OBSERVATIONS ON CUTTHROAT TROUT OF THE MOSQUITO LAKE SYSTEM QUEEN CHARLOTTE ISLANDS

By
A.D. de LEEUW

B.C. Ministry of Environment
Fisheries Branch
Smithers, B.C.

Skeena Fisheries Report # 57

March, 1987

TABLE OF CONTENTS

ABSTRACT

Resident juvenile and adult cutthroat trout (Oncorhynchus clarki) were sampled from February 1983 to July 1984 in Mosquito Lake and its tributaries on the Queen Charlotte Islands. Young of the year trout were found in two small (2—5 in width) tributary streams at average densities of 2.73 and 2.03/m^2 while in a larger (14 m width) stream the density was .36/m^2. Parr utilized these streams at .27, .43, and .05/m^2 respectively. Fry were generally found in shallow riffles, while parr utilized primarily pools. Fork length of lake fish averaged about 330 mm and ranged from 110 to 610 mm. Within streams trout lengths ranged from 20 to 145 mm. The most abundant age group in streams during the summer was 0+ (84%), followed by 1+ (13%), 2+ (2.5%) and some 3+ and 4+ (.5%). In the lake, age 5+ was the most numerous (30.7%) followed by 4+ (26.2%), 3+ (26.2%), 6+ (10.7%) and 2+ (6.2%). Of the 128 adult lake cutthroat sampled, 40% were males. Only 29% of all lake fish sampled were sexually mature, the majority of these were females. All fish in excess of 420 mm were mature females. Fecundity ranged from 617 to 742 for four females sampled. Results are discussed relative to other coastal cutthroat trout populations.

INTRODUCTION

Of the numerous fishing lakes on the Queen Charlotte Islands, Mosquito Lake is undoubtedly the best known. Situated among snow capped mountains, the lake provides excellent fishing during spring and early summer. Both local and an increasing number of off—island anglers participate in the fishery. From 1974 to 1983 angler success during an annual fishing derby ranged from .64 to 1.91 fish per day. The largest cutthroat entered in the derby weighed 2.75 kg.

Lake amenities include camping areas, boat launch, and ready access via well developed logging road. Increasing angler effort and salmon enhancement proposals for the area prompted the Ministry of Environment to collect baseline information on the Mosquito Lake cutthroat population. The objective of this study therefore was to describe Mosquito Lake cutthroat trout biology and distribution.

STUDY AREA

Located on northern Moresby Island of the Queen Charlotte Islands Mosquito Lake is part of the Pallant Creek system (Figure 1). A barrier falls on the outlet stream restricts the lake to non—anadromous species. Prior to introductions of both Coho Salmon (Oncorhynchus kisutch) and Steelhead trout (0. mykis) the lake was inhabited by resident cutthroat trout (0. clarki), kokanee (0. nerka), Dolly Varden char (Salvelinus malma), prickly sculpin (Cottus asper), three—spine stickle back (Gaster— ostius aculeatus) and unidentified lamprey (lampetra spp) species. Downstream of the barrier, Pallant Creek presently supports considerable numbers of pink (0. gorbuscha), chum (0. keta) and coho salmon in addition to steelhead and anadromous Dolly Varden char.

The lake is clear, has a surface area of approximately 635 hectares, a shoreline length of about 16 km, and is in excess of 65 m deep at its deepest point. Due to the steep sloped mountainous setting, littoral zones, are not abundant. Pallant Creek outflow stream temperatures range from .5 to 19°C, and annual discharge varies from .223 m^3/s to 126 m^3/s (Environment Canada, 1985). Mosquito Lake mid—summer T.D.S. (total dissolved solids) values are between 25 and 30 ppm, and the lake is regarded as oligotrophic. Additional information on the Pallant—Mosquito Lake system was reported by Caw (1978); de Leeuw (1984); Marshall et al. (1978); and Shephard (1978, 1982).

METHODS

Stream habitat was measured during intermediate and low flows after the method described by de Leeuw (1981). Sampling of fish in Mosquito Lake and its tributaries (Figure 1) was conducted from February, 1983 to June, 1984, using gillnets, baited traps, angling, weirs and electrofishing. In some cases data from fish collections made by other agencies were included in this study; these are cited in the report.

Juvenile densities in streams (No/m^2) were estimated by electrofishing using the 2 catch removal method (Seber and LeCren, 1967), where:

$$N = \frac{C1^2}{C1 - C2}$$

and where:

N = estimate of population in enclosed area
Cl = number of individuals in catch 1
C2 = number of individuals in catch 2

Fish were measured (fork length), in some cases weighed, scale samples taken and, where possible, maturity noted. Cutthroat ages were determined by scale interpretation (Narver and Withler, 1974). Scales were mounted on microscope slides and magnified fifty times. Scale radii and focus to annuli measurements were taken (mm) and the number of circuli counted. Fish lengths were back calculated according to scale measurements and weights estimated from length-weight formulae.

RESULTS AND DISCUSSION

DISTRIBUTION

Cutthroat trout were distributed throughout Mosquito Lake and its tributaries. Vertical distribution in Mosquito Lake was not investigated. Gillnets were more successful near the outlet and the Upper Pallant inlet (Appendix II) where littoral zones were pronounced (Figure 1). Angler catches of cutthroat were also noted to be higher in these areas. Dolly Varden char were rarely taken but were known to be abundant in the lake. In Marion Lake (near Squamish) cutthroat were found primarily near the surface during the summer, while Dolly Varden char utilized the deeper areas (Andrusak and Northcote, 1970).

Average densities of cutthroat fry in tributaries 1 and 2 during July were 2.and 2.03/m^2 respectively, whereas in the upper Pallant, a larger stream, density was only .36/m^2 (Table 1). Cutthroat parr were also found in greater numbers in smaller streams. Parr densities in tributaries 1 and 2 were .27 and .43/m^2 respectively, while in upper Pallant they were found at .05/m^2. In a small tributary to upper Pallant cutthroat parr density increased to .46/m^2 and fry density to

.65/m^2.

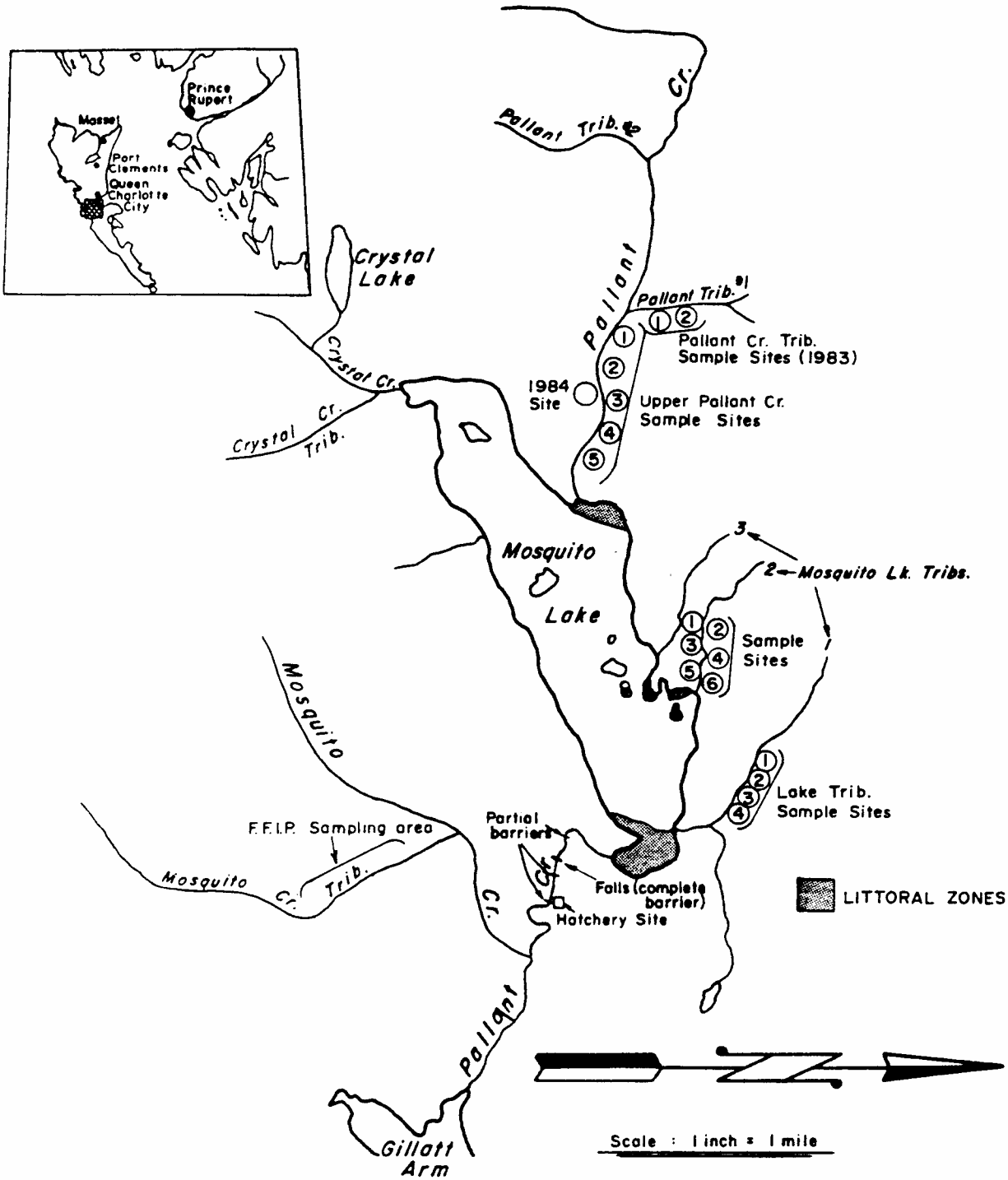

Fig. I PALLANT CREEK AND MOSQUITO LAKE SYSTEM

Increased density of juvenile cutthroat in the smaller secondary and tertiary tributaries was also observed in southwestern B.C. (Hartman and Gill, 1967). The largest fish electrofished from any lake tributary site was 142 mm, whereas the smallest lake—captured fish was 109 mm.

Within lake tributaries cutthroat fry were more numerous in shallow glides and riffles than in deeper pools (Figure 2). Although less apparent, the opposite was true for coho fry and cutthroat parr. The latter showed a preference for deeper stream areas. These observations corroborated results obtained in Bush and Holland creeks on southern Vancouver Island where, in the absence of competing species, older cutthroats predominated in pools (Glova, 1984). The overall within stream distribution therefore of Mosquito Lake tributary cutthroat was not markedly different from that documented for more southern coastal streams.

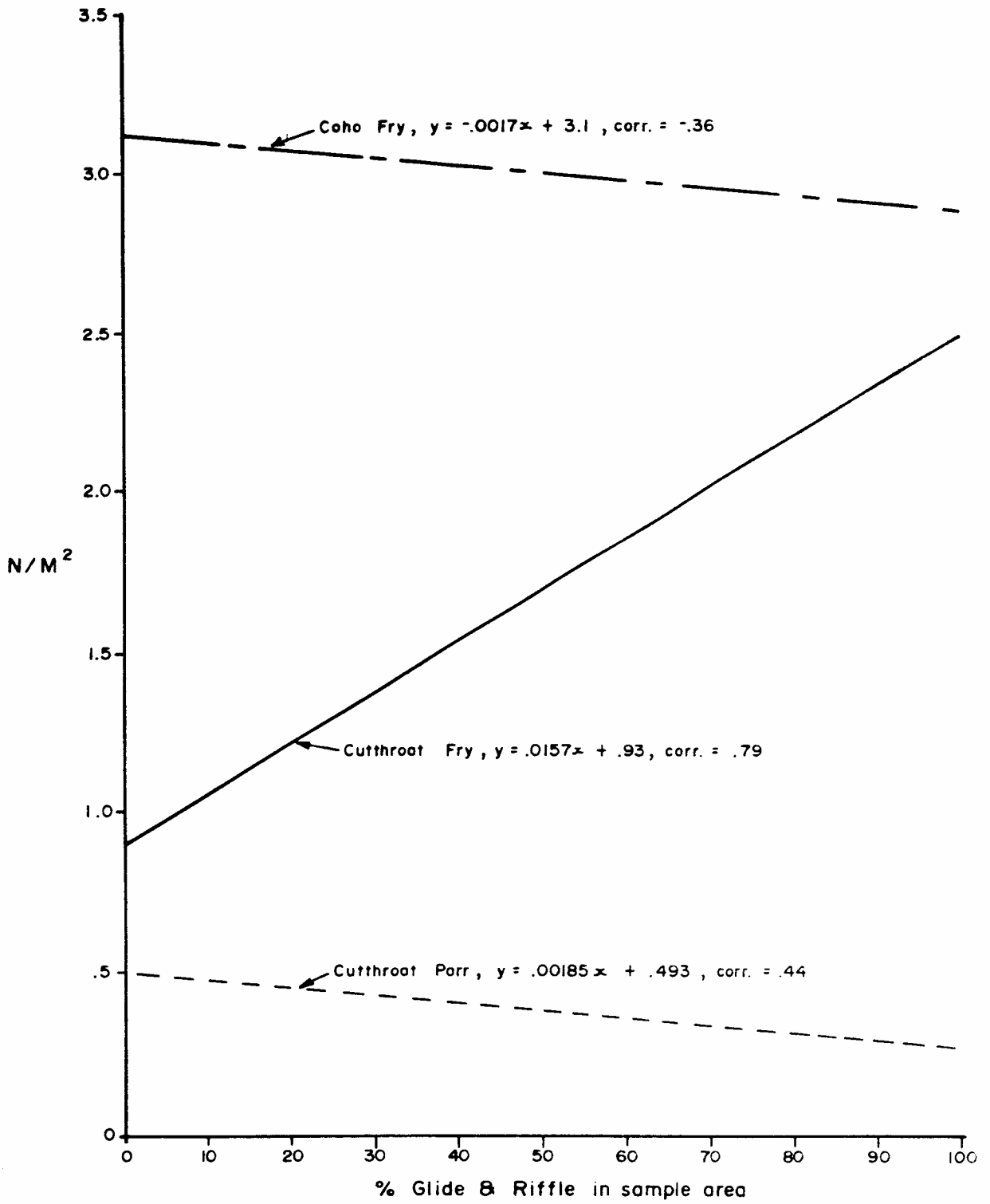

Fig. 2 Juvenile Cutthroat and Coho densities relative to % glide and riffle.

Table 1. Average densities of juvenile salmonids (n/m^2) electrofished from Mosquito Lake tributary streams in July, 1983.

Site	Channel Width (m)	Coho		Cutthroat		Dolly Varden		Rainbow	
		0+	Parr	0+	Parr	0+	Parr	0+	Parr
Upper Pallant	14.2	0.98	--	0.36	0.05	0.50	0.02	0.81	0.003
Upper Pallant trib	1.5	--	--	0.65	0.46	1.09	--	--	--
Mosquito Lake trib #1	2.4	2.80	--	2.72	0.27	--	--	--	--
Mosquito Lake trib #2	5.3	1.30	--	2.03	0.43	0.23	0.14	--	--

SIZE AND AGE

Gear type was size selective in the capture of Mosquito Lake cutthroats, with gillnets taking predominantly small fish. Larger fish were taken by angling (Figure 3 and Appendix II and III).

The average length of lake sampled fish was about 330 mm, and ranged from 110 to 610 mm. Within tributaries, excluding adult spawners, only small fish were captured, including an abundance of young of the year (0+) and progressively fewer 1, 2 and 3 year olds (Figure 3). This separation of age groups based on length frequently was not apparent in the lake sample.

Differences in length frequency grouping between stream and lake samples was possibly due to early emigration of larger parr from streams into the lake.

Scale radius and number of circuli were closely correlated with fork length, a fundamental assumption of fish growth and scale interpretation theory (Figures 4 & 5). Small fish had smaller scale radii and correspondingly fewer circuli per scale than did larger cutthroat.

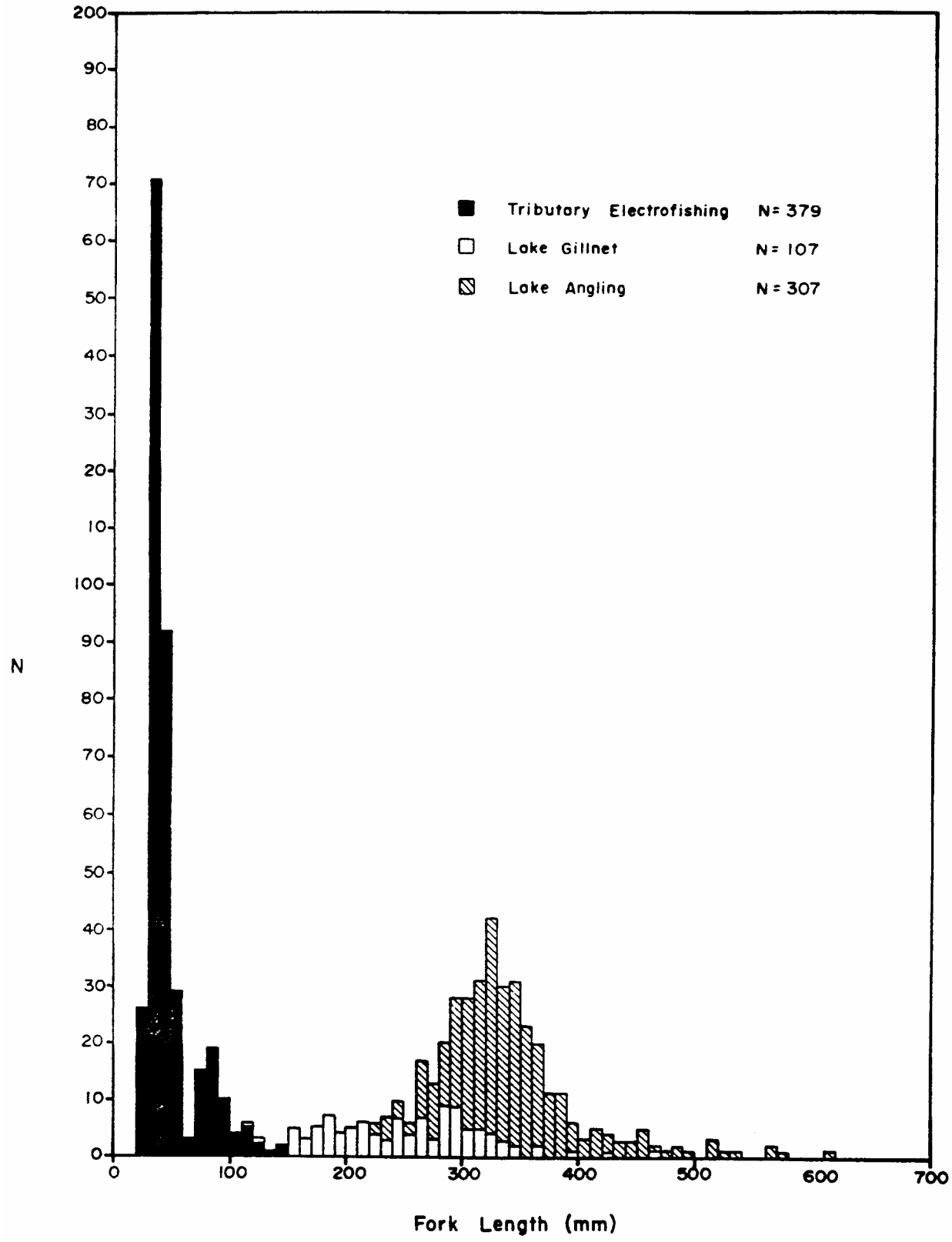

Fig. 3 Length Frequency Histogram of Cutthroat Trout Captured From Mosquito Lake and Tributaries , May — Aug.

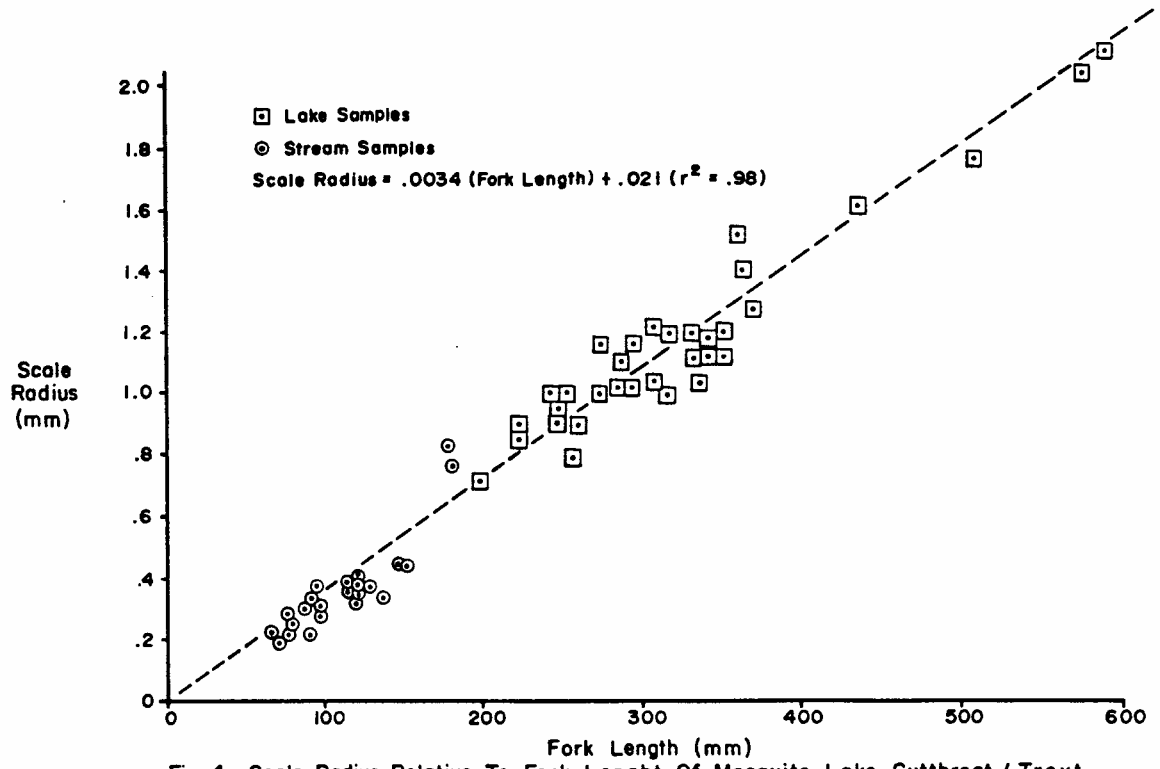

Fig. 4 Scale Radius Relative To Fork Lenght Of Mosquito Lake Cutthroat / Trout .
N = 56

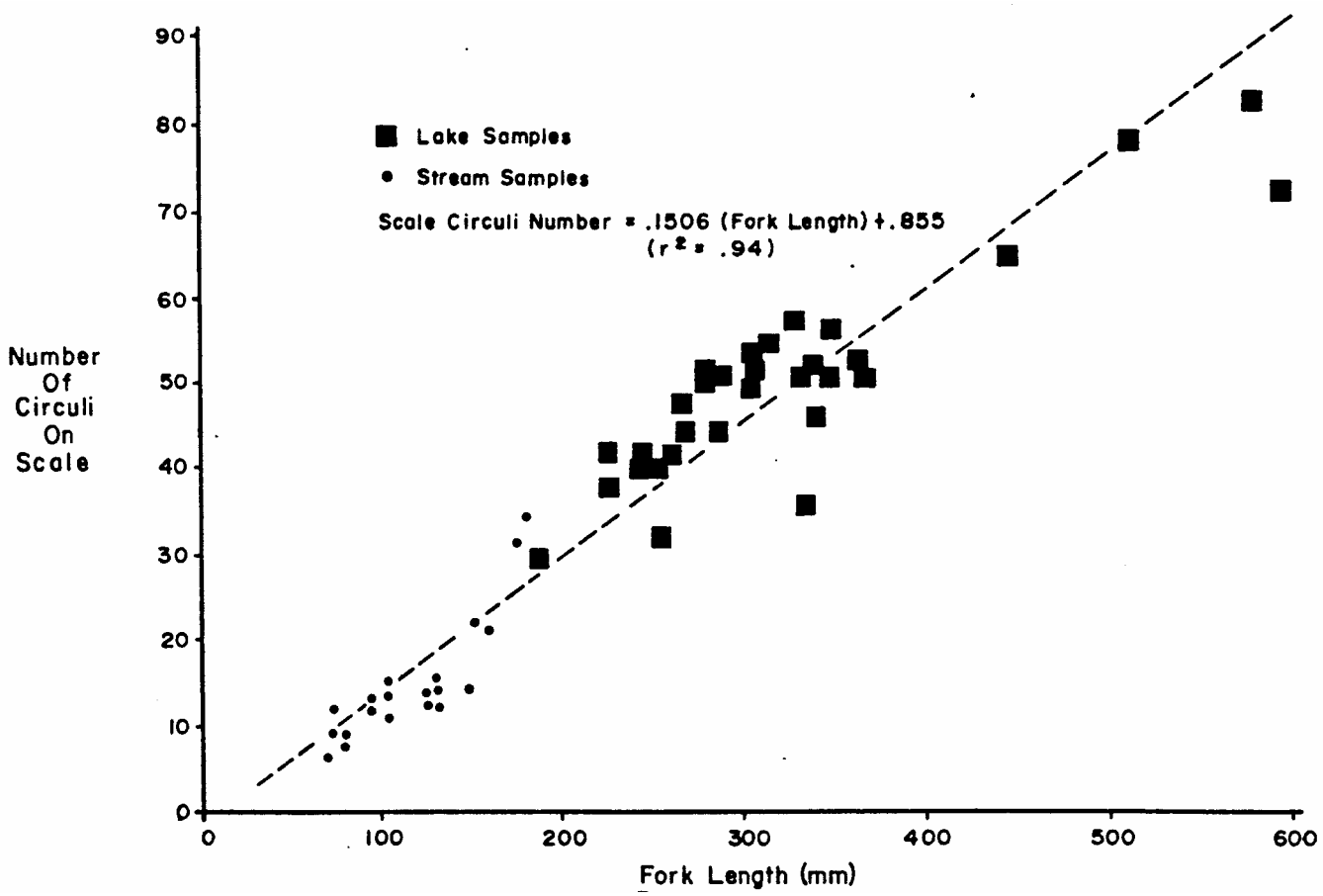

Fig. 5 Number of Scale Circuli Relative To Fork Length Of Mosquito Lake Cutthroat / trout.

In streams the cumulative number of circuli formed during the first 4 years was 6.2 (year 1), 12.8 (year 2), 19 (year 3) and 31.5 (year 4), while the corresponding values for scale radii were .16, .28, .44 and .76 mm respectively. Scales removed from lake fish revealed a slightly different pattern. Here the cumulative numbers of circuli layed down during 6 years were 8.4 (year 1), 19.5 (year 2), 28.6 (year 3), 41.9 (year 4), 51.2 (year 5) and 59 (year 6). The corresponding values for scale radii for these years were .21, .40, .65, .91, 1.16 and 1.50 mm respectively.

Clearly, within all age groups, the average size of lake fish was larger than stream inhabitants. Higher survival of larger stream emigrants or earlier migration into the lake by larger and/or faster growing individuals probably accounted for observed differences.

Seven cutthroat trout age groups were represented in the Mosquito Lake system. Repeat spawners were not detected, possibly a result of scale interpretation or sampling bias rather than an absence in the population.

Age specific lengths and weights of stream and lake cutthroat are shown in Table 3. Lengths of one year old lake fish in Table 3 and Figure 6 were back calculated from scale radii of older fish because the former were not captured in the lake.

Table 3. Back calculated age specific mean fork lengths (mm) and weight (g) of Mosquito Lake (N=65) and lake tributary (N=21) cutthroat trout sampled in early spring 1983.

	Lake				Tributary			
Age (Yrs)	F.L.	s.d.	WT.	s.d.	F.L.	s.d.	WT.	s.d.
0*					24	1	.1	.1—.2
1	56	15	2	1-4	47	9	1	1—2
2	112	24	15	7-26	87	11	7	5—10
3	185	41	68	32-124	120	9	19	15—23
4	265	50	164	86-278	220	3	114	110— 120
5	335	59	346	194-562				
6	435	79	757	414-1252				

* Lengths from Appendix IX

Fork lengths of Mosquito Lake tributary cutthroat back-calculated from scale radii were almost identical to trout from Chef Creek on Vancouver Island (Cooper, 1970). In the lake, growth was slightly greater than it was for the stream, and was comparable to cutthroat of Great Central Lake on Vancouver Island (Narver, 1975). Mosquito Lake cutthroat were slightly larger in the first two years than those of Great Central. The latter however were considerably larger at older ages (Table 4).

Table 4. Back—calculated fork length (mm) at annulus formation for some coastal cutthroat trout.

Location	Age 1	2	3	4	5	6	7	N
Mosquito Lk. Trib. QCI	46.8	86.9	120.3	220.3				21
Chef Cr. Vanc Island	48.2	83.2	114.0	133.5				
Mosquito Lk. QCI	55.6	111.5	185.0	261.5	335.0	435.0		65
Gr. Central Lk Van Is	44.6	93.8	205.0	319.0	404.0	464.0	428.0	240

In lake tributaries, young of the year were abundant in early June and averaged about 23.7 mm or .14 grams. In late July, these fish were about 39 mm and weighed .64 grams. One—year old stream cutthroat in early spring (from Table 3) were 46.8 mm, weighing 1.1 grams; in July (sampled) these fish averaged 84.2 mm and weighed 6.4 grams. Two—year old stream cutthroat in early spring (also from Table 3) averaged 86.9 mm or 7 grams, while in July these fish were 136.3 mm or 23.3 grams. Although only 3 three—year olds and no four—year old cutthroat were taken by electrofishing, these fish were sampled in early spring in baited fry traps. At this time, the average three—year old was 120.3 mm or 18.83 grams, while four—year olds averaged 220.3 mm or 114.4 grams (Table 5). These data supported the theory that larger tributary fish emigrate to the lake earlier. Other than spawning adults in April, no older cutthroat were taken from the tributaries.

In the lake, only 2 year—old and older cutthroat were sampled. Young of the year and one—year olds were absent from all lake catches regardless of the sampling method employed. Extensive fry trapping and beach seining in lake littoral zones resulted in minor numbers of two and three-year old cutthroat, while other small fish such as juvenile coho, kokanee and three spine stickleback were abundant in the catches. Angling and gillnets took the majority of older cutthroat.

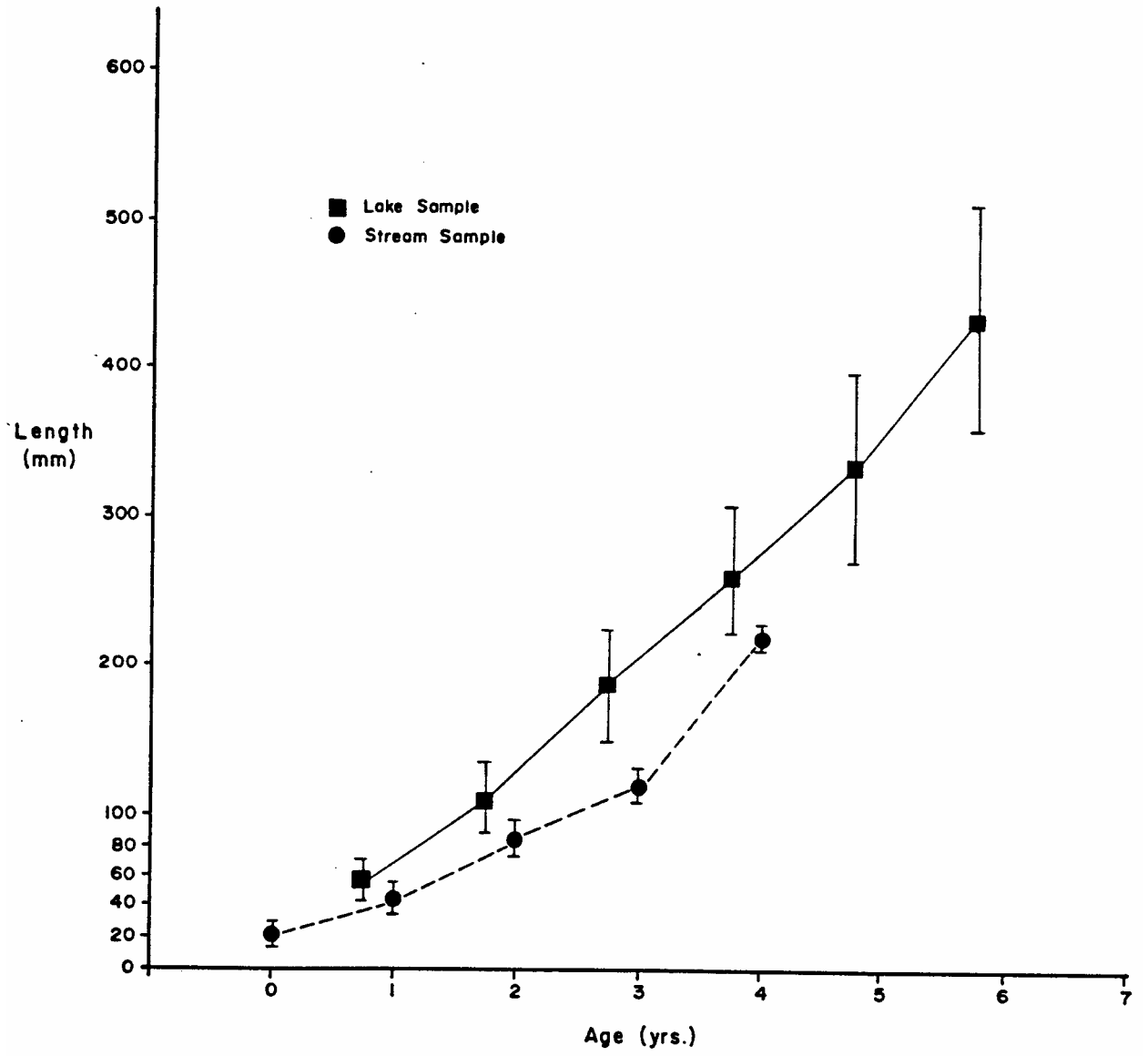

Fig. 6 Age Specific Lengths In Early Spring Of Mosquito Lake And Lake Tributary Cutthroat /Trout Calculated From Scale Radii.

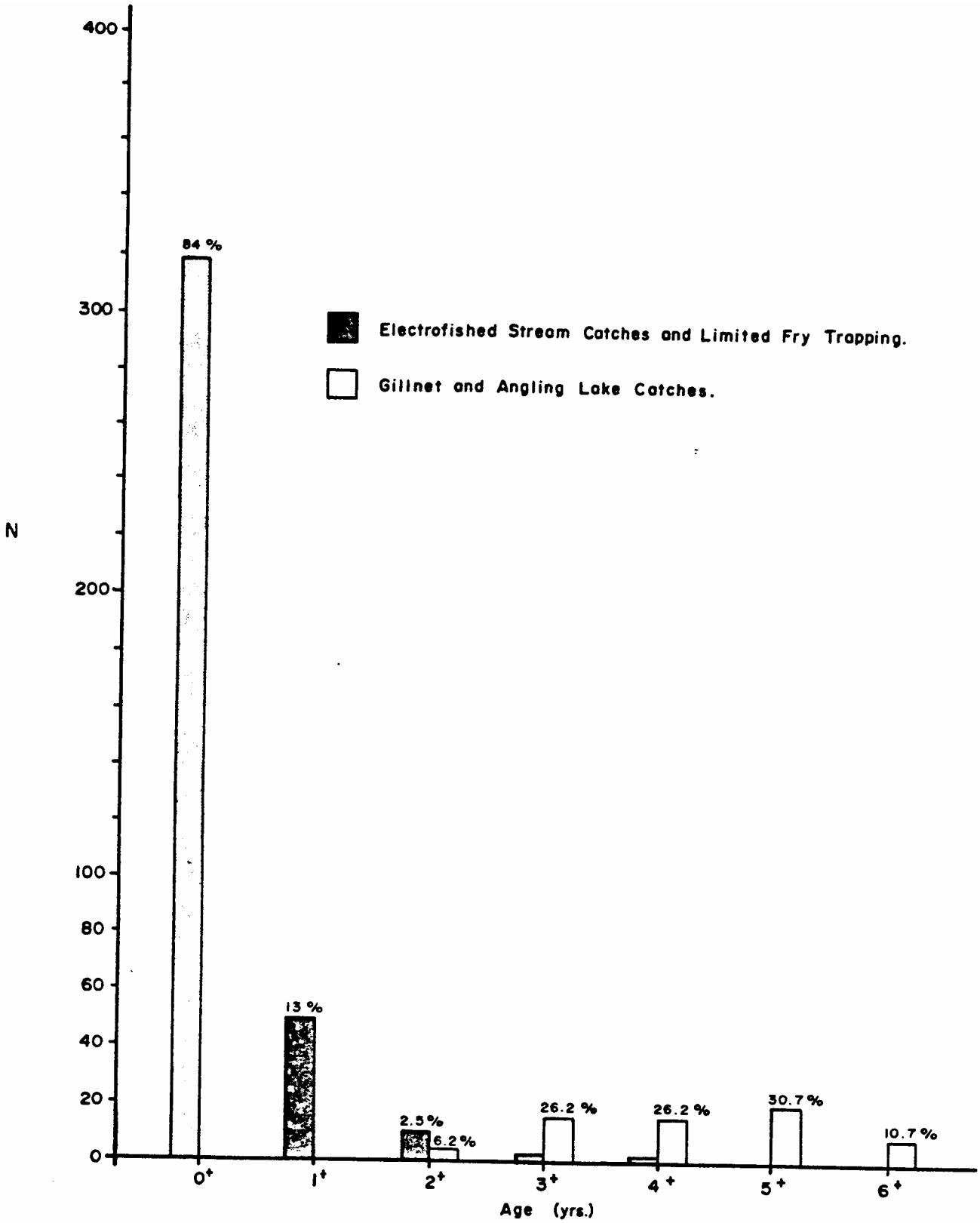

Fig.7 Age Frequency Distribution from Catches of Mosquito Lake and Lake Tributary Cutthroat / Trout

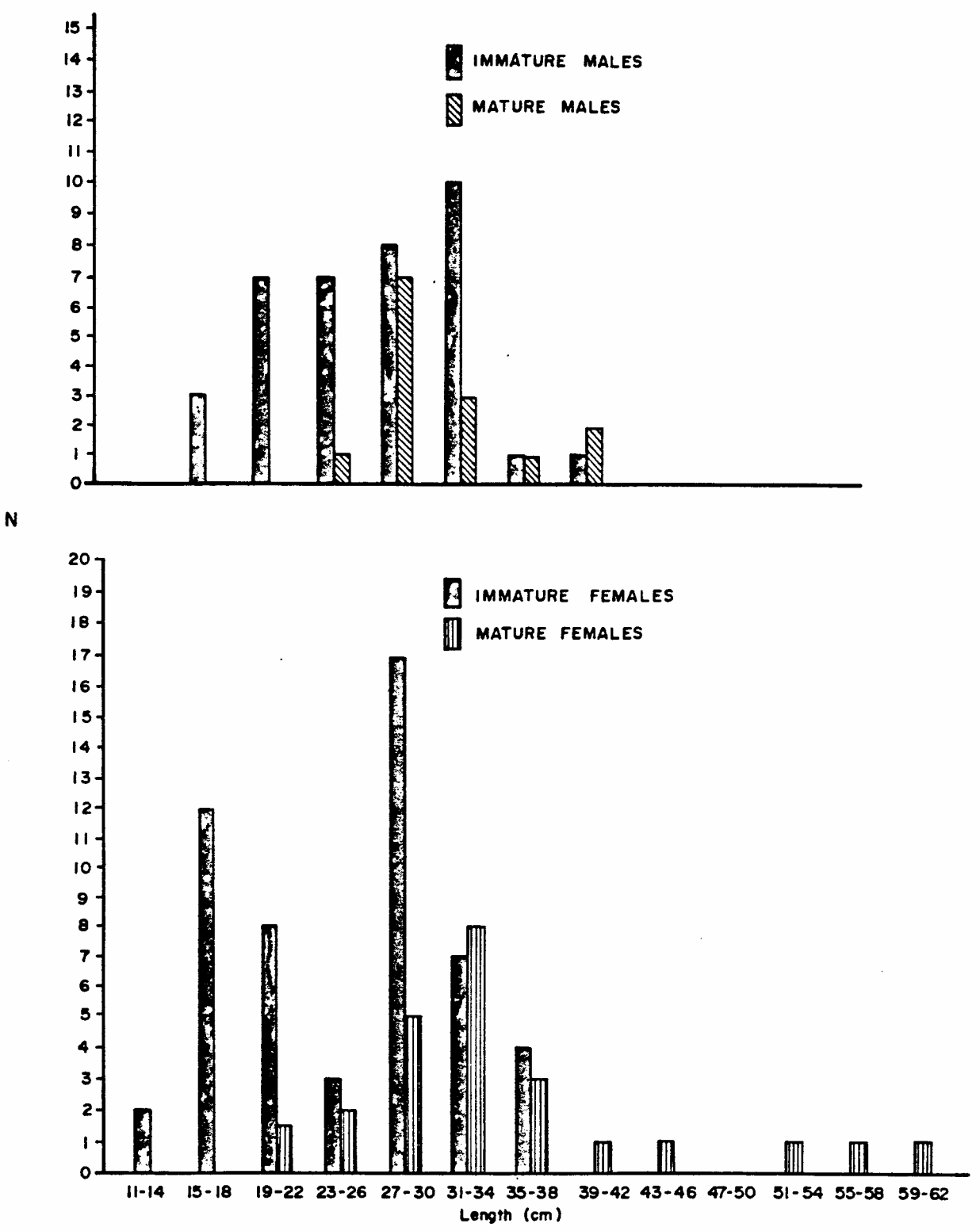

Fig.8 Sex and Maturity Relative to Fork Length of Mosquito Lake Cutthroat / Trout. N = 128

Table 5. Age specific average fork lengths (mm) and weights (g) of Mosquito Lake tributary cutthroat.

Age	Sample Date (1983)	Length	Weight*	N
0+	June 2	23.7	.14	10
	late July	39.0	.64	300
1+	April—May†	46.8	1.1	21
	July	84.2	6.4	49
2+	April—May†	86.9	7.0	16
	July	136.3	23.3	8
3+	April—May†	120.3	18.8	4
	July	141.7	30.4	3
4+	May	220.3	114.4	3

* Weights were estimated by using $wt(g) = 1.07 \times 10^{-5}(Lmm)^3$, calculated from date in the appendices.

† from Table 3.

The most abundant age group in the lake sample was 5+ (30.7%), followed by 4+ (26.2%), 3+ (26.2%), 6+ (10.7%) and 2+ (6.2%). Within the tributaries, young of the year comprised 84% of the total electofished catch, followed by 1+ (13%) and 2+ (2.5%) (Figure 7). The dominance of five year olds in the Mosquito Lake sample was not observed in Great Central Lake where four year olds were most prevalent (34.6%) (Narver, 1975).

SEX RATIO AND MATURITY

Of the 128 adult cutthroat sampled by angling in the lake, 51 (40%) were males. Females were dominant in the majority of size groups. This sex ratio was almost identical to the Great Central Lake populations (Narver, 1975). The smallest mature cutthroat sampled in Mosquito Lake was a 22 cm female, and all five cutthroat larger than 42 cm were mature females (Figure 8). The largest mature male was 42 cm. Only 37 (23 females, 14 males) or 29% of the 128 cutthroat sampled were mature.

Among four mature females sampled (35.6 — 37.5 cm) fecundity averaged 705. Total population egg production by size interval was estimated using a length—fecundity relationship developed from a pooled sample of Queen Charlotte Islands cutthroat (Table 7). Largest estimated egg production was attributable to fish in the 31—34 cm range (21.5%). Although the estimated individual fecundity of these fish was relatively low (i.e. 612/$^{+}_{0}$), the number of mature fish of this size within the sampled population was highest (53%).

Table 7. Estimated percent and total egg production of sampled Mosquito Lake cutthroat.

		Females			Eggs		
Length Interval (cm)	Total Sample	N	% Mature	Eggs/Female[1]	Tot	%	Cumulative Total %
11—14	2	2	0	0	0	0	0
15—18	15	12	0	0	0	0	0
19—22	16	9	11	153	153	.7	.7
23—26	13	5	40	261	522	2.3	3.0
27—30	37	22	23	412	2060	9.1	12.1
31—34	28	15	53	612	4896	21.5	33.6
35—38	10	7	43	867	2601	11.4	45.0
39—42	4	1	100	1185	1185	5.2	50.2
43—46	1	1	100	1572	1572	6.9	57.1
47-50	0	0	N/A	N/A	N/A	N/A	57.1
51—54	1	1	100	2582	2582	11.4	68.5
55—58	1	1	100	3201	3201	14.1	82.6
59—62	1	1	100	3952	3952	17.4	100
				Total	22,724	100	

1 Number of eggs/female calculated by N=1.7 (wt. g)—.93 obtained from a larger sample of Q.C.I. cutthroat.

Peak spawning of Mosquito Lake cutthroat appeared to occur in late April and early May. The earliest record of a fish in post—spawning condition was April 12. On this date also, 2 mature fish were taken in an upstream fence on lake tributary #2. Fish were observed spawning in lake tributaries as late as May 9 (Appendix IV). Throughout April and May, emigrating post—spawners were captured at the lake tributary #2 fence site. This fence was usually inoperable during freshet conditions, when earlier migrating spawners may have passed undetected.

MANAGEMENT RECOMMENDATIONS

Cutthroat trout management strategies relative to salmonid enhancement activities in the Pallant/Mosquito Lake drainage were discussed in de Leeuw, 1984. At the time of sampling, the cutthroat population was considered healthy and able to sustain the limited fishery. Monitoring of the trout population and fishery should be continued, however. This could best be accomplished through the annual fishing derby sponsored by the Sandspit Rod and Gun Club. Should success rates and size of fish decline substantially from presently reported values (1983—84), it is recommended that a minimum size restriction of 35 cm be imposed. At this length, 50% or more of all females were mature, and about 66% of the total angler sampled population would be conserved.

SUMMARY

1. Cutthroat trout were distributed throughout Mosquito Lake and its tributaries. In the lake, these fish ranged from about 200 to 610 mm fork length, whereas in the tributaries, sampled cutthroat ranged from about 20 to 150 mm. The lake also contains native populations of Dolly Varden char, kokanee, sculpin, lamprey and introduced coho salmon and steelhead trout.

2. Cutthroat fry densities were highest in the smaller tributaries at somewhat greater than 2 fry per m^2 while parr densities in these creeks were about .3 per m^2. Young of the year cutthroat were generally found in shallow riffles, whereas older cutthroat were found in pools.

3. Seven cutthroat trout age classes were represented in Mosquito Lake and its tributaries. In the lake, only 2—year old or older cutthroat were found. In the tributaries, all fish were immature juveniles ranging from young of the year to 4—year olds.

4. During the summer, the most dominant age of cutthroat in streams was young of the year. In Mosquito Lake, however, the dominant age was 5—year olds (30.7%) at an average length of 335 mm, weighing 346 grams.

5. Of the 128 cutthroat sampled for sexual maturity, only 51 or 40% were males, while only 37 or 29% of the total population sampled were mature. All fish sampled larger than 42 cm were mature females. Repeat spawners, although likely present, were not detected.

6. Fecundity ranged from 617 to 742 for four females sampled.

ACKNOWLEDGEMENTS

Initial cutthroat distribution data in Mosquito Lake and its tributaries were obtained by the Queen Charlotte Islands Chapter of the B.C. Steelhead Society, funded by the Salmonid Enhancement Program and the New Economic Expansion Program. The latter was most ably supervised and administered by F. Ferland of the Steelhead Society. Student assistance in eloctrofishing was made available by G. Taccogna, S.E.P. community advisor, through the Vancouver Sun's "Save the Salmon" program and was greatly appreciated. Continued sampling was accomplished by Ron Tetreau, George Schultze and Sig Hatlevik of the Fish and Wildlife Branch. The Sandspit Rod and Gun Club kindly provided additional Mosquito Lake cutthroat information. Finally without the help and support of the Pallant Creek hatchery staff, this project would not have been possible.

Editorial comments of the various drafts were provided by Bob Hooton, also of the Fish and Wildlife Branch. This report was typed by Betty Lockhart and Eileen Bouvier and the figures were drafted by Rob Layfield.

REFERENCES

Andrusak, H. and T.G. Nôrthcote. 1970. Management implications of spatial distribution and feeding ecology for cutthroat trout and Dolly Varden in coastal British Columbia lakes. Fisheries management publ. no. 13, B.C. Fish and Wildlife Branch. 14 pp.

Caw, G. 1978. An inventory of tributaries to the Copper and Pallant drainages, Moresby Island, Q.C.I. Stream inventory report, Fish and Wildlife Branch, Victoria, B.C. 78 pp.

Cooper, E.L. 1970. Growth of cutthroat trout (Salmo clarki) in Chef Creek, Vancouver Island, British Columbia. J. Fish. Res. Bd. Canada, 27(11) :2063—2070.

de Leeuw, A.D. 1981. A British Columbia stream habitat and fish population inventory system. p. 32—40. In: N.B. Armantrout (ed). Acquisition and utilization of aquatic habitat inventory information. Western Division American Fisheries Society.

de Leeuw, A.D. 1984. A fisheries management strategy for the Pallant Creek watershed, Queen Charlotte Islands. Skeena Fisheries Report 83—02, 31 pp. B.C. Ministry of Environment, Smithers, B.C.

Environment Canada, 1985. Historical, Stream flow Summary, British Columbia.

Glova, G.J. 1984. Management implications of the distribution and diet of sympatric populations of juvenile coho salmon and coastal cutthroat trout in small streams in British Columbia, Canada. Progressive Fish—Culturist 46(4) :269—227.

Hartman, G.F. and C.A. Gill. 1968. Distributions of Juvenile Steelhead and Cutthroat trout (Salmo gairdneri and S. clarki clarki) within streams in Southwestern British Columbia. J. Fish. Res. Board. Can. 25(l):33—48.

Marshall, D.E., R.F. Brown, G.A. Buxton, V.D. Chanley and D.G. Demontier. 1978. Preliminary catalogue of salmon streams and spawning escapements of Statistical Area 2E (Queen Charlotte Islands). Fisheries and Marine Service Data Report No. 72, 346 pp.

Narver, D.W. and F.D. Withler, 1974. Steelhead of the Nanaimo River; Aspects of their biology and the fishery from the three years of anglers' catches. Fisheries and Marine Services, Nanaimo, B.C. Cir. No. 99, 25 pp.

Narver, D.W. 1975. Notes on the ecology of cutthroat trout (Salmo clarki) in Great Central Lake, Vancouver Island, British Columbia. Fisheries and Marine Service, Technical report No. 567, 20 pp.

Seber, G.A.F. and E.D. LeCren. 1967. Estimating population parameters from catches large relative to the population. J. Anim. Ecol. 36:63 1—643.

Shepherd, B.G. 1978. Biological reconnaissance of the Mathers and Pallant Creeks to Dec., 1977. Fisheries and Marine Service Manuscript Rep. No. 1450.

Shepherd, B.G. 1982. Biological reconnaissance of Mathers and Pallant Creeks, Queen Charlotte Islands, December 1977 to December 1978. Canadian manuscript Report of Fisheries and Aquatic Sciences, No. 1648. 121 pp.

APPENDICES

APPENDIX I. Mosquito Lake tributaries electrofishing results, July 1983, catch 1 and 2 combined.

Coho				Cutthroat				Dolly Varden				Rainbow			
0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N
Upper Pallant Creek, site #1, Riffle, 30m^2, 12m long.															
60	1			30	1	73	1	31	1			39	1		
62	1			33	1	81	1	32	1			40	1		
63	1			35	1			36	1			42	1		
65	1			37	1			37	1			45	1		
66	1			39	1			38	1			48	2		
73	1			40	1			39	1			49	1		
81	1			42	1			40	1			50	3		
87	1			44	1			42	1			51	3		
												52	3		
												53	2		
												54	1		
												55	2		
												57	1		
												58	1		
												59	1		
												64	1		
Upper Pallant Creek, site #2, Riffle, 18m^2, 6m long.															
55	3			29	1			43	1			47	1		
56	1			33	1							52	1		
58	3			34	1							53	1		
59	1			35	3							54	1		
61	1			36	1							56	1		
62	1			37	1							59	1		
64	2			38	1										
65	2			39	1										
66	2			41	1										
67	1			42	1										
70	1			44	1										
71	1														
76	1														

APPENDIX I. continued. Mosquito Lake tributaries electrofishing

results, July 1983, catch 1 and 2 combined

Coho				Cutthroat				Dolly Varden				Rainbow			
0+		Parr		0+		Parr		0+		Parr		0+		Parr	
L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N
Upper Pallant Creek, site #3, Riffle, 76m^2, 19m long.															
53	1			26	2			29	1			41	2	88	1
54	1			27	2			32	2			45	1		
55	1			28	2			35	11			45	2		
56	2			30	4			36	6			48	2		
57	2			32	1			37	5			49	1		
58	1			34	3			39	10			50	1		
60	2			35	3			39	2			51	3		
61	2			37	4			40	7			52	3		
62	5			39	1			41	1			53	2		
63	1			40	1			42	7			54	2		
64	3			41	1			44	3			55	3		
65	2			42	1			47	1			56	6		
67	1							49	1			58	3		
68	3											60	5		
70	1											61	2		
												62	1		
												63	1		
Upper Pallant Creek, site #4, side pool, 84.5m^2, 13m long.															
55	1			32	1							47	1		
56	3			34	1							49	1		
57	1			35	2							52	1		
58	2			36	1							55	1		
59	3			38	1							56	1		
60	4			40	1										
61	3			41	1										
62	4			45	1										
63	1			48	1										
64	3														
65	7														
66	3														
67	2														
69	6														
70	1														
72	2														
73	1														
75	1														
81	1														

APPENDIX I. continued. Mosquito Lake tributaries electrofishing results, July 1983, catch 1 and 2 combined.

Coho				Cutthroat				Dolly Varden				Rainbow			
0+		Parr		0+		Parr		0+		Parr		0+		Parr	
L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N
Upper Pallant Creek, site #5, pool, 76 m^2, 15 m long.															
57	2	83	1	27	1	60	1	39	1	77	1	40	1		
60	1	87	1	35	1	77	1			80	2	45	1		
61	2	100	1	37	1	80	1			82	1	47	2		
63	2			38	1	82	1			127	1	49	3		
64	1			42	1	87	1					50	4		
65	2			45	1	88	1					51	4		
66	1					99	1					52	3		
67	3					100	1					53	1		
68	2					119	1					54	2		
69	1					135	1					55	3		
70	2											58	1		
72	1											add. 102 st.			
73	1														
74	1														
add. 46 coho															
Mosquito Lake trib #2, site #1, pool, glide, riffle sequence, 15.5m^2, 17m long.															
65	1			24	1	80	1	34	1	125	1				
69	1			26	1	88	1	39	1						
				27	1	90	1	42	1						
				28	1	92	1	43	1						
				29	2	121	1	44	3						
				30	3			48	1						
				31	1			49	1						
				33	1										
				34	2										
				35	4										
				36	4										
				37	5										
				38	2										
				39	6										
				40	1										
				42	1										
Mosquito Lake trib #2, site #2; pool, riffle, 5.0m^2, 5m long.															
64	2			31	1	102	1	39	1						
69	1			32	1	141	1	46	1						
				35	1			48	1						
				37	1										
				39	1										
				40	1										
				43	2										
				44	1										

APPENDIX I. continued. Mosquito Lake tributaries electrofishing results, July 1983, catch 1 and 2 combined.

Coho				Cutthroat				Dolly Varden				Rainbow			
0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N
Mosquito Lake trib #2, site #3, pool, riffle, 9.75 m^2, 8.5 m long.															
64	1			28	2	68	1	38	1	114	1				
65	1			29	1	86	1			87	1				
67	1			30	1	92	1								
68	1			31	4	106	1								
71	1			32	5										
73	1			33	2										
				34	3										
				35	1										
				37	1										
				38	1										
				39	1										
				40	1										
Mosquito Lake trib #2, site #4; pool, riffle, 10.25m^2, 5m long.															
58	1			26	1	78	2			79	1				
60	4			29	1	80	1			85	1				
62	2			30	3	82	1			87	1				
63	4			31	1	110	1								
64	1			33	2	115	1								
65	3			35	2	116	1								
66	1			36	1	142	1								
67	1			38	1										
68	3			40	4										
69	2														
70	2														
71	1														
72	1														
73	1														
75	1														
78	1														
81	1														
Mosquito Lake trib #2, site #5; glide, riffle 10.0 m^2, 8 m long.															
56	1			28	1	52	1	54	1	99	1				
58	3			30	1	71	1	63	1						
60	2			31	3	76	1	68	1						
61	2			32	4	88	1								
64	4			33	1										
65	1			34	3										
66	2			35	1										
67	1			37	1										

APPENDIX I. continued. Mosquito Lake tributaries electrofishing results, July 1983, catch 1 and 2 combined.

Coho				Cutthroat				Dolly Varden				Rainbow			
0+		Parr		0+		Parr		0+		Parr		0+		Parr	
L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N
Mosquito Lake trib #2, site #5; glide, riffle 10.0 m^2, 8 m long.															
69	1			38	1										
71	1			39	1										
74	2														
75	1														
76	1														
Mosquito Lake trib #2, site #6 glide, riffle, 10.75m^2, 11.5 m long.															
56	1			24	1	76	1								
57	1			26	1	78	1								
59	1			27	1	86	1								
60	1			28	2										
61	2			30	3										
63	1			31	3										
64	1			32	1										
67	2			33	2										
68	1			34	1										
70	1			35	2										
71	1			36	1										
72	1			37	1										
				38	1										
				39	2										
				42	1										
Mosquito Lake trib #1 site #1; glide, riffle, glide, 21.3m^2, 15.25m long.															
55	1			30	1	71	1								
57	1			31	2	77	1								
58	1			35	1	85	1								
59	1			36	3	86	1								
60	2			37	2	92	1								
61	2			38	3	96	1								
62	2			39	1	100	1								
63	1			40	2										
64	2			41	3										
65	1			42	2										
67	2			43	3										
68	5			44	4										
69	1			45	2										
70	4			46	1										
71	3			47	4										
72	3			48	5										
73	1			49	1										

APPENDIX I. continued. Mosquito Lake tributaries electrofishing results, July 1983, catch 1 and 2 combined.

Coho				Cutthroat				Dolly Varden				Rainbow			
0+		Parr		0+		Parr		0+		Parr		0+		Parr	
L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N	L(mm)	N
Mosquito Lake trib. #1, site #1; glide, riffle, glide, 21.3 m^2, 15.25 m long.															
74	2			50	3										
75	2			51	1										
76	3			54	1										
78	2			56	1										
79	1			57	1										
80	2			add. 6 cut											
81	1														
82	2														
83	2									1					
84	1									1					
85	1									1					
88	1														
add. 53 coho															
Mosquito Lake trib. #1 site #2; glide, riffle, 19.4m^2, 11m long.															
62	1			33	1	75	1								
69	1			34	1	83	1								
75	1			35	2	96	2								
76	3			36	2										
80	1			38	3										
81	1			39	2										
83	1			40	6										
				41	2										
				42	4										
				43	7										
				44	3										
				45	2										
				46	2										
				47	5										
				48	1										
				51	1										
				52	4										
				53	1										
				54	1										
				58	1										

APPENDIX I. continued. Mosquito Lake tributaries electrofishing results, July 1983, catch 1 and 2 combined.

Coho				Cutthroat				Dolly Varden				Rainbow			
0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N
Mosquito Lake trib. #1, site #3; riffle, glide, 21 m^2, 21 m long.															
70	1			30	1	75	2								
75	1			35	3	78	1								
77	1			37	1	83	1								
78	2			37	1	85	1								
79	1			39	2	93	1								
80	1			40	3	115	1								
86	1			41	1										
				43	3										
				44	2										
				45	7										
				46	6										
				47	2										
				48	4										
				49	1										
				50	3										
				51	2										
				53	2										
				54	2										
				55	2										
				58	1										
Mosquito Lake trib. #1 site #4; pool, 7.5m^2, 3m long.															
62	2			31	1	83	1								
63	1					91	1								
66	3														
70	7														
71	1														
72	2														
73	1														
74	3														
75	3														
76	2														
77	3														
78	2														
79	2														
80	3														
81	1														
82	1														
84	1														
85	2														

APPENDIX I. continued. Mosquito Lake tributaries electrofishing results, July 1983, catch 1 and 2 combined.

Coho				Cutthroat				Dolly Varden				Rainbow			
0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N	0+ L(mm)	N	Parr L(mm)	N
Upper Pallant Creek trib., site #1; glide, 7.2m^2, 9 m long.															
				22	1	65	1	35	1						
				30	1	72	1	39	1						
				31	1	86	1	40	1						
				35	1	88	1	41	1						
				36	1			42	1						
				38	1			43	1						
				43	1			44	2						
								48	1						
								50	2						
								51	1						
Upper Pallant trib., site #2; pool, glide, 5.5m^2, 8.5 m long.															
				35	1	79	1	35	1						
						127	1	40	1						
Upper Pallant Creek mainstem site, June 19, 1984: 2 riffles 2 glides, 487.6m^2, 65.5 m long.															
38	1			22	1	56	1	31	2	54	1			63	1
40	2			26	1	57	1	32	4	55	1			65	1
41	3			28	1	61	1	33	7	63	1			67	2

42	2		29	4	65	1	34	10	65	1		68	1
43	1				67	1	35	4	68	2		69	2
44	2				124	1	36	3	69	1		71	1
45	2						37	2	70	1		73	3
46	5						38	2	74	1		74	1
47	1						39	1	81	1		79	1
48	2						40	1	121	1		80	1
49	2								133	1			
50	1												
51	1												
52	2												
53	2												
54	3												
55	2												
56	5												
58	1												
59	4												
62	3												
63	1												
65	1												
66	3												

APPENDIX II Gillnet catches in Mosquito Lake

Date	Location	Species	Fork Length mm	Sex	Date	Location	Species	Fork Length mm	Sex
Apr 7/78	Outlet	ct	300	F	May 14/78	Outlet	ct	317	M
"	"	"	309	F	"	"	"	178	
"	"	"	271	F	"	S. Shore	ct	187	F
"	"	"	204		"	"	"	224	M
"	"	"	203		"	"	"	181	
"	"	"	188		"	"	"	237	F
Apr 8/78	Top End	ct	420	F(mat)	"	"	"	286	F
"	"	"	325	M	"	"	"	328	M
May6/78	Outlet	ct	201	M	"	"	"	290	F
"	"	"	160	F	"	"	"	306	M
"	"	"	153		"	"	"	310	F
"	"	"	171		"	"	"	287	F
May 7/78	Outlet	ct	299	F(spawned)	Jun 8/78	U. Pallant	ct	464	F
"	"	"	271	F(spawned)	"	"	"	397	M(spawned)
"	"	"	283	F(spawned)	"	"	"	299	F(spawned)
"	"	"	264	M	"	"	"	290	"
"	"	"	254	M	"	"	"	249	M
"	"	"	231	M	"	"	"	244	M
"	"	"	217	F	"	"	"	235	F
"	"	"	174	F	"	"	"	227	M
"	"	"	174	F	"	"	"	215	F
"	"	"	181	F	"	"	"	221	M
"	"	dv	256	F	"	"	"	215	M

"	"	ct	126	F	"	"	"	204	F
"	"	"	293	M	"	"	"	153	M
"	"	"	299	M	"	"	dv	189	F
"	"	"	282	F	"	Top End	ct	310	F(spawned)
"	"	"	217	F				289	F
"	"	"	191	F				278	M
"	"	"	164	M				284	F
"	"	dv	248	F				325	M
"	"	k	148	M				249	M
May 14/78	Outlet	ct	310	M				219	F
"	"	"	283	F				195	F
"	"	"	337	M				218	M

APPENDIX II continued, Gillnet catches in Mosquito Lake.

Date	Location	Species	Fork Length mm	Sex	Date	Location	Species	Fork Length mm	Sex
Jun 8/78	Top end	ct	173	F	Jun 8/84	Nr Outlet	Ct	335	
"	"	"	165	F	"	"	"	240	
"	"	"	187	M	"	"	"	282	
"	"	"	153	F	"	"	"	368	
"	"	"	159	F	"	"	"	362	
"	"	"	159	F	"	"	"	334	
"	"	"	182	F	"	"	"	191	
"	"	"	117	F	"	"	"	165	
"	"	k	161	M	"	"	"	172	
"	"	"	174	F	"	"	co	118	
"	"	dv	143		"	"	"	108	
Feb 9/83	"	ct	250		"	"	"	119	
"	"	"	295		"	"	"	115	
"	"	"	268		"	"	"	106	
"	"	"	302		"	"	"	108	
"	"	"	247		"	"	dv	132	
"	"	"	255		"	"	"	120	
"	"	"	240		"	"	"	175	
"	"	"	267		"	"	"	164	
"	"	"	240		Jul 18/84	cent. north	ct	263	

"	"	"	225
"	"	"	188
"	"	co	107
"	"	"	108
"	"	dv	234
"	"	"	275
"	"	"	313
"	"	"	207
"	"	"	278
"	"	cottis	154
"	"	"	183
Jun 18/84	nr outlet	ct	260
"	"	"	263
"	"	"	284
"	"	"	345
"	"	"	190
"	"	shore	
"	"	"	298
"	"	"	268
"	"	"	259
"	"	"	305
"	"	"	295
"	"	"	324
"	"	dv	219
"	"	"	243
"	"	"	234
"	"	"	255
"	"	"	283
"	"	"	267
"	"	"	305
"	"	"	307
"	"	"	
"	"	"	

APPENDIX III. Anglers' catches in Mosquito Lake.

Date	Species	Fork Length mm	Weight gr
Feb 27/83	ct	370	
"	"	370	
"	"	300	
"	"	300	
"	"	280	
Apr 12/83	"	510	1305
"	"	385	502
"	"	335	361
"	"	350	348
"	"	375	533
"	"	383	383
"	"	365	456
"	"	355	402
"	"	300	245
"	"	305	252
"	"	340	
"	"	350	
"	"	360	
Apr 12/84	ct	300	
"	"	455	
"	"	425	
"	"	350	
"	"	325	
"	"	360	
"	"	330	
"	"	300	
"	"	430	
"	"	335	
"	"	300	
"	"	360	
"	"	340	
"	"	335	
"	"	345	
"	"	320	
"	"	260	
"	"	305	

"	"	450		"	"	320	
"	"	335		"	"	265	
"	"	350		"	"	285	
"	"	335		"	"	350	
"	"	315		"	"	300	
"	"	375		"	"	330	
"	"	325		"	"	365	
"	"	370		"	"	335	
"	"	340		"	"	260	
Apr 12/84	"	300		"	"	300	
"	"	340		"	"	255	
"	"	305		"	"	375	
"	"	325		"	"	290	
"	"	440		Apr 13/84	ct	290	200
"	"	360		"	"	330	280
"	"	530		"	"	335	330
"	"	420		"	"	320	280
"	"	365		"	"	335	345
"	"	330		"	"	310	230

APPENDIX III, continued. Anglers' catches in Mosquito Lake.

Date	Species	Fork Length mm	Weight gr	Date	Species	Fork Length mm	Weight gr
Apr 13/84	ct	510	1430	May 19/84	ct	280	227
"	"	420	810	"	"	335	397
"	"	235	100	"	"	335	340
"	"	225	80	"	"	220	113
May 29/83	"	430	822	"	"	380	510
"	"	395	680	"	"	300	312
"	"	580	1984	"	"	265	198
"	"	415	709	"	"	300	--
"	"	355	425	"	"	290	227
"	"	370	482	"	"	320	340
"	"	320	340	"	"	320	312
"	"	365	482	"	"	480	992
"	"	345	482	"	"	340	369
"	"	310	283	"	"	390	482
"	"	310	283	"	"	370	539

"	"	340	369	"	"	470	1021
"	"	355	454	"	"	350	454
"	"	330	369	"	"	310	255
"	"	300	383	"	"	370	454
"	"	390	539	"	"	350	425
"	"	340	425	"	"	310	340
"	"	320	283	"	"	315	340
"	"	270	--	"	"	340	425
"	"	610	2749	"	"	320	340
"	"	330	425	"	"	310	255
"	"	520	1361	"	"	320	283
"	"	295	255	"	"	280	170
"	"	320	369	"	"	350	397
"	"	310	283	"	"	435	879
"	"	280	227	"	"	290	283
"	"	330	369	"	"	270	198
"	"	485	1134	"	"	310	--
"	"	310	340	"	"	310	283
"	"	320	340	"	"	310	283
"	"	330	312	"	"	280	255
"	"	314	312	"	"	340	340
"	"	400	652	"	"	320	283

APPENDIX III, continued. Anglers' catches in Mosquito Lake.

Date	Species	Fork Length mm	Weight gr	Date	Species	Fork Length mm	Weight gr
May 29/84	ct	320	283	Jun 10/84*	ct	457	879
"	"	315	312	"	"	302	255
"	"	320	312	"	"	291	227
"	"	320	283	"	"	338	354
"	"	310	255	"	"	351	397
"	"	280	227	"	"	395	566
"	"	340	369	"	"	291	227
"	"	320	283	"	"	324	312
"	"	240	170	"	"	359	425
"	"	300	227	"	"	231	113
"	"	340	425	"	"	342	369
"	"	320	255	"	"	367	454

"	"	290	255	"	"	467	936
Jun 10/84*	ct	313	283	"	"	359	425
"	"	324	312	"	"	297	241
"	"	264	170	"	"	411	638
"	"	303	255	"	"	291	227
"	"	351	397	"	"	291	227
"	"	324	312	"	"	342	369
"	"	324	312	"	"	337	354
"	"	367	454	"	"	278	198
"	"	291	227	"	"	339	354
"	"	401	595	"	"	278	198
"	"	367	454	"	"	319	298
"	"	359	425	"	"	324	312
"	"	510	1219	"	"	308	269
"	"	351	397	"	"	319	298
"	"	342	369	"	"	278	198
"	"	381	510	"	"	291	227
"	"	388	539	"	"	312	279
"	"	342	369	"	"	342	369
"	"	324	312	"	"	339	354
"	"	381	510	"	"	271	184
"	"	351	397	"	"	347	383
"	"	333	340	"	"	342	369
"	"	295	237	"	"	333	340
"	"	285	213	"	"	328	326

APPENDIX III, continued. Anglers' catches in Mosquito Lake.

Date	Species	Fork Length mm	Weight gr	Date	Species	Fork Length mm	Weight gr
Jun 10/84*	ct	342	369	Jun 10/84*	ct	271	184
"	"	359	425	"	"	363	439
"	"	346	382	"	dv	-	383
"	"	381	510	"	ct	248	141
"	"	359	425	"	"	264	170
"	"	297	241	"	"	291	227
"	"	303	255	"	"	324	312
"	"	405	610	"	"	347	383
"	"	381	510	"	"	308	269

"	"	557	1588	"	"	288	220
"	"	363	439	"	"	278	198
"	dv	-	234	"	"	313	283
"	ct	381	510	"	"	291	227
"	"	338	354	"	"	248	141
"	"	367	454	"	"	297	241
"	"	313	283	"	"	355	411
"	"	457	879	"	"	324	312
"	"	496	1120	"	"	313	283
"	"	381	510	"	"	278	198
"	"	347	383	"	"	264	170
"	"	328	326	"	"	239	126
"	"	326	319	"	"	447	822
"	"	363	439	"	"	231	113
"	"	363	439	"	"	353	404
"	"	411	638	"	"	365	447
"	"	411	638	"	"	274	190
"	"	340	362	"	"	326	319
"	"	386	531	"	"	282	206
"	"	573	1729	"	"	349	390
"	"	313	283	"	"	326	319
"	"	342	369	"	"	324	312
"	"	442	794	"	"	361	423
"	"	376	489	"	"	303	255
"	"	313	283	"	"	326	319
"	"	294	234	"	"	291	227
"	"	257	156	"	"	313	283
"	"	359	425	"	"	321	305

APPENDIX III, continued. Anglers' catches in Mosquito Lake.

Date	Species	Fork Length mm	Weight gr
Jun 10/84*	ct	264	170
"	"	344	376
"	"	372	475
"	"	261	163
"	"	333	340
"	"	410	634
"	"	331	333
"	"	385	524

* All fork lengths of fish for this date were calculated from weight by

$$\sqrt[3]{\frac{WT}{.92 \times 10^{5}}} = L$$

APEENDIX IV. Sex and maturity of some Mosquito Lake cutthroat.

Date	Methods-Location	Length cm	Weight gm	Sex	Maturity
Feb 27	Lake angling	37		M	
"	"	37		F	
"	"	30		F	
"	"	30		M	
"	"	28		M	
Mar 07	Lake angling	33		M	
"	"	30.5		F	
"	"	31.8		M	
"	"	33.7		F	
"	"	30.5		F	
"	"	31.1		M	
"	"	35.6		F	727 eggs
"	"	33.0		F	617 eggs
Apr 12	Lake angling	51.0	1305	F	spawned
"	"	38.5	502	F	spawned
"	"	33.5	361	M	immature
"	"	35.0	347.5	M	spawned
"	"	37.5	533	F	732 eggs
"	"	33.5	383	F	immature
"	"	36.5	456	F	immature
"	"	35.5	402	F	immature
"	"	30.0	245	M	mature
"	"	30.5	252	F	immature
Apr 12	Fence, trib #2	34.0		M	mature
"	"	31.0		F	mature
Apr 13	Lake angling	33.5	345	F	742 eggs
"	"	29.0	200	F	immature
"	"	33.0	280	F	immature
"	"	33.5	330	F	immature
"	"	32.0	280	F	immature
"	"	31.0	230	F	immature
"	"	51.0	1430	F	spawned
"	"	42.0	810	M	spawned
"	"	23.5	100	F	immature
"	"	22.5	80	M	mature
Apr 18	Fence, trib #2	26.4		F	spawned
"	"	32.5		F	spawned
"	"	27.8		M	mature
"	"	32.8		F	spawned
"	"	34.6		F	spawned
Apr 19	"	28.0		F	spawned

APPENDIX IV, continued. Sex and maturity of some Mosquito Lake cutthroat.

Date	Methods-Location	Length cm	Weight gm	Sex	Maturity
Apr 27	Lake angling	33.0	350	M	mature
"	"	27.0	210	M	spawned
"	"	29.5	240	M	spawned
"	"	32.8	350	M	spawned
"	"	24.5	150	M	immature
"	"	27.7	230	M	spawned
Apr 27	Lake angling	25.2	185	F	immature
"	"	22.5	122	F	immature
May 04	Fence, trib #2	28.0		M	
"	"	29.0		F	
May 09	"	25.0		F	spawning
"	"	34.0		F	spawning
"	"	28.0		M	spawning
"	"	28.0		M	spawning

APPENDIX V. Estimated juvenile salmonid densities (N/m^2) electrofished from Mosquito Lake tributaries, July 1983; June 19, 1984.

Location	Coho	Cutthroat	Dolly Varden	Rainbow

	0+	Parr	0+	Parr	0+	Parr	0+	Parr
Upper Pallant Creek; July 1983:								
Site 1	0.37		.33	.10	.33		1.03	
Site 2	1.22		.78		.06		.33	.013
Site 3	.49		.45		2.11		.71	
Site 4	1.66		.11	.13	.01	.08	1.92	.003
								(.006)
$\bar{X}$(S.D.)	.98		.36	.05	.50	.02	.81	
	(.54)		(.27)	(0.6)	(.90)	(.04)	(.72)	
Upper Pallant Creek trib; July 1983:								
Site 1			1.11	.56	1.81			
Site 2			.18	.36	.36			
$\bar{X}$(S.D.)			.65	.46	1.09			
			(.66)	(.14)	(1.03)			
Mosquito Lake Trib 1; July 1983:								
Site 1	4.98		2.44	.33				
Site 2	.52		2.94	.15				
Site 3	.38		2.52	.33				
Site 4	5.33		.13	.27				
$\bar{X}$(S.D.)	2.80		2.72	.27				
	(2.72)		(1.27)	(.08)				
Mosquito Lake Trib 2; July 1983:								
Site 1	.13		2.32	.32	.58	.06		
Site 2	.60		1.80	.40	.60			
Site 3	.62		2.46	.40	.10	.21		
Site 4	2.93		1.56	.78		.29		
Site 5	2.20		1.80	.40	.10	.30		
Site 6	1.30		2.23	.28				
$\bar{X}$(S.D.)	1.30		2.03	.43	.23	.14		
	(1.08)		(.36)	(.18)	(.28)	(.14)		
Upper Pallant Mainstem; June 19, 1984:								
	.26		.03	.03	.18	.06		.07
$\bar{X}$ Total:	1.69		1.30	.28	.35	.06	.81	.013

APPENDIX VI. Scale analysis of Mosquito Lake and Lake tributary cutthroat trout.

Location	Date	Fish Length mm	Year 1 R_1	C_2	Year 2 R	C	Year 3 R	C	Year 4 R	C	Year 5 R	C	Year 6 R	C	Total R	C
Study Trib.	Apr 26/83	93	.16	6	.36	15									.36	15
"	"	75	.16	6											.28	8
"	Apr 18/83	88	.20	7	.30	15									.30	15
"	Apr 19/83	120	.14	6	.26	12									.34	16
"	"	120	.24	6	.36	12									.40	15
"	"	115	.18	6	.32	13									.36	14
"	"	175	.20	7	.30	15	.46	18	.78	28					.84	32
"	"	145	.16	5	.32	12	.40	20							.44	22
"	"	120	.18	6	.36	14									.38	15
"	""	130	not	readable											.36	
"	"	140	.14	5	.30	13									.34	15
"	"	120	.18	7	.36	13									.36	13
Trib #2	"	78	.20	8											.26	9
"	"	72	.18	8											.24	9
"	"	150	.20	7	.38	18									.46	22
"	Apr 18/83	62	.18	6											.24	8
"	"	92	.14	5	.26	11									.26	11
"	"	68	.20	7											.26	9
"	"	90	.20	7	.30	11									.34	12
"	Apr 29/83	116	.18	5	.34	11									.36	13
"	"	93	.14	5	.24	8									.26	11
"	"	180	.16	6	.28	12	.44	19	.76	35					.76	35
$\bar{x}$			.18	6.2	.32	12.8	.43	19	.77	31.5						
S.D.			.03	.9	.04	2.3	.03	1.0	.01	4.9						
Var.			.001	.8	.002	4.9	.001	.7	-	12.3						
N			21	21	16	16	3		2	2						

APPENDIX VI. continued, Scale analysis of Mosquito Lake and Lake tributary cutthroat trout.

Location	Date	Fish Length mm	Year 1 R	C	Year 2 R	C	Year 3 R	C	Year 4 R	C	Year 5 R	C	Year 6 R	C	Total R	C
Mosquito Lake	May 29/83	610	.18	5	.36	11	.56	22	1.04	44	1.44	49	1.88	55	2.04	71
"	Apr 18/83	340	.12	5	.22	10	.44	19	.72	39	.96	51			1.12	54
"	"	350	.16	6	.34	16	.64	35	.92	50	1.06	55			1.14	58
"	"	360	.16		.32		.72		1.04		1.32				1.50	
"	"	440	.16	5	.28	11	.66	31	1.04	51	1.46	60			1.60	64
"	May 29/83	580	.16	5	.28	11	.72	28	1.04	44	1.70	67	1.96	76	2.10	82
"	Apr 13/83	335	.18	6	.26	11	.42	18	.58	25	.78	33	.96	34	1.02	36
"	"	350	.20	7	.32	15	.66	32	.96	40	1.10	52			1.20	52
"	"	510	.18	7	.40	15	.80	32	1.12	45	1.46	70	1.74	77	1.74	77
"	"	335	not	readable											1.16	
"	"	315	.18	5	.36	14	.82	39	1.20	56					1.20	56
"	Apr 27/83	328	not	readable											1.16	
"	"	245	.20	8	.44	19	.72	32	.92	42					.92	42
"	"	277	.14	6	.34	13	.48	20	.72	32					1.00	45
"	Apr 13/83	370	.18	8	.34	15	.62	30	.92	40	1.24	52			1.24	52
"	"	340	.14	5	.32	12	.64	26	.88	33	1.16	47			1.16	47
"	"	335	.20	7	.42	16	.60	29	.90	41	1.12	52			1.12	52
"	"	310	.18	7	.32	15	.64	32	.83	43					.98	50
"	"	290	.16	6	.34	14	.56	27	.86	42					.94	45
"	"	330	.22	6	.48	21	.82	41	1.04	53	1.20	59			1.20	59
"	Apr 29/83	295	.18	7	.34	15	.70	33	.96	46	1.16	52			1.16	52
"	"	301	.14	6	.30	14	.52	25	.84	44	1.04	53			1.09	53
"	"	252	not	readable											1.00	
"	Feb 9/84	285	.16	6	.30	13	.44	21	.84	41	1.10	52			1.10	52
"	"	302	.16	7	.44	22	.66	30	.80	39	1.04	49	1.24	55	1.24	55
"	"	247	.22	8	.24	12	.46	21	.72	32	.90	38			.94	42
"	"	255	.22	7	.44	16	.64	24	.78	32					.78	32

APPENDIX VI continued, Scale analysis of Mosquito Lake and Lake tributary cutthroat trout.

Location	Date	Fish Length mm	Year 1 R	C	Year 2 R	C	Year 3 R	C	Year 4 R	C	Year 5 R	C	Year 6 R	C	Total R	C
Mosquito Lake	Feb 9/84	255	.32	8	.48	23	.70	34	.90	42	1.44	49			.88	42
"	"	188	.20	6	.44	19	.72	30							.72	30
"	"	240	.22	8	.50	19	.80	32	1.00	41					1.00	41
"	"	267	.24	16	.84	35	1.04	48							1.16	48
"	"	224	.18	6	.44	20	.90	38							.90	38
"	Jun 8/83	282	.24		.44		.60		.84						1.04	
"	"	368	.24	7	.36	13	.64	25	1.04	41					1.36	53
"	"	260	.22	7	.50	21	.84	37							.94	42
"	"	263	.24	8	.48	17	.84	33	1.04	54					1.24	62
"	"	284	.28	9	.34	13	.54	23	.94	38	1.10	46			1.24	53
"	"	345	.12	5	.32	15	.44	20	.84	36	1.06	44	1.24		1.40	59
"	"	190	.24	8	.46	18	.64	25							.78	30
"	"	362	.24	8	.52	20	.88	35	1.12	47	1.24	56			1.40	64
"	"	334	.24	8	.48	20	.80	33	1.10	44					1.30	50
"	"	335	.28	11	.50	21	.84	38	1.06	46					1.14	52
"	"	240	.24	6	.36	13	.60	26	.72	33	.82	39			.86	42
"	Jun 10/83	305	.22	6	.42	17	.58	29	.88	47					1.08	57
"	"	350	.24	9	.44	19	.70	32	.92	45	1.12	45			1.22	59
"	"	168	.20	7	.32	14	.49	23							.56	28
"	Jun 19/84	172	.22	9	.42	18	.52	24							.56	27
"	"	193	.20		.44										.54	
"	"	109	.18	8	.36	16									.44	19
"	"	118	.12	6	.22	6	.22	11	.36	18					.44	21
"	"	130	.20	8	.34	16	.44	20	.44	20					.46	24
"	"	132	.20	6	.44	18									.52	22
"	"	142	.14	6	.36	14	.44	19							.52	22

APPENDIX VI. continued, Scale analysis of Mosquito Lake and Lake tributary cutthroat trout.

Location	Date	Fish Length mm	Year 1 R	1 C	Year 2 R	2 C	Year 3 R	3 C	Year 4 R	4 C	Year 5 R	5 C	Year 6 R	6 C	Total R	C
Mosquito Lake	Jun19/84	159	.30	10	.48	21	.56	27							.64	31
"	"	222	.20	7	.38	18	.58	30							.67	39
"	"	247	.20	12	.56	27	.82	40							.90	46
"	"	202	.24	6	.36	14	.42	22							.58	25
"	"	192	.22	8	.44	18	.64	28							.76	34
"	"	187	.28	8	.48	15	.66	24							.74	27
"	"	118	.22	8	.38	18									.44	20
"	May4/83	280	.24	9	.44	18	.70	31	1.00	48					1.10	53
"	"	290	.22	7	.44	17	.70	27	.84	35					1.04	42
"	Apr 12/83	510	.24	7	.46	18	.62	27	.82	36	1.24	53	1.50	63	1.62	72
"	"	380	.30	9	.50	21	.70	31	.94	42	1.20	54			1.36	60
"	Apr 20/83	243	.24	11	.40	17	.80	38							.96	46
"	Feb 9/84	250	.24	9	.56	23	.76	34	.90	40	1.10	49			1.18	53
"	"	295	.24	7	.44	15	.60	24	.84	34	1.00	43			1.10	46
-	"	268	.30	8	.54	19	.86	36	1.10	49					1.16	52
X			.21	8.4	.40	19.5	.65	28.6	.91	41.9	1.16	51.2	1.50	59		
S.D.			.05	9.1	.08	4.4	.14	6.1	.17	6.6	.20	8.1	.37	14.8		
Var.			.002	82.2	.007	612.8	.019	36.7	.027	42.7	.039	63.5	.120	188.9		
N.			65	60	65	62	61	56.0	45	43	27	26	7	7		

R_1 = Scale radius to end of winter anulus.

C_2 = Number of curculi to end of winter anulus.

APPENDIX VII. Estimated juvenile salmonid numbers electrofished from Mosquito Lake tributaries, July 1983: June 19, 1984.

Location	Coho		Cutthroat		Dolly Varden		Rainbow	
	0+	Parr	0+	Parr	0+	Parr	0+	Parr
Upper Pallant Creek; July 1983:								
Site 1	11		10	3	10		31	
Site 2	22		14		1		6	
Site 3	37		34		160		54	1
Site 4	140		11				5	
Site 5	88		8	10	1	6	144	
Mosquito Lake Tributary 1								
Site 1								
Site 2	106		52	7				
Site 3	10		57	3				
Site 4	8		53	7				
	40		1	2				
Mosquito Lake Tributary 2								
Site 1	2		36	5	9	1		
Site 2	3		9	2	3			
Site 3	6		24	4	1	2		
Site 4	30		16	8		3		
Site 5	22		18	4	1	3		
Site 6	14		23	3				
Upper Pallant Creek Tributary								
Site 1			0	4	13			
Site 2			1	2	2			
Upper Pallant Mainstem June, 1984								
	129	17	16		88	30		35

APPENDIX VIII. Habitat descriptions of electrofished Mosquito Lake tributary sites July 1983, June 1984

Site Location	Habitat Type	Habitat Area m^2	Cover m^2	Depth m. max.	Depth m. ave.
Upper Pallant, site 1	riffle	30.0	3.50	.3	.1
" " site 2	riffle	18.0	.25	.6	.3
" " site 3	riffle	76.0	.00	.3	.1
" " site 4	pool	84.0	22.50	.8	.3
" " site 5	pool	75.0	12.00	.5	.3
Mosquito Lake Trib 1, site 1*	G(20.13), R(1.13)	21.3	6.00	.40	.20
" " " site 2	G(10.4), R(9)	19.4	1.50	.30	.10
" " " site 3	G(8), R(13)	21.0	1.25	.15	.05
" " " site 4	Pool	7.5	1.50	.60	.30
Mosquito Lake Trib 2, site 1	P(3), G(8), R(4.5)	15.50	2.50	.5	.10
" " " site 2	P(3.75) R(1.25)	5.00	1.50	.5	.10
" " " site 3	P(3.75), R(6)	9.75	3.50	.6	.10
" " " site 4	P(8), R(2.25)	10.25	4.50	.7	.30
" " " site 5	G(9), R(1)	10.00	1.25	.3	.08
" " " site 6	G(10), R(.75)	10.75	1.00	.25	.08
Upper Pallant Trib site 1	Glide	7.2	5.0	.1	.30
" " " site 2	P(2.5), G(3)	5.5	3.8	.6	.18
Upper Pallant mainstem site June, 1984	R(81.4), G(406.2)	487.6	38.3	.95	.23

* type: P-pool; G-glide; R-riffle (m^2).

Where a number of different habitat types were inventoried, their individual areas are noted in brackets.

APPENDIX IX. Additional information on Mosquito Lake cutthroat trout populations.

Location	Date	Length mm	Weight gr
Lake trib #1	June 2, 1983	24	
"	"	23	
"	"	25	
"	"	22	
"	"	23	
"	"	24	
"	"	22	
"	"	25	
"	"	24	
"	"	25	
Upper Pallant Creek	June 19, 1984		
"	"	57	2.1
"	"	64	3.0
"	"	56	2.0
"	"	65	3.1
"	"	29	.5
"	"	28	.5
"	"	124	25.5
"	"	61	3.8
"	"	26	.1
"	"	22	.1