

## **PSC Northern Fund Final Report**

Project Number: NF-2016-I-6

Project Title: Mixed stock analysis of U.S. Districts 106, 108, and 111 sockeye salmon gillnet fisheries, 2016

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### **Abstract:**

The Stikine and Taku rivers in Southeast Alaska supports sockeye salmon runs important for various commercial and aboriginal fisheries in both Alaska and Canada. This project continues the use of mark- and age-enhanced genetic stock identification (GSI) of sockeye salmon harvested in the 2016 gillnet fishery in Districts 106, 108, and 111 by screening 96 single nucleotide polymorphic genetic markers in 12,469 salmon. Advances in mixed stock analysis methodologies allowed the incorporation of hatchery-marked fish and age composition into genetic-based fishery estimates. The mixed stock analysis model indicated that the *Non-Stikine* reporting group was the largest contributor in the District 106 fisheries in 2016. In the District 108 fisheries, *Tahltan* and *Enhanced Tahltan* were the largest contributors in the early weeks, while the contribution of *Stikine/Taku Mainstem* dominated later in the season. The *Taku Lakes* reporting group was the largest contributor in District 111 early in the season, while the *Enhanced Snettisham* group was the largest contributors in later weeks. The *Stikine/Taku Mainstem* group contributed throughout the season. The most common age group in the District 106 and 108 fisheries was age-1.3, while ages 1.2 and 1.3 were common in District 111.

### **Introduction:**

The Stikine River in Southeast Alaska (SEAK) supports sockeye salmon runs important for various commercial and aboriginal fisheries in both the United States (U.S.) and Canada. Stikine River sockeye salmon are harvested by commercial gillnet fisheries in U.S. Districts 106, 108 and 111, U.S. subsistence fisheries in the lower river, Canadian commercial gillnet in the lower and upper river, and Canadian aboriginal fisheries in the upper river.

The commercial gillnet fisheries in U.S. Districts 106 and 108 harvest wild stocks of sockeye salmon bound for Southeast Alaska (SEAK) island and mainland lakes, and for lakes and tributaries in the Stikine, Nass, and Skeena River drainages, while fisheries in District 111 harvest wild stocks of sockeye salmon primarily bound for several systems in the Taku River or to Crescent and Speel lakes in Alaska. Significant numbers of enhanced sockeye salmon bound for release sites in the Stikine and Taku rivers or to Snettisham Hatchery are also caught in these fisheries. Catches of Stikine and Taku river sockeye salmon stocks in Districts 106, 108 and 111 gillnet fisheries and the U.S. Stikine subsistence fishery are subject to a harvest sharing agreement outlined in Annex IV of the Pacific Salmon Treaty (PST), in which the U.S. is

allowed 50% of the Total Allowable Catch of Stikine River and a variable proportion of Taku River sockeye salmon depending on the return of enhanced fish. Stock contribution estimates are critical to document compliance with the harvest sharing agreements, reconstruct runs of wild stocks, estimate the return of enhanced fish, forecast upcoming returns, and support sustainable management.

This project completed mark- and age-enhanced GSI analysis on sockeye salmon tissue samples collected from commercial gillnet fisheries in areas near the Stikine and Taku rivers in 2016. The analysis focused on tissue samples collected in U.S. Districts 106, 108, and 111.

### **Objectives:**

The objective of this project is to estimate the stock composition of Southeast Alaska sockeye salmon fisheries near the Stikine and Taku rivers such that the estimates are within 10% of the true value 90% of the time. This will be accomplished through the following tasks:

- Determine the stock composition of sockeye salmon harvests from the District 106 drift gillnet fishery for 5 reporting groups including: 2 reporting groups of Stikine wild fish (*Stikine/Taku Mainstem* and *Tahltan Wild*), 2 reporting groups of Stikine hatchery-origin fish (*Enhanced Tahltan* and *Enhanced Tuya*), and one reporting group that includes all other non-Stikine wild- and hatchery-origin fish in the baseline (*Non-Stikine*). For 2016, provide estimates for:
  - Subdistrict 106-30
    - Total season, all age groups combined;
    - Total season, by age groups including ages-1.2, -1.3, -2.2, -2.3, 0-checks, and other;
    - At least 5 time strata, all age groups combined;
  - Subdistrict 106-41
    - Total season, all age groups combined;
    - Total season, by age groups including ages-1.2, -1.3, -2.2, -2.3, 0-checks, and other;
    - At least 5 time strata, all age groups combined.
- Determine the stock composition of sockeye salmon harvests from the District 108 drift gillnet fishery for the 5 reporting groups listed above. For 2016, provide estimates for:
  - District 108
    - Total season, all age groups combined;
    - Total season, by age groups including ages-1.2, -1.3, -2.2, -2.3, 0-checks, and other;
    - At least 5 time strata, all age groups combined.
- Determine the stock composition of sockeye salmon harvests from the District 111 drift gillnet fishery for 10 reporting groups including: 4 reporting groups of Taku area wild fish (*Stikine/Taku Mainstem*, *Taku Lakes*, *Tatsamenie Wild*, and *Speel Wild*), 4 reporting groups of Taku area hatchery-origin fish (*Enhanced Tatsamenie*, *Enhanced Little Trapper*, *Enhanced King Salmon* and *Enhanced Snettisham*), one reporting group of Stikine hatchery-origin fish (*Enhanced Stikine*), and one reporting group that includes all other fish in the baseline (*Other*). For 2016, provide estimates for:
  - District 111
    - Total season, all age groups combined;

- Total season, by age groups including ages-1.2, -1.3, -2.2, -2.3, 0-checks, and other;
- At least 5 time strata, all age groups combined.

## **Approach:**

### *Fishery Sampling*

Landings from drift gillnet fisheries were sampled by ADF&G at fish processing facilities in Petersburg, Wrangell, Ketchikan, and Juneau, and by observers on tenders. Sampling protocols ensured that the fish sampled were as representative of catches as possible. Axillary processes were excised and placed onto Whatman filter paper for dry preservation. Associated data for each sample including fishery and capture date were recorded, and the tissue sample for each fish was paired with age, sex, and length (ASL) information and with otolith samples.

### *Laboratory Analysis*

A single nucleotide polymorphism (SNP) baseline for SEAK and British Columbia (BC) including 45 markers was first completed in 2007. The baseline included all major sockeye salmon-producing systems in SEAK and in BC north of and including the Skeena River and from representative sockeye salmon-producing systems in BC south of the Skeena River. A cooperative project between ADF&G and DFO in 2007-2009 added several collections to the baseline for transboundary rivers (Northern Fund project no. NF-2008-I-15A). In addition, these and existing collections have been analyzed at a total of 96 SNP markers to further enhance the baseline for fishery applications. The current genetic baseline includes 171 populations and 96 markers (Table 1; Rogers Olive et al. *in review*).

Samples were analyzed for 96 SNP loci. Genomic DNA was extracted using a NucleoSpin® 96 Tissue Kit by Macherey-Nagel (Düren, Germany). All SNPs were detected using a TaqMAN SNP Genotyping Assay (Life Technologies). SNP assays were generally performed using the BioMark 96.96 Dynamic Array (Fluidigm). Re-analyses of failed assays was performed on the QuantStudio™ 12K Flex Real-Time PCR System (Life Technologies). Genotype data are stored in an *Oracle* database (*LOKI*) on a network drive maintained by ADF&G computer services. Quality control measures included reanalysis from DNA extraction from 8% of each collection for all markers to ensure genotype reproducibility and to identify laboratory errors and measure rates of inconsistencies during repeated analyses.

### *Mixture Analysis*

Mixture analyses included additional available data to help inform the genetic estimates; specifically, ages from matched scales and hatchery marks on matched otoliths. In this method (“mark- and age-enhanced GSI”), two sets of parameters are required: 1) a vector of stock compositions, summing to one, with a proportion for each of the wild and hatchery stocks weighted by harvest per stratum; and 2) a matrix of age composition, with a row for each of the wild and hatchery stocks (summing to one), and a column for each age class. This information is “completed” iteratively by stochastically assigning each wild fish to a population, then estimating the stock proportions based on summaries of assignments from each iteration. In this process, all available information is used to assign individuals to stock of origin based on age, genotype, and/or otolith information. For this method, only genotypes from wild fish are

necessary to complete stock composition estimates; thus only wild fish were genotyped for 2016 fisheries.

This algorithm was run for 40,000 Markov chain Monte Carlo repetitions, discarding the first 20,000 repetitions to eliminate the effect of the initial state (burn-in). The point estimates and credibility intervals for the stock proportions and age composition are simple summary statistics of the output.

A total of 39 weekly stock composition estimates and 24 age group estimates were made for the 2016 fisheries.

## **Results/Findings:**

### *Fishery sampling*

A total of 12,469 sockeye salmon were sampled in districts 106, 108 and 111 gillnet fisheries. In District 106, Subdistrict 30, 2,877 fish were sampled and in Subdistrict 41, 2,486 fish were sampled for a total of 5,363 District 106 samples. In districts 108 and 111, 3,850 and 3,256 sockeye salmon were sampled respectively (Table 2 and 3). Sockeye salmon were sampled from statistical weeks 25 through 36 for District 106, 25 through 34 for District 108, and 26 through 35 for District 111 (Tables 3 and 4).

### *Laboratory analyses*

Of the samples collected in District 106, 3,114 samples were genotyped at 96 SNP genetic markers. During quality control procedures a total of 262 samples were reanalyzed at all 96 markers for a total of 25,152 comparisons. The average failure rate for District 106 was 3%. Few inconsistencies were found (1% across all comparisons).

Of the samples collected in District 108, 1,527 samples were genotyped at 96 SNP genetic markers. During quality control procedures a total of 127 samples were reanalyzed at all 96 markers for a total of 12,192 comparisons. The average failure rate for District 108 was low at 1%. Few inconsistencies were found (0.3% across all comparisons).

Of the samples collected in District 111, 1,337 samples were genotyped at 96 SNP genetic markers. During quality control procedures a total of 110 samples were reanalyzed at all 96 markers for a total of 10,560 comparisons. The average failure rate for District 111 was low at 0.8%. Few inconsistencies were found (0.4% across all comparisons).

### *Mixture analysis*

Mixtures of fish representing catches by statistical week, age group, and subdistrict from U.S. Districts 106, 108 and 111 gillnet fisheries were analyzed. Stock composition estimates can be found in Figures 1–10. Total season estimates were made for each subdistrict or district by age class and over all ages, and were weighted by harvest in each stratum. In addition, results are given for fish of all age classes over every time stratum sampled, regardless of sample size. The estimates for Subdistrict 106-41 statistical week 28, District 108 statistical week 34, and District 111 statistical week 35 did not meet the minimum criteria for precision and accuracy accepted by the Pacific Salmon Commission (PSC) Transboundary Technical Committee (within 10% of the true mixture 90% of the time) and thus were not reported.

The largest component of the Subdistrict 106-30 harvest in 2016 was non-Stikine-origin fish (97%; Figure 1). This reporting group dominated catches in every statistical week (Figure 2). All other stocks were present at low proportions (<5%) over all statistical weeks with the exception of *Stikine/Taku Mainstem* in statistical weeks 26 thru 28 (range 8–9%). The most common age group in Subdistrict 106-30 for the *Non-Stikine* group was age-1.3 (60% of total), followed by age-2.3 (14%; Figures 3 and 4).

Similar to Subdistrict 106-30, the harvests in Subdistrict 106-41 were dominated by the *Non-Stikine* reporting group (72% over the entire season; Figure 1). This reporting group was the largest contributor in each statistical week, though other stocks were important contributors especially early in the season (Figure 5). The *Tahltan Wild* reporting group contributed between 14% and 26%, followed by the *Enhanced Tahltan* reporting group (range: 8–15%), and the *Enhanced Tuya* reporting group (range: 8–12%) in statistical weeks 25–29. The greatest contribution by the *Stikine/Taku Mainstem* reporting group was 8% in statistical week 29. The most common age group in Subdistrict 106-41 was age-1.3 (69% of total), followed by age-2.3 (11%), age-2.2 (and age-1.2 (each at 9% of the total; Figures 6 and 7).

Stock compositions in District 108 were quite different from District 106, with no single stock dominating every week. The largest contributor in statistical weeks 25 thru 28 was the *Tahltan* reporting group (range: 35–48%; Figure 8) and the *Stikine/Taku Mainstem* reporting group was the largest contributor in statistical weeks 29 thru 32 (range: 29–54%). The contribution of the *Enhanced Tahltan* reporting group steadily decreased from 23% in statistical week 25 to 5% in statistical week 32. The *non-Stikine* reporting group was an important contributor throughout the season, averaging 14% in statistical weeks 25 thru 31 with the largest contributions in weeks 32 and 33 (39% and 53% respectively). The *Enhanced Tuya* reporting group contributed between 6% and 16% in weeks 25–31 with the largest contribution in week 27. The greatest component of the total District 108 harvest was the *Tahltan* reporting group (39%), followed by the *Enhanced Tahltan* reporting group (19%; Figure 1). The total contribution over the entire season for the *non-Stikine*, *Stikine/Taku Mainstem*, and *Enhanced Tuya* reporting groups was 15%, 14%, and 12% respectively. The most common age group in District 108 was age-1.3 (83%), followed by age-1.2 (6%; Figures 9 and 10). All other ages were present at less than 5%.

The greatest contributor to the overall harvest in District 111 in 2016 was the *Enhanced Snettisham* reporting group (36%), followed by the *Stikine/Taku Mainstem* reporting group (28%; Figure 11). The *Taku Lakes* and *Tatsamenie Wild* reporting groups were also important contributors over the whole season (12% and 14% respectively). The remaining reporting groups were present at low proportions ( $\leq 5\%$ ). Samples were unavailable from Subdistrict 111-31 for statistical weeks 28, 27, and 32; therefore these weekly stock composition estimates were based solely on samples collected from Subdistrict 111-32. No samples were taken in statistical week 34. The stock composition in weeks 26 thru 28 was dominated by the *Taku Lakes* group (range: 55–69%) while the *Stikine/Taku Mainstem* group was an important contributor throughout the season (range: 20–35%) with the greatest contribution in statistical week 29 (Figure 12). The *Enhanced Snettisham* reporting group contributed the most in statistical weeks 29 thru 33 with the largest contribution in week 33 (57%). The *Other* group contributed at least 5% in 4 of the 8 statistical weeks, with the highest proportion in week 30 (10%;). All other reporting groups were

present at  $\leq 5\%$  in all weeks with the exception of *Enhanced King Salmon* (6%; statistical week 28) and *Enhanced Tatsamenie* (8%; statistical week 32). The most common age group in District 111 was age-1.3 (44%) followed closely by age-1.2 (42%; Figures 13 and 14).

### **Evaluation:**

We accomplished the following:

- A total of 5,363 samples from District 106, 3,850 samples from District 108 and 3,256 samples were collected from sockeye salmon gillnet fisheries during the 2016 season.
- A total of 3,114 samples from District 106, 1,527 samples from District 108 and 1,337 samples of sockeye salmon from District 111 were assayed for genotypes for the 96 SNP loci and quality control procedures revealed a low rate of inconsistencies. The genotypes for 2,843, 1,498 samples and 1,311 samples were used in analysis for districts 106, 108, and 111 respectively.
- Mixture analyses estimated the contributions of 5 reporting groups including Stikine wild and enhanced sockeye salmon to 12 temporal strata in Subdistrict 106-30, 10 temporal strata in 106-41, 9 temporal strata in District 108, and 8 temporal strata in District 111.
- Mixture analyses estimated the age compositions of harvests over the entire season in Subdistrict 106-30, Subdistrict 106-41, District 108, and District 111 over 6 ages.
- Mixture analyses estimate the seasonal stock composition over all ages for Subdistrict 106-30, Subdistrict 106-41, and District 108 for 5 reporting groups and for District 111 for 10 reporting groups.
- The improved methodology (mark- and age-enhanced GSI) has allowed us to combine several sources of data when estimating stock composition for Pacific Salmon Treaty (PST) purposes. In the past, GSI was conducted on only wild fish, and stock composition estimates for enhanced fish were conducted in a separate analysis using otolith and other data. This approach allows us to combine these analyses to provide the most accurate and efficient estimates possible for Stikine and Taku area fisheries. Work is currently underway to continue to improve this methodology to provide reliable estimates for statistical weeks where low sample sizes are an issue.
- Results will be incorporated into harvest estimates for PST purposes by the Transboundary Technical Committee (TTC *in prep*).

### **Project Products:**

Results from this project have been presented both to ADF&G Commercial Fisheries management staff and to the bilateral PSC Transboundary Technical Committee. A report published in the ADF&G Fishery Data Series is expected in 2017.

**Date Prepared:** June 12, 2017

### **References:**

Rogers Olive, S. D., S. E. Gilk-Baumer, E. K. C. Fox, and C. Habicht. *In prep*. Genetic baseline of Southeast Alaska sockeye salmon for mixed stock analyses, 2014. Alaska Department of Fish and Game, Fishery Data Series No. YY-XX, Anchorage.

TTC (Transboundary Technical Committee). *In prep.* Estimates of Transboundary River salmon production, harvest and escapement, and a review of joint enhancement activities in 2015. Pacific Salmon Commission Report TCTR, Vancouver.

Table 1. Reporting groups and collection locations defined for use in genetic stock identification of sockeye salmon caught in gillnet fisheries in Districts 106, 108, and 111 in 2016. Wild collections are ordered north to south and followed by enhanced collections.

District Reporting Groups		Collection Location	District Reporting Groups		Collection Location
106 and 108	111		106 and 108	111	
<i>Non-Stikine</i>	<i>Other</i>	Bainbridge Lake	<i>Non-Stikine (cont.)</i>	<i>Other (cont.)</i>	Vern Ritchie
		Coghill Lake			Chilkat Lake
		Eshamy Lake			Mosquito Lake
		Main Bay			Bear Flats
		Miners Lake			Mule Meadows
		Bering Lake			Chilkoot Lk - Beaches
		Clear Creek			Bear Creek
		Hatchery Creek			Chilkoot River
		Eyak – Mid Arm			Berners Bay
		Eyak – S. beaches			Lace River
		Gulkana - Fish Ck			Steep Creek
		Gulkana – E. Fork			Windfall Lake
		Klutina Lake			Auke Creek Weir
		Klutina River			Crescent Lake
		Banana Lake		<i>Speel</i>	Speel Lake
		Bear Hole			Snettisham
		Kushtaka Lake		<i>Other (cont.)</i>	Vivid Lake
		Long Lake weir			Bartlett River
		Mahlo River			North Berg Bay Inlet
		Martin Lake			Hoktaheen Lake
		Martin River			Neva Lake
		McKinley Lk 2007			Sitkoh Lake
		McKinley Lk 2008			Lake Eva
		McKinley Lk 1991			Kook Lake
		Salmon Creek			Pavlof Lake
		Mendeltna Creek			Hasselborg Lake
		Mentasta Lake			Kanalku Lake <sup>1</sup>
		Paxson Lake			Kutlaku Lake
		St. Anne Creek			Falls Lake
		Steamboat Lake			Ford Arm Creek
		Swede Lake			Klag Bay Stream
		Tanada Creek			Redfish Lake Beaches
		Tanada Lk - lower			Salmon Lake weir
		Tanada Lk - shore			Redoubt Lake - outlet
		Tebay R. - outlet			Benzeman Lake
		Tokun Lake		<i>Taku Lakes</i>	King Salmon Lake
		Tonsina Lake			Little Tatsamenie
		Ahrnklin River			Little Trapper Lake
		Akwe River			Kuthai Lake
		Dangerous River		<i>Tatsamenie</i>	Tatsamenie Lake
			<i>Stikine/Taku</i>	<i>Stikine/Taku</i>	
			<i>Mainstem</i>	<i>Mainstem</i>	
		East Alsek River			Hackett River
		Tahwah River			Nahlin River
		Old Situk River			Tulsequah River
		Mountain Stream			Yellow Bluff Slough
		Situk Lake			Sustahine Slough
		Blanchard River			Taku River
		Border Slough			Takwahoni/Sinwa Ck
		Klukshu River			Tuskwa/Chunk/Bear
		Upper Tatshenshini			Fish Creek
		Kwatini River			Yehring Creek
		Neskataheen Lk			Shakes Slough
		Tweedsmuir R.			Iskut River

-continued-

Table 1 (cont.)

District Reporting Groups		Collection Location	District Reporting Groups		Collection Location
106 and 108	111		106 and 108	111	
<i>Stikine/Taku Mainstem (cont.)</i>	<i>Stikine/Taku Mainstem (cont.)</i>	Verrett River	<i>Non-Stikine (cont.)</i>	<i>Other (cont.)</i>	Damdochax Creek
		Scud River			Meziadin Lake
		Andy/Porcupine			Tintina Creek
		Devil's Elbow			Weaver Creek
		Chutine River			Alastair Lake
		Chutine Lake			Pierre Creek
		Christina Lake			Fulton River
<i>Tahltan Wild</i>	<i>Other (cont.)</i>	Little Tahltan R.			Kitsumkalum Lake
		Tahltan Lake			Lower Tahlo River
<i>Non-Stikine (cont.)</i>		Hugh Smith Lake			McDonnell Lake
		McDonald Lake			Nangeese River
		Hatchery Creek			Nanika River
		Kah Sheets Lake			Slamgeesh River
		Kunk Lake			Johanson Lake
		Luck Lake			Swan Lake
		Big Lake			Upper Babine River
		Mill Creek Weir			Naden River
		Petersburg Lake			Kitlope Lake
		Red Bay Lake			Baker Lake
		Salmon Bay Lake			Issaquah Creek
		Shiple Lake			Cedar River
		Thoms Lake			Shuswap Lake
		Sarkar Lakes			Birkenhead River
		Heckman Lake			Chilko Lake
		Helm Lake			Gates Creek
		Karta River			Harrison River
		Kegan Lake			Horsefly River
		Mahoney Creek			Raft River
		Gene's Lake			Stellako River
		Fillmore Lake			Enhanced - Burnett Inlet
		Klakas Lake			Enhanced - Main Bay
		Essawah Lake		<i>Enhanced King Salmon</i>	Enhanced - King Salmon
		Eek Creek		<i>Enhanced Little Trapper</i>	Enhanced - Little Trapper
		Hetta Ck - Middle		<i>Enhanced Snettisham</i>	Enhanced - Sweetheart
		Hetta Ck - Early		<i>Enhanced Snettisham</i>	Enhanced - Speel Arm
		Hetta Lake		<i>Enhanced Tatsamenie</i>	Enhanced - Tatsamenie
			<i>Enhanced Tahltan</i>	<i>Enhanced Stikine</i>	Enhanced - Tahltan
		Klawock River			
		Bowser Lake	<i>Enhanced Tuya</i>	<i>Enhanced Stikine</i>	Enhanced - Tuya

Table 2. Number of sockeye salmon sampled from Subdistricts 106-30 and 106-41 gillnet harvests during each statistical week in 2016, total genotyped samples used in analysis, and otolith-marked or aged samples not genotyped (or failed genotyping).

District	Subdistrict	Statistical Week	Total Samples Collected	Genotypes Used in Analysis	Not Genotyped (otolith-marked or aged or both)		
106	30	25	10	0	0		
		26	120	51	69		
		27	289	119	170		
		28	304	124	180		
		29	300	199	101		
		30	300	171	129		
		31	300	252	48		
		32	300	274	26		
		33	300	107	193		
		34	300	98	202		
		35	263	57	206		
		36	91	26	65		
	41	25	240	45	195		
		26	280	104	176		
		27	139	109	30		
		28	61	41	20		
		29	210	162	48		
		30	300	287	13		
		31	298	209	89		
		32	302	203	99		
		33	300	104	196		
		34	218	71	147		
		35	2	0	0		
		36	136	30	106		
		Totals			5,363	2,843	2,508

Table 3. Number of sockeye salmon sampled from gillnet harvests in the sockeye salmon fisheries in District 108 during 2016 by statistical week, total genotyped samples used in analysis, and otolith-marked or aged samples not genotyped (or failed genotyping).

District	Statistical Week	Total Samples Collected	Genotypes Used in Analysis	Not Genotyped (otolith-marked or aged or both)
108	25	117	65	52
	26	528	162	366
	27	540	280	260
	28	510	270	240
	29	520	132	388
	30	370	93	277
	31	420	169	251
	32	460	182	278
	33	185	81	104
	34	168	64	104
Totals		3,818	1,498	2,320

Table 4. Number of sockeye salmon sampled from gillnet harvests in the sockeye salmon fisheries in District 111 during 2016 by statistical week, total genotyped samples used in analysis, and otolith-marked or aged samples not genotyped (or failed genotyping).

District	Statistical Week	Total Samples Collected	Genotypes Used in Analysis	Not Genotyped (otolith-marked or aged or both)
111	26*	80	74	6
	27*	400	105	295
	28	377	139	238
	29	560	186	374
	30	476	331	145
	31	600	172	428
	32*	400	217	183
	33	270	69	201
	35	53	18	35
	36	40	0	0
Totals		3,256	1,311	1,905

\*Samples only collected from Subdistrict 111-32.

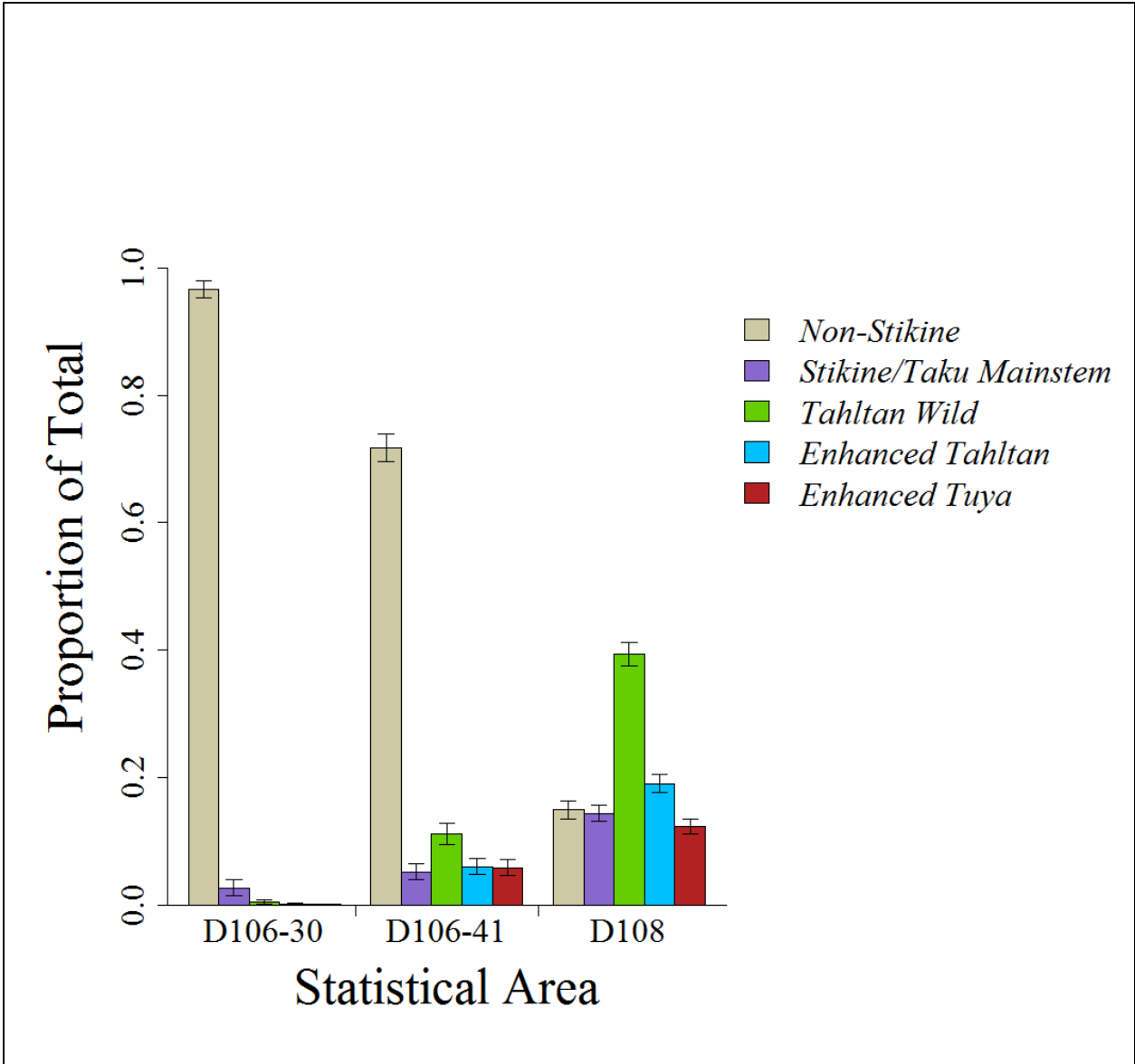


Figure 1. Total season stock composition estimates for Stikine River area fisheries 2016. Estimates were weighted by harvest per stratum. Error bars are upper and lower bounds of 90% credibility intervals.

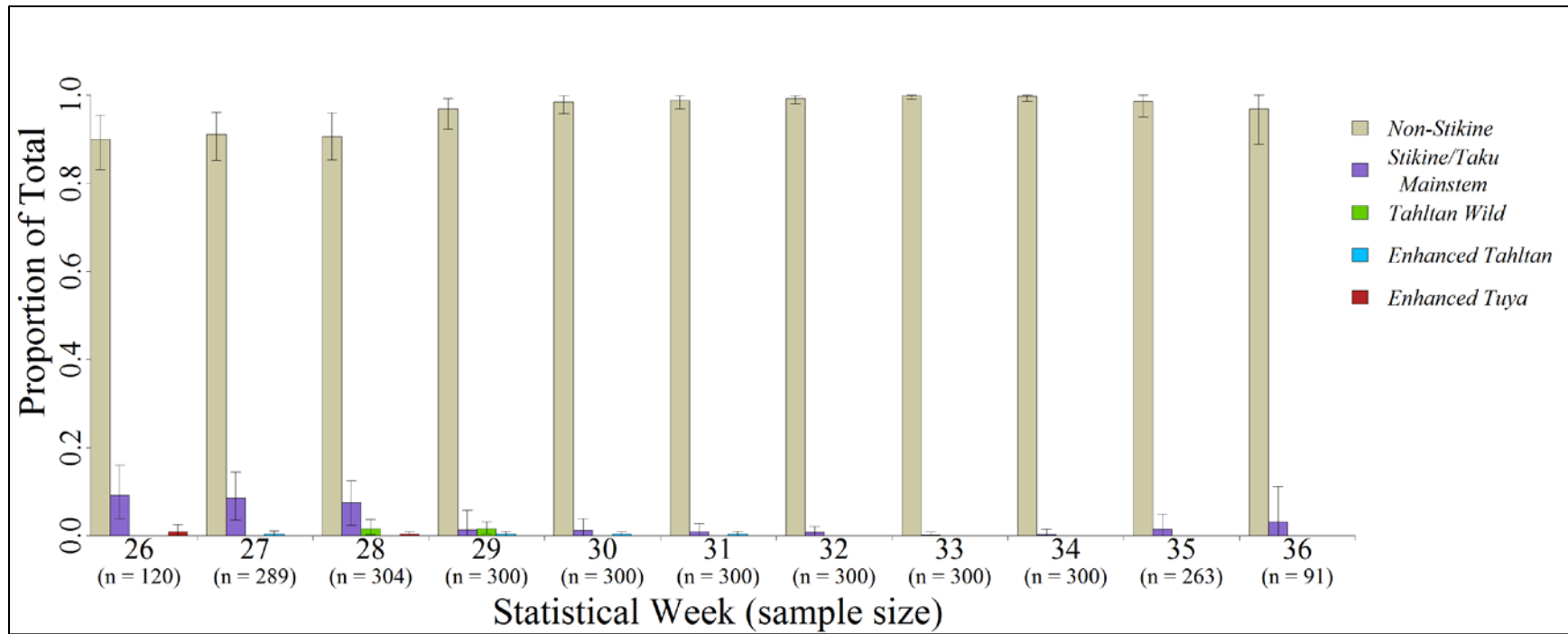


Figure 2. Stock composition estimates of sockeye salmon caught in the District 106-30 gillnet fishery in 2016. Sample size (n) includes genotyped, aged, and otolith-marked fish. Error bars are upper and lower bounds of 90% credibility intervals.

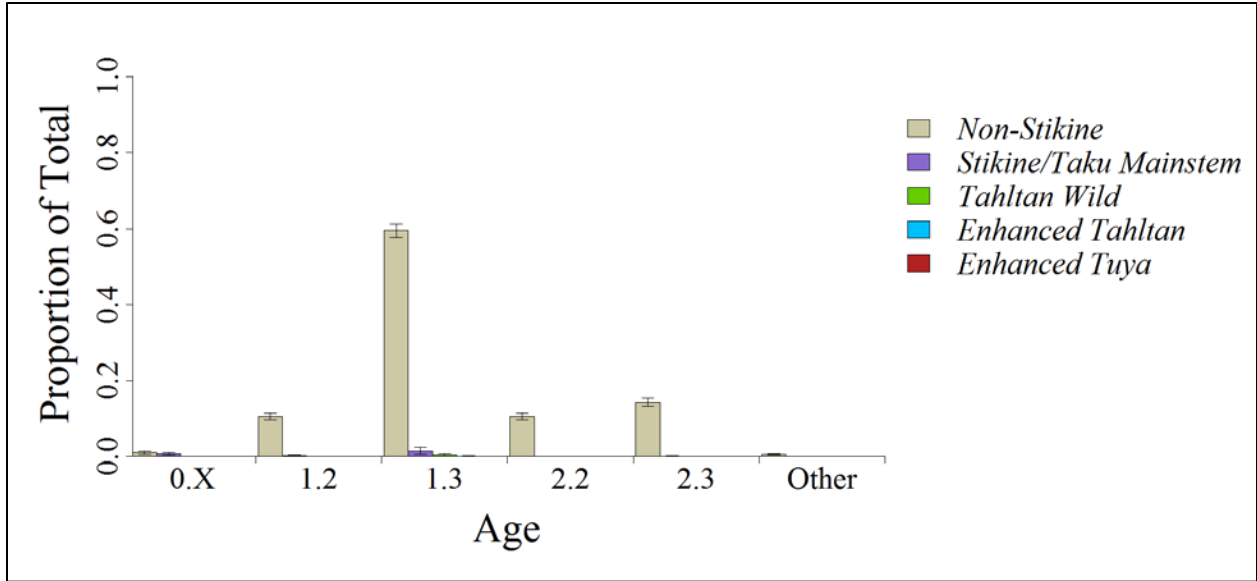


Figure 3. Age composition of sockeye salmon caught in the District 106-30 gillnet fishery in 2016 over the entire season. Error bars are upper and lower bounds of 90% credibility intervals.

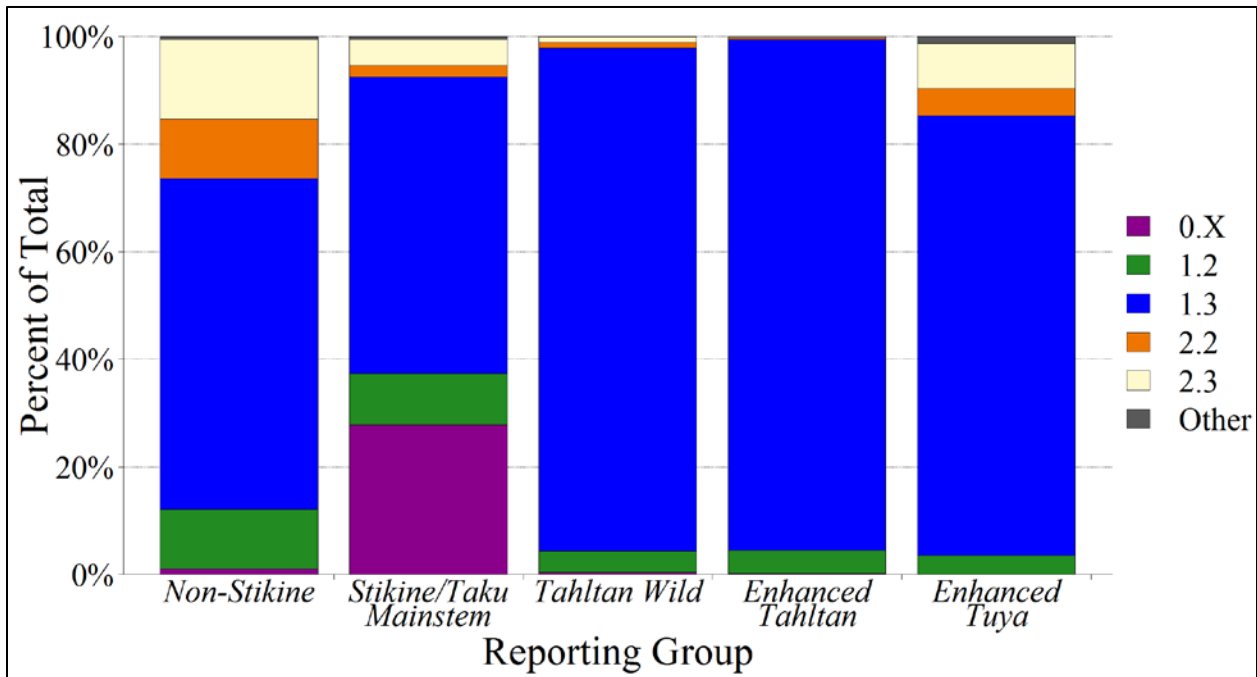


Figure 4. Age composition by reporting group of sockeye salmon caught in the District 106-30 gillnet fishery in 2016.

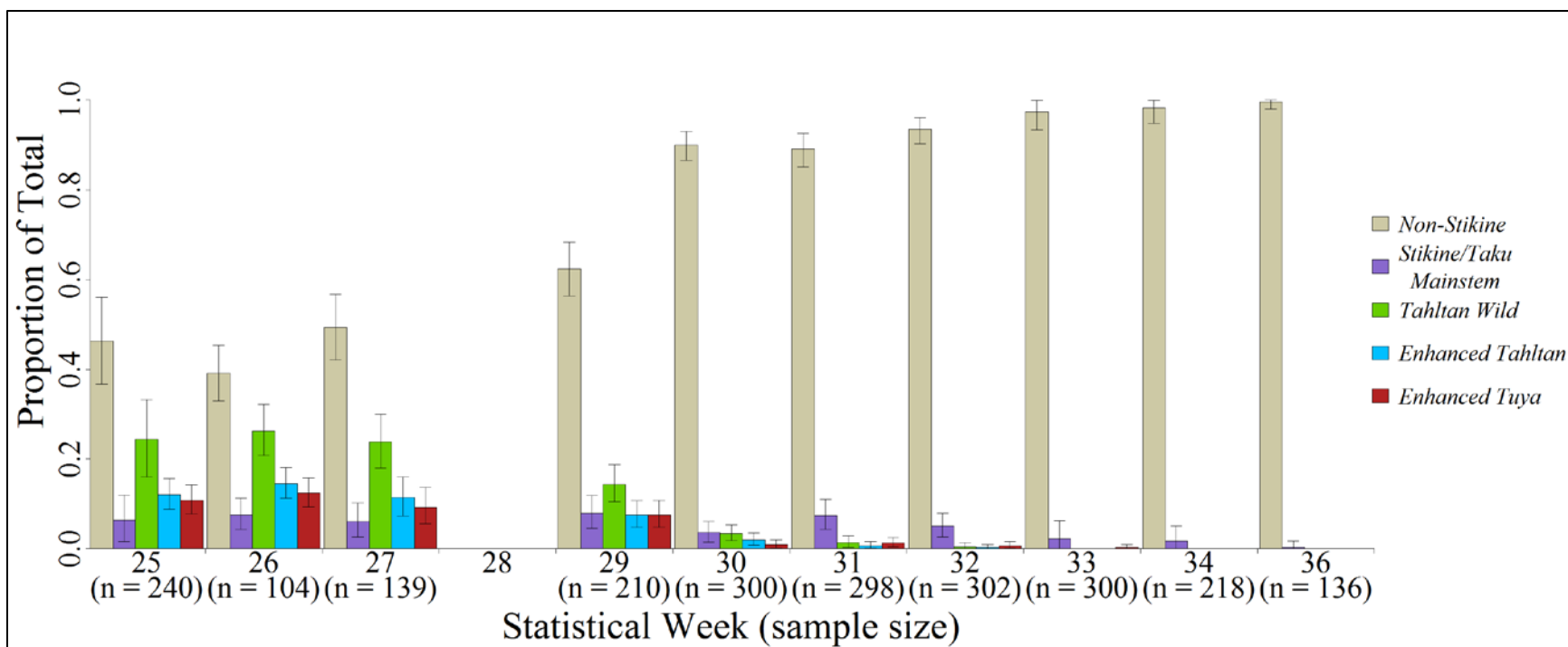


Figure 5. Stock composition estimates of sockeye salmon caught in the District 106-41 gillnet fishery in 2016. Sample size (n) includes genotyped, aged, and otolith-marked fish. Estimates in week 28 did not meet precision and accuracy goals identified by the TTC and thus are not reported. Error bars are upper and lower bounds of 90% credibility intervals.

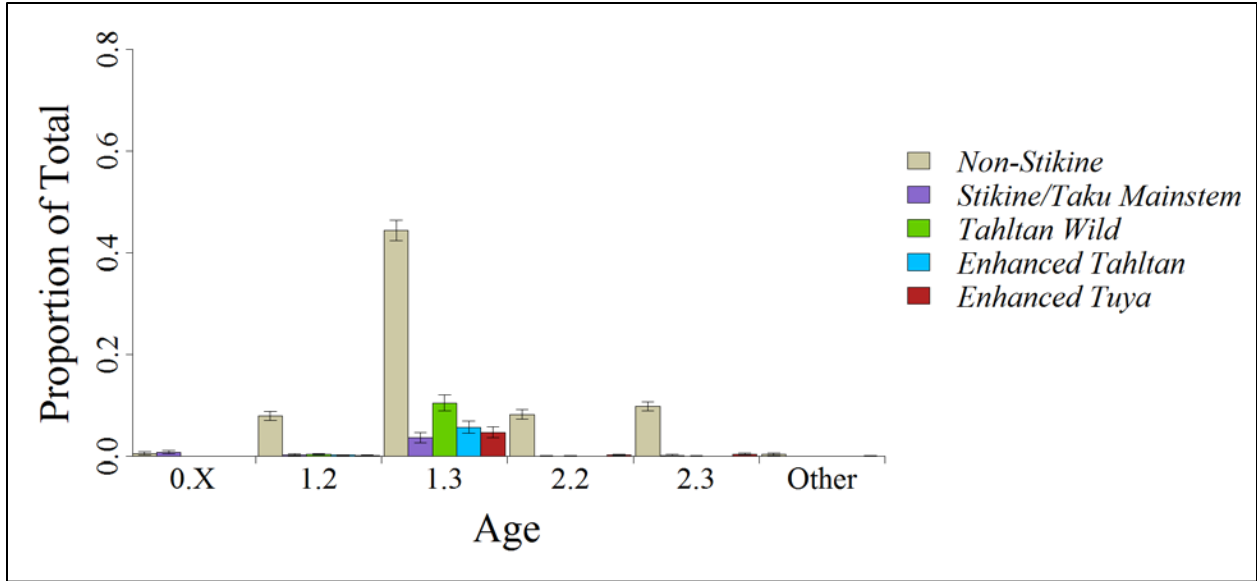


Figure 6. Total age composition of sockeye salmon caught in the District 106-41 gillnet fishery in 2016 over the entire season. Error bars are upper and lower bounds of 90% credibility intervals.

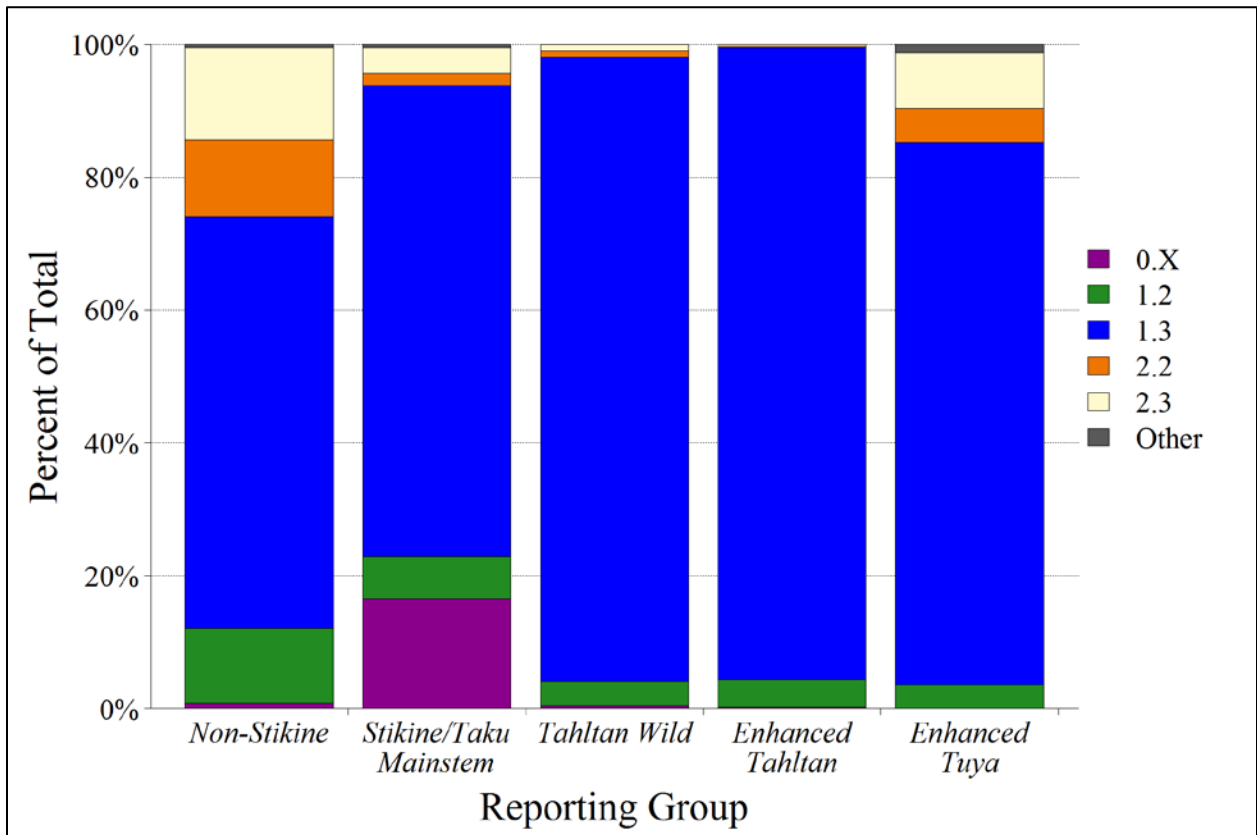


Figure 7. Age composition by reporting group of sockeye salmon caught in the District 106-41 gillnet fishery in 2016.

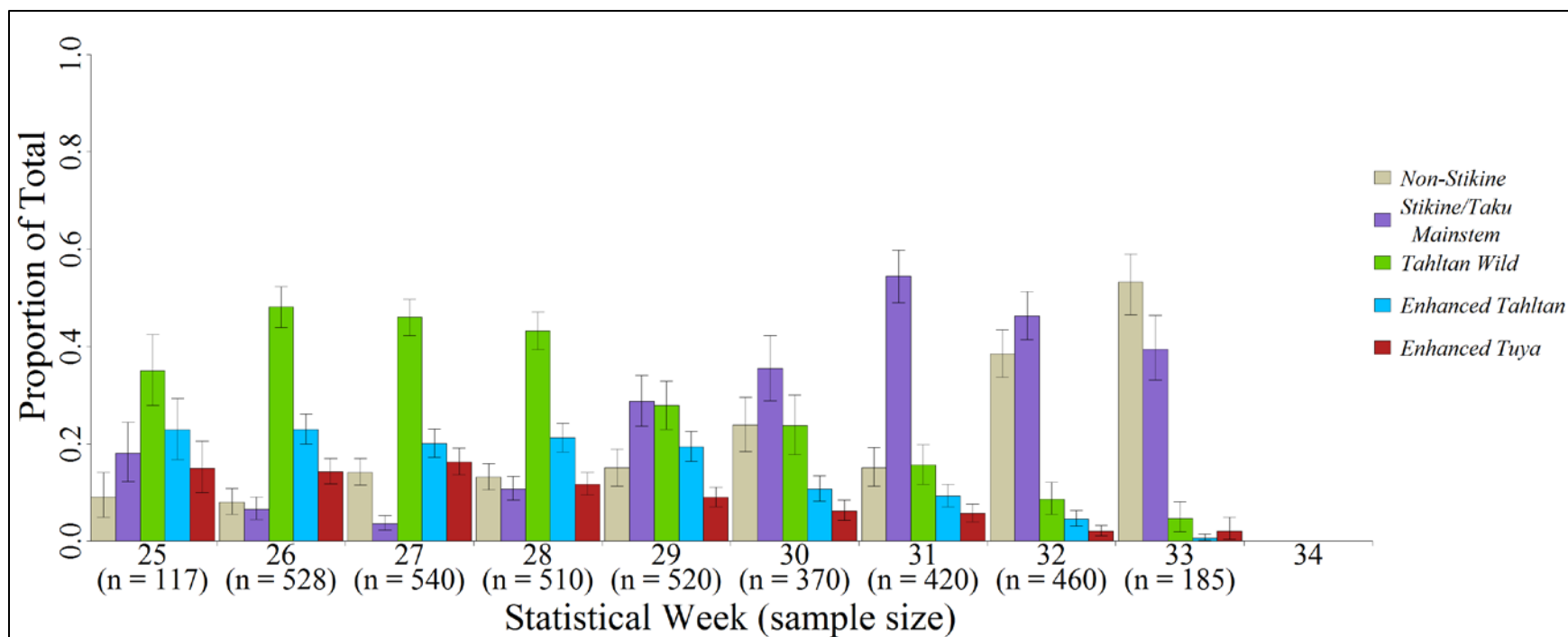


Figure 8. Stock composition estimates of sockeye salmon caught in the District 108 gillnet fishery in 2016. Sample size (n) includes genotyped, aged, and otolith-marked fish. Estimates in week 34 did not meet precision and accuracy goals identified by the TTC and thus are not reported. Error bars are upper and lower bounds of 90% credibility intervals.

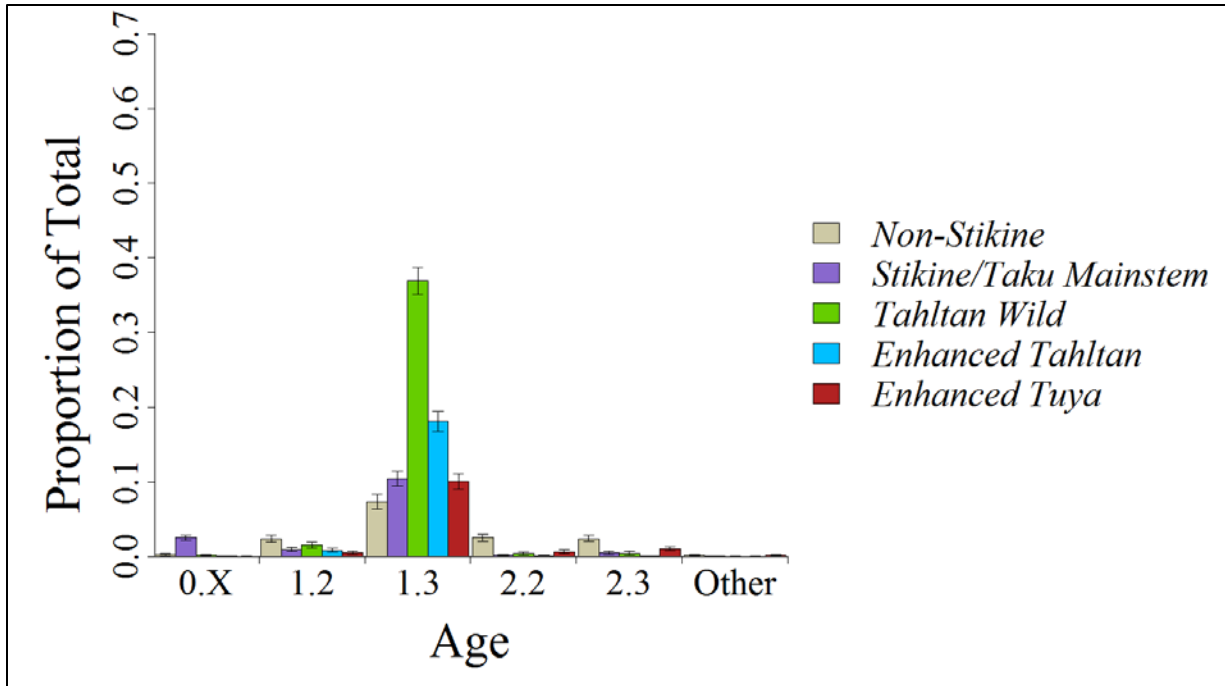


Figure 9. Total age composition of sockeye salmon caught in the District 108 gillnet fishery in 2016 over the entire season. Error bars are upper and lower bounds of 90% credibility intervals.

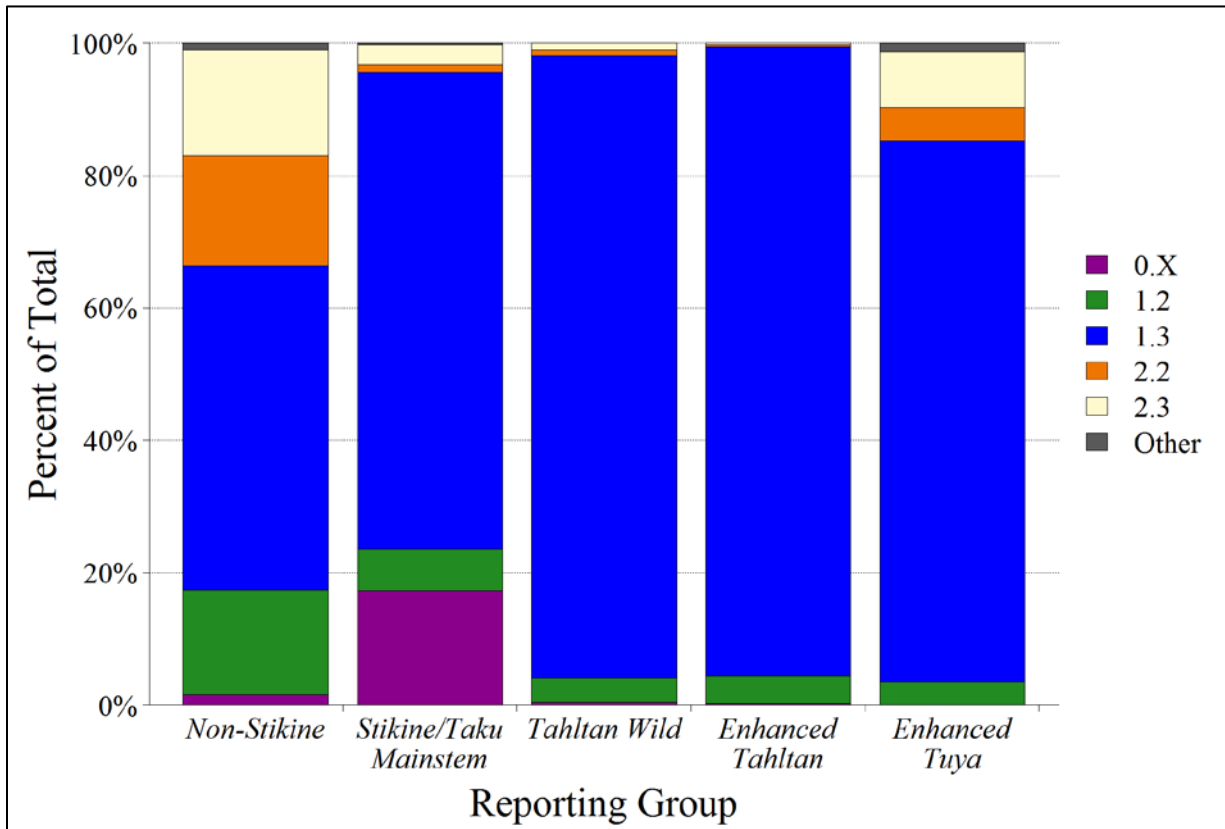


Figure 10. Age composition by reporting group of sockeye salmon caught in the District 108 gillnet fishery in 2016.

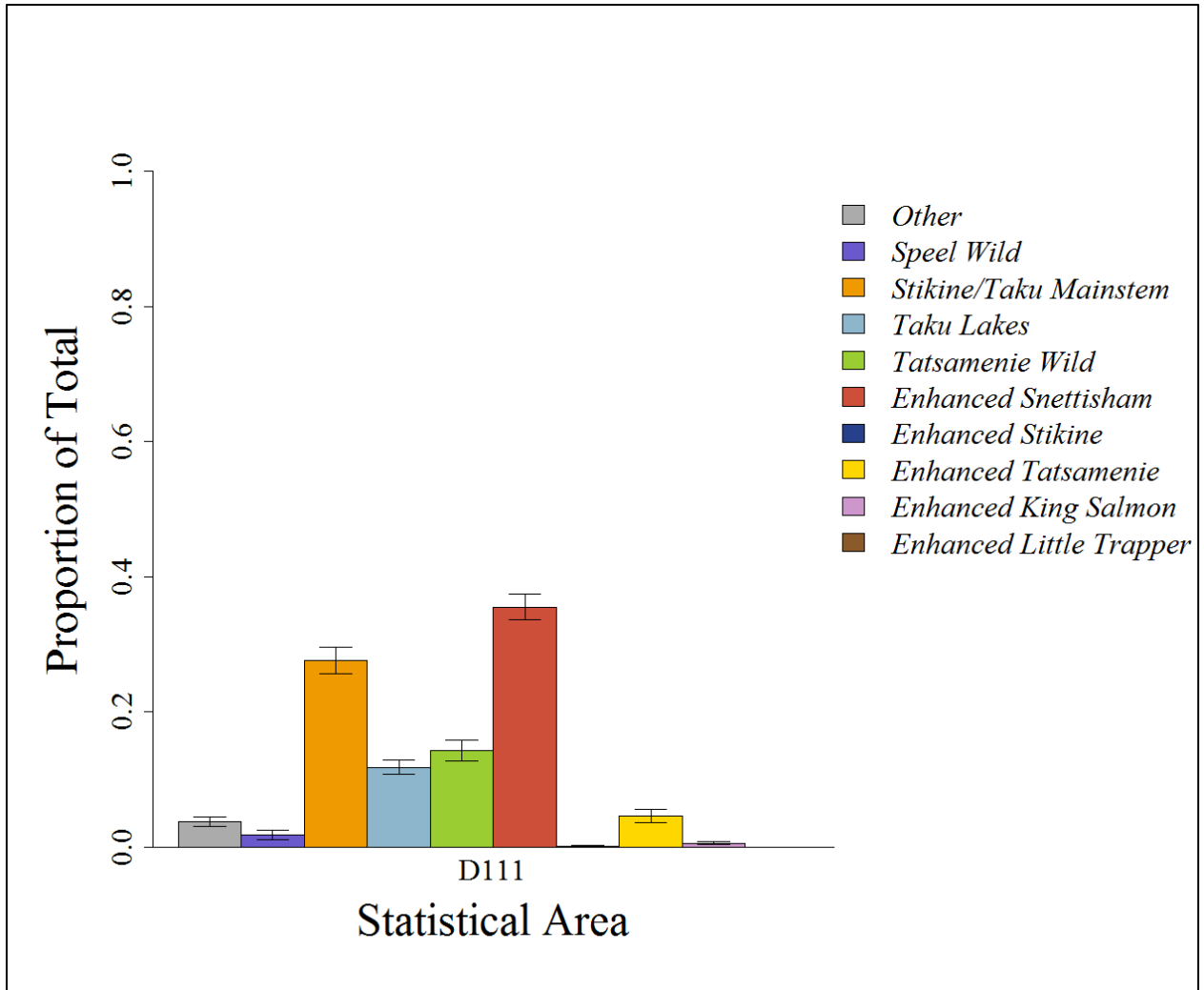


Figure 11. Total season stock composition estimates for Taku River area fisheries 2016. Estimates were weighted by harvest per stratum. Error bars are upper and lower bounds of 90% credibility intervals.

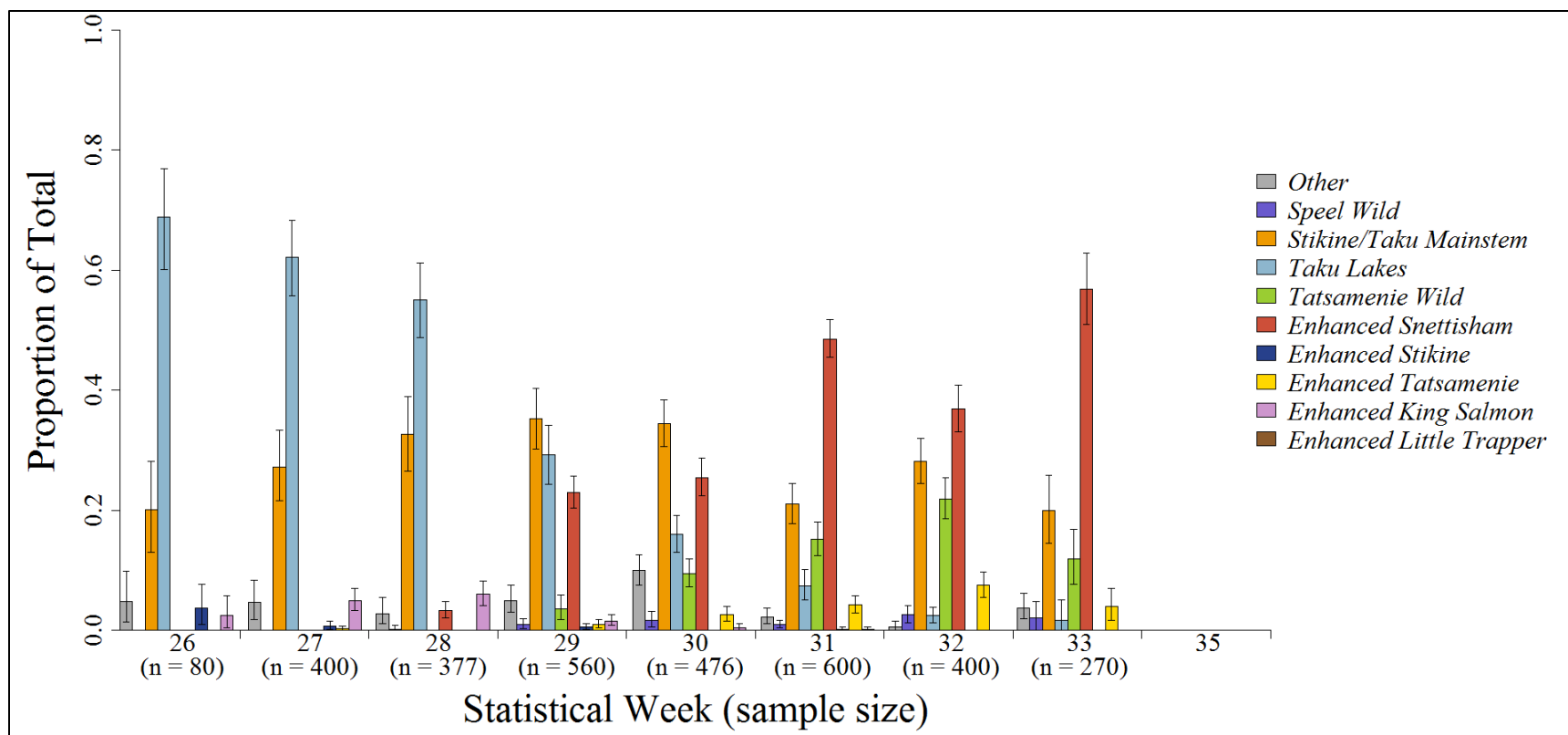


Figure 12. Stock composition estimates of sockeye salmon caught in the District 111 gillnet fishery in 2016. Sample size (n) includes genotyped, aged, and otolith-marked fish. Only samples from Subdistrict 111-32 were used in weeks 26, 27, and 32. Estimates in week 35 did not meet precision and accuracy goals identified by the TTC and thus are not reported. Error bars are upper and lower bounds of 90% credibility intervals.

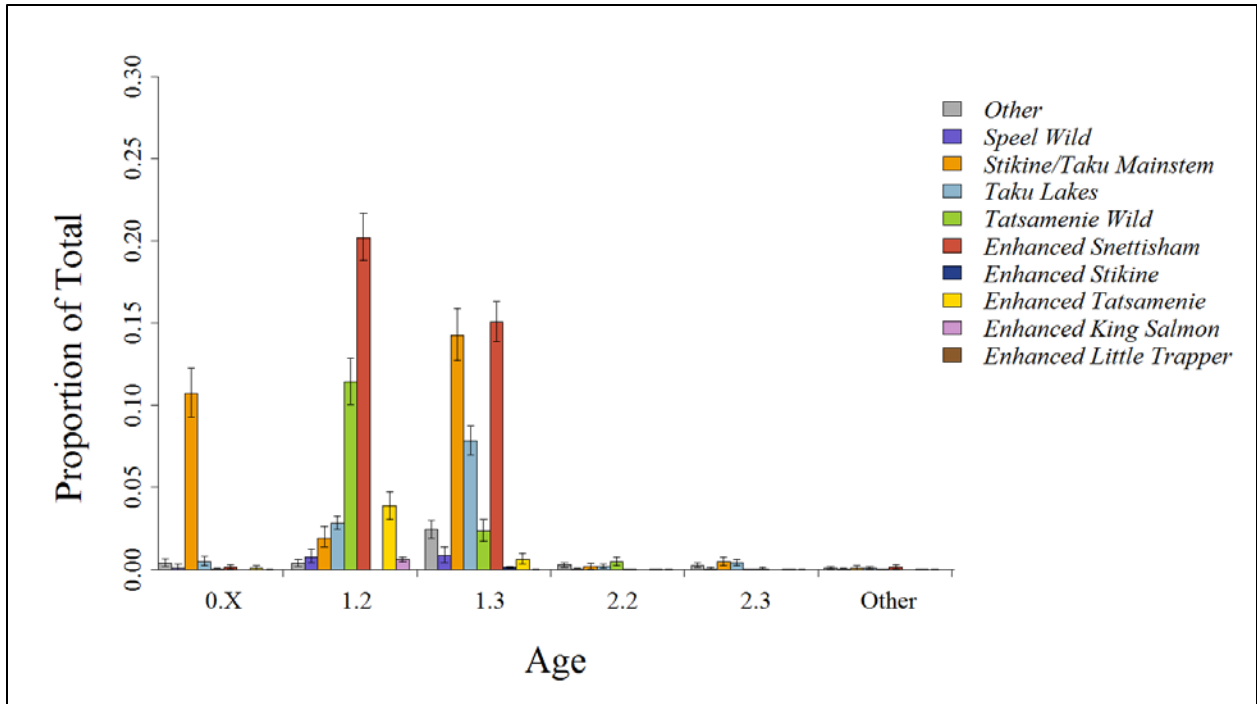


Figure 13. Total age composition of sockeye salmon caught in the District 111 gillnet fishery in 2016 over the entire season. Error bars are upper and lower bounds of 90% credibility intervals.

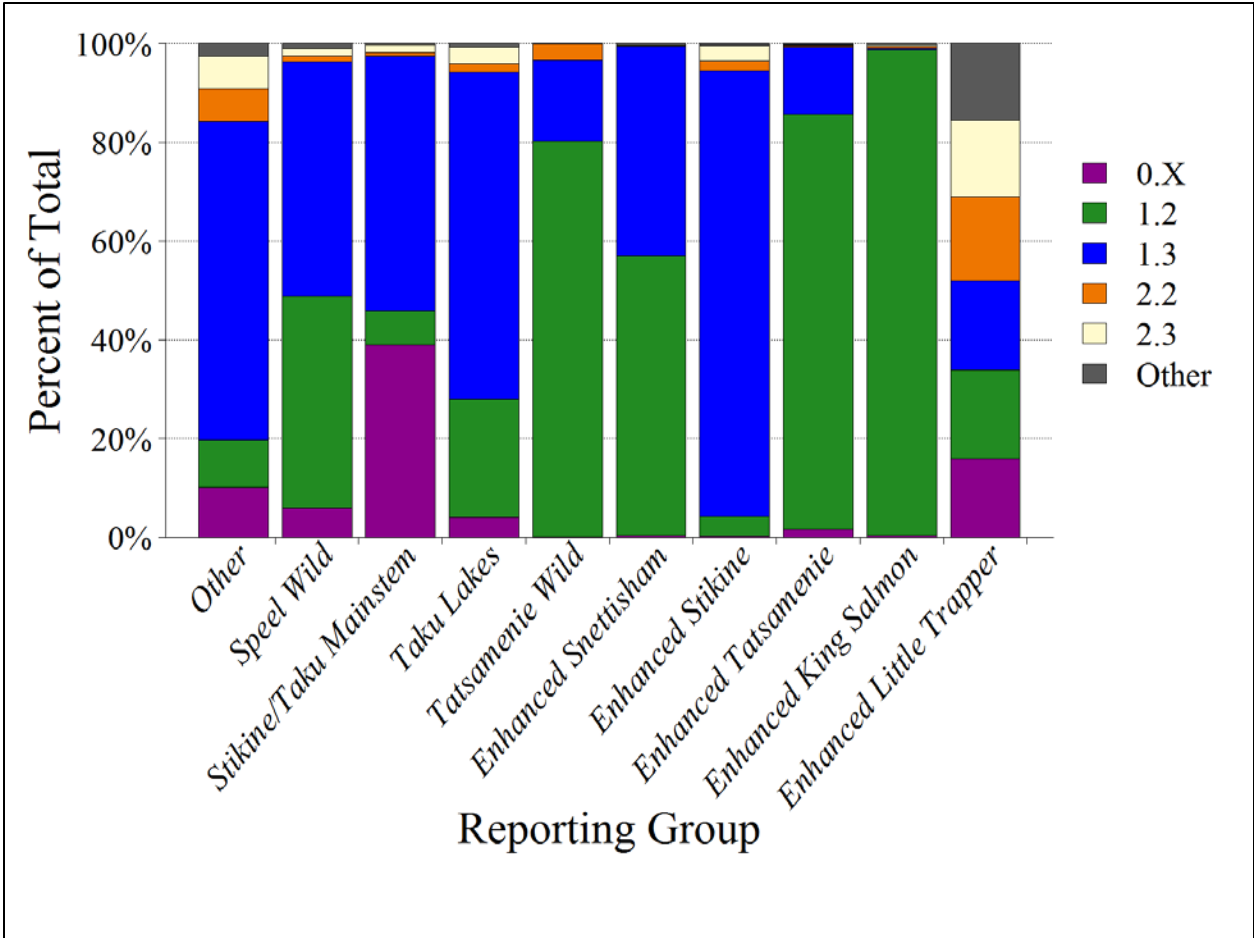


Figure 14. Age composition by reporting group of sockeye salmon caught in the District 111 gillnet fishery in 2016.