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STATE OF ALASKA

William A. Egan, Governor

Alaska Department of Fish and Game

C. L. Anderson, Commissioner

Sport Fish Division

E. S. Marvich, Director

ANNUAL REPORT OF PROGRESS, 1959-1960

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-1

SPORT FISH INVESTIGATIONS OF ALASKA

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Introduction

This report of progress consists of the Job Completion Reports from the State of Alaska's Federal Aid in Fish Restoration Project F-5-R-1.

In 1959 the Alaska Department of Fish and Game, as an agency of the new state, became eligible for participation in the program. Prior to this time the Federal Aid in Fish Restoration activity in Alaska had been a function of the Fish and Wildlife Service. During territorial status the federally conducted operation was appreciably less than the program now possible as a state.

The new state program under the Dingell-Johnson Act was activated July 1, 1959. Eleven separate studies made up the "Sport Fish Investigations of Alaska" project. Eight of the eleven were designed to reconnoiter the state's recreational fisheries resource and to provide background for the development of specific investigations as the need became apparent. Three problems of immediate concern appeared sufficiently defined and full scale investigations were mounted to explore their management implications. These included studies of Arctic grayling, Southeastern king salmon and recreational fishing access.

All of the investigations pose problems unique to Alaska in some respects and all provide ample scope for original work in the fisheries field. The recreational fishing access study is an example. Most of Alaska's fishing waters are still in the public domain and unfettered by private holdings--a unique situation. Successful prosecution of this activity now and in the immediate future can forestall many of the serious recreational use problems currently facing other states.

The various studies were staffed as personnel were recruited. Field work began as the supplies and equipment were procured. Initial progress was slowed somewhat by this and the necessary period of personnel indoctrination. A "cutoff" date for each job from one to three months before July, 1960 shortened the period covered. As a result, these first reports encompass an effective working period of considerably less than one year.

The enclosed progress reports are fragmentary in many respects and the interpretations contained therein are subject to re-evaluation as the work progresses.

Volume 1 Report No. 2-C

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1959-1960 SEGMENT

State: ALASKA

Project No.: F-5-R-1 Name: Sport Fish Investigations of Alaska

Job No.: 2-C Title: Creel Census and Population Sampling of the Sport Fishes in the Cook Inlet and Copper River Drainages

Period Covered: July 1, 1959 to March 30, 1960.

Abstract:

Preliminary investigations for establishing creel census and population sampling studies were made in the Upper Cook Inlet and adjacent areas during the initial year of the project.

During the winter of 1959-1960 an intensive creel census was conducted on Wasilla, Big and Mirror Lakes, using stratified random sampling techniques of a comparatively sophisticated design.

Two of the study areas, 400 acre Wasilla Lake and 3200 acre Big Lake, are located in the foreplain of the Matanuska Valley and have considerable natural reproduction of salmonoids. The third, Mirror Lake, has an area of 85 acres, is extremely shallow, and is located 24 miles from Anchorage on the highway to the Matanuska Valley. Mirror Lake is intensively managed, including an artificial recruitment of salmonoids added annually.

Wasilla Lake, Big Lake and Mirror Lake bore estimated sport fishing pressures of 1,406, 1,948, and 1,617 angler hours respectively. The rates of success for Wasilla Lake, Big Lake and Mirror Lake in the order named were 0.56, 0.44 and 0.76 fish per hour of angling effort. A point of considerable interest was the preponderance of young silver salmon in the catch from Big Lake (48.5%) and Mirror Lake (76.6%).

Objectives:

To investigate and measure the sport fish population trends and fishing success in major recreational fishing waters which are readily available to the area's anglers.

To evaluate the effect of management procedures currently applied to sport fishing waters.

To provide recommendations for the management of those waters.

Introduction:

There has been an increasing demand for information concerning the sport fishing pressures and harvest in the accessible lakes to the Anchorage and Matanuska Valley populations, particularly those lakes that have previously acquired some management by stocking and rehabilitation. Of some concern is the part of the winter sport fish catch made up of juvenile salmon in lakes providing rearing areas for salmon species. To these ends it was decided that a quantitative and qualitative study be made.

The areas selected for study support the largest percentage of winter sport fishing pressures because of their accessibility, and accommodations, and the availability of the species sought.

Big Lake is located on the western edge of the Matanuska Valley about 14 miles west of the town of Wasilla on a good paved and graded road. It has a surface area approaching 4,000 acres, with a major outlet, Fish Creek, emptying into Knik Arm. Species present are: rainbow trout, silver salmon, red salmon, fine scale sucker, two species of whitefish, dolly varden, lingcod (Burbot) and stickleback. In 1952, pressure studies by the Fish and Wildlife Service indicated that 10.9 percent of all fishing in the mainland south of the Alaska Range occurred here. There is a comparatively high summer residential population and over 500 cabins on the lake shore.

Wasilla Lake is located about in the center of the Matanuska Valley foreplain one mile east of the town of Wasilla. A paved highway extends to the lake from Palmer and Anchorage. Wasilla Lake has an estimated surface area of 370 acres with a single major outlet, Cottonwood Creek, into Knik Arm. Species of fish present are: rainbow trout, silver salmon, red salmon, fine scaled sucker, dolly varden, and stickleback. Wasilla Lake is part of an important salmon rearing system with large numbers of migrant adult silver and red salmon entering the system each summer and fall. Summer sport fishing pressures are intensive for the rainbow present.

Mirror Lake is located 24 miles from Anchorage on the Palmer Highway. The surface area of Mirror Lake is 85 acres. It has been under intensive management by the Alaska Department of Fish and Game since 1955, when it was rehabilitated with rotenone and successfully stocked with rainbow trout and silver salmon fry on an annual basis. Mirror Lake receives intensive summer and winter sport fishing pressures for the stocked silver salmon and rainbow trout.

Techniques:

Background information from the Fish and Wildlife Service and the Alaska Department of Fish and Game were utilized to provide direction for the initial phases of Job No. 2-C. The assessment of immediate problem areas was initiated and review of fresh water creel census techniques undertaken. The preliminary study sufficed to narrow the scope of the investigation to an intensive creel census of three bodies of heavily fished water in the Matanuska Valley. The objectives of this immediate study became:

1. To determine the total fishing pressure and sport fish harvest of Wasilla, Big, and Mirror Lakes.

2. To obtain catch ratio estimates between trout, char and salmon entering the sport fish catch.

3. To determine the extent of use of the sampled areas by winter sport fishermen by locality of residence.

4. To evaluate the present regulations in view of future management recommendations.

Techniques from California, Utah and Iowa workers were used in designing a creel census. Random-Stratification was employed in the selection of count days.

The duration of the fishing period was 126 days for Wasilla Lake and Big Lake, and 98 days for Mirror Lake. Fifty percent of the days during the fishing period were selected for sampling. The season was stratified into two week periods starting on December 1, 1959, and ending on March 30, 1960, for Wasilla and Big Lakes, and starting on December 21, 1959, and ending on March 30, 1960 for Mirror Lake.

Week days and weekend days were treated in separate ways. Week days were selected in random order, without repetition. The first weekend was selected by chance and and all following weekends in alternate order.

Because of the unique vagaries of winter ice fishing, each day sampled represented a complete count of all fishermen and their catch for that day. All fishermen on the sampled lake were contacted upon completion of fishing, interrogated as to number of hours fished, and a check of the anglers catch was made for scale samples and length and weight measurements. In most cases the angler was contacted at the beginning of fishing as well as at the completion of fishing.

Per strata estimates of total fishing pressure and total catch were calculated as follows:

$$X' = N_{\bar{x}} = \frac{1}{f} X$$

Where:

X' = Estimated catch
N = Days in period
$\bar{x}$ = Average of all 7 sampling days
f = 7/14 sampling fraction day
X = Total catch for all 7 sampling days

Confidence intervals were calculated from the formula:

$$\bar{Y} - t.025\sqrt{\frac{s^2}{n-1}} < \mu < \bar{Y} + t.025\sqrt{\frac{s^2}{n-1}}$$

Creel Census Design:

There are many ways in which to design a creel census sampling program. If consideration is given to each of the varied factors involved, the design can give results of relative accuracy, but only if allowance is made to compensate for these factors. Considerable detailed information is required prior to the formulation of an accurate census design.

Before the factors of an individual design is attempted the following questions should be answered.

1. What is an efficient method of sampling?

2. What is an adequate method?

3. What degree of error is acceptable?

4. How important is the census?

5. What do you do with the data after you have collected it?

An efficient method is the method that will give representative and comparative results. Insufficient data collected sporadically several times during the fishing season obviously cannot give either representative or comparative results from year to year, locality to locality, or establish some trend in the fishery.

The adequacy of a method of sampling simply means; is the data collected reliable enough to arrive at estimates or conclusions with any amount of precision? Experimental tests of sampling designs based on known 100 percent data have shown that an adequate number of weekends, holidays, and week days are necessary to obtain a reliable estimate of the total yield and number of anglers. (Best and Boles, 1956). In waters subject to considerable fluctuation in daily pressures and a long average fishing day common to Alaska, it can be seen that the sampling of creels must occur on a large number of days.

Acceptable limits of error provide criteria for determining the effort of sampling and the frequency of sampling. The upper and lower limits of accuracy can be set, but difficulty arises in establishing the location

of probable error within these limits. Increased frequency of sampling and larger sample sizes will reduce this error by further restricting the upper and lower limits. This is costly and time consuming however, and can defeat the purpose of sampling by becoming overly elaborate.

Outside factors to a large extent determine the importance of the census and the usefullness of the collected data. Residence of the anglers, relation to touristry, economic value of the fishery, effectiveness of regulations to cite a few. What happens to the collected data depends on these objectives. Firm objectives to answer specific questions should be stressed.

The term 'sophisticated' has been given to a census using intensive sampling designed to deal with the vagaries of each particular situation. In effect, each creel census design is tailor made to the situation according to the species of fish which the angler seeks, physical location of the area, size of the area, and any other applicable factors.

To note a few of the variables which affect in some manner the census design, largely from Neuhold and Lu, (1957).

A. 1. Weather at nearby centers of population.
   2. Time of day.
   3. Difference in mean pressures between week days, weekend days and holidays.
   4. Air temperature.
   5. The time of season.
   6. Number of trips and rate of success.
   7. Differences in mean numbers of fishermen between days following good or bad periods of success.
   8. Contact of all anglers on completion of fishing.
   9. Length of fishing period in the average fishing day.

B. Fisherman counts.

   1. Progressive count
      a. Starting point
      b. Direction of movement of census taker.
      c. Number of counts (a sample count at sufficient intervals of the average fishing day).

2. Instantaneous count.

All of the above are not unresolvable but must be considered in the design which tends to create a complex program highly dependent on the training and aggressiveness of the individual census taker. An attempt was made to formulate a complex (sophisticated) design incorporating accommodations and controls for the greatest possible accuracy in measuring winter fishery on Wasilla, Big and Mirror Lakes.

Findings:

Sampling periods were of two weeks duration and are listed as follows:

Location: Mirror Lake

Period	Dates
I	December 21 to January 3
II	January 4 to January 17
III	January 18 to January 31
IV	February 1 to February 14
V	February 15 to February 28
VI	February 29 to March 13
VII	March 14 to March 27

Location: Big Lake

Period	Dates
I	November 31 to December 13
II	December 14 to December 27
III	December 28 to January 10
IV	January 11 to January 25
V	January 25 to February 7
VI	February 8 to February 21
VII	February 22 to March 6
VIII	March 7 to March 20
IX	March 21 to March 30

Location: Wasilla Lake

Period	Dates
I	December 1 to December 14
II	December 15 to December 28
III	December 29 to January 11
IV	January 12 to January 25
V	January 26 to February 8
VI	February 9 to February 22
VII	February 23 to March 7
VIII	March 8 to March 21
IX	March 22 to March 30

Results of the creel census sampling are summarized for Wasilla, Big and Mirror Lakes in Table I.

Table I. Summary of creel census analysis, 1959-60 winter fishing season.

Location	Mirror Lake	Big Lake	Wasilla Lake
Average No. /FM/ day	6.87	4.24	3.89
Average No. fish/angler	1.9	1.6	1.7
Rate of success (F/hr.)	.76	.44	.56
Percent unsuccessful FM	56.9%	43.2%	45.5%
Average No. Hours Fished	2.5	3.65	3.05

Analysis of the sport fishery by periods is shown in tables 2, 3 and 4.

Table 5 presents the species composition in percent as determined from the creel checks.

Table 2. Fishery analysis by period, Mirror Lake, 1959-60.

Sampling Period	Number of Men Sampled	Total Estimated Men	Number of Fish Sampled	Total Estimated Fish	Number of Hours Sampled	Total Estimated Hours	Estimated No. of Silver Salmon	Estimated No. of Rainbow Trout	Rate of Success
I	90	180	210	420	236	472	330	90	.89
II	21	42	8	16	37.5	75	16	0	.211
III	57	114	131	262	149	298	204	58	.88
IV	63	126	165	330	160	320	266	64	1.03
V	60	120	91	182	157.5	315	142	40	.58
VI	14	28	0	0	23.5	47	0	0	0
VII	18	36	13	26	45	90	26	0	.29
Total	323	646	618	1,236	808.5	1,617	984	252	.76

Table 3. Fishery analysis by period, Wasilla Lake, 1959-60

Sampling Period	Number of Men Sampled	Total Estimated Men	Number of Fish Sampled	Total Estimated Fish	Number of Hours Sampled	Total Estimated Hours	Estimated No. of Silver Salmon	Estimated No. of Rainbow Trout	Rate of Success
I	14	28	20	40	28	56	36	4	.714
II	18	36	63	126	34.5	69	122	4	1.83
III	39	78	76	152	109.5	219	148	4	.694
IV	36	72	84	168	105	210	166	2	.80
V	45	90	72	144	127	254	144	0	.566
VI	29	58	28	56	85	170	56	0	.33
VII	30	60	32	64	163	326	64	0	.40
VIII	16	32	18	36	45	90	32	4	.40
IX	3	10	0	0	6	12	0	0	0
Total	230	464	393	786	703	1,406	768	18	.559

Table 4. Fishery analysis by periods, Big Lake, 1959-60

Sampling Period	Number of Men Sampled	Total Estimated Men	Number of Fish Sampled	Total Estimated Fish	Number of Hours Sampled	Total Estimated Hours	Estimated No. of Rainbow Trout	Estimated No. of Silver Salmon	Estimated No. of Dolly Varden	Rate of Success
I	29	58	73	146	74	148	10	90	46	.986
II	13	26	27	54	36	72	4	26	24	.75
III	25	50	74	148	67.5	135	34	46	68	1.09
IV	23	46	42	84	86	172	0	32	52	.488
V	34	68	81	162	149.5	299	0	50	112	.542
VI	37	74	32	64	161	322	2	18	44	.198
VII	56	112	46	92	203.5	407	12	56	24	.226
VIII	13	26	31	62	52	104	6	36	20	.596
IX	37	53	23	33	145	207	10	10	26	.158
Total	267	513	429	845	974	1,865	78	364	416	

Table 5. Species composition of the sport fish harvest for Mirror, Wasilla and Big Lakes, 1959-60.

	Species		
	Rainbow Trout	Dolly Varden	Silver Salmon
Mirror Lake	23.4%	*	76.6%
Wasilla Lake	99.7%	**	0.3%
Big Lake	9.1%	42.4%	48.5%

* Species not present
** Species present but none taken by anglers.

Table 6. Angler use by locality, Mirror, Wasilla and Big Lakes, 1959-60.

	Anchorage	Local	Military
Mirror Lake	51.5%	14.7%	33.7%
Wasilla Lake	36.5%	53.9%	9.6%
Big Lake	62.4%	24.1%	13.5%

Characteristics of the winter sport fishery on Wasilla Lake, Big Lake and Mirror Lake:

The winter sport fishery does not start in earnest in the Cook Inlet-Matanuska Valley until there is sufficient ice cover on the lakes to support automobiles. The automobiles serve as warming shelters for many.

In the 1959-60 winter fishery, sufficient ice cover on the three lakes investigated was observed during the second week of December. Prior to this time, through October and November, there was no fishing, or negligible fishing. The assumption is made that for all intents and purposes the summer sport fishery effectively ends with the opening day of the hunting season and resumes after ice cover. Skim ice during late October and November curtails fishing during this period.

Unique to winter creel census is the speed of coverage by the census clerk. The ability to drive a vehicle on the ice covered lakes permits very rapid angler interviews and resulted in complete angler contact during each sample day. All the anglers were interviewed after completion of their fishing and in most instances when they started fishing.

The winter period, characterized by very short periods of daylight, limited the fishing effort to between four and six hours per day. This concentrated fishing period also assisted the census coverage, enabling only one census taker to be on duty and obtain a complete census.

Wasilla Lake

The winter sport fishery on Wasilla Lake received a larger percentage of local fishing pressure than did Big Lake or Mirror Lake. These anglers were from the communities of Palmer and Wasilla. They accounted for 53.9% of the total intensity. (Table 6). Over half of the anglers interviewed caught at least one fish (Table 1).

Big Lake

Big Lake enjoys a more elaborate road system on the frozen lake surface than other lakes in the Matanuska Valley. Each year, as conditions permit, a road system is plowed through the snow and across the lake, connecting a majority of the shore front cabins. This road system accounted for

Big Lake being predominantly a weekend fishery. Fishermen would drive from Anchorage Friday evening or Saturday morning and stay over the weekend to fish. Accomodations are no problem at Big Lake with four lodges offering cabins and over 500 private dwellings present. This made feasible the approximately 140 mile drive, round trip, from Anchorage. In view of its size and apparent potential, the actual sport fishing pressure on Big Lake is very light.

Mirror Lake

Analysis of the sport fishing pressure on Mirror Lake showed considerable use by anglers from the Anchorage area, over 85% when the military anglers are combined. It appears the winter periods of short daylight and sub-zero temperature make the 130 mile round trip to the Matanuska Valley unattractive to many ice fishermen. They tend to concentrate on the lakes in close proximity to Anchorage during the periods when the air temperature drops below zero. This tendency also emphasizes the importance of maintaining or creating recreational fishing close to Anchorage for the ice fisherman.

The stocked silver salmon and rainbow trout provided an immensely popular recreational outlet. The silver salmon ranged between 7 and 8 inches and were the most frequently caught. Limits were common, even by small children.

Rainbow trout were less common in the catch, amounting to one in every four fish caught. Rainbow were considered by many as something extra, almost like a prize. Common feeling was that the silvers were the best size for eating. Size composition of the catch is shown in Figures 10 and 11.

Another aspect revealed by the angler interviews; in many instances the size of the fish or the number caught was not considered important. What these anglers felt important was the opportunity to get away from their routine life and to have an area easily accessible for providing this emotional outlet.

Weekday pressure was considerably higher at Mirror Lake than the other two sampled lakes. (Figure 6). Again, this was in part due to its close proximity to the angler population.

Differences in weekday and weekend angling pressures:

Figures 4, 5 and 6 indicate the differences in the number of fishermen counts between weekdays and weekend days. It can be repeated here that in formulating a sampling design for creel census it is imperative to treat weekdays and weekend days separately to reduce sampling error. Weekend days provided from 30 to 45 percent of all angling pressure.

Size composition of game fish entering the sport fish catch at Wasilla Lake, Big Lake and Mirror Lake:

The size composition for the game fishes entering the sport fishery at Wasilla, Big and Mirror Lakes are shown in Figures 7, 8, 9, 10 and 11.

As only one winter season's data is presented here, there is not sufficient information to make any assumptions as to trends in the populations.

It can be pointed out, however, that at Mirror Lake, 1958 plants of silver salmon and rainbow trout fry of 725 per surface acre were successful in surviving with an average growth of 5 inches during their 18 months of liberation.

Recommendations:

The 1959-60 winter sport fishery census on Wasilla Lake, Big Lake and Mirror Lake revealed relatively light angler use of lakes in the Matanuska Valley and the importance of management practices on those lakes near the Anchorage sport fishing population.

It is recommended that some liberalization of regulations be permitted on the large, natural reproducing lakes in the Matanuska Valley in the form of a year-round open season. It is further recommended that an experimental liberalization of gear be permitted in the allowance of three, marked and tended lines per angler through the ice only.

It is recommended that the overall creel census activity be continued through the succeeding job segment and conducted on water supporting a relatively intense summer fishery, primarily the Bonnie Lakes, Ravine Lake and Wiener Lake

Submitted by:

Rupert E. Andrews
Research Biologist
15 April 1960

Approved by:

Alex H. McRea
D-J Coordinator

E. S. Marvich, Chief
Sport Fish Division

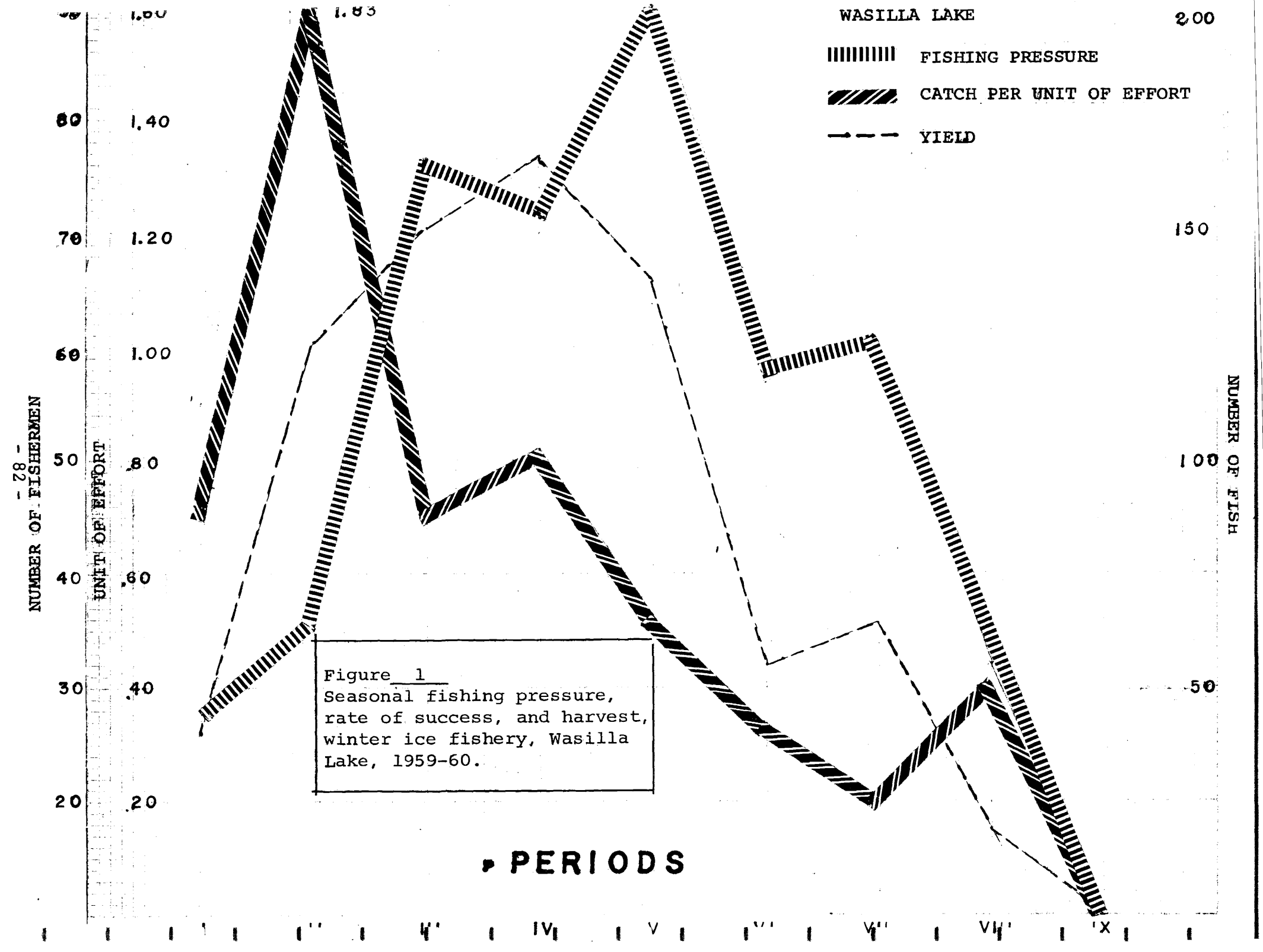


Figure 1
Seasonal fishing pressure, rate of success, and harvest, winter ice fishery, Wasilla Lake, 1959-60.

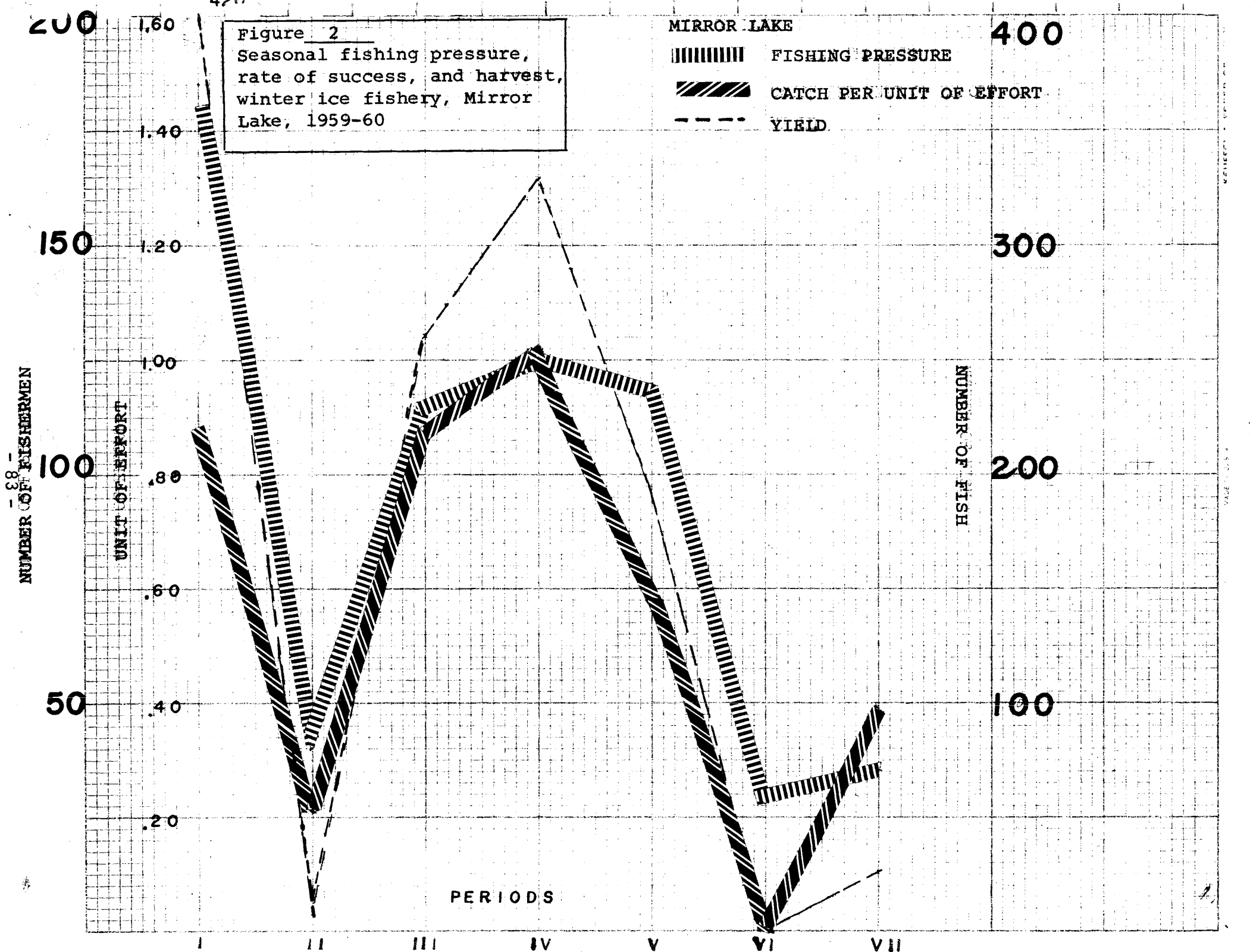


Figure 2
Seasonal fishing pressure, rate of success, and harvest, winter ice fishery, Mirror Lake, 1959-60
MIRROR LAKE
FISHING PRESSURE
CATCH PER UNIT OF EFFORT
YIELD
200
150
100
50
1.60
1.40
1.20
1.00
.80
.60
.40
.20
400
300
200
100
NUMBER OF FISHERMEN
UNIT OF EFFORT
NUMBER OF FISH
PERIODS
I
II
III
IV
V
VI
VII

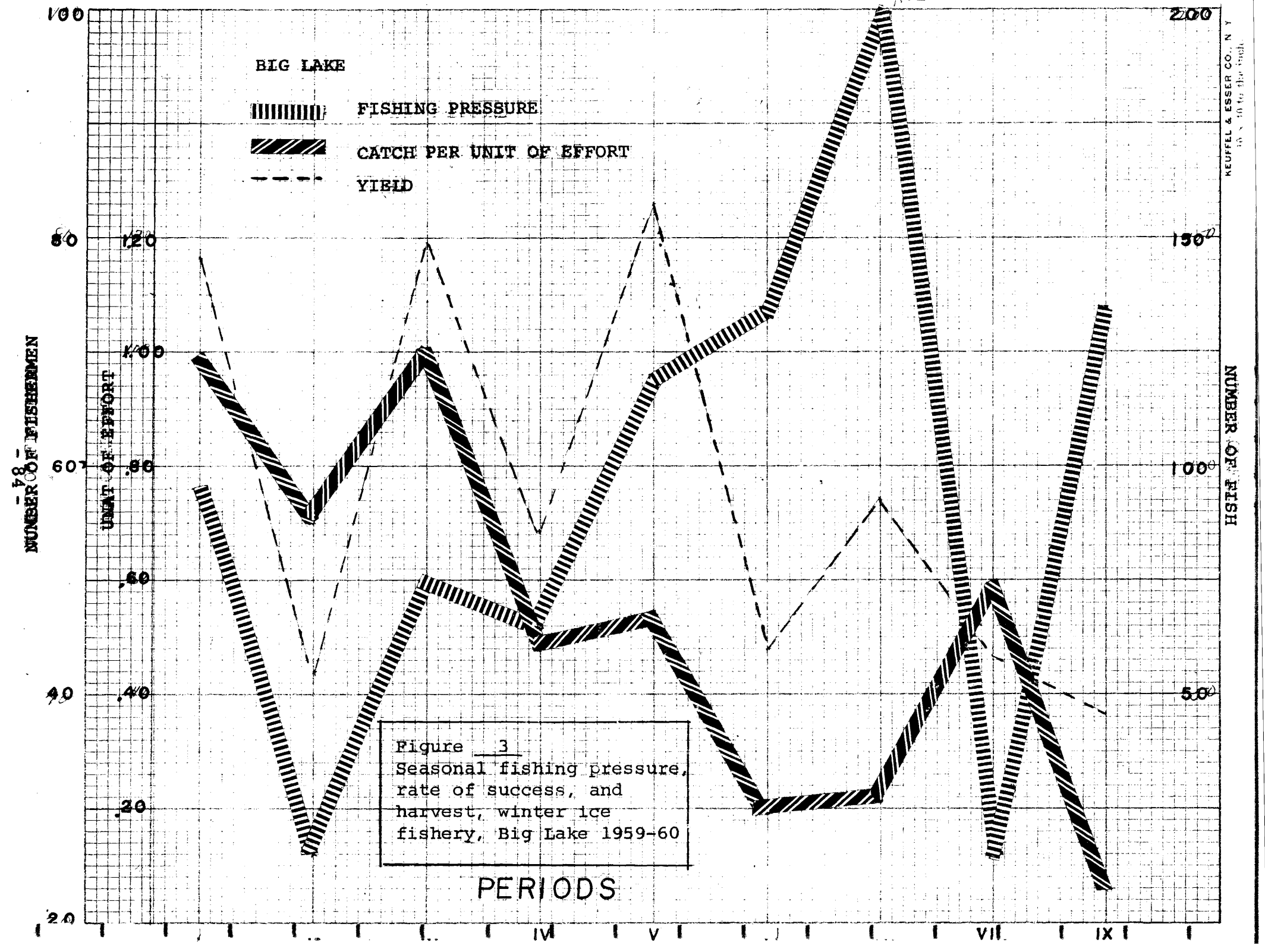
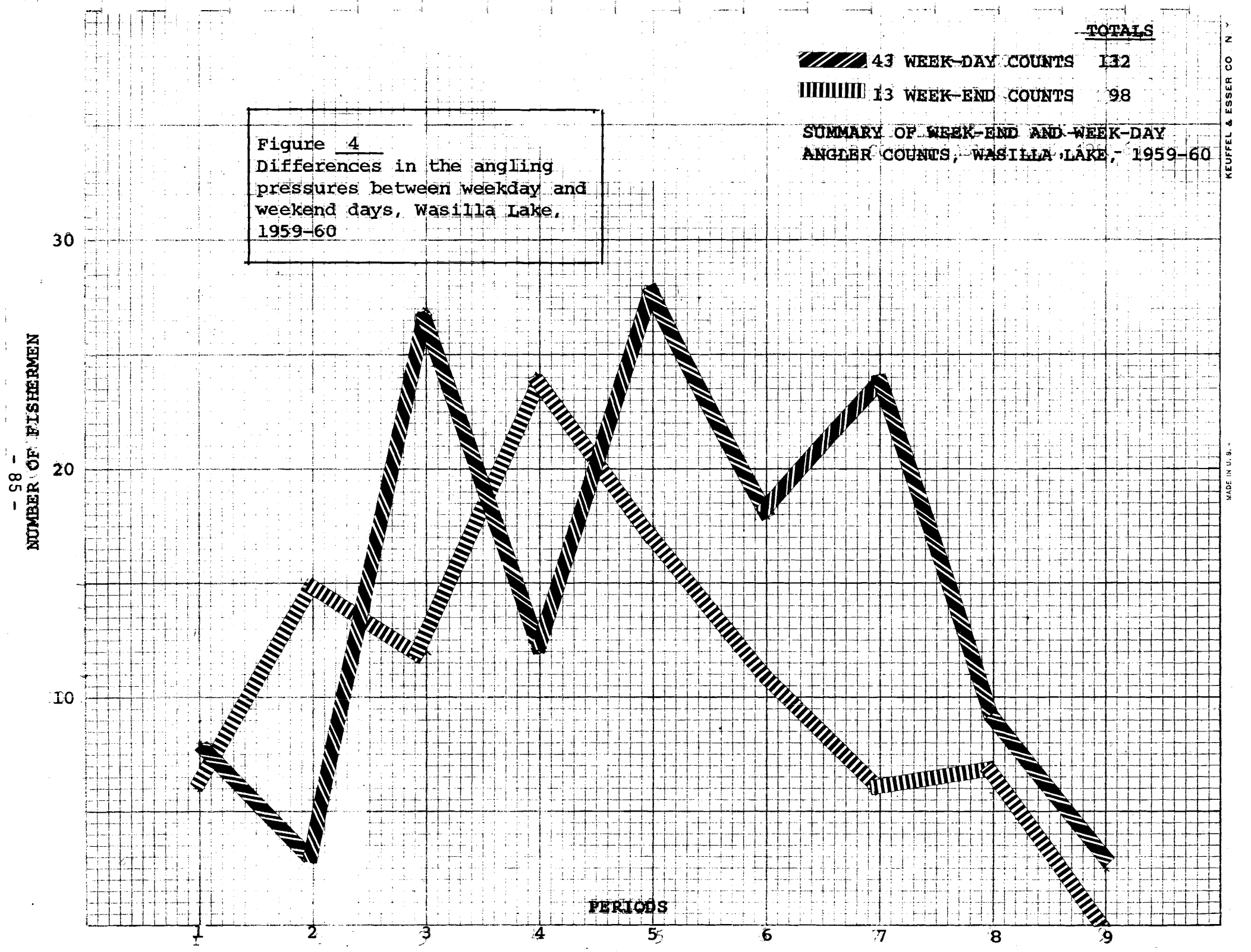


Figure 3
Seasonal fishing pressure, rate of success, and harvest, winter ice fishery, Big Lake 1959-60


TOTALS
43 WEEK-DAY COUNTS 132
13 WEEK-END COUNTS 98
SUMMARY OF WEEK-END AND WEEK-DAY ANGLER COUNTS, WASILLA LAKE, 1959-60
Figure 4
Differences in the angling pressures between weekday and weekend days, Wasilla Lake, 1959-60
NUMBER OF FISHERMEN
30
20
10
PERIODS
1
2
3
4
5
6
7
8
9
KEUFFEL & ESSER CO N Y
MADE IN U.S.A.

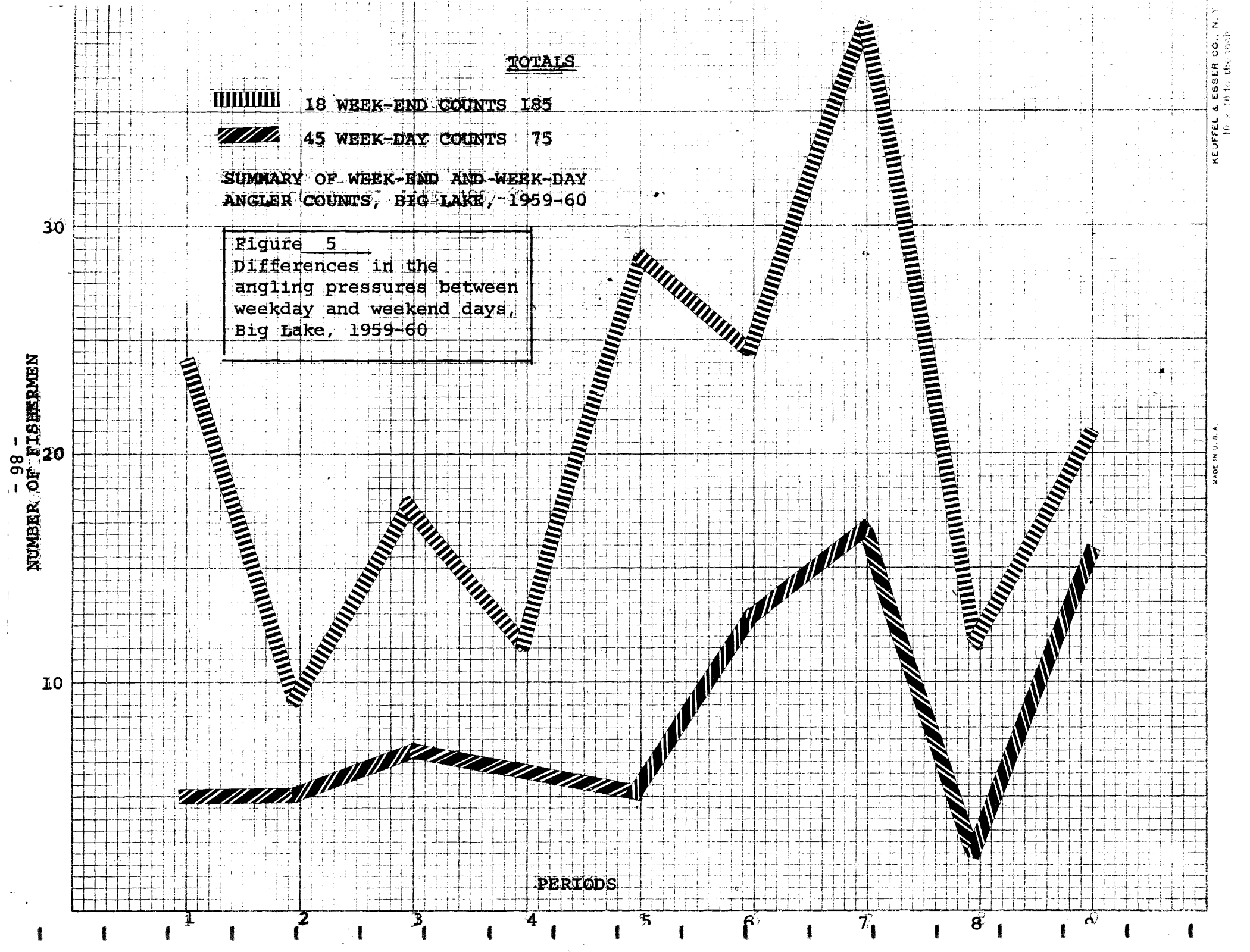


Figure 5
Differences in the angling pressures between weekday and weekend days, Big Lake, 1959-60

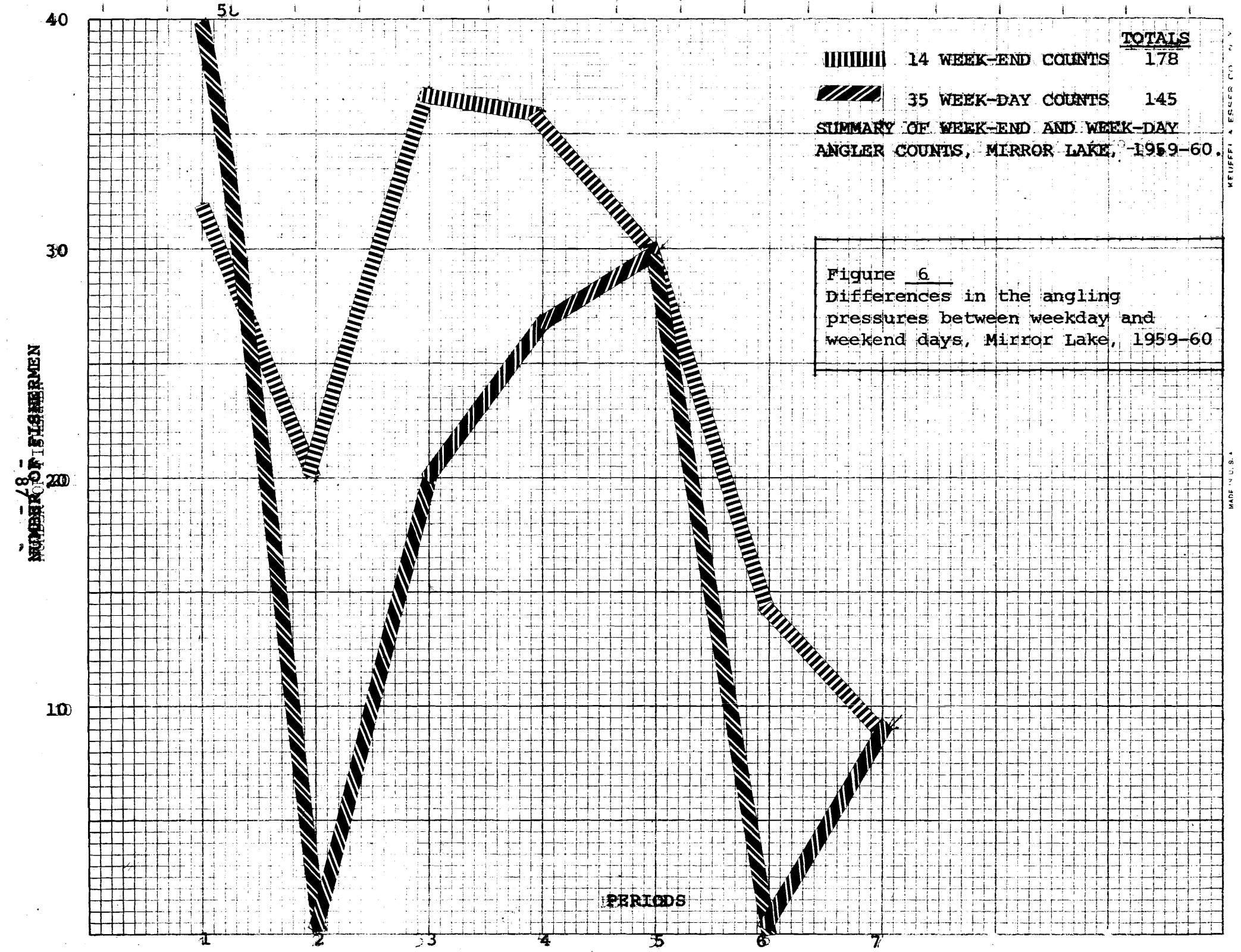


Figure 6
Differences in the angling pressures between weekday and weekend days, Mirror Lake, 1959-60

FIGURE 7.
LENGTH FREQUENCIES OF RAINBOW TROUT,
WASILLA LAKE CREEL CENSUS-1959-60

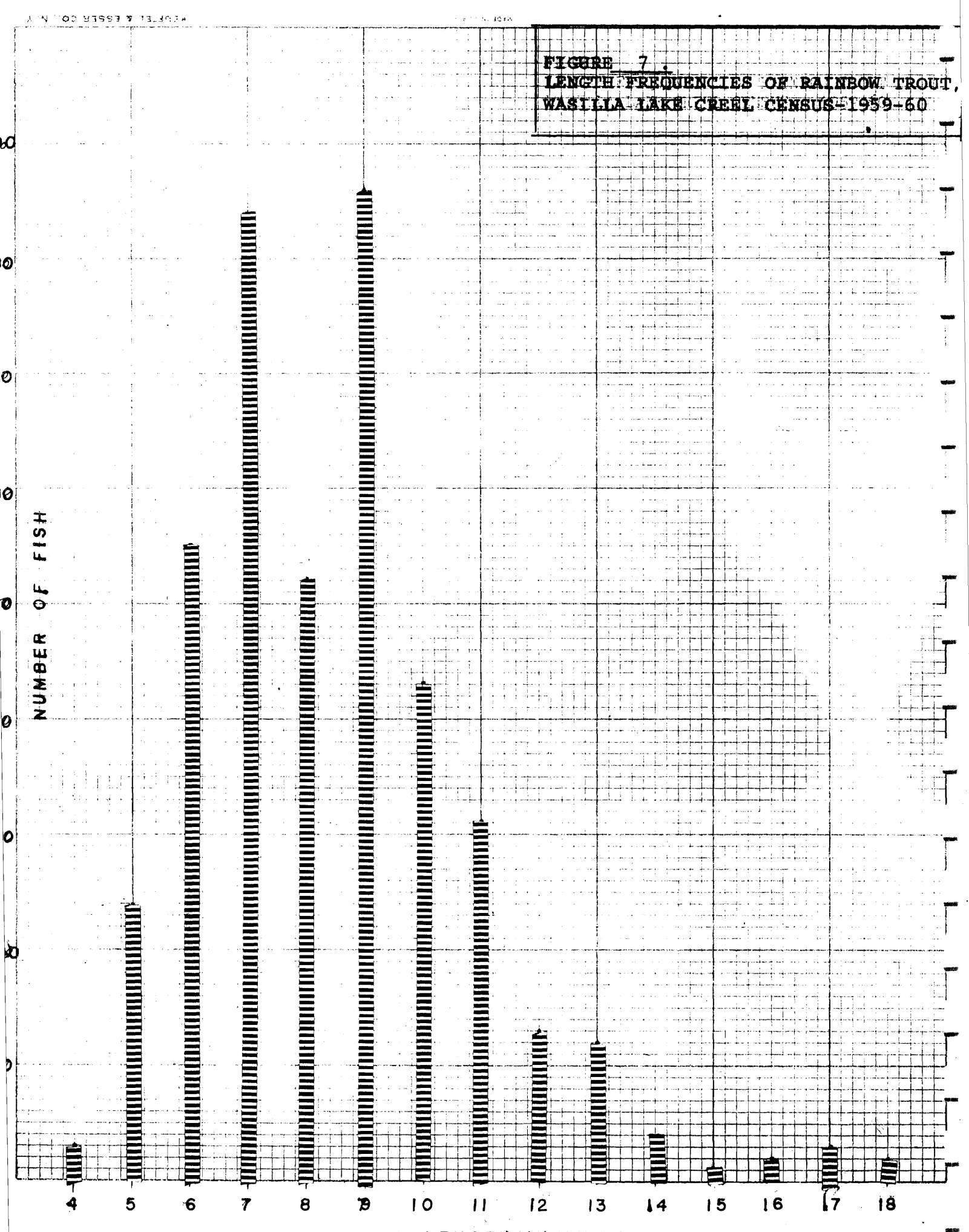


FIGURE 8
LENGTH COMPOSITION, RAINBOW TROUT
BIG LAKE, 1959-60

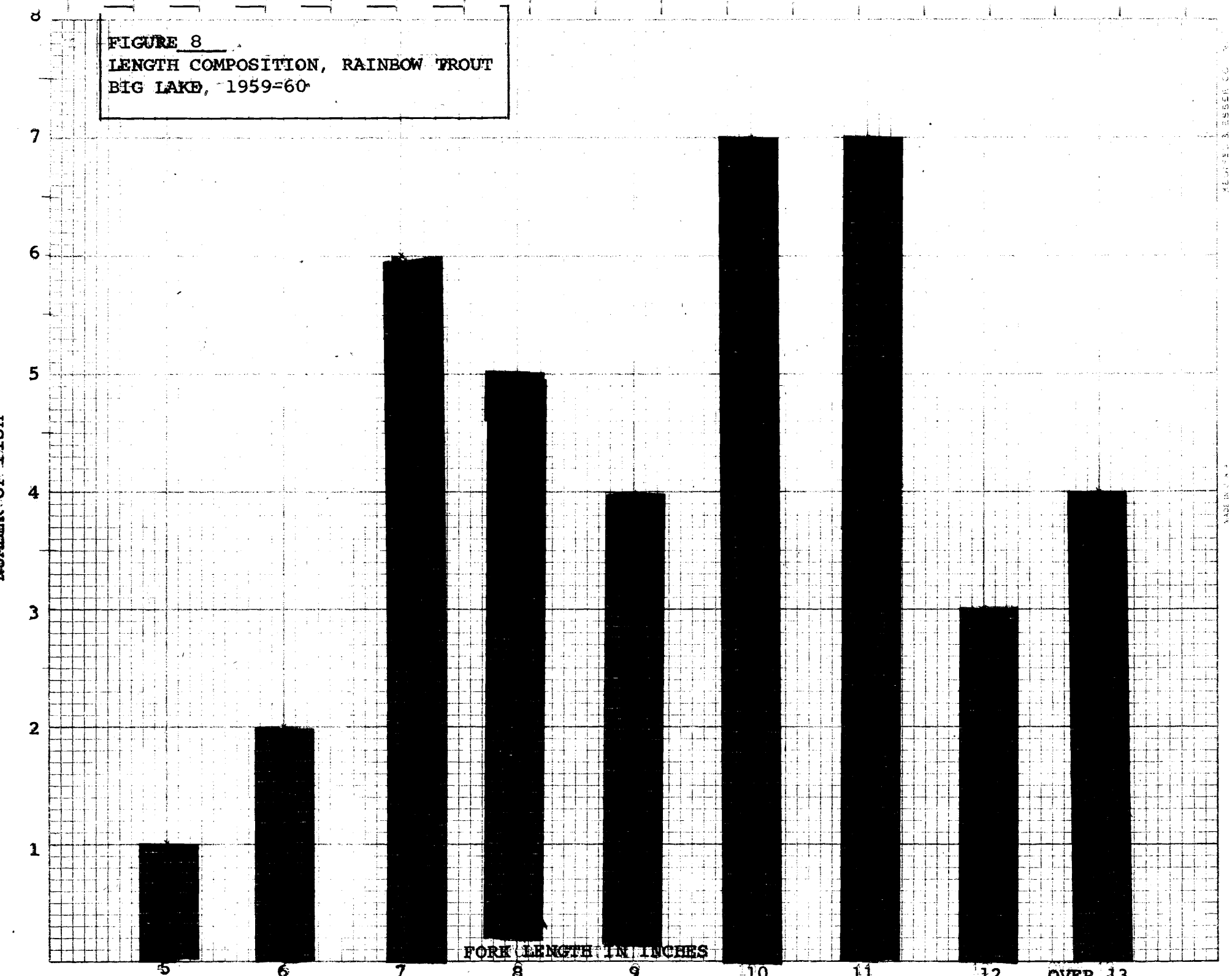
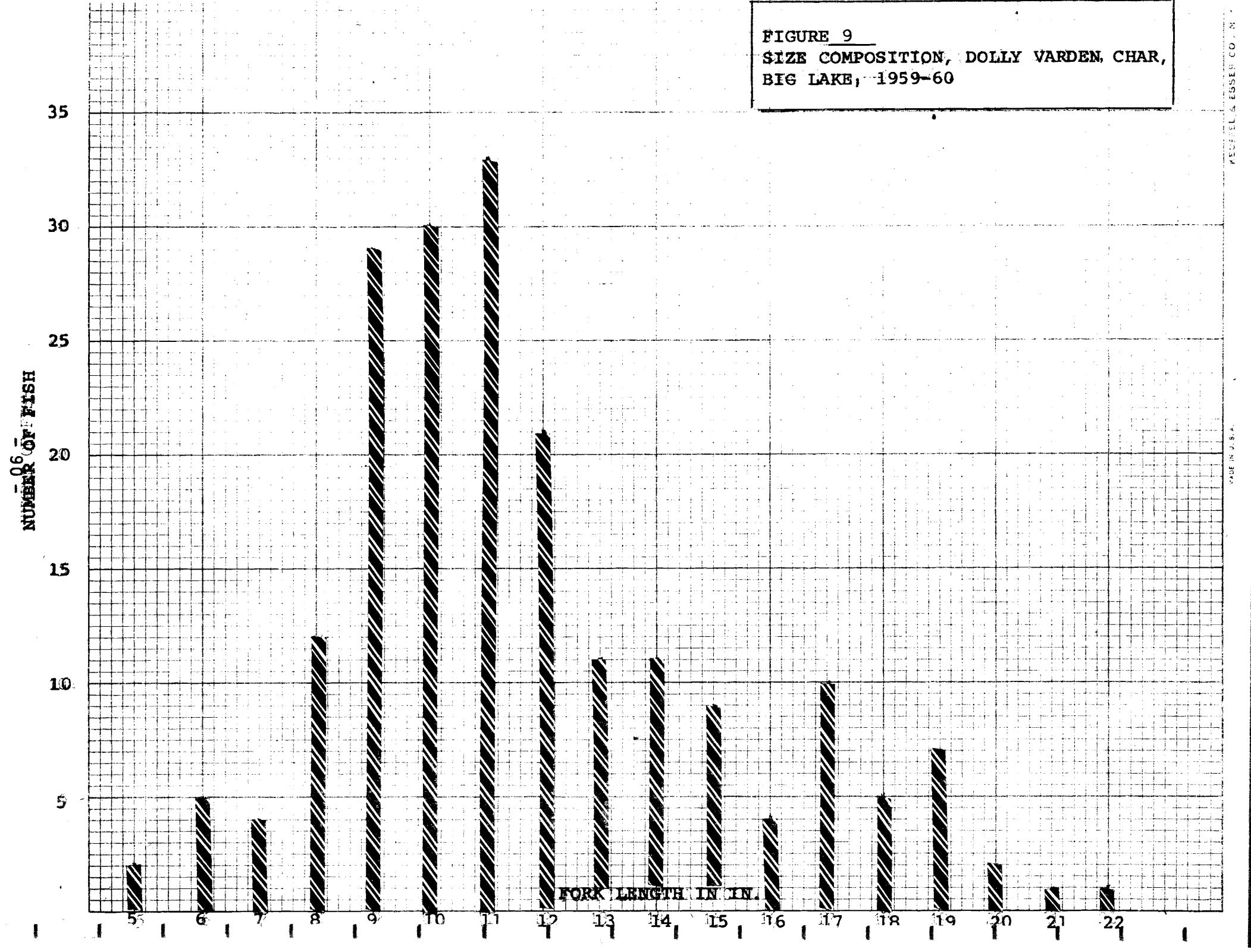


FIGURE 9
SIZE COMPOSITION, DOLLY VARDEN CHAR,
BIG LAKE, 1959-60



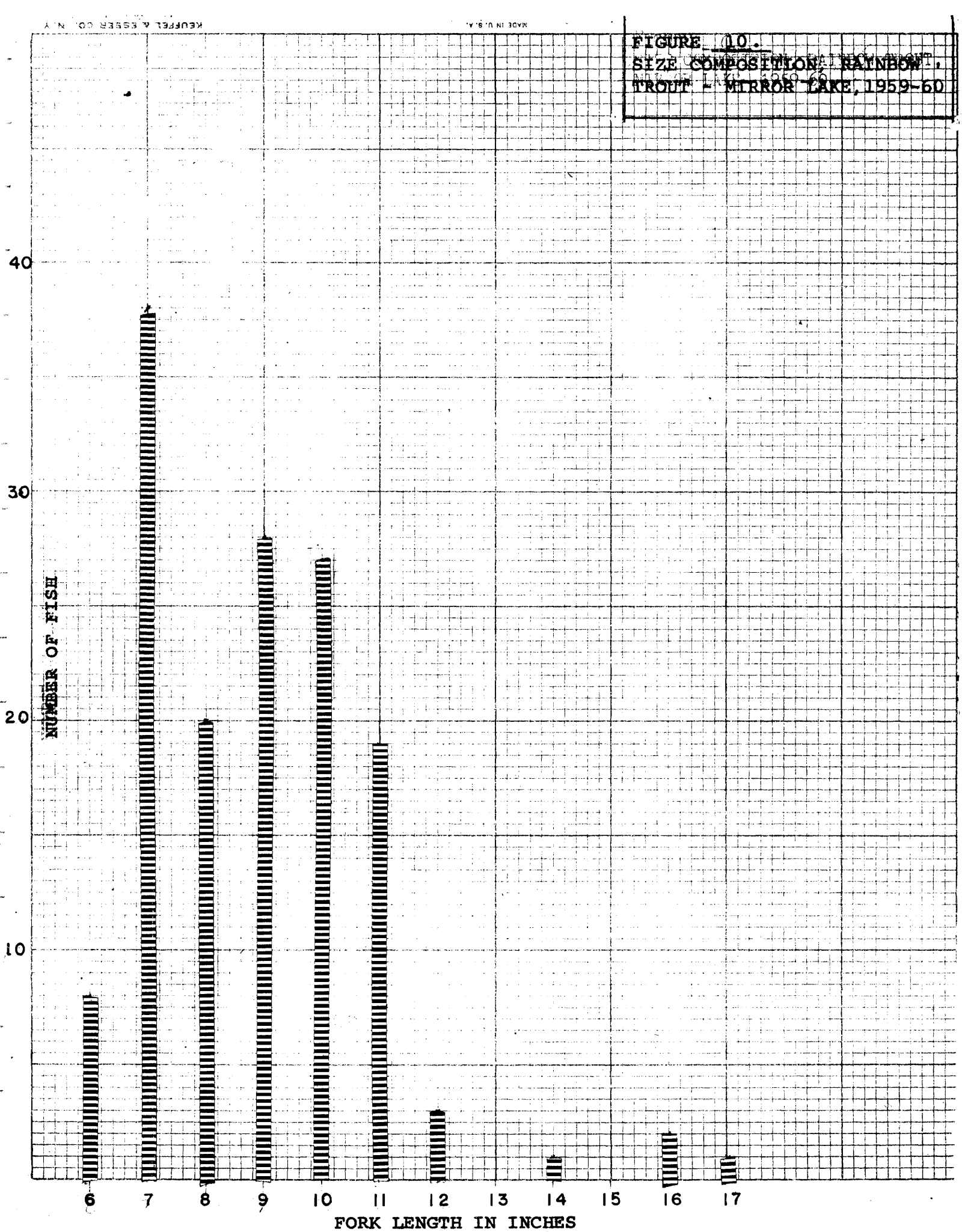
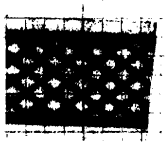


FIGURE 10.
SIZE COMPOSITION, RAINBOW TROUT - MIRROR LAKE, 1959-60
NUMBER OF FISH
40
30
20
10
6
7
8
9
10
11
12
13
14
15
16
17
FORK LENGTH IN INCHES

FIGURE 11 .
SIZE COMPOSITION, SILVER SALM
MIRROR LAKE, 1959-60

= 1959 PLANT



= 1958 PLANT

00

50

NUMBER OF FISH

00

50

3 4 5 6 7 8

FORK LENGTH IN INCHES

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