

2020/21

Angler Notice

Review

21 May 2020
Council Meeting



**Recommendations in reports are not to be
taken as Council Policy until adopted by Council**

CENTRAL SOUTH ISLAND REGION

2020/21 CSIFG Region Angler Notice Review

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2020/21 Angler Notice Review (CSIFG staff)

Introduction

In April 2013 Council resolved that it would implement triennial reviews of the Anglers Notice and between triennial reviews Council would only consider matters of urgency. The next triennial regulations review is in April 2022 for the 2022/23 Anglers Notice.

The last year has seen fishery management issues arise as a consequence of –

- i) a co-ordinated review of the state of the sea-run salmon fishery that includes potential for a new management regime,
- ii) on-line and generally un-informed debate around fishing conditions on the Mackenzie canals that allow spawning trout to be taken, and
- iii) the predicted success of the new Upper Ohau spring fishing season but unexpected rise in popularity that may jeopardise its continuation.

The sea-run salmon fishery and the Canals are nationally significant fisheries and recommendations for fishery management and controls on angling require Council's attention for possible implementation in the 2020/21 season. Introduction of a season limit bag for sea-run salmon is proposed as part of a threshold-based management regime for salmon. A draft of the proposed threshold regime is also provided in this report.

In addition to staff reports two public submissions in the form of petitions have been received. One in support and one opposing closure of the Rangitata River sea-run salmon fishery above the RDR intake at Klondyke. Angler access to the salmon fishery is a component of the future management regime and is considered after the salmon management reports.

One staff report and recommendations are provided on the Lake Heron land-locked Chinook salmon fishery and its potential to impact the sea-run salmon fishery of the Rakaia River. This issue has been raised by North Canterbury Fish and Game (NCFG) as a matter of urgency and is part of an on-going joint research project between CSI and NCFG.

At its March 2020 meeting Council approved new controls on Canal fishing and the report and recommendations are contained in this report for completeness even though no further action is required by Council.

The spring season on the upper Ohau River bisects two Angler Notice periods with changes to the start of the season not taking effect until 17 months after Council consideration. This requires staff reporting and Council consideration of recommendations for two seasons ahead. As a new fishing opportunity, staff survey work confirms it can offer an exceptional experience but could also be a victim of its own success.

Council formerly had one condition in the AN that required annual review – closure of all sea-run salmon fisheries to angling at the end of March. As part of extensive and on-going review of sea-run salmon management including the Anglers Notice, the function of the April closure is further considered in this AN report and recommendations proposed.

This Anglers Notice review has been a CSIFG team effort. All field staff have contributed to field work, reports, editing and proofing. The depth of assessment and extent of data collection required for these reports could not have been achieved in this Region ten years ago.

1.0 Season limit bag for sea-run salmon

1.1 Submitter

CSIFG staff in co-ordination with NCFG staff.

1.2 Condition requested

A season bag limit of four sea-run salmon in total for all CSIFG and NCFG regions sea-run salmon fisheries for the 2020/21 season.

1.3 Current conditions

No season bag limit for sea-run salmon,

1.4 Recommendation for Anglers Notice 2020/21

1. **A season bag limit of four sea-run salmon in total for all CSIFG Region's sea-run salmon fisheries for the 2020/21 season.**
2. **Amend condition 7.1 of Schedule 1 (national regulations) so that restrictions applying to fishing after taking a limit bag also apply to a season bag.**

Also please note the following provisions in the 2019/20 and 2020/21 Operational Work Plans -

CSIFG staff are directed to continue developing the adaptive management regime for managing sea-run salmon harvest with a view to incorporating this into a salmon management plan and work with NCFG staff to this end.

Objectives of the adaptive management strategy, among other, are to manage the NC and CSIFG regions sea-run salmon fishery with consistency and transparency, and to provide for simplification of conditions on salmon angling as application of the season bag develops into an efficient and accepted management tool.

1.5 Staff assessment

The Anglers Notice sets out conditions under which licence holders may fish, being conditions relating to – the size of fish, bag limit, open/closed waters, fishing gear/methods and the hours of fishing. Of these options, the size of the daily limit bag, open season and open area are options for consideration. In March 2020 the ability to apply a season limit bag was approved and is a further option for consideration.

The daily limit bag for all sea-run salmon fisheries is currently one fish and cannot be made any lower. All Fish and Game regions with sea-run salmon reduced the daily limit bag from two fish to one fish for the 2019/20 season on the understanding that it would save about 10% of season harvest. Further justification for reducing the daily limit was that it applies equally to all successful anglers, it cannot be avoided by fishing somewhere else, and it may help redistribute success to a greater number of anglers.

Area and season length controls are easily applied, and many combinations of small changes can be introduced to achieve the required result. History has shown that introducing conditions that achieve only small changes tend to affect a minority of anglers with the

hardships not equally distributed across all anglers. Area and season controls are not guaranteed to have the predicted effect if anglers displaced by the change in conditions instead fish the open area or time available elsewhere in the fishery.

To improve the success of season length controls, fish that are saved from being caught during the closure should not be exposed to angling later in the season – closure of the season early will be more effective than a later opening. On this basis fishing for sea-run salmon in April was uniformly closed in the NC and CSI F&G regions in 2019/20 with an estimated 8% reduction in season harvest. This estimate of saving was based on information available from the Rangitata River (Table 1). The two regions also closed October and November with an estimated 3% saving on season harvest.

Table 1. Impact of various season and area closures on season harvest from the Rangitata River based on multiple years of random harvest surveys between 1994 and 2018.

Condition	Application	Harvest reduction
Closed period	October + November	<3%
	December	<11%
	January	<30%
	February	<29%
	March	<22%
	April	5%
	Closed area	Gorge & above
SH1 to Gorge		<14%
Lagoon to SH1		<27%
Mouth, surf & lagoon		<54%

When introducing changes to the Anglers Notice for 2019/20, the NC and CSI F&G councils were seeking an overall reduction in sea-run salmon season harvest of approximately 20%. The combination of a daily limit bag and closure of October, November and April was predicted to achieve an approximate 18% reduction in angler harvest. Of the four individual changes only the daily limit bag was likely to achieve its estimated 10% saving. The other three controls were period closures and the achievement of the target would depend on the extent to which anglers would transfer their activity to the remaining open months.

The Season Bag

Season limit bags have been a topic of conversation for many years, most often when there are good runs in the rivers and anglers have more opportunity to accumulate big tallies over the season. Anglers commonly talk of a season bag of 15 to 20 fish and this may be acceptable as an ethical limit but it is not a valid fish conservation strategy because a limit of this size effects only a small number of anglers and has negligible effect on overall harvest.

During the NC and CSI end of season harvest surveys – telephone and email – information is collected on angler catch in individual rivers that can be summed as a season tally across all rivers. From 1994 to 2017 these surveys were independent with each F&G Region interviewing its own anglers at different sampling rates and with different questions. The 2018/19 season survey was the first where both regions anglers were interviewed as one sample population. This ensured consistency of effort and higher precision of the estimates.

The results of the 2018/19 season survey identified that 3,929 NC or CSI licenced anglers fished for salmon in the rivers of the NC and CSI F&G region. Of these anglers 879 were successful and caught 1,979 salmon. Three-quarters (78%) of salmon anglers caught no salmon and 94% of anglers caught two or fewer fish (Figure 1). The average season catch across all anglers who fished for salmon was 0.5 salmon for the season and the average for successful anglers was 2.25 fish for the season.

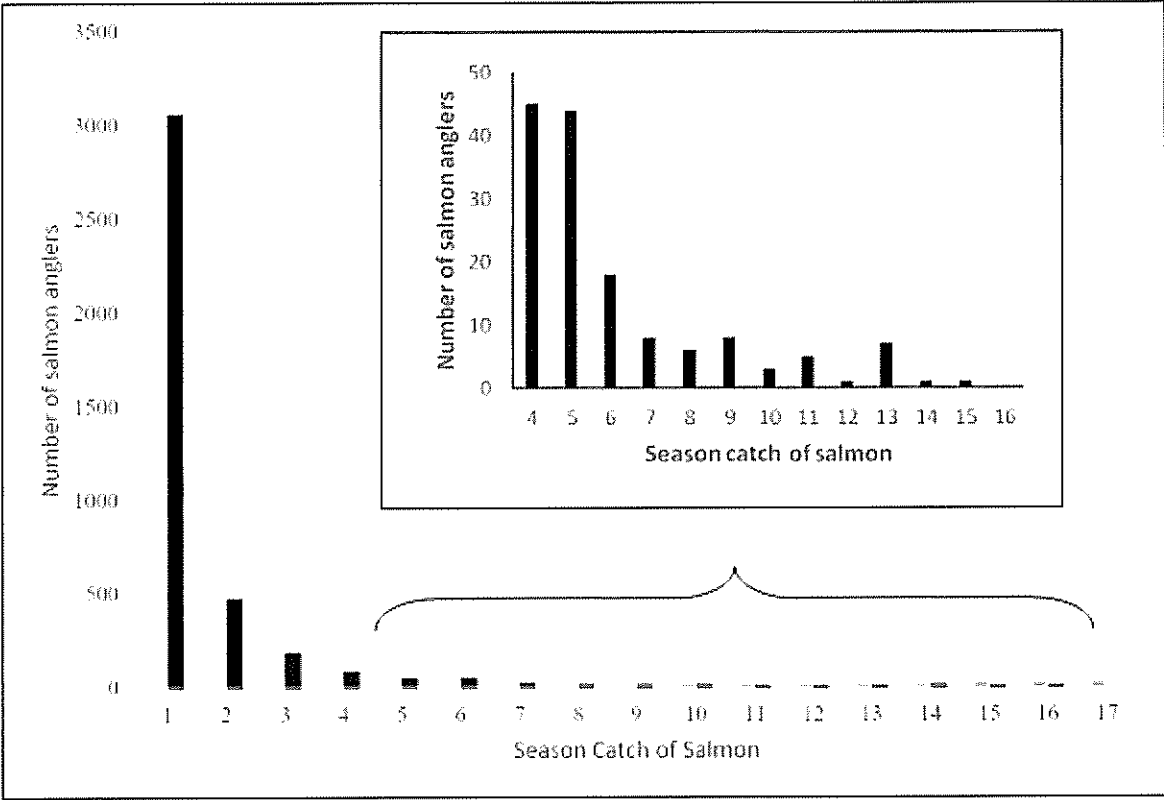


Figure 1. Distribution of season limit bags for NC and CSI F&G region licenced anglers who went sea-run salmon fishing in the NC or CSI F&G regions in the 2018/19 season.

Knowing the distribution of season limit bags enables the impact on anglers and fish survival of a range of season limit bag sizes to be assessed. Survey records identify the number of anglers that would have been affected, how they would be affected and what the potential increase in spawning numbers would have been for a range of season limit bag sizes had they been implemented in the 2017/18 season (Table 2).

Table 2. Impact of various season bag limits on 879 successful salmon anglers who caught 1,979 sea-run salmon across all NC and CSI F&G regions salmon fisheries in the 2018/19 season and potential stock saved that could have improved spawning in the Waimakariri, Rakaia and Rangitata rivers in 2019.

Season bag size	Successful anglers achieving bag size	Number of salmon saved	Proportion of total harvest saved	Potential increase in Waimak, Rakaia, Rangitata spawning
20	0%	0	0	0
10	2%	37	2%	1.6%
5	12%	211	11%	10%
4	17%	313	16%	14%
3	26%	460	23%	21%
2	47%	689	35%	32%
1	100%	1,100	56%	50%

In the 2018/19 season, 2% of anglers caught more than 10 salmon and the total number of salmon these anglers caught above the 10 was an additional 37 fish. Had the season bag of 10 operated the saving on harvest would have been 2% and these additional fish could have added 1.6% more fish onto the spawning grounds. Similarly, a season bag limit of 2 would have affected 47% of successful anglers and 689 fish would not have been caught and could have added 32% onto the spawning population. The calculations for additional spawners assumes 65% of the region-wide salmon that were not caught by anglers because of the season bag, spawned in either the Waimakariri or Rakaia or Rangitata which is the estimated proportion of region-wide spawning occurring in those rivers.

Using the season bag provides a simpler and more even-handed method for implementing significant control on angler catch instead of a number of less significant area or season restrictions. Only one condition is required to achieve a saving on harvest to meet the spawning target and this is particularly important when a 20% or greater improvement in spawning population size is required.

Joint NC and CSI F&G staff and councillor meetings in 2019 discussed standardising salmon fishing conditions across the regions and the need to improve wild salmon spawning numbers. A result of this process was introduction of additional daily bag limit and season length restrictions that were predicted to reduce harvest across the two regions by about 18%. This reduction remained short of the 40% considered necessary given the state of the fishery and it was agreed that introduction of a season bag limit was the next step towards achieving the required control on harvest.

The season bag analysis of the 2018/19 season indicates that a season bag of three fish could have reduced harvest by about 41% in combination with the daily bag and season controls already introduced. To achieve a similar level of control using only the season limit bag would require a season limit bag of two fish for a 35% reduction in harvest.

The current state of the wild fishery demands further improvement in the spawning population size and would likely justify a season bag limit of two fish. Access to a season bag as a control on harvest only became available in early 2020 and as a novel and significant control it will face potential administrative and acceptance issues in its early years. A period

of adjustment particularly for anglers would be warranted and it is recommended a season bag limit of 4 salmon be introduced for 2020/21 for an estimated 16% reduction in angler harvest and 14% increase in wild spawning (Table 2). All other current conditions would be retained.

Current salmon fishing regulations across the two Fish and Game regions contain season length and river area restrictions and a daily bag limit. Introduction of a season bag limit provides an opportunity to allow anglers to choose when and where they fish and how many salmon they may take while retaining greater control of season harvest with just the one season bag Angler Notice condition.

Nationally Fish and Game is considering a threshold-based management regime for salmon. Harvest management of salmon will be guided by the number of wild sea-run salmon spawning such that when spawning numbers are low there will be tighter control of angler catch to generate higher survival of spawners. When spawner numbers are high and the fishery is deemed to be healthy then angling conditions will be relaxed.

A more detailed review of the threshold management regime prepared by CSI and NC staff is provided in Section 3.0 of this Anglers Notice Report and includes additional recommendations for the 2020/21 season in combination with introduction of a season bag.

2.0 Close Rangitata River for salmon fishing above Klondyke

2.1 Submitters

Petition 1 D Lerner G Parnell, 323 signature petition supporting closure (Appendix 1)
Petition 2 D Keen and 25 signature petition opposing closure (Appendix 2)

2.2 Condition requested

Petition 1 -No fishing for or taking of salmon in the Rangitata River above the intake of the RDR at Klondyke from 1 December to 31 March to the headwaters adjacent to the spawning streams.

Petition 2 – retain current salmon season availability in the upper Rangitata

2.3 Current conditions

Rangitata River and tributaries downstream of Turn Again Point about 12km above the gorge open for salmon fishing 1 December to 31 March, and

Rangitata River and tributaries upstream of Turn Again Point about 12km above the Gorge open for salmon fishing 1 December to last day of February

2.4 Recommendation

3. **Subject to acceptance of Recommendation 1 for a season bag limit of 4 salmon for all CSI and NC sea-run chinook salmon fisheries, no change is recommended to the season opening and closing dates for salmon fishing above the RDR intake at Klondyke.**

2.5 Staff assessment

The issue of closing the upper Rangitata to salmon fishing whether from above the Arundel Bridge, above the Gorge, or above Turn Again Point has been raised by submitters four times in the last 20 years. On each occasion Council has resolved to retain the opportunity for anglers to fish for and take salmon in the upper Rangitata albeit with a season that closes at the end of February above Turn Again Point. The early closure above Turn Again Point, compared to the remainder of the river, prevents salmon being taken in the spawning streams and in the mainstem where they congregate prior to entering the spawning streams. Aerial spawning surveys of the mainstem upper Rangitata have not identified schooling of salmon downstream of Turn Again Point before the end of February.

Council has an Anglers Notice Policy adopted in 1997 that guides how it will resolve issues of availability of the fishery to anglers when fishery sustainability may be compromised. This is provided as Appendix 4. Specifically, Council will consider the balance of opportunity so there is a fair distribution of access to the fishery for all fishing methods and experiences. Where the combined harvest of all anglers threatens resource sustainability, harvest of all methods will be regulated in preference to restricting access. So that when times are hard, as they have been for some time for salmon fishing, any harvest restrictions should be applied evenly to spread the hardship rather than target a particular angling method or area. This principle is compromised by a proposal to close the salmon fishery above the RDR intake at Klondyke where one group of anglers bear all the hardship and those who fish anywhere else on the river bear none.

There is no dispute that the sea-run salmon fishery is under threat. This has been recognized by the New Zealand Fish and Game Council by formation of the National Sea-run Salmon Committee (NSRSC) and the participation of all South Island Fish and Game regions and Salmon Anglers Association representatives on that committee. The initiative coming from the NSRSC and being recommended for implementation in the 2020/21 season is for introduction of a season bag limit for salmon. Central South Island and North Canterbury Fish and Game regions are driving this initiative.

CSI and NCFG are proposing introduction of a four sea-run salmon season bag limit for the 2020/21 season with an estimated 16% saving in harvest across the CSI and NC sea-run salmon fisheries. A draft threshold management strategy for setting salmon fishing regulations (Section 3.0) states that the current condition of the fishery justifies a two salmon season bag limit but given the potential administrative and acceptance issues in its early years a season bag of four has been recommended. The period of adjustment to a season bag will not be prolonged and there is an expectation that a season bag of two will be implemented the following season. A season bag of two could produce an estimated 35% saving in harvest.

Long term salmon harvest surveys undertaken by Fish and Game for the Rangitata indicate on average about 5% of total river salmon harvest occurs in the Gorge and above. Four fish and two fish season bags are predicted to generate 16% and 35% saving on harvest respectively and for both, the hardship is spread across all methods and areas. The additional saving of 5% at the expense of all salmon angling above the RDR intake is not consistent with Council's Angler Notice Policy. One of the benefits of the season bag is that it can reduce the need for other season, area and method regulations that make current fishing regulations complicated. The over-riding issue is control of harvest to meet spawning targets and provided fishing remains ethical and sporting, and the targets are met, where and when harvest occurs is less significant.

The draft management strategy proposes a possible restriction regime that upriver fishing is withheld when the season bag becomes one fish and the overall saving on harvest required exceeds 50% (Table 2, Section 3.0 page 17).

Petition 1 suggests that upriver closure could be removed when monitoring indicates an improvement in the number of salmon returning to spawn. The draft threshold management strategy provides such a mechanism.

Petition 2 offers three options for reducing angler catch. Option 1 is introduction of a season bag. This has been promoted by CSIFG and NCFG councils and discussed in Section 1 of this Anglers Notice report. Option 2 is closure of all waters of the Rangitata to salmon fishing from the end of March. This is an option that would be considered under the Adaptive Management Strategy to achieve the target saving on angler catch if the season bag is not approved as the primary tool. Option 3 suggests closure of the entire salmon fishery for three years. This would likely generate improved runs in the short term – for the three years after reopening, however the issue is the long term sustainability of the fishery and the need to control harvest annually to achieve spawning targets that aim to produce a healthier fishery every season.

Anecdotal reports have been received by CSIFG of two anglers fishing above the Rangitata Gorge in the 2018/19 season catching 30 salmon or more between them. Current regulations permit this level of harvest through only limiting daily catch. Implementing a season catch limit controls the potential for anglers to catch socially unacceptable high season tallies. In this respect a season bag affects everyone equally and a season bag taken in one part of the river has no greater or lesser impact on spawning numbers than a season limit taken anywhere else on that river. If a season limit bag of four had applied in 2018/19, those two upriver anglers would have been legally restricted to four fish each – about a 75% reduction in harvest from what their reported catch was. In addition approximately 140 other anglers fishing any of the salmon rivers and any available reaches of those rivers would have been restricted to four fish if the season bag of four had been in place (Figure 1, Section 1.0).

It is recommended that initially implementing a season bag of four salmon provides sufficient control on excessive catch without the need to remove the opportunity and experience of upriver angling that is requested by Petition1. Further restriction of the season bag below four is highly likely.

3.0 DRAFT Adaptive Management Strategy for Setting North Canterbury and Central South Island Sea-run Salmon Fishing Regulations

Mark Webb
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Vision

To manage the wild Chinook salmon fishery at sustainable levels using a transparent, adaptive management approach to ensure adequate salmon spawn each year and to provide a healthy recreational sports fishery.

Background

A wild sea-run salmon fishery has established in the South Island since being introduced to New Zealand over a century ago. The salmon fishery is currently experiencing a sustained period of poor returns, with fishery managers believing the reasons for this to be complex and unpredictable. Some of the likely reasons for the decline include warmer ocean temperatures on the east coast of the South Island in recent years, reduced and degraded spawning habitat due to land development, reduced river flows through abstraction, lower juvenile salmon survival through loss of habitat and ineffective fish screens, and gradual increase in harvest levels over the period when the number of wild salmon returning to the rivers has been declining.

Monitoring of wild salmon in the Waimakariri, Rakaia and Rangitata rivers provides a record of annual angler catch, spawning population size, total run size and trends across 26 years. These fisheries, including the Waitaki for its shorter period of record, show very similar population trends, either increasing or decreasing together on an annual basis and they all share the current critically low state (Figure 1).

Fish & Game is tasked with setting sea-run salmon angling regulations to ensure that harvest is sustainable, to enable all licence holders fair and equitable access to the fishery, and to provide a full and diverse range of angling opportunities.

This is difficult to achieve for a number of reasons, notably we are required to set regulations well in advance of the season ahead and without a full understanding of the season that has just finished so we are unable to react quickly to salmon population changes. At the same time there is huge pressure to satisfy angler harvest expectations that are driven by historical achievements when the fishery was much stronger. With an increasing trend in the proportion of returning salmon that are harvested, particularly in the Waimakariri fishery, Councils understand they must make some tough decisions and take steps to increase the number of salmon that survive to spawn.

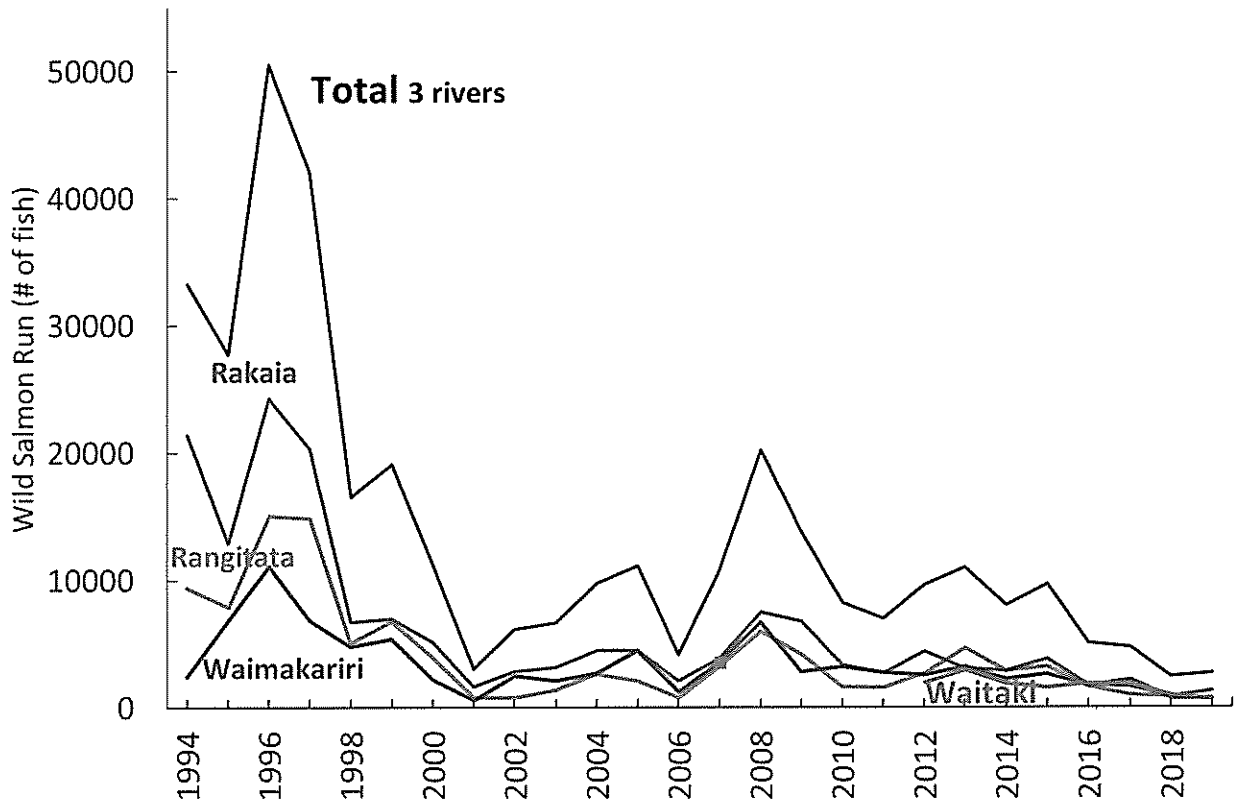


Figure 1. Estimated wild salmon returning to the Waimakariri (blue), Rakaia (red), and Rangitata (green) rivers for 1994 to 2019, Waitaki River (brown) 2007 and 2012 to 2019, and total for the Waimakariri, Rakaia and Rangitata (black) 1994 to 2019.

The proportion of the wild re-a-run salmon caught by anglers each year, as a percentage of the total estimated returns, has been slowly increasing over time, for example in recent years harvest rates have been over 50% in the Waimakariri River and around 40% in the Rakaia and Rangitata. At the current run sizes, international experience would suggest harvest rates above 50% are not sustainable and it is possible that life history patterns, genetic diversity and salmon population resilience may be adversely affected.

On the positive side there is a growing acceptance by anglers that to rebuild the salmon fishery, we need to significantly reduce the harvest of wild salmon in order to increase the numbers of fish returning to the spawning streams. Fish and Game has a limited number of regulatory options to try and ensure adequate salmon numbers reach their spawning grounds each year, such as daily limits, changing season length and opening/ closing areas of river to fishing. The option of a season catch limit is currently being sought.

In a perfect management regime, we would be able to open and close the salmon fishery to ensure sufficient numbers return to their spawning grounds each season as they do in key North American fisheries. However, we do not currently have the resources to determine return numbers in real time, we do not know the spawning targets we need to achieve, nor do we have the legislative support to implement this adaptive approach.

A Strategy to Rebuild the Wild Fishery

The North Canterbury and Central South Island Fish and Game Councils are aiming to introduce an adaptive salmon management strategy that identifies minimum spawning targets across key rivers and implements a model for setting harvest regulations to help rebuild the fishery. This requires a long-term commitment to the management strategy supported by quality monitoring that identifies the effectiveness of actions taken.

An estimated three-quarters of all South Island sea-run salmon caught are taken from the Waimakariri, Rakaia and Rangitata and these are the rivers for which we have the most robust and consistent monitoring information. It is sensible that these rivers should be the indicators of the state of the North Canterbury and Central South Island salmon fishery and management of the fishery as a whole should be referenced to the dynamics of the Waimakariri, Rakaia, and Rangitata fisheries. Over time, monitoring to the required standard in other NC and CSI salmon fisheries would enable these rivers to be added to the adaptive management strategy.

The first part of the strategy requires the setting of thresholds for the number of spawning salmon that are needed based on the 26-year historical spawning population range and minimum acceptable spawning population size. Between the thresholds there are defined spawning population bands.

Three spawning thresholds should be sufficient to categorise the health of the spawning population with the upper threshold being the level above which the fishery can be considered healthy and where a minimum of harvest conditions would apply (Table 1). Across the last 26 years of spawning population information, the 75th percentile could be the level above which the fisheries are considered to be healthy. The second and third thresholds provide two bands with increasing restrictions on harvest to help prevent the fishery falling below the third threshold. The second threshold could correspond to the median or middle value of the 26-year spawning records for the Rangitata, Waimakariri and Rakaia rivers. Below the third threshold the fishery would have maximum harvest restrictions imposed without closing the fishery and this level has been determined to be just below the lowest recorded spawning population size in each of the rivers over the last 26 years.

Table 1. Example of possible spawning population thresholds and season bag conditions triggered based on 26 years of record for Rangitata, Rakaia, and Waimakariri spawning numbers combined.

Combined No. of Spawners	Season Bag
less than 1,000	1
1,000-5,100	2
5,100-7,800	4
7,800+	10

The second part of the strategy is to identify what the conditions on angler catch are that will apply when the spawning population is in each band. Catch regulations will be aimed at increasing the number of fish that survive to spawn when the population is in a low population band or relax angling restrictions when the population is healthy.

Options for Harvest Management

North Canterbury (NC) and Central South Island (CSI) Fish and Game staff are continuing to advance mechanisms for applying harvest controls under a proposed threshold management regime to target achievement of minimum spawning numbers.

The NC and CSI Fish and Game Councils are considering application of a season bag limit for the 2020/21 season for the number of salmon an angler may catch in a season. At present the recommendation to Councils is to introduce a season bag limit of four salmon across the two Regions. Staff consider that the ability to manage salmon harvest through a season bag is a master stroke for ensuring sustainability targets are achieved and provides a simpler and more even-handed method for implementing significant control on angler catch. The season bag should replace a number of less significant area or season restrictions.

Current salmon fishing regulations across the two Fish and Game regions contain season length and river area restrictions and a daily bag limit. Introduction of a season bag limit provides an opportunity to allow anglers to choose when and where they fish and how many salmon they may take while retaining greater control of season harvest with just the one season bag Angler Notice condition.

In 2019/20, the salmon fishing season in NC and CSI was reduced to December to March inclusive, and the daily bag limit was reduced to one salmon. In the absence of the ability to introduce a season bag limit, the changes to season length and daily catch were the most significant changes the Fish and Game Councils could make to increase the survival of salmon to improve wild spawning. These two changes combined were estimated to result in a likely 15% to 20% reduction in season harvest by anglers.

The proposed season bag of four for 2020/21 is predicted to produce a similar reduction in season harvest of 15% to 20%. Introduction of a season bag provides the opportunity to review and possibly replace restrictions on season length and daily bag limit.

Season Length

The proportion of season harvest attributable to months of the fishing season has been estimated from angler surveys during full-length seasons. In estimating potential harvest saved by closing parts of the season there is no way to consider changed angler behaviour in response to the closure. If anglers transfer the effort they would have put in, from the newly closed period to the remaining open period, then there is no reduction in season effort and likely no change in season harvest. The estimated reduction in harvest would be a maximum estimate that assumes anglers don't fish the open season more intensively. The real effect on harvest will be less than estimated from the assumption that anglers do not transfer their activity.

Concentrating angler effort into a shorter time period may have adverse effects on resilience of the salmon population. Research on Pacific salmon indicates that salmon in the population will run at predetermined times and this is an inherited trait. By concentrating angling to a shorter time within the greater period of the run, the natural diversity of the population is threatened. This works against population resilience which is the feature that helps salmon populations cope with adverse environmental conditions. Ideally harvest pressure should be spread across the whole run in response to the number of salmon present and this normally occurs when anglers respond to the presence of runs of salmon.

Our salmon rivers do not all have their traditional peak salmon fishing at the same time. The Waimakariri and Waitaki rivers have their peak salmon runs in March and April compared to the Rakaia and Rangitata rivers that peak in January and February. Closed seasons set across all the rivers will affect some to a greater extent than others, while closed seasons that differ between rivers risk shifting angler pressure to those that remain open.

In summary, changing the availability of the salmon fishing season may not achieve the savings in harvest anticipated and may negatively impact the resilience of the salmon population to the adverse environmental conditions that we believe are active now.

Daily Bag Limit

Reduction of the daily limit bag from two salmon to one was estimated to achieve a 10% to 15% reduction in season harvest. In years with good runs when anglers were more likely to catch a second fish in one day, the reduction of the daily bag to one fish was estimated to save around 15% of season harvest. In the poor run years that we have been having in most of the last 20 years, there is less opportunity for anglers to catch two fish so a daily limit of one fish was estimated to save about 10% of season harvest.

To a large extent introduction of a season bag replaces the function of a daily bag, particularly when the season bag is two fish or less. If the season bag is one or two fish, then the additional constraint of a daily bag is not required. In this situation an angler may choose to catch two fish in one day if the daily bag limit allows and that angler's season is then over. Alternatively, the angler may choose to keep one fish on each of two days. If the season bag limit is one fish, then automatically the daily bag is also one fish. With a low season limit, anglers who choose to keep a fish when the run size is small quickly catch their limit and leave the fishery. When the season bag is three or more fish and the salmon population is stronger, the daily bag limit of two fish provides more opportunity for anglers to spread their catch over multiple days and extend their fishing opportunities.

The current conditions around catch and release are that no licence holder shall continue to fish for a particular species of sports fish on any day in which he or she has already killed the limit bag for that species.

In summary, a daily bag limit of two fish is more effective at spreading catch at higher population levels when the season bag limit is three or more fish. In low salmon population seasons when the proposed season bag limit would be one or two fish, the addition of a daily bag restriction of one or two fish respectively has very little impact on season harvest or the distribution of catch across the season.

Closed Areas

The issue of closing upper reaches of salmon rivers to salmon angling has been frequently raised in areas where upriver fishing remains available. All headwater salmon rivers where spawning is confined to small headwater spring-fed tributaries, close to salmon fishing in the mainstem at the end of February. The early closures compared to the remainder of the rivers, prevents salmon being taken in the spawning streams and in the mainstem reaches where they congregate prior to entering the spawning streams.

CSI Fish and Game Council has an Anglers Notice Policy that guides how it will resolve issues of availability of the fishery to anglers when fishery sustainability may be compromised. In summary this asks Council to consider the balance of opportunity so there is

a fair distribution of access to the fishery for all fishing methods and experiences. Where the combined harvest of all anglers threatens resource sustainability, harvest of all methods will be regulated in preference to restricting access. So that when times are hard, as they have been for salmon fishing for some time, harvest restrictions should be applied evenly to spread the hardship rather than target a particular angling method or area.

In summary, one of the benefits of application of the season bag limit is that it can reduce the need for other season, area and method regulations that make current fishing regulations complicated. The over-riding issue is control of harvest to meet spawning targets and provided fishing remains ethical and sporting, and the targets are met, where and when harvest occurs is less significant.

The draft Adaptive Management Strategy being developed by NC and CSI staff identifies the conditions on angler catch that could apply when the spawning population is within each of the threshold bands. These conditions would be aimed at increasing the number of fish that survive to spawn when the population is in a low abundance band or relaxing angling conditions when abundance is high (Table 2).

Table 2. Example of possible spawning population thresholds and the angling regulations triggered based on 26 years of record for Rangitata, Rakaia, and Waimakariri spawning numbers combined.

Spawning Thresholds	Season Bag	Daily Bag	Season Length	Above Gorge Bridges/Klondyke
less than 1,000	1	1	1 Oct-30 Apr	Closed
1,000-5,100	2	2	1 Oct-30 Apr	Open
5,100-7,800	4	2	1 Oct-30 Apr	Open
7,800+	10	2	1 Oct-30 Apr	Open

Although the exact minimum spawning threshold is likely to change as our understanding of minimum escapement targets improves, the objective is to maintain the spawning populations above the minimum threshold and to move toward a more transparent and responsive management system for setting harvest regulations.

Summary

Sea-run Chinook salmon are an iconic sports fish that generate incredible passion and commitment in the anglers who fish for them. In recent years, since about 2000, the sea-run salmon fishery has been very depressed at historically low levels and has shown little sign of prolonged recovery. In response to anglers' concerns around the state of the fishery, a salmon symposium was held December 2017, where local and international salmon experts presented their thoughts as to what may be contributing to the decline. A common concern was that the large, and in some cases increasing proportion of salmon caught by anglers during the period of depressed run size may prevent the fishery from taking advantage of favourable conditions at sea for recovery.

In a major change to the way angler harvest and its impact on spawning population size is managed, a new long-term strategy for setting regulations is being proposed. The objective is to protect wild salmon spawning numbers by setting thresholds for spawner numbers based on the 26-year historical range and minimum spawning population size. Between the

thresholds there are spawning population bands that have angler catch regulations associated with them.

Joint NC and CSI F&G staff and councillor meetings in 2019 discussed standardising salmon fishing conditions across the regions and the need to improve wild salmon spawning numbers. A result of this process was introduction of additional daily bag limit and season length restrictions that were predicted to reduce harvest across the two regions by about 18%. This reduction remained short of the 40% considered necessary given the state of the fishery and it was agreed that introduction of a season bag limit was the next step towards achieving the required control on harvest.

Introduction of a season catch limit has been recommended by scientists as the favoured regulation to reduce harvest and rebuild spawning numbers. A season limit bag offers a consistent and simple method to achieve staged spawning population targets. The simplicity arises from the need to change only the size of the bag limit to reach a target rather than a range of different season, area and timing conditions. The consistency is achieved from its equal application to all salmon anglers fishing all rivers.

The current state of the wild fishery demands further improvement in the spawning population size. Total spawning in the Waimakariri, Rakaia and Rangitata rivers last year was only 1,300 salmon and would likely justify application of a season bag limit of two fish. Access to a season bag as a control on harvest only became available in early 2020 and as a novel and significant control it will face potential administrative and acceptance issues in its early years. A period of adjustment particularly for anglers would be warranted and it is recommended a season bag limit of 4 salmon be introduced for 2020/21.

Recommendations

Subject to Council's adoption of recommendations 1. to 3., in the Central South Island Fish and Game Region –

- 4. The Open Season shall be 1 October 2020 to 30 April 2021**
- 5. The daily bag limit shall be two sea-run salmon**
- 6. Reinstate upriver mainstem and tributaries sea-run salmon spawning protections that existed prior to 2006 when the April closure was introduced i.e. –**
 - i. No licence holder shall fish for salmon in the Rangitata River and tributaries upstream of Turn Again Point and shown by white posts on the riverbank, between 1 March and 30 April.**
 - ii. No licence holder shall fish for salmon in the Waitaki River and its tributaries between the Waitaki Dam and the mouth of the Maerewhenua River between 1 April and 30 April.**

4.0 **Reduction in Lake Heron salmon bag limit**

4.1 Submitter
CSIFG Staff

4.2 Condition Requested
A daily bag limit of four sports fish for Lake Heron. Current size limits to be retained.

4.3 Current Conditions
Daily bag limit of 6 sports fish of which no more than 4 are to be trout.
(Potential for a daily bag limit of up to 6 salmon)
The minimum length for salmon shall be 250mm and the maximum length 450mm.

4.4 Recommendation

7. **Lake Heron daily bag limit be four sports fish. The minimum length for salmon killed in Lake Heron shall be 250mm and the maximum length shall be 450mm.**

4.5 Staff assessment (Hamish Stevens)

Lake Heron is a popular fishery that contains three species of sports fish namely chinook salmon, rainbow and brown trout. Current research has identified two life histories of Lake Heron chinook salmon - those that migrate to the ocean returning as sea-run adults or sea-run type, and those that remain in the lake or lake-type.

Sea-run salmon enter the Rakaia River between November and April, migrate up the Rakaia River and Lake Stream, arriving at Lake Heron in mid to late April where the majority school before entering Mellish Stream to spawn. Numbers of spawning sea-run salmon in the stream range between 150 and 500 fish annually. Spawning habitat is in short supply at Mellish Stream with approximately 200m of stream length with suitable spawning gravels available. Spawning habitat limitation results in a large amount of superimposition of redds even in years when returns are relatively low. In recognition of the importance of the Mellish Stream spawning run and the schooling behaviour of salmon in the lake prior to entering the stream, current regulations prohibit the harvest of sea-run salmon in Lake Heron through imposition of a 450mm maximum size limit and a closed season in Lake Stream.

Very little is known about the life history or the contribution lake-type salmon make to the returning run of salmon to Lake Heron. Central South Island Fish & Game is currently funding research to investigate this however unavoidable delays mean the project will not be completed in time to inform the 2020/21 Anglers Notice review.

Sea-run otoliths that were collected in 2018 have been aged and prepared for further analysis at a University laboratory. Age estimations for the 68 sea-run adults suggest nearly 40% are 4-year old and the remainder 3-year old, none have been identified as 2-year olds. The 4-year old and 3-year old fish appear to cover a similar size range 550-810mm in length and it is possible that the 4-year old fish had a significant period of freshwater rearing before entering the ocean. If true, this would go some way to explaining the similarities in size range observed between the two cohorts and suggests lake type rearing could be an important component of sea-run returns.

Sampling of angler caught lake-type chinook in 2018 suggested 2-year olds (200-250mm) and 3-year olds (350-450mm) made up the catch. In addition to the angler caught salmon 1-year olds were also present and likely to be less than 100mm in length. The contribution of different life history types to the returning sea-run adult population, is unknown. Identifying the proportions of two- and three-year-old lake-type chinook that migrate to sea and return as part of the sea run, is one of the key questions the current research project aims to answer.

Within Lake Heron three-year old lake-type salmon provide an important recreational fishery and it's common to see over 100 anglers targeting these fish on the opening of the High-Country fishing season in early November. The fishery has a significant opening day culture and is popular with families, many of whom have fished Lake Heron for generations. Lake-type chinook are an important component of Lake Heron's popularity, as they are not overly difficult to catch and are present in good numbers. It is important to note that current bag limit conditions for lake-type chinook have remained consistent for the past 30+ years. There are no records of lake-type fish spawning in or around Lake Heron and this is not uncommon among other South Island lake-type chinook populations. It is possible that spawning occurs undetected.

At present staff cannot advise Council with certainty in the management of this unique and important fishery. There is currently no evidence to support or reject a view that current harvest levels of lake-type chinook are unsustainable. There is no doubt anglers highly value the opportunities provided by the lake-type chinook fishery at Lake Heron. Against this we must balance the possible contribution of lake-type Lake Heron origin fish to the sea-run salmon fishery on the East Coast that is currently at historically low levels. Both regionally and nationally, Fish & Game New Zealand are concerned about the current state of the sea-run salmon fishery and various measures are being taken to improve sea-run salmon management.

Staff recommend that with the uncertainties around the importance of Lake Heron lake-type chinook to the sea-run population, and the highly valued fishery they provide, Council look to take a precautionary approach to allowing harvest of lake-type fish. In the past Council has introduced size restrictions that protect the returning sea-run chinook to Lake Heron. Further restriction on harvest of lake-type chinook is an additional step until more information is known about this fishery. Staff propose that the chinook salmon daily limit for Lake Heron be reduced from a maximum of six to four by reducing the sports fish daily bag limit to four. This would retain the ability for anglers to catch up to four trout. Current size limits that protect sea-run salmon remain valid and should be retained.

It is anticipated that the Lake Heron research project will be completed to a point where it would inform Council for the 2021/22 Anglers Notice review. At that time a full review of Lake Heron lake-type chinook management will have been completed and recommendations on any future harvest conditions if needed, will be made.

5.0 Tekapo Canal winter fishing

5.1 Submitter
CSIFG Staff

5.2 The staff report seeking a closed season for all sports fishing upstream of the SH8 Bridge on the Tekapo Canal from 1 June to 31 August 2021, was considered by Council at its 19 March meeting. Council resolved –

20-023 THAT COUNCIL RECEIVE THE REPORT ON THE UPPER TEKAPO CANAL TROUT HARVEST AND ANGLER USE SURVEY AND APPROVE ALL FIVE RECOMMENDATIONS SET OUT IN THE REPORT.

The recommendations were as follows:

1. Introduce a closed season for all sports fishing above the SH8 Bridge on the Tekapo Canal from 1 June to 31 August 2021.
2. Make no additional spawning season closures at the canal fishery for the 2020-2021 sports fishing season.
3. Repeat this survey during the trout spawning season of 2020 and include the Month of May to better capture brown trout spawning.
4. Proactively promote best practice catch and release techniques targeted to canal anglers before and during the spawning season fishing opportunities.
5. Produce a scoping document that identifies options for long-term management of sustainable hydro-canal trout and salmon populations in the recreational interests of anglers.

There is no need for Council to reconsider this issue. The staff report is reproduced in this Anglers Notice review as Appendix 4 to complete the record of Council considerations and to provide a complete record of all 2020/21 Angler Notice information.

6.0 Upper Ohau River spring season opening

6.1 Submitter
CSIFG Staff

6.2 Condition Requested
The 2021 spring season runs from 1 October to the start of the High Country season on the first Saturday in November. This will delay the opening of the season to a month later than current

6.3 Current Conditions
The 2020 spring season runs from 1 September to the start of the High Country season on the first Saturday in November.

6.4 Recommendation for Anglers Notice 2020/21

8. **Notify a 1 October 2020 to 30 April 2021 open season for the upper Ohau River.**

Note: this recommended season represents a precautionary approach to managing potential over-use by closing the September 2021 part of the spring season and provides time to further assess the ongoing sustainability of upper Ohau River spring season fishery subject to a creel survey undertaken during the 2020 spring season.

Also note that as provided in the 2019/20 and 2020/21 Operational Work Plans -

- 1. Staff will repeat the 2019 creel survey in the 2020 September and October spring season and subject to results will identify options for managing angler use including management as a controlled fishery.*
- 2. Staff will continue to maintain the existing enhanced spawning habitat and work with Meridian Energy to enhance additional areas of spawning habitat.*
- 3. Staff will continue to undertake annual spawning surveys.*

6.5 Staff assessment (Rhys Adams)

Background

Prior to the construction of the Ohau chain of power stations, associated structures and waterways in the 1970's and 1980's, the Ohau River sustained an internationally renowned trout fishery with a natural flow regime. Earnest attempts were made to restore the river fishery in the newly severed upper section between Lakes Ohau and Ruataniwha post power scheme construction. The power company of the time worked with fishery experts to identify the required flows for trout spawning and rearing and for providing trout fishing conditions. Seasonal residual flows of between 12m³/s & 8m³/s were restored in 1993. The restored flows were significantly reduced from natural flows yet were predicted to maintain optimal trout fishery habitat.

The fishery did not re-establish to the expectation of fishery managers and anglers. Monitoring of flow restoration and fishery dynamics has shown the fishery to be depressed. A reduction in high flow events and the presence of silt, periphyton and didymo does not provide a food source that sustains a trout population befitting the river.

The river is valued as a component of the greater upper Waitaki fishery but significantly underperforms as a summer angling destination, holding only low numbers of adult fish and nuisance levels of didymo. The upper river's recent value is associated with its spawning run fishing opportunities and potential support roles its trout spawning habitat makes to recruitment for interconnected fisheries of Lake Ruataniwha and the Ohau B Canal.

Spawning surveys undertaken by CSI over the 2016 and 2017 spawning seasons established that many of the prime spawning areas are used repeatedly by trout throughout the May to October period and that many of those fish are trophy-sized trout originating from Ohau B Canal. Brown trout mainly spawn from May to August and rainbows from June to October. These surveys provided evidence that the size of the spawning run is greater than the spawning habitat available. In other words, the river is spawning habitat limited.

By September most spawning gravels have been utilised and any subsequent spawning risks destroying established redds and killing the developing eggs and alevins from earlier spawning. In effect, spawning that occurs from September onwards is unlikely to add significant value to the overall annual spawning production. By October, most trout have finished spawning and returned to Lake Ruataniwha or the Ohau B Canal, leaving only the occasional resident fish and a diminishing number of late spawners through to November.

To increase the productivity of spawning in the river Central South Island Fish & Game (CSI) partnered with Meridian Energy Limited (Meridian) to enhance spawning habitat. The first stage of the project completed in May 2019 was creation of an enhanced spawning braid. During the winter of 2019, a rare flood washed most the enhanced gravels out of the braid. The gravels were deposited in a shallow run a short distance downstream where they provided about 500m² of suitable spawning habitat. The introduction of gravels was a qualified success and increased the redds counted in the area from an average of 6 in previous years to 49 in 2019.

Prior to 2018, the upper Ohau River fishing season opened as a 'High-Country' waterway on the first Saturday of November and closed at the end of the regular summer season on April 30. This season gave anglers underwhelming opportunity to target low populations of resident adult trout and the occasional early-run brown trout in late April and post-spawning rainbow trout in early November. Additional to these opportunities, anglers targeted winter fishing at the river mouth for trout congregating in Lake Ruataniwha prior to running into the upper Ohau River to spawn.

CSI introduced a new fishing season initiative in 2018 on the upper Ohau River. The new 'spring- season' was designed to provide the opportunity for fly and spin anglers to regain the river fishing opportunities lost by the construction of the hydro scheme and utilise the Ohau River fishery while good numbers of rainbow trout were present. It was intended the season would re-establish a valued fishery in the river by allowing large canal-origin trout to be caught in a semi-natural river environment after all brown trout spawning and two-thirds of rainbow trout spawning had occurred. Introduction of the spring fishing season was dependent on demonstrable spawning enhancement success compensating for negative impacts on juvenile trout recruitment from allowing anglers to harvest or temporarily interrupt spawning rainbow in the new spring-season.

The timing of the review of angling regulations and the standard Fish & Game year being October to September required the river to open on the 1st of October 2018 followed by a 1st of September opening in 2019. The regulations applied were a 2 trout daily bag limit and methods restricted to fly and spin only.

To gain further information and assess the potential for any unsustainable catch or inappropriate angling practices to take place or develop, specific ranging and creel surveys were undertaken in October 2018, the transition to a spring-season, and in the following year - September and October 2019, the first full spring-season.

This report summarises the results of that survey and provides recommendations for the future management of the spring-season.

Method

In 2018, ranging on opening day of the October season resulted in encountering six anglers only. The anglers had mixed success, some found the terrain and fishing tough while one angler was very happy after catching an 8-pound rainbow. No further assessment of October 2018 fishing at the upper Ohau River was made.

In the following year intensive creel surveys of the upper Ohau fishery were completed during the first full September and October spring-season. Angling information was collected to assess angler usage, angler interactions, angler perceptions, trout catch and trout harvest. In 2019, the survey dates were stratified to capture the anticipated angler use variation throughout September and October, and targeted Opening Day, weekends and weekdays. Due to survey design and staff resourcing constraints, not all survey dates were randomised. There was an inherent bias towards days with weather and water conditions considered good for fishing in this survey as staff wanted to ensure they captured catch and harvest data rather than travel to and from Temuka to gain no information of angling activity during un-fishable weather.

On up to 8 occasions on each survey day all access and river viewpoints were visited in a circuit to estimate a count of anglers on the river during daylight hours. Whenever an angler could be approached a field interview was completed, involving a licence and regulation compliance check and the collection of the anglers contact details. If an angler had completed their day's fishing, a full interview was completed in the field. If an angler was still fishing at the time of the encounter, a follow-up phone interview was undertaken within 24 hours from the angler completing their fishing.

Angler information and feedback was collected including: time spent fishing, method, catch, whether catch was harvested or released, size of fish, angler encounters, satisfaction with the experience, general comments about their intent to return to fish and their thoughts on the opportunities provided by the upper Ohau fishery spring-season.

CSI staff were not present on the river during all daylight hours and there is a possibility that anglers who only fished for a short time around dusk and dawn were not encountered. Estimates on the number of anglers were made to account for the fact that on occasion vehicles were found but no anglers were observed, or occasionally angling parties that were interviewed reported they had observed other anglers that were not evidently encountered by staff.

When a party of multiple anglers was encountered a spokesperson was selected as the point of contact for the follow up interview. The catch and harvest data were accurately recorded for each individual angler. In a small number of cases, it is likely the information relating to the perceptions and commentary obtained only reflected the opinion of the party spokesperson rather than a consensus of party members.

Results

Five survey days were completed in September and four in October (Table 1). In total 69 field interviews were completed. Estimated daily angler numbers ranged from 3 to 24 anglers. The fishing conditions were considered “good” or “OK” on each survey day based on each staff member’s opinion of overall weather and water conditions. The results of the survey reflect only a ‘good fishing conditions’ index of angling throughout the spring-season. It is likely that during poor conditions there would be none or very few anglers. Most anglers were sight-fishing and would naturally be averse to fishing in high-wind and rain as it would make spotting trout and casting difficult.

On Wednesday 25th September, a spawning survey was undertaken on the river over a three-hour period. The conditions were considered generally poor for fishing with gusty winds. No anglers were encountered that day. This survey supports the view that these weather conditions sustained negligible fishing activity.

Table 1. Surveys schedule, surveyor effort and angler count observations from the spring-season 2019, upper Ohau River Creel Survey.

Date	Day	Anglers Observed	Anglers interviewed	Estimate of total anglers	Survey start and finish times	Rangers hours on river	General fishing condition
1/09/2019	Sunday	22	22	24	0900-1630	7.5	good
5/09/2019	Thursday	4	4	4	1000-1530	5.5	good
10/09/2019	Tuesday	5	5	7	0850-1645	8	good
21/09/2019	Saturday	10	8	10	0830-1700	7.5	good
27/09/2019	Friday	11	10	11	0900-1730	5.5	good
6/10/2019	Sunday	6	6	6	0930-1745	6.25	good
8/10/2019	Tuesday	5	5	5	0845-1700	2.75	good
19/10/2019	Saturday	9	8	9	0840-1700	4.8	good
31/10/2019	Thursday	1	1	3	0900-1600	3.5	OK

The 1st September 2019, opening on the upper Ohau River was not actively advertised within Fish & Game media in the lead-in to the opening but still attracted the highest use of any day within the survey period (Table 1). The relative high use of opening day indicated that it was a targeted event by those anglers who likely read about the new season initiative a year earlier. The initiative was featured in the CSI section of Fish & Game Magazine special issue 47 and covered in CSI’s Weekly Fishing Report as a ranging report of the previous October opening in 2018.

Catch and harvest

Anglers provided 63 complete daily catch and effort records from 69 angler interviews spanning 9 survey days during the spring-season. It was estimated that a total additional 10 anglers fished the river during the survey days that were not interviewed making the total estimated daily angler use of 79 days. A full summary table of survey date and survey period angler use, catch and harvest estimates are found in Attachment 1.

Individual daily angler catches ranged from 0 to 9 trout. On opening day, 1 September, total estimated angler catch was 52.4 trout landed by 24 anglers. The remaining 8 survey days total estimated catch ranged from no fish caught to 23.8. Estimated total catch for all anglers on all nine survey days combined was 148.1 trout.

On 6 of 9 survey days no trout harvest (fish kept) was recorded. On the three survey dates harvest was recorded, it is estimated harvest for all anglers totalled 1, 4 and 8.7 trout, respectively. The highest harvest on one day occurred on opening day (8.7 trout).

Across survey dates, the proportion of the total daily catch harvested varied from none to 33%. The overall average daily proportion of the catch that was harvested was 7.3%, or about 1 trout kept for every 13 released. Alternatively, on average 92.7% of trout were released back to the water. Estimated total harvest for all anglers on all 9 survey days combined was 13.7 trout.

Size and assemblage of the catch

Of the 69 anglers interviewed over the survey, 39 provided full records of the estimated size of all fish caught in pounds. The complete size-of-catch records were summarised to provide an unbiased record of the size and species assemblage of the catch (Table 2).

Table 2. The number, species compositions and summarised size statistics of trout caught by anglers who provided complete size-of-catch records during 2019 spring-season.

Species	Number caught	Species proportion	Average of size (lb)	Min of size (lb)	Max of size (lb)	Catch less than 2 lb	Catch between 2 and 9.9lb	Catch 10 lb or larger+
Brown	11	10.5%	1.5	0.5	4.5	73%	27%	0%
Rainbow	94	89.5%	8.5	0.5	20.5	10%	46%	45%
Total	105		7.8	0.5	20.5	16%	44%	40%

Rainbow trout dominated the spring-season catch (89.5%) and were notably bigger than brown trout. Brown trout appeared to be of a size common to New Zealand fisheries with the largest being recorded at only 4.5 pound. Rainbow trout were much bigger and at sizes expected from canal-origin fish, averaging over 8 pounds with a maximum size of around 20 pounds and 40% being 10-pounds or larger.

Angling methods

There was a nearly even split of methods with 45% of anglers spin fishing, 46% of anglers fly fishing and 9% fishing with both methods on the same day.

Angler encounters

To assess the potential angler conflict to arise due to over-crowding of anglers during the season, angling parties were asked how many anglers who were not in their party, did they encounter and how that impacted on their experience.

On opening day, 1st September, 10 angling parties reported encountering between 0 and 10 other anglers. Parties reported that their angler encounters had either a “positive” (4 parties) or “neutral” (6 parties) impact on their fishing experience.

For the remaining 6 survey days of the season, 14 angling parties reported encountering between 0 and 4 anglers on their day fishing. Parties reported that their angler encounters had either a “positive” (8 parties) or “neutral” (6 parties) impact on their fishing experience.

No parties reported encounters with other anglers causing a “negative” impact on their fishing experience.

To summarise the reasoning behind their classification of impact, “positive” impacts were reported where angling parties encountered no anglers or when encountering anglers, they enjoyed or benefitted from the brief interaction with them. Angling parties that reported “neutral” impact, generally either worked in with other anglers or managed to avoid them in order to find enough water for both parties to fish unaffected.

Rating the angling experience

All interviewed anglers or angling party spokespersons were given the opportunity to rate their overall satisfaction with their day fishing on the upper Oahu River. Some anglers were interviewed multiple times during the survey and were given the opportunity to comment on each occasion. Fifty responses were recorded. Most anglers rated their day “very satisfied” (64%), some anglers were “satisfied” (26%) and a relatively small number rated their experience as “neutral” (10%). No anglers rated their experience as “unsatisfied”.

In summary the high satisfaction ratings were based on the quality of the fishing, the large fish, and the scenic surrounding. The “neutral” ratings were based on previously experiencing better fishing success at the same river and for not catching any fish on the day.

Angler perceptions of the spring-season

All interviewed anglers or angling party spokespersons were given the opportunity to comment generally on the opportunity provided by the new spring-season (September / October) on the upper Ohau River. Some anglers were interviewed multiple times during the survey and were given the opportunity to comment on each occasion. In summary, anglers appreciated the opportunity and experience offered by fishing when it is not traditionally available. They considered the fishery as enhanced by the canal system rather than a wild fishery and they were keen to see the spring-season continued, provided spawning was enhanced and their interaction with spawning fish can be managed sustainably.

A full list of responses is available in Attachment 2 of this report.

General field observations

Anglers tended to fish short sections of the river and target congregations of fish, often associated with notable areas of spawning redds. The difficulty traversing the large slippery boulders, limited safe crossing points and thorn riddled riparian vegetation also facilitated only fishing short sections of river. Although the entire length of the river was fished, there were favoured sections, especially by anglers who returned to fish the river on more than one occasion.

The fishing appeared to be more productive in September and although October still provided for many highly satisfied anglers the fish number and catchability appeared to reduce notably. Some anglers reported that there was still the occasional canal trout in the river in early November 2018.

There were essentially no negative angler interactions because anglers, by and large, did not actively compete for the same fishing areas. There was ample space to spread out to alternative spots if a favourite area was already occupied. Anglers appeared to favour fishing the river in a traditional sight-fishing style with early to mid-morning starts and mid-afternoon finishes.

It is CSI staff opinion that the river provides very challenging fishing as the riparian terrain, slippery didymo covered boulders and challenging sight fishing conditions make for tricky fishing. Add to that the frustration involved with trying to avoid hooking didymo and subsequently unhooking it when fouling lures and flies.

It is a fishery that mainly suits physically capable intermediate to expert level anglers who enjoy the challenge of fishing boulder rivers. It also attracts anglers who are willing to tolerate the challenge of the terrain to secure a very large fish. There is a large component of the angling community who will much prefer the easy access fishing options available nearby in the Twizel area once they have experienced the challenging fishing on offer in the upper Ohau River.

Word of mouth rather than active promotion seemed to result in a steady stream of newcomers to the river throughout the spring-season. There was very little conspicuous social media activity exposing the new opportunity by anglers, however towards the end of October a prominent YouTube influencer produced a video on the experience and although the angler did not name the river it was evident from the backdrop and likely canal origin of the fish that the upper Ohau River was the only place it could be. The spring-season is likely to make a more explicit appearance on the social media platforms of “influencer” anglers during the 2020 season which will increase its popularity, especially internationally.

Discussion

This survey has established that the September-October 2019 spring-season on the upper Ohau River provided a highly valued and satisfying fishing experience. This validates the efforts of CSI and Meridian to invest in spawning habitat enhancement and to introduce the unique spring-season. The key to the success of the spring-season was to allow anglers to access trout of extreme size that originate from the canals in a semi-natural river habitat. Without the spring-season the upper Ohau River would retain its spawning values but continue to offer a depressed fishing experience.

The levels of angler use encountered over the 9 stratified survey days did not cause any conflict and the levels of catch (approximately 148 trout) and harvest (approximately 14 trout) appeared to be modest with most fish (92.7%) being released.

A total spring-season catch or harvest estimate was not made as it was considered likely to provide an unreliable estimate. This is because the survey days were not all randomised and are biased towards fair-weather. To simply scale-up the data represent the total period would likely provide an appreciable overestimate of spring-season catch and harvest. The opinions and recommendations of staff have been formed by reviewing the 9 stratified survey dates as a fair-weather index of the spring-season angling dynamics. It is assumed that on days with poor general weather for fishing that catch and harvest levels would be lower than what was observed in this survey, which occurred on only days considered either “good” or “OK” fishing conditions.

If the 2019 September-October spring-season levels of angler use, catch and harvest were maintained in future seasons, CSI staff would consider the spring-season sustainable. This assessment would be conditional on maintaining the existing spawning enhancement programme and annual monitoring of the spawning population.

The fish caught and harvested during the spring-season should generally be considered a component of the spawning run of Lake Ruataniwha and the Ohau B Canal. The spring-season has provided an additional, novel and highly regarded way to fish for the resident trout of Lake Ruataniwha and the Ohau B Canal. For some anglers who do not like the aesthetics of the canals, this is their opportunity to sight-fish extremely large trout in a semi-natural river fishery.

The new opportunity provided at the upper Ohau River could reduce the opportunities for anglers at Lake Ruataniwha and the Ohau B Canal if catch and harvest levels were too high. Staff are of the opinion that this is not currently the case and the catch and harvest levels observed on survey dates in the 2019 spring-season were modest and insignificant, respectively.

Lake Ruataniwha and the Ohau B Canal sustain resilient fisheries with varied river, lake and canal habitat that supports all trout life stages and has a ready supply of supplementary food from the two salmon farms operating in the Ohau B Canal. These fisheries also have multiple sources of recruitment and do not rely on the upper Ohau River trout spawning alone for their recruitment. Trout migrate downstream into these waterways from Lake Ohau via the Ohau weir and from lakes Pukaki and Ohau via the canal system.

It is also unlikely that the impact of 2019 spring-season harvest of upper Ohau River trout negatively affected recruitment to downstream fisheries. The available spawning gravels in the upper Ohau River continued to be fully utilised and spawning habitat enhancement produced additional recruitment by increasing the area and quality of spawning gravels to offset harvest of spawning fish.

There is little doubt in the minds of CSI staff and some anglers interviewed that the future popularity of the upper Ohau River spring-season will exceed that observed during the 2019 survey. The fishing opportunity in 2019 was not actively promoted by CSI in the lead-in to this survey period and angling-community knowledge of the opportunity grew throughout the season, mainly through word of mouth and to a limited extent via social media. Whether or

not CSI choose to actively promote the upcoming 2020 season or not, there will be an increase in its use.

Fishing conditions for the 2020 spring-season covering 1 to 30 September 2020 are already in place and were gazetted in June 2019. Council's current review of the CSI Region's Anglers Notice is for the period 1 October 2020 to 30 September 2021. Further, the current Anglers Notice review for the upper Ohau River covers that part of the upper Ohau 2020 spring-season starting 1 October and finishing 31 October 2020, then the normal season of 1 November 2020 to 30 April 2021, and for the first month of the 2021 spring-season - 1 September to 30 September 2021. The only change Council can make to the 2020 spring-season in the current Anglers Notice time frame is to close October 2020. This would create an unusual situation of the fishery being open in September, closed in October, then open again in November.

If angling conditions remain as they are for the 2020 spring-season this provides the opportunity to assess the sustainability of the spring fishery under predicted increased fishing pressure and possibly higher harvest. The 2020 season should represent future angling dynamics much more accurately than did the 2019 season with its limited promotion.

There is a possibility that with further exposure and promotion of the fishery during the 2020 spring-season, that angler usage and catch of the following 2021 spring-season could reach levels that are considered unsustainable and angler conflict could cause dissatisfaction with the fishing experience. The assessment of the likelihood of that happening can only be made by repeating the 2019 survey reported here, during the upcoming 2020 spring-season.

Given staff concern at the potential for angler use and catch in September 2021 to reach unsustainable levels and anglers to become unsatisfied with the experience it is recommend that for the spring-season of 2021, a precautionary approach is taken and the month of September 2021 is closed to fishing in the upper Ohau River. Subject to results of the spring 2020 season survey it may be that our concerns of high catch and harvest are allayed, and Council may consider reinstating September at the next opportunity.

Staff recommend retaining the October 2021 part of the spring-season to maintain a highly valued opportunity. The 2016 and 2017 spawning surveys indicate that most fish have returned to Lake Ruataniwha and the Ohau B Canal by early October and a relatively small proportion of the rainbow trout spawning run remains available to anglers. Staff believe that by maintaining October 2021 component of the spring-season, it is unlikely that this fishery will be subject to unsustainable catch or harvest.

If monitoring of the 2020 spring-season results in the assessment that angling opportunities should be restricted, then all management options should be explored in an effort to maintain a sustainable and satisfactory spring-season that retains spawning run fishing options. Traditional and novel ways to manage potential over-use in future should be considered thoroughly including but not limited to management by designating the waterway a Controlled Fishery. Controlled fisheries are approved under current legislation and are already in place in other Fish & Game Regions where angler use is controlled through a permit system. Although a Controlled Fishery requires resourcing for administration and enforcement, it offers an appropriate tool for monitoring and maintaining the highly valued fishing experience under pressure from increasing popularity.

A further support mechanism for maintaining the spring-season under increased angler use would be to create new spawning enhancement sites that increase recruitment of trout in the Upper Ohau River, Lake Ruataniwha and Ohau B Canal systems.

Attachment 1

Summary table of 9 survey dates data from the 2019 spring-season creel survey of the upper Ohau River including recorded and estimated angler use, and angler catch and harvest. "trout" means combined brown and rainbow trout.

Survey date	Estimated total anglers	Number of interviewed anglers	Number of anglers providing full catch and effort records	Minimum trout landed per angler	Maximum trout landed per angler	Average number of trout landed per angler	Average catch rate (trout/hour)	Sum of recorded trout landed	Estimated total angler's total trout landed	Average number of trout harvested per angler	Sum of recorded trout harvest	percentage of catch harvested	Estimated total angler's total trout harvested
1-Sep	24	22	22	0	9	2.2	0.5	48	52.4	0.36	8	16.7	8.7
5-Sep	4	4	4	0	1	0.8	1.1	3	3.0	0.25	1	33.3	1.0
10-Sep	7	5	2	2	3	2.5	0.3	5	17.5	0.00	0	0.0	0.0
21-Sep	10	8	5	0	9	2.2	0.2	13	23.8	0.40	2	15.4	4.0
27-Sep	11	10	10	0	6	1.9	0.3	19	20.9	0.00	0	0.0	0.0
6-Oct	6	6	6	0	5	1.3	0.4	8	8.0	0.00	0	0.0	0.0
8-Oct	5	5	5	0	0	0.0	0.0	0	0.0	0.00	0	0.0	0.0
19-Oct	9	8	8	0	3	0.5	0.1	4	4.5	0.00	0	0.0	0.0
31-Oct	3	1	1	6	6	6.0	1.0	6	18.0	0.00	0	0.0	0.0
Survey dates totals	79	69	63	0	9	1.7	0.4	106	148.1	0.17	11	7.3	13.7

Attachment 2.

Responses to the survey question: *“Fish & Game is interested to hear if you have any other comments regarding the opportunity provided by the new September / October season on the upper Ohau River”.*

1/09/2019	happy in the knowledge more spawning redds being constructed by F&G to help with sustainability, not wild fishery rather a by-product of the salmon farm, Great idea for the season thanks F&G
1/09/2019	The reason Fish & Game have opened the season early makes good sense
1/09/2019	pot hunting - any good condition fish would be harvested
1/09/2019	great to have the opportunity for fly fishing to have a realistic chance of catching a canal size fish
1/09/2019	concerned about lack of spawning gravels so want F&G to introduce more to help with sustainability
1/09/2019	worried people could be poaching pre-season
1/09/2019	Think it's a great idea - happy with new season, saw the article in last years F&G Magazine and made a trip of it for a new experience. Wouldn't fish canal but would fish for canal fish in river.
1/09/2019	Fantastic opportunity - there is bugger all fish in the river in summer. I fished the river 20 years ago and remember it being hard fishing.
1/09/2019	Good to have September Option with 1 October upcoming - positive about the opportunity
1/09/2019	Rapt for October, now we have September - you beauty.
5/09/2019	Think its great F&G give anglers an opportunity to fish for these fish when they are there. When the season normally opens there are no fish in the river. great job F&G
10/09/2019	Positive, provides winter opportunity, happy about spawning enhancement.
21/09/2019	Very Unique, think it will become much more used when more people hear about it, Best flyfishing Alan has ever had in 30 years flyfishing, likely to need further management of anglers.
21/09/2019	Great opportunity, Great River and challenging
21/09/2019	2 sections may need angling restricted as spawning is prevalent, not great fighting fish, would support Fly only and C&R in Sept/Oct, Would support October only fishing.
21/09/2019	Great thing, get away from everyone
21/09/2019	Fish not easy to catch spin fishing
27/09/2019	New to me, keen to see the potential - interested to hear the survey statistics
27/09/2019	nice to be able to fish it for a longer season
27/09/2019	haven't really got comment but wouldn't like to see it overfished
27/09/2019	Great idea if it can be controlled, C&R good idea.
27/09/2019	compared to opening day only 10% of fish left
6/10/2019	All good awesome job on the season
6/10/2019	Been a great thing for me. Concerned about how others may utilise fishery i.e. take fish unsuitable for eating. General greedy people. (I) won't be publicising fishery at all.
6/10/2019	Good to see Fish & Game out monitoring and great place to fish
8/10/2019	Very Good idea, enhanced spawning is good, world class fishery
8/10/2019	Its excellent but reservations about spawning fish - would never kill one.

19/10/2019	First year fished it, its great, be cool to see it remain open for September
19/10/2019	no change - protect fishery
19/10/2019	I am super fortunate to have the opportunity- next time I'll fish from the top down
19/10/2019	no change, great
31/10/2019	Great Idea - cool to have unique fishery - will encourage visitors - look forward to coming back - needs to be flooded, huge asset.

APPENDIX 1

Petition 1

We the undersigned request a change to the Central South Island fishing regulations to prohibit the fishing for and the taking of salmon above the RDR intake at Klondyke on the upper Rangitata River effective 1st December to 31st March 2021.

Note to above – Reasons for request

To protect and increase the number of spawning salmon in the headwaters of the Rangitata River adjacent to the spawning streams until such time as records and data gathered would indicate an improvement in the number of salmon returning to spawn.

In summary this request would be an important part of a sound management strategy to enhance and reinstate the wild run of salmon in the Rangitata River.

Name	Address	Valid licence Yes/No
Gary Strachan	233 Dobson St Ashburton	Y
Richard Fridd	667 Dromore Methven	N
Finnian Cleary	162 Station Rd	N
Bryan Craig-Parker	27 Charlcott St Christchurch	Y
Jan Craig -Parker	27 Charlcott St Christchurch	N
David Johnstone	11 Constable Pl Christchurch	Y
Gavin Garlick	369 Wrens Rd Ashburton	Y
Linda Glos (?)	369 Wrens Rd Ashburton	Y
Shirley Strachan	233 Dobson St Ashburton	N
Hughie Morchie	54 Aitkens St Ashburton	Y
Trevor Isitt	63 Englefield Rd Christchurch	Y
Gary Webb	19 Coniston Dr	Y
Otuo Dungey	2/14 Ascot Pl	Y
Lester Dungey	23 Church St Ashburton	Y
Mark Preston	48 Ansonby St Christchurch	Y
Grant Glassey	5A Suffolk St	Y
Chris Glassey	5A Suffolk St	Y
Don Heslewood	4 Te awa Ave	N
Michael Moir	17 Elizabeth St	Y
Gillian Mcloy-lang	369 Wrens Rd Coldstream	Y
Paul Boon	55 Ludlow Drive	Y
Libby Ross	14 Baker St	N
Cole Beeman	111 Methven Highway	Y
Kaye Whiting	8 Kerr St Ashburton	N
Chris Helem	3 Bridge St Rakaia	Y
Vanessa McElroy	1 Beatty Cre Ashburton	Y
Litisha Harley	133 Kermode St Ashburton	Y
Allan Storrie	332 Havelock	N
Sue Brocherie	17 Elizabeth St Rangiora	Y
David ??eval	21 B Oak Grove	Y
P McG??	68 Grahams Rd	Y
Cameron McCormick	103 McMurdo St	Y
E J Riley	16 Seagrave Pl Christchurch	Y
Alan Lowe	106 Belt Rd Ashburton	Y
Dave Allan	5 Millichamp St Ashburton	Y

Name	Address	Valid licence Yes/No
Shane McCallister	233 Fleming Rd Ashburton	Y
G Hodgson	173 Harland St Ashburton	Y
T King	5 Heffora Pl Ashburton	Y
R Strachan	76 Nursery Dr Tinwald	Y
N Fegan	164 Chalmers Ave	Y
B R Chamberlain	9 Waterford Pl Tinwald	Y
Darren Bird	14 Aitken St Ashburton	Y
B R Tarbotton	65 Grove St Ashburton	Y
G Tarbotton	65 Grove St Ashburton	Y
Korry Chiders	87 Thomson St Ashburton	Y
Noel McKenna	87 Thomson St Ashburton	Y
Lee Frewen	25 Harrison St Ashburton	Y
Jason Strachan	25 Harrison St Ashburton	Y
Neil Daois	115 Burwood Rd	Y
Linda Penman	PO Box 22057 Christchurch	N
Debbie Hansen	3/369 Wrens Rd Ashburton	N
Sandy Gottermeyer	196 Easterbrook Rd Kaiapoi	N
Lisa Bird	14 Aitken St Ashburton	N
Graham Larson	9 Begonia Lan	Y
Maree Larson	9 Begonia Lan	N
Michael Jones	142 Le Cren St	Y
Trevor Nolan	66 Ormsby St Temuka	Y
Geoff Andrews	68 Cox St Geraldine	Y
Renshe Tepstra	8D Renoir Dr	Y
Yaye Gledhill	8D Renoir Dr	Y
Robin Austin	6 Mountainview Rd	Y
Rob Lones	2/5 Horton St Pleasant Point	Y
Jenny Jones	2/5 Horton St Pleasant Point	Y
Craig Ross	73 Churchill Ave Palmerston	Y
Blue Rooney	43 Guise St Temuka	Y
Winston Reece	10 Rapke St	Y
Norm Anderson	8 Regency Christchurch	Y
Graham Sanson	10 Flemington Ave Christchurch	Y
Leon Burdett	39 Glencairn St	Y
Max Carrington	86 Spencer Rd Rotorua	Y
Sandra Carrington	86 Spencer Rd Rotorua	Y
Evan Carter	27 Trafalgar St Timaru	Y
Colin Heard	770 SH30 Rotorua	Y
Suzie Dallas	11a Flanders Av Napier	Y
Dave Herring	??? Merrin St Christchurch	N
Peter Boulton	25B Fairview Rd Timaru	Y
Fiona Boulton	25B Fairview Rd Timaru	Y
Clive Gilbert	121 Brookfield Av Timaru	Y
Blair Arthur	43 Guy Rd Mosgiel	Y
Kaye Arthur	43 Guy Rd Mosgiel	Y
Stuart McLeod	61 Seven Oaks Dr Christchurch	Y
Andrea McLeod	61 Seven Oaks Dr Christchurch	Y
Alan Cooper	1 Wyn St Christchurch	Y

Name	Address	Valid licence Yes/No
Alister Foster	480 Orari Station Rd Geraldine	Y
Thai Ong	48 Rangitata Huts Rd	Y
Julian Clark	39 Smarts Rd Christchurch	Y
Brant Keeley	144 Levi Rd Rolleston	Y
Mike Stickings	17 Cross St ??	Y
Jim Whipp	74a Brynley St Hornby	Y
A Brooks	19B Cracroft Tce Christchurch	Y
Chris Burt	113 Johnstons Rd ???	Y
Mike Hawke	12 Bellbird Pl Rolleston	Y
Mike Lumb	5 Hurunui Dr Napier	Y
Frank Lumb	76 Barker Rd Napier	Y
Warren Stratford	550 Temuka Orari HW	N
Dave Larner	10 ?? Rd Outram	Y
Derek Davies	47 Cottonwood St Christchurch	Y
Hugh Walker	18 Carrington Clse Lincoln	Y
Julie Walker	18 Carrington Clse Lincoln	Y
Brian Donaldson	75 Ravelston St Dunedin	Y
Wayne Bradley	17 ??	Y
Brian Palmer	3 St Thomas Pl Christchurch	Y
Basil Millar	Middle Swamp Rd Temuka	Y
Bruce Wallace	89 Murray St Temuka	Y
??	6 Woodley Ave Twizel	Y
??	82/150 Rangitata Huts Rd	N
Colin Wilson	72/150 Rangitata Huts Rd	Y
Bob Mortimer	Hut 61 South Rangitata	Y
Allison Mortimer	Hut 61 South Rangitata	N
Jackson ormandy	Kurow	N
Bill Whipp	Hut 66 Rangitata	N
Linda Whipp	Hut 66 Rangitata	Y
Shorty Longman	15 Waitaki St Timaru	Y
Maurice Langley	8 Shaftsbury St Christchurch	Y
Illona Langley	8 Shaftsbury St Christchurch	Y
Arthur Morrison	28 ?? Cres Christchurch	y
Tony Karon	Hut 15 Rangitata south	Y
Jeremy Boulton	268 Fairview Rd	Y
Paige Bowman	48 South Belt	Y
Lindsay Wilson	Rangitata Huts Rd	Y
Christopher Tew	119a Creek Rd Ashburton	Y
Judith Tew	119a Creek Rd Ashburton	N
George Nicholson	12/150 Rangitata Huts Rd	N
Russell Wood	27/150 Rangitata Huts Rd	Y
David ????	72/150 Rangitata Huts Rd	N
Graham Parnell	15 Leeston Rd Springston	Y
Suzanne Parnell	15 Leeston Rd Springston	Y
Ted Mugford	4 Rd Christchurch	Y
Ian Jenkins	406 Wai Iti Rd Timaru	Y
Paul McKenzie	Hut 76 Rangitata	Y
A Allan	29 Bidwill St	Y

Name	Address	Valid Licence Y/N
P J Ritchie	76 Rangitata Huts Rd	Y
Mary Mugford	84 Hayes Rd Christchurch	Y
Bruce Harbourne	8/150 Rangitata Huts Rd	Y
Barry Clark	Lake Tekapo	Y
Vivienne Wood	37/150 Rangitata Huts Rd	N
T Prescott	45/150 Rangitata Huts Rd	N
B Wilson	3/150 Rangitata Huts Rd	N
Ray Hill	1/150 Rangitata Huts Rd	Y
Grant Rooney	44 Wallingford Rd Temuka	Y
Harold Pateman	93 Morgans Rd Timaru	Y
Jeanette Pateman	93 Morgans Rd Timaru	N
David Pettersen	33A Hayhurst St Temuka	Y
Kevin Alfield	14 Ocean View Pl	Y
Graeme Cave	3 Ocean View Pl	Y
Linda Cave	3 Ocean View Pl	N
Paul Stewart	74 pacific Dr	Y
Allan Butterworth	42 Pacific Dr	Y
Phil Wright	97 Pacific Dr	Y
A Patterson	44 Ocean View Pl	Y
Dougal Robertson	1004 Springs Rd	Y
Kate Patterson	6 Ocean View Rd	Y
Terry White	Payne Cres	Y
??	25 OceanView Pl	Y
Mike Cuddihy	91 Pacific Dr	Y
Pat Curry	22 OceanView Pl	Y
Kevin Allan	32 Ocean View Pl	Y
Peter Tr????	32 Pacific Dr	Y
Rob Allan	75 Beechcroft Rd	Y
Ken Hemmingway	34 Pacific Dr	Y
J ??	83 Pacific Dr	Y
Gill Patterson	36 Ocean View Pl	Y
Ron Skelton	30 Pacific Dr	Y
Suzie Harkerss	13 Sarsfield St Southbridge	N
Andrew Harkerss	13 Sarsfield St Southbridge	Y
Martin Knight	58 High St South Bridge	N
Russell Jolly	10 Pacific Dr	Y
Nerrolli Turner	38 Ocean View Pl	Y
Andrew Ablett	40 Ocean View Pl	Y
Brodie Ablett	40 Ocean View Pl	Y
Bruce McKay	77 Pacific dr	Y
Andy Lewis	69 Nayland St	Y
Mark Lewis	78A Fairweather Cres Kaiapoi	Y
Hayley Gallagher	2 Ben Elder Pl Ashburton	Y
Lynne Brown	63a Grange St Christchurch	N
Scott McIntosh	32 Jean Archie Dr	Y
Lori Phillips	32 Jean Archie Dr	Y
Bevan Phillips	63A Grange St Christchurch	Y
Nancy Winter	315 Havelock St	N

Name	Address	Valid licence Yes/No
Martin Preston	7 Hurst Pl Christchurch	N
Kerry Phillips	7 Hurst Pl Christchurch	N
Rikki Burgess	768 Liddington	Y
Lance Taylor	37 Grove St	N
Glen Lewis	19 Falcon Dr	N
Richard Sparrow	5 Middle Rd	Y
Scott Clark	702 Le Bretons	Y
Lindsay Branston	759 ??	N
Sela Hala	129 Victoria St	N
Mapic ??	4B Brucefield	N
Vaera Umaga	20 Mitchell Pl	N
Wendy Haskett	2 Hugh St	N
Beaven Broker	43 Geoff Gearing Dr	N
Jobe Teoloton	289 Moore St	N
Graeme Ward	6 Fairfield Rd	N
M J Talafua	90 Winter st	N
Take Kitona	92 Princes St	N
Delia McKay	101 Rakaia	N
PuroKn??	87 Alford Forest	N
Aaron Soal	123 Trevors Rd	Y
Deidre Vries	193 Walnut Ave	N
Sheree price	32 Bridge St	N
Robert Clarke	Rangitata Huts	Y
Raylene Clarke	Rangitata Huts	N
David Rooney	35a Rathore St Timaru	Y
Peter Rooney	35a Rathore St Timaru	Y
Tim Wakefield	90 Rangitata Huts	Y
Wayne Wilson	225 Burwood Rd Christchurch	Y
Janice Wilson	85 Rangitata Huts	N
Grant Ivey	40 St George St	Y
V ???	126 Rangitata Huts	Y
Ann Pye	89 Rangitata Huts	Y
Simon Ro??	92 Rangitata Huts	N
Aiden Pye	89 Rangitata Huts	Y
Steve Oliver	1187 Earl Rd Geraldine	Y
Shona Gray	81 Rangitata Huts	N
Phil de Joux	Beaconsfield Rd	Y
Petter Raggat	113 Johnstones Rd	Y
Stu Marsh	48 Main North Rd Woodend	Y
Paul Centofanti	7 Anne St Cave	Y
Colin Highstead	38 Gleniti Rd	Y
John Ell	11 Scarff Pl Christchurch	Y
Wayne Humpries	RD 2 Gore	Y
Ashley Clarke	11 Wattle Lane	Y
Mark Albert	15 Ashbury Ave	Y
Alistair Chapman	49 Elizabeth St Ashburton	Y
Wayne McCarthy	139 Belt Rd	Y
Peter Clarke	34 Nixon St	Y

Name	Address	Valid licence Yes/No
Edward Moore	2 Hefford Pl	Y
Dean Officer	61 Cross St Ashburton	Y
Ken Dickinson	369 Wrens Rd	Y
Matthew Lewis	4 Sudbury St Ashburton	N
Ashlee Poulter	6 Jane St Ashburton	N
Duane Aberhart	14 Bridge St Ashburton	N
Adam Williams	58 Dunford St Rakaia	Y
Darren Robinson	4 Ra?? Terrace	Y
Rex Taylor	48 Pacific Dr Rakaia	Y
Lorraine Taylor	48 Pacific Dr Rakaia	N
Dave Hutton	62 Pacific Dr	Y
Heath Thomas	64 Pacific Dr	Y
Murray Andrews	73 Pacific Dr	Y
Margaret Tonkin	73 Pacific Dr	Y
Bill Southward	76 Pacific Dr	Y
R N??	82 Pacific Dr	N
S N??	82 Pacific Dr	N
J Challis	46 Chert St Rolleston	N
N Challis	46 Chert St Rolleston	N
E Knight	109 Pacific Dr	Y
Sam ??	104 Pacific Dr	Y
Hamish Jones	102 Pacific Dr	N
Murray Saunders	100 Pacific Dr	Y
Kevin Frazier	93 William St	Y
Courtney Milner	194/305 Worcester St	N
Jessie Ross	15a Radner St Christchurch	N
M Smart	113 Cameron St Ashburton	Y
Penny Allan	49 Tongariro St Christchurch	Y
Tim Allen	49 Tongariro St Christchurch	N
Leigh Tobeck	5 Harrod Pl	Y
Peter Murphy	79 Chapter St	Y
Kevin Marsh	1 Te Rau Akaka St	N
Di Palmer	79 Chapter St	N
Helen Marsh	1 Te Rau Akaka St	N
Karen Frazier	93 William St	Y
John Falloon	58 Phillip St Ashburton	Y
Shirley Falloon	1 Te Rau Akaka St	N
Darryl French	5 Oldham Pl Darfield	Y
R Bell	28 Tarbottons Rd	Y
L Duncan	6 Walshs Rd	N
N Duncan	6 Walshs Rd	N
J King	60b Cameron St	N
M Woodford	2/142 Chalmers Ave	N
R Breach	39 Chervier St	N
M Broker	3 Trellich pl	N
J McGuire		Y
Tony G??	12 Thomsons Tinwald	N
Nick Dabbs	75 Cov St	N

Name	Address	Valid licence Yes/No
Mike Boon	314 Havelock St	N
Peter Sugrue	51 Charbury Ave Rolleston	N
Mercedes Walkham	33 Clark St	N
Jess Sheehan	46 Wakanui Rd	N
Robbie Green	35 Ryan St Christchurch	Y
Bernie Smalley	47 Ambleside Dr Christchurch	Y
Scott Turner	76 Clausen Ave Leeston	Y
Ross Turner	16 Ocean View	Y
Glen Parnell	22 Selwyn St Christchurch	Y
Corrie Parnell	11 Coachmans Rd Christchurch	Y
Phil Hart	Woodlands Rd Timaru	N
Tom Arthur	2 RD Oturehua	Y
Gony Webster	160 Airport Rd Alexandra	Y
Jim Rutherford	Poolburn 2RD	Y
Ih?? He??	Taupo Rd ??	Y
Graeme Wilson	Johnstone St Tinwald	Y
Ross Edmonstone	Gordons Rd Ashburton	Y
Murray Hodgson	74 Beach Rd Ashburton	Y
Fred Sloper	300 Moore St Ashburton	Y
Wayne Fitzsimons	27 King St Ashburton	Y
Allan Millichamp	Tinwald	Y
Jacko	RD 4 Ashburton	Y
G Brooke	Eton St Ashburton	Y
R Averall	1023 Ashburton – Methven HW	Y
D Rutherford	56 Cox St	N
L B Dungey	23 Church St	Y
Peter ??	55 ?? St	Y
Fred Reddecliffe	189 Company Rd	Y
R M Grant	70 Belt Rd Ashburton	N
Chris Symes	68 Taylor Rd Geraldine	Y
Makayla Symes	68 Taylor Rd Geraldine	Y
Allan Wellman	Ashburton	N
Karen Kilgour	27 Eton St	N
Peter Kilgour	27 Eton St	N
Jake Strachan	25 Waymouth St	Y
Carlos Aberhart	345 Wakanui Rd	N
Laurie Rankin	369 Wrens Rd	N
Wes?? Gar??	Rangitata Huts	Y
Chris Robinson	105 Pacific Dr	Y
Barry McKay	18 Mathue Pl Springston	Y
Chris Leonard	17 Massey Cres Christchurch	Y
Logan Kez??	38 Bluegum Pl Christchurch	y
Chloe Hawthorn	172 Rutland St Christchurch	Y
Peter Weeks	137a King St Temuka	Y
Brian Christmas	15 Spring Rd Timaru	Y

APPENDIX 2

Petition 2

2020 CSI Angler Notice submission on behalf of the upper Rangitata River fisherman.

To whom it may concern

This submission is on behalf of the upper river fisherman on the Rangitata River CSI.

As a group we oppose any opposition submission asking for a closure to upper river fishing

Name	Address
E Prattley	243 McKeown Rd Geraldine
A Stewart	51 Bennett Rd Geraldine
R Gardenbroek	7 Rutheiglen Ave Christchurch
Gerald Aubrey	Ben McLeod Stn Rangitata Gorge
Donald Aubrey	4563 Rangitata Gorge Rd
Craig Fiaver	Rata Peaks Stn Rangitata Gorge Rd
? Taylor	Rata Peaks Stn Rangitata Gorge Rd
Trevor Prattley	270 Woodbury Rd Geraldine
Stephen Scannell	11 Shaw St Temuka
Dave Chambers	14 Davie St Temuka
S Larcombe	40 McKenzie St Geraldine
Graeme Larcombe	203 Orari River Rd Peel Forest
Rowan Larcombe	203 Orari River Rd Peel Forest
Brent Patterson	291 Flatman Rd Geraldine
Hamish Mackenzie	60 Studholme St Temuka
Chris Edge	158 McKeowns Rd Geraldine
Emily Edge	158 McKeowns Rd Geraldine
Shane Peake	48 Harper St Timaru
Mark Patterson	23 George St Geraldine
Chris Watson	7 Harrison St Ashburton
Bailey Patterson	291 Flatman Rd Geraldine
Cathy Patterson	291 Flatman Rd Geraldine
Gerald Scott	31A Campbell St Geraldine
Stephen Keen	Infinity Dr Wanaka
David Keen	20 Campbell St Geraldine

Anglers Notice Policy Adopted by Council July 1997

An amendment to the Anglers Notice is justified if it removes an existing compromise to at least one of the following principles. An addition may be made to the Anglers Notice if it is supported by at least one of the following principles and does not compromise any of the others.

Angler notice regulations are derived from principles that will -

- i) Manage the availability of the resource to anglers
- ii) Promote ethical angling methods and angler behaviour
- iii) Provide for a balance of angler opportunity, success, and satisfaction
- iv) Maintain the sustainability of the resource

Guidelines for Application of Angler Notice Policy

The following supplementary information provides clarification and explanation of the four Angler Notice principles with examples where practical.

1.0 Availability of the Resource to Anglers

- 1.1 Availability means physical access to the resource and the opportunity for enjoyment of a full range of angling experiences e.g. wilderness, coastal, estuarine
- 1.2 Council's purpose in maintaining a sports fishery resource is to make it available to as many anglers as possible who may use as wide a variety of fishing methods as possible.
- 1.3 Angler impact on the resource should primarily be controlled by limitations on harvest except where methods are physically incompatible or where overcrowding significantly reduces angler satisfaction. These are issues addressed under the principle of balanced opportunity.

2.0 Ethical Standards of Behaviour

- 2.1 All angling methods considered sporting should be permitted.
- 2.2 A code of ethical standards of behaviour will be developed by Council And provided to licence holders. It will be reviewed as required.
- 2.3 Ethical standards may support and clarify regulations in the Anglers Notice and may relate to any activity in preparation for, during, or after fishing e.g. method of transport, disposal of fish.

3.0 Balance of Opportunity

- 3.1 Provides for Council to consider how to maximise angler satisfaction where this may not have been assessed.
- 3.2 Promotes fair distribution of the physical and aesthetic benefits of angling i.e. fish and enjoyment respectively.

- 3.3 Necessitates that Council considers its statutory obligation to provide for and protect the anglers right to choose from a diverse range of fishing experiences and that this provision may not necessarily mean regulation for the majority.
- 3.4 Where angler participation, success, and satisfaction are compromised by overcrowding or use of incompatible methods Council will endeavour to maintain the regional balance of opportunity by uniform regulation across all anglers or by balanced segregation of methods.
- 4.0 Sustainability of the Resource
 - 4.1 Where sustainability is not threatened, harvest controls may be introduced on ethical grounds or to ensure the regional balance of participation, success, and satisfaction is maintained.
 - 4.2 Where harvest of the resource by an identified method(s) compromises all angling activity by threatening resource viability, harvest of the identified method(s) will be regulated.
 - 4.3 Where the combined harvest of all methods threatens resource sustainability, harvest of all methods will be regulated in preference to restricting access i.e. reduction in limit bag or season length rather than closing parts of the fishery
 - 4.4 Council will endeavour to ensure sustainability of the resource and will regulate availability of it to the angler and any other aspect of angler activity accordingly.

Sports fish harvest and angler use dynamics of the upper Tekapo Canal fishery during the 2019 rainbow trout spawning season

Prepared for the Central South Island Fish and Game Council

Rhys Adams, March 2020

Introduction

The Mackenzie Basin hydro canal fishery incorporates the Tekapo, Pukaki-Ohau A, and Ohau canals and according to the 2014/15 National Angler Survey (NAS) is collectively the most popular freshwater sports fishery in New Zealand. The popularity of the fishery has grown dramatically with over a 16-fold increase in angler-use measured between 1994/1995 and 2014/2015 by the NAS. The Tekapo Canal attracted about one-quarter of all canal-based angling activity during the 2014/2015 season in the CSI Region.

Even under the strain of increasing angler use, CSI Fish & Game (CSI) have assessed the fishery to be sustainable and able to maintain the satisfaction of its anglers by providing high levels of catch and harvest. However, in recent years CSI staff (staff) have encountered a concerning perception amongst a relatively small but dedicated part of the angling community that the quality of canal fishing has steadily decreased since about the 2016-2017 sports fishing season until present.

Angler concerns have been expressed to CSI via formal submissions to Angler Notice reviews, angler-staff interaction through meetings, ranging, emails and phone calls. Additionally, non-interactive observations of online fishing community activity like Facebook posts and petitions have been recognised. Although angler concerns and their suggested solutions vary greatly, a notable component of this concern surrounds the sustainability of the increased targeting and harvest of spawning trout in wintertime. Staff have identified the primary area of concern as the upper Tekapo Canal where large numbers of anglers congregate to target known areas of trout spawning where redds are evident. Without doubt, the popularity of this area has skyrocketed over the past three winters along with the use of “egg rolling” methods. This has seemingly been fuelled by promotion of the area and successful methods on social media.

Historically, CSI have considered year-round trout harvest in the canals as sustainable. This approach assumes that most canal trout are recruited via downstream migration from the headwater lakes through the hydro power structures rather than from within-canal spawning as identified by Bloomberg & Graynoth (1991). Although within-canal spawning occurs, CSI has considered that it is likely to only support recruitment rather than being able to sustain the catch and harvest levels experienced. The rationale being that the within-canal spawning and juvenile rearing habitat is suboptimal and that there are high predation levels of trout fry and parr. Faced with the current concerns of anglers, staff have considered it appropriate to re-assess the potential for anglers to affect the sustainability of the Tekapo Canal fishery by targeting trout in the spawning season.

Addressing potential issues of sustainability of the canal fishery is a difficult task for CSI. To date CSI has relied greatly on staff experience and observations and stand-alone research projects to inform the management of fisheries sustainability through the setting of angling regulations and season lengths. There are currently no regular or comparable sports fish

population or harvest monitoring programs in place at the canals to assess changes in the fishery on which to base ongoing reviews of canal fisheries management. Likewise, other than the NAS, which is completed on a seven-year cycle, there is no other regular or comparable angler-use survey in place.

Currently, management decisions are based on an accumulation of knowledge including: staff observation of the fisheries establishment and growth, which began with the construction and commissioning of the canals and then the introduction of the first of many salmon farms in 1992; sports fish harvest and angling trends gained by regular ranging efforts and angler interactions; population dynamics observed through the salvage of sports fish during the de-watering of canals and associated parts of the greater hydro scheme; drift dives and sonar surveys; spawning observations; migration and recruitment pathways knowledge gained through salvage and mark-recapture initiatives; a survey of canal angler use and sports fish harvest during the 2015-2016 season; and salmon stocking assessments based on tagged fish releases.

Even with this wealth of observation and knowledge of many of the canal fishery dynamics, many fundamental aspects related directly to the sustainability of the fishery remain unknown. For example, the current angler concerns surrounding the sustainability of targeting spawning fish at the upper Tekapo Canal would be addressed if we could establish the relative value of the two recruitment pathways of trout in the Tekapo Canal, that being either spawning within the canal or downstream migration into the canal from Lake Tekapo. If we could also monitor population levels annually and pair these two sets of information, we could set population thresholds and adjust regulations to maximise angling opportunity.

Staff effort has already gone into establishing the relative contribution of the recruitment pathways at the Tekapo Canal by using otolith microchemistry to identify natal origin of rainbow trout caught by anglers in the canal. However, difficulties have arisen with establishing a viable and cost-effective project design and work continues to establish if indeed this is a viable management tool for CSI. This highlights the challenges faced with an evidence-based management approach at the canals.

Acknowledging the current concerns of anglers and a lack of recruitment pathways and population understanding, an effort was made to initiate an evidence-based review of the angler use and harvest of the upper Tekapo Canal fishery during the rainbow trout spawning season of 2019. The aim of the survey was to capture a 'snap-shot' of angling dynamics and sports fish catch and harvest to put some perspective on the angler's concerns and to assess the need for regulation changes. This report summarises the findings of the survey and assesses regulation change options should the Council wish to pursue a conservation-minded approach to managing the targeting of spawning trout in the upper Tekapo Canal.

Survey Programme

During the months of June to October 2019, inclusive, on the upper Tekapo Canal, CSI's four Fish & Game Officers collected angler interview and angler counts information spanning 38 days. Survey effort was stratified into 13 strata that were broken down by month, and type of day including weekday, weekend and holiday weekend. Fourteen randomly selected dates were surveyed to capture all strata types and additional data were collected where possible with angler counts occurring on 14 non-scheduled dates, and fishing information collected for 10 non-scheduled dates.

The upper/lower canal was delineated by the State Highway 8 Bridge. The upper canal section makes up 45% or 11.9km of the Tekapo Canal. Four canal sections were identified within the

upper canal: Tekapo A Power Station to Tekapo Powerhouse Road Bridge (0.85km), Tekapo Powerhouse Road Bridge to the anglers carpark at the locked road gate (5.78km), angler carpark/locked gate to pine tree block (2.35km), and pine tree block to the State Highway 8 Bridge (2.92km). The section of canal from about the angler's carpark/locked gate down to the pine block incorporated part of the canal that is colloquially known as the "Magic Carpet". This area of canal is a hotspot for fishing and is mainly visited by anglers who park their vehicles at the Magic Carpet carpark.

Angler interviews were undertaken in addition to regular licence and regulation compliance checks by Fish & Game Officers. Anglers were asked if they wished to participate in a survey, which most anglers (~95%) agreed to. Questions were asked at the time of the compliance check and a phone number was collected so that the angler could be interviewed later that day/night or the next day, once their current day's fishing had been completed. The interviewers collected information relating to licence type, the angler's primary method, time spent fishing, and fish species caught (successfully landed), whether each fish was kept (harvested) or released and the estimated weight of each fish. During the field interview anglers were asked if they fished the canal the day prior, if so, a full record of that days fishing information was collected. Not all anglers present on the canal were approached for interview, and of those approached and who provided contact information, not all could be later contacted to provide their catch information.

During individual angler counts of the survey reach, it was noted that not all anglers counted could be subsequently interviewed due to them leaving the survey area. Comparing the number of anglers counted and the numbers of angler successfully interviewed, it is estimated that a range of approximately 50-90% of the angler's present were successfully interviewed any given survey day.

Angler counts were undertaken to estimate the total angler effort at the upper Tekapo Canal on each survey day. 5-9 counts were completed daily during visible light hours on scheduled surveys days. One to three additional counts were completed on non-scheduled survey days. The length of the canal to the locked road gate was driven continuously and all active anglers observed from the road were counted. Binoculars were used at times for assistance and a spotting scope used to count anglers on the lowest section from the locked gate. Each individual angler count was represented by the middle minute of the duration of the count. The angler counts were spread throughout the day to capture variability of angler use as a result of angler behaviour or as a reaction to changing weather or flow. Due to staff resourcing and perceived angler detectability issues, no night-time angler counts were completed. Therefore, the survey only estimated harvest and angler use from approximately dawn until dusk within visible day light hours.

Early in the survey period a trail camera was trialled as a method of counting anglers or their cars to collect data when field staff were not present. Counting congregations of vehicles was considered a viable method whereby simultaneous counts of angler and vehicles undertaken by staff could be used to calibrate the trail camera vehicle counts to estimate angler counts. A trail camera was positioned to capture regular 'time-lapse' images of vehicles at the Magic Carpet carpark from the 13th of June onwards.

It should be noted that this survey effort was considered the minimum required to estimate the angler use and catch of the five-month survey period and the results of this survey should be considered a useful index of the fishery dynamics only.

Results

Over the survey period a total of 300 individual anglers were successfully surveyed based on 14 scheduled survey dates and provided 358 records of daily angling activity. One hundred and nine angler counts were completed spanning 24 dates. On 141 dates, 1,509 trail camera photographs were taken and utilised for counting vehicles.

Angler use of the canal fishery

The highest individual count of active anglers within the total survey area made by staff was 43 at approximately 2:40pm on the Queen’s Birthday Holiday Monday in June. The highest individual count of active anglers on the Magic Carpet was 23 on the same day at 8:50am.

Angler use was estimated by calculating representative “angler days” from observed angler counts. An “angler day” represents the effort (hours spent fishing) of one angler over a single day. Angler days were estimated by using an ‘area under curve’ (AUC) method. This method predicts a pattern or ‘curve’ of angler counts over a specified day length from actual angler counts recorded at individual times within each stratum. The counts are measured as total AUC minutes/hours. AUC hours were then converted to angler days by dividing them by the actual average number of hours that anglers, fishing within the associated stratum, fished for. The result is a predicted total daily angler days count that represents one day within the stratum and is multiplied by the number of stratum days to get the total stratum angler days.

The trail camera vehicle counts at the Magic Carpet carpark were used to estimate angler counts at the Magic Carpet sections only and were combined with all other non-Magic Carpet sections to estimate total survey area angler counts. The vehicle counts were daily records and were converted to angler counts using a ratio of 1.48 anglers per vehicle, which was established as the average vehicles-to-anglers ratio as observed in the angler counts undertaken by staff. The use of the vehicles-to-anglers ratio was assessed by applying a linear regression to the data. The regression showed that there was a very strong relationship between the numbers of cars in the Magic Carpet carpark and the number of anglers fishing the Magic Carpet (r-squared = 0.925). Therefore, the use of the vehicle counts to estimate angler counts was deemed viable. The same assessment was made to review if the Magic Carpet carpark counts could be used to estimate total survey area angler counts. This only provided very weak evidence of a correlation (r-squared = 0.094), so was not pursued.

As no angler counts were completed in darkness hours the method assumes there were no anglers fishing at night, therefore, angler counts represent visible daylight hours only.

Table 1. Estimates of time (hours) spent fishing and angler days for the total survey period and each stratum. There is distinction made between the section of the survey area including the Magic Carpet and the rest of canal. Some rounding error is included.

Month-Stratum	Average daily hours spent fishing	Average non-Magic Carpet angler days	Average Magic Carpet angler days	Total average angler days	Days in stratum	Total survey angler days
weekday	6.5	9	13	22	19	418
weekend	5.6	35	21	56	8	448
holiday						
weekend	3.8	37	33	71	3	212
June total						1,078
weekday	4.0	17	20	37	23	855

weekend	3.5	28	28	56	8	447
July total						1,303
weekday	5.8	3	6	9	22	197
weekend	4.1	38	13	51	9	461
August total						658
weekday	2.1	15	10	24	20	490
weekend	4.1	15	10	25	7	177
holiday						
weekend	1.9	9	16	25	3	74
September total						741
weekday	4.0	3	2	5	22	112
weekend	1.4	17	12	29	6	172
holiday						
weekend	2.1	27	2	29	3	86
October total						370
Survey total					153	4,149

It is estimated that there was 4,149 angler days during the survey period, with the most popular month being July (1,303 angler days) followed by June (1,078 angler days) (Table 1). The use in August (658 angler days) and September (741 angler days) is a notable reduction from the previous months and October has a distinctly lower use (370 angler days) than August and September. In four of thirteen strata, the magic carpet use is greater than the rest of survey area.

Angler use comparisons with the 2015-2016 canal harvest survey

The 2019 targeted survey and the 2015-2016 canal fishery survey used similar methods; however, the data are not directly comparable as the design of the two surveys are on different scales. The 2015-2016 canal harvest survey was designed to estimate combined fishery use of all the canals over a year and was not considered accurate enough to individually estimate angler use and catch from each canal or any section of an individual canal. To put this in perspective during the 2015-2016 survey the Magic Carpet was considered a secret spot and was only fished by a small but dedicated group. Very few anglers were counted and interviewed specifically at the Magic Carpet during that survey, therefore there is very little data to directly compare with the 2019 survey.

Relationship between angler use and canal flow

Popular fishing techniques like “egg rolling” rely on strong canal current to allow imitation fish eggs and other lures to flow semi-naturally down the canal bed along with a small sinker. Preliminary analysis was undertaken to compare canal flow records with angler counts to explore the relationship between flow and angler numbers. Statistically, the level of canal flow explained 46% of the variation in angler numbers (correlation coefficient =0.46) suggesting there is some relationship between the presence of anglers and flow. It is likely that with further isolation of other factors that could affect angler numbers, such as weather and section of the canal fished, a stronger relationship may be able to be established. If the survey is to be repeated, then the flow vs. angler relationship should be further explored so data comparisons can be considered in relation to flow variations that may be observed.

Sports fish harvest and catch and release

Angler interviews identified that approximately 60% of daily visits resulted in no fish caught by an angler. 17% of visits resulted in one fish caught and 10% of visits resulted in two fish caught. Approximately 13% of visits resulted in between three and 16 fish caught.

Lake Tekapo and subsequently the Tekapo Canal water clarity was affected by a major headwater flood event in March 2019. There were some suggestions by anglers that water clarity effected catch and that clear water is more productive for the egg rolling method. From the start to the end of the survey period there was a conspicuous improvement in water clarity.

Salmon were present in the survey area occasionally and did get caught. However, Staff did not observe any surveyed anglers successfully landing a salmon and strongly believe, based on interaction with the anglers who reported salmon catch, that some of the salmon recorded were small silver-coloured rainbow trout incorrectly identified by anglers. It must be noted that the catch of salmon within the survey is likely to be an overestimate, and conversely the catch of rainbow trout is likely to be an underestimate.

To estimate total catch and release and catch and harvest (kept) for the individual randomised survey dates, the average rates of fish kept or released were multiplied by the estimated angler days count (Table 2).

Table 2. Estimated total sports fish catch, presented as fish either caught and kept (harvested) or caught and released on individual scheduled random survey dates for the upper Tekapo Canal, June to October 2019.

Month	Strata-day	Rainbows kept	Rainbow released	Brown kept	Brown released	Salmon kept	Salmon released
June	Weekday	1	42	0	12	0	0
June	Weekend	2	80	0	31	0	5
June	Holiday weekend	4	32	1	13	0	1
June	Weekend	2	29	0	8	0	0
July	Weekday	0	37	1	7	0	1
July	Weekend	0	3	0	8	0	0
August	Weekday	2	29	0	16	0	1
August	Weekend	2	41	2	6	0	2
September	Weekday	0	0	2	0	0	0
September	Weekend	1	11	0	4	0	0
September	Holiday weekend	0	0	0	0	0	0
October	Weekday	0	0	0	0	0	0
October	Weekend	0	0	0	0	0	0
October	Holiday weekend	0	14	0	0	0	0

The daily catch and the resulting decision to either catch and release or harvest those fish varies greatly. On three of fourteen survey days, all within the months of September and October no catch at all was recorded as opposed to the estimated highest catch of 82 fish on a June weekend day (Table 2).

There were relatively few fish caught and kept (harvested/killed) and the decision to catch and release dominated the catch. The proportion of daily harvest measured varies from none to approximately 11% for rainbow trout with an average of approximately 3%. For brown trout the daily proportion of fish caught and harvested varies from none to all with an average of approximately 15% harvest. For salmon, on the scheduled survey dates all fish caught were released. One salmon was harvested on one non-scheduled survey date (July weekday) and is incorporated in the month and total catch estimates (Table 3). Because of the misidentification issue regarding salmon it is possible that rainbow trout harvest rates were slightly higher than 3% on average.

None of the 300 individual anglers surveyed throughout the period harvested more than one sports fish per day. This indicates that the true proportion of anglers that harvest their 2-trout daily bag limit is likely to be very small.

For a monthly estimate of catch, the individual catch within each stratum was multiplied by the number of days in that stratum and all stratum totals were combined to give survey period totals (Table 3).

Table 3. Estimates of sports fish catch, presented as fish either caught and kept (harvested) or caught and released on a monthly basis for the upper Tekapo Canal, June to October 2019.

Month	Rainbow kept	Rainbow released	Brown kept	Brown released	Salmon kept	salmon released
June	47	1343	16	461	0	54
July	0	1028	24	241	24	71
August	32	755	10	251	0	31
September	35	140	29	84	0	0
October	0	36	0	0	0	0
Total	114	3302	79	1037	24	156

Total rainbow trout catch is estimated at 3,416, of which 114 were harvested. Total brown trout catch is estimated at 1,116 with 79 of those being harvested. Approximately 4,712 fish, including salmon, in total were successfully caught. It is likely that some of the fish were caught multiple times and released successfully, therefore the number of individual fish caught is likely to be lower than total of all sports fish caught.

Total catch for the survey period was dominated by rainbow trout at over three-fold levels to brown trout. When considering brown trout catch it is worth noting that the start of the brown trout spawning season was most probably not incorporated in this survey and that a significant amount of brown trout catch may not have been captured by the survey.

Salmon catch is low and is believed to be an overestimate due to rainbow trout misidentification by anglers that staff have experienced. During the survey there was no observations of catch that would suggest that a more than minor escapement of salmon occurred from the salmon farm in the lower canal and migrated upstream to the surveyed reach and affected salmon catch levels.

In some months either zero catch or harvest was captured by the survey, but It is likely that some amount of catch and harvest did occur. It is likely that the true catch or harvest levels would have been relatively low.

The catch of rainbow trout and salmon followed a similar pattern to angler activity and there was a large proportion of the catch achieved in June and July, a notable catch in August and then relatively low level of catch through September to October. For brown trout June had the highest catch with a moderate catch in July and August with the catch tapering off through September and October.

From anecdotal field observations and trail camera observations it was assumed that night-time fishing activity was minimal during the survey period and accordingly catch and harvest during this time is relatively low and unlikely to compromise overall results of this survey.

Fish size

Where an angler could provide the estimated weight of every fish caught on a date, that data were compiled to provide an unbiased index of the size of the fish caught throughout the survey period. (Table 4).

Table 4. Summary data of fish weights in pounds (lb) of 366 fish caught throughout the survey period as reported by anglers.

Species	Min weight	Max weight	Average weight	% < 1.5	% 1.5 - 9.9	% 10+	Total fish count
Rainbow	0.3	34	6.5	18	54	28	267
Brown	0.5	19	4.1	6	90	4	89
Salmon	0.3	7	2.3	40	60	0	10

Fish caught spanned the expected size ranges at the canals from one to two-year-old juvenile fish weighing less than one pound right up to exceeding 30 pounds. Approximately 76% of all fish caught weighed under 10 pounds. A significant proportion of rainbow trout catch (18%) was small fish (although legal size) at less than 1.5-pound. Twenty-eight percent of rainbow trout were considered large in a New Zealand-wide context at 10-pounds or larger. There were few large (4%) or small (6%) brown trout caught.

Eighteen of the 366 fish were harvested, of which 12 were rainbow trout, 5 were brown trout and 1 was a salmon (Table 5).

Table 5. Summary data of the size in pounds (lb) of fish caught and harvested throughout the survey period.

Species	Min weight	Max weight	Average weight	% 10 lb+	Total Fish count
Rainbow	1.5	31	10.6	50	12
Brown	2.5	19	6.6	20	5
Salmon	n/a	7	n/a	n/a	1

The weights of harvested fish spanned the size range of 1.5 to 31 pound. Because of the low sample size (18 fish) it is hard to draw inference about what size of fish it is that anglers preferred to harvest.

Fishing Method

The primary method used by an angler interviewed was recorded against daily angler catch. For analysis the methods were categorised into the three authorised methods: fly, spin and bait and additionally the “egg rolling” technique was recorded as its own method. Technically, an egg

rolling assembly, which uses a spin rod rigged with a small sinker and generally 1-2 imitation eggs, is considered to be spin fishing. Some of the imitation egg lures used are scented synthetic soft baits, which then makes the method bait fishing.

‘Egg rolling’ dominates the catch that means that spin fishing was by far the most successful method used during the survey, possibly accounting for over 80% of fish caught (Table 6). Traditional spin fishing accounted for a small amount (2%) of that catch. Bait fishing, including scented soft baiting, accounted for a small but significant part (12%) of the catch and is an underestimate because an unknown proportion of egg rolling is legally defined as bait fishing. Fly fishing was seldom used during the survey and accounted for approximately 0.1% of total catch. Approximately 2% of the catch could not be attributed to a defined method.

Table 6. The total estimated catch of fish for the survey period according to the successful method. Some rounding error included.

Method	Rainbow	Brown	Salmon	% total catch
Bait	340	189	47	12
Egg rolling	3024	784	132	84
Spin	43	69	0	2
Fly	3	0	0	0
Unknown	5	74	0	2

Additional information

Spawning redds have previously been observed by anglers and staff in the canals, primarily at the upper Tekapo Canal and to a far lesser extent in the Ohau A Canal near the intake from Lake Ohau.

On one occasion, September 19th, 2019, 51 redds were counted in the Tekapo Canal reach between The Tekapo A Power Station and the Fork Stream culvert. The majority of these redds were subject to de-watering during periods where the canal flow was shut off, as was the case on September 19. Reduced flow and zero-flow events appeared to be more common or at least longer in duration during the months of September and October. On September 23 one of the dewatered redds was dug to inspect the health of the eggs contained and all eggs found had died. Spawning redds were also observed but not recorded in the reach between the Magic Carpet and the Fork Stream Culvert. No redds have been observed or recorded below the Magic Carpet.

During the survey period while ranging the Stilling Basin area of the lower Tekapo Canal, staff observed trout fry using the exposed basin wall boulders as refuge. On two occasions staff recovered trout fry using electric fishing equipment (Table 7). Based on the size and life stage, staff deemed them to be of within-canal spawning origin and too small to have been spawned in a tributary of Lake Tekapo and migrated to the lower Tekapo Canal as fry. Although anecdotal evidence of the presence of juvenile trout in the canal previously existed, this is the first recorded sample of juvenile fish that provides evidence of successful spawning within the Tekapo Canal.

Table 7. Trout fry electric fished from the Stilling Basin in the Tekapo Canal in October and November 2019.

Date	Waterway	Location	species	length (mm)	number	comments
31/10/2019	Tekapo Canal	Stilling Basin	unknown trout	~25-39	6	all fry

		(farms)				
26/11/2019	Tekapo Canal	Stilling Basin (farms)	unknown trout	~23-53	11	includes 1 parr

Discussion

This survey has provided insight into the realities of the angler use and catch dynamics of trout in the upper Tekapo Canal in the winter and spring of 2019. The survey has no previous equivalent survey to compare to. It was undertaken in response to angler concerns that the quality of the greater canal fishery has declined and that much of that concern was associated with the dramatic increase of the targeting of trout during the spawning season. This survey informs the reality of angler use and catch of a single rainbow trout spawning season at the upper Tekapo Canal, but it is not appropriate to consider the finding relevant for addressing the sustainability of the greater canal fishery. The upper Tekapo Canal is a unique part of the canal system that has experienced an intense growth in use by anglers who target spawning trout and can be assessed in isolation to other parts of the canal fishery.

Ultimately, annual population monitoring should be used to assess the sustainability of populations in relation to existing management and to monitor effects of any changes to management. At this point in time, with no annual population monitoring in place, the concerns of angler remain unsubstantiated, however it must be recognised in the absence of scientific evidence to the contrary that it is reasonable to take a precautionary approach to managing the perceived issues. To this end, an angler use and harvest survey can provide valuable guidance to options in fisheries management should a conservation-minded approach be taken to the ongoing management of catch, harvest and protection of spawning trout in the upper Tekapo Canal.

Staff believe that currently there is enough recruitment and enough food to sustain a highly valued canal trout fishery and recognise that increasing use and/or the increasing levels of angling expertise could have led to a reduction in opportunity and satisfaction of anglers. This however does not mean that the fishery is in decline or unsustainable; rather it may mean that the quality of fishing previously experienced may be unattainable for some anglers due to an increasing number of increasingly successful anglers targeting the same fish population.

It is accepted that the satisfaction of an angler who targeted spawning trout in the upper Tekapo Canal prior to perhaps the 2017-2018 season, and especially those who fish the Magic Carpet with egg rolling techniques, would have a perception that the fishery has declined or that their satisfaction levels have decreased. Anglers have told us that it was only a few seasons ago that they could have the Magic Carpet to themselves on a weekend and catch multiple exceptionally large trout a day. Now they are likely to be fishing with ten to twenty other anglers and be lucky to catch one of two exceptionally large trout each day. The competition for the same resource has increased dramatically. It is possible that much of the angler's general concern of canal fishery sustainability stems from this unique area of the canal system as anglers fish shoulder to shoulder and witness everything from trout actively spawning to poor handling of fish during photographic sessions. There are many aspects to this spawning season angling that an individual may take exception to. However, the popularity of the fishing speaks for itself and regardless of some angler's concerns – the opportunity to fish this part of the canal fishery is highly valued by anglers and should be maintained where possible.

It appears to be a common assumption amongst anglers that all recruitment of trout in the canals comes from within-canal spawning. This assumption naturally fuels the questions of the sustainability of fishing for spawning fish. Indeed, some spawning is successful in the canal to at least the parr life stage, but we have no information to say how many of these fish contribute to catch and harvest of adult canal trout. On the other hand, there is evidence that trout migrate into the canal from headwater lakes. Again, we have no information to say how many of those contribute to the catch and harvest of adult trout in the canal. Currently, there is no silver bullet for managing this type of fishing opportunity vs recruitment and the sustainability conundrum that is unique to the canals. For that reason, it is fair to take a conservation-minded approach and assume it is possible both recruitment pathways make a meaningful contribution to the sustainability of the Tekapo Canal fishery.

Should the Council wish to take a conservative-minded approach to managing angling at the upper Tekapo Canal during the trout spawning season, by imposing angling restrictions, in the absence of evidence-based population and recruitment information and monitoring, then there must be recognisable advantages to counteract the loss in opportunity. Any restriction in angler use or methods should ultimately aim to minimise any interference that anglers have on the ability of trout to self-sustain.

In the following discussion the results of the 2019 survey are reviewed with recommendations of options for managing potential restrictions to angling at the upper Tekapo Canal during the rainbow trout spawning season for the purpose of protecting trout spawning.

Options for restricting angler use

The months of June and July were very popular for anglers at the upper Tekapo Canal. August and September had notable angler use levels while the number of anglers in October decreased significantly.

If a closed season was to be used to reduce angling catch and fish disturbance then June and July should be considered priority months, August and September are moderate priority months and October as a low priority month for closure.

If the canal was to be considered a “high-country” waterway then a standard spawning season closure would be from May 1st to the first Saturday in November. The length of the standard high-country closure is not considered appropriate for the upper Tekapo Canal given its unique value to anglers as a year-round fishing destination.

Staff recommend that an appropriate restriction to angler use of the upper Tekapo Canal to protect rainbow and brown trout spawning is a June to August inclusive closure upstream of SH8. A June to August closure restricts high angler use periods in addition to one moderate use period but still maintains “shoulder season” spawning fishing opportunities in May and September and October in the upper Tekapo Canal. This closure should allow a significant proportion of spawning to occur undisturbed, which is likely to result in the full utilisation of the small area of available spawning habitat. There will be no catch or harvest of fish during that period. Additionally, those fish that would have been harvested or died from poor handling during a full open season would be available to anglers for catch in the lower canal during the closure period or within the entire canal in the normal season.

There is likely to be some angler displacement to other parts of the canal system as a direct result of the suggested closure. The upper parts of Pukaki and Ohau A canals are likely to

receive some of the displaced anglers as these are favoured wintertime angling options for anglers that favour the egg rolling technique in fast flowing water.

Options for restricting angler catch

Rainbow trout catch was significant in June and decreases through the months to an insignificant catch level in October. Most of the rainbow catch occurs in June and July, but August is still a significant month. September and October had relatively low catches.

If a closed season is to be used to reduce rainbow trout catch then June and July should be considered priority months, August a moderate priority month and September and October as low priority months for closure.

Brown trout were mainly caught in June and in reasonable numbers in July and August. Low number were caught in September and October.

If a closed season is to be used to reduce brown trout catch then June should be considered a priority month, July and August as moderate priority months and September and October as low priority months for closure.

Any closure aimed at trout fishing has the potential to unnecessarily restrict salmon catch. The worst case would be if many salmon escaped from the farm on the lower Tekapo Canal and migrated up to the top of the canal and competed for the food resources of trout until the season re-opened and they were subject to removal (harvest) by anglers. Although the occasional salmon is caught in the upper canal, no mass migrations of salmon have been observed at the upper canal. If a salmon season was to remain in place while a trout season was closed, anglers would predominantly catch trout and disturb spawning, therefore any closure must be for all species to have the desired effect to protect trout spawning.

A closure of the Tekapo Canal upstream of SH8, for the months of June to August inclusive, is recommended by staff to significantly reduce sports fish catch during trout spawning season.

Options for restricting angler Harvest

As a proportion of total catch, rainbow trout harvest was extremely low at around 3% for the period examined. This is in part believed to be low because anglers are aware that it is spawning season so trout will have reduced flesh quality and anglers want to return them to the water to continue to spawn.

The harvest of brown trout at 15% was still considered low even though it was higher than for rainbows. The higher proportion of browns taken is likely to reflect that more browns are of the preferred size for eating with fewer browns being very small or very large as is the case with rainbow trout.

The total sports fish harvest in this survey is only estimated at around 200 fish across five months. This is not considered to be a significant harvest level in a fishery as productive as the Tekapo canal where there were approximately 4,700 fish successfully landed in total during the survey period.

There is little perceivable conservation value in introducing a reduced trout bag limit from two to one as no surveyed angler harvested more than one sports fish per day. A reduced bag would still allow the catch, harvest and disturbance of spawning trout.

The use of catch and release or a zero-bag limit as a conservation measure is not recommended by staff. Staff believe that the ability for an angler to harvest and utilise any fish not fit for release should be maintained with at least a 1-fish bag limit. It should be recognised that catch and release has the potential to reduce the ability for a trout to spawn successfully and may even cause death. Considering the extremely high levels of catch and release practiced by anglers at the upper Tekapo Canal, there is potential for poor catch and release practice to cause a reduction in the fish population to levels that could affect the opportunity of anglers. Staff recognise that compared to other fisheries there is a high occurrence of poor fish handling at the canals.

Staff recommend that reducing bag limits is not an appropriate tool for protecting trout spawning at the upper Tekapo Canal. It is recommended that pro-active advocacy of best-practice catch and release be targeted to canal anglers in the lead-in and during any spawning season fishing opportunities.

Options for restricting method

Any attempt to regulate catch and harvest levels by way of restricting methods needs to primarily address the high level of catch observed by anglers “egg rolling”. By legal definition, egg rolling incorporates both spin and bait angling methods. Although no data were collected on the relative levels of bait or spin lures used by egg rolling anglers, staff believe that bait is used at lower levels compared to lures. There are many technical compliance challenges with trying to restrict “egg rolling” and to restrict both bait and spin methods that it incorporates. To do so would effectively close the fishery for all except for an insignificant number of fly anglers.

Restricting season length is considered a more practical compliance tool that can effectively manage a reduction in the catch and harvest of fish at the upper Tekapo Canal during the spawning season.

Staff recommendations

For the 2020-2021 Anglers’ Notice review

Recommendation 1: Introduce a closed season for all sports fishing above the SH8 Bridge on the Tekapo Canal from June 1 to August 31, 2021.

Justification summary: This closure represents a conservation-minded measure to address neither substantiated nor disproven angler concerns that the targeting of spawning trout in the upper Tekapo Canal is unsustainable. The three-month closure will allow undisturbed spawning that is likely to result in the full utilisation of the small area of spawning habitat available and will maintain highly valued opportunities for anglers to undertake “spawning season” fishing in the “shoulder season” months of May, September and October. If future research and monitoring establishes evidence that year-round fishing can be sustainable then a year-round season should resume to provide a highly valued fishing opportunity. Any research of this nature should be prioritised where possible.

Recommendation 2: Make no additional spawning season closures at the canal fishery for the 2020-2021 sports fishing season.

Justification: Other than the upper part of the Tekapo Canal, the upper part of the Ohau A Canal is the only other canal section where trout redds have been observed by staff, albeit in very low numbers. Most of the canal system does not appear to offer suitable spawning gravels although congregations of trout do occur in the spawning season at the upper parts of canals. The Ohau B

Canal is the only canal with connectivity to river and creek spawning habitat. It is believed to be largely sustained by spawning activity in the upper Ohau River, Lake Pukaki and Lake Ohau.

There is little justification, except perhaps for the upper Ohau A Canal, that any closed season should be introduced to protect within-canal spawning. Although there is some spawning in the Ohau A Canal, the Pukaki-Ohau A Canal fishery is believed to be sustainable based on sufficient downstream migration of trout through the Ohau and Pukaki control gates. There are also other dynamics related to salmon farming changes in the Pukaki-Ohau A Canal that should be considered before any review of regulation change is made. The salmon farm operating in the Pukaki-Ohau A Canal has dramatically reduced its operation to only one raft of pens that will service just the hatchery brood stock and research needs. This in effect has caused a massive reduction in salmon food pellet availability for the wild trout and escapee salmon. It has also decreased the likelihood of salmon escaping from the farm pens into the canals. This change in dynamics will require the Pukaki-Ohau A Canal fishery to essentially “reset” to match the new availability of supplementary salmon pellet food. Staff suggest that the canal should be allowed to reset for several years before any regulation change that reduces season length is reviewed at the Pukaki-Ohau A Canal.

Ongoing upper Tekapo Canal management

Recommendation 3: Repeat this survey during the trout spawning season of 2020 and include the Month of May to better capture brown trout spawning.

Justification summary: The next anglers notice review considers the fishing season starting 1 October 2020. If Council wishes to close or restrict the upper Tekapo Canal fishery in winter as recommended by staff, this will not be applied until winter 2021 at the earliest. The final “unrestricted” spawning season where angler use and catch and other variables could be surveyed is from May to October 2020. It must be recognised that a survey of this nature does take a significant amount of staff time to undertake and report.

Recommendation 4: proactively promote best practice catch and release techniques targeted to canal anglers before and during the spawning season fishing opportunities.

Justification summary: thousands of trout were caught and released at the upper Tekapo Canal during the 2019 winter. The high level of fish handling presents a significant risk for anglers to unintentionally affect “spawning fitness” and kill fish. Best practice catch and release minimises this risk. Catch and release advocacy may need to incorporate compliance and enforcement messaging to be effective by creating a deterrence to poor fish handling by presenting that it is an offence within the CSI Region to cause undue injury to any fish intended for release.

Long-term management of the canal fishery

Recommendation 5: Produce a scoping document that identifies options for long-term management of sustainable hydro-canal trout and salmon populations in the recreational interests of anglers.

Justification summary: The greater Mackenzie Basin hydro-canal fishery is the most fished freshwater fishery in New Zealand. The fishery is unique and dynamic and is a challenge for CSI to manage sustainably with an evidence-based approach. There are many aspects fundamental to its sustainability that have not been researched sufficiently and are not monitored regularly. Additionally, there is no guiding process or document specifically for the ongoing management of the canal fishery. Should Council wish to take an evidence-based approach to canal management there first needs to be an identification process of all relevant aspects of

canal-fishery management and the associated priorities to be investigated and undertaken. This should be a first step to the establishment of a long-term canal fishery management strategy or plan.

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