



2021 SALMON MONITORING REPORT

Report Compiled by Steve Terry: August 2021

INTRODUCTION

North Canterbury Fish & Game Council has been consistently monitoring sea-run Chinook salmon returns for 28 years. The South Islands East Coast salmon fishery has seen a steady decline over the last decade, with very low returns to all rivers in each of the last five years. Anglers have been looking to Fish & Game to restore the fishery and ensure harvest rates are managed at sustainable levels. In an effort to do this, North Canterbury & Central South Island Fish & Game councils have introduced a season bag limit restriction of two salmon per angler for the 2021/22 salmon fishing season.

Our headwater salmon spawning surveys showed a count for the Rakaia River of 741 and 363 for the Waimakariri River. This compares with 784 in the Rakaia and 545 in the Waimakariri in 2020.

Based on our angler harvest surveys, an estimate of the total salmon catch in each river was: Rakaia 434, Waimakariri 303, Hurunui 89 and Waiau 19. This compares with Rakaia 380, Waimakariri 567, Hurunui 233 and Waiau 89 in the 2019/20 angling season.

METHODS

Estimates of annual salmon returns consist of combining the number of salmon that reach their spawning streams, angler catch, and returns to hatchery facilities such as Silverstream and Fish & Game managed hatcheries, either current or historic.

a. Spawning Escapement

Historically from 1993 – 2012, Area Under the Curve (AUC) methodology was used to calculate spawning escapement in the Rakaia and Waimakariri rivers. Due to financial constraints, the period from 2013 – 2020 used the Peak Count method to calculate escapement. This year a helicopter was used to count each spawning stream four times in the Rakaia and Waimakariri catchments.

Observations over the last 20 years indicate that the salmon observed during the peak counts usually represents the majority of the spawning salmon. There are usually very few carcasses observed at this time (<10%). Calculations indicate that the historically reported AUC spawning numbers are likely to be around 1.5 x the number seen on the recent Peak Counts. Using this multiplier for calculating comparable spawning numbers in each stream, the graphed results look very similar to the historically reported results using the AUC model (Figure 3).

The accuracy of the reporting of salmon spawning escapement and harvest / catch estimates is affected by the methods used to interpret these counts, specifically the relationship between individual salmon aerial count data and the proportion of the run this represents, compared with angler catch. Salmon generally congregate in pools around the entrance to the spawning streams in reasonable numbers towards the end of March in the Rakaia, and end of April in the Waimakariri. Peak salmon spawning occurs late April to late May, and most runs taper off by mid-June when very few live salmon are left, although smaller runs of salmon may spawn as late as August.

Generally, the Rakaia salmon numbers reach their peak in the spawning streams at the beginning of May, the Hurunui and Waiau rivers the second week of May, and the Waimakariri River the third week of May. When only a single trend count was carried out (at peak spawning time), as much of the river was counted as possible to ensure any salmon waiting below the traditional spawning reaches were accounted for, as well as counting all carcasses. Historically during peak counts, very few dead salmon are usually observed, with 5 - 10% carcass to live fish considered to be the peak.

To calculate the annual total trend count for the Rakaia River, the peak count data from all streams in the catchment was added to the aerial observations by CSI staff for Mellish Stream and the total salmon returning to the Montrose and Whisky Creek hatcheries. To calculate the annual total trend count for the Waimakariri River, the peak aerial count data from all streams in the catchment was added to the total returns to Silverstream hatchery.

Due to financial constraints, the Hurunui and Waiau catchments were only counted once in 2021 around the peak of spawning, although a number of partial counts were carried out while collecting salmon DNA for the Winnemem Wintu research project, with very few salmon seen on these flights.

b. Angler Salmon Catch

Historically phone surveys (and more recently phone combined with email surveys), (Table 1) were carried out at the end of the salmon fishing season in conjunction with CSI and Otago Fish & Game, to determine the number of salmon that were caught from each river. This survey began in 1993 and now offers a long-term dataset of comparable results.

The survey now consists of an email sent to all full season licence holders in the three regions who had supplied an email address, with a follow-up email sent to non-respondents. The results from this email survey were treated as a separate harvest strata and were not included in the harvest extrapolation from further phone surveys.

Licence holders that harvested one or more salmon in the previous four seasons were classed as the top strata, and as many as possible were phoned. All strata were further broken down by licence type. Licence type was split into family and adult. The adult category includes adult whole season, loyal senior and local area licences. A number of anglers were then surveyed in the random strata.

The survey results were then analysed and the results extrapolated to include all licence holders in the three regions. An estimate of the total salmon catch in each river by NC, CSI and Otago licence holders was then calculated.

Table 1. Email & Phone Survey Respondents

Region	Licence Type	Category	Population total	Number surveyed	Percent surveyed
North Canterbury	Adult	Email respondent	1,617	1,617	100%
		Random	4,701	242	5%
		Previously successful	261	182	70%
	Family	Email respondent	779	779	100%
		Random	2,272	112	5%
		Previously successful	96	66	69%



RESULTS

a. Rakaia River Returns

See Appendix 1 for counts on each spawning stream, and Appendix 4 for total counts.

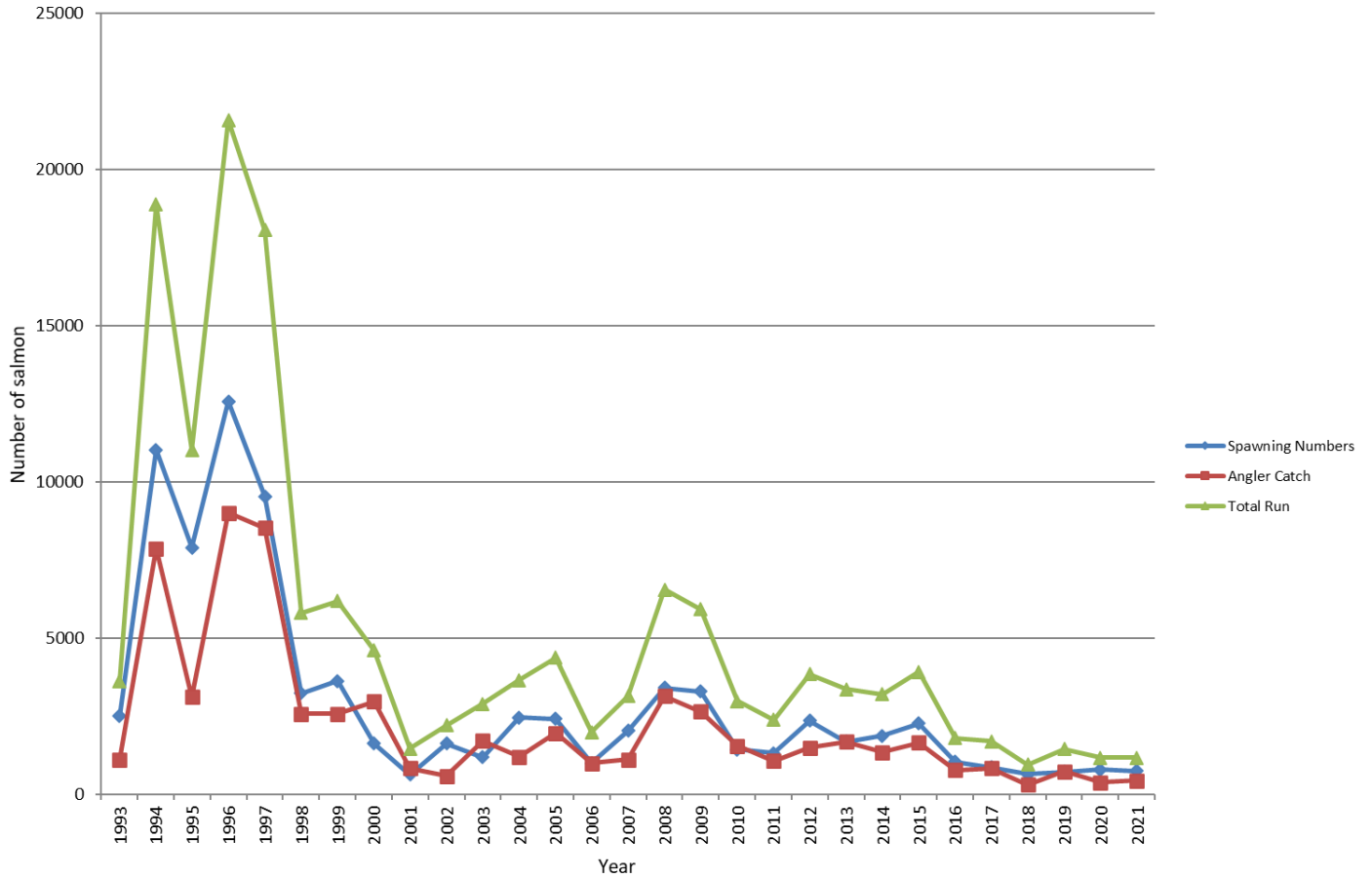


Figure 1 – Rakaia River salmon spawning escapement, angler catch and total run

b. Waimakariri River Returns

Most salmon anglers reported their lowest catches last seasons, with many seasoned anglers not catching any salmon, which combined with low spawning numbers, was some of the poorest runs on record for the Waimakariri River.

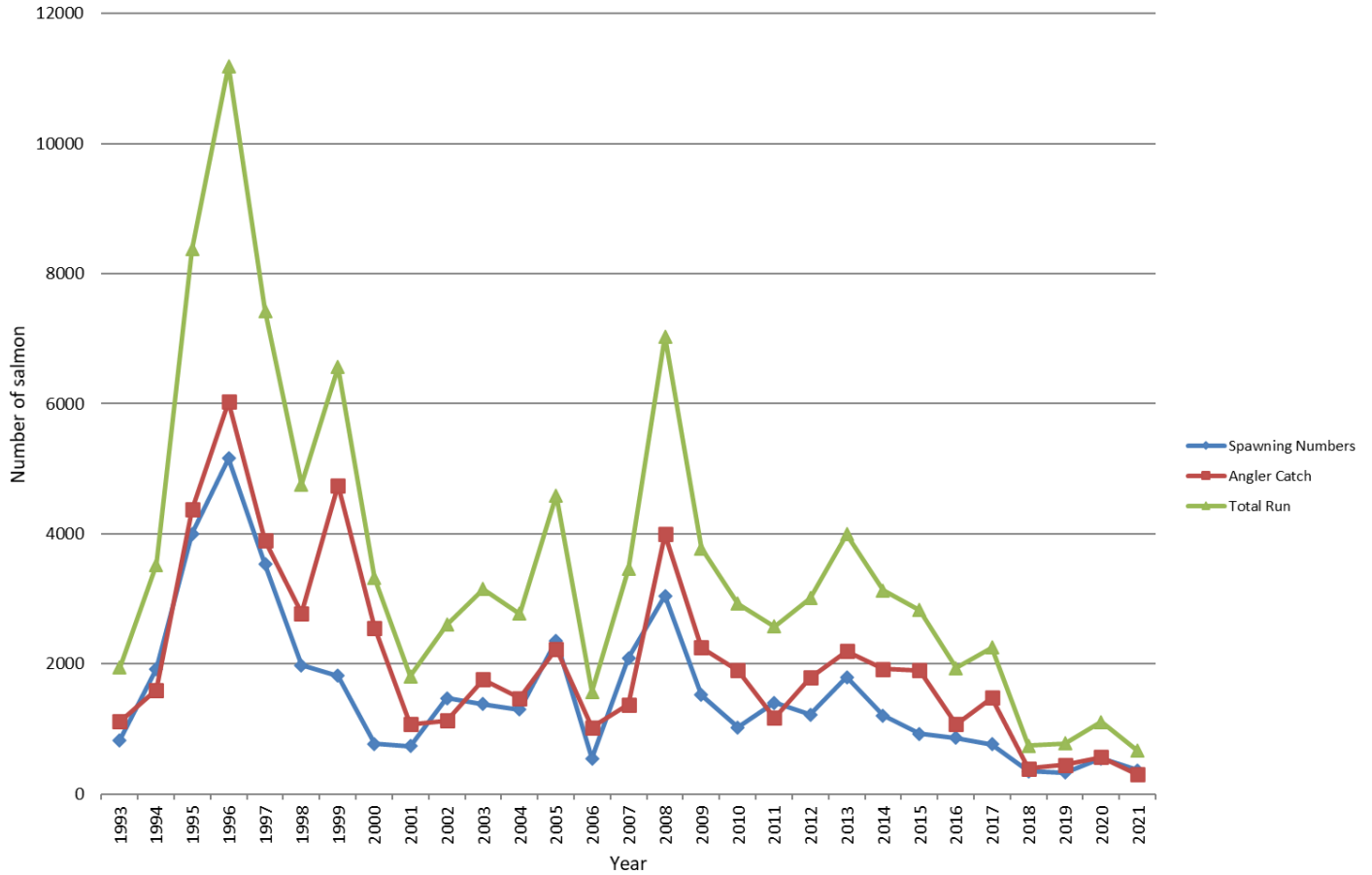


Figure 2 – Waimakariri River salmon spawning escapement, angler catch and total run

c. Peak Count vs Traditional AUC Methodology to Calculate Total Run

The graph below shows what percentage the peak count calculated total run is of the AUC total run for the Rakaia and Waimakariri rivers. This ranges from around 65% in the Rakaia to 90% in the Waimakariri, but is trending up as the peak count and angler harvest methodology is refined each year.

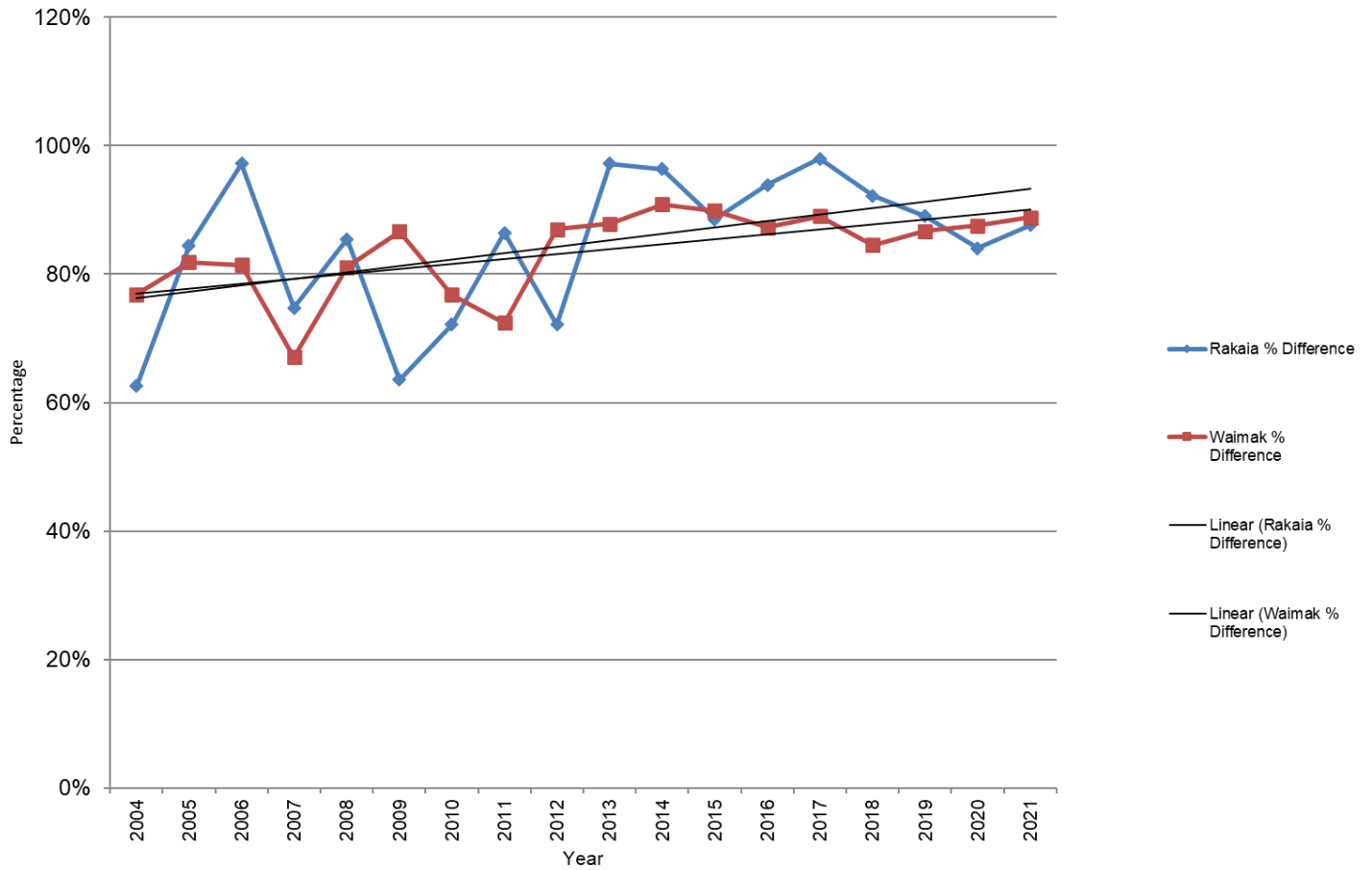


Figure 3 – Estimated percentage the peak count total run is of the AUC total run

d. Angler Catch in Canterbury Rivers

The Waimakariri had the lowest number of salmon caught since records began. Angler Larry Burke collected catch data from the McIntosh’s Rocks and Mouth areas in the lower Waimakariri River again this year, including fin-clipped salmon (see Appendix 5), however this data has not been compared with the phone harvest data. Table 2 below shows the breakdown of the harvest survey.

Table 2. Salmon harvested by NC anglers in 2021

	Total anglers			Successful anglers			Salmon caught			Fin-clipped caught		
		±			±			±			±	
Hurunui	499	±	139	64	±	55	89	±	84	20	±	37
Kaiapoi	302	±	99	30	±	37	42	±	38	13	±	5
Rakaia	1,207	±	183	204	±	63	434	±	229	86	±	80
Tentburn	5	±	2	3	±	-	5	±	-	-	±	-
Waiau	214	±	92	11	±	2	19	±	6	3	±	3
Waimakariri	1,883	±	233	191	±	67	261	±	69	55	±	8

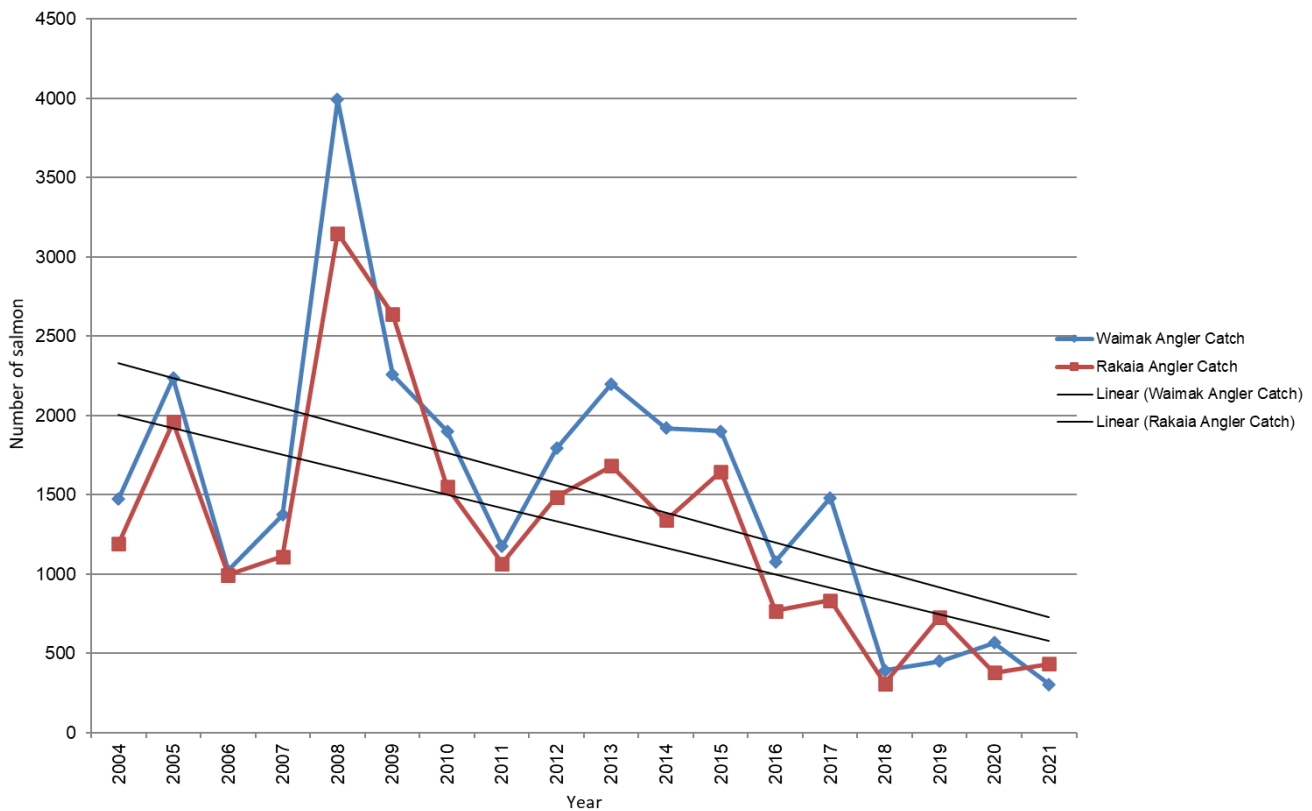


Figure 4 – Angler catch numbers in the Rakaia and Waimakariri rivers.

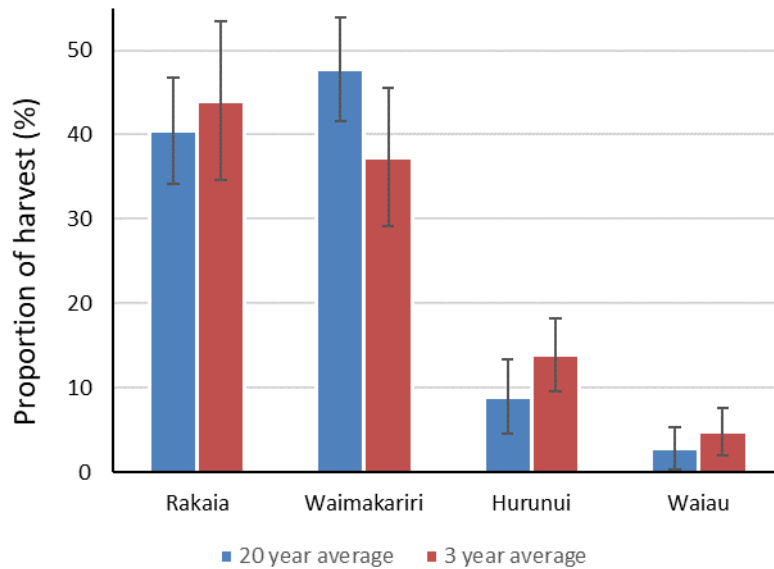


Figure 5 – Comparison of the average (mean) harvest distribution across North Canterbury salmon rivers in the last 20 years (blue) vs three years (red), showing that the Waiau and Hurunui rivers in recent years appear to support a growing portion of the regions total salmon harvest. Error bars on harvest estimates illustrate ± 1 SD.

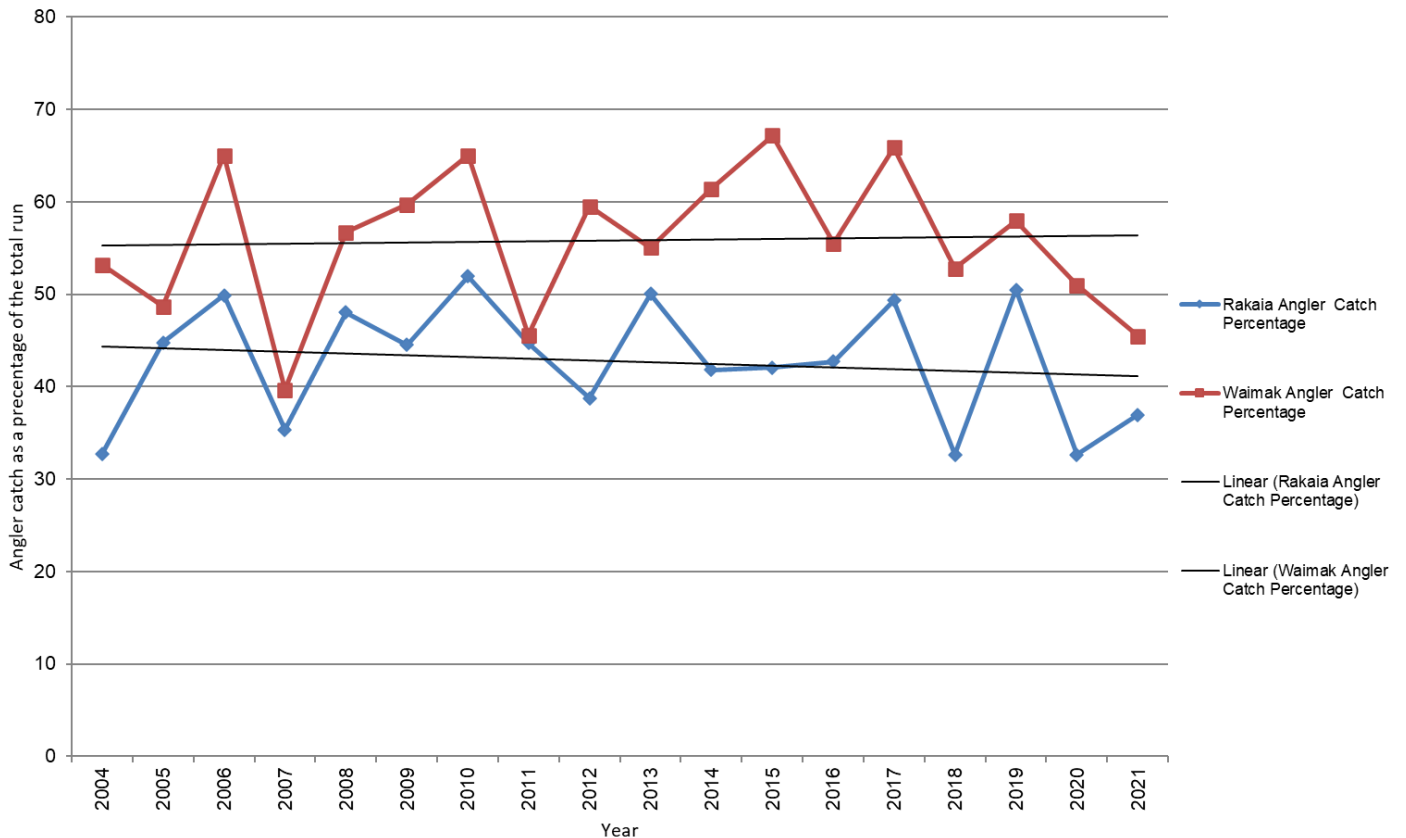


Figure 6 - Angler catch as a percentage of the total estimated salmon run in the Rakaia and Waimakariri rivers since 2004.

DISCUSSION

Preserving the pristine state of our spring fed streams and wetlands is critical to ensure ecological values of these areas are protected. These include variables such as ineffective but already consented fish screens and the long-term cumulative degradation of habitat and water quality. A gradual decline in instream and riparian habitat on some of the streams is likely to have reduced the spawning and rearing habitat quality. This is likely to have resulted in reduced spawning success (lower % of fry hatch / emergence survival). Reduced ecosystem health and food (invertebrate) abundance may also stimulate premature migration of many juvenile fry from the relative safety of these streams, into flood-prone mainstem river segments.

Staff regularly communicate with key landowners when gathering data, enabling long-term data sets to be collected for greater understanding of the issues. This helps ensure that local changes to land use can be discussed when required. The relationships that have been carefully developed with these landowners are critical to achieving changes in land management practice that we are increasingly realising will be required to improve and aid salmon recovery.

Introduction of a seasonal catch limit bag for the 2021/22 season is seen as the most useful tool Fish & Game have to manage salmon harvest sustainably and has been recommended by scientists as the least harmful regulation to further reduce harvest and rebuild spawning numbers. Moving towards an adaptive salmon management strategy and identifying minimum escapement targets at river or sub-catchment levels and implementing a model for setting harvest regulations aims to rebuild the fishery over the long-term. This requires a long-term commitment to quality monitoring. In addition to designing, funding and conducting robust total run size surveys, there is also a need to continue high quality salmon harvest monitoring between Fish & Game regions, similar to how the current national gamebird harvest survey is conducted.

ACKNOWLEDGEMENTS

The North Canterbury Fish & Game Council would like to thank the following people for their assistance with the 2020/21 salmon monitoring program:

Simon WerthMuller (Rakaia Helicopters), Bill Hayles (Alpine Springs Helicopters), Richard Hill (Flock Hill Station), Mark & Belinda Ensor (Glenariffe Station), Don & Julie Paterson (Manuka Point Station), James & Jane Smiley (Mt. Algidus Station), Paul & Belinda Ensor (Glenaan Station), Tim & Anna Hutchinson (Double Hill Station), Silverstream Hatchery staff, Jayde Couper, Mark Webb & Hamish Stevens (CSIF&G), Larry Burke and Kevin Belcher (Lower Waimakariri River salmon catch records).

APPENDIX

A 1:1 Aerial Count Dates

RT	Hydra	Manuka	Double	Glenariffe	Goat/Wilber	Winding	Cass	One Tree	Cora Lynn	Poulter	Turk/Rail/Bea	Waiau	Hurunui
8/04/2021	23	73	23	12	23	85	Not Flown	24	24	24	24	23	23
21/04/2021	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	27
28/04/2021	55	83	12	55	Not Flown	Not Flown	16	6	17	Not Flown	Not Flown	Not Flown	27
3/05/2021	54	75	6	28	4	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown
7/05/2021	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	25
10/05/2021	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	0	3	10	15	32	Not Flown	Not Flown
13/05/2021	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	30	Not Flown	Not Flown
14/05/2021	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	25
21/05/2021	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	9	Not Flown	Not Flown
25/05/2021	41	60	11	20	8	8	32	6	26	Not Flown	8	25	Not Flown
26/05/2021	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	30	Not Flown	Not Flown	4
1/07/2021	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	Not Flown	11	19	22	33	3	Not Flown	Not Flown

A 1:2 Reported trap counts

The Salmon Smolt NZ Silverstream hatchery manager reported that 47 salmon had been counted through the trap.

The Montrose Estate farm manager reported he estimated that between 25 and 35 salmon had entered/spawned in Montrose Stream, with 30 the figure recorded.

A 1:3 Spawning Stream Counts, Angler Catch, Total Run

Rakaia Tributaries											Rakaia	
	Hydra Waters	Manuka Pt	Double Hill	Glenariffe	Mellish, Goat	Montrose, Bully	Nat Spawning	Spawning	Angler	Total	Angler	
	RT=23	RT=23	RT=23	RT=23	Wilberforce Strm	Whisky Traps	(Exc. Montrose)	Numbers	Catch	Run	Catch %	
1993	710	152	427	713	504		2506	2506	1116	3622	31	
1994	2565	339	1511	4497	2110		11022	11022	7861	18883	42	
1995	2353	280	718	3026	1524		7901	7901	3120	11021	28	
1996	2968	589	1204	5442	2371		12574	12574	9008	21582	42	
1997	1912	701	1456	3630	1838		9537	9537	8531	18068	47	
1998	994	157	520	912	652		3235	3235	2567	5802	44	
1999	963	219	229	1528	684		3623	3623	2567	6190	41	
2000	518	127	367	271	342		1625	1625	2975	4600	65	
2001	303	31	62	100	133		629	629	829	1458	57	
2002	881	140	156	93	354		1624	1624	585	2209	26	
2003	430	143	172	89	229	120	1063	1183	1714	2897	59	
2004	929	216	184	522	498	110	2349	2459	1195	3654	33	
2005	572	210	186	261	334	850	1563	2413	1958	4371	45	
2006	228	63	80	118	400	110	889	999	994	1993	50	
2007	938	208	147	469	90	180	1852	2032	1110	3142	35	
2008	956	719	281	652	550	250	3158	3408	3149	6557	48	
2009	875	448	393	771	350	450	2837	3287	2639	5926	45	
2010	317	274	175	405	150	112	1321	1433	1550	2983	52	
2011	404	109	59	139	350	257	1061	1318	1066	2384	45	
2012	509	550	78	505	500	210	2142	2352	1488	3840	39	
2013	516	198	98	234	384	250	1430	1680	1683	3363	50	
2014	183	533	111	198	341	500	1366	1866	1341	3207	42	
2015	503	602	173	599	263	130	2140	2270	1647	3917	42	
2016	153	368	101	165	228	17	1015	1032	769	1801	43	
2017	288	227	30	47	245	20	837	857	834	1691	49	
2018	185	122	32	81	117	101	537	638	309	947	33	
2019	183	155	48	83	150	96	619	715	729	1444	50	
2020	272	119	57	108	178	50	734	784	380	1164	33	
2021	156	203	29	130	193	30	711	741	434	1175	37	

Waimakariri Tributaries											
	Poulter RT=24	Winding Crk RT=24	Cass Hill RT=24	Cora Lynn RT=24	Bealey/Rail/Turk One Tree Swamp	Silverstream TrapCensus	Nat.Spawning excl.Silverstrm	Spawning Numbers	Angler Catch	Total Run	Angler Catch %
1993	266	210	148	129	75		828	828	1116	1944	57
1994	318	151	305	198	96	855	1068	1923	1597	3520	45
1995	1072	649	569	234	247	1230	2771	4001	4372	8373	52
1996	1364	1501	727	353	397	818	4342	5160	6033	11193	54
1997	635	529	948	342	248	830	2702	3532	3893	7425	52
1998	442	268	584	271	157	260	1722	1982	2778	4760	58
1999	519	268	210	201	117	500	1315	1815	4748	6563	72
2000	145	55	129	55	38	347	422	769	2553	3322	77
2001	55	18	81	19	17	547	190	737	1075	1812	59
2002	768	201	103	48	103	250	1223	1473	1128	2601	43
2003	362	117	238	Not Counted^	68	600	785	1385	1764	3149	56
2004	425	179	175	217	96	205	1092	1297	1475	2772	53
2005	989	442	223	265	138	300	2057	2357	2234	4591	49
2006	83	56	91	70	80	170	380	550	1022	1572	65
2007	508	278	370	549	110	275	1815	2090	1373	3463	40
2008	1296	284	268	517	320	360	2685	3045	3991	7036	57
2009	548	115	204	194	100	360	1161	1521	2256	3777	60
2010	353	179	302	89	40	60	963	1023	1902	2925	65
2011	485	223	196	374	65	60	1343	1403	1175	2578	46
2012	391	191	103	224	70	240	979	1219	1793	3012	60
2013	723	140	162	408	24	340	1457	1797	2199	3996	55
2014	362	173	129	108	86	350	858	1208	1921	3129	61
2015	495	77	83	126	78	70	859	929	1902	2831	67
2016	386	41	107	86	123	120	743	863	1077	1940	56
2017	405	35	107	93	101	27	741	768	1482	2250	66
2018	171	48	51	45	29	8	344	352	394	746	53
2019	104	32	72	51	53	16	312	328	452	780	58
2020	222	17	62	93	62	89	456	545	567	1112	51
2021	99	12	70	81	54	47	316	363	303	666	45

A 1:4 Salmon harvest records reported to North Canterbury Fish and Game

Please note that while external harvest reports provide a useful indication of localised harvest numbers, they are not a harvest census count nor a quantitative estimate. Therefore, while helpful, these reports are neither compatible nor comparable to the Fish & Game email / phone survey. The Fish & Game harvest survey provides a statistically robust quantitative harvest estimate based on an extensive survey of licence holders across several Fish & Game regions.

New Zealand Salmon Anglers Association harvest report

The salmon community from the Mackintosh's area of the Waimakariri River annually conduct a survey of salmon caught and keep records of the number of 'Finned Clipped' fish, to the best endeavour of accuracy.

The catch figures are as follows:

Total =162 landed, 61 were fin-clipped.

Larry Burke
NZSAA