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EVALUATION OF ENHANCEMENT EFFORTS FOR  
RAINBOW TROUT AND COHO SALMON IN  
SOUTHCENTRAL ALASKA, 1989<sup>1</sup>

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## ABSTRACT

Experiments were conducted to provide information for the development of improved stocking practices for hatchery-reared rainbow trout *Oncorhynchus mykiss* and coho salmon *Oncorhynchus kisutch* in landlocked lakes.

In one set of experiments, coho salmon of Little Susitna River origin were stocked at a size of 3.7 grams in four lakes in June 1988, and at 1.1 grams to 1.3 grams in another four lakes in July 1988, for comparison of mean length at age 0+ and age 1 and comparison of survival to age 0+. In September 1988, estimated survivals of coho salmon stocked at 3.7 grams ranged from 48 percent to 90 percent and averaged 60 percent, while mean lengths ranged from 109 millimeters to 126 millimeters and averaged 118 millimeters; mean lengths at age 1 in May 1989 ranged from 124 millimeters to 150 millimeters and averaged 139 millimeters. Estimated survivals of coho salmon stocked at 1.1 grams to 1.3 grams ranged from 27 percent to 36 percent and averaged 33 percent, while mean lengths at age 0+ ranged from 78 millimeters to 89 millimeters and averaged 85 millimeters; mean lengths at age 1 ranged from 115 millimeters to 129 millimeters and averaged 118 millimeters. Based on these findings, we recommend stocking coho salmon fingerling in landlocked lakes soon after ice-out at as large a size as can be produced at warm-water hatcheries.

In another set of experiments, 1 gram rainbow trout of Swanson River origin were stocked at densities of 100, 200, 400, 800, or 1,000 per surface acre in July or August 1988 in landlocked lakes for comparison of survival to age 1 and comparison of mean length at age 1 and age 1+. In May or June 1989, estimated survivals for the trout stocked at 100 per surface acre in four lakes averaged 30 percent, at 200 per acre in four lakes averaged 26 percent, at 400 per acre in three lakes averaged 8 percent, at 800 per acre in three lakes averaged 10 percent, and at 1,000 per acre in one lake the survival was 15 percent. In September or October 1989, mean lengths at age 1+ for trout stocked at 100 per surface acre averaged 197 millimeters, at 200 per acre averaged 184 millimeters, at 400 per acre averaged 204 millimeters, at 800 per acre averaged 158 millimeters, and in the one lake stocked at 1,000 per acre rainbow trout mean length was 172 millimeters. We recommend this stocking density experiment be continued for at least 2 more years to determine the effects of annual fingerling releases on trout survival and growth.

In an additional experiment, 2 gram triploid (sterile) rainbow trout and diploid (normal) rainbow trout of the Swanson River origin were stocked at approximately equal densities in Johnson Lake in September 1988 for comparison of survival and mean length at age 1, although only 37 percent of the experimental group stocked as triploids were actually triploid. Survival at age 1 for the triploid group was estimated at 46 percent, while estimated survival for diploid trout was 53 percent. Mean lengths at age 1+ were 214 millimeters and 220 millimeters for the triploid and diploid trout, respectively. Triploid rainbow (100 percent determined to be triploid) and diploid trout were planted in Johnson Lake in 1989. We recommend this experiment be continued to determine if sterile fish have a greater rate of growth and survival through several age classes.

KEY WORDS: Southcentral Alaska, lake stocking practices, rainbow trout, *Oncorhynchus mykiss*, coho salmon, *Oncorhynchus kisutch*, abundance, growth, survival.

## INTRODUCTION

Stocked lakes benefit sport anglers and industries related to sport fishing by providing diverse, year-round fishing opportunities and by diverting pressure from natural stocks. In southcentral Alaska, selected landlocked lakes have been stocked on an annual or biennial basis with hatchery-reared game fish since 1952. The majority of these lakes, ranging in size from approximately 3 to 200 surface hectares, were barren or contained only threespine stickleback *Gasterosteus aculeatus* prior to stocking. The lakes are stocked with rainbow trout *Oncorhynchus mykiss*, Arctic grayling *Thymallus arcticus*, or landlocked salmon *Oncorhynchus spp.*, depending on the nature of the water to be stocked, the availability of fish for stocking, and the desires of the angling public for diversified fishing opportunities.

To date, the stocking program has had mixed results. Although contributions to the sport creel have been noted, poor survival of stocked fish has also been observed. One reason for the observed low survivals may be a lack of understanding of the relationship between stocking procedures and the resultant survival and growth of stocked fish. For this reason, it is necessary to evaluate the various stocking procedures being used in terms of their ability to influence the survival of stocked fish. This includes evaluations of brood stocks, stocking densities and sizes, and the timing and frequency of stockings.

This report presents research regarding the effects of stocking size on coho salmon *O. kisutch*, the effects of triploidy, and stocking density on the survival of rainbow trout in landlocked lakes in southcentral Alaska. This research will be used to devise stocking procedures to maximize the survival of stocked fish in the most cost-efficient manner.

## METHODS

An experiment was undertaken to compare the survival and growth of landlocked coho salmon stocked at different sizes in several Matanuska-Susitna Valley lakes (Figure 1). In June 1988, 3.7 g coho salmon fingerlings of Little Susitna River origin were stocked from Ft. Richardson Hatchery (a warm-water rearing facility) in Bear Paw, Echo, Junction, and Loon Lakes at densities of approximately 200 fish per surface acre. In July 1988, Benka, Prator, Rocky, and Wolf Lakes were stocked from Big Lake Hatchery (a cold-water rearing facility) with 1.1 g to 1.3 g coho salmon fingerlings of Little Susitna River origin at densities of approximately 200 fish per surface acre. All eight lakes contain populations of threespine stickleback.

Rainbow trout of the Swanson River origin were stocked in 17 Matanuska-Susitna Valley lakes in 1988 for experiments to be performed in 1989. To determine the effects of stocking density on rainbow trout survival and growth, Lynne, Tigger, Vera, and Walby Lakes were planted with 1 g rainbow trout fingerlings at approximately 100 per surface acre; Barley, Beverly, Carpenter, Morvro, and "X" Lakes at approximately 200 per acre; Diamond, Kalmbach, and Long (K/B) Lakes at approximately 400 trout per surface acre; Crystal, Honeybee, and Little Lonely Lakes at approximately 800 per surface acre; and Dawn Lake was

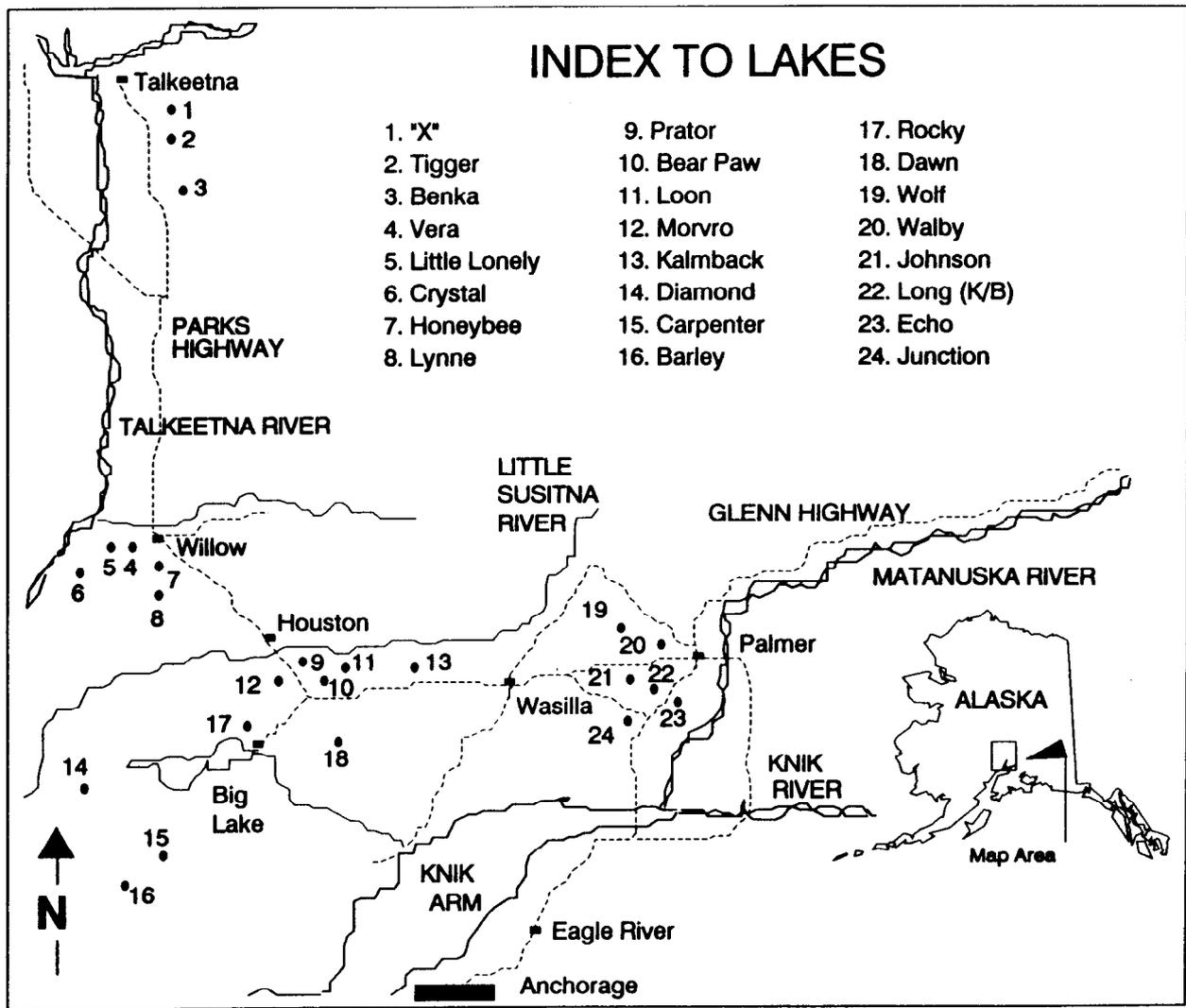


Figure 1. Sample lakes area of the Matanuska-Susitna Valley, 1988-1989.

stocked at approximately 1,000 rainbow trout per surface acre. All 16 lakes contain populations of threespine stickleback.

To determine if there are significant differences in survival and growth between Swanson River strain triploid (sterile) rainbow trout and diploid (normal) Swanson River strain rainbow trout, 964 fingerlings that had been exposed to temperature shock at the egg stage and 1,000 normal fingerlings were planted at a size of 2 g in stickleback-free Johnson Lake in September 1988. The triploid fingerlings, of which 37% were estimated to be triploid by blood analysis (Carmen Olito, Ft. Richardson Rainbow Trout Broodstock Center, personal communication), were marked with a right ventral fin clip whereas the diploid fingerlings received a left ventral fin clip. Johnson Lake is closed to sport fishing.

#### Coho Salmon and Rainbow Trout Sampling

Coho salmon were captured for marking purposes in August or September 1988, released to mix throughout the lake for approximately 8 months, then sampled for marked-unmarked ratios in May 1989. Rainbow trout were captured for marking purposes in May, June, or early July 1989, released to mix throughout the lake for approximately 3 months, then sampled for marked-unmarked ratios in September or October 1989.

Coho salmon and rainbow trout were captured using fyke nets. The fyke nets were 2.7 m (9 ft) in length, 0.8 m (30 in) in diameter, and included two 0.9 m (3 ft) by 6.1 m (20 ft) wings (two square aluminum frames and six steel or aluminum hoops supported the entrance and body of the fyke net). Internal throats, body, and wings were 4.8 mm (3/16 in) square mesh knotless nylon. Salmon eggs were used as bait in fyke nets. Fyke nets were set parallel to the shoreline in randomly selected sites and directions and fished for approximately 24 hours each.

Coho salmon and rainbow trout captured in fyke nets were placed in a tub, oxygenated with a portable 7.5 kg (20 lb) oxygen bottle and anesthetized with equal parts of MS-222 and Quinate. The catch of target age fish in each fyke net was then enumerated, adipose finclipped (during the marking session), and placed in a 1.2 m (4 ft) by 1.2 m (4 ft) by 2.4 m (8 ft) covered holding pen made of plastic pipe covered by 4.8 mm (3/16 in) knotless nylon mesh; all other fish captured in fyke nets were released. After fish from all fyke nets were in the holding pen, a minimum of 100 age 0+ coho salmon or age 1 rainbow trout were randomly selected and measured for fork length (FL) to the nearest millimeter. Upon completion of the capture session, fish were released from the holding pen in the middle of each lake. All diploid and triploid age 1+ trout in Johnson Lake were marked with a numbered anchor tag before release for identification in following years.

#### Size Selectivity

In order to determine whether size selectivity occurred at the time of marking or recapture, a non-parametric two-sample Kolmogorov-Smirnov (Conover 1980) test was used to compare length distributions between marked and unmarked coho

salmon at the time of sampling for recaptures. Tests with p-values less than 0.10 were considered significant.

### Equal Probability of Capture

Marked fish were released in approximately the middle of each lake. An important assumption of the Petersen estimator is that marked fish are completely mixed with the unmarked population, or that all fish have equal probability of capture. This assumption would be met if the separate marked fish migrate and mix throughout the lake prior to a recapture sample, or if the recovery effort was equally distributed throughout the lake. In order to test this assumption, we compared the ratio of marked to unmarked rainbow trout in fyke nets fished in various areas around the perimeter of each lake. These comparisons were made using chi-square tests of homogeneity.

### Abundance Estimator

The abundance of age 0+ coho salmon and age 1 rainbow trout was estimated using the mark-recapture estimator for closed populations: the Chapman modification of the Petersen estimator (Seber 1982). Several assumptions of the mark-recapture estimator were tested before the estimation method was chosen.

Petersen Estimator:

The abundance at time of marking, N, is estimated by:

$$\hat{N} = \frac{(M+1)(R+1)}{(C+1)} - 1 \quad (1)$$

and the variance by:

$$\text{Var}(\hat{N}) = \frac{(M+1)(C+1)(C-R)(M-R)}{(R+1)^2(R+2)} \quad (2)$$

where:

M = number of marked fish released,

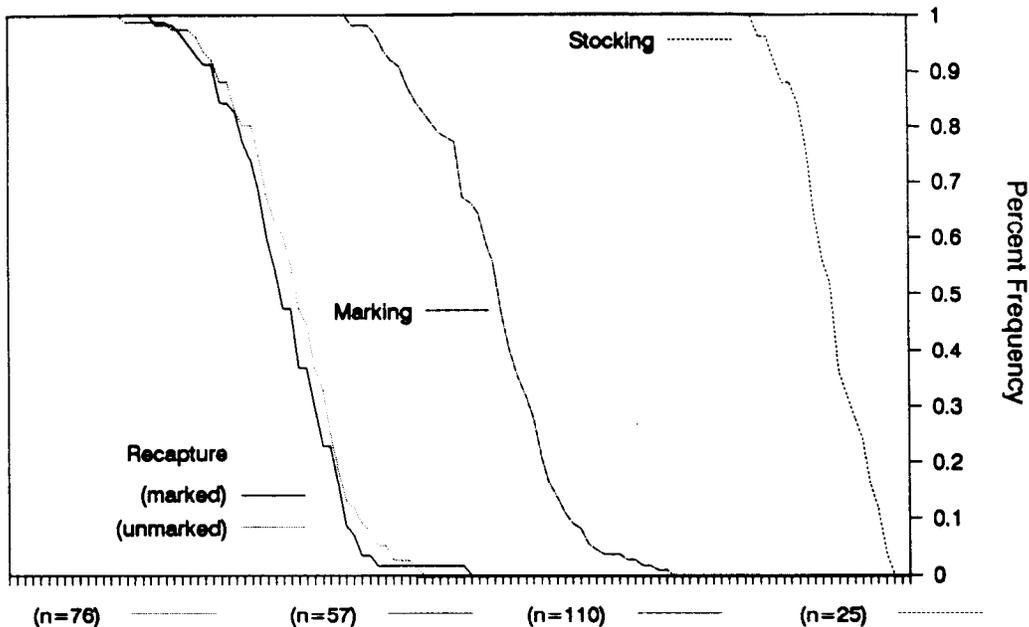
R = number of recaptures,

C = number of fish examined for recaptures.

The assumptions for this estimate are:

1. there is no recruitment or immigration into the population or emigration out of the population between sampling events,
2. marking does not affect the catchability,

## ROCKY LAKE



## WOLF LAKE

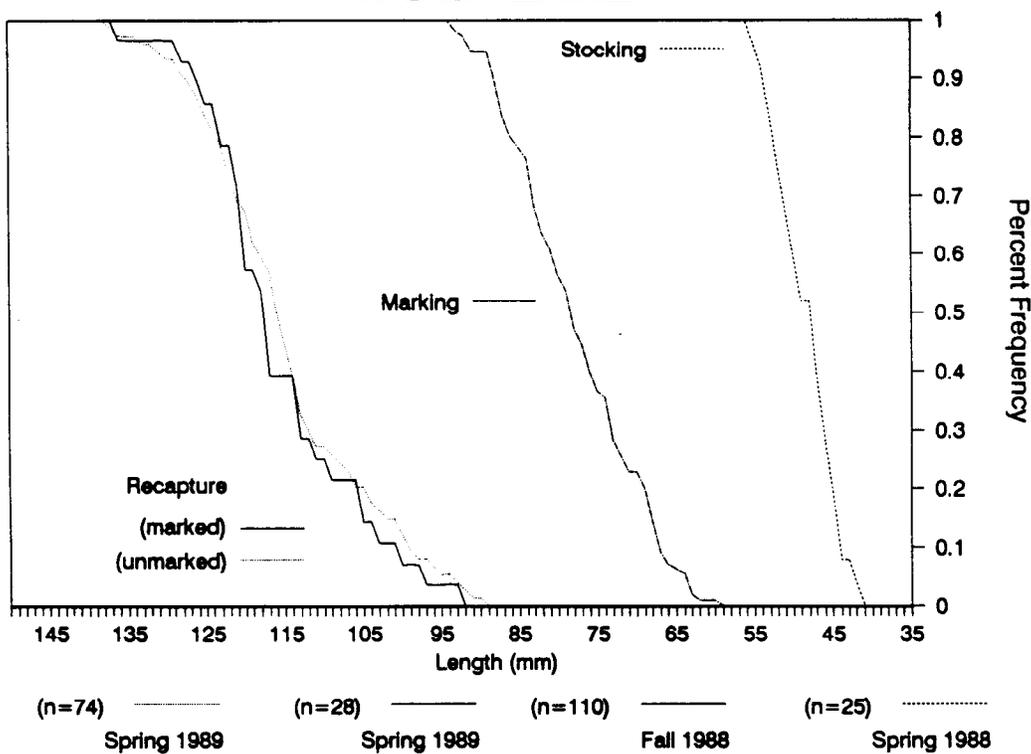


Figure 2. Cumulative length distributions of landlocked coho salmon at time of stocking, during the marking session, and during the recapture session in Rocky and Wolf Lakes, 1988-1989.

Table 2. Population estimates for coho salmon of Little Susitna River origin in Bear Paw, Echo, Junction, Loon, Benka, Prator, Rocky, and Wolf Lakes, 1988-1989.

Lake	Date Stocked	Number Stocked	Size Stocked	Fall 1988	Spring 1989		Petersen Population Estimate				
				Number Marked	Total Captured	Marked Recaptures	Number	Bias	95% CI	Survival	95% CI
Bear Paw	06/7/88	8,980	3.70g	901	305	63	4,313	28	3,414 - 5,211	48%	38% - 58%
Echo	06/7/88	4,600	3.70g	851	625	128	4,135	16	3,551 - 4,718	90%	77% - 103%
Junction	06/7/88	2,180	3.70g	667	184	108	1,134	6	1,010 - 1,258	52%	46% - 58%
Loon	06/7/88	21,575	3.70g	1,760	907	144	11,028	14	9,457 - 12,598	51%	44% - 58%
Benka	07/5/88	24,600	1.26g	2,189	418	114	7,979	85	6,775 - 9,183	32%	28% - 37%
Prator	07/5/88	19,838	1.26g	2,568	420	154	6,978	29	6,134 - 7,821	35%	31% - 39%
Rocky	07/5/88	11,740	1.07g	1,970	625	293	4,197	2	3,875 - 4,518	36%	33% - 38%
Wolf	07/5/88	12,400	1.26g	877	297	76	2,965	28	2,437 - 3,492	27%	22% - 32%

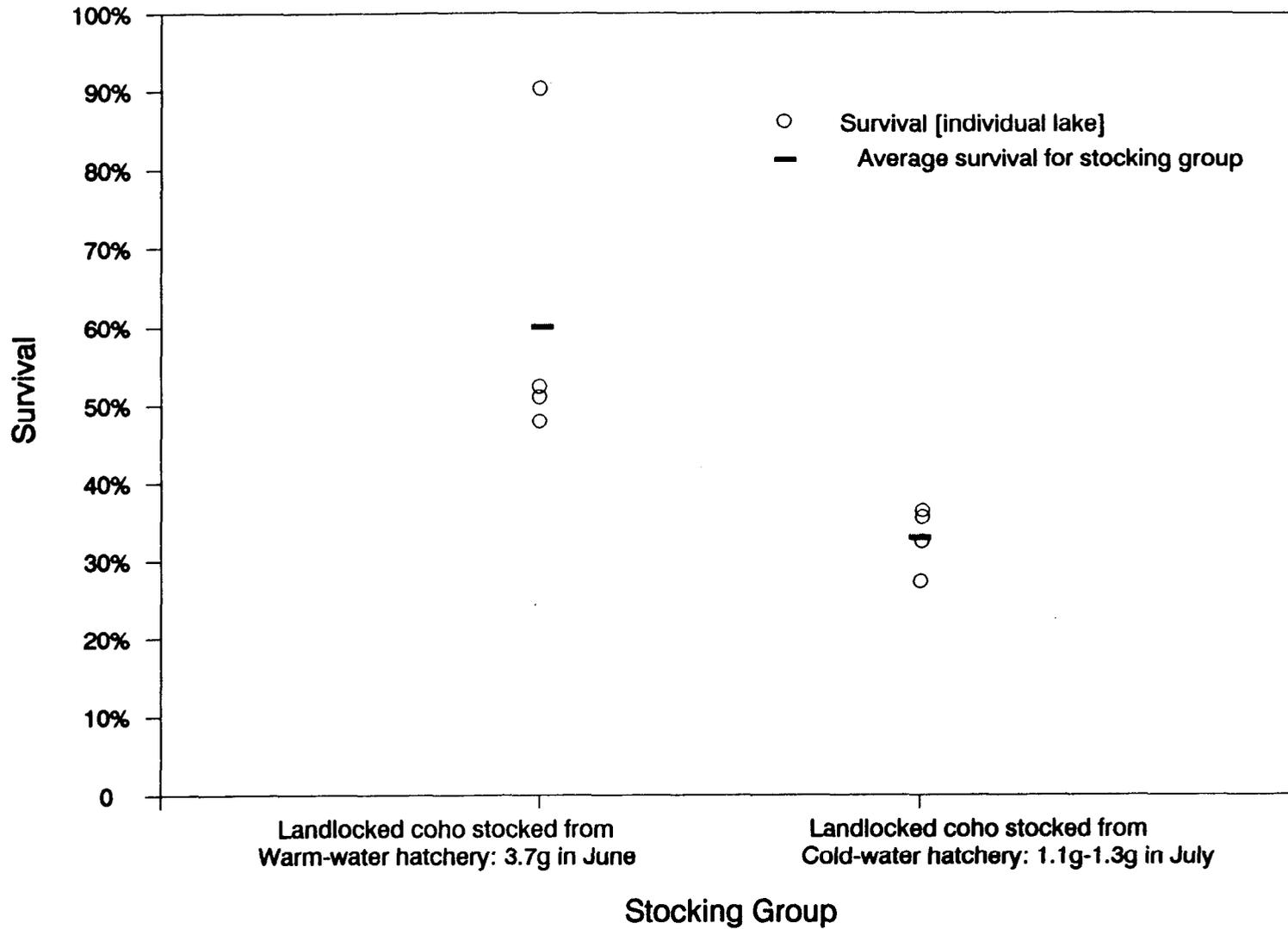


Figure 3. Estimated survivals at age 0 of landlocked coho salmon stocked at two different size groups in selected Matanuska-Susitna Valley lakes, 1988.

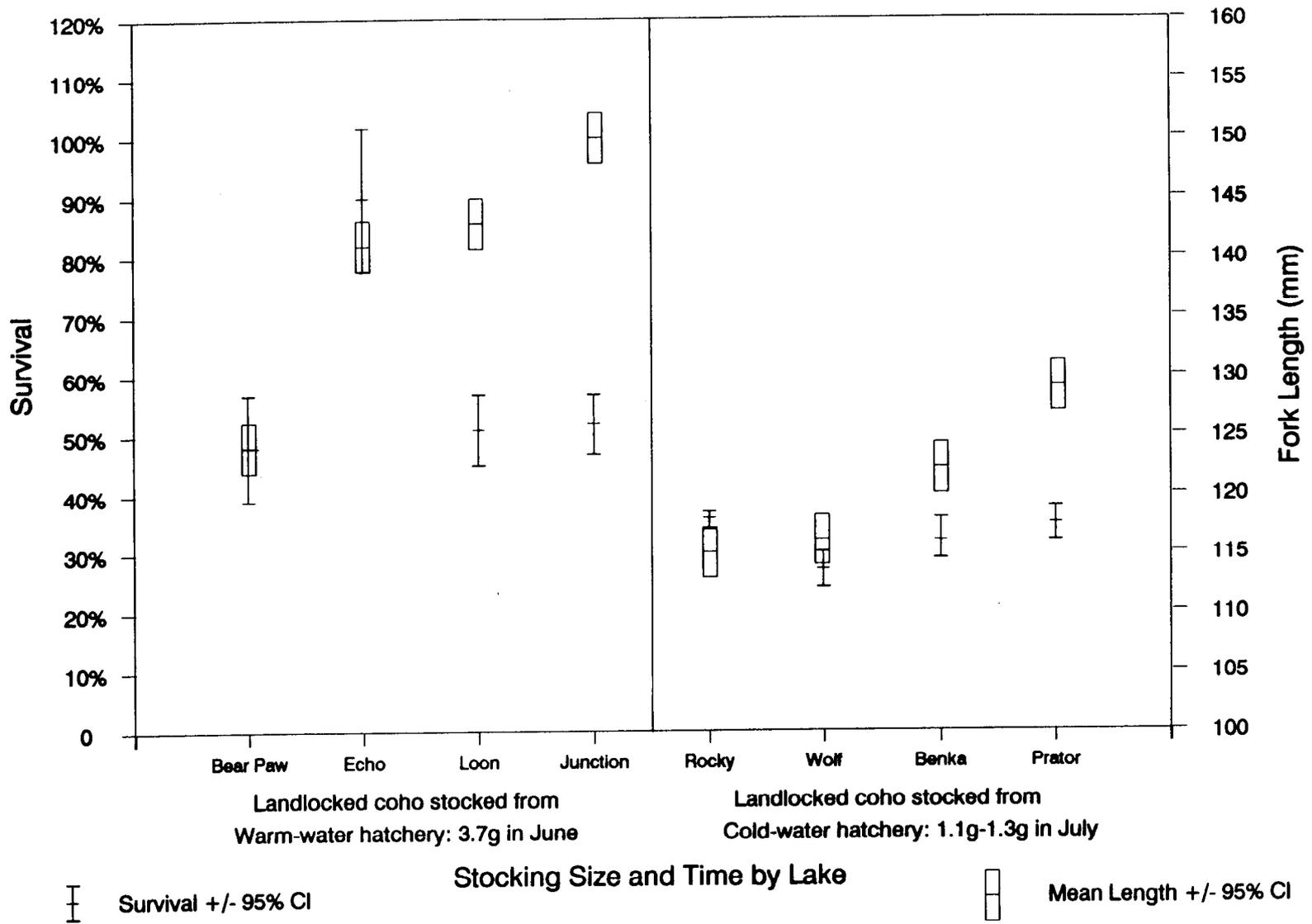


Figure 4. Estimated survivals at age 0 and mean lengths at age 1 of landlocked coho salmon stocked at two different size groups in selected Matanuska-Susitna Valley lakes, 1988.

9 mm). In May 1989, mean lengths of captured age 1 coho salmon from the 3.7 g stocking group averaged 140 mm (range 124 mm to 150 mm) and for the 1.1 g to 1.3 g stocking group averaged 121 mm (range 115 mm to 129 mm) (Table 3 and Figures 4 and 5).

#### Recommendations:

We recommend stocking fingerling coho salmon in landlocked lakes soon after ice-out at as large a size as can be produced at warm-water hatcheries.

#### Rainbow Trout Stocking Densities

##### Equal Probability of Capture:

During the spring marking session, rainbow trout were released in approximately the middle of each lake. During the fall recapture session we recorded the numbers of marked and unmarked fish captured in each fyke net but did not measure fish by fyke net. A comparison of the ratio of marked to unmarked age 1+ trout using chi-square tests of homogeneity indicated no significant ( $P > 0.05$ ) differences in catch between fyke nets within any of the lakes (Table 4).

Beverly Lake, which had been stocked at 200 fish per acre, was eliminated from the experiment. During the spring marking session, we observed rainbow trout varying in size from fingerling to mature adult in a small outlet stream. We were not able to break out age 1 fish (stocked in 1988) from older age classes based on length measurements of trout captured in fyke nets as was possible in all the other lakes, i.e., Barley and Vera Lakes versus Beverly Lake (Figure 6). We suspect that both naturally spawned fingerling from previous plants and 1988 stocked trout were present in Beverly Lake.

##### Population Estimates and Survival:

Estimated survivals at age 1 for Swanson strain rainbow trout stocked at approximately 1 g at a density of 100 fish per surface acre in four lakes averaged 30% (range 21% to 40%). Fish stocked at a density of 200 per acre in four lakes averaged 26% (range 14% to 60%), at 400 per acre in three lakes averaged 8% (range 2% to 16%), at 800 per acre in three lakes averaged 10% (range 5% to 16%), and at 1,000 per acre in one lake the estimated survival was 15% (Table 5 and Figures 7 and 8).

The survival rates for trout stocked at densities of 200 per acre are similar to previously estimated survival rates in Matanuska-Susitna Valley lakes. Between 1978 and 1983, survival estimates for Swanson strain rainbow trout stocked at densities of 200 fish per surface acre in stickleback-infested lakes ranged from 8% to 35% for 1 g trout (average 24% for nine estimates) and 9% to 63% for 2 g trout (average 36% for 10 estimates). One gram trout had been stocked in August and 2 g fish were stocked in October (Havens 1984).

In May, June, or July 1989, mean lengths of age 1 rainbow trout averaged 124 mm, 117 mm, 111 mm, 105 mm, and 104 mm for trout that had been stocked at densities of 100, 200, 400, 800, and 1,000 fish per acre, respectively

Table 3. Stocking history and length data for coho salmon of Little Susitna River origin captured by fyke nets in Bear Paw, Echo, Junction, Loon, Benka, Prator, Rocky, and Wolf Lakes, 1988-1989.

Lake <sup>a</sup>	Date Stocked	Number Stocked	Size Stocked	Date Captured	Number Measured	Length		
						Mean (mm)	SE	Range (mm)
Bear Paw	06/7/88	8,980	3.70g	09/15/88	108	109	1	98-124
				05/12/89	118	124	1	105-139
Echo	06/7/88	4,600	3.70g	09/22/88	100	121	1	100-138
				05/02/89	119	141	1	108-165
Junction	06/7/88	2,180	3.70g	09/10/88	133	126	1	106-179
				05/04/89	99	150	1	136-184
Loon	06/7/88	21,575	3.70g	09/13/88	104	114	1	98-141
				05/16/89	120	143	1	106-165
Benka	07/5/88	24,600	1.26g	09/20/88	102	85	1	58- 99
				05/23/89	155	122	1	89-134
Prator	07/5/88	19,838	1.26g	09/13/88	110	87	1	56-108
				05/11/89	136	129	1	73-144
Rocky	07/5/88	11,740	1.07g	09/15/88	110	89	1	66-107
				05/10/89	133	115	1	92-136
Wolf	07/5/88	12,400	1.26g	08/30/88	110	78	1	60- 94
				05/09/89	102	116	1	90-138

<sup>a</sup> Bear Paw, Echo, Junction, Benka, Prator, Rocky, and Wolf Lakes contain populations of threespine stickleback. Loon Lake contains populations of ninespine stickleback.

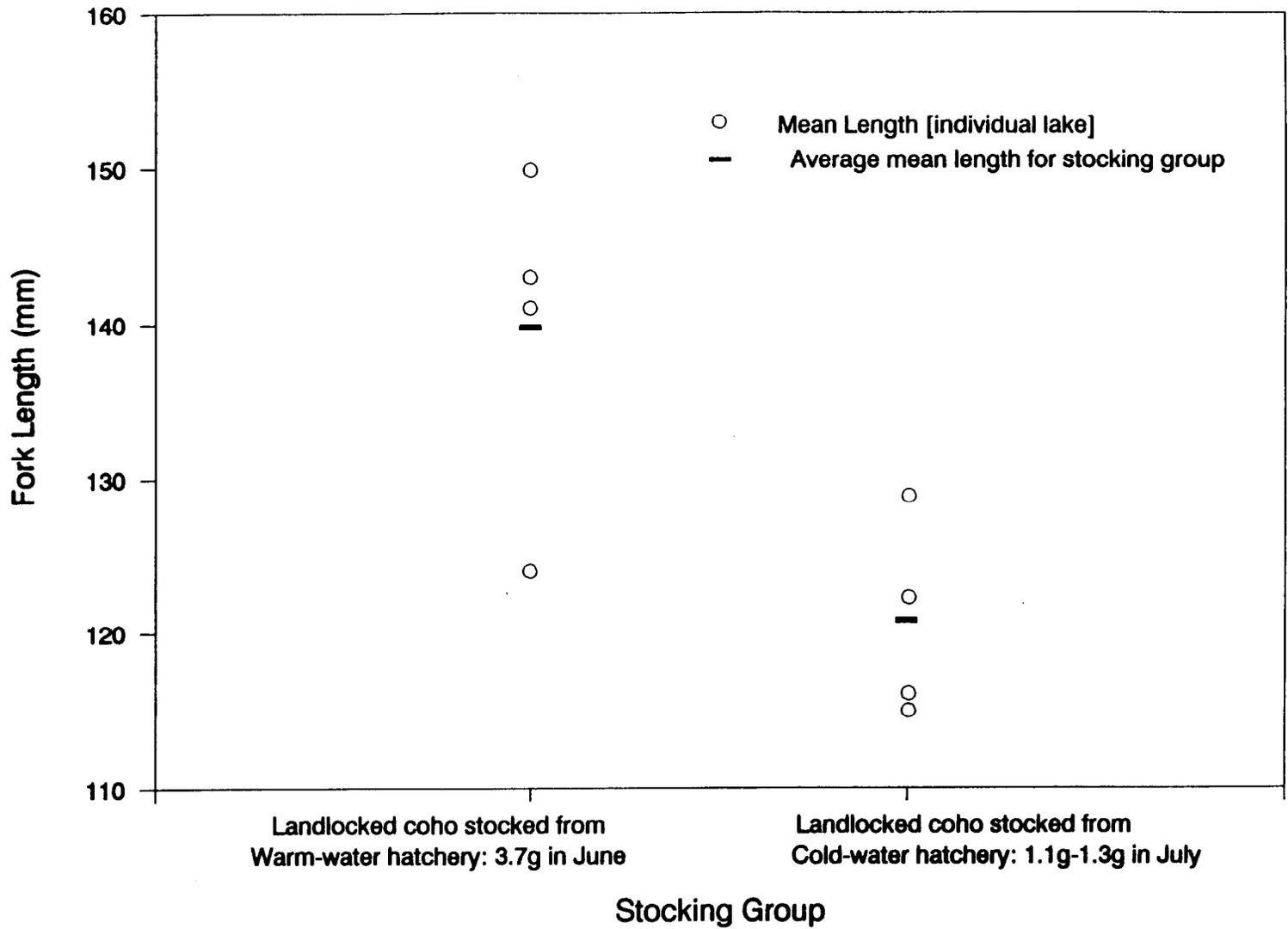


Figure 5. Mean lengths at age 1 of landlocked coho salmon stocked at two different size groups in selected Matanuska-Susitna Valley lakes, 1988.

Table 4. Results of chi-square tests comparing the ratio of marked to unmarked age 1 rainbow trout captured by fyke nets within each of the sample lakes, 1989.

Comparison	Chi-square	Degrees of Freedom	P
Lynne Lake	4.50	8	> 0.90
Tigger Lake	3.52	6	> 0.70
Vera Lake	5.11	8	> 0.80
Walby Lake	0.04	1	> 0.90
Barley Lake	11.87	7	> 0.20
Carpenter Lake	16.74	9	> 0.30
Norvro Lake	6.59	7	> 0.50
"X" Lake	7.92	5	> 0.20
Diamond Lake	3.06	3	> 0.50
Kalmback Lake	7.22	7	> 0.50
Long (K/B) Lake	21.78	15	> 0.20
Crystal Lake	13.25	8	> 0.20
Honeybee Lake	7.56	6	> 0.30
Little Lonely Lake	15.60	13	> 0.30
Dawn Lake	0.70	3	> 0.90
Johnson Lake (Diploid)	0.47	3	> 0.95
(Triploid)	0.61	3	> 0.90

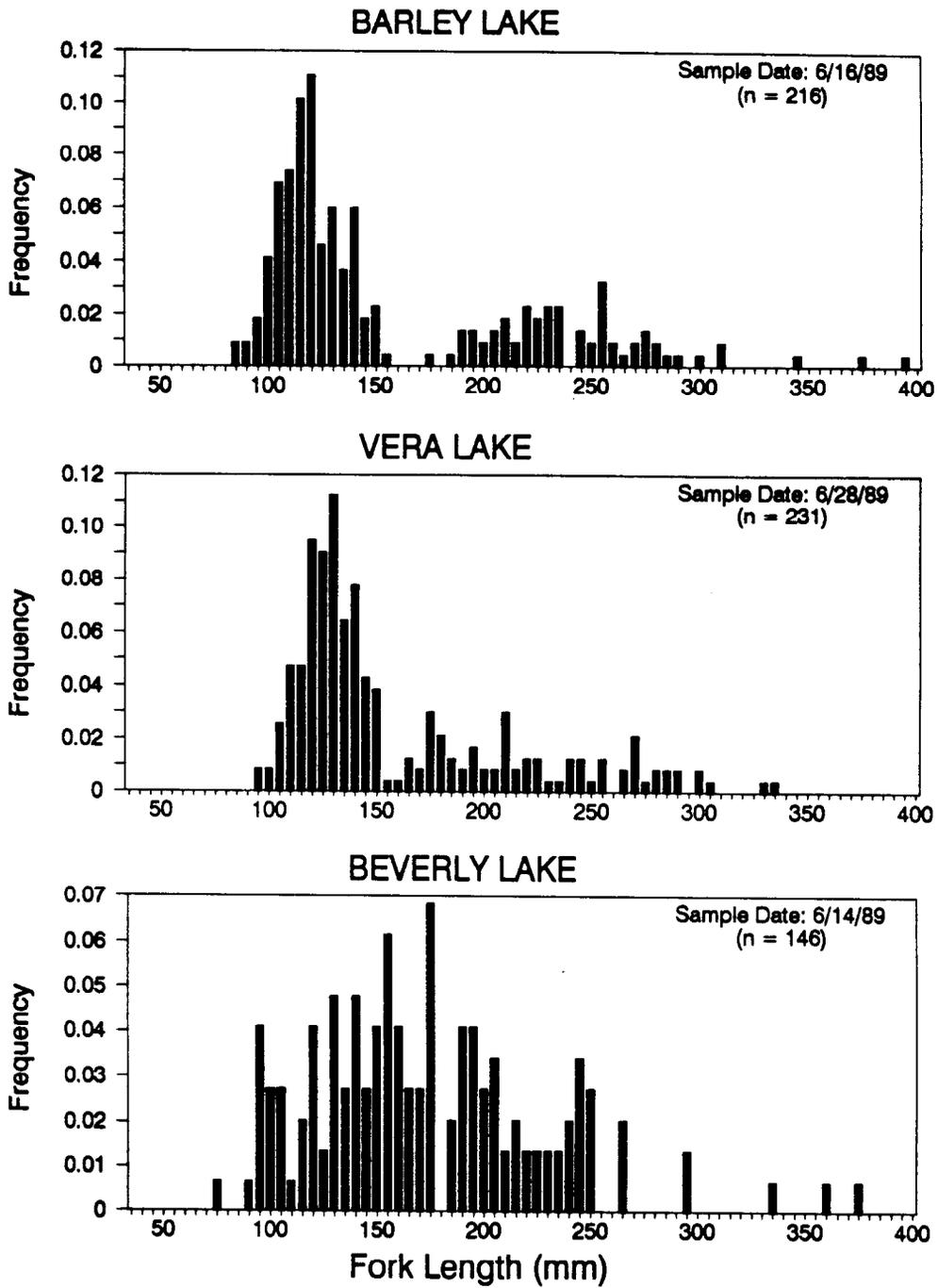


Figure 6. Length frequency comparison of rainbow trout captured by fyke nets in Barley, Vera, and Beverly Lakes, June 1989.

Table 5. Population estimates for rainbow trout of Swanson River origin in selected Matanuska-Susitna Valley lakes, 1989.

Lake	Date Stocked	Number Stocked	Fish/Acre	Size Stocked	Spring	Fall 1989		Petersen Population Estimate			
					1989	Total	Marked	Number	95% CI	Survival	95% CI
					Number	Captured	Recaptures				
Lynne	08/01/88	7,056	101	1.20g	772	512	186	2,121	1,910 - 2,331	30%	27% - 34%
Tigger	08/03/88	1,877	99	1.08g	313	140	83	527	466 - 588	28%	25% - 31%
Vera	08/01/88	10,850	98	1.20g	730	1,397	234	4,349	3,932 - 4,766	40%	36% - 44%
Walby	08/01/88	5,378	100	1.20g	615	274	152	1,107	1,006 - 1,208	21%	19% - 22%
Barley	08/01/88	3,695	199	1.20g	748	867	292	2,219	2,058 - 2,380	60%	56% - 64%
Carpenter	08/01/88	35,255	200	1.20g	816	1,141	203	4,574	4,082 - 5,065	14%	13% - 16%
Morvro	07/29/88	17,333	200	1.00g	578	682	144	2,727	2,387 - 3,067	16%	14% - 18%
"X"	07/28/88	20,843	206	1.10g	1,059	485	162	3,160	2,798 - 3,523	15%	13% - 17%
Diamond	07/29/88	55,622	400	1.00g	340	731	244	1,019	964 - 1,074	2%	2% - 2%
Kalmback	07/29/88	51,850	415	1.00g	1,325	318	149	2,820	2,512 - 3,128	5%	5% - 6%
Long (K/B)	07/28/88	30,575	411	1.10g	1,015	1,052	218	4,885	4,376 - 5,394	16%	14% - 18%
Crystal	08/01/88	105,415	800	1.20g	861	446	69	5,504	4,377 - 6,632	5%	4% - 6%
Honeybee	08/01/88	46,206	797	1.20g	2,083	770	210	7,615	6,787 - 8,443	16%	15% - 18%
Little Lonely	08/01/88	44,820	800	1.10g	1,563	1,313	467	4,391	4,124 - 4,658	10%	9% - 10%
Dawn	08/01/88	12,376	1,049	1.20g	982	229	118	1,900	1,679 - 2,121	15%	14% - 17%

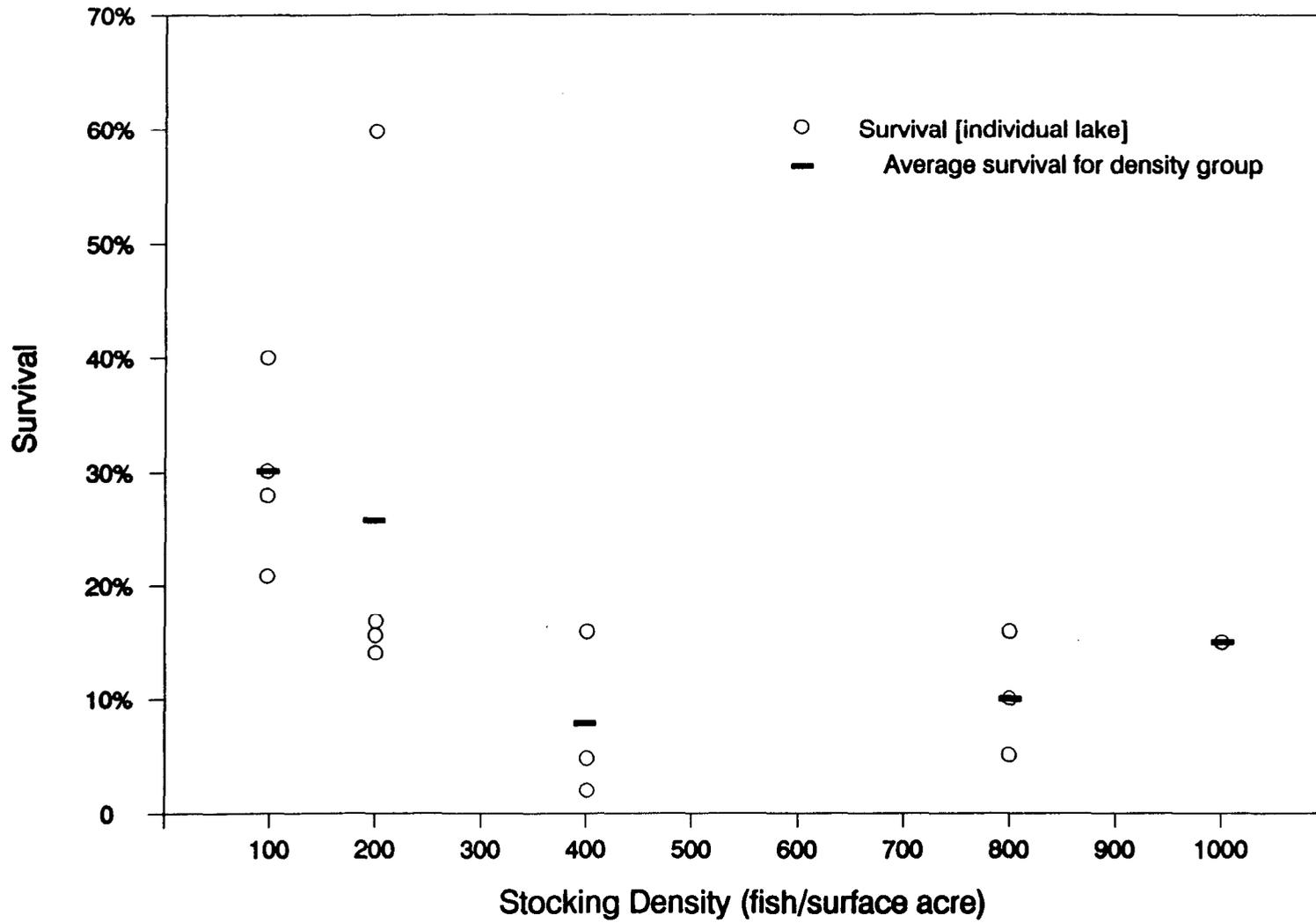


Figure 7. Estimated survivals at age 1 of Swanson strain rainbow trout stocked at various densities in selected Matanuska-Susitna Valley lakes, 1988.

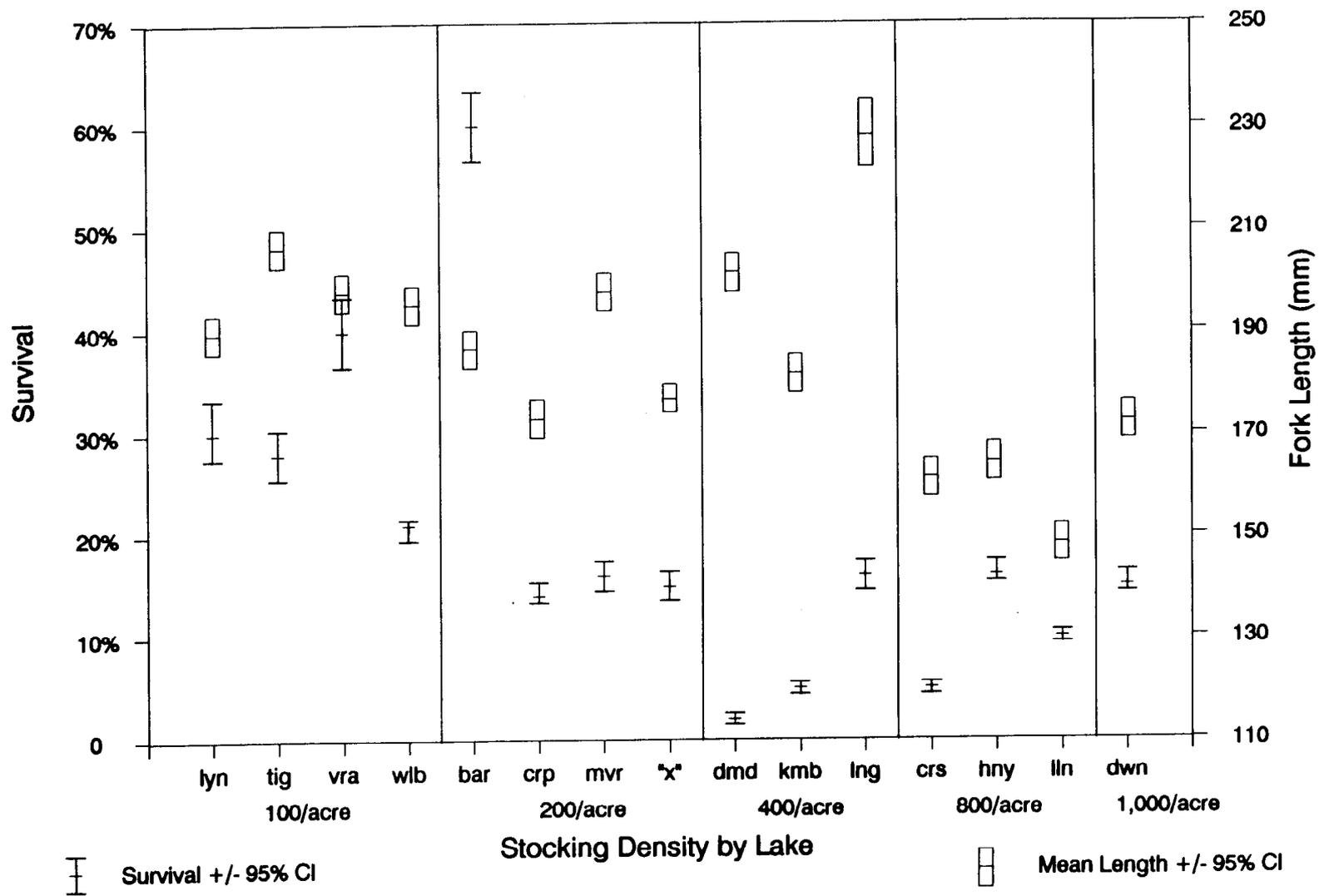


Figure 8. Estimated survivals at age 1 and mean lengths at age 1+ of Swanson strain rainbow trout stocked at various densities in selected Matanuska-Susitna Valley lakes, 1988.

(Table 6). By September or October 1989, mean lengths of age 1+ rainbow trout that had been stocked at 100 per acre averaged 197 mm, fish stocked at 200 per acre averaged 184 mm, at 400 per acre averaged 204 mm, at 800 per acre averaged 158 mm, and at 1,000 per acre rainbow trout mean length was 172 mm (Table 6 and Figures 8 and 9).

The number of trout produced from the 1989 plants averaged 30, 52, 32, 84, and 161 per acre from initial stocking densities of 100, 200, 400, 800, and 1,000 fish per acre (Table 7). Figure 10 shows the estimated surviving number of rainbow trout per acre by lake along with the mean length of fish at age 1+. In general, data from the first year of experimentation indicated that stocking rainbow trout at a density of 100 fish per acre resulted in almost as many harvestable size fish as density plants of 200 or 400 fish per acre. Although more trout were produced at stocking densities of 800 and 1,000 per acre, fish from these lakes were smaller at age 1+.

#### Recommendations:

Rainbow trout fingerling were again stocked in July 1989 at densities of 100, 200, 400, or 800 fish per surface acre for estimates of survival and mean length to be performed in 1990. Length samples of these fingerling were taken in September or October 1989, during the recapture session of the 1989 experiments, and are presented in Appendix A1. We recommend this density experiment be continued to assess the effects of repeated density plants on fingerling survival to age 1 and on growth of trout through several years. Since the lowest stocking density yielded the most promising results, we also recommend that the study design be modified to incorporate stocking density less than 100 per acre. We also recommend that all age 2 and older trout captured in the spring of each year be measured and marked with a numbered anchor tag to help separate age classes for future identification.

#### Triploid and Diploid Rainbow Trout

Estimated survivals at age 1 for Swanson strain diploid (LV) and triploid (RV) rainbow trout stocked at 2 g at a combined density of 50 fish per surface acre in Johnson Lake were 53% and 46%, respectively (Table 8). There was no significant ( $P > 0.05$ ) difference in the ratio of the number of trout stocked to the estimated number of fish surviving between diploid and triploid stocking groups.

Mean length of diploid trout was 166 mm in July and 220 mm at age 1+ in October, while mean length of triploid trout was 163 mm in July and 214 mm in October (Table 9). There was no significant difference between mean lengths of diploid and triploid trout in July, but the difference in mean lengths at age 1+ was significant ( $P < 0.05$ ).

#### Recommendations:

A portion of the trout stocked in 1988 should be collected in 1990 at age 2 and in 1991 at age 3 to determine the percentage of trout marked with an RV finclip exhibiting triploid characteristic restricted gonad development as compared to the LV finclipped trout. Those fish should be measured to

Table 6. Stocking history and length data for rainbow trout of Swanson River origin captured by fyke nets in selected Matanuska-Susitna Valley lakes, 1989.

Lake	Date Stocked	Number Stocked	Fish/Acre	Fish/Shoreline Mile	Size Stocked	Date Captured	Number Measured	Length		
								Mean (mm)	SE	Range (mm)
Lynne	08/01/88	7,056	101	3,714	1.20g	06/06/89	136	119	1	83-156
						09/21/89	146	189	2	138-245
Tigger	08/03/88	1,877	99	2,086	1.08g	06/20/89	185	136	1	92-179
						09/20/89	138	206	2	141-260
Vera	08/01/88	10,850	98	3,875	1.20g	06/28/89	154	125	1	93-153
						09/26/89	145	199	2	147-262
Walby	08/01/88	5,378	100	3,841	1.20g	06/01/89	142	114	1	76-148
						09/15/89	156	195	2	112-280
Barley	08/01/88	3,695	199	4,619	1.20g	06/16/89	148	118	1	84-153
						09/28/89	143	186	2	140-233
Carpenter	08/01/88	35,255	200	9,278	1.20g	06/27/89	147	109	1	88-128
						09/28/89	161	173	2	120-220
Morvro	07/29/88	17,333	200	9,629	1.00g	06/22/89	207	137	1	95-180
						10/03/89	150	199	2	130-250
"X"	07/28/88	20,843	206	6,513	1.10g	05/24/89	156	104	1	78-129
						09/20/89	285	178	1	123-228
Diamond	07/29/88	55,622	400	20,601	1.00g	05/18/89	52	83	1	63-100
						10/05/89	156	202	2	139-247
Kalmbach	07/29/88	51,850	415	22,543	1.00g	07/05/89	186	120	1	82-148
						10/03/89	155	182	2	127-238
Long (K/B)	07/28/88	30,575	411	12,740	1.10g	05/31/89	218	131	1	90-173
						09/29/89	155	229	3	143-340
Crystal	08/01/88	105,415	800	37,648	1.20g	06/09/89	142	89	1	64-118
						09/29/89	138	161	2	103-222

(Continued)

Table 6. (Page 2 of 2).

Lake	Date Stocked	Number Stocked	Fish/Acre	Fish/Shoreline Mile	Size Stocked	Date Captured	Number Measured	Length		
								Mean (mm)	SE	Range (mm)
Honeybee	08/01/88	46,206	797	20,090	1.20g	06/06/89	154	122	1	86-159
						09/21/89	153	165	2	114-218
Little Lonely	08/01/88	44,820	800	24,900	1.10g	06/27/89	155	105	1	72-132
						09/22/89	144	148	2	102-189
Dawn	08/01/88	12,376	1,049	20,627	1.20g	06/01/89	158	104	1	78-148
						09/13/89	167	172	2	115-230

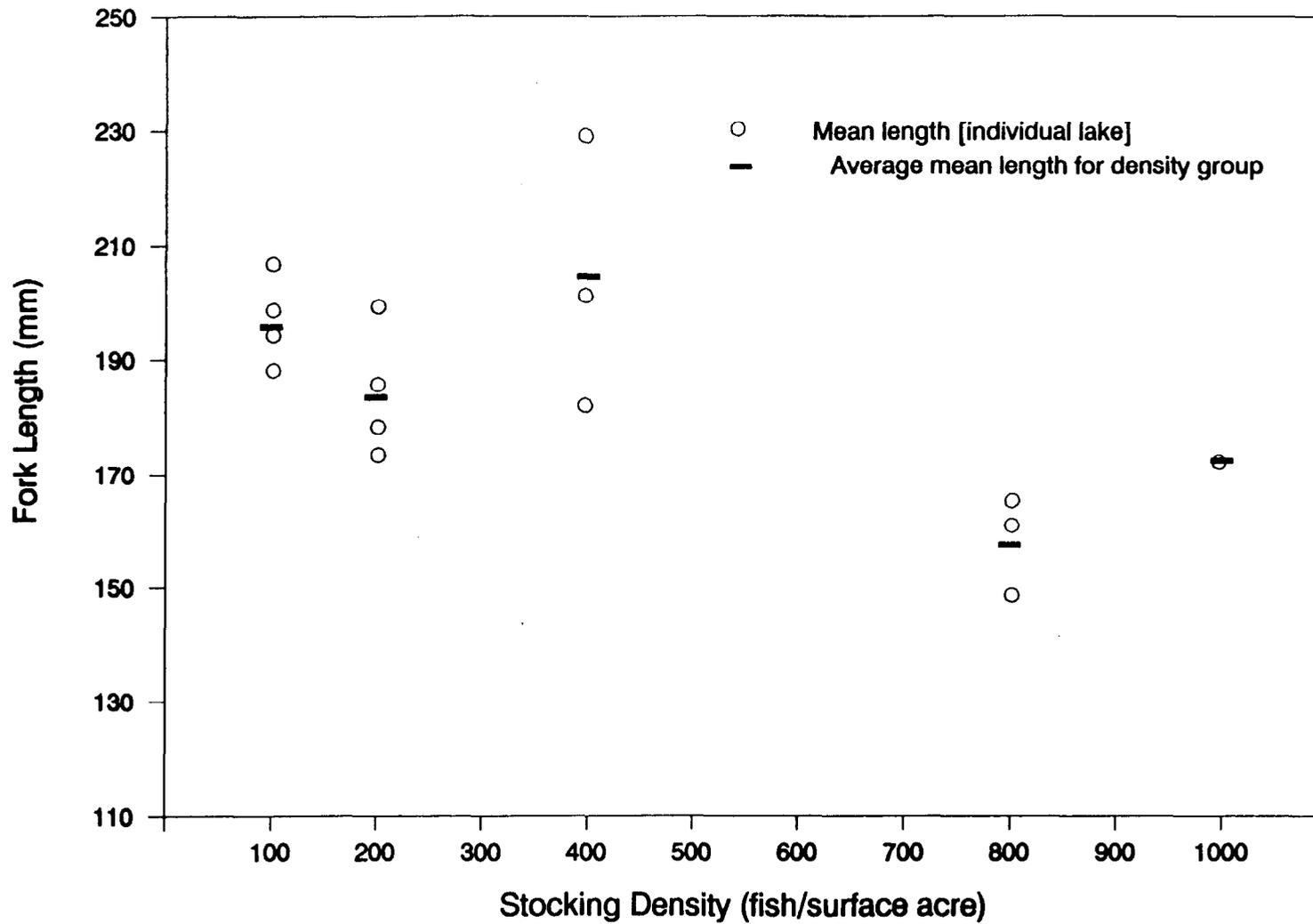


Figure 9. Mean lengths at age 1+ of Swanson strain rainbow trout stocked at various densities in selected Matanuska-Susitna Valley lakes, 1988.

Table 7. Numbers of surviving age 1 Swanson strain rainbow trout per surface acre in selected Matanuska-Susitna Valley lakes, 1989.

Lake	Date Stocked	Number Stocked	Fish/Acre	Surface Acres	Spring	Fall 1989		Petersen Population Estimate			
					1989	Total	Marked	Number	95% CI	Trout/Acre	95% CI
					Number	Captured	Recaptures				
Lynne	08/01/88	7,056	101	70	772	512	186	2,121	1,910 - 2,331	30	27 - 33
Tigger	08/03/88	1,877	99	18.9	313	140	83	527	466 - 588	28	25 - 31
Vera	08/01/88	10,850	98	110.5	730	1,397	234	4,349	3,932 - 4,766	39	36 - 43
Walby	08/01/88	5,378	100	53.9	615	274	152	1,107	1,006 - 1,208	21	19 - 22
Barley	08/01/88	3,695	199	18.6	748	867	292	2,219	2,058 - 2,380	119	111 - 128
Carpenter	08/01/88	35,255	200	176.4	816	1,141	203	4,574	4,082 - 5,065	26	23 - 29
Morvro	07/29/88	17,333	200	86.6	578	682	144	2,727	2,387 - 3,067	31	28 - 35
"X"	07/28/88	20,843	206	101.4	1,059	485	162	3,160	2,798 - 3,523	31	28 - 35
Diamond	07/29/88	55,622	400	139	340	731	244	1,019	964 - 1,074	7	7 - 7
Kalmbach	07/29/88	51,850	415	125	1,325	318	149	2,820	2,512 - 3,128	23	20 - 25
Long (K/B)	07/28/88	30,575	411	74.4	1,015	1,052	218	4,885	4,376 - 5,394	66	59 - 73
Crystal	08/01/88	105,415	800	131.7	861	446	69	5,504	4,377 - 6,632	42	33 - 50
Honeybee	08/01/88	46,206	797	58	2,083	770	210	7,615	6,787 - 8,443	131	117 - 146
Little Lonely	08/01/88	44,820	800	56	1,563	1,313	467	4,391	4,124 - 4,658	78	74 - 83
Dawn	08/01/88	12,376	1,049	11.8	982	229	118	1,900	1,679 - 2,121	161	142 - 180

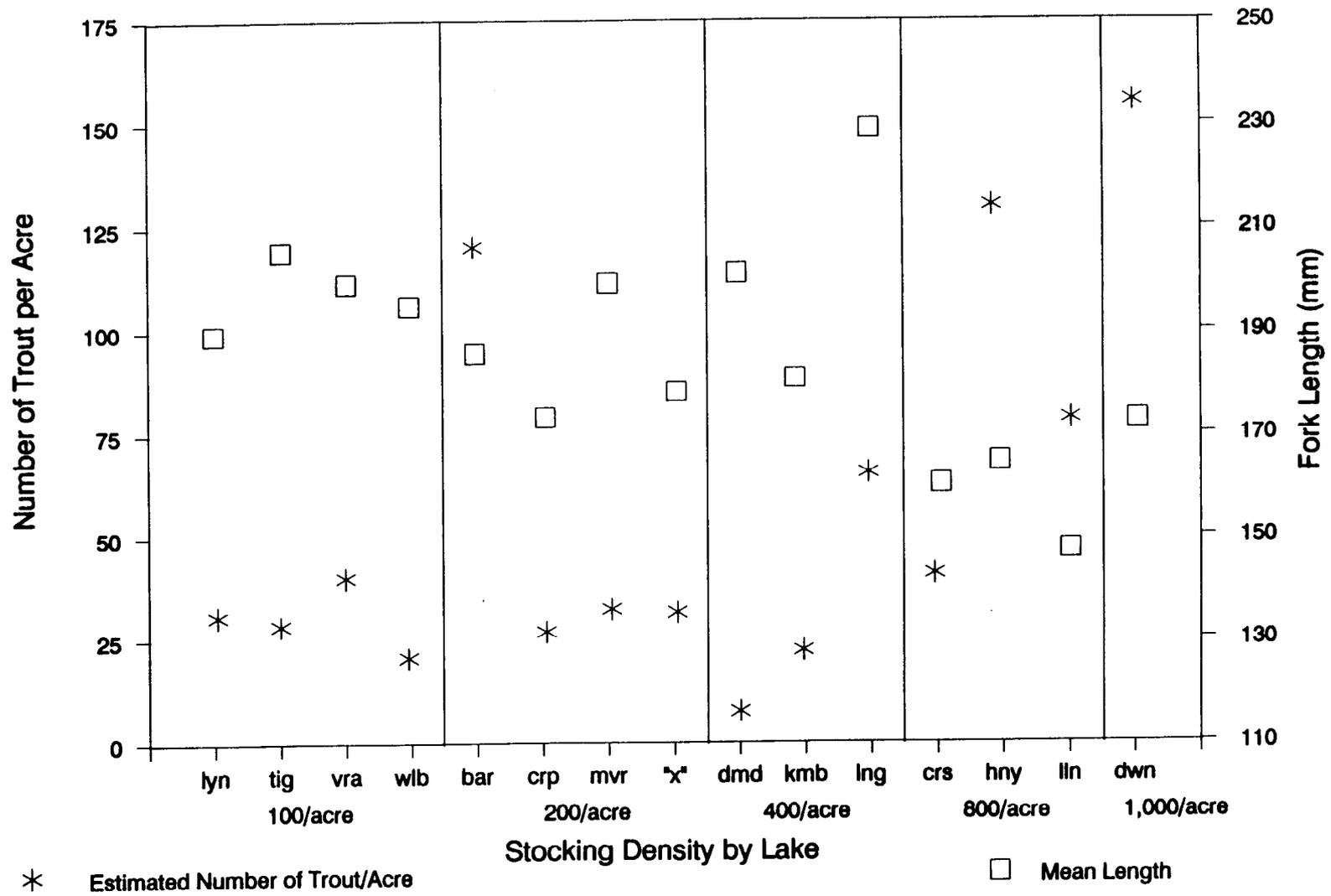


Figure 10. Estimated number of surviving rainbow trout per surface acre at age 1 and mean lengths at age 1+ of Swanson strain rainbow trout stocked at various densities in selected Matanuska-Susitna Valley lakes, 1988.

Table 8. Population estimates for diploid (LV) and triploid (RV) rainbow trout of Swanson River origin in Johnson Lake, 1989.

Lake	Date Stocked	Number Stocked	Size Stocked	Summer	Fall 1989		Petersen Population Estimate			
				1989	-----		-----			
				Number Marked	Total Captured	Marked Recaptures	Number	95% CI	Survival	95% CI
Johnson	09/13/88	1,000 LV	2.00g	165	308	95	534	477 - 592	53%	48% - 59%
		977 RV	2.00g	144	277	89	448	401 - 494	46%	41% - 51%

Table 9. Stocking history and length data for diploid (LV) and triploid (RV) rainbow trout of Swanson River origin captured by fyke nets in Johnson Lake, 1989.

Lake	Date Stocked	Number Stocked	Fish/Acre	Size Stocked	Date Captured	Number Measured	Length		
							Mean (mm)	SE	Range (mm)
Johnson	09/13/88	1,000 LV	25	2.00g	07/17/89	165	166	1	128-206
					10/13/89	307	220	1	147-286
		977 RV	24	2.00g	07/17/89	144	163	2	120-207
					10/13/89	250	214	1	159-272

determine if trout with restricted gonad development are significantly different in mean length from normal trout of the same age class.

Johnson Lake was stocked in September 1989 with equal densities of diploid and triploid rainbow trout. It was estimated that all fingerling marked with an RV finclip were triploid (Carmen Olito, personal communication). Fyke nets fished on 10 October captured 237 diploid and 99 triploid age 0+ trout (Appendix A1). Estimates of survival to age 1 and mean length at age 1 and age 1+ should be performed.

#### ACKNOWLEDGEMENTS

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APPENDIX A

Appendix A1. Stocking history and length data for rainbow trout of Swanson River origin captured by fyke nets in selected Matanuska-Susitna Valley lakes, 1989.

Lake	Date Stocked	Number Stocked	Fish/ Acre	Shoreline Mile	Size Stocked	Date Captured	Number Caught	Catch/ Net Hour	Number Measured	Length		
										Mean (mm)	SE	Range (mm)
Lynne	07/19/89	6,990	100	3,679	1.4g	09/20/89	793	3.80	26	96	1	78-108
Tigger	07/13/89	2,020	107	2,244	1.5g	09/18/89	0					
Vera	07/19/89	11,025	100	3,938	1.3g	09/26/89	1,210	5.90	49	107	1	89-120
Walby	07/19/89	5,390	100	3,850	1.5g	09/13/89	38	.08	16	72	1	62- 83
Barley	07/19/89	3,720	200	4,650	1.5g	09/28/89	1,471	9.20	21	103	2	84-120
Carpenter	07/19/89	35,280	200	9,284	1.1g	09/28/89	2,551	12.40	51	93	1	77-109
Morvro	07/20/89	17,320	200	9,622	1.1g	10/03/89	1,695	7.80	25	89	1	72-106
"X"	07/13/89	20,487	202	6,402	1.5g	09/19/89	0					
Diamond	07/20/89	55,600	400	20,593	1.1g	09/06/89	2,187	2.55	24	79	1	68- 88
Kalmbach	07/20/89	52,000	416	22,609	1.5g	10/03/89	1,207	5.50	17	89	2	73-104
Long (K/B)	07/13/89	29,914	402	12,464	1.5g	09/29/89	162	0.45	42	91	1	70-115
Crystal	07/19/89	105,442	801	37,658	1.5g	09/25/89	10,945	19.20	20	74	2	39- 88
Honeybee	07/19/89	46,150	796	20,065	1.4g	09/21/89	240	1.50	27	79	2	62-100
Little Lonely	07/19/89	44,805	800	24,892	1.3g	09/22/89	995	2.90	18	82	2	72- 97
Dawn	07/19/89	9,440	800	15,733	1.5g	09/12/89	1,203	5.12	27	84	1	69- 97
Johnson	09/15/89	2,017	LV 50		3.0g	10/10/89	237	0.71	27	79	1	68- 94
		2,057	RV 50		2.7g	10/10/89	99	0.29	35	76	1	64- 89

