

# Alaskan Harvest of BC Salmon: State of Knowledge

## Part 1: Southeast Alaska Catch of Salmon and Southeast Alaska Pink Salmon Escapements

Version 1

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## Preface

This report is part of a series of reports on the ‘State of Knowledge’ of Alaskan interception of BC salmon. This report series is a summary of existing information that was compiled from a number of sources. We also provide information on 2021 catch in Southern Southeast Alaska. The intent of this report series is to promote discussion, identify knowledge gaps, attempt to collect, and make available, all relevant data, and provide recommendations to improve our understanding of Alaskan interceptions of Canadian salmon. To that end, we encourage feedback and discussion on the content, and welcome additional information that we may have missed. As such, it should be considered a ‘living document’. Future versions will include clarifications, edits, and likely additional content. Changes will be tracked and recorded for transparency and collaborative purposes. Please reach out to either of the authors for further information or to provide feedback or additional content.

To complete this ‘State of Knowledge’ report series, we procured, compiled, and surveyed data from numerous sources (e.g., Pacific Salmon Commission website and reports, Fisheries and Oceans Canada, Alaska Department of Fish and Game, Pacific Salmon Foundation, LGL Limited). Estimates of Alaskan capture of BC salmon were from multiple sources and required an extensive effort to compile, including numerous discussions with staff from DFO (NC, WCVI, ECVI, ISC and Fraser regions), LGL Limited, the Pacific Salmon Commission, the Pacific Salmon Foundation, and Alaska Department of Fish and Game.

The objectives of the reports in this series were to:

1. Identify and compile data sources on Southeast Alaska (SEAK) catch of BC salmon, with a focus on South Southeast Alaska (SSEAK);
2. Summarize information on recent and historical SSEAK catch at the regional, stock aggregate, DFO Statistical Area and Conservation Unit (CU) level where possible, including proportions of SEAK catch;
3. Provide details on information specific to District 104 fisheries (Noyes and Dall Island), where possible;
4. Provide context and/or estimates for SSEAK catch of BC salmon in the 2021 fishing season;
5. Identify gaps in knowledge and provide high-level recommendations to stimulate discussion.

While we limited our review and summary to SSEAK salmon fisheries, we do include other areas and fisheries where information was available.

The following points should be considered for context when reading this report series:

- Many of the populations of Canadian salmon that are caught in SSEAK are at depressed or extremely depressed levels of abundance (e.g., North and Central Coast BC chum, some Fraser sockeye Conservation Units (CUs) and have had few, or severely curtailed, Canadian fisheries in recent years.
- There are numerous assumptions and uncertainties in much of the information presented here that simply could not be detailed fully; however, we have tried to identify reference materials and resources that may provide further details should the reader be interested.
- Some of the information presented is based on studies that were completed 35+ years ago.
- There have been recent shifts in terminal run-timing that may influence where and when salmon are present in SSEAK fisheries.

- Climate change and associated marine conditions (e.g., sea surface temperatures, marine heat waves) may be influencing migration routes and migration timing relative to the tagging studies completed in the early 1980's that are used to underpin many of the migration and run-timing assumptions currently employed.
- The effects of climate change in freshwater and marine environments are compounded by natural and human-caused landscape change. These marine and freshwater ecosystem changes are impacting Pacific salmon at every stage of their life-cycle. The changing conditions already observed likely will continue, and possibly accelerate, warranting expanded efforts to understand and address uncertainties in exploitation in both SSEAK and BC.

The Report Series includes:

- Summary
- Part 1: Southeast Alaska Harvest and Pink Salmon Escapement
- Part 2: Southeast Alaskan Harvest of BC Sockeye Salmon
- Part 3: Southeast Alaskan Harvest of BC Chinook Salmon
- Part 4: Southeast Alaskan Harvest of BC Chinook Salmon
- Part 5: Southeast Alaskan Harvest of BC Chum Salmon
- Part 6: Southeast Alaskan Harvest of BC Pink Salmon
- Part 7: Southeast Alaskan Harvest of BC Steelhead Trout

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## Glossary

ADFG: Alaska Department of Fish and Game.

Bycatch: Catch of a species that is not targeted.

CC: Central Coast (DFO Statistical Management Areas 7-10).

Conservation Unit: A CU is a group of wild salmon sufficiently isolated from other groups that, if extirpated is very unlikely to recolonize naturally within an acceptable timeframe, such as a human lifetime or a specified number of salmon generations.

CWT: Coded Wire Tag. Passive tags implanted in juvenile salmon that are used to identify where and when fish were either released (hatcheries) or tagged (wild systems).

DFO: Department of Fisheries and Oceans.

District: Refers to Alaskan fisheries management areas.

ECVI: East Coast Vancouver Island (Vancouver Island sections of DFO Statistical Management Areas 11-19, 28)

Encounters: All the fish (kept/retained + released) that are encountered in a fishery. Estimates of encounters may include estimates of drop-off (fish that are on/in gear but escape before they are brought on board).

Escapement: Escapement refers to the number of spawners that return to a stream/area/system (fish that have escaped being captured in fisheries). Inter-changeable in this report with spawners or spawner abundance.

Exploitation Rate: Exploitation rate is the amount of catch as a proportion of the total run. We try to present all data in this report as exploitation rates.

FSC: First Nations Section 35(1) Food, Social, and Ceremonial use harvest.

Fraser: Fraser River (DFO Statistical Management Area 29).

FRIM (Fisheries Related Incidental Mortality): FRIM accounts for mortality that occurs prior to capture (e.g., depredation and drop-out mortality), during handling (i.e., on-board mortality), and after release (i.e., post-release mortality). It is added to kept/retained catch/mortalities to estimate total fishing-related mortalities.

Harvest Rate: Harvest rate refers to the proportion of fish caught versus those available to be caught. E.g., for Skeena sockeye, the harvest rate in the marine commercial fishery is the catch divided by the Total Return to Canada, not the Total Run.

ISC: Inner South Coast Areas (Mainland BC sections of DFO Statistical Areas 11-18, 28)

Kept: Fish that are kept in fisheries. Also retained catch.

NC: North Coast (DFO Statistical Management Areas 1-6).

Released: Fish that are caught and then released (live or dead) from a fishery.

Retained: Fish that are kept in fisheries. Also kept catch.

Statistical Area: Refers to DFO Pacific Fisheries Management Areas, or Statistical Area. Haida Gwaii is areas 1 and 2, Nass is area 3, Skeena is area 4, Central Coast is areas 6-10, Johnstone Strait and Strait of Georgia is areas 11-18, Juan de Fuca is areas 19-20, West Coast Vancouver Island is areas 21-27, Howe Sound is area 28, and the Fraser River is area 29.

Total Mortalities: Total mortality includes all natural and fishing-related causes. The latter is composed of retained catch, plus any incidental mortalities associated with fishing activities.

Total Run: Total run (or total abundance) refers to the total return of fish in a given year (total catch + escapement).

WCVI: West Coast Vancouver Island (DFO Statistical Management Areas 20-27).



# 1 Introduction and Methods

This report provides background information on catch of salmon and steelhead in SEAK fisheries, as well as information on SEAK pink salmon escapements. Information on Southeast Alaska (SEAK) catch and pink salmon escapement information was compiled from a number of sources. Catch data was available online or provided by Alaska Department of Fish and Game staff. Pink salmon escapement information was extracted from Pison (2021). Table 1 provides a summary of information used in this report.

All figures and statistical analyses were completed using R statistical software (R core team 2020).

*Table 1: Types of data, sources, and year ranges used in this report for SEAK salmon and steelhead catches and pink salmon escapements.*

<i>Species</i>	<i>Region/Area</i>	<i>Type of Data</i>	<i>Data Source</i>	<i>Year</i>
<i>All</i>	SEAK	Gross earnings and landed catch by Area	ADFG 2021a	1979-2021
	SEAK	Commercial “Blue Sheet” data	ADFG 2021b	1980-2020
	SEAK	Commercial “Blue Sheet” data	ADFG 2021c	2021
	SEAK	SEAK landings by District and Gear	ADFG 2021d	1985-present
	SEAK	District 104 salmon landings by stat week, gear type and species	ADFG 2021e	1985-present
<i>Pink Salmon</i>	District 104	District 104 catch	Piston 2021	1960-2018
	Various	Pink salmon escapements	Piston 2021	1960-2018
<i>Sockeye Salmon</i>	District 104	District 104 sockeye catch	Piston 2021	1960-2018

## 2 Southeast Alaskan Harvest

This section provides a background on harvest of sockeye, Chinook, chum, pink, and coho salmon in Southeast Alaska (SEAK). It provides important context for discussions of SEAK harvest of BC salmon.

- Figure 1 shows Southeast Alaskan fisheries management areas. Note the location of the District 104 (Noyes and Dall Island) and District 101 (Tree Point) areas.
- Total catch of all species in SEAK commercial fisheries has ranged from ~15 million to ~105 million (Figure 3). Pink salmon dominate catch numbers. Chum salmon are the second most caught, with increases in numbers since the 1980s.
- Harvest value from commercial fisheries from 1979 to 2021 has ranged from approximately 50 million USD to nearly 250 million USD in 2013 (Figure 4). Pink and chum salmon make up ~30% of the overall value, with coho at ~ 18%, and Chinook and sockeye at ~11%.
- Figure 5 shows the harvest and harvest value of all salmon species in SEAK from 1979-2021. Catch of chum salmon increased dramatically in the early 1990s. Catches of Chinook and coho salmon are trending down in recent years. Pink salmon catch is highly variable, with a discernable odd year/even year pattern (odd years being higher). Sockeye catches peaked in the mid-90s and have trended down since. Value is influenced by both the number of fish caught and the price per pound in any given year. Chum salmon now contribute the most value in SEAK fisheries.

- Figure 6 shows the harvest of pacific salmon in SEAK commercial fisheries by species in even and odd years. For all species except pink, there is no difference in median catch between even and odd years. For pink salmon, odd year median catch is significantly higher.
- ADFG “Blue Sheet” harvest data for SEAK commercial fisheries was requested and provided from ADFG for 1979-2020.
  - Figure 7 (Chinook), Figure 8 (chum), Figure 9 (pink), Figure 10 (coho) and Figure 11 (sockeye) show the harvest of salmon by SEAK fishery for 1979-2020. Note that the Troll fishery data was incorrect in the original data provided, and we added data manually for Troll fisheries from 2004 to 2020 using data provided in the annual Run Forecasts and Harvest Projections from the ADFG website.<sup>1</sup>
  - Chinook and coho salmon are caught predominantly in troll fisheries, with some catch in northern and southern purse seine fisheries.
  - Pink salmon are predominantly caught in seine fisheries, but many are also caught in the hatchery cost recovery and hatchery terminal fisheries.
  - Chum salmon are predominantly caught in the hatchery cost recovery fisheries (since hatchery production ramped up in the 1990s) and terminal hatchery fisheries, with many being caught in the southern and northern purse seine fisheries.
  - Sockeye salmon are primarily caught in the southern purse seine fisheries, while also being caught in the Lynn Canal, Yakutat and set gillnet fisheries, with some also being caught in the Tree Point fishery.
- Weekly proportion of pink salmon catch in the District 104 seine fishery from 1960-2018 is shown in Figure 12 (Piston 2021). Most years show the same profile with harvest peaking in weeks 32-33.
- Catch of pink and sockeye salmon in District 104 (1960-2018) by subdistrict (104-10 to 104-50) is shown in Figure 13. Note that the peak weeks for pink catch is generally weeks 32 and 33, however, sockeye catches peak in weeks 31 and 32 (or approximately 1 week earlier). Also note that most of the catch of both pink and sockeye salmon is from subdistricts 104-10, 20, and 40.
- 2021 catch by fishery in SEAK varies by species (Figure 14). Pink (91%) and sockeye (70%) salmon were predominantly caught in the northern and southern seine fisheries with only a small proportion of sockeye caught in the Tree Point gillnet fishery (8%), coho (53%) and Chinook (65%) salmon were caught predominantly in the Summer Troll fishery, with some coho caught in the northern and southern seine fisheries (20%). Chum salmon were caught mostly in terminal hatchery fisheries (61%), however a significant portion were caught in the northern and southern seine (18%) and summer troll (8%) fisheries.
- Figure 15 shows the catch of Chinook, pink and sockeye salmon from Southeast Alaska districts 101, 102, 103, 104, and 106 in 2021, for seines and gillnets.
  - Note that the pattern of harvest is similar to that in other years, with sockeye harvest peaking in the D104 fishery slightly before the peak in pink harvest. In 2021, pink harvest was highest in D104 and D101, with the vast majority of sockeye harvest from D104.
  - Chinook was non-retention in the purse seine fisheries through almost all of 2021, however in one day of opening ~ 6,000 Chinook were kept in D104.

Data Sources:

<sup>1</sup> <https://www.adfg.alaska.gov/sf/publications/>: select “Title” in field and enter “Run forecasts and harvest projections” in the Search String field.

### 3 Southeast Alaska Pink Salmon Escapement

Pink salmon return to many systems in Alaska, and sometimes in great abundance. This section provides a summary of pink index escapement information from Piston (2021) to provide background information on pink salmon escapement and the locations of the major populations.

- Figure 16 show the locations of pink salmon stock groups and index streams. Note that there are no index streams or stock groups located in the District 104 area on the west side of Noyes and Dall Island.
- Total South SEAK pink salmon index escapement is shown in Figure 17. Pink salmon escapements have increased since 1960 and since ~ 1980 have ranged from approximately 5 million to nearly 15 million.
- South SEAK pink salmon index escapement by District is shown in Figure 18. Escapements have increased since the 60s especially in D101, D102 and D103. D105, 6, and 7 have increased, but are more variable. In recent years, the majority of pink salmon returns have been to D101, 102 and D103 (southern Districts). Note that D104 is not included in this figure as there are no pink salmon escapement index streams there.

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Available online at:

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## 5 Figures

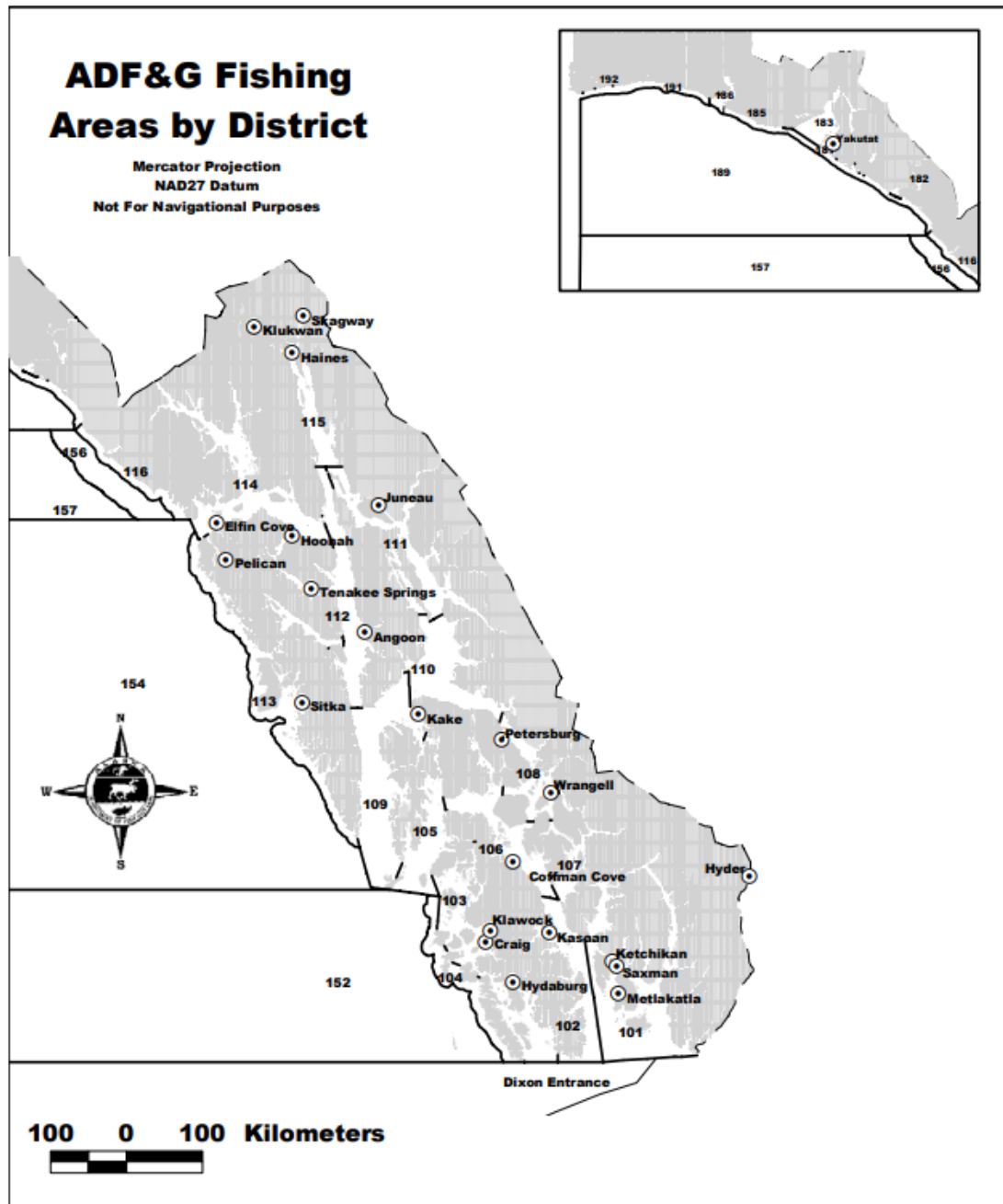


Figure 1: Map of Southeast Alaska Fishing Areas by District.

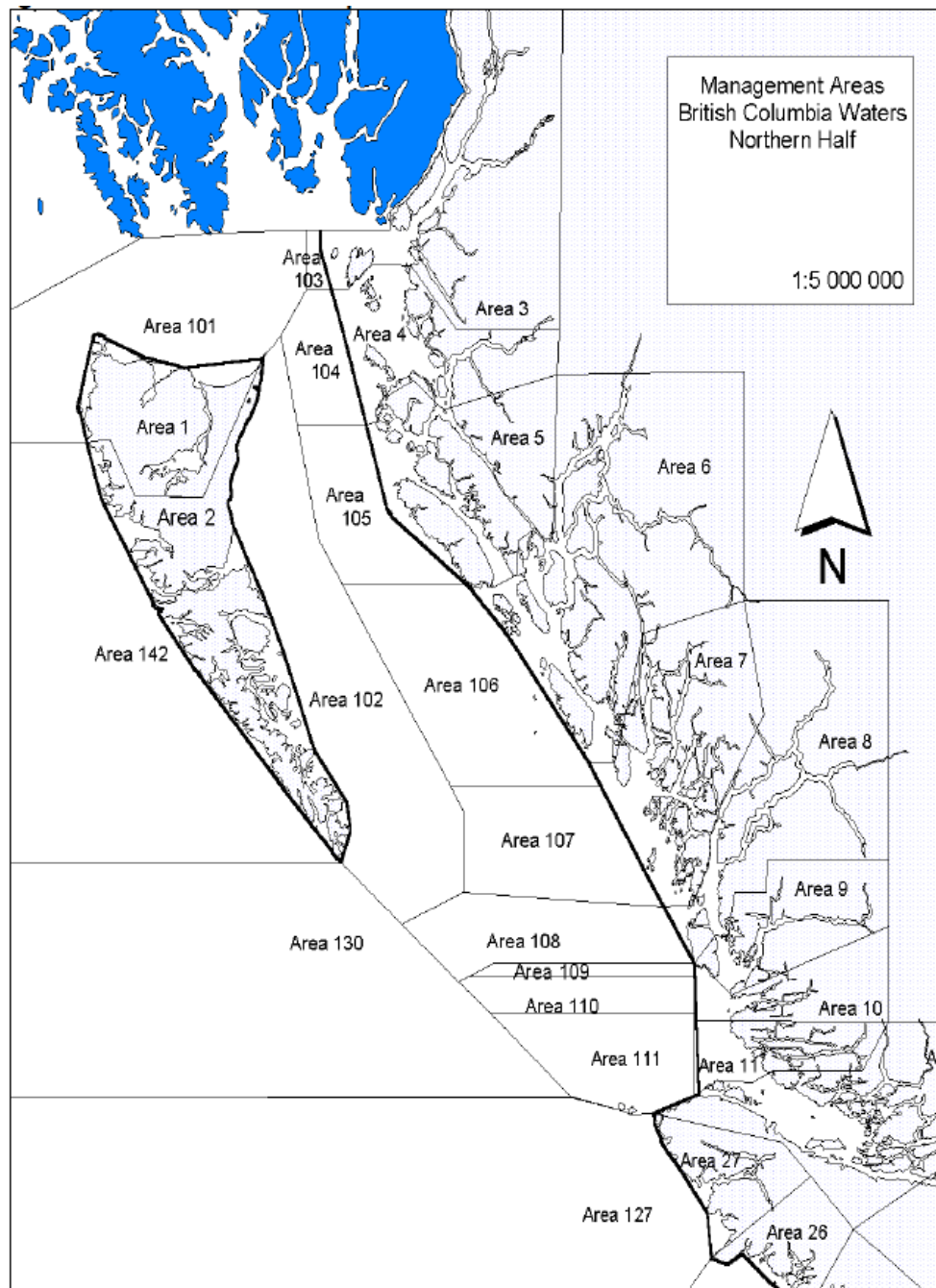


Figure 2. Map of DFO Statistical Areas in the North and Central Coast Areas.

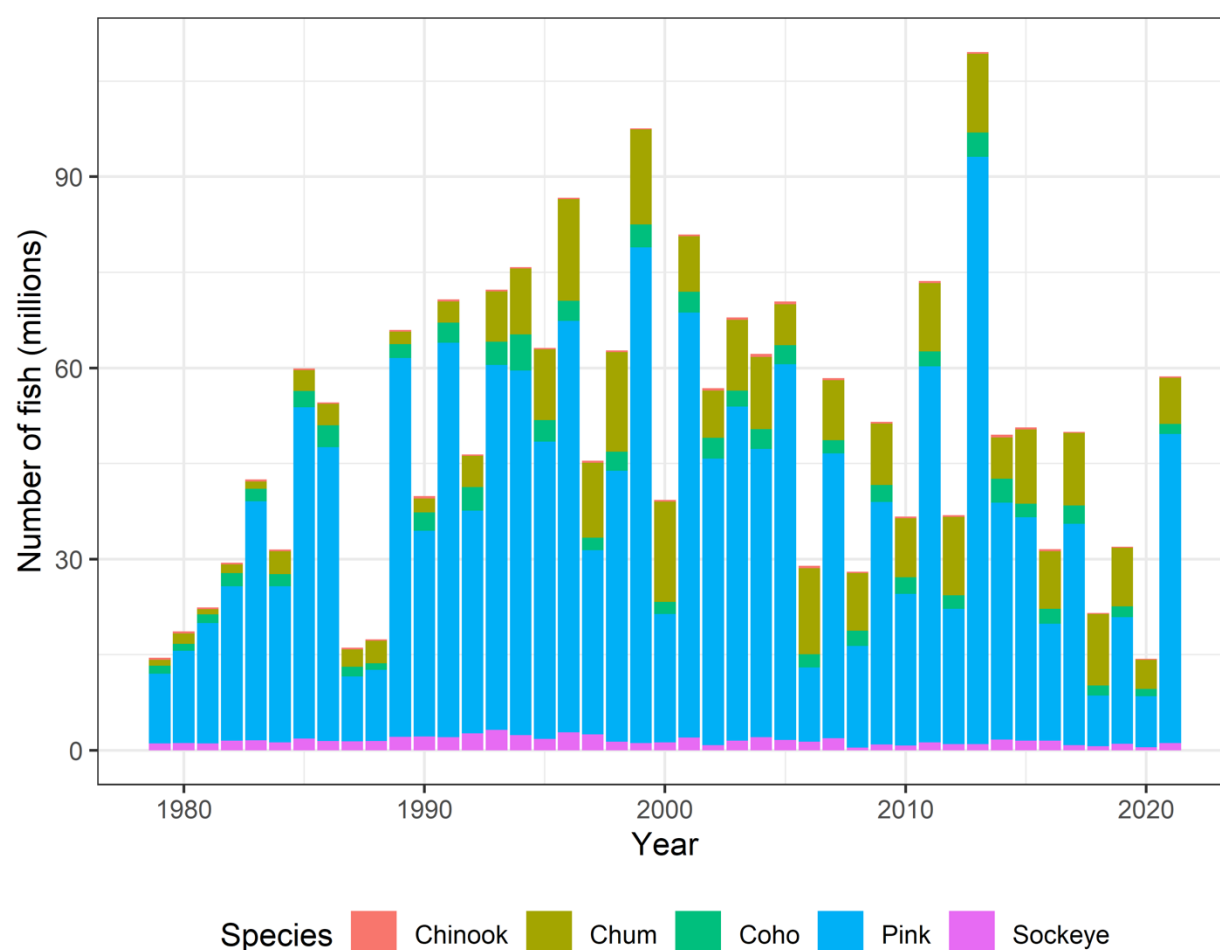


Figure 3: Southeast Alaska, US (SEAK) harvest in million number of fish by species over time for 1979-2021. Harvest is shown for Chinook (red), Chum (olive), Coho (green), Pink (blue), and Sockeye (pink) Salmon. Overall column height shows the total harvest by year. 2021 data are preliminary.

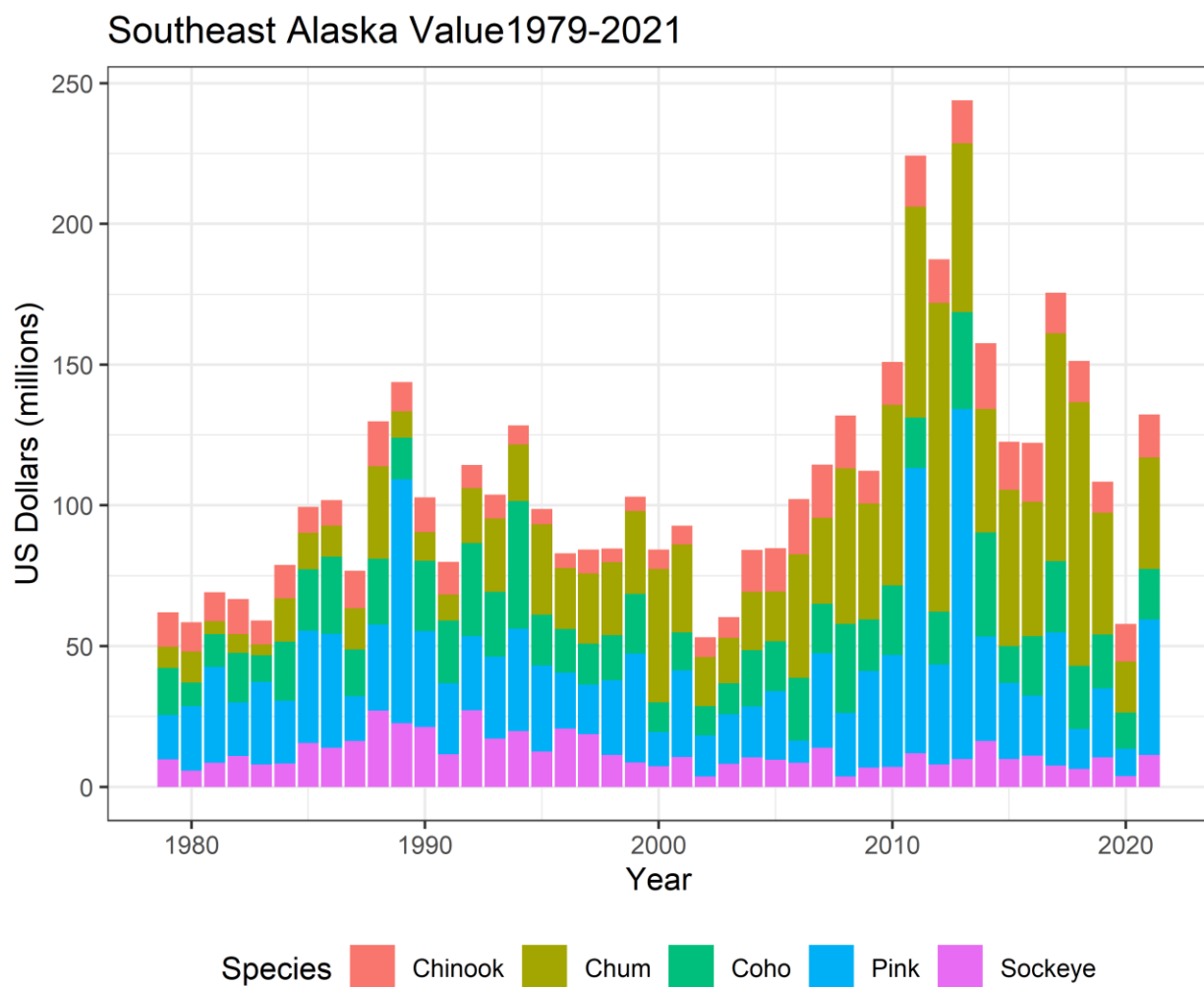


Figure 4: Southeast Alaska, US (SEAK) harvest value in millions of US Dollars from 1979-2021. Harvest value is shown by species Chinook (red), Chum (olive), Coho (green), Pink (blue), and Sockeye (pink). Overall column height shows the total harvest value by year. 2021 data are preliminary.

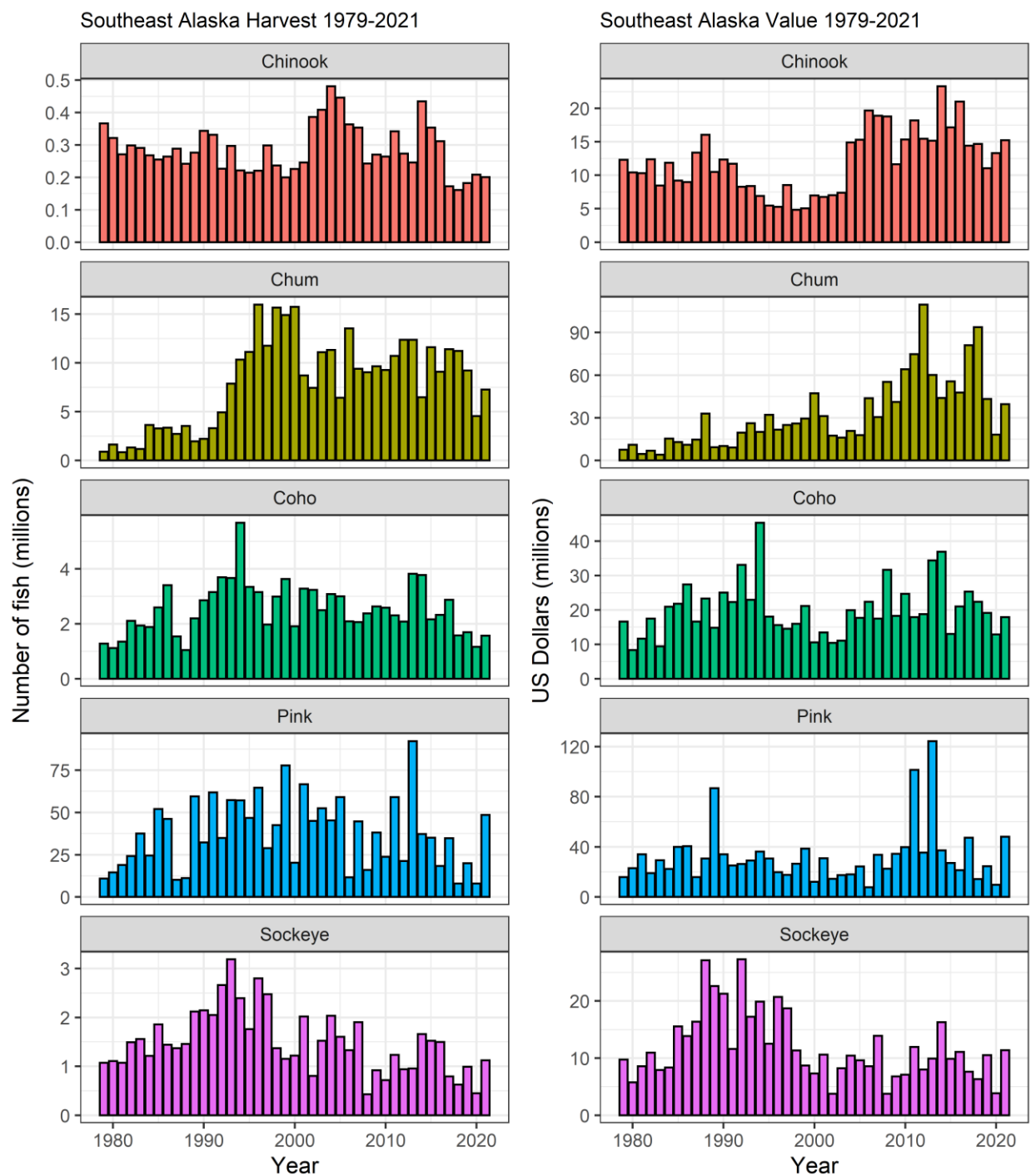


Figure 5: Southeast Alaska, US (SEAK) harvest (millions of fish) and value (millions of US Dollars) by species from 1979-2021. 2021 data are preliminary.



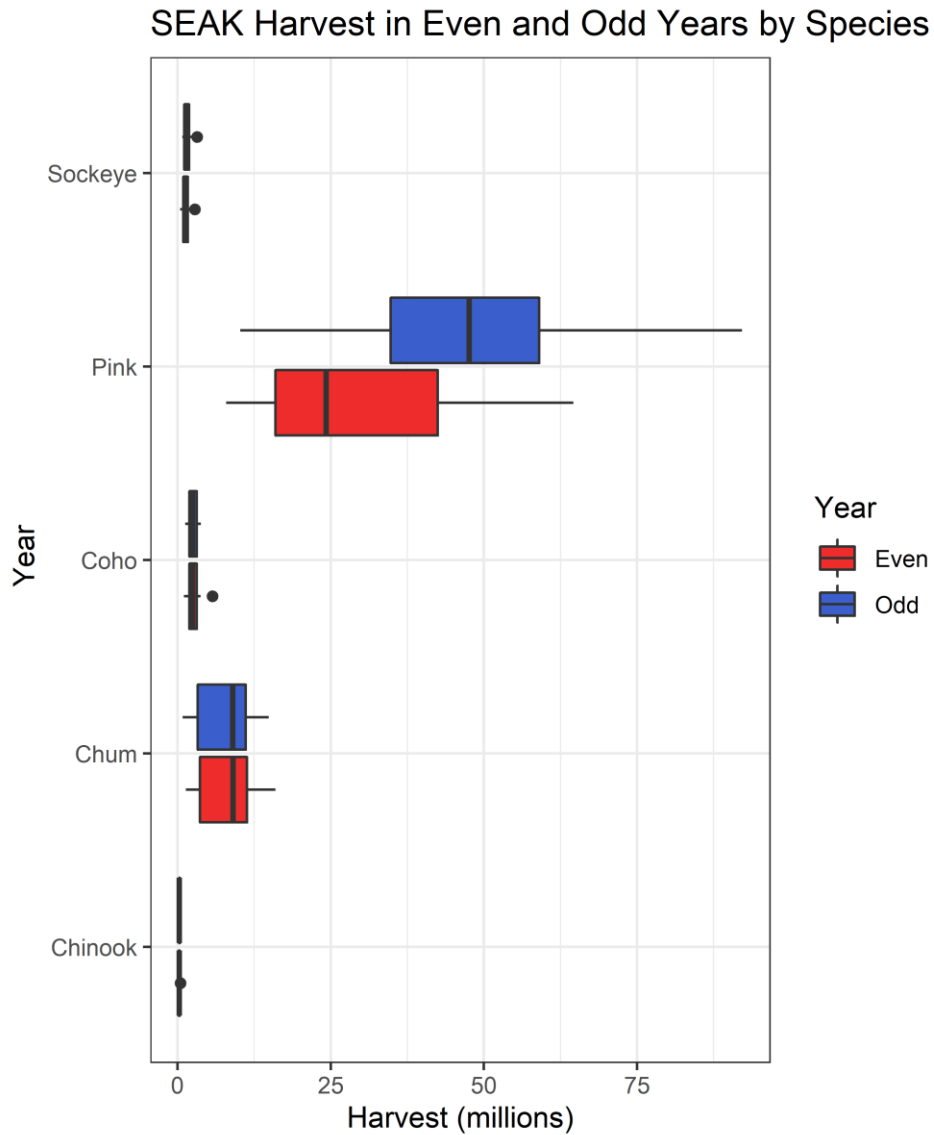


Figure 6: Southeast Alaska, US (SEAK) harvest in million of fish in even and odd years from 1979-2021. Even years are shown by the blue bars, and odd are red. The thick black line is the median value, the box in indicates the interquartile range (25<sup>th</sup> to 75<sup>th</sup> percentiles – or middle 50% of the data), whiskers are 1.5x the interquartile range and dots are outliers (< 5<sup>th</sup> or > 95<sup>th</sup> percentile).

## SEAK Catch of Chinook Salmon by Fishery

Blue Sheet Fisheries (1980-2020)

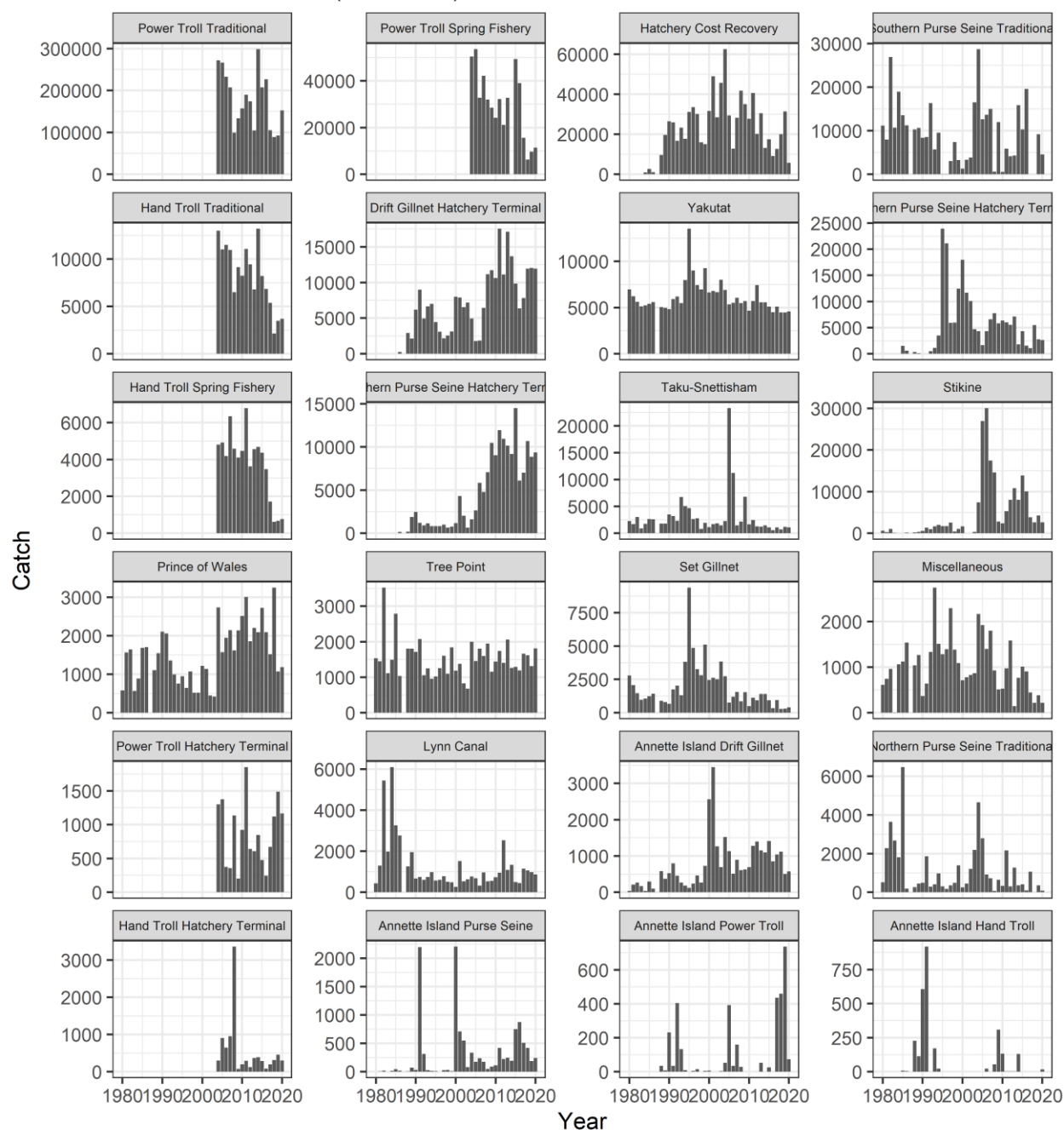


Figure 7: Southeast Alaska, US (SEAK) harvest of Chinook by fishery between 1980 and 2020. Note that the y-axis scales are scaled by individual facet. Facets are arranged in order of greatest to smallest total catch over all years.

## SEAK Catch of Chum Salmon by Fishery Blue Sheet Fisheries (1980-2020)

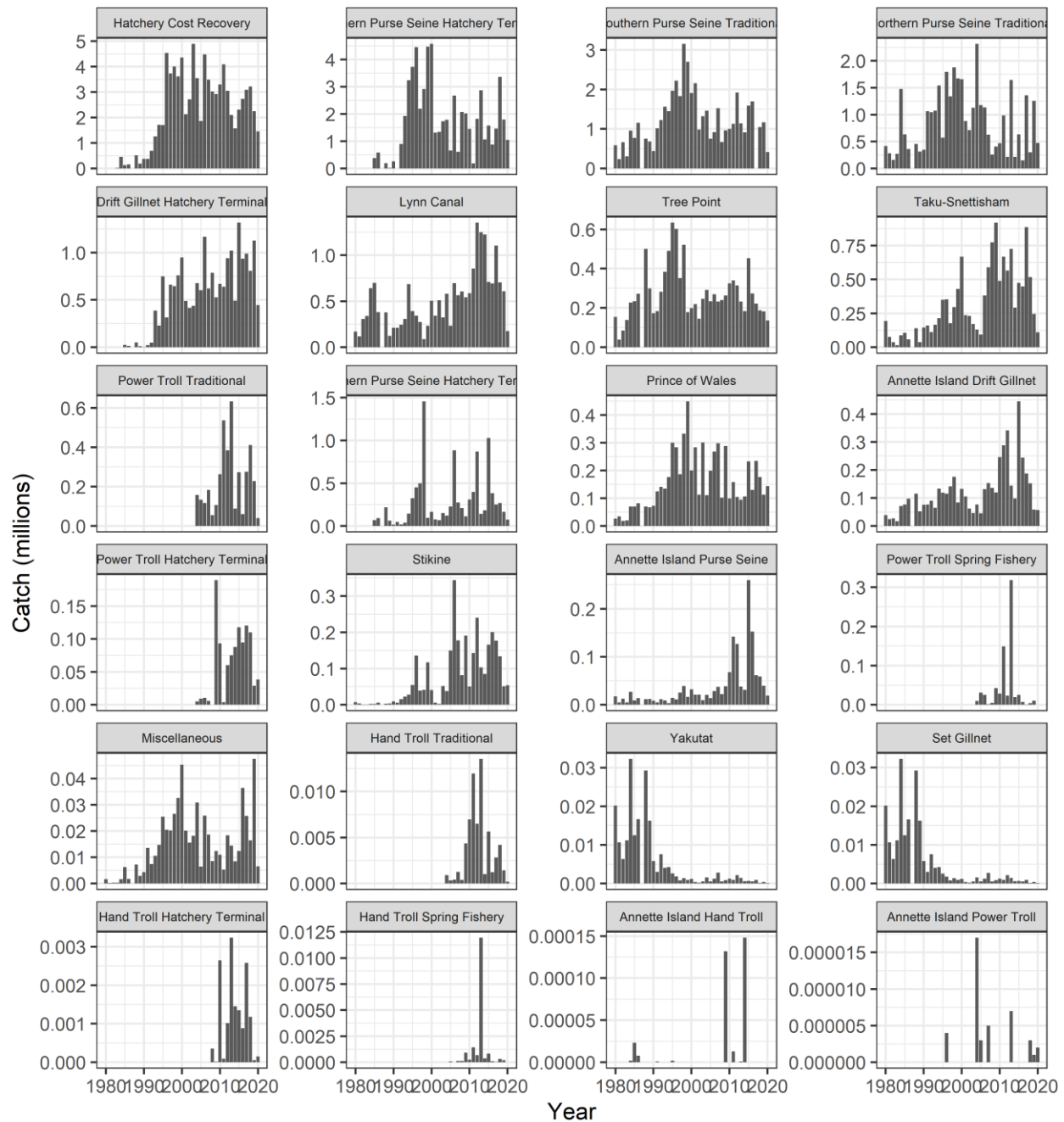


Figure 8: Southeast Alaska, US (SEAK) harvest of chum by fishery between 1980 and 2020. Note that the y-axis scales are scaled by individual facet.

## SEAK Catch of Pink Salmon by Fishery Blue Sheet Fisheries (1980-2020)

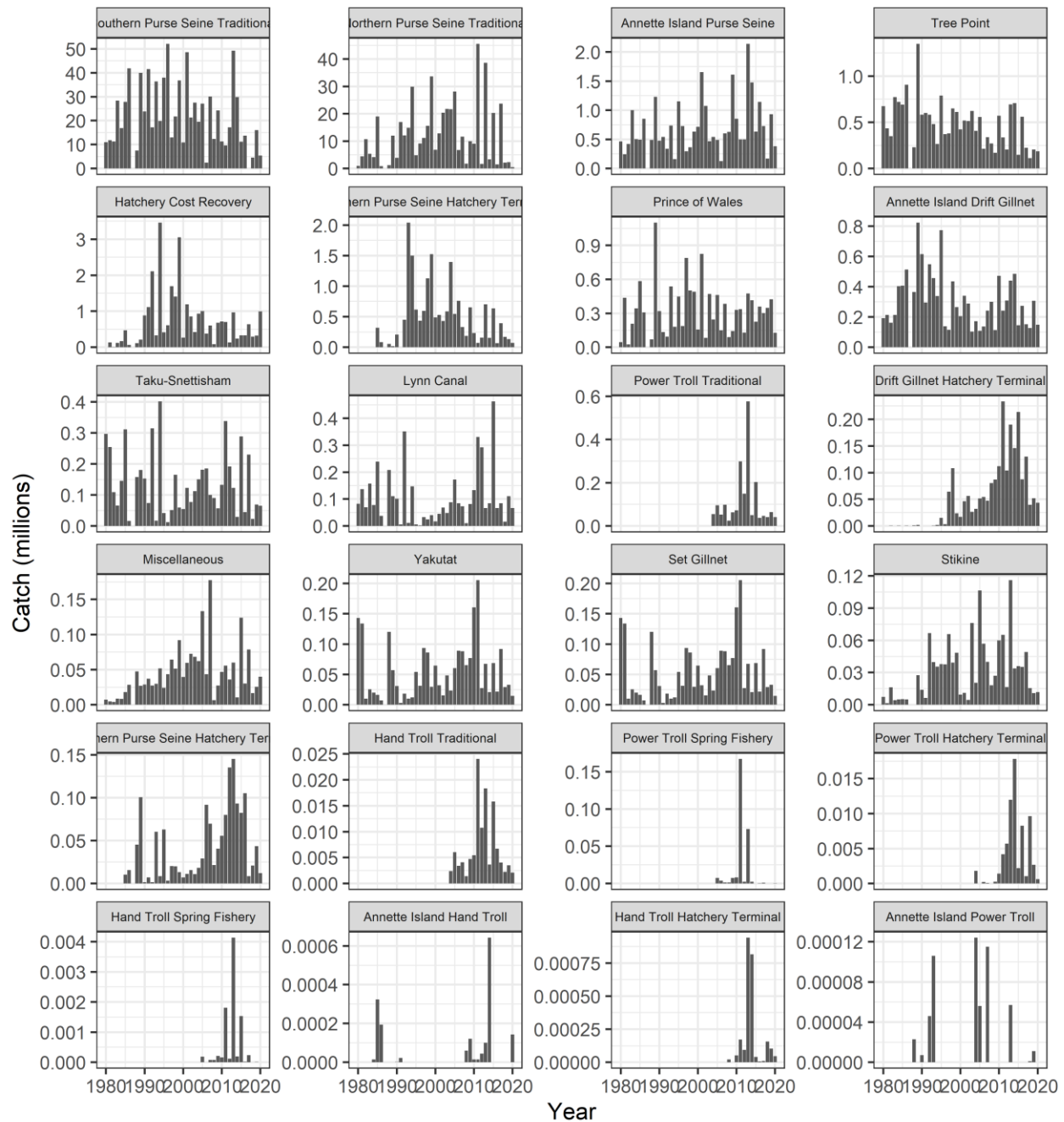


Figure 9: Southeast Alaska, US (SEAK) harvest of pink by region between 1979 and 2020. Note that the y-axis scales are scaled by individual facet.

## SEAK Catch of Coho Salmon by Fishery Blue Sheet Fisheries (1980-2020)

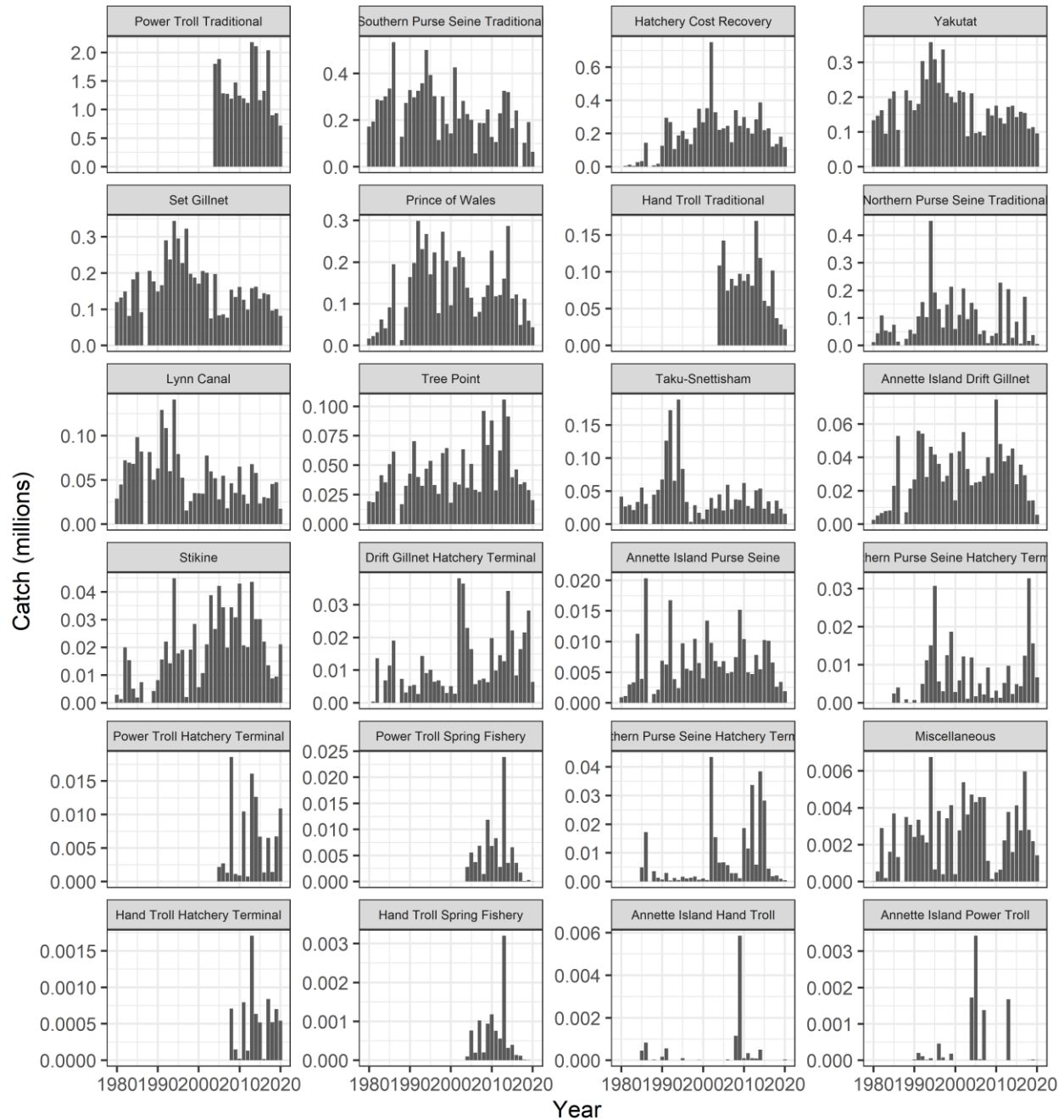


Figure 10: Southeast Alaska, US (SEAK) harvest of coho by fishery between 1980 and 2020. Note that the y-axis scales are scaled by individual facet.

## SEAK Catch of Sockeye Salmon by Fishery Blue Sheet Fisheries (1980-2020)

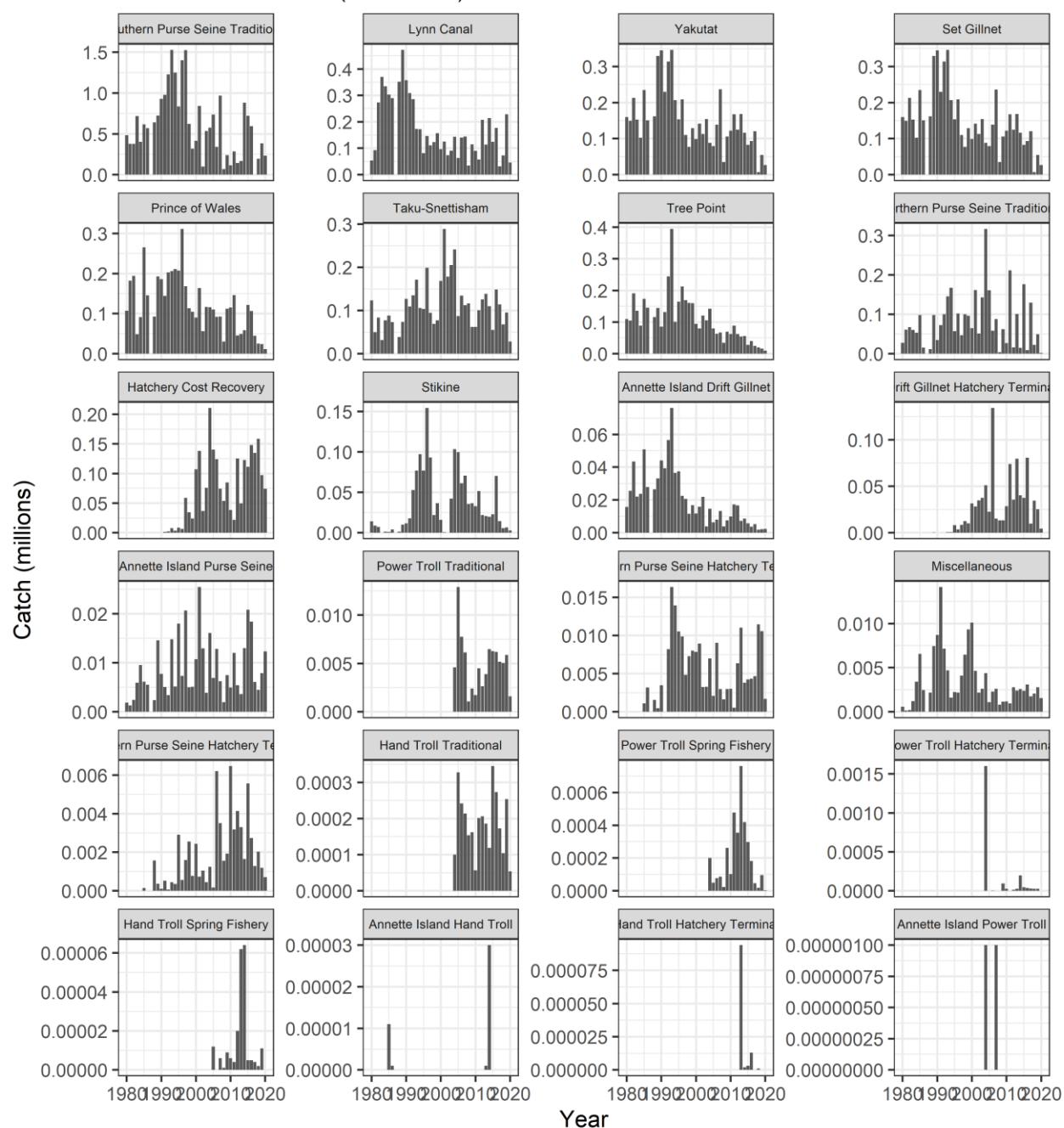


Figure 11: Southeast Alaska, US (SEAK) harvest of sockeye by fishery between 1980 and 2020. Note that the y-axis scales are scaled by individual facet.

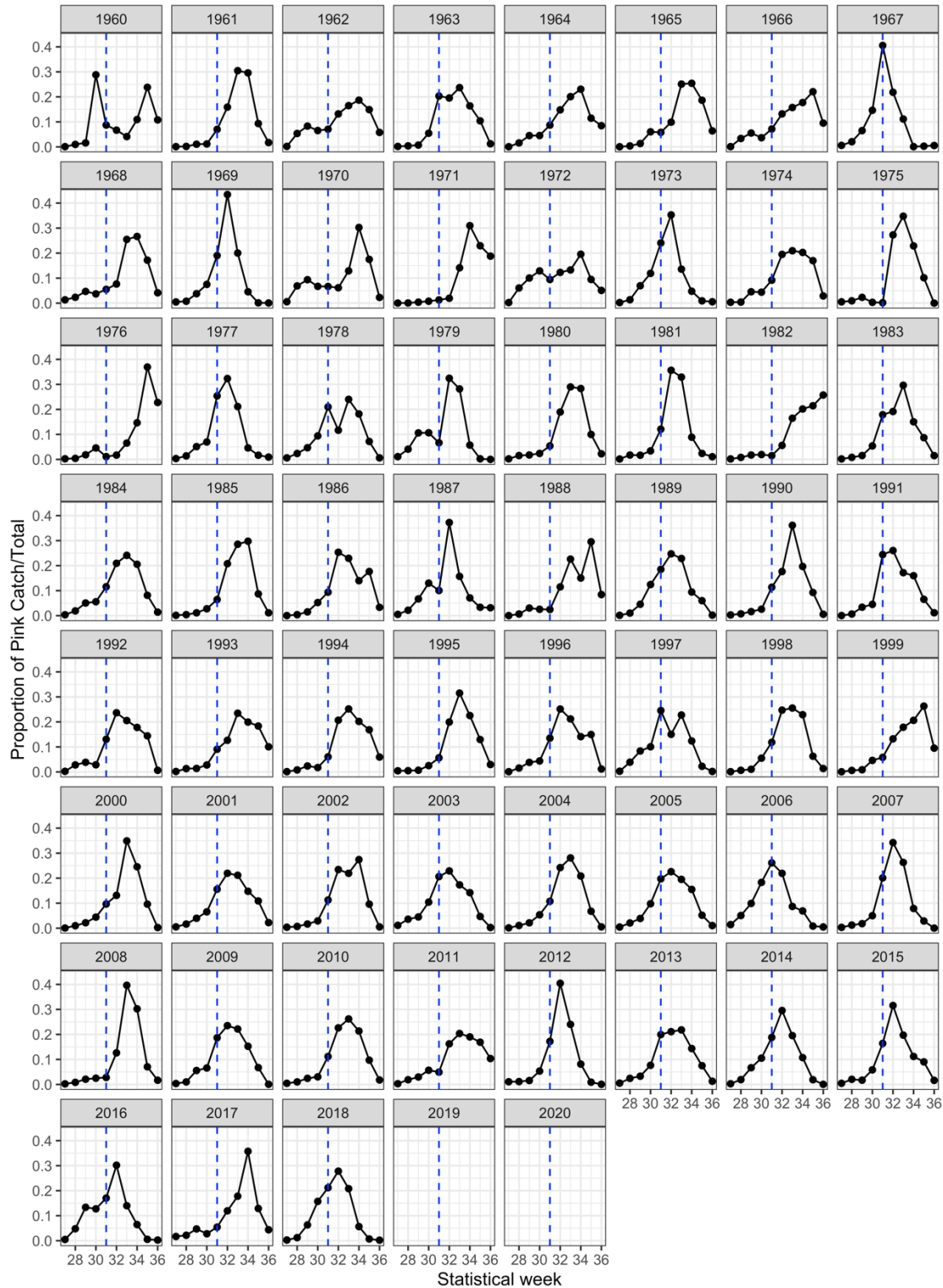


Figure 12: Weekly catch of pink salmon in the District 104 seine fishery from 1960-2018. The blue dotted line represents statistical week 31. Data from Piston, 2021.

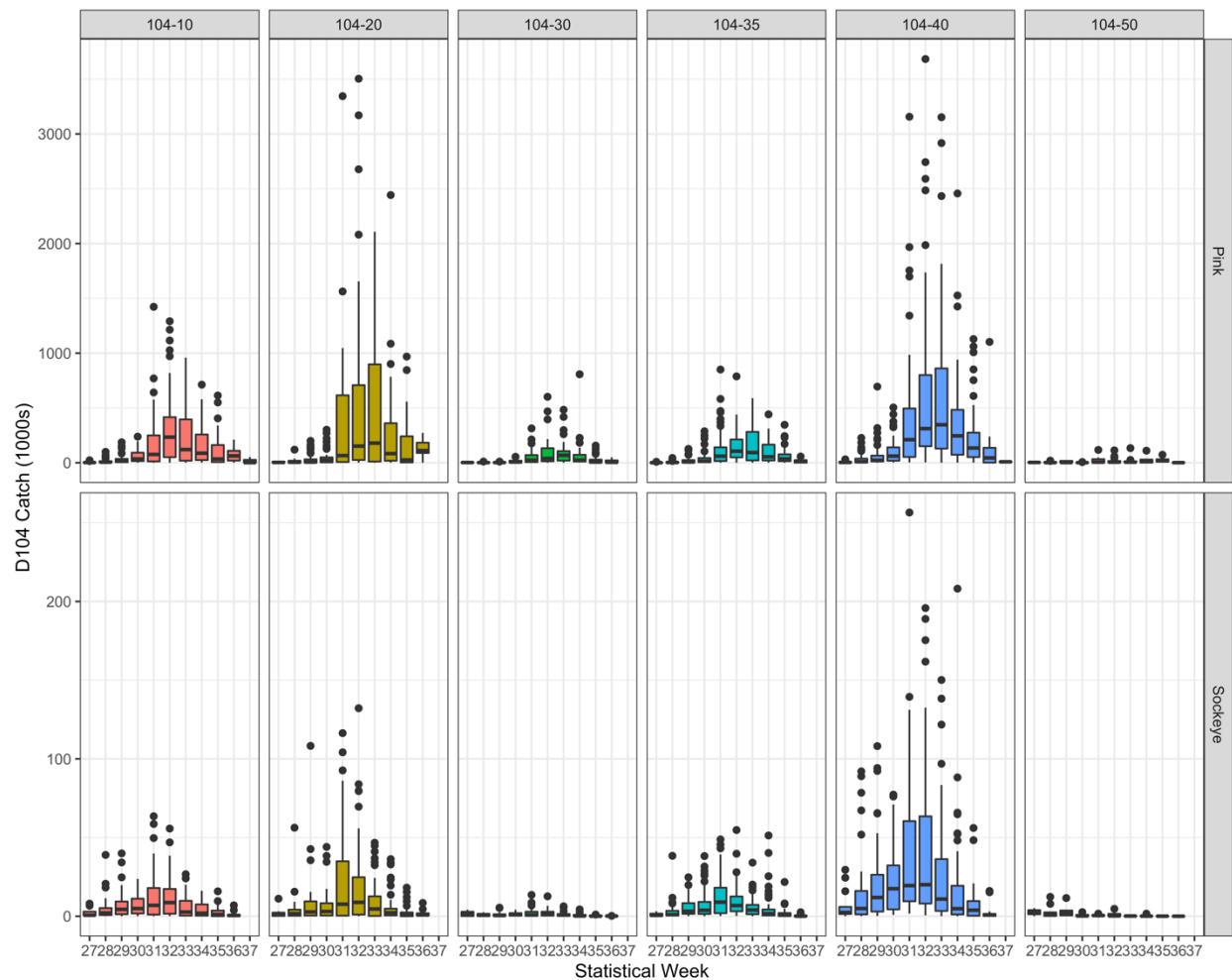


Figure 13: Southeast Alaska, US (SEAK) Pink and Sockeye Salmon catch in District 104 sub-areas by statistical week. This figure shows the distribution of Catch in thousands in District 104 sub-areas 104-10 to 104-50 of Pink (top) and Sockeye (bottom) Salmon by SEAK for statistical weeks 27-36 for years 1960-2018. The thick black line is the median value, the box indicates the interquartile range (25<sup>th</sup> to 75<sup>th</sup> percentiles – or middle 50% of the data), whiskers are 1.5x the interquartile range and dots are outliers (< 5<sup>th</sup> or > 95<sup>th</sup> percentile). Data from Piston (2021).



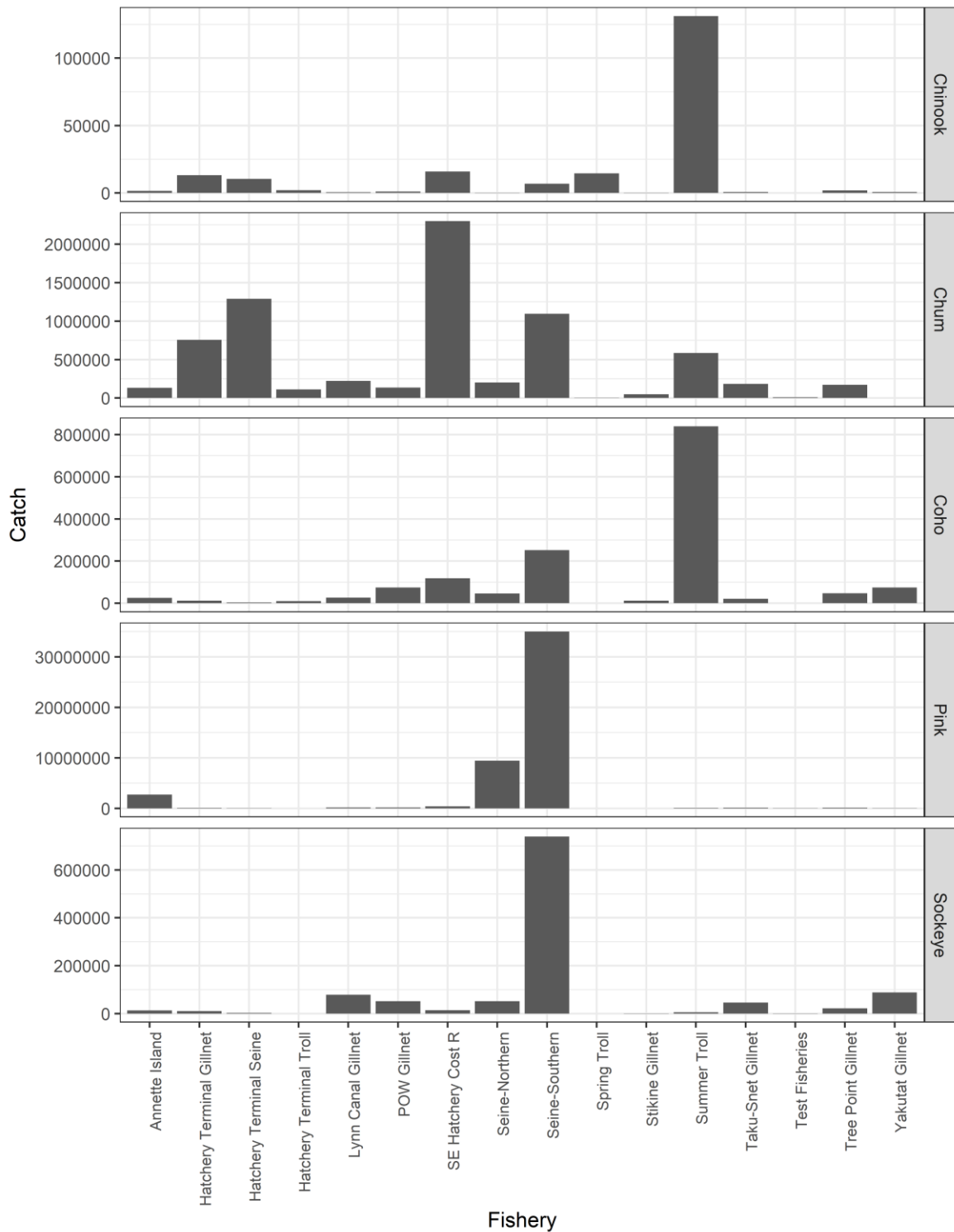


Figure 14: Harvest of all salmon species in SEAK fisheries in 2021. Source: ADFG Blue Sheet data 2021.

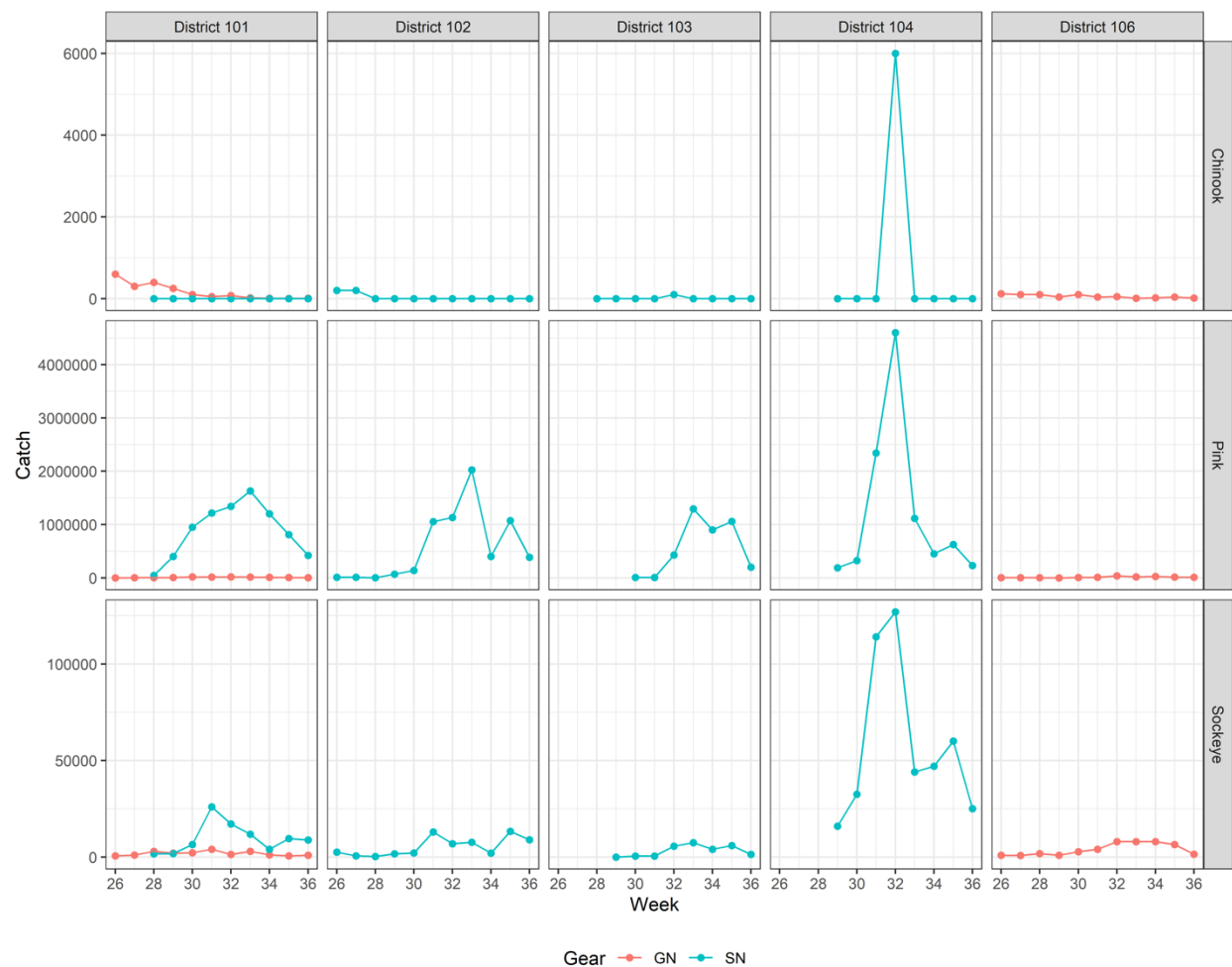


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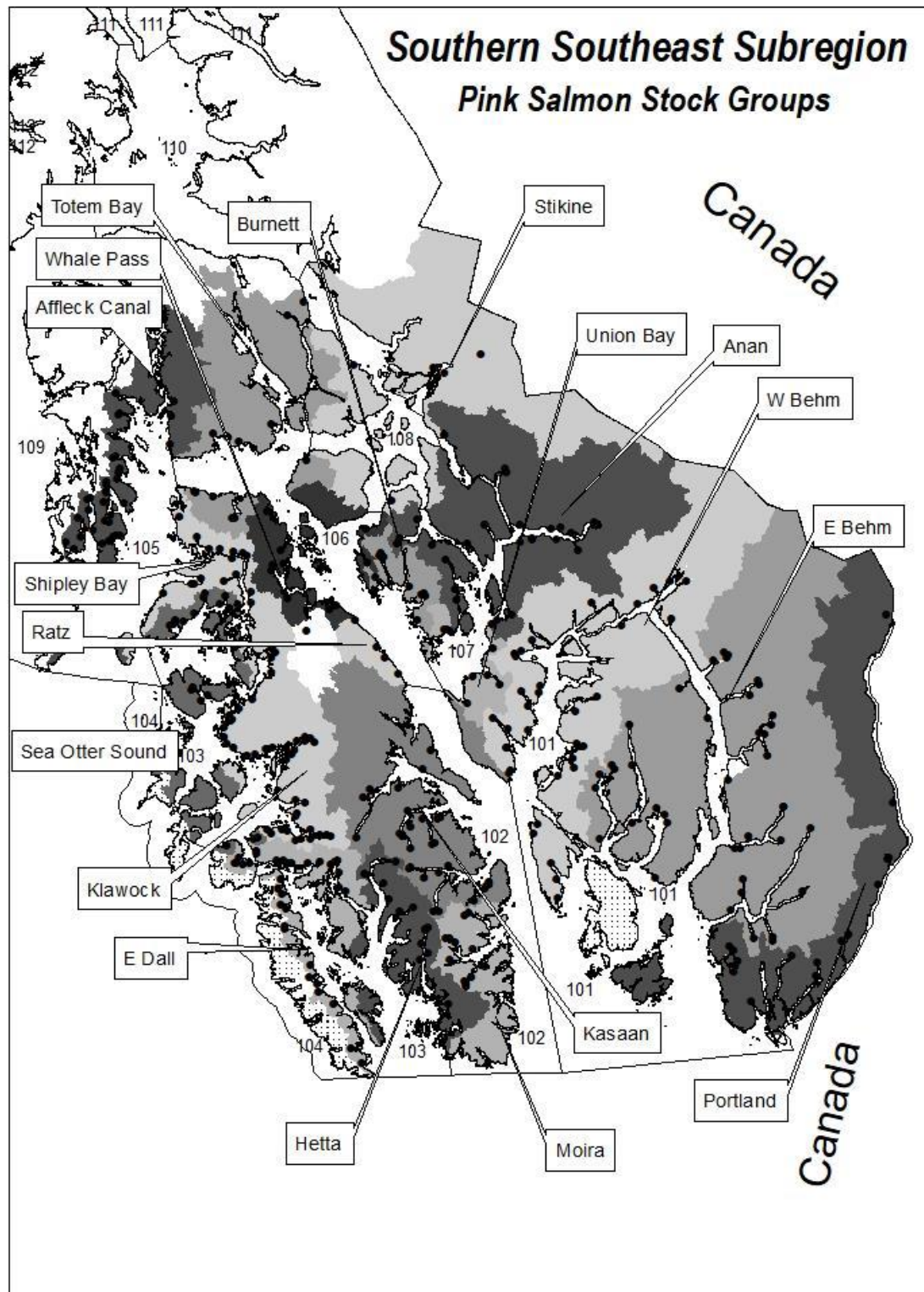


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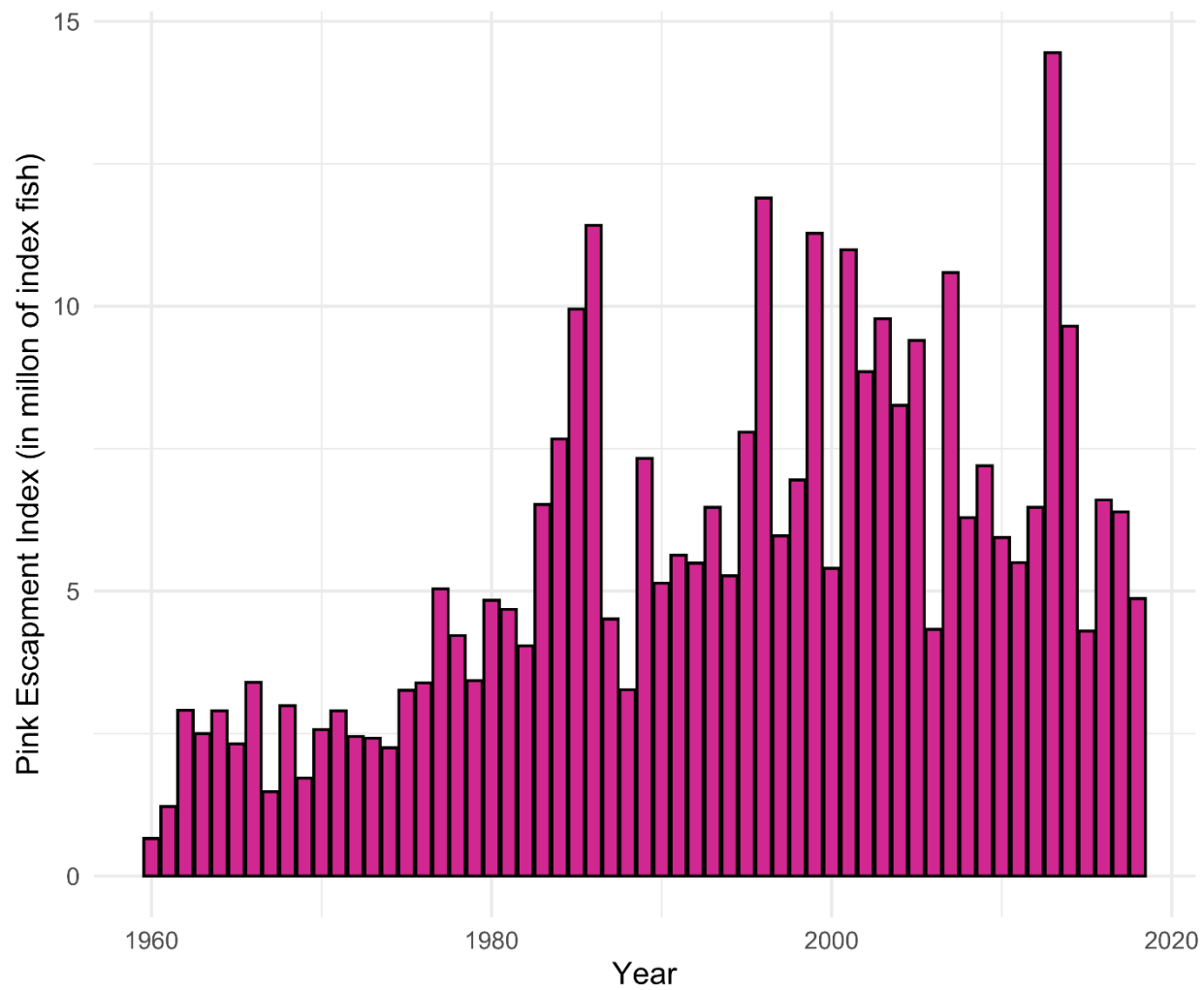


Figure 17: Southern Southeast Alaska, US (SSEAK) pink salmon escapement index in millions of index fish for years 1960-2018. Data from Piston (2021).

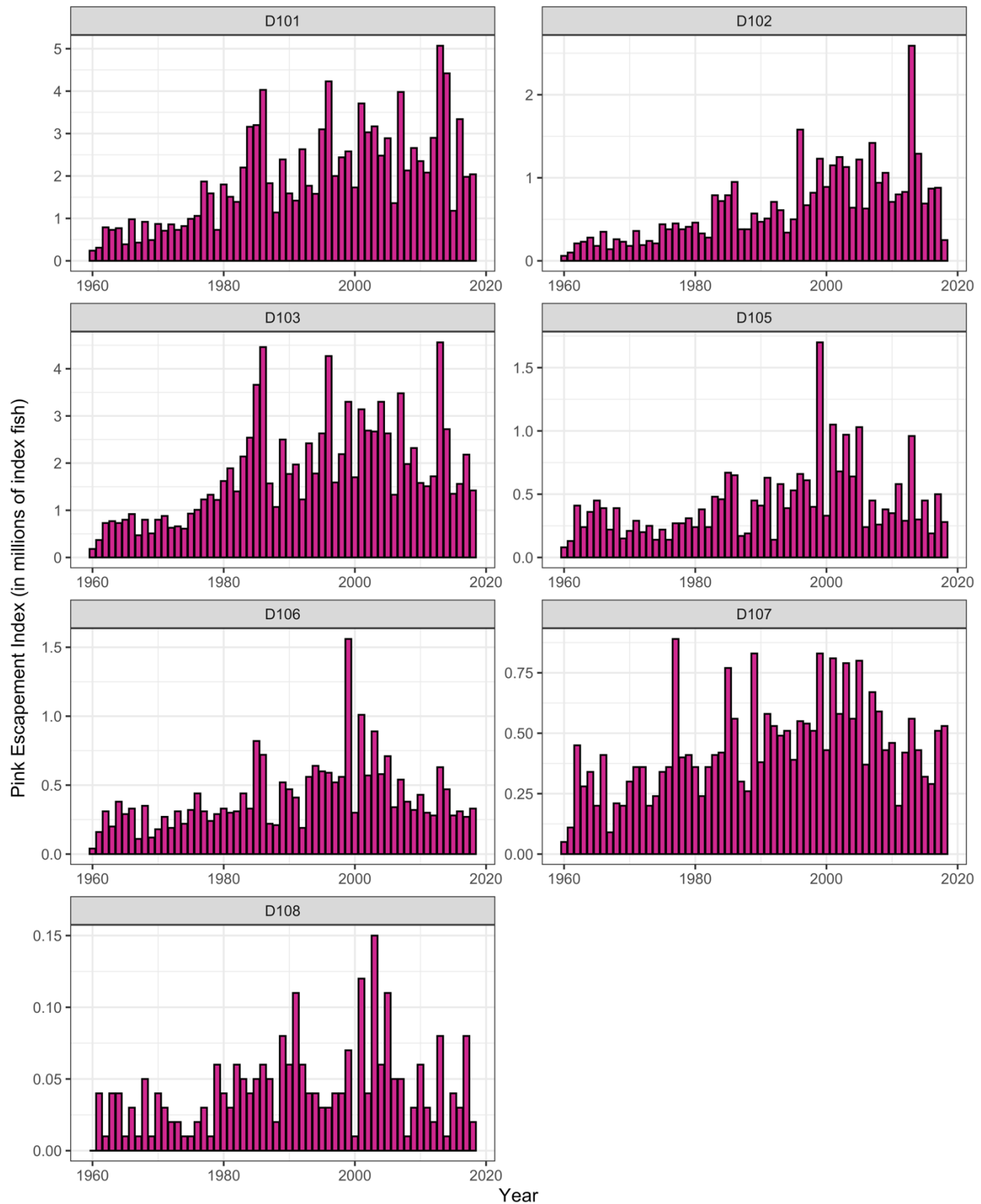


Figure 18: Southern Southeast Alaska, US (SSEAK) pink Salmon escapement index in million of index fish by district D101-D108 for years 1960-2018. Data from Piston (2021).