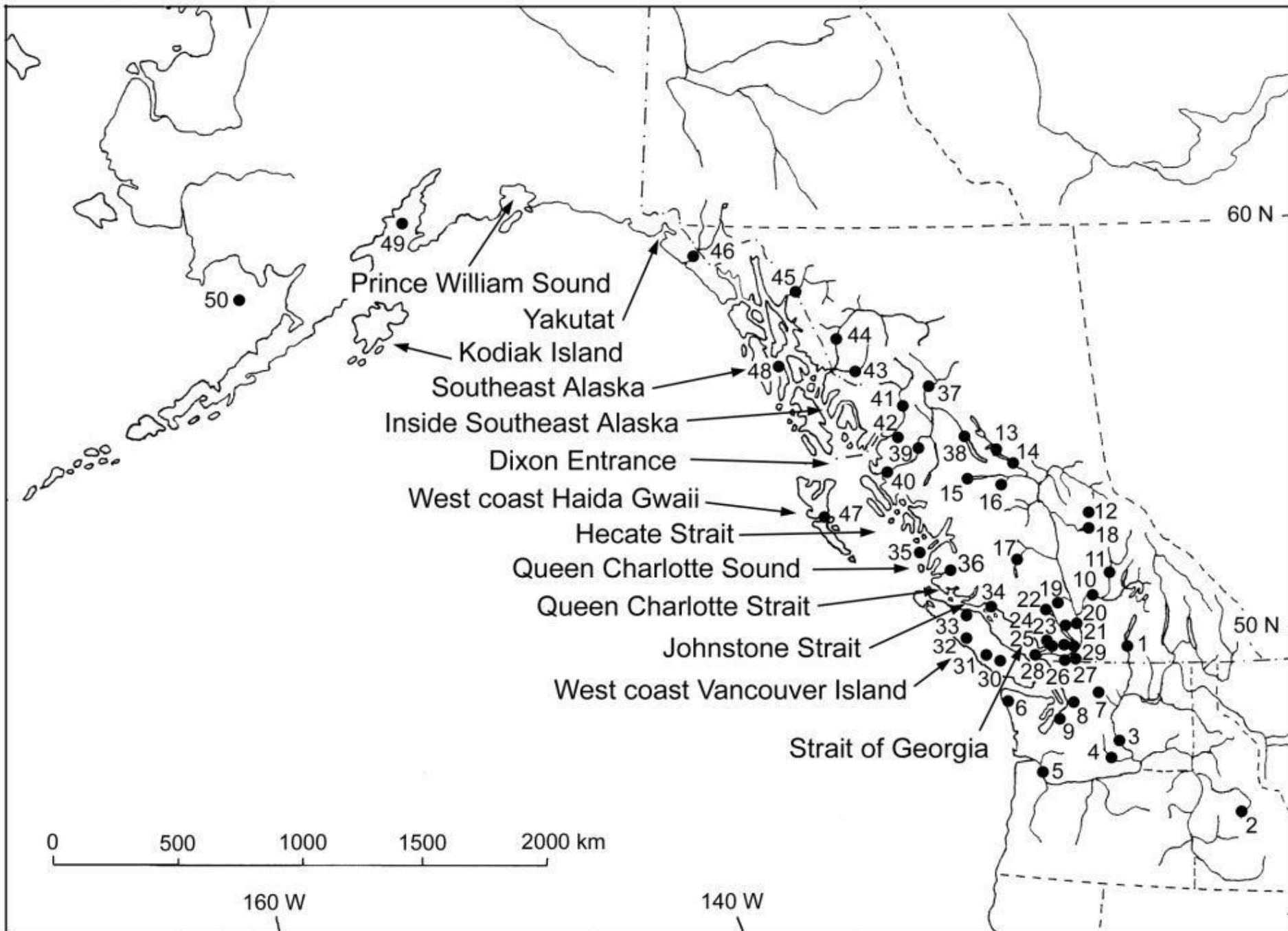


# Stock-specific migration pathways and size of juvenile sockeye salmon in British Columbia waters and in the Gulf of Alaska

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# Study parameters

- 10,500 juvenile sockeye salmon sampled in 11 sampling regions ranging from the Strait of Georgia to west of Kodiak Island between 1996-2011.
- Samples were grouped into spring, summer, fall, and winter sampling periods.
- DNA stock identification was available to 50 populations or stocks for 10,500 individuals, as was juvenile fork length and weight.



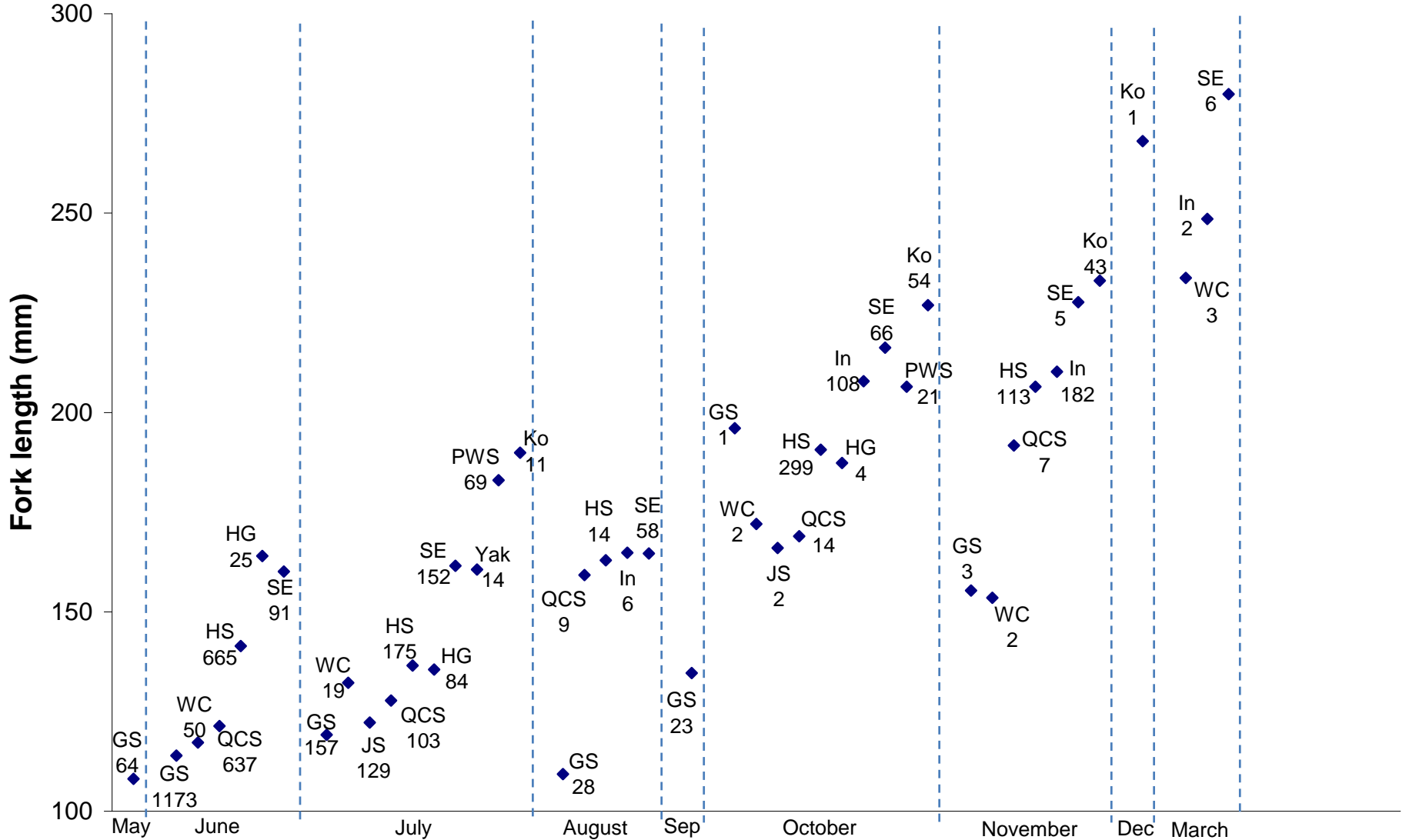
# Stock identification accuracy

- 20 individuals from each of 50 populations or stocks were combined into a single sample of 1,000 individuals.
- Population allele frequencies recalculated after removal of the 20 individuals, 387 populations in baseline ranging from Japan to the Columbia River, approximately 70,000 individuals in baseline
- Overall accuracy of individual identification across 50 populations or stocks was 96.7%

# General findings

- Stock compositions of the mixtures increased in diversity in more northern sampling locations, indicative of a general northward movement of juveniles.
- Larger individuals from the same stock were observed in more northern locations compared with those sampled at the same time in more southern locations.
- For stocks with small (2g) smolt body size, not all individuals migrated northward in the summer, with some individuals still present in local areas in the fall and winter after spring entry into the marine environment.
- A small number of individuals overwinter in coastal waters north of their natal rivers

# Fraser River juvenile length



# Stock-specific CPUE for Central Coast and Owikeno Lake juvenile sockeye salmon in summer and fall in 3 sampling regions

		Summer	Summer		Fall	Fall
Sampling Region	N	Central	Owikeno	N	Central	Owikeno
Queen Charlotte Sound	1035	0.63	0.95	115	0.08	0.09
Hecate Strait	1716	0.20	0.20	834	0.16	0.20
Inside southeast Alaska	17	0.00	0.04	598	0.06	0.04

# Wide dispersion of South Thompson juveniles in summer (June, July, August) sampling

Sampling Region	N	% South Thompson
Strait of Georgia	1611	31
West coast Vancouver Island	1573	3
Johnstone Strait	145	21
Queen Charlotte Sound	1035	10
Hecate Strait	1716	10
Haida Gwaii	219	11
Southeast Alaska	790	3
Yakutat	25	4
Prince William Sound	167	8
Kodiak Island	61	3

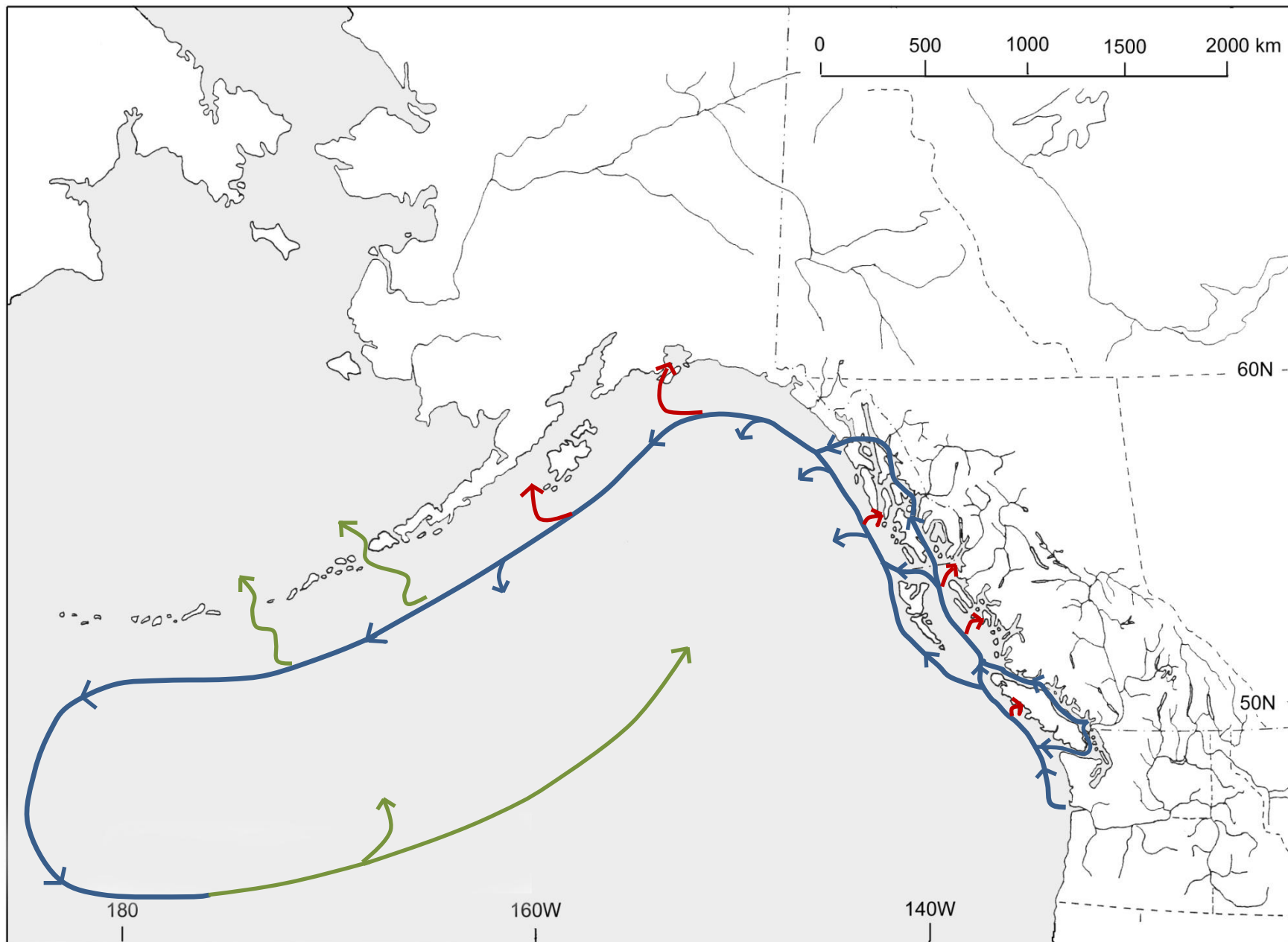


# Why is variation in juvenile body size observed with latitude?

- Juvenile migration pattern is likely correlated with juvenile body size upon entering marine waters, with larger individuals migrating northward more rapidly.
- The more rapidly migrating individuals within a population may be individuals that have spent two years in fresh water prior to migrating to the ocean, or have larger initial body size.
- Higher quality food (more lipids in prey) is present in more northern locations.

# Do Fraser River sockeye salmon juveniles rear in the Strait of Georgia?

- Some Fraser River populations, such as Cultus Lake, appeared to have spent little time rearing in the Strait of Georgia, as individuals from this population were primarily observed in June and July samples from Hecate Strait, Dixon Entrance, and southeast Alaska.
- Other Fraser River populations, such as Chilko Lake and Quesnel Lake, were widely distributed in July surveys, being observed from the Gulf of Alaska to the Strait of Georgia.
- Sockeye salmon production from the Fraser River drainage is dominated by returns to large lakes in the drainage.
- The average migration pattern displayed by Fraser River sockeye salmon is thus closer to that of the type shown by individuals originating from large lakes, and thus more like the pattern displayed by individuals from Chilko Lake rather than the pattern displayed by individuals originating from Cultus Lake.



# Summary

- Stock composition of juvenile samples from more northern sampling areas, such as southeast Alaska, displayed a wide array of origins of the juveniles, ranging from the Columbia River to southeast Alaska.
- In the same sampling month, individuals from the same stock were larger in more northern locations compared with those sampled at the same time in more southern locations.
- Smaller juvenile body size during summer from large production lakes in the Fraser River may account for some of the observed fall and winter rearing of juveniles in northern British Columbia and southeast Alaska waters.
- Stocks with small smolt body size display delay in northward migration behaviour.
- There is likely a wide geographic dispersion during the first ocean winter of rearing for specific stocks.