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# 2005 Dinosaur Reservoir Creel Survey Report

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Rebecca Stiemer  
March 2006

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peaces Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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2005 Dinosaur Reservoir

# Creel Survey Report

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## **EXECUTIVE SUMMARY**

Anglers fishing Dinosaur Reservoir in 2005 were surveyed for a period of 14 weeks from May 21<sup>st</sup> to August 24<sup>th</sup>. The survey used a double stratified random creel sampling method based on Dixon (1986). In addition to obtaining information regarding angler origin, harvest characteristics and composition, results were used to provide an evaluation of the Dinosaur Reservoir rainbow trout stocking program that was terminated in 2003.

An estimated 1040 (+/- 137) anglers utilized Dinosaur Reservoir during the summer creel survey period. These anglers expended an estimated 1342 hours to catch 896 (+/- 266) fish of which, 114 were rainbow trout (63%) and 52 were lake trout (29%). This represented an overall catch rate of 0.67 fish per hour for the season. This catch rate is higher, compared to previous surveys, due to the lower number of hours spent angling.

The average angler day was 1.29 hours. Sixty eight percent (68%) of fish caught were released. Local fishermen accounted for half of the successful anglers (50%) utilizing Dinosaur Reservoir during the 2005 survey period.

In 2000, local anglers accounted for over three quarters of all anglers (88%), and the release rate was sixty seven percent. The average angler day in 2000 was 2.09 hours.

Local anglers utilizing Dinosaur Lake have decreased from 88% in 2000 to 50% in 2005. The average angler day also decreased from 2.09 hours in 2000 to 1.29 hours in 2005. Both of these statistical decreases may be a result of the wet rainy summer of 2005. The released rate in 2005 has remained constant with the release rate in 2000.

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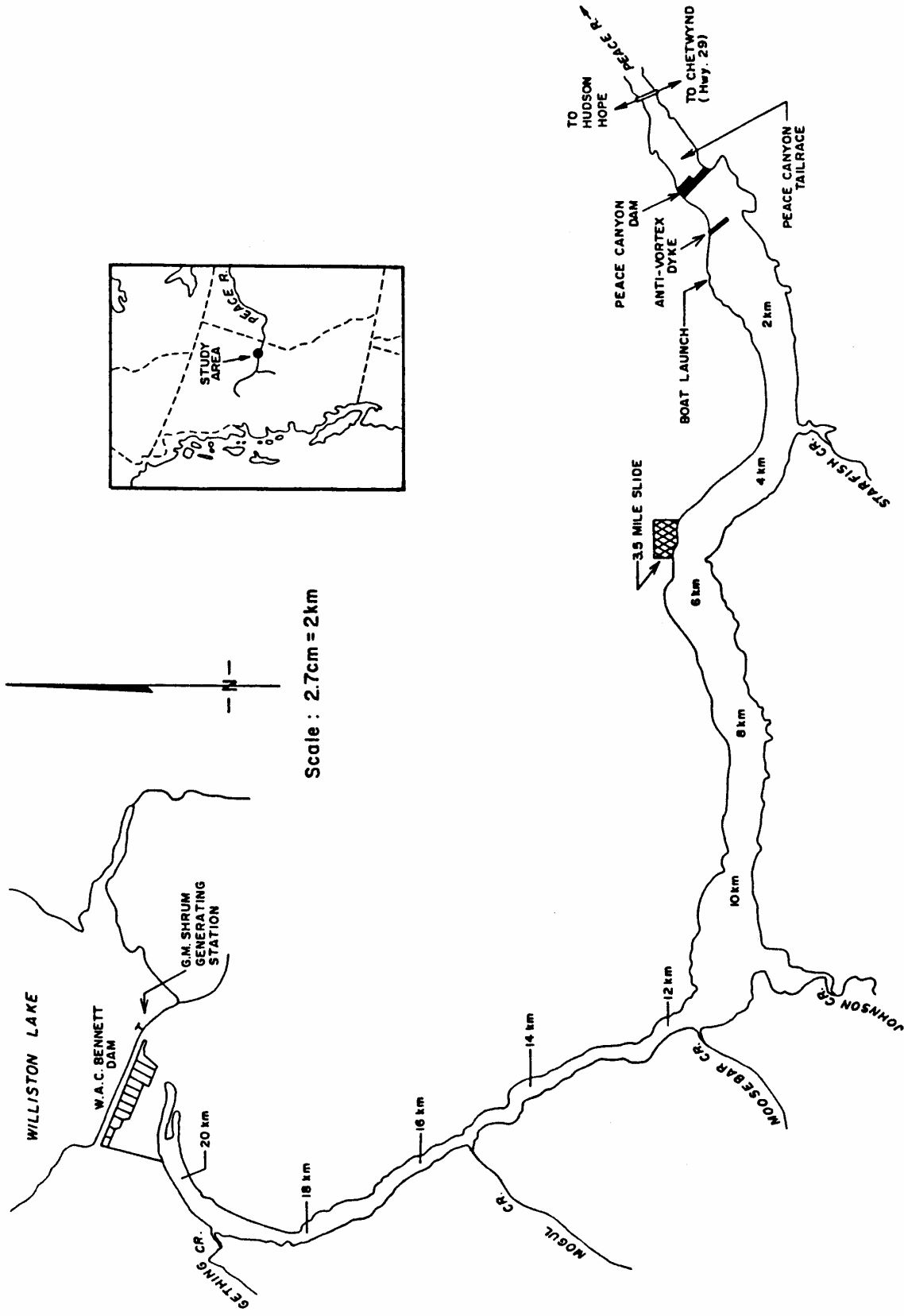


Figure 1. Map and Location of Dinosaur Lake.

# INTRODUCTION

## Background

Dinosaur Reservoir was formed in 1980 with the completion of the Peace Canyon Dam. In order to improve recreational angling opportunities, this reservoir was stocked with rainbow trout (*Oncorhynchus mykiss*). The stocking was initially carried out by the Peace Canyon Hatchery (funded by B.C. Hydro) until 1988 when the facility was closed. Then the reservoir was stocked with fish provided by the Ministry of Environment Lands and Parks until 2003. Angler creel surveys conducted from 1984 to 1988 indicated that many of the trout stocked into the reservoir were entrained through the dam and into the Peace River. The remaining “hatchery” fish still comprised about 50% of the anglers’ total catch from Dinosaur Reservoir.

Since the closure of the hatchery in 1988, no creel survey evaluations were conducted until 1999 and 2000. From 1999 to 2003 approximately 24,716 catchable rainbow trout and 17,532 fingerlings were released into Dinosaur Lake.

This 2005 survey was to determine if any major changes have occurred in the fishery over the last five years and if the recent termination of annual stocking has affected angler effort and success.

## Objectives

This evaluation of the sport fishery in Dinosaur Reservoir is required to determine the impact of terminating of the stocking program as well as to provide additional baseline data of ongoing enhancement activities. The information gathered may also be used in the development of future fisheries management strategies for Dinosaur Reservoir.

# METHODS

The creel survey was conducted at the single road access point to Dinosaur Reservoir. The survey followed the methodologies of a “Double Stratified Random Sample Creel Survey” (Dixon 1986).

This 2005 survey lasted a total of 13.5 weeks. A minimum of four sample periods were utilized each week from May 21<sup>st</sup> weekend until August 24<sup>th</sup>. Sampling was divided into four strata, which were analyzed separately to increase statistical significance of the results. Strata were defined as:

Weekend AM – 8:00am-3:30pm	Strata 1
Weekend PM – 3:30pm-10:30pm	Strata 2
Weekday AM – 8:00am-3:30pm	Strata 3
Weekend PM – 3:30pm-10:30pm	Strata 4

Sample periods were 7.5 hours in the mornings and 7.0 hours in the afternoons. Holiday weekdays counted as weekends.

Information was recorded for angler data and biological data. Successful anglers returning during the sampling period were interviewed and their harvest was sampled where possible. Unsuccessful anglers during the survey period were merely counted upon their departure. A small number of shore anglers were occasionally missed, usually because they returned to the campsite on smaller side trails or simply drove

away before the surveyor could interview them. The survey was voluntary, but no refusals were encountered.

Angler data recorded included:

- Time angling trip was concluded.
- Boat or Shore angler(s).
- Number in party.
- Number of anglers in party.
- Where does the angler normally reside: Local (Peace River Area), Resident (B.C.), Non Resident (Canada but not BC) or Non-Canadian.
- How many hours did the angler(s) fish?
- What type of terminal gear was used: Bait (any gear with bait on it) Hardware or Fly.
- How many fish, by species, were killed or released and any marks on fish kept and released.

Biological information was collected on all harvested fish that were not cleaned, and few that were cleaned but with heads intact. Others were not sampled because of time constraints during a busy period, or if the angler was in a hurry.

Biological information recorded included:

- Species. The following abbreviations are in use throughout this report:
  - RBT = Rainbow Trout
  - KO = Kokanee
  - MW = Whitefish (Mountain)
  - BT = Bull Trout
  - LT = Lake Trout
- Weight (g)
- Length (mm)
- Capture Method (**B**ait, **H**ardware, or **F**ly)
- Age (Scale Sample, Fin Ray Sample and/or Otolith Sample)
- Date
- Marks
- Comments

## RESULTS

Approximately 24,716 catchable adipose fin clipped rainbow trout and 17,532 fingerlings were released into Dinosaur Reservoir from 1999 to 2003 (see table 1).

These catchable size fish are a direct addition to the unknown number and size of native stock available to the recreational angler. The adipose clips allow an identification of the stocking contribution. These clipped rainbow trout did show up in the 2005 survey. Seven out of thirty-six rainbow trout sampled, or 24% were clipped.

Table 1. 1999 to 2003 stocking history.

<i>Species</i>	<i>Date Stocked</i>	<i>Number Stocked</i>	<i>Marking</i>	<i>Average Weight (g)</i>	<i>Type</i>
Rainbow Trout	2003-06-17	5030	Adipose	174.75	Catchables
Rainbow Trout	2002-07-07	5030	Adipose	152.29	Catchables
Rainbow Trout	2001-07-11	5006	Adipose	185.19	Catchables
Rainbow Trout	2000-07-12	4640	Adipose	204.09	Catchables
Rainbow Trout	2000-07-12	10010	Adipose	45.45	Fingerlings
Rainbow Trout	1999-07-27	5010	Adipose	174.85	Catchables
Rainbow Trout	1999-07-27	7522	Right Ventral	72.57	Fingerlings

### **Angler Data** *(all confidence intervals are at 95% level)*

A total of 167 successful anglers in 84 parties were interviewed and 84 unsuccessful anglers in 42 parties were recorded. The estimated angler effort for the season (May 21-Aug 31<sup>st</sup>) was 1040 angler days. The estimate hour expended per angler day was 1.29 hours. The average angler success rate was 0.67 fish per hour and sixty eight percent (68%) of fish were released. The average angler party was comprised of 1.99 people. These anglers expended an estimated 1344 hours to catch an estimated 896 (+/- 266) fish, 555 (+/- 267) which were rainbow trout and 248 ( $\pm$  79) which were lake trout. The preferred catch for most anglers was larger lake trout and medium size rainbow trout. This would explain why 100% of kokanee were released and why the majority of bull trout were also released. First Nations harvested all bull trout. Local fishermen accounted half of the successful anglers (50%) utilizing Dinosaur Lake during the 2005 season (See Table 3).

Table 2. Release rates by species.

<i>Release Rate (%)</i>					
<i>RBT</i>	<i>LT</i>	<i>BT</i>	<i>MW</i>	<i>KO</i>	<i>ALL</i>
73.8%	61.6%	82.2%	83.4%	100%	68%

Table 3. **Angler Origin.**

<b>Angler Origin for Successful Anglers</b>					
	<i>Total</i>	<i>Local</i>	<i>Res</i>	<i>Non-Res</i>	<i>Non-Can</i>
Season (#)	774	385	329	46	14
Season (%)	100%	50%	39%	8%	1%

**Angler Origin for Successful Anglers For Spring (May – June) and Summer (July – August)**

	<i>Total</i>	<i>Local</i>	<i>Res</i>	<i>Non-Res</i>	<i>Non-Can</i>
May – June (#)	326	225	72	25	4
May – June (%)	42%	69%	22%	8%	1%
July – August (#)	448	160	257	21	10
July – August (%)	58%	36%	57%	5%	2%

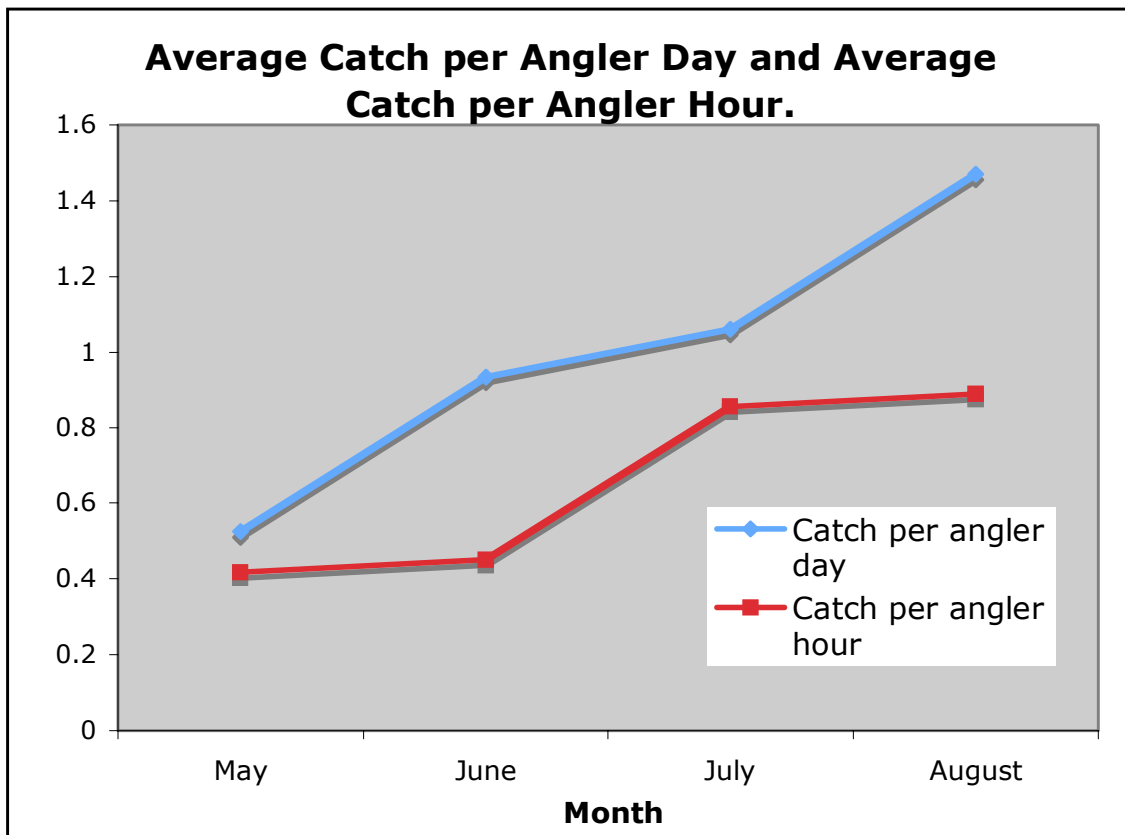


Figure 2. Average number of fish caught per day and per hour for successful anglers.

Table 4. Angling methods.

Gear Used	n	%
Bait	248	28%
Hardware	644	72%
Fly	4	0.5%

### Biological Data

A total of 67 fish were sampled out of a possible 90. Rainbow trout was the predominant sport fish (63%) captured by anglers on Dinosaur Lake. Biological data was collected on 67 sport fish harvested during the survey period. This included 29 rainbow trout, 32 lake trout, 5 whitefish, and 1 kokanee. No bull trout were sampled. There were no confirmed or reported catches of arctic grayling, lake whitefish or burbot.

An estimated 896 fish were caught during the creel census of 2005. Most of these 555 (63%) were rainbow trout. There were no obvious signs of parasites or disease, all caught and sampled fish appeared healthy. No changes in condition were evident as fish aged.

Tables 5 to 7 and Figures 3 to 10 illustrate key findings (see below).

Table 5. Number of fish sampled by Month.

	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug</i>	<i>Total</i>
Samples Taken	4	47	14	2	67
<b>Species Distribution</b>					
RBT	4	16	9	0	29
LT	0	25	5	2	32
BT	0	0	0	0	0
MW	0	5	0	0	5
KO	0	1	0	0	1

Table 6. Average length (mm) and weight (grams) of sampled fish.

Avg. Sample Fork Length (mm)	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug</i>	<i>Total</i>
RBT	304	350	315	na	323
LT	na	512	477	495	495
MW	na	341	na	na	341
Avg. Sample Weight (g)					
RBT	331	898	338	na	520
LT	na	1520	1159	1192	1290
WG	na	613	na	na	613

Table 7. Estimated total catch.

Estimated Total Catch (Killed + Released)						
	<i>RBT</i>	<i>LT</i>	<i>BT</i>	<i>MW*</i>	<i>KO</i>	<i>TOTAL</i>
May	25	26	7	0	0	58
June	103	87	0	10	2	202
July	134	52	6	0	0	192
August	246	81	0	0	0	327
Season	555	248	41	21	3	896
Confidence for season total (+/-) 266						

Note: Season is not sum of monthly calculations.

\* See discussion on page 23 regarding whitefish estimate.

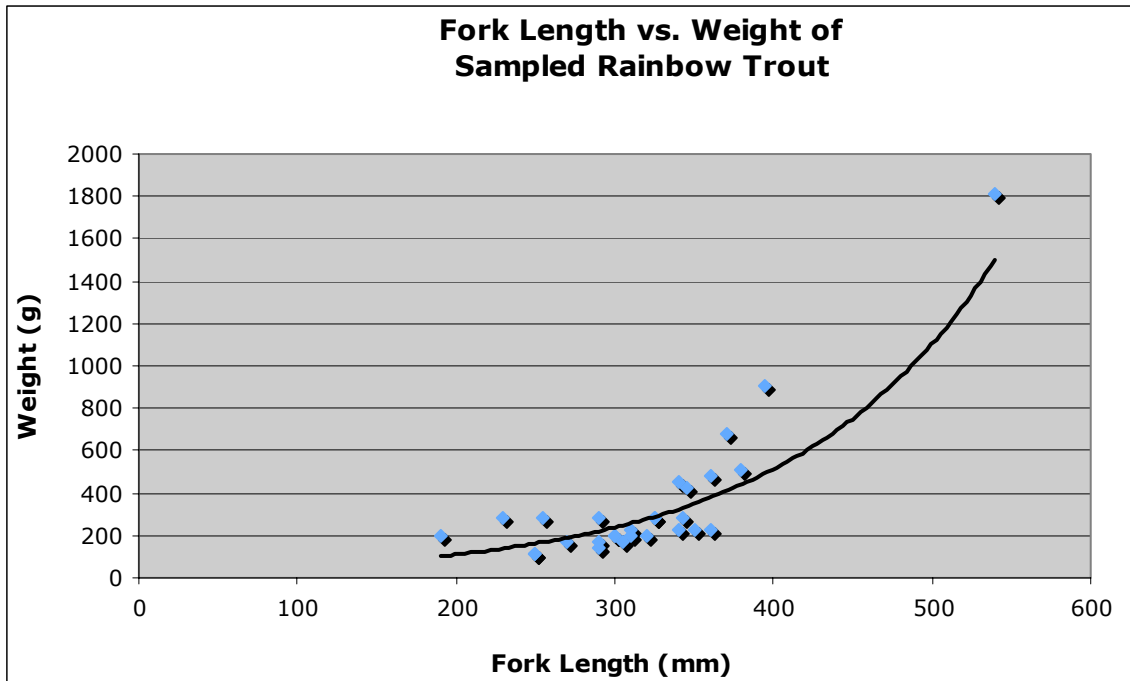


Figure 3. Fork Length vs. weight of sampled Rainbow Trout.

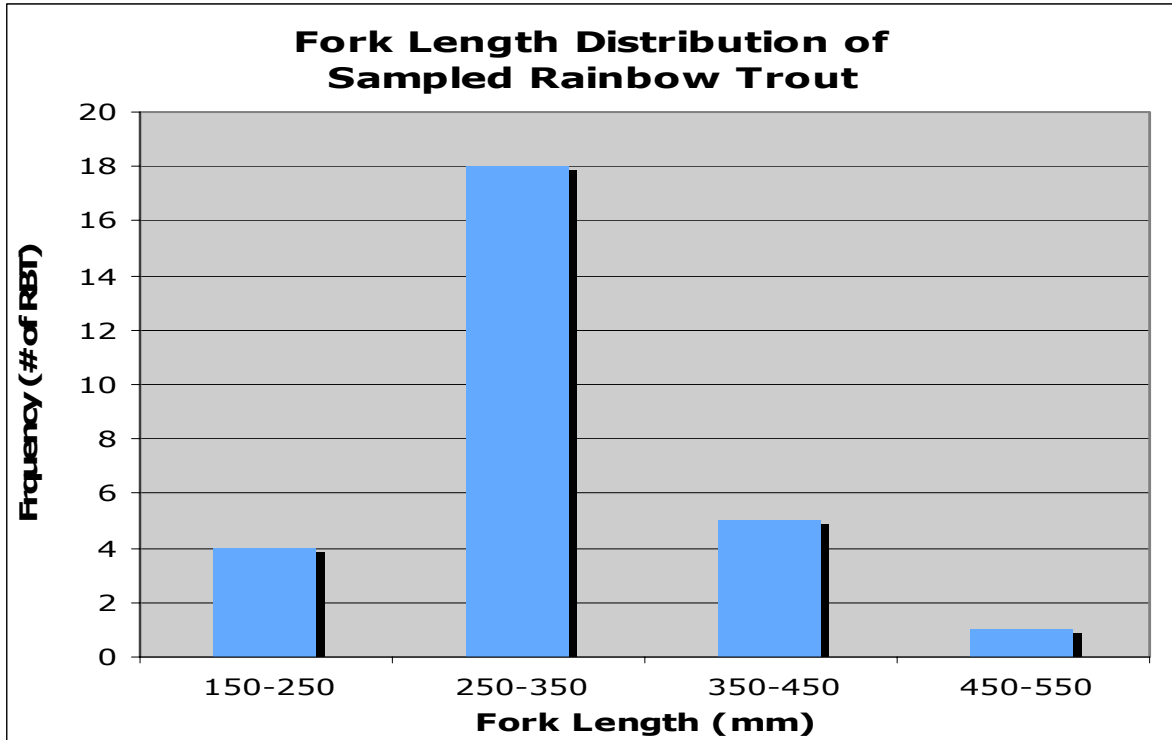


Figure 4. Fork length distribution of sampled Rainbow Trout.

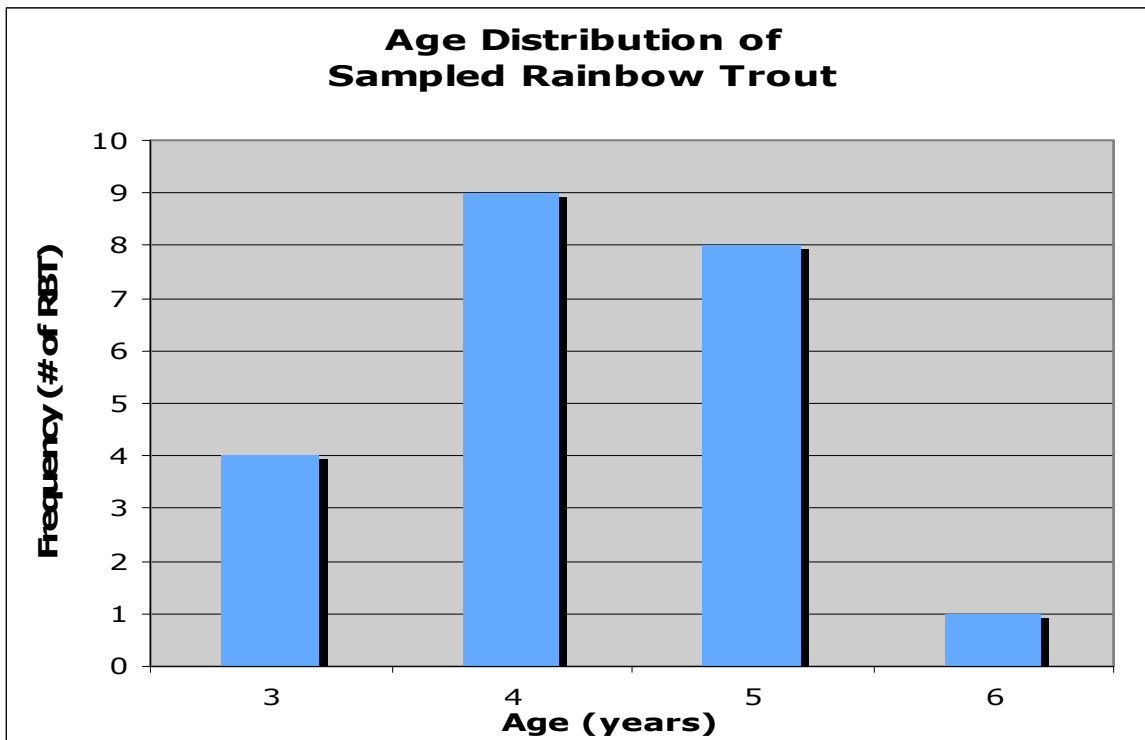


Figure 5. Age distribution of sampled Rainbow Trout.

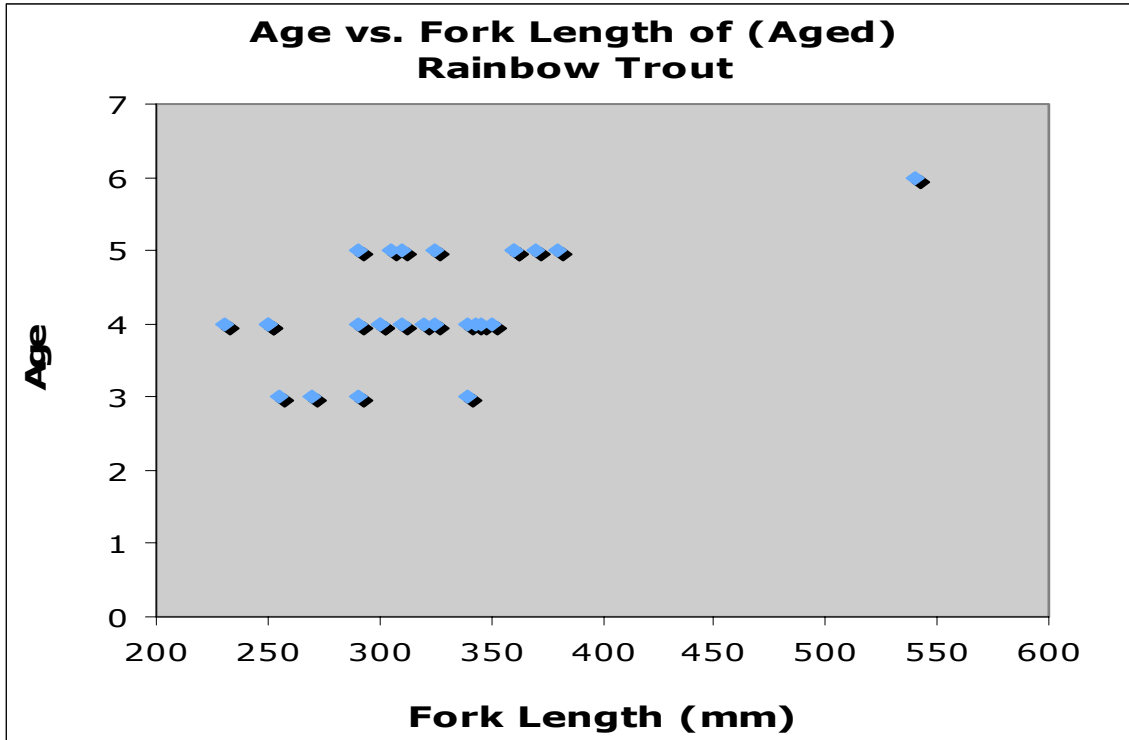


Figure 6. Age vs. fork length of sampled Rainbow Trout.

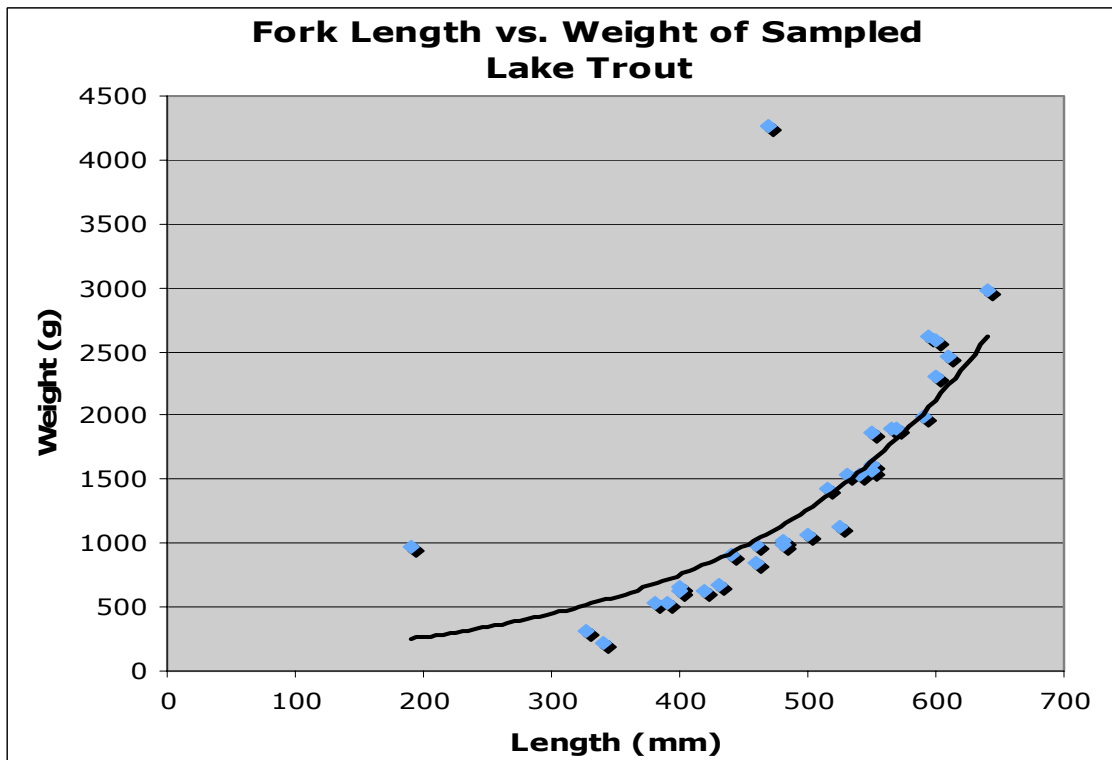


Figure 7. Fork length vs. weight of sampled Lake Trout.

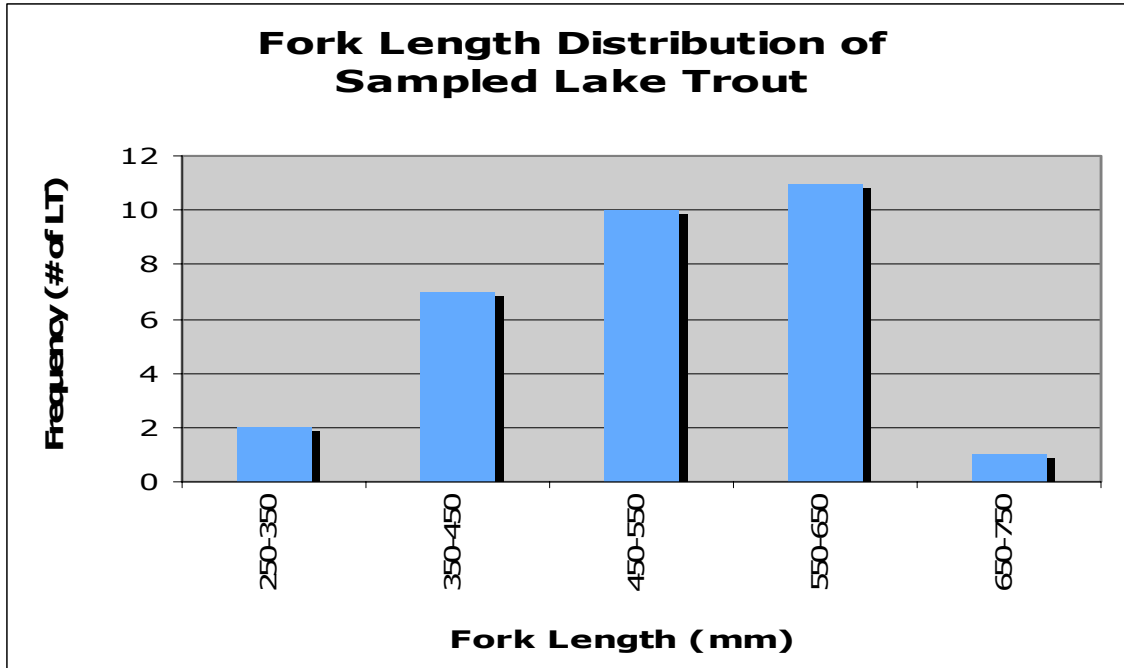


Figure 8. Fork length distribution of sampled Lake Trout

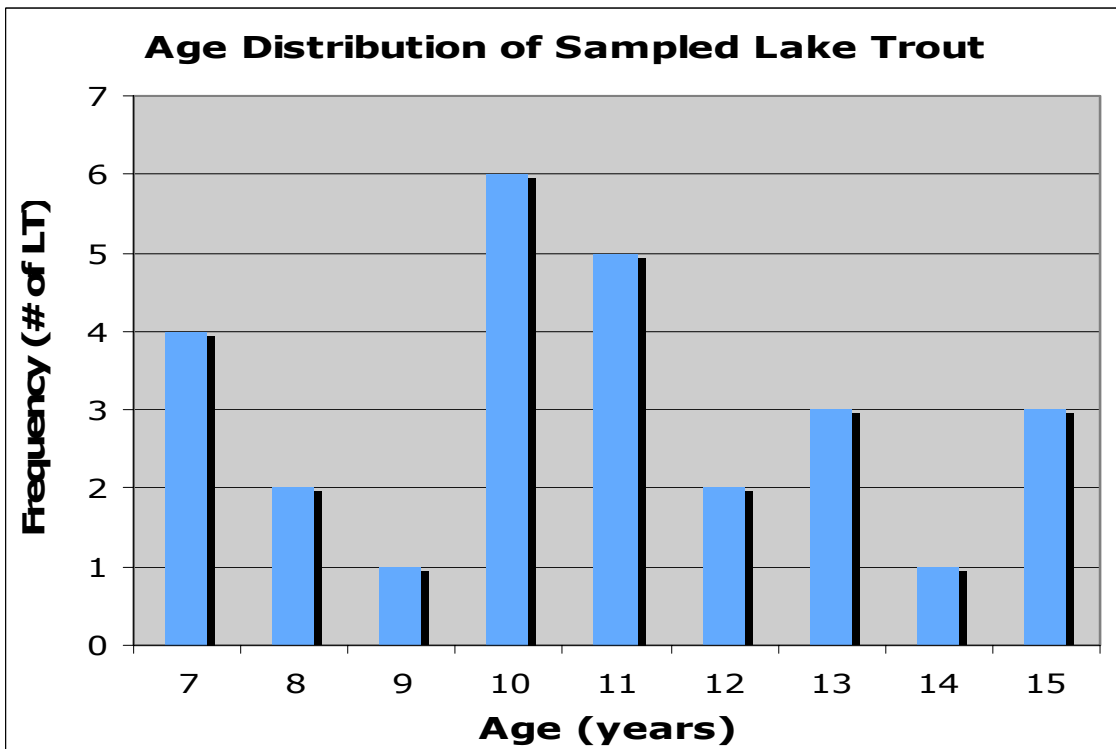


Figure 9. Age distribution of sampled Lake Trout.

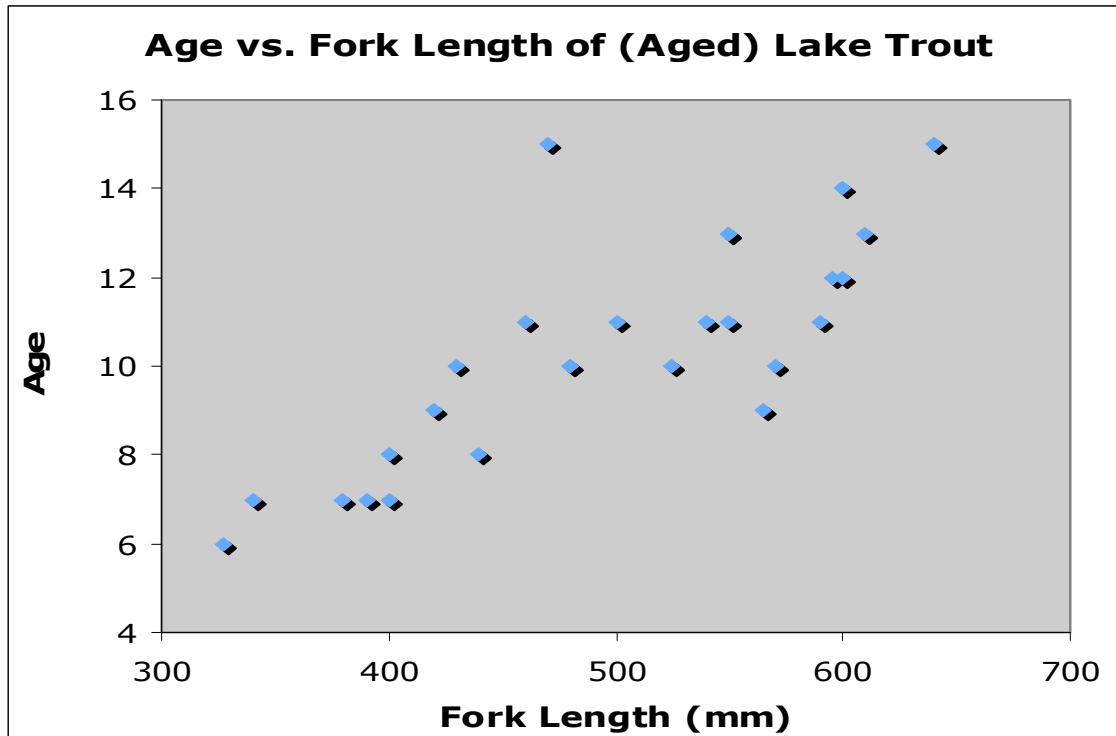


Figure 10. Age vs. Fork Length of sampled Lake Trout.

## DISCUSSION

### Comparisons with Previous Surveys

Table 8. Data comparisons with previous Dinosaur Reservoir Angling Surveys (1984-2005).

Year	Effort (Anglers)	Effort (Hours)	Catch	Harvest	Proportion Harvested	Catch Rate (Fish/hr)	Composition %Wild %Hatchery
1984	4702	13470	3965	3965	1.00	0.29	41.2 58.8
1985	1237	3940	1195	627	0.52	0.30	64.4 35.6
1986	2044	6397	2380	799	0.33	0.37	53.2 46.8
1987	1240	2932	597	274	0.45	0.20	48.6 51.4
1988	1599	3496	997	421	0.42	0.29	47.9 52.1
1999	1787	3772	1276	421	0.33	0.31	N/A N/A
2000	1761	4339	1236	368	0.30	0.25	64.8 35.2
2005	1040	1342	896	258	0.30	0.67	75.9 24.1

## Observations

Angler satisfaction was not measured quantitatively, but there appeared to be a perception of below average angling opportunities and inconsistent success. However, the actual success rate of 0.67 fish per hour is rated as high by Pattenden & Ash (1993b). This is directly related to the low angling effort, which could be related to the poor weather in the summer of 2005.

Qualitative observation and discussion revealed a profile of the typical angler: as a local or a BC resident, in a boat, with low to average angling skill and experience, and concerned more with overall experience (scenery, weather, socialization etc.) with as much as angling success. These anglers often were fishing as a secondary activity; the main reason for the visit was boating. The scenery and length of the reservoir make it ideal for boating and sightseeing.

The existence of the municipal campground adjacent to the boat launch allows heightened popularity on weekends, mostly with local families (Ft. St. John, Dawson Creek, and Chetwynd). Dinosaur Lake also attracts anglers who are generally stopping for one night on their way to/from Alaska.

The reports of whitefish caught and released were likely Peamouth Chub (*Mylocheilus Caurinus*) or Northern Pike Minnow (*Ptychocheilus oregonensis*). Small sample sizes and large variance for most species resulted in too much error for meaningful confidence intervals (see table 7). Unlike the 1999 and 2000 surveys (Joslin 1999, & 2000), there was an increased number of lake trout reported; therefore data for lake trout as well as rainbow trout are considered valid. Adequate data was available for comparing wild and stocked populations (24% of rainbow trout sampled were stocked fish).

Regarding the downstream movement of released fish, Hammond (1986) monitored release and found fish moved from GMS Tailrace to lower Dinosaur Reservoir in a period of less than three weeks. Although it is unknown exactly how many fish travel through the Peace Canyon Dam, or the resulting mortality rate, enhancing the spawning habitats in Dinosaur Lake would be beneficial.

Wood brush structures were installed in 2004 and 2005 at various sites throughout Dinosaur Reservoir. These structures consist of two large logs cabled together at one end and anchored into the shore approximately 4-5m apart in the form a triangle. The area between the logs was then filled with wood brush to create a rearing habitat for fish. These structures attract fish populations and reduce entrainment.

## Summary

The low angling effort is probably due to the very cold wet summer. The majority of the days surveyed in June and July were rainy with below average temperatures. The 2005 survey recorded only successful anglers, which biases the overall catch rate compared to previous surveys. The previous surveys included the stocking program whereas this survey was conducted to monitor the impact of terminating the stocking program.

Notwithstanding the successful interview methodology discrepancies to previous surveys, the number of lake trout recorded also improved compared to the last survey completed in 2000. It is probable that this increase is because the population is expanding and anglers are becoming more effective at catching lake trout.

Like previous surveys (except 1999) data was available for comparing wild and stocked populations. The stocked rainbow trout sample comprised of 24% of all rainbow trout sampled and all were between 3 and 5 years old.

Since the stocking program has been terminated, enhancing the reservoir for the existing fish population is extremely important to provide habitat and to reduce entrainment. Anglers reported fish were consistently caught near or around the installed woody structures, confirming this to be a successful way of enhancing fish habitat.

#### Acknowledgements

The author would like to thank B. Blackman and G. Leering who designed the creel and provided editorial comments on the report.

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## APPENDIX A

### Data Summary (with 95% Confidence Intervals)

**Note: Results cover sample period ONLY (May 22-Aug 24).**

#### Total number of successful and unsuccessful anglers

	1	2	3	4	Total
May	85	73.3	0	63	221.3
June	60	52	66	62.3	240.3
July	46.8	59.7	70	80	256.5
Aug	22.5	81	110	101.2	314.7
Season	186.8 ±65	240.7 ±50.5	308.1 ±96.7	304.2 ±50.2	1039.8 ±136.5

*Note: Season is not sum of monthly calculations*

#### Total number of successful anglers

	Weekend/holi day am1	Weekend/holiday pm2	Weekday am3	Weekday pm4	Total
May	45	26.6	0	52.5	124.1
June	64	46	44	48.4	202.4
July	33	48.73	60	80	221.73
Aug	20.97	45	55	104.5	225.47
Season	136.8 ± 50	171 ± 47	194.65 ± 27	272 ± 58	773.31 ± 99

*Note: Season is not sum of monthly calculations*

#### Total number of hours spent fishing of successful anglers

	Weekend/holi day am1	Weekend/holiday pm2	Weekday am3	Weekday pm4	Total
May	43.3	20	0	53.76	117.06
June	232	81.04	37.18	69.3	419.52
July	44	59.73	60	110	273.73
Aug	18	160	60.5	134.86	373.36
Season	1000.44 ± 228				

*Note: Season is not sum of monthly calculations*

**Total number of each sport species killed and released**

	RBT	LT	BT	MW	KO
May	25.25	26	6.7	0	0
June	103	87.4	0	9.5	2
July	133.69	52	6.27	0	0
Aug	245.97	80.5	0	0	0
Season	554.60 ± 267				

*Note: Small sample sizes and high variance for most species resulted in too much error for meaningful confidence intervals.*

**Total number of each sport species killed**

	RBT	LT	BT	MW	KO
May	11.95	15.5	6.7	0	0
June	26.3	66	0	8	0
July	76.94	9.46	0	0	0
Aug	58.53	20	0	0	0
Season	145.44 ± 63				

*Note: Small sample sizes and high variance for most species resulted in too much error for meaningful confidence intervals.*

**Total number of each sport species released**

	RBT	LT	BT	MW	KO
May	13.3	10.5	0	0	0
June	76.7	21.4	0	9.5	2
July	59.5	42.54	46.27	0	0
Aug	187.53	60.5	0	0	0
Season	409.16 ± 249				

*Note: Small sample sizes and high variance for most species resulted in too much error for meaningful confidence intervals.*

**Total number of boats**

Season	260.79 ± 67
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**Percentage of successful anglers broken down by residency and gear type**

Visitor Residency

	Local	Res	Non-Res	Non-Can	Total
Season (n)	385	328	46	14	773
Season (%)	50%	43%	6%	2%	100%

**Capture Methods**

	n	%
Bait	204	26%
Hardware	565	73%
Fly	5	0.6%

**Percentage of hours spent fishing by residency and gear type**

Visitor Residency

	Local	Res	Non-Res	Non-Can	Total
Season (n)	522	389	768	128	1000
Season (%)	52%	39%	8%	1%	100%

Capture Methods

	n	%
Bait	274	27%
Hardware	720	72%
Fly	6	1.0%

*Note: Percentages of hours and capture methods are from successful anglers only*

**Percentage of fish killed by residency and gear type**

	Local	Res	Non-Res	Non-Can	Total
Season (n)	125	108	21	4	258
Season (%)	48%	42%	8%	2%	100%

Capture Methods

	n	%
Bait	83	32%
Hardware	175	68%
Fly	0	0%

**Percentage of fish released by residency and gear type**

	Local	Res	Non-Res	Non-Can	Total
Season (n)	367	262	10	0	638
Season (%)	58%	40%	1%	0%	100%

Capture Methods

	n	%
Bait	163	25%
Hardware	470	74%
Fly	47	1%

**Percentage of fish killed and released by residency and gear type**

	Local	Res	Non-Res	Non-Can	Total
Season (n)	489	370	32	5	896
Season (%)	55%	41%	3.5%	0.5%	100%

Capture Methods	n	%
Bait	248	28%
Hardware	644	72%
Fly	4	0.5%

**Average Catch per angler hour of all species, catch per unit effort**

	May	June	July	August	Season
	0.418	0.451	0.857	0.889	0.896 ± 2

**Total Catch, of all sport species, per angler day (catch/angler day)**

	May	June	July	August	Season
	0.524	0.934	1.06	1.47	1.16 ± 2.7

**Average Length of (hours) of an angler-day**

	May	June	July	August	Season
	1.26	2.07	1.23	1.66	1.29

**Average number of anglers per boat**

	May	June	July	August	Season
	3.39	2.04	2.78	5.77	2.96+ 1.5

**Average killed catch per boat**

	May	June	July	August	Season
	1.48	1.01	1.08	2.01	0.989 ± 1.1

**Average total catch per boat**

	May	June	July	August	Season
	1.78	1.9	2.94	8.5	3.43 ± 3.90

**Release rate for each species**

	RBT	LT	BT	MW
Season	73.80%	61.60%	82.20%	83.40%

Number of Samples taken	May	June	July	August	Total/Season
# samples	4	42	14	2	62

**Species Distribution**

RBT	4	16	9	0	29
LT	0	25	5	2	32
BT	0	0	0	0	0
MW	0	5	0	0	5
KO	0	1	0	0	1

**Avg. Sample Length**

RBT	304	350	315	na	323
LT	na	512.1	477.4	495	494.8
MW	na	341	na	na	341

**Avg. Sample Weight**

RBT	331.3	897.5	337.9	na	520.2
LT	na	1520.1	1159.3	1191.5	1290.3
MW	na	612.8	na	na	612.8

**Biomass removed (total killed x avg. weight)**

	g	kg
RBT	17166.6	17.2
LT	30967.2	31.0
MW	612.8	0.6