MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana Title Flathead Lake Fisheries Study

Project No. F-33-R-4 Title The Seasonal and Depth Distribution of

Job No. I-a the Fish Population in Flathead Lake

Period Covered July 1, 1969 through December 30, 1970

ABSTRACT

Length frequency distribution of total length measurements were prepared on 8,130 fish that represented eleven of the twenty fish species in Flathead Lake. These distributions were used as a basis to describe the population structures of these fish. The eleven species represent all of the major fish species in the lake except kokanee salmon.

The seasonal distribution pattern, populations characteristics, summary of age and growth data and a frequency histogram are presented by species.

Fish species discussed include: Dolly Varden, lake whitefish, pygmy whitefish, mountain whitefish, lake trout, cutthroat trout, northern squawfish, peamouth, longnose sucker, largescale sucker and yellow perch.

BACKGROUND

Fisheries managers on large deep oligotrophic lakes in the western United States have generally had similar problems. These large lakes usually contain populations of migrating salmonids that require the development of specialized equipment to adequately understand the populations during both their lake and stream residency. Knowledge of both habitats and the relationship that exists between them is most essential to maintaining the fisheries resource. The assessment of such relationships are complex. Often the situation is complicated by changes in water quality, water levels and flows that can result from water development projects. The most drastic example is complete loss of spawning accessability to a river or stream by a dam or diversion.

Flathead Lake, in northwestern Montana, is part of a large interdependent lake-river system. This system offers the public a national renowned lake and stream fishery and many other types of water-based recreation amidst a setting of mountains. The lake has 126,000 surface acres with a maximum depth of 400 feet. It is fed by a watershed containing over 180 river miles which includes portions of Glacier National Park and the Bob Marshall Wilderness.

Fishery investigations in the area were first initiated in 1953 and were directed toward the assessment of the fishery in the river system above the lake. The result of this work clearly defined an inter-dependency of this lake and river system.

OBJECTIVES

The objectives of this study are to develop techniques for using specialized equipment in determining the relative abundance of the various fishes in the lake to determine their seasonal geographic and depth distribution and to establish criteria for measuring year to year trends in species populations.

PROCEDURES

A year-around fish sampling program was initiated in October, 1966 on Flathead Lake to define the seasonal and depth distribution of fish. Eleven specific areas of the lake, selected on the basis of ecological characteristics (Hanzel, 1970) have been sampled periodically during twelve netting series. These sampling series were grouped into the four seasons: winter, spring, summer and fall.

Sampling was conducted from a 35-foot boat, the "Dolly Varden", formerly a commerical fishing boat and now modified to handle specialized fishing gear. The boat is rigged with gill net reel, a boom and a hydraulic powered winch. It also has recording sonar that is capable of giving precise bottom measurements, locating fish and recording their depth and area distribution.

Gill nets used for this study ranged from an 8-foot by 125-foot net with five mesh sizes to a net 8-foot by 1,300-foot with eight different meshes. Sections of net 24 feet deep were frequently added to give further information on depth distribution. Although the nets used varied in size and length the predominant net (65 percent of 191 sets) consisted of a specially designed net for Flathead Lake. This "Flathead Net" was 600 feet long with three sections: a 100-foot by 8-foot net containing a 50-foot section of 5/8-inch mesh (mesh in stretched measure) and another 50-foot section with 1 1/4-inch mesh; a 250-foot by 8-foot net; and a 250-foot by 24-foot net. The 250-foot nets have 50-foot sections each of 1 1/2, 2, 2 1/2, 3 and 4-inch mesh. The 250-foot by 24-foot net was not fished during most of the winter sampling period because of icing condition.

Typical sets were on the bottom and were fished overnight for a period of approximately 20 hours. Proper placement and alignment of the nets and depths were checked and recorded on sonar tape. Sets ranged in water depth from 8 to 144 feet.

All fish collected were measured to the nearest one-tenth inch in total length, (T.L.) weighed to the nearest one-hundredth of a pound and a scale sample extracted and stored in individual envelopes. The metric system of measurement (mm and g) was initiated in the field during 1969. A cursory examination was also made into the abdominal cavity for sex determination and gonadal development.

FINDINGS

The seasonal area and depth distribution of fish in Flathead Lake was recently described by Hanzel, 1970. In the discussion of fish distribution, no mention of fish lengths or ranges were made. It is the intent of this report to present a summary and discussion of the size and length frequency of eleven species of fish collected in Flathead Lake from October, 1966 through December, 1970.

Fish species discussed will include: Dolly Varden [1/], lake whitefish, pygmy whitefish, mountain whitefish, lake trout, cutthroat trout, northern squawfish, peamouth, longnose sucker, largescale sucker, and yellow perch. Length data on kokanee, one of the major fish species present in the lake will not be summarized because the information collected represents data on only maturing fish.

Eight other species of fish present in the lake will also be omitted from this report because of the small numbers collected. These fish are coho salmon, rainbow trout, brook trout, largemouth bass, pumpkinseed, redside shiner, slimy sculpin and black bullhead.

The fish measurements included in this report were collected during 12 netting series on Flathead Lake. The individual netting series are defined by dates, designated seasons, areas sampled and the number and lengths of nets used in Table 1. The seasonal fishing efforts are summarized and presented in Table 2. It is evident from these tables that fishing efforts were not constant during the series and that caution is required when interpreting and comparing the data presented on seasonal catch and species distribution. Winter and spring collection periods did show the lowest catches of total fish while the highest catches were recorded during the fall periods when 57.2 fish were caught per net set. The location of the designated sample areas (Figure 1) are the same as those described by Hanzel, 1970.

One additional sample area, Area 12, was included in this summary because sufficient fish data has accumulated from this most southern area of the lake and has not been previously discussed. This area frequently called Polson Bay represents an entirely different aquatic habitat compared to the rest of this deep oligotrophic lake by waters and currents of the Flathead River which flows through the area. Out flow volumes of the river and the lake level are controlled by Kerr Dam located approximately six miles downstream from the lake. Water storage and flood control manipulation patterns generally cause an annual 10 feet drawdown in lake water levels. This drawdown is more dramatic in this shallow bay area than in most areas of the lake. The bay contains approximately 30 square miles of water and has a maximum depth of 24 feet.

Frequency Distribution

Frequency distribution of total length measurements were prepared on 8,130 fish and will be used to describe the individual population structure of eleven of the twelve major fish species in the lake. As mentioned earlier, kokanee are omitted from these analyses.

[1/] Common names of fishes in this report are those given in American Fisheries Society, Special Publication No. 6. 1970. A list of common and scientific names from the United States and Canada. Pub. No. 2, Second Edition, 102pp.

Table 1. The description of twelve netting series on Flathead Lake by date, season, areas sampled, number and type of net used, October 1966 through December 1970

Series	Dates	Designated Season	Areas Sampled	Number of Sets	Lengths of nets used (feet)
A	10/66- 4/67	WINTER	1-2-3	9	-125 to 1,300
B	7/67- 8/67	SUMMER	1-2-3-4-5-6-8-9	9	-All 600
C	9/67-12/67	FALL	1-2-3-11	6	-All 600
D	1/68- 3/68	WINTER	1-4-5-6-7-8-9-10	19	-All 600
E	5/68- 7/68	SPRING	1-2-3-4-5-6-8-9-10-11-12	20	-600
				1	-125
F	8/68-10/68	SUMMER	1-2-3-4-5-6-7-8-9-10-11	19	-All 600
G	4/69- 5/69	SPRING	1	3	-All 600
H	6/69- 8/69	SUMMER	1-2-3-4-5-6-7-8-9-10-11	24	-All 600
I	9/69-12/69	FALL	1-3-4-5-6-7-8-9-10-11-12	26	-350
				2	-600
				1	-125
J	3/70	WINTER	1-2-4-5-8-9-10	7	-250
K	6/70- 8/70	SUMMER	1-2-3-4-5-6-12	11	-125
				9	-600
L	10/70-12/70	FALL	1-2-3-4-5-6-7-8-9-10-11-12	14	-600
				10	-125

Table 2. A seasonal summary of the fishery effort on Flathead Lake, October 1966 through December 1970

Seasons	Series	Number of Sets	Number of Fish	Percent	Number of fish/set
Winter	A:D:J	35	692	8.5%	19.8
Spring	E:G	24	591	7.3%	24.6
Summer	B:F:H:K	72	3,418	42.0%	47.5
Fall	C:I:L	60	3,429	42.2%	57.2
			8,130	100.0%	

Table 3. The size range in inches (in) and millimeters (mm), maximum weight of an individual fish in pounds (lbs) and grams (g), and total number of fish (by species) collected from Flathead Lake, October 1966 through December 1970

Species	Size Range (T.L.) Minimum in. (mm)	Size Range (T.L.) Maximum in. (mm)	Weight lbs.	Weight (g)	Number of Fish
Dolly Varden	6.6 (168)	36.0 (914)	18.50	(8,391)	985
Lake whitefish	5.5 (140)	23.9 (606)	4.92	(2,233)	2,446
Pygmy whitefish	3.1 (79)	7.2 (183)	0.10	(45)	551
Mountain whitefish	5.3 (135)	17.2 (437)	1.27	(576)	349
Lake trout	7.8 (198)	42.0 (1,067)	32.00	(14,515)	106
Cutthroat trout	8.5 (216)	20.2 (513)	3.30	(1,497)	70
Peamouth	4.7 (119)	13.3 (338)	0.79	(357)	1,439
Northern squawfish	3.4 (86)	22.3 (567)	4.50	(2,128)	1,200
Longnose sucker	4.5 (114)	18.2 (462)	2.09	(948)	178
Largescale sucker	6.4 (163)	25.6 (650)	3.52	(1,597)	104
Yellow perch	5.2 (133)	15.4 (391)	1.01	(496)	702
					8,130

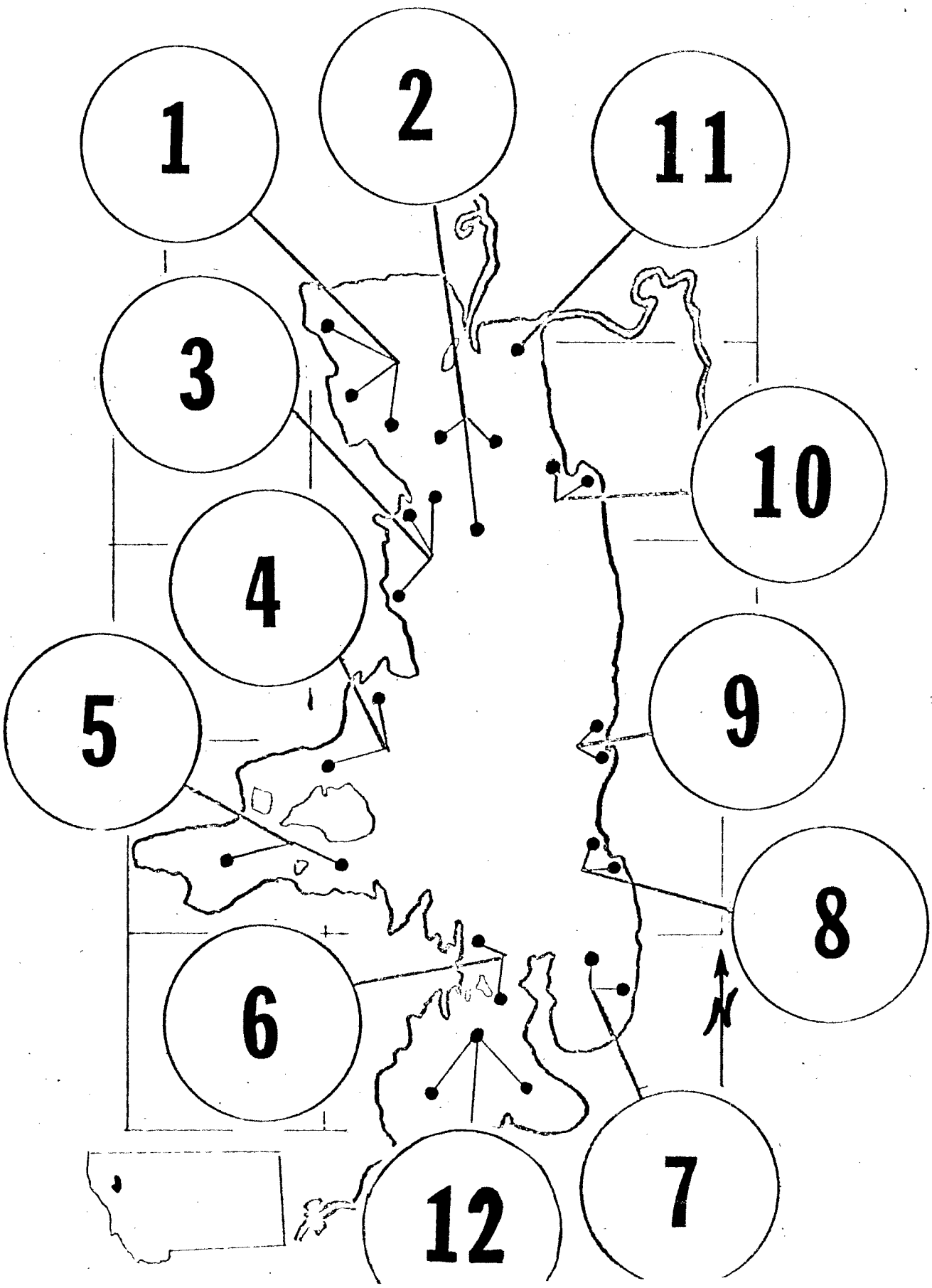

Figure 1. The location of areas and the number of points sampled in Flathead Lake, October 1966 through December 1970.

The length frequency intervals were selected from the size ranges of the species and age and growth data available from the lake. A summary of the size ranges, largest individuals (by weight) and the number of fish included in the frequency distributions are presented in Table 3. A summary of the available age and growth data used will be presented in the discussion by species. Scales were collected from a sample of each species and plastic scale impressions have been prepared. Examination and analysis are not complete at this time. Concentration areas, species peculiarities and preference zones will be discussed by species. All area references in the discussion will refer to those sample areas as numbered and shown in Figure 1.

Species length frequency histograms are presented in Figures 2 through 12 to pictorially describe individual population structures. The seasonal variation and availability within each frequency interval is also illustrated in the figures and is expressed as the seasonal proportion of that species caught by intervals. The figures also includes total number of fish enumerated by season in each interval and the seasonal percentage of these totals.

Species Discussion

Dolly Varden

Length frequency data were summarized on 985 Dolly Varden (Figure 2) with the largest fish weighing 18.5 pounds (8,391 g) and length measurements ranging from 6.6 inches (168 mm) to 36.0 (914 mm).

Age and growth information on Dolly Varden from Flathead Lake has been reported by Block, 1955 and Rahrer, 1963, Calculated mean lengths, in inches, at annulus formation by Block and Rahrer were as follows:

	AGE CLASS							
(Number of fish)	I	II	III	IV	V	VI	VII	VIII
Block (87)	3.0	5.9	9.2	13.2	18.0	22.3	27.2	30.7
Rahrer (289)	2.8	5.5	8.2	12.7	17.8	23.4	28.5	34.5

Block also determined the maturity of Dolly Varden in the Flathead River system to be at age five which occurs at approximately 18.0 inches.

The tabulation of the frequency information shows 68.3 percent of the Dolly Varden population in the lake to be less than 18 inches. These young or immature fish showed a particularly strong dominance in the spring catch data and represented 90.5 percent of their total numbers. Immature fish were 77.1 percent of the summers catch, 56.5 and 54.3 percent of the winters and falls catch, respectively.

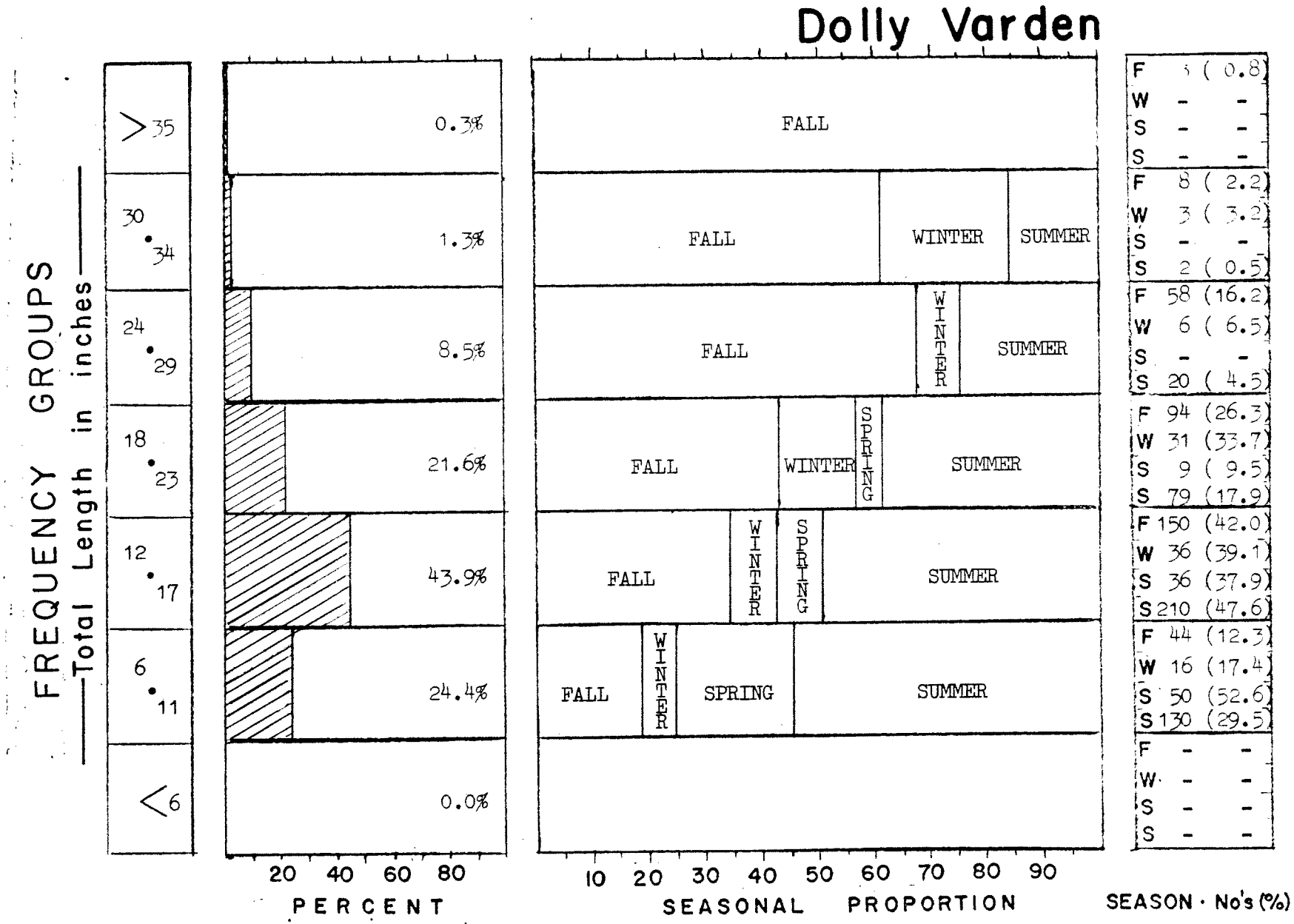

Figure 2. Length frequency distribution of 985 Dolly Varden collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

The group of fish from 12 through 17 inches showed little variation in the percentage of total fish taken during all of the sample seasons. This group's percentages ranged from 37.9 to 47.6 percent throughout the sample periods. Such consistent representation of immature fish, regardless of numbers, indicates a stable population that has consistent recruitment of young fish.

Block (1955) found sizeable populations of immature Dolly Varden ranging in size from 3.5 to 9.6 inches and mostly two to three years old in five tributary streams in the upper Flathead River system. No four year old fish were found in these tributaries. Dolly Varden, less than 6 inches in length, have not been taken in the lake, which further confirms the movement of these juvenile fish to the lake after they reach their third year of life.

The seasonal incidence (Figure 2) of the mature Dolly Varden taken in the netting does suggest the season and length of time this size fish were absent from the lake during spawning and prior to their subsequent return. The spring period of netting produced the least number of mature sized fish and their numbers in the lake progressively increased until fall when they were the most numerous.

Although the Dolly Varden were found to have a wide spread distribution in the lake, four of the sample areas (Areas 1, 2, 5 and 4) accounted for 51.4 percent of all fish. The other lake areas, listed by preference (number of fish taken in each area) were 8, 9, 10, 11, 3, 6, 7 and 12. The most limited distribution occurred during the spring sampling period when they were found concentrated in Areas 4, 5, 8, 9 and 10.

Lake Whitefish

Length frequency data were summarized for 2,446 lake whitefish (Figure 3) with the largest fish weighing 4.92 pounds (2,233 g) and length measurements ranging from 5.5 inches (140 mm) to 23.9 inches (606 mm). The largest lake whitefish ever recorded from Flathead Lake was a twelve-year-old, 6 pound 1 ounce (2,753 g) fish recorded by Brunson and Newman, 1951.

Age and growth data on lake whitefish from the lake have been reported by Bjorklund, (1953). He compared growth patterns of these fish from Yellow Bay and Polson Bay, Areas 9 and 12, respectively. Calculated mean lengths, in inches, at annulus formation were as follows:

	AGE CLASS						
(Number of fish)	I	II	III	IV	V	VI	VII
Yellow Bay (76)	6.7	11.6	14.0	15.1	16.2	16.9	
Polson Bay (89)	8.0	10.4	12.4	13.1	13.6	14.2	16.3

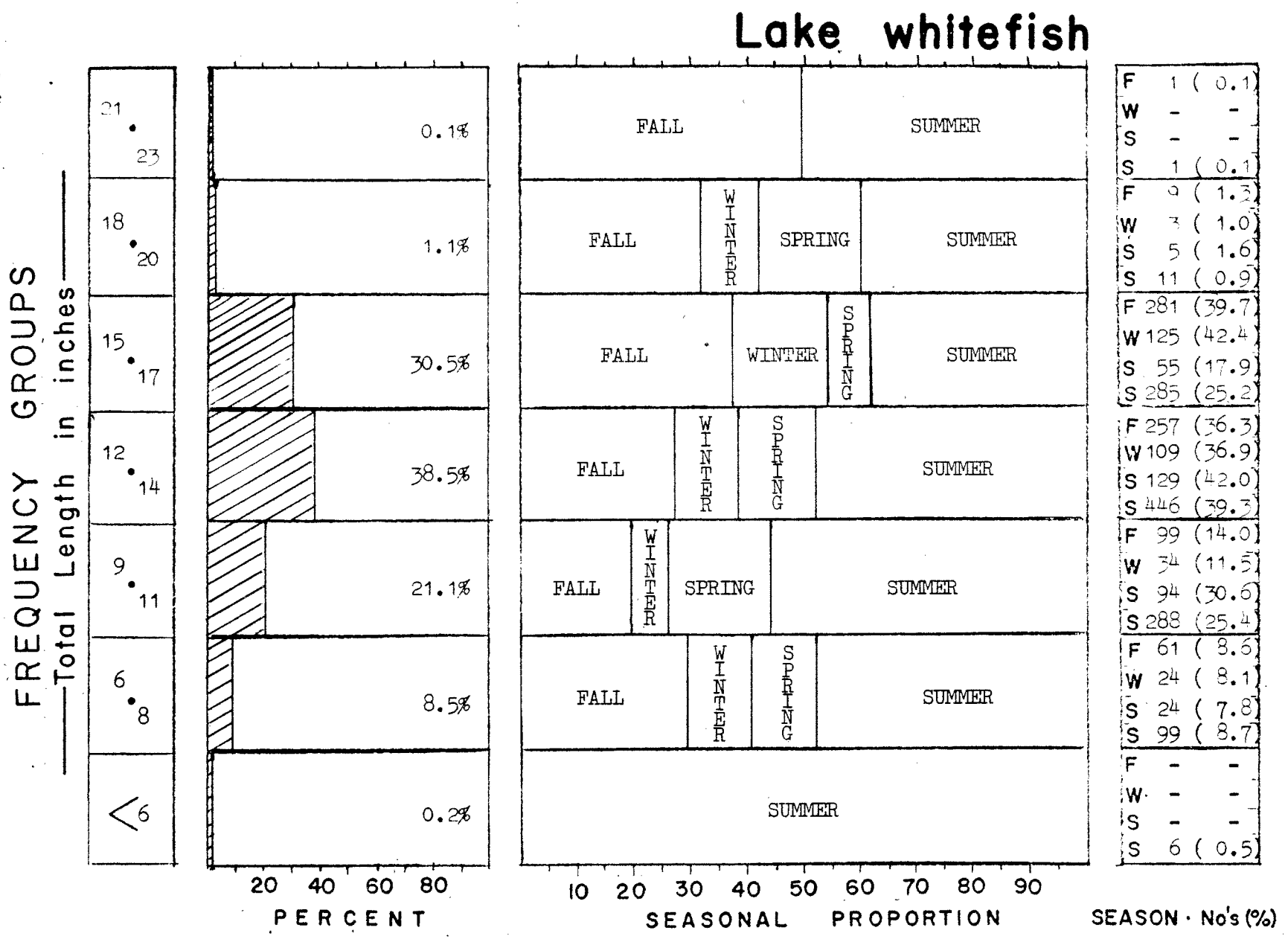

Figure 3. Length frequency distribution of 2,446 lake whitefish collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

Bjorklund compared age class frequency distributions and found a considerable overlap of lengths to occur in most age groups between age classes II through VII. He found mature males at age II, with the majority mature by age III. Females were mostly mature by age IV.

In his discussion, Bjorklund (1953), considered the lake whitefish population to be only slightly exploited. Under such conditions, the population structure should have a trend toward a higher ratio of older to younger fish. This situation was true in 1951 and was further emphasized during the present study when less than 30.0 percent of the fish were considered immature and less than 11.0 inches. The only major difference in the population structure since 1951 was an increase in the number of fish larger than 15.0 inches. Bjorklund found these fish represented 2.0 percent of the total fish collected: whereas, in the present study they accounted for 31.7 percent (Figure 3).

Lake whitefish have shown a wide-spread distribution in the lake and can be taken in nearly any bottom net set. In general, catches will be represented by a mixture of old and young fish. A large concentration of immature fish was taken only once and occurred in early summer in Area 1 more than one mile from shore.

Some lake area preferences were indicated by four sample areas accounting for 58.2 percent of the fish collected. These areas ranked in decreasing order of abundance were Areas 1, 2, 11 and 3. The other sample areas ranked by preferences were: 6, 9, 8, 12, 5, 10, 4 and 7.

Pygmy Whitefish

Length frequency data were summarized for 551 pygmy whitefish (Figure 4) with the largest individual weighing 0.10 pounds (45 g) and the length measurements ranging from 3.1 inches (79 mm) to 7.2 inches (183 mm).

Information on the pygmy whitefish in Flathead Lake is limited to the reporting of the general area distribution by Hanzel (1970) and a listing of parasites found in specimens taken from Flathead Lake and other waters in western Montana by Newell and Canaris, (1969).

Netting results have shown pygmy whitefish occupy the deeper areas of the lake, from 90 to 144 feet. During the spawning season in late November and early December, larger numbers were found along the shoreline in shallow water.

Spawning populations of pygmy whitefish were observed during 1969 and 1970 in the Swan and Flathead Rivers. The run in Flathead River consisted of concentrations of 200 fish or more and were found twenty-five miles upstream from the lake. The Swan River fish occurred in about the same pattern of concentrations as the Flathead River but were confined to the lower two miles of the river by a diversion dam across the river. Males were predominant (87 percent) in the spawning populations during both years. Comparing the length frequency structure of the Swan River runs, the 1970 run had more small fish but had the largest individuals. Two-thirds of the fish were less than 4 inches. The 1969 run was more uniform in size with about equal numbers of fish above and below the 4-inch measurement.

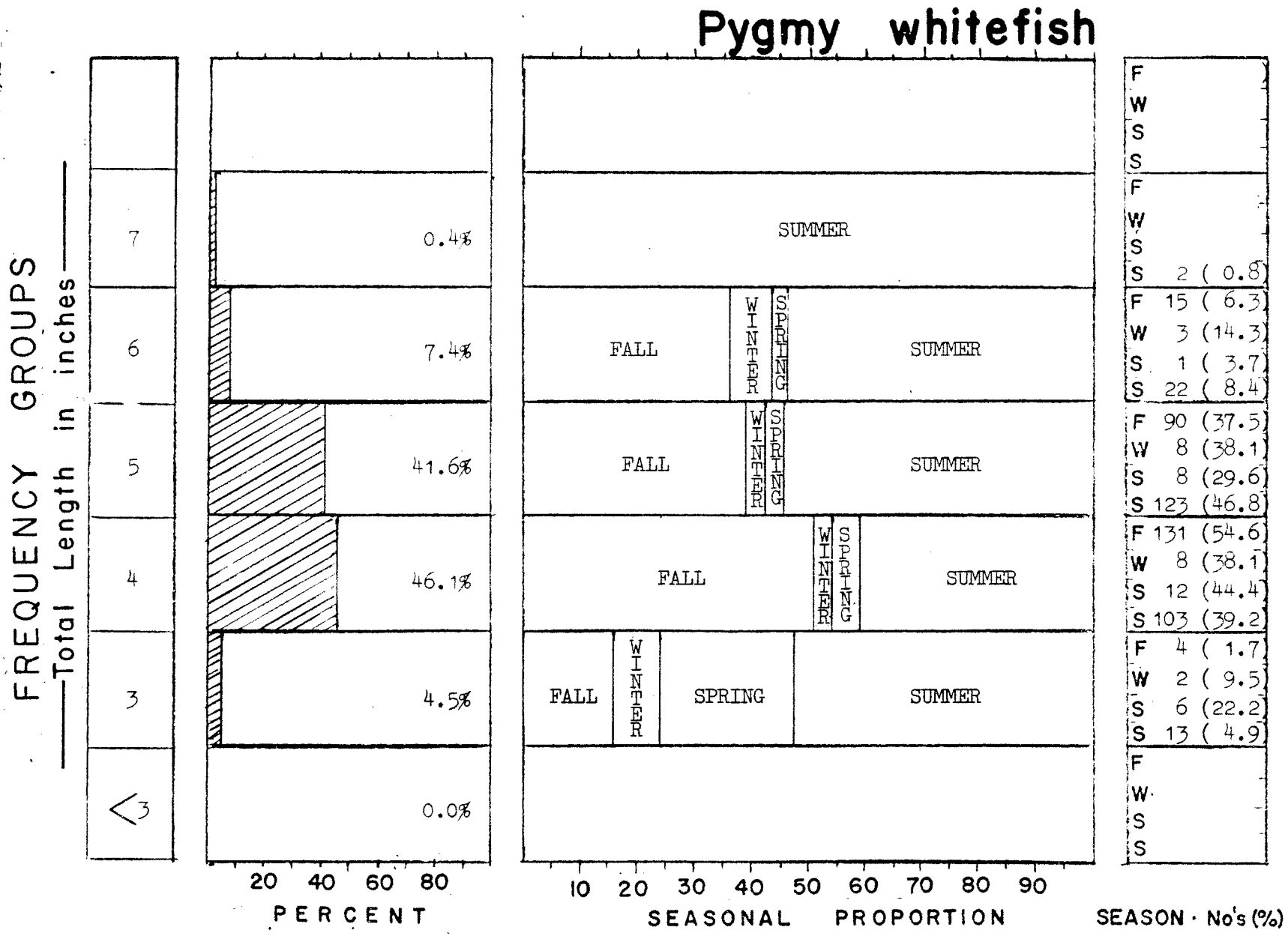

Figure 4. Length frequency distribution of 551 pygmy whitefish collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

The size range of the spawning males was 4.1 inches (104 mm) to 5.9 inches (150 mm); and spawning females, 4.5 inches (114 mm) to 6.6 inches (168 mm). Although several small mature females were present during both years, the majority of the females were larger than 5 inches (127 mm). The male population generally was made up of fish less than 5 inches. Other possible spawning areas were indicated by the presence of ripe fish taken in Table and Skidoo Bays, Areas 3 and 7, respectively.

Area preferences were indicated when 75.6 percent of the pygmy whitefish were taken in four sample areas. These areas in decreasing order were Areas 4, 1, 2 and 8. The remaining lake areas in their order of abundance were Areas 3, 11, 5, 9, 7, 6 and 10. This listing of preference areas excludes those spawning fish that gathered at the mouths of the Swan and Flathead Rivers.

Mountain Whitefish

Length frequency data were summarized for 349 mountain whitefish (Figure 5) with the largest fish weighing 1.17 pounds (576 g) and length measurements ranging from 5.3 inches (135 mm) to 17.2 inches (437 mm). The general area distribution reported by Hanzel (1970) is the only information available since Elrod et. al. (1929) first described these fish as a valuable food fish. Fishing effort expended to catch this species has decreased since 1916. A major factor contributing to this decreased use was the establishment of kokanee in the lake. This introduction resulted in a shift of fishermen efforts from whitefish to kokanee during the fall. The kokanee grow larger than the whitefish and are available in greater numbers and in more areas during this season when the whitefish are most readily taken.

This species demonstrated a specific preference for shallow water areas and near the surface in the pelagic areas. Rarely were they taken in waters deeper than 60 feet. During the fall, these fish apparently move into shallow waters and concentrate along the entire shoreline. During the fall over seventy percent of all mountain whitefish were taken in the shallow water areas.

Areas in order of preference as indicated by the total number of fish taken were 5, 11, 6, 9, 10, 4, 7, 2, 3, 1 and 8.

Lake Trout

Length frequency data were summarized for 106 lake trout (Figure 6) with the largest fish weighing 32.0 pounds (14.5 kg) and length measurements ranging from 7.8 inches (197 mm) to 42.0 inches (1,067 mm). Although not officially recorded lake trout in excess of 35 pounds have been reported.

Areas of concentration of lake trout have not changed since Hanzel (1970) described their general area distribution. Major summer use includes Areas 3, 4, 5, 8 and 10. During the fall, fish concentrate and generally limit their distribution to Areas 4, 5 and 7. Lake trout have not been taken or reported from Polson Bay, Area 12.

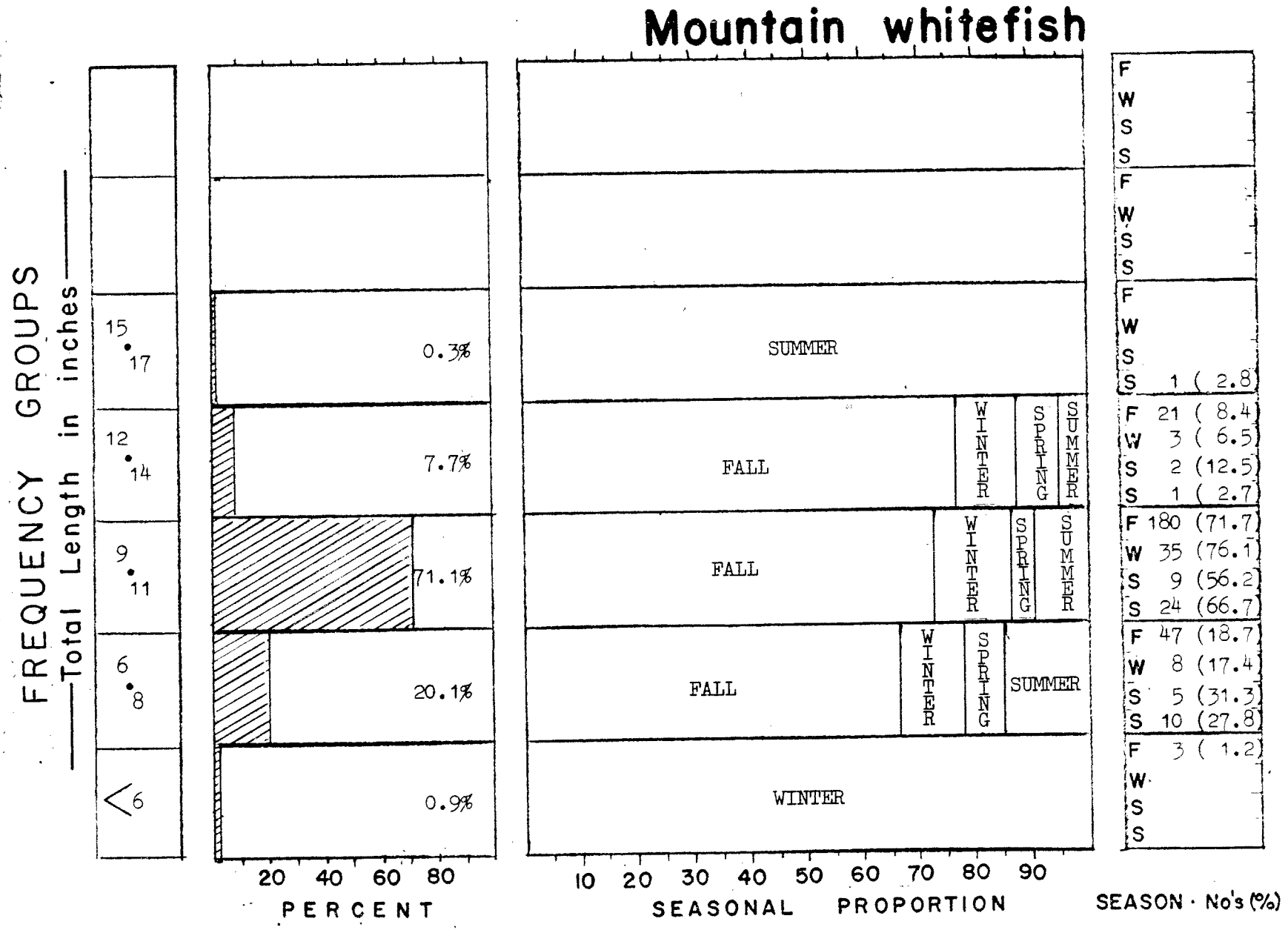

Figure 5. Length frequency distribution of 349 mountain whitefish collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

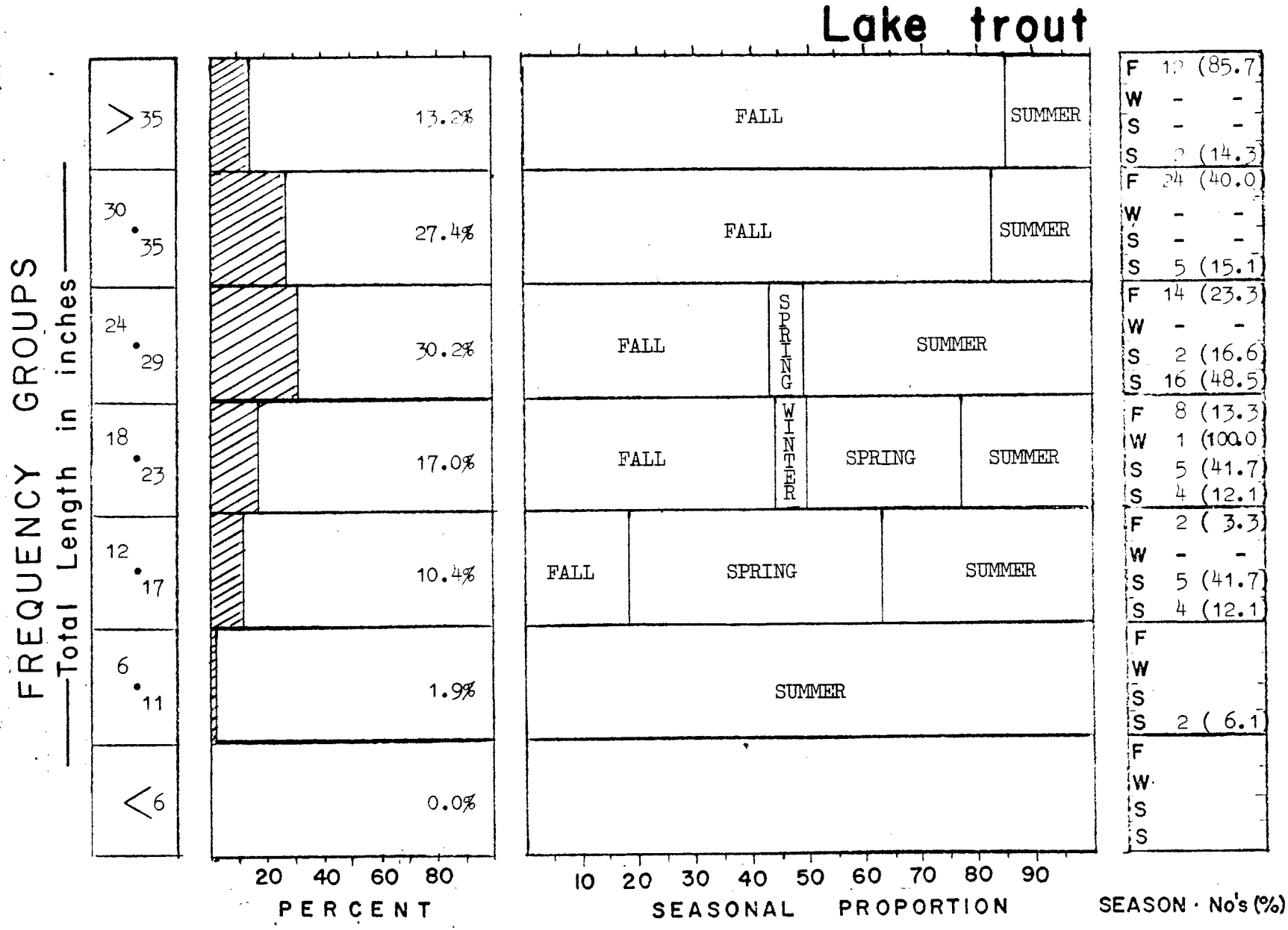

Figure 6. Length frequency distribution of 106 lake trout collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

Many of the lake trout netted were returned to the water unharmed. Estimates of weight and length were made and included in this summary. The following estimated weights were included in these length frequency intervals: 1 to 4 pound fish were put into the 18 to 23 inch group; 5 to 10 pound fish into the 24 to 29 inch group; 11 to 18 pound fish into the 30 to 34 inch group and fish over 19 pounds into the 35 inch and larger size group.

It was apparent from the length frequency histogram (Figure 6) that the juvenile lake trout population is quite small or was unavailable to present collection areas or methods. Immature fish, less than 17 inches were only taken at two points, Areas 3 and 8.

Cutthroat Trout

Length frequency data were summarized for 70 cutthroat trout (Figure 7) with the largest fish weighing 3.30 pounds (1,497 g). This was a spawner, taken in the Flathead River during the spring run from the lake. Total length measurements for this species ranged from 8.5 inches (216 mm) to 20.2 inches (513 mm).

Age and growth data for cutthroat trout in the Flathead River has been reported by Block, 1955 and Johnson, 1961. Calculated mean lengths, in inches, at annulus formation by Block and Johnson were as follows:

	AGE CLASS					
(Number of fish)	I	II	III	IV	V	VI
Block (61)	2.4	5.8	8.7	13.3	15.0	16.0
Johnson (559)	2.2	4.7	7.7	11.3	13.1	14.9

Both Block and Johnson found a predominance of age-class II fish in the river system above the lake. Hanzel (1966) described the movements of these fish by the tag and recapture method as they progressively moved downstream to the lake.

The complete absence of fish less than eight inches in the lake combined with the movement pattern of the juvenile fish from the river to the lake illustrates the complete dependence of the lake on the upper river system for the recruitment of this species.

Johnson (1961) found the following age-class structure in spawning fish: III-32 percent; IV-60 percent; V-24 percent; and VI-13 percent.

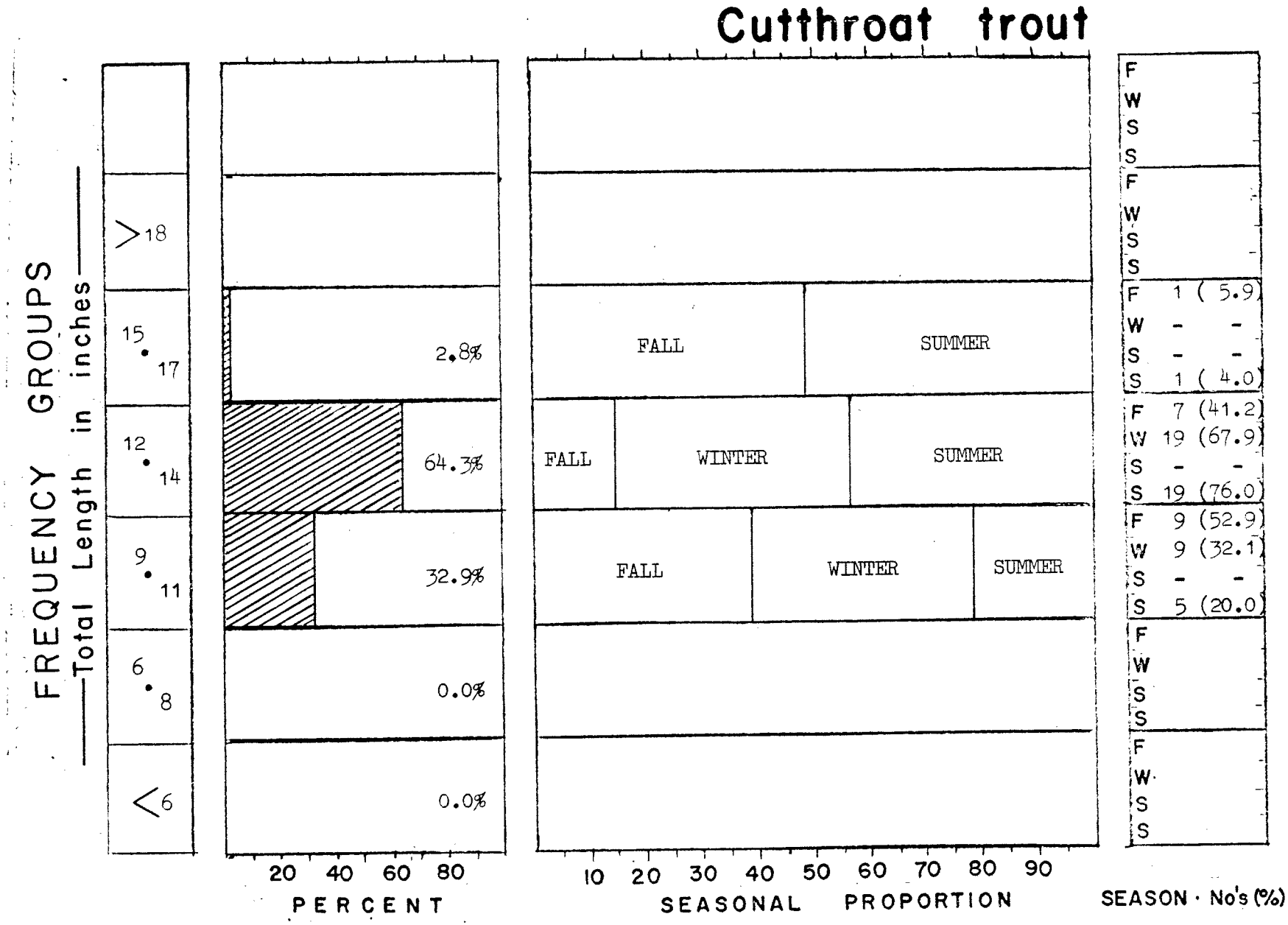

Figure 7. Length frequency distribution of 70 cutthroat trout collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

Cutthroat trout distribution in the lake was found to be specific by season and area. No cutthroat were taken during the spring samples series which is the time when most mature fish are on their spawning runs into the upper Flathead River drainage. During the summer and fall, cutthroat were generally found near the surface and were dispersed over the entire lake. Concentrations during the winter were more restricted in area but the numbers of fish found were considerably more than those of any other season. Preference for lake areas listed in decreasing order of catch, were Areas 1, 2, 11, 4, 10, 6, 7, 5, 9 and 3.

Northern Squawfish

Length frequency data were summarized on 1,200 northern squawfish (Figure 8) with the largest fish weighing 4.50 pounds (2,128 g) and length measurements ranging from 3.4 inches (86 mm) to 22.3 inches (567 mm).

Age and growth data from Flathead Lake were reported by Rahrer, 1963. Calculated mean lengths, in inches, at annulus formation for 200 fish were as follows:

AGE CLASS								
I	II	III	IV	V	VI	VII	VIII	IX
1.2	2.1	3.2	4.4	5.7	6.9	8.0	9.2	10.3
X	XI	XII	XIII	XIV	XV	XVI	XVII	
11.4	12.5	13.6	14.7	15.9	17.1	18.0	19.1	

These fish are present in most shallow protected areas of the lake in waters less than 90 feet deep but are generally found in large schools or concentrations. This species remains in mass as they moved seasonally from one area to another. Stations that represented the most consistent year-around catch of squawfish were those located along the west shore. The largest fall collections occurred in Skidoo and Big Fork Bays, Area 7 and 11, respectively. Area 12, Polson Bay, represented the largest summer concentration.

Eighty-five percent of squawfish less than six inches were taken during the fall collections. These immature fish were more numerous in the southern areas of the lake (Areas 5, 6, 12 and 7).

Peamouth

Length frequency data were summarized for 1,439 peamouth (Figure 9), the largest fish wighing 0.79 pounds (357 g) and length measurements ranging from 4.7 inches (119 mm) to 13.3 inches (338 mm). The largest recorded peamouth taken from Flathead Lake was 14.0 inches, reported by Rahrer, 1963.

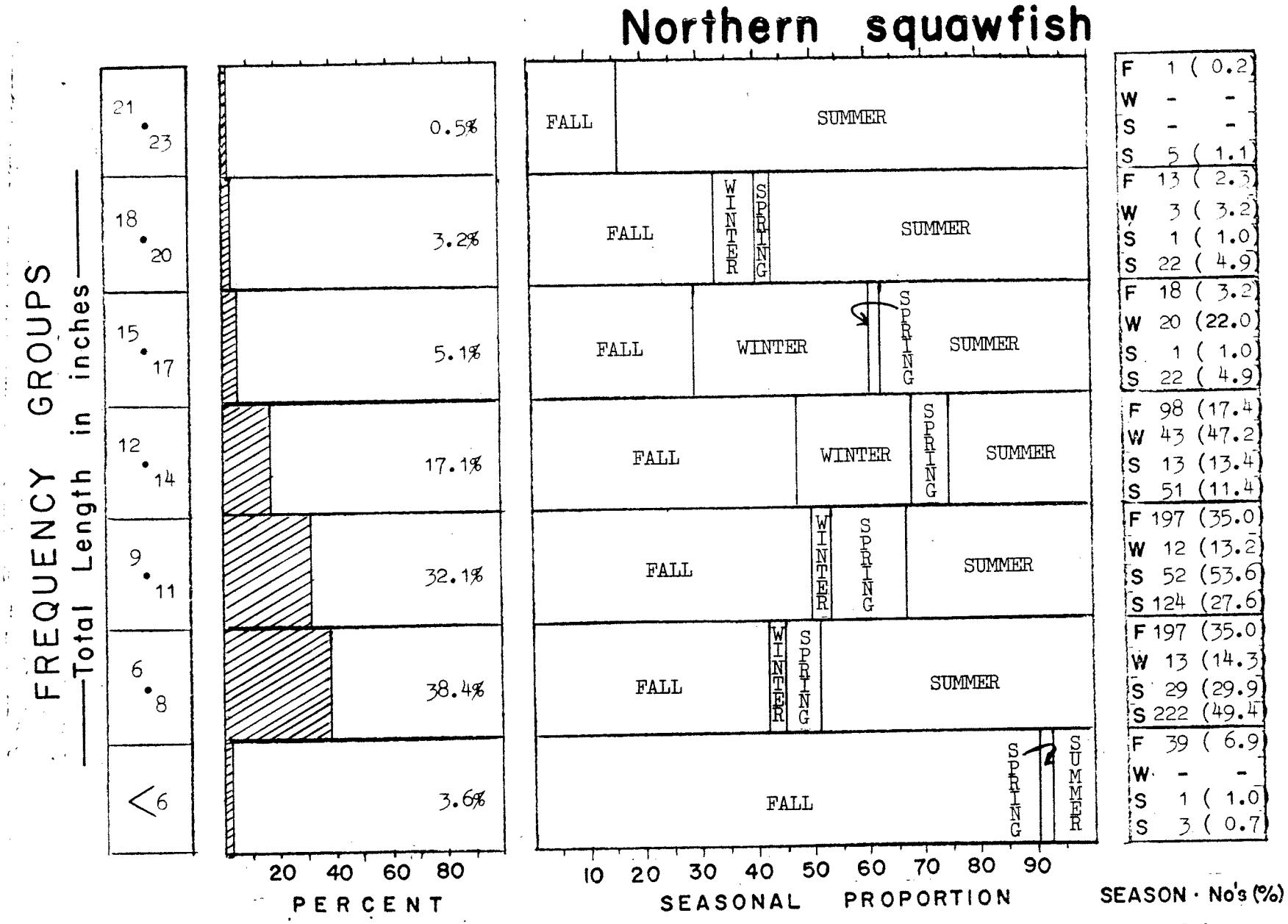

Figure 8. Length frequency distribution of 1,200 Northern squawfish collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

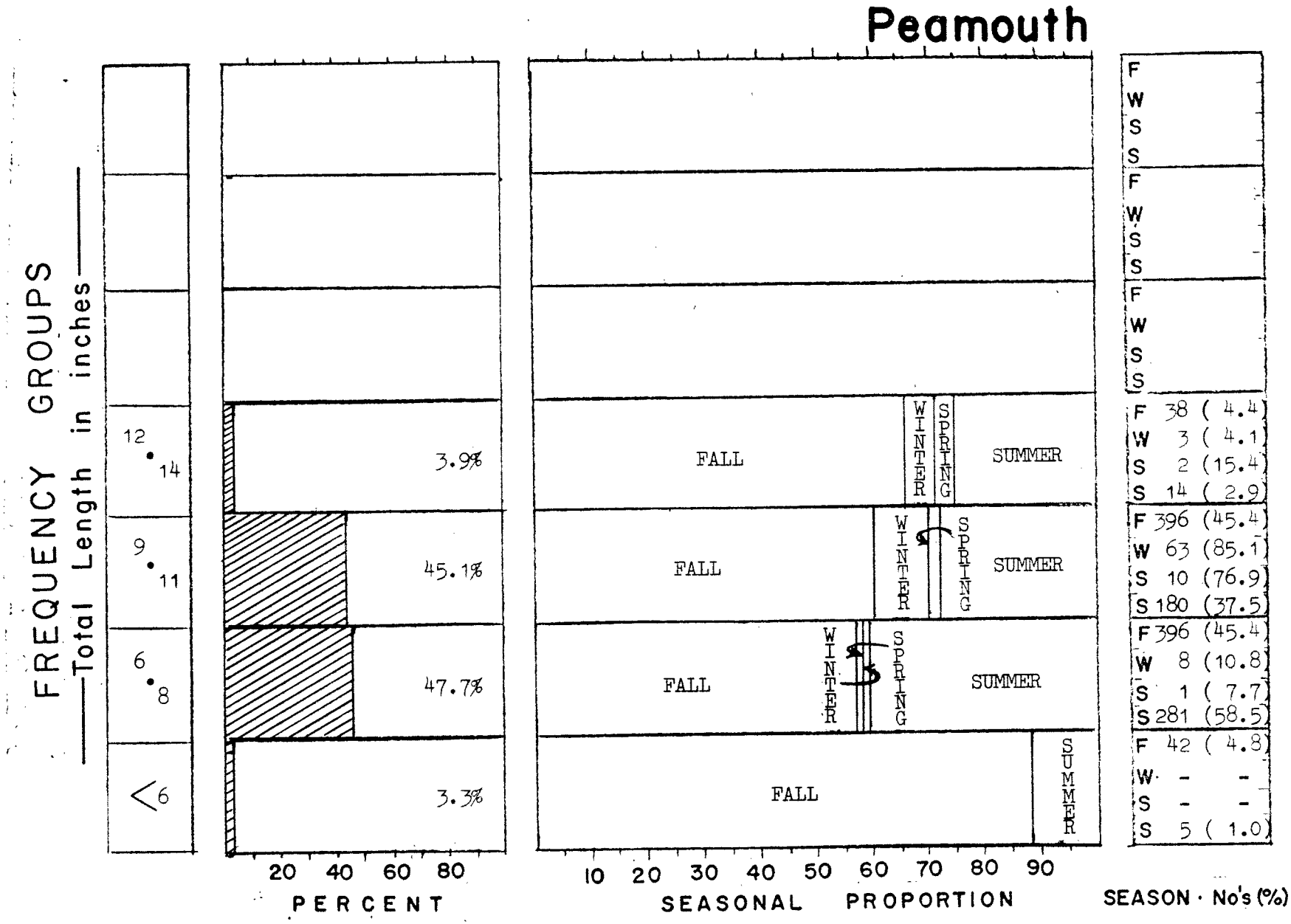

Figure 9. Length frequency distribution of 1,439 peamouth collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

Age and growth information from Flathead Lake was reported by Rahrer, the calculated mean lengths, in inches, annulus formation for 192 fish were:

AGE CLASS								
I	II	III	IV	V	VI	VII	VIII	IX
1.9	3.3	4.5	5.8	7.0	8.2	9.2	10.2	11.2
X	XI	XII	XIII					
12.0	12.5	13.1	13.5					

The peamouth, like the squawfish, were predominantly an inhabitant of the shallow protected areas of the lake. The largest numbers of fish were recorded during the summer and fall periods. Winter populations were confined to the southern areas of the lake, except for Area 12, Polson Bay. This most southern bay was almost devoid of this species during the winter and spring seasons. By summer, the peamouth apparently move enmasse into Polson Bay and represent the larger summer catches in the lake. Spring distributions were confined to areas along the west shore.

The largest seasonal concentration of fish was found during the fall of 1969, when 40 to 70 fish were taken per net, (net 250 x 8 feet). Concentrations the following summer ranged from 20 to 40 fish per net and in the fall of 1970 the numbers decreased to 20 to 30 fish/net.

The majority of juvenile peamouth, less than 6 inches, were found in areas along the east shoreline during the summer periods but seemed to disperse to all shoreline areas by fall.

Longnose Sucker

Length frequency data were summarized for 178 longnose suckers, (Figure 10) the largest weighing 2.09 pounds (948 g) and length measurements ranging from 4.5 inches (114 mm) to 18.2 inches (462 mm).

Elrod, 1929 found this sucker present in the lake in 1916 and Hanzel (1970), described their general area distribution.

During the winter season suckers were primarily confined to protective cover areas along the east and west shorelines. None were found in Polson Bay, Area 12. The largest spring concentration was in Rollins Bay, Area 4. A wide dispersal to all areas of the lake was noted during the summer season.

Suckers less than 6 inches were only taken in the fall season in Areas 1 and 12, Somers and Polson Bay. This limited range of small fish was noted during 1969 and 1970 samples seasons.

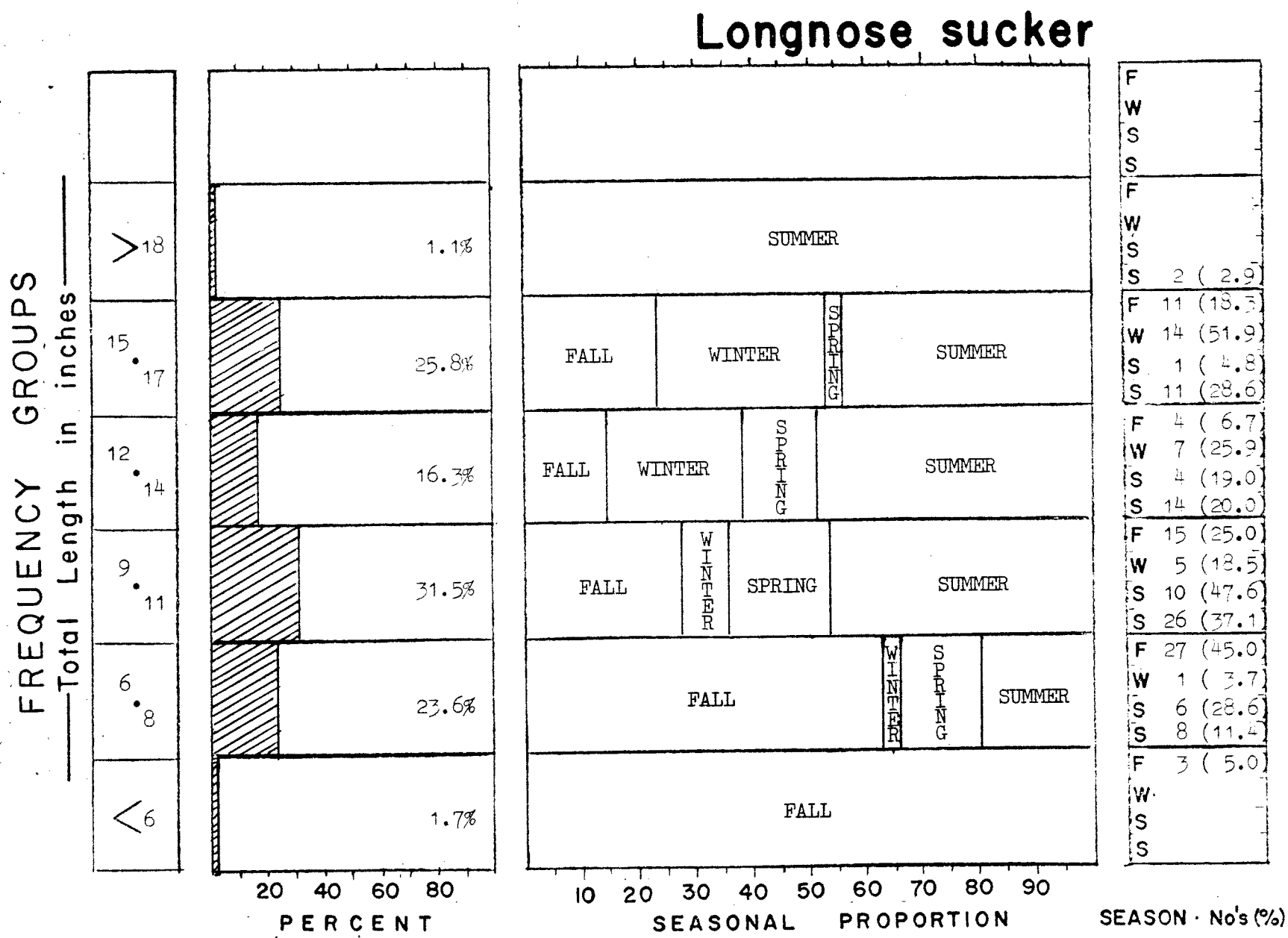

Figure 10. Length frequency distribution of 178 longnose suckers collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

Preferences as indicated by decreasing number of suckers taken by area were Areas 1, 3, 8, 9, 10, 2, 11, 5, 4, 7, 6 and 12.

Largescale Sucker

Length frequency data were summarized for 104 largescale suckers (Figure 11) with the largest fish weighing 3.52 pounds (1.597 g) and length measurements ranging from 6.4 inches (163 mm) to 25.6 inches (650 mm).

Elrod (1929), described this sucker as being more numerous than the longnose sucker in the lake. Hanzel (1970) in his work on area distribution found only limited numbers. This species occurred in very limited areas during the sample seasons. Wintering concentrations were considered sparse, with the largest numbers occuring in Areas 7, 4 and 5. Spring catches were represented by two fish; one caught in Area 1, the other in Area 12. The largest summer distributions were in Areas 12, 4, 5 and 9. During the fall, catches in Areas 1 and 5 represented the largest numbers.

Year around preferences were suggested by 60.6 percent being taken in Areas 12, 1, 5 and 4. The other areas, in decreasing order were: Area 6, 7, 10, 2, 8, 11, 3 and 9.

The scarcity of fish less than 15 inches, and the predominance of large fish during the sampling is demonstrated in the frequency histogram in Figure 11. Since nets with mesh sizes capable of collecting the smaller sucker were used throughout the sampling period, either the numbers and distribution of these small fish were so scarce and limited that they were not sampled, or these sizes of fish do not enter the lake population until they reached a size over 15 inches. The latter consideration suggests a complete dependance on the inflowing stream for reproduction and the rearing of juvenile sized fish.

Yellow Perch

Length data were summarized on 702 yellow perch (Figure 12) with the largest fish weighing 1.01 pounds (496 g) and length measurements ranging from 5.2 inches (33 mm) to 15.4 inches (391 mm).

Age and growth data from Flathead Lake were reported by Rahrer, 1963. Calculated mean lengths, in inches, at annulus formation for 243 fish were as follows:

AGE CLASS						
I	II	III	IV	V	VI	VII
1.0	1.9	3.3	5.1	7.0	8.7	10.0

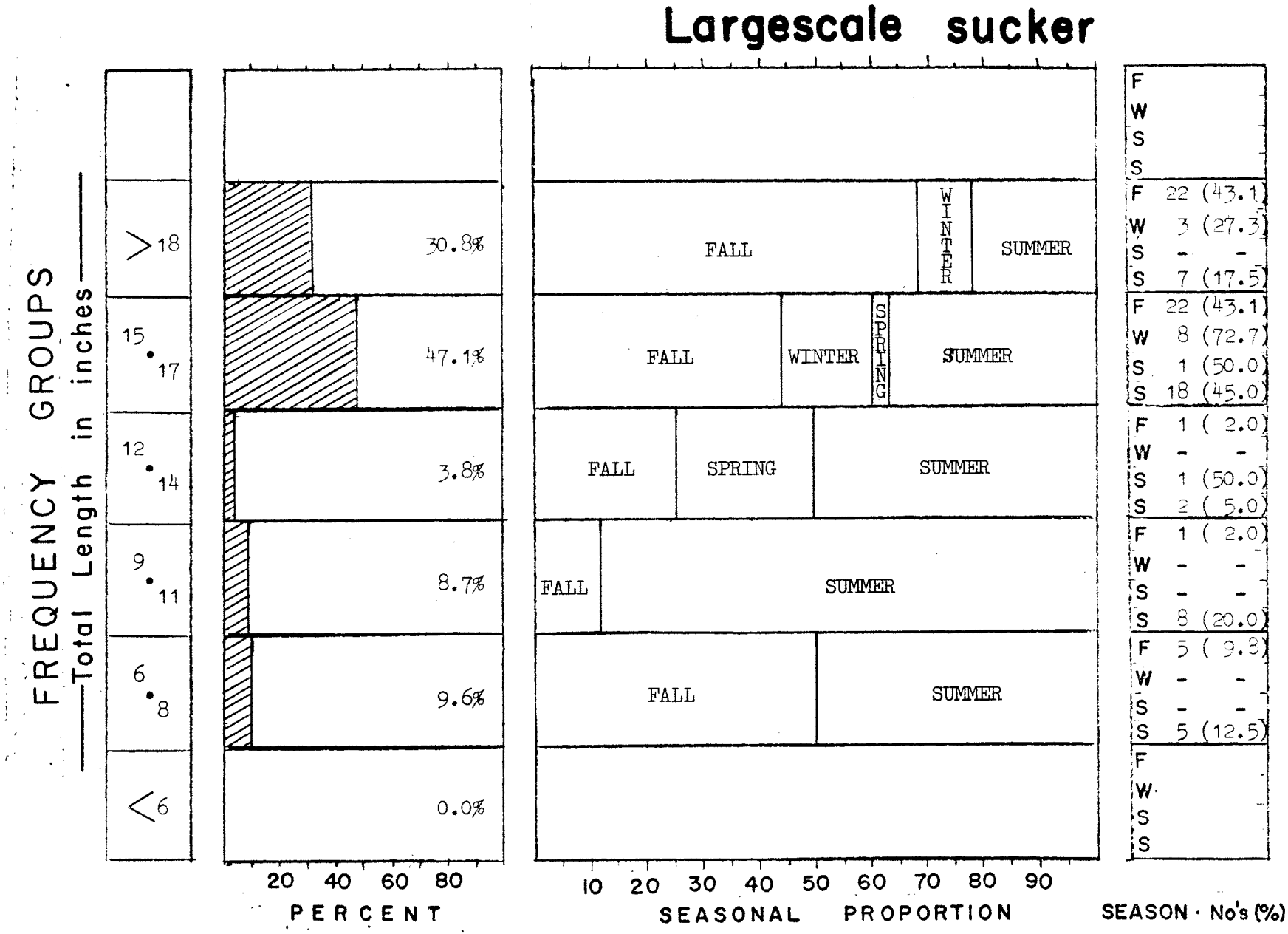

Figure 11. Length frequency distribution of 104 largescale sucker collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

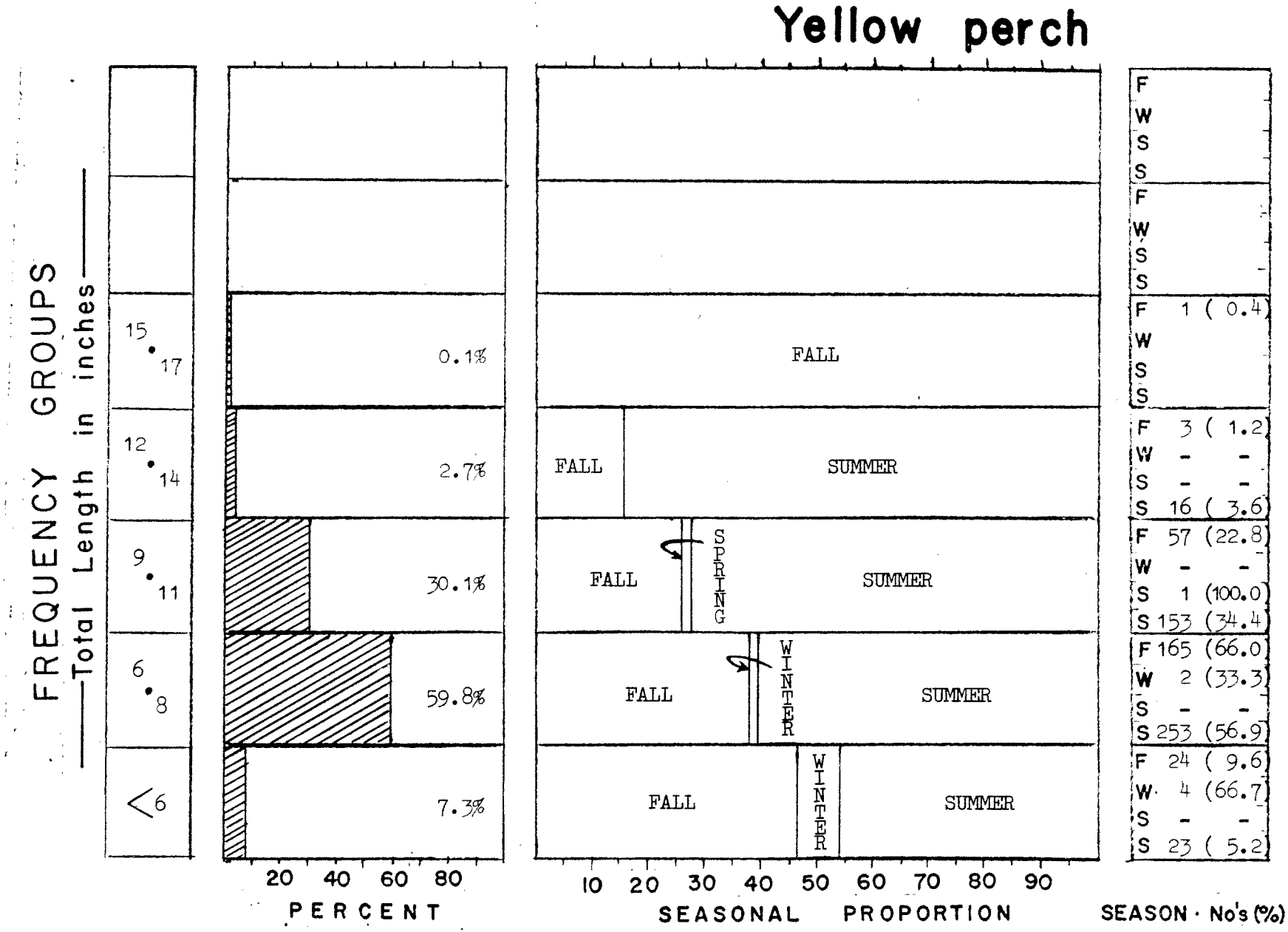

Figure 12. Length frequency distribution of 702 yellow perch collected in Flathead Lake, October 1966 through December 1970. The figure, left to right, expresses: 1) the length frequency groups; 2) the percent of total fish collected in each frequency group; 3) the seasonal proportion of total fish collected in each frequency group; 4) the number and percent (in parentheses) of fish in each of the frequency groups by season.

Perch distribution was described as being present over most of the lake but they were rarely taken in waters deeper than 30 feet (Hanzel 1970). This widespread distribution was evident only during the summer and early fall seasons. Late in the fall when water temperatures cooled, perch left the shorelines for deeper water. Movements beyond this point areas are not known, but possibly could be to Areas 1 and 12; the only areas perch were found year around.

RECOMMENDATIONS

The major emphasis of research should continue to be directed toward the determination of the seasonal depth and area distribution of the fish. Special consideration given: (1) to an intensive sampling program within small areas of the lake to determine the seasonal duration, extent and relative abundance of the fish; (2) to completing the analysis of the fish scales collected during previous sampling to permit correlation of age, growth, time of annulus, formation and (3) comparing growth rates between stations and the time of sampling; (4) to developing new techniques for sampling juvenile kokanee populations for determining population trends; (5) to continuing measurement of water quality and relating effects of significant changes in the water quality on the fish population, particularly age class strength.

LITERATURE CITED

Block, D. G. 1955. Trout migration and spawning studies on the North Fork drainage of the Flathead River. Unpubl. Thesis, Montana State Univ., pp. 1-83.

Bjorklund, R. G. 1953. The lake whitefish, Coregonus clupeaformis (Mitchell), in Flathead Lake, Montana. Unpubl. M. S. Thesis, Univ. of Montana. 144pp.

Brunson, R. B. and H. William Newman, 1951. The summer food of Coregonus clupeaformis from Yellow Bay, Flathead Lake, Montana. Proc. Mont. Acad. Sci. 10:5-7.

Elrod, M. J. and J. W. Howard, G. D. Schallenberger. 1929. Flathead Lake-Millions of dewdrops. The fishes, chemistry and physics of Flathead Lake, Montana. Wildl. 2(1):5-15.

Hanzel, D. A. 1966. Survey of Cutthroat Trout and Dolly Varden in the Flathead River and Tributaries Above Flathead Lake. Comp. Report, Montana Fish and Game Dept., F-7-R-14, Job III.

Hanzel, D. A. 1970. Flathead Lake, investigation of its fish populations and its chemical and physical characteristics. Comp. Report, Montana Fish and Game Dept. F-33-R-3, Job I.

Johnson, H. E. 1961. Observations of the Life History and Movements of Cutthroat Trout in Flathead River Drainage, Montana. Proc. Mont. Acad. Sci., 23:96-110.

Newell, Robert and A. G. Canaris. 1969. Parasites of the Pygmy Whitefish and Mountain Whitefish from Western Montana. Proc. Helm. Soc. of Wash. Vol. 36, No. 2, pp274-276.

Rahrer, J. F. 1963. Age and growth of four species of fish - Flathead Lake, Montana. Proc. Mont. Acad. Sci. 23:144-156.

Prepared by Delano A. Hanzel

Date June 1, 1971

Water referred to:

07-6400-03