



**EASTERN REGION**

**Ohau Channel Diversion Wall Trout Monitoring**  
**2012-13**

**Prepared for Fisheries Panel Meeting 15 October 2013**

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 2012. Data from Lake Rotoiti trout, approximately 41 months after diversion wall was completed.

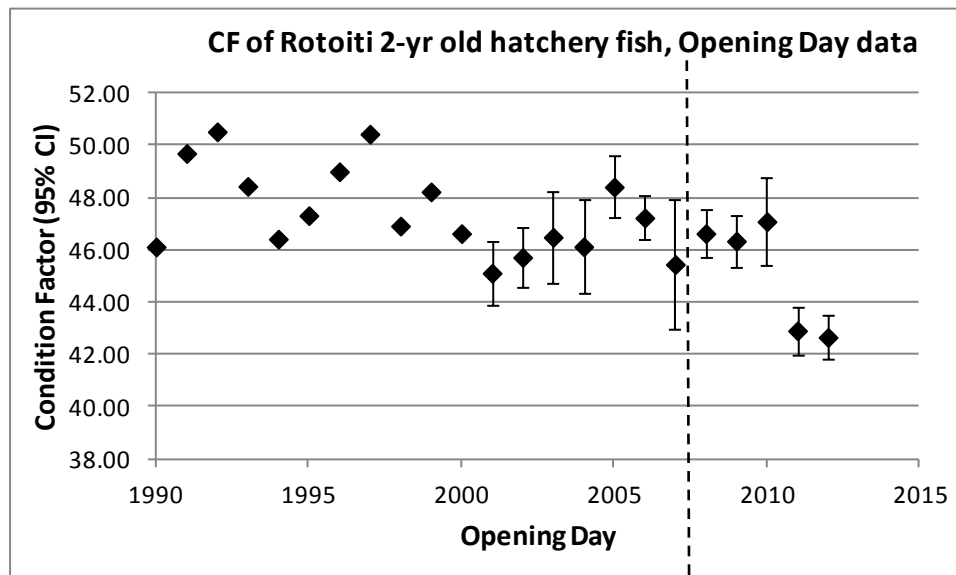
### Summer Survey Data

- Continuous summer survey from November to April each year
- Trout characteristics collected from all fish measured – 54 to 59 months post wall completion

### **Possible wall Impacts?**

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 drop in trout length.

- Data from the 2012 Opening Day (Table 2 and figure below) showed that trout condition from the hatchery 2-year-old group was well below the long term average.
- A slight drop in condition factor was noted between the 2012-13 and 2011-12 Lake Rotoiti Opening Day data (2-yr-old fish).



***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 2012-13 summer was poorer than it was from the fish surveyed from the previous summer and below the last eleven-year average.

Table 1. Summer Survey Comparison of overall average rainbow trout lengths and weights. Significant differences between years are shown in bold (P<0.05).

Lake	Feature	AVG	12-13	11-12	10-11	09-10	08-09	07-08	06-07	05-06	04-05	03-04	02-03
<b>Rotoiti</b>	Length (mm)	511	522	<b>516</b>	<b>525</b>	501	512	520	518	527	<b>517</b>	491	467
	Weight (kg)	1.78	1.79	1.71	1.83	1.68	1.83	1.75	1.71	1.98	<b>2.12</b>	<b>1.74</b>	1.43
	Cond' Factor	45.05	<b>42.11</b>	43.33	43.47	<b>44.51</b>	<b>46.32</b>	42.00	<b>42.14</b>	45.76	46.96	<b>50.80</b>	<b>48.13</b>
<b>Rotoiti</b>	Wild L	482	490	492	491	478	476	500	513	492	466	448	456
	<b>% WILD</b>	49%	39%	40%	45%	37%	30%	44%	62%	57%	54%	50%	76%
	Hatch L	523	540	531	552	515	526	536	520	539	516	476	496
	N (all fish)	148	165	390	128	159	161	86	89	90	218	60	78
Tarawera	Length (mm)	524	532	<b>541</b>	<b>516</b>	536	529	532	516	510	498	518	540
	Weight (kg)	1.66	<b>1.63</b>	<b>1.87</b>	<b>1.49</b>	1.71	1.70	1.63	1.57	1.54	1.49	1.72	1.94
Rotorua	Length (mm)	459	443	431	436	456	<b>460</b>	<b>485</b>	465	466	472	<b>480</b>	455
	Weight (kg)	1.17	0.98	0.88	<b>0.80</b>	1.10	<b>1.10</b>	<b>1.36</b>	1.21	<b>1.2</b>	1.49	<b>1.54</b>	1.24
Okataina	Length (mm)	550	529	537	553	552	545	534	522	533	571	593	<b>589</b>
	Weight (kg)	1.96	1.79	1.97	2.00	2.05	1.98	1.70	1.56	1.54	2.16	2.55	<b>2.23</b>
Rrua FF L		485	464	500	485	500	<b>428</b>	500	<b>460</b>	500	495	500	502
Rrua FF Wt		1.44	1.13	1.59	1.44	1.59	<b>0.80</b>	1.59	1.29	1.59	1.46	1.59	1.73
Rrua Tr L		465	446	477	462	477	445	477	455	477	<b>456</b>	477	464
Rrua Tr Wt		1.14	1.02	1.23	1.18	1.23	0.81	1.23	1.15	1.23	<b>1.07</b>	1.23	1.20

**Possible wall Impacts?**

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

- Opening Day data from 2012 Opening (1<sup>st</sup> October 2012) showed 31.2% of the opening day catch (excluding fly fishing) was made up of wild trout (Table 2). This is a low percentage (for the fifth successive opening), but has been recorded at this level following the large increase in liberations since 2001. It is also an improvement from the last three openings.
- The Summer creel survey data (Table 1) shows that the percentage of wild trout in the catch measured during the 2012-13 summer creel survey was 39%. This is compared to the 40% measured in the 2011-12 summer, 45% during the 2010-11 survey, the 37% recorded over the 2009-10 summer and the 30% wild during the 2008-09 summer.
- Liberations of hatchery trout into Lake Rotoiti increased slightly during 2010-2011 and we would expect this to have a slight effect of 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 affect of the diversion wall, or may have been affected 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 held steadily around the 30% mark for the last five openings and is similar to the 2001 Opening Day percentage.

We might also expect a decline in the ratio of younger wild fish to older wild fish 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 47%. During the 2012 opening, the percentage of younger class wild trout was 47%.

**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)
1994	12000	6500	6100	60	534	1.96	<b>46.42</b>	0.38	60.0	
1995	12500	6500	6000	69	518	1.80	<b>47.32</b>	0.35	69.0	16
1996	13000	6500	6000	57	536	2.10	<b>49.00</b>	0.26	58.0	42
1997	14500	8500	6000	57	522	1.99	<b>50.44</b>	0.22	57.8	17
1998	14500	7500	7000	63	522	1.85	<b>46.92</b>	0.15	61.0	31
1999	14500	3500	11000	54	522	1.90	<b>48.23</b>	0.15	54.0	36
2000	14500	3500	11000	44	517	1.81	<b>46.63</b>	0.17	41.0	30
2001	27000	12500	14500	30	507	1.63	<b>45.01</b>	0.22	28.3	94
2002	25000	10500	14500	44	500	1.60	<b>45.90</b>	0.28	41.9	70
2003	25000	10500	14500	42	505	1.65	<b>46.29</b>	0.22	42.2	35
2004	24500	10000	14500	43	514	1.74	<b>46.06</b>	0.17	41.4	45
2005	15000	7500	7500	42	530	1.96	<b>48.58</b>	0.24	39.2	79
2006	23000	15500	7500	37	514	1.78	<b>47.22</b>	0.20	37.6	176
2007	25000	10500	14500	36	514	1.69	<b>45.57</b>	0.19	36.1	112
2008	25000	10500	14500	33	519	1.80	<b>46.63</b>	0.16	31.9	121
2009	25500	10500	14500	30	518	1.79	<b>46.34</b>	0.25	28.0	87
2010	28500	13500	14500	32	509	1.71	<b>47.09</b>	0.22	30.9	48
2011	29500	14500	14500	31	489	1.40	<b>42.90</b>	0.21	29.9	105
2012	28500	13500	14500	35	506	1.53	<b>42.65</b>	0.22	31.2	107

**Table 2.1 Data summary statistics**

	% Wild	2yr lgth	2yr wgt	2yr CF	cpue	% Wild exFF
Mean	43.13	516	1.77	46.59	0.22	43.13
Standard Error	2.81419	2.64389	0.03917	0.42642	0.01415	2.94934
Median	42	517	1.79	46.63	0.22	41.0
Mode	57	522	1.96	46.63	0.22	#N/A
Standard Deviation	12.26677	11.52445	0.17075	1.85872	0.06167	12.85586
Sample Variance	150.474	132.813	0.029	3.455	0.004	165.273
Kurtosis	-0.8468	0.4914	0.1568	1.0486	1.5122	-0.9198
Skewness	0.6171	-0.2806	-0.2052	-0.3160	1.2054	0.6138
Range	39	47	0.70	7.79	0.23	41
Minimum	30	489	1.4	42.65	0.15	28
Maximum	69	536	2.1	50.44	0.38	69
Count	19	19	19	19	19	19
Confidence	5.52	5.18	0.08	0.84	0.03	5.78

**Table 3. Composition of Wild trout caught Opening Day by Age Cohort**

Season start	AVG	12-13	11-12	10-11	09-10	08-09	07-08	06-07	05-06
Wild 1+	47	47	59	28	23	27	16	64	51
Wild 2& Older	52	52	27	25	50	32	52	58	53
All Wild	83	<b>99</b>	<b>86</b>	<b>53</b>	<b>73</b>	<b>59</b>	<b>68</b>	<b>122</b>	<b>104</b>
Wild 1+	47%	47%	69%	53%	32%	46%	24%	52%	49%
Wild 2& Older	53%	53%	30%	47%	68%	54%	76%	48%	51%

### **1.1 Summary of Opening Day/ Summer Creel**

The condition of 2-yr-old opening day catch from Lake Rotoiti fish was fairly stable through the 2001-2010 period with a high point occurring in 2005. In 2011 a significant drop in rainbow trout condition factor was noted. A further decline in condition was picked up at the 2012 opening, though length and weight were better than the 2011 opening figures. The 2012 opening day 2-yr-old condition factor is still well behind the 2010 figure.

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.

Wild percentage appears to be holding steady (30% since wall put in) after an initial 10% drop coinciding with construction of the wall, but the percentage of wild fish in the catch had been sliding for a couple of years prior to construction. There has been no dip recorded in wild numbers during Lake Rotoiti creel surveys due to increased hatchery liberations thus far.

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.

Summer harvest was low over the 2012-13 summer on Lake Rotoiti. Winter catch rate has yet to be calculated, though indications are that it was not as good as the 2012 winter following a poorer summer harvest. During the 2012 winter, the average catch was much improved compared to the 2011 winter and the best recorded since the 2007 winter. The fish caught by Rotoiti anglers during the 2012 winter were larger and significantly heavier ( $P=0.017$ ) than those caught in 2011 and were bigger than the last 10-year average (596mm). Lake Rotorua creel surveys have shown a drop in condition of rainbow trout since the 2007-08 season when the wall was constructed. This may also have been caused by warmer summer temperatures and algal blooms through this period. The 2012-13 summer survey showed an improvement in size, weight and condition.

## **2. OHAU CHANNEL TROUT FISHERY SURVEY DATA**

Fisheries Surveys at the Ohau Channel were completed under contract by a student in 2005-06, and subsequently by Aquatek Consultants in 2007-08, 2008-09, 2009-10, 2010-11, 2011-12 and 2012-13. The data collected provides 2 years of fisheries statistics pre-wall construction and 5 years following completion.

### **EXECUTIVE SUMMARY**

- A total of 82 angler creel surveys were conducted at the Ohau Channel over the 2012-13 angling season. Anglers were encountered (fishing) during only 44 of the surveys. A lower number of anglers were interviewed during the course of the 2012-13 survey than had been seen in the seven previous creel surveys.
- The 2012-13 angling season at the Ohau Channel produced a slightly improved average catch rate than the 2011-12 season. The 0.23 fish per hour recorded was the second poorest during the seven completed Ohau Channel creel surveys.
- The average brown trout caught during the 2012-13 season was smaller, significantly lighter and in significantly poorer condition compared to those from the 2011-12 survey. Only 4 brown trout were measured compared with 12 during 2011-12, 5 during 2010-11, 34 during 2009-10, 20 during 2008-09, 38 during 2007-08 and 48 during the 2005-06 survey. The average rainbow trout caught was significantly smaller, lighter but in significantly better condition than those caught during the 2011-12 season.
- Anglers interviewed during the 2012-13 season perceived their catch rate ( $P=0.01$ ) and the size of the fish they were catching ( $P=0.02$ ) to be significantly poorer compared to the 2011-12 season. Anglers overall satisfaction levels were significantly poorer ( $P<0.001$ ) and provided the lowest ranking of satisfaction recorded during the seven years surveyed.
- Over the course of the 2012-13 survey, the perceived decline in the fishing influenced a total of 3% of anglers to state they were either satisfied or highly satisfied with their seasons fishing. This was a significant decline from the 2011-12 season and the lowest percentage of satisfied anglers recorded during the seven Ohau Channel creels so far undertaken.
- Over the 2012-13 season, 96% of surveyed anglers did not voice detractions to their angling experience in the Ohau Channel. Of the few that did, those mentioned included the poor weather for fishing and the lack of access to angling.



## **2.1 Data Collection**

A total of 44 survey events were undertaken at the Ohau Channel over the 2012-13 season when anglers were present. Angler contacts encountered per survey were lower than all previously surveyed seasons (Table 4).

**Table 4. Surveys conducted and anglers interviewed**

	<b>2012-13</b>	<b>2011-12</b>	<b>2010-11</b>	<b>2009-10</b>	<b>2008-09</b>	<b>2007-08</b>	<b>2005-06</b>
<b>Survey events</b>	82	82	82	82	82	82	82
<b>Nil angler encounters</b>	38	15	19	28	22	17	3
<b>Total Anglers</b>	163	270	412	518	373	496	576
<b>Anglers per survey*</b>	4	4	7	10	6	8	7

\*Anglers per survey =calculated from surveys when anglers present

## **2.2 Angler catch rates**

The angler catch information (CPUE = fish per rod hour) gathered during the surveys during the 2005-06 and 2007-08 to 2012-13 seasons is summarized in Table 5.

**Table 5. Catch rate data 2005-06, and 2007-08 to 2011-12 seasons.**

	<b>2012-13</b>	<b>2011-12</b>	<b>2010-11</b>	<b>2009-10</b>	<b>2008-09</b>	<b>2007-08</b>	<b>2005-06</b>
<b>Hrs fished</b>	390.75	521.5	826.5	1015.5	728.10	934.15	1099.1
<b>Kept</b>	73	94	125	394	212	371	349
<b>OSRT</b>	15	33	90	221	42	24	102
<b>USRT</b>	14	36	29	14	4	16	34
<b>CPUE(sum)</b>	0.23	0.24	<b>0.26</b>	<b>0.60</b>	0.35	0.42	0.41
<b>HPUE(sum)</b>	0.19	0.18	0.15	0.39	0.29	0.40	0.32
<b>Avg indiv' cpue</b>	0.23	0.20	<b>0.27</b>	<b>0.61</b>	0.30	<b>0.40</b>	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

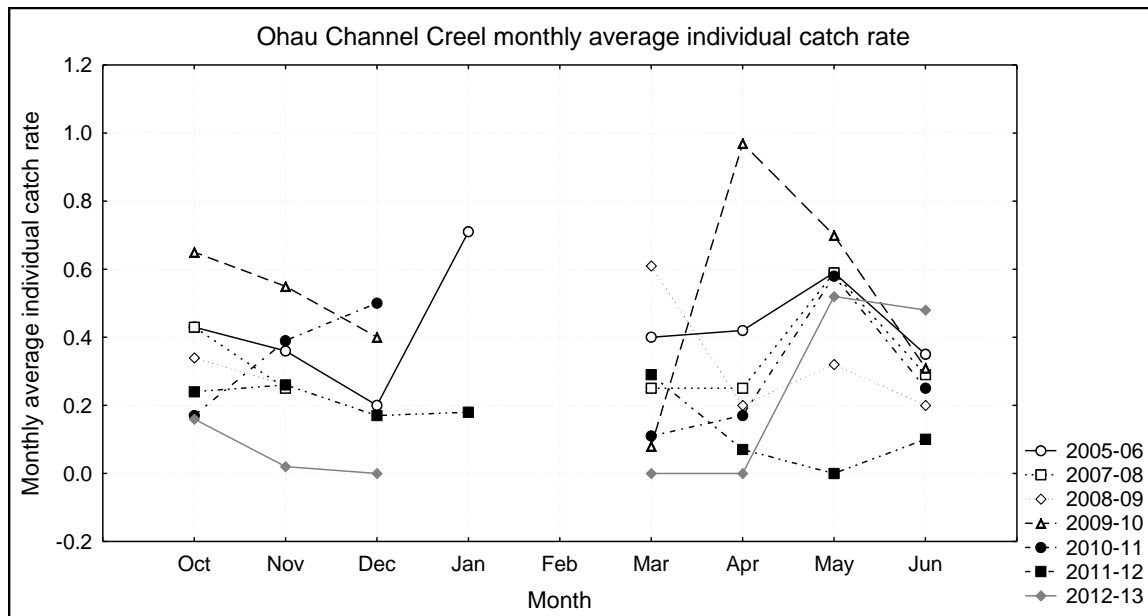
Indiv' = average of all individual anglers catch rate – good for perception calculations

Mann Whitney tests of the average individual anglers catch rate show a non-significant statistical difference between the 2012-13 and 2011-12 season ( $P=0.936$ ). There was also a non significant difference between the 2011-12 and the 2010-11 seasons ( $P=0.879$ ). There was a significant difference between the 2010-11 and 2009-10 seasons ( $P<0.001$ ) and between the 2009-10 and 2008-09 seasons ( $P<0.001$ ). There was no significant difference between the 2007-08 and 2008-09 seasons catch rates ( $P=0.52$ ) whereas there was just a significant difference noted between the 2005-06 and 2007-08 catch rates ( $P=0.049$ ). This type of difference is typically due to the spread of catch rates between anglers although Figures 2.2-2.6 suggest little difference was apparent. Angler experience (Figure 2.8-2.13) may account for differences seen in catch rates as inexperienced anglers have lower catch rates generally. The frequency of individual anglers visiting the Ohau Channel during the 2012-13 season differed from the general trend seen in the 2011-12 season as there was a great reduction in the number of anglers

who visited only once, similar numbers in the 20-29 and 30-39 brackets and also an increase in the number of anglers that visited between 100-120+ times in the season.

### **2.3 Seasonality of Catch Rates**

During the 2012-13 season (5 years post wall construction) the average recorded catch rate was low compared with previous years but slightly better than the 2011-12 opening, with one fish caught for slightly less than seven hours angling effort. The remainder of October did not show much improvement in the angling. November surveys resulted in just one fish being recorded as kept from 35 hours effort. No angling was recorded at the channel during the months December, March or April. May produced the highest catch rates recorded for the season at the Ohau Channel with one fish caught in just under two hours effort and surveys indicated the best finish to the season in June seen in the course of the monitoring (Table 6). The hours reported were however the lowest recorded for June since the 2005-06 survey.



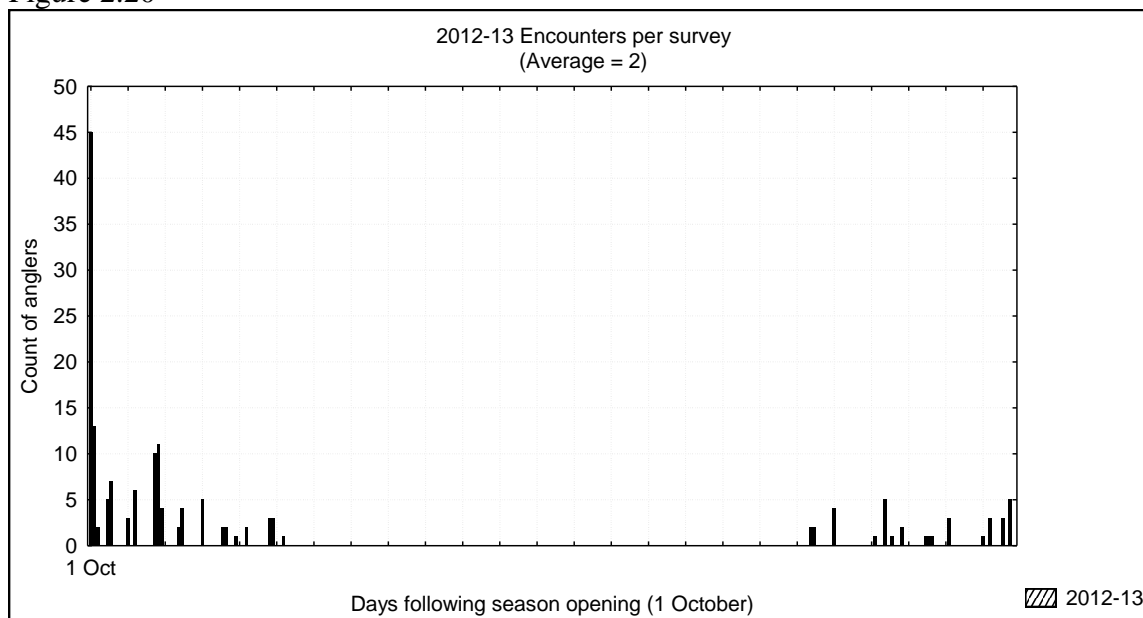
**Figure 2.1 Angler catch rates by year during the season**

**Table 6. 2012-13 Catch rates during the season (other season tables in appendix)**

	Hrs	Kept	OSRT	USRT	cpue Sum	cpue indi'v
Opening Weekend	151	23	2	5	0.17	0.15
All October	275.5	42	7	5	0.18	0.16
November	35	1	0	3	0.03	0.02
December	0	0	0	0	0.00	0.00
Jan & Feb						
March	0	0	0	0	0.00	0.00
April	0	0	0	0	0.00	0.00
May	32	12	3	4	0.47	0.52
June	48	18	5	2	0.48	0.48

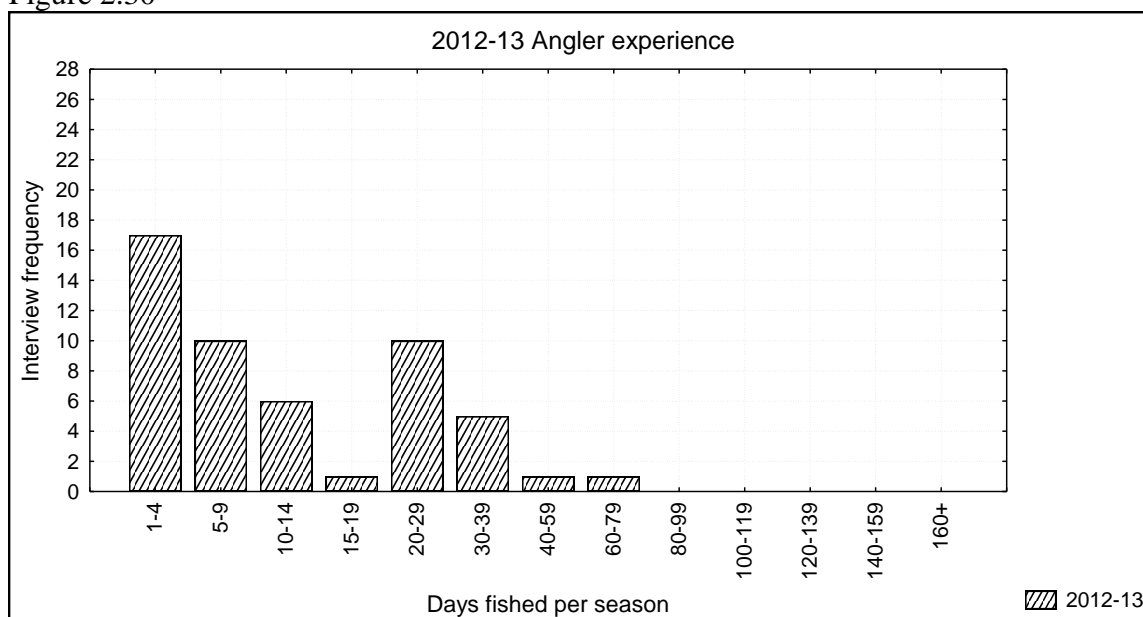
This seasonality of catch rates in past seasons tends to mirror the encounter rate during the season (Figure 2.20 and Figures 2.21-2.26 in appendix). Basically if catch rates were higher then the interviewers tended to encounter more anglers, when they were lower they encountered less anglers. During the 2012-13 season angler encounter rates were highest at the start (October) and the end of the season (June) when expectations of catching fish were highest, however the end of the season resulted in fewer angler encounters than June 2012 and equated to the lowest number of anglers seen since the 2005-06 season. 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.

Figure 2.20



Changes in catch rate can often be related also to a change in the level of experience of anglers. Anglers were asked about their experience and this varied little between the four surveys (Figure 2.30 and Figures 2.31-2.35 in appendix).

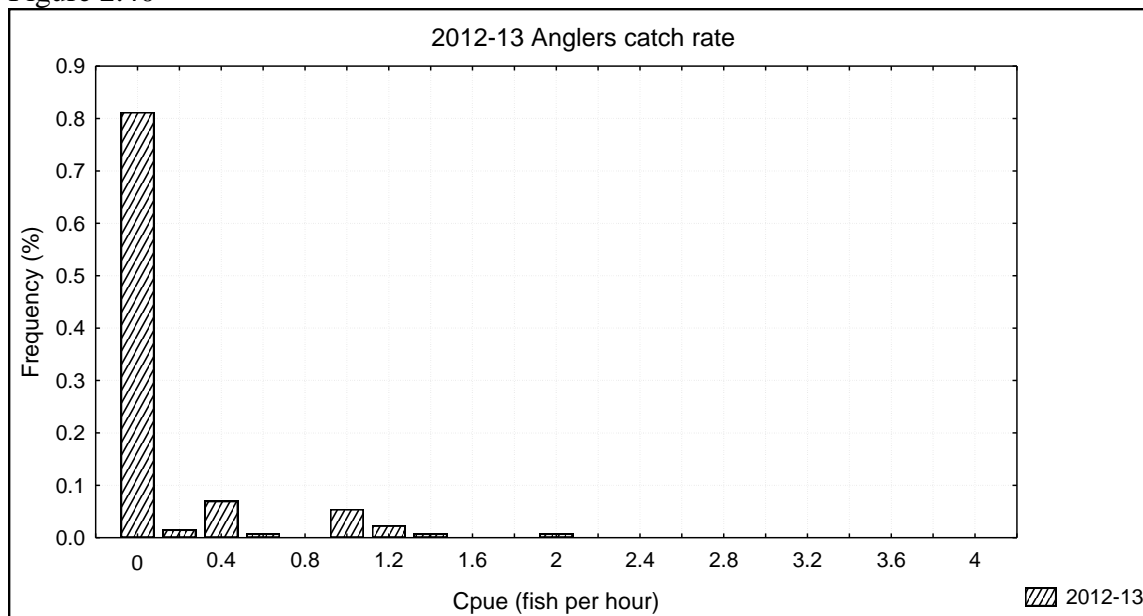
Figure 2.30



## 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 60% of anglers not having caught a fish when interviewed. (Figure 2.40 and Figures 2.41-2.45 in appendix)

Figure 2.40



## **2.5 Characteristics of fish caught**

Table 7. Brown trout and rainbow trout average length and weight data surveyed from Ohau Channel during 2005-06 and the 2007-08 to 2012-13 seasons. Significant differences shown in bold.

	2012-13	2011-12	2010-11	2009-10	2008-09	2007-08	2005-06
Brown length	614	669	672	<b>650</b>	702	675	662
Brown weight	<b>2.68</b>	3.94	3.91	4.12	4.63	4.71	4.32
Brown c.f.	<b>39.2</b>	46.87	45.45	53.49	<b>47.79</b>	53.63	52.96
Rainbow length	<b>492</b>	516	<b>507</b>	<b>541</b>	<b>554</b>	543	541
Rainbow weight	1.51	1.58	<b>1.56</b>	2.11	2.22	2.30	2.25
Rainbow c.f.	<b>44.06</b>	40.39	<b>41.55</b>	47.19	46.1	50.98	50.09

The average brown trout caught during the 2012-13 season was shorter, significantly lighter ( $P=0.042$ ) and in significantly poorer condition ( $P=0.019$ ) than the average brown measured during the 2011-12 survey. A total of 4 brown trout were measured compared with 12 during 2011-12, 5 during 2010-11, 34 during 2009-10, 20 during 2008-09, 38 during 2007-08 and 48 during the 2005-06 survey. The average rainbow trout caught was significantly shorter ( $P=0.032$ ), lighter but in significantly better condition ( $P=0.006$ ) than those caught during the 2011-12 season.

## **2.6 Anglers perceptions and Satisfaction**

Anglers were asked to rate (Table 12) 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 should be considered to be 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 summers 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 13. and Figure 3.0.

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

	2012-13	2011-12	2010-11	2009-10	2008-09	2007-08	2005-06
Cpue	<b>4.74</b>	<b>4.37</b>	<b>4.06</b>	<b>2.23</b>	<b>3.89</b>	2.94	2.9
Size	<b>4.74</b>	<b>4.38</b>	<b>4.05</b>	<b>2.32</b>	<b>3.87</b>	<b>2.98</b>	2.28
Satisfaction	<b>3.84</b>	3.31	<b>3.16</b>	<b>2.02</b>	<b>3.28</b>	<b>2.44</b>	1.75
% satisfied	<b>3%</b>	19%	<b>19%</b>	<b>88%</b>	<b>16%</b>	<b>66%</b>	98%

A decline in angler perceptions was noted between the 2005-06 season and the 2007-08 season for catch rate, and a significant decline for fish size and satisfaction ( $P < 0.001$ ).

Perceptions were further lowered during the 2008-09 season when angler perceptions for all three characteristics (catch rate, fish size and satisfaction) were again significantly lower compared with the 2007-08 season ( $P < 0.001$ ). Where anglers believed fish size was significantly poorer, fish measured by surveyors were larger, although brown trout were slightly lighter and rainbows significantly lighter meaning trout condition was poorer.

Anglers interviewed during the 2010-11 season felt that their catch rate, the size of the fish they were catching and their overall level of satisfaction were all significantly poorer ( $P < 0.001$ ) than during the 2009-10 season. The marked decline in angler perceptions was supported by measured catch rate and by fish characteristics. Measured catch rate during the 2010-11 season was significantly worse ( $P < 0.001$ ) than the catch rate surveyed during the 2009-10 season.

Anglers interviewed during the 2011-12 season perceived their catch rate and the size of the fish they were catching to be significantly poorer than during the 2010-11 season ( $P = 0.033$  and  $0.031$  respectively). The overall level of satisfaction was also reduced and provided the lowest satisfaction ranking recorded over the six years surveyed. The marked decline in angler perceptions was supported by measured catch rate, but only partially by fish characteristics (rainbow condition was slightly lower). Measured catch rate during the 2011-12 season was lower than the catch rate data collected during the 2010-11 season.

Over the course of the 2012-13 season anglers perceived their catch rate to be significantly poorer than during the 2011-12 angling season ( $P = 0.01$ ). These perceptions matched the measured results from the October to April period though the end of the season (May/ June) had elevated catch rates which lifted the average 2012-13 cpue above the 2011-12 average cpue. Fish size and condition was also perceived to be significantly poorer ( $P = 0.02$ ). Perceptions of fish size and condition matched the measured brown trout characteristics and largely the rainbow statistics (length and weight decline) although the condition of the rainbows was improved. Overall satisfaction was also significantly lowered (See 2.61 below).

Figure 3.0 Angler Perceptions of catch rate and fish size

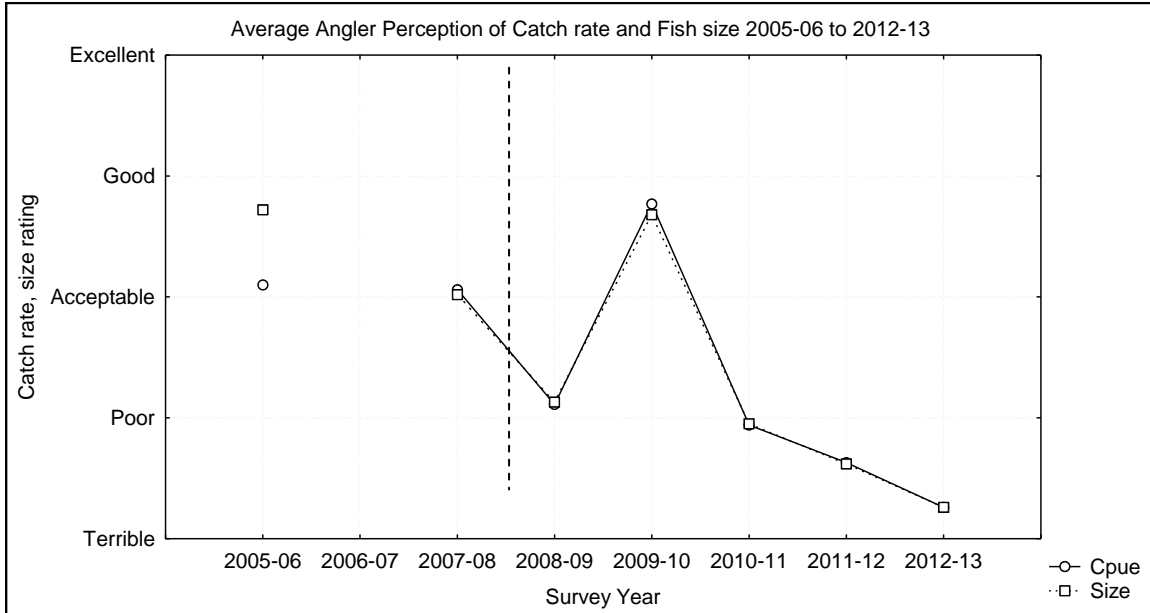
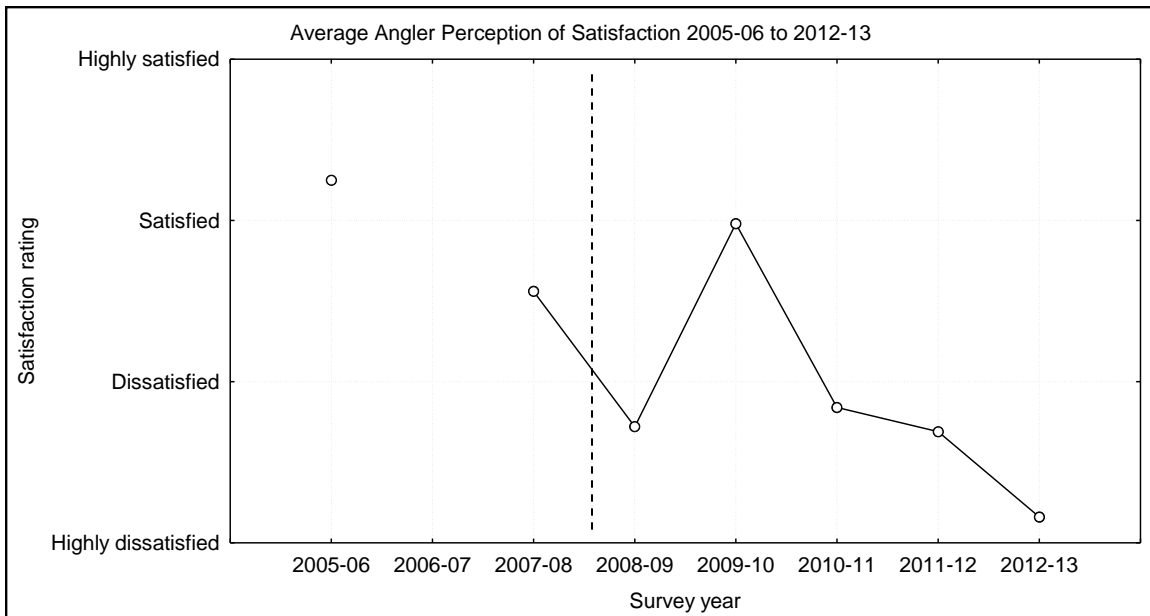


Figure 3.1 Angler Perceptions of Satisfaction



## 2.61 Percentage of anglers Satisfied

The percentage of anglers that expressed they were either satisfied or extremely satisfied with their angling has changed significantly over the course of the 6 completed surveys (figure 3.0).

In the 2005-06 season, a total of 98% of anglers stated they were satisfied with their seasons angling in the Ohau Channel. This dropped significantly during the 2007-08 season to 66% of anglers ( $P < 0.001$ ).

Throughout the 2008-09 season, only 16% of anglers felt that they were satisfied with their angling experience. This figure had dramatically dropped away over the first 3 seasons surveyed ( $P < 0.001$  Binomial Comparative Trial). To have only 16% of anglers saying they were satisfied or highly satisfied was **very low**. Typically, angler satisfaction on Fish & Game surveys gets to a low point of 70%.

During the course of the 2009-10 survey, the perceived improvement in the fishing was such that 88% of anglers said they were either satisfied or highly satisfied with their seasons fishing. This was a significant improvement ( $P < 0.001$  Binomial Comparative Trial).

Over the course of the 2010-11 season, poor catch rates and reduced fish size altered anglers perceptions in such a way that a total of 19% of anglers said that they felt they were either satisfied or highly satisfied with their seasons angling in the Ohau Channel. This was significantly poorer than the level achieved during the 2009-10 season ( $P < 0.001$  Binomial Comparative Trial).

During the 2011-12 season, despite the slight increase in size of the rainbow catch and improvement in condition of the browns caught, the worst catch rates recorded over the six years of the Ohau Creel survey resulted in the percentage of satisfied anglers remaining at 19%.

The level of satisfaction recorded during the 2012-13 season was significantly lower than during the 2011-12 season ( $P < 0.001$ ). Just 3% of anglers said they were satisfied or highly satisfied with their angling at the Ohau Channel during the 2012-13 season. This was a significant drop from the 2011-12 season ( $P = 0.007$ ). All of the perception attributes measured produced poorer values than had previously been recorded during the Ohau Channel Creel Surveys.



## **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 2012-13 surveys are shown in Table 10.

Table 10. Stated detractions to angling experience

<b>DETRACTION</b>	<b>2012-13</b>	<b>2011-12</b>	<b>2010-11</b>	<b>2009-10</b>	<b>2008-09</b>	<b>2007-08</b>	<b>2005-06</b>
Crowds						2.5%	9%
Shags							5%
Quality Water		1%		3%	3.9%		5%
Boats							4%
Rude anglers						1%	3%
Limited access	2%						3%
Weir*		1%	2%				2%
Snags					1.3%		2%
Other users						2.5%	2%
Few fish		1%	9%	4%			2%
Technology							1%
Poor conditioned fish			15%	8%	1.3%		1%
Pollution					1.3%		1%
Poachers				7%			1%
No Toilet							1%
No regulation signs							1%
Weather	2%						
<b>Nil</b>	<b>96%</b>	<b>97%</b>	<b>74%</b>	<b>78%</b>	<b>92.1%</b>	<b>94%</b>	<b>55%</b>
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Over the 2012-13 season when asked what detracted from their fishing experience in the channel, 96% of surveyed anglers did not supply any detracting features to their angling experience in the Ohau Channel. Of those that voiced detractions, limited access due to Council weed spraying operations was mentioned by 2% of respondents. Weather detracted from the fishing of another 2% of respondents.

A greater number of detractions were highlighted when surveyed anglers were asked why they were satisfied or dissatisfied.

### **2.71 Why Anglers were Satisfied or Dissatisfied**

During the 2008-09 survey, 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 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.

Over the course of the 2009-10 interviews, anglers were 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.

During the 2010-11 season 5 anglers out of 226 (2% of respondents) mentioned the wall as a causative factor that led to their poor fishing.

Through the 2011-12 surveys when asked why they were satisfied or dissatisfied, 66% did not provide any reason. 15% of respondents mentioned the lack of fish being caught. 7% mentioned the poor quality of the fish that were caught and another 7% made a direct mention of the wall and this related to stopping fish passage and restricting smelt from entering the channel. A further 2% of the respondents voiced directly that Fish & Game needed to address the problem.

Over the course of the 2012-13 surveys 136 out of 163 respondents gave no comment (83%). 8% of replies stated that they were dissatisfied because of poor catch rate. 4% indicated that something needed to be done to the diversion wall. 2% were dissatisfied because of poor fish size. The lack of smelt present during angling sessions caused dissatisfaction to a further 1% of anglers that voiced opinions. A further 1% of respondents were 'satisfied' because the fishing was "not too bad".

## **2.8 Ohau Creel Summary**

Prior to the wall being built, anglers could fish at two major publicly accessible points of the channel. The first being the start of the channel by the weir from Marama Resort side (true left) and Takinga St (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.

Excepting the 2009-10 season, angler catch rate has been lower than pre wall totals and has been deteriorating. The number of anglers fishing the channel has also been lower, particularly over the 2011-12 and 2012-13 seasons.

The condition factor of trout caught within the channel has declined compared with pre-wall measurements since the wall was built. The 2009-10 season noted a slight improvement in both rainbow and brown condition before a drop in condition through 2010-11 and 2011-12 particularly in the rainbow trout measured. The 2012-13 season saw a significant drop in brown trout condition, but with only 4 fish measured is too few

to make a decent comparison. The rainbows improved significantly in terms of condition, but length was significantly reduced. Lake Rotoiti opening day creel surveys noted a significant drop in rainbow two-year-old condition factor during 2011-12 and a further depression for the 2012-13 two-year-olds. An anecdotal perception of the 2013-14 Opening (just completed) points toward an improvement in this seasons 2-year-old catch. The summer creel undertaken annually on Lake Rotorua has also shown a decline in fish condition since 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. The 2012-13 summer creel indicated an improvement in rainbow trout size and condition, along with anecdotal reports of smelt appearing in numbers. This was the best rainbow trout condition noted since the 2009-10 summer creel.

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.

In four of the five angling seasons surveyed since the diversion wall was constructed, angler's perceptions of catch rate and fish size have been rated 'poor' to 'terrible' and anglers satisfaction has been classed 'dissatisfied' to 'highly dissatisfied'. Only one of the five seasons surveyed since the wall construction has produced acceptable to good perception ratings for catch rate and fish size, and produced satisfied Ohau Channel anglers.

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. Only 1.8% of respondents in 2009-10, 2% in 2010-11 and 7% in 2011-12 mentioned the wall (one, five and nine anglers respectively). Two anglers during the 2011-12 survey also stated that Fish & Game needed to address the problem. It is possible that the anglers when asked why they were dissatisfied 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 have again picked the most visible factor affecting them.

During the course of the 2012-13 season, 4% (n=7) of anglers who made a comment mentioned that the wall was directly influencing their dissatisfaction.

Angling clubs and 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 have been taken by Fish & Game, and

Fish & Game are bearing the brunt of angler reaction over perceived effects of the diversion wall. A lack of information provided to public on the progress of the wall consenting process did not assist anglers coming to terms with changes that they perceived to be occurring in the fishery whether factual or otherwise. Information pamphlets detailing the Ohau Diversion Wall consent and monitoring to date were produced by Bay of Plenty Regional Council during the 2012-13 angling season. Unfortunately these were not made available till after the closing of the Ohau channel fishing season at the end of June. They have been handed out to many anglers prior to and at the start of the 2013-14 season.

**Appendix/ Additional Figures**

Seasonality of catch rates (*Figures 6.1 – 6.6*)

Catch rate distribution (*Figures 2.41 – 2.46*)

Angler Experience (*Figures 2.31 – 2.36*)

Seasonality of Interviews (*Figures 2.21 – 2.26*)

**Seasonality of Catch Rates (figures 6.1-6.6)**

**Table 6.1. 2005-06 Catch rates during the season**

	Hrs	Kept	OSRT	USRT	cpue Sum	cpue indi'v
Opening Weekend	238.5	88	11	3	0.42	0.44
All October	536.95	173	46	6	0.41	0.43
November	177.25	46	25	8	0.40	0.36
December	71.25	10	5	7	0.21	0.20
Jan & Feb	12.75	7	2	0	0.71	0.71
March	49.45	11	6	0	0.34	0.40
April	130.95	52	7	6	0.45	0.42
May	100.75	43	11	5	0.54	0.59
June	19.75	7	0	2	0.35	0.35

**Table 6.2. 2007-08 Catch rates during the season**

	Hrs	Kept	OSRT	USRT	cpue Sum	cpue indi'v
Opening Weekend	226.5	95	3	2	0.43	0.64
All October	433.65	230	8	5	0.55	0.47
November	100.0	13	0	1	0.13	0.08
December	5.25	2	0	0	0.38	0.67
Jan & Feb						
March	10.0	1	0	0	0.10	0.14
April	80.0	17	0	0	0.21	0.24
May	173.0	83	16	9	0.57	0.66
June	132.25	25	0	1	0.18	0.29

**Table 6.3. 2008-09 Catch rates during the season**

	Hrs	Kept	OSRT	USRT	cpue Sum	cpue indi'v
Opening Weekend	186.3	100	4	0	0.56	0.55
All October	408.6	141	12	0	0.37	0.34
November	66.75	14	5	1	0.28	0.26
December						
Jan & Feb						
March	27.0	10	5	1	0.56	0.61
April	41.0	2	6	0	0.20	0.20
May	67.0	25	10	2	0.52	0.32
June	117.75	20	4	0	0.20	0.20

**Table 6.4. 2009-10 Catch rates during the season**

	Hrs	Kept	OSRT	USRT	cpue Sum	cpue indi'v
Opening Weekend	304.25	198	24	0	0.73	0.67
All October	596.25	307	103	2	1.87	0.65
November	137	27	38	1	0.48	0.55
December	12.5	7	0	0	0.56	0.40
Jan & Feb						
March	25.5	1	0	1	0.04	0.08
April	56	11	40	2	0.91	0.97
May	56	21	18	7	0.70	0.70
June	132.25	20	22	1	0.32	0.31

***Table 6.5. 2010-11 Catch rates during the season***

	Hrs	Kept	OSRT	USRT	cpue Sum	cpue indi'v
Opening Weekend	270.75	51	11	9	0.23	0.35
All October	449	62	17	11	0.18	0.17
November	55.5	7	10	3	0.31	0.39
December	7.5	1	3	0	0.53	0.5
Jan & Feb						
March	16	2	0	0	0.13	0.11
April	30.75	6	1	3	0.23	0.17
May	98	27	39	2	0.67	0.58
June	165.5	20	18	10	0.23	0.25

***Table 6.6. 2011-12 Catch rates during the season***

	Hrs	Kept	OSRT	USRT	cpue Sum	cpue indi'v
Opening Weekend	198	43	12	6	0.28	0.24
All October	336	74	28	8	0.30	0.26
November	26.75	5	2	1	0.26	0.17
December	15	3	0	0	0.20	0.18
Jan & Feb						
March	11.5	2	1	8	0.26	0.29
April	37	3	0	11	0.08	0.07
May	9.75	0	0	0	0.00	0.00
June	85.5	7	2	8	0.11	0.10

**Catch Rate Distribution (Figures 2.41–2.46)**

Figure 2.41

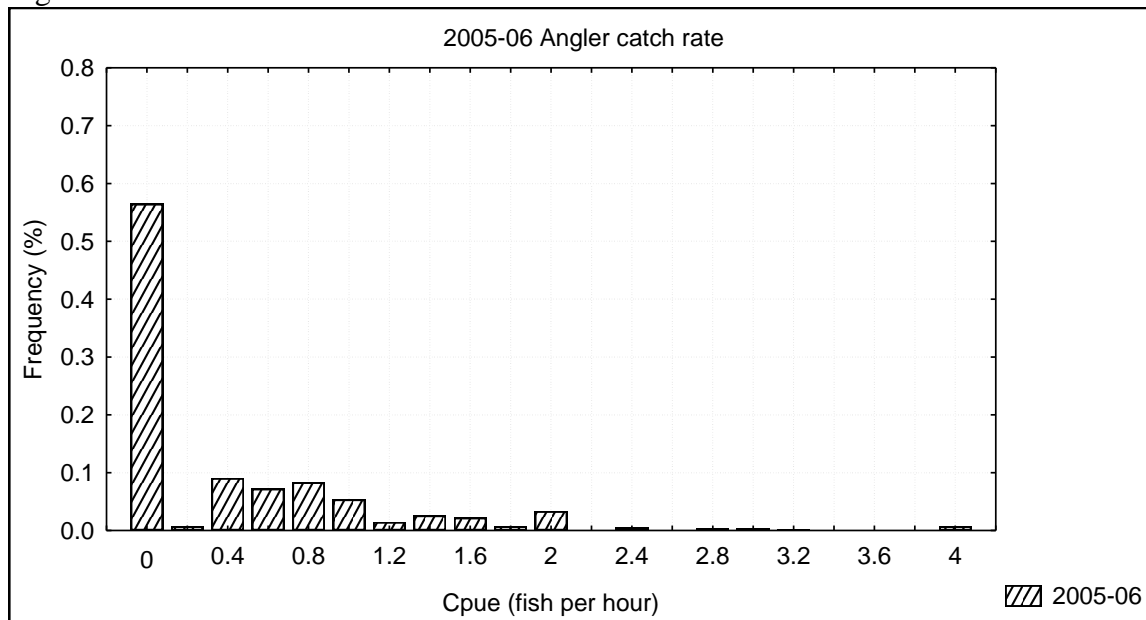


Figure 2.42

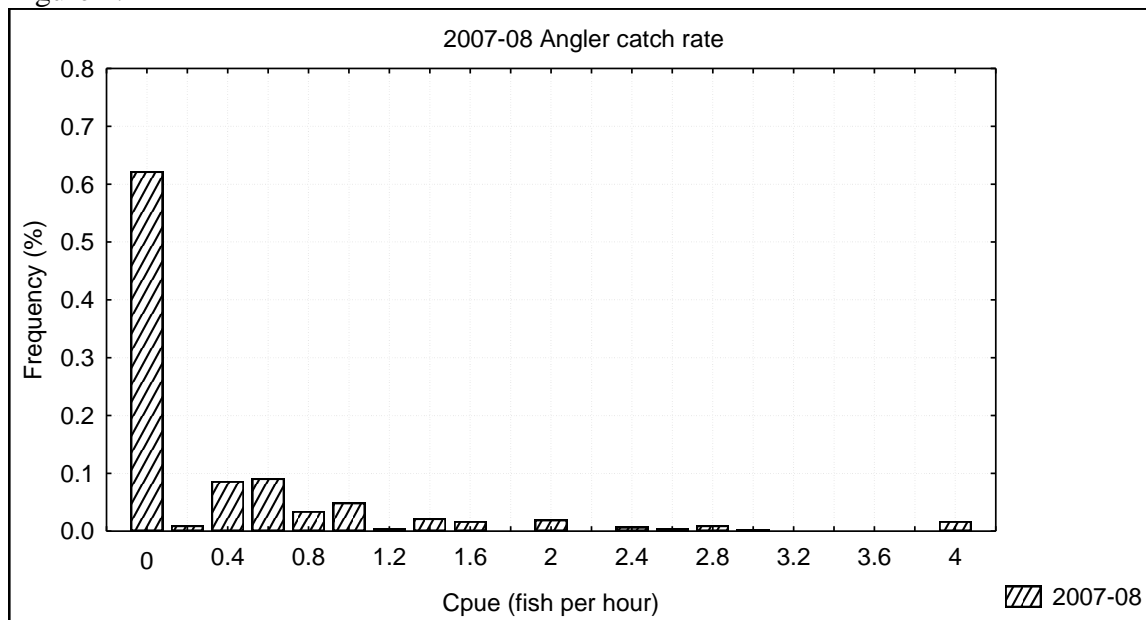




Figure 2.43

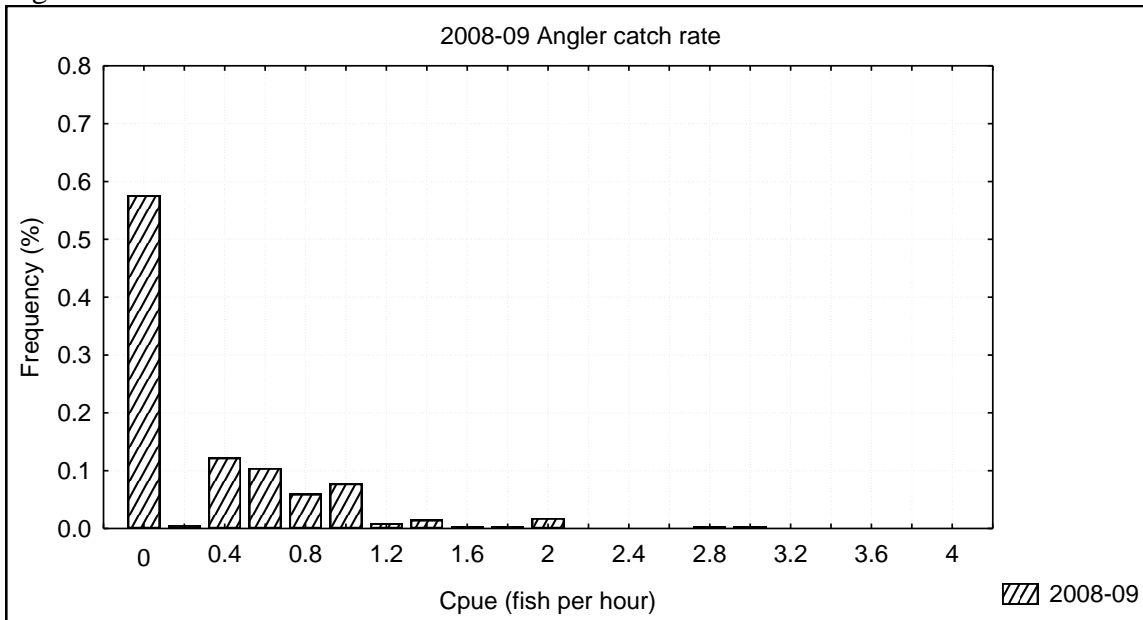


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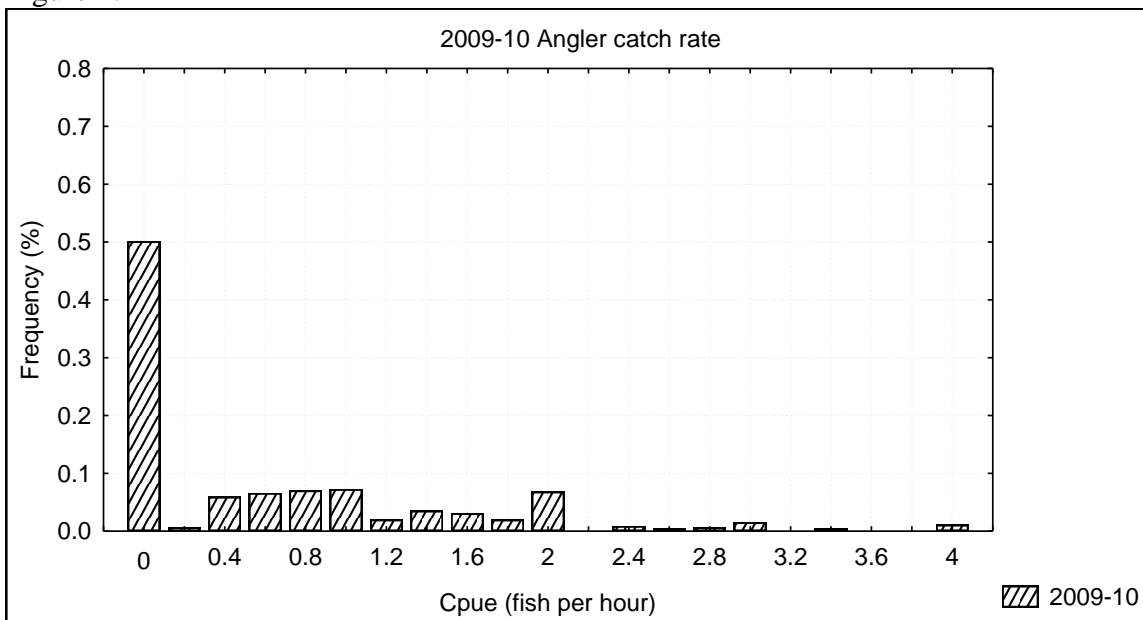


Figure 2.45

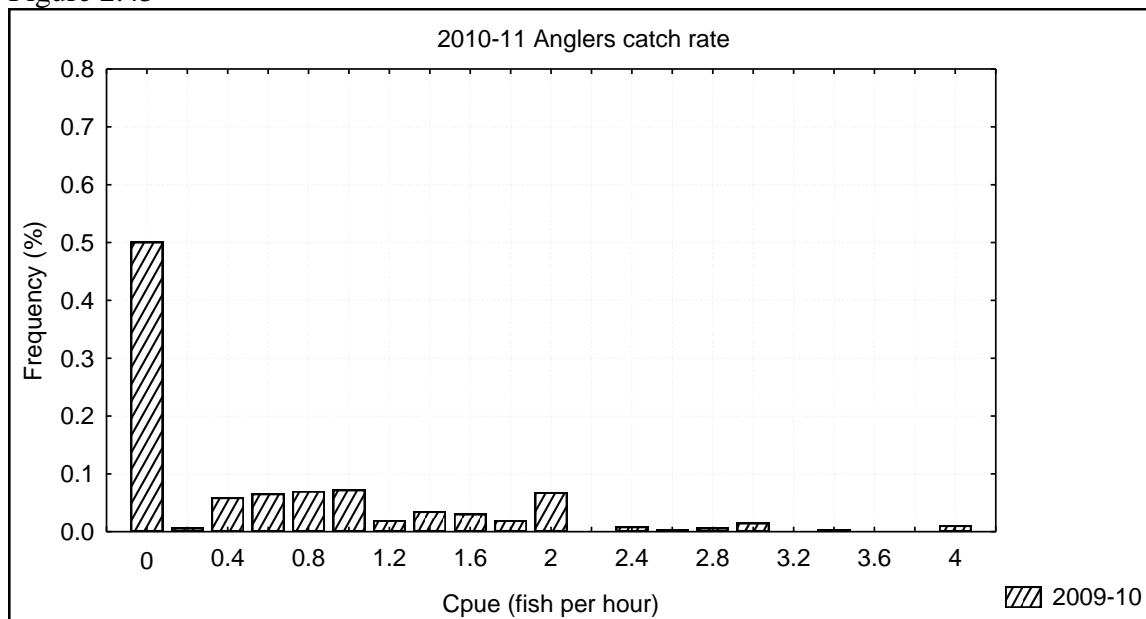
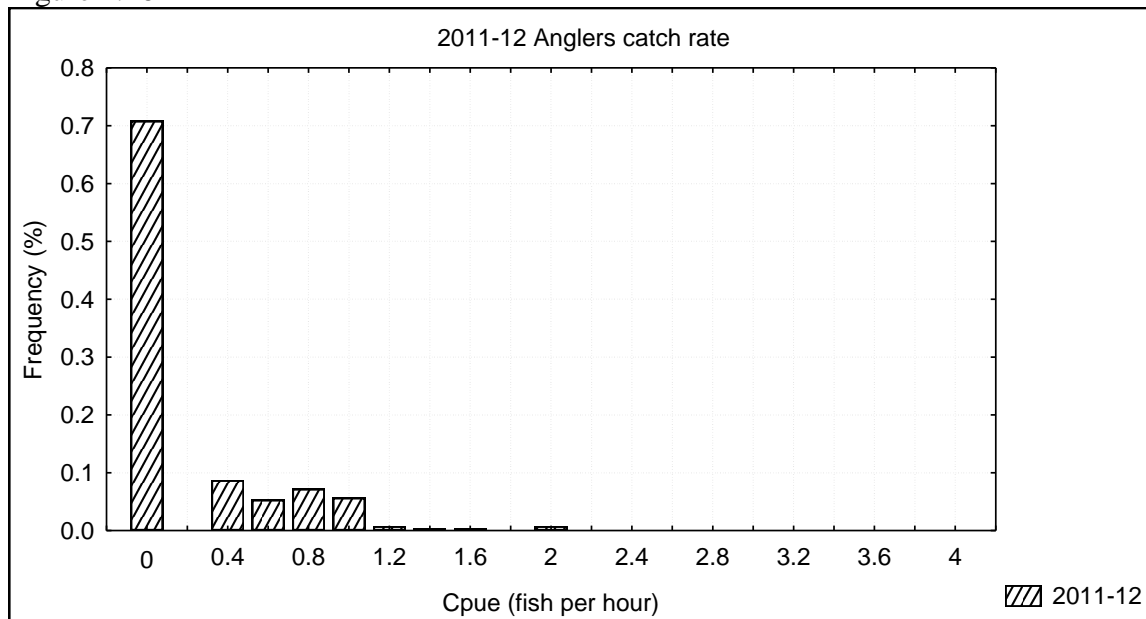


Figure 2.46



### Angler Experience

Figure 2.31 – 2.36 Angler frequency (days fished per season by individual anglers)

Figure 2.31

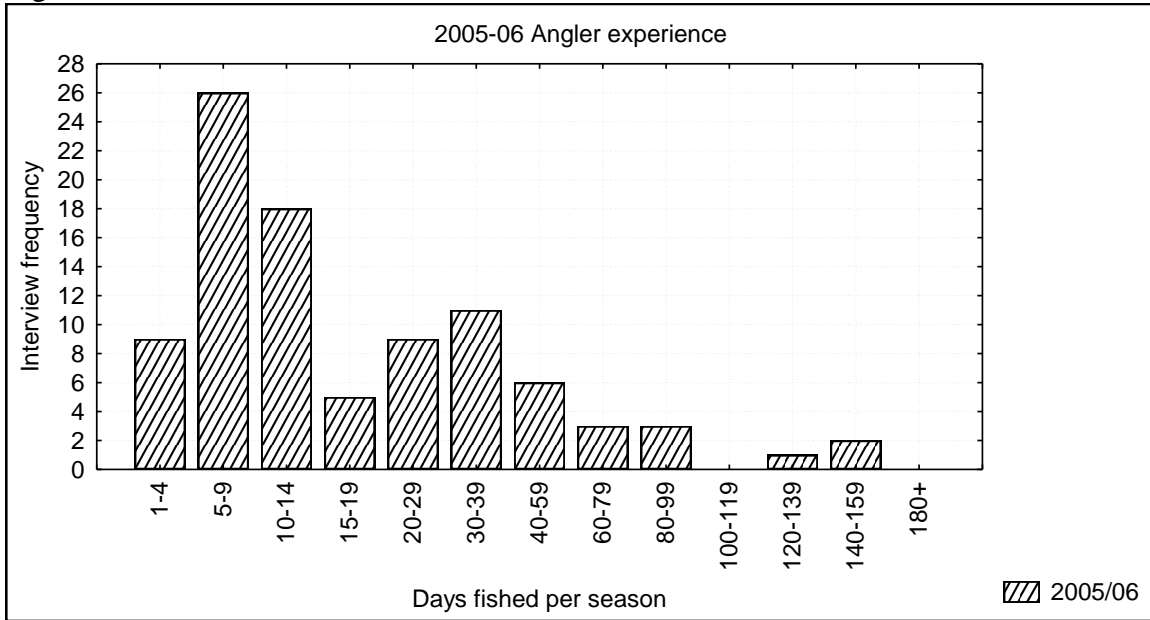


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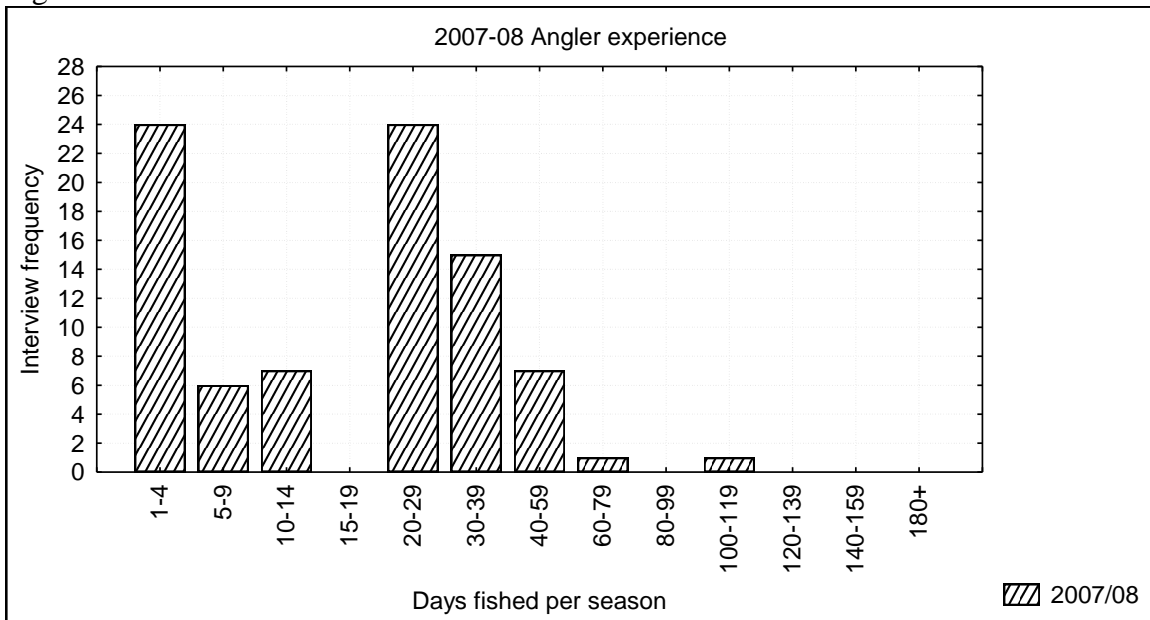


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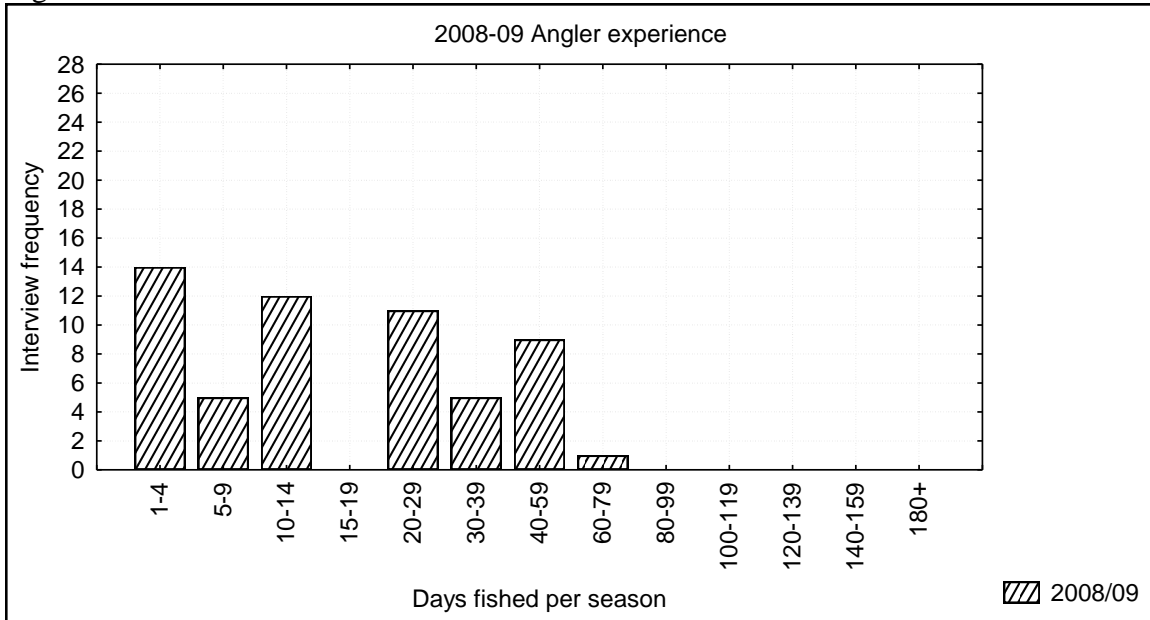


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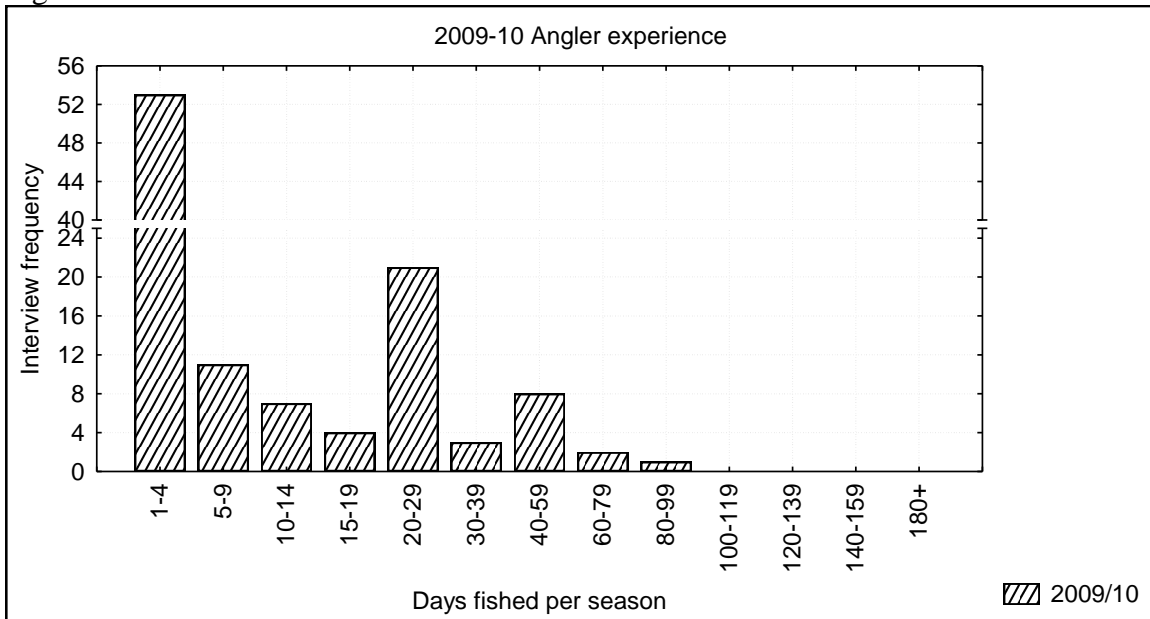


Figure 2.35

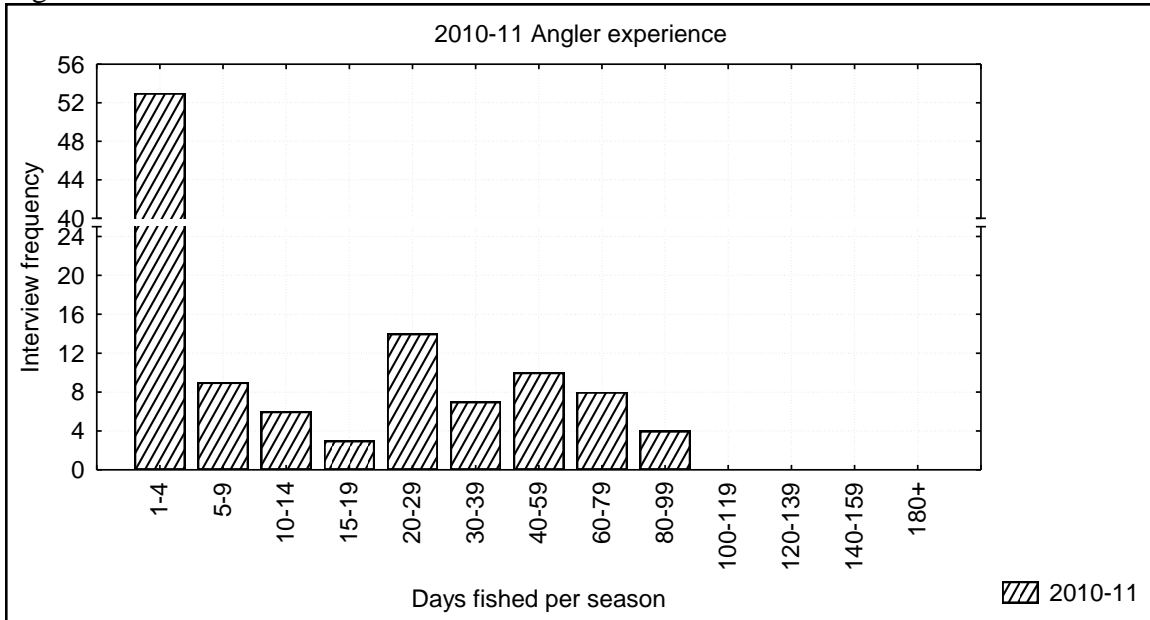
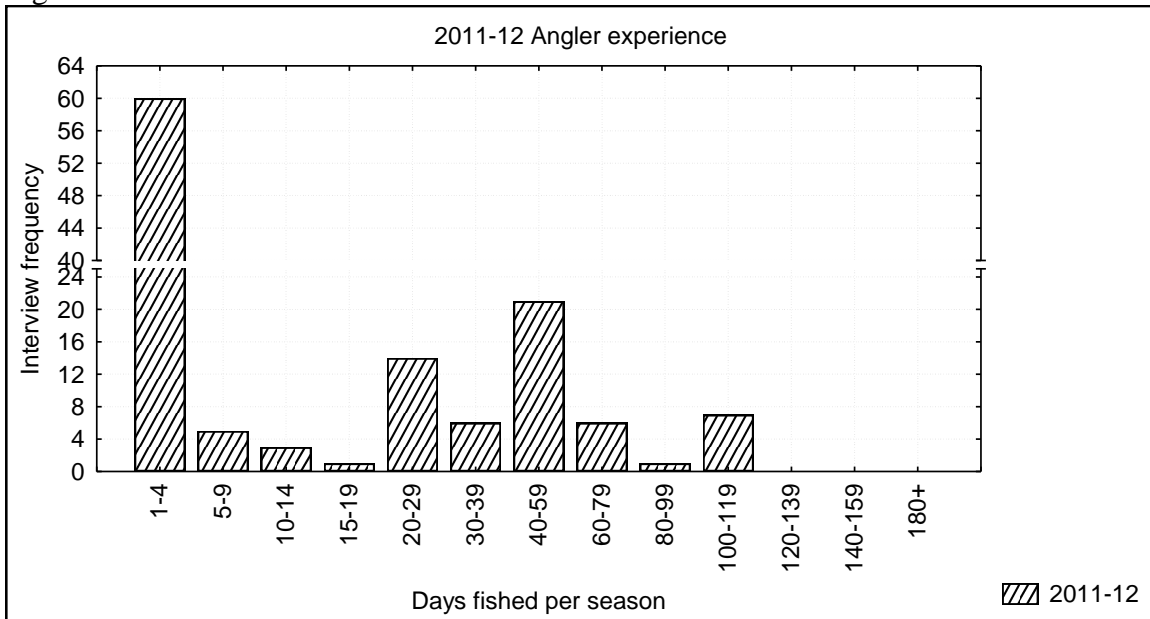


Figure 2.36



Seasonality of angler encounters    Figure 2.21-2.26

Figure 2.21

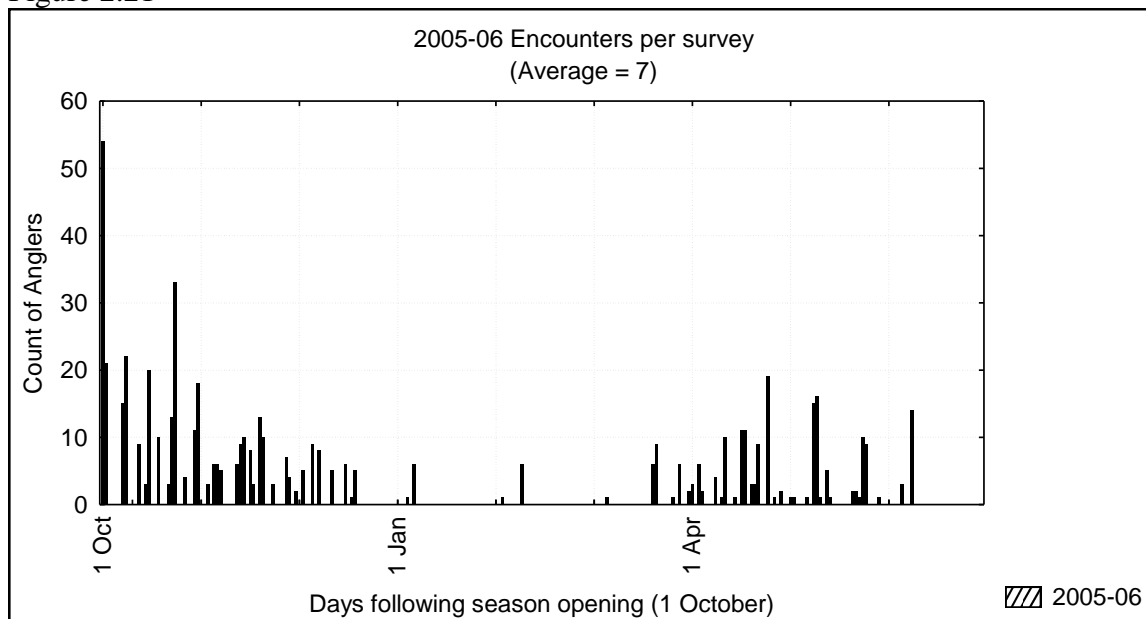


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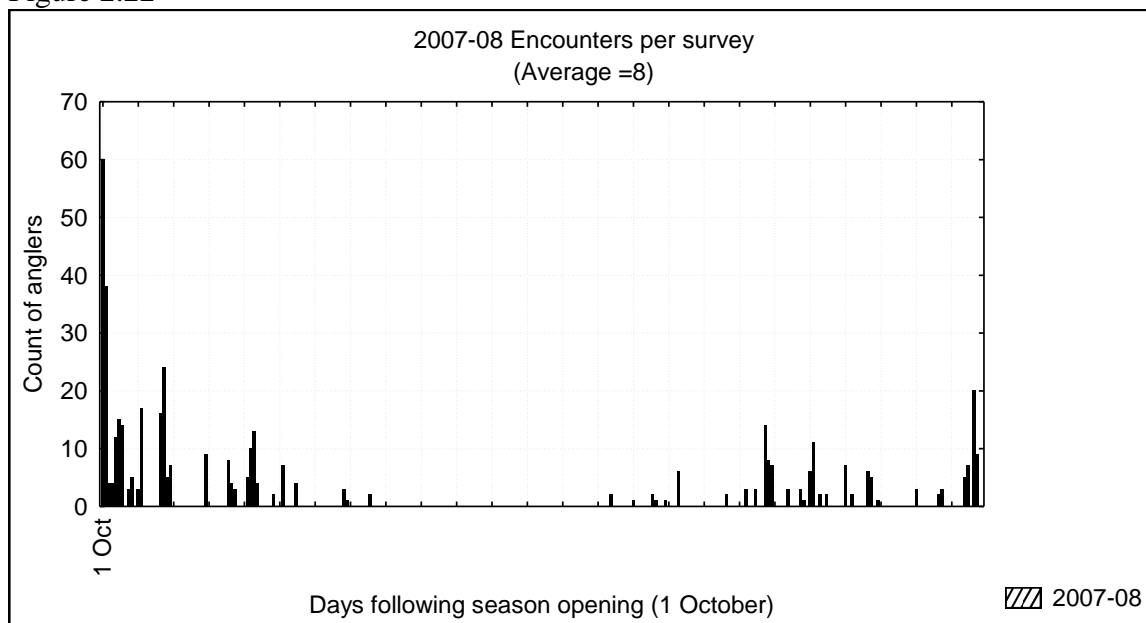


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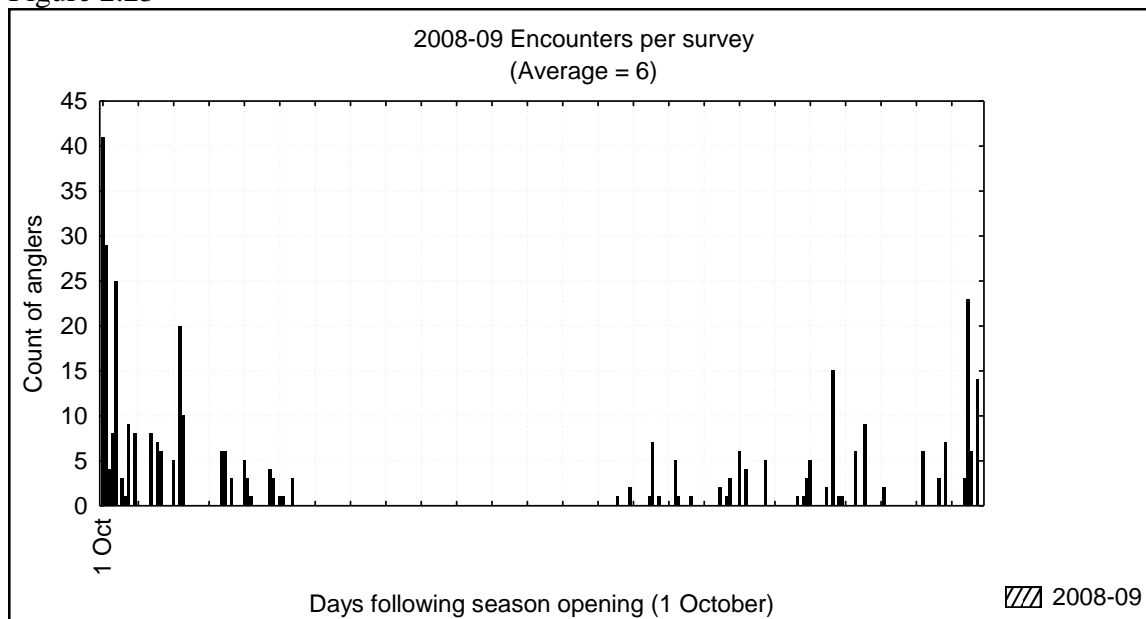


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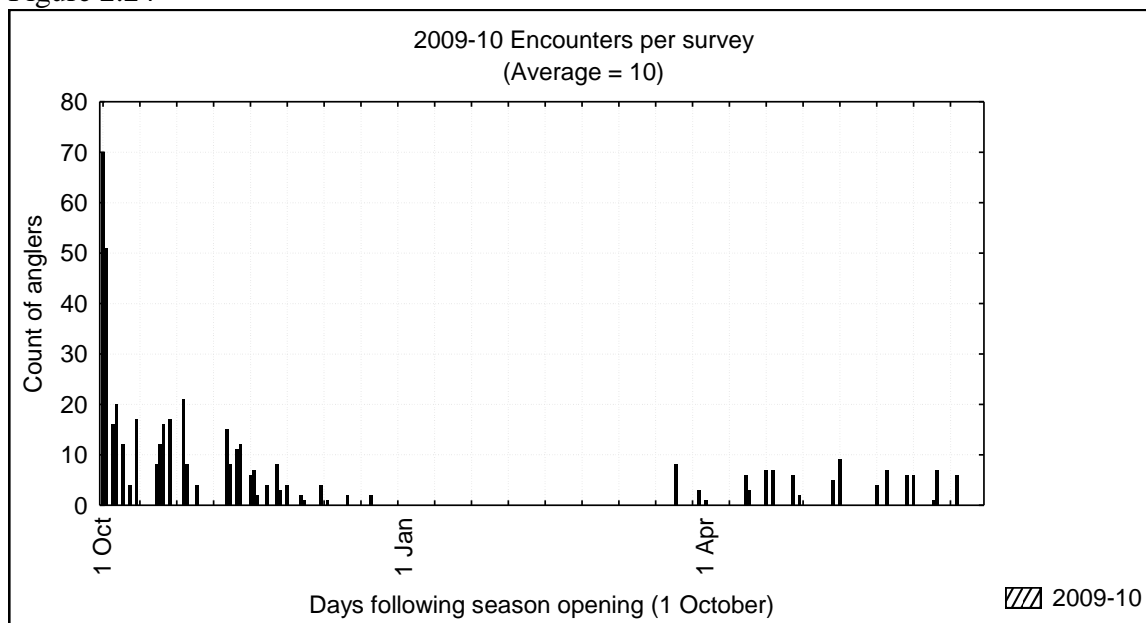


Figure 2.25

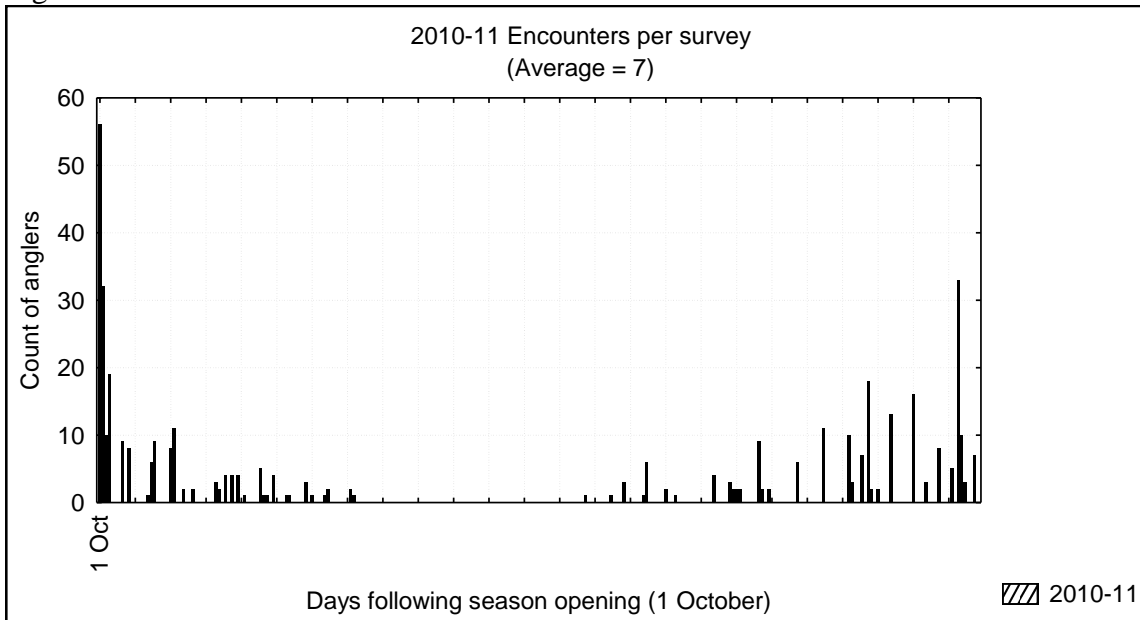
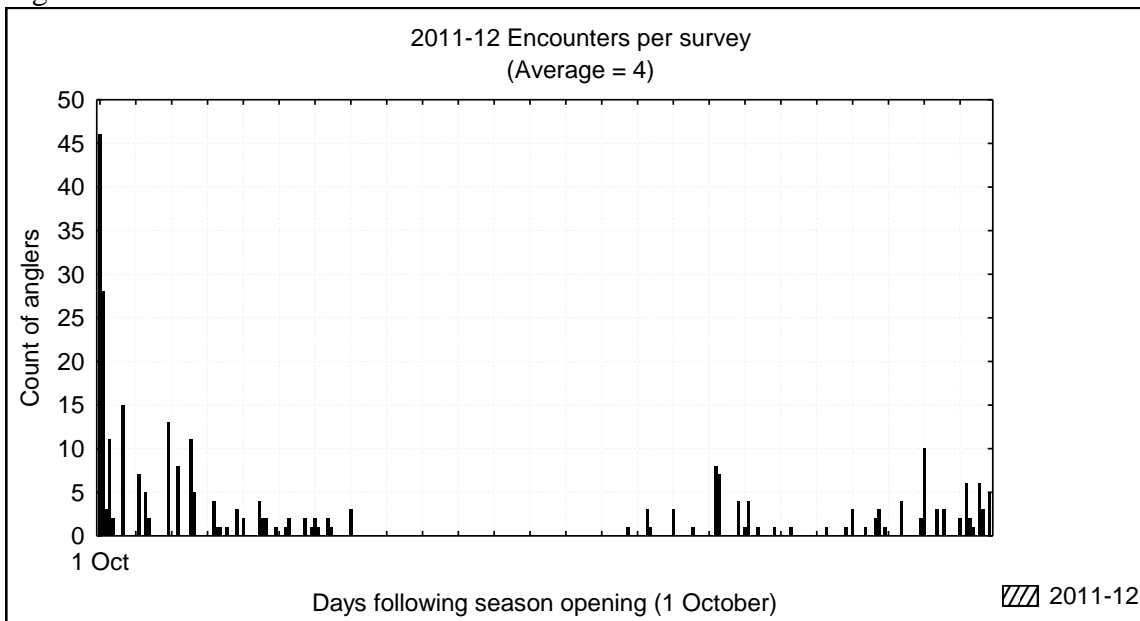


Figure 2.26



### **Acknowledgements**

Thank you to Aquatek Consultants for undertaking the survey work, and thank you to all anglers who gave their time to contribute to the survey.