Current Management Issue: Thinking About Policy and Stock Boundaries

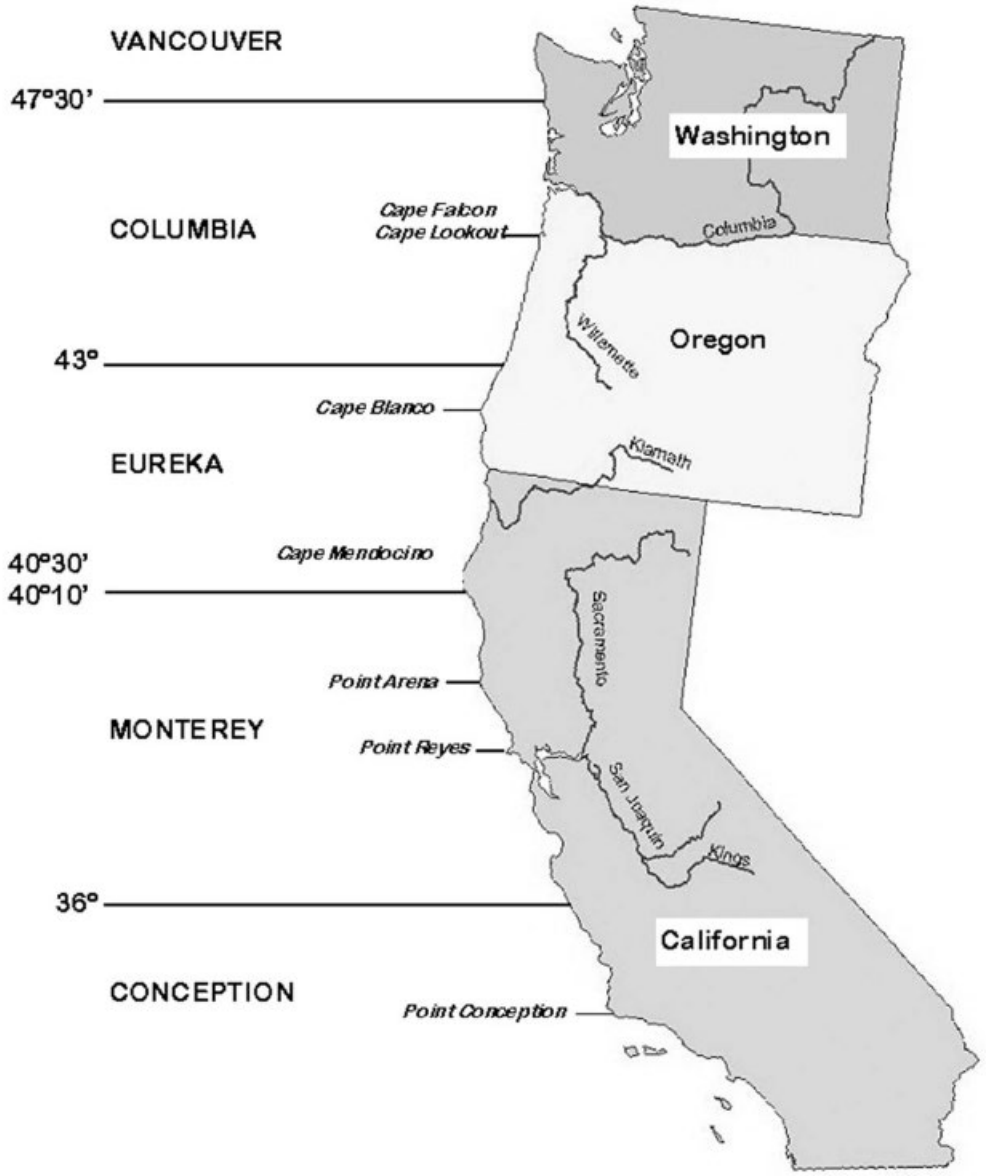
2023 Western Groundfish Conference

Corey Niles

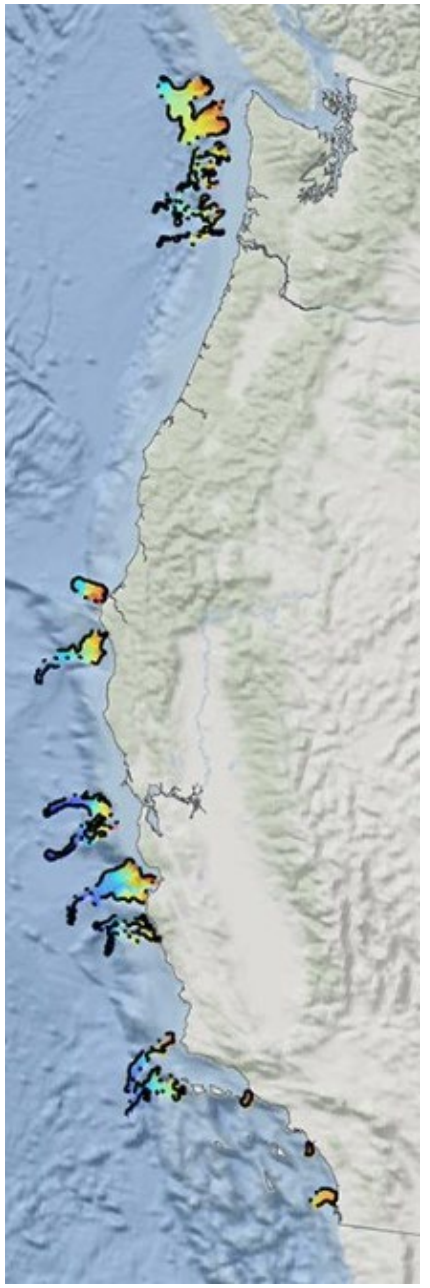
Intergovernmental Ocean Policy

Washington Department of Fish and Wildlife

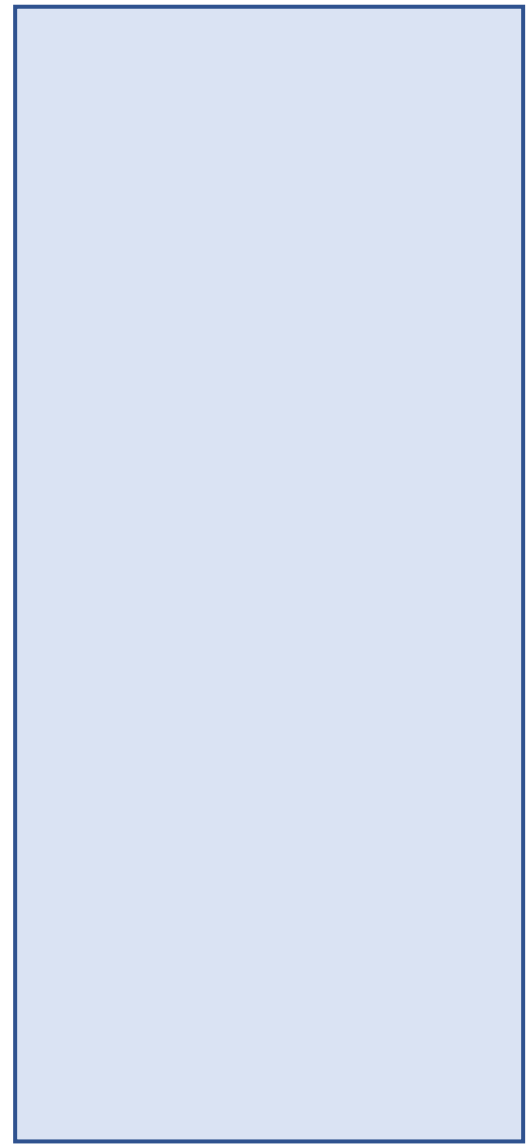
Why this topic?

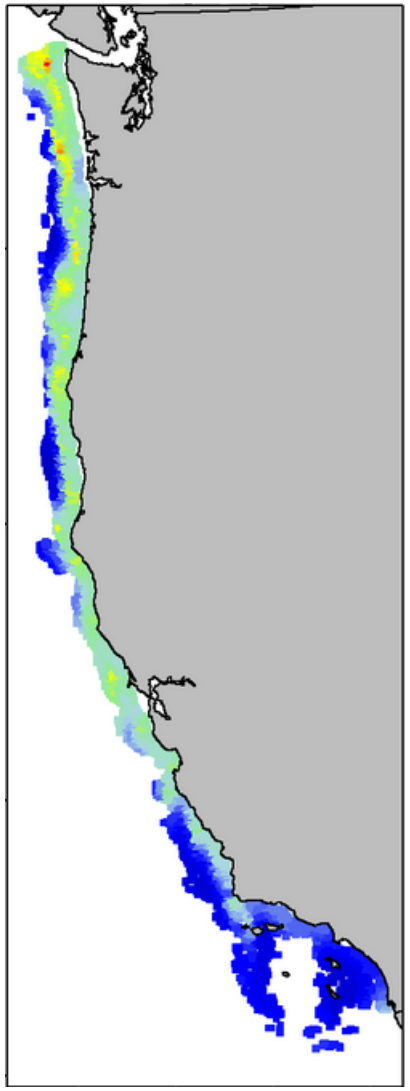


https://www.pcouncil.org/documents/2019/10/fs13-geography-of-rockfish.pdf/

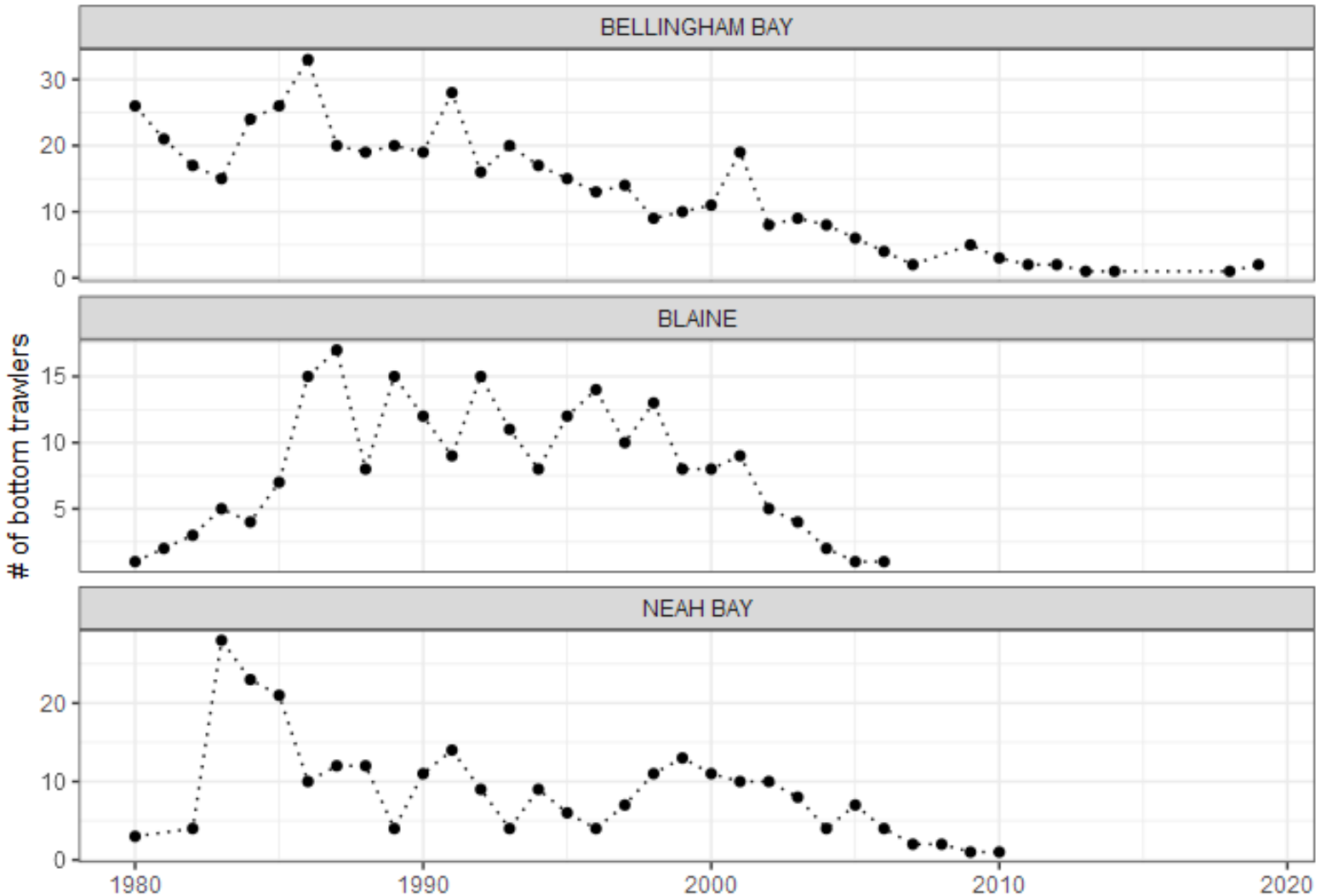


https://www.boem.gov/environment/large-submarine-canyons-atlas

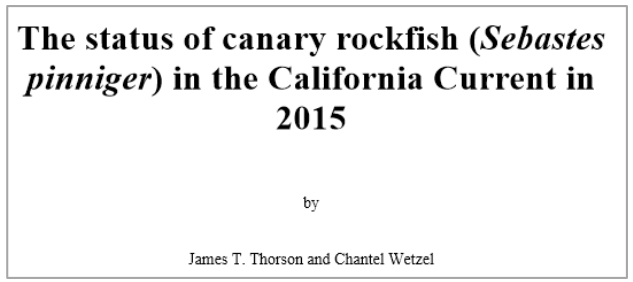




https://james-thorson.shinyapps.io/FishViz/


BELLINGHAM BAY
BLAINE
NEAH BAY
# of bottom trawlers
0
10
20
30
5
15
1980
1990
2000
2010
2020

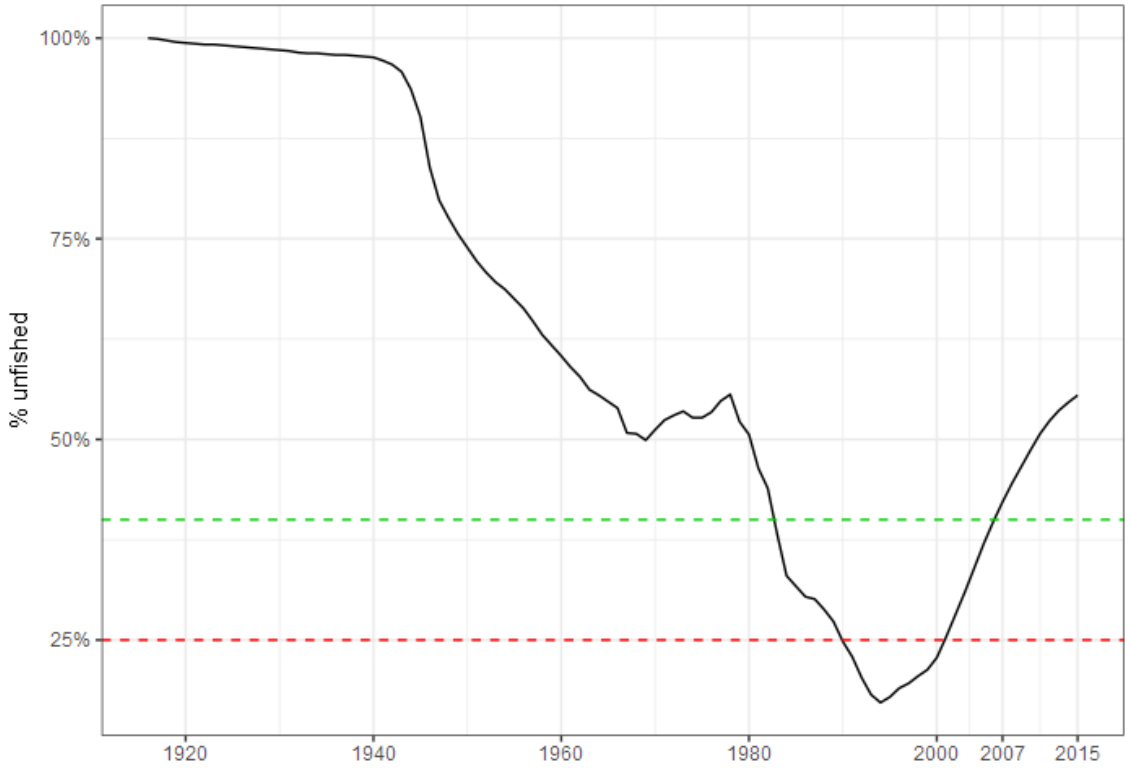
"Recovery . . . **began earlier in Washington** than either Oregon or California, **and relative spawning output in Washington … is estimated to be higher** than in Oregon or California in 2014. **California is estimated to have experienced the lowest** level of relative spawning output during the historical period of any state (occurring in 1999), and is estimated as having the lowest relative spawning output in 2014."



The status of canary rockfish (*Sebastes pinniger*) in the California Current in 2015

by

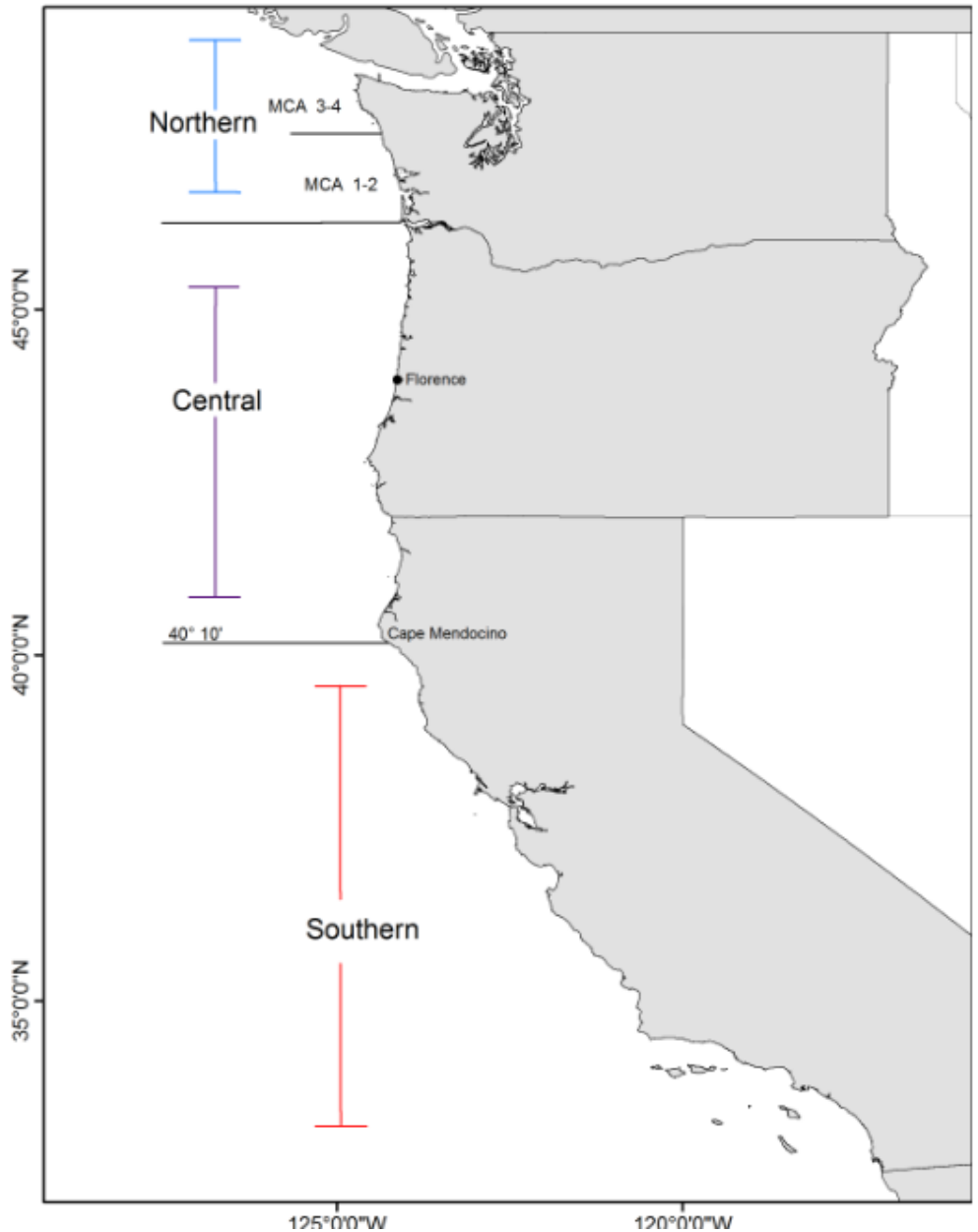
James T. Thorson and Chantel Wetzel



Source: Table 23–Summary time series for base model

https://www.pcouncil.org/documents/2016/05/the-status-of-canary-rockfish-sebastes-pinniger-in-the-california-current-in-2015-march-2016.pdf/

Why now?



Status of China rockfish off the U.S. Pacific Coast in 2015

E.J. Dick[1]
Melissa Monk[1]
Ian Taylor[2]
Melissa Haltuch[2]
Tien-Shui Tsou[3]
Patrick Mirick[4]

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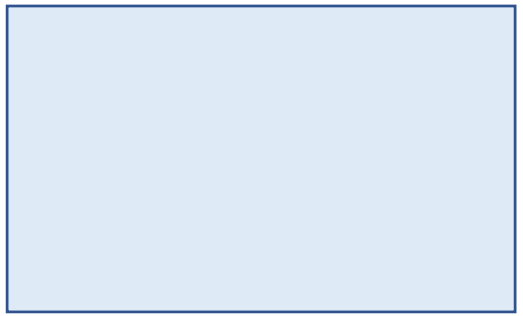
[2]Northwest Fisheries Science Center, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 2725 Montlake Boulevard East, Seattle, Washington 98112

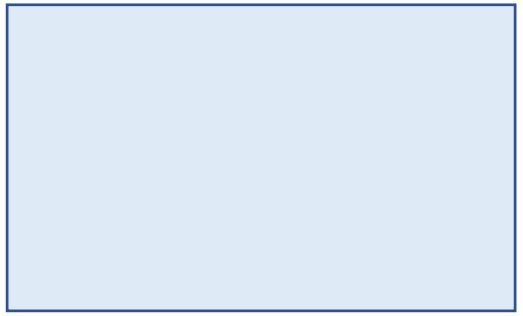
[3]Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia, Washington 98501

[4]Oregon Department of Fish and Wildlife, 2040 SE Marine Science Drive, Newport, OR 97365

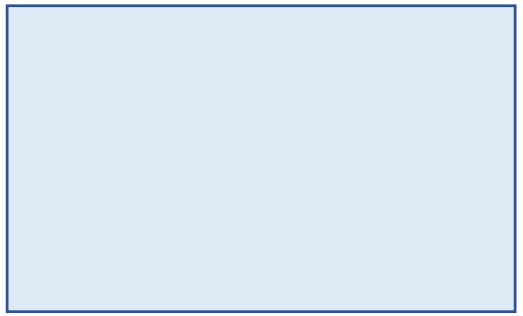
April 2016



WA
Fraction unfished: 0.39
Unfished Spawning Output: 17.19



OR
Fraction unfished: 0.47
Unfished Spawning Output: 19.71

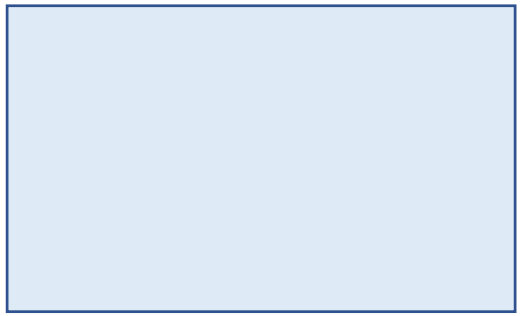


CA
Fraction unfished: 0.14
Unfished Spawning Output: 55.08

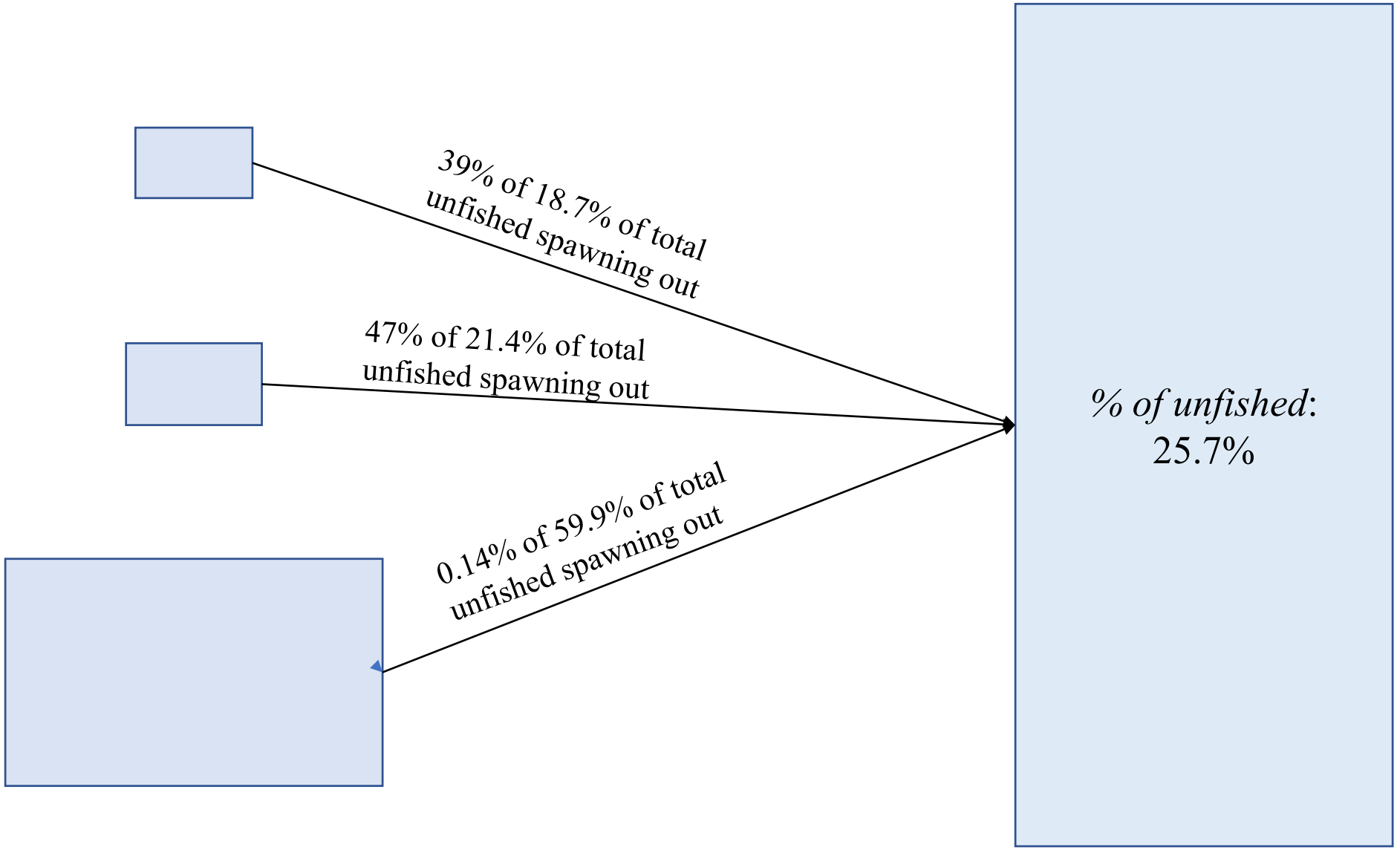
Quillback Rockfish 2021

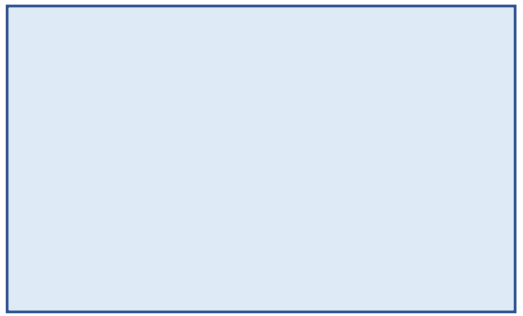
WA
Fraction unfished: 0.39
Unfished Spawning Output: 17.19

OR
Fraction unfished: 0.47
Unfished Spawning Output: 19.71

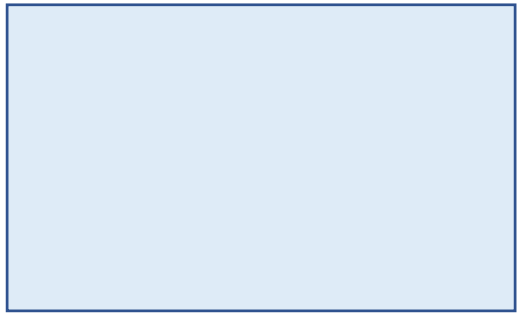


CA
Fraction unfished: 0.14
Unfished Spawning Output: 55.08

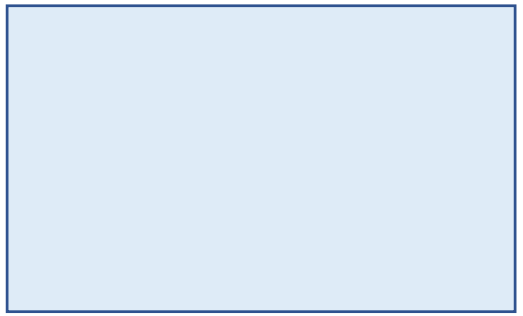

39% of 18.7% of total unfished spawning out
47% of 21.4% of total unfished spawning out
0.14% of 59.9% of total unfished spawning out
% of unfished: 25.7%



WA
Standard SPR 50% HCR

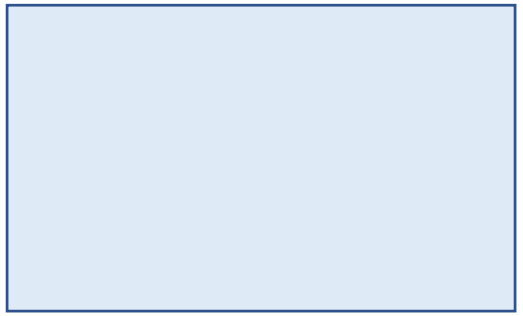


OR
Standard SPR 50% HCR

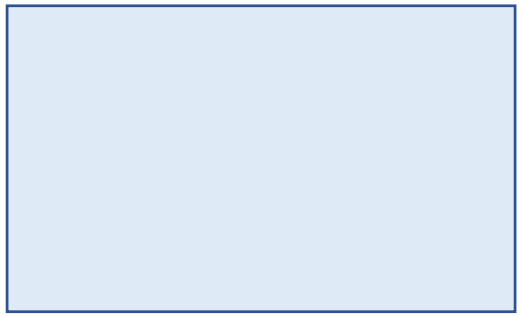


CA
SPR 55% based on rebuilding analysis

My basic argument:
This was not an unreasonable or arbitrary approach, let’s take a closer look at it.



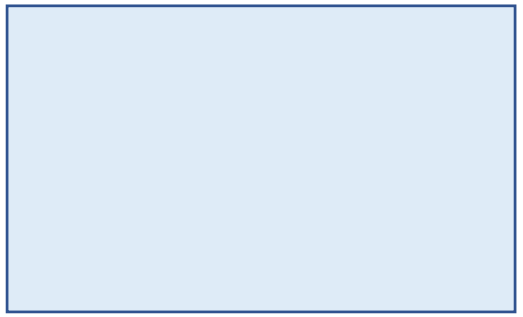
WA
Fraction unfished: 7.65
Unfished Spawning Output: 0.419



OR
Fraction unfished: 38.75
Unfished Spawning Output: 0.74

Copper Rockfish 2021

CA N. of Point Conception
Fraction unfished: 415.81
Unfished Spawning Output: 0.39



CA S. of Point Conception
Fraction unfished: 233.04
Unfished Spawning Output: 0.18

WA
Fraction unfished: 7.65
Unfished Spawning Output: 0.419

OR
Fraction unfished: 38.75
Unfished Spawning Output: 0.74

CA N. of Point Conception
Fraction unfished: 415.81
Unfished Spawning Output: 0.39

CA S. of Point Conception
Fraction unfished: 233.04
Unfished Spawning Output: 0.18

PFMC September 2021

Discussion of criteria for combining regional assessments for status determination led to the question of best practices for combining assessment results. A spatially stratified assessment does not necessarily imply stratified stock status determination. In the case of copper rockfish, there is limited direct evidence for distinct stocks. The use of deterministic recruitment could be driving the different trends between assessment areas. For copper rockfish there is uncertainty in the biological stock structure that requires further work. The SSC agreed that the rebuilding analysis for the Mop-Up Review Panel would include a table that lists the various sources of information that could lead to a decision on whether to pool northern and southern California stock assessments for status determination. This table would list each source, and the strengths and weaknesses of each information source. The rebuilding analysis will pertain to southern California but the document should report stock status if northern and southern California are pooled.

The SSC deferred a conclusion on pooling or splitting the California stock assessments to the Mop-Up Review Panel where two options will be evaluated: 1) a rebuilding analysis based on the SSC-endorsed southern California model, and 2) one based on the stock assessment guidance from combined California copper rockfish assessments.

https://www.pcouncil.org/documents/2021/09/c-6-a-supplemental-ssc-report-1-2.pdf/

“when to aggregate assessments across stock delineation boundaries *for status determination*.”

localized depletion vs. overfished status

PFMC November 2021

SSC recommendations Nov. 2021

Quillback rockfish:

- Three separate stock areas be maintained for status determination: California, Oregon, and Washington

Copper rockfish:

- Pooling the biomass estimates from Southern and Northern California assessments to determine status in California
- Pooling the biomass estimates from the Oregon and Washington assessments for a northern area status determination

Sunset/vermilion rockfish:

- Separate stock areas should be assumed for status determination for the Southern and Northern California assessments because of the presence of sunset rockfish primarily south of Point Conception.
- The Oregon and Washington assessments should be combined into a single stock area because of the lack of population structure within vermilion rockfish at the northern extent of its range.

The SSC reviewed the rebuilding analysis for southern California copper rockfish and confirmed that the analysis appears to be technically correct. The rebuilding analysis indicates a minimum rebuilding time of 10 years and a mean generation time of 17 years, but also indicated that most rebuilding strategies identified in the Terms of Reference for Rebuilding Analyses did not achieve rebuilding by a T_{max} of 2033, with at least 50% probability. Essentially, only rebuilding strategies with SPR rates greater than 0.935 had at least a 50% probability of rebuilding by T_{max}. These strategies were associated with removals of approximately 2 metric tons in 2023. As the current

Dr. Brian Langseth (Northwest Fisheries Science Center) provided the SSC with an update to a presentation from a Groundfish Subcommittee (GFSC) meeting held via webinar on September 29-30, 2021 that focused on available information to determine stock management delineation for copper and quillback rockfish off the U.S. West Coast. The new information was primarily related to quillback rockfish, which was found to differ very little from that for copper rockfish. In general, adult quillback rockfish exhibit limited observed movements with high site fidelity. There is little understanding of larval dispersal patterns for these species, which is likely the mechanism by which mixing would occur given evidence for limited adult movement. However, minimal genetic variation between Washington and Alaska has been observed, which suggests the potential for broad scale larval dispersal. The only notable genetic differences observed occur between Puget Sound and coastal regions. Estimated recruitment deviations for quillback rockfish showed some unquantified degree of spatial coherence. However, this alone does not necessarily imply connectivity during the larval stage as broad scale environmental forcing could be responsible.

https://www.pcouncil.org/documents/2021/11/e-3-a-supplemental-ssc-report-1-2.pdf/

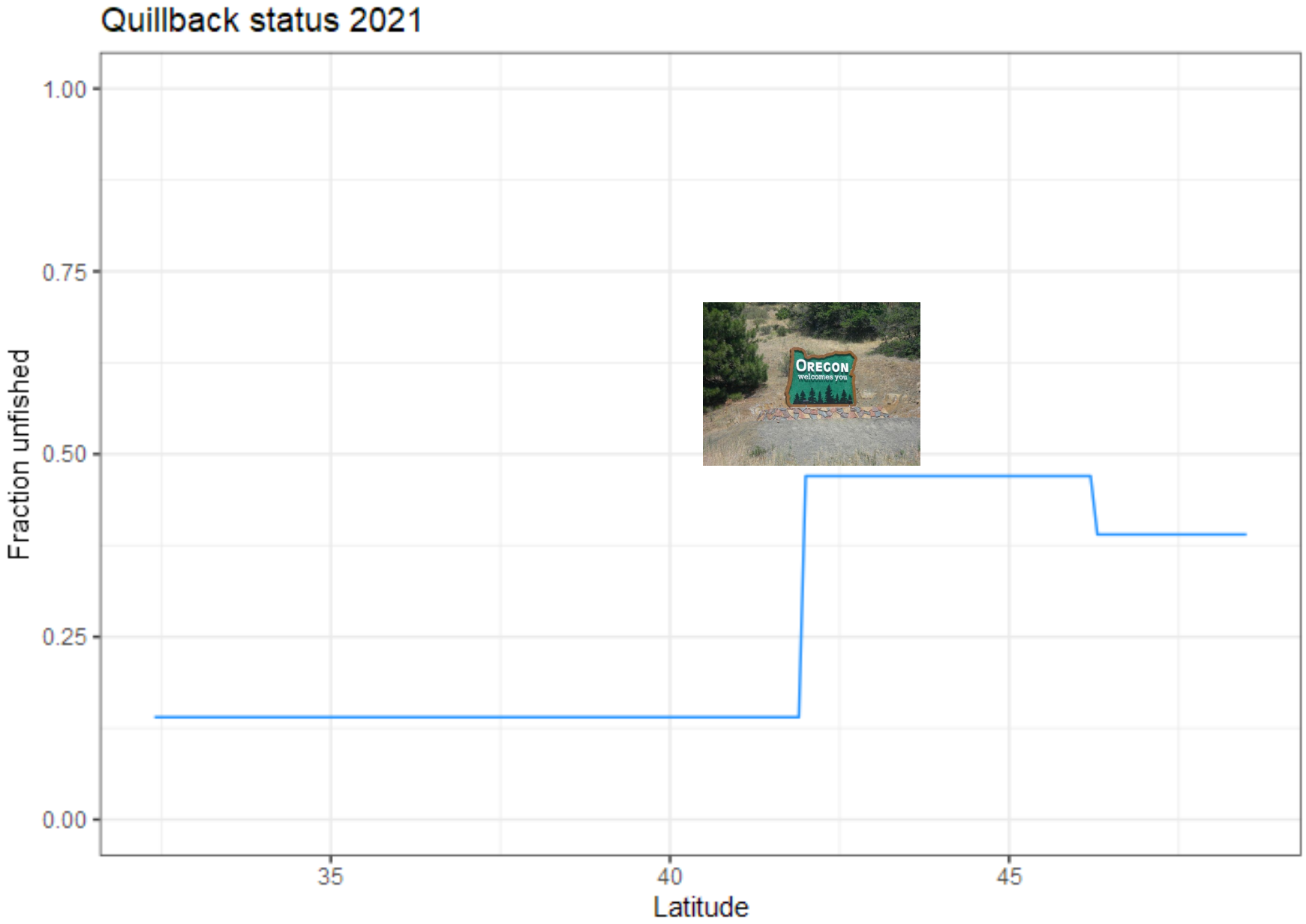
The PFMC Science and Statistical Committee so far:

“Nearshore rockfish can’t be coastwide.”

“You need to have at least one boundary”

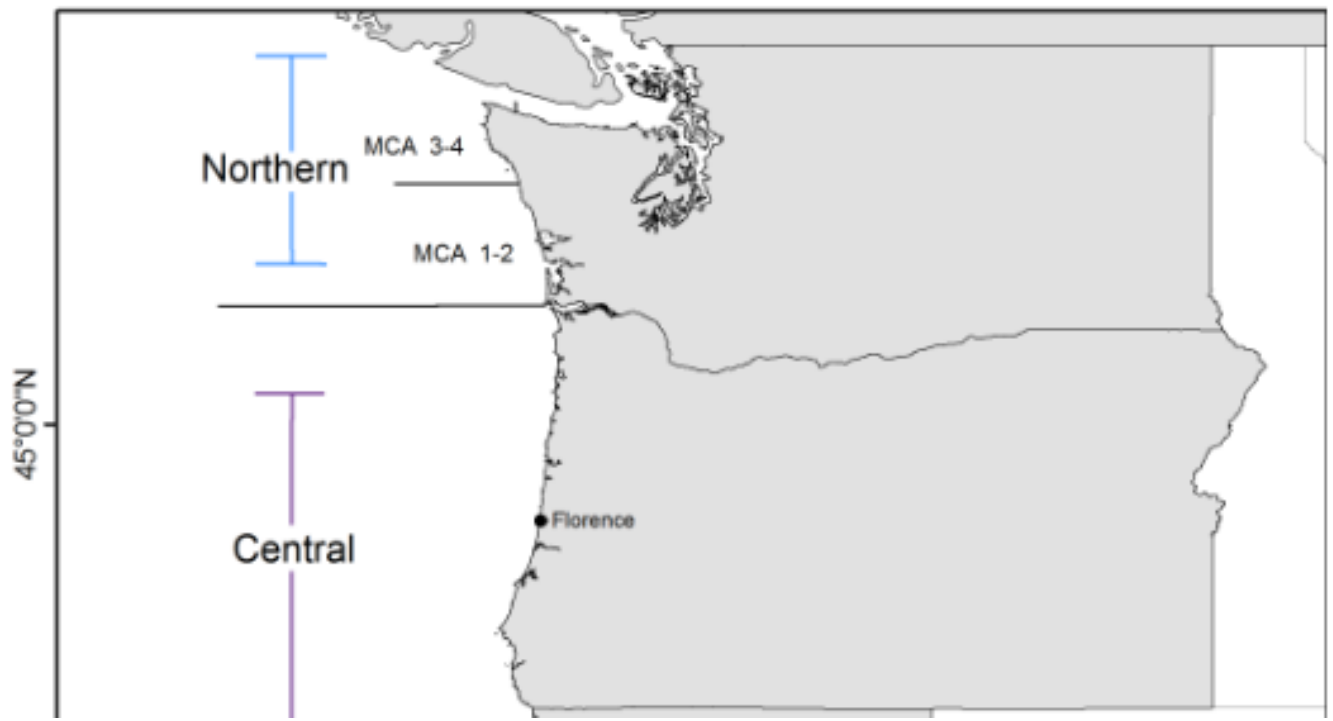
A response:

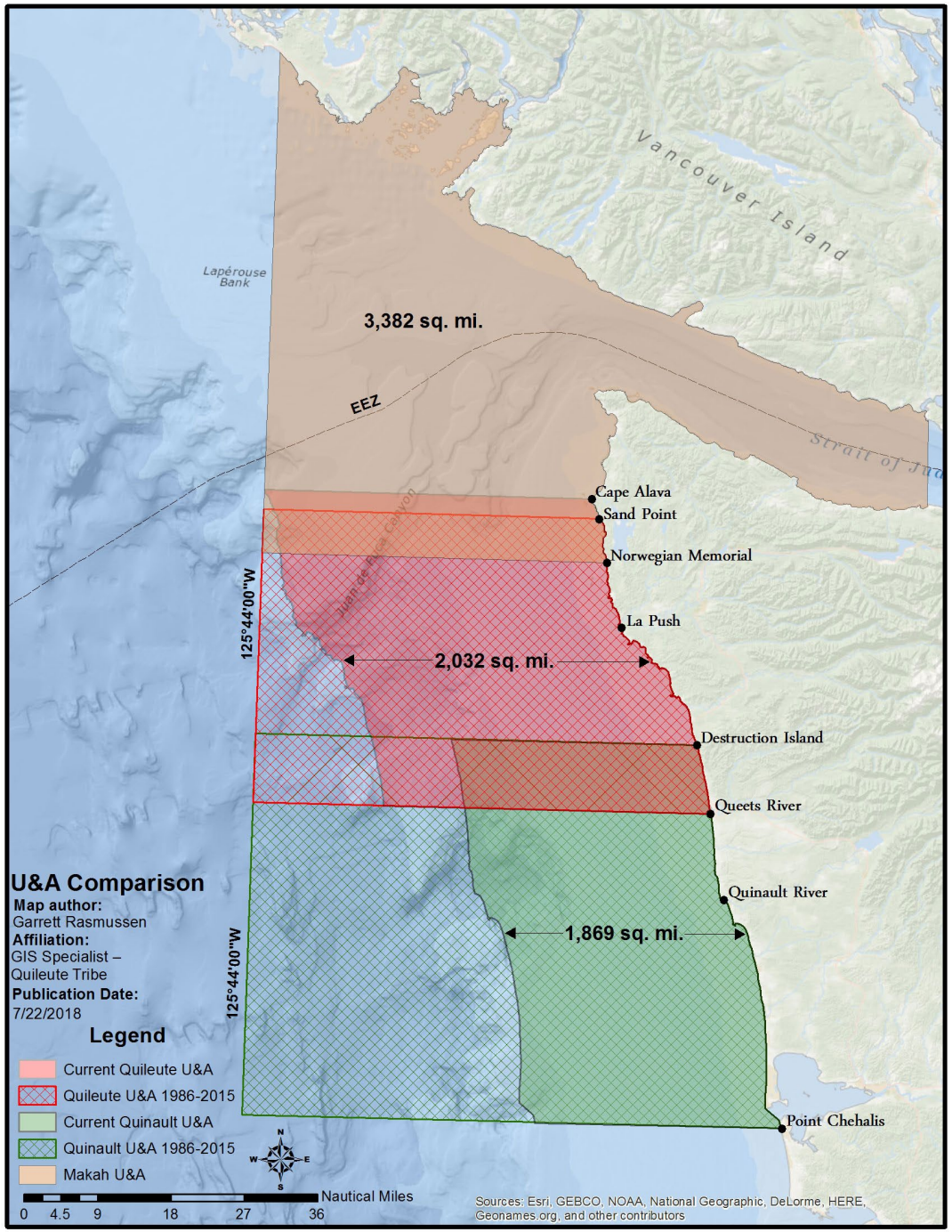
"No one is saying they're coastwide, but what if population connectivity is more like a cline/gradient/stepping stone?"


Quillback status 2021
1.00
0.75
0.50
0.25
0.00
Fraction unfished
35
40
45
Latitude
OREGON
welcomes you

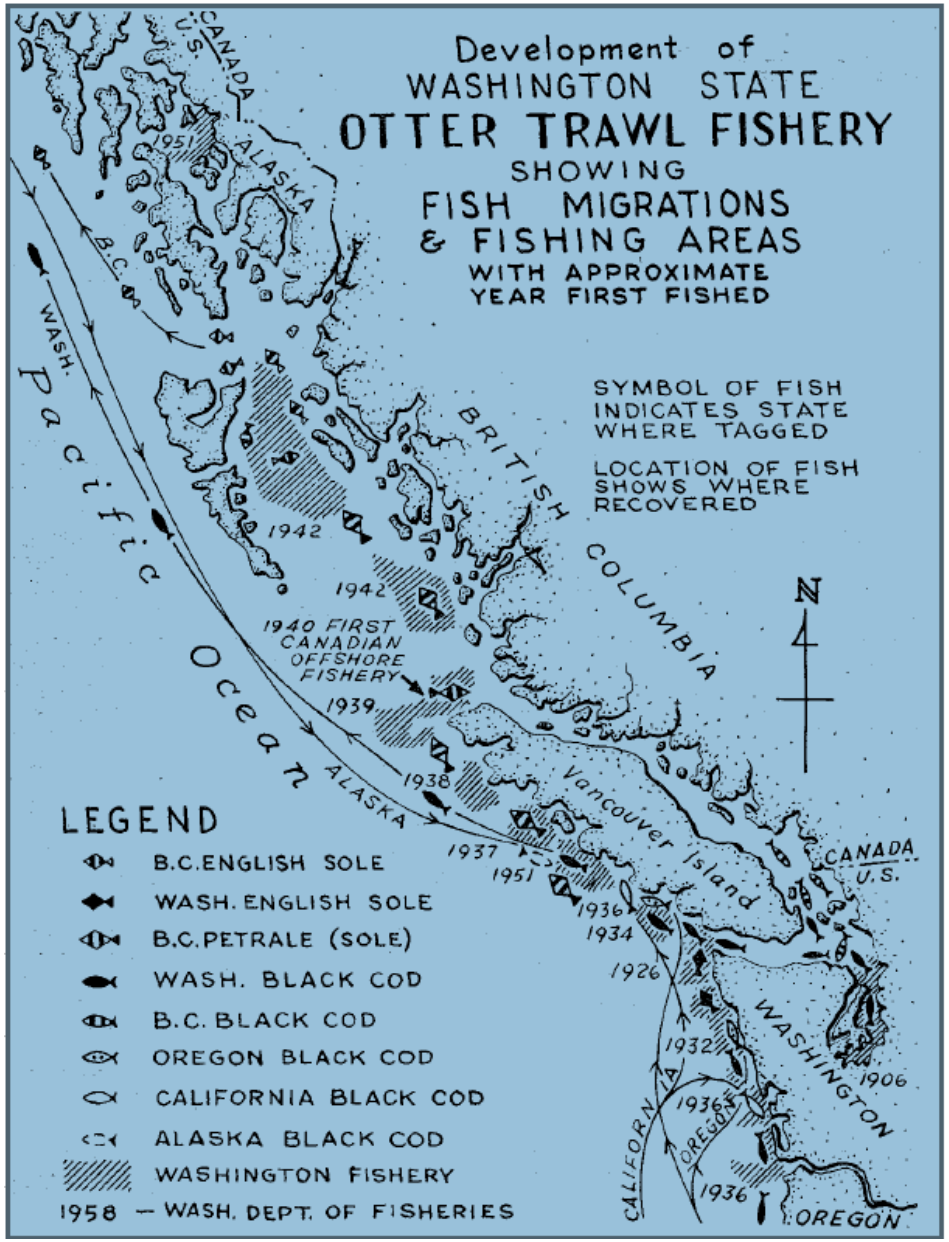
Our population genetic study of black rockfish found evidence of more than one stock. In fact, based on microsatellites, there may be at least three populations along the species range; one concentrated in the south (U.S. West Coast), one that is concentrated at a single collection (Brookings, OR), and one that is concentrated in the north (Western Alaska). Our analyses of both mitochondrial sequences and nuclear microsatellite genotypic data from black rockfish collections reveal the presence of abrupt genetic clines (i.e., short isolation-by-distance trends) centered on three different geographic locations. Two genetic clines occur on relatively small geographic scales within the U.S. West Coast of our study (within 2–3 degrees latitude) and all three are significant isolation-by-distance correlations using a minimum of four neighboring collections. A relatively steep genetic cline based on high $F_{ST}/(1- F_{ST})$ revealed by our mtDNA dataset was centered between latitudes 38 to 42 (collections 3 to 7). This is similar to the pattern in yellowtail rockfish which exhibited a trend from between those same latitudes that appeared centered at Cape Mendocino (Latitude 40.5; Hess et al. 2011). However, unlike yellowtail rockfish, this genetic cline was not as steep [0.8 versus 1.8 $F_{ST}/(1- F_{ST})$ per 1000 km], it did not divide the region into two separate regional stocks, and it may be centered slightly further south (between collections 4 and 5, Point Arena). Further, the composition of mitochondrial haplotypes that comprise this cline resemble a staircase that begins in the southernmost range (San Francisco, CA) as relatively high frequency of southern haplotypes, which then decrease rapidly going northward (Crescent City, CA), and then again increase rapidly to a high frequency of southern haplotypes (Charleston, OR). These two transitions represent the

Hess, J.E., Hyde, J.R. and Moran, P., 2023 https://doi.org/10.1007/s00227-023-04207-2


Northern
MCA 3-4
MCA 1-2
Central
Florence
45°0'0"N



https://quileutenation.org/natural-resources/09-1/map/



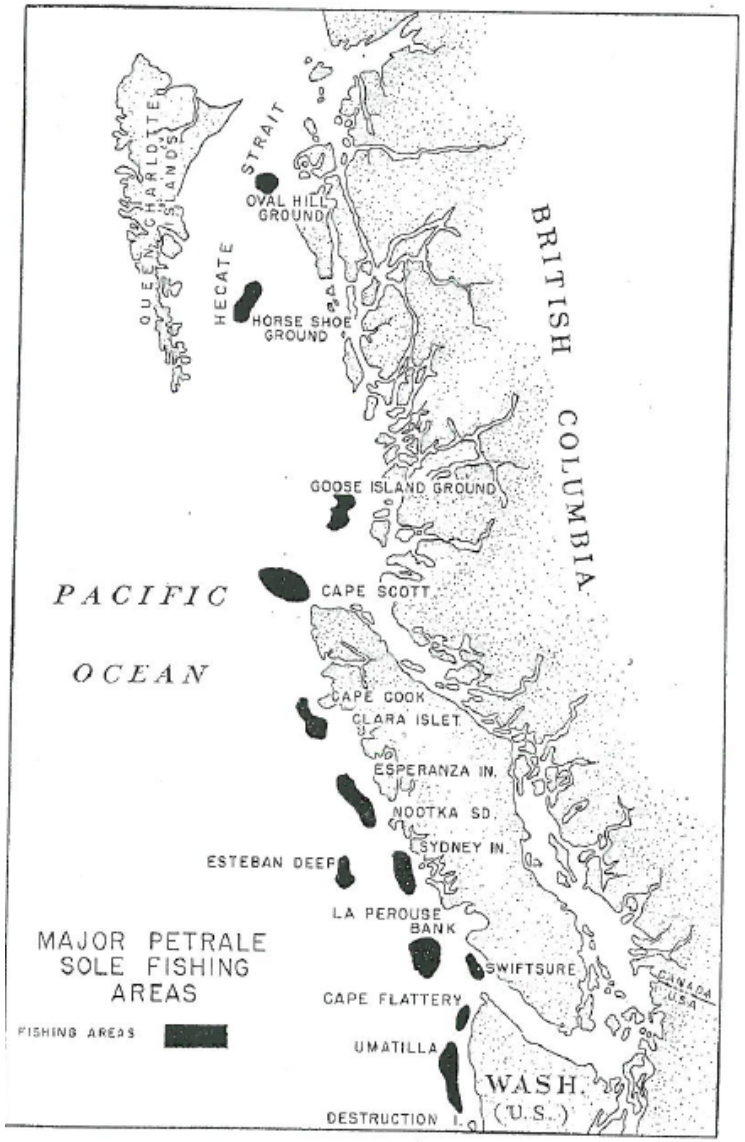


FIGURE 1. The general locations of some of the important petrale sole fishing grounds along the Washington and Vancouver Island coast.

D. Alverson and B. Chatwin (1957) https://doi.org/10.1139/f57-042

https://sanctuaries.noaa.gov/science/sentinel-site-program/olympic-coast/climate-change-ocean-acidification.html

Thank you