

Alaskan Harvest of BC Salmon: State of Knowledge

Part 3: Chinook Salmon

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

Information on Southeast Alaska (SEAK) catch of BC Chinook salmon was compiled from a number of sources including the Pacific Salmon Foundation Salmon Explorer, LGL Limited, PSC Chinook Technical Committee (CTC) reports and indicator stock mortality distribution tables derived from Coded Wire Tag (CWT) recovery information. We drew predominantly on the Pacific Salmon Explorer for coast wide Conservation Unit level data (PSF 2021) and LGL's North and Central Coast Run Reconstruction website for north coast Statistical Area level data (LGL 2021a). PSC CTC reports can be found online¹ as well as the most recent versions of the mortality distribution tables (PSC CTC 2021). There are also a number of reports on genetic stock composition in SEAK mixed-stock fisheries that we summarise (Crane et al. 2000; Templin et al. 2011; Gilk-Baumer et al. 2013, 2017a,b; Shedd 2020).

Background on the methodology for estimating SEAK catch of north and central coast Chinook salmon by Statistical Area and Conservation Unit is detailed in English et al. 2018 (Appendix D and Table 6).

We provide some background information on SEAK and southern Southeast Alaska (SSEAK) harvest of Chinook salmon historically and in 2021, as well as information on catch information and timing of catch in District 104. SEAK exploitation rates and proportion of total catch are summarised for north and central coast BC Statistical Areas and Conservation Units. We also present information on SEAK catch of Chinook using the PSC CTC mortality distribution tables based on CWT recoveries.

We do not currently have information on specific fisheries or Districts that contribute to exploitation rate estimates via CWT recoveries for Chinook, so we have used SEAK throughout this report where appropriate.

Table 1 provides a summary of the types of data used, the data source and the years the data covers. Figure 1 and Figure 2 provide maps of SEAK fishing Districts and North Coast BC DFO Statistical Areas respectively.

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

¹ <https://www.psc.org/publications/technical-reports/technical-committee-reports/chinook/>

Table 1: Types of data, sources, and year range used in this report for Chinook salmon by region. ADFG fishery data are not included in this table.

<i>Species</i>	<i>Region/Area</i>	<i>Type of Data</i>	<i>Data Source</i>	<i>Year</i>
<i>Chinook salmon</i>	BC NC/CC Areas 1-10, by Statistical Area	Escapement, harvest and exploitation rates from run reconstructions	LGL 2021 (North and Central Coast Run Reconstructions)	Various
	BC NC/CC Areas 1-10, by Conservation Unit	Escapement, harvest and exploitation rates from run reconstructions	PSF 2021 (Pacific Salmon Explorer)	Various
	All areas	Mortality distribution tables	PSC CTC 2021	Various
	BC	SEAK Fishery Genetic Stock Composition	Crane et al. 2000; Templin et al. 2011; Gilk-Baumer et al. 2013, 2017a,b; Shedd 2020	Various

2 SEAK Catch Of Chinook Salmon

Summary information on Chinook salmon harvest in SEAK and SSEAK (historically and for 2021) is provided in this report for context. SEAK catch and value (1979-2020) were downloaded from the ADFG website (ADFG 2021a). “Blue Sheet” commercial data from 1980-2020 were provided by ADFG (ADFG 2021b). Preliminary Chinook salmon harvest information for commercial SEAK harvest in 2021 by fishery type (“Blue Sheet Data”) was downloaded from the ADFG website (ADFG 2021c). District and gear level catch data from 1985-2020 and weekly District 104 catch by gear were also provided by ADFG (2021d and 2021e respectively).

- Total Chinook salmon catch in SEAK from 1979 to 2021 (2021 preliminary) is shown in Figure 3 and averaged 286,000 (median 271,000). Catch peaked in the mid-2000s, and since 2010 catches have averaged just under ~ 260,000 Chinook per year. Total SEAK catch of Chinook in 2021 was just over 200,000, below the recent and long-term averages.
- Chinook salmon catch in SEAK is historically dominated by power troll traditional (60%) and spring (11%) fisheries, with smaller contributions (< 25,000 median catch) from other fisheries (e.g., southern purse seine, hatchery cost recovery, etc.) (Figure 4). Median catch from 1979-2021 in the southern purse seine fisheries is just under 10,000, but in some years can be much higher (20-30,000). The total 2021 catch in Southern Purse Seine fisheries was 6,836 (ADFG 2021c), lower than the median catch at the ~ 35th percentile of all years.
- Figure 5 shows the catch over time by SEAK “Blue Sheet” fishery. Notably catches in the Power Troll Traditional Fishery are highly variable between years, and there is no major trend. The second most abundant fishery, Power Troll Spring Fishery, follows the same trend. Other fisheries show mixed trends. All fisheries catches are likely confounded by fishing regulations (e.g., non-retention periods) and local/regional Chinook abundance.

- Median total catch (all gears) of Chinook salmon in SSEAK Districts 101-106 shows that the median catch of Chinook catch is highest in District 104, followed by District 101. District 102, 103, 105 and 106 median catch is substantially lower. District 104 contributes about 43% over the entire time series, followed by District 101 at ~ 24% (Figure 6).
- Total catches (all gears) in District 104 is highly variable but has declined substantially since around 2000 (Figure 7). The last few years have seen relatively low catches at less than or around 20,000. District 101 catch has remained relatively constant since increasing in the 90s. Catch in District 104 was higher than in the last 4 years in 2021.
- The proportion of total District 101-106 catch of Chinook salmon for each district over time is shown in Figure 8. The proportion of Chinook salmon caught in District 104 has declined over time, and now represents between 25% and 40% in most years. District 101 proportion has increased to about the same, and Districts 102, 105 and 106 have remained relatively constant at low levels. The District 103 proportion was much higher than in previous recent years in 2020 and 2021. These shifts may have important implications related to harvest of specific stocks, if stock composition varies by District.
- In 2021, total SEAK catch of Chinook salmon (including Yakutat at 577 fish) was just over 200,000. SSEAK Districts 101-106 accounted for only about 50,000 of that. As in most years, most catch was taken in the summer troll fishery (~ 61% or 131,000) (Figure 9).
- District 104 only catch of Chinook salmon in 2021 was ~20,000, split between power troll (~13,500) and seine (~6,000) fisheries. In 2021, the Chinook retention period in the District 104 seine fishery retention was only ~ 2 days, suggesting that there were many more releases that we do not currently have information on. This means that total mortalities were likely much higher than the 6,000 recorded kept catch. Weekly catch in purse seine fisheries shows the catch during the retention period in Week 32, with catch in the power troll fishery highest in Weeks 27 and 28. was highest in Week 31 and 32, with a significant catch later on in Week 36 (Figure 10). 2021 data is preliminary.

3 SEAK Catch of BC Origin Chinook

This section of the report provides a summary of information on SEAK exploitation rates on BC Chinook salmon, as well as proportions of SEAK exploitation by Statistical Area and Conservation Unit for north and central coast BC (Areas 1-10).

3.1 North Coast and Central Coast Exploitation Rates

3.1.1 Statistical Areas

Estimates of SEAK exploitation rates on north and central coast Chinook salmon from 1985 to 2017 are derived using various methods as detailed in Appendix D of English et al. (2018). It is beyond the scope of this report to provide all the details for each statistical area, but they are largely derived from CWT indicator stocks from Kitsumkalum River Chinook (Area 4-Skeena) and Atnarko River Chinook (Area 8-Central Coast), or genetic data (e.g., Area 3 Chinook). Numerous assumptions are made for years missing data to infill missing years or infer exploitation rates from one area to another (see Appendix E, English et al. 2018).

Canadian exploitation rates for north and central coast BC Chinook Areas with data are shown in Figure 11. Area 9S refers to Area 9 Summer Chinook, and Area 9W refers to Wannock Chinook.

- Canadian exploitation rates have been variable, but in general have remained relatively constant (Areas 3, 6, 9W, and 9S), increased (Area 8) or decreased (Area 10) (Figure 11). There is little

recent data for Areas 10, and Area 8 ERs are likely driven by catch of enhanced Atnarko River Chinook.

- SEAK ERs have increased (9W and 9S), averaged about the same (Areas 3, 4, and 6), or decreased (Areas 8 and 10). over time. Area 4 ERs were historically the highest, averaging around ~40-50%, dropped in the late 90s and in recent years have averaged between 10 and 20%. SEAK ERs range from near 0 to close to 40% in some Areas (Area 9W and 9S in recent years).
- The proportion of exploitation attributed to SEAK fisheries for north and central coast Chinook salmon is shown in Figure 12. Canadian exploitation rates include both Section 35(1) FSC catches and any sport catches, where as SEAK exploitation rates are based on commercial fisheries only.² SEAK percent of exploitation ranges widely between Areas, with SEAK proportion very low in Area 3, between 20-50% in Area 4, between near 0 and 50% in Area 6, between 12 and 50% in Area 8 (but declining in recent years), between ~ 10% and 75% and increasing in recent years for Areas 9S, 9W and 10.

3.1.2 Conservation Units

Extrapolation of Statistical Area SEAK ER estimates to Chinook CUs are detailed in Table 5 of English et al. (2018). We are currently working with LGL and PSF to resolve a data issue for the Northern Coastal Streams and Dean River CUs, and will update this report with revised data once resolved. Since SEAK ERs in CUs are derived from the related Statistical Areas, the basic patterns described above for Statistical Areas hold true for CUs within their respective Areas.

- Distribution of SEAK ERs on Chinook salmon by CU are shown in Figure 13. Median SEAK ERs range from almost 20% to 2%, following the patterns for Area specific ERs. Due to information on run-timing, there are some Skeena CUs (Upper Bulkley River and Kalum-Early Timing) with much lower median ERs (10% of Kalum-Late Timing estimates). Central coast CUs median SEAK ER is around 10%, but much higher in some years (note trends in recent years above). There is some variation in the years included in median values as some CUs are missing some years that others are not.
- Figure 14 shows SEAK ERs over time by CU for north and central coast CUs. There is some variation in trends between CUs, however following Area specific SEAK ERs, there are substantial increases in SEAK ERs in recent years in Rivers Inlet and Wannock Chinook CUs. SEAK ER on Skeena CUs

3.2 South Coast Area and CU Specific Exploitation Rates

When we accessed the Pacific Salmon Explorer in October, 2021, there were no Chinook CUs in the south coast, Vancouver Island, or Fraser areas with exploitation rate information. We are currently following up with DFO Stock Assessment to determine if estimates of SEAK ERs on stocks other than CTC indicator stocks are available, and if the CTC indicator stock mortality distribution data (discussed below) can be used as a proxy for other populations and areas.

• ² This may lead to some bias, however the proportion of SEAK exploitation commercial only catch would be higher if CDN FSC and sport were not included. Unfortunately, separate estimates of CDN FSC and sport exploitation rates were not available at the time of report writing, but will be investigated further.

3.3 CWT Indicator Stocks

We downloaded the mortality distribution tables for all CTC indicator stocks (PSC CTC 2021), which contains exploitation rate data derived from CWT recoveries in fisheries from Alaska to California. We then extracted the information for Canadian stocks and manipulated the data for analysis in R.

The mortality distribution tables provide estimates of mortality in fisheries for CTC indicator stocks. These were converted to ERs and SEAK fishery data was compiled. Six SEAK fisheries were identified, SEAK net, troll and sport, and SEAK Terminal net, troll and sport. We did not include the Terminal fisheries for stocks that return to north and south coast BC in figures, since they have extremely low ERs on all stocks in the vast majority of years (not including Transboundary Rivers, which have much higher terminal SEAK ERs). However they are included in calculations of total SEAK ER by stock. We identified 15 stocks with information on SEAK ERs in our summary.

- Median exploitation rates in SEAK net and sport fisheries range from 0 to ~ 5%, and median ERs in SEAK troll fisheries range from 0 to 15% (Figure 15). SEAK troll fisheries have the highest median ERs for all stocks. Stocks from all regions (ECVI, Fraser, ISC, North Coast, and WCVI) have significant ERs in SEAK fisheries.
- Furthermore, 2 groups of stocks are immediately apparent; there are many stocks (Nanaimo, Cowichan, Harrison, Chilliwak, Nicola and Dome) that have very low presence in any of the SEAK fisheries. This is consistent with what we know about their life history and marine distribution patterns (see for example Riddell et al. 2013).
- Median total SEAK ERs range from near 0 to 20% (Table 2, Figure 16) Table 2: Median total and fishery specific SEAK ERs for CTC indicator stocks included in this summary.. There is no consistent pattern across regions, SEAK ERs are highest on Robertson Chinook, followed by Kitsumkalum and Quinsum, and then Phillips, Lower Shuswap, Atnarko, Big Qualicum, Middle Shuswap and Puntledge.

Table 2: Median total and fishery specific SEAK ERs for CTC indicator stocks included in this summary.

Stock	Region	Total ER	Terminal Fisheries					
			SEAK.Net	SEAK.Sport	SEAK.Troll	SEAK.Net	SEAK.Sport	SEAK.Troll
Robertson	WCVI	20.51	2.55	2.03	14.20	0.00	0.00	0.00
Kitsumkalum	North Coast	20.06	0.00	3.55	13.90	0.00	0.00	0.00
Quinsum	ECVI	19.76	4.99	1.84	11.95	0.00	0.00	0.00
Phillips	ISC	15.53	4.73	1.56	9.29	0.00	0.00	0.00
Lower Shuswap	Fraser	13.54	0.01	0.88	10.43	0.00	0.00	0.00
Atnarko	North Coast	7.98	0.04	0.53	6.53	0.00	0.00	0.00
Big Qualicum	ECVI	7.66	0.81	0.00	4.93	0.00	0.00	0.00
Middle Shuswap	Fraser	4.71	0.00	0.53	4.23	0.00	0.00	0.00
Puntledge	ECVI	4.24	0.00	0.00	3.03	0.00	0.00	0.00
Nanaimo	ECVI	0.95	0.00	0.00	0.42	0.00	0.00	0.00
Cowichan	ECVI	0.53	0.00	0.00	0.30	0.00	0.00	0.00
Harrison	Fraser	0.37	0.00	0.00	0.27	0.00	0.00	0.00
Chilliwack	Fraser	0.13	0.00	0.00	0.13	0.00	0.00	0.00
Dome	Fraser	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nicola	Fraser	0.00	0.00	0.00	0.00	0.00	0.00	0.00

- Figure 17 shows total SEAK ERs by year for Canadian CTC Chinook indicator stocks (excluding Transboundary systems). Total SEAK ERs have trended lower in recent years for most stocks, with the exception of Puntledge River, which increased slightly in the 2000s and has remained

relatively stable since. Note that the Phillips and Middle Shuswap stocks have short time series (< 10 years).

For more details on the specifics of the PSC CTC Chinook indicator and CWT programs, we refer you to the PSC CTC website and technical reports³.

3.4 Genetic Data

We reviewed a series of Genetic Stock Identification (GSI) reports detailing stock compositions from sampling conducted in SEAK fisheries from 1998 to 2019. They are focused on the summer troll fishery in most cases, with a 2016 exception for sampling in sport fisheries.

Table 3: Summary of key findings related to Canadian Chinook caught in SEAK troll and sport fisheries based on genetic stock ID (1999-2019).

<i>Source</i>	<i>Fishery/Year</i>	<i>Key Findings</i>
<i>Crane et al. 2000</i>	Summer Troll/1998	1. WCVI (17%) and Thompson River (14%) Chinook were large contributors to legal samples. 2. Strait of Georgia Chinook (14%) were large contributors to sub-legal Chinook samples.
<i>Templin et al. 2011</i>	Troll fisheries (1999-2003)	WCVI, Thompson River, Central BC (CBC), Skeena and Nass River, and Strait of Georgia Chinook all contribute significant catch to troll fisheries.
<i>Gilk-Baumer et al. 2013</i>	Troll fisheries (2004-2009)	The Canada reporting group (CBC, WCVI, ECVI) was a prominent contributor in all troll (winter, spring, summer) in most years, although there was some variation in timing and specific contributions.
<i>Gilk-Baumer et al. 2015</i>	Troll fisheries/2015	North/Central BC, South Thompson and WCVI Chinook were among the most important contributors to troll fisheries.
<i>Gilk-Baumer et al. 2017</i>	Troll fisheries/2016	North/Central BC, South Thompson and WCVI Chinook were among the most important contributors to troll and sport fisheries.
<i>Shedd 2019</i>	Troll and sport fisheries/2019	South Thompson and WCVI each contributed > 10% to troll fisheries. WCVI and South Thompson contributed significantly to sport fisheries.

Results from these studies are largely in agreement with PSC CTC Chinook indicator stock mortality distributions based on CWTs and presented by region in the previous section. Although there is considerable interannual variability, Chinook stocks from WCVI, Thompson River, Central BC, Skeena and Nass, ECVI were important contributors to SEAK troll and sport fisheries. A comprehensive stock by stock and fishery by fishery review of these studies is outside the scope of this report, however the referenced reports contain many more details on timing and seasonal variation in stock composition results.

³ <https://www.psc.org/publications/technical-reports/technical-committee-reports/chinook/>

3.5 1980s Release Studies

Reports completed in 1987 and 1988 (Rowse and Marshall 1988; Rowse 1989) surveyed fishers on numbers of Chinook released, retained for personal use, or retained for sale. The reports estimated that total mortalities of Chinook were many times higher than what was reported on sales slips. We could not find similar reports for recent years.

3.6 2021 Estimates

2021 estimates of SEAK ERs for Chinook salmon will not be available in the immediate future. Based on recent trends and catches in SEAK in 2021, it would be expected that estimates of SEAK ERs on north and central coast BC would follow recent trends.

4 Information Gaps

We were unable to find direct information on the number of Chinook releases (sub-legal and legal) during periods of seine retention, other than those presented in the PSC CTC Technical Reports (see PSC CTC 2020 for example). In 2021, Chinook retention was only ~ 2 days in the District 104 purse seine fishery. During that time, almost 6,000 Chinook were caught, retained and recorded. It is unknown how many releases there were during the non-retention period throughout the rest of the season. Furthermore, it is unknown if there is any catch salmon of released Chinook in non-retention periods. This makes it difficult to determine total mortalities, or stock compositions during non-retention periods.

5 References

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6 Figures

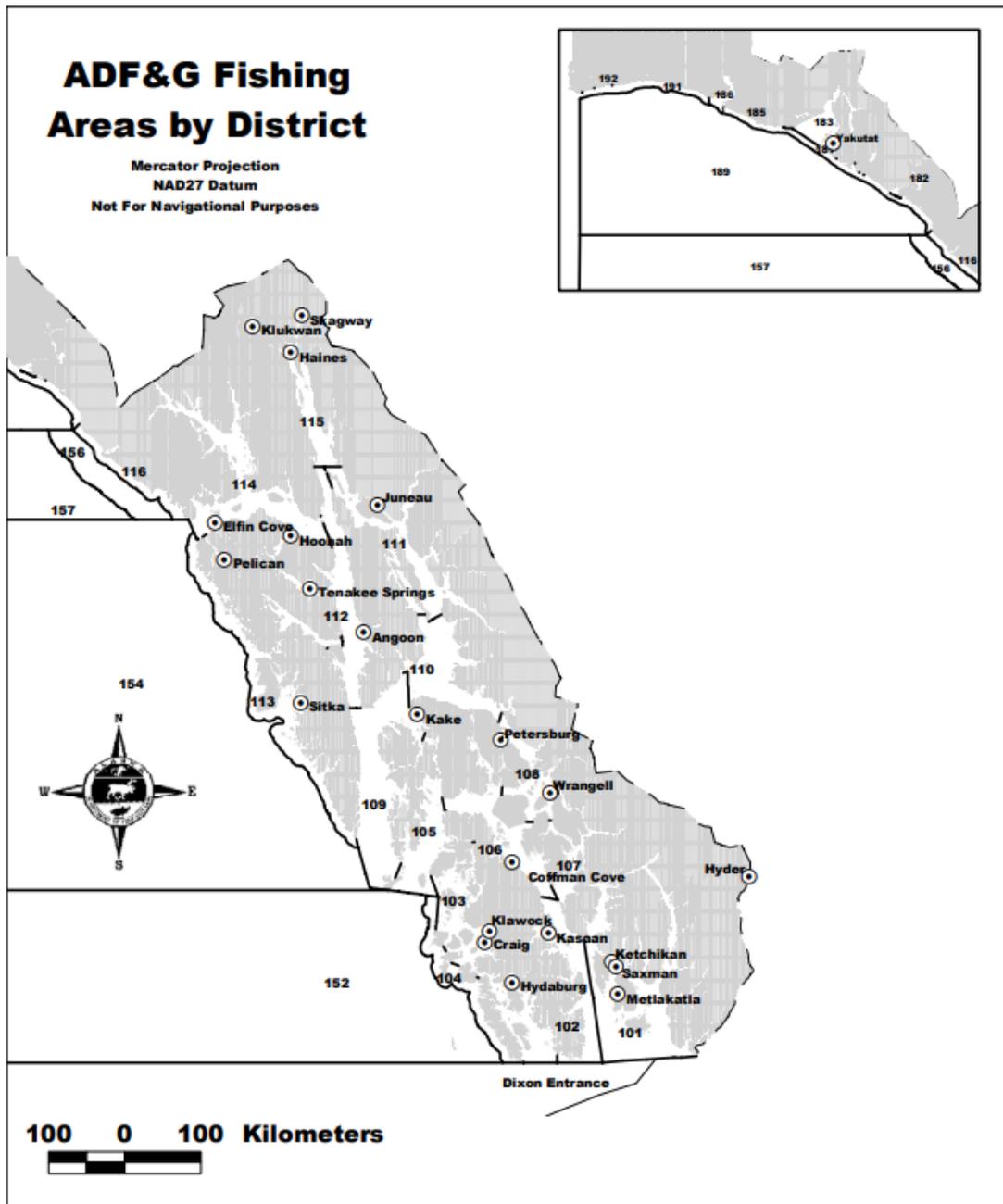


Figure 1: Map of Southeast Alaska Fishing Areas by District.

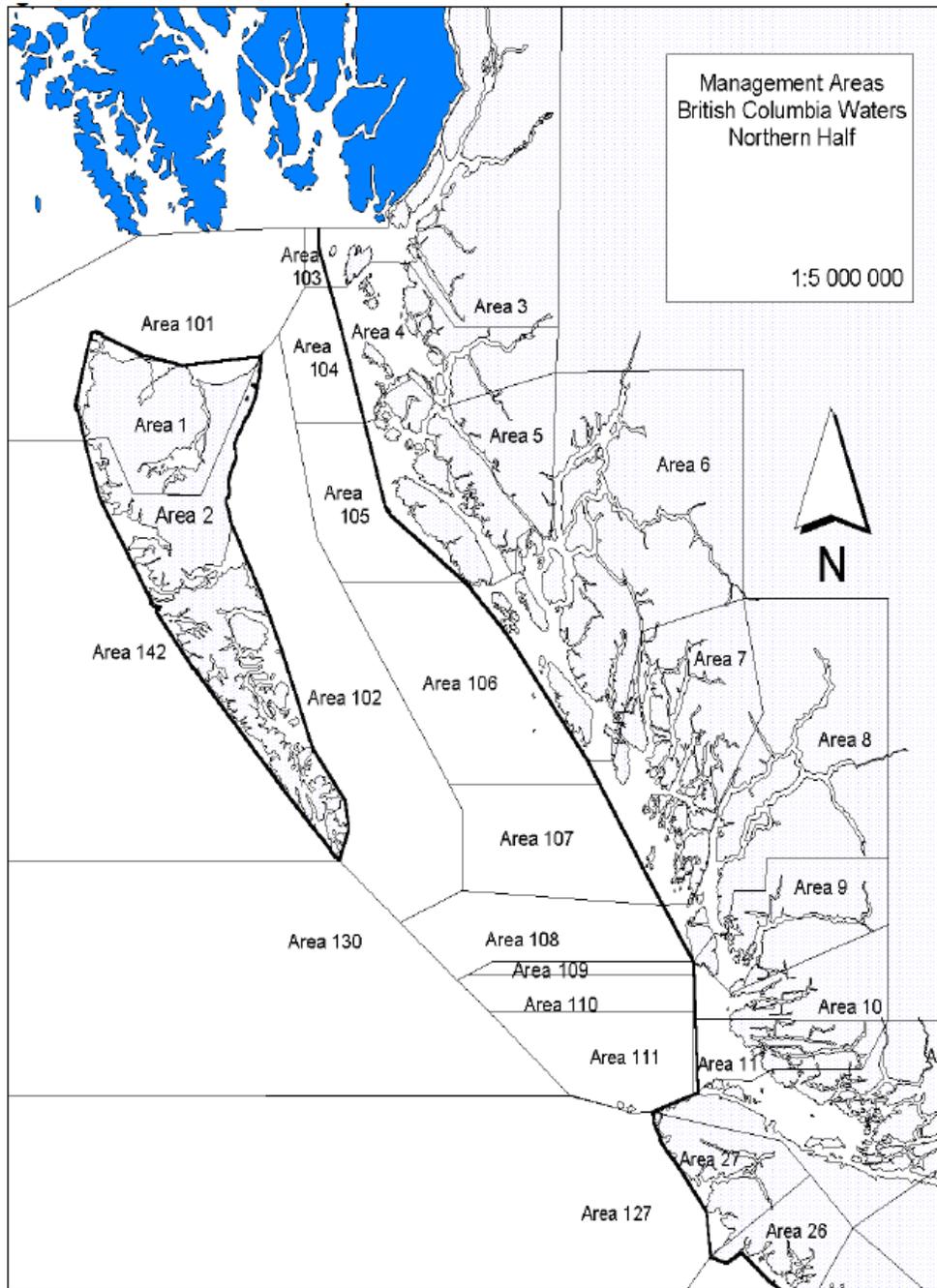


Figure 2. Map of DFO Statistical Areas in the North and Central Coast Areas.

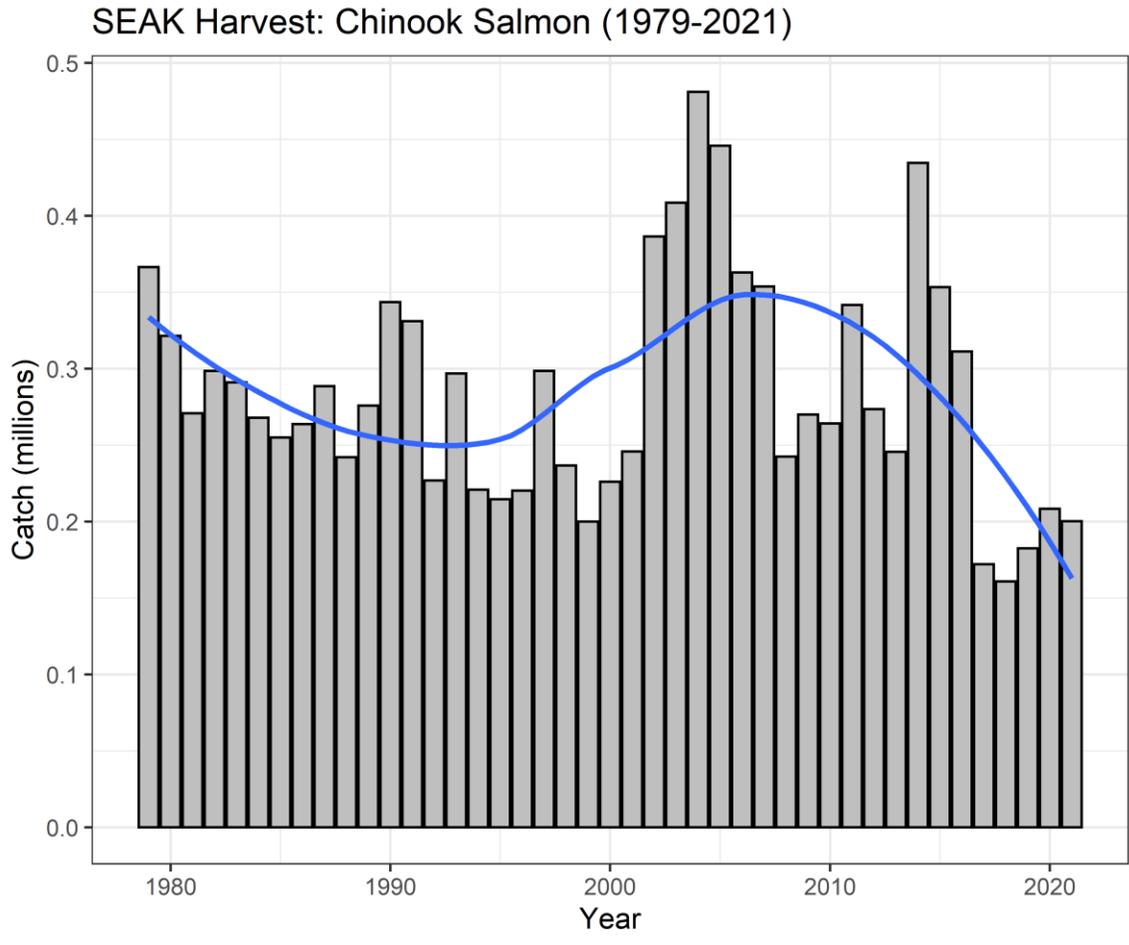


Figure 3: Total SEAK harvest (millions of fish) of Chinook salmon from 1979-2021. Blue line is fit using LOESS.
 Source: ADFG 2021a (1979-2020), ADFG 2021b (2021).

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

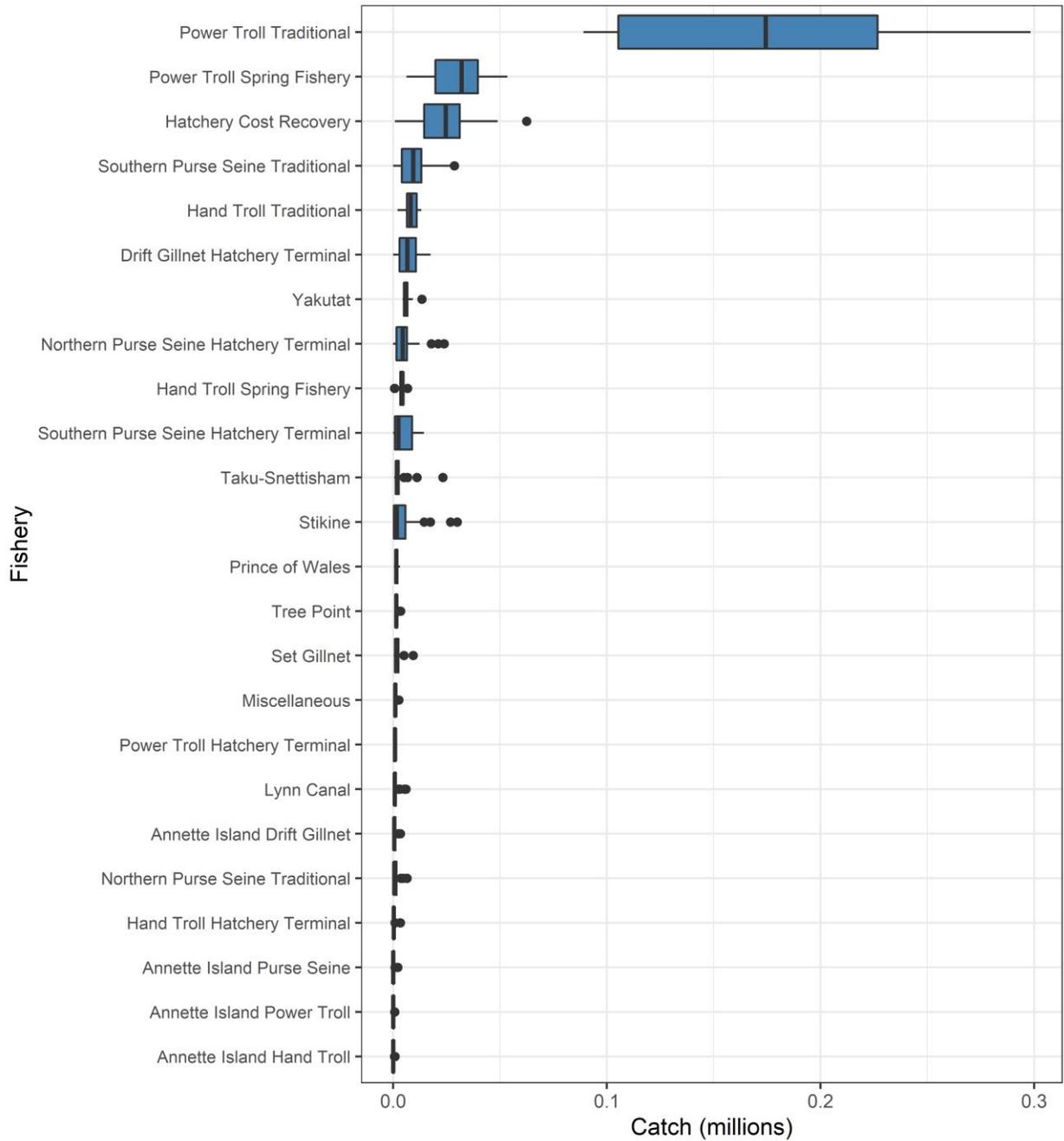


Figure 4: Distribution of total Chinook salmon commercial catch in SEAK “Blue Sheet” fisheries 1980-2021. Fisheries are ordered from highest catch to lowest catch. The thick black line is the median value, the box in indicates the interquartile range (25th to 75th percentiles – or middle 50% of the data), whiskers are 1.5x the interquartile range and dots are outliers (< 5th or > 95th percentile). Source: ADFG 2021c.

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

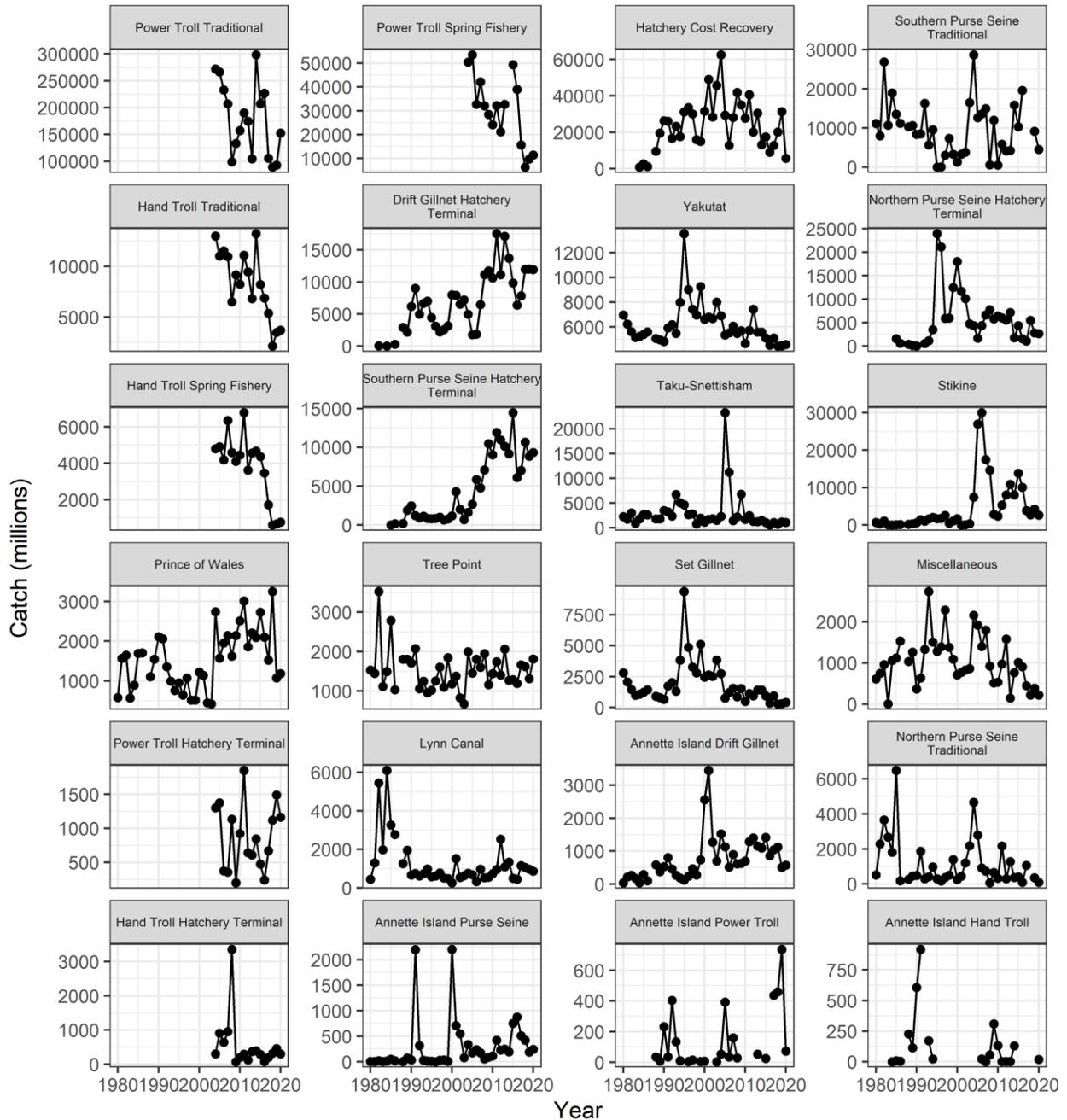


Figure 5: Total Chinook salmon commercial catch in SEAK “Blue Sheet” fisheries by year for 1980-2021. Note y-axis scales are not equal. Fisheries are ordered from highest all year median catch to lowest. The thick black line is the median value, the box indicates the interquartile range (25th to 75th percentiles – or middle 50% of the data), whiskers are 1.5x the interquartile range and dots are outliers (< 5th or > 95th percentile). Source: ADFG 2021c.

Total SSEAK Catch All Gear by District (101-106) Chinook Salmon (1985-2021)

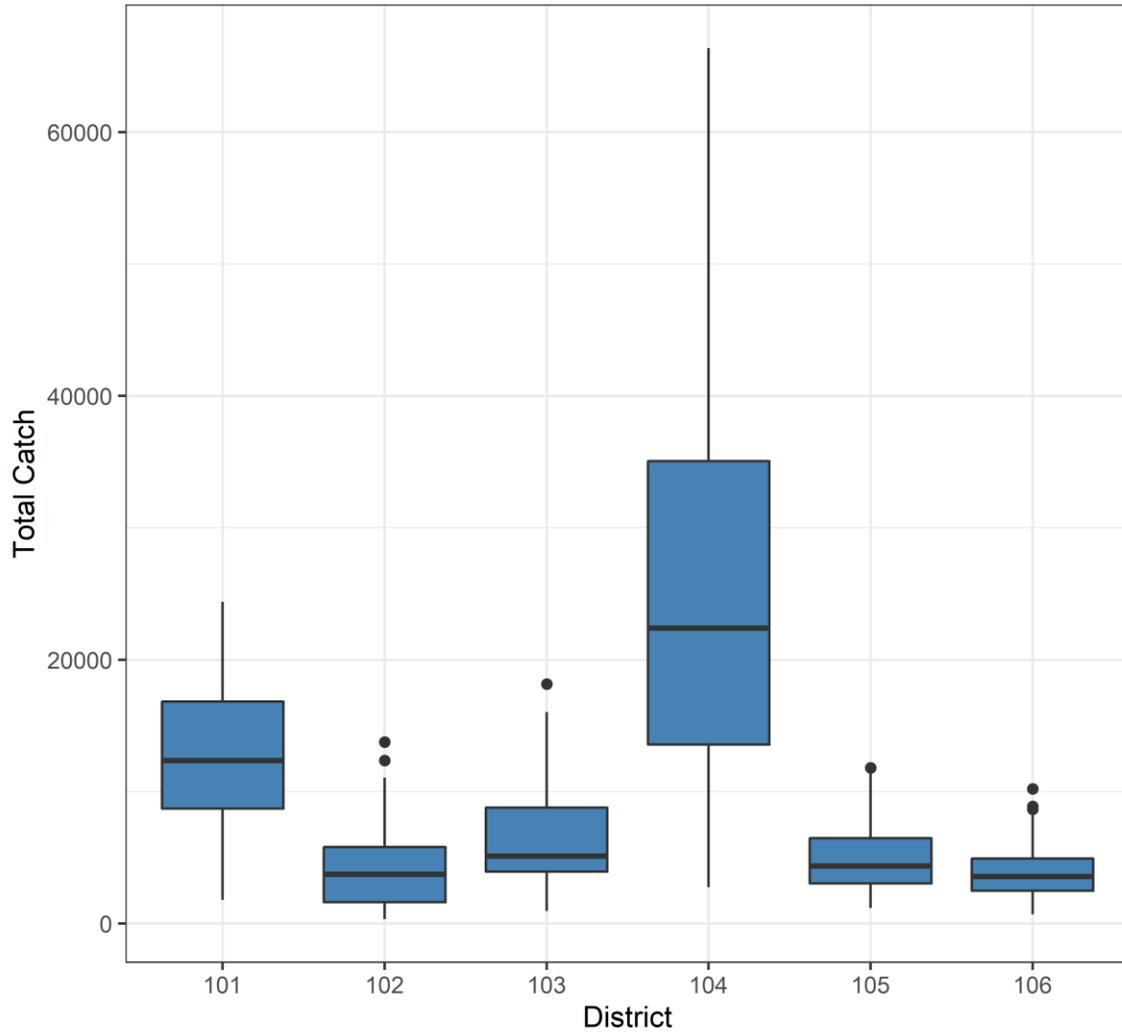


Figure 6: Median catch of Chinook salmon from all gears in SSEAK fisheries by district (districts 101-106) from 1985-2021. The thick black line is the median value, the box indicates the interquartile range (25th to 75th percentiles – or middle 50% of the data), whiskers are 1.5x the interquartile range and dots are outliers (< 5th or > 95th percentile). Source: ADFG 2021d.

SSEAK Catch All Gear by District (101-106)
Chinook Salmon (1985-2021)

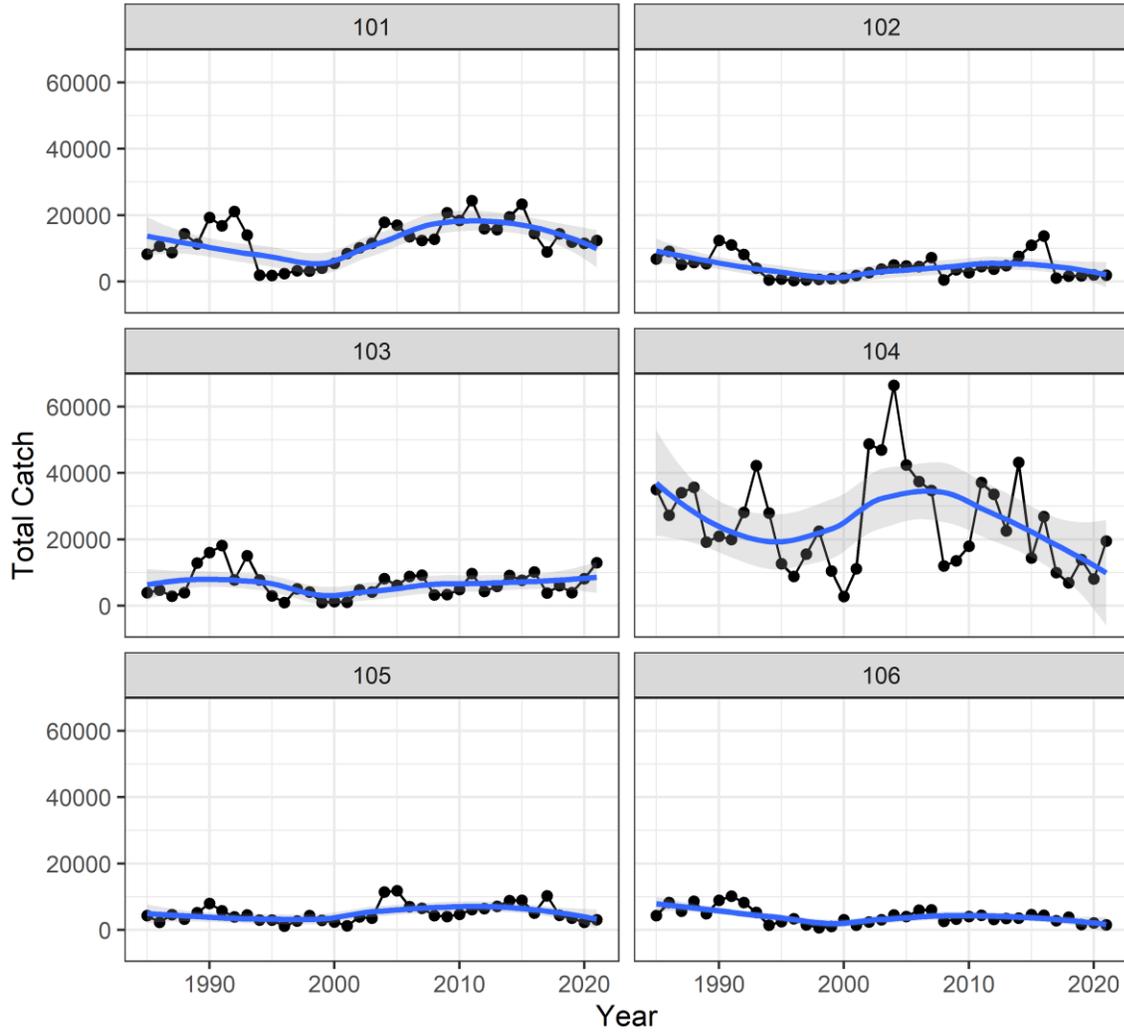


Figure 7: Total catch of Chinook salmon by year for SSEAK Districts 101-106 (1985-2021). Smoothed lines are derived by LOESS with standard errors shown in grey. Source: ADFG 2021d.

Proportion of Total D101-106 Catch Chinook Salmon (1985-2021)

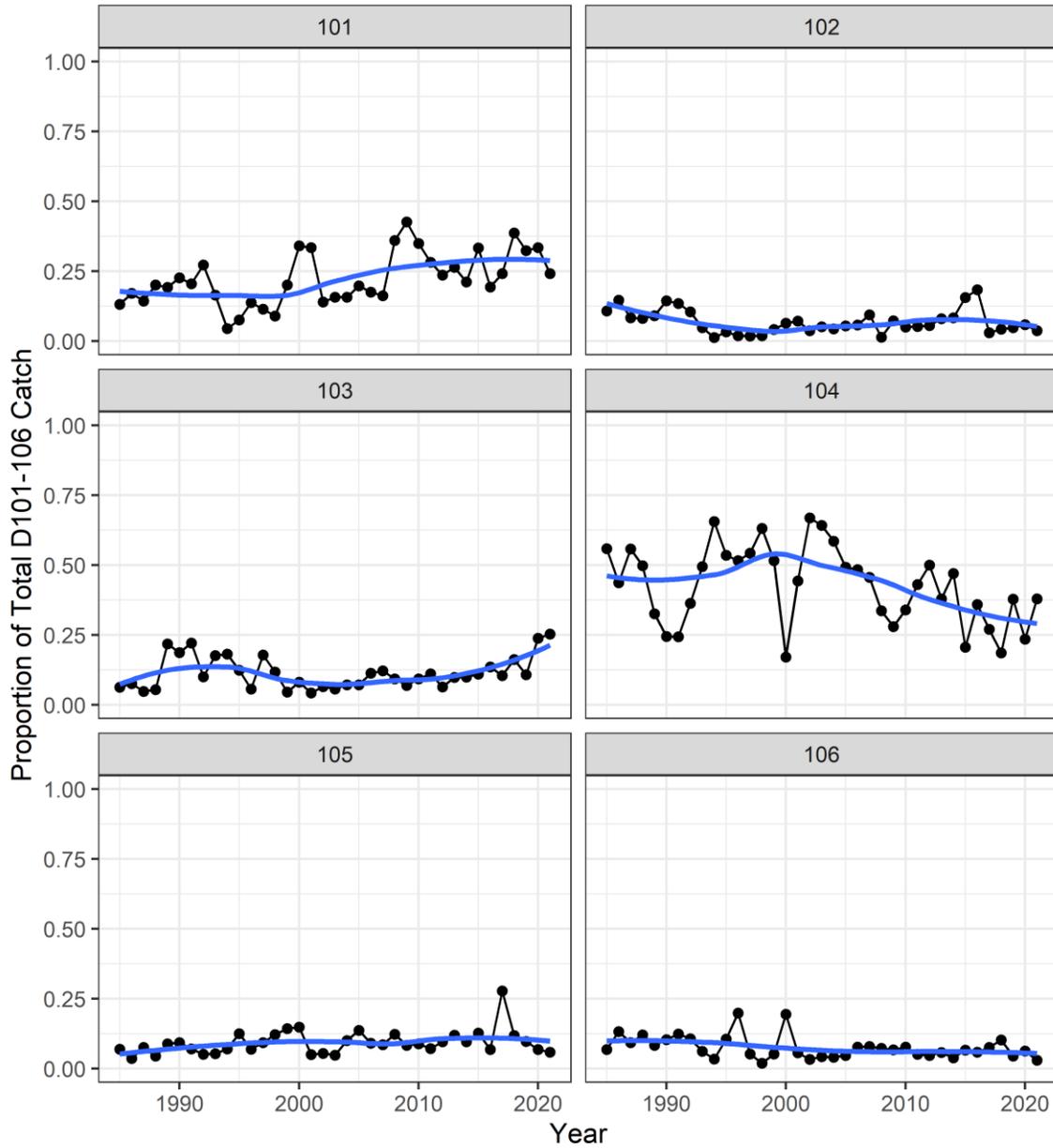


Figure 8: Proportion of total SSEAK District 101-106 Chinook salmon catch (all gears) by year for 1985-2021. Blue lines are estimated by LOESS fits. Source: ADFG 2021d.

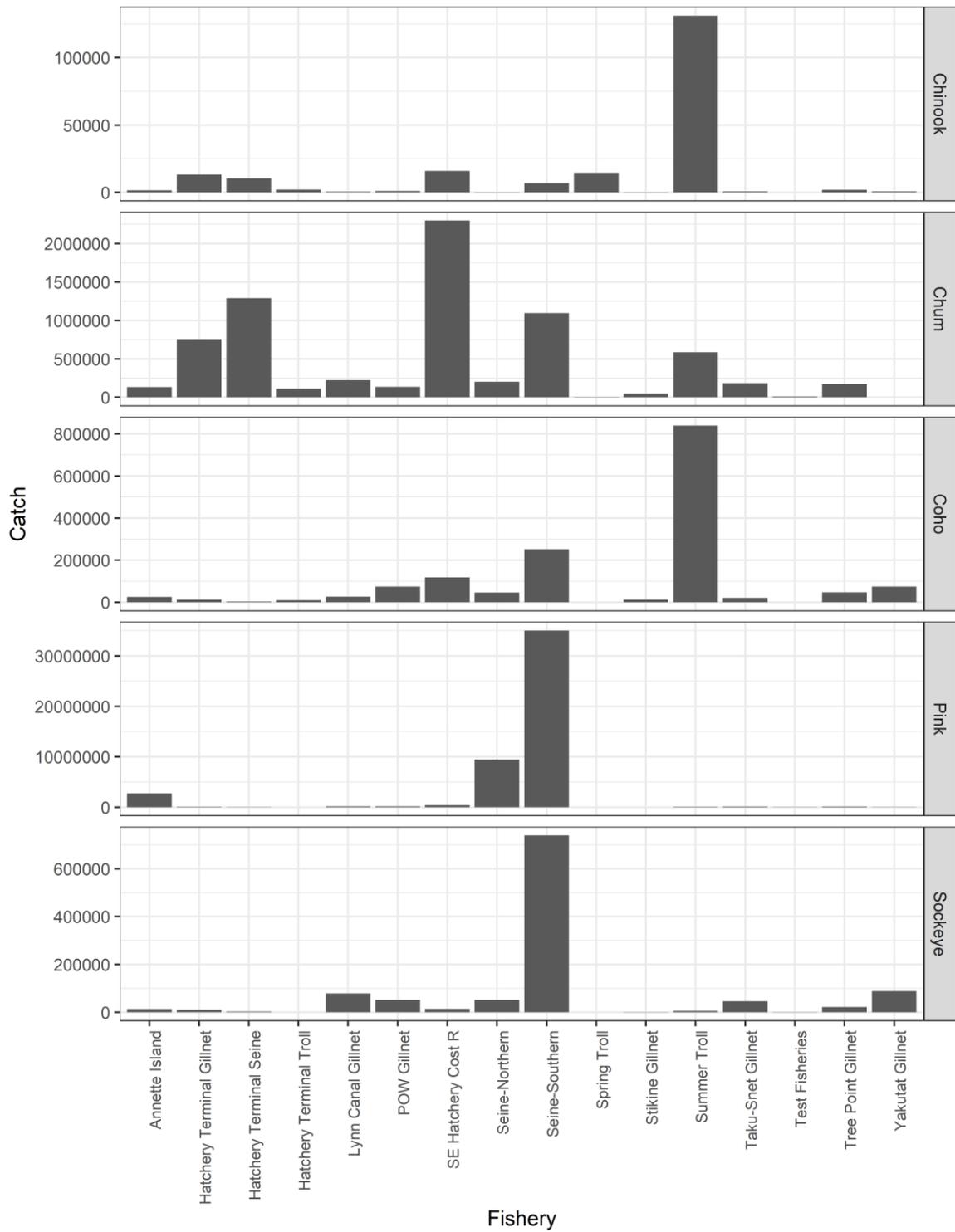


Figure 9: Harvest of all salmon species in SEAK “Blue Sheet” commercial fisheries in 2021. Source: ADFG 2021b.

Weekly Harvest of Chinook Salmon by Gear Type District 104: 2021

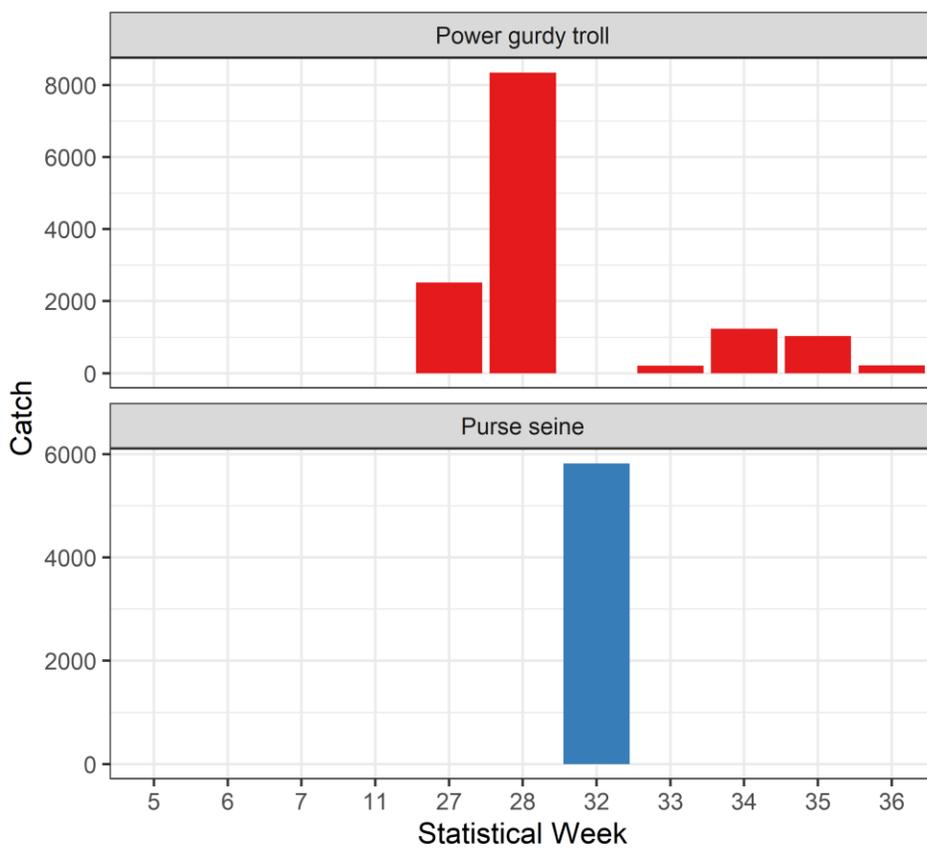


Figure 10: Weekly catch of Chinook salmon in District 104 fisheries by gear type for 2021. Note y-axis scales are not the same between panels. Source: ADFG 2021e.

SEAK and CDN Exploitation Rates Chinook (1985-2017)

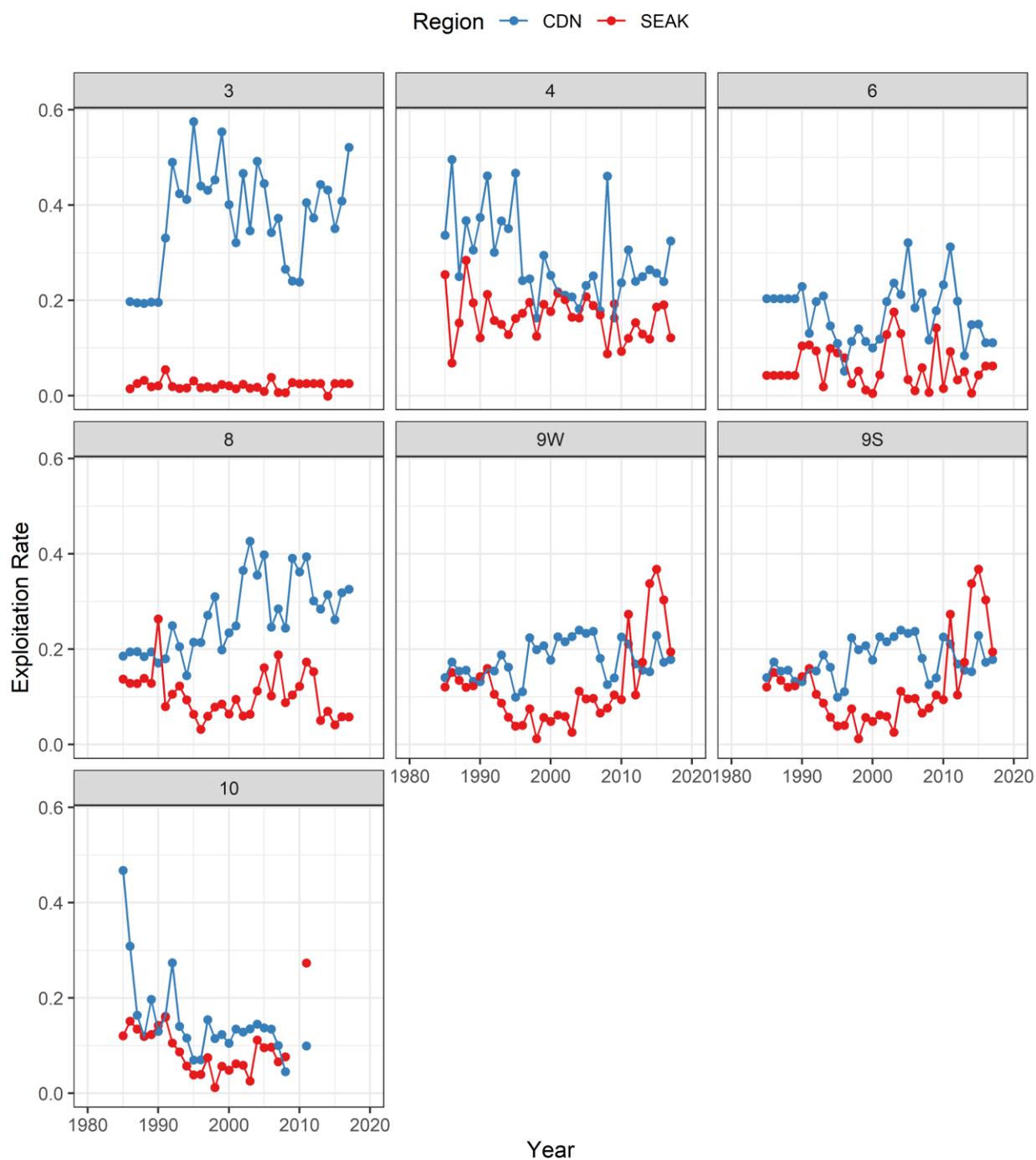


Figure 11: SEAK (red) and Canadian (blue) exploitation rates by year for north and central coast (Statistical Areas 1-10) Chinook salmon from 1985-2017. Source: LGL 2021a.

SEAK Percent of Total Exploitation
Chinook Salmon (1954-2017)

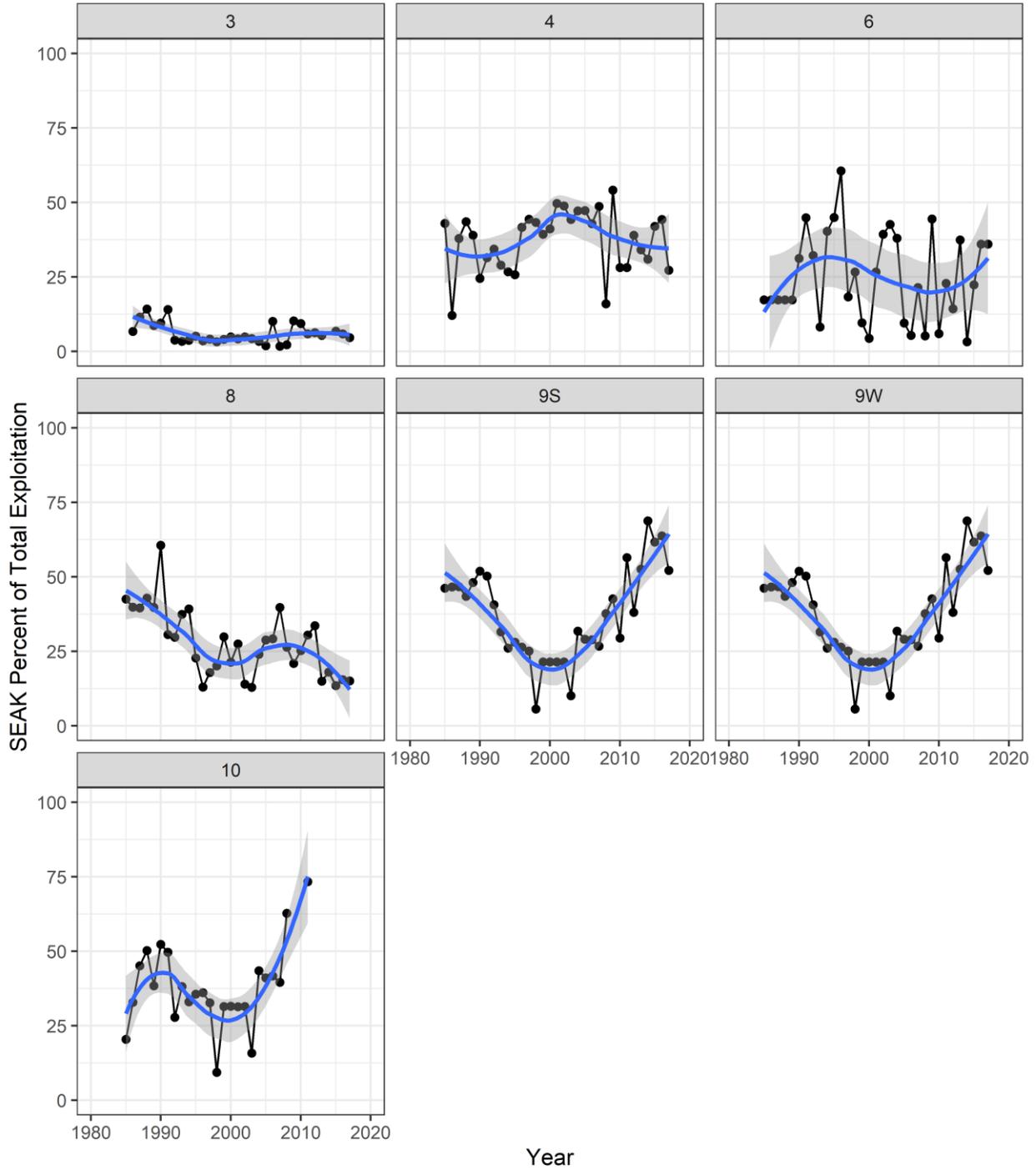


Figure 12: Percent of exploitation attributed to SEAK for Chinook salmon from north and central coast BC from 1954-2017. Trend lines and SEs were derived using LOESS in R. Source: LGL 2021.

SEAK Exploitation Rate by Conservation Unit Chinook Salmon (1985-2017)

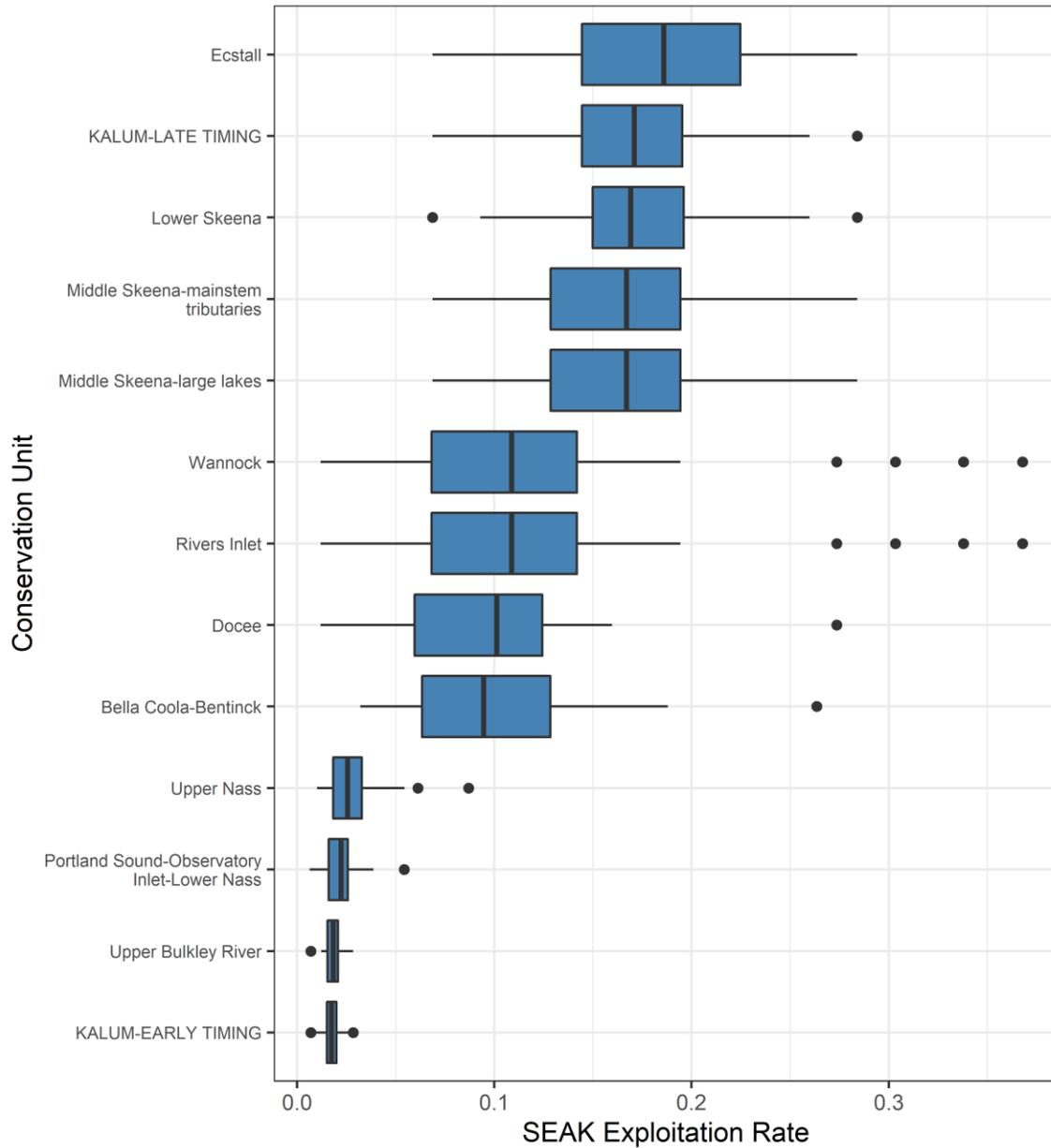


Figure 13: Boxplot of SEAK exploitation rates on Chinook north and central coast BC Conservation Units for 1954 to 2017. CUs are ordered from highest median exploitation rate to lowest. Source: PSF 2021.

SEAK Exploitation Rate by Conservation Unit Chinook Salmon (1985-2017)

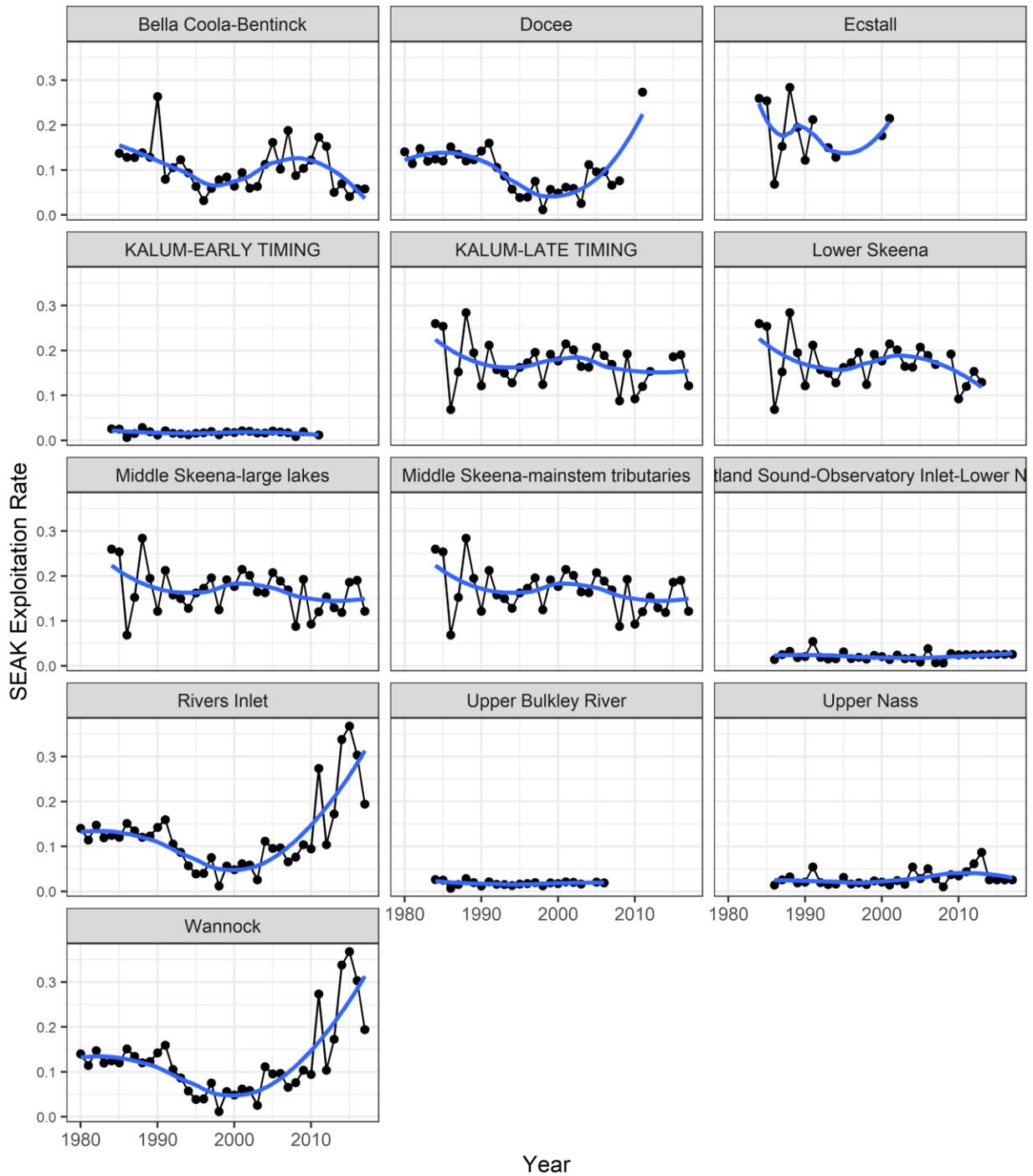


Figure 14: SEAK exploitation rates for Chinook salmon from north and central coast Conservation Units from 1954-2017. Trend lines derived using LOESS in R. Source: PSF 2021.

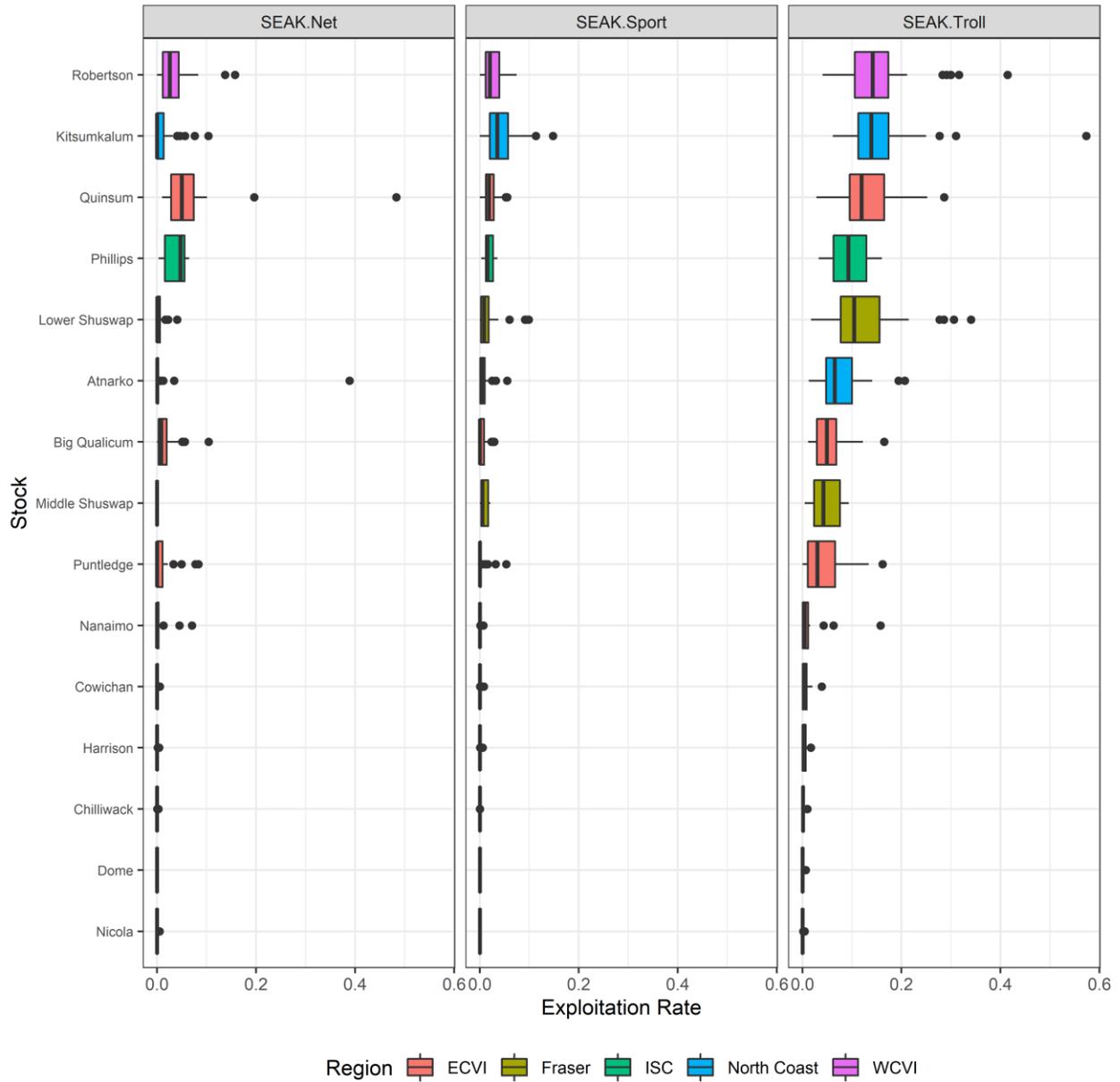


Figure 15: Median exploitation rates for Canadian (excluding Transboundary stocks) CTC indicator stocks in SEAK net, troll, and sport fisheries. Box fill indicates stock region. The thick black line is the median value, the box in indicates the interquartile range (25th to 75th percentiles – or middle 50% of the data), whiskers are 1.5x the interquartile range and dots are outliers (< 5th or > 95th percentile). Source: PSC CTC 2021.

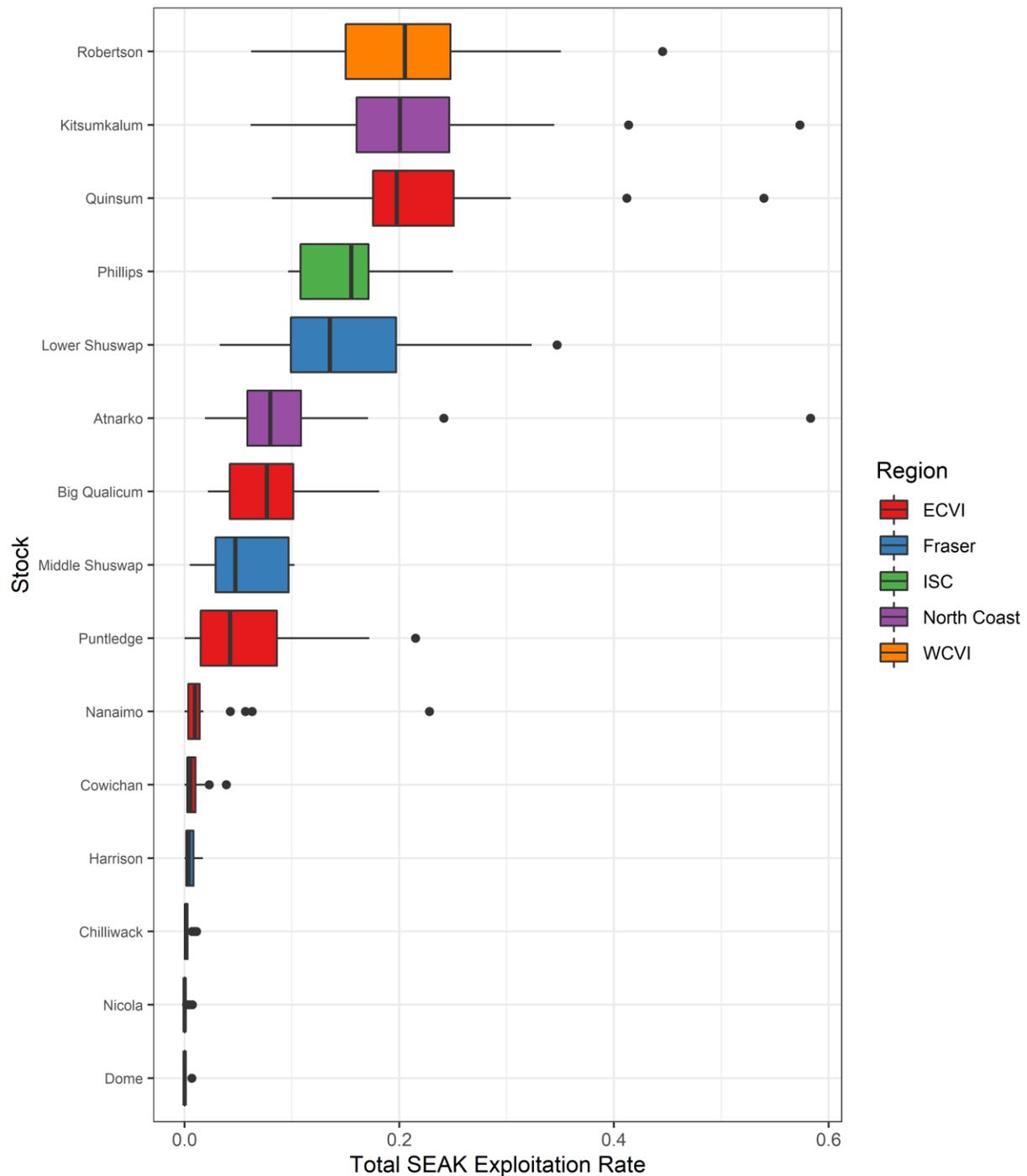


Figure 16: Median total SEAK exploitation rates for Canadian (excluding Transboundary stocks) CTC indicator stocks. Box fill indicates stock region. The thick black line is the median value, the box in indicates the interquartile range (25th to 75th percentiles – or middle 50% of the data), whiskers are 1.5x the interquartile range and dots are outliers (< 5th or > 95th percentile). Source: PSC CTC 2021.

Total SEAK Exploitation Rate CTC Chinook Indicator Stocks

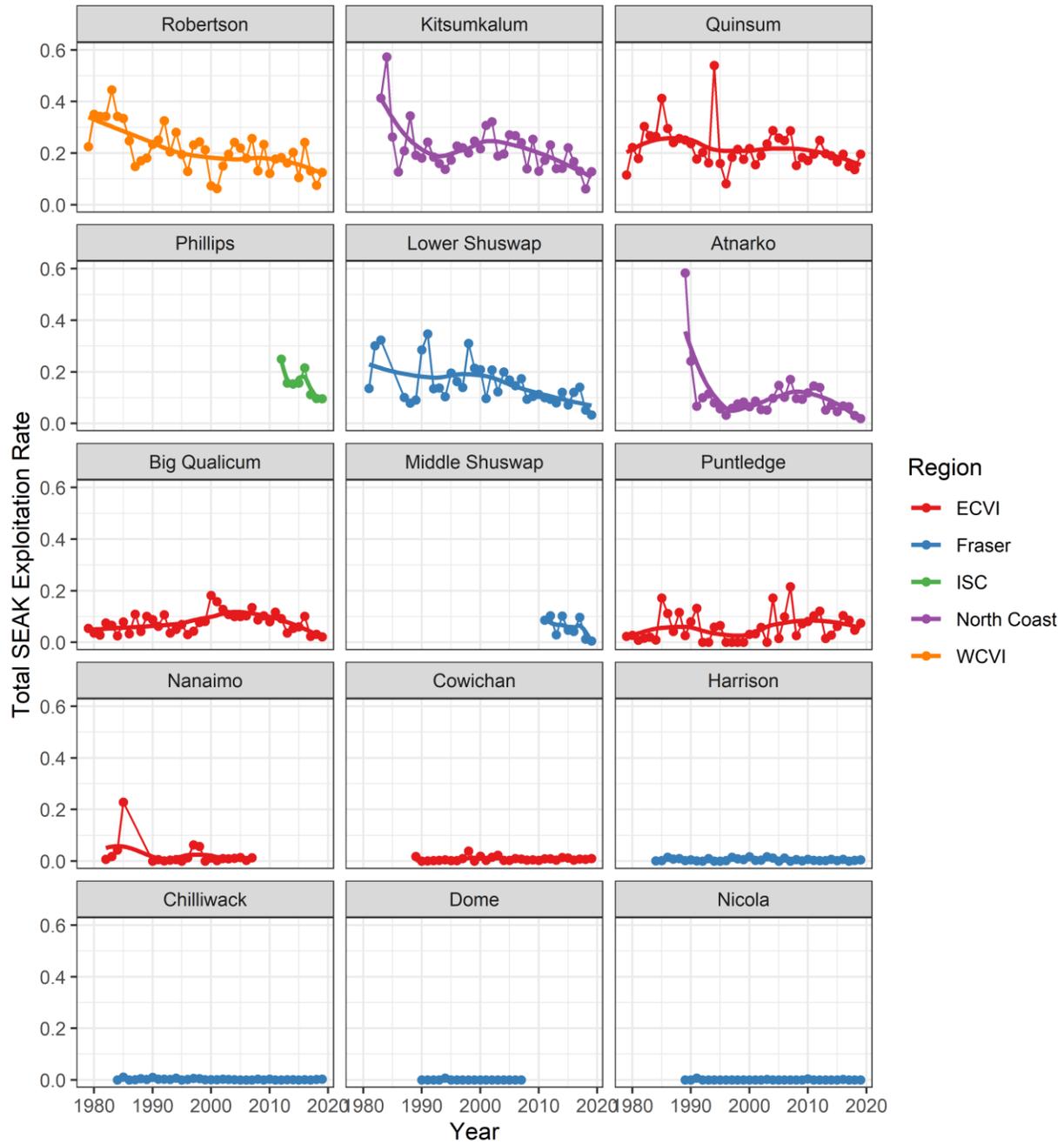


Figure 17: Total SEAK exploitation rates for Canadian (excluding Transboundary stocks) CTC indicator stocks by year (1979-2019). Trend lines derived using LOESS in R. Source: PSC CTC 2021.

