A review of biological samples collected from commercial groundfish fisheries in British Columbia, 1996–2022

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A REVIEW OF BIOLOGICAL SAMPLES COLLECTED FROM COMMERCIAL GROUNDFISH FISHERIES IN BRITISH COLUMBIA, 1996–2022

by

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CONTENTS

ABSTRACT

Walker, L.C., Rogers, L.A., Anderson, S.C., and Haggarty D.R. 2025. A review of biological samples collected from commercial groundfish fisheries in British Columbia, 1996–2022. Can. Tech. Rep. Fish. Aquat. Sci. 3722: vi + 148 p. https://doi.org/10.60825/ywpx-4051

Biological data collected from commercial fishing catches are an important component of fisheries stock assessments. In Canada's Pacific Region, these data have been collected by the At-Sea Observer Program (ASOP), dockside sampling programs, and special projects. However, during the COVID-19 pandemic, the ASOP was paused, and it has not been reintroduced, profoundly affecting the type and quantity of data collected from commercial fishing catches. This report was developed to provide an overview of data collection and availability from 1996 to 2022 for major BC groundfish species of commercial and conservation interest. The data were presented at a coastwide scale and also by finer Pacific Marine Fisheries Commission (PMFC) areas so that spatial and temporal trends in British Columbia could be identified. The goals of the report were to (1) summarize available data collected on commercial fishing vessels and (2) represent the temporal and spatial trends of the biological data by groundfish species. This report highlights which data are no longer being collected and can guide decisions on future sampling programs, data collection, and resource allocation.

RÉSUMÉ

Walker, L.C., Rogers, L.A., Anderson, S.C., and Haggarty D.R. 2025. A review of biological samples collected from commercial groundfish fisheries in British Columbia, 1996–2022. Can. Tech. Rep. Fish. Aquat. Sci. 3722: vi + 148 p. https://doi.org/10.60825/ywpx-4051

Les données biologiques recueillies dans les prises de la pêche commerciale constituent un élément important de l'évaluation des stocks de poissons. Dans la région du Pacifique au Canada, ces données ont été recueillies dans le cadre du Programme des observateurs en mer (POM), des programmes de vérification à quai et de projets spéciaux. Cependant, la pandémie de COVID-19 a mené à l'interruption du POM, qui n'a d'ailleurs pas encore été remis en œuvre, ce qui a pour effet d'affecter de manière importante le type et la quantité de données recueillies dans les prises de la pêche commerciale. Ce rapport a été rédigé dans le but de donner un aperçu de la cueillette et de la disponibilité des données de 1996 à 2022 pour les principales espèces de poissons de fond d'intérêt sur le plan commercial et sur le plan de la conservation en Colombie-Britannique. On a présenté les données à l'échelle de la côte et par zones de la Commission des pêches maritimes du Pacifique (CPMP) à plus petite échelle afin de déterminer les tendances spatiales et temporelles en Colombie-Britannique. Les objectifs du rapport étaient de 1) résumer les données disponibles recueillies sur les navires de pêche commerciale et 2) représenter les tendances temporelles et spatiales des données biologiques par espèce de poisson de fond. Ce rapport met en évidence les données qui ne sont plus recueillies et peut aider à orienter les décisions relatives aux futurs programmes de surveillance, à la cueillette de données et à l'affectation des ressources.

1 Species Index by Common Name

2 Introduction

Biological specimen data collected from commercial fishing catches are an important component of fisheries stock assessments. In Canada's Pacific groundfish fisheries, biological data have been collected by the At-Sea Observer Program (ASOP), dockside sampling programs, and special projects (Davis 2008). Biological specimen data are also collected from Fisheries and Oceans Canada (DFO) research surveys and other non-commercial programs (e.g., the International Pacific Halibut Commission Fishery-Independent Setline Survey—IPHC FISS), but these data and programs are outside the scope of this project. For the most recent data synopsis of research surveys, see Anderson and Dunic (2025).

Canada's Pacific commercial groundfish fisheries comprise seven distinct commercial sector groups: Groundfish Trawl[1], Halibut, Sablefish, Inside Rockfish, Outside Rockfish, Lingcod, and Dogfish (DFO 2024a). These sectors vary by gear type, licensing, and management (Davis 2008; DFO 2019a, 2024a). Groundfish trawl vessels may fish under an Option "A" or "B" groundfish trawl license. Option "A" groundfish trawl vessels are permitted to midwater trawl coastwide and bottom trawl in all areas except Area 4B. Option "B" groundfish trawl vessels are permitted to bottom trawl only and are restricted to Area 4B (DFO 2019a, 2024a). The other six sectors are licensed separately; gear types include longline, trap, troll, and handline. Since fisheries integration in 2006, these sectors have allowed for the reallocation of quota between vessels and fisheries to accommodate catch of non-target species (DFO 2006).

Biological data are collected at several stages of sampling and processing. A *sample* typically includes all or part of the catch taken in a sampling event from a fishing set. Individual fish in the sample are called *specimens*, which are commonly measured for length and weight, assessed for sex and maturity status, and dissected to remove and store age structures. Age structures are processed into age data by request and usually proceed as needed for stock assessments to conserve limited resources at the Sclerochronology Lab (SCL). In some cases, specimens also have tissue samples collected for genetic analysis.

The ASOP began in 1996, instituted by DFO to strengthen stock assessments, provide a means of area-specific management, and effectively monitor catch and discards of non-target species (DFO 1996). The program was operated by Archipelago Marine Research Ltd. (AMR), which was originally under contract with DFO and the commercial groundfish fishing industry until industry took over the full cost of the program in 2012. Under this program, most commercial bottom trawl fishing vessels were required to fund a trained (DFO-certified), independent on-board observer to maintain an independent fishing log, record catch and discards, and collect biological specimen data (DFO 1996). Biological specimen data collected by the ASOP could include specimen length, sex, maturity status, and age structure or genetic tissue extraction and storage. Specimen weights were rarely collected at sea, and only by handheld scale. The program also collected sample-level data, such as fishing event start and end times, spatial data, and catch weights.

From 1996 to 2019, bottom trawl vessels participating under license Option "A" were subject to mandatory 100% observer coverage for all vessels. Option "A" vessels midwater trawling for

[1] Includes the Pacific Hake midwater trawl fishery: domestic freezer trawler and shoreside, observed Joint-Venture, and foreign (excluding US)

Pacific Hake, and in some years Walleye Pollock, were initially excluded from this requirement; however, partial coverage by the ASOP was required beginning in 2002 (DFO 1996, 2002a). From 1996 to 2006, Option "B" bottom trawl vessels were subject to partial observer coverage (~5–10% of total sea days), but from 2007 to 2019, they were subject to mandatory 100% observer coverage (DFO 1996, 2006, 2007). The six line fishery sectors were also initially exempt from carrying at-sea observers 100% of the time, although the partial coverage requirements varied between ~1–11% of sea days, fleet dependent, between 1999 and 2005 (DFO 1999a, 2002b, 2005). In 2006, 100% observer coverage was required for vessels in the line fishery sectors, but this could be met by way of either an at-sea observer or the use of an electric monitoring (EM) system. During the COVID-19 pandemic, the ASOP was paused and has not been reintroduced. The resulting shift to strictly EM has profoundly affected the type and quantity of data collected from commercial fisheries (DFO 2024a).

Electronic Monitoring was introduced in the line fisheries in 2006. EM systems include CCTV cameras, a control centre, GPS, winch and hydraulic sensors. EM records visual footage of all fishing operations, providing a means of auditing all fish caught (retained and discarded), by trip and set (DFO 2006; Stanley et al. 2015). Due to the difficulty of identifying rockfish species in imagery, and given that most rockfish die during capture, 100% retention of rockfish is required for identification by the Dockside Monitoring Program (DMP). EM can also be used to audit spatial data and the timing of gear deployment or retrieval. However, except for Sablefish[2], systems to collect biological specimen samples at sea have not been developed (Stanley et al. 2015).

DFO dockside sampling programs also collected biological specimen data from commercial fishing catches, which could include specimen length, weight, sex, maturity status, and age structure or genetic tissue extraction and storage. Dockside biological sampling of the Pacific groundfish fisheries began in the late 1950s. Dockside sampling occurred in Prince Rupert and Vancouver until the programs ended in 2010 and 2017, respectively. Sampling also occurred on the west coast of Vancouver Island for Pacific Hake and Walleye Pollock only. A pilot project to collect dockside biological samples from the trawl fishery began in 2023, but those data are not included in this report. Note that the dockside sampling program is separate from the DMP, which validates catch landing weights (DFO 2024a).

Commercial data were also collected during special projects for a few groundfish species. These special projects were studies completed jointly by DFO with industry participation. For example, two special projects on Yelloweye Rockfish took place in 1997 and 1998 (Yamanaka et al. 2000; Kronlund and Yamanaka 2001). Data from special projects are also available from before 1996. For example, a study on two Pacific Ocean Perch stocks occurred from 1980 to 1993 (Leaman and Stanley 1993).

This report was developed to provide an overview of available biological specimen data collected on commercial groundfish fishing vessels from 1996 to 2022 for major BC groundfish species with commercial catch quota and conservation interest. While biological data are available before

[2]Sablefish trap and hook and line fisheries have been sampled by a voluntary commercial catch sampling program since 1995 (Haist et al. 2001). Under the voluntary program, samples are collected and frozen at sea by a fishing crew and brought back to shore for biological sampling. Before 2018, samples of whole fish were frozen. Starting in 2018, a head-only sampling program was initiated (Lacko et al. 2023). More details in Section 5.

1996, we focus on this time period with the aim of supporting decision-making around future commercial sampling programs and, in particular, sampling to replace the ASOP that began in 1996. We only reported on species with commercial catch quota because these species are commercially important and require biological data for stock assessment and management purposes. The data are presented by year at a coastwide scale and also by finer Pacific States Marine Fisheries Commission (PMFC) areas (Figure 1) so that spatial and temporal trends can be identified. A thorough review of the sampling programs is out of the scope of this project.

How a sample of fish is collected from a fishing set can influence how the specimen data are used. Unsorted samples correspond to a random or total collection from the full catch. By contrast, sorted samples correspond to a selective collection or a collection from a selected portion of the catch (e.g., a sample from the retained fish only). Consequently, unsorted samples are valued as more closely approximating unbiased random samples of catch, while sorted samples may need to be modelled to account for expected sampling bias.

Biological data demands have changed over time to support changing assessment and research needs. While specimen data from sorted samples were commonly used in stock assessments before the mid-1990s, unsorted aged specimen data are more commonly sought for integrated age-structured assessments now. Spatially explicit latitude and longitude records are increasingly needed for spatiotemporal standardization of composition data and research on spatial patterns in body condition and growth (Frid et al. 2016; Thorson and Haltuch 2019; Lindmark et al. 2023; English et al. 2025). Efforts have been made to improve data quality to meet changing needs (DFO 1996, 2006) and to reevaluate lesser-used data from the past. Several recent rockfish assessments have made use of sorted data after determining a negligible difference in size distribution between unsorted and sorted samples in some cases (Starr and Haigh 2022a, 2022b, 2023), and other assessments have used retention curves to reconcile differences where they occur (Taylor et al. 2023).

The groundfish commercial biosampling report was modelled after the groundfish data synopsis (Anderson et al. 2019; Anderson and Dunic 2025). The process for creating the report is automated so that it can be updated periodically and reproducibly. The process pulls data from government databases to generate figures before assembling the report. The figures are displayed by species and follow standardized layouts, similar to the groundfish data synopsis report. The main figures of this report are presented in four-page, species-by-species subsections that visually synthesize the available commercial data for each species. The report covers 29 groundfish species that have commercial catch quota. However, three quota species—China Rockfish (*Sebastes nebulosus*), Copper Rockfish (*Sebastes caurinus*), and Tiger Rockfish (*Sebastes nigrocinctus*)—had little to no data. Consequently, they were not included because the lack of data is already illustrated in the groundfish data synopsis (Anderson and Dunic 2025).

The data were pulled from Groundfish databases using the R package gfdata (Anderson et al. 2019; Keppel et al. 2022). The commercial catch data were pulled from the `GF_MERGED_CATCH` table in the GFFOS database using the `gfdata::get_catch()` function. The commercial specimen data were pulled from tables in the GFBioSQL database using the `gfdata::get_commercial_samples()` function. Details of the data extraction process can be found in Appendix A.

Each set of pages for a single species is laid out in the same format. The page layout begins with details and relevant publications about the species. The figures are laid out such that the

first page shows the amount of catch and number of specimens. The second page compares counts of unsorted and sorted commercial specimens. The third page illustrates the temporal representativeness of sampling. The fourth page shows age and length frequency data. Detailed figure captions are included in Section 3. The figures display the data separated by PMFC areas and year (Figure 1). The details on the figures are small and intended to be viewed on screen under magnification rather than in a printed format.

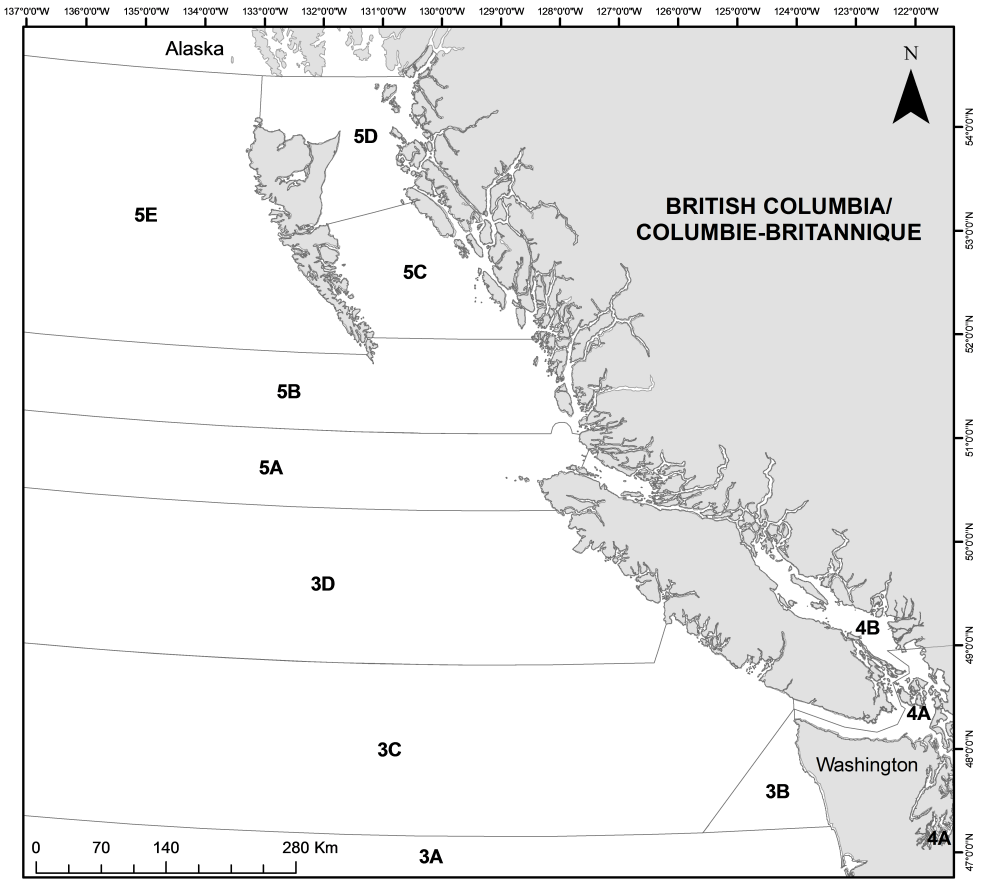


Figure 1. Map of PMFC areas 5AB (Queen Charlotte Sound), 5CD (Hecate Strait), 5E (West Coast Haida Gwaii), 3CD (West Coast Vancouver Island), and 4B (Strait of Georgia). These are close, but not identical, to similarly named Groundfish Management Unit areas. Areas 3AB and 4A are outside of Canadian waters.

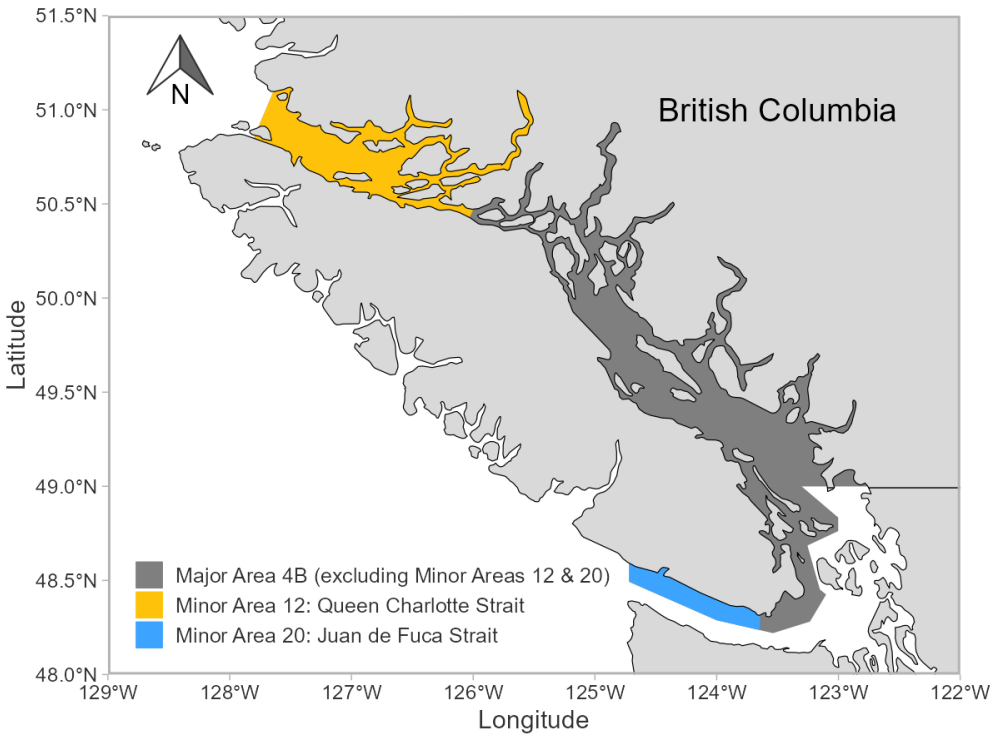


Figure 2. Map of Minor Areas 12 (Queen Charlotte Strait) and 20 (Juan de Fuca Strait) within PMFC Area 4B. Some species were either not found or had fishing closures in the Strait of Georgia (dark grey region), but had a small amount of catch or specimens collected in Area 4B. In these cases, the catch or specimens usually came from Minor Areas 12 and 20.

3 Plot Descriptions

This section provides captions for each of the visualizations that form the species-by-species pages. Pacific Ocean Perch is used as an example species for all plots.

3.1 Commercial catch and specimen counts

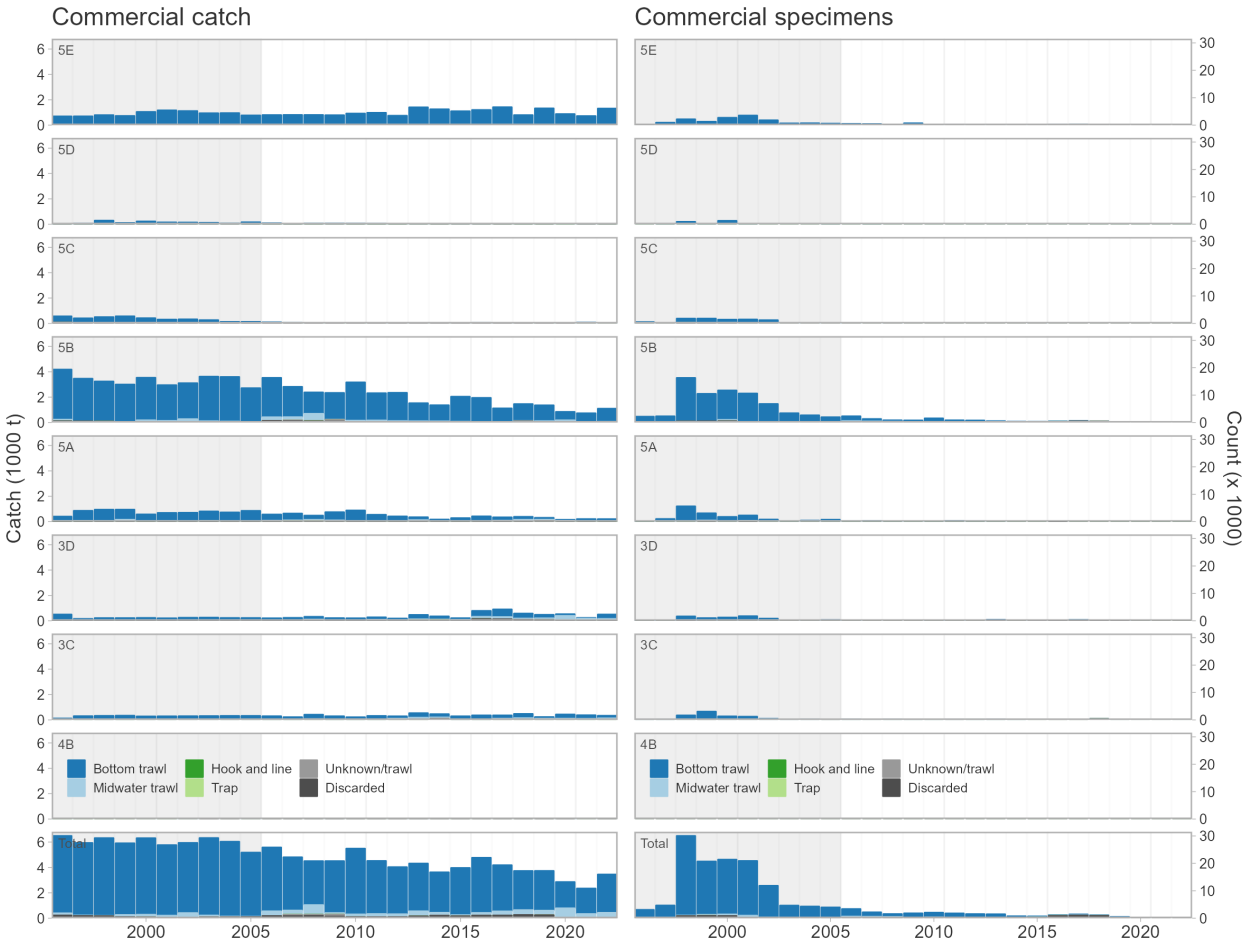


Figure 3. Example commercial fishery catch and specimens plots for Pacific Ocean Perch. The commercial catch weight is calculated as the summed weight (tonnes or kilotonnes) of landings aggregated by year, and the commercial specimens count is calculated as the sum of individual specimens (count) collected by year. Catch from various gear types is indicated by colour. Discards include reported discard weights from all fisheries (gear types) combined; however, trap, hook and line, midwater trawl, and Strait of Georgia bottom trawl discards are less reliable prior to fisheries integration in 2006 and are therefore not included. Years before 2006 are shaded grey to indicate that non-trawl catch data are considered less reliable than modern data: an electronic monitoring program was implemented for non-trawl sectors in 2006.

3.2 Commercial specimen counts by type

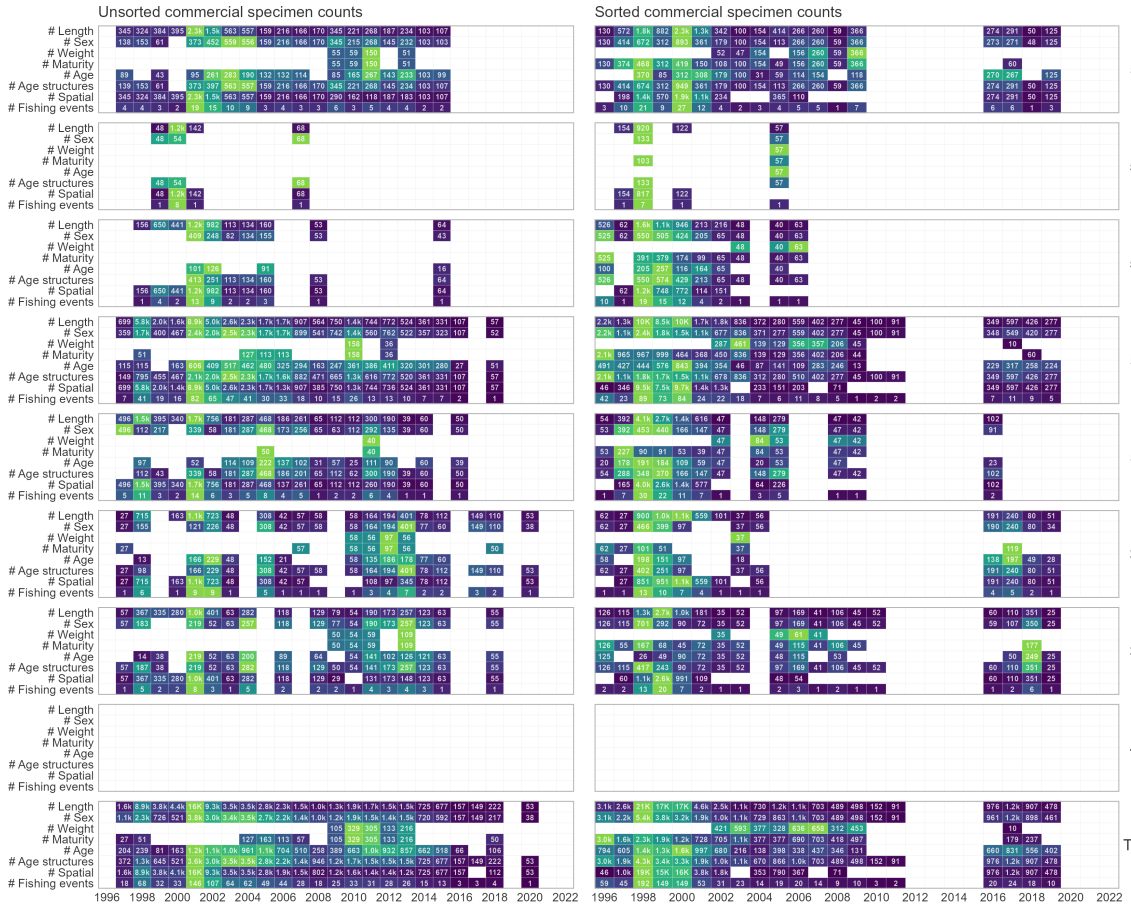


Figure 4. Example specimen-availability plot for Pacific Ocean Perch. This plot displays the number of individual fish for which the following biological data are available: length, sex, weight, maturity status, age, age structures, and spatial data, and, in addition, the number of fishing events. Here, the number of lengths serves as a proxy for the total number of specimens. Age structures refers to age structures that have been collected and stored, but have not necessarily been aged. Age means that the age has been assessed from the ageing structure. For a specimen to have spatial data, it must have complete latitude and longitude data for either the start or the end of the tow/set, or both. Data are separated by sampling description (unsorted or sorted), by year (horizontal axis), and by major management area (vertical axis panels). For sorted samples, specimen data were collected after the fish had been sorted as a keeper or discard. The number of specimens for a particular measurement or sample in a particular area-year combination are displayed rounded to two significant figures when greater than 1000. Cell colour reflects the (unrounded) number of available specimens with a particular measurement or sample, relative to other years. Light colours indicate a high quantity of specimens, while dark colours indicate a low quantity. Blank panels indicate year-measurement combinations without any data.

3.3 Representativeness (unsorted) plot

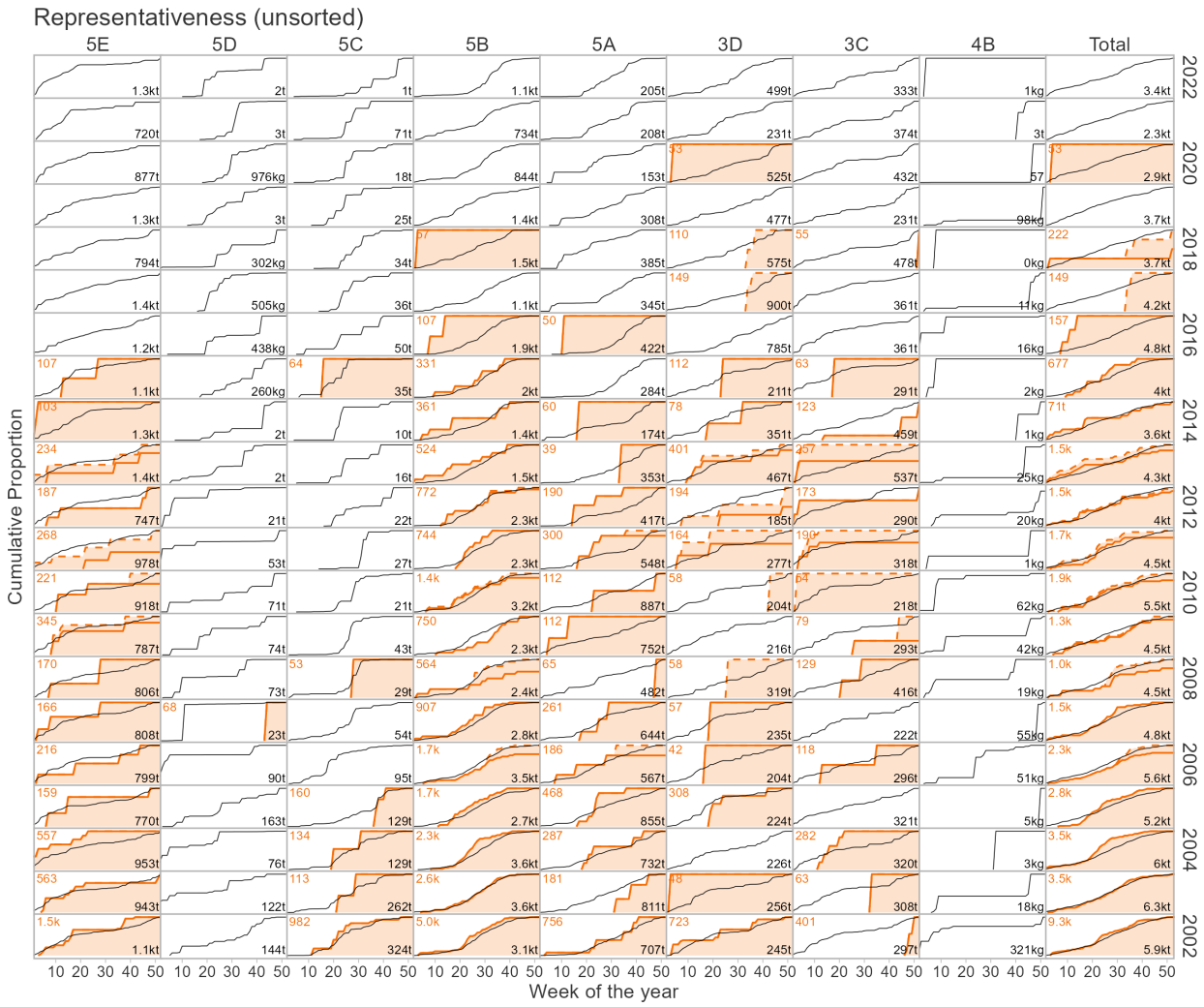


Figure 5. Example representativeness plot for Pacific Ocean Perch. This plot shows the cumulative proportion of commercial biological specimens from unsorted samples (orange line) and catch (black line) by week of year (horizontal-axis) for management areas (columns) and years (rows) to give a qualitative indicator of sampling representativeness. Sampling is considered more temporally representative of catch when cumulative specimen and catch profiles are more closely aligned. The dashed orange line with orange shading underneath shows the cumulative proportion of all unsorted specimens, while the solid orange line depicts the cumulative proportion of unsorted specimens with spatially explicit data. The total number of unsorted specimens collected is shown in the top left corner for each panel (orange count), while the total landed catch weight is shown in the bottom right corner for each panel (black count). The units for total landed weight are in kilograms (kg), tonnes (t), or kilotonnes (1 kt = 1000 t). Note, we show only the years 2002–2022 for this example figure.

3.4 Age composition data

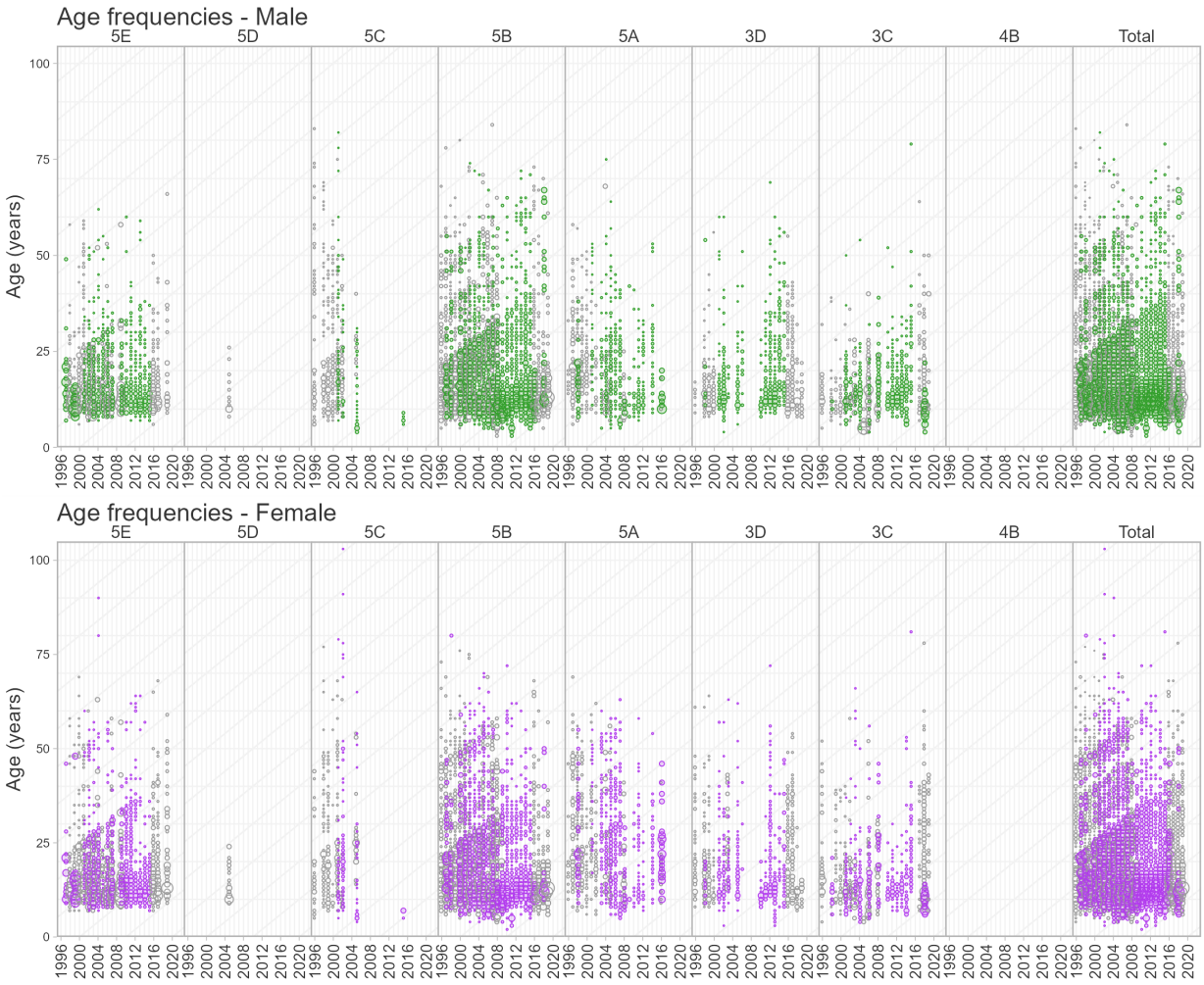


Figure 6. Example age-frequency plot for Pacific Ocean Perch. Male age frequencies are shown in the top panel (green: unsorted; grey: sorted) and female age frequencies in the bottom panel (purple: unsorted; grey: sorted). Circle area indicates the relative abundance of fish of a particular age (vertical axis) in a given year (horizontal axis). Diagonal lines are shown at five-year intervals to facilitate tracing cohorts through time.

3.5 Length composition data (unsorted)

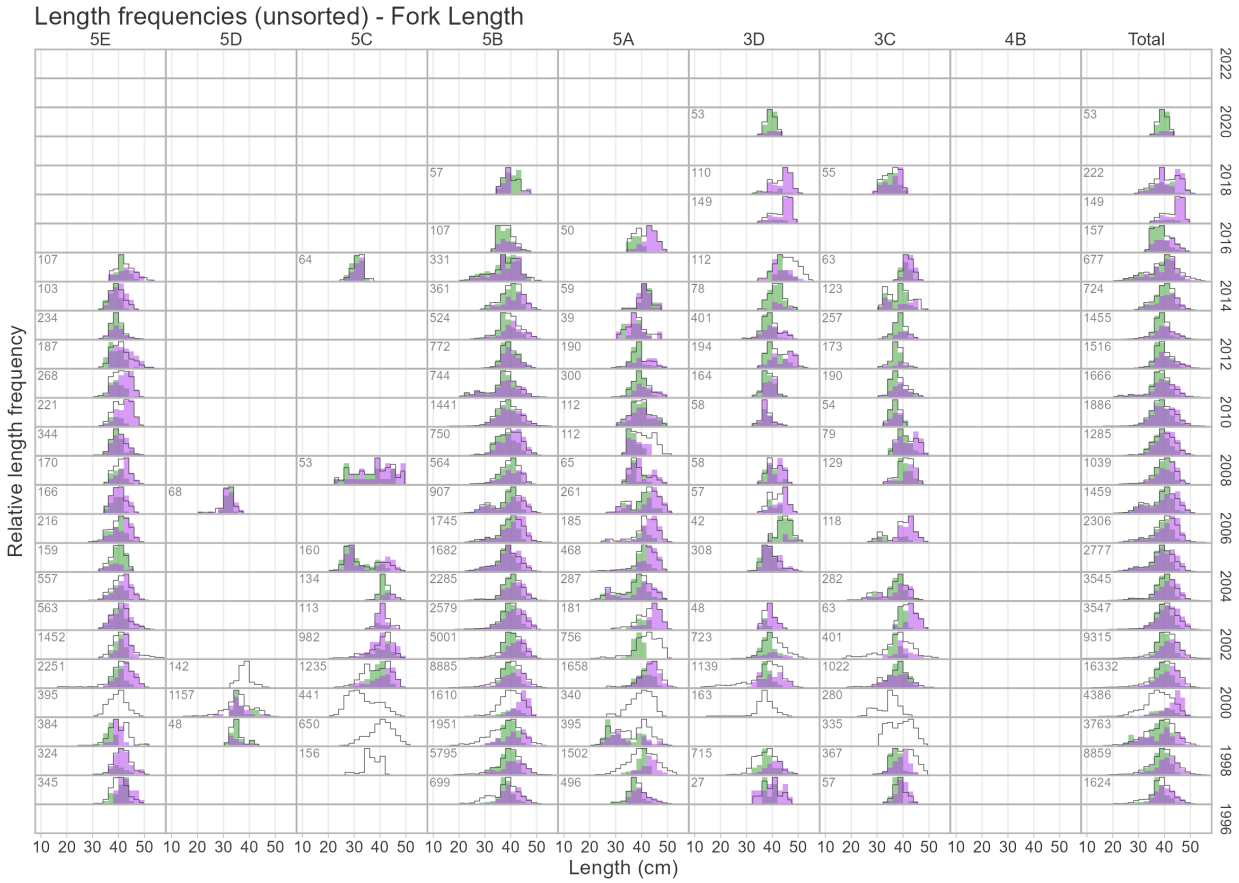


Figure 7. Example length-frequency histogram for unsorted specimens of Pacific Ocean Perch. The bars represent relative length frequency (purple: female; green: male), while the histogram outline represents total relative length frequency of unsorted specimens (black line: female, male, and unsexed). The total number of unsorted specimens (male and female, excluding unsexed) measured for a given area (columns) and year (rows) are indicated in the top left and right corner of each panel, in grey. The dominant length type is indicated in the figure title. If a species has length measurements in more than one length type and the non-dominant length type measurements are less than 1% of the total specimens, the non-dominant length type are not included in the histogram. For the few species where the non-dominant length type measurements are more than 1% of the total specimens, we replaced the age-frequency plot with a second length-frequency plot, as there were no age samples for those species.

4 Results

This section contains the species-by-species data visualizations. Each species is shown on four pages with similar layout used throughout. See Section 3 for detailed figure captions, including information on interpretation of the figures. In addition to the figures, we also provide the scientific name, taxonomic details, DFO species code (commonly the page number in Hart et al. 1988), a link to the FishBase and WoRMS (World Register of Marine Species) web pages, details of the most recent DFO Research Documents and Science Advisory Reports, and information or publications related to designations by the COSEWIC[3] and listings under the SARA[4] (if applicable). We also provide a short narrative of the major trends apparent for each species. The species are ordered according to DFO species codes. Section 1 provides links to the pages sorted alphabetically by common name.

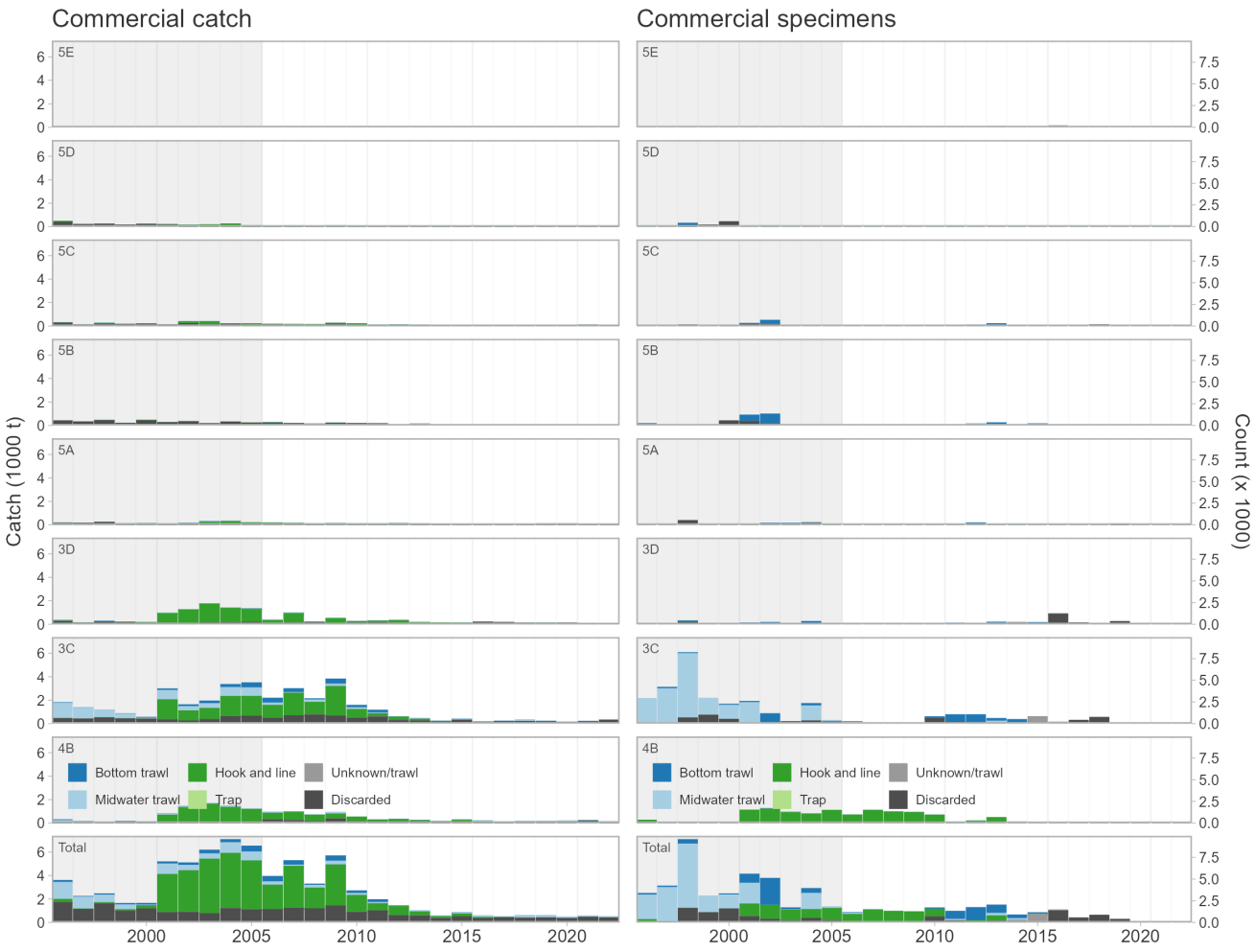
[3] Committee on the Status of Endangered Wildlife in Canada

[4] *Species at Risk Act*

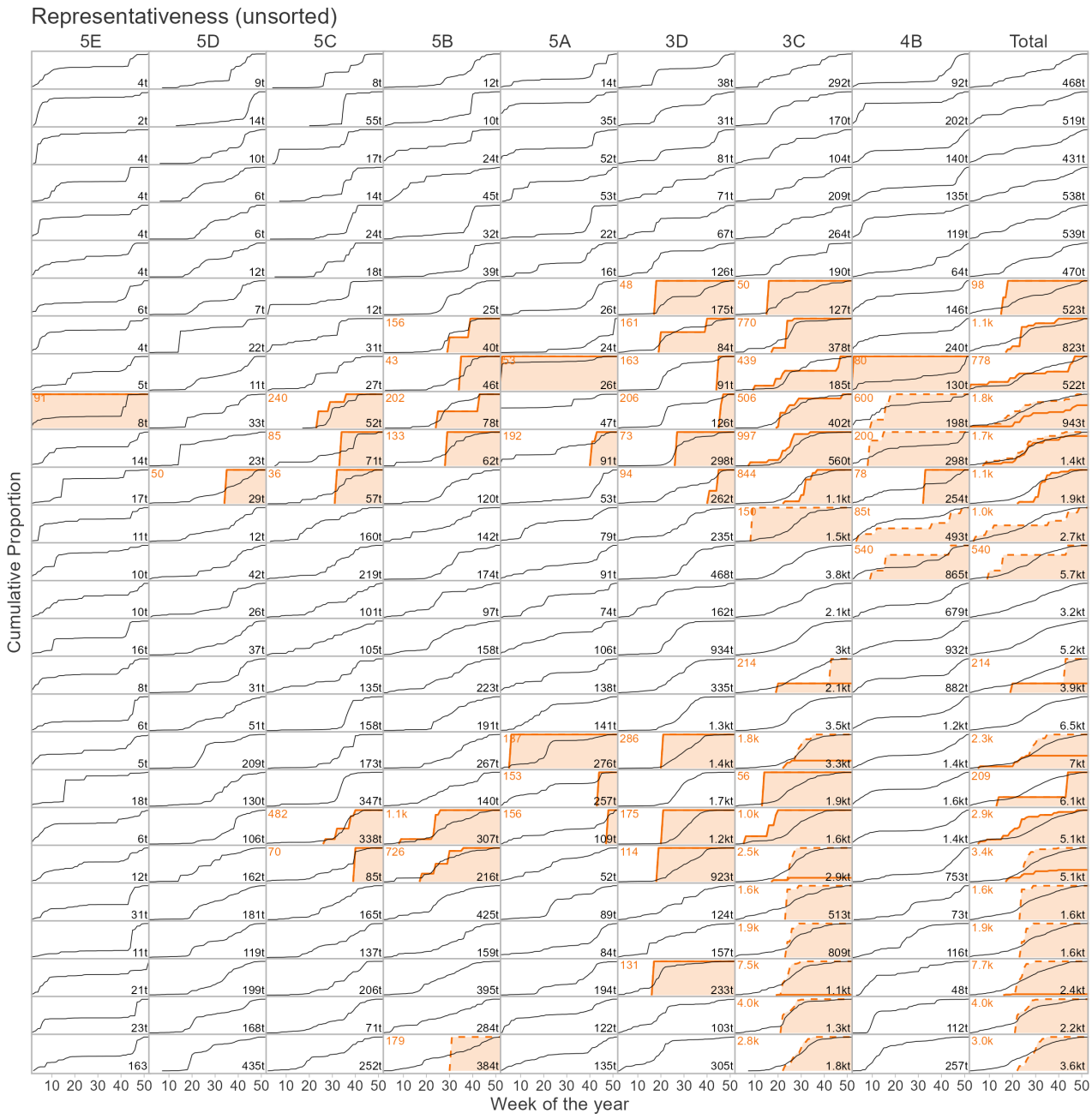
4.1 Pacific Spiny Dogfish

Squalus suckleyi (44)
Order: Squaliformes, Family: Squalidae, FishBase, WoRMS
Last Research Document: Galluci et al. (2011)
Last Science Advisory Report: DFO (2010)
COSEWIC Status Report: COSEWIC (2011)
COSEWIC Status: Special Concern

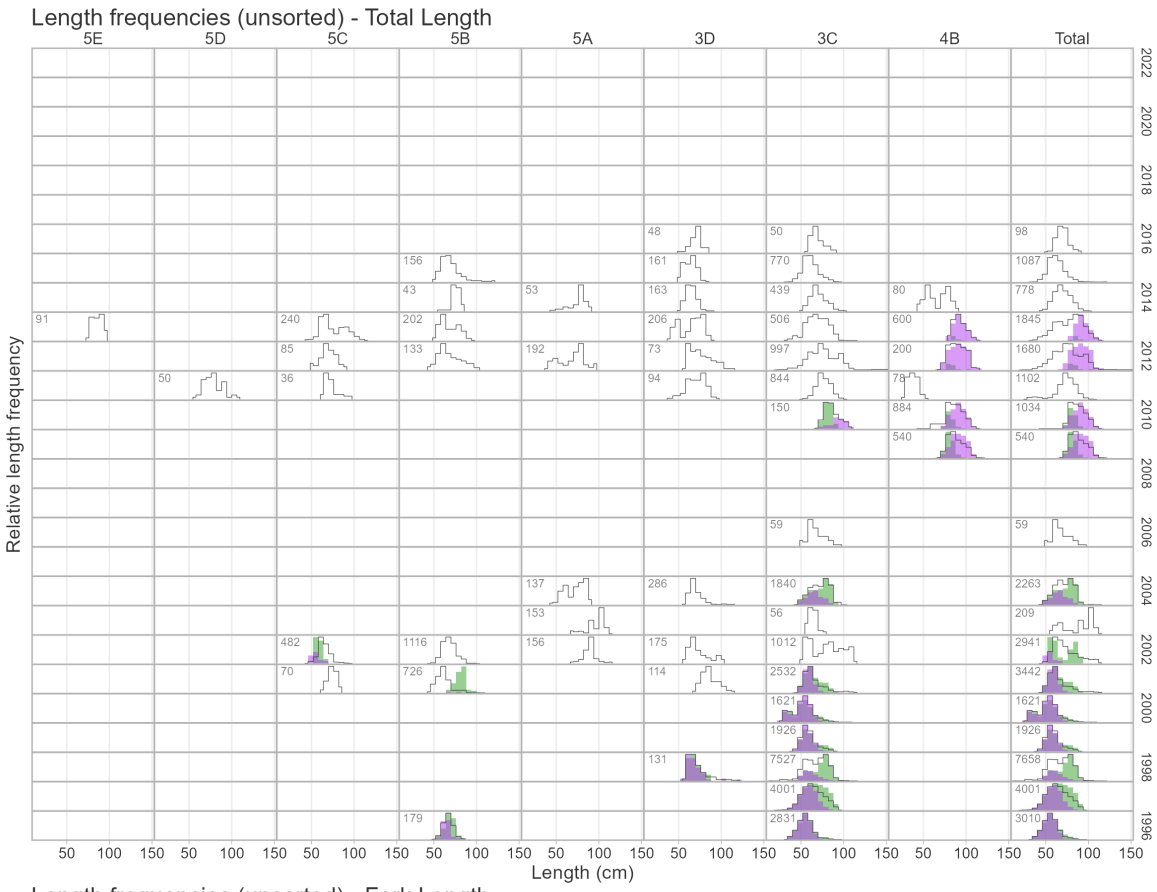
Pacific Spiny Dogfish were caught mostly by hook and line, but were also caught by bottom and midwater trawl. They were caught more commonly in the southern regions (Areas 3CD and 4B). The catch peaked in 2004, then declined on average until 2014, with minor peaks in 2007 and 2009. Increased hook and line catches in the early 2000s could be due to an effort transfer from the salmon fishery with the introduction of the Pacific Fisheries Adjustment and Restructuring (PFAR) program of the late 1990s (DFO 2012a). Specimen collection was highest in Area 3C and peaked in 1998. Unsorted specimen collection occurred from 1996 to 2016, lacking data in 2005, 2007, and 2008. Sorted specimen collection occurred from 1996 to 2019, lacking data in 1997, 2012, and 2015. Roughly a third of the unsorted specimens had latitude and longitude data. Cumulative total sampling matched cumulative total catch in a few years (2012–2014) with biological sampling. Between 1996 and 2022, 35,449 unsorted specimens were collected, and of these, 320 (<1%) had age structures, but none have been aged. All unsorted specimens had lengths; of these, 21,934 (62%) were sexed, but none had weights. Since there were no age data to plot, the age frequency plot was replaced by a second length-frequency plot for fork lengths.

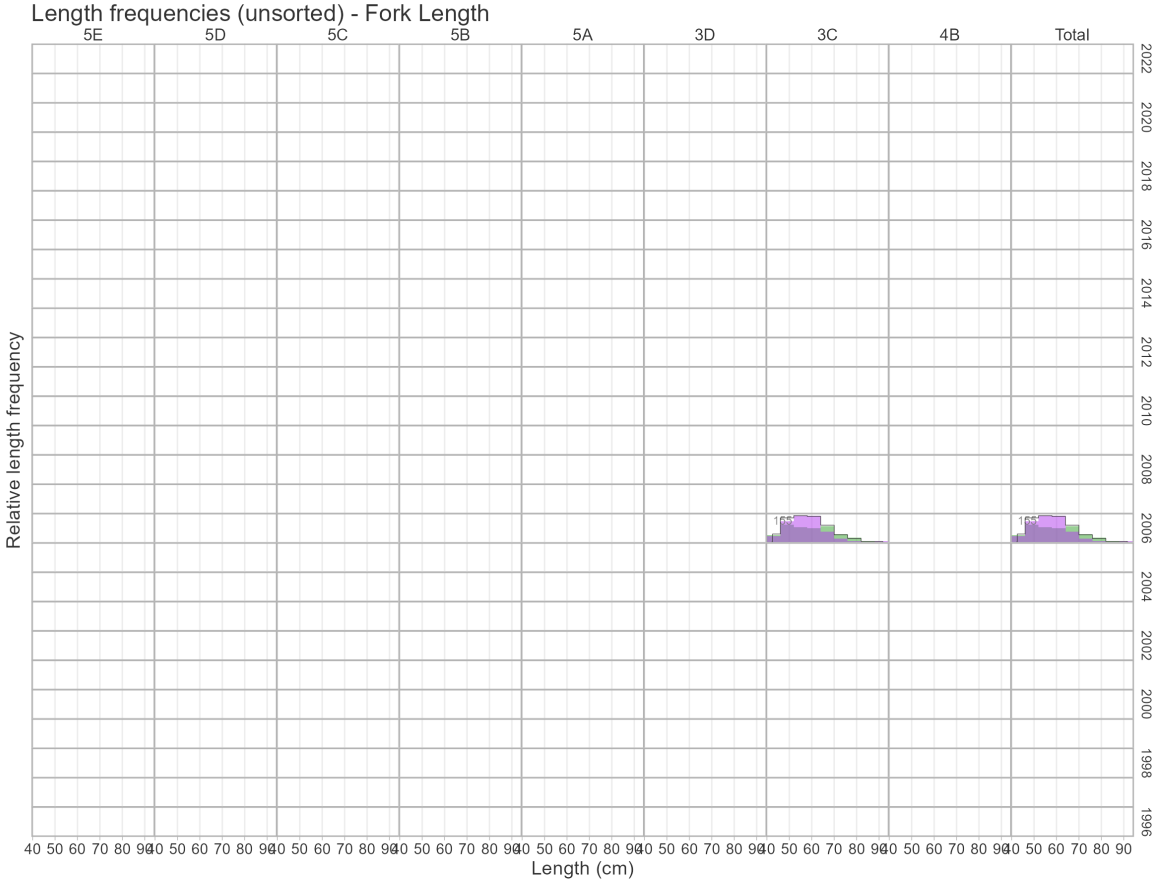

Commercial catch
Commercial specimens
Catch (1000 t)
Count (x 1000)
5E
5D
5C
5B
5A
3D
3C
4B
Total
Bottom trawl
Hook and line
Unknown/trawl
Midwater trawl
Trap
Discarded
2000
2005
2010
2015
2020

Pacific Spiny Dogfish


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
Week of the year
10 20 30 40 50

Pacific Spiny Dogfish



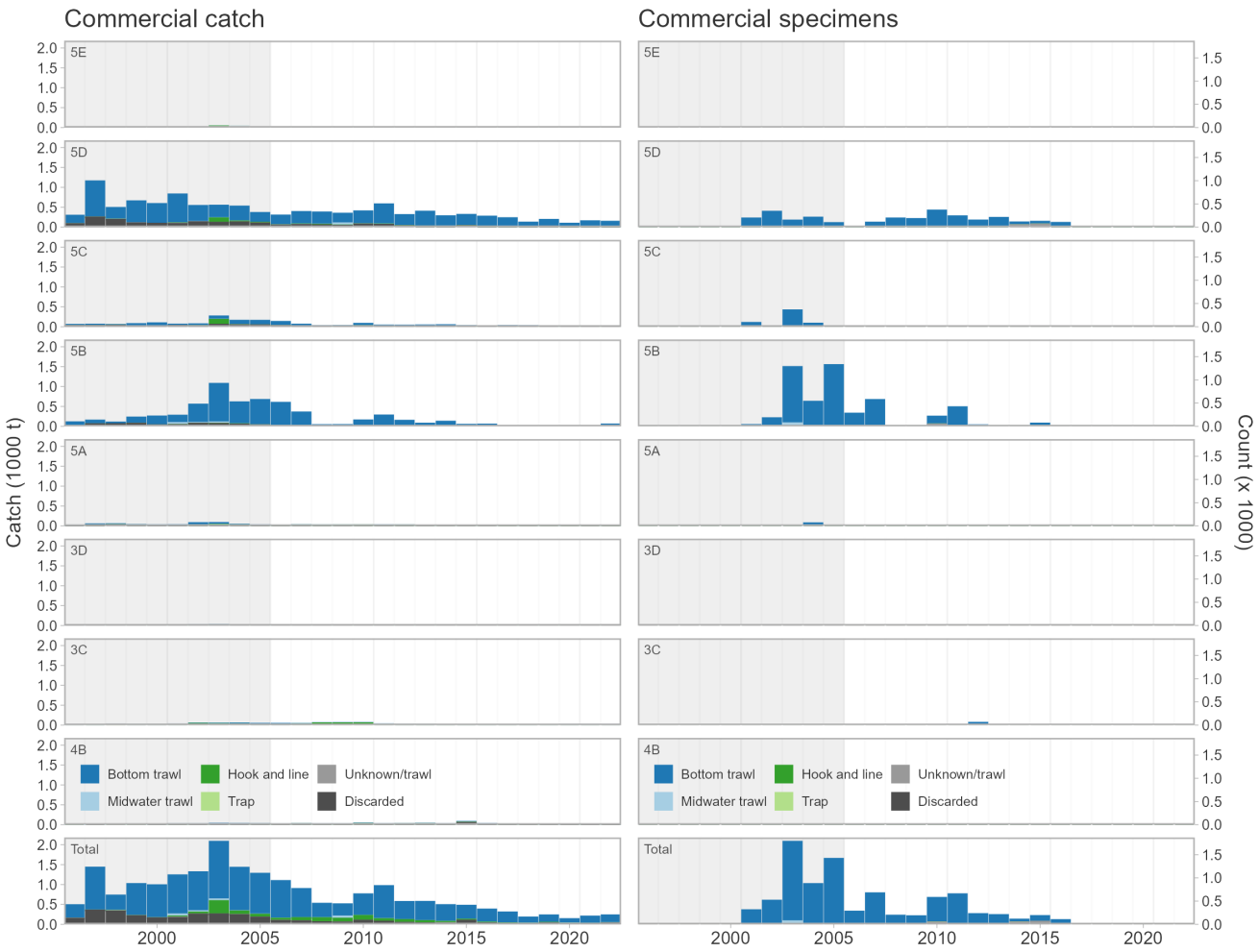


4.2 Big Skate

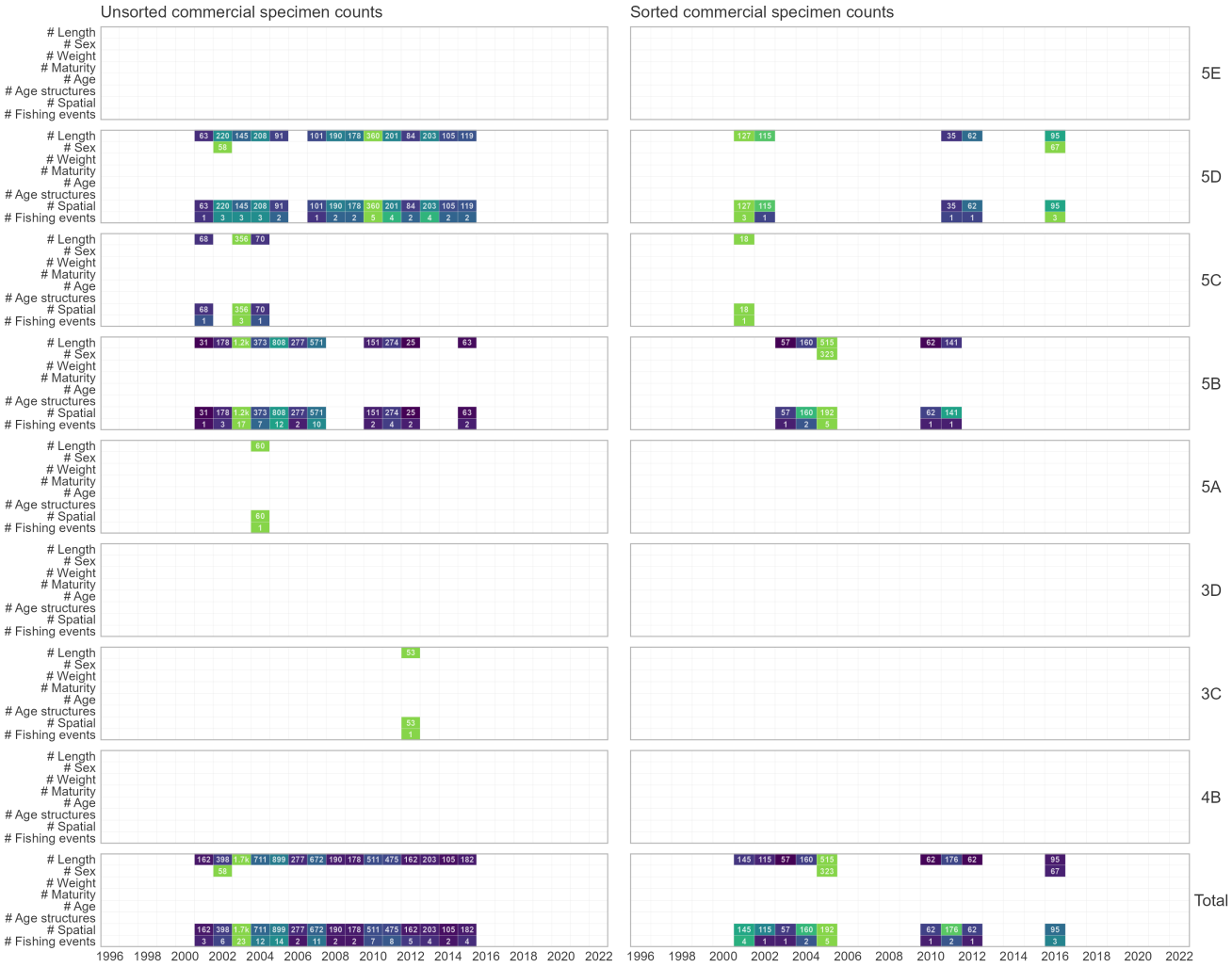
Beringraja binoculata (56)
Order: Rajiformes, Family: Rajidae, FishBase, WoRMS
Last Research Document: King et al. (2015)
Last Science Advisory Report: DFO (2014a)
COSEWIC Status Report: COSEWIC (2007a)

Big Skate were caught mostly by bottom trawl, and occasionally by midwater trawl and hook and line. The catch and specimen collection mainly occurred in Areas 5D and 5B. The other areas had little, if any, catch. The largest catch and specimen collection occurred in 2003, both of which have since generally declined. The increased sampling in 2003 was due to a tagging project conducted with industry (King and McFarlane 2010). Unsorted specimens were collected annually from 2001 to 2015. Sorted specimen collection occurred from 2001 to 2016, with gaps from 2006 to 2009 and 2013 to 2015. All unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched during roughly half of the years with biological sampling, particularly from 2002 to 2005. Area 5B had the most representative sampling. Between 1996 and 2022, 6,850 unsorted specimens were collected, and none had age structures. All unsorted specimens had lengths; of these, 58 (<1%) were sexed, and none had weights.

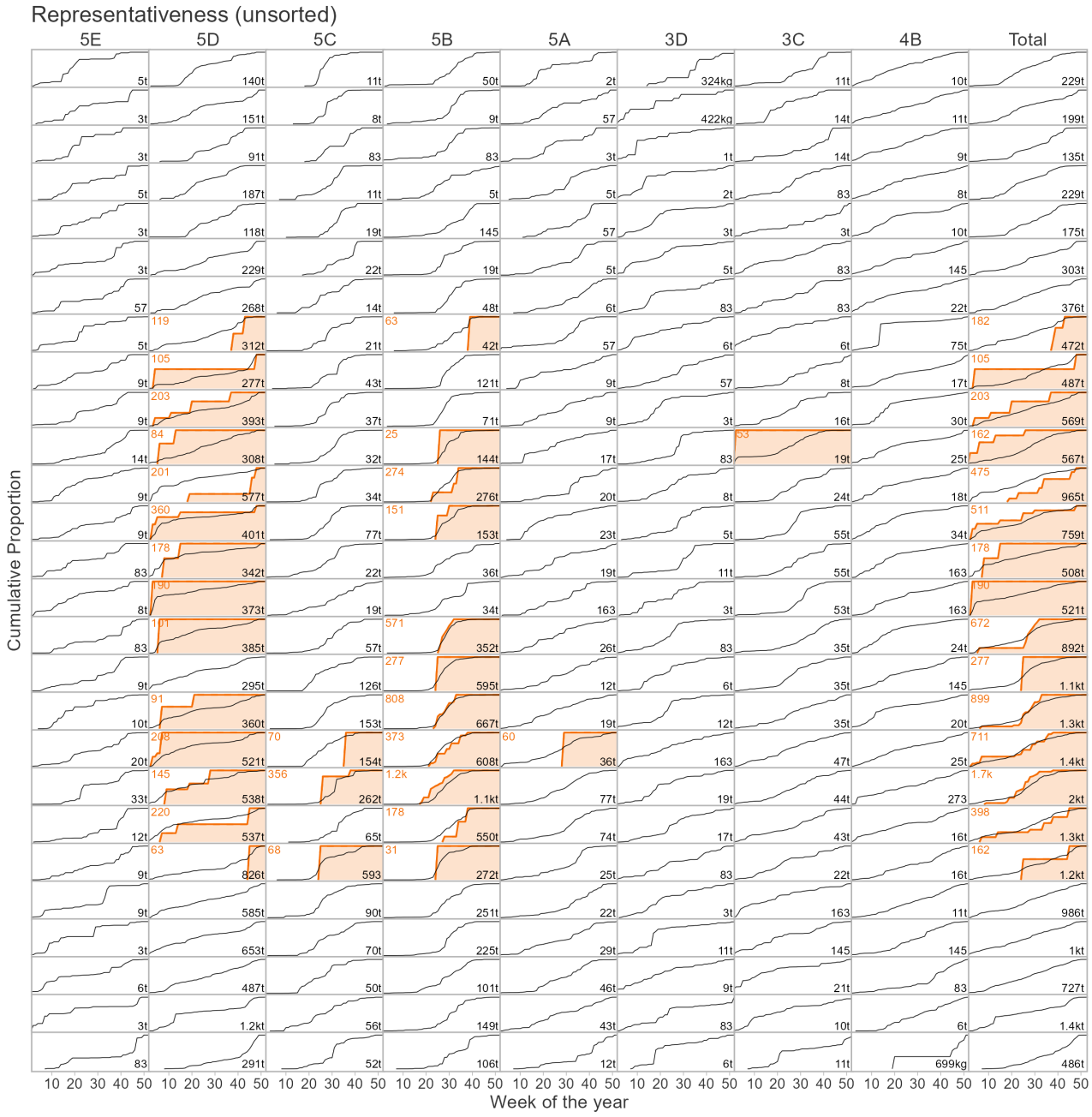
Big Skate


Commercial catch
Commercial specimens
Catch (1000 t)
Count (x 1000)
5E
5D
5C
5B
5A
3D
3C
4B
Total
Bottom trawl
Hook and line
Unknown/trawl
Midwater trawl
Trap
Discarded
2000
2005
2010
2015
2020

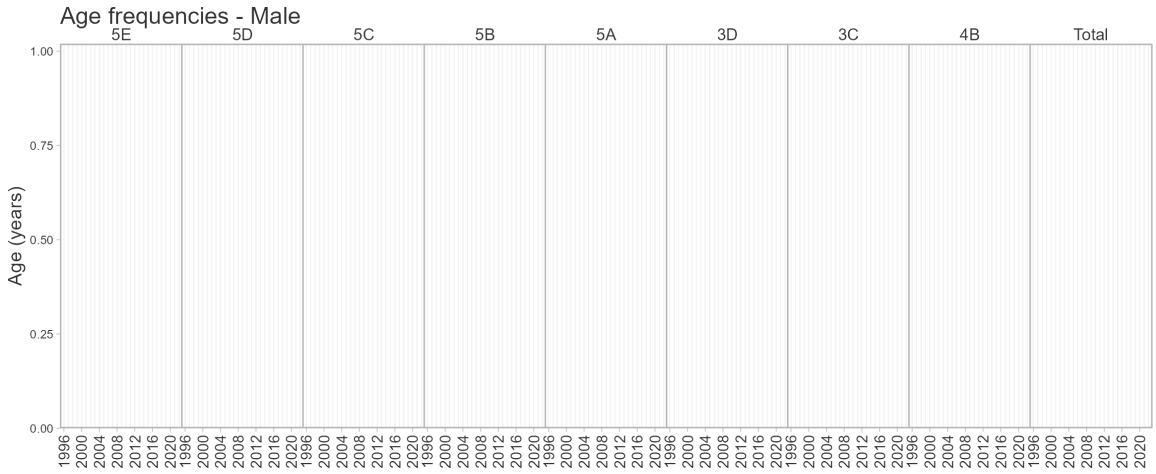
Big Skate

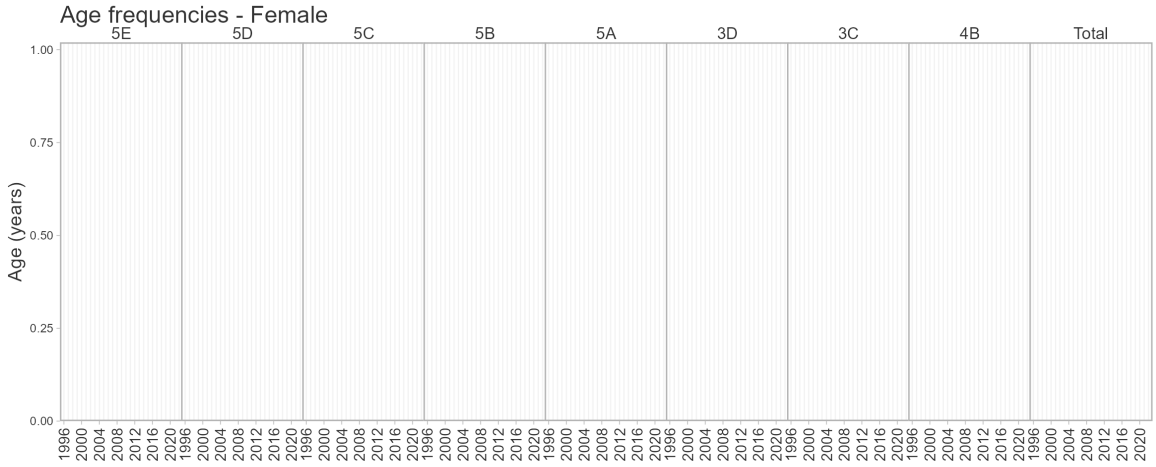

Unsorted commercial specimen counts
Sorted commercial specimen counts
Length
Sex
Weight
Maturity
Age
Age structures
Spatial
Fishing events
5E
5D
5C
5B
5A
3D
3C
4B
Total
1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022

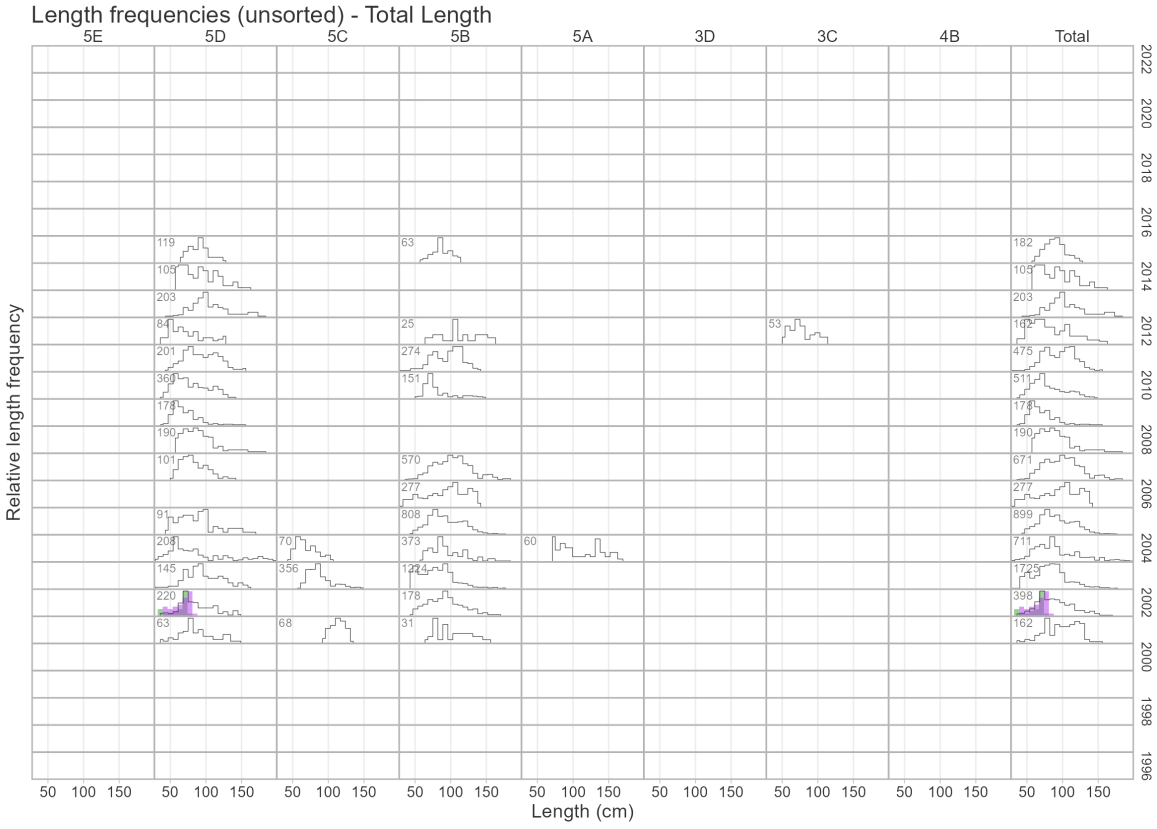
Big Skate


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
Week of the year
10 20 30 40 50

Big Skate


Age frequencies - Male
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)
1.00
0.75
0.50
0.25
0.00

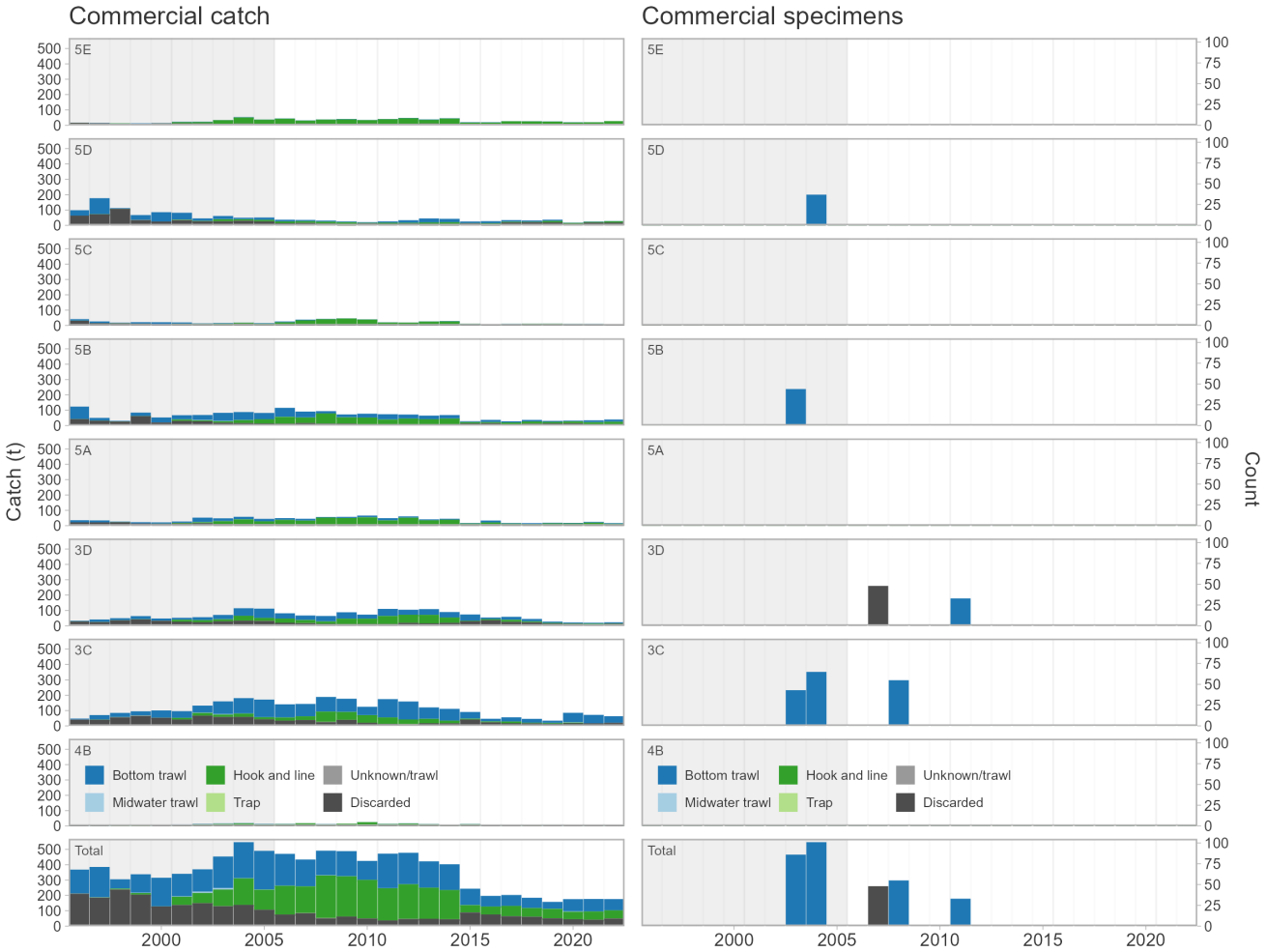

Age frequencies - Female
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)
1.00
0.75
0.50
0.25
0.00


Length frequencies (unsorted) - Total Length
5E
5D
5C
5B
5A
3D
3C
4B
Total
Relative length frequency
Length (cm)

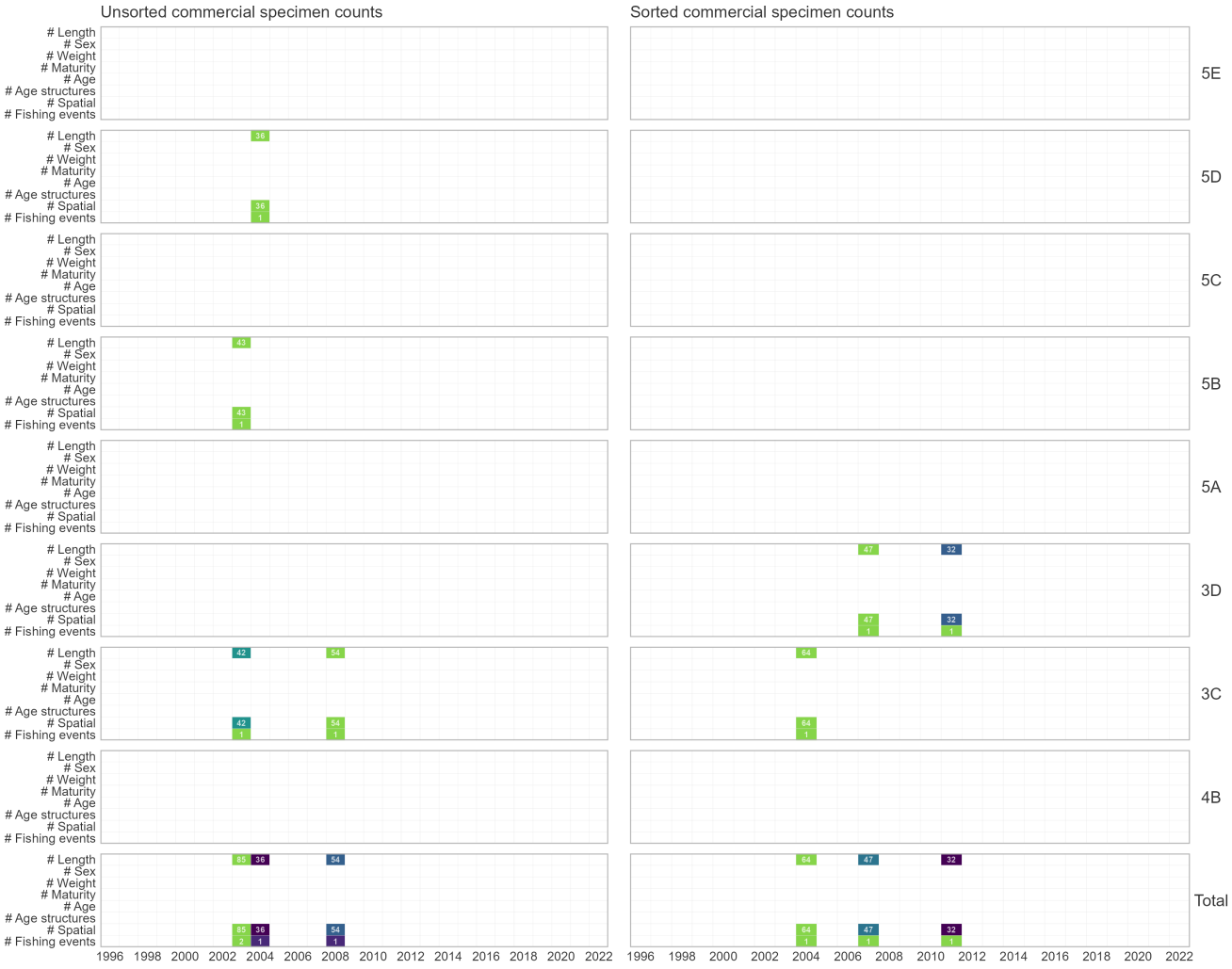
4.3 Longnose Skate

Raja rhina (59)
Order: Rajiformes, Family: Rajidae, FishBase, WoRMS
Last Research Document: King et al. (2015)
Last Science Advisory Report: DFO (2014a)
COSEWIC Status Report: COSEWIC (2007a)
COSEWIC Status: Not at Risk

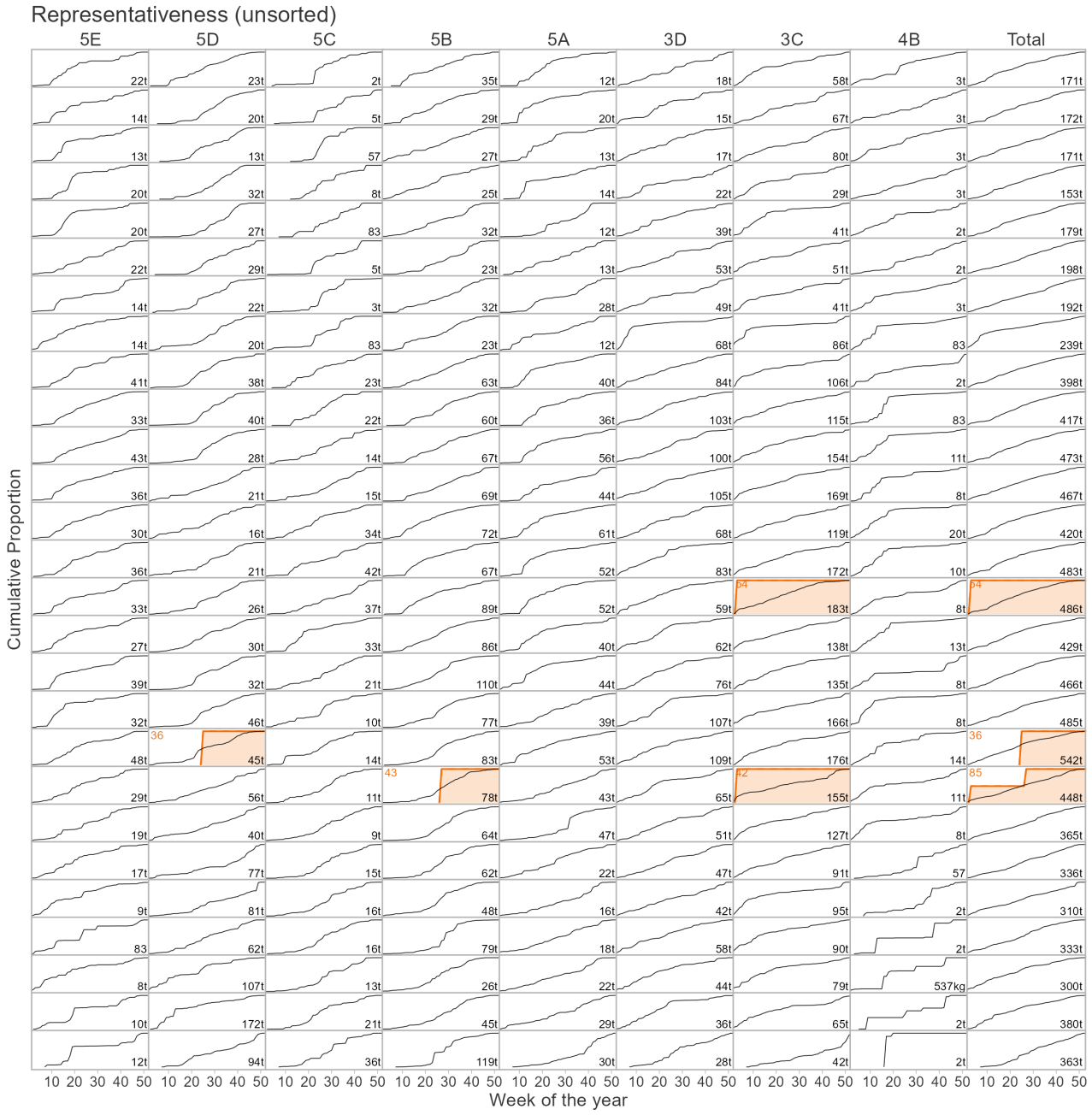
Longnose Skate were caught mostly by bottom trawl and hook and line, and occasionally by midwater trawl. Longnose Skate was caught in all areas, but the catch was slightly higher in Area 3C. Specimen collection was sparse and from bottom trawl only. All specimens had latitude and longitude data. Cumulative total sampling did not match cumulative total catch in most years with biological sampling. Between 1996 and 2022, 175 unsorted specimens were collected, but none had age structures. All unsorted specimens had lengths, but none were sexed or had weights.



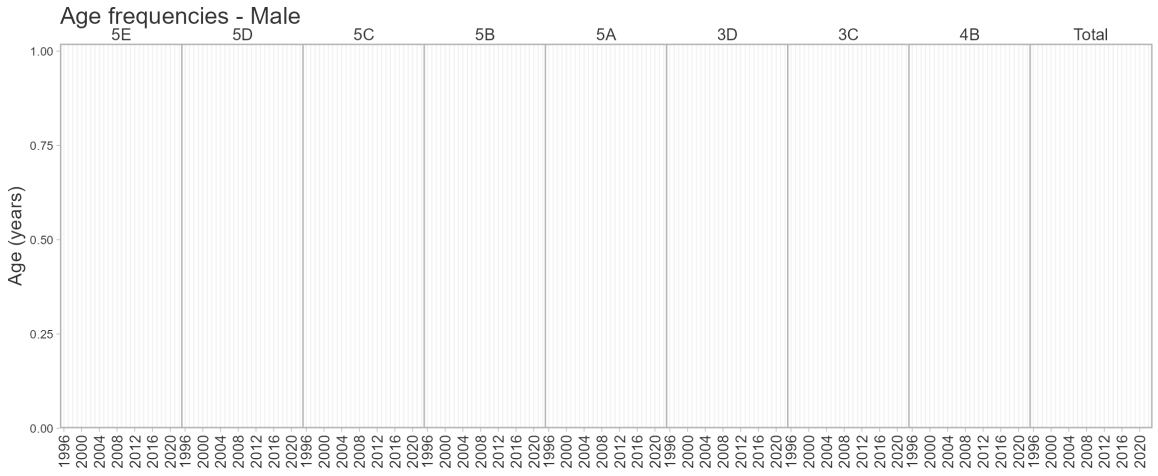
Longnose Skate

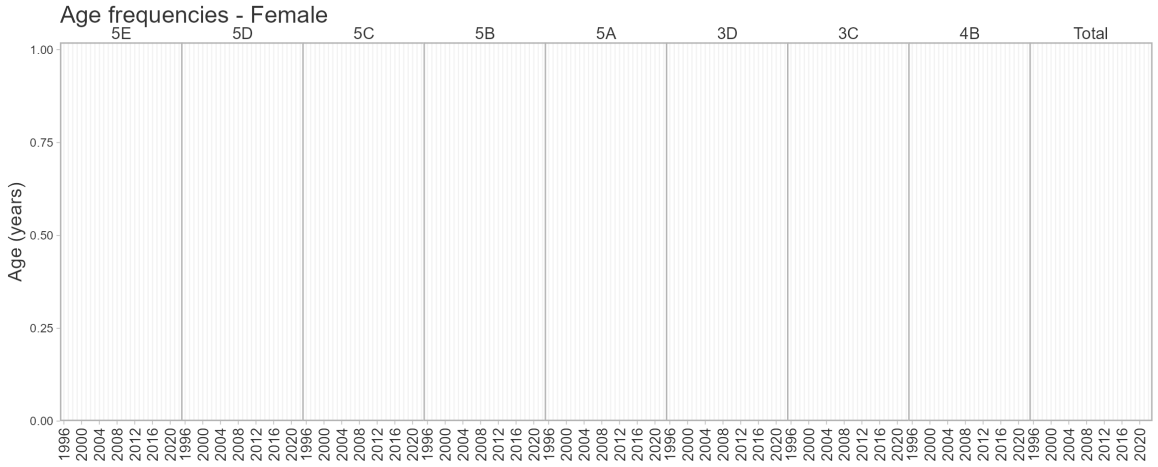


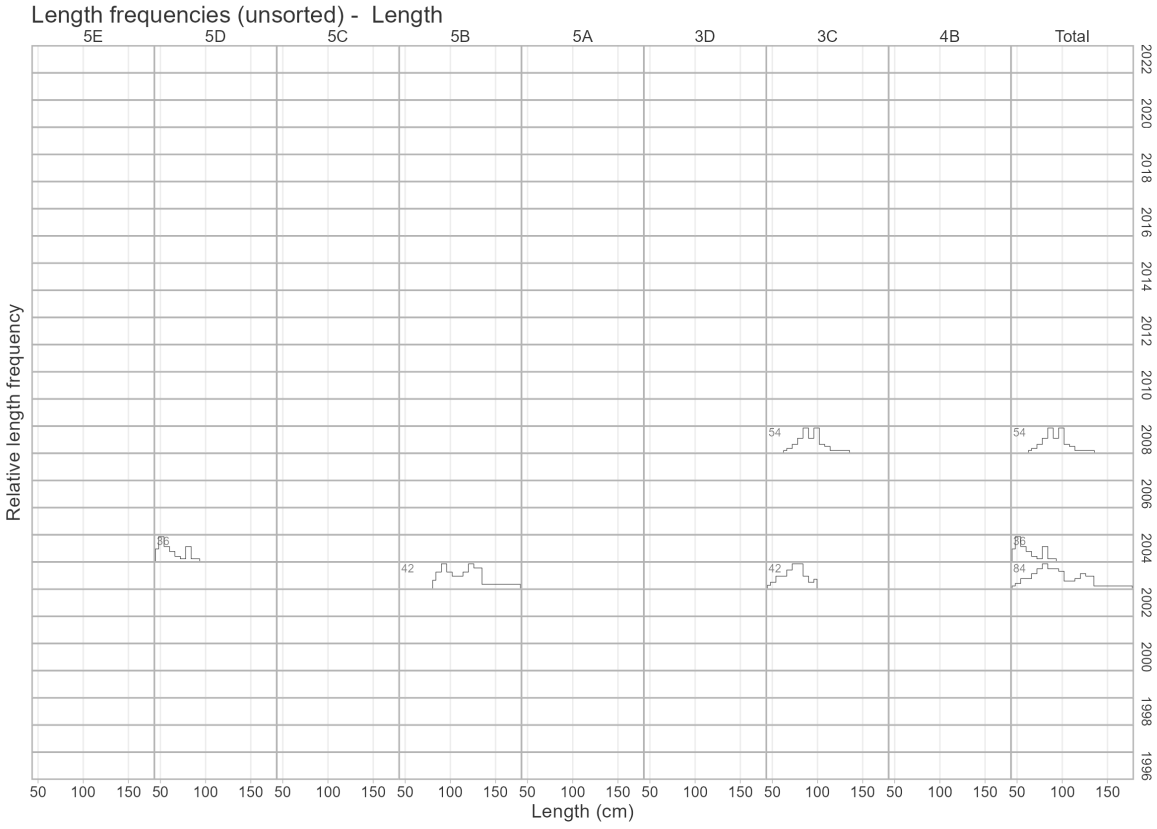
Longnose Skate



Longnose Skate



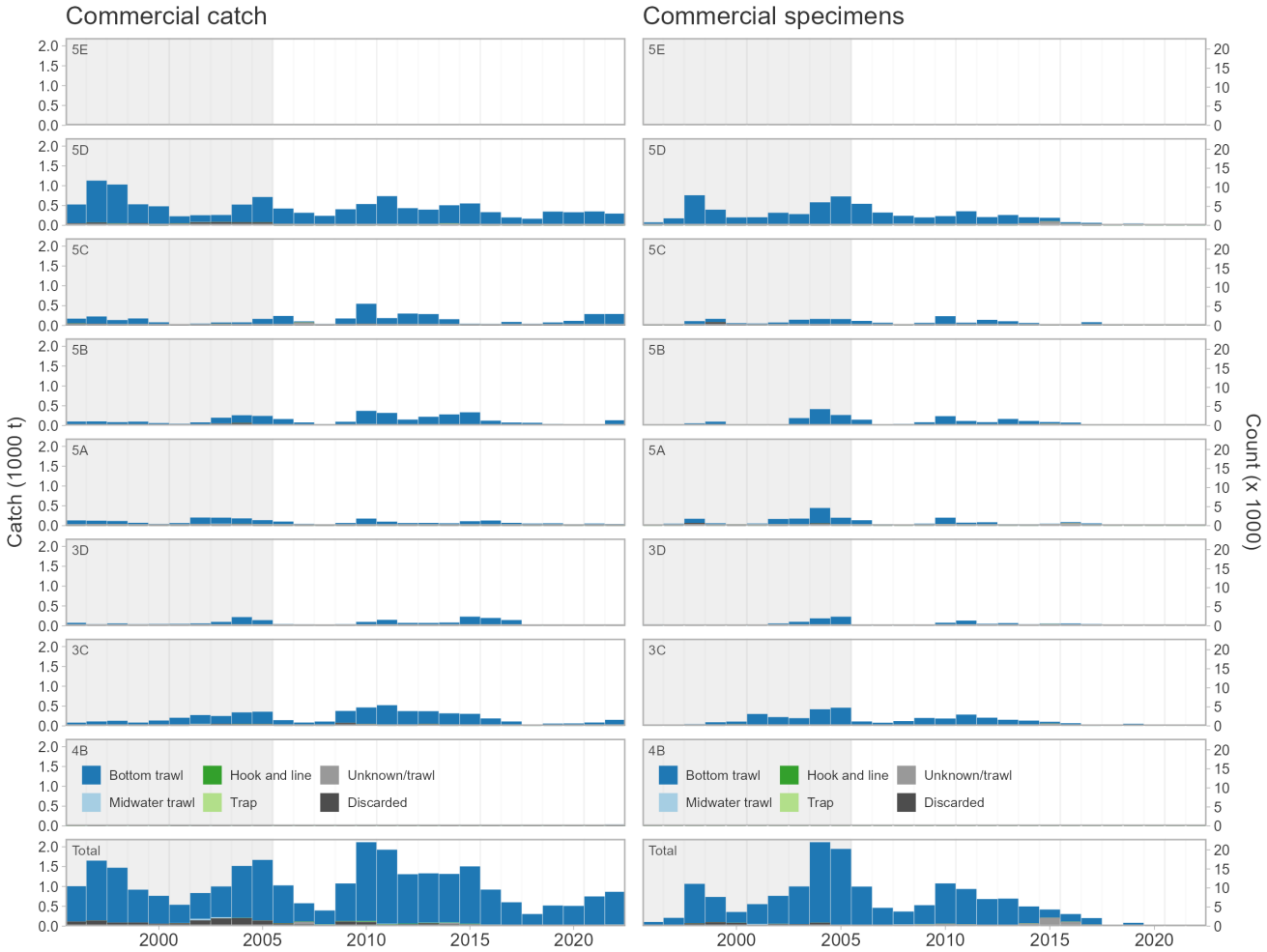




4.4 Pacific Cod

Gadus macrocephalus (222)
Order: Gadiformes, Family: Gadidae, FishBase, WoRMS
Last Research Document: Forrest et al. (2020)
Last Science Advisory Report: DFO (2019b)
Last Science Response: DFO (2021), DFO (2024b)

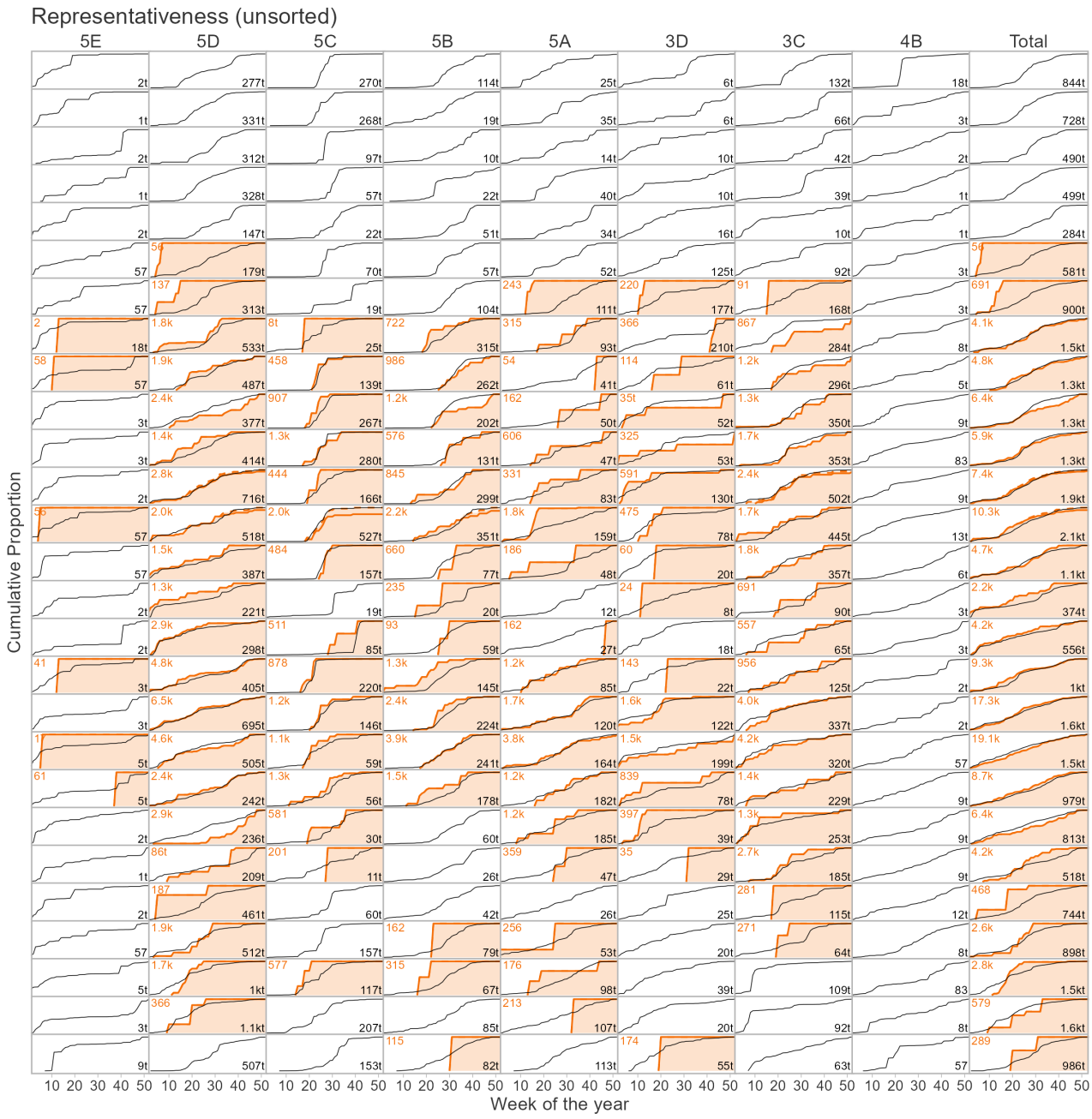
Pacific Cod were caught mostly by bottom trawl. Catch and specimen collection were highest in Area 5D. Total catch fluctuated over the years, peaking in 1997, 2005, and 2010. Specimen collection similarly peaked in 1998, 2004, and 2010. Unsorted specimens were collected annually from 1996 to 2017. Sorted specimens were collected annually from 1996 to 2014 and from 2016 to 2019. Most unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched most of the years with biological sampling, particularly from 2002 to 2015. Between 1996 and 2022, 122,475 unsorted specimens were collected, and of these, 394 (<1%) had age structures, and 25 (<1% of specimens; 6% of age structures) have been aged. Both otolith and fin ray ageing methods for Pacific Cod are considered challenging (Chilton and Beamish 1982), so age structures were rarely collected or aged. All unsorted specimens had lengths; of these, 1,758 (1%) were sexed, while 1,024 (<1%) had weights.



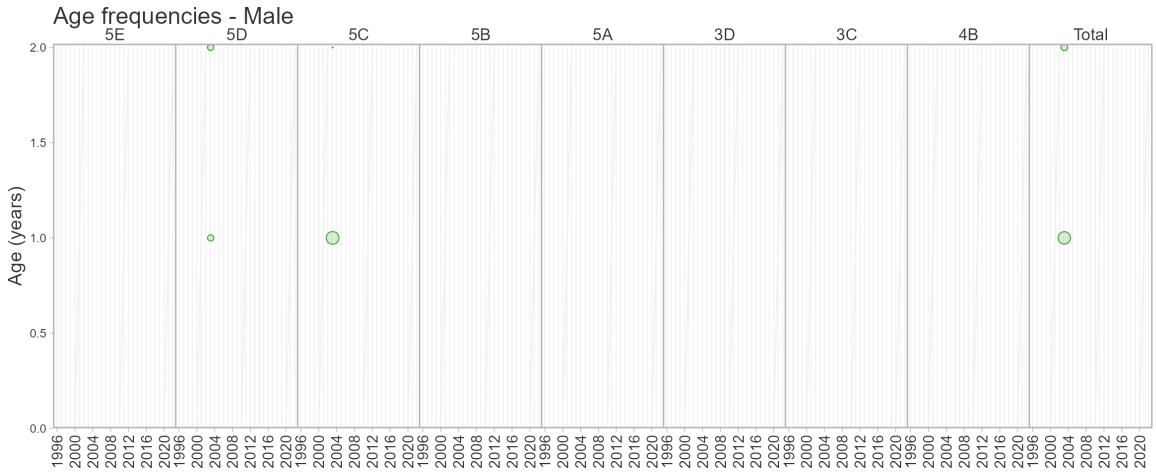
Pacific Cod

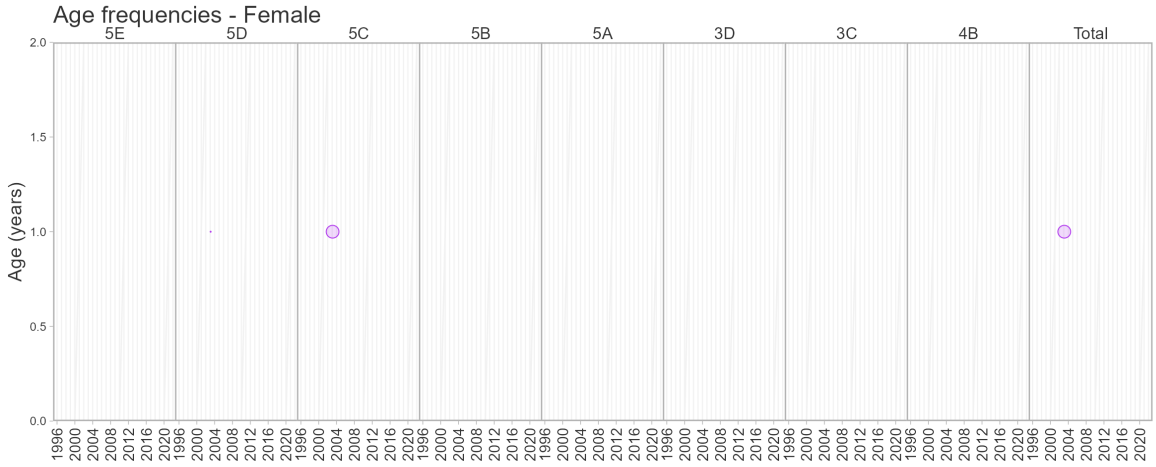

Unsorted commercial specimen counts
Sorted commercial specimen counts
Length
Sex
Weight
Maturity
Age
Age structures
Spatial
Fishing events
5E
5D
5C
5B
5A
3D
3C
4B
Total
1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022

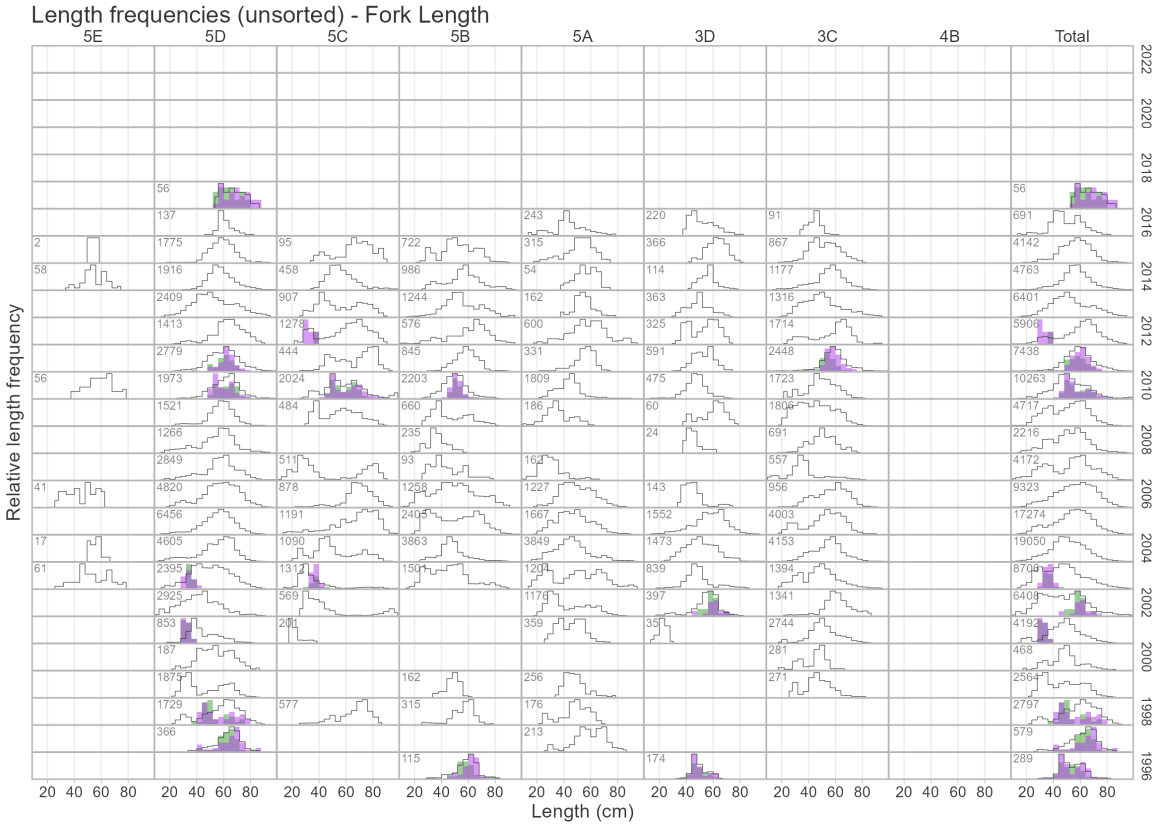
Pacific Cod


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
10 20 30 40 50
Week of the year

Pacific Cod


Age frequencies - Male
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)
2.0
1.5
1.0
0.5
0.0
1996
2000
2004
2008
2012
2016
2020

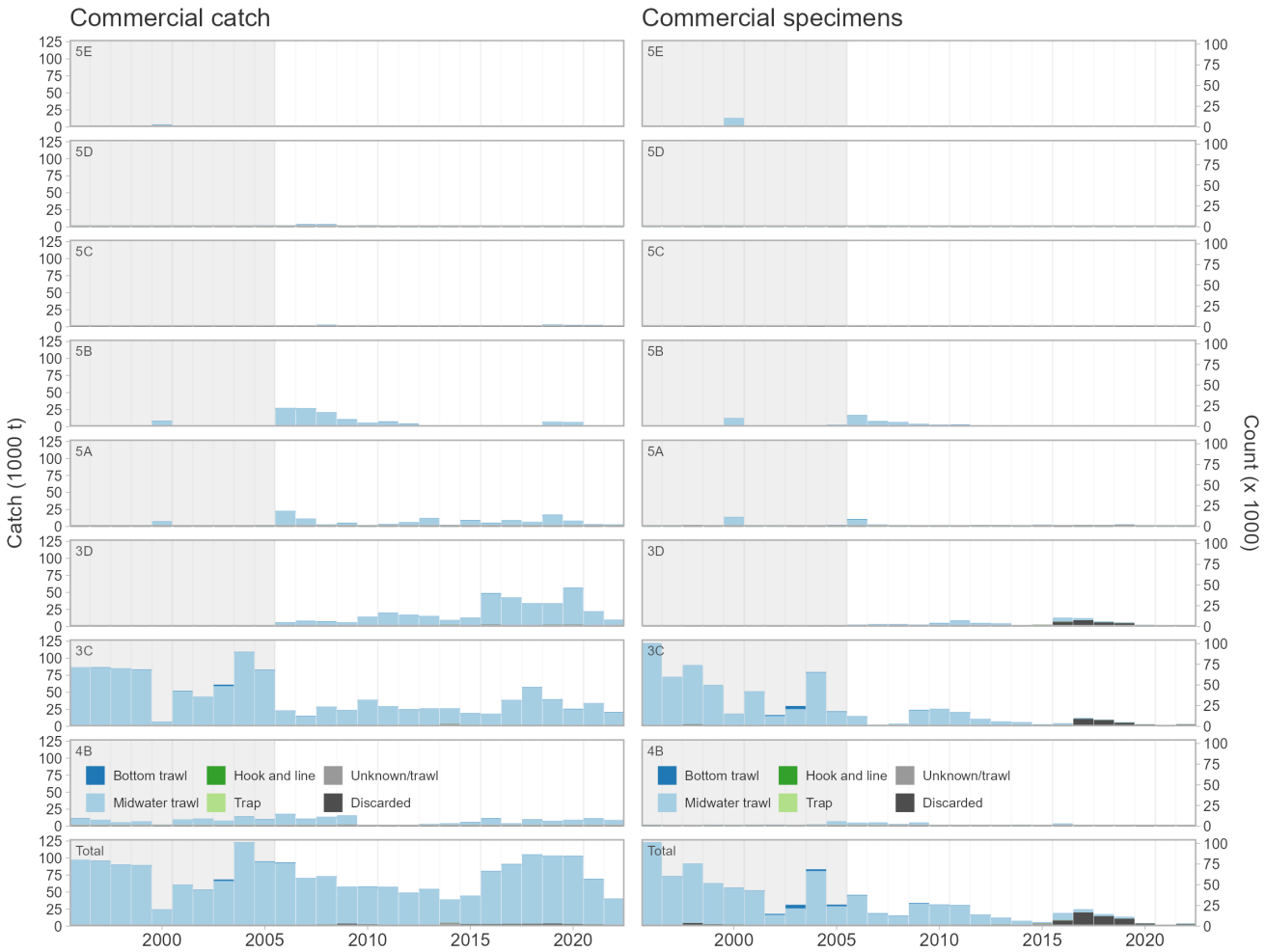

Age frequencies - Female
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)
2.0
1.5
1.0
0.5
0.0
1996
2000
2004
2008
2012
2016
2020


Length frequencies (unsorted) - Fork Length
5E
5D
5C
5B
5A
3D
3C
4B
Total
Relative length frequency
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
20 40 60 80
Length (cm)

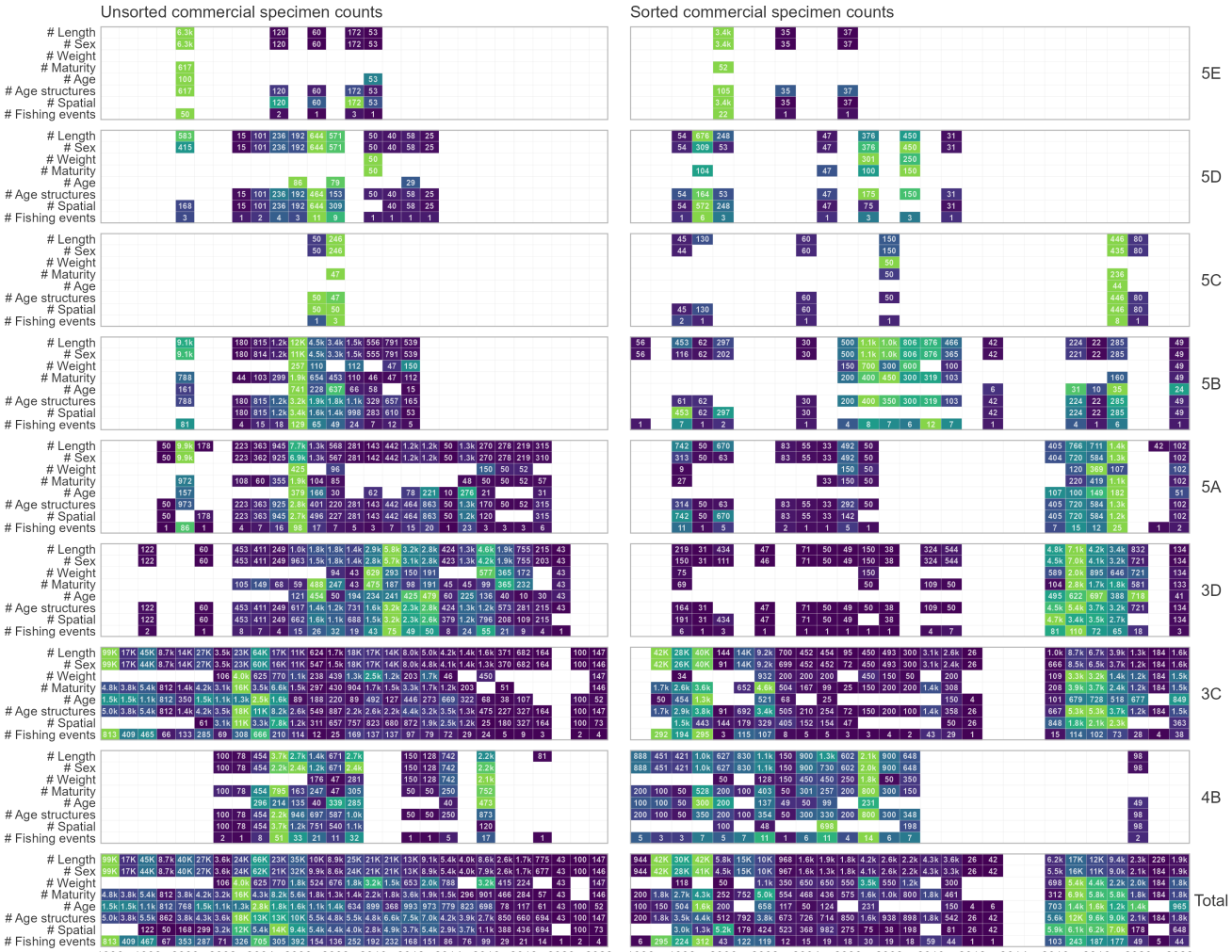
4.5 Pacific Hake

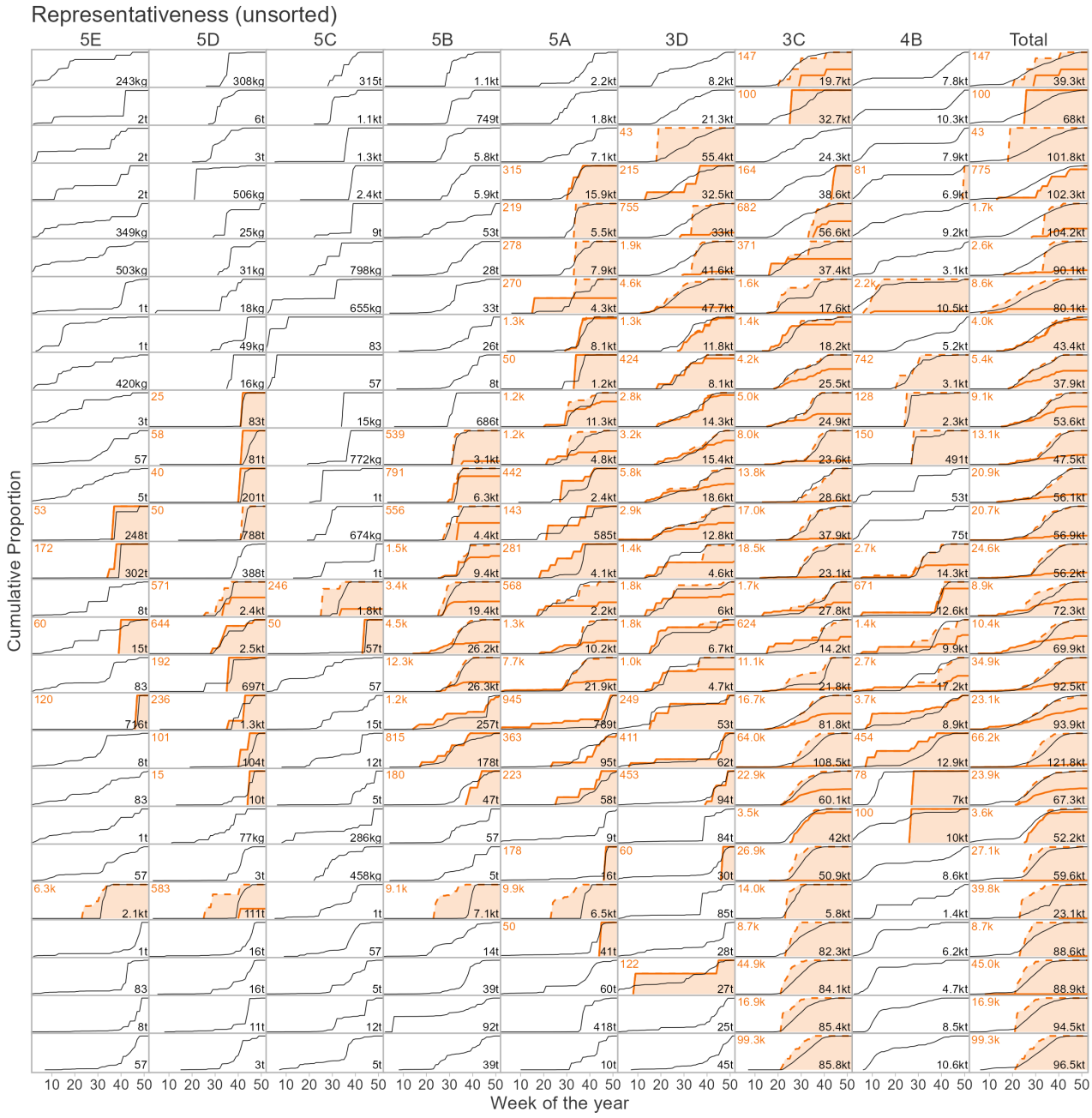
Merluccius productus (225)
Order: Gadiformes, Family: Merlucciidae, FishBase, WoRMS
Last joint Canada-US stock assessment: Johnson et al. (2025a)

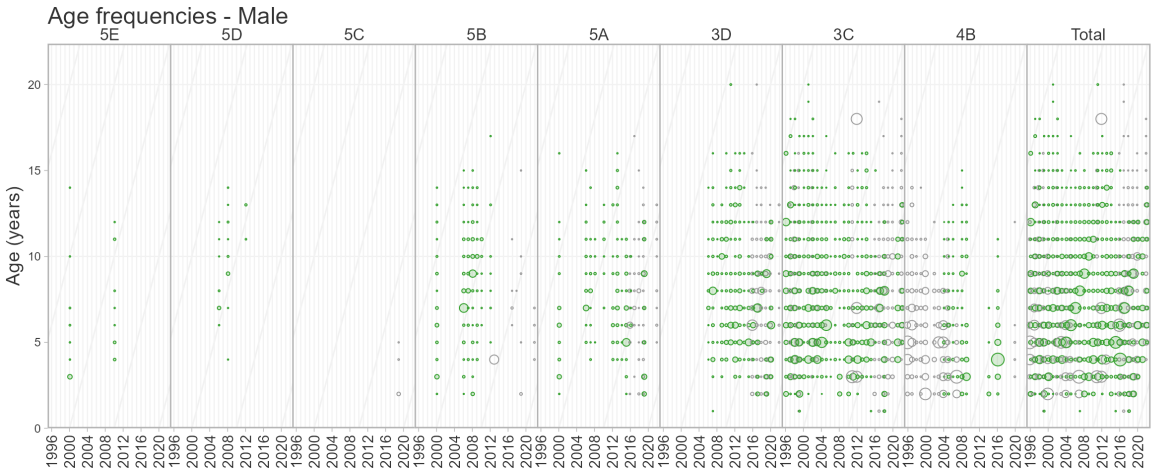
Pacific Hake were caught mostly by midwater trawl. The catch and specimen collection were highest in Area 3C up to 2015, after which the catch was higher in Area 3D in some years. Total catch fluctuated over time, peaking around 1996–1999, 2004, and 2018–2020. Total specimen collection has fluctuated but declined on average since 1996. Unsorted specimens were collected annually over the 27-year time period of this study. Sorted specimen collection occurred in all years except 2014 and 2015. Approximately 16% of the unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched for most of the years with biological sampling, particularly from 2005 to 2015. Between 1996 and 2022, 519,976 unsorted specimens were collected, and of these, 137,233 (26%) had age structures, and 24,854 (5% of specimens; 18% of age structures) have been aged. The SCL regularly ages commercial hake otoliths for the annual stock assessment work done jointly by DFO and the National Oceanic and Atmospheric Administration (NOAA). All unsorted specimens had lengths; of these, 506,759 (97%) were sexed, while 22,621 (4%) had weights.

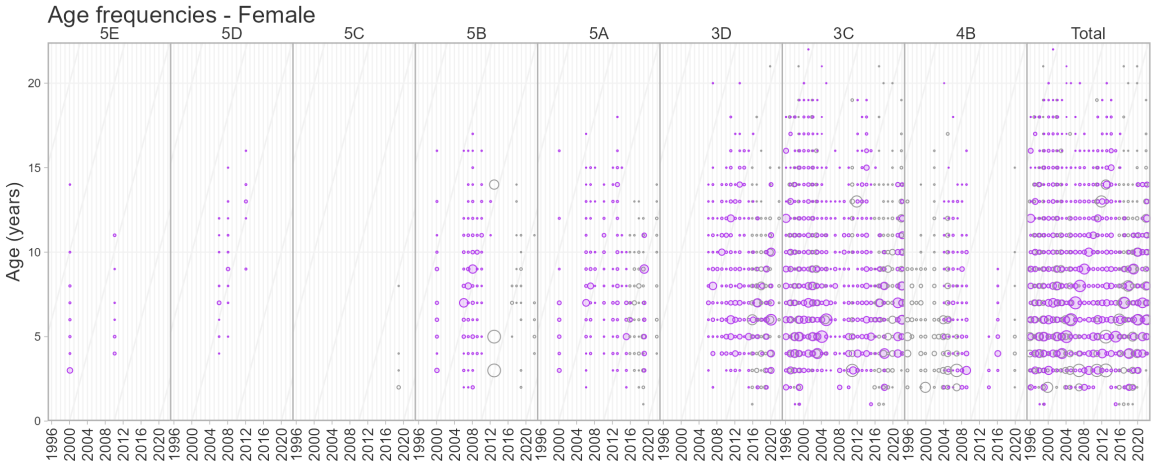


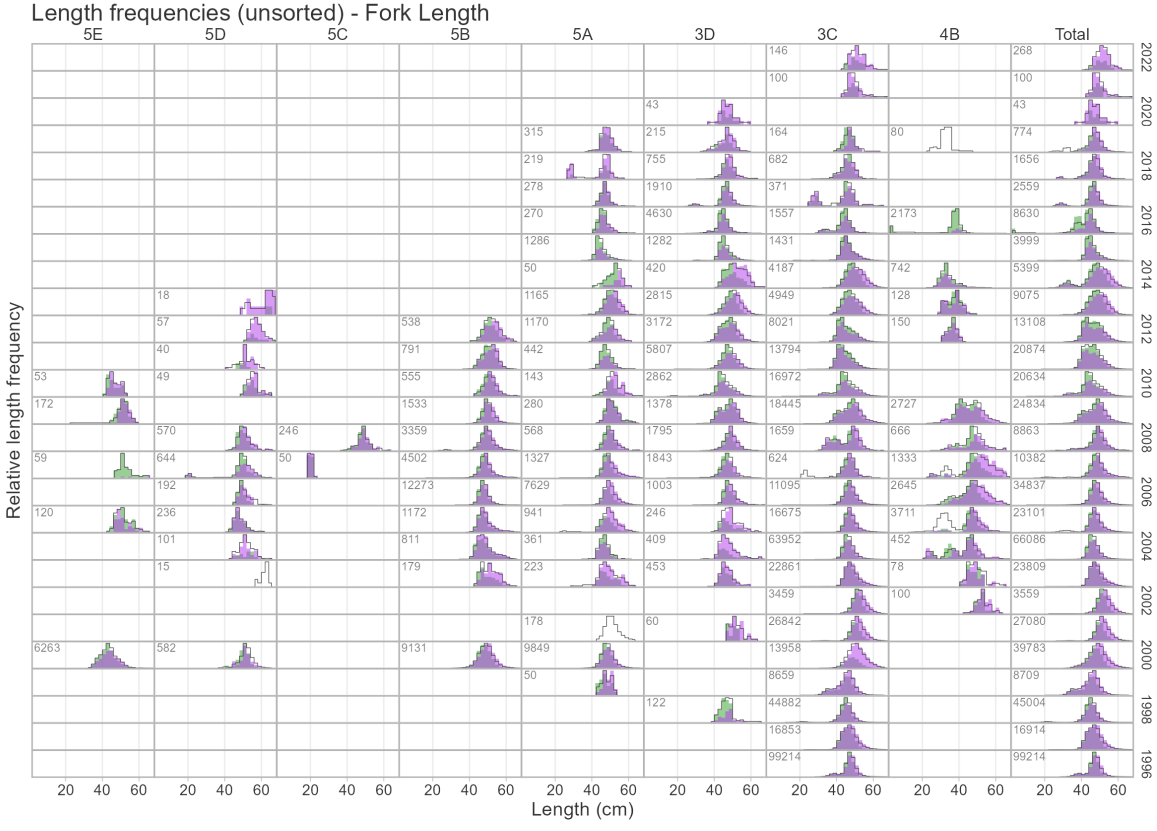
Pacific Hake




Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
Week of the year
10 20 30 40 50


Age frequencies - Male
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)

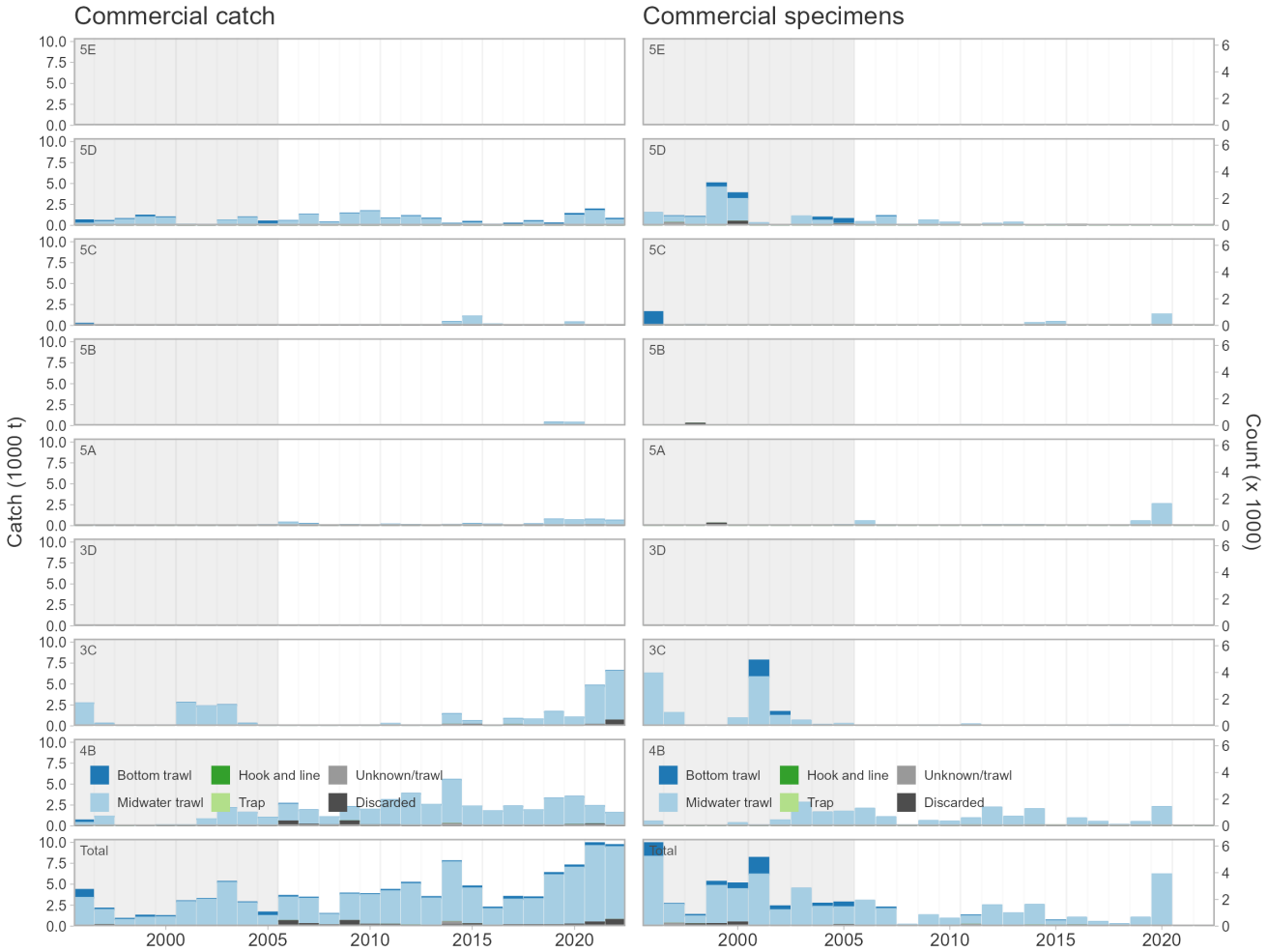

Age frequencies - Female
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)


Length frequencies (unsorted) - Fork Length
5E
5D
5C
5B
5A
3D
3C
4B
Total
Relative length frequency
Length (cm)

4.6 Walleye Pollock

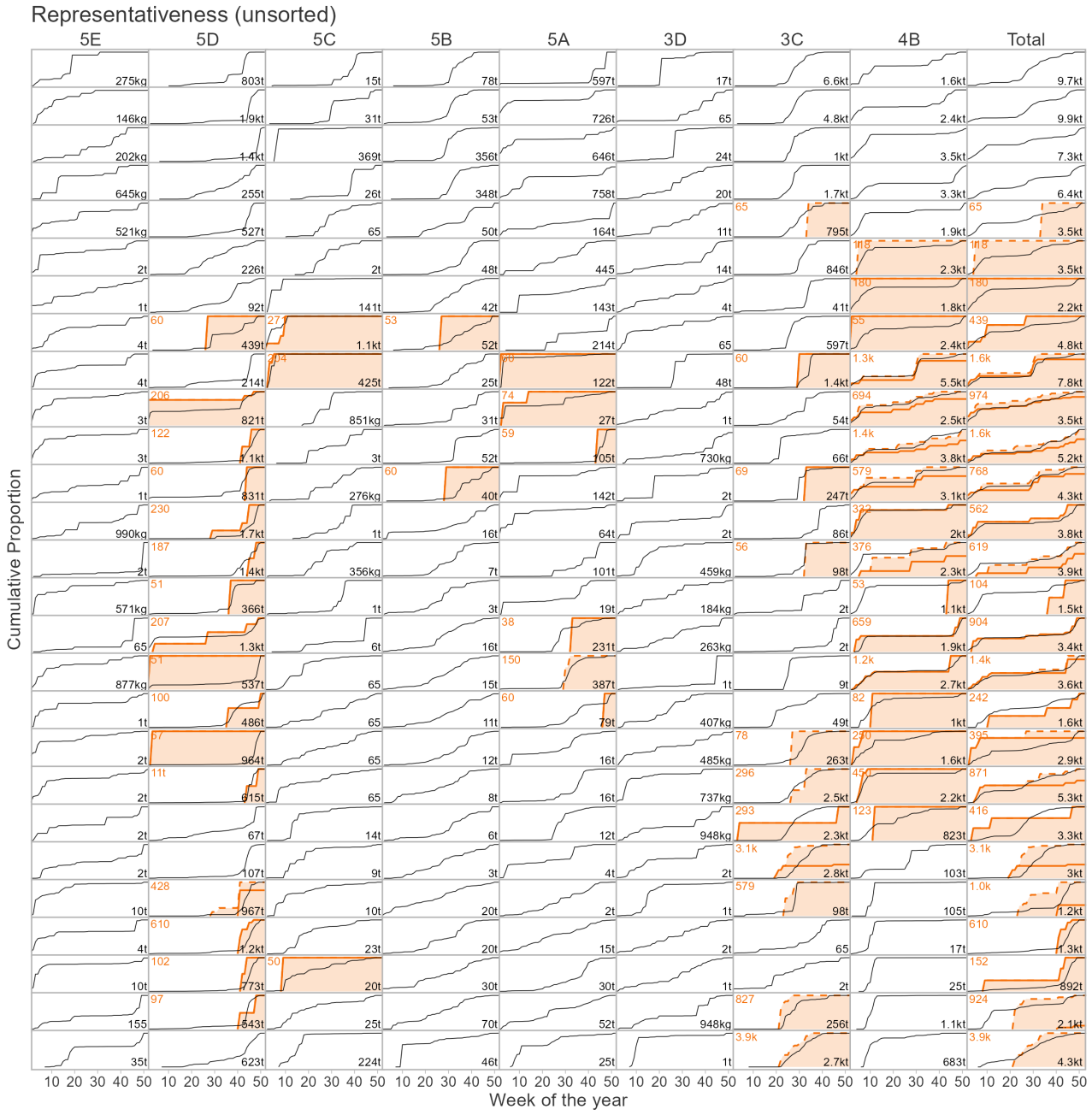
Gadus chalcogrammus (228)
Order: Gadiformes, Family: Gadidae, FishBase, WoRMS
Last Research Document: Starr and Haigh (2021a)
Last Science Advisory Report: DFO (2018a)

Walleye Pollock were caught mostly by midwater trawl and occasionally by bottom trawl. Catch and specimen collection mainly occurred in Areas 5D, 3C, and 4B. Catch peaked in 2021, trending upward since 1996 on average. Specimen collection peaked in 1996, 2001, and 2020. Unsorted specimens were collected annually from 1996 to 2018. Sorted specimen collection occurred from 1996 to 2007, in 2009 and 2011, and from 2016 to 2020. Roughly half of the unsorted samples had latitude and longitude data. Cumulative total sampling profiles and cumulative total catch profiles matched in half of the years with biological sampling. Between 1996 and 2022, 20,960 unsorted specimens were collected, and of these, 12,759 (61%) had age structures, but none have been aged due to unreliable ages in survey samples (Starr and Haigh 2021a). All unsorted specimens had lengths; of these, 16,447 (78%) were sexed, while 1,275 (6%) had weights.

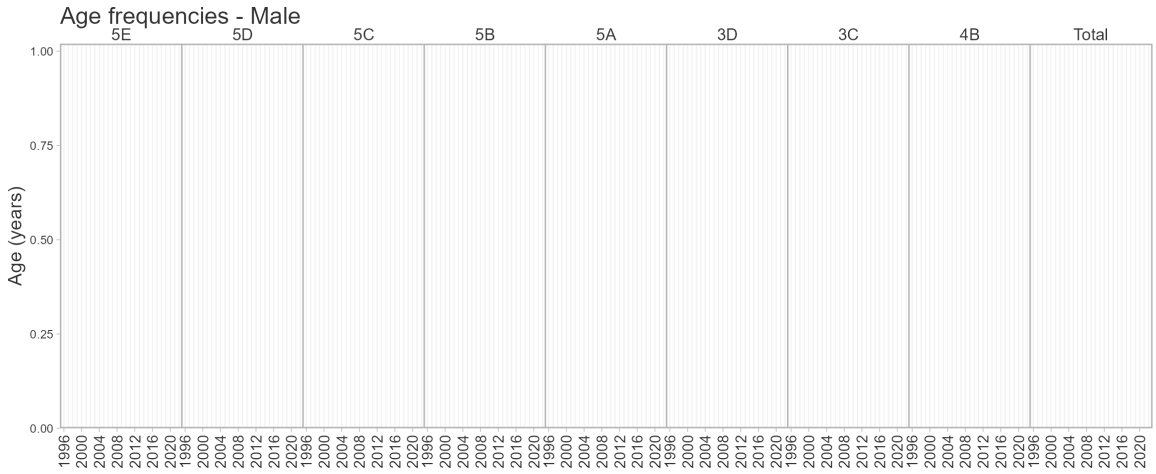


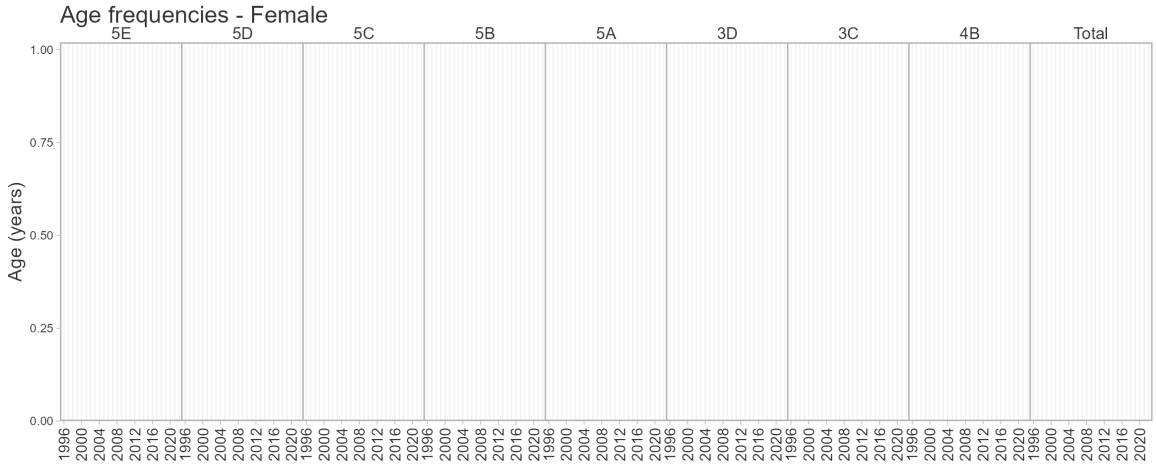
Walleye Pollock

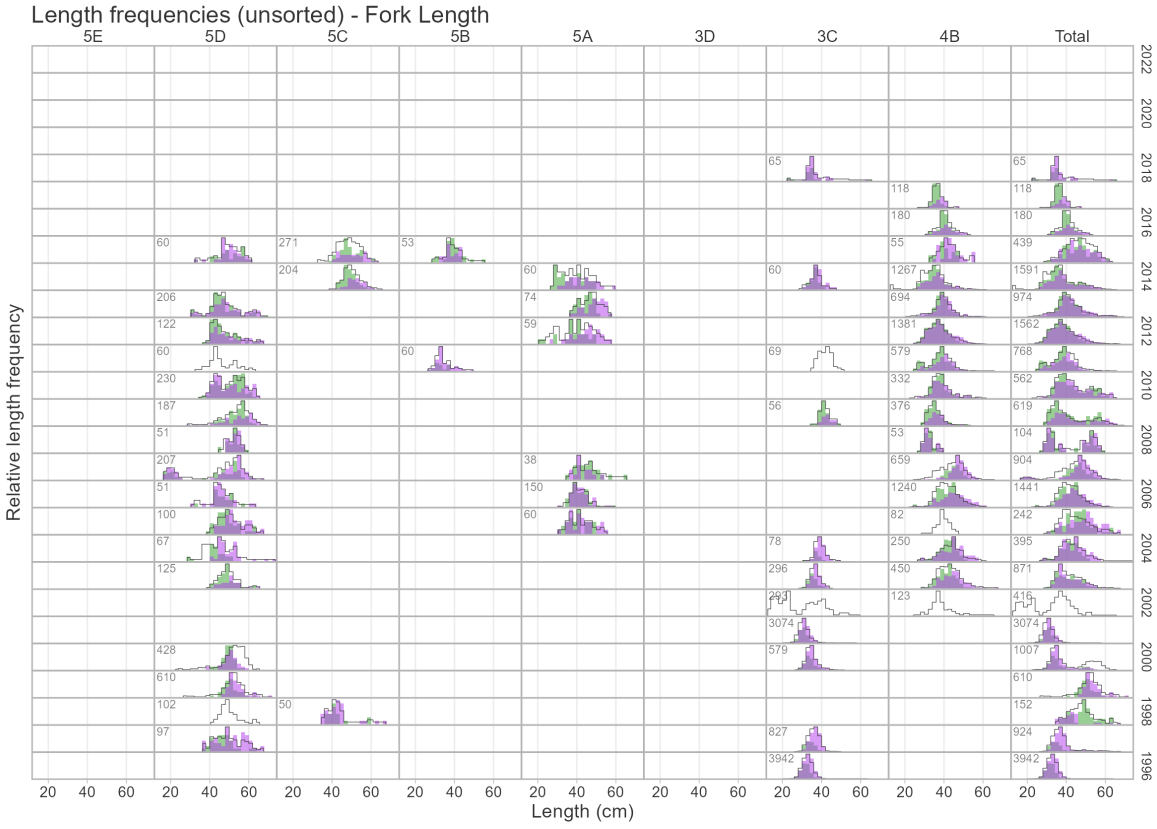
Walleye Pollock



Walleye Pollock





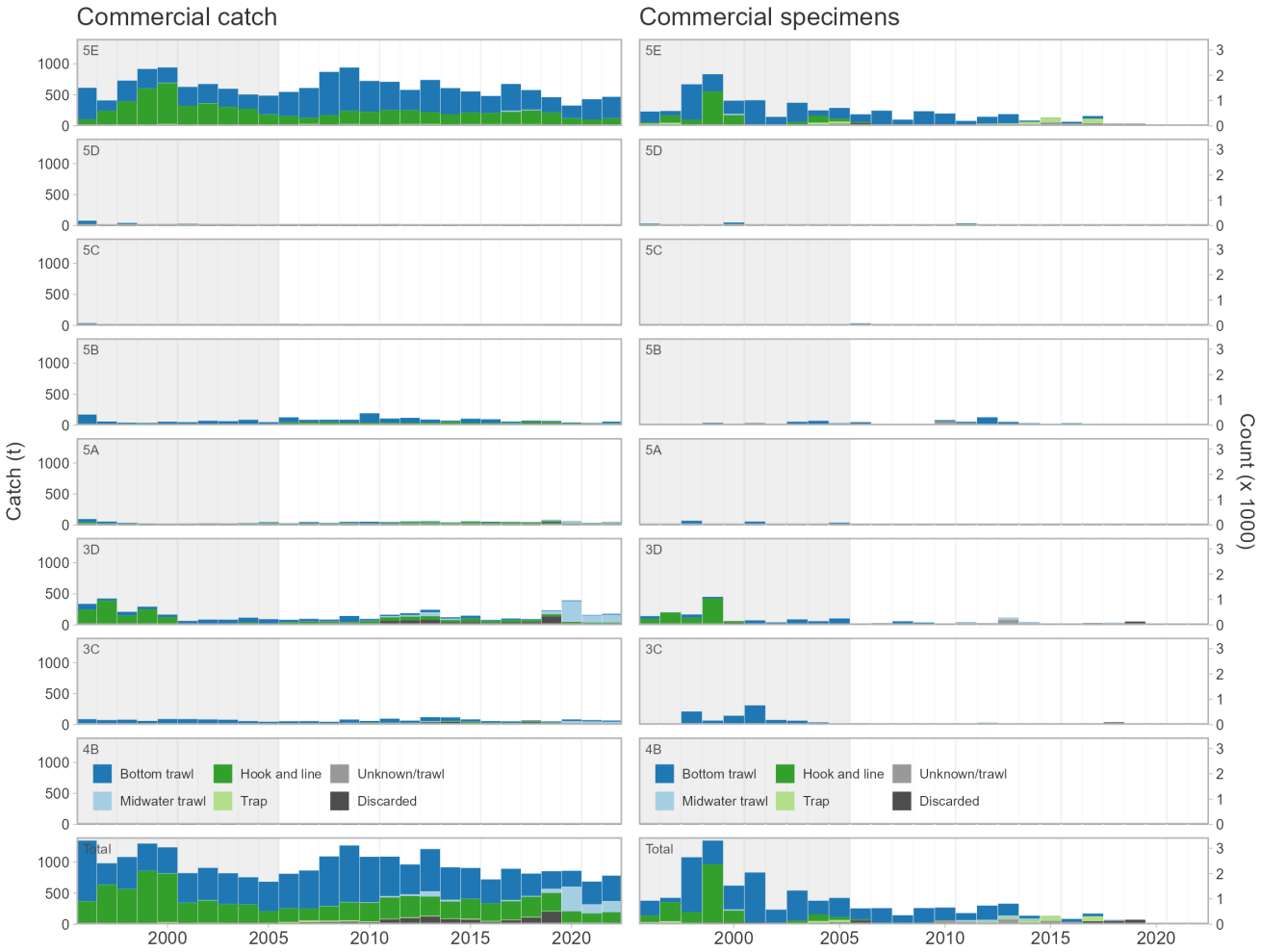


4.7 Rougheye/Blackspotted Rockfish Complex

Sebastes aleutianus/melanostictus (394)
Order: Perciformes, Family: Sebastidae, FishBase 1, FishBase 2
Last Research Document: Starr and Haigh (2020)
Last Science Advisory Report: DFO (2020a)
Species at Risk Act Management Plan Series: DFO (2012b)
COSEWIC Status Report: COSEWIC (2007b)
COSEWIC Status: Special Concern, SARA Status: Special Concern

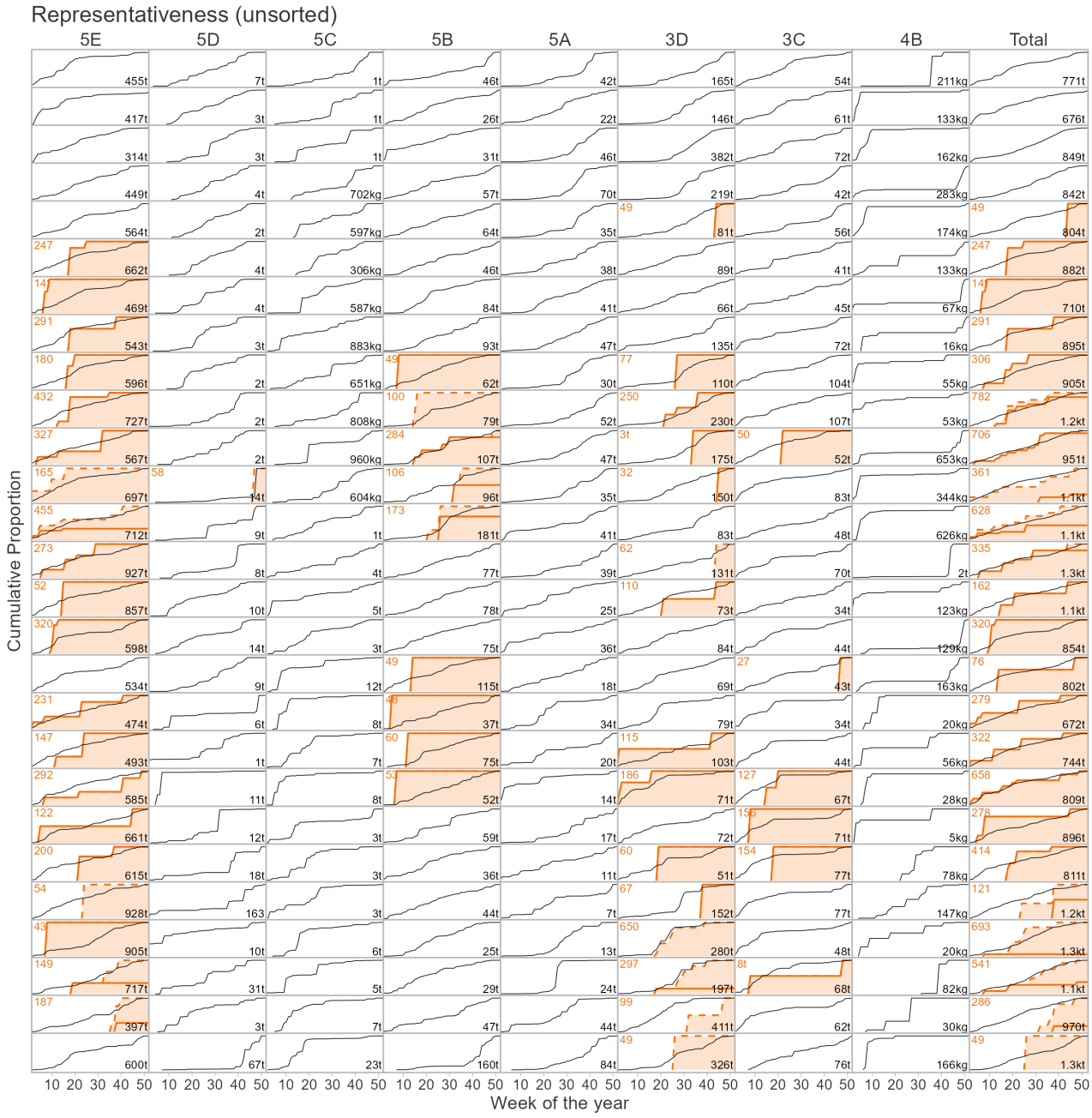
Rougheye-Blackspotted Rockfish were caught mostly by bottom and midwater trawl, hook, and line, and occasionally by trap. Area 5E had the largest catch and specimen collection. Catch has remained relatively stable but has slowly decreased on average since 2009. Specimen collection peaked in 1999, then quickly declined. Unsorted specimens were collected annually from 1996 to 2018. Sorted specimens were collected from 1996 to 2009, in 2011, and from 2016 to 2019. Nearly all of the unsorted specimens had latitude and longitude data. Cumulative total samples and cumulative total catch matched in roughly half of the years with biological sampling. Between 1996 and 2022, 8,021 unsorted specimens were collected, and of these, 7,223 (90%) had age structures, and 1,492 (19% of specimens; 21% of age structures) have been aged. All unsorted specimens had lengths; of these, 7,044 (88%) were sexed, while 2,128 (27%) had weights.

Rougheye/Blackspotted Rockfish Complex

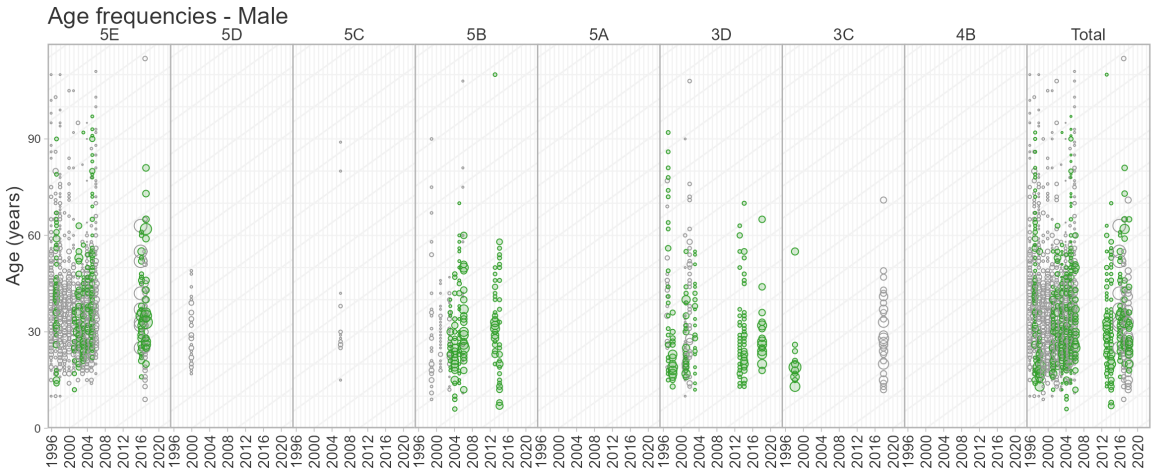


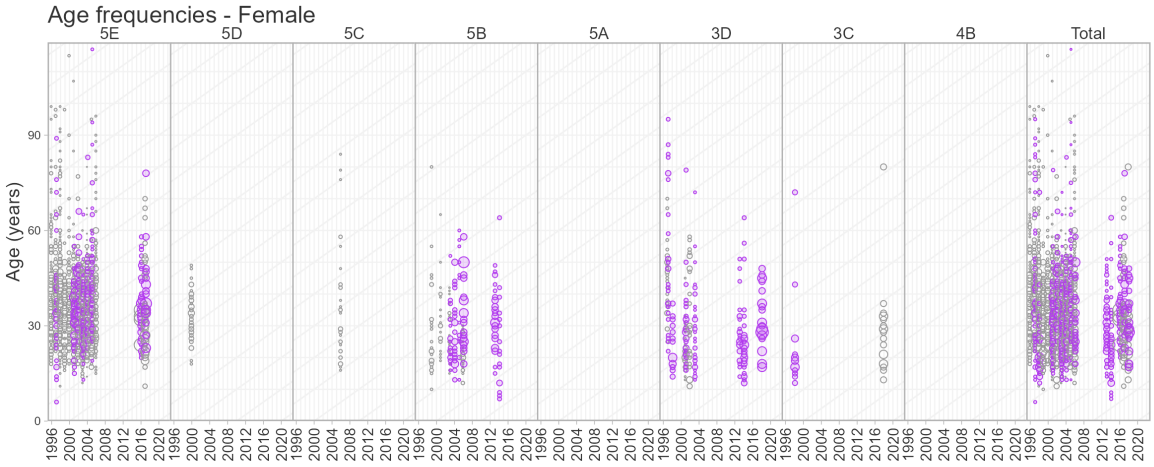
Rougheye/Blackspotted Rockfish Complex

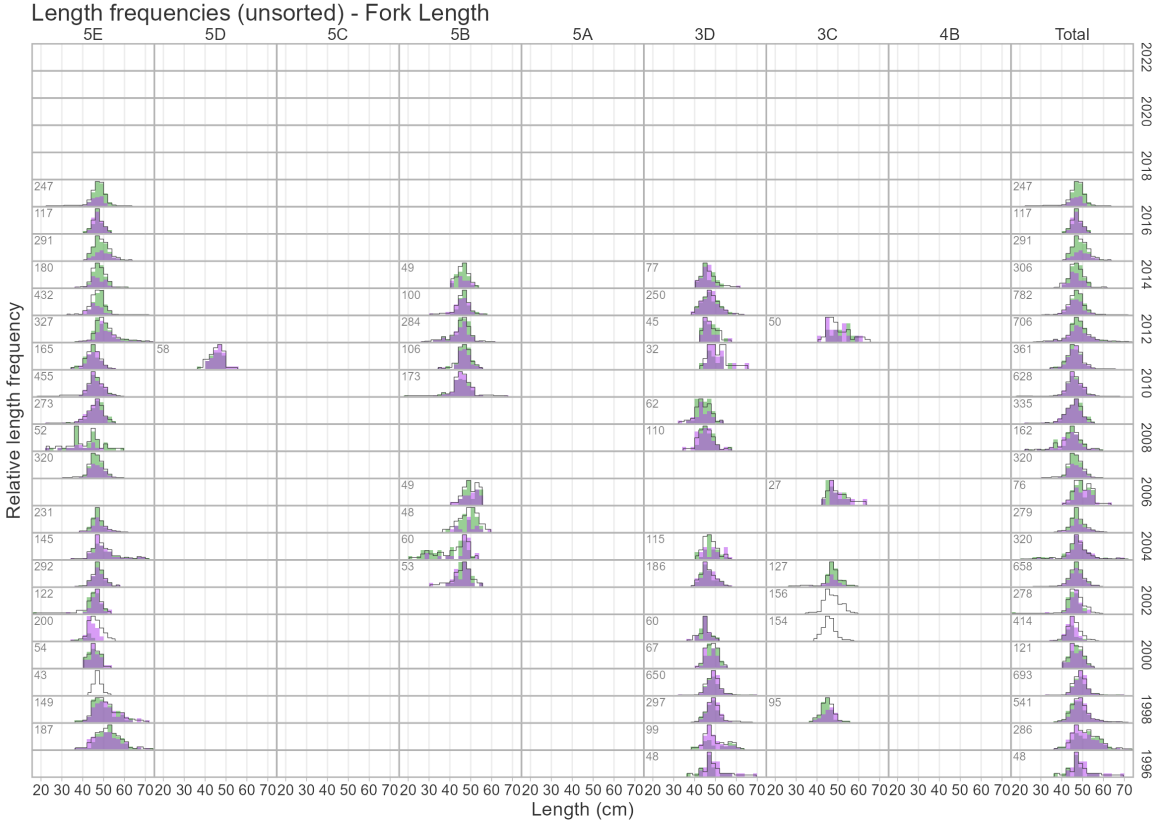
Rougheye/Blackspotted Rockfish Complex



Rougheye/Blackspotted Rockfish Complex



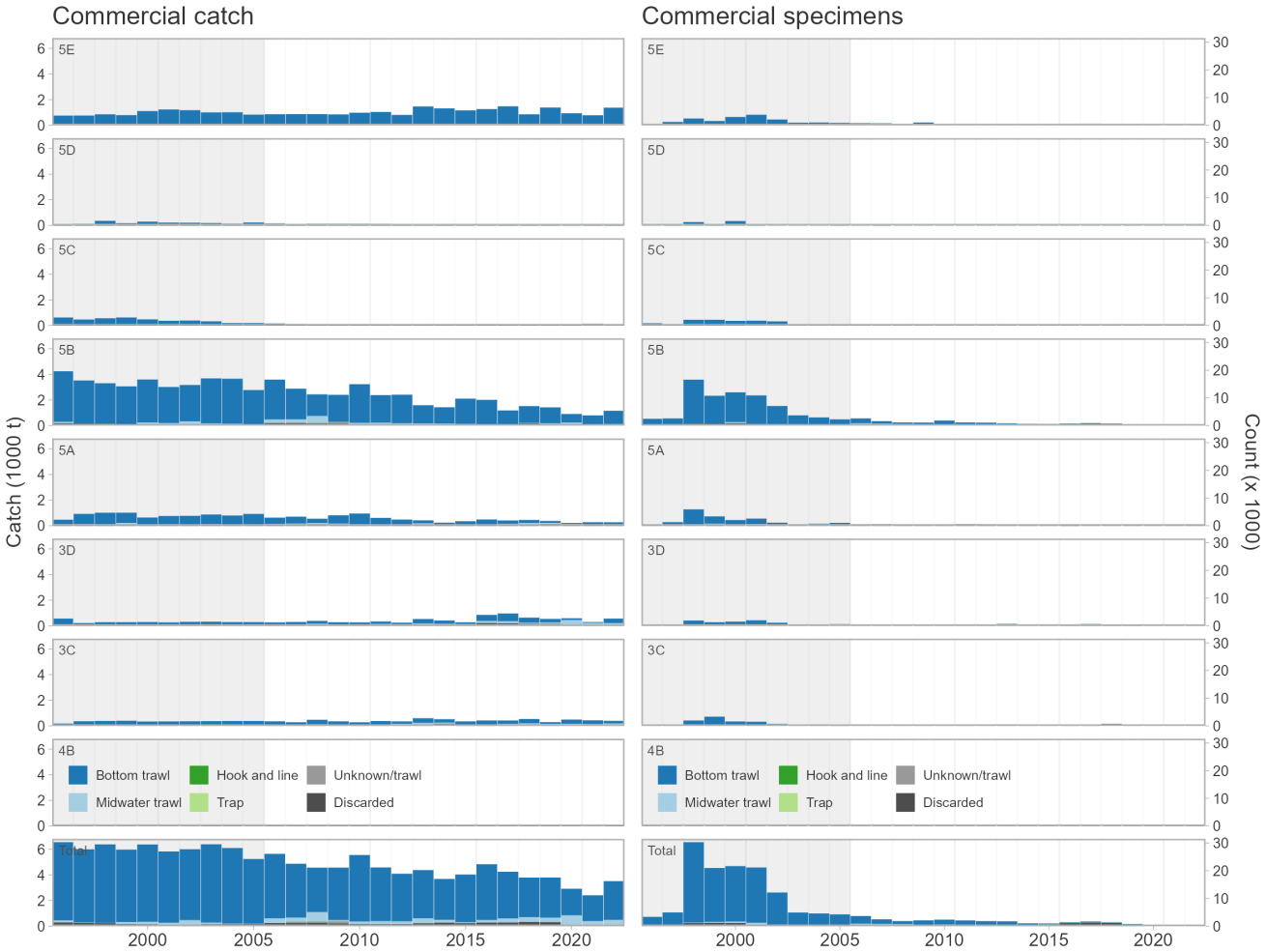




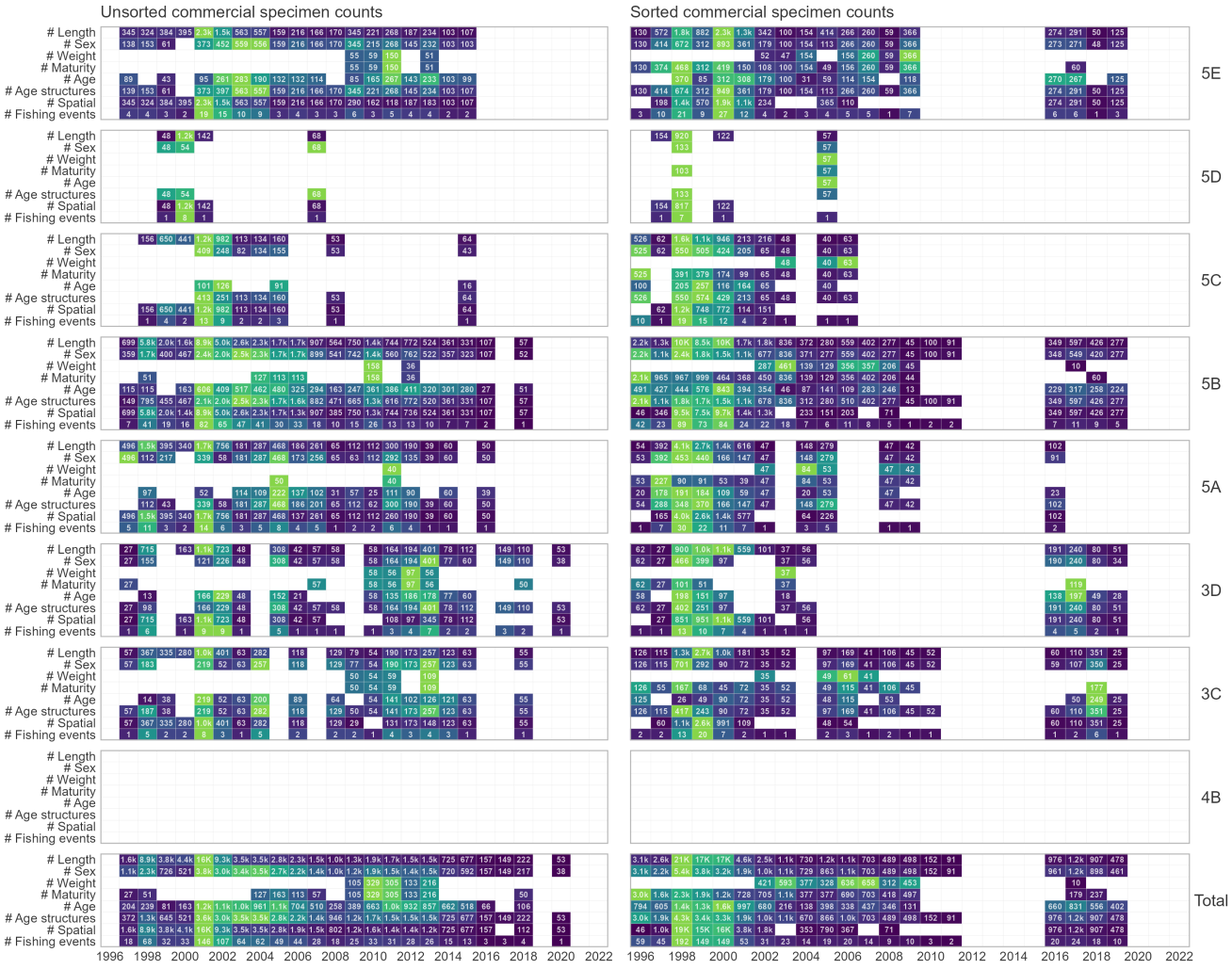
4.8 Pacific Ocean Perch

Sebastes alutus (396)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Starr and Haigh (2025)
Last Science Advisory Report: DFO (2024c)

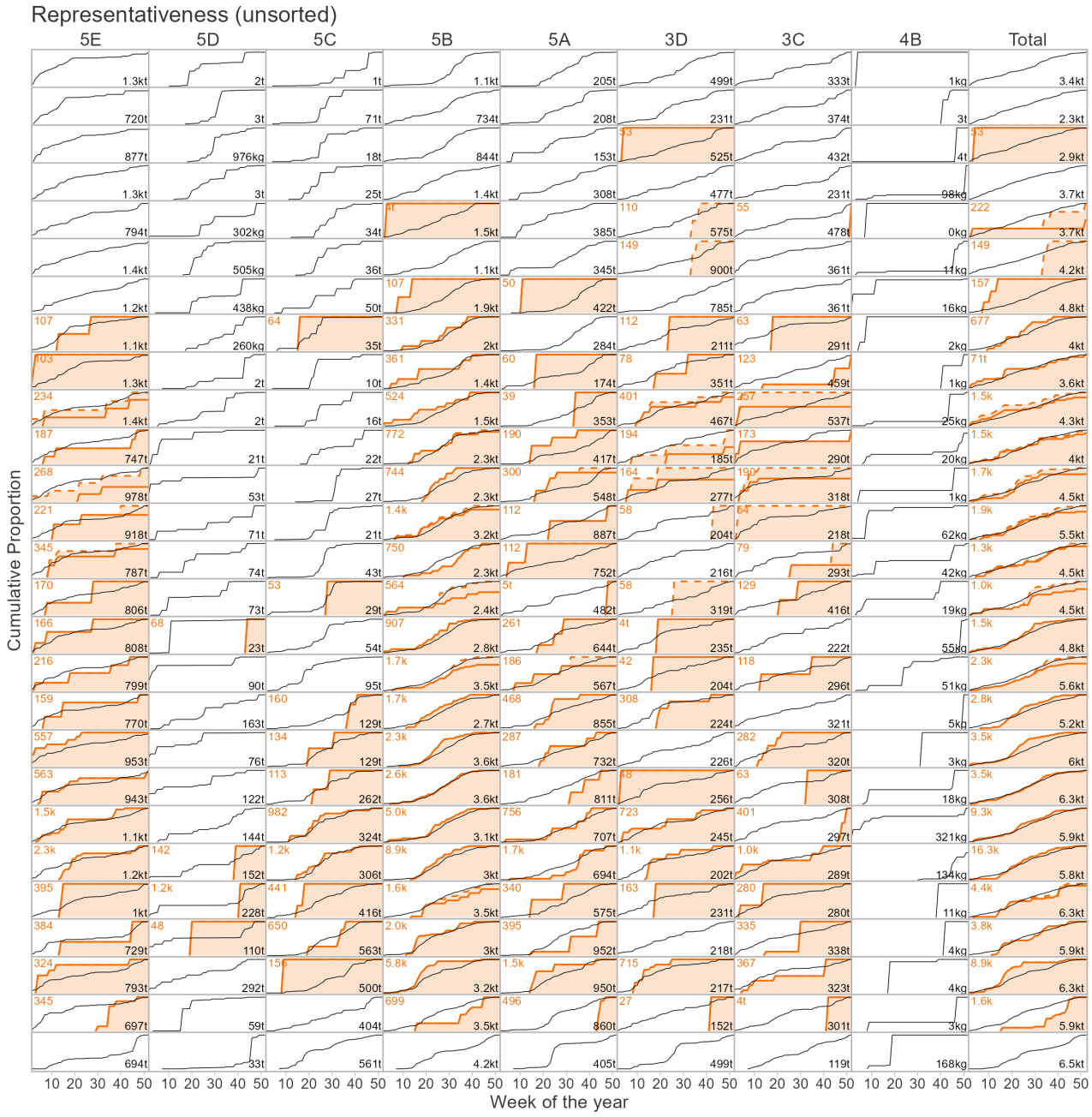
Pacific Ocean Perch were caught mostly by bottom trawl and occasionally by midwater trawl. Areas 5E and 5B had the highest catch. The catch has slowly decreased, on average, since the early 2000s. Specimen collection was highest in Area 5B. Specimen collection peaked suddenly in 1998, then declined until 2007, and has since remained low. Unsorted specimen collection occurred annually from 1997 to 2018 and in 2020. Sorted specimen collection occurred annually from 1996 to 2011 and from 2016 to 2019. Nearly all of the unsorted samples had latitude and longitude data. Cumulative total sampling and catch profiles matched in most years with biological sampling, particularly from 2001 to 2014. Between 1996 and 2022, 68,746 unsorted specimens were collected, and of these, 33,104 (48%) had age structures, and 12,771 (19% of specimens; 39% of age structures) had been aged. All unsorted specimens had lengths; of these, 35,055 (51%) were sexed, while 1,088 (2%) had weights.



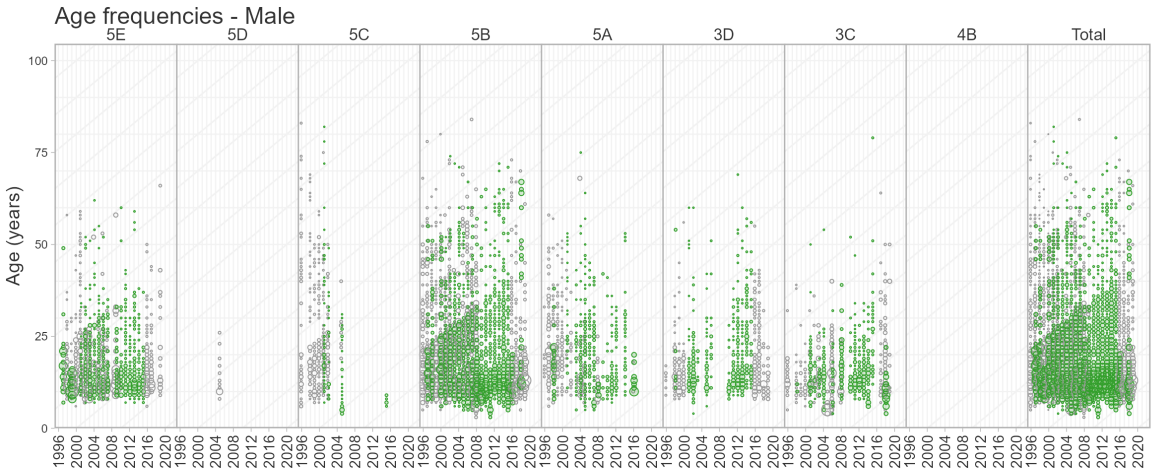
Pacific Ocean Perch

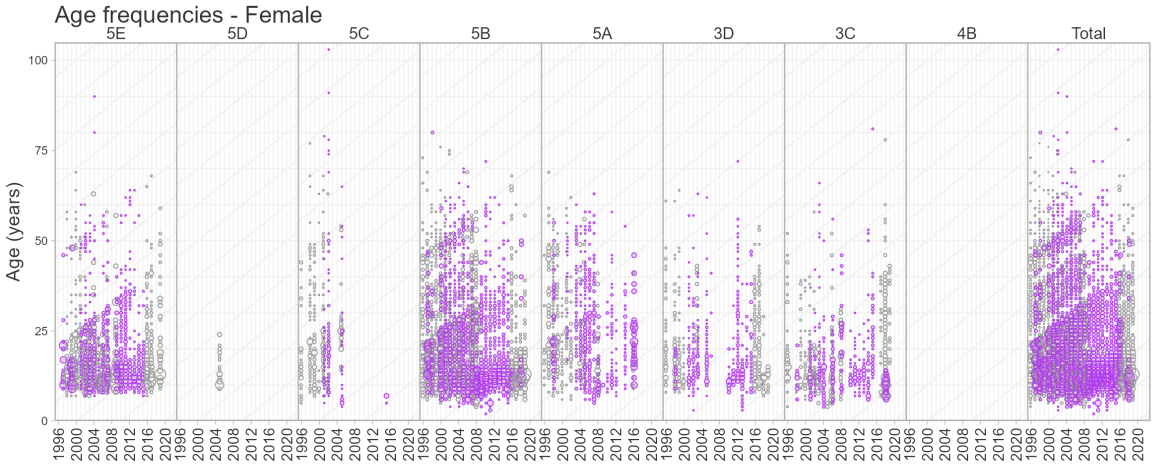


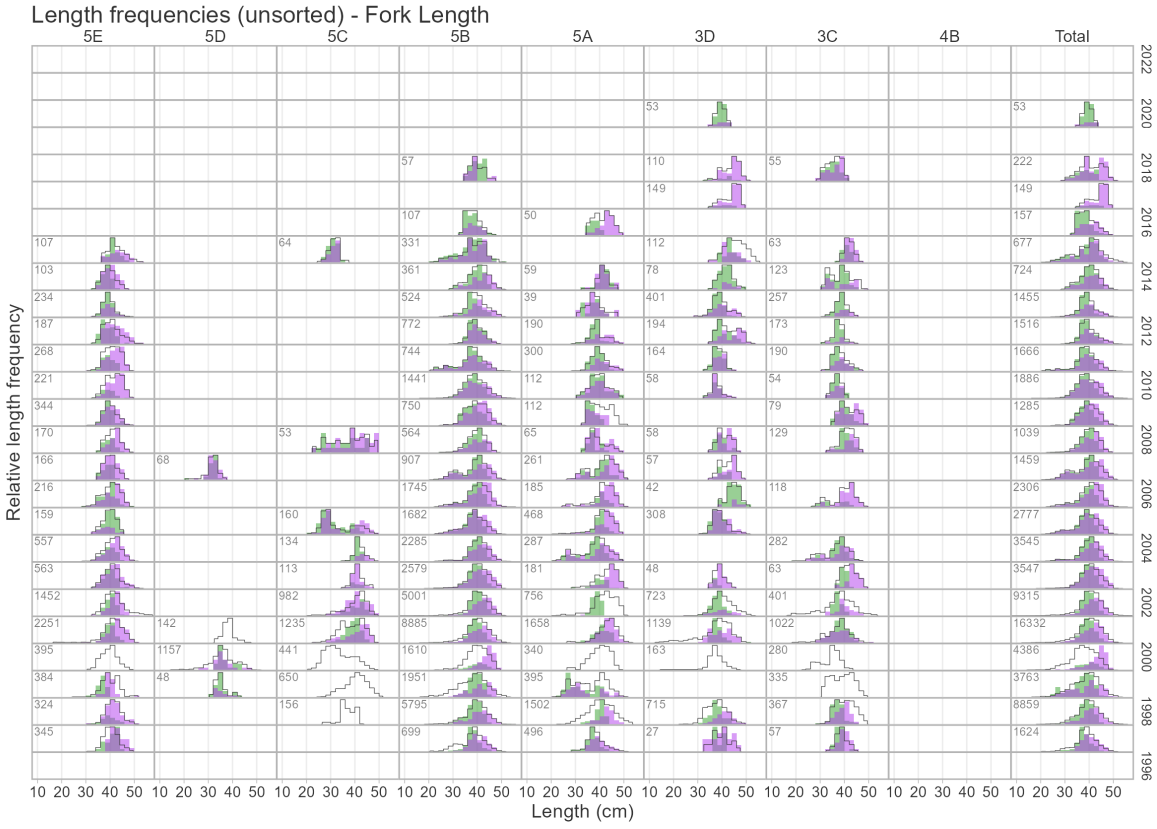
Pacific Ocean Perch



Pacific Ocean Perch



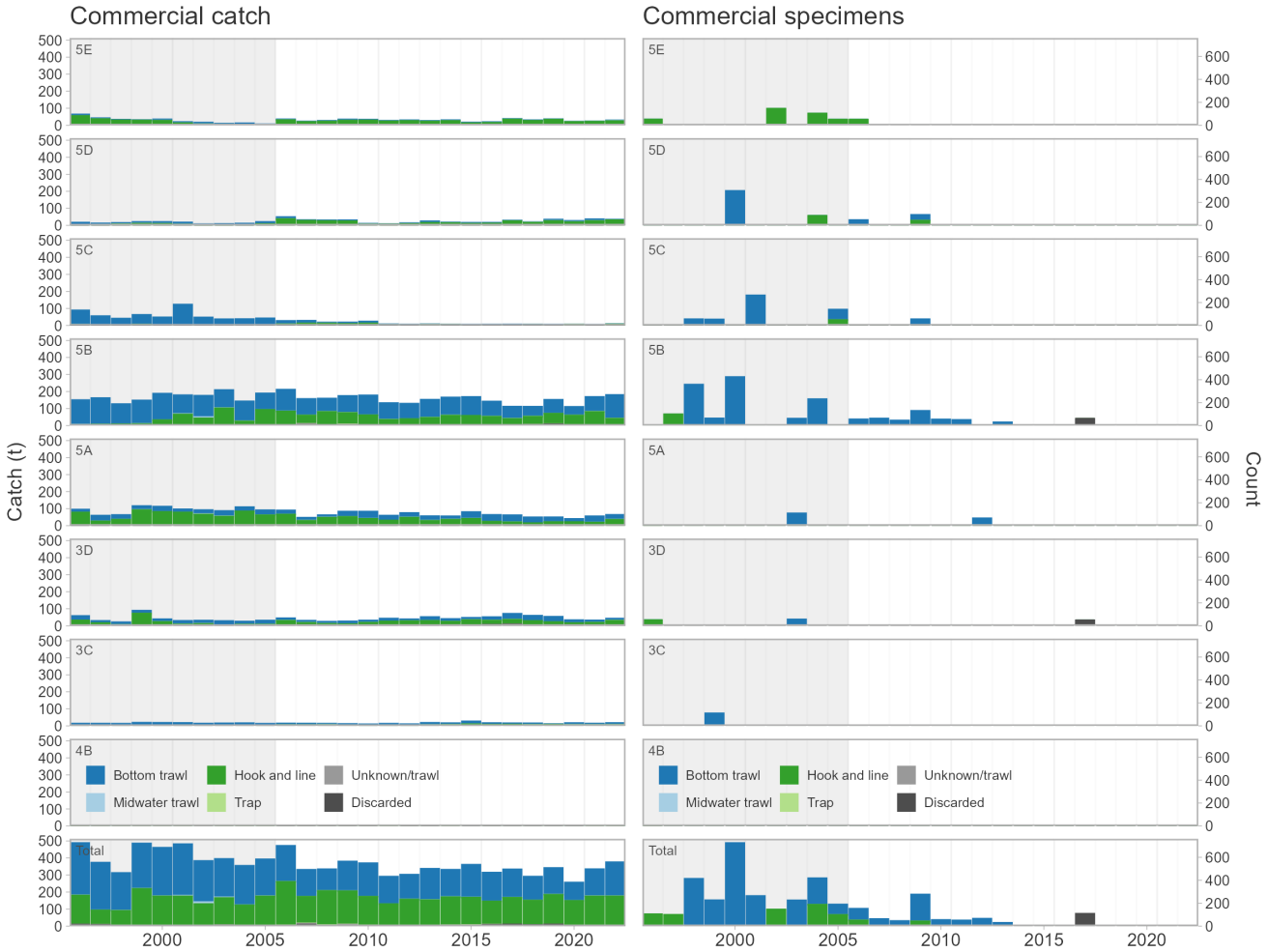




4.9 Redbanded Rockfish

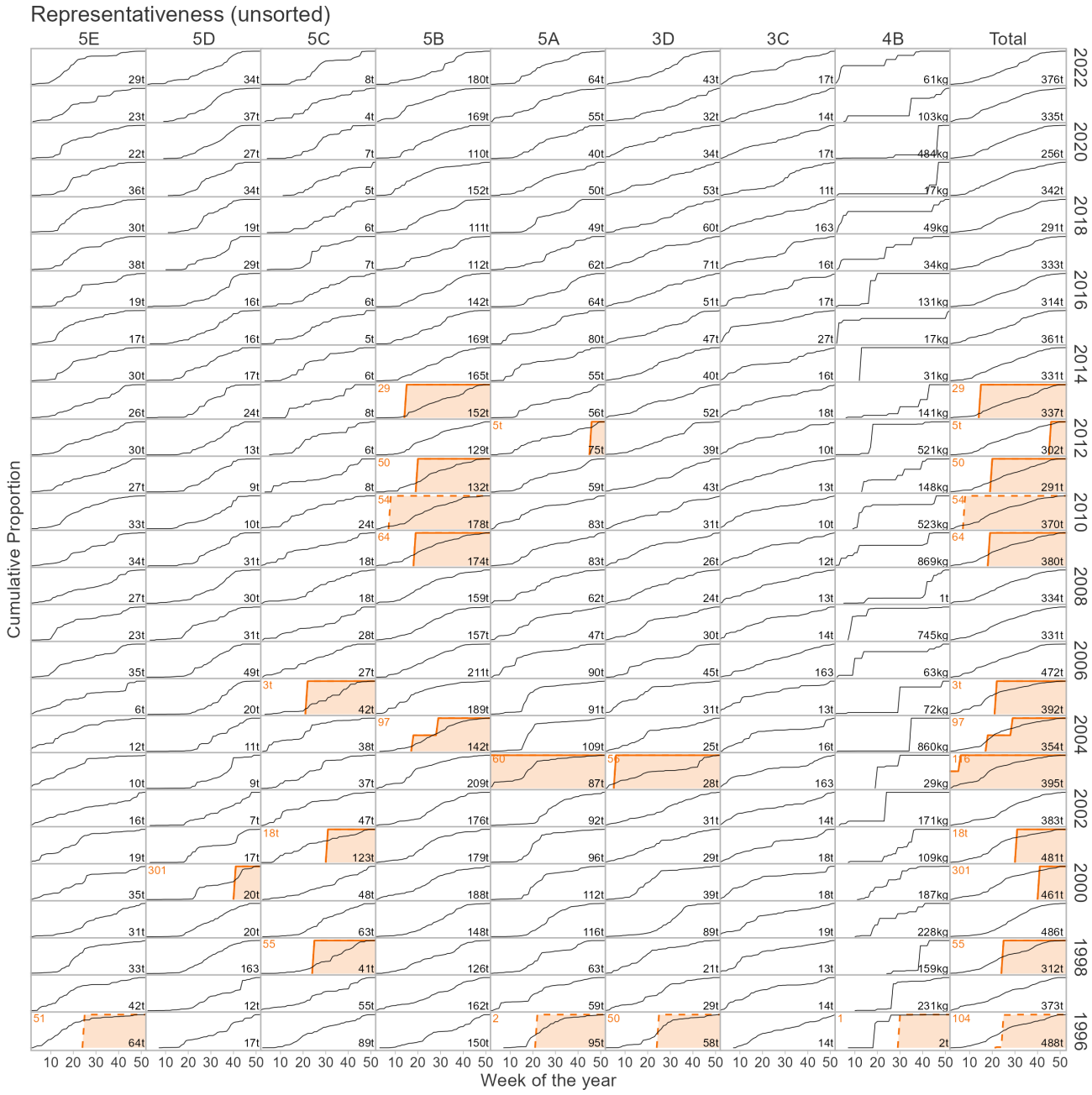
Sebastes babcocki (401)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Edwards et al. (2017)

Redbanded Rockfish were caught mostly by bottom trawl and hook and line, and occasionally by midwater trawl. Catch was marginally higher in Area 5B. Catch remained consistent over time, with minor fluctuations. Specimen collection was highest in 2000, with minor peaks in 1998, 2004, and 2009. Unsorted specimen collection was limited and inconsistent from 1996 to 2013. Sorted specimen collection occurred from 1997 to 2009 and in 2015. Nearly all of the unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles did not match in the years with biological sampling. Between 1996 and 2022, 1,135 unsorted specimens were collected, and of these, 676 (60%) had age structures, and 386 (34% of specimens; 57% of age structures) have been aged. All unsorted specimens had lengths; of these, 677 (60%) were sexed, while 157 (14%) had weights.

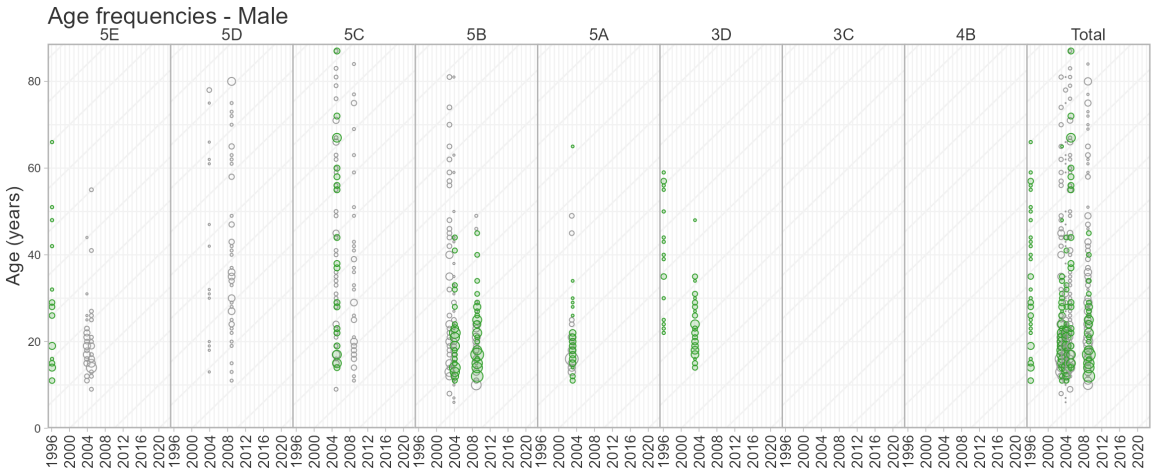


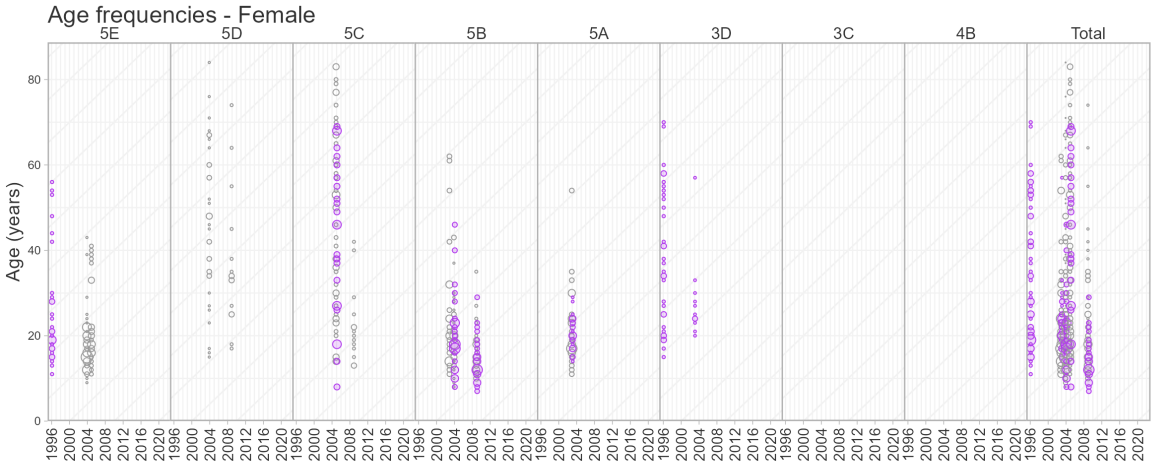
Redbanded Rockfish

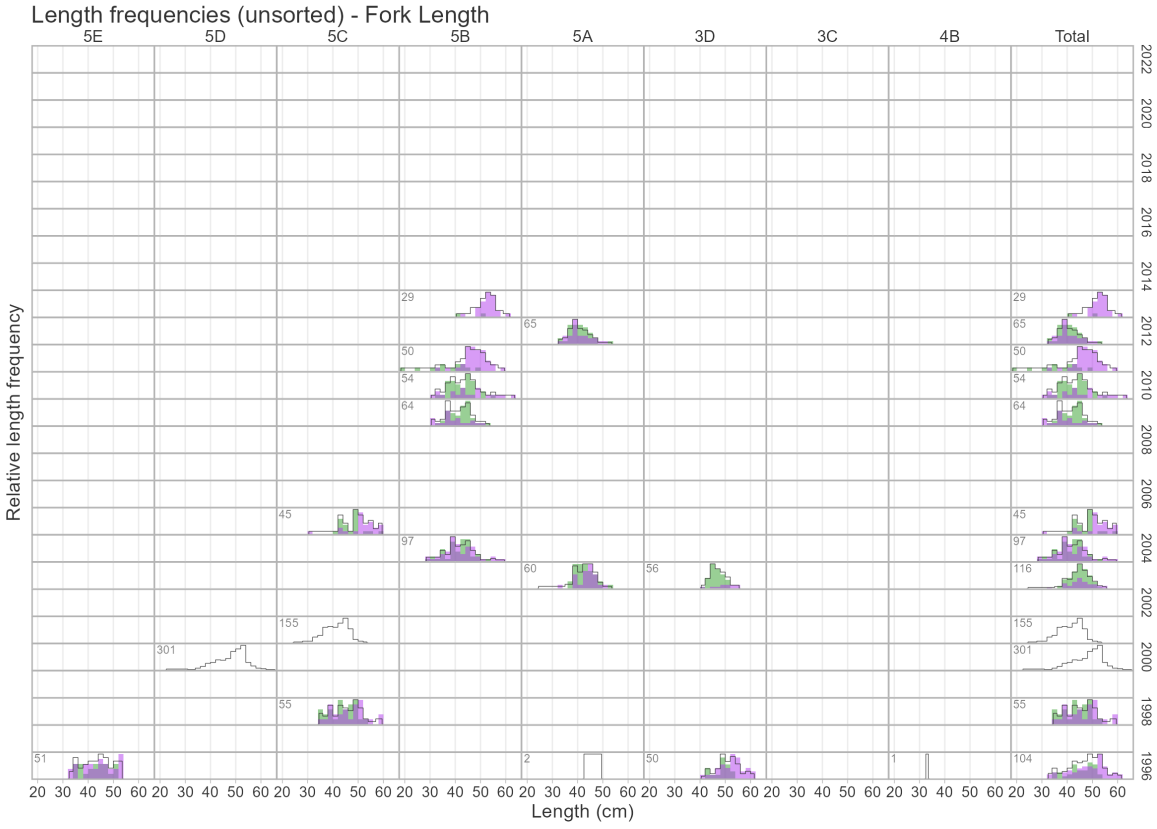
Redbanded Rockfish



Redbanded Rockfish



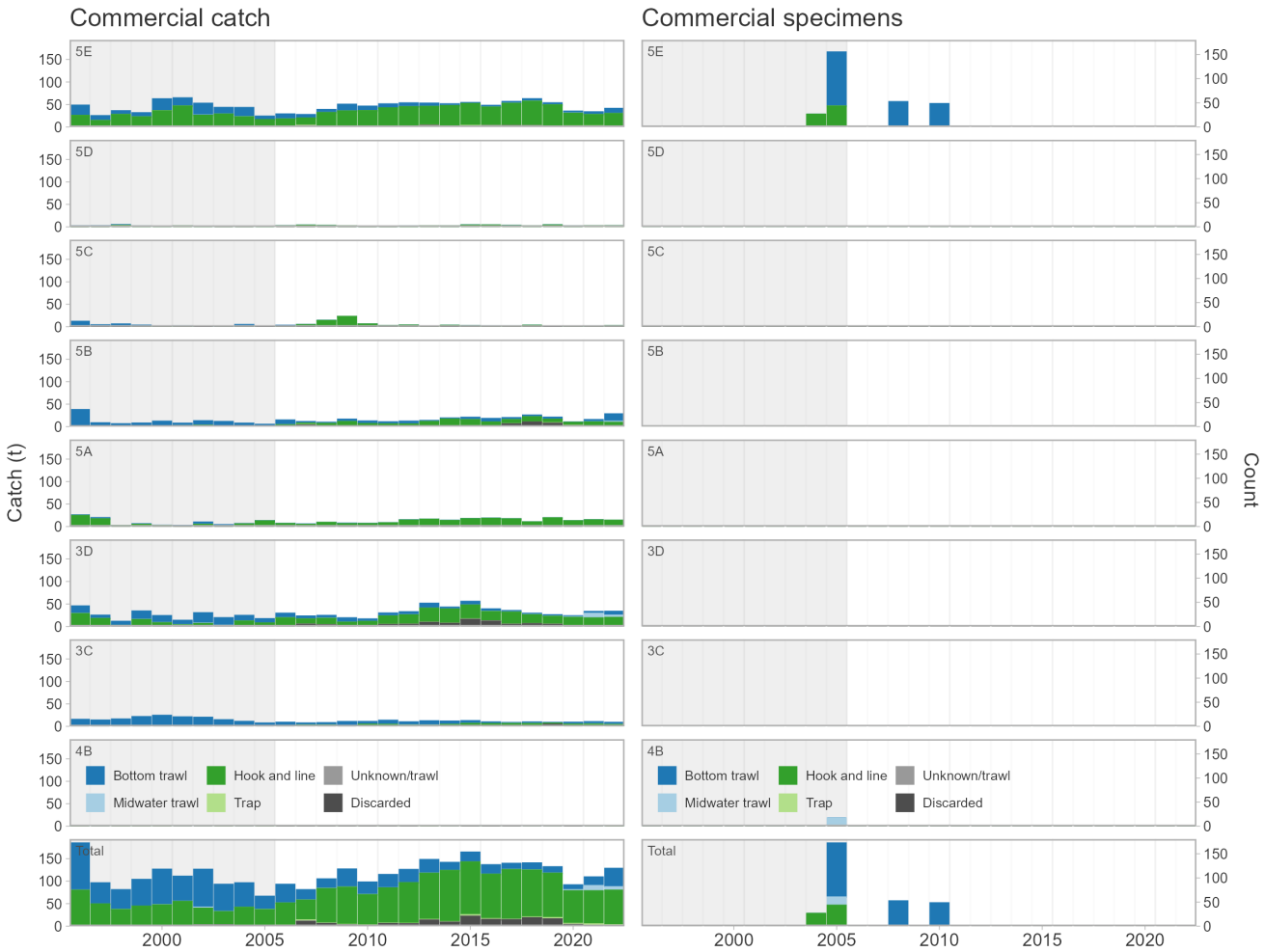




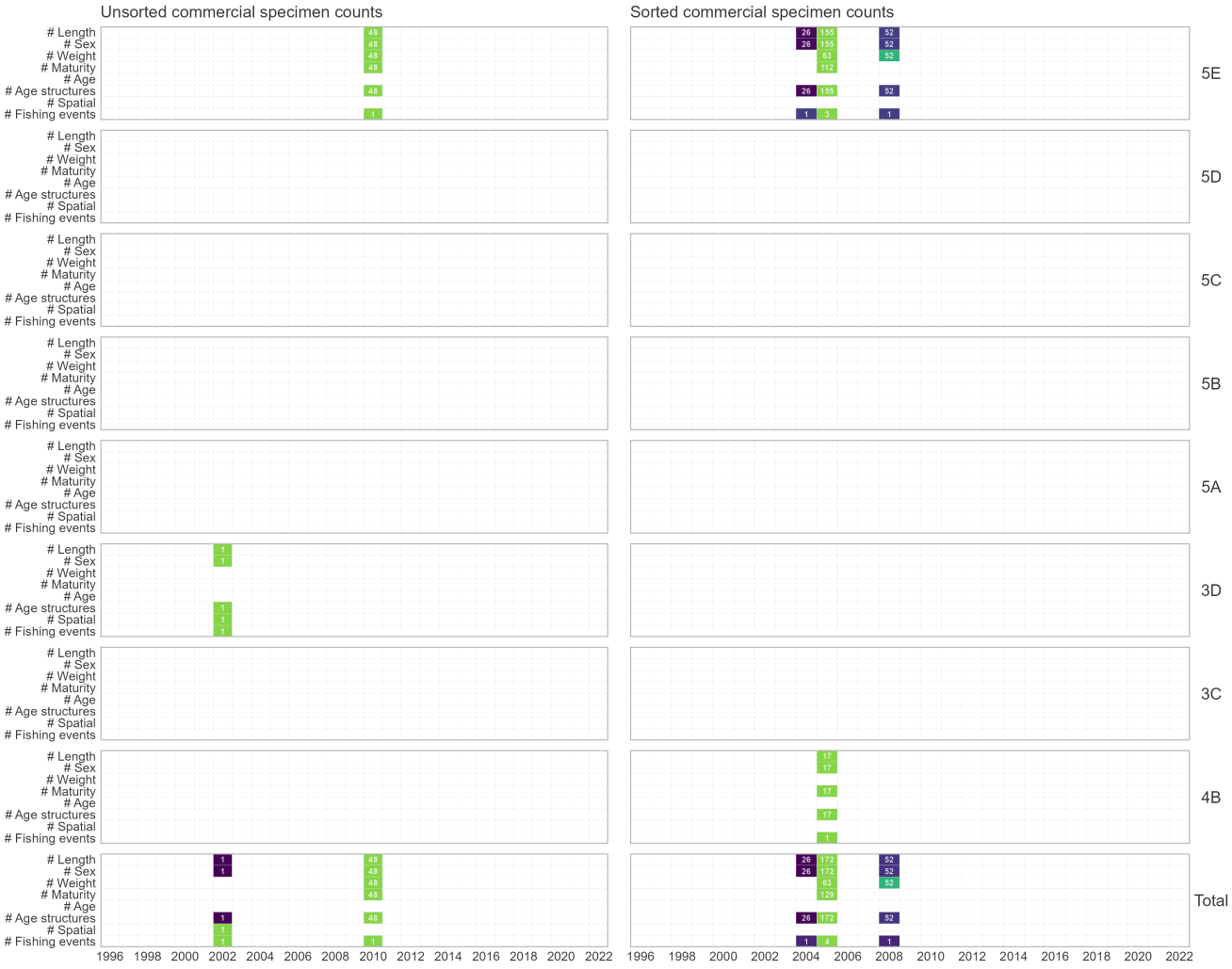
4.10 Shortraker Rockfish

Sebastes borealis (403)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Schnute et al. (1999)
Last Science Advisory Report: DFO (1999b)

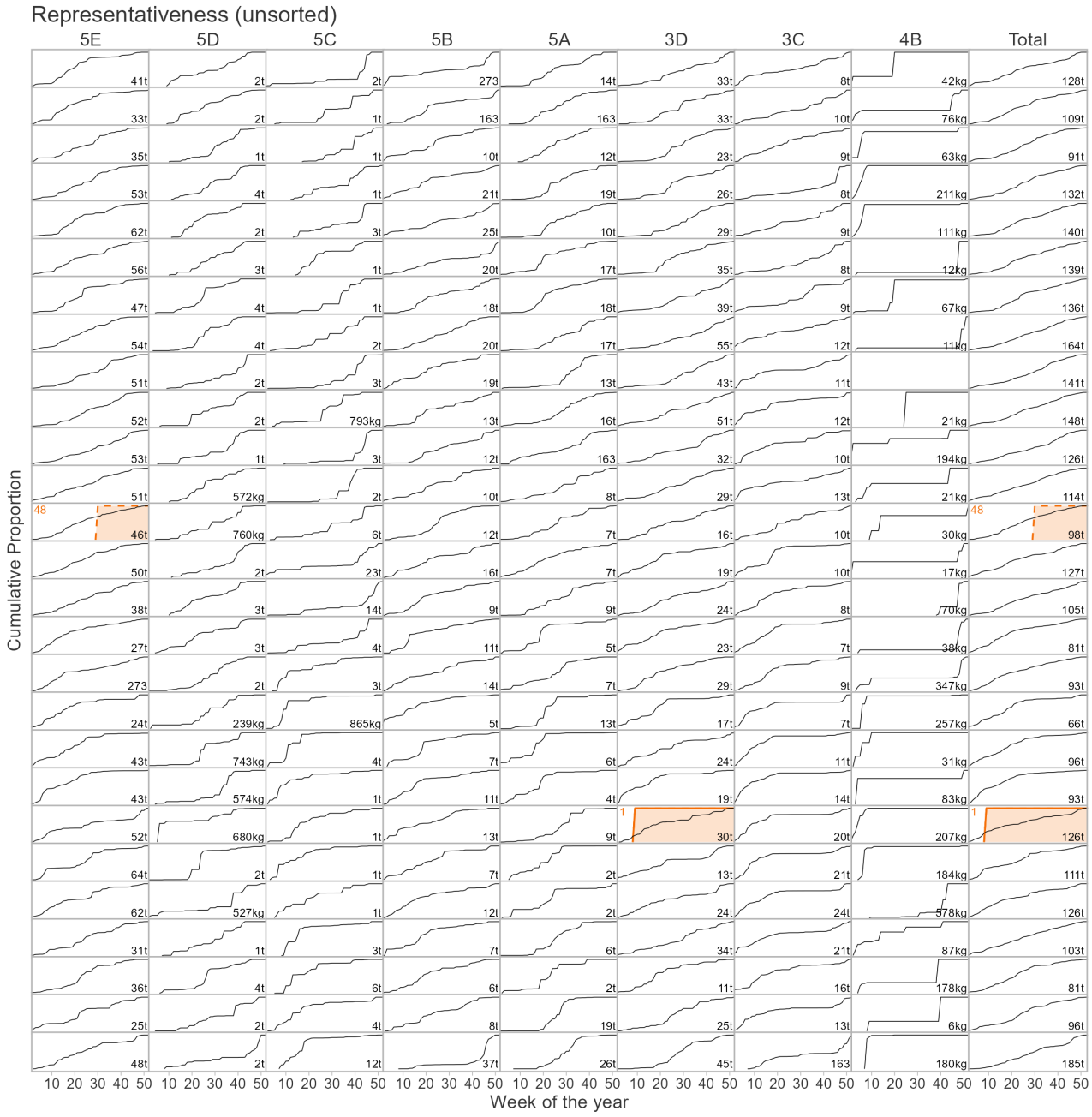
Shortraker Rockfish were caught mostly by hook, line, and bottom trawl, and occasionally by midwater trawl. Areas 5E and 3D had marginally higher catch. Catch remained relatively stable over time, with minor fluctuations. Specimen collection was limited and infrequent. Cumulative total sampling and catch profiles did not match. Between 1996 and 2022, 49 unsorted specimens were collected, and of these, 49 (100%) had age structures, but none have been aged. All unsorted specimens had lengths; of these, 49 (100%) were sexed, while 48 (98%) had weights.



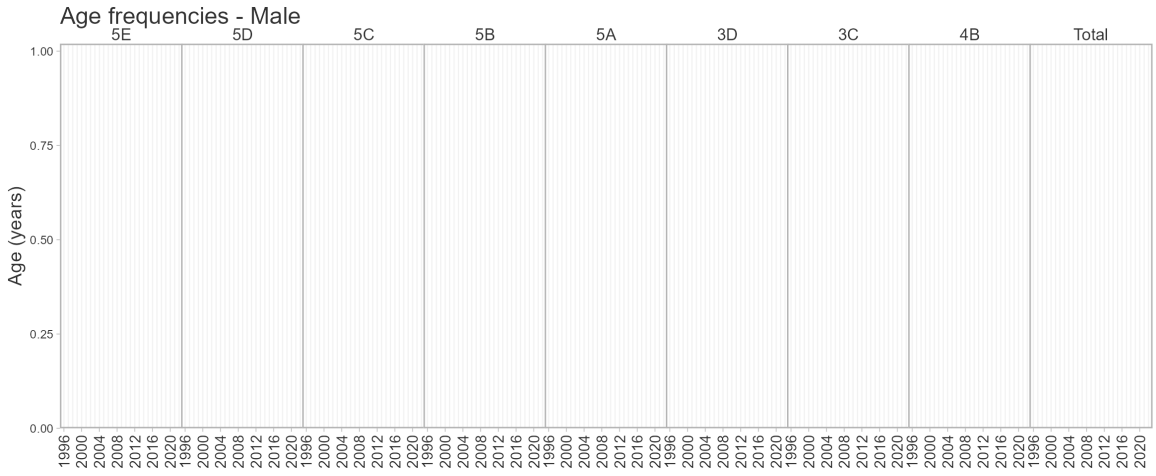
Shortraker Rockfish

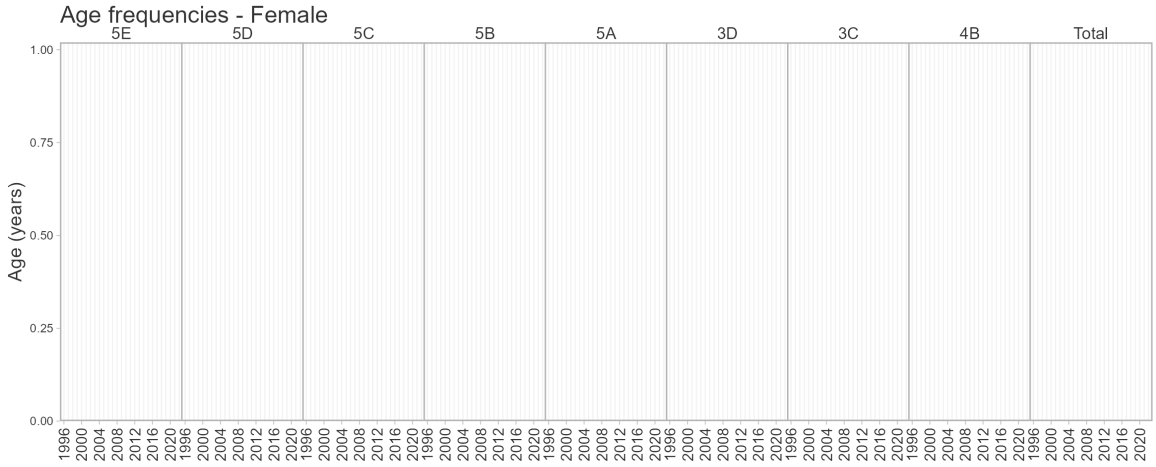


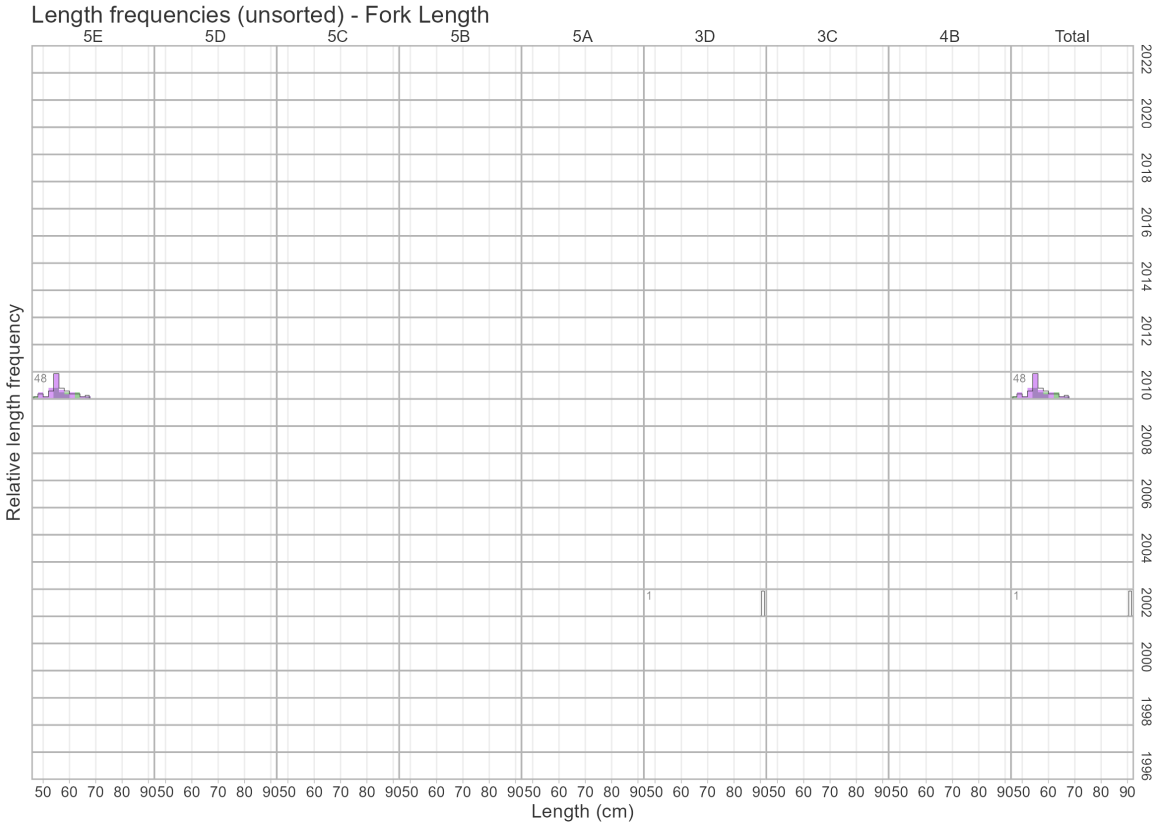
Shortraker Rockfish



Shortraker Rockfish



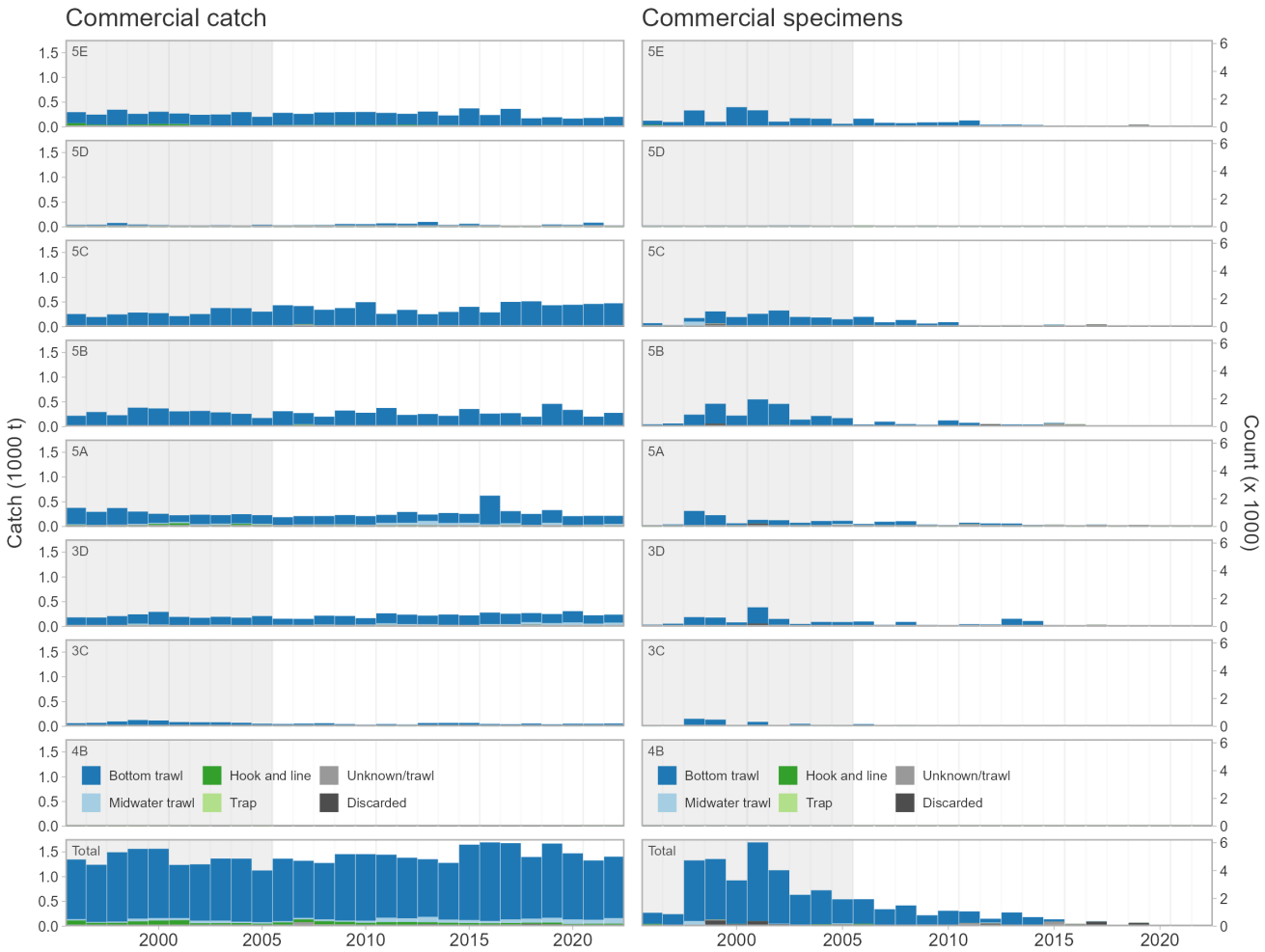




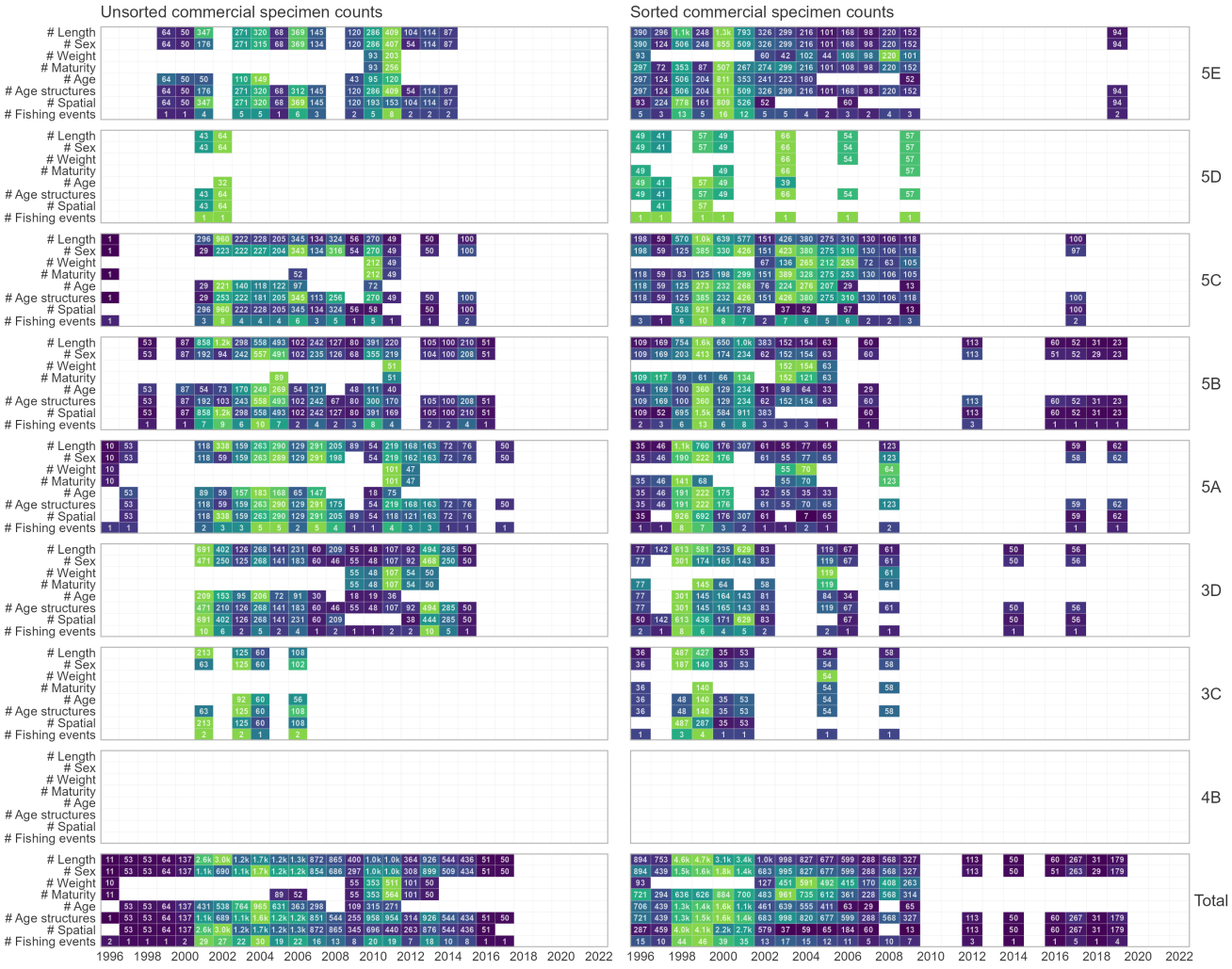
4.11 Silvergray Rockfish

Sebastes brevispinis (405)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Starr et al. (2016)
Last Science Advisory Report: DFO (2014b)

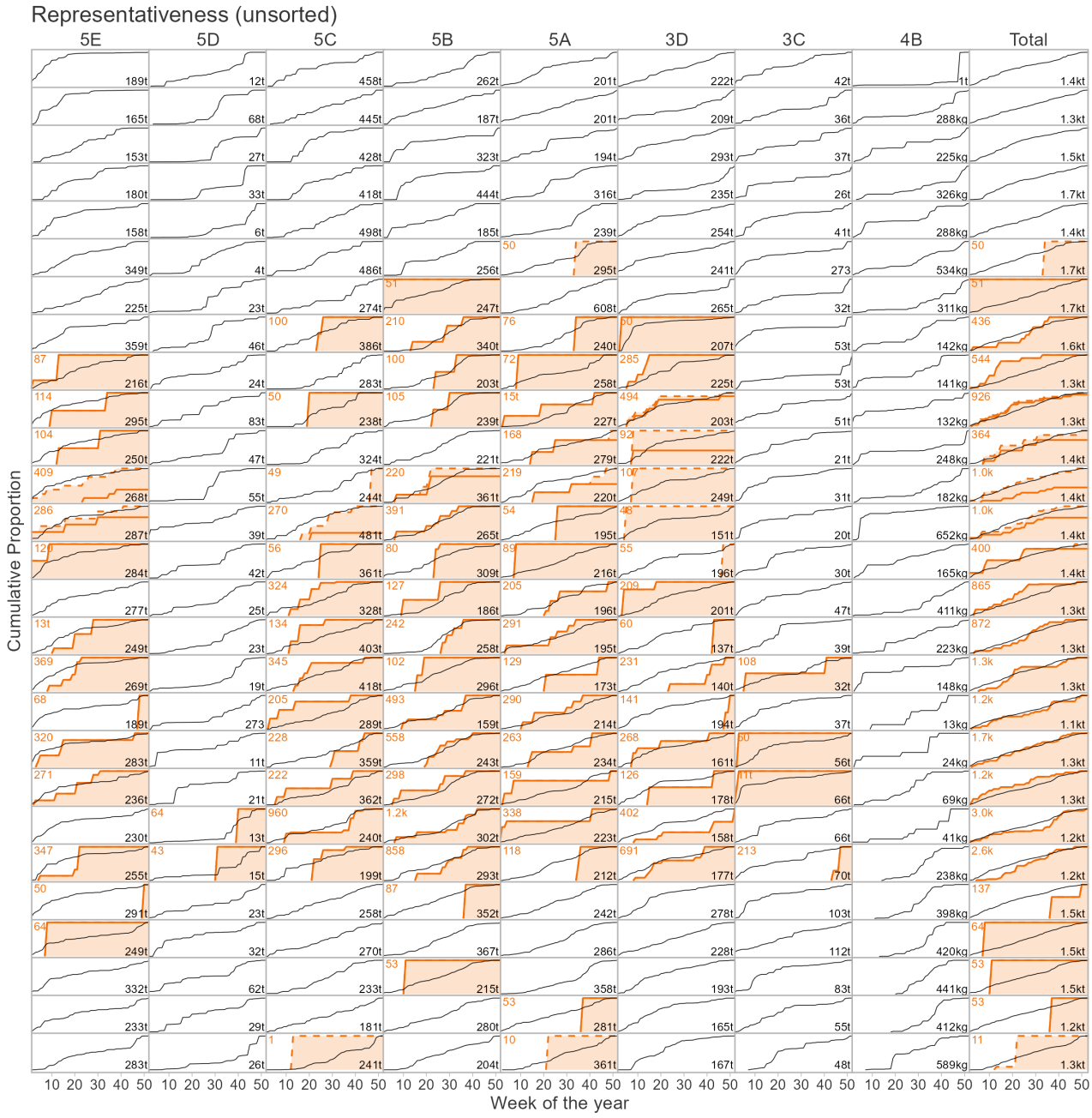
Silvergray Rockfish were caught mostly by bottom trawl, and occasionally by hook, line, and midwater trawl. Catch occurred relatively evenly across areas except for Areas 5D, 3C, and 4B, where the catch was low or negligible. The catch remained relatively stable over time. Specimen collection peaked in 2001, then declined quickly. Unsorted specimens were collected annually from 1996 to 2017. Sorted specimen collection occurred from 1996 to 2009, in 2012 and 2014, and from 2016 to 2019. Nearly all of the unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched in most years with biological sampling, particularly from 2001 to 2013. Between 1996 and 2022, 17,786 unsorted specimens were collected, and of these, 13,142 (74%) had age structures, and 4,992 (28% of specimens; 38% of age structures) have been aged. All unsorted specimens had lengths; of these, 13,457 (76%) were sexed, while 1,080 (6%) had weights.



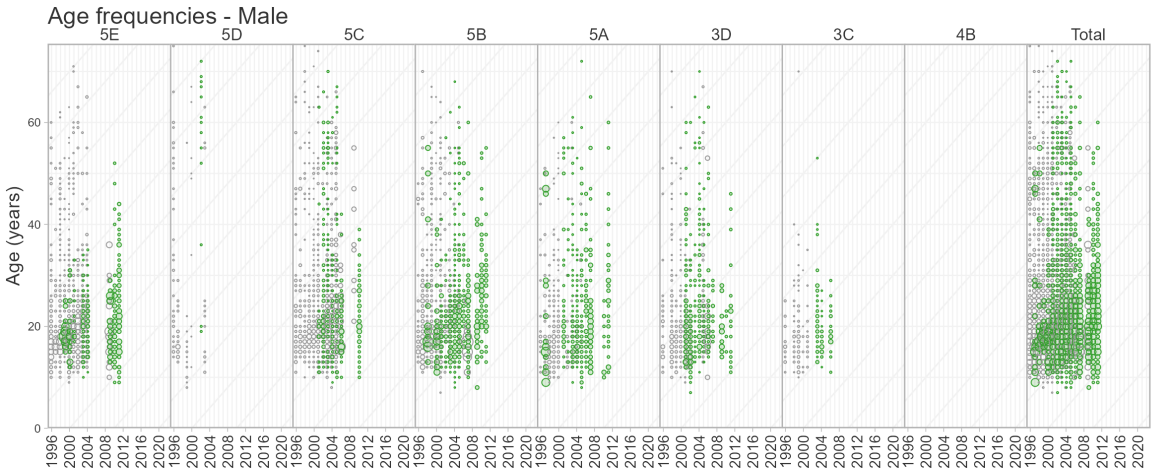
Silvergray Rockfish

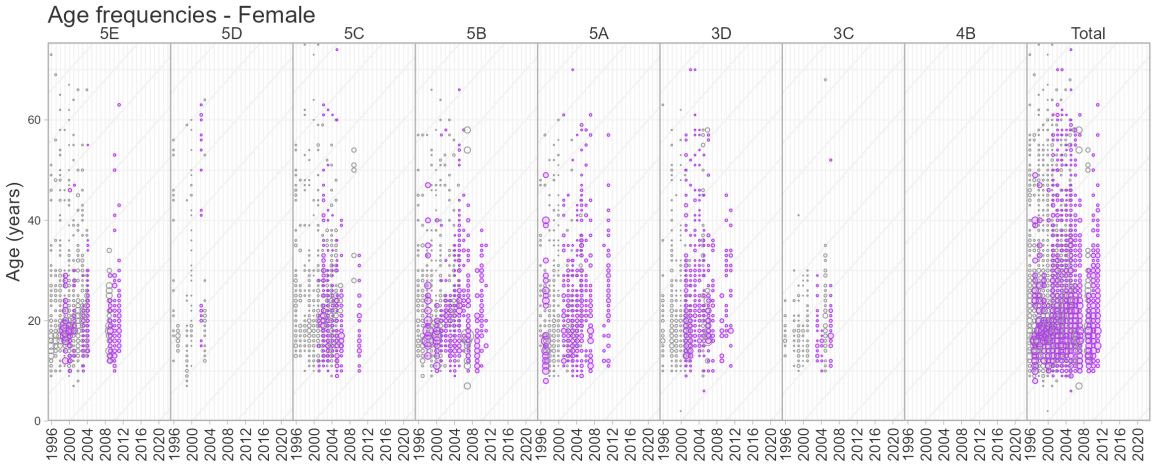


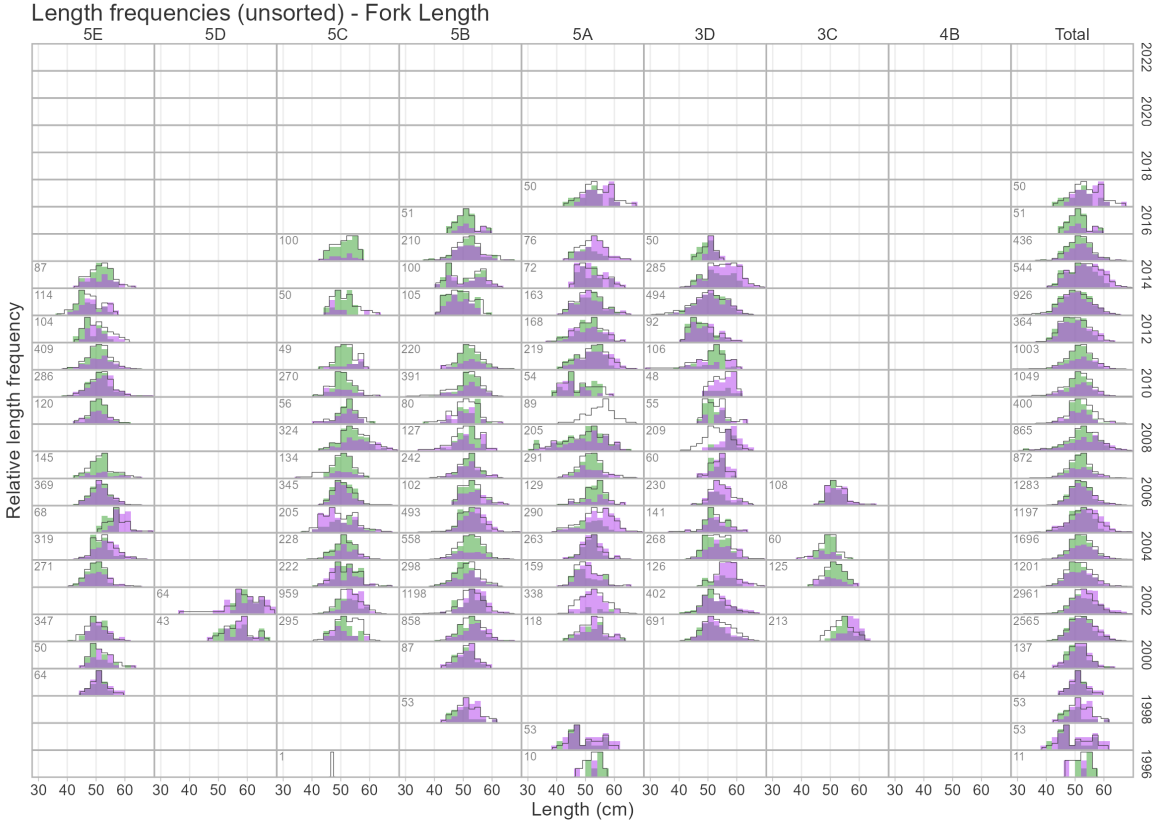
Silvergray Rockfish



Silvergray Rockfish



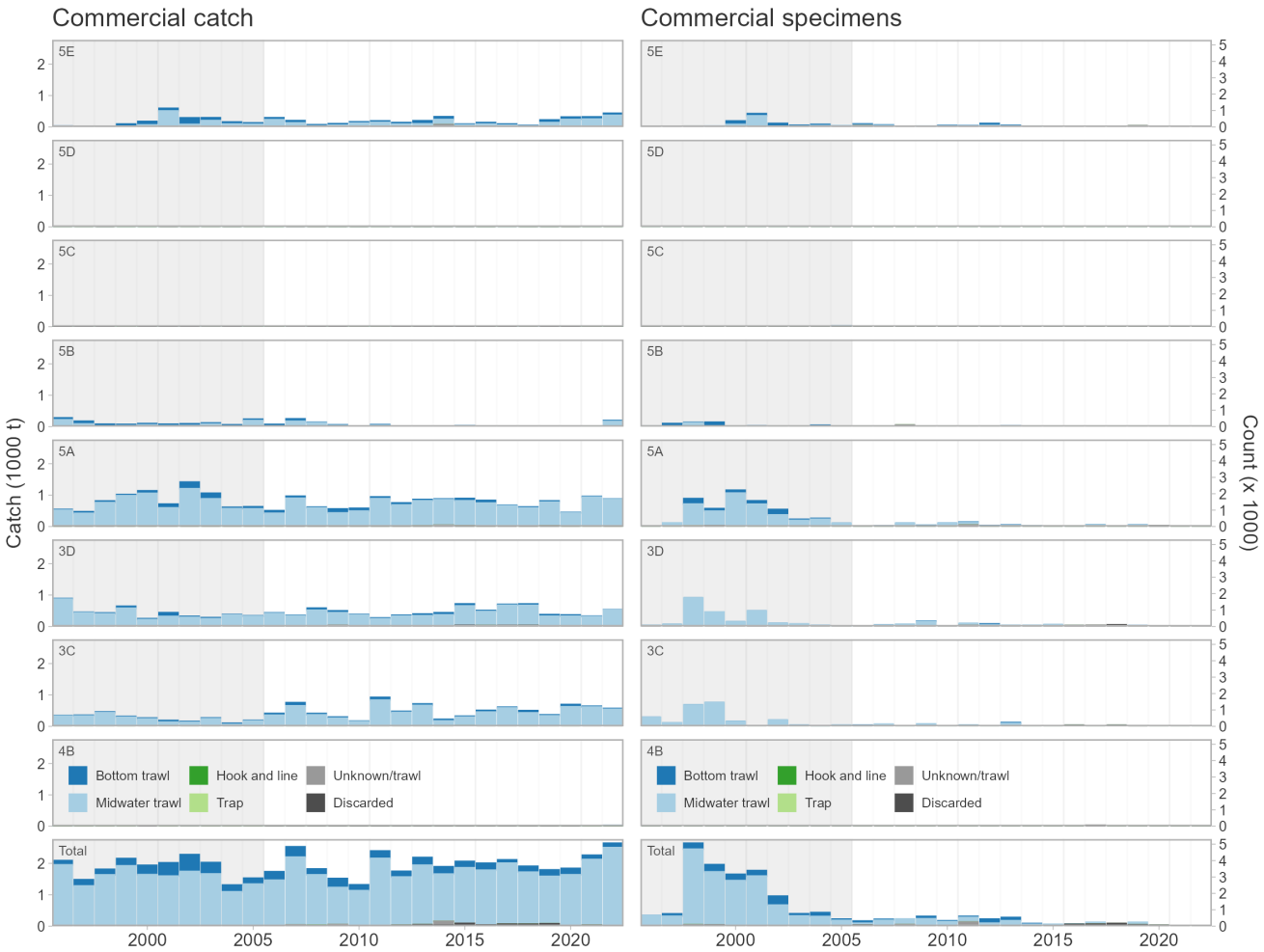




4.12 Widow Rockfish

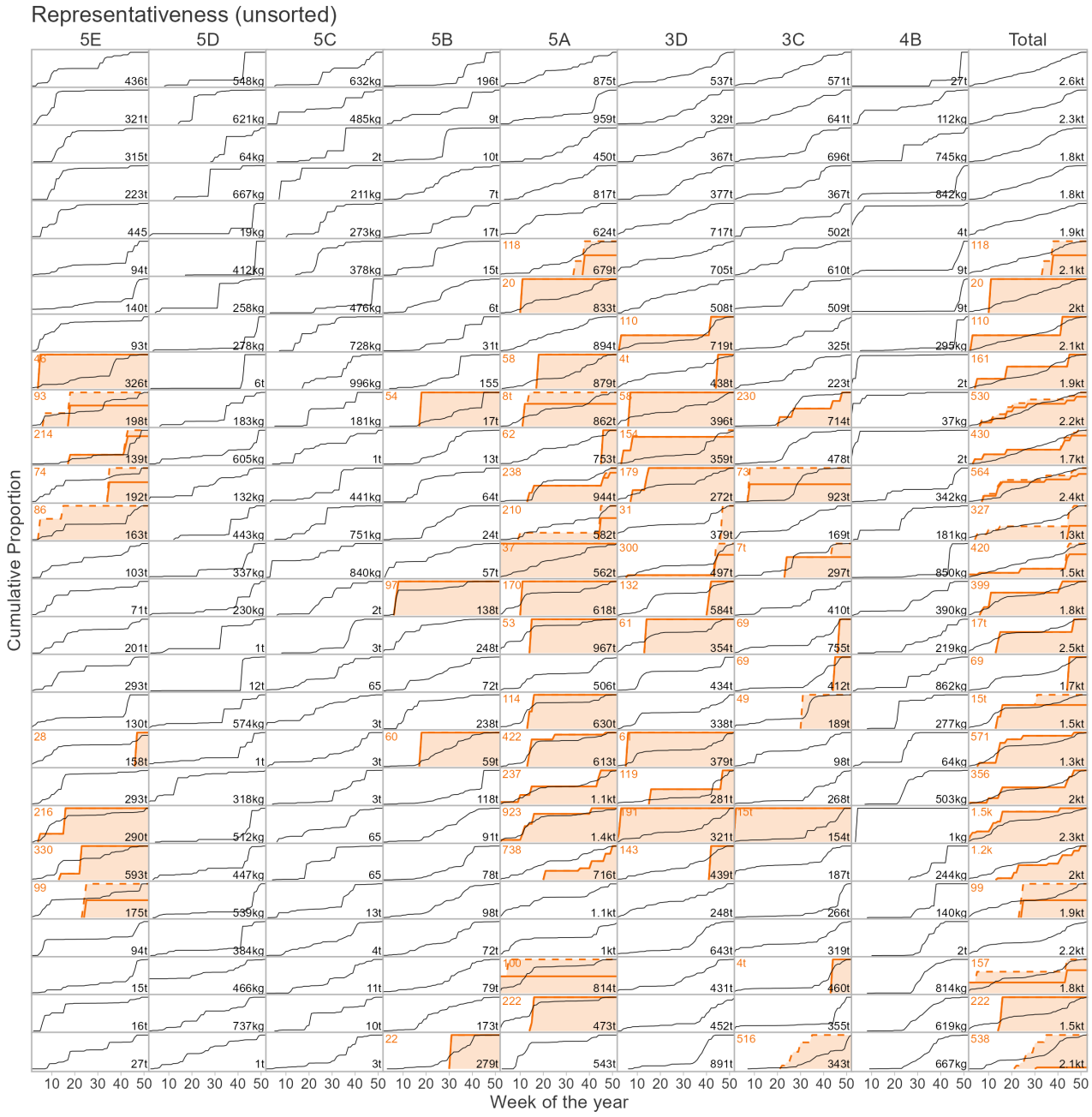
Sebastes entomelas (417)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Starr and Haigh (2021b)
Last Science Advisory Report: DFO (2019c)

Widow Rockfish were caught mostly by midwater and bottom trawl. Catch and specimen collection were highest in Areas 5A and 3CD. Catch was relatively stable over time, with minor fluctuations. Specimen collection peaked suddenly in 1998 and then decreased. Unsorted specimen collection occurred from 1996 to 2017, lacking data in 1999. Sorted specimen collection occurred from 1996 to 2009, in 2011, and from 2016 to 2020. Nearly all of the unsorted samples had latitude and longitude data. Cumulative total sampling and cumulative total catch profiles matched in half of the years with biological sampling. Between 1996 and 2022, 8,141 unsorted specimens were collected, and of these, 5,158 (63%) had age structures, and 3,742 (46% of specimens; 73% of age structures) have been aged. All unsorted specimens had lengths; of these, 5,196 (64%) were sexed, while 560 (7%) had weights.

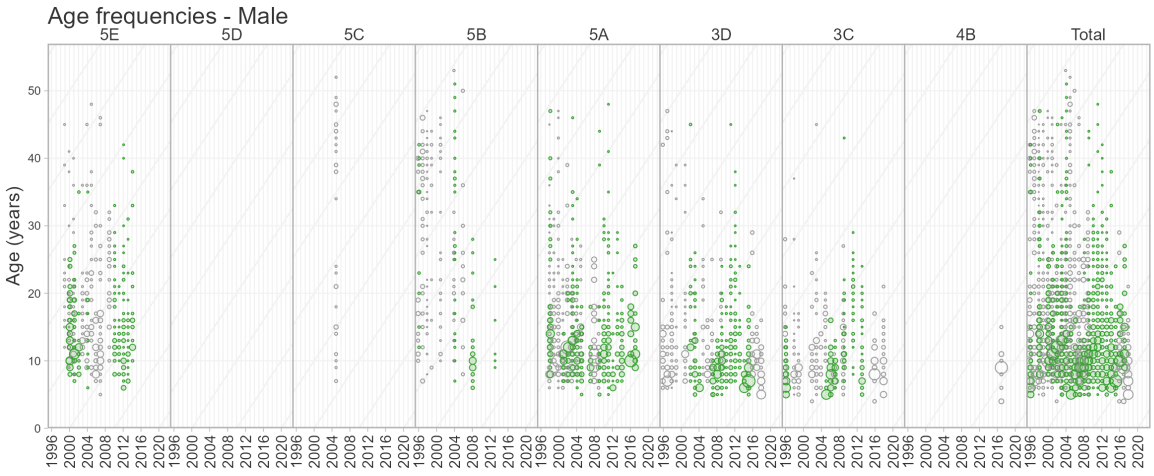


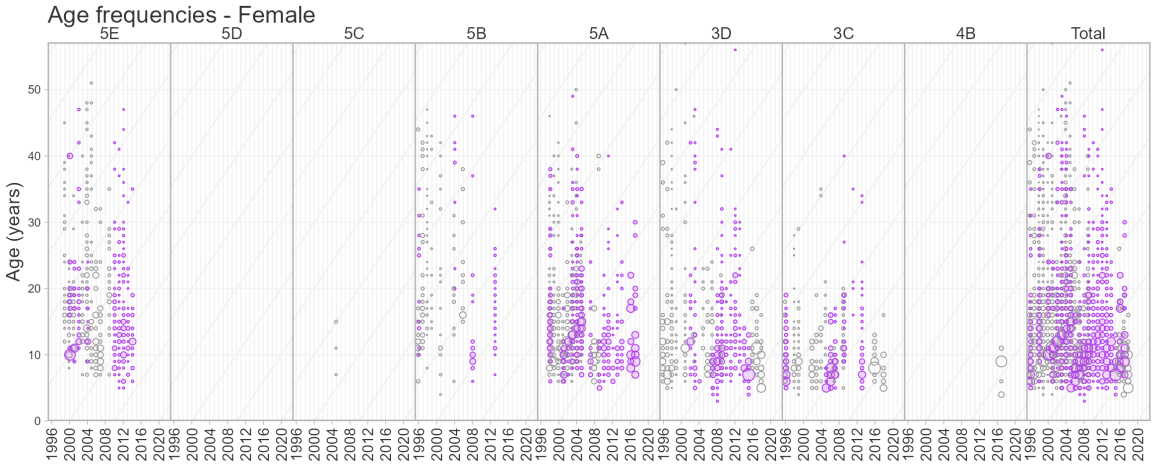
Widow Rockfish

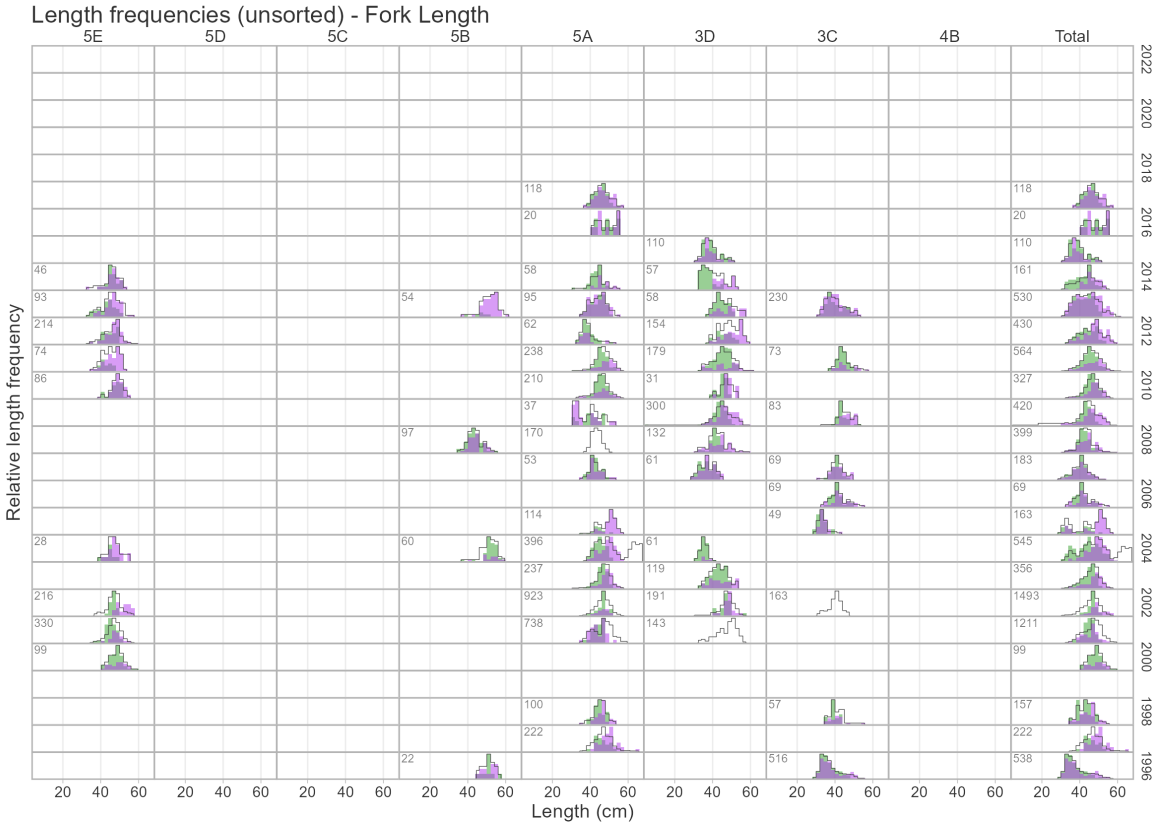
Widow Rockfish



Widow Rockfish



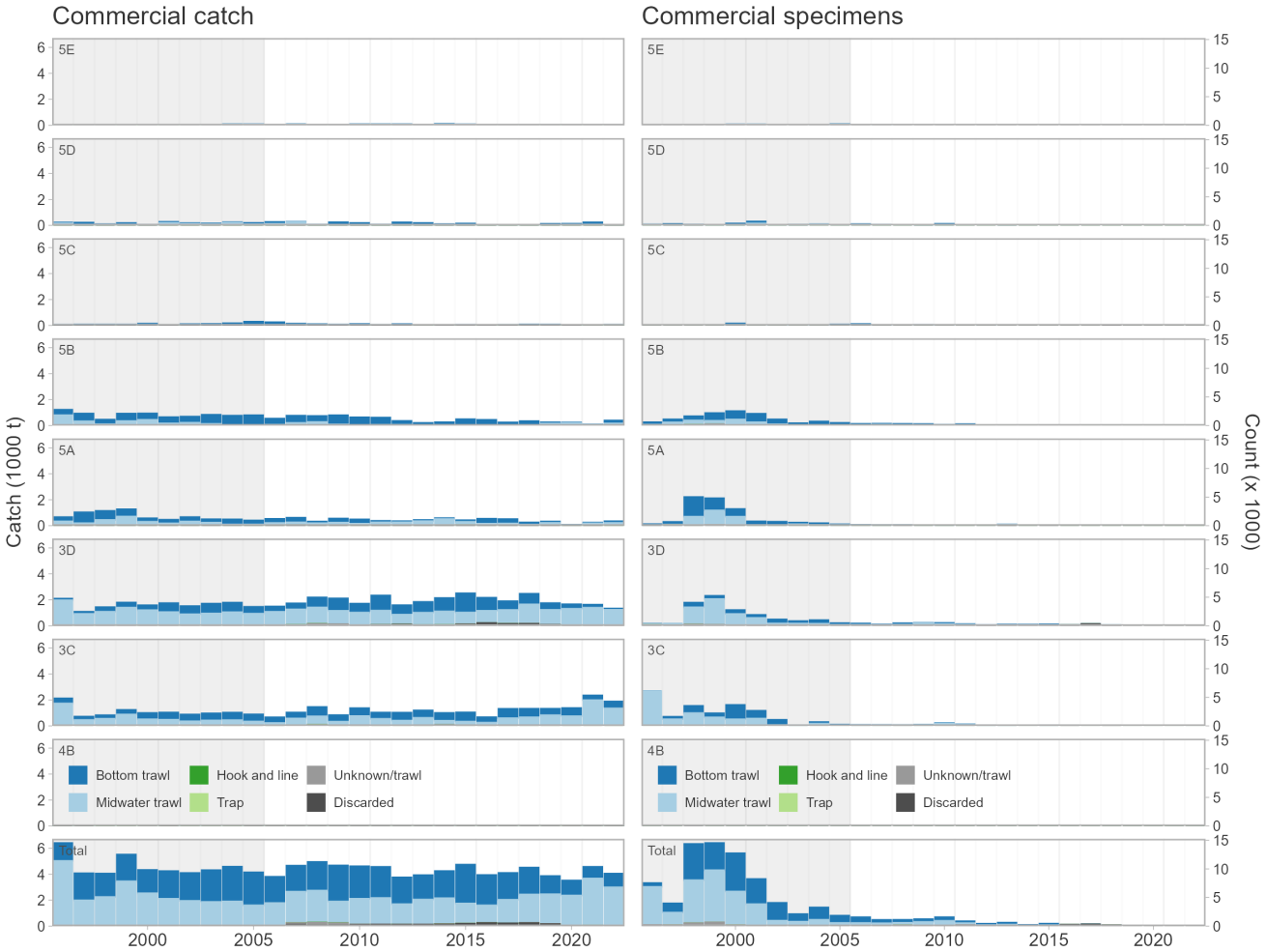




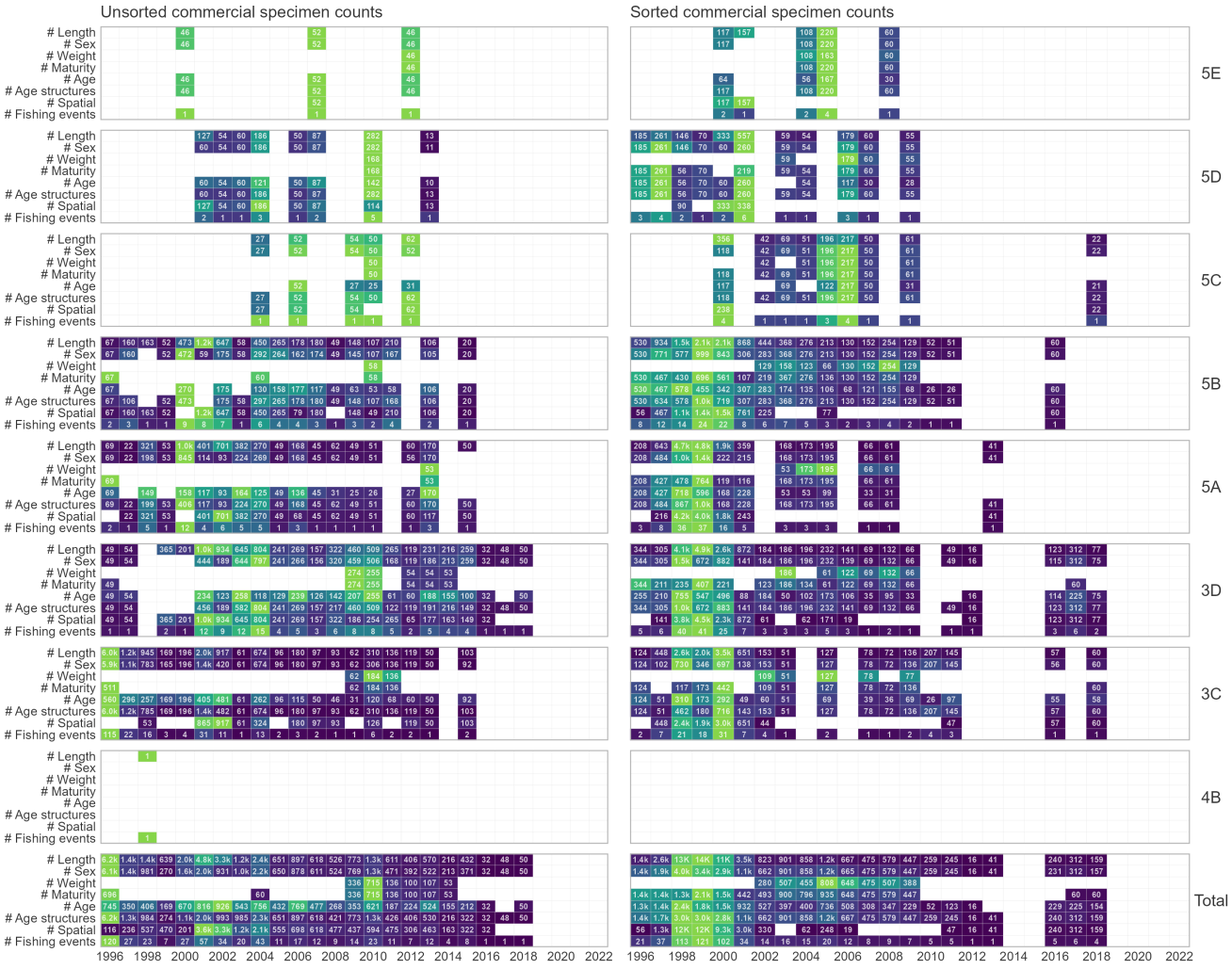
4.13 Yellowtail Rockfish

Sebastes flavidus (418)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Science Advisory Report: DFO (2025a)

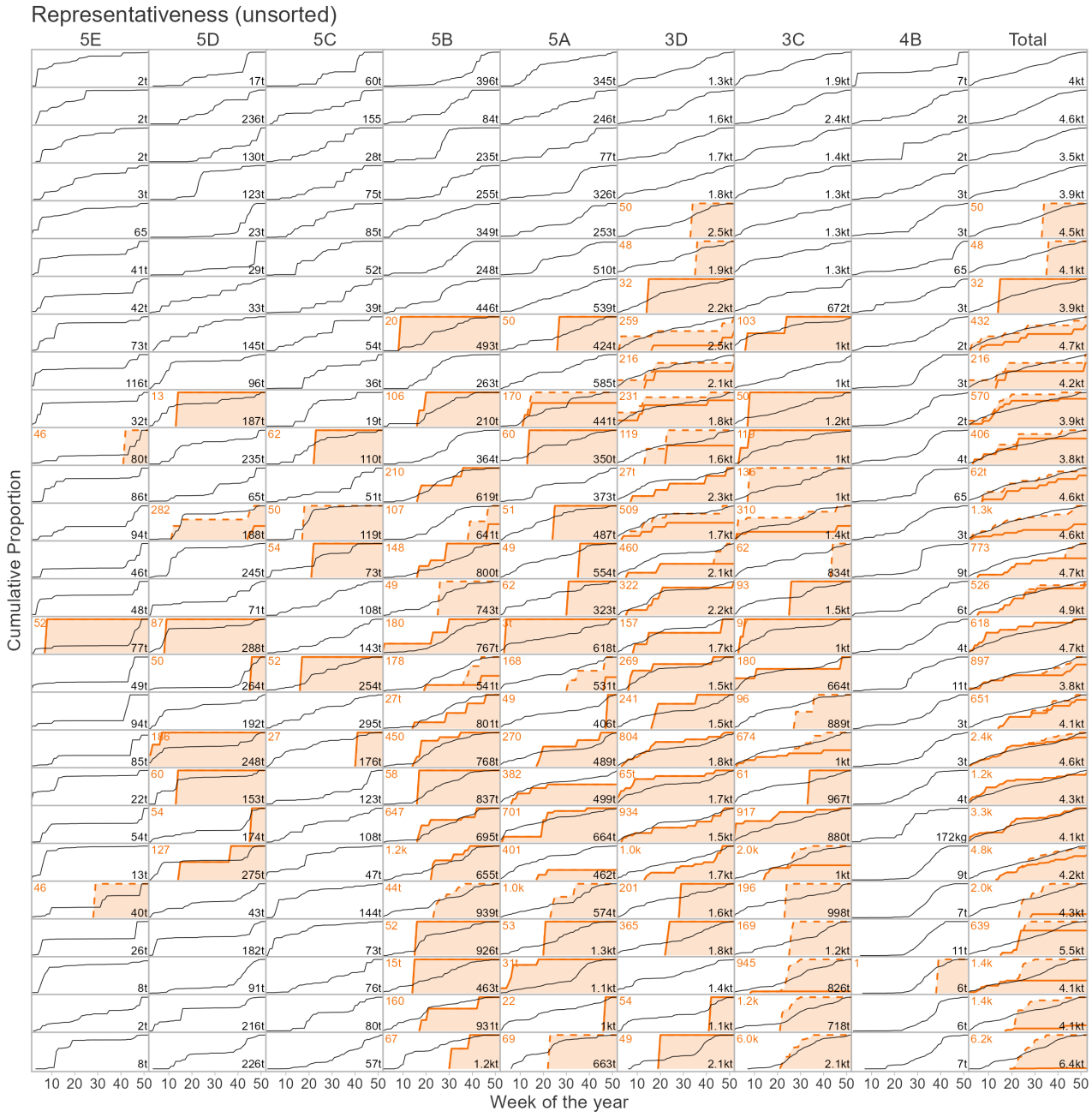
Yellowtail Rockfish were caught mostly by bottom and midwater trawl. Catch and specimen collection was highest in Area 3D. The catch remained stable over time. Specimen collection peaked in 1999, quickly decreased until 2004, and then remained low. Unsorted specimens were collected annually from 1996 to 2018. Sorted specimens were collected from 1996 to 2013 and from 2016 to 2018. Roughly half of the unsorted samples had latitude and longitude data. Cumulative total sampling and catch profiles matched in roughly half of the years with biological sampling, especially 2002–2015. Between 1996 and 2022, 30,351 unsorted specimens were collected, and of these, 22,807 (75%) had age structures, and 9,685 (32% of specimens; 42% of age structures) have been aged. All unsorted specimens had lengths; of these, 23,421 (77%) were sexed, while 1,447 (5%) had weights.



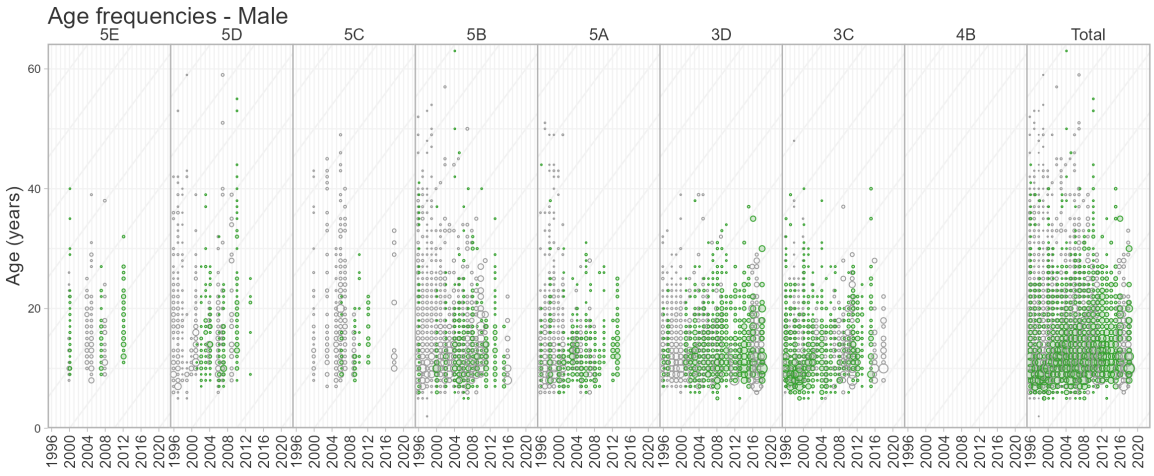
Yellowtail Rockfish

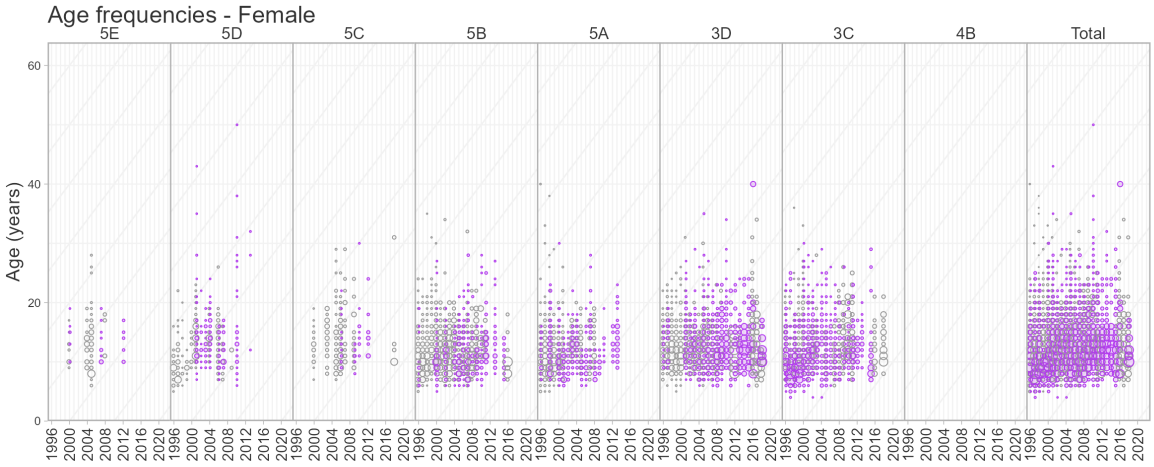


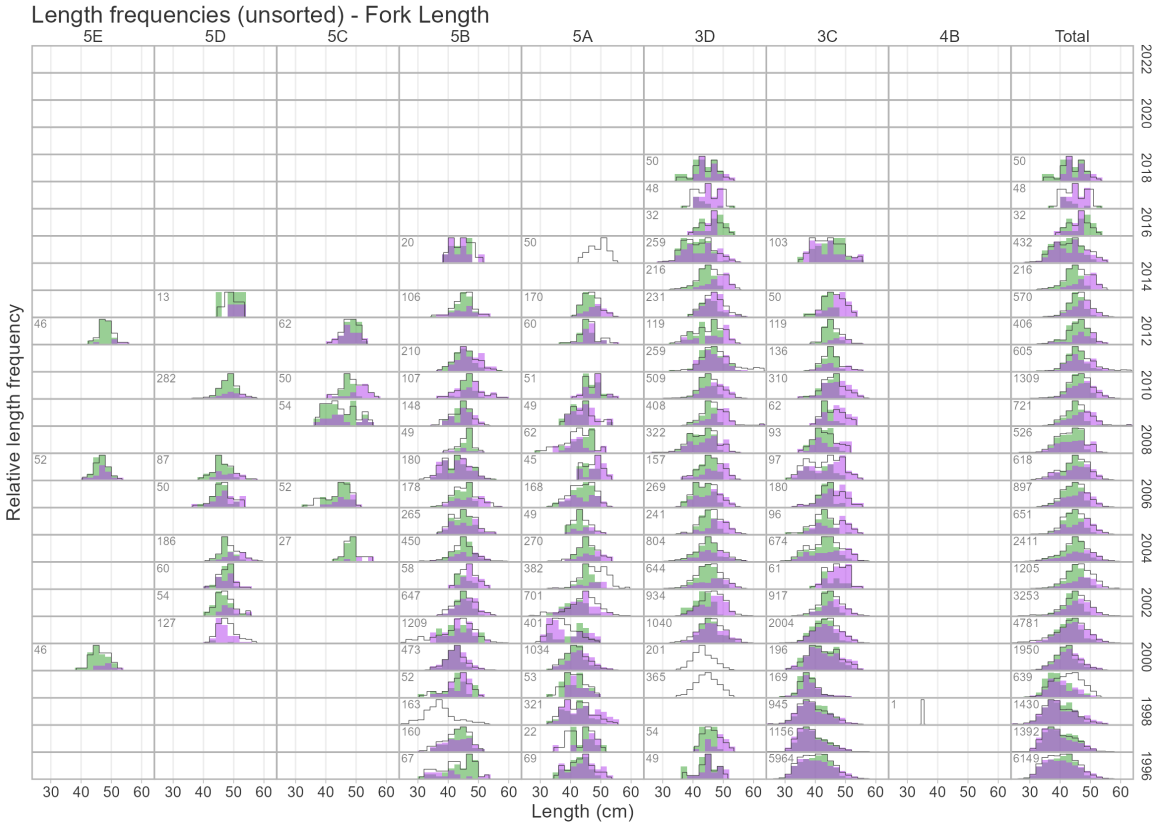
Yellowtail Rockfish



Yellowtail Rockfish





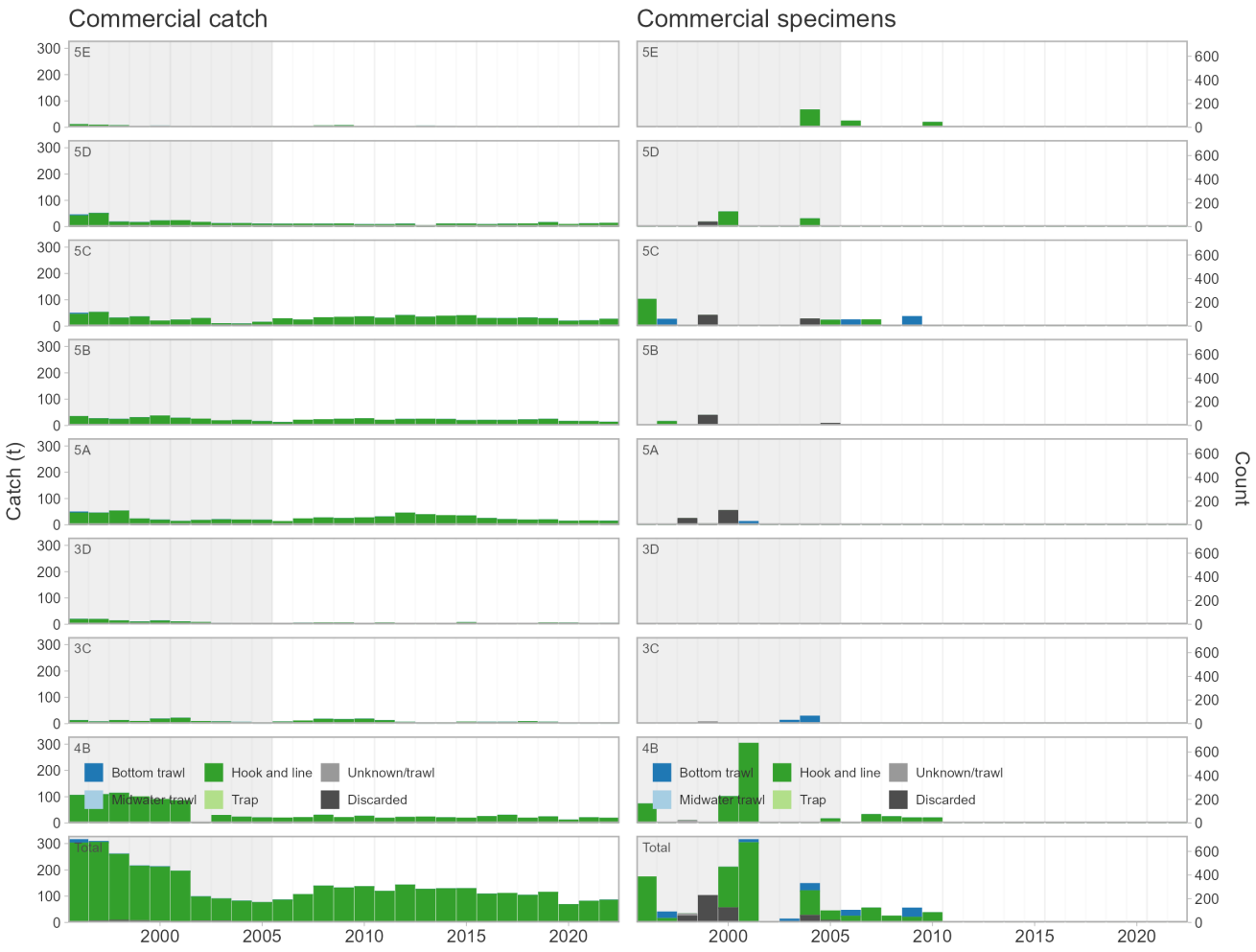


4.14 Quillback Rockfish

Sebastes maliger (424)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Documents: Huynh et al. (2024), Huynh et al. (2025)
Last Science Advisory Reports: DFO (2023a), DFO (2023b)
COSEWIC Status Report: COSEWIC (2009)
COSEWIC Status: Threatened

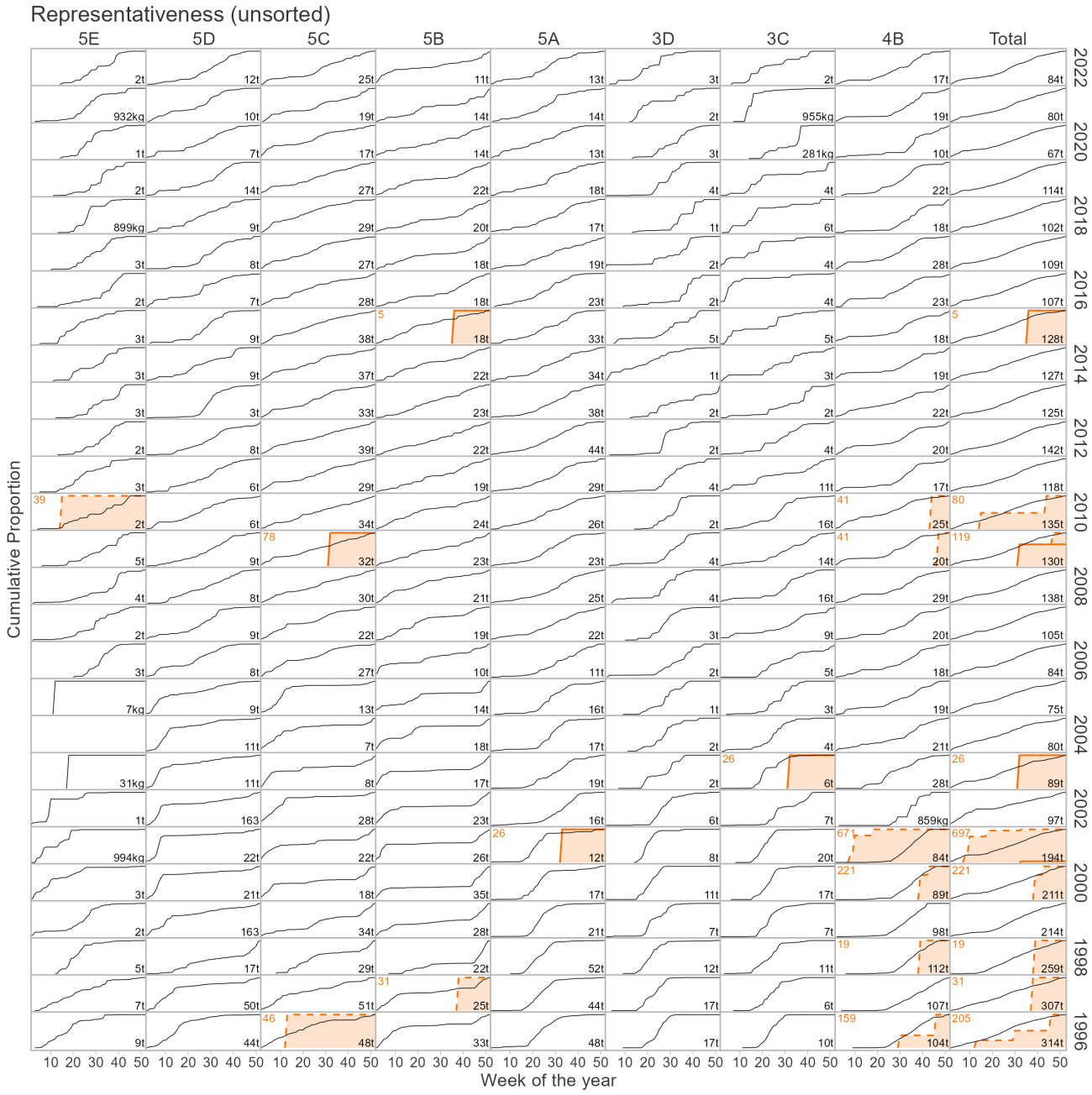
Quillback Rockfish were caught mostly by hook and line. Catch was highest in Area 4B from 1996 to 2001, then marginally higher in Areas 5A and 5C from 2002 to 2022. Commercial catch was highest in 1996, then decreased until 2002, after which it remained stable. Specimen collection was highest in Area 4B and peaked in 2001. Unsorted specimen collection was limited and inconsistent between 1996 and 2015. Sorted specimen collection occurred from 1996 to 2008, lacking data in 1997 and from 2001 to 2003. Few of the unsorted samples had latitude and longitude data. Cumulative total sampling and catch profiles did not match in years with biological sampling. Between 1996 and 2022, 1,404 unsorted specimens were collected, and of these, 1,349 (96%) had age structures, and 868 (62% of specimens; 64% of age structures) have been aged. All unsorted specimens had lengths; of these, 1,354 (96%) were sexed, while 1,141 (81%) had weights.

Quillback Rockfish

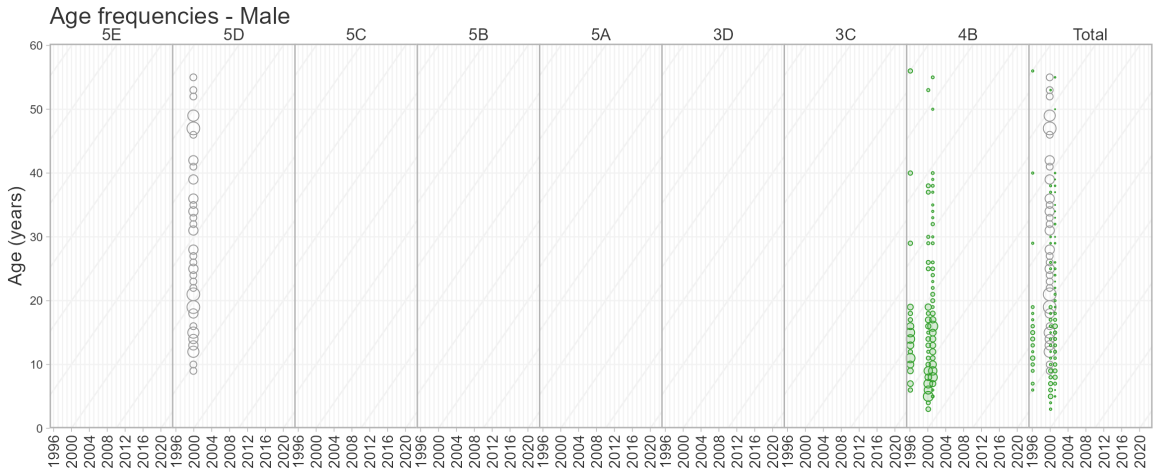


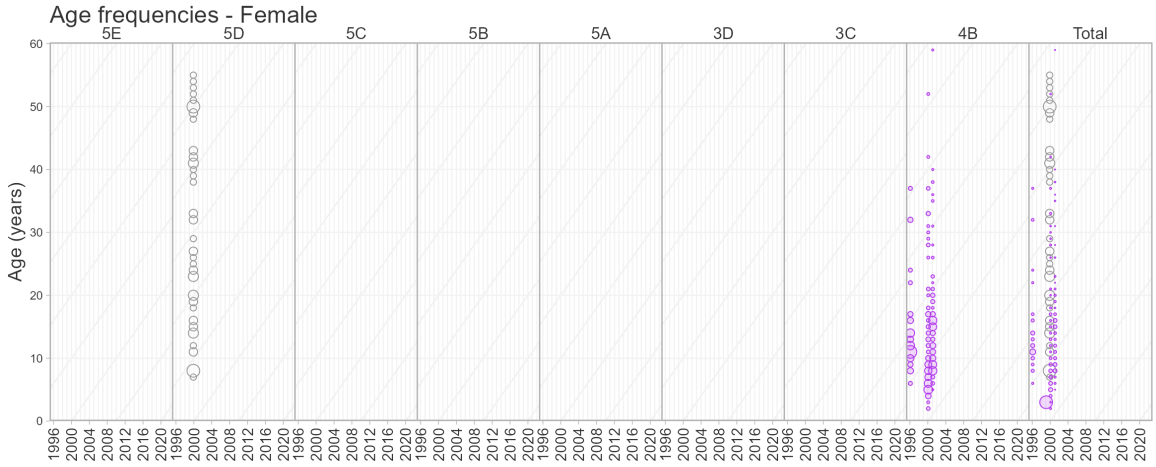
Quillback Rockfish

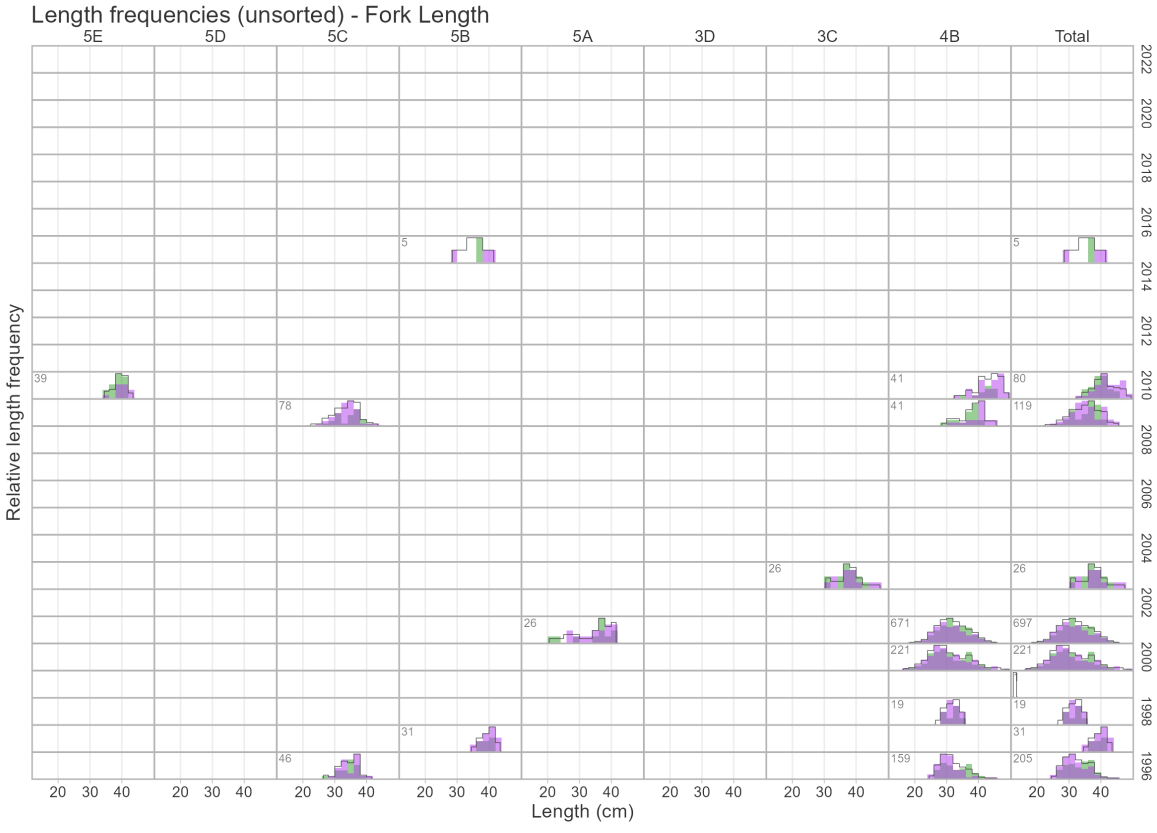
Quillback Rockfish



Quillback Rockfish





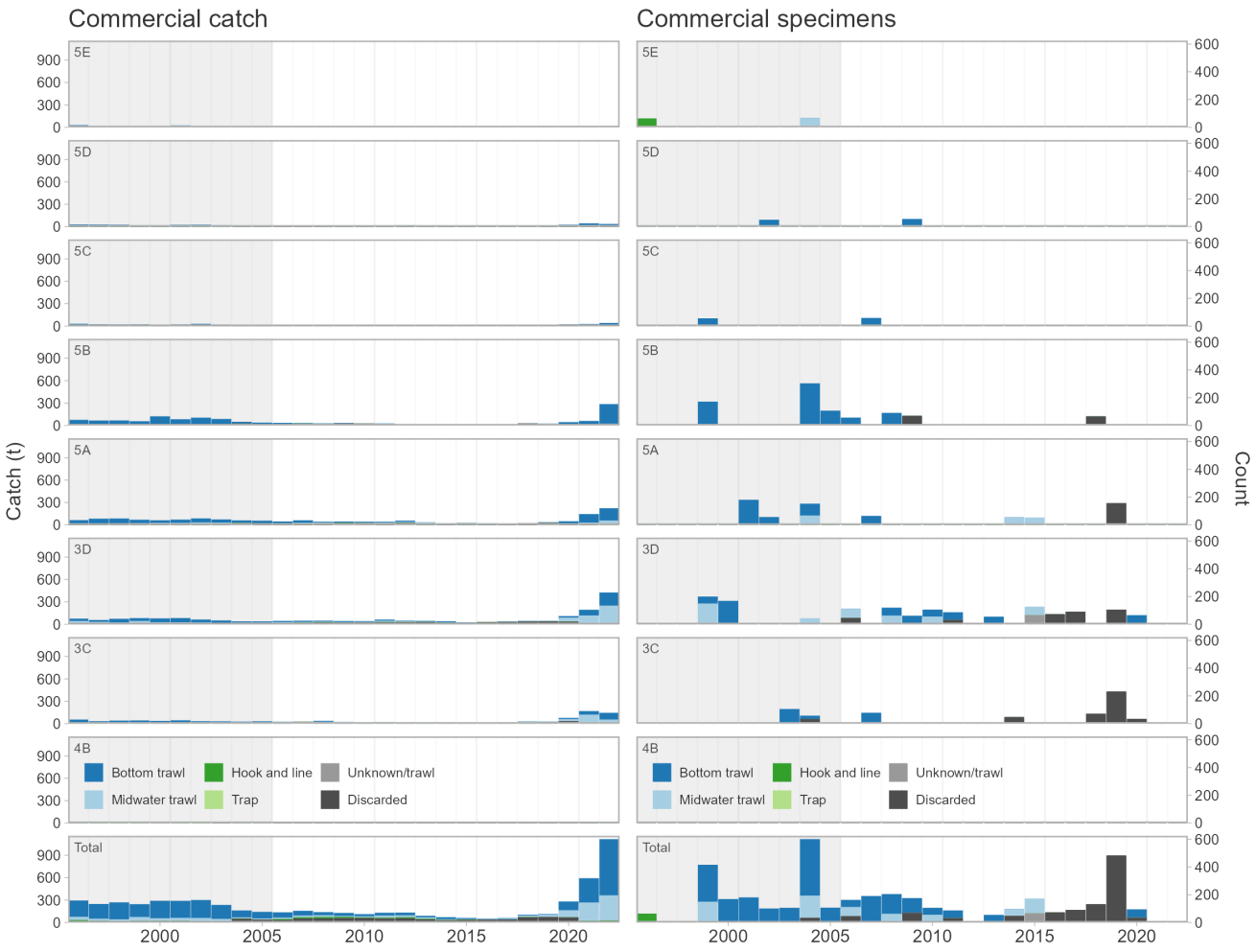


4.15 Bocaccio

Sebastes paucispinis (435)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Starr and Haigh (2022a)
Last Science Advisory Report: DFO (2020b)
Last Science Response: DFO (2024d)
COSEWIC Status Report: COSEWIC (2013)
COSEWIC Status: Endangered

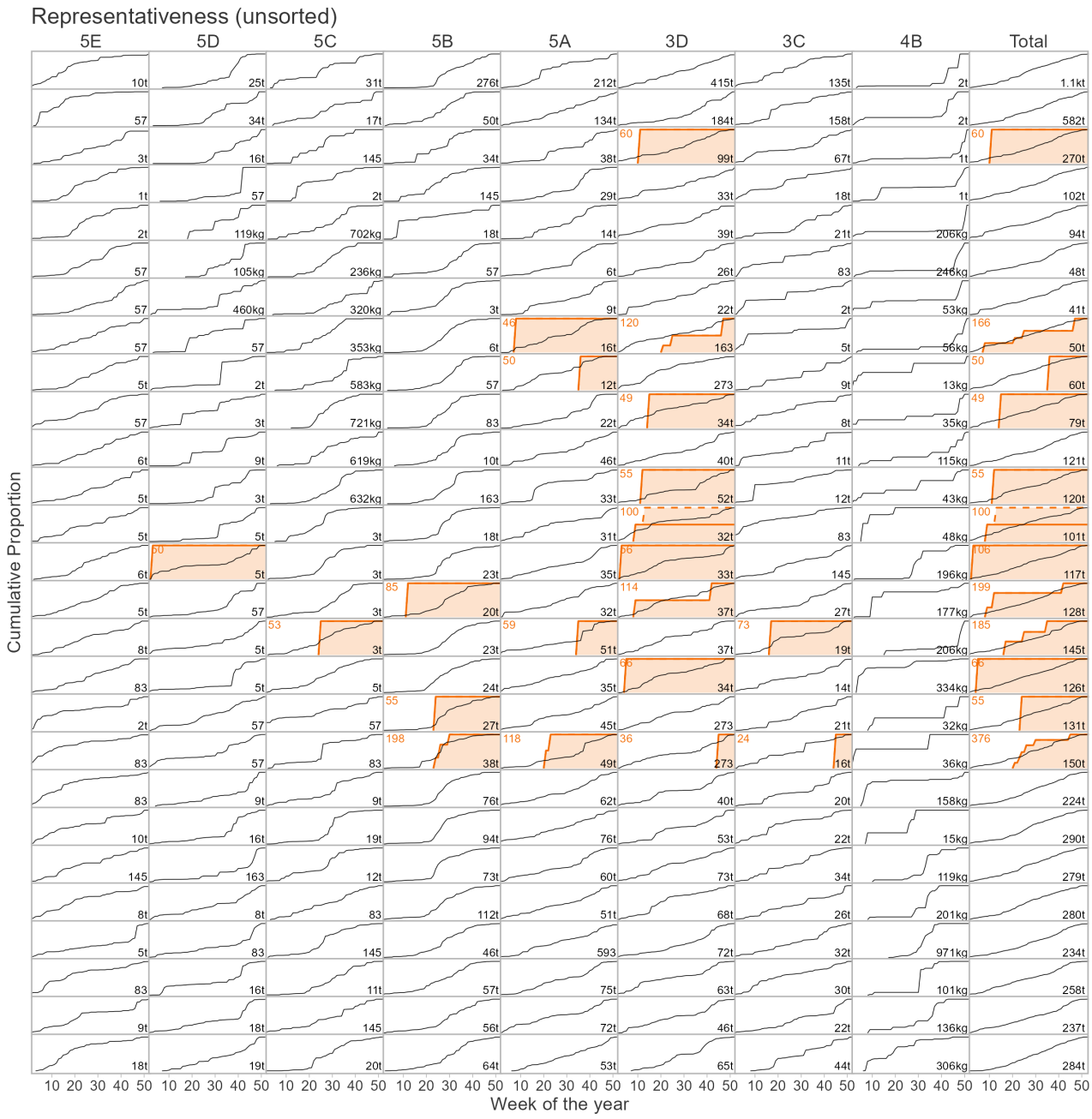
Bocaccio were caught mostly by bottom and midwater trawl and occasionally by hook and line. The catch and specimen collection was marginally higher in Areas 5AB and 3CD. There have been no reported trawl landings of Bocaccio from the Strait of Georgia since 1983 (COSEWIC 2002). Any catch in 4B came from minor areas 12 (Queen Charlotte Strait) and 20 (Juan de Fuca Strait) (Figure 2). The largest catch occurred in 2022, while specimen collection peaked in 1999, 2004, and 2019. Unsorted specimen collection occurred from 2004 to 2020, but lacked data in 2012 and from 2016 to 2019. Sorted specimen collection occurred from 1996 to 2020, but had many gaps. Nearly all unsorted samples had latitude and longitude data. Cumulative total sampling did not match cumulative total catch in most years with biological samples. Between 1996 and 2022, 1,467 unsorted specimens were collected, and of these, 1,382 (94%) had age structures, and 1,206 (82% of specimens; 87% of age structures) had been aged. All unsorted specimens had lengths; of these, 1,353 (92%) were sexed, while 50 (3%) had weights.

Bocaccio

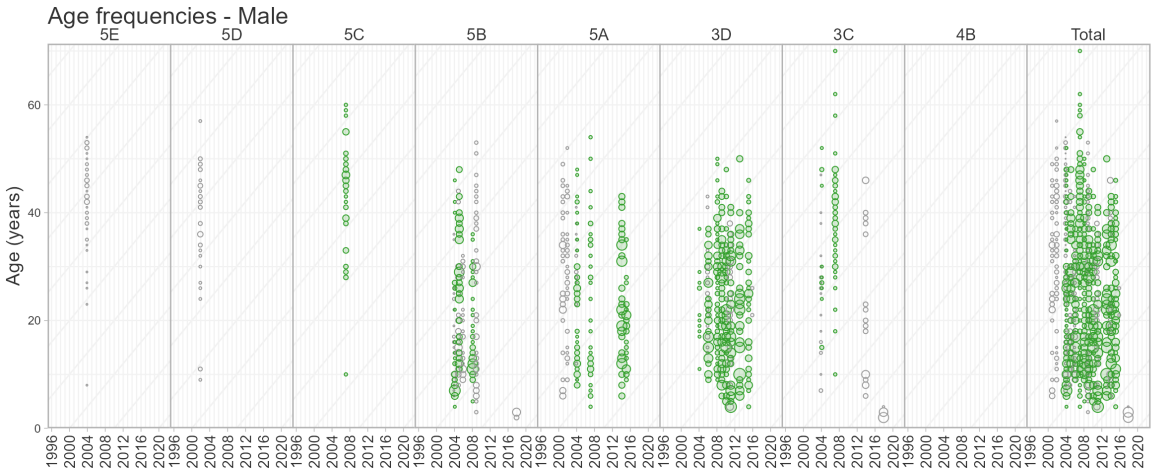

Commercial catch
Commercial specimens
Catch (t)
Count
5E
5D
5C
5B
5A
3D
3C
4B
Total
Bottom trawl
Midwater trawl
Hook and line
Trap
Unknown/trawl
Discarded
0
300
600
900
200
400
2000
2005
2010
2015
2020

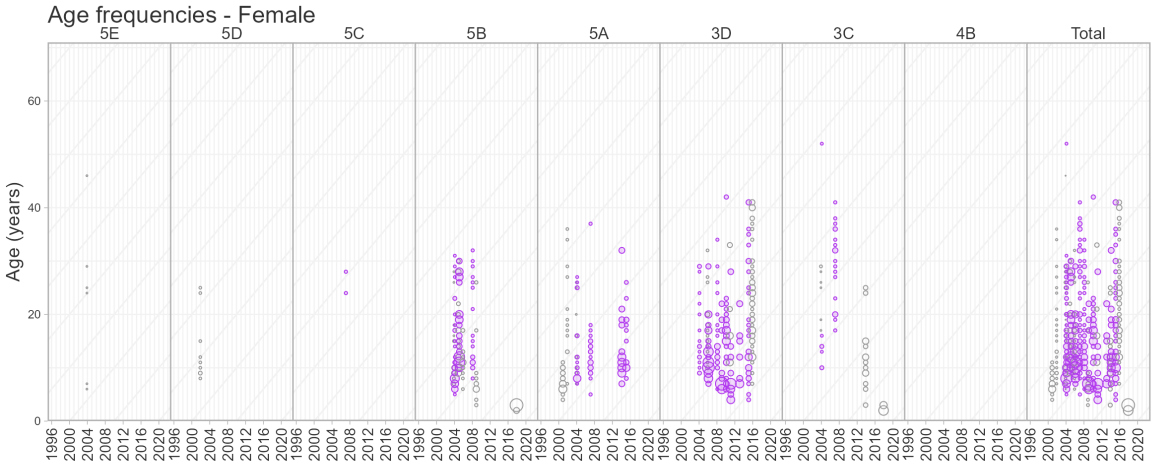
Bocaccio

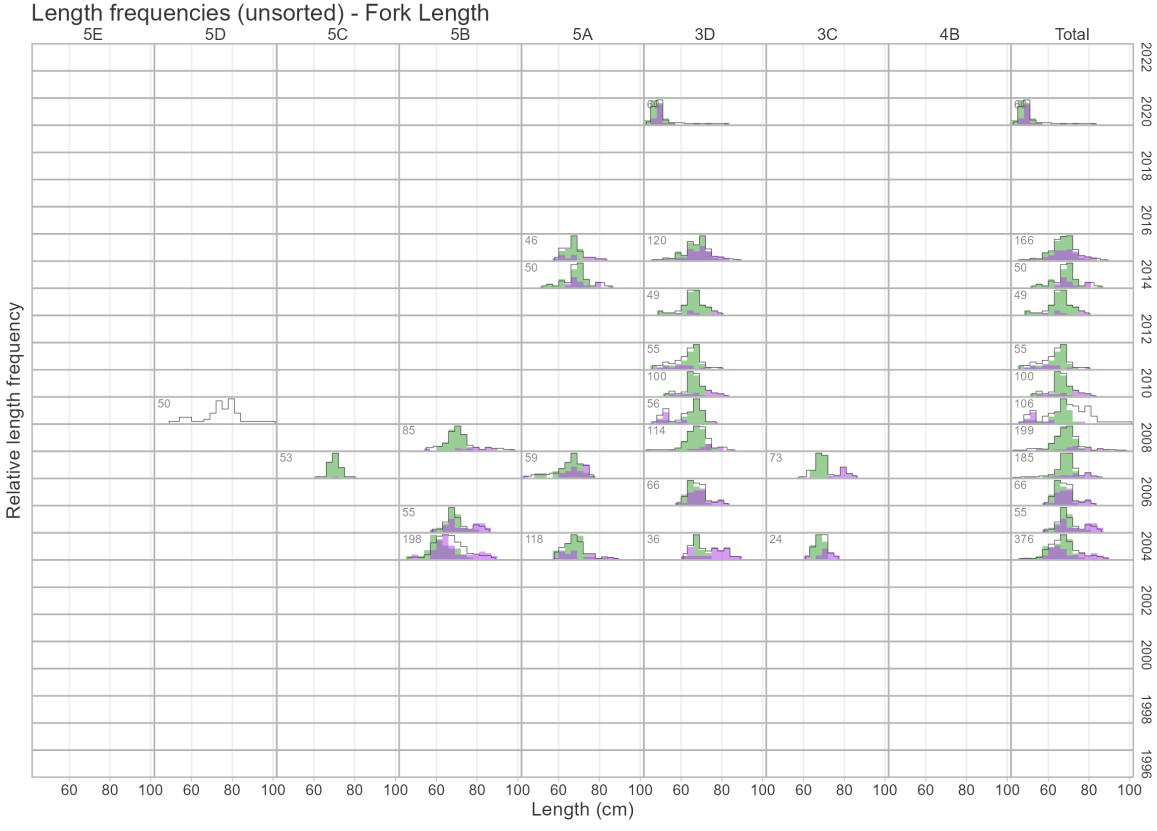

Unsorted commercial specimen counts
Sorted commercial specimen counts
Length
Sex
Weight
Maturity
Age
Age structures
Spatial
Fishing events
5E
5D
5C
5B
5A
3D
3C
4B
Total
1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
10 20 30 40 50
Week of the year

Bocaccio


Age frequencies - Male
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)

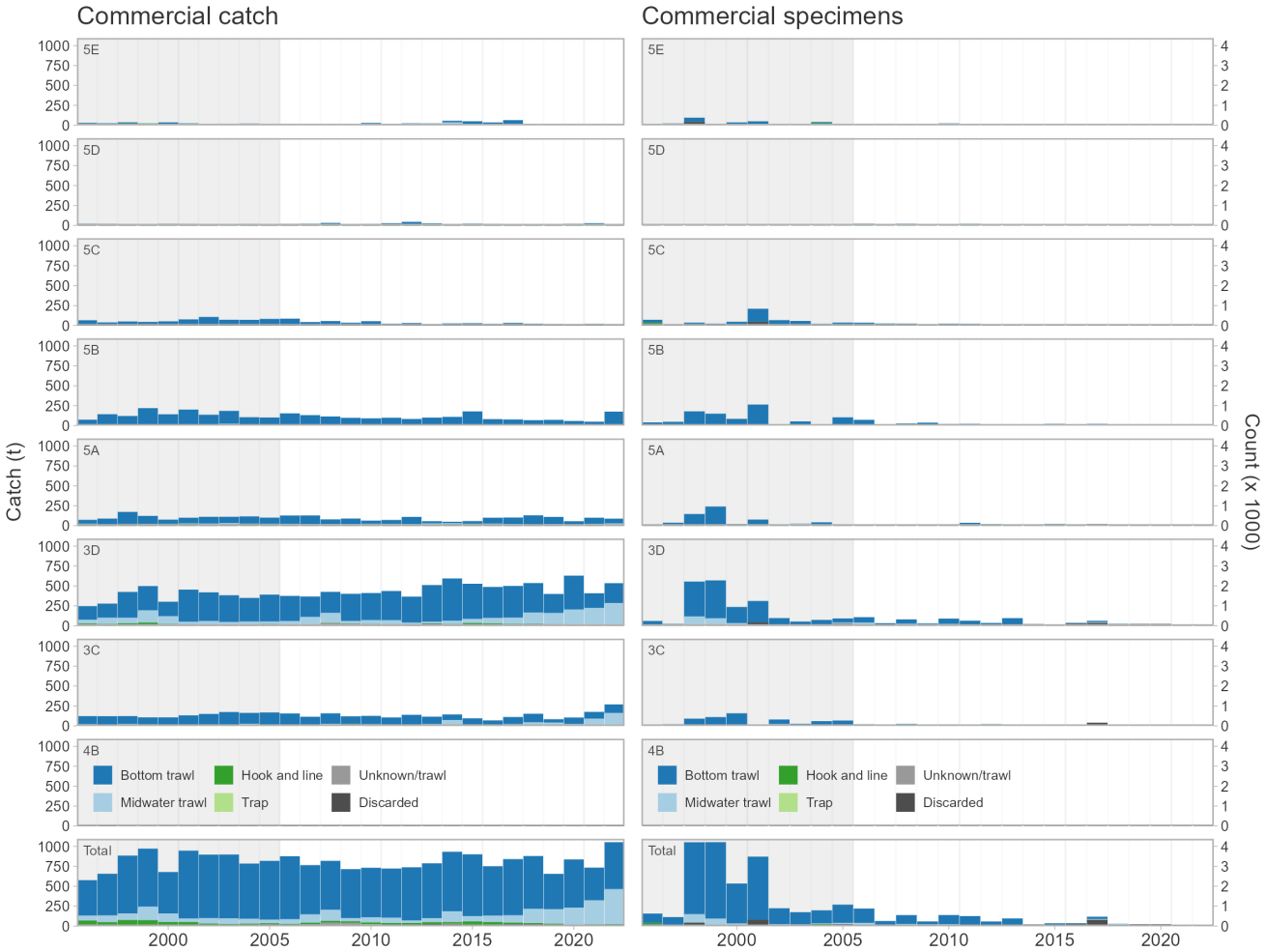

Age frequencies - Female
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)


Length frequencies (unsorted) - Fork Length
5E
5D
5C
5B
5A
3D
3C
4B
Total
Relative length frequency
Length (cm)

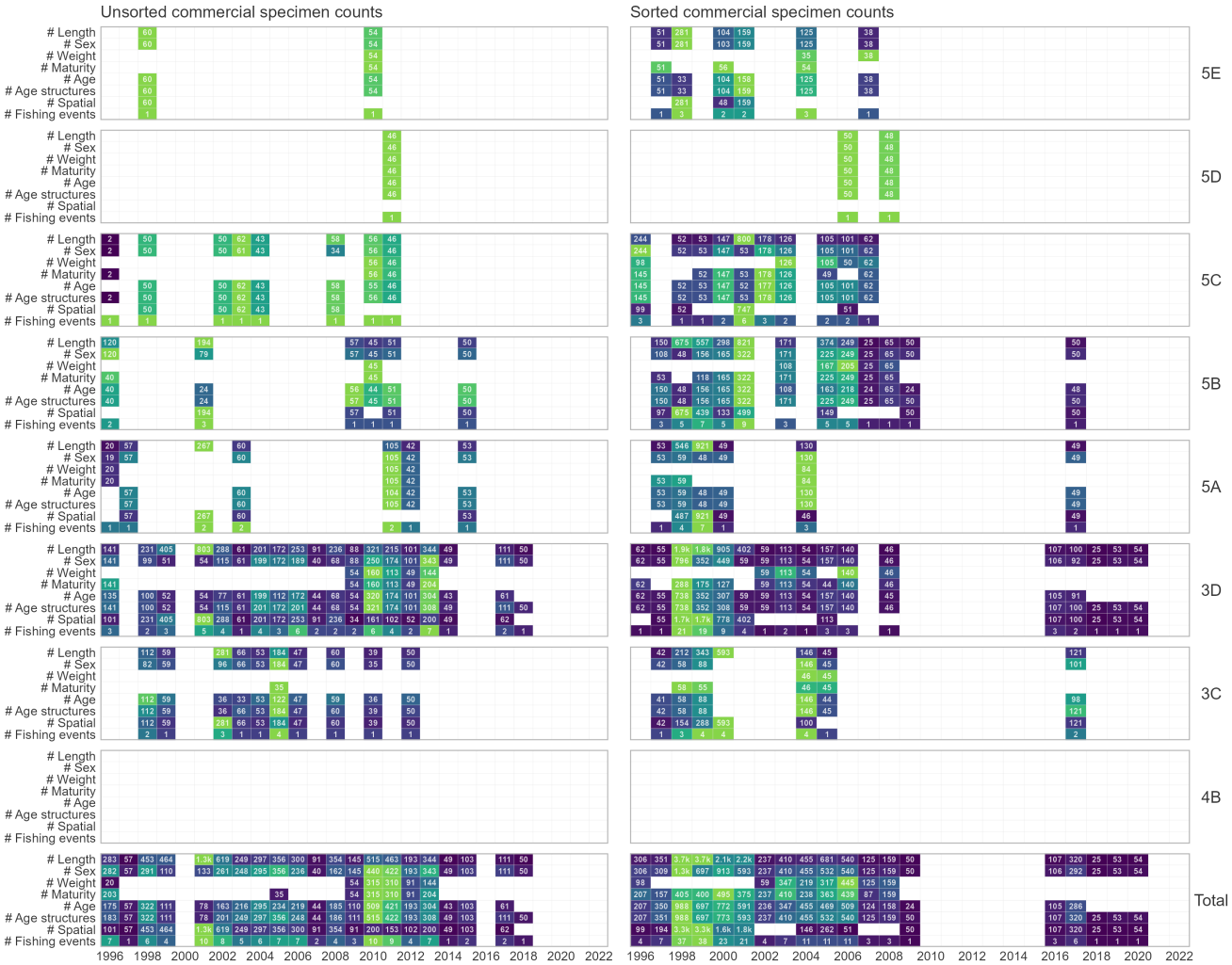
4.16 Canary Rockfish

Sebastes pinniger (437)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Starr and Haigh (2023)
Last Science Advisory Report: DFO (2023c)
COSEWIC Status Report: COSEWIC (2007c)
COSEWIC Status: Threatened

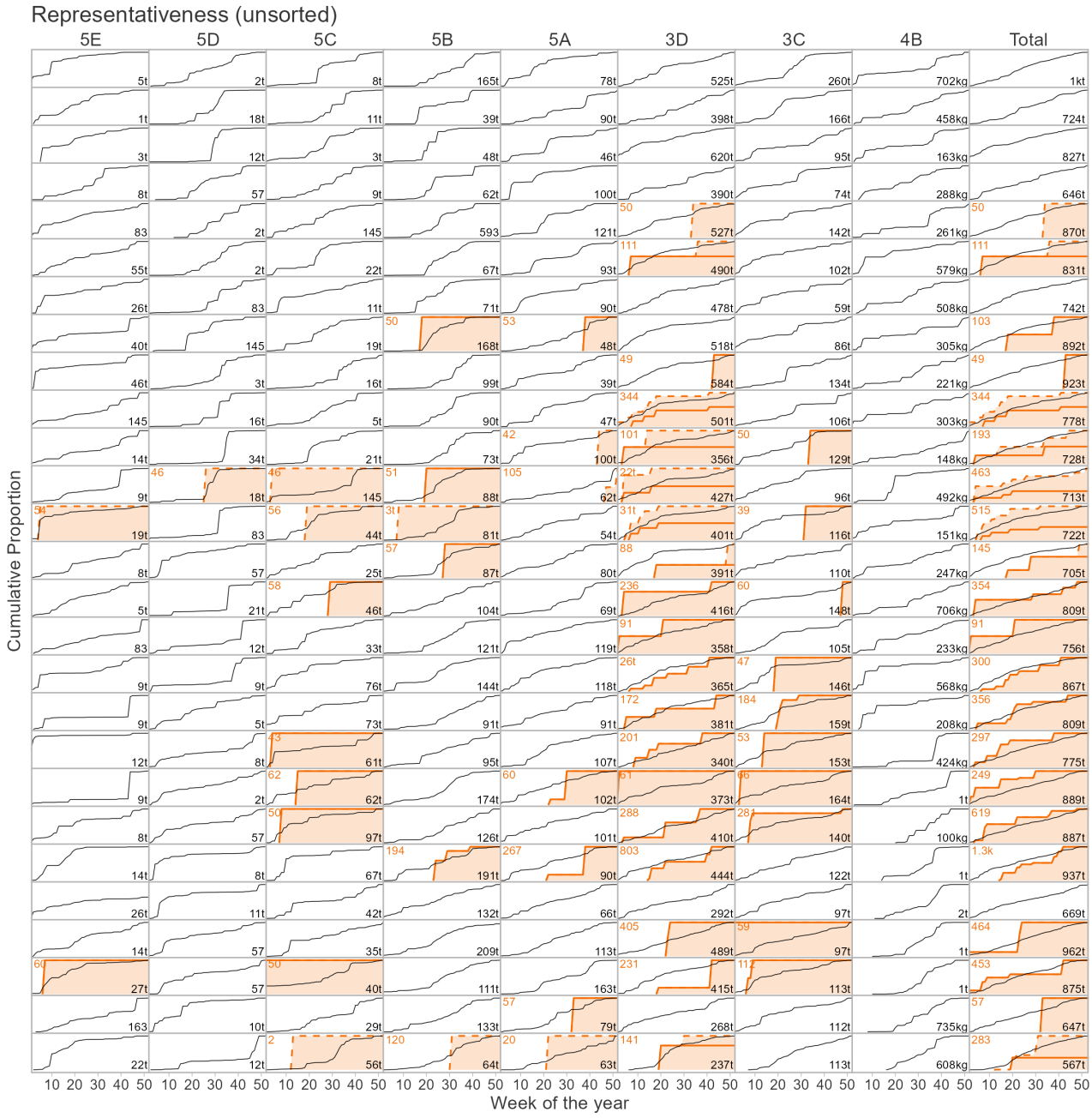
Canary Rockfish were caught mostly by bottom and midwater trawl, and occasionally by hook and line. Area 3D had the most catch and specimens collected. Catch remained relatively consistent, while specimen collection decreased significantly after peaking in 1999. Unsorted specimen collection occurred from 1996 to 2018, lacking data in 2000 and 2016. Sorted specimen collection occurred annually from 1996 to 2009 and from 2016 to 2020. Nearly all unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched in roughly half of the years with biological samples. Between 1996 and 2022, 6,760 unsorted specimens were collected, and of these, 4,194 (62%) had age structures, and 3,843 (57% of specimens; 92% of age structures) had been aged. All unsorted specimens had lengths; of these, 4,327 (64%) were sexed, while 934 (14%) had weights.



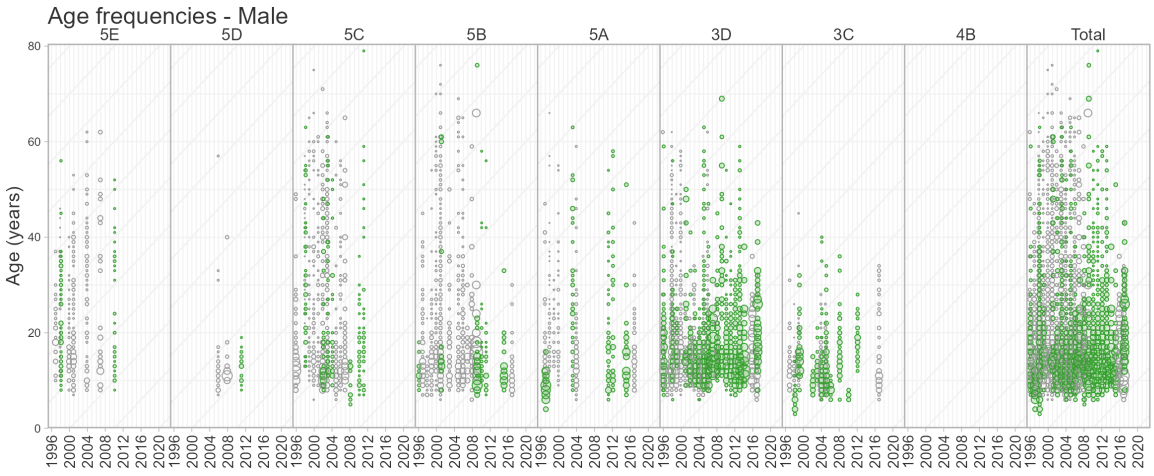
Canary Rockfish

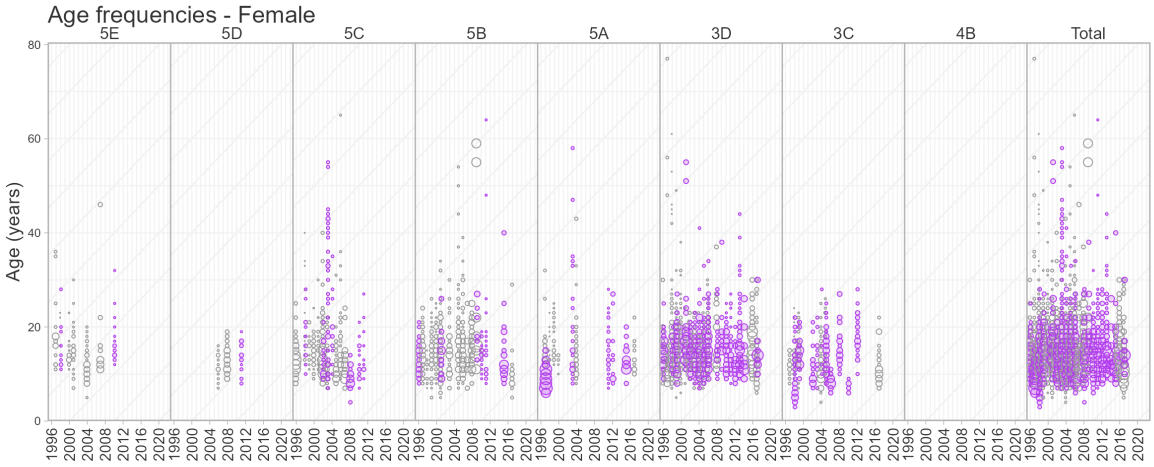


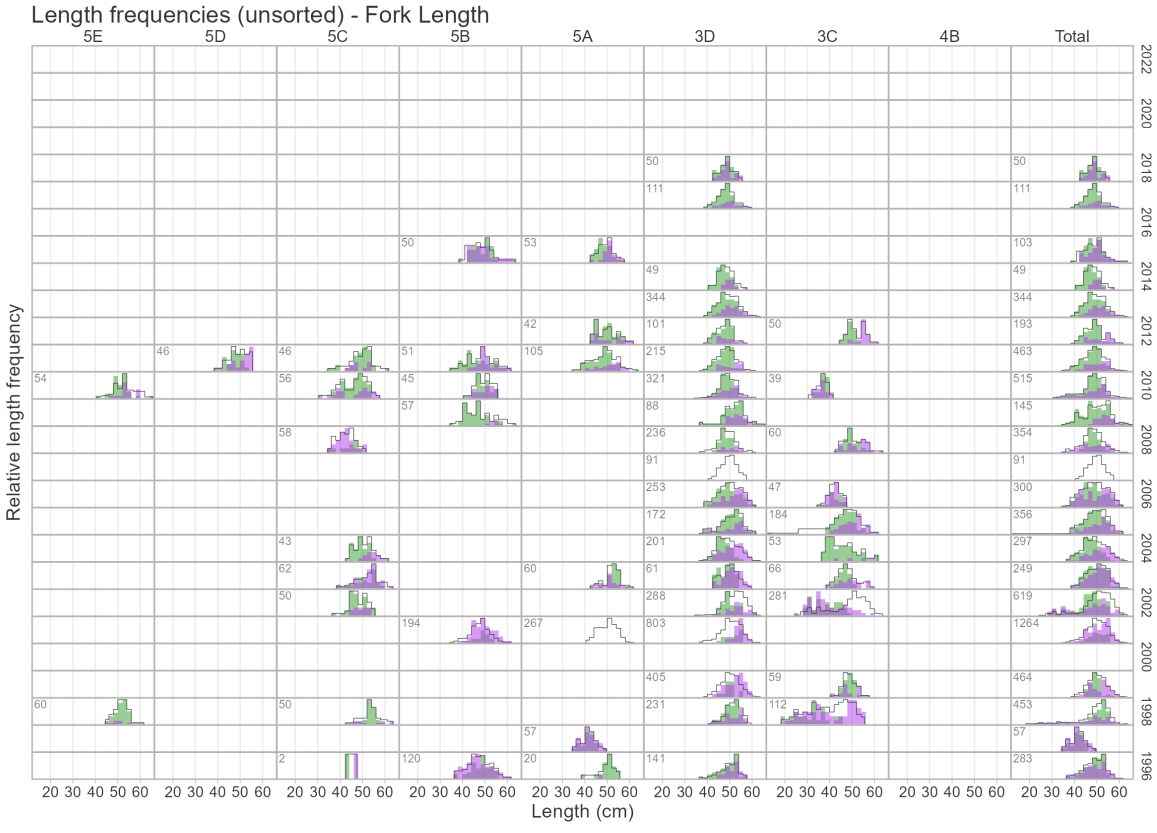
Canary Rockfish



Canary Rockfish



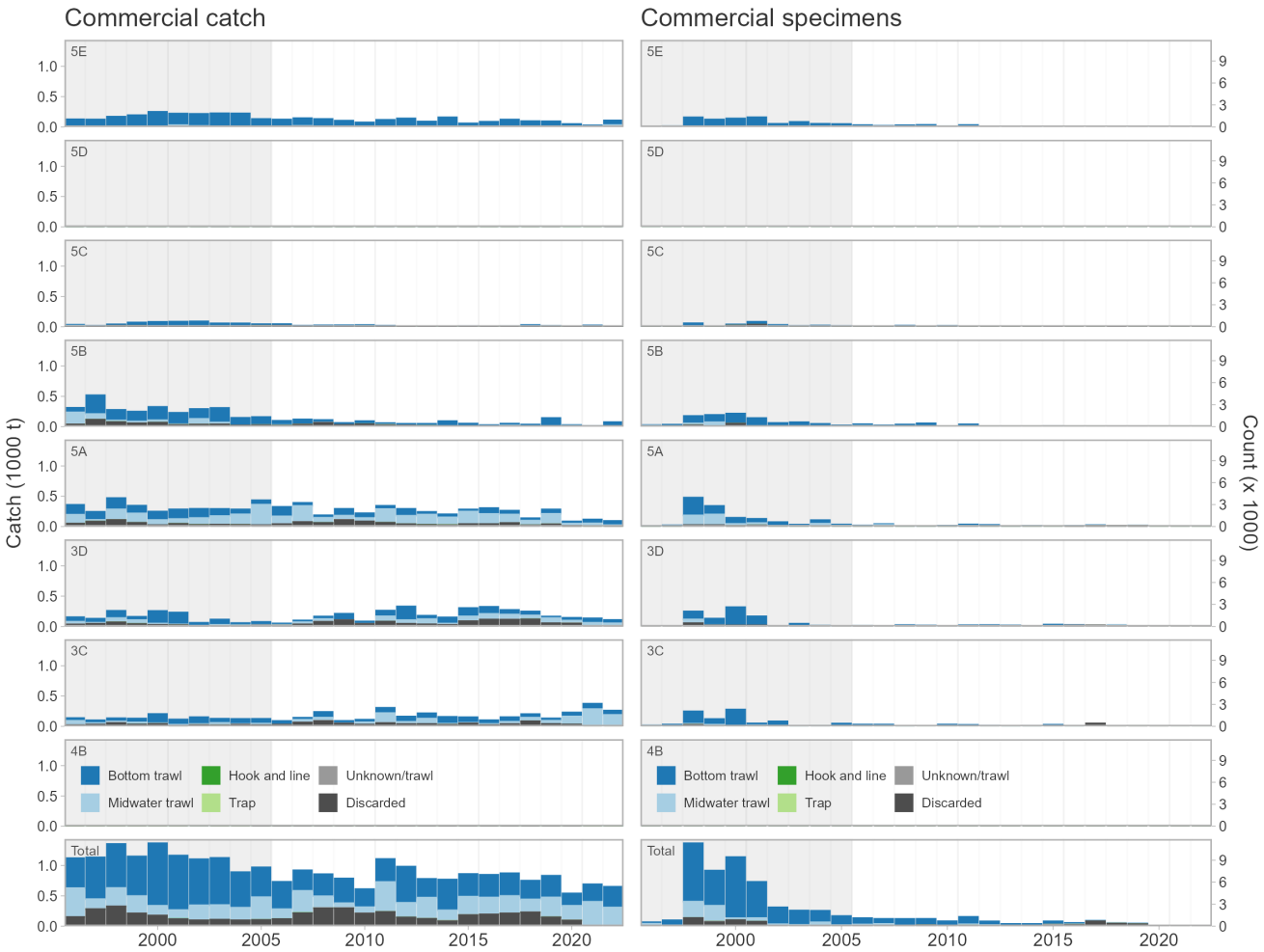




4.17 Redstripe Rockfish

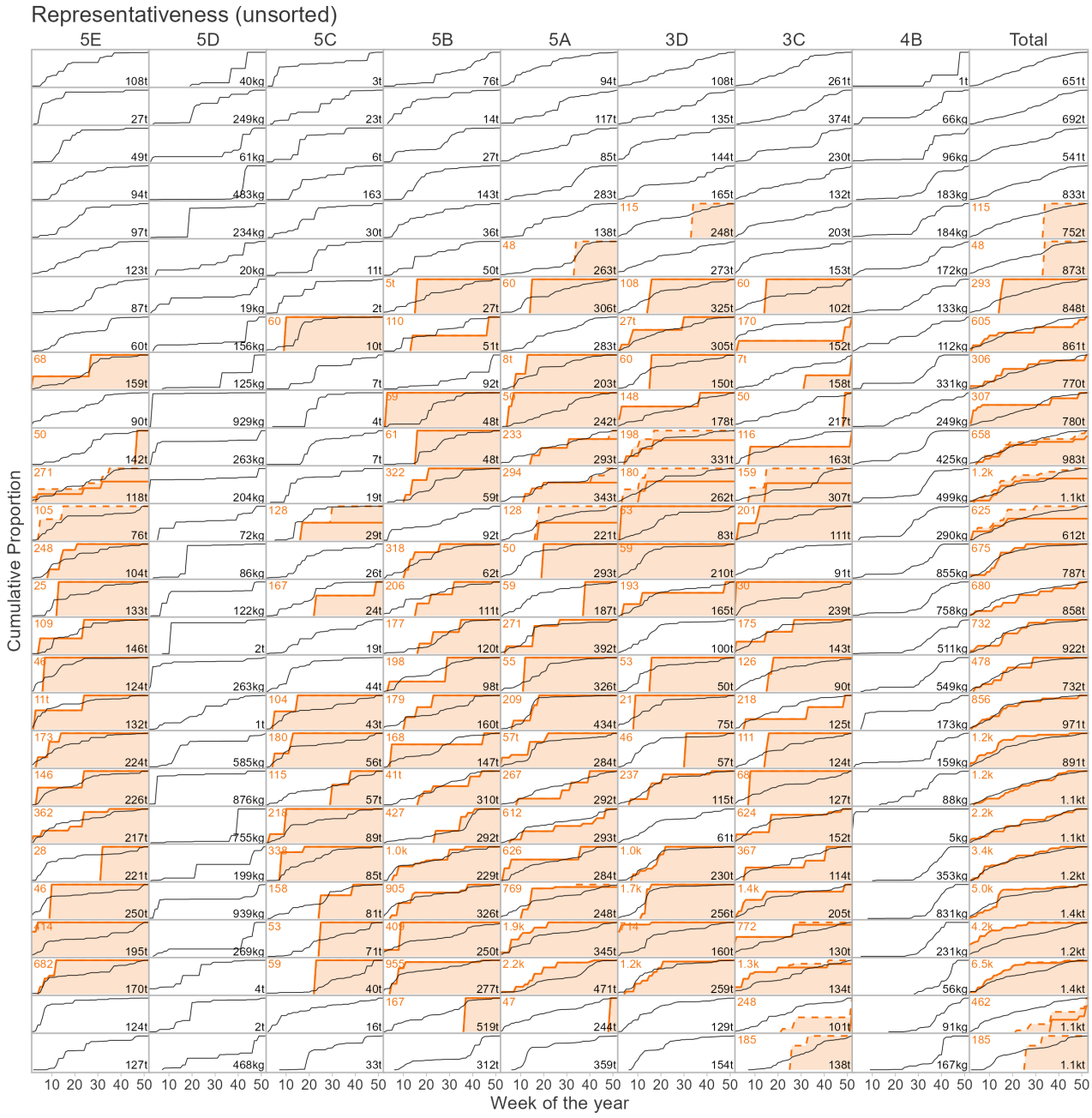
Sebastes proriger (439)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Starr and Haigh (2021c)
Last Science Advisory Report: DFO (2018b)

Redstripe Rockfish were caught mostly by bottom and midwater trawl. Catch and specimen collection occurred relatively evenly in all areas except Areas 5D and 4B, where the catch was negligible. Catch gradually declined from 2000 to 2010, increased in 2011, then declined again from 2012 to 2022. Specimen collection peaked suddenly in 1998 and 2000, then decreased quickly. Unsorted specimens were collected annually from 1996 to 2018. Sorted specimens were collected annually from 1996 to 2011 and from 2015 to 2020. Nearly all of the unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched in most years with biological sampling, particularly from 2001 to 2009. Between 1996 and 2022, 32,054 unsorted specimens were collected, and of these, 12,303 (38%) had age structures, and 3,677 (11% of specimens; 30% of age structures) have been aged. All unsorted specimens had lengths; of these, 13,113 (41%) were sexed, while 709 (2%) had weights.

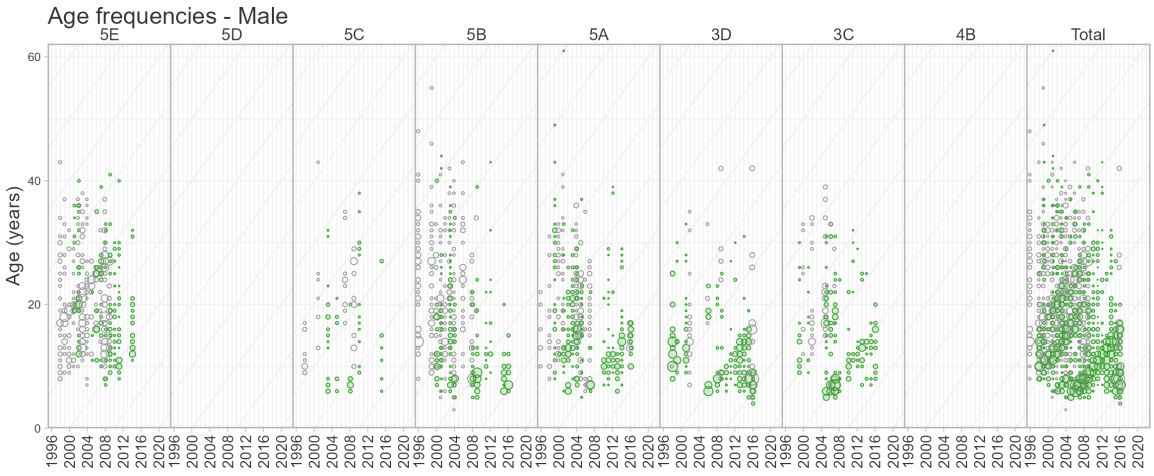


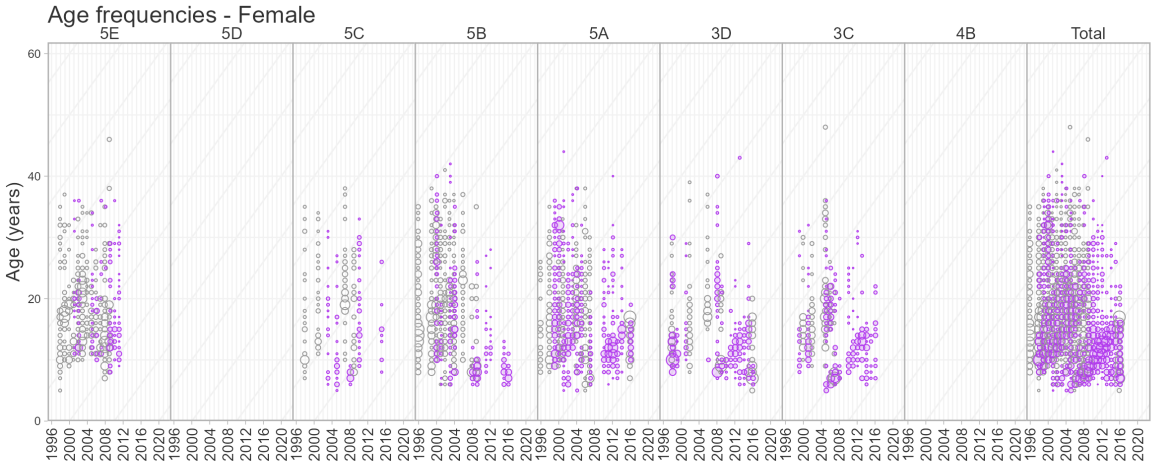
Redstripe Rockfish

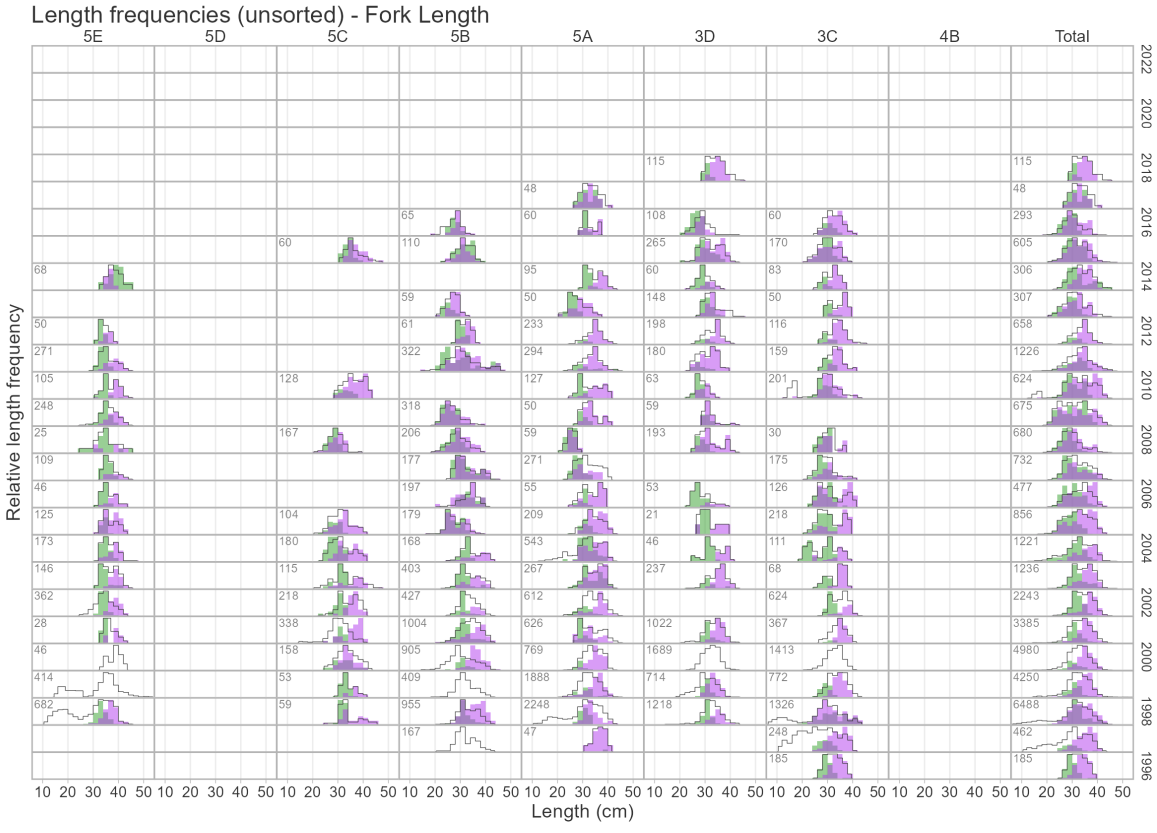
Redstripe Rockfish



Redstripe Rockfish



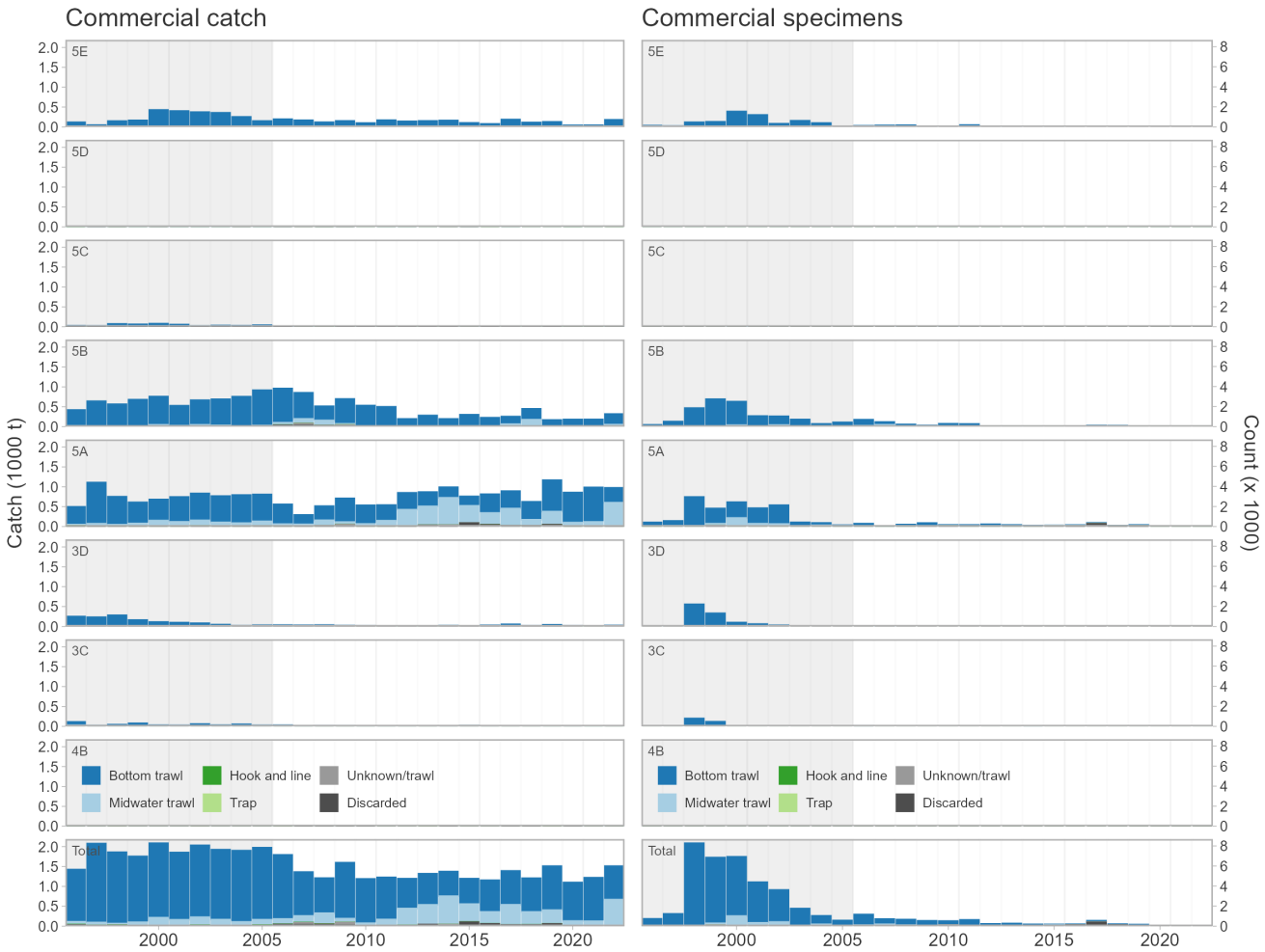




4.18 Yellowmouth Rockfish

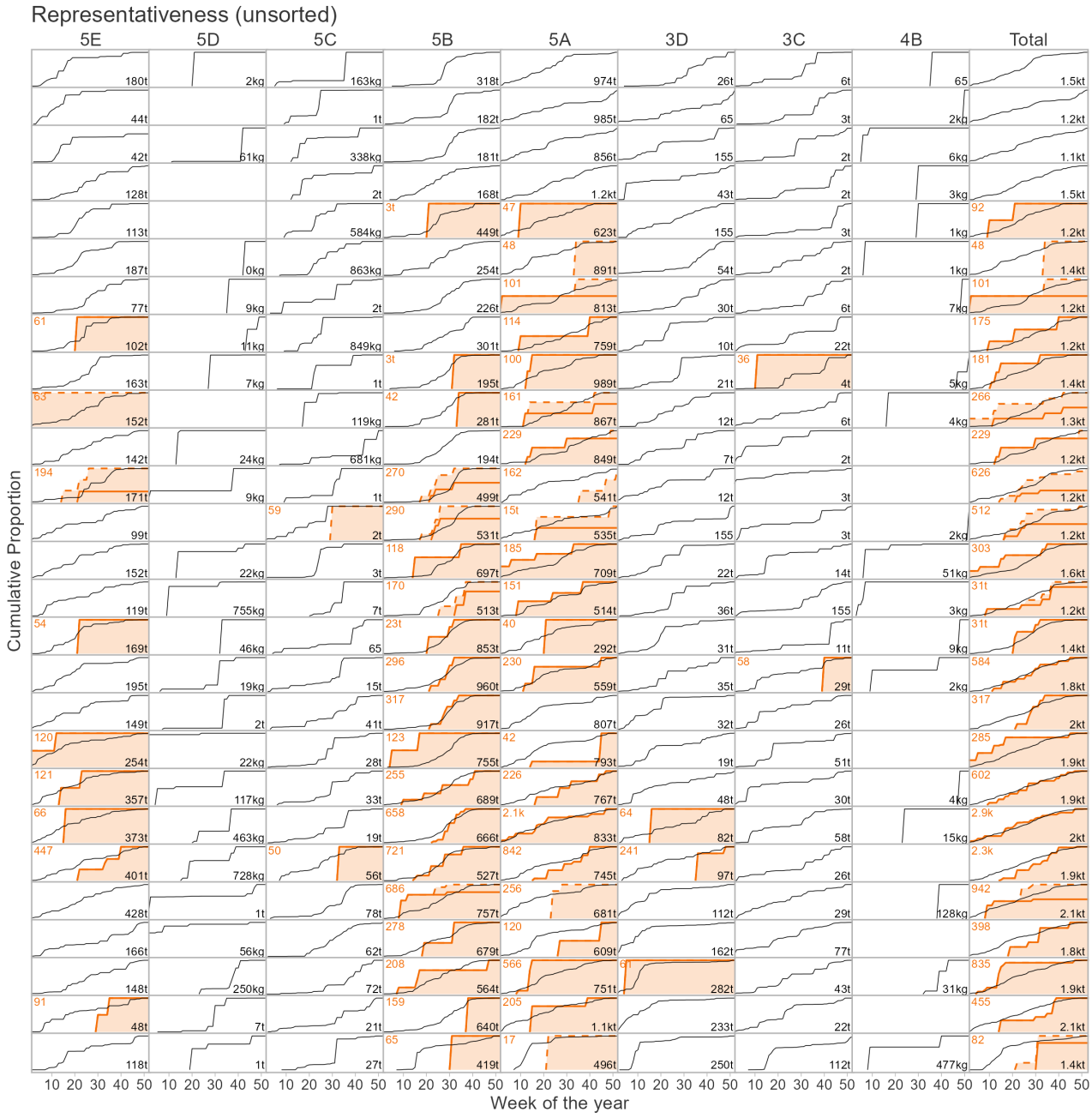
Sebastes reedi (440)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Starr and Haigh (2022b)
Last Science Advisory Report: DFO (2022)
COSEWIC Status Report: COSEWIC (2010)
COSEWIC Status: Threatened

Yellowmouth Rockfish were caught mostly by bottom and midwater trawl. Catch and specimen collection were highest in Areas 5AB. Catch remained stable from 1996 to 2005, decreased until 2008, before stabilizing again. Specimen collection peaked suddenly in 1998, decreased quickly until 2004, and then remained low. Unsorted specimens were collected annually from 1996 to 2018. Sorted specimens were collected from 1996 to 2009 and from 2016 to 2019. Nearly all of the unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched in fewer than half of the years with biological sampling. Between 1996 and 2022, 12,835 unsorted specimens were collected, and of these, 7,396 (58%) had age structures, and 3,142 (24% of specimens; 42% of age structures) have been aged. All unsorted specimens had lengths; of these, 7,727 (60%) were sexed, while 913 (7%) had weights.

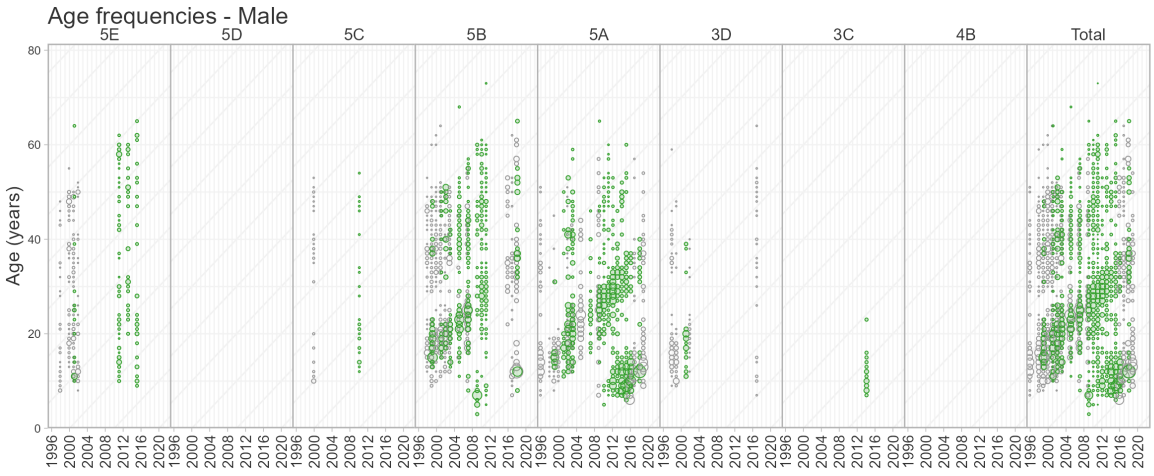


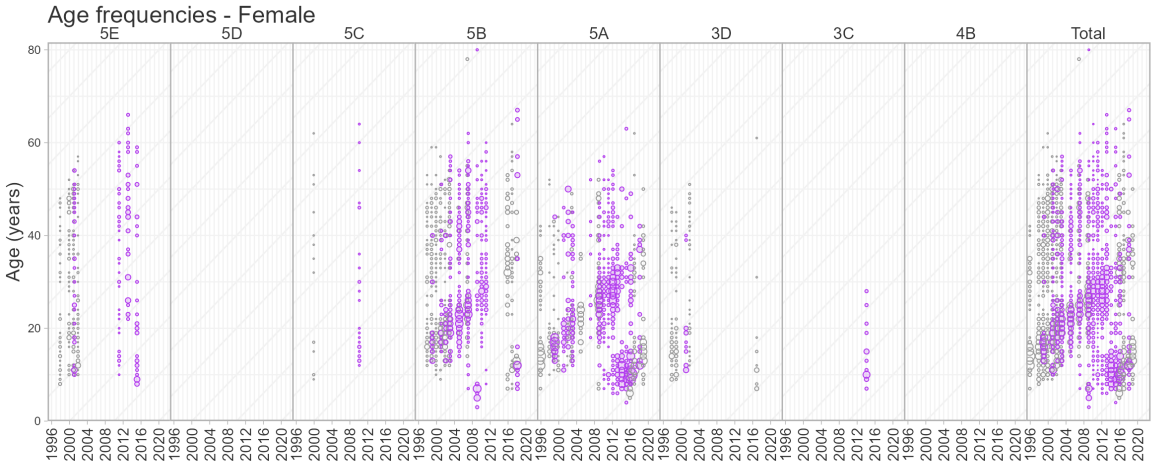
Yellowmouth Rockfish

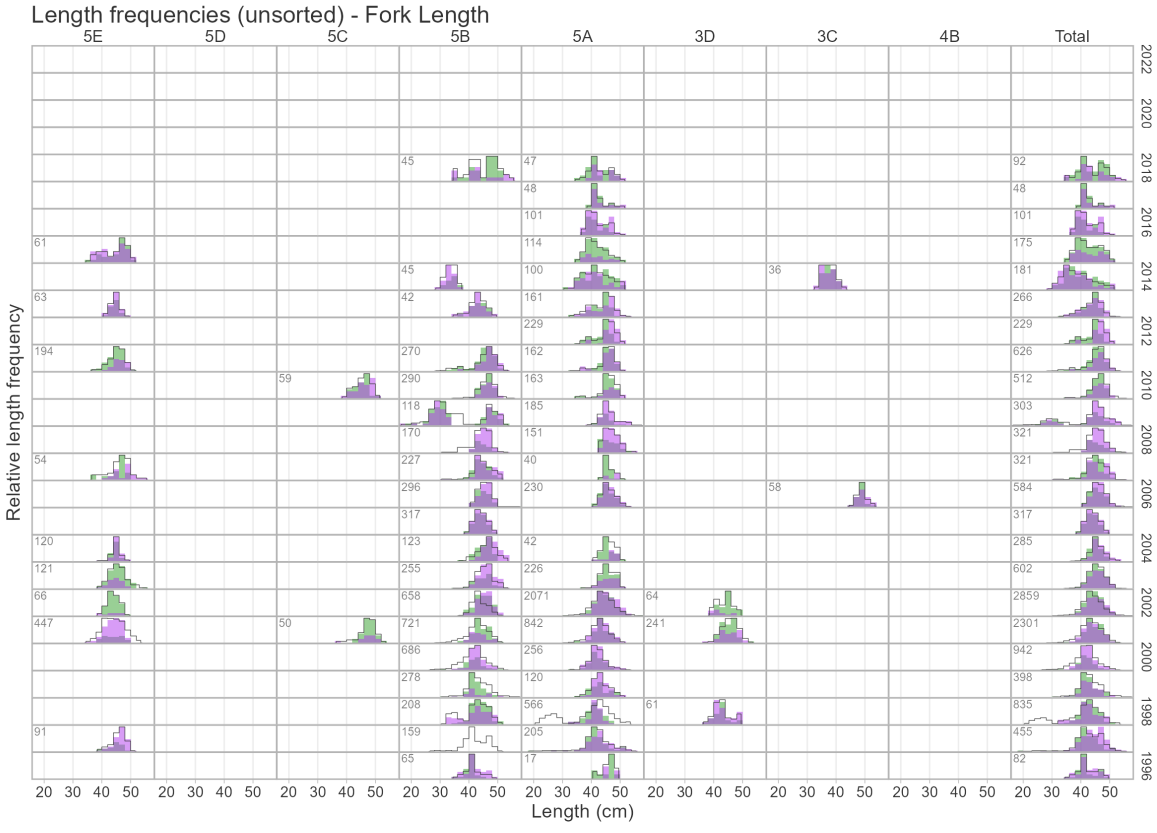
Yellowmouth Rockfish



Yellowmouth Rockfish







4.19 Yelloweye Rockfish

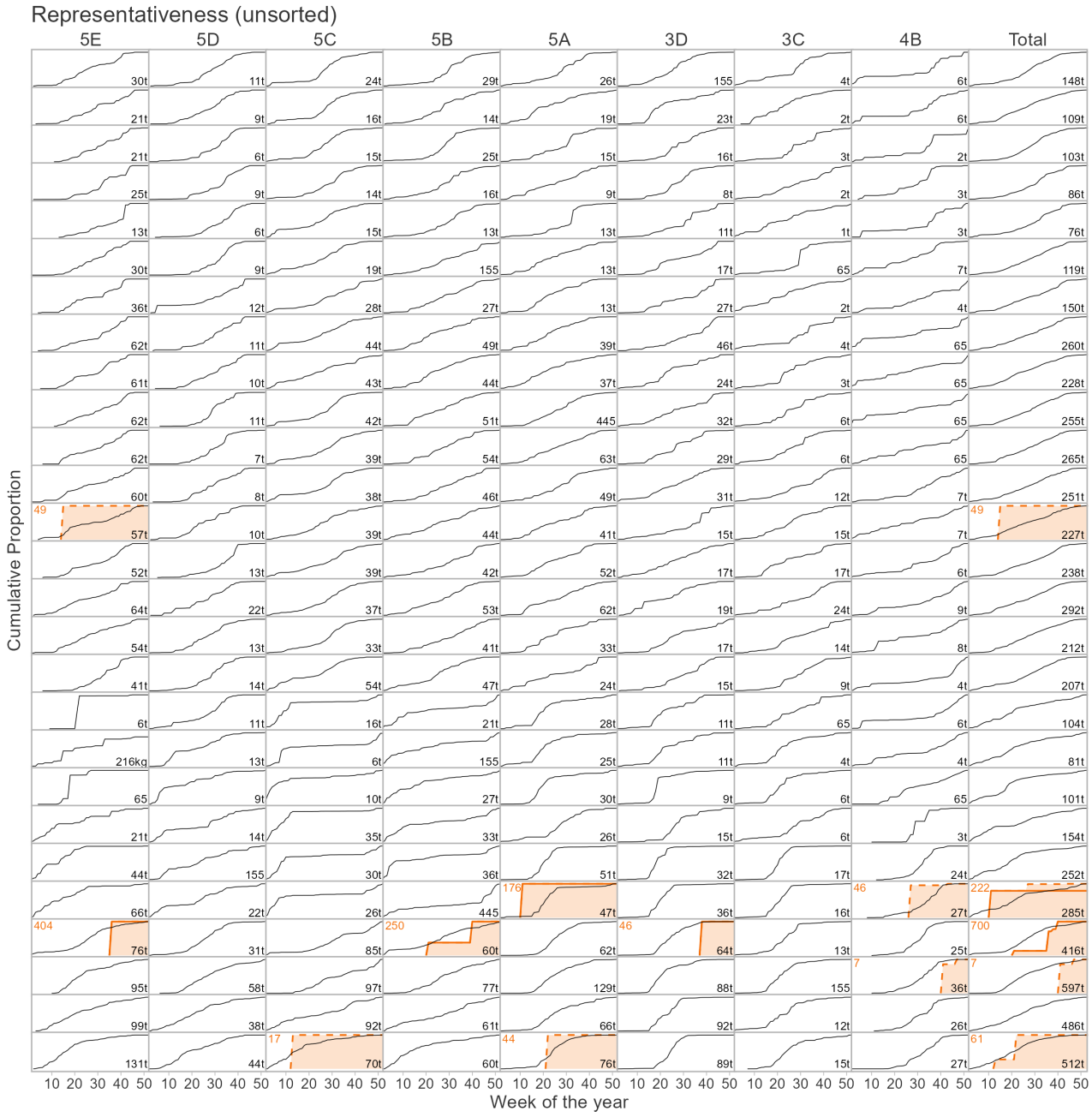
Sebastes ruberrimus (442)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Documents: Cox et al. (2020), Haggarty et al. (2022)
Last Science Advisory Reports: DFO (2020c), DFO (2020d)
Species at Risk Act Management Plan Series and Last Science Responses: DFO (2020e), DFO (2023d), DFO (2023e)
COSEWIC Status Report: COSEWIC (2020)
COSEWIC Status: Threatened, SARA Status: Special Concern

Yelloweye Rockfish were caught mostly by hook and line. Catch and specimen collection occurred in all areas. Catch peaked in 1998, decreased until 2004, increased until 2008, remained relatively stable until 2015, decreased again until 2018, then gradually increased until 2022. Specimen collection was highest in 1999, but variable and limited. Unsorted specimen collection was limited, occurring only in 1996, from 1998 to 2000, and in 2010. Sorted specimens were collected annually from 1996 to 2008. Roughly half of the unsorted samples had latitude and longitude data. Cumulative total sampling and catch profiles did not match. Between 1996 and 2022, 1,039 unsorted specimens were collected, and of these, 814 (78%) had age structures, and 633 (61% of specimens; 78% of age structures) have been aged. All unsorted specimens had lengths; of these, 1,005 (97%) were sexed, while 627 (60%) had weights. A lack of commercial samples is cited as a major source of uncertainty in Yelloweye Rockfish stock assessments (Cox et al. 2020).

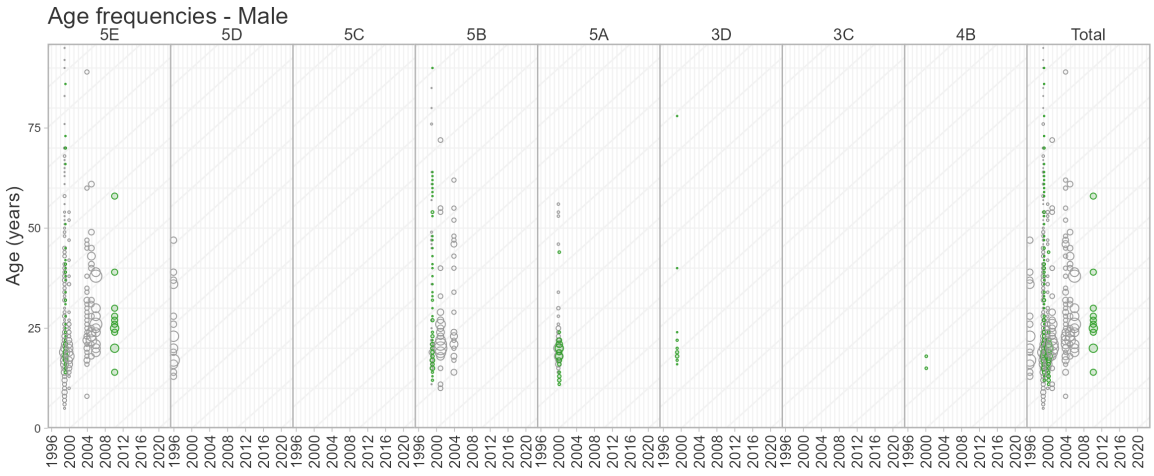
Yelloweye Rockfish

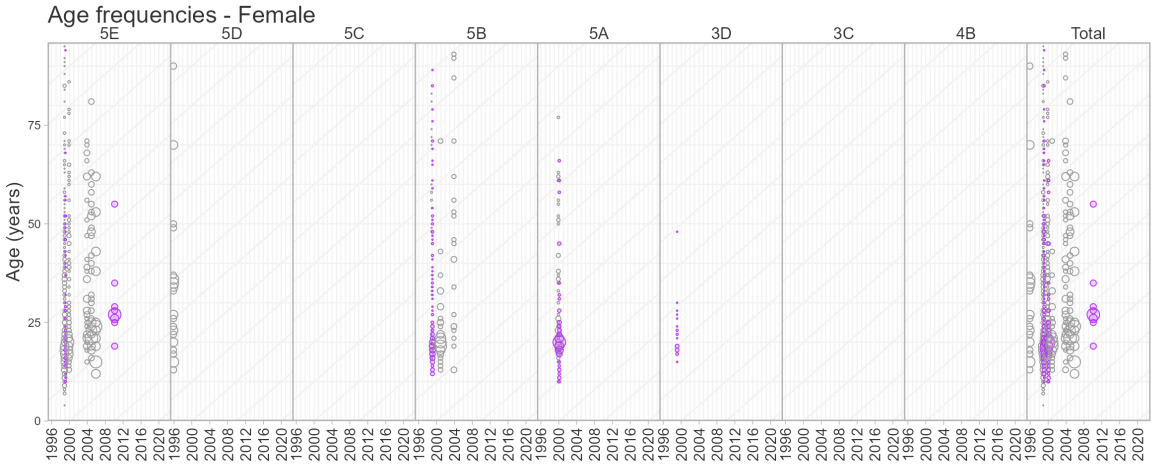
Yelloweye Rockfish

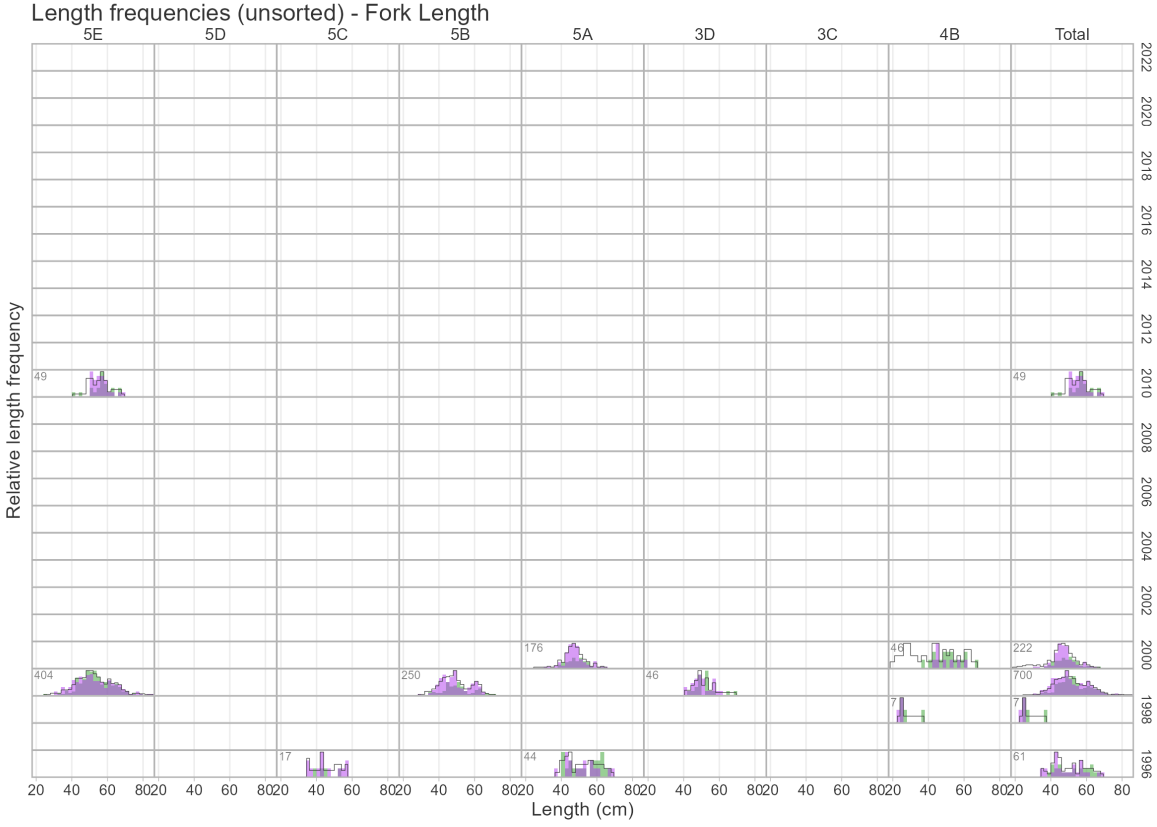
Yelloweye Rockfish



Yelloweye Rockfish





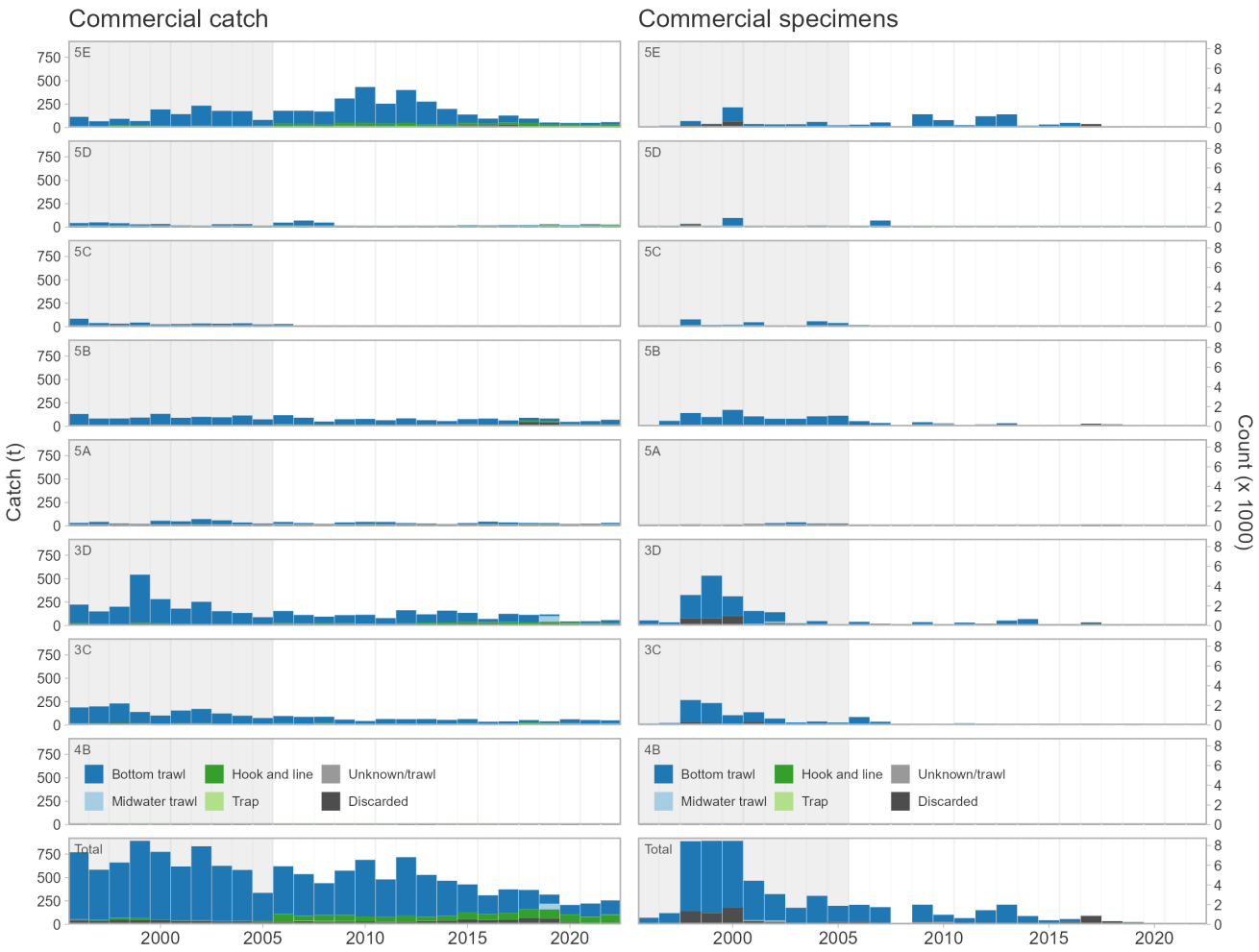


4.20 Shortspine Thornyhead

Sebastolobus alascanus (451)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Starr and Haigh (2017)
Last Science Advisory Report: DFO (2016)

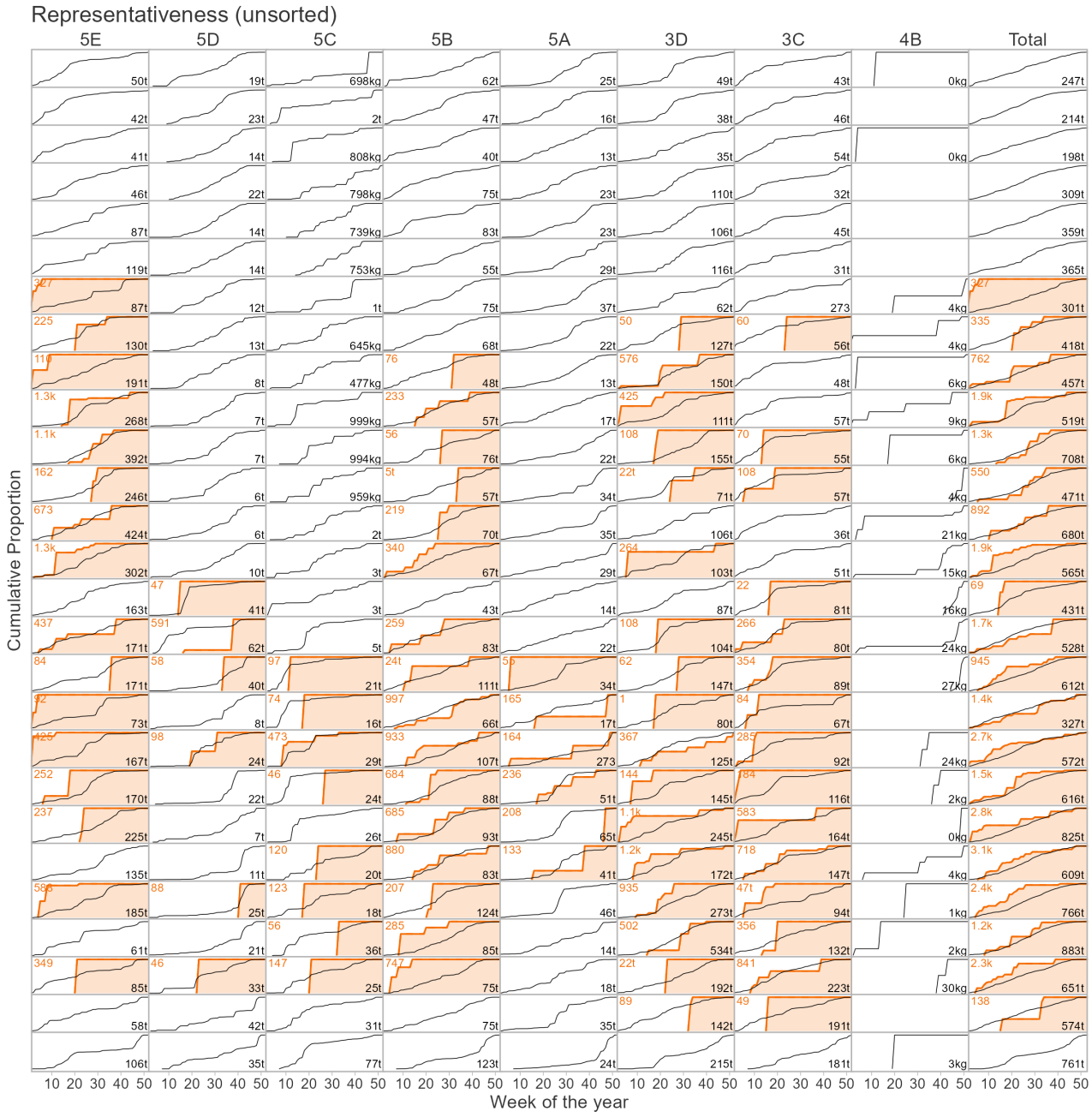
Shortspine Thornyhead were caught mostly by bottom trawl, and occasionally by hook and line and midwater trawl. Areas 5E and 3D had marginally higher catch. Catch trended downward from 1999 to 2022, on average. Specimen collection peaked from 1998 to 2000, then decreased suddenly. Unsorted specimens were collected annually from 1997 to 2016. Sorted specimen collection occurred from 1996 to 2006, in 2009 and 2012, and from 2016 to 2019. All of the unsorted specimens had latitude and longitude data. Cumulative total sampling profiles tended to match cumulative total catch profiles in most years with biological sampling. Between 1996 and 2022, 28,299 unsorted specimens were collected, and of these, 9,653 (34%) had age structures, but none have been aged. Challenges in ageing otoliths, as often encountered for deep-sea species and confirmed by the SCL on research specimens, led to the choice not to age commercial otoliths (DFO 2016; Starr and Haigh 2017). All unsorted specimens had lengths; of these, 9,249 (33%) were sexed, while none had weights. The dominant length type was total length, but fork length measurements were also collected. We replaced the age frequency plot with a second length-frequency plot for fork lengths.

Shortspine Thornyhead

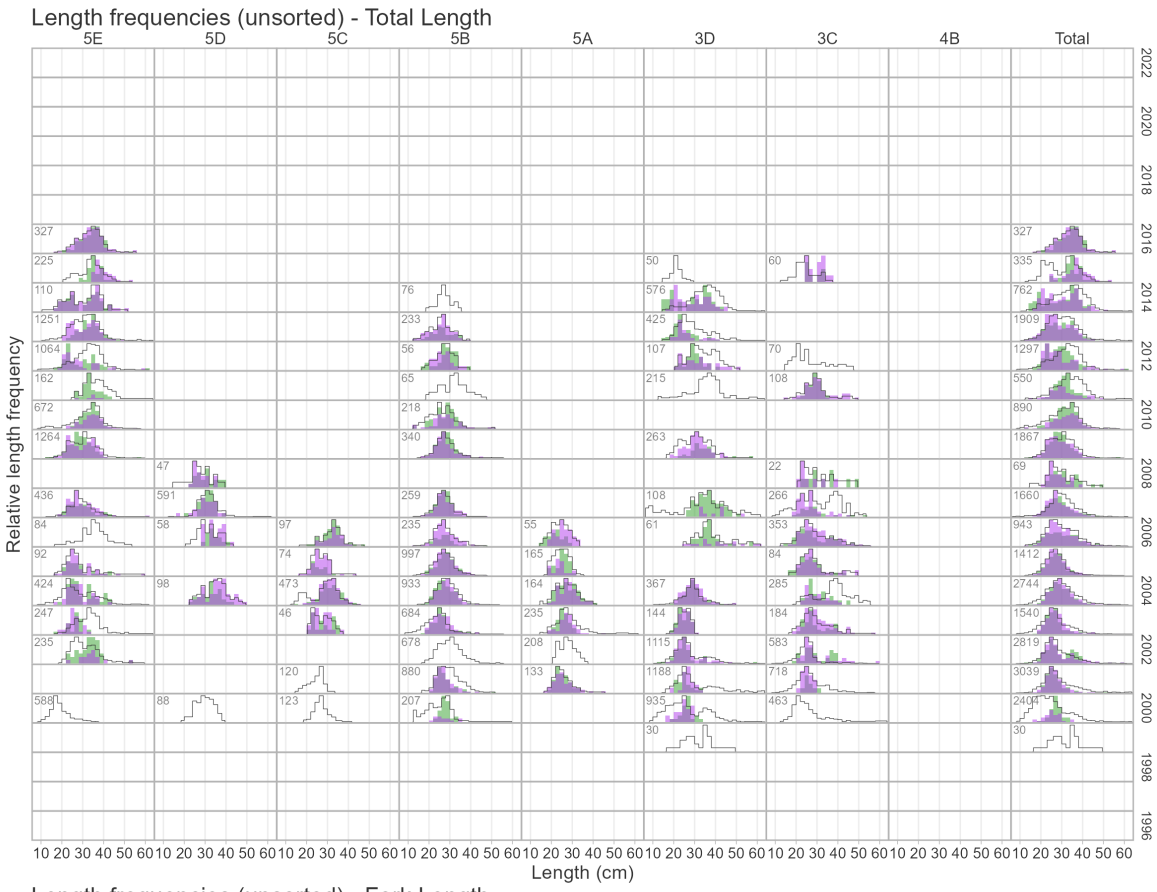


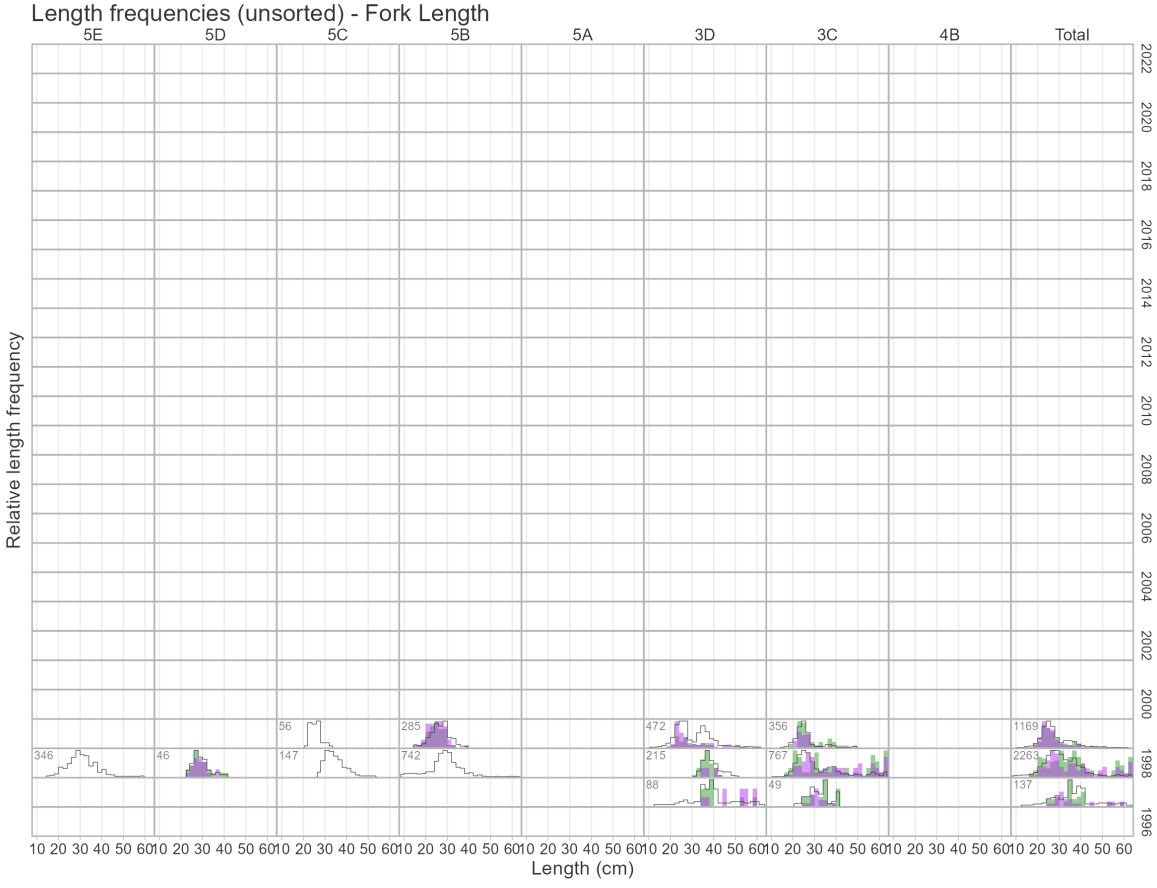
Shortspine Thornyhead

Shortspine Thornyhead



Shortspine Thornyhead



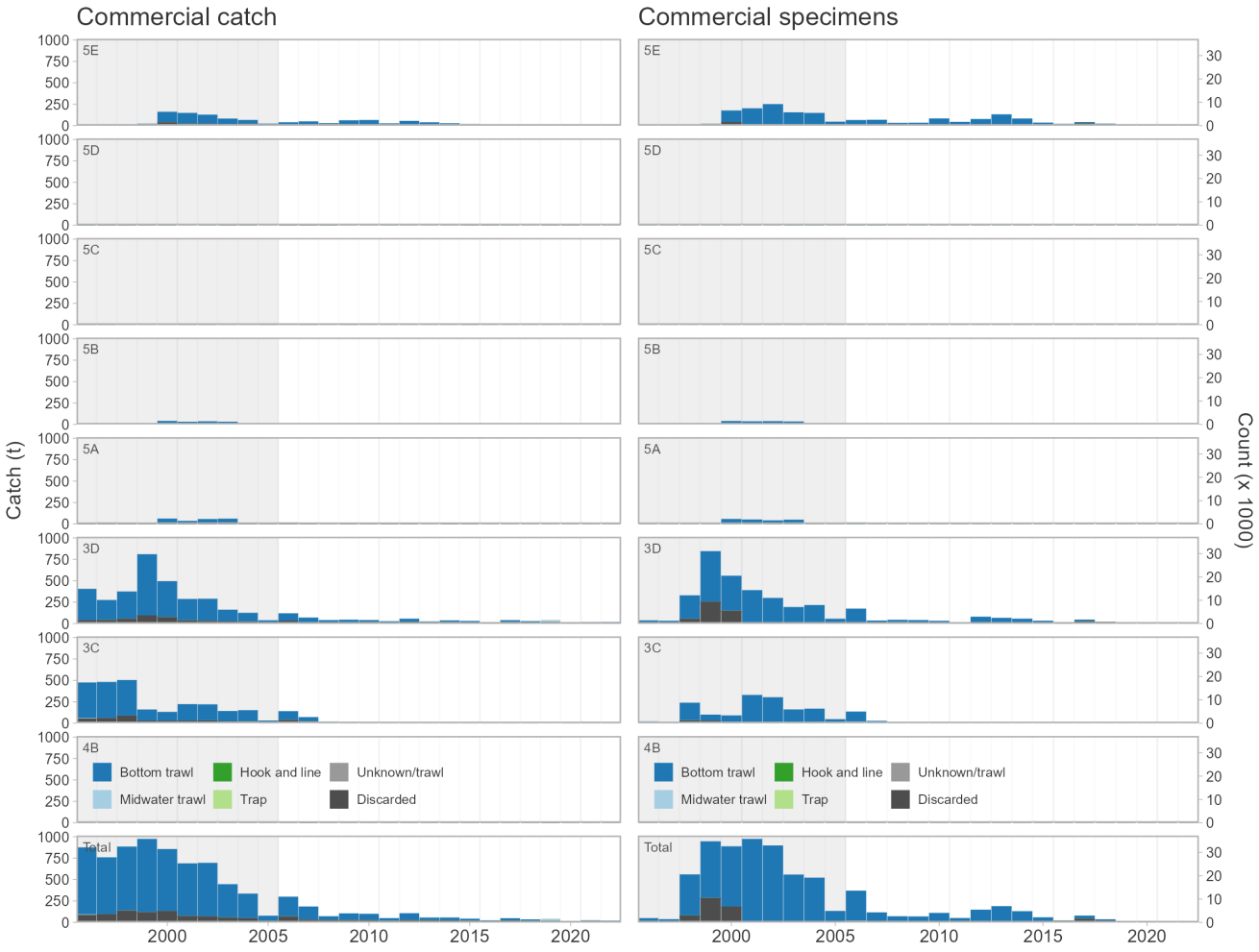


4.21 Longspine Thornyhead

Sebastolobus altivelis (453)
Order: Perciformes, Family: Sebastidae, FishBase, WoRMS
Last Research Document: Haigh et al. (2005)
Species at Risk Act Management Plan Series: DFO (2012b)
COSEWIC Status Report: COSEWIC (2007d)
COSEWIC Status: Special Concern, SARA Status: Special Concern

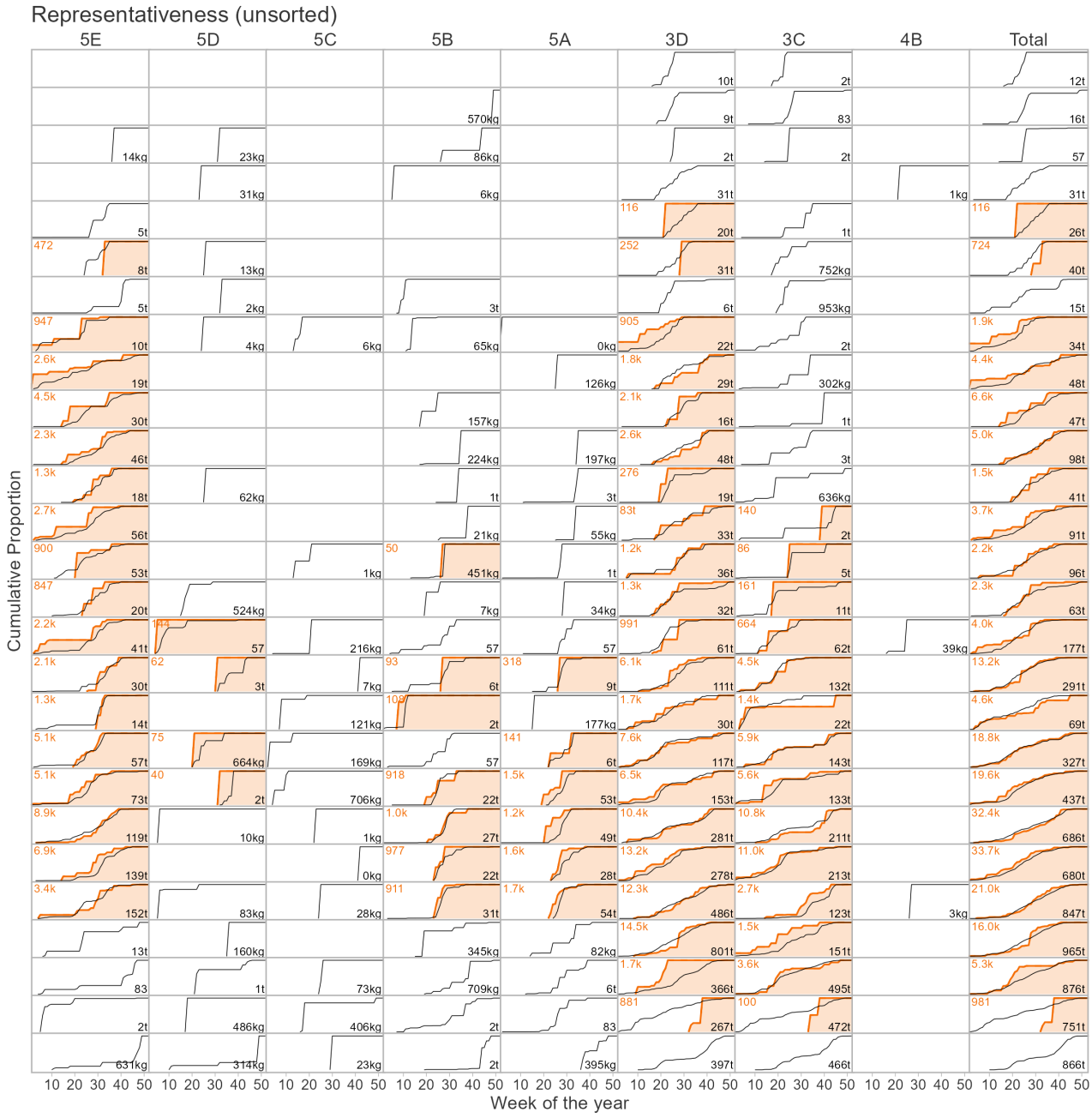
Longspine Thornyhead were caught mostly by bottom trawl. Catch and specimen collection were highest in Area 3D. Catch peaked in 1999, while specimen collection peaked in 2001; both have declined since, on average. Unsorted specimens were collected annually from 1997 to 2015 and from 2017 to 2018. Sorted specimen collection occurred from 1996 to 2018, with several large gaps from 2004 to 2015. The abundance of specimens collected in the early 2000s was due to the implementation of an exploratory fishery, requiring biological samples from commercial tows (Schnute et al. 2004). All unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched most of the years with biological sampling, particularly from 2000 to 2012. Between 1996 and 2022, 198,013 unsorted specimens were collected, and of these, 34,488 (17%) had age structures, but none have been aged. Challenges in ageing otoliths, as often encountered for deep-sea species and confirmed by the SCL on research specimens, led to the choice not to age commercial otoliths (Starr and Haigh 2000; Starr 2001). All unsorted specimens had lengths, and of these, 29,916 (15%) were sexed, while 50 (<1%) had weights. The dominant length type was total length, but fork length measurements were also collected. We replaced the age frequency plot with a second length-frequency plot for fork lengths.

Longspine Thornyhead

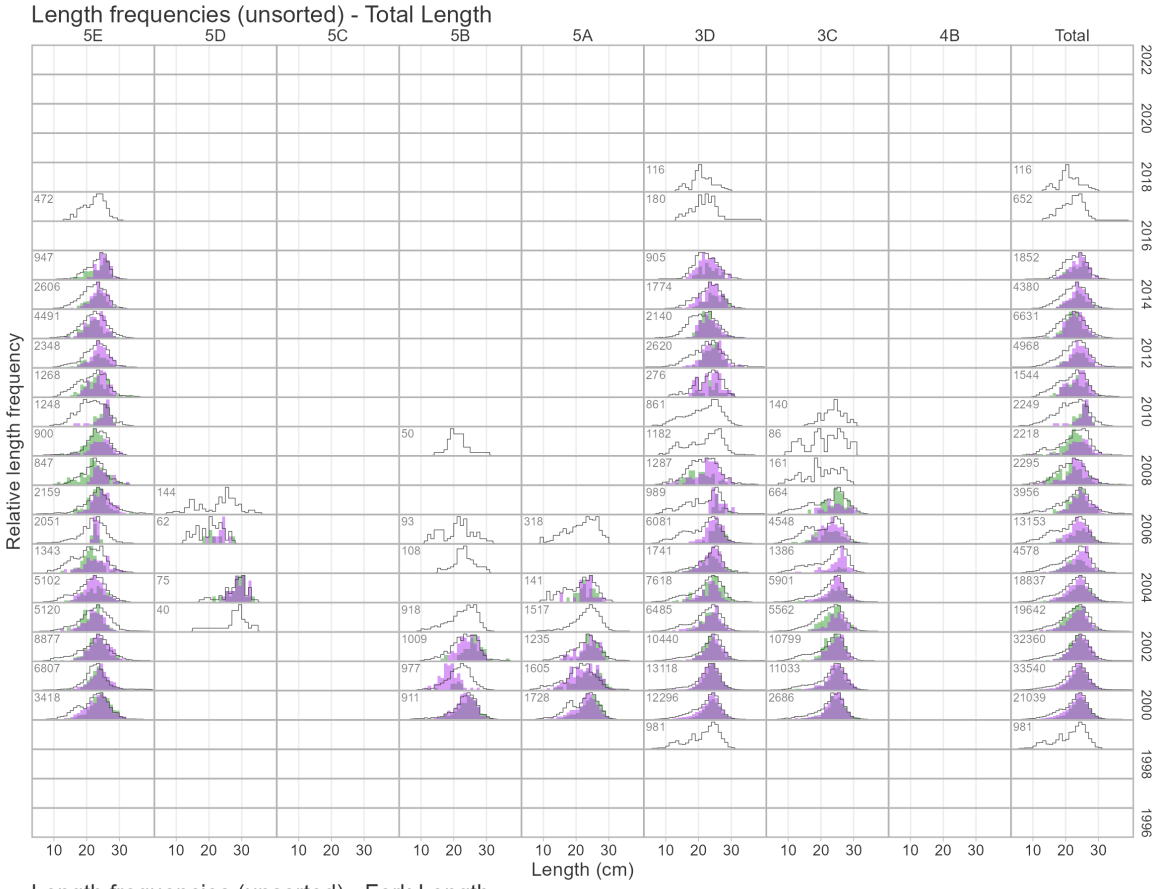


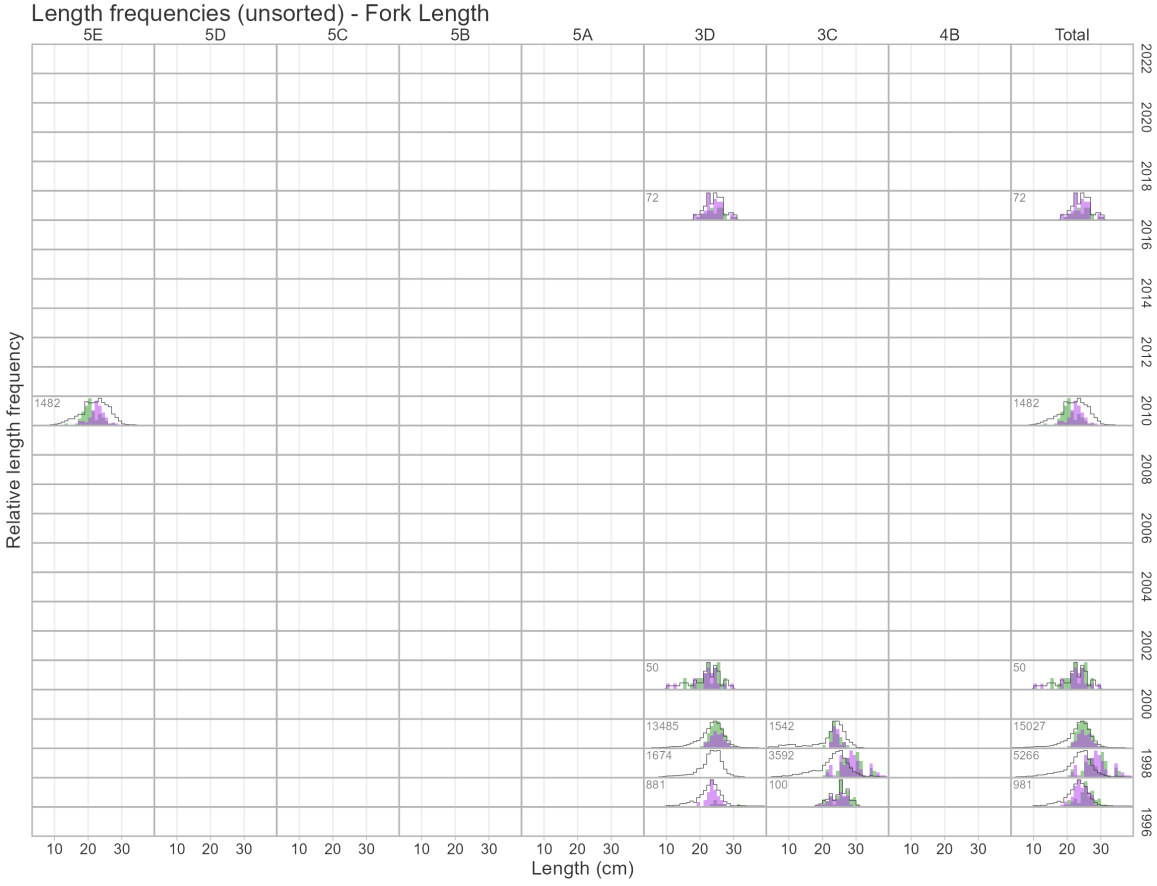
Longspine Thornyhead

Longspine Thornyhead



Longspine Thornyhead

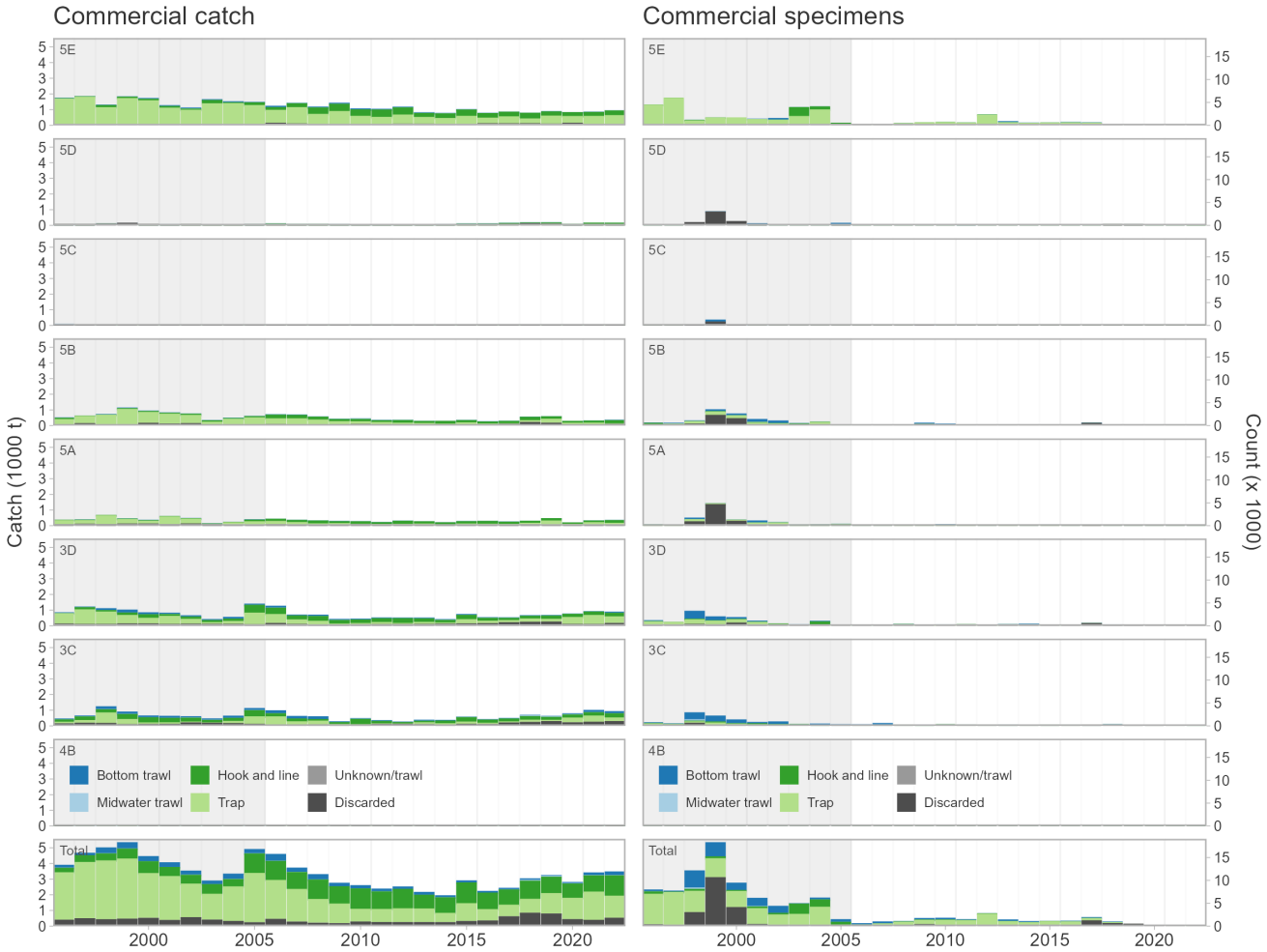




4.22 Sablefish

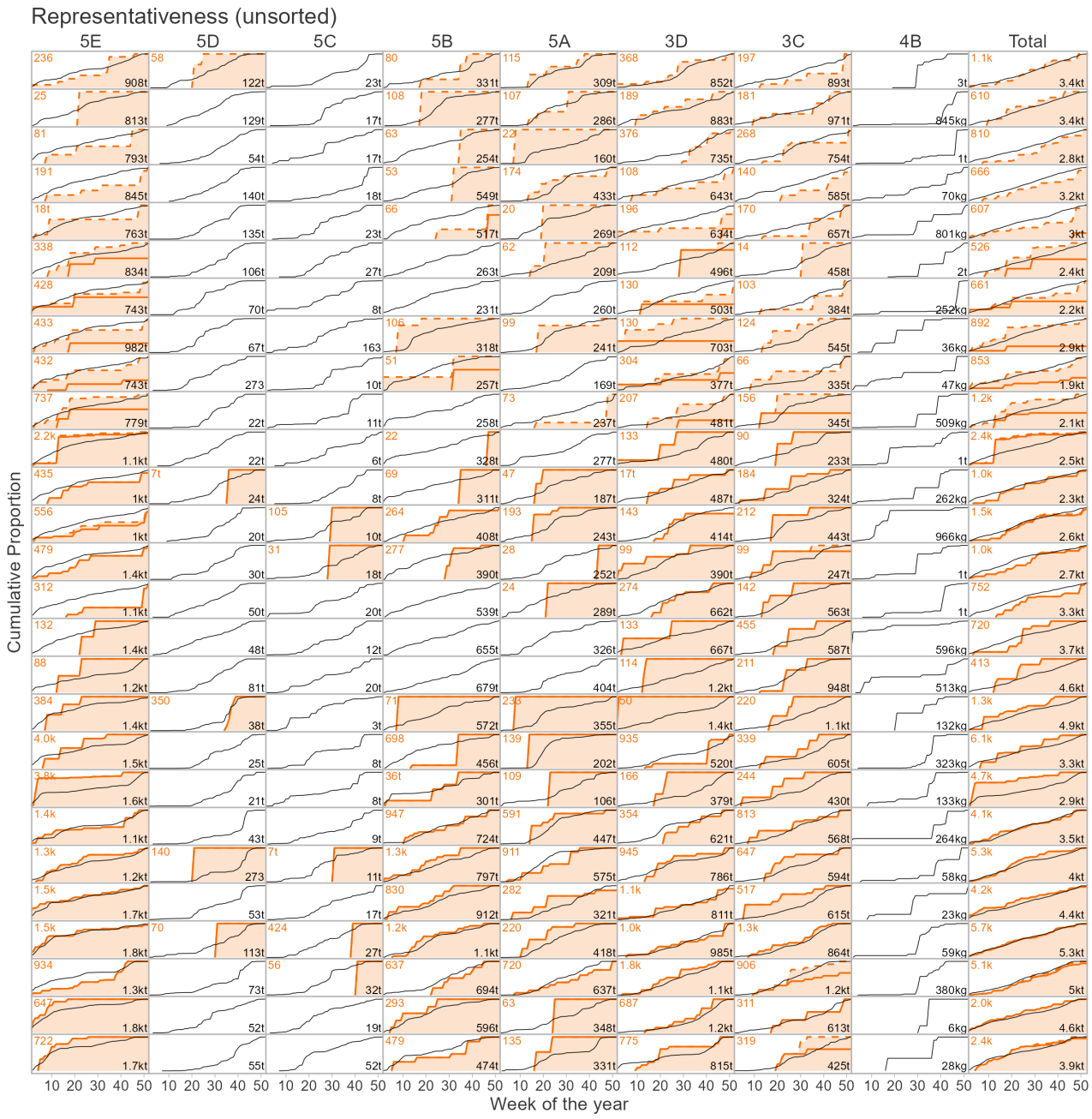
Anoplopoma fimbria (455)
Order: Perciformes, Family: Anoplopomatidae, FishBase, WoRMS
Last Research Documents: Cox et al. (2019), Cox et al. (2023), Johnson et al. (2025b)
Last Science Advisory Report: DFO (2023f)
Last Science Response: DFO (2024e)

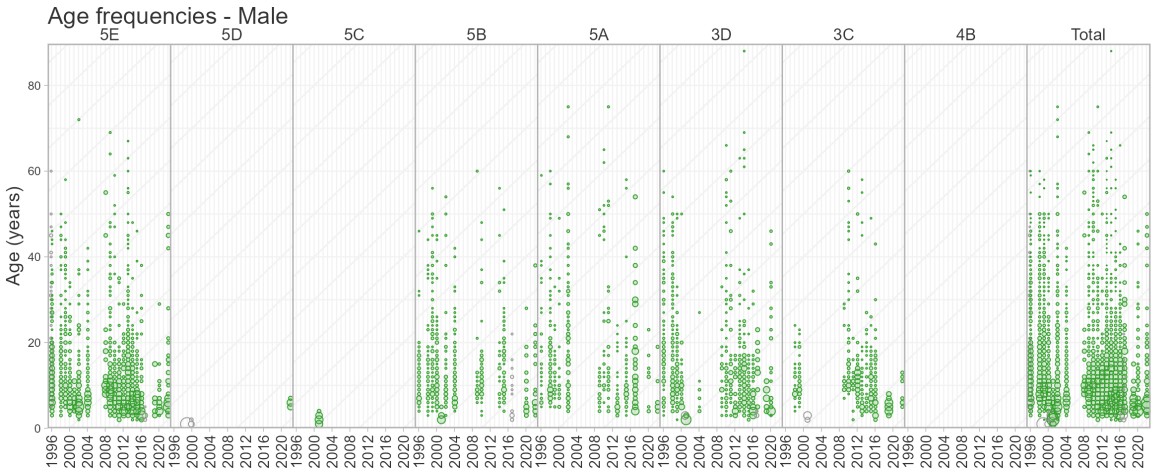
Sablefish were caught mostly by trap, hook, and line, and occasionally by bottom and midwater trawl. Area 5E had marginally higher catch and specimen collection. Catch peaked in 1999 and 2005; after a low point in 2014, catch gradually increased until 2022. Specimen collection peaked in 1999, then decreased suddenly. Unsorted specimens were collected annually over the 27-year time period. Sorted specimen collection was inconsistent from 1996 to 2020, lacking many years of data from 2003 to 2015. Roughly half of the unsorted samples had latitude and longitude data. Cumulative total sampling and catch profiles matched in most of the years with biological sampling. Between 1996 and 2022, 56,907 unsorted specimens were collected, and of these, 38,792 (68%) had age structures, and 8,895 (16% of specimens; 23% of age structures) have been aged. All unsorted specimens had lengths; of these, 46,193 (81%) were sexed, while 33,368 (59%) had weights.

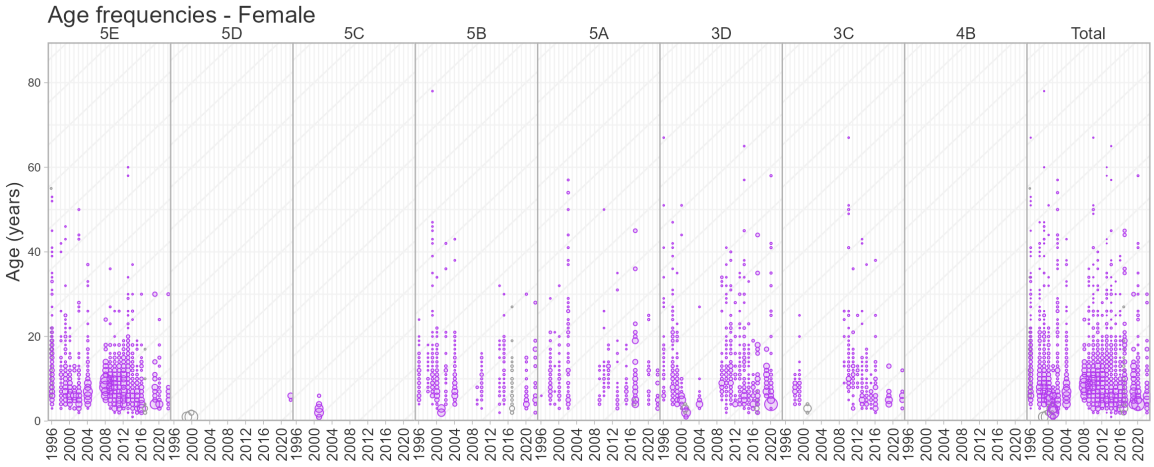


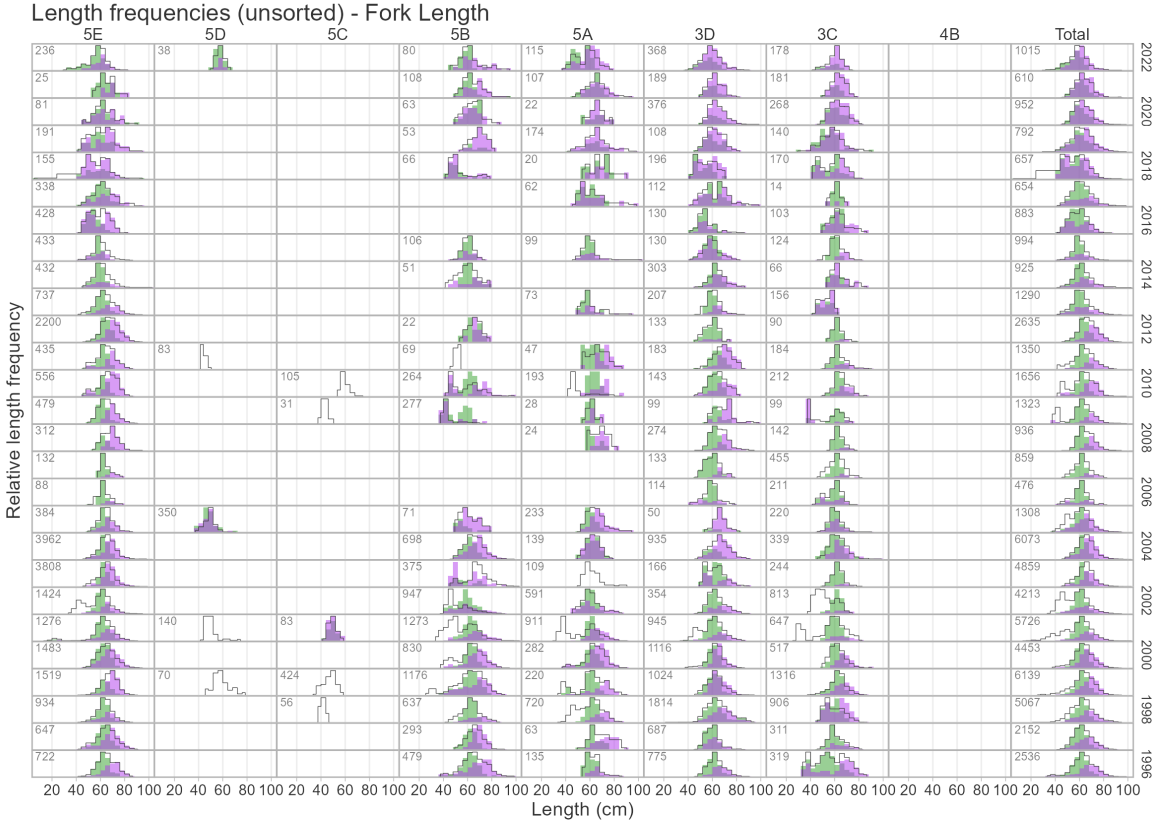
Sablefish


Unsorted commercial specimen counts
Sorted commercial specimen counts
Length
Sex
Weight
Maturity
Age
Age structures
Spatial
Fishing events
5E
5D
5C
5B
5A
3D
3C
4B
Total
1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
10 20 30 40 50
Week of the year


Age frequencies - Male
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)

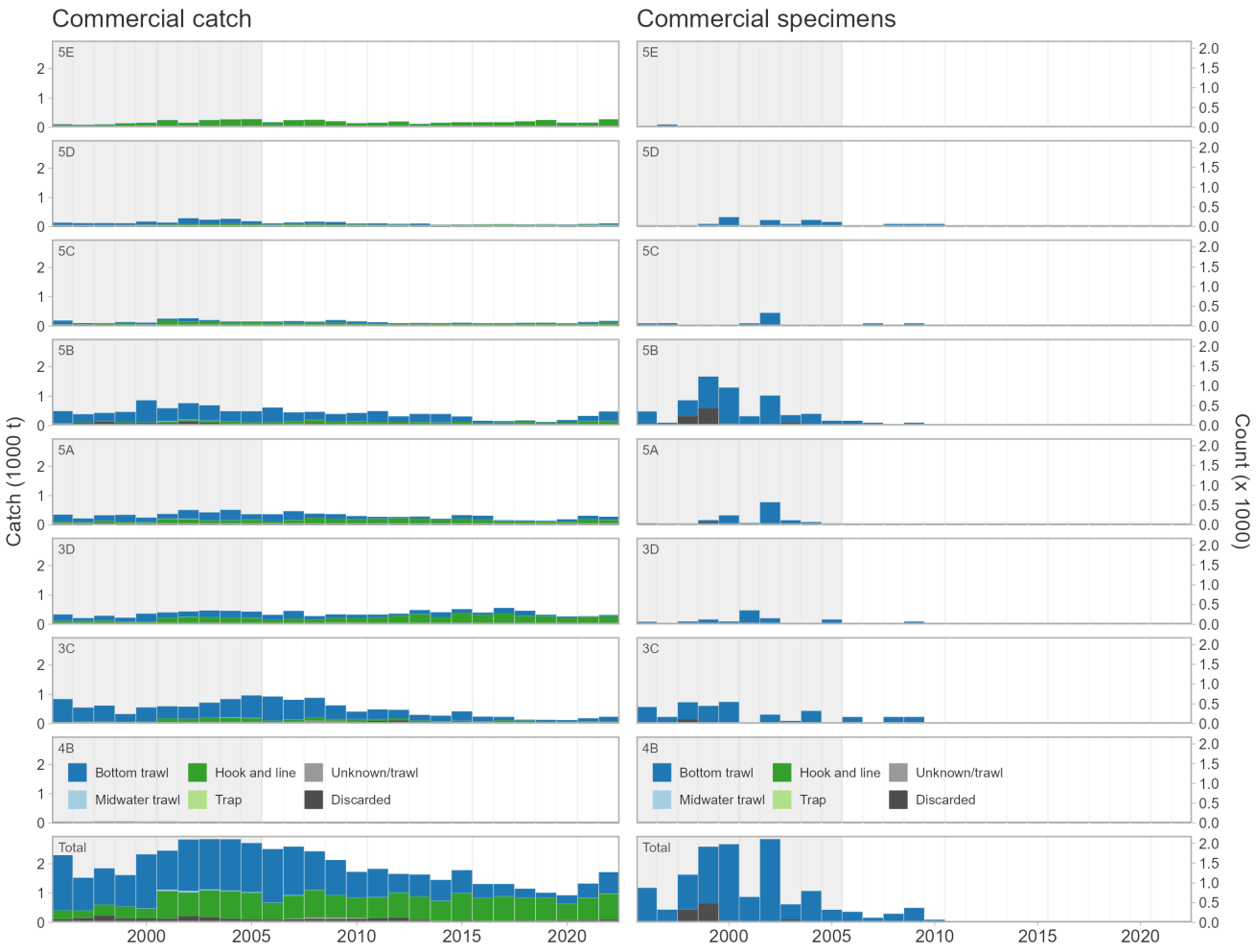

Age frequencies - Female
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)


Length frequencies (unsorted) - Fork Length
5E
5D
5C
5B
5A
3D
3C
4B
Total
Relative length frequency
Length (cm)

4.23 Lingcod

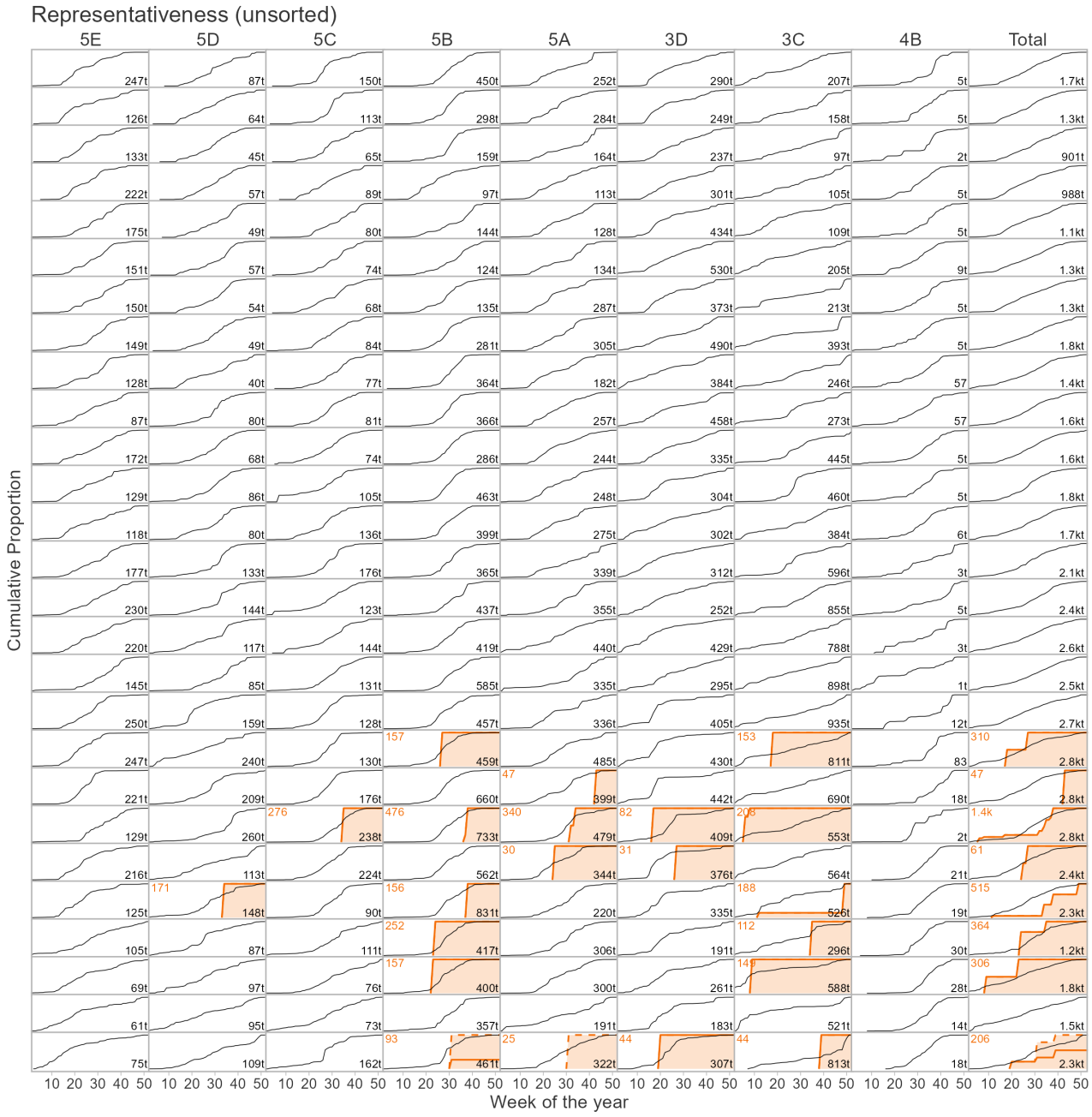
Ophiodon elongatus (467)
Order: Perciformes, Family: Hexagrammidae, FishBase, WoRMS
Last Research Documents: King et al. (2011), Holt et al. (2016a)
Last Science Advisory Reports: DFO (2011), DFO (2015)

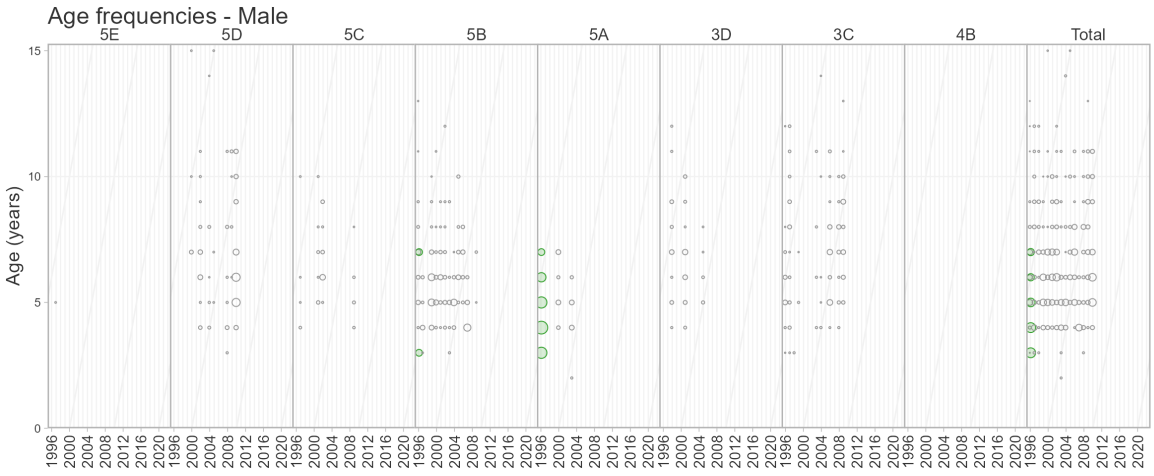
Lingcod were caught mostly by bottom trawl, hook and line, and occasionally by midwater trawl. The catch was slightly higher in Areas 5AB and 3CD. Catch in Area 4B was low and would have only come from minor areas 12 (Queen Charlotte Strait) and 20 (Juan de Fuca Strait) (Figure 2) as the commercial fishery in the Strait of Georgia has been closed since 1990 (Holt et al. 2016a). Catch from the hook and line fishery remained relatively consistent from 2001 to 2022. The trawl fishery catch decreased from 2008 to 2020 but slightly increased from 2021 to 2022. Specimen collection was variable from 2000 to 2004 and remained low from 2005 onward. Unsorted specimen collection occurred only in 1996 and 1998–2004. Sorted specimens were collected annually from 1996 to 2010. Nearly all unsorted specimens had latitude and longitude data. Cumulative total sampling poorly matched the cumulative total catch in all years with biological sampling. Between 1996 and 2022, 3,191 unsorted specimens were collected, and of these, 208 (7%) had age structures, and 50 (2% of specimens; 24% of age structures) have been aged. All unsorted specimens had lengths; of these, 233 (7%) were sexed, and none had weights.

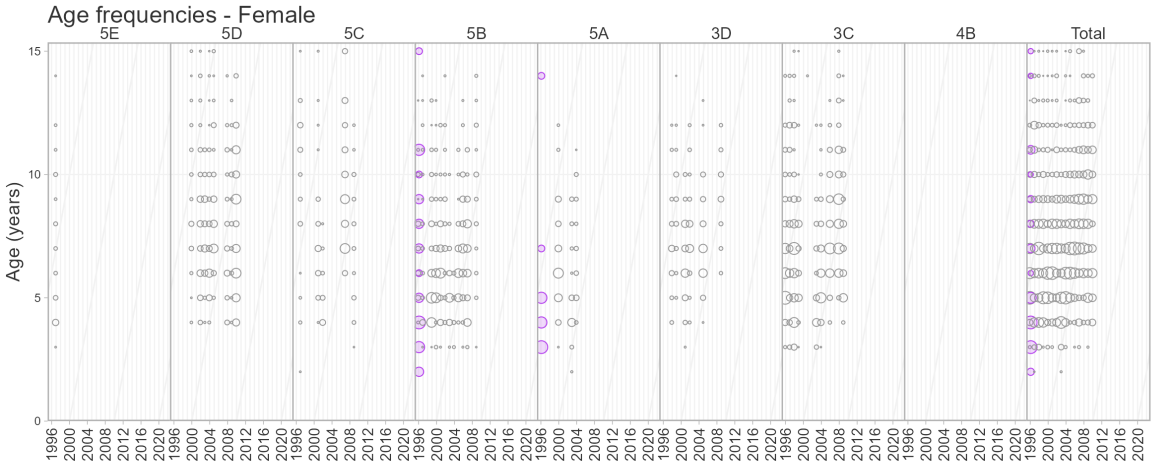

Commercial catch
Commercial specimens
Catch (1000 t)
Count (x 1000)
5E
5D
5C
5B
5A
3D
3C
4B
Total
Bottom trawl
Hook and line
Unknown/trawl
Midwater trawl
Trap
Discarded
2000
2005
2010
2015
2020

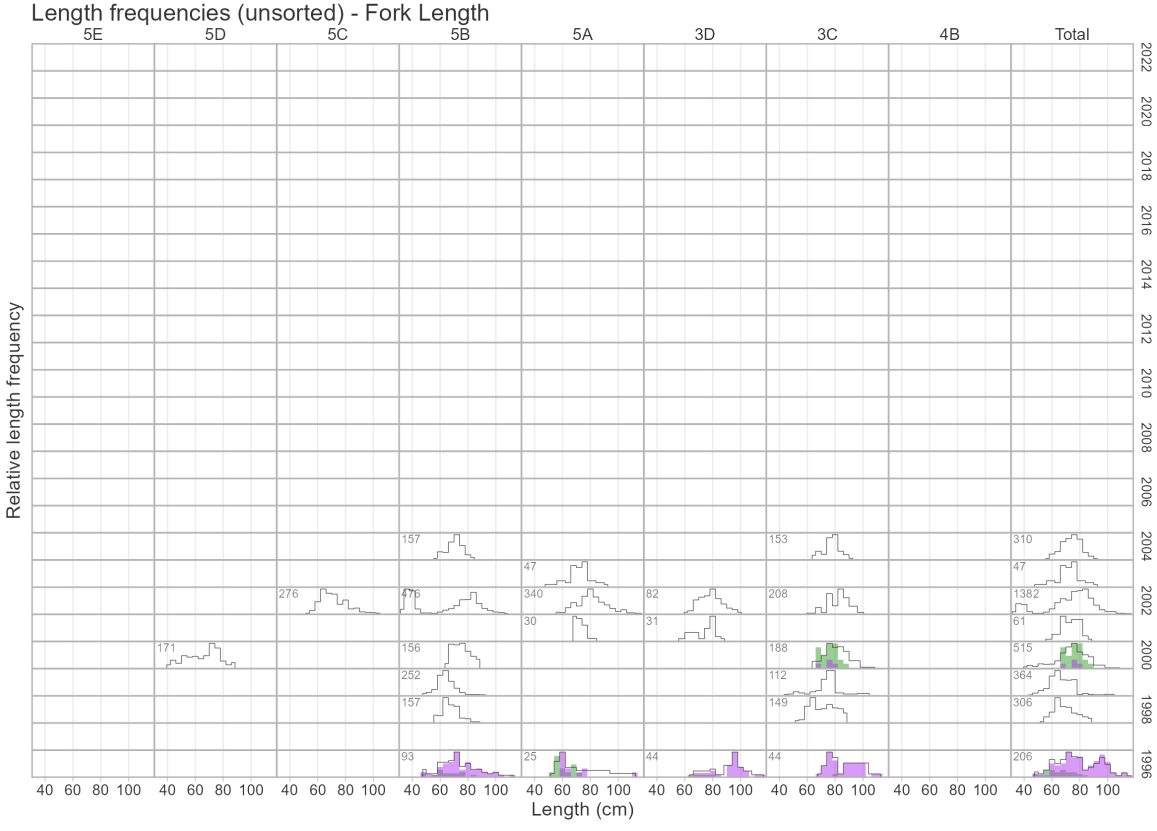
Lingcod


Unsorted commercial specimen counts
Sorted commercial specimen counts
Length
Sex
Weight
Maturity
Age
Age structures
Spatial
Fishing events
5E
5D
5C
5B
5A
3D
3C
4B
Total
1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
Cumulative Proportion
Week of the year
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996


Age frequencies - Male
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)

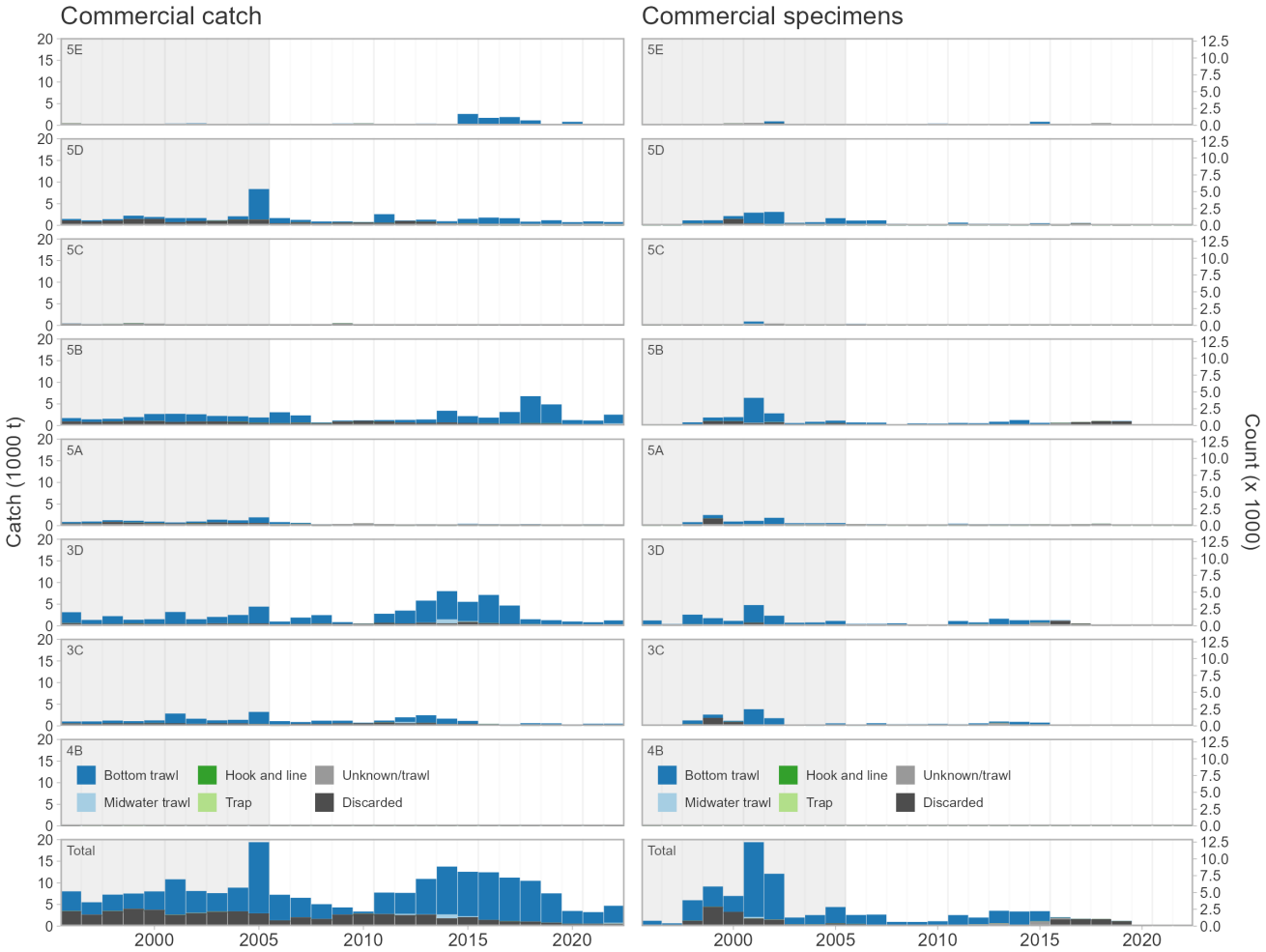

Age frequencies - Female
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)


Length frequencies (unsorted) - Fork Length
5E
5D
5C
5B
5A
3D
3C
4B
Total
Relative length frequency
Length (cm)

4.24 Arrowtooth Flounder

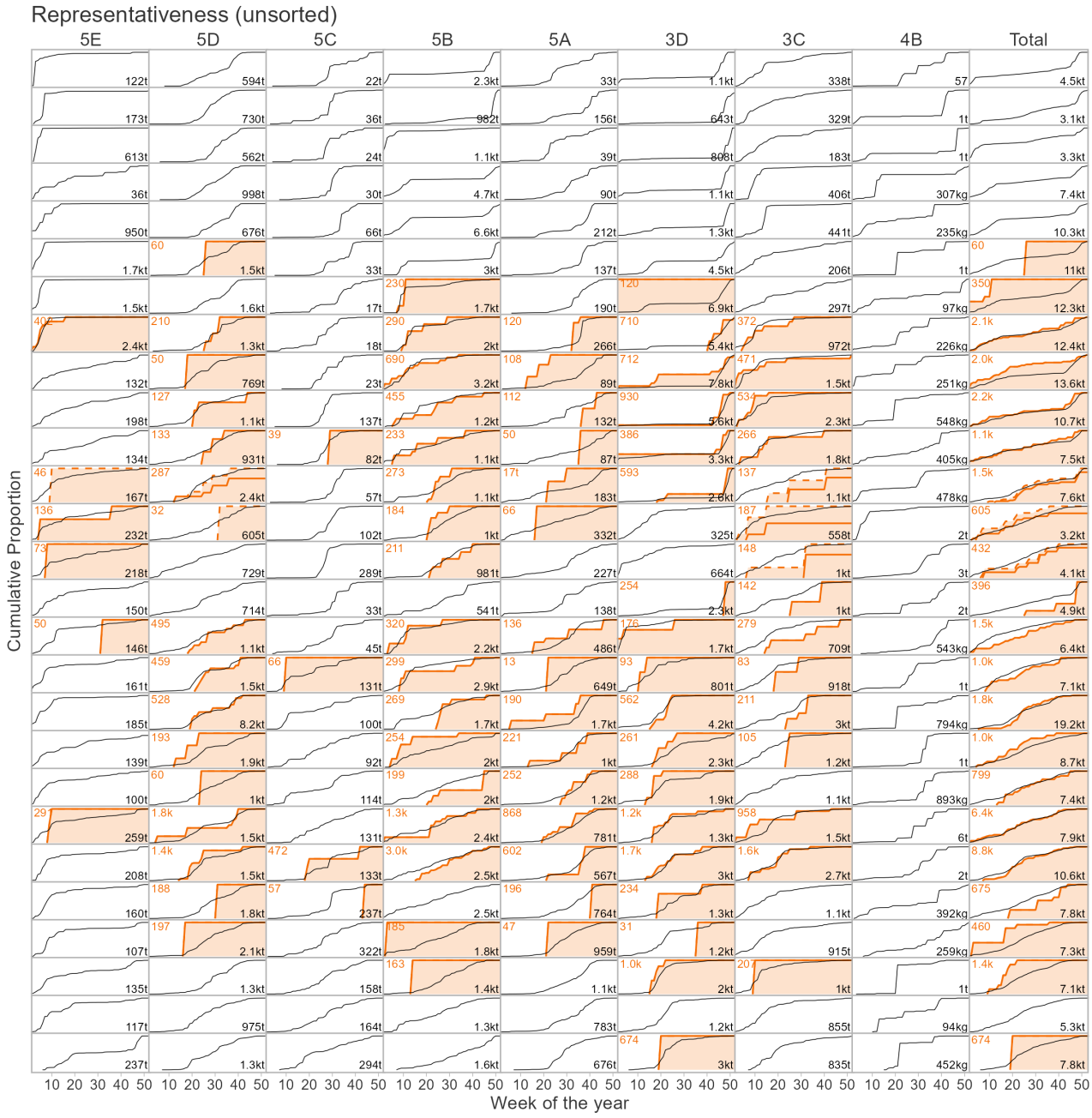
Atheresthes stomias (602)
Order: Pleuronectiformes, Family: Pleuronectidae, FishBase, WoRMS
Last Research Document: Grandin and Forrest (2017)
Last Science Advisory Report: DFO (2023g)

Arrowtooth Flounder were caught mostly by bottom trawl. The catch was marginally higher in Areas 5D, 5B, and 3D. The largest catch occurred in 2005, but the largest specimen collection occurred in 2001. Unsorted specimen collection occurred in 1996 and annually from 1998 to 2017. Sorted specimen collection occurred from 1997 to 2020, but lacked data from 2010 to 2015. Nearly all unsorted samples had latitude and longitude data. Cumulative total sampling and catch profiles matched in most of the years with biological sampling, particularly from 2001 to 2015, but excluding 2008. Between 1996 and 2022, 35,256 unsorted specimens were collected, and of these, 17,447 (50%) had age structures, and 3,098 (9% of specimens; 18% of age structures) had been aged. All unsorted specimens had lengths; of these, 18,470 (52%) were sexed, while 340 (1%) had weights.

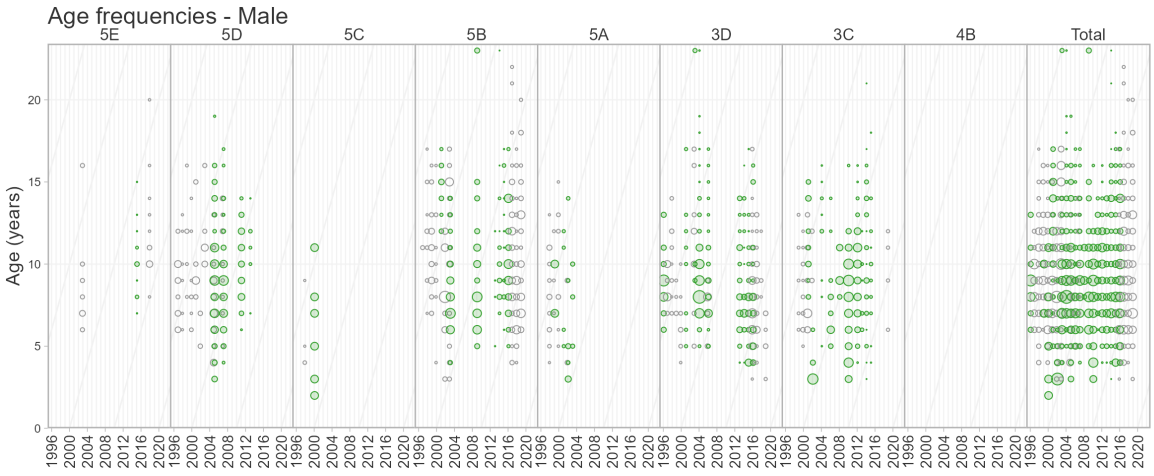


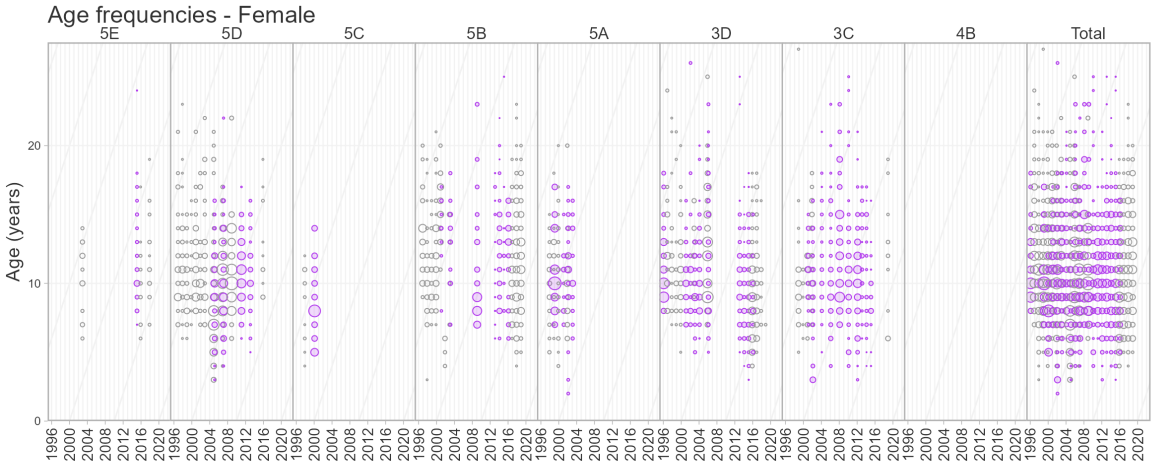
Arrowtooth Flounder

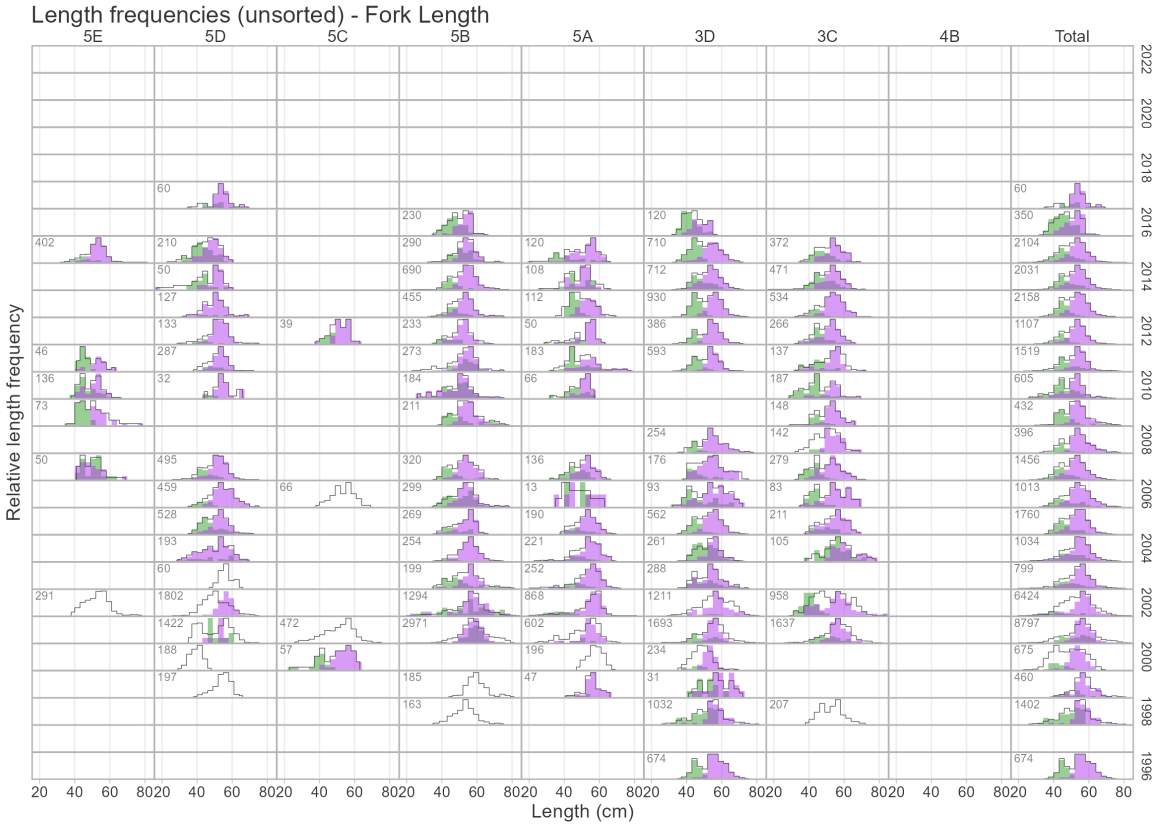
Arrowtooth Flounder



Arrowtooth Flounder



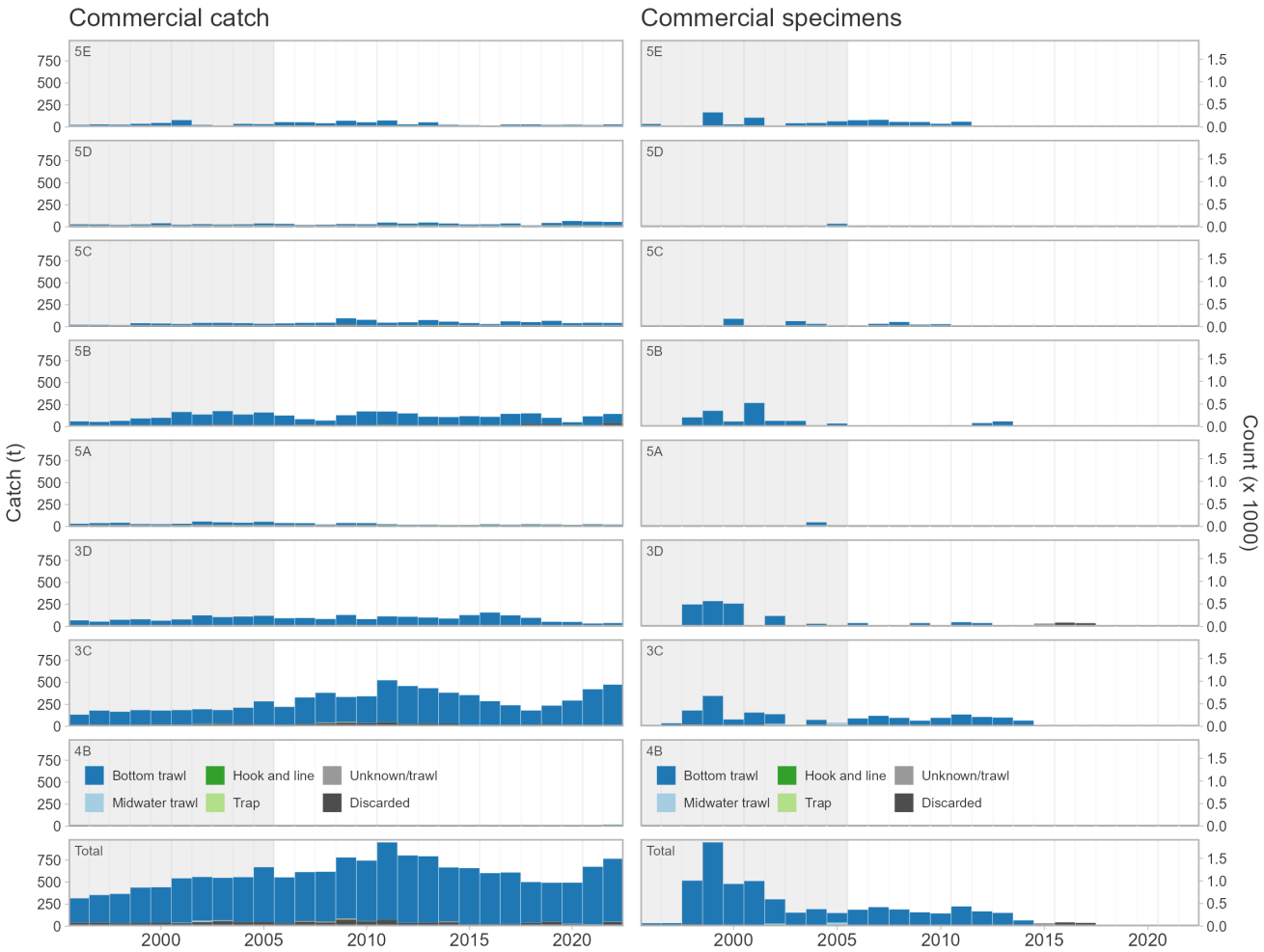




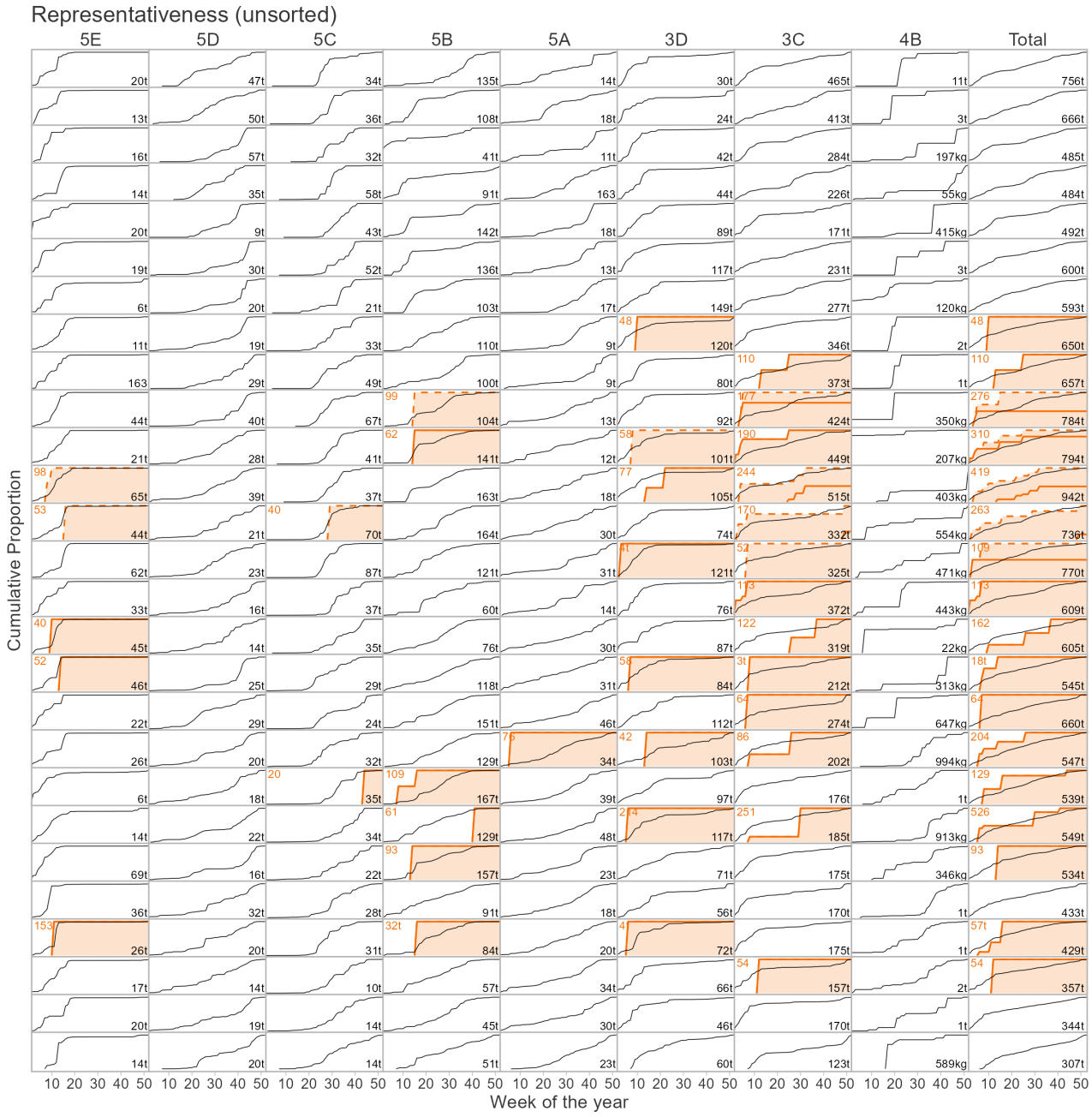
4.25 Petrale Sole

Eopsetta jordani (607)
Order: Pleuronectiformes, Family: Pleuronectidae, FishBase, WoRMS
Last Research Document: Starr (2009a)
Last Science Advisory Report: DFO (2025b)

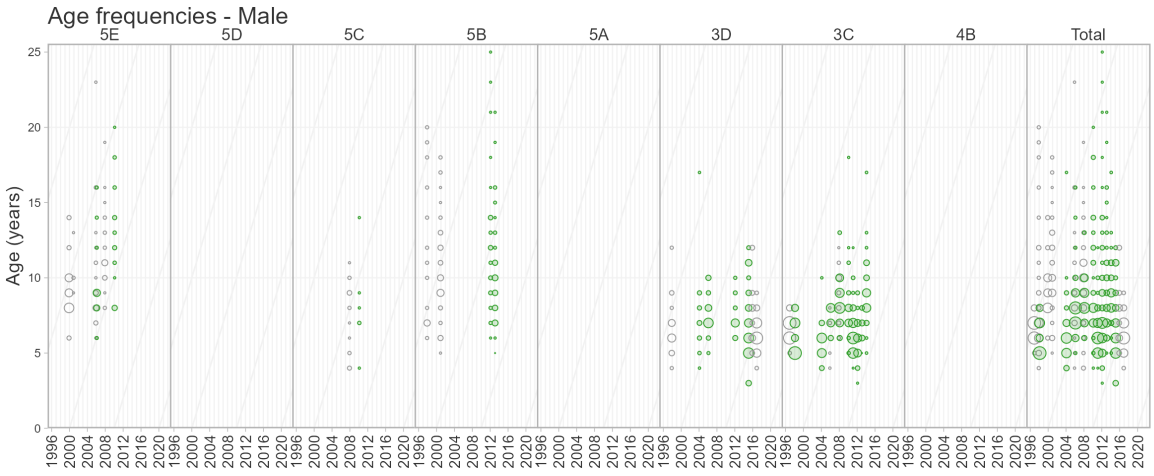
Petrale Sole were caught mostly by bottom trawl. The catch was marginally higher in Area 3C. The catch slowly increased until 2011, slowly decreased until 2020, then increased again until 2022. Specimen collection peaked in 1999, then decreased until 2003, after which it remained low. Unsorted specimen collection occurred from 1998 to 2015, lacking data in 2000. Sorted specimen collection occurred annually from 1996 to 2009 and from 2016 to 2017. Nearly all of the unsorted samples had latitude and longitude data. Cumulative total sampling roughly matched cumulative total catch in a few years (2010–2012) with biological sampling. Between 1996 and 2022, 3,578 unsorted specimens were collected, and of these, 2,435 (68%) had age structures, and 1,186 (33% of specimens; 49% of age structures) have been aged. All unsorted specimens had lengths; of these, 2,511 (70%) were sexed, while 658 (18%) had weights.

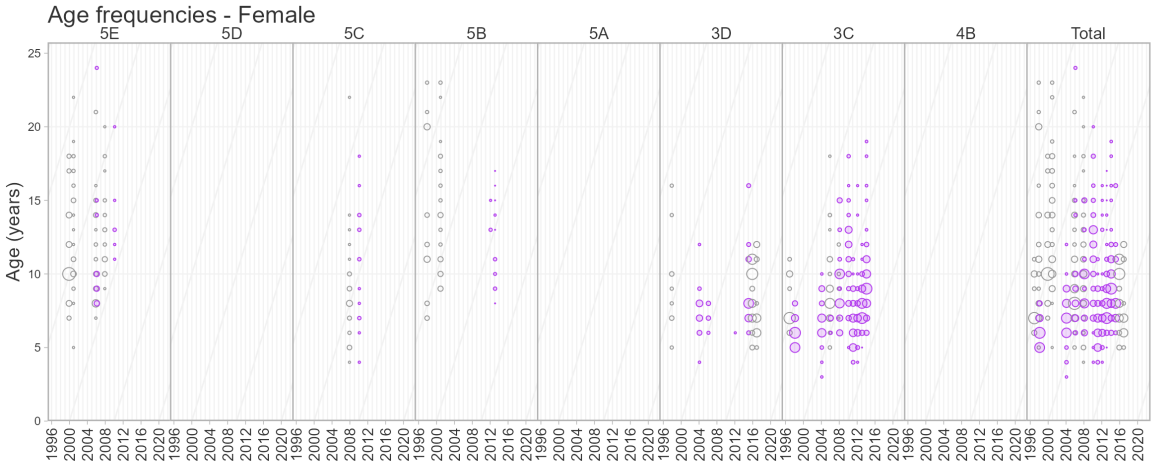


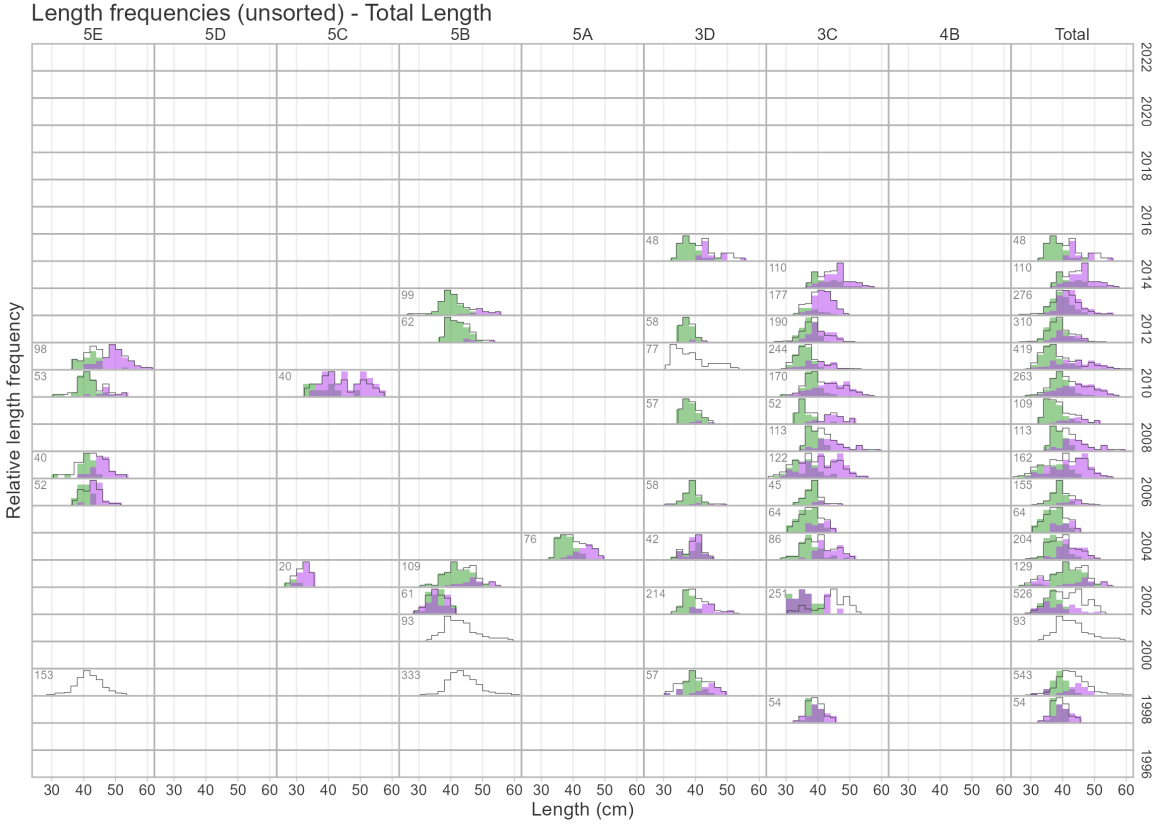
Petrale Sole


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
Week of the year
10 20 30 40 50

Petrale Sole





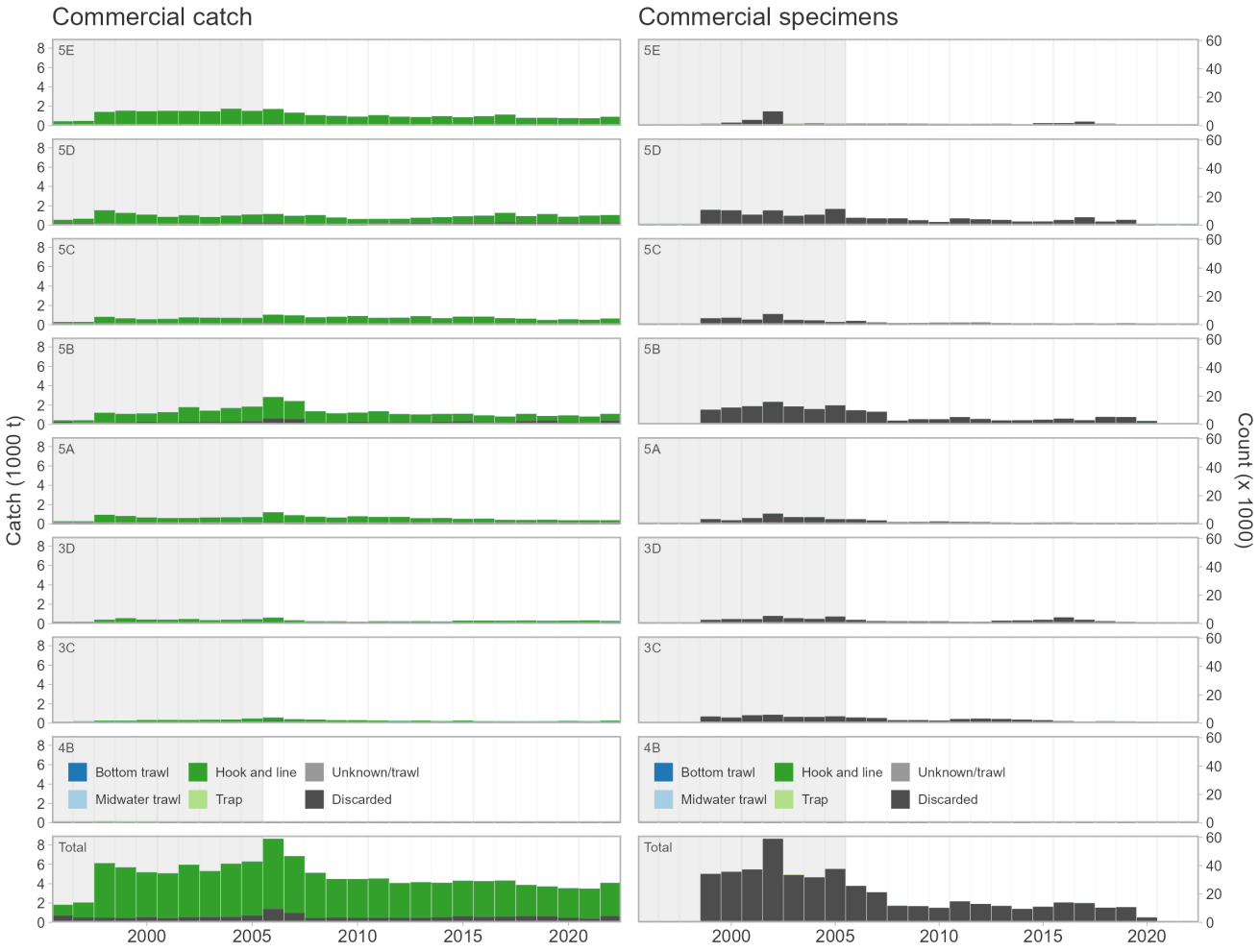


4.26 Pacific Halibut

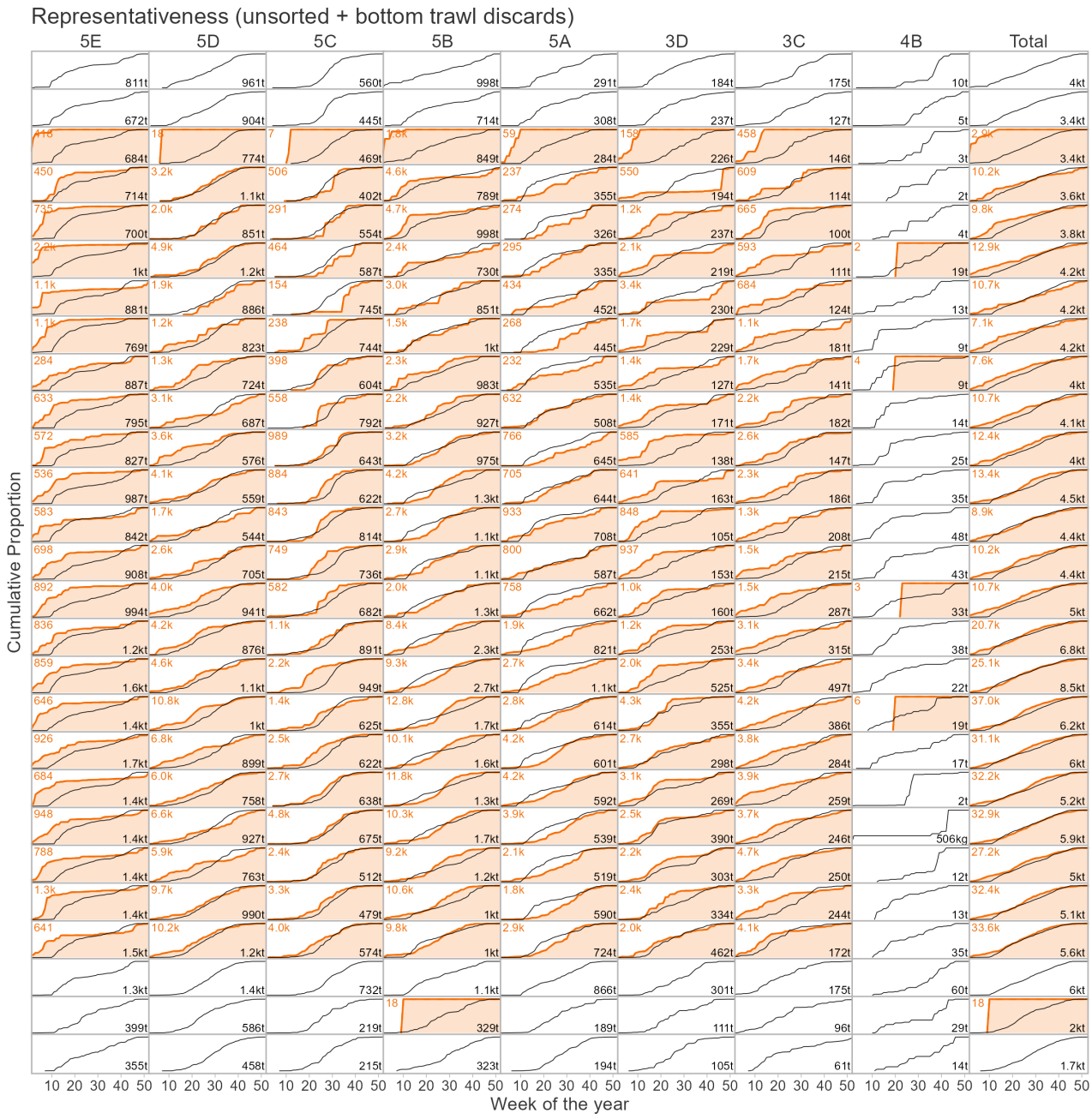
Hippoglossus stenolepis (614)
Order: Pleuronectiformes, Family: Pleuronectidae, FishBase, WoRMS
IPHC Stock Assessment: Stewart and Hicks (2025)

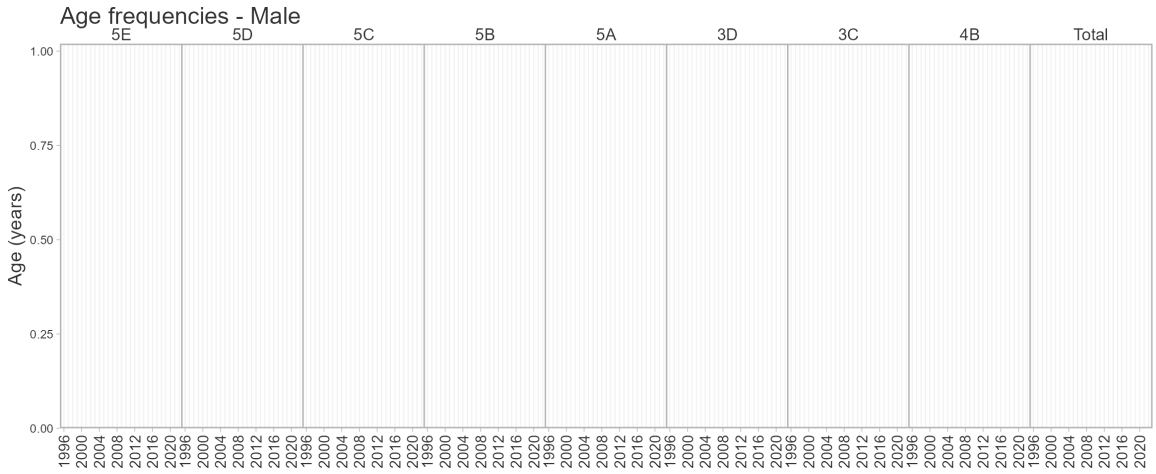
Pacific Halibut were caught mostly by hook and line. The catch was slightly higher in the northern areas, occurring fairly evenly across Areas 5BCDE. The catch peaked in 2006, declined until 2009, and has since remained relatively constant. Specimen collection peaked in 2002 and mostly came from discarded specimens. The bottom trawl fleet is not permitted to retain Pacific Halibut, but must measure them for quota management. Since all Halibut caught by trawl are discarded, regardless of size, we considered them as unsorted in Figures 3 (representativeness), 4 (age compositions), and 5 (length compositions). Sorted specimens were collected in 1997 and annually from 1999 to 2020, while unsorted specimen collection was limited. All specimens had latitude and longitude data. Cumulative total sampling (unsorted and bottom trawl discards) and catch profiles matched in all years with biological sampling except 1997 and 2020. Between 1996 and 2022, 399,640 specimens (unsorted and bottom trawl discards) were collected, and of these, 1 (<1%) had age structures, but none have been aged. All specimens (unsorted and bottom trawl discards) had lengths; of these, 140 (<1%) were sexed, while 399,369 (99.9%) had weights (mostly derived from a length-weight table).

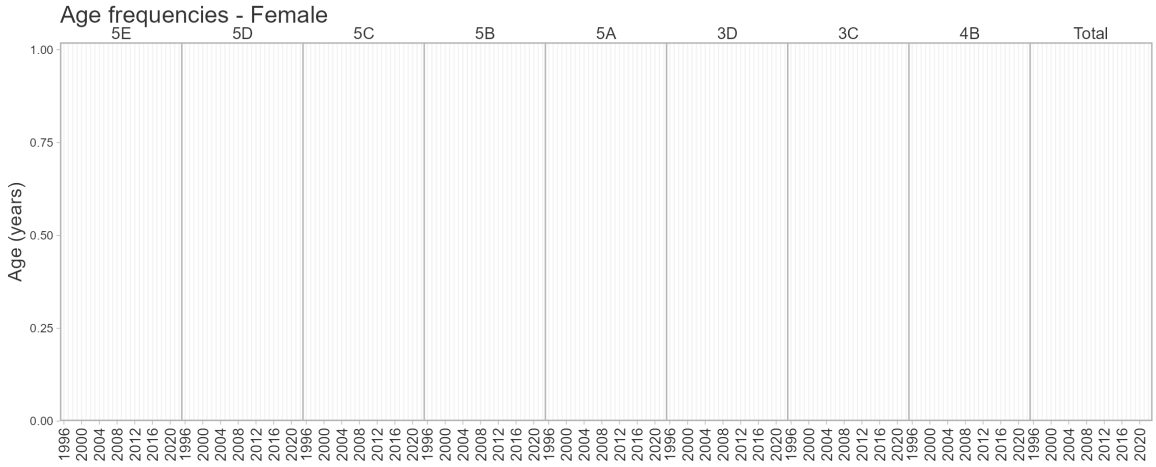
Pacific Halibut

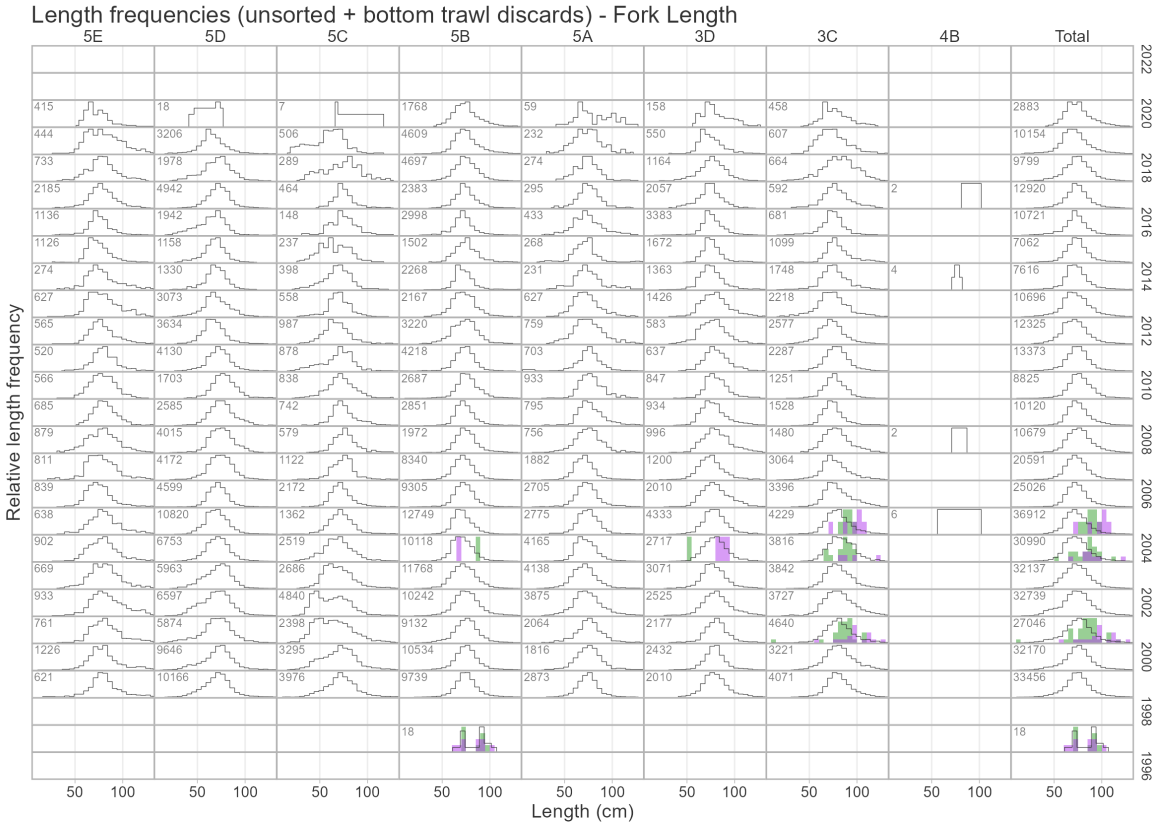


Pacific Halibut


Representativeness (unsorted + bottom trawl discards)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
Week of the year
10 20 30 40 50


Age frequencies - Male
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)
1.00
0.75
0.50
0.25
0.00

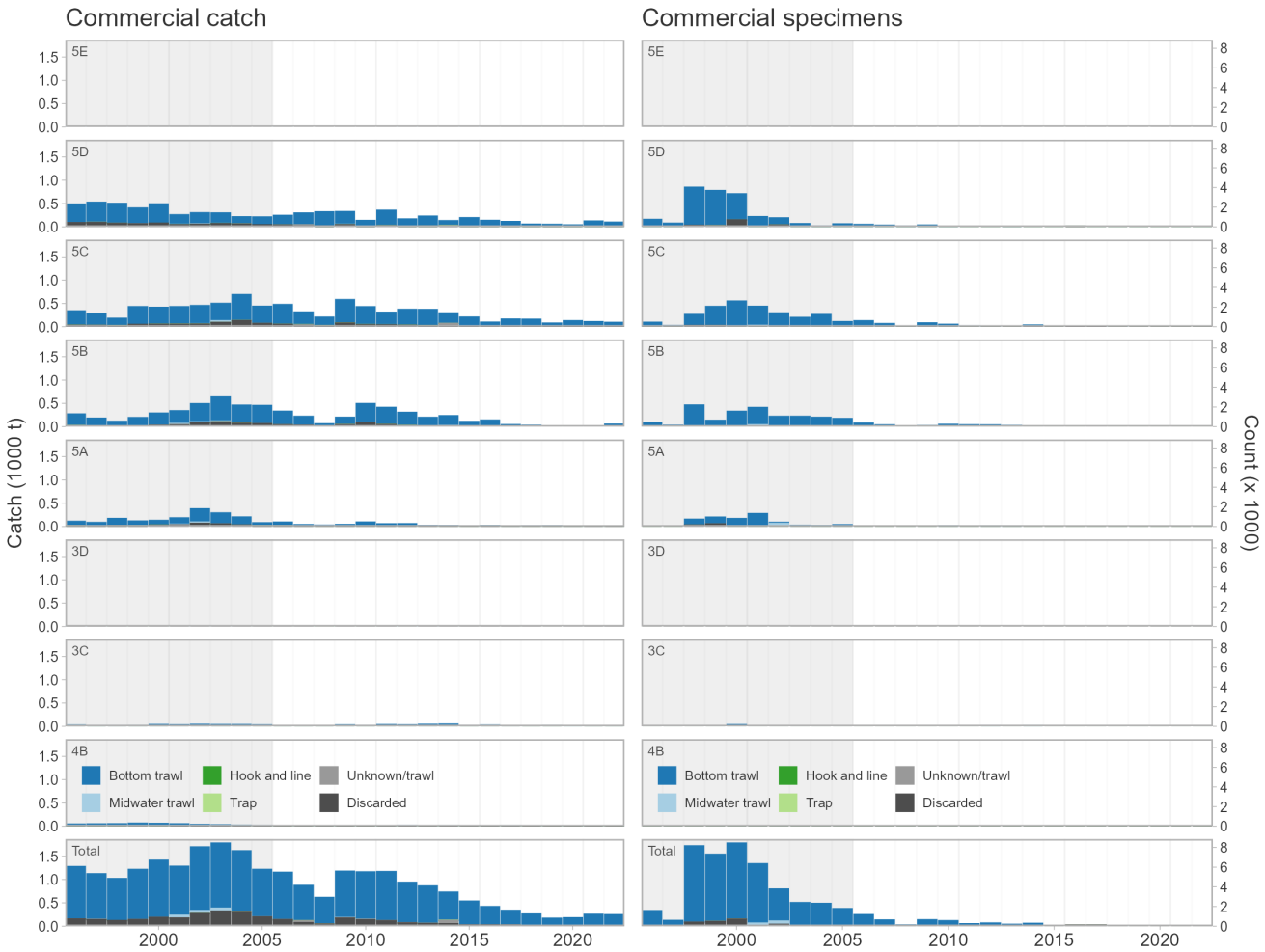

Age frequencies - Female
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)
1.00
0.75
0.50
0.25
0.00


Length frequencies (unsorted + bottom trawl discards) - Fork Length
5E
5D
5C
5B
5A
3D
3C
4B
Total
Relative length frequency
Length (cm)

4.27 Southern Rock Sole

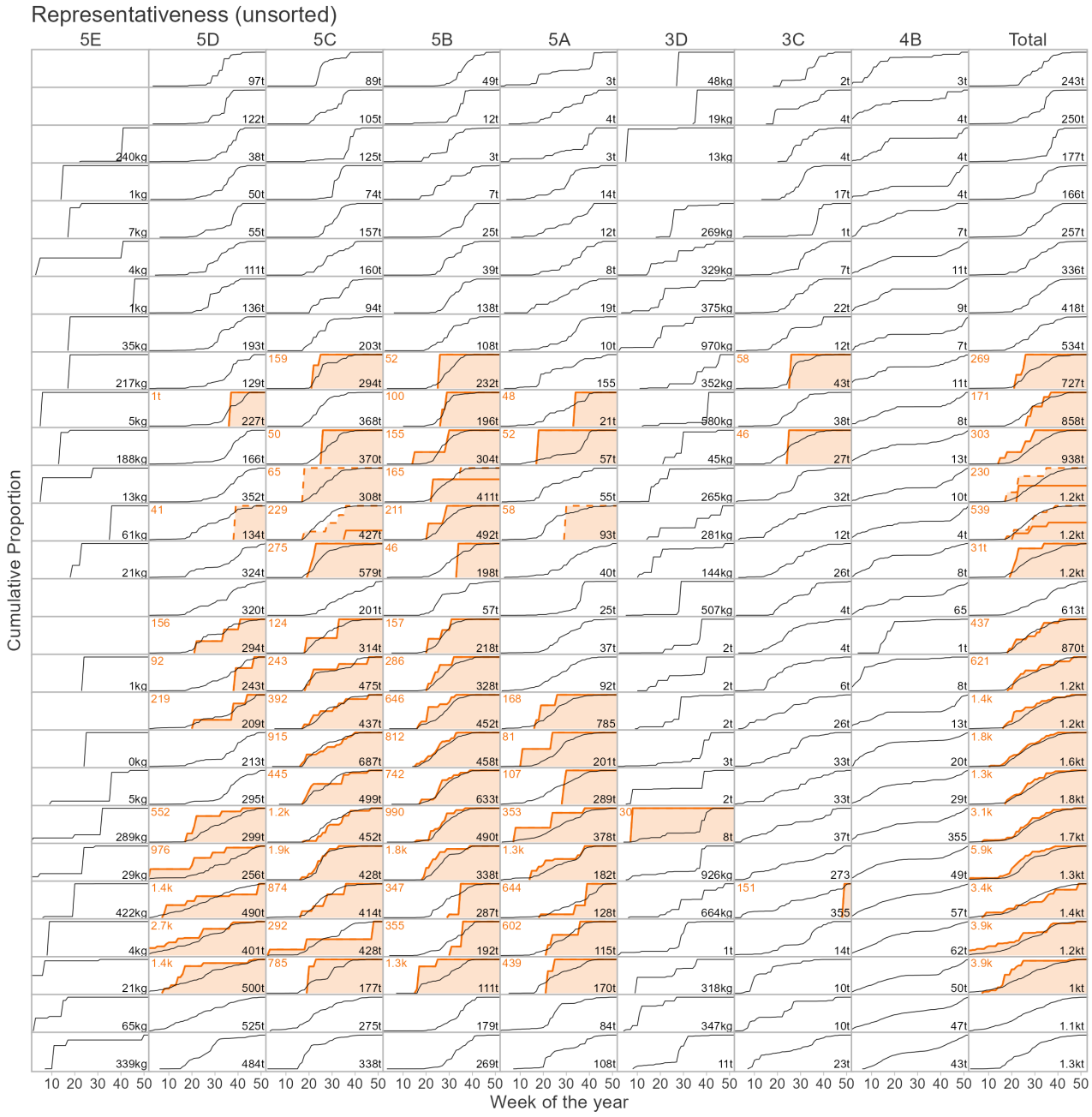
Lepidopsetta bilineata (621)
Order: Pleuronectiformes, Family: Pleuronectidae, FishBase, WoRMS
Last Research Document: Holt et al. (2016b)
Last Science Advisory Report: DFO (2014c)

Southern Rock Sole were caught mostly by bottom trawl. Catch and specimen collection mainly occurred in Areas 5ABCD. Catch peaked in 2003, declined until 2008, peaked again from 2009 to 2011, then declined until 2019. Specimen collection peaked in 2000, declined until 2008, and then remained low. Unsorted specimen collection occurred from 1998 to 2014, lacking data in 2008. Sorted specimen collection occurred from 1996 to 2009 and from 2016 to 2018. Nearly all of the unsorted samples had latitude and longitude data. Cumulative total sampling and catch profiles matched during most years with biological sampling, particularly from 2002 to 2007. Between 1996 and 2022, 27,649 unsorted specimens were collected, and of these, 8,849 (32%) had age structures, and 3,469 (13% of specimens; 39% of age structures) have been aged. All unsorted specimens had lengths; of these, 8,845 (32%) were sexed, while 386 (1%) had weights.

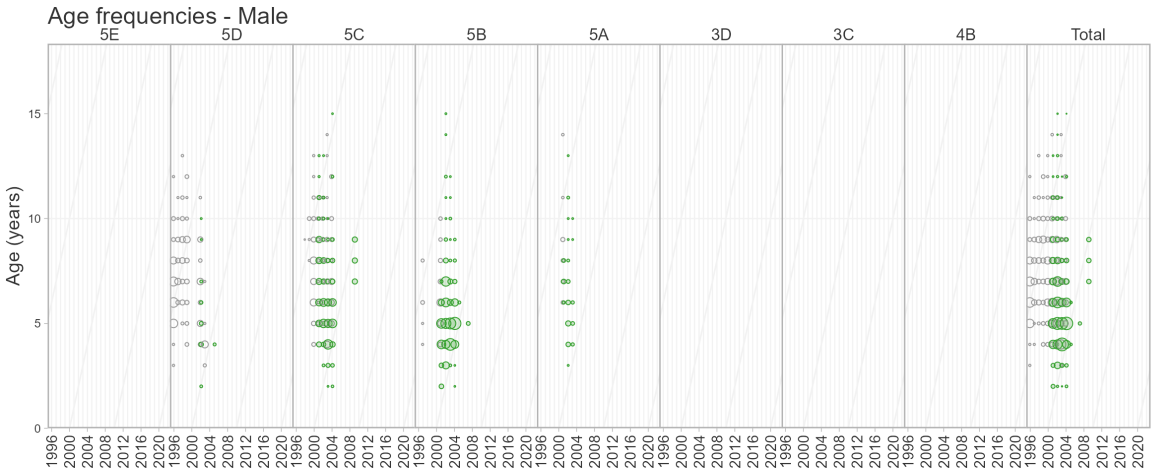


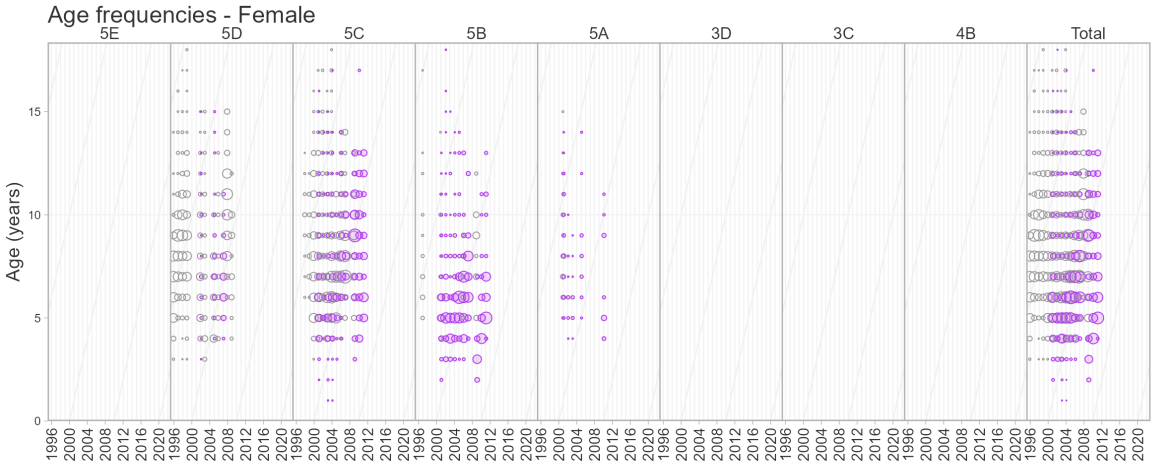
Southern Rock Sole

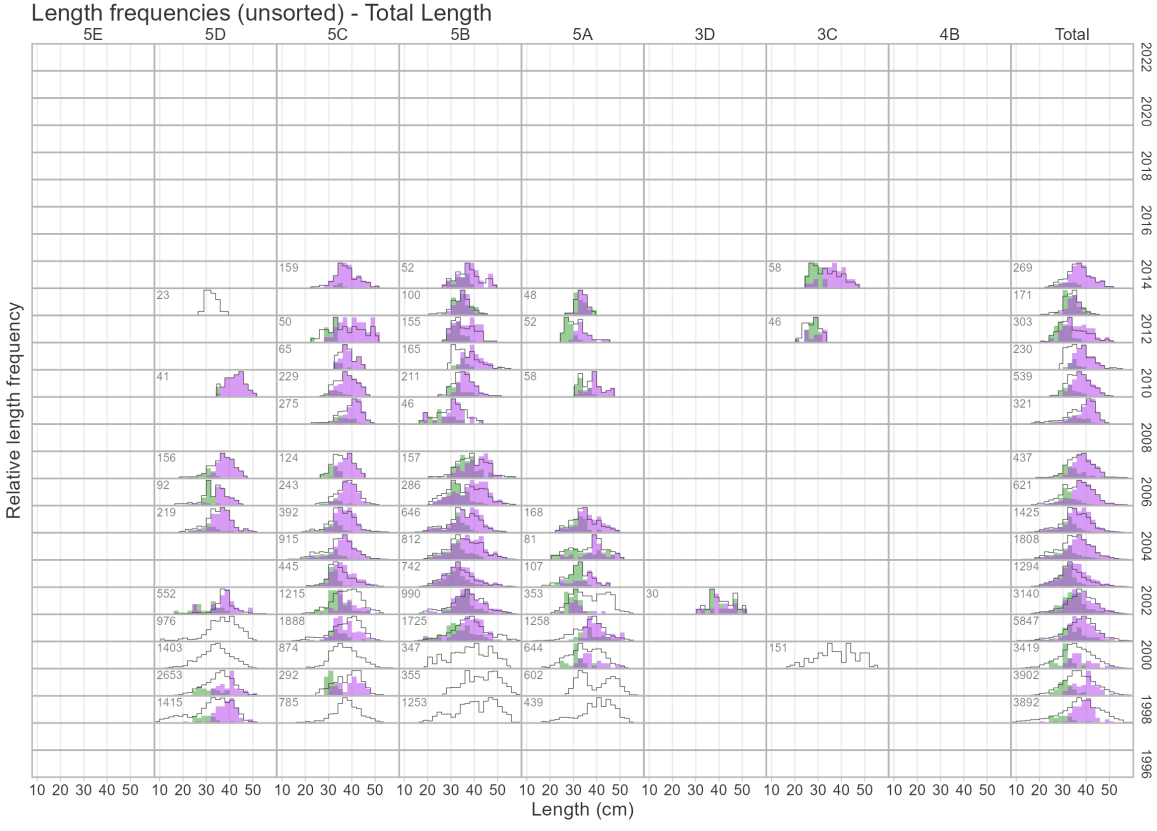
Southern Rock Sole



Southern Rock Sole



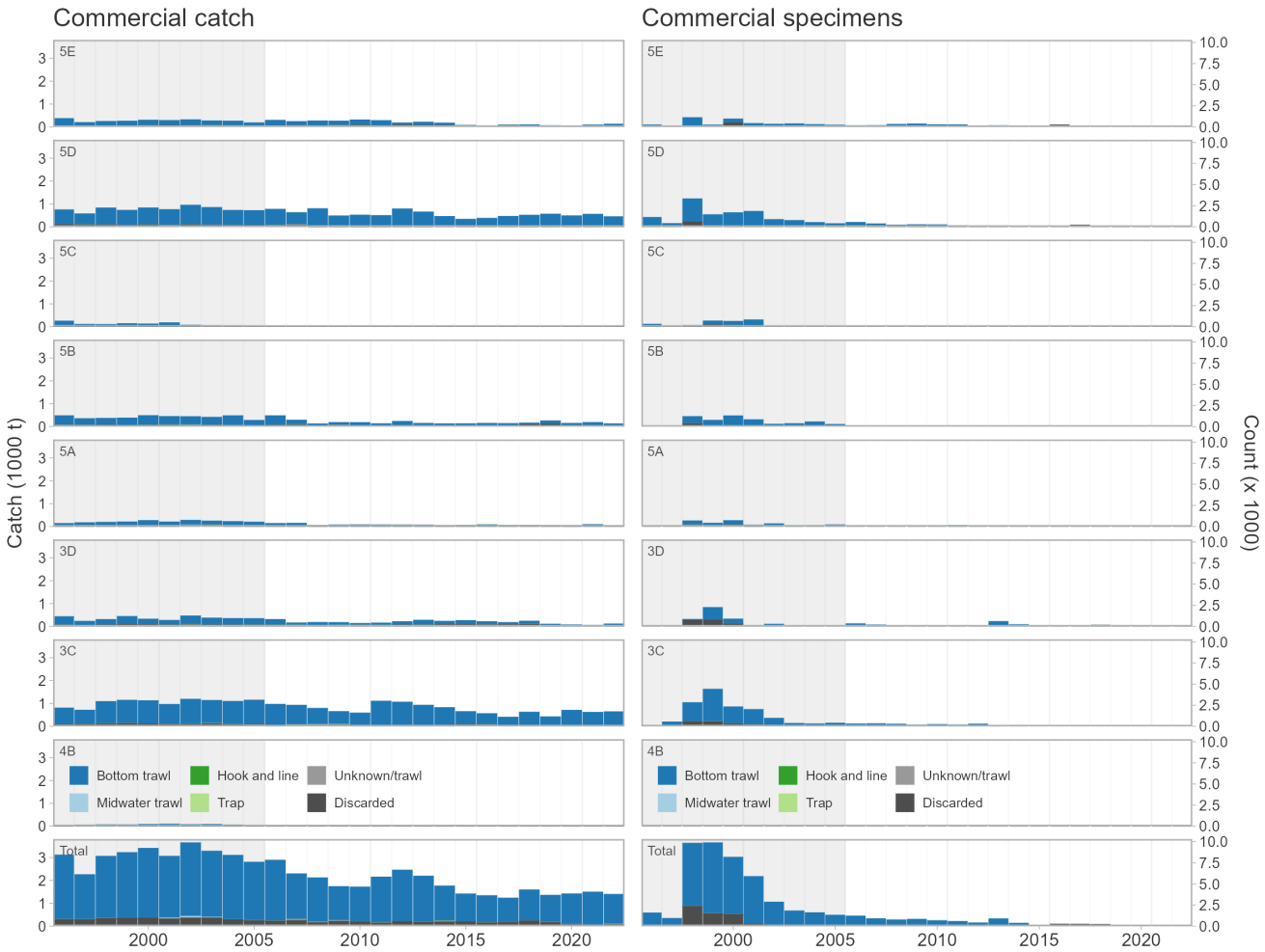




4.28 Dover Sole

Microstomus pacificus (626)
Order: Pleuronectiformes, Family: Pleuronectidae, FishBase, WoRMS
Last Science Advisory Report: DFO (1999c)

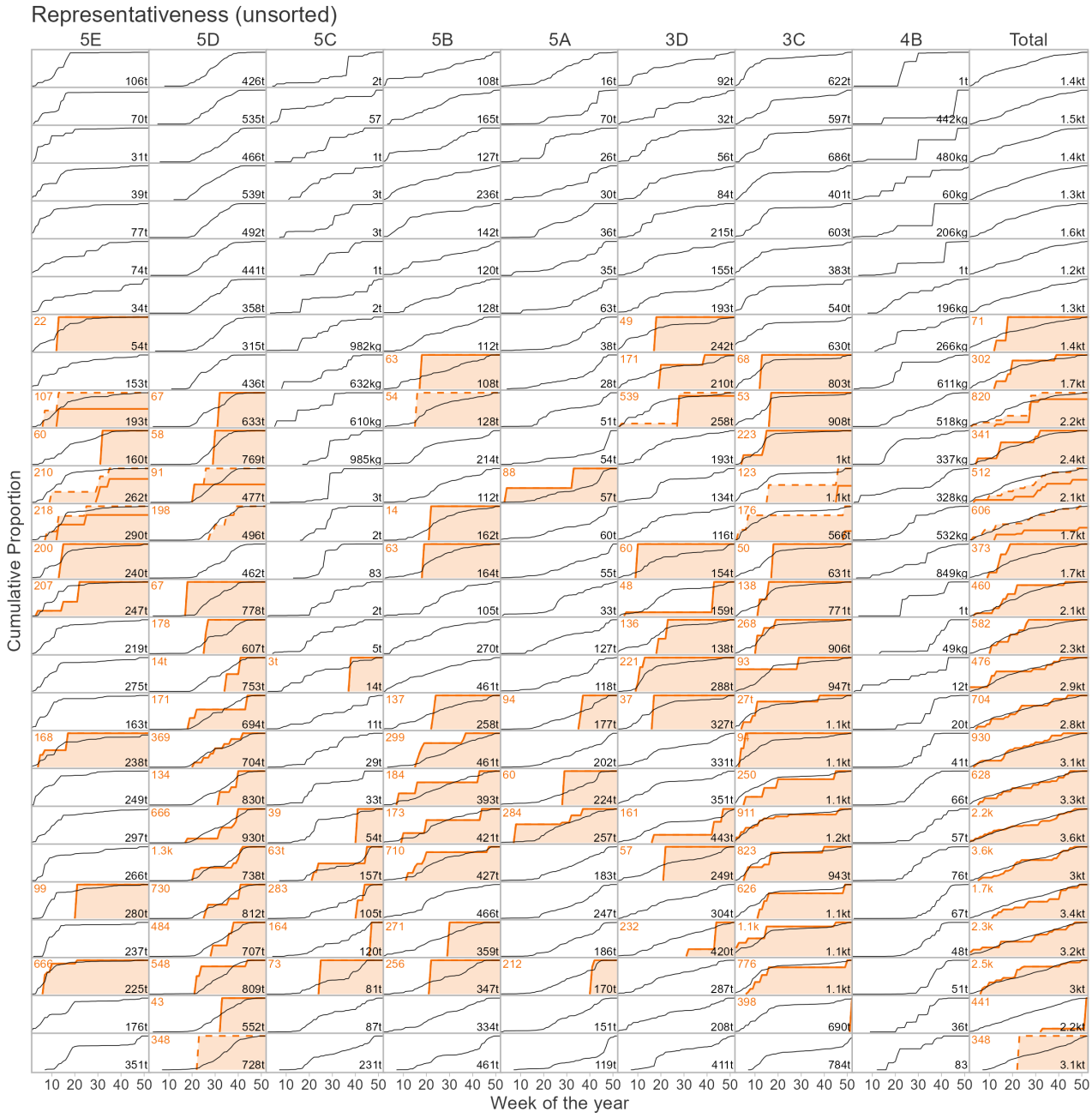
Dover Sole were caught mostly by bottom trawl. The catch and specimen collection was slightly higher in Areas 5D and 3C. The total catch peaked in 2002, decreased until 2010, peaked again in 2012, decreased until 2015, and then remained stable. The specimen collection peaked suddenly in 1998, then decreased quickly after 1999. Unsorted specimens were collected annually from 1996 to 2015. Sorted specimen collection occurred annually from 1996 to 2009 and from 2016 to 2019. Nearly all unsorted samples had latitude and longitude data. Cumulative total sampling and catch profiles matched in most years with biological samples, particularly from 1999 to 2006. Between 1996 and 2022, 19,927 unsorted specimens were collected, and of these, 8,612 (43%) had age structures, and 2,517 (13% of specimens; 29% of age structures) had been aged. All unsorted specimens had lengths; of these, 8,991 (45%) were sexed, while 709 (4%) had weights.



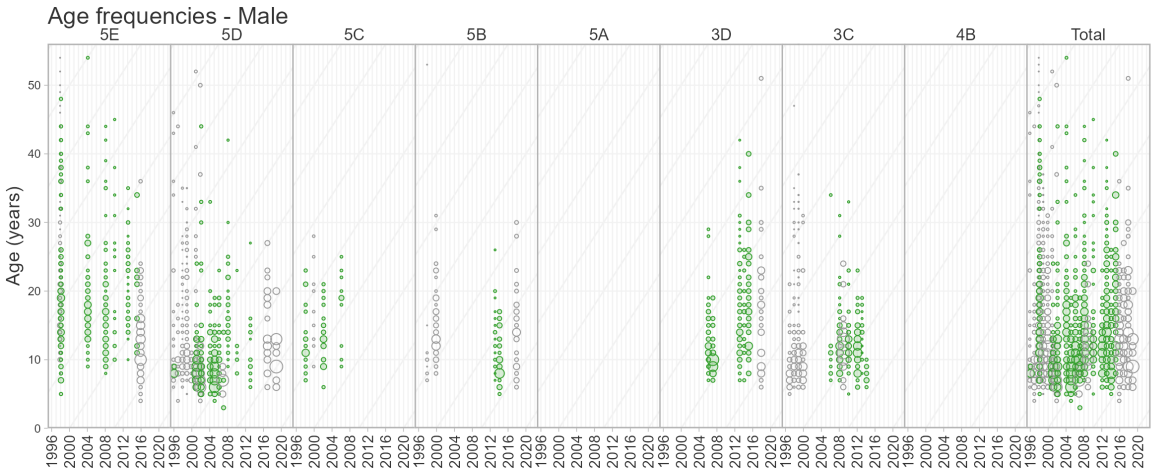
Dover Sole

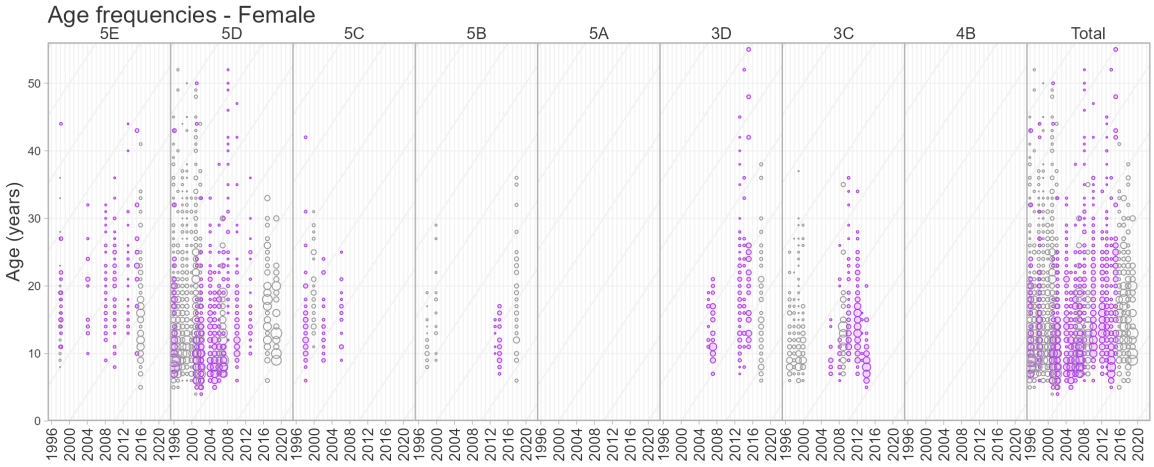

Unsorted commercial specimen counts
Sorted commercial specimen counts
Length
Sex
Weight
Maturity
Age
Age structures
Spatial
Fishing events
5E
5D
5C
5B
5A
3D
3C
4B
Total
1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022

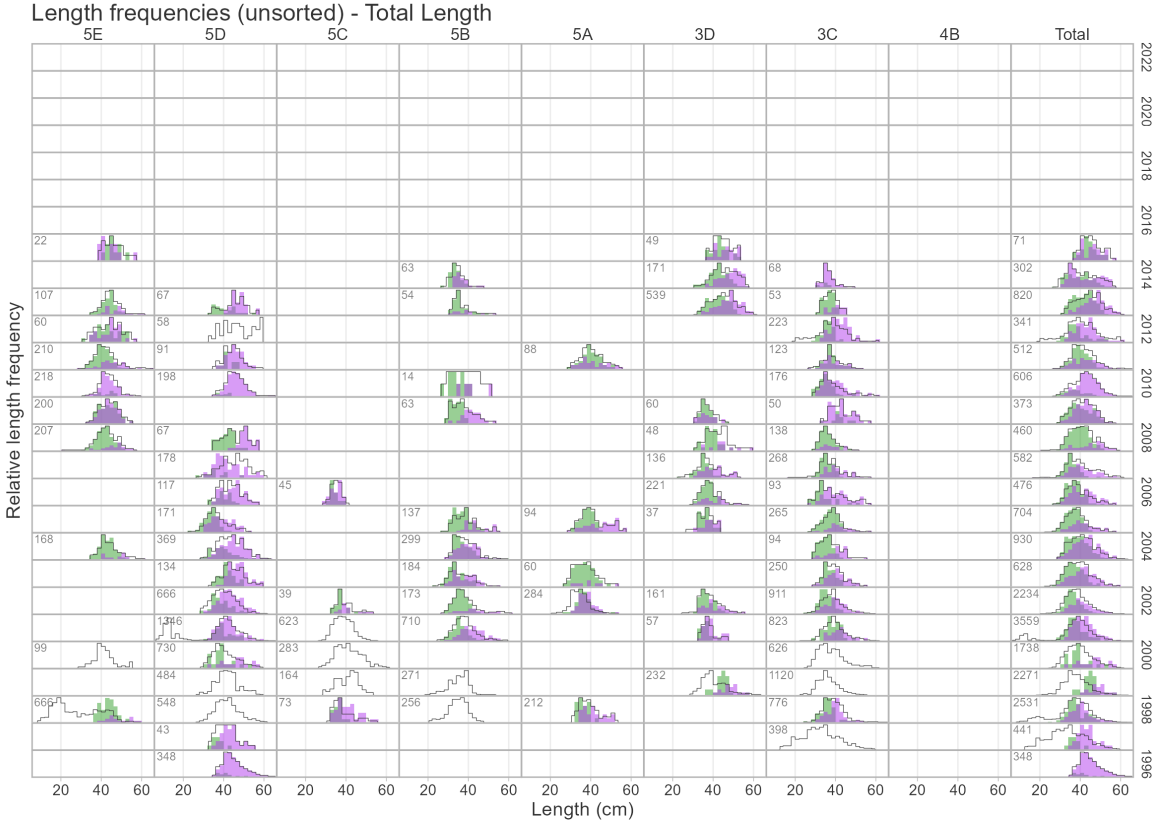
Dover Sole


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
Week of the year
10 20 30 40 50

Dover Sole


Age frequencies - Male
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)

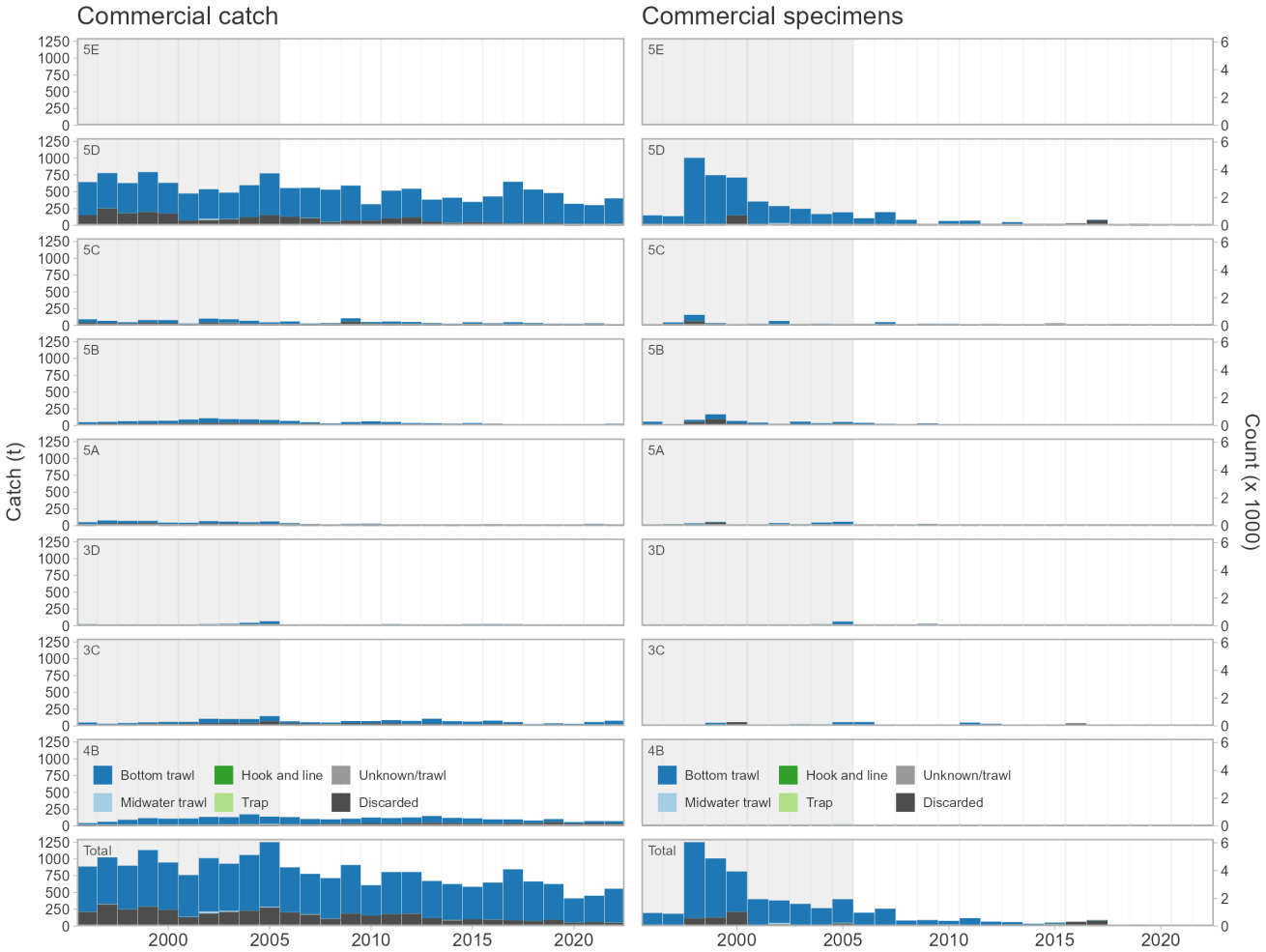

Age frequencies - Female
5E
5D
5C
5B
5A
3D
3C
4B
Total
Age (years)


Length frequencies (unsorted) - Total Length
5E
5D
5C
5B
5A
3D
3C
4B
Total
Relative length frequency
Length (cm)

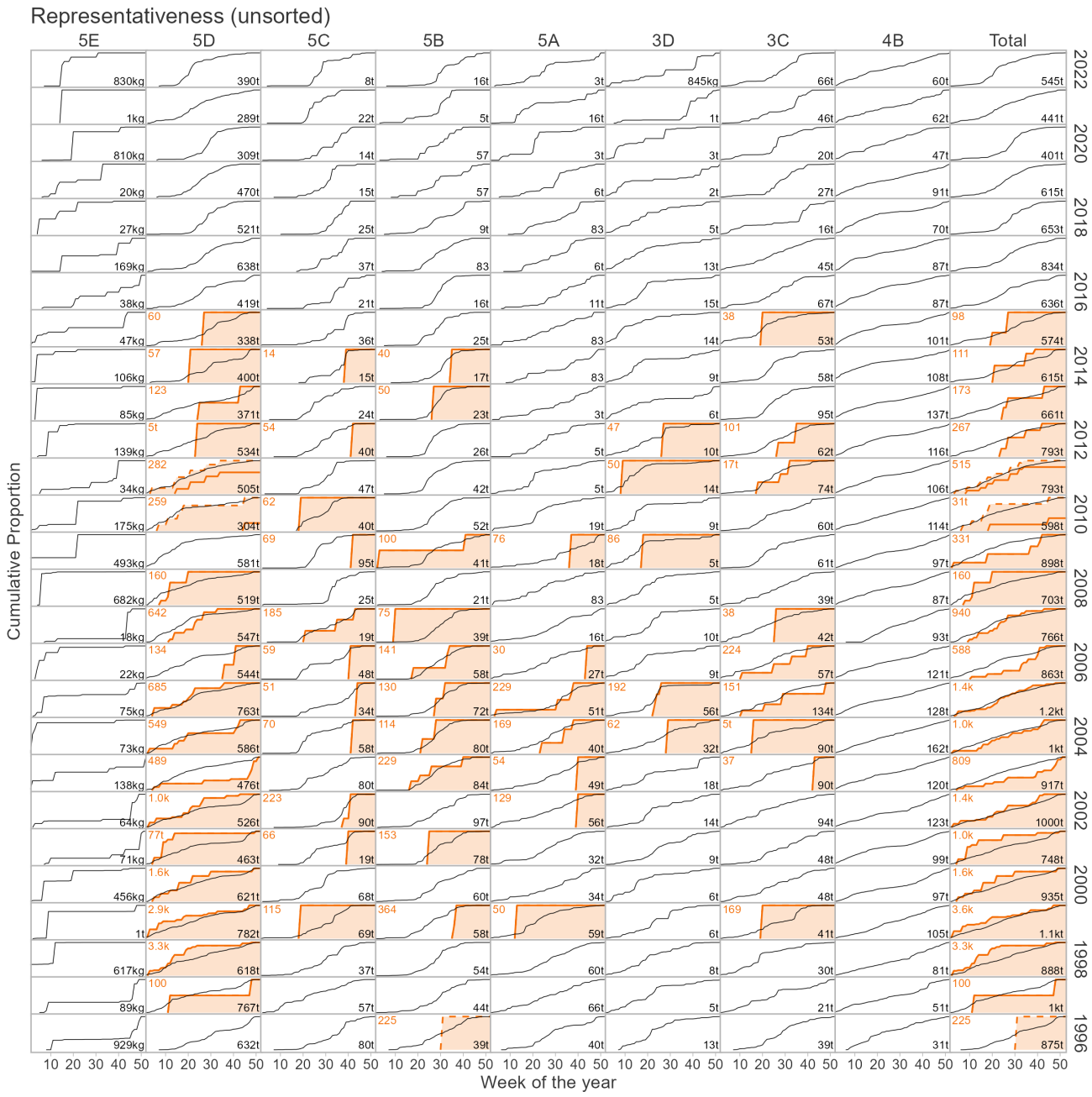
4.29 English Sole

Parophrys vetulus (628)
Order: Pleuronectiformes, Family: Pleuronectidae, FishBase, WoRMS
Last Research Document: Starr (2009b)
Last Science Advisory Report: DFO (1999d)

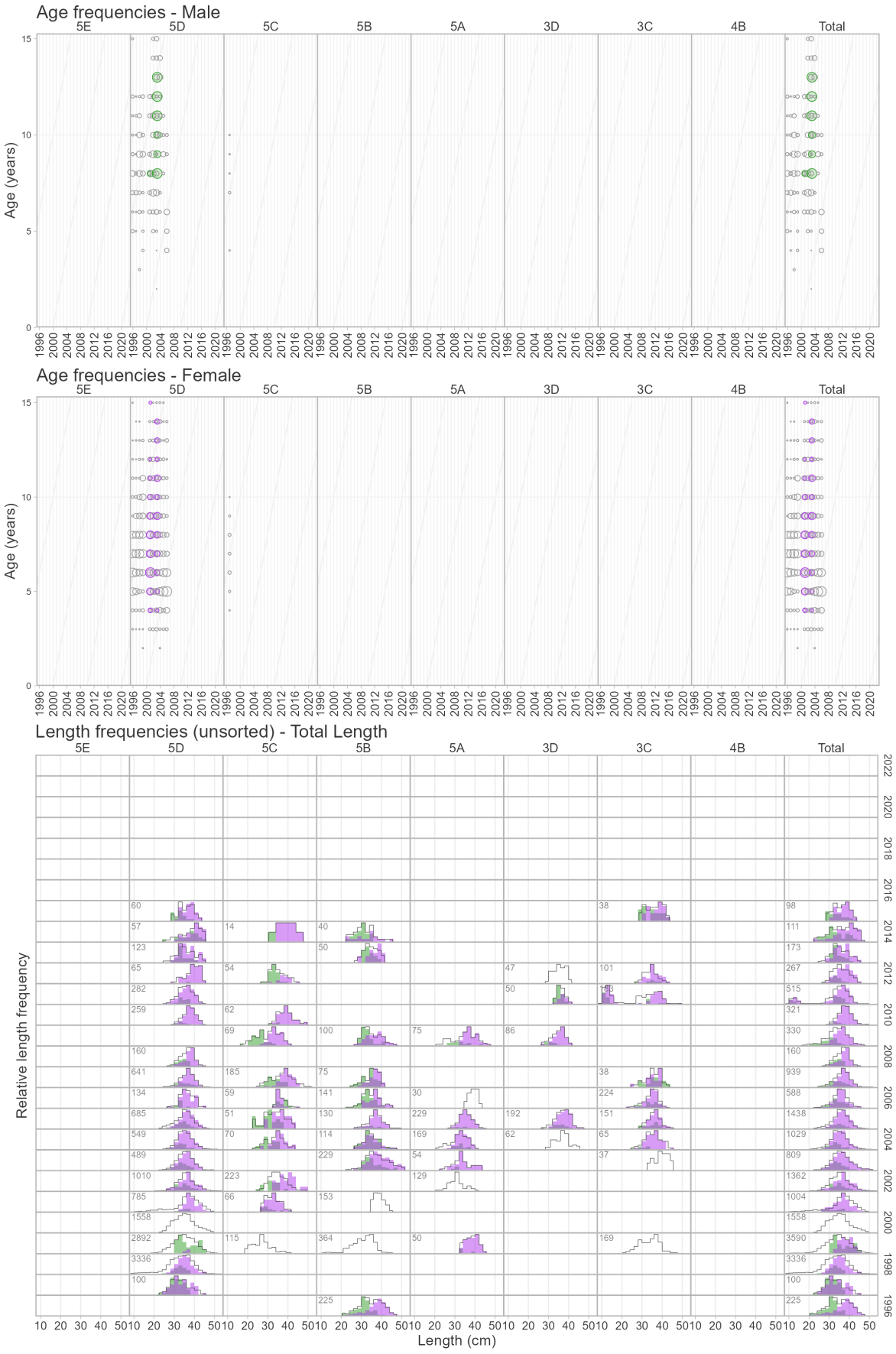
English Sole were caught mostly by bottom trawl. The catch and specimen collection mainly occurred in Area 5D. Catch varied year to year but gradually decreased on average since 2005. Specimen collection peaked suddenly in 1998, then decreased quickly, remaining low from 2008 onward. Area 4B had the second largest catch, but only one sample of specimens was collected. Unsorted specimens were collected annually from 1996 to 2015. Sorted specimens were collected from 1996 to 2009, in 2013, and from 2015 to 2019. Nearly all unsorted specimens had latitude and longitude data. Cumulative total sampling and catch profiles matched in most years with biological sampling, particularly from 1999 to 2005. Between 1996 and 2022, 17,955 unsorted specimens were collected, and of these, 7,234 (40%) had age structures, and 103 (<1% of specimens; 1% of age structures) had been aged. All unsorted specimens had lengths; of these, 7,196 (40%) were sexed, while 298 (2%) had weights.



English Sole


Representativeness (unsorted)
5E
5D
5C
5B
5A
3D
3C
4B
Total
2022
2020
2018
2016
2014
2012
2010
2008
2006
2004
2002
2000
1998
1996
Cumulative Proportion
Week of the year
10 20 30 40 50

English Sole



5 Discussion

In this report, we summarized the available data collected from commercial fishing vessels by At-Sea Observers and Dockside Samplers from 1996 to 2022 for 29 groundfish species found in British Columbia. We presented the data for each species over four pages. The first page displayed the commercial catch and specimen collection for each year and area. The second page summarized the type and quantity of data collected for that species. The third page qualitatively showed how temporally representative the specimen collections were compared to the catch. The fourth page plotted the age (unsorted and sorted specimens) and length frequency (unsorted specimens only) data, separated by sex, for each year and PMFC area.

Of the 29 species included in this report, Pacific Hake had the most complete data coverage across time. Unsorted specimens of Pacific Hake were collected every year, and sorted specimen data were only lacking from 2014 and 2015. Every area contained at least some, if not abundant, data. Notably, Areas 5CDE and Area 4B lack recent specimen data, but Area 3C contained abundant data up to 2022. Sablefish also had complete data coverage across time for unsorted specimens, and Pacific Ocean Perch had near-complete coverage. Other species that had relatively consistent data coverage until 2015 were Arrowtooth Flounder and Yellowtail Rockfish. Pacific Halibut had consistent data across space and time, but the data were almost exclusively from sorted specimens.

Longnose Skate and Shortraker Rockfish were the two most poorly sampled species in this report, with only seven or eight sampling events in only four or three areas over the 27 years, respectively. Big Skate and Yelloweye Rockfish were also poorly sampled. Yelloweye Rockfish were primarily caught by the hook-and-line fleet, where biological sampling programs to complement Electronic Monitoring have not yet been developed. Most commercial samples of Yelloweye Rockfish that do exist are a result of special projects undertaken jointly by DFO Science and the fishing industry.

Due to the COVID-19 pandemic, the ASOP was suspended in 2020, which stopped sampling for most species included in this report. However, unsorted biological specimen data collection stopped before 2019 for many species. Typically, unsorted flatfish sampling ended in 2015, and sorted sampling ended between 2017 and 2019. Unsorted rockfish sampling stopped in 2018 or earlier for some species, while most rockfish continued sorted sampling until 2020. Many species also exhibited a gap in sorted specimen collection in the late 2000s to early 2010s, lasting 1–7 years. If this gap occurred, the collection of unsorted specimens usually increased during that time. However, the shift in specimen classification could be the result of a change of sampling protocol or in how the specimens were coded in the database. Considering all samples (unsorted and sorted), 14 of the 29 species had sampling opportunities end with the suspension of the ASOP: Arrowtooth Flounder, Canary Rockfish, Dover Sole, English Sole, Pacific Cod, Pacific Ocean Perch, Pacific Spiny Dogfish, Redstripe Rockfish, Rougheye/Blackspotted Rockfish Complex, Shortspine Thornyhead, Silvergray Rockfish, Walleye Pollock, Widow Rockfish, and Yellowmouth Rockfish.

The number of specimens collected in a year was typically related to the magnitude of the catch of that year; however, other influences on the number of specimens collection could include changes in management, sampling protocols, market demands, and fishery economics. Most

species had little to no biological data collected in Area 4B, but these species were either not found or had fishing closures in the Strait of Georgia. If these species did have a small amount of catch or specimens collected in Area 4B, they usually came from minor areas 12 (Queen Charlotte Strait) and 20 (Juan de Fuca Strait) (Figure 2). The few species with a high quantity of catch and specimens collected from Area 4B were Pacific Hake, Pacific Spiny Dogfish, Quillback Rockfish, and Walleye Pollock. These species were caught and sampled throughout Area 4B. English Sole were historically caught in high quantities throughout Area 4B, but since 1996, only one sample has been collected, and it was in minor area 12. In addition, for most species, the best specimen collection across all areas occurred pre-2005, likely by dockside sampling. In the case of rockfishes, this trend could be linked to the reduction, by up to 75%, in the total allowable catch (TAC) for some inshore stocks between 2002 and 2005 (Davis 2008). Similarly, temporal representativeness tended to be higher when more samples were collected. Often, if sampling was not temporally representative at the area level, it was temporally representative when totalled across all areas.

Only two species had commercial samples collected between the suspension of the ASOP in 2020 and 2022: Pacific Hake and Sablefish. AMR port samplers collected Pacific Hake samples from the landed catch of electronically monitored shoreside trips (Johnson et al. 2025a). Pacific Hake samples were not collected from freezer trawlers between 2020-2021; however, in 2022, samples were collected by fishing crew from two tows per trip and delivered to AMR port samplers as frozen specimens (Johnson et al. 2025a). Sablefish were sampled by a voluntary head-only sampling program, which started in 2018 (Haist et al. 2001; Lacko et al. 2023). In the head-only sampling program, specimens are processed at sea with a “J-cut” to remove the head, the gonads are examined to determine sex, the operculum is marked with standardized knife cuts to indicate sex, and the head is stored frozen for later sampling (Lacko et al. 2023). On shore, the frozen head samples are measured for interorbital distance, which can be converted to fork length, and dissected for otoliths for future ageing (Lacko et al. 2023).

Weight data from individual fish are important in some stock assessments, such as Pacific Cod and Walleye Pollock, which rely heavily on commercial mean-weight indices; however, weight data were lacking for many species. Weights are challenging to measure at sea because scales generally rely on an immobile base to infer mass from the force imposed by gravity. At sea, additional forces due to ship motion often frustrate accurate weight measurement. Where specimen weights were collected, they were generally measured on shore (dockside) from sorted specimens between 2000 and 2010. Specimen weights were rarely measured at sea, though some At-Sea Observers may have occasionally had hand scales. Note, while Pacific Halibut had abundant sorted specimen weight data, the majority of the data were derived from a length-weight relationship table. Surprisingly, sexed length data were also often missing for species easily sexed externally (i.e., sharks and skates).

While assembling this report, we discovered several challenges with classifying specimens as unsorted or sorted. For example, Pacific Halibut are not permitted for retention by trawl gear regardless of size, so all specimens are measured for quota management and then discarded. Since they are discarded, the current system classifies them as sorted. However, since *all* specimens are discarded, the sample is unbiased and a “total catch” sample, so the specimens could be considered unsorted. Another example is unsorted specimens with weight measurements. The ASOP rarely had scales at sea; however, it is unlikely that any specimens sampled dockside were truly unsorted. Those specimens may be unsorted by species, but

unless 100% retention was required, small unmarketable fish were often discarded at sea. Unsorted specimens with weights may simply be an issue with how the specimens were coded at the time. Another challenge we faced was discerning specimens sampled at sea vs. dockside. There is no single column that indicates whether a specimen was sampled at sea or dockside, rather several columns must be used together, and the columns are not always in agreement. With further investigation, a future report could attempt to quantify the number of specimens sampled at sea during the observer era. These issues require further investigation outside of this report.

Data required for stock assessments continue to change as data analysis methods and fishery patterns change. Sorted specimen data that were adequate for earlier assessment models have been used less in recent years, while the need for unsorted specimens, especially ageing data, to condition integrated age-structured models has grown. Despite the common need for ageing data, fewer than half the collected commercial age structures have been analyzed on average. Specimens with an associated latitude and longitude are also increasingly needed to standardize composition data in space and time (Thorson and Haltuch 2019; Anderson et al. 2024). These data can also be used for research investigating variation in body size, condition, and growth (e.g., Frid et al. 2016; Lindmark et al. 2023; English et al. 2025). Despite a continued need for unsorted specimen data that preserves the latitude and longitude of catch, commercial specimen collection declined markedly between the early 2000s and the beginning of the COVID-19 pandemic in 2020, from which it has yet to recover. This report summarized the commercial biological sampling data for 29 groundfish species over 27 years, including data types and trends. We hope this information helps inform future commercial sampling decisions for groundfish in British Columbia.

6 Acknowledgments

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APPENDIX A DATA EXTRACTION

We extracted biological data from commercial fishing catches from the GFBioSQL database using the R package gfdata, version number 0.1.4 (Anderson et al. 2019; Keppel et al. 2022).

To install the version of gfdata used during the making of this report, use the following code:

```
remotes::install_github("pbs-assess/gfdata@df0b7bf")
```

From the `gfdata` package, we used the `get_commercial_samples()` function.

To extract the data for a given species:

```
gfdata::get_commercial_samples(species = "species common name", unsorted_only =
FALSE, return_all_lengths = TRUE)
```

The SQL filters used in the extraction of data from the GFBioSQL database are detailed in Appendix C.2.3 of Anderson et al. (2019). Here we adapt Table C.6 from Anderson et al. (2019):

Table A.1. Description of filters in the SQL queries extracting commercial sample data from GFBio with `get-comm-samples.sql`.

Filters	Rationale
Filtered out `TRIP_SUBTYPE_CODE` `2, 3` (research trips)	To extract only commercial data
Filtered for `SAMPLE_TYPE_CODE` `1, 2, 6, 7, 8` (random or total)	To extract only those records of sample type 'random' or 'total'
Filtered for `SPECIES_CATEGORY_CODE` `0, 1, 3, 4, 5, 6`	To remove samples sorted on unknown criteria
Filtered for `SAMPLE_SOURCE_CODE` `NULL, 1, 2, 3`	To extract both sorted and unsorted samples for later filtration for desired analysis (removed stomach contents samples)