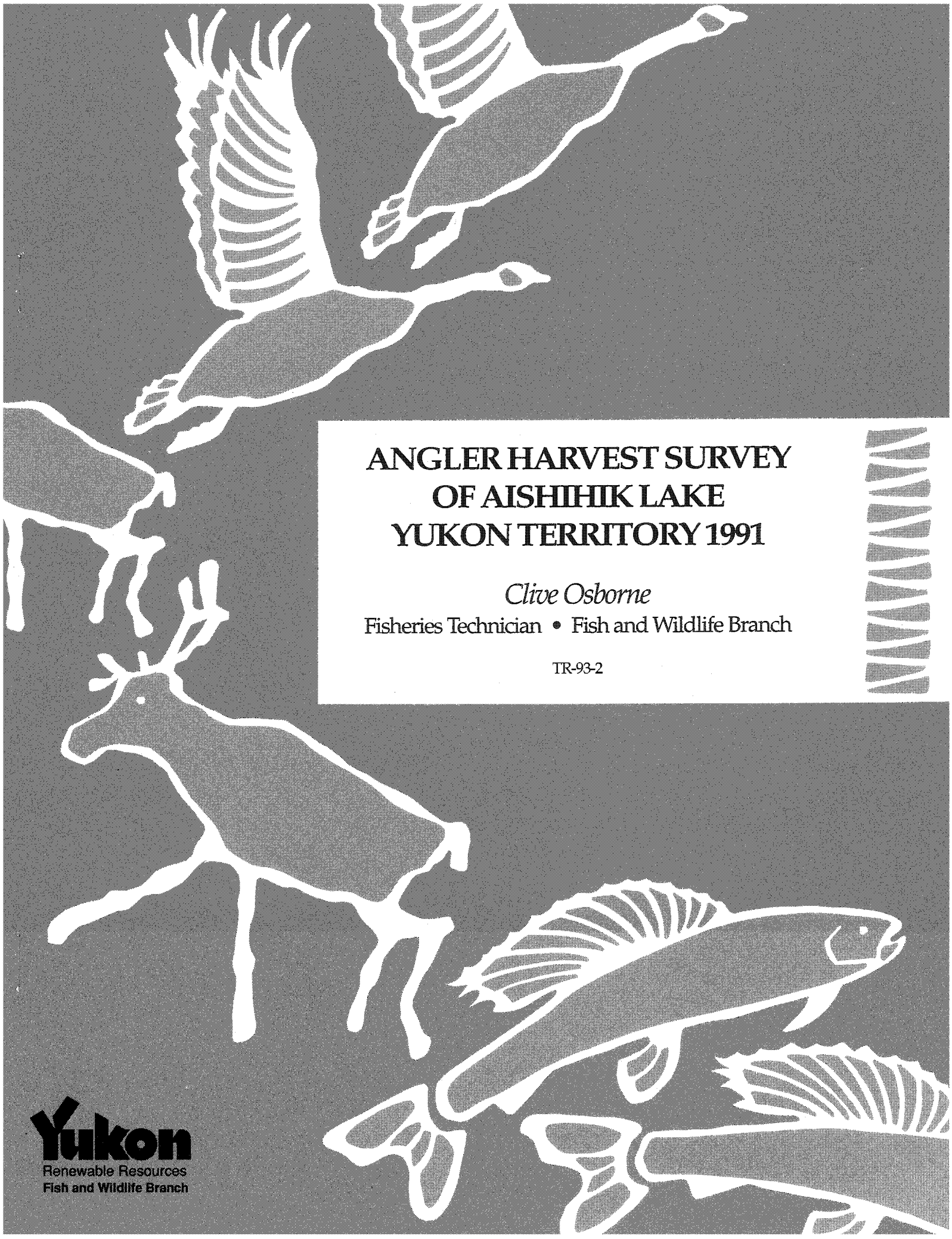

ANGLER HARVEST SURVEY OF AISHIHIK LAKE YUKON TERRITORY 1991

Clive Osborne

Fisheries Technician • Fish and Wildlife Branch

TR-93-2

Yukon
Renewable Resources
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Clive Osborne, Fisheries Technician, Fish and Wildlife Branch

Technical Report
April, 1993

Government of Yukon **TR-93-2**

ANGLER HARVEST SURVEY OF AISHIHIK LAKE YUKON TERRITORY, 1990.

Clive Osborne

Director, Fish & Wildlife Branch

Supervisor

1991

ABSTRACT

Aishihik Lake is located approximately 110 kilometres northwest of Whitehorse. The lake and surrounding area provides recreational camping, fishing and sport hunting opportunities. During the summer of 1991, the Fisheries section of the Department of Renewable Resources conducted an angler harvest survey to assess the level of sport fishing on the lake.

Two distinct fisheries were observed during the course of the survey. Visitors to the Aishihik Lake campground engage in a shore based fishery for arctic grayling at the south end of the lake and along the Canyon Creek outlet to the lake. Many local anglers make the lake a destination specifically for lake trout fishing by boat. An average of 26.3 hours of angling effort per day was determined for the lake. The estimated harvest for lake trout and arctic grayling from the lake was 164 fish (311 kgms.) and 133 fish (113 kgms.) respectively. The catch per unit effort (0.23) and harvest per unit effort (0.06) for lake trout are substantially less (4-9 x) than data from the early 1980's indicating a decline in angling quality. Growth rates for both lake trout and arctic grayling appear to be slow and fish are not exceptionally large. Lake Trout show isometric growth (ie. weight = length^3) while arctic grayling show positive allometric growth (ie. weight exceeds length^3). Sex ratios of the angler catch appear to be skewed, toward males in Arctic Grayling and toward females in Lake Trout.

The weight (yield) of the estimated number of lake trout retained by anglers, in the summer of 1991, was 310.7 kilograms. A maximum sustained yield for lake trout of 5296 kilograms (0.37 kgms./ha) was determined from test-netting composition data. An optimum sustained annual yield of 791 kilograms for lake trout is recommended as a management target level.

ACKNOWLEDGEMENTS

The author would like to express his appreciation to the Champagne - Aishihik Band for making available field personnel: to Lanaya Hume and Natalie Oles who conducted the summer harvest survey . Advice on data analysis and editorial comments on the text were provided by Nick de Graff and Len Mychasiw and were much appreciated. Dr. Nigel Lester reviewed this report and provided many valuable editorial comments and design suggestions. The typing expertise of Caroline Lajoie was very welcome.

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1 INTRODUCTION

Aishihik Lake is situated approximately 110 kilometres northwest of Whitehorse on the Alaska highway and 43 kilometres north of the highway on the Aishihik Road (Figure 1). Aishihik and Sekulman Lakes are popular destinations for serious anglers and hunters. A territorial campground and boat launch are situated at the southern tip of the lake at kilometre 43.

Canyon, Aishihik and Sekulman Lakes serve as reservoirs for a 30 megawatt hydro-electrical generating station 5 kilometres south of Canyon Lake. These lakes have been the subject of a study into the hydro-related impacts of lake levels on fish populations, during 1991 and 1992. As a component of this study, the Fisheries Section undertook an angler survey to quantify fishing effort and harvest. The specific objectives of the survey were to:

1.) Estimate the level of sport harvested fish species
2.) Estimate total angling effort (angler days)
3.) Determine relative angling quality
4.) Collect biological data from angler catch
5.) Formulate a future management strategy for the maintenance of fish stocks through estimates of sustainable yields

1.1 Description of the Study Area

The following description was summarized from Oswald and Senyk (1977). Aishihik Lake (61°30'N, 137°15'W) is situated within the Ruby Range Ecoregion which includes the Kluane, Ruby and Nisling

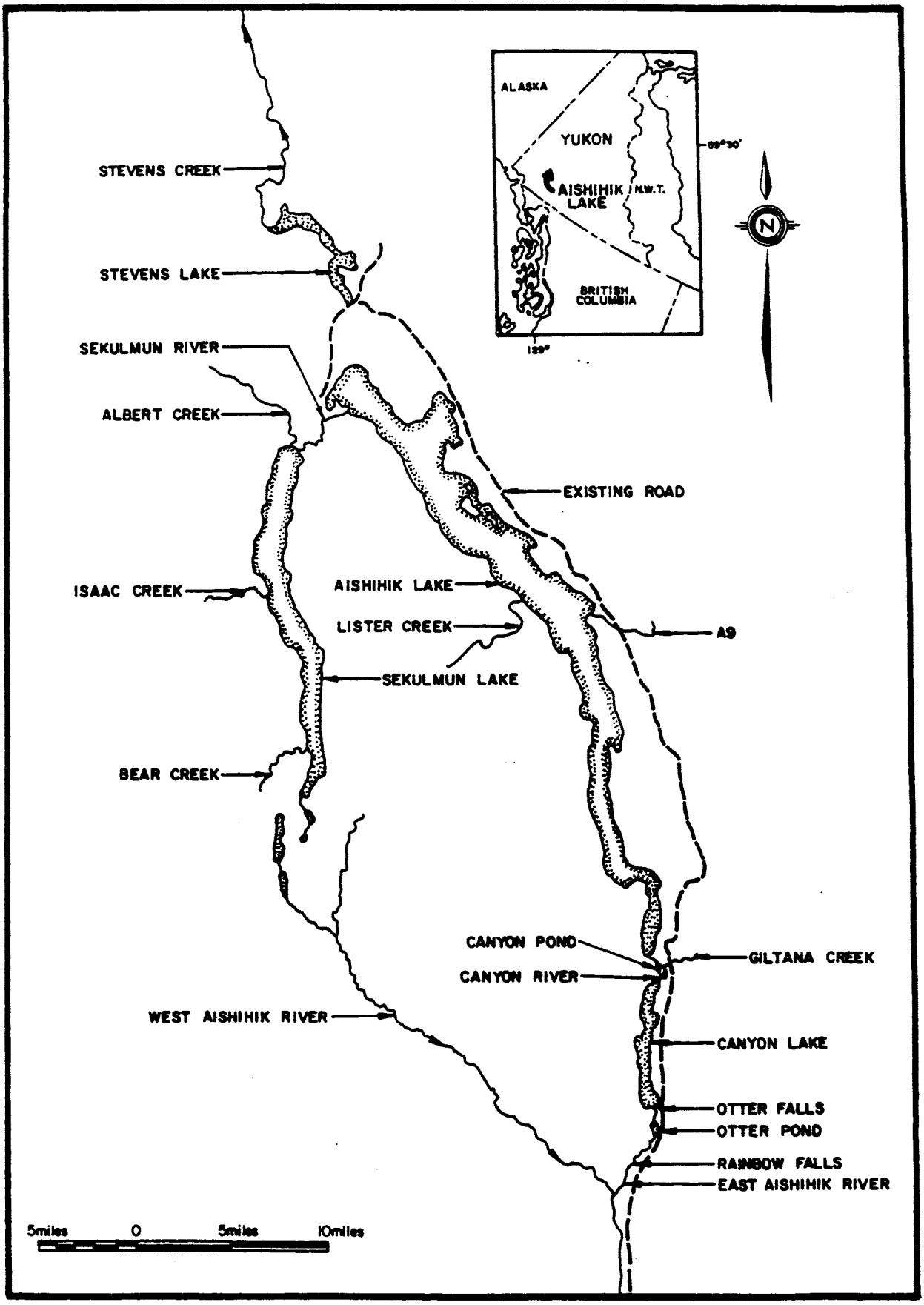

Figure 1. Map of Aishihik, Canyon and Sekulman Lakes

Ranges, the Shakwak Valley and Kluane Plateau. Sekulman and Asihihik Lakes form the headwaters of the Alsek River drainage via the Aishihik and Dezdeash Rivers. The bedrock of the area is principally granitic and metamorphic rock. The region has annual precipitation at lower elevations from 190 to 285 mm. and has a mean annual temperature of -4° C. Winds are common and often very strong in major valleys. The region lies within an area of discontinuous permafrost with poor soil drainage sites. Black spruce predominates on poorly drained sites. Paper birch and aspen poplar trees are scattered throughout the region.

The lake is approximately 53 kilometres in length and 6 kilometres in width at its widest point. It has surface area of 145 square kilometres and a mean depth of 37.6 meters. Yukon Energy Corporation maintains a dam at the outlet of the lake to facilitate water storage.

1.2 The Fishery

Aishihik Lake supports populations of lake trout, northern pike, arctic grayling, humpback and round whitefish, burbot and longnose sucker. Lake trout, northern pike and arctic grayling are the target species for sport anglers. Lake trout is the most sought species by boat anglers. More experienced anglers with larger boats will venture to the north end of the lake (McRobb, 1989). Arctic grayling are pursued by shore fishermen at the campground and in the river downstream of the dam.

2 MATERIALS AND METHODS

2.1 Angler Harvest Survey

The angler harvest survey on Aishihik Lake commenced June 1 and terminated September 2, 1991. The survey was an access design and the sample unit was the day. An attempt was made to intercept all anglers that fished on sample days. Sample days were selected at random from the entire summer survey period. Catch, harvest, angling effort and biological data were collected from anglers interviewed at the Aishihik Lake campground upon completion of the day's fishing.

The following information was obtained through an interview with each angler party:

1. Number of anglers in the party.
2. Country of Origin if not a Yukon resident.
3. Method of fishing and number of rods used.
4. Number of hours spent fishing.
5. Number of fish caught and released or consumed during shore lunch.

Harvest and total effort estimates were determined using a stratified random sample design. At the time of analysis, the data was separated into 3 strata, week-end days, long week-end days, and week days. Their respective sampling efforts were 100% for long week-end days, 40% for week-end days and 71% for week days.

2.2 Biological Sampling

If anglers were agreeable, otoliths were taken for age determination, stomach contents were sampled, and sexual maturity was determined for all fish retained. Sample fish were measured for fork length (+/-0.1 mm.) and round weight (+/-10 gms.) The gonads were examined for sex and maturity. Gonadal maturation was assessed according to the following categories:

Immature	- no gonad development
Mature	- gonads filling greater than 2/3 of the body cavity
Ripe	- gonads filling body cavity, milt or eggs free in body cavity, eggs completely round, testes white, fish in spawning condition
Spent	- gonads collapsed and flaccid
Unknown	- little gonad development but size of fish indicates that the fish may have spawned in past years

Otoliths were sectioned with a low speed isomet saw and annuli were counted under a microfiche reader. Stomach contents were also examined cursorily for invertebrate or fish content.

2.3 Analyses

Estimates of angling effort, the number of fish by species caught and of the number of fish retained (harvest) were derived by

the following formula for a stratified random estimate:

$$\hat{Y} = \sum_{i=1}^{ALL\ STRATA} (N_i\ \bar{Y}_i)$$

Where $\hat{Y}_i$ = stratum estimate
N_i = *Total number of sample units, stratum i*
$\bar{Y}_i$ (*the stratum mean estimate*)
$= \bar{y}_i$ = *the stratum sample mean*

The stratum sample mean is the average of daily totals accross the stratum. The formula for the variance estimator is:

$$V(\hat{Y}) = \sum_{i=1}^{ALL\ STRATA} (N_i^2\ V(\bar{Y}_i))$$

Where $V(\hat{Y})$ = *the variance of the estimate*
$V(\bar{Y}_i)$ (*the variance of the stratum mean estimate*)
$= s_i^2$ = (*the stratum sample variance*)

The stratum sample variance (s^2) is the variance about the average of daily totals accross the stratum. Normal confidence limit intervals were calculated by the formula:

$$C.L. = 1.96\sqrt{V(Y)}$$

Age - Frequency distributions were constructed for combined sexes for both arctic grayling and lake trout. The mean age of maturity was calculated using Abrasov's Estimate (Abrasov, 1967) from age specific maturity schedules.

An estimate of yield was obtained by calculating the product of the estimated number of fish kept by anglers and the mean weight of sampled fish. Maximum sustained yield (MSY) for Aishihik Lake was

determined using a mean annual air temperature climatic index combined with an estimate of Ryder's morphoedaphic index (MEI) of 1.62 calculated from measurements of total dissolved solids in the lake water taken over the field season. The equation used for MSY estimate is:

$$\log (MSY) = 0.050 (TEMP) + 0.280 \log (MEI) + 0.236$$

and was taken from Schlesinger and Regier (1982). The value used for TEMP in the equation was -4.4°C., the mean annual temperature over a thirty year period for the Aishihik Village located at the north end of Aishihik Lake (Environment Canada, 1982).

3 RESULTS

3.1 Angler Catch, Harvest and Effort

A total of 111 Aishihik Lake anglers were interviewed. The majority of the fishermen were from Whitehorse (35%). The remaining anglers were local residents (Aishihik and Champagne villages) (16%), U.S. residents (14%), out-of-territory Canadians (11%), Yukon (8%), and Others (15%). Table 1 summarises the interview catch / effort data by species. Estimates of the total number of anglers and the total number of hours fished over the survey period is presented in Table 2. A total of 1686 rod hours were fished on Aishihik Lake by 278 anglers interviewed over the survey period. This represents a mean of 26.3 angler hours a day. Sixty-three percent of the anglers interviewed fished 53% of the total rod hours recorded during the survey, on week days.

TABLE 1 Summary of Interview Catch/Effort Data from the Angler Harvest Survey on Aishihik Lake, Summer 1991.

Species	Catch	Harvest	Catch/Unit Effort	Harvest/Unit Effort
A. Grayling	372	96	0.24	0.06
Lake Trout	392	108	0.23	0.06
Northern Pike	172	42	0.11	0.03

TABLE 2 Stratified Random Estimate of Angling Effort (Number of Angler Days and Angler Hours) for Aishihik Lake Based on Summer Angler Harvest Survey, 1991

Origin	No. of Anglers *	Total Angler Hours *	Hours Fished/ Angler Day *
Local	43	182.3	4.2
Whitehorse	95	429.0	4.5
Yukon	21	106.7	6.0
Canadian	29	129.9	4.5
U.S.A.	37	246.6	6.7
Other	40	545.8	13.6
Unknown	13	45.3	3.5
TOTAL SAMPLE	278	1685.5	6.0
ESTIMATE	394	2388.5	
Confidence Int.	104	598.3	

* (Observed Totals from Interview Data)

A summary of the estimates of fish caught and harvested by anglers over the summer creel period is presented in Table 3. Estimated total harvest by weight is summarized in Table 4 and further analyzed by stratum in Appendix 1. Arctic grayling and northern pike mean daily catchs for week days (6.42, 1.58) were not significantly different than for weekend days (5.43, 3.09). However, for lake trout, the mean daily catch for week days (9.05) was significantly different than for weekend days (4.78)(Non parametric Chi Squared test, $p = 0.5$, d.f. = 1, two tailed test). Total harvest of lake trout, arctic grayling and northern pike were estimated to be 311, 35 and 21 kilograms.

3.2 Biological Data

A total of 43 arctic grayling and 33 lake trout were sampled for biological information. The biological data detailing age, fork length, weight, sex, maturity and condition for all fish sampled during the creel census is presented in Appendix 2. This data is summarized into age specific mean length, weight, condition factor and frequency in Table 5 and further summarized in Table 6. Mean length and mean weight were plotted against age for lake trout in Figure 2 and for arctic grayling in Figure 3. Age - Frequency distributions for combined sexes of both species are presented in Figure 4. Length - Frequency distributions for combined sexes for both species, are presented in Figure 5.

TABLE 3 Estimated Total Catch and Harvest for Aishihik Lake Based on Summer Angler Harvest Survey, 1991

Species	Total No. of Fish Caught	95% Confidence Limits (+/-)	% Frequency	Total No. of Fish Retained	95% Confidence Limits (+/-)	% Frequency
Lake Trout	653.20	214.36	44.5	163.52	48.69	45.0
N. Pike	267.21	129.82	18.2	66.90	40.73	18.4
A. Grayling	547.00	167.20	37.2	132.65	51.52	36.5
TOTAL	1467.41	511.38		363.07	140.92	

TABLE 4 Estimated Total Harvest by Weight for Aishihik Lake Based on Angler Harvest Survey, 1991

Species	Total No. of Fish Caught	Estimated Total Weight of Fish Retained (kgms.)	Mean Weight of Sampled Fish (gms.)	95% Confidence Interval
Lake Trout	653.2	310.7	1900.0	92.5
N. Pike	267.21	*	*	
A. Grayling	547.00	96.3	265.2	37.7

* Northern Pike not sampled

TABLE 5 Lake Trout and Arctic Grayling Age Specific Mean Lengths, Weights and Condition Factors - Aishihik Lake Angler Harvest Survey, 1991

Species	Age	Number	% Frequency	Mean Length	Mean Weight	Mean Condition Factor
Arctic Grayling	2	14	33	248	171	1.1
	3	23	53	283	279	1.2
	4	4	9	339	430	1.1
	5	2	5	313	525	1.9
TOTAL		43	100			
WEIGHTED MEAN				296	351	1.3
Lake Trout	6	2	6	400	750	1.2
	7	2	6	366	525	1.1
	8	3	9	509	1536	1.2
	9	4	12	529	1450	1.0
	10	6	18	508	1648	1.3
	11	1	3	570		
	12	2	6	527	1950	1.3
	13	2	6	607	2675	1.2
	14	3	9	496	1375	1.1
	15	1	3	500	1500	1.2
	16	2	6	627	2250	0.9
	17	2	6	692	3400	1.0
	18	2	6	550	1725	1.0
	19	1	3	518	800	0.6
TOTAL		33	100			
WEIGHTED MEAN				528	1600	1.1

TABLE 6 Summary of Biological Characteristics of Fish Caught in the Aishihik Lake Angler Harvest Survey.

Species	Mean Age of Catch	Mean Fork Length (mm.)	Mean Weight (grams)	Mean Age of Maturity	N
A. Grayling	2.9	296	351	3.2	43
Lake Trout	11.7	528	1900	9.6	33

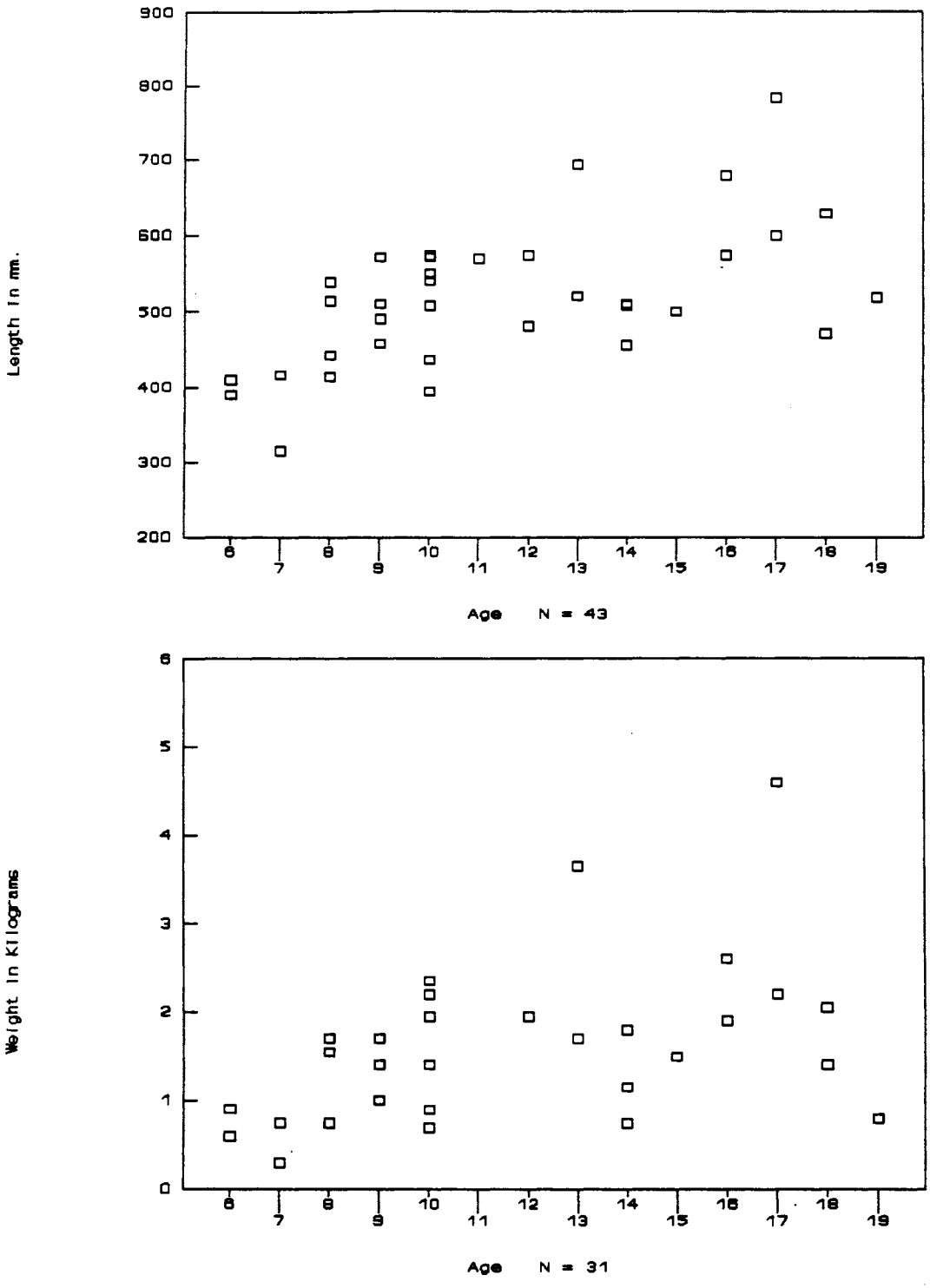

Figure 2 Age - Length and Age - Weight Relationships of Lake Trout Sampled during the Aishihik Lake Angler Harvest Survey, 1991.

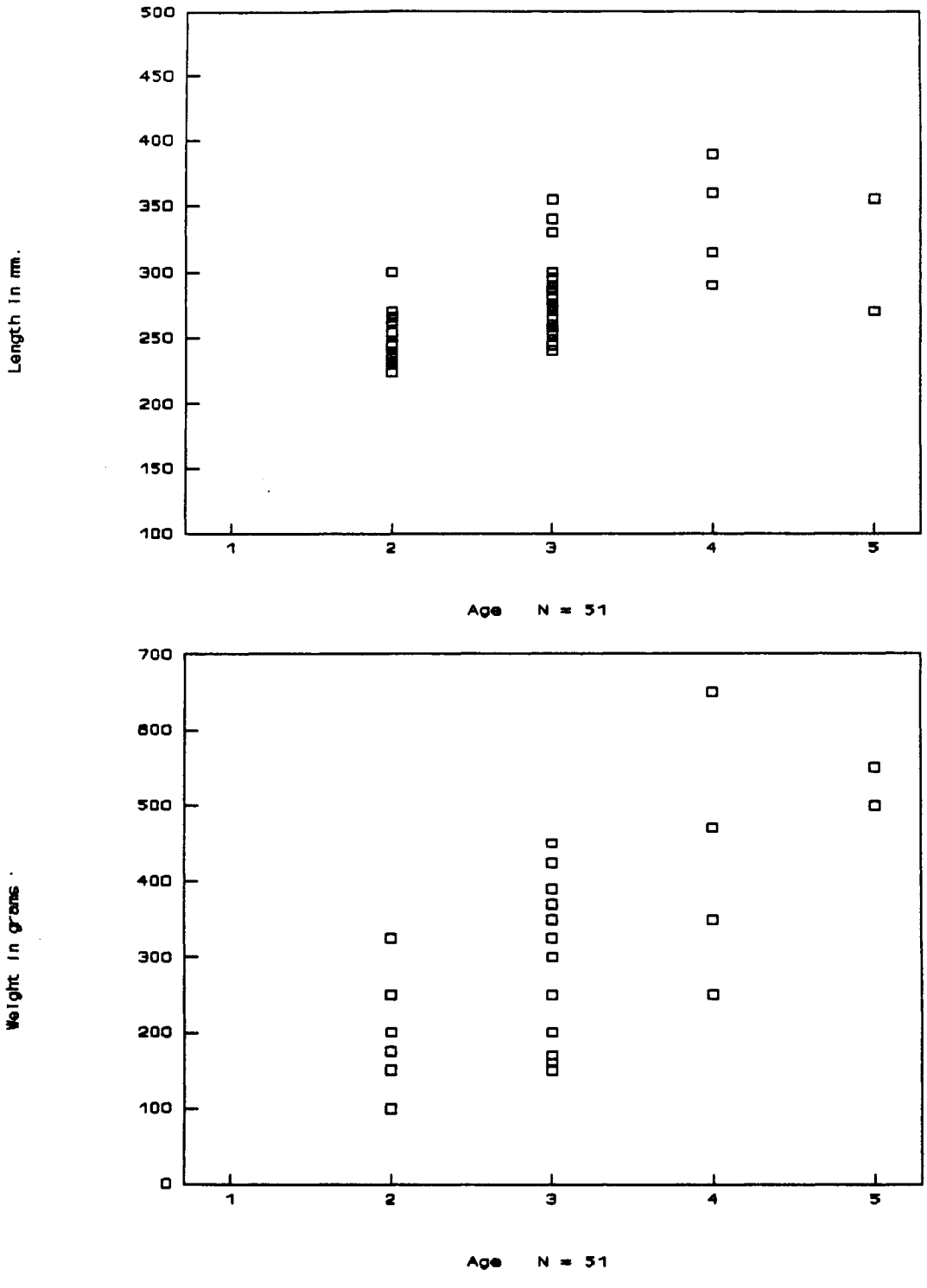

Figure 3 Age - Length and Age - Weight Relationships of Arctic Grayling Sampled during the Aishihik Lake Angler Harvest Survey, 1991.

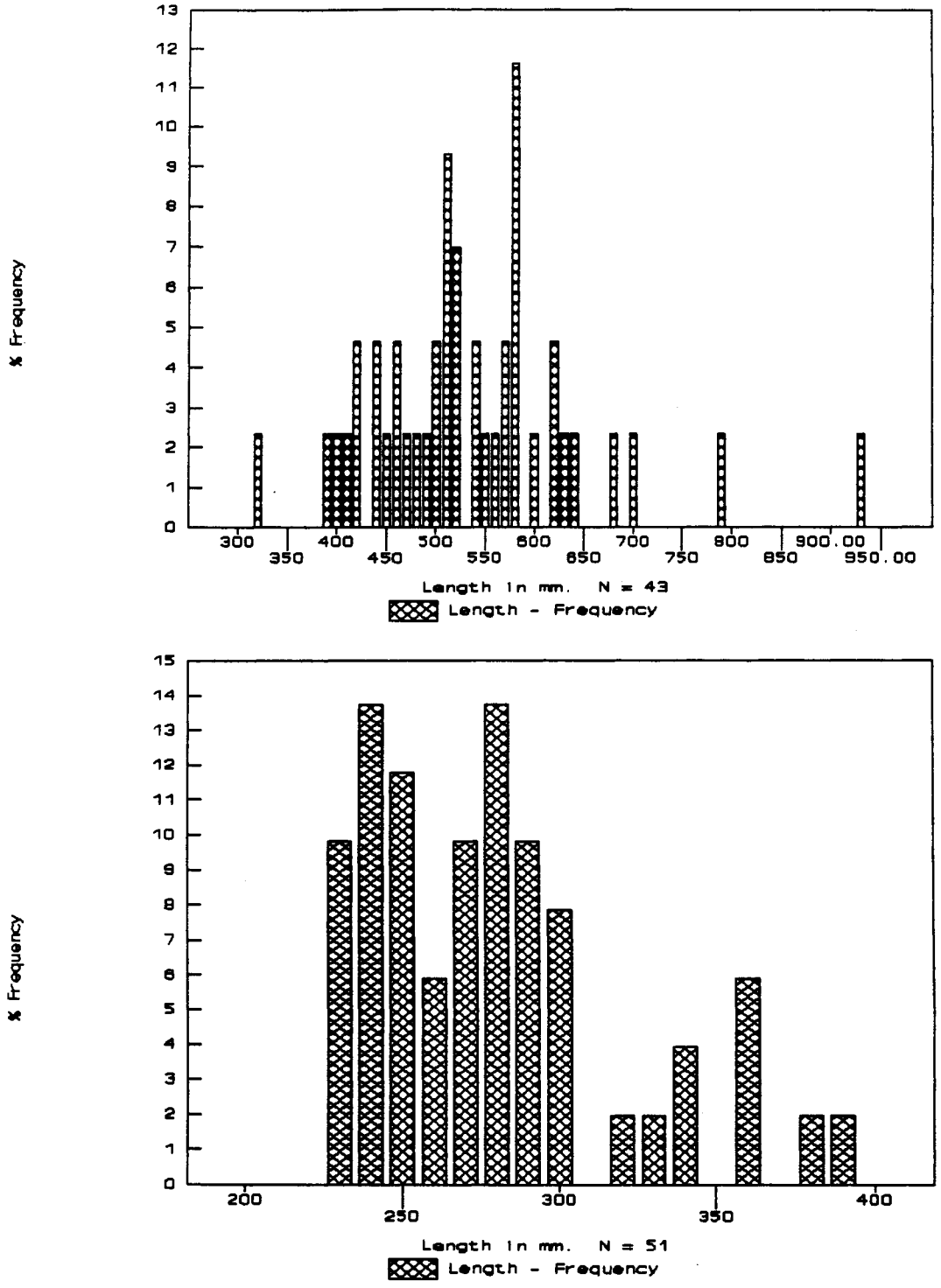

Figure 4 Length Frequency Distribution of Lake Trout and Arctic Grayling Sampled during the Aishihik Lake Angler Harvest Survey, 1991.

3.2.1 Age and Growth

The mean age of the catch for arctic grayling was 2.9 years and the ages ranged from 2 to 5 years. The mean age of the catch for lake trout age was 11.7 years and the ages ranged from 6 - 19 years. The mean length and weight for arctic grayling in the sample was 296 mm. (11.7 in.) and 351 grams (0.8 lbs) and for lake trout the mean length and weight was 528 mm. (20.8 in.) and 1660 gms. (3.7 lbs.). The length-weight regression showed isometric growth[1] for both sexes of lake trout and for arctic grayling males and positive allometric growth[2] for arctic grayling females (Table 7). Mean condition factors of 1.1 and 1.3 indicate that both lake trout and arctic grayling populations are in good condition.

TABLE 7 Length - Weight Relationships of Lake Trout and Arctic Grayling from the Aishihik Lake Angler Harvest Survey, 1991

Species	Sex	Equation	N	Correlation Coefficient
Lake Trout	M	Log Weight = -5.10 + Log Length * 3.06	11	0.95
	F	Log Weight = -4.12 + Log Length * 2.68	22	0.82
	Combined Sexes	Log Weight = -4.55 + Log Length * 2.84	33	0.87
Arctic Grayling	M	Log Weight = -4.54 + Log Length * 2.84	23	0.88
	F	Log Weight = -5.40 + Log Length * 3.19	21	0.73
	Combined Sexes	Log Weight = -4.96 + Log Length * 3.01	44	0.80

[1] Weight equals length^3

[2] Weight exceeds length^3

3.2.2 Sex and Maturity

The mean age of maturity was 3.2 and 9.6 years for arctic grayling and lake trout. The sex ratio of the sampled fish was 0.59 females to 1 male for arctic grayling and 1.7 females to 1 male for lake trout. The weighted mean lengths for arctic grayling and lake trout from the angler catch are 278 and 525 millimeters. These lengths represent ages between 2 and 3 years for arctic grayling and greater than 8 years for lake trout. The mean weights for arctic grayling and lake trout are 269 and 1614 grams. These weights represent ages between 2 and 3 years for arctic grayling and greater than 9 years for lake trout.

4 DISCUSSION

4.1 Angler Catch, Harvest and Effort

While Whitehorse residents were the largest (34%) group of anglers interviewed, the effort is more evenly spread among the other origin groups than is typical of other Yukon lakes. The higher proportion of fishing effort expended on weekdays suggests that this lake is visited by people on holiday who stay and fish for several days as indicated by the high mean number (26.3) of angler hours per day

Statistics gathered from other harvest surveys on Yukon lakes of similar size are compared with the present study (Figures 5 & 6). The catch per rod hour for Aishihik Lake suggests that lake trout fishing is fairly good. The total number of rod hours fished and the estimated number of angler days are low when compared with

other lakes. However, the mean number of hours fished per day is significantly higher than the other lakes suggesting that anglers spend longer periods on the lake. Anglers who fish at the north end of the lake, likely make multi-day trips.

The Catch per Unit Effort (CUE) of 0.24 for arctic grayling taken from Aishihik Lake may be compared with 0.48, 0.08 and 0.09 for Little Atlin, Francis and Ethel Lakes which are of similar size. CUEs for six lakes surveyed by Horler (1989, Tables 3-9) ranged from 0.8 to 6.0 with a mean of 2.46. The CUEs for arctic grayling for Marsh, Tagish and Fox Lakes (Horler, 1983) were 1.9, 0.2 and 0.74 respectively suggesting that angling success is relatively low on Aishihik lake. Arctic grayling are likely caught in sheltered waters, by anglers who find weather conditions unsuitable for venturing out onto the lake in small boats.

4.2 Age and Growth

The age - frequency distributions seem to indicate that both the lake trout and arctic grayling populations are fairly stable and healthy. Most of the older age classes in both species are represented in the catch and none of the age classes is completely missing except for lake trout greater than 19 years of age. Male fish are not represented in 7 of the 14 age classes. With a sample size of only 33 fish, it is not unusual to see missing older age classes in lake trout. The mean length and weight of the catch is greater than the length and weight of lake trout at the age of first maturity.

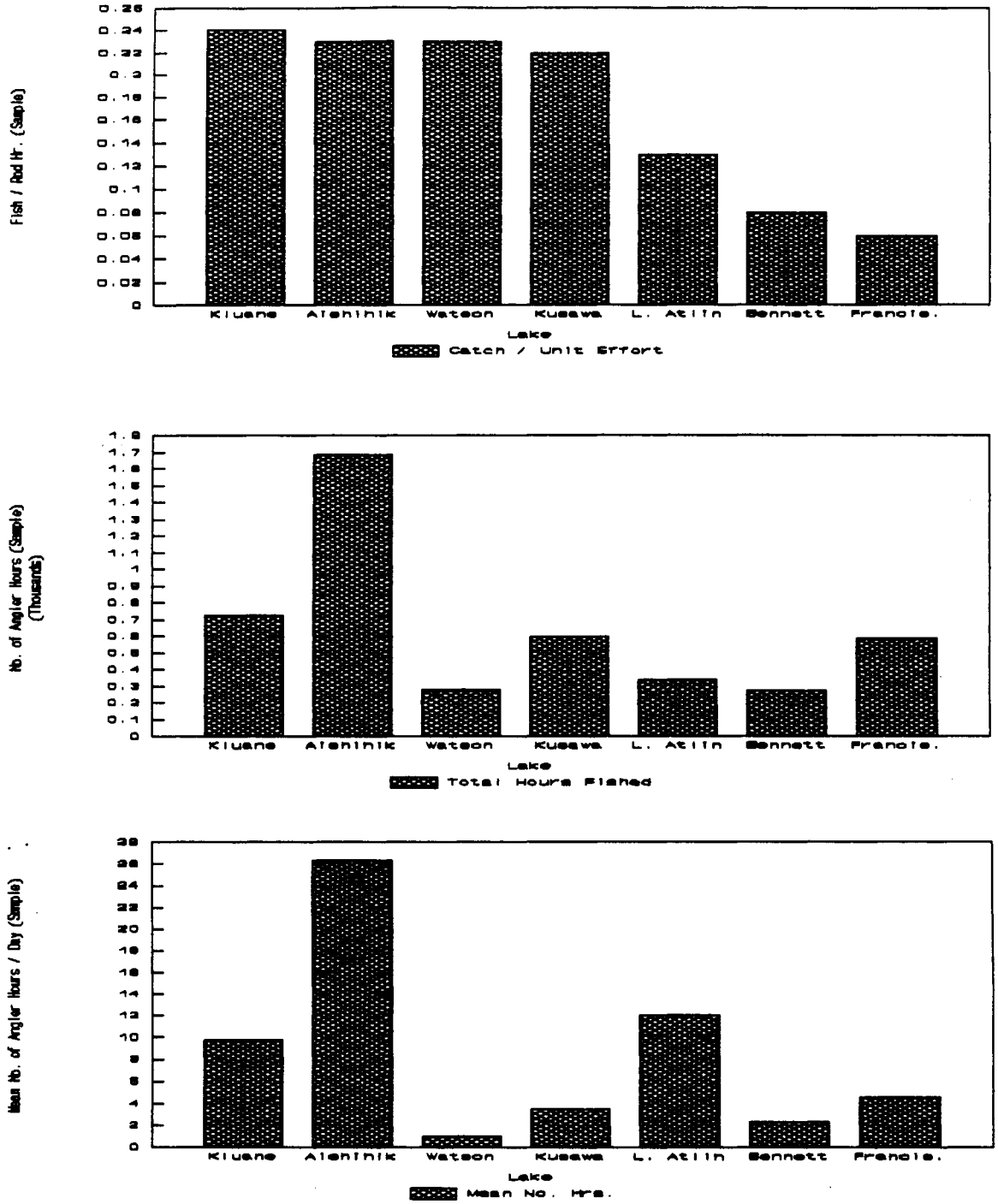

Figure 5 Comparison of Aishihik Lake Lake Trout Catch Effort Statistics to Several Areas within the Southern Yukon Territory (Data Taken From Angler Interviews)

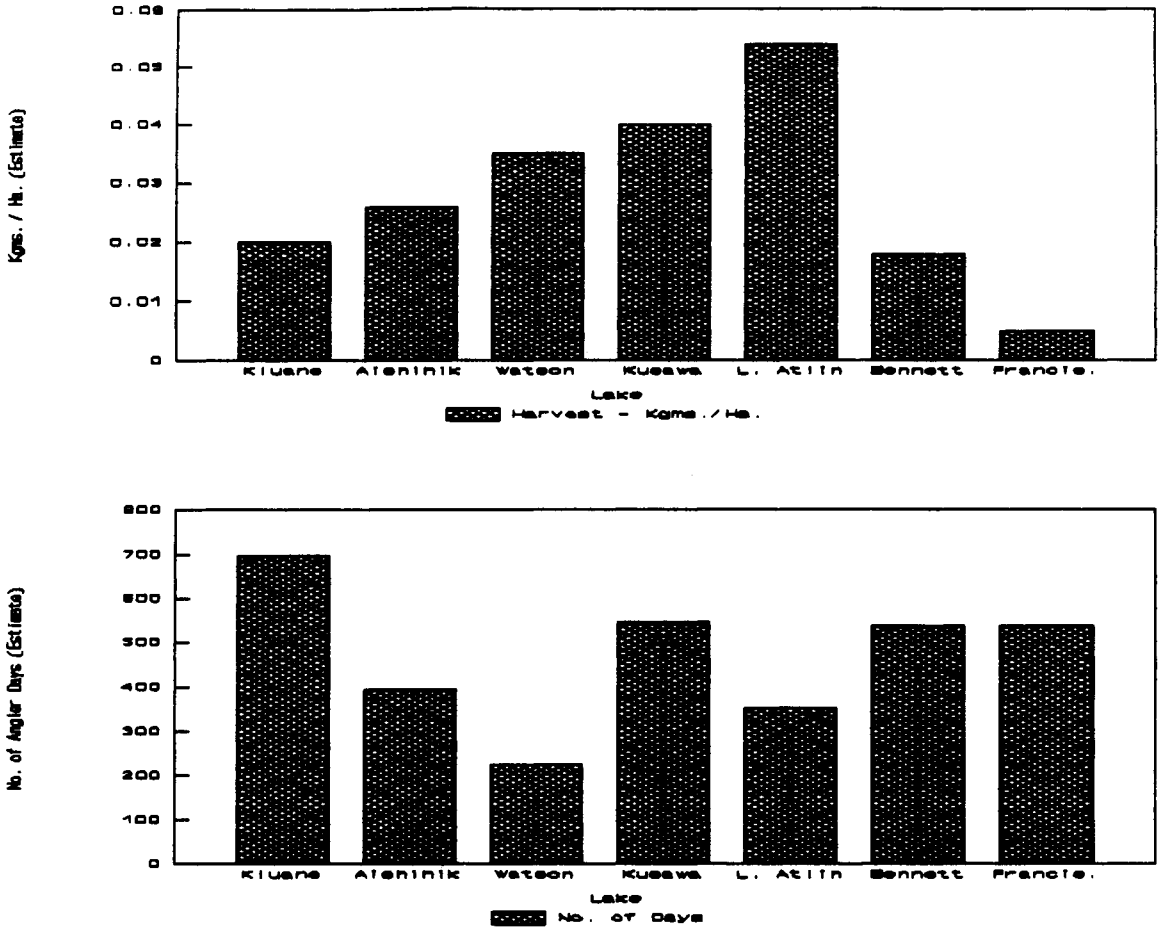

Figure 6 Comparison of Aishihik Lake Lake Trout Harvest and Angling Effort (Angler Days) Estimates to Several Areas within the Southern Yukon Territory.

For arctic grayling, 94% of the catch is occurring at or near the age of first maturity. Due to the small sample sizes, the data can only suggest that there is high fishing pressure on the river area downstream of the dam or that it is a rearing area for arctic grayling.

4.3 Yield

The estimated yields of lake trout and arctic grayling for Aishihik Lake during the summer of 1991 are 311 kilograms (C.L. 267 - 362) and 35 kilograms (C.L. 30 - 42).

The maximum sustained yield (MSY) estimate for all lake species for Aishihik Lake is 1.2 kgms. / ha (17,458 kgms.). A species specific MSY may be obtained using catch composition by weight data obtained from the lake index netting carried out during the same summer. The catch composition and allocation of the total MSY to lake trout is presented in the following table:

TABLE 8 Lake Trout Maximum Sustained Yield for Aishihik Lake

SPECIES	% COMPOSITION	MSY KILOGRAMS	MSY KILOGRAMS/ HECTARE
Lake Trout	30.6	5276	0.37
Other Species	69.4	12183	0.83

4.4 Management Implications

4.4.1 Sustained Yield

Using the MSY for lake trout of 5276 kilograms and the mean weight of angler caught lake trout during the harvest survey, the maximum sustained yield would be 2777 fish. O'Connor (1978) has suggested a figure of 15% of the MSY as optimum sustained yield (OSY) for a high quality sport fishery. The target OSY for Aishihik Lake would then be 791 kilograms (417 fish). Using this target to evaluate the level of harvest, the estimated harvest of 164 (311 kilograms) lake trout during the summer of 1991 indicates that fishing pressure is 39 percent of the optimum sustained yield.

4.4.2 Regulation

Horler (1985) determined a mean figure of 34 percent as the proportion (by weight) of the catch of all species made up by lake trout as determined from several southern Yukon lakes. The figure of 30.6 percent lake trout determined from the 1992 index netting program is quite close to Horler's mean value. Accordingly, a total of 417 fish reflects an optimum harvest level of 15% of the MSY as a management objective.

There appears to be two distinct fisheries on Aishihik Lake, one for lake trout and one for arctic grayling. Arctic grayling angling is primarily shore based and conducted on the both sides of the dam at the south end of the lake. Fishing for arctic grayling is likely an incidental recreational activity undertaken by people

using the territorial campground. The catch per unit effort figure of 0.24 for A. grayling is fair, relative to other lakes in the Yukon that have not been subject to development. Canyon Pond, situated approximately 1 kilometre downstream from the outlet of Aishihik, is known to be a significant spawning and rearing site for A. grayling (Walker and Brown, 1974).

High Quality Lake Mangement regulations were introduced on Aishihik Lake at the beginning of the season. These regulations require that fish whose lengths fall within the slot limit (65 - 100 cm. for lake trout, 40 - 48 cm. for arctic grayling) are required to be released unharmed to the lake. Though the sample sizes are small, the data indicate that there is a good compliance with the regulations for both species (92% for lake trout and 100% for arctic grayling) (Figure 4). The absence of large fish in the arctic grayling catch likely reflects their absence in the general population rather than their being caught and released.

Lake Trout is the target species for boat anglers visiting the lake. The lake's remote location and frequent high winds have been a factor in protecting the stock from over exploitation and there remains good quality fishing at present. The catch per unit effort is similar to other lakes in the Yukon where there is high quality fishing. While this survey does not indicate that fish stocks are being over harvested, a future survey or test netting program is recommended to evaluate trend data. Given the high fishing expertise of the low numbers of anglers frequenting Aishihik Lake, the present regulations are adequate for maintaining good quality fishing. Future harvest surveys should also assess the level of harvest of Arctic Grayling on the Aishihik river downstream of the Aishihik Lake control structure.

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APPENDIX 1

AISHIHIK LAKE CREEL CENSUS

DATA REPORT

CREEL PERIOD June 1 - Sept 2 / 1990

PERSONEL Lenaya Hume, Natalie Oles

METHODS

SAMPLE DESIGN

Stratified random sample

SAMPLE SELECTION

No. of days in creel period = N =		99
No. of days sampled = n	65	
Sampling effort =	66%	
No. of days in stratum 1 = (Weekend days)		25
No. of days sampled = n	10	
Sampling effort =	40%	
No. of days in stratum 2 = (Week days)		65
No. of days sampled = n	46	
Sampling effort =	71%	
No. of days in stratum 3 = (Long weekend days)		9
No. of days sampled = n	9	
Sampling effort =	100%	

RESULTS

EFFORT

ANGLER ORIGIN BY %

No. of Anglers	111
Yukon Resident	78%
Resident Canadian	9%
Non - Resident	13%

CATCH - EFFORT

SPECIES	TOTAL HRS. FISHED	MEAN HRS. FISHED / DAY	TOTAL NO. CAUGHT	CUE	TOTAL NO. RETAINED	HUE
A. Grayling	1534.00	23.97	372.00	0.24	96.00	0.06
(Stratum 1)	300.50	27.32	38.00	0.13	18.00	0.06
(Stratum 2)	972.00	21.13	250.00	0.26	65.00	0.07
(Stratum 3)	261.50	37.36	84.00	0.32	13.00	0.05
Lake Trout	1685.50	26.34	392.00	0.23	108.00	0.06
(Stratum 1)	300.50	27.32	123	0.41	19	0.06
(Stratum 2)	1123.50	24.42	220.00	0.20	44.00	0.04
(Stratum 3)	261.50	37.36	49.00	0.19	45.00	0.17
N. Pike	1600.00	25.00	172.00	0.11	42.00	0.03
(Stratum 1)	300.50	27.32	28	0.09	12	0.04
(Stratum 2)	1038.00	22.57	142.00	0.14	28.00	0.03
(Stratum 3)	261.50	37.36	2.00	0.01	2.00	0.01

ESTIMATES

TOTAL EFFORT

	EFFORT ESTIMATE (Angler Days)	NORMAL LIMITS + or -
Total	394.29	39.97
(Stratum 1)	168.25	
(Stratum 2)	209.3	
(Stratum 3)	16.74	

HARVEST

SPECIES	HARVEST ESTIMATE (No.of Fis	NORMAL LIMITS + OR -	HARVEST ESTIMATE (Wt.in kgms)	NORMAL LIMITS + OR -
Lake Trout	163.52	27.43284	310.688	52.12240
(Stratum 1)	43.25			
(Stratum 2)	62.4			
(Stratum 3)	57.87			
A. Grayling	132.65	51.5	35.179	13.6578
(Stratum 1)	41			
(Stratum 2)	91.65			
(Stratum 3)	16.74			
Northern Pike	69.51	40.73	21.432	12.55828
(Stratum 1)	27.25			
(Stratum 2)	39.65			
(Stratum 3)	2.61			

AREA OF LAKE 14500.00 HECTARES

HARVEST ESTIMATE	Lake Trout	0.0214 + or -	0.0036
	Arctic Grayling	0.0024 + or -	0.0009
	N. Pike	0.0015 + or -	0.0009

APPENDIX 2

TABLE 1 AISHIHIK LAKE LAKE TROUT CREEL BIOLOGICAL DATA

DATE	SAMPLE #	Fk. Length (mm.)	Weight (gms.)	Sex	Maturity	Age (Years)	Cond. Factor	Morph	Flesh	Stomach Contents
09-Jun-91	1	490	1400	1	3	9	1.19	1/3	3	1
09-Jun-91	2	520	1700	1	2	13	1.21	1/3	3	5
10-Jun-91	3	680	2600	1	3	16	0.83	1/3	2	5
10-Jun-91	4	510	1800	1	2	14	1.36	1/3	2	1
10-Jun-91	5	458	1000	1	3	9	1.04	1/3	2	1
13-Jun-91	10	572	2200	1	2	10	1.18	1/4	3	1
12-Jun-91	11	442		1	2	8	0.00	1/4	2	1
12-Jun-91	12	570		2	2		0.00	1/4	2	5
12-Jun-91	13	510		1	3	9	0.00	1/4	2	5
12-Jun-91	14	570		2	2	11	0.00	1/4	2	5
12-Jun-91	15	480		2	3	12	0.00	1/4	2	4
14-Jun-91	17	784	4600	2	2	17	0.95	1/4	2	5
15-Jun-91	18	394	700	2	3	10	1.14	1/4	2	5
20-Jun-91	19	416	750	2	3	7	1.04	1/4	2	4
20-Jun-91	20	316	300	1	1	7	0.95	1/4	2	1
25-Jun-91	21	436	900	1	2	10	1.09	1/4	2	5
26-Jun-91	22	514	1550	1	3	8	1.14	1/4	2	1
28-Jun-91	30	630	2050	2	2	18	0.82	1/4	2	5
29-Jun-91	31	410	900	2	1	6	1.31	1/4	2	1
29-Jun-91	32	600	2200	2	2	17	1.02	1/4	2	4
29-Jun-91	33	508	750	2	2	14	0.57	1/4	2	1
29-Jun-91	34	550	2200	1	2	10	1.32	1/4	2	5
29-Jun-91	35a	574	2350	2	2	10	1.24	1/4	2	5
29-Jun-91	35b	572	1700	2	2	9	0.91	1/4	2	5
29-Jun-91	36	538	1700	2	2	8	1.09	1/4	2	5
29-Jun-91	37	508	1400	2	3	10	1.07	1/4	2	5
29-Jun-91	38	540	1950	1	3	10	1.24	1/4	2	5
29-Jun-91	39	494	1350	2	3		1.12	1/4	2	5
29-Jun-91	40	434	800	2	3		0.98	1/4	2	5
30-Jun-91	41	414	750			8	1.06	1/3	2	1
30-Jun-91	42	500	1500	2	2	15	1.20	1/4	2	4
30-Jun-91	43	470	1400	2	2	18	1.35	1/4	2	1
30-Jun-91	44	390	600	2	1	6	1.01	1/4	2	1
30-Jun-91	45	694	3650			13	1.09			1
01-Jul-91	46	926	10000				1.26	1/3		
01-Jul-91	47	456	1150	2	1	14	1.21	1/4	2	1
01-Jul-91	48	640	3250	1	2		1.24	1/4	2	5
01-Jul-91	49	620	2300	2	2		0.97	1/4	2	5
01-Jul-91	50	552	1750	2	3		1.04	1/4	2	1
01-Jul-91	51	618	2350	1	2		1.00	1/4	2	5
07-Jul-91	52	518	800	2	2	19	0.58	1/4	2	1
17-Jul-91	53	574	1900	2	2	16	1.00	1/4	2	5
17-Jul-91	54	574	1950	2	2	12	1.03	1/4	2	1
Total		22966	72200			447				
Mean		534	1900			11	1.25			
S.D.		109	1611			4				
Var.		11900	2596622			14				

Codes

Sex	Maturity	Morph	Flesh	Stomach Contents
Male - 1	Imm. - 1	White Belly - 1	White - 1	Invert. - 1
Female - 2	Mat. - 2	Orange Belly - 2	Orange - 2	Fish - 2
Unknown - 3	Unknown - 3	Green Back - 3	Yellow - 3	Snails - 3
		Black Back - 4		Unknown - 4
				Empty - 5

TABLE 2 AISHIHIK LAKE ARCTIC GRAYLING CREEL BIOLOGICAL DATA

DATE	SAMPLE #	Fk. Length (mm.)	Weight (gms.)	Sex	Maturity	Age (Years)	Cond. Factor	Morph	Flesh	Stomach Contents
09-Jun-91	1	360	470	1	3	4	1.01	4	1	4
10-Jun-91	2	270	500	2	3	5	2.54	4	1	5
13-Jun-91	3	255	200	2	3	3	1.21	4	1	5
13-Jun-91	4	230	175	1	3	2	1.44	4	1	5
13-Jun-91	5	315	250	2	3	4	0.80	4	1	5
13-Jun-91	6	232	100	2	3	2	0.80	4	1	5
13-Jun-91	7	245	200	1	3		1.36	4	1	5
13-Jun-91	8	280	300	1	3		1.37	4	1	5
14-Jun-91	9	260	200	2	1	3	1.14	4	1	4
14-Jun-91	10	276	250	1	3	3	1.19	4	1	4
14-Jun-91	11	246	200	1	3		1.34	4	1	4
14-Jun-91	12	240	200	2	1		1.45	4	1	4
14-Jun-91	13	280	350	2	1	3	1.59	4	1	4
14-Jun-91	14	288	300	2	3	3	1.26	4	1	4
14-Jun-91	15	378	600	1	2		1.11	4	1	4
14-Jun-91	16	222	100	2	3		0.91	4	1	4
14-Jun-91	17	234	100	2	3		0.78	4	1	4
14-Jun-91	18	272				3	0.00	4	1	
15-Jun-91	19	224	100	2	1	2	0.89	4	1	4
15-Jun-91	20	252	150	2	1	3	0.94	4	1	4
15-Jun-91	21	286	350	1	3	3	1.50	4	1	4
15-Jun-91	22	274	300	1	3	3	1.46	4	1	4
15-Jun-91	23	288	300	1	3	3	1.26	4	1	4
15-Jun-91	24	262	250	1	1	2	1.39	4	1	4
15-Jun-91	25	230	150	1	1	2	1.23	4	1	4
15-Jun-91	26	266	200	2	3	2	1.06	4	1	4
15-Jun-91	27	254	200	2	1	2	1.22	4	1	4
20-Jun-91	28	296	325	2	1	3	1.25	4	1	4
20-Jun-91	29	280	250	1	1		1.14	4	1	4
25-Jun-91	30	356	550	1	2	5	1.22	4	1	4
20-Jun-91	31	244	170	2	3	3	1.17	4	1	4
28-Jun-91	32	390	650	2	2	4	1.10	4	1	4
29-Jun-91	33	246	150	2	1	2	1.01	4	1	4
29-Jun-91	34	270	200	1	1	2	1.02	4	1	4
29-Jun-91	35	240	160	1	1	3	1.16	4	1	4
29-Jun-91	36	355	425	1	1	3	0.95	4	1	4
29-Jun-91	37	340	450	2	1	3	1.14	4	1	4
29-Jun-91	38	244	150	1	1	2	1.03	4	1	4
29-Jun-91	39	238	100	1	1	2	0.74	4	1	4
29-Jun-91	40	236	150	1	1	2	1.14	4	1	4
29-Jun-91	41	296	300	1	2	3	1.16	4	1	4
29-Jun-91	42	264	200	2	1	3	1.09	4	1	4
30-Jun-91	43	272	200	1	3	3	0.99	4	1	4
30-Jun-91	44	234	150	1	1	2	1.17	4	1	4
30-Jun-91	45	244	150	2	1	3	1.03	4	1	4
18-Aug-91	51	300	325	1	2	2	1.20	1	1	1
18-Aug-91	52	300	300	1	1	3	1.11	1	1	1
18-Aug-91	53	330	370	1	1	3	1.03	1	1	1
18-Aug-91	54	290	300	1	3	3	1.23	1	1	1
18-Aug-91	55	340	390	1	3	3	0.99	1	1	1
18-Aug-91	56	290	350	2	2	4	1.44	1	1	1
Total		14114.00	13260.00			123				
Mean		276.75	265.20			3	1.25			
S.D.		41.85	132.70			1				
Var.		1751.35	17609.14			1				

Codes

Sex	Maturity	Morph	Flesh	Stomach Contents
Male - 1	Imm. - 1	White Belly - 1	White - 1	Invert. - 1
Female - 2	Mat. - 2	Orange Belly - 2	Orange - 2	Fish - 2
Unknown - 3	Unknown - 3	Green Back - 3	Yellow - 3	Snails - 3
		Black Back - 4		Unknown - 4
				Empty - 5