# SMURFing along the Oregon coast: Understanding the impacts of a changing climate on rockfish recruitment

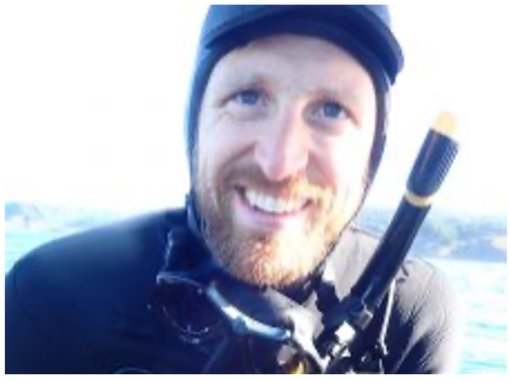
Kirsten Grorud-Colvert (OSU)
along with Su Sponaugle & Cameron Royer (OSU),
ODFW Marine Reserves Team
& Oregon Coast Aquarium

Oregon State University

Oregon Ocean Science Trust

Oregon Coast Aquarium

OREGON Fish & Wildlife



OREGON
MARINE RESERVES
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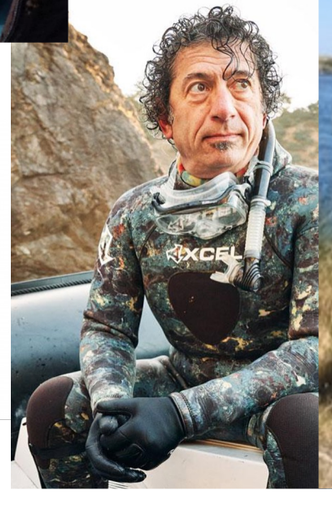

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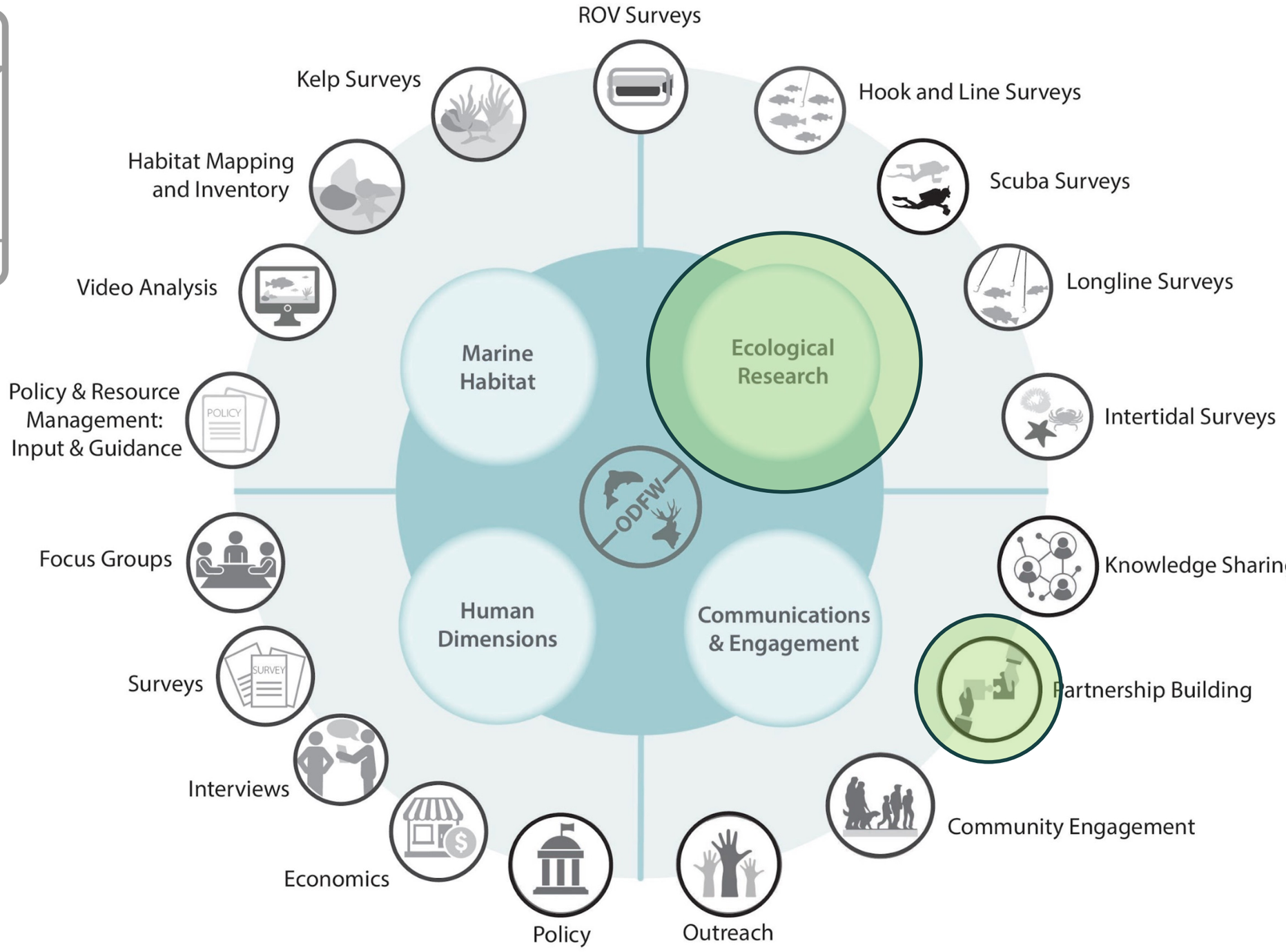
Nearshore Ecology Program



# Goals

## MARINE RESERVES

### Conservation

- Conserve marine habitats and biodiversity

### Research

- Serve as scientific reference sites

### Communities

- Sense of Place
- Avoid significant adverse impacts to ocean users and coastal communities

# FIVE SITES

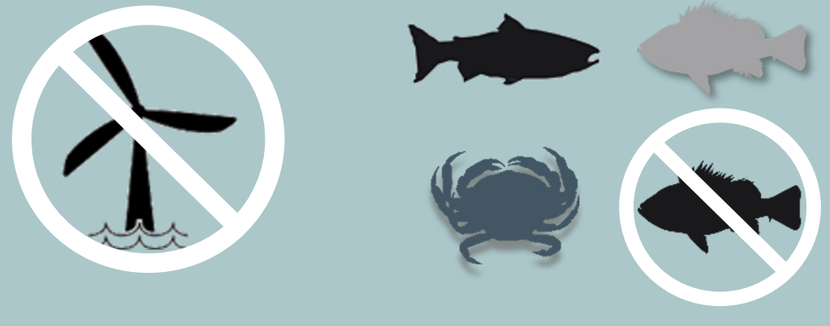
% State Waters

Marine Reserve

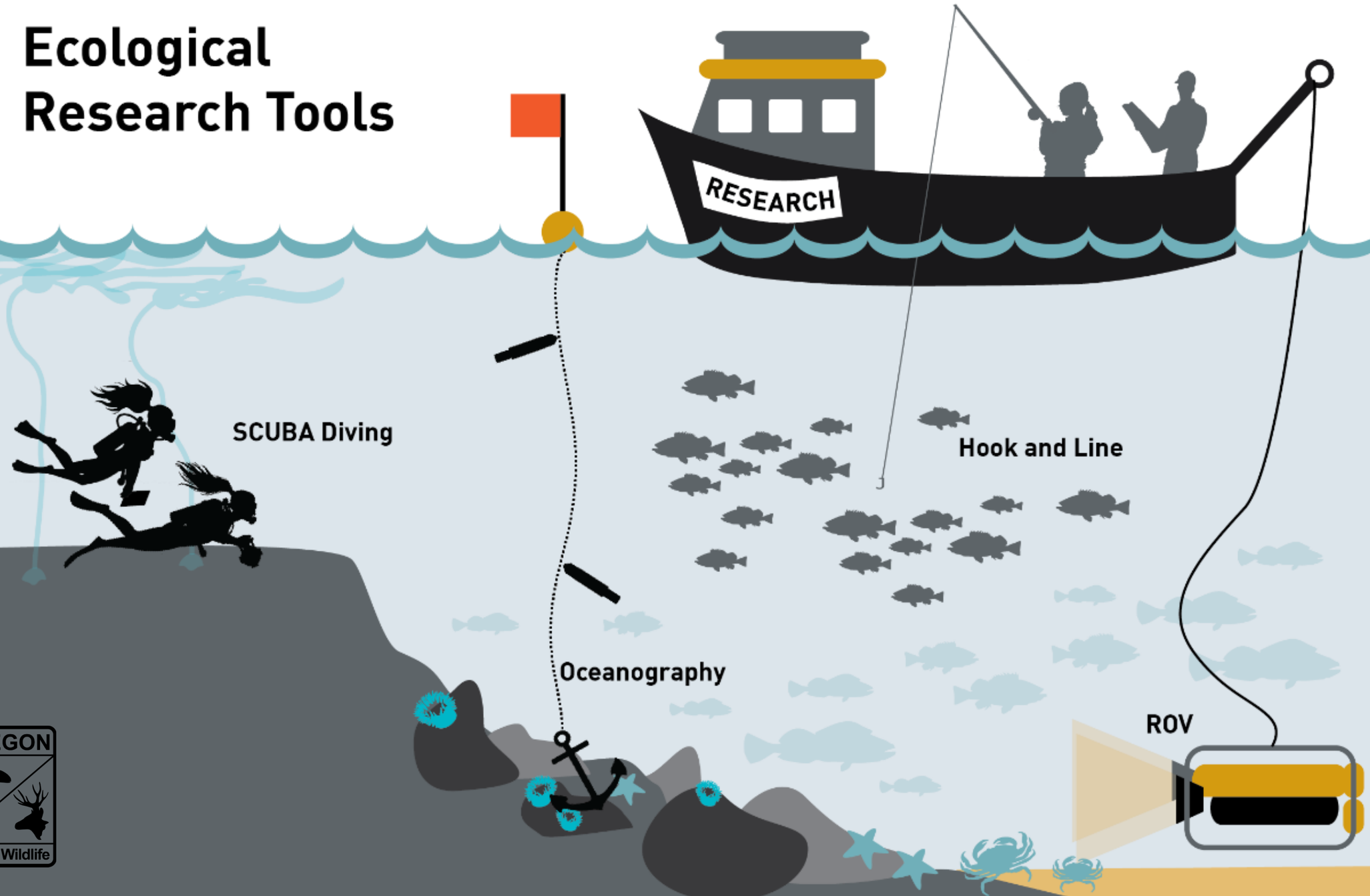
3%

Marine Protected Area

6%



# Ecological Research Tools



# OSU - ODFW – OCAq SMURF collaboration

Longstanding collaboration has grown since 2011, at both Otter Rock MR and Redfish Rocks MR

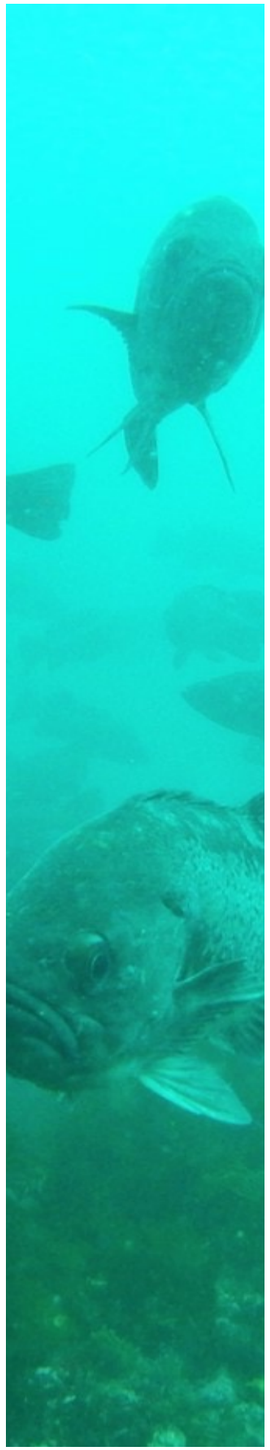
Falls within marine reserves mandates of a) conserving biodiversity (**understanding and quantifying**) and b) serving as scientific reference sites (**hubs for collaborative research**)

Work together very closely to make the yearly SMURF cycle happen!

Application to OR nearshore management (stock assessments e.g., Cabezon 2019, Black Rockfish 2023, Yellowtail 2025)

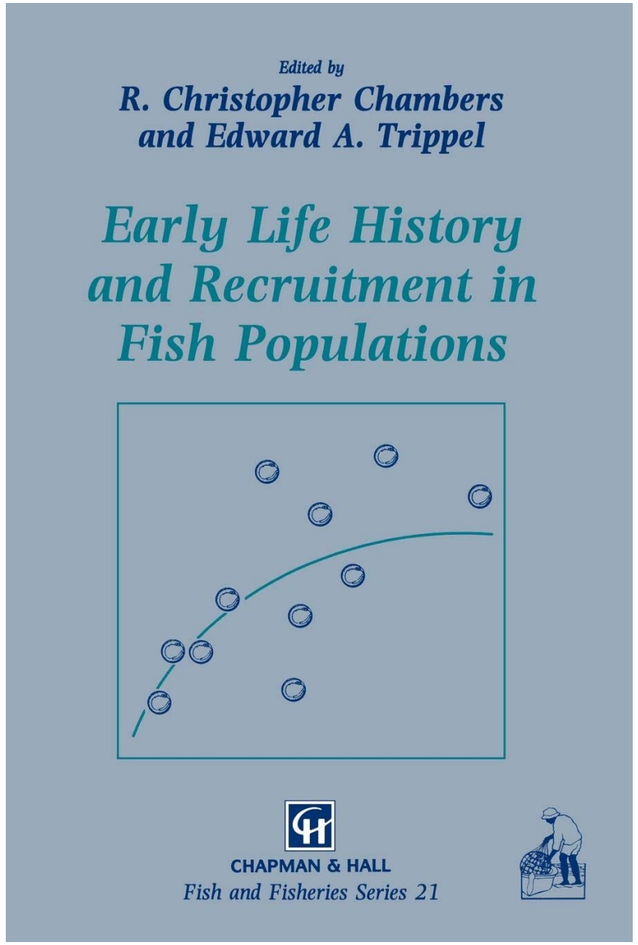
# Groundfish in Oregon

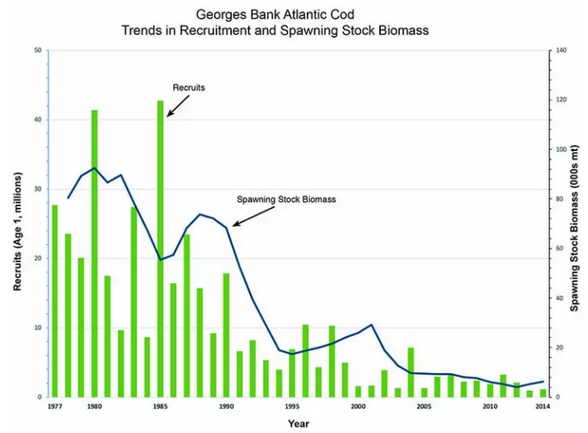
ODFW



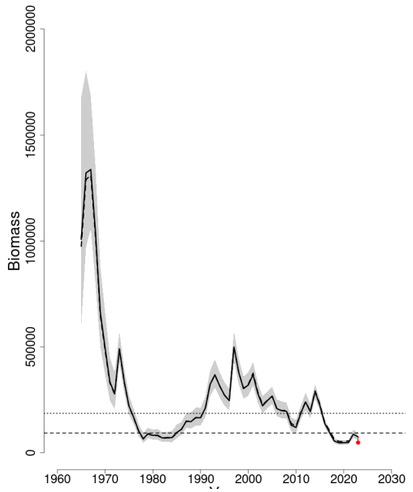
# Recruitment variability

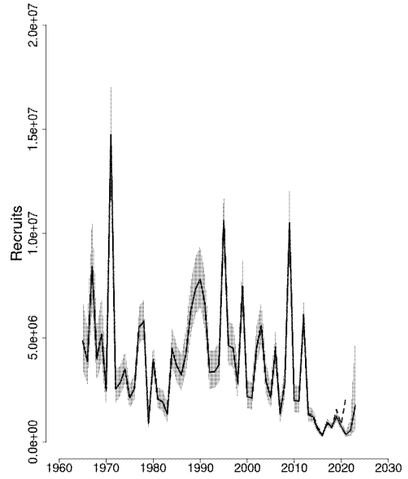
## influences adult dynamics, which can drastically affect stocks

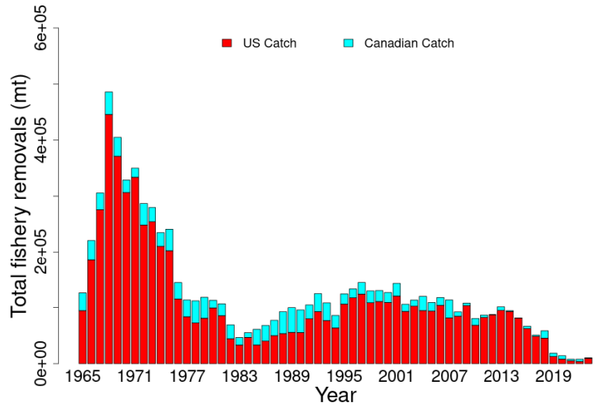



Low recruitment (along with intensive fishing) caused spawning stock biomass to plummet for Georges Bank cod and Atlantic herring

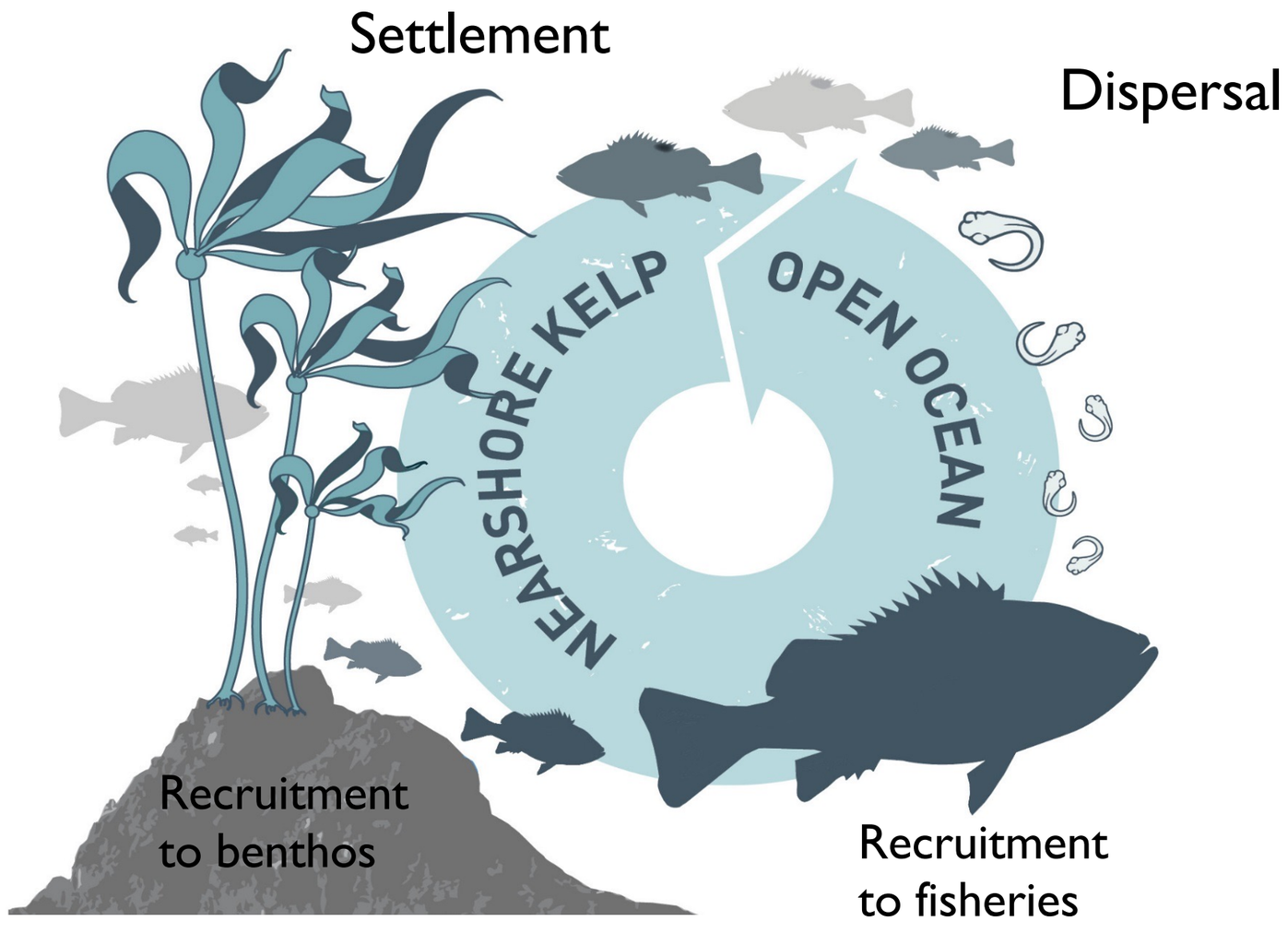



Atlantic States Marine Fisheries Commission

# Juvenile recruitment is a key component of understanding important species and stocks

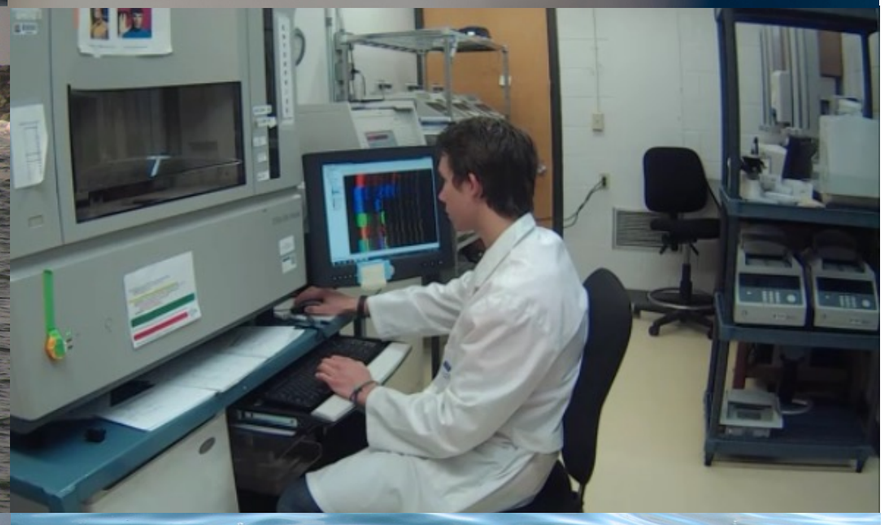



Schematic: ODFW

These juveniles are exposed to a productive but highly variable environment

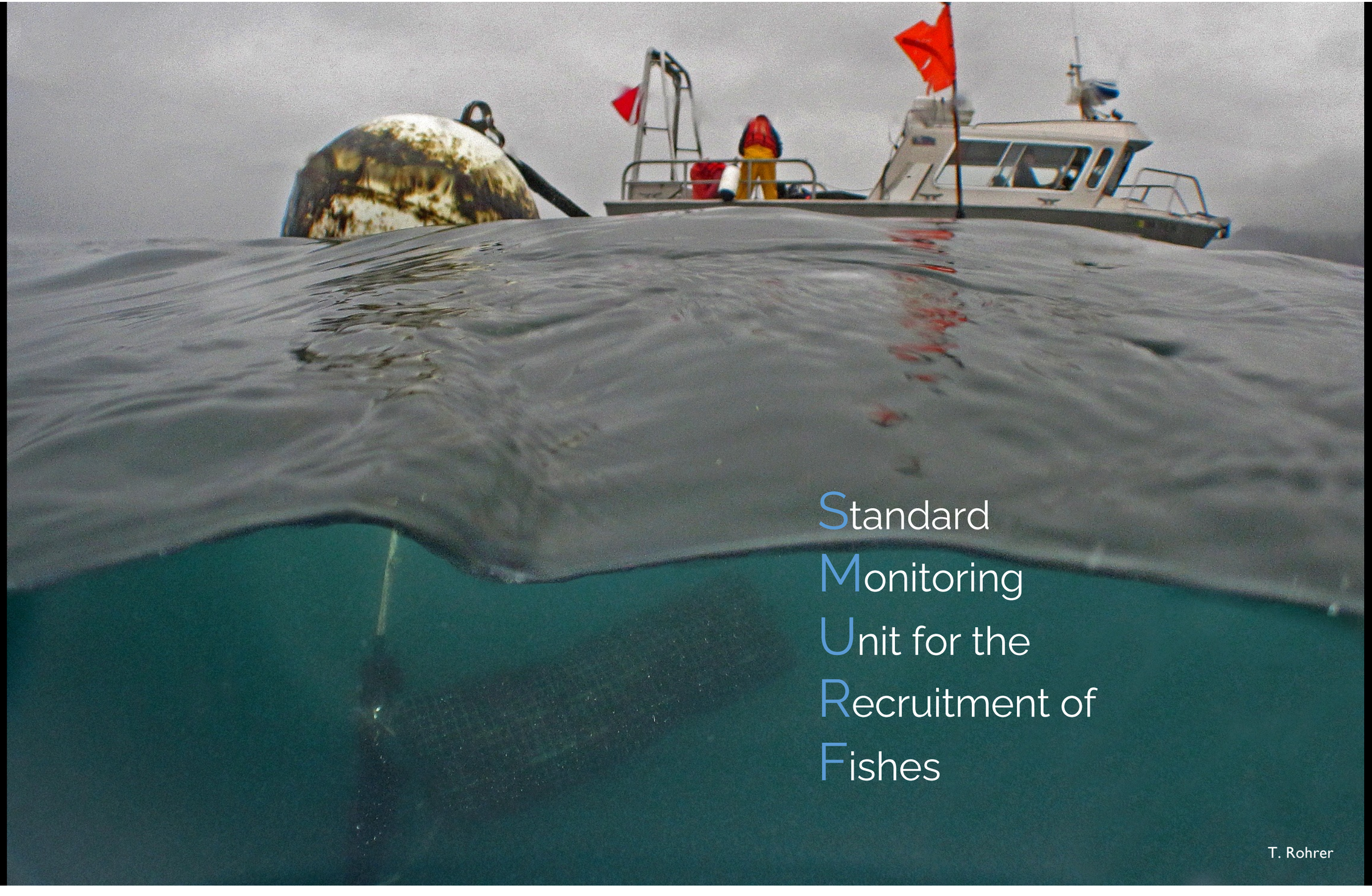
What does that mean for recruitment in a changing ocean?

ODFW


# The SMURF Project

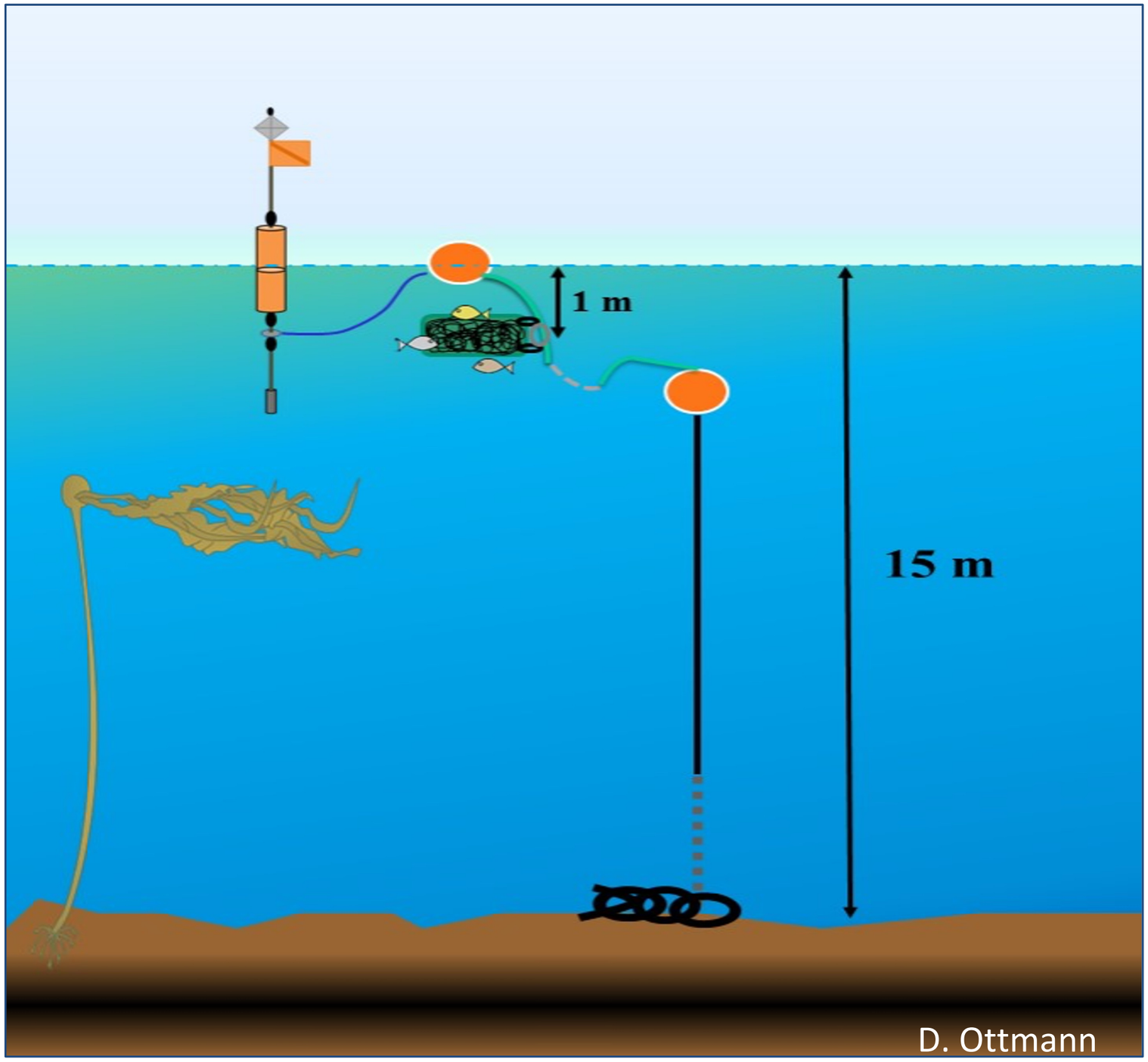
## Understanding juvenile dynamics of commercially and culturally important fishes

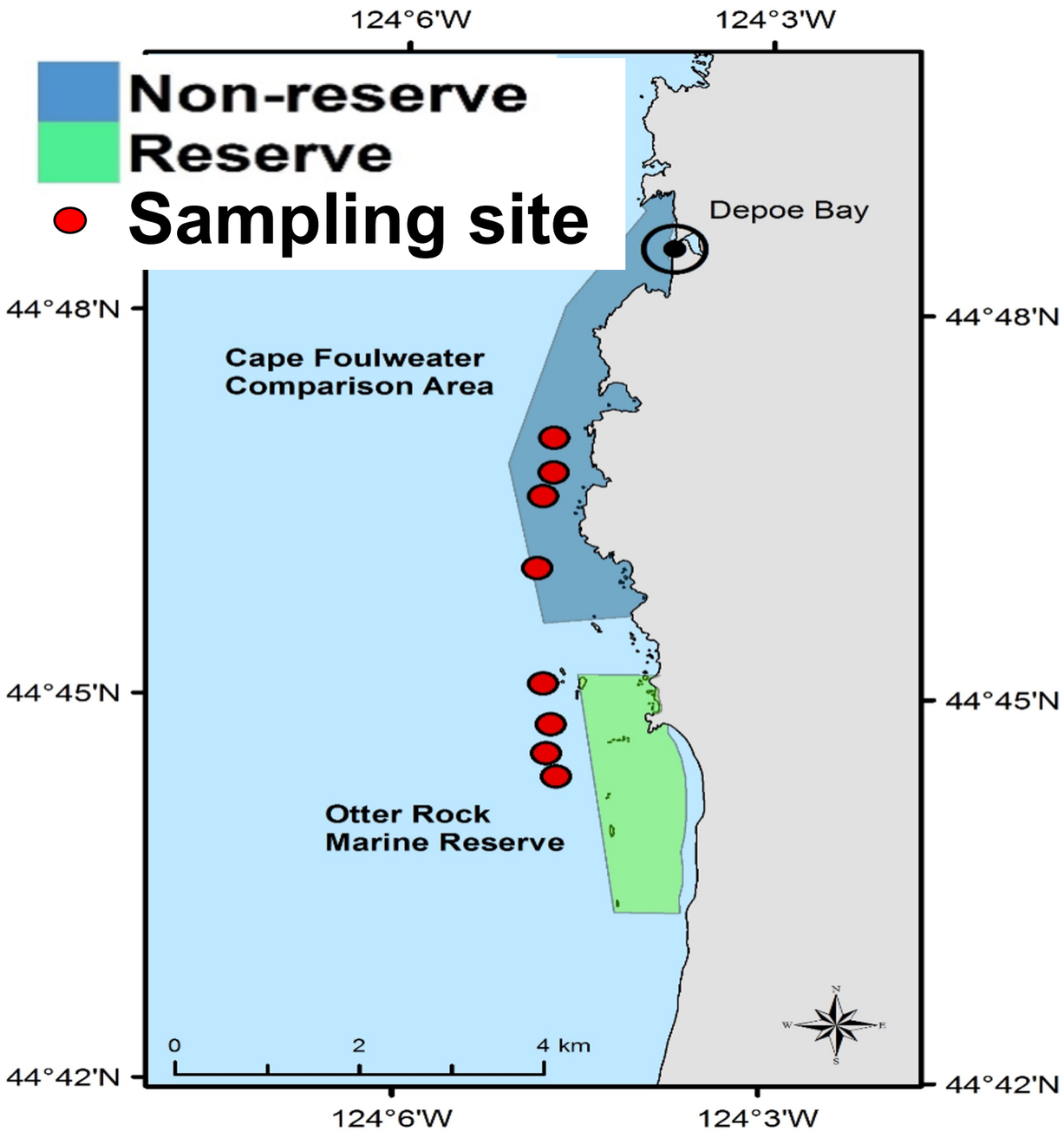


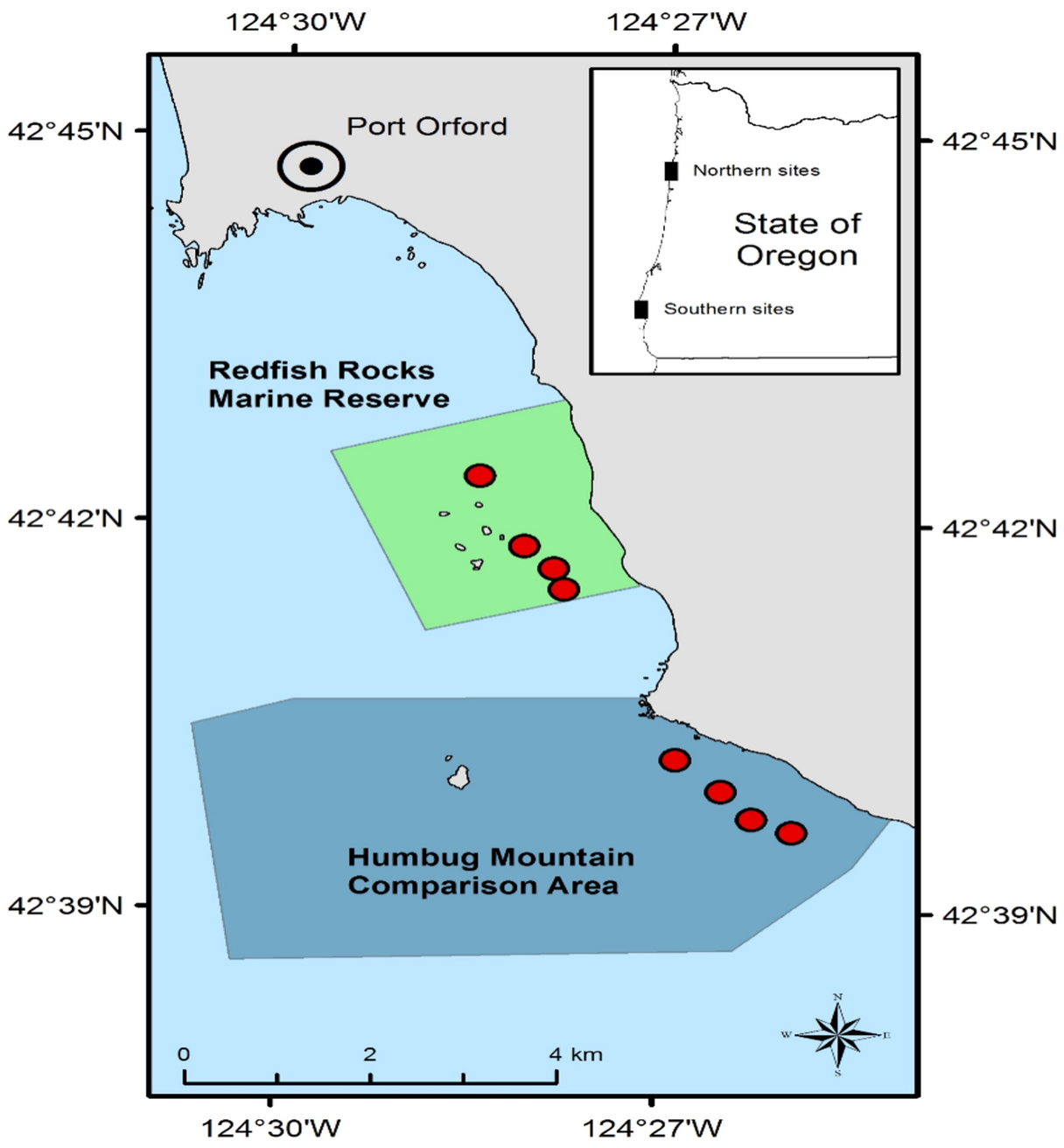
# Standard Monitoring Unit for the Recruitment of Fishes

T. Rohrer

# SMURFs




Non-reserve
Reserve
Sampling site
124°6'W
124°3'W
44°48'N
44°45'N
44°42'N
Depoe Bay
Cape Foulweater
Comparison Area
Otter Rock
Marine Reserve
0
2
4 km
N
W
E
S

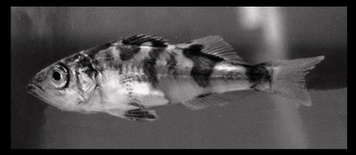

124°30'W
124°27'W
42°45'N
42°42'N
42°39'N
Port Orford
Northern sites
State of
Oregon
Southern sites
Redfish Rocks
Marine Reserve
Humbug Mountain
Comparison Area
0
2
4 km
N
W
E
S

# SMURFs are deployed nearshore and retrieved every 2 weeks

# Common fish recruits

Cabezon

Red Irish lord



Bocaccio

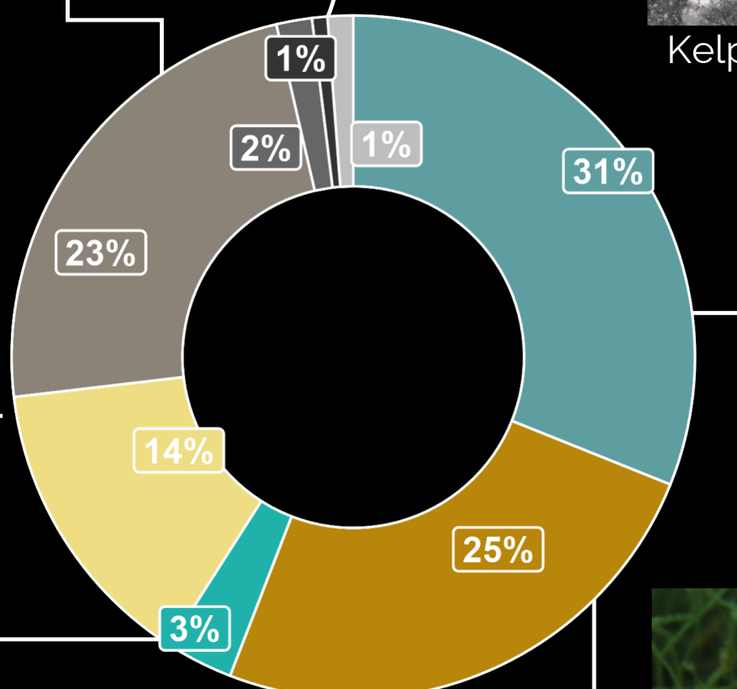
Rock greenling

Kelp greenling

Slimy snailfish


Prickleback

Penpoint gunnel



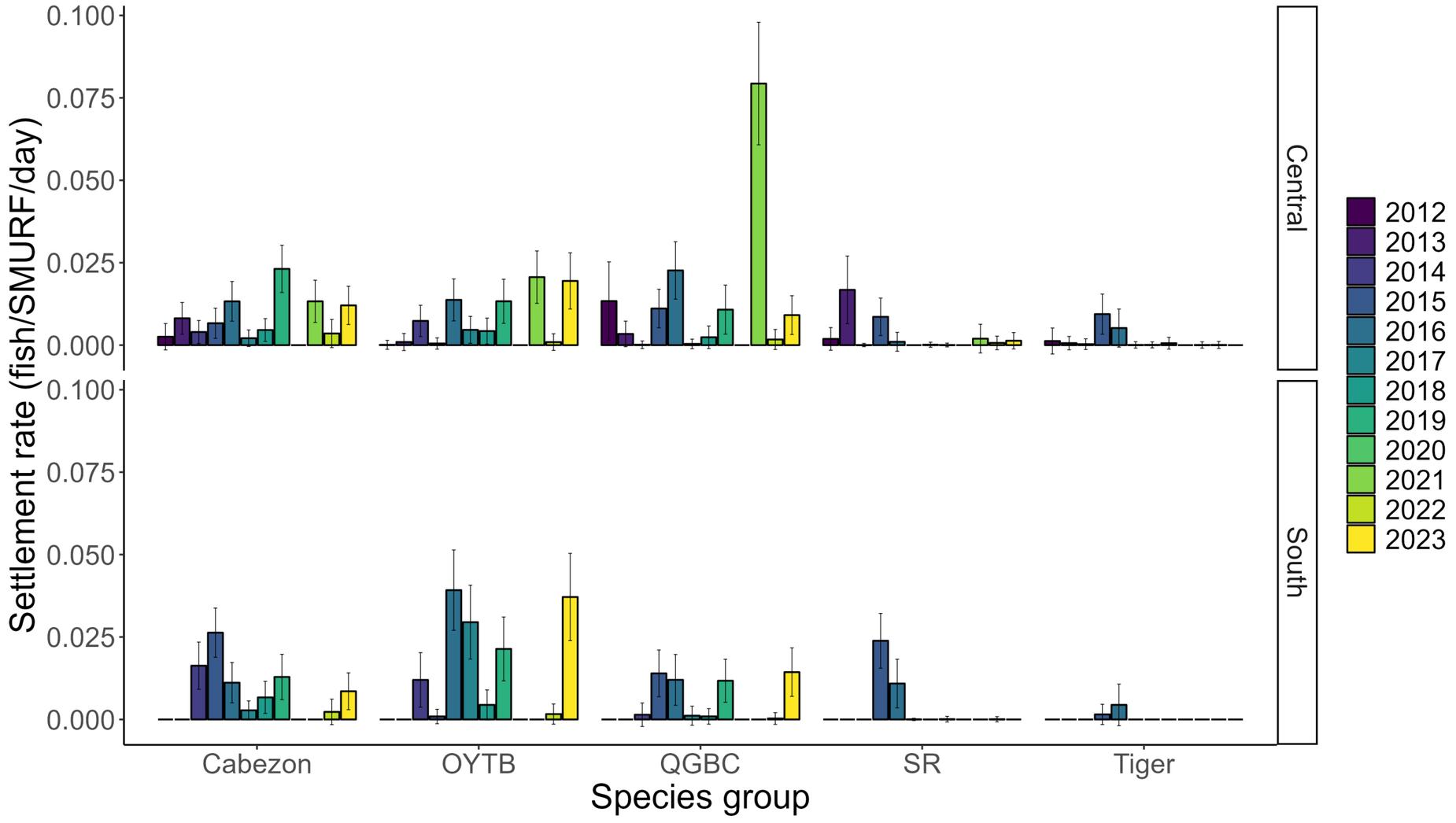

**SR** = Splitnose/Redbanded

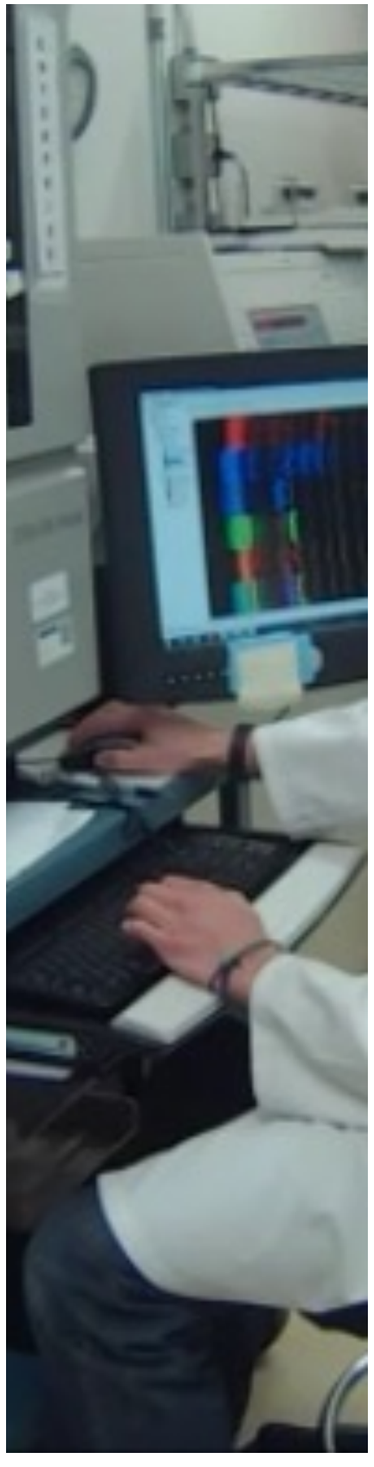

Tiger rockfish

**OYTB** = Olive / Yellowtail / Black / Blue rockfish

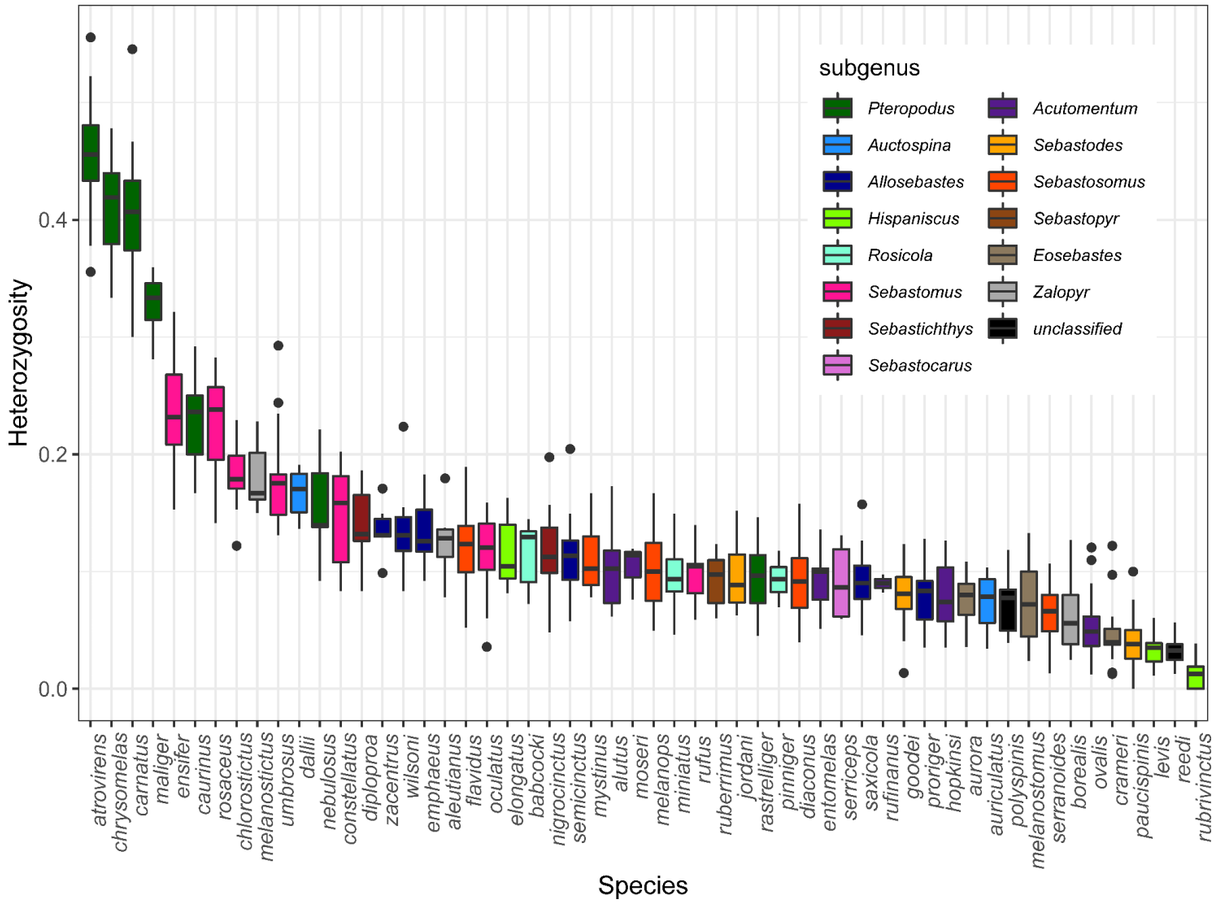
**QGBCC** = Quillback / Gopher / Black & Yellow / Copper / China rockfish

# Variability in fish recruitment



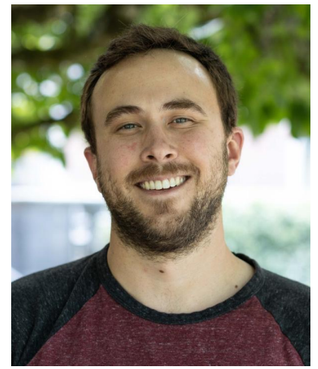


# We now use cutting edge genetic techniques to ID juvenile rockfishes

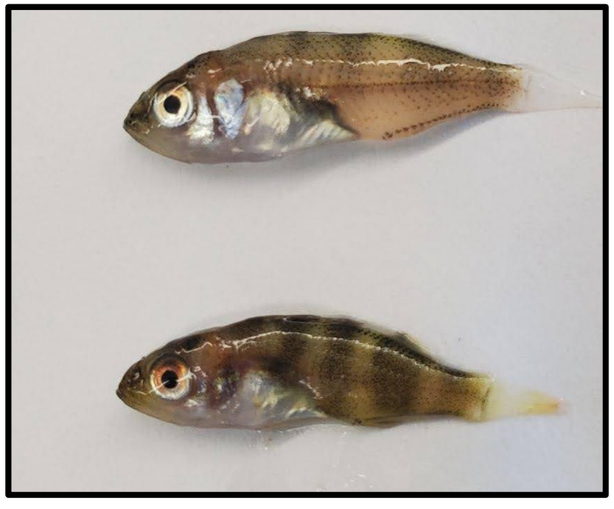


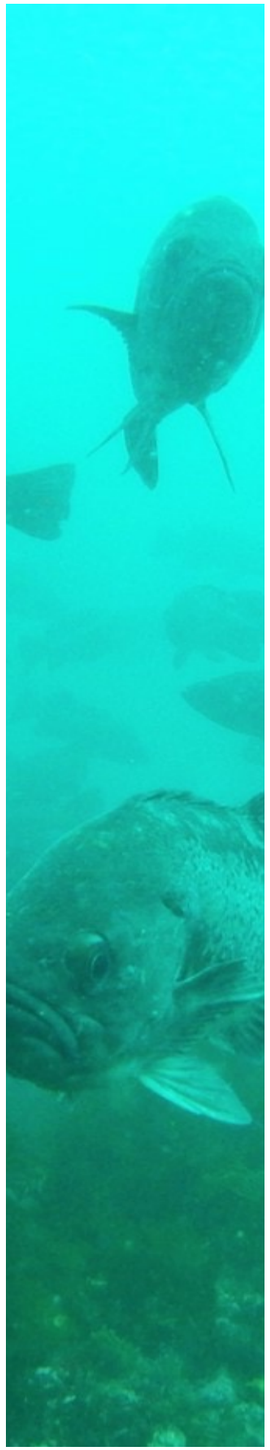

Baetscher, D. S., H. M. Nuetzel, and J. C. Garza. 2023. Highly accurate species identification of Eastern Pacific rockfishes (Sebastes spp.) with high-throughput DNA sequencing. Conservation Genetics.

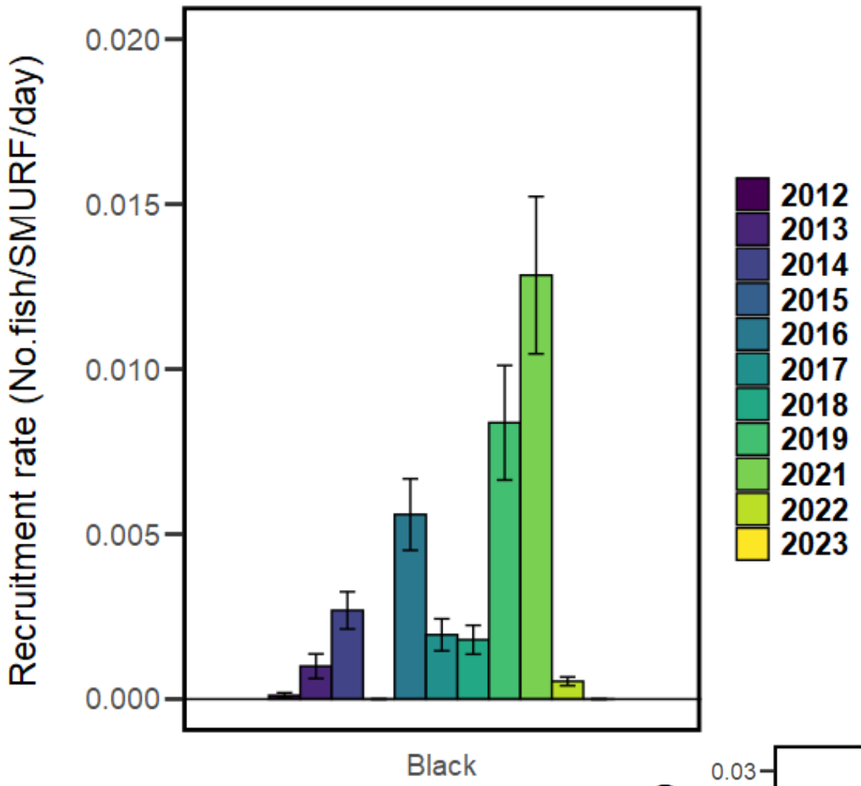
Kathleen O'Malley
ODFW State Fisheries Geneticist

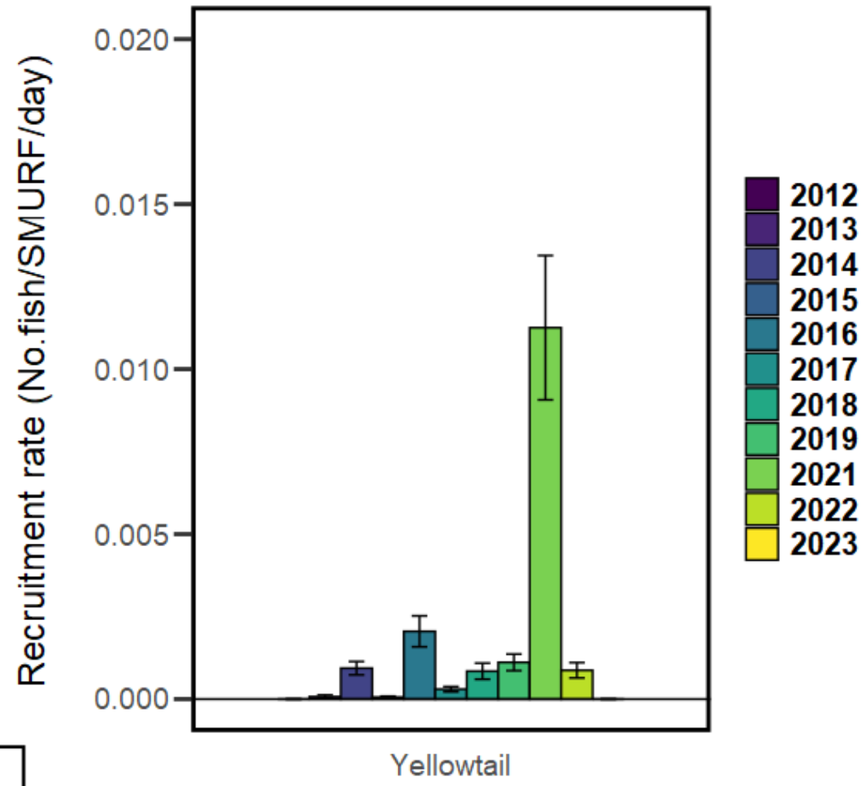


Cameron Royer
OSU Grad Student

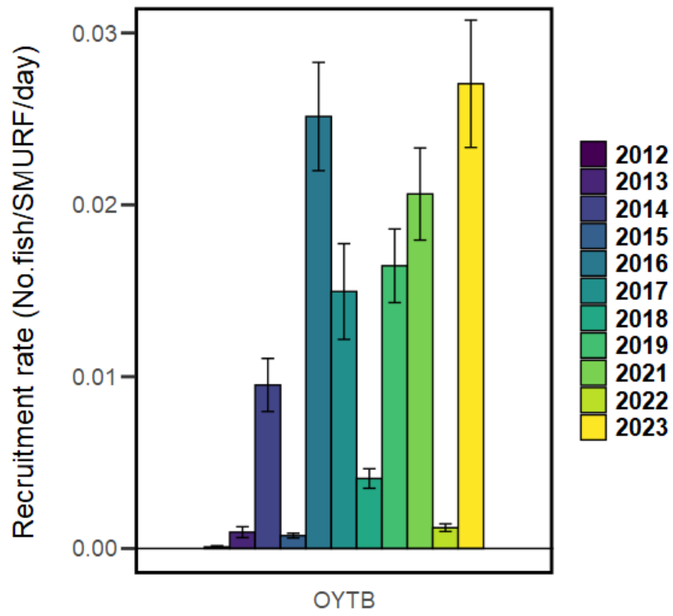






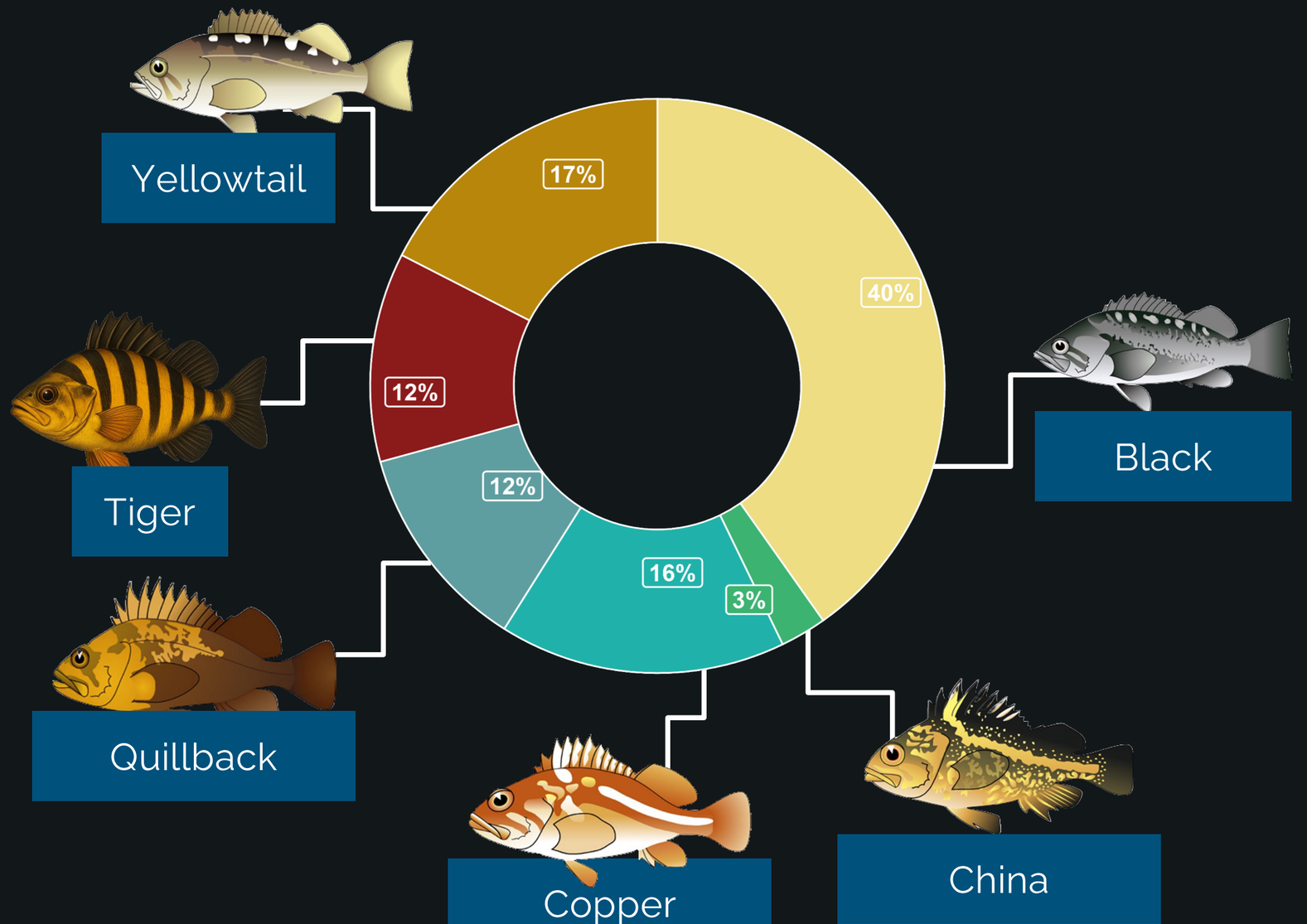




From species grouped to individual species

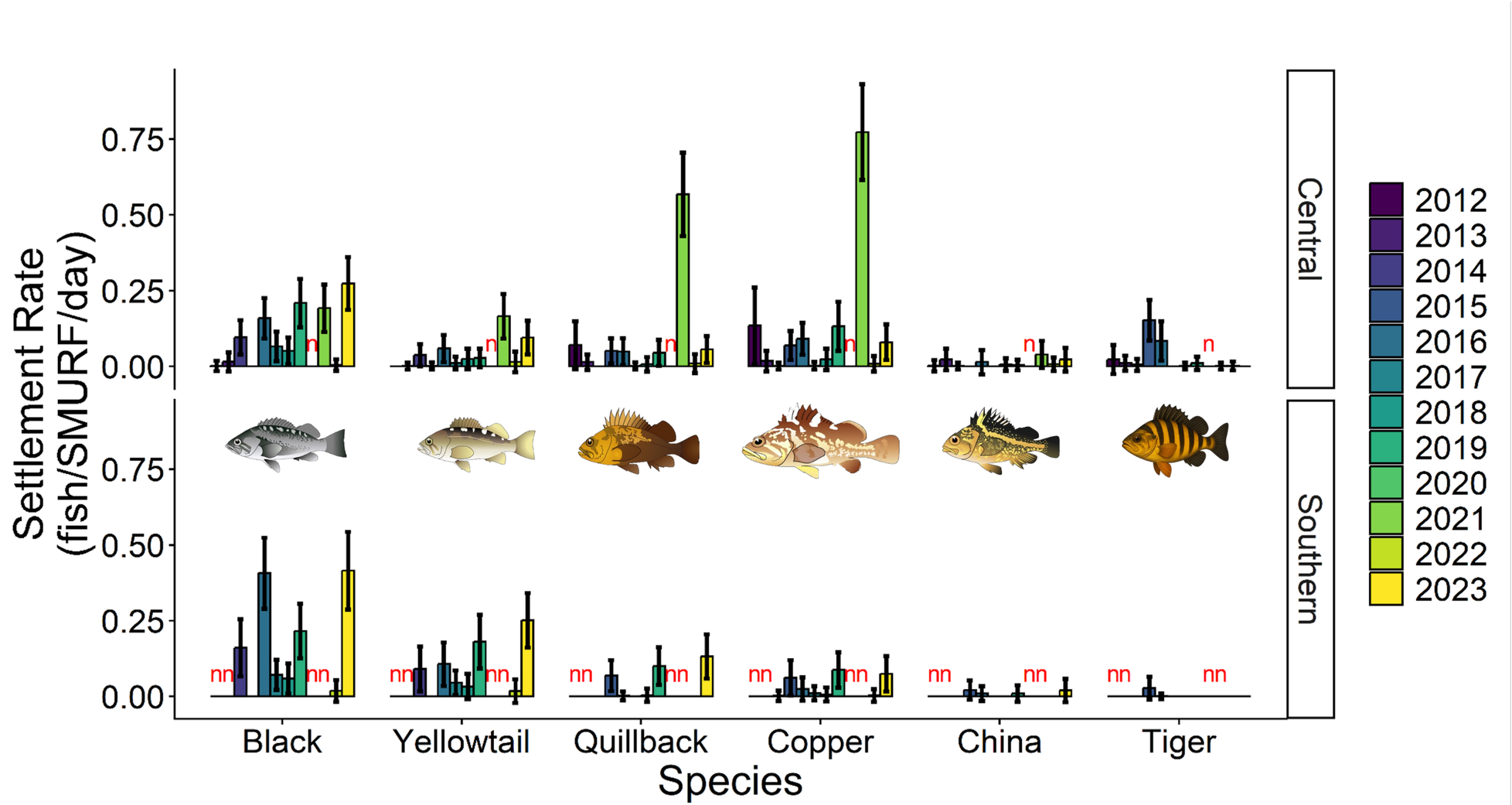


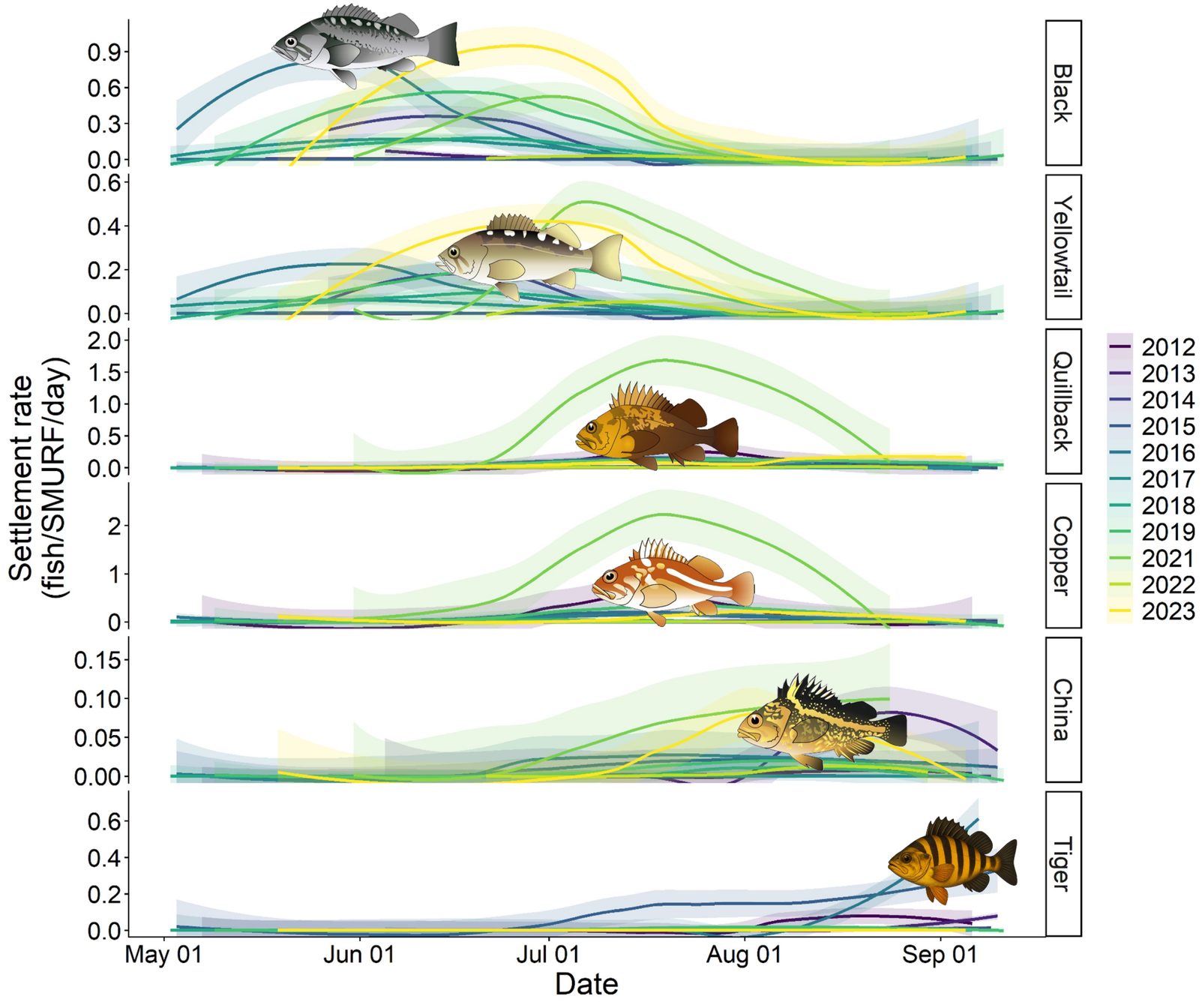

Black and Yellowtail Rockfishes have different dynamics

# Rockfish species most frequently sampled by the SMURFs

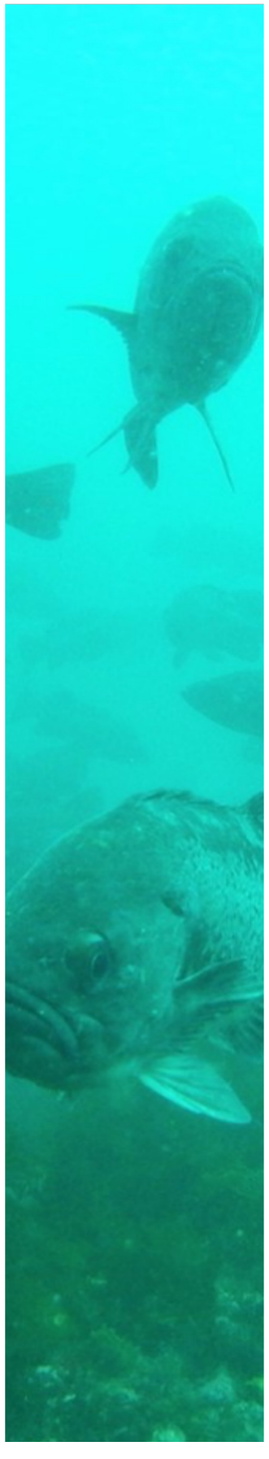


# Differences in settlement between years & regions

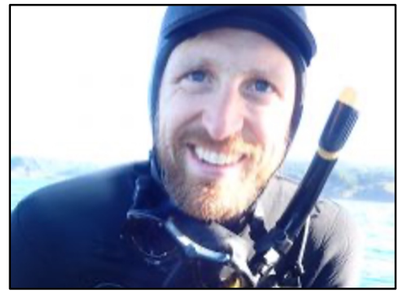




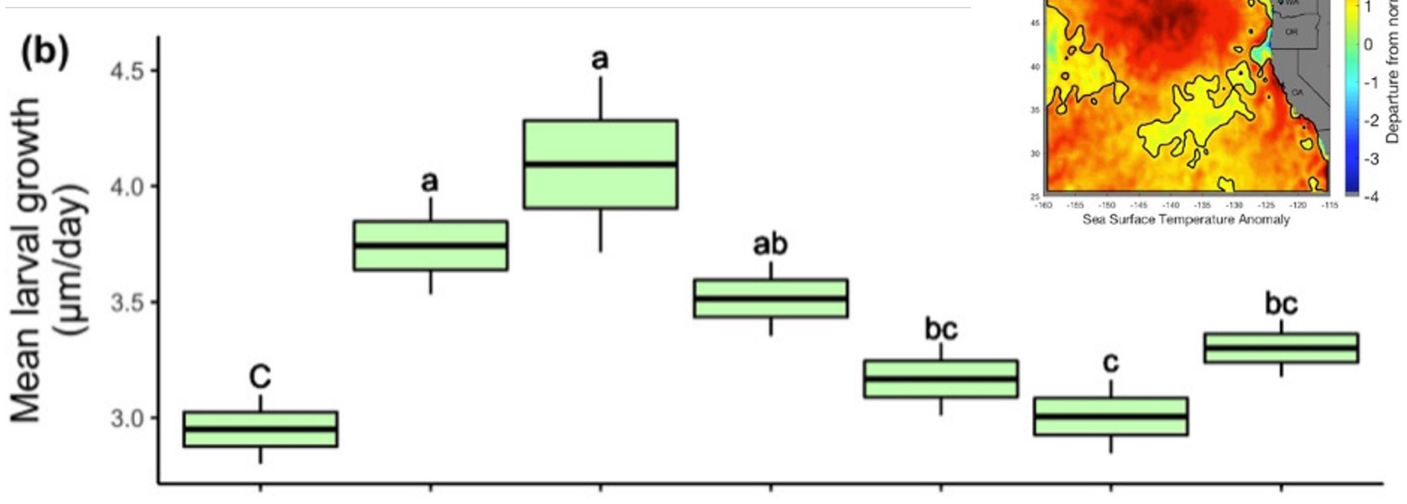

# Different species settle at different times of the year



# These data help us understand the impact of heat waves in the ocean

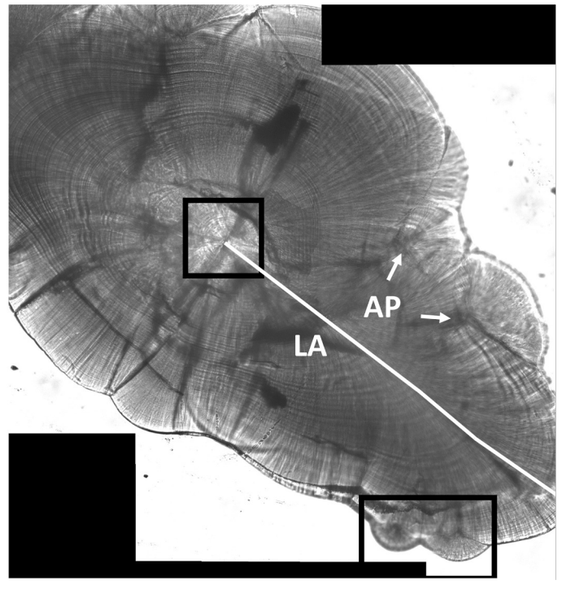


Will Fennie
Alaska Fisheries
Science Center, NOAA



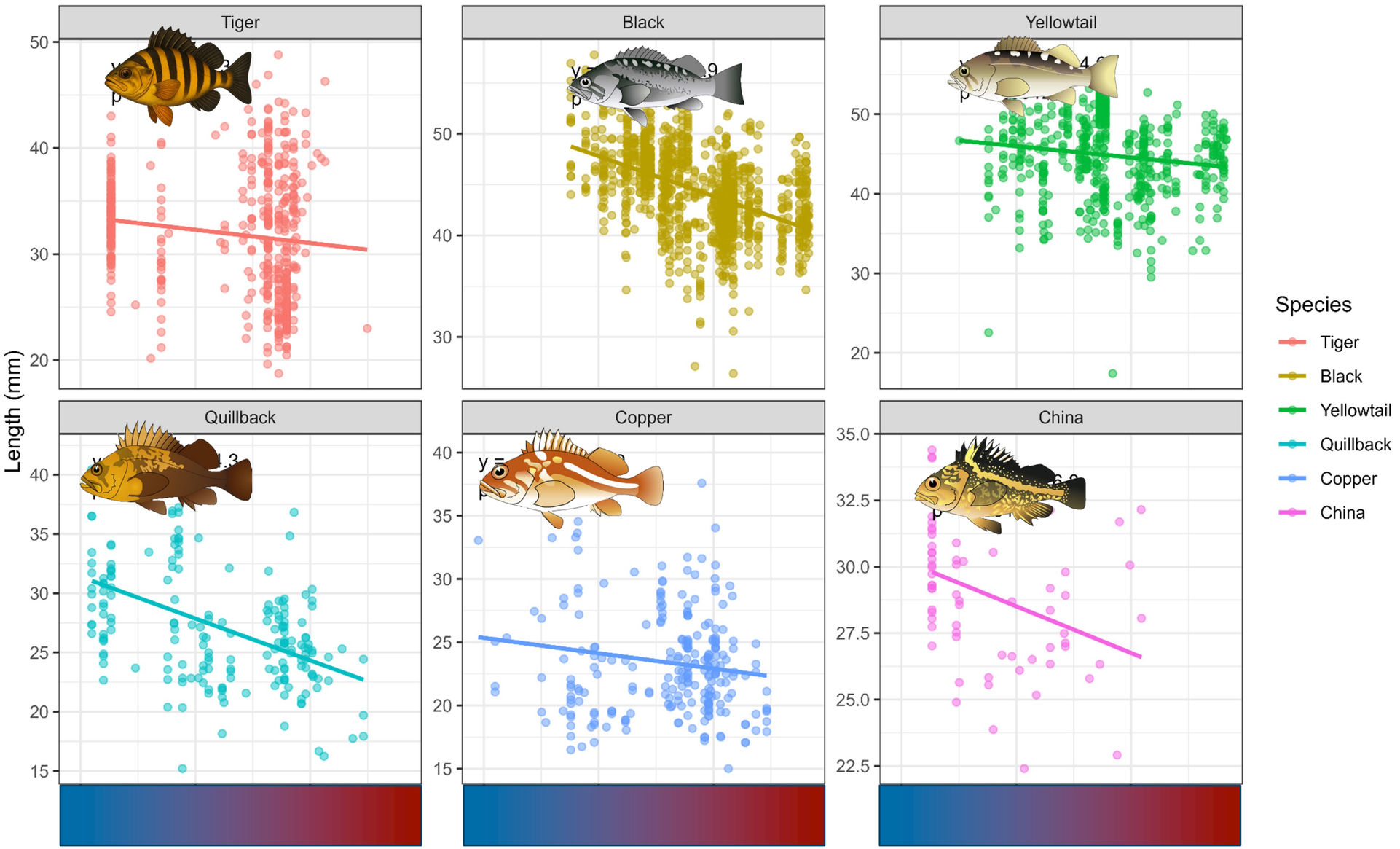


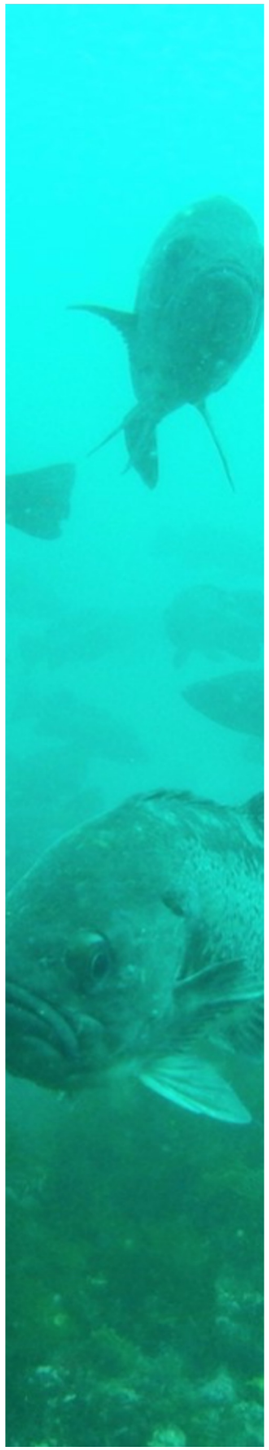




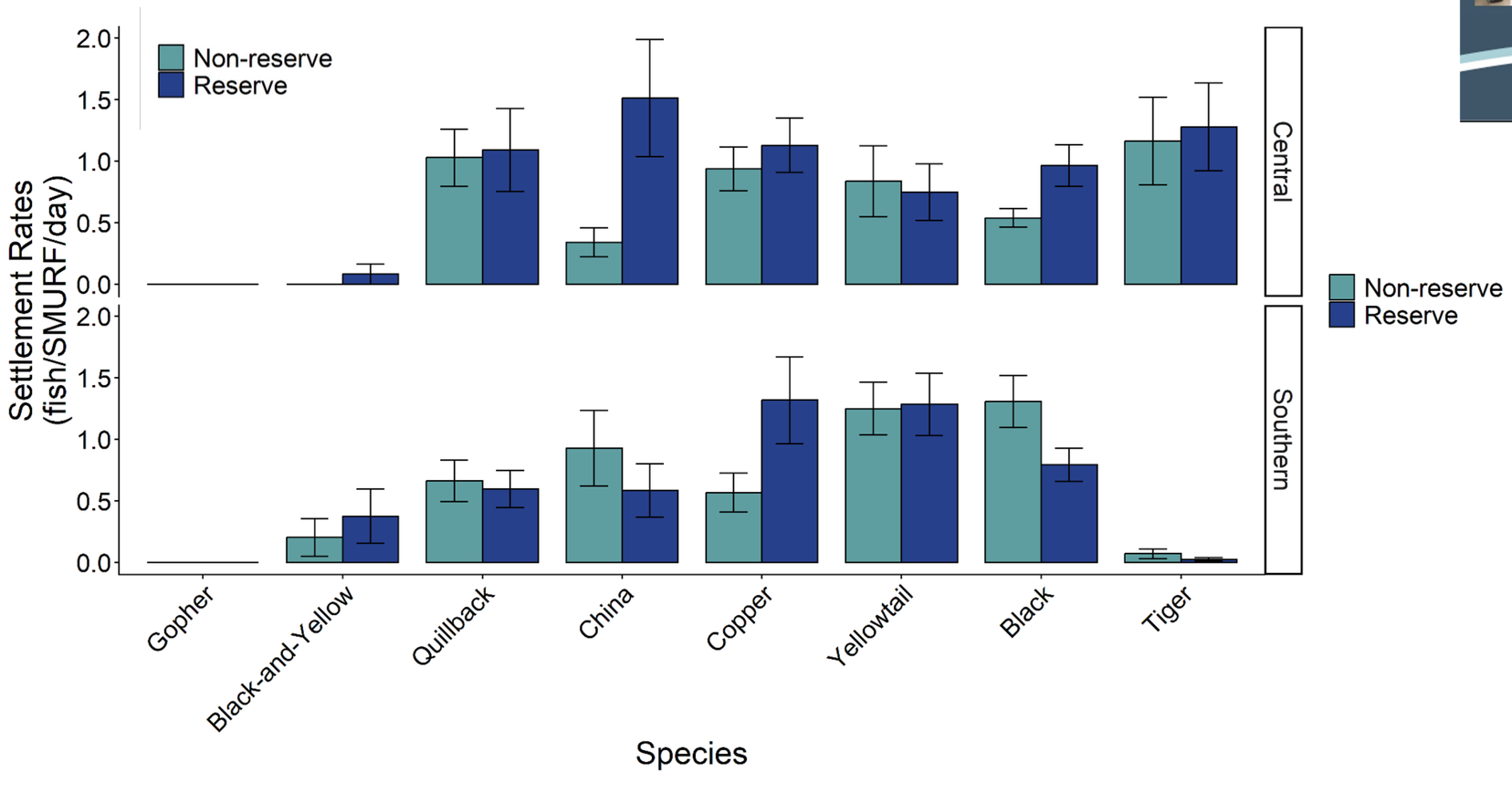

Black Rockfish larval growth increased during warm periods, but without sufficient prey, survival was reduced

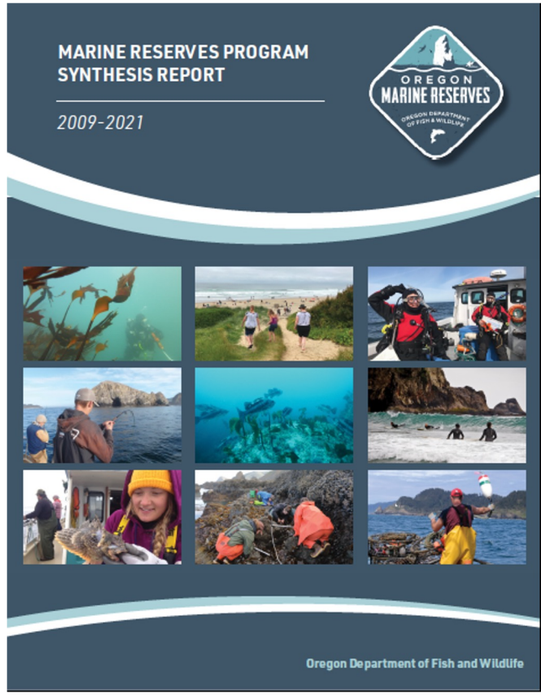
# Settling fish are smaller during warmer years



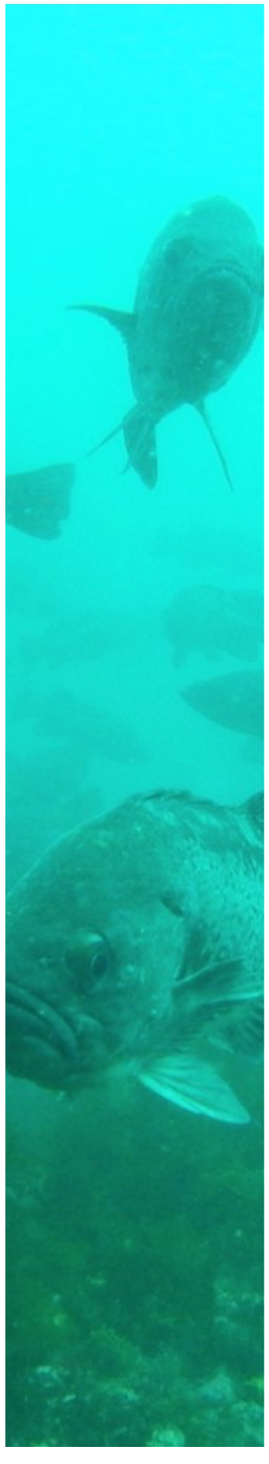


# These data help us understand what Oregon's marine reserves are protecting

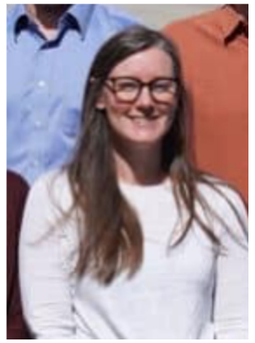



Patterns indicate that Oregon marine reserves are protecting important habitat for juveniles

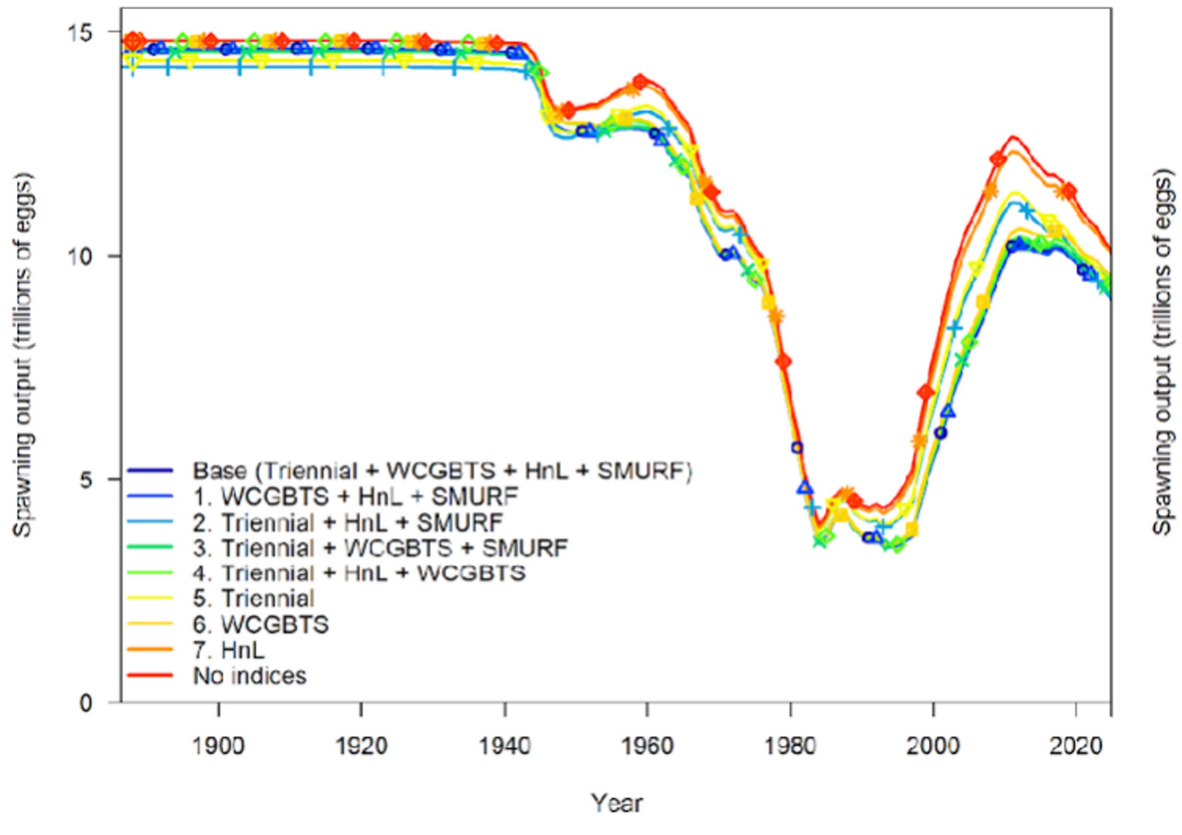


# These data help improve fisheries forecasts



Ali Whitman
*ODFW*

Megan Feddern
*NOAA*

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**Stock Assessment Review Panel Review of 2025 Stock Assessment for Yellowtail Rockfish North of 40°10´ N off the U.S. West Coast**

Including SMURF juvenile data improved the Yellowtail Rockfish fishery models

# Thank you!

This project would not have been possible without the incredible support & collaboration of:

Research Partners: Sponaugle-Cowen Lab members, ODFW, Oregon Coast Aquarium, Port Orford Field Station

Volunteers & Field Assistants: Dedicated community members, students, friends, & family who contributed their time & energy in the field & lab

Funding Support: Oregon Ocean Science Trust (OOST) & Oregon Department of Fish & Wildlife