

Black Rockfish Data Sources and Assessment Planning for California

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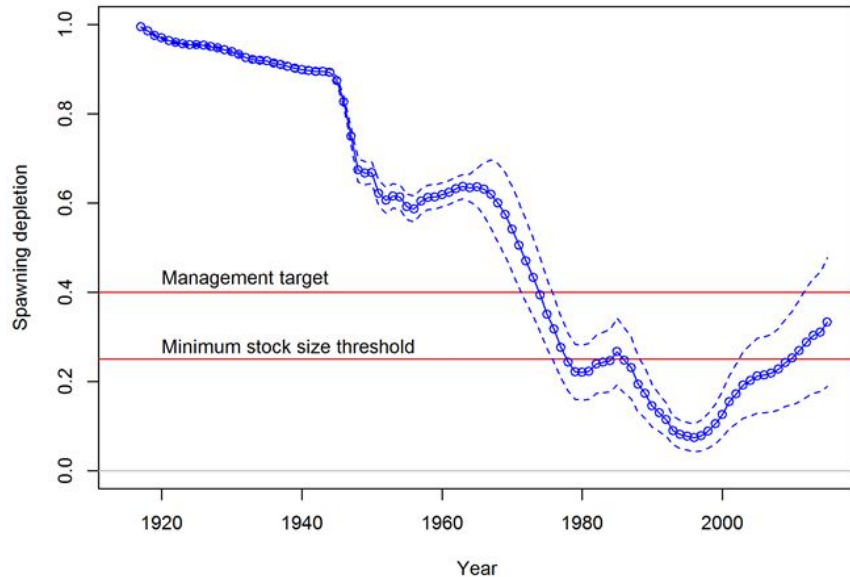
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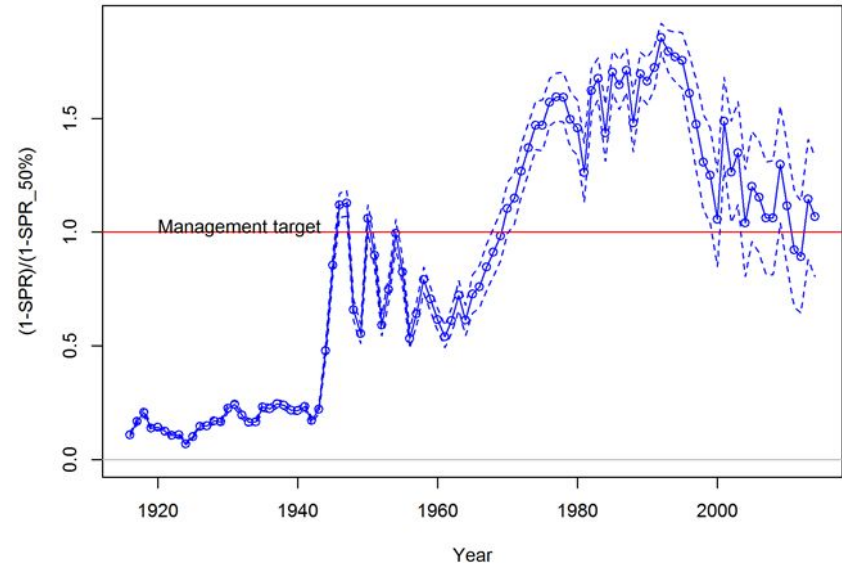
2015 California Stock Assessment (Cope et al. 2016)

- Spawning output in 2015 between minimum and target, with increasing trend
- Recent fishing intensity was near target levels

Spawning Output Relative to Target & Limit



Fishing Intensity Relative to Target



2015 California Stock Assessment (Cope et al. 2016)

- Stock Structure: U.S. waters between CA/OR border and US/Mexico border
- Length-based, age-structured model (Stock Synthesis 3)
- Fishing fleet structure
 - 3 statewide commercial fisheries: trawl, non-trawl (landed dead), non-trawl (landed alive)
 - 1 statewide recreational fishery, modeled as a single fleet
- Fishery-Dependent Surveys (biomass trend information)
 - 2 onboard-observer CPFV recreational surveys: 1988-1999 and 2000-2014
 - MRFSS Recreational Dockside CPUE, 1980-2003
- Length and age composition data from comm., rec., and research sources
- Sex-specific natural mortality (0.18 female, 0.13 male) and growth
- Beverton-Holt stock-recruitment relationship with steepness fixed at 0.77

Major Uncertainties & Research Recommendations (2015)

- Fleet selectivity and natural mortality (“hide ‘em or kill ‘em”)
 - Further investigation into movement of females (pending ODFW report)
 - 2023 STAT will consider alternative hypotheses in assessment
- Productivity and stock structure not well understood
 - Productivity (e.g., steepness and growth) estimation is TBD
 - Exploring alternative fleet structure within CA
- Development of fishery-independent, nearshore survey
 - CCFRP survey has recently expanded to include northern areas
 - Exploring these data in 2023
- Further development of fishery-dependent indices
 - Exploring new index based on catch rates from recreational private/rental fleet
- Uncertainty in historical landings
 - Identify periods with greatest uncertainty to explore effects of catch uncertainty

Stock Structure

- 2015 assessment had state-specific models
- Beginning with single-area model for all of California
- Possible change to fleet structure (spatial differences in size composition)
- Examining data for spatial differences in
 - Growth
 - Exploitation history
 - Catch rates (density proxy)
- Movement studies
 - Several studies have found limited movement, with occasional recaptures at long distances
 - Investigating recent studies; possibility of directional adult movement?

Historical Landings Overview

- Recreational

- 1928-1980: California Catch Reconstruction (CPFV and private; Ralston et al. 2010)
- 1981 - 2003: MRFSS
 - Interpolate missing years and modes
 - Partition regional catch using % of catch by county (Albin et al. 1993)
- 2004-present: CRFS

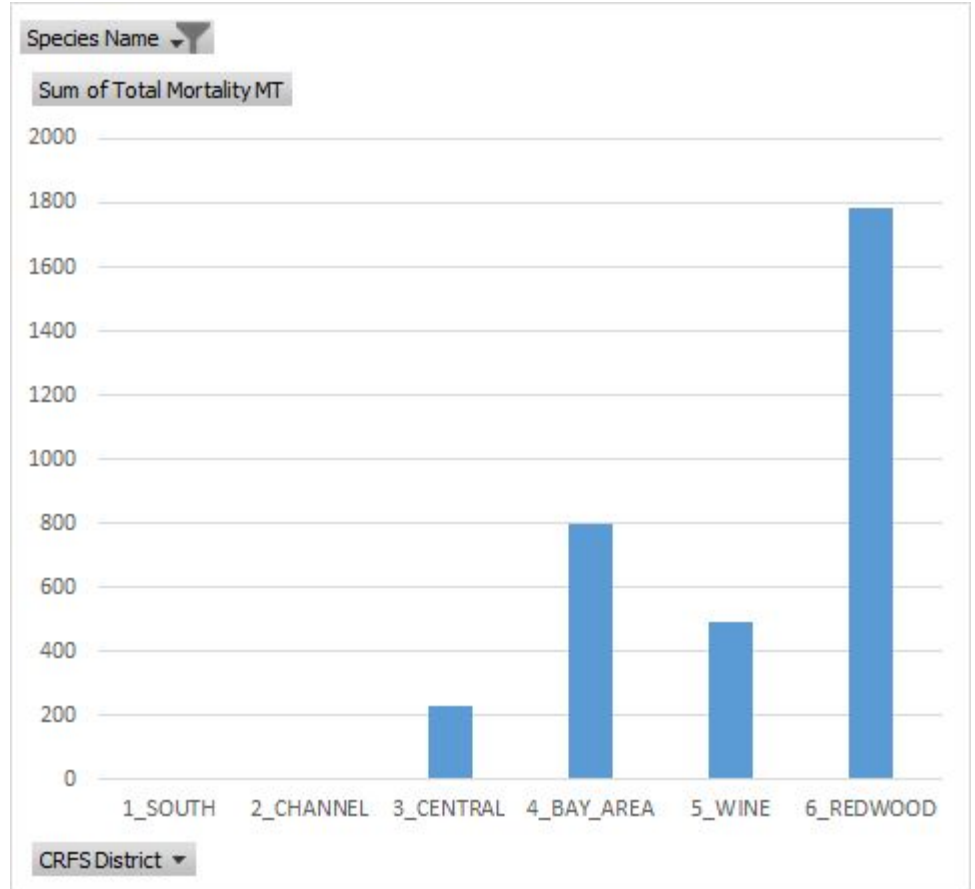
- Commercial

- 1900-1915: linear ramp to 1916 estimates (trawl, non-trawl)
- 1916-1968: California Catch Reconstruction (trawl, non-trawl; Ralston et al. 2010)
- 1969-1980: CALCOM (fish tickets recovered by SWFSC, ratio estimates per Pearson 2008)
- 1981-present: PacFIN

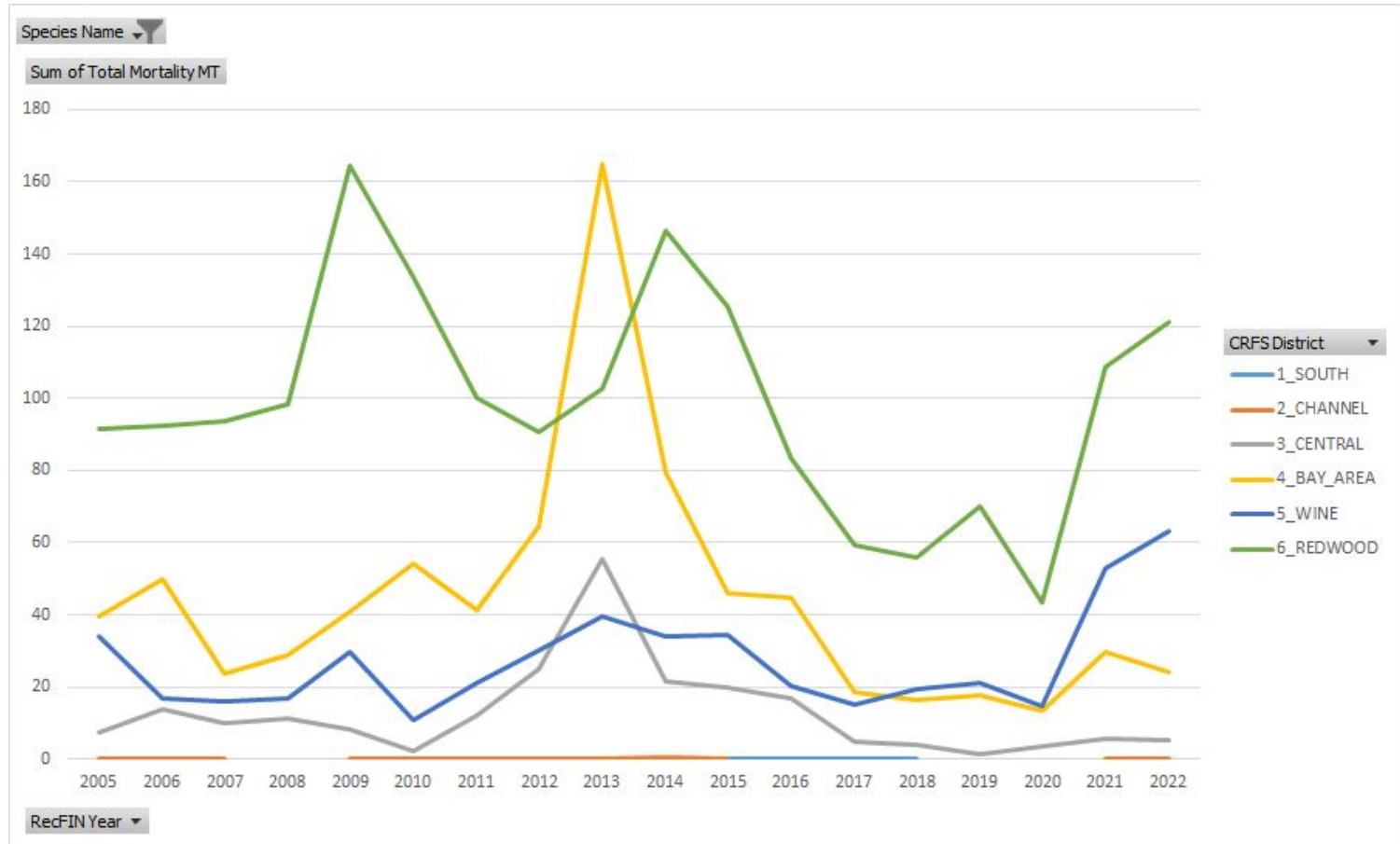
California Recreational Fisheries Survey (CRFS) Districts



Recreational Catch (mt, 2005-2022)

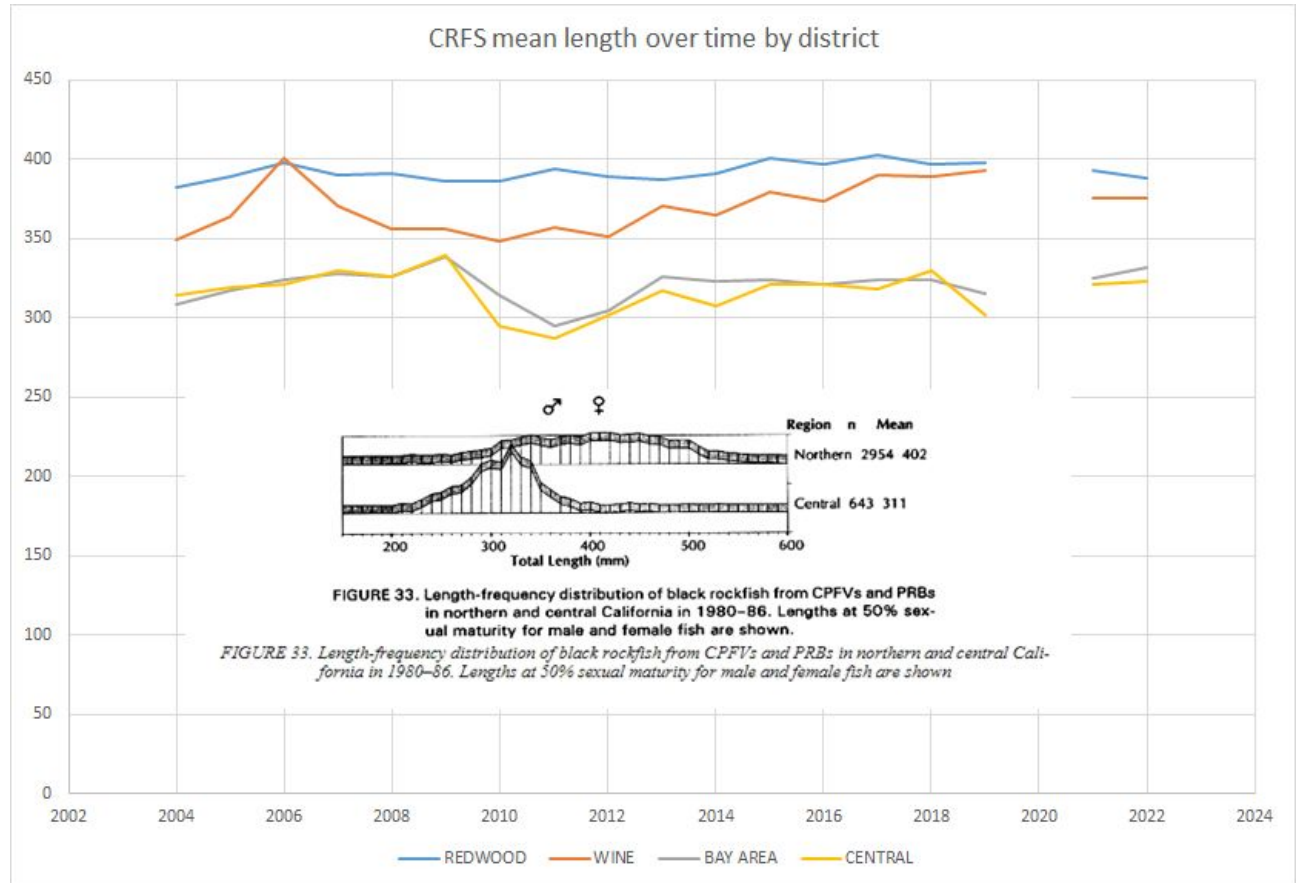


Recent recreational landings, all modes combined



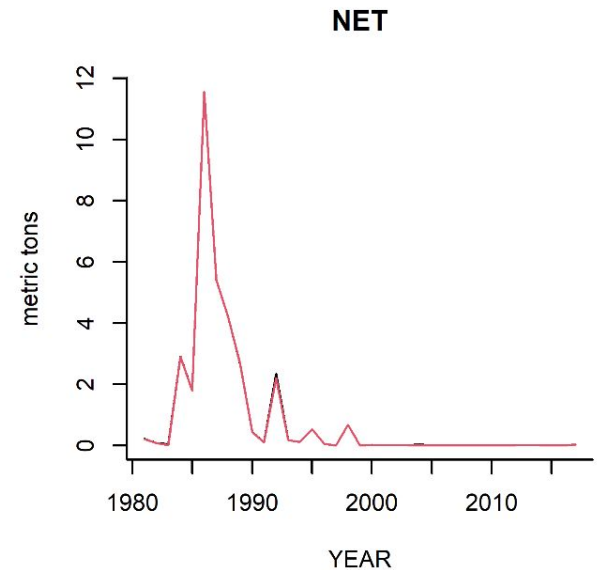
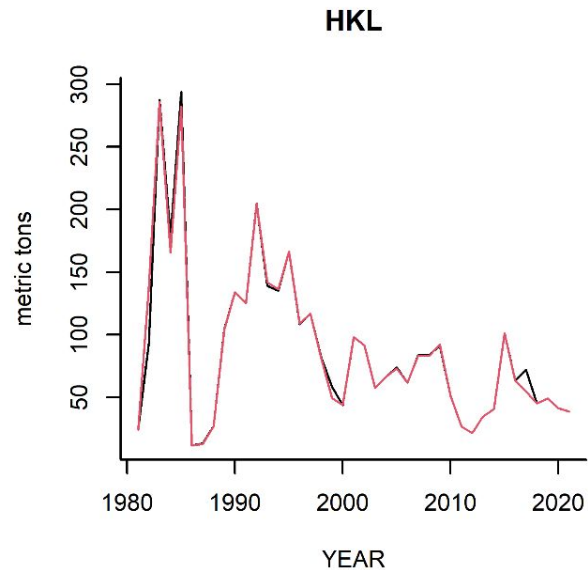
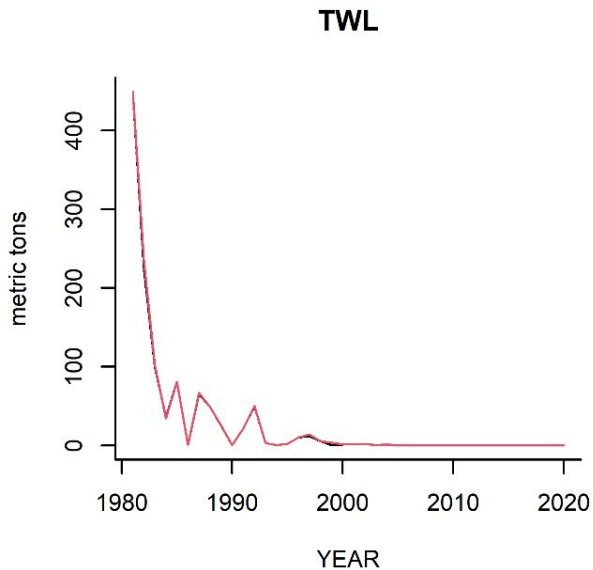
Recreational mean lengths, all modes combined

- Could define fleets spatially (“fleets as areas”)
- Northern Fleet, districts 5-6
- Central Fleet, Districts 3-4
- Allows for fleet-specific selectivity
- Also, separate CPFV from private boats



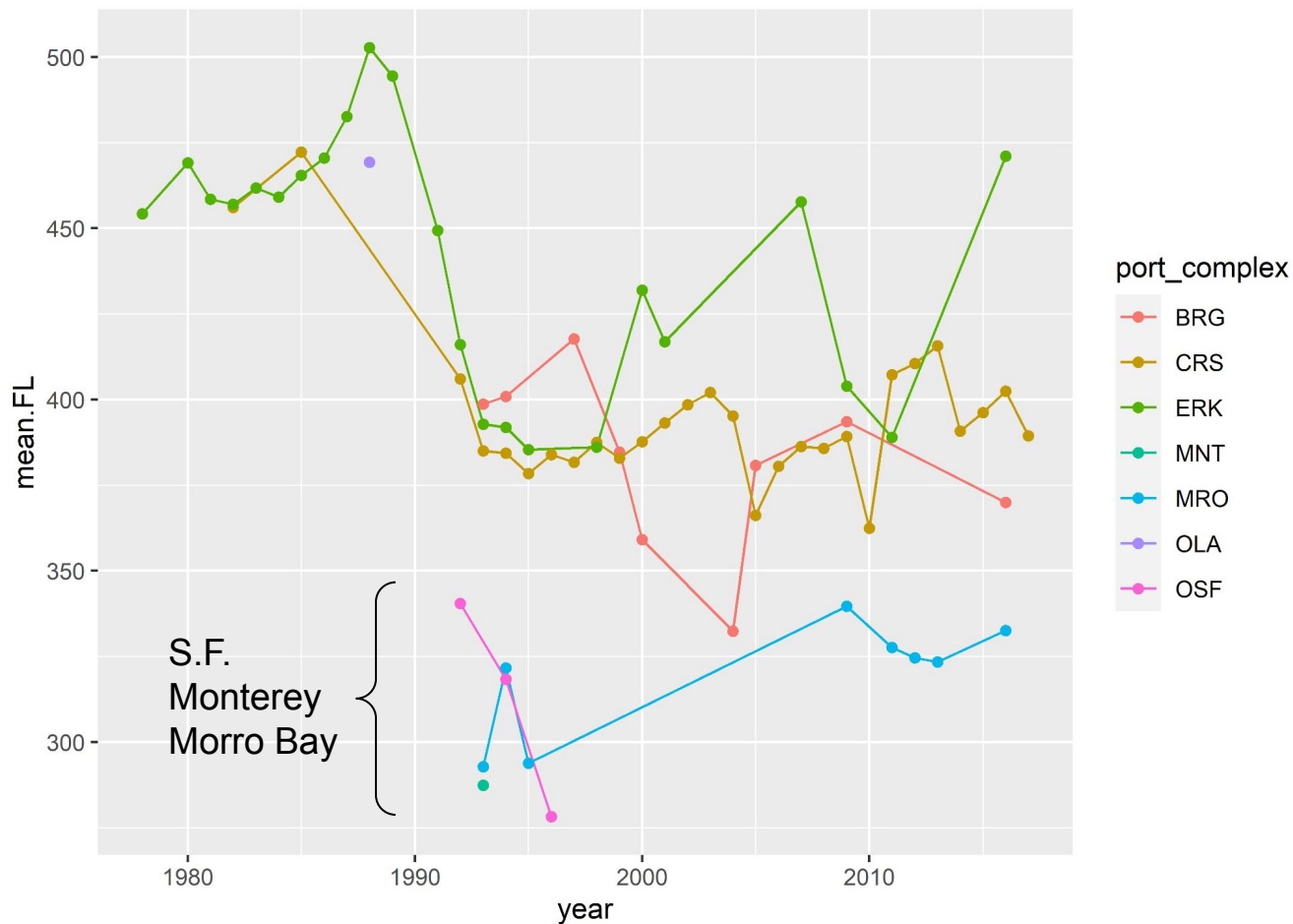
Recent commercial catch by major gear group, 1981-2021

- PacFIN (black) and CALCOM (red) show no major differences
- Hook and line will be further divided into live & dead landings, as in 2015
- Net gears are small % of total; likely will combine with fleet having similar selectivity; same approach for other minor gears (<1% of total catch)



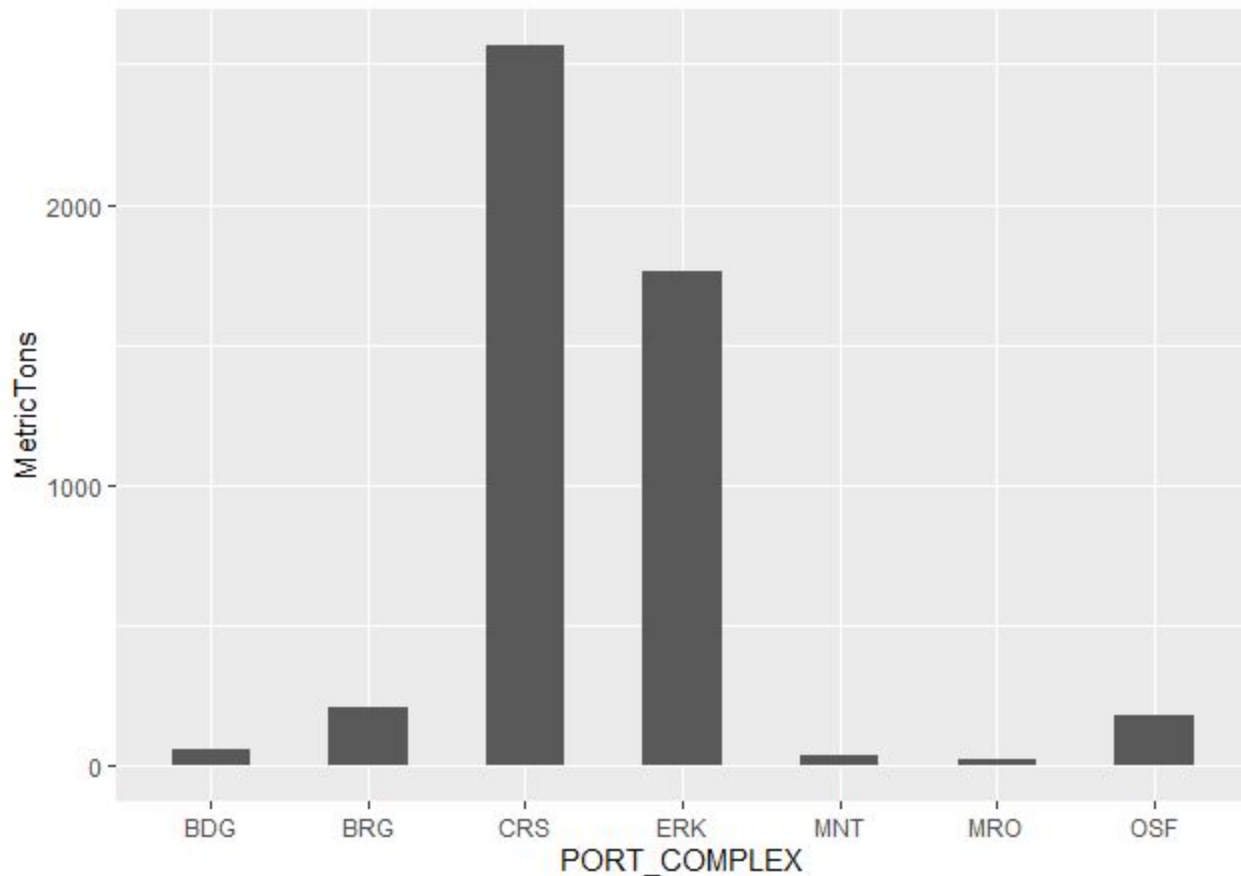
Commercial mean lengths

- Mean fork length (sexes combined, $n \geq 20$ shown)
- Larger fish in Eureka, Crescent City, Fort Bragg
- Smaller fish in S.F., Monterey, Morro Bay
- Similar pattern to rec. fishery



Commercial catch by port complex, 1981-2021

- All gears combined
- Larger % of commercial catch is north of S.F., relative to recreational catch
- Less benefit of using fleets as areas



Discard and unidentified catch

- Discards
 - WCGOP commercial discard estimates (TBD)
 - Recreational discards included in total mortality
 - Recreational size compositions for discards from onboard observers (modeling TBD)

- “Rockfish Genus” in recreational catch
 - Mainly angler-reported, but also an issue during pandemic due to sampling limitations
 - Rockfish genus not currently included in recreational mortality estimates
 - Consider allocation of this category to species; rough estimate of unidentified catch
 - Species compositions could differ by year, retained vs. discarded, and by district
 - Underestimation of total mortality can result in lower estimates of biomass and yield

Age Data

2015 Assessment

- Abrams research study (~300 otoliths)
- Lea et al. 1999 (~200)
- CALCOM commercial (~850)
- CA recreational, 1980-1984 (~300)

NWFSC ageing laboratory working on over 2000 new ages for 2023 assessment

sample_year	source	project	gear_type	pacfin_code_id	N_aged	N_structures	age_structure	priority	comment	cumulative + 10% DR
2022	CA	Rec. Bio. Groundfish Project	Hook and Line	BLCK	0	582	otolith	1		641
2021	CA	Commercial	Hook and Line	BLCK	0	454	otolith	2	▶	1140
2020	CA	Commercial	Hook and Line	BLCK	0	457	otolith	3	▶	1643
2011	CA	Abrams Research	Hook and Line	BLCK	0	400	otolith	4	630 available ▶	2083
2010	CA	Abrams Research	Hook and Line	BLCK	0	300	otolith	5	▶	2413
TBD	CA	CCFRP	Hook and Line	BLCK	0	200	otolith	6	▶	2633
2019	CA	Commercial Pilot Project	Hook and Line	BLCK	0	320	otolith	7	▶	2985
remaining 2011	CA	Abrams Research	Hook and Line	BLCK	0	230	otolith	8		3238

Indices of Abundance

- 2015 Assessment
 - 2 onboard CPFV observer indices
 - 1 dockside MRFSS index

- 2023 Assessment (in addition to the above)
 - Dockside private/rental boat index (because CPFV sample sizes decrease in northern CA)
 - Explore habitat-weighted versions of onboard CPFV indices
 - Revisit SWFSC pelagic juvenile rockfish index
 - PISCO and SWFSC dive surveys

Biology

- Plan to examine length-at-age by sex, area, and time block, if possible
- Maximum observed age (by sex) will inform priors for natural mortality
- Maturity at length likely borrowed from Oregon samples (CA studies?)
- Fecundity at length based on meta-analysis (Dick et al. 2017)
- Plan to examine weight-length by area and sex, if possible