Summary of available data to support U.S. West Coast groundfish stock assessments

by
Chantel R. Wetzel[1]

[1]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

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Contents

1 Introduction

This document provides a detailed summary of commonly used data sources that may be used to support assessments in 2025. A detailed summary of data available by year and across sources can allow the Pacific Fishery Management Council (Council) and advisory bodies to understand the coverage of data across time and the potential viability of a new assessment or assessment type. The following additions and changes have been done relative the the version of this report provided at the March 2024 Council meeting:

- Relative indices of abundance for species observed by the Northwest Fisheries Science Center (NWFSC) West Coast Groundfish Bottom Trawl (WCGBT) survey have been added.
- Relative indices of abundance for species observed by the NWFSC Hook-and-Line (HKL) survey have been added. Summaries of data collected between 2004-2023 are now included.
- Relative juvenile indices of abundance for selected species that are well observed at small sizes by the NWFSC WCGBT survey have been added. The species included are arrowtooth flounder, darkblotched rockfish, Dover sole, English sole, longspine thornyhead, Pacific sanddab, petrale sole, sablefish, shortspine thornyhead, and splitnose rockfish.
- Survey length data composition plots were included only for species identified for potential assessment in 2025 at the March Council meeting. These figures were provided in March for all species and can be found online in Agenda Item F.3, Supplemental Attachment 4, March 2024.
- A preliminary relative index of abudance from the International Pacific Halibut Commission (IPHC) survey is included for yelloweye rockfish based on sample stations off the Washington coast. The preliminary index was estimated by staff at Washington Department of Fish and Wildlife (WDFW). A future assessment of yelloweye rockfish may further refine how these data are modeled potentially resulting in slight changes in the year-to-year estimates. A plot of the designed-based (raw catch-per-unit-effort) estimates is included for comparison.
- A three-panel figure visualizing California quillback rockfish age and length from read age structures by the Cooperative Ageing Program (CAP) lab to date (4/11/2024), the distribution of lengths from read and unread age structures by data source at the CAP ageing lab, and the distribution of ages from read age structures.

1.1 Biological Samples

Data from Pacific Fisheries Information Network (PacFIN), Recreational Fisheries Information Network (RecFIN), Southwest Fisheries Science Center (SWFSC) Commercial Passenger Fishing Vessel (CPFV) cooperative collections, California Collaborative Research Program

(CCFRP) survey, the Northwest Fisheries Science Center (NWFSC) West Coast Groundfish Bottom Trawl Survey (WCGBT), and NWFSC Hook-and-Line (HKL) surveys are summarized.

Commercial data summaries were downloaded from PacFIN on December 13, 2023. The number of length samples, aged fish, and unread age structures (e.g., otoliths, fin rays, or spines) samples by species, state, and year were summarized. Age structure records were provided directly from the WDFW for 2000-2023 and Pacific States Marine Fisheries Council (PSMFC) commercial collection in California for 2011-2023. Oregon Department of Fish and Wildlife (ODFW) confirmed that age structure records in PacFIN were correct and recommended using these data directly. Data available between 2000-2023 are summarized here.

Recreational data summaries were downloaded from RecFIN on December 13, 2023. The number of length samples, aged fish, and unread age structures were summarized by species and state between 2000-2023. Available age and age structure counts for Oregon and Washington were downloaded from RecFIN on January 30, 2024.

Data collected by the NWFSC WCGBT survey between 2003-2023 and the NWFSC HKL survey from 2004-2023 are summarized by species. Similar to the summaries provided for the commercial and recreational fisheries; lengths, aged fish, and unread age structures collected are available by year. Additionally, the number of tows (NWFSC WCGBT survey) or sites (NWFSC HKL survey) that observed each species by year are also provided. CCFRP length samples by year and species are summarized here as well. No additional CCFRP data are included in this report. A separate report detailing CCFRP data is available in the March Briefing Book under Agenda Item F.3, Attachment 3, March 2024.

1.2 California Ad-hoc Age-Structure Collections

California Department of Fish and Wildlife (CDFW) provided age structure sample numbers collected via various methods from commercial and recreational fisheries. These samples were collected outside the standard sampling protocol for either California Recreational Fisheries Survey (CRFS) or the Pacific States Marine Fisheries Commission (PSMFC) commercial sampling program. These collections were labeled as "CDFW Ad-hoc" collections for each species. Details on the collection methodology for the recreational and commercial samples are below.

There are no age or age structure sample data in RecFIN that have been collected from California recreational fisheries. Recent age structure collections from 2017-2023 were provided directly by CDFW. The recreational age structure collections provided by CDFW were collected by various methods: 1) from angler surrendered fish for copper rockfish, quillback rockfish, and yelloweye rockfish that were kept in excess of recreational bag limits or were prohibited to be retained, 2) cowcod under CDFW's Exempted Fishing Permit encountered incidentally by Commercial Passenger Fishing Vessels, and 3) randomly sampled species from private/rental and party/charter recreational vessels. Any future assessment,

will need to investigate the California recreational age structures for representativeness to determine whether they could be linked to a recreational fleet within a model.

Age structures collected from 12 groundfish species in 2019 by CDFW from purposive sampling (i.e., non-random) from commercially landed fish. This commercial pilot project involved obtaining randomly selected fish from participating fish businesses, either at the time of landing, or in the case of multiple landings utilizing the same gear type, after the landing had occurred. These ages would not be associated with a commercial fleet in an assessment due to their non-random collections.

Age structures collected from carcasses of groundfish species between 2017-2019 by CDFW recreational fisheries. These collections may be considered by future assessments but would likely only be used as marginal ages (i.e., would not inform growth) given the uncertainty around the true fish length (e.g., length prior to filleting).

1.3 Survey Length Compositions

The length data collected by the NWFSC WCGBT survey were expanded using a generalized area-based stratification. The composition data were expanded using a design-based approach with strata based on state latitudes with two depth strata: 55 - 183 m and 183 - 549 m, with an exception for four specie. The four species have considerable biomass at depths greater than 549 m: sablefish, Dover sole, longspine thornyhead, and shortspine thornyhead. Thus an additional depth strata that covered deeper waters, 549 - 1,280 m, for each state area was added. The expanded length composition data were summarized using either a 2 or 4 cm bin structure depending upon the range between maximum and minimum lengths observed within the survey data. Species where the range between the maximum and minimum lengths observed by the survey were less than 60 cm, 2 cm data bins were used, while for species where the range was 60 cm or greater the data bins were set at 4 cm. All length observations were treated as unsexed fish in this exercise for simplicity and for ease of observing potential trends in length observations across time. The generalized stratification and bin structure selected here provides a simple summary of the data that can be useful for decision making, but will likely differ from a species-specific approach that would be selected in a future assessment. Additionally, the NWFSC WCGBT survey selectivity for each species will impact the lengths observed and has not been explicitly accounted for in this analysis.

The length data collected by the NWFSC HKL survey were summarized to reflect the proportion of observations by species, length bin, and year. The length composition data were summarized using either a 2 or 4 cm bin structure depending upon the range between maximum and minimum lengths observed within the survey data, in the same manner as for the NWFSC WCGBT survey. Similar to the NWFSC WCGBT survey, the selectivity of the NWFSC HKL survey for each species will impact the lengths observed and has not been explicitly accounted for in this analysis.

The length data plots for the CCFRP survey are not provided here. For detailed information about CCFRP survey data please see the separate CCFRP report.

1.4 Survey Relative Indices of Abundance

Indices of abundance were estimated from the NWFSC WCGBT survey using a spatiotemporal model (smdTMB) for species well-observed by the survey. The indices were estimated using a generalized set-up across species using either a gamma or log-normal distribution, with the dispersion parameter held constant across years with 200-500 knots used to create the mesh. The model structure for each species is provided in Section 4. Future species-specific indices of abundance created with sdmTMB would likely select a more tailored approach for model settings (e.g., knots, distributions) which could result in slight changes in year-by-year values for the indices of abundance. The indices of abundance presented here should only be considered illustrative of potential trends in abundance across time.

Indices of abundance were estimated from the NWFSC HKL survey for well-observed species using a negative-binomial model that accounted for year, site, and drop number. Additional covariates that would typically be explored when developing species-specific indices for use in stock assessments were not explored in this analysis for simplicity. The selection of how to model these data for a particular species may vary from the approach applied here. For example, the recent vermilion and sunset rockfish assessment modeled the data as two indices (i.e., one for areas outside of the Cowcod Conservation Areas [CCA] and one for sites inside the CCAs). In contrast, the recent assessment of copper rockfish estimated a single index with observations by areas weighted (nearshore sites, northern Channel Islands, Southern Channel Islands).

1.5 Maturity Data Collections

Maturity samples for a wide range of West Coast groundfish species have been collected across a range of sources: NWFSC WCGBT survey, NWFSC HKL survey, Pacific hake survey, at-sea sampling of the Pacific hake fishery, and port sampling by ODFW and WDFW. Samples have been collected between 2009 - 2022. The following summary does not include collection from the 2023 NWFSC WCGBT and HKL surveys. Summaries of the maturity collections is provided for each species. This data summary only includes collections led by the NWFSC but other collections could be available at the SWFSC, CDFW, ODFW, WDFW, or other research groups. Future data summaries will look to integrate these additional collections in subsequent versions of this document.

1.6 Additional Data

Data may be available for consideration in future assessments that are currently not included in this report. A summary of potential additional data that could be available are described below:

- Totals for data collected in 2023 in PacFIN and RecFIN are incomplete for all states.
- Data collected in 2023 by the CCFRP are not yet available. Additionally, in recent years CCFRP has been collecting age structures from a small number of fish from the reference area (i.e., areas open to fishing). The numbers of age structures and aged fish

from this survey were not available for this report. There is a separate document is provided that summarizes data collected by the CCFRP for select species that details the number of samples by location, area type (marine protected area or reference area), and plots of available length compositions.

- Historical data collections from various research projects exist at the SWFSC that have not been cataloged and entered into any database. Species-specific searches may yield additional samples within these collections.

While this document only summarizes data from 2000-2023, there are additional data available from earlier years that could be incorporated into future assessments.

- ODFW and WDFW have substantial collections from periods prior to the years summarized in this report from their commercial and recreational sampling programs.
- CDFW is undergoing a review of historical age structures collections (i.e., referred to as refugia samples) for samples from the 1980s and earlier. If sufficient documentation exists for these historical samples they could be potentially included in future assessments. Since this work is ongoing it is unclear how many samples may be available across species.

Finally, summarizing commercial and recreational data from each state accurately continues to be challenging due to differences by state in what information is transmitted to PacFIN and RecFIN (e.g., California commercial age structure collections). Receiving and understanding the available commercial and recreational data requires emailing various representative in each state who thankfully have been accommodating in answering questions and providing additional data summaries. However, given the challenges around acquiring and collating, data summaries may not be comprehensive or have unintentional errors. Any issues identified will be addressed in future versions.

2 Preliminary Species Idenfitified for Assessment in 2025

At the March 2024 Pacific Fishery Management Council meeting, a preliminary list of groundfish species to consider for assessment in 2025 was identified (March Decision Document). The available data collected from the recreational and commercial fisheries by state, select scientific surveys, and additional age structure collection for these species are provided to inform final selection of species to assess in 2025.

Chilipepper

The most recent assessment of chilipepper was an update assessment conducted in 2015. Across available data, chilipepper have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 91 positive tows per year. The NWFSC HKL survey has an average of 25 positive sets per year the area south of Point Conception in California.

Coastwide a total of 157 maturity samples have been collected and 157 read by researchers at the NWFSC.

Table 1: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for chilipepper.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	1	NA	NA
California	CDFW-Ad hoc	0	0	124
California	Commercial	39,249	7,862	5,776
California	NWFSC HKL	2,619	0	2,371
California	NWFSC WCGBT	32,613	8,068	4,369
California	Recreational	9,604	0	0
California	SWFSC-CPFV Coop.	4	0	4
Oregon	Commercial	3,913	0	3,797
Oregon	NWFSC WCGBT	2,071	484	402
Oregon	Recreational	51	0	0
Washington	Commercial	84	0	84
Washington	NWFSC WCGBT	91	27	40
Washington	Recreational	1	0	0

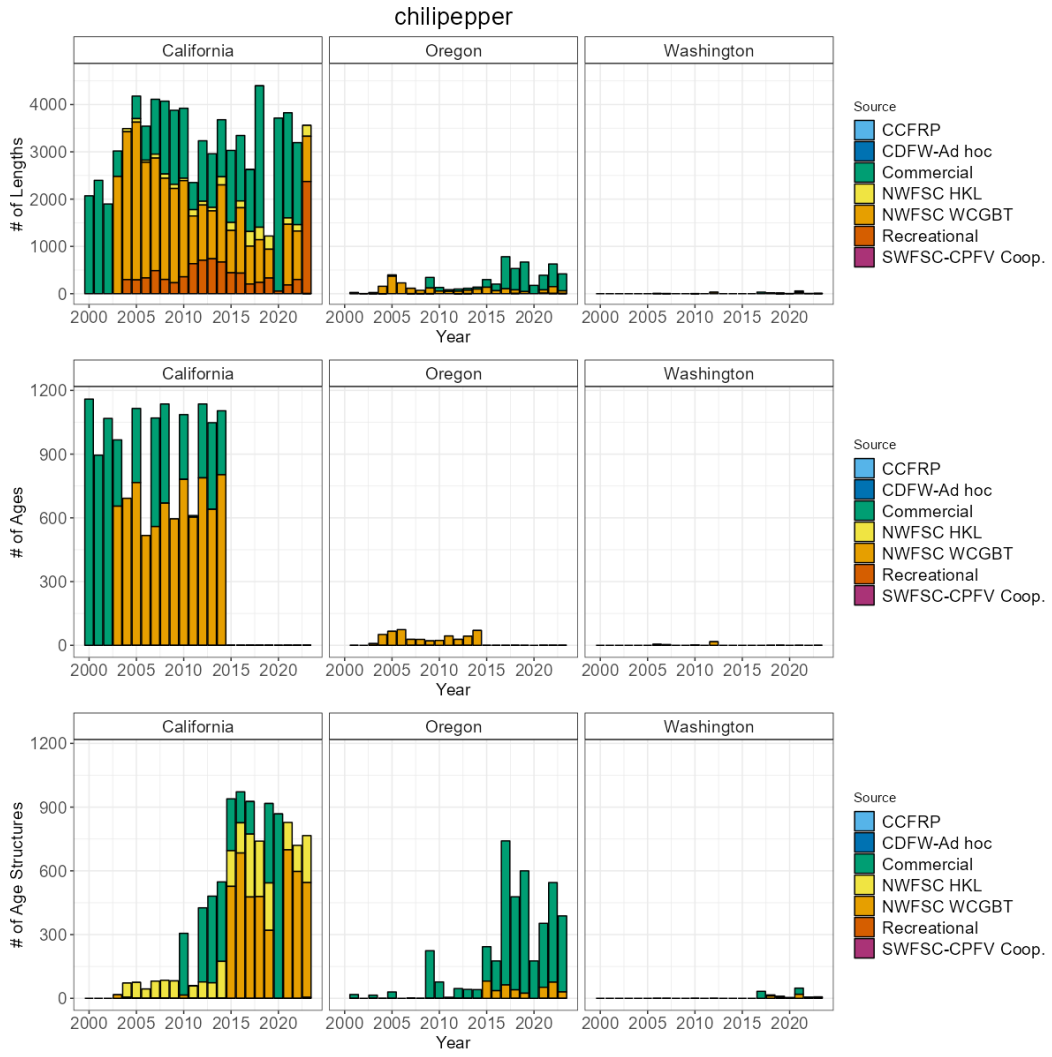

Figure 1: Total number of available lengths, read ages, and unread age structures by data source by year for chilipepper. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

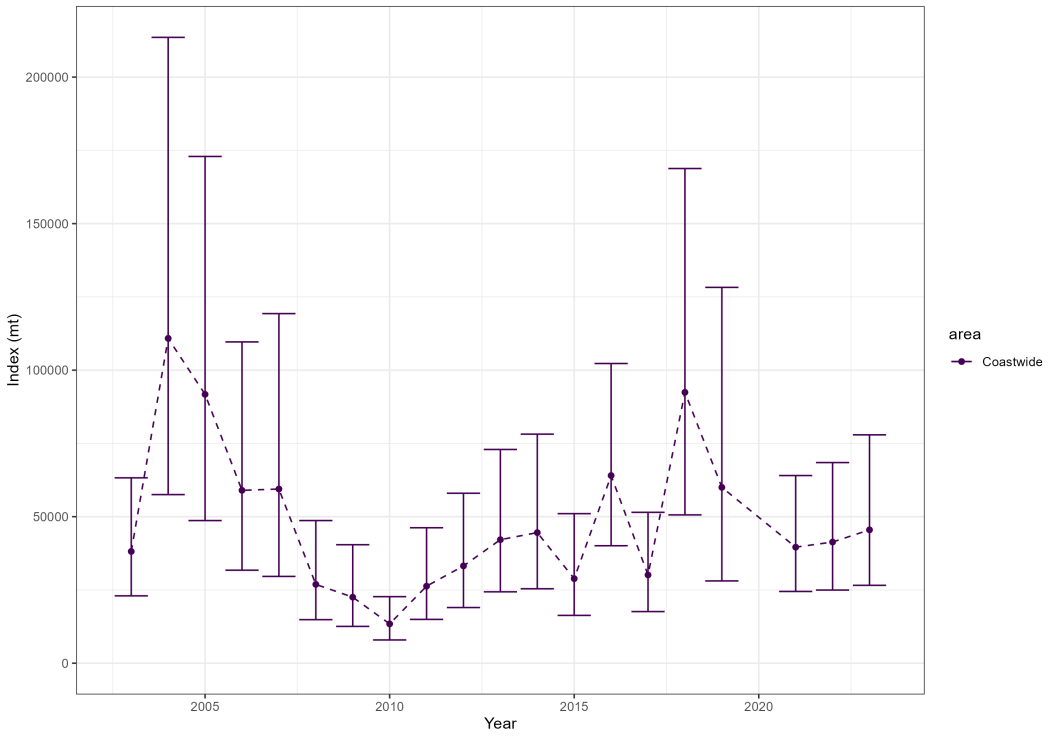

Figure 2: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for chilipepper. The NWFSC WCGBT has a coastwide average of 91 positive tows per year.

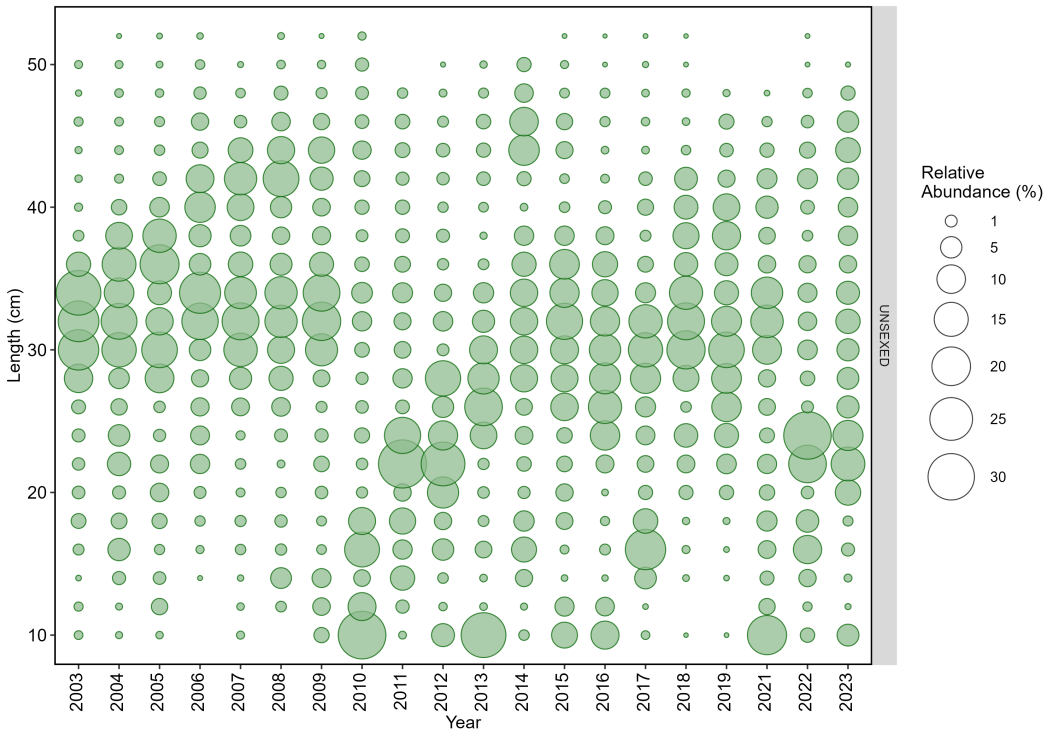

Figure 3: Length (cm) compostion data from the NWFSC West Coast Groundfish Bottom Trawl survey for chilipepper. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

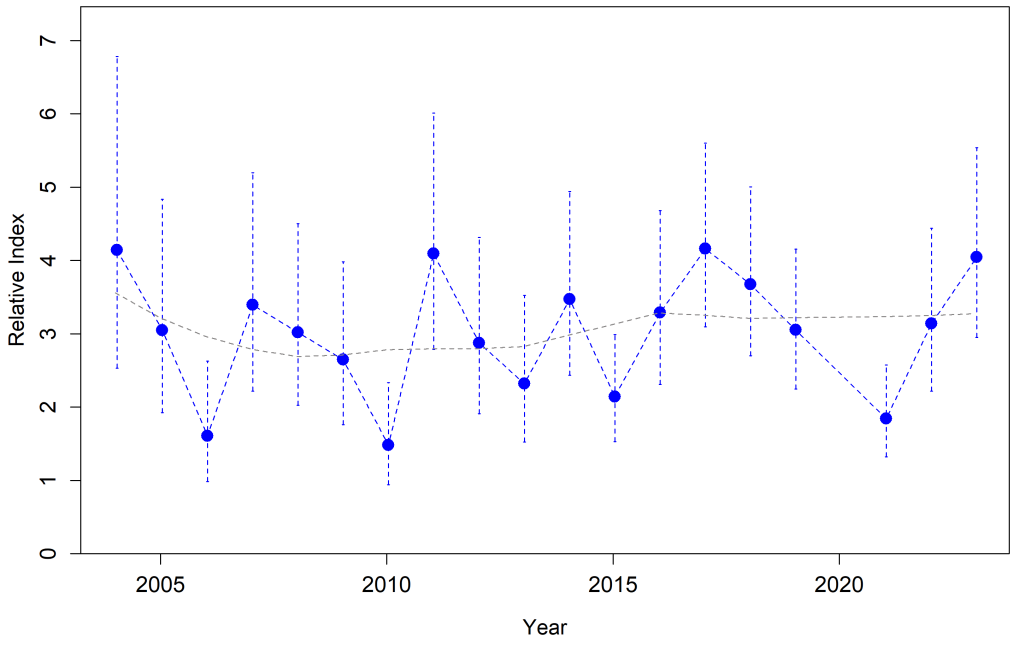

Figure 4: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for chilipepper. The NWFSC HKL survey has an average of 25 positive sets per year the area south of Point Conception in California.

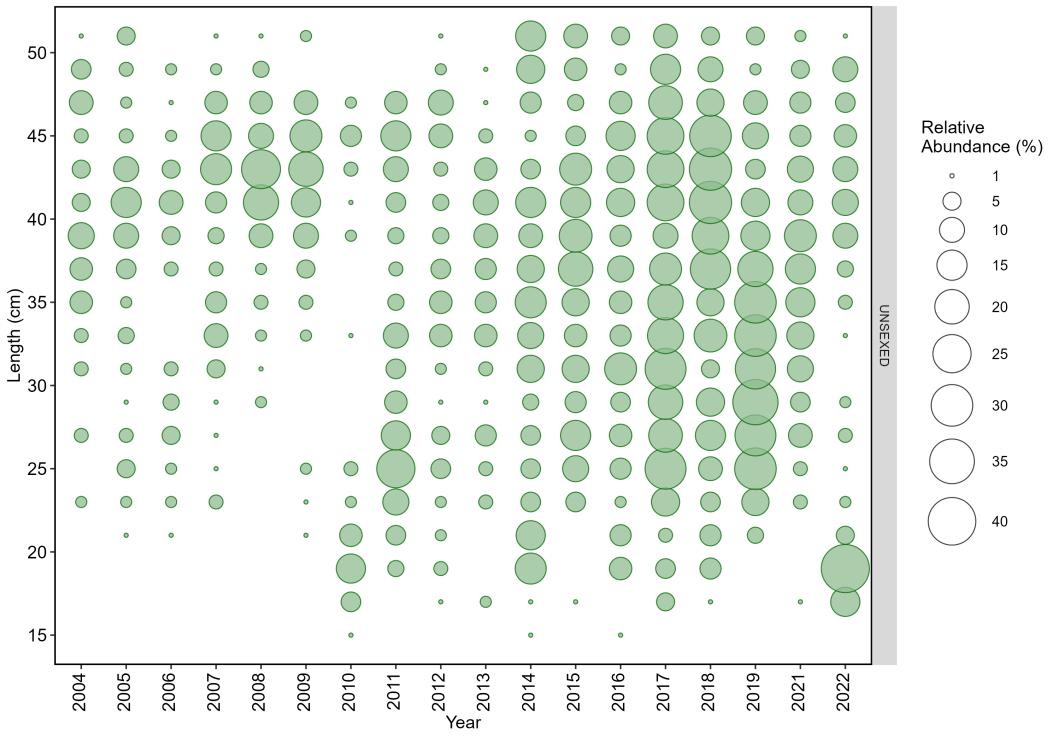

Figure 5: Length (cm) compostion data from the NWFSC Hook and Line survey for chilipepper. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

English sole

The most recent assessment of English sole was a data-moderate assessment conducted in 2013. Across available data, English sole have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 264 positive tows per year.

Table 2: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for English sole.

State	Source	Lengths	Ages	Age Structures
California	Commercial	23,868	0	1,583
California	NWFSC WCGBT	43,625	478	8,592
California	Recreational	17	0	0
Oregon	Commercial	32,135	1,015	24,612
Oregon	NWFSC WCGBT	28,590	264	4,810
Oregon	Recreational	24	0	0
Washington	Commercial	19,160	10,482	2,601
Washington	NWFSC WCGBT	14,697	156	3,124
Washington	Recreational	2	0	1

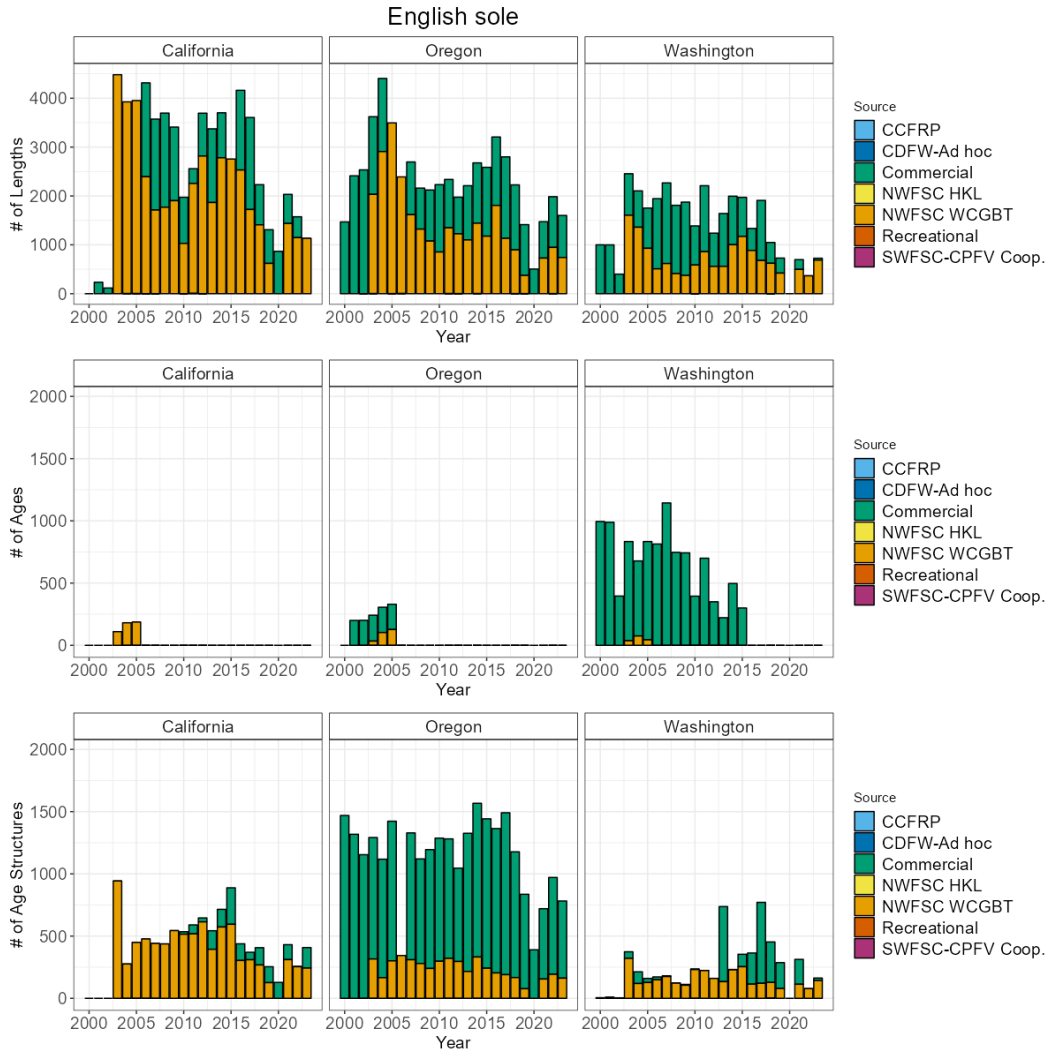

Figure 6: Total number of available lengths, read ages, and unread age structures by data source by year for English sole. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

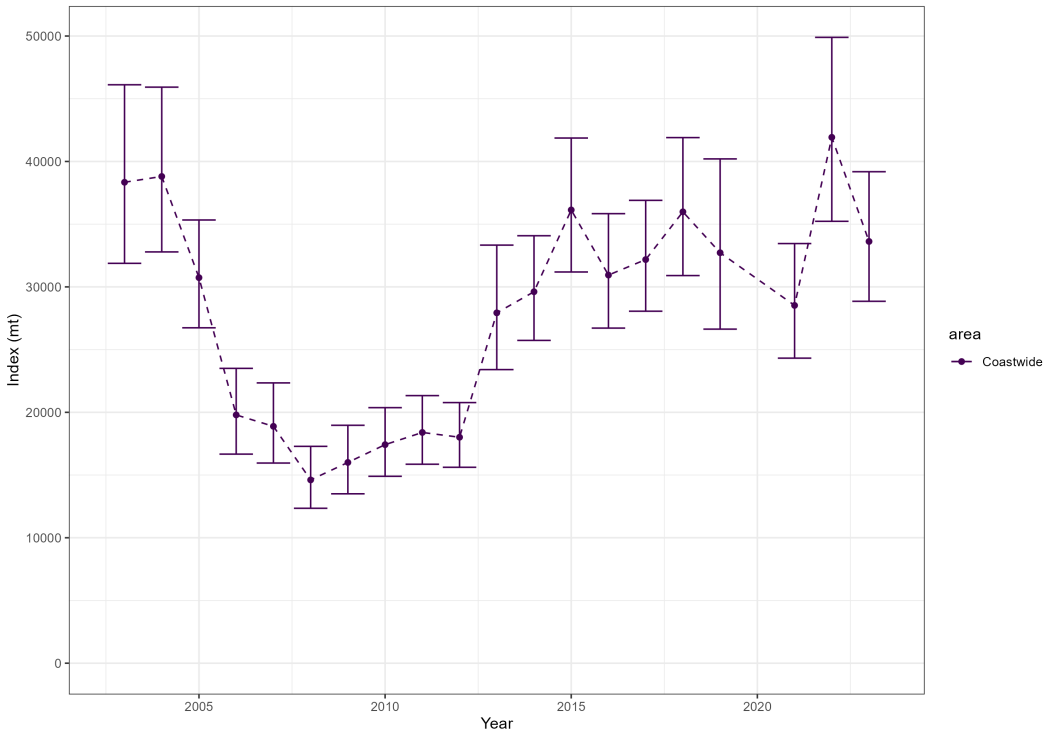

Figure 7: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for English sole. The NWFSC WCGBT survey has an average of 264 positive tows per year.

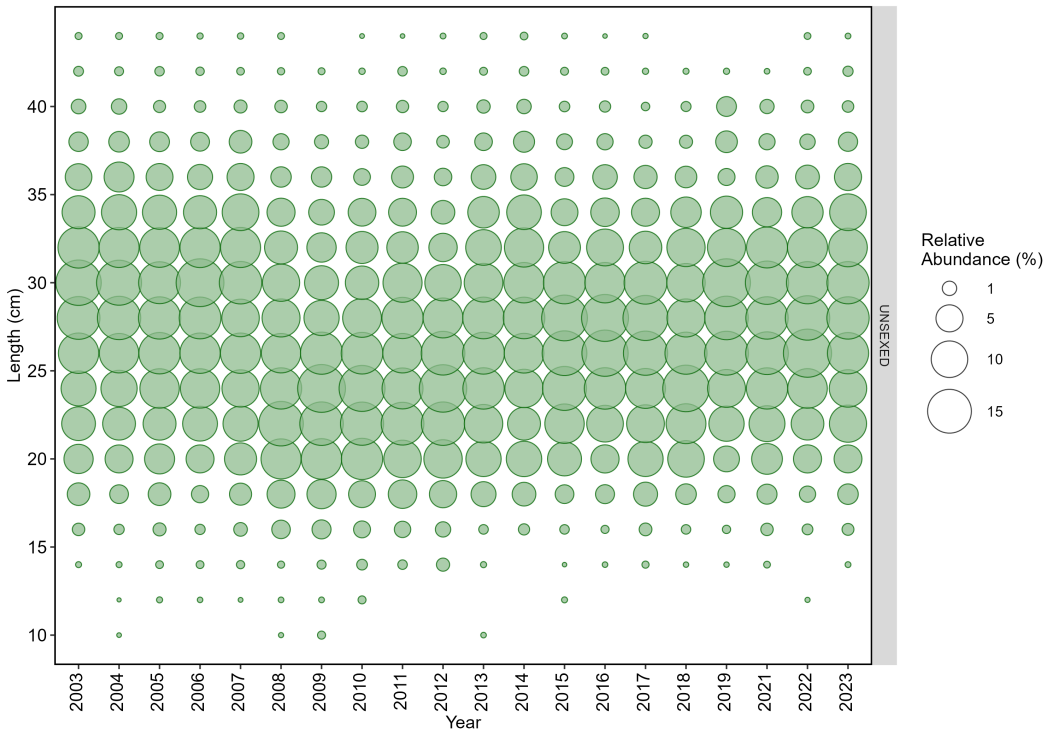

Figure 8: Length (cm) compostion data from the NWFSC West Coast Groundfish Bottom Trawl survey for English sole. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

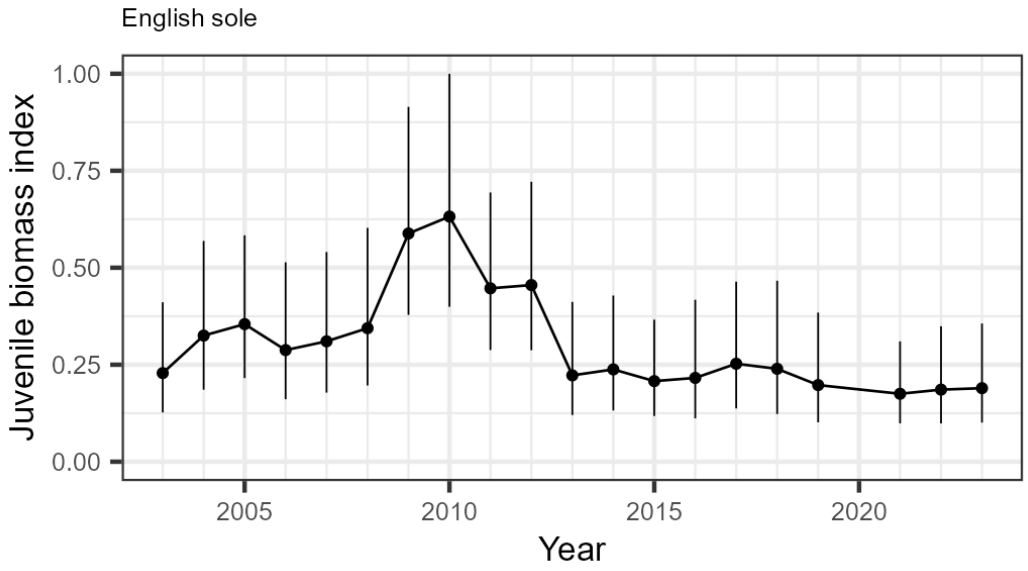

Figure 9: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for English sole. The juvenile index represents fish 16 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of English sole in 2013 did not estimate annual recruitment deviations.

Table 3: The median length (cm) associated with fish age 3 or younger for English sole based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
1	19
2	22
3	26

Petrale sole

The most recent assessment of petrale sole was a benchmark assessment conducted in 2023. Across available data, petrale sole have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 271 positive tows per year.

Coastwide a total of 728 maturity samples have been collected and 394 read by researchers at the NWFSC.

Table 4: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for petrale sole.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	10	NA	NA
California	Commercial	56,613	4,035	4,153
California	NWFSC HKL	2	0	0
California	NWFSC WCGBT	34,359	7,165	2,698
California	Recreational	2,229	0	0
Oregon	Commercial	45,557	12,006	26,579
Oregon	NWFSC WCGBT	27,699	4,493	3,022
Oregon	Recreational	2,798	0	0
Washington	Commercial	28,401	16,305	1,429
Washington	NWFSC WCGBT	17,168	3,040	2,190
Washington	Recreational	59	22	12

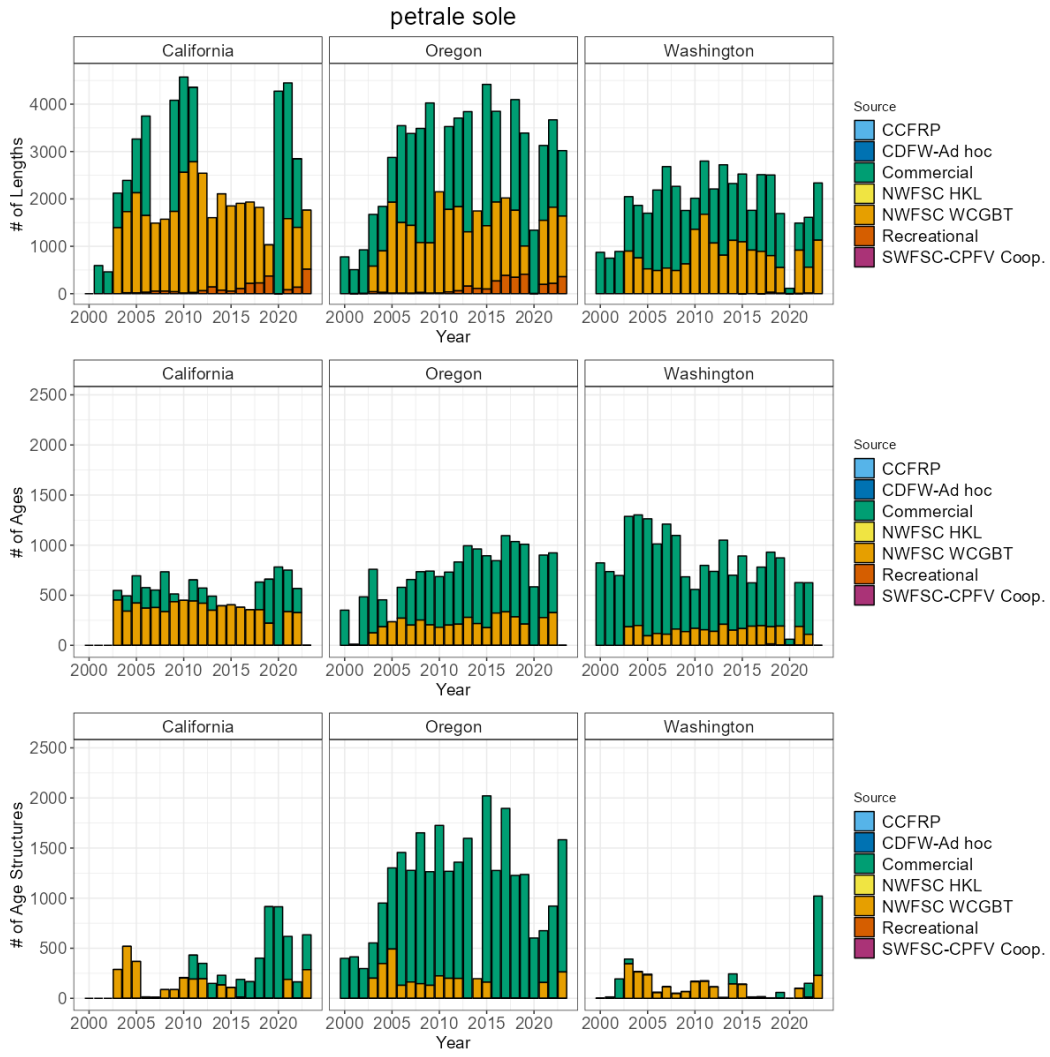

Figure 10: Total number of available lengths, read ages, and unread age structures by data source by year for petrale sole. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

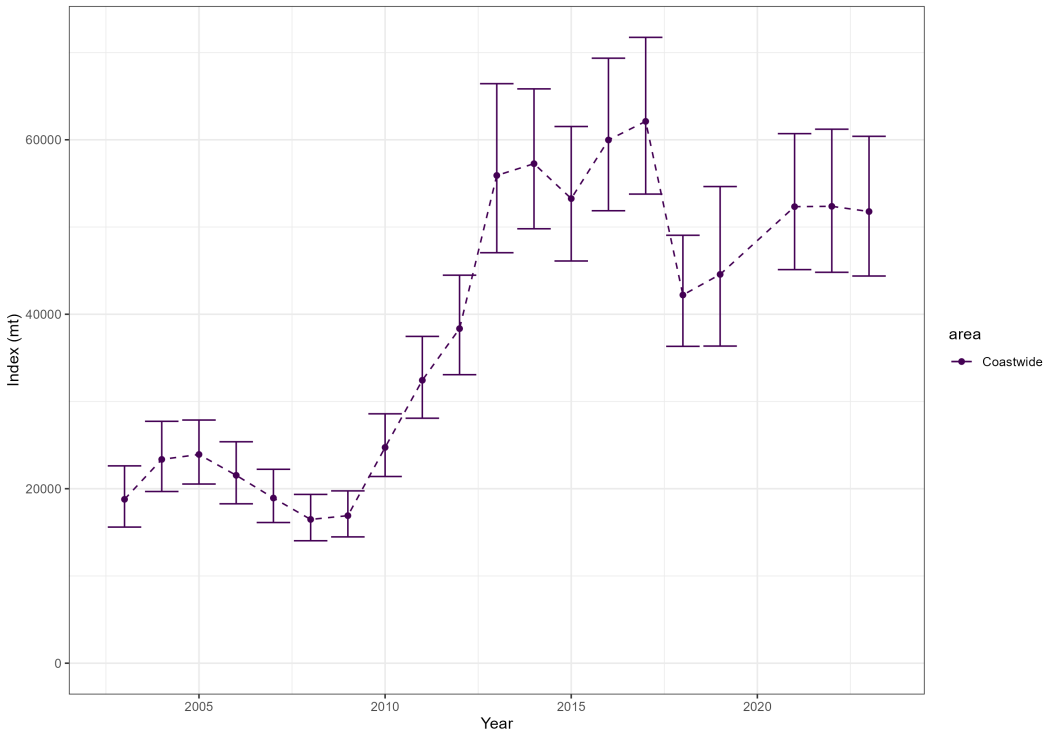

Figure 11: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for petrale sole. The NWFSC WCGBT survey has an average of 271 positive tows per year.

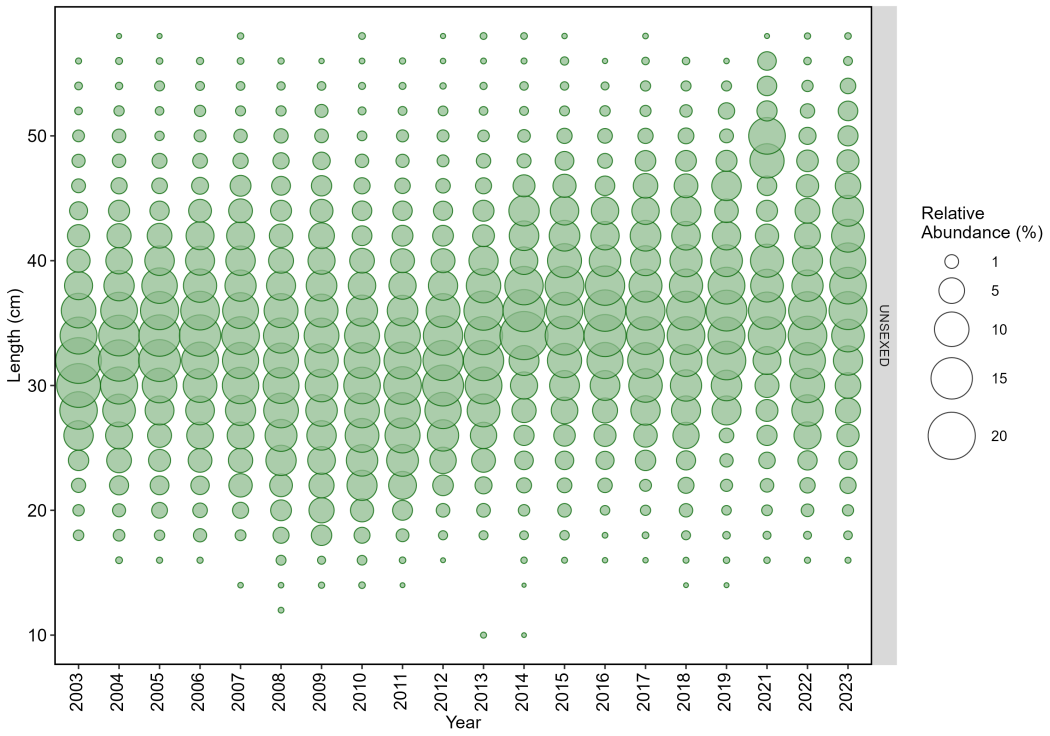

Figure 12: Length (cm) compostion data from the NWFSC West Coast Groundfish Bottom Trawl survey for petrale sole. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

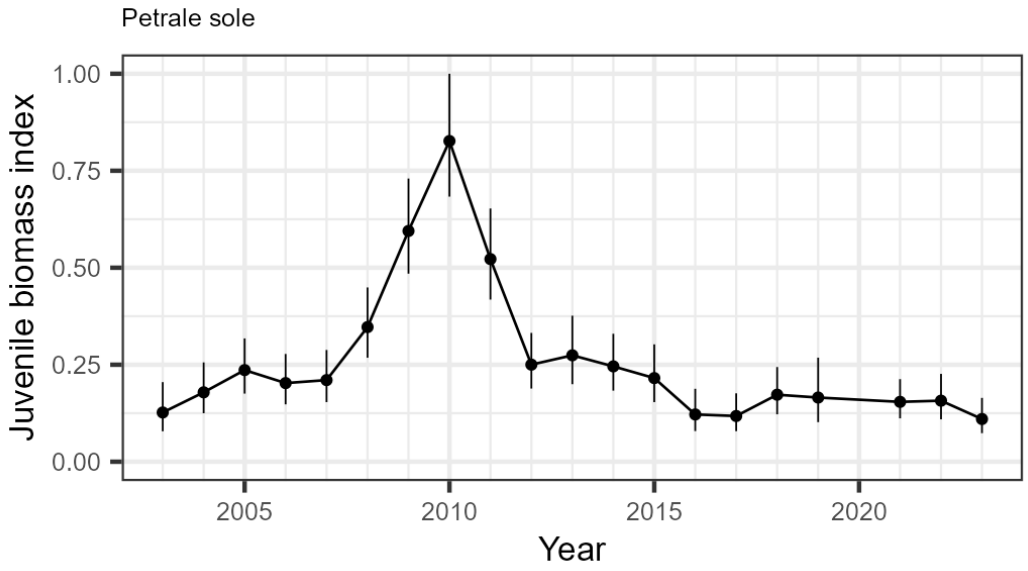

Figure 13: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for petrale sole. The juvenile index represents fish 21 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of petrale sole in 2023 estimated large recruitments (i.e., greater than 0.50) in 2006, 2007, and 2008.

Table 5: The median length (cm) associated with fish age 4 or younger for petrale sole based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
1	18.0
2	21.5
3	26.0
4	29.5

Quillback rockfish

The most recent assessment of quillback rockfish was a data-moderate assessment conducted in 2021. Across available data, quillback rockfish have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 4 positive tows per year.

Coastwide a total of 3 maturity samples have been collected and 0 read by researchers at the NWFSC. There are ongoing additional data collections led by SWFSC staff being conducted this year to inform maturity and fecundity of quillback rockfish in California waters. Any samples collected by these efforts will be available to inform a potential 2025 assessment.

There are various sources of age structure for quillback rockfish in California that are not reflected in the data totals below. As of April 11, 2024 the Cooperative Ageing Program (CAP) in Newport Oregon had the following age structures that are not included in summaries in this document: 138 from the CCFRP survey (currently being read), 119 from a research program conducted by Jeff Abrams (already read), and 23 from various SWFSC data collection efforts (currently being read).

Table 6: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for quillback rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	332	NA	NA
California	CDFW-Ad hoc	0	0	147
California	Commercial	1,151	0	262
California	NWFSC WCGBT	26	21	0
California	Recreational	5,810	0	0
California	SWFSC-CPFV Coop.	135	0	135
Oregon	Commercial	3,579	475	1,038
Oregon	NWFSC WCGBT	119	82	20
Oregon	Recreational	20,133	1,522	2,767
Washington	Commercial	185	37	35
Washington	NWFSC WCGBT	100	70	9
Washington	Recreational	5,076	2,154	487

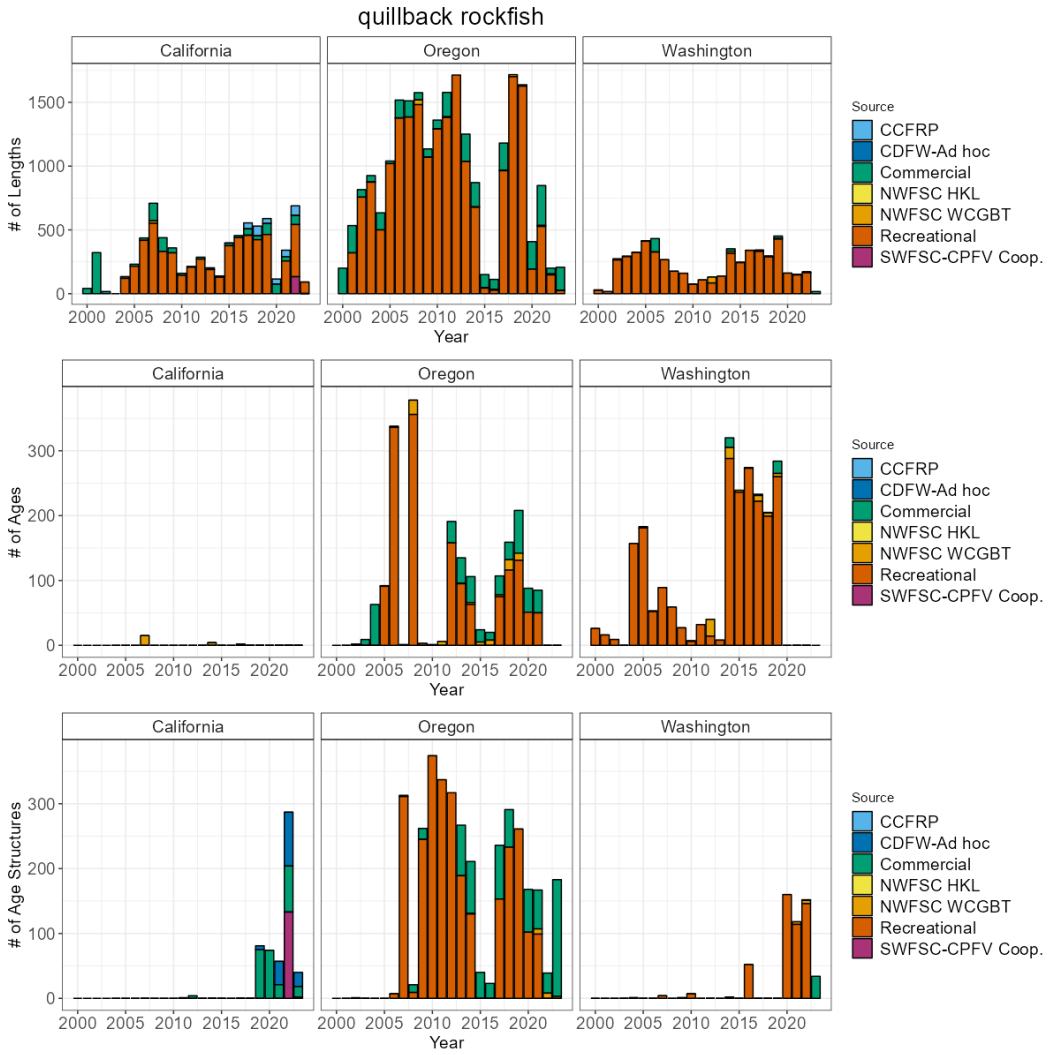

Figure 14: Total number of available lengths, read ages, and unread age structures by data source by year for quillback rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

A summary of California quillback rockfish age structuresthat have been sent to the CAP ageing lab in Newport, Oregon. as of April 11, 2024 is provide below. Approximately 50 percent of the age structures have been read with finalized ages with the remaining samples currently being read and finalized. Any additional samples that arrive at the ageing lab this year will be prioritized for age reading. The number of samples from small California quillback rockfish (e.g., less than 24 cm) has increased but remains limited, increasing from 5 at the end of 2021 to 24 with the majority of the new samples being from fish between 22-23.9 cm. The lack of samples from young sizes may create challanges in estimating all growth parameters, potentially requiring some growth parameters to be fixed in a future assessment.

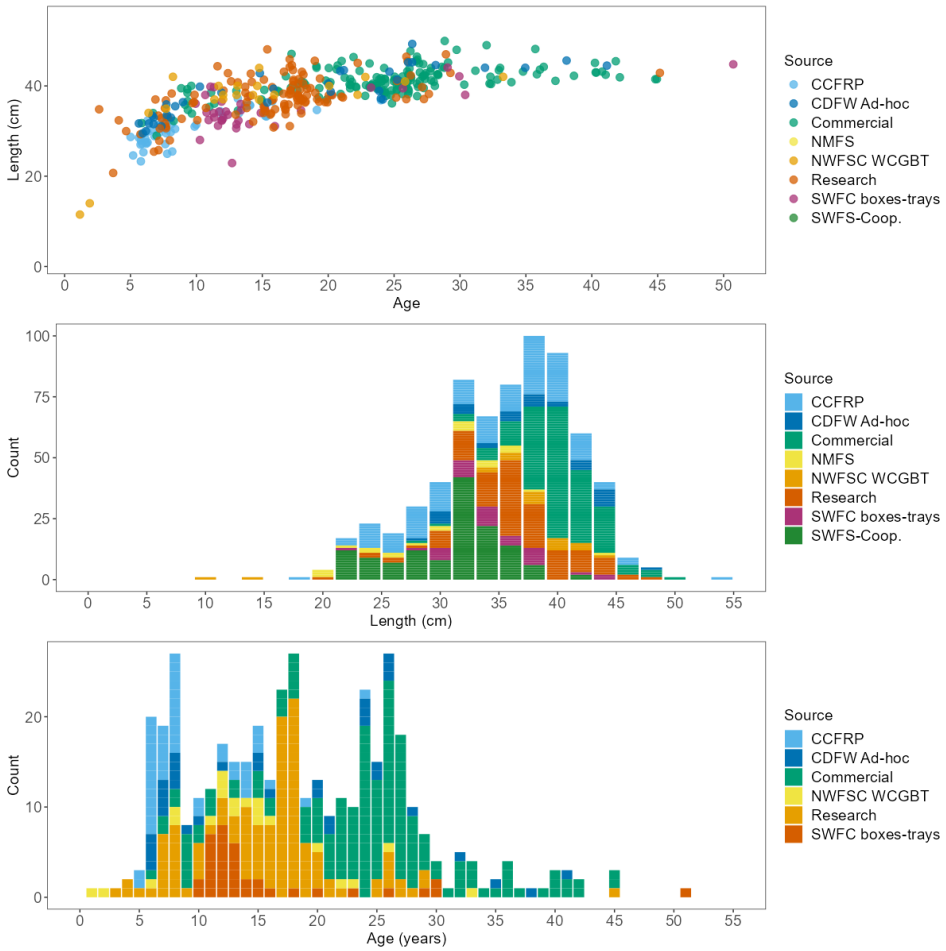

Figure 15: Age-length for aged California quillback rockfish by data source, the distribution of lengths from read and unread age structures by data source at the CAP ageing lab as of 4/11/2024, and the distribution of ages from read age structures. The NMFS age structures have been collected by targeted collections. The SWFSC boxes-trays samples are from historical collections from either recreational or commerical fisheries.

Rougheye and blackspotted rockfish

The most recent assessment of rougheye and blackspotted rockfish was a benchmark assessment conducted in 2013. Across available data, rougheye and blackspotted rockfish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 28 positive tows per year.

Coastwide a total of 295 maturity samples have been collected and 86 read by researchers at the NWFSC. Research being led by the NWFSC has incorporated genetic samples to inform species-specific maturity for rougheye rockfish and blackspotted rockfish that could inform a potential 2025 assessment.Research to better understand the species-specific biology of rougheye rockfish and blackspotted rockfish and the proportion of each species observed off the West Coast in select data sets (NWFSC WCGBT, At-sea Pacific hake fishery, West Coast Groundfish Observer Program, and ODFW) has been conducted by researchers at the NWFSC. Some of the key determinations from this research are 1) across all data sources approximately 85 percent and 15 percent of the genetic samples were determined to be rougheye rockfish and blackspotted rockfish, respectively, 2) the rate of field identification erorr in the NWFSC WCGBT survey samples is 10 percent for blackspotted rockfish, 3) the NWFSC WCGBT survey observes very few blackpotted rockfish of 25 cm or less compared to observations of rougheye rockfish of similar sizes, and 4) there are differences in otolith weights and growth between the two species (personal communication, Peter Frey, NWFSC).

Table 7: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for rougheye and blackspotted rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	1,166	0	312
California	NWFSC HKL	1	0	1
California	NWFSC WCGBT	15	5	9
Oregon	Commercial	18,517	725	16,888
Oregon	NWFSC WCGBT	1,023	528	323
Washington	Commercial	31,086	396	15,696
Washington	NWFSC WCGBT	1,204	429	625
Washington	Recreational	2	0	0

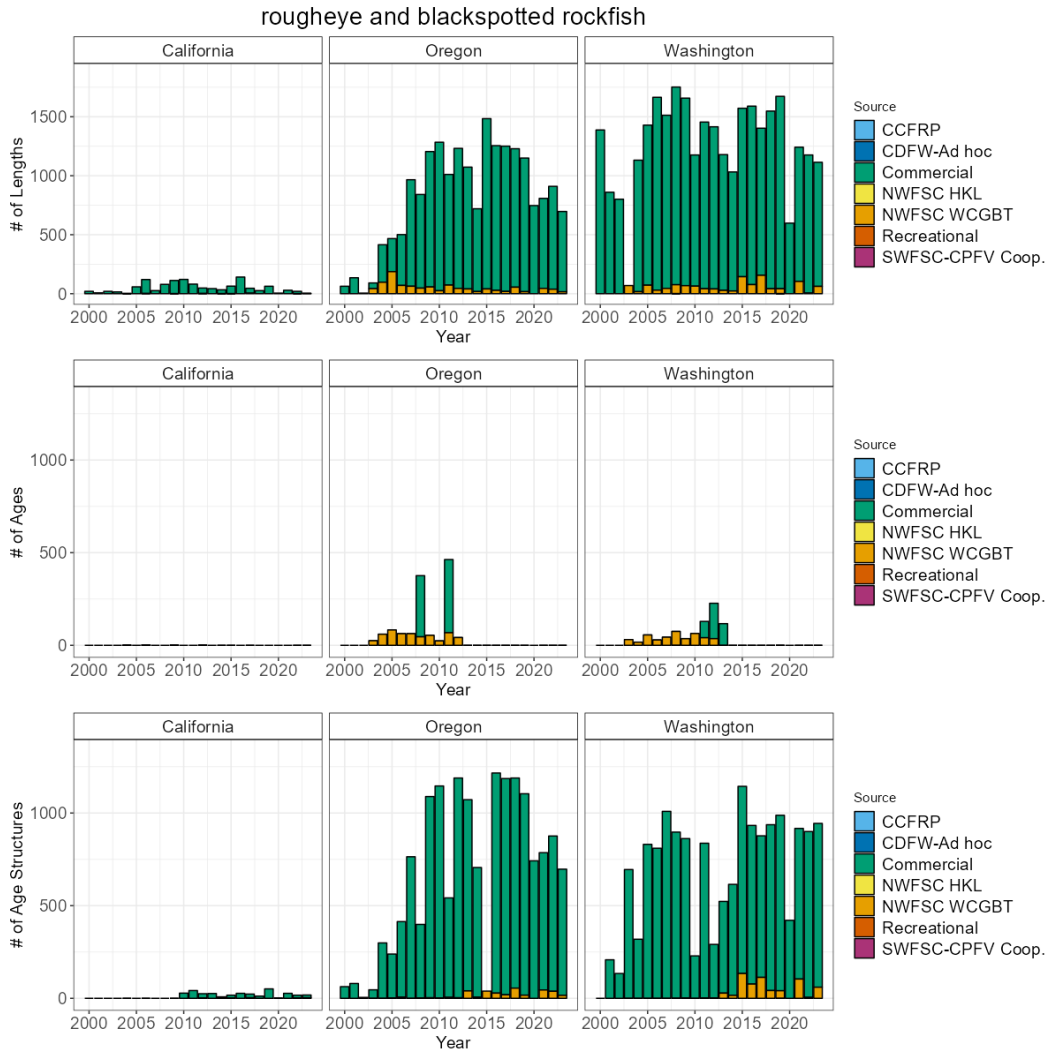

Figure 16: Total number of available lengths, read ages, and unread age structures by data source by year for rougheye and blackspotted rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

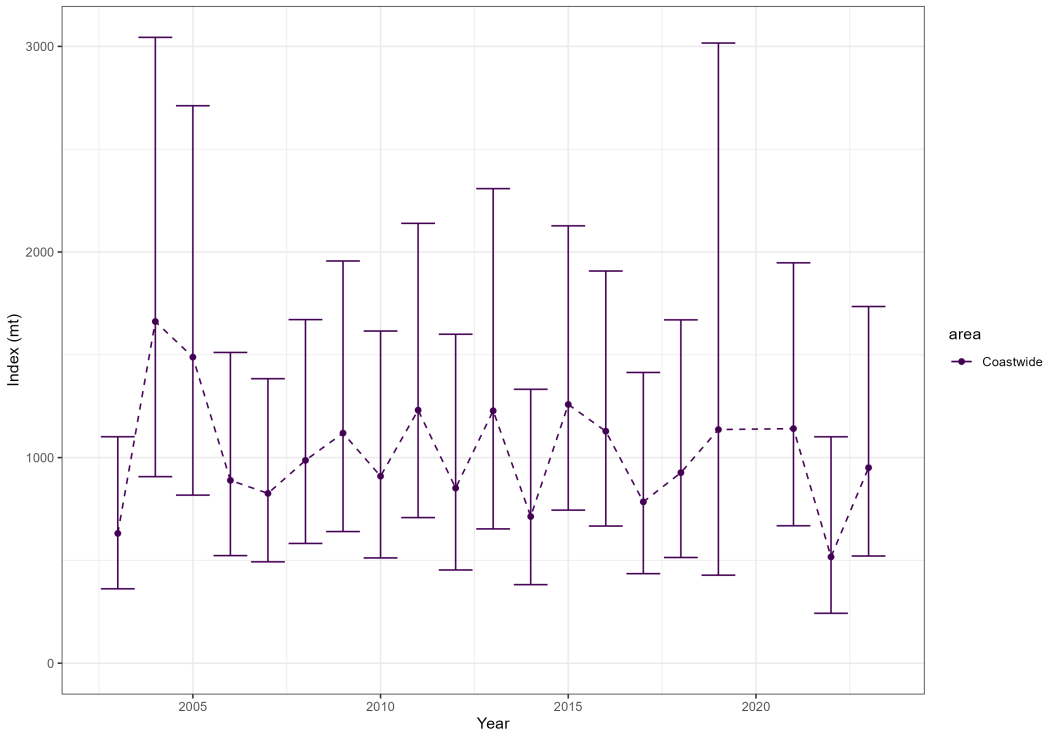

Figure 17: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for rougheye and blackspotted rockfish. The NWFSC WCGBT survey has an average of 28 positive tows per year.

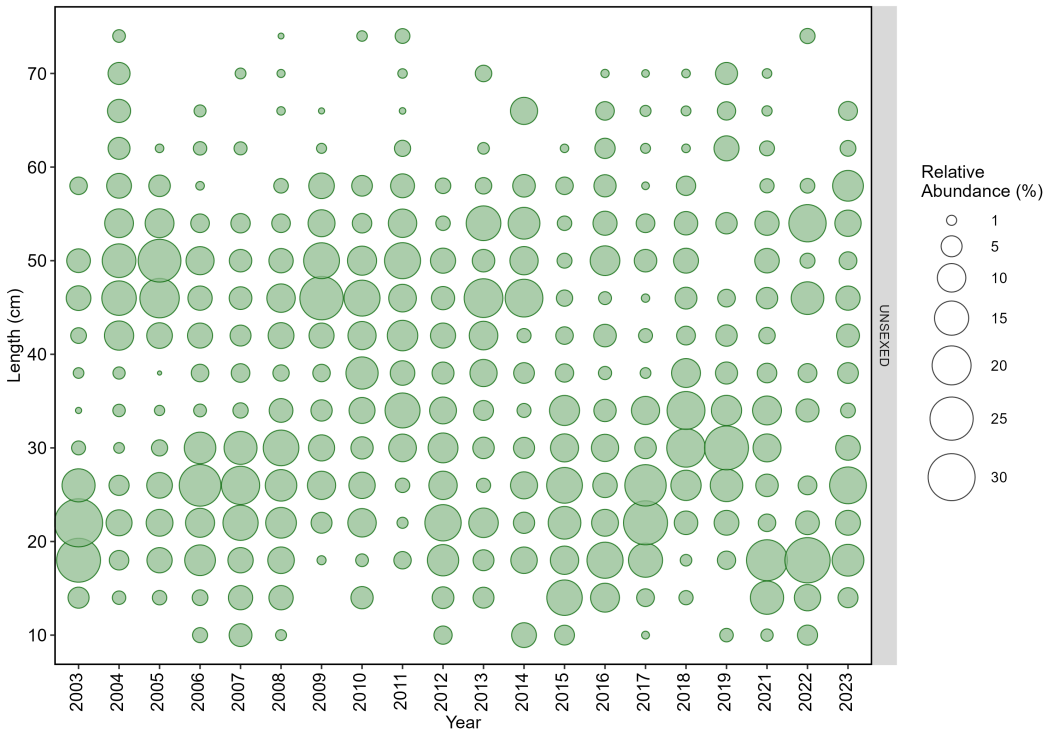

Figure 18: Length (cm) compostion data from the NWFSC West Coast Groundfish Bottom Trawl survey for rougheye and blackspotted rockfish. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

Sablefish

The most recent assessment of sablefish was an update assessment conducted in 2023. Across available data, sablefish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 420 positive tows per year.

Coastwide a total of 1321 maturity samples have been collected and 876 read by researchers at the NWFSC. Time-varying estimates of weight-at-age of sablefish are currently being developed by researchers at the NWFSC which can better account for growth variability in future assessments.

Table 8: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for sablefish.

State	Source	Lengths	Ages	Age Structures
California	CDFW-Ad hoc	0	0	13
California	Commercial	92,304	7,666	6,497
California	NWFSC WCGBT	47,908	12,309	6,567
California	Recreational	407	0	0
Oregon	Commercial	83,614	13,359	67,174
Oregon	NWFSC WCGBT	31,848	8,328	4,353
Oregon	Recreational	2,344	0	0
Washington	Commercial	70,713	3,481	9,755
Washington	NWFSC WCGBT	14,415	3,950	2,055
Washington	Recreational	538	0	316

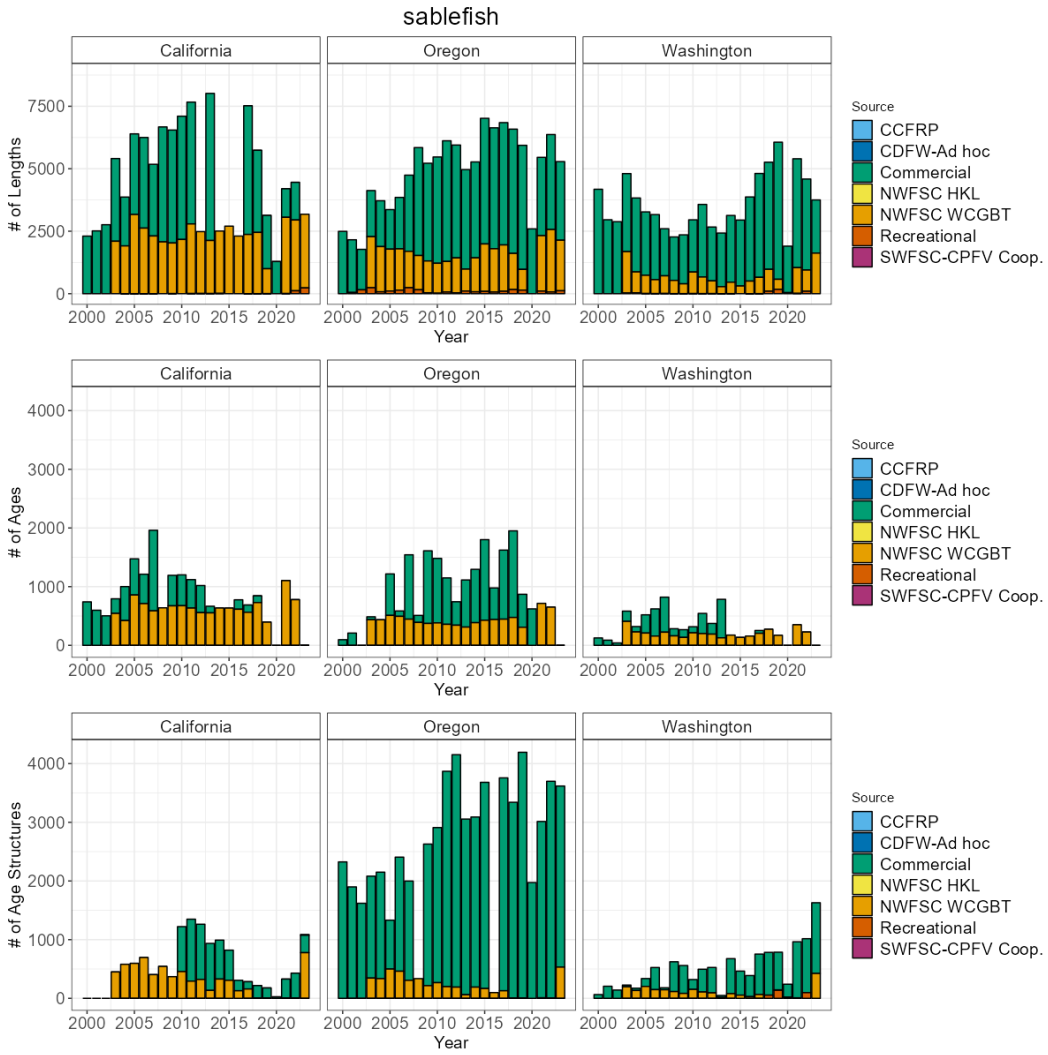

Figure 19: Total number of available lengths, read ages, and unread age structures by data source by year for sablefish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

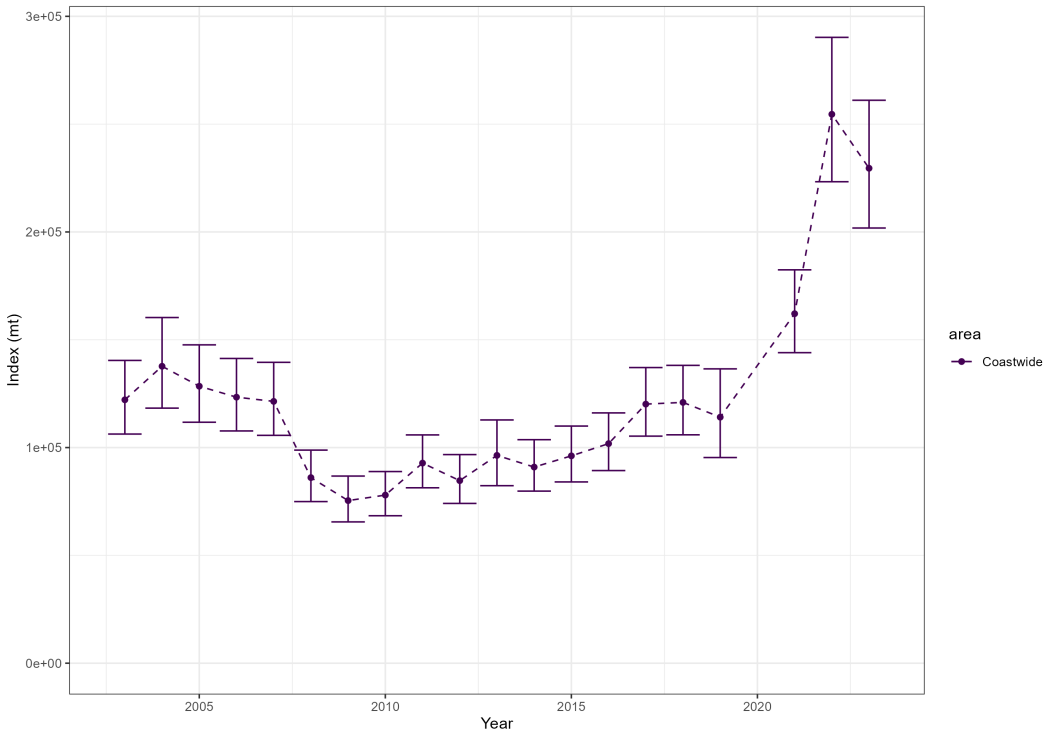

Figure 20: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for sablefish. The NWFSC WCGBT survey has an average of 420 positive tows per year.

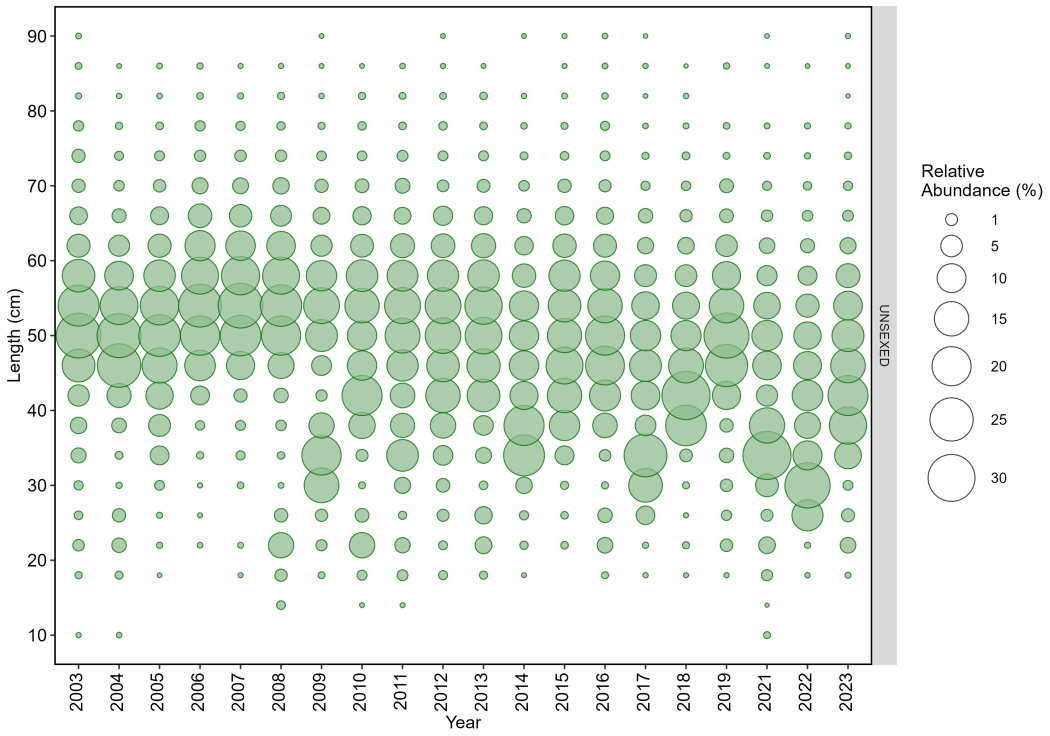

Figure 21: Length (cm) compostion data from the NWFSC West Coast Groundfish Bottom Trawl survey for sablefish. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

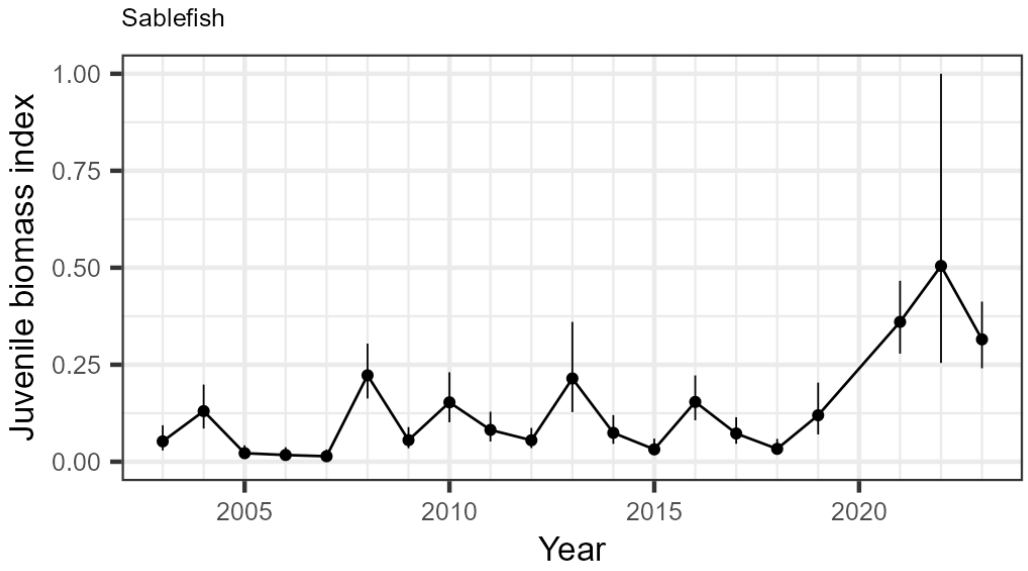

Figure 22: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for sablefish. The juvenile index represents fish 29 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of sablefish in 2023 estimated large recruitments (i.e., greater than 0.50) in 2008, 2010, 2013, 2015, 2016, 2017, 2020, and 2021.

Table 9: The median length (cm) associated with fish age 2 or younger for sablefish based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
0	24.5
1	36.0
2	43.5

Widow rockfish

The most recent assessment of widow rockfish was an update assessment conducted in 2019. Across available data, widow rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 25 positive tows per year. The NWFSC HKL survey has an average of 16 positive sets per year the area south of Point Conception in California.

Coastwide a total of 270 maturity samples have been collected and 50 read by researchers at the NWFSC.

Table 10: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for widow rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	17	NA	NA
California	CDFW-Ad hoc	0	0	41
California	Commercial	9,962	1,884	3,606
California	NWFSC HKL	903	0	873
California	NWFSC WCGBT	1,679	990	172
California	Recreational	7,217	0	0
California	SWFSC-CPFV Coop.	12	0	12
Oregon	Commercial	34,261	10,611	19,706
Oregon	NWFSC WCGBT	1,862	1,002	221
Oregon	Recreational	6,419	0	0
Washington	Commercial	18,999	10,059	4,946
Washington	NWFSC WCGBT	1,041	515	76
Washington	Recreational	4,162	2,328	1,149

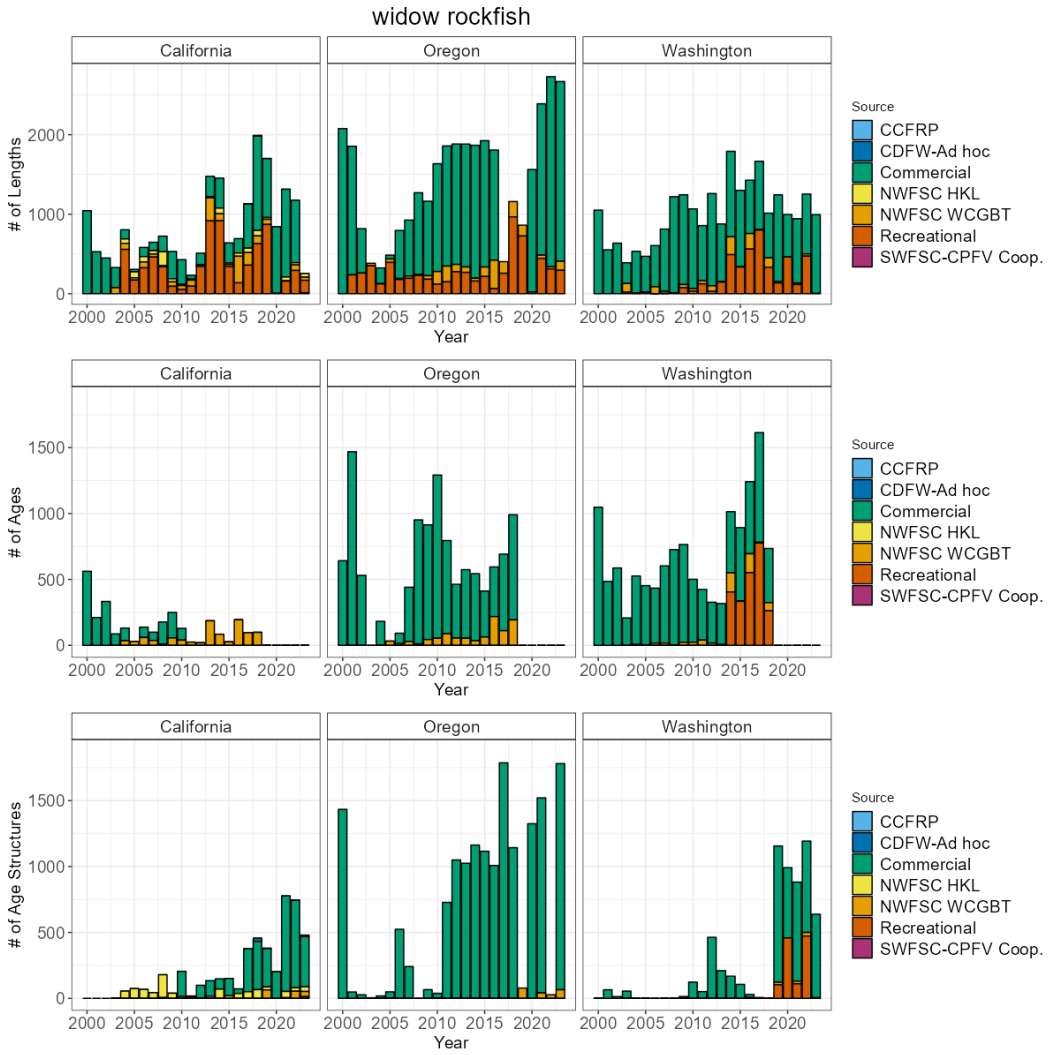

Figure 23: Total number of available lengths, read ages, and unread age structures by data source by year for widow rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

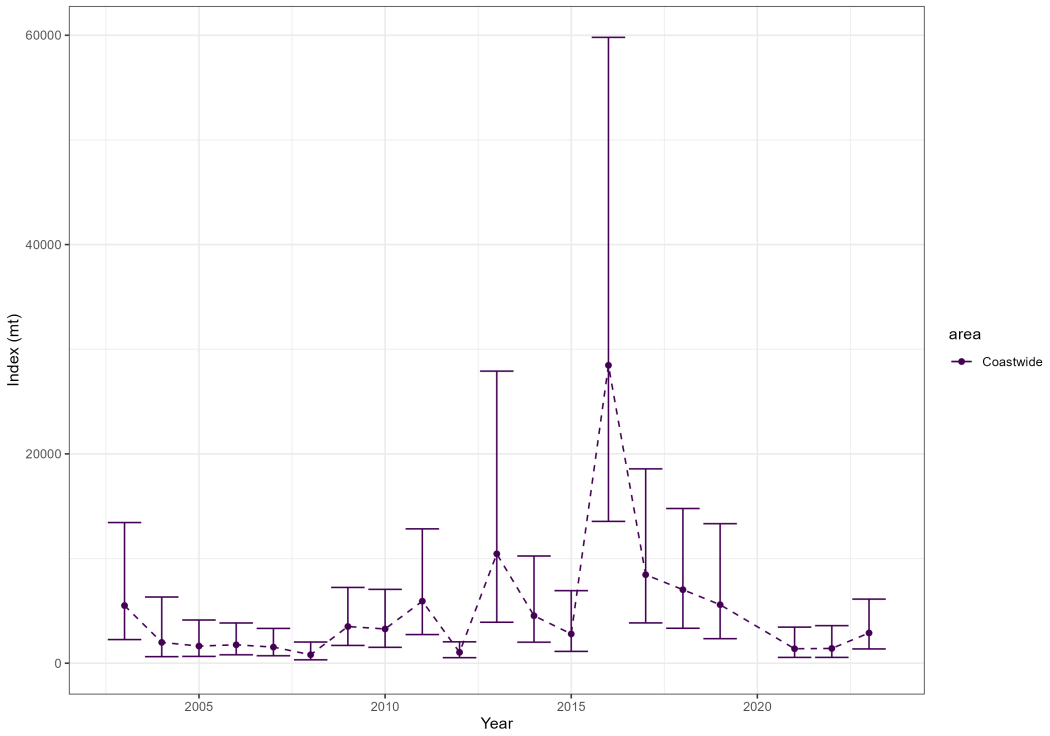

Figure 24: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for widow rockfish. The NWFSC WCGBT has a coastwide average of 25 positive tows per year.

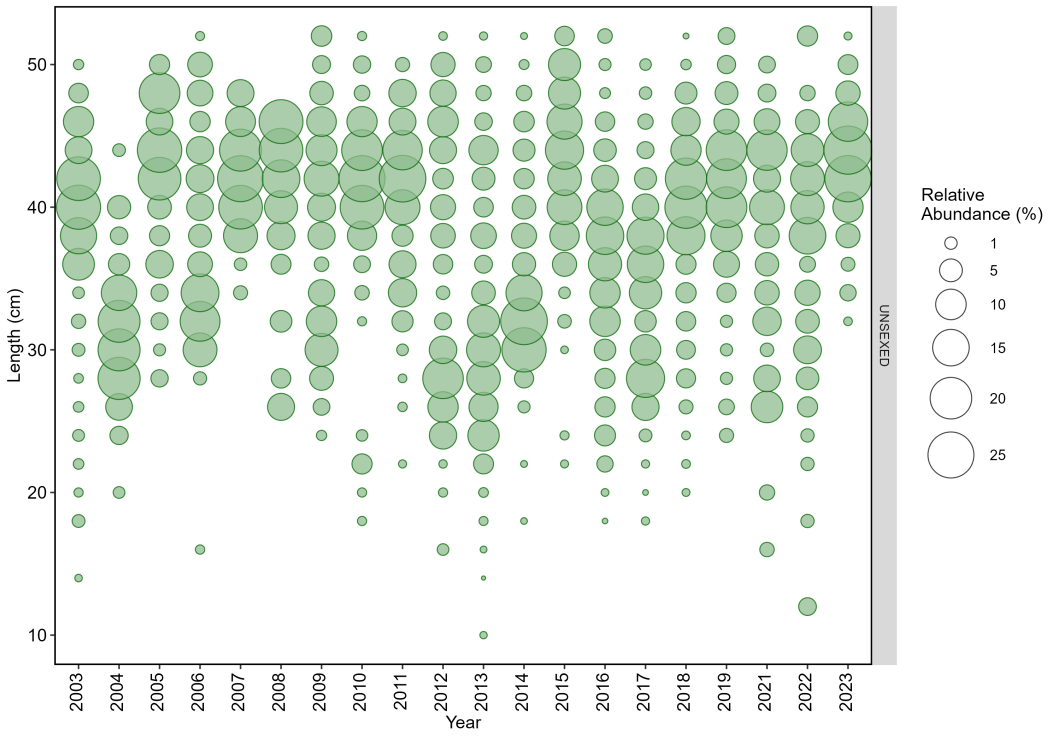

Figure 25: Length (cm) compostion data from the NWFSC West Coast Groundfish Bottom Trawl survey for widow rockfish. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

Yelloweye rockfish

The most recent assessment of yelloweye rockfish was a benchmark assessment conducted in 2017. Across available data, yelloweye rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 15 positive tows per year. The NWFSC HKL survey has an average of 4 positive sets per year the area south of Point Conception in California.

Coastwide a total of 624 maturity samples have been collected and 97 read by researchers at the NWFSC. A tagging study examining yelloweye rockfish movement in Oregon waters (Stonewall Bank) has been conducted and subsequent species distribution model is underway led by ODFW and NWFSC researchers.

Table 11: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for yelloweye rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	212	NA	NA
California	CDFW-Ad hoc	0	0	446
California	Commercial	258	0	94
California	NWFSC HKL	146	0	139
California	NWFSC WCGBT	158	101	57
California	Recreational	1,093	0	0
Oregon	Commercial	1,459	449	655
Oregon	NWFSC WCGBT	433	311	121
Oregon	Recreational	2,471	0	0
Washington	Commercial	2,248	867	737
Washington	NWFSC WCGBT	402	271	131
Washington	Recreational	584	323	231

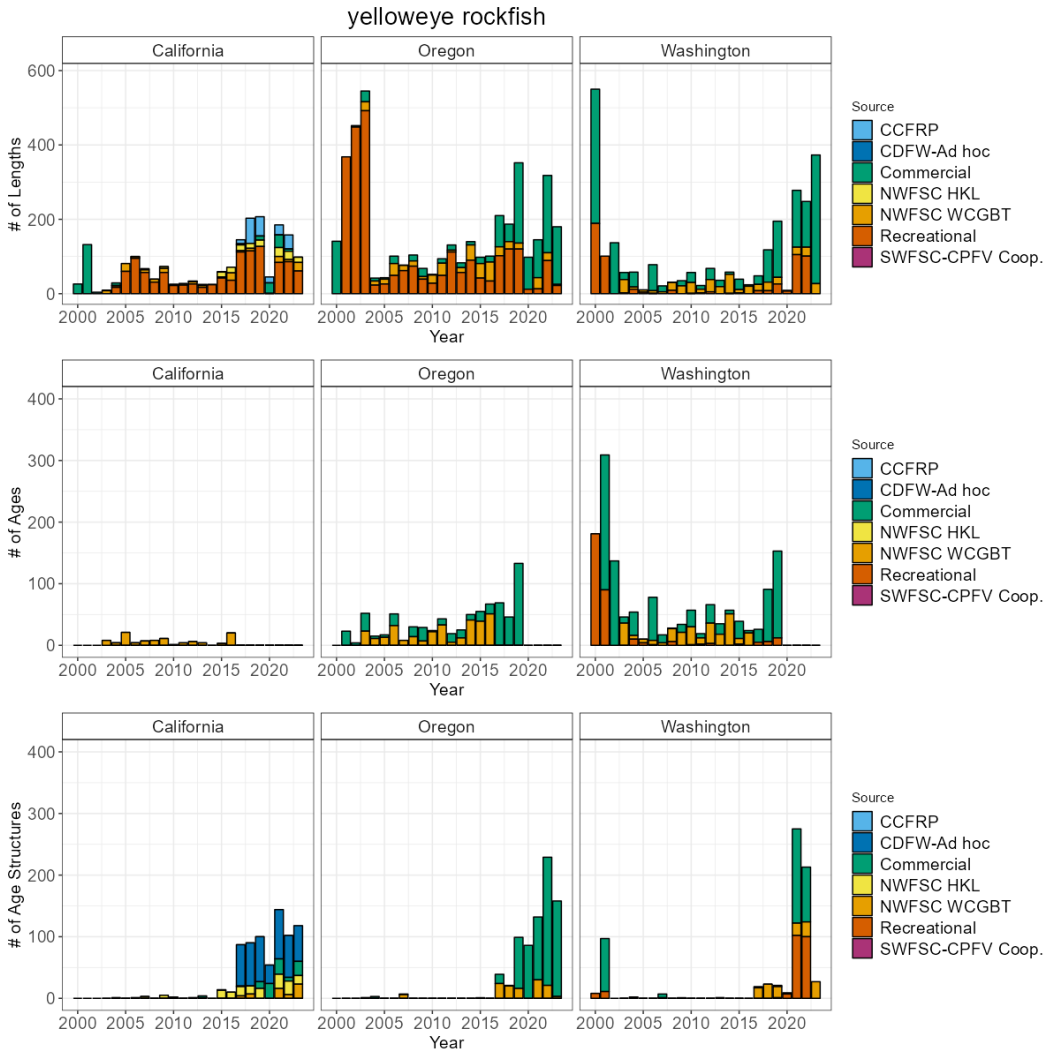

Figure 26: Total number of available lengths, read ages, and unread age structures by data source by year for yelloweye rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

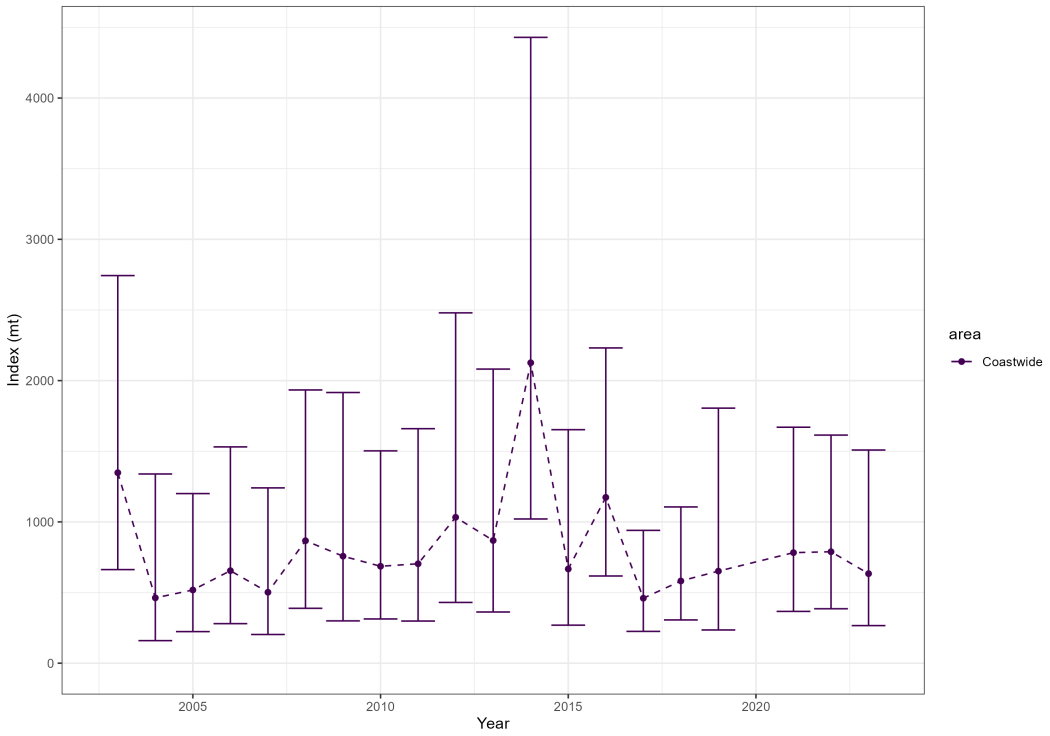

Figure 27: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for yelloweye rockfish. The NWFSC WCGBT has a coastwide average of 15 positive tows per year.

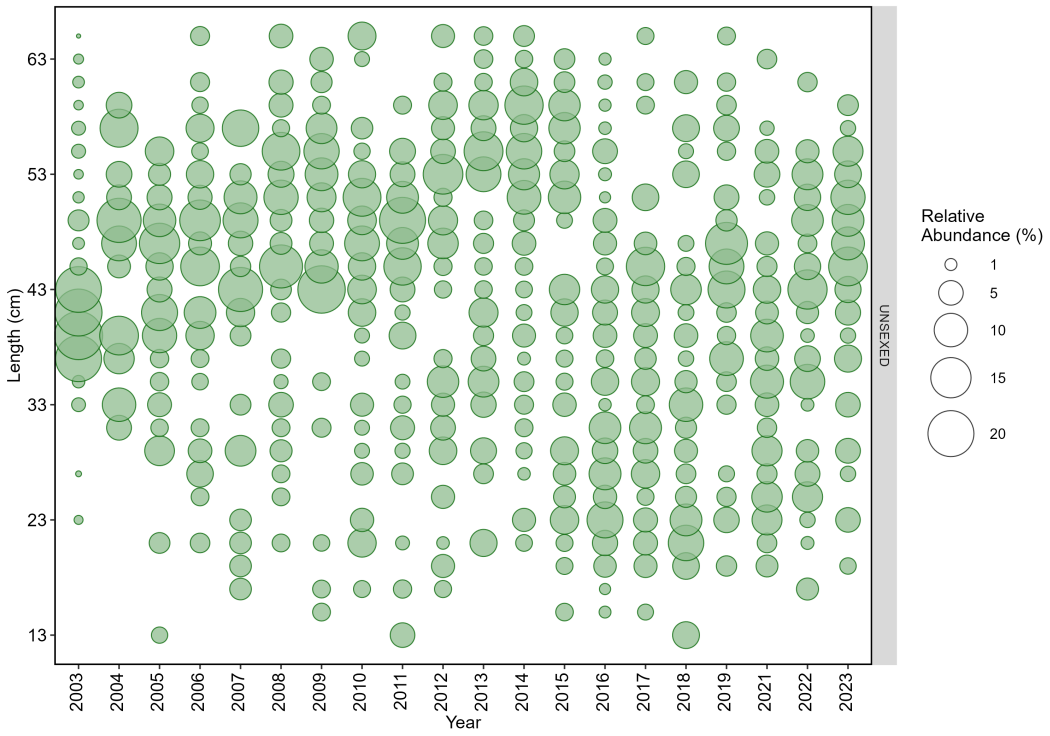

Figure 28: Length (cm) compostion data from the NWFSC West Coast Groundfish Bottom Trawl survey for yelloweye rockfish. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

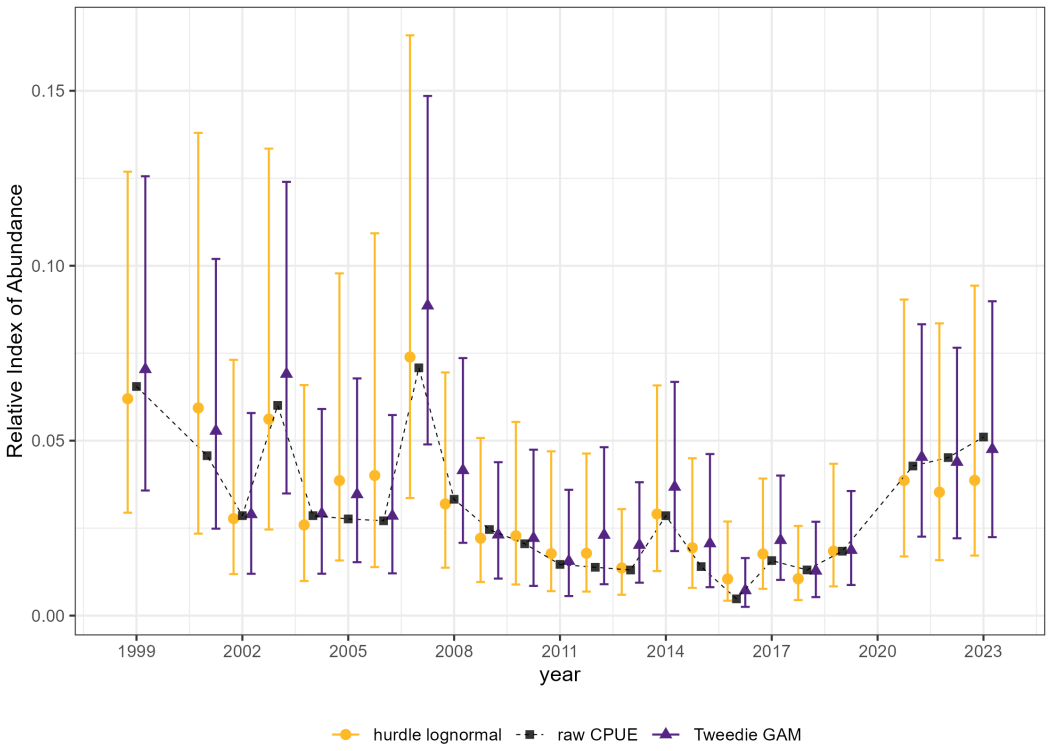

Figure 29: Preliminary relative index of abundance for the International Pacific Halibut Commission (IPHC) survey for yellowye rockfish from stations off the Washington coast. The indices are compared when estimated using a hurdle model with a lognormal error distribution, a spatial generalized additive model with a tweedie error distribution, or the raw catch-per-unit-effort (CPUE).

Yellowtail rockfish north

The most recent assessment of yellowtail rockfish north was a benchmark assessment conducted in 2017. Across available data, yellowtail rockfish north have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 43 positive tows per year.

Coastwide a total of 638 maturity samples have been collected and 468 read by researchers at the NWFSC. There is ongoing research being led by staff at the NWFSC to estimate spatial and temporal biological and functional length-at-maturity for yellowtail rockfish across the coast that will be available for a potential 2025 assessment.

Table 12: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for yellowtail rockfish north.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	125	NA	NA
California	Commercial	3,982	740	2,000
California	NWFSC WCGBT	733	174	109
California	Recreational	3,206	0	0
Oregon	Commercial	45,390	26,042	10,820
Oregon	NWFSC WCGBT	3,214	837	1,046
Oregon	Recreational	42,007	0	204
Washington	Commercial	38,139	27,186	0
Washington	NWFSC WCGBT	12,690	3,783	2,805
Washington	Recreational	13,775	7,327	25

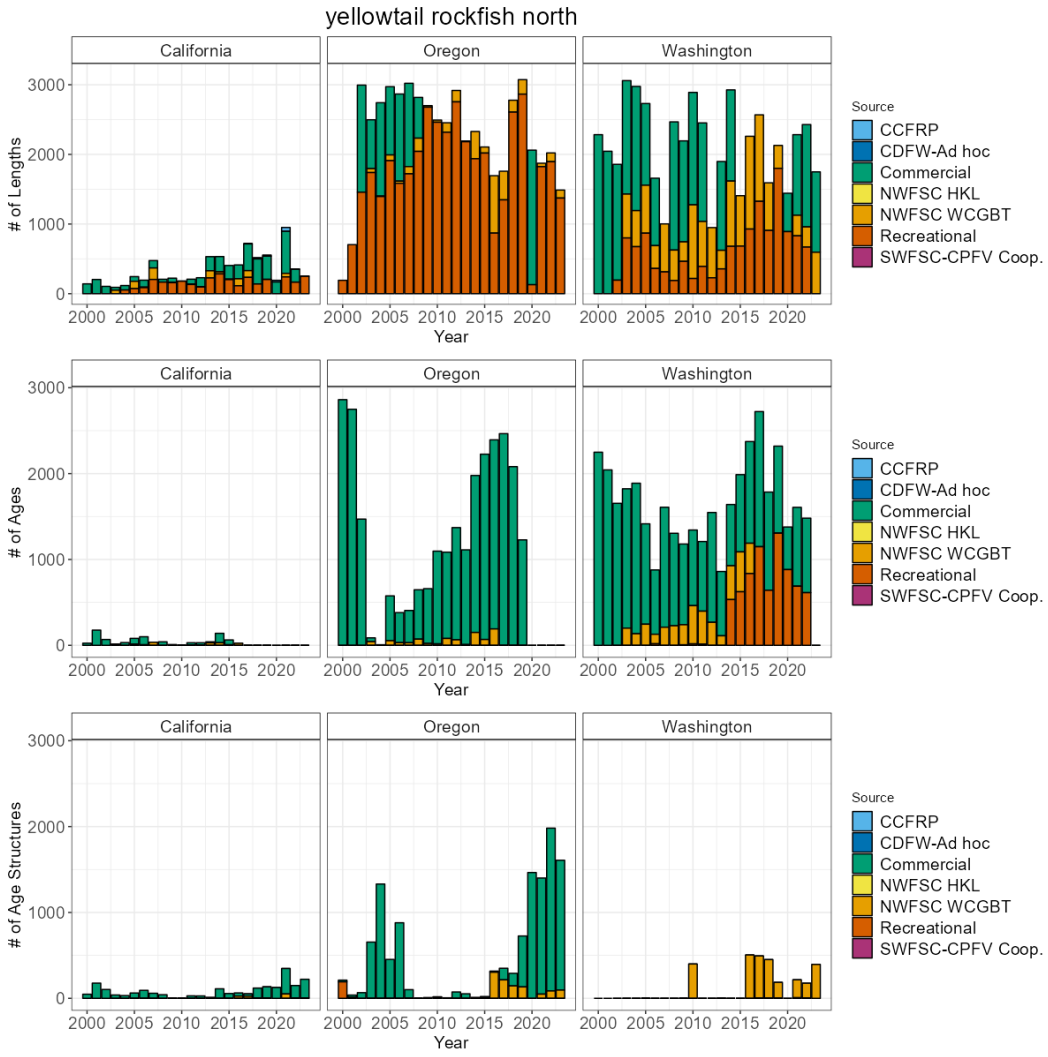

Figure 30: Total number of available lengths, read ages, and unread age structures by data source by year for yellowtail rockfish north. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

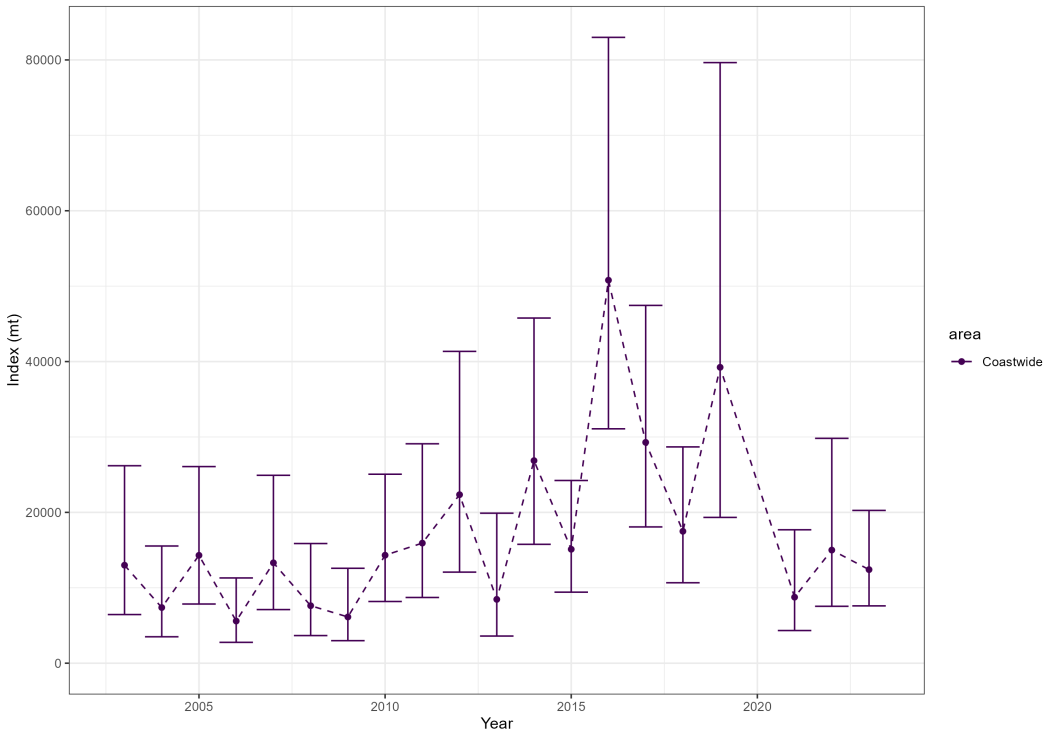

Figure 31: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for yellowtail rockfish north. The NWFSC WCGBT survey has an average of 43 positive tows per year.

Yellowtail rockfish south

To date, no assessment or analysis has been conducted on yellowtail rockfish south. Across available data, yellowtail rockfish south have been observed and sampled by both the commercial and recreational fisheries and the NWFSC HKL survey. The NWFSC WCGBT has a coastwide average of 3 positive tows per year. The NWFSC HKL survey has an average of 13 positive sets per year the area south of Point Conception in California.

Coastwide a total of 638 maturity samples have been collected and 468 read by researchers at the NWFSC. There is ongoing research being led by staff at the NWFSC to estimate spatial and temporal biological and functional length-at-maturity for yellowtail rockfish across the coast that will be available for a potential 2025 assessment.

Table 13: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for yellowtail rockfish south.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	4,485	NA	NA
California	CDFW-Ad hoc	0	0	652
California	Commercial	1,199	62	422
California	NWFSC HKL	1,932	124	1,503
California	NWFSC WCGBT	1,072	380	175
California	Recreational	65,064	0	0
California	SWFSC-CPFV Coop.	419	0	419

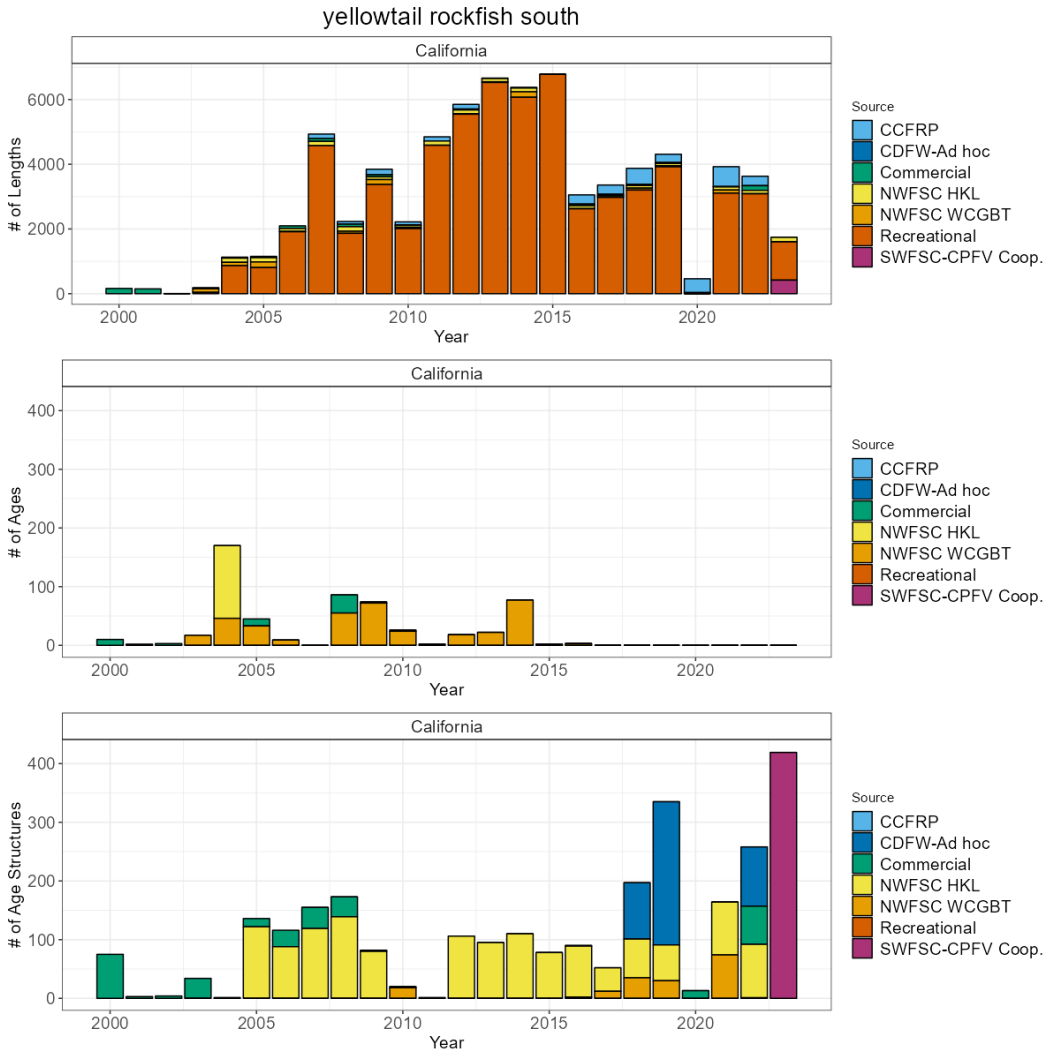

Figure 32: Total number of available lengths, read ages, and unread age structures by data source by year for yellowtail rockfish south. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

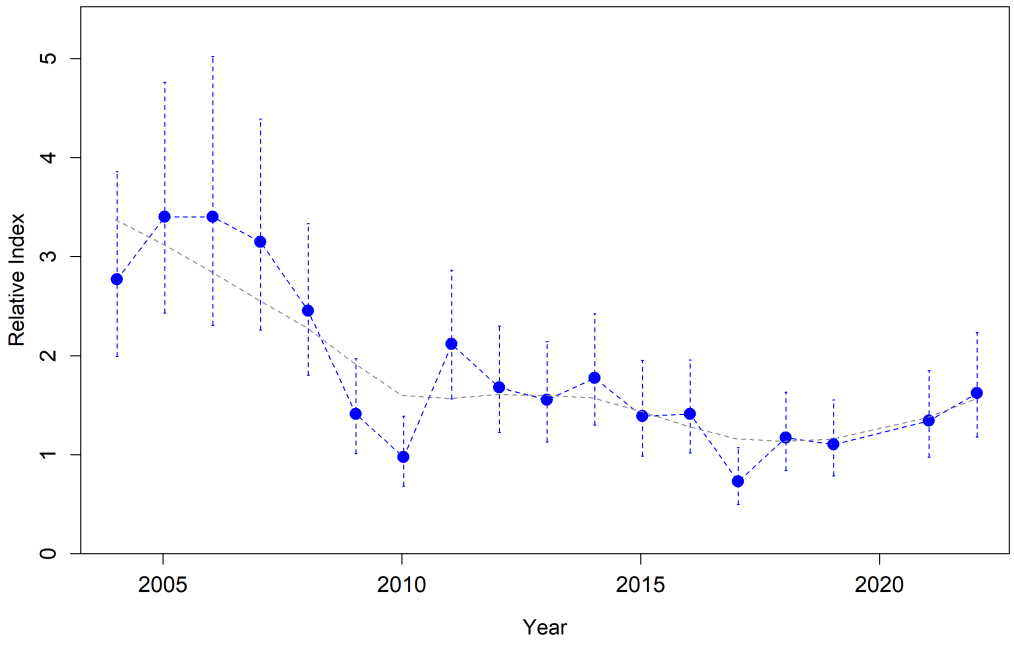

Figure 33: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for yellowtail rockfish south. The NWFSC HKL survey has an average of 13 positive sets per year the area south of Point Conception in California.

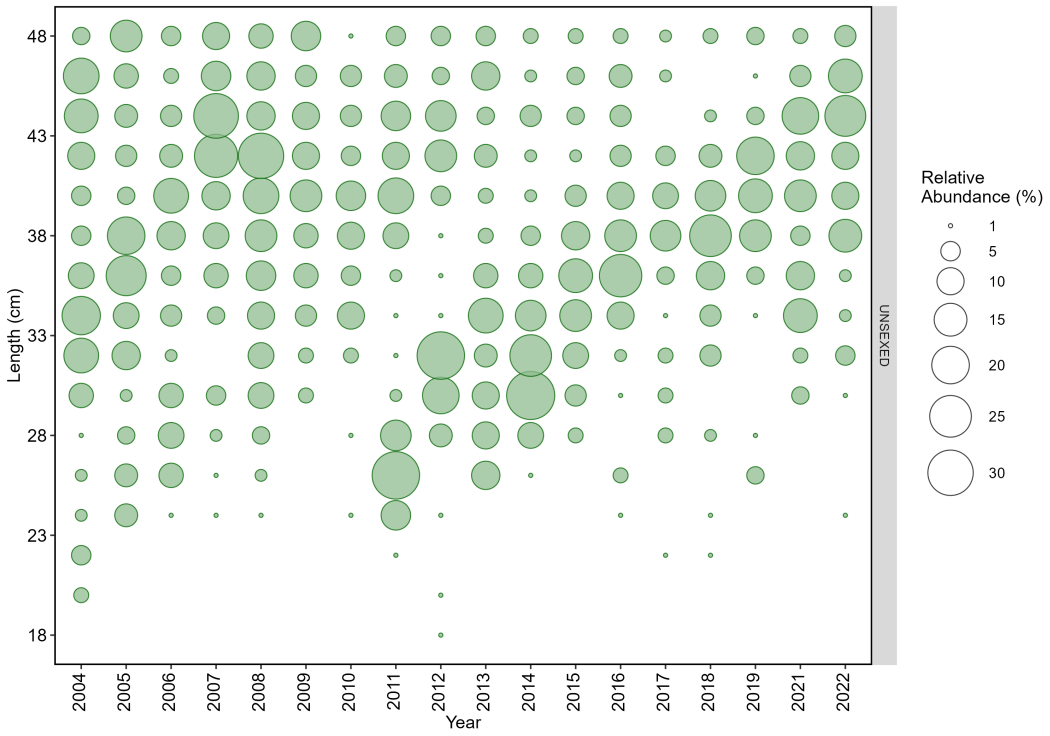

Figure 34: Length (cm) compostion data from the NWFSC Hook and Line survey for yellowtail rockfish south. Size of the circles within a year indicate higher (larger circles) and lower (smaller circles) proportion observed by length bin.

3 Other Groundfish Species

Arrowtooth flounder

The most recent assessment of arrowtooth flounder was an update assessment conducted in 2017. Across available data, arrowtooth flounder have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 226 positive tows per year.

Coastwide a total of 254 maturity samples have been collected and 0 read by researchers at the NWFSC.

Table 14: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for arrowtooth flounder.

State	Source	Lengths	Ages	Age Structures
California	Commercial	7,596	0	0
California	NWFSC WCGBT	9,422	802	2,593
California	Recreational	19	0	0
Oregon	Commercial	21,739	0	18,285
Oregon	NWFSC WCGBT	26,157	2,078	6,129
Oregon	Recreational	136	0	0
Washington	Commercial	13,612	763	3,461
Washington	NWFSC WCGBT	21,622	1,448	4,225
Washington	Recreational	29	0	18

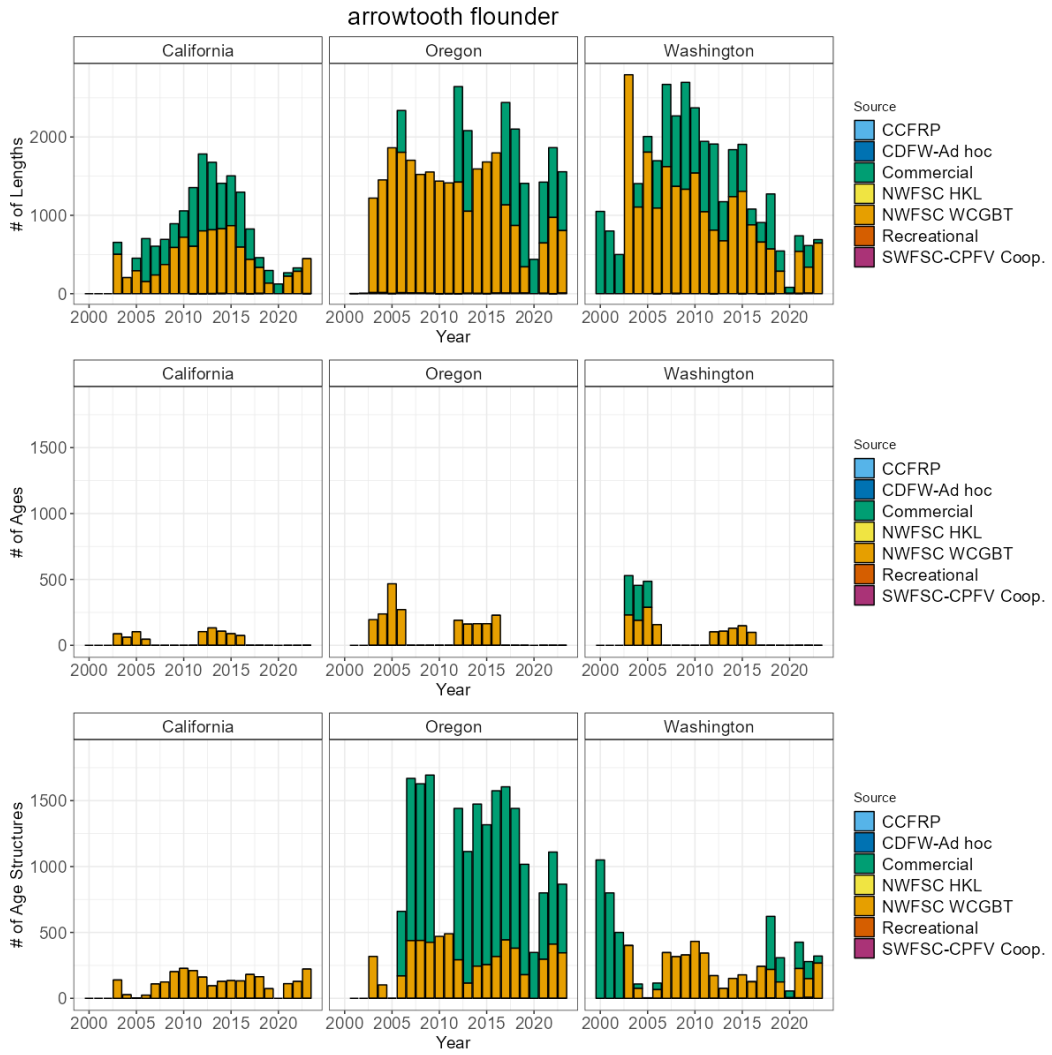

Figure 35: Total number of available lengths, read ages, and unread age structures by data source by year for arrowtooth flounder. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

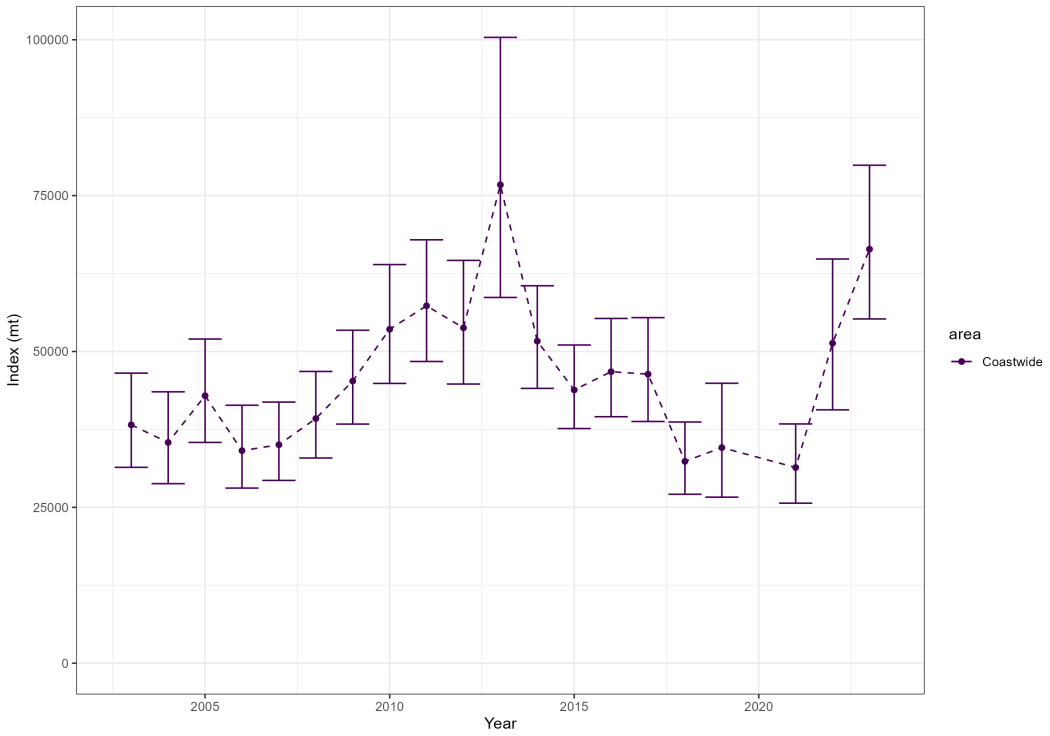

Figure 36: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for arrowtooth flounder. The NWFSC WCGBT survey has an average of 226 positive tows per year.

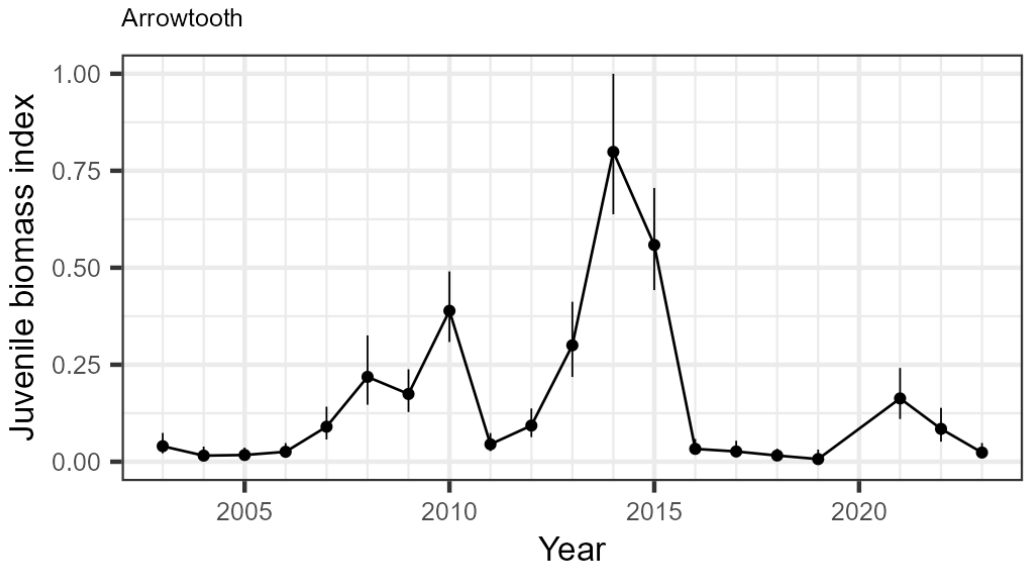

Figure 37: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for arrowtooth flounder. The juvenile index represents fish 22 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of arrowtooth flounder in 2017 estimated large recruitments (i.e., greater than 0.50) in 2011, 2012, and 2013.

Table 15: The median length (cm) associated with fish age 3 or younger for arrowtooth flounder based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
1	19
2	25
3	31

Aurora rockfish

The most recent assessment of aurora rockfish was a benchmark assessment conducted in 2013. Across available data, aurora rockfish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 84 positive tows per year.

Coastwide a total of 567 maturity samples have been collected and 567 read by researchers at the NWFSC.

Table 16: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for aurora rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	20,697	723	3,170
California	NWFSC WCGBT	25,467	2,269	7,604
Oregon	Commercial	12,761	480	12,010
Oregon	NWFSC WCGBT	5,112	749	2,701
Washington	Commercial	1,342	0	692
Washington	NWFSC WCGBT	459	72	250

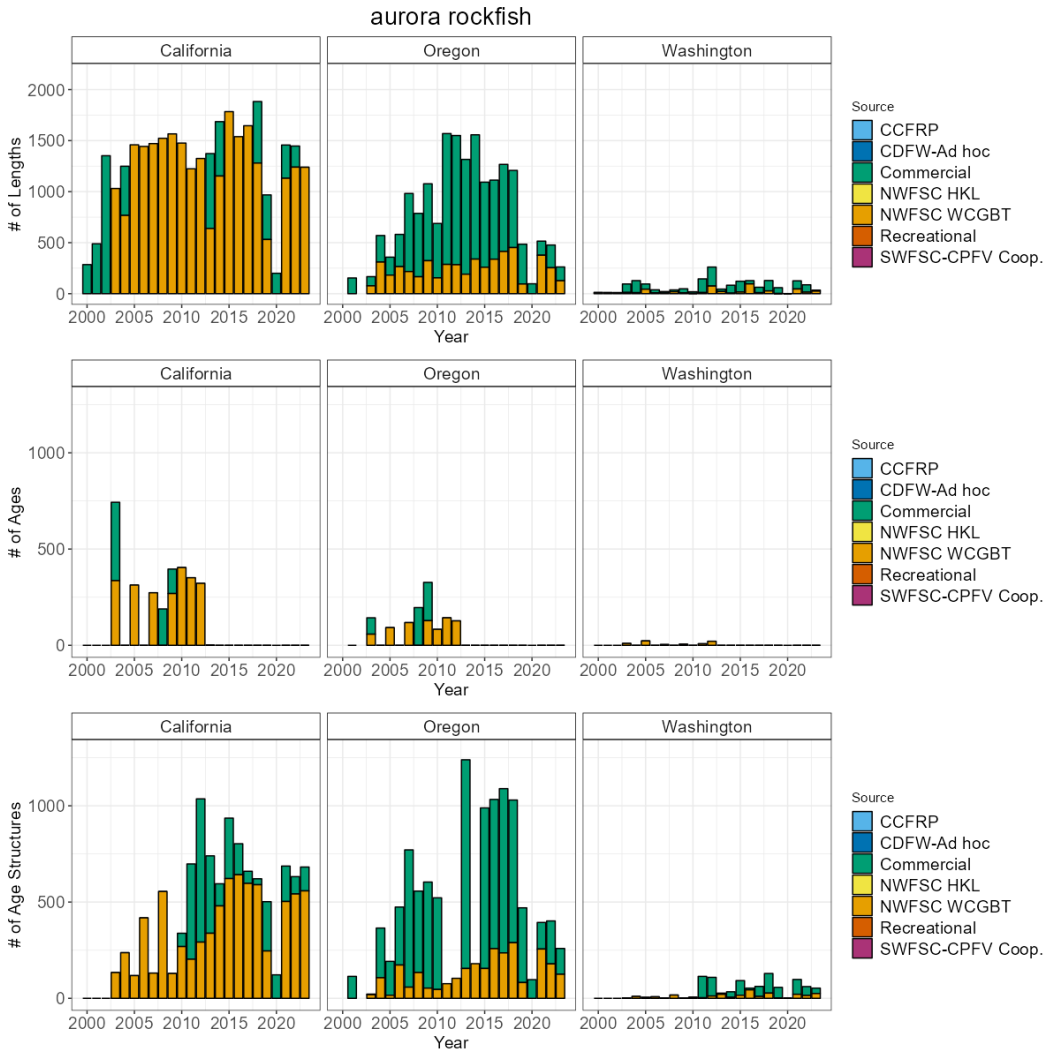

Figure 38: Total number of available lengths, read ages, and unread age structures by data source by year for aurora rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

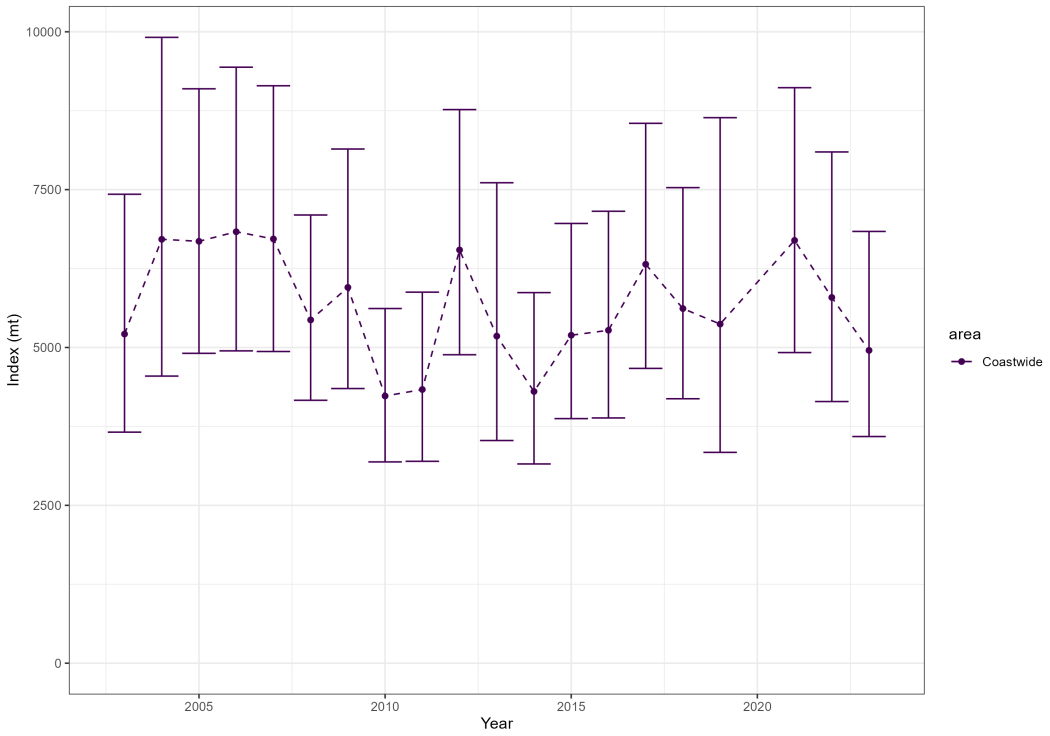

Figure 39: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for aurora rockfish. The NWFSC WCGBT survey has an average of 84 positive tows per year.

Bank rockfish

The most recent assessment of bank rockfish was a data-limited assessment conducted in 2010. Across available data, bank rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 12 positive tows per year. The NWFSC HKL survey has an average of 27 positive sets per year the area south of Point Conception in California.

Coastwide a total of 733 maturity samples have been collected and 62 read by researchers at the NWFSC.

Table 17: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for bank rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	10,282	0	1,146
California	NWFSC HKL	3,442	0	3,399
California	NWFSC WCGBT	1,993	0	1,351
California	Recreational	854	0	0
California	SWFSC-CPFV Coop.	15	0	15
Oregon	Commercial	1,615	0	1,569
Oregon	NWFSC WCGBT	139	0	52
Washington	Commercial	244	0	236
Washington	NWFSC WCGBT	4	0	4

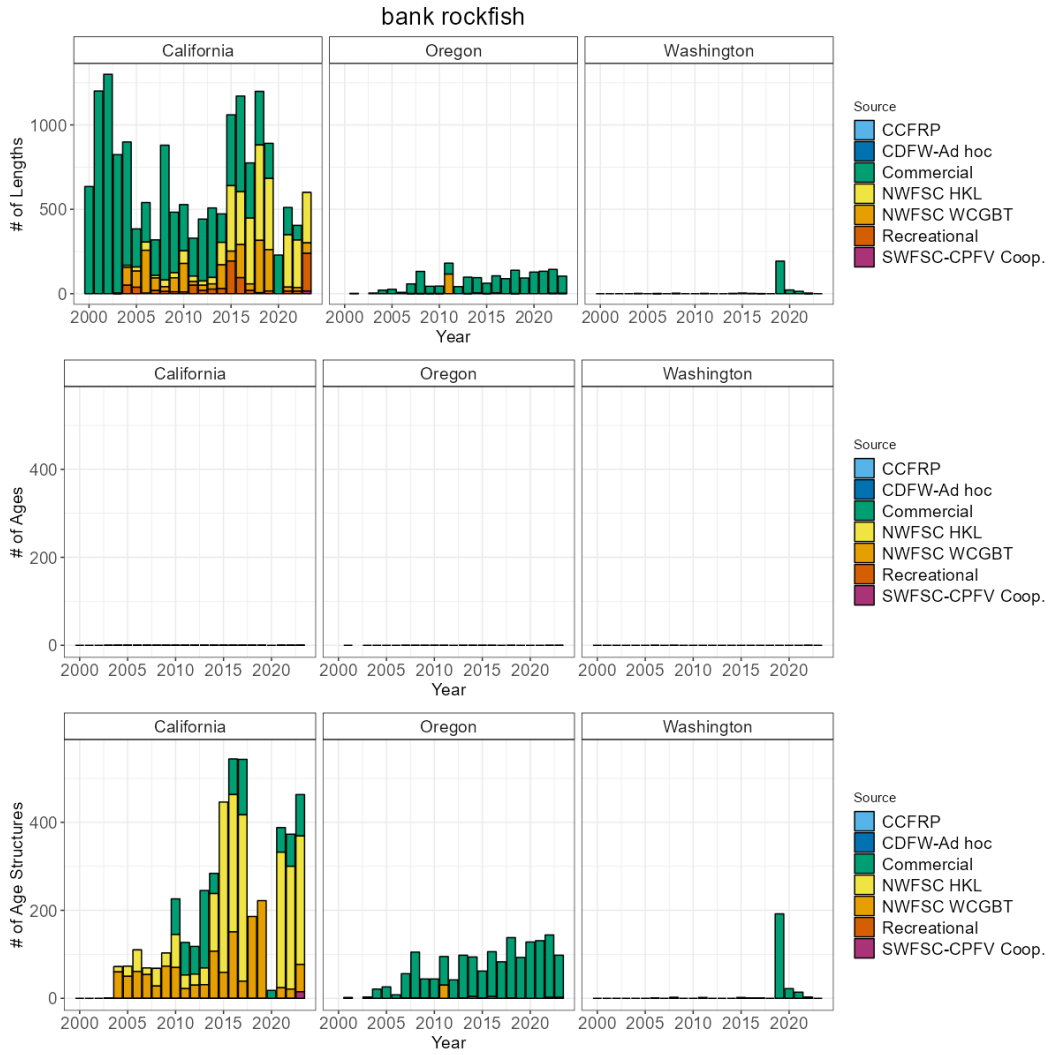

Figure 40: Total number of available lengths, read ages, and unread age structures by data source by year for bank rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

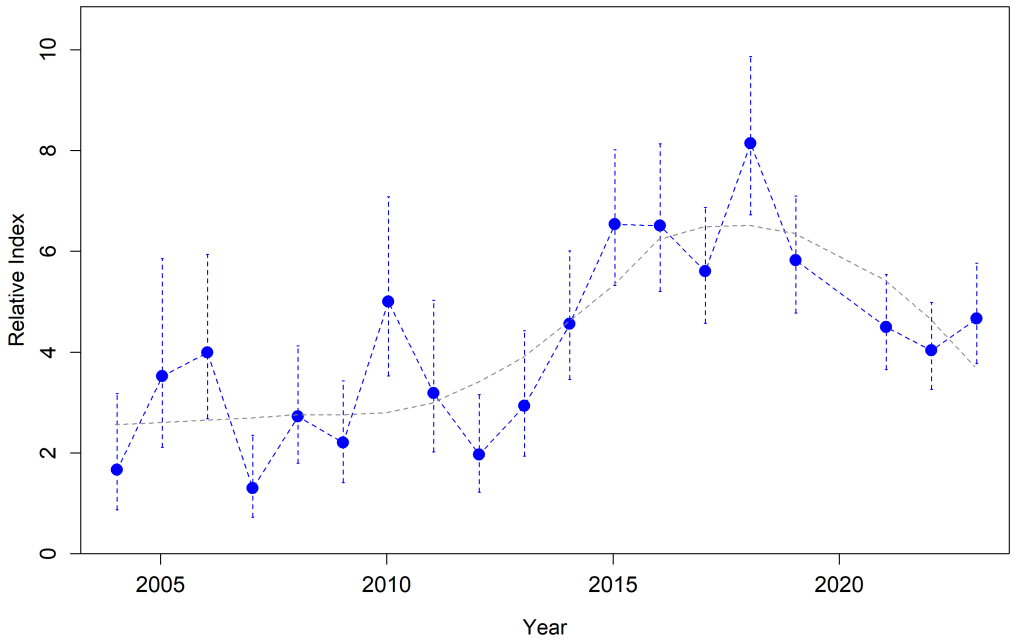

Figure 41: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for bank rockfish. The NWFSC HKL survey has an average of 27 positive sets per year the area south of Point Conception in California.

Big skate

The most recent assessment of big skate was a benchmark assessment conducted in 2019. Across available data, big skate have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 92 positive tows per year.

Coastwide a total of 180 maturity samples have been collected and 180 read by researchers at the NWFSC.

Table 18: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for big skate.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	1	NA	NA
California	Commercial	1,579	0	0
California	NWFSC WCGBT	2,205	351	102
California	Recreational	33	0	0
Oregon	Commercial	6,920	652	1,877
Oregon	NWFSC WCGBT	2,359	386	270
Oregon	Recreational	14	0	0
Washington	Commercial	1,450	104	537
Washington	NWFSC WCGBT	2,135	297	209

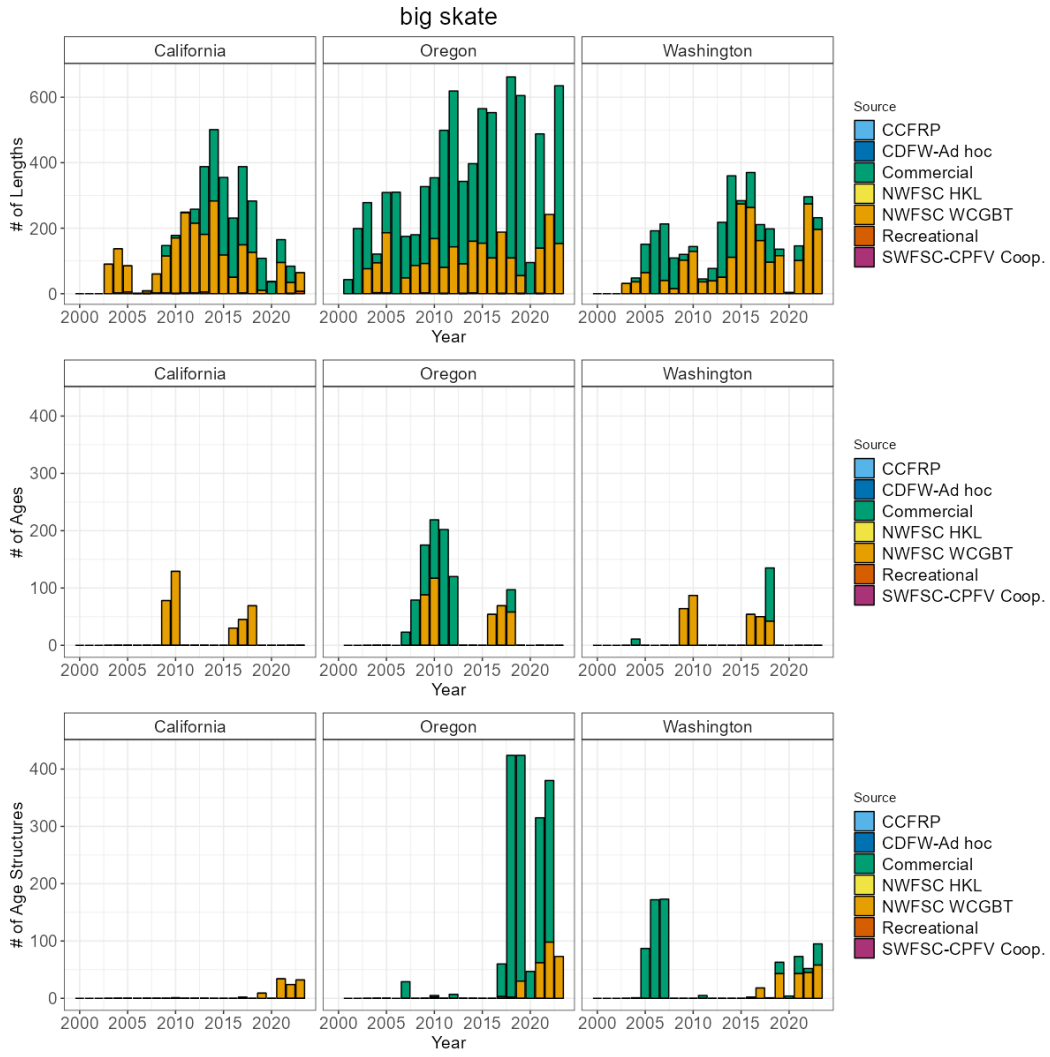

Figure 42: Total number of available lengths, read ages, and unread age structures by data source by year for big skate. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

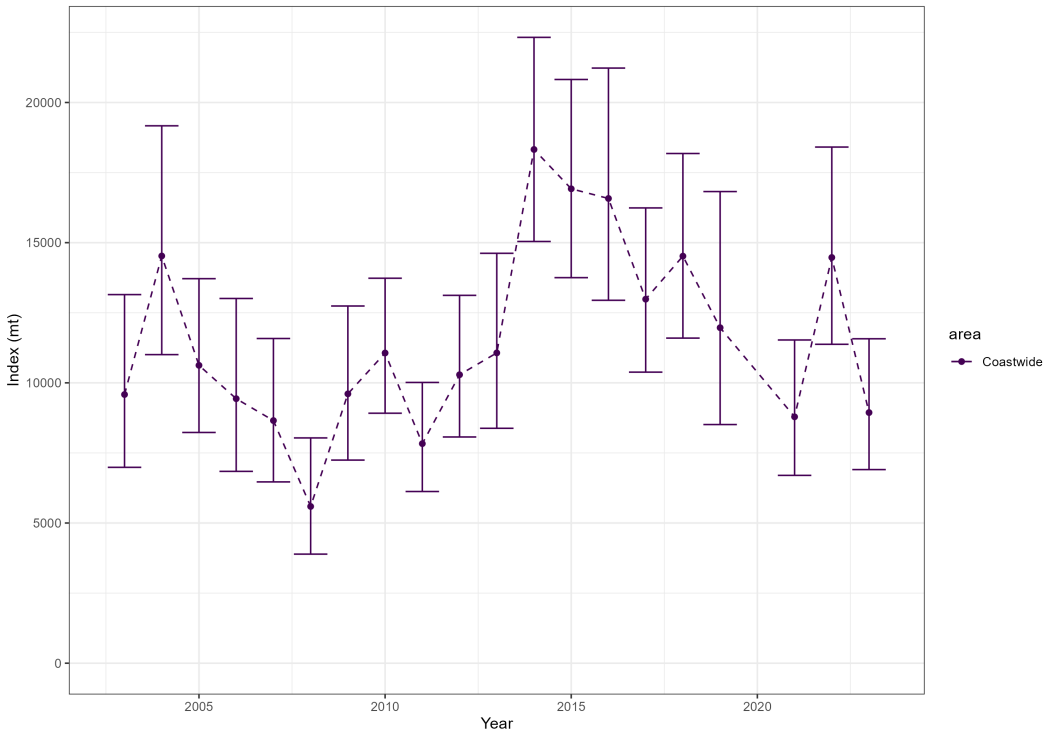

Figure 43: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for big skate. The NWFSC WCGBT survey has an average of 92 positive tows per year.

Black rockfish

The most recent assessment of black rockfish was a benchmark assessment conducted in 2023. Across available data, black rockfish have been observed and sampled by both commercial and recreational fisheries.

Coastwide a total of 643 maturity samples have been collected and 599 read by researchers at the NWFSC. ODFW is currently planning another acoustic visual survey for 2025 that will provide an additional measure of absolute abundance of black rockfish in Oregon waters.

Table 19: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for black rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	18,732	NA	NA
California	CDFW-Ad hoc	0	0	790
California	Commercial	13,182	1,461	1,896
California	NWFSC WCGBT	3	0	3
California	Recreational	138,362	0	0
California	SWFSC-CPFV Coop.	140	0	140
Oregon	Commercial	90,402	16,456	18,719
Oregon	NWFSC WCGBT	11	0	11
Oregon	Recreational	243,233	34,289	7,221
Washington	Commercial	95	20	0
Washington	NWFSC WCGBT	2	0	2
Washington	Recreational	56,876	39,816	1,822

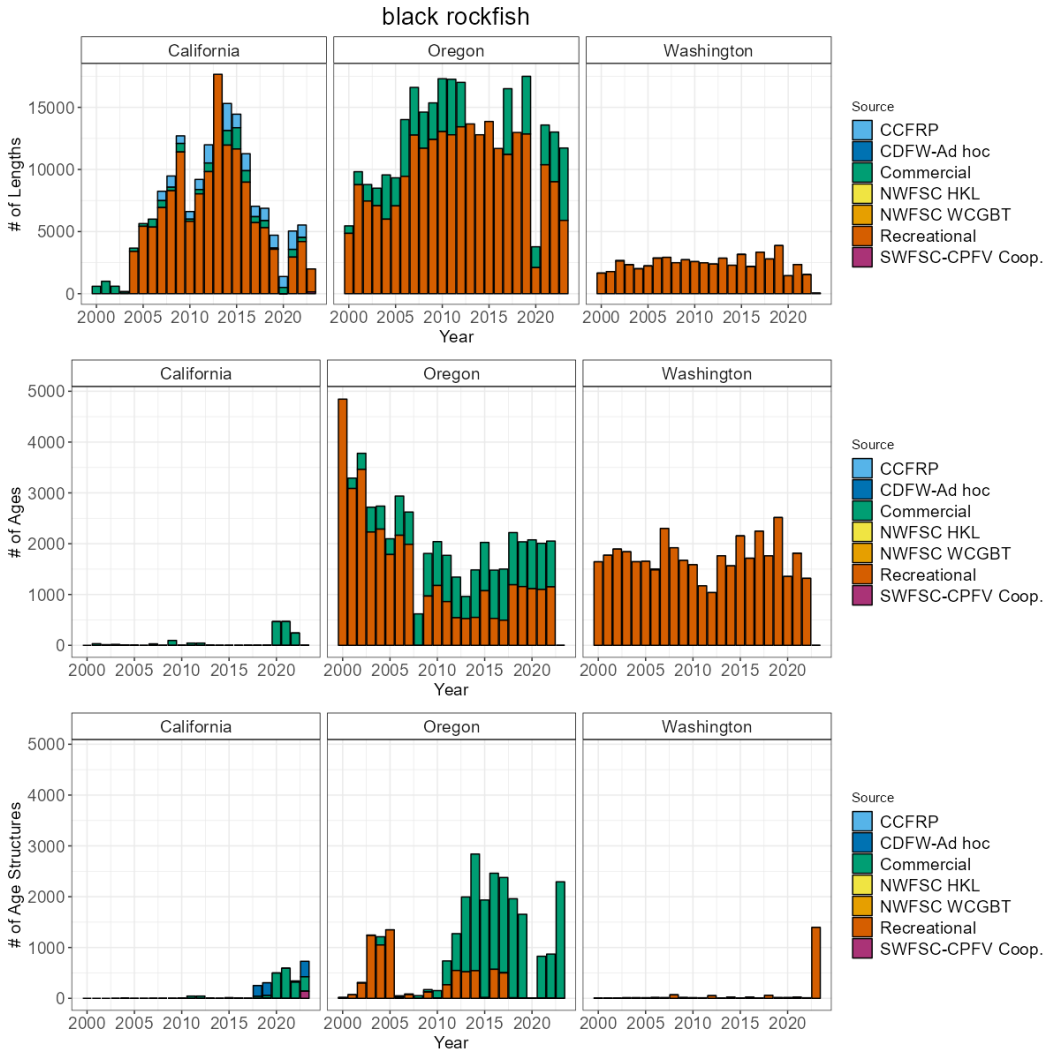

Figure 44: Total number of available lengths, read ages, and unread age structures by data source by year for black rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Blackgill rockfish

The most recent assessment of blackgill rockfish was an update assessment conducted in 2017. Across available data, blackgill rockfish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 35 positive tows per year.

Coastwide a total of 126 maturity samples have been collected and 126 read by researchers at the NWFSC.

Table 20: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for blackgill rockfish.

State	Source	Lengths	Ages	Age Structures
California	CDFW-Ad hoc	0	0	87
California	Commercial	20,862	1,097	2,893
California	NWFSC HKL	6	0	6
California	NWFSC WCGBT	9,923	1,937	5,125
California	Recreational	2	0	0
Oregon	Commercial	6,745	0	6,616
Oregon	NWFSC WCGBT	277	11	245
Washington	Commercial	711	0	147
Washington	NWFSC WCGBT	13	0	13

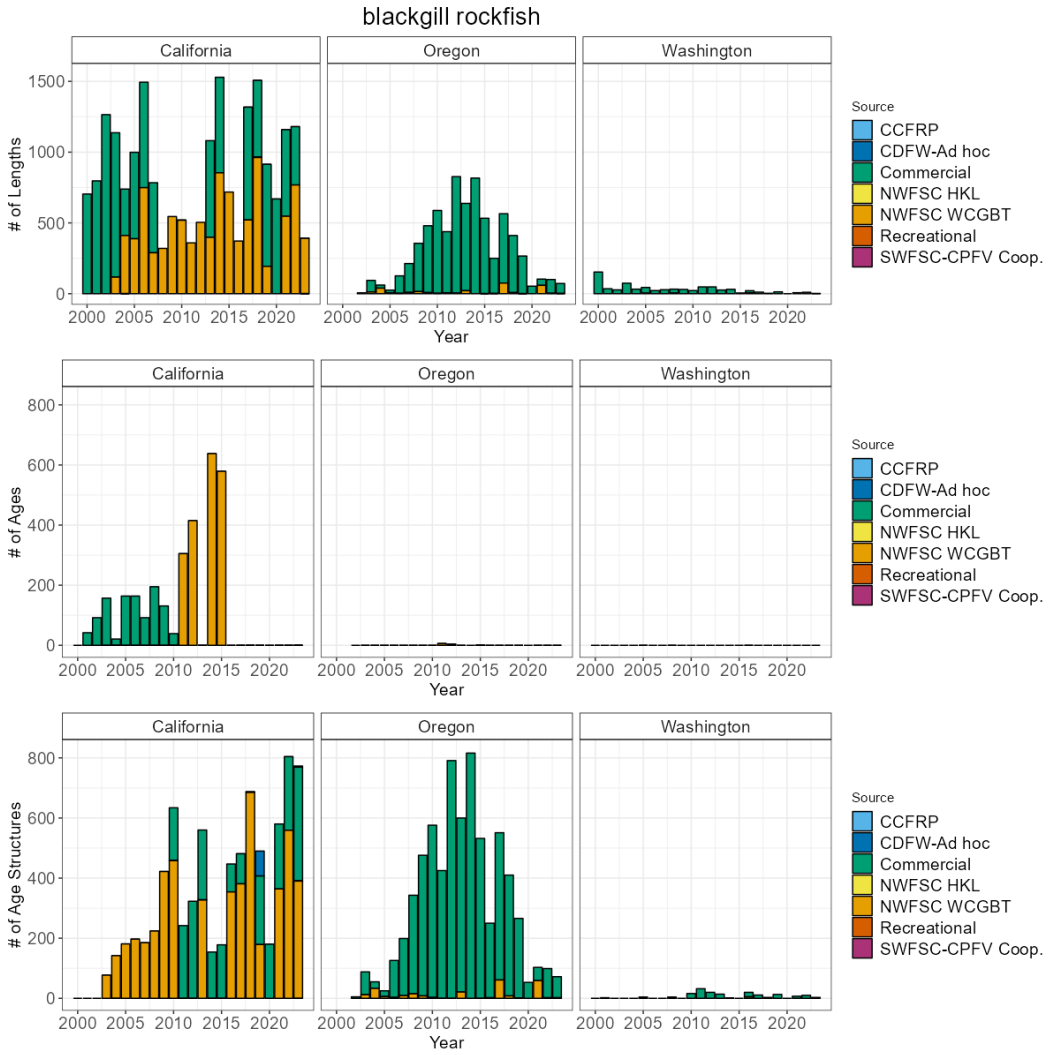

Figure 45: Total number of available lengths, read ages, and unread age structures by data source by year for blackgill rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

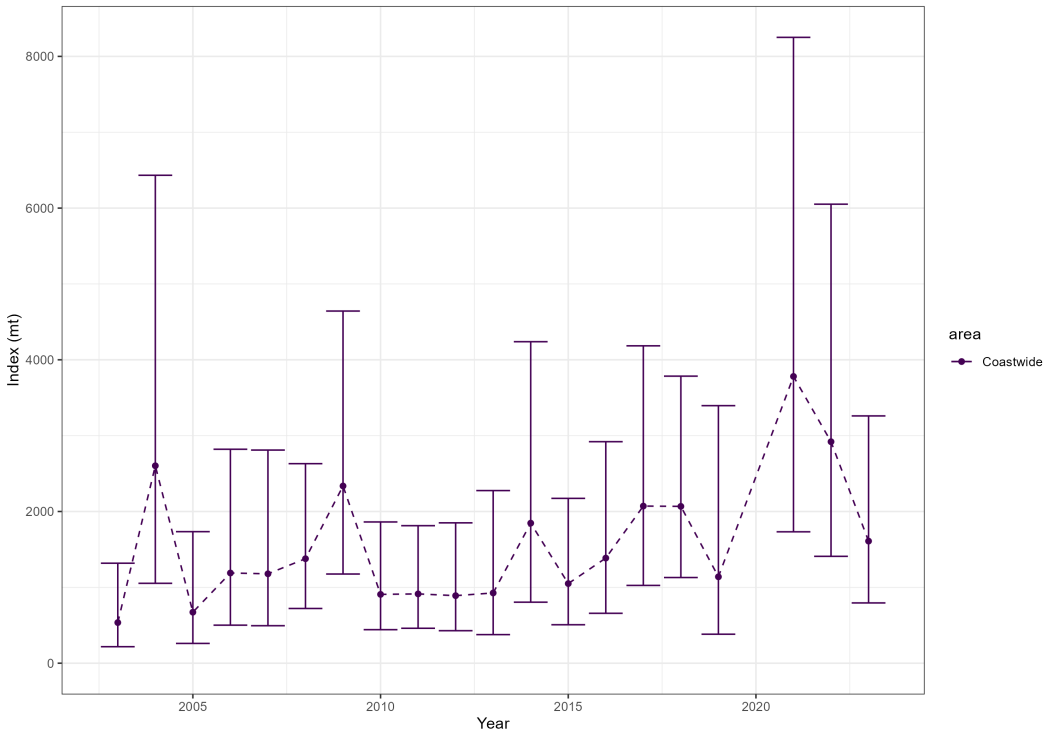

Figure 46: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for blackgill rockfish. The NWFSC WCGBT survey has an average of 35 positive tows per year.

Blue and deacon rockfish

The most recent assessment of blue and deacon rockfish was a benchmark assessment conducted in 2017. Across available data, blue and deacon rockfish have been observed and sampled by both the commercial and recreational fisheries and the NWFSC HKL survey. The NWFSC HKL survey has an average of 10 positive sets per year.

Coastwide a total of 70 maturity samples have been collected and 0 read by researchers at the NWFSC. ODFW is currently planning another acoustic visual survey for 2025 that will provide an additional measure of absolute abundance of blue and deacon rockfish in Oregon waters.

Table 21: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for blue and deacon rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	81,497	NA	NA
California	CDFW-Ad hoc	0	0	1,254
California	Commercial	6,127	82	1,193
California	NWFSC HKL	770	0	726
California	NWFSC WCGBT	124	0	42
California	Recreational	159,726	0	0
California	SWFSC-CPFV Coop.	233	0	232
Oregon	Commercial	5,653	2,191	1,975
Oregon	Recreational	33,967	3,813	8,487
Washington	Recreational	4,779	101	3,148

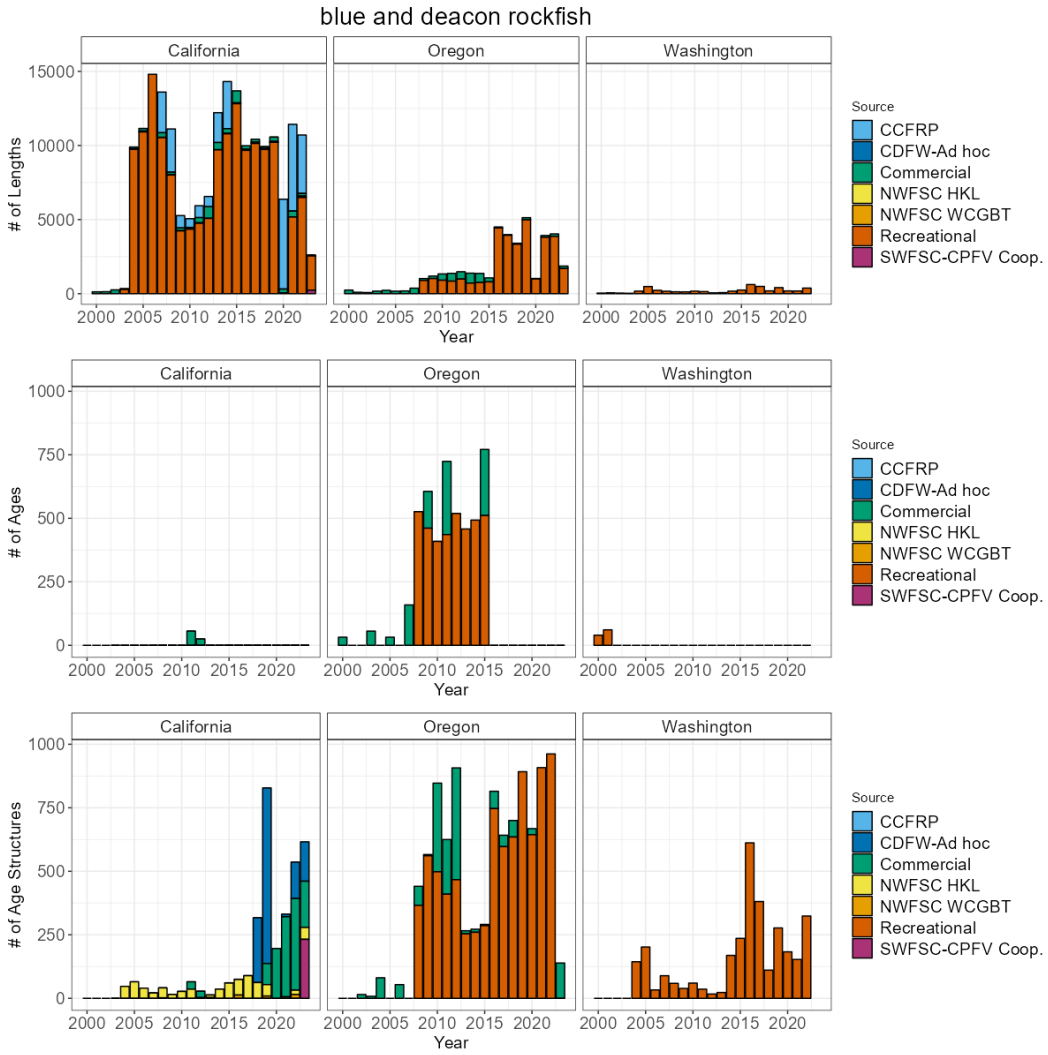

Figure 47: Total number of available lengths, read ages, and unread age structures by data source by year for blue and deacon rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Bocaccio

The most recent assessment of bocaccio was an update assessment conducted in 2017. Across available data, bocaccio have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 50 positive tows per year. The NWFSC HKL survey has an average of 115 positive sets per year the area south of Point Conception in California.

Coastwide a total of 837 maturity samples have been collected and 737 read by researchers at the NWFSC.

Table 22: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for bocaccio.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	53	NA	NA
California	CDFW-Ad hoc	0	0	227
California	Commercial	12,713	121	2,530
California	NWFSC HKL	20,394	0	13,458
California	NWFSC WCGBT	9,799	2,759	3,508
California	Recreational	49,415	0	0
California	SWFSC-CPFV Coop.	1	0	1
Oregon	Commercial	4,630	0	4,466
Oregon	NWFSC WCGBT	214	20	142
Oregon	Recreational	900	0	0
Washington	Commercial	2,481	0	1,463
Washington	NWFSC WCGBT	426	74	302
Washington	Recreational	625	0	433

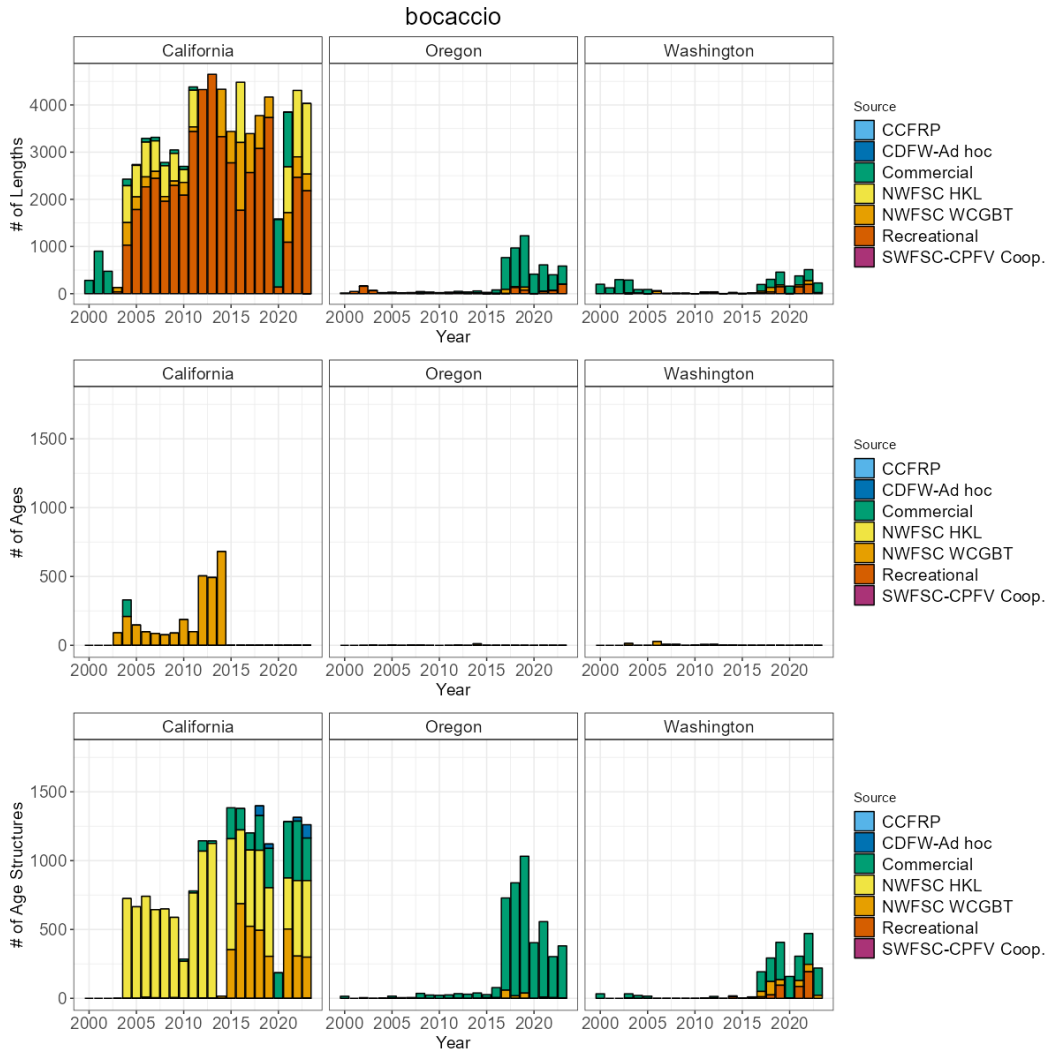

Figure 48: Total number of available lengths, read ages, and unread age structures by data source by year for bocaccio. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

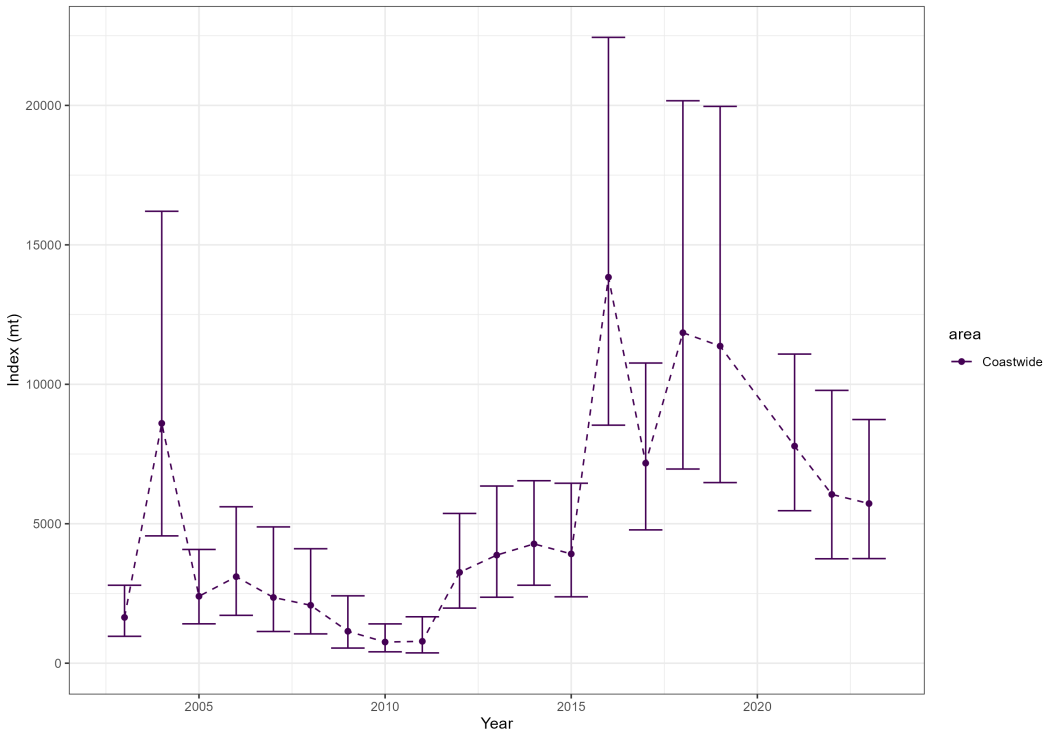

Figure 49: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for bocaccio. The NWFSC WCGBT has a coastwide average of 50 positive tows per year.

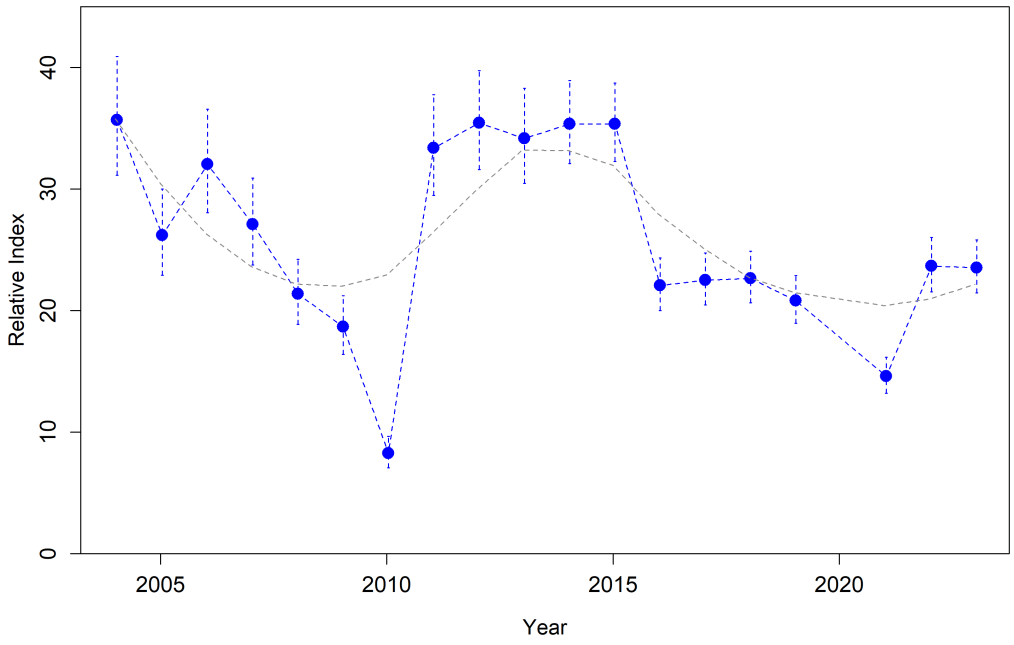

Figure 50: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for bocaccio. The NWFSC HKL survey has an average of 115 positive sets per year the area south of Point Conception in California.

Brown rockfish

The most recent assessment of brown rockfish was a data-moderate assessment conducted in 2013. Across available data, brown rockfish have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT has a coastwide average of 6 positive tows per year. The NWFSC HKL survey has an average of 1 positive sets per year the area south of Point Conception in California.

Coastwide a total of 46 maturity samples have been collected and 0 read by researchers at the NWFSC.

Table 23: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for brown rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	2,032	NA	NA
California	CDFW-Ad hoc	0	0	772
California	Commercial	5,017	0	99
California	NWFSC HKL	22	0	20
California	NWFSC WCGBT	693	0	543
California	Recreational	78,162	0	0
California	SWFSC-CPFV Coop.	113	0	113
Oregon	Commercial	11	0	3
Oregon	NWFSC WCGBT	2	0	2
Oregon	Recreational	556	13	56
Washington	Recreational	56	0	38

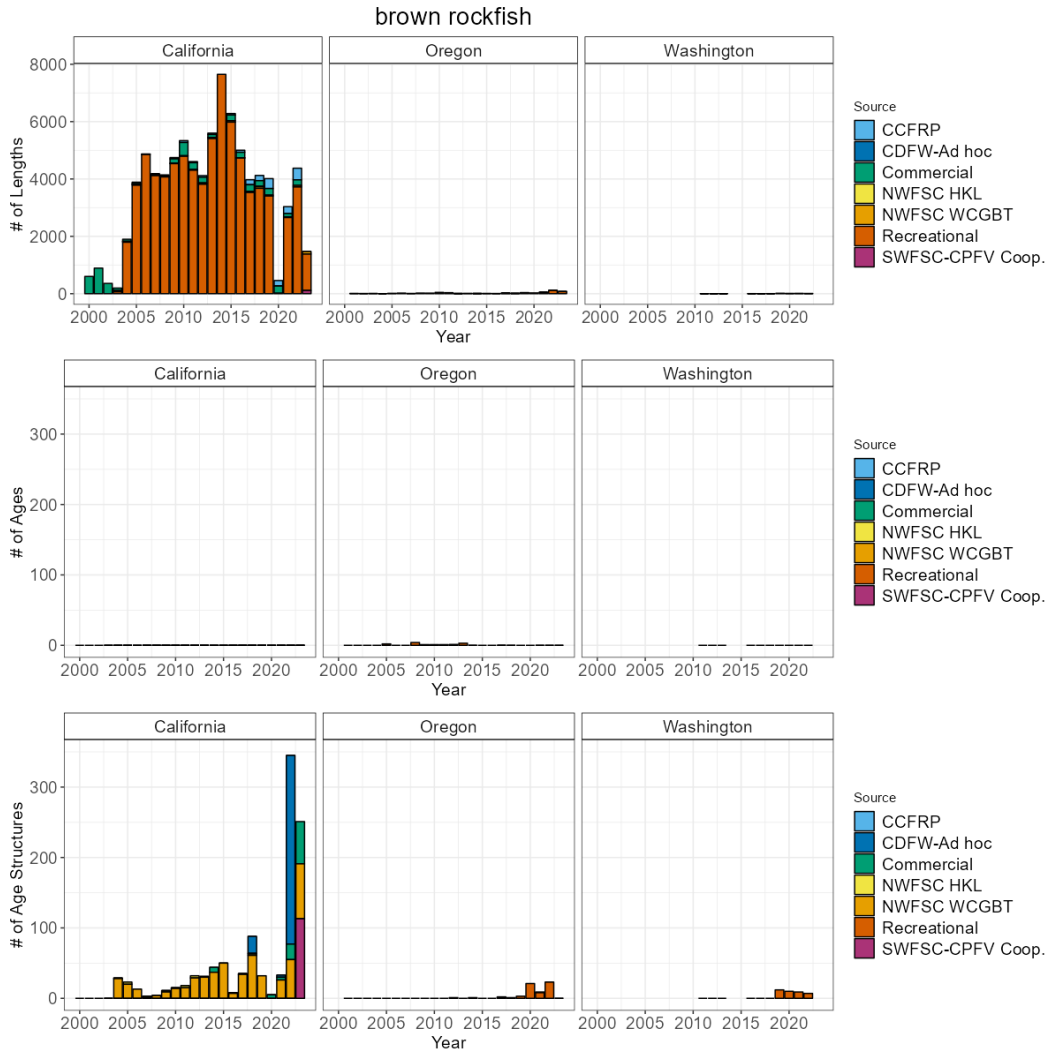

Figure 51: Total number of available lengths, read ages, and unread age structures by data source by year for brown rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Cabezon

The most recent assessment of cabezon was a benchmark assessment conducted in 2019. Across available data, cabezon have been observed and sampled by both commercial and recreational fisheries.

Table 24: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for cabezon.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	505	NA	NA
California	CDFW-Ad hoc	0	0	34
California	Commercial	7,848	0	16
California	NWFSC WCGBT	5	0	4
California	Recreational	15,737	0	0
California	SWFSC-CPFV Coop.	1	0	1
Oregon	Commercial	18,154	366	368
Oregon	NWFSC WCGBT	1	0	1
Oregon	Recreational	28,167	2,328	1,314
Washington	NWFSC WCGBT	1	0	1
Washington	Recreational	4,535	0	2,351

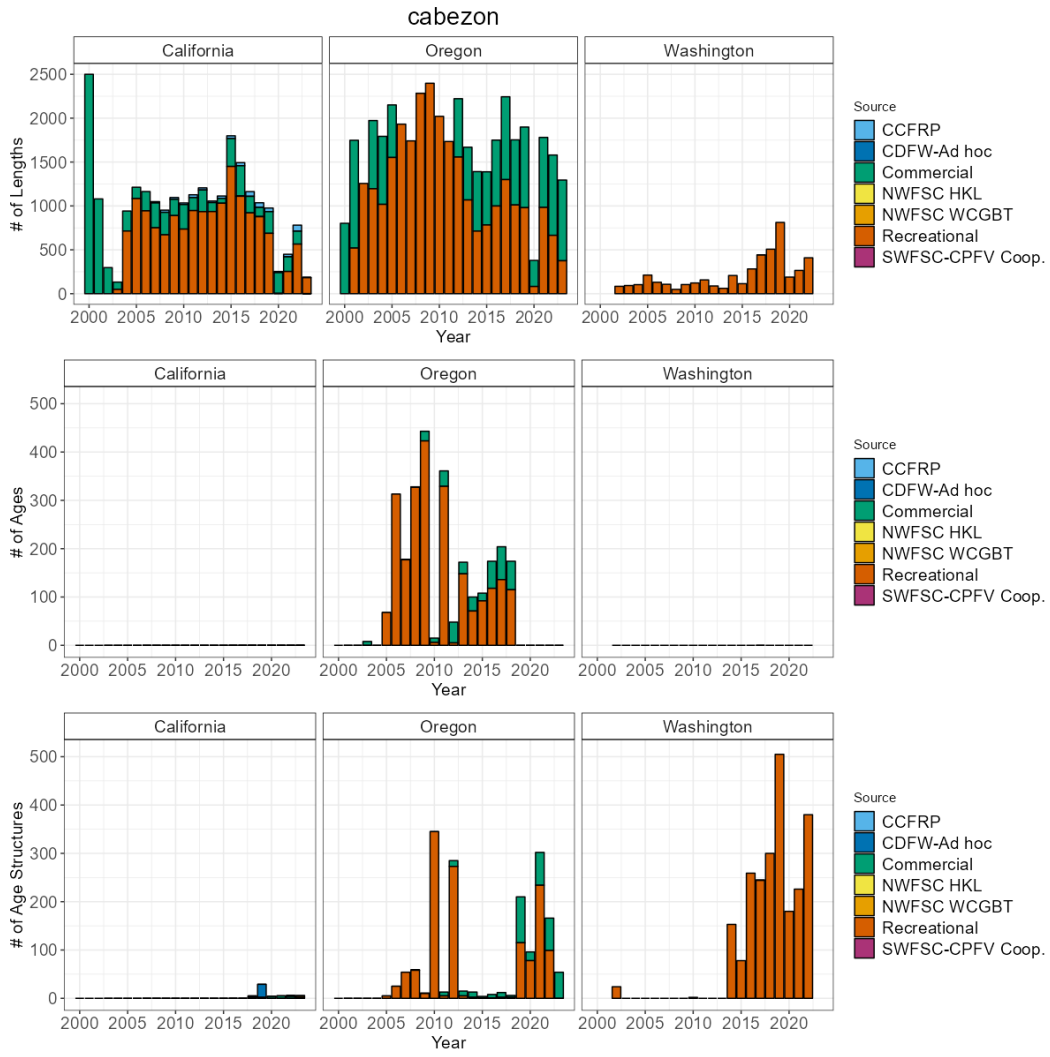

Figure 52: Total number of available lengths, read ages, and unread age structures by data source by year for cabezon. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

California scorpionfish

The most recent assessment of California scorpionfish was a benchmark assessment conducted in 2017. Across available data, California scorpionfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 13 positive tows per year. The NWFSC HKL survey has an average of 1 positive sets per year the area south of Point Conception in California.

Table 25: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for California scorpionfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	340	NA	NA
California	Commercial	768	0	0
California	NWFSC HKL	42	0	22
California	NWFSC WCGBT	3,992	911	939
California	Recreational	62,590	0	0
California	SWFSC-CPFV Coop.	85	0	85

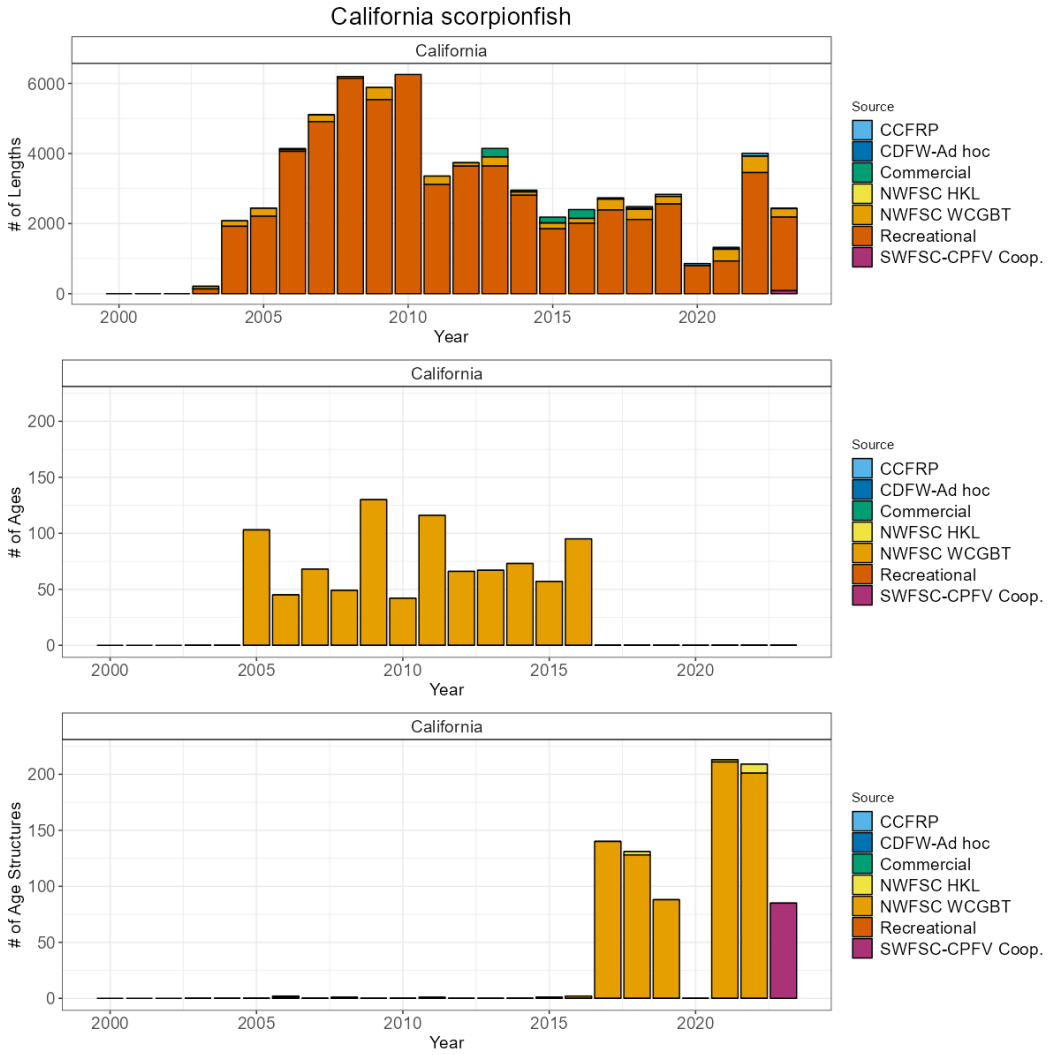

Figure 53: Total number of available lengths, read ages, and unread age structures by data source by year for California scorpionfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Canary rockfish

The most recent assessment of canary rockfish was a benchmark assessment conducted in 2023. Across available data, canary rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 53 positive tows per year. The NWFSC HKL survey has an average of 7 positive sets per year the area south of Point Conception in California.

Coastwide a total of 1228 maturity samples have been collected and 1169 read by researchers at the NWFSC.

Table 26: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for canary rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	3,427	NA	NA
California	CDFW-Ad hoc	0	0	676
California	Commercial	8,066	310	2,884
California	NWFSC HKL	395	192	198
California	NWFSC WCGBT	3,168	1,854	94
California	Recreational	21,042	0	0
California	SWFSC-CPFV Coop.	284	0	284
Oregon	Commercial	25,739	16,367	7,322
Oregon	NWFSC WCGBT	4,524	3,052	47
Oregon	Recreational	35,213	2,878	2,353
Washington	Commercial	11,580	10,113	782
Washington	NWFSC WCGBT	6,331	3,556	272
Washington	Recreational	6,991	5,032	1,144

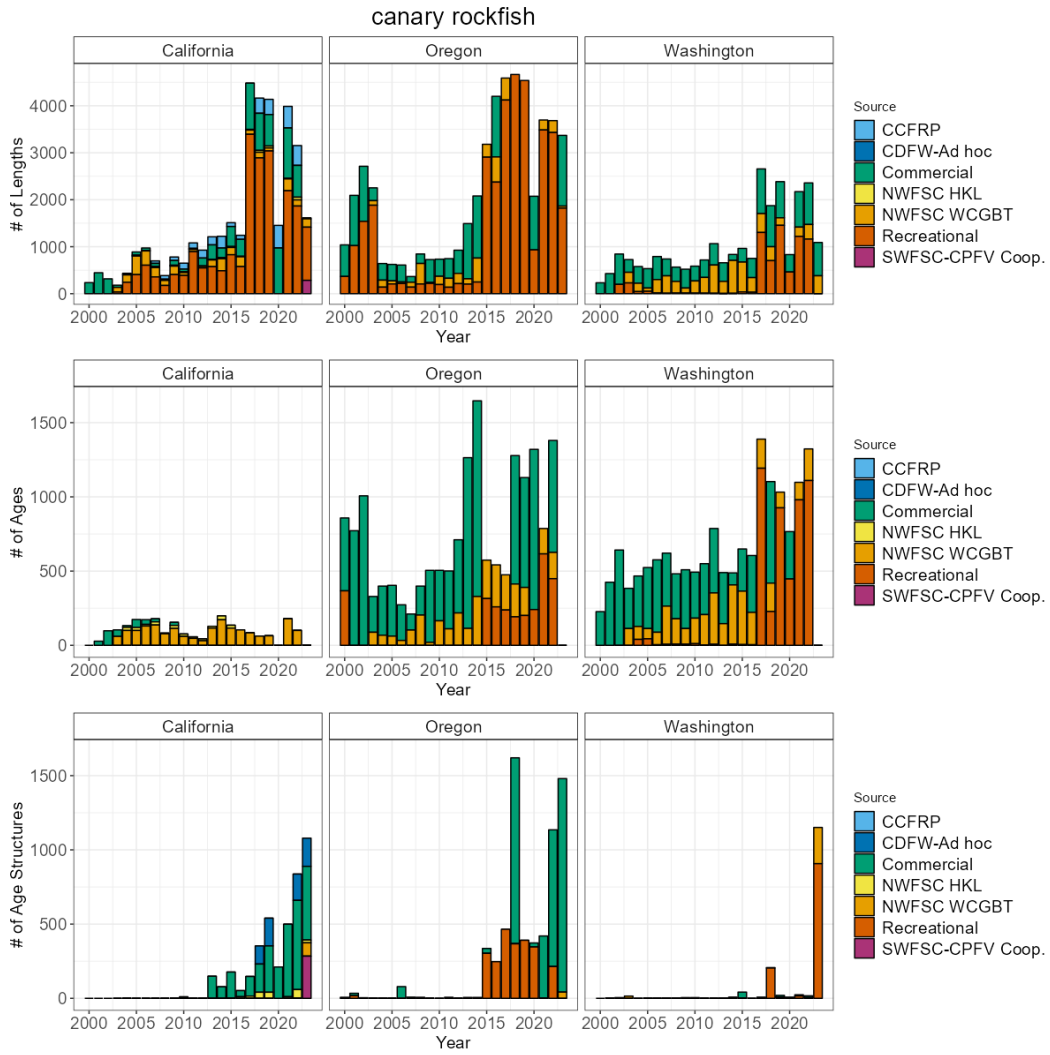

Figure 54: Total number of available lengths, read ages, and unread age structures by data source by year for canary rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

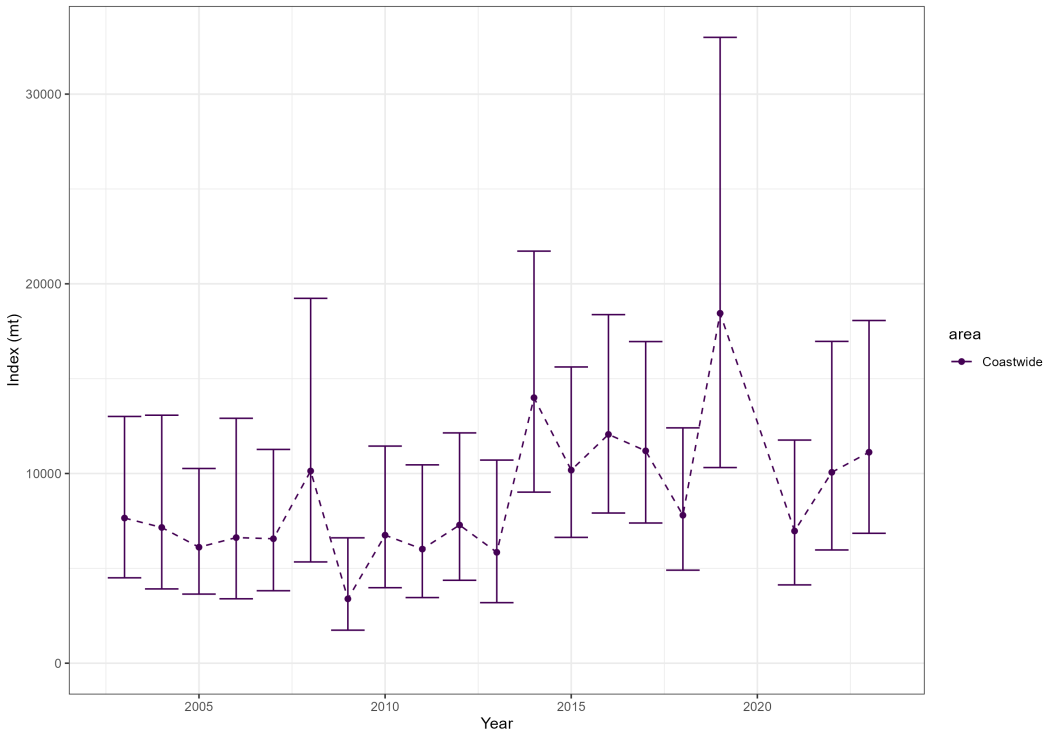

Figure 55: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for canary rockfish. The NWFSC WCGBT has a coastwide average of 53 positive tows per year.

China rockfish

The most recent assessment of China rockfish was a benchmark assessment conducted in 2015. Across available data, China rockfish have been observed and sampled by both commercial and recreational fisheries.

Additionally, larval drift modeling in concert with population genetics of China rockfish has be conducted by researchers at Oregon State University.

Table 27: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for China rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	2,017	NA	NA
California	CDFW-Ad hoc	0	0	68
California	Commercial	1,650	0	2
California	Recreational	17,298	0	0
California	SWFSC-CPFV Coop.	3	0	3
Oregon	Commercial	18,209	1,393	1,371
Oregon	Recreational	14,403	928	1,472
Washington	Recreational	4,526	1,293	1,460

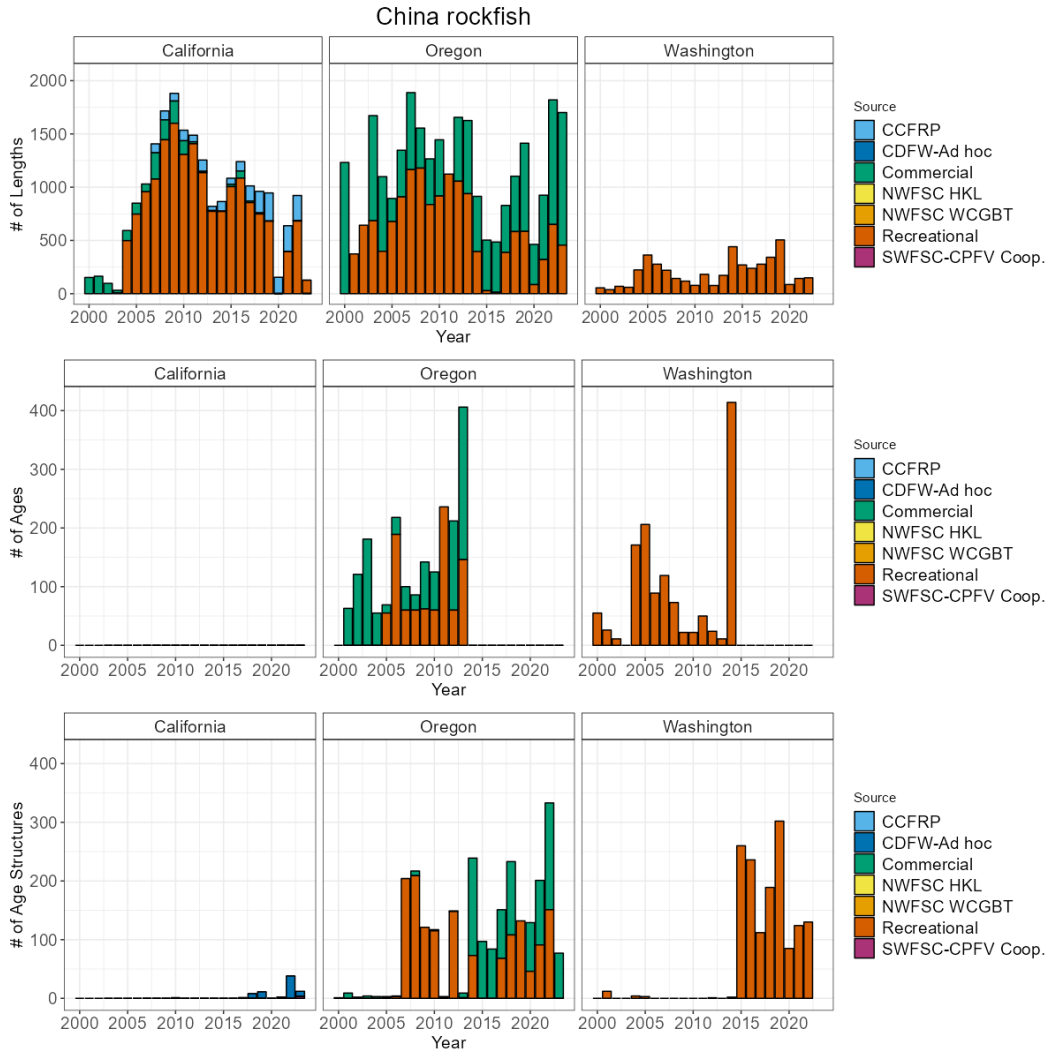

Figure 56: Total number of available lengths, read ages, and unread age structures by data source by year for China rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Copper rockfish

The most recent assessment of copper rockfish was a benchmark assessment conducted in 2023. Across available data, copper rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 9 positive tows per year. The NWFSC HKL survey has an average of 24 positive sets per year the area south of Point Conception in California.

Coastwide a total of 182 maturity samples have been collected and 182 read by researchers at the NWFSC.

Table 28: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for copper rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	5,977	NA	NA
California	CDFW-Ad hoc	0	0	267
California	Commercial	2,633	234	293
California	NWFSC HKL	1,299	1,213	81
California	NWFSC WCGBT	1,329	833	89
California	Recreational	63,388	0	0
California	SWFSC-CPFV Coop.	1,017	762	255
Oregon	Commercial	1,934	351	162
Oregon	NWFSC WCGBT	4	4	0
Oregon	Recreational	15,294	2,298	365
Washington	Commercial	6	1	0
Washington	Recreational	3,575	1,752	464

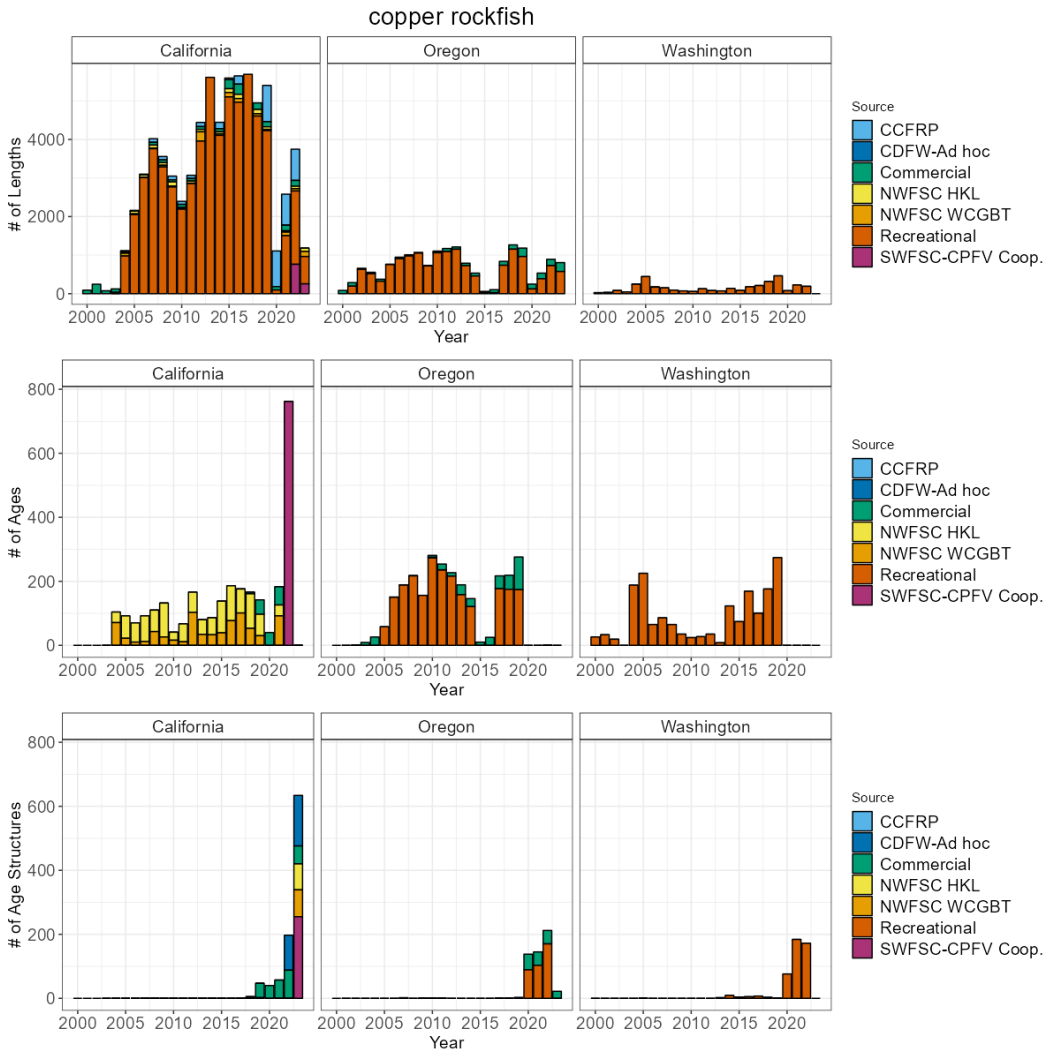

Figure 57: Total number of available lengths, read ages, and unread age structures by data source by year for copper rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

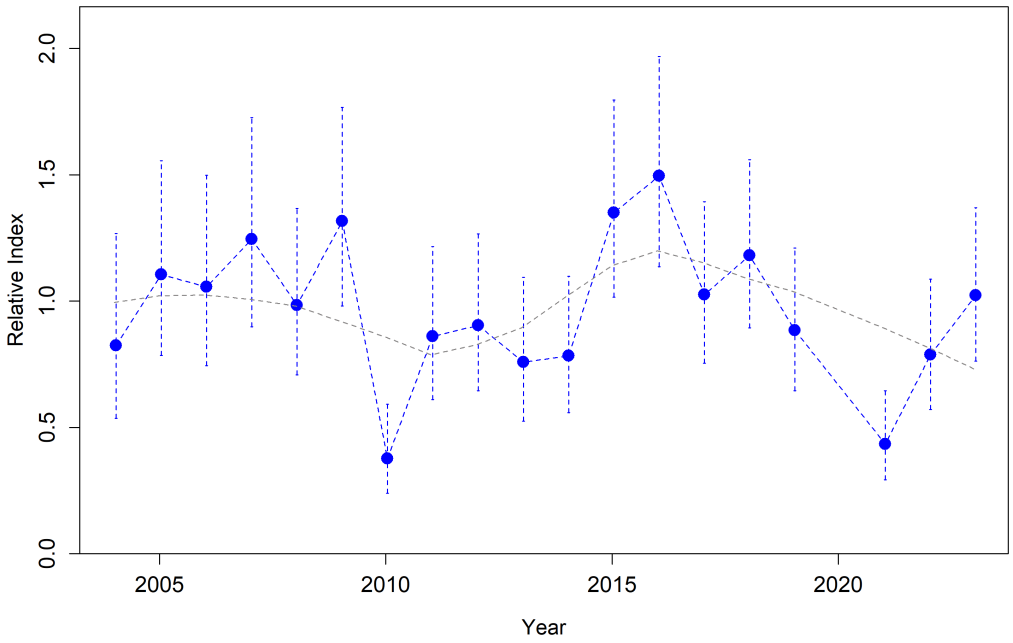

Figure 58: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for copper rockfish. The NWFSC HKL survey has an average of 24 positive sets per year the area south of Point Conception in California.

Cowcod

The most recent assessment of cowcod was a benchmark assessment conducted in 2019. Across available data, cowcod have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 19 positive tows per year. The NWFSC HKL survey has an average of 22 positive sets per year the area south of Point Conception in California.

Coastwide a total of 355 maturity samples have been collected and 102 read by researchers at the NWFSC.

Table 29: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for cowcod.

State	Source	Lengths	Ages	Age Structures
California	CDFW-Ad hoc	0	0	51
California	Commercial	1,218	0	547
California	NWFSC HKL	954	440	484
California	NWFSC WCGBT	881	462	407
California	Recreational	220	0	0
Oregon	Commercial	78	0	76
Oregon	NWFSC WCGBT	10	3	7
Washington	Commercial	1	0	0
Washington	NWFSC WCGBT	1	0	1

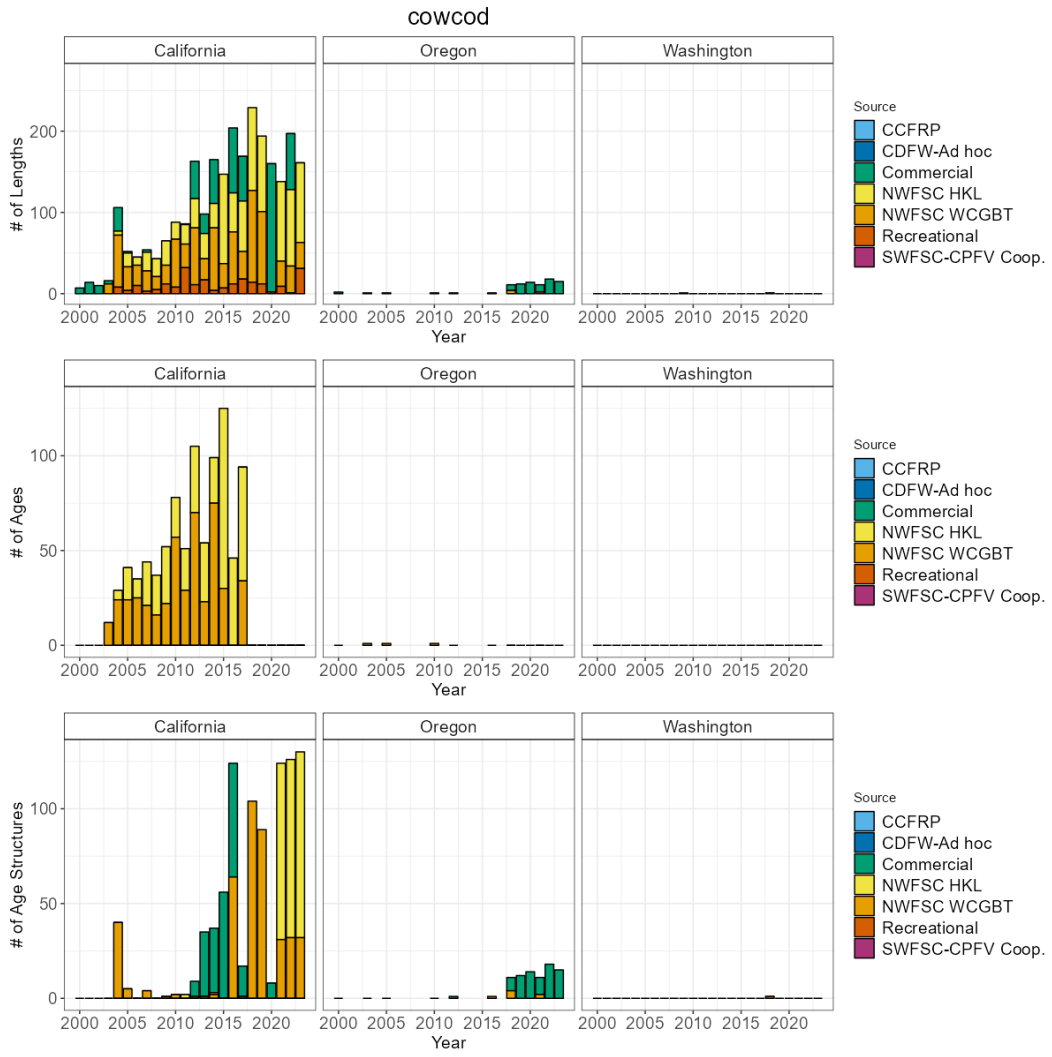

Figure 59: Total number of available lengths, read ages, and unread age structures by data source by year for cowcod. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

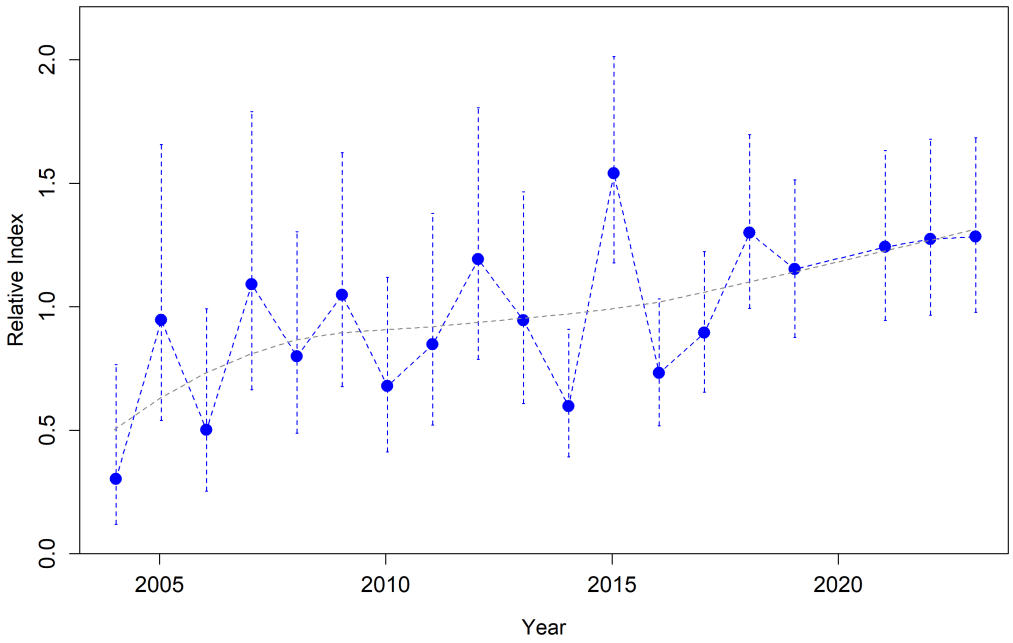

Figure 60: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for cowcod. The NWFSC HKL survey has an average of 22 positive sets per year the area south of Point Conception in California.

Curlfin sole

To date, no assessment or analysis has been conducted on curlfin sole. Across available data, curlfin sole have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 74 positive tows per year.

Table 30: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for curlfin sole.

State	Source	Lengths	Ages	Age Structures
California	NWFSC WCGBT	9,136	0	1,235
California	Recreational	5	0	0
Oregon	NWFSC WCGBT	1,316	0	325
Oregon	Recreational	1	0	0
Washington	NWFSC WCGBT	172	0	53

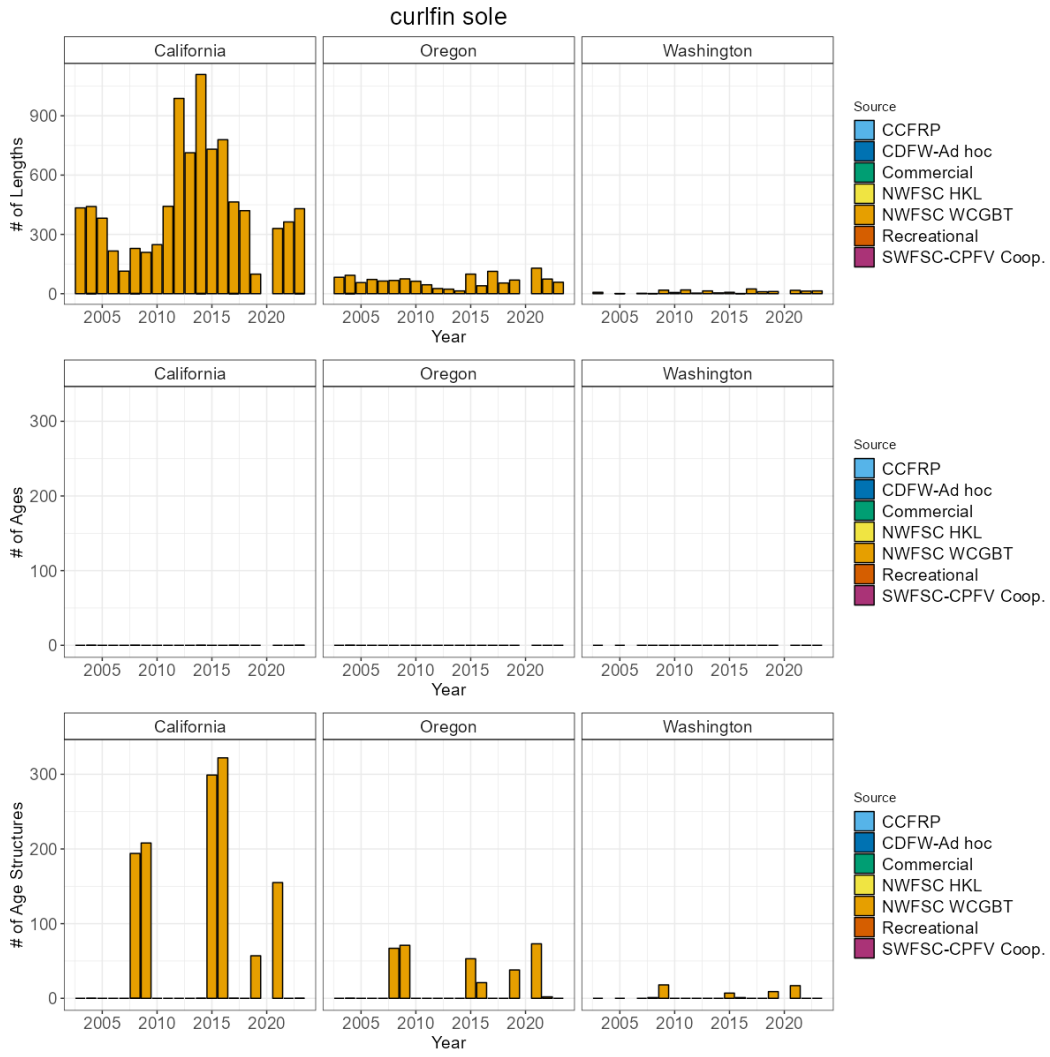

Figure 61: Total number of available lengths, read ages, and unread age structures by data source by year for curlfin sole. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

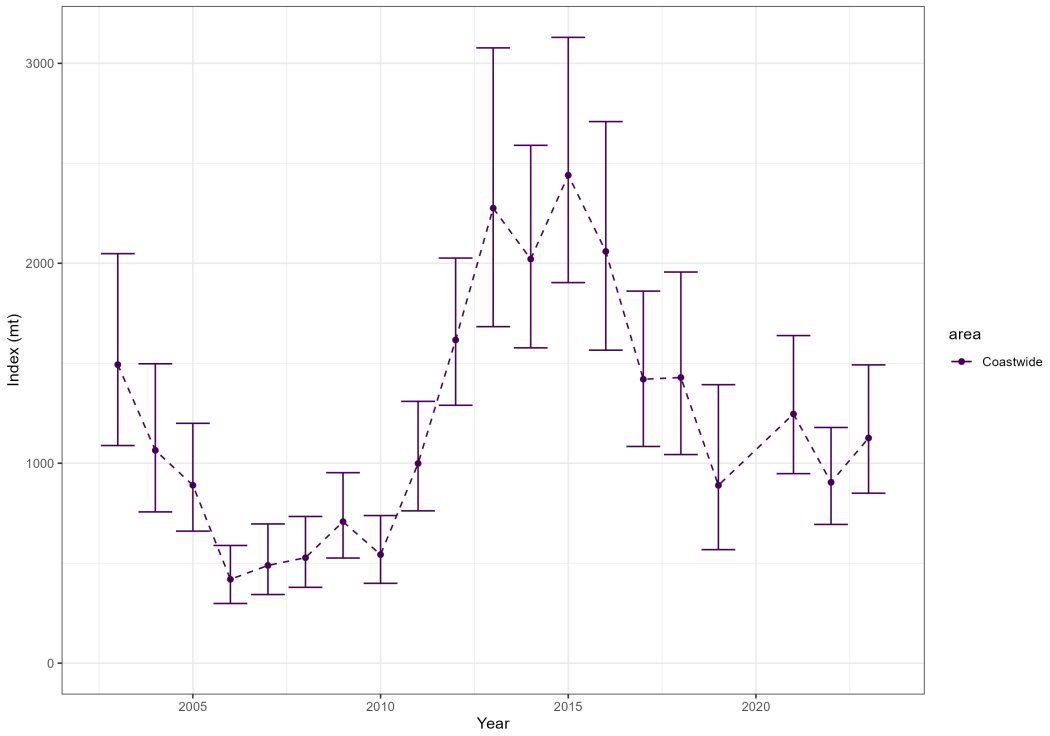

Figure 62: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for curlfin sole. The NWFSC WCGBT survey has an average of 74 positive tows per year.

Darkblotched rockfish

The most recent assessment of darkblotched rockfish was an update assessment conducted in 2017. Across available data, darkblotched rockfish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 112 positive tows per year.

Coastwide a total of 958 maturity samples have been collected and 898 read by researchers at the NWFSC.

Table 31: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for darkblotched rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	23,551	6,288	3,187
California	NWFSC WCGBT	7,146	2,561	717
Oregon	Commercial	46,618	24,239	18,625
Oregon	NWFSC WCGBT	19,343	6,117	2,213
Oregon	Recreational	6	0	0
Washington	Commercial	12,760	4,419	3,585
Washington	NWFSC WCGBT	10,245	3,041	982
Washington	Recreational	1	0	0

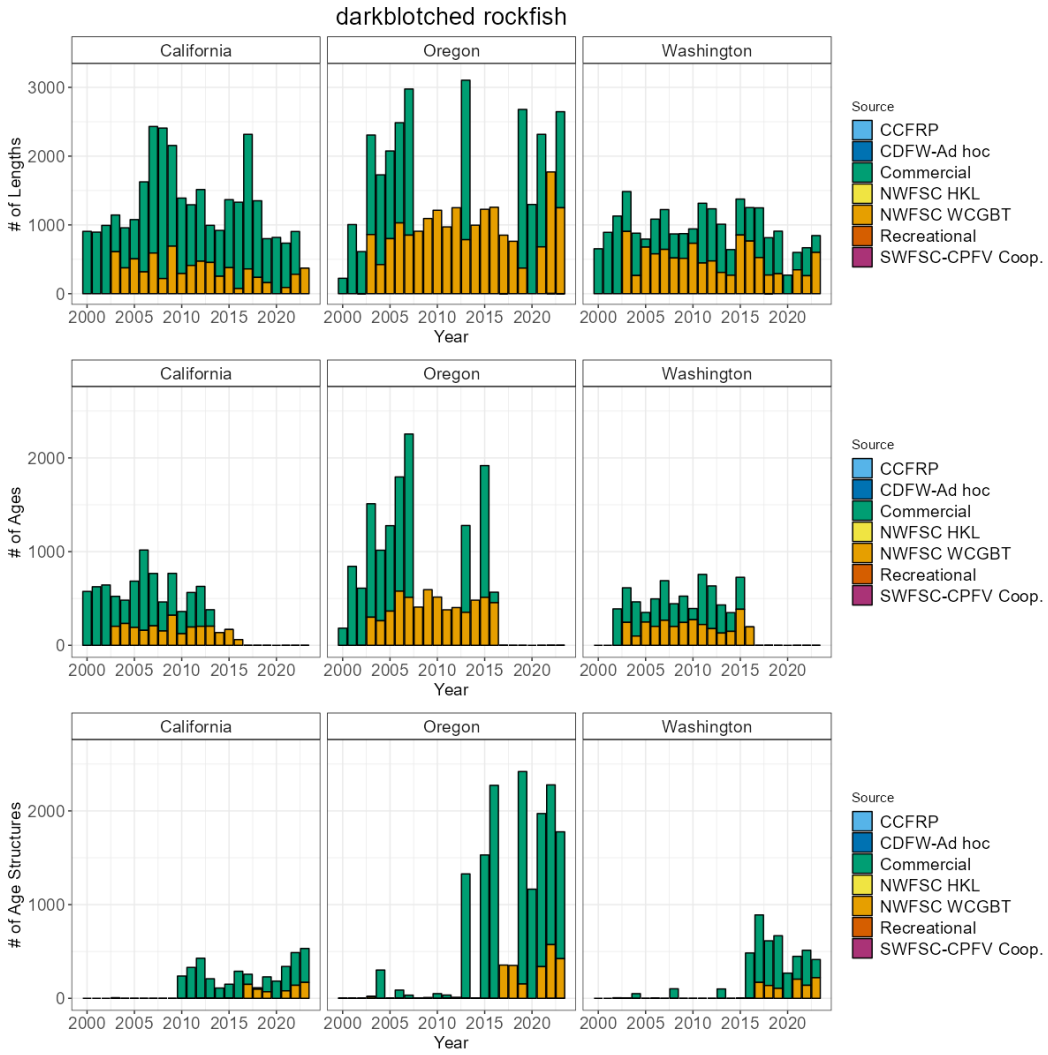

Figure 63: Total number of available lengths, read ages, and unread age structures by data source by year for darkblotched rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

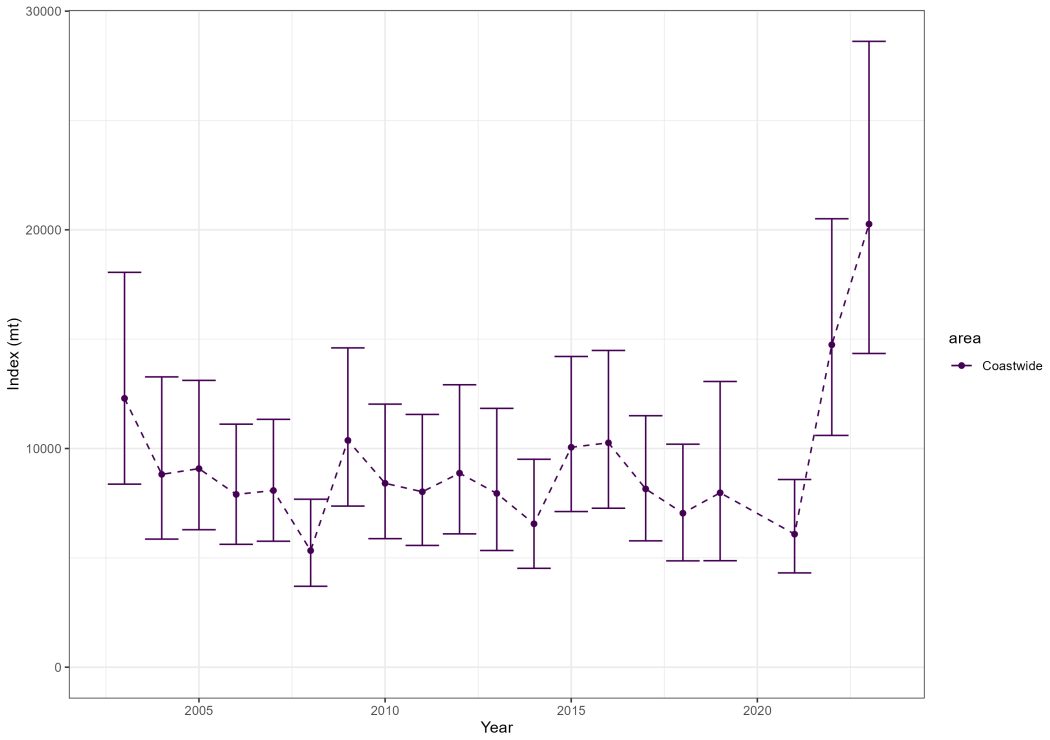

Figure 64: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for darkblotched rockfish. The NWFSC WCGBT survey has an average of 112 positive tows per year.

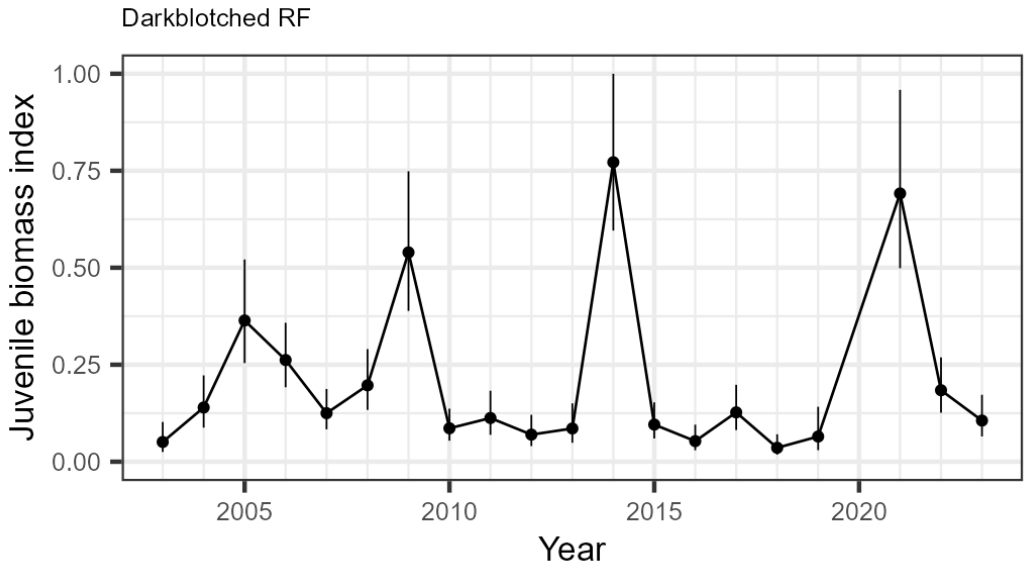

Figure 65: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for darkblotched rockfish. The juvenile index represents fish 15 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of darkblotched rockfish in 2017 estimated large recruitments (i.e., greater than 0.50) in 2008 and 2013.

Table 32: The median length (cm) associated with fish age 2 or younger for darkblotched rockfish based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
0	9
1	14
2	18

Dover sole

The most recent assessment of Dover sole was a benchmark assessment conducted in 2021. Across available data, Dover sole have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 530 positive tows per year.

Coastwide a total of 722 maturity samples have been collected and 258 read by researchers at the NWFSC.

Table 33: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for Dover sole.

State	Source	Lengths	Ages	Age Structures
California	Commercial	45,970	11,407	6,466
California	NWFSC WCGBT	83,404	8,577	5,310
California	Recreational	9	0	0
Oregon	Commercial	62,878	10,192	34,093
Oregon	NWFSC WCGBT	63,022	5,454	3,592
Oregon	Recreational	22	0	0
Washington	Commercial	25,415	7,385	8,651
Washington	NWFSC WCGBT	35,481	2,866	2,074
Washington	Recreational	2	0	0

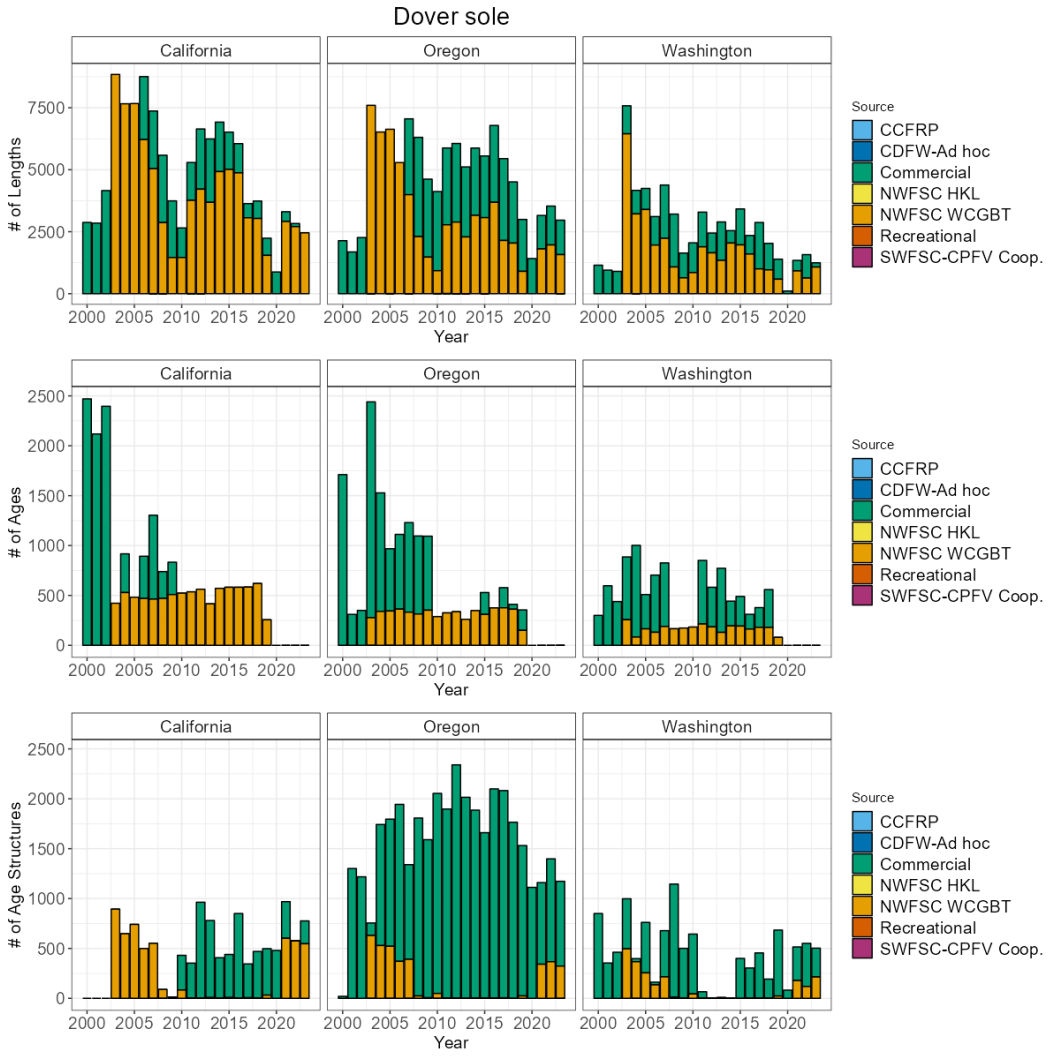

Figure 66: Total number of available lengths, read ages, and unread age structures by data source by year for Dover sole. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

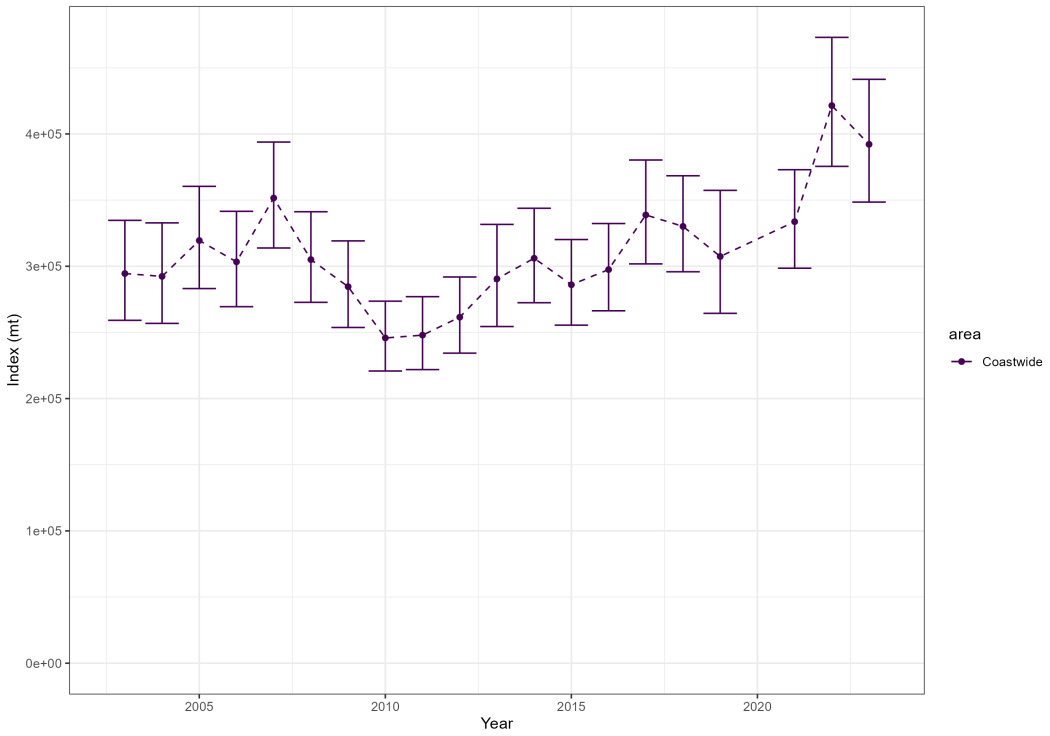

Figure 67: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for Dover sole. The NWFSC WCGBT survey has an average of 530 positive tows per year.

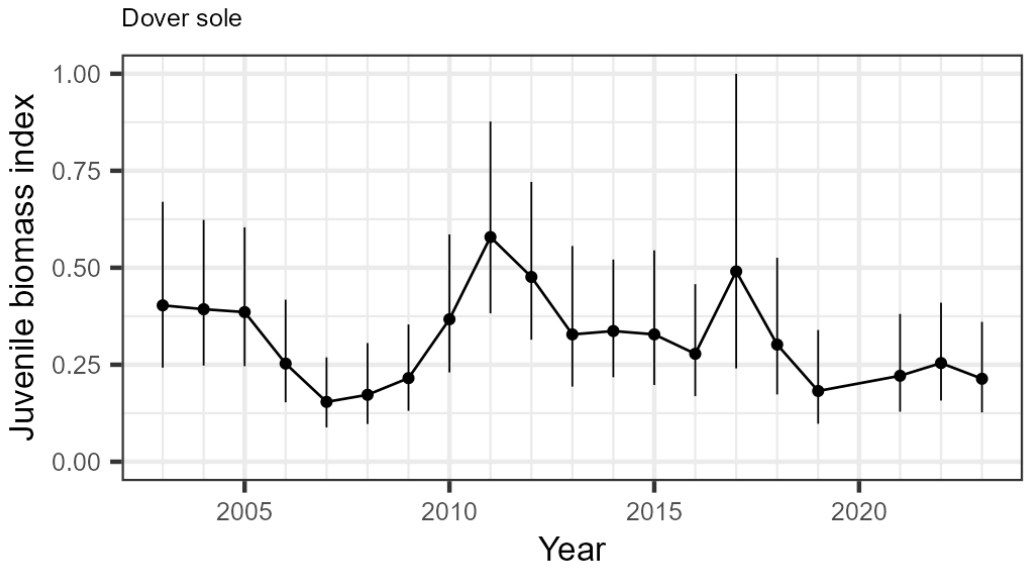

Figure 68: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for Dover sole. The juvenile index represents fish 17 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of Dover sole in 2021 estimated a sinlge large recruitment (i.e., greater than 0.50) in 2009.

Table 34: The median length (cm) associated with fish age 6 or younger for Dover sole based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
1	10
2	17
3	22
4	25
5	27
6	29

Flag rockfish

The most recent assessment of flag rockfish was a data-limited assessment conducted in 2010. Across available data, flag rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 7 positive tows per year. The NWFSC HKL survey has an average of 9 positive sets per year the area south of Point Conception in California.

Table 35: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for flag rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	1	NA	NA
California	CDFW-Ad hoc	0	0	23
California	Commercial	295	0	5
California	NWFSC HKL	222	0	200
California	NWFSC WCGBT	489	3	361
California	Recreational	11,733	0	0
California	SWFSC-CPFV Coop.	17	0	17
Oregon	NWFSC WCGBT	4	0	4
Oregon	Recreational	14	0	0

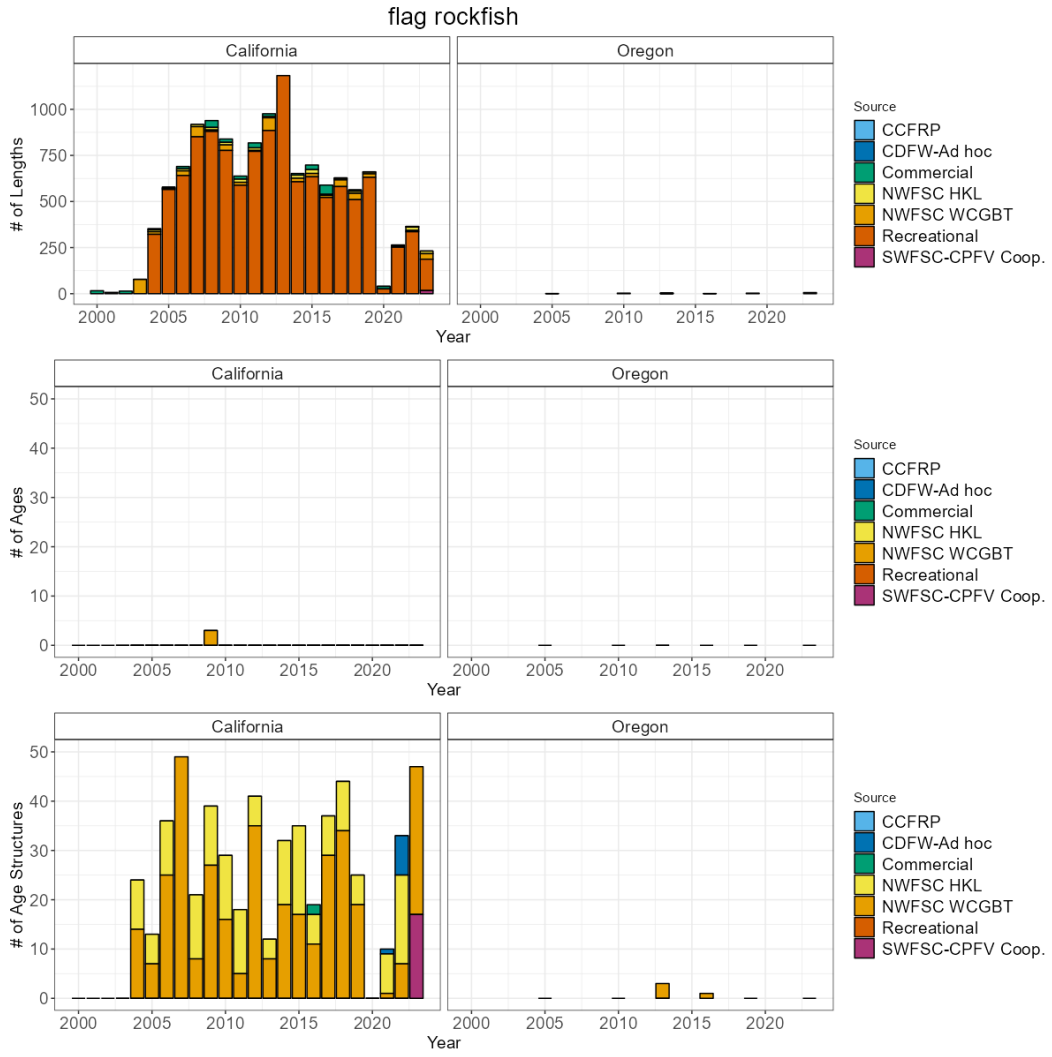

Figure 69: Total number of available lengths, read ages, and unread age structures by data source by year for flag rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Flathead sole

To date, no assessment or analysis has been conducted on flathead sole. Across available data, flathead sole have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 52 positive tows per year.

Table 36: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for flathead sole.

State	Source	Lengths	Ages	Age Structures
California	Commercial	1	0	0
California	NWFSC WCGBT	76	0	38
Oregon	Commercial	1,501	0	1,381
Oregon	NWFSC WCGBT	3,777	0	1,627
Oregon	Recreational	1	0	0
Washington	Commercial	1	0	1
Washington	NWFSC WCGBT	7,699	0	1,788

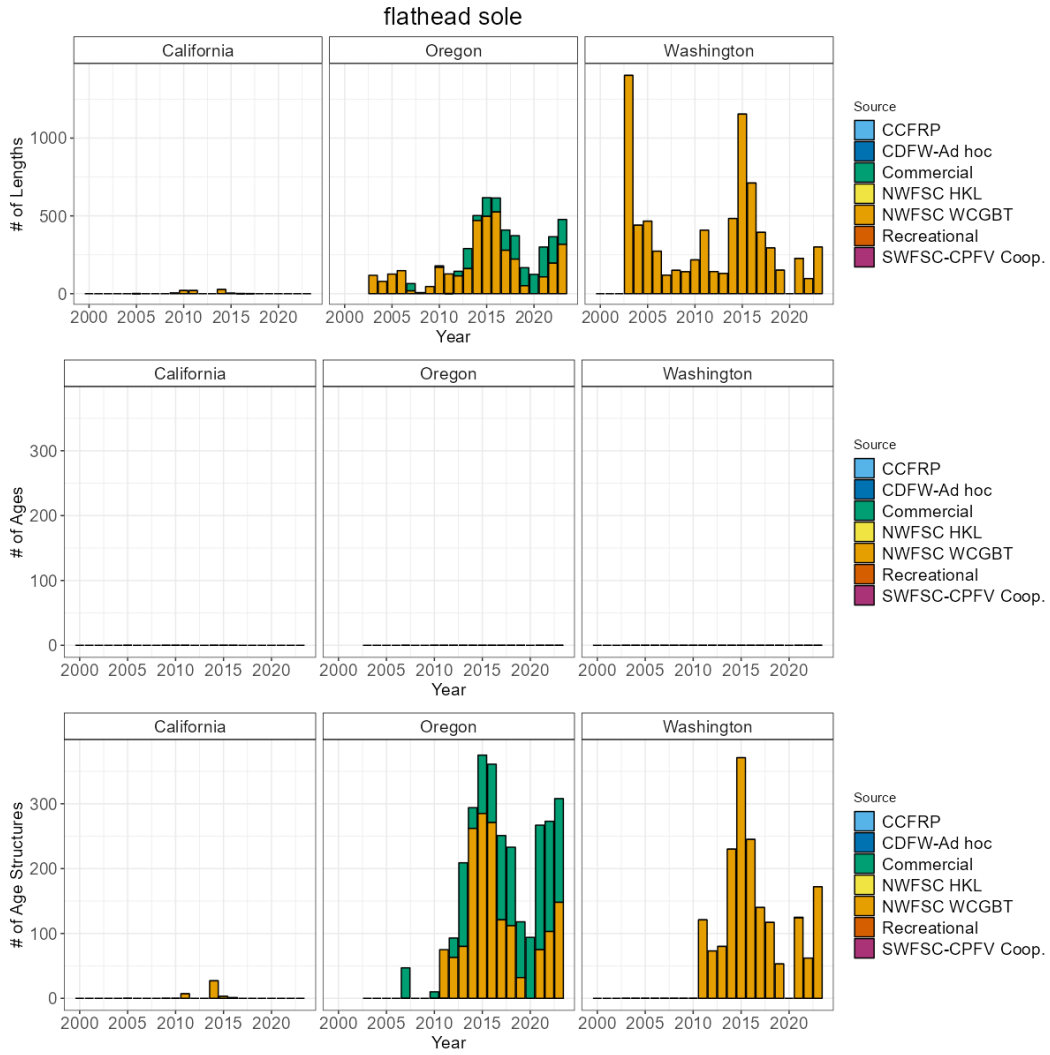

Figure 70: Total number of available lengths, read ages, and unread age structures by data source by year for flathead sole. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

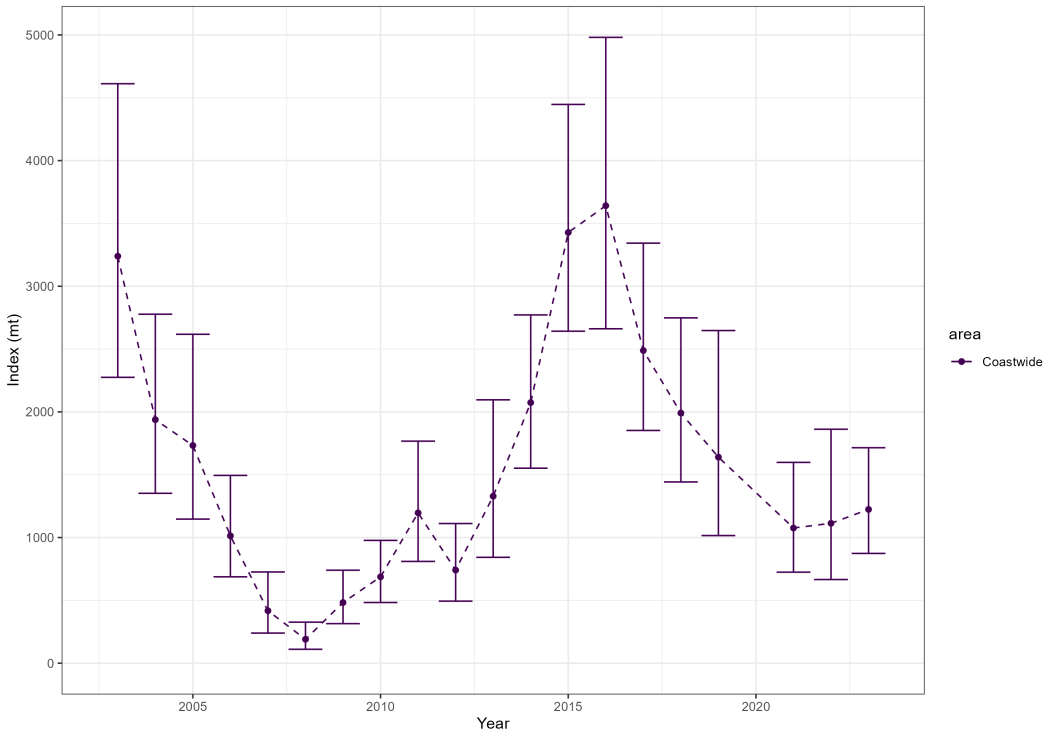

Figure 71: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for flathead sole. The NWFSC WCGBT survey has an average of 52 positive tows per year.

Gopher and black and yellow rockfish

The most recent assessment of gopher and black and yellow rockfish was a benchmark assessment conducted in 2019. Across available data, gopher and black and yellow rockfish have been observed and sampled by both commercial and recreational fisheries. The NWFSC WCGBT survey has an average of 1 positive tows per year.

Table 37: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for gopher and black and yellow rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	32,887	NA	NA
California	CDFW-Ad hoc	0	0	312
California	Commercial	26,547	46	246
California	NWFSC HKL	9	0	7
California	NWFSC WCGBT	15	0	13
California	Recreational	98,757	0	0
California	SWFSC-CPFV Coop.	107	0	107
Oregon	Commercial	265	0	24
Oregon	NWFSC WCGBT	2	0	2
Oregon	Recreational	174	0	21

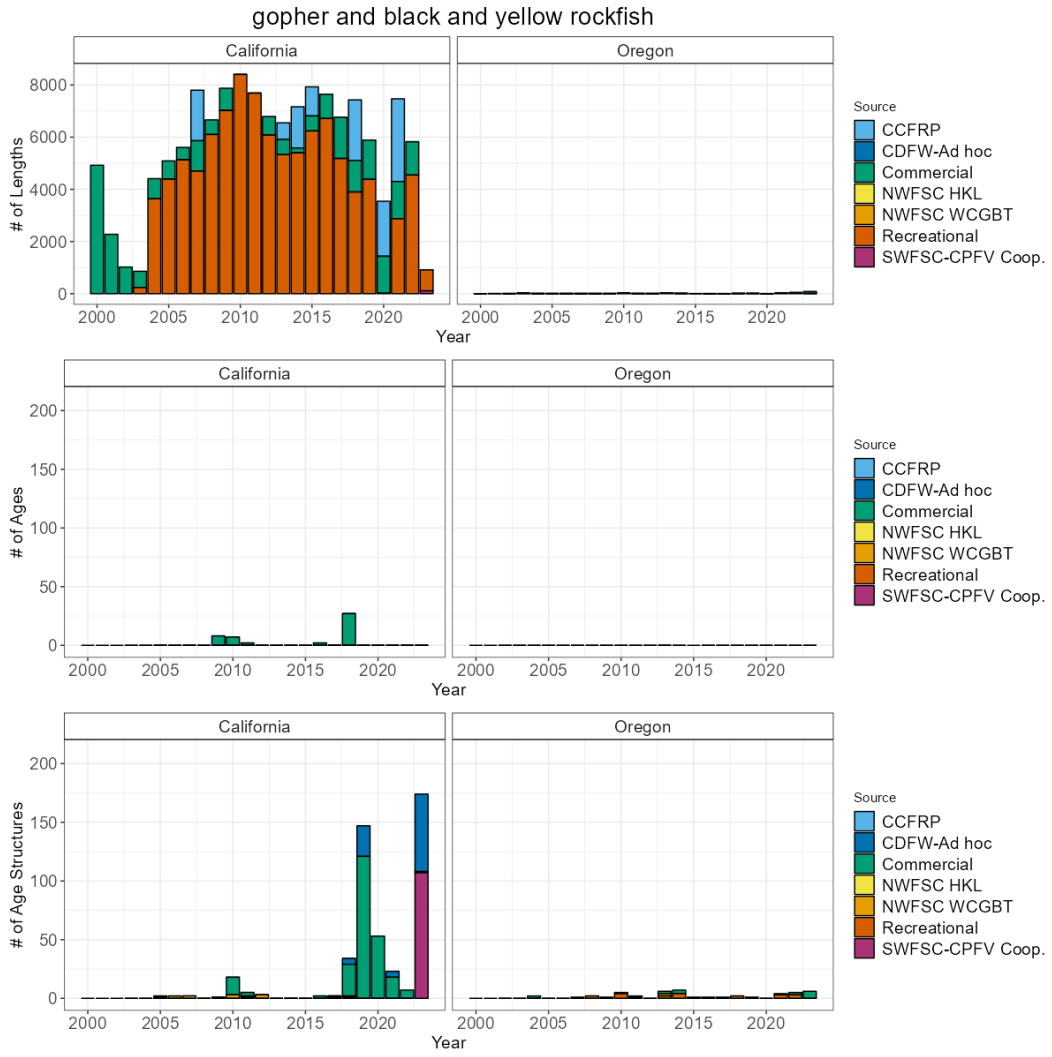

Figure 72: Total number of available lengths, read ages, and unread age structures by data source by year for gopher and black and yellow rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Grass rockfish

The most recent assessment of grass rockfish was a data-limited assessment conducted in 2010. Across available data, grass rockfish have been observed and sampled by both commercial and recreational fisheries.

Table 38: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for grass rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	25	NA	NA
California	CDFW-Ad hoc	0	0	18
California	Commercial	4,894	0	1
California	Recreational	5,084	0	0
Oregon	Commercial	923	0	7
Oregon	Recreational	156	0	10
Washington	Recreational	12	0	9

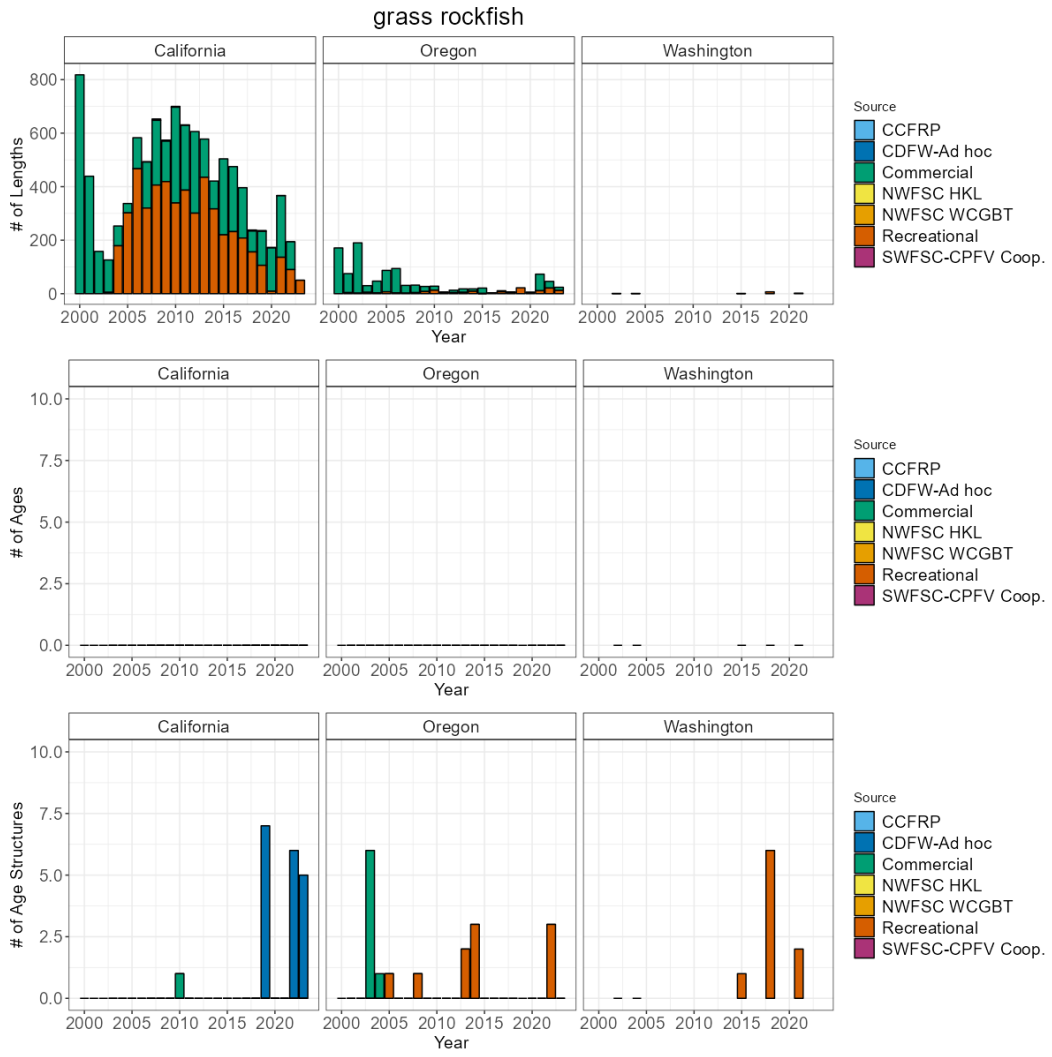

Figure 73: Total number of available lengths, read ages, and unread age structures by data source by year for grass rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Greenspotted rockfish

The most recent assessment of greenspotted rockfish was a benchmark assessment conducted in 2011. Across available data, greenspotted rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 35 positive tows per year. The NWFSC HKL survey has an average of 63 positive sets per year the area south of Point Conception in California.

Coastwide a total of 314 maturity samples have been collected and 175 read by researchers at the NWFSC.

Table 39: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for greenspotted rockfish.

State	Source	Lengths	Ages	Age Structures
California	CDFW-Ad hoc	0	0	404
California	Commercial	3,893	0	500
California	NWFSC HKL	5,754	843	4,720
California	NWFSC WCGBT	7,415	701	3,537
California	Recreational	20,306	0	0
California	SWFSC-CPFV Coop.	245	0	245
Oregon	Commercial	695	0	687
Oregon	NWFSC WCGBT	1,208	0	941
Oregon	Recreational	144	0	0
Washington	Commercial	11	0	6
Washington	NWFSC WCGBT	43	0	39

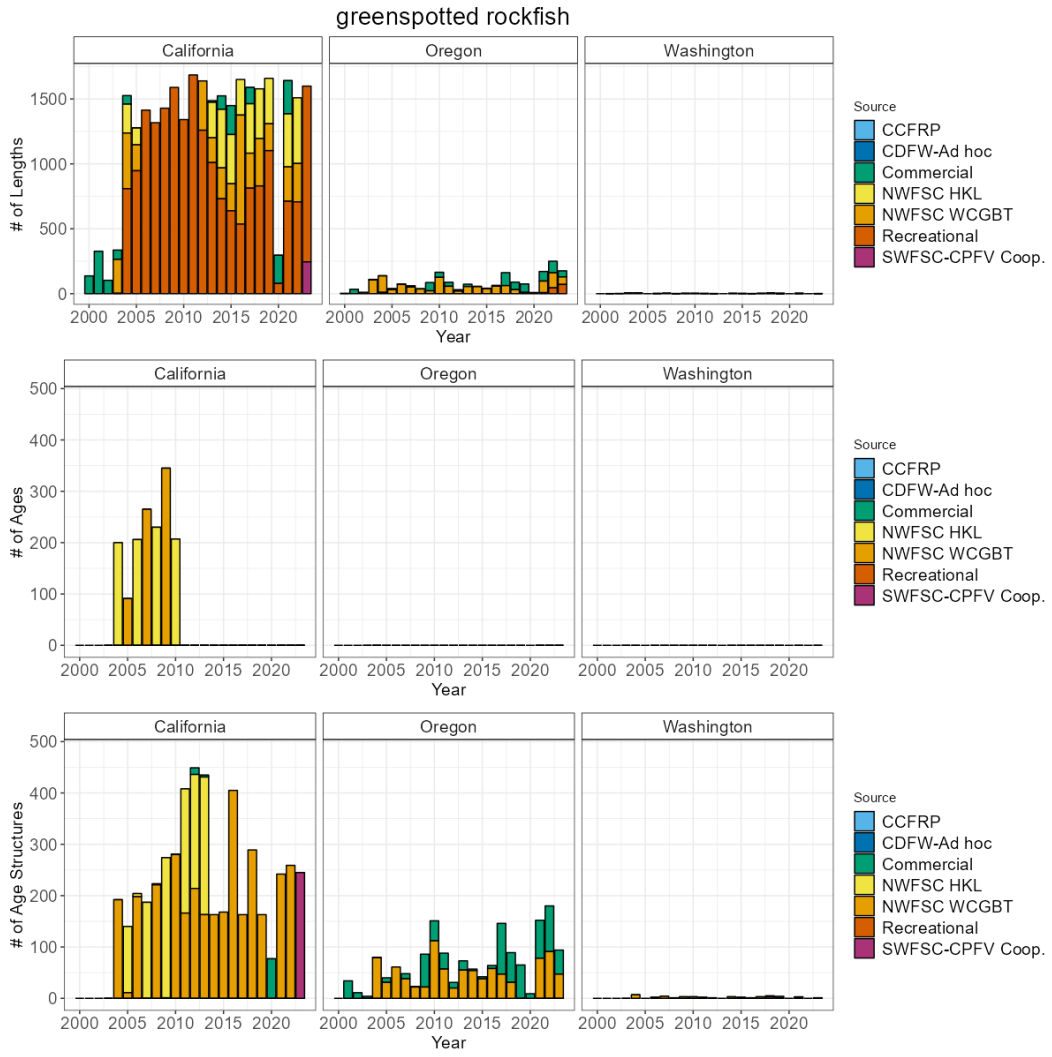

Figure 74: Total number of available lengths, read ages, and unread age structures by data source by year for greenspotted rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

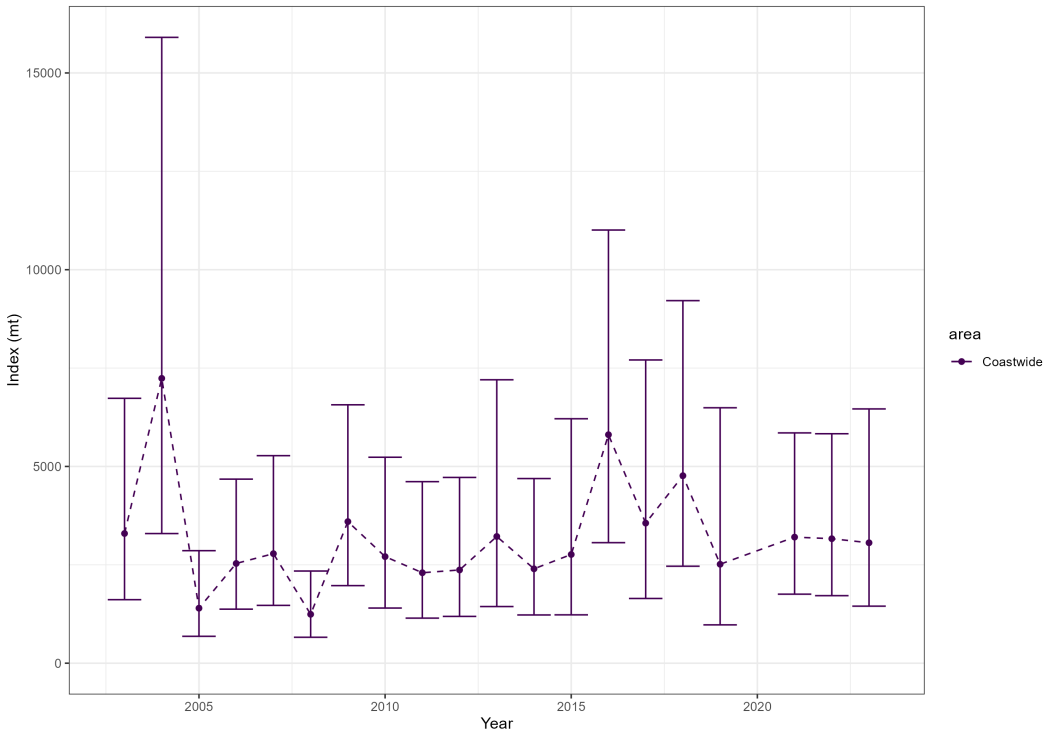

Figure 75: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for greenspotted rockfish. The NWFSC WCGBT has a coastwide average of 35 positive tows per year.

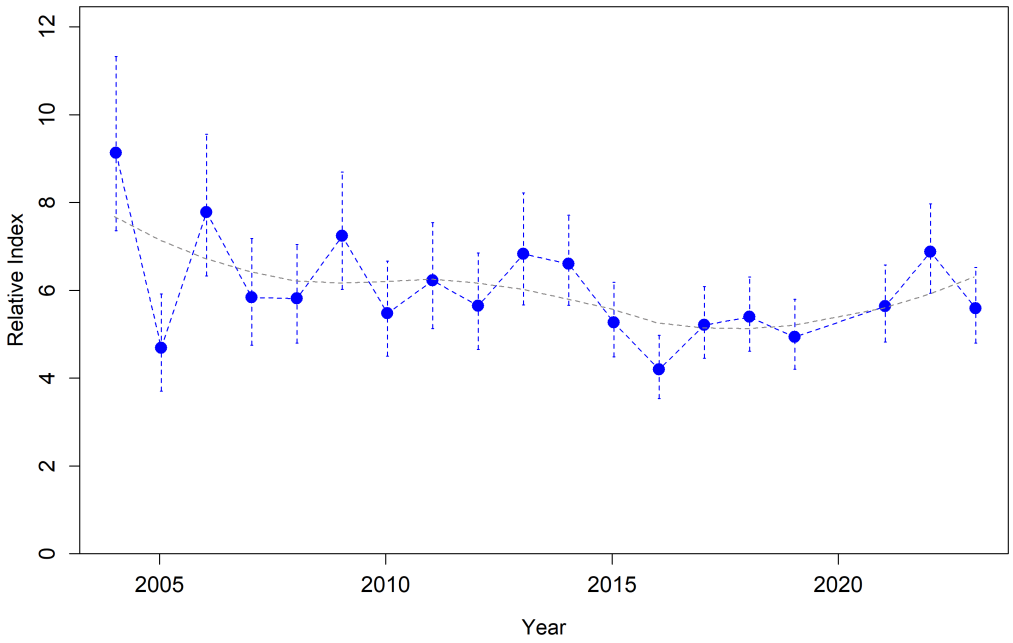

Figure 76: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for greenspotted rockfish. The NWFSC HKL survey has an average of 63 positive sets per year the area south of Point Conception in California.

Greenstriped rockfish

The most recent assessment of greenstriped rockfish was a benchmark assessment conducted in 2009. Across available data, greenstriped rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 161 positive tows per year. The NWFSC HKL survey has an average of 26 positive sets per year the area south of Point Conception in California.

Coastwide a total of 73 maturity samples have been collected and 73 read by researchers at the NWFSC.

Table 40: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for greenstriped rockfish.

State	Source	Lengths	Ages	Age Structures
California	CDFW-Ad hoc	0	0	40
California	Commercial	3,079	0	381
California	NWFSC HKL	1,105	0	1,089
California	NWFSC WCGBT	15,963	1,359	3,912
California	Recreational	2,990	0	0
California	SWFSC-CPFV Coop.	127	0	127
Oregon	Commercial	7,204	0	6,525
Oregon	NWFSC WCGBT	17,678	1,263	3,362
Oregon	Recreational	735	0	0
Washington	Commercial	5,777	0	1,476
Washington	NWFSC WCGBT	11,105	792	2,058
Washington	Recreational	117	0	76

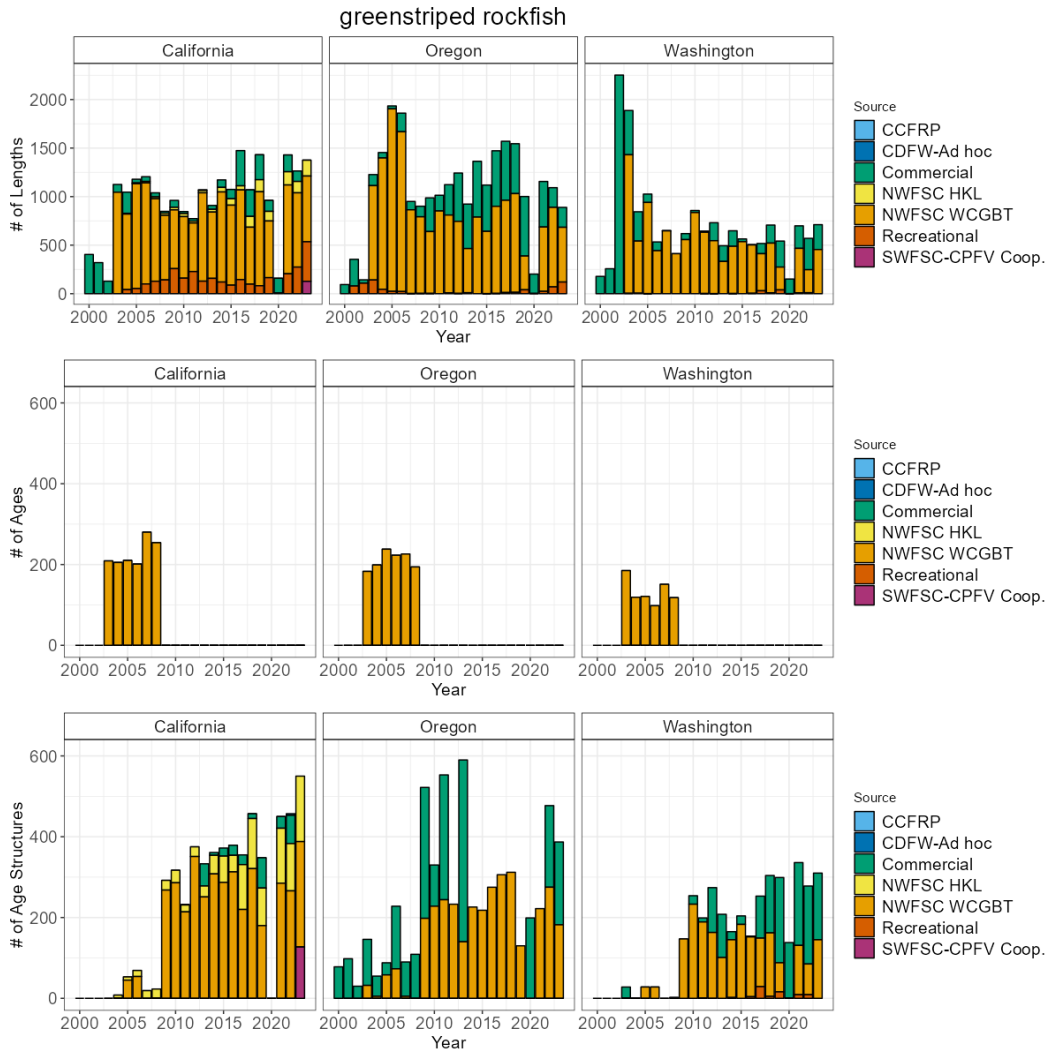

Figure 77: Total number of available lengths, read ages, and unread age structures by data source by year for greenstriped rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

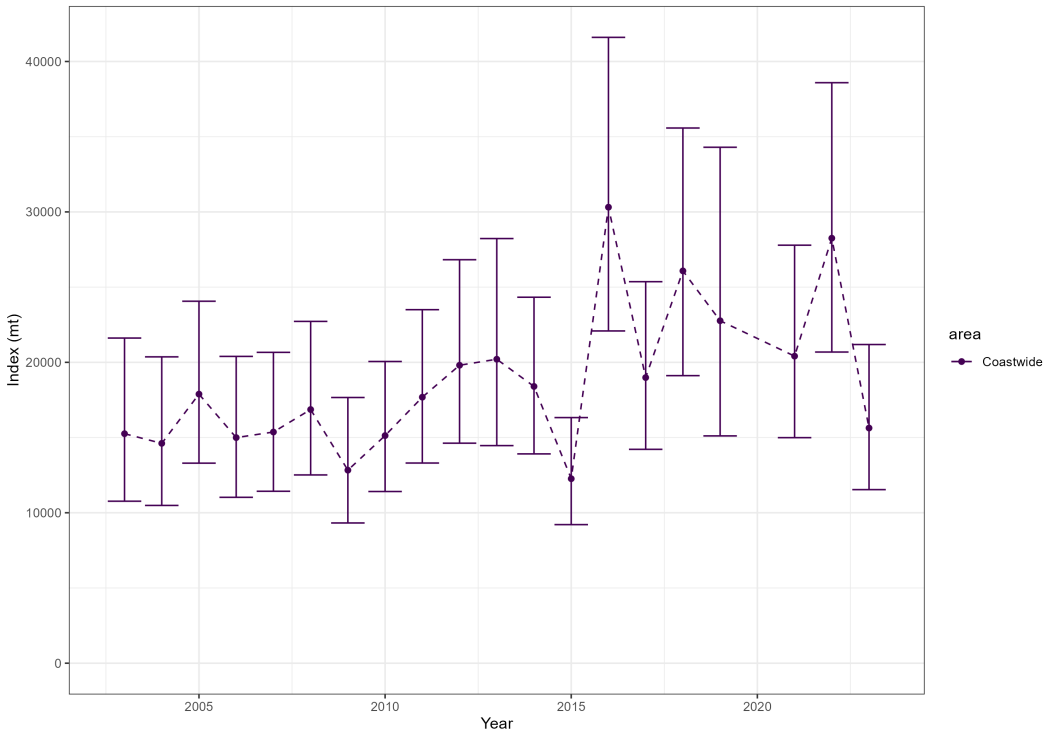

Figure 78: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for greenstriped rockfish. The NWFSC WCGBT has a coastwide average of 161 positive tows per year.

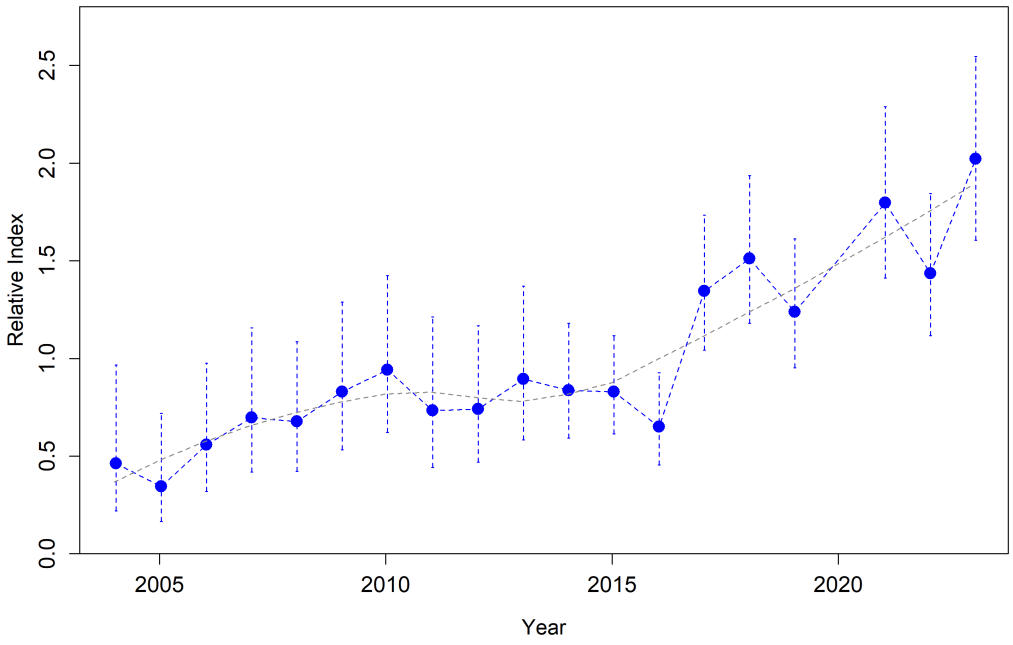

Figure 79: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for greenstriped rockfish. The NWFSC HKL survey has an average of 26 positive sets per year the area south of Point Conception in California.

Honeycomb rockfish

The most recent assessment of honeycomb rockfish was a data-limited assessment conducted in 2010. Across available data, honeycomb rockfish have been observed and sampled by recreational fisheries and the both the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 1 positive tows per year. The NWFSC HKL survey has an average of 6 positive sets per year the area south of Point Conception in California.

Table 41: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for honeycomb rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	500	NA	NA
California	CDFW-Ad hoc	0	0	14
California	Commercial	87	0	13
California	NWFSC HKL	254	0	223
California	NWFSC WCGBT	301	0	188
California	Recreational	14,418	0	0
California	SWFSC-CPFV Coop.	8	0	8

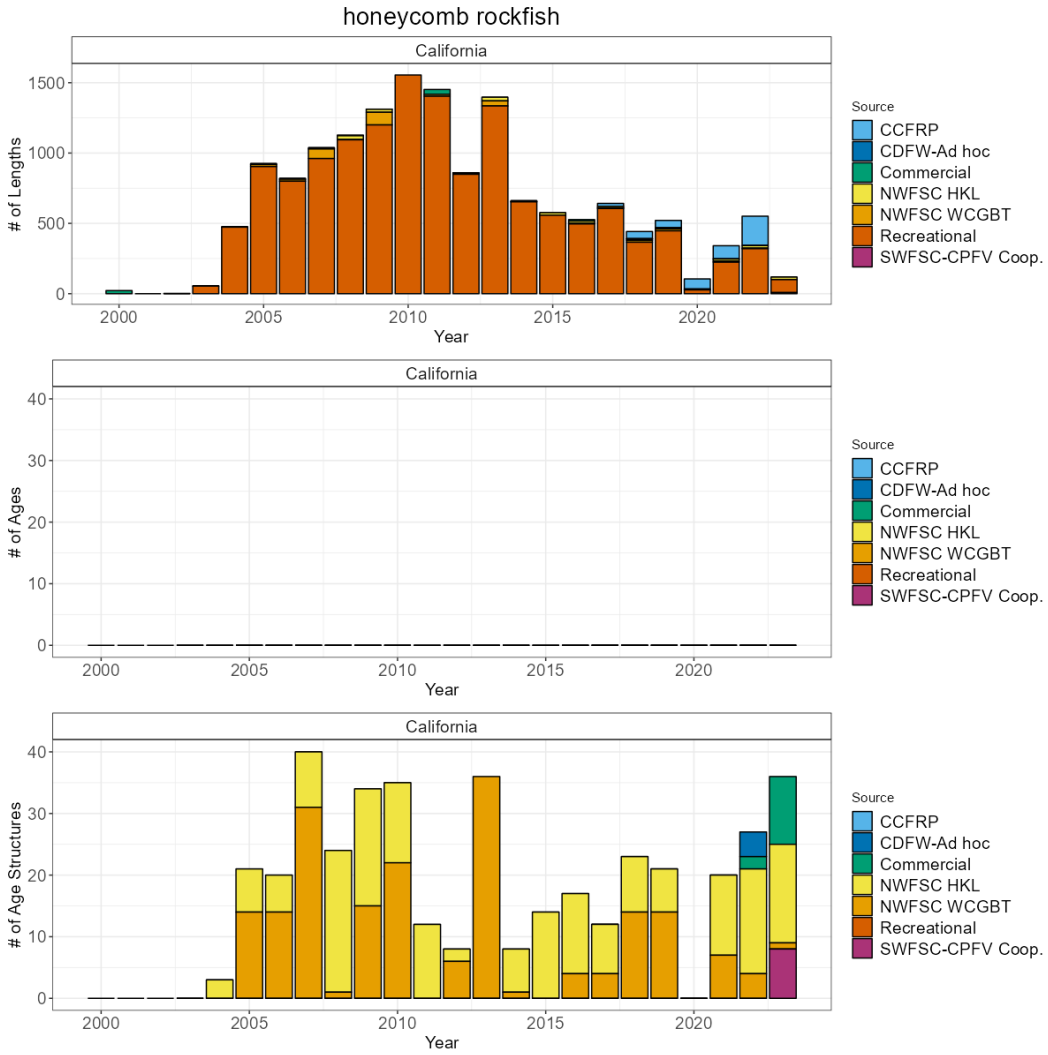

Figure 80: Total number of available lengths, read ages, and unread age structures by data source by year for honeycomb rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Kelp greenling

The most recent assessment of kelp greenling was a benchmark assessment conducted in 2015. Across available data, kelp greenling have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 10 positive tows per year.

Coastwide a total of 8 maturity samples have been collected and 8 read by researchers at the NWFSC.

Table 42: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for kelp greenling.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	949	NA	NA
California	CDFW-Ad hoc	0	0	7
California	Commercial	3,031	0	2
California	NWFSC WCGBT	51	0	46
California	Recreational	10,655	0	0
Oregon	Commercial	41,674	348	634
Oregon	NWFSC WCGBT	651	0	482
Oregon	Recreational	34,883	2,553	3,456
Washington	Commercial	2	0	1
Washington	NWFSC WCGBT	203	0	183
Washington	Recreational	5,547	1,308	1,190

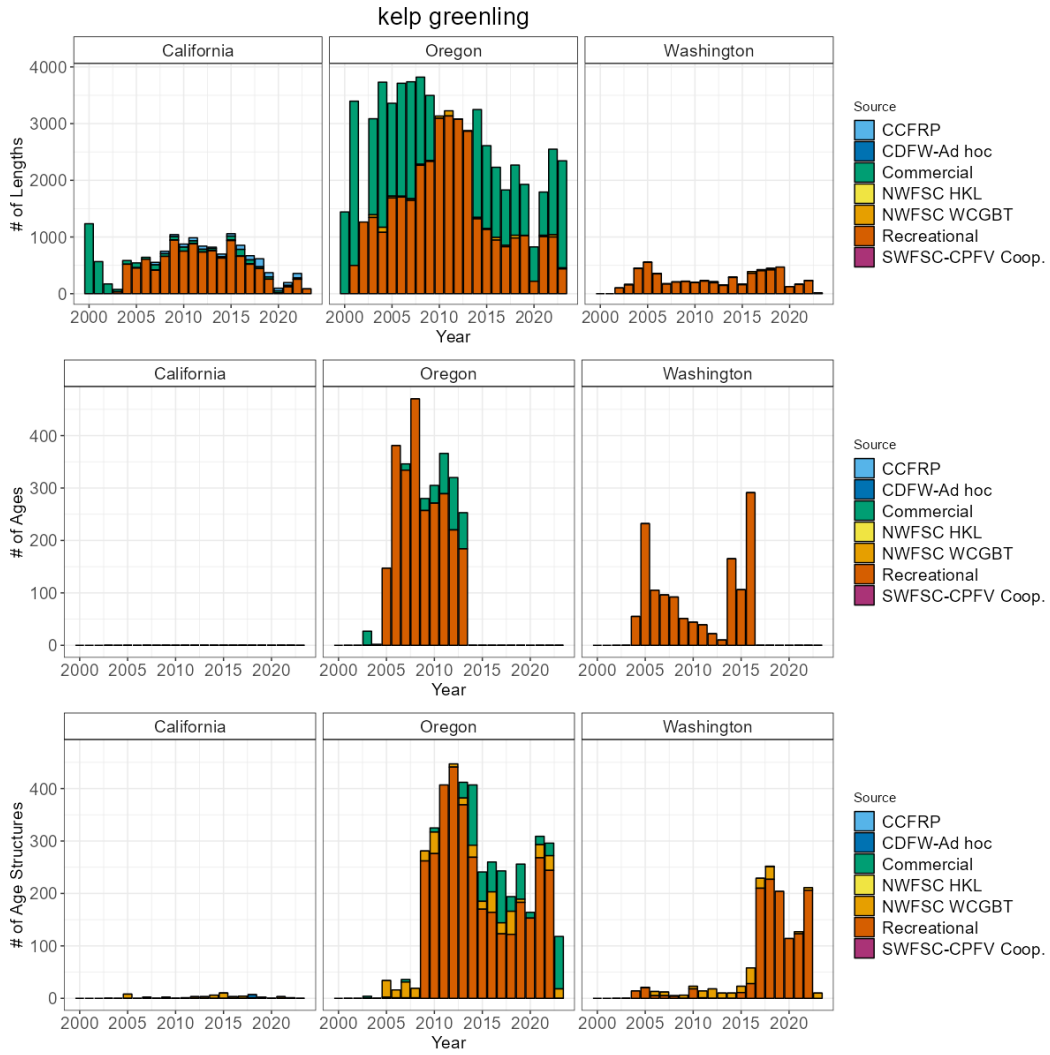

Figure 81: Total number of available lengths, read ages, and unread age structures by data source by year for kelp greenling. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Kelp rockfish

The most recent assessment of kelp rockfish was a data-limited assessment conducted in 2010. Across available data, kelp rockfish have been observed and sampled by both commercial and recreational fisheries.

Table 43: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for kelp rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	3,125	NA	NA
California	CDFW-Ad hoc	0	0	26
California	Commercial	853	0	3
California	NWFSC WCGBT	5	0	5
California	Recreational	13,802	0	0
California	SWFSC-CPFV Coop.	2	0	2
Oregon	Recreational	2	0	0

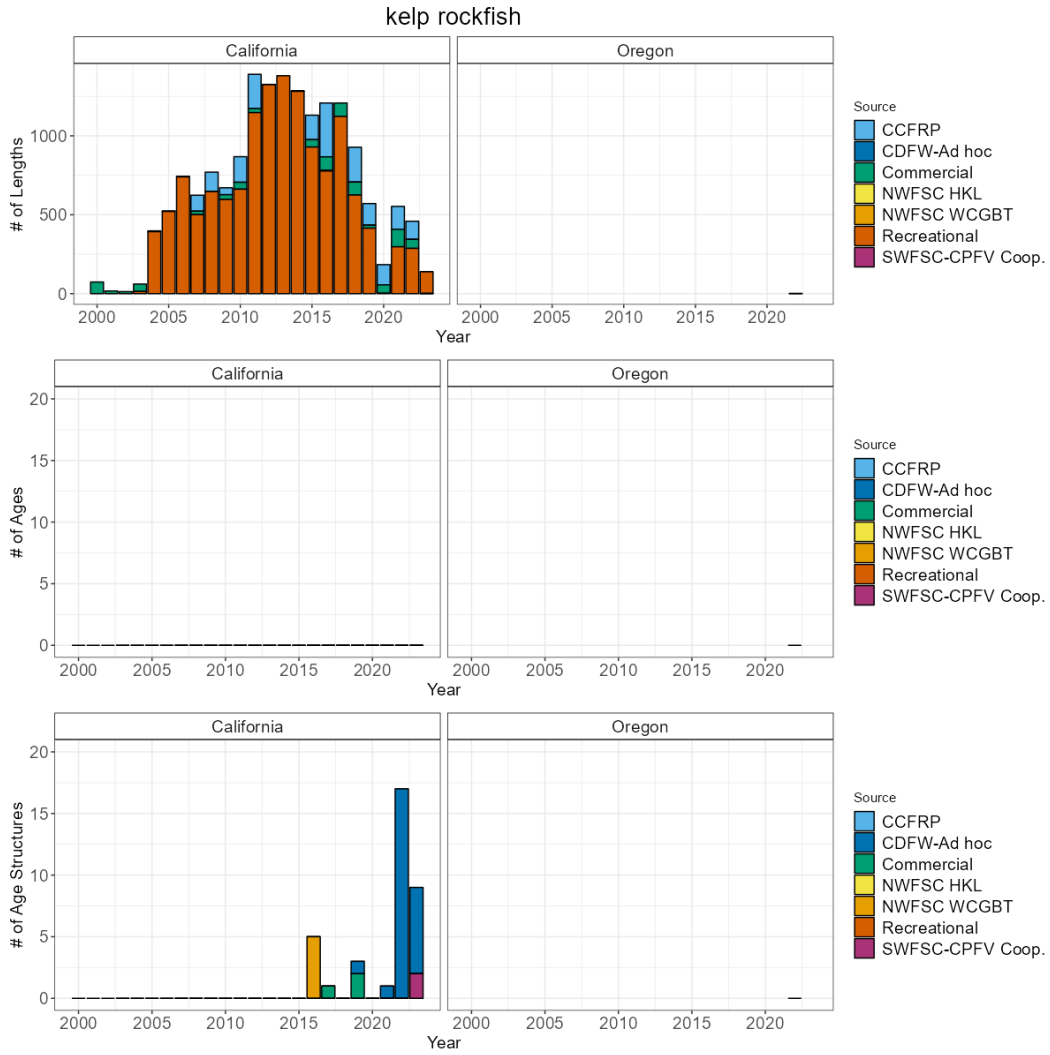

Figure 82: Total number of available lengths, read ages, and unread age structures by data source by year for kelp rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Leopard shark

The most recent assessment of leopard shark was a data-limited assessment conducted in 2010. Across available data, leopard shark have been observed and sampled by only recreational fisheries.

Table 44: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for leopard shark.

State	Source	Lengths	Ages	Age Structures
California	Recreational	1,103	0	0

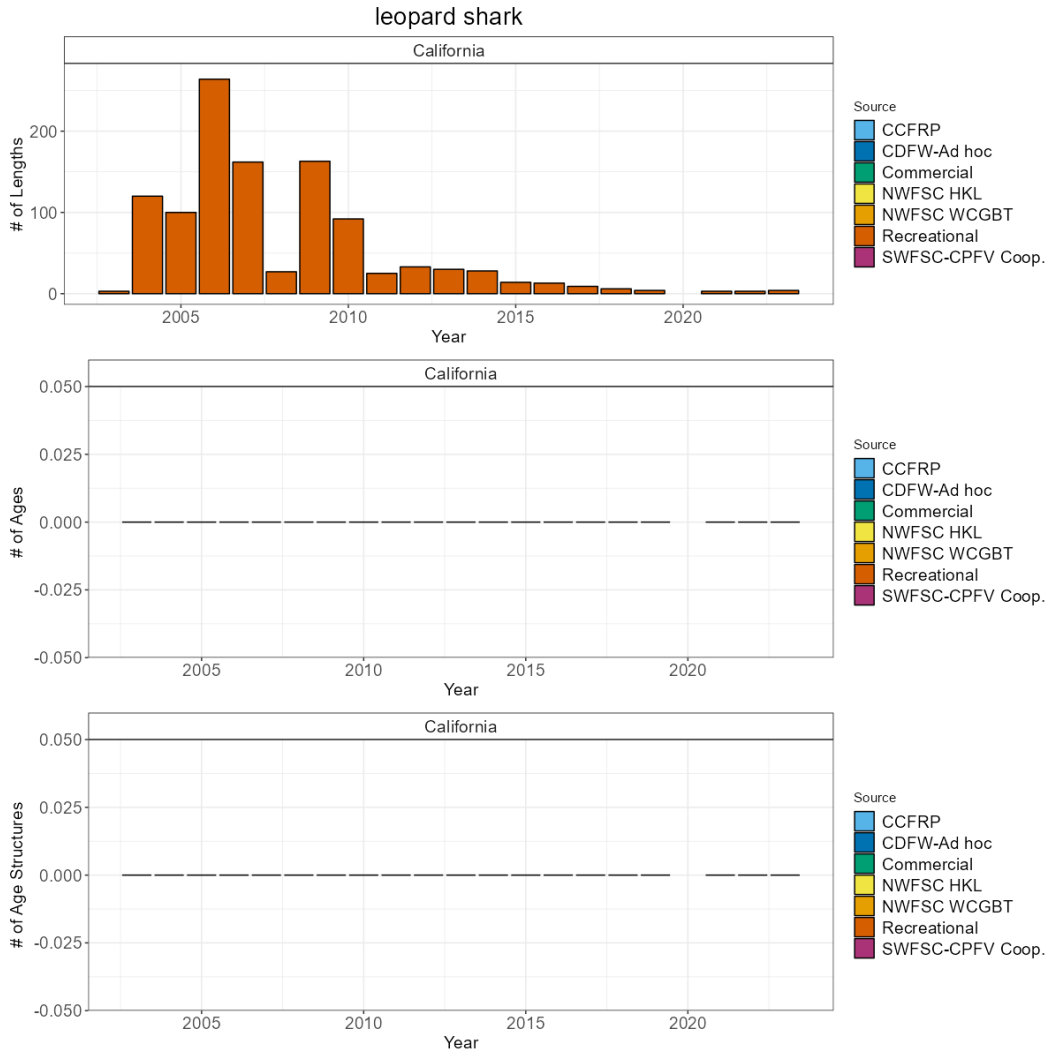

Figure 83: Total number of available lengths, read ages, and unread age structures by data source by year for leopard shark. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Lingcod

The most recent assessment of lingcod was a benchmark assessment conducted in 2021. Across available data, lingcod have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 208 positive tows per year. The NWFSC HKL survey has an average of 27 positive sets per year the area south of Point Conception in California.

Coastwide a total of 1161 maturity samples have been collected and 760 read by researchers at the NWFSC.

Table 45: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for lingcod.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	5,581	NA	NA
California	CDFW-Ad hoc	0	0	441
California	Commercial	11,401	681	0
California	NWFSC HKL	958	0	59
California	NWFSC WCGBT	14,030	4,650	2,802
California	Recreational	98,243	0	0
California	SWFSC-CPFV Coop.	1	0	1
Oregon	Commercial	38,250	5,301	3,643
Oregon	NWFSC WCGBT	8,522	2,638	2,099
Oregon	Recreational	144,218	9,062	15,444
Washington	Commercial	10,550	6,319	1,044
Washington	NWFSC WCGBT	6,373	1,726	1,340
Washington	Recreational	31,256	16,971	2,997

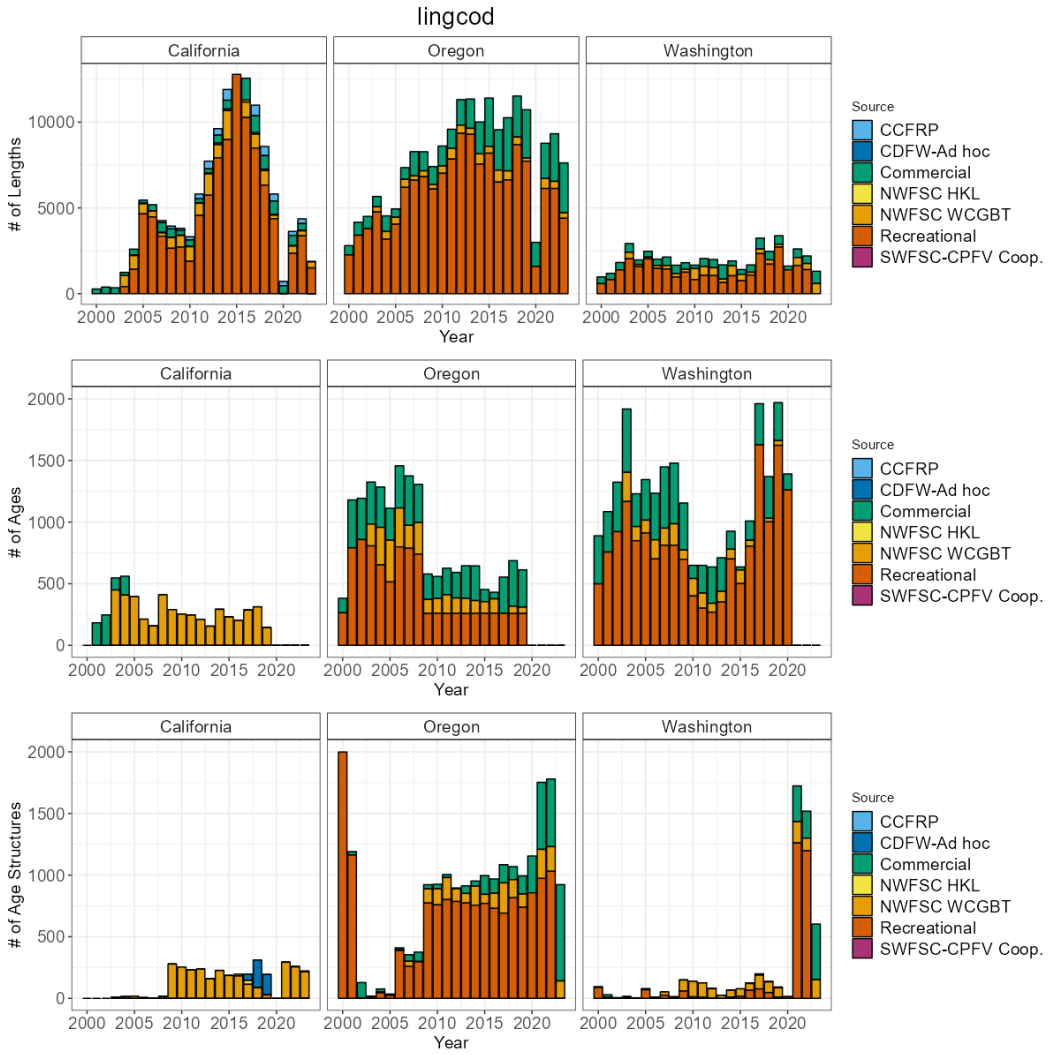

Figure 84: Total number of available lengths, read ages, and unread age structures by data source by year for lingcod. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

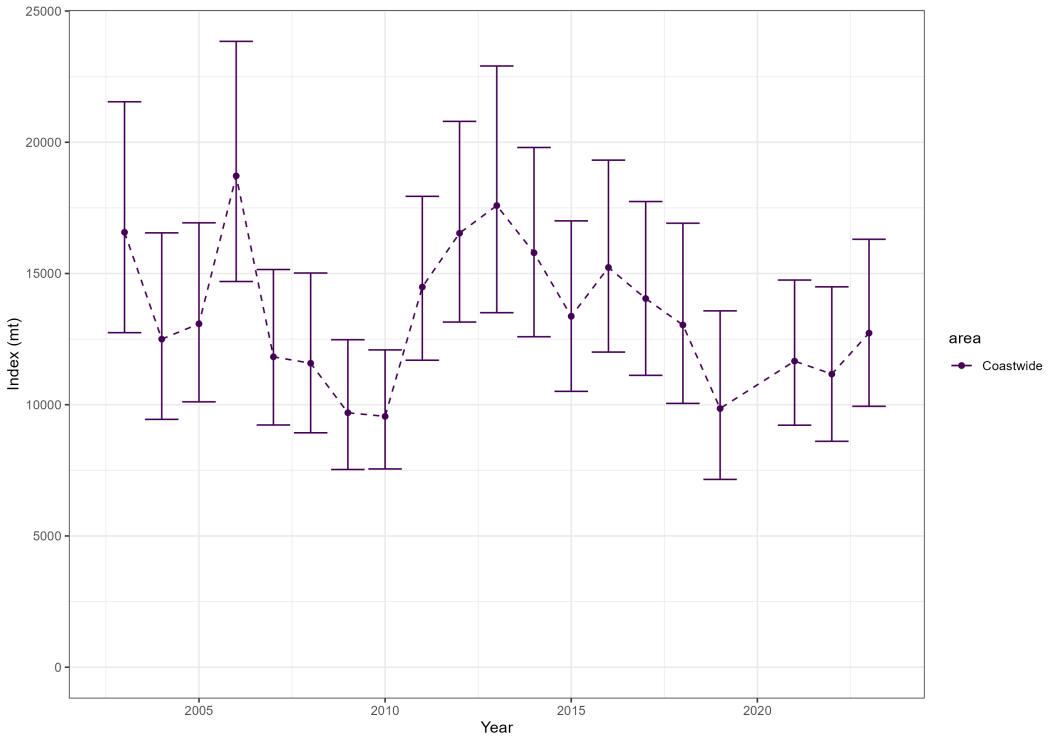

Figure 85: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for lingcod north.

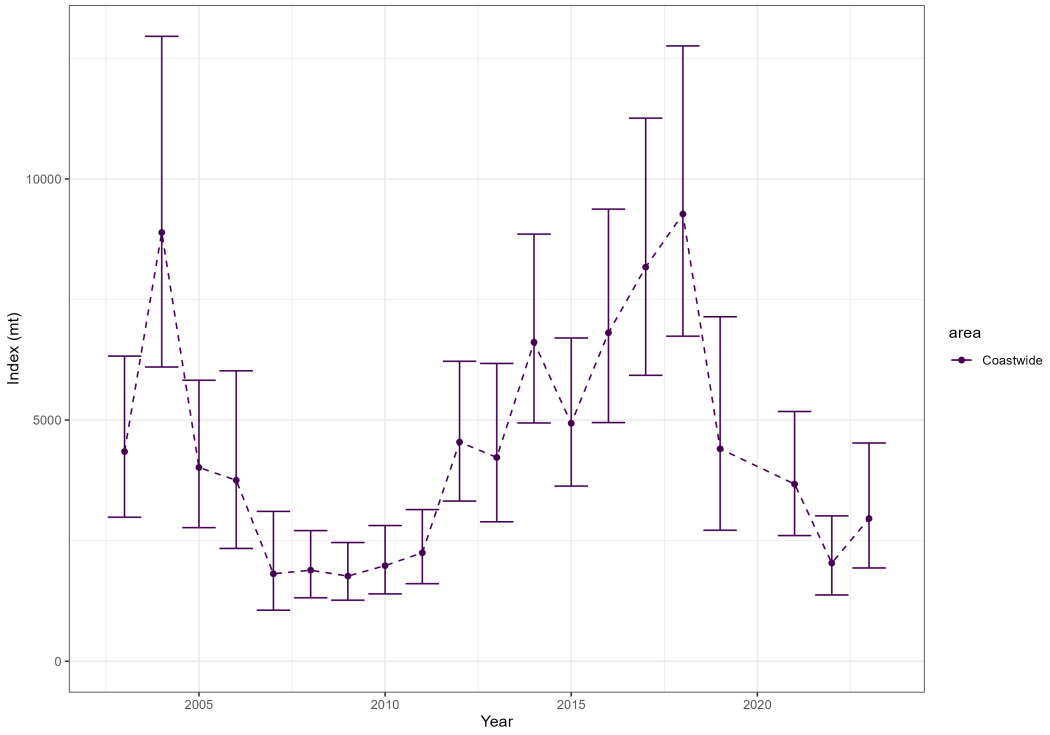

Figure 86: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for lingcod south.

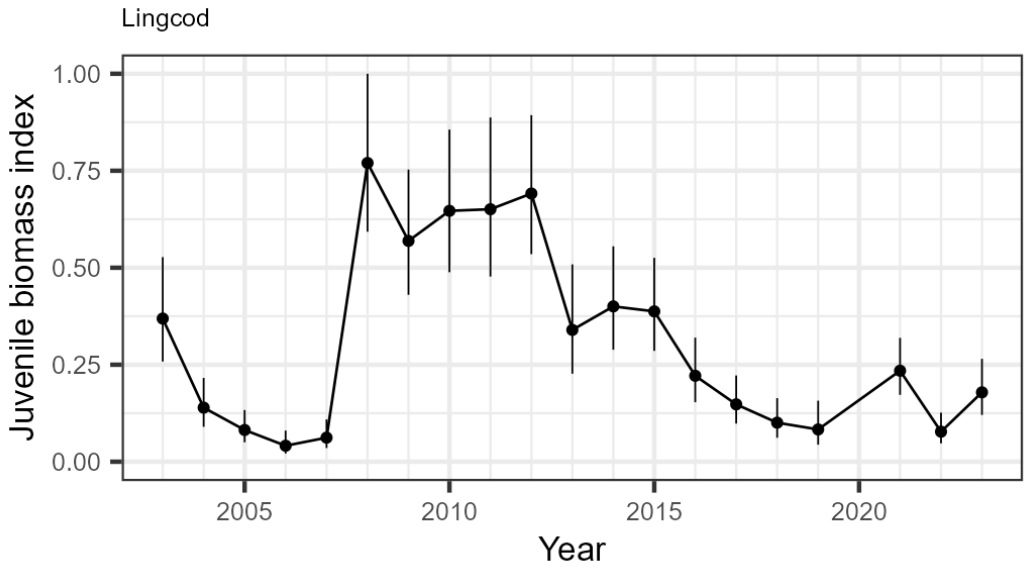

Figure 87: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for lingcod. The juvenile index represents fish 25 cm or less selected by the NWFSC WCGBT survey. The juvenile index uses coastwide data. Lingcod was most recently assessed in 2021 as two stock north and south of 40.10 N. latitude. The southern model estimated large recruitments (i.e., greater than 0.50) in 2008, 2010, and 2013. The northern model estimated a single large positive recruitment in 2008. .

Table 46: The median length (cm) associated with fish age 1 or younger for lingcod based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
0	19
1	31

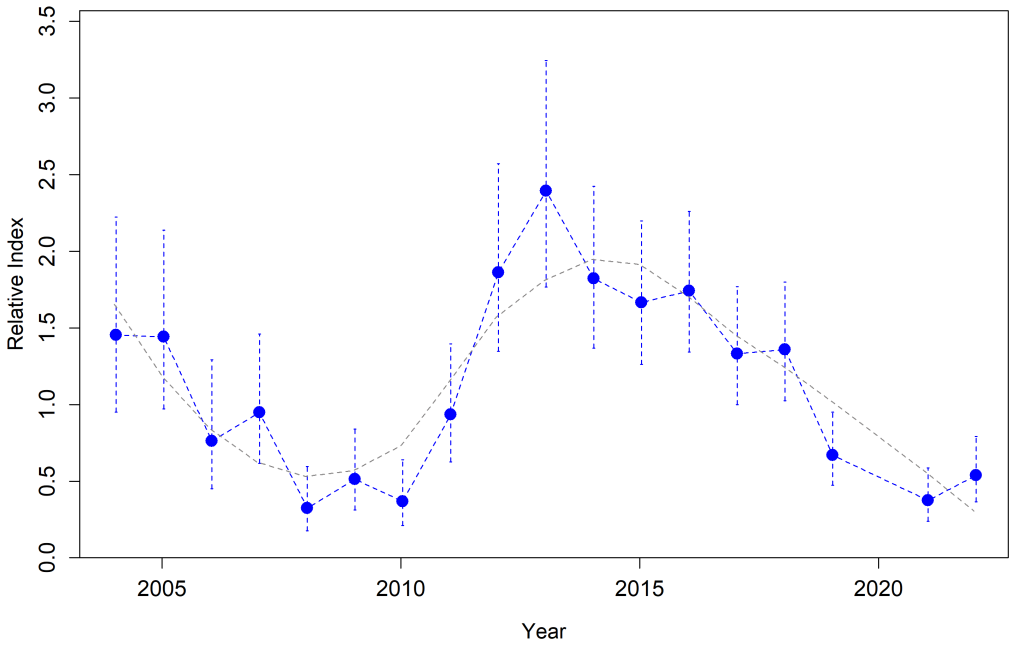

Figure 88: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for lingcod south. The NWFSC HKL survey has an average of 27 positive sets per year the area south of Point Conception in California.

Longnose skate

The most recent assessment of longnose skate was a benchmark assessment conducted in 2019. Across available data, longnose skate have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 351 positive tows per year.

Coastwide a total of 508 maturity samples have been collected and 508 read by researchers at the NWFSC.

Table 47: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for longnose skate.

State	Source	Lengths	Ages	Age Structures
California	Commercial	10,058	0	0
California	NWFSC WCGBT	33,239	336	1,057
California	Recreational	7	0	0
Oregon	Commercial	18,692	0	6,814
Oregon	NWFSC WCGBT	16,139	209	661
Oregon	Recreational	22	0	0
Washington	Commercial	7,631	0	1,423
Washington	NWFSC WCGBT	9,407	102	334

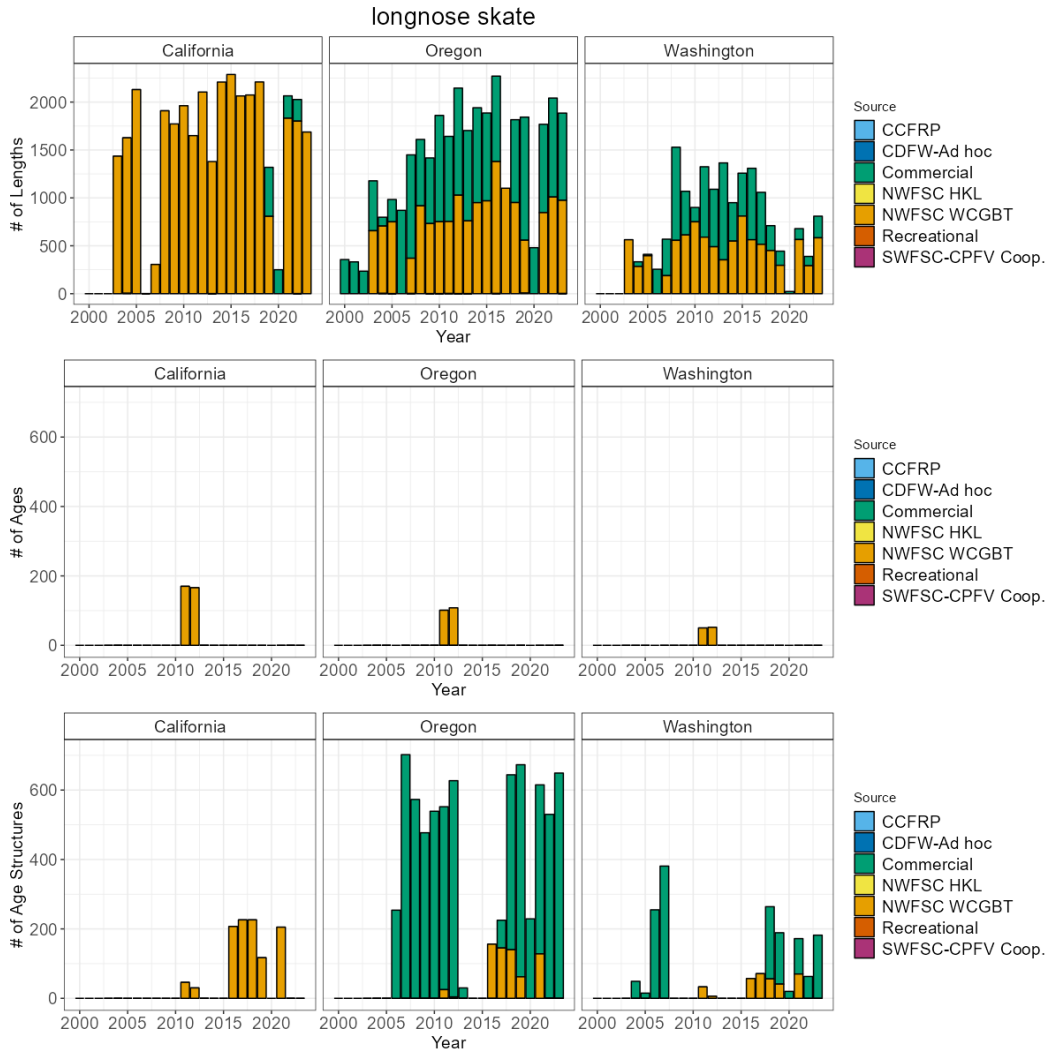

Figure 89: Total number of available lengths, read ages, and unread age structures by data source by year for longnose skate. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

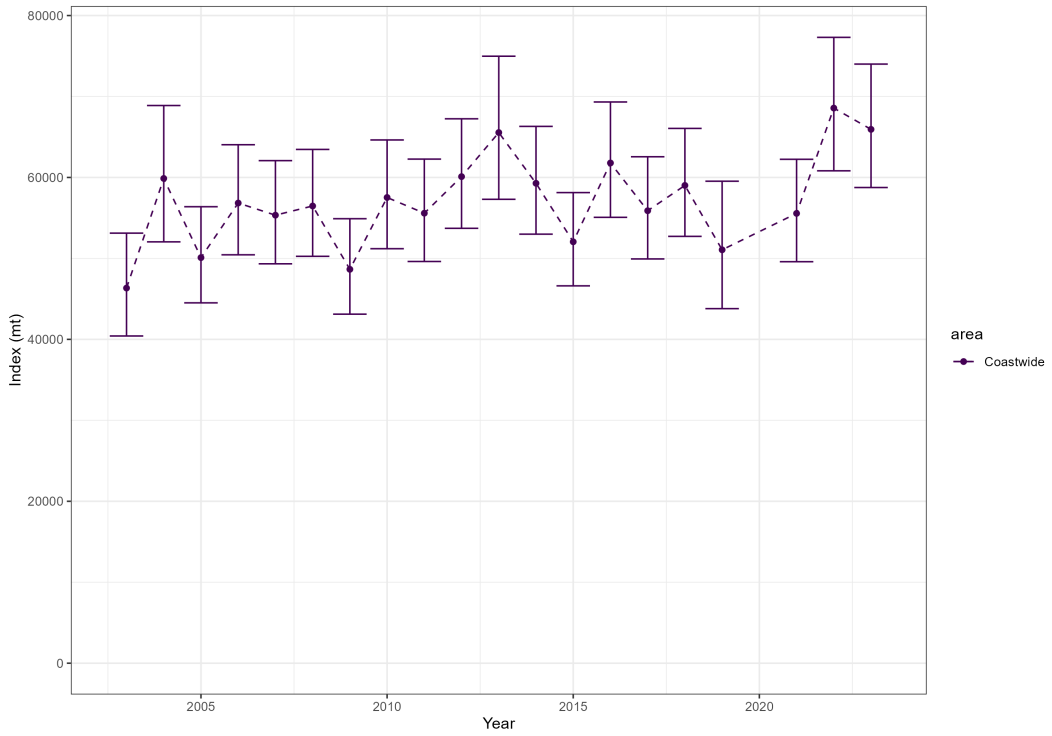

Figure 90: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for longnose skate. The NWFSC WCGBT survey has an average of 351 positive tows per year.

Longspine thornyhead

The most recent assessment of longspine thornyhead was a benchmark assessment conducted in 2013. Across available data, longspine thornyhead have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 222 positive tows per year.

Coastwide a total of 184 maturity samples have been collected and 0 read by researchers at the NWFSC.

Table 48: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for longspine thornyhead.

State	Source	Lengths	Ages	Age Structures
California	Commercial	77,606	0	0
California	NWFSC WCGBT	70,562	0	9,343
Oregon	Commercial	29,381	30	22,443
Oregon	NWFSC WCGBT	31,288	0	3,779
Washington	Commercial	5,956	0	152
Washington	NWFSC WCGBT	15,033	0	1,934

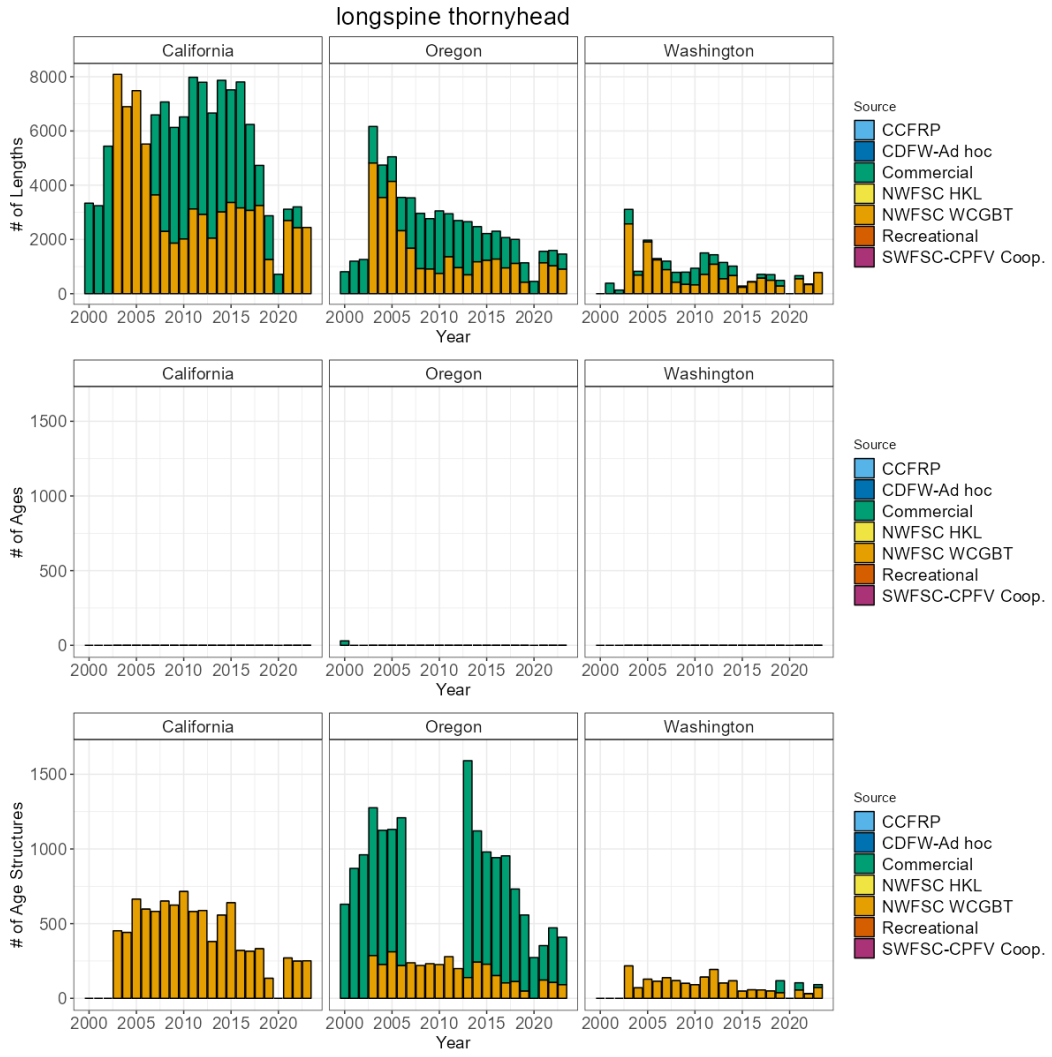

Figure 91: Total number of available lengths, read ages, and unread age structures by data source by year for longspine thornyhead. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

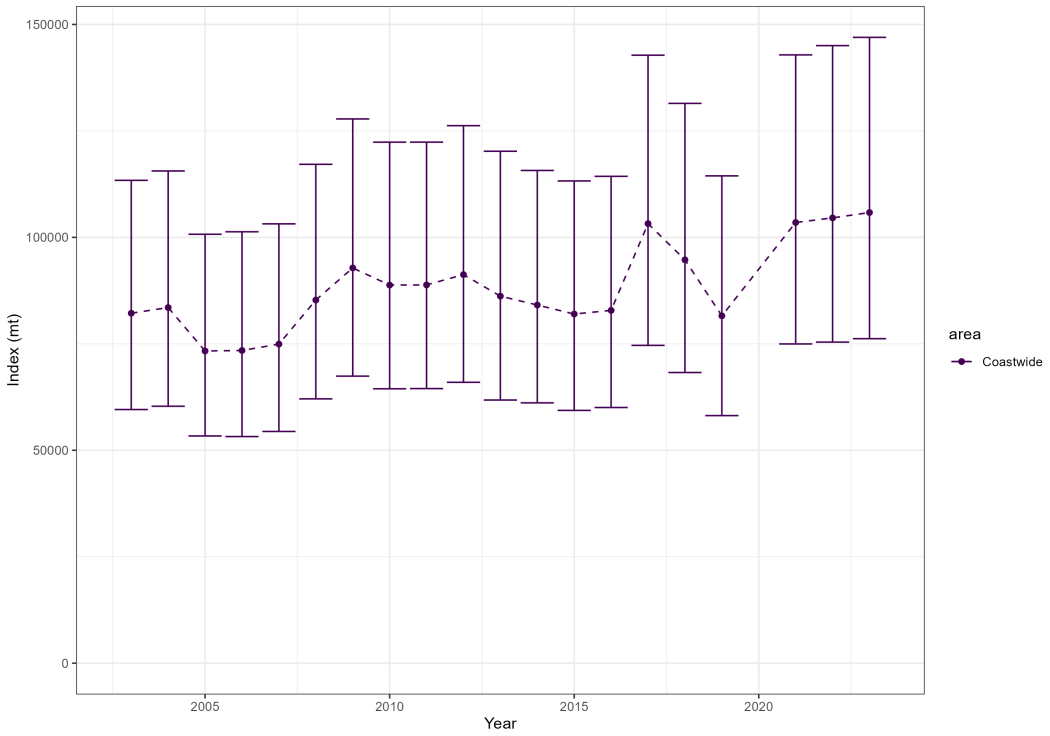

Figure 92: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for longspine thornyhead. The NWFSC WCGBT survey has an average of 222 positive tows per year.

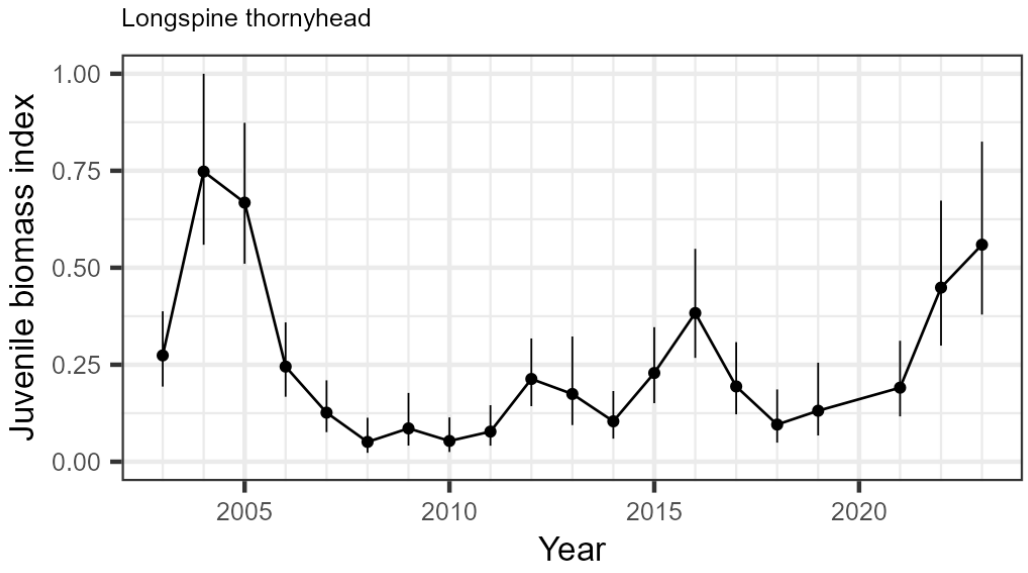

Figure 93: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for longspine thornyhead. The juvenile index represents fish 7 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of longspine thornyead in 2013 estimated a sinlge large recruitment (i.e., greater than 0.50) in 2003.

Olive rockfish

The most recent assessment of olive rockfish was a data-limited assessment conducted in 2010. Across available data, olive rockfish have been observed and sampled by both the commercial and recreational fisheries and the NWFSC HKL survey. The NWFSC HKL survey has an average of 12 positive sets per year.

Coastwide a total of 27 maturity samples have been collected and 1 read by researchers at the NWFSC.

Table 49: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for olive rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	10,151	NA	NA
California	CDFW-Ad hoc	0	0	156
California	Commercial	404	0	94
California	NWFSC HKL	715	0	629
California	NWFSC WCGBT	6	0	6
California	Recreational	39,154	0	0
California	SWFSC-CPFV Coop.	48	0	48
Oregon	Commercial	6	0	4
Oregon	Recreational	39	0	0

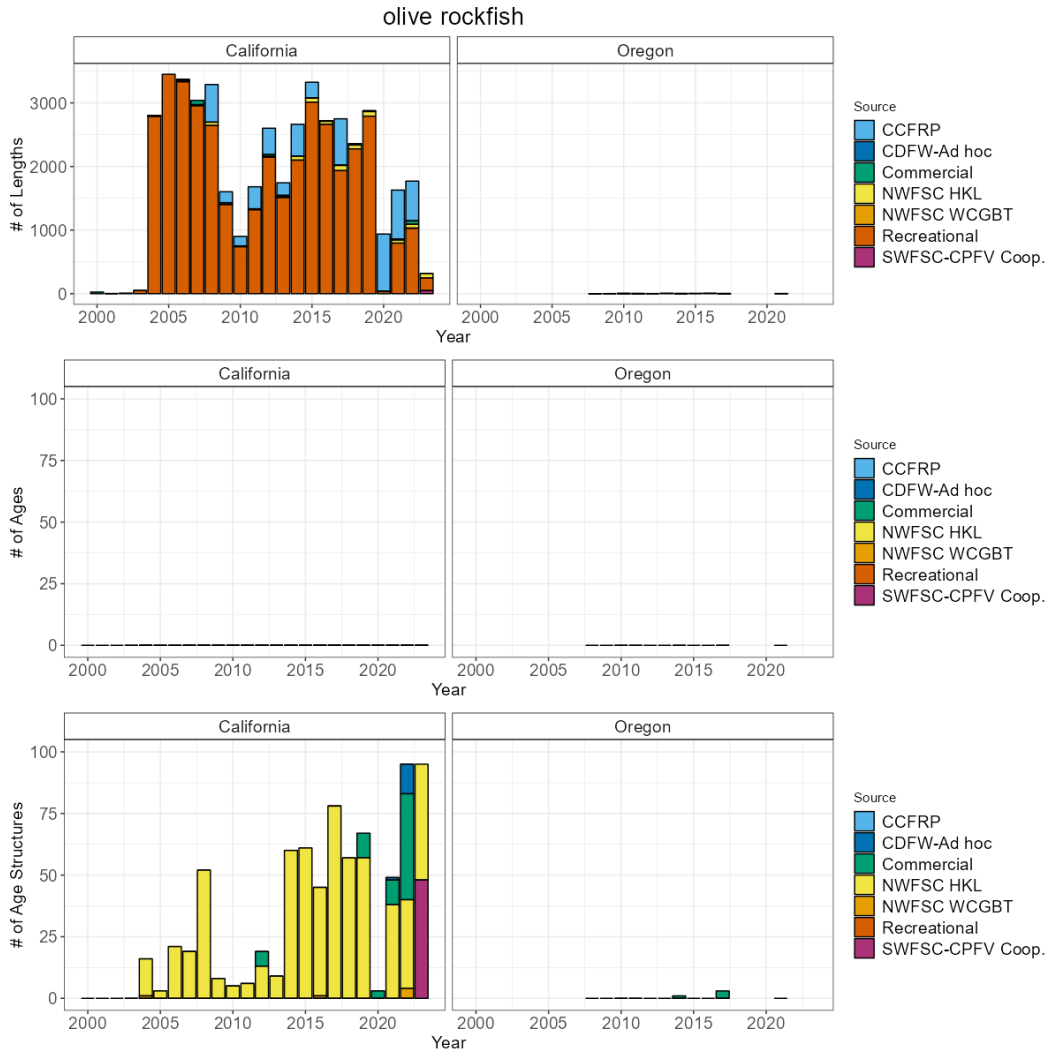

Figure 94: Total number of available lengths, read ages, and unread age structures by data source by year for olive rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Pacific cod

To date, no assessment or analysis has been conducted on Pacific cod. Across available data, Pacific cod have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 29 positive tows per year.

Coastwide a total of 125 maturity samples have been collected and 0 read by researchers at the NWFSC.

Table 50: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for Pacific cod.

State	Source	Lengths	Ages	Age Structures
California	Commercial	28	0	9
California	NWFSC WCGBT	14	0	0
Oregon	Commercial	4,491	0	4,249
Oregon	NWFSC WCGBT	279	0	98
Oregon	Recreational	57	0	0
Washington	Commercial	15,909	346	1,656
Washington	NWFSC WCGBT	3,865	0	1,387
Washington	Recreational	377	0	124

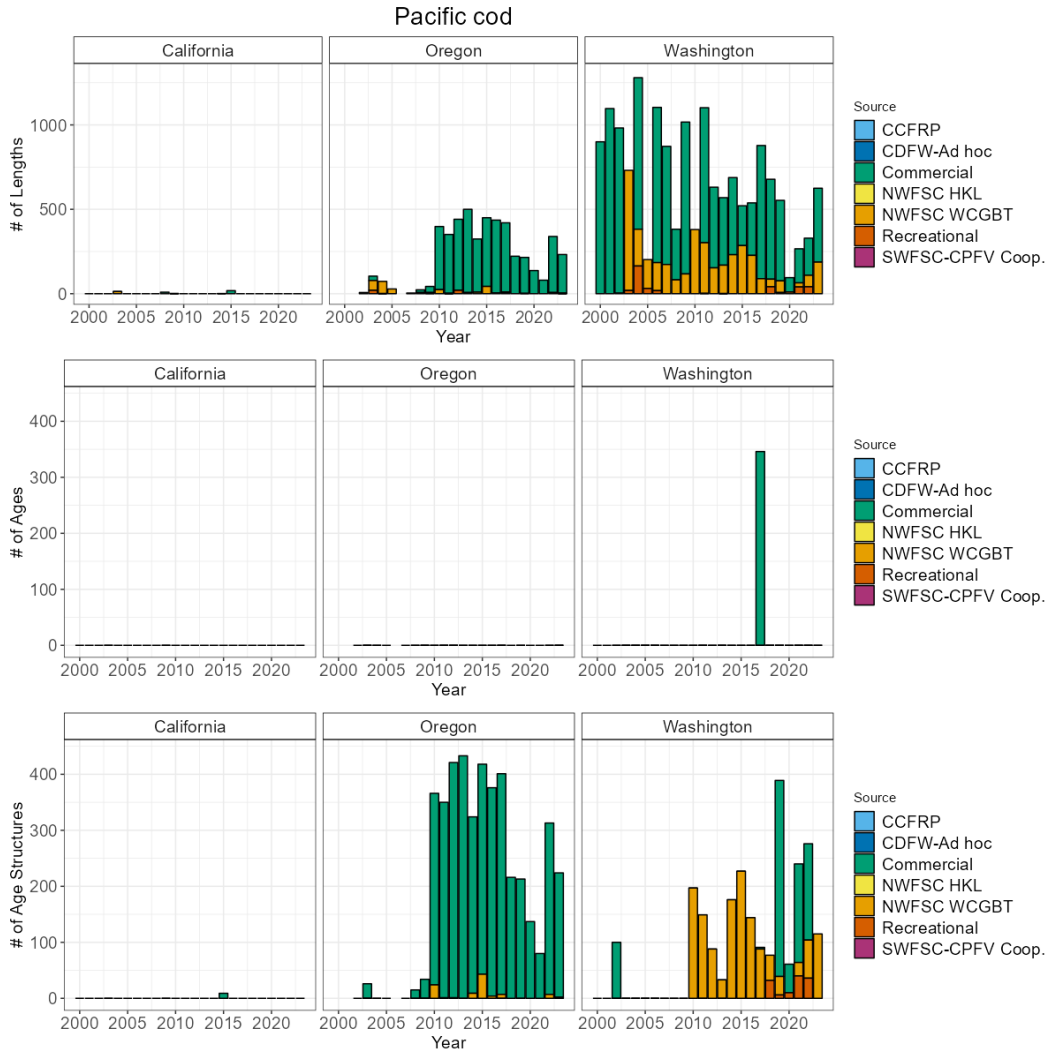

Figure 95: Total number of available lengths, read ages, and unread age structures by data source by year for Pacific cod. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

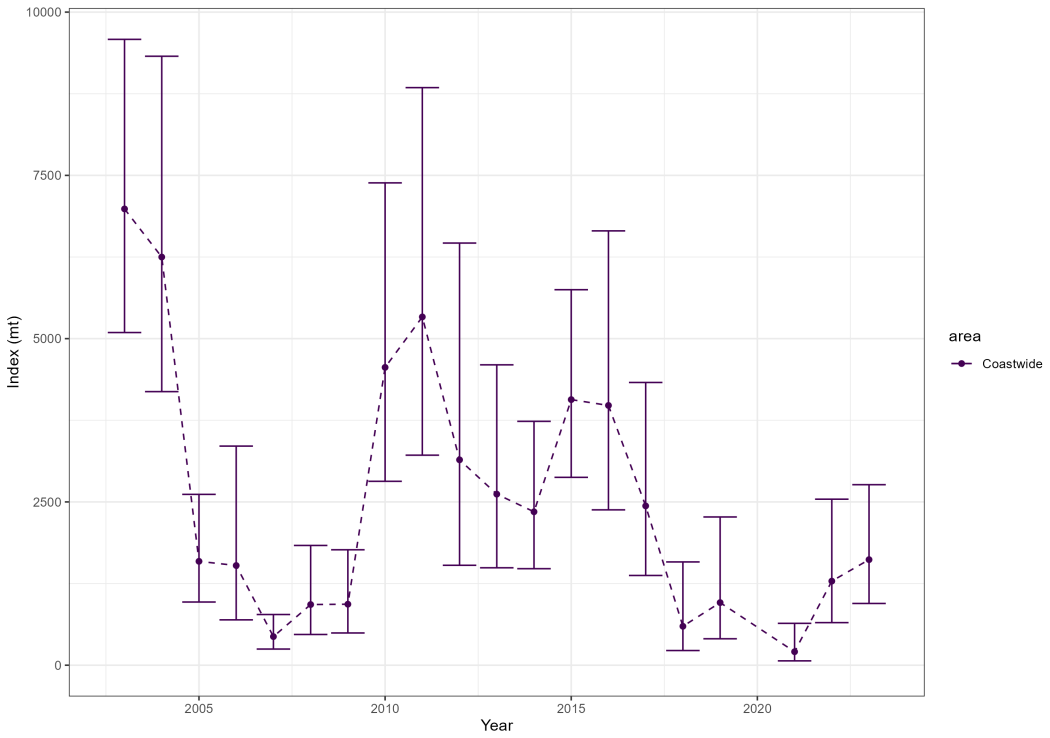

Figure 96: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for Pacific cod. The NWFSC WCGBT survey has an average of 29 positive tows per year.

Pacific ocean perch

The most recent assessment of Pacific ocean perch was a benchmark assessment conducted in 2017. Across available data, Pacific ocean perch have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 48 positive tows per year.

Coastwide a total of 583 maturity samples have been collected and 583 read by researchers at the NWFSC.

Table 51: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for Pacific ocean perch.

State	Source	Lengths	Ages	Age Structures
California	Commercial	1,133	0	592
California	NWFSC WCGBT	223	78	144
Oregon	Commercial	36,258	11,948	20,442
Oregon	NWFSC WCGBT	7,466	2,669	2,797
Oregon	Recreational	5	0	0
Washington	Commercial	13,106	6,847	2,873
Washington	NWFSC WCGBT	9,131	3,135	2,284
Washington	Recreational	13	2	4

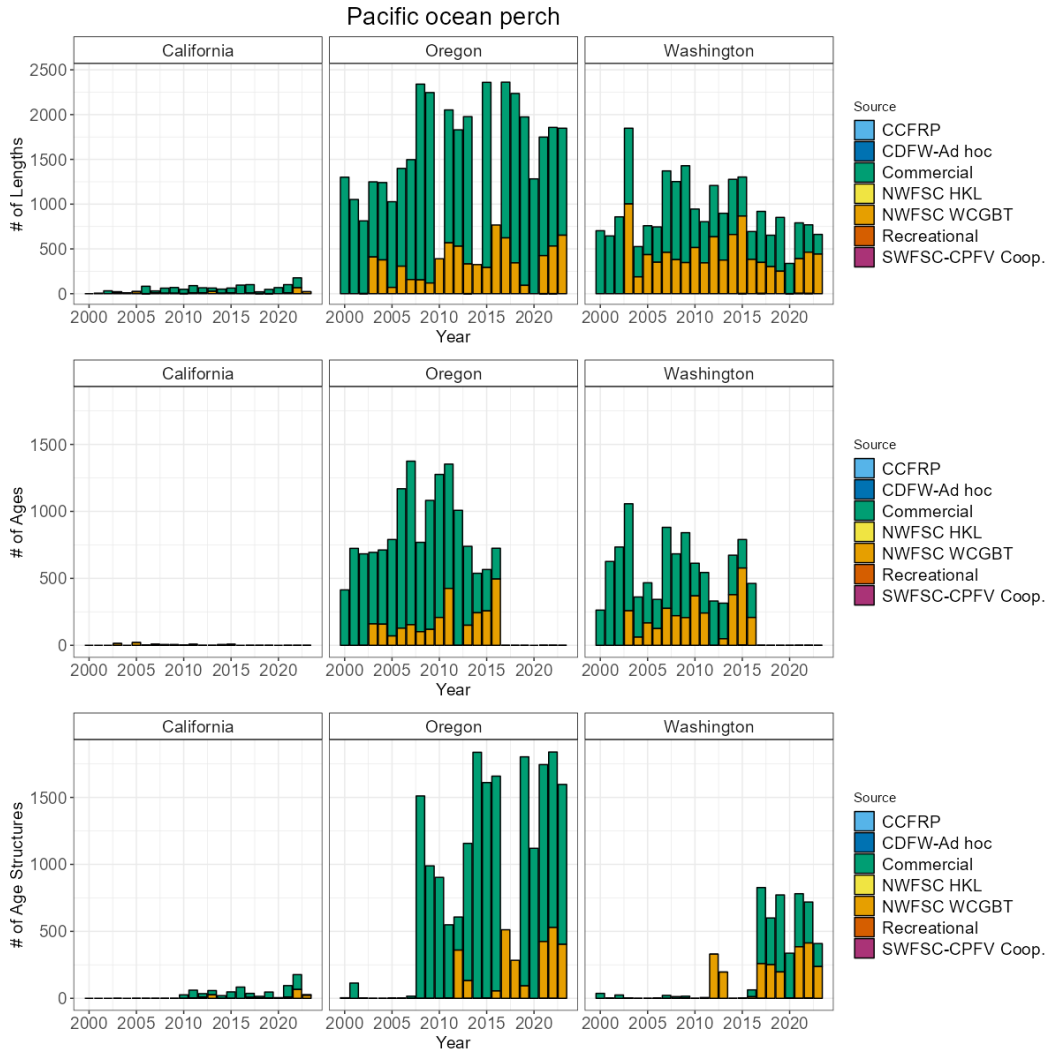

Figure 97: Total number of available lengths, read ages, and unread age structures by data source by year for Pacific ocean perch. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

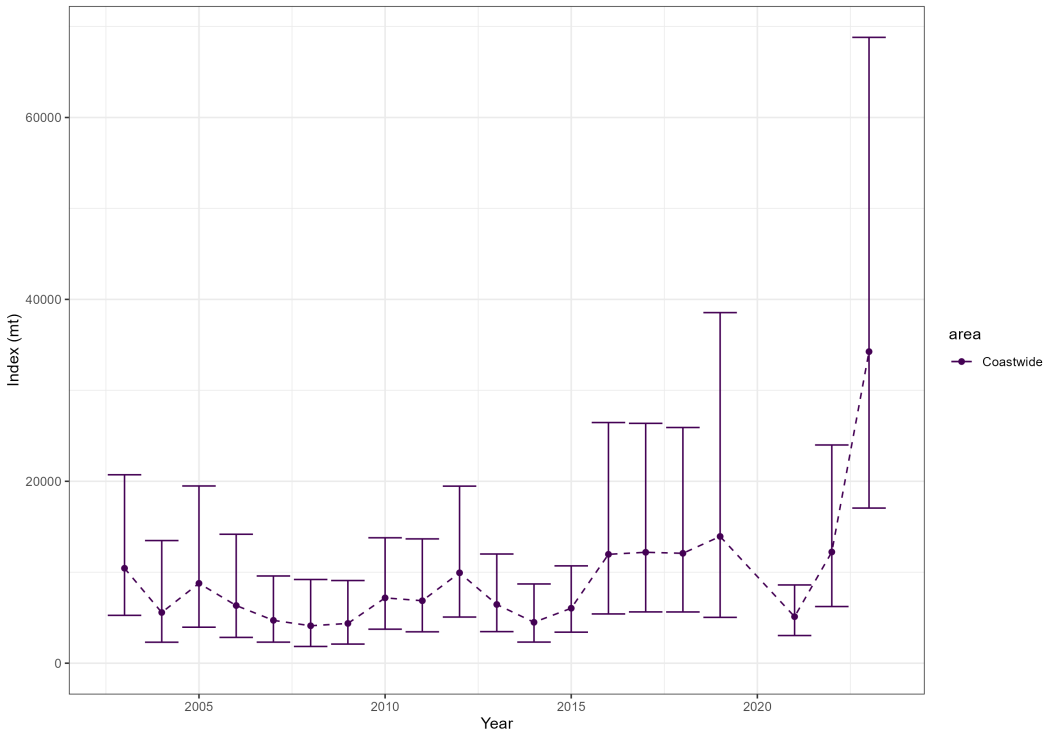

Figure 98: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for Pacific ocean perch. The NWFSC WCGBT survey has an average of 48 positive tows per year.

Pacific sanddab

The most recent assessment of Pacific sanddab was a data-limited assessment conducted in 2010. Across available data, Pacific sanddab have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 207 positive tows per year.

Table 52: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for Pacific sanddab.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	222	NA	NA
California	Commercial	24,256	1,105	446
California	NWFSC WCGBT	52,433	4,714	3,709
California	Recreational	47,230	0	0
Oregon	Commercial	14,051	2,707	10,305
Oregon	NWFSC WCGBT	25,567	2,241	1,885
Oregon	Recreational	1,588	0	0
Washington	Commercial	120	0	50
Washington	NWFSC WCGBT	11,660	1,006	990
Washington	Recreational	9	0	0

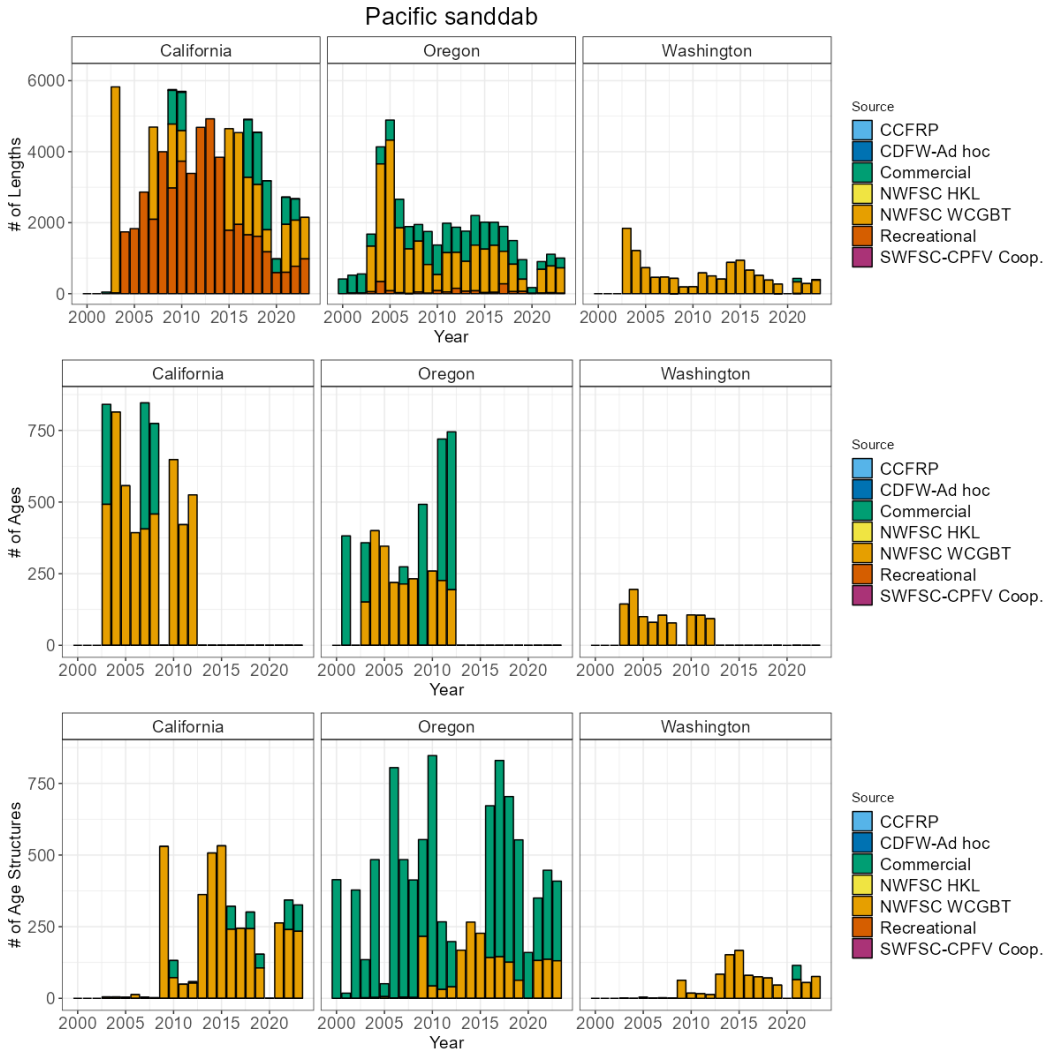

Figure 99: Total number of available lengths, read ages, and unread age structures by data source by year for Pacific sanddab. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

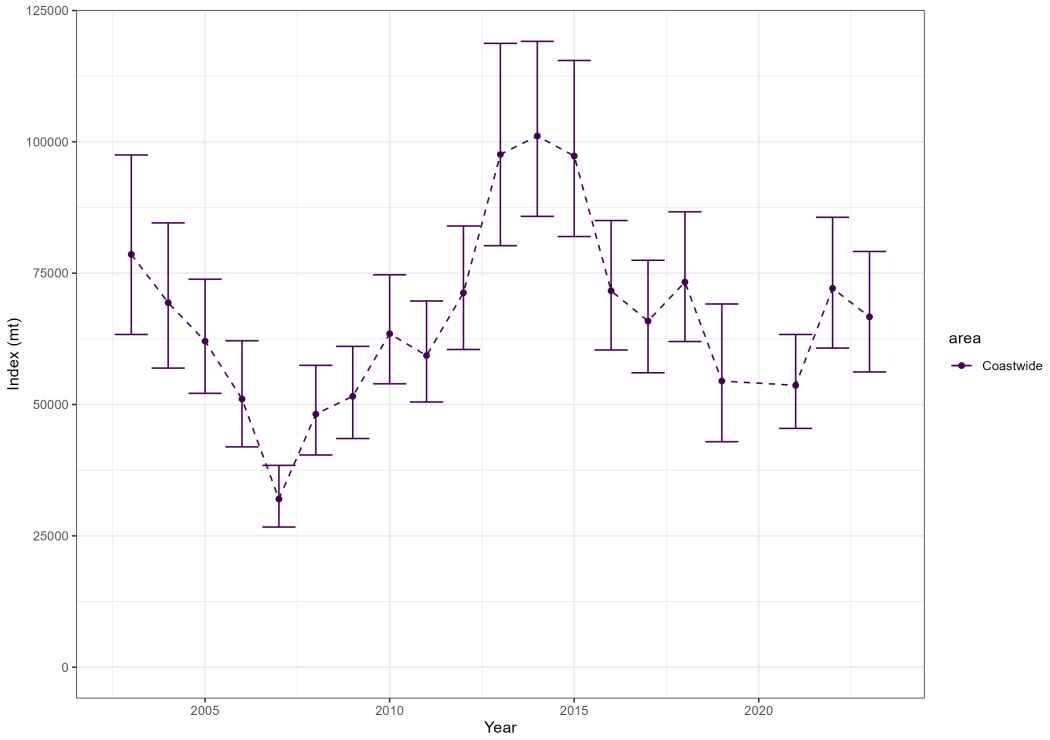

Figure 100: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for Pacific sanddab. The NWFSC WCGBT survey has an average of 207 positive tows per year.

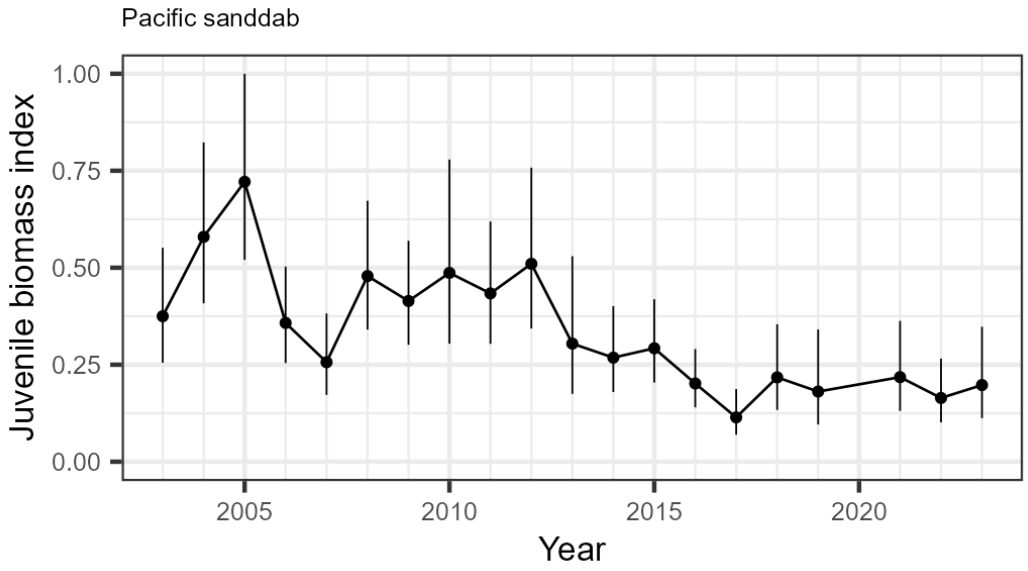

Figure 101: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for Pacific sanddab. The juvenile index represents fish 13 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of Pacific sandab in 2013 (not adopted for use by management) estimated a large recruitment (i.e., greater than 0.50) in 2010.

Table 53: The median length (cm) associated with fish age 3 or younger for Pacific sanddab based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
0	10
1	14
2	17
3	20

Pacific spiny dogfish

The most recent assessment of Pacific spiny dogfish was a benchmark assessment conducted in 2021. Across available data, Pacific spiny dogfish have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 165 positive tows per year.

Tagging studies of are currently being conducted to better understand the movement of Pacific spiny dogfish off the U.S. West Coast. This research is being conducted by scientists at the NWFSC and ODFW and is anticipated to conclude in 2025.

Table 54: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for Pacific spiny dogfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	2	NA	NA
California	Commercial	330	0	0
California	NWFSC HKL	7	0	0
California	NWFSC WCGBT	17,599	285	4,609
Oregon	Commercial	4,049	0	958
Oregon	NWFSC WCGBT	4,014	124	1,711
Washington	Commercial	9,569	3,473	1,432
Washington	NWFSC WCGBT	11,646	182	2,922

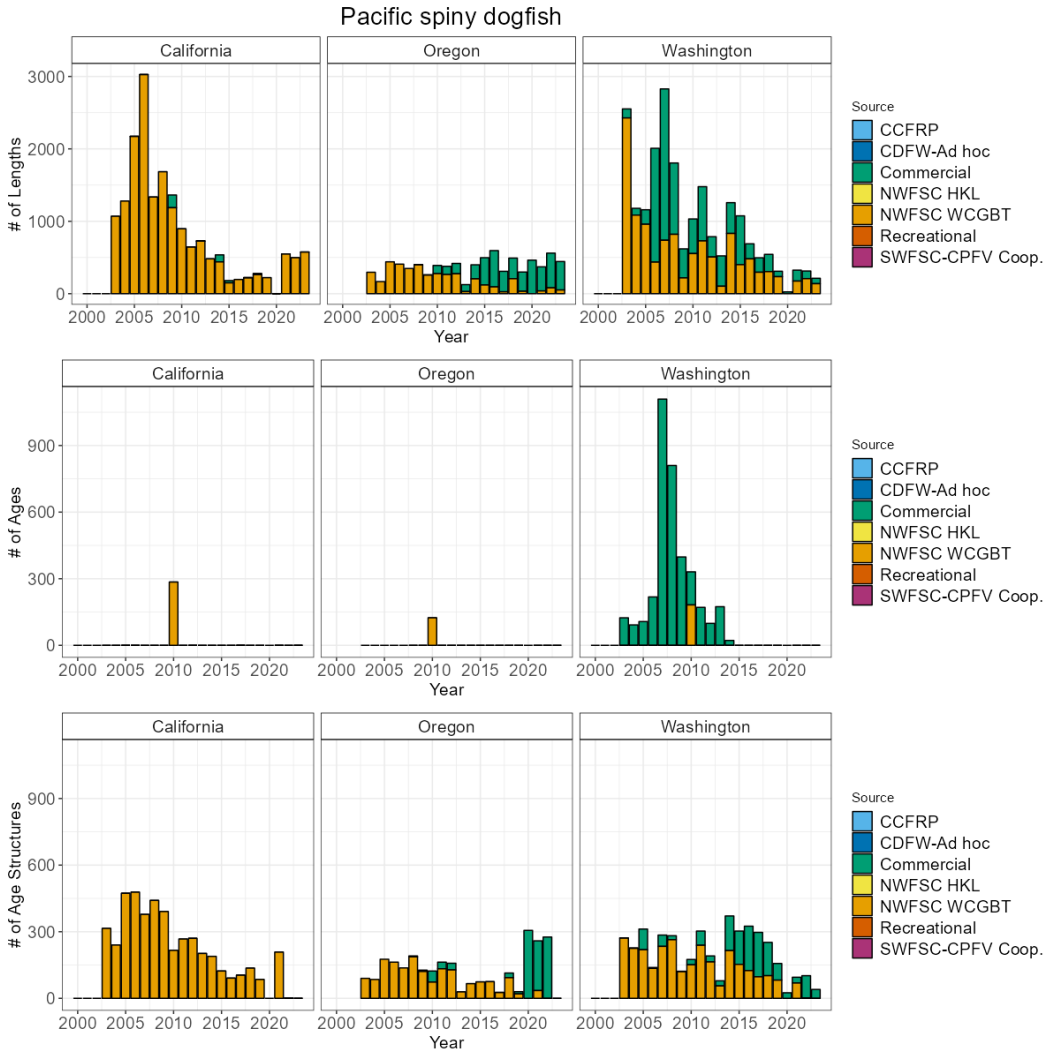

Figure 102: Total number of available lengths, read ages, and unread age structures by data source by year for Pacific spiny dogfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

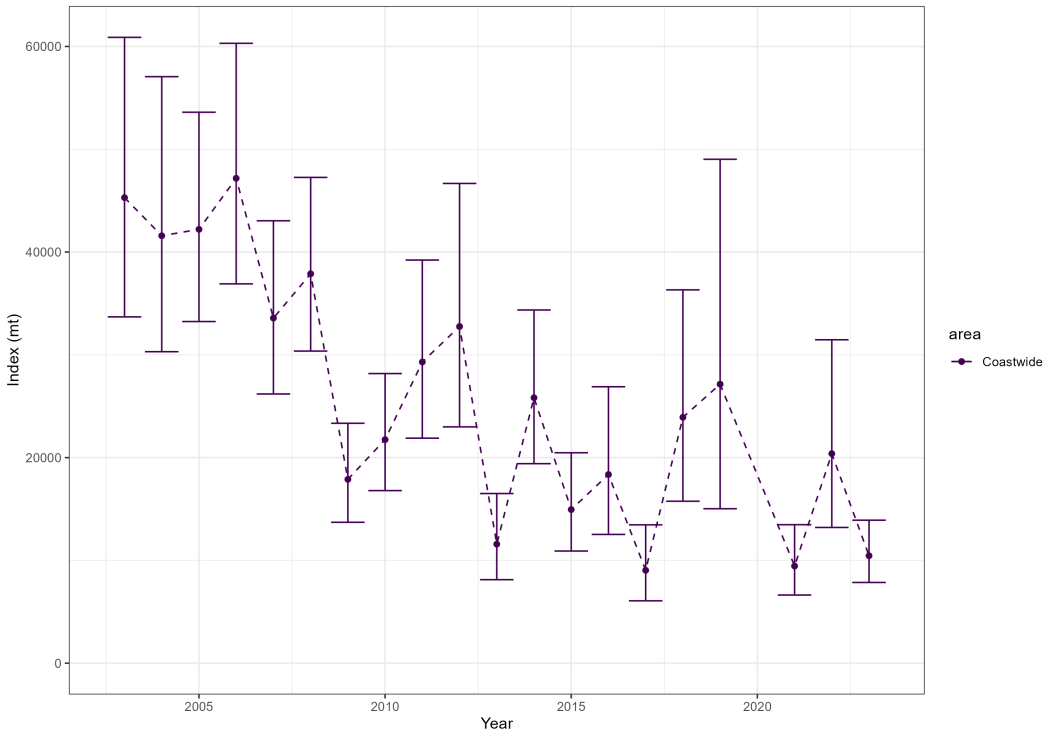

Figure 103: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for Pacific spiny dogfish. The NWFSC WCGBT survey has an average of 165 positive tows per year.

Redbanded rockfish

The most recent assessment of redbanded rockfish was a data-limited assessment conducted in 2010. Across available data, redbanded rockfish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 53 positive tows per year.

Coastwide a total of 333 maturity samples have been collected and 0 read by researchers at the NWFSC.

Table 55: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for redbanded rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	5,463	1	1,937
California	NWFSC WCGBT	965	0	933
California	Recreational	5	0	0
Oregon	Commercial	13,437	278	12,759
Oregon	NWFSC WCGBT	1,701	0	1,612
Oregon	Recreational	58	0	0
Washington	Commercial	16,533	0	8,666
Washington	NWFSC WCGBT	1,167	0	1,092
Washington	Recreational	74	0	28

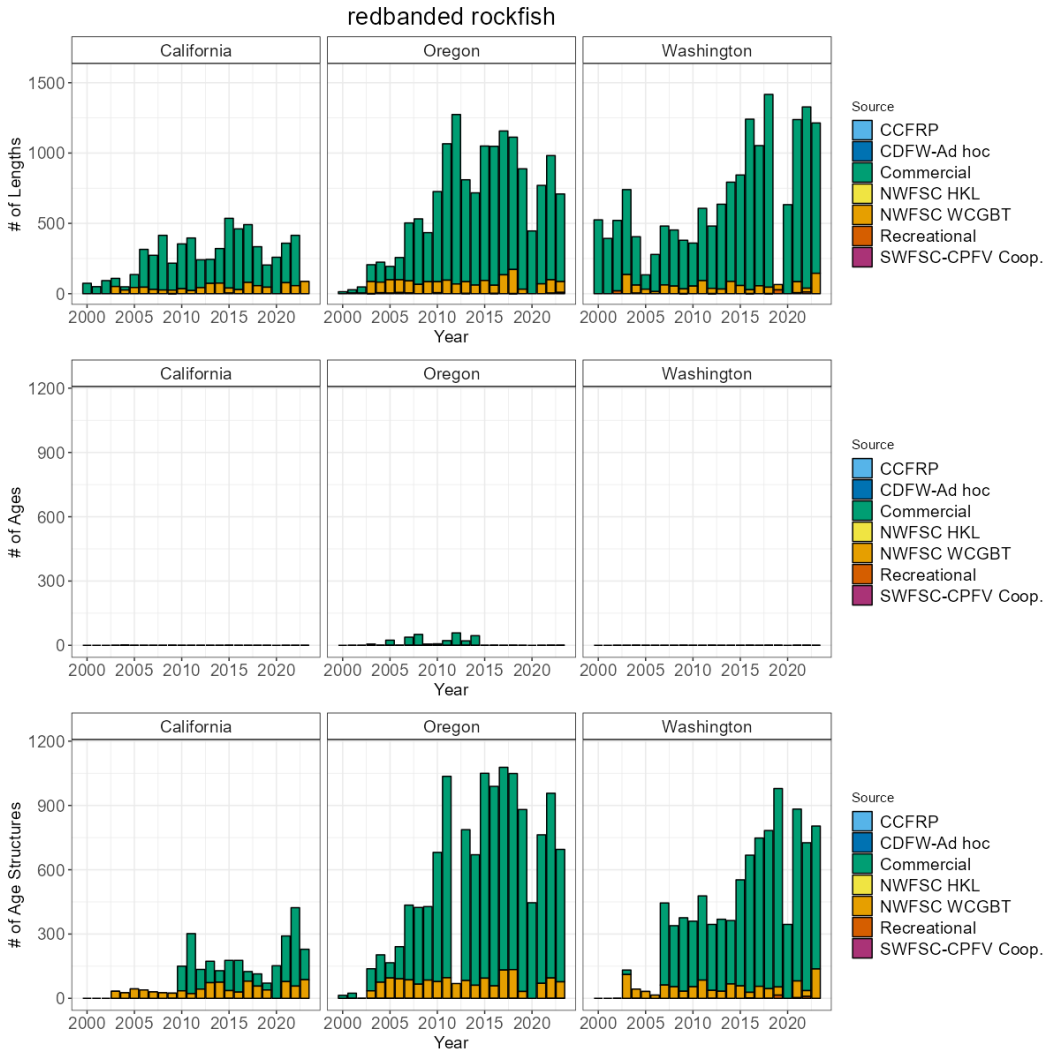

Figure 104: Total number of available lengths, read ages, and unread age structures by data source by year for redbanded rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

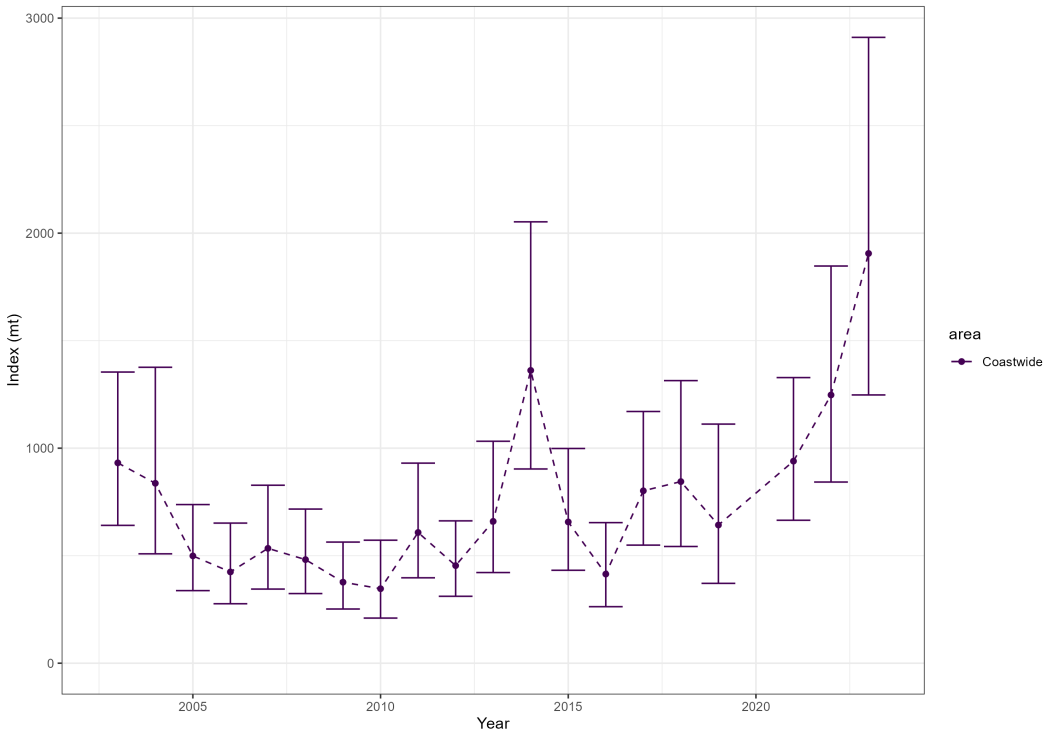

Figure 105: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for redbanded rockfish. The NWFSC WCGBT survey has an average of 53 positive tows per year.

Redstripe rockfish

The most recent assessment of redstripe rockfish was a data-limited assessment conducted in 2010. Across available data, redstripe rockfish have been observed and sampled by recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 13 positive tows per year.

Table 56: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for redstripe rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	32	0	0
California	NWFSC WCGBT	348	0	199
California	Recreational	19	0	0
Oregon	Commercial	4,291	0	4,141
Oregon	NWFSC WCGBT	3,954	0	1,731
Oregon	Recreational	312	0	0
Washington	Commercial	3,457	0	1,097
Washington	NWFSC WCGBT	3,383	0	1,700
Washington	Recreational	6	0	6

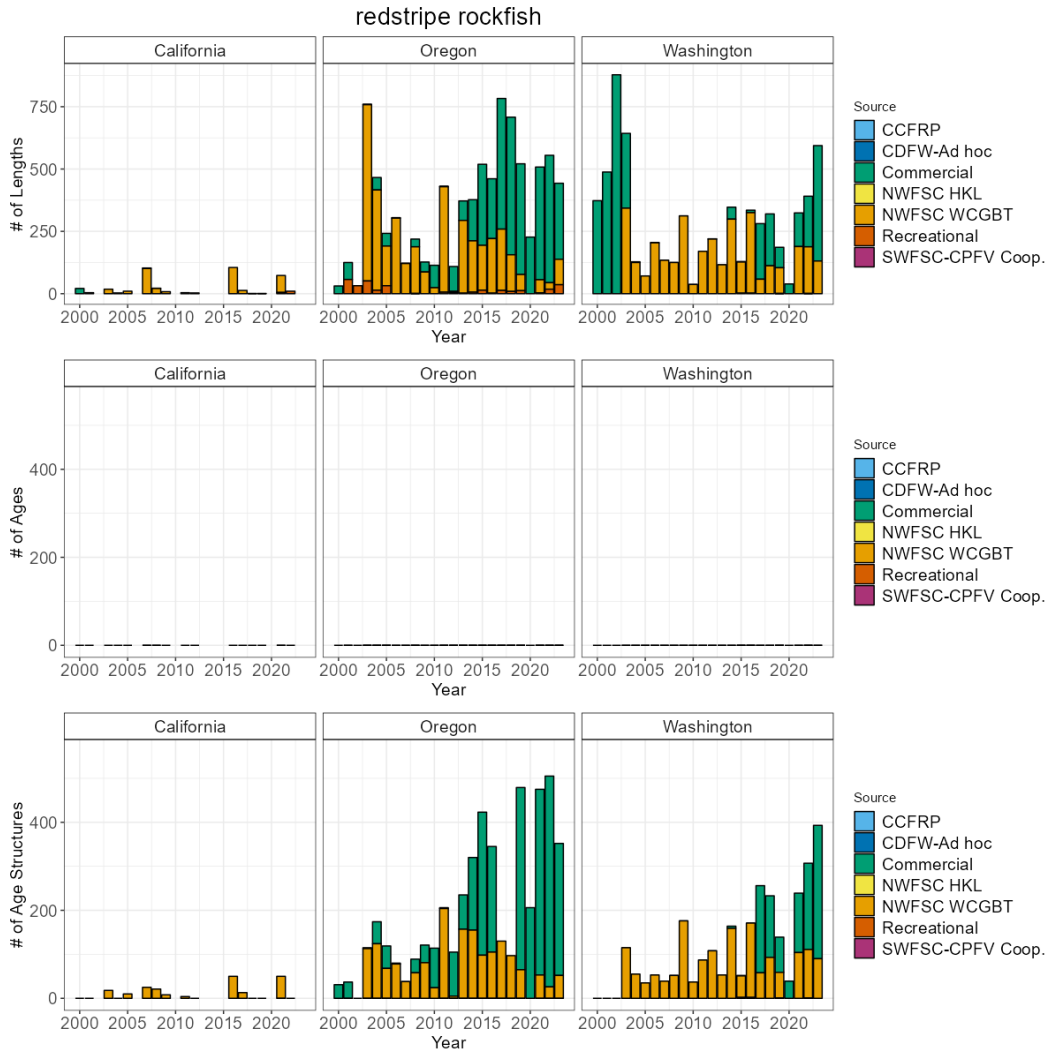

Figure 106: Total number of available lengths, read ages, and unread age structures by data source by year for redstripe rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Rex sole

The most recent assessment of rex sole was a data-moderate assessment conducted in 2023. Across available data, rex sole have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 384 positive tows per year.

Table 57: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for rex sole.

State	Source	Lengths	Ages	Age Structures
California	Commercial	35,679	0	1,787
California	NWFSC WCGBT	56,004	273	4,771
California	Recreational	1	0	0
Oregon	Commercial	24,666	0	19,844
Oregon	NWFSC WCGBT	62,018	200	4,242
Washington	Commercial	2,315	0	1,635
Washington	NWFSC WCGBT	28,509	148	2,126

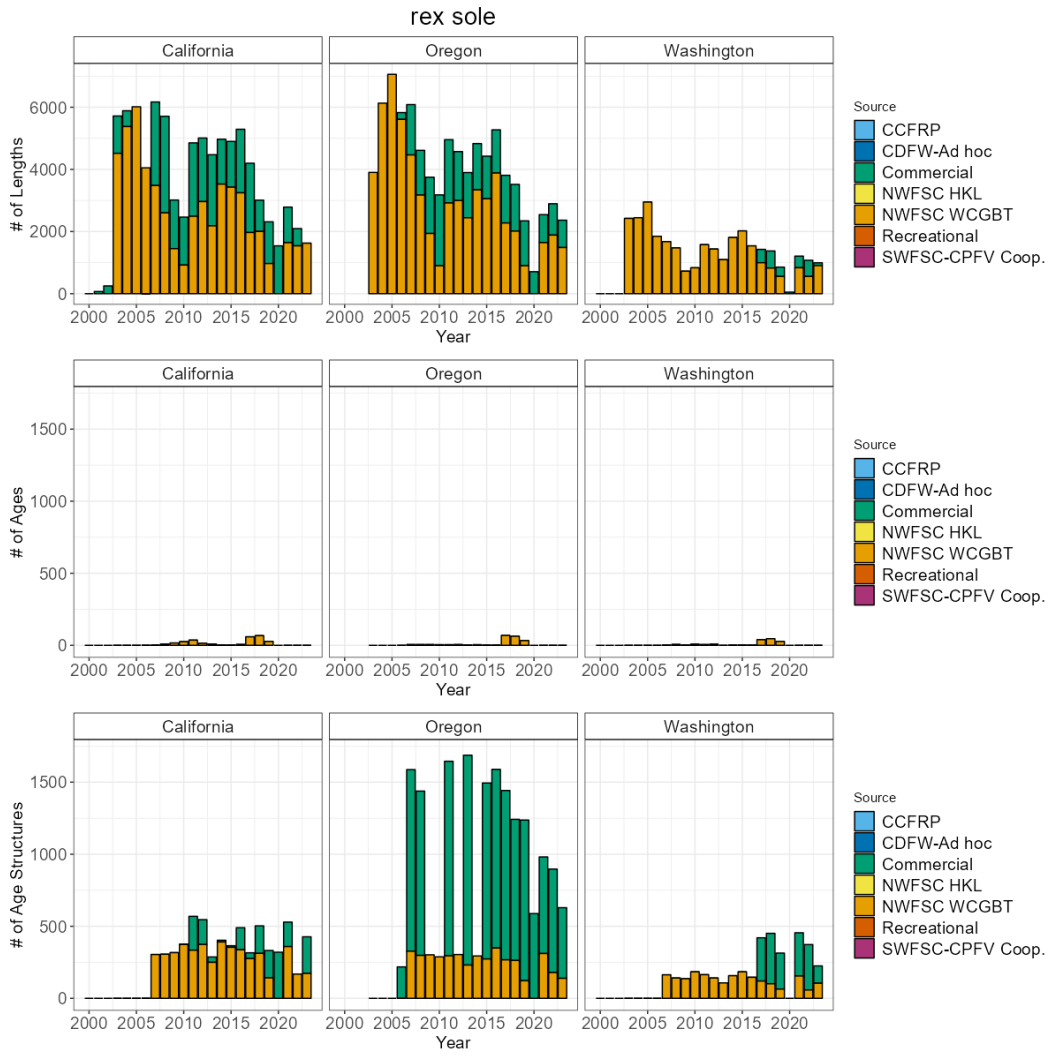

Figure 107: Total number of available lengths, read ages, and unread age structures by data source by year for rex sole. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

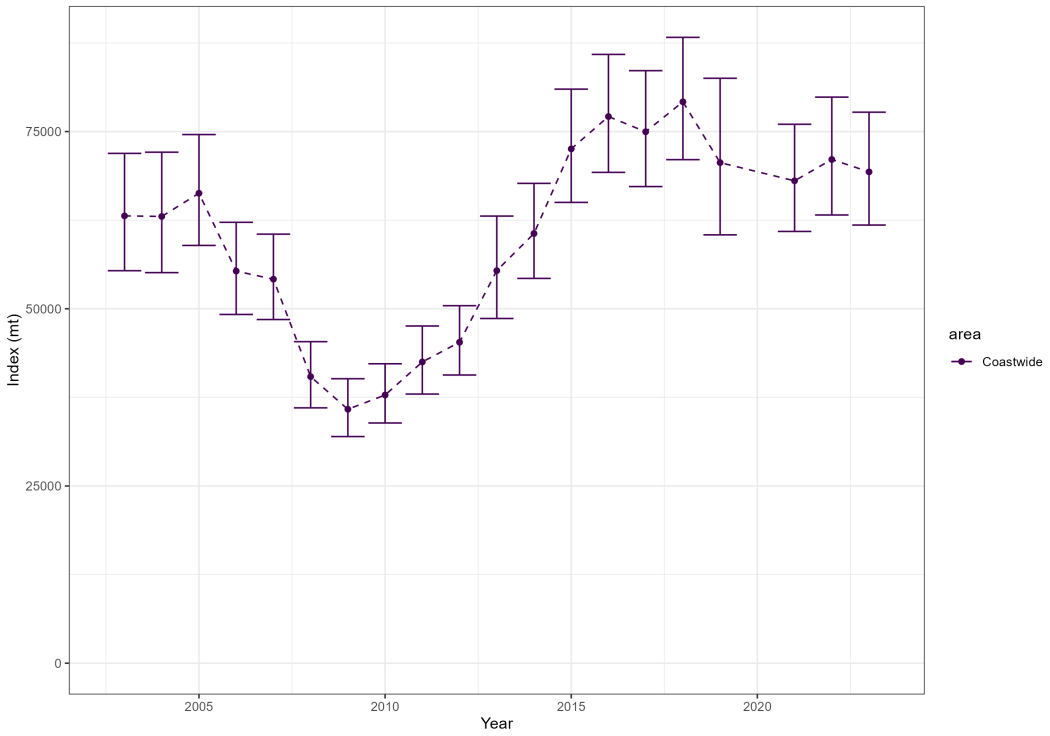

Figure 108: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for rex sole. The NWFSC WCGBT survey has an average of 384 positive tows per year.

Rosethorn rockfish

The most recent assessment of rosethorn rockfish was a data-limited assessment conducted in 2010. Across available data, rosethorn rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT survey has an average of 48 positive tows per year.

Table 58: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for rosethorn rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	202	0	0
California	NWFSC HKL	36	0	27
California	NWFSC WCGBT	2,945	0	1,458
California	Recreational	37	0	0
Oregon	Commercial	2,183	0	2,100
Oregon	NWFSC WCGBT	9,688	0	3,846
Oregon	Recreational	551	0	0
Washington	Commercial	1,586	0	967
Washington	NWFSC WCGBT	6,835	0	2,853
Washington	Recreational	6	0	3

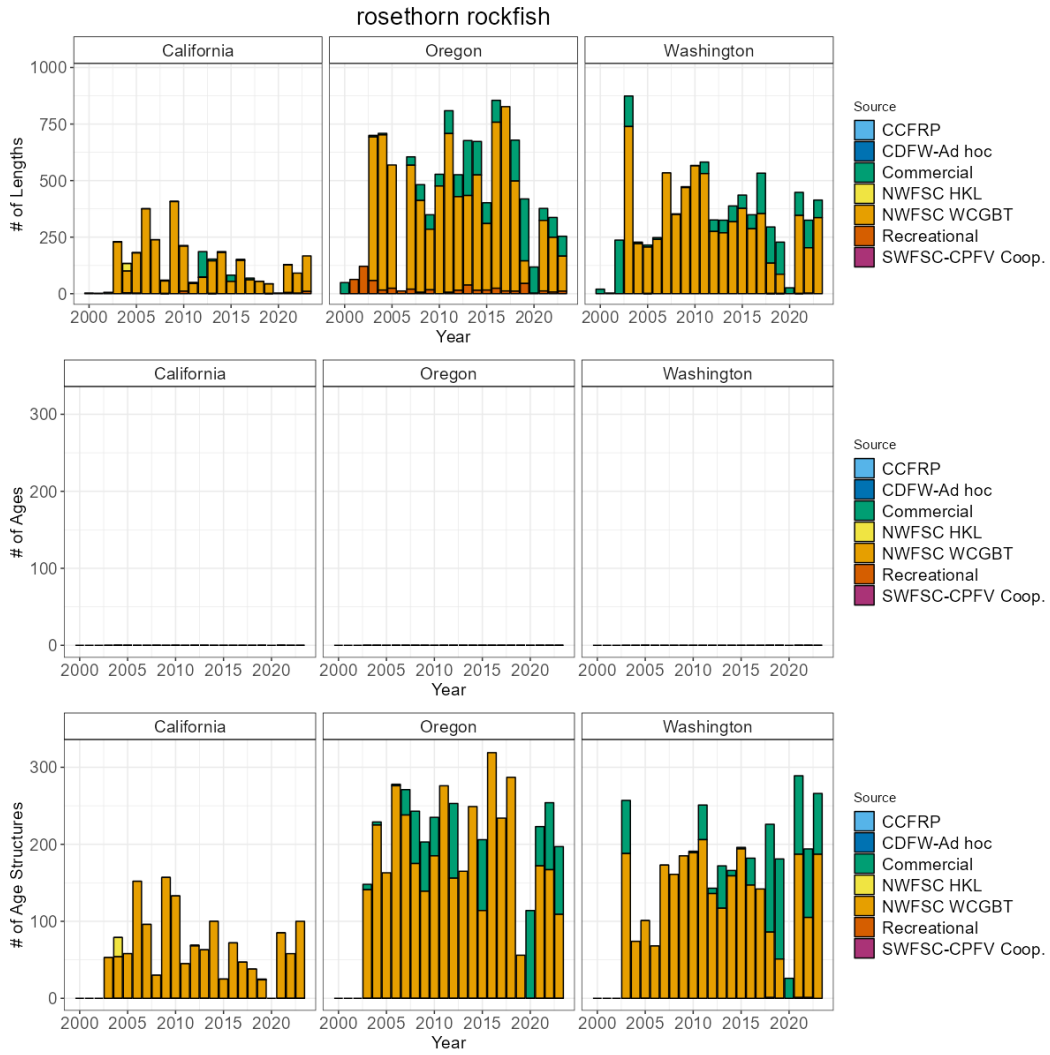

Figure 109: Total number of available lengths, read ages, and unread age structures by data source by year for rosethorn rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

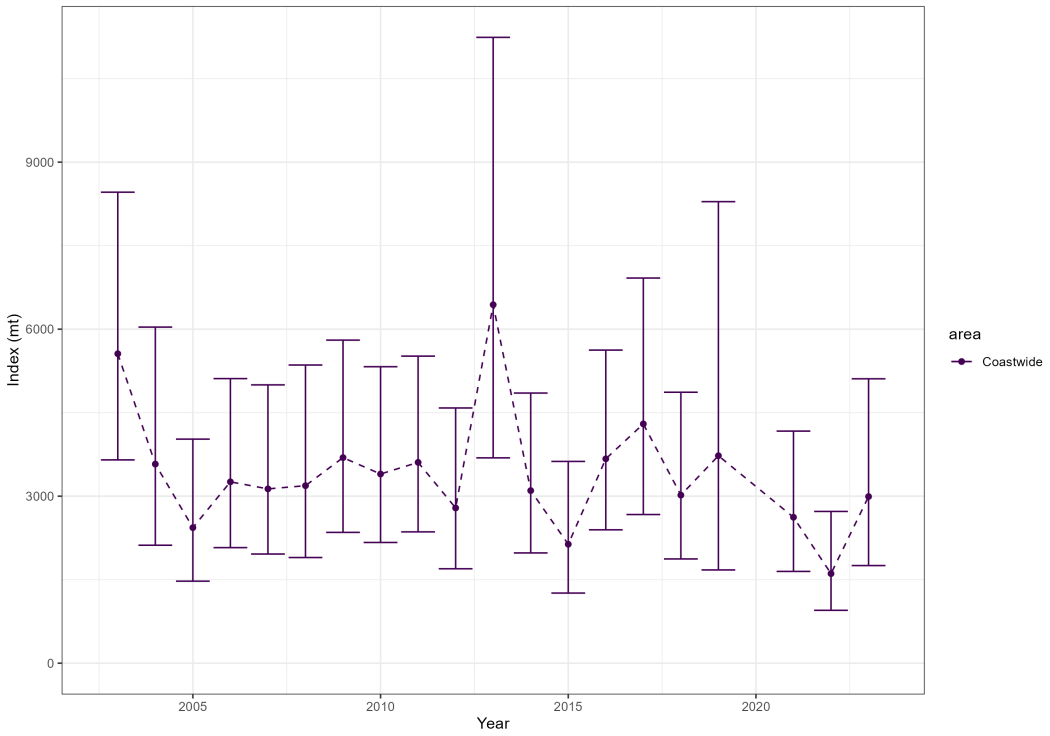

Figure 110: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for rosethorn rockfish. The NWFSC WCGBT survey has an average of 48 positive tows per year.

Rosy rockfish

The most recent assessment of rosy rockfish was a data-limited assessment conducted in 2010. Across available data, rosy rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 2 positive tows per year. The NWFSC HKL survey has an average of 23 positive sets per year the area south of Point Conception in California.

Coastwide a total of 59 maturity samples have been collected and 39 read by researchers at the NWFSC.

Table 59: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for rosy rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	1,091	NA	NA
California	CDFW-Ad hoc	0	0	8
California	Commercial	305	0	0
California	NWFSC HKL	1,228	181	961
California	NWFSC WCGBT	375	0	195
California	Recreational	20,763	0	0
California	SWFSC-CPFV Coop.	11	0	11
Oregon	Commercial	44	0	15
Oregon	NWFSC WCGBT	1	0	1
Oregon	Recreational	232	0	0

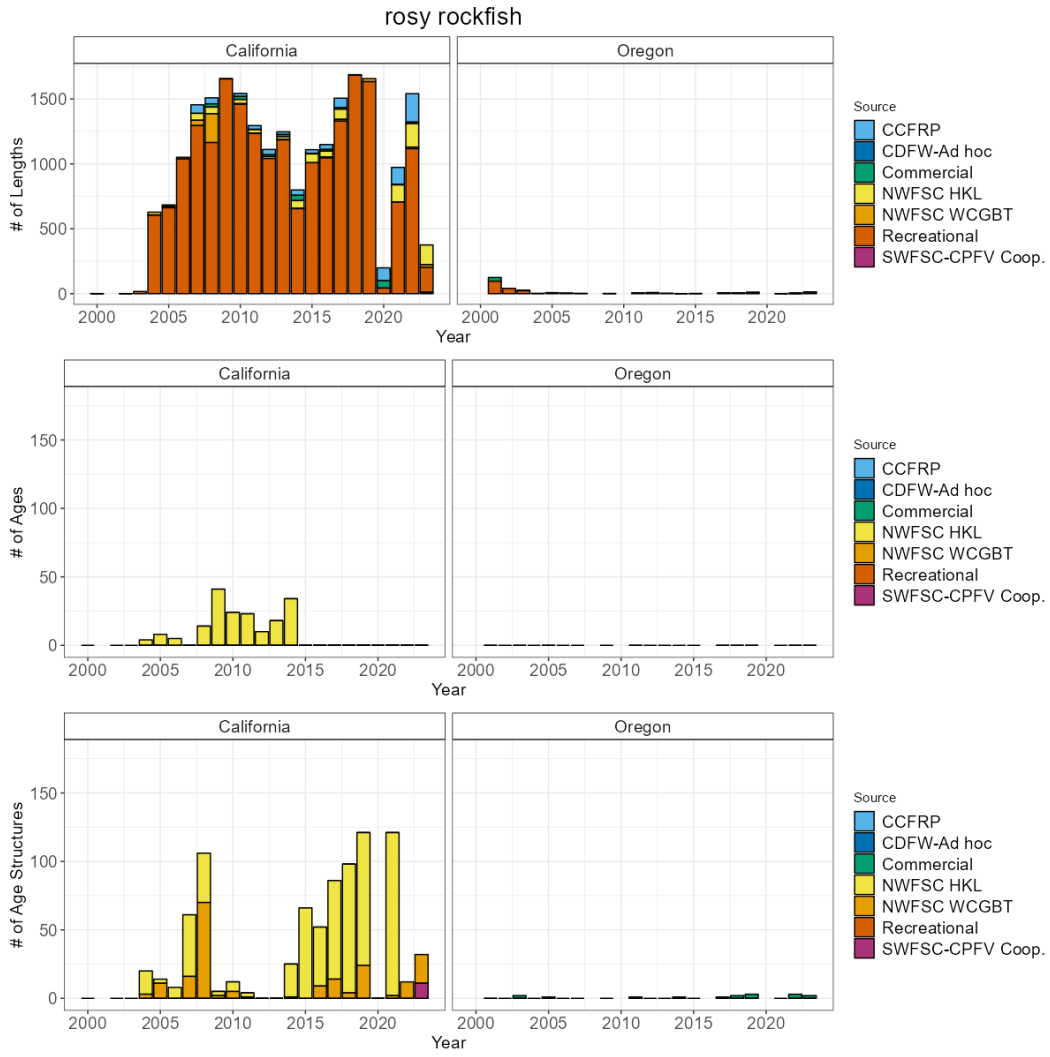

Figure 111: Total number of available lengths, read ages, and unread age structures by data source by year for rosy rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

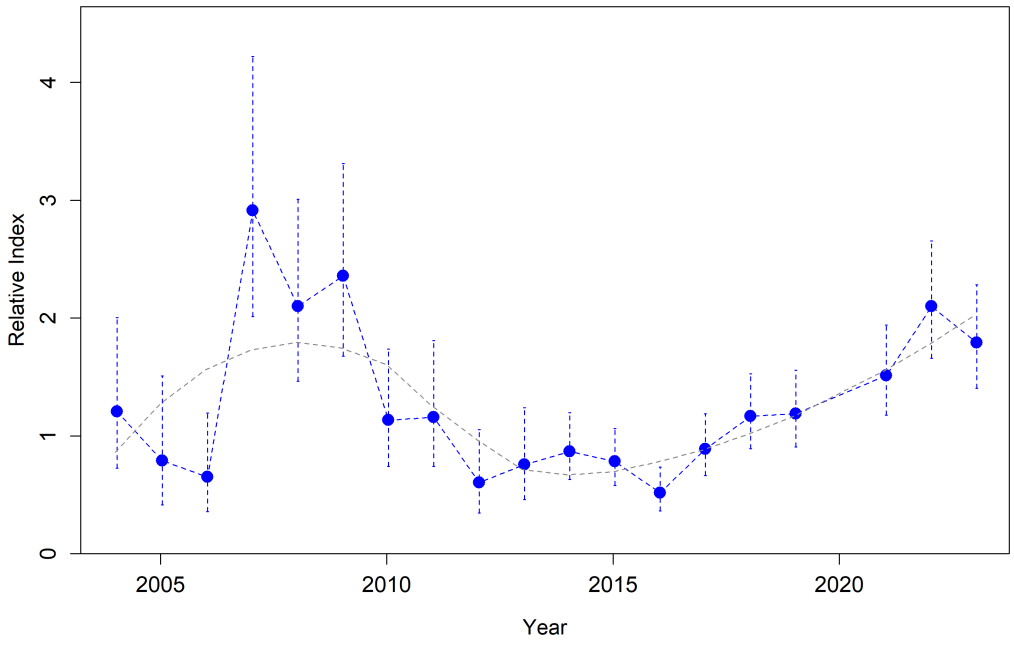

Figure 112: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for rosy rockfish. The NWFSC HKL survey has an average of 23 positive sets per year the area south of Point Conception in California.

Sand sole

The most recent assessment of sand sole was a data-limited assessment conducted in 2010. Across available data, sand sole have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 10 positive tows per year.

Table 60: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for sand sole.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	8	NA	NA
California	Commercial	4,595	0	0
California	NWFSC WCGBT	309	0	265
California	Recreational	628	0	0
Oregon	Commercial	3,550	0	3,322
Oregon	NWFSC WCGBT	660	0	248
Oregon	Recreational	929	0	0
Washington	Commercial	4	0	4
Washington	NWFSC WCGBT	233	0	78
Washington	Recreational	2	0	0

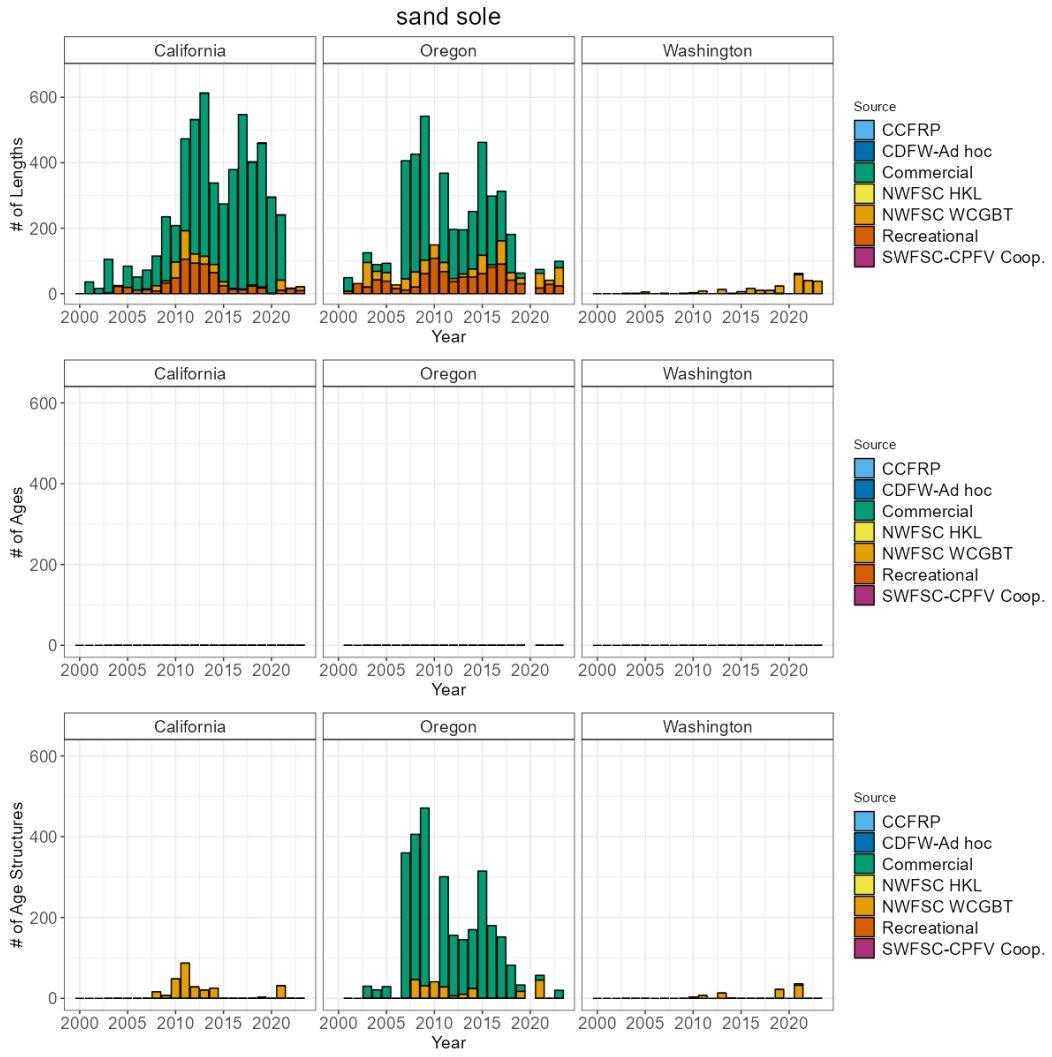

Figure 113: Total number of available lengths, read ages, and unread age structures by data source by year for sand sole. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Sharpchin rockfish

The most recent assessment of sharpchin rockfish was a data-moderate assessment conducted in NA. Across available data, sharpchin rockfish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 43 positive tows per year.

Table 61: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for sharpchin rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	181	0	20
California	NWFSC HKL	13	0	13
California	NWFSC WCGBT	3,411	0	1,739
Oregon	Commercial	2,819	0	2,769
Oregon	NWFSC WCGBT	8,773	0	3,472
Washington	Commercial	2,208	0	445
Washington	NWFSC WCGBT	7,376	0	3,269

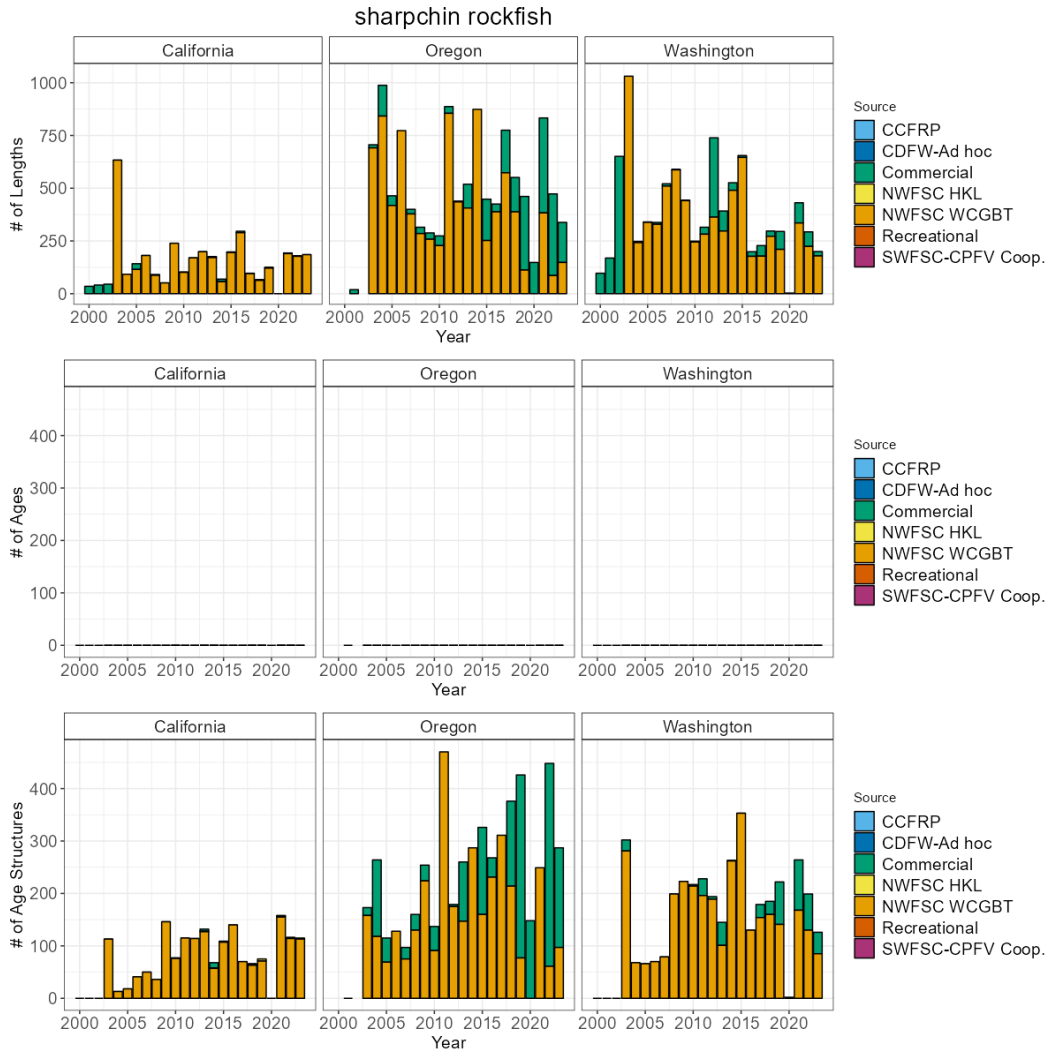

Figure 114: Total number of available lengths, read ages, and unread age structures by data source by year for sharpchin rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

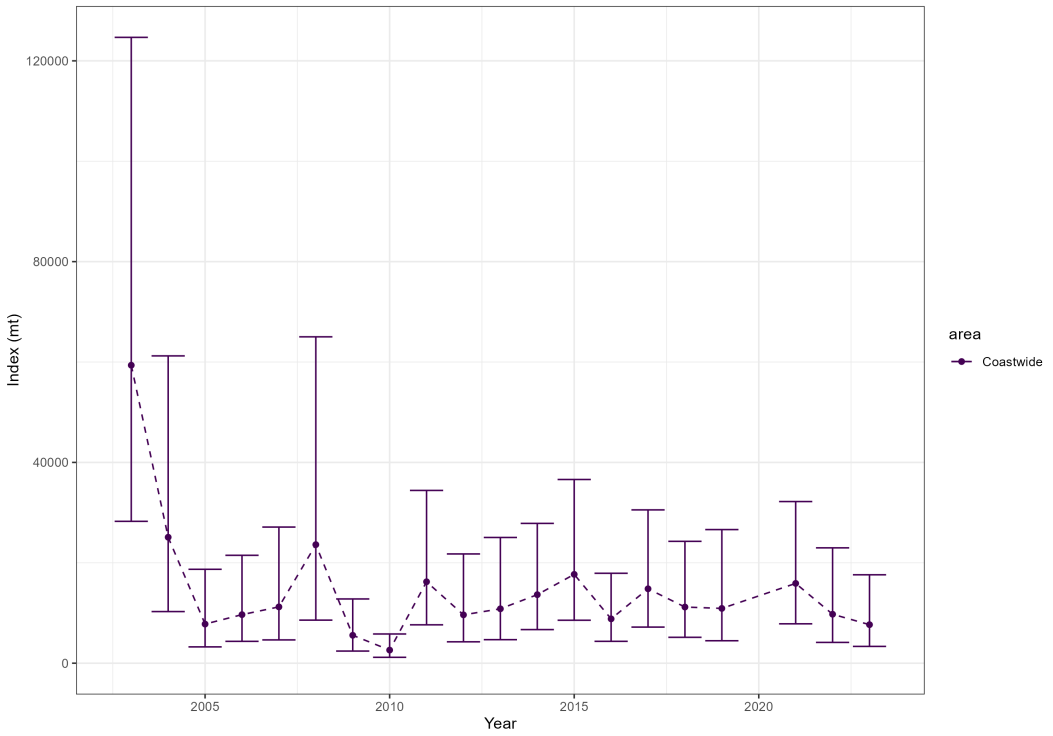

Figure 115: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for sharpchin rockfish. The NWFSC WCGBT survey has an average of 43 positive tows per year.

Shortraker rockfish

The most recent assessment of shortraker rockfish was a data-limited assessment conducted in 2010. Across available data, shortraker rockfish have been observed and sampled by only commercial fisheries. The NWFSC WCGBT survey has an average of 1 positive tows per year.

Table 62: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for shortraker rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	71	0	37
California	NWFSC WCGBT	1	0	0
Oregon	Commercial	3,080	20	3,032
Oregon	NWFSC WCGBT	30	0	29
Washington	Commercial	3,274	0	2,420
Washington	NWFSC WCGBT	21	0	19

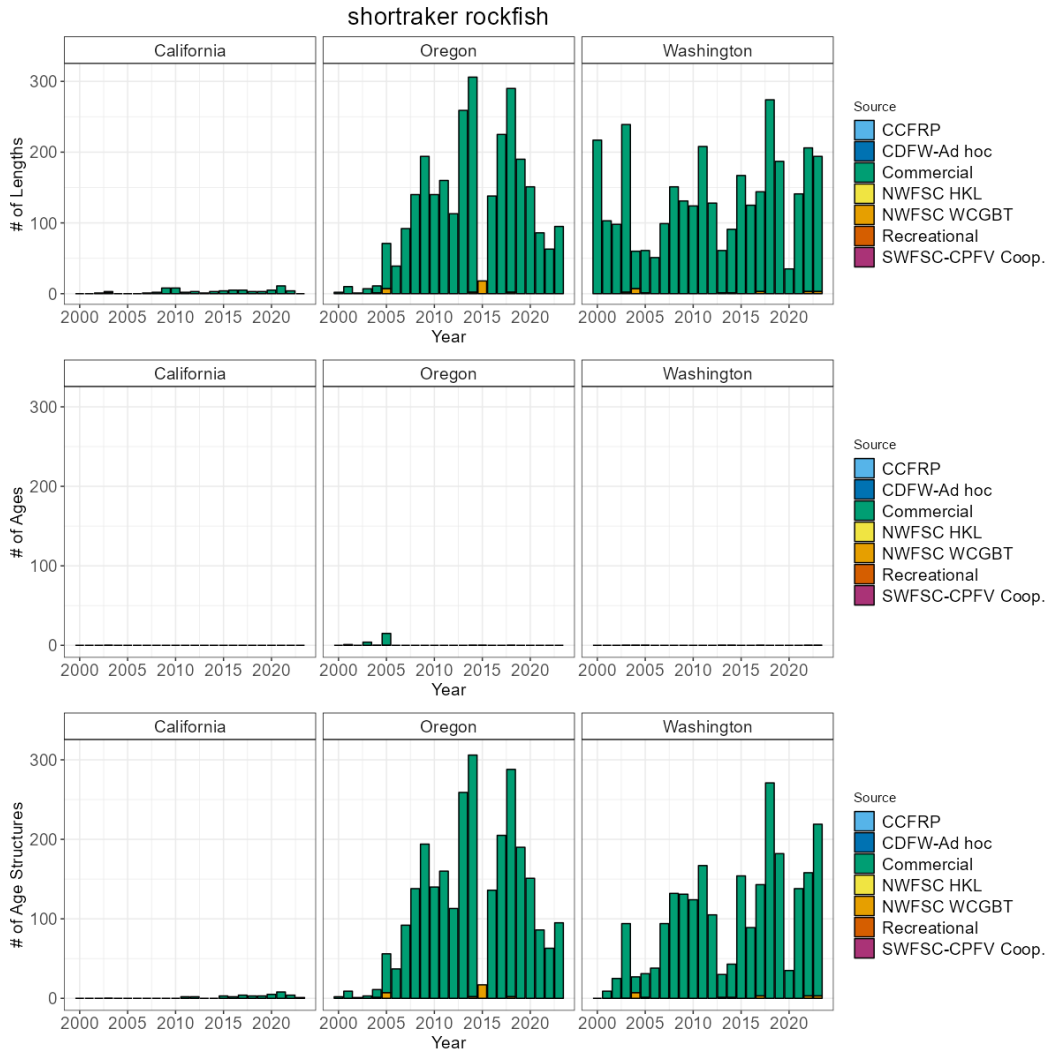

Figure 116: Total number of available lengths, read ages, and unread age structures by data source by year for shortraker rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Shortspine thornyhead

The most recent assessment of shortspine thornyhead was a data-moderate assessment conducted in 2023. Across available data, shortspine thornyhead have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 322 positive tows per year.

Coastwide a total of 1141 maturity samples have been collected and 591 read by researchers at the NWFSC.

Table 63: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for shortspine thornyhead.

State	Source	Lengths	Ages	Age Structures
California	CDFW-Ad hoc	0	0	1
California	Commercial	62,267	0	327
California	NWFSC WCGBT	45,806	0	11,723
California	Recreational	3	0	0
Oregon	Commercial	36,244	0	27,719
Oregon	NWFSC WCGBT	39,188	0	6,811
Washington	Commercial	20,125	0	926
Washington	NWFSC WCGBT	13,566	0	2,944

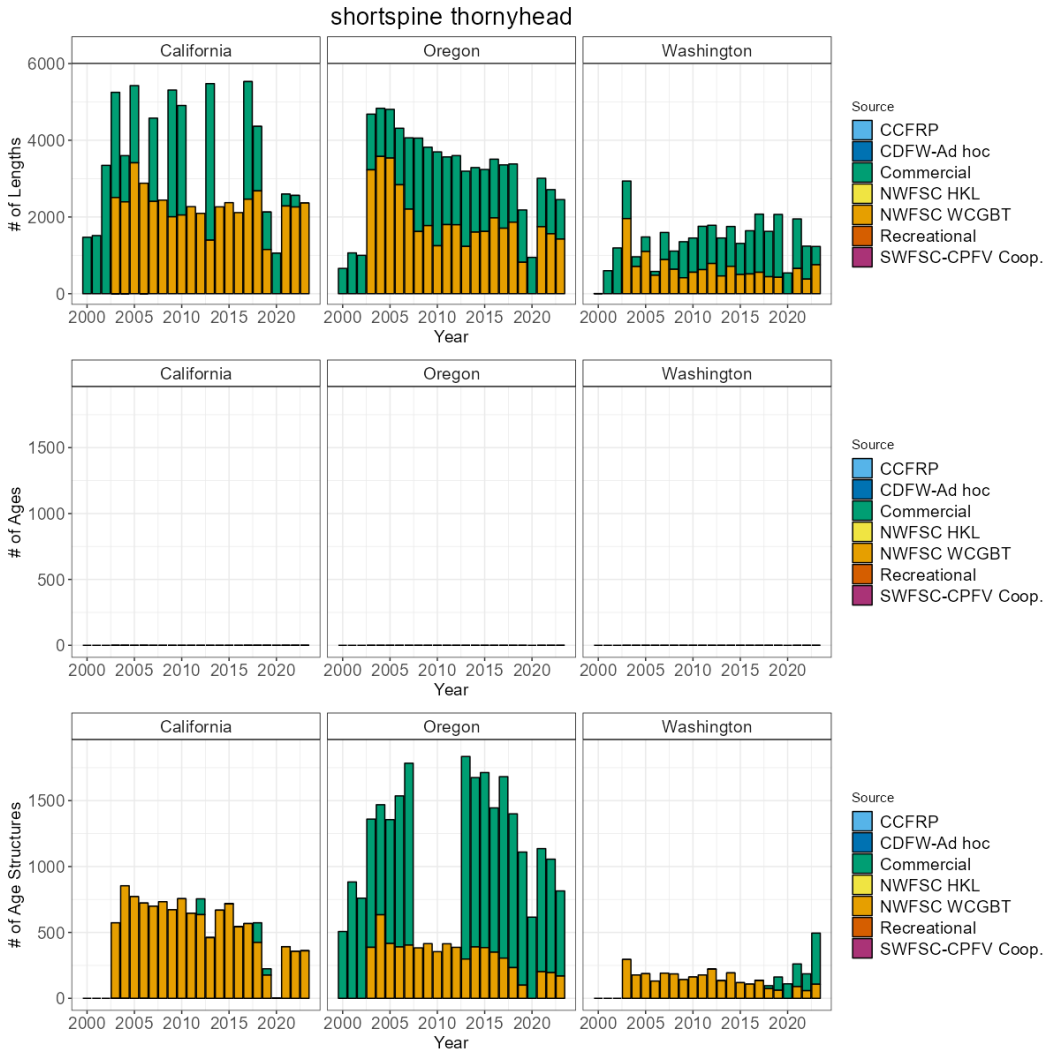

Figure 117: Total number of available lengths, read ages, and unread age structures by data source by year for shortspine thornyhead. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

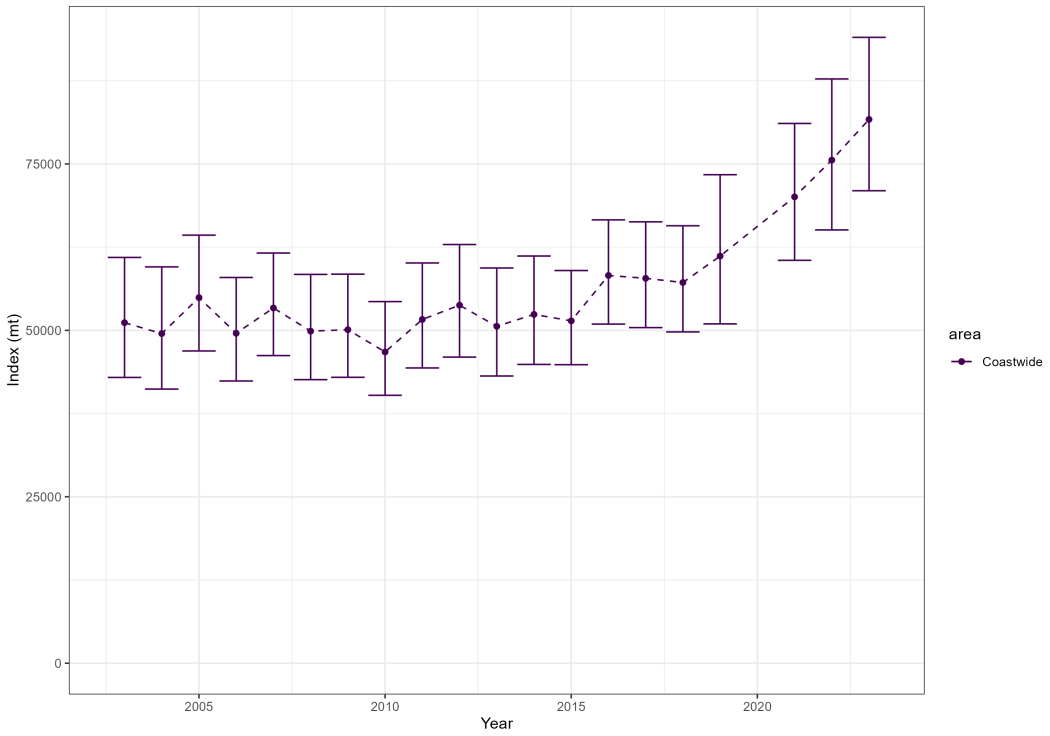

Figure 118: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for shortspine thornyhead. The NWFSC WCGBT survey has an average of 322 positive tows per year.

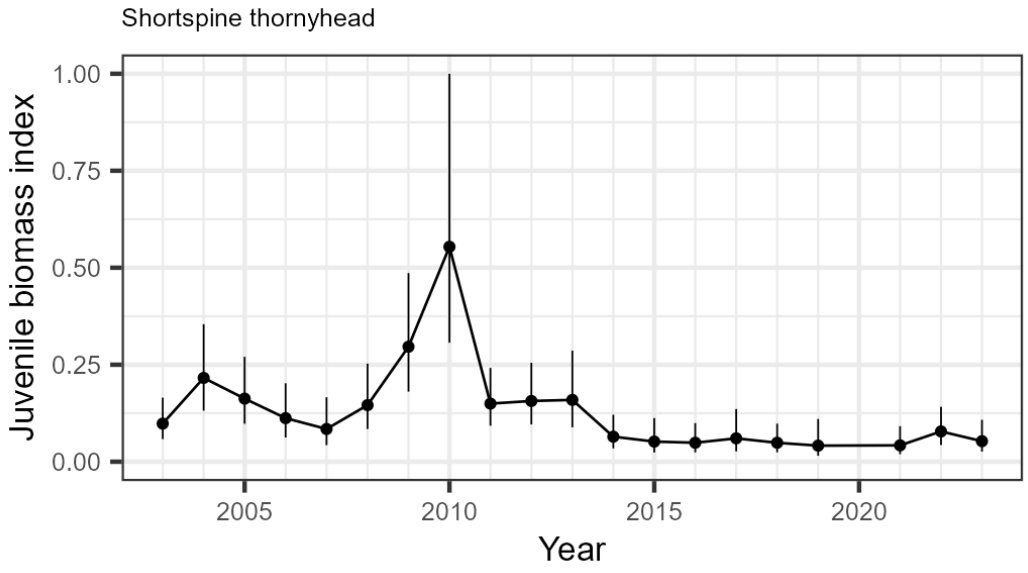

Figure 119: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for shortspine thornyhead. The juvenile index represents fish 8 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of shortspine thornyhead conducted in 2023 estimated large recruitments (i.e., greater than 0.50) in 2003, 2004, 2005, 2006, 2007, and 2008.

Silvergray rockfish

The most recent assessment of silvergray rockfish was a data-limited assessment conducted in 2010. Across available data, silvergray rockfish have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 6 positive tows per year.

Table 64: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for silvergray rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	17	0	0
California	NWFSC HKL	4	0	3
California	NWFSC WCGBT	15	0	15
California	Recreational	1	0	0
Oregon	Commercial	2,860	0	2,759
Oregon	NWFSC WCGBT	419	0	331
Oregon	Recreational	593	0	0
Washington	Commercial	1,310	0	0
Washington	NWFSC WCGBT	396	0	369
Washington	Recreational	137	0	102

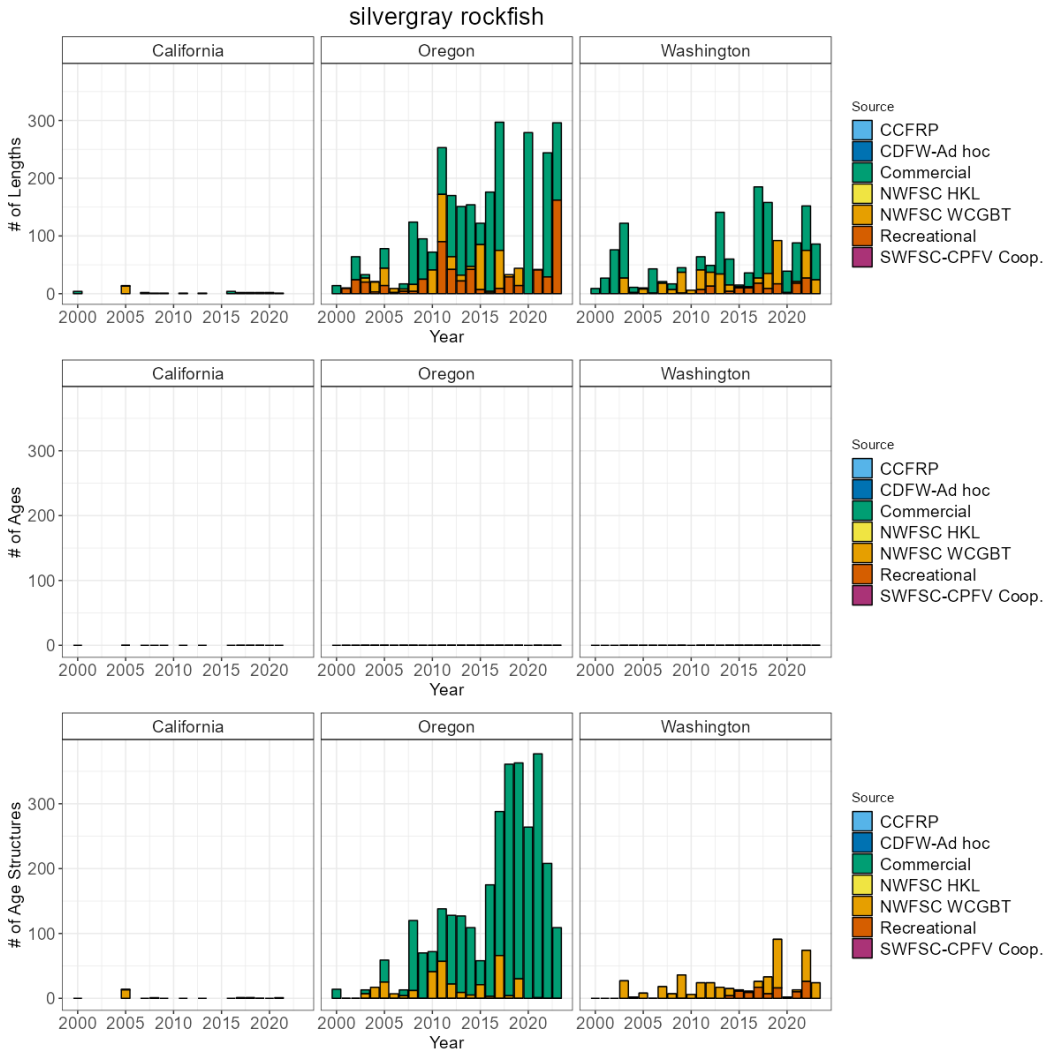

Figure 120: Total number of available lengths, read ages, and unread age structures by data source by year for silvergray rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Speckled rockfish

The most recent assessment of speckled rockfish was a data-limited assessment conducted in 2010. Across available data, speckled rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 2 positive tows per year. The NWFSC HKL survey has an average of 48 positive sets per year the area south of Point Conception in California.

Coastwide a total of 459 maturity samples have been collected and 301 read by researchers at the NWFSC.

Table 65: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for speckled rockfish.

State	Source	Lengths	Ages	Age Structures
California	CDFW-Ad hoc	0	0	11
California	Commercial	412	0	1
California	NWFSC HKL	4,408	0	4,222
California	NWFSC WCGBT	285	0	157
California	Recreational	10,144	0	0
California	SWFSC-CPFV Coop.	84	0	82
Oregon	Recreational	2	0	0

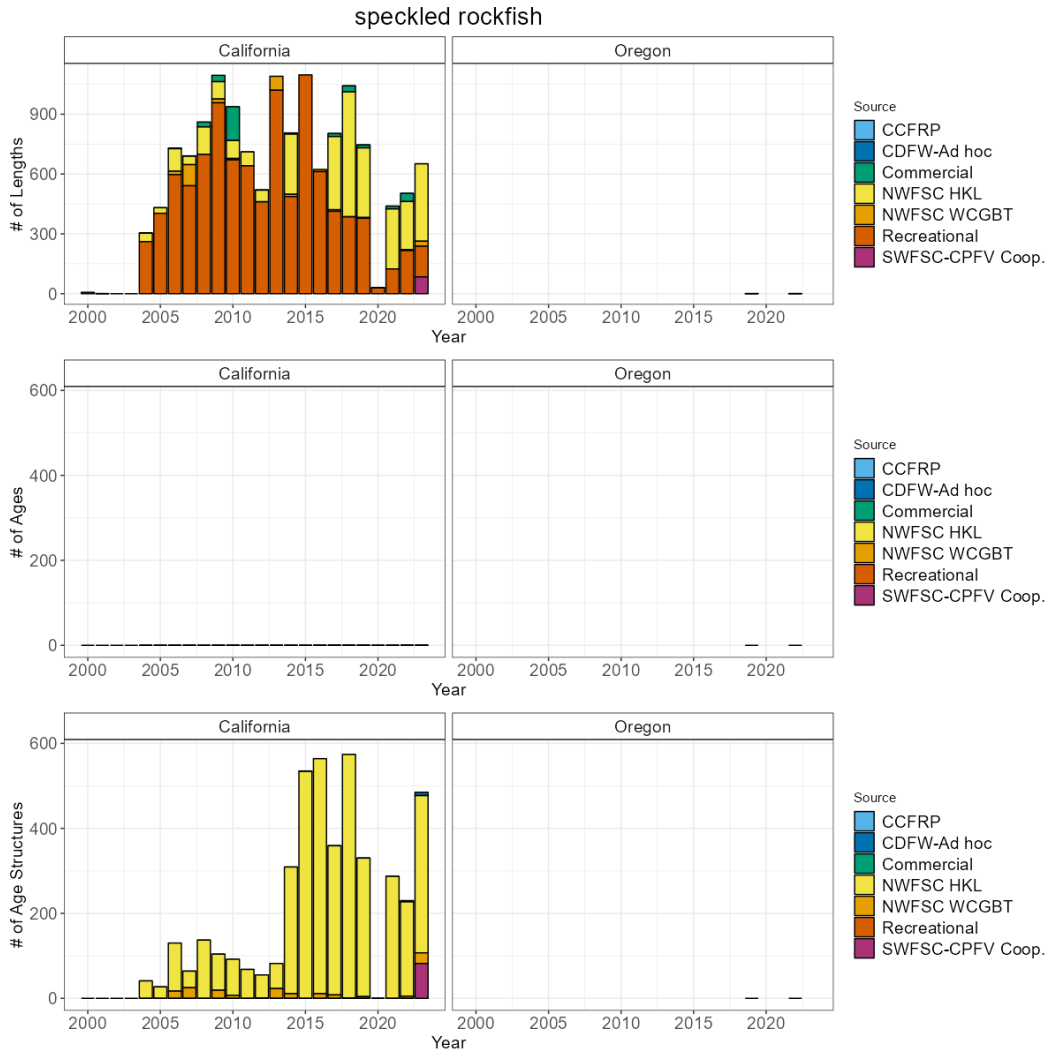

Figure 121: Total number of available lengths, read ages, and unread age structures by data source by year for speckled rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

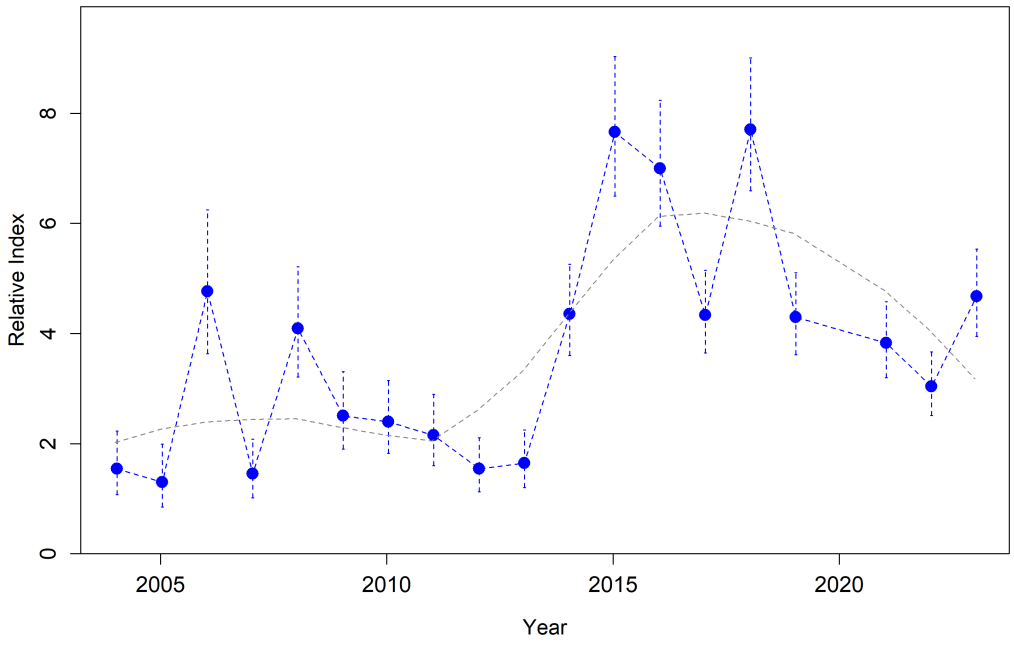

Figure 122: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for speckled rockfish. The NWFSC HKL survey has an average of 48 positive sets per year the area south of Point Conception in California.

Splitnose rockfish

The most recent assessment of splitnose rockfish was a benchmark assessment conducted in 2009. Across available data, splitnose rockfish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 128 positive tows per year.

Table 66: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for splitnose rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	17,558	0	1,311
California	NWFSC WCGBT	32,476	1,568	5,866
Oregon	Commercial	12,509	0	12,266
Oregon	NWFSC WCGBT	16,505	1,011	3,288
Washington	Commercial	3,175	3	990
Washington	NWFSC WCGBT	3,703	327	771

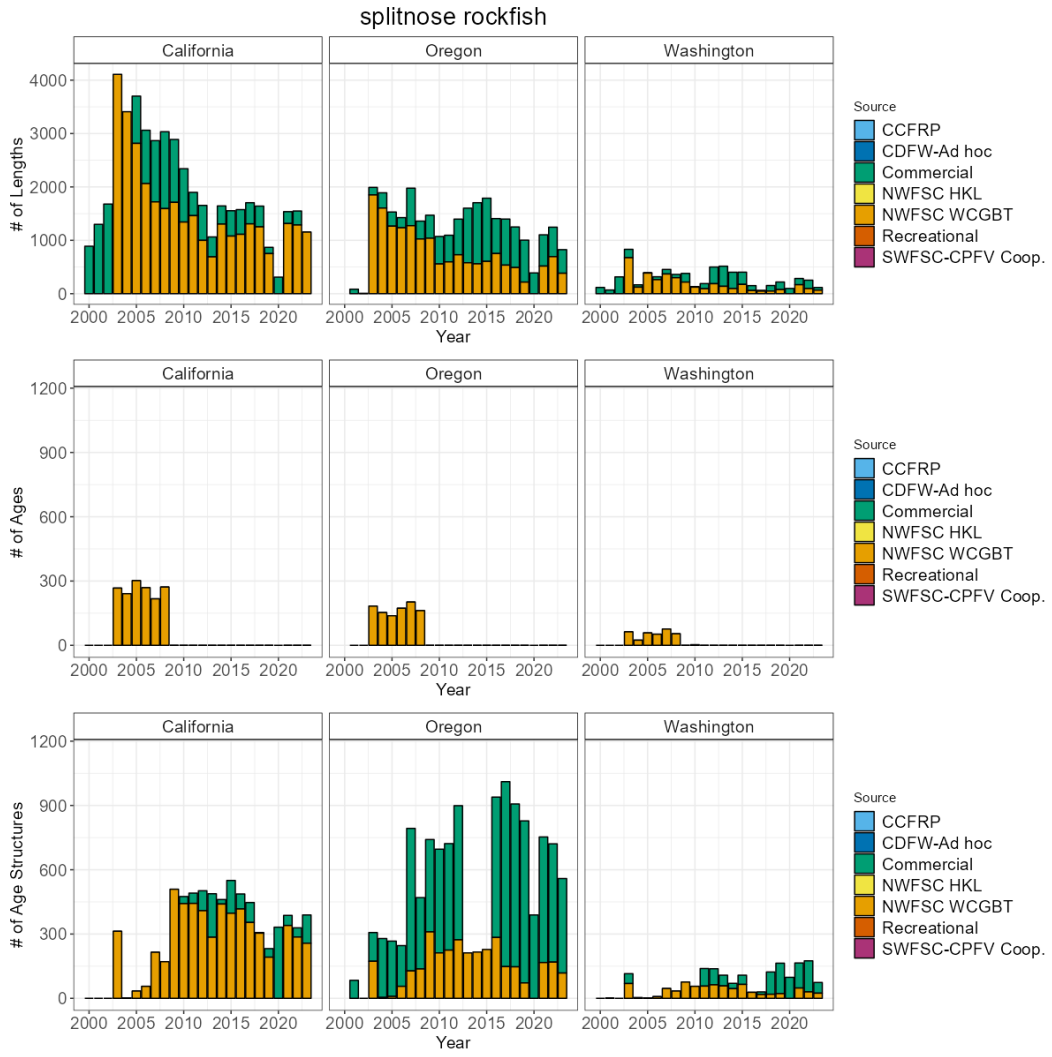

Figure 123: Total number of available lengths, read ages, and unread age structures by data source by year for splitnose rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

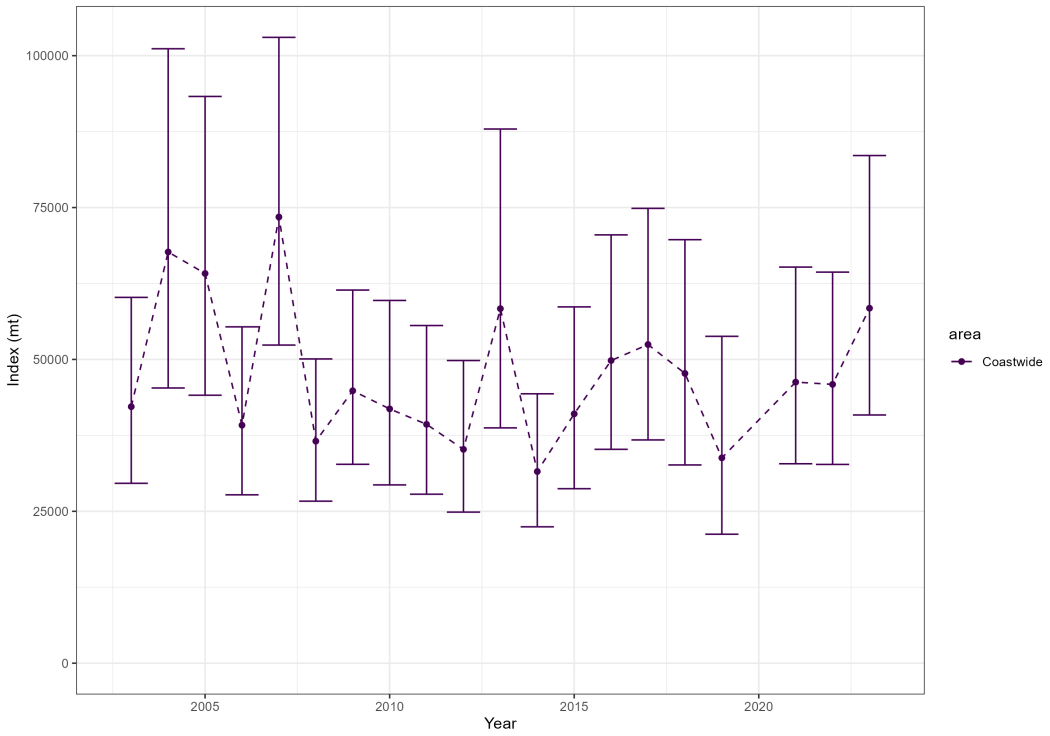

Figure 124: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for splitnose rockfish. The NWFSC WCGBT survey has an average of 128 positive tows per year.

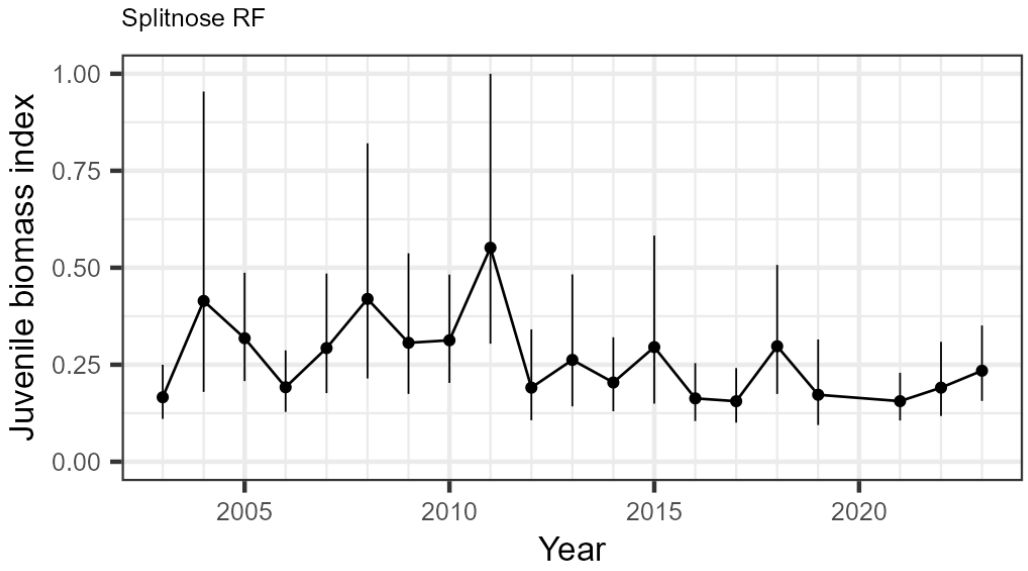

Figure 125: Juvenile index of abundance estiamted from the NWFSC West Coast Groundfish Bottom Trawl survey for splitnose rockfish. The juvenile index represents fish 10 cm or less selected by the NWFSC WCGBT survey. The most recent assessment of splitnose rockfish conducted in 2009 estimated large recruitments (i.e., greater than 0.50) in 2003, 2004, 2005, 2006, and 2007.

Table 67: The median length (cm) associated with fish age 2 or younger for splitnose rockfish based on aged fish from the NWFSC West Coast Groundfish Bottom Trawl survey.

Age	Length (cm)
0	7
1	9
2	12

Squarespot rockfish

The most recent assessment of squarespot rockfish was a data-moderate assessment conducted in 2021. Across available data, squarespot rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 10 positive tows per year. The NWFSC HKL survey has an average of 29 positive sets per year the area south of Point Conception in California.

Coastwide a total of 118 maturity samples have been collected and 118 read by researchers at the NWFSC.

Table 68: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for squarespot rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	5	NA	NA
California	CDFW-Ad hoc	0	0	12
California	Commercial	116	0	29
California	NWFSC HKL	2,078	344	1,623
California	NWFSC WCGBT	4,760	402	1,140
California	Recreational	17,587	0	0
California	SWFSC-CPFV Coop.	2	0	2
Oregon	NWFSC WCGBT	4	1	1

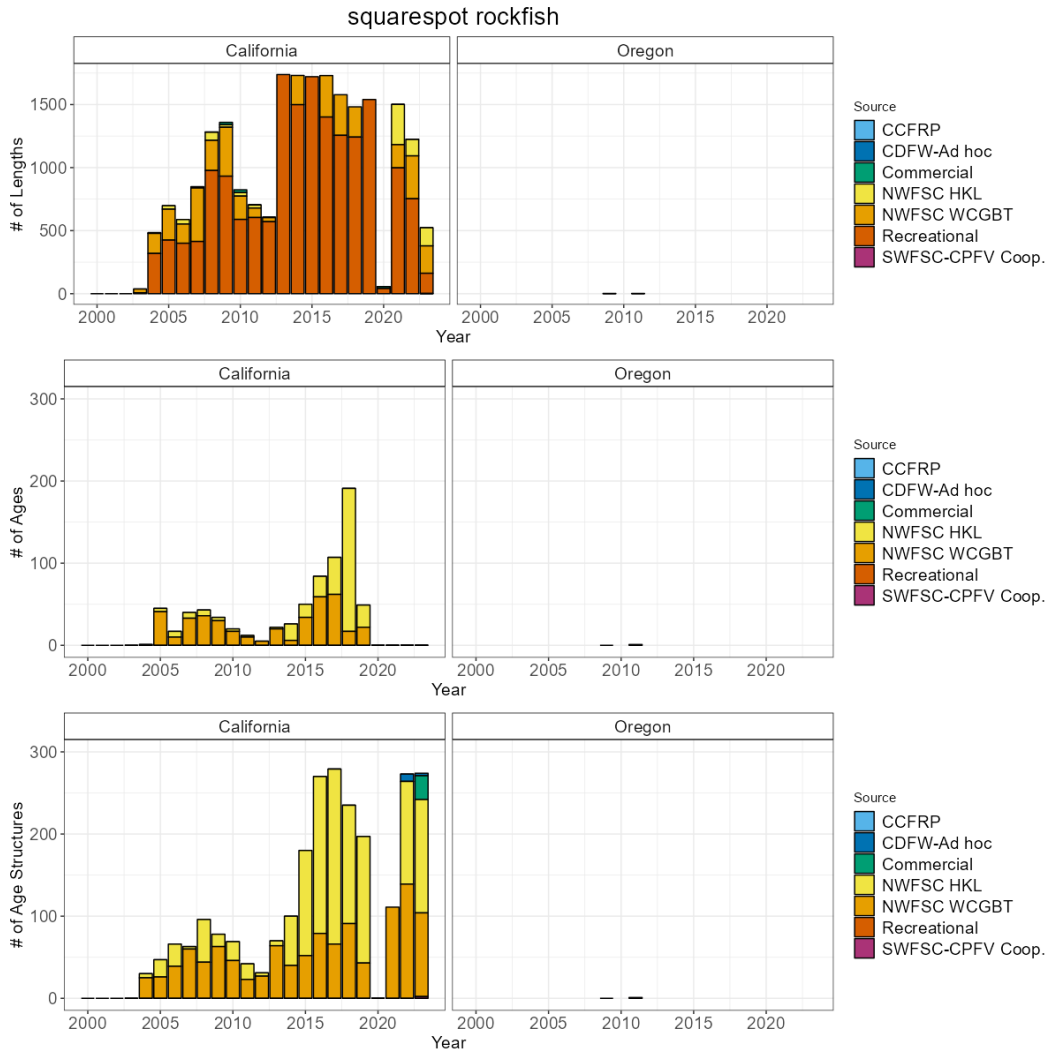

Figure 126: Total number of available lengths, read ages, and unread age structures by data source by year for squarespot rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

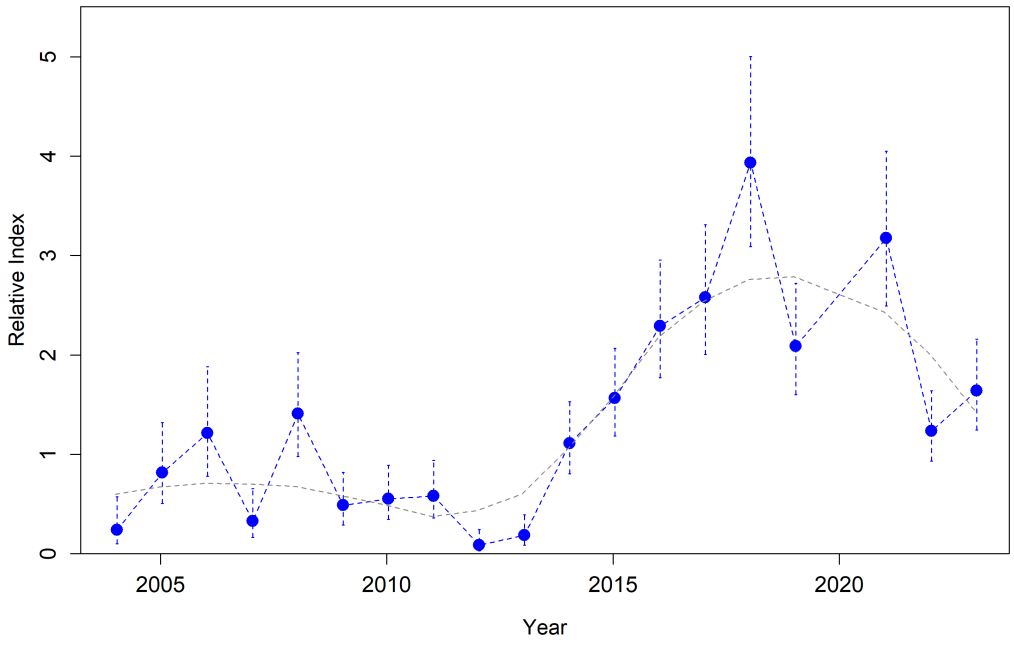

Figure 127: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for squarespot rockfish. The NWFSC HKL survey has an average of 29 positive sets per year the area south of Point Conception in California.

Starry flounder

The most recent assessment of starry flounder was a data-limited assessment conducted in 2010. Across available data, starry flounder have been observed and sampled by both the commercial and recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 9 positive tows per year.

Coastwide a total of 213 maturity samples have been collected and 0 read by researchers at the NWFSC.

Table 69: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for starry flounder.

State	Source	Lengths	Ages	Age Structures
California	Commercial	4,086	0	0
California	NWFSC WCGBT	386	0	349
California	Recreational	535	0	0
Oregon	Commercial	2,933	0	2,788
Oregon	NWFSC WCGBT	91	0	76
Oregon	Recreational	176	0	0
Washington	Commercial	11	0	11
Washington	NWFSC WCGBT	68	0	68
Washington	Recreational	92	0	8

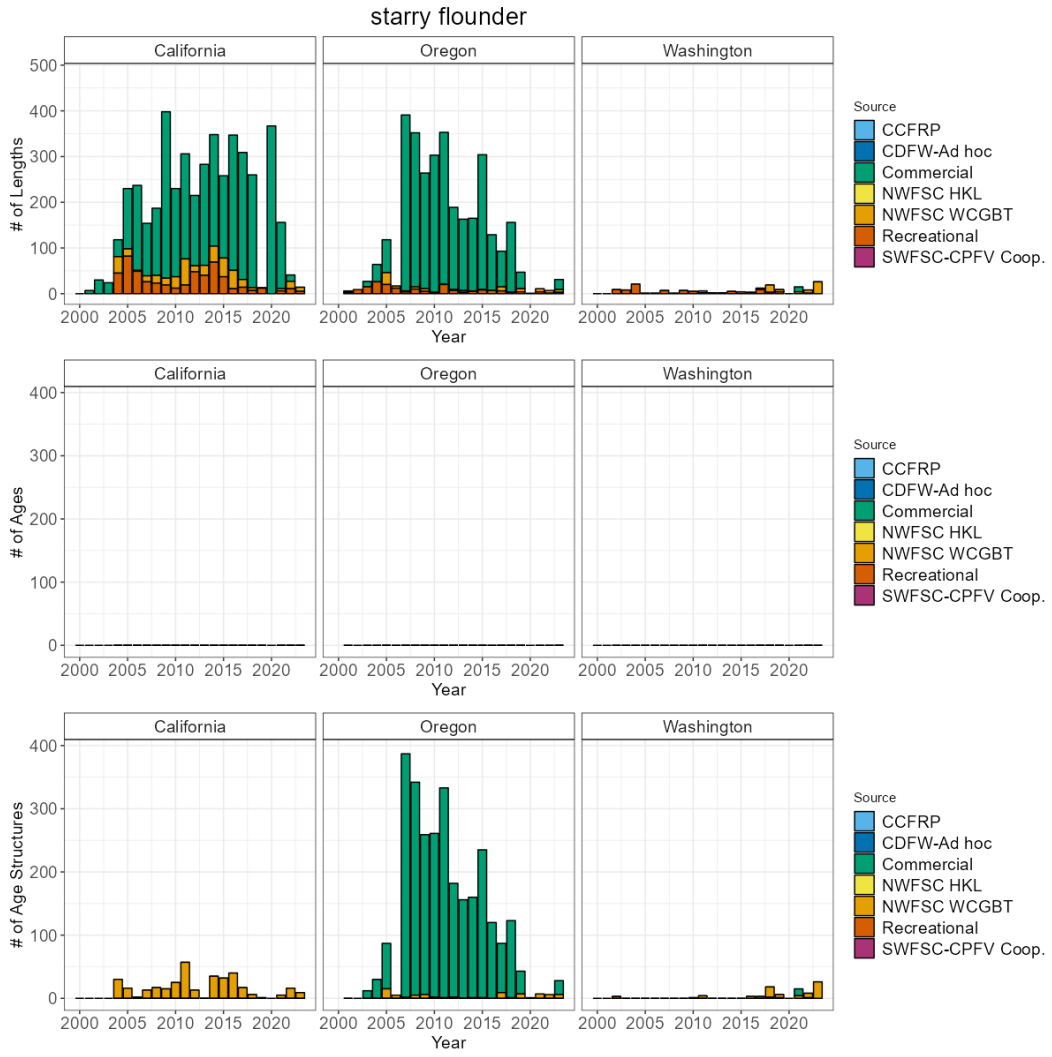

Figure 128: Total number of available lengths, read ages, and unread age structures by data source by year for starry flounder. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Starry rockfish

The most recent assessment of starry rockfish was a data-limited assessment conducted in 2010. Across available data, starry rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 2 positive tows per year. The NWFSC HKL survey has an average of 52 positive sets per year the area south of Point Conception in California.

Table 70: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for starry rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	208	NA	NA
California	CDFW-Ad hoc	0	0	111
California	Commercial	676	0	65
California	NWFSC HKL	3,216	0	3,092
California	NWFSC WCGBT	86	0	80
California	Recreational	34,688	0	0
California	SWFSC-CPFV Coop.	110	0	110

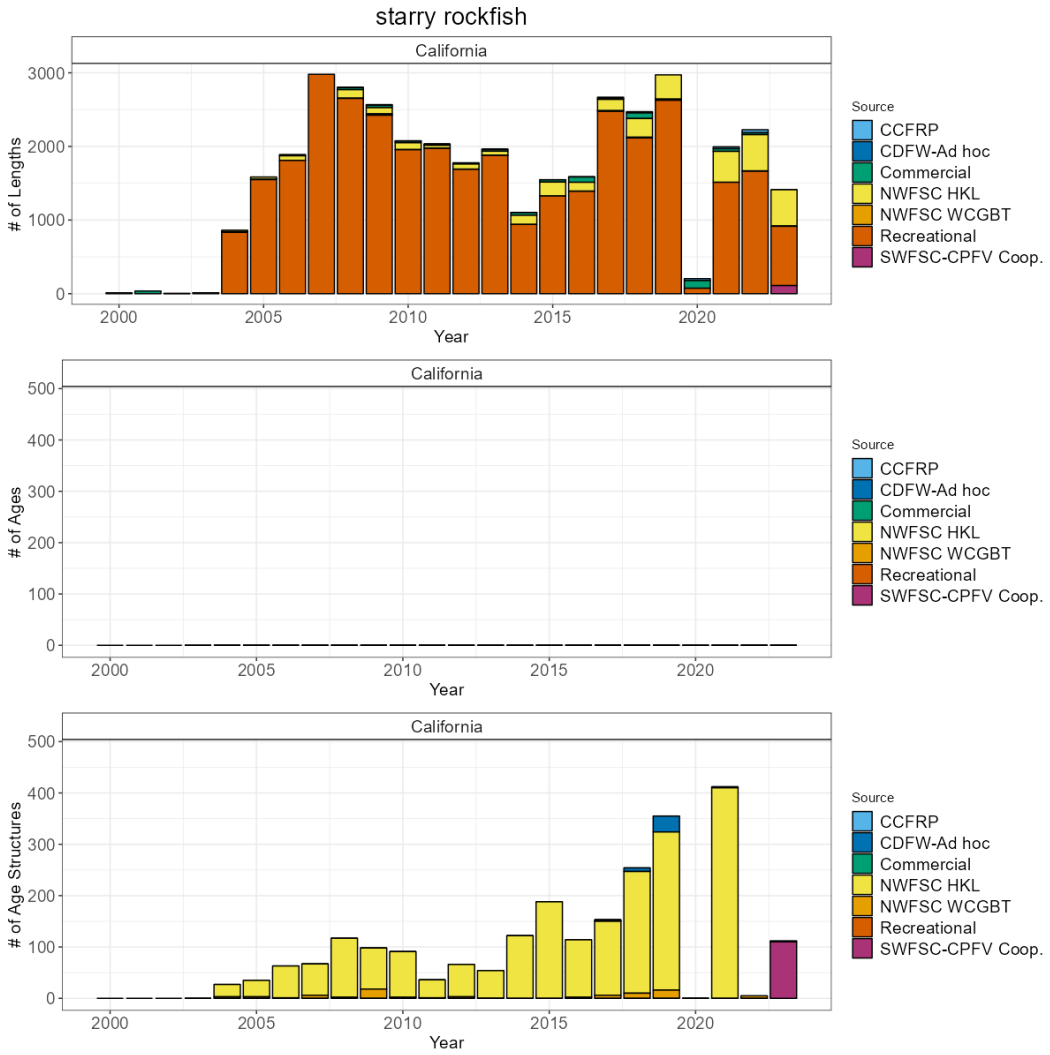

Figure 129: Total number of available lengths, read ages, and unread age structures by data source by year for starry rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

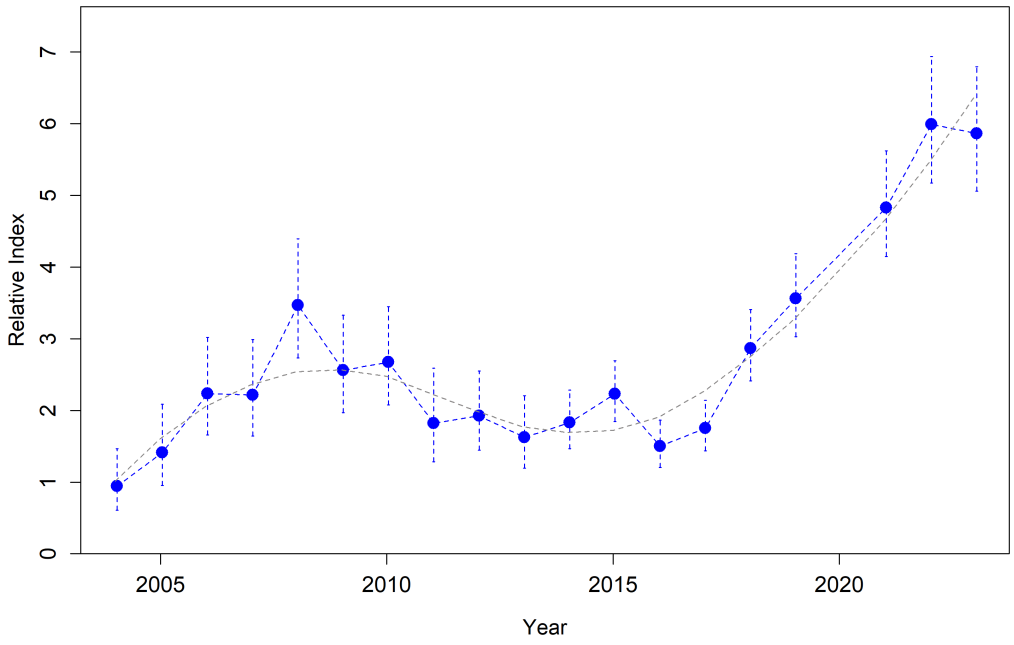

Figure 130: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for starry rockfish. The NWFSC HKL survey has an average of 52 positive sets per year the area south of Point Conception in California.

Stripetail rockfish

The most recent assessment of stripetail rockfish was a data-limited assessment conducted in 2010. Across available data, stripetail rockfish have been observed and sampled by recreational fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 139 positive tows per year.

Coastwide a total of 67 maturity samples have been collected and 67 read by researchers at the NWFSC.

Table 71: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for stripetail rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	776	0	0
California	NWFSC HKL	2	0	2
California	NWFSC WCGBT	41,014	0	8,326
California	Recreational	82	0	0
Oregon	Commercial	1,699	0	1,661
Oregon	NWFSC WCGBT	8,084	0	2,073
Washington	NWFSC WCGBT	1,667	0	564

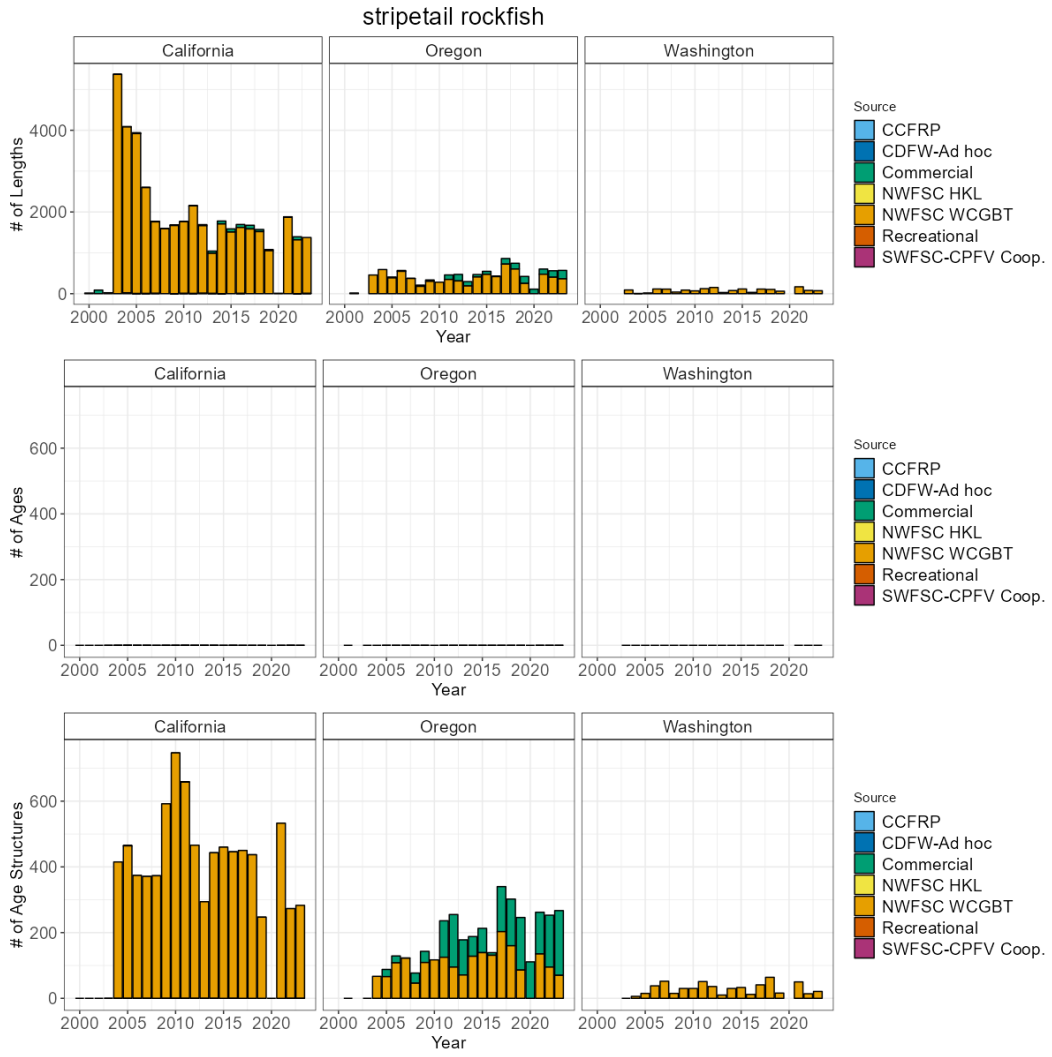

Figure 131: Total number of available lengths, read ages, and unread age structures by data source by year for stripetail rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

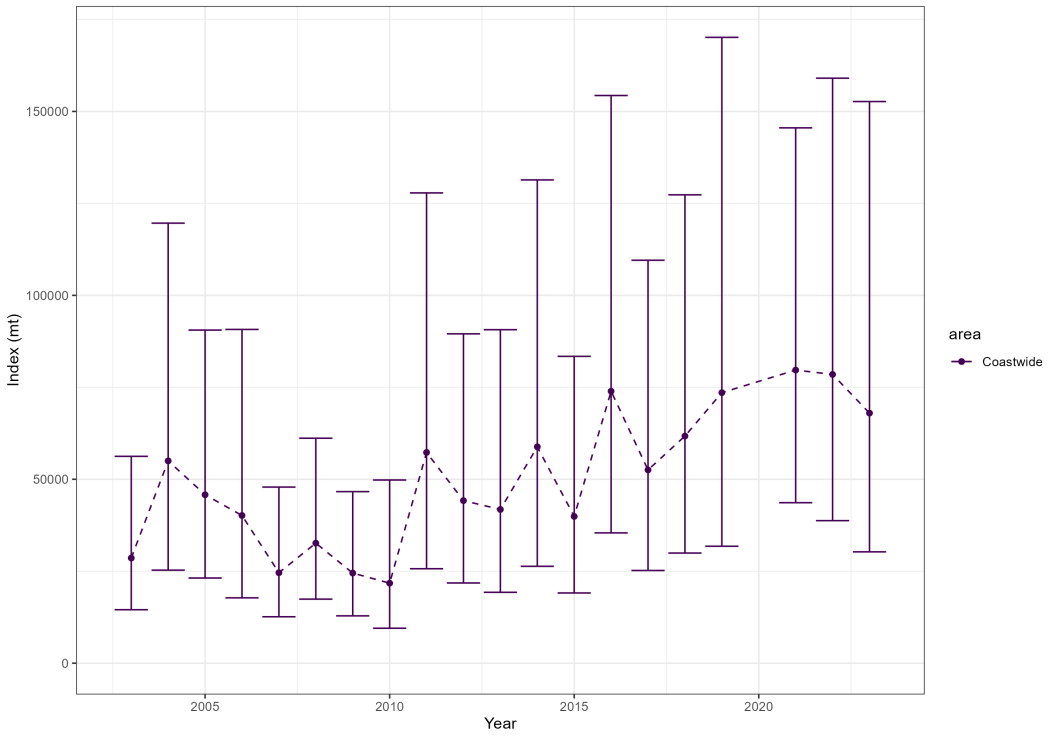

Figure 132: Estimated relative index of abundance from the NWFSC West Coast Groundfish Bottom Trawl survey for stripetail rockfish. The NWFSC WCGBT survey has an average of 139 positive tows per year.

Treefish

The most recent assessment of treefish was a data-limited assessment conducted in 2010. Across available data, treefish have been observed and sampled by both commercial and recreational fisheries.

Table 72: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for treefish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	685	NA	NA
California	CDFW-Ad hoc	0	0	10
California	Commercial	988	0	0
California	NWFSC HKL	8	0	4
California	NWFSC WCGBT	1	0	1
California	Recreational	11,087	0	0
California	SWFSC-CPFV Coop.	23	0	23

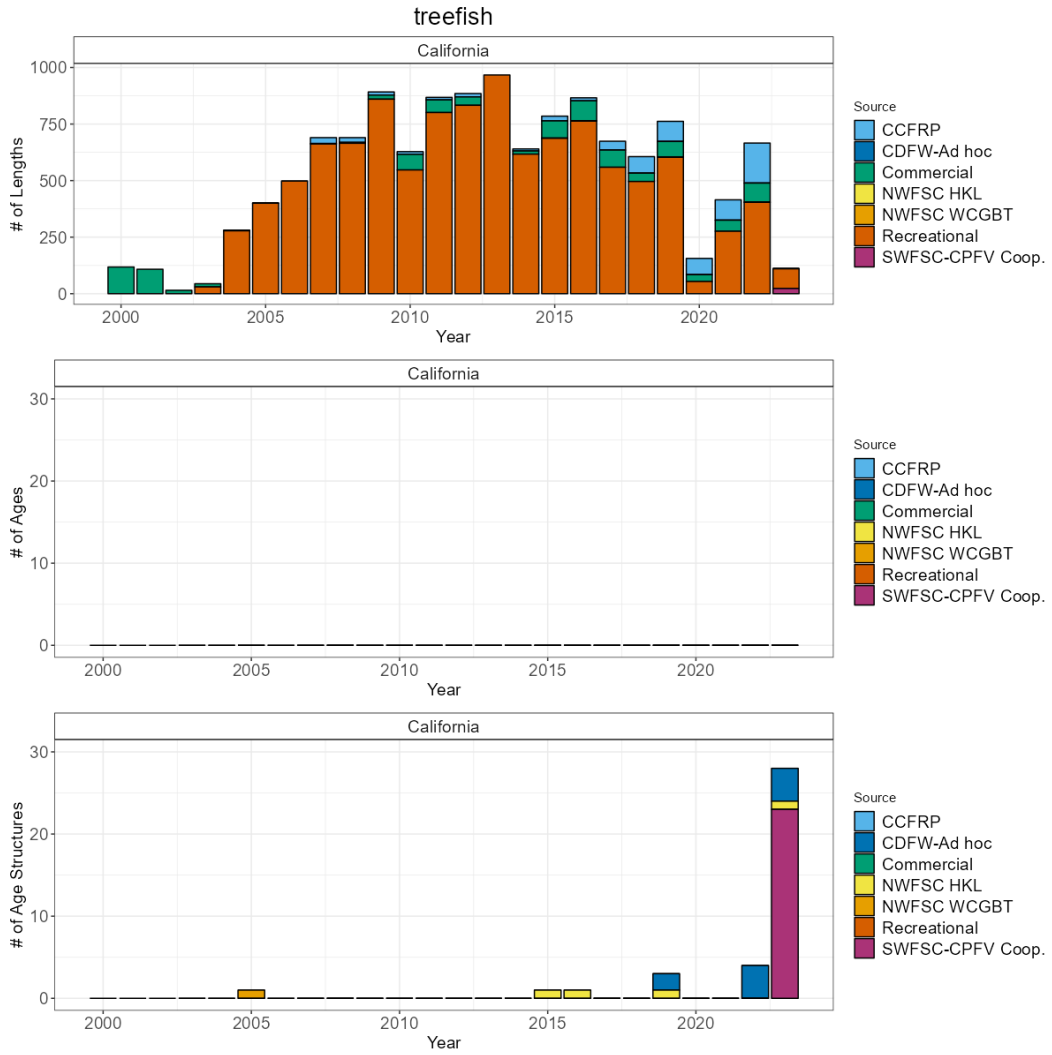

Figure 133: Total number of available lengths, read ages, and unread age structures by data source by year for treefish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

Vermilion and sunset rockfish

The most recent assessment of vermilion and sunset rockfish was a benchmark assessment conducted in 2021. Across available data, vermilion and sunset rockfish have been observed and sampled by both commercial and recreational fisheries and the NWFSC WCGBT and HKL surveys. The NWFSC WCGBT has a coastwide average of 12 positive tows per year. The NWFSC HKL survey has an average of 110 positive sets per year the area south of Point Conception in California.

Coastwide a total of 1643 maturity samples have been collected and 1139 read by researchers at the NWFSC.

Table 73: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for vermilion and sunset rockfish.

State	Source	Lengths	Ages	Age Structures
California	CCFRP	5,780	NA	NA
California	CDFW-Ad hoc	0	0	1,043
California	Commercial	8,030	0	775
California	NWFSC HKL	30,154	2,565	18,454
California	NWFSC WCGBT	3,354	1,754	638
California	Recreational	140,885	0	0
California	SWFSC-CPFV Coop.	432	0	432
Oregon	Commercial	2,783	1,121	1,184
Oregon	NWFSC WCGBT	2	2	0
Oregon	Recreational	14,490	1,315	1,165
Washington	Recreational	1,528	771	199

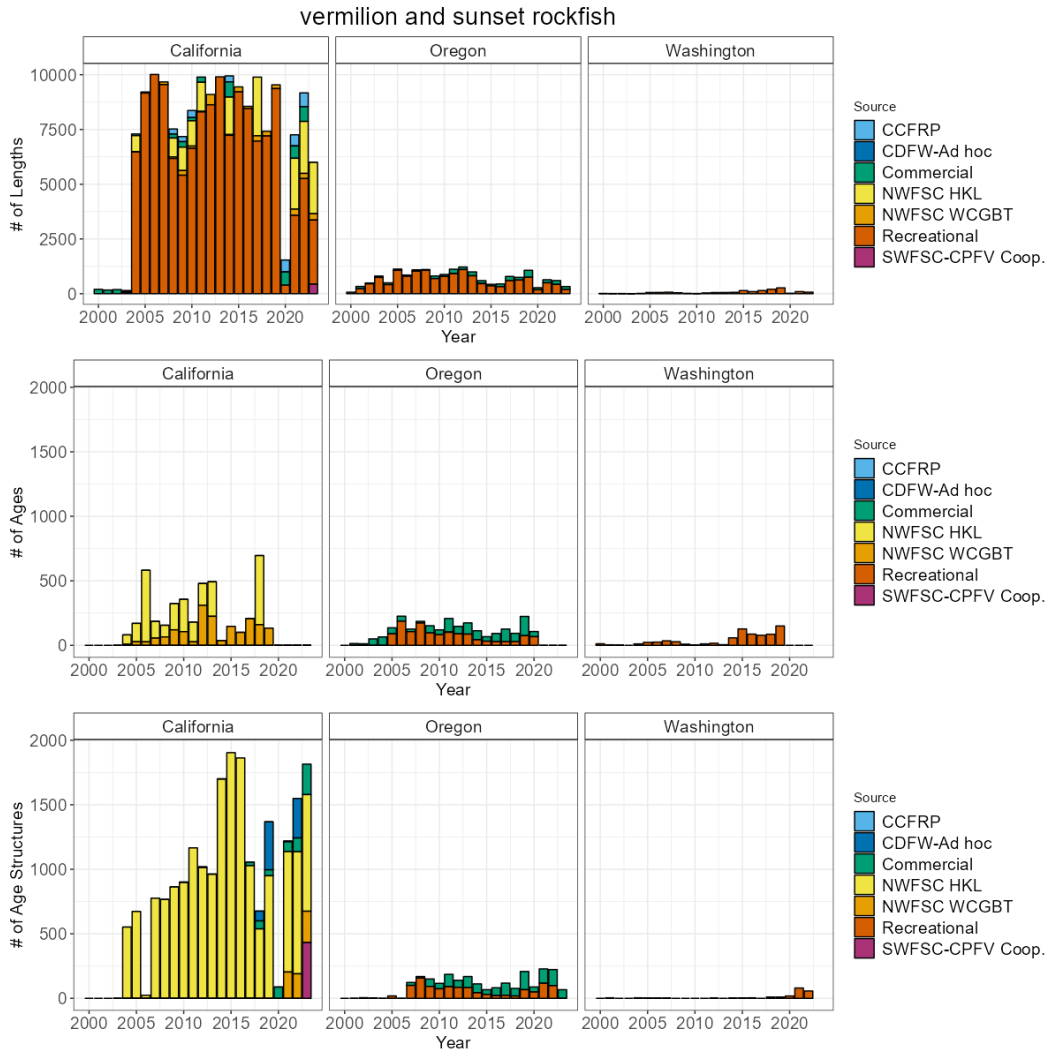

Figure 134: Total number of available lengths, read ages, and unread age structures by data source by year for vermilion and sunset rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

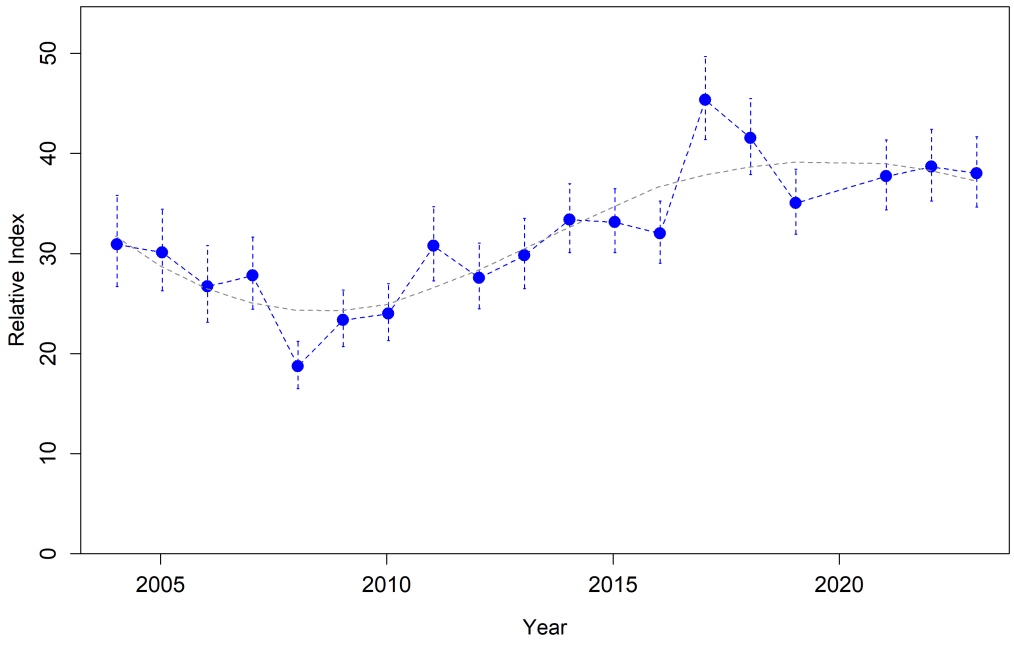

Figure 135: Index of abundance from the NWFSC Hook and Line survey from 2004-2023 (excluding 2020) for vermilion and sunset rockfish. The NWFSC HKL survey has an average of 110 positive sets per year the area south of Point Conception in California.

Yellowmouth rockfish

The most recent assessment of yellowmouth rockfish was a data-limited assessment conducted in 2010. Across available data, yellowmouth rockfish have been observed and sampled by commercial fisheries and the NWFSC WCGBT survey. The NWFSC WCGBT survey has an average of 2 positive tows per year.

Coastwide a total of 8 maturity samples have been collected and 0 read by researchers at the NWFSC.

Table 74: Total number of available lengths, read ages, and unread age structures by data source and state between 2000-2023 for yellowmouth rockfish.

State	Source	Lengths	Ages	Age Structures
California	Commercial	23	0	0
California	NWFSC WCGBT	1	0	1
Oregon	Commercial	2,856	0	2,840
Oregon	NWFSC WCGBT	530	0	261
Oregon	Recreational	49	0	0
Washington	Commercial	473	1	344
Washington	NWFSC WCGBT	52	0	52
Washington	Recreational	2	0	0

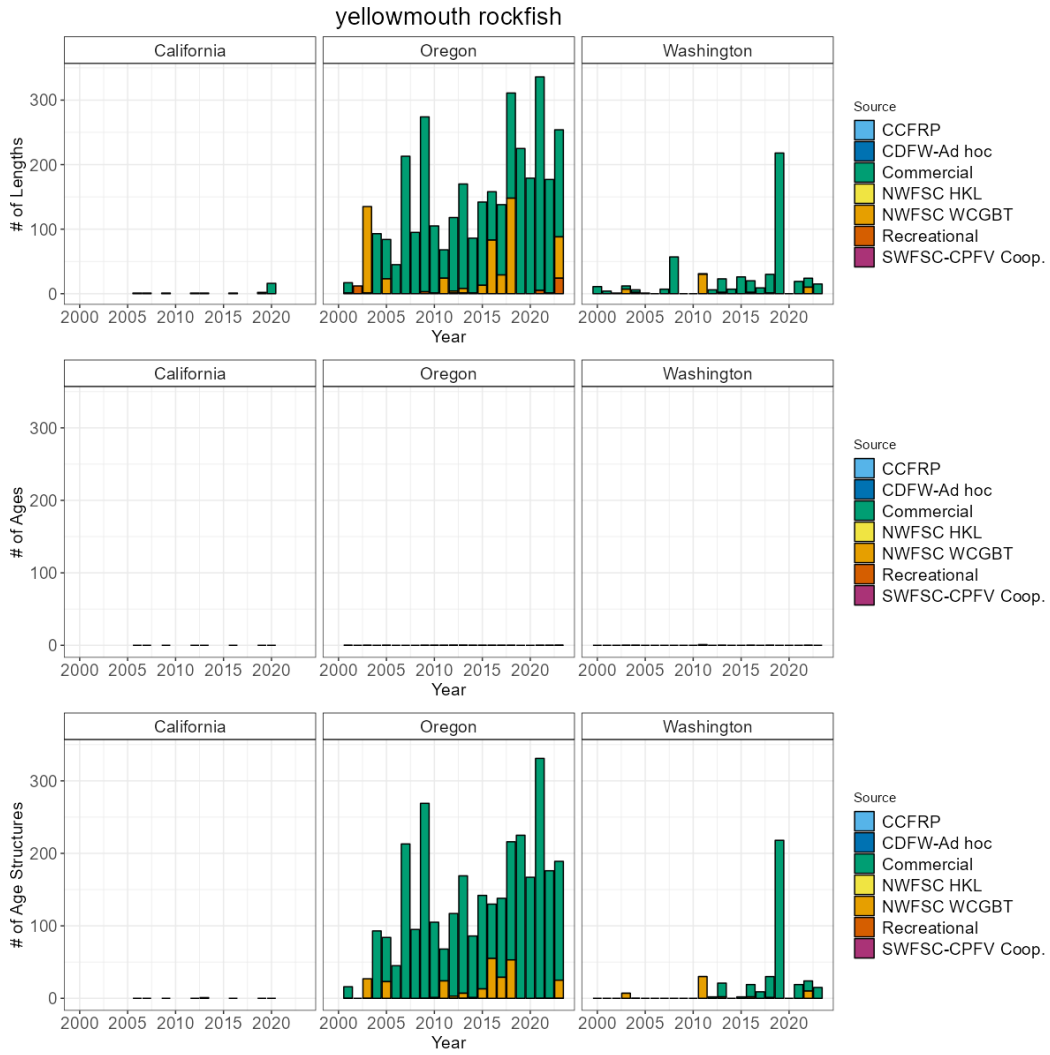

Figure 136: Total number of available lengths, read ages, and unread age structures by data source by year for yellowmouth rockfish. Note the y-axis is unique for the number of lengths plot row compared to the number of age and age structure plot rows.

4 Index Estimation for the NWFSC WCGBT Survey

Table 75: Setting used for estimating indices of abundance for the NWFSC WCGBT survey by species.

	species	family	formula	min depth	max depth	min latitude	max latitude	spatiotemporal1	spatiotemporal2
14	arrowtooth flounder	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-Inf	34.000	Inf	iid	iid
15	aurora rockfish	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-183	-Inf	-Inf	Inf	off	iid
16	big skate	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-500	-Inf	Inf	iid	iid
17	blackgill rockfish	delta_gamma()	catch_weight ~ 0 + fyear	-183	-850	35.000	Inf	off	off
18	bocaccio	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-500	-Inf	Inf	iid	iid
3	canary rockfish	delta_lognormal()	catch_weight ~ 0 + fyear + pass_scaled	-55	-275	-Inf	Inf	iid	off
4	canary rockfish	delta_lognormal()	catch_weight ~ 0 + fyear	-55	-366	37.000	Inf	iid	off
19	chilipepper	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-500	-Inf	Inf	iid	iid
20	curlfin sole	tweedie()	catch_weight ~ 0 + fyear + pass_scaled	-55	-450	-Inf	Inf	iid	iid
21	darkblotched rockfish	delta_lognormal()	catch_weight ~ 0 + fyear + pass_scaled	-55	-675	33.500	Inf	off	iid
22	Dover sole	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-Inf	-Inf	Inf	iid	iid
23	English sole	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-475	-Inf	Inf	iid	iid
24	flathead sole	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-450	41.000	Inf	iid	iid
25	greenspotted rockfish	delta_lognormal()	catch_weight ~ 0 + fyear	-55	-350	-Inf	Inf	iid	iid
26	greenstriped rockfish	delta_gamma()	catch_weight ~ 0 + fyear	-55	-675	-Inf	Inf	iid	iid
27	lingcod	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-450	40.167	Inf	iid	iid
28	lingcod	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-450	-Inf	40.1667	iid	iid
29	longnose skate	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-Inf	-Inf	Inf	iid	iid
30	longspine thornyhead	delta_lognormal()	catch_weight ~ 0 + fyear + pass_scaled + depth_scaled + depth_scaled_squared	-300	-Inf	-Inf	Inf	off	off

Table 75: Setting used for estimating indices of abundance for the NWFSC WCGBT survey by species. (*continued)*

	species	family	formula	min depth	max depth	min latitude	max latitude	spatiotemporal1	spatiotemporal2
31	Pacific cod	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-300	39.000	Inf	iid	iid
32	Pacific ocean perch	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-500	35.000	Inf	iid	iid
33	Pacific sanddab	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-500	-Inf	Inf	iid	off
34	Pacific spiny dogfish	delta_lognormal()	catch_weight ~ 0 + fyear + pass_scaled	-55	-700	-Inf	Inf	iid	iid
1	petrale sole	delta_lognormal()	catch_weight ~ 0 + fyear + pass_scaled	-55	-675	-Inf	Inf	iid	iid
35	redbanded rockfish	delta_gamma()	catch_weight ~ 0 + fyear	-55	-675	33.500	Inf	off	iid
5	rex sole	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-700	-Inf	Inf	iid	iid
6	rex sole	delta_lognormal()	catch_weight ~ 0 + fyear	-55	-500	-Inf	Inf	iid	iid
36	rosethorn rockfish	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-675	-Inf	Inf	iid	off
37	rougheye and blackspotted rockfish	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-875	33.500	Inf	iid	iid
13	sablefish	delta_lognormal()	catch_weight ~ 0 + fyear	-55	-Inf	-Inf	Inf	iid	iid
38	sharpchin rockfish	delta_lognormal()	catch_weight ~ 0 + fyear + pass_scaled	-55	-475	33.000	Inf	iid	off
7	shortspine thornyhead	delta_lognormal()	catch_weight ~ 0 + fyear + pass_scaled + depth_scaled + depth_scaled_squared	-55	-Inf	-Inf	Inf	iid	iid
8	shortspine thornyhead	delta_lognormal()	catch_weight ~ 0 + fyear + depth_scaled + depth_scaled_squared	-55	-Inf	-Inf	Inf	iid	iid
9	shortspine thornyhead	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-Inf	-Inf	Inf	off	iid
39	splitnose rockfish	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-700	-Inf	Inf	iid	off
40	stripetail rockfish	delta_gamma()	catch_weight ~ 0 + fyear	-55	-500	-Inf	Inf	off	iid
41	widow rockfish	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-675	33.500	Inf	off	off

Table 75: Setting used for estimating indices of abundance for the NWFSC WCGBT survey by species. (*continued)*

	species	family	formula	min depth	max depth	min latitude	max latitude	spatiotemporal1	spatiotemporal2
42	yelloweye rockfish	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-325	34.500	Inf	off	off
43	yellowtail rockfish	delta_gamma()	catch_weight ~ 0 + fyear + pass_scaled	-55	-425	40.167	Inf	off	iid

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