June 1983

LOWER FLATHEAD SYSTEM FISHERIES STUDY

South Bay of Flathead Lake, Volume III

Final Report 1983

DOE/BP-39830-3

This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views of this report are the author's and do not necessarily represent the views of BPA.

This document should be cited as follows:

Cross,David Principle Investigator, Ian Waite, Project Biologist, Confederated Salish and Kootenai Tribes, Tom Vogel, Project Manager, U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Contract No. DE-AI79-1983BP39830, Columbia River Basin Fish and Wildlife Program Measures, 73 electronic pages (BPA Report DOE/BP-39830-3)

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Bonneville Power Administration
Environment, Fish and Wildlife Division
P.O. Box 3621
905 N.E. 11th Avenue
Portland, OR 97208-3621

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LOWER FLATHEAD SYSTEM FISHERIES STUDY
South Bay of Flathead Lake, Volume III

Final Report FY 1983 - 1987

Prepared By

David Cross, Principle Investigator
and
Ian Waite, Project Biologist
Confederated Salish and Kootenai Tribes
P.O. Box 278
Pablo, Montana 59855

Prepared For

Tom Vogel, Project Manager
U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97208
Contract No. DE-AI79-83BP39830

Columbia River Basin Fish and Wildlife Program Measures
804(a)(3),(b)(6)

June 1988

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ACKNOWLEDGEMENTS

Many people contributed to the work accomplished during this study. Project biologists, W. H. Bradshaw, P. Pajak and M. P. Wunderlich designed, modified and conducted field research and produced several annual progress reports. Field technicians F. Gillin and M. Barnaby helped in all aspects of field work and in compiling data. We thank T. Courville, G. Dupuis, R. Mathias, C. Marengo, M. Papin and T. Tanner for their hours spent in the field. M. L. Parker provided secretarial support throughout this study. We wish to thank the many agencies and institutions which provided technical advice, assistance, and critical report review including the Confederated Salish and Kootenai Tribes Natural Resource Department; Montana Department of Fish, Wildlife and Parks; U.S. Bureau of Indian Affairs; University of Montana Biological Station; U.S. Fish and Wildlife Service; U.S. Forest Service; and Montana Power Company. Special thanks go to Tom Vogel, Bonneville Power Administration's Program Manager, for his support in assisting the project through difficult times. Finally, we thank S. Burke for graphics, J. DosSantos for organizing, and B. Rice and C. Villegas for patiently typing the many versions of this final report.

ABSTRACT

The Lower Flathead System Fisheries Study assessed the effects of Kerr Dam operation on the fisheries of the lower Flathead ecosystem. South Bay, the southern most lobe of Flathead Lake, is the most extensive area of shallow water, and therefore, most effected by changes in lake levels. This study began in January of 1984 and was completed in early 1987.

Vegetative and structural cover are relatively limited in South Bay, a condition which could contribute to lower recruitment for some fish species. Our data show that the study area contained 0.04% structural and 5.4% vegetative cover in June at full pool. Both figures are less than 1.0% at minimum pool. Structural complexity mediates the ecological interactions between littoral zone fish and their prey, and can affect local productivity and growth in fish. Structural complexity may also be important to overwinter survival of young perch in Flathead Lake. Winter conditions, including ice cover and fall drawdown, seasonally eliminate the vegetative portion of most rooted macrophytes in South Bay. This results in substantial loss of what little structural cover exists, depriving the perch population of habitat which has been occupied all summer. The loss of cover from draw-down concentrates and probably exposes perch to greater predation, including cannibalism, than would occur if structural complexity were greater.

Gross trends in water quality data collected in South Bay during the study indicate relative spatial and temporal homogeneity for all parameters with the exception of water temperature. Water temperature was sufficiently variable by month and evaluation area to be a potentially important factor influencing fish distribution in South Bay. Seasonal trends in species composition generally followed annual temperature cycles (i.e. cold water species abundance increasing in fall) and supports this hypothesis.

The timing of yellow perch spawning in Flathead Lake corresponds with maximum draw-down under present hydroelectric operations. Refill provides increased habitat for the population to expand into just as fry are hatched. Winter draw-down exposes yellow perch of all ages to greater predation due to a lack of cover, particularly young-of-the-year perch which are heavily cannibalized. This pattern may actually be of benefit to the perch population as a whole by reducing recruitment, providing a ready forage base in winter when aquatic insects may not be readily available, and preventing stunting, a common problem in perch populations.

The growing importance of the yellow perch fishery is easily illustrated through creel survey comparisons. In 1966, it was reported that the yellow perch harvest comprized 17% of the total lake-wide catch. By 1982, the percentage of perch in angler's creels increased to 33%. Today anglers harvest between 30,000 and 40,000 perch annually from South Bay.

Study results lead to the following conclusions:

1. Yellow perch support an important and growing fishery in South Bay of Flathead Lake.
2. The existing pattern of lake drawdown and fill for hydroelectric purposes coincidentally corresponds to the biological requirements of yellow perch for spawning and increased habitat upon hatching.
3. Fall drawdown exposes young-of-the-year fish to predation and possibly prevents stunting of the perch population.
4. Recruitment in the existing largemouth bass population of South Bay is probably controlled by an overwhelming yellow perch population which may directly prey upon young bass and/or compete with them for a limited food supply.
5. The presence of northern pike in South Bay could not be documented.
6. Structural complexity in South Bay is extremely limited at all times of the year. However, this physical deficiency can be enhanced through the use of artificial reefs.

INTRODUCTION

With the concurrence of the Bonneville Power Administration, the Lower Flathead System Fisheries Study was expanded in 1984 to include the South Bay of Flathead Lake. South Bay, the southern most lobe of Flathead Lake, represents approximately eleven percent of the total lake surface area. South Bay is also the most extensive area of shallow water in Flathead lake, and therefore, most effected by changes in lake levels.

The Confederated Salish and Kootenai Tribes has long recognized a significant data gap of how lake level fluctuations affect fish species resident to South Bay, notably yellow perch (Perca flavescens), lake whitefish (Coregonus clupeaformis), largemouth bass (Micropterus salmoides) and northern pike (Esox lucius).

The objectives of the study were:

I. Assess existing aquatic habitat in the South Bay of Flathead Lake and its relationship to the present size, distribution, and maintenance of yellow perch, largemouth bass, northern pike, mountain whitefish (Prosopium williamsoni) and lake whitefish populations in the bay.

II. Assess how and to what extent hydroelectric operation affects the quality and quantity of aquatic habitat in South Bay and different life stages of existing target fish populations.

III. Develop an array of fisheries management options to mitigate any possible negative impacts of present hydroelectric operations.

The Tribes in cooperation with the Montana Department of Fish, Wildlife and Parks will be developing an interagency fisheries mitigation protection plan (IMP), which will be presented to the Northwest Power Planning Council in October of 1989. This plan will incorporate the findings and recommendations from all the Flathead Basin fisheries studies, producing a comprehensive, basin wide, management and mitigation plan.

DESCRIPTION OF STUDY AREA

South Bay of Flathead Lake

Montana's Flathead River-Lake ecosystem, with tributaries originating in Canada, Glacier National Park, and the Bob Marshall Wilderness is nationally known for its clean, clear waters and near pristine conditions and constitutes the northeastern most drainage of the Columbia River. The lower Flathead system, as defined for this study, included the south half of Flathead Lake, the lower Flathead River, and its major tributaries.

Flathead Lake divides the Flathead River into upper and lower reaches and covers 50,992 ha (U.S. E.P.A. 1983). The lake study area (Figure 1) is the southern most lobe of Flathead Lake, called South Bay. The study area is separated from the main lake by an island-dotted channel, the Narrows, and is bounded on the south by Polson Bridge which spans the outlet of the lake. South Bay, the most extensive shallow area in Flathead Lake (Moore et al. 1982), has a maximum depth of 10.6 m, an average depth of 4.6 m, and a surface area of 5,448 ha. The 18,379 km^2 drainage area of Flathead Lake (U.S. E.P.A. 1983) encompasses the upper Flathead River, the Swan, Stillwater, and Whitefish Rivers.

Hydroelectric power generation within the Flathead River drainage plays a major role in the hydrologic profile of Flathead Lake. The operation of Kerr Dam results in a maximum annual fluctuation of lake surface elevations between 878.7 m and 881.8 m above sea level. Minimum lake elevations are usually reached in March, followed by a rapid fill period which ensures elevations of 880.9 m by May 30 and the maximum of 881.8 m by June 15. The maximum is maintained through Labor Day, at which time the extended drawdown period is initiated and continues until minimum elevations are again reached in March. The May 30, June 15, and Labor Day dates are the result of a Memorandum of Understanding between the Montana Power Company, the U.S. Army Corps of Engineers, and Flathead Lake Owners Association (Montana Power Company 1976). Changing lake levels have a disproportionate influence on South Bay because it is relatively shallow and has more gently sloping bottom contours compared to most other parts of the lake. The annual dewatering and reflooding of this extensive littoral area and its associated vegetation may adversely impact resident fish populations known to utilize such habitat. Shoreline vegetation is dominated by emergent _Typha_, _Carex_, and _Scirpus_ while principal aquatic genera include _Chara_, _Myriophyllum_, and _Potamogeton_.

The weather of the Flathead basin, moderated by Flathead Lake, is warmer than nearby Rocky Mountain areas (U.S. E.P.A. 1983). At Polson, the mean January temperature is -3.8^{o}C, and mean July temperature is 19.6^{o}C with an annual mean of 7.5^{o}C. Precipitation averages 38.1 cm per year, half of which typically falls during May and June. Total snow cover seldom exceeds 0.3 m. Surface ice generally forms over the entire lake once in ten years. Shallow bays usually freeze annually and prevailing winds are from the south and north, paralleling the major valley axis.

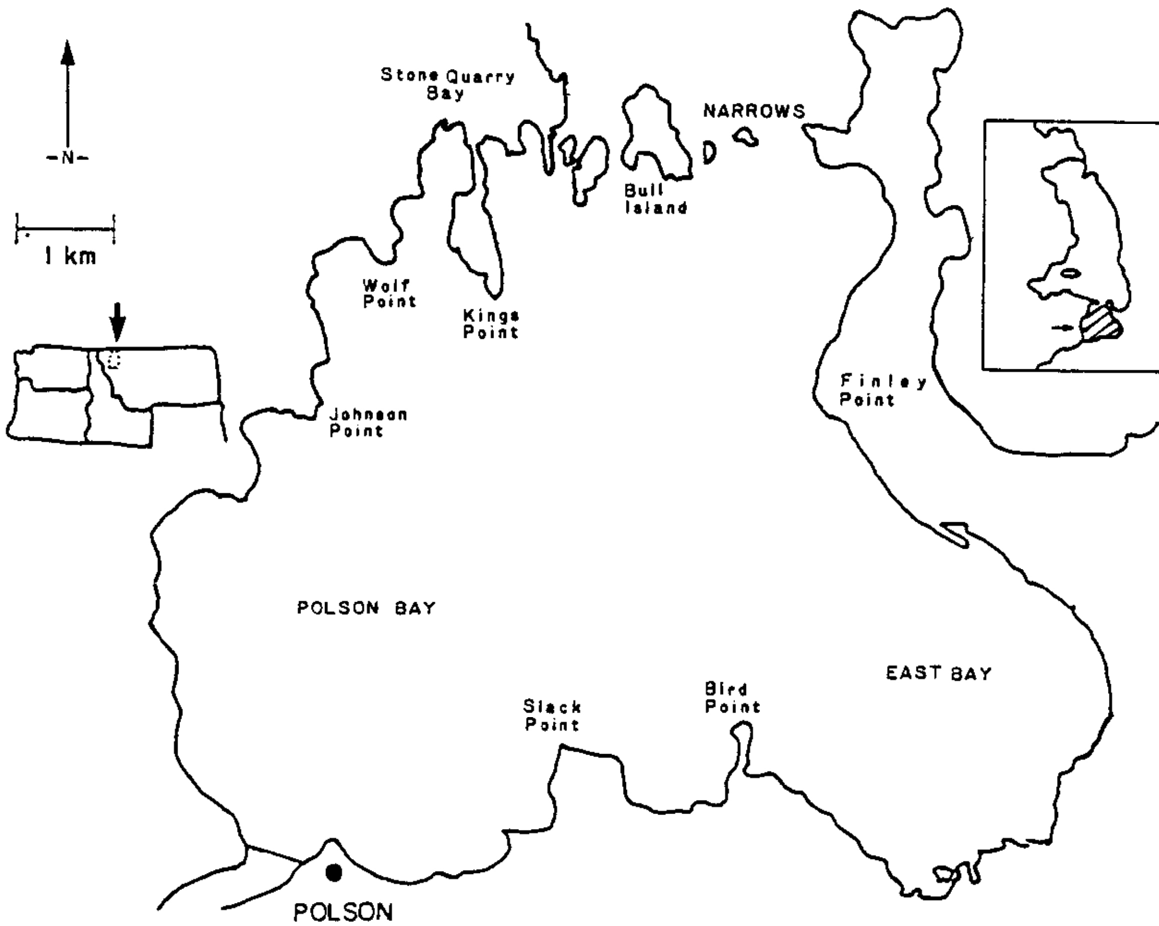

Figure 1. Location and important features of South Bay, Flathead Lake, Montana.

Moore et al. (1982) provided a detailed account of the sediment geochemistry of Flathead Lake. Due to the shallow nature of South Bay, its sediments are unique among those of Flathead Lake in several respects. Algal productivity can be twice as high in shallow bays as in open water areas (U.S. E.P.A. 1983) and has resulted in thicker organic layers in areas such as South Bay than in the main lake. In addition, wave processes unique to shallower areas have redistributed an accumulation of coarse sand to the northern part of South Bay (Lorang 1984), an area which apparently receives little sediment from the annual lake plume. South Bay also has higher amounts of non-transported silt in surface sediments than the main lake, likewise a result of the reworking of shoreline sediments by wave action (Moore et al. 1982).

Flathead Lake is oligo-mesotrophic in terms of algal productivity, water clarity, dominant phytoplankton species, and total dissolved solids. Eutrophication of Flathead Lake has been accelerated in recent years, primarily due to effluent from increased cultural development (Stanford et al. 1983).

METHODS AND MATERIALS

Habitat Evaluation

During 1984, a pilot study of South Bay established criteria for dominant habitat type mapping, and physical habitat evaluation methods were developed for use during the rest of the study. A variety of survey techniques (Johnson and Nielsen 1983, Terrell et al. 1982, Johnson and Stein 1979) were reviewed and select methods tested to assess their relative efficiency for completion of this study.

Preliminary habitat types were delineated using overlays of mapped sediment distribution and depth as reported in Lorang (1984). These parameters were selected as a basis for habitat types because of their shared importance in determining habitat suitability for species such as yellow perch and largemouth bass (Stuber et al. 1982) known to inhabit the study area. Resultant maps were groundproofed using the following techniques.

1) twenty nine SCUBA and snorkel surveys were completed both within and across mapped habitat types to confirm relative substrate homogeneity and approximate boundaries. Groundproofing surveys, 100 m long, were conducted in permanently inundated areas from March to June before maximum lake levels were reached. A stratified sampling approach (Johnson and Nielsen 1983) was used to subsample all major habitat types; additional surveys were used to groundproof similar, noncontiguous areas. Aerial and shoreline photos were taken in conjunction with substrate samples in groundproofing surveys of all seasonally inundated areas.

2) substrate samples were visually classified by dominant particle size and compared with mapped types. In addition to substrate evaluations, hydroacoustic surveys were conducted to verify the depth classification of mapped habitat types (i.e. shallow, mid-depth, or deep). Sonar surveys were completed along each transect and were initiated and terminated as close to the highwater mark as possible. Corrections were made for the shallower, unsurveyed portions of each transect. Depthfinder adjustments and boat speed were held constant throughout individual runs to minimize confounding in the interpretation of recorded depth data. All sonar tapes were subsequently analyzed for mean and maximum depths (relative to 881.8 m elevation), linear distance within the drawdown zone, and general agreement with existing depth contour maps.

3) independent records of lake elevation and weather, provided by Montana Power Company, were reviewed and used to further characterize the environmental constraints imposed on South Bay. Mean, minimum, and maximum monthly lake elevations were summarizd for the period 1977 to 1983.

4) planimetric methods were used with revised maps from Lorang (1984) to determine more accurately the relative extent of seasonally inundated areas. The study area was divided into two major subareas, Polson Bay and East Bay, based on observed differences in sediment distribution, water quality data, and currents as indicated in LANDSAT

photographs. A Lasico rolling disk planimeter was then used to determine surface area of South Bay, both subareas, and the maximum drawdown zone within each. These measurements were compared with similar estimates derived from the transect surveys. All depths and computed areas were adjusted to the maximum lake elevation of of 881.8 m.

Evaluation Areas

Lake habitat types reported in Darling et al. (1984) were reclassified using the substrate size, classes and nomenclature of Stuber et al. (1982). These revisions were designed to make future sampling and analyses more ecologically based rather than retain the original geologic classifications of Lorang (1984).

The depth intervals for habitat types established in 1984 were also revised. Both substrate and water quality data indicated relative homogeneity between mid-depth (3-6 m) and deep (6-10 m) water habitats of South Bay and thus, these two intervals were combined into a single "permanently inundated" zone. The shallow (< 3 m) depth interval was renamed the "seasonally inundated" zone for purposes of this study. Evaluation areas for sampling purposes were then redefined. The fourteen areas include all unique combinations of substrate type and depth zone (Figure 2).

Water Quality

Beginning in April 1984, measurements of temperature, dissolved oxygen, pH, and conductivity were taken at ten permanent sites every other week. Eleven inshore stations were added to the sampling schedule in June when rising water levels had reflooded seasonally exposed areas. All water quality measurements were taken at 0.5 m depth intervals. Secchi visibility, air temperature, wind and water conditions were also recorded at each station. Beginning on September 14, 1984 water quality measurements were taken at 1.0 m increments at twenty-six permanent sites located within each of the fourteen evaluation areas (Figure 2). During January and February of 1986 measurements were taken only from Polson Bridge due to winter ice conditions. Beginning in May 1986 measurements were taken at surface, mid-depth, and bottom stations at the twenty-six sites (mid-depth taken only at depths greater than 1 m.

Four Ryan model-J thermographs (90-day) were also utilized to obtain a continuous record of water temperatures. The thermographs were placed in each of the two major subareas within South Bay (Figure 3). These instruments were anchored on the bottom in at least 1 m of water in an attempt to minimize temperature variability, and to better reflect actual temperatures within the occupied habitat of target fish species.

Vegetative Cover

In 1985 hydroacoustic surveys were conducted in early June, and again in October, to estimate minimum and maximum percentages of vegetation respectively. Vegetation was defined as any submerged macrophyte at least 30 cm in height. This minimum height was chosen as

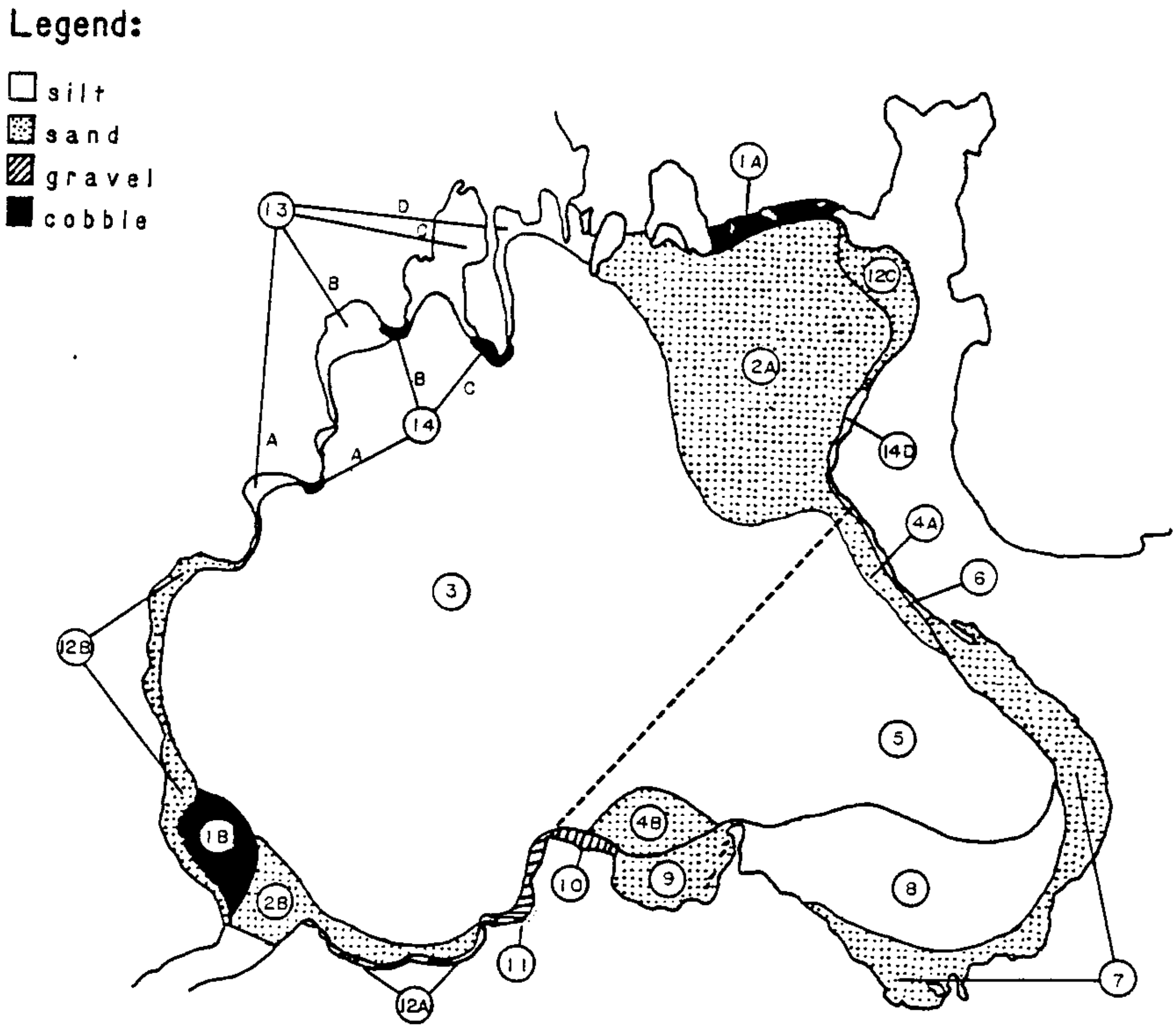

Figure 2. Evaluation areas based on depth and substrate characteristics (see legend) in South Bay (modified from Lorang 1984).

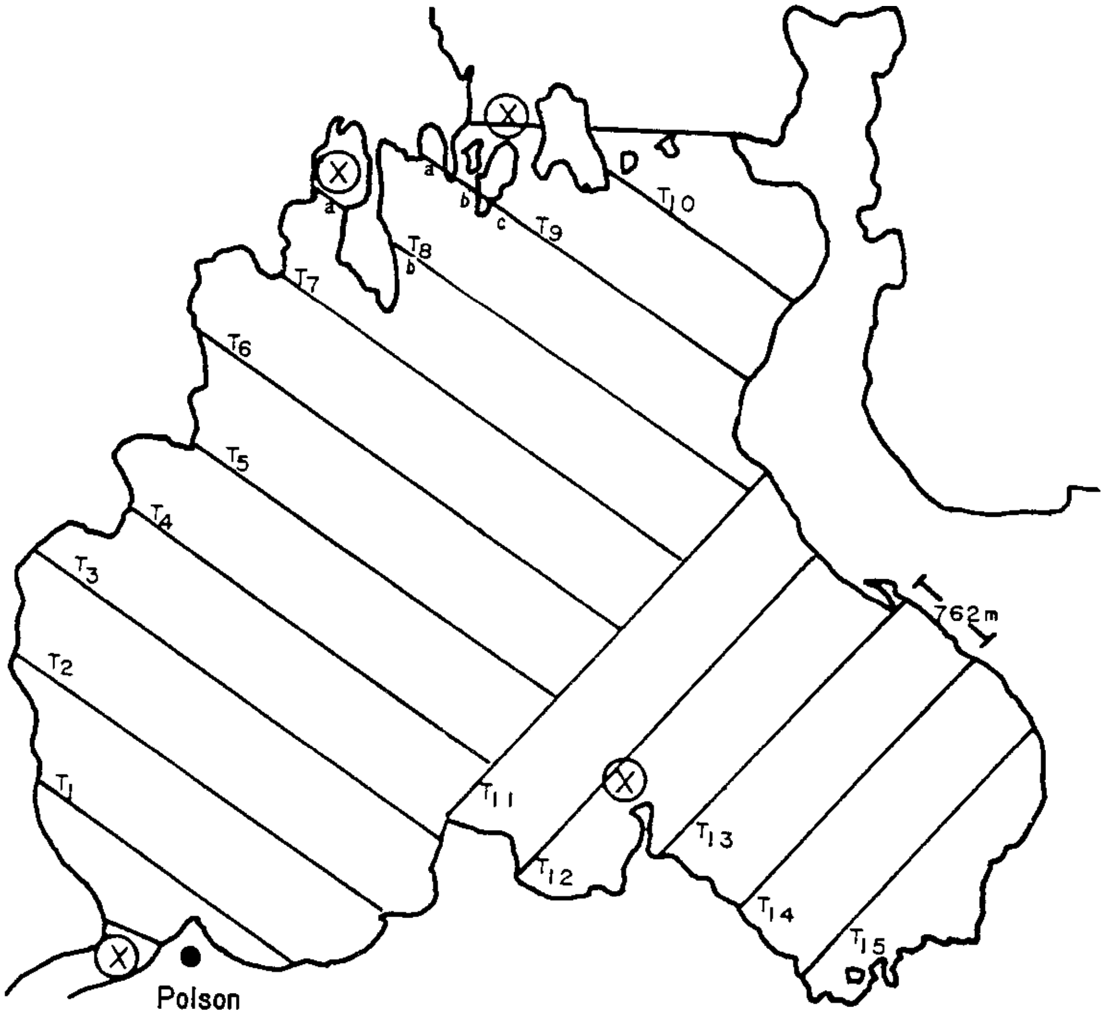

Figure 3. Locations for continuous recording thermographs (X) and permanent habitat evaluation transects established in South Bay.

the direct result of observed utilization patterns by yellow perch, the dominant target species in South Bay. These latter observations were restricted to the ice-free months and were made by SCUBA divers at both minimum and maximum lake elevations. A Lowrance model X-15 depth finder was used to conduct the vegetation surveys along each of the fifteen permanent transects established in 1984 (Figure 3). Initially, divers were towed behind the sonar boat using a dive sled, recording observations as to the presence of aquatic vegetation and fish (Darling et al. 1984). These observations were conducted in conjunction with sonar tapes, thereby checking the accuracy of the sonar runs.

Percent vegetation was computed from the proportion of each sonar transect which intersected vegetation 30 cm or greater in height. To do this, dividers were set to the equivalent of 30 cm (on sonar tapes) and drawn along the "lake bottom" of each tape to mark all vegetation which exceeded this minimum height. The portions of each transect which intersected vegetation, as defined, were then summed by evaluation area. This number was then divided by the total of sample transects in the same area to obtain percent vegetation. This procedure was repeated for all fifteen surveys and tabulated by evaluation area.

Fish Sampling

Larval Fish

As a result of preliminary sampling conducted through the spring and summer of 1984 (Darling et al. 1984), 32 locations were selected as permanent sampling stations for 1985 and 1986 (Figure 4). Both seasonally and permanently inundated area as well as the various substrate types found in South Bay are represented by these sampling locations.

Poor weather dictated an intermittent sampling schedule from late March through May 1985 and 1986, but as conditions improved, an essentially bi-weekly schedule became practical.

In 1985 and 1986 two nets were suspended from opposite sides of the bow on the sampling boat to collect simultaneous sample replicates. At each station, nets were pushed for ten minutes at a tachometer reading of 1600 rpm. The half-meter nets used for larval sampling were constructed of 900 micron Nitex mesh and equipped with a General Oceanics flowmeter, 13.5 kg lead weight, and plankton cup. During standard sampling the net was suspended from a 2 m PVC outrigger mounted near the bow of the boat. This gear was pushed close to the shoreline in inshore areas and between predetermined compass points in offshore areas. Flowmeter readings were taken before and after each tow.

The volume of water filtered by the half-meter net during each tow was calculated from the difference in flow meter readings multiplied by a calibration factor. The calibration factor was derived from a series of tows over a known distance at a given speed using the formula: C = (A*L)/D, where C is the calibration factor (m^3 per revolution of the flowmeter), A is the area (m^2) of the net opening, L is the length (m) of the tow, and D is the mean difference in revolutions between beginning and ending flow meter readings. A factor of 0.005383 m^3 per flowmeter revolution resulted from the average of five calibration tows

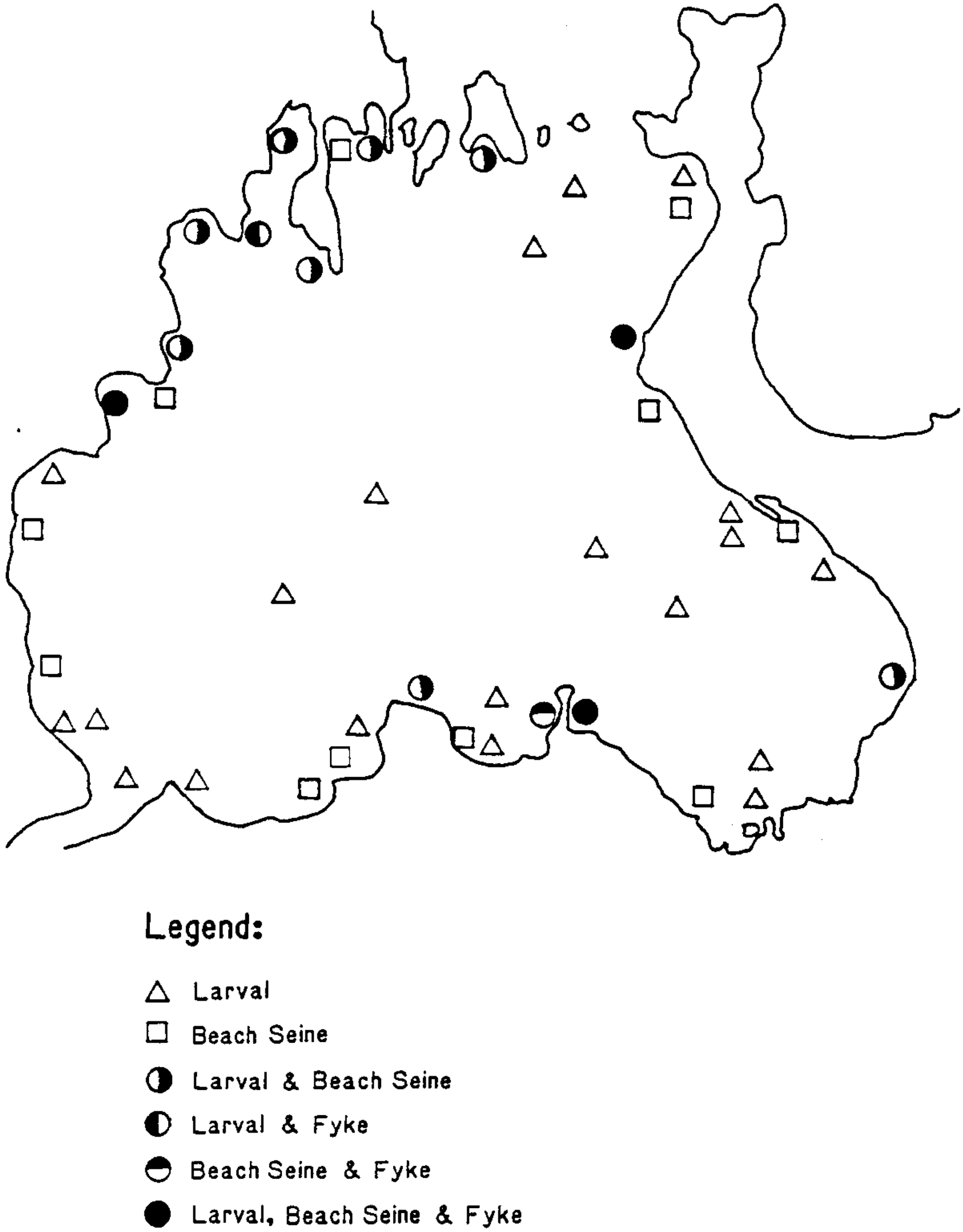

Figure 4. Larval fish, beach seine and fyke net trap locations used for fish sampling throughout South Bay.

with the half-meter net. A 15 minute tow filtered approximately 180 m^3 of water, and the distance traveled in this time at idle speed was completed within given habitat types on all transects. Total catches of larval fish were paired with associated water volumes. Catch-per-unit-effort (CPUE) was calculated as fish per m^3 of water filtered.

Specimens from each tow were washed from the plankton cup into a collection jar and preserved in 5% formalin stained with Rose Bengal. In the laboratory, larval fish were separated from vegetation and debris and stored in vials containing a mixture of 74% distilled water, 15% methyl alcohol, 10% formalin, and 1% acetic acid. All specimens were measured and identified to the lowest taxonomic unit possible using characteristics given by Auer (1982), Snyder (1981), and Mansuetti (1964). Following the criteria of Snyder (1976), fish were designated as larvae if the adult fin complement was not fully developed or if median finfolds were visible.

Beach Seining

Exploratory beach seining in 1984 (Darling et al. 1984) provided the basis for selecting the 24 permanent seining stations sampled in 1985 and 1986 (Figure 4). Major substrate types present in South Bay were sampled in both seasonally and permanently inundated shorelines during three distinct sampling periods. Sampling was conducted with a 106.68 m by 2.44 m beach seine constructed of 6.25 mm square mesh, knotless, nylon netting.

In 1985 and 1986 samples were collected from 16 locations during evaluation period I and 24 locations in periods II and III. Depending on the size and composition of individual catches, several procedures were used to obtain size class distribution data. When seine catches were small, the total length (TL) of all fish was measured to the nearest millimeter. If catches were larger (i.e. $N > 50$) and appeared homogenous with respect to size class distribution, a subsample was measured ($N = 25$-35), and the remainder of the catch simply counted. For very large catches (i.e. $N > 1000$) of homogenous size class distribution, a subsample of fish was measured (TL), and a numeric estimate of remaining fish was obtained by calculating the average number of fish/small dipnet multiplied by the total number of small dipnets of fish. For very large catches (i.e. $N > 1000$) with several size classes, fish which appeared larger or smaller than the majority of fish in the net, or species represented by few individuals were removed and measured (TL). An abundance estimate of fish remaining after size class subsampling was obtained by calculating the average number of fish contained in a small dipnet and multiplying this value by the total number of dipnets of fish in the seine. In the latter two cases, the number of fish subsampled for length distribution data was added to the abundance estimates, and size class data from the subsample was applied to the abundance estimates on a proportional basis. Usually 15-20 fish from each seining location were placed on ice and returned to the laboratory for weighing (0.1 g).

Fyke Net Trapping

The primary purpose of fyke netting was to tag fish in order to examine fish movements within South Bay. All fish captured were weighed (g), measured (TL) and sexed when possible. Fish were tagged (floy or fingerling), scales taken and released. Sampling for adult fish was conducted at five sites (Figure 4) from March through June 1984 using three fyke traps. Only three of five sites were sampled at any one time. Fyke traps were fished at five shoreline locations from 3 April through 18 June 1985. Fyke traps were 1.8 m in diameter and constructed of #15, 25.4 mm tarred nylon mesh. A maximum of 122 m of 25.4 mm mesh lead material in 30.5 m lengths, 3 m deep, was used on inshore and offshore sides of each trap. Inshore leads extended to the shoreline. Traps and leads were anchored with fence posts in soft bottom areas and çement block clusters in rocky bottom areas. The traps were checked two to seven times per week and moved as necessary when water levels fluctuated. All traps were removed by the end of June.

Gill Netting

Experimental gill nets with mesh sizes ranging from 1.9 to 5.1 cm were used to determine the relative distribution of adult target species in South Bay in 1985 and 1986. Sampling was conducted during each of the three elevation periods and included both spatial and temporal components. Supplemental samples were taken in vegetation to examine specifically the utilization of this dominant cover component.

In an effort to minimize sampling variability, five nets were fished simultaneously, placed perpendicular to prevailing bottom contours, and were fished for approximately equal duration. All data were converted to catch-per-unit-effort (CPUE = fish/hr) for analysis.

All fish of the target species were measured (TL), weighed (g), and tagged. Scale samples were taken and sex determined, when possible, prior to releasing fish. Recaptured tagged fish were remeasured and the location recorded. The original methods and locations of captures were determined from previous data records. Floy tags were used on fish 150 mm TL and larger, while fish less than 150 mm TL were marked with fingerling tags.

Sampling for this study component was conducted within each of the fourteen evaluation areas during the three lake elevation periods (Figure 5). Five gill net sets were completed within each evaluation area. Nets were set after sunset and allowed to fish for approximately one hour.

A 24 hour period was sampled to determine the diel habitat utilization patterns of target fish species. One evaluation area was selected in each of the Polson (I) and East Bay (II) subareas for this purpose. Gill net stations 3c and 5c (Figure 5) were sampled at 4 hr intervals beginning at 0800. Fishing effort was approximately 1 hr for all sets and catches were recorded as described previously.

Six paired gill nets sets were completed in East Bay to determine if utilization by target fish species was significantly higher in vegetated versus non-vegetated areas. Although several evaluation areas were sampled, individual paired samples were taken within the same

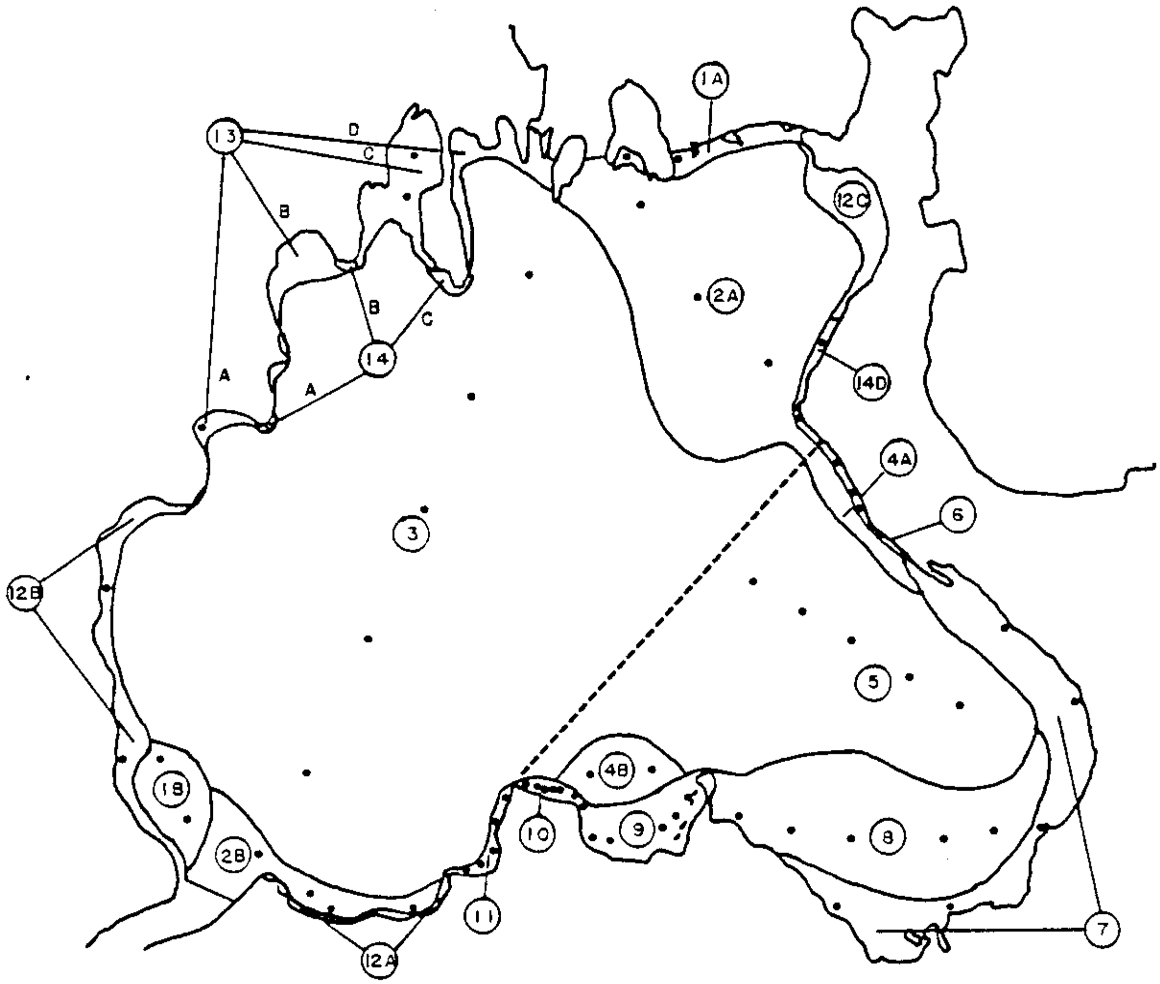

Figure 5. Gill net sample locations (•) within the 14 different evaluation areas of South Bay, 1984-1986.

evaluation area. All sets were made in August when aquatic vegetation was near its maximum annual density.

Upon inspection, the CPUE gill net data from 1985 and 1986 did not meet necessary assumptions of homogeneity of variance and normality to allow parametric statistics to be performed. Attempted transformations of the data still did not allow the assumptions to be met satisfactorily, and nonparametric alternatives were used.

Kruskal-Wallis One-Way ANOVA were used to compare catch between evaluation areas for the full year and within each period for 1985 and 1986. Comparisons between periods were performed using the Mann-Whitney U two-sample test. All tests were performed on four variables: numbers of yellow perch, yellow perch CPUE, numbers of salmonids and their CPUE.

Hydroacoustic recordings, to detect the presence or absence of vegetation, were also made during the more extensive night sampling of all evaluation areas. These records will be used to assess further the use of vegetation by target fish species in other habitat types and seasons.

Data from recaptured fish were analyzed to determine if seasonal patterns of movement for fish species could be established.

Age Class Structure

Fish captured by beach seining, fyke net trapping, and the 1985 ice fishery creel survey provided scales used for age class analysis. Scales were taken from between the dorsal fin insertion (first dorsal fin for Percids) and the lateral line. Scale samples collected for the ice fishery were subsampled by 10 mm size classes. If there were more than 25 representatives of a given size class, 25% of the scale samples were selected at random from the group. Acetate impressions were made from scales following methods reported by Darling et al. (1984). Distances from the focus to the outer edge of each annulus, and to the scale margin were measured on the anterio-dorsal axis at 48X for yellow perch. Following the recommendation of Bagenal and Tesch (1978) a "birthday" was assigned to fish. A birthday of May 1 was assigned to yellow perch based on the apparent peak of spawning activity in South Bay as reported in Darling et al. (1984).

Data were entered into a personal computer using dBASE III software. Summary statistics (mean, sum, standard deviation, standard, minimum, maximum, range, sample size) were calculated using either dBASE III or SPSS PC programs. To be conservative and because the assumptions for parametric statistices could not be fully met, nonparametric statistics were used for tests comparing the difference between independent variables. Mann-Whitney U tests were employed for paired-tests, while Kruskal-Wallis One-Way ANOVA tests were used when an independent numeric variable had more than two values. These statistical procedures were used for all different sets and tests run only where appropriate.

Creel Survey

A creel survey, patterned after discussions of survey methodologies by Neuhold and Lu (1957), was conducted on the East Bay ice fishery from 12 January through 31 March 1985. Total angler estimates were derived daily from five instantaneous angler counts made from shoreline vantage points (Figure 6). The times of daily instantaneous angler counts varied over the survey period as daylight hours increased.

Completed trip interviews were conducted at departure points (Figure 6) to obtain catch and creel data, and information about fishing time, catch composition, and catch size distribution.

Information from the 1985 survey was analyzed through Computing Services of Montana State University using a program developed by the Montana Department of Fish, Wildlife, and Parks (Robert McFarland, MDFWP, Helena, Montana).

Two additional creel surveys were conducted on East Bay. The first covered the winter ice fishery from 21 December 1985 through 16 March 1986. The second creel survey, which began on 13 April 1986 and ended on 2 May 1986, was directed at a boat fishery that targets concentrations of spawning yellow perch in East Bay.

Although methodologies of the latter two surveys were generally patterned after discussions by Neuhold and Lu (1957) and Malvestuto et al. (1978), specific details of the two survey procedures were somewhat different from each other and the 1985 survey.

For the 1985-1986 ice fishery survey, total angler estimates were derived daily from five instantaneous angler counts made from shoreline vantage points, as with the 1985 winter creel survey (Figure 6). However, the times of daily instantaneous angler counts, for the 1985-1986 survey remained constant and were obtained at 1030, 1200, 1330, 1500, and 1630.

Completed trip angler interviews were conducted at access points (Figure 6) to obtain catch and creel data, and information about fishing time, catch composition, and catch size distribution.

Results from the 1984-1985 ice fishery creel survey (Pajak et al. 1986) revealed a low creel rate for yellow perch relative to the catch rate. It was apparent that this difference resulted from many small, immature fish being caught relative to each individual fish creeled. To determine the size distribution of yellow perch caught but not creeled, fish which had been discarded on the ice by anglers were measured on three dates. Samples were collected on 29 and 30 December 1985, and again on 16 January 1986. It was assumed that yellow perch found on the ice were representative of non-creeled fish and that changes in total length caused by freezing and dessication were negligible.

A stratified two-stage sampling schedule was developed for the creel survey of the spring yellow perch fishery. Within each two week time period, four weekdays and two weekend days were randomly selected for survey activities. Five instantaneous boat and angler counts were made every two hours during the day with the time of the initial count chosen randomly from 0700, 0800, 0900, 1000, or 1100 hours. Boat and angler counts were obtained from vantage points (Figure 6) using

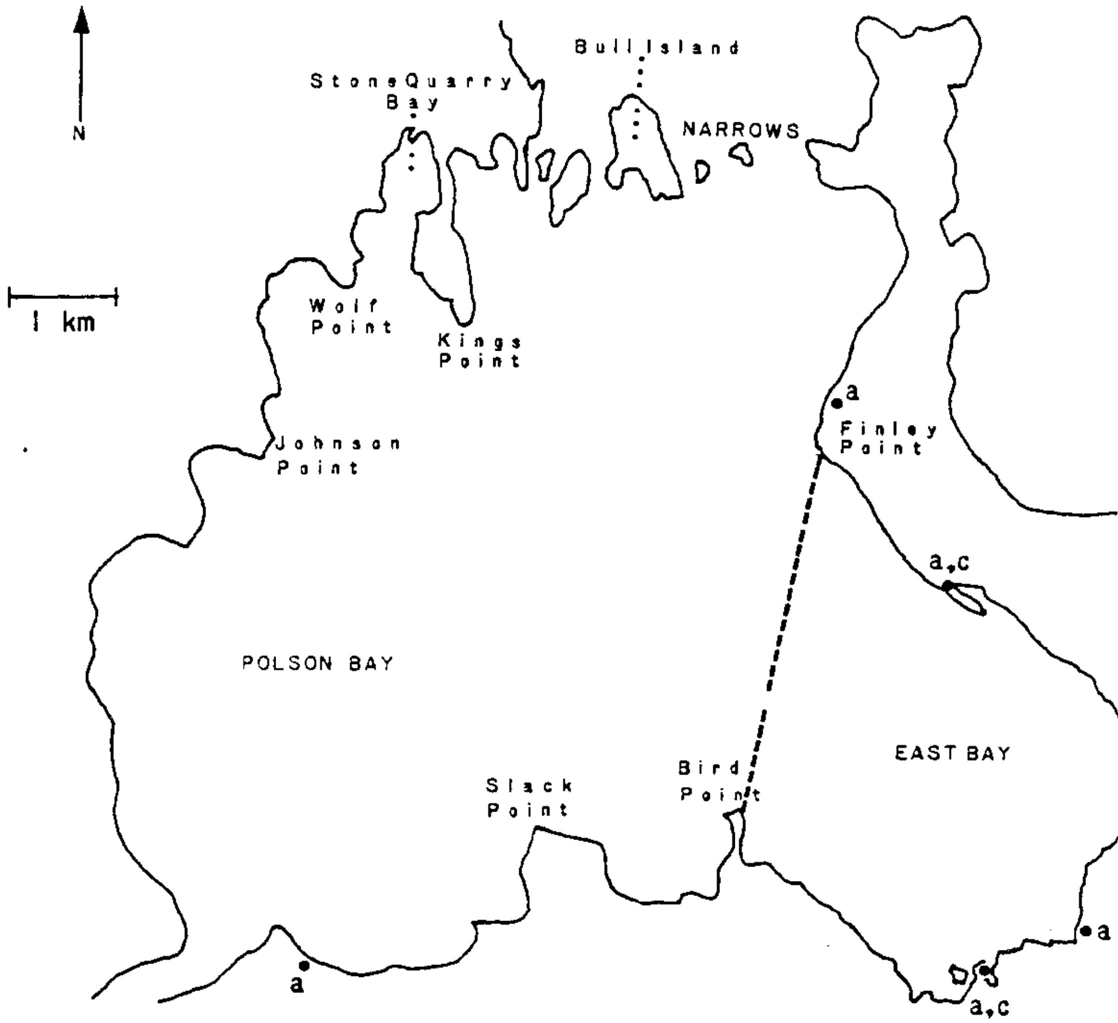

Figure 6. Angler access points (a) and locations for instantaneous angler counts (c) for the winter and spring perch fishery surveys on East Bay, Flathead Lake, Montana. Fishing pressure occurred almost exclusively in the area East of the dashed line. Access points north or west of the dashed line were used during the spring fishery.

binoculars or a spotting scope. Most harvest information was obtained from completed trip interviews conducted at boat access points (Figure 6), but several incomplete trip interviews were also obtained.

For the 1986 surveys catch and effort statistics used to derive total harvest estimates for the ice fishery were developed with SPSS/PC+ software (SPSS Inc. 1984). The mean fish per angler per hour (C) was calculated by dividing the mean fish per party by mean party size (P) divided by mean hours fished. [(H), $C = C_p/P/H$]. Effort is equal to the total hours in the fishery (H_T) multiplied by mean angler counts (A). Harvest is therefore determined by multiplying Effort by mean fish per angler per hour, $C_T = E*C$.

RESULTS

Habitat Evaluation

Review of LANDSAT photographs, sediment distribution data, and bay morphometry suggested two physically distinct subareas within South Bay (Figure 7). This major stratification of the study area was adopted for the purposes of data summary and analysis and is further supported by the unique presence of persistent aquatic vegetation in the East Bay subarea only.

Planimetric analysis of the total study area indicated that approximately 18.1%, or 986 ha, is within the maximum drawdown zone (Figure 7). Of this area regulated by hydroelectric operations, 71.0% is located in East Bay (II). This subarea comprises only 30.4% of the total study area which in turn represents 10.7% of the total lake surface.

SCUBA, shoreline, and aerial surveys generally confirmed mapped boundaries and habitat type homogeneity based on the data of Lorang (1984), but several inconsistencies were observed. Seasonally inundated portions of Polson Bay (I), typed as sand (SS2) and muddy ooze (SMO), contained extensive areas of cobble and gravel respectively. Large deposits of cobble and boulder were also observed in habitat types in both Polson and East Bays mapped as sandy mud (MSM) or muddy ooze (MMO). A third and recurring inconsistency was the lack of observable boundaries between finer substrates, particularly the sand, sandy mud, and muddy ooze types. However, these smaller substrate types were not easily distinguished by evaluators.

The depth component of each habitat type was groundproofed using sonar surveys. A total of 53,280 m of transect were sounded (Table 1). Based on transect data, mean and maximum depths for subarea I were 5.19 m and 10.63 m, respectively. Comparable figures for subarea II were 3.48 m and 6.02 m, respectively. A gradual increase in depth was observed towards the central axis of each subarea and toward their respective northern boundaries as well. The mean depth for all transects combined was 4.62 m, and the maximum 10.63 m, the same as that reported for subarea I. Average transect length was 3,552 m.

Seasonally inundated areas, or those less than 3 m deep at maximum lake levels, comprised an average of 10.4% of each transect (Table 1). This proportion is substantially less than the 18.1% determined using planimetric method and the data of Lorang (1984). Further comparisons of depth data from this study with that of Lorang (1984) were not possible because lake elevation reference measures were not reported in the latter study. Bathymetric maps prepared by the MDFWP incorporate much of the Lorang (1984) data for South Bay and thus could not be used for independent comparison either. However, gross trends in bottom contour data are similar in this and the studies cited.

Lake elevation data for the past seven years (1977- 1983), recorded in Polson by the Montana Power Company, are summarized in Figure 8. These years were chosen for evaluation because they represent a discrete period of dam operation according to a state researcher (J. Decker-Hess, MDFWP, pers. comm.). The mean and range of monthly

Depth Interval	Habitat Types: Transported Sand (S1)	Untransported Sand (S2)	Sandy Cobble (SC)	Sandy Mud (SM)	Muddy Ooze (MO)
S-Shallow (<3 m)	SS1	SS2	SSC	SSM*	SMO
M-Middepth (3 m to < 6 m)	MS1	MS2	MSC	MSM	MMO
D-Deep (>6 m)	MS1	DS2*	DSC	DSM*	DMO

*these types not observed within the study area.

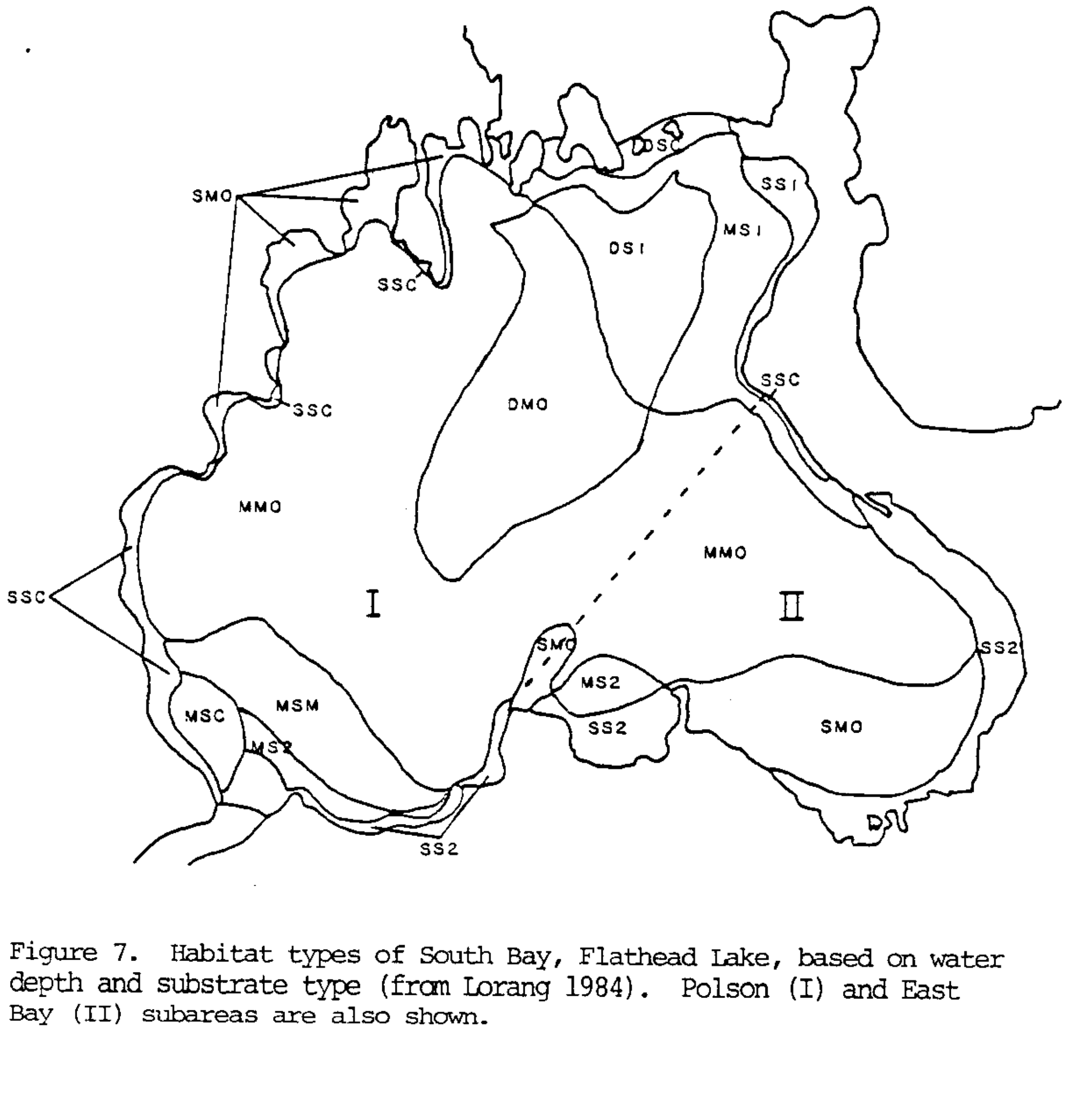

Figure 7. Habitat types of South Bay, Flathead Lake, based on water depth and substrate type (from Lorang 1984). Polson (I) and East Bay (II) subareas are also shown.

Table 1. Mean and maximum transect depths and transect proportions within seasonally inundated areas of South Bay, Flathead Lake.

Transect No.	Total Length(m)	Mean Depth(m)	Maximum Depth(m)	Seasonal inundated Length(m)	%
1	2820	4.16	4.96	229	8.1
2	3920	4.67	5.64	222	5.7
3	4140	4.90	5.64	257	6.2
4	3930	5.26	6.45	250	6.4
5	3860	5.71	6.45	72	1.9
6	4530	5.62	6.58	106	2.3
7	4210	5.86	6.40	<25*	<0.5*
8a**	525	2.27	3.02	413	78.7
		} 5.08			
b	3905	5.46	6.68	61	1.6
9a**	230	3.34	4.17	87	37.8
b	280	3.95 } 4.91	6.00	45	16.1
c	2660	5.15	6.97	61	2.3
10	2070	5.75	10.63	71	3.4
11	3960	4.68	6.02	103	2.6
12	3680	3.95	5.48	446	12.1
13	2970	3.21	4.67	696	23.4
14	2810	3.16	4.26	709	25.2
15	2780	2.42	3.58	1722	61.9
Total	53,280	-	-	5550	-
Mean	3,552	4.62	5.75	370	10.4

* Assumed to be zero for summary statistics.
**Subunits combined and weighted by transect before computing summary statistics.

elevations are plotted for those years evaluated. Maximum summer lake levels (881.8m) were reached in July and observed as late as September. The minimum elevation (878.7 m) was reached most often in March and occurred on a less regular basis than the recreationally mandated maximum. This minimum was observed in March in four out of seven years examined (1977-83), twice in February (1979, 1980), twice in April (1977, 1980), and all three of these months in 1980. In contrast to the relative stability of minimum and maximum elevations, much greater fluctuations in mean monthly elevations were observed during the drawdown September- March) and fill (March-July) periods, particularly the latter. The greatest range (2.35 m) in mean monthly elevation was observed in May, a month of rapid filling.

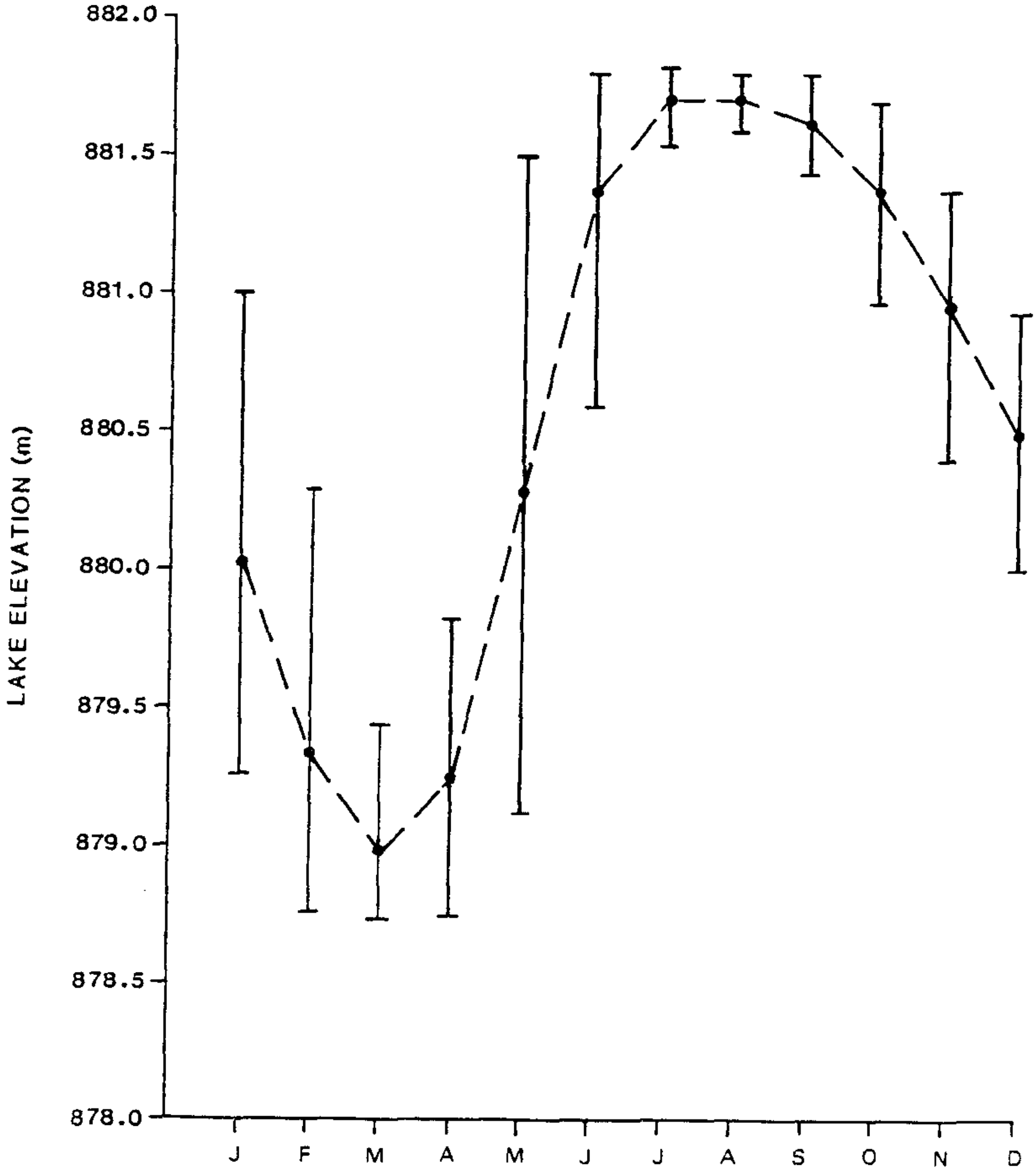

Figure 8. Minimum, maximum and mean monthly lake elevations (1977-83) for South Bay recorded at Polson, Montana.

Vegetative Cover

Results from hydroacoustic surveys in June indicate that vegetation (> 30 cm) comprises approximately 5.4%, or 270 ha, of the entire South Bay study area at maximum lake surface elevations. Most of this taller vegetation is <u>Potamogeton</u> or <u>Myriophyllum</u> and occurs primarily in silt substrates of East Bay. Although <u>Chara</u> is more common, it rarely exceeds 30 cm in height and has been observed to have lower utilization rates by adult yellow perch. Percent vegetation in the East Bay and Polson Bay subareas in June was 17.6 and 0.1 respectively. When total surface area at maximum lake elevations is considered, less than one percent (0.1) of South Bay supports vegetation greater than 30 cm in height. This vegetation is restricted to a single, permanent inundated evaluation area (5) in East Bay (Table 2). (Note: Vegetation still only comprises 0.7 percent by area of South Bay at minimum elevations).

Table 2. Percent vegetation by evaluation area and month in South Bay of Flathead Lake, 1985.

Evaluation Area Number	% of Study Area	% Vegetation June	% Vegetation October
1[b]	2.0	0	0
2	12.0	0	0
3	50.4	0	<1.0
4	1.8	0	24.4
5	17.8	3.7	16.9
6[c]	<1.0	0	0
7	3.2	23.9	16.8
8	6.6	59.4	34.9
9	<1.0	0	0
10	<1.0	0	0
11	<1.0	0	0
12	1.4	0	0
13	3.4	1.2	0
14	<1.0[a]	0	0

[a] no transect intersected subareas 14A, 14B, or 14C.
[b] areas 1 through 5 are permanently inundated.
[c] areas 6 through 14 are seasonally inundated.

Water Quality

Water quality parameters; water temperature, pH, dissolved oxygen, and conductivity were collected at 32 locations within South Bay from 16 April 1984 to 10 September 1986. Monthly means for South Bay ranged from 0 to 22.6^{o}C for water temperature, 6.54 to 8.59 for pH, 163.71 to

192.13 uM/cm for conductivity, and dissolved oxygen 8.30 mg/l to 12.73 mg/l (Appendix A). No water quality parameters exceeded tolerance limits of yellow perch and it is believed that water temperature affected fish distribution within South Bay to any observable degree. Water temperatures were consistent between years with surface water freezing during winter months, usually beginning in November, then warming to its seasonal high sometime in July.

Fish Sampling

Larval Fish

Whitefish were the first fish to appear in ichthyoplankton samples. Primarily due to the abundance of lake whitefish in Flathead Lake relative to mountain whitefish these larvae were assumed to be lake whitefish. The lack of dichotomous keys made positive identification uncertain.

Whitefish larvae normally appeared in samples in late March with abundance peaking in April and May. By mid-June larval whitefish were no longer captured by our sampling method. Nearly twice as many whitefish larvae were captured in 1985 (466) than in 1986 (263).

Yellow perch larvae appeared in ichthyoplankton samples in early May in 1985 and 1986. Peak numbers were observed in late May and early June. In 1985, 7,469 yellow perch larvae were captured and 2,109 in 1986. The mean number of whitefish and yellow perch larvae per evaluation area for 1985 was 6.71 and 43.02, respectively, and 3.77 and 13.68, respectively, in 1986. The differences between years for yellow perch were significant ($P < .001$).

Beach Seining

A total of 143,765 yellow perch were captured by beach seining during the three evaluation periods in 1985. Most (85.6%) of the catch occurred in evaluation period III with lesser percentages captured in period I (8.4%) and II (6.0%). Average yellow perch catch per seine haul (N) for all samples taken in evaluation periods I, II, and III was 673 (N = 18), 358 (N = 24), and 5,127 (N = 24), respectively.

Large numbers of perch (>1,000) were collected from 2 to 10 locations during each of the evaluation periods in 1985 (Appendix B). The two stations yielding large numbers in May (period I) were located on opposite sides of South Bay. In July (period II) large catches were made in the northeast and northern areas of the Bay, while in September (period III) they were collected from the eastern shore, the northwestern shore, and the western shore. Generally the percentage of perch captured during the three evaluation periods over any substrate type was not proportional to the percentage of stations containing each substrate type (Table 3).

In 1986 a total of 71,221 yellow perch were seined. Period I had the greatest percentage of perch, 56,085 or 78.7% (Appendix B). Periods II and III, represented 9.7 and 11.6%, respectively, of the total 1986

Table 3. Total yellow perch catch by substrate type and evaluation period. Samples were collected from South Bay by beach seine in 1985 and 1986.

	EVALUATION PERIOD					
	I		II		III	
Year	Total Perch	Substrate	Total Perch	Substrate	Total Perch	Substrate
1985	11,045	Silt	1,020	Silt	69,841	Silt
	285	Sand	2,579	Sand	23,947	Sand
			189	Gravel	210	Gravel
	876	Cobble	4,809	Cobble	29,054	Cobble
1986	37,273	Silt	1,847	Silt	2,418	Silt
	1,936	Sand	2,664	Sand	3,816	Sand
			1,256	Gravel	1,838	Gravel
	16,876	Cobble	1,136	Cobble	161	Cobble

catch. The average yellow perch catch per seine haul by period was 3,505 (N = 16) period I, 288 (N = 24) period II, and 343 (N = 24) period III.

While yellow perch numbers were greater in East Bay evaluation sites than in Polson Bay for 1985 and 1986, neither were significantly different (P>.05). No significant difference in the distribution of yellow perch based upon habitat type was identified.

Fyke Net Trapping

The location at the Narrows yeilded the lowest catches among the five fyke trap locations in 1984 (Appendix C). The area was difficult to sample effectively with the fyke traps due to limited shallow water and proximity to steep drop-offs. Because of this, the site was abandoned in 1985.

Trapping at all other locations was more effective and was conducted for varying time periods (Appendix C). In general, more fish were captured when additional lengths of offshore lead material were added. The offshore lead length ranged from 100 to 300 m for all trap locations.

The dominant target fish captured at all trap locations in 1984 and 1985 was yellow perch. Lake whitefish and bull trout were caught intermittently at the Bird Point and Finley Point locations. No northern pike or largemouth bass were captured with the fyke traps, (Appendix C).

Yellow perch catch frequencies at all trap locations exhibited peaks between 15 and 21 April and between 21 and 24 May 1984 (Figure 9). In

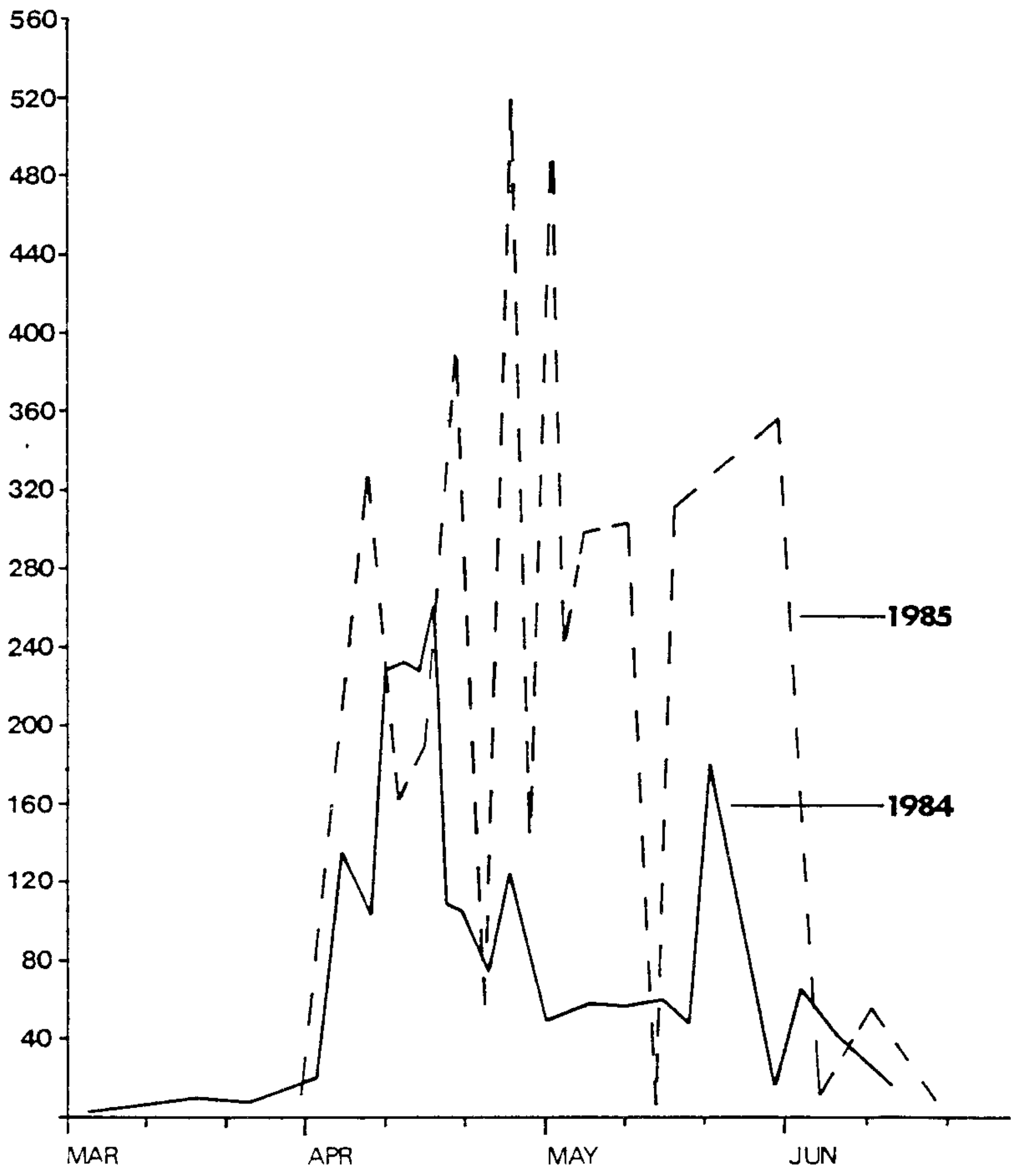

Figure 9. Total catch of yellow perch from all fyke traps in South Bay during 1984 and 1985.

1985 a peak was noted between 15 April and 23 May. During the time period between and including these peaks, 84.8% of the yellow perch captured to be at or approaching in spawning condition. Sixty percent were female and 40% were male. Sizes ranged from 100 to 313 mm TL.

Comparing the yellow perch fyke net catch data between years indicates differences in numbers of perch and the CPUE. The mean number of yellow perch caught in 1984 was 20.80 and 44.98 in 1985. The mean CPUE of yellow perch (YPCPUE) was significantly larger (P < .002) in 1985 (10.94) than in 1984 (6.42), but the mean total length of yellow perch from fyke nets was significantly longer in 1984 (229.0 mm TL) than in 1985 (213.1 mm TL).

Gill Netting

. Experimental gill net sampling conducted in South Bay from 1984 through 1986, produced a total of 5,328 fish (Table 4). Yellow perch, northern squawfish (Ptychocheilus oregonensis) and peamouth chub (Mylocheilus caurinus) were the predominate fish species captured each year. All remaining species captured (mountain whitefish, bull, cutthroat and rainbow trout, largescale and longnose sucker, redside shiner, pumpkinseed and kokanee salmon) comprised less than 2% of the total catch in any one year.

Table 4. Total numbers of fish captured and the percent composition of each species using experimental gill nets in South Bay, Flathead Lake, 1984-1986.

	1984	1985	1986
Yellow perch	889 (99)	1,183 (40)	583 (31)
Northern squawfish	-	720 (28)	782 (42)
Peamouth chub	-	386 (15)	333 (18)
Lake whitefish	-	154 (6)	42 (2)
Total hours fished	58	357	191

In 1984, gill net sampling for elevation period I was, conducted during the day while that for periods II and III was completed at night. When individual species and evaluation period are considered, yellow perch appear to dominate the catch in period I with an absolute and relative increase in CPUE for all other species in periods II and III (Appendix D).

Yellow perch CPUE in 1985 was highest in the permanently inundated evaluation areas (5, 6) located in East Bay. The relatively high CPUE for yellow perch in this area was due primarily to large catches during the first evaluation period (i.e. April) at stations d and e (Figure 5).

Northern squawfish, the second most abundant species in 1985, were captured at the highest rates (CPUE) in seasonally inundated areas (1, 11, 12, 13) of Polson Bay. Similarly, CPUE was highest for peamouth chub in seasonally inundated areas (10, 11, 12) along the southern shores of Polson Bay. Lake whitefish catch rates were highest in a sandy area (9) in East Bay and along rocky shores (1, 14) in the vicinity of Kings Point and the Narrows.

The same trend through evaluation periods for number of perch versus all other species as reported for 1985 was observed in 1986. Perch made up 78% (341) of the total gill net catch in period I, only 13% (115) in period II, and 23% (127) in period III (Table 4). The two highest catches of yellow perch (32, 219) were in evaluation area 5 in East Bay on 14 April in period I. The number of yellow perch captured decreased from period I to period II throughout South Bay while the number of all other fish increased. The number of fish other than yellow perch caught in period I was 99, in period II, 743, a substantial increase. The number of perch increased from period II to III while the number of other fish captured decreased. For the three periods combined the mean catch per net and mean catch per evaluation area of yellow perch was 3.55 and 17.67, respectively (Appendix D).

Gill net samples in the presence of vegetation or absence of vegetation was conducted in 1985 and 1986. During the two years, a total of 330 yellow perch, 4 whitefish, 27 northern squawfish, and 6 large scale sucker were caught in gill net. Mann-Whitney U two-sample tests were performed on each year separately. The numbers of yellow perch and their CPUE was not significantly different in 1985 but was ($P < .01$) in 1986. In 1986 yellow perch numbers were greater in the presence of vegetation than in the absence of vegetation.

Tagged Fish

Throughout the project adult and juvenile fish were tagged after capture. A total of 8,888 yellow perch were tagged with a return rate, as of 30 April 1987, of 6.9% (541); 44 bull trout were tagged with a 29.5% return rate. There were 372 lake whitefish and 55 mountain whitefish tagged with only 1 return of each species.

A total of 541 tagged yellow perch were recaptured, 93.1 % of these were originally captured in fyke nets, 4.5 % in gill nets, and the remaining 2.4 %, in beach seines. East Bay areas were the origin of 74.2 % of the yellow perch originally captured and tagged. Recaptures were also most common in East Bay (68.6%). Fyke nets were the source for 54.4% of the first recapture followed closely by fisherman (42.3%). Together they accounted for 96.7% of all yellow perch recaptured. Only 36 yellow perch were recaptured a second time, most of those by fyke nets (28). Of the 44 tagged bull trout, all 13 returned were captured by fisherman; twelve from the upper Flathead River.

Time from inital capture to recapture varied from 1 to 1,095 days for yellow perch. Forty-three percent were recaptured in the first 30 days and the majority of these in fyke nets. Plots of movement of fish recaptured revealed no distinct seasonal pattern. Some yellow perch were recaptured one or two years later in the same general location of their original capture, while others had moved across the Bay a distance of 8 km in less than a month. The majority of recaptures came from the same general location as their original capture.

Creel Survey

Study creel surveys were conducted during the winter ice fishing season in both 1985 and 1986. In 1986, the spring boat fishery was also surveyed.

The total numbers of yellow perch caught and creeled during the 1985 ice fishery were 47,382 and 17, 319, respectively, yielding a creel rate of 36.6%. However, in 1985 anglers were not surveyed during approximately the first two weeks of the ice fishery. During that time, anecdotal information suggests that catch rates and angler pressure were higher than later in the season. Therefore, the total harvest estimate of 17,319 fish for 1985 is conservative. A simple expansion, assuming angler effort and creel rate values during these two weeks to be equal to those for the remainder of the survey period, results in a total 1985 harvest estimate for the ice fishery of 20,388 fish.

During the 1986 ice fishery 80,173 perch were caught and 32,465 creeled, yielding a creel rate of 40.5%. The higher estimates for the 1986 fishery were attributed to increased efforts from more anglers.

The spring boat fishery, which occurs primarily in April for groups of spawning perch, was monitored in East Bay during 1986. This survey was stratified into two categories, weekdays and weekends. The mean creeled fish/angler/hour was higher for the weekends (4.4) than for the weekdays (3.4). Total pressure was also higher for the weekends (980) than for the weekdays (495) due to the greater mean angler count for the weekends (14.0) versus the weekdays (3.3). The harvest estimate for the weekend category (4,351) was more than twice that of the weekdays (1,678) giving a total spring yellow perch harvest estimate of 6,029 fish. Adding this total to the winter fishery, brings the 1986 survey period yellow perch harvest to 38,494 fish. However, this represents only those fish harvested from East Bay. An additional 2,000 to 5,000 fish are estimated to be harvested annually outside of East Bay, bringing the total harvest to yellow perch in Flathead Lake to approximately 41,500 fish in 1986.

Responses to inquiries regarding angler residence are compiled in Table 5 for the 1985-1986 ice fishery creel survey. The "Other"

Table 5. Origin of anglers interviewed during the 1985-1986 East Bay ice fishery creel survey.

Angler Residence	Number from Locality	Percent of Total
Kalispell	108	29.0
Polson	107	28.8
Missoula	69	18.5
Ronan	9	2.4
East Shore	8	2.2
Bigfork	5	1.3
Pablo	4	1.1
St. Ignatius	1	0.3
Other	61	16.4
	372	100.0

category includes a variety of Montana localities not otherwise listed, as well as out-of-state locations. The majority (83.6%) of the anglers participating in the ice fishery resided within 96 km of East Bay, approximately 35% resided within the boundaries of the Flathead Indian Reservation. Of the 371 anglers who responded to the question of Tribal member-ship, less than 1.0% claimed Tribal affiliation.

Of 1,430 yellow perch, subsampled from angler creels in 1985, 80% were between 175 and 275 mm TL, with a mean of 227 mm TL. The average size of perch returned during the 1986 ice fishery was 155.7 mm TL, or about 70 mm smaller than fish that were creeled (Figure 10). The average size of yellow perch creeled in the 1985 and 1986 East Bay ice fishery (228 mm) was slightly larger than the average for yellow perch creeled lakewide (210 mm) during 1962 and 1963 (Robbins and Worlund 1966), and may reflect angler selectivity or better perch habitat offered in East Bay.

The 1985 and 1986 ice fishery harvest estimates are twice and three times, respectively, the harvest estimated by Graham and Fredenberg (1983). They reported a yellow perch harvest from the 1982 ice fishery (South, Skidoo, and Somers Bays) that was 99% of the total catch, and a creel rate of 1.2 fish/angler hr. This contrasts sharply with 1985 and 1986 data. Ice fishery harvest estimates were approximately 37% and 43% of the total catch in 1985 and 1986, respectively, and creel rates were 3.2/hr in 1985 and and 3.9/hr in 1986. Differences between survey results may stem from differences in methodologies and monitoring effort, increased fishing pressure and a possible change in the large perch population to a structure heavily skewed toward smaller fish.

The yellow perch harvest from Flathead Lake is second only to kokanee salmon. However, because of the recent decline of kokanee within the Flathead system, yellow perch may indeed become the most creeled fish species taken from Flathead Lake.

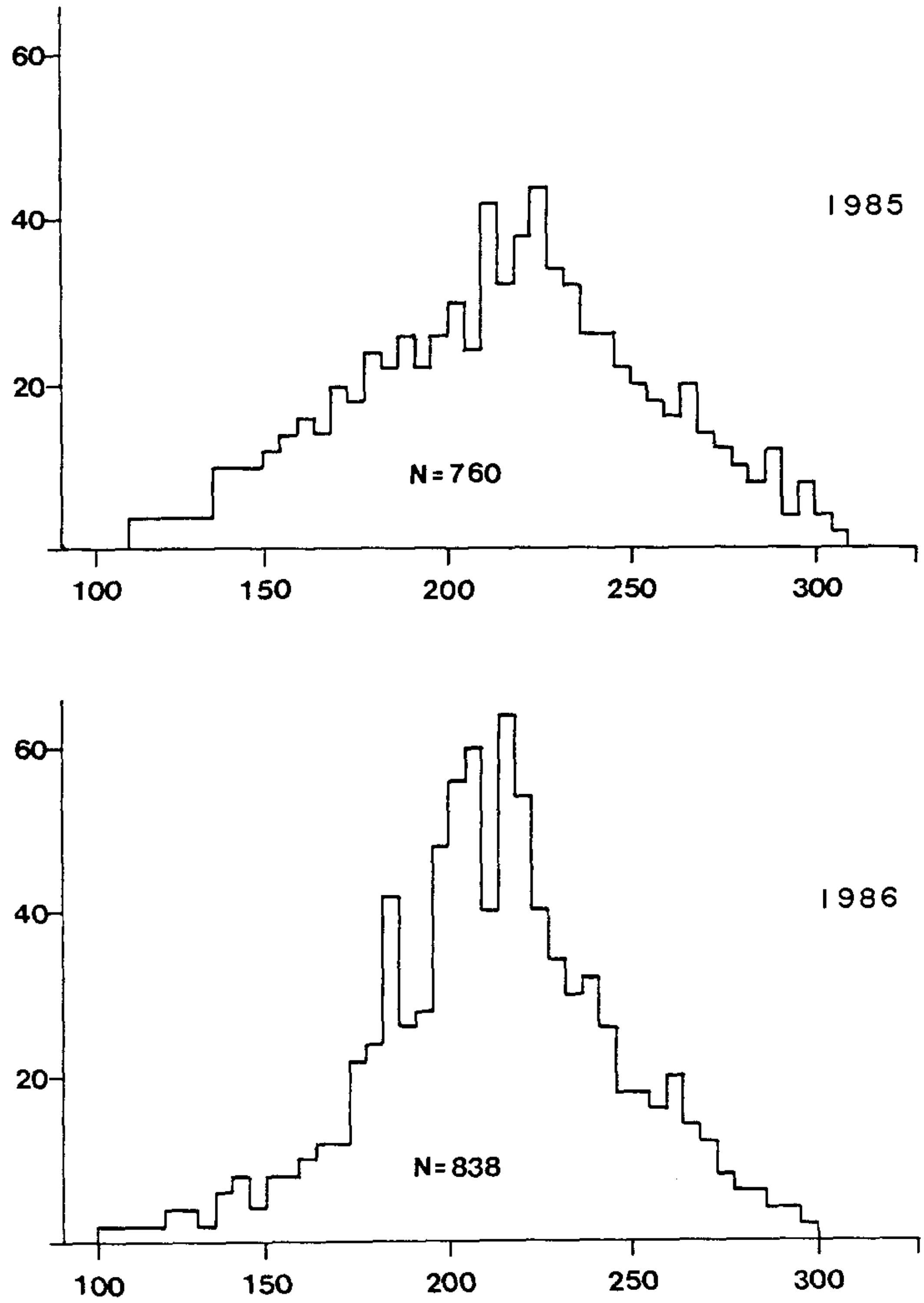

Figure 10. Creeled yellow perch length distributions from the 1985 and 1986 ice fisheries on East Bay, Flathead Lake, Montana.

DISCUSSION and CONCLUSIONS

Vegetative and structural cover are relatively limited in South Bay, a condition which could contribute to lower recruitment for some fish species. Our data show that the study area contained 0.04% structural and 5.4% vegetative cover in June at full pool. Both figures are less than 1.0% at minimum pool. Structural complexity mediates the ecological interactions between littoral zone fish and their prey, and can affect local productivity and growth in fish (Crowder and Cooper 1979, Prince and Maughan 1979, Wege and Anderson 1979). Structural complexity is thought to alter the outcome of predator-prey interactions (Glass 1971, Smith 1972, Murdoch and Oaten 1975), and predation is suggested as an important factor in mediating the effects of competition among prey (Hall et al. 1970, Neill 1975). These factors may explain the observed failure of largemouth bass to successfully survive to recruitment in any great numbers. Abundant yellow perch in South Bay may prey upon larval bass to the point of suppressing the bass population, or outcompete young bass for zooplankton. Most likely, all the above contribute synergistically to early life mortality among Flathead Lake bass.

Structural complexity may also be important to overwinter survival of young perch in Flathead Lake. Winter conditions, including ice cover and fall drawdown, seasonally eliminate the vegetative portion of most rooted macrophytes in South Bay. This results in substantial loss of what little structural cover exists, depriving the perch population of habitat which has been occupied all summer. Ware (1973) identified prey exposure as a major component of the total risk prey incur. The loss of cover from draw-down concentrates and probably exposes perch to greater predation, including cannibalism, than would occur if structural complexity were greater.

Gross trends in water quality data collected in South Bay during the study indicate relative spatial and temporal homogeneity for all parameters with the exception of water temperature. Observed ranges for dissolved oxygen, pH and conductivity were similar in 1984, 1985 and 1986, and probably do not play a decisive role in habitat utilization patterns for target fish species. Although pre-dawn levels of dissolved oxygen were measured below 5 mg/l in some inshore areas of East Bay (February 1985), these readings were anomalous and could be avoided by resident fish populations in those areas.

In contrast, water temperature was sufficiently variable by month and evaluation area to be a potentially important factor influencing fish distribution in South Bay. Seasonal trends in species composition generally followed annual temperature cycles (i.e. cold water species abundance increasing in fall) and supports this hypothesis. Temperatures within South Bay in May were observed to drop as much as 5 $^{\circ}$C in five minutes near the narrows, a reflection of upwelling at that site, and may vary as much as 4.5 $^{\circ}$C between evaluation areas in June and November. Yellow perch and rainbow trout have both been reported to prefer temperatures within 1.4 $^{\circ}$C of an acclimation temperature (15 $^{\circ}$C) (Cherry et al. 1977) and would likely respond to the thermal gradients observed in South Bay.

The timing of yellow perch spawning in Flathead Lake corresponds with maximum draw-down under present hydroelectric operations. Refill provides increased habitat for the population to expand into just as fry are hatched. As a result yellow perch do not experience the early life history losses observed in Flathead Lake kokanee under the same operational pattern (Beattie and Clancey 1987). Winter draw-down exposes yellow perch of all ages to greater predation due to a lack of cover, particularly young-of-the-year perch which are heavily cannibalized. This pattern may actually be of benefit to the perch population as a whole by reducing recruitment, providing a ready forage base in winter when aquatic insects may not be readily available, and preventing stunting, a common problem in perch populations.

The growing importance of the yellow perch fishery is illustrated by comparison of past creel surveys and those conducted during this study. Robbins and Worlund (1966) reported harvest rates for Flathead Lake fisheries and estimated that yellow perch harvest was second only to kokanee salmon, comprising 17% of all fish harvested lake-wide between May 1962 and April 1963. In an 1982 lake wide census (Graham and Fredenberg 1983), a harvest composition of 6% yellow perch was reported. When only shore and ice anglers were considered in the latter survey, the percentage of yellow perch increased to 33%. Today anglers harvest between 30,000 and 40,000 perch annually just from South Bay.

Study results lead to the following conclusions:

1. Yellow perch support an important and growing fishery in South Bay of Flathead Lake.
2. The existing pattern of lake drawdown and fill for hydroelectric purposes coincidentally corresponds to the biological requirements of yellow perch for spawning and increased habitat upon hatching.
3. Fall drawdown exposes young-of-the-year fish to predation and probably prevents stunting of the perch population.
4. Recruitment in the existing largemouth bass population of South Bay is probably controlled by an overwhelming yellow perch population which may directly prey upon young bass and/or compete with them for a limited food supply.
5. The presence of northern pike in South Bay could not be documented.
6. Structural complexity in South Bay is extremely limited at all times of the year. However, this physical deficiency can be enhanced through the use of artificial reefs.

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APPENDIX A

SUMMARY OF WATER QUALITY PARAMETERS, SOUTH BAY

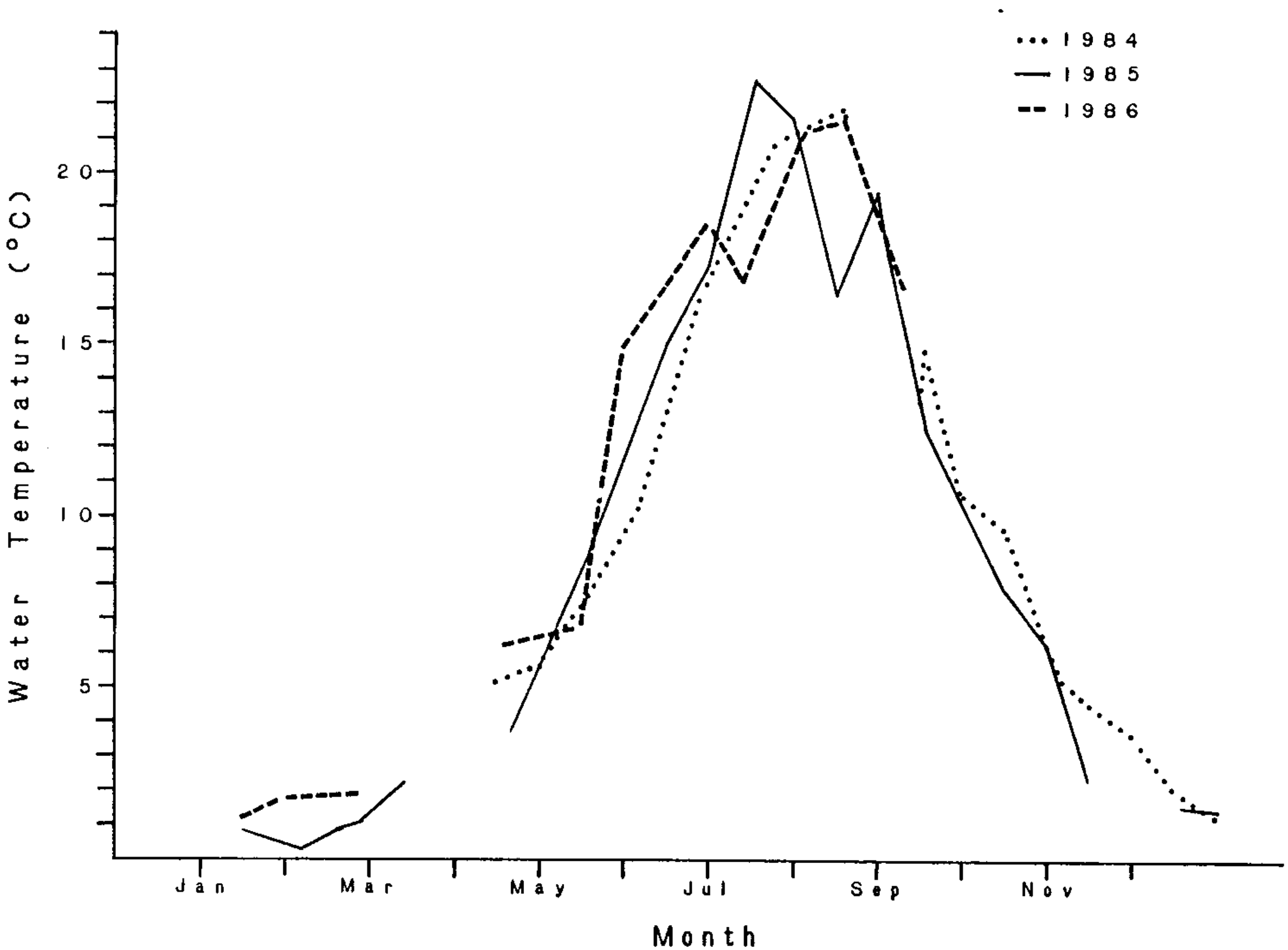

Figure A1. Mean monthly water column temperatures (°C) from South Bay of Flathead Lake, Montana, 1984-1986.

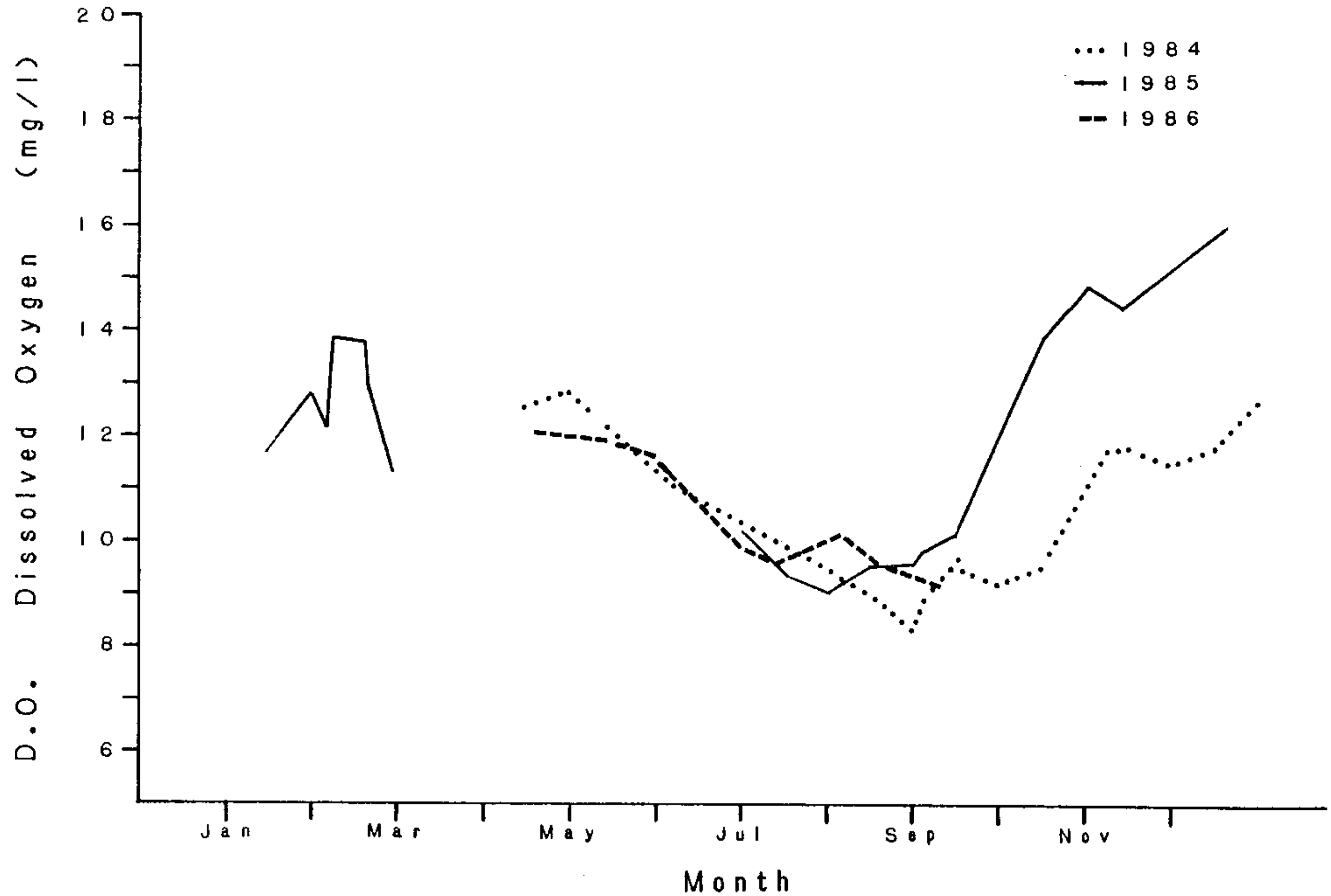

Figure A2. Mean monthly water column dissolved oxygen levels (mg/l) from South Bay of Flathead Lake, Montana, 1984-1986.

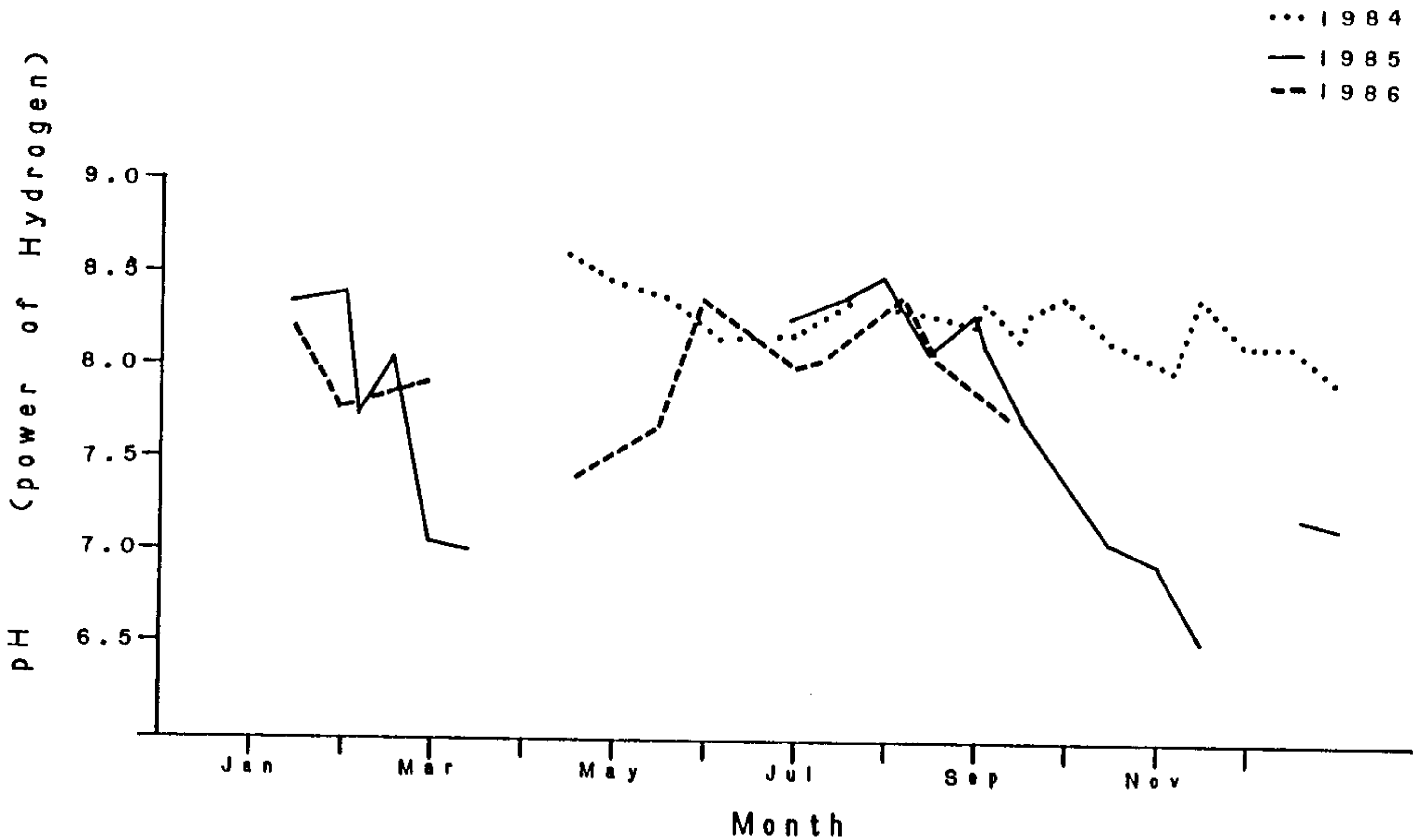

Figure A3. Mean water column pH from South Bay of Flathead Lake, Montana, 1984-1986.

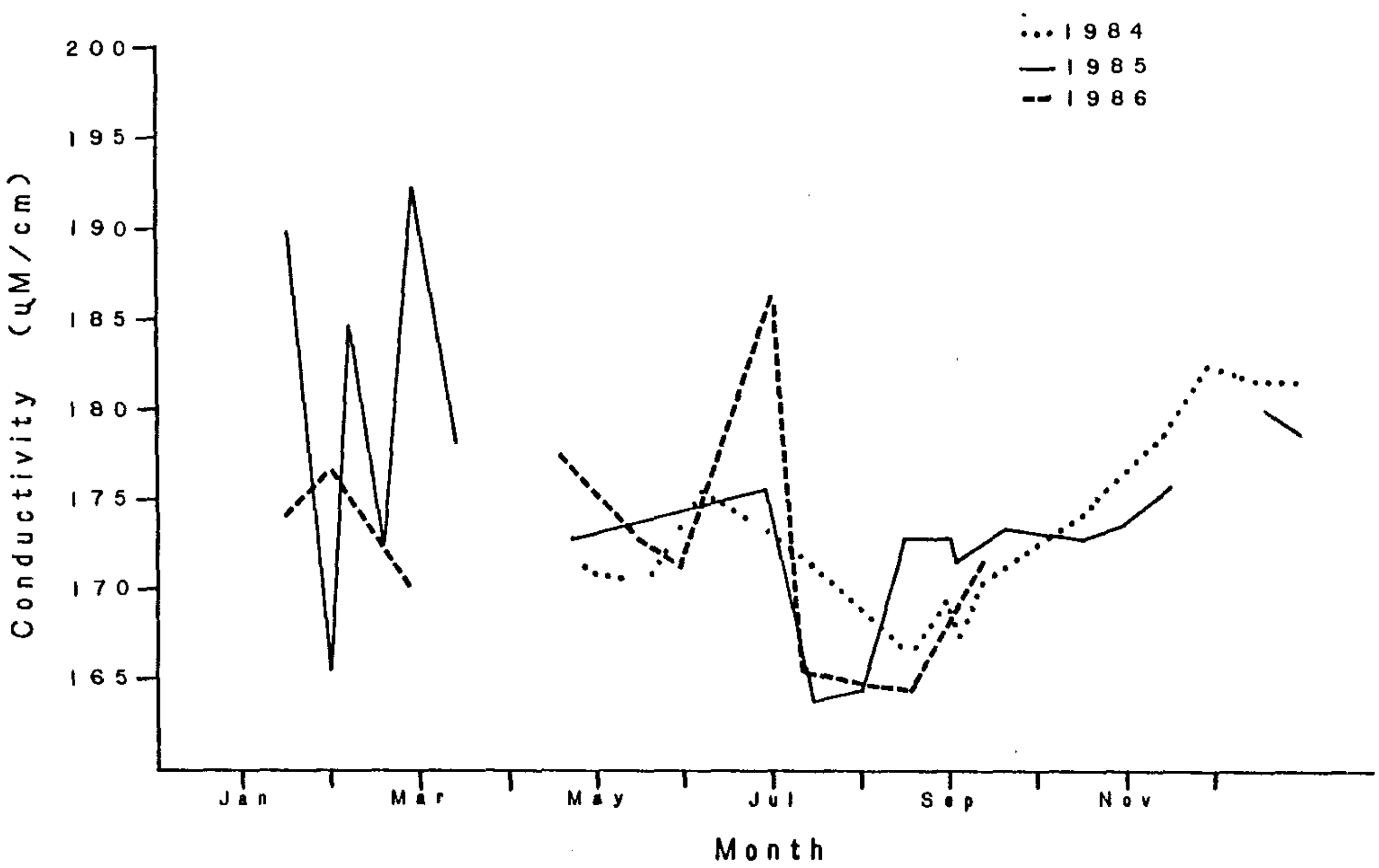

Figure A4. Mean water column conductivity (μM/cm) from South Bay of Flathead Lake, Montana, 1984-1986.

APPENDIX B

SUMMARY OF BEACH SEINING CATCHES COLLECTED FROM SOUTH BAY OF FLATHEAD LAKE, 1985-1986

SEINE DATA LIST CODES
FOR 1985 AND 1986

STATION LOCATION:

1	=	bots	=	Boettcher Park South
2	=	botn	=	Boettcher Park North
3	=	slpt	=	Slack Point
4	=	sukw	=	Sucker Bay West
5	=	suke	=	Sucker Bay East
6	=	bdpe	=	Bird Point East
7	=	soeb	=	South East Bay
8	=	ebph	=	East Bay Photo Station
9	=	wlsp	=	Willow Spit
10	=	ston	=	Stoners
11	=	fnpt	=	Finley Point State Park
12	=	farn	=	Farnum
13	=	bule	=	Bull Island East
14	=	bulw	=	Bull Island West
15	=	lapb	=	Lansing Point Bay
16	=	casb	=	Causeway Bay
17	=	king	=	Kings Point
18	=	sqry	=	Stone Quarry Bay
19	=	grin	=	Grinde
20	=	jpne	=	Johnson Point Northeast
21	=	jpsw	=	Johnson Point Southeast
22	=	jpbn	=	Johnson Point Bay North
23	=	wshn	=	West Shore North
24	=	wshs	=	West Shore South

SPECIES:

YP	=	yellow perch
LWF	=	lake whitefish
MWF	=	mountain whitefish
DV	=	bull trout
RCT	=	rainbow/cutthroat
LMB	=	largemouth bass

WIND VELOCITY:

0	=	no data
1	=	calm
2	=	0 - 5 mph
3	=	5 - 10 mph
4	=	10 - 15 mph
5	=	15 - 20 mph
6	=	> 20 mph

WAVE HEIGHT:

0	=	no data
1	=	calm
2	=	0 - 12"
3	=	12 - 24"
4	=	> 24"
5	=	no ice

WTEMP = Water temperature, 0 = no data.

ATEMP = Air temperature, 0 = no data.

DEP = Maximum water depth

TIME = Start of sample

DIR = Wind direction

SKY = % clouds, 0 may indicate no data.

Record#	DATE	TIME	STA	EVAL	LOC	HAB	WTEMP	ATEMP	DEP	WIND	WAVE	DIR	SKY	YP	LWF	RCT	DV	MWF	LMB
1	05/02/85	820	bots	2b	1	snoi	10	15	1.0	1	1		0	76	4	0	0	0	0
2	05/02/85	0	ebon	5	8	sloi	14	18	1.0	0	2	nw	99	7380	0	0	1	0	0
3	05/02/85	1230	suke	9	5	snsi	15	17	1.0	0	1	n	99	7	0	0	0	0	0
4	05/02/85	1500	ston	4a	10	snoi	15	21	1.5	1	1		99	81	0	0	0	0	0
5	05/02/85	0	botn	3	2	sloi	10	13	1.0	0	2	n	99	846	2	0	0	0	0
6	05/02/85	1130	slot	4b	3	snoi	12	15	3.0	0	2	n	99	115	0	0	0	3	0
7	05/03/85	1300	fnot	2a	11	snoi	8	17	3.5	0	2	n	50	93	0	0	0	0	0
8	05/03/85	0	farm	2a	12	snoi	13	16	1.0	0	2	n	25	113	0	0	0	0	0
9	05/13/85	0	bule	1	13	snoi	8	6	2.0	1	1		0	6	0	0	0	3	0
10	05/13/85	1040	bulw	1	14	snoi	8	6	2.5	1	1		0	6	0	0	0	0	0
11	05/13/85	1130	lapo	3	15	sloi	14	10	1.0	0	2	sw	0	252	0	0	0	0	0
12	05/13/85	1305	caso	3	16	sloi	8	7	1.5	0	2	s	0	34	0	0	0	0	0
13	05/13/85	1405	king	3	17	sloi	9	17	3.5	1	1		0	0	0	0	0	0	0
14	05/13/85	1455	grin	14	19	cosi	14	14	1.0	0	2	s	0	4229	0	0	0	1	0
15	05/13/85	1100	jpon	3	22	sloi	10	14	1.0	1	1		75	336	2	0	0	0	0
16	05/14/85	1330	wsns	3	24	sloi	0	13	1.0	0	2	n	99	573	0	0	0	0	0
17	05/14/85	930	jpne	3	20	sloi	10	10	3.5	1	1		50	44	1	0	0	0	0
18	05/14/85	1000	jpsw	3	21	sloi	10	11	2.0	1	1		75	85	7	5	2	0	0
19	05/14/85	1430	bulw	1	14	snoi	24	29	2.5	4	2	sw	60	1332	0	0	0	0	0
20	07/22/85	0	ebon	7	8	snsi	24	27	2.0	4	2	sw	85	396	0	0	0	0	2
21	07/22/85	1120	farm	12c	12	snsi	24	28	1.0	4	3	sw	35	1337	0	0	0	0	0
22	07/22/85	0	caso	13d	16	sisi	24	31	1.5	4	2	sw	90	129	0	0	0	0	0
23	07/22/85	1230	king	14	17	cosi	23	31	4.0	2	2	se	80	0	0	0	0	0	0
24	07/22/85	1045	sory	13c	18	sisi	0	0	1.5	2	1	s	65	666	0	0	0	0	0
25	07/23/85	1030	bule	1	13	snoi	23	26	3.0	3	3	s	70	119	0	0	0	0	0
26	07/23/85	940	lapo	13d	15	slsi	22	24	1.0	4	2	s	80	65	1	0	0	0	0
27	07/23/85	0	slot	10	3	gvsi	22	25	3.0	3	2	s	50	78	0	0	0	0	0
28	07/24/85	0	sukw	9	4	snsi	23	24	0.0	3	2	s	25	80	0	0	0	0	0
29	07/24/85	1335	suke	9	5	snsi	23	24	1.0	3	2	s	50	17	0	0	0	0	0
30	07/24/85	1040	wiso	7	9	snsi	24	19	1.0	3	2	w	50	123	0	0	0	0	0
31	07/24/85	0	bdpe	8	6	sisi	24	21	3.0	3	2	ne	25	316	0	0	0	0	0
32	07/24/85	1006	ston	6	10	cosi	24	19	3.0	3	2	w	50	2548	0	0	0	0	0
33	07/25/85	0	botn	11	2	gvsi	22	20	2.5	0	2	nw	0	189	0	0	0	0	0
34	07/25/85	0	jpon	13a	22	sisi	22	24	2.0	3	2	ne	0	29	0	0	0	0	0
35	07/25/85	0	jpsw	13a	21	sisi	23	24	2.0	3	2	e	0	0	0	0	0	0	0
36	07/25/85	0	wsns	12b	24	snsi	22	24	2.0	3	2	ne	0	32	0	0	0	0	0
37	07/25/85	0	bots	12a	1	snsi	22	22	2.5	3	2	n	0	105	0	0	0	0	0
38	07/25/85	1300	wsnn	12b	23	snsi	23	24	1.0	3	2	ne	0	57	0	0	0	0	0
39	07/26/85	1210	grin	13b	19	slsi	25	24	2.5	2	2	s	10	26	0	0	0	0	0
40	07/26/85	830	fnot	14d	11	cosi	22	12	3.5	2	2	sw	0	1542	0	0	0	0	0
41	07/26/85	1100	jpne	14a	20	cosi	23	21	5.0	1	1		0	0	0	0	0	0	0
42	07/26/85	940	sceo	8	7	sisi	23	21	1.5	2	2	n	0	214	0	0	0	0	0
43	09/19/85	1100	jpon	13a	22	sisi	12	9	2.0	1	1		99	38127	0	0	0	0	0
44	09/19/85	1025	wsnn	12b	23	snsi	12	9	1.0	1	2		99	1135	0	0	0	0	0
45	09/19/85	1235	jpsw	13a	21	sisi	12	14	2.0	1	2		95	450	0	0	0	0	0
46	09/19/85	930	wsns	12b	24	snsi	13	9	2.0	1	2		99	10221	0	0	0	0	0
47	09/23/85	1115	ston	6	10	cosi	12	12	3.0	2	2	nw	15	21984	0	0	0	0	0
48	09/23/85	1015	fnot	14d	11	cosi	11	9	3.5	2	2	n	0	11195	0	0	3	0	0
49	09/23/85	945	farm	12c	12	snsi	12	9	1.0	2	2	n	0	11	5	0	0	0	0
50	09/23/85	1245	wiso	7	9	snsi	13	12	1.0	2	2		99	4541	0	0	0	0	5
51	09/24/85	0	suke	9	5	snsi	12	17	1.0	1	1		20	338	0	0	0	0	0
52	09/24/85	945	botn	11	2	gvsi	11	11	2.5	1	2		65	130	0	0	0	0	0
53	09/24/85	900	bots	12a	1	snsi	11	9	2.5	2	2		95	189	1	0	0	0	0

54	09/24/85	1035	sukw	9	4	snsi	12	6	0.0	1	2		35	3	2	0	0	1	0
55	09/24/85	1015	slpt	1	13	snoi	11	6	3.0	1	2		35	6	0	0	0	0	0
56	09/25/85	1020	ebon	7	8	snsi	12	7	2.0	1	1		0	2153	0	0	0	0	0
57	09/25/85	915	bdce	8	6	slsi	12	10	3.0	2	2	e	0	57	1	0	0	0	0
58	09/25/85	1230	grin	13b	19	slsi	13	18	2.5	2	2	e	0	55	0	0	0	0	0
59	09/25/85	1130	jone	14a	20	cosi	12	13	5.0	2	2	ne	0	0	0	0	0	0	0
60	09/25/85	935	soeb	8	7	slsi	12	14	1.5	1	2		0	609	0	0	0	0	0
61	09/25/85	1300	sory	13c	18	slsi	14	15	1.5	2	2	e	0	18898	0	0	0	0	0
62	09/26/85	1100	laob	13d	15	slsi	13	17	1.0	2	2	s	0	3335	0	0	0	0	0
63	09/26/85	1015	casb	13d	16	slsi	13	13	1.5	2	2	s	10	14553	0	0	0	0	0
64	09/26/85	930	king	14	17	cosi	13	15	4.0	2	2	se	20	443	0	2	0	0	0
65	09/26/85	1300	bule	1	13	snoi	13	20	3.0	2	2	s	10	0	0	0	0	0	0
66	09/26/85	1230	bulw	1	14	snoi	13	20	2.5	2	2	s	0	0	3	0	0	0	0
67	05/05/86	0	grin	14	19	cosi	12	18	1.0	0	2	e	50	16876	0	0	0	0	0
68	05/05/86	0	jone	3	20	sloi	12	18	3.5	0	2	e	50	9	0	0	0	0	0
69	05/07/86	0	jptn	3	22	sloi	10	10	1.0	0	2	ne	70	15690	0	0	0	0	0
70	05/07/86	0	wsns	3	24	sloi	18	12	1.0	0	2	e	60	7677	0	0	0	0	0
71	05/07/86	0	jpsw	3	21	sloi	10	10	2.0	0	2	ne	80	1190	1	0	1	0	0
72	05/08/86	0	bots	2b	1	snoi	10	12	1.0	0	2	w	20	912	4	0	0	0	0
73	05/08/86	0	botn	3	2	sloi	0	0	1.0	0	2	n	20	11955	1	0	0	0	0
74	05/08/86	0	slpt	4b	3	snoi	12	10	3.0	0	2	n	20	251	0	0	0	0	0
75	05/09/86	0	bulw	1	14	snoi	9	15	2.5	0	2	n	50	3	0	0	0	0	0
76	05/09/86	0	ston	4a	10	snoi	0	10	1.5	0	2	n	50	14	0	0	0	4	0
77	05/09/86	0	suke	9	5	snsi	8	10	1.0	0	2	n	60	93	0	0	0	0	0
78	05/09/86	0	fnot	2a	11	snoi	10	12	3.5	0	2	n	50	558	0	0	0	0	0
79	05/12/86	0	laob	3	15	sloi	9	8	1.0	3	3	s	99	544	0	0	0	0	0
80	05/12/86	0	casb	3	16	sloi	9	8	1.5	3	3	s	99	208	0	0	0	0	0
81	05/15/86	0	farn	2a	12	snoi	0	15	1.0	0	2	sw	30	103	6	0	0	0	0
82	05/16/86	0	bule	1	13	snoi	10	15	2.0	0	2	sw	30	2	0	0	0	0	0
83	07/30/86	900	bots	12a	1	snsi	18	19	2.5	3	2	sw	0	180	0	0	0	0	0
84	07/29/86	1030	botn	11	2	gvsi	22	20	2.5	2	2	nw	99	1240	0	0	0	0	0
85	07/29/86	1100	slpt	10	3	gvsi	22	20	3.0	2	2	nw	99	16	0	0	0	0	0
86	07/29/86	1115	sukw	9	4	snsi	22	20	0.0	2	2	nw	99	0	0	0	0	0	0
87	07/30/86	930	suke	9	5	snsi	0	0	1.0	2	2	sw	0	85	0	0	0	0	0
88	07/29/86	1200	bdce	8	6	slsi	20	20	3.0	2	2	sw	99	188	0	0	0	0	0
89	07/29/86	1300	soeb	8	7	slsi	20	19	1.5	3	2	sw	70	620	0	0	0	0	0
90	07/29/86	1345	ebon	7	8	snsi	22	20	2.0	3	2	w	50	409	0	0	0	0	6
91	07/30/86	1015	wisb	7	9	snsi	24	19	1.0	3	2	sw	0	240	0	0	0	0	8
92	07/30/86	1130	ston	6	10	cosi	21	20	3.0	2	2	sw	0	1058	0	0	0	0	0
93	07/30/86	1140	fnot	14c	11	cosi	21	20	3.5	2	2	sw	0	67	0	0	0	0	0
94	07/30/86	1150	farn	12c	12	snsi	20	20	1.0	2	2	sw	0	1117	1	0	0	0	0
95	07/30/86	1920	bule	1	13	snoi	22	20	3.0	0	2	s	25	0	0	0	0	0	0
96	07/30/86	1300	bulw	1	14	snoi	23	19	2.5	3	2	sw	10	70	0	0	0	0	0
97	07/28/86	1500	laob	13d	15	slsi	20	20	1.0	2	2	s	0	365	0	0	0	0	0
98	07/28/86	1430	casb	13d	16	slsi	22	20	1.5	2	2	s	0	255	0	0	0	0	0
99	07/28/86	1400	king	14	17	cosi	0	0	4.0	2	3	s	0	0	0	1	0	0	0
100	07/28/86	1300	sory	13c	18	slsi	0	0	1.5	3	1	se	0	325	0	0	0	0	0
101	07/28/86	1315	grin	13b	19	slsi	20	0	2.5	2	2	s	0	35	0	0	0	0	0
102	07/28/86	1130	jone	14a	20	cosi	20	20	5.0	3	2	s	0	11	0	0	0	0	0
103	07/28/86	1100	jpsw	13a	21	slsi	20	20	2.0	2	2	se	0	19	0	0	0	0	0
104	07/28/86	1030	jpon	13a	22	slsi	20	20	2.0	2	2	s	0	38	0	0	0	0	0
105	07/28/86	1010	wsnn	12b	23	snsi	20	20	1.0	1	2		0	490	0	0	0	0	0
106	07/28/86	930	wsns	12b	24	snsi	21	19	2.0	2	2	s	0	73	0	0	0	0	0
107	09/02/86	1200	botn	11	2	gvsi	20	20	2.5	2	2	sw	75	115	0	0	0	0	0

108	09/02/86	1330	slot	10	3	gvsi	0	0	3.0	2	2	sw	80	1722	0	0	0	0	0
109	09/02/86	1410	sukw	9	4	snsi	20	24	0.0	2	2	sw	90	5	0	0	0	0	0
110	09/02/86	1430	suxe	9	5	snsi	21	23	1.0	2	2	sw	99	484	0	0	0	0	0
111	09/02/86	1215	bots	12a	1	snsi	20	20	2.5	2	2	sw	60	572	0	0	0	0	0
112	09/03/86	1015	wsns	12b	24	snsi	21	23	2.0	3	2	s	10	290	0	0	0	0	0
113	09/03/86	1100	wsnn	12b	23	snsi	21	22	1.0	2	2	s	25	1538	0	0	0	0	0
114	09/03/86	1200	jpan	13a	22	slsi	21	26	2.0	2	2	s	25	105	0	0	0	0	0
115	09/03/86	1420	sory	13c	18	slsi	22	25	1.5	0	2	s	50	779	0	0	0	0	0
116	09/03/86	1245	josw	13a	21	slsi	22	25	2.0	2	2	s	60	79	0	0	0	0	0
117	09/03/86	1345	grin	13b	19	slsi	22	28	2.5	2	2	s	50	54	0	0	0	0	0
118	09/03/86	1300	jone	14a	20	cosi	0	0	5.0	2	3	s	70	2	0	0	0	0	0
119	09/04/86	1333	ston	6	10	cosi	20	24	3.0	0	2	w	10	150	0	0	0	0	0
120	09/04/86	1000	caso	13d	16	slsi	20	18	1.5	0	0	n	0	57	0	0	0	0	0
121	09/04/86	1030	laoo	13c	15	slsi	20	19	1.0	2	1	n	20	16	0	0	0	0	0
122	09/04/86	930	king	14	17	cosi	20	18	4.0	3	3	n	20	0	0	0	0	0	0
123	09/04/86	1107	bulw	1	14	snoi	20	22	2.5	0	2	n	15	2	0	0	0	0	0
124	09/04/86	1300	fnos	14d	11	cosi	20	23	3.5	0	2	n	10	9	0	0	0	0	0
125	09/04/86	1200	bule	1	13	snoi	20	22	3.0	0	2	n	10	12	0	0	0	0	0
126	09/04/86	1236	farm	12c	12	snsi	21	23	1.0	0	2	n	10	25	0	0	0	0	0
127	09/09/86	1130	wiso	7	9	snsi	0	0	1.0	2	2	se	99	47	0	0	0	0	0
128	09/09/86	1045	epon	7	8	snsi	17	17	2.0	2	2	se	99	840	0	0	0	0	0
129	09/09/86	1000	soeo	8	7	slsi	18	11	1.5	2	2	se	99	917	0	0	0	0	1
130	09/09/86	930	pope	8	6	slsi	17	11	3.0	2	2	se	99	411	0	0	0	0	0

APPENDIX C

SUMMARY OF FYKE NET TRAPPING
COLLECTED FROM SOUTH BAY
OF FLATHEAD LAKE, 1984-1985

FYKE NET DATA LIST CODES
FOR 1984 AND 1985

SPECIES:

YP = yellow perch
LWF = lake whitefish
MWF = mountain whitefish
DV = bull trout
RBCT = rainbow trout

WIND VELOCITY:

1 = no wind
2 = 1 - 5 mph
3 = 6 - 10 mph
4 = 11 - 15 mph
5 = 16 - 20 mph
6 = > 20 mph

WAVE HEIGHT:

1 = calm
2 = 0 - 12"
3 = 12 - 24"
4 = > 24"
5 = ice

WTEMP = Water temperature, 0 indicates no data.

YP through KOK refers to all fish caught in the trap for each species. This includes previously tagged fish and unmeasured fish.

YPNET = Perch caught in the trap leads. This number is not included in YP.

RECAP = The number of perch which were previously tagged. This number is included in YP.

DAYS = The number of days since the trap was last checked.

AREA = The surface area (square feet) of leads attached to the trap.

Record#	DATE	LOC	WTEMP	STA	YP	LWF	MWF	DV	RBCT	KGK	YPNET	REDAP	DAYS	AREA
1	03/26/84	3	5	bcd1	0	0	0	0	0	0	0	0	4.00	1800
2	03/28/84	3	0	bcd1	4	1	0	0	0	0	0	0	2.03	1800
3	03/29/84	3	8	bcd1	1	0	0	0	0	0	0	0	1.13	1800
4	04/03/84	3	10	bcd1	16	1	0	0	1	0	0	0	3.90	1800
5	04/04/84	3	0	bcd1	19	3	0	0	0	0	0	0	2.00	1800
6	04/07/84	3	0	bcd1	70	1	0	0	0	0	0	0	3.00	1800
7	04/09/84	3	9	bcd1	189	0	0	0	0	0	0	0	2.00	1800
8	04/10/84	3	10	bcd1	21	0	0	1	0	0	0	2	1.00	1800
9	04/11/84	3	9	bcd1	14	1	0	0	0	0	0	0	0.53	1800
10	04/12/84	3	7	bcd1	9	2	0	0	0	0	0	2	0.98	1800
11	04/13/84	3	0	bcd1	35	0	0	0	0	0	2	0	1.15	1800
12	04/15/84	3	9	bcd1	156	0	0	0	0	0	0	2	1.92	1800
13	04/16/84	3	9	bcd1	72	0	0	0	0	0	17	13	1.00	1800
14	04/17/84	3	12	bcd1	140	1	0	0	0	0	0	5	1.00	1800
15	04/18/84	3	12	bcd1	97	0	0	0	0	0	0	6	0.56	1800
16	04/19/84	3	13	bcd1	106	1	0	1	0	0	0	12	0.95	1800
17	04/20/84	3	8	bcd1	257	3	0	0	0	0	0	15	1.00	1800
18	04/21/84	3	9	bcd1	129	1	0	0	0	0	0	7	0.88	1800
19	04/22/84	3	8	bcd1	123	2	0	0	0	0	0	14	1.02	1800
20	04/23/84	3	9	bcd1	74	1	0	0	0	0	0	17	1.00	1800
21	04/24/84	3	9	bcd1	32	0	0	1	0	0	0	3	1.00	1800
22	04/25/84	3	8	bcd1	10	0	0	0	0	0	0	0	1.00	1800
23	04/27/84	3	5	bcd1	62	1	0	2	1	0	0	8	2.00	1800
24	04/30/84	3	9	bcd1	59	2	0	0	0	0	0	10	3.00	1800
25	05/02/84	3	11	bcd1	36	1	0	0	0	0	22	4	2.00	1800
26	05/04/84	3	7	bcd1	16	2	0	0	0	1	6	4	1.83	1800
27	05/07/84	3	9	bcd1	19	2	0	0	0	0	0	1	3.00	1800
28	05/09/84	3	12	bcd1	27	0	0	0	0	0	14	2	2.00	1800
29	05/11/84	3	8	bcd1	8	1	0	1	1	0	0	0	2.00	1800
30	05/14/84	3	12	bcd1	44	0	0	0	0	0	55	4	3.00	1800
31	05/16/84	3	9	bcd1	27	0	0	0	0	0	53	0	2.00	1800
32	05/18/84	3	10	bcd1	11	0	0	0	0	0	19	0	2.00	1800
33	05/21/84	3	0	bcd1	41	2	0	0	0	0	22	1	3.00	1900
34	05/24/84	3	9	bcd1	56	3	0	0	0	0	31	2	3.00	1800
35	11/13/84	3	5	bcd1	0	0	1	0	0	0	0	0	5.00	1800
36	11/15/84	3	4	bcd1	0	0	0	0	0	0	0	0	2.00	1800
37	11/19/84	3	4	bcd1	0	4	1	0	0	0	0	0	4.00	1800
38	11/21/84	3	5	bcd1	0	0	3	0	0	0	0	0	2.00	1800
39	11/26/84	3	3	bcd1	0	0	0	0	0	0	0	0	5.00	1800
40	11/29/84	3	4	bcd1	1	0	1	0	0	0	0	0	2.00	1800
41	11/30/84	3	4	bcd1	27	0	0	0	0	0	0	0	1.02	1800
42	12/03/84	3	1	bcd1	0	0	0	0	0	0	0	0	3.00	1800
43	05/31/84	7	13	bcd2	0	0	0	0	0	0	0	0	2.00	1800
44	06/04/84	7	14	bcd2	30	0	0	0	0	0	0	2	4.00	1800
45	06/06/84	8	11	bcd3	4	0	0	0	0	0	0	0	2.00	1800
46	06/08/84	8	0	bcd3	3	0	1	0	2	14	0	0	2.00	1800
47	06/11/84	8	0	bcd3	0	0	0	0	0	3	0	0	3.00	1800
48	06/13/84	8	0	bcd3	0	0	0	0	0	0	0	0	2.00	1800
49	06/15/84	8	14	bcd3	13	0	0	0	0	0	0	0	1.00	1800
50	06/18/84	8	15	bcd3	2	0	0	0	0	0	3	0	3.00	1800
51	06/22/84	8	15	bcd3	0	0	0	0	0	0	0	0	4.00	1800
52	06/25/84	8	17	bcd3	2	0	0	0	0	0	0	0	3.00	1800
53	06/28/84	8	18	bcd3	0	0	0	0	0	0	3	0	3.00	1500

54	03/09/84	1	5	fbo1	5	4	0	0	1	0	0	0	1.00	1800
55	03/12/84	1	5	fbo1	0	0	0	0	0	0	0	0	3.02	1800
56	03/14/84	1	6	fbo1	0	18	0	1	1	0	0	0	2.00	1800
57	03/19/84	1	6	fbo1	0	0	0	0	0	0	0	0	3.04	1800
58	03/22/84	1	6	fbo1	9	2	0	0	0	0	0	0	2.98	1800
59	03/23/84	1	5	fbo1	1	1	0	0	0	0	0	0	1.00	1800
60	03/26/84	1	5	fbo1	0	0	0	0	1	0	0	0	2.93	1800
61	03/28/84	1	0	fbo1	1	1	0	1	1	0	0	0	2.15	1800
62	03/29/84	1	8	fbo1	0	1	0	0	1	0	0	0	0.96	1800
63	04/02/84	1	0	fbo1	0	0	0	0	0	0	0	0	3.95	1800
64	04/04/84	1	0	fbo1	0	3	0	0	0	0	0	0	2.00	1800
65	04/11/84	1	7	fbo1	0	0	0	0	0	0	0	0	7.00	1800
66	04/13/84	1	8	fbo1	31	0	0	1	2	2	0	0	2.02	1800
67	04/15/84	1	8	fbo1	63	0	0	0	0	0	0	0	1.92	1800
68	04/16/84	1	8	fbo1	19	0	0	0	0	0	0	0	1.00	1800
69	04/17/84	1	13	fbo1	4	0	0	0	0	0	0	1	1.00	1800
70	04/19/84	1	0	fbo1	4	1	0	1	0	0	0	0	1.85	1800
71	04/20/84	1	9	fbo1	6	3	0	0	0	0	0	0	1.00	1800
72	04/23/84	1	12	fbo1	0	6	0	0	0	1	0	0	3.00	1800
73	04/24/84	1	10	fbo1	17	16	0	2	0	0	0	0	1.00	1800
74	06/04/84	1	14	fbo1	0	0	0	0	0	0	0	0	6.00	1800
75	06/06/84	1	12	fbo1	0	0	0	0	0	0	0	0	2.00	1800
76	06/11/84	1	10	fbo1	8	8	0	0	0	0	0	0	5.00	1800
77	06/13/84	1	0	fbo1	1	0	0	0	0	0	0	0	2.00	1800
78	11/08/84	9	6	fbo2	1	0	2	0	0	0	0	0	1.00	2400
79	11/09/84	9	5	fbo2	0	1	5	1	1	1	0	0	1.00	2400
80	11/11/84	9	5	fbo2	3	8	5	0	0	0	0	0	2.27	2400
81	11/13/84	9	5	fbo2	0	3	4	0	1	0	0	0	1.75	2400
82	11/15/84	9	4	fbo2	0	0	1	0	1	0	0	0	2.00	2400
83	11/19/84	9	4	fbo2	0	2	0	0	1	0	0	0	4.00	2400
84	11/21/84	9	4	fbo2	0	1	5	0	0	0	0	0	2.00	2400
85	11/25/84	9	3	fbo2	0	0	0	0	0	0	0	0	5.00	2400
86	11/28/84	9	4	fbo2	0	0	0	0	0	0	0	0	2.00	2400
87	11/30/84	9	3	fbo2	0	0	0	0	0	0	0	0	2.00	2400
88	12/03/84	9	1	fbo2	0	0	0	0	0	0	0	0	2.94	2400
89	04/25/84	5	6	gof1	0	0	0	0	0	0	0	0	1.00	1800
90	04/27/84	5	8	gof1	2	0	0	0	0	0	0	1	2.00	1800
91	04/30/84	5	10	gof1	3	0	0	0	0	0	0	0	3.00	1800
92	05/04/84	6	8	gof2	3	0	0	0	0	0	0	0	4.00	1800
93	05/07/84	6	9	gof2	0	1	0	0	0	0	0	0	3.00	1800
94	05/09/84	6	10	gof2	11	0	0	0	0	0	0	1	2.00	1800
95	05/11/84	6	9	gof2	1	0	0	1	0	0	0	0	2.00	1800
96	05/14/84	6	10	gof2	3	0	0	0	1	0	0	0	3.00	1800
97	05/16/84	6	9	gof2	3	0	0	0	0	0	0	0	2.00	1800
98	05/18/84	6	0	gof2	11	0	0	0	0	1	7	0	2.00	1800
99	05/21/84	6	0	gof2	7	1	0	0	0	0	25	0	3.00	1800
100	05/24/84	6	10	gof2	9	0	0	1	0	0	0	0	3.00	1800
101	03/22/84	2	5	naro	0	0	0	0	1	0	0	0	3.00	1200
102	03/23/84	2	4	naro	0	0	0	0	0	0	0	0	1.00	1200
103	03/26/84	2	3	naro	1	0	0	0	0	0	0	0	2.92	1200
104	03/29/84	2	0	naro	0	0	0	0	0	0	0	0	2.21	1200
105	04/02/84	2	0	naro	0	0	0	0	0	0	0	0	4.63	1800
106	04/04/84	2	0	naro	0	0	0	0	0	0	0	0	2.00	1800
107	04/06/84	2	0	naro	2	0	0	0	0	0	0	0	2.00	1800

108	04/11/84	4	10	wesn	1	1	0	1	0	0	0	0	2.00	2400
109	04/15/84	4	9	wesn	15	1	0	0	0	0	0	0	3.88	2400
110	04/16/84	4	12	wesn	19	0	0	0	0	0	1	1	1.00	2400
111	04/17/84	4	15	wesn	2	0	0	0	0	0	0	1	1.00	2400
112	04/19/84	4	12	wesn	37	0	0	1	0	0	0	0	2.00	2400
113	04/21/84	4	9	wesn	49	0	0	0	0	0	0	0	1.85	2400
114	04/24/84	4	10	wesn	3	0	0	0	0	0	0	0	3.00	2400
115	04/27/84	4	9	wesn	17	0	0	2	0	0	0	1	3.00	2400
116	05/01/84	4	9	wesn	35	0	0	1	0	0	5	1	4.00	2400
117	05/04/84	4	8	wesn	1	0	0	0	0	0	0	0	3.00	2400
118	05/07/84	4	9	wesn	0	0	0	0	0	0	0	0	3.00	2400
119	05/09/84	4	10	wesn	4	0	0	0	0	0	0	0	2.00	2400
120	05/11/84	4	9	wesn	0	0	0	0	0	0	0	0	2.00	2400
121	05/14/84	4	0	wesn	4	0	0	0	0	0	15	1	3.00	2400
122	05/16/84	4	11	wesn	0	0	0	0	0	0	0	0	2.00	2400
123	05/18/84	4	0	wesn	7	0	0	0	0	0	3	0	2.00	2400
124	05/21/84	4	0	wesn	0	0	0	0	0	0	0	0	3.00	2400
125	05/24/84	4	10	wesn	75	0	0	0	0	0	0	0	3.00	2400
126	05/29/84	4	17	wesn	9	0	0	0	0	0	0	0	5.00	2400
127	05/31/84	4	12	wesn	5	0	0	0	0	0	7	0	2.00	2400
128	06/04/84	4	13	wesn	39	0	0	0	0	0	0	1	4.00	2400
129	06/05/84	4	11	wesn	23	2	0	0	0	0	1	0	2.00	2400
130	06/08/84	4	11	wesn	11	0	0	0	0	0	8	0	2.00	2400
131	06/11/84	4	13	wesn	2	0	0	0	0	0	0	1	3.00	2400
132	06/13/84	4	0	wesn	3	0	0	1	0	0	0	0	2.00	2400
133	04/09/85	3	6	bdo1	0	0	0	0	0	0	0	0	1.00	2400
134	04/10/85	3	8	bdo1	0	0	0	0	0	0	0	0	1.10	2400
135	04/11/85	3	11	bdo1	5	1	0	0	0	0	30	0	0.94	2400
136	04/12/85	3	12	bdo1	13	0	0	0	0	0	14	0	1.00	2400
137	04/14/85	3	7	bdo1	15	0	0	0	0	0	20	0	2.00	2400
138	04/16/85	3	8	bdo1	43	0	0	0	0	0	0	4	2.25	2400
139	04/17/85	3	12	bdo1	23	0	0	0	0	0	120	1	0.83	2400
140	04/19/85	3	0	bdo1	75	0	0	0	0	0	39	5	2.00	2400
141	04/21/85	3	5	bdo1	21	2	0	0	1	0	0	4	2.00	2400
142	04/23/85	3	9	bdo1	1	4	0	0	1	0	0	0	2.00	2400
143	04/25/85	3	6	bdo1	22	1	0	0	0	0	0	1	2.00	2400
144	04/29/85	3	9	bdo1	61	0	0	0	0	0	0	6	4.00	2400
145	04/30/85	3	9	bdo1	18	0	0	0	0	0	0	3	1.00	2400
146	05/01/85	3	10	bdo1	0	0	0	0	0	0	0	0	0.90	2400
147	05/03/85	3	12	bdo1	119	0	0	0	0	0	0	5	2.00	2400
148	05/05/85	3	0	bdo1	0	0	0	0	0	0	0	0	2.00	2400
149	05/06/85	3	9	bdo1	52	0	0	0	0	0	0	2	1.21	2400
150	05/08/85	3	0	bdo1	97	0	0	0	0	0	0	2	1.83	2400
151	05/10/85	3	11	bdo1	38	0	0	0	0	0	0	0	2.13	2400
152	05/15/85	3	13	bdo1	0	0	0	0	0	0	21	0	1.00	2400
153	05/20/85	3	17	bdo1	72	0	0	0	0	0	0	4	4.00	2400
154	05/21/85	3	0	bdo1	4	0	0	0	0	0	0	0	1.00	2400
155	05/23/85	3	19	bdo1	57	0	0	0	0	0	0	2	2.00	2400
156	04/19/85	11	9	bdo4	127	0	0	0	0	0	0	7	2.00	2400
157	04/21/85	11	5	bdo4	15	0	0	0	0	0	0	1	0.92	2400
158	04/23/85	11	9	bdo4	51	0	0	0	0	0	0	2	2.00	2400
159	04/25/85	11	5	bdo4	21	0	0	0	0	0	0	1	2.00	2400
160	04/29/85	11	9	bdo4	492	0	0	0	0	0	0	30	4.00	2400
161	04/30/85	11	10	bdo4	66	0	0	0	0	0	0	5	1.00	2400
162	05/01/85	11	10	bdo4	46	0	0	0	0	0	0	1	0.94	2400

163	05/03/85	11	12	bdo4	392	0	0	0	0	0	0	10	1.88	2400
164	05/06/85	11	9	bdo4	49	0	0	0	0	0	0	1	3.00	2400
165	05/08/85	11	12	bdo4	204	0	0	0	0	0	0	3	2.00	2400
166	05/10/85	11	0	bdo4	173	2	0	0	0	0	0	7	2.07	2400
167	05/15/85	11	13	bdo4	6	6	0	0	0	0	0	0	1.00	2400
168	05/19/85	11	19	bdo4	153	2	0	0	0	0	0	9	2.33	2400
169	05/21/85	11	0	bdo4	12	0	0	0	0	0	0	0	2.00	2400
170	05/22/85	11	0	bdo4	125	0	0	0	0	0	0	2	2.00	2400
171	06/05/85	11	14	bdo4	0	0	0	0	0	0	0	0	0.00	2400
172	06/06/85	11	13	bdo4	0	0	0	0	0	0	0	0	1.00	2400
173	06/07/85	11	14	bdo4	0	0	0	0	0	0	0	0	1.00	2400
174	06/10/85	11	14	bdo4	4	0	0	0	0	0	0	0	3.00	2400
175	06/11/85	11	15	bdo4	0	0	0	0	0	0	0	0	1.00	2400
176	06/12/85	11	15	bdo4	29	0	0	0	0	0	0	1	1.00	2400
177	06/14/85	11	15	bdo4	2	0	0	0	0	0	0	0	2.00	2400
178	06/17/85	11	15	bdo4	9	0	0	0	0	0	0	0	3.00	2400
179	04/03/85	10	5	bear	1	1	0	0	0	0	0	0	1.00	1200
180	04/04/85	10	4	bear	0	0	0	0	0	0	0	0	1.00	1200
181	04/05/85	10	4	bear	7	0	0	0	0	0	0	0	0.96	2400
182	04/08/85	10	8	bear	10	0	0	0	0	0	0	0	2.00	2400
183	04/12/85	9	12	fbo2	31	3	0	0	0	0	0	0	1.00	2400
184	04/14/85	9	9	fbo2	78	0	0	0	0	0	0	1	2.08	2400
185	04/15/85	9	5	fbo2	11	0	0	0	0	0	0	0	1.08	2400
186	04/16/85	9	5	fbo2	60	0	0	0	1	0	0	3	0.36	2400
187	04/17/85	9	14	fbo2	19	16	1	0	1	1	0	1	1.02	2400
188	04/22/85	9	6	fbo2	318	7	5	0	0	1	0	15	4.85	2400
189	04/23/85	9	9	fbo2	4	3	0	0	0	0	0	0	1.00	2400
190	04/25/85	9	6	fbo2	6	2	0	1	0	0	0	0	2.00	2400
191	04/29/85	9	9	fbo2	1	0	0	0	0	0	0	0	4.00	2400
192	05/01/85	9	0	fbo2	0	0	0	0	0	0	6	0	2.00	2400
193	05/03/85	9	10	fbo2	16	0	0	0	0	0	0	0	1.92	2400
194	05/05/85	9	0	fbo2	0	0	0	0	0	0	0	0	2.08	2400
195	05/06/85	9	8	fbo2	121	0	0	0	0	0	0	2	1.00	2400
196	05/09/85	9	0	fbo2	18	0	1	0	0	0	0	0	3.00	2400
197	05/10/85	9	11	fbo2	63	0	0	0	0	0	0	1	0.90	2400
198	05/16/85	9	10	fbo2	0	0	0	0	0	0	0	0	1.00	2400
199	05/20/85	9	21	fbo2	0	0	0	0	0	0	0	0	4.00	2400
200	05/21/85	9	14	fbo2	37	0	0	0	0	0	0	0	0.89	2400
201	05/23/85	9	17	fbo2	5	0	0	0	0	0	0	0	2.00	2400
202	05/01/85	12	0	form	0	0	0	0	0	0	0	0	1.00	1800
203	05/03/85	12	10	form	14	0	0	0	0	0	0	0	1.93	3000
204	05/05/85	12	0	form	21	0	0	0	0	0	0	0	2.22	3000
205	05/06/85	12	8	form	0	0	0	0	0	0	0	0	0.39	3000
206	05/10/85	12	11	form	22	0	0	0	0	0	0	0	4.00	3000
207	05/16/85	12	11	form	0	0	0	0	0	0	0	0	1.00	4200
208	05/20/85	12	14	form	36	0	0	0	0	0	0	4	4.04	4200
209	05/21/85	12	14	form	19	0	0	0	0	0	0	2	0.95	4200
210	05/22/85	12	21	form	154	0	0	0	0	0	0	0	1.25	4200
211	05/23/85	12	17	form	103	0	0	0	0	0	0	8	0.31	4200
212	06/05/85	12	14	form	13	0	0	0	0	0	0	0	0.00	4200
213	06/06/85	12	13	form	0	0	0	0	0	0	0	0	1.00	4200
214	06/07/85	12	15	form	1	0	0	0	0	0	0	0	1.00	4200
215	06/10/85	12	14	form	18	0	0	0	0	0	12	0	3.00	4200
216	06/11/85	12	0	form	13	0	0	0	0	0	0	1	1.00	4200

217	06/12/85	12	15	form	6	0	0	0	0	0	0	0	1.00	4200
218	06/13/85	12	0	form	0	0	0	0	0	0	0	0	1.00	4200
219	06/14/85	12	15	form	0	0	0	0	0	0	0	0	1.00	4200
220	06/18/85	12	17	form	12	0	0	0	0	0	0	0	4.00	4200
221	04/09/85	4	6	wesn	3	0	0	0	0	0	0	0	1.00	2400
222	04/10/85	4	8	wesn	19	0	0	0	0	0	0	0	1.00	3600
223	04/11/85	4	10	wesn	70	0	0	0	0	0	5	0	1.08	3600
224	04/12/85	4	12	wesn	70	0	0	0	0	0	0	2	0.96	3600
225	04/14/85	4	9	wesn	55	0	0	0	0	0	56	0	2.01	3600
226	04/15/85	4	12	wesn	172	0	0	0	0	0	0	1	1.00	3600
227	04/16/85	4	9	wesn	27	0	0	1	0	0	0	1	1.00	3600
228	04/19/85	4	8	wesn	1	0	0	0	0	0	0	0	3.00	3600
229	04/25/85	4	6	wesn	5	0	0	0	0	0	0	0	6.00	3600
230	04/30/85	4	7	wesn	35	0	0	0	0	0	0	0	5.00	3600

APPENDIX D

SUMMARY OF GILL NET CATCHES COLLECTED FROM SOUTH BAY OF FLATHEAD LAKE, 1985-1986

GILL NET DATA LIST CODES
FOR 1985 - 1986

SPECIES:

YP = yellow perch
LWF = lake whitefish
MWF = mountain whitefish
DV = bull trout
RCT = rainbow/cutthroat
NSQ = northern squawfish
PMC = peamouth chub
LNS = longnose sucker
LSS = largescale sucker

WIND VELOCITY:

1 = no wind
2 = 0 - 5 mph
3 = 5 - 10 mph
4 = 10 - 15 mph
5 = > 15 mph

WAVE HEIGHT:

1 = calm
2 = 0 - 12"
3 = 12 - 24"
4 = > 24"

CLOUD COVER:

1 = 0%
2 = 25%
3 = 50%
4 = 75%
5 = 100%

STATION = (See Figure 5).

SWTEMP = Surface water temperature

MINDEPTH = Minimum depth sampled

SECCHI = Secchi disc depth

Record#	DATE	WLEVEL	START	STOP	STATION	AIRTEMP	WINDDIR	WINDVEL	WAVE	CLOUDS	SWTEMP	MINDEPTH	SECCHI	YP	LWF	MWF	DV	RCT	NSQ	PMC	LNS	LSS	EFFORT	EVAL	PERIOD
1	04/30/85	2885.23	1151	1502	1Aa	13.0	N	1	2	1	6.0	3.0	3.5	0	1	0	0	0	0	0	0	0	3.18	1	1
2	04/30/85	2885.23	1134	1414	1Ab	10.0	N	1	2	1	5.0	4.2	3.5	0	0	0	0	0	0	0	0	0	2.67	1	1
3	04/30/85	2885.23	1116	1320	1Ac	10.0	N	1	2	1	5.0	3.6	3.0	0	0	0	0	0	0	0	0	1	2.07	1	1
4	04/30/85	2885.23	1548	1648	1Ba	13.0	N	1	1	1	10.0	0.0	3.5	0	0	0	0	0	0	0	0	0	1.00	1	1
5	04/30/85	2885.23	1536	1638	1Bb	13.0	N	1	1	1	10.0	0.0	3.0	0	0	0	0	0	0	0	0	0	1.03	1	1
6	07/11/85	2892.92	2200	2227	1Aa	22.0	S	1	1	3	23.5	3.0	3.6	0	0	0	0	0	0	0	0	0	0.45	1	2
7	07/11/85	2892.92	2208	2239	1Ab	22.0	SW	1	1	3	23.5	3.0	9.1	0	1	0	0	0	7	5	0	1	0.52	1	2
8	07/11/85	2892.92	2218	2310	1Ac	22.0	SW	1	1	3	23.5	3.0	3.9	3	0	0	0	0	8	6	0	5	0.87	1	2
9	07/15/85	2893.00	2345	2432	1Ba	19.0	S	1	2	2	23.0	3.0	3.6	5	0	0	0	0	13	0	0	0	0.78	1	2
10	07/15/85	2893.00	2352	2524	1Bb	19.0	S	1	2	2	23.0	3.0	4.2	2	0	0	0	0	11	0	0	1	1.53	1	2
11	09/23/85	2892.98	2041	2141	1Aa	12.0	S	2	2	5	13.0	1.9	3.9	0	0	0	0	0	8	18	0	0	1.00	1	3
12	09/23/85	2892.98	2056	2156	1Ab	12.0	S	2	2	5	12.0	1.9	6.3	0	0	0	1	0	13	17	0	0	1.00	1	3
13	09/23/85	2892.98	2110	2215	1Ac	12.0	S	2	2	5	13.0	1.9	3.5	0	0	0	1	1	16	26	0	0	1.08	1	3
14	09/23/85	2892.98	2320	2420	1Ba	11.0	SW	2	2	5	12.0	3.1	3.3	0	0	0	0	0	18	0	0	0	1.00	1	3
15	09/23/85	2892.98	2340	2440	1Bb	11.0	SW	2	2	5	12.0	3.1	3.8	0	0	0	0	0	9	1	0	1	1.00	1	3
16	05/01/85	2885.27	1104	1404	2Aa	10.0	N	1	2	3	6.0	4.8	6.0	0	2	0	0	0	0	0	0	0	3.00	2	1
17	05/01/85	2885.27	1114	1420	2Ab	9.0	N	1	2	2	5.0	5.1	5.5	0	0	0	0	0	0	0	0	0	3.10	2	1
18	05/01/85	2885.27	1124	1424	2Ac	9.0	N	1	2	2	6.0	2.5	2.5	0	0	0	0	0	0	0	0	0	3.00	2	1
19	05/01/85	2885.27	1003	1203	2Ba	10.0	NW	1	2	5	9.0	3.0	3.5	0	0	0	0	0	0	0	0	0	2.00	2	1
20	05/01/85	2885.27	1016	1216	2Bb	12.0	NW	1	2	3	9.0	2.1	2.5	0	0	0	0	0	0	0	0	0	2.00	2	1
21	06/26/85	2892.85	2200	2300	2Aa	17.0	SE	1	1	1	16.0	5.7	6.0	8	1	0	0	0	0	6	0	0	1.00	2	2
22	06/26/85	2892.85	2210	2318	2Ab	17.0	SE	1	1	1	16.0	7.3	7.3	0	9	0	0	0	0	3	0	0	1.13	2	2
23	06/26/85	2892.85	2221	2346	2Ac	17.0	SE	1	1	1	16.0	3.7	4.1	1	1	0	0	0	0	1	0	0	1.42	2	2
24	06/26/85	2892.85	2410	2510	2Ba	17.0	SE	1	1	1	16.0	5.4	5.4	0	4	0	0	0	0	0	0	0	1.00	2	2
25	06/26/85	2892.85	2425	2528	2Bb	17.0	SE	1	1	1	16.0	2.7	3.3	0	1	0	0	0	2	0	0	0	1.05	2	2
26	09/30/85	2892.78	2005	2105	2Aa	10.0	E	2	2	2	12.0	6.9	6.9	0	0	0	0	0	2	9	0	0	1.00	2	3
27	09/30/85	2892.78	2020	2120	2Ab	9.0	SE	2	2	2	12.0	6.9	7.2	0	1	0	0	0	0	2	0	0	1.00	2	3
28	09/30/85	2892.78	2035	2135	2Ac	9.0	SE	2	2	2	12.0	6.6	6.6	0	1	0	0	0	0	0	0	0	1.00	2	3
29	09/30/85	2892.78	2200	2300	2Ba	6.0	S	2	2	2	12.0	5.4	5.4	0	0	0	0	0	5	0	0	1	1.00	2	3
30	09/30/85	2892.78	2215	2315	2Bb	6.0	S	2	2	2	12.0	3.1	3.3	1	0	0	0	0	3	0	0	1	1.00	2	3
31	04/22/85	2885.16	1057	1354	3A	3.0	S	0	2	3	3.0	3.6	3.6	5	1	0	0	0	0	0	0	0	2.95	3	1
32	04/22/85	2885.16	1049	1326	3B	3.0	S	0	2	5	4.0	3.6	3.6	15	0	0	0	0	0	0	0	0	2.62	3	1
33	04/22/85	2885.16	1041	1242	3C	3.0	S	0	2	5	3.0	3.3	3.3	3	1	0	0	0	0	0	0	0	2.02	3	1
34	04/22/85	2885.16	1021	1238	3D	3.0	0	0	2	5	3.0	3.0	3.0	0	0	0	0	0	0	0	0	0	2.28	3	1
35	04/22/85	2885.16	1006	1231	3E	3.0	S	0	2	5	3.0	3.0	3.0	0	0	0	0	0	0	0	0	0	2.42	3	1

36	07/21/85	2892.78	2420	2547	3A	23.0	SW	2	2	1	23.0	6.1	6.1	0	0	0	0	0	1	9	0	0	1.45	3	2
37	07/21/85	2892.78	2402	2530	3B	23.0	SW	1	2	1	23.0	6.1	6.1	0	0	0	0	0	0	3	0	0	1.47	3	2
38	07/21/85	2892.78	2244	2440	3C	23.0	NW	1	1	1	23.0	6.1	6.1	0	0	0	0	0	2	1	0	1	1.93	3	2
39	07/21/85	2892.78	2225	2330	3D	26.0	WNW	1	2	1	23.0	5.8	5.8	1	0	0	0	0	2	0	0	0	1.08	3	2
40	07/21/85	2892.78	2200	2305	3E	26.0	NW	1	2	1	23.0	5.2	5.2	1	0	0	0	0	3	0	0	1	1.08	3	2
41	09/19/85	2892.95	2200	2300	3A	11.0	W	2	1	1	12.0	6.0	0.0	0	1	0	0	0	0	0	0	0	1.00	3	3
42	09/19/85	2892.95	2145	2247	3B	11.0	W	2	1	1	12.0	6.0	0.0	0	0	0	0	0	0	0	0	1	1.03	3	3
43	09/19/85	2892.95	2130	2235	3C	11.0	SE	2	2	2	12.0	5.9	0.0	0	0	0	0	0	0	0	0	0	1.08	3	3
44	09/19/85	2892.95	2115	2221	3D	11.0	SE	2	2	2	12.0	5.8	0.0	0	0	0	0	0	1	0	0	0	1.10	3	3
45	09/19/85	2892.95	2100	2208	3E	11.0	SE	3	2	2	12.0	5.8	0.0	0	1	0	0	0	3	1	0	0	1.13	3	3
46	04/26/85	2885.24	1045	1250	4Aa	6.0	S	1	2	5	5.0	2.4	0.0	0	0	0	0	0	0	0	0	0	2.08	4	1
47	04/26/85	2885.24	1035	1240	4Ab	6.0	S	1	1	5	5.0	0.0	0.0	4	0	0	0	0	0	0	0	0	2.08	4	1
48	04/26/85	2885.24	1025	1225	4Ac	6.0	S	0	2	5	5.0	0.0	0.0	1	0	0	0	0	0	0	0	0	2.00	4	1
49	04/26/85	2885.24	951	1151	4Ba	6.0	S	1	1	5	5.0	2.1	3.0	0	0	0	0	0	0	0	0	0	2.00	4	1
50	04/26/85	2885.24	954	1157	4Bb	6.0	S	1	1	5	5.0	0.0	0.0	0	0	0	0	0	0	0	0	0	2.05	4	1
51	07/10/85	2892.92	2220	2320	4Aa	25.0	NW	2	2	1	23.0	3.0	3.3	2	0	0	0	0	7	0	2	1	1.00	4	2
52	07/10/85	2892.92	2231	2350	4Ab	25.0	NW	2	2	1	23.0	3.0	3.3	7	0	0	0	0	16	0	1	0	1.32	4	2
53	07/10/85	2892.92	2238	2409	4Ac	25.0	NW	2	2	1	23.0	3.0	3.0	1	0	0	0	0	4	5	0	0	1.52	4	2
54	07/15/85	2893.00	2200	2301	4Ba	24.0	N	2	2	2	23.0	4.0	0.0	5	0	0	0	0	2	3	0	2	1.02	4	2
55	07/15/85	2893.00	2230	2331	4Bb	23.0	N	2	2	2	23.0	3.7	0.0	4	0	0	0	0	4	1	0	3	1.02	4	2
56	10/17/85	2892.72	2006	2106	4Aa	14.0	0	1	1	2	8.0	3.0	3.5	0	3	0	0	0	1	0	0	0	1.00	4	3
57	10/17/85	2892.72	2021	2121	4Ab	14.0	0	1	1	2	8.0	3.0	3.3	0	3	0	0	0	0	0	0	0	1.00	4	3
58	10/17/85	2892.72	2036	2136	4Ac	14.0	0	1	1	2	8.0	3.0	3.3	0	2	0	0	0	0	0	0	0	1.00	4	3
59	10/17/85	2892.72	2220	2320	4Ba	8.0	SE	2	2	1	8.0	4.3	4.3	0	0	0	0	0	0	0	0	0	1.00	4	3
60	10/17/85	2892.72	2205	2305	4Bb	8.0	SE	2	2	1	8.0	6.9	6.9	0	3	0	0	0	0	1	0	0	1.00	4	3
61	04/16/85	2883.55	1048	1722	5A	12.0	N	0	2	5	12.0	0.0	0.0	0	1	0	0	0	0	0	0	0	6.57	5	1
62	04/16/85	2883.55	1056	1700	5B	12.0	N	1	2	5	12.0	0.0	0.0	32	0	3	0	0	0	0	0	0	6.07	5	1
63	04/16/85	2883.55	1109	1730	5C	15.0	N	1	1	4	12.0	0.0	0.0	48	0	2	1	0	0	0	0	0	6.35	5	1
64	04/16/85	2883.55	1115	1430	5D	14.0	N	0	2	5	12.0	0.0	0.0	163	0	0	0	0	0	0	0	0	3.25	5	1
65	04/16/85	2883.55	1131	1429	5E	12.0	N	0	2	5	12.0	2.0	2.0	226	0	0	0	0	0	0	0	0	2.97	5	1
66	07/08/85	2892.99	2200	2300	5A	24.5	SE	1	2	1	24.0	5.5	5.5	1	0	0	0	0	0	2	2	0	1.00	5	2
67	07/08/85	2892.99	2210	2314	5B	24.5	SE	1	2	1	24.0	5.2	5.2	0	0	0	0	0	0	1	2	0	1.07	5	2
68	07/08/85	2892.99	2224	2354	5C	24.5	SE	1	2	1	24.0	4.7	4.6	0	0	0	0	0	4	0	0	0	1.50	5	2
69	07/08/85	2892.99	2400	2500	5D	24.5	SE	2	2	1	24.0	4.3	4.3	1	0	0	0	0	1	0	0	0	1.00	5	2
70	07/08/85	2892.99	2410	2515	5E	24.5	SE	1	2	1	24.0	3.6	3.6	1	0	0	0	0	0	0	0	0	1.08	5	2
71	09/25/85	2892.96	2035	2148	5A	13.0	0	1	1	1	13.5	5.5	5.5	0	0	0	0	0	0	0	0	0	1.22	5	3

72	09/25/85	2892.96	2050	2155	5B	13.0	0	1	1	1	13.5	5.5	5.5	0	0	0	0	0	0	2	0	1	1.09	5	3
73	09/25/85	2892.96	2105	2205	5C	13.0	SE	2	2	1	13.5	5.5	5.5	2	2	0	0	0	0	3	0	0	1.00	5	3
74	09/25/85	2892.96	2120	2224	5D	13.0	SE	2	2	1	13.5	4.9	4.9	3	0	0	0	0	3	2	0	0	1.07	5	3
75	09/25/85	2892.96	2135	2238	5E	13.0	SE	2	2	1	13.5	4.9	4.9	2	1	0	0	0	6	1	0	0	1.05	5	3
76	07/02/85	2892.86	2200	2306	6A	26.0	SW	2	3	3	22.0	1.8	3.0	9	0	0	0	0	4	0	0	0	1.10	6	2
77	07/02/85	2892.86	2205	2329	6B	26.0	SW	2	3	3	22.0	1.8	3.0	6	0	0	0	0	6	1	3	0	1.40	6	2
78	07/02/85	2892.86	2211	2246	6C	26.0	SW	2	3	3	22.0	1.8	2.4	5	0	0	0	0	4	1	0	0	0.58	6	2
79	07/02/85	2892.86	2349	2452	6D	26.0	SW	2	3	3	22.0	1.8	3.0	2	0	0	0	0	5	2	0	2	1.05	6	2
80	07/02/85	2892.86	2352	2420	6E	26.0	SW	2	3	3	22.0	1.8	2.7	0	0	0	0	0	6	4	0	0	0.47	6	2
81	06/30/85	2892.92	2200	2300	7A	25.0	NW	2	2	1	21.0	1.8	1.8	5	0	0	0	0	3	1	4	1	1.00	7	2
82	06/30/85	2892.92	2215	2315	7B	25.0	NW	2	2	1	21.0	1.8	1.8	0	0	0	0	0	1	0	1	1	1.00	7	2
83	06/30/85	2892.92	2327	2427	7C	25.0	NW	2	2	1	21.0	1.8	1.8	1	0	0	0	0	2	1	0	1	1.00	7	2
84	06/30/85	2892.92	2338	2438	7D	25.0	NW	2	2	1	21.0	1.8	2.4	1	0	0	0	0	0	0	0	0	1.00	7	2
85	06/30/85	2892.92	2349	2449	7E	25.0	NW	2	2	1	21.0	1.8	2.1	1	0	0	0	0	0	0	0	0	1.00	7	2
86	10/20/85	2892.55	1915	2025	7A	9.0	0	1	1	5	9.0	1.8	2.1	1	2	0	0	0	1	0	0	0	1.17	7	3
87	10/20/85	2892.55	1930	2040	7B	9.0	0	1	1	5	9.0	1.8	2.1	0	0	0	0	0	2	0	0	0	1.17	7	3
88	10/20/85	2892.55	1945	2048	7C	9.0	0	1	1	5	9.0	1.8	1.8	0	0	0	0	0	0	0	0	0	1.05	7	3
89	10/20/85	2892.55	2000	2100	7D	9.0	0	1	1	5	9.0	1.8	2.4	0	0	0	0	0	0	0	0	1	1.00	7	3
90	10/20/85	2892.55	2015	2115	7E	9.0	0	1	1	5	9.0	1.8	2.1	0	2	0	0	0	0	0	0	0	1.00	7	3
91	07/01/85	2892.87	2200	2300	8A	18.0	S	1	2	2	21.0	1.8	3.0	0	0	0	0	0	1	0	3	0	1.00	8	2
92	07/01/85	2892.87	2224	2324	8B	18.0	S	1	2	2	21.0	2.1	2.4	6	0	0	0	0	0	1	0	1	1.00	8	2
93	07/01/85	2892.87	2357	2457	8C	18.0	S	1	2	2	21.0	2.7	3.0	0	0	0	0	0	1	0	0	0	1.00	8	2
94	07/01/85	2892.87	2400	2500	8D	18.0	S	1	2	2	21.0	2.4	2.4	2	0	0	0	0	1	0	0	2	1.00	8	2
95	07/01/85	2892.87	2415	2515	8E	18.0	S	1	2	2	21.0	1.8	1.8	3	0	0	0	0	0	0	0	1	1.00	8	2
96	10/29/85	2892.17	1850	1959	8A	2.0	E	2	2	2	8.0	1.8	2.1	0	2	0	0	0	0	0	0	0	1.15	8	3
97	10/29/85	2892.17	1905	2015	8B	2.0	E	2	2	2	8.0	2.7	2.7	0	1	0	1	1	0	0	0	0	1.17	8	3
98	10/29/85	2892.17	1920	2032	8C	1.0	E	2	2	2	8.0	3.2	3.2	1	1	0	0	0	0	0	0	0	1.20	8	3
99	10/29/85	2892.17	1935	2048	8D	1.0	S	2	2	2	8.0	2.1	2.1	2	1	0	0	0	0	0	0	0	1.22	8	3
100	10/29/85	2892.17	1950	2058	8E	1.0	S	2	2	2	8.0	2.4	2.4	2	1	0	0	0	0	0	0	0	1.13	8	3
101	06/17/85	2892.43	2200	2400	9A	17.0	N	2	3	1	15.0	1.8	0.0	0	4	0	0	0	6	2	0	0	2.00	9	2
102	06/17/85	2892.43	2210	2438	9B	17.0	N	2	3	1	15.0	1.8	0.0	3	5	0	0	0	7	3	0	0	2.47	9	2
103	06/17/85	2892.43	2219	2512	9C	17.0	N	2	3	1	15.0	1.8	0.0	1	2	0	0	0	6	8	1	1	2.88	9	2
104	06/17/85	2892.43	2229	2540	9D	17.0	N	2	3	1	15.0	1.8	0.0	2	7	0	0	1	15	10	0	1	3.18	9	2
105	06/17/85	2892.43	2238	2618	9E	17.0	N	2	3	1	15.0	1.8	0.0	0	1	0	1	1	10	10	2	0	3.67	9	2
106	09/20/85	2892.98	2055	2157	9A	14.0	S	2	2	5	13.0	1.8	0.0	0	4	0	0	0	0	1	0	1	1.03	9	3
107	09/20/85	2892.98	2110	2217	9B	14.0	S	2	2	5	13.0	1.8	0.0	1	3	0	0	0	0	0	0	0	1.12	9	3

108	09/20/85	2892.98	2125	2235	9C	14.0	S	2	2	5	13.0	1.8	0.0	2	0	0	0	0	0	0	0	0	1.17	9	3
109	09/20/85	2892.98	2140	2244	9D	14.0	S	2	2	5	13.0	1.8	0.0	1	3	0	0	0	6	0	0	0	1.07	9	3
110	09/20/85	2892.98	2155	2305	9E	14.0	S	2	2	5	13.0	1.8	0.0	0	2	0	0	0	3	1	0	0	1.17	9	3
111	06/18/85	2892.40	2200	2324	10A	18.0	W	1	1	1	18.0	1.8	0.0	3	1	0	1	1	5	11	0	3	1.40	10	2
112	06/18/85	2892.40	2209	2241	10B	18.0	W	1	1	1	18.0	2.4	3.0	18	2	0	0	0	5	5	0	0	0.53	10	2
113	06/18/85	2892.40	2217	2417	10C	18.0	W	1	1	1	18.0	2.0	2.4	1	0	0	0	0	2	2	0	0	2.00	10	2
114	06/18/85	2892.40	2221	2429	10D	18.0	W	1	1	1	18.0	2.0	3.1	2	0	0	0	0	2	1	0	0	2.13	10	2
115	06/18/85	2892.40	2227	2441	10E	18.0	W	1	1	1	18.0	2.0	3.1	3	0	0	0	0	7	3	0	2	2.23	10	2
116	09/13/85	2893.10	2100	2200	10A	14.0	S	1	1	4	15.0	1.8	0.0	0	0	0	0	0	15	7	0	0	1.00	10	3
117	09/13/85	2893.10	2115	2215	10B	14.0	S	1	2	4	15.0	1.8	0.0	0	0	0	0	0	11	12	0	0	1.00	10	3
118	09/13/85	2893.10	2130	2230	10C	14.0	S	1	2	3	15.0	1.8	0.0	0	0	0	0	0	0	1	0	0	1.00	10	3
119	09/13/85	2893.10	2145	2245	10D	14.0	S	1	1	3	15.0	1.8	0.0	0	0	0	0	0	5	2	0	0	1.00	10	3
120	09/13/85	2893.10	2200	2300	10E	14.0	S	1	1	2	15.0	1.8	0.0	0	0	0	0	0	5	7	0	0	1.00	10	3
121	06/19/85	2892.40	2200	2306	11A	22.0	W	2	3	1	18.0	2.0	3.0	6	0	0	0	0	11	1	0	1	1.10	11	2
122	06/19/85	2892.40	2204	2333	11B	22.0	W	2	3	1	18.0	2.0	2.5	6	0	0	0	0	6	5	0	0	1.48	11	2
123	06/19/85	2892.40	2208	2354	11C	22.0	W	2	3	1	18.0	2.0	3.1	6	0	0	0	0	2	6	0	0	1.10	11	2
124	06/19/85	2892.40	2212	2430	11D	22.0	W	2	3	1	18.0	2.0	4.0	11	0	0	0	0	15	22	0	3	2.30	11	2
125	06/19/85	2892.40	2216	2253	11E	22.0	W	2	3	1	18.0	2.0	3.0	1	1	0	0	0	0	0	0	0	0.62	11	2
126	09/12/85	2893.02	2039	2142	11A	12.0	SE	2	2	4	15.0	1.8	1.8	0	0	0	0	0	38	0	0	0	1.05	11	3
127	09/12/85	2893.02	2054	2201	11B	12.0	SE	2	2	4	15.0	1.8	0.0	2	0	0	0	0	6	0	0	0	1.12	11	3
128	09/12/85	2893.02	2109	2212	11C	12.0	S	2	2	4	15.0	1.8	0.0	1	1	0	0	0	11	3	0	0	1.05	11	3
129	09/12/85	2893.02	2124	2224	11D	11.0	S	2	2	4	15.0	1.8	0.0	1	0	0	0	0	7	3	0	1	1.00	11	3
130	09/12/85	2893.02	2139	2243	11E	11.0	S	2	2	4	15.0	1.8	0.0	0	0	0	0	0	7	1	0	0	1.07	11	3
131	06/27/85	2892.88	2300	2337	12Aa	17.0	E	1	1	1	17.0	1.8	2.7	4	0	0	0	0	6	0	0	1	0.62	12	2
132	06/27/85	2892.88	2310	2425	12Ab	17.0	SE	1	1	1	17.0	1.8	1.8	2	0	0	0	0	8	0	2	0	1.25	12	2
133	06/27/85	2892.88	2401	2505	12Ba	17.0	SE	1	1	1	17.0	1.8	1.8	1	0	0	0	0	10	0	0	2	1.07	12	2
134	06/27/85	2892.88	2415	2515	12Bb	17.0	E	1	1	1	17.0	1.8	3.3	0	0	0	0	0	11	1	0	0	1.00	12	2
135	06/27/85	2892.88	2200	2235	12Ca	17.0	E	1	1	1	15.0	1.8	2.7	6	0	0	0	0	4	2	0	2	0.58	12	2
136	09/24/85	2892.95	2238	2338	12Aa	10.0	W	2	1	4	13.0	1.8	2.7	0	0	0	0	0	5	1	0	0	1.00	12	3
137	09/24/85	2892.95	2253	2353	12Ab	10.0	W	2	1	4	13.0	1.8	3.0	0	0	0	0	0	8	3	0	0	1.00	12	3
138	09/24/85	2892.95	2208	2308	12Ba	10.0	W	2	1	3	13.0	1.8	2.7	1	0	0	0	0	12	0	0	0	1.00	12	3
139	09/24/85	2892.95	2223	2323	12Bb	10.0	W	2	1	4	13.0	1.8	2.4	1	0	0	0	0	5	8	0	1	1.00	12	3
140	09/24/85	2892.95	2025	2125	12Ca	13.0	SW	2	2	4	13.0	1.8	2.3	1	0	0	0	0	11	50	0	1	1.00	12	3
141	07/22/85	2892.77	2228	2250	13A	22.0	NW	2	2	2	25.0	1.8	2.4	0	0	0	0	0	9	1	2	0	0.37	13	2
142	07/22/85	2892.77	2309	2430	13B	18.0	NW	1	2	2	19.0	1.8	1.8	0	0	0	0	0	0	0	0	0	1.35	13	2
143	07/22/85	2892.77	2401	2530	13Ca	18.0	SW	2	2	2	22.0	2.4	2.4	0	0	0	0	0	4	0	0	0	1.48	13	2

144	07/22/85	2892.77	2447	2558	13Cb	18.0	SW	2	2	2	22.0	3.9	3.9	0	0	0	0	0	24	0	0	0	1.18	13	2
145	10/21/85	2892.48	2350	2450	13A	7.0	S	4	3	5	10.0	1.8	3.0	0	0	0	0	0	5	0	0	0	1.00	13	3
146	10/21/85	2892.48	2215	2315	13B	7.0	S	4	3	5	10.0	1.8	3.0	0	3	0	0	0	4	2	0	0	1.00	13	3
147	10/21/85	2892.48	2005	2105	13D	9.0	S	4	3	5	9.0	1.8	3.4	0	3	0	0	0	8	8	0	0	1.00	13	3
148	10/21/85	2892.48	1925	2025	13Ca	11.0	S	3	2	5	10.0	2.1	2.1	0	0	0	0	0	1	0	0	0	1.00	13	3
149	10/21/85	2892.48	1950	2050	13Cb	11.0	S	3	2	5	10.0	3.4	3.4	0	0	0	0	0	2	0	0	1	1.00	13	3
150	06/25/85	2892.89	2257	2613	14A	12.0	0	1	1	1	15.0	2.5	5.1	0	4	0	1	0	38	6	1	7	3.27	14	2
151	06/25/85	2892.89	2242	2520	14B	13.0	0	1	1	1	16.0	2.0	5.0	1	1	0	0	0	42	3	1	13	2.63	14	2
152	06/25/85	2892.89	2228	2415	14C	14.0	0	1	1	1	15.0	3.1	6.0	7	9	0	0	0	31	9	0	3	1.78	14	2
153	06/25/85	2892.89	2211	2352	14Da	14.0	0	1	1	1	15.0	2.0	4.0	2	0	0	0	0	6	1	0	0	1.02	14	2
154	06/25/85	2892.89	2203	2320	14Db	13.0	0	1	1	1	16.0	2.0	3.9	6	0	0	0	0	6	1	0	0	1.28	14	2

Record#	ID	DATE	WLEVEL	START	STOP	STATION	AIRTEMP	WINDDIR	WINDVEL	WAVE	CLOUDS	SWTEMP	MINDEPTH	SECCHI	YP	LWF	MWF	DV	RCT	NSQ	PMC	LNS	LSS	EFFORT	EVAL	PERIOD
1	1	04/16/86	2885.32	2010	2110	1Aa	9.0	S	0	0	3	6.0	7.0	0.0	0	0	1	0	0	0	0	0	0	1.00	1	1
2	2	04/16/86	2885.32	2030	2130	1Ab	9.0	S	2	2	3	6.0	7.0	0.0	0	0	0	0	0	1	0	0	0	1.00	1	1
3	3	04/16/86	2885.32	2045	2145	1Ac	9.0	SE	3	2	3	6.0	0.0	0.0	0	0	0	0	0	0	0	0	0	1.00	1	1
4	4	04/16/86	2885.32	2210	2310	1Ba	6.0	S	2	2	3	6.0	5.0	0.0	0	0	0	0	0	3	5	0	2	1.00	1	1
5	5	04/16/86	2885.32	2218	2318	1Bb	6.0	S	2	2	3	6.0	4.0	0.0	1	1	0	0	0	4	3	0	1	1.00	1	1
6	6	07/22/86	2892.56	2205	2305	1Aa	19.0	N	2	2	2	19.0	6.0	6.0	0	0	0	0	0	17	5	0	0	1.00	1	2
7	7	07/22/86	2892.56	2225	2325	1Ab	19.0	N	2	2	2	19.0	6.0	6.0	0	0	0	0	0	43	31	0	3	1.00	1	2
8	8	07/22/86	2892.56	2245	2345	1Ac	19.0	N	2	2	2	19.0	6.0	6.0	0	0	0	0	0	48	64	0	19	1.00	1	2
9	9	07/22/86	2892.56	2423	2523	1Ba	17.0	S	2	2	1	20.0	6.0	6.0	0	0	0	0	0	12	24	0	3	1.00	1	2
10	10	07/22/86	2892.56	2435	2553	1Bb	17.0	S	2	2	1	20.0	6.0	6.0	1	0	0	0	0	7	23	0	1	1.30	1	2
11	11	08/28/86	2892.80	2117	2233	1Ba	0.0		1	2	2	0.0	0.0	0.0	1	0	0	0	0	9	2	0	0	1.27	1	3
12	12	08/28/86	2892.80	2128	2247	1Bb	0.0		0	0	2	0.0	0.0	0.0	0	0	0	0	0	14	1	0	3	1.32	1	3
13	13	09/02/86	2892.80	2115	2215	1Aa	0.0	W	4	3	3	0.0	0.0	0.0	0	0	0	0	0	3	0	0	2	1.00	1	3
14	14	09/02/86	2892.80	2130	2232	1Ab	0.0	W	4	3	3	0.0	0.0	0.0	0	0	0	0	0	7	2	0	0	1.03	1	3
15	15	09/02/86	2892.80	2145	2245	1Ac	0.0	W	4	3	3	0.0	0.0	0.0	1	0	0	0	0	9	1	1	0	1.00	1	3
16	16	05/01/86	2886.13	2125	2225	2Aa	9.0		1	1	4	7.0	16.0	0.0	1	2	0	0	0	0	0	0	0	1.00	2	1
17	17	05/01/86	2886.13	2145	2245	2Ab	9.0		1	1	4	7.0	16.0	0.0	0	2	0	0	1	0	0	0	0	1.00	2	1
18	18	05/01/86	2886.13	2205	2305	2Ac	9.0	SW	2	2	4	7.0	7.0	0.0	0	1	0	0	0	0	0	0	0	1.00	2	1
19	19	05/01/86	2886.13	2325	2425	2Ba	10.0		1	1	5	9.0	11.0	0.0	0	0	0	0	0	2	0	0	0	1.00	2	1
20	20	05/01/86	2886.13	2340	2440	2Bb	10.0		1	1	5	9.0	6.0	0.0	1	1	0	0	0	0	0	0	1	1.00	2	1
21	21	07/31/86	2892.58	2202	2306	2Aa	20.0	N	2	2	2	20.0	22.0	10.0	1	0	0	0	0	6	9	0	0	1.07	2	2
22	22	07/31/86	2892.58	2220	2320	2Ab	20.0	N	2	2	2	20.0	22.0	22.0	3	5	0	0	0	9	4	0	0	1.00	2	2
23	23	07/31/86	2892.58	2240	2353	2Ac	20.0	N	2	2	2	20.0	12.0	12.0	0	0	0	0	0	4	2	0	1	1.22	2	2
24	24	07/31/86	2892.58	2526	2635	2Ba	16.0	S	2	1	2	20.0	16.0	16.0	0	0	0	0	0	10	1	0	0	1.15	2	2
25	25	07/31/86	2892.58	2546	2652	2Bb	16.0	S	2	1	2	20.0	10.0	10.0	0	0	0	0	0	5	0	0	0	1.10	2	2
26	26	08/25/86	2892.81	2435	2524	2Aa	0.0	NNW	4	3	1	0.0	0.0	0.0	1	0	0	0	0	0	0	0	0	0.82	2	3
27	27	08/25/86	2892.81	2453	2540	2Ab	0.0	N	3	3	4	0.0	0.0	0.0	1	0	0	0	0	3	0	0	0	0.78	2	3
28	28	08/25/86	2892.81	2510	2553	2Ac	0.0	NNW	5	4	1	0.0	0.0	0.0	1	0	0	0	0	0	0	0	0	0.72	2	3
29	29	08/25/86	2892.81	2644	2741	2Ba	0.0	NNW	4	3	1	0.0	0.0	0.0	1	0	0	0	0	20	1	0	0	0.95	2	3
30	30	08/25/86	2892.81	2632	2727	2Bb	0.0	N	4	4	1	0.0	0.0	0.0	0	0	0	0	0	10	0	0	0	0.92	2	3
31	31	04/21/86	2885.22	2100	2200	3A	13.0	W	2	2	2	8.0	14.0	0.0	3	0	0	0	0	0	0	0	0	1.00	3	1
32	32	04/21/86	2885.22	2045	2145	3B	13.0	SW	2	2	2	8.0	13.0	0.0	1	0	0	0	0	0	0	0	0	1.00	3	1
33	33	04/21/86	2885.22	2030	2136	3C	13.0	SW	2	2	2	8.0	12.0	0.0	0	2	0	0	0	0	0	0	0	1.10	3	1
34	34	04/21/86	2885.22	2015	2120	3D	13.0	W	2	2	2	8.0	10.0	0.0	0	2	0	0	0	0	0	0	0	1.08	3	1

35	35	04/21/86	2885.22	2000	2110	3E	13.0	W	2	2	2	8.0	9.0	0.0	0	1	0	0	0	0	0	0	0	1.17	3	1
36	36	07/07/86	2892.65	2315	2415	3A	19.0	NE	2	2	2	18.0	0.0	0.0	1	0	0	0	0	0	0	0	0	1.00	3	2
37	37	07/07/86	2892.65	2300	2407	3B	19.0	NE	2	2	2	18.0	0.0	0.0	0	0	0	0	0	0	0	0	3	1.12	3	2
38	38	07/07/86	2892.65	2245	2353	3C	19.0	NE	2	2	2	18.0	0.0	0.0	1	6	0	0	0	0	1	0	0	1.13	3	2
39	39	07/07/86	2892.65	2230	2334	3D	19.0	NE	2	2	2	18.0	0.0	0.0	1	1	0	0	0	0	0	0	0	1.07	3	2
40	40	07/07/86	2892.65	2215	2324	3E	19.0	NE	2	2	2	18.0	0.0	0.0	2	0	0	0	0	0	1	0	0	1.15	3	2
41	41	08/25/86	2892.81	2125	2356	3A	0.0	N	2	2	1	0.0	0.0	0.0	6	0	0	0	0	3	1	0	0	2.52	3	3
42	42	08/25/86	2892.81	2109	2340	3B	0.0	N	2	2	1	0.0	0.0	0.0	5	0	1	0	0	8	1	0	0	2.52	3	3
43	43	08/25/86	2892.81	2100	2335	3C	0.0		1	1	1	0.0	0.0	0.0	12	0	1	0	0	8	5	0	0	2.58	3	3
44	44	08/25/86	2892.81	2053	2235	3D	0.0	N	2	2	1	0.0	0.0	0.0	6	0	0	0	0	6	12	0	0	1.70	3	3
45	45	08/25/86	2892.81	2043	2143	3E	0.0	N	2	2	1	0.0	0.0	0.0	21	0	0	0	0	3	5	0	0	1.00	3	3
46	46	04/23/86	2885.29	2133	2233	4Aa	6.0	SE	2	2	3	10.0	6.0	0.0	4	4	0	1	0	2	3	0	0	1.00	4	1
47	47	04/23/86	2885.29	2153	2253	4Ab	6.0	SE	2	2	3	10.0	6.0	0.0	18	2	0	1	0	2	11	0	0	1.00	4	1
48	48	04/23/86	2885.29	2213	2326	4Ac	6.0	SE	2	2	3	10.0	6.0	0.0	21	0	0	1	0	0	0	0	0	1.22	4	1
49	49	04/23/86	2885.29	2430	2530	4Ba	4.0		1	1	1	9.0	8.0	0.0	5	2	0	0	0	0	2	0	0	1.00	4	1
50	50	04/23/86	2885.29	2408	2508	4Bb	4.0		1	1	1	9.0	7.5	0.0	11	1	0	0	1	0	2	0	0	1.00	4	1
51	51	07/23/86	2892.63	2215	2315	4Aa	18.0	SW	3	2	2	20.0	0.0	0.0	0	0	0	0	0	9	1	0	0	1.00	4	2
52	52	07/23/86	2892.63	2230	2330	4Ab	18.0	S	2	2	2	20.0	12.0	12.0	1	0	0	0	0	1	0	0	0	1.00	4	2
53	53	07/23/86	2892.63	2245	2347	4Ac	18.0	S	4	3	2	20.0	12.0	12.0	0	0	0	0	0	4	7	0	4	1.03	4	2
54	54	07/23/86	2892.63	2411	2511	4Ba	18.0	S	3	2	2	20.0	16.0	10.0	0	0	0	0	0	9	3	0	0	1.00	4	2
55	55	07/23/86	2892.63	2426	2526	4Bb	18.0	S	3	2	2	20.0	16.0	10.0	0	0	0	0	0	4	1	0	1	1.00	4	2
56	56	08/26/86	2892.78	2445	2550	4Aa	18.0	S	2	2	2	20.0	6.0	6.0	0	0	0	0	0	5	2	0	2	1.08	4	3
57	57	08/26/86	2892.78	2505	2605	4Ab	18.0	S	2	2	2	20.0	6.0	6.0	0	0	0	0	0	4	2	0	3	1.00	4	3
58	58	08/26/86	2892.78	2345	2455	4Ba	18.0	S	2	2	2	20.0	6.0	6.0	0	0	0	0	0	3	0	0	0	1.17	4	3
59	59	08/26/86	2892.78	2355	2505	4Bb	18.0	S	2	2	2	20.0	6.0	6.0	0	0	0	0	0	3	0	0	1	1.17	4	3
60	60	08/26/86	2892.78	2520	2628	4Dc	18.0	N	2	2	2	20.0	6.0	6.0	2	0	0	0	0	2	3	0	1	1.13	4	3
61	61	04/14/86	2885.31	2027	2130	5A	8.5	N	2	2	2	8.0	0.0	0.0	0	2	0	0	0	0	0	0	0	1.05	5	1
62	62	04/14/86	2885.31	2042	2151	5B	8.5	N	2	2	2	8.0	0.0	0.0	32	2	0	0	0	0	0	0	0	1.15	5	1
63	63	04/14/86	2885.31	2057	2245	5C	8.5	N	2	2	2	8.0	0.0	0.0	219	3	0	0	0	0	0	0	0	1.80	5	1
64	64	04/14/86	2885.31	2112	2450	5D	8.5	N	2	2	2	0.0	8.0	0.0	8	0	0	0	0	0	7	0	0	3.63	5	1
65	65	04/14/86	2885.31	2127	2512	5E	8.5	N	2	2	2	8.0	0.0	0.0	16	2	0	0	0	5	7	0	1	3.75	5	1
66	66	07/30/86	2892.57	2210	2314	5A	18.0	SW	2	2	2	20.0	13.0	13.0	2	0	0	0	0	7	3	0	0	1.07	5	2
67	67	07/30/86	2892.57	2225	2326	5B	18.0	SW	2	2	2	20.0	13.0	13.0	0	0	0	0	0	4	6	0	0	1.02	5	2
68	68	07/30/86	2892.57	2240	2344	5C	18.0	SE	2	2	2	20.0	12.0	12.0	1	0	0	0	0	11	5	0	1	1.07	5	2
69	69	07/30/86	2892.57	2255	2401	5D	18.0	SE	2	2	2	20.0	12.0	12.0	0	0	0	0	0	1	4	0	2	1.10	5	2
70	70	07/30/86	2892.57	2310	2414	5E	18.0	SE	2	2	2	20.0	11.0	11.0	1	0	0	0	0	6	5	0	0	1.07	5	2

71	71	08/27/86	2892.75	2108	2212	5A	0.0		1	2	2	22.0	15.0	10.0	13	0	0	0	0	1	7	0	0	1.07	5	3
72	72	08/27/86	2892.75	2119	2234	5B	0.0		1	2	2	0.0	12.0	10.0	4	0	0	0	0	4	1	0	0	1.25	5	3
73	73	08/27/86	2892.75	2132	2249	5C	0.0		2	2	2	0.0	0.0	0.0	1	0	0	0	0	2	1	0	0	1.28	5	3
74	74	08/27/86	2892.75	2148	2301	5D	0.0		1	2	2	0.0	0.0	0.0	0	0	0	0	0	3	0	0	0	1.22	5	3
75	75	08/27/86	2892.75	2202	2313	5E	0.0		2	1	2	0.0	0.0	0.0	0	0	0	0	0	1	0	0	0	1.18	5	3
76	76	07/07/86	2892.65	2200	2320	6A	18.0	N	0	2	2	18.0	6.0	6.0	5	0	0	0	0	5	0	0	2	1.33	6	2
77	77	07/07/86	2892.65	2215	2346	6B	18.0	N	0	2	2	18.0	6.0	6.0	26	0	0	0	0	5	0	0	1	1.52	6	2
78	78	07/07/86	2892.65	2230	2403	6C	16.0	N	2	2	2	18.0	6.0	6.0	16	0	0	0	0	7	2	0	0	1.55	6	2
79	79	07/07/86	2892.65	2245	2420	6D	16.0	N	2	2	2	18.0	6.0	6.0	13	0	0	0	0	4	0	0	1	1.58	6	2
80	80	07/07/86	2892.65	2300	2430	6E	16.0	N	2	2	2	18.0	6.0	6.0	4	0	0	0	0	4	0	0	1	1.50	6	2
81	81	08/27/86	2892.75	2336	2435	6A	0.0		1	1	1	0.0	0.0	0.0	2	0	0	0	0	1	0	0	0	0.98	6	3
82	82	08/27/86	2892.75	2351	2449	6B	0.0		1	1	1	0.0	6.0	6.0	1	0	0	0	0	1	0	0	0	0.97	6	3
83	83	08/27/86	2892.75	2411	2511	6C	0.0		1	1	1	0.0	6.0	6.0	2	0	0	0	0	0	0	0	0	1.00	6	3
84	84	08/27/86	2892.75	2422	2522	6D	0.0		1	1	1	0.0	6.0	6.0	3	0	0	0	0	0	0	0	0	1.00	6	3
85	85	08/27/86	2892.75	2433	2535	6E	0.0		1	1	1	0.0	6.0	6.0	3	0	0	0	0	0	0	0	1	1.03	6	3
86	86	07/31/86	2892.58	2215	2320	7A	17.0	SE	2	2	2	21.0	6.0	6.0	0	0	0	0	0	2	0	0	0	1.08	7	2
87	87	07/31/86	2892.58	2231	2341	7B	17.0	SE	2	2	2	21.0	6.0	6.0	0	0	0	0	0	7	0	0	0	1.17	7	2
88	88	07/31/86	2892.58	2245	2348	7C	17.0	SE	3	2	2	21.0	6.0	6.0	0	0	0	0	0	5	0	0	0	1.05	7	2
89	89	07/31/86	2892.58	2300	2401	7D	17.0	SE	3	2	2	21.0	6.0	6.0	0	0	0	0	0	6	0	0	0	1.02	7	2
90	90	07/31/86	2892.58	2315	2415	7E	17.0		1	1	2	21.0	6.0	6.0	0	0	0	0	0	4	0	0	0	1.00	7	2
91	91	08/27/86	2892.75	2335	2435	7A	18.0	S	0	2	1	22.0	0.0	0.0	0	0	0	0	0	1	0	0	0	1.00	7	3
92	92	08/27/86	2892.75	2350	2450	7B	18.0	S	0	2	1	23.0	0.0	0.0	0	0	0	0	0	0	0	0	0	1.00	7	3
93	93	08/27/86	2892.75	2405	2505	7C	18.0	S	0	2	1	23.0	0.0	0.0	0	0	0	0	0	1	0	0	0	1.00	7	3
94	94	08/27/86	2892.75	2420	2522	7D	18.0	S	0	2	1	23.0	0.0	0.0	0	0	0	0	0	7	0	0	0	1.03	7	3
95	95	08/27/86	2892.75	2435	2540	7E	18.0	S	0	2	1	22.0	0.0	0.0	0	0	0	0	0	0	0	0	0	1.08	7	3
96	96	07/30/86	2892.57	2200	2311	8A	15.0	S	2	2	2	19.0	0.0	0.0	3	0	0	0	0	3	0	0	0	1.18	8	2
97	97	07/30/86	2892.57	2215	2322	8B	15.0	S	2	2	2	19.0	0.0	0.0	2	0	0	0	0	3	0	0	0	1.12	8	2
98	98	07/30/86	2892.57	2230	2340	8C	15.0	S	2	2	2	20.0	0.0	0.0	2	0	0	0	0	3	1	0	1	1.17	8	2
99	99	07/30/86	2892.57	2245	2352	8D	15.0	S	2	2	2	20.0	0.0	0.0	1	0	0	0	0	0	0	0	0	1.12	8	2
100	100	07/30/86	2892.57	2300	2408	8E	15.0	S	2	2	2	20.0	0.0	0.0	0	0	0	0	0	3	0	0	0	1.13	8	2
101	101	08/27/86	2892.75	2130	2236	8A	20.0	S	0	2	1	23.0	0.0	0.0	4	0	0	0	0	8	0	0	0	1.10	8	3
102	102	08/27/86	2892.75	2145	2250	8B	23.0	S	0	2	1	23.0	0.0	0.0	4	0	0	0	0	2	0	0	0	1.08	8	3
103	103	08/27/86	2892.75	2200	2300	8C	20.0	S	0	2	1	23.0	0.0	0.0	0	0	0	0	0	0	0	0	1	1.00	8	3
104	104	08/27/86	2892.75	2215	2319	8D	19.0	S	0	2	1	23.0	0.0	0.0	0	0	0	0	0	0	0	0	0	1.07	8	3
105	105	08/27/86	2892.75	2230	2330	8E	19.0	S	0	2	1	23.0	0.0	0.0	1	0	0	0	0	0	0	0	0	1.00	8	3
106	106	07/23/86	2892.63	2330	2437	9A	18.0	S	2	2	2	19.0	0.0	0.0	0	0	0	0	0	3	0	0	0	1.12	9	2

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107	107	07/23/86	2892.63	2315	2427	9B	18.0	S	2	2	2	19.0	0.0	0.0	2	0	0	0	0	2	0	0	0	1.20	9	2
108	108	07/23/86	2892.63	2300	2412	9C	18.0	S	2	2	2	19.0	0.0	0.0	3	0	0	0	0	5	1	0	0	1.20	9	2
109	109	07/23/86	2892.63	2245	2353	9D	19.0	W	2	2	2	19.0	0.0	0.0	0	0	0	0	0	1	0	1	0	1.13	9	2
110	110	07/23/86	2892.63	2230	2344	9E	19.0	W	2	2	2	19.0	6.0	6.0	1	0	0	0	0	0	2	1	0	1.23	9	2
111	111	08/26/86	2892.78	2230	2335	9A	18.0	S	2	2	2	22.0	6.0	6.0	0	0	0	0	0	2	0	0	1	1.08	9	3
112	112	08/26/86	2892.78	2215	2323	9B	18.0	S	2	2	2	22.0	6.0	6.0	0	0	0	0	0	1	0	0	1	1.13	9	3
113	113	08/26/86	2892.78	2200	2308	9C	19.0	S	2	2	2	21.0	6.0	6.0	1	0	0	0	0	0	0	0	0	1.13	9	3
114	114	08/26/86	2892.78	2145	2250	9D	19.0	S	2	2	2	0.0	6.0	6.0	0	0	0	0	0	0	0	0	0	1.08	9	3
115	115	08/26/86	2892.78	2130	2239	9E	20.0	S	2	2	2	0.0	6.0	6.0	1	0	0	0	0	2	0	0	1	1.15	9	3
116	116	07/10/86	2892.73	2245	2357	10B	19.0	N	2	2	2	20.0	0.0	0.0	0	0	0	0	0	4	0	0	4	1.20	10	2
117	117	07/22/86	2892.56	2300	2415	10A	19.0	N	2	2	2	20.0	6.0	6.0	2	0	0	0	0	5	0	0	4	1.25	10	2
118	118	07/22/86	2892.56	2230	2343	10C	19.0	N	2	2	2	20.0	0.0	0.0	1	0	0	0	0	2	0	0	1	1.22	10	2
119	119	07/22/86	2892.56	2215	2330	10D	19.0	N	2	2	2	20.0	6.0	6.0	3	0	0	0	0	3	0	0	1	1.25	10	2
120	120	07/22/86	2892.56	2200	2315	10E	19.0	N	2	2	2	20.0	6.0	6.0	1	0	0	0	0	5	0	0	1	1.25	10	2
121	121	08/26/86	2892.78	2230	2337	10A	20.0	N	2	2	2	0.0	6.0	6.0	0	0	0	0	0	3	0	0	0	1.12	10	3
122	122	08/26/86	2892.78	2215	2322	10B	20.0	N	2	2	2	0.0	6.0	6.0	0	0	0	0	0	0	0	0	3	1.12	10	3
123	123	08/26/86	2892.78	2200	2307	10C	20.0	N	2	2	2	0.0	6.0	6.0	1	0	0	0	0	0	0	0	0	1.12	10	3
124	124	08/26/86	2892.78	2145	2250	10D	20.0	N	2	2	2	0.0	6.0	6.0	0	0	0	0	0	3	0	0	2	1.08	10	3
125	125	08/26/86	2892.78	2130	2242	10E	20.0	N	2	2	2	0.0	6.0	6.0	0	0	0	0	0	2	0	0	1	1.20	10	3
126	126	07/24/86	2892.65	2330	2435	11A	17.0	S	2	2	2	20.0	0.0	0.0	0	0	0	0	0	3	1	0	3	1.08	11	2
127	127	07/24/86	2892.65	2315	2422	11B	17.0	S	2	2	2	20.0	0.0	0.0	1	0	0	0	0	8	0	0	0	1.12	11	2
128	128	07/24/86	2892.65	2300	2400	11C	18.0	S	2	2	2	20.0	0.0	0.0	1	0	0	0	0	1	0	0	0	1.00	11	2
129	129	07/24/86	2892.65	2245	2357	11D	19.0	S	2	2	2	20.0	0.0	0.0	3	0	0	0	0	1	0	0	0	1.20	11	2
130	130	07/24/86	2892.65	2230	2341	11E	19.0	S	2	2	2	20.0	0.0	0.0	2	0	0	0	0	2	0	0	1	1.18	11	2
131	131	08/26/86	2892.78	2345	2455	11A	21.0	N	2	2	2	0.0	6.0	6.0	1	0	0	0	0	4	0	0	0	1.17	11	3
132	132	08/26/86	2892.78	2400	2508	11B	21.0	N	2	2	2	0.0	6.0	6.0	0	0	0	0	0	3	0	0	0	1.13	11	3
133	133	08/26/86	2892.78	2415	2526	11C	18.0	N	2	2	2	0.0	6.0	6.0	0	0	0	0	0	2	0	0	0	1.18	11	3
134	134	08/26/86	2892.78	2430	2535	11D	18.0	N	2	2	2	21.0	6.0	6.0	1	0	0	0	0	5	0	0	0	1.08	11	3
135	135	08/26/86	2892.78	2445	2553	11E	18.0	N	2	2	2	21.0	6.0	6.0	1	0	0	0	0	4	0	0	0	1.13	11	3
136	136	07/31/86	2892.58	2708	2808	12Aa	15.0		1	1	2	20.0	6.0	6.0	0	0	0	0	0	1	0	0	0	1.00	12	2
137	137	07/31/86	2892.58	2725	2825	12Ab	15.0		1	1	2	20.0	6.0	6.0	0	0	0	0	0	2	0	0	0	1.00	12	2
138	138	07/31/86	2892.58	2458	2558	12Ba	16.0	S	2	1	2	20.0	6.0	6.0	0	0	0	0	0	9	0	0	0	1.00	12	2
139	139	07/31/86	2892.58	2516	2616	12Bb	16.0	S	2	1	2	20.0	6.0	6.0	1	0	0	0	0	8	0	0	0	1.00	12	2
140	140	07/31/86	2892.58	2255	2406	12Ca	20.0	N	2	2	2	20.0	6.0	6.0	0	0	0	0	0	17	7	0	0	1.18	12	2
141	141	08/28/86	2892.80	2146	2302	12Aa	0.0		0	0	2	0.0	0.0	0.0	0	0	0	0	0	4	0	0	0	1.27	12	3
142	142	08/28/86	2892.80	2145	2313	12Ab	0.0		0	0	2	0.0	0.0	0.0	2	0	0	0	0	10	0	0	0	1.47	12	3

143	143	08/28/86	2892.80	2057	2205	12Ba	0.0	W	2	2	2	0.0	0.0	0.0	3	0	0	0	0	12	0	0	1	1.13	12	3
144	144	08/28/86	2692.80	2108	2218	12Bb	0.0		1	2	2	0.0	0.0	0.0	3	0	0	0	0	14	3	0	1	1.17	12	3
145	145	09/02/86	2892.80	2237	2340	12Ca	0.0	W	3	3	3	0.0	0.0	0.0	1	0	0	0	0	2	1	0	0	1.05	12	3
146	146	07/29/86	2892.54	2204	2304	13A	17.0	SW	4	2	2	19.0	6.0	6.0	0	0	0	0	0	6	2	0	1	1.00	13	2
147	147	07/29/86	2892.54	2220	2320	13B	17.0	SW	4	2	2	19.0	6.0	6.0	3	0	0	0	0	0	0	0	0	1.00	13	2
148	148	07/29/86	2892.54	2505	2605	13D	16.0	SW	4	2	2	20.0	6.0	6.0	2	0	0	0	0	3	6	0	3	1.00	13	2
149	149	07/29/86	2892.54	2335	2435	13Ca	16.0	SW	3	2	2	20.0	8.0	8.0	1	0	0	0	0	6	0	0	4	1.00	13	2
150	150	07/29/86	2892.54	2350	2450	13Cb	16.0	SW	3	2	2	20.0	10.0	10.0	0	0	0	0	0	16	1	0	0	1.00	13	2
151	151	08/26/86	2892.78	2131	2250	13A	0.0		1	1	2	0.0	0.0	0.0	1	0	0	0	0	12	0	0	0	1.32	13	3
152	152	08/26/86	2692.78	2436	2529	13B	0.0		1	2	1	0.0	6.0	6.0	0	0	0	0	0	2	0	0	0	0.88	13	3
153	153	08/26/86	2892.78	2518	2635	13D	0.0		1	1	1	0.0	6.0	6.0	2	0	0	0	0	17	0	0	0	1.28	13	3
154	154	08/26/86	2892.78	2500	2622	13Ca	0.0		1	1	1	0.0	10.0	10.0	0	0	0	0	0	2	0	0	0	1.37	13	3
155	155	08/26/86	2892.78	2507	2600	13Cb	0.0		1	1	1	0.0	6.0	6.0	0	0	0	0	0	7	0	0	0	0.88	13	3
156	156	07/31/86	2892.58	2433	2535	14A	17.0		0	2	2	17.0	6.0	6.0	0	0	0	0	0	8	3	2	1	1.03	14	2
157	157	07/31/86	2892.58	2448	2548	14B	17.0		1	2	2	18.0	6.0	6.0	0	0	0	0	0	4	6	0	0	1.00	14	2
158	158	07/31/86	2892.58	2519	2620	14D	17.0		1	2	2	18.0	6.0	6.0	1	0	0	0	0	11	2	0	0	1.02	14	2
159	159	07/31/86	2892.58	2504	2604	14c	17.0		1	2	2	17.0	6.0	6.0	0	0	0	0	0	2	6	0	0	1.00	14	2
160	160	08/26/86	2892.78	2136	2310	14A	0.0		1	1	2	0.0	0.0	0.0	1	0	0	0	1	13	0	0	0	1.57	14	3
161	161	08/26/86	2892.78	2444	2540	14B	0.0	N	2	1	1	0.0	0.0	0.0	0	0	0	0	0	14	0	0	0	0.93	14	3
162	162	08/26/86	2892.78	2202	2335	14C	0.0		1	1	2	0.0	0.0	0.0	1	0	0	0	0	50	0	1	1	1.55	14	3
163	163	08/26/86	2892.78	2717	2817	14Da	0.0		0	0	0	0.0	0.0	0.0	7	0	0	0	0	5	0	0	0	1.00	14	3
164	164	08/26/86	2892.78	2732	2836	14Db	0.0	N	0	1	1	0.0	0.0	0.0	4	0	0	0	0	0	2	0	1	1.07	14	3