



EASTERN REGION

Ohau Channel Diversion Wall Trout Monitoring
2018-19

Prepared for Fisheries Panel Meeting 5th November 2019

The following report is split into 2 sections

1. Lake Rotoiti Trout Fishery Survey Data (Opening Day and Summer Creel reports)
2. Ohau Channel Creel Survey

1. LAKE ROTOITI TROUT FISHERY SURVEY DATA

Trout Season Opening Day Survey data.

- Angler and fish data is collected on October 1 each season.
- Opening Day 2018. Data from Lake Rotoiti trout, approximately 10.25 years after diversion wall was constructed.

Summer Survey Data

- Continuous summer survey from November to April each year
- Trout characteristics collected from all fish measured –10.3 to 10.75 years post wall completion

Possible impacts of the diversion wall on the trout fishery?

A) It might be expected that effects to the trout fishery may be seen through affecting the smelt food supply in Lake Rotoiti – Changes may subsequently be seen in trout growth? Declining condition factor (weight loss) may precede a decline in trout length.

- Data from the 2011-2013 and 2016-2017 Opening periods (Table 2 and figure below) illustrates a decline in condition factor compared to the pre-wall and immediate post wall period.
- This decline may have started post the 2000 opening day?

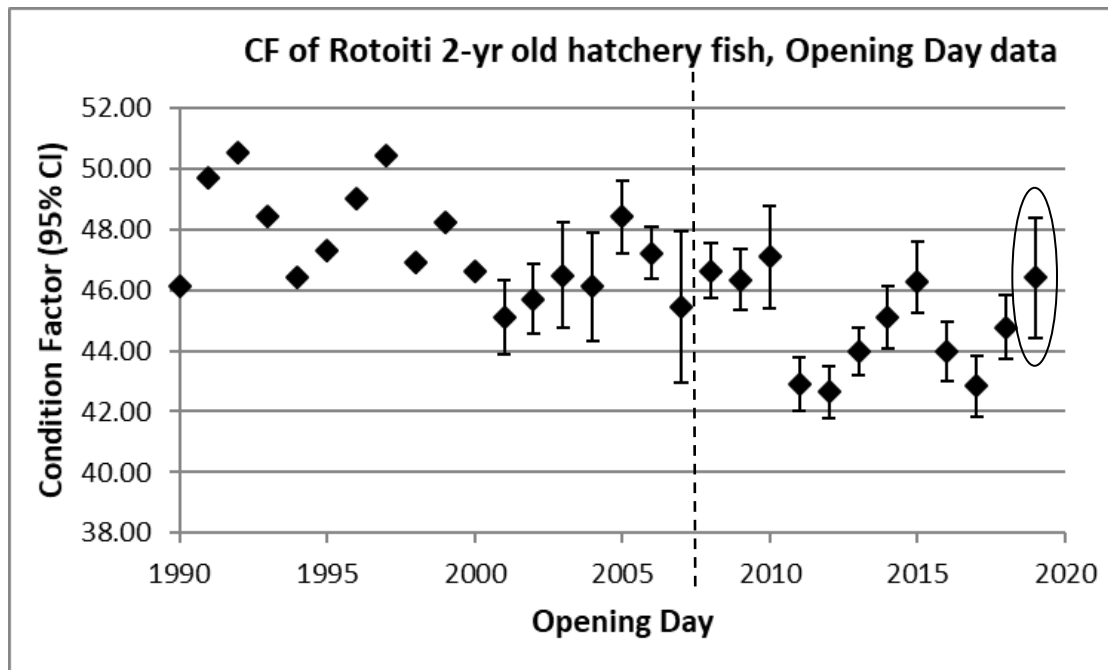


Figure 1.1 Condition factor of Lake Rotoiti 2-year-old trout on Opening Day

- The summer survey data for Lake Rotoiti (Table 1) shows that average rainbow trout condition over the 2018-19 summer was comparable to the fish condition surveyed from the 2017-18 summer and just behind the last ten-year average.

Lake	Feature	AVG	18-19	17-18	16-17	15-16	14-15	13-14	12-13	11-12	10-11	09-10	08-09
Rotoiti	Length (mm)	519	511	515	514	550	518	523	522	516	525	501	512
	Weight (kg)	1.78	1.67	1.69	1.76	2.14	1.80	1.80	1.79	1.71	1.83	1.68	1.83
	Cond' Factor	43.99	43.74	43.73	45.49	45.29	45.48	44.23	42.11	43.33	43.47	44.51	46.32
Rotoiti	Wild L	491	488	482	477	508	480	507	490	492	491	478	476
	% WILD	32%	33%	26%	25%	19%	26%	23%	39%	39%	45%	37%	26%
	Hatch L	532	522	526	526	560	532	527	540	531	552	515	526
	N (all fish)	163	104	109	159	128	195	243	165	390	128	159	161
Tarawera	Length (mm)	515	487	486	507	509	503	499	532	541	516	536	529
	Weight (kg)	1.55	1.43	1.27	1.52	1.49	1.42	1.42	1.63	1.87	1.49	1.71	1.70
Rotorua	Length (mm)	454	460	460	455	456	439	455	443	431	436	456	460
	Weight (kg)	1.08	1.13	1.00	1.21	1.08	0.99	1.23	0.98	0.88	0.80	1.10	1.10
Okataina	Length (mm)	529	501	520	523	508	539	515	529	537	553	552	545
	Weight (kg)	1.78	1.47	1.56	1.86	1.65	1.83	1.70	1.79	1.97	2.00	2.05	1.98
Rrua FF L		469	487	490	-	456	455	456	492	464	449	428	460
Rrua FF Wt		1.21	1.3	1.08	-	1.10	1.12	1.10	1.49	1.13	1.09	0.80	1.29
Rrua Tr L		449	453	453	455	433	453	433	449	440	429	445	455
Rrua Tr Wt		1.04	1.09	0.97	1.21	0.96	1.04	0.96	1.18	0.97	0.86	0.81	1.15

Possible impacts of the diversion wall on the trout fishery?

B) Effect on trout migration/impact on wild fishery – Change in % wild fish in catch?

- Opening Day data shows a drop in the opening day catch (excluding fly fishing) of wild trout in the 2008-2012 openings compared to the pre-wall catch. A further decline was recorded in the 2013 to 2015 data and again 2016 to 2017 before rebounding in 2018 (Table 2).
- The Summer creel survey data (Table 1) shows that the percentage of wild trout in the catch measured since the 2013-14 summer creel survey averaged 25.3%. This is compared to the 37.2% since the wall was constructed in 2008 up to the 2013-14 summer, and 41.6% in the 2005 to 2008 period.
- Liberations of hatchery trout into Lake Rotoiti increased slightly during 2010-2011 and this would be expected to have the effect of slightly decreasing the wild percentage in the catch (assuming wild recruitment was consistent).

It is possible that a low percentage of wild trout recorded may be an effect of the diversion wall, or may have been influenced by an increase in hatchery liberations since 2009 to meet angling pressure.

We know that there is passage of adult trout between the lakes from the acoustic tagging done to monitor trout moving into cold water flows. Of the 30 adult trout tagged in Lake Rotorua at least three (?) were recorded as having moved into or through the Ohau Channel at some stage during the study.

Mature adult trout are known to migrate into the channel in autumn and early winter and pass through the channel to spawn in the channel or further afield in Lake Rotorua tributaries. After spawning these fish will return to the lake (October-December?) to recover.

At some time, juvenile trout will emigrate downstream out of the Lake Rotorua tributaries and Lake Rotorua and travel back into Lake Rotoiti. We know from trout otolith micro-chemistry that juvenile trout from Lake Rotorua tributaries contribute to the wild Rotoiti fisheries.

If downstream migrating wild trout were diverted by the wall and travelled down the Kaituna River - as immature sub-adults or post spawned recovering mature adults – this would reduce the percentage of wild fish seen in the lake Rotoiti catch in years after the diversion.

The percentage of wild fish (excluding fly fishing) has been steadily around the 30% mark for openings in the 2008-2012 period which was similar to the 2001 Opening Day percentage. The 2013-2018 openings showed a wild percentage (excluding trout caught fly fishing) averaging 22.2%.

It might also be expected to observe a decline in the younger wild: older wild fish ratio if the returning immature fish have been differentially affected. This data from previous Opening Days has been compiled in Table 3 and shows that the percentage of younger trout in the wild catch has

in past years been as low as 24%, and averages approximately 50%. Since the 2013 opening, the percentage of younger class wild trout has averaged 60%.

Table 2. Opening Day Data. Lake Rotoiti

Open day	Total lib	Spring lib	Aut lib	% Wild	2yr length	2yr weight	2yr CF	cpue	% Wild exFF	2yr (n)
1998	14500	7500	7000	63	522	1.85	46.92	0.15	61.0	31
1999	14500	3500	11000	54	522	1.90	48.23	0.15	54.0	36
2000	14500	3500	11000	44	517	1.81	46.63	0.17	41.0	30
2001	27000	12500	14500	30	507	1.63	45.01	0.22	28.3	94
2002	25000	10500	14500	44	500	1.60	45.90	0.28	41.9	70
2003	25000	10500	14500	42	505	1.65	46.29	0.22	42.2	35
2004	24500	10000	14500	43	514	1.74	46.06	0.17	41.4	45
2005	15000	7500	7500	42	530	1.96	48.58	0.24	39.2	79
2006	23000	15500	7500	34	514	1.78	47.22	0.20	37.6	176
2007	25000	10500	14500	36	514	1.69	45.57	0.19	36.1	112
2008	25000	10500	14500	33	519	1.80	46.63	0.16	31.9	121
2009	25500	10500	14500	30	518	1.79	46.34	0.25	28.0	87
2010	28500	13500	14500	32	509	1.71	47.09	0.22	30.9	48
2011	29500	14500	14500	31	489	1.40	42.90	0.21	29.9	105
2012	28500	13500	14500	35	506	1.53	42.65	0.22	31.2	107
2013	28500	13500	14500	25	499	1.51	43.98	0.25	21.6	125
2014	28500	13500	14500	22	492	1.50	45.11	0.21	22.0	90
2015	28500	13500	14500	26	491	1.52	46.27	0.20	25.6	138
2016	28500	13500	14500	20	496	1.49	43.91	0.23	17.9	102
2017	28500	13500	14500	18	495	1.43	42.57	0.22	18.0	111
2018	28500	13500	14500	28	495	1.51	45.32	0.26	28.0	71

Table 2.1 Data summary statistics

	% Wild	2yr lgth	2yr wgt	2yr CF	cpue	% Wild exFF
Mean	35	507	1.66	45.68	0.21	33.7
Standard Error	2.421	2.593	0.035	0.37	0.008	2.406
Median	33	507	1.65	46.06	0.22	31.2
Mode	Multiple	514	1.51	46.63	0.22	28
Standard Deviation	11.096	11.884	0.162	1.695	0.036	11.026
Sample Variance	123	141	0.027	2.87	0.001	121.6
Kurtosis	0.77348	-1.09581	-1.10175	-0.38217	-0.52654	0.66482
Skewness	0.793447	0.073541	0.157624	-0.427825	-0.113868	0.767463
Range	45	41	0.56	6.01	0.13	43.1
Minimum	18	489	1.4	42.57	0.15	17.9
Maximum	63	530	1.96	48.58	0.28	61
Count	21	21	21	21	21	21
Confidence	4.746	5.083	0.069	0.725	0.015	4.716

Table 3. Composition of Wild trout caught Opening Day by Age Cohort (Lake Rotoiti Surveys)

Season start	AVG	18-19	17-18	16-17	15-16	14-15	13-14	12-13	11-12	10-11	09-10	08-09	07-08	06-07	05-06
Wild 1+	37	41	27	25	47	27	39	47	59	28	23	27	16	64	51
Wild 2&up	35	21	13	30	29	19	26	52	27	25	50	32	52	58	53
All Wild	72	62	40	55	76	46	65	99	86	53	73	59	68	122	104
Wild 1+	52%	66%	68%	45%	62%	59%	60%	47%	69%	53%	32%	46%	24%	52%	49%
Wild 2&up	48%	34%	32%	55%	38%	41%	40%	53%	30%	47%	68%	54%	76%	48%	51%

Table 4. Surveys conducted and anglers interviewed (Ohau Creel Surveys)

	18-19	17-18	16-17	15-16	14-15	13-14	12-13	11-12	10-11	09-10	08-09	07-08	05-06
Survey events	57	82	82	82	82	82	82	82	82	82	82	82	82
Nil angler encounters	19	20	19	12	33	32	15	19	28	22	17	3	15
Total Anglers	178	177	280	274	159	216	270	412	518	373	496	576	270
Anglers per survey*	4.68	2.86	4.4	3.9	2.5	4	4	7	10	6	8	7	4

*Anglers per survey =calculated from surveys when anglers present

Table 5. Catch rate data 2005-06, and 2007-08 to 2016-17 seasons. (Ohau Creel Surveys)

	18-19	17-18	16-17	15-16	14-15	13-14	12-13	11-12	10-11	09-10	08-09	07-08	05-06
Hrs fished	405.75	465.75	509.75	546.25	305.75	472.95	390.75	521.5	826.5	1015.5	728.10	934.15	1099.1
Kept	112	113	143	161	62	125	73	93	124	390	193	275	349
OSRT	29	31	15	66	29	83	15	33	89	221	42	24	102
USRT	8	23	18	17	20	39	14	36	29	14	4	16	34
CPUE(sum)	0.35	0.31	0.31	0.42	0.30	0.44	0.23	0.24	0.26	0.60	0.32	0.32	0.41
HPUE(sum)	0.28	0.24	0.28	0.29	0.20	0.27	0.19	0.18	0.15	0.38	0.27	0.29	0.32
Avg ind' cpue	0.34	0.30	0.25	0.38	0.32	0.38	0.23	0.20	0.27	0.61	0.30	0.40	0.42

CPUE = catch per unit effort (fish per hour and includes oversized returned)

HPUE = Harvest per unit effort (fish per hour kept)

(sum) is calculated from all fish caught/all hours fished – good for harvest calculations

Indiv' = average of all individual anglers catch rate – good for perception calculations

1.1 Summary of Opening Day/ Summer Creel

The condition of 2-yr-old opening day catch from Lake Rotoiti fish remained relatively stable through the 2001-2010 period with a high point occurring in 2005. During 2011, a significant drop in rainbow trout condition factor was picked up. A further decline in condition was noted at the 2012 opening, though length and weight were superior to the 2011 opening statistics. Opening day surveys over 2013-14, 2014-15 and 2015-16 demonstrated ongoing improvement in 2-yr-old trout condition factor prior to a significant condition decline ($P < 0.001$) at the 2016-17 opening. This significant decline continued through the 2017-18 opening ($P = 0.014$). Theories for the deterioration in condition are listed below.

Fish & Game liberations into Lake Rotoiti began increasing in 2009 with 500 February liberated rainbows (N9 tag). An extra 3000 were liberated in September 2010 to respond to an increase in angling pressure to the lake as illustrated in the NIWA National Angler Survey (NAS). The extra numbers make up a 12% increase to total Rotoiti liberations. The increase in liberation numbers coincides with the drop in Lake Rotoiti 2-year-old condition factor, so is likely a Fish & Game created affect and not associated with the diversion wall. We would expect to have seen a slide in condition factor occurring since construction if that was the case. Further changes to the liberation strategy for Rotoiti began in September 2012 spreading the seasonal liberations over more months. This means the same number of fish released in smaller batches over a wider timeframe instead of the traditional all in one liberation. This was trialled to observe whether increased survival was possible by avoiding releasing yearlings at poor growth times of year. Following three years monitoring a wider spread of size ranges has been recorded, which has affected the opening day, summer creel and winter creel average sizes. During the 2015 spring releases, the November and December months were removed from the liberation schedule. The reason for this was to reduce the spread in fish size and to increase the average size of the fish caught.

The percentage of wild fish in the Lake Rotoiti opening day catch had dropped from the low 40% level to the mid 30% in the two years prior to the walls construction. It hovered at the lower 30% level for 5 years following construction then dropped around 10% to sit at the mid 20% wild level through the 2013-2015 period.

The percentage of young wild rainbow trout in the opening day catch does not appear to have drastically altered since the diversion wall was put in place. Since the 2013-14 opening day, a higher percentage of hatchery fish have been represented in the opening day creel. Increased survival of newly liberated and younger fish may have resulted from the staggered liberation strategy started at the 2012 spring liberations.

Summer catch rates over the 2018-19 summer were just below the 2015-16 to 2017-18 summer period but in line with the past 10-yr-average of 0.26 fish per hour on Lake Rotoiti. During the 2019 winter, the average catch rate surveyed was reduced compared to the 2018 winter. Fewer fish were presented for weighing by Rotoiti anglers during the 2018 winter, but those that were measured were larger, heavier and in better condition than the 2017 winter fish. Following on from the construction of the Ohau diversion wall in the 2007-08 angling season, Lake Rotorua creel surveys demonstrated a decline in

rainbow trout condition. This may have been caused by warmer summer temperatures, lack of successful smelt spawning and/or algal blooms through this period. Both the 2012-13 and 2013-14 summer surveys showed consecutive improvements in size, weight and condition of rainbow trout, before condition deteriorated again over the 2014-15 and 2015-16 summers. The latter two summers had particularly warm lake temperatures forcing fish to seek thermal refuge for at least part of the summer.

The 2016-17 summer was cooler and windier allowing the Lake Rotorua trout population to remain in the main lake body rather than seeking thermal refuge for extended periods. The average size of trout caught during the 2016-17 summer was 1mm shorter, but significantly heavier ($P < 0.001$) than the average 2015-16 summer fish.

Both the 2017-18 and 2018-19 summers resulted in trout accumulating within the cooler inflows providing high catch rates for anglers. The 2018-19 summer was more pronounced in respect of thermal escapement than the 2017-18 summer.

The Lake Rotorua rainbow trout measured over the 2018-19 summer were on average slightly shorter (2.5mm), but significantly heavier (110g, $P = 0.03$) (Table 8) and were in significantly better condition ($P < 0.001$) than the fish measured during the 2017-18 summer.

2. OHAU CHANNEL TROUT FISHERY SURVEY DATA

Fisheries Surveys at the Ohau Channel were completed under contract by a MSc. student in 2005-06, and subsequently by Aquatek Consultants in 2007-08 to 2012-13. JFB Consultants surveyed during the 2013-14 season. Aquatek were again contracted to continue surveys during the 2014-15 to 2018-19 period. The data collected provides 2 years of fisheries statistics pre-wall construction and 11 years post completion.

EXECUTIVE SUMMARY

- A total of 57 angler creel surveys were conducted at the Ohau Channel over the 2018-19 angling season. Anglers were encountered (fishing) during 38 of the survey events.
- The 2018-19 angling season at the Ohau Channel produced a higher average catch rate than the 2016-17 season. The 0.34 fish per hour recorded was just above the average of the 13 completed Ohau Channel creel surveys.
- The average sized brown trout caught during the 2018-19 season was smaller, lighter and in poorer average condition compared to those from the 2017-18 survey. A total of 9 brown trout were measured compared with 22 during the 2017-18 season, 17 during the 2016-17 season, 20 during the 2015-16 season and 6 during the 2014-15 season. The average rainbow trout caught was longer, significantly heavier ($P=0.034$) but in lesser condition than those caught during the 2017-18 season.
- Anglers interviewed during the 2018-19 season perceived both their catch rate and fish size and condition to be significantly poorer compared to the 2017-18 season ($P<0.001$). Overall, angler's satisfaction levels were lowered compared to those fishing during the 2017-18 season.
- Over the course of the 2018-19 survey, 58% of anglers stated they were either satisfied or highly satisfied with their seasons fishing.
- A total of 17 comments regarding detractions were logged with surveyors over the 2018-19 season. The most common detraction to Ohau Channel angling related to the wall not letting fish through (6% responses) followed by snags in the Channel (4%) and lack of smelt in the channel (5%).

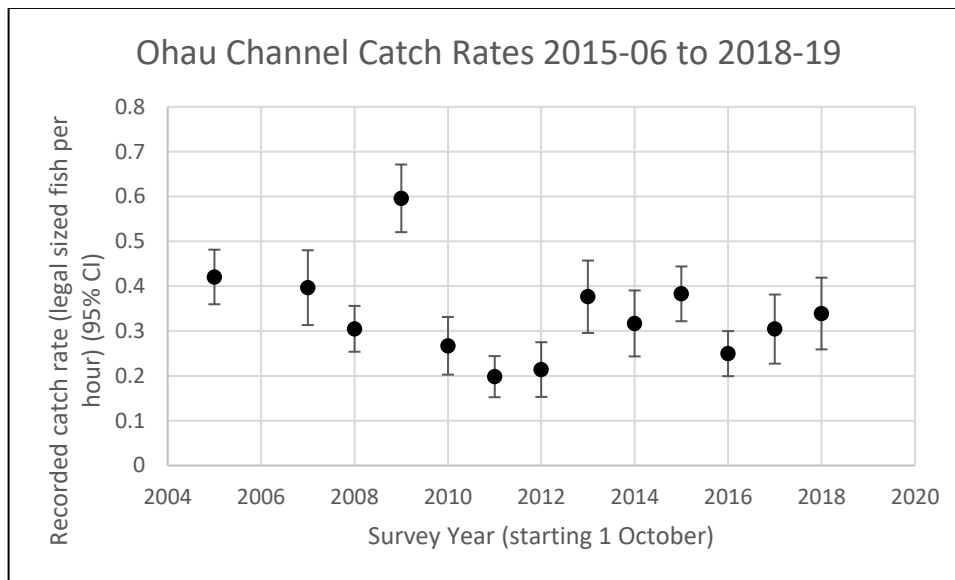
2.1 Data Collection

A total of 38 survey events were undertaken at the Ohau Channel over the 2018-19 season when anglers were present.

2.2 Angler catch rates

Angler catch rate information (CPUE = fish per rod hour) gathered during the surveys during the 2005-06 and 2007-08 to 2018-19 seasons is summarized in Table 5.

The average individual catch rate over the entire season (0.34 fish/hr) was improved from the 2017-18 season and represents the 6th highest (out of 13) monitored since the Ohau creel surveys began.



The average individual catch rates recorded between seasons have fluctuated over the course of the 13 completed surveys. Angler experience (Figure 2.30) may account for differences seen in catch rates as inexperienced anglers generally have lower catch rates. The frequency of individual anglers visiting the Ohau Channel during the 2018-19 season differed from the average figure of all survey seasons as there was a great reduction in the number of anglers who visited only once, similar numbers in the 10-14 and 40-59 brackets.

2.3 Seasonality of Catch Rates

The opening day and average October individual catch rates for the 2018-19 season were acceptable though slightly behind the average catch rate statistics since Ohau Channel Surveys were implemented. The best opening to an Ohau Channel angling season was witnessed during the 2009-10 season. The 2013-14 and 2015-16 opening provided the

2nd equal best start which were just ahead of the 2007-08 opening immediately prior to the diversion wall's construction. Having large smelt densities in the channel coinciding with the trout fishing season opening is an aspect that the 'good' openings have in common and the poorer openings lack.

October resulted in the highest angling effort recorded as per other survey years.

Recorded catch rates peaked in April though few anglers were encountered. April and May provided the best catch rate statistics for the season before a poor conclusion to the season was documented in June.

Figure 2.1 Angler catch rates by year during the season

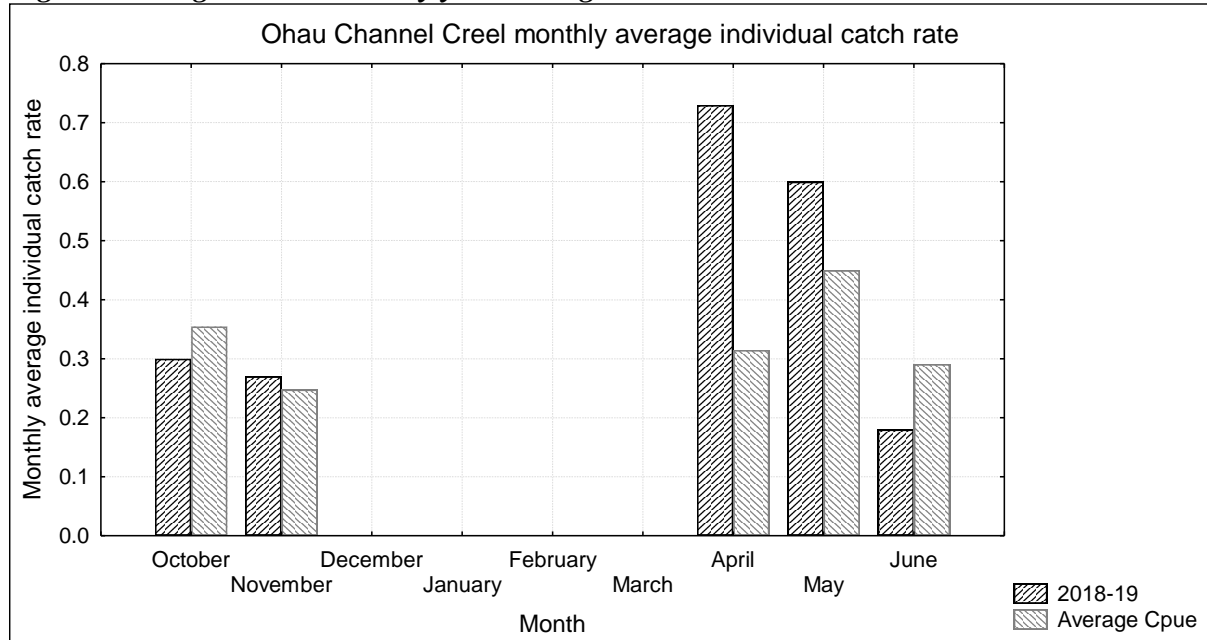


Table 6. 2018-19 Catch rates during the season (other season tables in appendix)

	Hrs	Kept	OSRT	USRT	cpue Sum	cpue indi'v
Opening Weekend	121.5	41	7	0	0.40	0.42
All October	266.25	62	18	6	0.30	0.30
November	48.0	14	0	0	0.29	0.27
December						
Jan & Feb						
March						
April	20.25	9	6	0	0.74	0.73
May	48.75	23	5	2	0.57	0.60
June	22.50	4	0	0	0.18	0.18

This seasonality of catch rates in past seasons tends to mirror the encounter rate during the season (Figure 2.20). Basically, if catch rates were higher, the interviewers tended to encounter more anglers, when they were lower, they encountered less anglers. During the 2018-19 season, angler encounter rates were highest during October as with other years. The start of the season usually has high catch rates after being rested for three months and the end of the season traditionally sees fish move into the channel when Lake

Rotorua’s temperature, that feeds the channel, cools. Interestingly, the end of 2018-19 season had very low encounter rates and few fish caught following high catch rates reported in April and May.

Figure 2.20

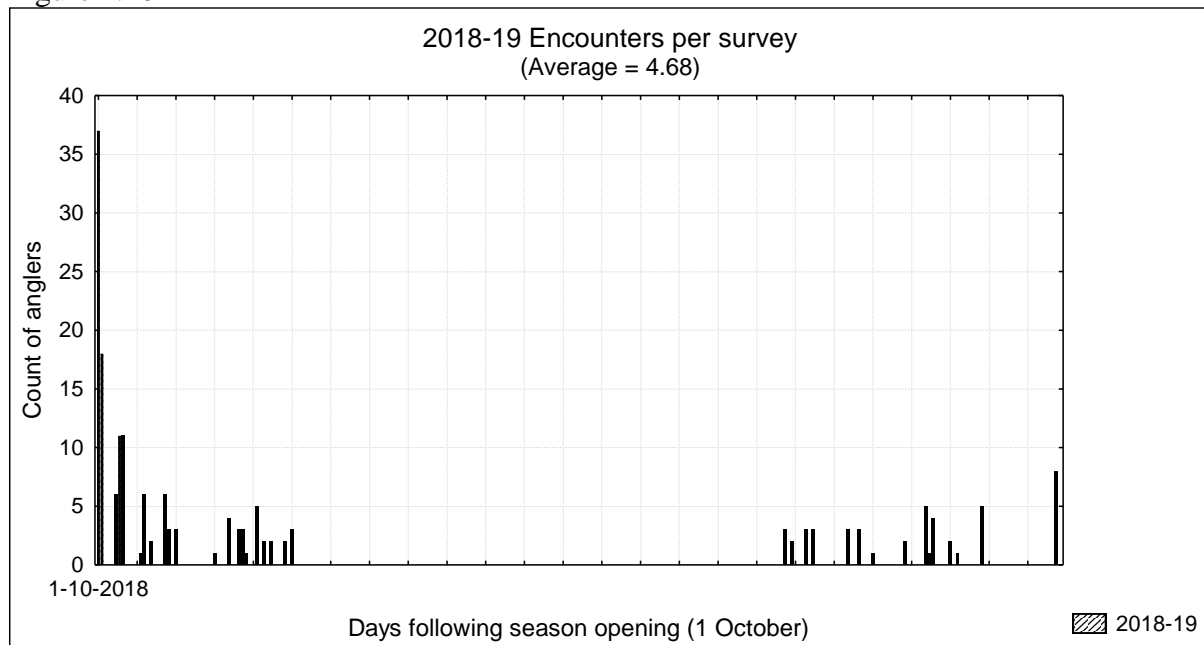
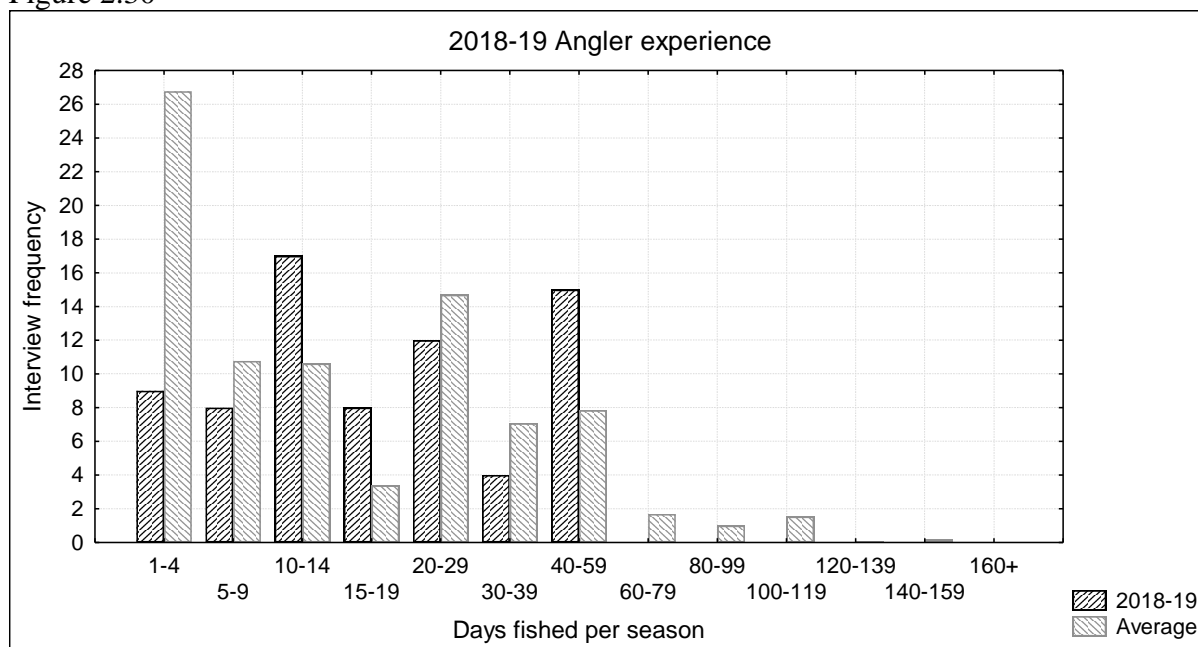


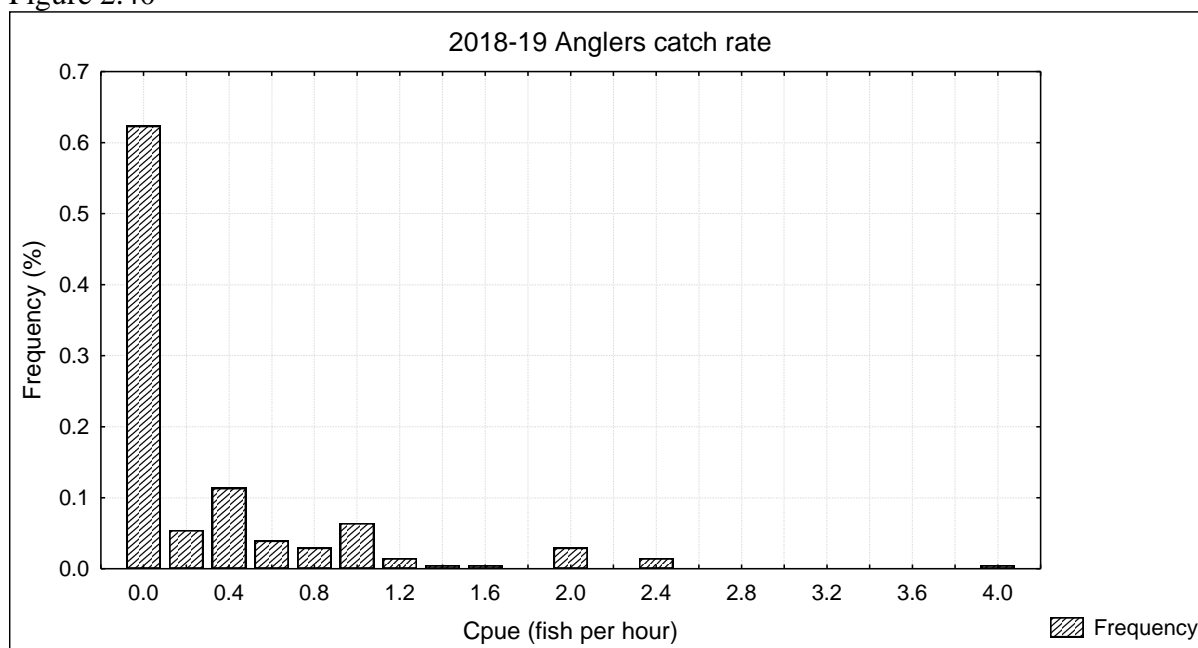
Figure 2.30



2.4 Catch Rate Distribution

Plots of catch rate distribution across anglers from one year to the next have shown little real difference with typically 65% of anglers not having caught a fish when interviewed. (Figure 2.40)

Figure 2.40



2.5 Characteristics of fish caught

The average brown trout caught during the 2018-19 season was smaller (24mm), lighter (390g) and in poorer condition than the average brown measured during the 2017-18 survey. A lower total of 9 brown trout were measured compared with 22 during 2017-18 and 17 during 2016-17. The average rainbow trout caught was longer (15mm), significantly heavier (150g) ($P=0.0.34$) but in slightly poorer condition compared to those caught during the 2017-18 season.

2.6 Anglers perceptions and Satisfaction

Anglers were asked to rate (Table 8) how they felt about their catch rates and the size and condition of the fish they were catching this summer compared to previous summers. Anglers were also asked to rate their level of satisfaction with the summers fishing.

Table 8. Rating scales for assessing angler perceptions and satisfaction.

Ratings for CPUE and Size.		Rating for level of Satisfaction.	
Value	Description	Value	Description
1	Excellent	1	Highly satisfied
2	Good	2	Satisfied
3	Average/Acceptable	3	Dissatisfied
4	Poor	4	Strongly dissatisfied
5	Terrible		

The average rating used in the following tables and figures is the average calculated from all anglers perceptions on catch rate, fish size and condition, and satisfaction. The average rating is considered as the answer given by a hypothetical "average angler". Size and condition are grouped into the same question as past surveys have found anglers most often group these characteristics together. Satisfaction is also assessed by the percentage of anglers who responded that they were satisfied (highly satisfied or satisfied) with their fishing.

The rating for the average angler for catch rate (cpue), fish size and angler satisfaction, including percentage of satisfied anglers is shown in Table 9. and Figures 3.0, 3.1.

Table 7. Brown trout and rainbow trout average length and weight data surveyed from Ohau Channel during 2005-06 and the 2007-08 to 2018-19 seasons. Significant differences shown in bold.

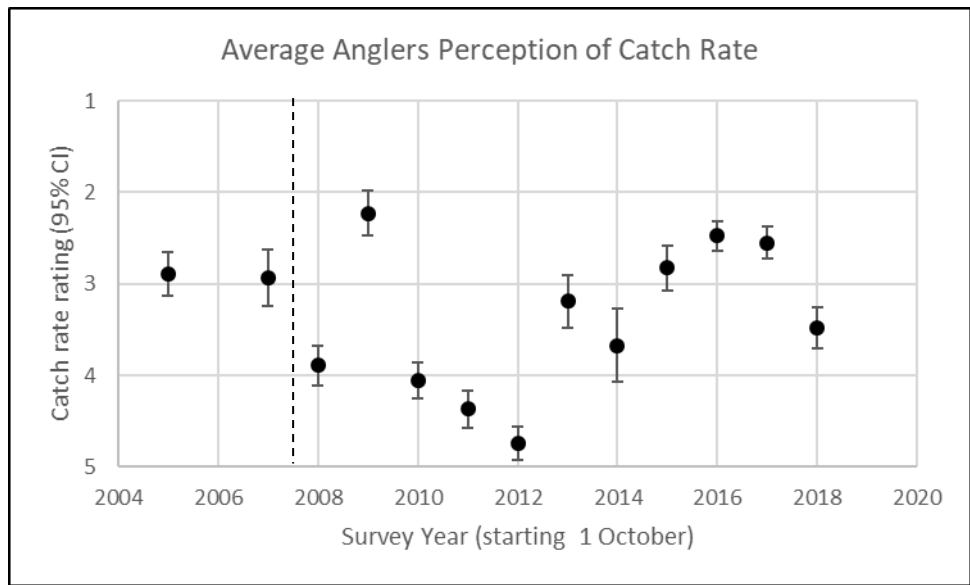
	18-19	17-18	16-17	15-16	14-15	13-14	12-13	11-12	10-11	09-10	08-09	07-08	05-06
Brown length	580	604	626	612	623	645	614	669	672	650	702	675	662
Brown weight	2.47	2.86	3.26	2.83	2.93	3.75	2.68	3.94	3.91	4.12	4.63	4.71	4.32
Brown c.f.	42.94	45.60	47.34	43.93	42.21	50.36	39.20	46.87	45.45	53.49	47.79	53.63	52.96
Rainbow length	514	499	506	503	519	512	492	516	507	541	554	543	541
Rainbow weight	1.64	1.50	1.58	1.62	1.55	1.69	1.51	1.58	1.56	2.11	2.22	2.30	2.25
Rainbow c.f.	42.94	43.36	43.37	44.76	39.81	44.57	44.06	40.39	41.55	47.19	46.1	50.98	50.09

Table 9. Angler perceptions (1=excellent, 5=terrible)

	18-19	17-18	16-17	15-16	14-15	13-14	12-13	11-12	10-11	09-10	08-09	07-08	05-06
Cpue	3.48	2.55	2.48	2.82	3.68	3.19	4.74	4.37	4.06	2.23	3.89	2.94	2.9
Size	3.35	2.49	2.51	2.82	3.76	3.01	4.74	4.38	4.05	2.32	3.87	2.98	2.28
Satisfaction	2.39	2.30	2.32	2.37	2.92	2.34	3.84	3.31	3.16	2.02	3.28	2.44	1.75
% satisfied	58%	72%	67%	68%	33%	69%	3%	19%	19%	88%	16%	66%	98%

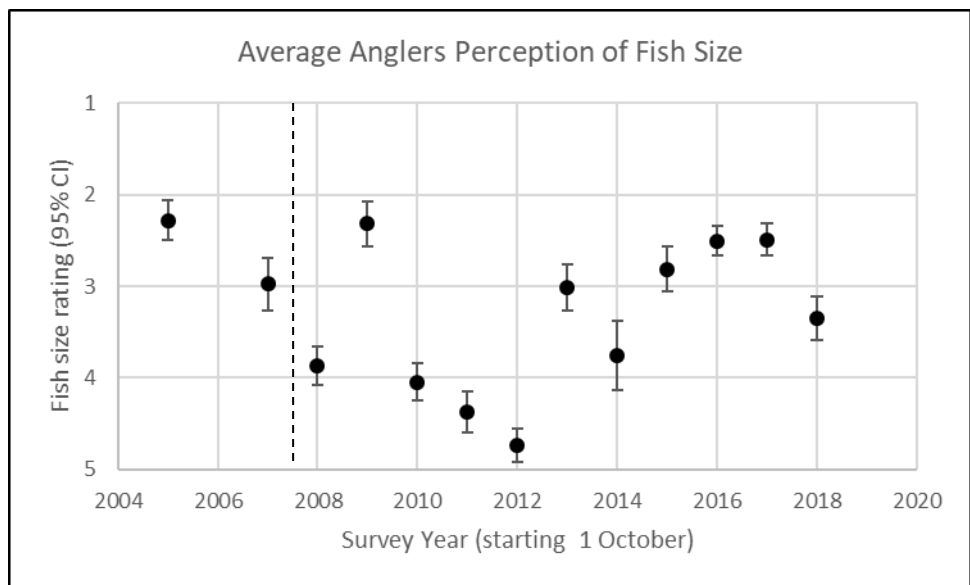
Over the course of the 2018-19 season, anglers considered both size of fish caught and fish condition along with their catch rate to be significantly poorer. Anglers also gave a poorer rating for their perception of satisfaction with their angling experience.

Figure 3.0 Angler Perceptions of Catch Rate



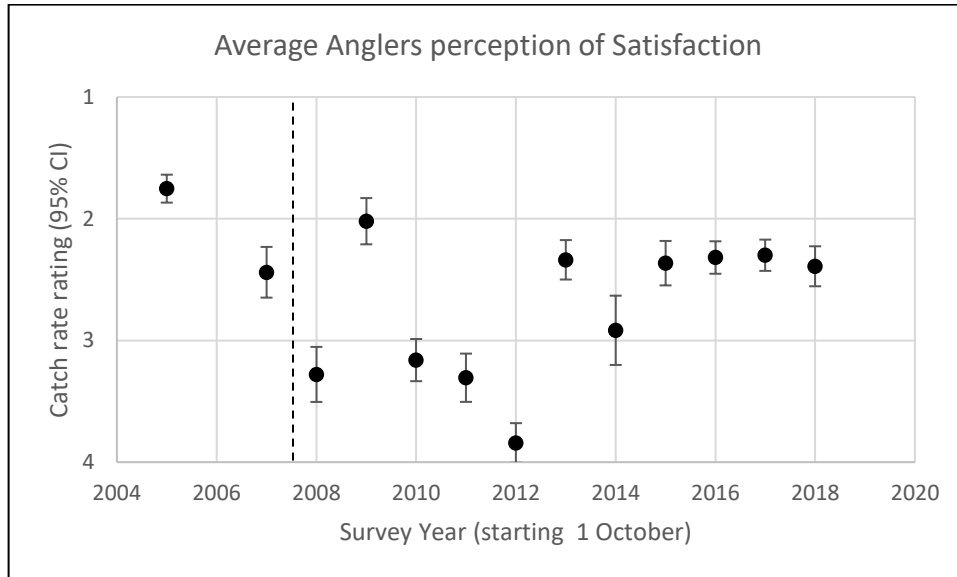
Ratings: 1=Excellent, 3=Average, 5=Terrible

Figure 3.1 Angler Perceptions of Fish Size



Ratings: 1=Excellent, 3=Average, 5=Terrible

Figure 3.2 Angler Perceptions of Satisfaction



Ratings: 1=Highly Satisfied, 2=Satisfied, 3= dissatisfied, 4=Strongly Dissatisfied

2.61 Percentage of anglers Satisfied

Over the 2018-19 season, the percentage of satisfied anglers dropped from the 72% level achieved during the 2017-18 season with 58% of anglers stating they were satisfied with their Ohau Channel trout fishing.

2.7 Angler Detractions

In order to attempt to quantify what real issues are facing anglers fishing the Ohau Channel they are asked "what, if anything, detracts from their angling experience?" The percentage responses for the 2005-06 and 2007-08 to 2018-19 surveys are shown in Table 10.

Over the course of the 2018-19 season 6% of replies to the question (4 total comments) were directly targeted at the diversion wall. One of these mentioned that 'the wall is not letting the fish up). 5% of replies stated that having no smelt visible in the channel detracted from their angling experience. Smelt are a prey species of the trout that would presumably attract trout into the channel. 3% of anglers stating their opinion said that low water levels were a detraction and a further 3% stated that snags in the waterway detracted from their experience through loss of flies and tackle.

Fish & Game received very few calls about poaching at the channel over the past five seasons (2013-14 to 2018-19 seasons). One angler reported that the presence of poachers detracted from their angling, but it is unknown whether any reporting of this incident occurred.

More detractions were highlighted when surveyed anglers were asked why they were satisfied or dissatisfied (Section 2.71).

Table 10. Stated detractions to angling experience

DETRACTION	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	2012-13	2011-12	2010-11	2009-10	2008-09	2007-08	2005-06
Crowds			3%	1.4%								2.5%	9%
Shags													5%
Quality Water			3%					1%		3%	3.9%		5%
Boats													4%
Rude anglers												1%	3%
Limited access	2%			1.4%			2%						3%
Weir*	6%		16%	4.3%		4%		1%	2%				2%
Snags	5%	4%				1%					1.3%		2%
Other users						8%						2.5%	2%
Few fish		16%	11%	30.4%		26%		1%	9%	4%			2%
Technology													1%
Lack of smelt	5%	5%	3%										
Poor cond. fish	2%	18%*	11%	4.3%					15%	8%	1.3%		1%
Pollution		3%	5%	5.8%		3%					1.3%		1%
Poachers	2%		1%			1%				7%			1%
No Toilet													1%
No reg. signs													1%
Weather	3%	5%	14%				2%						
Nil	75%	50%	34%	52.2%	100%	57%	96%	97%	74%	78%	92.1%	94%	55%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

2.71 Why Anglers were Satisfied or Dissatisfied

At the time of the 2008-09 creel, the surveyors noted that “The Wall” was the most common topic of discussion during the survey yet no anglers actually mentioned it as detracting from, or being a detraction to, their fishing. On discussing this with surveyors further, they felt the anglers considered the more immediate and visible detractions when asked this question so responses typically related to what they could see or what was affecting them directly at the time they were interviewed.

Since the 2009-10 Ohau creel survey, anglers have been asked whether they were satisfied or dissatisfied with their summers fishing and then why? This was done to tease out whether anglers felt the wall itself was having a negative (or positive) effect upon the fishery. Only 1 angler out of 55 (1.8% of respondents) said that there were no fish running through the channel perhaps due to the presence of the wall.

Over the course of the 2018-19 angling season at the Ohau Channel 37 anglers stated they were satisfied with their trout fishing experience. 38% of these satisfied anglers stated they were satisfied because fish were being caught. 24% stated they were satisfied because fish were in good condition or were good size. 11% were satisfied because smelt were present and visible. 8% were satisfied because they could see trout present within the channel. 11% were satisfied because there was excellent access to the Ohau Channel. A further 8% were satisfied because they felt the Ohau Channel was a nice location to visit and fish.

A further 27 anglers stated that they were dissatisfied with their Ohau Channel angling. When asked to explain why they were dissatisfied, 86% said they were dissatisfied because the fishing was hard, and they had caught few if any fish. A further 14% stated their dissatisfaction was due to the small size and/or poor condition of fish being caught.

2.8 Ohau Creel Summary

Prior to the wall being built, anglers could fish at two major publicly accessible points of the channel with high chance of hooking a fish. The first being the start of the channel by the weir from Marama Resort (now Ramada Resort) side (true left) and Takinga Street (true right). The other area was where the channel entered Lake Rotoiti known as the Ohau Channel Delta. Both of these areas had deep water drop offs where trout would congregate and hold. The remainder of the channel is largely privately owned where general public do not have access. Since the diversion wall was built, the area that was previously known as the ‘Delta’ has gradually filled in and become a poor angling area as fish no longer hold in that zone. Extra pressure has since been placed on the Lake Rotorua end of the channel as most anglers moved to the area that had legally permitted angler access and the best opportunity to catch trout.

The condition factor of trout caught within the channel has declined compared with pre-wall measurements following the wall being built. Unfortunately, just two surveys were conducted prior to the Ohau wall’s construction, however pre-wall browns averaged 53.30cf points compared to 45.93cf post-wall. Rainbows pre-wall averaged 50.54cf compared to 43.46cf post-wall. The summer creel undertaken annually on Lake Rotorua

also recorded a decline in fish condition around and following 2007-08 when the wall was constructed. This may be a consequence of lack of smelt in Lake Rotorua and/or warm summer lake temperatures and algal blooms affecting the lake from this period. Lake Rotorua monitoring indicated an improvement in rainbow trout size and condition during the 2012-13 and 2013-14 seasons, along with anecdotal reports of smelt appearing in numbers. A subsequent decline in condition was then noted in Rotorua catch from the 2014-15 season with very warm summer water temperatures. This indicates a high likelihood that Lake Rotorua fish condition is a key driver of what is occurring within the Ohau Channel catch and therefore anglers perceptions of fish quality.

In the two seasons surveyed prior to the wall being in place, anglers perceptions of catch rate, fish size and satisfaction were rated acceptable to good/satisfied.

Since the diversion wall was constructed, seven of the eleven angling seasons surveyed have resulted in anglers rating their catch rate as below average. Four seasons out of the eleven surveyed post-wall were rated as poor to terrible in terms of catch rate. These seasons were 2008-09, 2010-11, 2011-12 and 2012-13.

For fish size, six of the eleven seasons post-wall were considered below average by anglers with five of the eleven being rated as poor to terrible. These were (as for catch rate) 2008-09, 2010-11, 2011-12, 2012-13 along with the 2014-15 season.

Anglers have rated their level of satisfaction in fishing the Ohau Channel as 'Dissatisfied' to 'Strongly dissatisfied' for these same five seasons (2008-09, 2010-11, 2011-12, 2012-13 and 2014-15). However, the past four seasons 2015-16 to 2018-19 have been very consistent at a slightly better than average satisfaction rating and similar to the 2007-08 season immediately prior to the walls construction.

In response to what detracts from their angling experience, fishers have over the course of the surveys identified three main areas of detractions. The quality of the water (which also encompasses the water level), the number of fish caught and the quality of the fish caught. These are all immediately in line of anglers sight and the first things that come to mind, such as 'I haven't caught any fish', 'my fish are terrible' or 'the water is low and filthy'.

The fishery advisory panel wished to get more in-depth information on the drivers of angler satisfaction or dissatisfaction so asked why anglers were satisfied or dissatisfied. In response to this, few anglers have mentioned the wall as a causative factor. Less than 5% of anglers surveyed have generally responded that they believe the wall is creating an issue to the trout fishery. Two anglers during the 2011-12 survey also stated that Fish & Game needed to address the problem. In the 2016-17 season 16% of anglers voicing a detraction to their angling mentioned the weir, though it is not clear whether this was a comment toward the diversion wall or the operation of the Lake Rotorua outlet weir. It is possible that asked why they were dissatisfied; anglers have simply replied 'because I haven't caught any fish' or 'because the fish are in terrible condition'. Without asking a particularly leading question, the anglers may pick the most visible factor they are aware of or have heard others talking about.

Angling clubs and some individuals have commented negatively on the angling in the Ohau Channel since the construction of the diversion wall, except for the 2009-10 season, when the opening was described as very good to excellent. A number of letters from the Ohau Angling Club and phone calls from anglers were received by Fish & Game over the seasons closest to the diversion walls construction. Information pamphlets produced and distributed by Bay of Plenty Regional Council following the 2012-13 angling season have aided angler understanding of fishery processes as have meetings with the Ohau Anglers Club. There has been a positive reduction in correspondence coming back to the Eastern Fish and Game Council since this was provided.

Following the 2015-16 season opening, it was discovered through aerial photography that a hole had scoured underneath the diversion wall at the site of the old delta. Over the 2015-16 season there were good numbers of smelt observed in the channel over a lengthy period and good fishing was recorded. It is not known whether undermining of the wall had played an important role in the smelt appearance or angling improvements seen.

Two fish passes were retrofitted into the wall during the first week of October 2017. Further monitoring is required to ensure that the pass arrangement is providing the desired effect. This is largely dependent on water velocity being low enough to allow burst swimming for juvenile smelt, and monitoring of whether smelt and juvenile bullies are using the pass arrangement.

Over the course of the 2018-19 angling season at the Ohau Channel 37 anglers stated they were satisfied with their trout fishing experience. 38% of these satisfied anglers stated they were satisfied because fish were being caught. 24% stated they were satisfied because fish were in good condition or were good size. 11% were satisfied because smelt were present and visible. 8% were satisfied because they could see trout present within the channel. 11% were satisfied because there was excellent access to the Ohau Channel. A further 8% were satisfied because they felt the Ohau Channel was a nice location to visit and fish.

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Acknowledgements

Thank you to Aquatek consultants for undertaking the survey work during the 2018-19 season and thanks also to all anglers who gave their time to contribute to the survey.