

Occurrence of Juvenile Pacific Salmon in the Southern and Central Coastal Waters of British Columbia

Lisa D. Siemens, Joy Wade

Fisheries and Oceans Canada
National Capital Region
200 Kent Street
Ottawa, ON
K1A 0E6

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OCCURRENCE OF JUVENILE PACIFIC SALMON IN THE SOUTHERN AND CENTRAL
COASTAL WATERS OF BRITISH COLUMBIA

by

Lisa D. Siemens¹, Joy Wade²

¹Fisheries and Oceans Canada
National Capital Region
200 Kent Street
Ottawa, ON
K1A 0E6

²Fundy Aqua Services, Inc.
1859 Delanice Way
NanOOSE Bay, BC
V9P 9B3

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ABSTRACT

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Fisheries and Oceans Canada (DFO) is responsible for making science-informed decisions to protect aquatic ecosystems. This includes the protection of ecologically and economically important species, such as Pacific salmon. While information exists on Pacific salmon occurrence in certain coastal waters of British Columbia (BC), the monthly occurrence of juveniles remains largely undocumented. This study aims to address this knowledge gap by investigating the temporal occurrence of juvenile Pacific salmon on the BC coast using existing datasets and publications. Data were sourced from primary publications and grey literature (i.e., DFO datasets, publicly available datasets, and consultant reports). The consolidated occurrence data for each anadromous Pacific salmon species are presented by month for each of seven zones, covering south and central coastal waters of BC. The results provide evidence that juveniles of all Pacific salmon species were present in most months of the year in most zones. However, data was limited for some months, particularly December and January, so juvenile presence in those cases remains uncertain. The study does not confirm fish absence or provide abundance or population information. This research was conducted to compile existing information that can serve as a citable resource for informing future DFO applications.

RÉSUMÉ

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Il incombe au ministère des Pêches et des Océans (MPO) de prendre des décisions fondées sur la science pour protéger les écosystèmes aquatiques. Ces décisions portent notamment sur la protection d'espèces importantes sur les plans écologique et économique, comme les saumons du Pacifique. Bien que qu'il existe des renseignements sur l'occurrence des saumons du Pacifique dans certaines eaux côtières de la Colombie-Britannique, la présence mensuelle des juvéniles reste largement méconnue. La présente étude visait à combler cette lacune dans les connaissances en examinant l'occurrence temporelle des saumons du Pacifique juvéniles sur la côte de la Colombie-Britannique à l'aide des ensembles de données et des publications accessibles. Les données utilisées provenaient de publications primaires et de la littérature grise (ensembles de données du MPO, ensembles de données accessibles au public et rapports de consultation). Des données regroupées sur la présence de chacune des espèces de saumons anadromes du Pacifique sont présentées par mois pour chacune des sept zones étudiées, lesquelles couvrent les eaux côtières du sud et du centre de la Colombie-Britannique. Les résultats démontrent que des juvéniles de toutes les espèces de saumons du Pacifique sont présents la plupart des mois de l'année dans la plupart des zones. Cependant, les données sont limitées pour certains mois, en particulier décembre et janvier, de sorte que l'occurrence de juvéniles pendant ces mois demeure incertaine. L'étude ne confirme pas l'absence de poissons et ne fournit pas d'information sur l'abondance ni les populations. Cette recherche avait pour but de compiler des renseignements existants pouvant servir de ressources citable pour éclairer les futures demandes du MPO.

1 INTRODUCTION

Pacific salmon are ecologically and economically important species in British Columbia (BC). Fisheries and Oceans Canada (DFO) has a responsibility to protect Pacific salmon while ensuring economically, socially, and environmentally sustainable fisheries. Ongoing and current scientific research specific to Pacific salmon is required to support this mandate.

There are five species of anadromous Pacific salmon which inhabit coastal and freshwater habitats throughout BC: Chinook Salmon (*Oncorhynchus tshawytscha*), Chum Salmon (*O. keta*), Coho Salmon (*O. kisutch*), Pink Salmon (*O. gorbuscha*), and Sockeye Salmon (*O. nerka*). Life history characteristics vary significantly between and within the species. Examples include freshwater residence time, outmigration timing, marine migration patterns, age at maturity, and therefore, juvenile occurrence in coastal waters.

The occurrence of a species within a specific area of interest could be an important consideration for decision makers. Published information specific to juvenile Pacific salmon occurrence (i.e., presence or absence) in the coastal waters of BC exists but is generally limited to catch data for a particular survey (e.g., Jung et al. 2024; Neville et al. 2025; Tabata et al. 2024). Other related primary publications include juvenile abundance estimates (e.g., Beamish et al. 2000; Rousseau et al. 2017; Thompson and Neville 2024), residence timing (e.g., Neville et al. 2016; Preikshot et al. 2012; Rechisky et al. 2021), migration patterns (e.g., Beacham et al. 2014; Chittenden et al. 2009; Melnychuk et al. 2010), and distribution (e.g., Fisher et al. 2007; Neville et al. 2013; Trudel et al. 2009). However, no studies specifically document observations of juvenile Pacific salmon on the British Columbia coast for each month of the year. To address this knowledge gap, this study consolidates existing juvenile salmon occurrence information from multiple sources to summarize what species of Pacific salmon are present throughout the year in the southern and central coastal waters of BC. Though information also exists for North Coast and Haida Gwaii coastal waters, these areas were excluded because the initial investigation was focused on Atlantic salmon growing areas. The study is not designed to confirm absence of juvenile salmon or provide information on juvenile salmon abundance or specific genetic populations.

This work was initially undertaken to address an aquaculture science question; however, the focus has subsequently been expanded. The intention of this study is to pull together existing information on juvenile Pacific salmon occurrence to inform various DFO applications and decision-making processes related to DFO's role in the protection of Pacific salmon. This may include aquaculture management, fish and fish habitat protection, and stock assessment, among other relevant topics.

2 METHODS

2.1 STUDY AREA

The study area includes the coastal waters of BC from the southern Canada-United States border, up to and including the Central Coast of BC. To ensure an informative spatial scale was used, the study area was divided into seven zones based loosely on watershed boundaries. In some cases, watersheds were merged to create a larger zone due to data availability or to preserve ocean connectivity. The zone names include: 1) West Coast Vancouver Island – North (WCVI-N), 2) West Coast Vancouver Island – South (WCVI-S), 3) Salish Sea, 4) Discovery Islands, 5) Broughton Archipelago, 6) Port Hardy, and 7) Central Coast (Figure 1). North Coast

and Haida Gwaii coastal waters were not included as they were outside of the original scope of this study, which focused on Atlantic salmon growing regions (Section 1).

The coastal waters in this study include both marine and estuary habitats; since the focus was on occurrence in coastal waters, all freshwater habitats located in the study area were excluded.



Figure 1. The study area including zone names and boundaries, located in British Columbia, Canada.

2.2 STUDY SPECIES

The study included juveniles of all five anadromous Pacific salmon species found on the west coast of Canada: Chinook, Chum, Coho, Pink, and Sockeye Salmon. Salmon were generally classified as juveniles if they were in their first year at sea. However, some data sources defined 'juvenile salmon' differently (Section 4.2.1) or provided no definition of the term. Therefore, fish in this study were considered to be juvenile if they had been identified as such by the source study. Additional juvenile classification information and potential implications are provided in Section 4.2.1.

The study includes data from both wild and hatchery-reared juvenile salmon. In most cases, the data sources did not specify if the fish were hatchery or wild fish; therefore, the enhancement status of fish included in this study is unknown.

2.3 DATA COLLECTION

Data on juvenile Pacific salmon occurrence within the study area were extracted from both primary publications and grey literature. The data sources included primary publications, DFO datasets, publicly available datasets, and consultant reports.

2.3.1 Data Sources

2.3.1.1 Primary Publications

Published scientific literature related to juvenile Pacific salmon occurrence was collected through literature searches and was screened using pre-defined eligibility criteria (Appendix A).

The initial search for relevant scientific literature was conducted in October 2021 using three databases ([ProQuest](#) Biological Science Collection and Earth, Atmospheric & Aquatic Science Collection; [Web of Science](#) Core Collection; and [Cabi VetMed Resource](#)). The databases were searched using pre-defined search terms. In addition, the [Federal Science Libraries Network](#) (FSLN) and three specialty websites ([Canadian Science Advisory Secretariat](#) (CSAS), [Kintama Research Services](#), and [Salish Sea Marine Survival Project](#)) were searched for relevant primary publications with simplified criteria due to database and website limitations. The specialty website searches were included to supplement the dataset with primary publications that were not captured in the database searches.

In December 2024, an additional search was conducted on the same databases and websites to find articles that had been published since October 2021. The methods used for the initial search were repeated.

Following the literature searches, all publications were reviewed for usable data through a two-step screening process using pre-defined eligibility criteria. For all databases and websites except for the FSLN, Kintama Research Services, and Salish Sea Survival Project, the first screening was completed by two people, each person screening approximately half of the publications. All articles that were excluded by one person were reviewed by the second person using the same screening criteria to ensure consistency. Any disagreement resulted in the article being included in the second screening process. One person completed the first screening for the remaining database (i.e., FSLN) and a different person screened the remaining websites (i.e., Kintama Research Services, and Salish Sea Survival Project). The second screening process for all databases and websites was completed by one person.

A complete list of search terms, screening method details, and the number of records returned for each database and website is provided in Appendix A.

2.3.1.2 Grey Literature

Grey literature known to contain data on juvenile Pacific salmon occurrence was also reviewed for usable data. The sources of grey literature that contributed to this study included DFO datasets, publicly available datasets, and consultant reports.

The DFO datasets included juvenile salmon survey information from various DFO research programs based out of the Pacific Biological Station in Nanaimo. The data were provided upon request in two datasets: one included data from the High Seas Salmon Program, Basin and Coastal-Scale Interactions Program (BSCI), and Integrated Pelagic Ecosystem Survey (IPES) (Jackie R. King and Amy M. Tabata, Ecosystem Sciences Division, pers. comm, 2025), the other

included data from the Salmon Marine Interactions Program (SMIP) (Chrys M. Neville, Ecosystem Sciences Division, pers. comm, 2025).

Publicly available juvenile salmon survey datasets were obtained from the Cedar Coast Field Station, Hakai Institute, and Salmon Coast Field Station. These associations assess juvenile Pacific salmon health through fishing surveys as part of their operations. All publicly available datasets were obtained through GitHub with permission, if required.

Additionally, publicly available consultant reports containing wild juvenile salmon sea lice monitoring data were obtained from the following aquaculture companies that operate in BC: Cermaq Canada, Grieg Seafood, and MOWI Canada West. The majority of these reports were accessed from company websites. However, Grieg Seafood only retains the most recently completed reports online, previous years of monitoring data were accessed from reports that were downloaded when they were publicly available.

The DFO datasets were initially provided in November 2021, and updates were provided in January 2025. The publicly available datasets and consultant reports were accessed in October 2021, and again in December 2024 to check for updates and newly published data.

A summary of the grey literature sources used for the study is provided in Table 1.

Table 1. Grey literature sources that provided data for this study, including the survey method used and date range available from each source.

Category	Data Source	Survey Method	Data Date Range
DFO Dataset 1	High Seas Salmon Program	Trawl	2000-2024
	Basin and Coastal-Scale Interactions Program (BSCI)		
	Integrated Pelagic Ecosystem Survey (IPES)		
DFO Dataset 2	Salmon Marine Interactions Program (SMIP)	Trawl	2002-2023
		Purse Seine	2014-2016
Publicly Available Datasets	Cedar Coast Field Station	Beach Seine	2018-2021
	Hakai Institute	Purse Seine	2015-2023
	Salmon Coast Field Station	Beach Seine	2001-2024
Consultant Reports	Cermaq Canada	Beach Seine	2004, 2014-2024
	Grieg Seafood		
	MOWI Canada West		

2.3.2 Data Extraction

Data from primary publications and grey literature were manually extracted into separate spreadsheets for each data source. Data from DFO and publicly available datasets (Table 1) were either downloaded or received as spreadsheets, then converted into a standardized format using R (R-Core-Team 2024). Once all data were collected, the spreadsheets were combined into one master dataset and duplicate data were identified and removed.

The following data were extracted, at a minimum: location, species, month, year, occurrence (presence/absence), survey method, juvenile definition or confirmation of 'juvenile' (Section 2.2),

reference, and data description. Catch numbers and fishing effort were recorded wherever possible. Data were only extracted from a source if they could be separated by zone (see below), species, month, and year; all other data were screened out (Section 2.3.1, Appendix A). The survey location provided by the data source was used to assign the data to specific zones within the project area (Figure 1). Zone boundaries were created as described in Section 2.1. Data were assigned to a particular zone based on GPS coordinates, where available, otherwise they were assigned by examining maps or descriptive text in the source document. Data were recorded for all Pacific salmon species targeted by the source study, as well as those included as incidental catch. To assign 'present' under the occurrence field, the author either needed to provide the number of fish that were caught or detected during a survey, or confirm species presence within the text of the document. A species was considered to be present if one or more fish were caught. Survey methods varied between studies and included trawl, beach seine, purse seine, seine (unspecified type or beach and purse seine combination), telemetry, and micro-troll. The majority of the data sources conducted trawl, purse seine, and beach seine surveys. All other survey methods were grouped together and categorized as 'other'. The data description category was included in the dataset to flag duplicate data. Fishing effort, where available, was used to highlight method variability between sources within the dataset.

2.3.2.1 Quality Control

Quality control measures were implemented during data extraction for all data sources to ensure consistency during data collection and minimize the likelihood of transcription and coding errors.

The data were collected from multiple sources by five different people. To maintain consistency, a template spreadsheet and detailed instructions were developed and distributed. Meetings were held to discuss and resolve any data extraction or conversion concerns.

To check for potential transcription errors and data interpretation inconsistencies, a portion of the collected data was reviewed. To minimize human error and judgement inconsistencies, a person could not review data that they had extracted. This quality control process was completed by four people. Approximately 15% of publications and reports, and 100% of the R-scripts were reviewed for proper data extraction.

2.3.3 Data Date Range

The data collected was initially not limited by year to ensure all available data were considered for use before determining the most relevant years. Though salmon occurrence data from some sources were available from the years 1961-2024, the dataset was restricted to 2000-2024 for this study for the following reasons:

- The majority (~ 90%) of data were from the years 2000-2024;
- to reflect more recent oceanic and freshwater conditions; and
- to reflect more current threats and stressors to Pacific salmon.

A comparison of the data using the current (2000-2024) and historical (1961-2024) date ranges is available in Appendix B.

2.4 DATA ANALYSIS

The data were analyzed to determine the presence of juvenile Pacific salmon in each zone (Figure 1) and month of the year, with each species analyzed separately. Due to inconsistencies in survey methods between data sources, analysis options were limited. Data were pooled and

presented as the number of years that data were available and the percentage of those years fish were reported (i.e., present).

Visual representations of the data were created by analyzing each zone separately using data from all fishing methods combined, recognizing that some fishing methods are more successful than others at catching a particular species (Section 4.2.3). To supplement the main analysis, the data for each zone were summarized to show the number of years fish were reported and the number of years data were available based on four categories of fishing methods: trawl, beach seine, purse seine, and other (i.e., telemetry, micro-troll, and unspecified seine type). This supplementary information is presented in Appendix C.

All data transformations and analyses were completed in R (R-Core-Team 2024).

3 RESULTS

3.1 DATA SUMMARY

Data on juvenile Pacific salmon occurrences were collected from 107 different sources (Appendix D) including 23 primary publications, 2 DFO datasets, 3 publicly available datasets, and 79 publicly available consultant reports. The data spanned a 24-year period from 2000-2024 with a relatively even distribution; 19% of the data were from years 2000-2006, 26% from 2007-2012, 30% from 2013-2018, and 25% from 2019-2024.

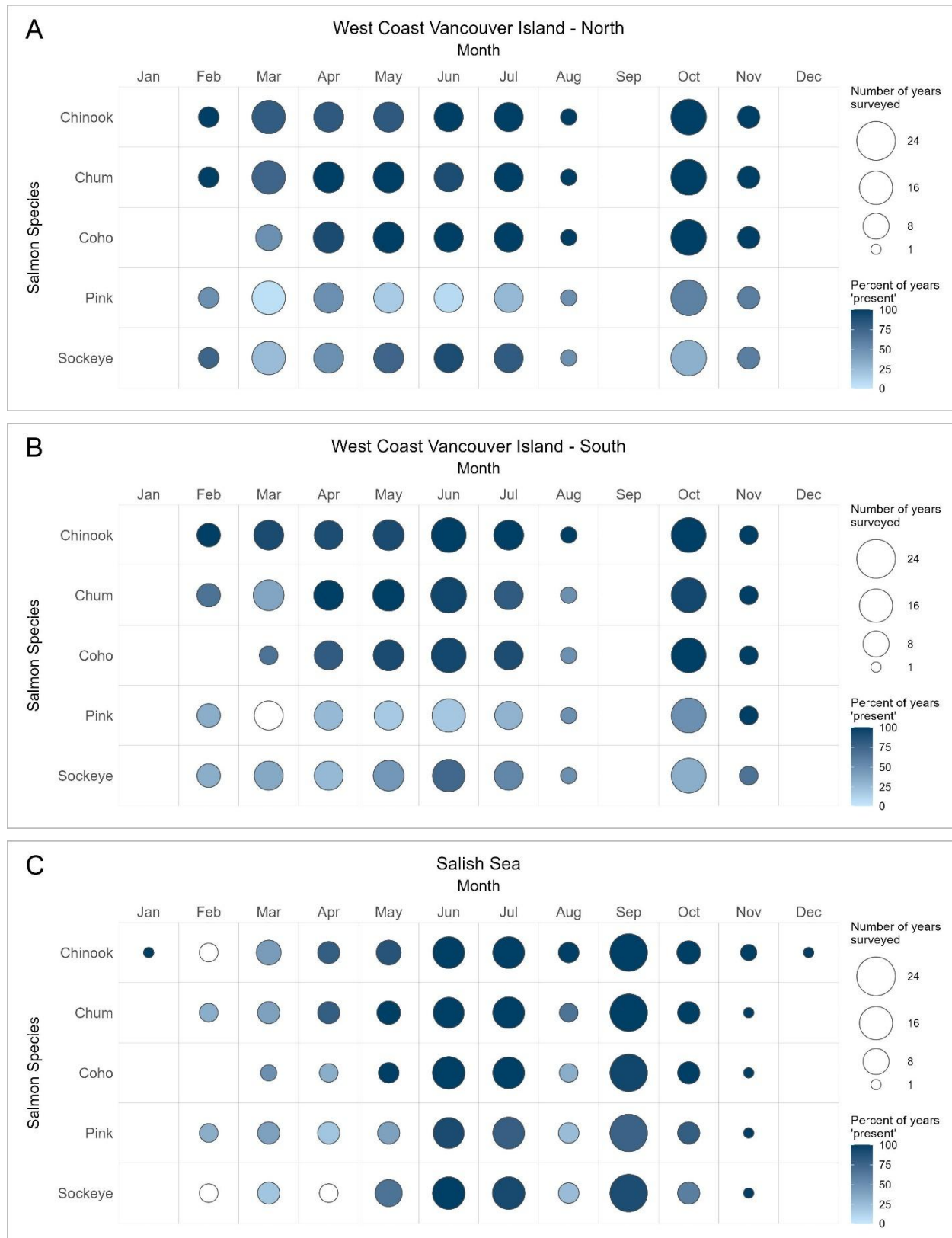
Trawl, beach seine, and purse seine studies made up 68%, 23%, and 7% of the dataset, respectively. All other methods (telemetry, micro-troll, and unspecified seine type) were grouped, which made up approximately 2% of the dataset. Data displayed by survey method is available in Appendix C.

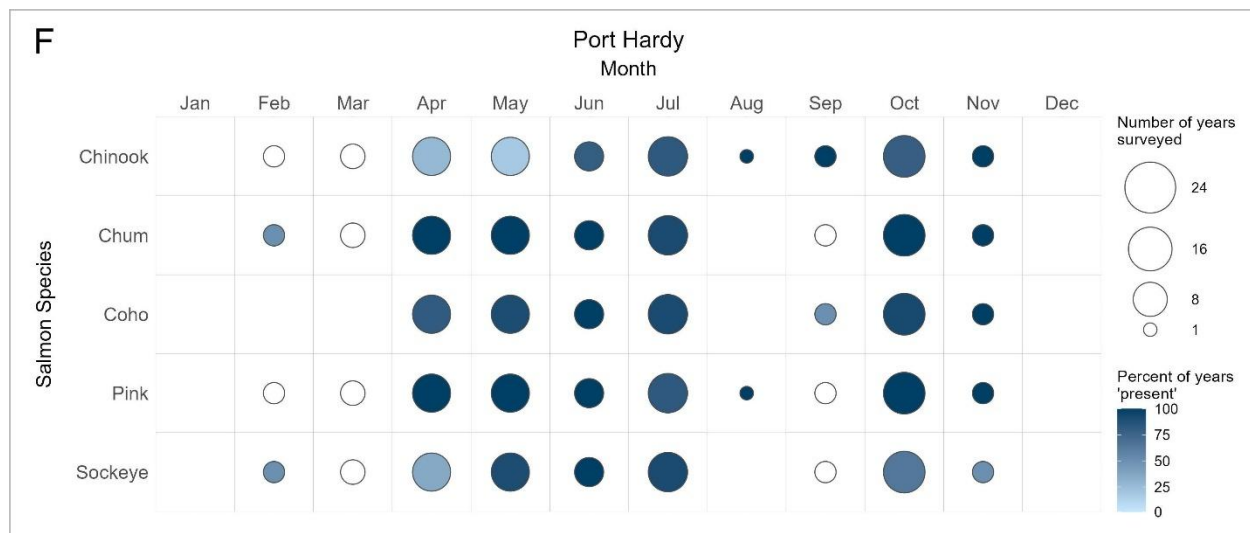
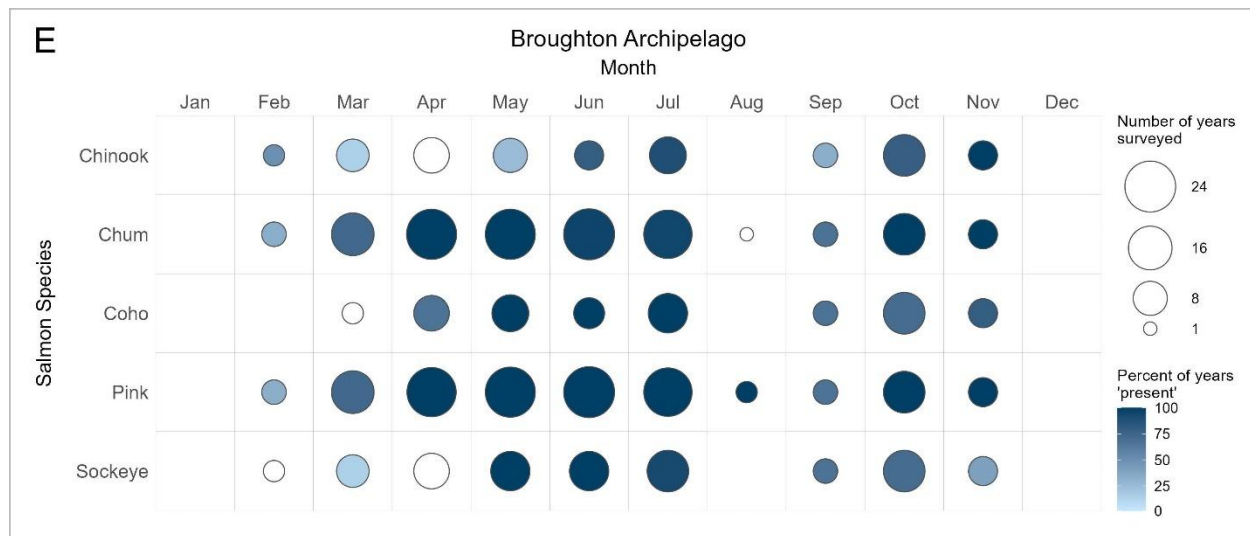
Juvenile salmon data were available to varying degrees for each zone, species, and month. December and January were data deficient throughout the study area across all study years. Data were sparse in August and September, with four or less years of data available in all zones except the Salish Sea and the Discovery Islands, where many years (>20) of data were available in September.

3.2 JUVENILE PACIFIC SALMON OCCURRENCE

The occurrence of juvenile Pacific salmon in each zone is presented in Figure 2 (A-G). The data is presented for each species of Pacific salmon by month and shows the number of years survey data were available (size of circle) and percentage of those years that juveniles were reported (color of circle). Months where no circle is present in the figure means no data were available to substantiate fish presence. An open (white) circle means no fish were reported (i.e., caught or detected) during the years when survey data was available.

Juvenile Pacific salmon occurred throughout the study area in most months of the year. Most species were observed in each zone at least mid-spring (March or April) through fall (November). In general, the percentage of years juvenile Pacific salmon (all species) were reported, was lower in late winter and early spring than in summer and fall. Data availability in most winter months was sparse, so species presence is unknown throughout that period.





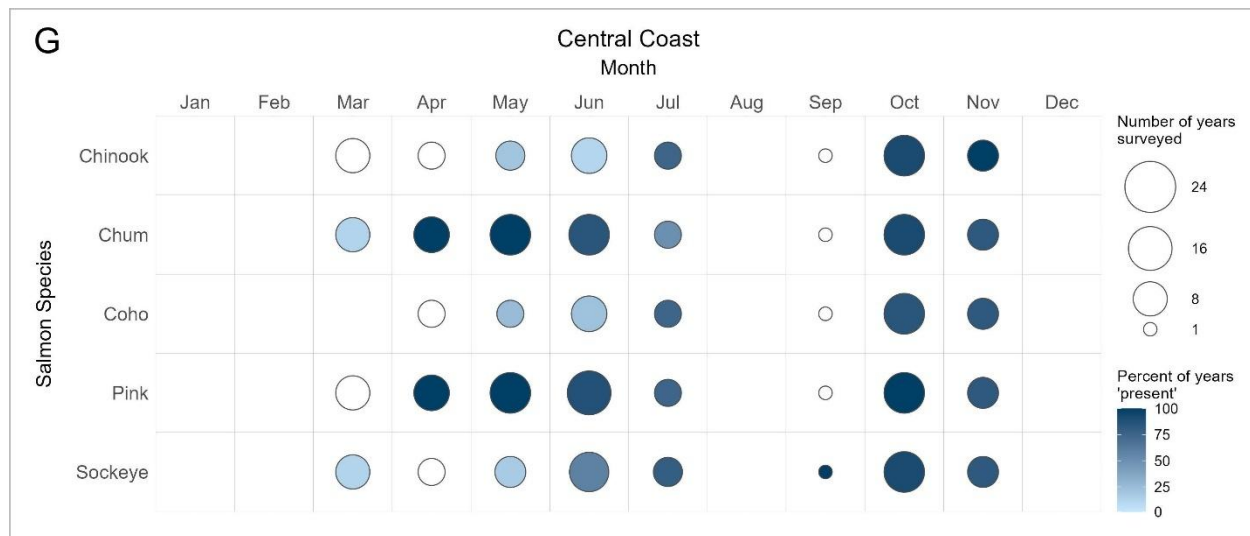


Figure 2. Juvenile Pacific salmon occurrence presented by zone (A-G). The size of the circle indicates the number of years that studies were conducted, and the color indicates the percentage of years studied that a species was reported, both are continuous variables. Absence of a circle means no data were available, while an open (white) circle indicates the species was not caught. See Section 4.2.1 for an explanation of the sparse Coho Salmon data in February and March. The data presented were collected from the sources referenced in Appendix D.

4 DISCUSSION

4.1 JUVENILE PACIFIC SALMON OCCURRENCE

This study compiled data to investigate the presence of juvenile Pacific salmon species in each month of the year in the southern and central coastal waters of BC. The data demonstrated that juveniles of each species of Pacific salmon were present throughout our study area in most months of the year, where data were available. More specifically, all species appeared to be present in each zone mid-spring through fall, or longer (Figure 2). This pattern was slightly delayed in the Central Coast zone; however, it was both the largest and most data deficient zone. Species presence during winter months, particularly December and January, in most zones remains unknown due to insufficient data in those months.

In most cases, an increase in evidence of species presence (i.e., percent of years present) appeared to coincide with juvenile outmigration from freshwater to marine environments in spring (Figure 2). However, in some zones (i.e., WCVI-N, WCVI-S, Salish Sea), Chinook Salmon were consistently caught throughout the year. This could be expected, as some Chinook Salmon are known to reside in the Strait of Georgia for their first ocean year (Healey 1991), or longer (Johnson and Jones 2015). In addition, there is published evidence to suggest that at least some Chinook Salmon juveniles originating from WCVI also remain on the WCVI for their first year at sea (Tucker et al. 2015; Tucker et al. 2011, 2012).

WCVI Pink Salmon were detected in less than 50% of the surveyed years, with the exception of a few cases. This could be expected due to their unique two-year life cycle and a low number of spawning populations originating from streams in those areas (Riddell and Beamish 2003). This pattern was less pronounced for Pink Salmon in other zones, likely because of alternating spawning years (odd versus even years) for populations that migrate into or through those areas (Beacham et al. 1985).

4.2 CONSIDERATIONS AND DATA LIMITATIONS

This analysis brought together a large amount of information on the monthly occurrence of the five anadromous Pacific salmon species in south and central coastal waters of BC. While this information may inform a range of future DFO applications and decision-making processes, it is important to recognize several caveats and limitations of these results.

4.2.1 Juvenile Classification

The data sources included in this study generally defined juvenile salmon as fish in their first year at sea. In most cases when this was not explicitly stated, juvenile status was determined by the data source using fish size, a commonly accepted method for classifying juvenile salmon (e.g., Trudel et al. 2007). For one large dataset provided by DFO (i.e., DFO dataset containing the High Seas Salmon Program, BSCI, and IPES data), Coho Salmon caught in February or March of their first year at sea were not considered to be juvenile salmon. Though Coho Salmon catches in these months exists in their master dataset, the fish have been labelled as non-juveniles by the current dataset custodians; therefore, they were not included in the dataset provided by this source. High Seas Salmon Program data reports that were published prior to the classification change described above have identified juvenile Coho Salmon in February and March within our study area, particularly on the WCVI and in the Salish Sea. The reports are publicly available on the Federal Science Libraries Network, using the search methods described in Table 3 (Appendix A).

Some data sources did not specify their criteria for juvenile classification. This could be problematic because life history variations within species could lead to various interpretations for juvenile classification. This is of particular concern for Chinook Salmon, as the species may migrate to the ocean as sub-yearling or yearling fish. Therefore, the potential for erroneous data (i.e., juvenile misclassification) does exist in this dataset due to missing juvenile classification information from some source studies.

4.2.2 Fish Abundance and Absence

This study presented information on juvenile salmon occurrence using survey data collected from various sources. The study was not designed to provide information on fish abundance. Since data were consolidated from studies with different fishing/detection methods (e.g., fishing equipment, fishing depths, and fishing effort), abundance data were incomparable between and sometimes within studies.

For the reasons mentioned above and due to variations in data availability, if a species was not reported, it does not necessarily mean that species is absent in a particular zone and month. Therefore, the study does not confirm absence of juvenile salmon within the study area.

4.2.3 Fishing Methods

This study includes data from sources using a variety of fishing methods. Due to variations between Pacific salmon species, some methods are more suitable than others for catching a particular species. The following is a brief overview of common fishing methods for juvenile salmon and their general suitability by species, which should be carefully considered when interpreting the results of this study, particularly in cases where fish were not caught.

Trawling is an effective, albeit somewhat indiscriminate, method of fishing. It can be conducted in inshore environments but can potentially be difficult to maneuver through confined waters (Beamish et al. 2000), depending on the equipment used. Trawl equipment can be deployed at different depths in the water column (Beamish et al. 2003), making it a suitable method for

fishing in various habitats. Trawling has been widely used to conduct juvenile salmon surveys (Beamish et al. 2003), with regular success in capturing all species of Pacific salmon (e.g., Welch et al. 2003).

Purse seines can be used to obtain samples of virtually any species that concentrates at or near the ocean surface (Durkin and Park 1967). They are suitable for use in areas deeper than five meters (Johnson and Jones 2015), but can be restricted to areas without excessive currents or tides (Beamish et al. 2003). Purse seine surveys are commonly used to sample all species of juvenile salmon because they have a high catch per unit of effort and are relatively nonselective (Hartt and Dell 1986).

Beach seining is an effective way of catching most juvenile salmon species in near-shore waters following downstream migration or during nearshore rearing. Chum and Pink Salmon tend to rear in near-shore habitat prior to migrating to deeper waters (Beamish et al. 2003; Radchenko et al. 2018). Chinook Salmon may also reside in nearshore water for varying periods, depending on whether they migrated to the ocean as yearlings or sub-yearlings (Williams 1989). Coho and Sockeye Salmon tend to move past near-shore habitat more quickly (Williams 1989). As such, beach seines may not be particularly effective in catching juvenile Coho Salmon and Sockeye Salmon. This method is not likely to be effective at catching any juvenile Pacific salmon once they are expected to have migrated to deeper water.

Successfully catching juvenile Pacific salmon also depends on other factors such as fish behavior (e.g., net avoidance) and survey design (e.g., equipment, fishing depth, fishing effort, targeted versus predefined or random survey locations, etc.). For example, juvenile Chum, Pink, and Sockeye Salmon are generally captured within 30 m of the surface, while habitat depths for Coho and Chinook Salmon are the top 45 m and 60 m of the water column, respectively (Beamish et al. 2012; Beamish et al. 2000). Thus, if a survey is conducted at a depth of 30 m or less, Chinook Salmon and Coho Salmon may be under-represented in the sample.

The survey methods used for each zone, species, and month are available in Appendix C.

4.2.4 Fishing Effort

The fishing effort between and within data sources used in this study is variable. Sources provided data from surveys with different equipment and methods. For example, data was used from multi-day trawl surveys and single seine surveys. If one or more fish were caught, that species was considered 'present', no matter the survey effort.

In addition, a 'present' species for a particular year could have been detected through many surveys, or a single event. Figure 2 shows where juvenile Pacific salmon are known to occur on the BC coast throughout the year. The size of the circle represents how many years of data is available for each species, while the color shows the percentage of those years that a species was caught. It does not show how much data was available for each year or any indication of survey effort.

The variability described above created limits on the which analyses could be done, how the data could be presented, and how this information should be used. Including fishing effort in our analysis was not possible due to the complexities discussed above. To add context to the occurrence findings provided in Figure 2, the data is also presented by fishing method in Appendix C.

4.2.5 Genetic Populations and Conservation Status

The Pacific salmon observations compiled in this study very likely represent a wide range of distinct genetic populations originating from both British Columbia and the United States.

Different populations may have different migration patterns and residence times. Though published information on genetic populations in BC waters exists (e.g., Beacham et al. 2016; Trudel et al. 2009; Tucker et al. 2015), the majority of the data sources that were used in this study did not provide fish population information, therefore it was not possible to comment on which populations were reported in the study area. Since genetic population information was not included, the conservation status of the fish reported in this study is also unknown. However, the occurrence of a species in a particular area might be weighed differently by decision makers, based on which particular genetic populations occur in a zone during a given month, and their conservation status. Future research to provide greater detail on the genetic origin of the salmon occurring in each month and zone could help to address this knowledge gap.

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6 REFERENCES

- Beacham, T.D., Withler, R.E., and Gould, A.P. 1985. Biochemical genetic stock identification of Pink Salmon (*Oncorhynchus gorbuscha*) in southern British Columbia and Puget Sound. *Can. J. Fish. Aquat. Sci.* **42**: 1474-1483. doi:<https://doi.org/10.1139/f85-185>.
- Beacham, T.D., Beamish, R.J., Candy, J.R., Wallace, C., Tucker, S., Moss, J.H., and Trudel, M. 2014. Stock-specific migration pathways of juvenile Sockeye Salmon in British Columbia waters and in the Gulf of Alaska. *Trans. Am. Fish. Soc.* **143**(6): 1386-1403. doi:<https://doi.org/10.1080/00028487.2014.935476>.
- Beacham, T.D., Beamish, R.J., Neville, C.M., Candy, J.R., Wallace, C., Tucker, S., and Trudel, M. 2016. Stock-specific size and migration of juvenile Coho salmon in British Columbia and southeast Alaska Waters. *Mar. Coast. Fish.* **8**(1): 292-314. doi:<https://doi.org/10.1080/19425120.2016.1161683>.
- Beamish, R.J., Pearsall, I.A., and Healey, M.C. 2003. A history of the research on the early marine life of Pacific salmon off Canada's Pacific coast. *N. Pac. Anadr. Fish Comm. Bull.* **3**: 1-40.
- Beamish, R.J., Neville, C., Sweeting, R., and Lange, K. 2012. The synchronous failure of juvenile Pacific salmon and herring production in the Strait of Georgia in 2007 and the poor return of Sockeye Salmon to the Fraser River in 2009. *Mar. Coast. Fish. Dynam. Manag. Ecosys. Sci.* **4**: 403-414. doi:<https://doi.org/10.1080/19425120.2012.676607>.
- Beamish, R.J., McCaughan, D., King, J.R., Sweeting, R.M., and McFarlane, G.A. 2000. Estimating the abundance of juvenile Coho Salmon in the Strait of Georgia by means of surface trawls. *N. Am. J. Fish. Manage.* **20**: 369-375. doi:[https://doi.org/10.1577/1548-8675\(2000\)020%3C0369:ETAOJC%3E2.3.CO;2](https://doi.org/10.1577/1548-8675(2000)020%3C0369:ETAOJC%3E2.3.CO;2).
- Chittenden, C., Beamish, R., Neville, C., Sweeting, R., and McKinley, R. 2009. The use of acoustic tags to determine the timing and location of the juvenile Coho Salmon migration out of the Strait of Georgia, Canada. *Trans. Am. Fish. Soc.* **138**(6): 1220-1225. doi:<https://doi.org/10.1577/T09-037.1>.
- Durkin, J.T., and Park, D.L. 1967. A purse seine for sampling juvenile salmonids. *Prog. Fish-Cult.* **29**(1): 56-59. doi:[https://doi.org/10.1577/1548-8640\(1967\)29\[56:APSFJSJ\]2.0.CO;2](https://doi.org/10.1577/1548-8640(1967)29[56:APSFJSJ]2.0.CO;2).
- Fisher, J., Trudel, M., Ammann, A., Orsi, J.A., Piccolo, J., Bucher, C., Casillas, E., Harding, J.A., MacFarlane, R.B., Brodeur, R.D., Morris, J.F.T., and Welch, D.W. 2007. Comparisons of the coastal distributions and abundances of juvenile Pacific salmon from Central California to the Northern Gulf of Alaska. *Am. Fish. Soc. Symp.* **57**: 31-80.
- Hartt, A.C., and Dell, M.B. 1986. Early oceanic migrations and growth of juvenile Pacific salmon and Steelhead Trout. *INPFC Bulletin* **46**: 1-105.
- Healey, M.C. 1991. Life history of Chinook Salmon (*Oncorhynchus tshawytscha*). In *Pacific salmon life histories. Edited by C. Groot and L. Margolis*. UBC Press, Vancouver, Canada. pp. 311-393.
- Johnson, S.C., and Jones, S.R.M. 2015. Monitoring for sea lice on wild salmon in western and eastern Canada. *DFO Can. Sci. Advis. Sec. Res. Doc.* **2014/060**: vi + 33 p.
- Jung, Y., Tabata, A., Flynn, K.L., Zubkowski, T.B., and King, J.R. 2024. Juvenile Pacific salmon (*Oncorhynchus* spp.) trawl survey on the South coast of British Columbia, June 10 to June 14, 2018. *Can. Data Rep. Fish. Aquat. Sci.* **1407**: vi +28 p.

- Melnychuk, M.C., Welch, D.W., and Walters, C.J. 2010. Spatio-temporal migration patterns of Pacific salmon smolts in rivers and coastal marine waters. PLoS One **5**(9): 15 p.
doi:<http://dx.doi.org/10.1371/journal.pone.0012916>.
- Neville, C., Spencer, S., and Kevin, M. 2025. Juvenile Pacific salmon survey in the Strait of Georgia and associated waters, June 21 to July 4, 2018 (SOG survey 2018-03). Can. Data Rep. Fish. Aquat. Sci. **1430**: ix + 346 p.
- Neville, C.M., Trudel, M., Beamish, R.J., and Johnson, S.C. 2013. The early marine distribution of juvenile Sockeye Salmon produced from the extreme low return in 2009 and the extreme high return in 2010. N. Pac. Anadr. Fish Comm. Tech. Rep. **9**: 65-68.
- Neville, C.M., Johnson, S.C., Beacham, T.D., Whitehouse, T., Tadey, J., and Trudel, M. 2016. Initial estimates from an integrated study examining the residence period and migration timing of juvenile Sockeye Salmon from the Fraser River through coastal waters of British Columbia. N. Pac. Anadr. Fish Comm. Bull. **6**: 45-60.
doi:<http://dx.doi.org/10.23849/npafcb6/45.60>.
- Preikshot, D., Beamish, R.J., Sweeting, R.M., Neville, C.M., and Beacham, T.D. 2012. The residence time of juvenile Fraser River Sockeye Salmon in the Strait of Georgia. Mar. Coast. Fish. Dynam. Manag. Ecosys. Sci. **4**(1): 438-449.
doi:<http://dx.doi.org/10.1080/19425120.2012.683235>.
- R-Core-Team. 2024. R: A language and environment for statistical computing (version 4.1.1). R Foundation for Statistical Computing, Vienna, Austria.
- Radchenko, V.I., Beamish, R.J., Heard, W.R., and Temnykh, O.S. 2018. Ocean ecology of Pink Salmon. *In* The ocean ecology of Pacific salmon and trout. *Edited by* R.J. Beamish. American Fisheries Society, Bethesda, Maryland, USA. pp. 15-160.
- Rechisky, E.L., Porter, A.D., Johnston, S.D., Stevenson, C.F., Hinch, S.G., Hunt, B.P.V., and Welch, D.W. 2021. Exposure time of wild juvenile Sockeye Salmon to open-net-pen Atlantic salmon farms in British Columbia, Canada. N. Am. J. Fish. Manage. **41**: 650–660. doi:<https://doi.org/10.1002/nafm.10574>.
- Riddell, B.E., and Beamish, R.J. 2003. Distribution and monitoring of Pink Salmon (*Oncorhynchus gorbuscha*) in British Columbia, Canada – a contribution to the development of a Pink Salmon watch. NPAFC Doc **707**: 33 p.
- Rousseau, S., Gauthier, S., Johnson, S., Neville, C., and Trudel, M. 2017. Use of inverted echosounders to monitor the migration timing and abundance of juvenile salmon in the Discovery Islands, British Columbia. Can. Tech. Rep. Fish. Aquat. Sci. **3227**: viii + 33 p.
- Tabata, A., Flynn, K.L., Zubkowski, T.B., and King, J.R. 2024. Ecosystem-based juvenile Pacific salmon (*Oncorhynchus* spp.) trawl survey off North and West Coast Vancouver Island, British Columbia, October 5 - 14, 2023. Can. Data Rep. Fish. Aquat. Sci. **1394**: vi +34p.
- Thompson, P.L., and Neville, C.M. 2024. Spatial estimates of juvenile Pacific salmon (*Oncorhynchus* spp.) abundance in the Strait of Georgia. Can. Tech. Rep. Fish. Aquat. Sci. **3597**: v + 30 p.
- Trudel, M., Fisher, J., Orsi, J.A., Morris, J.F.T., Thiess, M.E., Sweeting, R.M., Hinton, S., Fergusson, E.A., and Welch, D.W. 2009. Distribution and migration of juvenile Chinook Salmon derived from coded wire tag recoveries along the Continental Shelf of Western North America. Trans. Am. Fish. Soc. **138**(6): 1369-1391.
doi:<https://doi.org/10.1577/T08-181.1>.

- Trudel, M., Jones, S.R.M., Thiess, M.E., Morris, J.F.T., Welch, D.W., Sweeting, R.M., Moss, J.H., Wing, B.L., Farley Jr, E.V., Murphy, J.M., Baldwin, R.E., and Jacobson, K.C. 2007. Infestations of motile salmon lice on Pacific salmon along the west coast of North America. *Am. Fish. Soc. Symp.* **57**: 157-182.
- Tucker, S., Beacham, T., and Trudel, M. 2015. Seasonal distribution of juvenile Vancouver Island Chinook Salmon. *NPAFC Doc* **1603**: 15 p.
- Tucker, S., Trudel, M., Welch, D.W., Candy, J.R., Morris, J.F.T., Thiess, M.E., Wallace, C., and Beacham, T.D. 2011. Life history and seasonal stock-specific ocean migration of juvenile Chinook Salmon. *Trans. Am. Fish. Soc.* **140**(4): 1101-1119.
doi:<https://doi.org/10.1080/00028487.2011.607035>.
- Tucker, S., Trudel, M., Welch, D.W., Candy, J.R., Morris, J.F.T., Thiess, M.E., Wallace, C., and Beacham, T.D. 2012. Annual coastal migration of juvenile Chinook Salmon: static stock-specific patterns in a highly dynamic ocean. *Mar. Ecol. Prog. Ser.* **449**: 245-262.
doi:10.3354/meps09528.
- Welch, D.W., Morris, J.F., Trudel, M., Thiess, M.E., Zubkowski, T.B., Jacobs, M.C., Winchell, P.M., and MacLean, H.R.C. 2003. A summary of Canadian High Seas salmon surveys in the Gulf of Alaska, 1995 to 2003. *NPAFC Doc* **712**: 68 p.
- Williams, G. 1989. Coastal/estuarine fish habitat description & assessment manual: part 1, species/habitat outlines. Prepared for Fisheries and Oceans Canada. G.L. Williams and Associates Ltd., Coquitlam, B.C.

APPENDICES

APPENDIX A: LITERATURE REVIEW METHODS

Scientific Literature Databases and Websites

Database and Website Searches

On October 18, 2021, titles and abstracts were searched in three databases for relevant publications using pre-defined terms. In addition, three specialty websites were searched manually due to website search limitations. On December 6, 2024, an additional search was conducted to find documents that had been published since October 18, 2021. The same database and website search methods that were used in 2021 were used in 2024. Searches were limited to publications written in English. Duplicate publications captured through the searches were identified and removed prior to the screening process.

The databases, websites, search terms (using the proper syntax for each database), and number of records retrieved are presented in Table 2.

First Screening

Titles and abstracts of unique records were screened using the following criteria:

Inclusion:

- Scholarly journal articles, CSAS publications, government reports, technical reports, meta-analyses, thesis, dissertations, and books; and
- Studies including information about any of the five species of Pacific salmon (i.e., Chinook, Coho, Chum, Sockeye or Pink Salmon).

Exclusion:

- Abstracts, letters to the editor, conference proceedings, magazine articles, news articles, and blogs;
- Studies in which the salmon species was not specified;
- Studies that did not fully or partially occur on the Pacific coast of BC;
- Studies that exclusively focus on freshwater environments; and
- Studies conducted under controlled laboratory conditions.

Second Screening

The full text of each remaining record was screened using the following criteria:

Inclusion:

- Studies that provide information on the occurrence, distribution, migration, or residence of juvenile Pacific salmon in BC.

Exclusion:

- Studies that only provide information on adult Pacific salmon;
- Studies located outside of the study area and adjacent areas;
- Studies that were inaccessible; and
- Studies that do not present required information for this study (e.g., juvenile salmon occurrence data described in Section 2.3.2).

Following the second screening, duplicate data that was already available through grey literature datasets was located and removed.

The number of records remaining after duplicates were removed, after each screening, and the final number of records used in the dataset are available in Table 2.

Table 2. Search terms used, notes, and number of records retrieved for each of three databases and three websites of scientific articles searched on October 18, 2021 and December 6, 2024.

Database or Website	Search Terms	Additional Notes	Number of Records (2021)	Number of Additional Records (2024)
ProQuest Biological Science and Earth, Atmospheric & Aquatic Science Collections	Abs((juvenile) AND (chinook OR chum OR sockeye OR pink OR coho OR "Pacific salmon") AND (salmon) AND ("British Columbia" OR BC OR "west coast") AND (occurrence OR distribution OR migrat* OR reside*)) OR ti((juvenile) AND (chinook OR chum OR sockeye OR pink OR coho OR "Pacific salmon") AND (salmon) AND ("British Columbia" OR BC OR "west coast") AND (occurrence OR distribution OR migrat* OR reside*))	NA	247	11
Web of Science Core Collection	AB=((juvenile) AND (chinook OR chum OR sockeye OR pink OR coho OR "Pacific salmon") AND (salmon) AND ("British Columbia" OR BC OR "west coast") AND (occurrence OR distribution OR migrat* OR reside*)) OR TI=((juvenile) AND (chinook OR chum OR sockeye OR pink OR coho OR "Pacific salmon") AND (salmon) AND ("British Columbia" OR BC OR "west coast") AND (occurrence OR distribution OR migrat* OR reside*))	NA	92	15
Cabi VetMed Resource	(juvenile) AND (chinook OR chum OR sockeye OR pink OR coho OR "Pacific salmon") AND (salmon) AND ("British Columbia" OR BC OR "west coast") AND (occurrence OR distribution OR migrat* OR reside*)	No search within abstract or title option available.	48	4
Canadian Science Advisory Secretariat	juvenile AND salmon	No Boolean search function.	2	1
Salish Sea Marine Survival Project	(juvenile) AND (chinook OR chum OR sockeye OR pink OR coho OR "Pacific salmon") AND (salmon) AND ("British Columbia" OR BC OR "west coast") AND (occurrence OR distribution OR migrat* OR reside*)	No publication search function; publications manually searched.	3	0

Kintama Research Services	(juvenile) AND (chinook OR chum OR sockeye OR pink OR coho OR "Pacific salmon") AND (salmon) AND ("British Columbia" OR BC OR "west coast") AND (occurrence OR distribution OR migrat* OR reside*)	No publication search function; publications manually searched.	2	0
Total	Total number of records retrieved		394	31
Search Duplicates	Number of records after search duplicates removed		237	18
1st Screening	Number of records after the first screening		168	11
2nd Screening	Number of records after the second screening		26	1
Data Duplicates	Number of records after data duplicates removed		25	1
Date Restriction	Number of records after year restricted to 2000-2024		21	1
Total Used	Final number of records used		22	

Federal Science Libraries Network

Due to search engine limitations, documents in this database were searched for and screened differently than the main literature review.

Database Searches

The Federal Science Libraries Network (FSLN) was searched over a three-day period in October 2021, and again on December 7, 2024, to retrieve articles published since the initial search.

The FSLN has a set record return maximum per search, so individual searches for each species were necessary. The search engine allows searching by title but not abstract, so predefined search terms were searched for throughout the document. Not all documents in the library were keyword searchable; therefore, some publications may not have been picked up in the search. The search was limited to include the DFO library only and publications written in French or English. Duplicate publications captured throughout the FSLN search were identified and removed prior to the screening process.

The search terms using the proper syntax for this database and the number of records retrieved are presented in Table 3.

First Screening

Titles, abstracts, and full text of unique records were screened using the following criteria:

Inclusion:

- Studies including information about any of the five species of Pacific salmon (i.e., Chinook, Coho, Chum, Sockeye or Pink Salmon).

Exclusion:

- Studies that only provide information on adult Pacific salmon;
- Studies in which the salmon species was not specified;
- Studies that do not fully or partially occur on the Pacific coast of BC;
- Studies conducted under controlled laboratory conditions; and
- Studies that were inaccessible.

Duplicate sources that were already captured in the main literature review or that contain data already provided through the grey literature datasets were removed following the first screening.

Second Screening

The full text of each remaining record was screened using the following criteria:

Inclusion:

- Studies that provide information on the occurrence, distribution, migration, or residence of juvenile Pacific salmon in BC.

Exclusion:

- Studies that exclusively focus on freshwater environments.
- Studies that do not present required information for this study (e.g., juvenile salmon occurrence data described in Section 2.3.2).

The number of records remaining after duplicates were removed, after each screening, and the final number of records used in the dataset are available in Table 3.

Table 3. Search terms used, notes, and number of records retrieved from the Federal Science Libraries Network database searched in October 2021 and December 2024.

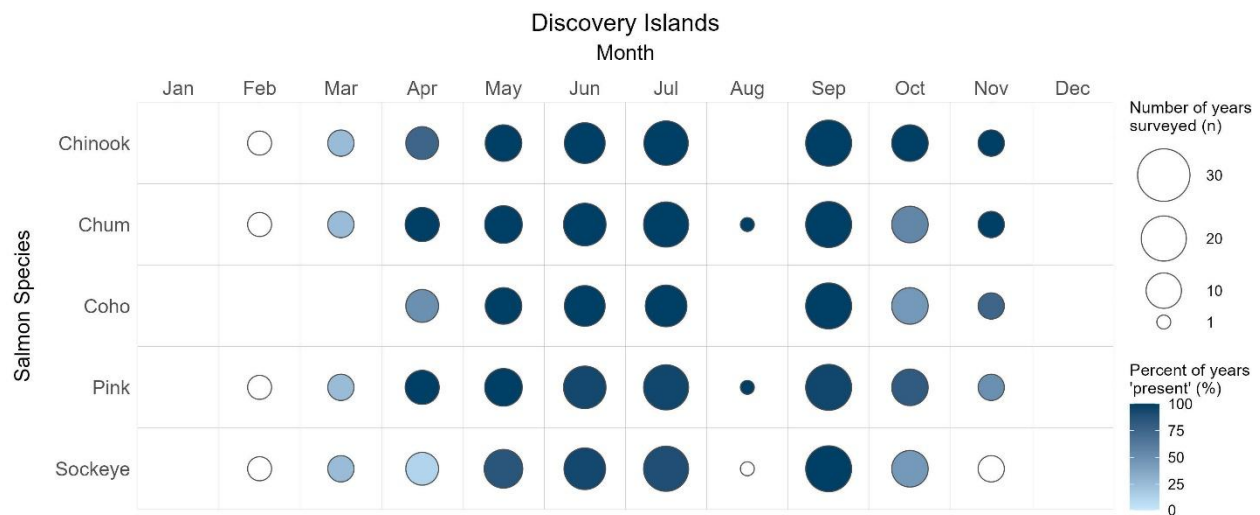
Database or Website	Search Terms	Number of Records (2021)	Number of Additional Records (2024)
Federal Science Libraries Network (FSLN)	("British Columbia" OR BC) AND (juvenile* OR immature* OR smolt*) AND ("Chinook salmon" OR "Chinook" OR " <i>Oncorhynchus tshawytscha</i> " OR " <i>O. tshawytscha</i> ")	326	22
	("British Columbia" OR BC) AND (juvenile* OR immature* OR smolt*) AND ("Chum salmon" OR "Chum" OR " <i>Oncorhynchus keta</i> " OR " <i>O. keta</i> ")	178	12
	("British Columbia" OR BC) AND (juvenile* OR immature* OR smolt*) AND ("Coho salmon" OR "Coho" OR " <i>Oncorhynchus kisutch</i> " OR " <i>O. kisutch</i> ")	491	14
	("British Columbia" OR BC) AND (juvenile* OR immature* OR smolt*) AND ("Pink salmon" OR "Pink" OR " <i>Oncorhynchus gorbuscha</i> " OR " <i>O. gorbuscha</i> ")	138	13
	("British Columbia" OR BC) AND (juvenile* OR immature* OR smolt*) AND ("Sockeye salmon" OR "Sockeye" OR " <i>Oncorhynchus nerka</i> " OR " <i>O. nerka</i> ")	304	23
Total	Total number of records retrieved	1437	84
Search Duplicates	Number of records after FSLN duplicates removed	850	36
1st Screening	Number of records after the first screening	271	20
Main Search and Data Duplicates	Number of records after duplicates collected in the main literature search and data duplicates removed	103	20
2nd Screening	Number of records after the second screening	33	0
Date Restriction	Number of records after year restricted to 2000-2024	1	0
Total Used	Final number of records used	1	

APPENDIX B: DATA DATE-RANGE COMPARISON

Salmon occurrence data were available from the years 1961-2024; however, the dataset was restricted to 2000-2024 for reasons explained in Section 2.3.3. The only zones that showed distinguishable differences in the figures if all years of data were included versus only 2000-2024 were the Discovery Islands and Central Coast. In the Discovery Islands, the historical data filled gaps for January, February, March, August, and December. On the Central Coast, the historical data supplemented sparse data for August and September. Historical data were available for all other zones, but the plots were visually indistinguishable when compared to the more recent timeframe.

A comparison of the data using the current (2000-2024) and historical (1961-2024) date ranges for the Discovery Islands zone is presented in Figure 3. **Error! Reference source not found..** Data sources used for years 2000-2024 are available in Appendix D, sources used for years 1961-1999 are available in Appendix E.

Current Dataset (2000-2024)



Historical Dataset (1961-2024)

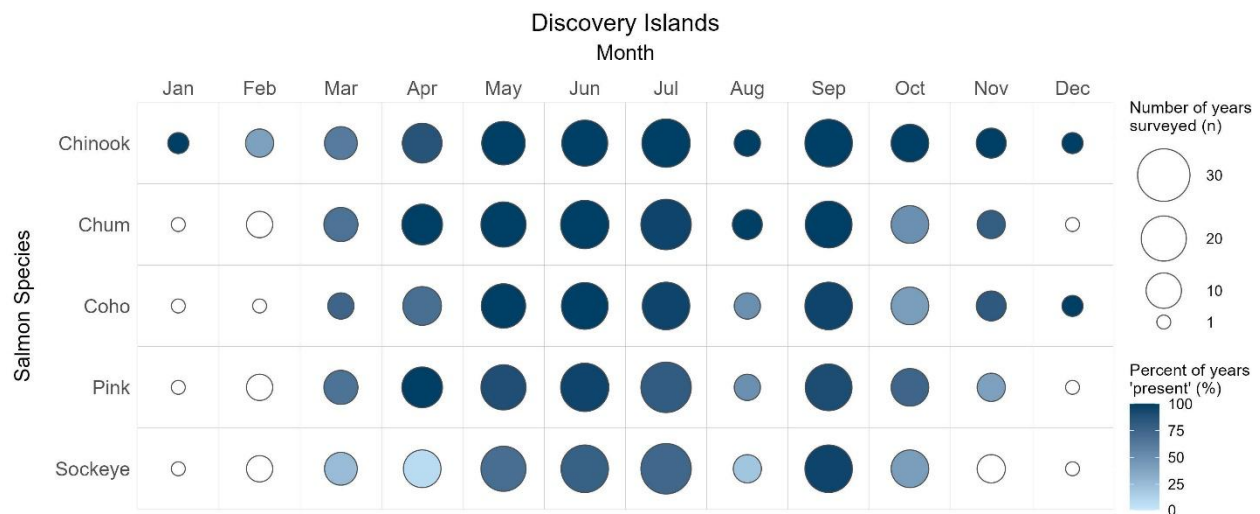


Figure 3. Juvenile Pacific salmon occurrence presented by data date range for the Discovery Islands zone. The size of the circle indicates the number of years that studies were conducted, and the color indicates the percentage of years studied that a species was reported, both are continuous variables. Absence of a circle means no data were available, while an open (white) circle indicates the species was not caught.

APPENDIX C: DATA BY SURVEY METHOD

Juvenile occurrence data separated by survey method, for each zone, 2000-2024 (Table 4). The specific years that data was available overlaps between survey method for each zone, so the numbers will not necessarily add up to be the same as those displayed in Figure 2 (A-G).

Table 4. Number of years juvenile Pacific salmon were reported (2000-2024), separated by survey method for each zone. The total number of years that data were available is provided in brackets (maximum 25). Blank cells indicate data were not available.

West Coast Vancouver Island - North												
Trawl Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook		4 (4)	9 (9)			11 (11)	11 (11)	2 (2)		19 (19)	5 (5)	
Chum		4 (4)	4 (9)			10 (11)	11 (11)	2 (2)		19 (19)	5 (5)	
Coho						11 (11)	11 (11)	2 (2)		19 (19)	5 (5)	
Pink		2 (4)	1 (9)			1 (11)	3 (11)	1 (2)		11 (19)	3 (5)	
Sockeye		3 (4)	3 (9)			10 (11)	9 (11)	1 (2)		6 (19)	3 (5)	
Beach Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook			4 (8)	10 (12)	10 (12)							
Chum			8 (8)	13 (13)	13 (13)	0 (1)						
Coho			4 (8)	12 (13)	13 (13)	1 (1)						
Pink			0 (8)	6 (12)	2 (12)							
Sockeye			1 (8)	6 (12)	9 (12)							
West Coast Vancouver Island - South												
Trawl Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook		6 (6)	8 (9)			11 (12)	10 (10)	1 (2)		18 (18)	3 (3)	
Chum		4 (6)	1 (9)			11 (12)	7 (10)	1 (2)		17 (18)	3 (3)	
Coho						11 (12)	9 (10)	1 (2)		18 (18)	3 (3)	
Pink		2 (6)	0 (9)			2 (12)	3 (10)	1 (2)		9 (18)	3 (3)	
Sockeye		2 (6)	4 (9)			11 (12)	5 (10)	0 (2)		6 (18)	2 (3)	

Beach Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook			3 (3)	10 (11)	12 (13)	9 (9)	4 (4)	1 (1)				
Chum		1 (1)	4 (4)	12 (12)	14 (14)	9 (11)	1 (3)	0 (1)				
Coho			2 (3)	9 (11)	12 (13)	9 (9)	1 (3)	0 (1)				
Pink			0 (2)	3 (11)	2 (11)	1 (5)						
Sockeye			0 (2)	3 (11)	6 (13)	1 (6)	1 (2)	0 (1)				
Purse Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook					2 (2)	2 (2)	2 (2)	1 (1)				
Chum					2 (2)	2 (2)	2 (2)	0 (1)				
Coho					2 (2)	2 (2)	2 (2)	0 (1)				
Pink												
Sockeye					2 (2)	2 (2)	2 (2)	1 (1)				
Salish Sea												
Trawl Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook		0 (3)	0 (3)	0 (2)	2 (2)	13 (13)	13 (13)	2 (2)	22 (22)	5 (5)	1 (1)	
Chum		1 (3)	0 (3)	3 (4)	4 (4)	12 (12)	13 (13)	2 (2)	22 (22)	5 (5)	1 (1)	
Coho				1 (2)	2 (2)	12 (12)	13 (13)	0 (2)	21 (22)	5 (5)	1 (1)	
Pink		1 (3)	1 (3)	1 (4)	2 (4)	12 (12)	11 (13)	1 (2)	17 (22)	4 (5)	1 (1)	
Sockeye		0 (3)	1 (3)	0 (2)	3 (4)	14 (14)	14 (14)	1 (2)	20 (22)	3 (5)	1 (1)	
Beach Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook			1 (2)	2 (3)	5 (6)	3 (3)	1 (1)	1 (1)				
Chum			2 (2)	1 (1)	3 (3)	1 (1)	0 (1)	0 (1)				
Coho			1 (2)	0 (1)	2 (2)	1 (1)	1 (1)	1 (1)				
Pink			1 (2)	0 (1)	0 (2)	0 (1)	0 (1)	0 (1)				
Sockeye			0 (2)	0 (1)	0 (2)	1 (1)	0 (1)	0 (1)				

Purse Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook					1 (1)	2 (2)	3 (3)	1 (1)				
Chum						1 (1)	1 (1)	0 (1)				
Coho						1 (1)	1 (1)	0 (1)				
Pink						0 (1)	0 (1)	0 (1)				
Sockeye					2 (2)	2 (3)	0 (1)	0 (1)				
Other Methods												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook	1 (1)		2 (2)	2 (2)	2 (2)	2 (2)	2 (2)	1 (2)	2 (3)	3 (3)	1 (1)	1 (1)
Chum									1 (1)			
Coho						2 (2)						
Pink								0 (1)	0 (1)	0 (1)		
Sockeye					5 (5)			0 (1)	0 (1)	0 (1)		
Discovery Islands												
Trawl Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook		0 (3)	1 (4)			11 (11)	13 (13)		21 (21)	11 (11)	4 (4)	
Chum		0 (3)	1 (4)			11 (11)	13 (13)		21 (21)	6 (11)	4 (4)	
Coho						11 (11)	13 (13)		21 (21)	5 (11)	3 (4)	
Pink		0 (3)	1 (4)			10 (11)	12 (13)		20 (21)	9 (11)	2 (4)	
Sockeye		0 (3)	1 (4)			10 (11)	13 (13)		21 (21)	5 (11)	0 (4)	
Beach Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook				6 (8)	8 (8)	2 (2)						
Chum				9 (9)	9 (9)	3 (3)						
Coho				4 (8)	8 (8)	1 (2)						
Pink				9 (9)	9 (9)	3 (3)						
Sockeye				1 (8)	3 (8)	1 (2)						

Purse Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook					10 (10)	9 (9)	9 (9)					
Chum					10 (10)	10 (10)	10 (10)	1 (1)				
Coho					7 (7)	7 (7)	6 (6)					
Pink					10 (10)	10 (10)	10 (10)	1 (1)				
Sockeye					11 (12)	12 (12)	8 (10)	0 (1)				
Other Methods												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook												
Chum												
Coho												
Pink												
Sockeye					1 (1)		1 (1)					
Broughton Archipelago												
Trawl Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook		1 (2)	1 (5)			2 (2)	8 (9)		1 (3)	11 (14)	5 (5)	
Chum		0 (2)	0 (5)			2 (2)	9 (9)		2 (3)	14 (14)	5 (5)	
Coho						2 (2)	9 (9)		2 (3)	10 (14)	4 (5)	
Pink		0 (2)	1 (5)			1 (2)	8 (9)	1 (1)	2 (3)	14 (14)	5 (5)	
Sockeye		0 (2)	0 (5)			1 (2)	8 (9)		2 (3)	10 (14)	2 (5)	
Beach Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook			0 (2)	0 (9)	2 (8)	2 (3)						
Chum		1 (1)	10 (11)	22 (22)	23 (23)	22 (23)	6 (7)	0 (1)				
Coho			0 (2)	6 (9)	8 (8)	3 (3)						
Pink		1 (1)	10 (11)	22 (22)	23 (23)	23 (23)	7 (7)	1 (1)				
Sockeye			1 (2)	0 (9)	9 (10)	12 (12)	1 (1)					

Purse Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook						2 (2)	1 (1)					
Chum					4 (4)	5 (5)	5 (5)					
Coho					4 (4)	5 (5)	4 (4)					
Pink					3 (4)	5 (5)	5 (5)					
Sockeye					4 (4)	5 (5)	5 (5)					
Other Methods												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook												
Chum			5 (5)	5 (5)	6 (6)	6 (6)	3 (3)					
Coho												
Pink			2 (2)	3 (3)	5 (5)	5 (5)	2 (2)					
Sockeye												
Port Hardy												
Trawl Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook		0 (2)	0 (3)			3 (3)	10 (12)		2 (2)	11 (14)	2 (2)	
Chum		1 (2)	0 (3)			3 (3)	11 (12)		0 (2)	14 (14)	2 (2)	
Coho						3 (3)	11 (12)		1 (2)	13 (14)	2 (2)	
Pink		0 (2)	0 (3)			3 (3)	10 (12)	1 (1)	0 (2)	14 (14)	2 (2)	
Sockeye		1 (2)	0 (3)			3 (3)	11 (12)		0 (2)	9 (14)	1 (2)	
Beach Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook				3 (11)	2 (11)	1 (4)	1 (1)					
Chum				11 (11)	11 (11)	3 (4)	0 (1)					
Coho				9 (11)	10 (11)	3 (4)	0 (1)					
Pink				11 (11)	11 (11)	3 (4)	1 (1)					
Sockeye				4 (11)	10 (11)	3 (4)	0 (1)					

Other Methods												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook								1 (1)				
Chum												
Coho												
Pink												
Sockeye							1 (1)					
Central Coast												
Trawl Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook			0 (8)			1 (5)	3 (4)		0 (1)	12 (13)	6 (6)	
Chum			1 (8)			4 (5)	2 (4)		0 (1)	12 (13)	5 (6)	
Coho						1 (5)	3 (4)		0 (1)	11 (13)	5 (6)	
Pink			0 (8)			2 (5)	3 (4)		0 (1)	13 (13)	5 (6)	
Sockeye			1 (8)			3 (5)	3 (4)		1 (1)	12 (13)	5 (6)	
Beach Seine Data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook				0 (4)	1 (5)	0 (4)						
Chum				9 (9)	13 (13)	8 (9)						
Coho				0 (4)	1 (4)	1 (4)						
Pink				9 (9)	13 (13)	13 (13)						
Sockeye				0 (4)	0 (5)	1 (5)						
Other Methods												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook												
Chum												
Coho												
Pink												
Sockeye					1 (1)	3 (3)	1 (1)					

APPENDIX D: DATA SOURCES

Primary Publications

Literature Review

- Bassett, M.C., Patterson, D.A., and Shrimpton, J.M. 2018. Temporal and spatial differences in smolting among *Oncorhynchus nerka* populations throughout fresh and seawater migration. *J. Fish. Biol.* **93**: 510-518. doi:<http://dx.doi.org/10.1111/jfb.13678>.
- Beamish, R.J., Jones, S., Neville, C., Sweeting, R., Karreman, G., Saksida, S., and Gordon, E. 2006. Exceptional marine survival of Pink Salmon that entered the marine environment in 2003 suggests that farmed Atlantic salmon and Pacific salmon can coexist successfully in a marine ecosystem on the Pacific coast of Canada. *ICES J. Mar. Sci.* **63**(7): 1326-1337. doi:10.1016/j.icesjms.2006.04.011.
- Chalifour, L., Scott, D.C., MacDuffee, M., Stark, S., Dower, J.F., Beacham, T.D., Martin, T.G., and Baum, J.K. 2021. Chinook Salmon exhibit long-term rearing and early marine growth in the Fraser River, British Columbia, a large urban estuary. *Can. J. Fish. Aquat. Sci.* **78**(5): 539-550. doi:<https://doi.org/10.1139/cjfas-2020-0247>.
- Chittenden, C.M., Melnychuk, M.C., Welch, D.W., and McKinley, R.S. 2010. An investigation into the poor survival of an endangered Coho Salmon population. *PLoS One* **5**(5): e10869. doi:10.1371/journal.pone.0010869.
- Chittenden, C.M., Sweeting, R., Neville, C.M., Young, K., Galbraith, M., Carmack, E., Vagle, S., Dempsey, M., Eert, J., and Beamish, R.J. 2018. Estuarine and marine diets of out-migrating Chinook Salmon smolts in relation to local zooplankton populations, including harmful blooms. *Estuar. Coast. Shelf Sci.* **200**: 335-348. doi:<https://doi.org/10.1016/j.ecss.2017.11.021>.
- Duguid, W.D.P., and Juanes, F. 2017. Microtrolling: an economical method to nonlethally sample and tag juvenile Pacific salmon at sea. *Trans. Am. Fish. Soc.* **146**(2): 359-369. doi:10.1080/00028487.2016.1256835.
- Garzke, J., Forster, I., Godwin, S., Johnson, B.T., Krkosek, M., Mahara, N., Pakhomov, E.A., Rogers, L.A., and Hunt, B.P.V. 2022. Dynamic coastal pelagic habitat drives rapid changes in growth and condition of juvenile Sockeye Salmon (*Oncorhynchus nerka*) during early marine migration. *FACETS* **7**: 1328-1347. doi:<https://doi.org/10.1101/2022.03.21.484660>.
- Hamilton, S.L., Bravender, B.A., Beggs, C., and Munro, B. 2008. Distribution and abundance of juvenile salmonids and other fish species in the Courtenay River estuary and Baynes Sound, 2001. *Can. Tech. Rep. Fish. Aquat. Sci.* **2806**: xxvii + 213 p.
- Jones, S.R.M., and Hargreaves, N.B. 2007. The abundance and distribution of *Lepeophtheirus salmonis* (Copepoda: caligidae) on Pink (*Oncorhynchus gorbuscha*) and Chum (*O. keta*) Salmon in coastal British Columbia. *Journal of Parasitology* **93**(6): 1324-1331. doi:<https://doi.org/10.1645/GE-1252.1>.
- Jones, S.R.M., and Beamish, R.J. 2011. *Lepeophtheirus salmonis* on salmonids in the northeast Pacific Ocean. In *Salmon lice: an integrated approach to understanding parasite abundance and distribution*, first edition. Edited by S. Jones and R. Beamish. Blackwell Publishing Ltd., Oxford, UK. pp. 307-329.

- Kennedy, L.A., Juanes, F., and El-Sabaawi, R. 2018. Eelgrass as valuable nearshore foraging habitat for juvenile Pacific salmon in the early marine period. *Mar. Coast. Fish.* **10**(2): 190-203. doi:<https://doi.org/10.1002/mcf2.10018>.
- Morton, A., Routledge, R., and Krkosek, M. 2008. Sea louse infestation in wild juvenile salmon and Pacific herring associated with fish farms off the east-central coast of Vancouver Island, British Columbia. *N. Am. J. Fish. Manage.* **28**(2): 523-532. doi:<https://doi.org/10.1577/M07-042.1>.
- Neville, C.M., Beamish, R.J., and Chittenden, C.M. 2015. Poor survival of acoustically-tagged juvenile Chinook Salmon in the Strait of Georgia, British Columbia, Canada [Article]. *Trans. Am. Fish. Soc.* **144**(1): 25-33. doi:10.1080/00028487.2014.954053.
- Neville, C.M., Trudel, M., Beamish, R.J., and Johnson, S.C. 2013. The early marine distribution of juvenile Sockeye Salmon produced from the extreme low return in 2009 and the extreme high return in 2010. *N. Pac. Anadr. Fish Comm. Tech. Rep.* **9**: 65-68.
- Neville, C.M., Johnson, S.C., Beacham, T.D., Whitehouse, T., Tadey, J., and Trudel, M. 2016. Initial estimates from an integrated study examining the residence period and migration timing of juvenile Sockeye Salmon from the Fraser River through coastal waters of British Columbia. *N. Pac. Anadr. Fish Comm. Bull.* **6**: 45-60. doi:10.23849/npafcb6/45.60.
- Rechisky, E.L., Porter, A.D., Duguid, W., and Welch, D.W. 2019a. Mortality, movements, and migration timing of age-0 Cowichan Chinook Salmon tagged in the Southern Gulf Islands in fall. Kintama Research Services Ltd., Nanaimo, BC.
- Rechisky, E.L., Porter, A.D., Clark, T.D., Furey, N.B., Gale, M.K., Hinch, S.G., and Welch, D.W. 2019b. Quantifying survival of age-2 Chilko Lake Sockeye Salmon during the first 50 days of migration. *Can. J. Fish. Aquat. Sci.* **76**(1): 136-152. doi:<https://doi.org/10.1139/cjfas-2017-0425>.
- Rechisky, E.L., Porter, A.D., Johnston, S.D., Stevenson, C.F., Hinch, S.G., Hunt, B.P.V., and Welch, D. 2021. Exposure time of wild, juvenile Sockeye Salmon to open-net-pen Atlantic salmon farms in British Columbia, Canada. *N. Am. J. Fish. Manage.* **41**: 650-660. doi:<https://doi.org/10.1002/nafm.10574>.
- Saksida, S.M., Marty, G.D., Jones, S.R., Manchester, H.A., Diamond, C.L., Bidulka, J., and St-Hilaire, S. 2012. Parasites and hepatic lesions among Pink Salmon, *Oncorhynchus gorbuscha* (Walbaum), during early seawater residence. *J. Fish Dis.* **35**(2): 137-151. doi:10.1111/j.1365-2761.2011.01330.x.
- Stables, T.B., Perrin, C.J., and Rosenau, M.L. 2005. Acoustic and trawl surveys to locate eulachon aggregations in the lower Fraser River, British Columbia. *N. Am. J. Fish. Manage.* **25**(2): 675-688. doi:10.1577/M03-188.1.
- Stocks, A.P., Pakhomov, E.A., and Hunt, B.P.V. 2014. A simple method to assess the marine environment residence duration of juvenile Sockeye Salmon (*Oncorhynchus nerka*) using laser ablation. *Can. J. Fish. Aquat. Sci.* **71**: 1437-1446.
- Tanasichuk, R.W., Grayson, J., Yakimishyn, J., Taylor, S., and Dagley, G.D. 2014. The early marine biology of the hatchery/wild juvenile salmonid (*Oncorhynchus* sp.) community in Barkley Sound, Canada. *Open Fish Science Journal* **7**: 8-22. doi:10.2174/1874401X01407010008.
- Thakur, K.K., Vanderstichel, R., Li, S., Laurin, E., Tucker, S., Neville, C., Tabata, A., and Miller, K.M. 2018. A comparison of infectious agents between hatchery-enhanced and wild out-

migrating juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) from Cowichan River, British Columbia. FACETS 3(1): 695-721. doi:<https://doi.org/10.1139/facets-2017-0113>.

Grey Literature

DFO Datasets

- Neville, C. 2025. Unpublished data [dataset]. Salmon Marine Interactions Program, Ecosystem Sciences Division, Pacific Region, Fisheries and Oceans Canada.
- Tabata, A., and King, J. 2025. Unpublished data [dataset]. Regional Ecosystem Effects on Fish and Fisheries Section, Ecosystem Sciences Division, Pacific Region, Fisheries and Oceans Canada.

Publicly Available Datasets

- Cedar Coast Field Station. 2021. Monitoring sea-louse parasites on juvenile wild salmon in Clayoquot Sound on the West Coast of Vancouver Island, British Columbia, Canada [dataset]. Available from <https://github.com/cedarcoastfieldstation/Sea-lice-database> [accessed 10-12-2024].
- Johnson, B., Gan, J., Godwin, S., Bachen, K., van der Stap, T., Krkosek, M., Rogers, L.A., Portner, L., Janusson, C., and Hunt, B.P.V. 2023. Hakai Institute Juvenile Salmon Program time series (1.5.0) [dataset]. Available from <https://doi.org/10.21966/1.566666> [accessed 16-12-2024].
- Peacock, S.J., Bateman, A.W., Krkosek, M., Connors, B., Rogers, S., Portner, L., Polk, Z., Webb, C., and Morton, A. 2016. Sea-louse parasites on juvenile wild salmon in the Broughton Archipelago, British Columbia, Canada [dataset]. Available from <https://github.com/sjpeacock/Sea-lice-database> [accessed 10-12-2024].

Consultant Reports

- BC CAHS. 2016a. Kitasoo fisheries wild juvenile Pacific salmon sea lice monitoring program: 2016. BC Centre for Aquatic Health Sciences, Campbell River, BC.
- BC CAHS. 2016b. 2015 Kitasoo fisheries wild juvenile Pacific salmon sea lice monitoring program. BC Centre for Aquatic Health Sciences.
- BC CAHS. 2018a. Juvenile salmonid sea lice assessment 2018: Klemtu. Prepared for Marine Harvest Canada. BC Centre for Aquatic Health Sciences, Campbell River, BC.
- BC CAHS. 2018b. Juvenile salmonid sea lice assessment 2017: Klemtu. Prepared for Marine Harvest Canada. BC Centre for Aquatic Health Sciences, Campbell River, BC.
- BC CAHS. 2019. Juvenile salmonid sea lice assessment 2019: Klemtu. Prepared for Mowi Canada West. BC Centre for Aquatic Health Sciences, Campbell River, BC.
- BC CAHS. 2020. Juvenile salmonid sea lice assessment 2020: Klemtu. Prepared for Mowi Canada West. BC Centre for Aquatic Health Sciences, Campbell River, BC.
- BC CAHS. 2021. Juvenile salmonid sea lice assessment 2021: Klemtu. Prepared for Mowi Canada West. BC Centre for Aquatic Health Sciences., Campbell River, BC.
- BC CAHS. 2022. Juvenile salmonid sea lice assessment 2022: Klemtu. Prepared for Mowi Canada West. BC Centre for Aquatic Health Sciences., Campbell River, BC.
- BC CAHS. 2023. Juvenile salmonid sea lice assessment, 2023: Klemtu. Prepared for Mowi Canada West. BC Centre for Aquatic Health Sciences., Campbell River, BC.
- BC CAHS. 2024. Juvenile salmonid sea lice assessment, 2024: Klemtu. Prepared for Mowi Canada West. BC Centre for Aquatic Health Sciences., Campbell River, BC.
- Cermaq. 2015. 2015 juvenile wild salmon monitoring program: Clayoquot Sound, BC. Prepared for Clayoquot Sea Lice Monitoring Group. Cermaq, Cambell River, BC.

- MBC. 2005. Sea lice analysis 2004, beach seine samples: Bedwell Sound, Fortune Channel, and Tofino Inlet. Prepared for West Coast Vancouver Island Aquatic Management Society. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2010. Hecate Channel and Esperanza Inlet juvenile wild salmon sea lice infection monitoring. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2011. Sea lice analysis, 2011: Beach seine samples Clayoquot Sound, BC. Prepared for the Clayoquot Sea Lice Monitoring Group. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2013. Prevalence of sea lice (*Lepeophtheirus salmonis* and *Caligus clemensi*) on juvenile salmonids captured in Nootka Sound, BC: 2013. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2014. Prevalence of sea lice (*Lepeophtheirus salmonis* and *Caligus clemensi*) on juvenile salmonids captured in Nootka Sound, BC: 2014. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2015a. Prevalence of sea lice (*Lepeophtheirus salmonis* and *Caligus clemensi*) on juvenile salmonids captured in the Broughton Archipelago. Prepared for Marine Harvest Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2015b. Prevalence of sea lice (*Lepeophtheirus salmonis* and *Caligus clemensi*) on juvenile salmonids captured in the Quatsino Sound, 2015. Prepared for Marine Harvest Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2015c. Prevalence of sea lice (*Lepeophtheirus salmonis* and *Caligus clemensi*) on juvenile salmonids captured in Nootka Sound, BC: 2015. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2016a. Wild juvenile salmonid monitoring program: Quatsino Sound, BC, 2016. Prepared for Marine Harvest Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2016b. Wild juvenile salmonid monitoring program: Broughton Archipelago, 2016. Prepared for Marine Harvest Canada, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2016c. Wild juvenile salmonid monitoring program: Clayoquot Sound, BC, 2016. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2016d. Wild juvenile salmonid monitoring program: Nootka Sound, BC, 2016. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2017a. Wild juvenile salmonid monitoring program: Discovery Islands, 2017. Prepared for Marine Harvest Canada, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2017b. Wild juvenile salmonid monitoring program: Clayoquot Sound, BC, 2017. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2017c. Wild juvenile salmonid monitoring program: Quatsino Sound, BC, 2017. Prepared for Marine Harvest Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2017d. Wild juvenile salmonid monitoring program: Broughton Archipelago, 2017. Prepared for Marine Harvest Canada, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2017e. Wild juvenile salmonid monitoring program: Esperanza Inlet, BC, 2017. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2017f. Wild juvenile salmonid monitoring program: Nootka Sound, BC, 2017. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2018a. Wild juvenile salmonid monitoring program: Clayoquot Sound, BC, 2018. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.

- MBC. 2018b. Wild juvenile salmonid monitoring program: Broughton Archipelago, 2018. Prepared for Marine Harvest Canada, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2018c. Wild juvenile salmonid monitoring program: Discovery Islands, 2018. Prepared for Marine Harvest Canada, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2018d. Wild juvenile salmonid monitoring program: Quatsino Sound, BC, 2018. Prepared for Marine Harvest Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2018e. Wild juvenile salmonid monitoring program: Nootka Sound, BC, 2018. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2019a. Wild juvenile salmonid monitoring program: Clayoquot Sound, BC, 2019. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2019b. Wild juvenile salmonid monitoring program: Broughton Archipelago, 2019. Prepared for MOWI Canada West and Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2019c. Wild juvenile salmonid monitoring program: Quatsino Sound, BC, 2019. Prepared for MOWI Canada West. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2019d. Wild juvenile salmonid monitoring program: Discovery Islands, 2019. Prepared for Marine Harvest Canada, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2019e. Wild juvenile salmonid monitoring program: Esperanza Inlet, BC, 2019. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2020a. Wild juvenile salmonid monitoring program, 2020: Discovery Islands, BC. Prepared for MOWI Canada West, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2020b. Wild juvenile salmonid monitoring program, 2020: Broughton Archipelago, BC. Prepared for MOWI Canada West and Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2020c. Wild juvenile salmonid monitoring program, 2020: Quatsino Sound, BC. Prepared for MOWI Canada West. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2020d. Wild juvenile salmonid monitoring program, 2020: Clayoquot Sound, BC. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2020e. Wild juvenile salmonid monitoring program, 2020: Esperanza Inlet, BC. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2021a. Wild juvenile salmonid monitoring program, 2021: Clayoquot Sound, BC. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2021b. Wild juvenile salmonid monitoring program, 2021: Broughton Archipelago, BC. Prepared for MOWI Canada West and Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2021c. Wild juvenile salmonid monitoring program, 2021: Muchalat Inlet, Nootka Sound, BC. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2021d. Wild juvenile salmonid monitoring program, 2021: Clio Channel and Chatham Channel, BC. Prepared for Grieg Seafood Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2021e. Wild juvenile salmonid monitoring program, 2021: Discovery Islands, BC. Prepared for MOWI Canada West, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2021f. Wild juvenile salmonid monitoring program, 2021: Quatsino Sound, BC. Prepared for MOWI Canada West. Mainstream Biological Consulting, Campbell River, BC.

- MBC. 2021g. Wild juvenile salmonid monitoring program, 2021: Jervis Inlet and Sechelt Inlet, BC. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting., Campbell River, BC.
- MBC. 2021h. Wild juvenile salmonid monitoring program 2021: Esperanza Inlet, BC. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting., Campbell River, BC.
- MBC. 2022a. Wild juvenile salmonid monitoring program: 2022 Broughton Archipelago, BC. Prepared for Mowi Canada West and Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2022b. Wild juvenile salmonid monitoring program, 2022: Clio Channel and Chatham Channel, BC. Prepared for Grieg Seafood Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2022c. Wild juvenile salmonid monitoring program, 2022: Clayoquot Sound, BC. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2022d. Wild juvenile salmonid monitoring program, 2022: Discovery Islands, BC. Prepared for Mowi Canada West, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2022e. Wild juvenile salmonid monitoring program, 2022: Muchalat Inlet, Nootka Sound, BC. Prepared for Grieg Seafood BC, Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2022f. Wild juvenile salmonid monitoring program, 2022: Quatsino Sound, BC. Prepared for Mowi Canada West. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2023a. Wild juvenile salmonid monitoring program, 2023: Broughton Archipelago, BC. Prepared for Mowi Canada West and Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2023b. Wild juvenile salmonid monitoring program, 2023: Clayoquot Sound, BC. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2023c. Wild juvenile salmonid monitoring program, 2023: Discovery Islands, BC. Prepared for Mowi Canada West, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2023d. Wild juvenile salmonid monitoring program, 2023: Queen Charlotte Strait and Goletas Channel, BC. Prepared for Mowi Canada West. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2023e. Wild juvenile salmonid monitoring program, 2023: Quatsino Sound, BC. Prepared for Mowi Canada West. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2024a. Wild juvenile salmonid monitoring program: 2024 Clio Channel and Chatham Channel, BC. Prepared for Grieg Seafood BC Ltd. . Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2024b. Wild juvenile salmonid monitoring program, 2024: Broughton Archipelago, BC. Prepared for MOWI Canada West. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2024c. Wild juvenile salmonid monitoring program, 2024: Clayoquot Sound, BC. Prepared for Cermaq Canada. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2024d. Wild juvenile salmonid monitoring program, 2024: Discovery Islands, BC. Prepared for Mowi Canada West, Cermaq Canada, and Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2024e. Wild juvenile salmonid monitoring program, 2024: Esperanza Inlet, Nootka Sound, BC. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2024f. Wild juvenile salmonid monitoring program, 2024: Muchalat Inlet, Nootka Sound, BC. Prepared for Grieg Seafood BC Ltd. Mainstream Biological Consulting, Campbell River, BC.

- MBC. 2024g. Wild juvenile salmonid monitoring program, 2024: Queen Charlotte Strait and Goletas Channel, BC. Prepared for Mowi Canada West. Mainstream Biological Consulting, Campbell River, BC.
- MBC. 2024h. Wild juvenile salmonid monitoring program, 2024: Quatsino Sound, BC. Prepared for Mowi Canada West. Mainstream Biological Consulting, Campbell River, BC.
- Pacificus. 2014. Sea lice monitoring study in Goletas Channel and Queen Charlotte Strait, BC: Year 3. Prepared for Tlatlasikwala First Nation, Gwa'sala-Nakwaxda'xw First Nation, and Marine Harvest Canada Inc. Pacificus Biological Services Ltd, Port Hardy, BC.
- Pacificus. 2015. Sea lice monitoring study in Goletas Channel and Queen Charlotte Strait, BC: Year 4. Prepared for Tlatlasikwala First Nation, Gwa'sala-Nakwaxda'xw First Nation, and Marine Harvest Canada Inc. Pacificus Biological Services Ltd, Port Hardy, BC.
- Pacificus. 2016. Sea lice monitoring study in Goletas Channel and Queen Charlotte Strait, BC: Year 5. Prepared for Tlatlasikwala First Nation, Gwa'sala-Nakwaxda'xw First Nation, and Marine Harvest Canada Inc. Pacificus Biological Services Ltd, Port Hardy, BC.
- Pacificus. 2017. Sea lice monitoring study in Goletas Channel and Queen Charlotte Strait, BC: Year 6. Prepared for Tlatlasikwala First Nation and Marine Harvest Canada Inc. Pacificus Biological Services Ltd, Port Hardy, BC.
- Pacificus. 2018. Sea lice monitoring study in Goletas Channel and Queen Charlotte Strait, BC: Year 7. Prepared for Tlatlasikwala First Nation and Marine Harvest Canada Inc. Pacificus Biological Services Ltd, Port Hardy, BC.
- Pacificus. 2019. Sea lice monitoring study in Goletas Channel and Queen Charlotte Strait, BC: Year 8. Prepared for Tlatlasikwala First Nation and Mowi Canada West. Pacificus Biological Services Ltd, Port Hardy, BC.
- Pacificus. 2020. Sea lice monitoring study in Goletas Channel and Queen Charlotte Strait, BC: Year 9. Prepared for Tlatlasikwala First Nation and Mowi Canada West. Pacificus Biological Services Ltd, Port Hardy, BC.
- Pacificus. 2021. Sea lice monitoring study in Goletas Channel and Queen Charlotte Strait, BC: Year 10. Prepared for MOWI Canada West. Pacificus Biological Services Ltd., Port Hardy, BC.

APPENDIX E: SUPPLEMENTAL DATA SOURCES

The following references provided data that was used for the supplemental information presented in Figure 3 (Appendix B). They include juvenile salmon occurrence data that was available for the Discovery Islands zone for the years 1961-1999 (inclusive).

- Anderson, S.S., and Bravender, B.A. 1998. Catch, length, and weight data for juvenile salmonids sampled from the Campbell River estuary and Discovery Passage, B.C., during 1994 and 1995. *Can. Data Rep. Fish. Aquat. Sci.* **1037**: 181 p.
- Bravender, B.A., Annand, C., Hillaby, A., and Naylor, J. 1997. Fish species, juvenile Chinook diets and epibenthos in the Englishman River estuary, 1993. *Can. Data Rep. Fish. Aquat. Sci.* **1021**: 41 p.
- Chang, B.D., Kotyk, M.S., Brown, T.J., Levings, C.D., McAllister, C.D., and Macdonald, J.S. 1984. Length and weight data for unmarked juvenile salmon sampled in the Campbell River estuary and Discovery Passage, 1983. *Can. Data Rep. Fish. Aquat. Sci.* **446**: iii + 39 p.
- Korman, J., Bravender, B., and Levings, C.D. 1997. Utilization of the Campbell River estuary by juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) in 1994. *Can. Tech. Rep. Fish. Aquat. Sci.* **2169**: 45 p.
- Koty, M., Chang, B.D., Brown, T.J., Levings, C.D., and McAllister, C.D. 1983. Length and weight data for unmarked juvenile salmon sampled in the Campbell River estuary and Discovery Passage, 1982. *Can. Data Rep. Fish. Aquat. Sci.* **408**: iii + 61 p.
- Koty, M.S., Brown, T.J., Kask, B.A., Levings, C.D., McAllister, C.D., and Macdonald, J.S. 1986. Length and weight data for unmarked juvenile salmonids sampled in the Campbell River estuary and Discovery Passage, 1985. *Can. Data Rep. Fish. Aquat. Sci.* **616**: 29 p.
- Koty, M.S., Brown, T.J., Kask, B.A., Levings, C.D., McAllister, C.D., Macdonald, J.S., and Chang, B.D. 1985. Length and weight data for unmarked juvenile salmonids sampled in the Campbell River estuary and Discovery Passage, 1984. *Can. Data Rep. Fish. Aquat. Sci.* **513**: 54 p.
- Levings, C.D., and Kotyk, M. 1983. Results of two boat trawling for juvenile salmonids in Discovery Passage and nearby channels, Northern Strait of Georgia. *Can. MS Rep. Fish. Aquat. Sci.* **1730**: iv + 55 p.
- Raymond, B.A., Wayne, M.M., and Morrison, J.A. 1985. Vegetation, invertebrate distribution and fish utilization of the Campbell River estuary, British Columbia. *Can. MS Rep. Fish. Aquat. Sci.* **1829**: 46 p.