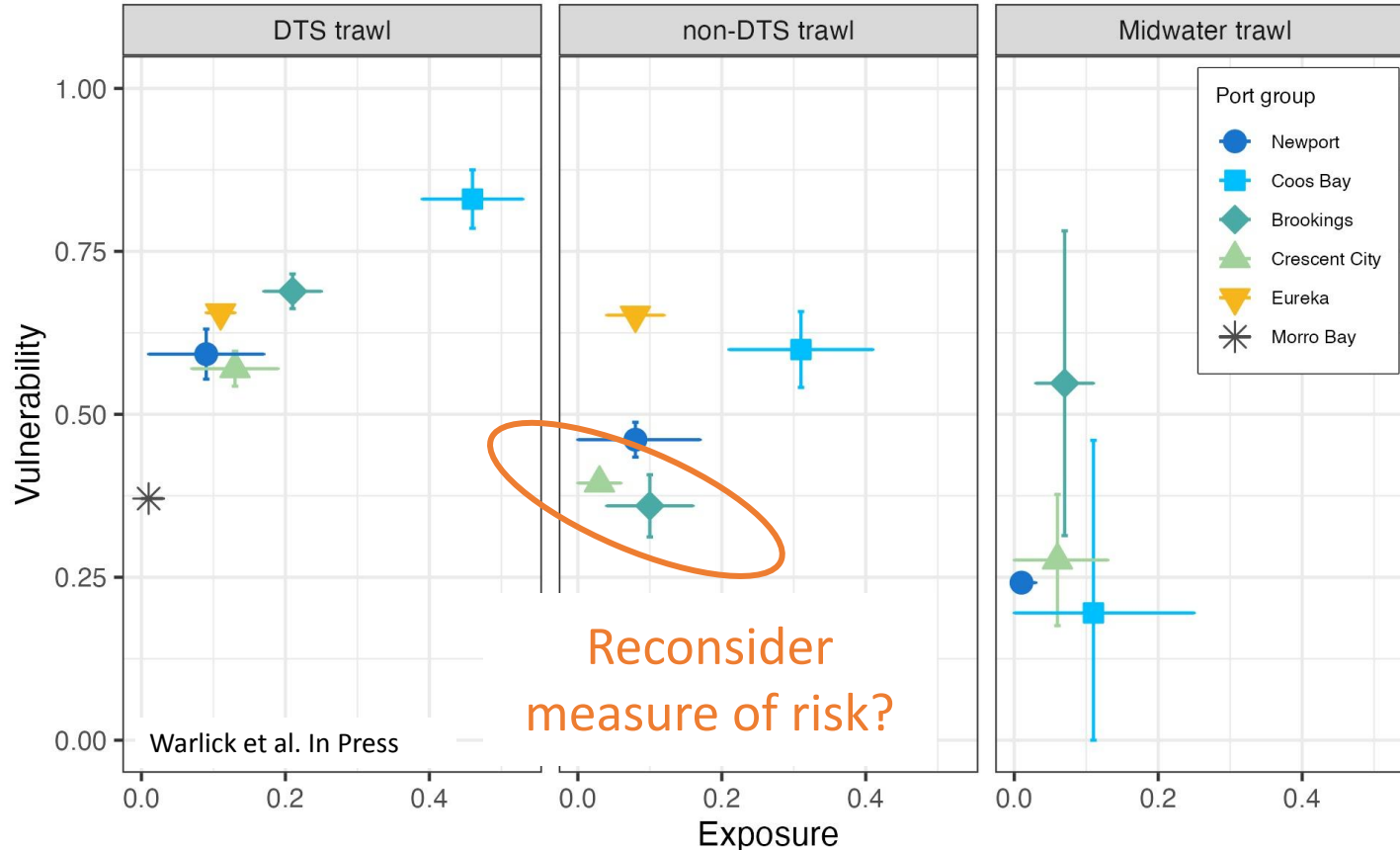


Changes to our perception of risk?

- Increasing densities of non-DTS species inside OSEAs, particularly for Brookings, OR and Crescent City, CA
- Relatively stable for DTS bottom trawl species



Historical risk of displacement from OSE areas

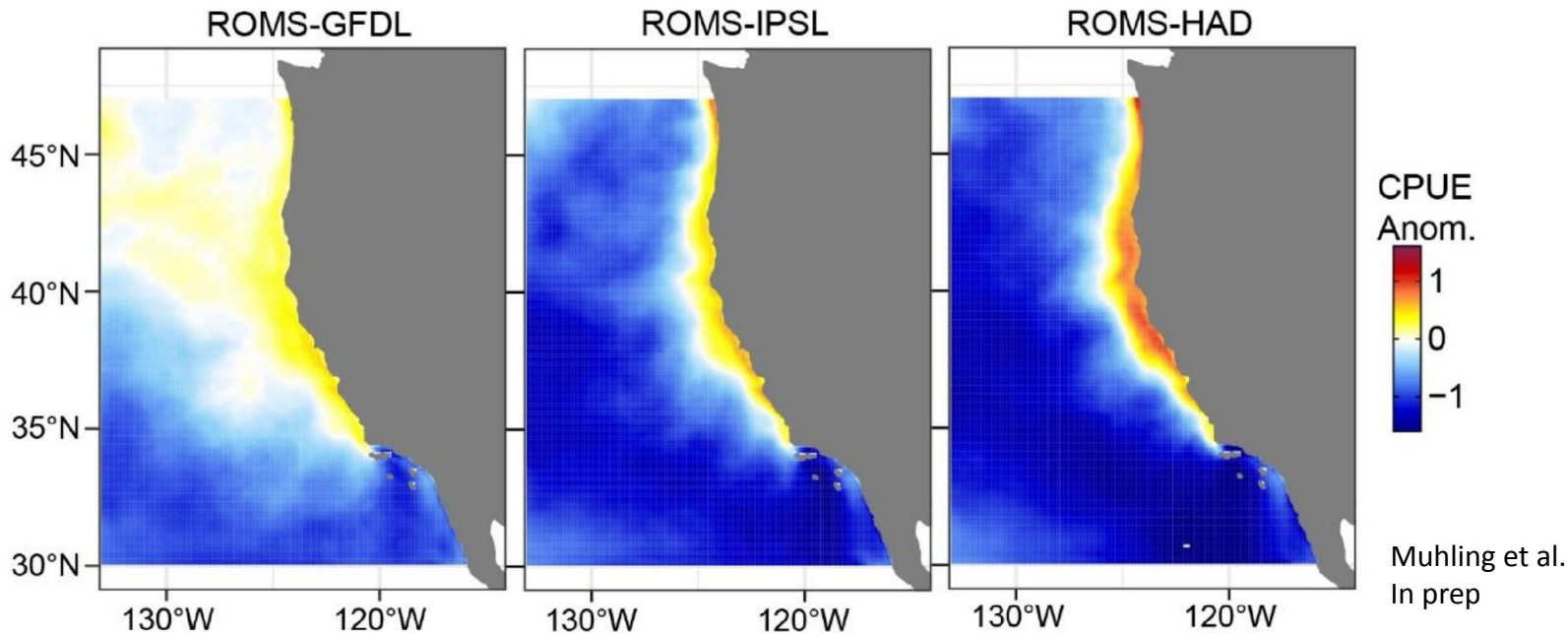


Exposure =
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Albacore fisheries risk in future?

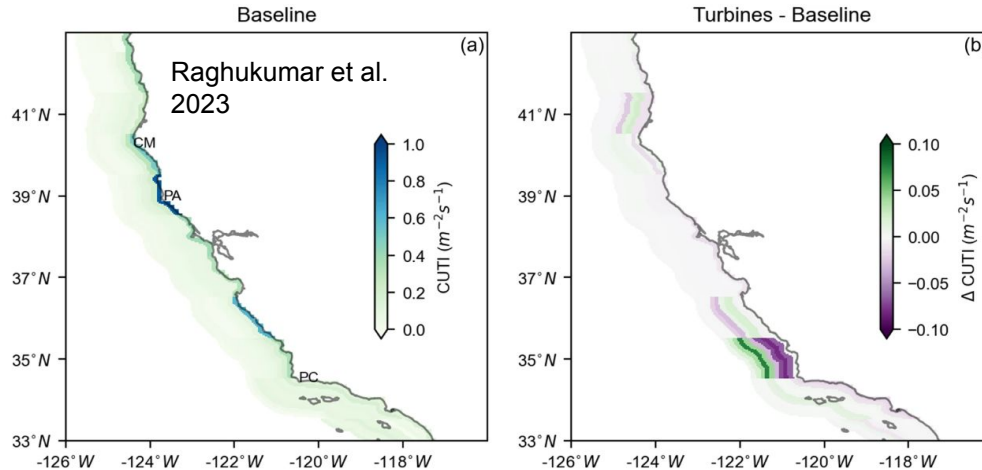
- SDM predicting albacore CPUE (fish/vessel/day) from logbooks
 - Application of this model to downscaled projections shows a northward shift in cooler months, and an inshore shift in warmer months by end 21st century



Data gaps, uncertainty and other analyses underway

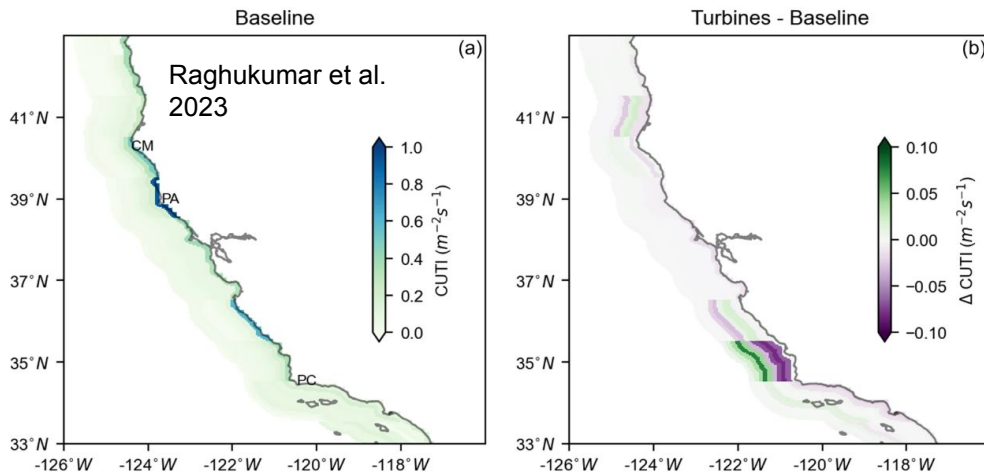
Data gaps and uncertainty for fisheries?

- Impacts to the underlying oceanographic conditions are understudied...

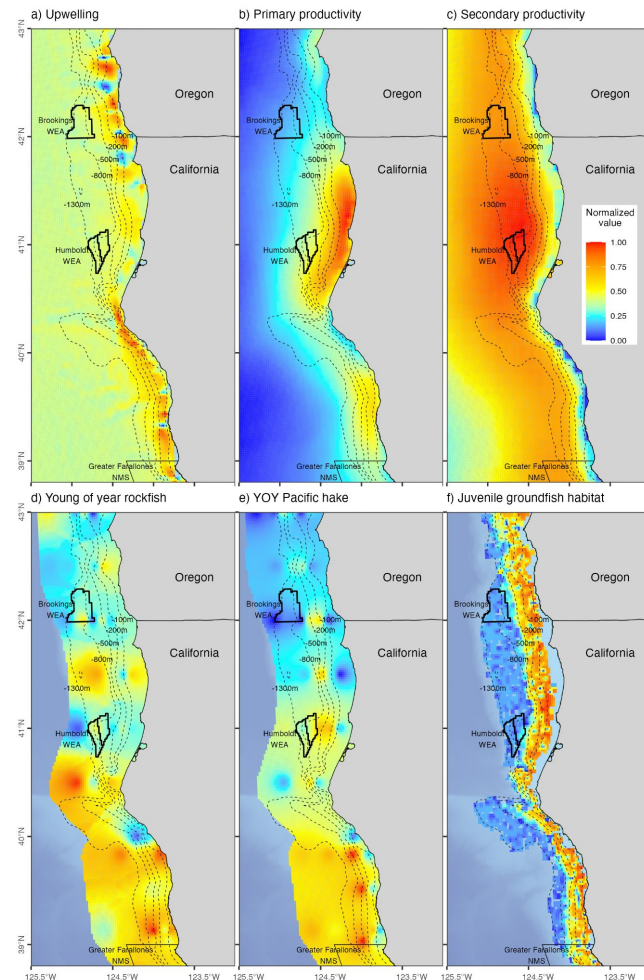


Data gaps and uncertainty for fisheries?

- Impacts to the underlying oceanographic conditions are understudied...
- Ecosystem indicators under development
 - Add to planning and siting process?
 - Guide monitoring plans and survey designs
 - Serve as early-warning indicators?

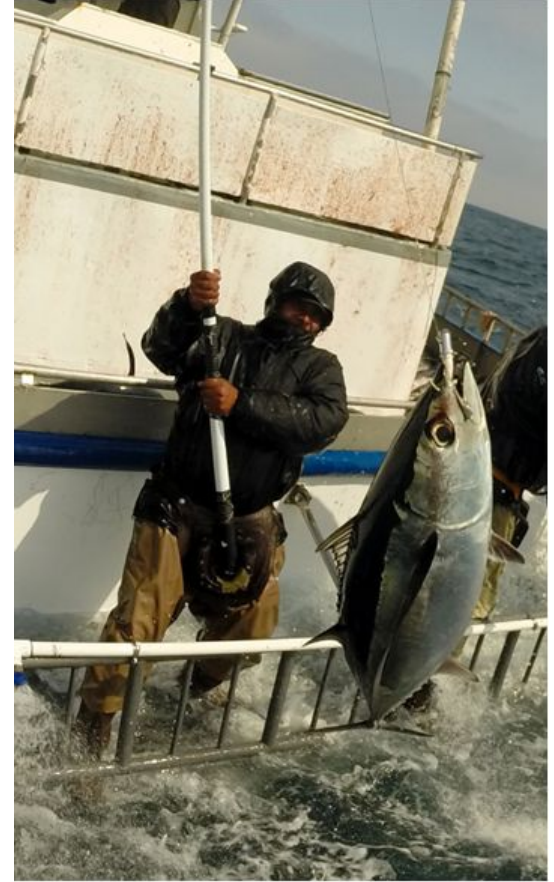


2024-2025 CA Current Ecosystem Status Report



Data gaps and uncertainty for fisheries?

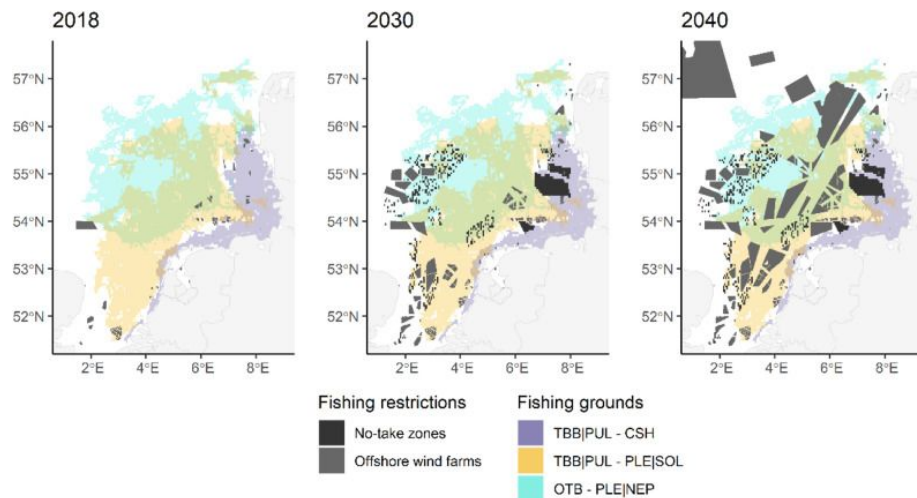
- Impacts to the underlying oceanographic conditions are understudied...
- Ecosystem indicators under development
 - Add to planning and siting process?
 - Designing monitoring plans and designs
 - Serve as early-warning indicators?
- Attraction versus production near new infrastructure?



Data gaps and uncertainty for fisheries?

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 - Add to planning and siting process?
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- Attraction versus production near new infrastructure?
- Fisheries behavior modeling
 - Where will fishers redistribute effort?
 - How will costs/revenue change?

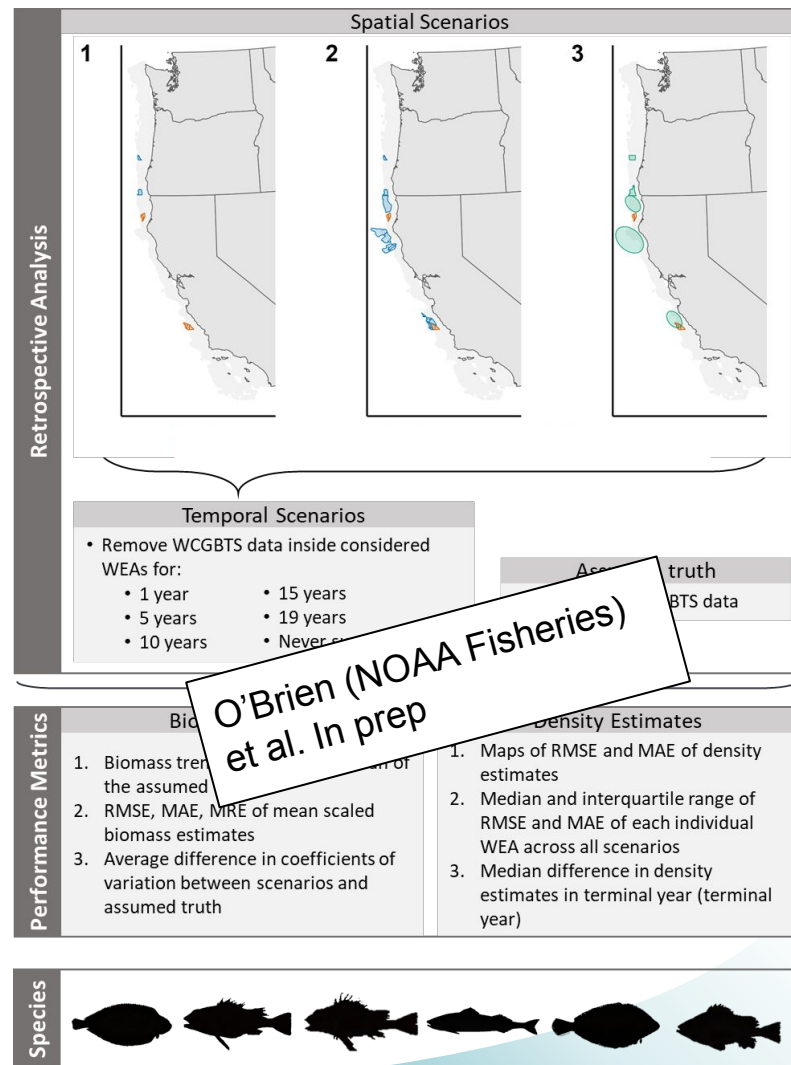
North Sea example



Letschert et al. 2025

Data gaps and uncertainty for fisheries?

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- Fisheries behavior modeling
 - Where will fishers redistribute effort?
 - How will costs/revenue change?
- Impacts to survey data and stock assessments?



Take home messages...

1. Seasonal upwelling fuels productivity
2. Spatial planning tools are available for identifying & minimizing potential interactions
3. Including future scenarios in planning efforts may reveal important considerations
4. There are many understudied links for assessing impacts to fisheries

NMFS West
Coast Strategic
Science Plan



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Questions?

