Estimation of stock composition of coho salmon in northern and central coastal fisheries in British Columbia

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ABSTRACT

Direct DNA sequencing is powering a revolution in the application of genetics to resource management, with parentage-based tagging (PBT) increasingly applied to salmon fisheries and hatchery broodstock management and assessment. Genetic stock identification (GSI) and PBT were applied to assessment of 2018 coho salmon fisheries and hatchery broodstocks in British Columbia (BC), Canada, with 6,391 individuals successfully genotyped in fishery samples and 7,805 individuals genotyped in 40 hatchery broodstocks. Population-specific contributions to mixed-stock fisheries and exploitation rates were estimated with coded-wire tags (CWTs) and GSI-PBT technologies for six populations. PBT assignments, verified by CWTs, were 100% accurate for 308 individuals with respect to population of origin and age. There was generally reasonably close agreement of estimated population-specific exploitation rates between CWT and genetic methods. We conclude that a genetic approach can improve upon the results available from the current CWT program for assessment and management of coho salmon fisheries and hatchery broodstocks in BC, and provide information critical to aid in implementation of Canada's Policy for Conservation of Wild Pacific Salmon.

Keywords: amplicon sequencing; fishery management; genetic stock identification mixed-stock fishery; parentage-based tagging; salmonids

INTRODUCTION

Production from hatcheries is currently an important factor contributing to abundance for many species of Pacific salmon (Ruggerone and Irvine, 2018), with the objectives of either increasing fishery harvest or supplementing production for populations of conservation concern. Harvesting hatchery production may come at a cost to unenhanced wild populations if both hatchery and wild populations are exploited in mixed-stock fisheries (Hatchery Scientific Review Group (HSRG), 2014; Flagg, 2015). Ideally, fisheries and hatchery production should be managed in such a way as to ensure that wild populations are safeguarded and harvest attributed to both wild and hatchery-origin parents is sustainable. Finding the balance between conservation and exploitation is the ongoing dilemma for Pacific salmon fisheries management, and development of techniques to aid fishery managers in this quest is an important goal.

A unified approach to assessment and management of hatchery production and fisheries targeting hatchery and wild salmon is desirable. Analysis of genetic variation may provide the link between hatchery broodstock and fisheries management assessment. Direct DNA sequencing is the driver of a revolution in the application of genetics to fisheries management and assessment, providing cost-effective genotyping at single nucleotide polymorphism (SNP) loci (Campbell et al. 2015) or microsatellites (Bradbury et al. 2018). Genotyping individuals at hundreds of SNPs with a single SNP panel via direct DNA sequencing is driving a revolutionary change in fisheries management applications. A new era is at hand not only for salmon fishery assessment and hatchery management, but by harnessing the power of applying genetic variation to resource management and forensic applications, unparalleled resolution in determining the origin of individual animals is achievable.

Genetic analysis provides an alternative method of salmon fisheries management and assessment to that provided by coded-wire tags (CWTs; Jefferts et al., 1963). One such genetic application is parentage-based tagging (PBT; Anderson and Garza, 2006). Through PBT, if all parents in the broodstock of a hatchery have been sampled and genotyped, then all of the offspring of the hatchery have been genetically "tagged". This means that the hatchery of release and importantly the age of the individual when sampled in a fishery or an escapement are obtained by matching the individual's genotype to that of prospective parents (Anderson, 2012; Wang, 2016). In Pacific salmon, PBT has been applied in assessment of CWT equivalency, individual reproductive success, and effective population size in both natural and hatchery settings (Abadia-Cardoso et al., 2013; Steele et al., 2013; Ford et al., 2015; Hinrichsen et al., 2016). One significant advantage of the combination of mass marking hatchery-origin individuals via an adipose fin clip and PBT implementation is the capability to identify visually, sample, and if desired, remove hatchery fish of local and stray origin in threatened wild populations. Many other advantages exist through using this technology, although it requires development and uptake by fisheries management to fully realize its potential.

As outlined by Steele et al. (2019), PBT uses molecular-based approaches to conduct large-scale parentage assignments and has resulted in the unprecedented ability to identify genetically millions of hatchery-origin salmonids. Application of a combined PBT and genetic stock identification (GSI) approach to Pacific salmon fisheries and escapement assessment was outlined by Hess et al. (2016) and Steele et al. (2019) in an application for upper Columbia River steelhead trout (*Oncorhynchus mykiss*), but was limited in geographic scale. Highly mixed-stock marine fishery applications provide a more challenging case of the utility of PBT and GSI to identify individuals sampled, in which a large number of geographically-diverse populations may

be contributing to the mixed-stock sample. In some initial steps, Beacham et al. (2017) expanded the approach to illustrate the potential of PBT and GSI for ocean fisheries assessment for coho salmon (*O. kisutch*), and later for Chinook salmon (*O. tshawytscha*) (Beacham et al., 2018). Beacham et al. (2019a) provided evidence that PBT-GSI-based assessment and management of hatchery-origin and wild coho salmon was a practical approach, as demonstrated by a large-scale application to fisheries management and assessment in British Columbia (BC). In addition, population- and family-specific distributions among fisheries, origins and productivity of hatchery broodstocks and associated stray rates among populations were evaluated via PBT (Beacham et al., 2019b). These approaches showed large potential, providing an impetus to continue genotyping broodstocks and to increase the number of participating hatcheries.

In BC, CWTs are applied to both coho and Chinook salmon for fisheries and stock assessment purposes, but on an annual basis approximately five times more CWTs are applied to Chinook salmon juveniles than coho salmon juveniles. There are correspondingly far greater numbers of CWTs sampled from Chinook salmon fisheries in BC compared with coho salmon fisheries, so much so that presently the number of CWTs recovered annually from coho salmon fisheries in BC fisheries is only about 3% of that recovered in the late 1980s (Beacham et al., 2019a). A combined PBT and GSI approach to coho salmon fishery assessment provides a method to alleviate the deficiencies of the current CWT method of assessment for coho salmon in BC (Beacham et al., 2019a). However, reticence to implement change can be an impediment to adoption of new technologies (Bernatchez et al., 2017). The present level of information derived from the CWT program for coho salmon in BC provides a fairly modest threshold of performance to exceed in terms of consideration for requiring alternate fishery assessment methods (Beacham et al., 2019a). Continued demonstration of the effectiveness of applying both PBT and GSI to assessing of salmon fisheries remains necessary to overcome reticence to implement a genetic approach to assessment. In practice, once hatchery assessment staff observe the power of GSI and PBT in operation, some may opt to implement PBT as the primary method for broodstock assessment. Since a diverse array of information is obtained via GSI-PBT for fisheries and hatchery broodstock assessment (Beacham et al., 2019a; Beacham et al., 2019b), implementation of a GSI-PBT approach to assessment can meet the requirements of both fishery and hatchery managers, unifying assessment activities in both areas. It can also capture a much larger number of populations than are currently being observed through existing management approaches.

In the current study, the GSI-PBT approach developed by Beacham et al. (2017; 2019a; 2019b) was applied to coho salmon fisheries and hatchery broodstocks in BC in 2018. Commercial and recreational coho salmon fisheries were sampled for both CWTs and genetic variation. Genotyping by amplicon sequencing methodology was used to genotype coho salmon at 304 amplicons for a single SNP per amplicon. Complete broodstock genotyping for PBT analysis was conducted for 20 hatchery broodstocks in 2014, 31 broodstocks in 2015, and 30 broodstocks in 2016. These genotypes were incorporated into a stock identification baseline comprising 57,982 individuals from 332 populations ranging from southeast Russia to California, with the baseline employed for both PBT and GSI analyses (Beacham et al., *in review*). A comparison of the population-specific contributions to mixed-stock fisheries and exploitation rates estimated with CWTs and GSI-PBT technologies was conducted, finding broadly concordant results from both technologies, but with expanded scope provided by the genetic technology. New information about population-specific distribution patterns and

contributions to mixed-stock fisheries was identified, improving our ability to understand the variance that exists among different hatchery-enhanced populations. With these results, we conclude that a genetic approach can improve upon the results available from the current CWT program for assessment and management of coho salmon hatchery broodstocks and fisheries in BC, and can provide critical information to aid in implementation of Canada's Policy for Conservation of Wild Pacific Salmon (WSP; Fisheries and Oceans Canada (DFO), 2005).

METHODS

Fishery sample collection

A total of 6,391 individuals was genotyped from fishery samples collected in 2018. In brief, samples were grouped by general geographic area as outlined by Beacham et al. (2019a), with the locations of statistical areas outlined by http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/areas-secteurs/index-eng.html. Additional coho salmon samples (both adipose fin clipped and unclipped) were obtained from a gillnet test fishery targeting sockeye salmon (*Oncorhynchus nerka*) near Round Island in northern Johnstone Strait (Figure 1).

In 2018, for the northern (Area F) freezer troll fishery, selected freezer boats were required to keep heads of all coho salmon caught, with the mark type (adipose fin clipped or not) unknown for an individual head. Upon landing, the heads were counted and checked electronically for CWTs, and randomly sampled to a maximum of 50 heads per delivery. If a CWT was detected, the head was sent to a central CWT head recovery laboratory in Vancouver, BC where the tissue sample for DNA extraction was subsequently taken. Field tissue samples for DNA extraction were taken only from individuals with no CWTs detected.

In 2018, for the northern ice boat troll fishery, samples of coho salmon with known clip status were obtained as an ancillary aspect of standard Fisheries and Oceans Canada contract catch sampling for CWTs. Both adipose fin clipped and unclipped individuals were examined through this program, with similar sampling protocols as outlined in the northern freezer troll sampling described above. Clipped fish not containing a CWT were sampled in the field through this program, and heads containing a CWT were sent to the head recovery laboratory in Vancouver.

The 2018 BC recreational fishery samples originated from voluntary head recoveries of adipose fin-clipped coho salmon from recreational fisheries in southern BC, and direct sampling of the catch in some northern recreational fisheries. Samples from the recreational fishery in southern BC were derived from clipped individuals, but they may not have been marked with a CWT when delivered to the CWT head recovery laboratory. Thus, samples in 2018 were obtained from all individuals that would be routinely processed under the CWT recovery program for coho salmon in BC. Samples were collected from a recreational fishery (clipped and unclipped individuals) from Haida Gwaii near Langara Island, recreational fisheries in northern BC (Area 3 and Area 4, clipped and unclipped individuals), a recreational fishery near Rivers Inlet (Area 8, clipped and unclipped individuals) in the central coast, and sampling (clipped individuals) of recreational fisheries in southern BC (Figure 1).

Monthly catch composition estimates were determined for clipped individuals from various fisheries in BC. Seasonal catch composition estimates from genetic assignments were determined by recording the number of genotyped individuals that were sourced from the fishery in each month of sampling, and weighting individual monthly samples by the recorded catch in the month. Individuals were randomly chosen for months in which the number of available

genotyped fish was in excess of the number required for the seasonal sample. For example, if 50% of the annual catch was recorded in one month and 200 genotyped individuals were available from the fishery, then all individuals sampled would be included in the seasonal sample, but contributions of individuals from other months would be scaled relative to the monthly contribution to the seasonal catch. Further, if the catch in one other month was 20% of the annual catch, and 175 genotyped samples were available, then 200*(20%/50%)=80 genotyped individuals were randomly chosen from the available 175 genotypes for inclusion into the seasonal sample.

In the northern BC troll fishery, samplers electronically checked clipped individuals for the presence of a CWT, and heads from those individuals containing a CWT were subsequently sent to the central laboratory for processing. Tissue samples from clipped individuals with no CWTs were provided for genotyping. In order to estimate monthly and seasonal stock composition in this fishery, we pooled the individuals obtained from direct fishery sampling with those subsequently sent to the central laboratory for CWT recovery in order to provide a more comprehensive and unbiased pool of individuals to estimate monthly and seasonal stock compositions in the fishery. In each sample analyzed over all BC fisheries, the number of individuals identified via PBT relative to the total genotyped individuals in the sample was tabulated, and summarized over sample, fishery, and season.

GSI-PBT baseline

When PBT-based sampling of the hatchery broodstocks was originated in 2014, 20 broodstocks from southern BC were included in the analysis, generating a PBT baseline comprising 6,061 genotyped individuals (Beacham et al., 2017). In 2016, the program had expanded to include 30 broodstocks from both northern and southern BC, and included 7,013 genotyped individuals. By 2018, the program had continued to expand to include sampling from 40 hatchery broodstocks in BC, and including 7,805 genotyped individuals.

As well as the PBT portion of the baseline having expanded, the GSI portion of the baseline was increased beyond the 117 populations and 20,242 individuals genotyped reported by Beacham et al. (2017). As outlined by Beacham et al. (*in review*), the combined GSI-PBT baseline applied in the current analysis consisted of 57,982 genotyped coho salmon from 332 populations from Russia, Alaska, BC, Washington, Oregon, and California. Estimates of stock composition by Conservation Unit (CU) as defined under Canada's WSP are possible based solely on GSI (Beacham et al., *in review*), and when combined with assignment of individuals via PBT, provided a powerful technique for assignment of individuals of unknown origin to some populations. Boundaries of the CUs were outlined in Figure 1 in Beacham et al. (*in review*).

Exploitation rate

As previously outlined by Beacham et al. (2019a), exploitation rate of adult coho salmon in BC fisheries was estimated via both CWTs and genetics. Exploitation rate for a population is defined as adult catch/(adult catch+escapement). For CWTs, the observed number of CWTs was corrected by "no-pin" tag loss rates and was expanded by the population's tag-specific marking rate summed over tag codes and expanded again by the sampling rate for the fishery in order to estimate catch of hatchery-origin individuals. The observed number of CWTs in escapement sampling was expanded in a similar manner in order to estimate the hatchery contribution to the escapement. For genetics, the seasonal catch of adipose fin-clipped individuals in a fishery was

multiplied by a seasonal stock composition estimate in order to estimate population-specific hatchery-origin catch. The abundance of hatchery-origin escapement was calculated as the estimated escapement multiplied by the proportion of adipose fin-clipped adults observed in the escapement for those populations where all of the juveniles were adipose fin clipped upon release (i.e., mass marking). For those populations where mass marking did not occur, the 2018 hatchery broodstock sample obtained was assumed to be representative of the escapement in terms of the proportion of hatchery or wild-origin individuals. To determine this proportion, hatchery-origin individuals in the broodstock were identified as those that assigned to parents via PBT against the 2014 or 2015 hatchery broodstocks from the same river. The proportion of hatchery-origin individuals was then compared to the total number of genotyped individuals in the broodstock, and this value was then used as the estimated hatchery proportion for the broader population.

Genotyping

The detailed procedure for library preparation and genotyping was outlined by Beacham et al. (2017), and a summarized version provided by Beacham et al. (2019a). The process involved loading amplified DNA from 768 individuals (up to 304 amplicons per individual) on an Ion Torrent Proton P1 chip (v3; Thermo Fisher) with an Ion Chef. Two chips are loaded consecutively with one run of the Ion Chef, then loaded on to an Ion Torrent Proton sequencer. Genotyping per amplicon, per individual was conducted using the Torrent Suite Variant Caller® at one SNP site in each amplicon defined by a hotspot file and previously described (Beacham et al., 2019a). Genotypes at all available, predefined SNP sites per individual were assembled to provide multi-locus genotypes that were the basic input for PBT analysis.

Identification of individuals

PBT was used to identify individuals in fishery and broodstock samples by matching the genotype of the individual to the genotypes of prospective parents (COLONY; Jones and Wang, 2010; Wang, 2016). COLONY was utilized to assign offspring to parents, as it can produce assignments even when the one of the parents is putatively missing from the dataset, either due to a missing parental sample, or failure to produce sufficient coverage of the parental genotype from an existing sample.

The baseline for individuals sampled in the 2018 fisheries and hatchery broodstocks included all broodstocks sampled in 2014, 2015, and 2016, with each year class run separately in the COLONY analysis. COLONY was run with all broodstocks sampled each year as a single unit for analysis of fishery and escapement samples, with no differentiation among populations. Although the COLONY assumption of a single population in the parent pool was therefore violated, analysis of known-origin samples indicated that very high levels of accuracy were achieved in assignments when pooling of potential parents in contributing populations was conducted (Beacham et al., 2019a). Two-parent assignments were accepted only when both assigned parents originated from the same population. Two-parent and single-parent assignments were accepted only when the probability of correct assignment was ≥ 0.85 as determined by COLONY for the parent pair. An additional constraint on the single-parent assignment before it was accepted was that both the PBT assignment and GSI assignment corresponded to populations in the same CU. Polygamous mating was assumed for the COLONY analysis. Simple pairwise comparisons between offspring and potential parents were

conducted. Individuals with more than 120 missing genotypes (of the 304 total) were eliminated from further analyses. An estimated genotyping error rate of 1% was used for COLONY assignments. Previously, Beacham et al. (2017) had reported that an average genotyping error rate of 1.07% (1,220 discrepancies in 114,105 comparisons) or an allele error rate of 0.53% (1,220 discrepancies in 228,210 comparisons) was observed over the 304 SNPs scored. The parent pair output file was the basic file used in subsequent analyses.

RESULTS

General trends in fishery sample GSI assignments

The northern troll fishery (Area F) is the largest commercial fishery for coho salmon in BC. Both adipose fin-clipped and unclipped individuals are retained in this fishery. Coho salmon from CUs in northern BC dominated the catch in the troll fishery. For example, sampling of the July catch indicated that the Hecate Strait Mainland (HSM) was the most abundant CU, averaging about 20% of the catch (Figure 2, Supplementary Table 1). By August, this CU accounted for an average of 11% of the catch. The July coho salmon catch averaged 12% Northern Coastal Streams (NCS) CU origin, while that of August averaged 14% of the catch. Coho salmon from the Haida Gwaii-Graham Island Lowlands (HG-GIL) CU comprised about 12% of the July catch and 9% of the August catch, while those from the Douglas Channel-Kitimat Arm (DC-KA) CU comprised 8% of the July catch and 10% of the August catch.

The troll fishery also intercepted coho salmon from southeast Alaska, southern BC, as well as southern United States of America origin. Coho salmon of southeast Alaskan origin were a minor part of the July fishery (5%), but by August, 16% of the catch on average originated from southeast Alaska, with the highest proportions of southeast Alaska-origin coho salmon observed in late August (25%) (Supplementary Table 1). Coho salmon from southern BC CUs stayed more constant, comprising 18% of the July catch and 16% of the August catch, with CUs from Vancouver Island contributing 7% and 5% to the July and August catches, respectively. Coho salmon from geographic locations south of BC (i.e., contiguous US) were estimated to have comprised an average of 2% of the July catch and 9% of the August catch.

The recreational fishery near Haida Gwaii typically occurs in more inshore areas than the troll fishery and has a longer duration, and as such has the potential to exploit different stocks than the troll fishery. In June, coho salmon from the DC-KA CU comprised the largest portion of the catch (27%), followed by the HG-GIL CU (20%), HSM CU (14%), southern BC CUs (9%), and the upper Skeena River CU (6%) (Figure 3, Supplementary Table 1). By July, the NCS CU comprised, on average, 16% of the catch, southern BC CUs 15%, the HSM CU 14%, and the HG-GIL CU 10% of the catch. The upper Skeena River CU was observed to comprise, on average, 5% of the catch. By August, the HG-GIL CU comprised, on average, 18% of the catch, southern BC CUs 16%, NCS CU 15%, HSM CU 13%, southeast Alaska 11% of the catch, and the upper Skeena River CU 1% of the catch. By September, coho salmon from geographic locations south of BC were estimated to have comprised the largest portion of the catch (16%), followed by southern BC CUs (15%) and southeast Alaska (15%).

Some clear trends were observed in the catch distribution of the recreational fishery. The relative contributions of coho salmon from southeast Alaska and geographic areas south of BC increased from June to September. In contrast, the contributions of the upper Skeena River CU and the DC-KA CU declined over time (Figure 3, Supplementary Table 1).

Comparison of CWT and PBT individual identification

There were nine populations where CWTs were applied and that had broodstock from the population in 2015 genotyped. From these populations, 372 individuals were recovered in fishery samples having both a CWT observed and genotypes available. PBT assignments were made for 82.8% (308/372) of the genotyped individuals, and the PBT assignments that were made were 100% accurate with respect to both population of origin and age (Table 1).

Application of GSI and PBT to fishery samples

In addition to the nine populations where CWTs were applied and the broodstock previously genotyped, PBT identifications in the fishery samples were made for individuals in 18 other populations where no CWTs were applied. An additional 1,200 individuals were identified in fishery samples for these populations via PBT, as well as an additional 220 individuals in populations where CWTs were applied, with these individuals not displaying a CWT (Table 1).

The distribution of hatchery-origin coho salmon at the time of interception in fisheries varied in distance and expanse depending on the population of origin. The Robertson Creek and Nitinat River populations from the WCVI, along with the Quinsam River population on the ECVI ranged widely, with individuals from these populations observed in northern commercial troll and recreational fisheries through to the Juan de Fuca Strait recreational fishery at the south end of Vancouver Island (Table 2). For example, 32.3% of the Nitinat River PBT identifications were made in the northern troll and recreational fisheries, as were 21.8% of the Quinsam River identifications and 13.4% of the Robertson Creek identifications. In contrast, the WCVI Conuma River population was observed primarily in WCVI fisheries, with only 0.8% of PBT identifications observed in the northern troll and recreational fisheries, and 96.0% of PBT identifications observed in marine WCVI fisheries (Table 2). This highlights the phenotypic differences among hatcheries in terms of distribution of fish in mixed-stock fisheries.

PBT marine fishery identifications for some major hatchery producers, such as Capilano River and Chilliwack River, were mainly limited to Johnstone Strait, the Strait of Georgia, Juan de Fuca Strait, and the west coast of Vancouver Island. For example, 41.6% of all PBT identifications of Capilano River coho salmon salmon occurred in the southern Strait of Georgia recreational fishery (Table 2). Identification of individuals from the interior Fraser River populations (i.e., Coldwater, Eagle, Salmon rivers), with fisheries managed to curtail exploitation on these populations, was restricted primarily to local fisheries in southern Johnstone Strait, the Strait of Georgia and Juan de Fuca Strait. Freshwater fishery PBT identifications were made for the Inch Creek, Norrish Creek, and Chilliwack River populations, all of which contribute substantially to localized fisheries.

Estimation of catch of hatchery-origin populations

For each marine fishery, the adipose fin-clipped portion of the catch for individual populations was estimated as the seasonal catch of clipped individuals times the seasonal stock composition estimates of the clipped catch. Hatchery contributions to the adipose fin-clipped catch were estimated to be the largest in the WCVI recreational fishery, with the Conuma River (16.1%), Chilliwack River (8.0%), and Robertson Creek (7.9%) populations the largest Canadian contributors to the catch (Table 3). The freshwater fishery catch for lower Fraser River hatchery populations is a typical annual occurrence, and in the case of the Chilliwack River population, can contribute significantly to a fishery (Table 3).

Origin of 2018 hatchery broodstocks

There were 31 hatchery broodstocks sampled in 2018 for which it was possible to investigate origins via PBT identification. Of these 31 populations, 7,281 of 7,376 individuals were successfully genotyped (98.37% success rate). Four large hatchery broodstocks (Chilliwack River, Puntledge River, Capilano River, and Quinsam River) accounted for 39.6% of the total number of broodstock individuals sampled. Although all broodstock individuals were sampled, thirteen populations had fewer than 100 individuals genotyped. Overall, approximately 65% of individuals genotyped (4,406 fish) were assigned to hatchery parents from 2014, 2015, or 2016. The assignment rate varied considerably among populations, ranging from only 6% at Chapman Creek and Coldwater River where the broodstock was obtained by seining in the river, to 95% at Inch Creek where the broodstock swam into the hatchery facility (Table 4).

Hatchery-origin jacks or jills (age 2 spawners) comprised an average 2.1% of broodstock fish, with the highest value (37.1%) observed for the Roy Creek population (Table 4). Hatchery strays identified in sampled populations identified via PBT were incorporated into broodstocks at an average rate of 2.0% (86 strays in 4,406 individuals), with virtually all straying occurring between geographically proximate populations.

Estimation of exploitation rate

One of the main assessment requirements for fishery management is estimation of exploitation rate (ER). Importantly, either CWTs or genetics can be applied to estimate population-specific ER. For the Quinsam River population, the ER estimated in Canadian fisheries via CWTs was 29%, while ER derived from a combination of PBT and GSI was 36% (Table 5). The higher ER estimated through genetics was largely a result of the higher estimated catch of adipose fin-clipped individuals (2,896) compared with CWTs (1,890) (Table 5). For the Puntledge River population, where <15% of the juvenile production was clipped, the ER estimated via genetics was similar (7%) to that from CWTs (12%). ER estimated via CWTs and genetics were quite similar for the Big Qualicum River (18% versus 21%), Robertson Creek (49% versus 43%), and Inch Creek (27% versus 25%) populations (Table 5). ER for the Coldwater River population estimated via CWTs (22%) was less than that estimated via genetics (32%), which was largely attributable to lower estimated hatchery contributions to the escapement via genetics than was obtained via CWTs (Table 5). Similar results were also observed for the Eagle River population (Table 5).

DISCUSSION

Genetic technologies applied in the current study allowed stock identification of coho salmon sampled from mixed-stock fisheries, regardless of whether the individuals sampled originated from hatcheries or wild spawning, thus enabling assessment of fishery impacts by CU for conservation-based management as envisaged in the Wild Salmon Policy (WSP). Assessment of coho salmon fisheries impacts in BC has been traditionally conducted using CWTs. However, as CWTs are not applied to releases from some of the largest hatcheries in southern BC due to funding limitations or logistical constraints, the contributions of these hatcheries to mixed-stock ocean fisheries remained unknown. In addition, little production from the smaller hatcheries in BC is marked with CWTs, rendering the production functionally invisible in CWT-based assessment. It would clearly be desirable to base an assessment method

in which the twin objectives of fishery and hatchery assessment could be met, and could be applied to all hatcheries, not only a subset. The results from this study further demonstrate the importance of this, given the differences among hatcheries including aspects such as marine distribution and range of interception in fisheries, straying rates, and use of hatchery fish within subsequent year broodstock. Clearly the interpretation of results from a subset of hatcheries extended to all hatcheries is not ideal.

Stock identification

Stock identification applied in the study incorporated both GSI and PBT. SNP genotyping via direct DNA sequencing of amplicons and automated scoring of genotypes at hundreds of SNPs resulted in cost-effective genotyping and the ability to generate baselines that were used in both GSI and PBT. The GSI application of the baseline provided the ability to provide accurate estimates of stock composition to very discrete geographic regions or CUs or in some cases populations (Beacham et al., *in review*). Once the GSI portion of the baseline is constructed, it can be applied to mixed-stock fishery analysis over many years, and requires only a minimal amount of annual maintenance. The GSI baseline can be applied to fisheries where both hatchery-origin and natural-origin coho are caught, but importantly, in cases where integrated hatcheries are implemented (i.e., resulting in very similar or undifferentiated hatchery and wild populations), an individual's hatchery or natural origin cannot be determined solely with GSI. Further, GSI alone cannot assign age to unknown individuals, and age is essential for calculation of exploitation rate where fisheries exploit multi-aged species such as Chinook salmon.

Once hatchery broodstocks have been genotyped, PBT provides the ability to identify accurately the hatchery of release and age of the individual if it is assigned to parents, the same information as provided by CWTs. Like CWTs where annual tagging of some portion of the production is required, annual genotyping of hatchery broodstocks is required for implementation of PBT. Thus, the GSI portion of a GSI-PBT baseline requires minimal revision, but the PBT portion requires annual broodstock genotyping.

Fishery distributions of hatchery populations can be hatchery-specific, making it difficult to extend results from a subset to the entirety of the hatchery populations in BC. Three populations on the WCVI did not display the same distribution of fishery PBT identifications. The southern WCVI Nitinat River population and the central Robertson Creek population both displayed northern commercial and recreational fishery PBT identifications, with 26.3% (15/57) of all 2017 and 2018 Nitinat River and 12.7% (64/505) of all 2017 and 2018 Robertson Creek PBT identifications observed in the northern fisheries (Beacham et al., 2019a, current study). In contrast, for the Conuma River population situated on northern WCVI, only 0.8% (1/133) of all 2017 and 2018 fishery PBT identifications were observed in the northern fisheries. Although the Conuma River population was the most northern of the WCVI populations, it was also the population least likely to be observed in northern fisheries, instead being observed almost exclusively in WCVI fisheries. The reason for the differences in marine distributions of these relatively close populations geographically is unknown, but indicates the variability that may be expected among different hatchery populations. The Robertson Creek population is a CWT indicator population for WCVI, but clearly was not representative of all WCVI coho salmon populations, such as Conuma River population.

Hatchery management

The large hatchery broodstock populations surveyed in the study (Chilliwack, Capilano, Quinsam, Qualicum) have been managed primarily for fishery harvest, whereas some populations with small broodstocks were developed for conservation and/or assessment purposes (Eagle, Salmon, Coldwater). The proportion of hatchery-origin fish in the 2018 broodstocks reflected this dichotomy in purpose, with the large populations generally dominated (>70%) by hatchery-origin fish. Broodstocks in smaller hatcheries are frequently captured through seining, and the proportion of hatchery-origin coho salmon in these broodstocks tended to be substantially lower (<10%) (Eagle, Coldwater, Conuma). With both hatchery- and natural-origin fish contributing to spawning in the natural and hatchery environments, little genetic differentiation between fish originating from the two environments would be expected, although the degree of domestication may be higher for the large enhancement programs where hatchery-origin individuals comprised a greater proportion of the broodstock. A genome-wide lack of genetic differentiation based on spawning origin was confirmed for two populations sampled in our study (Quinsam River, Capilano River), but parallel epigenetic differences between hatchery- and natural-origin origin smolts of the two populations were noted (Le Luyer et al., 2017). Evaluation of the persistence of these epigenetic differences will be valuable to examine.

Strays were incorporated into the 2018 hatchery broodstocks at a rate of 2.0% (86 strays in 4,406 PBT-assigned individuals), similar to the rate observed in 2017 non-broodstock escapement (0.7%, 10 strays identified in 1,530 assigned individuals) (Beacham et al., 2019a) or in the 2017 hatchery broodstocks (1.0%; 45 strays in 4,447 assigned individuals) (Beacham et al., 2019b). The highest stray rates were observed to occur between geographically proximate populations (e.g., Puntledge River and Trent River; Capilano River and Seymour River; and Inch Creek and Norrish Creek). Labelle (1992) reported that straying in three populations on the southeast coast of Vancouver Island was < 2%, similar to the rate observed in the current study. Strays that were incorporated into the hatchery broodstocks were therefore observed to be only a minor component of the broodstocks.

Fishery exploitation rates

Determination of exploitation rates is a key requirement of fishery assessment, and is one of the principal objectives of the CWT assessment program. If both CWT- and genetics-derived exploitation rates are similar, then this suggests that the rates are representative of actual fisheries. This was the case for the ECVI Quinsam River population, and the average exploitation rate during 2017 and 2018 Canadian fisheries was 30%, with a genetics-based estimate of 32% (Beacham et al., 2019a, current study). As outlined by Beacham et al. (2019b), water temperatures at the Puntledge River hatchery become too high during the summer for juvenile rearing, so approximately 85% of the production from the 2014 and 2015 broodstocks was released as fry and were not adipose fin clipped. Therefore, rather than estimating the hatchery component of the escapement visually through presence of adipose fin clips, the proportion of hatchery contribution to the escapement was estimated via PBT of the 2018 broodstock. Catch estimates for Puntledge River between the two methods are similar in 2018 (299 versus 328 coho salmon), so the difference between the two methods in ER (12% CWTs, 7% genetics) was mainly a function of the estimated hatchery contribution to the escapement. The fry released were not marked with CWTs, and would not be included in the estimated hatchery component. However, PBT can recognize any contributions that the fry made to the 2018 hatchery broodstock, and thus a higher contribution of hatchery-origin coho salmon to the escapement (4,266 individuals) was estimated via genetics than via CWTs (2,219 individuals),

resulting in a lower exploitation rate estimated via genetics. The third CWT indicator population in the ECVI-Georgia Strait CU was the Qualicum River, where essentially all of the hatchery production is clipped prior to release. Average exploitation rate over 2017 and 2018 fisheries was 20% with CWTs and 21% with genetics (Beacham et al., 2019a, current study). When all of the hatchery production was clipped prior to release, there was generally reasonably close agreement of estimated exploitation rates between the two methods.

CWTs are applied to three populations (i.e., Coldwater River, Salmon River, Eagle River) in the Thompson River drainage, part of the Fraser River drainage commonly known as interior Fraser, a group of CUs and populations of conservation concern. Due to conservation concerns, hatchery production is not typically mass adipose fin clipped upon release, as virtually all fisheries in southern BC can retain only adipose fin-clipped individuals. However smolt releases from the 2015 Salmon River broodyear were adipose fin clipped but received no CWTs. Thus, no comparison of exploitation rates derived from CWTs and genetics was possible for this population. As only individuals with CWTs were adipose fin clipped for the Coldwater River and Eagle River populations, PBT was used to identify the proportion of hatchery-origin individuals in the 2018 hatchery broodstocks, which were assumed to be representative of the escapement. For both populations, the estimated hatchery contributions to the escapement were lower estimated with genetics than via CWTs. It may be possible that the hatchery broodstocks in these cases were not representative of the overall escapement, particularly if adipose fin-clipped individuals were less likely to be incorporated into the broodstock than unclipped individuals.

Future developments

Fisheries and Oceans Canada may institute in 2020 an assessment fishery designed to estimate wild escapement within a CU that contains an indicator population, with retention of both adipose fin clipped individuals and non-clipped individuals in the fishery. The key assumption is that ratio of catch of the CU (estimated via genetics) divided by the catch of the indicator population (estimated via GSI and PBT) is proportionately the same as CU wild escapement divided by the wild component of the indicator population. That is, within a fishery near the end of the season: $C_w/C_h = E_w/E_h$ where: C_w = catch of wild coho salmon delineated by CU from samples analyzed by GSI, C_h = catch of the indicator population analyzed by PBT and GSI, E_h = unmarked escapement in the indicator population, and E_w = escapement of wild or unmarked coho salmon by CU (which is the unknown to determine). If successful, then a genetics method of fishery assessment including both adipose fin clipped and unclipped coho salmon in retained catch provides a very cost-effective method of estimating not only catch by CU but also wild-origin escapement within the CU, provided an indicator population within the CU has an associated escapement-assessment program.

Summary

PBT merged with GSI provided a very powerful and versatile tool that can be applied across a broad spectrum of applications for both fisheries and hatchery broodstock assessment. Assessment of CU-specific, age-specific, or population-specific mixed-stock fishery impacts can be routinely estimated via GSI and PBT provided fishery sampling has been adequate. The PBT portion of the baseline increases the accuracy of GSI-estimated stock composition if hatchery-origin individuals are included in the catch (Beacham et al. 2018, 2019a), and can also be applied to evaluation of family-related variation in migration, differential productivity within broodstocks, and family-

related variation in productivity and survival (Beacham et al. 2019b), as well as evaluation of different hatchery release strategies. Genetics provides the fusion between fishery assessment and hatchery broodstock assessment, as the PBT-enhanced GSI baseline can be applied to both fishery and hatchery broodstock assessment, including both hatchery-origin and natural-origin assessment.

The current study outlined the application of GSI and PBT to identify BC-origin coho salmon to specific Canadian hatcheries and CUs. The SNP panel used in the study encompassed 304 SNPs (Beacham et al. 2017), and an upgraded version to 482 SNPs outlined by Beacham et al. (in review) was first applied to genotyping hatchery broodstocks in 2016. This upgraded version was thus available for assessment of fisheries and hatchery broodstocks in 2019, as most coho salmon mature at three years of age in BC (Sandercock 1991). It is anticipated that this enhanced SNP panel and the increased number of facilities at which broodstock genotyping has occurred (40 broodstocks) will provide improved stock composition results relative to those of the current study when applied to coho salmon fishery samples and hatchery broodstocks in 2019 and subsequently.

The single polymerase chain reaction allowed hundreds of SNPs to be amplified concurrently, and direct DNA sequencing of the resultant amplicons, coupled with automated scoring of the genotypes, resulted in cost-effective genotyping and unprecedented ability to provide accurate estimates of stock composition or individual identification to very discrete geographic regions or CUs. Similar results can be expected when applied to other salmonid and perhaps non-salmonid species, ushering in a new era in application of genetic variation to resource management and forensic analysis.

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Table 1. Hatchery populations in various CUs with PBT assignments summarized in relation to CWT presence. Summarized values include the number of genotyped individuals assigned by PBT with CWTs, without CWTs, and total. The percentage of individuals assigned by PBT when CWTs were present is given for populations where the individuals were genotyped in the fishery samples and in which the 2015 broodstock was genotyped.

Conservation Unit	Population	PBT assignments			% CWT assigned
		With CWTs	No CWTs	PBT sum	
Lower Skeena	Zymacord	3	1	4	100.0
Juan de Fuca-Pachena	Nitinat	0	35	35	
West Vancouver Island	Robertson	110	136	246	76.4
	Conuma	0	123	123	
East Vancouver Island-Georgia Strait	Quinsam	60	66	126	73.2
	Puntledge	5	2	7	80.0
	Qualicum	54	5	59	81.5
	Trent	0	2	2	
	Rosewall	0	11	11	
	French	0	4	4	
	Goldstream	0	9	9	
Howe Sound-Burrard Inlet	Tenderfoot	0	35	35	
	Mamquam	0	13	13	
	Capilano	0	239	239	
	Seymour	7	1	8	57.1
Lower Fraser	Inch	124	9	133	93.5
	Norrish	0	147	147	
	Chilliwack	0	485	485	
	Chehalis	0	35	35	
	Stave	0	35	35	
	Coquitlam	0	1	1	
	Kanaka	0	9	9	
Lower Thompson	Coldwater	6	0	6	100.0
South Thompson	Eagle	3	0	3	100.0
	Salmon	0	1	1	
Boundary Bay	Nicomekl	0	14	14	
	Serpentine	0	2	2	
	Total	372	1,420	1,792	82.8

Table 2. PBT assignments by hatchery population for fisheries in BC during 2018 for samples sent to a central laboratory for potential CWT recovery. Fisheries were: 1) northern troll; 2) northern sport; 3) central sport; 4) Johnstone Strait sport; 5) Strait of Georgia sport (north); 6) Strait of Georgia sport (south); 7) Juan de Fuca Strait sport; 8) west coast Vancouver Island sport and troll; 9) Barkley Sound and Alberni Inlet sport,commercial and First Nations; 10) freshwater sport; and 11) all fisheries

Population	Fishery										
	1	2	3	4	5	6	7	8	9	10	11
Zymacord	2									2	4
Nitinat		11	2				2	20			35
Robertson	19	14	1				2	104	103	3	246
Conuma		1	2					119		1	123
Quinsam	17	10	6	41	12		6	13		20	126[1]
Puntledge	1			5	1						7
Big Qualicum	1			24	13	2	5	4		9	59[1]
Trent						1		1			2
Rosewall				3	6			1			11[1]
French					2	2					4
Goldstream					1	3	4				9[1]
Tenderfoot		5		7	12	4	2	5			35
Mamquam		1			6	1	2	2	1		13
Capilano			1	22	54	99	49	11		1	239[2]
Seymour (SoG)				2		4		2			8
Inch		1		3	22	13	10	10		74	133
Norrish			1	6	18	8	2	7		103	147[2]
Chilliwack			2	83	77	52	39	53		177	485[2]
Chehalis				5	9	4	6	6		5	35
Stave				7	10	5	2	6		5	35
Coquitlam								1			1
Kanaka			1	2	5		1				9
Coldwater						1	3			1	6[1]
Eagle				2		1					3
Salmon							1				1
Nicomekl				1	4	2	4	3			14
Serpentine					1	1					2
Total	40	43	16	213	253	203	140	368	104	401	1792[3]

[1] includes one individual of unknown marine catch region

[2] includes two individuals of unknown marine catch origin

[3] includes 11 individuals of unknown marine catch origin

Table 3. Catch of hatchery-origin coho salmon by population for fisheries in BC during 2018 with catch derived from GSI-PBT for eight fisheries in BC. Population-specific hatchery-origin catch was estimated as (hatchery-origin catch) * (population-specific seasonal stock composition). Fisheries were: 1) northern troll, 2) northern sport, 3) Johnstone Strait sport, 4) Strait of Georgia-north sport, 5) Strait of Georgia-south sport, 6) Juan de Fuca Strait sport, 7) west coast Vancouver Island sport and troll, 8) freshwater sport, 9) all fisheries. N is the number of individuals included in the seasonal sample for estimated stock composition of the catch. N-PBT is the number of individuals in the sample identified via PBT.

Population	1	2	3	4	5	6	7	8	9
Adipose fin-clipped catch	5.046	1,277	7,022	6,177	4,888	8,844	27,598		
N	208	184	232	312	216	324	625		
N-PBT	23	29	132	181	125	130	208		
Zymacord	41	0	0	0	0	0	0		41
Nitinat	0	60	104	0	0	27	647		838
Robertson	388	90	0	0	0	55	2,169[1]		2702
Conuma	0	7	75	0	0	0	4,439		4521
Quinsam	344	84	1,241	209	28	235	523	232	2896
Puntledge	49	0	213	43	23	0	0		328
Big Qualicum	0	0	650	293	2	261	425		1631
Trent	0	0	11	0	30	0	45		86
Rosewall	1	0	138	70	0	0	148		357
French	0	0	0	52	23	0	0		75
Goldstream	81	0	0	44	4	178	17		324
Tenderfoot	0	17	141	216	111	61	294		840
Mamquam	0	26	7	185	1	111	90		420
Capilano	0	0	596	865	1,714	1,413	417		5005
Seymour (SoG)	0	0	83	0	107	0	129		319
Inch	6	0	126	408	267	343	315	389	1,854
Norrish	0	0	156	342	157	70	359	843	1,927
Chilliwack	49	96	1,810	1,204	700	1,096	2,210	8,230	15,395
Chehalis	0	0	140	159	70	195	217	21	802
Stave	0	0	254	273	25	127	305	15	999
Coquitlam	0	0	0	2	0	1	0		3
Kanaka	0	0	254	185	0	101	0		540
Coldwater	0	0	30	0	22	82	0	1	135

Eagle	0	0	30	0	0	0	0		30
Salmon	0	0	0	0	0	27	0		27
Nicomekl	0	0	129	44	68	163	280		684
Serpentine	0	0	10	54	1	13	0		78
All PBT populations	959	380	6,198	4,648	3,353	4,559	12,450	9,730	42,856

[1] Includes adipose fin-clipped catch in Alberni canal which was tabulated separately from the WCVI catch

Table 4. Origin and age determined via PBT of individuals included in 2018 hatchery broodstocks. Percentage not assigned is the percentage of the 2018 hatchery broodstock fish that could not be assigned via PBT to any hatchery broodstock genotyped in either 2014, 2015, or 2016.

Population	Brood received	Brood genotyped	Assigned to	Number	% assigned	% not assigned
Zymacord	12	12	2015 Zymacord	2	16.7	83.3
Kitimat	388	388	2015 Kitimat	67	17.3	82.7
Nitinat	489	483	2015 Nitinat	424	87.8	11.0
			2016 Nitinat	6	1.2	
Robertson	222	222	2015 Robertson	83	37.4	62.6
Conuma	228	218	2015 Conuma	19	8.7	91.3
Quinsam	564	561	2015 Quinsam	507	90.4	5.7
			2014 Quinsam	1	0.2	
			2016 Quinsam	21	3.7	
Puntledge	802	793	2015 Puntledge	454	57.3	39.3
			2014 Puntledge	4	0.5	
			2015 Qualicum	1	0.1	
			2015 Trent	20	2.5	
			2015 Rosewall	1	0.1	
			2015 Quinsam	1	0.1	
			2016 Roy	1	0.1	
Qualicum	420	390	2015 Qualicum	273	70.0	28.3
			2014 Qualicum	1	0.3	
			2016 Qualicum	1	0.3	
			2015 Puntledge	2	0.5	
			2015 French	1	0.3	
			2015 Goldstream	1	0.3	
Trent	38	36	2015 Trent	29	80.6	19.4
Rosewall	96	96	2015 Rosewall	75	78.1	20.9
			2015 Quinsam	1	1.0	
Roy	62	62	2016 Roy	23	37.1	59.7
			2015 Trent	2	3.2	
French	45	45	2015 French	11	24.4	71.2
			2015 Puntledge	1	2.2	
			2014 Qualicum	1	2.2	
Goldstream	206	204	2015 Goldstream	38	18.6	80.4
			2016 Goldstream	2	1.0	
Chapman	48	47	2015 Chapman	3	6.4	93.6
Mamquam	29	29	2015 Mamquam	14	48.3	48.3
			2014 Mamquam	1	3.4	
Tenderfoot	188	188	2015 Tenderfoot	40	21.3	77.6
			2015 Mamquam	2	1,1	
Capilano	671	670	2015 Capilano	518	77.3	18.8
			2014 Capilano	3	0.5	
			2016 Capilano	12	1.8	

			2015 Seymour	7	1.5	
			2016 Seymour	1	0.1	
Seymour	277	271	2015 Seymour	69	25.5	66.4
			2016 Seymour	1	0.4	
			2015 Capilano	21	7.7	
Inch	196	196	2015 Inch	172	87.8	4.6
			2016 Inch	3	1.5	
			2015 Norrish	12	6.1	
Norrish	161	161	2015 Norrish	93	57.8	37.9
			2016 Norrish	2	1.2	
			2015 Inch	5	3.1	
Chilliwack	879	858	2015 Chilliwack	748	87.2	12.5
			2014 Chilliwack	2	0.2	
			2016 Chilliwack	1	0.1	
Chehalis	391	391	2015 Chehalis	277	70.8	27.7
			2016 Chehalis	6	1.5	
Alouette	79	78	2015 Alouette	9	11.5	78.2
			2016 Alouette	7	9.0	
			2015 Capilano	1	1.3	
Stave	188	188	2015 Stave	140	74.5	25.0
			2016 Stave	1	0.5	
Coquitlam	72	70	2015 Coquitlam	4	5.7	88.6
			2016 Coquitlam	4	5.7	
Kanaka	72	71	2015 Kanaka	41	57.7	38.1
			2015 Alouette	1	1.4	
			2015 Chilliwack	2	2.8	
Coldwater	217	217	2015 Coldwater	12	5.5	93.6
			2014 Coldwater	2	0.9	
Salmon	38	38	2015 Salmon	20	52.6	47.4
Eagle	70	70	2015 Eagle	6	8.6	91.4
Nicomekl	70	70	2015 Nicomekl	24	34.3	65.7
Serpentine	158	158	2015 Serpentine	44	27.8	71.6
			2015 Nicomekl	1	0.6	

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Table 5. Observed number of CWTs from 2018 Canadian fishery sampling, estimated 2018 catch in Canadian fisheries of hatchery-origin adult coho salmon via CWTs, exploitation rate (ER, %) via CWTs of adult coho salmon in Canadian fisheries, estimated 2018 escapement of hatchery-origin adult coho salmon, observed assignments via PBT from 2018 fishery sampling, estimated catch via GSI-PBT, ER of clipped adult coho salmon, total adult 2018 escapement, adipose fin clip rate observed in escapement or percentage of 2018 hatchery broodstock assigned via PBT, and hatchery component of adult escapement for selected coho salmon populations.

Population	Coded-wire tags				PBT-GSI			Adipose Clips		
	Catch			Escapement	Catch			Escapement		
	Obs. CWTs (adults)	Estimated Catch (adults)	ER (%)	Hatchery-origin	Obs. PBT	Estimated Catch	ER (%)	Total adults	Clip rate	Hatchery-origin
Quinsam	96	1890	29	4703	124	2,896	36	5,965	86.2	5,142
Puntledge	10	299	12	2219	7	328	7	7,446	57.3[1]	4,266
Qualicum	89	1219	18	5686	59	1,631	21	8,932	70.0	6,252
Robertson (swim ins)[5]	181	5529	49	5670	236	2,702	43	3,742	94.7	3,544
Inch	162	2148	27	5776	129	1,854	25	6,508	87	5,662
Coldwater	9	117	22	420	6	134	32	4,366	6.4[1]	279
Eagle	3	32	4	870	3	39	12	3.031	8.6[1]	261S

[1] Percentage of 2018 broodstock assigned via PBT to 2015 parental broodstock in Table 4 as all production from the 2015 was not adipose fin clipped.

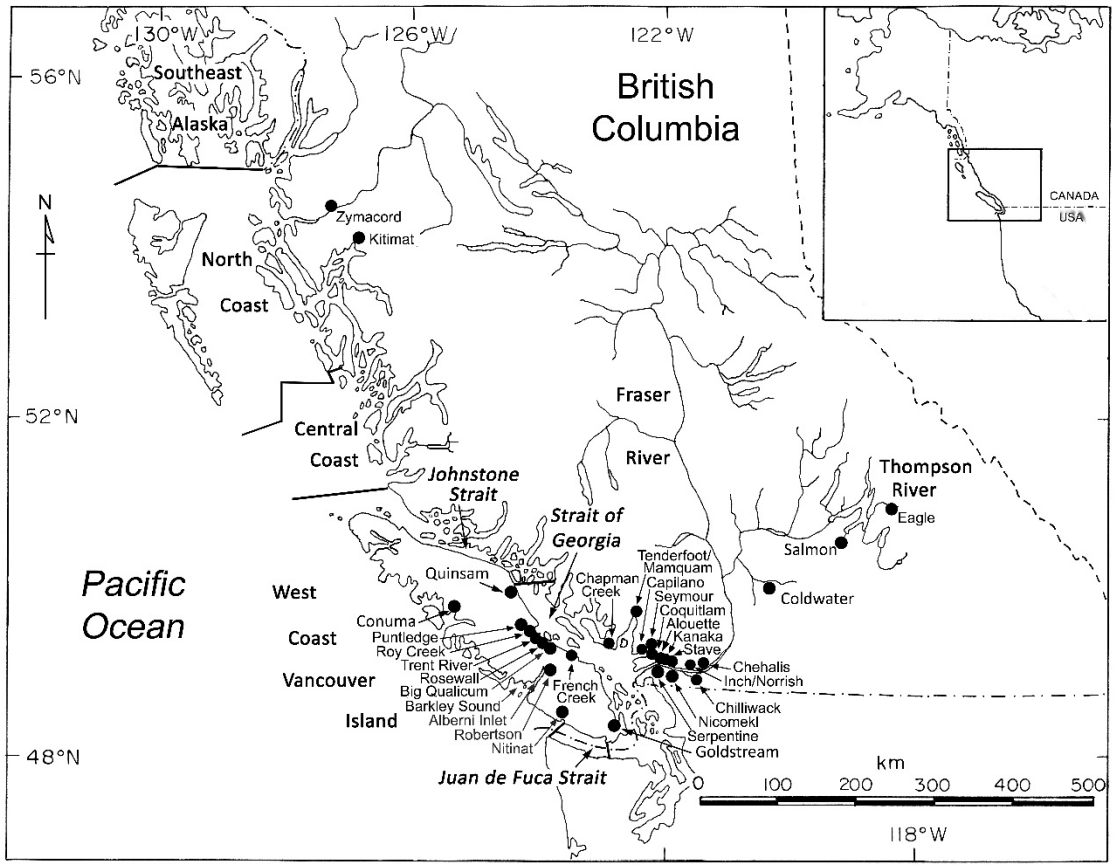

Figure 1. Map indicating geographic locations for fishery sampling and 31 populations for which parentage-based tagging was applied in estimation of stock composition or origins of 2018 hatchery broodstocks.

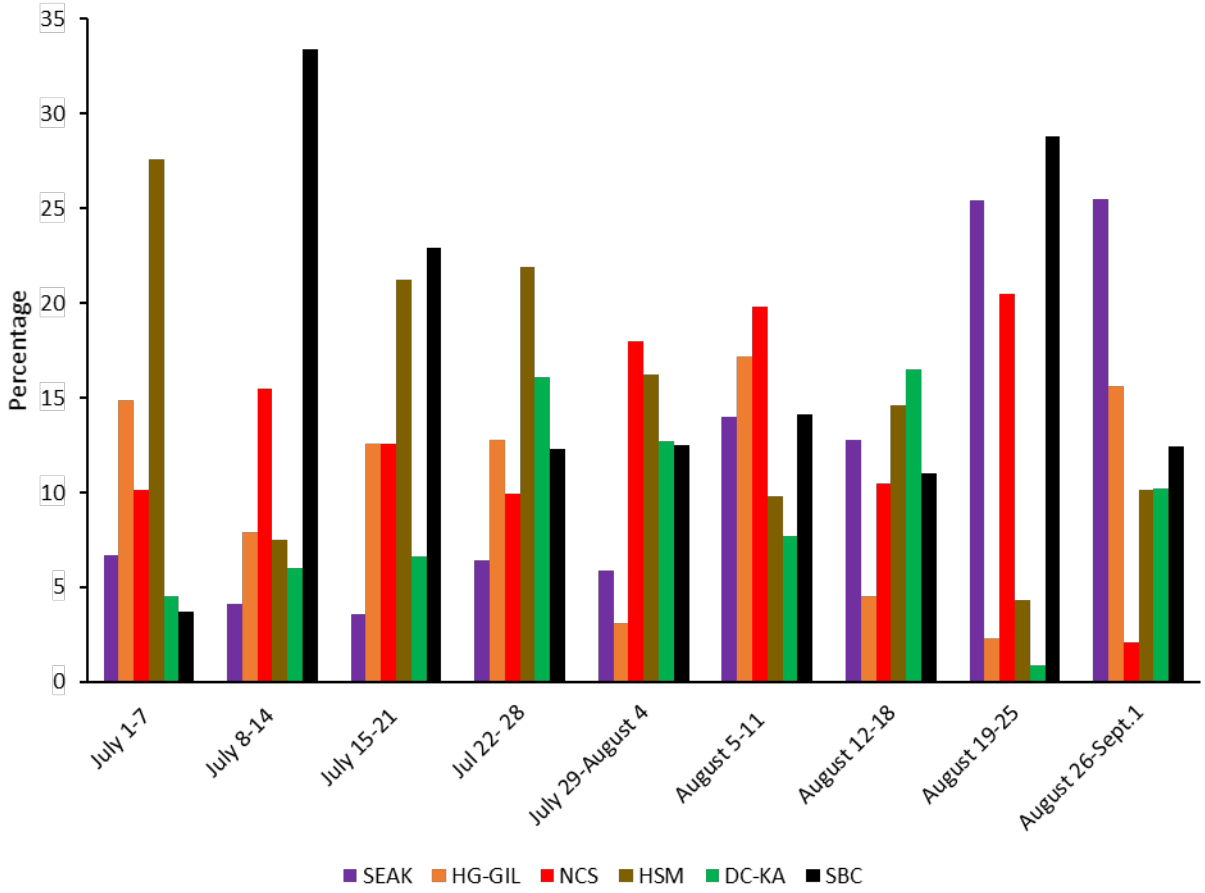

Figure 2. Weekly stock compositions of coho salmon in the northern troll fishery, July-August 2018. Percentage of catch originating from southeast Alaska (SEAK), Haida Gwaii-Graham Island Lowlands (HG-GIL) CU, Northern Coastal Streams (NCS) CU, Hecate Strait Mainland (HSM) CU, Douglas Channel-Kitimat Arm (DC-KA) CU, and CUs from southern British Columbia (SBC) are illustrated.

Fig

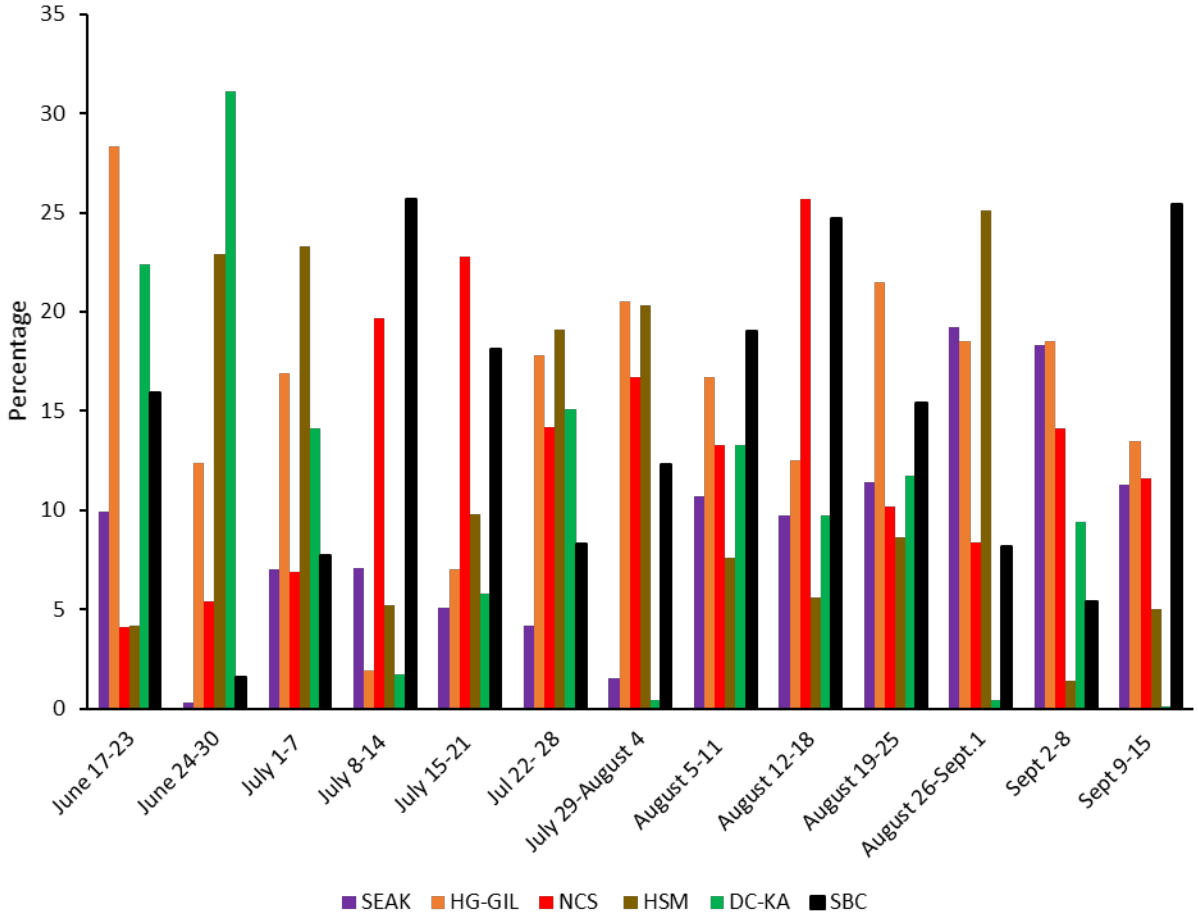

Figure 3. Weekly stock compositions of coho salmon in a recreational fishery near Langara Island, Haida Gwaii. Percentage of catch originating from the region or CUs as described in Figure 2 are illustrated.

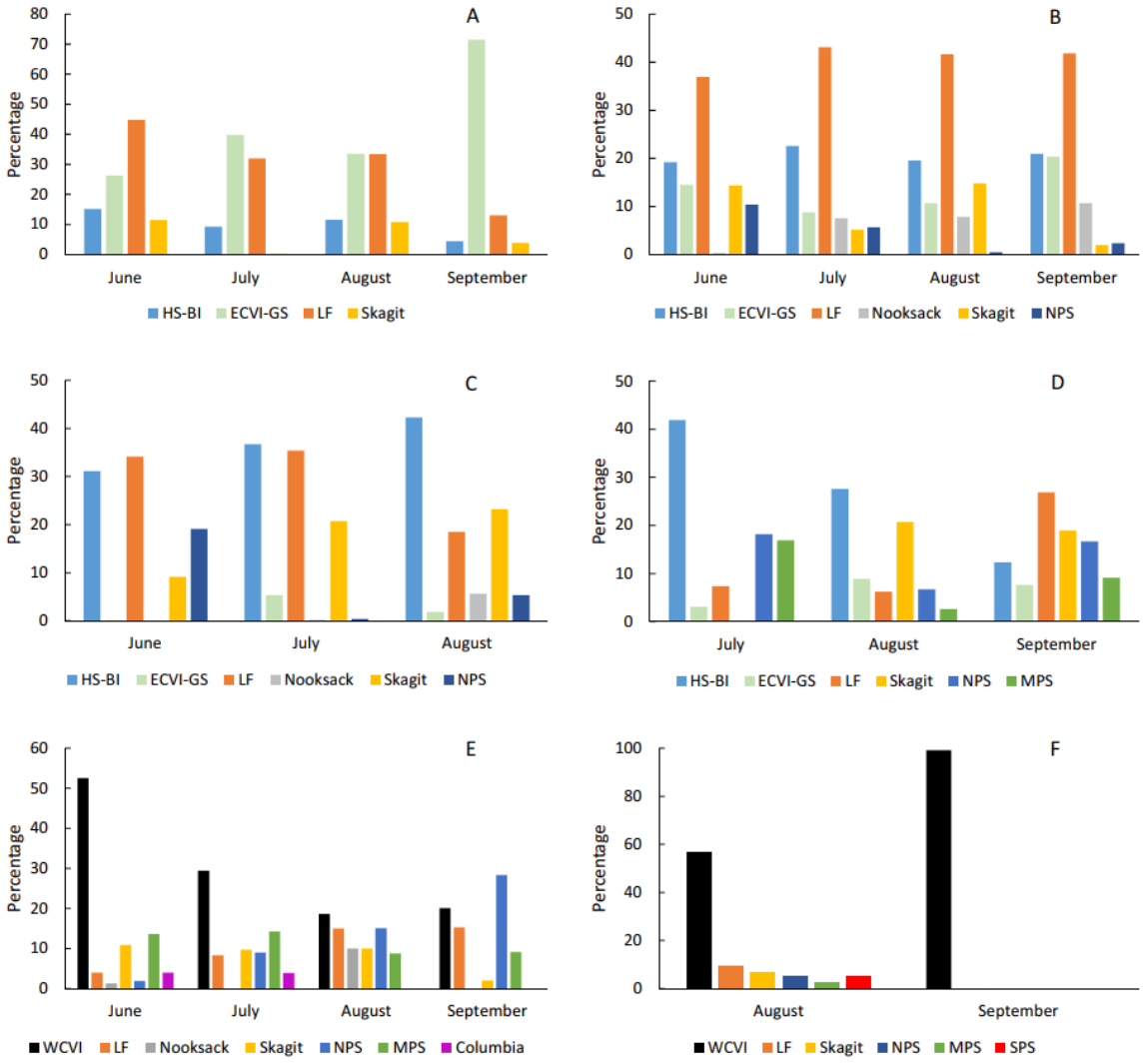

Figure 4. Monthly stock compositions for recreational fisheries in A) Johnstone, B) northern Strait of Georgia, C) southern Strait of Georgia, D) Juan de Fuca Strait, E) west coast of Vancouver Island, and F) Barkley Sound and Alberni Inlet. Percentage of catch originating from Howe Sound-Burrard Inlet (HS-BI) CU, East Coast Vancouver Island-Georgia Strait (ECVI-GS) CU, Lower Fraser (LF) CU, West Coast Vancouver Island (WCVI) CU, Nooksack River (Nooksack), Skagit River (Skagit), North Puget Sound (NPS), Mid Puget Sound (MPS), South Puget Sound (SPS), and Columbia River (Columbia) are illustrated.

Supplementary Table 1. Percentage stock composition by geographic region or CU of 2018 northern Area F ice boat troll fishery, Langara recreational fishery, central coast recreational fishery (primarily Area 8), central coast commercial freezer troll fishery (Areas 6, 7, 8, and 107), Chatam Sound recreational fishery, Area 3 and 4 recreational fishery, and Round Island test fishery. Standard deviation is in parentheses. N-PBT is the number of individuals identified in the sample via PBT.

Region/Conservation Unit	2018 Northern ice boat troll (Area F)								
	July 1-7	July 8-14	July 15-21	Jul 22- 28	July 29-August 4	August 5-11	August 12-18	August 19-25	August 26-Sept.1
Sample size	43	242	415	237	73	204	108	52	77
N-PBT	0	0	0	0	0	0	0	0	0
Southeast Alaska	6.7 (4.2)	4.1 (1.5)	3.6 (1.1)	6.4 (1.9)	5.9 (3.0)	14.0 (3.0)	12.8 (4.1)	25.4 (7.3)	25.5 (6.0)
Alsek River	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)
Lower Stikine	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)
Lower Nass	0.0 (0.2)	0.0 (0.0)	0.2 (0.5)	1.0 (1.0)	0.1 (0.5)	0.1 (0.4)	0.0 (0.1)	0.0 (0.2)	1.6 (3.1)
Upper Nass	13.8 (5.0)	3.4 (1.3)	2.5 (0.9)	4.1 (1.5)	5.2 (3.0)	0.4 (0.7)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (0.0)	0.0 (0.0)	0.2 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 90.0)	0.0 (0.1)	0.0 (0.0)
Skeena Estuary	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.3)	0.0 (0.1)
Lower Skeena	0.0 (0.7)	1.9 (1.4)	2.2 (0.8)	0.9 (0.9)	1.0 (1.7)	0.1 (0.5)	0.9 (1.0)	1.6 (2.1)	5.1 (3.4)
Middle Skeena	0.0 (0.2)	1.6 (0.8)	0.9 (0.5)	0.3 (0.6)	0.2 (0.7)	1.0 (0.7)	1.0 (0.9)	0.0 (0.2)	0.0 (0.1)
Upper Skeena	0.0 (0.1)	2.4 (1.1)	2.2 (0.8)	3.9 (1.5)	1.8 (2.2)	3.7 (1.5)	3.7 (1.8)	0.0 (0.2)	0.0 (0.2)

Haida Gwaii-Graham Island Lowlands	14.9 (5.4)	7.9 (1.8)	12.6 (1.6)	12.8 (2.1)	3.1 (2.2)	17.2 (2.6)	4.5 (2.0)	2.3 (2.4)	15.6 (4.3)
Haida Gwaii-East	2.3 (2.1)	0.0 (0.2)	1.5 (0.6)	1.1 (0.8)	1.4 (1.3)	1.3 (0.9)	1.9 (1.2)	2.3 (2.2)	1.9 (1.6)
Haida Gwaii-West	2.3 (2.4)	0.5 (0.6)	0.3 (0.3)	0.0 (0.1)	0.0 (0.1)	3.8 (1.3)	0.0 (0.1)	0.0 (0.3)	1.3 (1.2)
Northern Coastal Streams	10.1 (7.0)	15.5 (3.4)	12.6 (2.4)	9.9 (2.6)	18.0 (6.9)	19.8 (4.4)	10.5 (3.6)	20.5 (7.5)	2.1 (2.2)
Hecate Strait Mainland	27.6 (8.7)	7.5 (2.6)	21.2 (2.5)	21.9 (3.3)	16.2 (6.1)	9.8 (3.2)	14.6 (4.5)	4.3 (5.0)	10.1 (4.3)
Mussel-Kynoch	0.0 (0.1)	0.0 (0.0)	0.2 (0.4)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.5 (0.9)	0.0 (0.1)	0.0 (0.1)
Douglas Channel-Kitimat Arm	4.5 (4.4)	6.0 (1.9)	6.6 (1.6)	16.1 (2.8)	12.7 (7.1)	7.7 (2.5)	16.5 (4.5)	0.9 (3.4)	10.2 (3.6)
Bella Coola-Dean Rivers	0.0 (0.4)	2.9 (1.3)	6.3 (1.6)	4.8 (1.6)	4.5 (3.3)	1.0 (1.3)	1.5 (1.9)	0.5 (2.6)	0.1 (0.8)
Rivers Inlet	13.9 (6.2)	10.1 (2.5)	1.3 (1.2)	2.7 (2.1)	6.1 (4.6)	2.3 (2.0)	10.5 (3.5)	0.4 (1.1)	6.8 (3.5)
Smith Inlet	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.3)	0.6 (0.6)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	3.7 (5.0)	10.5 (2.6)	5.0 (1.4)	4.5 (1.6)	1.2 (1.2)	5.4 (2.4)	0.3 (0.8)	17.0 (5.6)	0.0 (0.3)
Homathko-Klinaklini Rivers	0.0 (0.2)	5.2 (1.7)	5.6 (1.3)	2.7 (1.1)	4.2 (3.4)	3.1 (1.9)	3.5 (3.6)	1.3 (2.3)	4.1 (2.6)
Georgia Strait Mainland	0.0 (0.2)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)
Howe Sound-Burrard Inlet	0.0 (0.3)	3.8 (1.5)	3.1 (1.0)	1.3 (1.0)	0.9 (1.6)	1.1 (1.2)	1.9 (2.5)	0.0 (0.5)	2.4 (2.2)

East Vancouver Island-Georgia Strait	0.0 (0.8)	2.8 (1.3)	4.9 (1.3)	2.7 (1.1)	0.1 (0.5)	3.1 (1.3)	2.3 (1.9)	0.0 (0.5)	0.4 (1.1)
East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.0)	2.5 (1.0)	0.6 (0.4)	0.0 (0.2)	2.4 (2.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	1.3 (1.4)
Nahwitti Lowland	0.0 (0.4)	2.5 (1.0)	0.1 (0.2)	0.4 (0.6)	0.1 (0.6)	0.0 (0.2)	0.0 (0.3)	0.1 (0.5)	0.1 (0.4)
West Vancouver Island	0.0 (0.5)	3.0 (1.1)	1.8 (0.7)	0.7 (0.9)	2.8 (1.9)	0.0 (0.1)	0.0 (0.2)	6.0 (4.0)	0.0 (0.2)
Clayoquot	0.0 (0.8)	0.0 (0.3)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	1.3 (1.9)	0.2 (0.8)	4.3 (4.6)	0.0 (0.1)
Juan de Fuca-Pachena	0.0 (0.4)	1.9 (1.0)	0.5 (0.5)	0.0 (0.1)	0.7 (1.7)	0.1 (0.4)	2.8 (2.0)	0.1 (0.4)	1.4 (1.2)
Lower Fraser	0.0 (0.6)	0.5 (0.5)	0.6 (0.5)	0.0 (0.1)	0.0 (0.4)	0.0 (0.2)	0.0 (0.2)	0.0 (0.7)	1.3 (1.4)
Lillooet	0.0 (0.2)	0.3 (0.4)	0.2 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)
Fraser Canyon	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.1 (0.2)
Interior Fraser	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Lower Thompson	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)
North Thompson	0.0 (0.5)	0.4 (0.5)	0.2 (0.2)	0.0 (0.1)	0.0 (0.4)	0.0 (0.2)	0.0 (0.2)	0.0 (0.6)	1.3 (1.4)
South Thompson	0.0 (0.6)	0.0 (0.1)	0.3 (0.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.5)	0.0 (0.4)
Boundary Bay	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.1 (0.5)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.2)
Nooksack River	0.0 (0.1)	0.1 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	1.8 (2.0)
Skagit River	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.3 (0.6)	0.0 (0.4)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	0.0 (0.2)
Northern Puget Sound	0.0 (0.3)	0.2 (0.4)	0.0 (0.1)	1.5 (0.9)	5.8 (2.9)	0.0 (0.1)	0.1 (0.7)	5.3 (3.2)	0.0 (0.2)
Mid-Puget Sound	0.0 (0.1)	0.0 (0.1)	0.4 (0.4)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	2.0 (1.8)	0.0 (0.1)	0.0 (0.1)

Southern Puget Sound	0.0 (0.1)	0.0 (0.1)	0.2 (0.3)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.3)	0.0 (0.7)	0.0 (0.2)
Juan de Fuca Strait	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	0.6 (0.9)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)
Hood Canal	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.1 (0.2)	0.3 (0.7)	0.0 (0.5)	0.0 (0.1)
Coastal Washington	0.0 (0.4)	2.3 (1.0)	1.5 (0.6)	0.0 (0.1)	4.3 (2.4)	2.4 (1.2)	5.8 (2.2)	7.7 (3.9)	5.5 (2.5)
Columbia River	0.0 (0.3)	0.0 (0.1)	0.5 (0.3)	0.0 (0.1)	1.2 (1.4)	0.0 (0.1)	1.9 (1.3)	0.0 (0.7)	0.0 (0.2)
Oregon	0.0 (0.3)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.4)	0.0 (0.2)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

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58 Supplementary Table 1 continued.

Region/Conservation Unit	Area 1 sport								
	June 10-16	June 17-23	June 24-30	July 1-7	July 8-14	July 15-21	Jul 22- 28	July 29-August 4	August 5-11
Sample size	7	58	70	70	70	70	68	61	69
N-PBT	0	0	0	0	0	0	0	0	0
Southeast Alaska	1.2 (5.6)	9.9 (5.4)	0.3 (1.5)	7.0 (3.5)	7.1 (3.8)	5.1 (4.1)	4.2 (2.7)	1.5 (2.0)	10.7 (4.3)
Alsek River	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	1.5 (1.5)	0.0 (0.1)
Lower Stikine	0.0 (0.7)	0.1 (0.5)	0.0 (0.0)	0.0 (0.1)	0.3 (0.8)	0.0 (0.1)	1.1 (1.5)	2.1 (2.5)	1.7 (2.2)
Lower Nass	0.0 (2.8)	0.0 (0.1)	2.0 (1.9)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	3.6 (3.0)	0.9 (2.1)
Upper Nass	0.0 (0.8)	0.0 (0.0)	3.0 (2.0)	0.2 (0.7)	2.8 (2.5)	1.3 (1.5)	1.0 (1.5)	0.0 (0.1)	5.3 (3.0)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (1.3)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	1.4 (1.4)
Skeena Estuary	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Lower Skeena	0.0 (1.0)	0.0 (0.3)	0.1 (0.5)	0.0 (0.2)	0.0 (0.1)	0.6 (1.1)	0.1 (0.5)	0.3 (1.5)	0.5 (1.2)
Middle Skeena	13.5 (11.5)	0.8 (1.7)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.2 (0.9)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)
Upper Skeena	0.8 (2.6)	4.3 (2.9)	7.0 (2.8)	5.5 (2.9)	5.4 (2.7)	4.1 (2.5)	4.9 (2.8)	6.1 (3.1)	0.0 (0.1)
Haida Gwaii-Graham Island Lowlands	14.3 (11.6)	28.3 (6.0)	12.4 (3.8)	16.9 (4.3)	1.9 (2.0)	7.0 (3.1)	17.8 (4.7)	20.5 (5.2)	16.7 (4.6)

Haida Gwaii-East	0.1 (1.2)	1.3 (2.0)	1.4 (1.4)	1.0 (1.3)	1.4 (1.3)	0.0 (0.2)	0.0 (0.3)	0.5 (1.1)	0.0 (0.2)
Haida Gwaii-West	0.0 (1.7)	5.2 (2.8)	1.7 (1.6)	0.0 (0.2)	1.4 (1.4)	4.2 (2.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)
Northern Coastal Streams	0.1 (4.1)	4.1 (4.7)	5.4 (3.2)	6.9 (3.7)	19.7 (6.0)	22.8 (6.5)	14.2 (5.3)	16.7 (7.0)	13.3 (6.2)
Hecate Strait Mainland	24.3 (15.2)	4.2 (4.6)	22.9 (5.5)	23.3 (5.9)	5.2 (3.2)	9.8 (4.4)	19.1 (5.9)	20.3 (6.9)	7.6 (6.1)
Mussel-Kynoch	0.0 (1.2)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	1.0 (1.3)	0.1 (0.3)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)
Douglas Channel-Kitimat Arm	27.5 (14.9)	22.4 (6.1)	31.1 (6.5)	14.1 (4.4)	1.7 (2.4)	5.8 (3.3)	15.1 (5.0)	0.4 (1.4)	13.2 (5.4)
Bella Coola-Dean Rivers	16.1 (13.4)	2.7 (3.0)	1.3 (2.5)	15.4 (4.8)	12.3 (4.3)	4.8 (3.1)	0.1 (0.6)	2.8 (2.7)	0.0 (0.3)
Rivers Inlet	0.0 (1.9)	0.5 (1.7)	9.7 (4.3)	0.2 (1.2)	14.1 (5.1)	12.8 (5.2)	11.1 (4.5)	9.5 (4.7)	0.9 (2.4)
Smith Inlet	0.0 (0.9)	0.0 (0.2)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.1 (0.7)	3.1 (2.0)	0.0 (0.2)	0.0 (0.0)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	0.1 (1.7)	0.0 (0.6)	0.1 (0.5)	0.0 (0.3)	1.6 (1.7)	7.3 (3.3)	0.0 (0.3)	0.8 (1.8)	6.1 (3.5)
Homathko-Klinaklini Rivers	0.0 (0.2)	0.1 (0.9)	0.1 (0.7)	0.0 (0.3)	9.2 (3.6)	2.8 (2.1)	0.6 (1.4)	4.2 (2.8)	0.8 (1.4)
Georgia Strait Mainland	0.0 (2.1)	0.0 (0.0)	1.4 (1.5)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Howe Sound-Burrard Inlet	0.0 (2.4)	0.2 (0.9)	0.0 (0.3)	0.1 (0.6)	3.1 (2.4)	0.1 (0.8)	3.5 (2.4)	0.1 (0.4)	3.6 (2.3)

East Vancouver Island-Georgia Strait	0.0 (2.1)	4.0 (3.5)	0.0 (0.4)	0.5 (1.1)	4.1 (2.8)	0.1 (0.7)	0.8 (1.6)	4.8 (3.0)	2.9 (1.9)
East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	4.6 (2.5)	1.5 (1.4)	0.0 (0.1)	0.0 (0.0)	1.2 (1.5)
Nahwitti Lowland	2.1 (7.1)	4.7 (3.3)	0.0 (0.4)	4.1 (2.9)	1.7 (1.6)	0.0 (0.6)	0.0 (0.4)	0.5 (1.4)	0.0 (0.4)
West Vancouver Island	0.0 (1.9)	5.4 (3.2)	0.0 (0.3)	2.8 (2.6)	1.4 (1.5)	1.6 (1.7)	3.4 (2.5)	1.6 (1.5)	4.3 (2.5)
Clayoquot	0.0 (1.6)	0.0 (0.2)	0.0 (0.1)	0.2 (1.4)	0.0 (0.0)	4.6 (2.9)	0.0 (0.1)	0.0 (0.1)	0.1 (0.7)
Juan de Fuca-Pachena	0.0 (1.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.1 (0.5)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)
Lower Fraser	0.0 (3.3)	1.5 (1.7)	0.0 (0.4)	0.0 (0.5)	0.0 (0.5)	0.0 (0.6)	0.0 (0.4)	0.3 (1.1)	0.0 (0.4)
Lillooet	0.0 (1.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)
Fraser Canyon	0.0 (1.2)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Interior Fraser	0.0 (0.5)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.3)	0.0 (0.3)
Lower Thompson	0.0 (0.6)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)
North Thompson	0.0 (3.4)	0.0 (0.4)	0.0 (0.4)	0.0 (0.5)	0.0 (0.2)	0.0 (0.3)	0.0 (0.3)	0.0 (0.3)	0.0 (0.4)
South Thompson	0.0 (2.7)	0.0 (0.6)	0.0 (0.3)	0.0 (0.4)	0.0 (0.5)	0.0 (0.4)	0.0 (0.4)	0.0 (0.4)	0.0 (0.3)
Boundary Bay	0.0 (1.9)	0.0 (0.3)	0.0 (0.3)	0.0 (0.3)	0.0 (0.1)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)
Nooksack River	0.0 (1.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.3)	0.0 (0.5)	0.0 (0.0)
Skagit River	0.0 (2.9)	0.0 (0.4)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)

Northern Puget Sound	0.0 (1.1)	0.0 (0.1)	0.0 (0.1)	0.1 (0.6)	0.0 (0.1)	0.1 (0.4)	0.0 (0.2)	0.0 (0.3)	2.9 (2.0)
Mid-Puget Sound	0.0 (0.5)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)
Southern Puget Sound	0.0 (1.5)	0.0 (0.2)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.3 (1.0)	0.0 (0.2)
Juan de Fuca Strait	0.0 (0.9)	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)	0.1 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)
Hood Canal	0.0 (1.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)
Coastal Washington	0.0 (2.1)	0.0 (0.4)	0.0 (0.2)	1.5 (1.6)	0.0 (0.2)	2.9 (1.9)	0.0 (0.5)	1.6 (1.6)	5.8 (2.7)
Columbia River	0.0 (2.3)	0.0 (0.3)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)
Oregon	0.0 (2.3)	0.0 (0.3)	0.0 (0.3)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

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61 Supplementary Table 1 continued.

Region/Conservation Unit	Area 1 sport					Central coast sport			
	August 12-18	August 19-25	August 26-Sept.1	Sept 2-8	Sept 9-15	July 8-14	July 15-21	Jul 22- 28	July 29-August 4
Sample size	70	69	70	70	22	50	49	49	50
N-PBT	0	0	0	0	0	0	0	0	0
Southeast Alaska	9.7 (3.7)	11.4 (4.0)	19.2 (5.6)	18.3 (5.0)	11.3 (7.0)	1.9 (1.9)	0.0 (0.4)	0.4 (1.3)	0.0 (0.3)
Alsek River	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)
Lower Stikine	1.6 (1.7)	0.0 (0.2)	0.6 (1.7)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Lower Nass	2.4 (2.6)	6.8 (3.5)	4.1 (3.8)	0.0 (0.1)	0.2 (1.2)	0.0 (0.2)	0.0 (0.5)	0.0 (0.1)	0.0 (0.3)
Upper Nass	0.0 (0.0)	0.0 (0.1)	0.0 (0.4)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.3)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (0.0)	1.4 (1.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Skeena Estuary	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)
Lower Skeena	0.1 (0.4)	0.3 (1.2)	3.2 (3.1)	8.7 (3.6)	0.0 (0.9)	0.0 (0.3)	0.9 (1.8)	0.0 (0.2)	0.0 (0.3)
Middle Skeena	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)
Upper Skeena	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.5)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)
Haida Gwaii-Graham Island Lowlands	12.5 (4.0)	21.5 (4.9)	18.5 (4.7)	18.5 (4.4)	13.5 (6.7)	0.0 (0.2)	0.0 (0.4)	0.0 (0.3)	0.0 (0.2)

Haida Gwaii-East	0.4 (0.9)	4.4 (2.4)	1.4 (1.4)	1.5 (1.6)	1.3 (3.1)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.6)
Haida Gwaii-West	3.1 (2.2)	0.0 (0.2)	1.4 (1.4)	1.4 (1.5)	4.6 (4.3)	0.0 (0.1)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)
Northern Coastal Streams	25.7 (6.5)	10.2 (4.6)	8.4 (3.9)	14.1 (4.2)	11.6 (7.6)	10.4 (4.6)	6.5 (4.0)	13.5 (5.3)	24.7 (6.7)
Hecate Strait Mainland	5.6 (3.3)	8.6 (4.3)	25.1 (5.8)	1.4 (1.6)	5.0 (4.2)	0.5 (1.4)	0.1 (0.8)	3.3 (3.3)	8.0 (4.4)
Mussel-Kynoch	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)
Douglas Channel-Kitimat Arm	9.7 (4.5)	11.7 (4.5)	0.4 (1.4)	9.4 (3.7)	0.1 (0.9)	0.0 (0.2)	1.0 (3.0)	2.2 (2.2)	0.4 (1.0)
Bella Coola-Dean Rivers	1.2 (2.5)	4.5 (3.1)	1.8 (1.8)	0.0 (0.2)	5.8 (6.9)	19.7 (6.1)	25.5 (7.8)	12.3 (5.2)	9.0 (4.2)
Rivers Inlet	0.6 (1.5)	0.0 (0.4)	7.2 (3.7)	6.8 (3.4)	3.6 (5.1)	8.8 (4.2)	32.2 (7.8)	21.4 (6.1)	17.7 (5.3)
Smith Inlet	0.1 (0.4)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.6)	9.4 (4.3)	0.2 (0.8)	10.4 (4.2)	14.0 (4.8)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	9.0 (4.4)	0.3 (1.0)	0.1 (0.4)	0.1 (1.0)	4.2 (8.2)	16.3 (5.6)	7.9 (4.7)	8.5 (5.0)	0.1 (1.0)
Homathko-Klinaklini Rivers	7.0 (3.5)	5.8 (3.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	15.7 (5.3)	6.6 (5.5)	9.9 (5.2)	10.3 (4.5)
Georgia Strait Mainland	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)
Howe Sound-Burrard Inlet	2.0 (1.8)	1.7 (2.0)	0.0 (0.4)	0.2 (0.7)	0.4 (1.7)	1.3 (2.3)	12.5 (5.6)	4.1 (3.2)	12.8 (5.1)

East Vancouver Island-Georgia Strait	2.3 (1.9)	3.2 (2.3)	6.5 (3.4)	3.8 (3.5)	18.5 (8.5)	4.0 (2.6)	5.2 (3.8)	7.9 (3.9)	0.8 (1.7)
East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.1)	2.9 (2.0)	0.0 (0.1)	0.0 (0.0)	2.1 (4.3)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Nahwitti Lowland	1.5 (1.4)	0.0 (0.3)	0.3 (1.0)	0.5 (1.3)	0.0 (1.1)	5.1 (3.4)	0.0 (0.3)	0.0 (0.3)	0.0 (0.4)
West Vancouver Island	1.4 (1.4)	1.4 (1.4)	0.0 (0.1)	0.0 (0.2)	0.1 (1.0)	4.8 (3.2)	1.4 (2.9)	6.1 (3.4)	2.0 (2.2)
Clayoquot	0.0 (0.2)	0.0 (0.2)	0.0 (0.4)	0.1 (0.4)	0.1 (0.4)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Juan de Fuca-Pachena	0.0 (0.2)	0.0 (0.2)	0.0 (0.3)	0.7 (1.5)	0.0 (0.8)	0.0 (0.2)	0.0 (0.4)	0.0 (0.3)	0.0 (0.1)
Lower Fraser	0.0 (0.5)	0.0 (0.4)	1.2 (1.5)	0.0 (0.3)	0.0 (1.2)	2.0 (1.9)	0.0 (0.5)	0.0 (0.5)	0.0 (0.5)
Lillooet	0.0 (0.1)	0.6 (1.0)	0.0 (0.2)	0.0 (0.2)	0.0 (0.4)	0.0 (0.3)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)
Fraser Canyon	0.1 (0.4)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)
Interior Fraser	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.4)	0.0 (0.1)	0.0 (0.3)	0.0 (0.2)
Lower Thompson	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.3)	0.0 (0.8)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)
North Thompson	1.4 (1.3)	0.1 (0.6)	0.0 (0.4)	0.0 (0.3)	0.0 (1.5)	0.0 (0.3)	0.0 (0.5)	0.0 (0.6)	0.0 (0.9)
South Thompson	0.0 (0.4)	0.0 (0.4)	0.0 (0.4)	0.0 (0.3)	0.0 (0.9)	0.0 (0.4)	0.0 (0.6)	0.0 (0.6)	0.0 (0.4)
Boundary Bay	0.0 (0.1)	0.0 (0.1)	0.1 (0.3)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)
Nooksack River	0.0 (0.1)	0.0 (0.1)	0.0 (0.4)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)
Skagit River	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.1 (0.2)	0.0 (0.8)	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)

Northern Puget Sound	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	3.4 (2.5)	0.0 (0.4)	0.0 (0.2)	0.0 (0.2)	0.0 (0.4)	0.0 (0.3)
Mid-Puget Sound	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.4)	0.0 (0.3)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)
Southern Puget Sound	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	3.3 (5.2)	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)
Juan de Fuca Strait	0.0 (0.1)	0.0 (0.2)	0.2 (0.5)	1.3 (1.7)	0.0 (0.4)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)
Hood Canal	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.4}	0.0 (0.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)
Coastal Washington	2.9 (1.8)	0.1 (0.4)	0.0 (0.3)	9.7 (3.4)	14.3 (6.9)	0.0 (0.3)	0.0 (0.4)	0.0 (0.3)	0.0 (0.3)
Columbia River	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.8)	0.0 (0.4)	0.0 (0.3)	0.0 (0.3)	0.0 (0.2)
Oregon	0.0 (0.3)	2.8 (2.0)	0.0 (0.3)	0.0 (0.3)	0.0 (0.9)	0.0 (0.3)	0.0 (0.3)	0.0 (0.4)	0.0 (0.3)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

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64 Supplementary Table 1 continued.

Region/Conservation Unit	Central coast sport				Central coast troll			Chatham Sound sport	
					Area 6-9, 6-10, 6-11, 6-13	Area 6-9	Area 6-9		
	August 5-11	August 12-18	August 19-25	August 26-Sept.1	August 3-6	August 9-15	August 16-25	July 15-21	Jul 22- 28
Sample size	50	50	50	50	30	33	45	78	84
N-PBT	0	0	0	0	0	0	0	0	0
Southeast Alaska	0.0 (0.9)	3.7 (3.5)	0.0 (0.4)	0.0 (0.3)	1.3 (2.7)	0.0 (0.5)	0.3 (1.3)	1.6 (2.0)	0.0 (0.5)
Alsek River	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Lower Stikine	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Lower Nass	0.0 (0.2)	0.0 (0.3)	0.0 (0.0)	0.5 (1.6)	0.0 (0.3)	0.0 (0.3)	0.0 (0.1)	0.0 (0.0)	1.1 (2.0)
Upper Nass	0.0 (0.2)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	3.8 (2.1)	5.0 (2.3)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)
Skeena Estuary	0.0 (0.0)	0.0 (0.2)	0.0 (0.4)	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)
Lower Skeena	0.0 (0.4)	0.0 (0.1)	0.0 (0.2)	0.7 (1.7)	0.0 (0.3)	0.0 (0.6)	0.1 (0.7)	0.0 (0.4)	5.0 (2.5)
Middle Skeena	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.6)	2.5 (1.9)	4.5 (2.4)
Upper Skeena	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.3)	0.0 (0.3)	0.0 (0.4)	0.4 (1.4)	0.1 (0.4)	6.0 (2.7)

Haida Gwaii-Graham Island Lowlands	0.0 (0.4)	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.3)	0.1 (0.8)	4.4 (2.3)	1.2 (1.1)
Haida Gwaii-East	0.0 (0.2)	0.0 (0.2)	0.0 (0.3)	0.0 (0.3)	0.0 (0.2)	0.0 (0.4)	0.0 (0.2)	3.9 (2.1)	0.0 (0.2)
Haida Gwaii-West	0.0 (0.3)	0.0 (0.5)	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.3)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)
Northern Coastal Streams	31.6 (8.4)	11.5 (5.7)	25.1 (8.6)	8.1 (4.6)	32.0 (11.5)	28.9 (13.6)	28.8 (9.3)	14.6 (5.0)	4.7 (3.2)
Hecate Strait Mainland	9.8 (6.1)	18.1 (5.9)	4.0 (4.5)	0.8 (2.9)	36.2 (11.3)	4.1 (6.8)	1.6 (3.8)	15.8 (4.7)	6.3 (3.1)
Mussel-Kynoch	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.1 (0.2)	0.0 (0.1)	0.0 (0.1)
Douglas Channel-Kitimat Arm	0.2 (1.0)	6.1 (4.2)	1.4 (4.0)	4.9 (4.8)	15.0 (8.3)	52.1 (12.4)	65.5 (9.3)	19.1 (5.2)	28.4 (5.9)
Bella Coola-Dean Rivers	23.8 (7.7)	15.2 (5.2)	12.8 (5.5)	30.2 (6.7)	2.9 (4.2)	0.2 (0.9)	0.9 (3.0)	3.5 (2.6)	14.9 (5.4)
Rivers Inlet	27.0 (7.0)	25.0 (6.6)	30.0 (7.6)	35.4 (8.2)	0.4 (2.5)	12.7 (10.5)	0.3 (1.5)	7.4 (4.7)	5.3 (4.9)
Smith Inlet	0.0 (0.2)	10.5 (4.5)	6.2 (3.8)	0.0 (0.4)	0.0 (0.5)	0.0 (0.3)	0.0 (0.3)	1.3 (1.2)	0.0 (0.1)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	0.5 (1.7)	3.7 (2.9)	5.4 (4.0)	9.1 (5.5)	1.6 (4.0)	0.1 (1.1)	0.1 (0.5)	5.5 (3.2)	5.2 (4.1)
Homathko-Klinaklini Rivers	1.7 (4.3)	0.0 (0.2)	7.9 (4.3)	0.0 (0.2)	0.0 (0.4)	0.1 (0.5)	0.0 (0.4)	1.5 (2.3)	0.1 (0.9)
Georgia Strait Mainland	0.0 (0.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)

Howe Sound-Burrard Inlet	5.1 (3.9)	1.4 (2.5)	2.8 (2.9)	4.4 (3.5)	3.6 (5.9)	0.5 (2.0)	0.3 (1.2)	4.1 (3.8)	3.7 (2.8)
East Vancouver Island-Georgia Strait	0.0 (0.5)	4.4 (3.4)	3.5 (2.9)	4.0 (2.9)	0.8 (2.6)	0.1 (0.8)	0.7 (1.9)	4.3 (2.6)	0.0 (0.3)
East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.5)	0.0 (0.1)	0.1 (0.6)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.0)
Nahwitti Lowland	0.0 (0.4)	0.1 (1.0)	0.0 (0.3)	0.0 (0.3)	5.4 (4.9)	0.4 (1.7)	0.1 (0.7)	0.0 (0.2)	0.0 (0.3)
West Vancouver Island	0.1 (0.9)	0.0 (0.2)	0.0 (0.3)	2.0 (1.9)	0.1 (1.0)	0.0 (0.4)	0.0 (0.3)	3.9 (2.2)	8.3 (2.8)
Clayoquot	0.0 (0.2)	0.2 (0.6)	0.8 (2.3)	0.0 (0.3)	0.2 (0.8)	0.0 (0.4)	0.1 (0.6)	0.0 (0.2)	0.1 (0.4)
Juan de Fuca-Pachena	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.5)	0.0 (0.4)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)
Lower Fraser	0.0 (0.5)	0.0 (0.6)	0.0 (0.5)	0.0 (0.7)	0.0 (0.8)	0.0 (1.1)	0.1 (0.9)	0.0 (0.3)	0.0 (0.3)
Lillooet	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.5)	0.0 (0.3)	0.0 (0.1)	0.0 (0.3)
Fraser Canyon	0.0 (0.1)	0.0 (0.5)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.2)
Interior Fraser	0.0 (0.2)	0.0 (0.5)	0.0 (0.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)
Lower Thompson	0.0 (0.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)
North Thompson	0.0 (0.7)	0.0 (0.5)	0.0 (0.4)	0.0 (0.4)	0.0 (0.7)	0.0 (0.6)	0.0 (0.4)	0.0 (0.2)	0.0 (0.4)
South Thompson	0.0 (0.3)	0.0 (0.5)	0.0 (0.4)	0.0 (0.5)	0.0 (0.5)	0.0 (0.8)	0.0 (0.7)	0.0 (0.1)	0.0 (0.3)
Boundary Bay	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.5)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)
Nooksack River	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.4)	0.1 (0.9)	0.1 (0.4)	0.0 (0.1)	0.0 (0.2)

Skagit River	0.0 (0.7)	0.0 (0.2)	0.0 (0.1)	0.0 (0.3)	0.0 (0.4)	0.0 (0.4)	0.3 (1.0)	0.0 (0.1)	0.0 (0.2)
Northern Puget Sound	0.0 (0.4)	0.0 (0.3)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.2 (0.9)	0.0 (0.4)	0.0 (0.4)	0.0 (0.1)
Mid-Puget Sound	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.5)	0.0 (0.6)	0.0 (0.2)	0.0 (0.1)
Southern Puget Sound	0.0 (0.2)	0.0 (0.6)	0.0 (0.2)	0.0 (0.2)	0.0 (0.5)	0.0 (0.3)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)
Juan de Fuca Strait	0.0 (0.2)	0.0 (0.1)	0.1 (0.7)	0.0 (0.2)	0.1 (0.8)	0.4 (1.5)	0.0 (0.3)	0.0 (0.1)	0.0 (0.0)
Hood Canal	0.0 (0.3)	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)	0.0 (0.4)	0.0 (0.3)	0.0 (0.2)	0.0 (0.1)
Coastal Washington	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.3)	0.0 (0.6)	0.0 (0.3)	0.0 (0.3)	0.0 (0.2)	0.0 (0.2)
Columbia River	0.0 (0.4)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.6)	0.0 (0.5)	0.0 (0.3)	2.6 (1.7)	0.0 (0.3)
Oregon	0.0 (0.4)	0.0 (0.2)	0.0 (0.2)	0.0 (0.4)	0.0 (0.4)	0.0 (0.3)	0.0 (0.3)	0.0 (0.2)	0.0 (0.0)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

67 Supplementary Table 1 continued.

Region/Conservation Unit	Chatham Sound sport					Areas 3 and 4 sport			
	July 29-August 4	August 5-11	August 12-18	August 19-25	August 26-Sept.1	Jul 22- 28	August 5-11	August 12-18	August 19-25
Sample size	32	25	22	20	7	30	30	68	59
N-PBT	0	0	0	0	0	0	0	0	0
Southeast Alaska	9.7 (6.1)	2.5 (3.4)	4.3 (5.0)	22.3 (10.4)	0.4 (3.3)	0.1 (1.5)	5.8 (5.0)	1.0 (1.6)	12.6 (4.8)
Alsek River	0.0 (0.1)	0.0 (0.2)	0.0 (0.4)	0.0 (0.4)	0.0 (0.6)	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)
Lower Stikine	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	0.8 (2.9)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Lower Nass	0.0 (0.3)	0.0 (0.2)	5.9 (5.6)	0.0 (0.9)	2.4 (6.1)	0.0 (0.3)	0.0 (0.2)	0.1 (0.6)	0.0 (0.2)
Upper Nass	0.0 (0.1)	0.0 (0.2)	0.0 (0.6)	0.2 (2.0)	0.4 (2.4)	0.0 (0.4)	9.6 (5.4)	26.8 (5.9)	10.9 (4.0)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (0.1)	0.0 (0.0)	0.0 (0.4)	1.4 (3.9)	0.0 (0.6)	0.0 (0.0)	0.0 (0.4)	1.5 (1.5)	1.7 (1.6)
Skeena Estuary	0.0 (0.3)	0.0 (0.4)	0.0 (0.2)	0.0 (0.3)	0.0 (1.2)	0.0 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.3)
Lower Skeena	3.6 (3.3)	0.0 (0.5)	0.1 (1.1)	15.8 (9.1)	18.6 (18.8)	0.1 (1.1)	0.6 (2.3)	1.2 (1.7)	12.5 (4.7)
Middle Skeena	0.0 (0.1)	4.4 (6.6)	15.0 (7.7)	0.0 (0.3)	2.8 (7.9)	0.1 (1.2)	7.3 (5.7)	2.3 (2.5)	3.5 (3.1)
Upper Skeena	9.2 (5.4)	7.6 (6.8)	25.6 (9.3)	14.7 (7.5)	12.6 (11.5)	6.5 (4.2)	13.1 (6.4)	5.6 (4.4)	7.6 (4.2)
Haida Gwaii-Graham Island Lowlands	0.4 (1.9)	4.0 (3.7)	0.0 (0.5)	0.0 (0.8)	0.1 (2.6)	9.3 (5.2)	0.0 (0.4)	0.0 (0.4)	0.0 (0.3)

Haida Gwaii-East	3.1 (2.8)	0.0 (0.5)	0.0 (0.6)	0.0 (0.6)	0.0 (2.5)	0.9 (2.0)	0.0 (0.4)	0.0 (0.2)	0.0 (0.2)
Haida Gwaii-West	0.0 (0.3)	0.0 (0.6)	0.0 (0.2)	0.0 (0.5)	0.0 (2.0)	0.0 (0.4)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)
Northern Coastal Streams	7.5 (5.7)	20.5 (8.9)	3.7 (5.1)	13.0 (8.6)	0.3 (3.0)	4.6 (6.0)	3.8 (3.5)	17.3 (5.4)	16.1 (5.9)
Hecate Strait Mainland	15.8 (6.8)	27.4 (9.6)	16.3 (8.9)	0.2 (1.2)	28.0 (14.3)	26.4 (9.0)	8.7 (6.4)	3.8 (2.8)	3.2 (4.3)
Mussel-Kynoch	0.0 (0.1)	0.0 (0.1)	0.0((0.3)	0.0 (0.6)	0.0 (2.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	1.1 (1.5)
Douglas Channel-Kitimat Arm	14.4 (6.6)	13.1 (7.2)	19.1 (8.8)	13.4 (10.2)	0.3 (1.4)	18.0 (8.2)	24.4 (7.7)	29.8 (5.9)	16.1 (7.5)
Bella Coola-Dean Rivers	0.1 (0.7)	1.4 (3.1)	0.1 (0.9)	0.7 (2.8)	11.3 (12.0)	0.1 (0.6)	7.1 (5.2)	0.1 (0.4)	0.1 (0.6)
Rivers Inlet	0.0 (0.5)	0.5 (2.5)	0.7 (1.9)	0.1 (0.7)	7.5 (12.1)	0.1 (0.7)	4.5 (4.3)	0.0 (0.2)	13.8 (7.4)
Smith Inlet	0.0 (0.3)	0.0 (0.5)	0.0 (0.7)	0.0 (0.2)	0.0 (2.2)	0.0 (0.3)	0.0 (0.5)	0.0 (0.1)	0.0 (0.3)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	12.1 (5.7)	0.0 (0.9)	0.0 (0.7)	0.0 (0.6)	0.0 (1.3)	5.4 (7.4)	0.5 (1.6)	3.0 (2.7)	0.6 (1.7)
Homathko-Klinaklini Rivers	13.1 (5.8)	14.5 (7.3)	0.0 (0.4)	3.6 (5.1)	0.6 (3.1)	0.1 (1.1)	4.6 (4.6)	4.6 (3.3)	0.0 (0.0)
Georgia Strait Mainland	0.0 (0.2)	0.0 (0.6)	0.0 (0.4)	0.0 (0.3)	0.0 (1.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)
Howe Sound-Burrard Inlet	0.0 (0.6)	0.1 (1.2)	0.0 (0.9)	3.6 (5.1)	0.1 (2.5)	24.4 (8.0)	2.8 (3.7)	0.0 (0.2)	0.1 (0.7)

East Vancouver Island-Georgia Strait	4.6 (4.4)	0.0 (1.1)	0.0 (0.6)	0.0 (0.9)	0.0 (3.3)	0.1 (1.6)	0.2 (1.1)	0.0 (0.4)	0.0 (0.3)
East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.3)	0.0 (0.5)	3.4 (3.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Nahwitti Lowland	0.1 (0.6)	0.0 (0.7)	0.0 (0.5)	0.0 (0.8)	0.0 (2.2)	0.3 (0.6)	0.0 (0.7)	0.0 (0.3)	0.0 (0.4)
West Vancouver Island	6.3 (4.3)	4.0 (3.9)	9.1 (5.5)	10.0 (6.2)	14.3 (11.0)	0.0 (0.2)	6.7 (4.3)	2.9 (2.2)	0.0 (0.3)
Clayoquot	0.0 (0.3)	0.0 (0.3)	0.0 (0.4)	0.0 (0.7)	0.0 (0.9)	0.0 (0.6)	0.0 (0.7)	0.0 (0.1)	0.0 (0.1)
Juan de Fuca-Pachena	0.0 (0.4)	0.0 (0.3)	0.0 (0.3)	0.0 (0.4)	0.0 (1.4)	0.0 (0.9)	0.0 (0.4)	0.0 (0.2)	0.0 (0.3)
Lower Fraser	0.0 (0.6)	0.0 (0.9)	0.0 (1.2)	0.0 (1.4)	0.2 (3.5)	0.0 (0.4)	0.1 (1.2)	0.0 (0.4)	0.0 (0.5)
Lillooet	0.0 (0.5)	0.0 (0.5)	0.0 (0.3)	0.0 (0.5)	0.0 (1.4)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)
Fraser Canyon	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)
Interior Fraser	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)	0.0 (0.6)	0.0 (2.4)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)
Lower Thompson	0.0 (0.2)	0.0 (0.3)	0.0 (1.1)	0.0 (0.5)	0.0 (1.5)	0.0 (0.8)	0.0 (0.5)	0.0 (0.1)	0.0 (0.1)
North Thompson	0.0 (0.7)	0.0 (0.9)	0.0 (1.0)	0.0 (1.3)	0.0 (3.0)	0.0 (0.8)	0.0 (0.8)	0.0 (0.4)	0.0 (0.4)
South Thompson	0.0 (0.8)	0.0 (0.9)	0.0 (1.3)	0.0 (0.9)	0.0 (2.5)	0.0 (0.6)	0.0 (0.6)	0.0 (0.4)	0.0 (0.4)
Boundary Bay	0.0 (0.3)	0.0 (0.2)	0.0 (0.1)	0.0 (0.7)	0.0 (0.6)	0.0 (0.5)	0.0 (0.4)	0.0 (0.1)	0.0 (0.2)
Nooksack River	0.0 (0.1)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.5)	0.0 (0.1)	0.0 (0.1)
Skagit River	0.0 (0.3)	0.0 (0.7)	0.0 (0.6)	0.0 (0.3)	0.0 (1.1)	0.0 (0.3)	0.0 (0.6)	0.0 (0.1)	0.0 (0.3)

Northern Puget Sound	0.0 (0.4)	0.0 (0.6)	0.0 (0.3)	0.0 (0.9)	0.0 (1.1)	0.0 (0.5)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)
Mid-Puget Sound	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.8)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)
Southern Puget Sound	0.0 (0.7)	0.0 (0.5)	0.0 (0.5)	0.0 (0.7)	0.0 (1.1)	0.0 (0.5)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)
Juan de Fuca Strait	0.0 (0.2)	0.0 (0.1)	0.0 (0.3)	0.0 (0.2)	0.0 (1.0)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)
Hood Canal	0.0 (0.3)	0.0 (0.3)	0.0 (0.2)	0.0 (0.5)	0.0 (1.3)	0.0 (0.2)	0.0 (0.5)	0.0 (0.1)	0.0 (0.2)
Coastal Washington	0.0 (0.5)	0.0 (0.5)	0.0 (0.6)	0.0 (1.3)	0.0 (1.3)	0.0 (0.4)	0.0 (0.4)	0.0 (0.2)	0.0 (0.2)
Columbia River	0.0 (0.6)	0.0 (0.5)	0.0 (0.3)	0.0 (0.8)	0.0 (2.7)	0.0 (0.6)	0.0 (0.5)	0.0 (0.1)	0.0 (0.4)
Oregon	0.0 (0.5)	0.0 (0.8)	0.0 (1.0)	0.0 (1.1)	0.0 (1.2)	0.0 (0.6)	0.0 (0.7)	0.0 (0.2)	0.0 (0.2)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

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70 Supplementary Table 1 concluded.

Region/Conservation Unit	Area 3 and 4 sport		Round Island test fishery
	August 26-Sept.1	Sept 2-8	July 14-August 11
Sample size	68	50	43
N-PBT	0	0	0
Southeast Alaska	21.1 (5.2)	40.8 (7.6)	0.0 (0.9)
Alsek River	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)
Lower Stikine	0.2 (0.6)	0.0 (0.1)	0.0 (0.1)
Lower Nass	2.2 (3.1)	7.4 (4.5)	0.0 (0.0)
Upper Nass	4.0 (2.9)	0.7 (1.7)	0.0 (0.0)
Portland Sound-Observatory Inlet-Portland Canal	5.9 (2.7)	0.0 (0.1)	0.0 (0.0)
Skeena Estuary	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Lower Skeena	4.6 (3.9)	9.9 (4.6)	0.0 (0.3)
Middle Skeena	7.1 (3.0)	0.0 (0.2)	0.0 (1.0)
Upper Skeena	0.0 (0.1)	0.0 (0.4)	0.0 (0.4)
Haida Gwaii-Graham Island Lowlands	0.0 (0.2)	0.0 (0.4)	0.0 (0.2)

Haida Gwaii-East	0.0 (0.2)	0.0 (0.2)	0.0 (0.4)
Haida Gwaii-West	0.0 (0.1)	0.0 (0.4)	0.0 (0.0)
Northern Coastal Streams	3.0 (3.0)	2.2 (4.0)	0.1 (1.7)
Hecate Strait Mainland	9.2 (3.8)	6.5 (3.8)	1.9 (1.4)
Mussel-Kynoch	0.0 (0.1)	0.0 90.1)	0.0 (0.0)
Douglas Channel-Kitimat Arm	25.3 (6.0)	27.8 (7.3)	1.3 (3.6)
Bella Coola-Dean Rivers	7.6 (4.2)	0.0 (0.7)	0.7 (1.6)
Rivers Inlet	0.6 (2.0)	0.3 (1.3)	1.2 (3.0)
Smith Inlet	0.0 (0.1)	0.0 (0.2)	2.3 (1.9)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	9.2 (4.3)	0.7 (2.0)	26.3 (11.2)
Homathko-Klinaklini Rivers	0.0 (0.3)	0.0 (0.1)	14.8 (6.9)
Georgia Strait Mainland	0.0 (0.1)	0.0 (0.1)	0.2 (1.2)
Howe Sound-Burrard Inlet	0.0 (0.3)	0.0 (0.4)	13.7 (8.4)

East Vancouver Island-Georgia Strait	0.0 (0.4)	0.0 (0.8)	19.9 (6.4)
East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (01)	0.0 (0.2)	3.2 (3.1)
Nahwitti Lowland	0.0 (0.4)	1.7 (2.5)	5.8 (3.9)
West Vancouver Island	0.0 (0.3)	2.0 (2.0)	2.6 (2.4)
Clayoquot	0.0 (0.3)	0.0 (0.1)	0.0 (0.0)
Juan de Fuca-Pachena	0.0 (0.2)	0.0 (0.3)	1.6 (2.5)
Lower Fraser	0.0 (0.6)	0.0 (0.6)	0.0 (0.2)
Lillooet	0.0 (0.3)	0.0 (0.4)	0.0 (0.3)
Fraser Canyon	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Interior Fraser	0.0 (0.2)	0.0 (0.1)	0.0 (0.0)
Lower Thompson	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)
North Thompson	0.0 (0.4)	0.0 (0.5)	0.0 (0.7)
South Thompson	0.0 (0.3)	0.0 (0.7)	0.0 (0.2)
Boundary Bay	0.0 (0.2)	0.0 (0.2)	0.0 (0.5)
Nooksack River	0.0 (0.3)	0.0 (0.2)	0.4 (1.9)
Skagit River	0.0 (0.1)	0.0 (0.2)	0.5 (2.9)

Northern Puget Sound	0.0 (0.2)	0.0 (0.2)	1.9 (3.1)
Mid-Puget Sound	0.0 (0.1)	0.0 (0.1)	0.2 (0.7)
Southern Puget Sound	0.0 (0.1)	0.0 (0.2)	0.4 (1.3)
Juan de Fuca Strait	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)
Hood Canal	0.0 (0.1)	0.0 (0.3)	0.4 (0.5)
Coastal Washington	0.0 (0.2)	0.0 (0.3)	0.6 (2.3)
Columbia River	0.0 (0.2)	0.0 (0.3)	0.0 (0.6)
Oregon	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)

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Supplementary Table 2. Percentage stock composition by geographic region or CU of 2018 fishery samples sent to a central laboratory for potential CWT recovery. All individuals from recreational fishery samples were presumed adipose fin clipped, and some individuals would also be marked with a CWT. Seasonal values were obtained by weighting monthly samples by catch such that not all indivduals genotyped were included in the seasonal sample. N-PBT is the number of individuals identified in the sample via PBT.

Region/Conservation Unit	Northern Area F troll				Northern sport			
	July	August	Sept.	Seasonal	July	August	Sept.	Seasonal
Sample size	125	189	30	208	87	144	34	184
N-PBT	17	19	3	23	17	20	3	29
Southeast Alaska	10.2 (3.7)	20.6 (3.3)	28.5 (8.7)	14.0 (2.7)	5.0 (2.9)	6.2 (1.8)	11.8 (4.7)	7.0 (2.5)
Alsek River	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Lower Stikine	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.1 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Lower Nass	0.0 (0.0)	2.9 (1.1)	0.0 (0.0)	1.0 (0.8)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)
Upper Nass	0.6 (0.6)	0.0 (0.1)	0.0 (0.2)	0.3 (0.4)	0.1 (0.5)	0.0 (0.1)	0.0 (0.0)	0.0 (0.5)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Skeena Estuary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Lower Skeena	1.7 (1.0)	1.1 (1.0)	0.1 (0.4)	1.1 (1.0)	0.0 (0.0)	0.0 (0.1)	0.0 (1.0)	0.0 (0.0)
Middle Skeena	4.2 (2.0)	0.3 (0.6)	0.0 (0.3)	3.7 (1.5)	0.5 (0.7)	0.7 (0.7)	0.0 (0.0)	0.3 (0.4)
Upper Skeena	4.7 (2.5)	2.2 (1.2)	0.0 (0.3)	2.9 (1.8)	0.4 (0.8)	0.0 (0.0)	0.0 (0.1)	0.1 (0.3)

Haida Gwaii-Graham Island Lowlands	1.6 (1.2)	0.0 (0.3)	0.0 (0.2)	1.0 (0.8)	0.0 (0.1)	0.9 (0.9)	0.0 (0.0)	0.6 (0.8)
Haida Gwaii-East	8.8 (2.3)	14.8 (2.0)	6.7 (4.5)	10.6 (2.7)	1.1 (1.4)	0.9 (0.8)	0.0 (1.1)	0.7 (0.6)
Haida Gwaii-West	0.6 (0.9)	0.0 (0.0)	0.0 (0.4)	0.3 (0.3)	1.1 (1.0)	0.0 (0.0)	0.0 (0.0)	0.5 (0.6)
Northern Coastal Streams	3.4 (2.6)	0.2 (0.3)	0.2 (2.3)	3.9 (1.9)	1.5 (1.4)	0.4 (0.7)	0.0 (1.2)	1.2 (0.8)
Hecate Strait Mainland	2.9 (3.2)	3.6 (2.0)	0.0 (0.4)	1.4 (1.4)	0.1 (0.5)	0.0 (0.3)	0.0 (0.3)	0.0 (0.1)
Mussel-Kynoch	0.0 (0.1)	0.0 (0.0)	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Douglas Channel-Kitimat Arm	0.0(0.0)	0.1 (0.2)	0.0 (0.4)	0.2 (0.8)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Bella Coola-Dean Rivers	2.8 (1.5)	0.4 (0.9)	0.1 (0.9)	1.6 (1.2)	2.3 (1.7)	0.0 (0.6)	0.0 (0.0)	1.6 (1.0)
Rivers Inlet	0.1 (0.4)	0.2 (0.7)	0.1 (0.9)	0.1 (0.5)	2.2 (1.6)	0.0 (0.2)	0.0 (0.3)	1.1 (0.6)
Smith Inlet	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	4.9 (2.1)	0.0 (0.2)	11.7 (6.5)	3.8 (1.5)	0.1 (0.3)	3.0 (1.5)	0.0 (0.2)	0.0 (0.2)
Homathko-Klinaklini Rivers	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)
Georgia Strait Mainland	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)

Howe Sound-Burrard Inlet	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	5.1 (2.7)	3.4 (1.5)	2.9 (2.8)	3.4 (1.5)
East Vancouver Island-Georgia Strait	8.0 (2.4)	10.1 (2.0)	13.1 (6.7)	9.4 (2.0)	1.7 (1.8)	6.6 (2.2)	18.1 (7.2)	6.6 (2.0)
East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Nahwitti Lowland	4.3 (2.1)	2.3 (1.5)	4.9 (5.0)	3.0 (1.2)	1.1 (1.3)	0.0 (0.2)	0.0 (0.2)	0.5 (0.5)
West Vancouver Island	8.8 (2.4)	4.8 (1.3)	6.7 (4.2)	7.7 (1.8)	15.1 (3.4)	4.2 (1.8)	0.0 (0.6)	8.7 (1.9)
Clayoquot	0.0 (0.2)	0.0 (0.3)	1.2 (3.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.4)	0.0 (0.0)
Juan de Fuca-Pachena	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	6.7 (3.0)	5.4 (2.4)	0.0 (0.1)	4.7 (1.6)
Lower Fraser	0.0 (0.2)	2.2 (1.0)	0.0 (0.8)	1.1 (0.7)	2.3 (1.5)	3.6 (1.7)	0.0 (0.2)	2.7 (1.4)
Lillooet	0.0 (0.1)	0.0 (0.0)	0.1 (0.7)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.4)	0.0 (0.0)
Fraser Canyon	0.0 (0.0)	0.0 (0.0)	3.2 (2.7)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Interior Fraser	0.0 (0.0)	0.0 (0.0)	0.0 (1.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	0.0 (0.0)
Lower Thompson	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)
North Thompson	0.0 (0.4)	0.0 (0.0)	0.0 (1.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	0.0 (0.7)	0.0 (0.1)
South Thompson	0.0 (0.1)	0.0 (0.1)	0.0 (0.8)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.3)	0.0 (0.2)
Boundary Bay	0.0 (0.0)	0.0 (0.1)	0.0 (0.3)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Nooksack River	0.0 (0.0)	0.0 (0.0)	0.0 (0.6)	0.1 (0.0)	0.1 (0.5)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)
Skagit River	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.1 (0.4)	1.0 (2.3)	0.1 (0.1)

Northern Puget Sound	1.0 (1.1)	5.5 (2.0)	3.0 (4.2)	4.1 (1.9)	2.6 (2.8)	0.8 (1.2)	0.5 (4.4)	2.5 (1.7)
Mid-Puget Sound	0.0 (0.0)	8.6 (1.8)	0.3 (1.5)	1.5 (1.4)	3.4 (2.8)	6.8 (2.2)	0.0 (0.1)	5.6 (2.4)
Southern Puget Sound	3.2 (1.3)	0.7 (1.2)	0.0 (0.0)	1.8 (1.8)	0.8 (1.4)	0.9 (0.6)	0.0 (0.0)	0.0 (0.0)
Juan de Fuca Strait	0.0 (0.0)	0.2 (0.5)	0.1 (0.4)	0.1 (0.3)	2.3 (2.3)	2.9 (2.1)	0.6 (2.8)	3.8 (1.8)
Hood Canal	0.1 (0.1)	0.9 (0.7)	0.0 (0.0)	0.3 (0.6)	0.0 (0.3)	0.2 (0.3)	3.1 (3.4)	0.0 (0.0)
Coastal Washington	20.0 (4.2)	12.6 (2.6)	13.3 (7.3)	17.9 (3.1)	35.0 (5.4)	43.6 (4.3)	62.0 (8.4)	39.9 (3.5)
Columbia River	8.1 (2.5)	5.8 (1.5)	6.7 (4.2)	7.2 (1.5)	9.0 (3.3)	8.8 (2.4)	0.0 (0.1)	7.8 (1.9)
Oregon	0.0 (0.1)	0.0	0.0 (0.5)	0.0 (0.1)	0.2 (0.5)	0.5 (0.7)	0.0	0.4 (0.5)
Northern California	0.0 (0.1)	0.0	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0	0.0 (0.0)

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79 Supplementary Table 2 continued

Region/Conservation Unit	Johnstone Strait sport					West coast Vancouver Island sport			
	June	July	August	Sept.	Seasonal	June	July	August	Sept.
Sample size	109	172	85	23	232	50	310	368	33
N-PBT	68	91	47	14	132	17	110	119	12
Southeast Alaska	0.0 (0.4)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	3.0 (1.8)
Alsek River	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Lower Stikine	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Lower Nass	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Upper Nass	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Skeena Estuary	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)
Lower Skeena	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.3)	0.0 (0.0)	0.0 (0.4)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)
Middle Skeena	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)
Upper Skeena	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.6)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Haida Gwaii-Graham Island Lowlands	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.5)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Haida Gwaii-East	0.0 (0.0)	0.0 (0.0)	1.2 (1.4)	0.0 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.5)

Haida Gwaii-West	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.5)
Northern Coastal Streams	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)
Hecate Strait Mainland	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.3 (0.4)	0.0 (0.1)
Mussel-Kynoch	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Douglas Channel-Kitimat Arm	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.1 (0.1)	0.1 (0.7)
Bella Coola-Dean Rivers	0.0 (0.0)	0.0 (0.1)	1.1 (1.2)	3.1 (4.6)	0.8 (0.6)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Rivers Inlet	0.0 (0.0)	0.0 (0.2)	0.0 (0.5)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.7 (1.4)
Smith Inlet	0.0 (0.0)	0.0 (0.0)	0.0 (0.4)	0.0 (0.6)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	0.1 (0.7)	0.2 (0.4)	1.3 (1.6)	0.1 (0.3)	0.3 (0.9)	0.0 (0.1)	0.0 (0.1)	0.1 (0.2)	0.0 (0.7)
Homathko-Klinaklini Rivers	0.0 (0.0)	0.0 (0.0)	0.0 (0.6)	0.2 (0.6)	0.1 (0.4)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)
Georgia Strait Mainland	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Howe Sound-Burrard Inlet	15.2 (3.5)	9.3 (2.2)	11.6 (4.0)	4.5 (5.0)	12.7 (2.4)	4.0 (2.8)	3.9 (1.1)	2.4 (0.7)	0.0 (0.1)
East Vancouver Island-Georgia Strait	26.3 (3.7)	39.8 (3.7)	33.6 (5.3)	71.4 (10.5)	32.1 (3.3)	1.0 (1.5)	5.0 (1.2)	2.9 (1.3)	9.2 (6.0)

East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Nahwitti Lowland	0.0 (0.0)	2.3 (1.2)	4.4 (2.1)	3.1 (3.9)	0.2 (0.4)	0.0 (0.1)	2.3 (0.8)	1.4 (0.6)	4.4 (4.6)
West Vancouver Island	0.0 (0.1)	3.6 (1.5)	0.0 (0.0)	0.0 (0.2)	1.1 (0.9)	52.5 (6.0)	29.4 (2.4)	18.6 (2.2)	20.1 (6.5)
Clayoquot	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (1.0)
Juan de Fuca-Pachena	0.0 (0.0)	1.6 (0.9)	0.0 (0.0)	0.0 (0.1)	1.5 (0.7)	4.4 (0.0)	2.9 (1.0)	2.5 (0.8)	0.0 (0.4)
Lower Fraser	44.9 (4.8)	32.0 (3.4)	33.5 (5.3)	13.1 (6.1)	39.1 (3.3)	4.0 (3.0)	8.3 (1.7)	15.0 (1.7)	15.3 (5.6)
Lillooet	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)
Fraser Canyon	0.0 (0.0)	0.0 (0.0)	0.0 (0.4)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Interior Fraser	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)
Lower Thompson	0.9 (0.7)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.4 (0.4)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
North Thompson	0.0 (0.2)	0.0 (0.4)	0.0 (0.6)	0.0 (1.3)	0.0 (0.1)	0.0 (0.4)	0.0 (0.0)	0.0 (0.1)	0.0 (0.5)
South Thompson	0.0 (0.2)	0.6 (0.6)	1.2 (1.2)	0.0 (2.1)	0.4 (0.5)	0.0 (0.8)	0.0 (0.0)	0.0 (0.1)	0.0 (0.5)
Boundary Bay	0.9 (0.9)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.5 (0.4)	0.0 (0.0)	0.9 (0.6)	0.9 (0.7)	2.8 (2.0)
Nooksack River	0.1 (0.3)	0.3 (0.8)	0.0 (0.4)	0.1 (0.0)	2.8 (1.2)	1.3 (1.9)	0.0 (0.1)	10.0 (2.0)	0.0 (0.4)
Skagit River	11.5 (2.7)	0.3 (0.3)	10.9 (3.6)	3.9 (5.3)	6.7 (1.8)	10.9 (5.5)	9.7 (2.6)	10.0 (2.2)	2.0 (2.7)
Northern Puget Sound	0.1 (0.4)	2.4 (1.4)	0.7 (1.5)	0.1 (0.5)	0.1 (0.3)	1.9 (2.7)	9.0 (2.6)	15.1 (2.1)	28.3 (10.6)
Mid-Puget Sound	0.0 (0.3)	0.5 (0.6)	0.2 (1.5)	0.3 (0.7)	1.2 (0.9)	13.6 (4.2)	14.3 (2.1)	8.8 (1.9)	9.1 (8.8)
Southern Puget Sound	0.0 (0.0)	0.0 (0.0)	0.2 (0.8)	0.2 (3.7)	0.0 (0.1)	0.2 (0.6)	4.9 (1.7)	0.2 (0.5)	4.7 (8.9)

Juan de Fuca Strait	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	1.6 (0.8)	0.9 (0.5)	0.0 (0.0)
Hood Canal	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (1.1)	0.0 (0.0)	2.0 (2.3)	0.4 (0.4)	9.3 (1.7)	0.0 (0.1)
Coastal Washington	0.0 (0.2)	1.2 (0.8)	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	3.6 (1.1)	1.6 (0.5)	0.1 (0.4)
Columbia River	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	0.0 (0.9)	0.0 (0.0)	4.0 (2.7)	3.9 (1.1)	0.0 (0.0)	0.0 (0.2)
Oregon	0.0 (0.3)	0.0 (0.0)	0.0 (0.1)	0.0 (0.4)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.4)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

83 Supplementary Table 2 continued

Region/Conservation Unit	WCVI sport		Barkley Sound/Alberni Inlet sport			Juan de Fuca Strait sport			
	Seasonal	June	July	August	Sept.	July	August	Sept.	Seasonal
Sample size	625	18	14	90	120	41	57	242	324
N-PBT	208	7	7	59	96	17	20	95	130
Southeast Alaska	0.2 (0.1)	0.0 (0.3)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Alsek River	0.0 (0.0)	0.0 (0.0)	0.0 (1.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Lower Stikine	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.8)	0.0 (0.0)	0.0 (0.0)
Lower Nass	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Upper Nass	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Skeena Estuary	0.0 (0.0)	0.0 (0.2)	0.0 (1.6)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Lower Skeena	0.0 (0.0)	0.0 (0.4)	0.0 (1.9)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)
Middle Skeena	0.0 (0.1)	0.0 (0.0)	0.0 (0.5)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Upper Skeena	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Haida Gwaii-Graham Island Lowlands	0.0 (0.0)	0.0 (0.1)	0.0 (1.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.5)	0.0 (0.1)	0.0 (0.0)
Haida Gwaii-East	0.0 (0.0)	0.0 (0.3)	0.0 (0.2)	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Haida Gwaii-West	0.0 (0.0)	0.0 (0.4)	0.0 (0.4)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.8)	0.0 (0.0)	0.0 (0.0)
Northern Coastal Streams	0.0 (0.0)	0.0 (1.4)	0.0 (0.7)	0.0 (0.4)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.1)	0.0 (0.0)
Hecate Strait Mainland	0.2 (0.3)	0.0 (0.1)	0.0 (1.5)	0.0 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Mussel-Kynoch	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)
Douglas Channel-Kitimat Arm	0.0 (0.1)	0.0 (0.4)	0.0 (0.7)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Bella Coola-Dean Rivers	0.0 (0.0)	0.2 (0.3)	0.0 (0.4)	0.0 (0.2)	0.0 (0.0)	0.0 (0.5)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)
Rivers Inlet	0.0 (0.0)	0.0 (0.2)	0.0 (1.5)	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Smith Inlet	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	0.2 (0.2)	0.0 (0.0)	7.0 (5.4)	0.3 (0.8)	0.0 (0.2)	2.5 (3.2)	0.0 (0.1)	0.0 (0.4)	0.1 (0.3)
Homathko-Klinaklini Rivers	0.0 (0.0)	1.2 (3.4)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Georgia Strait Mainland	0.0 (0.0)	0.0 (0.5)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)
Howe Sound-Burrard Inlet	3.4 (0.7)	9.2 (6.6)	0.0 (2.4)	1.1 (1.0)	0.8 (0.7)	41.9 (7.3)	27.6 (6.4)	12.3 (1.9)	18.3 (2.1)
East Vancouver Island-Georgia Strait	4.2 (1.0)	3.5 (6.0)	0.2 (0.8)	2.3 (1.8)	0.0 (0.1)	3.1 (2.9)	8.9 (4.6)	7.6 (1.6)	7.6 (1.7)

East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Nahwitti Lowland	2.1 (0.6)	0.6 (4.3)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.3)	0.0 (0.4)	0.0 (0.1)	0.0 (0.1)
West Vancouver Island	22.3 (1.9)	22.3 (9.0)	50.0 (12.9)	56.9 (5.2)	99.1 (0.8)	2.4 (1.9)	1.8 (1.7)	0.0 (0.4)	0.6 (0.4)
Clayoquot	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Juan de Fuca-Pachena	2.4 (0.5)	10.9 (7.1)	7.4 (6.0)	3.1 (1.8)	0.0 (0.0)	2.4 (2.2)	1.8 (1.9)	0.0 (0.0)	0.3 (0.4)
Lower Fraser	12.4 (1.2)	5.6 (5.9)	0.0 (1.7)	9.4 (3.2)	0.0 (0.1)	7.4 (3.9)	6.2 (3.1)	26.9 (3.4)	21.9 (2.9)
Lillooet	0.0 (0.0)	0.0 (0.4)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.6)	0.0 (0.1)	0.0 (0.0)
Fraser Canyon	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Interior Fraser	0.0 (0.0)	0.0 (0.1)	0.0 (1.4)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.4)	0.0 (0.0)	0.0 (0.0)
Lower Thompson	0.0 (0.0)	0.0 (0.3)	0.0 (0.9)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.4)	1.2 (0.7)	0.9 (0.5)
North Thompson	0.0 (0.0)	0.0 (1.9)	0.0 (1.3)	0.0 (0.2)	0.0 (0.3)	0.0 (0.4)	0.0 (0.8)	0.0 (0.1)	0.0 (0.1)
South Thompson	0.0 (0.0)	5.4 (4.4)	0.0 (0.8)	0.9 (1.1)	0.0 (0.1)	0.0 (0.8)	1.7 (1.6)	0.4 (0.4)	0.6 (0.4)
Boundary Bay	1.0 (0.4)	0.0 (0.1)	0.0 (0.5)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	2.8 (1.1)	2.0 (0.8)
Nooksack River	0.0 (0.0)	0.8 (3.1)	0.1 (0.8)	0.0 (0.3)	0.0 (0.0)	0.1 (0.6)	0.0 (0.7)	0.9 (1.0)	0.8 (1.2)
Skagit River	9.3 (1.5)	14.3 (9.7)	3.5 (5.6)	6.5 (2.7)	0.0 (0.0)	0.2 (1.6)	20.7 (6.8)	19.0 (3.1)	19.1 (2.6)
Northern Puget Sound	10.7 (1.8)	0.8 (3.1)	23.4 (12.0)	5.3 (2.6)	0.0 (0.0)	18.2 (5.8)	6.7 (4.8)	16.7 (3.4)	13.5 (2.5)
Mid-Puget Sound	13.9 (1.8)	24.8 (11.4)	0.2 (1.7)	2.5 (3.3)	0.0 (0.1)	16.9 (7.2)	2.6 (7.2)	9.1 (2.1)	7.6 (1.9)
Southern Puget Sound	7.2 (1.5)	0.1 (2.4)	0.2 (4.4)	7.1 (3.2)	0.0 (0.0)	0.0 (0.0)	5.7 (3.8)	0.4 (0.6)	2.0 (1.1)

Juan de Fuca Strait	1.3 (0.5)	0.0 (0.0)	0.0 (0.3)	0.1 (0.8)	0.0 (0.0)	1.7 (2.5)	0.4 (1.8)	1.4 (0.7)	1.6 (0.9)
Hood Canal	0.9 (0.4)	0.1 (0.7)	0.0 (0.0)	2.2 (1.2)	0.0 (0.1)	0.0 (0.0)	5.4 (3.0)	0.1 (0.1)	0.7 (0.5)
Coastal Washington	6.4 (1.1)	0.0 (0.8)	7.8 (8.2)	1.2 (1.2)	0.0 (0.1)	3.1 (2.9)	3.4 (2.2)	0.1 (0.3)	1.0 (0.6)
Columbia River	1.9 (0.6)	0.0 (0.1)	0.0 (0.7)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	7.0 (3.2)	0.0 (0.1)	1.3 (0.7)
Oregon	0.0 (0.0)	0.0 (0.2)	0.0 (0.3)	1.1 (1.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (2.4)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

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86 Supplementary Table 2 concluded

Region/Conservation Unit	Strait of Georgia-north sport					Strait of Georgia-south sport			
	June	July	August	Sept.	Seasonal	June	July	August	Seasonal
Sample size	106	105	166	38	312	20	64	130	218
N-PBT	62	58	93	28	181	10	40	73	125
Southeast Alaska	0.0 (0.2)	0.0 (0.1)	0.8 (0.8)	0.0 (0.1)	0.4 (0.4)	0.0 (0.3)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)
Alsek River	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Lower Stikine	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Lower Nass	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)
Upper Nass	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Portland Sound-Observatory Inlet-Portland Canal	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Skeena Estuary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Lower Skeena	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.5)	0.0 (0.0)	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Middle Skeena	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Upper Skeena	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.4)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Haida Gwaii-Graham Island Lowlands	0.0 (0.0)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.0)	0.0 (1.5)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)
Haida Gwaii-East	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.7)	0.0 (0.0)	0.0 (0.4)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)

Haida Gwaii-West	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)
Northern Coastal Streams	0.0 (0.1)	0.0 (0.0)	0.4 (0.5)	0.0 (0.5)	0.3 (0.5)	0.0 (1.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
Hecate Strait Mainland	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Mussel-Kynoch	0.0 (0.0)	0.0 (0.2)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Douglas Channel-Kitimat Arm	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.9)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)
Bella Coola-Dean Rivers	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.4)	0.0 (0.0)	0.0 (0.9)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Rivers Inlet	0.0 (0.2)	0.0 (0.0)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (1.5)	0.1 (0.6)	0.0 (0.0)	0.0 (0.0)
Smith Inlet	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)
Southern Coastal Streams-Queen Charlotte Strait-Johnstone Strait-Southern Fjords	0.0 (0.2)	0.0 (0.0)	0.9 (1.2)	0.0 (0.4)	0.6 (0.7)	0.0 (0.2)	0.6 (1.2)	0.9 (1.4)	0.8 (1.1)
Homathko-Klinaklini Rivers	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.4)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Georgia Strait Mainland	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (0.0)
Howe Sound-Burrard Inlet	19.2 (3.7)	22.6 (3.7)	19.6 (3.6)	21.0 (6.0)	20.5 (2.2)	31.1 (9.5)	36.7 9(.8)	42.3 (4.2)	39.8 (3.3)
East Vancouver Island-Georgia Strait	14.5 (3.9)	8.8 (2.9)	10.7 (2.6)	20.4 (5.7)	11.5 (1.8)	0.1 (0.8)	5.3 (2.9)	1.8 (0.9)	2.4 (1.3)

East Vancouver Island-Johnstone Strait-Southern Fjords	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)
Nahwitti Lowland	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)	0.0 (0.5)	0.0 (0.1)	0.0 (0.5)	0.0 (0.3)	0.0 (0.2)	0.0 (0.1)
West Vancouver Island	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.7)	0.0 (0.1)	0.0 (0.5)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Clayoquot	0.0 (0.0)	0.0 (0.1)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.7)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)
Juan de Fuca-Pachena	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Lower Fraser	37.0 (4.9)	43.1 (4.0)	41.7 (4.3)	41.9 (8.8)	41.7 (2.4)	34.1 (11.1)	35.4 (6.1)	18.5 (3.9)	25.0 (3.0)
Lillooet	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Fraser Canyon	0.1 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Interior Fraser	0.0 (0.1)	0.0 (0.3)	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.3)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Lower Thompson	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	5.0 (4.7)	0.0 (0.0)	0.0 (0.0)	0.5 (0.5)
North Thompson	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.0 (1.2)	0.0 (1.5)	0.0 (0.2)	0.0 (0.0)
South Thompson	0.0 (0.2)	0.0 (0.4)	0.0 (0.2)	0.0 (0.4)	0.0 (0.0)	0.0 (1.3)	0.0 (0.4)	0.0 (0.4)	0.0 (0.0)
Boundary Bay	3.3 (1.6)	1.0 (1.4)	2.1 (1.0)	0.0 (0.0)	1.6 (0.6)	0.0 (1.0)	0.0 (0.2)	2.3 (1.0)	1.4 (1.0)
Nooksack River	0.3 (0.5)	7.6 (3.0)	7.9 (3.0)	10.7 (5.2)	6.9 (1.9)	0.0 (0.0)	0.2 (0.8)	5.6 (2.6)	4.2 (2.1)
Skagit River	14.4 (4.9)	5.2 (2.4)	14.8 (3.4)	2.0 (2.6)	9.1 (1.9)	9.1 (8.8)	20.7 (5.0)	23.2 (3.2)	20.4 (2.9)
Northern Puget Sound	10.4 (3.8)	5.7 (2.5)	0.5 (1.4)	2.4 (4.3)	3.0 (1.3)	19.1 (10.4)	0.4 (1.1)	5.3 (2.2)	5.5 (1.4)
Mid-Puget Sound	0.8 (1.6)	3.8 (2.3)	0.0 (0.0)	1.4 (3.2)	2.9 (1.4)	0.5 (3.2)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)
Southern Puget Sound	0.0 (0.0)	2.2 (2.0)	0.0 (0.1)	0.0 (0.4)	1.2 (0.9)	0.0 (1.4)	0.5 (1.1	0.0 (0.0)	0.0 (0.0)

Juan de Fuca Strait	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Hood Canal	0.0 (0.0)	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.6 (0.8)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)
Coastal Washington	0.0 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.3 (3.2)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)
Columbia River	0.0 (0.1)	0.0 (0.1)	0.6 (0.5)	0.0 (0.1)	0.3 (0.2)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Oregon	0.0 (0.2)	0.0 (0.1)	0.1 (0.4)	0.0 (0.0)	0.0 (0.0)	0.0 (0.6)	0.0 (0.1)	0.0 (0.1)	0.0 (0.0)
Northern California	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)	0.0 (0.0)	0.0 (0.0)