MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-9-R-2 Work Plan No. III Job No. III A

Title of Job Phases of the Life History of the Utah Chub in Montana

Abstract:

An investigation of phases of the life history of the Utah chub in Hebgen Lake, Montana was made during the summer of 1953. This fish was probably introduced into Hebgen Lake by live-minnow fishermen in the late thirties. Forty-nine gill net sets were made from May 4 to October 11. The total catch was 1,030 chub, 64 trout, and 26 whitefish. Female chub were larger than males. Scales from a random sample of 472 chub have been mounted but readings are not complete. From ovary examination of 304 females it appeared that the majority of the spawning activity in 1953 occurred during the month of June. Gill net sets suggest that spawning was closely associated with shallow areas. Chub fry and fingerlings were found to be extensively distributed along well-protected shorelines. Samples of chub fry captured from August 3 to 6 averaged 0.8 inches in total length and those taken on October 31 averaged 1.3 inches. Approximately 100 chub stomachs were collected but analysis of these has not been completed. The use of toxicants to control chub in Hebgen Lake is considered impractical at this time. A general survey of the shore line was made and 14.5 miles or 22.2% of the total shore line was classified as acceptable for shore-type seining operations.

Objectives:

The Utah Chub is native to the Bonneville Basin of Utah and the upper Snake River drainage. It was first reported in Hebgen Lake, Montana in 1941 and is now present in the Madison River below Hebgen Lake to Three Forks, Montana, and also in Cliff Lake. It undoubtedly was introduced by live-minnow fishermen and is believed to be a contributing factor to the decline of the trout fishery. The object of this investigation is to gather basic information on the life history of the chub as a better understanding of the fish may lead to methods of controlling it.

Techniques Used:

Gill net settings, with 125 foot experimental nets, were made during the summer of 1953, and all information pertaining to the sets was recorded. From specimens thus obtained, measurements, scale samples, and stomach samples were taken. Gonads were examined to determine sex, degree of maturity, and to establish the spawning period. Numerous areas were seined to obtain immature fish and to note their distribution in the lake. Two surface temperature stations were established using maximum-minimum thermometers. Qualitative collections of plankton and aquatic plants were made.

Findings:

Hebgen Lake, a storage reservoir on the upper Madison River, is owned and operated by the Montana Power Company (Figure 1). It has been in service since 1914 and it functions to maintain a water supply for downstream power units. When full it has a surface area of 13,700 acres, a capacity of 344,730 acre feet, and a maximum depth at the dam of 61.5 feet. Operating policy has been to fill the lake during the spring and summer and release water as needed during the fall and winter. A new policy was adopted in 1953 whereby the water is released sharply in the fall so the low point is reached by mid-November (Figure 2). The volume of water in the lake at the low point in a normal year is approximately 160,000 acre feet.

Forty-nine gill net sets were made from May 4 to October 11, 1953. Most of the sets were made from June 15 to July 15, and confined principally to areas where chub were believed to be most abundant. Gill netting, with comparable nets, was also done by the Montana Fish and Game Department in 1948. These sets were made from July 13 to September 21, and in widely scattered localities of the lake (Table 1).

Measurements were made on a random sample of male and female chub taken by gill nets from May 30 to July 12, 1953 (Figure 3). The 292 males in this sample ranged in total length from 6.0 to 13.1 inches, with an average of 10.1. The 261 females ranged in total length from 7.1 to 13.9 inches, with an average of 10.9. The average size of the females is larger than the males.

A random sample of 472 scales was taken from adult and immature chub. These ranged in total length from 1.5 to 13.9 inches. All the scales have been mounted but the readings have not been completed.

The ovaries of 304 females, collected from June 15 to July 12, were examined. The females were then classified as being full, partially spent, or spent (Table 2). The ovaries of 16 females collected on May 30 were all full. Though the sample is small it appears that the majority of the spawning activity in 1953 occurred during the month of June. The temperatures for the period of June 15 to July 1 ranged from 54° to 61° F., and for the month of July from 60° to 76° F.

Observation of spawning was not possible because the lake level was rising during the spawning period and the water was turbid. Gill net sets indicate that spawning was closely associated with shallow areas. No observations were made of chub migrating upstream to spawn. No eggs were recovered by plankton net sampling or by dragging the bottom with a fine-mesh dip net. Numerous areas in the three arms of the lake were seined during the summer and fall. Chub fry and fingerlings were found along a considerable part of the protected shore lines. The prevailing wind is from the south and few fry or fingerlings of any kind were found along the exposed north shores.

Periodic collections of chub fry and fingerlings were made during the summer to follow their growth rate (Table 3). Measurements were taken from a random sample when large numbers were collected. The scarcity of chub fry and fingerlings in shallow areas on October 31, and the consistency of the range in total length for those collected, suggests that the larger young may move to deeper water. If this is true, the average total length for the young at the

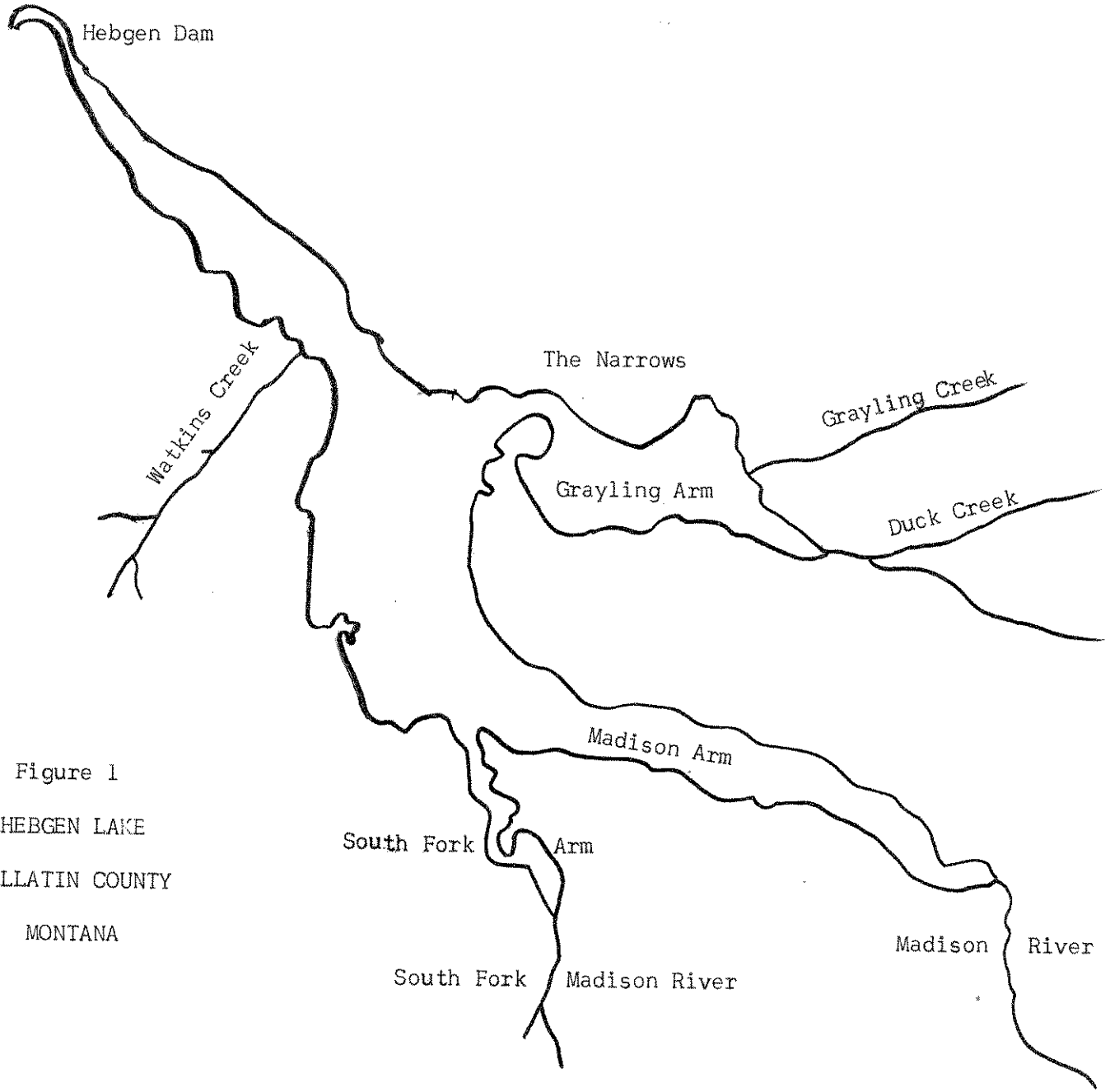

Figure 1

HEBGEN LAKE

GALLATIN COUNTY

MONTANA

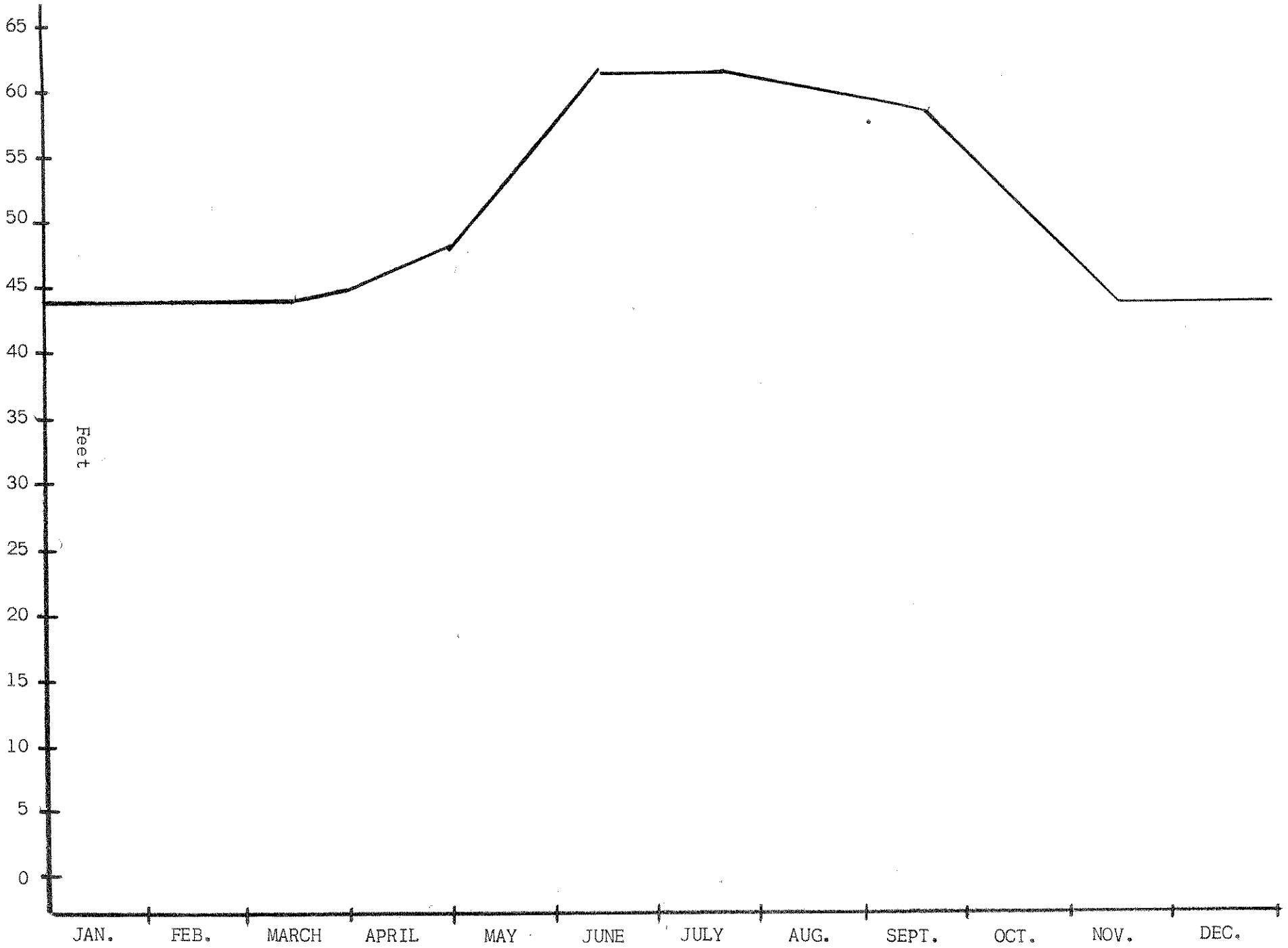

Figure 2. Hebgen Lake depths during normal year.

Year	Number of Sets	Total Time of Sets	Average Time per Set	Species	Number	Percent of Total	Catch per Hour
1948	49	96.5 hrs	1.97 hrs	Utah Chub	708	72.5	7.3
				Whitefish	147	15.1	1.5
				Loch Leven	79	8.1	0.8
				Rainbow	31	3.2	0.3
				Cutthroat	6	0.6	-
				Grayling	3	0.3	-
				Suckers	2	0.2	-
1953	49	124.0 hrs	2.53 hrs	Utah Chub	1030	91.9	8.3
				Whitefish	26	2.4	0.2
				Loch Leven	54	4.8	0.4
				Rainbow	10	0.9	0.1

Table 1. A summary of the gill net catches from Hebgen Lake for the summers of 1948 and 1953.

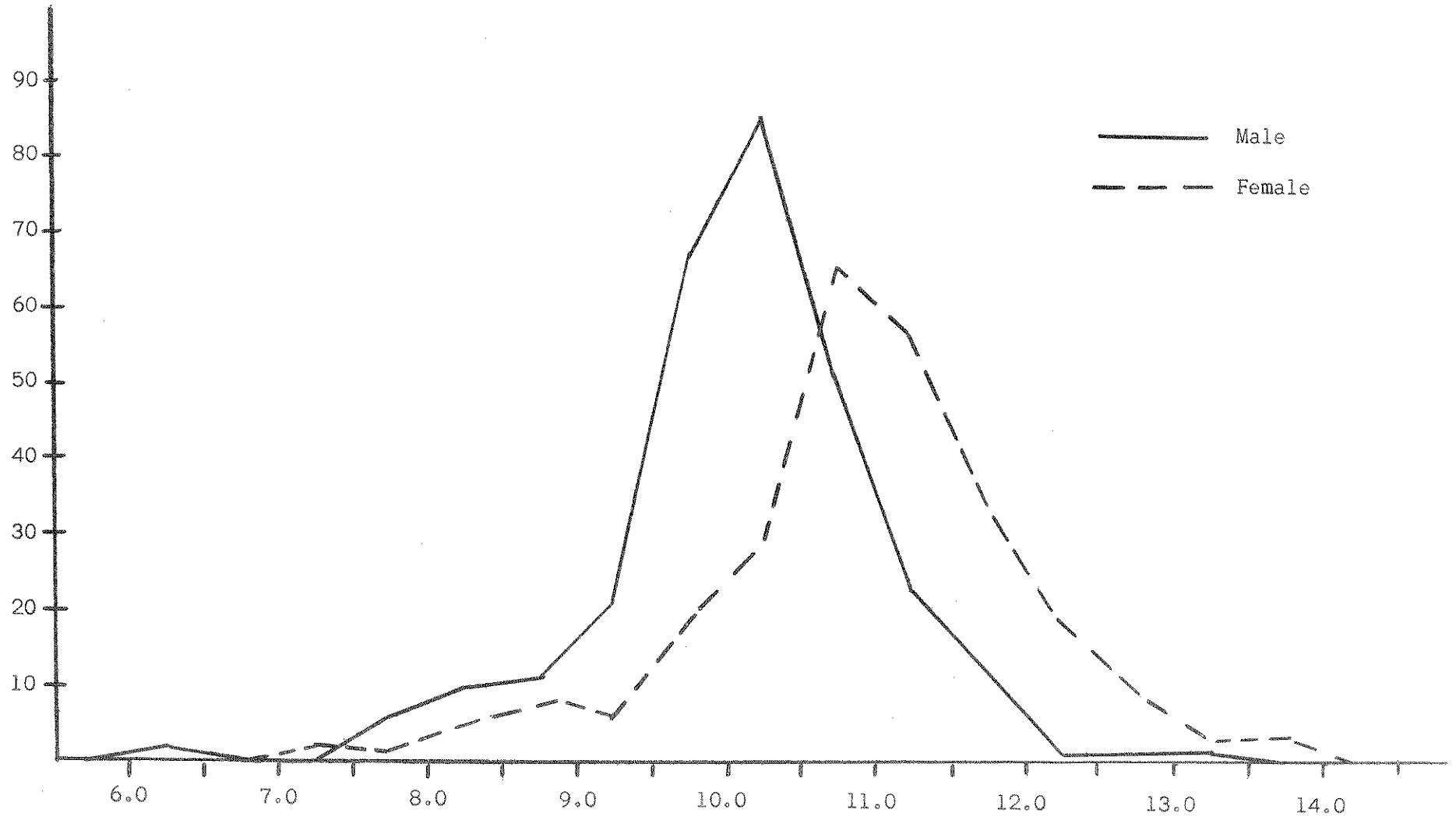

Figure 3. The total lengths of a random sample of male and female chub taken with gill nets in Hebgen Lake.

Table 2. Ovary conditions of chub captured during the spring of 1953 in Hebgen Lake.

Week Ending	Number of Females	Percent Full	Percent Partially Spent	Percent Spent
June 21	55	45.5	23.6	30.9
June 28	34	50.0	14.7	35.3
July 5	59	5.0	17.0	78.0
July 12	140	6.4	18.6	75.0

Table 3. Total lengths of chub fry and fingerlings collected during the summer and fall of 1953 in Hebgen Lake.

Number of Collections	Date	Number of Fish	Range (inches)	Average Length (inches)
7	Aug. 3-6	275	0.4 - 1.3	0.8
3	Aug. 27-28	347	0.6 - 2.1	1.0
3	Sept. 15-16	265	0.6 - 2.0	1.2
2	Oct. 31	62	0.8 - 2.0	1.3

later dates should be greater. The presence of small chub in the October 31 collection suggests late spawning, and that some chub may not form scales during their first year of life.

A length frequency polygon of 189 immature chub collected on August 6 indicates the presence of two age classes (Figure 4). These fish were all collected at the same time and place. The average total lengths for fish of the first and second modes are 0.9 and 2.8 inches respectively. This will be checked by the scale method for determining age.

An attempt to establish the hatching period for chub eggs was unsuccessful. Several ripe male and female chub were spawned at the Bozeman hatchery. The eggs were too small to be retained in the hatching trays and hatching jars were unavailable.

Approximately 100 chub stomachs were collected during the summer. Analysis of these stomachs is being carried out at the Department's Fishery Laboratory at Montana State College.

Sixty pounds of chub were collected and sent to the U. S. Fish and Wildlife Service Fishery Technological Laboratory in Seattle, Washington for analysis as to marketability, cold storage life, and chemical composition. The completion report on this analysis has not been received.

Because of the large size of Hebgen Lake it would be impossible to rehabilitate it with toxicants. It was thought that by periodically emptying the lake, and application of a toxicant followed by heavy stocking, the chub population might be controlled. An interview with representatives of the Montana Power Company revealed that they could not consider this. There are plans for repair work on the outlet for sometime in the near future and it would then be necessary to empty the lake. The Fish and Game Department will be informed in advance so that some type of control may be applied if deemed feasible.

A general survey was made of the shoreline when the lake level was down 12 feet in an attempt to evaluate the possibility of conducting large scale shore-type seining operations. Areas were not considered as potential seining sites because of inaccessibility, steep banks, timbered shore lines, and the presence of stumps and snags in the water. All area types were located on the original survey map and measured with a map measure. The total length of the shore line was determined to be 65.4 miles of which 14.5 miles (22.2%) was classified as seinable. However, actual seining operations may reveal that a portion of these areas are also not acceptable.

Analysis and Recommendations:

Continuation of the study on the life history of the chub with more refined methods is recommended. Studies should begin as soon as the ice leaves the lake to obtain more information on their spawning habits and distribution.

More information should be gathered on the removal and potential utilization of the chub. Grayling Arm is separated from the main lake by a short channel called "The Narrows". Using a planimeter on the original survey map the surface area for this arm was determined to be 2,223 acres or 16.2%

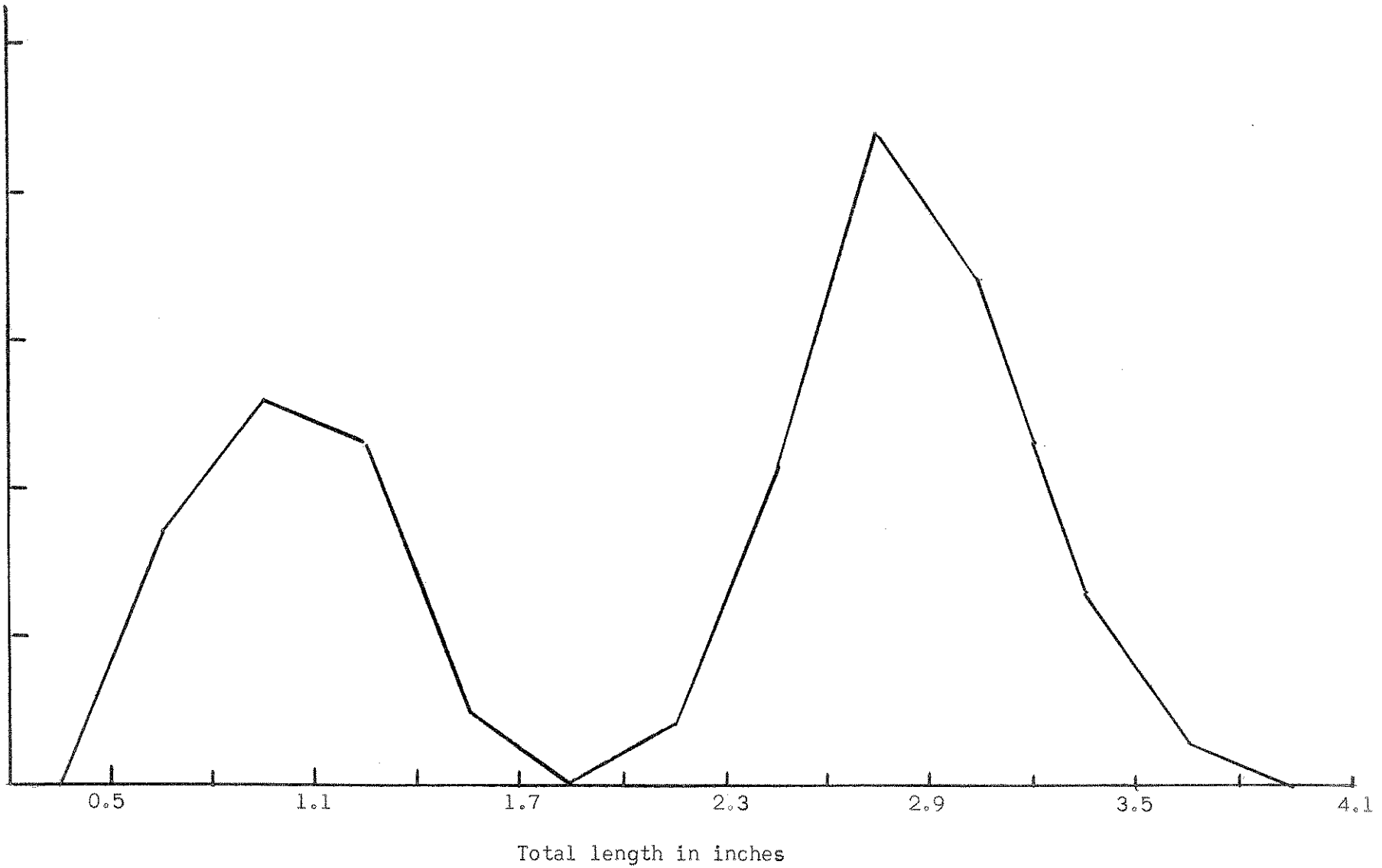

Figure 4. Length frequencies of chub collected on August 6, 1953 from one location in Hebgen Lake. Two chub over 4 inches not included.

of the total surface area of the lake at capacity. The arm is shallow and makes up a considerable portion of the littoral zone of the lake. The water regulating policy is such that the arm is almost completely drained every year during the winter months. Yet during the summer months the chub are believed to be more abundant here than in any other part of the lake. It is recommended that an investigation be made on the advisability and feasibility of constructing some type of trap across the area known as the "The Narrows".

Grayling Creek, a tributary of Grayling Arm, is reported to be blocked by beaver dams. It is recommended that a survey be made of lower Grayling Creek to determine if it is denied to spawning trout and grayling.

Summary:

An investigation of phases of the life history of the Utah chub in Hebgen Lake, Montana was made during the summer of 1953. This fish was probably introduced into Hebgen Lake by live-minnow fishermen in the late thirties. Forty-nine gill net sets were made from May 4 to October 11. The total catch was 1,030 chub, 64 trout, and 26 whitefish. Female chub were larger than males. Scales from a random sample of 472 chub have been mounted but readings are not complete. From ovary examination of 304 females it appeared that the majority of the spawning activity in 1953 occurred during the month of June. Gill net sets suggest that spawning was closely associated with shallow areas. Chub fry and fingerlings were found to be extensively distributed along well-protected shorelines. Samples of chub fry captured from August 3 to 6 averaged 0.8 inches in total length and those taken on October 31 averaged 1.3 inches. Approximately 100 chub stomachs were collected but analysis of these has not been completed. The use of toxicants to control chub in Hebgen Lake is considered impractical at this time. A general survey of the shore line was made and 14.5 miles or 22.2% of the total shore line was classified as acceptable for shore-type seining operations.

Data and Reports:

The original data and reports are with the project assistant at Montana State College, Bozeman, Montana.

Prepared by Richard J. Graham Approved by _____

Date April 29, 1954