INTERNAL REPORT 33

SURVEY OF POPULATION MAGNITUDE AND SPECIES COMPOSITION OF LIMNETIC FEEDING FISH

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This study was made to estimate seasonal abundance, growth, mortality and biomass of planktivore fish by species and age groups on Lake Washington, Lake Sammamish, and Chester Morse Lake, and to incorporate this information with other studies to test trophic dynamics models. Work in the initial year was directed toward assembling gear, developing and testing sampling techniques, and making preliminary surveys in two of the three lakes.

Salary budgeted did not permit hiring of a graduate student (James Traynor) on the project until May 1971. Therefore, sampling and field tests of methods on Lake Washington were conducted primarily under other funding with gear that was available. The sampling method chosen relies on echo sounders with midwater trawl or townet to estimate biomass of limnetic-feeding fish by species in the three lakes.

During the year, tests of echo sounding and net gear were made on Lake Washington, and considerable modification in equipment and methods of data processing ensued. The echo-sounder apparatus has been modified to use a higher frequency instrument with narrower beam for higher resolution and to reduce the frequency of recording of more than one fish at a given depth and instant. Background electronic noise has been reduced to a low level, and the unit has the power to detect individual fish about 1 inch long at 100 m deep. A Ross echo sounder of 100 KHZ with 10^{o} cone transducer and regulated transmit pulse is now being used. The instrument has been calibrated for signal strength.

Transect recordings are made on echogram paper and tape. An oscilloscope is used to check transmit pulse, target strength, and background noise. Tapes are processed by transfer of target signal strength data per depth interval and transect time to a computer for data readout. Under Sea Grant funding, a computer has been installed on campus specifically for echo-sounder tape analysis.

Transect surveys are conducted along transect lines, which provide area coverage of the lake. (Sixteen transects have been established on Lake Washington.)

On Lake Washington, fish samples for information on species composition, age, and size were collected by a 3-m midwater trawl, towed by a College of Fisheries vessel, M/V Commando, when available, and supplemented by the Oceanography Department's vessel, M/V Hoh. Test transects were run simultaneously with and parallel to the echo-sounder boat, a 16-foot Thunderbird outboard boat. Hauls and echo-sounder transects are made during the hours of darkness when the fish are not schooled and are more uniformly distributed. Net depth is controlled by the length of cable out and engine RPM, and checked by a bathykymograph attached to the net. The present technique is to make 5- or 10-minute tows at four depth intervals at

each station to check numerical catches by species and age against echo-sounder target information. Modifications in sampling scheme are being made to provide statistically adequate information.

Echo-sounder transects and net sampling series were conducted during November, December, January, February, March, April, May, June and August. Because developmental work ensued during this period, these series are used primarily for study of seasonal distribution of limnetic-feeding fish by area and depth, for preliminary estimates of population, particularly of young sockeye salmon, and for background data on size and growth.

Limnetic-fish sampling must be conducted by means of smaller boats in Lake Sammamish and Chester Morse Lake. The type of tow net used in Alaska sockeye lakes hold most promise. The net is towed behind and between two outboard boats with depressors on each net bridle to permit deeper fishing. Two boats have been outfitted with electric winches, cable, outboard motors, trailers, and safety apparatus, the net and depressors have been procured, and equipment tests will begin shortly.

Because a depth contour chart for Chester Morse Lake was not in existence, echo-sounding transects were made and a contour chart was compiled (Figure 1). Preliminary gill-net sampling in Chester Morse Lake indicates the presence of only rainbow trout, mountain whitefish, and Dolly Varden in the limnetic zone. Sampling on Lake Sammamish will begin as soon as the small boat gear is tested.

In early September, echo-sounder transects were run on Lake Washington to determine the feasibility of using the technique to estimate the population of adult sockeye salmon that have entered the lake to spawn. This is a further test of the capability of the instrument because it requires a differentiation by target strength. The estimate of about 290,000 adult salmon will be checked against a total of spawner counts now being made by the Department of Fisheries at a weir in the Cedar River, estimates in minor spawning areas, and the estimated sport catch of sockeye salmon after the survey date.

Several coordination meetings were held with the other aquatic investigators in the Lake Washington-Cedar River drainage, and discussion sessions were held with Dr. Larry Male of the modeling group. Dr. Mathisen, on two trips to the Soviet Union, contacted Soviet scientists who conducted modeling on salmon lakes. Dr. Burgner discussed coordination of aquatic modeling with Drs. Warren and Davis at OSU and participated in biome planning and program meetings as aquatic coordinator for the Western Coniferous Biome.

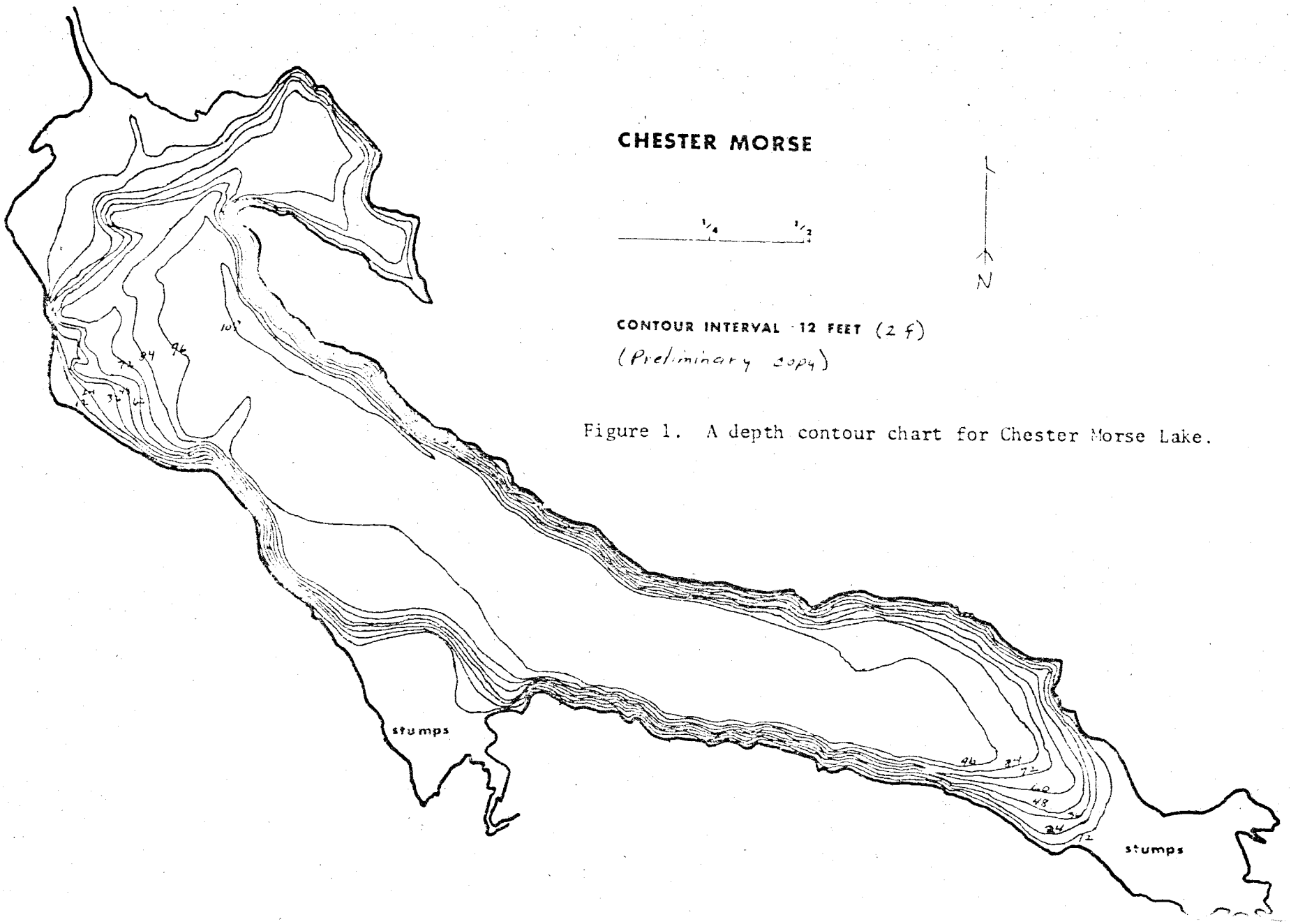

Figure 1. A depth contour chart for Chester Morse Lake.