2017/18 Central South Island Sea-run Salmon Returns–Season Summary (M Webb)

Annual review of salmon spawning effort for each salmon river in the Region has historically relied on ground survey of salmon redds as an index of spawner abundance and more latterly the additional use of repeat aerial counts of spawning salmon as a more direct measure of salmon abundance. The sum of estimated spawners and angler catch provides an estimate of the total run of salmon returning to fresh water for the season.

Between 1993/94 and 2015/16 annual catch of salmon by adult CSI whole season licensed anglers was obtained from end-of-season telephone interview of approximately 10% of whole season adult and family licensed anglers or about 1,200 phone calls. Since 2016/17 additional use has been made of licence holder email addresses to obtain responses from up to 1,800 anglers. The addition of the email survey at no cost has enabled reduction in the number of anglers that need to be interviewed by telephone and a reduction in overall survey costs. Typically harvest estimates for our larger fisheries now have improved 95% confidence limits that are +/- 25% of the estimate while smaller fisheries may be +/- 50%. The greater difficulty in contacting sufficient numbers of anglers who have fished the smaller rivers increases the variability of the results and reduces the confidence of our estimates.

The spawning component of the run is assessed by two methods in the CSI Region. Salmon redd (nest) counts continue in the Ashburton River system, tributaries of the Rangitata, and the Orari, Opihi, Tengawai, Waihi-Temuka, Waitaki and Hakataramea rivers. Some of these counts are completed by volunteers. These counts provide a valuable and continuing long-term record used as an index of spawning population size. Spawning estimates based on redd counts in the Ashburton, Orari, Opihi and Hakataramea catchments can be considered to underestimate total spawning effort.

The second method used to assess salmon spawning requires multiple counts of live salmon present in spawning tributaries of the Rangitata River at fortnightly intervals from March to June. An estimate of Waitaki River spawners was able to be made by this method until about 1999 when the Hakataramea River run began to be impacted by low flows. In recent years lower Waitaki River spawning has been assessed by aerial redd count as part of a joint project with Meridian Energy Limited.

The following summary for each salmon fishery in the CSI Region presents spawning counts and angler harvest estimates up to the end of the 2017/18 season and highlights trends where apparent. An overall, regional summary is also provided.

Ashburton River

An estimated 6 salmon were caught by anglers all of which were caught in the lower river. None were reported as being fin-clipped indicating it was unlikely any salmon of hatchery-origin entered the river. Since annual angler harvest surveys began in 1993, six seasons have produced similarly low angler success and three of these have been in the last four seasons (Figure 1).

Good river flows were present in the Ashburton throughout the season. Through November and December, the river was running at between 10 m^3/s and 25 m^3/s and from January to the end of March five floods of over 100m^3/s and numerous smaller freshes maintained an open river mouth for all but 19 days of the fishing season. This is the lowest incidence of mouth closure in the last 7 years. Across the 14 years for which we have reliable river mouth closure records, on average the mouth has closed 36 days per season and 60% of those days have been in January and February. There does not appear to be any relationship between angler catch and river mouth closure in seasons with up to 70 days closed out of 121 days.

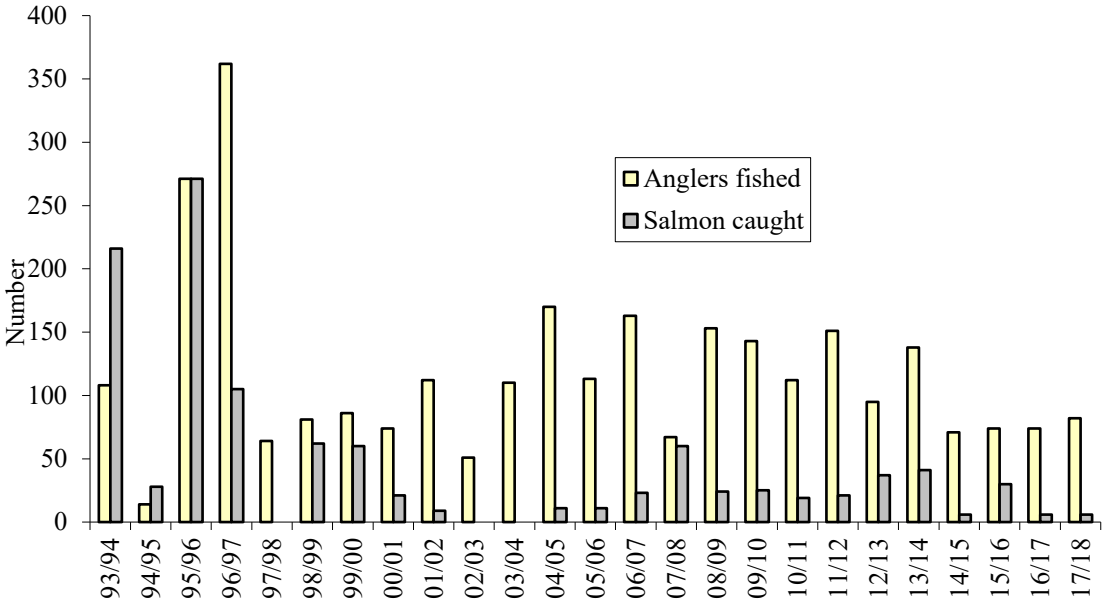

Figure 1. Number of anglers fishing and salmon taken from the Ashburton River estimated from end of season random survey, for October to April seasons from1993 to 2006 and for October to March seasons from 2006/07 onwards.

When river conditions allow, up to nine sections of the Ashburton River and tributaries are surveyed in June and July as indicators of relative salmon spawning population size. Across the catchment Bowyers Stream and Maori Lakes Outlet produce the most consistently surveyed salmon spawning record (Figure 2).

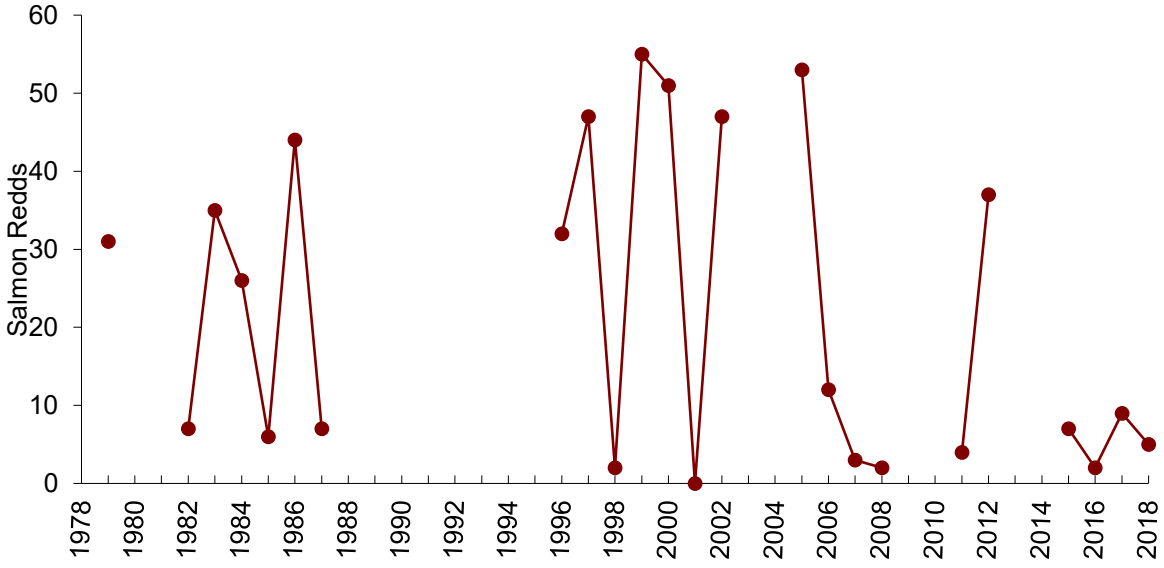

Figure 2. Annual salmon redd counts for Bowyers Stream and Maori Lakes Outlet in the Ashburton Catchment, 1979 to 2018.

Since at least the early 1980's salmon spawning in Bowyers and Maori Lakes Outlet has been extremely variable with lows of less than 10 redds often preceded or followed the next year by counts exceeding 40. While the last four years counts have been low they have not been beyond historical lows back to at least the early 1980's. What is of concern is the consistency of the current lows.

In December 2011 Maori Lakes Outlet received 25,000 McKinnon's hatchery-origin juvenile salmon. This was followed by 5,000 in December 2013 and 20,000 in December 2014. There is little in the angler catch or spawning record to indicate these releases have generated significant adult salmon returns.

Rangitata River

Salmon spawning surveys by redd count were first completed on Deep Stream and Deep Creek in the upper Rangitata in 1957 and continue today. Redd counts have been extended to other known spawning sites and indicate that about 93% of all known spawning in the Catchment occurs in Deep Stream and Deep Creek. Live salmon counts this season estimated that 274 fish spawned in Deep Stream (Mesopotamia) and 259 in Deep Creek (Mt Potts) for a catchment estimate of 573 salmon (Figure 3). Across the 26 years that live spawners have been counted on these two streams, this year's count is the third lowest and levels experienced in the last two years are comparable with those from 2000 to 2002.

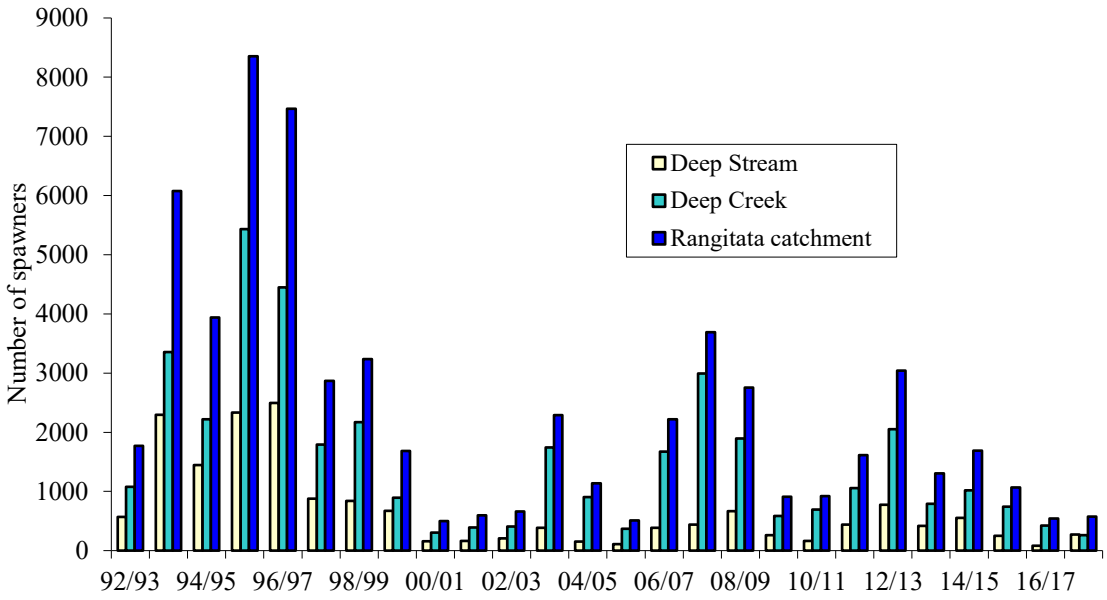

Figure 3. Estimated annual number of salmon spawning in Deep Stream, Deep Creek and total for the Rangitata Catchment.

A notable positive in this year's spawning is the relatively high use of Deep Stream compared to Deep Creek. This is the first year in our 26-year record of live spawning counts that Deep Stream has exceeded Deep Creek. It was the aim of our Deep Stream habitat enhancement programme introduced in 2010 to address the decline in spawning habitat quality in this stream. In the last four years Deep Stream has increased its average share of spawning to greater than 30% where it was less than 20% in the previous ten years. While it cannot yet be confirmed if the habitat project has contributed to this it is almost certain that the improved distribution of spawning in Deep

Stream is a result of willow removal immediately enhancing spawning habitat through reduced water depth, increasing water velocity and flushing of silted streambed. Conversely the apparent increase in Deep Stream's share of headwater spawning may not reflect a real improvement in Deep Stream and may instead reflect a decline in use of Deep Creek.

In 2009, 140 spawned-out salmon from Deep Stream and Deep Creek were examined for a fin clip and two fish (1.42%) were believed to be of hatchery-origin. In 2012 assessment of the origin of 38 spawned out salmon from Deep Stream and Deep Creek by visual check for fin clip and further analysis by scale reading did not identify the presence of any hatchery-origin salmon on these spawning grounds. In 2018, 18 salmon were examined for fin clips during spawning surveys on Deep Stream and Deep Creek and during the Winnemem Wintu June to September weekly surveys of Deep Creek. None of these fish were identified to be of hatchery-origin. These results suggest that since 2008/09 when McKinnon's Hatchery-origin salmon first returned as adults, straying of hatchery fish into the headwaters of the Rangitata has been very minor with hatchery fish contributing between 1.42% and 0% of spawning in the wild.

Aerial spawning surveys estimated a total catchment spawning population of 573 salmon all of which were likely to have been of wild origin. No wild fish strayed into McKinnons Creek. The estimated total of wild salmon that were not caught by anglers was 573.

Angler success in the Rangitata was poor with an estimated 647 anglers fishing for salmon and about 159 salmon caught (Figure 4). The last three seasons catches have been comparable with those of 2000 to 2005. This season approximately 12% of anglers who fished for salmon on the Rangitata caught fish and the average catch for successful anglers was two fish each. Less than 1% of anglers caught five or more salmon and 60% of all salmon were landed below SH1.

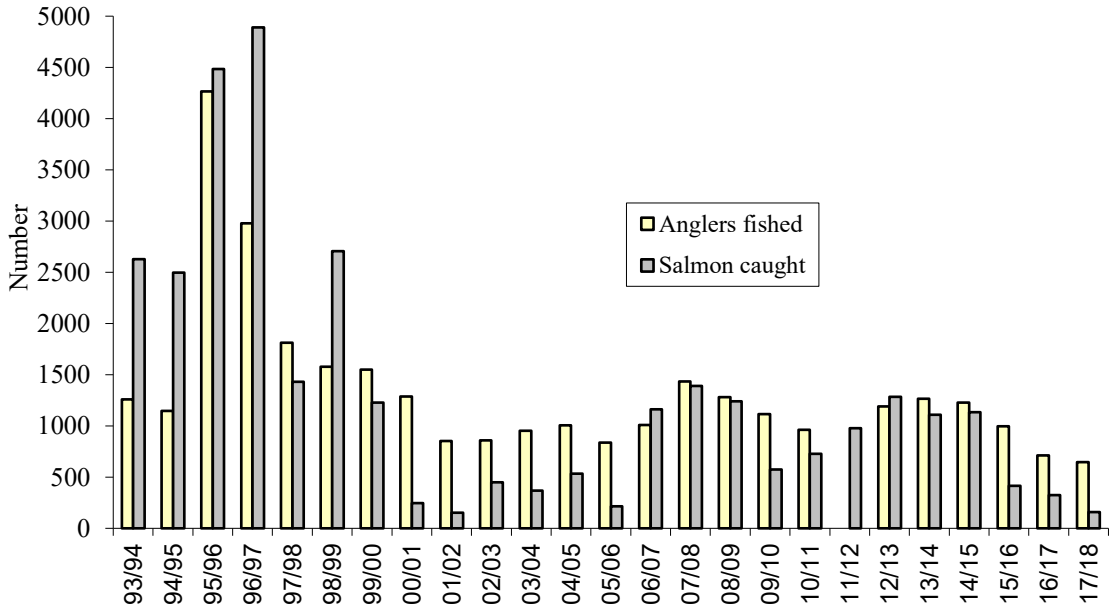

Figure 4. Number of anglers fishing and salmon taken from the Rangitata River, for October to April seasons from1993 to 2006 and for October to March seasons from 2006/07 onwards.

Fin-clipped salmon accounted for 14 of the 159 salmon estimated to have been caught. None were likely to have been two or four-year-old fish and 60% of three-year-old fish were fin-clipped at release. It is calculated that approximately 23 (15%) of the 159 salmon caught by Rangitata anglers were of hatchery-origin. It is estimated 80% of the hatchery-origin salmon were caught at

the river mouth where they made up about a quarter of the catch. No fin-clipped salmon were reported to have been caught higher up the river than the poles about 1km above the coast. There were anecdotal reports of fin-clipped salmon being caught around the mouth of McKinnon's Creek, 3km above the coast, but none of these catches were reported during the harvest surveys.

In summary of the hatchery-origin fish influence on the returning adult run, approximately 23 hatchery-origin salmon were caught by anglers, none were considered to have spawned in the wild and none returned to the McKinnons Hatchery trap. A total of 23 hatchery-origin fish returned to the Rangitata and the total wild fish run was estimated at 709 fish of which 136 were caught by anglers (Figure 5).

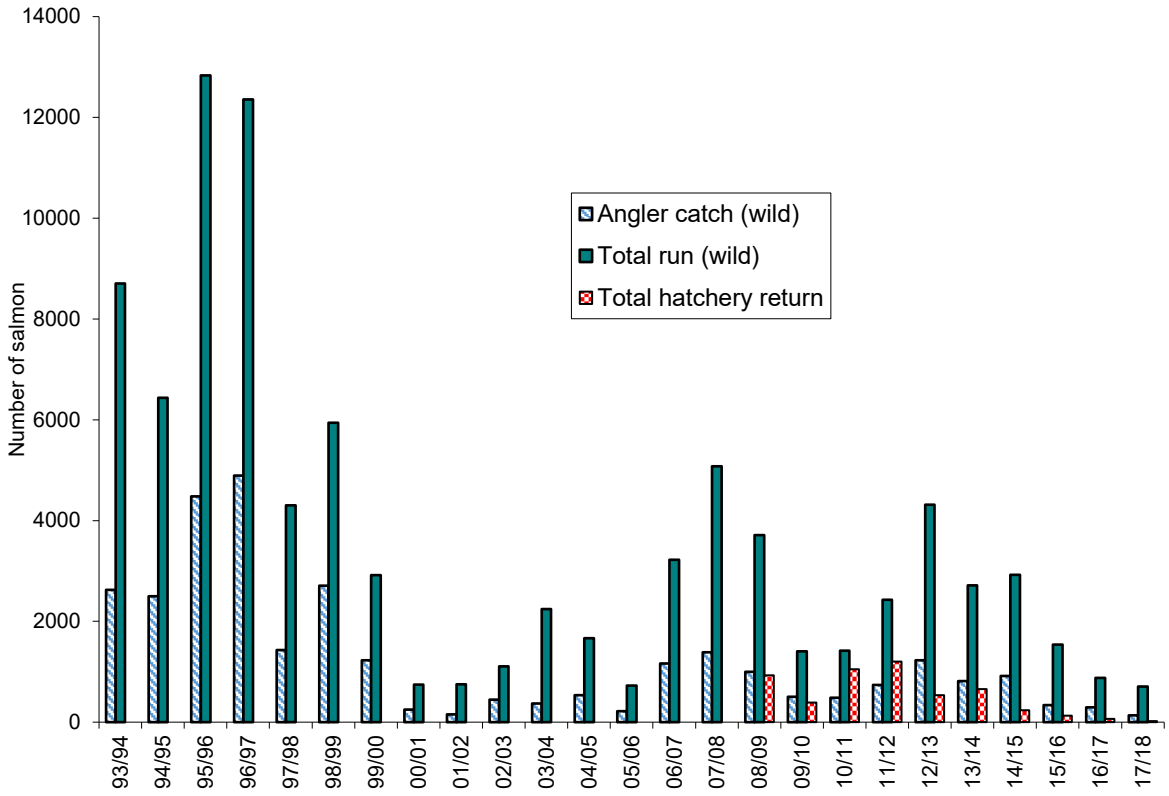

Figure 5. Annual salmon runs for the Rangitata River and component caught by anglers 1993 to 2018 and contribution of hatchery returns 2008 to 2018.

In the 2017/18 season anglers harvested approximately 19% of wild salmon returning to the Rangitata. Over the last ten seasons wild harvest has averaged 29% with annual harvest rates ranging from 19% to 36%. Over the same period an additional 20 to 300 hatchery-origin fish have been taken averaging 140 fish per season or an additional 22% bonus to the angler on top of wild fish

Orari River

The salmon fishery of the Orari has plummeted since the record high run of the 2013/14 season when 600 salmon were caught and a further 500 spawned. Approximately 160 anglers fished the river at some time during the 2017/18 season for catch of 16 salmon. This is far from the worst season – no salmon were caught at all in five seasons between 2000 and 2008 (Figure 6).

While no fin-clipped hatchery-origin salmon were reported this season, in the ten years that McKinnons Hatchery salmon have strayed to the Orari on their return as adults, they have

sustained an average of 35% of the angler catch. Similarly, a random sample of 80 spawned out salmon carcases from the upper South Branch in 2014 found 35% to be fin-clipped and were therefore McKinnons hatchery-origin fish released at one year of age into McKinnons Creek that strayed to the Orari on their return. The absence of fin-clipped fish in the angler catch in 2017/18 suggests the contribution to Orari spawning from hatchery-origin fish was also zero.

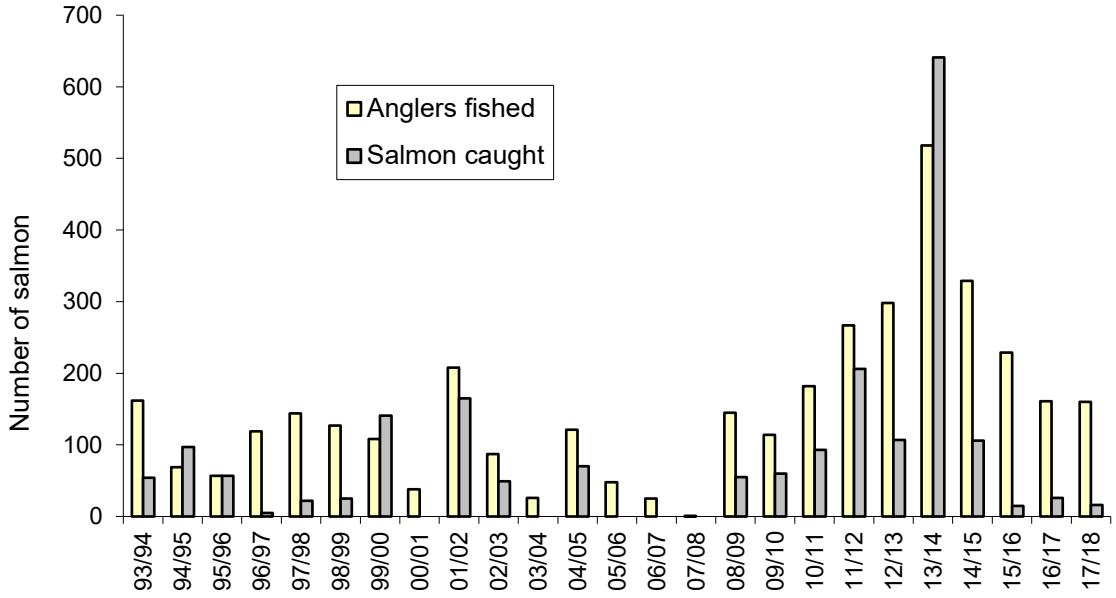

Figure 6. Number of anglers fishing and salmon taken from the Orari River, for October to April seasons from1993 to 2006 and for October to March seasons from 2006/07 onwards.

Salmon redd counts estimated a spawning population likely to number about 30 and similar in size to the previous two seasons. Overall run size for 2017/18 was likely to have been between 50 and 100 fish which is similar to the two previous years and the median run size since 2000 would be approximately 200 fish.

In addition to straying of returning hatchery-origin adults that were fin-clipped as juveniles, there have been releases of fully finned hatchery-origin juvenile salmon directly into the Orari Catchment. The first release of McKinnon's origin fry into the north branch of the Ohapi was of 3,000 juveniles from the 2010 brood year released in March 2011. These fish could have made an appearance in angler catch as three-year olds (almost four) in the 2012/13 season. From the 2011 brood year 21,000 McKinnon's origin fish were released into the north, south and middle branches of the Ohapi in December 2011 and could have contributed to the 2013/14 season angler catch as three-year olds. From the 2013 brood year 7,000 McKinnons origin fingerlings were released into each of the Middle and North branches of the Ohapi in late 2013. No hatchery releases were made after 2013 and adult returns from earlier releases would have ceased by 2016/17. Hatchery releases directly to the Ohapi are not fin-clipped so there is no simple means to estimate the success of these releases.

Opihi River

During the 2017/18 season approximately 250 anglers fished the Opihi for salmon and landed 33 (Figure 7). In the previous 21 years annually, an average of 500 anglers would fish the river and catch an average of 415 fish (range 28 to 1,370). In the last four seasons catch has not exceeded

40 fish and angler use has halved. Prior to 2014 the Opihi was the most consistent performer of all our salmon fisheries back to 1993 when current harvest surveys started.

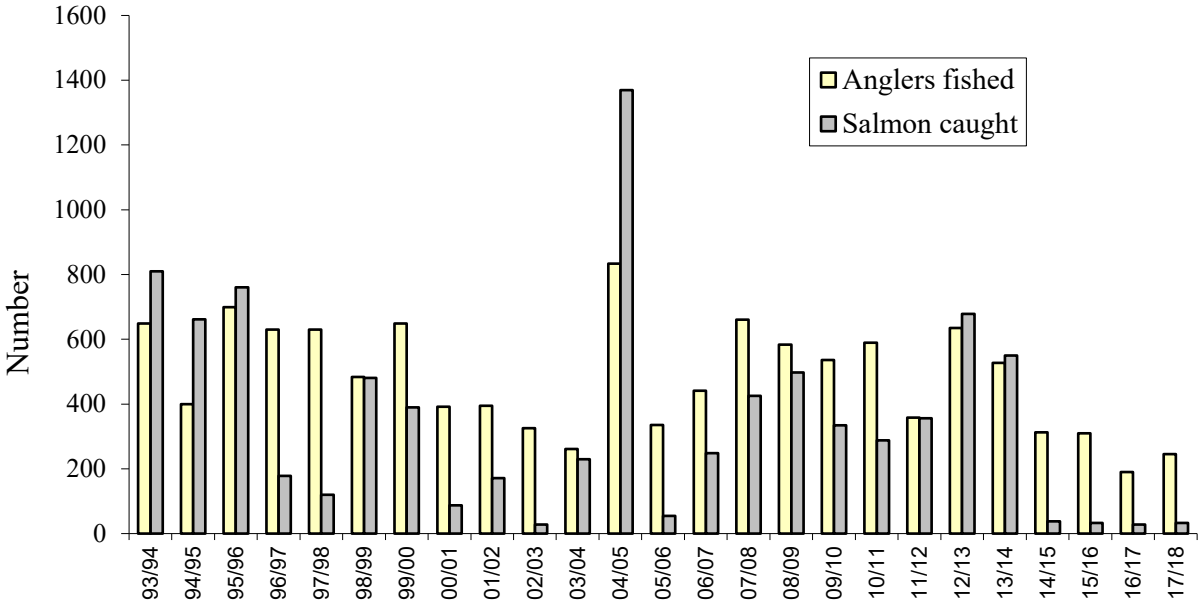

Figure 7. Number of anglers fishing and salmon taken from the Opihi River, for October to April seasons from1993 to 2006 and for October to March seasons from 2006/07 onwards.

Ground-based spawning surveys were undertaken from June in most of the high use salmon spawning reaches of the Opihi and its tributaries (Figure 8). Estimated Opihi catchment spawning was 33 redds corresponding to a spawning population of about 100 salmon. Added to angler catch this indicates a 2017/18 salmon run of about 130 salmon and is consistent with the 100 to 200 salmon estimated for the three previous seasons.

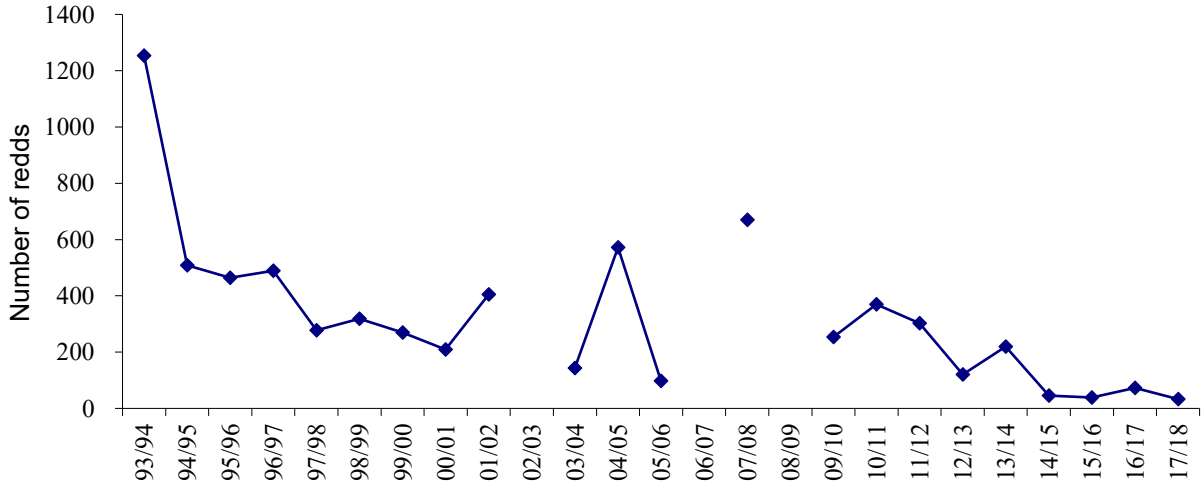

Figure 8. Estimated Opihi catchment salmon spawning from survey of representative reaches from 1993 to 2018.

In the last four seasons, spawning and angler catch components of the Opihi run have been consistent and low. Factors that may have contributed to this include –

i. The 14/15 and 15/16 seasons had periods when the Opihi River mouth was blocked for up to four weeks at a time. However, pre Opuha Dam (1998), there were years

when the mouth was blocked during the fishing season for more than 100 days and salmon runs continued at higher levels than present.

ii. From 2009 to 2014 floods in April and May occurred in five of the six years. These would have had a negative impact on salmon productivity in the Opihi mainstem and lower river tributaries. In those years the Opuha Dam protected the Opuha River from extensive flooding and the Opuha River accounted for two-thirds of all spawning. So, while there was significant flooding in the catchment, higher survival for juvenile salmon from the Opuha should have compensated.

iii. Straying McKinnon's origin fin-clipped salmon were identified as being caught in the Opihi in 2017/18 from our end of season surveys. In the three previous seasons 8 to 12 were caught and between 2008/09 and 2013/14 McKinnon's hatchery-origin salmon contributed 100 to 200 salmon to the Opihi angler each year.

In addition to straying of juvenile fin-clipped salmon released from McKinnons hatchery and returning to the Opihi as adults, there have been direct releases of McKinnons origin juvenile salmon and eyed ova into the Opihi at or near Three Springs Stream above Fairlie as follows –

2011 - 15,000, 2010 brood year fish released in March 2011 the majority of which would have returned at almost three years of age in the 2012/13 season.

2011 - 30,000, 2011 brood year fry released in December 2011 that may have returned at almost three years of age in the 2013/14 season.

2013 - 12,000 fry from the 2013 brood year were released in August 2013, about 5km above Kimball that may have returned at almost three years of age in the 2015/16 season.

2014 – 70,000 eyed ova to incubators in July to Three Springs. Likely return 2016/17 at almost three years of age.

2015 - 50,000 eyed ova to incubators in July to Three Springs. Likely return 2017/18 at almost three years of age.

2016 – 20,000 eyed ova to incubators in July to Three Springs. Likely return 2018/19 at almost three years of age.

None of these fish/ova were able to be marked in any way to enable success of releases to be reviewed. Salmon redd counts have been performed annually on Three Springs and provide a limited measure of success of releases at producing adults that return to spawn. In the last five years a peak of 12 redds was found in Three Springs in 2014 with all other counts less than three. Prior to 2014 and back to 2000, six counts were undertaken, and all yielded no redds. These results provide some evidence that recent fry and ova releases may have generated small adult returns generally of 10 adults or less to Three Springs. Return of adults to the Opihi other than to Three Springs cannot be identified.

Waitaki River

The 30 May 2018 Waitaki River salmon spawning survey provided information for comparison with surveys undertaken between 1975 and 2017. For the last five years mainstem Waitaki discoloration has limited surveys to the upper river reaches with these counts scaled up using the relationship established in the 2012 and 2013 surveys that covered all of the mainstem reaches. In addition, 35 side streams were surveyed, 18 of which have been surveyed every year since 2012.

In 2018 total Catchment salmon spawning including the Hakataramea was estimated at 296 redds compared to a range of 470 to 780 redds between 2012 and 2017. The Hakataramea estimate was based on the number of kelts retrieved from the upstream side of the Waitaki Riparian Enhancement Society fish trap in the lower Haka as an indicator of the number of fish that moved upstream when the river was in flood in early May and the salmon trap was removed.

Since 2012, surveys have targeted identified side streams. In 2012 and 2013 these side streams contributed 44% and 33%, respectively, of all redds counted in the lower Waitaki River. This year side streams were estimated to have contributed 68 redds or 23% of Catchment spawning. It was also noticeable that this year only three salmon redds were counted in the lower 42km of the Waitaki River and this section contains 12 of the original 18 identified side streams.

Based on indicative long-term redd counts for the Hakataramea River prior to 2000, the historical average range for salmon spawning effort across the lower Waitaki Catchment would have been 2,000 to 2,500 redds. In 8 years surveyed out of the last 20 years, annual spawning activity is likely to have ranged between 500 and 1,000 redds and in 2018 only 300 redds were estimated to have been present. The 2018 count was well below the historical level indicative of a healthy fishery and while there has been variation in the size of the spawning population in the last eight surveys the overall trend has been downward.

It was estimated that 133 salmon were caught from the Waitaki during the season and was comparable with the estimated 121 caught in 2016/17 (Figure 9). Angler interest was at least maintained from last year with 520 anglers fishing the river for salmon and 10% were successful at catching a salmon. Average catch for successful anglers was 2.4 fish each for the season.

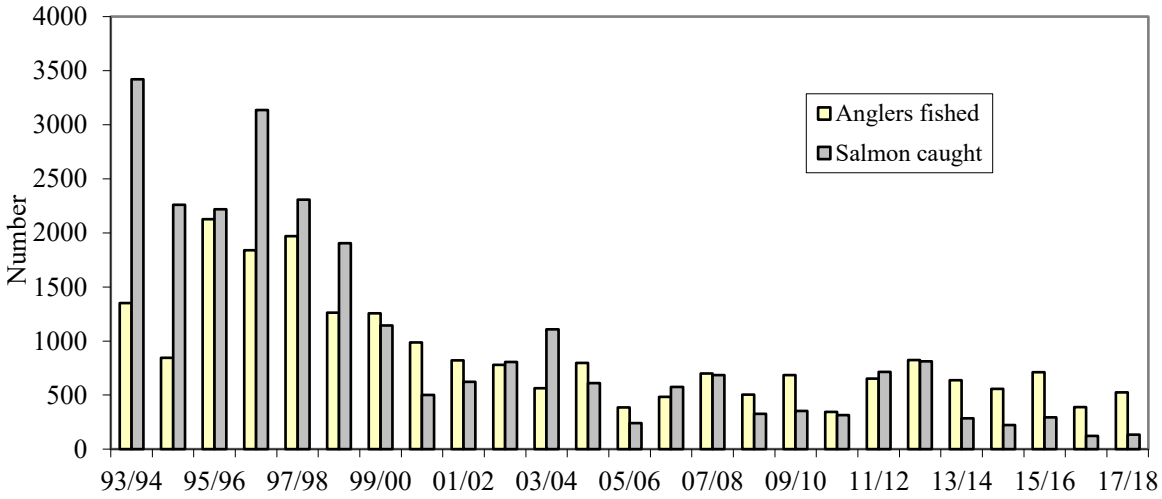

Figure 9. Number of anglers fishing, and salmon taken from the Waitaki River for October to April seasons from1993/94 to 2005/06 and for October to March seasons from 2006/07 onwards.

Our angler surveys indicated 6 fin-clipped salmon were caught in the Waitaki and most likely to have been released as juveniles from the WRES hatchery. This was somewhat surprising as no fin-clipped salmon were presented to WRES to claim a cash prize. The first fin-clipped salmon were landed in the 2013/14 season and since that time 22 have been recorded. Over the five seasons hatchery-origin fish have represented an average of 2.6% of angler catch. Assuming hatchery-origin salmon are similarly represented in the spawning population it is estimated that total returns of hatchery fish to the Waitaki have averaged 24 salmon per year and ranged from

11 to 37 since 2013/14. No assessment of the presence of fin-clipped salmon on the spawning grounds has been undertaken to confirm if hatchery-origin adult salmon are spawning in the wild.

Regional Perspective

CSI Fish and Game have been making annual harvest estimates for catch of all salmon by CSI licence holders since 1993. In that time there has been a significant change to fishing regulations, principally the reduction in season length since 2005/06, and supplementation of angler catch with hatchery fish in at least three rivers since 2008/09. To make annual harvest estimates for wild salmon comparable across all of the 1993/94 to 2017/18 seasons, recorded harvest must be adjusted by removal of hatchery-origin catch and addition of an assumed April harvest in the years that those differences appear (Table 1).

Table 1. Season angler catch of wild salmon in CSI Region rivers and total for the Region for October to April seasons from 1993/94 to 2017/18. Figures for the 93/94 to 05/06 seasons are actual catches while 06/07 season onwards estimates have been scaled up to include an estimated April catch had that month been available to anglers after first deducting angler catch of hatchery-origin fish in the Rangitata, Orari and Opihi rivers from 08/09 onwards and catch of hatchery-origin fish in the Waitaki from 13/14.

Season	Ashburton	Rangitata	Orari	Opihi	Waitaki	Total Wild fish	Rangi + Orari + Opihi Hatchery fish (Waitaki)
93/94	216	2,628	54	810	3,420	7,128	
94/95	28	2,497	97	662	2,261	5,545	
95/96	271	4,483	57	760	2,217	7,788	
96/97	105	4,890	5	178	3,135	8,313	
97/98	0	1,430	22	120	2,306	3,878	
98/99	62	2,706	25	481	1,903	5,177	
99/00	60	1,228	141	390	1,143	2,962	
00/01	21	247	0	87	500	855	
01/02	9	152	165	171	623	1,120	
02/03	0	449	49	28	807	1,333	
03/04	0	367	0	230	1,108	1,705	
04/05	20	533	70	1,600	611	2,834	
05/06	0	216	0	55	240	511	
06/07	23	1,221	0	293	739	2,276	
07/08	60	1,458	0	502	1,083	3,103	
08/09	24	1,048	32	327	966	2,397	490
09/10	25	531	38	232	447	1,273	232
10/11	19	509	28	266	567	1,389	374
11/12	21	777	212	297	760	2,067	419
12/13	37	1,278	113	811	1,013	3,252	178
13/14	41	855	464	498	860	2,718	706 (5)
14/15	6	1,035	108	34	830	2,013	187 (2)
15/16	30	356	120	31	324	861	84 (3)
16/17	6	305	26	19	253	609	46 (6)
17/18	6	143	19	39	170	377	23(6)

In 2006 Council set a regional threshold of 3,650 fish to be caught annually to indicate the recreational fishery was in good health. This threshold was set based on historical catches to that time for full October to April seasons and in the absence of supplementation by hatchery-origin

salmon. The 2017/18 season sum of 377 fish calculated for the full October to April season and excluding hatchery supplementation, is below the threshold for consideration of reopening of April to salmon fishing.

Waitaki April Closure

It was acknowledged by Council in 2006 when introducing the April salmon season closure that with the main run of salmon occurring on average one year in five in April, the closure would impact on Waitaki anglers more than anglers at any other river. It must also be stressed that since 2006 the Waitaki has been the river in most need of protection for spawning fish.

In the twelve seasons since the April closure was introduced it is estimated that on average 37% of the Waitaki salmon run has occurred after the season closure at the end of March, peaking at about 73% in 2014/15 (Table 2).

Table 2. Actual catch of salmon by Waitaki River anglers for October to March seasons, estimated additional catch had the April season been open, and estimated extra spawning sustained by fish not caught by anglers.

Season	Actual catch Oct - March	Estimated Catch Oct - April	Salmon not caught in April	April as % of season	Additional spawning (eggs deposited)
2006/07	576	739	163	22	285,000
2007/08	686	1,083	397	37	695,000
2008/09	327	966	639	66	1,120,000
2009/10	353	447	94	21	165,000
2010/11	314	567	253	44	444,000
2011/12	715	760	45	6	79,000
2012/13	811	1013	202	20	354,000
2013/14	285	860	575	67	1,009,000
2014/15	224	830	606	73	1,060,000
2015/16	295	324	29	9	51,000
2016/17	121	253	132	52	231,000
2017/18	133	170	37	22	38,500
Average				37	457,000

While imposition of the April closure on Waitaki anglers is considered a harsh sacrifice there has been a significant benefit to the fishery with between 50,000 and 1.1 million eggs and an average of 457,000 extra salmon eggs deposited each season to help sustain the fishery.

Hatchery Supplementation

Since 2007, McKinnons Hatchery on the lower Rangitata has been releasing between 50,000 and 95,000, one-year old fin-clipped juvenile salmon to the Rangitata. The 2017/18 season was the tenth season where hatchery-origin returning adult fish supplemented angler catch.

In the 2017/18 season 14 McKinnon's origin fin-clipped salmon were caught by anglers in the Rangitata and with approximately 60% of McKinnon's releases being fin-clipped it is likely another 9 hatchery-origin fish were caught by anglers but not recognised as the adipose fin of each would have been intact. No hatchery-origin fin-clipped salmon were caught in the Orari and Opihi rivers. No hatchery-origin fin-clipped salmon returned to the hatchery and ground surveys on the

upper Rangitata spawning grounds did not find any fin-clipped salmon (Table 3). Overall, McKinnon's origin salmon totalled 23 fish or 2.4% of the 931 returning salmon in the Rangitata, Opihi and Orari rivers in the 2017/18 season.

Table 3. Number of wild and hatchery-origin fin-clipped and non-fin-clipped salmon returning to the Rangitata, Orari and Opihi rivers that were caught by anglers, or spawned in those rivers, or returned to McKinnons Hatchery for the 2008/09 to 2017/18 seasons. Eight hatchery-origin salmon caught by anglers in the Ashburton River and eleven in the Waitaki have not been included.

	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18
Rangitata River										
Hatchery angler caught	241	67	241	237	69	294	150	76	30	23
Hatchery spawned	39	2	33	42	61	18	24	15	7	0
Returns to hatchery	650	389	774	731	408	344	64	37	28	0
Total hatchery-origin	930	458	1,048	1,010	538	656	238	128	65	23
Wild angler caught	998	506	485	740	1,229	812	914	338	293	136
Wild spawned	2,714	901	905	1,610	3,042	1,283	1,666	1,055	498	573
Wild returns to hatchery	0	0	31	79	42	621	346	146	42	0
Total wild	3,712	1,407	1,421	2,429	4,313	2,716	2,926	1539	833	709
Orari River										
Hatchery angler caught	28	28	70	29	13	270	20	0	4	0
Hatchery spawned	72	90	62	49	24	350	4	0	7	0
Total hatchery	100	118	132	78	37	620	24	0	11	0
Wild angler caught	27	32	23	177	94	371	86	15	22	16
Wild spawned	48	60	41	51	176	150	12	15	40	50
Total wild	75	92	64	228	270	521	98	30	62	66
Opihi River										
Hatchery angler caught	221	137	63	104	13	142	10	8	12	0
Hatchery spawned	25	30	32	27	9	23	30	24	2	0
Total hatchery	246	167	95	131	22	165	40	32	14	0
Wild angler caught	277	197	225	252	665	408	28	25	15	33
Wild spawned	525	670	668	573	591	477	70	76	148	100
Total wild	802	867	893	825	1,256	885	98	101	163	133
All Rivers										
Fin clip angler caught	490	232	374	370	95	353	90	42	23	14
Angler non fin clip catch	0	0	0	49	83	353	90	42	23	9
Hatchery spawned	136	122	127	118	94	391	58	39	7	0
Returns to hatchery	650	389	774	731	408	344	64	37	28	0
Total hatchery	**1,276**	**743**	**1,275**	**1,268**	**680**	**1,441**	**302**	**160**	**81**	**23**
Wild angler caught	1,302	735	733	1,169	1,988	1,591	1,028	378	330	185
Wild spawned	3,287	1,631	1,614	2,234	3,809	1,910	1,748	1,146	686	723
Wild returns to hatchery	0	0	31	79	42	621	346	146	42	0
Total wild	**4,589**	**2,366**	**2,378**	**3,482**	**5,839**	**4,122**	**3,122**	**1,670**	**1,058**	**908**

The age composition of returning hatchery-origin salmon has been determined from scale growth ring analysis of angler-caught and hatchery-trapped salmon for some season's returns since the 2008/09 season. In addition, the frequency with which certain sized (length) salmon occur in the angler and hatchery returns can be used to identify age classes of salmon. The age composition of the 23-hatchery salmon that returned to the rivers last season has been estimated to have been approximately 1 (4%) three-year-old fish from the 2014 brood year, 18 (78%) two-year-old fish from the 2015 brood year, and 4 (18%) one-year-old fish from the 2016 brood year.

Age class returns, and fin-clip rates are essential information for estimating overall return (survival) for each release of juvenile fish from McKinnons Hatchery (Table 3).

Table 3. Brood year, year of release, age at return and overall return rate as a percentage of the total number of fin-clipped and non-fin-clipped juvenile salmon released from McKinnons Hatchery.

Brood year	Number released	Date of release	% fin-clipped	No. return 1^+	No. return 2^+	No. return 3^+	Total return	Percent return
2006	55,000	July 07	100	0	1,254	203	1457	2.64
2007	72,000	July 08	100	22	433	89	544	0.75
2008	52,000	July 09	100	107	837	7	951	1.82
2009	65,000	July 10	100	349	1,072	8	1,429	2.20
2010	70,000	July 11	53.7	189	636	21	846	1.21
2011	95,000	July 12	47.4	36	1,400	5	1,441	1.51
2012	63,000	July 13	68.25	20	292	3	315	0.5
2013	64,000	June 14	50	5	132	3	140	0.22
2014	35,000	Jun 15	100	13	32	1	46	0.13
2015	65,000	June 16	60	15	18	2018/19	33+	
2016	68,000	Jun/Jul 17	0	4	2018/19	2019/20	4+	
2017	55,000	July 18	37	2018/19	2019/20	2020/21		

To date there have been nine hatchery releases that have run their full life. The 2006 to 2013 broods have completed return out to 3^+ (almost four years old) and produced a range of returns from 0.13% to 2.64% and averaged 1.22%.

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Volunteers:
Wayne Watson Andrew Weaver
River mouth Dairy Keepers:
Robert Mann Bill Whipp
Runholders:

Ashley O'Donnell	(Mt Potts)	Donald Whyte	(Mt Possession)
Roger Johnson	(Forest Creek)	L & M Hooke	(Ohapi)
Malcolm Prouting	(Mesopotamia)	Leighton Pye	(Ohapi)
Colin Drummond	(Erewhon)	Michael Tayler	(Korari)