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Observed and Estimated Bycatch of Salmon in U.S. West Coast Fisheries, 2002–20

March 2022

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National Marine Fisheries Service
Northwest Fisheries Science Center

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(Richerson et al. 2022)[1]

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NOAA FISHERIES

Observed and Estimated Bycatch of Salmon in U.S. West Coast Fisheries, 2002–20

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Background

This report summarizes the observed and estimated bycatch of all salmon species observed in fisheries monitored by the West Coast Groundfish Observer Program (WCGOP), the At-Sea Hake Observer Program (A-SHOP), the Electronic Monitoring (EM) Program, and the Catch Monitor (CM) Program. WCGOP and A-SHOP are managed by NOAA Fisheries' Northwest Fisheries Science Center's Fisheries Observation Science Program (FOS). The EM and CM Programs are managed by the Pacific States Marine Fisheries Commission. We present salmon bycatch in terms of both weight and numbers of individuals, by species. Methods used in this report are similar to the methods presented in the previous salmon report (Somers et al. 2015) and the most recent groundfish mortality report (Somers et al. 2022).

A-SHOP observes vessels that catch and process Pacific hake at sea. WCGOP observes a number of fleets that deliver catch shoreside for processing, including sectors that target and incidentally catch groundfish. Both programs place trained scientists on board commercial fishing vessels to observe and sample catch; WCGOP specifically focuses on sampling at-sea discards. Once landed shoreside, catch is sampled by the CM Program; for vessels fishing under maximized or optimized retention, this sampling quantifies the majority of their bycatch. All salmon encountered by EM fisheries are either observed at sea or retained and sampled dockside. This report also includes fish ticket landings data from the Pacific Fishery Information Network (PacFIN). This report is updated every year to include the newest year of data, the most current data from FOS and PacFIN for previous years, and the most recent data processing procedures. Data processing updates are described in the annual groundfish mortality report, which is available in draft form annually in the Pacific Fishery Management Council's September Briefing Book, and later in the year in final form as a NOAA Technical Memorandum.

In this report, we provide two tables for each fishing sector in which salmon bycatch occurred, one showing observer or sampling coverage for all strata with observed or electronically monitored effort and a second showing bycatch data for only those strata with salmon bycatch. Tables include seasonal, latitudinal, and/or depth strata when appropriate, while preserving confidentiality. For the processed-shoreside fisheries, seasons are defined as winter (January to April and November to December) or summer (May to October); for the processed-at-sea fisheries, seasons are defined as spring (15 May, when the season opens, to 30 June) or fall (1 July to 31 December). Latitudinal divisions are defined as Cape Falcon (lat 45.77°N), Cape Blanco (lat 42.83°N), and Cape Mendocino (lat 40.5°N). For the catch share bottom trawl fishery and catch share EM fisheries, depth strata have been updated to reflect depth bins more relevant to salmon management (0–100, 100–150, 150–250, and 250+ fathoms). This update applies to estimates disseminated since 2019. This may result in slightly different estimates of total bycatch relative to earlier reports. In addition, we include an estimate of bycatch rates for A-SHOP and catch share fisheries (total salmon bycatch divided by total landed target weight in a stratum). All weight units are in metric tons (mt), except for individual fish in biological data tables, which are in kilograms (kg). All count values were rounded to an integer value using standard rounding rules in each table for presentation purposes; for that reason, a sum of the rounded values over rows within sector-level tables may not be equivalent to the value

in the final summary tables. Similarly, zero values represent cases where catch or salmon was present, but the numeric value was less than the digits shown. In cases where fewer than three vessels were active, data cannot be shown in order to maintain confidentiality; these strata are reported as asterisks (*). Additionally, the "at" symbol (@) represents strata for which the potential bootstrapping pool had fewer than three vessels and so could not be estimated. This represented less than 0.25% of fishing effort in regards to yearly landings. Finally, the "hash" symbol (#) represents cases where only a single haul with salmon was observed, so the standard error calculation is not informative.

In addition to sector-specific coverage and bycatch information, we also include a bycatch summary table as well as summaries of the biological data collected by WCGOP, A-SHOP, and the CM Program.

From 16–30 April 2020, observer and catch monitor coverage requirements were waived in order to implement mitigation measures to minimize potential COVID-19 transmission. For catch share fisheries, we estimated bycatch during this period using vessel- and gear-specific bycatch ratios from the previous year. This resulted in an estimated 15 Chinook salmon and <1 coho salmon being caught by the catch share bottom trawl fishery, and <1 Chinook salmon and <1 chum salmon being caught by the midwater rockfish sector during the period. Because these estimates could not be assigned to an effort stratum, they are only included in the summary table (Table 29) and in the figures. For non-catch share fisheries, we included the waiver period effort with all other unobserved effort and used the usual ratio expansion methods.

Trends 2002–20

We focus on Chinook and coho salmon bycatch trends because observed fisheries catch these species in the greatest amounts and at the highest rates. Additionally, these species are targeted by ocean troll fisheries, and both species include multiple populations that are listed under the Endangered Species Act. Accounting for salmon bycatch in groundfish fisheries is important in balancing the needs of different stakeholders in the groundfish and salmon fisheries, as well as conserving salmon and the species that depend upon them.

We present data from 2002 to 2020. Chinook salmon bycatch in the hake fishery[1] as a whole has been volatile, with a high in 2014. In 2020, total bycatch in this fishery was lower than in all previous years except 2009. Non-catch share[2] (NCS) bycatch has been minimal across all years. After extremely high bycatch in 2002 and 2003, mostly in the limited entry bottom trawl fishery, Chinook salmon bycatch has remained relatively low in the shoreside nonhake fishery. In 2014, Chinook salmon bycatch in the shoreside nonhake fishery[3] was the highest since 2005 (mostly attributed to the catch share bottom trawl fishery), but bycatch was relatively low from 2016–20.

Over the time period examined, coho salmon bycatch was generally an order of magnitude lower than Chinook salmon bycatch, with considerable amounts of interannual variability. Bycatch in the hake fishery was higher in 2002, 2005, 2007, 2011, 2014, and 2019 than in other years. Bycatch in the NCS and shoreside nonhake catch share fisheries has remained at low or moderate levels across all years, though NCS bycatch of coho salmon in 2018 and 2019 was higher than the preceding several years. In 2020, coho salmon bycatch in these sectors was low.

Figure 1 summarizes Chinook and coho salmon bycatch from 2002–20 in the combined hake, shoreside nonhake, and non-catch share sectors. Figures 2–8 show salmon bycatch for selected sectors in more detail, including bycatch of Chinook, chum, coho, pink, sockeye, and unspecified salmon. Figures 9–11 summarize the number of biological samples collected by A-SHOP, WCGOP, and the CM Program. The accompanying spreadsheet contains coverage and bycatch estimates for all observed/monitored sectors with recorded salmon bycatch, as well as a summary table and information on biological data collected.

[1] Includes shoreside and at-sea hake sectors.
[2] Includes non-catch share exempted fishing permits, sablefish primary, nearshore, open access (OA) California halibut, pink shrimp, and OA hook-and-line sectors.
[3] Includes shoreside limited entry (LE) and catch share (CS) bottom trawl, CS fixed gear, CS midwater rockfish, and LE California halibut.

Figures

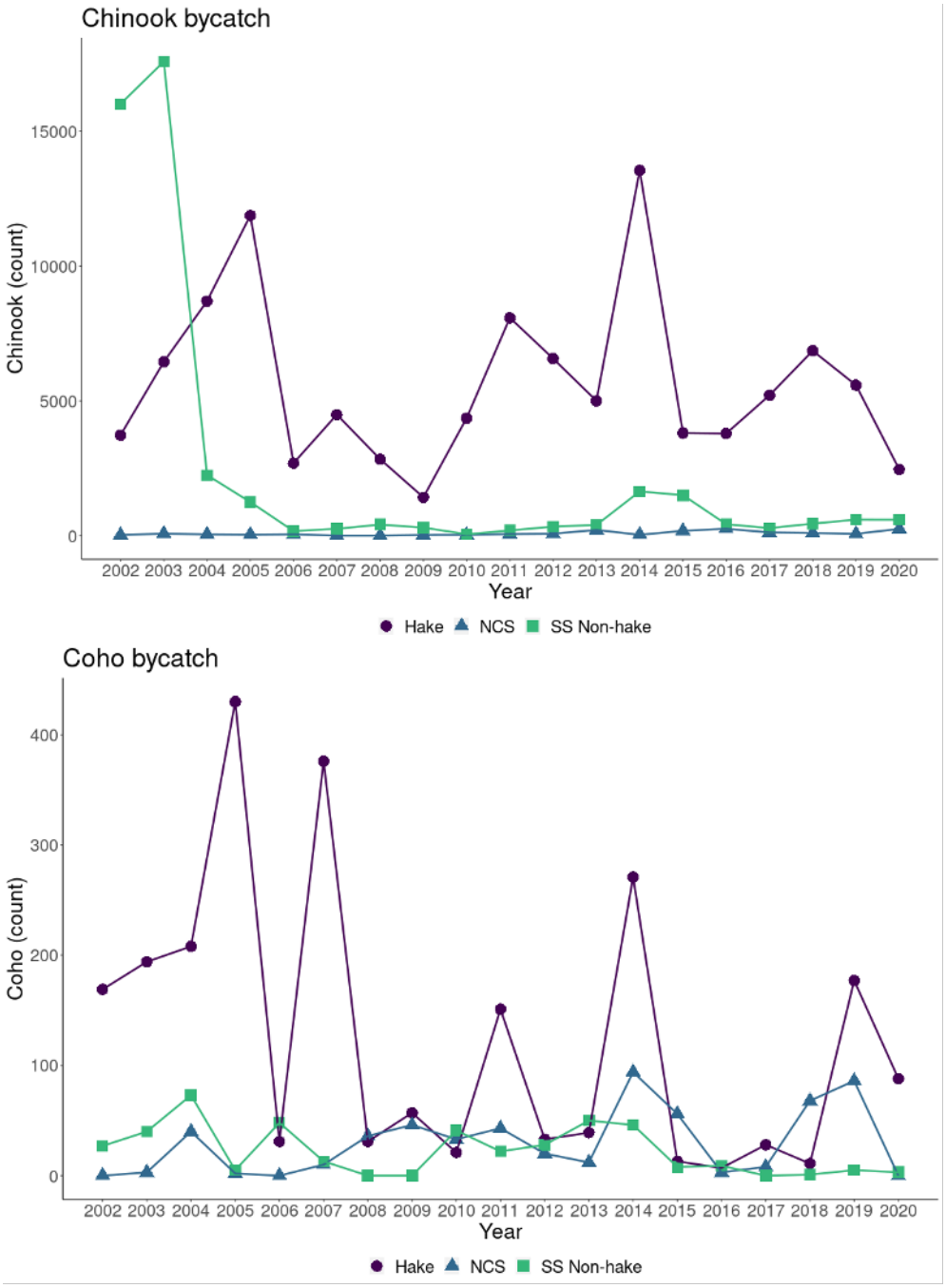

Figure 1. Chinook (top) and coho (bottom) salmon bycatch in fisheries monitored by A-SHOP, WCGOP, and the CM and EM Programs, 2002–20. Hake includes at-sea catcher–processors, at-sea mothership catcher vessels, and shoreside processors. Non-catch share (NCS) includes non-catch share exempted fishing permits, sablefish primary, nearshore, open access (OA) California halibut, pink shrimp, and OA hook-and-line. Shoreside (SS) nonhake includes shoreside limited entry (LE) and catch share (CS) bottom trawl, CS fixed gear, CS midwater rockfish, and LE California halibut.

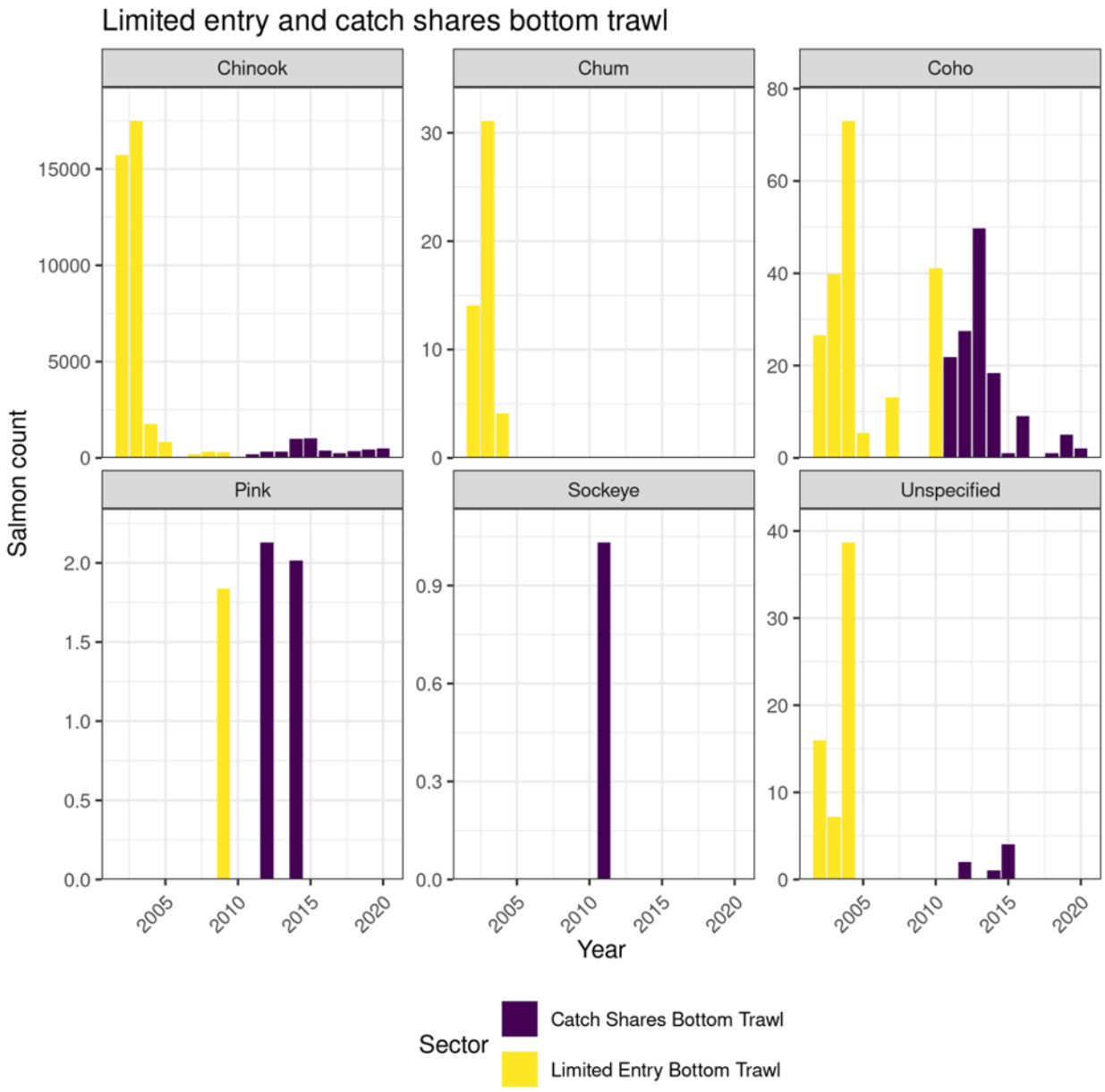

Figure 2. Salmon bycatch in the limited entry (2002–10) and catch share (2011–20) bottom trawl fishery. Note that the limited entry bottom trawl fishery counts represent estimates based on partial observer coverage, while the catch share bottom trawl fishery has full observer or electronic monitoring coverage. For confidentiality reasons, nonhake midwater trawl in 2011 and LE California halibut in 2011–13 are here combined with catch share bottom trawl. Data from electronically monitored bottom trawl vessels are included here.

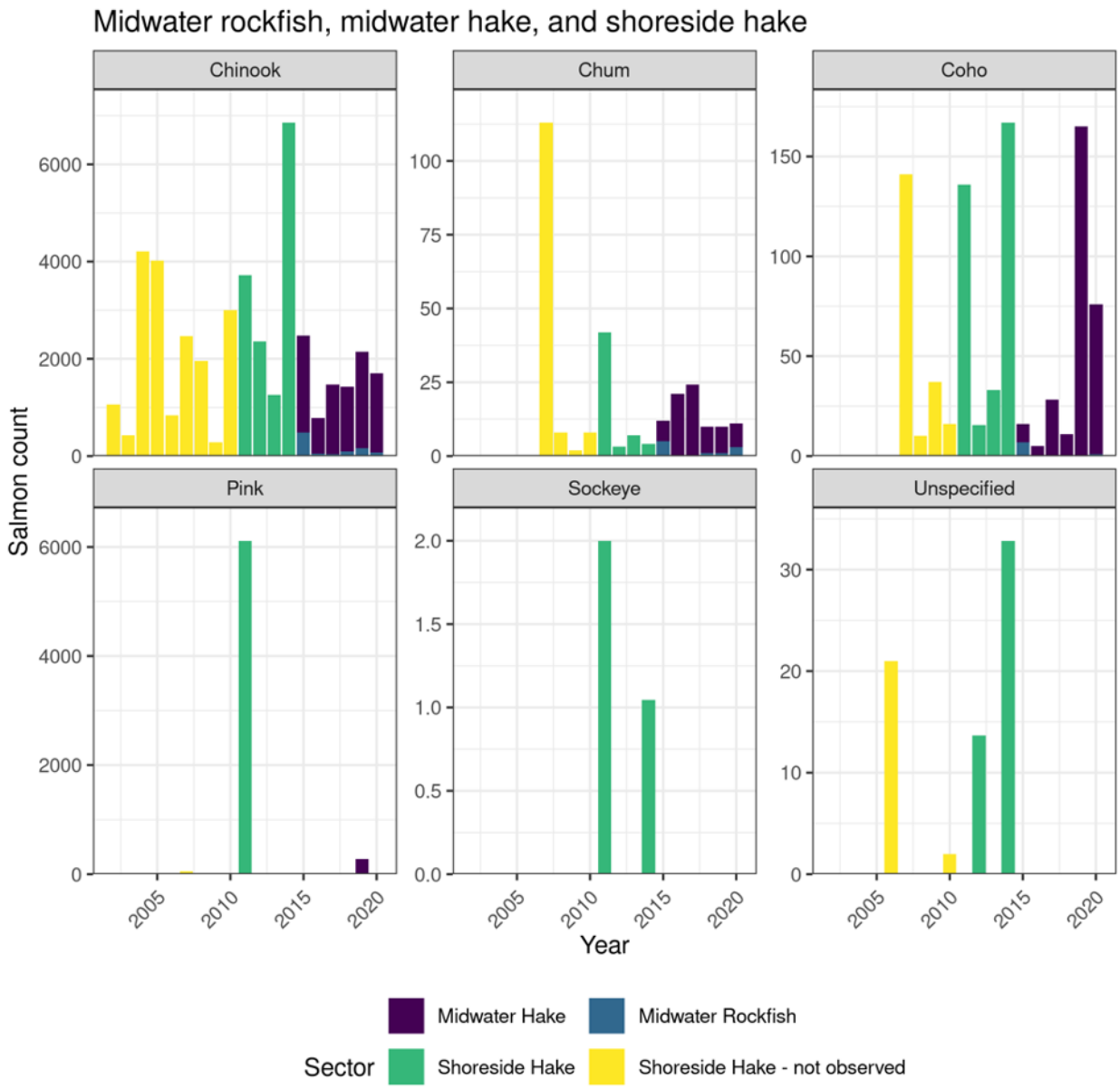

Figure 3. Salmon bycatch in shoreside midwater trawl sectors. Note that in 2015, the definition for shoreside midwater hake changed from the captain's stated target to the proportion of hake landed; thus, the shore-based hake fishery was called "shoreside hake" prior to 2015 and "midwater hake" thereafter. Shoreside midwater hake was not observed prior to 2011, and the counts presented here come from shoreside monitoring data housed in PacFin. From 2011 on, these sectors have full observer or electronic monitoring coverage. Note that for confidentiality reasons, nonhake catch share midwater trawl in 2011 is shown combined with catch share bottom trawl in Figure 2. Data from electronically monitored midwater trawl vessels are included here.

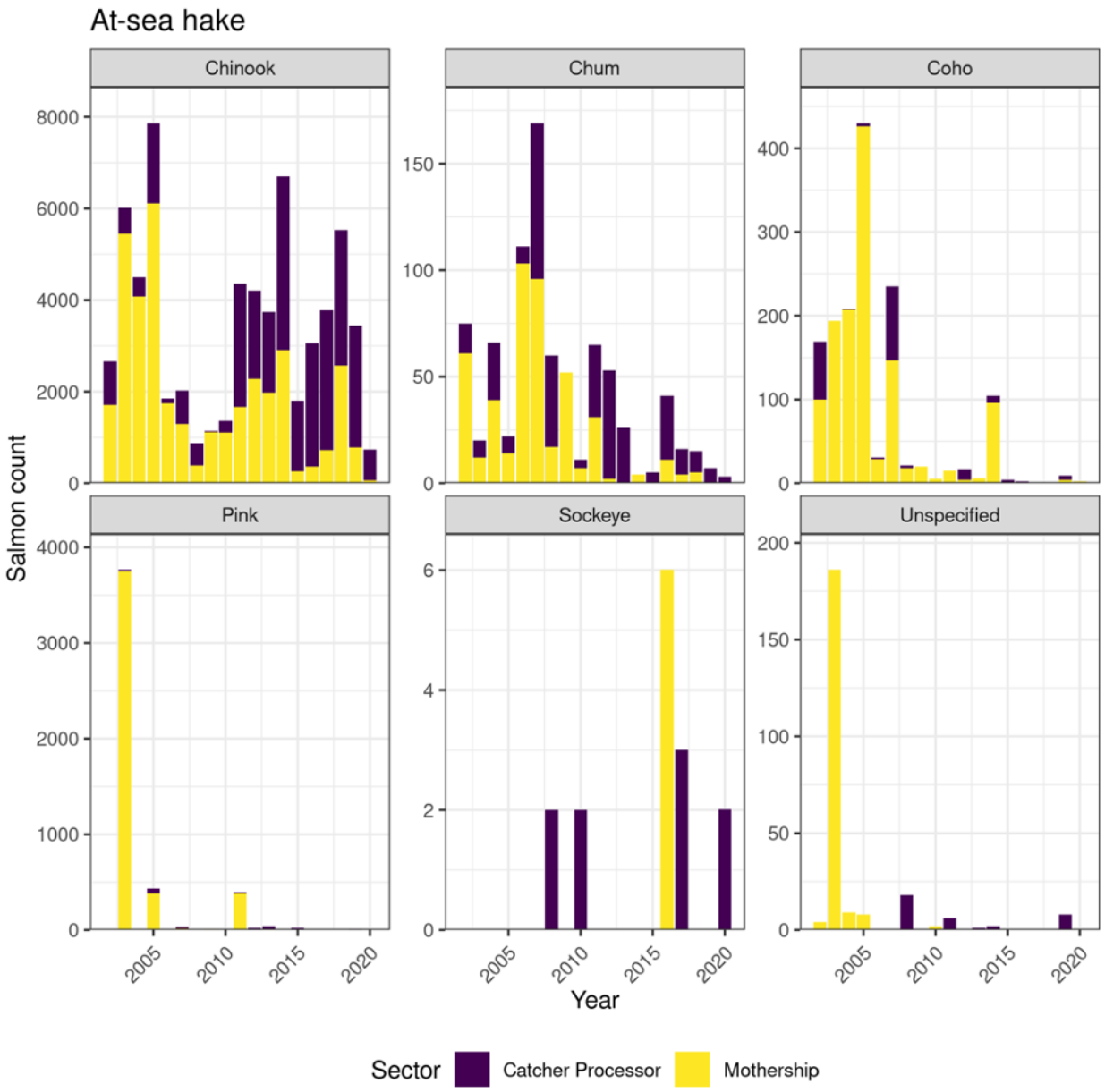

Figure 4. Salmon bycatch in the at-sea hake fishery. This sector has full observer coverage. Data from the tribal mothership sector (active prior to 2013) are included here, excepting 2012 for confidentiality reasons.

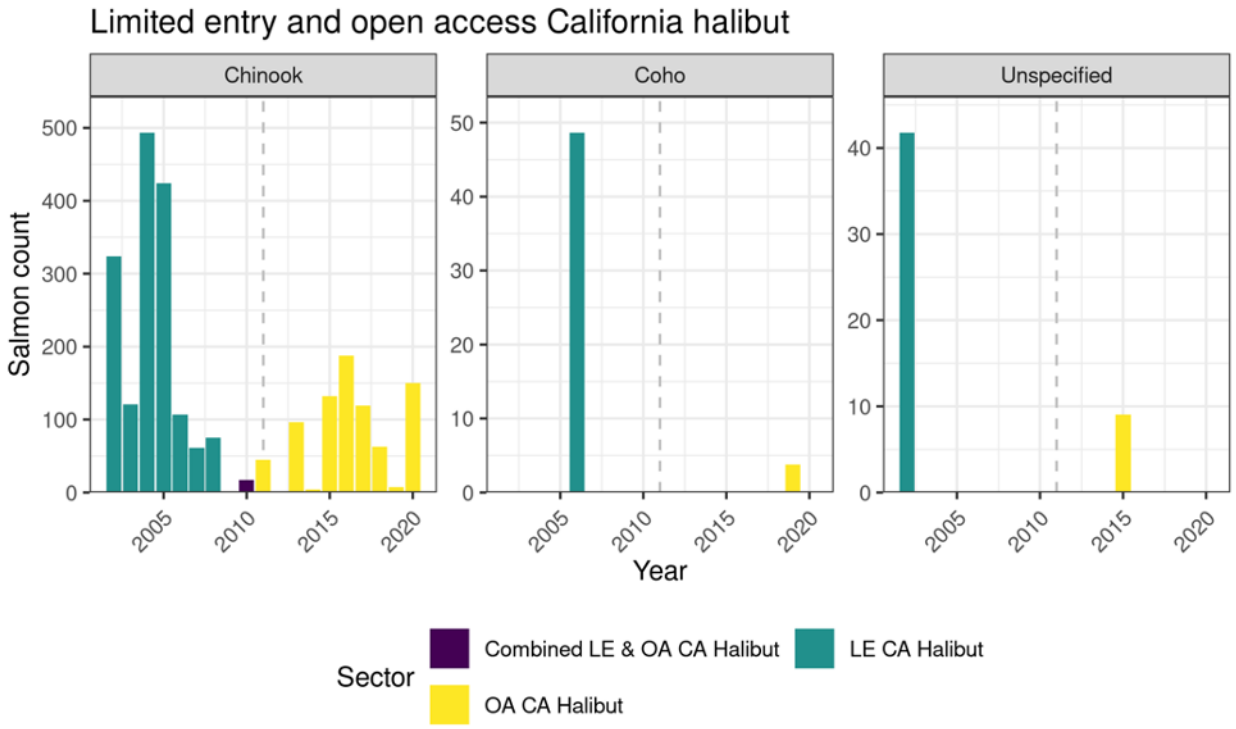

Figure 5. Estimated salmon bycatch in the limited entry and open access California halibut fishery. Note that, starting in 2011, LE California halibut is combined with CS bottom trawl for confidentiality reasons, but there has been no activity in this sector since 2013.

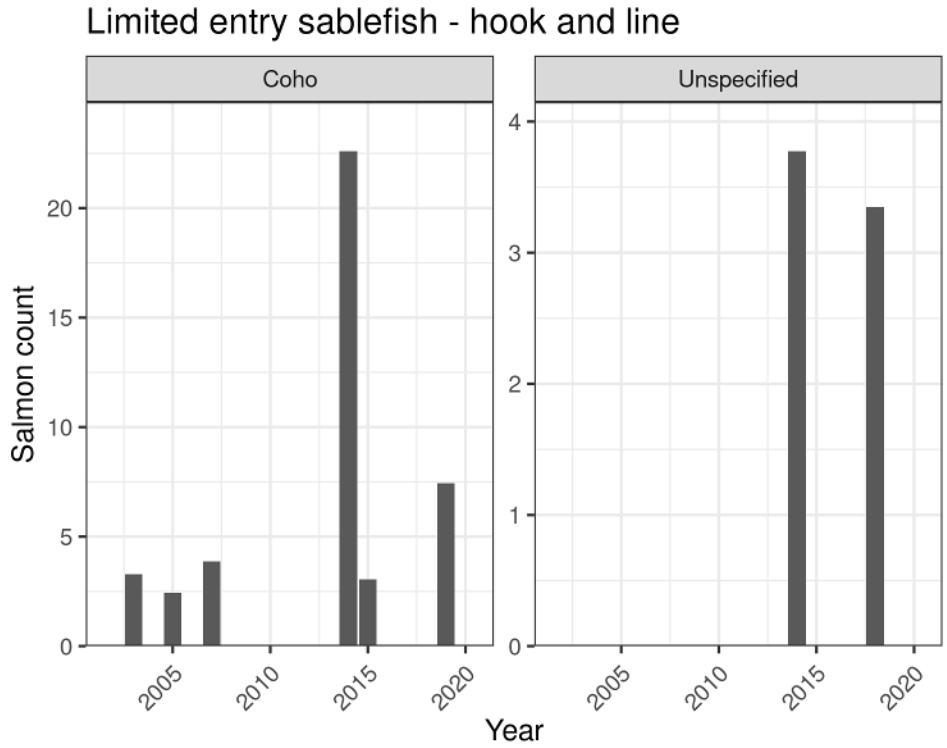

Figure 6. Estimated salmon bycatch in the limited entry sablefish hook-and-line fishery.

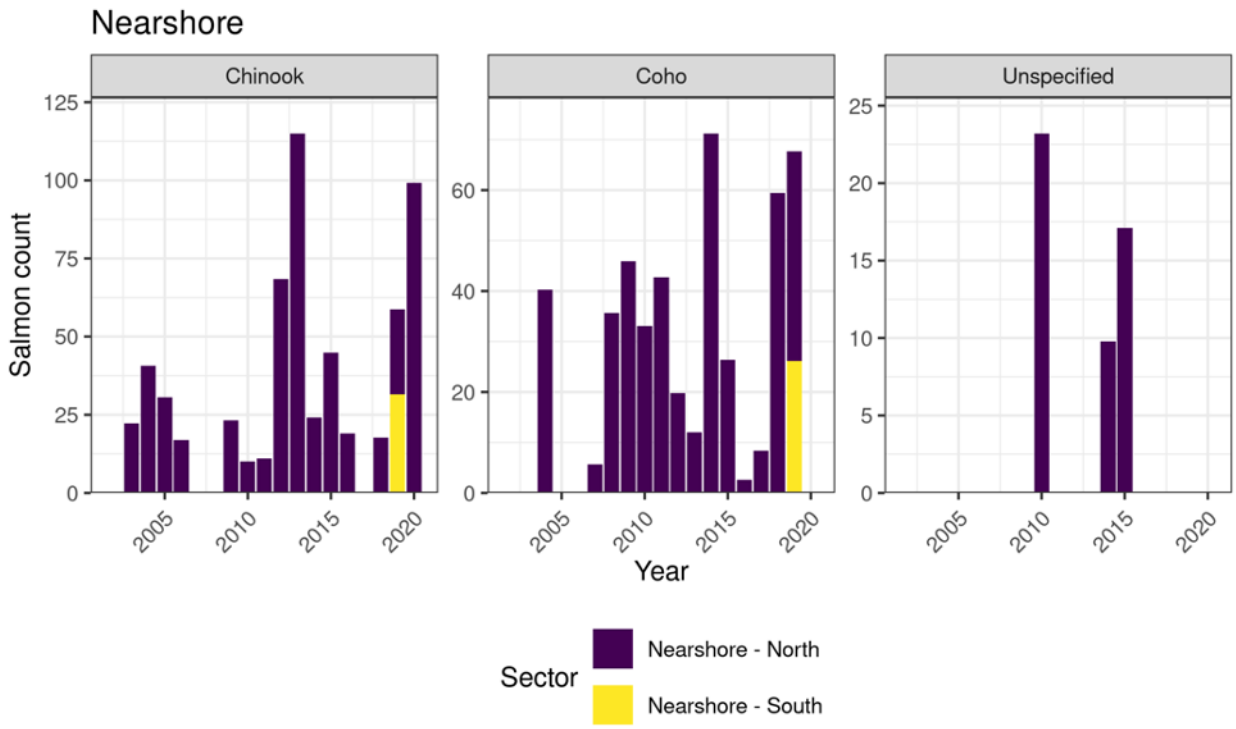

Figure 7. Estimated salmon bycatch in the nearshore fisheries north and south of lat 40.167°N.

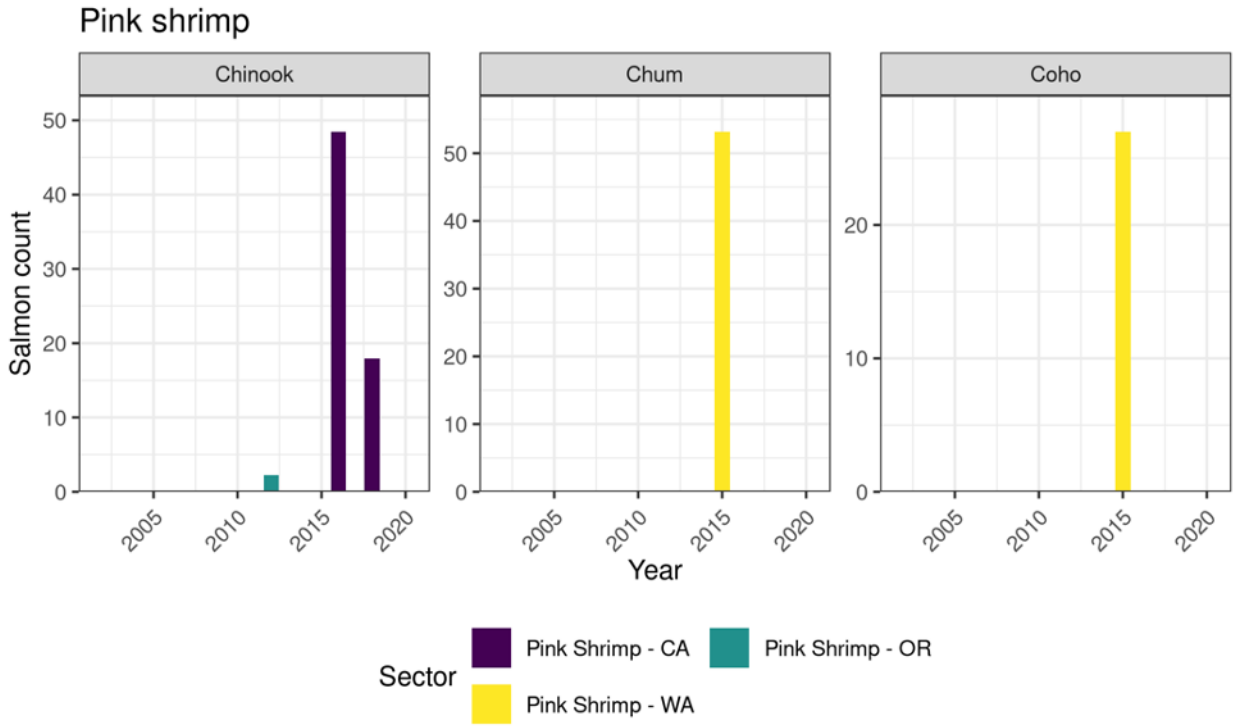

Figure 8. Estimated salmon bycatch in the pink shrimp fishery.

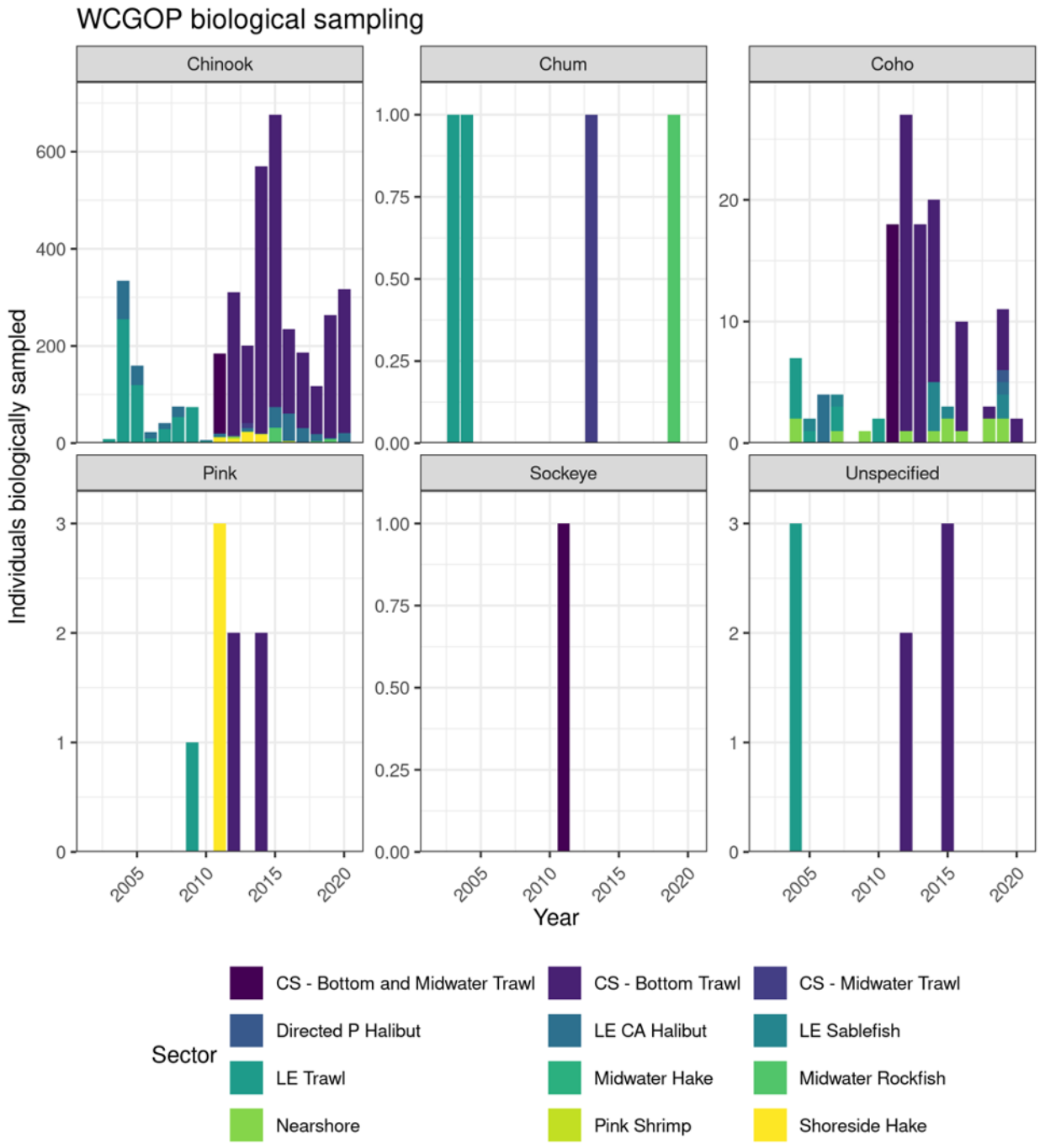

Figure 9. Number of salmon biologically sampled by WCGOP observers, 2002–20.

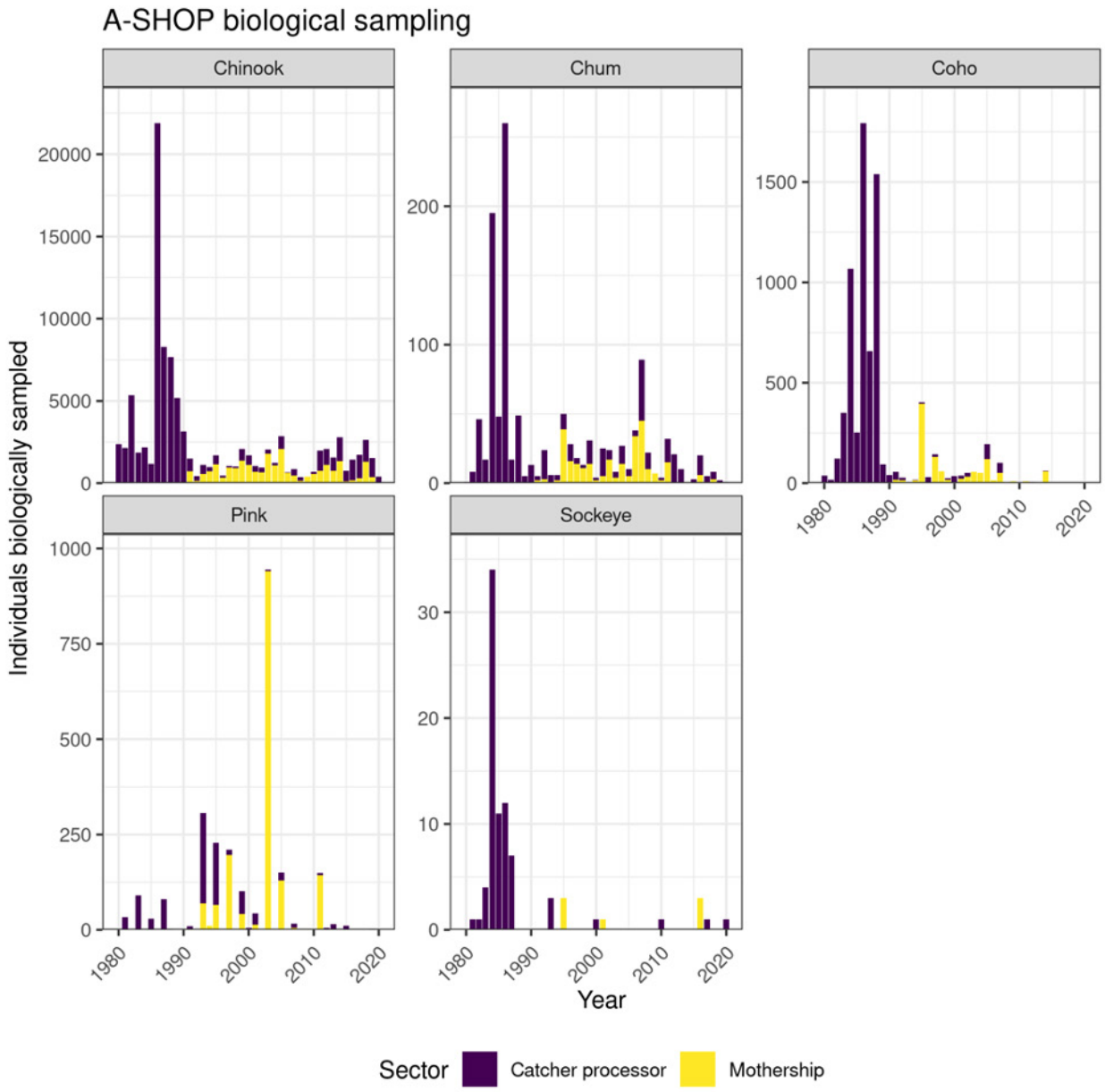

Figure 10. Number of salmon biologically sampled by A-SHOP observers, 1980–2020.

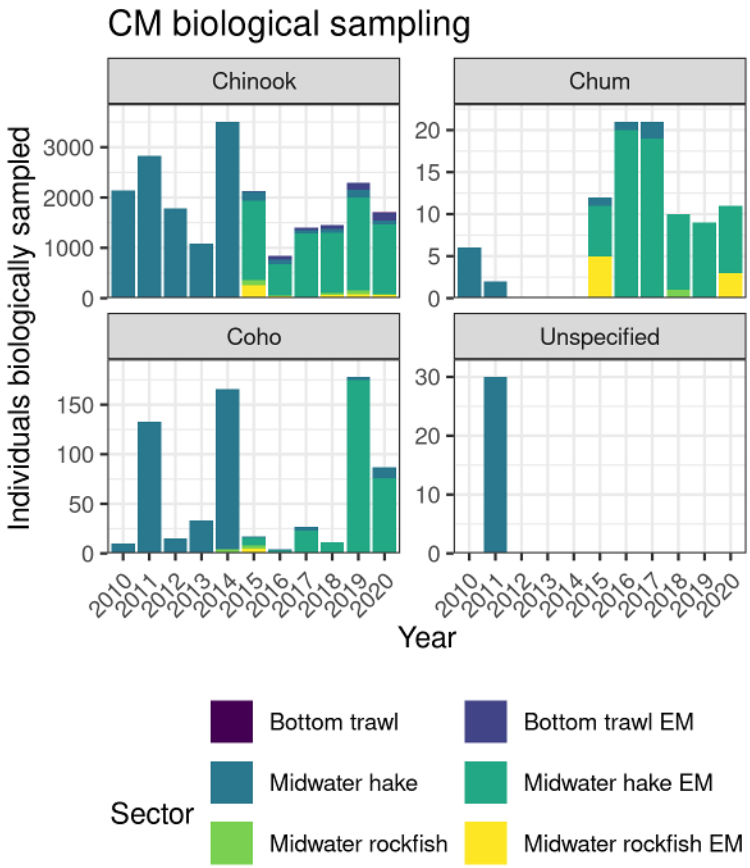

Figure 11. Number of salmon biologically sampled by the CM Program, 2010–20.

Tables

The tables described below can be downloaded from this report's NOAA Institutional Repository[4] record by following the "Supporting Files" link.

Table 1. Observed vessels, trips, hauls, catch, and salmon interactions, as well as total fleet landings, stratified by year, season, salmon management area, and depth interval, for the LE trawl fishery.

Table 2. Observed and expanded salmon bycatch in the LE trawl fishery.

Table 3. Observed vessels, trips, hauls, catch, and salmon interactions, as well as total fleet landings, stratified by year and season, for the LE CA halibut (CHLB) fishery. To preserve confidentiality, 2010 data are reported in Tables 7 and 8, combined with OA CA halibut; 2011 and 2013 data are reported in Table 16, combined with IFQ Bottom Trawl. 2012 data cannot be reported, and no fishing effort in LE CHLB has occurred since 2013.

Table 4. Observed and expanded salmon bycatch in the LE California halibut fishery.

Table 5. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by year, for the OA CA halibut fishery. Strata not listed were not observed.

Table 6. Observed and expanded salmon bycatch in the LE California halibut fishery.

Table 7. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, for the combined LE and OA CA halibut fishery, combined in 2010 to maintain confidentiality.

Table 8. Observed and expanded salmon bycatch in the combined LE and OA CHLB fishery in 2010.

Table 9. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by year and area, for the LE sablefish primary fishery using hook-and-line gear. Strata not listed were not observed.

Table 10. Observed and expanded salmon bycatch in the LE sablefish primary fishery using hook-and-line gear.

Table 11. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by state, year, and area, for the pink shrimp fishery. Strata not listed were not observed.

Table 12. Observed and expanded salmon bycatch in the pink shrimp fishery.

Table 13. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by state, year, and area, for the nearshore fishery. No salmon interactions south of lat 40.167°N occurred prior to 2019, so we only include information for the 2019 nearshore south fishery here.

Table 14. Observed and expanded salmon bycatch in the nearshore fishery.

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[4] https://repository.library.noaa.gov/

Table 19. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by year, season, depth bin, and salmon management area, for catch share nonhake bottom trawl, including nonhake midwater trawl in 2011 and LE California halibut in 2011 and 2013.

Table 20. Observed at-sea, estimated unknown, landed, and total salmon bycatch in the catch share nonhake bottom trawl fishery, including nonhake midwater trawl in 2011 and LE California halibut in 2011–13.

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Table 22. Observed at-sea, estimated unknown, landed, and total salmon bycatch in the CS hook-and-line fishery.

Table 23. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by year, target strategy, season, and salmon management area, for shoreside catch share non-EM midwater trawl. To maintain confidentiality, data from the 2019–20 midwater hake trawl sector are included in Tables 25 and 26, and data from the nonhake midwater trawl in 2011 are included in Tables 20 and 21. In 2015, the basis of the definition for shoreside midwater changed from the captain's stated target to the proportion of hake landed.

Table 24. Observed at-sea, estimated unknown, landed, and total salmon bycatch in the catch share midwater trawl fishery. To maintain confidentiality, data from the 2019–20 midwater hake trawl sector are included in Tables 25 and 26, and data from the nonhake midwater trawl in 2011 are included in Tables 19 and 20. In 2015, the basis of the definition for shoreside midwater changed from the captain's stated target to the proportion of hake landed.

Table 25. Effort in the electronically monitored (EM) portion of the shoreside catch share trawl fleet, based on EM, logbook, and fish ticket data. Data for the 2019–20 non-EM midwater hake sector are combined with EM data here here to preserve confidentiality (see Tables 23 and 24 for all other non-EM midwater hake information).

Table 26. Salmon bycatch EM portion of the shoreside catch share trawl fleet, based on EM, logbook, and fish ticket data. Data for the 2019–20 non-EM midwater hake sector are combined with EM data here to preserve confidentiality (see Tables 23 and 24 for all other non-EM midwater hake information). All salmon are required to be retained and sampled by shoreside catch monitors.

Table 27. Observed vessels, hauls, and salmon interactions, as well as fleet landings, stratified by sector, year, and season, for the at-sea hake fishery. Note that the small amount of effort in the 2012 tribal mothership sector is not included for confidentiality reasons.

Table 28. Observed salmon bycatch in the at-sea hake fishery. Note that the small amount of effort in the 2012 tribal mothership sector is not included for confidentiality reasons.

Table 29. Summary of salmon bycatch count and weight by species, sector, and year. Bycatch in the shoreside catch share fisheries includes both EM and 100%-observed subsectors. Weights were not recorded in the shoreside hake exempted fishing permit (EFP) sector.

Table 30. Summary of biological data for at-sea salmon catch, separated by sector, collected by WCGOP observers from 2002 to 2020. All data were not available for every specimen. Due to 100% coverage in catch share sectors, more biological data are typically collected.

Table 31. Summary of biological data for salmon discarded shoreside, collected by the Catch Monitor (CM) Program, 2010–20. All data were not available for every specimen, but 100% coverage of the catch typically leads to greater collection of biological data than in other fishery sectors.

Table 32. Summary of biological data for salmon species, separated by sector, collected by A-SHOP observers from 1980 to 2020.

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Somers, K. A., M. A. Bellman, J. E. Jannot, Y.-W. Lee, J. McVeigh, and V. Tuttle. 2015. Observed and estimated total bycatch of salmon in the 2002–2013 U.S. West Coast fisheries. National Marine Fisheries Service, Seattle.

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