U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY
BUREAU OF RECLAMATION

Description of the Pelagic Zooplankton and Fish Communities of Lakes Powell and Mead

By

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Open File Report 99-109

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EXECUTIVE SUMMARY

The pelagic zooplankton and fish communities of Lake Powell and Lake Mead were described and quantified through active sampling and use of single and dual beam scientific echosounders. Data collected on a quarterly basis for 2.5 years yielded information on fish distribution, size frequency, biomass (kg/m^3, fish/ha), and densities (fish/m^3, fish/ha). Surveys taken in August 1996 and 1997 were used to calculate the pelagic standing crop (kg/ha) and population estimates for striped bass.

Vertical gill nets fished from the surface to depths >30 m captured 449 fish representing six species. In Lake Powell, 240 fish included striped bass, threadfin shad, carp, walleye, and channel catfish. Lake Mead yielded 209 similar species with the addition of rainbow trout and absence of walleye. The catch was dominated by striped bass (44-57%), threadfin shad (24-50%) and carp (7-15%). The remaining three species represented less than 5% of the total catch. No centrarchids or native species were captured.

Vast volumes of pelagic habitat in the lower or downstream portions of these reservoirs contain few if any fish (<100/ha). Pelagic fish production was concentrated at the more productive inflow areas. Lake Powell's highest production was (total kg%) found at the Colorado River inflow (45-75%=P14, P13, P12), upper San Juan Arm (6-15% P08, P07), and Warm Creek (0.9-21%= P03) areas. Similarly on Lake Mead, fish production was most pronounced at Las Vegas Wash (10-59%=M02), upper Overton Arm (4-57%=M11) and Colorado River inflow (14-59%=M09, M08). The highest levels of fish biomass were measured at the Colorado River inflow (710 kg/ha) of Lake Powell and at Las Vegas Bay (292 kg/ha) where treated sewage effluent enters Lake Mead.

Fish standing crop was highly variable on a seasonal and annual basis. Fish numbers and biomass peaked after spawning (August), and measurements were lowest prior to spawning (March). Total reservoir standing crop in Lake Powell ranged from 453,097 kg in May 1996 to a study high of 10,852,738 kg in August 1996. Standard monitoring (Utah Department of Wildlife Resources) suggests the August 1996 levels may have represented a 25 year high. Levels in 1997 were substantially lower at 162,262 kg and 2,228,942 kg for the same months. Trends were similar for Lake Mead. May and August represent the low and high months, and overall production was higher in 1996. Total reservoir biomass was 296,736 in May and rose to 1,926,697 by August 1996. Values in 1997 were slightly lower at 101,016 kg in May and 1,454,778 in August.

Lake Powell fish densities were highest at the Colorado River inflow (P14=144,668 fish/ha) while Lake Mead's were found at Las Vegas Wash (M02=15,131 fish/ha). Densities declined from August 1996 to August 1997 for both reservoirs. Lake Powell's pelagic fish population was estimated at 276 million for August 1996 and 91 million for August 1997. Lake Mead estimates were approximately half of Lake Powell's, at 108 and 66 million respectively. While the total numbers of fish declined (-39 and -67%) between August 1996 and 1997, the percentage

of large fish (>16 cm) within each community increased nearly 300%. The pelagic striped bass community was estimated to have increased from 2.5 to 4.1 million in Lake Powell and 0.8 to 1.5 million in Lake Mead. We speculate that the rapid shift in predator/prey numbers may reflect the intercept of the predator/prey cycle. Increases in striped bass at the expense of threadfin shad which were rapidly disappearing. By the summer of 1998, striped bass in both reservoirs were experiencing extremely poor body condition, reduced numbers, and die-offs in some localized areas in Lake Powell.

Pelagic standing crop in both reservoirs exhibited a wide annual cycle between May (pre-spawning) and August (post-spawning). Variability in annual reproductive output is substantially greater than variability in annual carrying capacity. Spawning success does not in itself guarantee survival, but may be combined with carrying capacity during late winter as an indicator of the health reservoir fish populations. Managers should consider implementing some type of long-term acoustical monitoring program in order to develop the necessary data base to monitor changes in reservoir productivity. This could be easily and economically accomplished through late winter/early spring surveys.

INTRODUCTION

Fishery biologists from Arizona, Nevada, and Utah have been faced with the imposing dilemma of monitoring the pelagic fishery of Lakes Powell and Mead. Standard sampling procedures typically used to monitor shoreline fisheries are simply inadequate for the deep volumes of pelagic habitat found in these two reservoirs. Nearly a decade ago, Arizona and Nevada biologists recommended that hydroacoustics be used to monitor these communities (Persons and Dreyer 1987a,b, NDOW 1994). However, for various reasons an acoustical monitoring program was never fully implemented. This study represents the first attempt to describe the pelagic fishery of either reservoir using acoustic technology.

The objective of this two and one-half year study was to develop a data base which described the spatial distribution, densities, and standing crop of the pelagic zooplankton and fish communities of Lake Mead and Lake Powell. The two and a half year field study effort produced over 750 transects of acoustic data. The overall goal was not to conduct a comprehensive analysis of the data base, but rather to present a preliminary summary of the population and standing crop information and present the data base to management agencies for future use. Aspects of the data base will be further analyzed and hopefully publications will follow. The digitized data base will remain on file at both the Bureau of Reclamation's Technical Service Center (USBR) in Denver and with the United States Geological Survey (USGS) field station located in the same complex. It is available upon request to local resource managers, researchers, and modelers for further use.

An old fisherman's saying is that; "95% of the fish are found in 5% of the lake." Without a doubt, a great deal of fish production occurs in the shallower, protected littoral habitats. This investigation focused on the other 95% of the lake, known as the pelagic, or deep water zone. This study focused on striped bass and threadfin shad, species which dominate the pelagic fishery and represent the principal predator and prey species for both reservoirs. Limited data were collected in the littoral zone, but they were not analyzed due to three factors: 1) difficulty of sampling shallow habitats, 2) difficulty of detecting fish found in cover, and 3) the complexity of the fish community. Littoral or shoreline surveys are feasible, but the time and resources required were beyond the scope of this study.

Pelagic Communities - Very little is known about the distribution or standing crop of zooplankton and pelagic fish communities in Southwestern reservoirs. Until recently, standard sampling protocols didn't provide an effective method of measuring or following populations in medium, let alone large, bodies of water. Resource managers have typically monitored community trends by creel census, relative abundance information, and in some cases by trawl data. Population trends are then determined by comparing relative abundance. Active (electrofishing, trawling, angling) and passive (gill nets, traps) sampling methods provide managers trend information on fish numbers captured per unit time and effort. The resulting information provides an index that can be used to compare fish abundance trends. However, nearly all sampling methods have some degree of bias and are rarely used to develop population or standing crop estimates. While these techniques provide trend information, they are typically inadequate or too costly for use in population estimates.

The advent of the scientific echosounder, combined with advanced computer technology provides an effective and economical method of sampling large volumes of pelagic habitat. Unlike standard netting or trawling, fish do not easily evade detection and communities can be accurately measured (densities and biomass) while minimizing the need to actually handle fish. Previously, mark-recapture techniques provided the only method of standing crop estimates short of ichthyocides (rotenone), drainage, or non-reproductive fisheries. Aquatic biologists now have the technology to not only enumerate, but to also map the 3-dimensional distribution of fish and other aquatic organisms. The simple question of "how may fish?" can now be addressed.

Fisheries acoustics can provide information on spatial distribution, fish density and biomass, and size distribution. The technology is not new, but until recently, acoustics was rarely used for inland fisheries work because of high equipment costs and limited acceptance of the technology. Advances in digital computer technology, better training, and market competition has lowered costs making the technology affordable to state and federal agencies. Today, fishery acoustics is touted as an effective and reliable method of measuring pelagic planktivorous fish (Fleischer et al. 1997, Boxrucker 1996)

A better understanding of population size and structure of specific species could provide information to help managers set creel and slot limits and actually direct harvest efforts. While short-term management benefits derived from specific species are obvious, the long-term management implications of measuring overall fish production are equally important. Fluctuations in species composition is complex and often influenced by biological interactions such as predator/prey relationships, species composition, colonization of new species, and normal hydrologic or climatic cycles. Often it is difficult, if not impossible to determine if changes in relative abundance of a single, or group, of species represent a shifts within community structure or actually denotes changes in overall productivity or habitat.

Development of quantifiable baseline data on zooplankton and fish standing crop should provide managers and researchers the best chance of detecting shifts caused by fishery managment practices or habitat degradation related to changes in pollution, water and land use, or climatic change. The data base can furhter be used to better understand seasonal habitat preferences as it relates to physical and chemical water quality parameters. Lastly, acoustical monitoring provides an effective method of determining habitat suitability through the simple presence or absence of fish or zooplankton.

Study Site Description

Lake Powell and Lake Mead are located on the Colorado River and represent the two largest (by volume) manmade reservoirs in the Western Hemisphere (Figures 1 and 2). Located in the arid Southwestern United States, both reservoirs were built for water storage, flood control, and

Figure 1. General Map of Lake Powell showing study sites and zones.

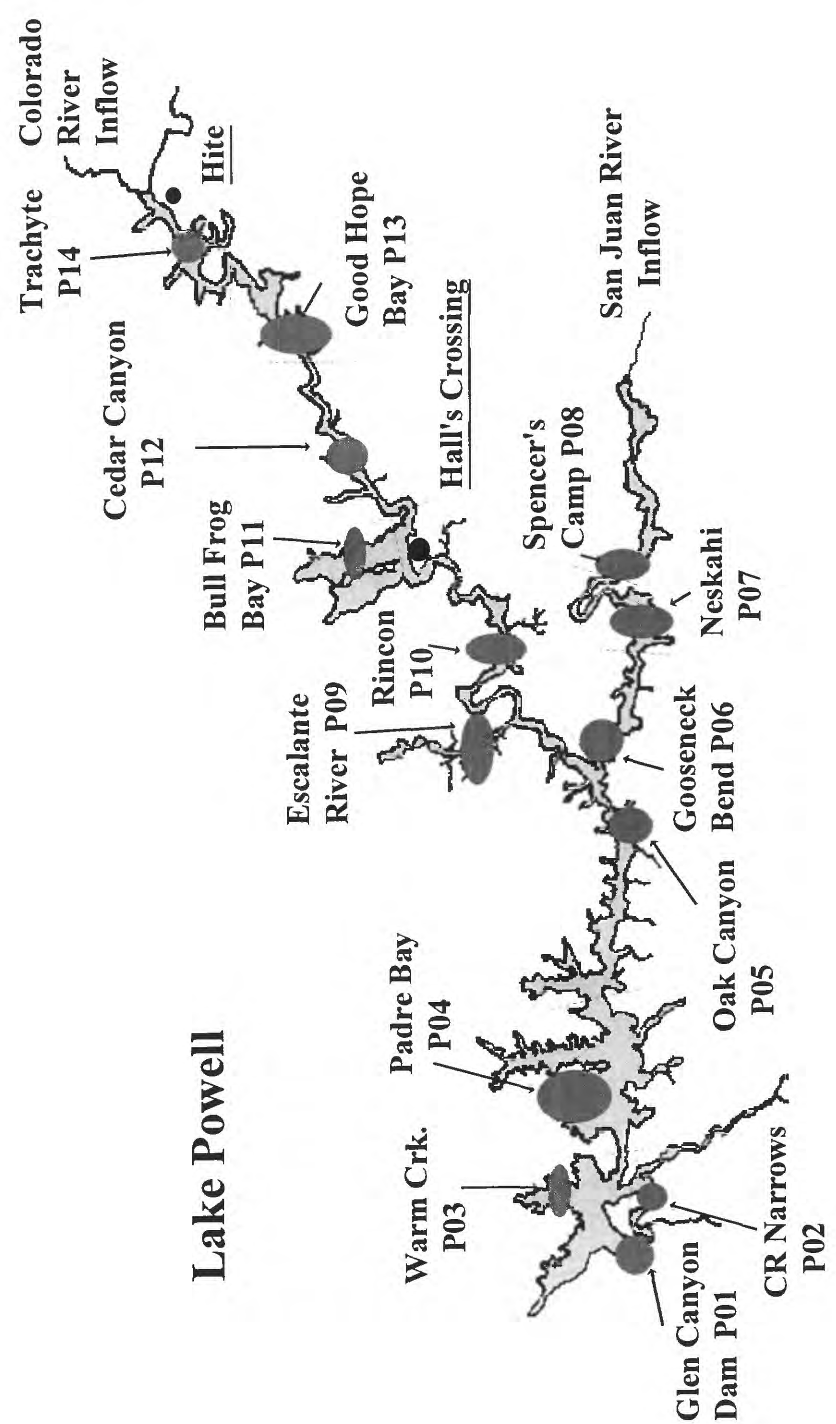
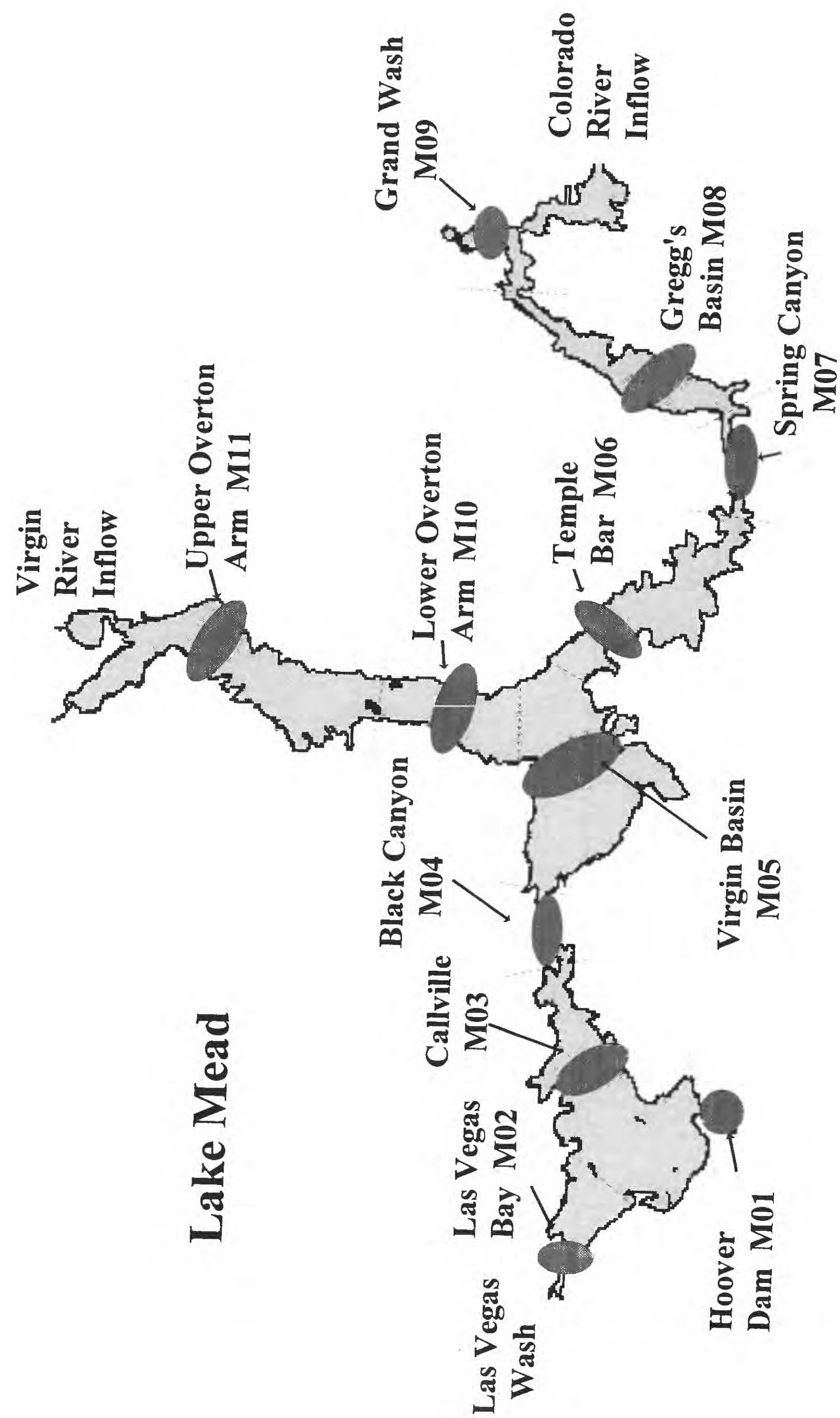


Figure 2. General Map of Lake Mead showing study sites and zones.



hydroelectric power and represent key operational features in the Colorado River Compact which regulates and manages water for the 7 southwestern states (WPR 1978). Lake Powell is found immediately upstream of the Grand Canyon on the Utah-Arizona state border while Lake Mead is located 380 km downstream, immediately downstream of the Grand Canyon and is bordered by Arizona and southern Nevada.

Lake Powell - Glen Canyon Dam is located near Page, Arizona, which is about 2 km downstream of the Utah/Arizona state line and 24 km upstream of Lee's Ferry, Az. The facility was built and is operated by the Bureau of Reclamation. Glen Canyon Dam was authorized under the Colorado River Storage Project. Construction began in 1956 and was finished by 1963. It represents one of the largest concrete arch dams in the world. The dam backs up water for over 340 km into the Colorado , San Juan, Escalante, and Dirty Devil Rivers. Principal inflows originate from the Colorado (88%) and San Juan (10%) Rivers. The reservoir is extremely narrow and irregular having steep canyon walls and 96 major side canyons. Lake Powell is accurately described as a large, inundated canyon. Wahweap and Padre Bays are located in the lower portion of the reservoir and represent the reservoirs largest basins. Lake Powell's surface area at full pool (el. 1,128 m) reaches 65,315 ha and the reservoir has 3,170 km of shoreline which exceeds that of coastal California. The reservoir initially filled in 1980, and has 33 x 10^9 cubic meters of active storage.

Lake Powell has a maximum depth of 178 m. Water is discharged through Glen Canyon Dam at elevation 1,052 m, normally a depth greater than 70 m. Discharge temperatures are cold and average about 8 to 9 ^{0}C. Reclamation and other agencies are examining the possible modification of the intake towers that would allow the release of warmer surface waters (BOR 1999).

The reservoir and surrounding area were incorporated into the National Park Service (NPS) system in 1968 through the creation of Glen Canyon National Recreation Area. The area is remote and access limited to 4 marinas: Wahweap, Hall's Crossing, Bull Frog, and Hite. Visitation is estimated at more than 3 million tourists a year.

Lake Mead - Hoover Dam is located in Black Canyon about 30 miles from Las Vegas, Nevada, and represents the highest and third largest concrete dam in the USA. The facility was built and is managed by the Bureau of Reclamation. The Boulder Canyon Project was authorized in 1928 as a solution to regulate the Colorado River by building a single dam. Construction was authorized under terms of the Colorado River Compact (1922). Work began in 1931 and the dam was dedicated in 1935.

The reservoir is approximately 185 km long and inundates portions of the Colorado and Virgin rivers. Lake Mead is comprised of four large basins: Boulder, Virgin, Temple, and Gregg. The reservoir was initially filled in 1940, with 36 x 10^9 cubic meters of storage, over 3 years of Colorado River flow. At full pool maximum width is 12.8 km with a depth of 178 m. Lake Mead at full pool has 165,815 surface ha and 885 km of shoreline. The reservoir serves as the primary surface water supply for Nevada, California, and Arizona.

The area encompassing Lake Mead and Lake Mohave was dedicated in 1964 to the NPS system as the Lake Mead National Recreation Area. Access to restricted on Lake Mead is restricted primarily to major marinas located at: Las Vegas Bay, Hemenway Harbor, Callville Bay, Echo Bay, and Temple Bar, and a few smaller facilities.

Table 1. Morphometric characteristics of Lakes Powell and Mead.

Criteria	Lake Powell	Lake Mead
Maximum Operation Level (m)	1128.0	374.0
Maximum Depth (m)	171.0	180.0
Mean Depth (m)	51.0	55.0
Surface Area (km^2)	653.0	660.0
Volume ($m^3 \times 10^9$)	33.0	36.0
Maximum Length (km)	300.0	183.0
Maximum Width (km)	25.0	28.0
Shoreline Development	26.0	9.7
Discharge Depth (m)	70.0	83.0
Retention Time (yr.)	3.3	3.7

General Water Quality - The Colorado River flows through relatively barren deserts and is fed by snowmelt from tributaries draining mountains of Colorado, Utah, Arizona, and New Mexico. There is roughly 630,000 km^2 within its drainage. The combination of snow melt, violent storms, and droughts produce a wide range of seasonal variations in discharge ranging from 20.5 to 425,000 m^3 per minute. Equally impressive has been the remarkably high sediment load accompanying floods that averaged $>10^8$ metric tons/year prior to the construction of Hoover Dam in 1935.

Construction of the mainstem dams greatly influenced specific aspects of water quality. Sediment transport was essentially halted downstream of the major reservoirs as they trapped sediments. Once impounded, the turbid river waters cleared. In terms of average nutrient levels and productivity, both reservoirs are phosphorus limited (<0.02 mg/L) and considered oligatrophic to mildly mesotrophic (LaBounty and Horn 1997, Paulson and Baker 1983, Vollenwieder 1970). Primary production is the highest at the inflows and decreases as one moves down lake. Highest productivity in Lake Powell is found at the Colorado and San Juan River inflow areas and at Warm Creek. The highest productivity in Lake Mead is found in Las Vegas Bay which receives wastewater effluent from Las Vegas Valley, and in the Virgin and Colorado River inflow areas.

Both reservoirs exhibit thermal, and in some cases, chemical stratification. A strong thermocline develops in summer at depths ranging from 15 to 25 m and surface water temperatures on Lake Mead reach 30°C in shallow, protected areas. The hydrodynamics of these systems are complex and influenced by the volume, location, and patterns of inflows and releases, and by reservoir morphology (LaBounty and Horn 1997).

Pelagic Fishery - Hoover Dam was constructed in 1936, creating Lake Mead which represented the first mainstem reservoir on the Colorado River designed for water storage and flood control. Construction of Lake Powell followed in 1964. Both reservoirs established impressive sport fisheries and were renown for their production of record black bass. The Lake Mead largemouth bass fishery peaked in 1963 with an estimated harvest of 799,592 fish (Allan and Roden 1978). The Lake Powell largemouth bass fishery peaked in 1971 (Scott and Gustaveson 1986).

Threadfin shad (*Dorosoma petenense*) were introduced to Lake Mead (1953) and Lake Powell (1968) to provide additional forage (May et al. 1975, Allan and Roden 1978). The introductions were a huge success and the species not only colonized the reservoir, but quickly spread throughout the entire lower river basin (Minckley 1973). Although threadfin shad abundance remained high, the annual harvest of largemouth bass dropped below 200,000 after 1970. Anglers had annually harvested over 400,000 largemouth bass between 1953 and 1969 (Allan and Roden 1978). Centrarchids were restricted to the shallower, shoreline habitats while their prey remained abundant in the reservoirs pelagic zone. State agencies began introducing pelagic game species into the unutilized deeper habitats in order to expand reservoir production. Smallmouth bass were introduced into Lake Powell to expand the warm water creel and several species of trout and stripped bass were stocked to establish a pelagic, cold water fishery (Allan and Roden 1978, Blommer and Gustaveson 1997).

Striped bass, salmon, and trout introductions were made on the belief that stocked fish would not be able to successfully spawn. However, it soon became apparent that one species; striped bass could. By 1982, the harvest of striped bass from Lake Mead surpassed all other species in the angler's creel (NDOW 1995). Similar trends soon followed in Lake Powell. It's estimated that anglers annually harvest nearly 1 million striped bass from Lake Mead (personal communication Jonh Hutchings NDOW) and 250,000 from Lake Powell (personal communications- Wayne Gustaveson UDOWR).

Pelagic habitats in both Lake Mead and Lake Powell are dominated by these two species. However, populations are extremely cyclic due to their reproductive capability, habitat conditions, food availability, prey overcropping, and thermal intolerance. Lake Powell represents the northern range for the threadfin shad in the Colorado River and winterkills are not uncommon. These kills occur not only during the winter, but can also be triggered by sudden warming trends in late winter or early spring (Gustaveson personal communique). Similar die-offs have not been reported on Lake Mead. While threadfin shad periodically reach their lower thermal limits, it's known from Southeastern reservoirs that adult striped bass distribution mat also be influenced by thermal stratification (Coutant 1985).

The two species form a two-story fishery during reservoir stratification. Threadfin shad and juvenile striped bass prosper in the warmer, more productive surface waters and can tolerate temperatures exceeding 35 °C. However, adult striped bass have a lower thermal tolerance which restricts them to deeper and cooler depths where food is often scarce. It has been speculated that during periods of strong thermal stratification, large striped bass may actually be isolated from their prey base resulting in poor body condition, decreased fecundity, and some cases death.

The prolific nature of both species, combined by the simple food chain results in dramatic population swings. An abundance of shad leads to increased fecundity and production of stripped bass. As striped bass year classes mature and switch toward a fish diet, the prey base can be severely depleted leading to emaciated predators and fish die-offs. As predators decline in numbers and condition, shad populations rebound, repeating the cycle. Trend data suggests these boom and bust cycles are fairly predictable, taking 3 to 4 years for each reservoir (NDOW 1995).

METHODS

Study Site Selection

The types of pelagic habitat were categorized with the help of local biologists (Utah, Arizona, Nevada, Reclamation, NPS). We discussed the known or perceived importance of specific areas, logistical problems (i.e., distance & time), and public safety issues (i.e. night netting and recreational boat traffic) associated with the proposed project. As a result, 25 study sites were selected: 14 on Lake Powell and 11 on Lake Mead (Figures 1 and 2, Appendix A) . Each site represented a major habitat type which fell into the categories of: large basins, inundated mainstem canyons, inundated side canyons, and fluctuating inflow nursery habitats. Actual sample sites (transect locations) were drawn on topographical maps along with the larger, corresponding study "zones." Surface area (full pool) of each habitat zone was measured with a digital planimeter and transect distance was determined using a Global Positioning System (GPS.) (Table 2).

Each study site contained four acoustical transects, three to measure fish standing crop, and one for zooplankton. At both dams and in the Escalante arm only three transects were run, two for fish and one for zooplankton. Transects typically crossed from opposing shorelines and were parallel to one another. There were exceptions at both dams and narrow canyons. At dams, transects ran from the center of the safety buoy line down the channel's thalweg for approximately 1 to 2 km and then ended or began along shore, where the same transect was repeated in the opposite direction. In narrow canyons, we started from shore, ran down the channel's thalweg for 1-2 km and then ended on the opposing shoreline. The transects zig-zagged longitudinally along the canyons. The cumulative transect distance for each trip was 70.8 km on Lake Powell and 95.0 km on Lake Mead.

Field surveys were conducted from a 7 meter cutty cabin craft powered with a 225-hp outboard motor. The vessel was equipped with differential GPS, fathometer, radar, DC/AC power, a side-mounted retractable hydrofoil, and an automatic-drip coffee maker. Transect coordinates were programmed into the GPS's navigational system to aid navigation and allow for repetitive sampling (Appendix A).

Table 2. Transect length (km) and surface area (ha) of the Lake Powell and Lake Mead study areas.

Lake Powell		**Trans. (km)**	**Area* (ha)**	**Lake Mead**		**Trans. (km)**	**Area* (ha)**
P01	Glen Canyon Dam	2.86	219.8	M01	Hoover Dam	3.08	121.4
P02	Channel	5.39	3,032.7	M02	Las Vegas Bay	6.52	2,922.7
P03	Warm Creek	4.18	7,175.8	M03	Callville	12.87	10,329.2
P04	Padre Bay	12.07	16,520.5	M04	Boulder Canyon	4.95	1,190.2
P05	Oak Canyon	5.26	6,019.7	M05	Virgin Basin	14.32	16,021.7
P06	Goose Neck	4.94	1,905.6	M06	Temple	11.59	5,163.2
P07	Piute Bay	4.81	2,265.7	M07	Spring Canyon	5.15	645.9
P08	Spencer's Camp[1]	2.35	2,087.9	M08	Gregg Basin	10.46	4,038.1
P09	Escalante	4.33	1,583.6	M09	Grand Wash	4.67	3,461.0
P10	Rincon	4.74	5,264.4	M10	Lower Overton	8.85	2,983.4
P11	Bull Frog	4.72	6,150.9	M11	Upper Overton	12.55	12,801.5
P12	Cedar Canyon	4.79	4,424.1		**Total**	**95.01**	**59,678**
P13	Good Hope Bay	6.34	4,353.6				
P14	Trachyte Canyon	4.08	2,889.2				
	Total	**70.86**	**63,894**				

*Surface elevation: Powell= @ 1,127.8 m, Mead=@ 365.8 m.
[1]Originally was Zahn Bay

It would have been preferable to standardize the collection time (day/night) for all sites, however, this was unrealistic due to the distances between sites and safety concerns related to night navigation. While data were collected both day and night, we reserved night surveys for high density areas and surveyed lower density areas during daylight hours. It's preferable to survey at night when fish schools disperse making echo integration and counting more accurate.

Sampling Techniques

Vertical Gill Netting - Species composition was determined using vertical gill nets. Six individual nets each with a different mesh size, with one having two sizes for a total of seven, were fished from the surface to a minimum depth of 30 m. Mesh sizes ranging from 12 mm to 64 mm. Nets were 2.5 m wide and were rolled on floatation spools. Rigging consisted of two floatation buoys, three lighted spar buoys, two-20 kg anchors and 350 m of 1.2 cm nylon line. The rigging was set relatively close to shore at depths ranging from 30 to 50 m. Nets were lowered and spreader bars attached until the nets reached within 1-2 m of the lake's bottom. Nets were set at dusk and allowed to fish overnight (12 hours). At dawn the nets were respooled. Fish weights, lengths, types, and depths were recorded. We attempted to sample five to six different areas on each reservoir.

Limnological Sampling and Analysis - Vertical water column profile data were collected using a Hydrolab ™ Surveyor III data logger. The instrument was calibrated prior to each field trip. Profiles were collected at the deepest zooplankton sampling site. Temperature, dissolved oxygen, conductivity, and pH were collected at discrete depth increments from the surface to the bottom, or a maximum depth of 100 m. Depth intervals sampled varied season to season. During times when reservoirs were nearly isothermal data was only collected every ten meters. As stratification increased more depth intervals had to be collected to describe the water column.. Data was stored using the data logger and downloaded at the conclusion of each field trip. Data were typically only collected down to a depth of 100 m due to equipment limitations.

Zooplankton were collected using a 64 *u*m birge style closing net with a 15 cm diameter mouth, and a snap shackle release mechanism. Three depths were sampled at each transect; 0-10 m, 10-20 m and 20-30 m. Duplicate zooplankton samples were collected at each depth - one at the beginning of the transect and one at the end. Samples were preserved in Lugols and stored in amber nalgene bottles until analyzed. Duplicates were pooled prior to analysis. An attempt was made to collect all zooplankton samples during daylight hours. This was done to minimize the effects of diel vertical migration affects when doing site to site comparisons.

Zooplankton enumerations were preformed by Dr. John Beaver, BSA. Three types of analyses were completed for each sample. Total zooplankton counts were performed and organisms enumerated as #/L down to species level when possible. Taxa were grouped into three major groups, rotifera, cladocera and copepoda for data presentation. Up to ten individuals of the most common taxa were measured and an estimated weight determined based on volume, allowing total biomass/L to be calculated. Net phytoplankton was counted and identified to species. Net phytoplankton primarily included algal species large enough to be entrained in a 64 *u*m plankton net.

Following enumeration, plankton samples were fractionated into three size classes using nitex netting mounted to pieces of 2.5 inch diameter schedule 40 PVC piping. Samples fractionated into >1000 *u*m, 500-1000 *u*m and <500 *u*m. To obtain a total estimated plankton biomass dry weight after enumeration, samples were filtered onto Whatman GF/C filters and dried for 24 hrs at 50°C then weighed. The purpose of size fractionation was primarily to help in facilitation analysis of hydroacoustic data, and to explore differences in relative proportions of zooplankton biomass as a proportion of total plankton biomass.

Zooplankton biomass, determined through counts was plotted for each station over time and depth; major groups as well as total biomass were identified. For spatial distribution across the reservoirs, the use of satellite images for each reservoir were employed. Average biomass (0-30m) for each site was determined and a suitable scale developed to encompass the range of values observed. Approximation was used to determine where changes in zooplankton between sites occurred. Usually this meant just splitting the difference between two sites. In the case of stations where large morphological differences in the lake were apparent such as sites between canyons and basins, the split was made at the interface of the two by making the assumption, each site was similar within itself. Thus, the images portrayed do not take into account patchiness in zooplankton communities nor may they represent the actual locations in the reservoir were density shifts occur. Areas on the reservoir not sampled were blacked out in the satellite pictures. These included the Muddy River Basin and Bonelli Bay on Lake Mead, and Navajo Canyon and the area around Castle Rock on Lake Powell. It was felt these sites were quite different from the surrounding reaches of the lake that were sampled, and were therefore left blank.

Acoustical Sampling and Analysis - Acoustical data were collected using a BioSonics ™, single-beam (DT-4000) scientific echosounder during the first year (November 1995 to August 1996) and dual-beam system (DT-5000) during the last year (November 1996 to January 1998). The DT-4000 used a 6° single beam transducer and the DT-5000 used a 6.2-13.6° dual-beam transducer. Both versions operated at 420 kHz. The transducer was mounted on hydrofoil which was lowered beside the boat and towed at a depth of 50 cm.

Fish surveys typically started along shore at depths <5 m. Fish detected from within a meter of the transducer to the lake's bottom (<101 m) were counted and extrapolated to volume. Plankton surveys examined depths between 1 to 30 m and were collected at -90 dB (0.5 mm). Surveys were conducted at speeds of 8 to10 km/h. Data collection was collected at a rate of 3 to 4 pings/s. Acquisition thresholds were set at -60 to -70 dB for fish and at -90 dB for zooplankton. Data were collected using a pentium class laptop computer and all data were stored on ZIP ™ disks for future analysis..

We consulted area biologists and defined "pelagic" as a water column greater than 20 m in depth. Data analysis was accomplished using three individual desktop computers loaded with BioSonics™ Analysis Program, Version 2.1.1. The analysis started at the ping where depths exceeded 20 m and continued until we reached depths <20 m on the opposite shoreline. The only exception to the depth criteria was at the inflow sites where depths occasionally were shallower than 20 m due to seasonal fluctuations in reservoir elevation.

Analysis involved three steps: editing echograms, set up, and analysis. Each echogram was reviewed prior to analysis to determine the number of pings to be analyzed (number of pings where depth exceeds 20 m) and to examine for acoustic abnormalities. The analysis program uses echo integration to estimate fish standing crop and densities. Echo integration is best suited for high density communities. Unfortunately, 87% of our transects found fewer than 200 targets, the minimum needed for an integration analysis using single beam acoustic data. Because of these low densities, we had to find an alternate method of estimating fish densities. A spreadsheet macro was developed to convert the number of targets counted to number of fish/ha.

Reservoirs were subdivided into habitat zones, each represented by one study station. Surface area (full pool) was measured from topographical maps using a digital planimeter. Standing crop and density values (kg-fish/ha) were multiplied by the zone's surface area (Table 2) to determine total kg and numbers of fish. Zone totals were tallied to develop standing crop and population estimates for each reservoir. Fish data were subdivided into numbers of fish larger and smaller than 16 cm (-40 dB) to estimate the population size of pelagic striped bass, carp, and walleye.

Hydroacoustic determination of plankton density was employed in an effort to provide a more economical and rapid means of assessing the large volumes of water. The volume back scattering co-efficient was used as a correlate against measured plankton biomass to determine plankton densities. Hydroacoustic analyses were preformed at a setting of 20 log R using the DT analyzer version 3.1.1. software on a PII 450 mhz desktop computer. Analysis were stratified to correspond to depths used for plankton collections: 0-10 m, 10-20 m, and 20-30 m. Results were plotted against zooplankton biomass, density, and net plankton fractionated biomass to determine the best regression fit. Initial analyses were restricted to sites where fish were not present in the hydro-acoustic data sets to minimize potential effects to the analyses. Once regression parameters were determined, an attempt was made to work with samples where fish were present to determine the effect of fish presence on regression parameters

Target strength analyses were used to explore the distribution of individual targets measured by the unit. Conversion to a density per cubic meter using this technique was not really possible using the number of acoustic targets identified due to acoustical limitations in the ability to define individual targets. Zooplankton densities are typically high enough that individual organisms are too close together to be separated in the acoustic beam. The ability to separate individual targets is a function of pulse width. Based on the system used for this study organisms must be about 30 cm apart to be classed as individual targets. It would be expected that most zooplankton are much closer together than this thus individual target analyses is not feasible and echo-integration techniques must be employed.

RESULTS

Zooplankton/Net Plankton/Phytoplankton

Zooplankton populations followed several trends that would be expected for a reservoir situation. The inflow areas typically exhibited the highest productivity; productivity decreases with distance downstream (Figures 3-8, Appendix C,D). This trend was apparent in Lake Mead with the inflow

Figure 3. Seasonal and spatial distribution of zooplankton biomass in the top 30m of the water column in Lake Mead. November 1995, January 1996.

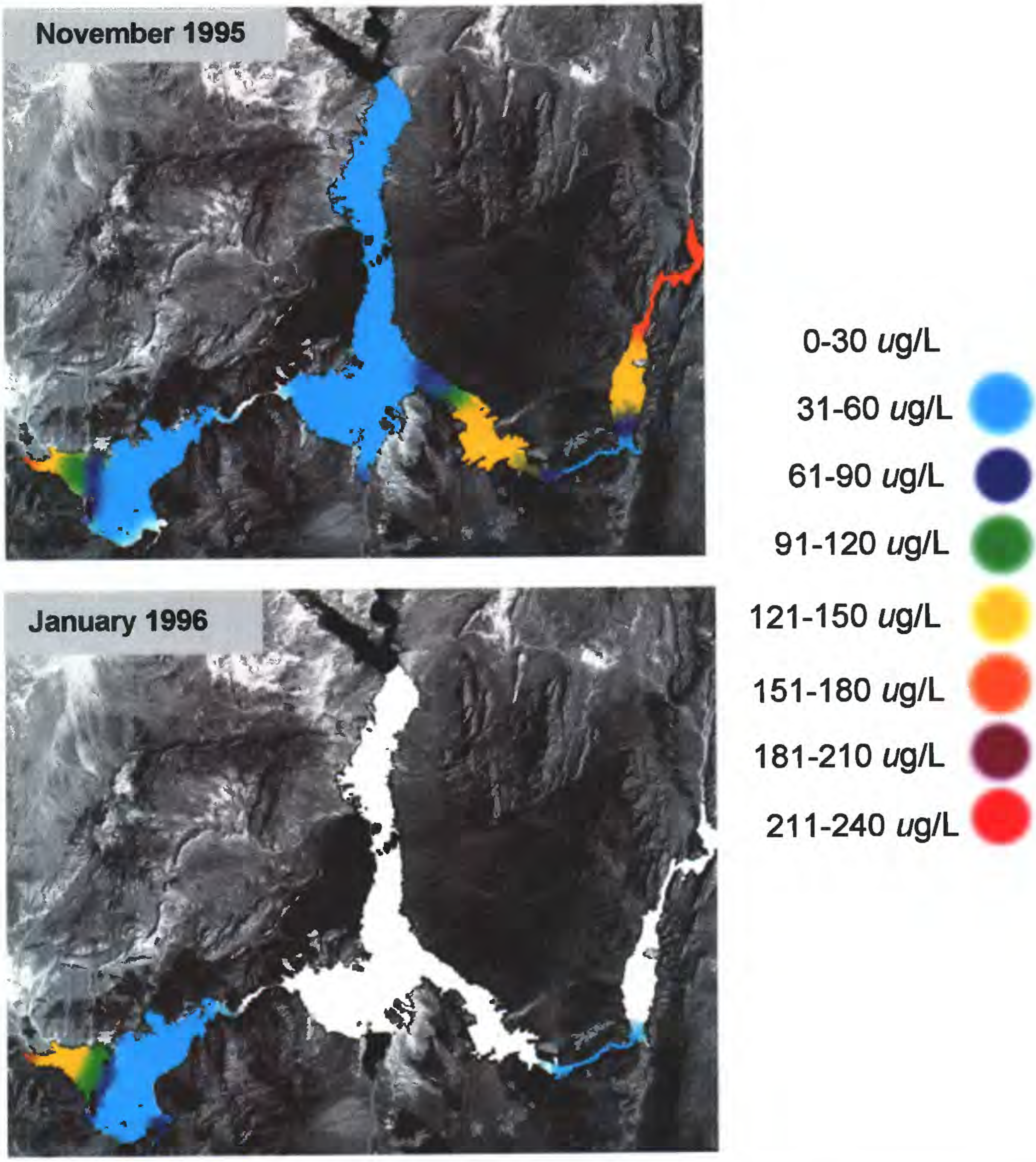


Figure 4. Seasonal and spatial distribution of zooplankton biomass in the top 30m of the water column in Lake Mead. May 1996 - January 1997.

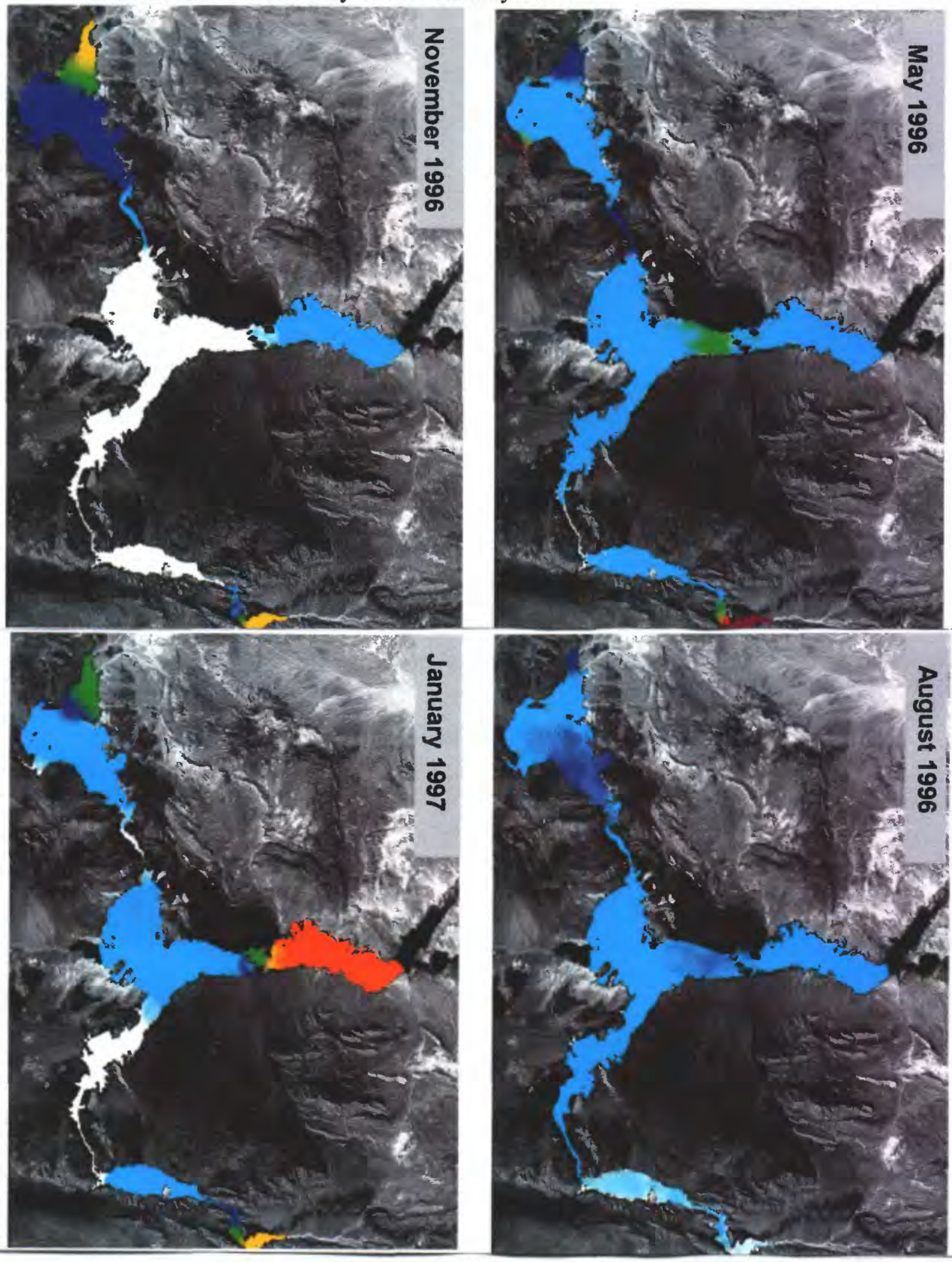


Figure 5. Seasonal and spatial distribution of zooplankton biomass in the top 30m of the water column in Lake Mead. May 1997 to January 1998.

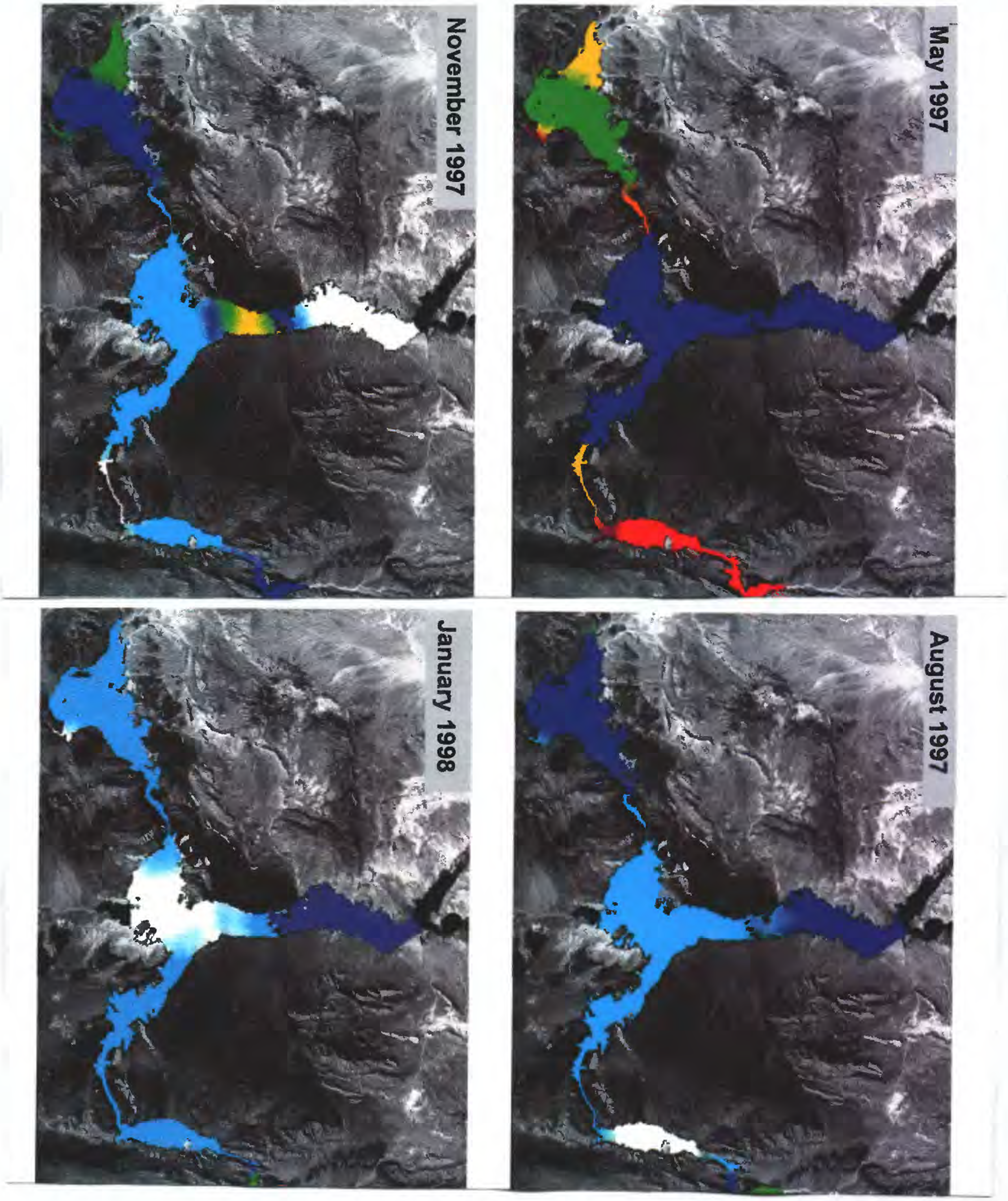


Figure 6. Seasonal and spatial distribution of zooplankton biomass in the top 30m of the water column in Lake Powell. November 1995 to January 1996.

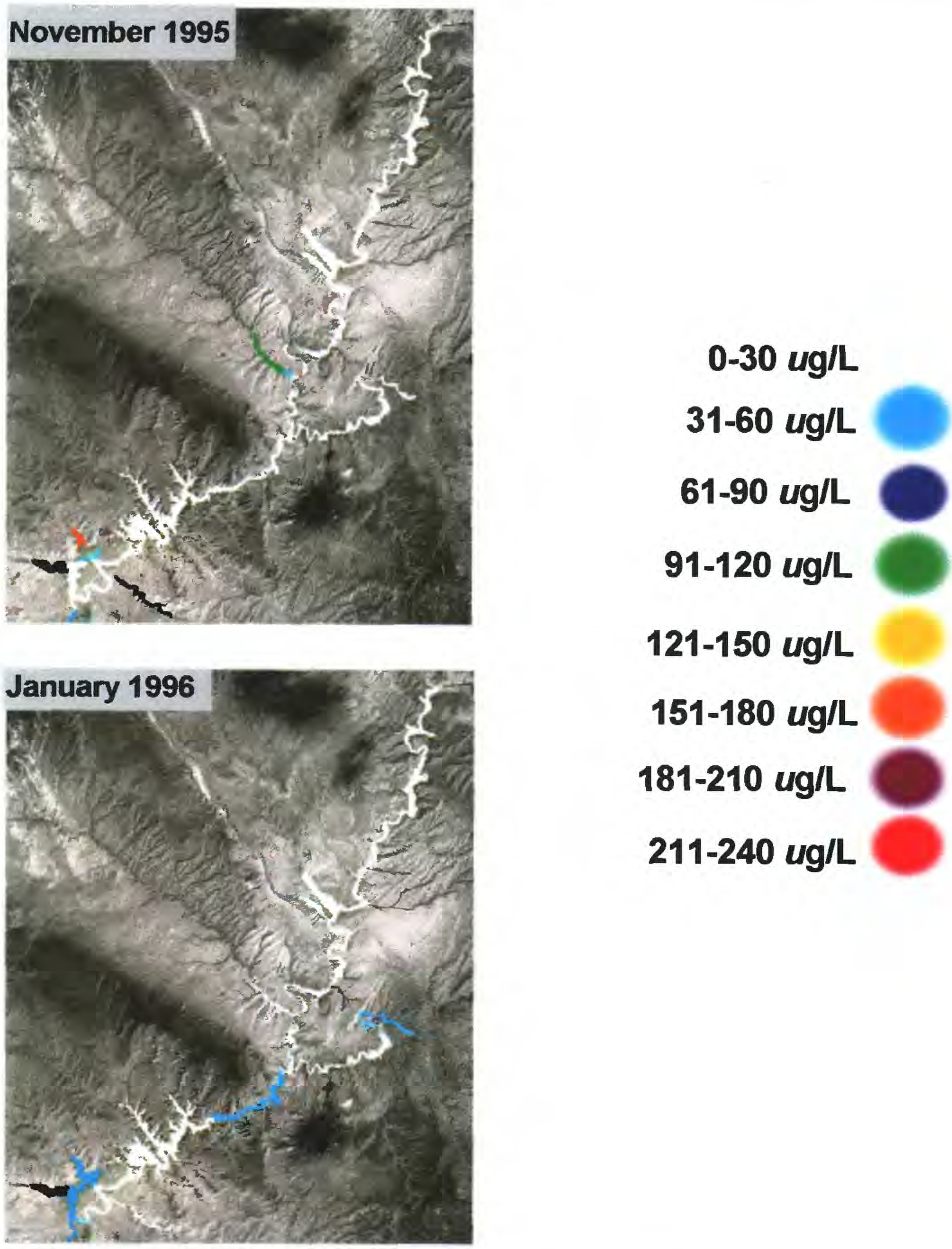


Figure 7. Seasonal and spatial distribution of zooplankton biomass in the top 30m of the water column in Lake Mead. May 1996 to January 1997.

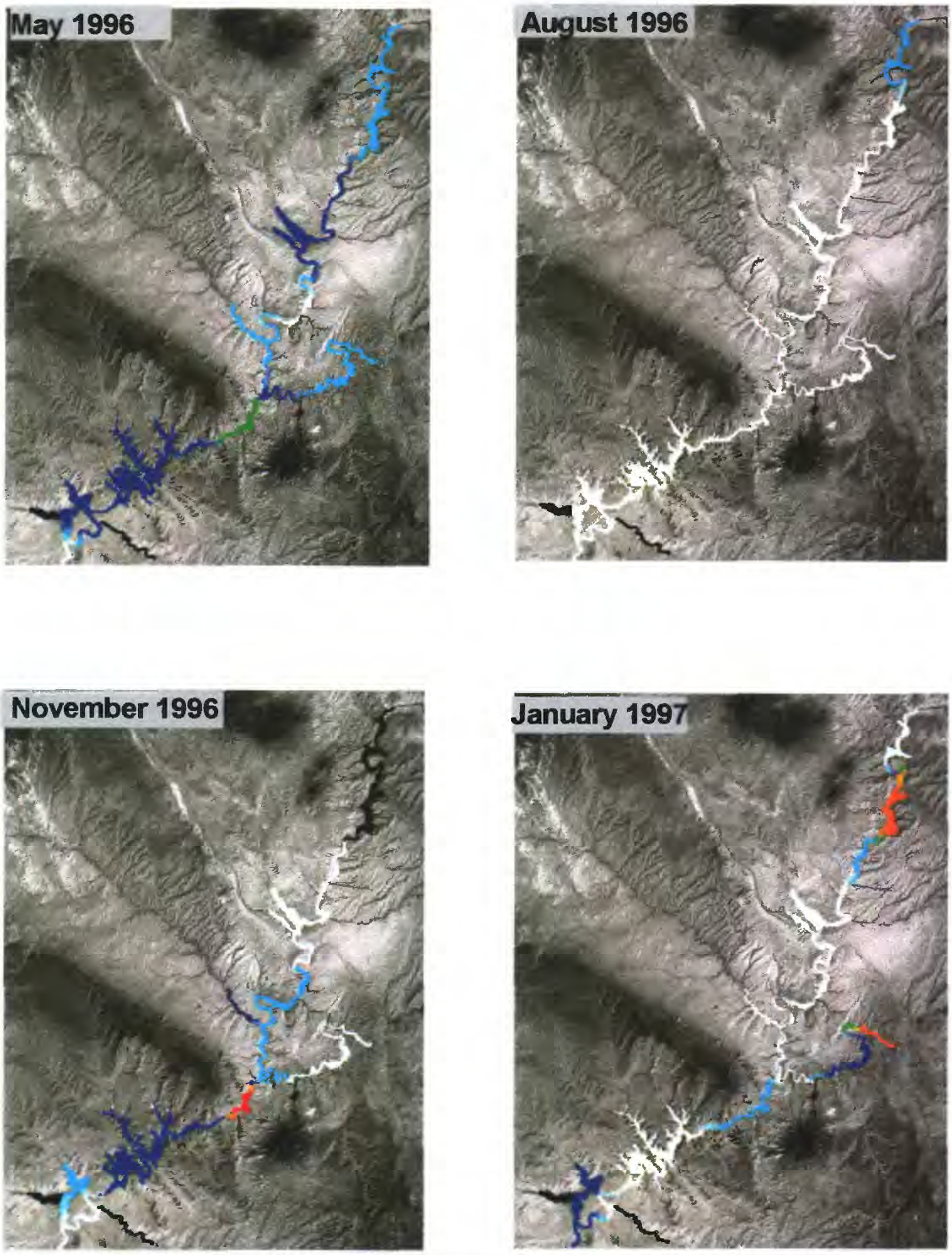
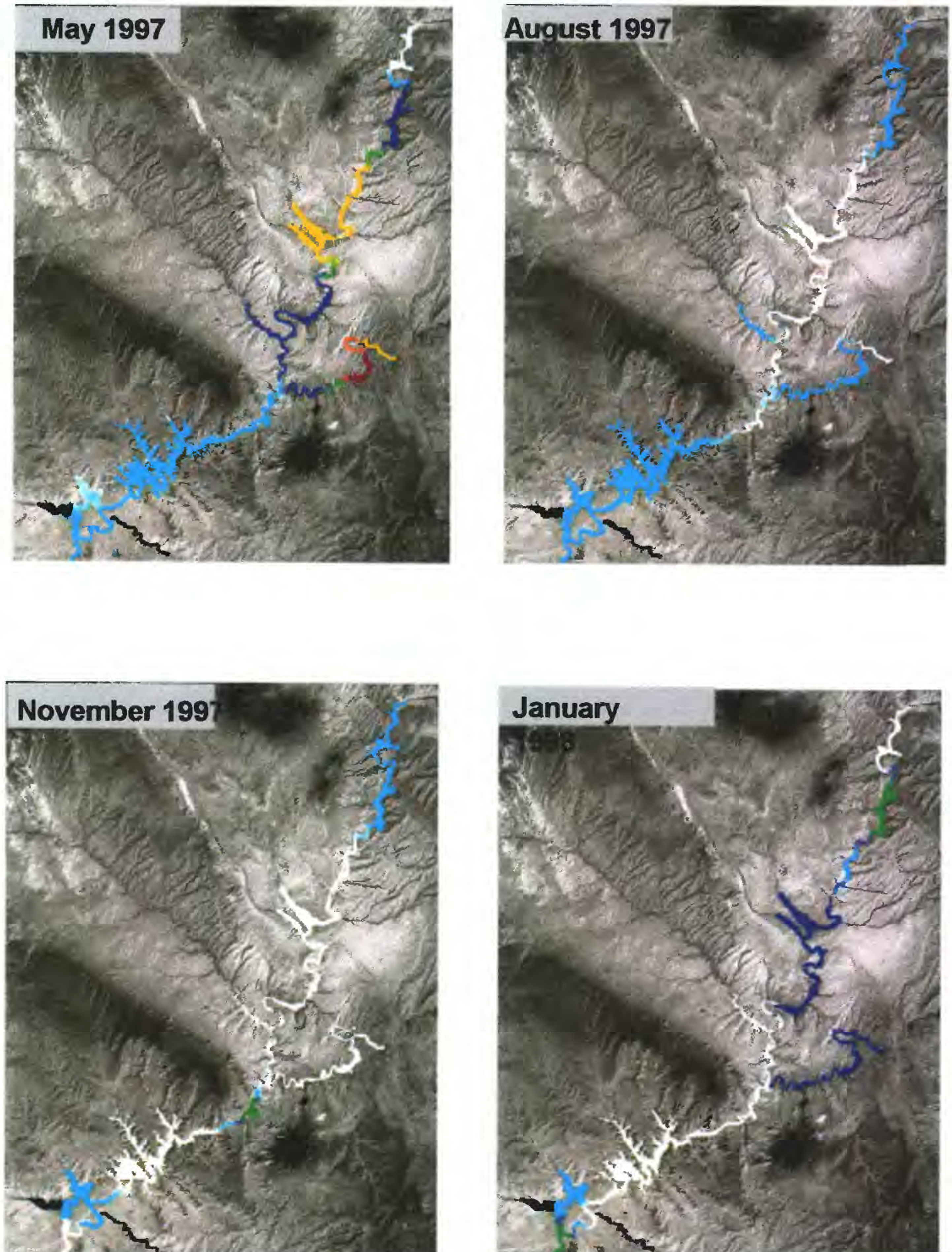


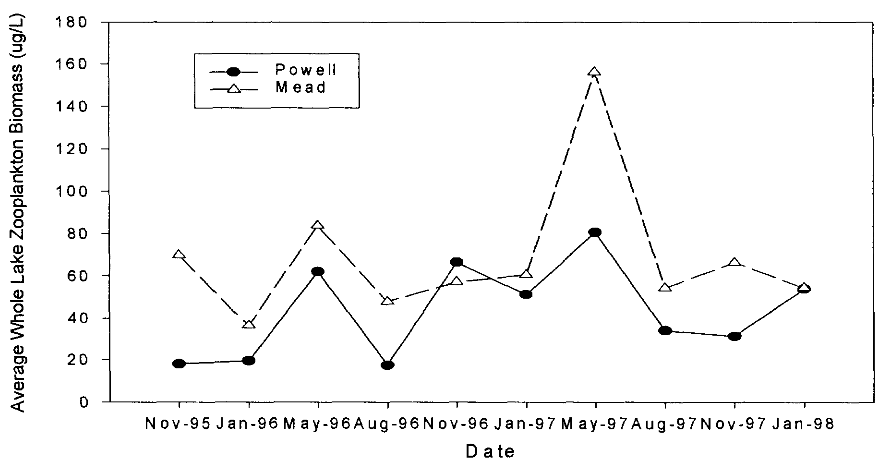
Figure 8. Seasonal and spatial distribution of zooplankton biomass in the top 30m of the water column in Lake Mead. May 1997 to January 1998.



areas of the Colorado River, Virgin River, and Las Vegas Wash being much more productive than the rest of the reservoir (Figures 3-5). There were occasional blooms scattered around the reservoir but the dominate pattern was still inflow productivity. Lake Powell, on the other, hand tended to have a much more random pattern of zooplankton production within the reservoir. Inflow zooplankton productivity was not consistently higher than in the rest of the reservoir (Figures 6-8)

Though fish densities and biomass were greater in Lake Powell, lake-wide average zooplankton biomass by comparison was higher in Lake Mead (Figure 9, Appendix C). Total net plankton biomass, however, was higher in Lake Powell in 1996 than in Lake Mead but lower during 1997 (Figure 10, Appendix D). Small net plankton, which includes phytoplankton, made up a greater proportion of the plankton biomass in Lake Powell than in Lake Mead, ranging from approximately 80% down to 60% (Figure 11).

Figure 9. Average whole reservoir zooplankton biomass (Cladocera, Copepoda, Rotifera) (*u*g/L) for Lakes Powell and Mead.



During the summer months in Lake Mead the proportion of small plankton was higher, but for the remainder of the year the community was dominated by larger size classes. Lake Powell showed a significant trend toward a shift to larger plankton during the course of the study, and subsequently a decrease in phytoplankton volume with increased grazing pressure (Figure 12). This correlates to continually decreasing shad populations in the lake and observed shifts may be a response to decreased grazing pressure. In Lake Mead, high zooplankton populations in Boulder Basin are an indicator of the influence of Las Vegas Wash. There were several exceptions to the rule, however, as are shown in the pictorial graphics. Local blooms could appear at any site though several sites seemed more common. Blooms were typically of *Daphnia* sp. in both reservoirs. Cladocerans as a percentage of total plankton biomass were the dominant zooplankton at almost all times in both reservoirs. On a numerical basis copepods were more common than cladocerans. Rotifers were variably dominant in terms of numbers, but made up a relatively insignificant proportion of total zooplankton biomass in either reservoir.

Figure 10. Average total lake-wide net plankton biomass (*u*g/L) for Lake Powell and Lake Mead.

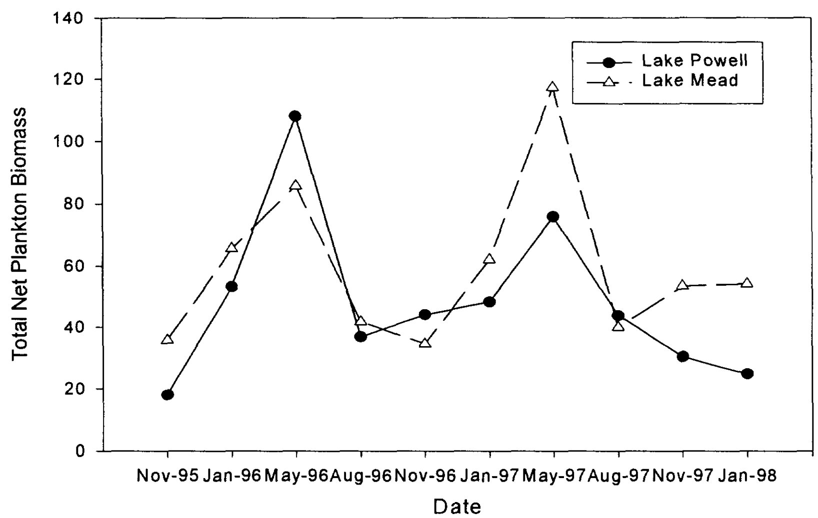


Figure 11. <500 *u*m size class as a percentage of total net plankton biomass inn Lake Powell and Lake Mead

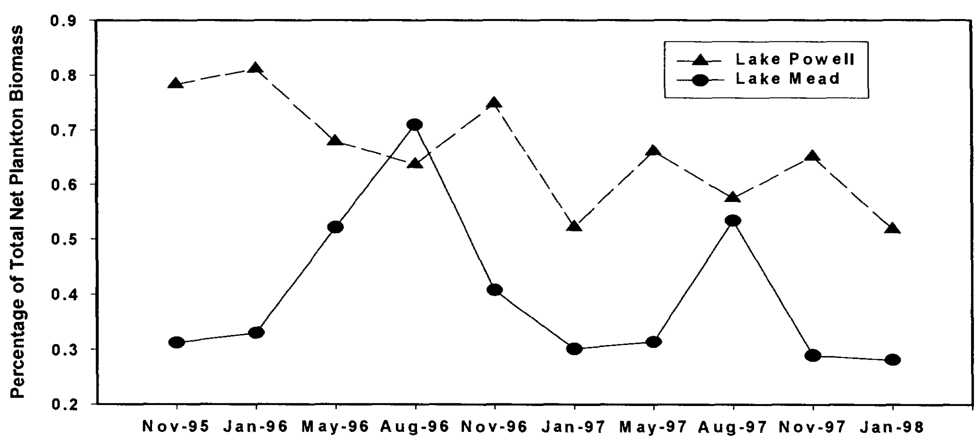
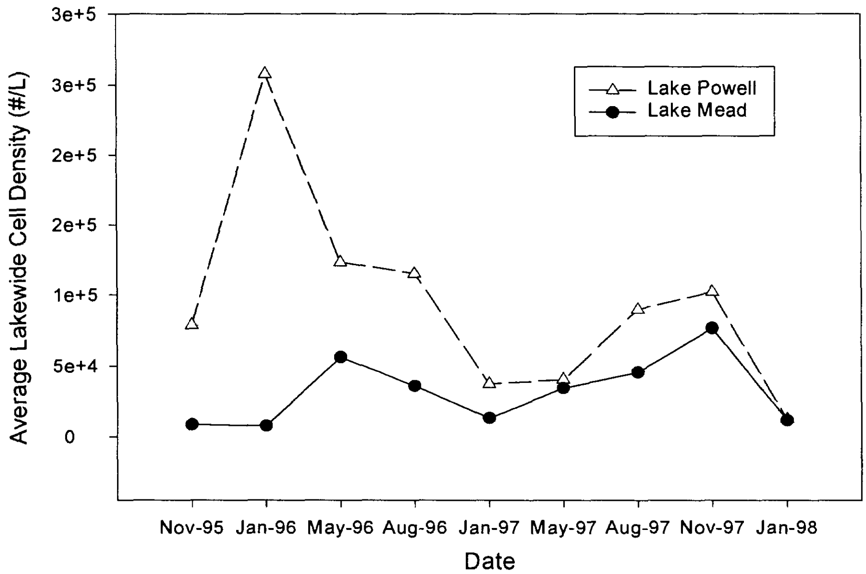


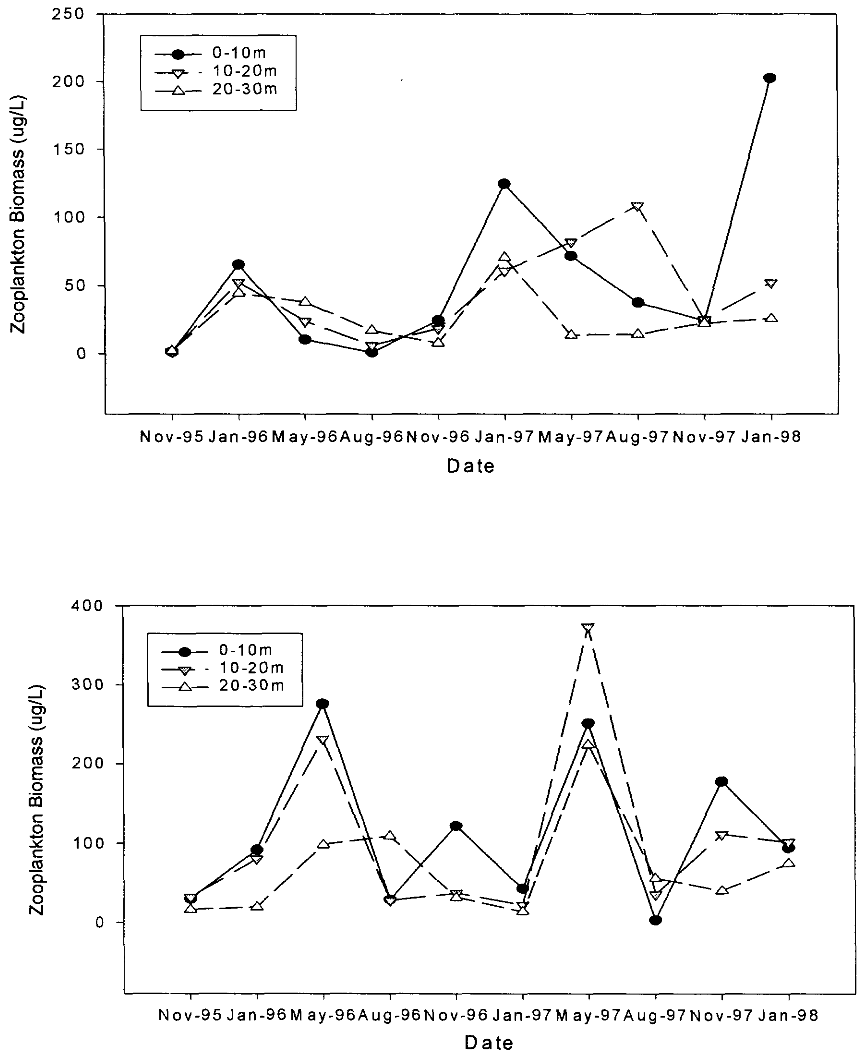
Figure 12. Average lakewide phytoplankton cell density in the top 30 m of the water column for Lake Powell and Lake Mead.



Generally relatively poor correlations existed between fish densities and zooplankton on a site to site basis, however, across years we do see a gross relationship between fish, zooplankton, and phytoplankton.. This is not unexpected given the dynamic nature of these reservoirs, and substantial differences in patterns of productivity across reservoir reaches. Fish densities in much of the reservoir are relatively low and as such may not exert much influence over pelagic plankton populations at all sites. This may represent a cascading effect where striped bass keep shad populations low enough that their influence on plankton populations remains minimal. However, there are probably other equally important factors such as climate and spawning success and habitat suitability for fish that are equally if not more important in determining shad presence than just predation affects.

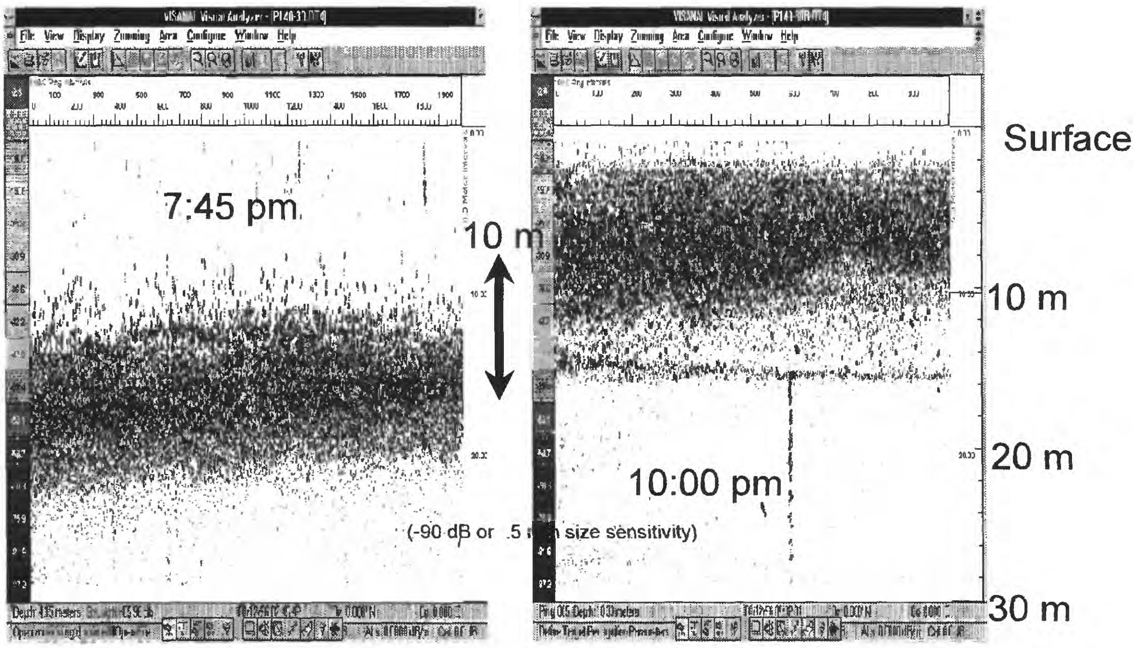
Patterns of seasonal plankton abundance varied widely between sites on each reservoir. Some similar trends, however, were observed. Depth distribution of zooplankton was strongly a function of season. During cooler periods such as during January the majority of zooplankton biomass was located in the top 10 m of the water column (Figure 13). As the season progressed, the center of biomass distribution moved deeper into the water column. In August most zooplankton biomass was located below 20 m. This has ramifications when comparing data sets collected over the years in these reservoirs. Apparent cycles in zooplankton populations may be present simply as a function of sampling technique. Additionally, on a diel basis there was substantial vertical movement of larger bodied zooplankton. This was most notable during the summer months. During daylight hours zooplankton biomass was concentrated in deeper water moving very quickly up to shallower depths after dark (Figure 14). This observation was not noted during winter periods and the majority of plankton was located in the top 10 m of the water column.. Diel migrations may be an escape from predation pressure as well as an energetic response to warm surface waters.

Figure 13. Seasonal vertical distribution of zooplankton biomass at station P1 (upper graph and at



M1, Lower graph).

Figure 14. Diel vertical migration of zooplankton in Lake Powell during August.



Seasonal patterns of zooplankton abundance showed different patterns depending on whether biomass or density were used to examine trends. This was a function of which groups and size classes of individuals were dominating the planktonic community during different seasons. Typically spring peaks in numerical abundance were dominated by increases in rotifers and copepods (Appendix C). Copepods, in particular, showed the largest numerical density changes typically peaking in May of each year, which corresponds to the time of highest reservoir productivity and is just at or prior to the onset of stratification. There was again a late fall peak associated with increased mixing resulting from the decay of thermal stratification. This pulse of productivity was not as pronounced as the spring bloom and further was more variable between sites in both reservoirs though the trend was for larger blooms to occur near inflow areas.

Seasonal patterns of net phytoplankton (phytoplankton entrained in a 64*u*m net) were quite pronounced, as would be expected (Figure 12, Appendix E). Seven major groups of net plankton were recognized in this study bacillariophyta, cryptophyta, chrysophyta, chlorophyta, cyanophyta, dinophyta, and euglenophyta. Generally only the larger genera in these groups are included in the data. Because our samples represent only net phytoplankton, a substantial portion of phytoplankton biomass is being ignored in this study. Appendices do not show data for cryptohyta and euglenophyta, as although they were occasionally collected cryptophytes especially, are much to small to be effectively entrained in our net.

In general for the two reservoirs, diatoms and blue-greens and chrysophytes were the numerically dominate groups. Diatoms tended to peak in January and May, while blue-green dominance was typically in August thru November. Chrysophytes tended to be dominant only during the May sampling trips.

Overall Powell had higher densities of phytoplankton than Lake Mead for much of the study. The vast majority of the difference was attributable to higher densities of Blue-green algae in Lake Powell than Lake Mead. Productivity of phytoplankton in Lake Mead increased with distance upstream from the dam, and was also high in Las Vegas Bay. A similar trend was also observed for Lake Powell. General seasonal trends were apparent for all groups of algae in both reservoirs. Much of the year to year variation is probably due to a combination of predation effects and climate, neither of which this study was designed to separate out. Differences in timing of blooms between the reservoirs is also attributable to location. Although both reservoirs are at similar latitudes, Lake Powell is significantly higher in elevation. This means it does not have as high a maximum temperature, and tends to have a shorter growing season. Strong stratification develops later and ends sooner.

Zooplankton Acoustics

The objective of hydro acoustic determination of zooplankton abundance was to determine if a significant relationship existed between zooplankton biomass and acoustic backscatter. Acoustical work with zooplankton, particularly in marine systems, has been ongoing for many years. For larger species such as Euphasids, acoustical relationships are quite robust (Greenlaw 1979). Freshwater applications, however, are fairly rare and the technology, although accepted, has not seen wide spread application. One advantage of digital acoustic systems (by digital we refer to the data being digitized at the transducer not at the surface unit) is the almost complete lack of noise associated with the system. Depending on setup, analog transducers are often subject to external noise such as outboard motor or generator operation, and other interference picked along the length of the cable. Our goal was to determine if with standard settings, we could obtain a reasonable estimate of plankton biomass in the reservoir. For the purposes of this study we did not try any alternative means of data analysis. The use of a standardized settings is desirable as it provides a level of uniformity and a means of direct comparison between data sets. Even if standardized settings are not possible, data collection still allows some gross spatial analysis of trends in plankton spatial abundance.

Acoustic target distribution within the reservoirs for most seasons shows a distinct break between fish and zooplankton for data analyzed down to a threshold of -90 dB. Plots of target strength distribution for fish show a drop off in target numbers at around -60 dB, with the majority of the fish targets being larger. Likewise with zooplankton -60 dB represents the upper end of targets observed, with the majority of targets in the -70 dB to -80 dB range (Figures 20-22). Zooplankton data were analyzed with an upper limit of -60 dB and a lower limit of -90 dB. For the analysis presented here, we did not make any modifications to the default programs provided by the manufacturer.

Hydroacoustic analysis of zooplankton communities in Lake Mead for January 1988, produced results similar to those for standard net sampling, indicating the utility of this approach to large scale studies of gross biomass distribution (Table 3) (Figures 15,16). For analyses presented here we made no attempt to remove fish targets from the data. Unfortunately, however, the presence of fish sharply reduced our ability to acoustically determine zooplankton abundance. Often times, fish were not commonly encountered in the top 10m of the water column during daytime acoustic runs, and thus represented no real analysis problem. In August, however, there was significant overlap in the size distributions of zooplankton and shad. This was due to the large populations of small shad present. Since we correlated zooplankton abundance against volume backscattering, fish targets biased this number upwards. Bias can be quite significant because for a given size target a fish tends to produce a much higher backscatter than a zooplankton. As figures 15 and 16 show very large backscattering values (-db) are associated with plankton levels that are much lower than expected given relationships determined during January. As is expected, with the inclusion of some fish, samples in August were biased on the high side with respect to estimation of zooplankton biomass (Table 3, Figures 15,16). Variability in fish densities and normally low populations of larger zooplankton genera at this time of the year combined to produce acoustic data with limited applicability.

One important aspect of making acoustic sampling applicable is the importance of repeatability. That is, sampling one date should give a similar relationship between enumerated and acoustic data as it does for other dates and locations (Morton and MacLellan 1992). Without this consistency, calibration to an enumerated plankton data set would be required for each trip. As indicated previously fish are known to interfere with estimates of plankton biomass. We further noted substantial seasonal differences within and between the two reservoirs. Finally, correlations between acoustic backscatter and plankton density differed between the two reservoirs. We attributed differences to be primarily as a result of differences in the plankton community composition between the two reservoirs. For Lake Mead , the highest correlations were between zooplankton biomass as determined by counts and acoustic backscattering (Table 3, Figures 15,16). For Lake Powell, the strongest correlations were found for total filtered plankton biomass (Table 3, Figure 16).

Regressions using enumerated zooplankton biomass for Lake Mead likely provided the highest correlation, as larger bodied cladocerans and copepods, which are within the detection limits of the sampling gear, make up the majority of the total plankton biomass in that reservoir. Other net plankton were a much smaller percentage of the total (Figure 11). In Lake Powell, on the other hand, smaller net plankton and algae made up the majority of the plankton biomass (Figure 11). Since volume backscattering for smaller organisms is less that for larger organisms, changes in abundance of smaller organisms will be less sensitive to acoustical determination than changes in populations of larger size planktors. Many plankton are probably below our acoustic threshold and fairly large changes in numbers from site to site have little impact on the acoustic signal. Since these numbers were not reflected in total counts (we used a 64 *u*m net) the regressions using them were inadequate.

In general, when reservoirs were dominated by larger bodied zooplankton, hydroacoustic estimates were more tightly correlated to zooplankton biomass. During the January and May sampling periods Lake Mead was heavily dominated by larger plankton, and regressions produced the best results for these sampling periods. Lake Powell, on the other hand, contained a large number of smaller plankton, which undoubtably decreased the resolution of the regressions. With low densities, and dominance by smaller bodied species, our measurements may be more a function of background noise then the acoustic unit actually being able to see the plankton (McNaught 1968,1969). We do no our net sampling is biased against smaller plankton (those that pass through the net), thus we underestimate the total biomass present. Phytoplankton cell densities tended to be higher in August and November, many of which are smaller than 64 *u*m, and may have contributed towards a decrease in the utility of regressions developed for those time periods. Careful analysis of background noise should be done and then an attempt made to subtract this from the data prior to analysis. May and January, the months producing the best regressions, were two months that tended to have the lowest net plankton cell density.

Table 3. Regression Coefficients for zooplankton biomass as a function of volume acoustic backscatter in the 0-10m depth range.

	b(0)	b(1)	r^2	b(0)	b(1)	r^2
	0-10m			10-20m		
Lake Mead						
Filtered Biomass						
November 1997	8.34	0.047	0.367	1.81	-0.02	0.27
August 1997	0.97	-0.03	0.069	4.05	-.00003	0.001
May 1997	6.98	0.027	0.511	7.66	0.030	0.352
January 1998	10.8	0.08	0.535	4.71	0.01	0.024
Enumerated Biomass						
November 1997	5.88	0.016	0.041	-2.83	-0.07	0.68
August 1997	-2.52	-0.07	0.216	3.39	-0.01	0.118
May 1997	7.81	0.039	0.789	8.94	0.04	0.499
January 1998	14.64	0.13	0.864	0.98	-0.02	0.213
Lake Powell						
Filtered Biomass						
November 1997	7.116	0.039	0.384	3.77	7.26	0.123
August 1997	5.32	0.015	0.029	4.10	3.29	0.016
May 1997	10.52	0.074	0.488	5.96	0.018	0.109
January 1998	10.04	0.071	0.413	-12.67	-0.15	8.39
Enumerated Biomass						
November 1997	7.56	0.043	0.147	0.019	-0.03	0.402
August 1997	-0.28	-0.05	0.288	1.784	-0.017	0.113
May 1997	9.088	0.056	0.283	0.128	-0.04	0.125
January 1998	7.79	0.034	0.125	3.57	8.45	0.063

Figure 15. Correlation between filtered and enumerated zooplankton abundance for Lake Mead for the 0-10m and 10-20m depth strata.

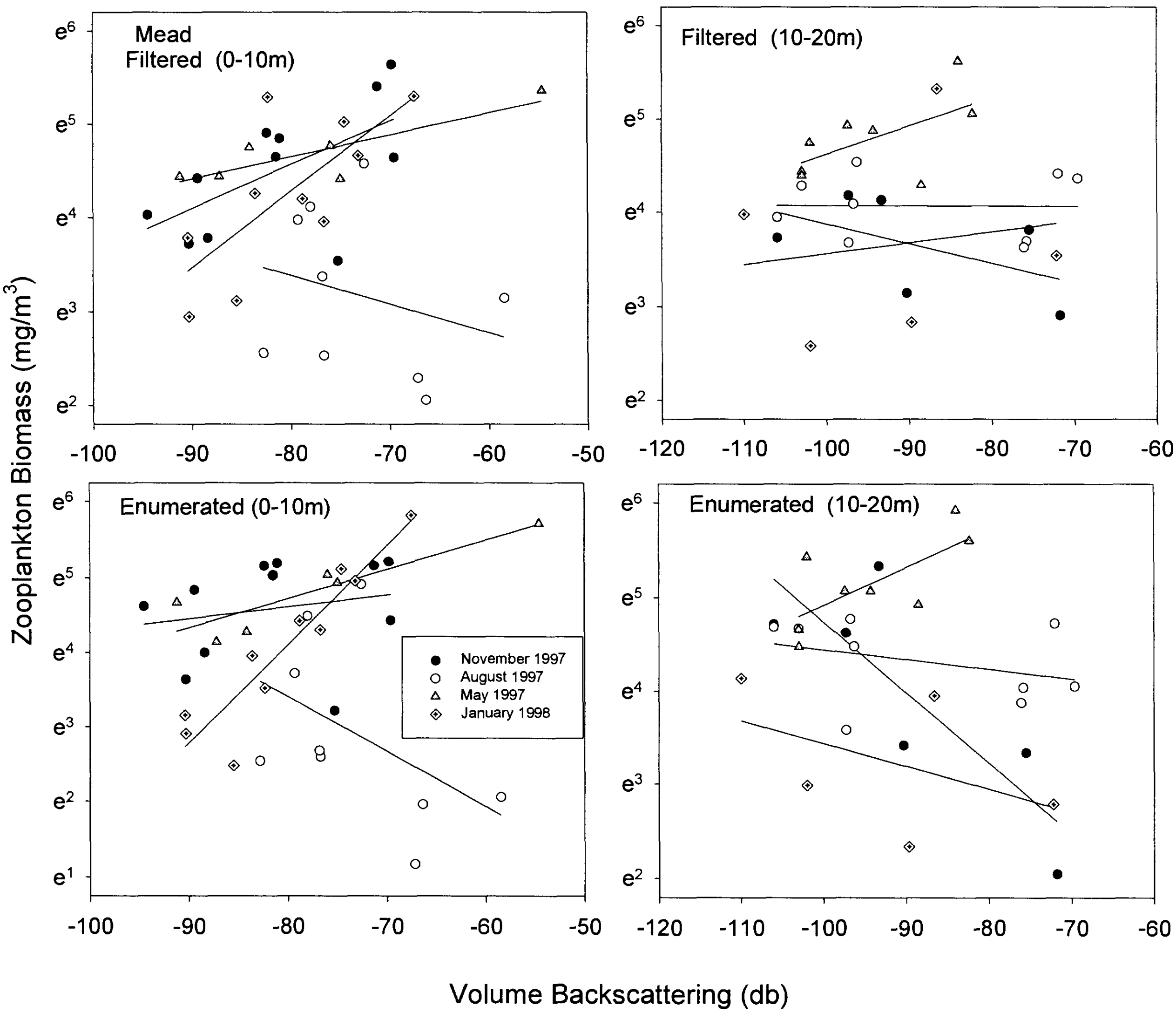
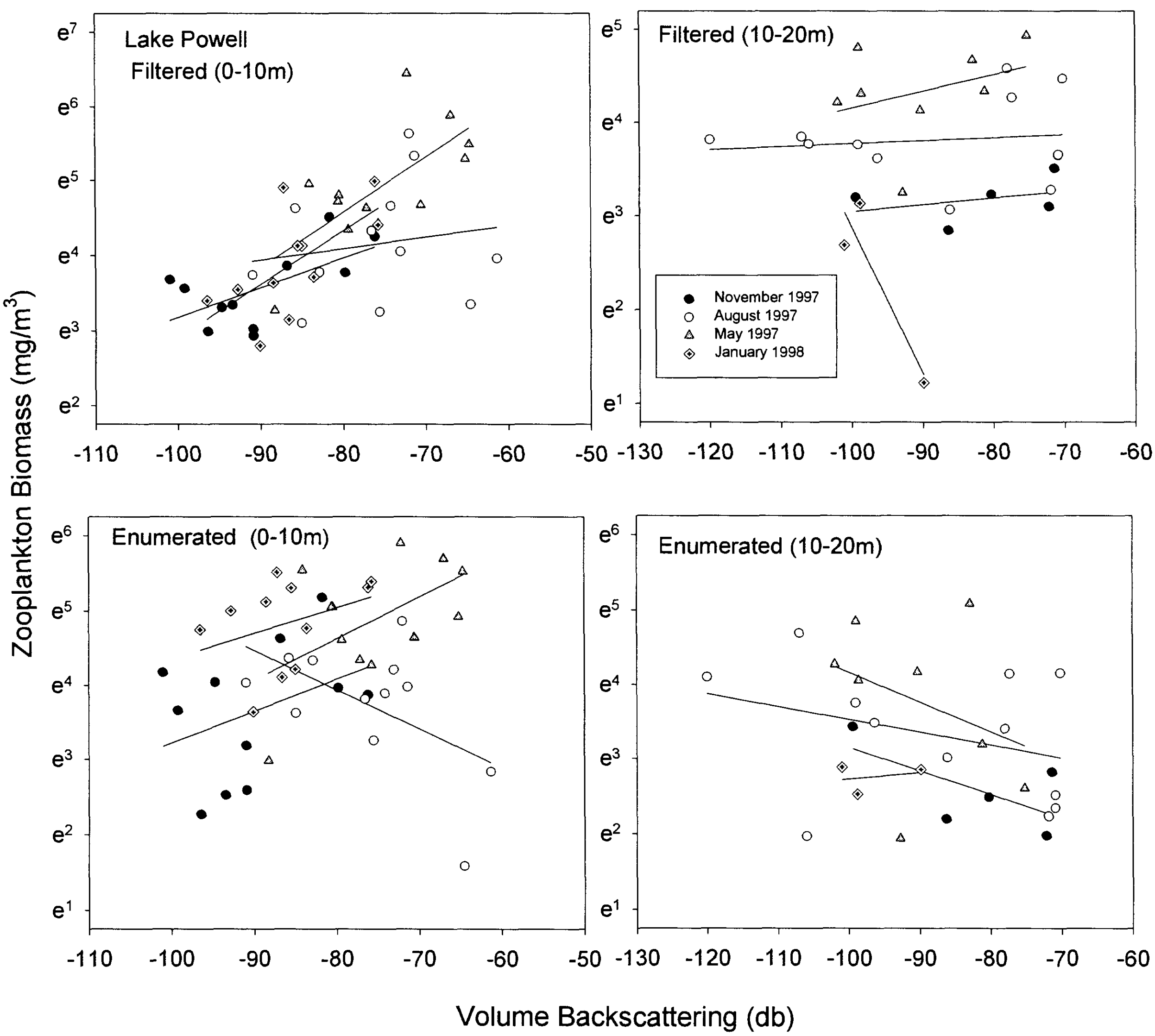
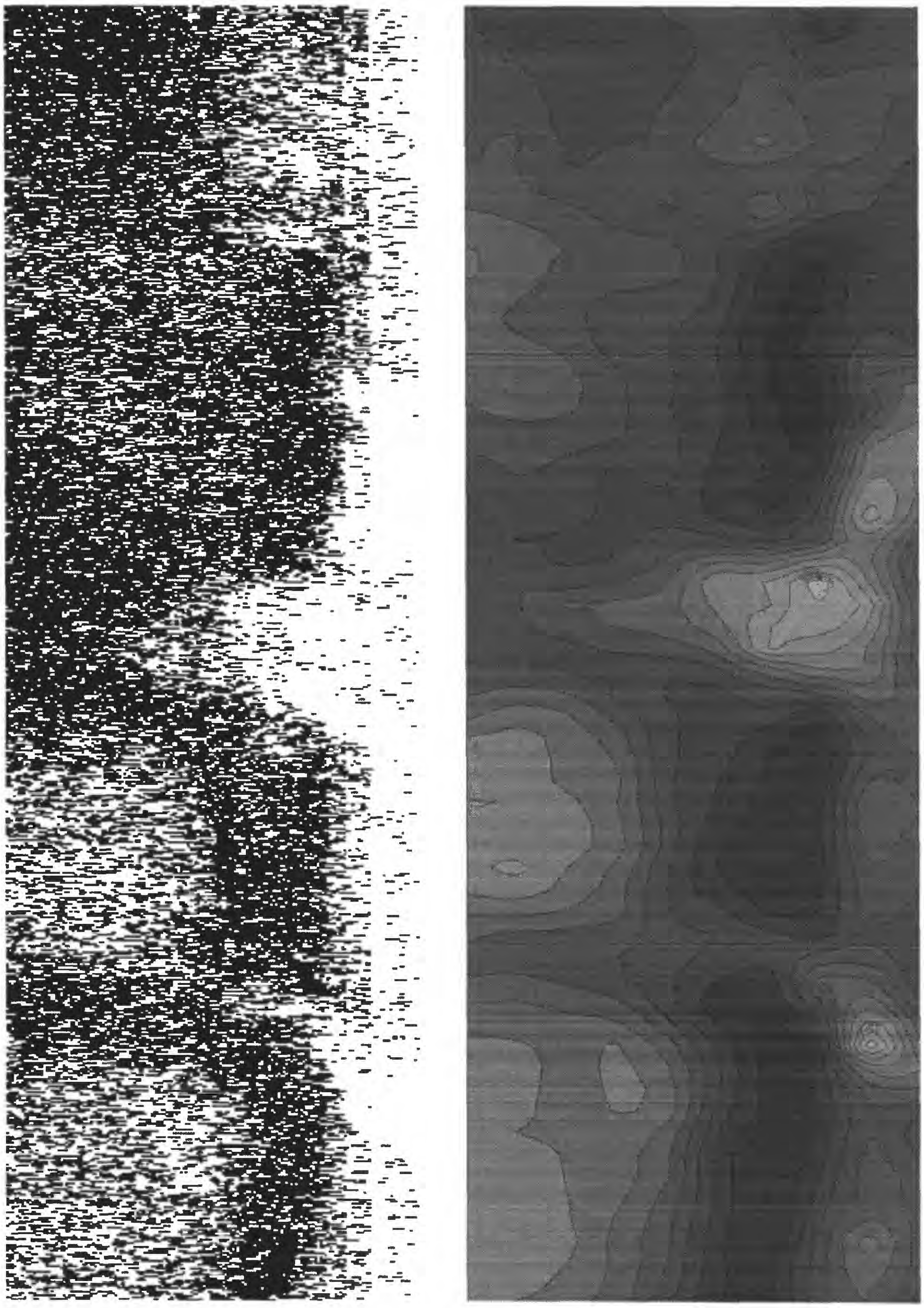


Figure 16. Correlation between filtered and enumerated zooplankton abundance for Lake Powell for the 0-10m and 10-20m depth strata.



Patchiness in zooplankton distributions further played a critical role in accuracy of our acoustic estimates. As shown using a hydroacoustic diagram, zooplankton distribution within a transect is extremely variable (Figure 17). Our sampling consisted of two-plankton tows, typically one at either end of the transect. Samples were then pooled and enumerated. As can be seen in the diagram there are regions in the water column almost devoid of an acoustic signal from plankton. If we were to happen to do a plankton tow through this reach, and then try to correlate to an acoustic transect that was averaging over many hundreds of meters, it is not difficult to imagine why discrepancies might arise due to sampling at different scales (Kelley 1976). If, on the other hand, we are interested in the scale of this patchiness, a raw acoustic output such as the one shown is probably an ideal exploratory method. This would be of value in looking at patchiness of potential planktivorus fish food across a large basin, and may be utilized in studies to explain aggregations of fish. Plankton are affected by currents, often tending to windrow on one side of a basin. The graph presented here likely reveals the impacts of langmuir circulation in the lake. This transect essentially cut perpendicular to the long direction of the cells. The areas of high concentration are the downwelling areas between cells.

Figure 17. Spatial distribution of zooplankton in Warm Creek Bay, Lake Powell. Picture on the left is the echo-trace generated by the hydroacoustic gear. The picture on right is a graphical representation of differences in relative zooplankton densities, with the darker shaded regions representing higher densities.



Vertical Gill Nets

Sampling produced a total of 449 fish representing 6 species (Table 4). Relatively few fish were captured, so the samples were combined for both years to derive species composition. A total of 240 striped bass, threadfin shad, carp, walleye, and channel catfish were captured in Lake Powell. Lake Mead produced 209 fish with the addition of rainbow trout and the absence of walleye. The catch was dominated by striped bass (44-57%), threadfin shad (24-50%) and carp (7-15%). The other three species represented less than 5% of the catch. No centrarchids or native species were captured. Specific information pertaining to lengths and weights is provided in Table 5 and Appendix F.

Table 4. Species composition of fish captured by vertical gill nets in Lake Powell and Lake Mead from November 1995 through January 1998.

Species	Lake Powell	Lake Mead
Striped bass (*Morone saxatilis*)	136 (56.7%)	93 (44.5%)
Threadfin shad (*Dorosoma petenense*)	57 (23.8%)	105 (50.2%)
Carp (*Cyprinus carpio*)	36 (15.0%)	7 (3.3%)
Channel catfish (*Ictalurus punctatus*)	4 (1.6%)	3 (1.5%)
Walleye (*Stizostedion vitreum*)	7 (2.9%)	0
Rainbow trout (*Oncorhynchus mykiss*)	0	1 (0.5%)
Totals	240	209

Initially we planned to set vertical gill nets at six Lake Powell sites (P04, P05, P07, P09, P10, P13) and five Lake Mead sites (M03, M05, M08, M10, M11). The number of sets were gradually reduced to 3 sites on each reservoir due to poor catch rates and logistics. Lower basin sites where we caught few, if any fish, were discontinued in favor of more productive areas. The sites commonly sampled on Lake Powell were Oak Canyon (P05), Piute Bay (P07), Rincon (P10), and Good Hope Bay (P13). On Lake Mead, nets were set at Callville Bay (M04), Gregg Basin (M08), and the upper Overton Arm (M11).

Some net samples were missed due to bad or threatening weather. Vertical gill nets were difficult to set or retrieve when it was windy, a condition which was quite common in spring and summer. We also had a couple of instances when nets were not set because of abnormally high recreational boat traffic and safety concerns.

Small threadfin shad dominated the fishery but they represented a relatively small percentage (24 -50%) of our catch. Small fish would simply swim through our nets and were more difficult to capture. Gill netting is accepted as being fish-size biased (Boxrucker 1995), providing more indicative information on larger fish. We also, on occasion, captured large striped bass by their mandibles in the small meshed (1.2 cm) nets. This led us to suspect they were captured indirectly as they were picking shad out of our nets. We felt the net data most accurately described the composition of fish >16 cm. Gill netting in Lake Powell suggests 74.3% of the fish >16 cm were striped bass compared to 89.4% in Lake Mead.

Table 5. Average lengths, weights and ranges of fish captured from Lake Powell and Lake Mead from November 1995 through January 1998.

Species	C. Catfish	Carp	TF Shad	Stp. Bass	Walleye	RB Trout
Lake Powell						
Avg. TL (mm)	285	470	103	467	422	
Maximum	350	575	155	622	503	
Minimum	155	410	86	165	268	
Avg. Weight (g)	202	1,342	9	1,259	961	
Maximum	330	2,100	32	2,300	1,400	
Minimum	34	860	4	36	640	
# Fish	4	36	57	136	7	0
Lake Mead						
Avg. TL (mm)	338	453	115	409		252
Maximum	420	473	195	772		
Minimum	285	422	85	218		
Avg. Weight (g)	384	1,149	15	765		320
Maximum	540	1,330	60	2,230		
Minimum	228	986	4	100		
# Fish	3	7	105	93	0	1

Fish Analysis

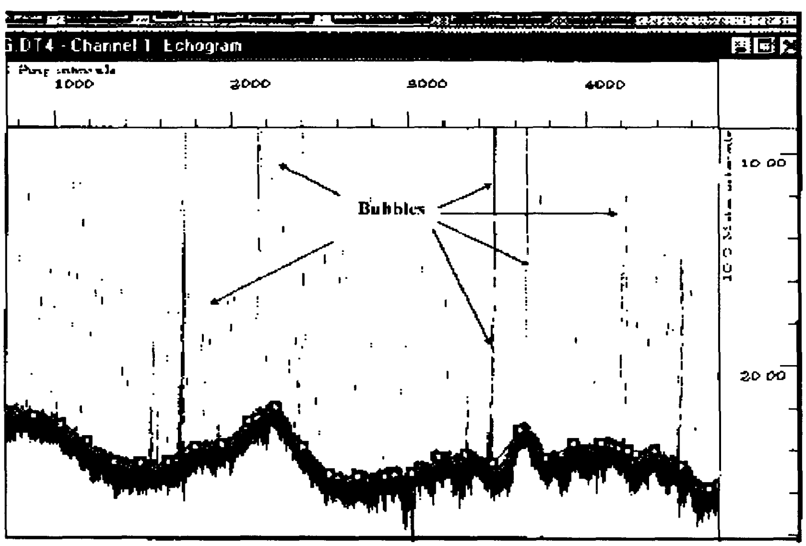
The single-beam echosounder was used until August 1996 when the system was upgraded to dual-beam. We experienced both software and hardware problems during our November 1996 and January 1997 field trips which interrupted data collection. Data acquisition resumed in May 1997, resulting in the completion of 8 field surveys that generated 750 transect files amounting to more than one gigabyte of acoustical data.

There was one additional glitch we discovered during data analysis. The configuration defaults of the DT-4000 and DT-5000 were different for the 1996 and 1997 data sets. The single-beam system used a linear type data thresholding (1/R) while the dual beam provided a squared type ($1/R^2$) (BioSonics 1998). This basically meant fish estimates derived from the single-beam were slightly more conservative than those measured by the dual beam.

We experienced minor problems with bad weather, equipment failure, and field conditions. Gas bubbles proved to be a problem in the inflow areas. Organic sediments decompose, generating methane and hydrogen sulfide gases. Unfortunately, the reflective characteristics of a single bubble is identical to that of a fish swim bladder, making it virtually impossible to distinguish them apart. However, in some instances, bubble vents generated a conspicuous bubble column (Figure 18). In these instances, they could be distinguished from fish and be removed from the analysis. Unfortunately, we had instances where this problem was simply too severe to allow fish analysis. Bubbles were so prevalent at Zahn Bay that we moved P08 further downstream to Spencer's Camp. We also experienced minor bubble problems at M02, and M09.

There were instances where bubbles were entrained into the water column by wave action. Wave induced turbulence forces air into the water column. Data analysis typically was started at a 1 m depth, however, under windy field conditions the analysis was started at 2 m to reduce the likelihood of including bubbles in the fish density estimates.

Figure 18. Echogram illustrating bubble plumes caused by sediment gas generation.



Standing crop estimates peaked after spawning for both years, but these values are probably conservative due to our inability to detect fish within 1 m of the surface and possible boat avoidance. During warm months, and especially at night, fish were typically found near the surface feeding. On extremely calm nights, fish were often seen attempting to avoid the boat. This behavior and its possible bias are recognized but have never been quantified. In addition to boat avoidance, the system has a "blind spot" near the surface. The echo-sounder can not detect fish within 50 cm of the transducer which is typically at a depth of 50 cm. Thus, we simply could not detect fish found within 1 meter of the surface. These two factors were undoubtedly more of a factor for summer surveys conducted at night.

Acoustical Analysis Techniques - There are two standard methods of analyzing acoustic data; echo integration and echo counting. Echo integration provides the best method of estimating fish biomass for schooling species or for high density communities. Fish densities are estimated by adding together the total amount of energy reflected back by all targets and dividing it by the average target strength. Target strength is either measured (dual-beam), estimated (single-beam), or selected by the analyzer. However, when there are few fish (</200 targets), the ability of the single beam system to predict or measure target strength (body size) is biased because of the large number of targets needed to estimate average target strength. Conversely, the dual-beam accurately measures target strength, but due to differences in target orientation a large number of targets are needed to minimize aspect related bias.

In the preliminary analysis, we discovered 72% of the Lake Powell's 299 transects and 92% of Lake Mead's 242 files had fewer than 200 targets which prevented us from determining fish size. The biosonics analysis program requires 200 to 500 targets to calculate an average sigma or average target strength. The average sigma, or fish size, is critical to determine fish densities.

We used the default settings for fish size (22.4 cm) to maintain analysis continuity. Low detection numbers did not effect biomass measurements, however, the resulting fish density output figures are artificial since the average fish size was arbitrarily set rather than measured.

To improve these density estimates, an echo counting program was written to calculate fish densities. Transect data were re-analyzed using output data generated by the Configure Target Strength mode which predicted (DT-4000) or measured (DT-5000) target (fish) size for all files. The resulting data summary files were subjected to an echo counting procedure using a FORTRAN program. This echo counting procedure is best suited for low-density communities where single-target recognition is high.

Target Strength Distribution - Target strength distribution was examined to determine the appropriate analysis threshold which would separate small fish from plankton for both reservoirs. This analysis was conducted on 1996 and 1997 zooplankton data collected at M02, M09, M11, P03, P08, and P14. Data were acquired at a threshold of -90 dB and analyzed for targets found between a range of -40 and -80 dB, representing a target size of 16 cm to 5 mm.

Based on Love's equation (1971) and similar regression research (MacLennan and Simmonds 1992, Fleischer et al. 1997) the size break between small fish and zooplankton appears to fall between a -60 and -65 dB threshold. Numerically, zooplankton dominates the aquatic community so a significant increase in target numbers would be expected as we encroach into that target size regime.

Table 6. Total fish lengths (cm) for dorsal aspect target strengths (-dB) for 430 kHz echosounder.

Decibels (-dB)	-30	-35	-40	-45	-50	-55	-60	-65	-70	-75	-80	-85	-90
Length (cm)	51.2	28.9	16.3	9.2	5.2	2.9	1.6	0.9	0.5	0.3	0.2	0.1	0.05

Figure 19 illustrates fish production in Lake Powell during August 1996 and shows a substantial overlap in the -60 to -65 dB range. Some of these targets may represent the macro-zooplanktor *Leptidora* and/or production of threadfin shad through late summer. Threadfin shad can spawn in late summer, even during their first year (Johnson 1971).

Figure 19. Target strength distribution (-40 to -80 dB) in Lake Powell during August 1996 using a single-beam echosounder.

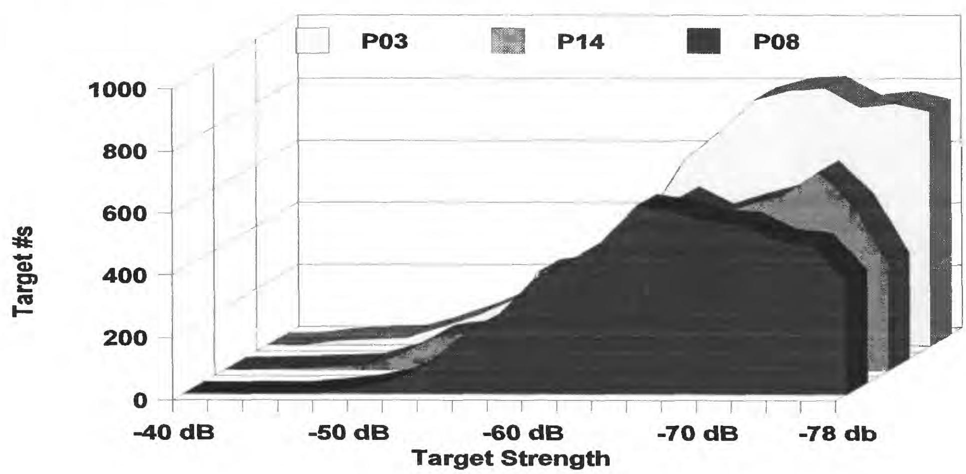


Figure 20. Target strength distribution (-40 to -80 dB) in Lake Mead during August 1996 using a single-beam echosounder.

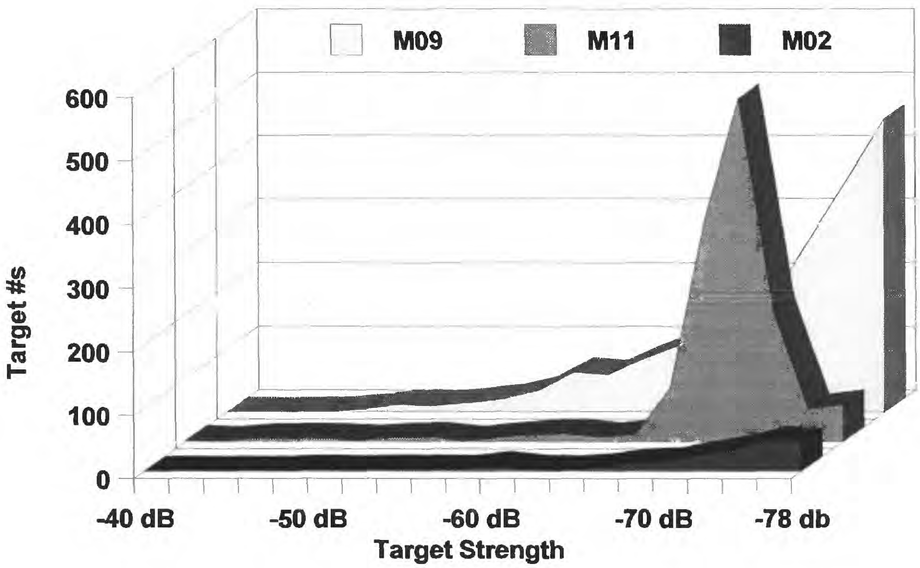


Figure 21. Target strength distribution (-40 to -80 dB) in Lake Powell during August 1997 using a dual-beam echosounder.

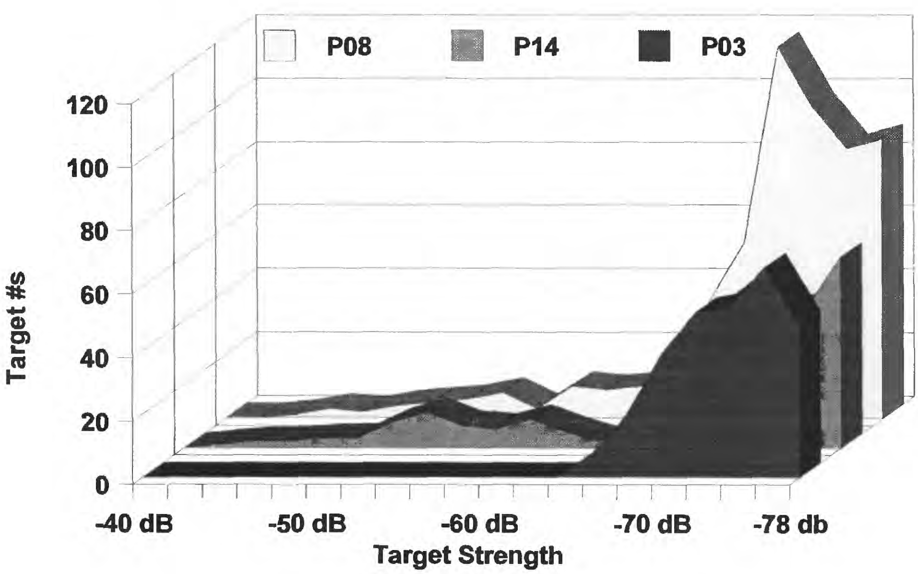
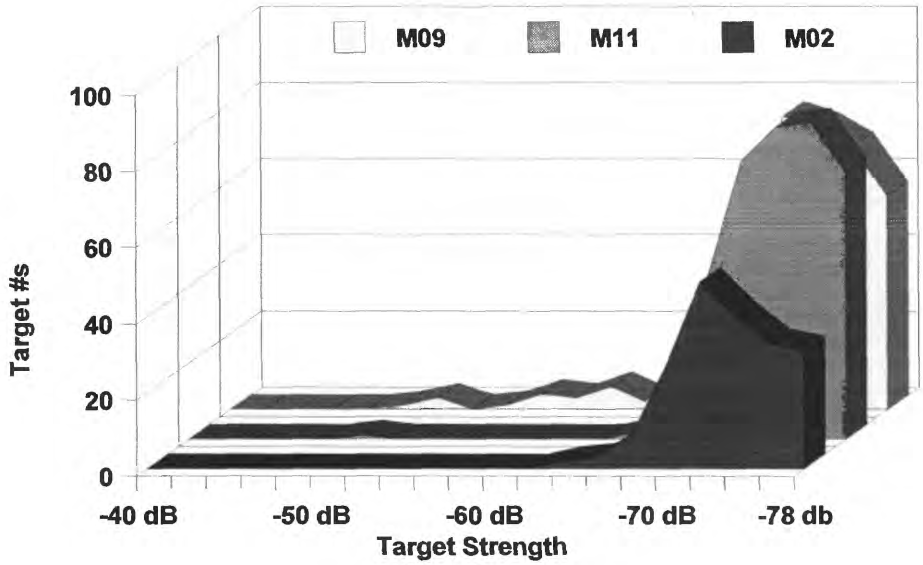


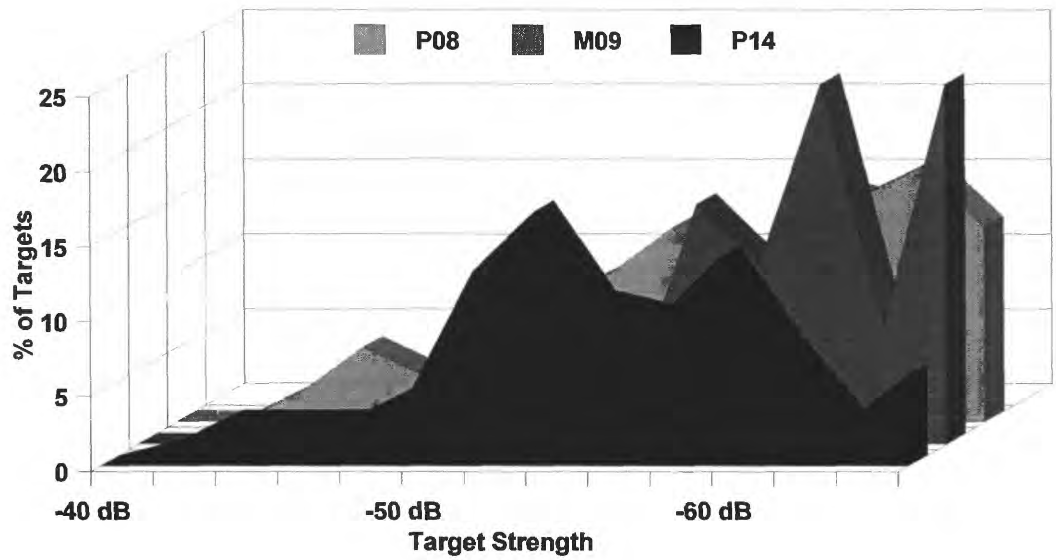
Figure 22. Target strength distribution (-40 to -80 dB) in Lake Mead during August 1997 using a dual-beam echosounder.



In contrast, Figures 20, 21, and 22 show a sharp drop in target numbers at the -65 dB range. These might be more typical of a bimodal target strength distribution showing fish and zooplankton. Fish size (>-60 dB) targets are totally absent from two transects (P03 and M02) in 1997.

Examining the August 1997 zooplankton data (-90 dB) for fish suggested that nearly 50% of the targets detected fell between the -60 and -65 dB threshold (Figure 23). It appears a -60 dB threshold may detect adult and larger juveniles, making it appropriate for the January, May, and November surveys but it missed small young-of-the-year (YOUNG-OF-THE-YEAR (YOY)) fish during late summer and was thus too conservative. For future studies we would recommend that all data be collected at a minimum acquisition threshold of -70 dB.

Figure 23. Target strength distribution (-40 to -80 dB) for August 1997 transects collected at Lake Powell.



Standing Crop Estimates - Length/weight regressions were developed for fish captured by gill nets and used to check software analysis parameters estimating biomass based on fish length. The default of the analysis program uses an average fish length default of 22.4 cm (100 g) to estimate densities. Our length-weight regression for Lake Powell (r^2 =0.988) showed a 224 mm fish weighed 102.7 g while the Lake Mead regression (r^2 =0.985) showed a slightly smaller fish at 99.6 g. Measurements for both reservoirs were pooled and the resulting regression (r^2 =0.988) predicted an average 224 mm fish to weigh 101.0 g. The programs default of 100 g was used for the analysis and in essence, 1 fish = 0.1 kg.

The analysis produced summary output files (CSV) for each analysis run. These files are named using eight characters that identified the reservoir, sample site, transect, and date. The first character designated the lake (M=Mead/P=Powell), the second and third the study site (01-14), the fourth the transect (A, B, C), the fifth and sixth the month, and seventh and eight, the year. For example, file P02ANO97.CSV represents a file collected from Lake Powell (P), study site 2 (02), transect A (A), during November 1997 (NO97).

Data were analyzed in five (echo-counting) and 10 m (echo-integration) depth increments. These strata were further divided into five vertical zones. Fish densities and biomass per surface area (fish-kg/ha) were calculated and averaged to provide a transect value. The three transect values were averaged and 90% confidence limits were calculated for each of the 25 study stations.

Standing crop (kg/ha) was variable, and influenced by schooling behavior, contiguous distribution patterns, location, and seasonality. The highest rates occurred after spawning in August and lows typically occurred just prior to spawning (May). Typically the August values were at least a magnitude greater, then spring measurements. The highest measurement (709 kg/ha) for Lake Powell was recorded at the Colorado River inflow while the Lake Mead high (292 kg/ha) occurred in Las Vegas Bay (Table 7).

Pelagic standing crop estimates were calculated by multiplying the study site values (kg/ha) by their respective surface area. Surface areas of each reservoir zones (Lake Powell n=14/ Mead n=11) were tallied to provide total reservoir values (Appendix G). Pelagic standing crop in Lake Powell ranged from 453,097(±577,365) kg in May 1996 to a study high of 10,852,738 (± 5,195,556)kg in August. Biomass values in 1997 were collected at a higher threshold (-60 dB) which partially explains the decrease to 162,262 (±209,064) kg in May and 2,228,942 (±1,324,614) kg in August (Figures 24 and 25).

Figure 24. Pelagic fish biomass (CL=90%) of Lake Powell measured quarterly from November 1995 through January 1998.

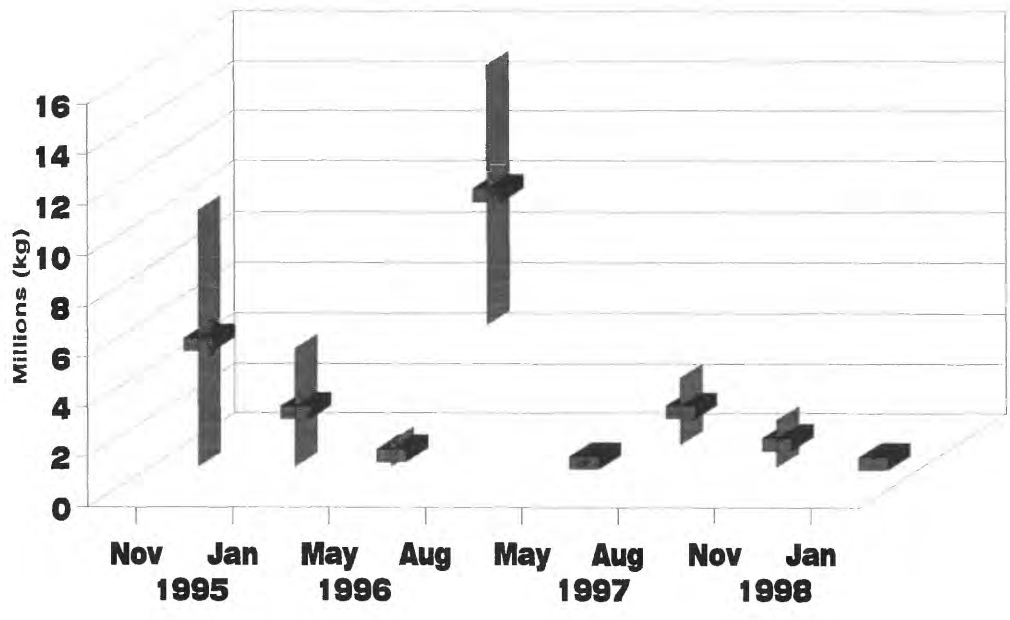


Table 7. Kilograms of fish biomass per surface hectare (90% =Conf. Limits) measured in the pelagic zone (>20 m) of Lake Powell and Lake Mead from November 1995 through January 1998 using echo integration.

Site	**1995---/**	**--------------1996**	**-----------/**		**---------------1997**	**---------------/**		**1998**
	Nov	**Feb**	**May**	**Aug**	**May**	**Aug**	**Oct**	**Jan**
Lake Powell								
P01	0.1 (0.2)	7.2 (12.3)	24.2 (21.0)	136.4 (21.6)	1.3 (-)	0.5 (0.4)	0.9 (-)	4.0 (4.3)
P02	0.1 (-)	3.8 (8.1)	2.3 (1.9)	21.3 (9.5)	0 (-)	1.7 (1.9)	0.1 (0.1)	0.6 (0.6)
P03	-- (-)	63.8 (15.7)	10.7 (4.4)	172.2 (48.8)	1.9 (0.6)	2.7 (1.1)	11.2 (9.2)	1.9 (1.3)
P04	10.2 (5.1)	4.4 (4.5)	4.1 (2.9)	78.2 (15.7)	1.2 (2.1)	1.1 (0.9)	0.2 (0.3)	0.5 (-)
P05	20.5 (13.4)	13.8 (12.9)	3.1 (2.1)	80.0 (14.6)	0.5 (0.7)	3.1 (3.1)	1.2 (0.7)	0.2 (0.1)
P06	4.6 (6.2)	63.3 (98.5)	5.5 (7.9)	170.6 (36.1)	0.4 (0.1)	1.2 (1.4)	1.3 (1.2)	0.9 (0.5)
P07	132.3 (37.6)	-- (-)	1.2 (0.5)	54.2 (6.7)	1.0 (0.7)	4.5 (3.7)	107.5 (76.3)	4.6 (0.8)
P08	--	-- (-)	0.8 (0.5)	240.1 (61.7)	2.3 (0.5)	162.0 (121.0)	59.7(11.1)	10.5 (5.5)
P09	6.5 (4.8)	24.4 (1.1)	5.2 (4.9)	132.9 (4.6)	4.6 (1.1)	4.6 (6.3)	1.2 (0.8)	1.5 (0.6)
P10	59.3 (17.1)	3.0 (1.6)	1.3 (1.3)	272.3 (46.3)	0.5 (0.3)	9.4 (-)	1.0 (0.5)	1.3 (0.4)
P11	91.3 (78.1)	185.7 (142.2)	11.6 (15.1)	33.7 (20.5)	0.2 (0.0)	24.9 (8.9)	6.0 (2.9)	1.6 (2.0)
P12	204.5 (90.5)	15.3 (3.7)	2.8 (2.7)	316.4 (223.9)	11.8 (5.8)	38.1 (30.0)	25.4 (12.9)	2.2 (0.5)
P13	403.3 (266.0)	10.2 (4.7)	10.1 (9.8)	344.2 (55.2)	10.5 (7.6)	98.5 (22.4)	26.4 (14.2)	12.2 (6.1)
P14	295.7 (148.8)	41.5 (11.4)	16.4 (9.1	709.7 (46.5)	1.6 (1.7)	366.4 (33.3)	61.1 (31.6)	5.1 (3.5)
OAK	--	2.5	39.2	255.7	5.7	0.2	--	--
EVAN	261.2	15.9	17.9	--	0.1	--	--	--
W Ck..	--	--	7.9	--	2.5	81.9	--	--
RINC	59.0	--	0	537.0	0.4	--	--	--
Lake Mead								
M01	0 (--)	1.5 (1.0)	4.0 (4.4)	27.5 (8.2)	0.5 (0.8)	53.0 (2.7)	0 (--)	0.1 (--)
M02	29.9 (10.2)	65.7 (10.0)	16.1 (10.9)	62.0 (31.6)	8.6 (6.7)	291.9 (58.2)	16.9 (23.0)	2.9 (0.4)
M03	0.4 (0.6)	0.2 (0.3)	1.9 (2.1)	31.5 (16.9)	0 (0.0)	3.8 (1.3)	0.1 (--)	0.5 (0.1)
M04	0.8 (0.7)	0.5 (0.7)	3.5 (0.5)	30.1 (27.4)	0.2 (--)	41.0 (32.0)	0.2 (0.3)	0 (--)
M05	0.6 (0.8)	0.1 (0.2)	1.9 (1.5)	4.2 (3.1)	0.1 (--)	3.3 (2.3)	0.1 (--)	0. 7 (0.9)
M06	0.6 (0.8)	0.1 (0.0)	0.6 (0.4)	15.4 (8.1)	0.1 (0.1)	2.0 (1.5)	0.9 (0.9)	0.1 (--)
M07	1.2 (0.7)	2.9 (1.2)	2.6 (1.9)	7.3 (0.7)	0.4 (0.4)	6.7 (5.9)	5.3 (1.7)	1.2 (0.8)
M08	39.3 (56.4)	8.6 (0.7)	1.2 (0.8)	27.7 (5.8)	1.6 (0.8)	21.8 (0.9)	17.0 (3.9)	4.4 (1.1)
M09	22.7 (25.0)	4.8 (4.1)	30.9(11.0)	82.2(2.0)	11.1 (8.8)	81.9 (58.8)	41.4 (13.7)	9.4 (5.6)
M10	1.5 (2.0)	0.8 (0.3)	1.0 (0.9)	5.6 (2.8)	2.1 (2.5)	2.8 (2.4)	0.1 (--)	--
M11	51.9(16.4)	9.8 (2.9)	5.9 (2.4)	13.0 (2.6)	1.8 (0.1)	4.7 (2.5)	9.6 (5.0)	0.6 (0.6)
LVB	--	16.7	0.1	624.9	--	991.0	--	19.3

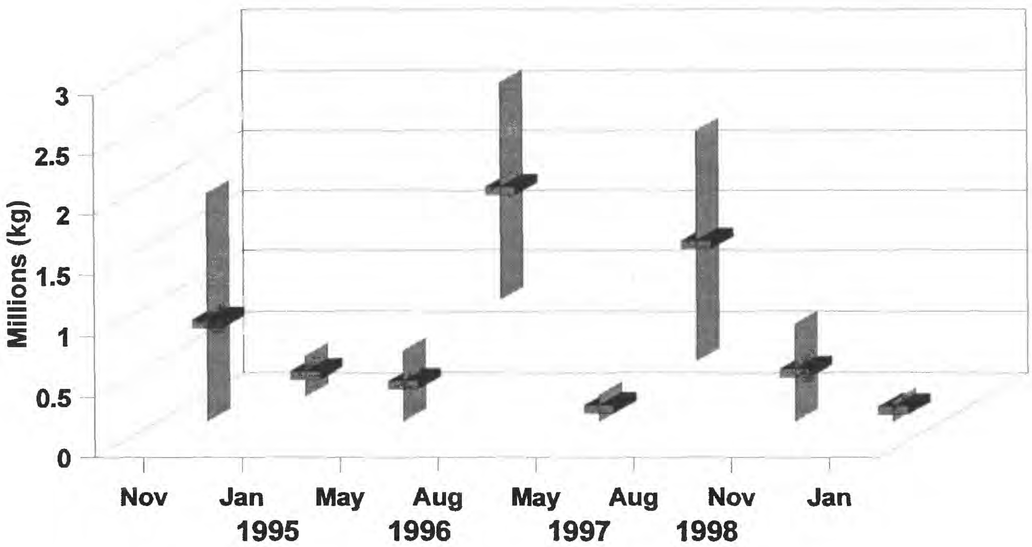


Figure 25. Pelagic fish biomass (CL=90%) of Lake Mead measured quarterly from November 1995 through January 1998.

Seasonal and annual trends were similar in Lake Mead. Standing Crop measurements taken during May and August representing the low and high months and overall production was slightly higher in 1996. Total reservoir biomass was 296,736 ($\pm$288,102) in May and 1,926,697 ($\pm$892,994) in August 1996. Values in 1997 also declined from 1996 levels; 101,016 ($\pm$122,768) kg in May and 1,454,778 ($\pm$948,763) kg in August (Figure 25).

Fish Distribution - The data base contains information pertaining to daily and seasonal migrations. Fish moved vertically and laterally within the water column on a hourly, daily, and seasonal basis. During the summer on bright sunny days striped bass and threadfin shad typically schooled just above the thermocline at depths between 20 and 30 m (Figure 26). It's suspected that the primary parameters that may influence distribution are light intensity, water temperature, predation pressure, and food availability. In late afternoon into the evening, schools would migrate toward the surface (Figure 27).

In late fall and early winter, thermal gradients weaken and fish migrate from shallower to deeper habitats. Fish densities continued to remain relatively high at the inflow areas, however, they did gravitate toward pelagic habitats that were at least >40 m deep. Here they were often found associated with the bottom, but at night they would rise and disperse throughout the water column to feed. Large numbers of fish migrated further downstream to deeper habitats (>100 m) where they often concentrated in stratified zones at depths >50 m. Fish appeared to prefer major side canyons or tributary arms rather than the mainstem channel in Lake Powell. Figure 28 shows an echogram taken in the Escalante Arm of Lake Powell during the January 1998 survey where we detected high concentrations of fish between 50 and 60 m. We did not detect any appreciable difference in temperature (±0.25 °C), however, conductance was slightly higher in this strata.

Geographically, fish distribution was skewed toward inflow and nursery habitats while specific densities were influenced by season, reproductive success, and habitat conditions. In actuality, each reservoir contained three unique and separate pelagic fisheries that were isolated by a region of low productivity. Fish biomass (total kg) in Lake Powell was concentrated at the Colorado River inflow area (45-75%=P14, P13, P12), upper San Juan Arm (6-15% P08, P07), and Warm Creek (0.9-21%= P03) (Figures 29 and 31). Annual fish biomass peaked in August at these three areas and by late fall, early winter, fish moved further down-reservoir to over winter in deeper habitats (P11-P13, P07).

Distribution on Lake Mead was similar. The three highly productive areas were found at Las Vegas Wash (10-59%=M02), upper Overton Arm (4-57%=M11), and the Colorado River inflow (14-59%=M09, M08) (Figures 30 and 32). Production in Las Vegas Bay (M02) appeared fairly consistent from 1996 to 1997, however further up lake we witnessed fairly dramatic shifts in fish biomass. In 1996, the Overton Arm supported the majority (total %) of reservoir wide fish biomass while in 1997 production shifted toward the Las Vegas Wash (M02) and Colorado River inflow area (M09). Standing crop of fish in the Virgin Basin (M05) remained relatively low for both years.

Figure 26. A daytime echogram taken August 1997 on Lake Powell showing fish schools concentrated near the reservoir's thermocline.

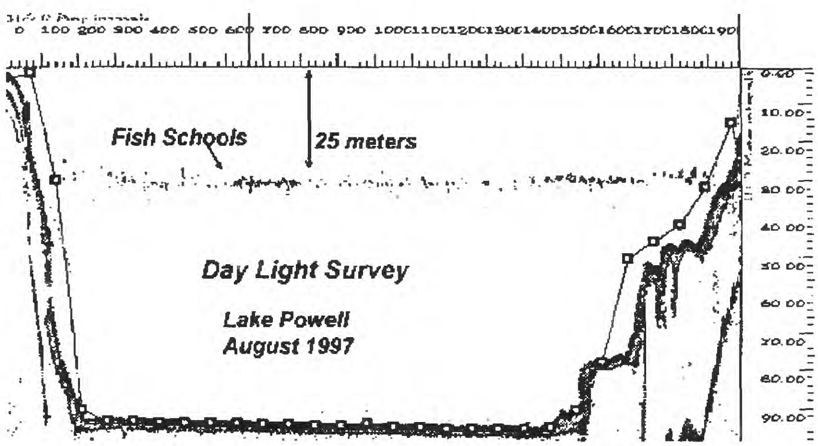


Figure 27. A night echogram showing fish dispersal within the top 20 m of the water column.

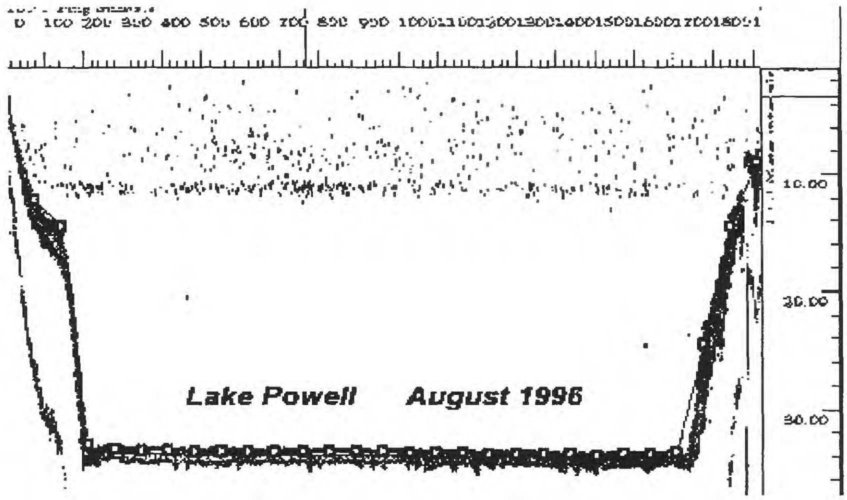
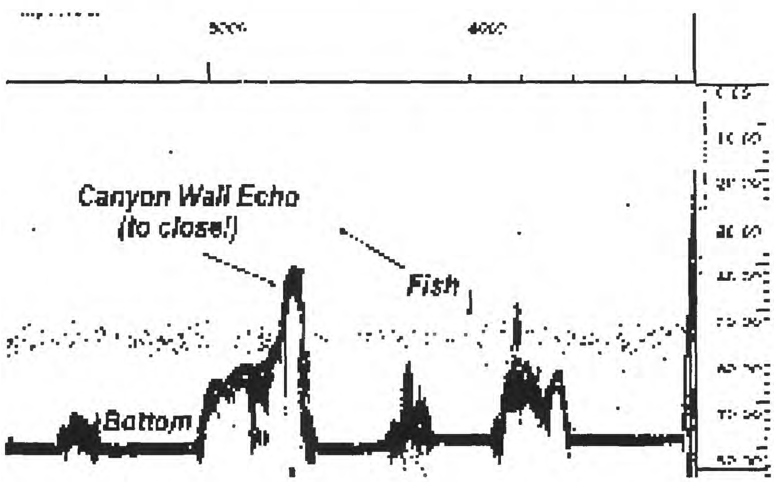


Figure 28. A January 1998 echogram showing fish concentrated at depths >50 m in the Escalante River Arm of Lake Powell.



Fish Densities - Density values calculated through the first analysis run (echo integration with an applied 6.0e-005 sigma) provided a "rough" estimate and was based on the assumption that the average fish size was 22.4 cm. To provide a more accurate numerical fish estimates, we had a subroutine written to echo-count using a simple rectangular geometric space to fish relationship (Dave Marino personal communique). The volume of water being sampled with each ping (6° beam) is simply the volume of a cone. The volume of a given strata is a conical section. Total volume sampled for each transect is found by multiplying the number of pings by the strata volume.

Figure 29. Seasonal distribution of pelagic fish biomass in Lake Mead, Arizona-Nevada from November 1995 through August 1996.

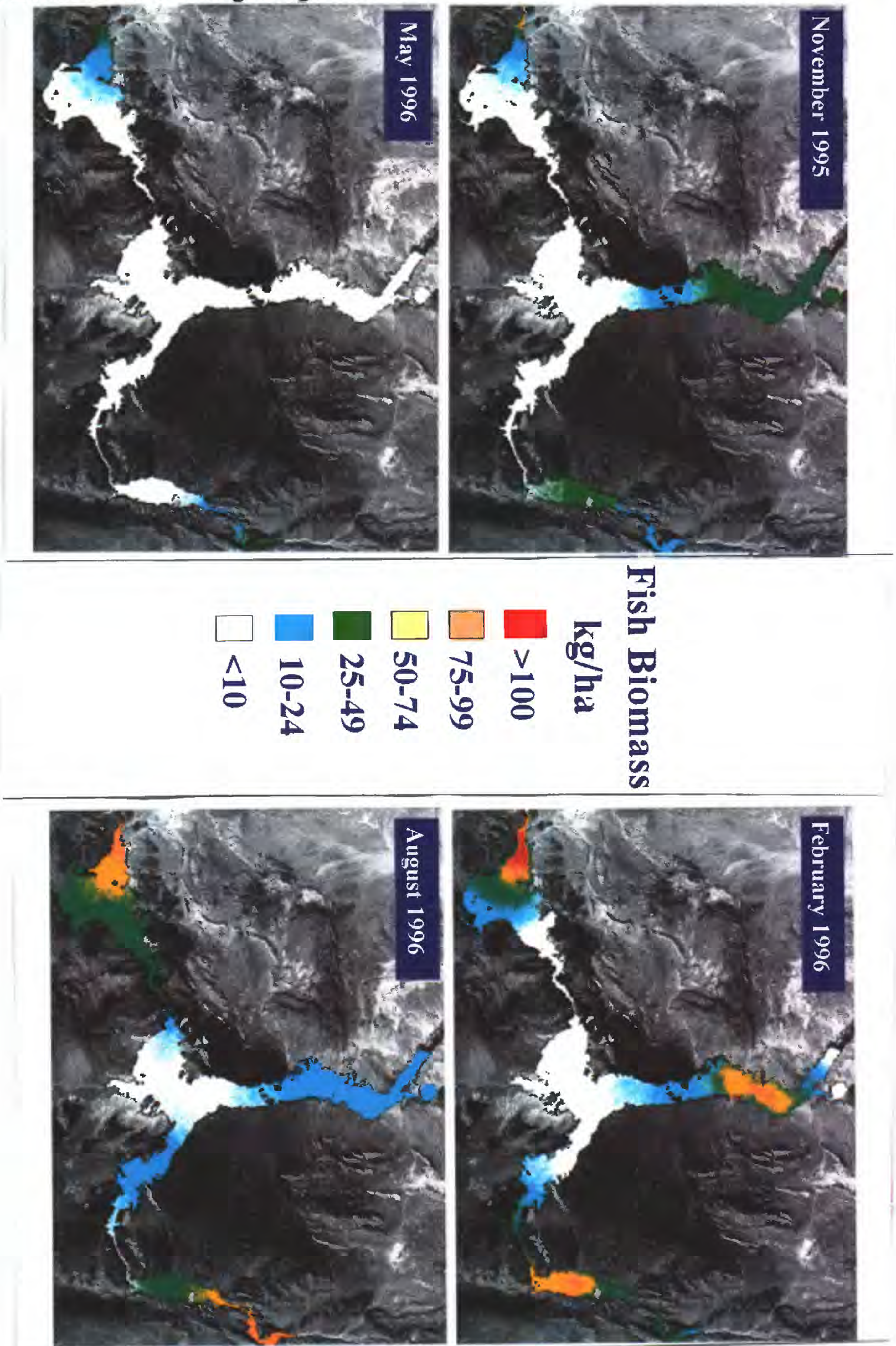


Figure 30. Seasonal distribution of pelagic fish biomass in Lake Powell, Utah from November 1995 through August 1996.

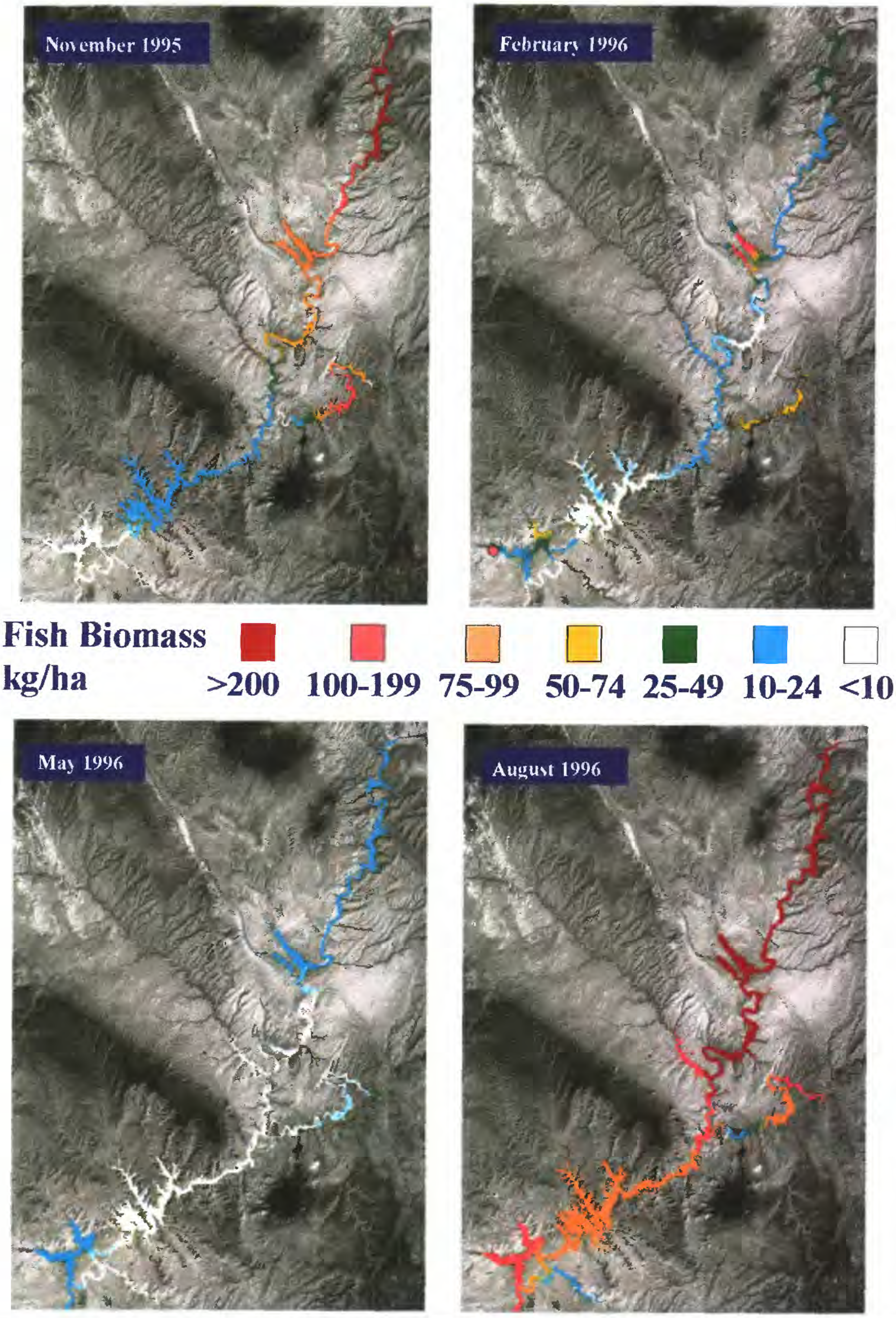


Figure 31. Seasonal distribution of pelagic fish biomass in Lake Mead, Arizona-Nevada from May 1997 through January 1998.

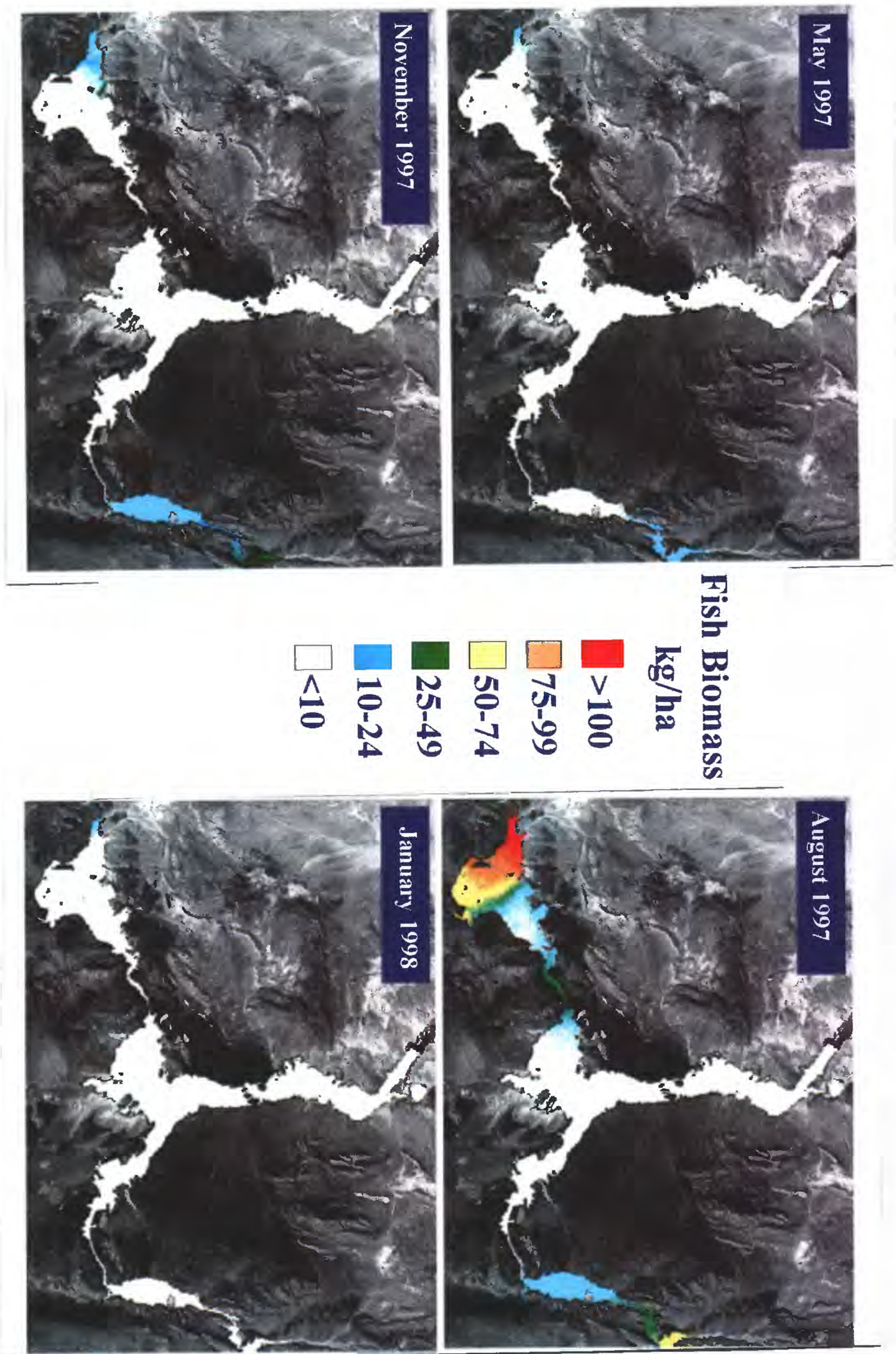
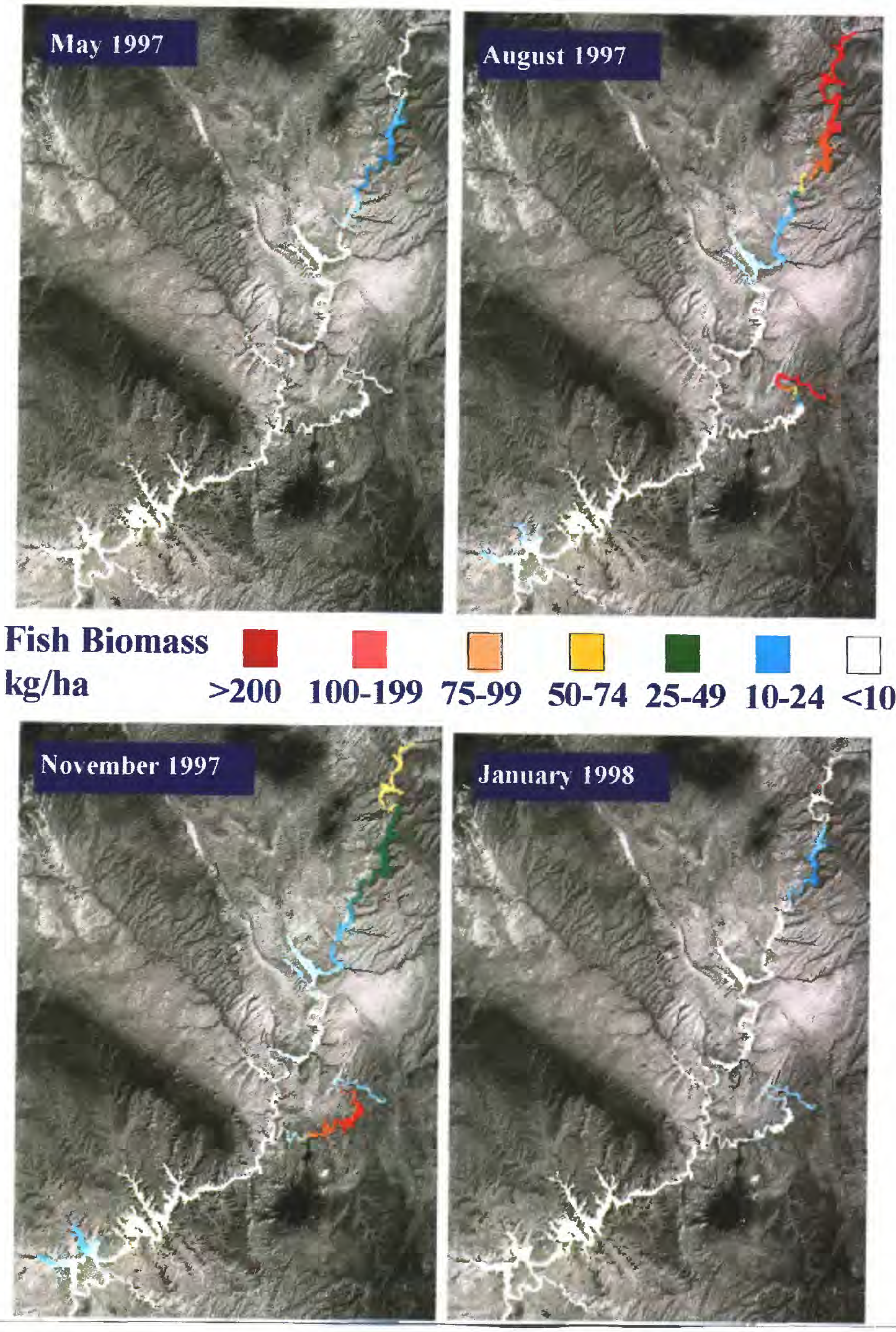


Figure 32. Seasonal distribution of pelagic fish biomass in Lake Powell, Utah from May1997 through January 1998.



Numbers of fish found in specific strata (VERTICAL INTEGRATION RESULTS) is divided by the sample volume to calculate fish/m^3. Strata values (fish/m^3) are summed to compute surface densities (fish/m^2 or fish/ha). A summary of fish density data is provided in Table 8. More in depth information including statistics can be found in Appendix H.

Table 8. Fish densities (fish/ha) measured in the pelagic zone (>20 m water column) of Lake Powell and Lake Mead from November 1995 through January 1998 using echo counting techniques.

Site	1995---/	--------------1996	-----------	/---------------	1997-------	--------	/1998	
	Nov	**Jan-Feb**	**May**	**Aug**	**May**	**Aug**	**Oct-Nov**	**Jan**
Lake Powell								
P01	1.2	31.8	363.3	3,000.9	8.1	40.4	0.7	13.4
P02	0.9	8.5	19.4	3,128.1	0.6	5.4	5.4	5.9
P03	--	4,946.7	1,127.6	29,655.9	15.6	80.1	94.5	76.2
P04	14.0	6.3	94.0	22,833.3	2.5	3.4	4.5	5.2
P05	72.8	263.0	143.5	9,202.9	2.7	57.3	11.2	10.2
P06	56.3	30.8	45.8	5,005.3	10.1	42.5	6.4	18.5
P07	573.8	--	8.5	10,676.7	10.7	32.6	6,549.1	98.7
P08	--	--	22.4	50,093.2	256.8	19,997.3	477.5	205.6
P09	99.2	65.6	65.1	2,787.9	11.5	12.8	9.8	163.1
P10	152.6	72.2	4.7	57,158.7	7.6	25.4	18.8	60.5
P11	338.6	391.9	84.3	659.9	0.0	173.5	171.1	22.17
P12	651.2	64.8	14.8	3,018.5	160.4	101.8	241.9	37.0
P13	1,286.8	238.8	172.2	44,746.7	314.1	7,958.0	2,275.7	162.9
P14	1,162.2	1,758.6	537.7	124,667.9	59.2	40,001.6	1,885.3	74.2
Lake Mead								
M01	6.2	366.3	27.1	596.1	2.5	0.5	0.6	1.9
M02	123.8	623.2	577.4	8,355.9	159.2	15,131.4	25.6	81.3
M03	4.0	0.0	28.1	794.1	0.4	45.5	3.5	14.1
M04	26.2	242.6	15.3	1,093.6	0.1	380.1	3.9	1.4
M05	2.5	2.0	10.1	537.9	0.5	185.9	1.5	0.8
M06	3.2	0.1	32.3	1,755.5	1.8	62.9	3.7	3.9
M07	10.2	16.0	58.2	474.2	107.9	257.2	41.9	21.3
M08	41.0	194.0	19.6	2,218.2	9.4	2,024.0	1,184.2	127.1
M09	553.8	819.1	922.9	8,818.5	1,362.8	1,863.3	253.1	151.8
M10	6.2	62.5	25.1	501.9	9.6	136.6	2.5	----
M11	83.3	193.6	889.8	1,185.6	93.7	147.6	660.1	14.3

Fish densities (and biomass) for both reservoirs declined from August 1996 to August 1997. Average reservoir fish densities dropped from 26,188 to 2,605 fish/ha for Lake Powell and 2,394 to 1,840 fish/ha for Lake Mead. Pelagic population estimates dropped from 276 million to 90 million in Lake Powell. Lake Mead experienced similar, but less severe decline from 108 million to 66 million fish. The vast majority (99%) of these fish were small (<16 cm) and suspected to be threadfin shad.

Table 9. Fish densities (fish/ha) and reservoir population estimates measured in the pelagic zone (>20 m water column) of Lake Powell and Lake Mead in August of 1996 and 1997 using echo counting procedures*.

Site	August 1996			August 1997		
	Average (fish/ha)	SD	Total Est. (CL=90%)	Average (fish/ha)	SD	Total Est. (CL=90%)
Lake Powell						
P01	3,001	292	659,478 ±108,458	40	56	8,883 ±54,918
P02	3,128	1,605	9,486,405 ±8,206,159	5	3	16,134 ± 43,458
P03	29,656	3,902	212,805,859 ±47,200,588	80	52	574,786 ± 632,982
P04	22,833	2,126	377,218,091 ±59,228,011	3	3	55,344 ± 92,350
P05	9,203	3,428	55,399,033 ± 34,785,131	57	47	344,088 ±473,873
P06	5,005	1,181	9,538,236 ±3,794,282	43	61	81,009 ±195,977
P07	10,677	1,564	24,190,481 ±5,974,885	33	32	73,840 ±122,961
P08	50,093	11,260	104,589,530 ±39,635,775	19,997	16,892	41,752,342 ± 59,458,193
P09	2,788	687	4,414,947 ±4,862,043	13	17	20,255 ±122,590
P10	57,092	17,683	300,907,351 ±157,962,239	25	NA	133,611 ±NA
P11	660	78	4,059,225 ±797,895	174	58	1,067,427 ±597,314
P12	3,019	1,143	13,354,174 ±8,525,468	102	102	450,504 ±757,447
P13	44,747	6,813	194,811,023 ±50,003,602	7,958	2,738	34,646,441 ±20,096,533
P14	144,668	28,684	360,195,570 ±32,125,662	40,002	13,798	115,574,078 ±67,209,616
	26,188 average		276,154,720 ±311,044,180	2,605 average		90,782,071 ±149,858,212
Lake Mead						
M01	596	93	72,375 ±50,742	<1	<1	55 ±345
M02	8,356	6,412	24,422,211 ±31,595,462	15,131	7,426	44,225,090 ±36,590,571
M03	794	301	8,202,179 ±5,235,231	46	31	470,390 ±533,501
M04	1,093	1,036	1,301,565 ±2,078,850	380	305	452,403 ±612,332
M05	538	629	8,618,377 ±16,973,838	186	87	2,978,589 ±2,356,307
M06	1,755	1,186	9,063,979 ±10,324,978	63	51	324,866 ±445,168
M07	474	187	306,273 ±203,413	257	394	166,100 ±428,787
M08	2,218	611	8,957,435 ±11,013,191	2,024	728	8,173,074 ±4,953,941
M09	8,818	4,664	30,520,863 ±27,213,705	1,863	1,679	6,448,916 ±9,794,353
M10	502	242	1,497,483 ±1,216,532	137	125	407,569 ±630,373
M11	1,186	245	15,177,295 ±5,292,000	148	32	1,889,241 ±687,055
	2,394 average		108,140,035 ±111,197,942	1,840 average		65,536,293 ±57,032,733

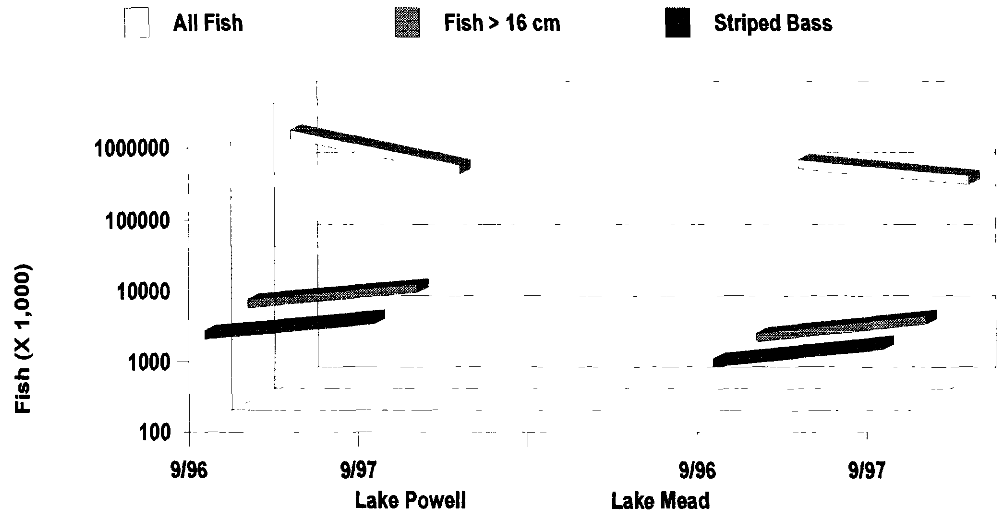
* -60 dB analysis threshold

Table 10. Reservoir population estimates of large fish (>16 cm) detected in the pelagic zone of Lake Powell and Lake Mead in August of 1996 and 1997 using echo counting procedures.

	-----------August 1996-----------			--------------August 1997--------------		
Site	**Fish >16 cm (Fish/ha)**	**SD**	**Total Fish # (CL=90%)**	**Fish >16 cm (Fish/ha)**	**SD**	**Total Fish# (Cl=90%)**
Lake Powell						
P01	42.1	19.7	9,232 ±7,306	0.1	0.1	13 ±37
P02	56.2	19.2	170,376 ±98,391	3.1	0.1	9,492 ±1,637
P03	100.1	3.8	718,016 ±45,926	37.5	52.9	268,951 ±640,081
P04	4.4	2.4	72,690 ±6,608	2.4	1.7	38,988 ±47,909
P05	5.9	3.9	35,516 ± 39,732	52.0	43.4	313,267 ±440,823
P06	138.4	118.3	263,761 ± 379,939	5.3	7.2	10,005 ±23,051
P07	9.1	6.6	20,550 ± 25,376	13.0	9.5	29,500 ±36,478
P08	11.0	7.5	23,050 ± 26,304	16.2	7.8	33,720 ±27,351
P09	37.1	54.6	58,674 ± 145,850	4.3	6.1	6,826 ±43,074
P10	7.5	2.8	39,220 ± 24,953	17.9	--	94,391 ± --
P11	15.0	10.8	92,448 ± 112,377	71.3	59.6	438,313 ±617,550
P12	161.3	129.6	713,560 ± 966,223	9.1	8.5	40,126 ±62,821
P13	44.3	18.7	192,779 ± 137,225	422.9	188.6	1,841,111 ±869,929
P14	28.1	16.3	81,303 ± 79,159	337.3	228.9	974,396 ±1,114,576
Total			2,491,176 ± 2,095,369			4,099,098 ±3,925,317
Lake Mead						
M01	2.6	1.4	312 ± 765	0.0	0.0	0 ± 0
M02	15.2	12.5	44,309 ± 61,669	125.6	45.2	287,991 ± 222,125
M03	39.2	63.4	404,903 ± 1,104,170	3.0	3.6	30,574 ± 63,007
M04	3.5	4.1	4,201 ± 8,211	8.4	10.3	10,022 ± 20,587
M05	8.5	11.6	135,704 ± 314,012	0.9	0.7	14,099 ± 17,624
M06	10.2	14.6	52,871 ± 127,010	2.8	2.6	14,508 ± 22,201
M07	3.8	2.7	2,422 ± 2,971	8.2	8.4	5,264 ± 9,107
M08	4.4	3.3	17,727 ± 59,278	56.2	15.5	226,739 ± 105,392
M09	23.9	28.7	82,718± 167,512	205.1	179.2	709,747 ± 1,045,568
M10	13.5	19.6	40,396± 98,439	3.4	4.8	10,084 ± 24,162
M11	4.6	4.9	59,143± 106,248	14.3	3.2	183,445 ± 69,125
Total			844,706± 2,053,263			1,492,474 ± 1,598,898

It is interesting to note that the proportion of large to small fish shifted. While the overall pelagic standing crop declined (-67%), the number of large fish increased 300% (Figure 33). Lake Mead's decline was slightly less at 39%, while the increase of larger fish (+288%) was similar to Lake Powell's.

Figure 33. Comparison of the total numbers of pelagic fish, fish larger than 16 cm, and striped bass found in Lake Powell and Lake Mead during August 1996 and 1997.



Striped Bass and Carp Population Estimates - Large fish (non-shad >16 cm) population estimates were developed for the August 1996 and 1997 surveys using echo-counting techniques and species composition information derived from vertical gill netting. Summary of the density output for fish >16 cm (-40 dB) is provided in Appendix J. Striped bass represented 74.3% and 89.4% of the larger fish netted in Lake Powell and Lake Mead while carp represented 19.7% and 6.7% respectively. In August 1996, it's estimated the striped bass community in Lake Powell numbered 1,850,943 ($\pm$1,556,859) while Lake Mead supported 755,167 ($\pm$1,835,886). Large fish numbers increased by nearly 70% in 1977. Pelagic striped bass numbered 3,045,630 ($\pm$2,916,510) in Lake Powell and 1,334,272 ($\pm$1,429,415) in Lake Mead (Table 11). Carp made up a higher percentage of the pelagic fishery in Lake Powell (19.7 versus 6.7%) compared to Lake Mead. Carp numbers ranged from over 807,000 in Lake Powell to a high of 137,000 for Lake Mead.

Table 11. Reservoir population estimates for the pelagic striped bass, carp, and walleye in Lake Mead and Lake Powell from November 1995 through January 1998.

Species	%*	August 1996	August 1997
Lake Powell			
Striped Bass	74.3	1,850,943 ± 1,556,859[1]	3,045,630 ± 2,916,510
Carp	19.7	490,762 ± 412,788	807,522 ± 773,287
Walleye	3.8	94,665 ± 79,624	155,766 ± 149,162
Lake Mead			
Striped Bass	89.4	755,167 ± 1,835,885	1,334,272 ± 1,429,415
Carp	6.7	56,595 ± 137,569	99,996 ± 79,624

*Based on combined gill net capture data (November 1995 - January 1998)

[1] Confidence limits = 90%

DISCUSSION

Technical advances in the past decade in computer technology, digital processing, and miniaturizing-electronics has substantially advanced fishery acoustics. While systems have become more economical and data acquisition easier, sampling design, data interpretation and presentation continue to challenge investigators. Analysis demands a skill in electronics, physics, and computer technology, but just as important is an understanding of specific aquatic communities. The marriage of these sciences is essential for accurate and meaningful data interpretation.

A critical challenge is the categorizing or separating of macro plankton from small fish. Echosounders can detect "targets" smaller than 500 μm (-90 dB), however they can not identify targets. Data interpretation balances on the investigators' familiarity with the composition and size of small fish and macro-zooplankton.

The problem of misinterpreting macro-zooplankton as small fish has occurred on Lake Mead (Mueller 1993) and Lake Havasu (BioSonics 1986) where there was either no distinction made between these organisms or large zooplankton may have been misinterpreted as small fish. There are several large zooplanktors, such as *Chaborous (*Boxrucker 1996), *Mysis,* and *Leptodora kindti* that can grow larger (18 mm) than most meta-larval fish (Snyder 1981). While the baseline acoustical data for these studies remain valid, data interpretation may be flawed.

A review of the plankton community (which included *Leptodora*) and estimated target strength correlations, convinced us that a -60 dB analysis threshold (2 cm) was necessary to separate *Leptodora* from juvenile fishes. However, following data collection we discovered published evidence that suggests the standard target strength regressions used by our analysis software and the acoustic community for over 2 decades might be in error (MacLennan and Simmonds 1992, Fleischer et al. 1997). Our data support the contention that actual thresholds for small fish may have been over estimated. For instance, the acquisition threshold for 2-cm targets would probably be closer to a -65 dB threshold (MacLennan and Simmonds 1992) than the -60 dB derived by Love's equation (Love 1977).

Comparison of target strength distribution of the -60, -65, -90 dB data sets for August 1997 suggests that the -60 dB threshold may have under estimated fish densities by 50%. It appears substantial numbers of small fry were not being detected at a -60 dB threshold. This was not a problem for other survey periods when fish had grown larger than three centimeters.

The Pelagic Community

Data illustrated pelagic fish communities were highly mobile, moving vertically, laterally, and longitudinally on a diel and seasonal bases. These movements, especially seasonal migrations between shallow and deeper habitats, can greatly influence population estimates. August surveys provided the highest estimates reflecting annual production. These measurements should be considered conservative, since young fish located within a meter of the surface cannot be detected.

Young fish survival is typically low as larvae and fry compete for food and attempt to avoid predators. Fall and spring surveys were influenced by fish moving between the pelagic and littoral zones to spawn and feed and during the winter, fish migrate into deeper seasonal habitats making them more detectible to acoustics. Winter surveys would be the most appropriate time to estimate carrying capacity and brood stock levels of threadfin shad and striped bass.

Pelagic fish communities of both reservoirs were highly variable. Downstream and central portions of both reservoirs can be described as being highly oligotrophic. Primary production (chlorophyll-*a*) in the central portions of the reservoirs is typically <2 *u*g/L (Paulson and Baker 1983) which is normally considered inadequate to sustain any appreciable levels of plankton or planktivorous fish (<10 kg/ha). These extremely low fish densities are contrasted by high primary production found in the inflow areas. These sites support three distinct pelagic fisheries in both reservoirs.

On Lake Powell, pelagic fish production was greatest at Warm Creek and the Colorado and San Juan Rivers where primary production is supported by nutrient loading (phosphorus). Lake Mead's pelagic fishery is supported by high productivity found in Las Vegas Wash and by inflows from the Colorado and Virgin Rivers. It's believed these communities expand and contract with changes in nutrient inputs, primary production, and spawning success. Actual recruitment appears dependent upon a multitude of other physical and biological factors such as food availability, habitat quality and quantity, and predator prey relationships.

Boom and Bust Fishery

When conditions are favorable, as they were in 1995 and 1996, pelagic communities can rapidly expand laterally, from nursery habitats down reservoir. Fish densities increased 3 to 4 orders of magnitude reflecting the fecundity of both threadfin shad and striped bass. Depended upon the size of the female, threadfin shad are capable of producing 800 to 21,000 eggs and are able to spawn their first year (Johnson 1971). A mature striped bass can annually produce 11,000 to 1-2 million eggs (Minckley 1973, Moyle 1976). This reproductive ability, coupled with favorable habitat conditions and food availability, permits both species to rapidly expand their populations.

Striped bass were introduced to take advantage of abundant shad populations. They have. Unfortunately their reproduction and growth potential can devastate shad and other potential prey species, literally overwhelming their food supply. This boom and bust phenomena is most pronounced in reservoirs that have simple prey bases like Lakes Powell and Mead (Axon and Whitehurst 1985).

Our data suggest total fish biomass for both reservoirs declined between August 1996 and 1997. This correlates nicely with larval shad trawl data collected by UDOWR (unpublished data -George Blommer) and similar trawling data for Lake Mead (Jim Hendricks) while large (>16 cm) fish numbers actually increased by nearly 300%. While we have only 2.5 years of data, we believe this shift in predator/prey composition illustrates the intersect of an increasing predator community at the expense of its prey base. The abundance of shad in 1996 apparently carried over into 1997 to support a thriving striped bass community. However, when we finished our field surveys in January 1998, we observed emaciated and dead striped bass in Lake Powell and reports of poor conditioned bass in Lake Mead. This supports earlier speculations that a shrinking forage base leads to a rapid decline in the striped bass fishery (John Hutchings -NDOW, Wayne Gustaveson-UDOWR personal communique).

Area biologists have studied the cyclic and dynamic nature of these fisheries. Persons and Dreyer (1987) showed a decline in condition factor and striped bass size before and after 1980. Some of these declines were attributed to reductions in nutrient loading associated with the closure of Glen Canyon Dam (NDOW 1980). There have been studies examining the merits of augmenting this loss with artificial fertilization (Paulson and baker 1984). The hypothesis being that increased productivity would be a stabilizing force. Unfortunately, investigators found nutrient uptake was rapid, with little or no measurable long-term benefits.

Our data suggests there were roughly twice as many fish in the pelagic zone of Lake Powell as compared to Lake Mead. Lake Powell may be more productive, however, it appears more vulnerable (rate and frequency) to the dramatic shifts in standing crop, species composition, and predator/prey ratios. Reduced nutrient inflows from the Colorado River and fairly consistent nutrient inputs from Las Vegas Wash may provide some degree of stability to the Lake Mead pelagic fishery.

Fish Movements

Pelagic fish densities and distribution are also influenced by the more subtle changes of season. Numerically, fish peaked following spawning and gradually declined, due to natural mortality, predation, and harvest until the next spawning cycle. Distribution within the reservoir remained high at, or near the three inflow nursery areas. During the summer, fish are typically found near the surface taking advantage of warmer temperatures and abundant food. Larger fish were typically found near or below the thermocline, inhabiting deeper cooler habitats. It's suspected the majority of the large fish were striped bass and carp, and in the case of Lake Powell, some walleye. In the fall, as reservoir temperatures cool, fish migrated from shallow to deeper habitats where they concentrate at depths greater than 40 m. Fish in Lake Powell typically moved to the side canyons during the winter where they were found in narrowly defined depths ranging between 40 to 80 m. These seasonal movements were quite evident in Bull Frog Basin, Piute Basin, and the Escalante River Arm. Seasonal distribution shifts were similar on Lake Mead where fish moved down reservoir from inflow areas to deeper portions of Gregg's Basin, Overton Arm, and Las Vegas Bay.

We also observed diel movements of shad and striped bass. Fish were typically found schooling at greater depths during daytime hours. In winter they were often detected on, or just above the bottom (depths <50 m). During the summer, fish formed schools near or just above the thermocline. Schooling fish became more active at dusk, dispersing toward the surface (Luecke and Wurtsbaugh 1993). Boisclair (1998) reported that horizontal migrations of shoreline fishes into pelagic zones can also occur at night. These movements are undoubtedly complex and influenced by factors such as food availability, thermal stratification, thermal preferences, light intensity, feeding behavior, and predator-prey interactions.

RECOMMENDATIONS

Hydroacoustics proved to be an effective technique to quantify the pelagic fishery of both reservoirs. Its application has both long-term and immediate management implications. On a long-term basis, the development of reservoir standing crop data would help monitor changes in reservoir carrying capacity. Without this type of data resolution, it would be virtually impossible to measure, let alone detect, changes in reservoir productivity resulting from subtle differences in climate change, reservoir operation, water quality, or habitat conditions.

This technology also provides resource managers cost effective and rapid information at a resolution not previously available. Based on our experience, a complete reservoir survey similar to our study design and data analysis could be completed by a team of two biologists in less than two weeks. The resulting data would provide managers extensive and timely plankton and fishery information that could be used in management decisions. Data would provide information on densities, population estimates, size distribution, and location and allow managers the option of passing this information along to anglers to increase harvest.

Another useful application would be its use to measure and monitor habitat degradation due to siltation and/or problems associated with water quality. A good example is Las Vegas Bay. Here organic loading has resulted in high rates of oxygen demand. During summer stratification, hypolimnetic habitats that are normally used by striped bass are totally anoxic. Fish either cannot survive or avoid in these low oxygen environments. Our system can three dimensionally map the bathometry and "fish free" zones. In essence, the absence or presence of fish would help describe dissolved oxygen conditions without the need to conduct extensive and timely water sampling. The bay could be easily mapped in a day which would provide information on current conditions and additional surveys would provide information on the expansion or contraction of these zones.

The ultimate monitoring goal would be to survey both the pelagic and littoral zones to estimate total reservoir biomass. Our transect data does include near shore (<20 m depths) data, however, we feel it's far too limited to accurately describe littoral communities. A more extensive survey design may be needed to address differences in species composition, species specific use of coves and structure, potential diel movements of shore oriented fishes into the pelagic zone to feed, and seasonality issues.

Acoustics could also be used to determine fish vulnerability to entrainment. Reclamation is currently examining possible fish entrainment at both Glen Canyon and Hoover Dams. Acoustics would provide density data at specific depths, providing operators information concerning densities of fish that might be vulnerable to entrainment or passage. For instance, Glen Canyon Dam is currently examining the release of surface waters to warm downstream releases. Based on the limited data we collected near Glen Canyon Dam in August 1996, fish densities suggest that surface withdrawals (10,000 cfs) could result in the passage of nearly 250,000 fish/week.

We recommend that future data be collected at a maximum low threshold of -70 dB. We also suggest that reservoir wide surveys be conducted at least once a year, preferably in late winter before fish move out of the deeper habitats to spawn. We feel transect data variability could be improved. Future monitoring should pay closer attention to bathometry to improve transect similarity.

ACKNOWLEDGMENTS

The study would not have been possible without the cooperation, assistance, and generosity from Wayne Gustaveson, George Blommer (UDOWR), Tom Liles (AGFD), John Hutchings, Jim Hendricks (NDOW), John Ritenour (GCNRA), Kent Turner (LMNRA), Tom Burke (BOR) and their respective staffs. Ray Bark assisted in data analysis, Blair Hanna helped develop the echocounting program, and numerous people aided in data collection. We give a special thanks to Dan Wiggens and Dave Marino (BioSonics) who answered countless questions regarding the analysis program and to the staff of the Lower Colorado Regional Office (BOR) for providing office and storage facilities and logistical support. Work was conducted under permits issued by NPS, NDOW, AGFD, and UDOWR. The study was funded jointly by USGS and Reclamation.

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ANALYSIS SETTINGS AND FORMAT

The following is a description of the methods and settings we used to analyze the data presented in this report.

Enter ***Visual Analyzer***----hit File, --hit Open Data File..
Select appropriate drive, and file name (*.dt4)--OK
Display Position Run entire file
Time-Varied-Gain 40
Transducer Default
Setting for Display and Analysis Threshold -65 or -60
'(analysis threshold must be =< aquisition threshold)
Absorption Coefficient Default
Salinity 0.0
Temperature 10, 15, 20 dependent upon season
Calibration offset -30 dB for biomass* 0. for echocounting
* the -30dB was used to amplify targets located deeper than 10 m which would otherwise have been lost. The amplification must be taken out during the analysis phase by subtracting the default sigma (6.0e-005) by -30dB or -003, setting sigma to 6.0e-002.

OK Echogram program starts running
Configure--hit *Bottom Tracking*--hit *Advanced Setting*-- activate *Contiguous*--OK--OK--
Configure--hit *Echo Recognition*--set *Target Threshold* -65 or -60 dB--OK
Configure--hit *EI/TS Analysis Setting*--hit *Reports and Strata*--
set ***Minimum Distance*** to 1 or 2m
(1m is the default appropriate for calm conditions, 2 m for waves or stormy conditions)
Maximum Distance-- This is specific to file or season. Select bottom depth or area below the majority of fish, (Normally 20-30 in summer, to 50-70 in winter)
Number of Strata--normally 3-5 for biomass (10 m depth increments) or 20 for echocounting (1m depth increments)
Number Reports 1 --OK-- ***EI Scaling/TS/Threshold***-- Sigma 6.e-005 (biomass) or set Output a use for EI (to conduct target strength analysis and echo counting) --set Selected Resolution and enter First and Last Ping number (ping number when depths >20 m and ping number when depths <20 m)--OK--
"icons"--hit ***show bottom***--hit ***edit bottom***--hit ***Redraw echogram***(completed)--manually edit bottom (using the cuser to move editing chain)--hit ***save edit***--
hit ***Analyze***--hit ***preform analysis***--Analyzer "***Preform analysis on viewed area only***?-- hit-No

Analysis begins.---ends--hit ***Report***--select a Name file(*.csv)-- hit OK--
hit "icon"- ***review results*** (to examine data summary) Once the summary file is closed it can only be opened to review from outside the analysis program (i.e notebook, windows, spreadsheet programs). Back out to start over.

DESCRIPTION OF THE DT ANALYSIS REPORT FORMAT

(Echo integration)

DT ANALYSIS REPORT,

DATAFILE INFORMATION,

--,

Analysis Version:, Visual Analyzer Version 2.1.1,
File Name:, E:\P02A.DT4,
Data Threshold:, -70.00, dB,
Threshold Type:, squared, **<u>Information pertaining to equipment and conditions</u>**
Ping Rate:, 2.00, pps,
Collection Range:, 0.98, to, 142.63, m,
Pulse Width:, 0.40, ms,
Absorption Coefficient:, 0.036372, dB/m,
Salinity:, 0.00, ppt,
Water Temperature:, 20.00, deg C,
Sound Velocity:, 1522.16, m/s,

TRANSDUCER INFORMATION,

--,

Serial Number:, 49526,
Beam Width:, 6.00, deg, **<u>Equipment specification</u>**
Transmit Frequency:, 420000, Hz,
Transmit Source Level:, 219.00, dB//uPa,
Receive Sensitivity:, -52.00, dBC/uPa,
Calibration Correction Narrow Beam:, -30.000, dB, **<u>A calibration setting used to amplify targets</u>**
Beam Pattern Factor:, 0.000991,

ANALYSIS PARAMETERS,

--,

Analyzed As: Single-Beam
Ping Range:, 10, to, 1950,
Sample Range:, 12.0, to, 42.0, m, **<u>Depth of analysis</u>**
Data Threshold:, -60.00, dB,
Number Strata:, 3, **<u>Number of depth increments</u>**
Number Reports:, 1,
Density Scaling Constant:, 1.052194e-014,

BOTTOM TRACKER PARAMETERS AND RESULTS,

--,

Bottom Threshold:, -3.00, dB,
Bottom Width:, 0.09, m,
Blanking Threshold:, -60.00, dB,
Blanking Zone:, 0.23, m,

Blanking Type:, CUMULATIVE
Alarm limit:, 05, pings,
Tracking Window:, 1.79, m,

Number processed:, 1941, pings, **Number of samples or pings examined**
Number found:, 1941, pings,
Find rate:, 100.00%,

VERTICAL INTEGRATION RESULTS,
---,

STRATA	TOP	BOTTOM	Sv (dB)	Applied Sigma	FPCM	
1	12.0	22.0	-4.299652e+001	6.000000e-002	8.359816e-004	**Fish Per Cubic Meter**
2	22.0	32.0	-4.539699e+001	6.000000e-002	4.810048e-004	
3	32.0	42.0	-5.585411e+001	6.000000e-002	4.329502e-005	

HORIZONTAL INTEGRATION RESULTS,
---,

REPORT	TIME AND DATE	Depth	Latitude	Longitude	Sv (dB)	Applied Sigma	FPUA
1	08/08/96 23:35:59	136.9	0° 0.000' N	0° 0.000' E	-4.565341e+001	6.000000e-002	1.360257e-002

Fish per unit (m^2) area (x 10,000 = fish/ha^2)

VOLUME BACKSCATTERING STRENGTH (dB),
---,
REPORT 1,
-------------,
STRATA 1, -4.300e+001,
STRATA 2, -4.540e+001,
STRATA 3, -5.585e+001,

ABSOLUTE DENSITY DISTRIBUTION MATRIX (IN NUMBER PER CUBIC METER),
---,
REPORT 1,
-------------,
STRATA 1, 8.360e-004, **Fish Per Cubic Meter**
STRATA 2, 4.810e-004,
STRATA 3, 4.330e-005,

PERCENT INTEGRATED MATRIX,
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REPORT 1,
----------,
STRATA 1, 100.000, **% of strata that was water versus bottom**
STRATA 2, 100.000,
STRATA 3, 99.404,

APPENDIX A

STUDY SITE COORDINATES
and
TRANSECT PROFILES

GPS Coordinates for Lakes Powell and Mead--Pelagic Fish Study.

Lake Powell

Site	Trans.*	Lat.	Long.
P01	N	N36'57'17.10"	W111'29'23.69"
P02	AS	N36'57'24.63"	W111'25'05.59"
P02	BS	N36'57'21.95"	W111'23'46.93"
P02	CN	N36'59'12.93"	W111'23'52.59"
P02	CS	N36'58'17.76"	W111'23'31.30"
P03	AN	N37'03'37.78"	W111'26'09.72"
P03	BN	N37'03'43.12"	W111'26'10.03"
P03	CN	N37'03'56.64"	W111'26'17.52"
P03	S	N37'03'16.84"	W111'26'54.56"
P03	WCN	N37'05'06.47"	W111'27'45.06"
P03	WCS	N37'04'37.18"	W111'27'22.55"
P04	AN	N37'03'11.22"	W111'19'46.29"
P04	BN	N37'04'18.97"	W111'18'51.78"
P04	CN	N37'05'16.91"	W111'18'13.08"
P04	S	N37'03'01.65"	W111'17'02.07"
P05	AS	N37'07'06.71"	W110.56'22.90"
P05	BS	N37'07'19.40"	W110'56'22.50"
P05	CN	N37'08'00.80	W110'57'15.20"
P05	CS	N37'07'39.99"	W110'56'27.40"
P05	N	N37'08'00.80"	W110'57'17.80"
P06	AN	N37'11'27.90"	W110'51'36.20"
P06	AS	N37'10'39.30"	W110'52'37.21"
P06	BN	N37'10'39.30"	W110'52'37.21"
P06	BS	N37'10'03.90"	W110'51'56.10"
P06	CN	N37'10'46.17"	W110'52'05'99"
P07	AN	N37"12'00.00"	W110'40'10.80"
P07	AS	N37'11'56.65"	W110'39'06.50"
P07	BN	N37'12'05.90"	W110'40'13.10"
P07	BS	N37'12'05.84"	W110'39'05.99"
P07	CN	N37'12'11.80"	W110'40'12.80"
P07	CS	N37'12'12.20"	W110'39'06.60"
P08	AN	N37'14'5.31"	W110'38'03.10"
P08	BN	N37'14'33.88"	W110'37'50.59"
P08	CN	N37'14'22.99"	W110'37'31.88"
P08	S	N37'14'09.37"	W110'37'56.89"
P09	N	N37'19'26.09"	W110'55'00.19"
P09	S	N37'18'41.76"	W110'53'49.20"
P10	AN	N37'19'33.32"	W110'47'45.25"
P10	AS	N37'18'41.72"	W110'47'55.98"
P10	BN	N37'19'33.92	W110'47'35.80"
P10	BS	N37'18'42.59"	W110'47'38.49"
P10	CN	N37'19'35.03"	W110'47'27.45"
P10	CS	N37'18'45.31"	W110'47'29.91"
P11	AN	N37'31'53.70"	W110'44'50.58"
P11	AS	N37'31'27.56"	W110'45'53.39"
P11	BN	N37'32'11.88"	W110'45'10.84"
P11	BS	N37'31'45.03"	W110'46'08.59"
P11	CN	N37'32'17.17"	W110'45'30.12"
P11	CS	N37'32'05.54"	W110'46'24.83"
P12	AN	N37'36'27.09"	W110'36'00.70"
P12	AS	N37'35'29.77"	W110'35'48.07"
P12	BS	N37'36'21.64"	W110'35'00.45"
P12	CN	N37'36'54.90"	W110.34'11.34"
P13	AS	N37'38'37.65"	W110'29'59.74"
P13	BS	N37'38'50.81"	W110'28'54.68"
P13	CS	N37'39'01.52"	W110'28'47.80"
P13	N	N37'39'38.80"	W110'30'05.15"
P14	AN	N37'49'08.37"	W110'27'10.97"
P14	AS	N37'48'21.03"	W110'27'23.53"
P14	BN	N37'49'08.35"	W110'27'00.37"
P14	BS	N37'48'23.87"	W110'27'14.31"
P14	CN	N37'49'08.06"	W110'26'55.15"
P14	CS	N37'48'27.98"	W110'27'00.60"

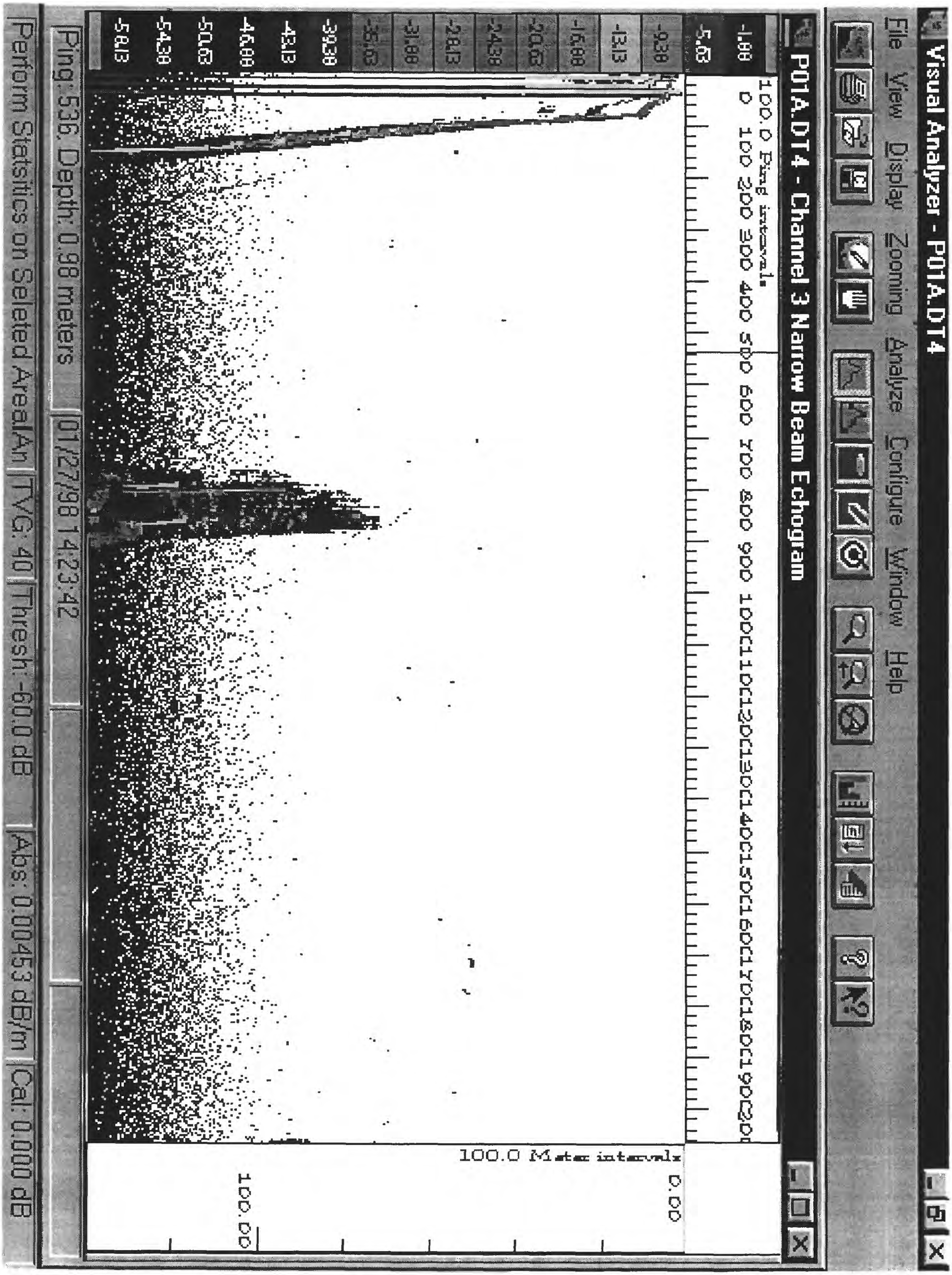
Lake Mead

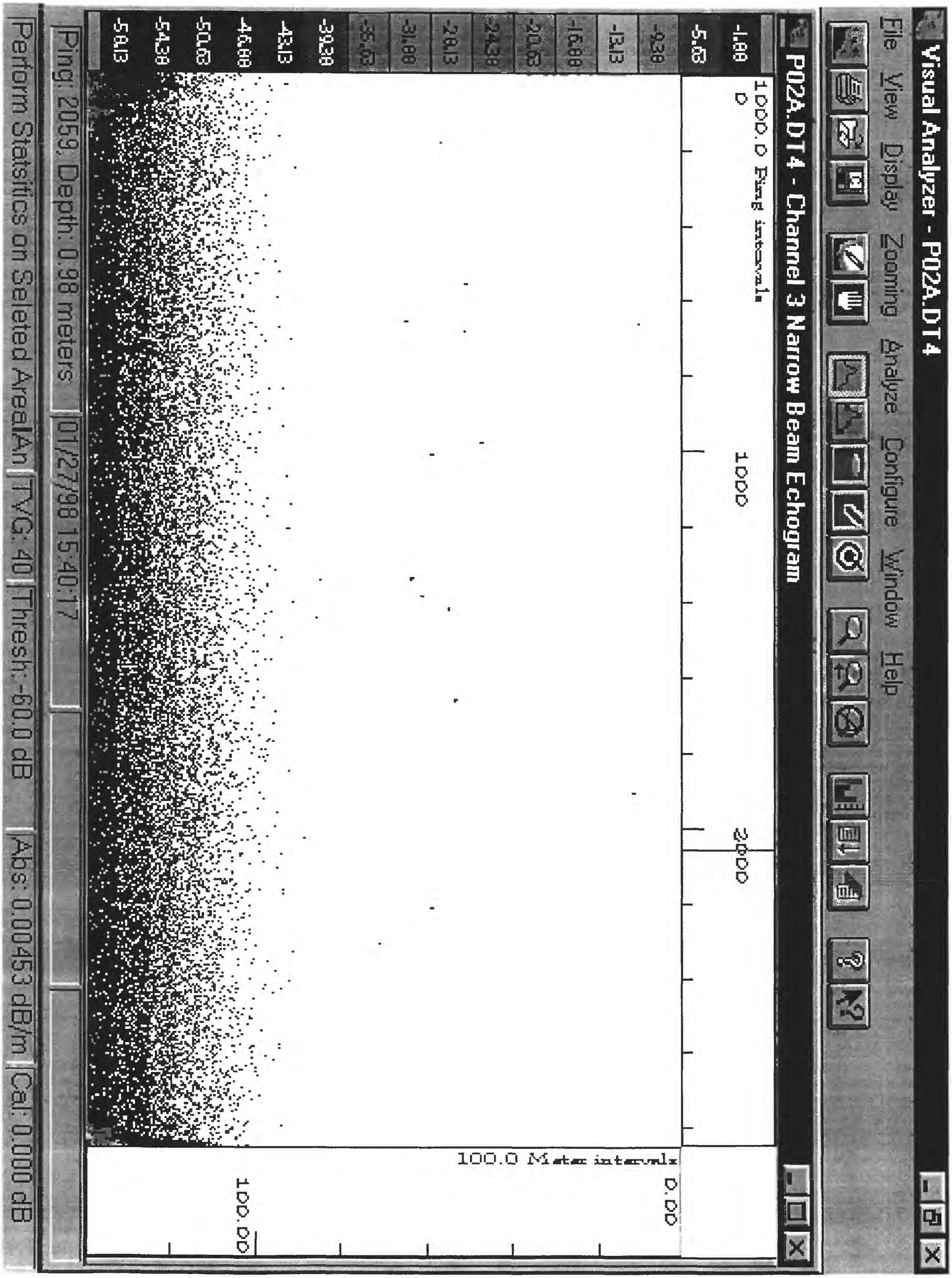
Site	Trans.*	Lat.	Long.
M01	N	N36'01'37.71"	W114'43'29.34"
M01	S	N36'01'02.74"	W114'44'07.20"
M02	AN	N36'07'35.09"	W114'49'09.22"
M02	AS	N36'06'41.87"	W114'50'19.20"
M02	BN	N36'07'33.52"	W114.49'17.56"
M02	BS	N36'06'50.98"	W114'50'19.71"
M02	CN	N36'07'36.66"	W114'49'22.92"
M02	CS	N36'06'50.14"	W114'50'26.90"
M03	AN	N36'07'14.17"	W114'43'42.72"
M03	AS	N36'04'58.38"	W114'42'49.77"
M03	BN	N36'07'28.50"	W114'43'14.65"
M03	BS	N36"05'10.51"	W114'42'20.88"
M03	CN	N36'07'27.10"	W114'42'36.29"
M03	CS	N36'05'19.02"	W114'41'48.45"
M04	AS	N36'08'19.98"	W114'36'13.31"
M04	BS	N36'08'37.22"	W114'35'13.41"
M04	CN	N36'09'08.06"	W114'33'03.10"
M04	CS	N36'09'03.88"	W114'34'11.67"
M05	AN	N36'09'04.46"	W114'26'52.64"
M05	AS	N36'07'03.03"	W114'25'27.87"
M05	BN	N36'09'29.97"	W114'27'04.13"
M05	BS	N36'07'00.66"	W114'25'10.61"
M05	CN	N36'09'29.44"	W114'26'18.04"
M05	CS	N36'07'08.83"	W114'25'10.34"
M06	AN	N36'04'15.13"	W114'17'47.46"
M06	AS	N36'03'51.12"	W114'20'18.26"
M06	BN	N36'04'05.04"	W114'17'43.57"
M06	BS	N36'03'37.26"	W114'20'12.03"
M06	CN	N36'03'52.37"	W114'17'40.09"
M06	CS	N36'03'32.16"	W114'20'10.07"
M07	AS	N36'00'50.14"	W114'13'15.97"
M07	BS	N36'01'08.54"	W114'12'20.75"
M07	CN	N36'01'44.73"	W114'10'06.50"
M07	CS	N36'01'22.49"	W114'11'03.36"
M08	AN	N36'04'55.00"	W114'08'48.06"
M08	AS	N36'04'08.73"	W114'06'39.74"
M08	BN	N36'05'15.00"	W114'08'38.65"
M08	BS	N36'04'27.37"	W114'06'30.52"
M08	CN	N36'05'40.32"	W114'08'24.81"
M08	CS	N36'04'44.94"	W114'06'27.81"
M09	AN	N36'13'01.21"	W113'59'48.87"
M09	AS	N36'12'40.70"	W114'00'50.45"
M09	BN	N36'13'09.68"	W113'59'56.41"
M09	BS	N36'12'50.31"	W114'00'54.85"
M09	CS	N36'12'55.65"	W114'00'54.25"
M10	AN	N36'14'14.38"	W114'24'53.22"
M10	AS	N36'13'43.29"	W114'23'06.32"
M10	BN	N36'14'29.47"	W114'24'49.59"
M10	BS	N36'13'58.55"	W114'22'56.50"
M10	CN	N36'14'41.30"	W114'24'48.13"
M10	CS	N36'14'05.99"	W114'22'53.07"
M11	AN	N36'25'03.03"	W114'22'20.87"
M11	AS	N36'23'30.18"	W114'20'19.88"
M11	BN	N36'25'17.79"	W114'22'06.64"
M11	BS	N36'23'35.63"	W114'20'18.85"
M11	CN	N36'25'25.07"	W114'21'56.44"
M11	CS	N36'23'45.89"	W114'20'04.16"

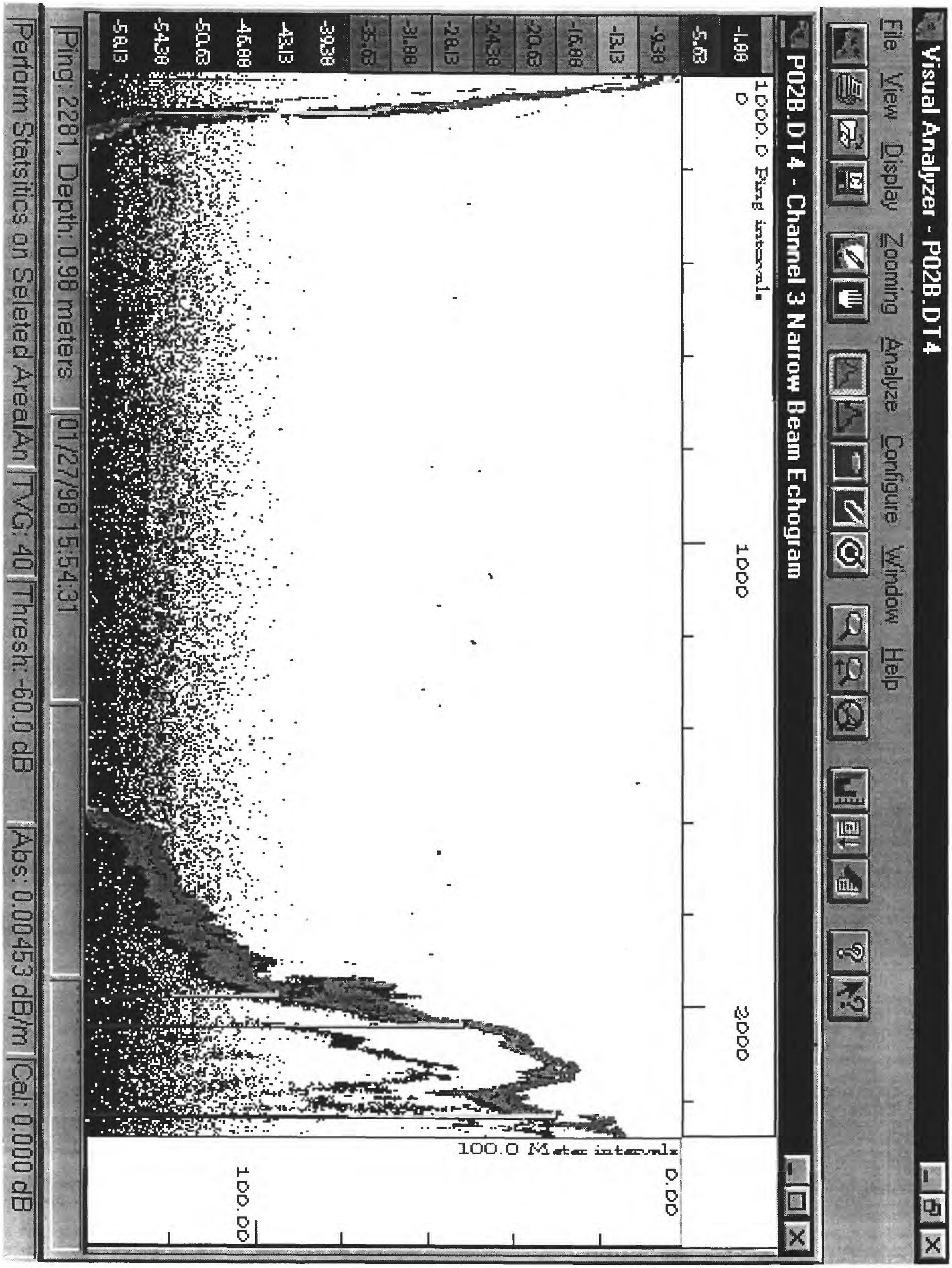
* A,B,C=transects
N=north end, S=south end. (i.e. AN=north end of transect A)

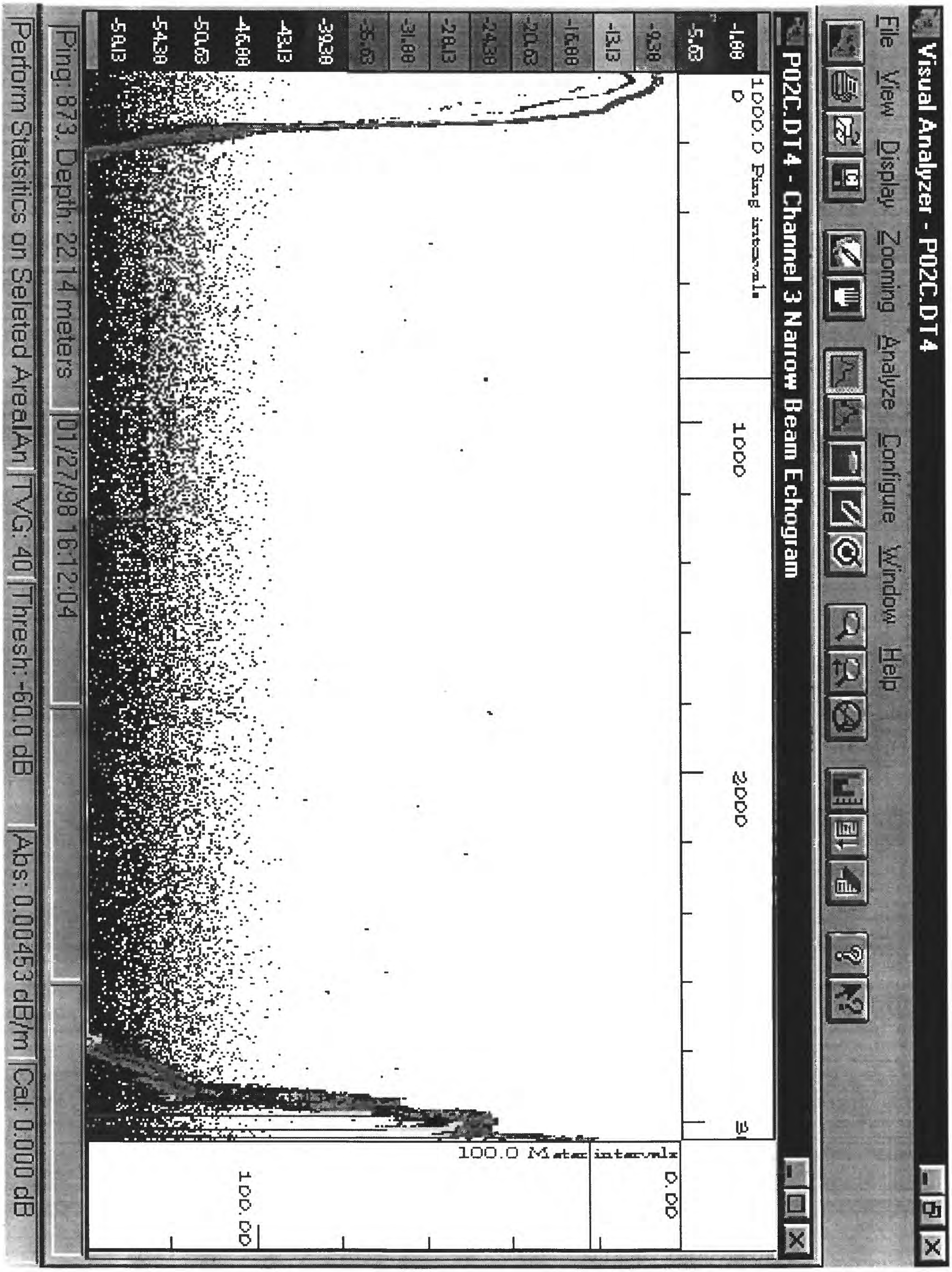
Lake Powell - Arizona, Utah				
Total Map Area - 161390 Acres @ 3700 El.				
Location		Hectares		Acres
P01		219.76		543.03
P02		3032.68		7493.67
P03		7175.85		17731.3
P04		16520.51		40821.63
P05		6019.73		14874.55
P06		1905.65		4708.8
P07		2265.72		5598.53
P08		2087.9		5159.13
P09		1583.65		3913.14
P10		5264.42		13008.21
P11		6150.9		15198.65
P12		4424.08		10931.75
P13		4353.64		10757.67
P14		2889.24		7139.21
DDC		314.12		776.19
SJR		1341.03		3313.63
Total		65548.88		161969.09
Actual		65314.53		161390
Difference		234.35 +		579.1 +
Percent Gain		0.36%		0.36%
Accuracy		99.64%		99.64%

Lake Maed - Arizona, Nevada				
Total Map Area - 162700 Acres @ 1210 El.				?????
Location		Hectares		Acres
M01		121.41		300
M02		2922.74		7222
M03		10329.16		25523
M04		1190.22		2941
M05		16021.67		39589
M06		5163.16		12758
M07		645.9		1596
M08		4038.1		9978
M09		3461		8552
M10		2983.45		7372
M11		12801.47		31632
Colo.R. Inlet		1146.11		2832
Iceberg Canyon		391.75		968
Total		61216.14		151263
Actual		65844.7		162700
Difference		-4628.56		-11437
Percent Loss		7.03%		7.03%
Accuracy		92.97%		92.97%

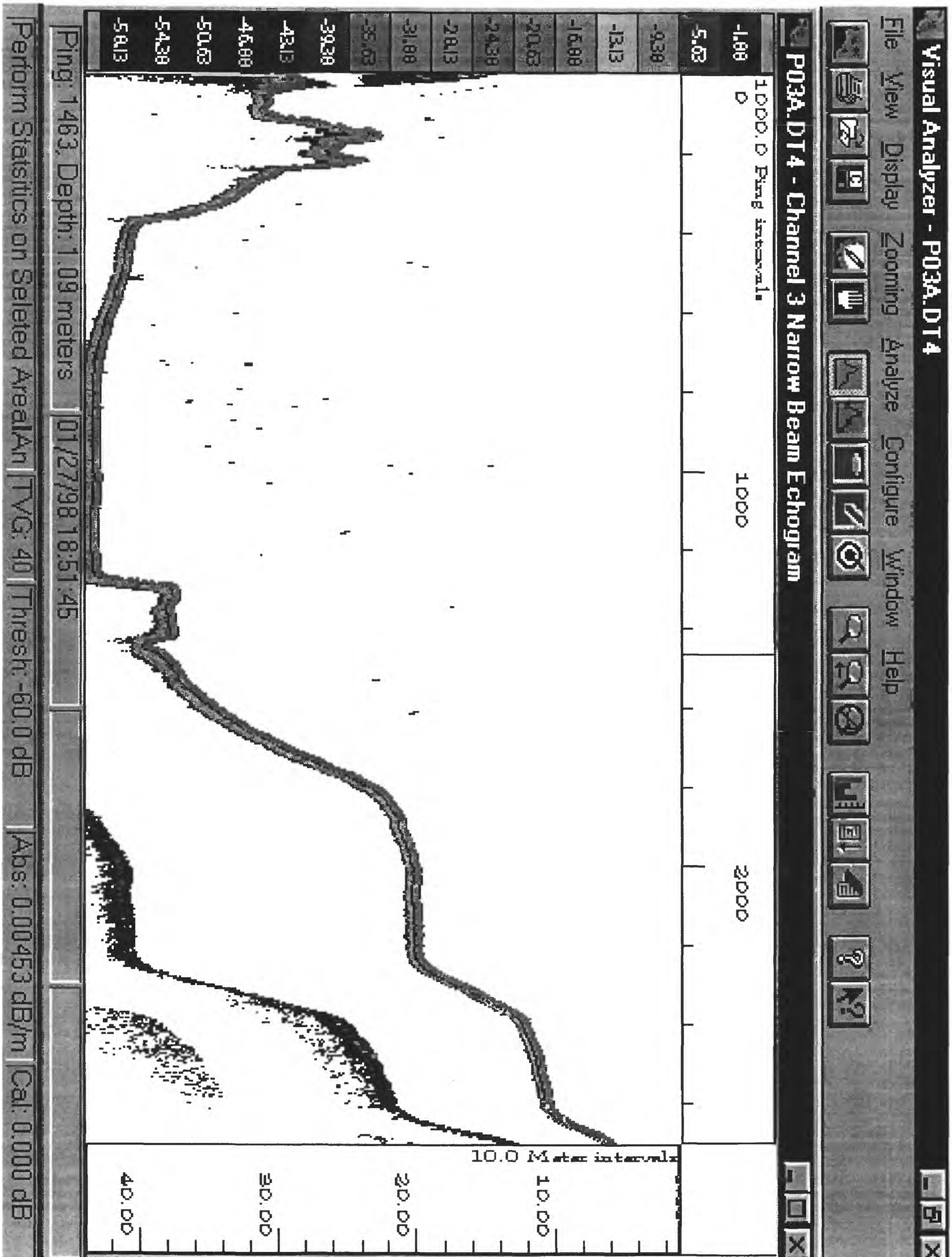

Visual Analyzer - P01A.DT4
File View Display Zooming Analyze Configure Window Help
P01A.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 536, Depth: 0.98 meters
01/27/98 14:23:42
Perform Statistics on Seleted Area/An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

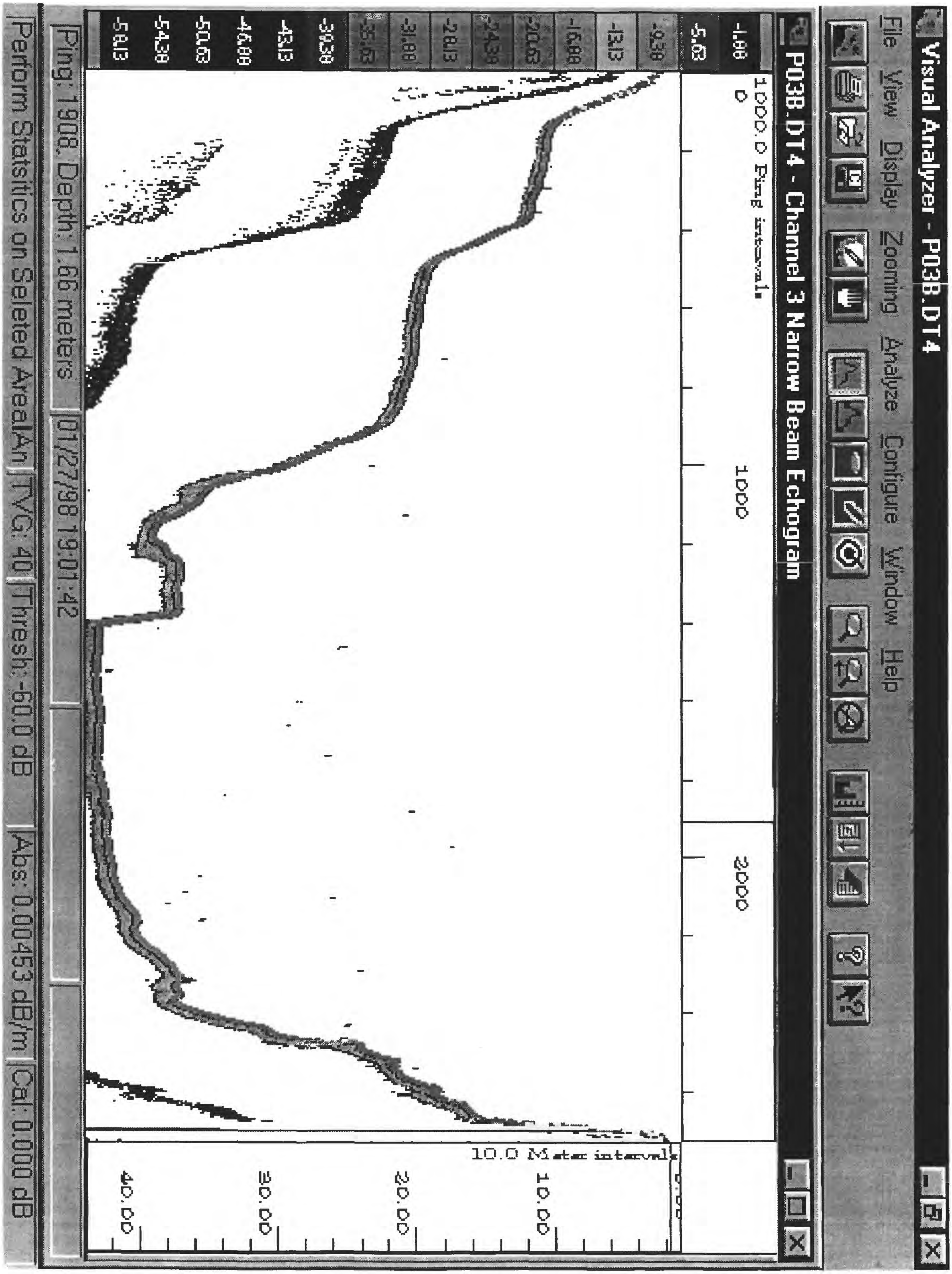

Visual Analyzer - P02A.DT4
File View Display Zooming Analyze Configure Window Help
P02A.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 2059, Depth: 0.98 meters
01/27/98 15:40:17
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

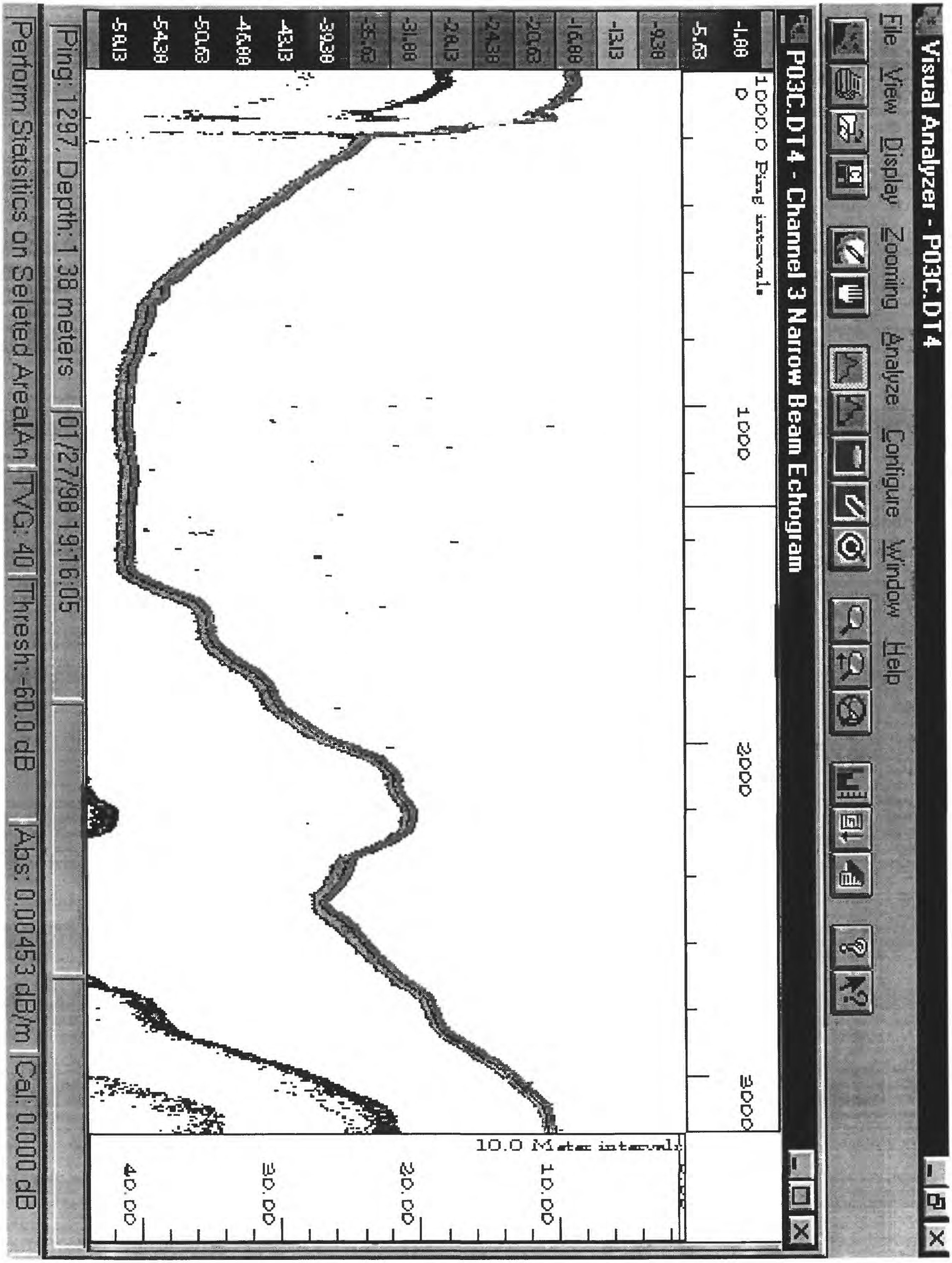

Visual Analyzer - P02B.DT4
File View Display Zooming Analyze Configure Window Help
P02B.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 2281, Depth: 0.98 meters
01/27/98 15:54:31
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

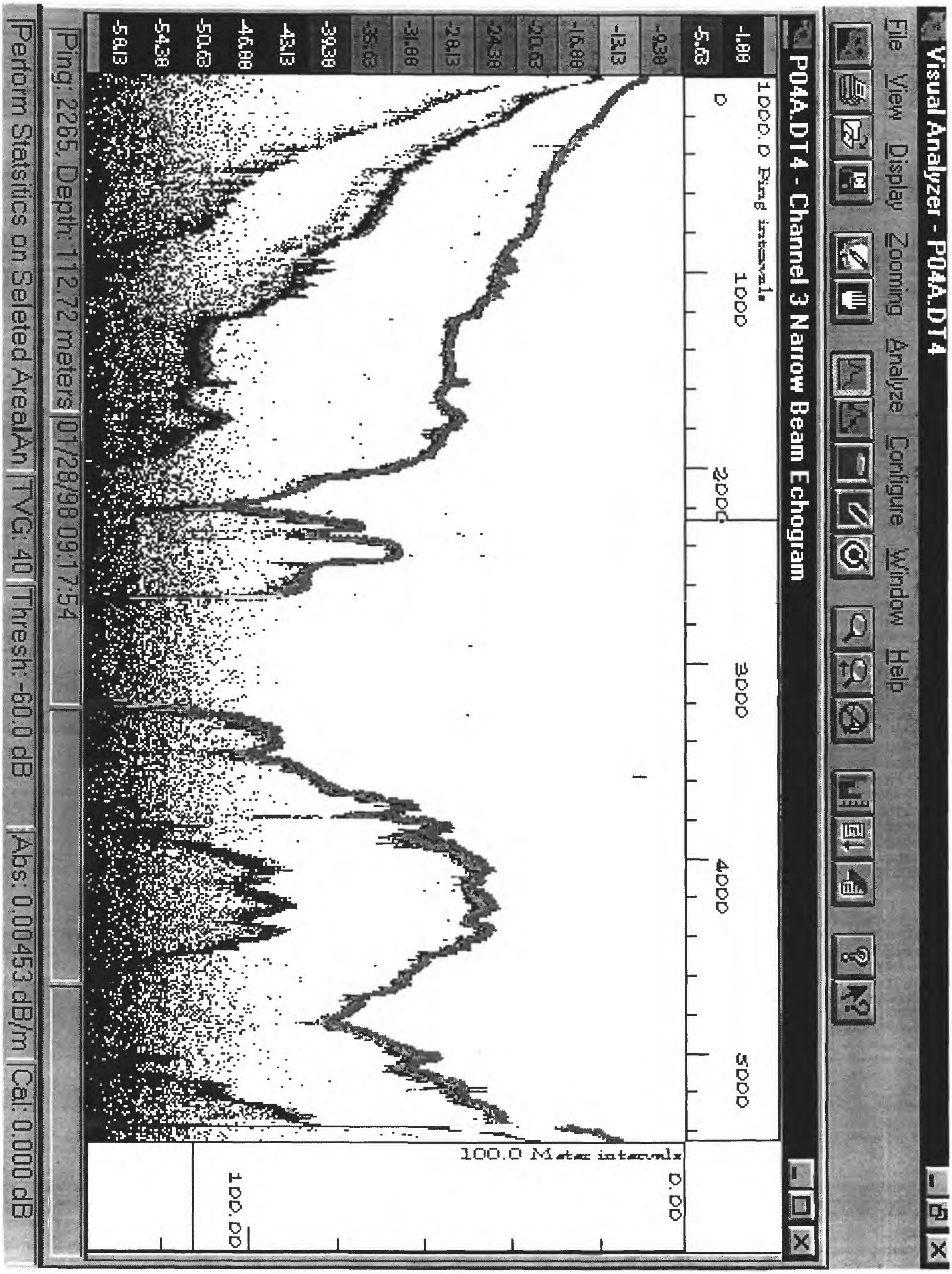


Visual Analyzer - P02C.DT4
File View Display Zooming Analyze Configure Window Help
P02C.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 873, Depth: 22.14 meters
01/27/98 16:12:04
Perform Statistics on Selected Areal An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

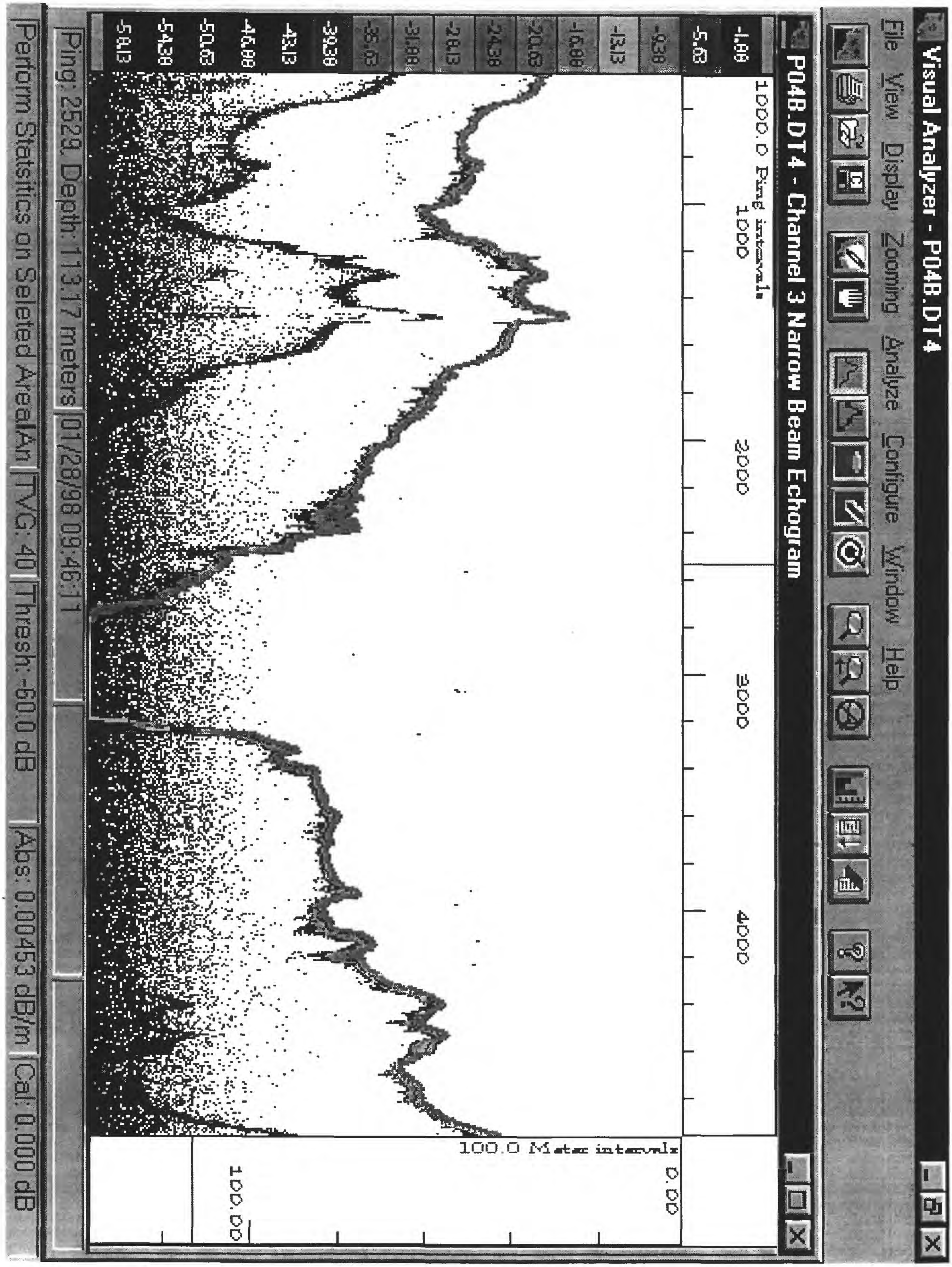

Visual Analyzer - P03A.DT4
File View Display Zooming Analyze Configure Window Help
P03A.DT4 - Channel 3 Narrow Beam Echogram
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
1000.0 Ping intervals
0
1000
2000
10.0 Meter intervals
10.00
20.00
30.00
40.00
Ping: 1463, Depth: 1.09 meters
01/27/98 18:51:45
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

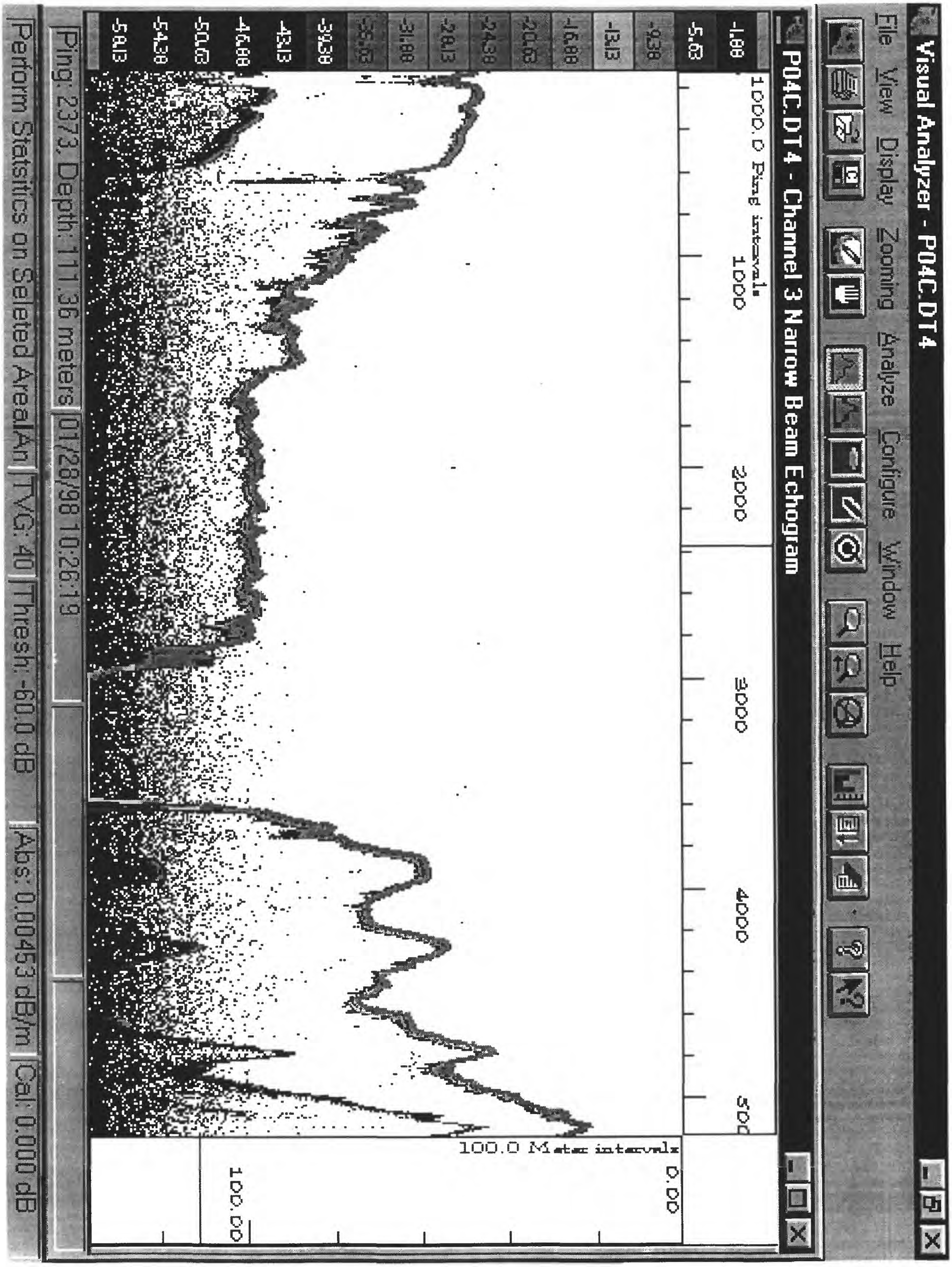

Visual Analyzer - P03B.DT4
File View Display Zooming Analyze Configure Window Help
P03B.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
10.0 Meter intervals
10.00
20.00
30.00
40.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1908, Depth: 1.66 meters
01/27/98 19:01:42
Perform Statistics on Seleted Area/An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

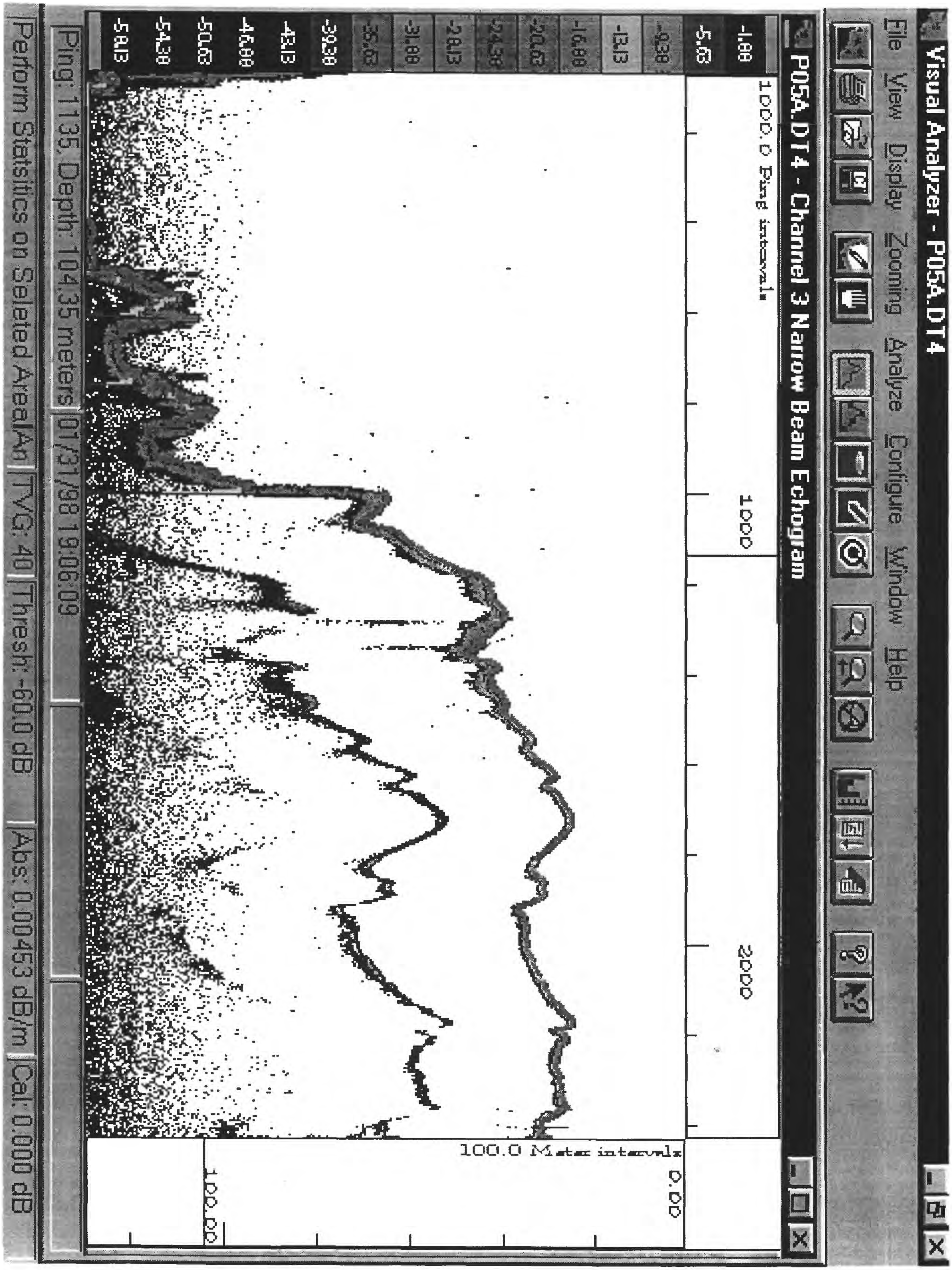

Visual Analyzer - P03C.DT4
File View Display Zooming Analyze Configure Window Help
P03C.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
3000
10.0 Meter intervals
10.00
20.00
30.00
40.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1297, Depth: 1.38 meters
01/27/98 19:16:05
Perform Statistics on Seleted Area[An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

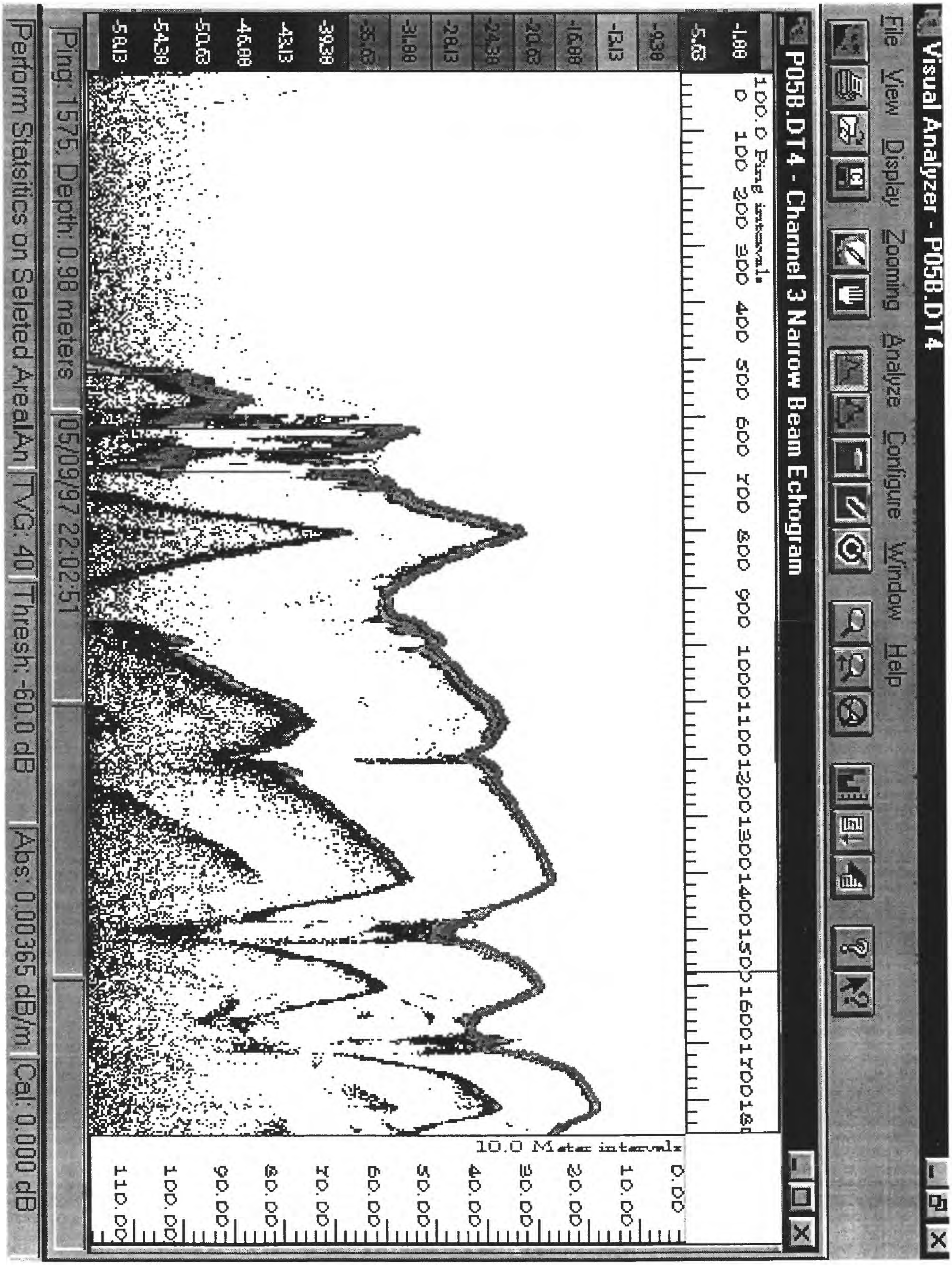


Visual Analyzer - P04A.DT4
File View Display Zooming Analyze Configure Window Help
P04A.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
3000
4000
5000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 2265, Depth: 112.72 meters
01/28/98 09:17:54
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB


Visual Analyzer - P04B.DT4
File View Display Zooming Analyze Configure Window Help
P04B.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
1000
2000
3000
4000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 2529, Depth: 113.17 meters
01/28/98 09:46:11
Perform Statistics on Seleted Areal An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB


Visual Analyzer - P04C.DT4
File View Display Zooming Analyze Configure Window Help
P04C.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
1000
2000
3000
4000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 2373, Depth: 111.36 meters
01/28/98 10:26:19
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB


Visual Analyzer - P05A.DT4
File View Display Zooming Analyze Configure Window Help
P05A.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
1000
2000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1135, Depth: 104.35 meters
01/31/98 19:06:09
Perform Statistics on Seleted Area
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB



Visual Analyzer - P05B.DT4
File View Display Zooming Analyze Configure Window Help
P05B.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
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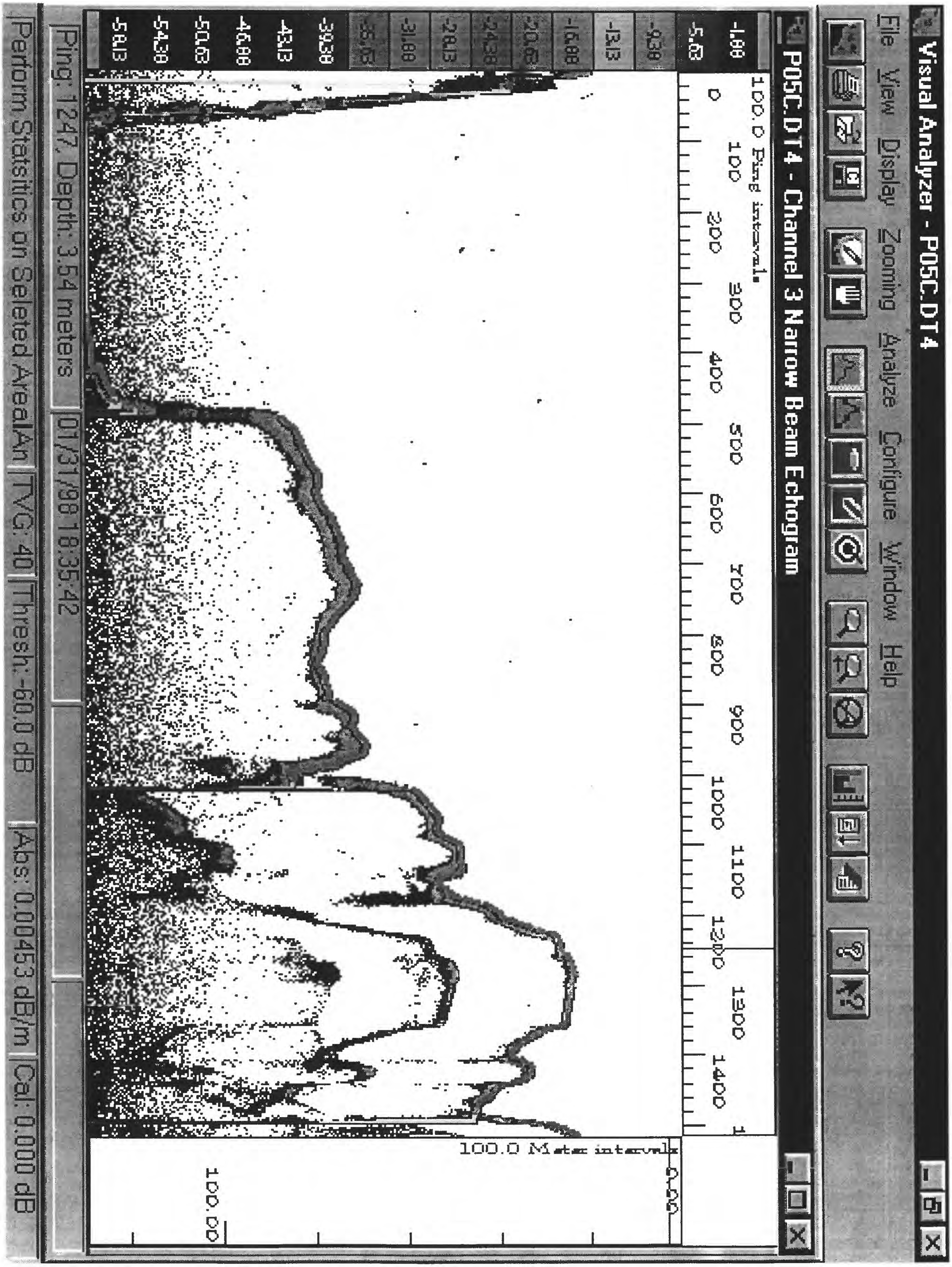
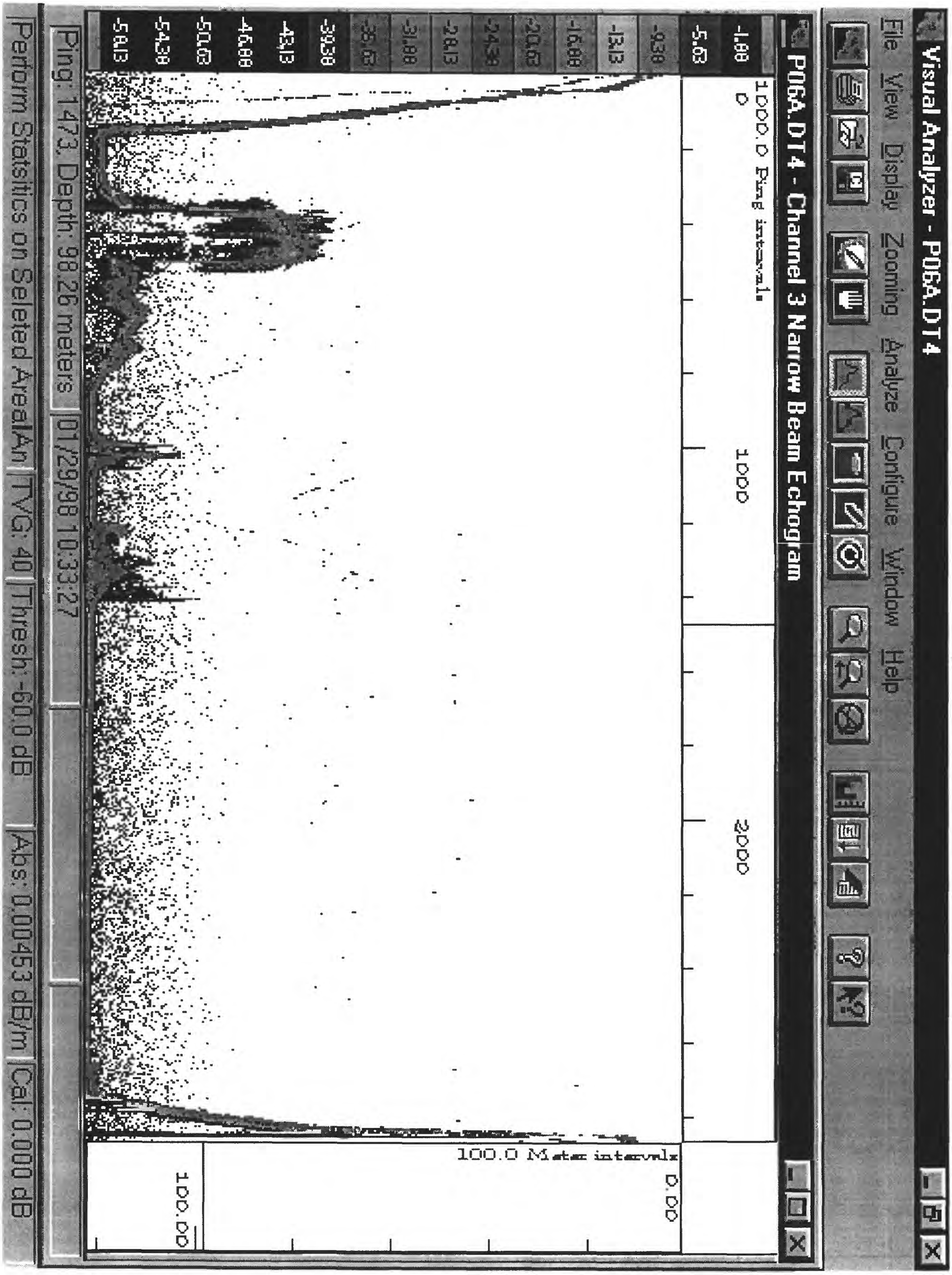
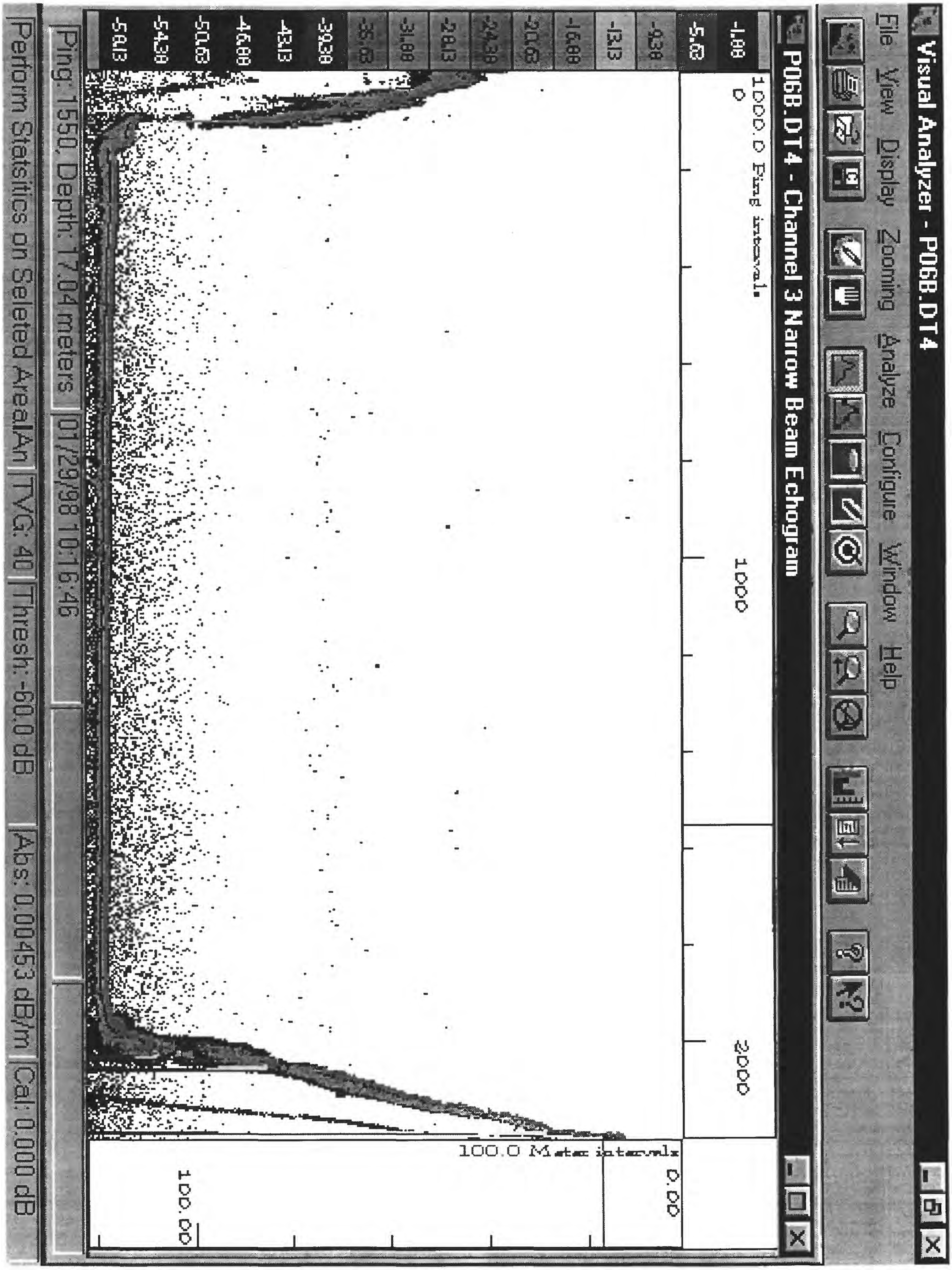
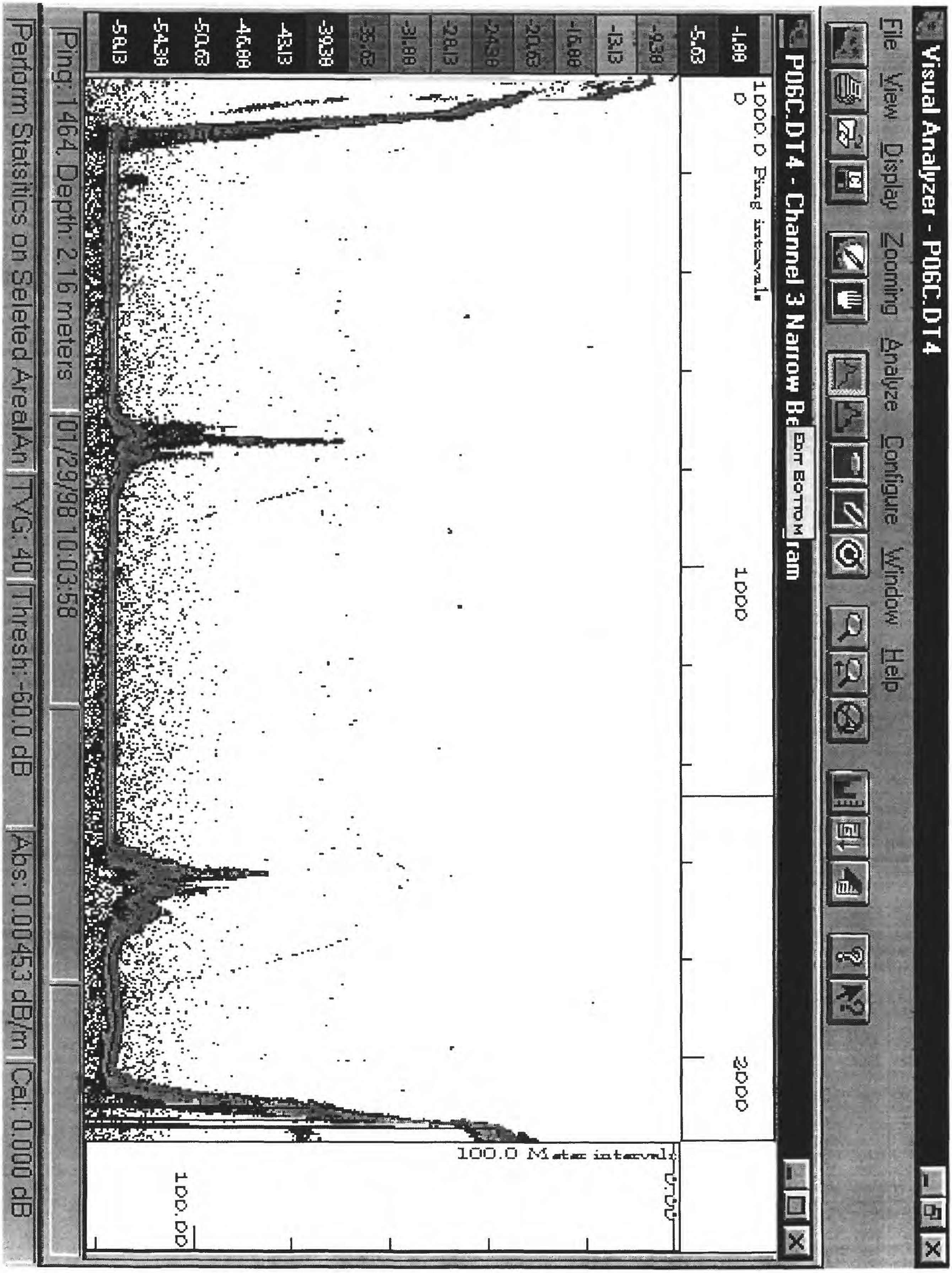
10.0 Meter intervals
0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00
-1.88 -5.63 -9.38 -13.13 -16.88 -20.63 -24.38 -28.13 -31.88 -35.63 -39.38 -43.13 -46.88 -50.63 -54.38 -58.13
Ping: 1575, Depth: 0.98 meters
05/09/97 22:02:51
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.000365 dB/m
Cal: 0.000 dB

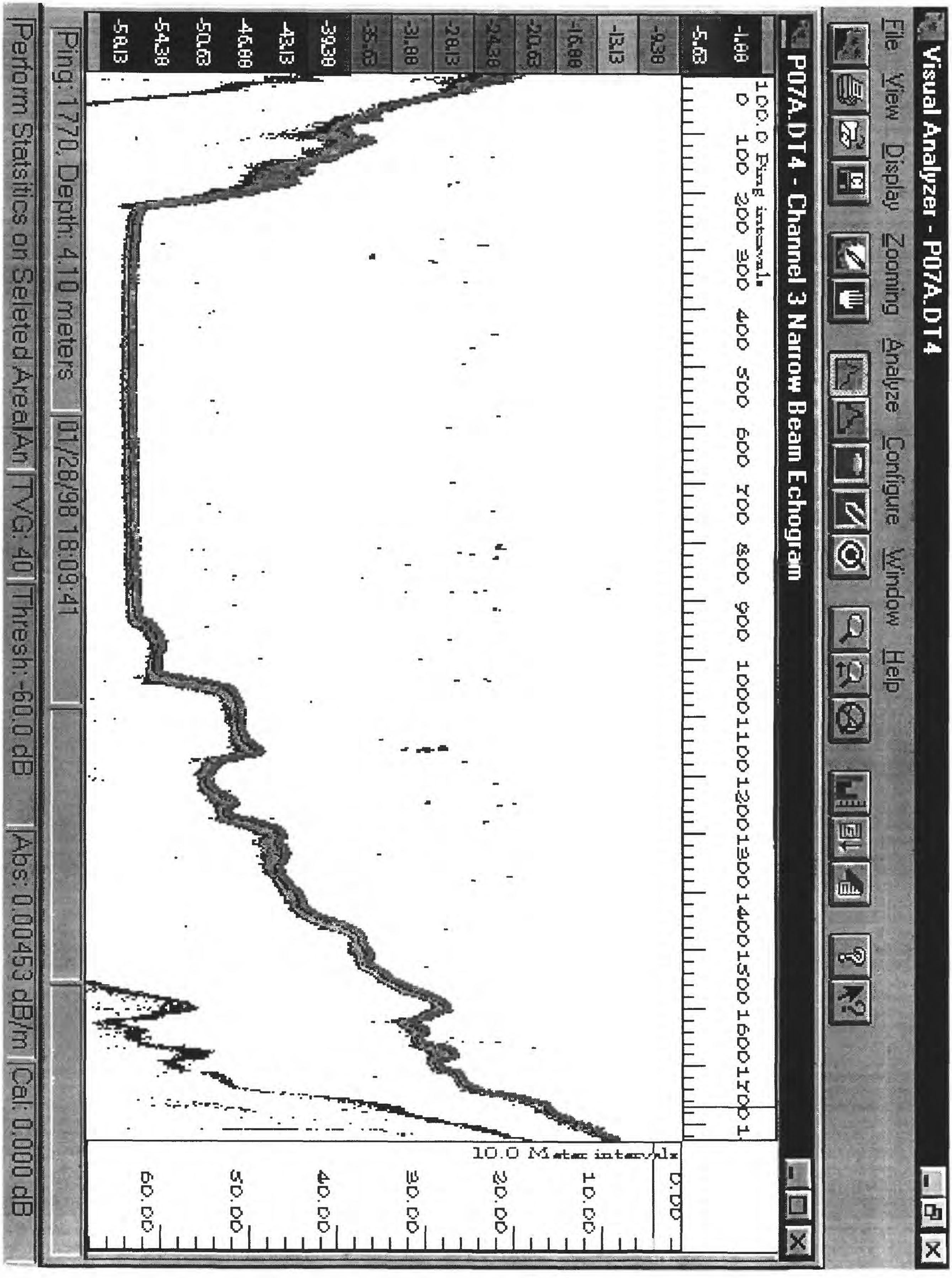

Visual Analyzer - P05C.DT4
File View Display Zooming Analyze Configure Window Help
P05C.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
100.0 Meter intervals
Ping: 1247, Depth: 3.54 meters
01/31/98 18:35:42
Perform Statistics on Seleted Areal An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB


Visual Analyzer - P06A.DT4
File View Display Zooming Analyze Configure Window Help
P06A.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1473, Depth: 98.26 meters
01/29/98 10:33:27
Perform Statistics on Seleted Areal/An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

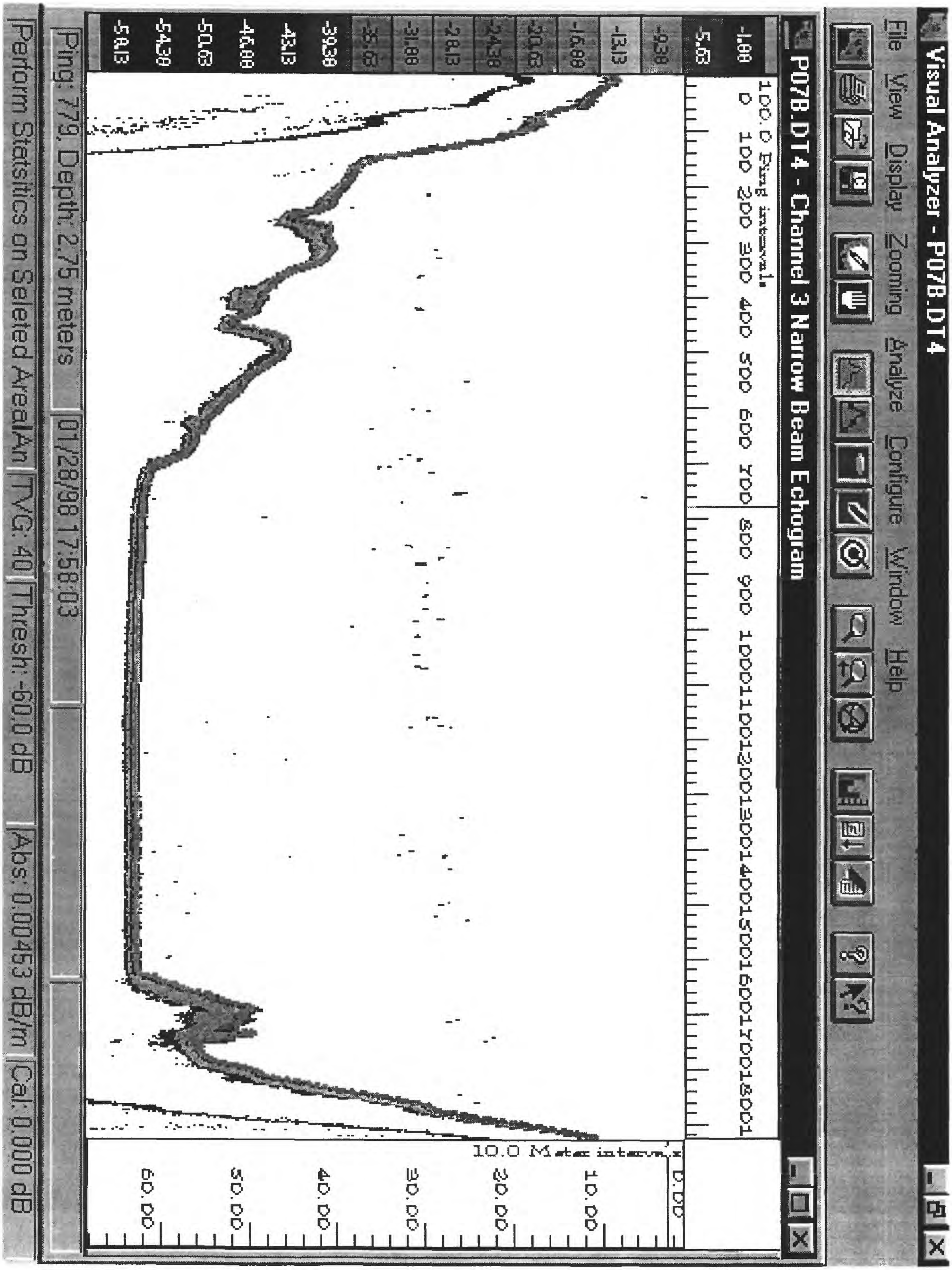


Visual Analyzer - P06B.DT4
File View Display Zooming Analyze Configure Window Help
P06B.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping interval.
0
1000
2000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1550, Depth: 17.04 meters
01/29/98 10:16:46
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

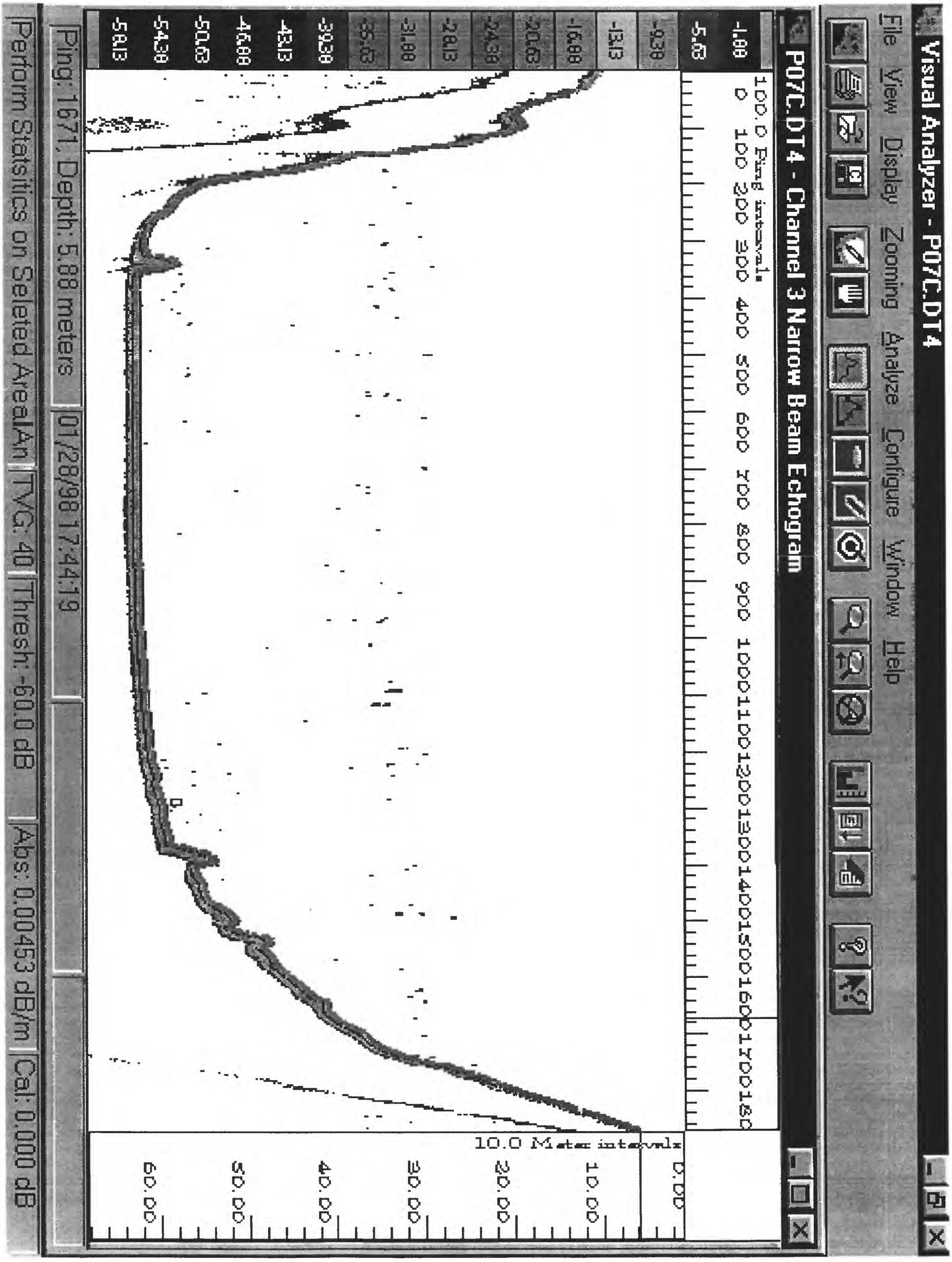

Visual Analyzer - P06C.DT4
File View Display Zooming Analyze Configure Window Help
P06C.DT4 - Channel 3 Narrow Be
EDIT BOTTOM
ram
1000.0 Ping intervals
0
1000
2000
100.0 Meter intervals
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1464, Depth: 2.16 meters
01/29/98 10:03:58
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

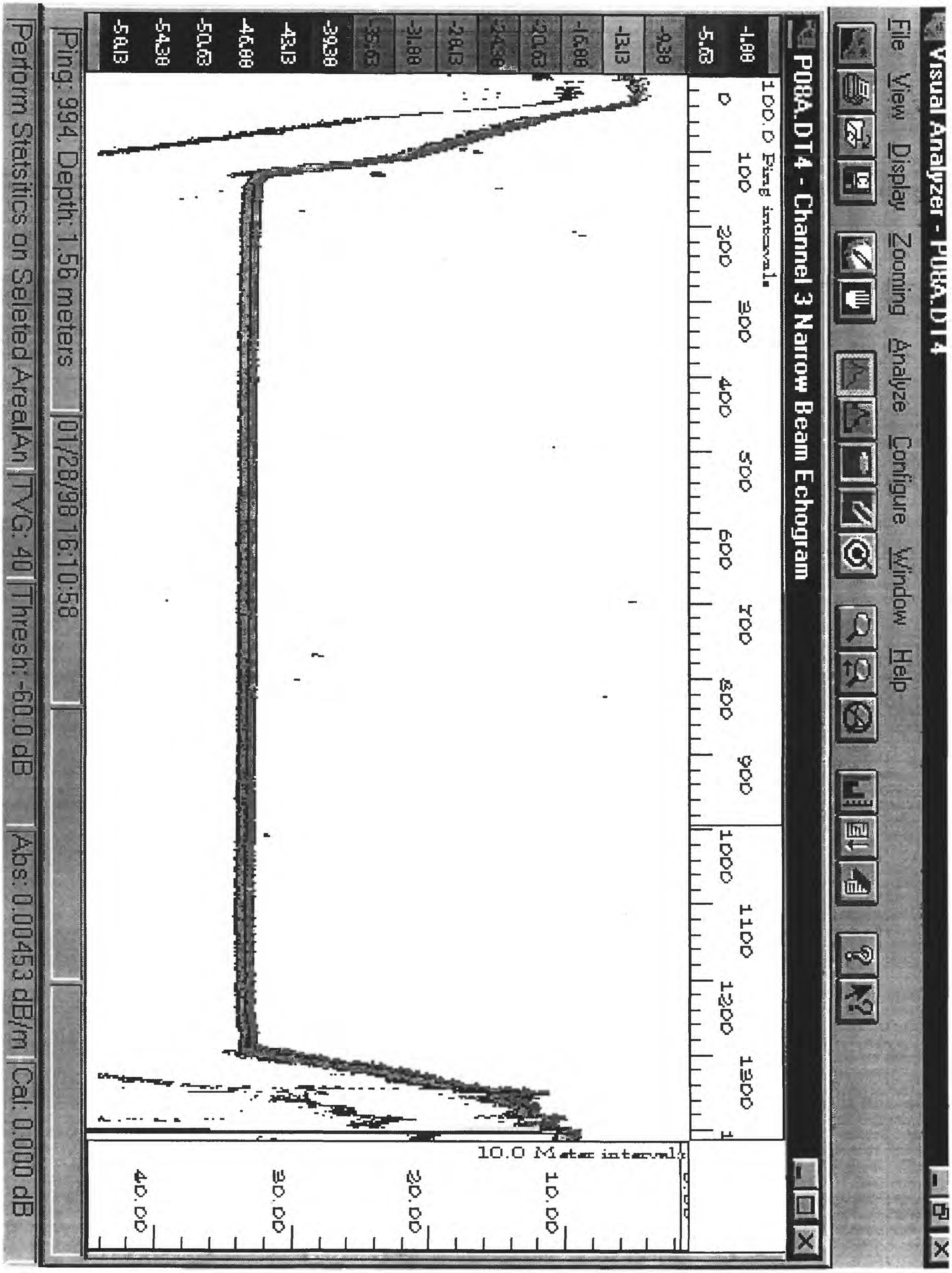


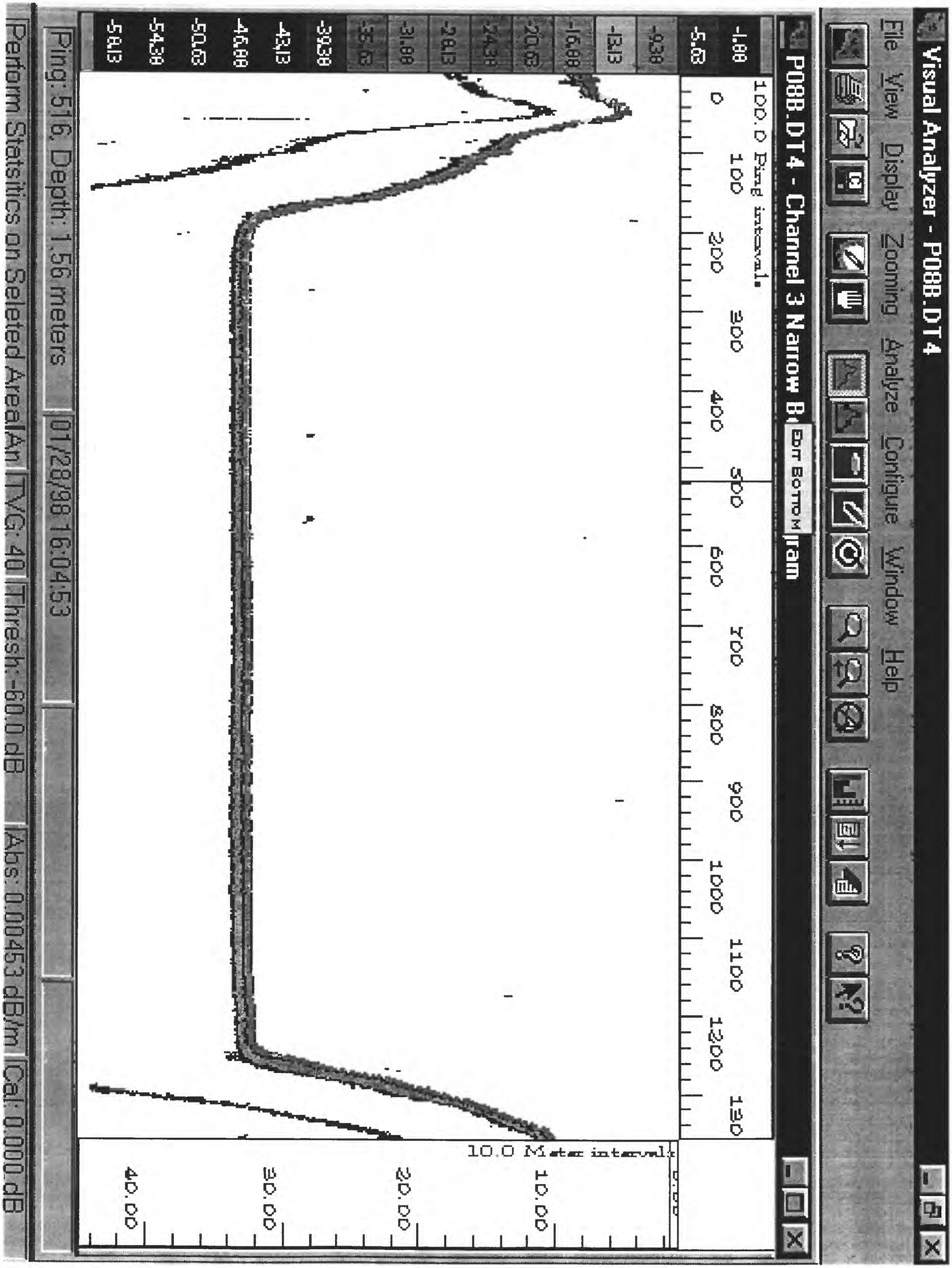
Visual Analyzer - P07A.DT4
File View Display Zooming Analyze Configure Window Help
P07A.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1770, Depth: 4.10 meters
01/28/98 18:09:41
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

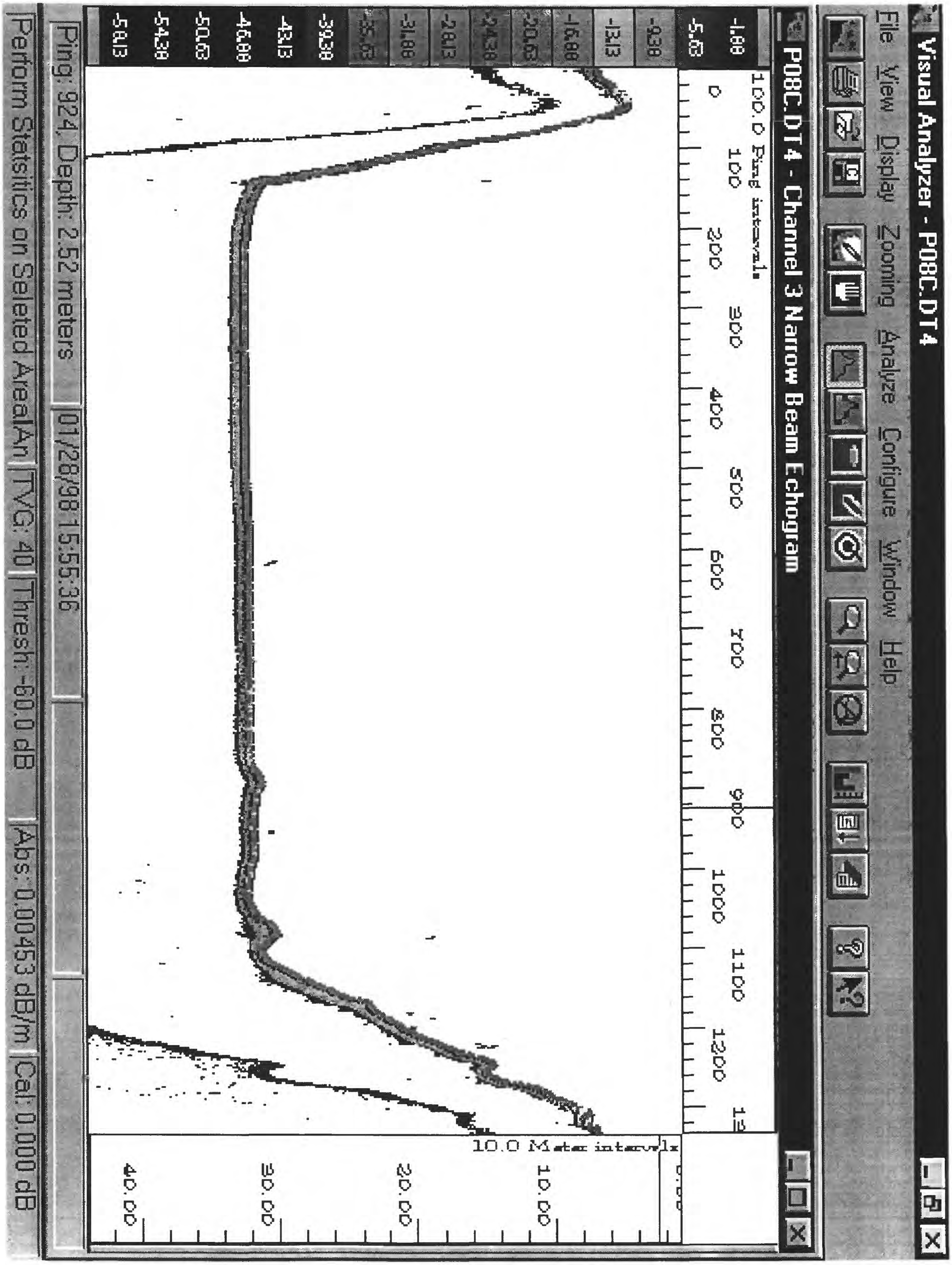


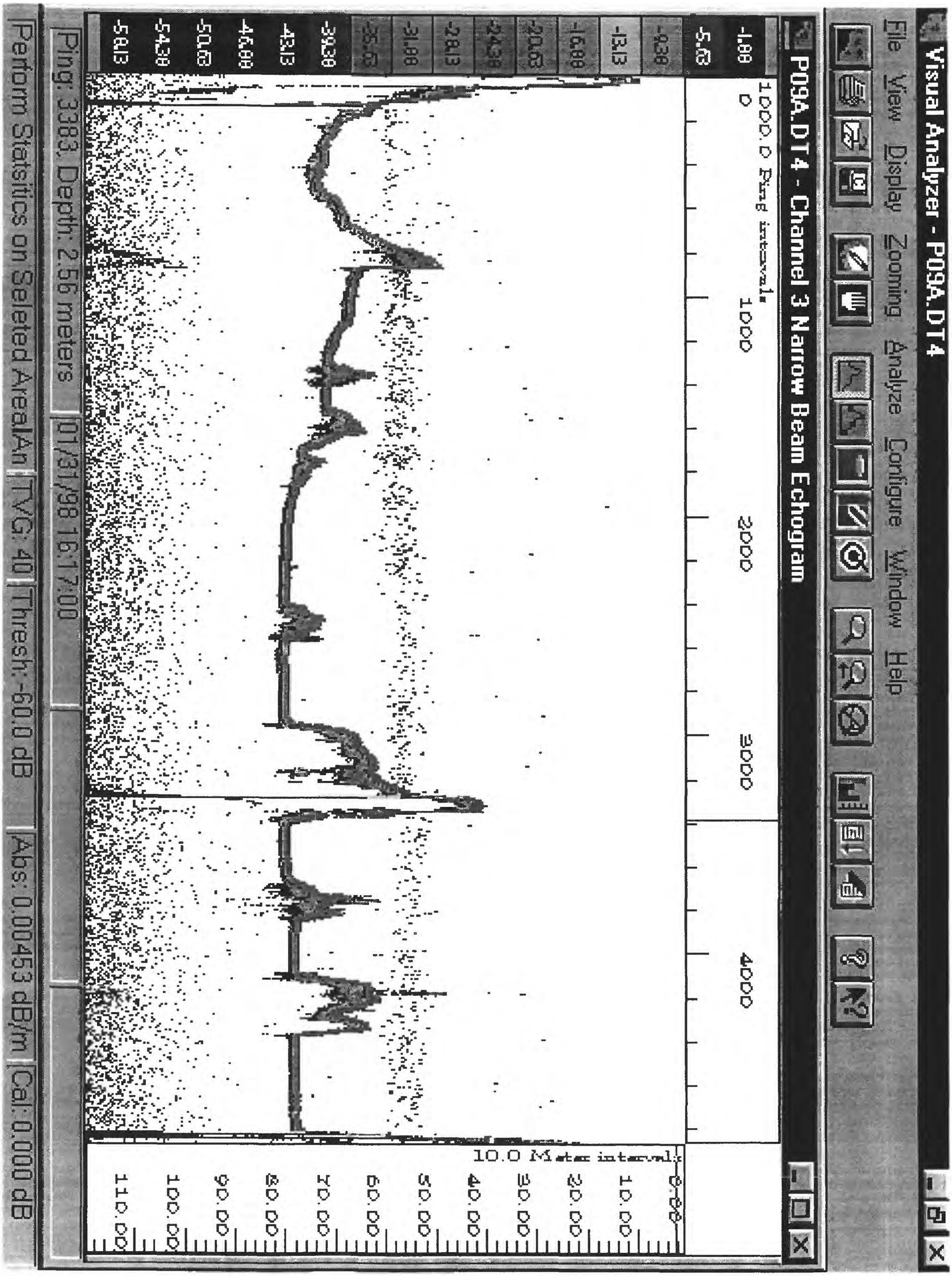
Visual Analyzer - P07B.DT4
File View Display Zooming Analyze Configure Window Help
P07B.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping interval
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
10.0 Meter interval
0.00
10.00
20.00
30.00
40.00
50.00
60.00
-1.00
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 779, Depth: 2.75 meters
01/28/98 17:58:03
Perform Statsitics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

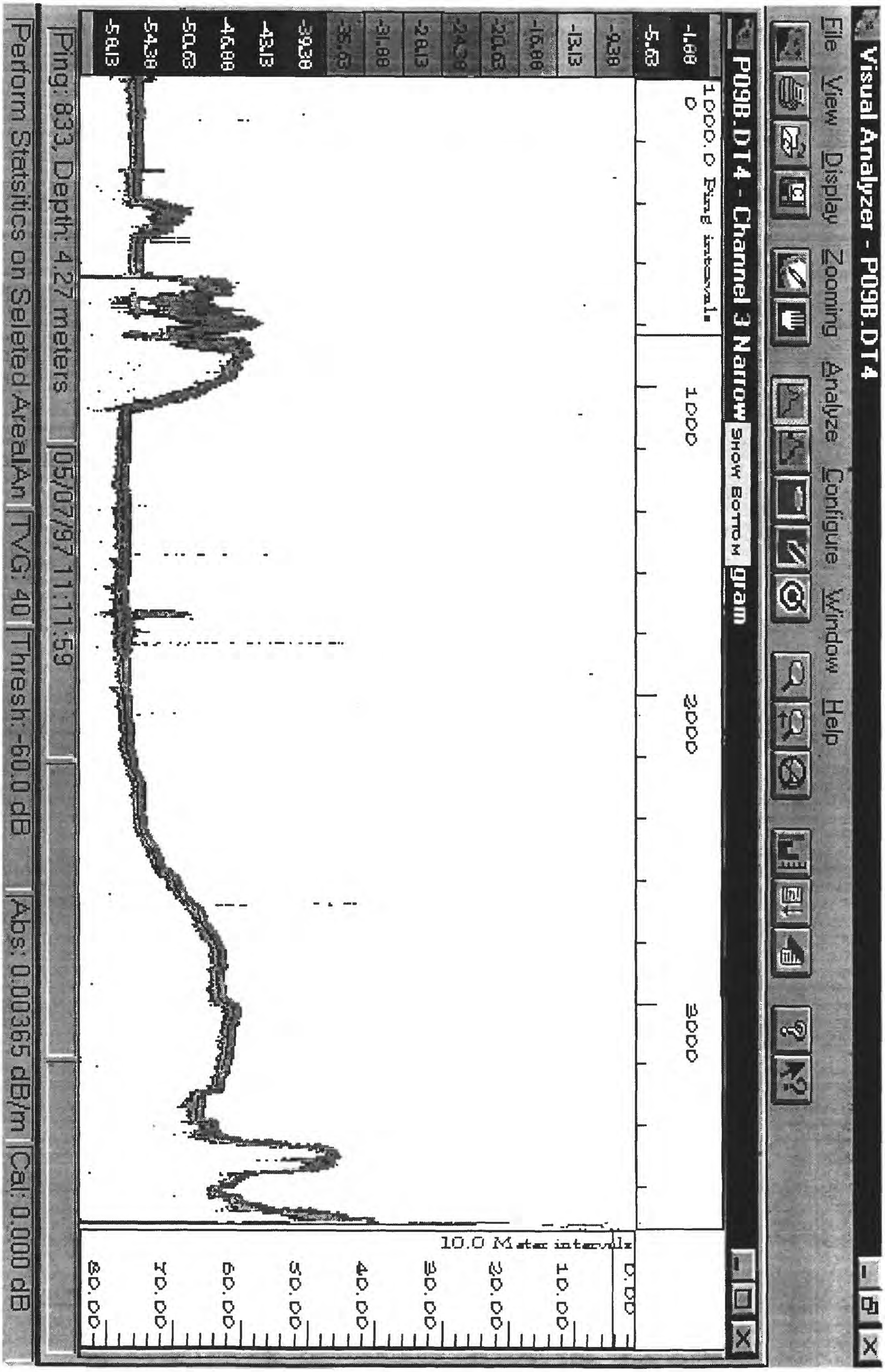

Visual Analyzer - P07C.DT4
File View Display Zooming Analyze Configure Window Help
P07C.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1671, Depth: 5.88 meters
01/28/98 17:44:19
Perform Statistics on Seleted Areal An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB


Visual Analyzer - P08A.DT4
File View Display Zooming Analyze Configure Window Help
P08A.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
10.0 Meter intervals
10.00
20.00
30.00
40.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 994, Depth: 1.56 meters
01/28/98 16:10:58
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

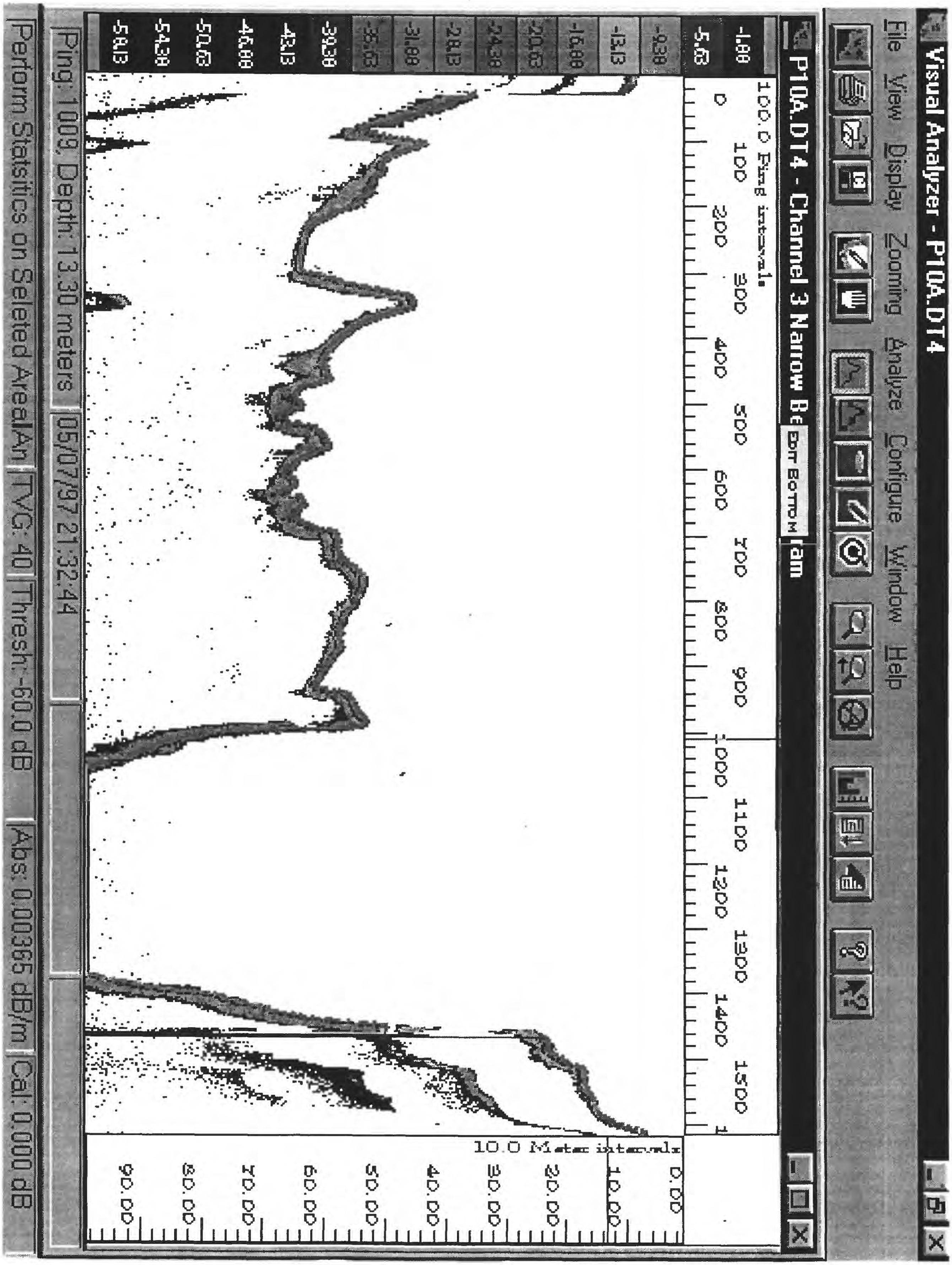

Visual Analyzer - P08B.DT4
File View Display Zooming Analyze Configure Window Help
P08B.DT4 - Channel 3 Narrow B
Edit Bottom
ram
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300
10.0 Meter intervals
10.00 20.00 30.00 40.00
-1.00 -5.63 -9.38 -13.13 -16.88 -20.63 -24.38 -28.13 -31.88 -35.63 -39.38 -43.13 -46.88 -50.63 -54.38 -58.13
Ping: 516, Depth: 1.56 meters
01/28/98 16:04:53
Perform Statistics on Selected Area/An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB


Visual Analyzer - P08C.DT4
File View Display Zooming Analyze Configure Window Help
P08C.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200
10.0 Meter intervals
10.00 20.00 30.00 40.00
-1.88 -5.63 -9.38 -13.13 -16.88 -20.63 -24.38 -28.13 -31.88 -35.63 -39.38 -43.13 -46.88 -50.63 -54.38 -58.13
Ping: 924, Depth: 2.52 meters
01/28/98 15:55:36
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

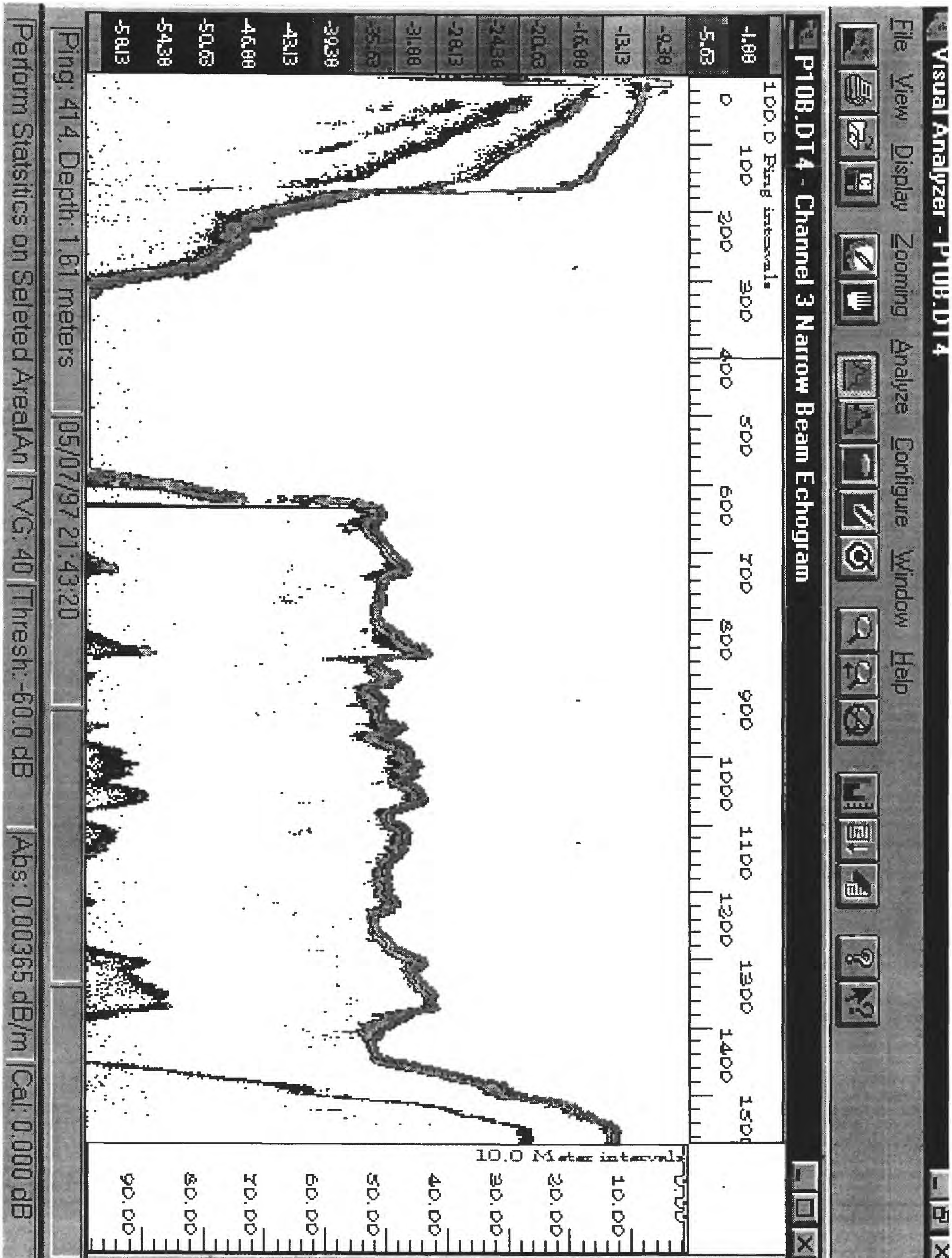

Visual Analyzer - P09A.DT4
File View Display Zooming Analyze Configure Window Help
P09A.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
3000
4000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 3383, Depth: 2.56 meters
01/31/98 16:17:00
Perform Statistics on Seleted Area/An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB



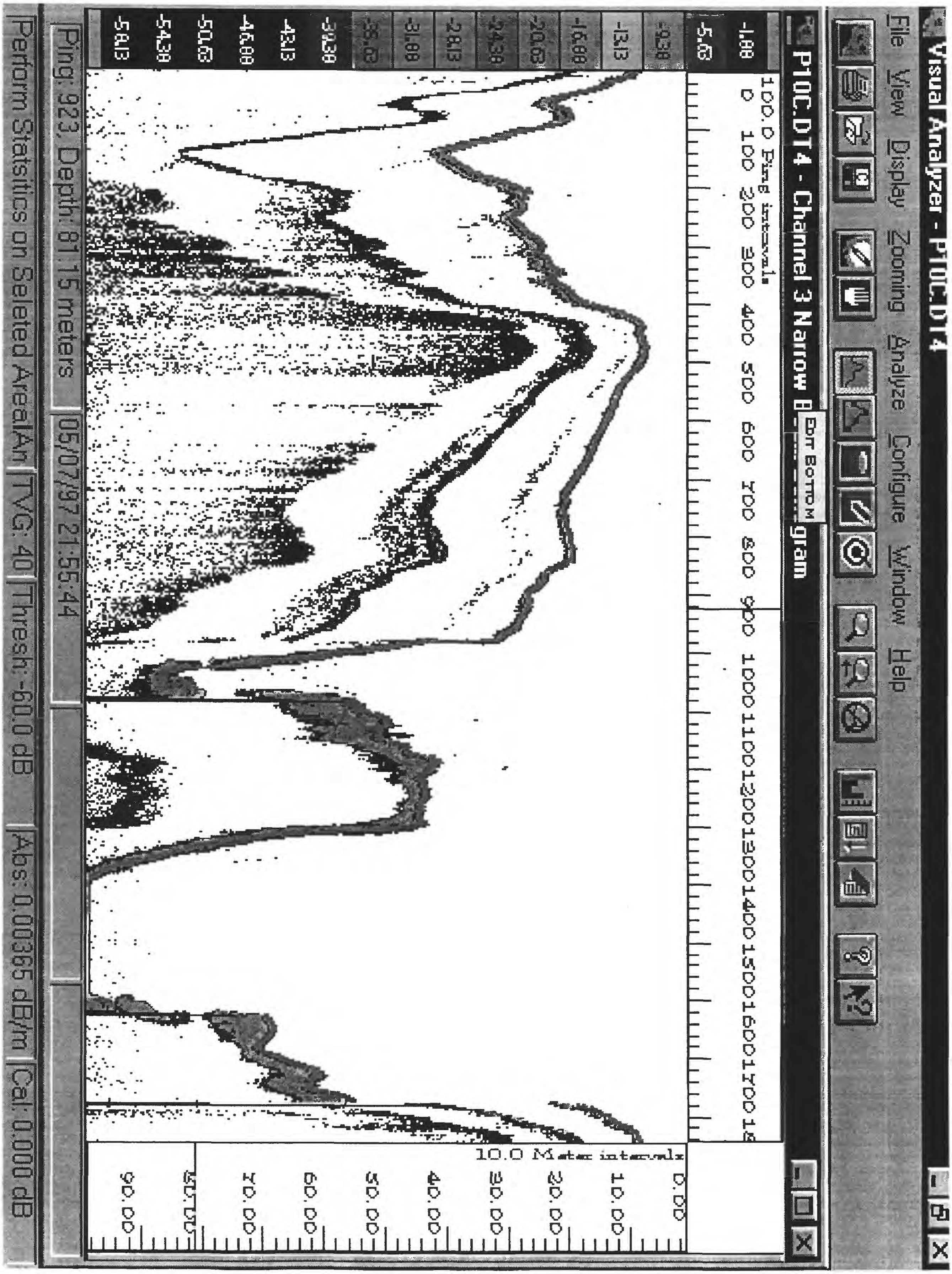
Visual Analyzer - P09B.DT4
File View Display Zooming Analyze Configure Window Help
P09B.DT4 - Channel 3 Narrow
SHOW BOTTOM
gram
1000.0 Ping intervals
0
1000
2000
3000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 833, Depth: 4.27 meters
05/07/97 11:11:59
Perform Statistics on Seleted Area
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB

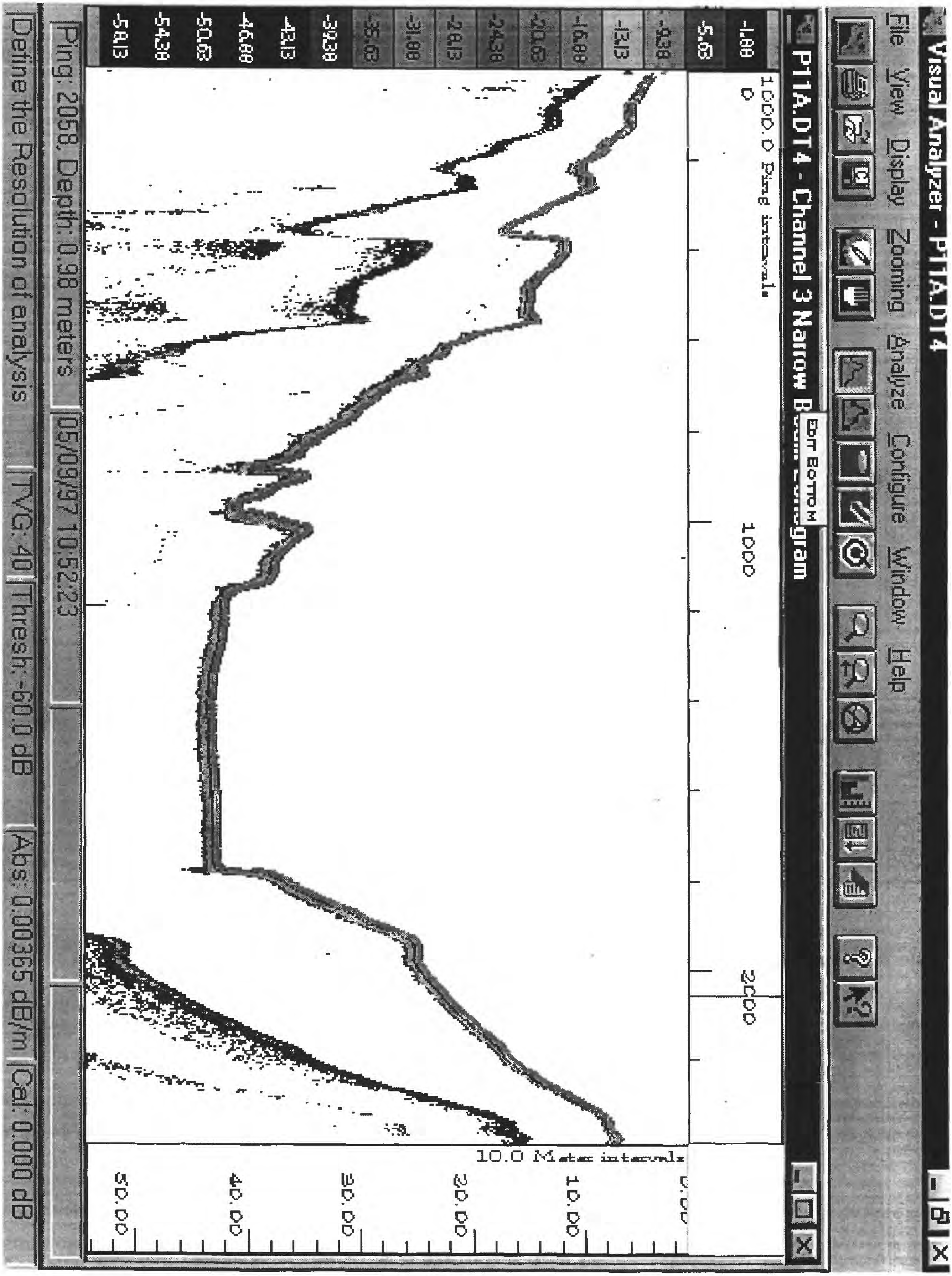


Visual Analyzer - P10A.DT4
File View Display Zooming Analyze Configure Window Help
P10A.DT4 - Channel 3 Narrow Beam
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
10.0 Meter intervals
0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00
-1.88 -5.63 -9.38 -13.13 -16.88 -20.63 -24.38 -28.13 -31.88 -35.63 -39.38 -43.13 -46.88 -50.63 -54.38 -58.13
Ping: 1009, Depth: 13.30 meters
05/07/97 21:32:44
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB

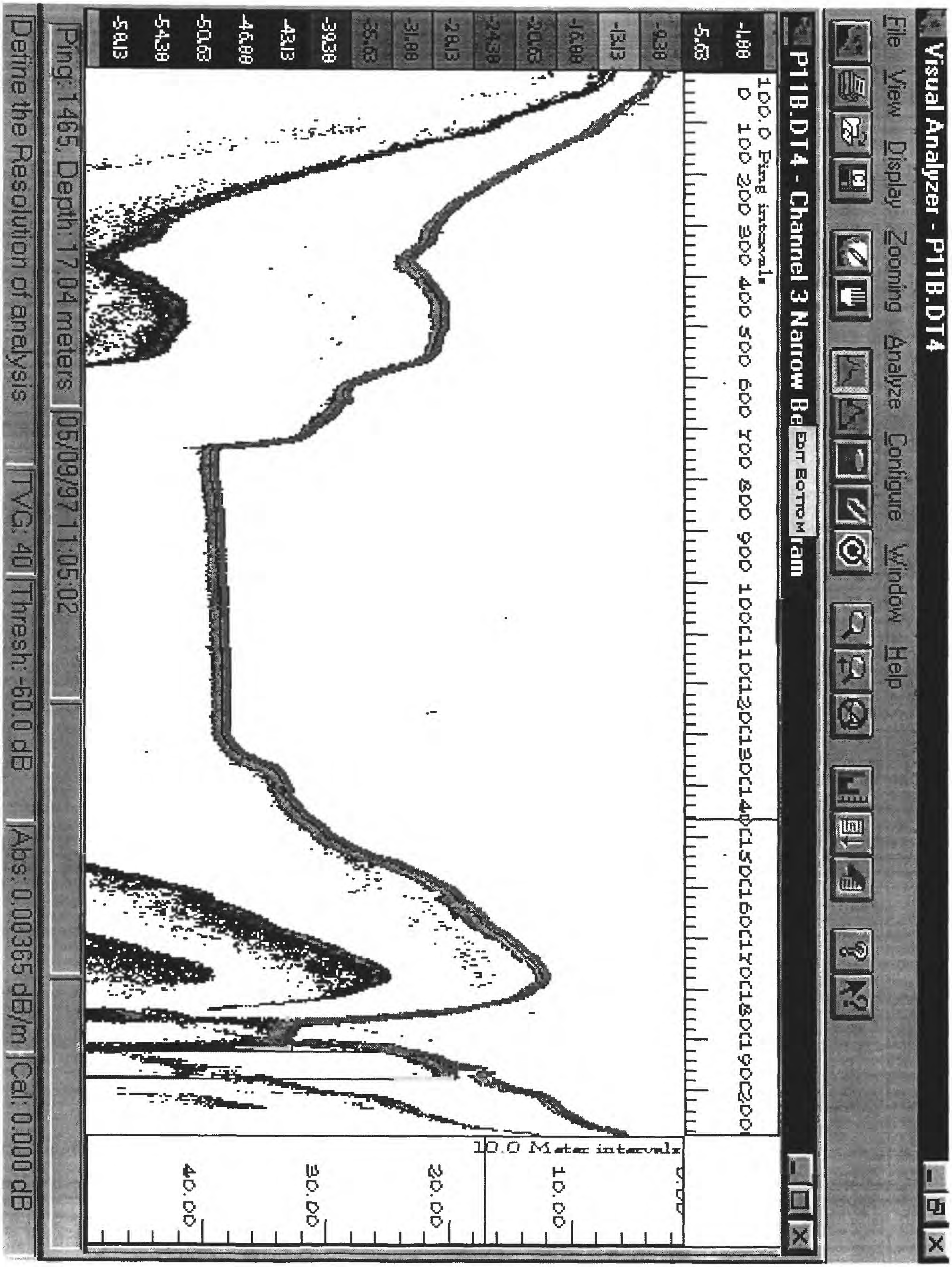


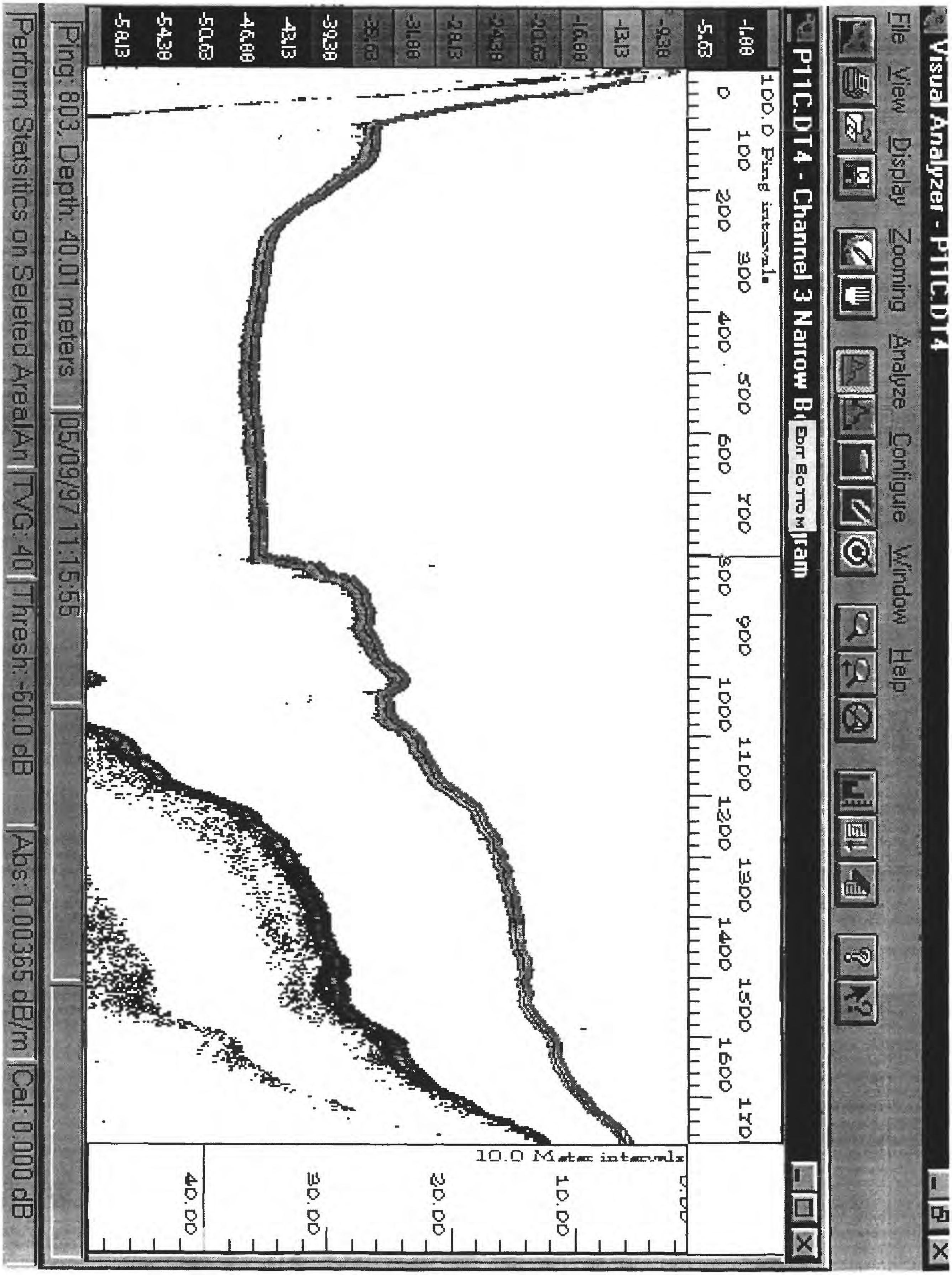
Visual Analyzer - P10B.DT4
File View Display Zooming Analyze Configure Window Help
P10B.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
10.0 Meter intervals
10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00
-1.88 -5.63 -9.38 -13.13 -16.88 -20.63 -24.38 -28.13 -31.88 -35.63 -39.38 -43.13 -46.88 -50.63 -54.38 -58.13
Ping: 414 Depth: 1.61 meters
05/07/97 21:43:20
Perform Statsitics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB

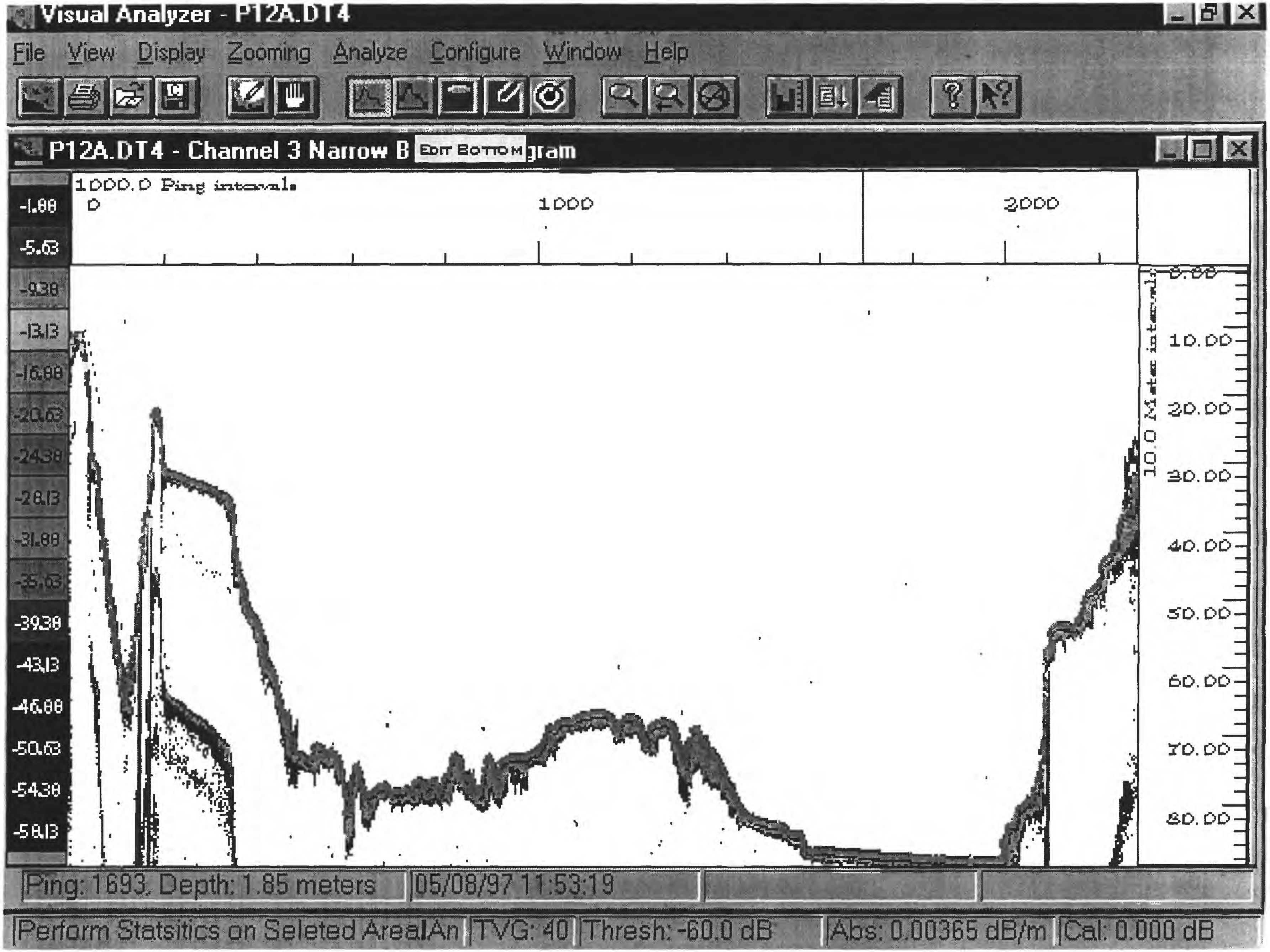

Visual Analyzer - P10C.DT4
File View Display Zooming Analyze Configure Window Help
P10C.DT4 - Channel 3 Narrow B
gram
EDIT BOTTOM
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700
10.0 Meter intervals
0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00
-1.88 -5.63 -9.38 -13.13 -16.88 -20.63 -24.38 -28.13 -31.88 -35.63 -39.38 -43.13 -46.88 -50.63 -54.38 -58.13
Ping: 923 Depth: 81.15 meters
05/07/97 21:55:44
Perform Statistics on Seleted Area
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB



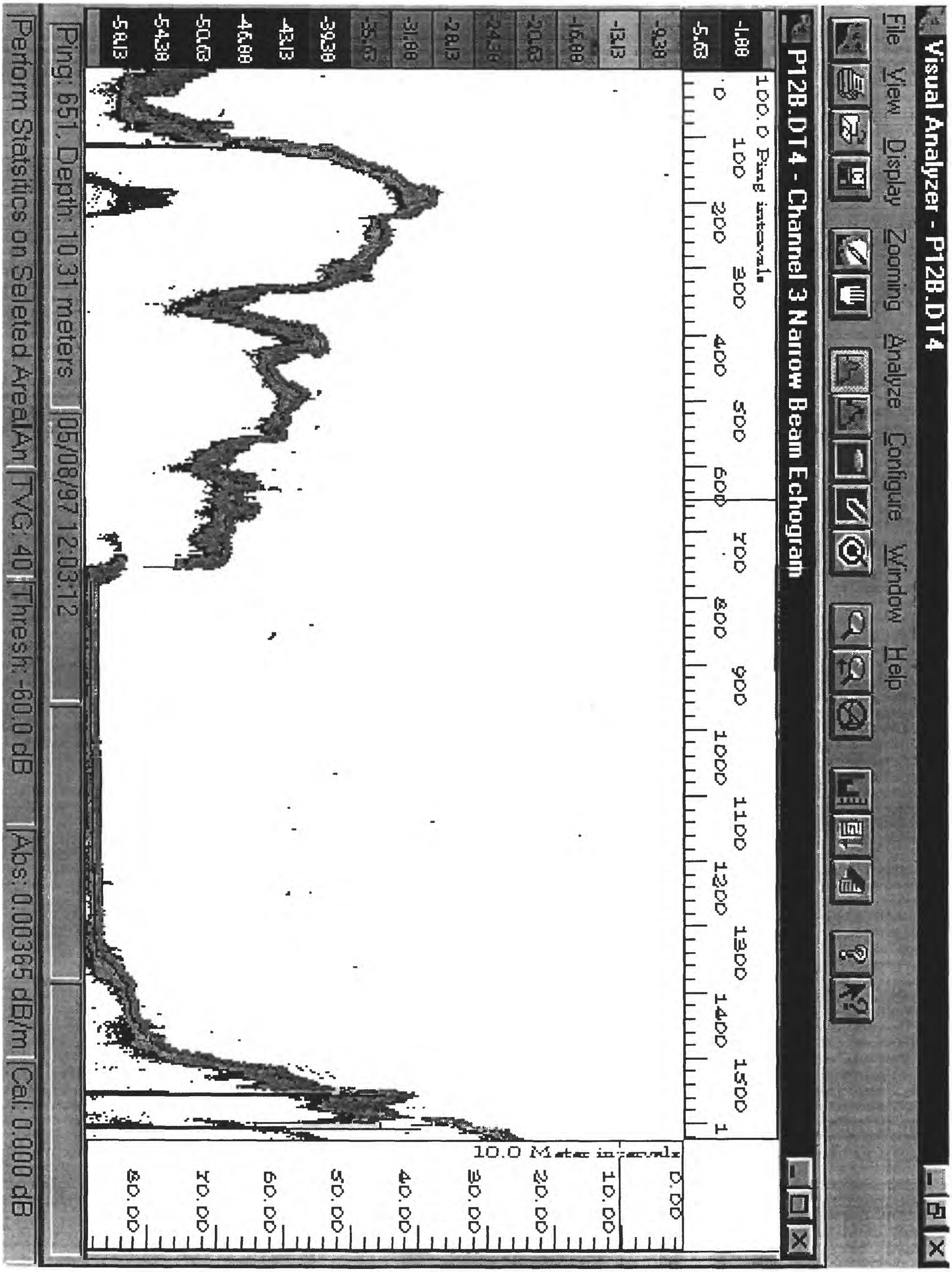
Visual Analyzer - P11A.DT4
File View Display Zooming Analyze Configure Window Help
P11A.DT4 - Channel 3 Narrow B
gram
Edit Bottom
1000.0 Ping intervals
0
1000
2000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 2058, Depth: 0.98 meters
05/09/97 10:52:23
Define the Resolution of analysis
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB

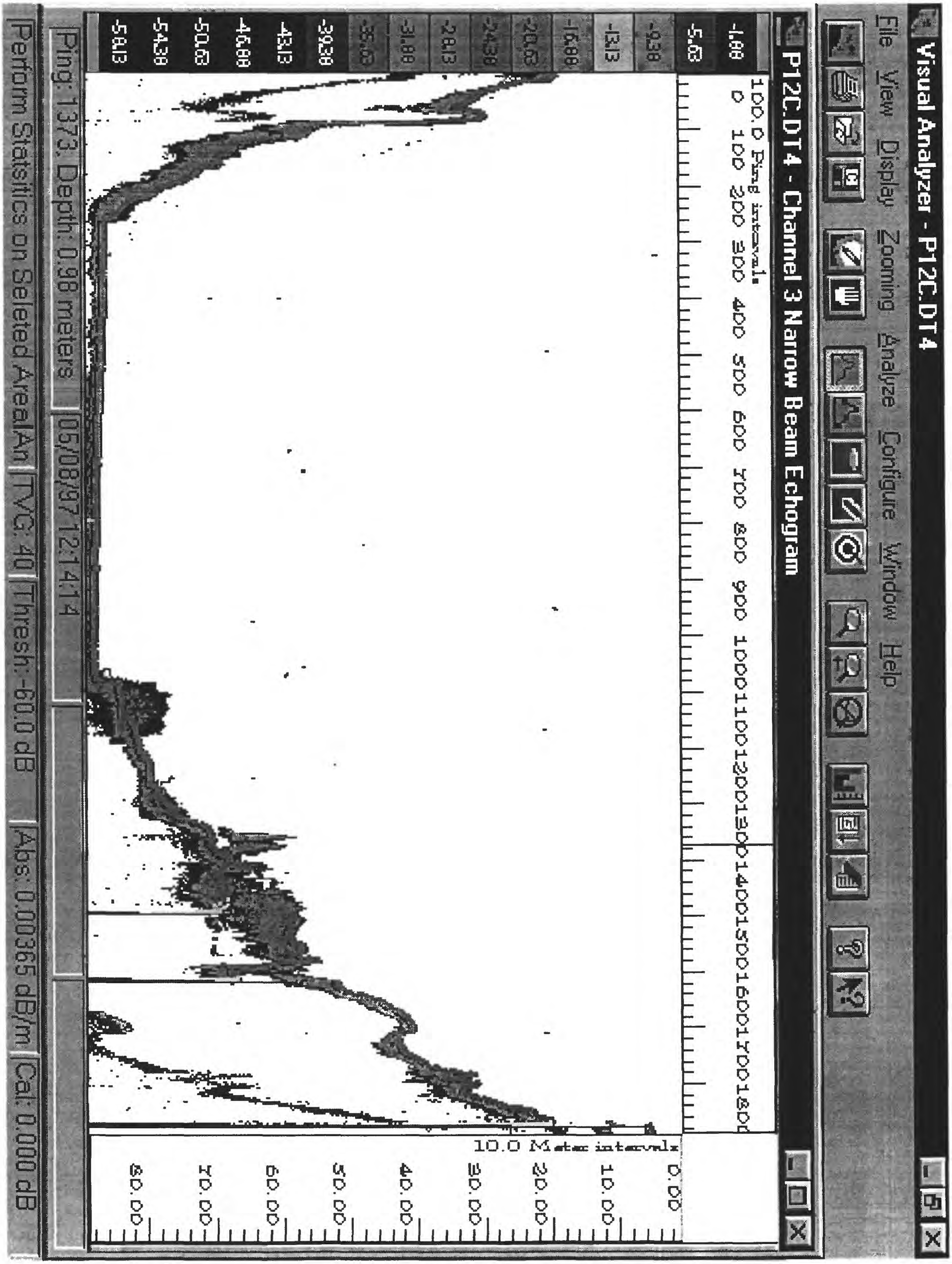

Visual Analyzer - P11B.DT4
File View Display Zooming Analyze Configure Window Help
P11B.DT4 - Channel 3 Narrow Be
Edit Bottom
100.0 Ping intervals
10.0 Meter intervals
10.00
20.00
30.00
40.00
Ping: 1465, Depth: 17.04 meters
05/09/97 11:05:02
Define the Resolution of analysis
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB


Visual Analyzer - P11C.DT4
File View Display Zooming Analyze Configure Window Help
P11C.DT4 - Channel 3 Narrow Beam
Bot Bottom
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700
10.0 Meter intervals
10.00 20.00 30.00 40.00
-1.88 -5.63 -9.38 -13.13 -16.88 -20.63 -24.38 -28.13 -31.88 -35.63 -39.38 -43.13 -46.88 -50.63 -54.38 -58.13
Ping: 803, Depth: 40.01 meters
05/09/97 11:15:55
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB

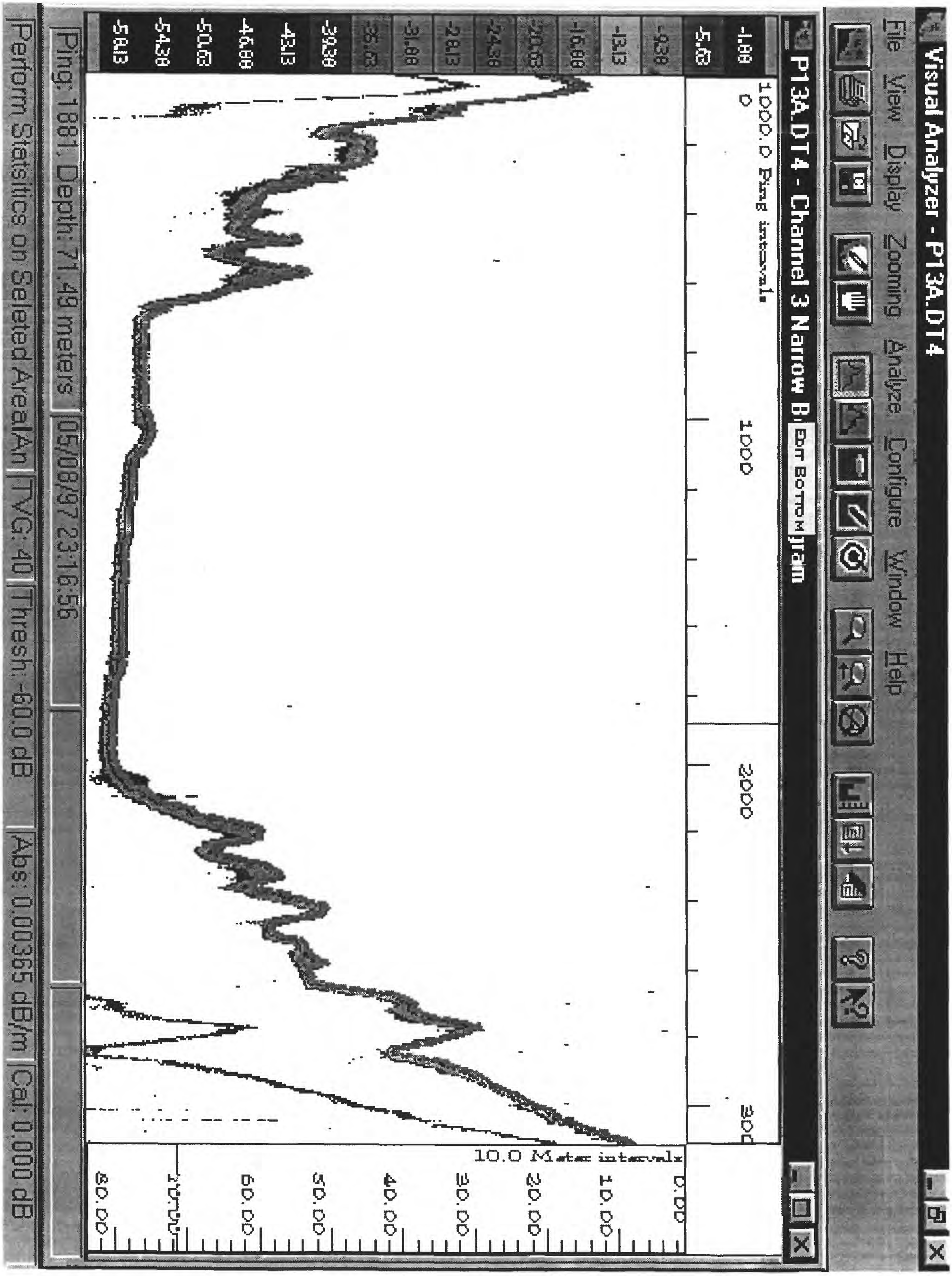


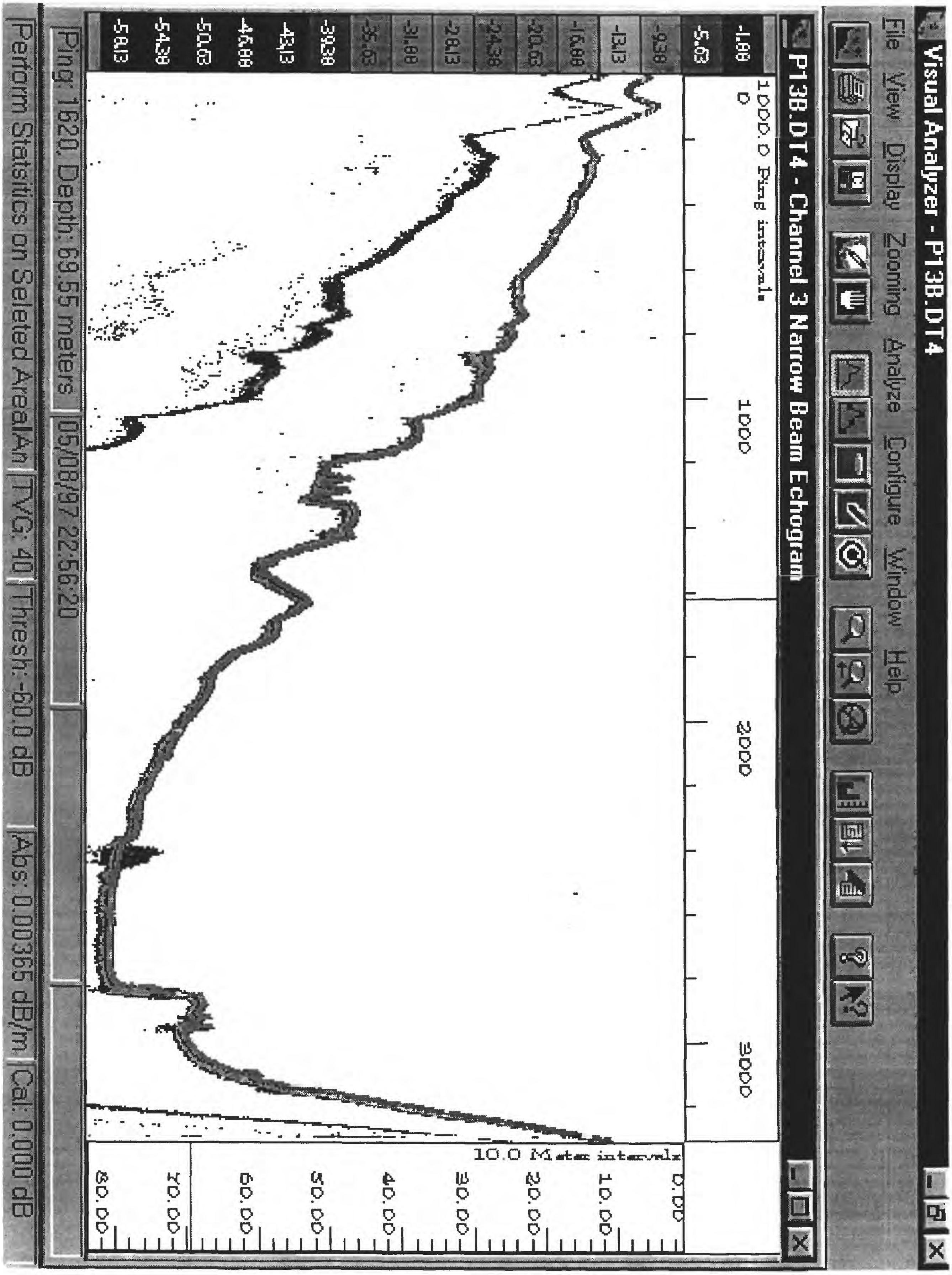
Visual Analyzer - P12A.DT4
File View Display Zooming Analyze Configure Window Help
P12A.DT4 - Channel 3 Narrow B EDIT BOTTOM gram
1000.0 Ping interval:
0
1000
2000
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
10.0 Meter interval:
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Ping: 1693, Depth: 1.85 meters
05/08/97 11:53:19
Perform Statsitics on Seleted AreaIAn
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB


Visual Analyzer - P12B.DT4
File View Display Zooming Analyze Configure Window Help
P12B.DT4 - Channel 3 Narrow Beam Echogram
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
10.0 Meter intervals
0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00
Ping: 651, Depth: 10.31 meters
05/08/97 12:03:12
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB

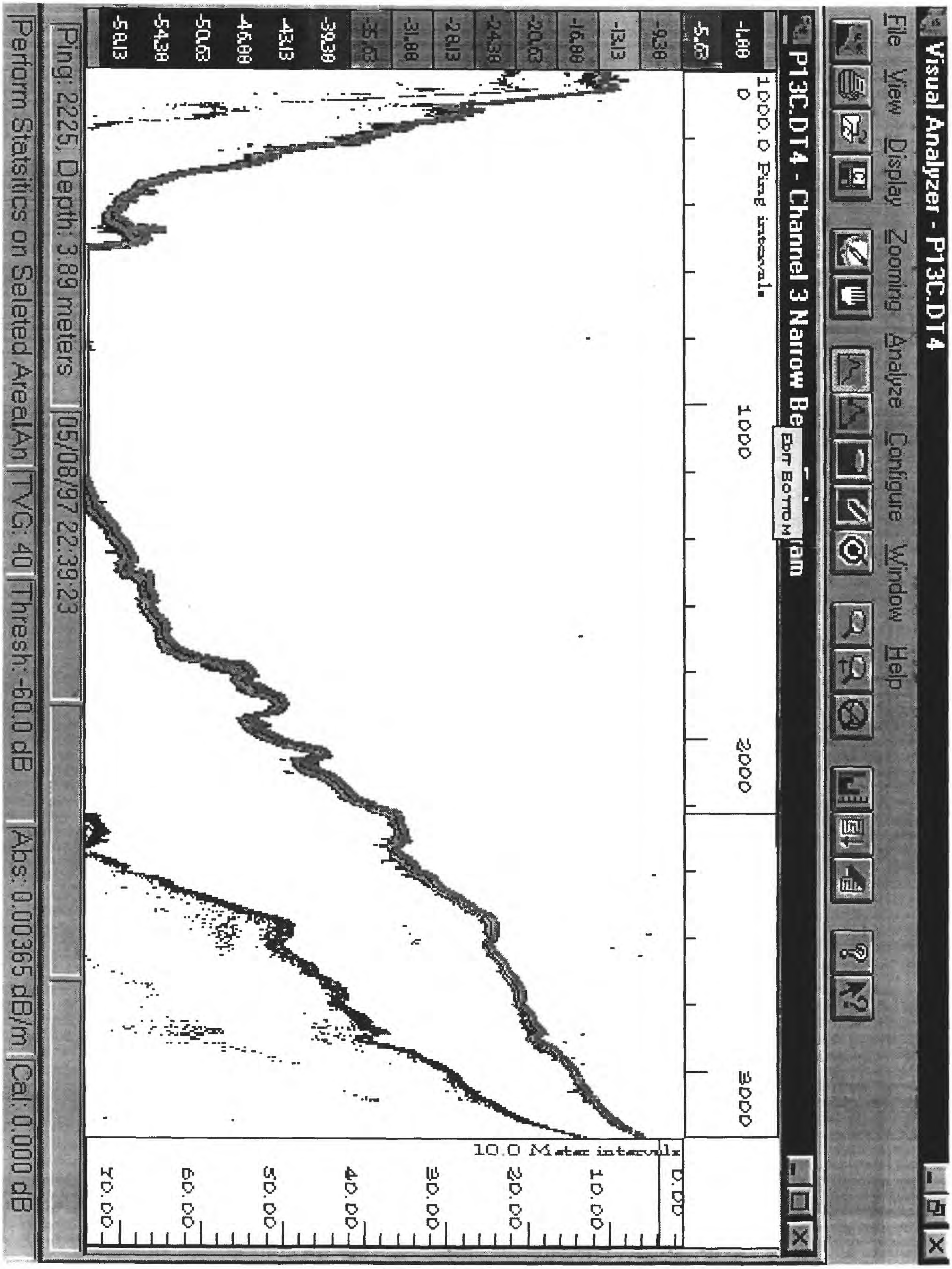


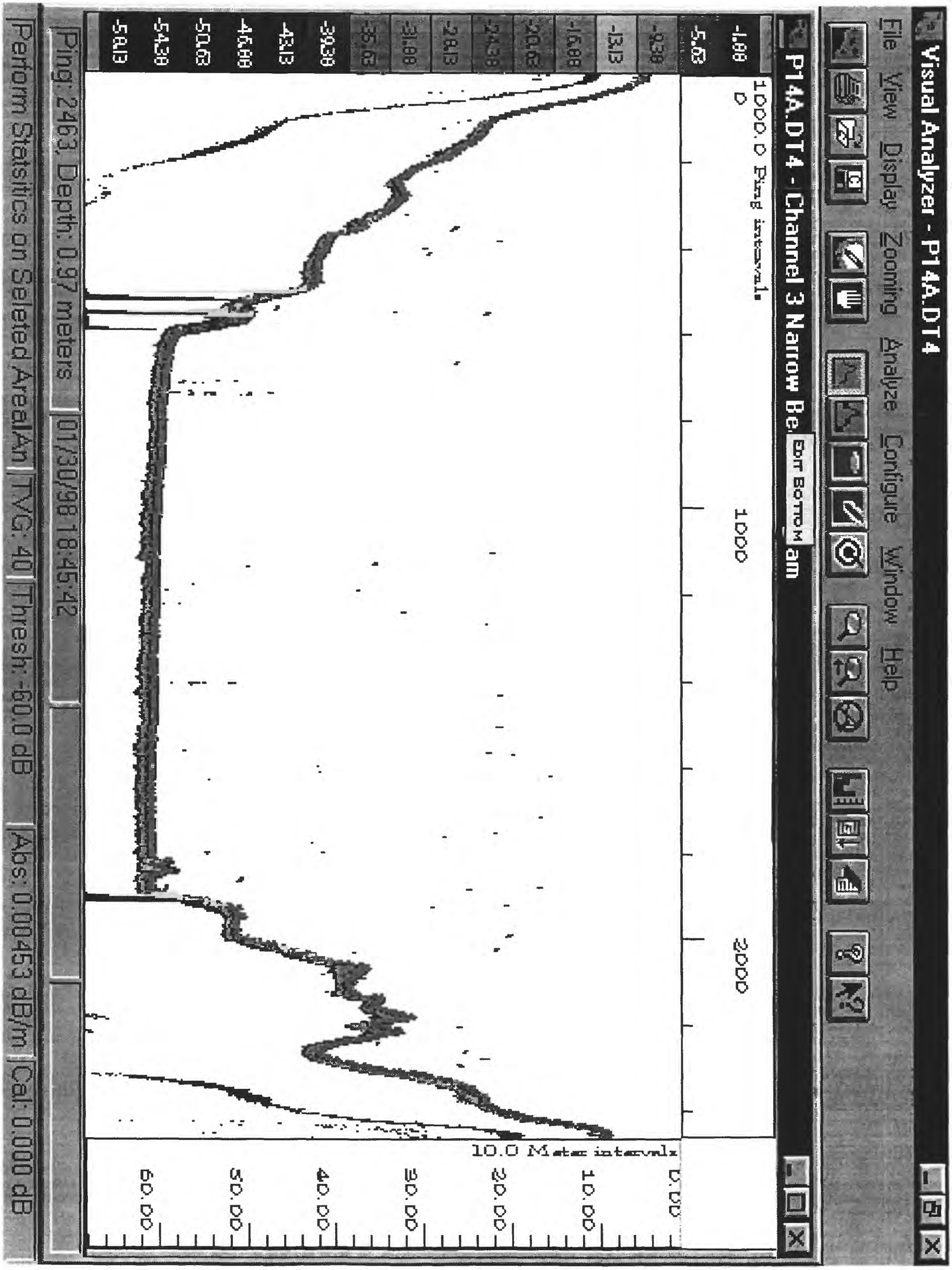
Visual Analyzer - P12C.DT4
File View Display Zooming Analyze Configure Window Help
P12C.DT4 - Channel 3 Narrow Beam Echogram
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1373, Depth: 0.98 meters
05/08/97 12:14:14
Perform Statistics on Seleted Area/An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB

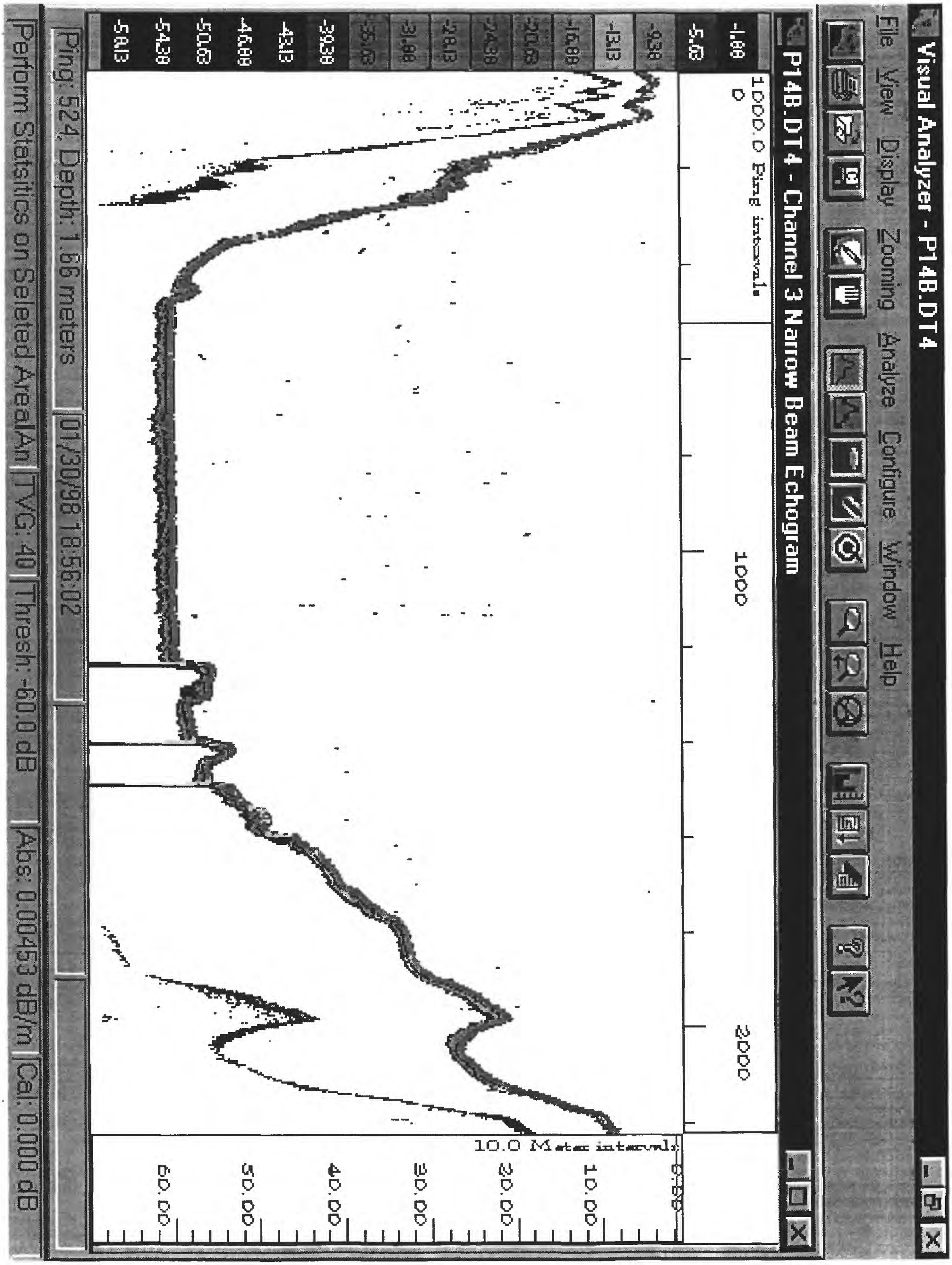

Visual Analyzer - P13A.DT4
File View Display Zooming Analyze Configure Window Help
P13A.DT4 - Channel 3 Narrow B
Edit Bottom
gram
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
1000.0 Ping intervals
0
1000
2000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
80.00
Ping: 1881, Depth: 71.49 meters
05/08/97 23:16:56
Perform Statistics on Seleted Area
TVG: 40
Thresh: -60.0 dB
Abs: 0.000365 dB/m
Cal: 0.000 dB

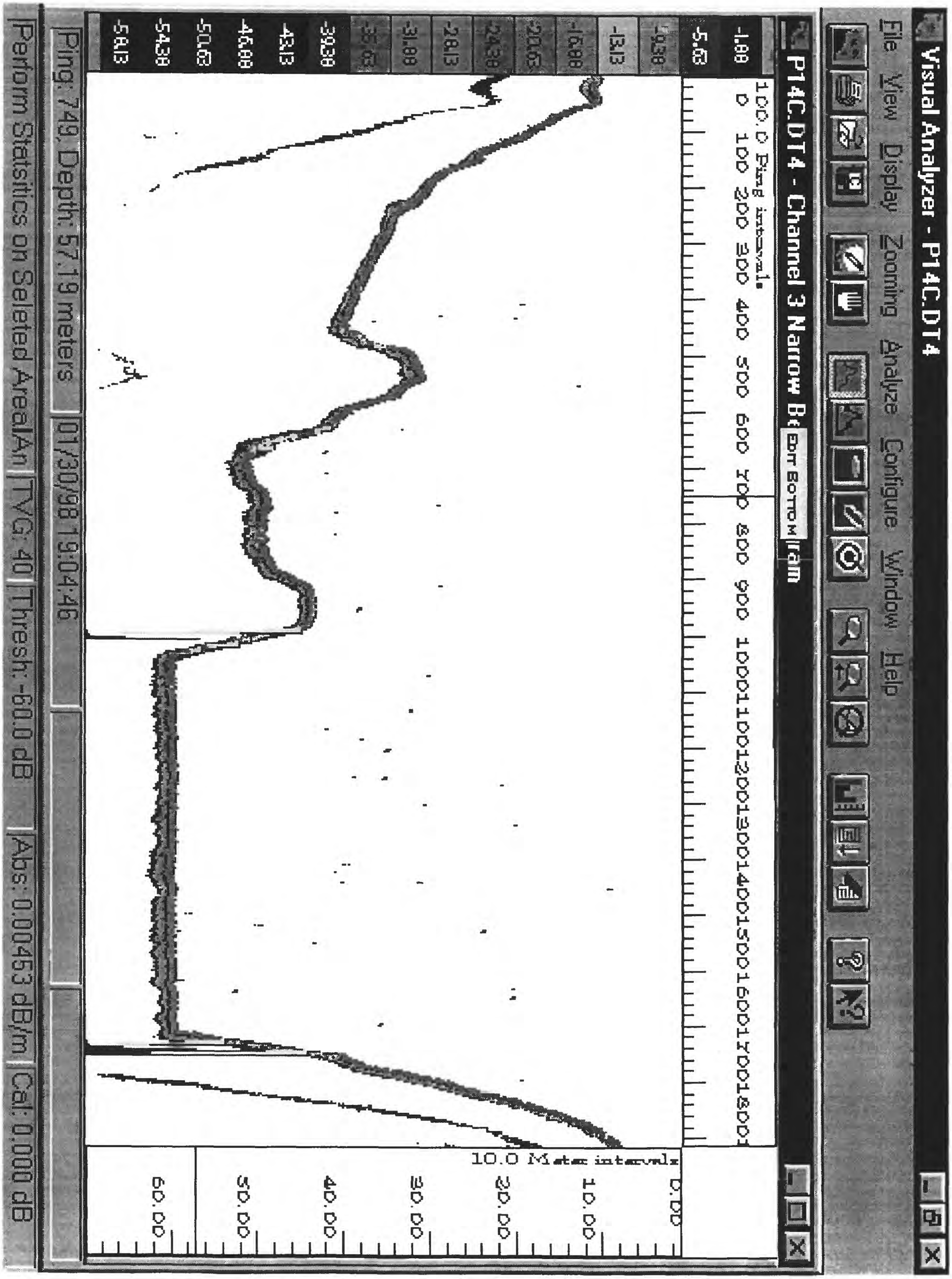


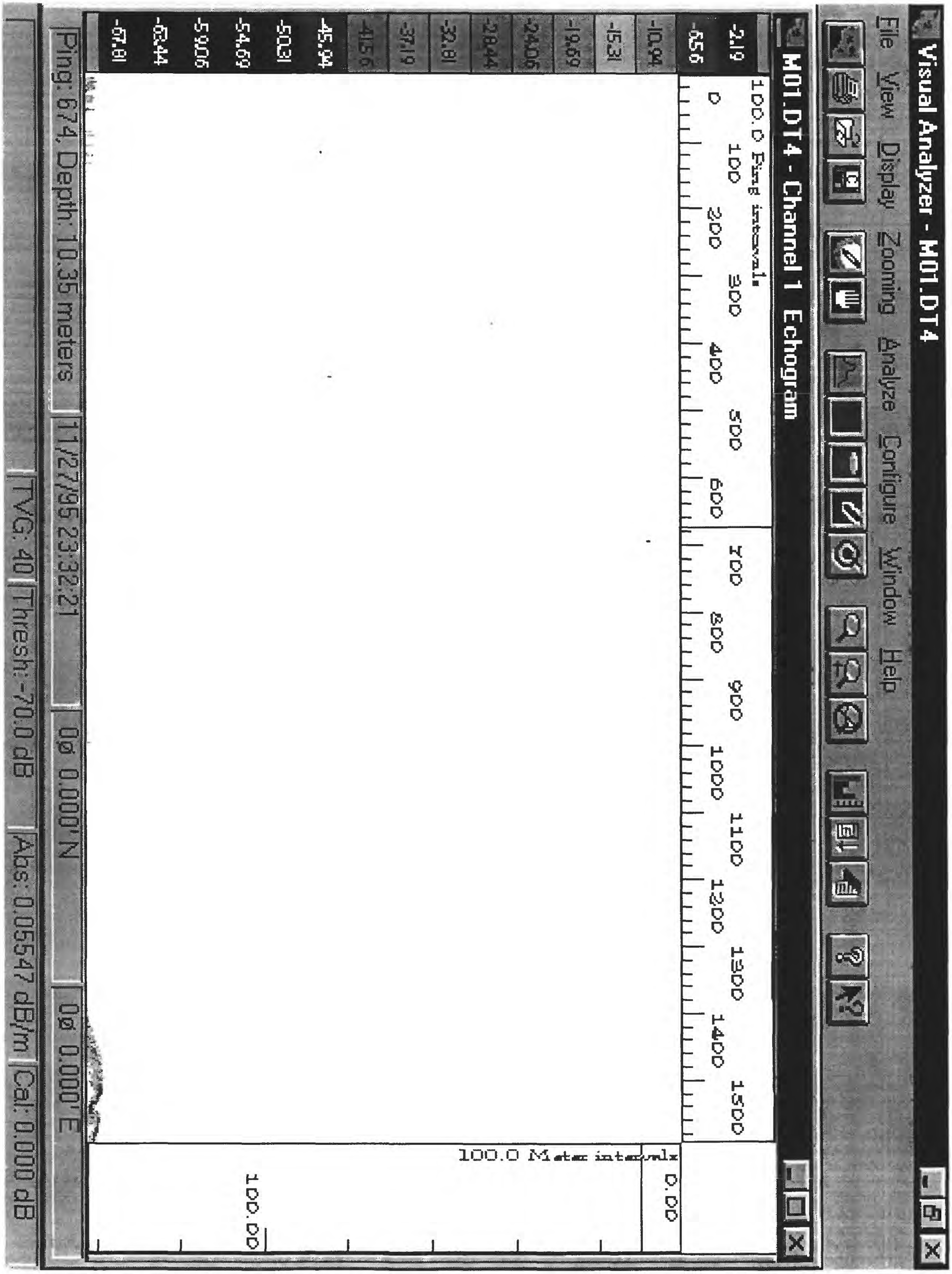
Visual Analyzer - P13B.DT4
File View Display Zooming Analyze Configure Window Help
P13B.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
3000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1620, Depth: 69.55 meters
05/08/97 22:56:20
Perform Statistics on Seleted Area|Ab
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB

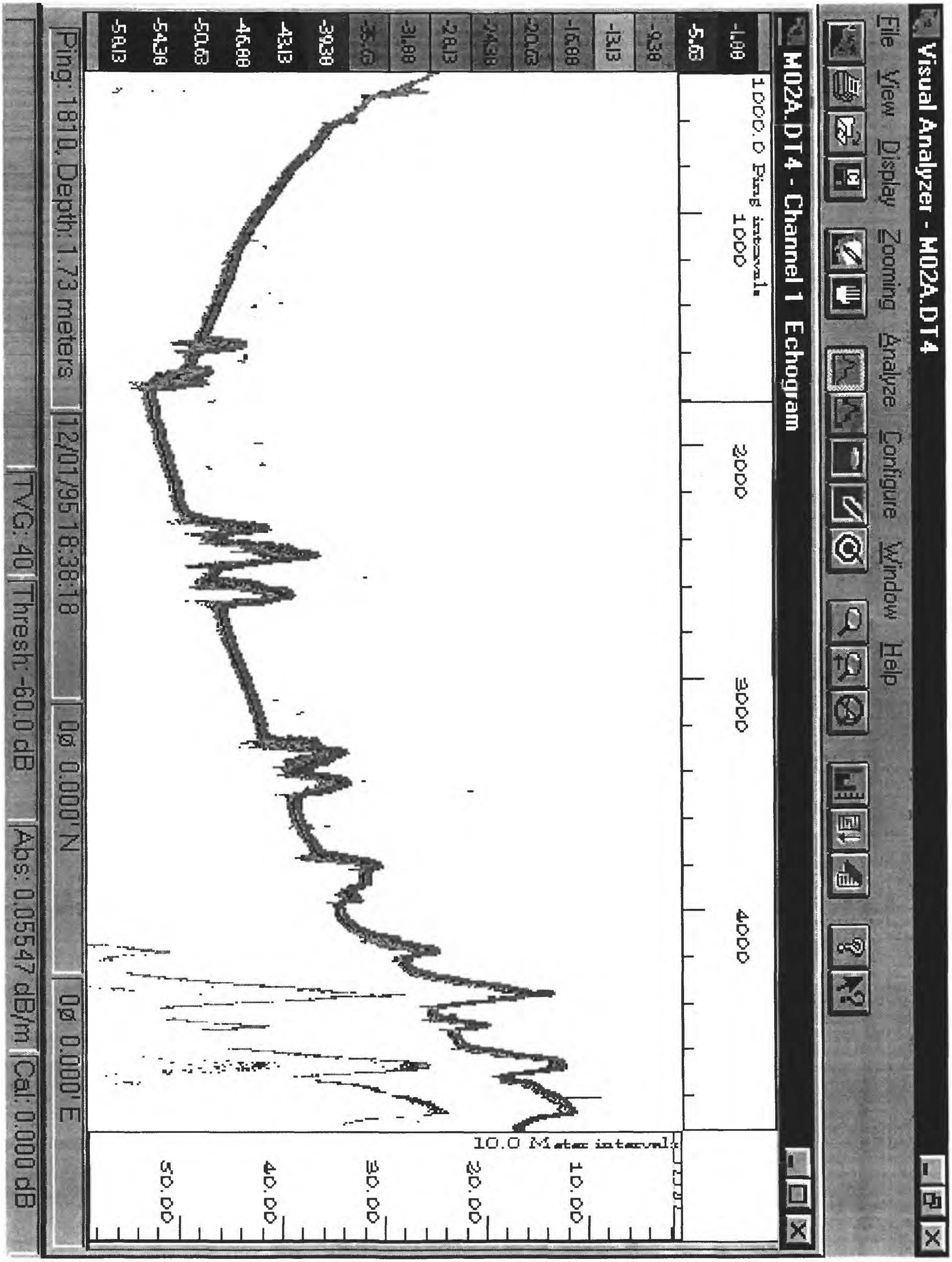

Visual Analyzer - P13C.DT4
File View Display Zooming Analyze Configure Window Help
P13C.DT4 - Channel 3 Narrow Be
am
EDIT BOTTOM
1000.0 Ping intervals
0
1000
2000
3000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 2225, Depth: 3.89 meters
05/08/97 22:39:23
Perform Statistics on Seleted Areal An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00365 dB/m
Cal: 0.000 dB


Visual Analyzer - P14A.DT4
File View Display Zooming Analyze Configure Window Help
P14A.DT4 - Channel 3 Narrow Beam
1000.0 Ping intervals
0
1000
2000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
Ping: 2463, Depth: 0.97 meters
01/30/98 18:45:42
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

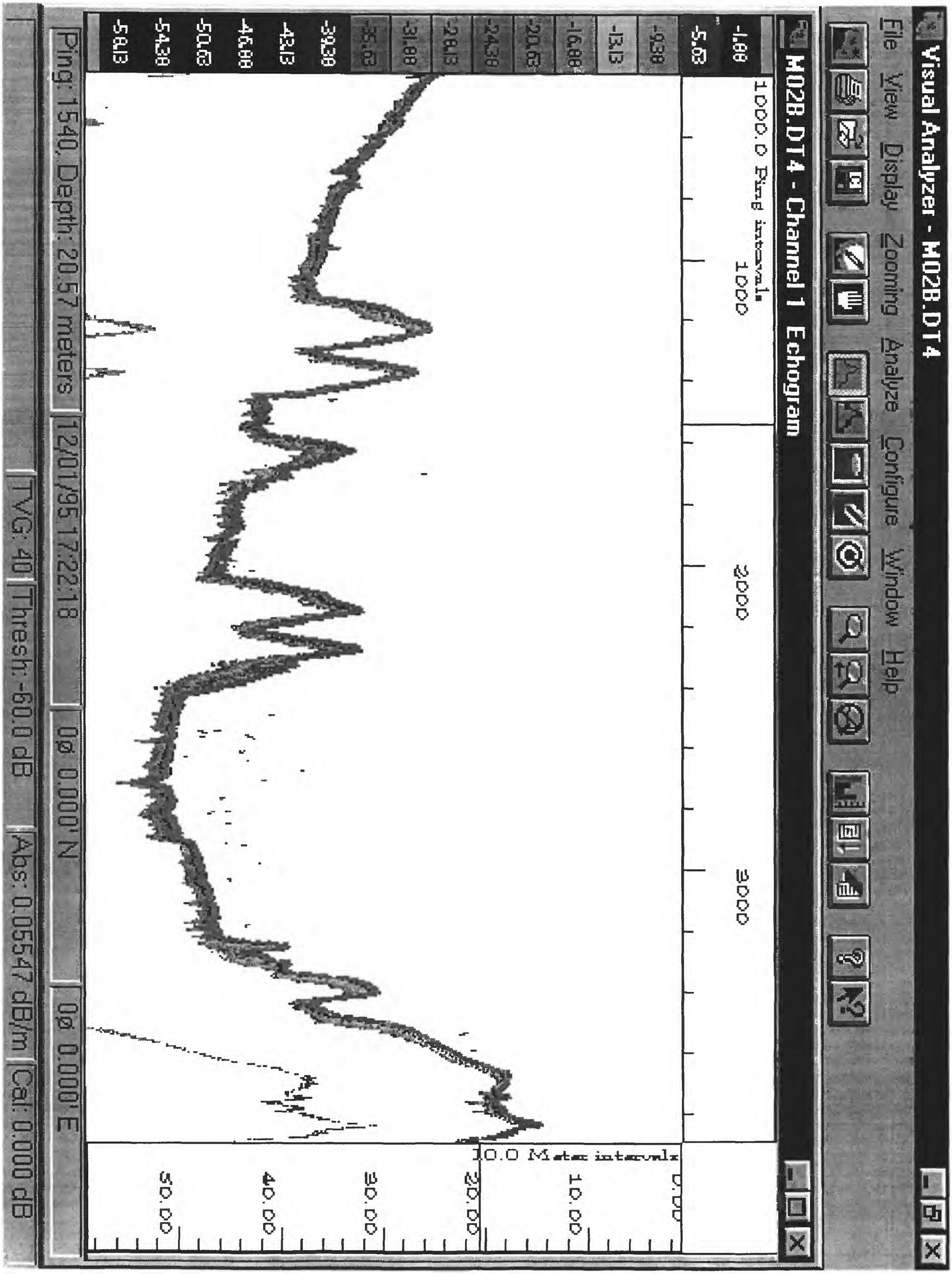

Visual Analyzer - P14B.DT4
File View Display Zooming Analyze Configure Window Help
P14B.DT4 - Channel 3 Narrow Beam Echogram
1000.0 Ping intervals
0
1000
2000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 524, Depth: 1.66 meters
01/30/98 18:56:02
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB

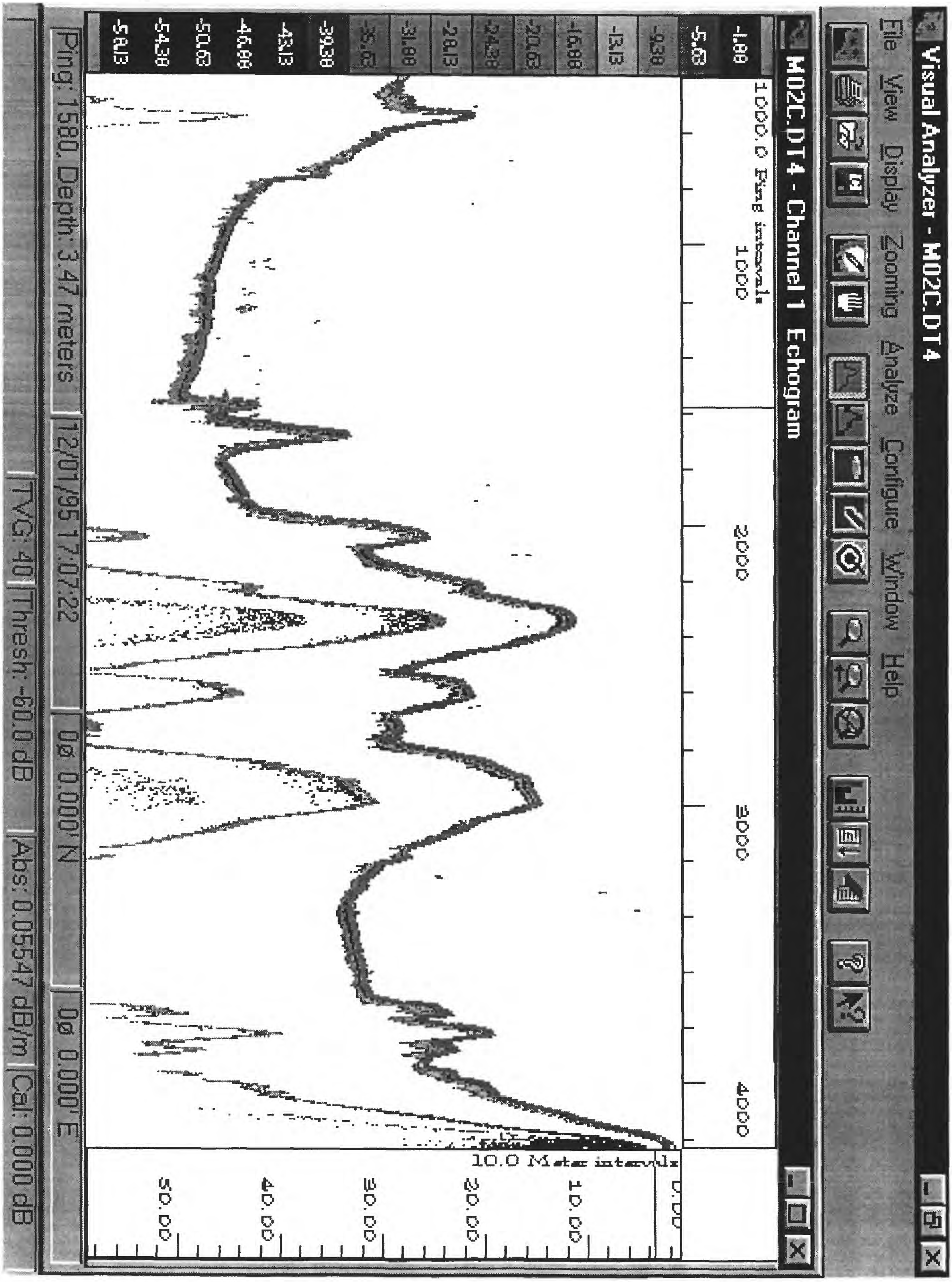

Visual Analyzer - P14C.DT4
File View Display Zooming Analyze Configure Window Help
P14C.DT4 - Channel 3 Narrow B
Edit Bottom
100.0 Ping intervals
10.0 Meter intervals
Ping: 749, Depth: 57.19 meters
01/30/98 19:04:46
Perform Statistics on Seleted Areal An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00453 dB/m
Cal: 0.000 dB


Visual Analyzer - M01.DT4
File View Display Zooming Analyze Configure Window Help
M01.DT4 - Channel 1 Echogram
-2.19
-6.56
-10.94
-15.31
-19.69
-24.06
-28.44
-32.81
-37.19
-41.56
-45.94
-50.31
-54.69
-59.06
-63.44
-67.81
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
100.0 Meter intervals
0.00
100.00
Ping: 674, Depth: 10.35 meters
11/27/95 23:32:21
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -70.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

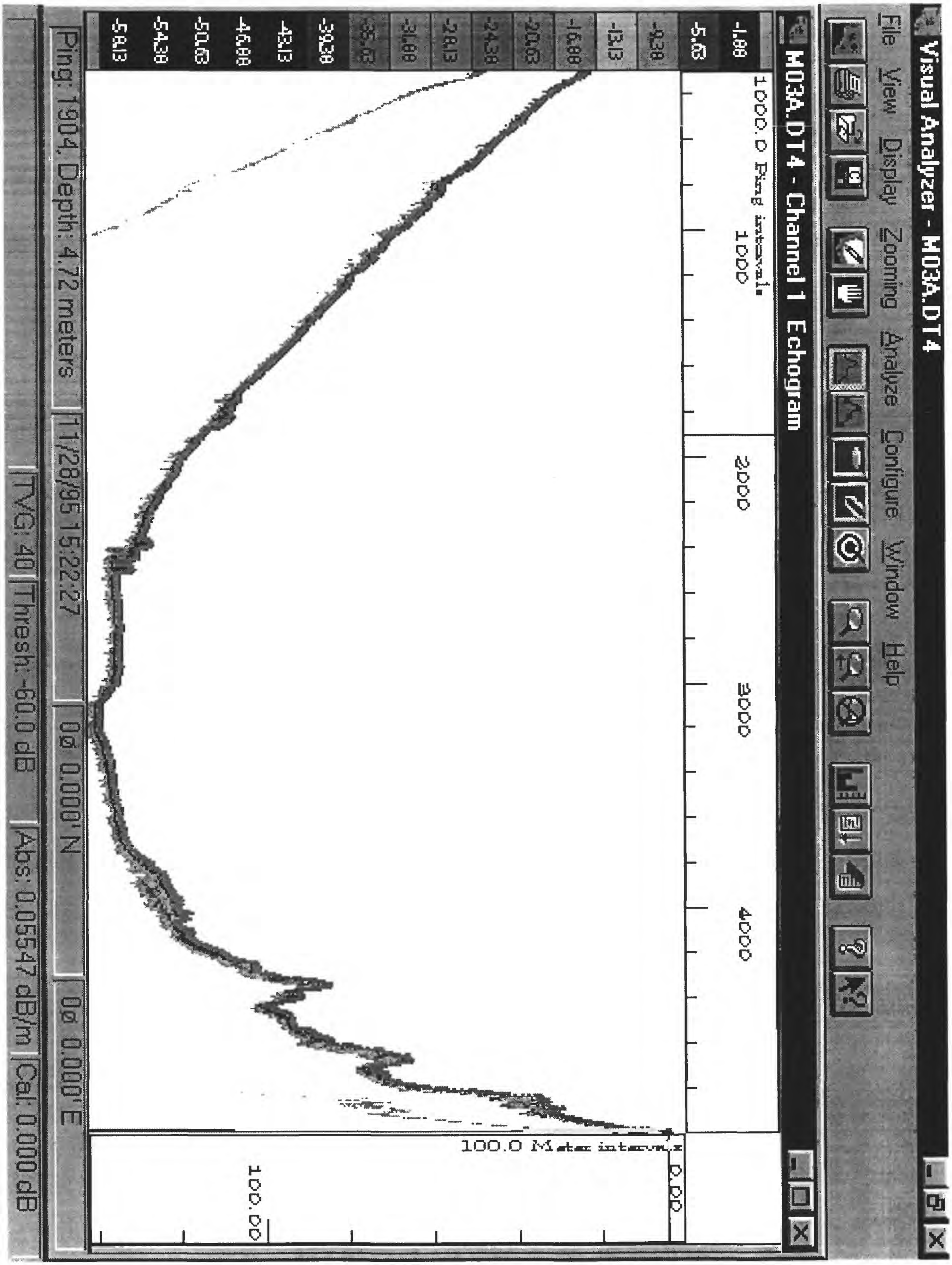


Visual Analyzer - M02A.DT4
File View Display Zooming Analyze Configure Window Help
M02A.DT4 - Channel 1 Echogram
1000.0 Ping interval:
1000
2000
3000
4000
10.0 Meter interval:
10.00
20.00
30.00
40.00
50.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1810, Depth: 1.73 meters
12/01/95 18:38:18
0ø 0.000'N
0ø 0.000'E
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

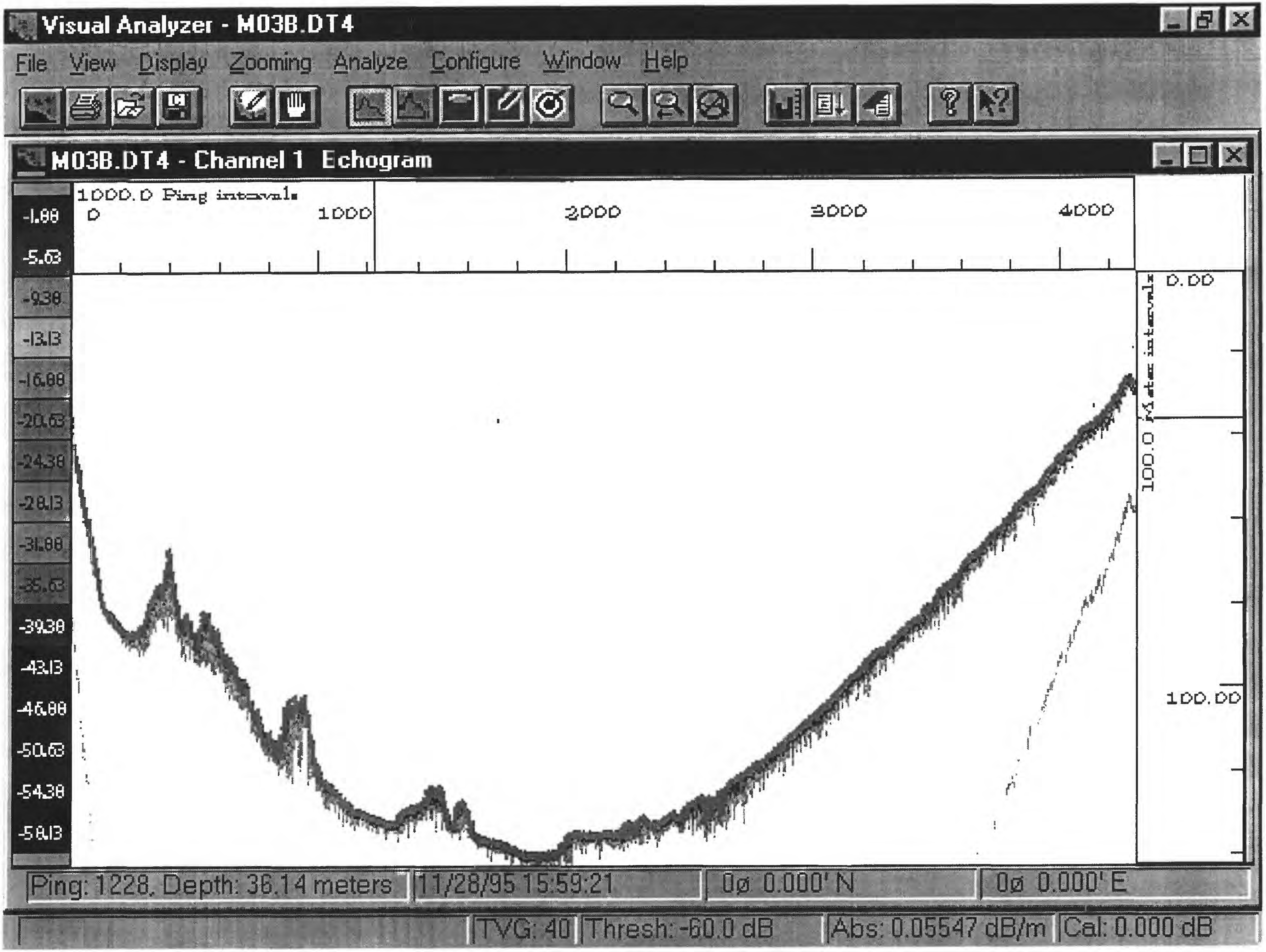

Visual Analyzer - M02B.DT4
File View Display Zooming Analyze Configure Window Help
M02B.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1540, Depth: 20.57 meters
12/01/95 17:22:18
0ø 0.000'N
0ø 0.000'E
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB



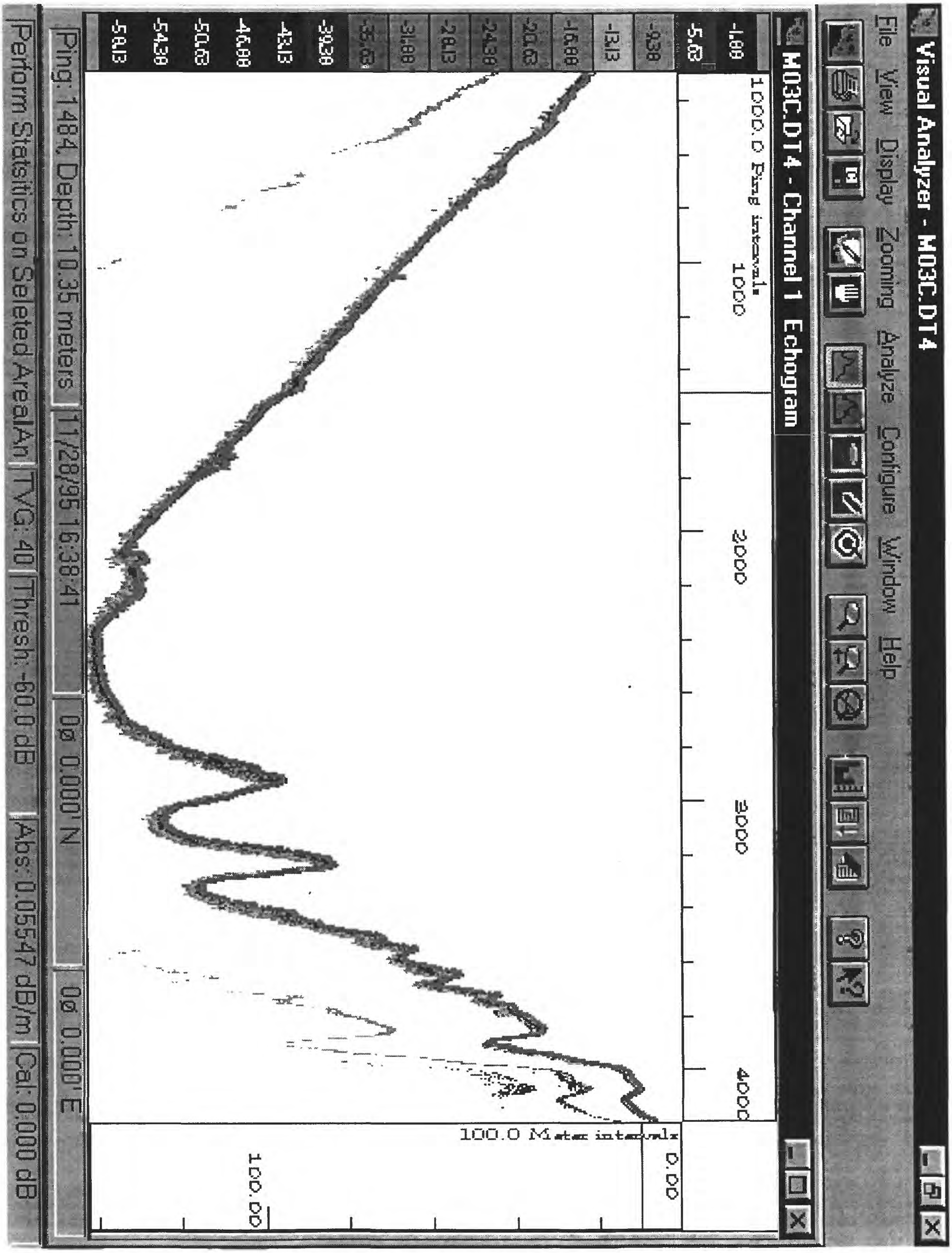
Visual Analyzer - M02C.DT4
File View Display Zooming Analyze Configure Window Help
M02C.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1580, Depth: 3.47 meters
12/01/95 17:07:22
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

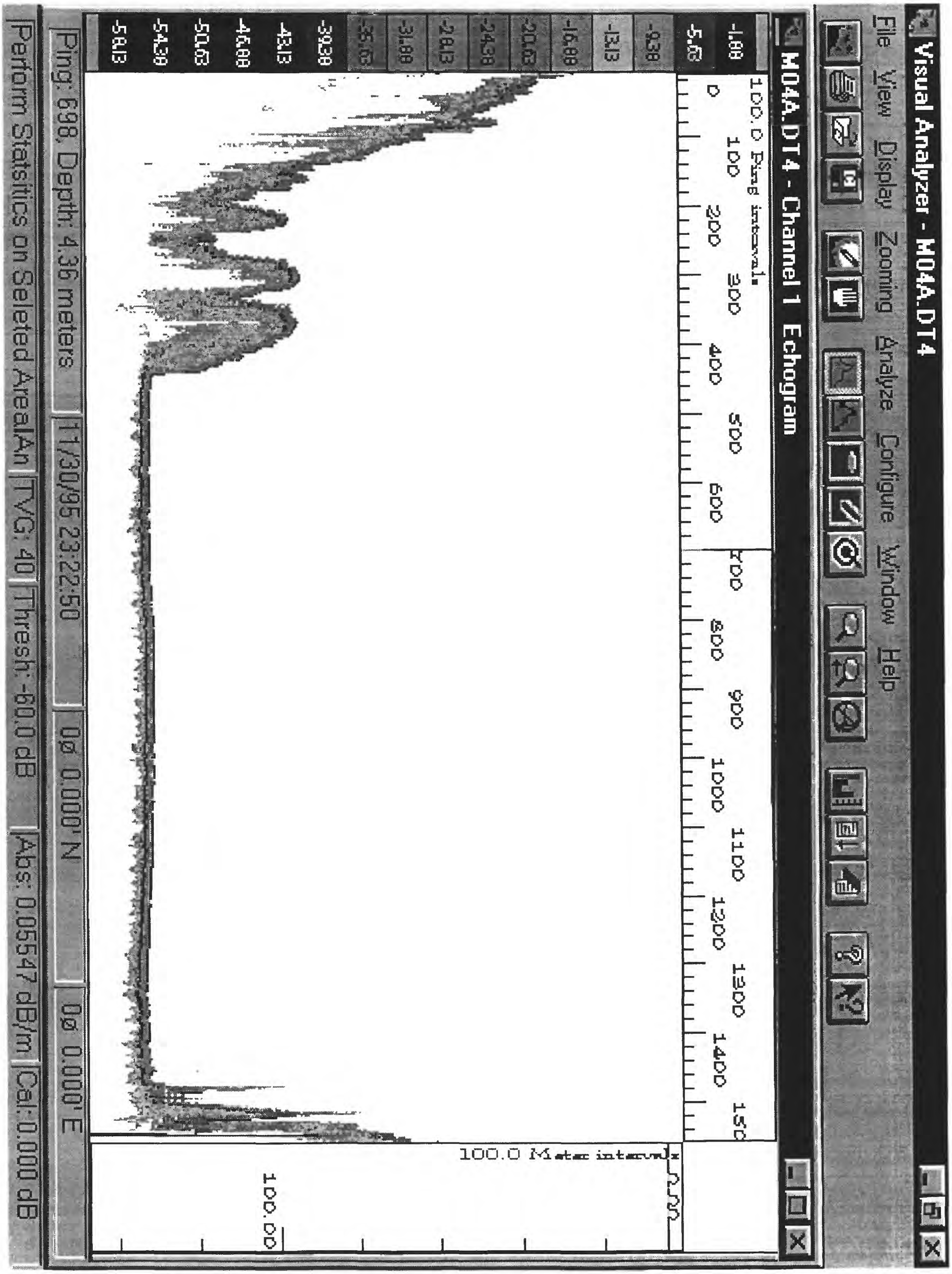


Visual Analyzer - M03A.DT4
File View Display Zooming Analyze Configure Window Help
M03A.DT4 - Channel 1 Echogram
1000.0 Ping interval:
1000
2000
3000
4000
100.0 Meter interval:
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1904, Depth: 4.72 meters
11/28/95 15:22:27
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

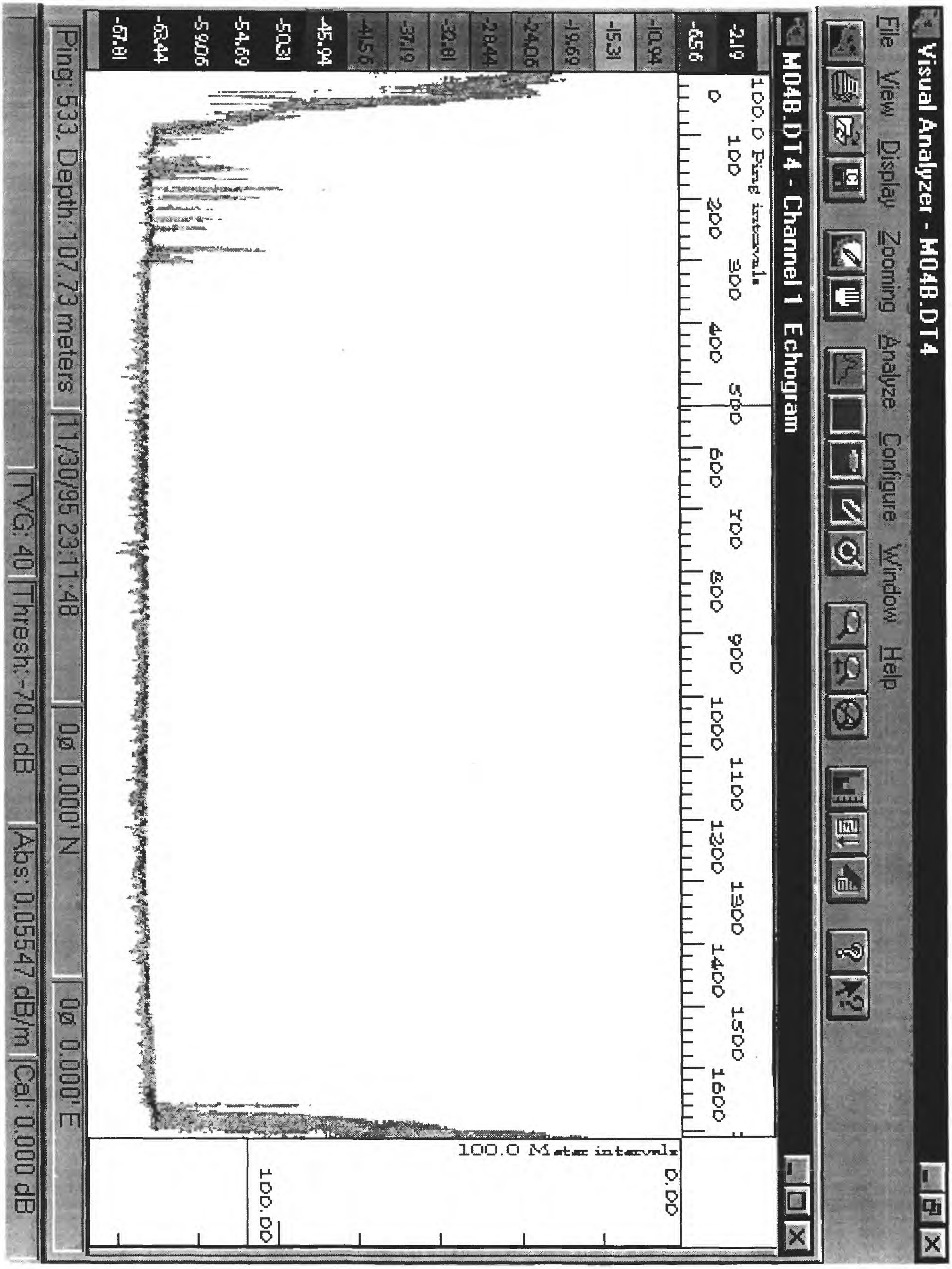


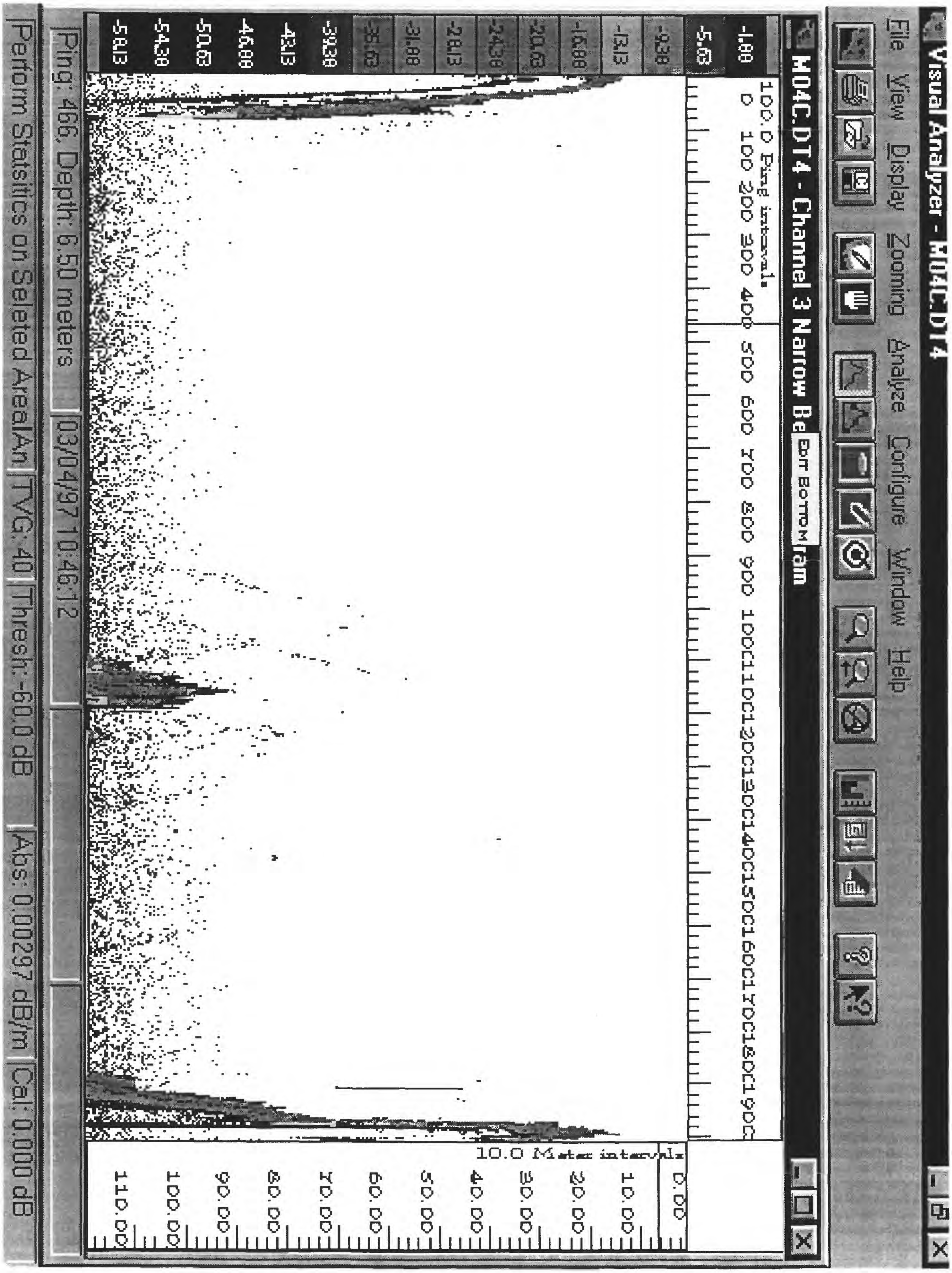
Visual Analyzer - M03B.DT4
File View Display Zooming Analyze Configure Window Help
M03B.DT4 - Channel 1 Echogram
1000.0 Ping intervals
0
1000
2000
3000
4000
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
100.0 Meter intervals
0.00
100.00
Ping: 1228, Depth: 36.14 meters
11/28/95 15:59:21
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB


Visual Analyzer - M03C.DT4
File View Display Zooming Analyze Configure Window Help
M03C.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1484, Depth: 10.35 meters
11/28/95 16:38:41
0ø 0.000' N
0ø 0.000' E
Perform Statistics on Seleted AreaIAn
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

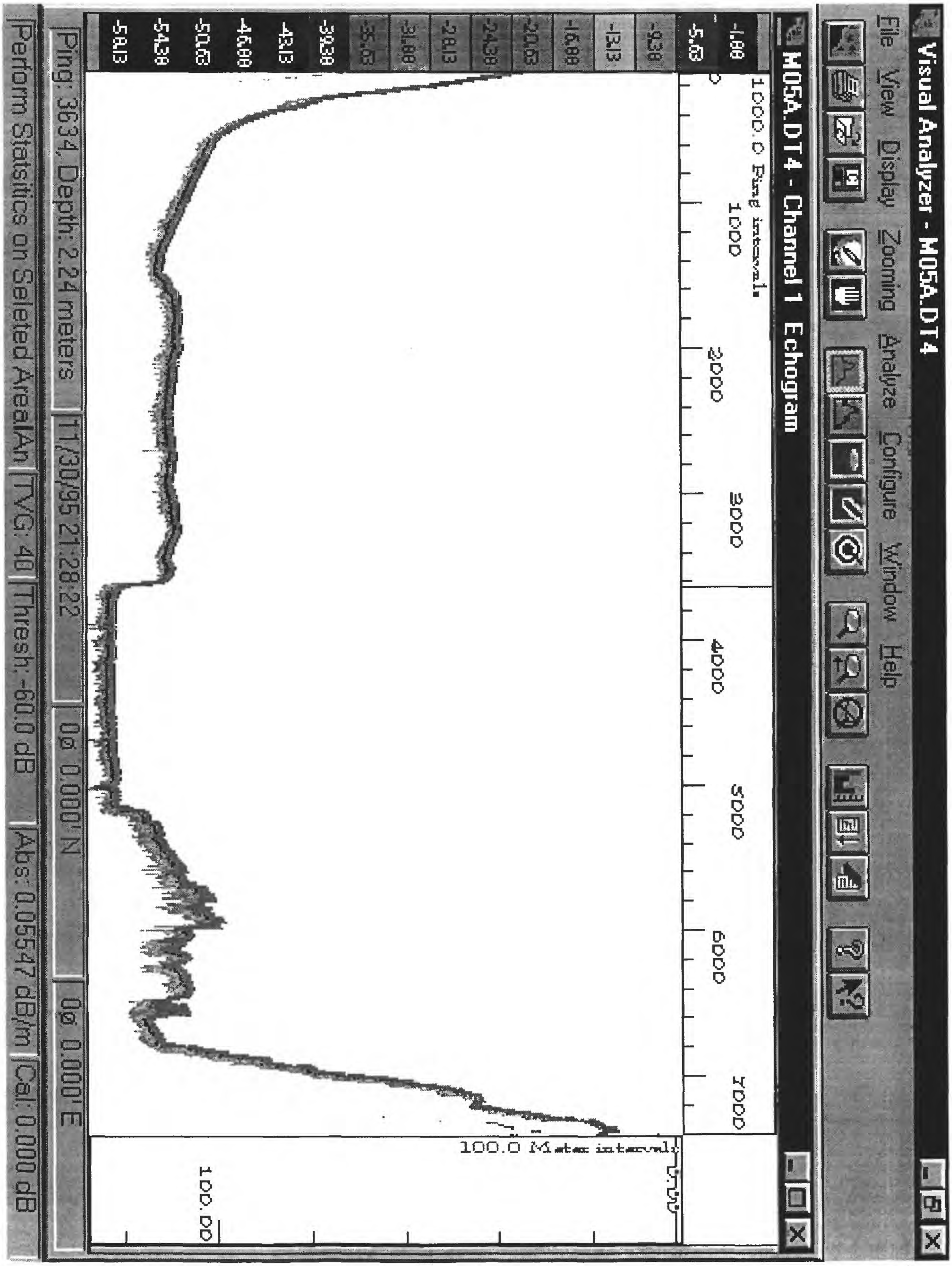


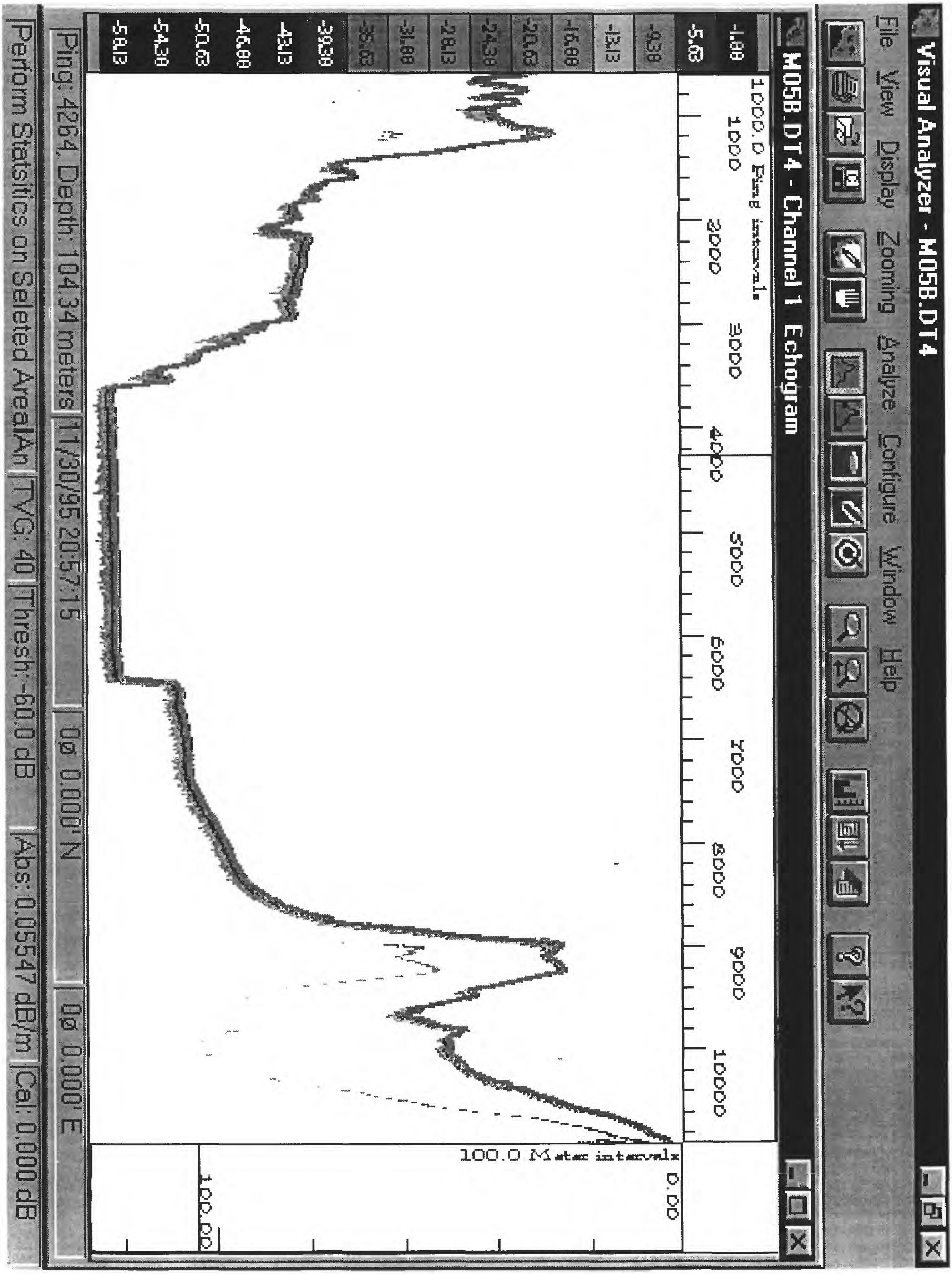
Visual Analyzer - M04A.DT4
File View Display Zooming Analyze Configure Window Help
M04A.DT4 - Channel 1 Echogram
100.0 Ping intervals
100.0 Meter intervals
Ping: 698, Depth: 4.36 meters
11/30/95 23:22:50
0ø 0.000' N
0ø 0.000' E
Perform Statsitics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

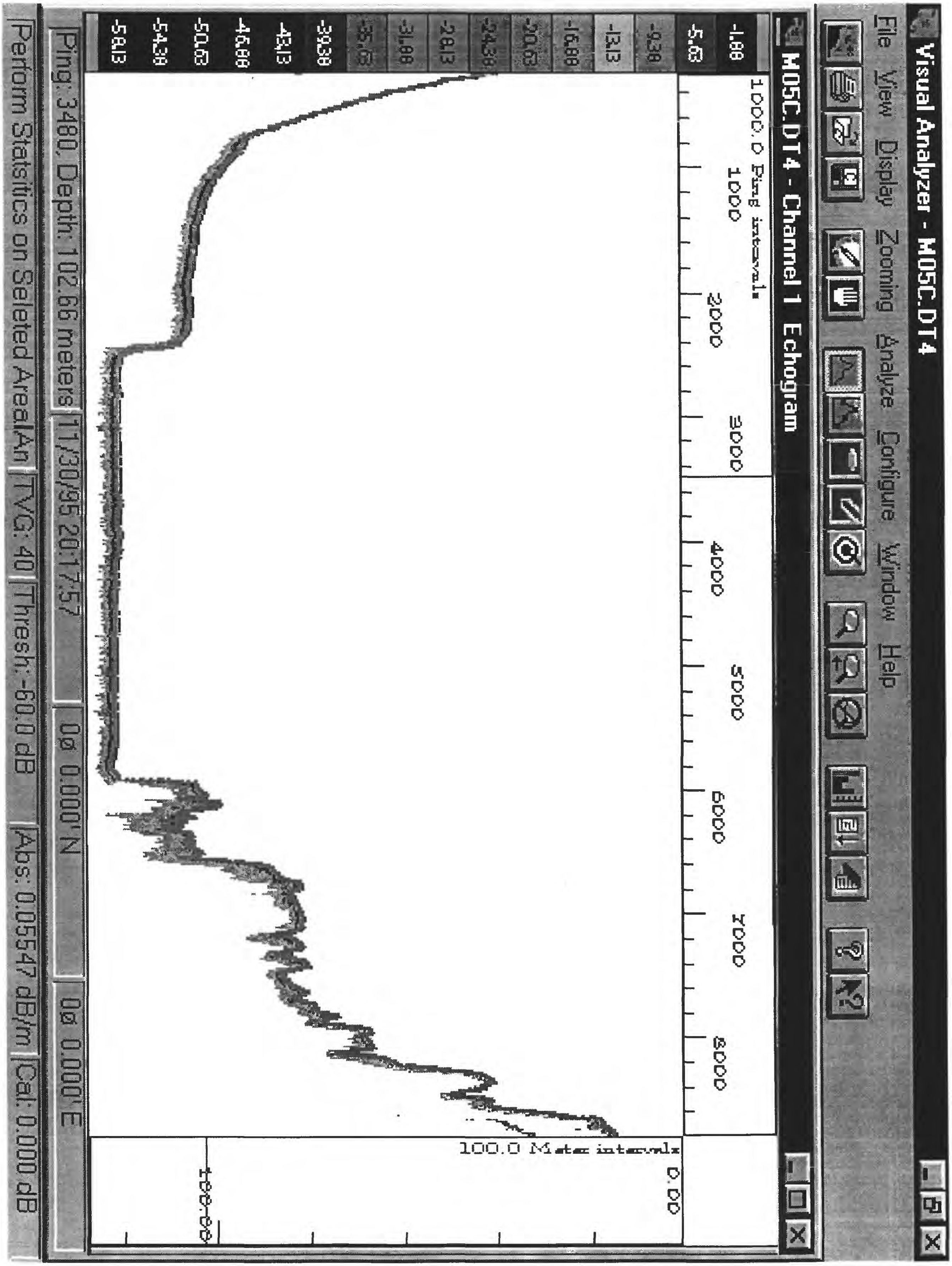

Visual Analyzer - M04B.DT4
File View Display Zooming Analyze Configure Window Help
M04B.DT4 - Channel 1 Echogram
-2.19
-6.56
-10.94
-15.31
-19.69
-24.06
-28.44
-32.81
-37.19
-41.56
-45.94
-50.31
-54.69
-59.06
-63.44
-67.81
100.0 Ping intervals
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
100.0 Meter intervals
0.00
100.00
Ping: 533, Depth: 107.73 meters
11/30/95 23:11:48
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -70.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

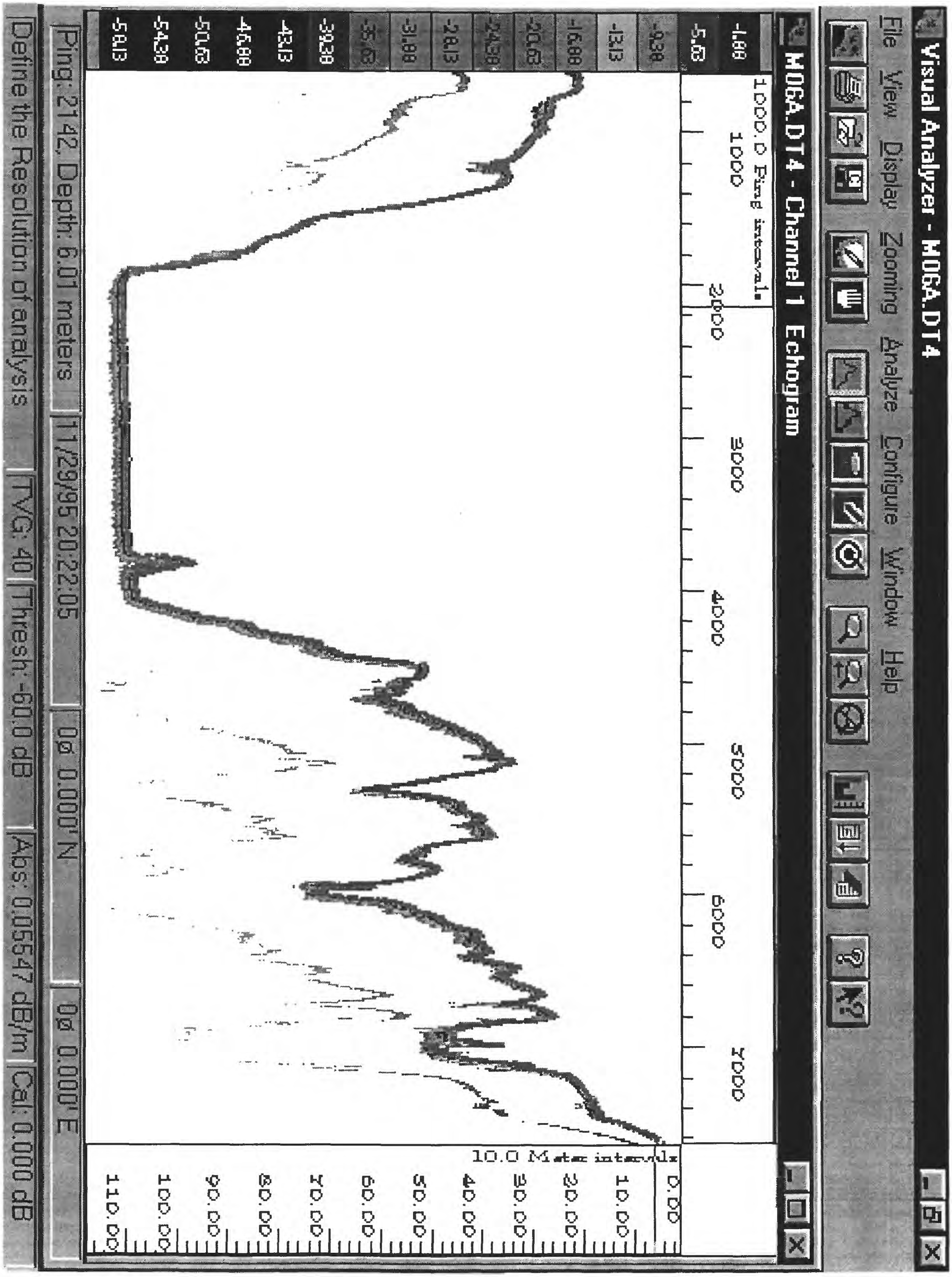


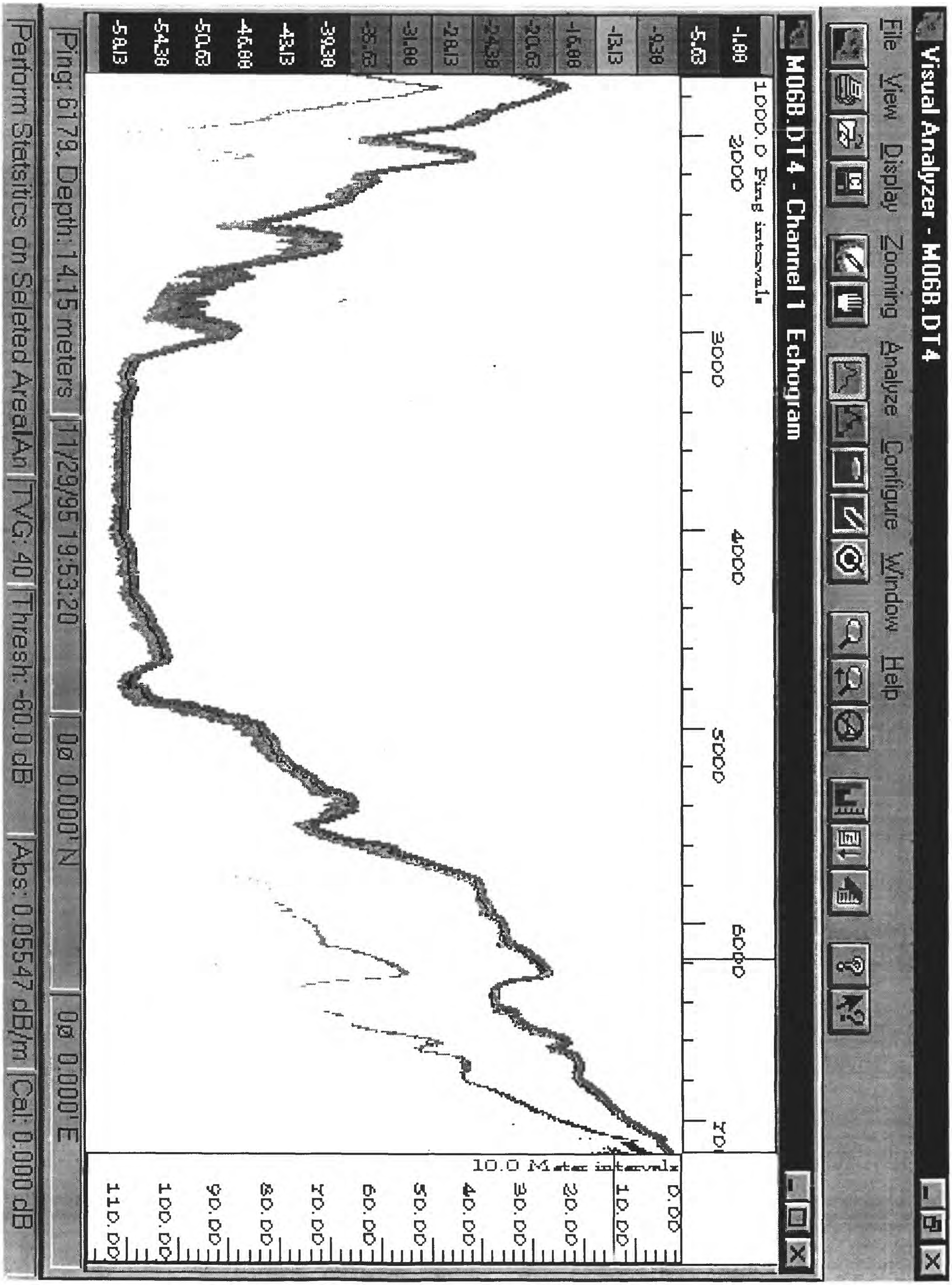
Visual Analyzer - M04C.DT4
File View Display Zooming Analyze Configure Window Help
M04C.DT4 - Channel 3 Narrow Be
Edit Bottom
100.0 Ping intervals
0 100 200 300 400 500 600 700 800 900
10.0 Meter intervals
0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00
-1.88 -5.63 -9.38 -13.13 -16.88 -20.63 -24.38 -28.13 -31.88 -35.63 -39.38 -43.13 -46.88 -50.63 -54.38 -58.13
Ping: 466, Depth: 6.50 meters
03/04/97 10:46:12
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00297 dB/m
Cal: 0.000 dB

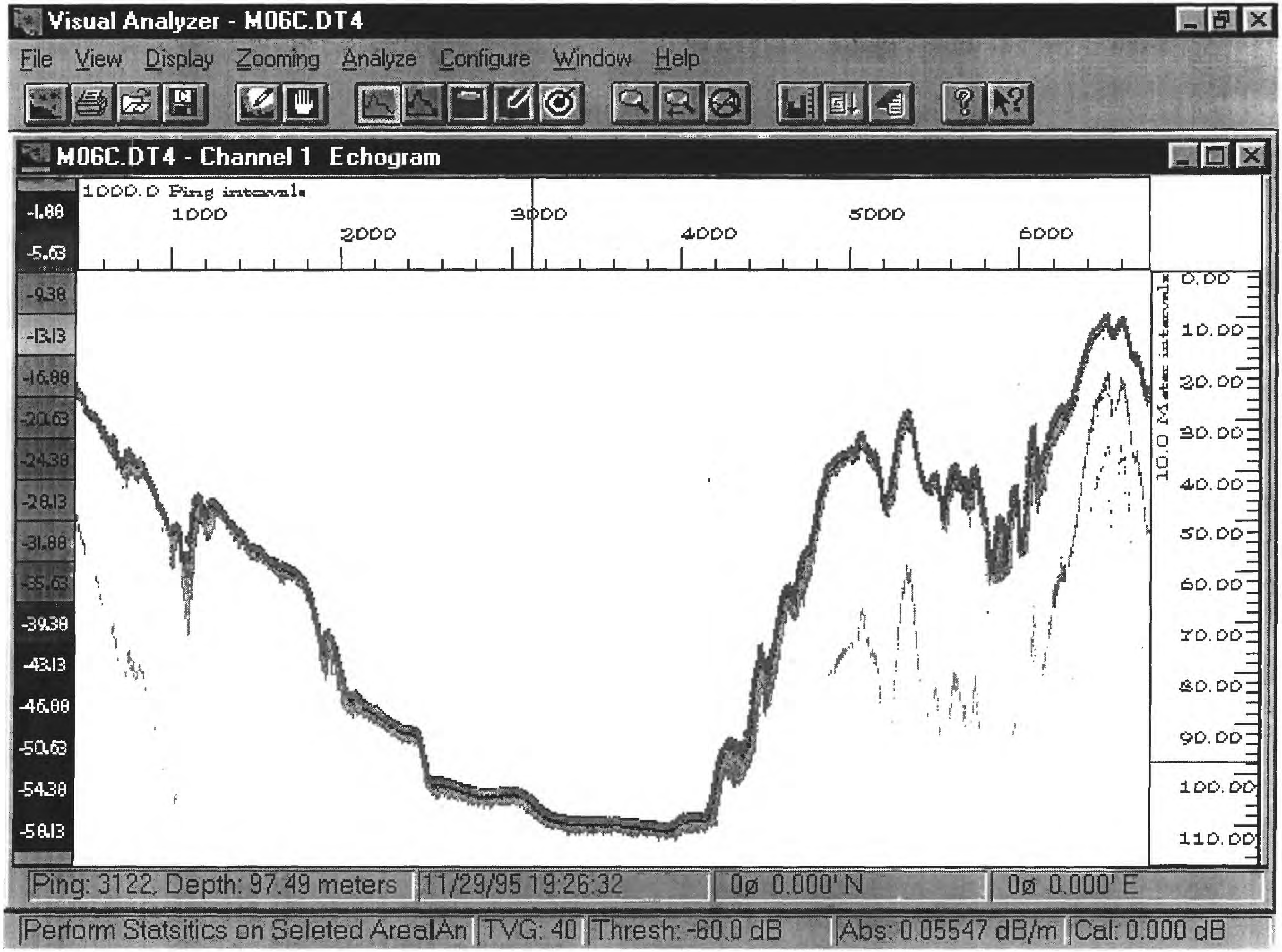

Visual Analyzer - M05A.DT4
File View Display Zooming Analyze Configure Window Help
M05A.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
6000
7000
100.0 Meter intervals
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 3634, Depth: 2.24 meters
11/30/95 21:28:22
0ø 0.000' N
0ø 0.000' E
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB


Visual Analyzer - M05B.DT4
File View Display Zooming Analyze Configure Window Help
M05B.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 4264, Depth: 104.34 meters
11/30/95 20:57:15
0ø 0.000' N
0ø 0.000' E
Perform Statistics on Seleted Areal An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

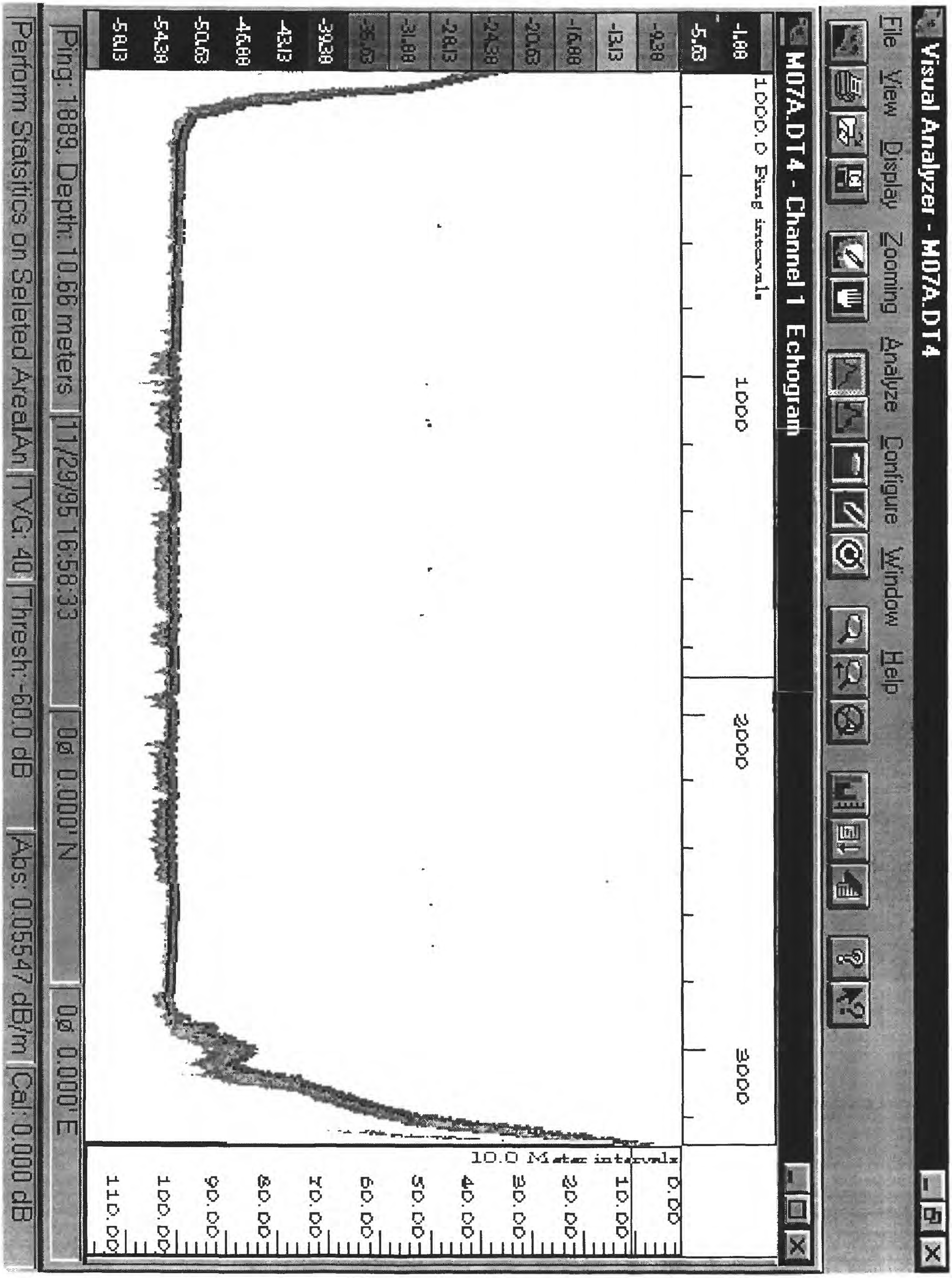

Visual Analyzer - M05C.DT4
File View Display Zooming Analyze Configure Window Help
M05C.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
6000
7000
8000
100.0 Meter intervals
0.00
100.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 3480, Depth: 102.66 meters
11/30/95 20:17:57
00 0.000'N
00 0.000'E
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

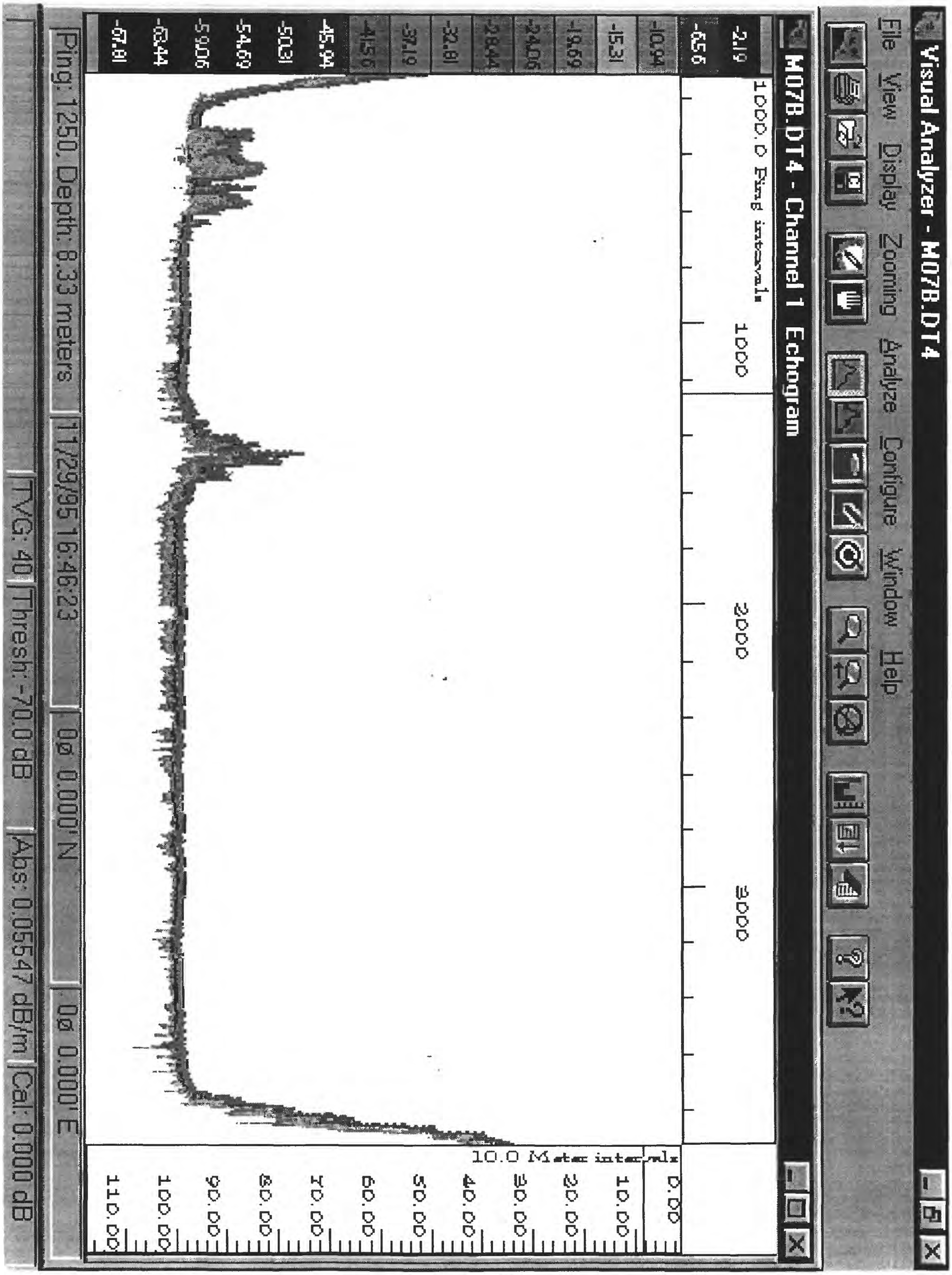

Visual Analyzer - M06A.DT4
File View Display Zooming Analyze Configure Window Help
M06A.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
6000
7000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
Ping: 2142, Depth: 6.01 meters
11/29/95 20:22:05
0ø 0.000'N
0ø 0.000'E
Define the Resolution of analysis
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

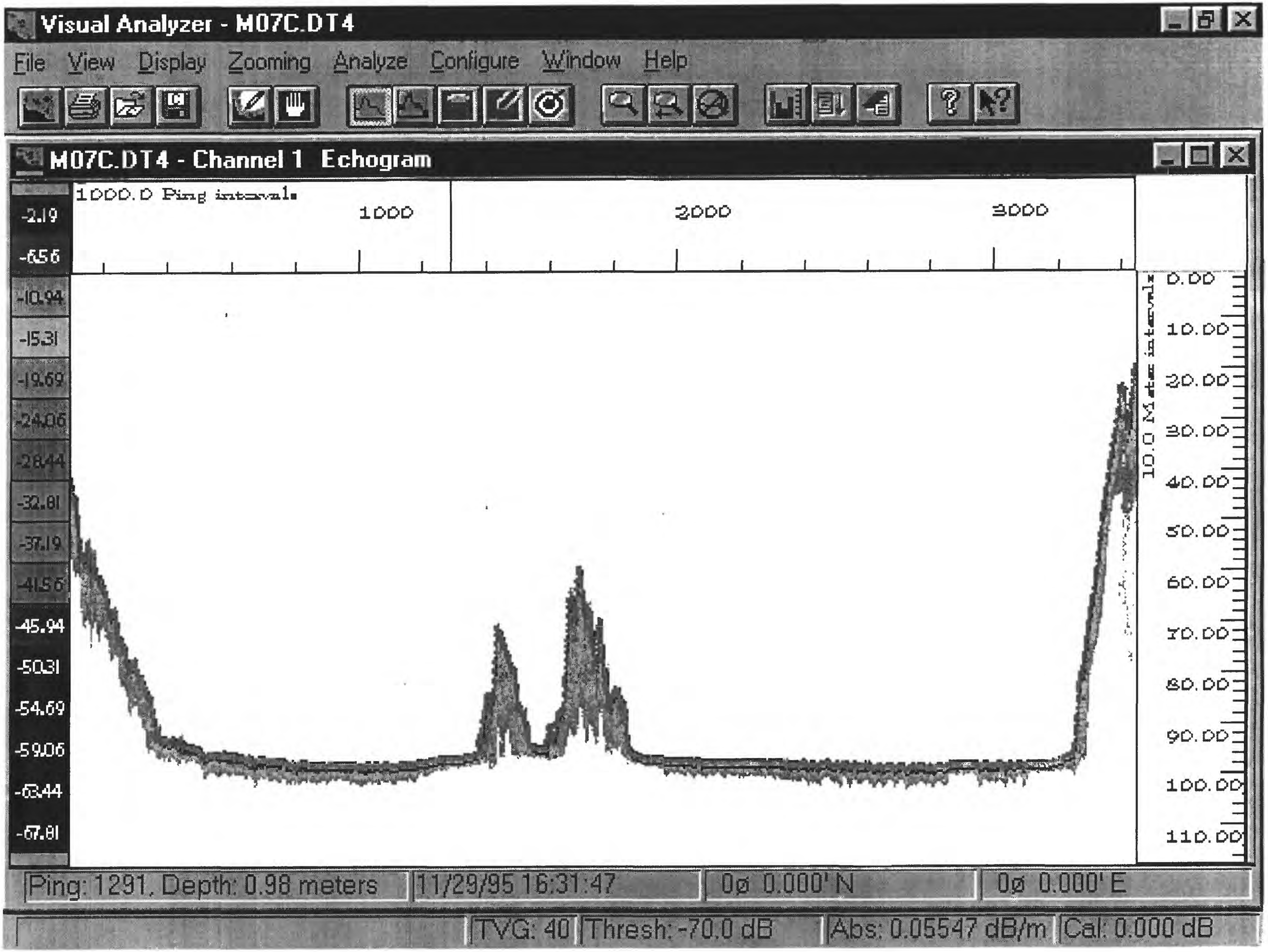

Visual Analyzer - M068.DT4
File View Display Zooming Analyze Configure Window Help
M068.DT4 - Channel 1 Echogram
1000.0 Ping intervals
2000
3000
4000
5000
6000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
-1.00
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 6179, Depth: 14.15 meters
11/29/95 19:53:20
00 0.000'N
00 0.000'E
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB



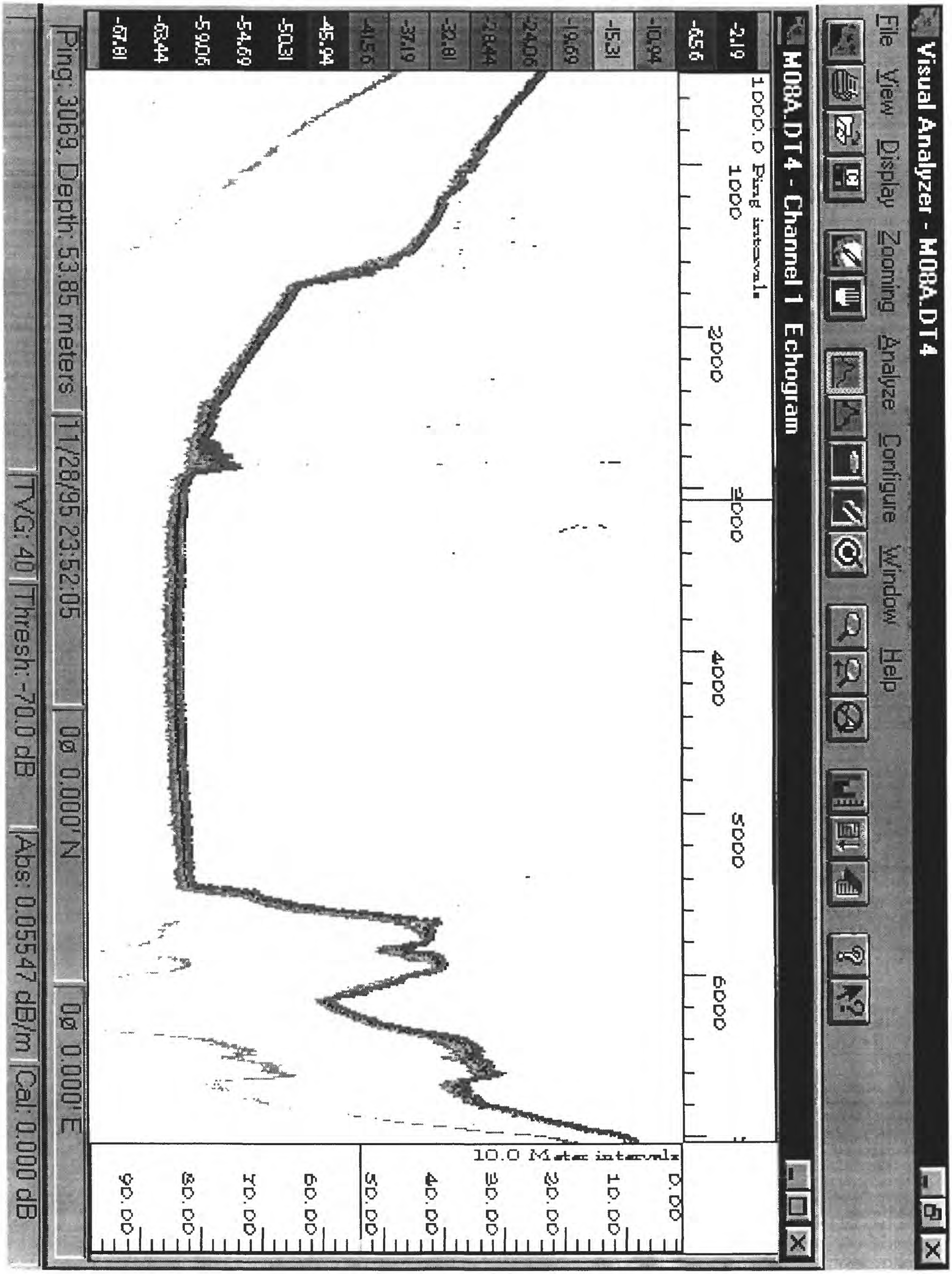
Visual Analyzer - M06C.DT4
File View Display Zooming Analyze Configure Window Help
M06C.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
6000
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
Ping: 3122, Depth: 97.49 meters
11/29/95 19:26:32
0ø 0.000' N
0ø 0.000' E
Perform Statsitics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

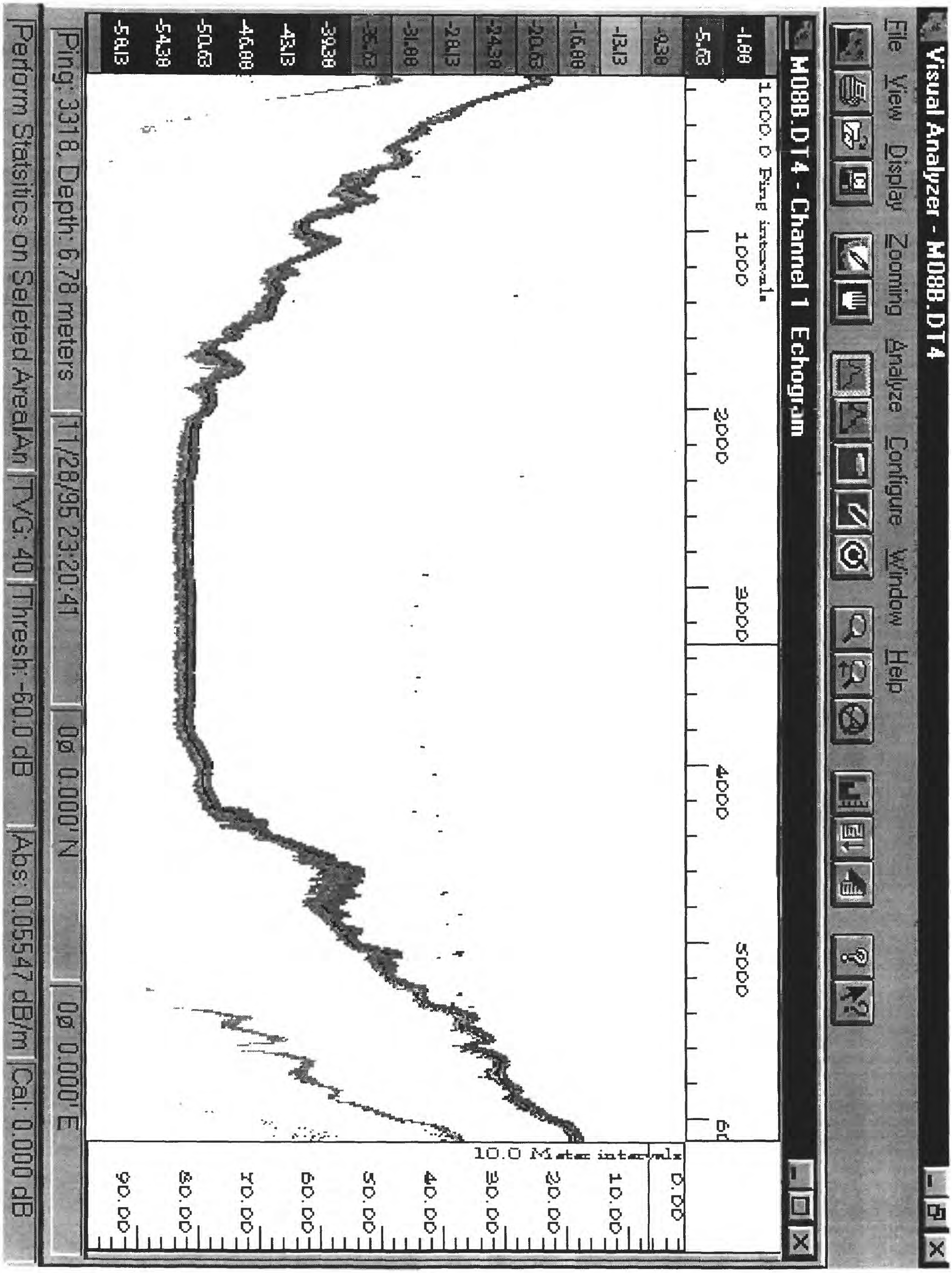

Visual Analyzer - M07A.DT4
File View Display Zooming Analyze Configure Window Help
M07A.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
10.0 Meter intervals
Ping: 1889, Depth: 10.66 meters
11/29/95 16:58:33
0ø 0.000' N
0ø 0.000' E
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

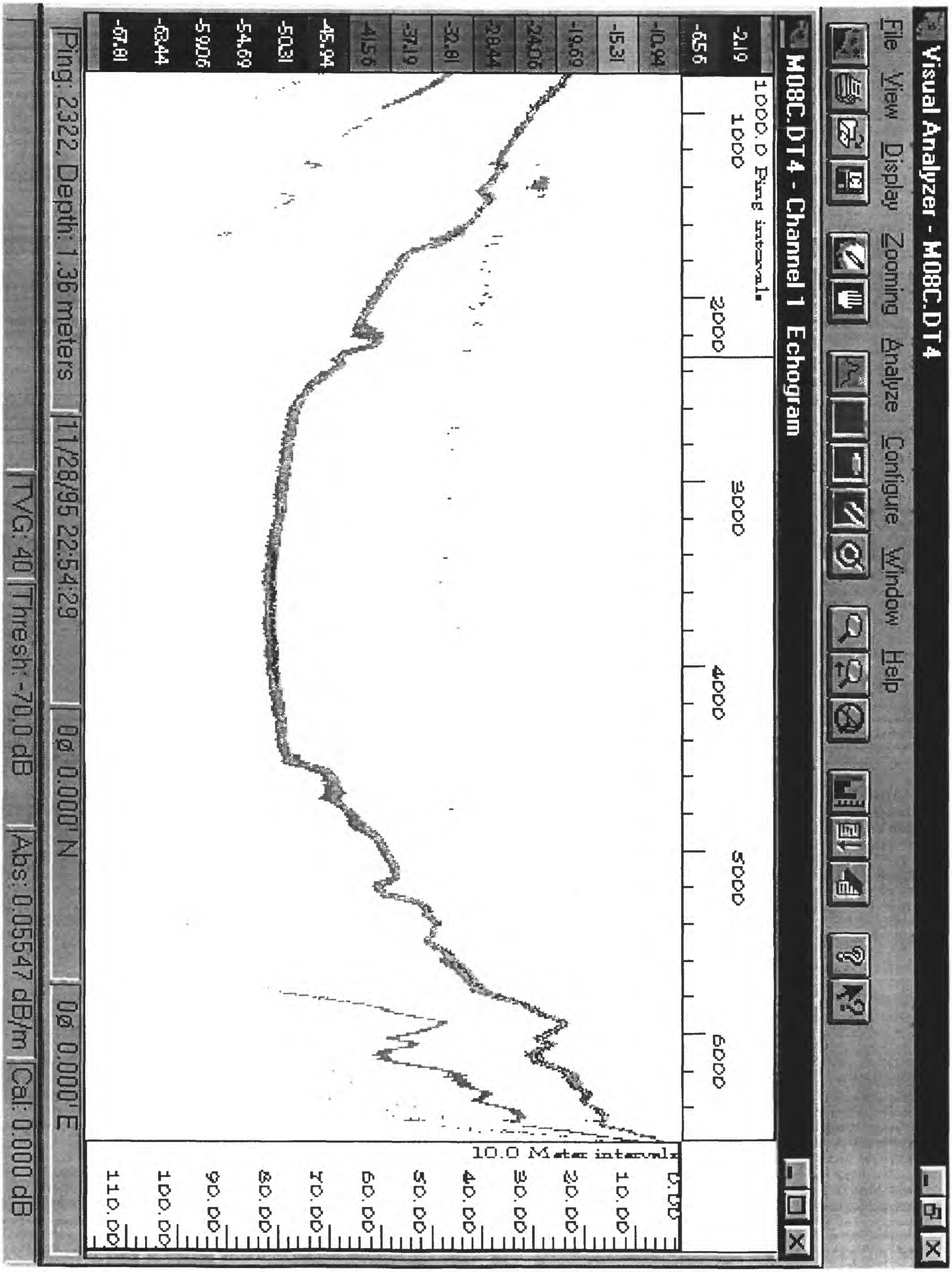

Visual Analyzer - M07B.DT4
File View Display Zooming Analyze Configure Window Help
M07B.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
-2.19
-6.56
-10.94
-15.31
-19.69
-24.06
-28.44
-32.81
-37.19
-41.56
-45.94
-50.31
-54.69
-59.06
-63.44
-67.81
Ping: 1250. Depth: 8.33 meters
11/29/95 16:46:23
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -70.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

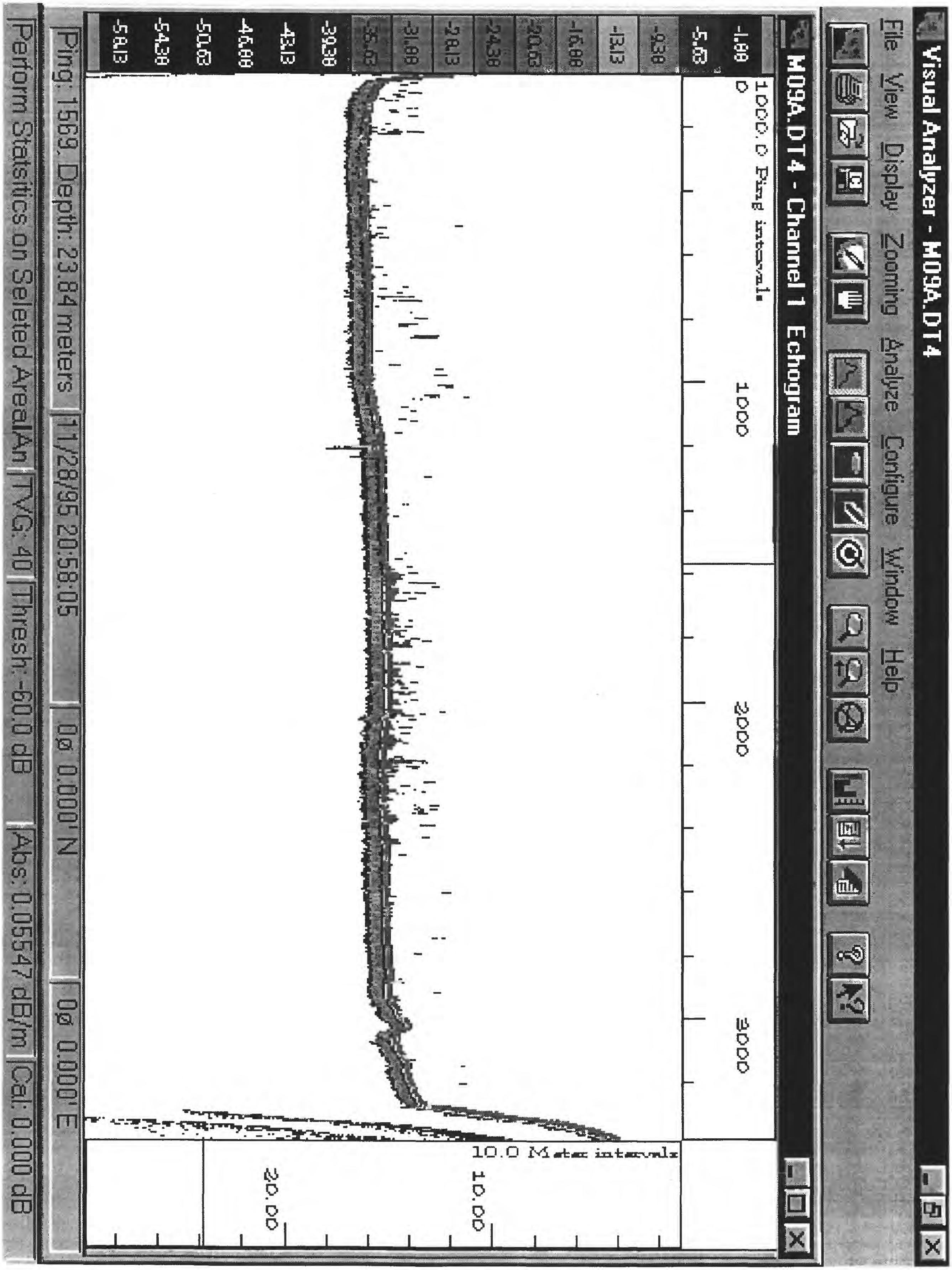


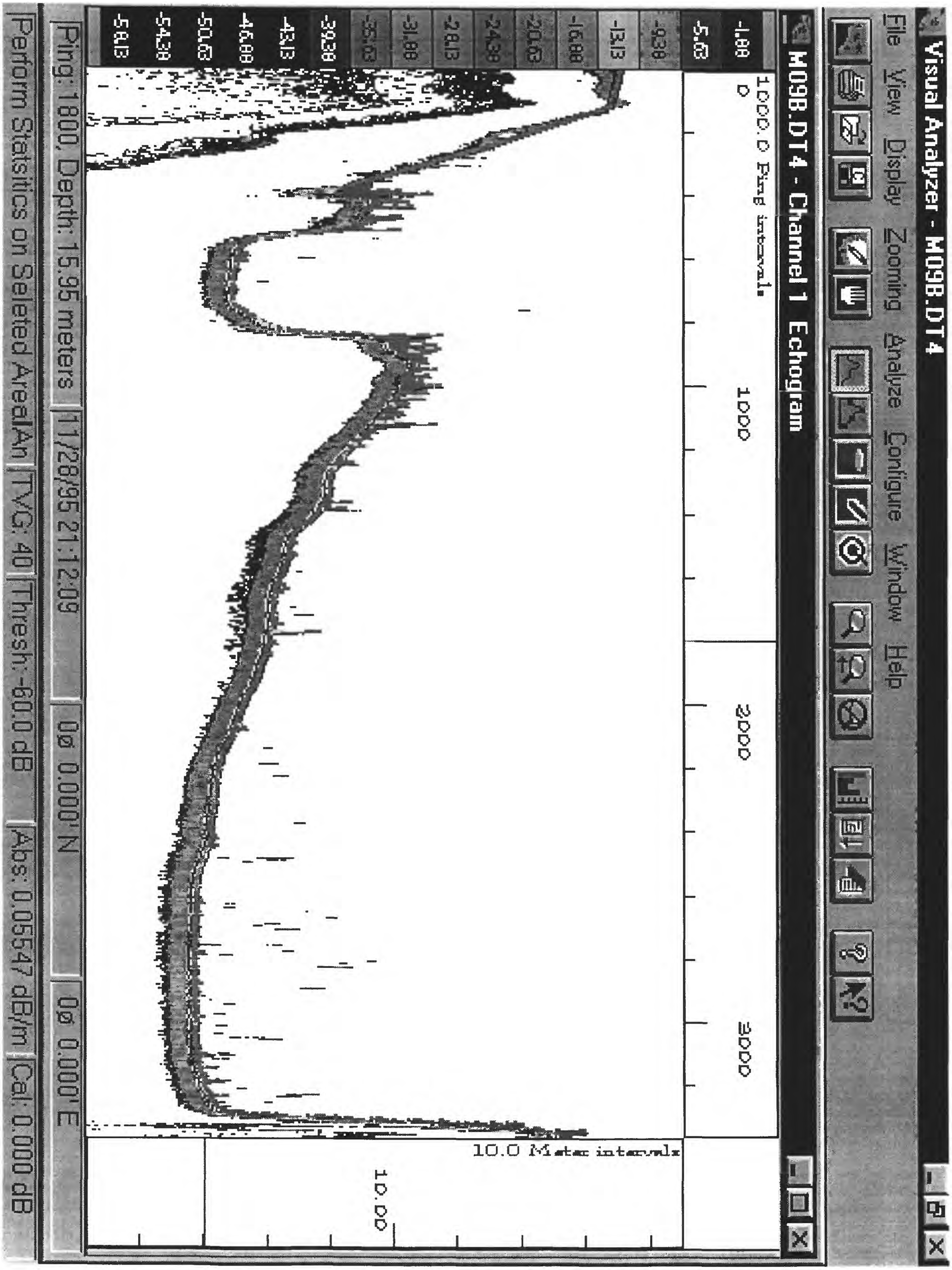
Visual Analyzer - M07C.DT4
File View Display Zooming Analyze Configure Window Help
M07C.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
-2.19
-6.56
-10.94
-15.31
-19.69
-24.06
-28.44
-32.81
-37.19
-41.56
-45.94
-50.31
-54.69
-59.06
-63.44
-67.81
Ping: 1291, Depth: 0.98 meters
11/29/95 16:31:47
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -70.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

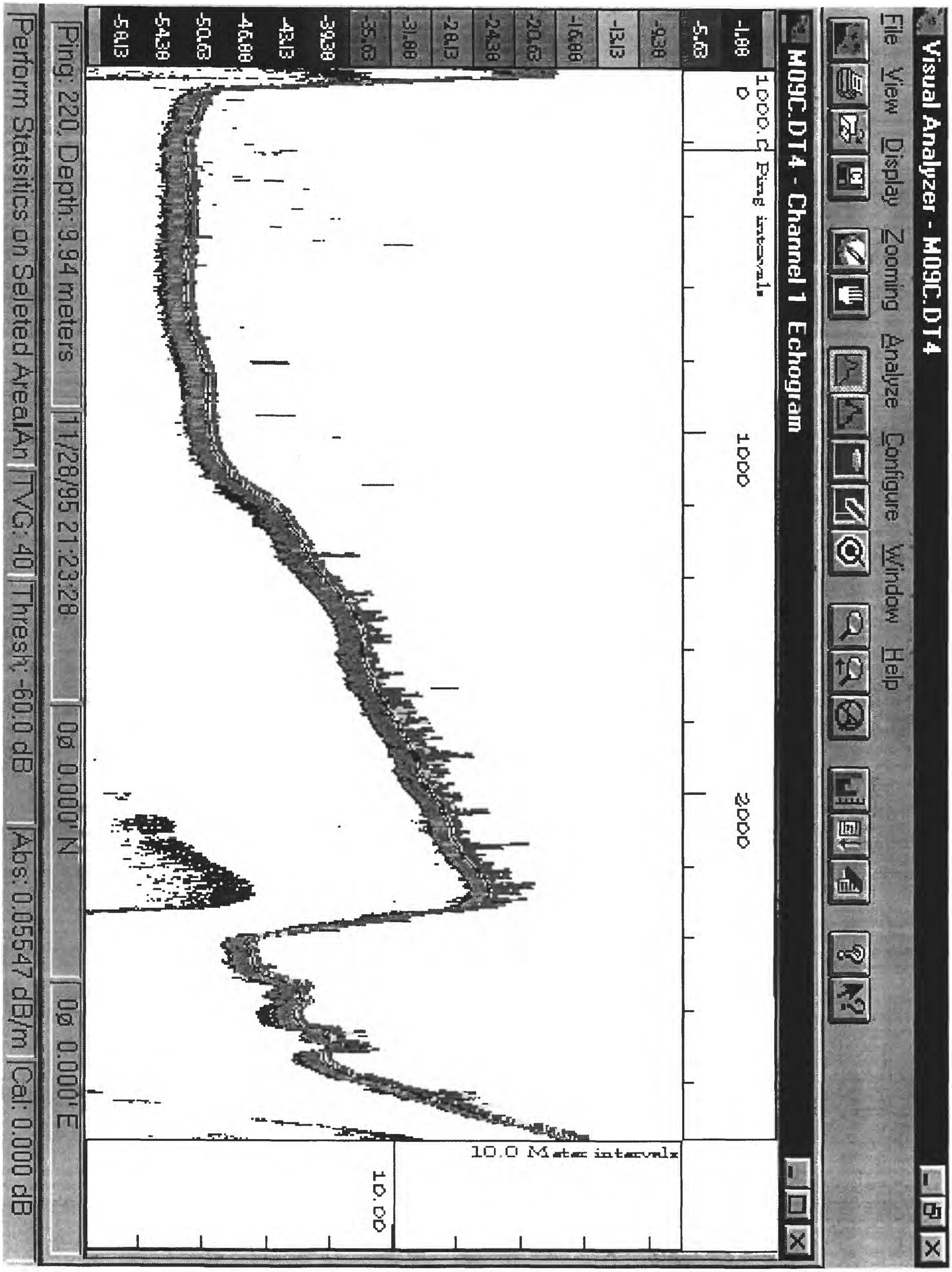

Visual Analyzer - M08A.DT4
File View Display Zooming Analyze Configure Window Help
M08A.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
6000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
-2.19
-6.56
-10.94
-15.31
-19.69
-24.06
-28.44
-32.81
-37.19
-41.56
-45.94
-50.31
-54.69
-59.06
-63.44
-67.81
Ping: 3069, Depth: 53.85 meters
11/28/95 23:52:05
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -70.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB


Visual Analyzer - M08B.DT4
File View Display Zooming Analyze Configure Window Help
M08B.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 3318, Depth: 6.78 meters
11/28/95 23:20:41
0ø 0.000'N
0ø 0.000'E
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

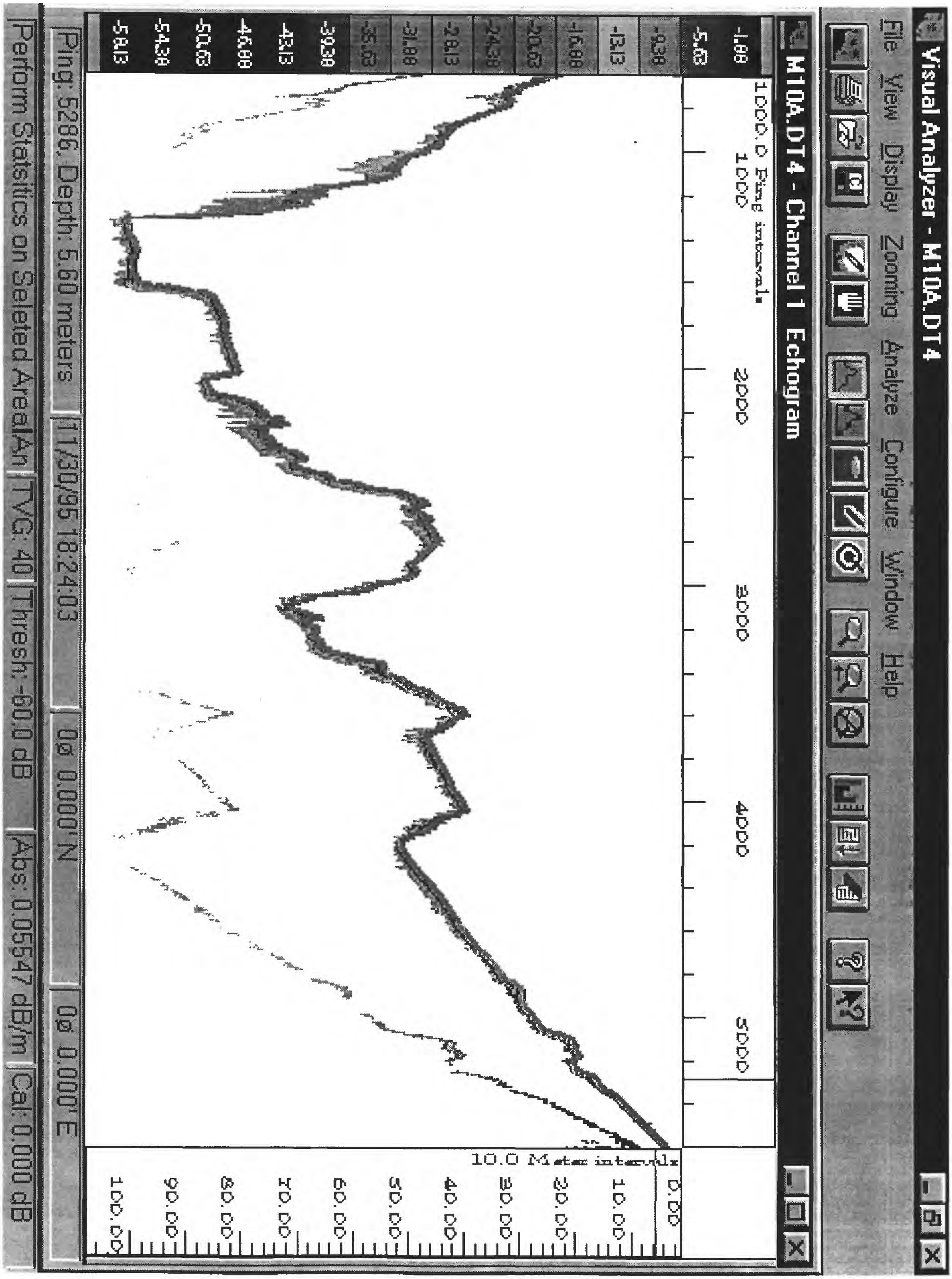

Visual Analyzer - M08C.DT4
File View Display Zooming Analyze Configure Window Help
M08C.DT4 - Channel 1 Echogram
1000.0 Ping interval.
1000
2000
3000
4000
5000
6000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
-2.19
-6.56
-10.94
-15.31
-19.69
-24.06
-28.44
-32.81
-37.19
-41.56
-45.94
-50.31
-54.69
-59.06
-63.44
-67.81
Ping: 2322, Depth: 1.36 meters
11/28/95 22:54:29
0ø 0.000' N
0ø 0.000' E
TVG: 40
Thresh: -70.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB


Visual Analyzer - M09A.DT4
File View Display Zooming Analyze Configure Window Help
M09A.DT4 - Channel 1 Echogram
1000.0 Ping intervals
0
1000
2000
3000
10.0 Meter intervals
10.00
20.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1569, Depth: 23.84 meters
11/28/95 20:58:05
0ø 0.000'N
0ø 0.000'E
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

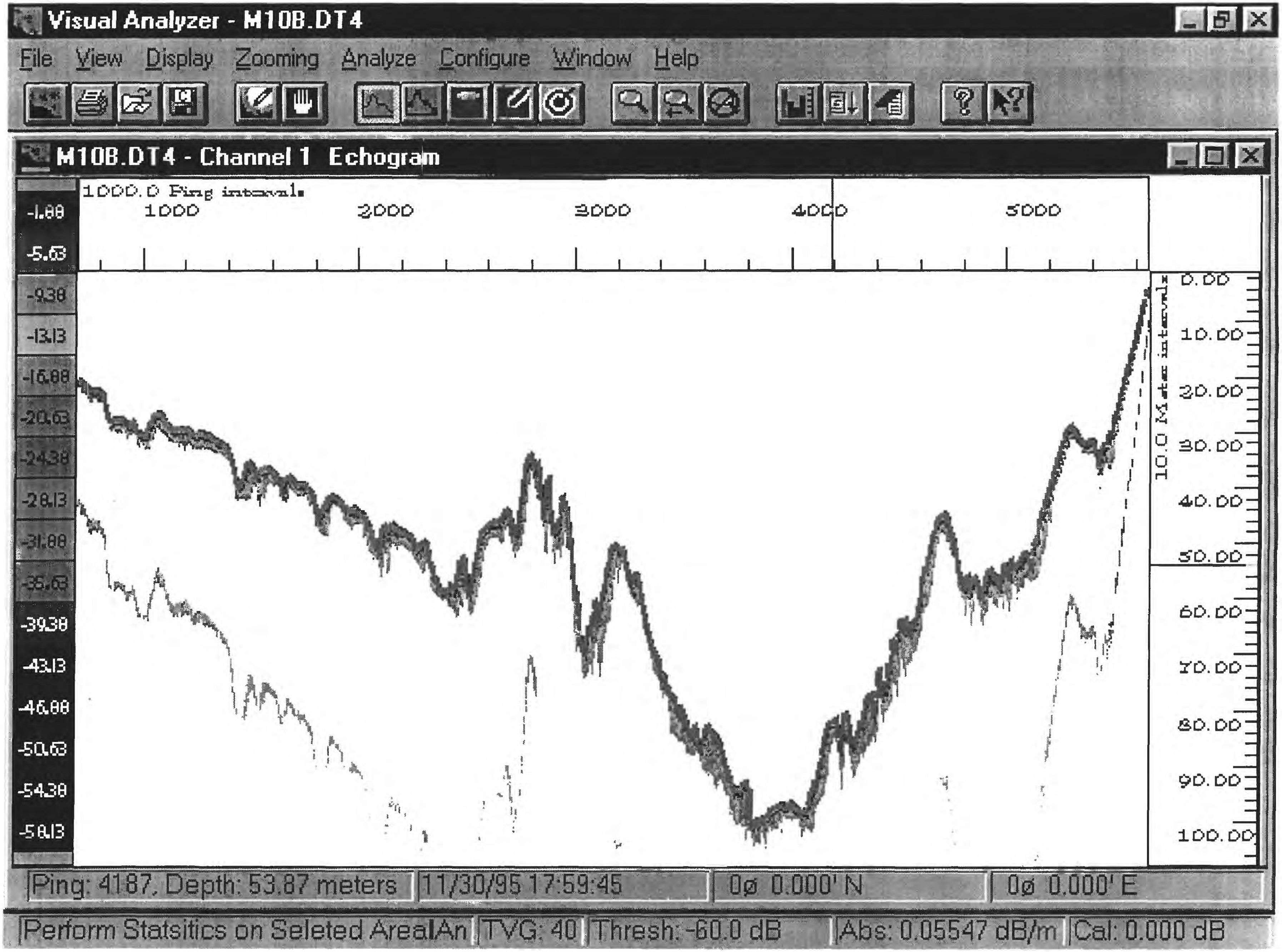

Visual Analyzer - M09B.DT4
File View Display Zooming Analyze Configure Window Help
M09B.DT4 - Channel 1 Echogram
1000.0 Ping intervals
0
1000
2000
3000
10.0 Meter intervals
10.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 1800, Depth: 15.95 meters
11/28/95 21:12:09
0ø 0.000' N
0ø 0.000' E
Perform Statistics on Seleted Areal/An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB



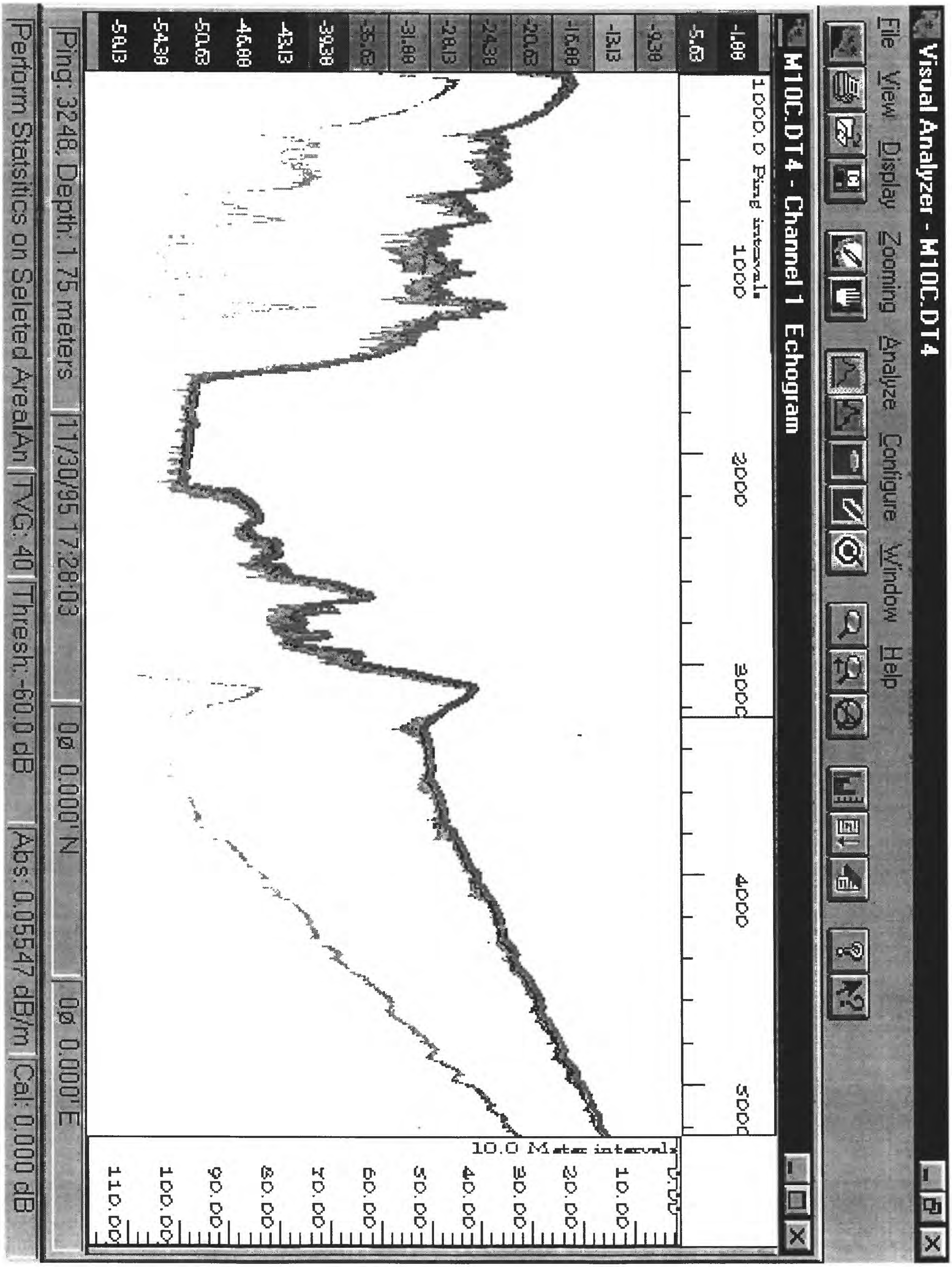
Visual Analyzer - M09C.DT4
File View Display Zooming Analyze Configure Window Help
M09C.DT4 - Channel 1 Echogram
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
1000.0 Ping intervals
0
1000
2000
10.0 Meter intervals
10.00
Ping: 220, Depth: 9.94 meters
11/28/95 21:23:28
0ø 0.000' N
0ø 0.000' E
Perform Statsitics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB



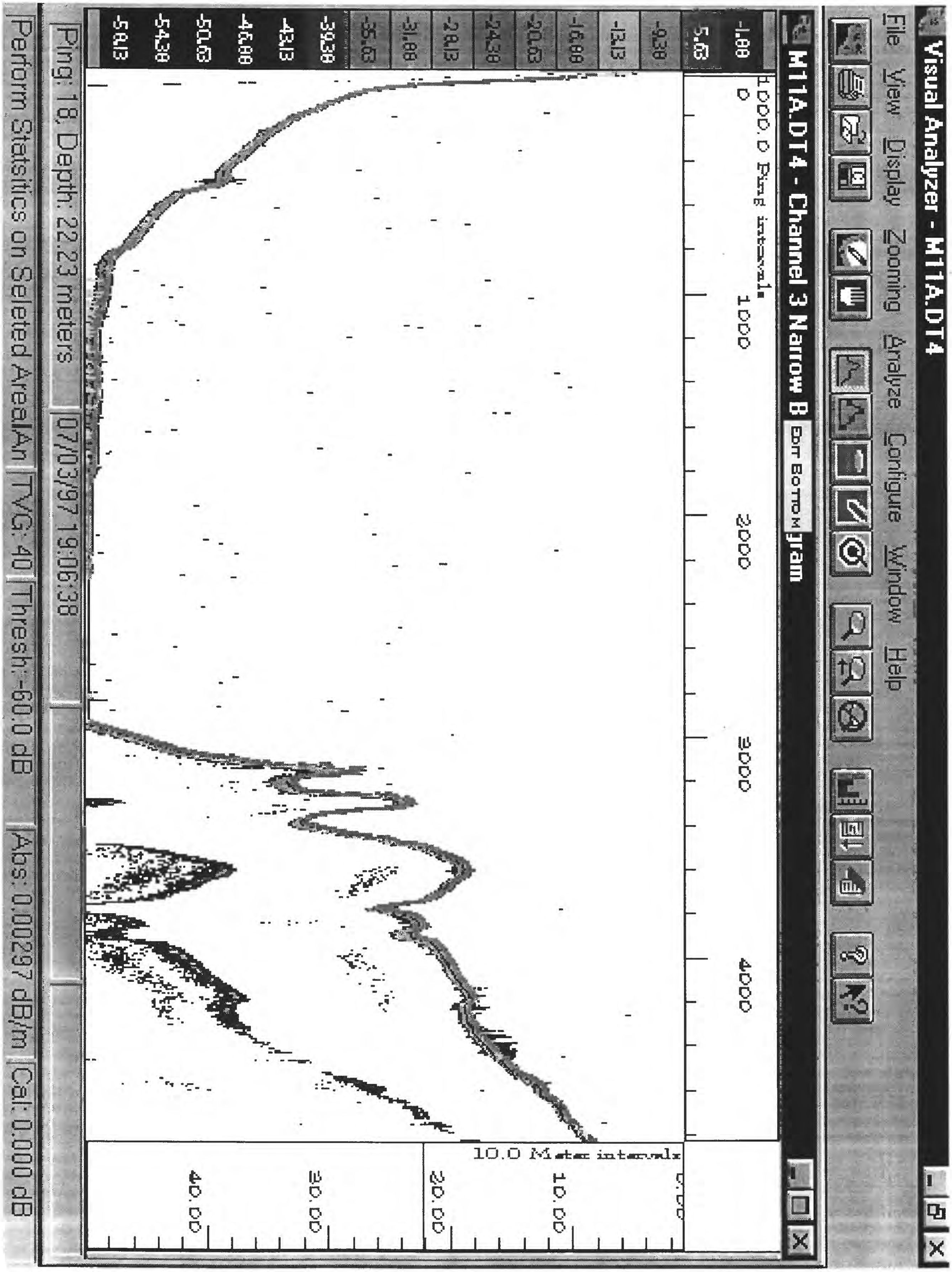
Visual Analyzer - M10A.DT4
File View Display Zooming Analyze Configure Window Help
M10A.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Ping: 5286, Depth: 5.60 meters
11/30/95 18:24:03
0ø 0.000'N
0ø 0.000'E
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB

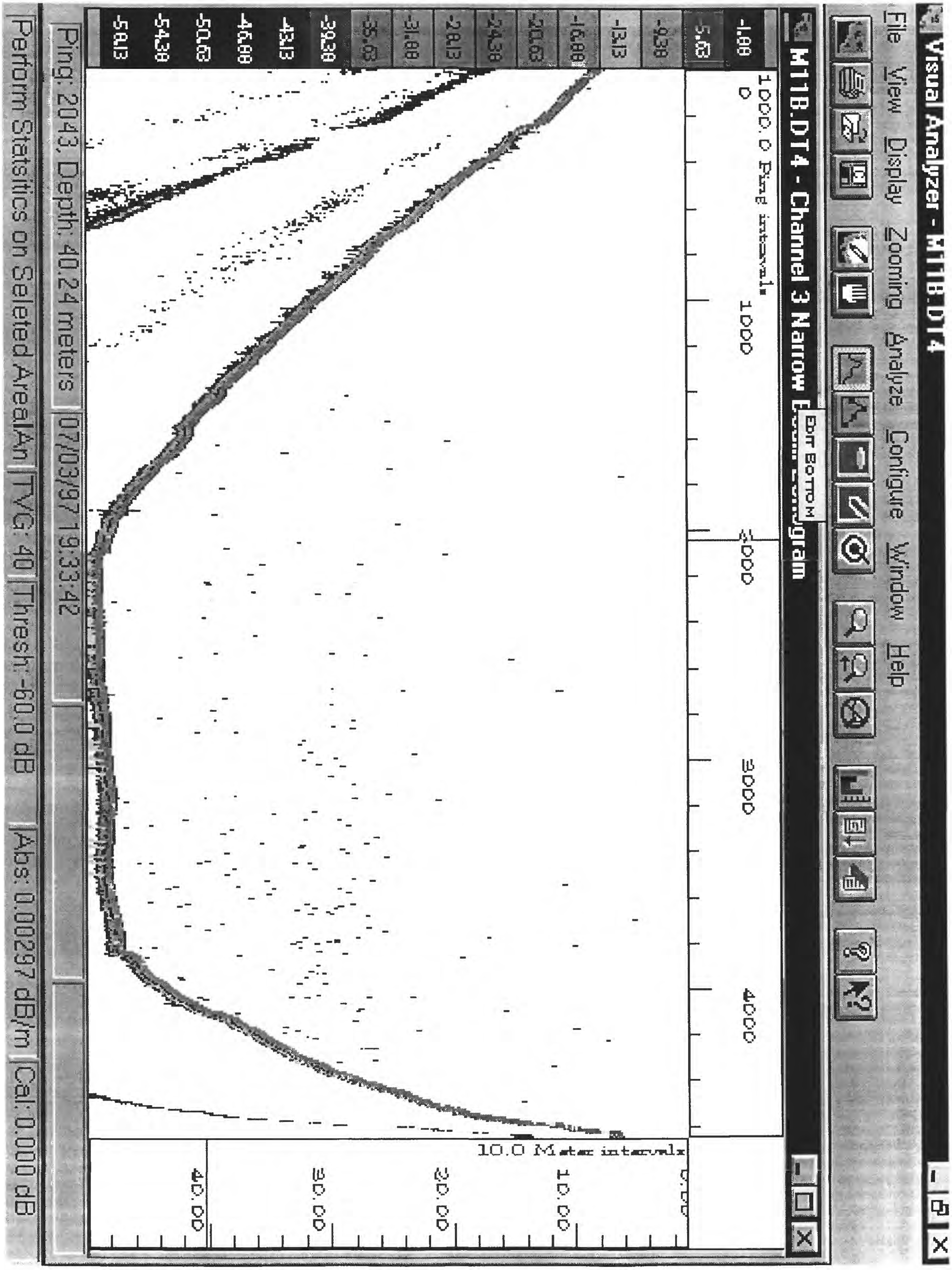


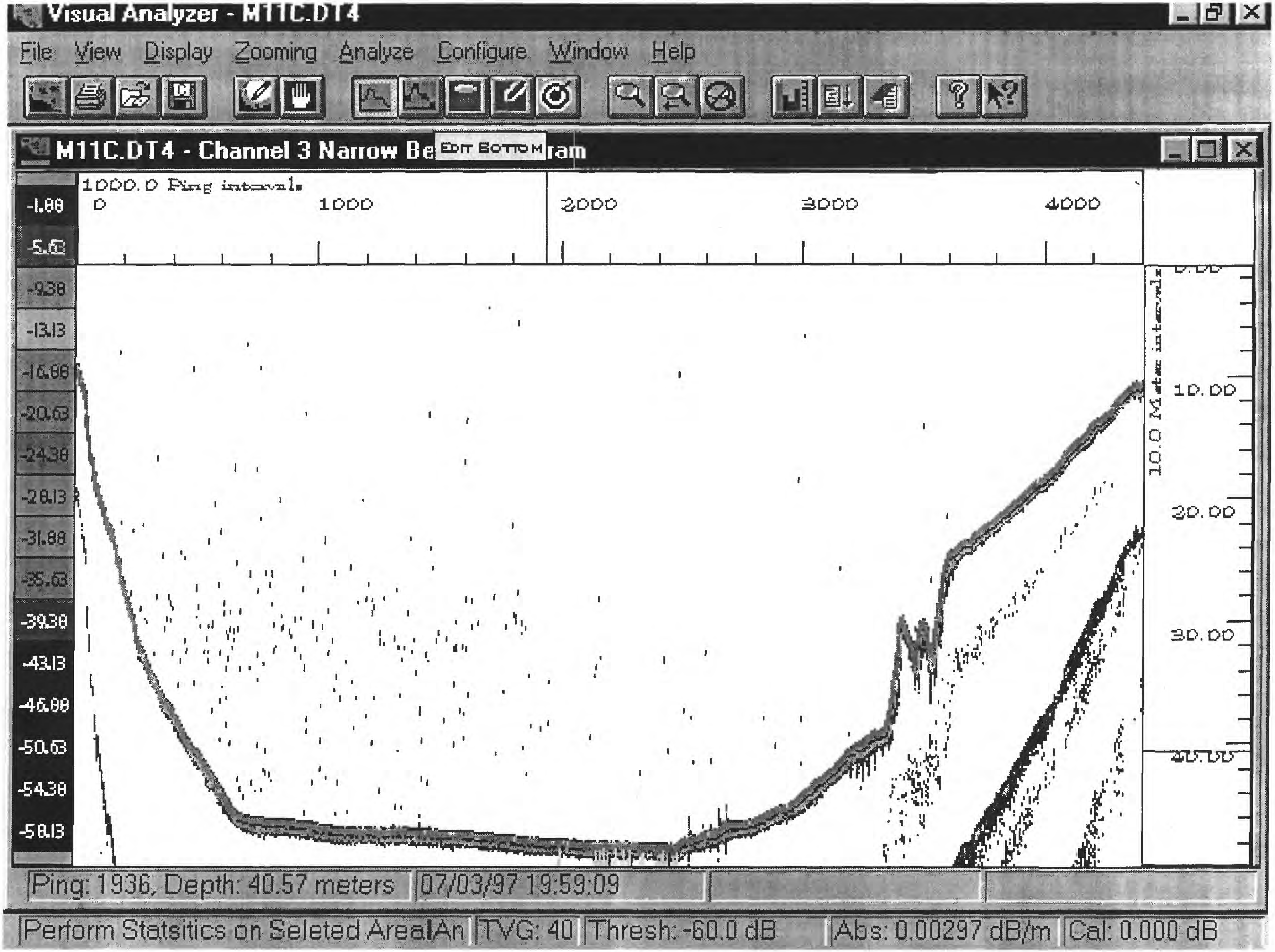
Visual Analyzer - M10B.DT4
File View Display Zooming Analyze Configure Window Help
M10B.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
10.0 Meter intervals
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Ping: 4187, Depth: 53.87 meters
11/30/95 17:59:45
0ø 0.000' N
0ø 0.000' E
Perform Statsitics on Seleted AreaIAn
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB



Visual Analyzer - M10C.DT4
File View Display Zooming Analyze Configure Window Help
M10C.DT4 - Channel 1 Echogram
1000.0 Ping intervals
1000
2000
3000
4000
5000
10.0 Meter intervals
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
-1.00
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 3248, Depth: 1.75 meters
11/30/95 17:28:03
0ø 0.000'N
0ø 0.000'E
Perform Statsitics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.05547 dB/m
Cal: 0.000 dB


Visual Analyzer - M11A.DT4
File View Display Zooming Analyze Configure Window Help
M11A.DT4 - Channel 3 Narrow B
EDIT BOTTOM
gram
1000.0 Ping intervals
0
1000
2000
3000
4000
10.0 Meter intervals
10.00
20.00
30.00
40.00
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
Ping: 18, Depth: 22.23 meters
07/03/97 19:06:38
Perform Statistics on Seleted Area/An
TVG: 40
Thresh: -60.0 dB
Abs: 0.000297 dB/m
Cal: 0.000 dB


Visual Analyzer - M11B.DT4
File View Display Zooming Analyze Configure Window Help
M11B.DT4 - Channel 3 Narrow
gram
EDIT BOTTOM
-1.00
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
1000.0 Ping intervals
0
1000
2000
3000
4000
10.0 Meter intervals
10.00
20.00
30.00
40.00
Ping: 2043, Depth: 40.24 meters
07/03/97 19:33:42
Perform Statistics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00297 dB/m
Cal: 0.000 dB


Visual Analyzer - M11C.DT4
File View Display Zooming Analyze Configure Window Help
M11C.DT4 - Channel 3 Narrow Be
EDIT BOTTOM
ram
1000.0 Ping intervals
0
1000
2000
3000
4000
-1.88
-5.63
-9.38
-13.13
-16.88
-20.63
-24.38
-28.13
-31.88
-35.63
-39.38
-43.13
-46.88
-50.63
-54.38
-58.13
10.0 Meter intervals
10.00
20.00
30.00
40.00
Ping: 1936, Depth: 40.57 meters
07/03/97 19:59:09
Perform Statsitics on Seleted Area|An
TVG: 40
Thresh: -60.0 dB
Abs: 0.00297 dB/m
Cal: 0.000 dB

APPENDIX B

LIMNOLOGICAL DATA

Table a. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for November 1995.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)
P1	0	17.55	8.42	645	7.1
P1	5	17.33	8.44	645	7.2
P1	10	17.29	8.44	645	7.24
P1	15	17.28	8.44	645	7.1
P1	20	17.28	8.43	645	7.2
P1	25	17.28	8.43	650	7.3
P1	30	17.28	8.42	650	7.3
P1	35	17.24	8.39	650	7.1
P1	40	16.8	8.26	680	5.9
P1	45	15.93	8.08	720	4.6
P1	50	15.02	8.1	720	5.5
P1	55	14.03	8.11	710	6.2
P1	60	12.41	8.1	710	6.7
P1	65	10.24	8.04	750	6.6
P1	70	8.8	8	800	6.6
P1	75	8.06	7.94	830	6.1
P2	0	17.4	8.5	640	7.53
P2	2	17.4	8.51	640	7.5
P2	4	17.4	8.51	640	7.5
P2	6	17.38	8.51	640	7.5
P2	8	17.38	8.51	640	7.5
P2	10	17.38	8.5	640	7.5
P2	15	17.38	8.5	640	7.55
P2	20	17.38	8.49	640	7.5
P2	25	17.38	8.49	640	7.65
P2	30	17.37	8.48	640	7.65
P2	35	17.25	8.46	640	7.5
P2	40	16.58	8.26	700	5.9
P2	45	15.57	8.17	700	5.7
P2	50	14.44	8.14	700	6
P2	55	12.86	8.11	710	6.7
P2	60	11.37	8.06	710	6.4
P2	65	10.24	8.01	740	6.5
P2	70	9.49	7.99	740	6.5
P4	0	17.51	8.36	550	7
P4	5	17.53	8.37	550	7
P4	10	17.53	8.37	550	7
P4	15	17.54	8.35	550	7
P4	20	17.54	8.35	550	7
P4	25	17.56	8.35	550	7
P4	30	17.02	8.03	560	4.4
P4	35	16.49	7.99	620	4.7
P4	40	15.86	8.04	650	5.15

P4	45	15.47	8.07	650	5.5
P4	50	14.36	8.13	680	6.2
P4	55	13.37	8.13	700	6.6
P5	0	17.27	8.19	450	8.34
P5	5	17.27	8.25	450	8
P5	10	17.23	8.25	450	7.9
P5	15	17.22	8.25	450	7.9
P5	20	17.22	8.25	460	7.9
P5	25	17.22	8.25	460	7.9
P5	30	17.2	8.24	460	7.9
P5	35	16.46	8	530	6
P5	40	15.51	7.92	600	5.6
P5	45	15.02	7.94	640	6
P5	50	14.16	7.96	650	6.36
P5	55	12.76	7.98	710	6.65
P5	60	11.79	7.95	710	6.67
P5	65	10.71	7.91	740	6.6
P5	70	9.77	7.92	800	6.66
P5	75	9.11	7.91	850	6.88
P6	0	17.27	8.19	405	7.39
P6	2	17.23	8.2	403	7.36
P6	4	17.18	8.2	403	7.29
P6	6	17.25	8.2	400	7.21
P6	8	17.26	8.19	400	7.27
P6	10	17.25	8.19	405	7.3
P6	15	17.22	8.17	410	7.3
P6	20	17.23	8.16	410	7.24
P6	25	17.17	8.14	410	7.25
P6	30	17.11	8.11	420	6.91
P6	35	16.39	7.89	440	5.28
P6	40	15.59	7.91	550	5.72
P6	45	14.86	7.94	550	5.93
P6	50	13.85	7.96	620	6.1
P6	55	12.73	7.92	620	6
P6	60	11.63	7.8	600	5.4
P6	65	10.91	7.73	670	3.75
P6	70	9.93	7.68	700	3.7
P7	0	17.93	8.19	381	7.96
P7	2	17.91	8.2	383	7.82
P7	4	17.79	8.18	388	7.51
P7	6	17.74	8.17	390	7.46
P7	8	17.74	8.16	388	7.43
P7	10	17.74	8.16	384	7.35
P7	15	17.72	8.14	395	7.31
P7	20	17.67	8.13	393	7.32
P7	25	17.72	8.17	470	6.45
P7	30	16.9	7.9	480	5.44
P7	35	16.76	7.93	480	5.6
P7	40	15.71	7.87	450	5.63
P7	45	14.81	7.75	420	4.9

P7	50	14.18	7.76	450	5.5
P7	55	13.17	7.73	508	5.2
P9	0	17.75	8.15	485	6.69
P9	2	17.7	8.16	482	6.65
P9	5	17.68	8.16	482	6.7
P9	10	17.67	8.15	480	6.7
P9	15	17.67	8.15	480	6.72
P9	20	17.65	8.14	485	6.7
P9	25	17.35	7.96	540	5.05
P9	30	16.91	7.91	580	5.3
P9	35	16.24	7.91	550	5.6
P9	40	15.7	7.93	600	5.85
P9	45	15.02	7.97	640	6.24
P9	50	14.03	7.99	640	6.37
P9	55	12.89	7.96	650	6.08
P9	60	11.4	7.84	670	4.52
P9	65	10.39	7.7	670	2.26
P10	0	17.9	8.05	426	7.33
P10	2	17.51	8.11	424	7.22
P10	5	17.36	8.13	426	7.06
P10	10	17.33	8.12	426	7.03
P10	15	17.33	8.12	426	7.04
P10	20	17.33	8.11	426	7.07
P10	25	17.31	8.12	426	7.07
P10	30	16.71	7.89	460	5.2
P10	35	16.05	7.87	500	5.5
P10	40	15.4	7.89	600	5.7
P10	45	14.94	7.9	600	5.85
P10	50	14.24	7.92	640	6
P11	0	17.23	8.38	448	8
P11	2	17.11	8.38	450	8
P11	5	17.02	8.35	452	7.75
P11	10	16.96	8.32	450	7.7
P11	15	16.94	8.31	450	7.7
P11	20	16.94	8.3	450	7.75
P11	25	16.87	8.3	460	7.75
P11	30	16.77	8.3	460	7.75
P11	35	15.92	7.95	520	4.9
P11	40	15.5	7.82	550	4.2
P11	45	15.14	7.79	600	3.8
P12	0	17.04	8.33	467	7.38
P12	2	17.01	8.33	465	7.34
P12	5	16.97	8.33	465	7.32
P12	10	16.96	8.31	465	7.25
P12	15	16.96	8.31	465	7.37
P12	20	16.97	8.3	465	7.36
P12	25	16.95	8.29	465	7.4
P12	30	17.19	8.23	720	6.2
P12	35	16.92	8.3	800	6.4
P12	40	16.45	8.36	860	6.8

P12	45	15.78	8.34	860	6.8
P12	50	15.48	8.33	860	6.8
P12	55	14.42	8.24	820	6.3
P12	60	13.4	8.09	800	5.9
P12	65	12.19	8.01	800	5.8
P13	0	16.98	8.33	505	7.78
P13	5	17	8.33	510	7.5
P13	10	16.96	8.32	510	7.43
P13	15	16.98	8.32	520	7.3
P13	20	17	8.32	520	7.3
P13	25	17	8.32	520	7.3
P13	30	17.28	8.23	760	6
P13	35	16.73	8.38	800	6.9
P13	45	15.72	8.37	830	7.15
P13	55	14.31	8.29	830	6.81
P14	0	16.87	8.43	615	7.85
P14	2	16.92	8.46	615	7.85
P14	5	16.87	8.47	615	7.8
P14	10	16.84	8.46	615	7.75
P14	15	16.79	8.45	620	7.75
P14	20	16.79	8.45	620	7.8
P14	25	16.77	8.45	630	7.85
P14	30	16.67	8.45	650	7.88
P14	35	16.57	8.45	710	7.9
P14	40	16.24	8.46	720	7.95
P14	45	15.45	8.48	800	8.1
P14	50	15	8.48	800	8.2
P14	55	14.19	8.48	850	8.5
P14	60	14.14	8.48	850	8.51

Table b. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for January 1996.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
P1	0.5	10.98	8.68	617	7.98	75.1
P1	3.7	10.92	8.67	617	8.19	77.0
P1	6.4	10.90	8.67	618	8.03	75.4
P1	8.6	10.89	8.67	618	8.00	75.1
P1	13.4	10.89	8.67	618	8.21	77.1
P1	19.5	10.88	8.67	618	8.15	76.5
P1	25.5	10.88	8.67	618	8.28	77.7
P1	32.2	10.87	8.67	618	8.06	75.6
P1	39.5	10.85	8.67	617	8.20	76.9
P1	50.1	10.82	8.67	618	8.33	78.0
P1	62.5	10.79	8.67	617	8.18	76.6
P1	74.4	8.20	8.33	867	7.72	68.1
P2	0.7	11.22	8.65	620	8.41	79.6
P2	5.8	11.22	8.65	621	8.50	80.4
P2	13.6	11.21	8.64	621	8.56	81.0
P2	19.0	11.21	8.64	622	8.43	79.7
P2	27.9	11.18	8.64	623	8.41	79.5
P2	36.4	11.14	8.65	623	8.38	79.1
P2	42.2	11.13	8.65	623	8.56	80.8
P2	50.4	11.09	8.65	622	9.17	86.5
P2	60.6	10.90	8.64	633	8.65	81.3
P2	69.3	9.74	8.41	799	8.45	77.3
P2	75.9	8.63	8.34	846	6.99	62.3
P2	84.1	7.89	8.26	892	6.54	57.2
P3	0.5	11.17	8.70	620	8.37	79.1
P3	5.0	10.64	8.71	622	8.75	81.6
P3	10.1	10.62	8.70	623	8.72	81.3
P3	20.1	10.59	8.70	623	8.60	80.1
P3	30.3	10.56	8.70	623	8.56	79.7
P3	38.2	10.13	8.72	623	8.74	80.7
P4	0.3	11.57	8.69	636	7.90	75.3
P4	4.7	11.39	8.68	639	7.88	74.8
P4	10.3	11.37	8.68	638	7.90	75.0
P4	20.1	11.35	8.68	638	7.94	75.3
P4	30.2	11.35	8.67	639	8.07	76.6
P4	40.0	11.34	8.67	639	8.00	75.9
P4	49.8	11.24	8.61	674	7.66	72.5
P4	60.4	10.83	8.47	774	6.50	61.0
P4	74.5	8.66	8.34	872	6.06	54.1
P4	80.6	8.10	8.31	894	5.80	51.0
P4	94.2	7.69	8.24	925	5.05	44.0
P6	0.2	10.80	8.63	540	9.00	84.3
P6	2.9	10.81	8.64	541	8.32	77.9
P6	6.9	10.80	8.64	541	8.24	77.2

P6	10.5	10.78	8.63	543	8.26	77.3
P6	15.1	10.78	8.63	542	8.19	76.7
P6	21.3	10.78	8.64	542	8.12	76.1
P6	26.8	10.79	8.64	542	8.10	75.8
P6	34.0	10.78	8.64	542	8.23	77.0
P6	38.8	10.77	8.63	543	8.15	76.3
P6	45.5	10.77	8.59	549	7.90	74.0
P6	51.8	10.19	8.44	529	6.87	63.4
P6	59.1	10.59	8.28	675	4.90	45.7
P6	67.1	10.65	8.35	753	5.59	52.3
P6	74.7	10.08	8.37	767	5.95	54.8
P6	83.5	9.13	8.18	777	3.96	35.7
P6	92.6	8.15	8.11	857	3.24	28.5
P6	98.3	8.00	8.10	874	3.13	27.5
P7	0.5	10.68	8.67	454	9.08	84.8
P7	8.0	10.41	8.66	455	8.81	81.7
P7	16.8	10.41	8.66	455	8.83	82.0
P7	27.3	10.40	8.66	456	8.79	81.6
P7	39.2	10.39	8.66	456	8.72	80.9
P7	49.7	9.35	8.66	473	9.01	81.5
P7	54.1	8.30	8.66	497	9.24	81.5
P7	58.8	7.79	8.66	506	9.21	80.2
P7	61.6	7.73	8.61	510	9.16	79.8
P8	0.4	9.23	8.80	450	9.53	86.0
P8	2.3	9.22	8.79	451	9.29	83.8
P8	8.6	9.11	8.77	452	9.42	84.7
P8	13.5	9.08	8.77	452	9.29	83.5
P8	16.6	8.84	8.77	457	9.39	83.9
P8	18.7	6.76	8.75	521	9.85	83.7
P8	19.2	6.62	8.74	526	9.94	84.2
P9	1.1	10.59	8.61	569	7.52	70.1
P9	4.1	10.62	8.60	571	7.57	70.6
P9	9.7	10.63	8.60	570	7.43	69.4
P9	20.7	10.64	8.60	570	7.46	69.6
P9	30.0	10.61	8.60	571	7.45	69.4
P9	40.5	10.62	8.60	571	7.50	70.0
P9	50.1	10.85	8.50	678	6.79	63.7
P9	60.3	10.26	8.49	763	6.62	61.3
P9	66.8	9.78	8.26	788	4.37	40.0
P10	1.0	10.80	8.69	596	8.19	76.7
P10	5.2	10.82	8.69	597	8.22	77.0
P10	10.1	10.82	8.69	598	8.37	78.4
P10	20.3	10.83	8.69	598	8.28	77.7
P10	29.6	10.84	8.69	599	8.23	77.1
P10	39.7	10.79	8.69	600	8.98	84.1
P10	45.4	10.76	8.69	603	8.24	77.1
P10	51.8	10.31	8.65	668	8.18	75.8
P10	60.1	9.42	8.65	705	8.24	74.7
P10	70.0	8.42	8.62	712	8.47	75.0
P10	81.8	8.06	8.58	721	8.47	74.4

P10	90.9	8.02	8.50	745	8.07	70.8
P11	1.0	10.10	8.76	561	8.45	77.8
P11	5.1	10.10	8.76	564	8.44	77.8
P11	10.1	10.08	8.76	564	8.60	79.2
P11	15.1	10.08	8.76	564	8.68	79.9
P11	20.4	10.06	8.76	564	8.52	78.4
P11	25.1	10.05	8.76	564	8.55	78.7
P11	30.1	10.00	8.76	564	8.63	79.4
P11	35.6	9.93	8.77	563	8.66	79.5
P11	36.7	9.84	8.77	563	8.67	79.4
P12	0.2	10.53	8.72	571	8.65	80.5
P12	6.1	10.49	8.72	572	8.71	81.0
P12	16.0	10.44	8.72	572	8.55	79.4
P12	25.7	10.44	8.71	572	8.53	79.2
P12	34.2	10.45	8.71	575	8.59	79.8
P12	38.3	10.44	8.71	575	8.59	79.8
P12	46.4	9.90	8.70	612	8.66	79.4
P12	53.0	9.34	8.71	625	8.82	79.9
P12	61.5	7.44	8.71	683	9.39	81.2
P12	67.4	7.09	8.71	694	9.49	81.4
P12	74.8	7.03	8.69	695	9.50	81.3
P12	74.8	7.03	8.70	694	9.91	84.8
P13	0.1	10.50	8.71	577	8.70	80.9
P13	8.2	10.47	8.71	580	8.66	80.5
P13	18.1	10.46	8.71	580	8.69	80.8
P13	25.2	10.44	8.71	580	8.66	80.5
P13	34.7	10.43	8.71	581	8.71	80.9
P13	40.0	10.27	8.71	592	8.72	80.7
P13	45.8	8.73	8.71	640	9.26	82.7
P13	46.1	8.68	8.71	640	9.14	81.4
P13	52.9	7.73	8.70	677	9.36	81.5
P13	63.9	7.12	8.70	694	9.65	82.8
P13	71.9	6.83	8.69	700	9.72	82.8
P13	76.3	6.83	8.67	700	9.55	81.4
P13	76.5	6.82	8.65	702	9.69	82.6
P14	1.0	9.92	8.73	582	8.96	82.2
P14	5.1	9.93	8.73	583	9.06	83.2
P14	10.1	9.90	8.73	584	9.06	83.1
P14	20.2	9.90	8.73	584	8.97	82.3
P14	30.2	9.83	8.73	586	8.95	82.0
P14	40.2	9.15	8.74	605	9.26	83.5
P14	49.4	7.04	8.74	692	9.82	84.1
P14	56.9	5.84	8.74	737	10.25	85.2

Table c. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for May 1996.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
P1	0.1	15.81	8.40	680	9.74	101.9
P1	1.1	15.49	8.41	681	9.84	102.2
P1	2.1	15.19	8.42	682	9.92	102.4
P1	3.0	14.97	8.42	682	9.99	102.7
P1	4.1	14.84	8.42	682	10.05	102.9
P1	5.0	14.78	8.42	682	10.07	103.0
P1	6.0	14.54	8.41	682	10.11	102.9
P1	7.0	14.39	8.41	681	10.13	102.8
P1	8.0	14.30	8.40	682	10.12	102.4
P1	9.0	14.09	8.39	681	10.11	101.9
P1	11.1	13.74	8.34	681	10.01	100.1
P1	13.1	12.95	8.26	682	9.68	95.1
P1	14.0	12.90	8.25	683	9.59	94.1
P1	19.0	12.15	8.17	684	9.25	89.3
P1	24.1	11.29	8.06	689	8.79	83.1
P1	29.0	10.97	8.01	691	8.51	80.0
P1	34.2	10.75	7.98	693	8.39	78.4
P1	39.1	10.62	7.98	696	8.37	78.0
P1	44.2	10.47	7.95	695	8.21	76.3
P1	49.1	10.28	7.93	700	8.10	74.9
P1	53.9	9.83	7.87	716	7.77	71.1
P1	59.0	8.96	7.83	736	7.70	69.0
P1	64.2	7.95	7.80	771	7.69	67.3
P1	69.0	7.79	7.77	786	7.53	65.6
P1	74.2	7.75	7.74	800	7.25	63.1
P1	79.1	7.75	7.69	830	6.79	59.1
P1	84.0	7.83	7.64	859	6.12	53.4
P1	89.1	7.85	7.58	890	5.42	47.3
P1	94.0	7.88	7.56	911	5.12	44.7
P1	98.2	7.85	7.53	940	4.61	40.3
P2	0.1	16.86	8.48	681	10.11	108.1
P2	1.0	16.51	8.47	680	10.12	107.4
P2	2.0	16.17	8.46	680	10.12	106.6
P2	3.0	15.86	8.43	679	10.11	105.8
P2	4.1	15.57	8.41	679	10.11	105.2
P2	5.1	15.42	8.40	679	10.05	104.2
P2	6.1	15.35	8.42	679	10.19	105.6
P2	7.0	15.25	8.43	679	10.29	106.4
P2	8.1	15.00	8.43	678	10.32	106.1
P2	9.1	14.26	8.41	680	10.31	104.2
P2	10.0	14.01	8.37	679	10.07	101.3
P2	14.1	12.33	8.16	682	9.35	90.6
P2	18.9	11.79	8.07	683	8.90	85.2
P2	24.0	11.12	7.99	687	8.53	80.4

P2	29.1	10.71	7.95	691	8.32	77.7
P2	34.1	10.49	7.92	695	8.20	76.2
P2	39.1	10.27	7.89	703	8.04	74.4
P2	44.0	10.10	7.87	707	7.93	73.0
P2	49.3	9.71	7.85	712	7.89	72.0
P2	54.1	9.16	7.83	717	7.89	71.0
P2	59.3	8.46	7.82	734	7.95	70.4
P2	64.1	8.05	7.81	747	8.01	70.2
P2	69.3	7.85	7.80	757	8.02	70.0
P2	74.4	7.74	7.78	768	7.93	69.0
P2	78.9	7.64	7.76	783	7.76	67.4
P2	84.3	7.64	7.71	808	7.38	64.1
P2	89.1	7.71	7.64	853	6.68	58.1
P2	94.3	7.77	7.57	896	5.87	51.1
P2	97.0	7.81	7.52	924	4.86	42.4
P3	0.0	15.78	8.38	681	9.49	99.2
P3	1.1	15.49	8.38	680	9.53	99.0
P3	2.0	15.45	8.37	679	9.58	99.4
P3	2.8	15.38	8.37	679	9.56	99.1
P3	4.1	15.25	8.37	679	9.60	99.2
P3	4.8	15.09	8.36	679	9.63	99.2
P3	6.1	15.07	8.36	678	9.64	99.2
P3	6.8	14.93	8.36	679	9.66	99.1
P3	8.0	14.82	8.35	680	9.67	99.0
P3	9.2	14.10	8.32	680	9.70	97.8
P3	14.0	12.77	8.19	682	9.26	90.6
P3	19.1	12.01	8.09	684	8.74	84.1
P3	24.2	11.69	8.04	686	8.48	81.0
P3	28.6	11.32	7.98	689	8.12	76.9
P3	34.4	10.59	7.88	700	7.70	71.7
P3	35.3	10.57	7.88	700	7.59	70.7
P4	0.2	15.23	8.37	676	9.58	98.9
P4	2.1	15.22	8.37	676	9.61	99.2
P4	3.0	15.18	8.37	676	9.63	99.3
P4	4.1	15.16	8.37	677	9.64	99.4
P4	5.0	15.14	8.37	676	9.64	99.4
P4	6.0	15.11	8.37	675	9.64	99.3
P4	7.3	14.83	8.35	678	9.68	99.2
P4	8.0	14.54	8.33	678	9.62	97.9
P4	9.0	13.70	8.29	681	9.55	95.4
P4	14.0	12.24	8.16	682	9.17	88.7
P4	19.0	11.66	8.10	682	8.92	85.2
P4	24.1	10.99	8.03	678	8.63	81.2
P4	29.0	10.58	7.98	681	8.44	78.6
P4	34.7	10.38	7.95	681	8.34	77.3
P4	39.0	10.28	7.94	685	8.24	76.1
P4	44.1	10.06	7.92	691	8.12	74.7
P4	48.9	9.86	7.90	696	8.05	73.7
P4	54.3	9.51	7.87	703	7.95	72.2
P4	59.2	9.18	7.85	716	7.88	71.0

P4	64.3	8.67	7.82	734	7.78	69.3
P4	69.2	8.10	7.80	756	7.76	68.1
P4	74.1	7.92	7.78	767	7.67	67.0
P4	79.2	7.59	7.75	797	7.45	64.6
P4	82.0	7.59	7.72	807	7.20	62.4
P5	0.2	15.95	8.32	659	9.16	96.1
P5	1.0	15.94	8.32	659	9.14	95.9
P5	2.0	15.80	8.32	658	9.16	95.8
P5	3.0	15.73	8.32	657	9.18	95.9
P5	4.1	15.65	8.32	655	9.21	96.0
P5	5.0	15.55	8.32	652	9.23	96.0
P5	6.1	15.41	8.32	653	9.25	95.9
P5	6.9	15.22	8.31	655	9.22	95.2
P5	8.0	15.17	8.31	655	9.22	95.1
P5	9.1	15.14	8.31	655	9.21	95.0
P5	9.9	15.00	8.30	654	9.21	94.6
P5	11.1	14.92	8.30	655	9.20	94.4
P5	12.1	14.82	8.29	653	9.20	94.1
P5	13.0	14.78	8.29	653	9.20	94.1
P5	13.9	14.66	8.28	653	9.17	93.6
P5	14.9	14.42	8.27	653	9.15	92.8
P5	19.1	12.39	8.15	638	9.06	87.9
P5	24.5	11.04	8.06	629	8.88	83.6
P5	28.9	10.33	8.03	629	8.79	81.3
P5	34.0	10.10	8.01	628	8.70	80.0
P5	39.4	9.81	8.00	632	8.65	79.1
P5	43.8	9.54	8.00	638	8.66	78.7
P5	49.3	9.22	8.00	654	8.69	78.4
P5	54.0	8.96	8.00	672	8.72	78.2
P5	59.2	8.71	8.00	692	8.75	78.0
P5	64.9	8.34	7.98	719	8.78	77.5
P5	69.6	8.08	7.97	737	8.80	77.2
P5	74.4	7.83	7.96	752	8.77	76.5
P5	78.7	7.60	7.93	766	8.67	75.2
P5	84.8	7.41	7.90	776	8.63	74.5
P5	89.4	7.28	7.84	799	8.25	71.0
P5	94.2	7.27	7.76	831	7.76	66.8
P5	96.5	7.33	7.66	873	6.73	58.0
P6	0.0	16.44	8.33	638	9.44	100.0
P6	0.7	16.36	8.32	636	9.45	99.9
P6	2.2	16.32	8.32	636	9.44	99.8
P6	3.1	15.95	8.31	638	9.49	99.5
P6	4.1	15.81	8.31	638	9.49	99.2
P6	5.0	15.61	8.30	637	9.49	98.9
P6	6.0	15.41	8.29	638	9.49	98.4
P6	7.1	15.16	8.29	640	9.51	98.1
P6	8.1	15.12	8.28	638	9.49	97.8
P6	8.9	14.97	8.28	638	9.49	97.4
P6	13.8	13.62	8.21	637	9.35	93.2
P6	18.7	12.69	8.14	624	9.17	89.6

P6	23.5	10.96	8.03	571	9.00	84.5
P6	29.2	10.28	7.98	567	8.84	81.7
P6	34.4	9.78	7.95	561	8.73	79.8
P6	38.8	9.43	7.92	556	8.62	78.0
P6	43.5	9.22	7.91	556	8.56	77.1
P6	48.8	9.01	7.89	557	8.53	76.5
P6	54.2	8.61	7.88	567	8.50	75.4
P6	59.1	8.28	7.87	602	8.51	75.0
P6	63.7	8.12	7.88	640	8.56	75.1
P6	69.2	7.77	7.80	695	8.34	72.6
P6	73.7	7.75	7.72	728	7.40	64.4
P6	78.9	7.84	7.64	766	6.58	57.4
P6	84.0	7.80	7.62	781	6.33	55.2
P6	88.7	7.75	7.60	799	6.14	53.4
P6	93.8	7.66	7.54	863	5.58	48.5
P6	97.6	7.62	7.46	913	4.27	37.1
P7	0.1	16.30	8.39	524	9.13	96.5
P7	0.9	16.16	8.39	524	9.18	96.7
P7	2.0	16.12	8.39	523	9.21	96.9
P7	3.1	16.05	8.39	523	9.25	97.2
P7	4.1	15.99	8.39	523	9.29	97.4
P7	6.0	15.82	8.38	522	9.39	98.2
P7	7.0	15.72	8.38	523	9.37	97.8
P7	8.0	15.47	8.38	522	9.44	97.9
P7	9.0	15.10	8.36	521	9.49	97.7
P7	10.0	14.85	8.35	521	9.49	97.2
P7	11.0	14.73	8.34	521	9.48	96.8
P7	12.3	14.01	8.31	522	9.45	95.0
P7	13.0	13.35	8.26	522	9.37	92.9
P7	14.1	13.10	8.23	522	9.29	91.5
P7	19.1	11.62	8.13	521	9.01	85.9
P7	24.0	10.29	8.05	522	8.86	81.9
P7	29.0	9.93	8.00	528	8.58	78.6
P7	34.1	9.63	7.97	534	8.47	77.1
P7	39.1	9.29	7.94	546	8.29	74.8
P7	44.5	9.01	7.89	561	8.03	72.0
P7	49.0	8.91	7.85	571	7.65	68.4
P7	54.2	8.74	7.81	585	7.20	64.1
P7	58.4	8.50	7.70	621	5.98	52.9
P8	0.1	16.91	8.42	556	9.38	100.4
P8	1.0	16.65	8.43	559	9.49	101.0
P8	1.9	16.66	8.43	559	9.51	101.2
P8	3.0	16.56	8.43	560	9.52	101.1
P8	3.9	16.52	8.43	561	9.52	101.1
P8	4.9	16.48	8.43	561	9.54	101.2
P8	6.0	16.43	8.43	559	9.56	101.3
P8	7.1	16.42	8.43	559	9.56	101.2
P8	7.9	15.89	8.42	556	9.59	100.4
P8	8.8	15.69	8.40	578	9.48	98.9
P8	11.3	14.97	8.31	631	9.13	93.7

P8	13.1	14.71	8.27	627	8.78	89.6
P8	14.5	14.42	8.24	616	8.74	88.6
P8	17.9	13.45	8.13	593	8.64	85.8
P8	18.8	13.13	8.08	574	8.20	80.9
P8	21.2	12.31	7.96	569	7.75	75.1
P8	23.6	11.63	7.87	577	7.86	75.0
P8	25.3	11.30	7.82	574	7.43	70.3
P8	27.7	10.80	7.78	569	6.99	65.3
P8	29.1	10.57	7.73	567	6.59	61.3
P9	0.9	17.38	8.43	632	8.96	96.8
P9	2.1	16.98	8.43	633	9.06	97.1
P9	3.0	16.72	8.43	633	9.18	97.9
P9	4.2	16.05	8.41	634	9.27	97.4
P9	5.1	15.85	8.41	634	9.29	97.2
P9	5.9	15.05	8.36	635	9.26	95.3
P9	7.0	14.90	8.35	634	9.28	95.1
P9	8.3	14.79	8.34	634	9.25	94.6
P9	8.8	14.64	8.33	634	9.28	94.6
P9	11.1	14.07	8.30	636	9.25	93.2
P9	13.0	13.81	8.28	636	9.14	91.6
P9	15.4	13.38	8.24	636	8.98	89.1
P9	18.0	12.79	8.19	635	8.85	86.6
P9	20.4	12.14	8.14	633	8.78	84.7
P9	22.1	11.97	8.13	632	8.74	84.0
P9	25.0	11.54	8.11	632	8.68	82.6
P9	28.1	11.02	8.09	628	8.61	81.0
P9	34.0	10.20	8.00	606	8.19	75.5
P9	39.0	9.60	7.93	586	7.79	70.9
P9	43.8	9.37	7.90	584	7.63	69.0
P9	48.7	9.21	7.87	607	7.42	66.9
P9	54.4	9.14	7.80	670	6.92	62.3
P9	59.2	9.10	7.58	753	4.58	41.1
P9	63.1	8.90	7.54	794	3.94	35.2
P9	69.3	8.71	7.58	794	4.55	40.5
P9	73.6	8.67	7.61	791	4.53	40.3
P10	0.0	16.96	8.32	633	8.95	95.8
P10	1.1	16.78	8.32	636	8.90	95.0
P10	2.2	16.54	8.32	634	9.00	95.6
P10	3.1	16.27	8.31	632	8.99	94.9
P10	4.1	15.75	8.31	632	9.03	94.3
P10	5.0	15.54	8.30	631	9.03	93.9
P10	6.0	15.40	8.30	631	9.01	93.4
P10	7.0	15.14	8.29	629	9.03	93.0
P10	8.1	15.07	8.28	629	9.00	92.6
P10	9.0	14.96	8.27	629	9.02	92.6
P10	11.0	14.09	8.24	629	8.94	90.0
P10	13.0	13.86	8.23	629	8.90	89.2
P10	15.5	12.98	8.18	632	8.81	86.6
P10	17.0	12.91	8.18	633	8.80	86.4
P10	18.9	12.62	8.17	633	8.74	85.2

P10	21.2	12.15	8.14	630	8.65	83.5
P10	22.9	12.01	8.13	631	8.67	83.4
P10	24.8	11.41	8.11	632	8.64	82.0
P10	27.0	11.09	8.10	632	8.66	81.6
P10	29.0	10.77	8.08	632	8.63	80.7
P10	34.2	10.39	8.07	635	8.59	79.6
P10	39.1	10.03	8.05	639	8.53	78.4
P10	43.9	9.75	8.04	646	8.53	77.8
P10	48.6	9.46	8.03	662	8.51	77.1
P10	54.5	9.22	8.02	678	8.46	76.3
P10	60.4	8.95	8.01	697	8.49	76.1
P10	64.8	8.72	8.00	709	8.52	75.9
P10	70.6	8.32	7.99	733	8.57	75.6
P10	74.4	8.06	7.98	749	8.53	74.8
P10	79.0	7.93	7.97	759	8.52	74.5
P10	83.7	7.68	7.94	776	8.52	74.0
P10	88.4	7.49	7.90	796	8.37	72.4
P10	93.5	7.46	7.86	808	8.19	70.8
P10	98.4	7.44	7.81	818	7.81	67.5
P11	0.0	17.95	8.41	633	8.42	92.0
P11	1.1	17.86	8.41	633	8.46	92.4
P11	1.9	17.46	8.40	633	8.51	92.1
P11	2.7	17.04	8.39	635	8.53	91.6
P11	3.3	16.44	8.38	635	8.63	91.5
P11	5.2	15.54	8.36	636	8.75	91.0
P11	6.2	15.00	8.34	638	8.74	89.8
P11	6.8	14.80	8.33	641	8.70	89.0
P11	8.3	14.53	8.32	639	8.73	88.9
P11	9.2	14.19	8.31	638	8.73	88.1
P11	11.3	13.51	8.29	634	8.79	87.4
P11	13.9	12.97	8.26	632	8.68	85.3
P11	18.8	12.61	8.23	634	8.50	82.9
P11	23.8	12.14	8.19	632	8.38	80.9
P11	28.6	11.58	8.15	634	8.27	78.8
P11	33.8	10.83	8.09	639	8.09	75.8
P11	36.6	10.38	8.04	644	7.87	72.9
P12	0.2	16.40	8.31	651	8.82	93.4
P12	1.0	16.37	8.31	650	8.83	93.4
P12	1.6	16.27	8.31	649	8.83	93.2
P12	3.0	16.33	8.31	650	8.84	93.5
P12	4.1	16.16	8.31	652	8.84	93.2
P12	4.7	16.06	8.31	652	8.82	92.8
P12	5.8	15.73	8.30	654	8.81	92.0
P12	7.1	15.45	8.30	656	8.77	91.0
P12	8.1	15.30	8.29	660	8.85	91.6
P12	8.8	15.24	8.29	662	8.82	91.1
P12	13.1	14.22	8.22	699	8.73	88.2
P12	14.5	14.14	8.21	705	8.70	87.8
P12	19.6	13.72	8.18	707	8.64	86.4
P12	24.6	12.75	8.12	706	8.48	83.0

P12	29.1	11.68	8.10	708	8.42	80.4
P12	32.7	10.96	8.07	712	8.35	78.4
P12	39.4	10.62	8.06	721	8.39	78.2
P12	44.2	10.51	8.05	726	8.28	77.0
P12	48.4	10.32	8.04	743	8.20	75.9
P12	54.0	10.09	8.02	763	8.14	74.9
P12	59.5	9.70	7.99	784	8.05	73.5
P12	65.1	9.36	7.96	793	7.95	71.9
P12	69.2	9.07	7.95	792	7.85	70.6
P12	74.4	8.64	7.94	791	7.92	70.5
P12	79.1	8.34	7.91	790	7.87	69.5
P12	84.4	8.22	7.88	789	7.65	67.4
P12	86.5	8.38	7.88	788	7.54	66.6
P13	0.1	15.79	8.29	689	9.00	94.1
P13	1.1	15.71	8.28	691	8.96	93.6
P13	1.8	15.42	8.27	695	8.91	92.4
P13	3.1	15.21	8.26	698	8.93	92.2
P13	4.1	15.05	8.25	700	8.81	90.7
P13	5.4	14.65	8.23	705	8.84	90.2
P13	6.3	14.46	8.20	703	8.71	88.5
P13	6.6	14.42	8.19	702	8.72	88.5
P13	8.3	14.38	8.19	702	8.67	87.9
P13	8.4	14.37	8.19	702	8.68	88.1
P13	11.6	14.21	8.18	702	8.66	87.5
P13	12.8	14.11	8.17	702	8.61	86.8
P13	14.6	13.98	8.18	708	8.61	86.6
P13	17.4	13.83	8.17	707	8.63	86.4
P13	19.4	13.72	8.15	706	8.57	85.7
P13	24.3	13.24	8.11	702	8.50	84.0
P13	29.7	12.77	8.08	706	8.49	83.1
P13	34.3	12.26	8.07	710	8.37	81.1
P13	39.7	11.04	8.06	715	8.38	78.9
P13	43.5	10.62	8.02	748	8.23	76.7
P13	49.7	10.22	8.01	755	8.25	76.2
P13	54.6	10.07	8.00	762	8.14	74.9
P13	59.7	9.91	7.97	794	8.04	73.7
P13	63.4	9.77	7.95	798	7.85	71.7
P13	69.5	9.20	7.91	804	7.76	70.0
P13	73.2	8.87	7.87	803	7.53	67.4
P13	79.4	8.69	7.77	807	7.29	65.0
P13	79.6	8.69	7.70	810	6.29	56.0
P14	0.3	16.56	8.40	654	9.18	97.5
P14	0.9	16.55	8.40	654	9.20	97.7
P14	1.8	16.55	8.40	654	9.22	97.9
P14	2.8	16.42	8.38	649	9.18	97.3
P14	3.8	16.30	8.35	646	9.13	96.5
P14	5.8	16.19	8.33	641	8.94	94.2
P14	8.1	15.94	8.27	630	8.72	91.4
P14	10.8	15.82	8.25	643	8.59	89.9
P14	14.6	15.43	8.18	628	8.43	87.5

P14	17.9	15.14	8.13	620	8.32	85.8
P14	19.8	14.70	8.12	650	8.22	83.9
P14	23.1	14.04	8.09	678	8.26	83.1
P14	25.4	13.70	8.08	686	8.17	81.6
P14	28.1	12.77	8.05	686	8.22	80.4
P14	31.3	12.15	8.01	683	8.19	79.0
P14	31.5	12.19	8.01	682	8.16	78.8
P14	34.5	11.83	7.98	694	8.04	77.1
P14	40.2	11.16	7.91	741	7.16	67.6
P14	46.0	10.80	7.92	768	7.12	66.7
P14	51.6	10.46	7.82	804	6.40	59.5
P14	55.8	10.39	7.81	808	6.32	58.6

Table d. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for August 1996.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
P1	0.7	26.63	8.52	686	8.18	107.9
P1	2.0	26.44	8.54	686	8.15	107.1
P1	4.0	25.99	8.56	686	8.05	105.0
P1	5.7	25.28	8.57	685	8.29	106.7
P1	8.2	25.08	8.59	683	8.68	111.3
P1	10.7	24.52	8.58	682	8.82	111.9
P1	12.6	21.20	8.51	685	9.13	108.8
P1	14.9	19.84	8.39	688	8.07	93.6
P1	16.9	18.89	8.30	686	7.60	86.5
P1	20.0	18.02	8.22	683	7.23	80.9
P1	23.3	16.92	8.14	688	6.95	76.0
P1	25.9	16.33	8.11	693	6.86	74.1
P1	29.8	15.16	8.02	694	6.63	69.9
P1	35.1	13.43	7.95	696	6.60	66.9
P1	39.9	12.60	7.93	699	6.58	65.4
P1	45.5	12.05	7.92	702	6.59	64.8
P1	49.9	11.58	7.92	701	6.63	64.5
P1	55.0	11.07	7.93	694	6.77	65.1
P1	60.8	10.43	7.97	682	7.11	67.4
P1	65.5	9.75	8.00	682	7.45	69.5
P1	69.9	9.18	8.00	704	7.55	69.4
P1	76.6	8.17	7.94	783	7.41	66.6
P1	80.8	8.01	7.93	798	7.28	65.1
P1	88.2	7.87	7.88	828	6.79	60.5
P1	98.9	7.84	7.79	889	6.33	56.4
P2	0.8	26.23	8.57	680	8.43	110.4
P2	3.0	26.25	8.58	680	8.40	110.1
P2	5.3	26.22	8.58	681	8.37	109.6
P2	8.0	25.36	8.61	678	8.85	114.0
P2	8.2	25.33	8.62	677	9.27	119.5
P2	8.3	25.11	8.62	677	9.23	118.4
P2	10.6	22.73	8.61	660	10.04	123.1
P2	12.3	20.96	8.47	657	9.03	107.1
P2	14.8	19.59	8.19	639	7.01	80.8
P2	18.1	18.45	8.05	635	6.48	73.1
P2	21.6	17.31	7.96	639	6.14	67.6
P2	24.8	16.56	7.96	656	6.20	67.3
P2	29.9	15.11	8.01	679	6.68	70.3
P2	36.1	13.30	7.98	684	7.01	70.9
P2	39.8	12.65	7.96	688	7.05	70.2
P2	45.4	11.89	7.94	697	6.99	68.5
P2	52.0	11.13	7.94	691	6.95	66.9
P2	60.5	10.26	8.01	671	7.62	71.8
P2	65.6	9.82	8.01	678	7.76	72.4

P2	69.9	9.28	8.02	697	7.83	72.2
P2	74.2	8.76	8.00	729	7.85	71.5
P2	81.2	8.23	7.96	779	7.69	69.2
P2	90.5	7.82	7.89	832	6.95	61.9
P2	94.5	7.78	7.87	848	6.67	59.3
P3	1.1	26.68	8.55	680	8.26	109.1
P3	2.6	26.71	8.55	680	8.32	109.9
P3	4.8	26.72	8.55	680	8.32	109.9
P3	7.2	26.57	8.55	680	8.42	110.9
P3	9.3	24.99	8.57	674	9.18	117.5
P3	10.4	24.11	8.57	667	9.47	119.3
P3	12.6	22.76	8.50	673	9.50	116.7
P3	14.5	21.18	8.39	681	8.44	100.5
P3	18.5	18.96	8.20	685	6.87	78.3
P3	19.4	18.27	8.13	683	6.51	73.1
P3	22.3	17.55	8.06	684	6.20	68.6
P3	25.3	16.89	8.02	685	6.12	66.9
P3	29.0	15.73	7.98	689	6.01	64.1
P3	33.9	13.92	7.86	700	5.31	54.4
P3	37.5	13.03	7.83	703	5.19	52.2
P3	39.5	12.66	7.84	704	5.26	52.4
P4	0.7	27.07	8.62	661	8.46	112.5
P4	2.8	27.07	8.62	661	8.53	113.4
P4	5.0	26.95	8.63	661	8.55	113.5
P4	6.9	25.91	8.64	661	9.01	117.3
P4	9.1	24.15	8.57	649	9.40	118.4
P4	10.5	23.24	8.64	616	10.67	132.2
P4	12.6	21.71	8.39	583	8.30	99.9
P4	14.9	19.96	8.03	577	6.33	73.6
P4	17.4	18.57	7.87	578	5.83	65.9
P4	20.8	17.49	7.89	610	5.87	64.9
P4	25.4	16.56	7.90	632	6.02	65.3
P4	30.9	14.83	7.96	669	6.58	68.8
P4	35.4	13.25	7.96	669	6.96	70.3
P4	41.1	12.20	7.97	676	7.19	70.9
P4	46.5	11.40	7.96	684	7.29	70.6
P4	51.0	10.78	7.97	680	7.40	70.6
P4	60.2	10.06	7.99	673	7.57	71.0
P4	70.2	9.37	8.00	691	7.76	71.7
P4	80.1	8.41	7.93	765	7.61	68.7
P4	82.4	8.31	7.93	775	7.37	66.4
P5	0.8	26.41	8.73	581	8.66	113.7
P5	2.5	25.96	8.75	580	8.77	114.3
P5	4.7	25.67	8.76	579	8.91	115.4
P5	6.7	25.17	8.74	580	8.78	112.8
P5	8.2	24.96	8.71	582	8.50	108.8
P5	10.4	24.64	8.66	577	8.05	102.3
P5	12.4	23.29	8.40	543	6.62	82.1
P5	14.2	20.90	7.88	478	5.40	64.0
P5	16.2	20.32	7.84	473	5.38	63.0

P5	18.7	19.18	7.84	505	5.40	61.8
P5	21.1	18.10	7.85	546	5.40	60.4
P5	25.7	16.41	7.87	561	5.94	64.2
P5	31.0	14.45	7.96	644	6.46	66.9
P5	36.7	12.98	8.02	662	7.05	70.7
P5	45.3	11.50	8.03	655	7.34	71.3
P5	51.6	10.65	8.05	652	7.62	72.6
P5	60.5	9.59	8.05	613	7.84	72.8
P5	69.5	9.08	8.06	669	7.94	72.8
P5	81.1	8.29	8.06	760	7.99	72.0
P5	97.9	7.57	7.94	844	7.14	63.2
P6	1.0	26.07	8.66	590	8.44	110.2
P6	2.3	26.10	8.66	591	8.50	111.0
P6	4.6	25.86	8.67	591	8.53	111.0
P6	6.2	25.78	8.67	591	8.59	111.6
P6	8.3	25.74	8.68	590	8.56	111.1
P6	10.2	25.41	8.68	588	8.50	109.6
P6	12.4	24.56	8.58	586	7.95	101.0
P6	14.4	21.85	8.32	591	7.22	87.1
P6	17.3	20.51	7.98	556	5.52	64.9
P6	20.4	19.21	7.98	591	5.56	63.7
P6	25.5	16.70	7.86	606	5.71	62.1
P6	30.4	14.29	7.96	589	6.77	70.0
P6	35.3	12.72	7.98	602	7.29	72.7
P6	40.5	11.68	8.00	599	7.55	73.5
P6	46.9	10.39	7.99	559	7.74	73.2
P6	52.5	9.81	7.98	548	7.79	72.7
P6	57.0	9.48	7.97	552	7.78	72.1
P6	65.6	9.00	7.93	573	7.47	68.4
P6	75.6	8.29	7.88	652	7.11	64.0
P6	85.6	8.06	7.80	741	6.13	54.9
P6	98.0	7.78	7.81	808	5.97	53.1
P7	1.0	26.93	8.56	557	7.93	105.1
P7	3.4	26.69	8.57	556	8.24	108.8
P7	6.3	26.31	8.58	557	8.32	109.1
P7	8.6	26.08	8.58	554	8.28	108.1
P7	10.5	25.36	8.45	519	7.19	92.6
P7	12.5	23.82	7.95	461	3.88	48.6
P7	15.5	21.28	7.71	467	2.80	33.3
P7	18.4	19.51	8.01	588	5.30	61.0
P7	20.6	18.44	7.99	604	5.59	63.0
P7	23.3	17.45	7.97	623	5.83	64.4
P7	27.8	15.44	7.90	582	6.21	65.7
P7	31.3	13.91	7.83	593	6.02	61.6
P7	36.7	12.05	7.82	562	6.24	61.3
P7	41.7	11.06	7.82	557	6.41	61.6
P7	47.5	10.28	7.84	557	6.58	62.1
P7	55.6	9.57	7.75	572	6.04	56.0
P7	60.4	9.32	7.65	584	4.70	43.3
P7	63.3	9.33	7.61	592	4.43	40.9

P8	0.9	26.74	8.55	492	8.11	107.1
P8	3.7	26.74	8.56	493	8.18	108.0
P8	6.5	26.29	8.55	494	7.99	104.7
P8	8.4	26.16	8.49	496	7.65	100.0
P8	10.4	26.08	8.45	498	7.33	95.7
P8	12.5	24.47	7.57	540	0.64	8.2
P8	14.4	21.49	7.56	480	0.28	3.3
P8	16.7	19.69	7.55	503	0.62	7.1
P8	18.6	18.62	7.62	559	2.47	28.0
P8	20.5	18.06	7.66	586	3.15	35.2
P8	22.5	17.35	7.74	614	3.95	43.5
P8	24.3	16.99	7.70	629	3.83	41.9
P8	26.7	16.18	7.58	658	2.47	26.6
P8	30.8	14.41	7.46	664	0.93	9.6
P8	34.3	13.31	7.44	647	0.71	7.2
P9	0.8	27.33	8.67	592	8.79	117.3
P9	2.5	26.78	8.69	593	8.92	117.9
P9	4.6	26.55	8.69	594	8.98	118.3
P9	6.6	26.41	8.69	593	8.94	117.4
P9	8.5	25.36	8.68	559	9.15	117.9
P9	10.5	24.55	8.55	553	8.35	106.0
P9	12.0	23.51	8.40	566	7.70	95.9
P9	14.2	21.50	7.97	528	5.62	67.3
P9	16.6	20.78	7.83	503	5.07	59.8
P9	18.5	20.15	7.80	500	5.01	58.4
P9	20.6	19.72	7.82	535	4.98	57.6
P9	22.2	18.86	8.05	648	6.08	69.1
P9	24.7	17.94	7.98	658	5.93	66.2
P9	26.8	17.03	8.00	652	6.25	68.5
P9	28.5	16.49	8.03	645	6.51	70.5
P9	30.5	15.57	8.05	637	7.08	75.3
P9	35.5	13.42	8.02	637	7.32	74.1
P9	40.4	12.26	8.02	643	7.56	74.7
P9	45.7	11.16	8.00	632	7.56	72.9
P9	50.4	10.42	7.97	622	7.38	69.8
P9	54.8	9.92	7.92	617	7.04	65.9
P9	57.6	9.70	7.88	622	6.59	61.3
P10	0.7	27.07	8.68	531	8.50	113.0
P10	3.0	26.79	8.69	531	8.67	114.6
P10	6.3	26.07	8.70	533	8.76	114.3
P10	8.5	25.37	8.57	540	7.40	95.4
P10	11.6	24.23	8.23	506	6.02	76.0
P10	13.9	21.45	7.77	464	5.08	60.8
P10	15.7	20.53	7.76	461	5.31	62.4
P10	17.3	20.08	7.77	464	5.48	63.8
P10	20.1	19.54	7.79	478	5.56	64.1
P10	23.2	18.36	7.80	530	5.49	61.8
P10	25.9	16.66	7.84	558	5.94	64.6
P10	30.3	15.12	7.92	582	6.71	70.6
P10	35.7	12.84	8.02	656	7.41	74.2

P10	40.6	11.90	8.05	653	7.68	75.2
P10	45.8	11.00	8.06	647	7.91	75.9
P10	50.5	10.51	8.06	644	8.01	76.0
P10	55.7	10.01	8.07	649	8.12	76.1
P10	61.1	9.62	8.08	669	8.17	75.9
P10	69.4	9.30	8.09	713	8.25	76.1
P10	81.2	8.38	8.06	772	8.28	74.7
P10	88.5	8.00	8.00	796	7.61	68.0
P10	97.8	7.74	7.87	843	7.27	64.6
P11	0.9	26.70	8.76	515	8.15	107.6
P11	3.6	26.50	8.77	515	8.33	109.6
P11	5.4	26.21	8.74	508	8.18	107.1
P11	7.5	26.03	8.71	502	8.00	104.3
P11	9.4	25.61	8.53	508	6.42	83.1
P11	11.4	24.88	8.16	498	4.85	61.9
P11	13.6	23.13	7.80	492	3.46	42.7
P11	15.6	21.38	7.73	494	3.35	40.0
P11	16.9	20.71	7.73	496	3.55	41.8
P11	18.8	20.26	7.73	498	3.76	43.9
P11	20.5	19.89	7.71	513	3.26	37.9
P11	22.8	18.98	7.66	557	2.57	29.3
P11	25.6	17.21	7.75	613	3.67	40.3
P11	29.2	15.79	7.79	627	4.36	46.5
P11	34.0	13.69	7.85	658	5.13	52.3
P11	39.3	12.35	7.83	673	5.19	51.4
P11	41.2	11.96	7.83	679	5.20	51.0
P12	1.4	26.24	8.71	504	8.57	112.2
P12	3.3	26.08	8.70	505	8.50	110.9
P12	5.4	25.99	8.67	506	8.25	107.5
P12	7.3	25.90	8.63	506	7.99	103.9
P12	9.1	25.39	8.48	508	6.81	87.8
P12	10.4	25.19	8.40	508	6.26	80.4
P12	11.5	25.10	8.38	507	6.17	79.1
P12	12.6	24.84	8.30	506	5.85	74.6
P12	13.3	24.62	8.25	503	5.59	71.0
P12	15.4	21.82	7.79	470	4.55	54.9
P12	17.4	20.52	7.74	451	4.95	58.2
P12	19.3	19.87	7.75	447	5.40	62.6
P12	22.4	19.04	7.77	452	5.77	65.8
P12	25.6	17.07	7.79	486	6.08	66.6
P12	30.6	14.29	7.96	614	7.05	72.8
P12	35.5	12.36	8.07	683	7.61	75.4
P12	40.9	11.45	8.09	684	7.88	76.4
P12	46.2	10.79	8.11	691	8.05	76.9
P12	51.5	10.50	8.11	701	8.11	76.9
P12	56.7	10.35	8.10	732	8.13	76.9
P12	63.9	10.17	8.05	774	7.77	73.2
P12	70.1	9.94	8.00	797	7.30	68.3
P12	78.9	9.24	7.89	811	6.28	57.9
P12	90.4	8.39	7.76	801	5.14	46.4

P13	0.7	27.79	8.69	503	8.41	113.3
P13	2.3	26.02	8.72	507	8.73	113.8
P13	4.7	25.80	8.69	511	8.56	111.1
P13	6.7	25.57	8.65	511	8.17	105.6
P13	8.5	25.48	8.57	516	7.50	96.8
P13	10.6	25.28	8.42	516	6.40	82.3
P13	12.8	25.23	8.39	541	6.21	79.8
P13	14.4	24.80	8.26	514	5.32	67.8
P13	16.5	22.42	7.79	494	4.16	50.8
P13	18.6	20.08	7.74	448	5.11	59.5
P13	20.7	19.50	7.73	445	5.32	61.3
P13	22.4	19.07	7.74	449	5.47	62.4
P13	24.4	17.49	7.76	471	5.76	63.6
P13	26.4	16.72	7.78	482	5.95	64.7
P13	28.7	15.80	7.81	502	6.38	68.1
P13	31.2	14.74	7.85	552	6.60	68.8
P13	35.8	12.88	8.01	697	7.27	72.8
P13	40.6	11.98	8.07	710	7.78	76.3
P13	45.7	11.29	8.09	708	8.02	77.5
P13	50.5	10.85	8.09	716	8.03	76.8
P13	55.3	10.58	8.07	745	7.90	75.1
P13	60.8	10.42	8.03	771	7.65	72.5
P13	65.4	10.24	8.00	786	7.27	68.6
P13	71.8	9.63	7.85	817	6.40	59.5
P13	75.3	9.30	7.79	817	5.10	47.0
P13	80.3	9.08	7.78	814	5.00	45.9
P14	1.6	27.16	8.77	652	10.97	146.0
P14	3.5	25.91	8.69	647	9.72	126.6
P14	5.5	25.65	8.50	655	7.48	96.9
P14	7.3	25.56	8.37	689	6.54	84.7
P14	9.6	25.43	8.37	693	6.48	83.6
P14	11.5	25.39	8.33	717	6.09	78.6
P14	13.5	24.81	8.13	771	4.54	57.9
P14	15.6	24.07	8.04	796	3.90	49.1
P14	17.3	21.82	7.87	614	4.13	49.7
P14	19.4	19.83	7.75	450	5.08	58.9
P14	22.4	18.59	7.78	451	5.75	65.0
P14	26.4	16.21	7.80	475	6.20	66.7
P14	30.8	14.74	7.81	535	6.46	67.4
P14	35.4	12.83	7.90	687	6.77	67.8
P14	40.5	11.98	7.95	732	7.02	68.9
P14	45.3	11.54	7.91	753	6.56	63.8
P14	50.8	11.07	7.85	775	5.81	55.8
P14	57.2	10.86	7.77	790	4.74	45.3
P14	58.1	10.86	7.74	791	4.48	42.9

Table e. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for November 1996.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)
P1	0.4	16.71	8.01	655	7.21
P1	2.1	16.44	8.01	659	7.12
P1	4.1	16.38	8.00	660	7.09
P1	6.0	16.36	8.00	660	7.07
P1	7.9	16.34	8.00	660	7.06
P1	10.1	16.34	8.00	661	7.05
P1	11.8	16.34	8.00	661	7.04
P1	13.9	16.34	8.00	661	7.03
P1	16.9	16.33	7.99	661	7.03
P1	20.0	16.33	7.99	661	7.03
P1	23.0	16.33	7.99	661	7.01
P1	26.0	16.22	7.96	661	6.84
P1	30.1	16.11	7.94	662	6.68
P1	35.0	15.98	7.87	663	6.29
P1	40.0	13.98	7.61	668	4.72
P1	44.6	13.01	7.57	675	4.56
P1	50.4	12.17	7.56	657	5.35
P1	55.5	11.39	7.57	650	5.70
P1	60.2	10.61	7.58	643	6.08
P1	65.4	9.75	7.59	648	6.44
P1	70.2	9.16	7.58	674	6.51
P1	79.9	8.27	7.56	742	6.47
P1	90.3	7.93	7.50	803	5.95
P1	96.7	7.85	7.46	840	5.42
P2	0.3	16.95	8.04	652	7.54
P2	2.2	16.85	8.05	654	7.49
P2	3.9	16.71	8.05	655	7.44
P2	6.4	16.63	8.05	653	7.43
P2	8.3	16.57	8.04	654	7.40
P2	10.2	16.54	8.04	654	7.39
P2	12.3	16.54	8.04	654	7.36
P2	14.0	16.53	8.04	655	7.35
P2	16.3	16.52	8.04	655	7.33
P2	17.7	16.52	8.04	656	7.32
P2	20.6	16.52	8.04	656	7.33
P2	21.9	16.52	8.04	656	7.34
P2	24.3	16.51	8.04	657	7.35
P2	25.9	16.50	8.04	656	7.34
P2	27.9	16.49	8.04	656	7.33
P2	30.3	16.49	8.04	657	7.32
P2	35.6	15.52	7.91	661	7.19
P2	40.2	13.55	7.72	667	6.07
P2	45.4	12.63	7.63	664	4.99

P2	50.5	11.71	7.61	645	5.86
P2	55.1	10.86	7.61	637	6.24
P2	60.1	10.21	7.61	629	6.49
P2	64.8	9.68	7.62	634	6.71
P2	70.1	9.22	7.61	657	6.79
P2	74.5	8.83	7.59	696	6.67
P2	80.1	8.46	7.55	741	6.21
P2	84.6	8.19	7.52	773	5.94
P2	90.4	7.97	7.51	794	5.96
P2	95.0	7.99	7.46	826	5.20
P3	0.6	16.07	8.04	640	7.38
P3	2.1	16.12	8.04	642	7.32
P3	2.7	16.14	8.04	643	7.30
P3	3.8	16.15	8.04	642	7.29
P3	5.9	16.15	8.04	643	7.29
P3	8.1	16.15	8.04	643	7.28
P3	10.0	16.16	8.03	643	7.28
P3	12.1	16.16	8.03	644	7.27
P3	15.0	16.15	8.03	644	7.27
P3	16.9	16.14	8.03	644	7.29
P3	19.2	16.13	8.03	645	7.30
P3	22.1	16.11	8.03	645	7.30
P3	24.1	16.11	8.03	646	7.32
P3	26.2	16.09	8.03	646	7.33
P3	29.0	16.05	8.04	646	7.40
P3	31.0	16.03	8.05	646	7.45
P3	33.5	15.92	8.04	647	7.43
P3	35.4	15.91	8.04	647	7.44
P3	37.8	15.59	7.95	650	6.51
P3	40.2	13.81	7.56	671	2.72
P3	42.8	13.14	7.50	678	2.37
P3	43.0	13.10	7.48	679	2.30
P4	0.3	17.10	7.95	609	7.09
P4	2.2	17.06	7.95	610	7.07
P4	4.1	16.83	7.96	610	7.06
P4	5.9	16.76	7.96	611	7.08
P4	8.4	16.74	7.95	611	7.07
P4	10.0	16.71	7.95	612	7.06
P4	12.1	16.71	7.95	611	7.05
P4	14.1	16.69	7.95	611	7.05
P4	16.4	16.68	7.95	611	7.06
P4	18.1	16.68	7.95	610	7.06
P4	20.0	16.66	7.95	610	7.06
P4	22.0	16.66	7.95	611	7.04
P4	24.3	16.66	7.95	611	7.04
P4	26.1	16.66	7.94	611	7.03
P4	28.3	16.64	7.94	611	7.02
P4	30.1	16.65	7.94	611	7.00
P4	35.1	14.87	7.65	643	5.21
P4	40.1	13.28	7.62	647	5.32

P4	45.1	12.46	7.60	644	5.68
P4	50.2	11.50	7.60	642	5.97
P4	54.9	10.80	7.61	631	6.26
P4	61.0	10.24	7.60	630	6.40
P4	65.2	9.73	7.61	630	6.68
P4	70.1	9.25	7.60	657	6.73
P4	75.0	8.71	7.58	700	6.66
P4	80.2	8.38	7.56	731	6.54
P4	85.3	8.10	7.53	763	6.34
P4	91.3	7.85	7.49	810	5.93
P4	95.7	7.81	7.44	844	4.89
P5	0.7	15.51	7.96	545	7.48
P5	1.8	15.52	7.96	545	7.45
P5	4.4	15.54	7.95	546	7.46
P5	7.3	15.56	7.95	547	7.44
P5	8.5	15.55	7.95	546	7.44
P5	10.3	15.55	7.95	548	7.43
P5	13.6	15.54	7.95	549	7.42
P5	14.1	15.55	7.95	549	7.42
P5	17.0	15.54	7.95	548	7.40
P5	18.3	15.54	7.95	549	7.39
P5	20.3	15.54	7.95	548	7.39
P5	22.5	15.54	7.95	549	7.38
P5	24.2	15.54	7.95	549	7.38
P5	26.2	15.54	7.95	549	7.38
P5	28.7	15.54	7.95	549	7.38
P5	30.8	15.54	7.95	549	7.39
P5	35.3	15.53	7.95	550	7.39
P5	40.7	13.27	7.74	620	7.10
P5	46.1	12.34	7.70	622	6.38
P5	50.6	11.41	7.68	615	6.57
P5	55.3	10.60	7.68	598	6.69
P5	60.4	10.11	7.66	603	6.87
P5	64.8	9.81	7.65	612	6.89
P5	70.2	9.55	7.64	638	6.94
P5	75.7	9.19	7.64	689	7.02
P5	80.2	8.77	7.62	722	7.04
P5	85.1	8.42	7.60	743	6.85
P5	89.9	8.07	7.58	767	6.70
P5	95.5	7.81	7.54	798	6.53
P6	0.4	16.87	7.88	559	6.72
P6	2.1	16.87	7.86	560	6.61
P6	4.2	16.73	7.85	562	6.58
P6	6.4	16.69	7.85	561	6.55
P6	8.2	16.68	7.84	561	6.53
P6	10.4	16.66	7.84	561	6.51
P6	11.4	16.63	7.84	560	6.49
P6	14.9	16.63	7.83	560	6.48
P6	17.2	16.63	7.83	560	6.48
P6	18.5	16.62	7.83	560	6.49

P6	20.4	16.61	7.83	559	6.49
P6	21.9	16.61	7.83	560	6.50
P6	24.3	16.61	7.83	560	6.49
P6	26.6	16.61	7.83	560	6.49
P6	27.6	16.61	7.83	560	6.47
P6	30.4	16.56	7.83	559	6.47
P6	35.2	14.78	7.63	563	5.41
P6	40.0	12.99	7.59	549	5.94
P6	40.1	13.00	7.60	548	5.85
P6	44.8	11.76	7.59	540	6.24
P6	49.9	10.80	7.57	531	6.46
P6	55.4	10.14	7.55	529	6.38
P6	60.6	9.67	7.52	539	6.28
P6	65.5	9.36	7.49	554	5.84
P6	70.1	9.05	7.47	580	5.69
P6	75.1	8.75	7.45	613	5.30
P6	80.5	8.31	7.40	687	4.93
P6	85.4	8.08	7.36	739	4.17
P6	90.3	7.94	7.35	775	3.99
P6	95.7	7.76	7.34	816	4.21
P7	0.2	16.74	7.97	576	7.44
P7	2.1	16.74	7.96	578	7.43
P7	4.5	16.58	7.95	578	7.38
P7	6.3	16.56	7.95	579	7.32
P7	8.4	16.56	7.93	579	7.22
P7	10.4	16.54	7.93	579	7.17
P7	12.2	16.53	7.92	579	7.15
P7	14.9	16.53	7.92	579	7.14
P7	17.8	16.53	7.92	579	7.13
P7	18.3	16.53	7.92	579	7.14
P7	20.3	16.52	7.92	579	7.15
P7	22.4	16.52	7.92	579	7.14
P7	24.7	16.51	7.92	579	7.13
P7	27.1	16.50	7.92	579	7.14
P7	28.7	16.48	7.92	579	7.14
P7	31.5	16.30	7.90	583	7.22
P7	35.4	15.58	7.83	603	6.69
P7	40.2	13.53	7.55	596	4.15
P7	46.0	11.83	7.51	558	4.19
P7	51.0	10.86	7.44	557	3.50
P7	55.4	10.51	7.40	556	3.12
P7	60.4	9.97	7.35	556	2.85
P8	0.2	16.40	7.98	601	7.23
P8	2.3	16.40	7.97	602	7.21
P8	4.3	16.39	7.97	603	7.17
P8	6.0	16.39	7.97	603	7.15
P8	8.8	16.39	7.96	603	7.13
P8	11.2	16.37	7.97	603	7.13
P8	12.2	16.37	7.96	603	7.12
P8	14.5	16.38	7.96	603	7.12

P8	17.1	16.38	7.96	603	7.12
P8	18.3	16.38	7.96	603	7.12
P8	20.9	16.36	7.96	604	7.12
P8	22.2	16.34	7.96	604	7.11
P8	24.1	16.18	7.96	603	7.13
P8	26.5	15.20	7.99	606	7.34
P8	28.5	13.79	7.98	621	7.53
P8	31.0	13.39	7.98	623	7.59
P8	31.4	13.37	7.98	623	7.75
P9	0.4	16.90	7.84	572	6.49
P9	2.2	16.89	7.84	572	6.49
P9	4.2	16.67	7.83	576	6.38
P9	8.0	16.64	7.83	576	6.31
P9	9.8	16.62	7.82	576	6.28
P9	12.9	16.60	7.81	574	6.28
P9	14.8	16.60	7.81	575	6.28
P9	16.9	16.61	7.81	576	6.27
P9	18.9	16.60	7.81	575	6.25
P9	21.0	16.60	7.81	577	6.24
P9	22.2	16.59	7.81	580	6.21
P9	24.7	16.59	7.81	581	6.18
P9	26.8	16.43	7.74	600	6.15
P9	27.4	16.17	7.61	615	3.98
P9	30.9	15.65	7.49	618	3.40
P9	32.8	15.31	7.46	615	3.05
P9	35.1	14.37	7.51	603	3.63
P9	41.1	12.76	7.53	612	5.13
P9	45.3	11.87	7.44	631	4.25
P9	50.8	11.17	7.43	631	2.98
P9	55.3	10.54	7.46	626	3.34
P9	59.8	10.22	7.47	627	4.57
P9	65.0	10.14	7.46	629	4.74
P10	0.3	16.45	7.89	512	7.03
P10	2.5	16.51	7.87	516	7.02
P10	4.5	16.51	7.87	515	7.00
P10	6.3	16.50	7.86	515	6.98
P10	8.6	16.50	7.85	515	6.96
P10	10.2	16.50	7.85	514	6.95
P10	12.1	16.51	7.85	515	6.96
P10	14.2	16.49	7.85	515	6.96
P10	16.2	16.50	7.84	515	6.95
P10	18.4	16.49	7.84	515	6.95
P10	19.8	16.46	7.84	515	6.96
P10	22.6	16.44	7.84	517	6.94
P10	24.9	16.44	7.83	517	6.93
P10	26.7	16.30	7.83	518	6.95
P10	28.5	16.05	7.80	529	6.86
P10	30.7	15.11	7.68	571	6.50
P10	35.1	13.92	7.65	599	5.79
P10	40.4	12.52	7.67	621	6.20

P10	50.6	11.21	7.67	641	6.70
P10	56.2	10.73	7.68	656	6.76
P10	59.9	10.41	7.69	669	6.91
P10	65.0	10.14	7.68	685	6.99
P10	71.1	9.89	7.67	704	7.00
P10	76.6	9.57	7.64	732	6.92
P10	79.6	9.31	7.61	749	6.52
P10	85.0	8.95	7.59	766	6.29
P10	90.6	8.43	7.55	789	5.97
P10	95.5	8.11	7.51	810	5.48
P11	0.2	15.93	7.95	567	7.54
P11	1.9	15.93	7.94	568	7.57
P11	3.9	15.84	7.93	568	7.57
P11	6.3	15.82	7.92	568	7.48
P11	9.2	15.81	7.91	568	7.43
P11	9.4	15.81	7.91	568	7.46
P11	12.9	15.77	7.91	567	7.42
P11	15.2	15.75	7.90	567	7.42
P11	16.2	15.75	7.90	567	7.39
P11	17.7	15.74	7.90	567	7.41
P11	17.9	15.72	7.90	567	7.39
P11	20.7	15.70	7.90	566	7.39
P11	22.4	15.70	7.90	565	7.40
P11	25.2	15.65	7.91	564	7.44
P11	26.1	15.63	7.91	564	7.45
P11	29.1	15.58	7.92	563	7.50
P11	31.2	15.41	7.93	560	7.55
P11	33.2	15.18	7.94	561	7.69
P11	35.0	13.86	7.79	622	7.98
P11	37.0	13.28	7.60	659	6.33
P11	37.7	13.06	7.55	665	3.80
P12	0.3	16.26	7.95	679	7.30
P12	2.3	16.13	7.94	680	7.27
P12	3.9	16.12	7.94	681	7.22
P12	6.3	16.10	7.93	683	7.20
P12	8.1	16.10	7.93	682	7.18
P12	10.4	16.11	7.93	682	7.17
P12	11.8	16.11	7.93	683	7.17
P12	14.3	16.10	7.93	684	7.17
P12	16.1	16.10	7.93	685	7.18
P12	18.4	16.10	7.92	684	7.18
P12	20.3	16.11	7.92	685	7.18
P12	22.3	16.10	7.92	685	7.18
P12	24.3	16.11	7.92	685	7.17
P12	26.6	16.10	7.92	685	7.17
P12	28.1	16.09	7.92	685	7.17
P12	30.5	16.09	7.92	687	7.16
P12	31.9	16.02	7.91	694	7.09
P12	34.1	15.75	7.87	701	6.79
P12	36.0	14.50	7.77	740	6.45

P12	38.2	13.83	7.70	717	5.66
P12	39.9	13.16	7.64	746	5.09
P12	45.6	12.43	7.60	735	4.93
P12	50.6	11.97	7.56	749	4.72
P12	55.1	11.56	7.52	749	4.22
P12	60.2	11.20	7.50	736	4.19
P12	65.7	10.65	7.48	747	4.22
P12	69.9	10.22	7.45	756	3.98
P12	75.5	9.89	7.44	758	3.97
P12	79.9	9.49	7.43	763	3.93
P12	85.4	9.22	7.40	766	3.76
P12	87.6	9.16	7.38	766	3.18
P13	0.4	16.22	7.89	718	7.24
13	2.0	16.16	7.90	719	7.23
P13	4.2	16.08	7.89	721	7.20
P13	6.4	16.05	7.89	725	7.15
P13	8.1	16.05	7.89	727	7.13
P13	10.6	16.05	7.89	730	7.13
P13	13.1	16.05	7.89	731	7.13
P13	13.6	16.05	7.89	732	7.14
P13	16.3	16.06	7.90	733	7.15
P13	18.4	16.06	7.90	734	7.15
P13	20.0	16.05	7.90	733	7.15
P13	22.1	16.07	7.90	735	7.16
P13	23.9	16.08	7.91	742	7.17
P13	26.2	16.10	7.91	744	7.18
P13	27.8	16.10	7.91	746	7.20
P13	30.2	16.10	7.92	748	7.20
P13	32.8	15.85	7.87	756	7.18
P13	33.5	15.31	7.79	754	6.23
P13	36.2	14.62	7.75	785	6.15
P13	38.5	14.05	7.70	784	5.64
P13	40.5	13.58	7.67	777	5.42
P13	44.8	12.59	7.60	766	5.09
P13	49.8	11.91	7.54	772	4.60
P13	55.5	11.77	7.54	806	4.68
P13	59.8	12.05	7.65	888	5.47
P13	65.1	11.54	7.57	846	4.84
P13	70.6	10.45	7.44	759	3.68
P13	74.9	10.14	7.42	765	3.48
P13	79.7	10.04	7.37	766	3.00
P13	80.9	10.01	7.36	767	2.66
P14	0.3	15.86	8.01	802	7.56
P14	2.1	15.87	8.01	804	7.60
P14	4.5	15.89	8.01	805	7.62
P14	6.6	15.87	8.01	806	7.61
P14	8.4	15.87	8.01	805	7.59
P14	10.7	15.85	8.01	808	7.55
P14	12.7	15.79	8.00	812	7.51
P14	14.1	15.79	8.00	811	7.45

P14	17.2	15.79	8.00	814	7.45
P14	18.8	15.79	8.00	814	7.44
P14	20.6	15.79	8.00	817	7.44
P14	22.0	15.79	8.00	821	7.43
P14	24.8	15.79	8.00	823	7.43
P14	27.0	15.79	8.00	823	7.42
P14	28.0	15.75	8.00	826	7.43
P14	30.3	15.71	8.00	841	7.41
P14	36.3	15.19	8.01	866	7.40
P14	40.0	14.89	8.02	874	7.45
P14	45.6	13.75	8.02	902	7.77
P14	49.2	12.80	8.02	926	8.00
P14	55.9	11.35	8.02	959	8.17
P14	59.0	11.27	8.01	962	8.53

Table f. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for January 1997.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
P1	0.3	9.53	8.06	649	8.43	80.4
P1	1.0	9.50	8.06	650	8.42	80.3
P1	1.4	9.46	8.07	650	8.44	80.4
P1	3.4	9.44	8.05	652	8.44	80.3
P1	4.7	9.43	8.05	651	8.44	80.3
P1	6.3	9.43	8.05	651	8.43	80.2
P1	6.6	9.43	8.05	652	8.43	80.1
P1	6.9	9.42	8.05	652	8.41	80.0
P1	8.8	9.41	8.05	652	8.40	79.9
P1	10.4	9.41	8.05	652	8.40	79.9
P1	12.4	9.40	8.05	652	8.39	79.7
P1	16.4	9.39	8.05	653	8.36	79.5
P1	19.1	9.41	8.05	653	8.36	79.5
P1	21.5	9.41	8.05	653	8.36	79.5
P1	25.5	9.39	8.05	653	8.36	79.5
P1	30.3	9.39	8.04	654	8.34	79.3
P1	35.9	9.40	8.04	654	8.31	79.0
P1	41.0	9.40	8.04	654	8.30	78.9
P1	45.2	9.38	8.05	653	8.31	79.0
P1	50.7	9.38	8.05	653	8.31	79.0
P1	57.2	9.33	8.06	651	8.32	79.0
P1	60.9	9.32	8.06	651	8.38	79.5
P1	66.2	9.26	8.05	652	8.40	79.6
P1	70.6	8.54	7.85	731	8.34	77.7
P1	75.3	8.04	7.73	778	6.53	60.1
P1	80.4	7.94	7.71	790	5.72	52.6
P1	85.5	7.88	7.68	802	5.59	51.2
P1	90.4	7.93	7.63	825	5.20	47.7
P1	95.5	7.94	7.59	848	4.67	42.9
P2	0.3	10.34	8.03	647	8.21	79.8
P2	0.6	10.20	8.03	647	8.19	79.3
P2	2.4	9.90	8.02	649	8.25	79.4
P2	3.7	9.70	8.03	649	8.17	78.3
P2	4.2	9.71	8.02	649	8.22	78.7
P2	6.3	9.67	8.03	650	8.16	78.0
P2	7.1	9.64	8.02	649	8.16	78.0
P2	8.5	9.63	8.02	648	8.16	78.0
P2	10.9	9.62	8.02	648	8.15	77.9
P2	12.8	9.62	8.02	648	8.13	77.7
P2	15.2	9.62	8.02	648	8.13	77.6
P2	16.8	9.62	8.01	649	8.11	77.5
P2	17.7	9.62	8.02	649	8.10	77.4
P2	20.8	9.62	8.01	650	8.09	77.4
P2	21.0	9.62	8.02	650	8.10	77.4

P2	23.1	9.62	8.02	650	8.10	77.4
P2	24.7	9.62	8.02	651	8.09	77.3
P2	27.4	9.62	8.02	651	8.08	77.3
P2	29.6	9.62	8.02	651	8.08	77.2
P2	31.4	9.63	8.02	652	8.08	77.3
P2	34.6	9.63	8.02	652	8.08	77.3
P2	40.8	9.63	8.02	653	8.07	77.2
P2	45.1	9.61	8.02	651	8.06	77.0
P2	52.0	9.57	8.01	653	8.05	76.8
P2	55.2	9.54	8.02	656	8.03	76.6
P2	60.8	9.24	7.91	686	7.66	72.5
P2	66.4	8.93	7.76	735	7.15	67.3
P2	70.4	8.52	7.72	751	5.79	53.9
P2	75.1	8.28	7.70	764	5.64	52.3
P2	80.6	8.05	7.67	783	5.50	50.6
P2	85.5	7.89	7.65	806	5.34	49.0
P2	91.2	7.82	7.62	828	5.03	46.0
P2	95.2	7.80	7.60	848	4.81	44.0
P2	97.3	7.80	7.58	855	4.50	41.2
P3	0.3	10.28	8.20	639	8.35	81.0
P3	2.7	9.85	8.20	641	8.40	80.7
P3	4.4	9.67	8.20	641	8.36	79.9
P3	6.3	9.61	8.20	641	8.34	79.7
P3	7.5	9.60	8.20	640	8.29	79.2
P3	8.1	9.59	8.20	641	8.32	79.4
P3	10.9	9.55	8.19	641	8.29	79.1
P3	13.7	9.51	8.18	642	8.28	79.0
P3	15.2	9.50	8.17	642	8.25	78.7
P3	16.2	9.50	8.18	642	8.21	78.2
P3	19.2	9.50	8.17	642	8.17	77.9
P3	21.2	9.50	8.17	642	8.16	77.7
P3	25.2	9.49	8.18	642	8.19	78.0
P3	30.5	9.47	8.18	643	8.19	78.0
P3	36.1	9.48	8.16	644	8.21	78.2
P4	0.5	10.64	8.14	636	7.78	76.1
P4	5.0	9.85	8.15	641	7.84	75.3
P4	10.1	9.78	8.15	641	7.86	75.4
P4	15.0	9.77	8.14	642	7.82	75.0
P4	20.1	9.75	8.13	642	7.77	74.5
P4	25.1	9.75	8.13	641	7.73	74.1
P4	30.0	9.74	8.12	641	7.69	73.7
P4	34.9	9.72	8.12	641	7.68	73.5
P4	40.2	9.62	8.11	646	7.58	72.5
P4	45.0	9.59	8.09	653	7.42	70.8
P4	49.9	9.49	8.06	666	7.20	68.6
P4	55.0	9.47	7.94	706	6.30	60.0
P4	59.7	9.55	7.81	802	4.91	46.9
P4	70.7	9.12	7.81	840	5.12	48.4
P4	75.2	8.77	7.76	820	4.77	44.7
P4	81.4	8.62	7.75	836	4.76	44.4

P4	89.2	8.11	7.72	819	4.65	42.9
P4	98.4	7.84	7.64	857	3.63	33.3
P5	0.2	9.40	8.21	633	8.26	78.5
P5	1.8	9.37	8.21	635	8.24	78.3
P5	4.1	9.30	8.21	635	8.24	78.2
P5	7.1	9.29	8.20	636	8.23	78.0
P5	9.0	9.29	8.20	636	8.21	77.9
P5	11.2	9.29	8.20	636	8.20	77.7
P5	13.3	9.28	8.20	637	8.20	77.8
P5	15.1	9.29	8.20	637	8.19	77.7
P5	17.2	9.28	8.20	637	8.19	77.7
P5	19.6	9.28	8.20	637	8.19	77.6
P5	21.3	9.28	8.19	638	8.18	77.5
P5	26.0	9.27	8.19	638	8.16	77.3
P5	30.5	9.25	8.19	638	8.15	77.2
P5	40.2	9.24	8.18	639	8.11	76.9
P5	45.5	9.24	8.18	639	8.10	76.7
P5	52.2	9.21	8.18	639	8.08	76.5
P5	55.5	9.19	8.17	640	8.07	76.3
P5	61.7	8.92	8.03	744	7.92	74.5
P5	66.1	8.87	8.05	807	7.12	66.8
P5	70.2	8.70	8.08	822	6.96	65.1
P5	77.8	8.52	8.08	826	7.09	66.1
P5	82.8	8.32	8.08	824	7.14	66.2
P5	87.4	8.16	8.09	823	7.20	66.5
P5	90.5	8.08	8.11	822	7.33	67.6
P5	96.7	7.99	8.12	821	7.50	69.0
P6	0.3	10.29	8.07	599	7.96	77.2
P6	2.8	9.45	8.07	600	8.03	76.4
P6	4.8	9.32	8.06	602	7.98	75.7
P6	5.7	9.28	8.05	601	7.86	74.5
P6	8.6	9.26	8.05	601	7.83	74.2
P6	10.5	9.25	8.04	601	7.83	74.2
P6	12.4	9.24	8.04	601	7.81	74.0
P6	14.6	9.24	8.04	603	7.80	73.9
P6	17.6	9.23	8.04	602	7.80	73.9
P6	20.0	9.22	8.04	603	7.80	73.9
P6	21.3	9.21	8.04	604	7.81	73.9
P6	22.9	9.19	8.04	606	7.80	73.8
P6	25.2	9.18	8.04	608	7.79	73.7
P6	27.4	9.17	8.04	612	7.79	73.6
P6	29.0	9.15	8.04	616	7.79	73.6
P6	29.3	9.14	8.05	618	7.90	74.7
P6	35.9	9.18	8.07	633	7.90	74.7
P6	40.9	9.19	8.07	636	7.93	75.0
P6	48.2	9.16	8.06	637	7.96	75.3
P6	52.3	9.04	7.99	640	7.93	74.7
P6	56.9	8.76	7.97	659	7.45	69.8
P6	60.9	8.58	7.87	683	7.12	66.4
P6	65.8	8.56	7.75	750	6.39	59.6

P6	70.4	8.77	7.81	829	5.41	50.7
P6	76.5	8.72	7.93	844	5.61	52.5
P6	81.2	8.47	7.96	836	6.30	58.7
P6	86.4	8.22	8.03	823	6.76	62.5
P6	91.4	8.10	8.03	823	7.36	67.9
P6	95.7	8.00	8.03	823	7.50	69.0
P7	0.4	10.04	8.16	598	8.48	81.9
P7	2.5	9.39	8.16	599	8.45	80.3
P7	3.3	9.32	8.16	599	8.43	79.9
P7	6.7	9.26	8.15	601	8.42	79.7
P7	8.5	9.25	8.15	601	8.38	79.4
P7	11.1	9.24	8.14	601	8.36	79.2
P7	12.6	9.24	8.14	601	8.34	79.0
P7	14.7	9.23	8.14	601	8.34	78.9
P7	16.9	9.22	8.14	601	8.32	78.7
P7	19.2	9.22	8.13	601	8.30	78.6
P7	20.9	9.21	8.13	601	8.29	78.5
P7	23.2	9.21	8.13	601	8.28	78.3
P7	25.0	9.21	8.13	602	8.26	78.2
P7	27.1	9.21	8.13	602	8.26	78.2
P7	29.0	9.21	8.13	602	8.25	78.1
P7	31.0	9.21	8.13	602	8.25	78.0
P7	35.8	9.21	8.13	602	8.24	78.0
P7	40.8	8.71	8.13	613	8.31	77.7
P7	45.5	8.39	8.13	620	8.24	76.5
P7	50.4	7.87	8.13	633	8.34	76.4
P7	55.4	7.69	8.13	638	8.37	76.4
P7	57.7	7.64	8.12	639	8.36	76.1
P7	60.0	7.59	8.13	642	8.36	76.1
P8	0.3	9.07	8.22	602	8.60	81.1
P8	2.4	8.96	8.21	603	8.63	81.2
P8	4.0	8.90	8.21	604	8.61	80.8
P8	5.5	8.88	8.21	604	8.60	80.7
P8	8.2	8.85	8.21	605	8.60	80.7
P8	10.3	8.83	8.21	605	8.61	80.7
P8	12.8	8.80	8.21	605	8.61	80.6
P8	14.0	8.78	8.21	605	8.60	80.5
P8	17.0	8.70	8.21	605	8.60	80.4
P8	18.8	8.51	8.21	610	8.64	80.4
P8	20.9	8.12	8.20	618	8.70	80.2
P8	23.1	7.75	8.20	627	8.82	80.5
P8	25.1	7.02	8.18	661	8.87	79.6
P8	27.0	6.32	8.16	696	8.99	79.3
P8	28.2	6.09	8.16	708	8.98	78.7
P8	29.4	5.66	8.14	735	9.13	79.2
P9	0.3	10.08	7.90	640	6.80	65.7
P9	3.1	9.82	7.91	642	6.68	64.2
P9	3.7	9.90	7.90	643	6.79	65.3
P9	6.5	9.65	7.91	644	6.69	63.9
P9	8.4	9.60	7.91	643	6.67	63.7

P9	9.9	9.57	7.90	642	6.62	63.2
P9	9.9	9.57	7.90	642	6.65	63.5
P9	12.1	9.57	7.90	642	6.57	62.7
P9	14.7	9.56	7.91	644	6.56	62.6
P9	17.0	9.55	7.91	644	6.63	63.2
P9	18.5	9.55	7.91	645	6.66	63.5
P9	20.4	9.55	7.91	645	6.67	63.6
P9	25.9	9.53	7.93	645	6.69	63.8
P9	30.5	9.55	7.98	664	7.14	68.1
P9	34.9	9.50	7.99	665	7.26	69.2
P9	40.5	9.79	7.92	710	6.96	66.8
P9	46.7	10.23	7.84	793	6.61	64.1
P9	50.9	10.23	7.78	812	5.86	56.9
P9	56.8	10.11	7.89	847	5.05	48.9
P9	61.0	9.72	7.86	852	5.85	56.0
P9	66.3	9.28	7.80	846	5.52	52.3
P9	66.9	9.25	7.80	847	5.36	50.8
P10	0.5	9.44	8.14	646	7.81	74.3
P10	2.9	9.45	8.14	646	7.82	74.4
P10	5.6	9.46	8.14	647	7.80	74.3
P10	7.7	9.46	8.14	648	7.79	74.2
P10	8.8	9.46	8.14	647	7.79	74.2
P10	11.0	9.45	8.14	648	7.79	74.2
P10	13.6	9.45	8.14	648	7.78	74.1
P10	15.5	9.46	8.14	648	7.79	74.2
P10	17.8	9.46	8.14	648	7.79	74.2
P10	21.0	9.46	8.14	648	7.78	74.1
P10	23.2	9.45	8.14	648	7.76	73.9
P10	25.3	9.42	8.13	646	7.75	73.7
P10	27.6	9.41	8.13	645	7.70	73.2
P10	29.0	9.41	8.12	645	7.68	73.1
P10	30.6	9.41	8.12	645	7.67	72.9
P10	36.3	9.40	8.12	644	7.66	72.8
P10	41.8	9.67	8.10	704	7.57	72.5
P10	46.4	9.21	8.15	699	7.52	71.2
P10	50.4	9.04	8.16	695	7.73	72.9
P10	57.1	8.65	8.18	688	7.83	73.2
P10	60.4	8.59	8.19	696	7.95	74.1
P10	65.9	8.09	8.18	784	8.07	74.4
P10	70.7	7.73	8.19	801	8.16	74.5
P10	75.5	7.38	8.20	807	8.24	74.7
P10	81.5	7.32	8.20	807	8.33	75.4
P10	86.7	7.27	8.20	807	8.34	75.4
P10	91.2	7.26	8.20	807	8.34	75.3
P10	95.0	7.24	8.20	808	8.34	75.3
P11	0.4	9.61	8.18	630	8.54	81.6
P11	2.0	9.08	8.17	632	8.47	79.9
P11	3.8	8.98	8.17	632	8.41	79.2
P11	6.3	8.95	8.17	632	8.40	79.1
P11	8.7	8.92	8.16	633	8.40	79.0

P11	10.5	8.92	8.16	633	8.39	78.9
P11	12.5	8.90	8.16	633	8.38	78.8
P11	15.2	8.90	8.16	633	8.36	78.6
P11	17.3	8.89	8.16	632	8.37	78.6
P11	19.6	8.89	8.15	632	8.35	78.4
P11	20.6	8.88	8.15	632	8.32	78.2
P11	26.7	8.87	8.15	633	8.32	78.1
P11	31.0	8.81	8.16	632	8.35	78.3
P11	36.0	8.62	8.15	630	8.34	77.8
P11	37.3	8.56	8.15	629	8.25	76.9
P12	0.2	9.70	8.18	641	8.33	79.7
P12	2.2	9.20	8.18	644	8.40	79.5
P12	4.5	9.02	8.18	644	8.38	79.0
P12	6.6	9.00	8.18	644	8.38	78.9
P12	9.1	8.94	8.17	643	8.37	78.7
P12	10.7	8.92	8.17	644	8.33	78.3
P12	14.3	8.90	8.17	645	8.30	78.0
P12	14.4	8.90	8.17	645	8.29	77.8
P12	16.9	8.89	8.16	645	8.26	77.6
P12	19.3	8.89	8.16	646	8.25	77.5
P12	21.0	8.89	8.16	646	8.25	77.5
P12	25.6	8.89	8.16	647	8.24	77.4
P12	31.6	8.86	8.16	656	8.24	77.3
P12	35.2	8.83	8.15	657	8.16	76.5
P12	41.4	8.70	8.16	673	8.17	76.4
P12	46.3	8.52	8.18	689	8.21	76.4
P12	50.9	8.01	8.19	713	8.40	77.2
P12	56.3	7.33	8.19	742	8.53	77.1
P12	60.1	6.72	8.19	767	8.61	76.7
P12	65.5	6.11	8.19	791	8.74	76.7
P12	71.9	5.97	8.19	796	8.81	77.1
P12	76.9	5.92	8.18	798	8.83	77.1
P12	80.7	5.88	8.18	799	8.81	76.9
P12	85.6	5.90	8.17	799	8.80	76.9
P13	0.4	10.04	8.19	654	8.39	81.0
P13	2.5	9.20	8.19	653	8.45	80.0
P13	4.7	9.06	8.19	656	8.41	79.3
P13	8.0	9.01	8.19	657	8.41	79.3
P13	9.5	8.99	8.19	657	8.40	79.1
P13	10.4	8.98	8.19	658	8.39	79.0
P13	13.8	8.95	8.18	657	8.40	79.0
P13	14.8	8.95	8.18	657	8.38	78.8
P13	18.1	8.94	8.18	658	8.38	78.8
P13	19.6	8.93	8.18	657	8.37	78.7
P13	21.3	8.93	8.18	658	8.36	78.6
P13	26.1	8.93	8.18	658	8.35	78.5
P13	30.7	8.88	8.18	664	8.34	78.3
P13	36.6	8.58	8.19	688	8.33	77.6
P13	40.8	8.10	8.19	712	8.42	77.6
P13	47.6	6.93	8.20	756	8.63	77.3

P13	50.9	6.53	8.20	773	8.67	76.9
P13	56.0	5.98	8.20	794	8.79	76.9
P13	60.0	5.84	8.20	798	8.91	77.7
P13	67.2	5.72	8.19	804	9.00	78.2
P13	71.1	5.61	8.19	808	8.96	77.6
P13	76.3	5.56	8.19	809	8.93	77.3
P13	77.0	5.56	8.18	810	8.90	77.0
P14	0.4	8.90	8.23	673	8.67	81.4
P14	2.3	8.75	8.24	676	8.67	81.2
P14	4.6	8.62	8.24	676	8.70	81.2
P14	7.2	8.59	8.24	676	8.69	81.0
P14	9.3	8.58	8.24	676	8.68	80.9
P14	11.5	8.57	8.24	677	8.66	80.7
P14	13.2	8.56	8.24	678	8.66	80.7
P14	15.3	8.56	8.24	678	8.65	80.6
P14	17.5	8.53	8.24	679	8.65	80.6
P14	19.3	8.50	8.24	681	8.65	80.5
P14	21.2	8.44	8.24	683	8.67	80.6
P14	26.3	7.98	8.24	707	8.70	79.9
P14	31.6	7.58	8.24	726	8.73	79.4
P14	35.9	7.54	8.24	728	8.74	79.4
P14	40.3	7.31	8.24	739	8.76	79.2
P14	45.6	6.82	8.24	763	8.93	79.8
P14	51.8	4.89	8.24	862	9.26	78.8
P14	56.5	4.71	8.24	870	9.40	79.6

Table g. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for May 1997.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
P1	0.4	18.50	8.60	675	9.62	113.3
P1	5.2	14.93	8.65	678	10.28	112.4
P1	10.3	13.56	8.59	679	10.22	108.4
P1	15.2	11.78	8.40	683	9.78	99.8
P1	20.5	10.89	8.24	685	9.01	90.0
P1	25.1	10.26	8.11	693	8.41	82.8
P1	30.2	9.91	8.04	698	8.03	78.4
P1	35.4	9.76	8.01	700	7.90	76.9
P1	40.1	9.61	7.99	701	7.80	75.6
P1	45.4	9.37	7.97	704	7.77	74.9
P1	50.2	9.18	7.95	717	7.62	73.1
P1	55.3	8.93	7.90	751	7.34	70.1
P1	60.1	8.48	7.83	810	6.67	63.0
P1	64.0	7.85	7.80	842	6.58	61.2
P1	70.7	7.61	7.77	855	6.51	60.2
P1	75.5	7.26	7.82	845	6.68	61.3
P1	80.1	7.25	7.81	848	6.81	62.4
P1	85.1	7.21	7.81	849	6.80	62.3
P1	90.2	7.19	7.80	850	6.74	61.7
P1	95.7	7.26	7.76	861	6.44	59.0
P1	99.1	7.26	7.75	864	6.22	57.0
P2	0.3	18.12	8.63	676	9.88	115.5
P2	5.1	15.48	8.68	678	10.57	117.0
P2	10.1	13.47	8.58	680	10.43	110.4
P2	15.1	11.46	8.33	685	9.52	96.4
P2	20.3	10.75	8.16	687	8.75	87.1
P2	25.3	10.10	8.06	692	8.28	81.2
P2	30.1	9.89	8.01	694	8.02	78.3
P2	35.1	9.55	7.97	697	7.89	76.4
P2	40.4	9.31	7.94	704	7.78	74.9
P2	45.2	9.23	7.93	706	7.76	74.6
P2	50.6	9.06	7.91	725	7.73	73.9
P2	60.0	8.43	7.83	793	6.96	65.6
P2	65.1	8.02	7.79	829	6.77	63.2
P2	69.5	7.76	7.80	835	6.69	62.0
P2	74.9	7.47	7.82	838	6.97	64.2
P2	80.1	7.34	7.82	837	7.06	64.8
P2	85.4	7.19	7.83	836	7.18	65.7
P2	90.5	7.08	7.83	838	7.21	65.8
P2	94.6	7.04	7.82	840	7.13	65.0
P2	98.6	7.06	7.79	846	6.95	63.4
P3	0.8	20.38	8.58	677	9.16	112.1
P3	4.9	15.55	8.63	679	10.35	114.7
P3	9.9	13.68	8.50	684	10.18	108.2

P3	15.2	11.44	8.27	688	9.19	92.9
P3	20.4	10.84	8.12	687	8.42	84.1
P3	25.4	10.36	7.99	697	7.70	76.0
P3	30.4	9.85	7.91	704	7.21	70.3
P3	36.2	9.63	7.84	712	6.81	66.1
P3	39.1	9.45	7.79	723	6.48	62.6
P4	0.4	21.70	8.61	674	9.41	118.2
P4	4.8	15.73	8.66	680	10.53	117.2
P4	10.1	14.30	8.60	679	10.52	113.5
P4	15.1	11.72	8.35	683	9.81	99.9
P4	20.9	10.77	8.13	684	8.73	87.0
P4	25.4	10.10	8.01	687	8.18	80.2
P4	30.0	9.47	7.94	694	7.87	76.1
P4	34.8	9.23	7.93	699	7.87	75.6
P4	40.4	9.10	7.91	707	7.86	75.3
P4	45.1	8.92	7.92	707	7.86	75.0
P4	50.8	8.76	7.88	731	7.72	73.4
P4	55.2	8.64	7.86	745	7.35	69.6
P4	60.3	8.43	7.81	779	7.02	66.2
P4	64.3	8.21	7.79	803	6.85	64.3
P4	69.6	7.87	7.78	828	6.79	63.2
P4	76.1	7.33	7.80	833	7.04	64.7
P4	81.4	7.21	7.80	831	7.12	65.1
P4	90.1	6.92	7.83	830	7.39	67.2
P4	93.7	6.88	7.82	830	7.44	67.5
P4	98.0	6.87	7.82	832	7.43	67.4
P5	0.4	19.53	8.58	670	9.54	114.7
P5	5.5	17.22	8.60	671	10.04	115.2
P5	10.5	14.42	8.52	670	10.37	112.1
P5	15.0	12.03	8.32	671	9.51	97.5
P5	15.1	11.89	8.27	672	9.25	94.5
P5	20.4	10.93	8.18	679	8.97	89.7
P5	24.9	10.37	8.11	681	8.68	85.7
P5	30.2	9.90	8.06	681	8.48	82.7
P5	35.1	9.43	8.02	683	8.40	81.1
P5	40.2	9.11	8.01	683	8.34	79.8
P5	45.1	8.79	7.99	687	8.34	79.3
P5	50.1	8.57	8.00	695	8.41	79.6
P5	54.7	8.28	8.01	706	8.54	80.2
P5	60.2	7.91	8.01	723	8.63	80.3
P5	65.1	7.71	8.01	733	8.70	80.6
P5	70.2	7.42	8.01	750	8.72	80.2
P5	75.1	7.21	7.99	772	8.60	78.7
P5	80.0	6.98	7.97	787	8.52	77.6
P5	85.3	6.78	7.96	797	8.43	76.3
P5	90.0	6.60	7.96	804	8.51	76.7
P5	99.1	6.52	7.95	808	8.45	76.0
P6	0.5	18.72	8.48	652	8.95	105.9
P6	4.5	16.37	8.51	651	9.53	107.4
P6	10.5	14.81	8.48	662	9.67	105.4

P6	15.4	11.84	8.31	646	9.36	95.5
P6	20.2	11.22	8.23	652	8.96	90.1
P6	25.1	10.43	8.14	661	8.57	84.7
P6	30.1	9.64	8.08	662	8.31	80.6
P6	35.1	9.06	8.01	652	8.10	77.5
P6	44.5	8.65	7.98	660	8.03	76.1
P6	50.2	8.48	7.97	674	8.00	75.5
P6	55.9	8.31	7.96	687	7.97	74.9
P6	60.3	8.12	7.95	708	7.93	74.2
P6	65.4	7.87	7.93	734	7.87	73.2
P6	70.3	7.61	7.92	758	7.83	72.4
P6	75.3	7.30	7.92	781	7.81	71.7
P6	80.8	7.07	7.92	797	7.77	70.9
P6	85.5	6.87	7.92	805	7.81	70.9
P6	90.2	6.75	7.92	808	7.84	71.0
P6	95.1	6.70	7.93	809	7.90	71.3
P6	98.7	6.66	7.93	810	7.92	71.5
P7	0.2	18.23	8.52	653	9.66	113.2
P7	4.3	16.92	8.56	645	10.05	114.5
P7	10.7	15.34	8.49	657	9.89	109.0
P7	14.9	12.32	8.07	672	8.29	85.6
P7	20.5	11.71	8.01	675	8.18	83.3
P7	25.5	10.86	7.90	694	7.66	76.4
P7	30.3	9.77	7.90	674	7.67	74.7
P7	35.0	9.19	7.92	662	7.91	75.9
P7	40.5	8.90	7.91	663	8.01	76.3
P7	45.3	8.83	7.89	672	7.83	74.5
P7	50.8	8.78	7.85	698	7.73	73.4
P7	55.5	8.65	7.76	723	6.93	65.7
P7	58.2	8.60	7.67	732	5.94	56.3
P8	0.2	20.67	8.55	669	9.57	117.8
P8	4.4	16.93	8.64	675	9.60	109.5
P8	10.2	15.14	8.35	662	8.10	89.0
P8	15.1	12.59	8.06	633	7.72	80.2
P8	20.7	11.62	7.96	653	7.67	77.9
P8	25.3	11.21	7.90	689	7.24	72.9
P8	27.4	10.84	7.77	718	6.29	62.8
P9	0.2	19.20	8.47	673	8.75	104.5
P9	5.3	15.82	8.50	674	9.62	107.2
P9	9.9	14.53	8.44	677	9.66	104.7
P9	15.1	12.18	8.30	676	9.37	96.4
P9	20.2	11.21	8.16	679	8.63	86.9
P9	24.7	10.53	8.07	678	8.24	81.6
P9	29.5	9.93	8.00	672	7.93	77.4
P9	30.3	9.92	7.99	673	7.83	76.5
P9	35.1	9.14	7.91	649	7.52	72.1
P9	40.0	8.74	7.83	641	6.55	62.2
P9	44.7	8.77	7.81	678	6.43	61.1
P9	50.5	9.01	7.82	747	6.46	61.8
P9	55.2	9.08	7.73	812	5.28	50.6

P9	60.6	9.03	7.73	846	5.20	49.7
P9	65.0	8.95	7.73	851	5.22	49.8
P9	66.1	8.91	7.72	852	5.04	48.1
P10	0.7	18.65	8.50	677	8.81	104.2
P10	5.1	17.56	8.51	678	9.25	107.0
P10	10.3	15.09	8.47	680	9.39	103.0
P10	15.1	12.13	8.33	682	9.30	95.5
P10	20.4	11.01	8.25	685	9.05	90.7
P10	25.5	10.39	8.20	690	8.92	88.0
P10	30.9	9.89	8.17	692	8.84	86.3
P10	35.5	9.57	8.15	690	8.78	85.0
P10	40.6	9.02	8.12	688	8.72	83.3
P10	45.2	8.79	8.11	689	8.70	82.7
P10	50.4	8.46	8.09	699	8.70	82.0
P10	55.5	8.17	8.08	712	8.70	81.5
P10	60.5	7.91	8.07	728	8.71	81.1
P10	65.5	7.72	8.06	741	8.68	80.4
P10	70.4	7.48	8.05	755	8.65	79.7
P10	75.0	7.22	8.04	770	8.62	78.8
P10	80.1	7.06	8.03	779	8.59	78.3
P10	85.4	6.69	7.99	802	8.42	76.1
P10	90.4	6.56	7.97	807	8.32	75.0
P10	95.0	6.49	7.96	812	8.24	74.1
P10	97.9	6.48	7.96	812	8.20	73.7
P11	0.8	18.91	8.47	685	8.91	105.9
P11	5.0	16.24	8.47	682	9.24	103.8
P11	10.7	14.25	8.38	697	9.11	98.2
P11	15.0	13.66	8.33	699	8.93	95.0
P11	19.6	13.05	8.29	688	8.71	91.4
P11	24.6	10.31	8.14	686	8.36	82.4
P11	30.2	9.73	8.09	688	8.23	80.0
P11	34.2	9.55	8.05	690	8.04	77.8
P12	0.4	16.62	8.33	644	8.98	101.7
P12	5.4	16.10	8.31	646	8.93	100.1
P12	10.5	14.08	8.18	653	8.42	90.4
P12	15.2	13.50	8.15	673	8.33	88.3
P12	20.4	12.47	8.13	697	8.41	87.1
P12	25.1	10.83	8.09	717	8.50	84.7
P12	29.6	10.39	8.05	716	8.50	84.0
P12	34.9	10.15	8.02	715	8.44	82.9
P12	40.1	9.75	7.99	715	8.38	81.5
P12	45.7	9.35	7.97	727	8.33	80.3
P12	50.3	9.19	7.96	734	8.25	79.2
P12	55.4	8.80	7.95	748	8.16	77.6
P12	60.5	8.41	7.94	770	8.06	75.9
P12	65.4	8.24	7.92	782	7.88	74.0
P12	65.5	8.26	7.92	782	7.85	73.7
P12	69.8	8.14	7.90	788	7.77	72.8
P12	75.9	7.68	7.88	806	7.63	70.6
P12	80.6	7.43	7.86	814	7.39	68.0

P12	85.1	7.25	7.80	820	7.06	64.7
P12	85.3	7.25	7.78	821	6.59	60.4
P13	0.6	18.31	8.40	653	9.86	115.8
P13	4.8	15.91	8.28	628	9.25	103.3
P13	8.9	14.98	8.19	613	8.72	95.4
P13	10.0	14.37	8.14	615	8.60	92.9
P13	15.2	13.56	8.07	638	8.34	88.5
P13	20.0	13.48	8.09	665	8.36	88.5
P13	24.9	12.69	8.06	688	8.39	87.3
P13	30.6	10.42	8.01	718	8.50	84.0
P13	35.3	10.19	7.98	715	8.46	83.1
P13	39.8	9.86	7.96	714	8.42	82.1
P13	45.1	9.58	7.95	721	8.46	81.9
P13	49.9	9.41	7.94	729	8.37	80.8
P13	50.2	9.38	7.94	729	8.38	80.8
P13	55.4	8.98	7.91	744	8.22	78.5
P13	59.7	8.78	7.88	759	7.90	75.1
P13	64.8	8.40	7.85	782	7.67	72.2
P13	70.0	8.13	7.83	800	7.49	70.1
P13	73.6	7.92	7.80	808	7.22	67.2
P14	0.6	15.89	8.16	544	8.82	98.4
P14	4.8	14.53	8.09	548	8.54	92.5
P14	10.2	14.32	8.08	553	8.51	91.8
P14	15.1	13.88	8.06	566	8.45	90.3
P14	20.2	13.56	8.06	588	8.36	88.6
P14	25.2	12.96	8.04	603	8.28	86.7
P14	30.2	10.83	8.00	705	8.37	83.5
P14	35.3	10.07	8.00	717	8.54	83.7
P14	40.4	9.83	7.97	726	8.29	80.7
P14	45.6	9.65	7.94	733	7.94	77.1
P14	50.0	9.48	7.89	739	7.45	72.0
P14	55.0	9.06	7.79	760	6.36	60.9
P14	55.6	9.14	7.75	753	5.86	56.1

Table h. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for August 1997.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
P1	0.0	26.45	8.37	668	7.37	100.2
P1	2.1	26.08	8.37	670	7.39	99.8
P1	4.1	25.99	8.37	669	7.41	99.9
P1	6.0	25.34	8.36	667	7.51	100.1
P1	8.1	25.16	8.34	666	7.42	98.6
P1	10.0	24.71	8.29	660	7.26	95.7
P1	12.1	22.69	8.12	644	7.15	90.7
P1	14.0	20.82	8.02	641	6.82	83.4
P1	15.9	19.77	7.94	639	6.38	76.4
P1	18.0	18.87	7.79	623	5.77	67.9
P1	20.1	18.26	7.76	624	6.06	70.4
P1	25.2	17.19	7.79	642	6.22	70.7
P1	30.0	15.98	7.82	658	6.62	73.4
P1	35.1	14.68	7.84	673	6.99	75.3
P1	40.0	13.44	7.85	681	7.35	77.1
P1	45.1	12.33	7.76	685	6.95	71.1
P1	50.0	11.76	7.73	686	6.99	70.6
P1	55.4	10.72	7.64	689	6.78	66.9
P1	60.1	10.31	7.62	688	6.74	65.8
P1	65.3	9.32	7.58	704	6.69	63.8
P1	70.0	8.88	7.57	719	6.64	62.7
P1	75.3	8.00	7.53	771	6.53	60.4
P1	80.2	7.60	7.48	808	6.20	56.8
P1	85.3	7.46	7.46	822	6.06	55.3
P1	90.2	7.36	7.46	829	6.04	55.0
P1	95.0	7.30	7.45	837	5.97	54.3
P1	97.8	7.31	7.45	837	5.99	54.4
P2	0.2	27.07	8.36	657	7.33	100.8
P2	2.3	26.47	8.37	658	7.41	100.8
P2	4.2	26.21	8.38	658	7.49	101.4
P2	5.7	25.83	8.37	655	7.45	100.2
P2	8.7	25.18	8.29	651	7.50	99.6
P2	10.3	23.47	7.98	598	6.02	77.5
P2	11.7	21.92	7.78	559	4.98	62.2
P2	13.1	21.05	7.69	545	5.11	62.7
P2	14.6	20.20	7.61	530	4.61	55.6
P2	16.2	19.33	7.54	512	4.30	51.1
P2	18.5	18.56	7.52	511	4.29	50.2
P2	21.6	17.81	7.52	531	4.42	50.8
P2	25.5	16.93	7.54	570	4.76	53.8
P2	31.2	15.98	7.63	612	5.14	56.9
P2	36.2	14.64	7.79	660	5.95	64.1
P2	40.9	13.31	7.87	680	6.84	71.5
P2	45.6	12.13	7.79	688	7.45	75.9

P2	51.2	10.98	7.67	687	6.91	68.6
P2	59.0	10.11	7.61	690	6.93	67.3
P2	62.1	9.72	7.60	694	6.91	66.5
P2	65.8	9.27	7.58	705	6.75	64.3
P2	70.7	8.74	7.57	721	6.70	63.1
P2	80.9	7.71	7.55	777	6.79	62.3
P2	90.5	7.34	7.46	824	6.34	57.7
P2	96.8	7.23	7.46	832	6.06	55.0
P3	0.3	26.87	8.37	660	7.62	104.4
P3	2.1	26.62	8.37	663	7.52	102.6
P3	5.0	25.98	8.36	667	7.62	102.8
P3	7.5	25.63	8.35	664	7.57	101.4
P3	8.4	25.42	8.32	662	7.49	99.9
P3	10.1	24.91	8.24	652	7.18	94.9
P3	12.7	21.20	7.77	570	6.71	82.7
P3	14.0	20.44	7.71	570	4.98	60.4
P3	16.0	19.80	7.67	588	4.81	57.6
P3	18.3	18.91	7.60	577	4.59	54.0
P3	20.8	18.14	7.57	579	4.57	52.9
P3	25.8	17.09	7.57	606	4.61	52.3
P3	30.7	16.25	7.61	633	4.84	54.0
P3	35.6	15.09	7.61	671	5.25	57.1
P3	39.9	13.65	7.60	692	5.32	56.1
P3	41.5	12.87	7.52	700	4.77	49.4
P4	2.4	26.82	8.42	632	7.57	103.6
P4	4.3	26.41	8.42	632	7.59	103.1
P4	6.4	26.07	8.42	629	7.68	103.7
P4	8.2	25.79	8.39	630	7.45	100.1
P4	10.0	23.57	7.91	542	5.11	65.9
P4	12.3	20.94	7.57	449	4.20	51.4
P4	14.3	20.50	7.55	476	4.13	50.2
P4	16.1	19.40	7.51	464	4.28	50.8
P4	18.5	18.48	7.49	466	4.64	54.1
P4	20.7	18.00	7.49	486	4.78	55.2
P4	25.6	16.91	7.52	534	5.17	58.3
P4	30.1	16.10	7.56	572	5.49	61.0
P4	35.5	15.03	7.64	626	6.05	65.7
P4	40.6	13.33	7.77	676	7.07	73.9
P4	45.5	12.02	7.74	685	7.19	73.0
P4	50.3	11.11	7.66	687	6.94	69.1
P4	55.1	10.35	7.61	688	6.85	67.0
P4	60.6	9.85	7.57	691	6.77	65.4
P4	64.9	9.60	7.57	694	6.68	64.2
P4	69.9	9.07	7.58	703	6.81	64.6
P4	75.5	8.53	7.58	722	6.92	64.8
P4	80.3	8.04	7.59	745	7.12	65.8
P4	85.0	7.66	7.57	769	7.11	65.2
P4	89.8	7.42	7.56	782	7.07	64.4
P4	94.9	7.16	7.53	803	6.95	63.0
P4	98.9	7.05	7.52	809	6.88	62.1

P5	0.1	26.28	8.53	453	7.68	104.0
P5	2.2	25.24	8.54	454	7.71	102.5
P5	4.4	25.05	8.52	455	7.69	101.8
P5	6.3	24.84	8.49	458	7.43	98.0
P5	7.3	24.57	8.42	463	7.03	92.3
P5	10.8	23.94	8.31	466	7.01	90.9
P5	12.7	23.16	8.15	450	6.43	82.2
P5	15.0	21.38	7.73	416	6.03	74.5
P5	16.8	19.50	7.59	409	5.24	62.4
P5	19.0	19.17	7.56	413	5.01	59.2
P5	20.8	18.61	7.54	424	4.97	58.1
P5	26.8	16.96	7.54	482	4.99	56.4
P5	30.5	16.19	7.58	520	5.50	61.2
P5	35.8	14.96	7.64	592	5.82	63.1
P5	41.0	13.56	7.71	650	6.49	68.2
P5	47.7	11.44	7.71	679	7.07	70.9
P5	51.2	10.72	7.68	683	7.03	69.3
P5	56.2	10.14	7.67	684	7.06	68.7
P5	61.1	9.54	7.64	686	7.14	68.4
P5	65.2	9.17	7.64	691	7.15	68.0
P5	71.4	8.79	7.64	699	7.24	68.3
P5	75.5	8.50	7.64	712	7.28	68.2
P5	81.5	8.08	7.64	733	7.38	68.3
P5	88.2	7.55	7.61	763	7.49	68.5
P5	92.4	7.25	7.59	778	7.47	67.8
P5	96.0	7.01	7.57	791	7.31	66.0
P6	0.2	25.38	8.48	473	7.36	98.0
P6	2.6	25.32	8.48	472	7.32	97.4
P6	4.8	24.83	8.47	471	7.36	97.1
P6	5.8	24.64	8.47	470	7.22	94.9
P6	8.0	24.42	8.44	467	7.05	92.3
P6	10.2	24.18	8.41	465	7.03	91.6
P6	12.1	23.93	8.33	462	6.49	84.2
P6	14.1	21.58	7.76	426	4.86	60.2
P6	16.2	20.62	7.62	431	4.47	54.4
P6	18.3	19.79	7.53	438	4.12	49.4
P6	20.5	19.08	7.49	452	3.97	46.9
P6	23.9	18.03	7.47	450	3.96	45.7
P6	25.4	17.52	7.47	441	4.08	46.7
P6	30.0	16.17	7.55	499	4.60	51.2
P6	35.5	14.79	7.67	614	6.07	65.6
P6	40.8	12.81	7.67	644	6.63	68.5
P6	46.1	11.42	7.64	668	6.85	68.6
P6	50.6	10.58	7.62	670	6.86	67.4
P6	55.1	9.99	7.60	665	6.91	67.0
P6	60.6	9.46	7.57	662	6.90	66.0
P6	66.1	9.07	7.53	667	6.74	63.9
P6	71.6	8.72	7.52	684	6.67	62.7
P6	76.0	8.51	7.52	698	6.60	61.8
P6	81.4	8.21	7.50	722	6.61	61.4

P6	86.8	7.91	7.46	748	6.57	60.6
P6	90.1	7.79	7.44	760	6.35	58.4
P6	95.8	7.46	7.40	781	6.02	54.9
P6	97.0	7.45	7.40	783	5.86	53.5
P7	0.5	26.32	8.58	411	7.41	100.4
P7	2.8	25.98	8.60	404	7.42	99.9
P7	4.6	25.44	8.56	411	7.46	99.6
P7	7.0	24.92	8.39	422	6.96	91.9
P7	8.3	24.73	8.17	433	6.24	82.1
P7	10.2	24.44	7.95	449	5.06	66.3
P7	12.5	23.93	7.61	477	3.84	49.8
P7	14.7	22.19	7.40	438	2.27	28.5
P7	16.5	20.63	7.41	349	2.04	24.9
P7	20.3	18.84	7.44	345	3.86	45.4
P7	25.6	16.99	7.50	353	4.66	52.7
P7	31.0	15.74	7.51	405	5.55	61.2
P7	35.4	14.69	7.57	589	5.75	62.0
P7	40.8	12.85	7.48	654	5.90	61.1
P7	45.4	11.48	7.44	675	5.59	56.1
P7	52.3	10.55	7.42	692	5.61	55.1
P7	56.2	10.09	7.37	698	5.60	54.4
P7	61.1	9.81	7.26	703	5.17	49.9
P7	65.0	9.66	7.06	709	3.90	37.5
P8	0.2	25.97	8.58	394	8.43	113.5
P8	2.5	25.97	8.58	396	8.01	107.8
P8	4.8	25.56	8.52	399	7.93	106.1
P8	6.9	24.98	8.31	432	7.54	99.8
P8	8.0	24.71	8.17	461	6.40	84.3
P8	10.6	24.34	7.94	519	5.68	74.3
P8	13.5	23.86	7.68	538	4.89	63.3
P8	14.9	23.37	7.55	535	4.02	51.6
P8	17.9	20.87	7.41	416	3.13	38.3
P8	21.0	18.37	7.41	351	1.71	19.9
P8	26.0	16.91	7.45	354	4.48	50.5
P8	31.0	15.77	7.36	395	3.89	42.8
P8	35.2	14.32	7.20	541	2.05	22.0
P8	35.6	14.32	7.18	546	1.46	15.6
P9	0.1	26.58	8.51	507	7.59	103.4
P9	2.1	26.22	8.52	506	7.47	101.2
P9	4.5	25.61	8.51	507	7.42	99.3
P9	6.7	24.59	8.43	449	7.23	94.9
P9	8.3	24.05	8.27	439	6.50	84.5
P9	11.0	23.17	7.96	430	5.91	75.6
P9	12.6	22.07	7.67	417	5.01	62.7
P9	15.1	21.18	7.57	402	4.31	53.0
P9	16.6	20.51	7.56	404	4.26	51.8
P9	18.3	19.88	7.55	411	4.40	52.8
P9	20.5	19.23	7.51	428	4.54	53.8
P9	25.1	17.95	7.47	491	4.33	49.9
P9	30.5	16.61	7.66	619	5.36	60.2

P9	36.0	14.72	7.66	605	6.17	66.6
P9	40.2	13.11	7.69	648	6.44	67.0
P9	45.7	11.49	7.62	664	6.63	66.5
P9	50.8	10.65	7.59	673	6.61	65.1
P9	56.3	9.76	7.50	672	6.62	63.8
P9	61.4	9.28	7.41	681	5.93	56.5
P9	66.2	9.12	7.34	694	5.06	48.1
P9	70.3	8.95	7.25	735	3.95	37.4
P9	76.0	8.58	7.20	808	3.08	28.9
P9	80.6	8.46	7.22	822	2.66	24.9
P9	85.6	8.31	7.16	831	2.59	24.1
P9	86.0	8.33	7.15	832	2.32	21.6
P10	0.0	27.27	8.62	427	7.46	102.9
P10	2.4	26.68	8.62	427	7.55	103.0
P10	4.1	25.77	8.64	427	7.62	102.3
P10	7.0	25.42	8.58	428	7.47	99.6
P10	9.9	24.39	8.22	429	7.35	96.1
P10	11.5	23.00	7.82	427	6.58	83.9
P10	12.4	22.08	7.61	423	5.07	63.4
P10	14.7	21.22	7.52	413	4.42	54.5
P10	16.3	20.95	7.49	409	4.40	53.9
P10	18.5	20.06	7.49	404	4.61	55.5
P10	21.1	19.24	7.49	410	4.80	56.8
P10	26.1	17.77	7.49	433	5.15	59.2
P10	31.6	16.14	7.54	527	5.58	62.0
P10	35.8	14.77	7.60	581	5.85	63.1
P10	40.8	12.89	7.65	642	6.52	67.5
P10	45.8	11.39	7.66	676	6.79	68.0
P10	51.5	10.33	7.66	686	7.04	68.8
P10	56.7	9.83	7.66	689	7.18	69.4
P10	60.7	9.53	7.65	692	7.26	69.7
P10	66.9	9.11	7.65	702	7.34	69.7
P10	70.1	8.95	7.64	711	7.36	69.6
P10	76.2	8.56	7.63	727	7.49	70.2
P10	83.3	8.17	7.61	747	7.52	69.8
P10	86.1	8.01	7.60	755	7.45	68.9
P10	90.5	7.64	7.55	773	7.15	65.5
P10	95.4	7.28	7.50	791	7.03	63.9
P11	0.1	25.87	8.63	445	7.41	99.6
P11	1.9	25.77	8.63	446	7.36	98.8
P11	4.6	25.71	8.62	447	7.35	98.5
P11	7.0	24.74	8.38	476	7.16	94.3
P11	9.2	24.06	8.16	489	6.60	85.9
P11	10.8	23.67	7.99	495	5.75	74.2
P11	13.1	23.09	7.76	467	5.33	68.0
P11	15.2	22.22	7.54	423	4.40	55.2
P11	16.9	21.18	7.47	409	3.55	43.7
P11	19.2	20.36	7.44	412	3.29	39.8
P11	21.0	19.88	7.44	417	3.23	38.7
P11	22.9	19.50	7.43	419	3.21	38.2

P11	25.0	18.81	7.42	434	3.43	40.3
P11	27.3	18.03	7.41	464	3.38	39.1
P11	28.5	17.53	7.41	469	3.22	36.8
P11	30.6	17.07	7.41	481	3.54	40.1
P11	35.1	15.08	7.44	562	3.85	41.8
P11	40.0	12.87	7.47	644	4.50	46.6
P11	44.0	10.87	7.41	700	4.64	45.9
P12	0.0	27.40	8.64	559	9.02	124.8
P12	2.0	25.86	8.66	496	8.27	111.2
P12	4.0	25.64	8.65	505	8.40	112.5
P12	6.2	25.06	8.53	547	7.89	104.5
P12	8.3	24.67	8.33	576	6.87	90.4
P12	10.3	24.39	8.19	592	6.07	79.4
P12	12.0	23.80	7.94	611	5.13	66.4
P12	14.1	23.33	7.84	645	4.87	62.6
P12	16.0	21.98	7.67	605	4.64	58.0
P12	18.1	20.72	7.55	484	4.58	55.9
P12	20.5	19.94	7.51	414	4.81	57.8
P12	25.0	18.20	7.48	403	5.21	60.4
P12	30.5	16.66	7.51	433	5.74	64.4
P12	35.4	15.13	7.53	534	5.77	62.8
P12	40.9	12.39	7.64	657	6.24	64.0
P12	45.6	11.13	7.67	686	6.72	66.9
P12	50.1	10.46	7.66	699	7.06	69.2
P12	55.4	10.05	7.62	714	7.08	68.8
P12	60.2	9.87	7.58	722	6.98	67.5
P12	65.8	9.57	7.54	733	6.77	65.0
P12	70.0	9.35	7.51	742	6.59	63.0
P12	75.7	8.96	7.43	762	6.04	57.1
P12	80.3	8.88	7.39	768	5.58	52.7
P12	85.3	8.50	7.34	784	5.27	49.4
P12	90.0	8.11	7.26	798	4.82	44.7
P12	91.7	8.05	7.19	800	3.28	30.3
P13	0.1	26.56	8.66	559	9.09	123.8
P13	2.0	25.74	8.66	563	9.03	121.2
P13	4.5	25.26	8.56	568	9.06	120.5
P13	7.1	24.60	8.27	583	8.24	108.3
P13	9.2	24.22	8.09	581	6.42	83.8
P13	10.7	24.08	8.03	611	5.48	71.3
P13	13.3	23.61	7.91	668	5.40	69.7
P13	15.2	22.89	7.74	593	5.02	63.9
P13	16.6	22.24	7.67	594	4.62	58.1
P13	18.2	21.38	7.58	516	4.52	55.8
P13	21.0	20.17	7.53	410	4.60	55.5
P13	23.1	18.82	7.51	394	4.91	57.6
P13	25.3	18.37	7.51	393	5.19	60.4
P13	27.1	17.98	7.51	396	5.47	63.1
P13	29.1	17.26	7.51	405	5.67	64.5
P13	31.4	16.44	7.50	428	5.81	64.9
P13	35.5	14.85	7.52	501	6.05	65.4

P13	41.0	12.70	7.61	632	6.33	65.3
P13	45.6	11.34	7.65	684	6.58	65.8
P13	50.2	10.59	7.65	706	6.96	68.4
P13	55.7	10.10	7.61	715	7.11	69.1
P13	60.4	9.85	7.58	723	7.04	68.1
P13	65.7	9.57	7.51	735	6.86	65.9
P13	70.6	9.29	7.43	749	6.36	60.6
P13	75.3	8.97	7.35	768	5.48	51.8
P14	0.2	26.29	8.48	686	9.65	130.9
P14	3.0	25.66	8.43	697	9.66	129.5
P14	4.6	25.32	8.36	718	9.53	127.0
P14	6.4	24.60	8.20	727	8.71	114.5
P14	9.1	24.33	8.03	756	6.90	90.2
P14	11.0	24.21	7.97	786	5.89	76.9
P14	13.2	23.74	7.98	804	5.65	73.2
P14	14.5	23.51	7.98	807	5.98	77.0
P14	17.4	23.17	7.95	808	6.17	79.0
P14	19.0	22.90	7.92	801	6.13	78.1
P14	20.5	22.15	7.83	744	5.53	69.4
P14	23.5	20.18	7.67	541	5.63	67.9
P14	24.6	19.20	7.63	475	5.20	61.5
P14	27.1	17.73	7.58	403	5.34	61.4
P14	28.7	17.30	7.56	405	5.48	62.3
P14	30.9	16.65	7.54	418	5.65	63.4
P14	35.5	14.82	7.51	482	5.80	62.6
P14	41.0	12.86	7.52	586	6.09	63.0
P14	45.3	11.76	7.51	654	6.25	63.1
P14	52.0	10.77	7.51	701	6.44	63.6
P14	55.9	10.30	7.36	721	6.12	59.8

Table f. Water quality profiles for Hydroacoustic sampling stations on Lake Powell for January 1998.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)
P1	0.5	10.24	7.57	618	8.45
P1	1.0	10.16	7.57	619	8.46
P1	2.2	9.98	7.56	619	8.45
P1	4.0	9.85	7.56	619	8.45
P1	6.1	9.81	7.56	619	8.44
P1	8.3	9.78	7.56	620	8.43
P1	9.9	9.78	7.56	620	8.41
P1	12.1	9.77	7.56	619	8.38
P1	14.1	9.76	7.56	619	8.37
P1	16.9	9.76	7.56	619	8.36
P1	18.0	9.76	7.56	619	8.36
P1	20.6	9.75	7.56	619	8.35
P1	22.5	9.75	7.56	619	8.35
P1	24.4	9.75	7.56	619	8.34
P1	26.3	9.74	7.56	618	8.34
P1	28.1	9.74	7.56	618	8.33
P1	31.3	9.74	7.55	618	8.33
P1	35.1	9.74	7.55	618	8.32
P1	39.4	9.72	7.56	617	8.33
P1	45.5	9.70	7.56	617	8.32
P1	51.0	9.62	7.55	618	8.32
P1	55.5	9.60	7.55	619	8.26
P1	60.8	9.49	7.50	636	7.95
P1	65.2	9.14	7.24	759	5.75
P1	70.5	8.64	7.18	777	5.45
P1	80.4	7.61	7.14	795	5.44
P1	91.1	7.43	7.12	814	5.26
P1	100.8	7.41	7.09	834	4.98
P1	109.9	7.52	7.04	853	4.35
P1	119.9	7.57	6.99	886	3.41
P1	130.1	7.54	6.96	882	3.05
P1	143.0	7.46	6.91	887	2.44
P2	0.5	10.37	7.54	613	8.39
P2	3.0	10.26	7.54	616	8.39
P2	4.0	10.08	7.54	617	8.37
P2	6.1	10.02	7.53	617	8.33
P2	8.2	10.01	7.53	617	8.30
P2	10.3	10.00	7.53	618	8.29
P2	12.2	9.99	7.53	618	8.28
P2	16.0	9.98	7.53	618	8.24
P2	18.2	9.98	7.52	619	8.22
P2	20.5	9.98	7.52	619	8.21
P2	24.9	9.98	7.52	619	8.19
P2	30.0	9.97	7.52	620	8.17

P2	35.0	9.94	7.52	621	8.17
P2	39.7	9.91	7.53	622	8.18
P2	45.1	9.88	7.53	622	8.18
P2	50.1	9.80	7.52	623	8.15
P2	55.4	9.79	7.32	733	6.60
P2	60.3	9.55	7.23	778	5.57
P2	64.9	9.27	7.21	788	5.62
P2	71.1	8.80	7.20	791	5.59
P2	80.3	8.01	7.15	793	5.40
P2	90.1	7.46	7.12	799	5.36
P2	100.3	7.28	7.10	820	5.21
P2	109.8	7.29	7.08	836	4.90
P2	119.7	7.42	7.02	857	3.89
P2	129.3	7.41	6.98	870	3.38
P2	139.2	7.38	6.94	876	2.88
P3	1.3	10.29	7.56	611	8.62
P3	2.4	10.20	7.56	611	8.54
P3	4.4	10.05	7.56	612	8.52
P3	7.6	9.96	7.55	612	8.45
P3	9.1	9.95	7.55	612	8.40
P3	12.5	9.94	7.55	612	8.38
P3	14.9	9.90	7.55	611	8.39
P3	18.7	9.89	7.55	611	8.41
P3	21.3	9.90	7.55	611	8.40
P3	25.0	9.88	7.56	611	8.41
P3	29.2	9.89	7.56	611	8.41
P3	30.2	9.89	7.56	611	8.41
P4	1.2	10.38	7.57	613	7.88
P4	2.0	10.36	7.58	615	7.89
P4	3.8	10.38	7.57	616	7.89
P4	6.9	10.36	7.57	617	7.90
P4	8.2	10.36	7.57	617	7.90
P4	10.0	10.35	7.57	616	7.90
P4	12.0	10.35	7.57	616	7.90
P4	15.0	10.35	7.57	617	7.89
P4	20.6	10.35	7.57	616	7.88
P4	24.8	10.35	7.57	616	7.88
P4	30.2	10.35	7.56	616	7.87
P4	35.1	10.34	7.56	616	7.86
P4	40.9	10.35	7.56	617	7.82
P4	45.7	10.38	7.32	702	5.62
P4	50.3	10.01	7.25	746	5.27
P4	55.3	9.52	7.25	771	5.36
P4	60.3	9.40	7.29	789	5.74
P4	69.9	8.65	7.30	798	5.91
P4	80.2	8.20	7.29	800	5.84
P4	90.4	7.58	7.21	803	5.24
P4	99.9	7.16	7.17	808	5.24
P4	110.7	7.15	7.15	822	5.02
P4	120.3	7.12	7.14	831	4.92

P4	130.1	7.18	7.10	850	4.44
P4	140.4	7.19	7.04	858	3.39
P5	0.9	10.03	7.60	585	8.43
P5	2.0	10.02	7.60	584	8.43
P5	3.8	10.03	7.60	584	8.44
P5	6.4	10.04	7.60	584	8.43
P5	8.0	10.04	7.60	584	8.43
P5	10.0	9.82	7.59	585	8.40
P5	10.4	9.98	7.59	584	8.42
P5	15.5	9.75	7.58	585	8.27
P5	20.5	9.73	7.58	585	8.24
P5	25.5	9.72	7.57	585	8.23
P5	31.8	9.72	7.57	585	8.21
P5	35.4	9.72	7.57	585	8.20
P5	40.6	9.71	7.57	585	8.18
P5	47.4	9.61	7.56	587	8.08
P5	50.3	9.10	7.48	597	7.61
P5	54.7	8.61	7.39	646	6.97
P5	61.0	8.73	7.49	776	7.53
P5	65.9	8.14	7.54	783	7.99
P5	70.0	8.02	7.55	780	8.07
P5	81.3	7.61	7.56	773	8.21
P5	90.4	7.53	7.55	771	8.20
P5	102.7	7.44	7.55	769	8.21
P5	110.4	7.41	7.54	769	8.13
P5	117.6	7.38	7.47	777	7.52
P5	130.1	6.95	7.14	814	4.46
P6	0.5	9.86	7.51	588	8.05
P6	1.9	9.87	7.50	590	8.05
P6	5.0	9.83	7.50	590	8.06
P6	7.0	9.79	7.50	590	8.01
P6	9.7	9.77	7.48	592	7.90
P6	13.2	9.74	7.48	591	7.91
P6	16.4	9.74	7.49	590	7.95
P6	19.9	9.74	7.49	591	7.94
P6	25.0	9.74	7.49	591	7.92
P6	30.4	9.74	7.48	591	7.92
P6	35.0	9.76	7.47	592	7.84
P6	40.0	9.79	7.45	596	7.63
P6	45.3	9.73	7.45	594	7.67
P6	49.9	8.78	7.39	586	7.37
P6	56.3	8.25	7.35	597	7.20
P6	60.0	8.22	7.26	653	6.30
P6	65.2	8.32	7.40	792	7.38
P6	70.8	8.13	7.48	792	7.80
P6	80.1	7.79	7.52	783	8.07
P6	90.5	7.66	7.52	778	8.16
P6	99.4	7.59	7.52	777	8.10
P6	109.0	7.53	7.50	777	8.03
P6	115.4	7.52	7.49	777	7.92

P7	0.7	10.02	7.55	546	8.34
P7	2.1	9.96	7.54	547	8.35
P7	4.2	9.64	7.53	548	8.29
P7	6.1	9.61	7.52	548	8.25
P7	8.0	9.61	7.52	548	8.23
P7	10.9	9.61	7.52	548	8.23
P7	13.3	9.59	7.51	548	8.22
P7	17.4	9.59	7.51	548	8.22
P7	20.7	9.59	7.51	548	8.21
P7	25.7	9.58	7.51	548	8.19
P7	30.5	9.58	7.51	548	8.18
P7	35.0	9.57	7.51	548	8.18
P7	40.4	8.88	7.49	558	8.21
P7	45.2	8.53	7.49	563	8.34
P7	50.7	7.90	7.48	577	8.51
P7	55.3	7.50	7.48	583	8.66
P7	61.5	7.23	7.47	589	8.71
P7	62.0	7.22	7.31	591	8.67
P8	0.9	9.70	7.58	545	8.72
P8	3.0	9.25	7.58	546	8.78
P8	5.0	9.16	7.58	546	8.77
P8	7.1	9.09	7.56	546	8.68
P8	9.9	9.07	7.55	546	8.61
P8	12.1	9.06	7.55	546	8.59
P8	15.6	9.06	7.56	546	8.63
P8	18.1	9.04	7.55	546	8.57
P8	21.0	9.03	7.55	546	8.60
P8	23.9	8.34	7.56	555	8.73
P8	26.1	8.04	7.55	561	8.84
P8	28.2	7.80	7.55	566	8.59
P8	29.1	6.07	7.47	627	9.16
P8	30.3	6.01	7.45	625	9.22
P8	31.6	5.96	7.44	626	9.20
P8	32.4	5.93	7.42	628	9.20
P9	0.6	10.09	7.44	611	6.66
P9	2.3	10.00	7.40	613	6.63
P9	4.2	9.81	7.39	613	6.58
P9	6.6	9.71	7.37	608	6.48
P9	8.3	9.70	7.36	607	6.44
P9	10.0	9.69	7.36	607	6.42
P9	15.3	9.69	7.35	607	6.37
P9	20.9	9.67	7.35	607	6.38
P9	25.1	9.67	7.35	606	6.39
P9	30.0	9.68	7.35	607	6.39
P9	34.8	9.65	7.35	605	6.37
P9	40.5	9.59	7.35	599	6.26
P9	45.9	9.61	7.25	651	5.15
P9	50.0	10.06	7.19	775	4.53
P9	55.4	9.91	7.22	797	4.88
P9	60.1	9.02	7.41	786	6.94

P9	66.5	8.15	7.45	791	7.33
P9	69.9	8.03	7.47	790	7.50
P9	74.8	8.06	7.42	789	7.10
P10	0.8	9.85	7.52	611	8.09
P10	2.4	9.80	7.51	613	8.09
P10	4.2	9.78	7.51	614	8.09
P10	5.9	9.78	7.52	615	8.07
P10	8.1	9.76	7.51	615	8.06
P10	10.6	9.76	7.51	616	8.05
P10	14.9	9.75	7.51	616	8.04
P10	20.4	9.75	7.51	616	8.02
P10	24.9	9.74	7.51	617	8.00
P10	30.6	9.74	7.51	617	7.98
P10	35.1	9.74	7.51	617	7.97
P10	40.0	9.74	7.51	617	7.96
P10	44.8	9.73	7.51	620	7.94
P10	50.0	9.42	7.54	684	7.91
P10	55.5	8.89	7.56	709	8.15
P10	60.5	8.05	7.57	740	8.41
P10	65.3	7.37	7.56	756	8.54
P10	69.9	7.25	7.55	757	8.57
P10	80.4	7.05	7.54	760	8.57
P10	89.7	7.03	7.54	759	8.55
P10	100.2	7.00	7.54	759	8.52
P10	110.3	7.00	7.53	760	8.49
P10	112.4	6.99	7.52	760	8.46
P11	0.8	9.66	7.66	618	8.65
P11	2.0	9.62	7.66	620	8.62
P11	4.1	9.49	7.65	621	8.61
P11	6.6	9.47	7.65	622	8.58
P11	8.0	9.43	7.64	622	8.53
P11	10.0	9.43	7.64	623	8.50
P11	12.3	9.42	7.64	623	8.47
P11	14.2	9.42	7.63	623	8.44
P11	16.7	9.42	7.63	623	8.45
P11	18.6	9.42	7.63	623	8.45
P11	20.1	9.42	7.64	624	8.44
P11	25.0	9.38	7.64	624	8.44
P11	30.6	9.27	7.65	623	8.49
P11	35.3	9.06	7.68	623	8.62
P11	37.4	9.07	7.68	623	8.63
P12	0.7	9.93	7.62	626	8.42
P12	2.1	9.88	7.62	630	8.38
P12	4.0	9.55	7.62	630	8.40
P12	6.2	9.51	7.62	630	8.38
P12	9.3	9.49	7.61	630	8.37
P12	12.0	9.48	7.61	630	8.35
P12	15.0	9.47	7.61	631	8.34
P12	20.1	9.47	7.61	631	8.30
P12	25.4	9.47	7.61	631	8.29

P12	30.0	9.45	7.61	632	8.28
P12	35.0	9.39	7.61	642	8.25
P12	40.6	9.30	7.61	662	8.27
P12	45.4	8.88	7.62	685	8.38
P12	49.9	8.41	7.63	706	8.54
P12	54.7	7.83	7.63	728	8.72
P12	60.0	7.20	7.63	748	8.89
P12	64.9	6.52	7.62	770	9.10
P12	69.9	6.37	7.62	774	9.14
P12	74.7	6.33	7.61	775	9.13
P12	79.3	6.30	7.61	776	9.13
P12	85.1	6.29	7.61	776	9.12
P12	89.9	6.28	7.60	777	9.05
P13	0.5	9.56	7.61	632	8.56
P13	3.1	9.49	7.61	633	8.51
P13	5.8	9.43	7.61	634	8.44
P13	10.3	9.42	7.60	635	8.40
P13	15.2	9.39	7.60	636	8.37
P13	20.1	9.37	7.60	638	8.36
P13	25.4	9.23	7.61	649	8.43
P13	30.1	9.22	7.61	649	8.44
P13	35.1	9.20	7.61	653	8.45
P13	39.6	8.87	7.62	680	8.51
P13	46.0	8.08	7.63	716	8.74
P13	50.4	7.77	7.63	726	8.82
P13	54.7	6.75	7.62	762	9.09
P13	60.5	6.66	7.62	765	9.17
P13	64.8	6.26	7.62	778	9.25
P13	70.7	6.10	7.61	784	9.28
P13	74.7	6.06	7.61	785	9.27
P13	78.7	6.06	7.61	785	9.25
P14	0.8	9.15	7.65	652	8.78
P14	3.0	9.14	7.65	653	8.79
P14	5.2	9.13	7.65	653	8.80
P14	8.1	9.05	7.65	655	8.76
P14	12.0	9.01	7.64	656	8.69
P14	16.1	9.00	7.63	657	8.66
P14	20.0	8.96	7.64	658	8.67
P14	25.8	8.93	7.64	659	8.66
P14	30.0	8.79	7.64	671	8.68
P14	36.1	8.38	7.65	693	8.77
P14	40.5	8.15	7.65	702	8.82
P14	44.7	7.41	7.64	731	9.08
P14	50.3	6.44	7.64	767	9.46
P14	54.7	5.31	7.62	813	9.86
P14	59.5	5.16	7.62	817	9.92

Table a. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for November 1995.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)
M1	0.3	18.49	7.73	1068	6.88
M1	2.9	18.49	7.73	1068	6.97
M1	5.4	18.51	7.74	1068	6.93
M1	6.8	18.51	7.73	1068	6.9
M1	9.1	18.51	7.74	1068	6.9
M1	11.6	18.51	7.73	1068	6.84
M1	14.8	18.51	7.73	1068	6.82
M1	20	18.51	7.73	1068	6.84
M1	23.9	18.5	7.74	1068	6.85
M1	28.9	18.49	7.76	1067	6.82
M1	34.2	18.45	7.75	1067	6.66
M1	40.5	18.25	7.69	1063	6.09
M1	46.9	16.38	7.5	1059	4.36
M1	52.5	14.19	7.47	1073	4.7
M1	57.6	13.57	7.46	1066	5.04
M1	62.5	13.25	7.46	1058	5.24
M1	67.7	12.91	7.49	1043	5.55
M1	75.2	12.67	7.47	1045	5.48
M1	80.1	12.49	7.46	1046	5.51
M1	84.9	12.35	7.45	1048	5.37
M1	90.1	12.25	7.44	1050	5.26
M2	0	13.55	7.96	1123	9.73
M2	0.3	17.71	8.05	1067	8.38
M2	2	17.62	8.06	1070	8.37
M2	5	17.57	8.06	1071	8.36
M2	10.2	17.54	8.05	1072	8.29
M2	15.1	17.52	8.05	1072	8.27
M2	19.8	17.53	8.05	1076	8.24
M2	25.1	17.5	8.05	1072	8.25
M2	30.1	17.49	8.05	1072	8.27
M2	35.7	17.47	8.05	1078	8.23
M2	41	17.48	8.02	1090	8.09
M2	41.3	17.48	8.02	1090	8.07
M3	0.6	18.28	7.95	1031	7.51
M3	2	18.3	7.95	1033	7.55
M3	5.1	18.31	7.95	1035	7.45
M3	8.1	18.31	7.95	1036	7.31
M3	10.1	18.3	7.95	1037	7.5
M3	15	18.29	7.94	1041	7.43
M3	20	18.31	7.94	1040	7.76
M3	24.9	18.3	7.93	1042	7.78
M3	30	18.29	7.92	1042	7.76
M3	35.1	17.49	7.62	1009	5.22
M3	40	16.21	7.57	1023	4.9

M3	45.1	15.53	7.55	1034	4.94
M3	50	14.48	7.55	1044	5.15
M3	54.8	14.02	7.56	1044	5.48
M3	60.2	13.71	7.55	1048	5.59
M3	65	13.26	7.58	1033	5.91
M3	66.8	13.22	7.58	1030	5.94
M3	70.7	13.03	7.58	1032	6.01
M3	80	12.42	7.57	1030	5.92
M3	90.6	12.25	7.54	1033	5.73
M3	99.6	12.14	7.52	1041	5.5
M4	0.5	18.08	8.07	992	8.33
M4	5	18.09	8.08	1005	8.29
M4	10.4	18.02	8.08	1006	8.3
M4	15	17.99	8.08	1004	8.27
M4	20.3	17.97	8.08	1004	8.25
M4	25.8	17.96	8.08	1004	8.23
M4	30.3	17.95	8.07	1004	8.22
M4	35.7	16.68	7.88	950	6.98
M4	40.3	16.03	7.79	963	6.32
M4	45	15.44	7.72	992	5.75
M4	50.5	14.65	7.67	1022	5.4
M4	55.3	13.82	7.66	1034	5.59
M4	60.2	13.4	7.66	1031	5.77
M4	64.7	13.07	7.66	1029	5.92
M4	69.9	12.94	7.66	1026	5.98
M4	80.1	12.64	7.67	1023	6.06
M4	90.1	12.24	7.66	1019	6.05
M4	100.9	12.15	7.61	1031	5.58
M5	0.5	17.93	8.13	964	8.56
M5	3	17.64	8.13	972	8.59
M5	5.1	17.56	8.14	971	8.59
M5	10	17.4	8.14	973	8.61
M5	15.1	17.36	8.13	974	8.56
M5	20.3	17.35	8.13	974	8.55
M5	24.7	17.34	8.13	973	8.53
M5	30.2	17.33	8.12	974	8.52
M5	35.7	17.29	8.12	976	8.5
M5	40.1	16.22	7.94	956	7.47
M5	45.2	14.97	7.91	926	7.55
M5	50.1	14.37	7.78	956	6.49
M5	60	13.51	7.66	1018	5.57
M5	70.1	12.93	7.66	1013	5.9
M5	80.6	12.45	7.67	1005	6.09
M5	90.4	12.16	7.66	1004	6.09
M5	100.7	12.05	7.64	1013	5.89
M6	0.4	17.96	8.08	957	8.37
M6	2	17.74	8.09	959	8.18
M6	5.1	17.68	8.1	958	7.94
M6	10	17.65	8.09	957	8.1
M6	15.1	17.65	8.09	958	8.15

M6	20	17.65	8.09	958	8.17
M6	25.3	17.65	8.09	958	8.11
M6	30.1	17.63	8.09	958	8.18
M6	35	16.75	8.03	915	7.51
M6	40.1	15.62	7.98	905	7.49
M6	45	14.83	7.93	907	7.42
M6	50	14.22	7.82	920	6.84
M6	55.4	13.44	7.65	967	5.43
M6	60.2	12.98	7.65	963	5.5
M6	65	12.51	7.65	949	5.83
M6	69.9	12.39	7.63	951	5.65
M6	80.6	12.07	7.58	952	5.11
M6	90.4	11.97	7.56	980	5.01
M6	100.3	11.93	7.54	987	5.01
M7	0.3	17.7	8.12	945	8.55
M7	1.8	17.73	8.13	947	8.56
M7	5.1	17.71	8.13	948	8.57
M7	9.9	17.7	8.13	949	8.57
M7	15.1	17.72	8.13	950	8.58
M7	20.1	17.71	8.12	950	8.56
M7	25.1	17.72	8.12	950	8.56
M7	30.2	17.51	8.11	942	8.57
M7	35	16.21	8.1	907	8.79
M7	40	15.03	8.07	895	9.04
M7	44.7	14.47	8.03	891	8.91
M7	50.2	13.91	7.91	902	8.05
M7	55	13.12	7.71	929	6.36
M7	59.9	12.84	7.67	933	6.02
M7	65.1	12.59	7.64	936	5.74
M7	70.2	12.43	7.61	937	5.48
M7	75.3	12.27	7.59	939	5.27
M7	80.1	12.11	7.55	945	4.93
M7	84.6	12.05	7.54	948	4.84
M7	90	11.95	7.53	953	4.75
M7	95.1	11.87	7.52	966	4.6
M8	0.3	17.66	8.14	934	8.86
M8	2	17.7	8.15	938	8.85
M8	5	17.72	8.15	941	8.86
M8	5.1	17.71	8.15	940	8.86
M8	10.1	17.71	8.15	941	8.84
M8	15	17.71	8.14	941	8.83
M8	19.9	17.7	8.14	942	8.83
M8	24.8	17.69	8.14	941	8.82
M8	30.1	17.05	8.1	924	8.8
M8	35.1	16.24	8.08	912	8.97
M8	39.7	15.72	8.05	902	9.01
M8	44.9	15.25	8.06	898	9.19
M8	49.7	14.73	8.05	892	9.31
M8	55.3	14.46	8.01	890	9.11
M8	61.5	14.21	7.98	891	8.92

M8	70.2	12.42	7.54	932	5.04
M8	79.8	12.04	7.47	935	4.42
M9	0.3	13.29	8.01	859	9.81
M9	2	13.19	7.99	861	9.68
M9	4	13.02	7.97	864	9.51
M9	6.2	13	7.97	863	9.42
M9	9.1	12.94	7.98	864	9.51
M9	13.4	12.86	7.99	864	9.6
M9	15.7	12.79	7.97	865	9.57
M10	0.3	17.19	8.14	966	8.59
M10	0.3	17.19	8.14	961	8.59
M10	5.4	17.17	8.15	979	8.6
M10	10.1	17.13	8.14	980	8.61
M10	15.2	17.13	8.14	980	8.6
M10	20	17.11	8.13	981	8.57
M10	25.1	17.1	8.12	983	8.48
M10	30.1	17.1	8.11	985	8.42
M10	40.2	16.83	8.05	987	7.75
M10	44.9	15.8	7.76	976	5.82
M10	49.8	15.23	7.65	998	4.9
M10	60.8	12.98	7.6	1017	4.88
M11	0.2	17.46	8.03	1030	8.61
M11	2	17.36	8.04	1032	8.56
M11	4.9	17.19	8.04	1035	8.59
M11	9.9	17.15	8.04	1037	8.53
M11	15.5	17.15	8.03	1037	8.49
M11	20.1	17.15	8.03	1037	8.46
M11	25	17.14	8.03	1038	8.44
M11	30.3	17.14	8.03	1038	8.42
M11	34.9	16.92	7.97	1043	7.9
M11	40	16.66	7.8	1054	6.47

Table b. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for January 1996.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
M1	0.6	13.7	8.09	1034	9.18	91.8
M1	10.5	13.39	8.08	1038	9.1	90.4
M1	19.9	13.36	8.08	1038	9.04	89.8
M1	29.6	13.27	8.07	1039	8.95	88.7
M1	40.1	13.27	8.06	1039	8.91	88.3
M1	54.3	13.25	8.06	1039	8.84	87.6
M1	69.9	13.24	8.03	1039	8.75	86.6
M1	85.3	12.94	7.86	1033	7.13	70.1
M1	97.2	12.38	7.69	1029	5.46	53
M2	0.5	13.62	8.1	1034	9.17	91.6
M2	5	13.32	8.09	1038	9.15	90.7
M2	10.2	13.27	8.09	1039	9.14	90.6
M2	20.2	13.24	8.09	1042	9.14	90.5
M2	30.1	13.22	8.1	1047	9.12	90.3
M2	39.8	13.24	8.09	1054	9.15	90.6
M2	40.2	13.24	8.08	1059	8.96	88.7
M3	0.3	14.27	8.11	1027	9.18	93
M3	4.9	13.52	8.1	1031	9.11	90.8
M3	10.4	13.41	8.08	1034	9.02	89.6
M3	19.8	13.3	8.06	1034	8.91	88.4
M3	30.5	13.3	8.06	1035	8.89	88.1
M3	40	13.29	8.05	1034	8.82	87.5
M3	55.2	13.26	8.06	1038	8.88	87.9
M3	70	13.13	7.97	1033	8.25	81.5
M3	85.2	12.66	7.78	1008	6.12	59.8
M3	85.2	12.66	7.78	1008	6.14	60.1
M3	98.4	12.45	7.71	1016	5.61	54.6
M4	0.4	13.1	8.16	997	8.29	81.8
M4	5.3	13.11	8.16	1001	8.48	83.8
M4	10.4	13.11	8.16	1001	8.42	83.1
M4	20.3	13.1	8.14	1002	8.42	83.1
M4	30.2	12.98	8.15	990	8.34	82.1
M4	39.5	12.94	8.17	987	8.47	83.3
M4	52.2	12.87	8.17	985	8.61	84.5
M4	61.9	12.76	8.14	986	8.61	84.3
M4	70.9	12.58	8.08	989	8.08	78.8
M4	77.9	12.5	8.07	993	7.93	77.2
M4	90.8	12.41	8.05	996	7.89	76.7
M4	97.9	12.37	7.98	999	7.27	70.6
M5	0.5	14.53	8.2	970	9.41	95.9
M5	5	13.07	8.19	975	9.43	93.1
M5	9.8	12.94	8.18	976	9.28	91.3
M5	20.4	12.89	8.17	977	9.21	90.5
M5	30.2	12.87	8.16	975	9.21	90.5

M5	39.9	12.87	8.15	978	9.14	89.8
M5	49.8	12.85	8.15	980	9.04	88.8
M5	59.6	12.81	8.15	980	9.07	89
M5	70	12.76	8.14	984	9.08	88.9
M5	81	12.54	8.02	979	8.21	80
M5	90	12.31	7.81	993	6.49	62.9
M5	97.7	12.3	7.75	1002	5.81	56.3
M6	0.6	13.42	8.26	919	9.14	90.9
M6	4.9	12.99	8.26	925	9.29	91.4
M6	10	12.95	8.25	925	9.3	91.5
M6	20.1	12.95	8.17	963	8.97	88.3
M6	29.9	12.91	8.16	976	8.86	87.1
M6	39.9	12.86	8.15	976	8.79	86.2
M6	50.3	12.79	8.15	980	8.81	86.4
M6	60	12.73	8.12	973	8.58	84
M6	69	12.4	8.09	926	8.38	81.4
M7	0.6	13.3	8.3	898	9.76	96.8
M7	5.3	12.85	8.29	898	9.9	97.2
M7	10.2	12.77	8.28	898	9.7	95
M7	20.1	12.68	8.27	894	9.62	94
M7	29.8	12.54	8.26	879	9.58	93.4
M7	39.7	12.26	8.25	860	9.55	92.5
M7	40.1	12.26	8.25	860	9.68	93.7
M7	50	12.18	8.25	861	9.57	92.5
M7	59.7	11.84	8.25	849	9.67	92.8
M7	69.9	11.66	8.25	842	9.84	93.9
M7	79.5	11.28	8.24	825	9.88	93.6
M7	89.5	11.09	8.22	816	9.89	93.3
M7	90.8	10.99	8.22	812	9.96	93.7
M8	0.3	15.07	8.31	886	10.02	103.2
M8	5	12.97	8.31	891	10.16	100
M8	10	12.79	8.3	893	10.13	99.2
M8	20.4	12.66	8.27	891	9.88	96.5
M8	30.3	12.58	8.26	892	9.85	96
M8	40.5	12.15	8.25	869	9.92	95.8
M8	50.5	11.88	8.24	850	9.98	95.8
M8	59.6	11.42	8.22	819	10.15	96.4
M8	70.2	11.19	8.21	810	10.08	95.3
M8	78.4	10.95	8.16	802	9.73	91.4
M9	0.4	11.76	8.29	761	10.93	104.6
M9	4.9	10.74	8.24	761	11.02	103
M9	10.3	10.21	8.24	774	11.07	102.2
M9	15.4	9.87	8.16	782	10.79	98.8
M9	17	9.84	8.14	782	9.92	90.8
M10	0.5	13.43	8.23	964	10.02	99.6
M10	5.2	13.01	8.22	965	9.91	97.6
M10	10.2	12.95	8.21	965	9.82	96.6
M10	20.3	12.84	8.18	967	9.67	94.9
M10	29.4	12.84	8.18	970	9.54	93.6
M10	41	12.82	8.17	976	9.45	92.7

M10	50.3	12.56	8.19	990	9.53	92.9
M10	61.7	12.48	8.2	995	9.56	93.1
M10	70	12.28	8.2	1006	9.71	94.1
M10	80.7	12.14	8.2	1016	9.74	94.1
M10	90.4	12.08	8.2	1019	9.7	93.6
M11	0.3	13.01	8.26	985	9.96	98.2
M11	5.3	12.55	8.25	987	10	97.5
M11	10.2	12.51	8.25	993	9.92	96.6
M11	20	12.38	8.22	1002	9.86	95.7
M11	30.3	12.29	8.24	1004	9.9	96
M11	39.5	11.9	8.2	1068	9.85	94.7

Table c. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for May 1996

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
M1	0.6	20.15	8.53	1038	9.85	112.8
M1	1	20.28	8.53	1037	9.84	113
M1	2.1	19.9	8.54	1039	9.89	112.6
M1	3.2	19.82	8.54	1040	9.88	112.4
M1	4	19.1	8.54	1039	10.01	112.3
M1	5	19.06	8.54	1039	10.03	112.4
M1	5.3	19.06	8.54	1039	10.03	112.4
M1	6.1	18.93	8.54	1040	10.04	112.2
M1	6.7	18.98	8.54	1040	10.05	112.4
M1	7.1	18.83	8.54	1041	10.08	112.3
M1	8	18.84	8.55	1041	10.08	112.5
M1	9	18.81	8.54	1041	10.08	112.3
M1	10.2	18.8	8.55	1041	10.11	112.6
M1	15	18.18	8.52	1042	10.16	111.8
M1	20	16.85	8.43	1041	10.01	107.2
M1	25.2	16.11	8.36	1041	9.79	103.2
M1	30	15.71	8.32	1040	9.65	100.8
M1	35.1	15.44	8.29	1039	9.51	98.8
M1	40.4	14.48	8.18	1040	9	91.6
M1	45.1	13.94	8.13	1039	8.78	88.3
M1	50	13.55	8.1	1039	8.64	86.2
M1	55.1	13.4	8.08	1041	8.53	84.8
M1	60	13.33	8.07	1043	8.49	84.2
M1	65	13.2	8.05	1046	8.32	82.3
M1	70.3	13.12	8.04	1048	8.11	80.1
M1	74.8	13.06	8.02	1047	7.92	78.1
M1	80.2	13	8.01	1047	7.76	76.4
M1	85	12.98	8.01	1046	7.68	75.6
M1	89.9	12.94	7.99	1046	7.5	73.8
M1	95.5	12.89	7.99	1046	7.44	73.1
M1	99.6	12.85	7.98	1044	7.33	71.9
M2	0.4	21.9	8.55	1049	9.27	109.8
M2	1	21.89	8.55	1062	9.28	109.9
M2	2	21.9	8.55	1063	9.3	110.2
M2	3	21.9	8.55	1066	9.32	110.5
M2	4	21.9	8.55	1065	9.33	110.6
M2	4.9	21.89	8.55	1068	9.39	111.2
M2	6	21.53	8.56	1077	9.52	112
M2	7	21.16	8.58	1091	9.83	114.9
M2	8	20.98	8.59	1101	10.06	117.1
M2	9	20.86	8.6	1108	10.17	118.1
M2	10	20.76	8.6	1113	10.23	118.6
M2	11.1	20.68	8.62	1131	10.41	120.4
M2	11.9	20.56	8.6	1129	10.29	118.8
M2	13.1	20.39	8.57	1169	10.14	116.7

M2	14.1	20.59	8.56	1264	9.92	114.6
M2	15	20.3	8.4	1468	9.24	106.3
M2	16.1	18.53	8.38	1242	9.36	103.9
M2	17.1	18.36	8.39	1216	9.42	104.1
M2	18	17.9	8.39	1149	9.5	104
M2	19	17.26	8.37	1103	9.43	101.8
M2	20.1	16.71	8.3	1103	9	96.1
M2	21	16.71	8.3	1101	8.97	95.8
M2	25	16.2	8.21	1112	8.34	88
M2	29.9	15.59	8.16	1101	8.23	85.8
M2	35	14.76	8.04	1095	7.68	78.6
M2	40	14.27	8	1084	7.51	76.1
M2	45	13.68	7.95	1072	7.26	72.6
M2	47.3	13.6	7.94	1068	7.1	70.9
M3	0.5	23.01	8.51	1037	9.02	109.1
M3	1	23.02	8.51	1036	9.02	109.2
M3	2.1	22.23	8.52	1040	9.13	108.8
M3	3.1	21.89	8.52	1037	9.14	108.2
M3	4	21.63	8.52	1037	9.2	108.5
M3	5	21.47	8.52	1038	9.23	108.5
M3	6	21.41	8.52	1038	9.22	108.2
M3	7	21.33	8.52	1039	9.25	108.3
M3	8	21.28	8.52	1039	9.26	108.4
M3	9	20.46	8.53	1038	9.55	110
M3	10	19.67	8.54	1041	9.83	111.5
M3	11	19.11	8.53	1033	10.04	112.6
M3	12	17.61	8.47	1014	10.19	110.8
M3	13	17	8.46	1026	10.31	110.7
M3	13.8	16.8	8.46	1028	10.31	110.3
M3	15	16.69	8.45	1028	10.21	108.9
M3	16	16.49	8.43	1029	10.12	107.5
M3	17.1	16.42	8.42	1030	10.1	107.1
M3	18.8	16.17	8.38	1029	9.87	104.1
M3	19.9	15.95	8.36	1027	9.69	101.7
M3	25.1	15.22	8.28	1018	9.35	96.7
M3	30.1	14.85	8.25	1015	9.25	94.9
M3	35.2	14.47	8.21	1011	9.12	92.8
M3	40.1	13.92	8.2	994	9.19	92.4
M3	45.1	13.61	8.13	1021	8.85	88.4
M3	49.9	13.4	8.12	1014	8.81	87.5
M3	55.3	13.25	8.1	1017	8.71	86.3
M3	60.1	13.09	8.11	1008	8.74	86.3
M3	65	12.99	8.09	1009	8.67	85.4
M3	70.1	12.87	8.05	1010	8.35	82
M3	75	12.81	8.04	1014	8.21	80.5
M3	80	12.79	8.02	1017	7.97	78.2
M3	85.1	12.75	8	1019	7.77	76.2
M3	90	12.71	7.97	1026	7.31	71.5
M3	95.2	12.68	7.95	1026	7.03	68.8
M3	99	12.67	7.93	1029	6.72	65.7

M4	0.6	21.49	8.57	951	8.18	96.1
M4	2	21.27	8.57	951	8.28	96.8
M4	2.9	21.24	8.57	951	8.28	96.8
M4	3.9	21.21	8.57	951	8.32	97.2
M4	5.1	21.23	8.57	951	8.36	97.7
M4	5.9	21.22	8.57	951	8.36	97.7
M4	6.9	21.22	8.57	951	8.42	98.4
M4	8.1	21.08	8.57	953	8.49	98.9
M4	9	20.98	8.56	955	8.48	98.6
M4	9.9	20.37	8.56	964	8.6	98.9
M4	12	19.54	8.55	979	8.68	98.2
M4	13.9	19.25	8.54	977	8.83	99.2
M4	16.1	18.73	8.52	977	8.89	98.9
M4	18	17.87	8.49	977	9	98.4
M4	19.9	16.04	8.41	980	9.03	95.1
M4	21.8	15.6	8.39	981	9.08	94.7
M4	24.2	15.23	8.36	981	8.96	92.7
M4	26	14.84	8.33	982	8.92	91.5
M4	27.9	14.83	8.33	982	8.81	90.4
M4	30.1	14.72	8.31	981	8.78	89.8
M4	34.9	14.29	8.28	980	8.81	89.2
M4	40	13.98	8.25	980	8.69	87.5
M4	45.2	13.57	8.22	982	8.67	86.5
M4	50.1	13.36	8.2	983	8.6	85.4
M4	54.8	13.16	8.19	983	8.62	85.2
M4	60.1	13.07	8.18	984	8.49	83.7
M4	65.2	12.96	8.16	987	8.4	82.7
M4	69.8	12.89	8.14	989	8.22	80.7
M4	75.3	12.79	8.12	992	8.1	79.4
M4	79.7	12.72	8.08	997	7.91	77.4
M4	85	12.67	8.06	1001	7.74	75.7
M4	90	12.66	8.04	1003	7.51	73.4
M4	96.2	12.64	8.03	1005	7.39	72.3
M4	99.1	12.63	8.02	1008	7.38	72.1
M5	0.5	23.11	8.53	947	8.22	99.6
M5	0.9	22.19	8.54	950	8.3	98.8
M5	1	22.24	8.54	948	8.29	98.8
M5	2.1	21.16	8.54	945	8.4	98
M5	3	21	8.54	946	8.43	98.1
M5	3.9	20.88	8.55	950	8.45	98.1
M5	5	20.8	8.55	952	8.46	98.1
M5	6	20.76	8.55	952	8.49	98.3
M5	7	20.7	8.55	953	8.48	98.2
M5	8	20.65	8.55	953	8.55	98.8
M5	8.9	20.61	8.56	953	8.45	97.6
M5	9.7	20.46	8.55	956	8.44	97.2
M5	12.1	19.99	8.54	962	8.56	97.7
M5	14	19.84	8.53	964	8.57	97.5
M5	15.6	19.16	8.52	981	8.69	97.6
M5	16.2	18.91	8.51	981	8.75	97.7

M5	18.3	17.39	8.44	979	8.86	95.9
M5	19.9	16.86	8.43	979	8.86	94.8
M5	24.8	15.7	8.38	980	8.95	93.5
M5	30	14.68	8.29	981	8.77	89.6
M5	35.3	14.11	8.24	976	8.57	86.4
M5	40.1	13.91	8.22	978	8.41	84.5
M5	45	13.65	8.2	975	8.4	83.9
M5	50	13.43	8.18	977	8.28	82.3
M5	55	13.22	8.16	978	8.22	81.3
M5	59.5	13.1	8.15	979	8.04	79.3
M5	65.2	12.92	8.14	975	8.02	78.9
M5	70	12.76	8.14	972	8.03	78.7
M5	75.2	12.63	8.12	963	7.91	77.2
M5	80.3	12.58	8.12	962	7.84	76.5
M5	84.7	12.55	8.11	963	7.73	75.4
M5	90.2	12.54	8.1	974	7.56	73.7
M5	95.1	12.54	8.1	977	7.49	73
M5	99.4	12.54	8.09	978	7.47	72.8
M6	0.5	20.67	8.61	873	7.32	84.6
M6	1.1	20.67	8.61	876	7.35	84.9
M6	3	20.62	8.61	878	7.35	84.9
M6	4.8	20.52	8.6	877	7.39	85.2
M6	7	20.29	8.6	875	7.43	85.2
M6	9.8	19.72	8.57	872	7.54	85.5
M6	12	19.43	8.56	870	7.61	85.9
M6	12.9	19.18	8.54	863	7.67	86
M6	14.5	18.26	8.49	857	7.78	85.7
M6	16.1	17.99	8.47	854	7.8	85.4
M6	18	17.78	8.48	869	7.83	85.4
M6	18.9	17.33	8.46	874	7.88	85.2
M6	20.1	17.2	8.45	869	7.94	85.6
M6	22	16.92	8.43	868	7.89	84.5
M6	24.2	16.54	8.42	875	7.89	83.9
M6	26.2	16.12	8.39	879	7.87	82.9
M6	28	15.57	8.35	891	7.89	82.1
M6	29.8	14.99	8.33	910	7.81	80.3
M6	35.2	14.11	8.27	927	7.71	77.8
M6	39.4	13.68	8.24	915	7.66	76.5
M6	42.7	13.43	8.23	912	7.66	76.2
M6	44.6	13.23	8.21	907	7.65	75.7
M6	50.7	12.85	8.19	897	7.61	74.7
M6	56.5	12.61	8.19	892	7.62	74.3
M6	60.5	12.5	8.18	888	7.6	74
M6	65.2	12.46	8.17	900	7.54	73.3
M6	70	12.37	8.17	903	7.58	73.5
M6	74.5	12.29	8.17	898	7.49	72.5
M6	79.7	12.31	8.16	914	7.43	72
M6	84.5	12.33	8.16	924	7.31	70.9
M6	90.6	12.36	8.15	932	7.28	70.7
M6	98.2	12.36	8.14	941	7.15	69.4

M7	0.7	20.63	8.47	831	8.17	94.3
M7	2	20.57	8.47	831	8.29	95.6
M7	4	20.35	8.48	832	8.28	95.1
M7	5.9	19.37	8.43	831	8.26	93
M7	6.9	18.88	8.39	830	8.15	90.9
M7	8.9	18.71	8.38	829	8.05	89.4
M7	10	18.58	8.37	829	7.99	88.5
M7	12.1	18.24	8.35	829	7.89	86.8
M7	13.1	17.53	8.29	829	7.86	85.3
M7	14.1	17.29	8.28	830	7.84	84.6
M7	14.8	17.23	8.28	830	7.82	84.3
M7	15.7	17.19	8.28	830	7.82	84.2
M7	16.9	17.01	8.27	831	7.79	83.6
M7	18.1	16.62	8.26	836	7.8	83.1
M7	19.9	16.31	8.26	844	7.83	82.9
M7	22	16.15	8.25	845	7.87	83
M7	24.1	15.85	8.25	851	7.87	82.5
M7	26	15.55	8.23	856	7.85	81.7
M7	27.9	15.28	8.23	865	7.87	81.4
M7	30	15	8.22	870	7.87	81
M7	35	14.57	8.21	885	7.93	80.8
M7	40.2	14.17	8.19	885	7.95	80.3
M7	44.8	13.38	8.15	874	7.98	79.2
M7	49.7	12.8	8.13	861	7.98	78.2
M7	55.1	12.63	8.12	858	7.93	77.4
M7	61	12.48	8.12	858	7.92	77.1
M7	65.6	12.22	8.11	859	7.8	75.5
M7	70.2	12.17	8.1	864	7.72	74.6
M7	75	12.15	8.1	865	7.62	73.6
M7	79.8	12.12	8.09	862	7.56	73
M7	85	12.13	8.09	868	7.53	72.7
M7	89.6	12.16	8.09	869	7.51	72.5
M7	97.7	12.14	8.08	877	7.48	72.2
M8	0.8	21.52	8.54	832	8.31	97.7
M8	1.8	21.46	8.54	832	8.27	97.1
M8	3.9	21.16	8.55	833	8.26	96.4
M8	6.3	20.85	8.55	834	8.24	95.5
M8	8	20.76	8.55	833	8.22	95.1
M8	10	20.32	8.53	834	8.16	93.7
M8	12.1	20.22	8.52	833	8.07	92.5
M8	14.1	20.04	8.5	833	8.09	92.4
M8	15.1	19.69	8.48	831	8.01	90.8
M8	16.4	19.09	8.44	832	8.16	91.4
M8	17.3	18.73	8.4	829	7.95	88.4
M8	18.1	17.95	8.34	817	7.92	86.6
M8	19.2	17.63	8.32	818	7.96	86.6
M8	20.5	17.43	8.31	822	7.93	85.8
M8	22.2	16.67	8.28	833	7.92	84.4
M8	24.4	16.25	8.27	838	7.95	84
M8	26.1	15.89	8.26	840	7.95	83.4

M8	27.9	15.57	8.25	844	8	83.2
M8	30	14.84	8.22	851	8.06	82.6
M8	35.2	14.07	8.18	862	8.05	81.1
M8	40	13.6	8.16	868	8.05	80.3
M8	45.4	13.14	8.13	859	8.09	79.9
M8	49.9	12.97	8.12	857	8.06	79.3
M8	55.1	12.8	8.12	856	7.95	77.9
M8	59.7	12.63	8.11	855	7.86	76.7
M8	66.1	12.4	8.11	855	7.79	75.7
M8	69.9	12.24	8.12	854	7.72	74.7
M8	75.1	12.13	8.11	854	7.64	73.7
M8	79.8	12.08	8.1	855	7.53	72.6
M8	80.5	12.1	8.06	856	7.46	71.9
M9	0.8	20.81	8.47	816	8	92.8
M9	2.5	20.73	8.46	816	8.07	93.4
M9	3.7	19.43	8.44	813	8.31	93.7
M9	4.7	19.02	8.42	811	8.3	92.8
M9	6.7	18.67	8.4	810	8.29	92.1
M9	9	18.12	8.34	810	8.29	91.1
M9	11.8	17.62	8.26	814	7.98	86.7
M9	13.6	17.16	8.17	822	7.4	79.6
M9	16.2	16.3	8.02	835	6.71	71
M9	17.8	15.81	7.9	842	6.01	62.9
M10	0.6	21.05	8.59	973	7.88	91.8
M10	1.8	21.02	8.59	973	7.89	91.9
M10	4	20.96	8.59	975	7.91	92
M10	6.1	20.93	8.59	975	7.94	92.3
M10	8	20.9	8.59	976	7.96	92.5
M10	10	20.9	8.59	976	7.97	92.6
M10	12	20.84	8.59	976	8	92.9
M10	13.9	20.73	8.59	976	8.06	93.3
M10	16	20.66	8.58	977	8.07	93.2
M10	17.1	20.64	8.58	977	8.06	93.1
M10	18	20.58	8.58	977	8.04	92.8
M10	18.9	18.97	8.52	984	8.26	92.3
M10	20.1	18.36	8.5	983	8.32	91.9
M10	22.1	16.51	8.43	994	8.48	90.1
M10	25.7	15.57	8.4	994	8.15	84.9
M10	29.9	15.11	8.35	994	8.05	83
M10	34.9	14.91	8.33	994	7.95	81.6
M10	39.7	14.64	8.3	995	7.9	80.7
M10	44.7	13.86	8.24	991	7.74	77.7
M10	49.4	13.77	8.23	990	7.68	76.9
M10	54.7	13.62	8.21	989	7.66	76.5
M10	59.7	13.53	8.21	988	7.6	75.8
M10	63.8	13.33	8.2	985	7.5	74.5
M10	69.6	13.28	8.19	985	7.52	74.5
M10	76.5	13.27	8.19	985	7.49	74.2
M10	77.3	13.27	8.19	985	7.42	73.5
M11	1	21.76	8.59	991	7.55	89.2

M11	2.1	21.74	8.59	992	7.59	89.6
M11	3.2	21.74	8.59	991	7.65	90.3
M11	4.3	21.74	8.59	992	7.66	90.4
M11	5.1	21.74	8.59	992	7.67	90.5
M11	6.2	21.74	8.59	991	7.69	90.8
M11	6.9	21.72	8.59	993	7.69	90.8
M11	8.2	21.72	8.59	992	7.71	91
M11	9	21.72	8.59	992	7.74	91.4
M11	10.4	21.72	8.59	992	7.73	91.3
M11	12	21.71	8.59	992	7.78	91.8
M11	13.2	21.69	8.59	992	7.78	91.8
M11	15	21.69	8.59	993	7.81	92.1
M11	17.1	21.61	8.58	993	7.82	92.2
M11	19	20.62	8.54	994	7.88	91.1
M11	20.2	20.22	8.53	996	7.89	90.5
M11	21	19.52	8.51	1002	7.99	90.3
M11	22.4	19.05	8.49	1005	8.04	90
M11	24	17.46	8.4	1020	8.02	86.9
M11	25.2	16.46	8.35	1027	8.12	86.2
M11	27.2	15.78	8.31	1031	7.89	82.5
M11	30.3	15.12	8.28	1021	7.85	81
M11	35.1	14.64	8.22	1018	7.61	77.8
M11	40.8	14.12	8.11	1012	7.18	72.5
M11	41.9	14.07	8.1	1010	7.14	72

Table d. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for August 1996.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
M1	1.6	28.36	8.36	1025	8.7	114.6
M1	3.4	28.15	8.37	1028	8.85	116
M1	5.9	27.64	8.38	1032	9.03	117.3
M1	7.6	27.45	8.39	1032	9.09	117.7
M1	9.5	27.28	8.37	1032	8.97	115.9
M1	12.4	27.21	8.36	1033	8.93	115.1
M1	14.3	27.1	8.35	1033	8.79	113.1
M1	15.6	27.05	8.33	1033	8.64	111.1
M1	17.4	26.26	8.23	1031	7.9	100.2
M1	20.3	24.18	8.09	1023	7.03	85.8
M1	25	19.83	7.95	1029	6.29	70.5
M1	26.4	19.49	7.93	1030	6.21	69.2
M1	30.8	18.06	7.89	1041	6.13	66.4
M1	36.7	16.8	7.87	1048	5.93	62.5
M1	40.8	15.49	7.87	1025	6.31	64.7
M1	45.7	14.77	7.87	1022	6.57	66.3
M1	50.7	14.31	7.88	1021	6.81	68.1
M1	55.7	13.84	7.88	1023	6.91	68.4
M1	60.8	13.56	7.88	1023	6.97	68.6
M1	66.1	13.39	7.89	1022	7.04	69
M1	70.6	13.25	7.89	1023	7.08	69.2
M1	80.3	13.04	7.87	1027	6.99	68
M1	89.1	13	7.86	1032	6.76	65.7
M1	98.2	12.87	7.84	1039	6.48	62.8
M2	1.4	30.42	8.52	1059	9.87	134.7
M2	4	29.61	8.59	1081	10.63	143
M2	5.8	29.44	8.55	1082	10.31	138.3
M2	8	29.39	8.56	1092	10.52	141
M2	10.9	27.75	8.33	1049	8.5	110.7
M2	12.5	27.56	8.24	1062	7.78	101
M2	14.9	26.96	8.03	1121	5.97	76.7
M2	17	25.85	7.93	1103	5.22	65.7
M2	19.7	23.68	7.88	1038	4.86	58.8
M2	22.6	21.99	7.8	1028	4.06	47.6
M2	25.8	20.33	7.72	1050	3.03	34.3
M2	30.7	18.28	7.68	1074	2.52	27.4
M2	35.5	17.11	7.65	1078	2.64	28
M2	40.9	15.96	7.66	1076	3.25	33.7
M2	45.4	15.33	7.65	1076	3.33	34.1
M3	1.9	29.87	8.43	1010	8.71	117.8
M3	2.8	29.44	8.43	1009	8.92	119.6
M3	3.8	29.26	8.44	1010	9	120.4
M3	4.8	29.17	8.44	1011	9.01	120.3
M3	5.8	29.06	8.45	1015	9.09	121.1

M3	6.8	28.98	8.45	1016	9.1	121.1
M3	7.8	28.9	8.45	1018	9.11	121
M3	9	28.78	8.45	1023	9.18	121.7
M3	9.9	28.63	8.45	1029	9.19	121.6
M3	10.9	28.46	8.43	1027	9.2	121.4
M3	11.8	27.88	8.39	1026	9.09	118.6
M3	12.8	27.39	8.36	1025	8.92	115.4
M3	13.7	27.16	8.33	1024	8.71	112.3
M3	14.8	26.95	8.31	1025	8.52	109.4
M3	15.7	26.48	8.28	1029	7.94	101.1
M3	16.8	25.38	8.19	1007	7.61	94.9
M3	17.8	24.93	8.16	1001	7.36	91
M3	18.8	22.93	8.06	963	6.98	83.2
M3	19.9	22.59	8.04	944	7	82.9
M3	21	21.73	8.01	942	6.79	79.1
M3	22.9	20.42	8	944	6.73	76.4
M3	24.8	19.84	7.97	952	6.63	74.5
M3	27.1	19.35	7.96	987	6.55	72.8
M3	29.2	18.38	7.94	1006	6.46	70.4
M3	31.2	17.84	7.9	1022	6.1	65.7
M3	35.7	16.48	7.88	1040	6.02	63
M3	40.6	15.49	7.9	1012	6.51	66.8
M3	45.7	14.71	7.9	1009	6.78	68.4
M3	52	14	7.91	1005	7.06	70.1
M3	55.6	13.85	7.92	1003	7.22	71.5
M3	60.8	13.58	7.92	1004	7.29	71.7
M3	66.1	13.32	7.92	1001	7.27	71.2
M3	76.4	13.07	7.91	1007	7.32	71.2
M3	87.8	12.93	7.88	1020	7.15	69.4
M3	98.4	12.84	7.86	1026	6.66	64.5
M4	1.4	29.35	8.44	972	8.82	118.1
M4	2.9	29.28	8.44	973	8.9	119.1
M4	4.8	29.18	8.45	974	8.97	119.8
M4	6.8	29.1	8.44	968	9.04	120.6
M4	8.7	29	8.44	971	9.16	122
M4	10.7	28.86	8.43	974	9.22	122.5
M4	12.6	28.31	8.42	997	9.51	125
M4	15	27.43	8.38	1005	9.17	118.8
M4	16	26.51	8.32	993	8.54	108.8
M4	16.8	24.95	8.25	918	8.1	100.2
M4	17.9	23.07	8.16	851	7.65	91.3
M4	18.7	22.55	8.12	839	7.52	88.9
M4	20.9	21.67	8.07	830	7.2	83.8
M4	22.6	20.79	8.04	842	7.02	80.2
M4	24.9	19.96	8.01	863	6.83	76.8
M4	27	19.19	8	886	6.69	74.1
M4	30.8	17.76	7.98	941	6.66	71.7
M4	35.7	16.47	7.96	976	6.74	70.6
M4	40.7	15.52	7.96	987	7.02	72
M4	46.4	14.6	7.96	999	7.14	71.9

M4	51.4	14.16	7.96	1000	7.26	72.4
M4	55.7	13.95	7.96	998	7.32	72.7
M4	60.5	13.61	7.96	999	7.38	72.7
M4	70.7	13.21	7.96	992	7.5	73.2
M4	81.9	12.96	7.95	994	7.41	71.9
M4	98.7	12.79	7.92	1009	6.93	67
M5	1.3	29.39	8.45	941	8.4	112.6
M5	3.8	29.23	8.46	941	8.56	114.4
M5	6.8	28.77	8.46	940	8.76	116.1
M5	8.7	28.66	8.45	941	8.67	114.7
M5	10.8	27.69	8.41	960	8.59	111.7
M5	12.9	27.21	8.39	950	8.44	108.8
M5	15.6	25.66	8.31	890	8.17	102.4
M5	17.8	22.91	8.16	824	7.55	89.9
M5	20.7	21.45	8.07	804	7.01	81.2
M5	24.9	19.96	8.03	858	6.75	75.9
M5	30.5	18.45	8	906	6.61	72.1
M5	36.6	16.11	7.98	978	6.72	69.8
M5	40.6	14.93	7.97	997	6.79	68.9
M5	45.6	14.42	7.96	999	6.85	68.6
M5	51.1	14.16	7.96	996	7.16	71.4
M5	56	13.8	7.95	992	6.89	68.1
M5	61.5	13.57	7.95	991	6.96	68.5
M5	67.2	13.33	7.96	989	7.23	70.7
M5	72.4	13.14	7.97	981	7.33	71.4
M5	76.5	12.98	7.97	971	7.4	71.9
M5	81.4	12.89	7.97	967	7.41	71.8
M5	90.2	12.77	7.95	981	7.27	70.3
M5	99.2	12.74	7.94	995	7.16	69.2
M6	1.8	29.1	8.46	909	8.71	116.1
M6	2.9	28.89	8.46	910	8.81	117
M6	3.8	28.79	8.47	911	8.85	117.3
M6	4.8	28.73	8.47	910	8.86	117.3
M6	5.8	28.67	8.47	909	8.88	117.5
M6	6.9	28.63	8.47	909	8.86	117.1
M6	7.8	28.59	8.47	909	8.86	117
M6	8.8	28.1	8.45	919	8.89	116.5
M6	9.7	27.76	8.44	930	8.97	116.9
M6	10.8	27.1	8.41	919	8.82	113.6
M6	11.8	26.61	8.39	921	8.65	110.4
M6	12.8	25.51	8.3	849	8.42	105.2
M6	13.8	24	8.2	805	7.87	95.6
M6	14.8	23.6	8.18	802	7.76	93.6
M6	15.8	22.86	8.16	794	7.72	91.8
M6	16.8	22.47	8.14	792	7.67	90.6
M6	17.9	21.96	8.12	789	7.56	88.4
M6	18.8	21.55	8.1	790	7.5	86.9
M6	19.9	21.13	8.09	791	7.46	85.8
M6	20.8	21.07	8.08	792	7.39	85
M6	22.8	20.85	8.08	793	7.35	84.2

M6	24.8	20.1	8.03	806	6.72	75.8
M6	26.9	18.97	7.99	844	6.47	71.3
M6	28.8	18.04	7.97	880	6.36	68.8
M6	30.7	17.25	7.96	909	6.42	68.3
M6	35.8	15.88	7.95	945	6.51	67.4
M6	40.7	15.05	7.96	954	6.87	69.8
M6	45.8	14.45	7.97	957	7.04	70.6
M6	50.9	13.99	7.97	946	7.29	72.4
M6	55.9	13.65	7.99	932	7.52	74.1
M6	60.7	13.24	7.98	917	7.56	73.8
M6	65.8	12.92	7.98	910	7.56	73.3
M6	70.9	12.77	7.98	904	7.52	72.7
M6	75.7	12.64	7.97	908	7.4	71.3
M6	80.9	12.58	7.96	914	7.27	70
M6	85.8	12.53	7.95	924	7.22	69.4
M6	90.8	12.54	7.94	948	6.99	67.2
M6	95.7	12.54	7.94	958	6.86	65.9
M6	99.8	12.56	7.94	964	6.82	65.6
M7	0.9	28.77	8.46	881	8.92	118.2
M7	2.2	28.71	8.47	882	8.89	117.7
M7	3	28.6	8.46	884	8.86	117
M7	4.1	28.42	8.46	886	8.94	117.7
M7	5.8	28.36	8.46	887	8.98	118.1
M7	7	27.86	8.45	880	9.12	118.9
M7	8.3	27.43	8.43	872	9.08	117.5
M7	9	27.15	8.41	865	8.96	115.4
M7	10.1	26.69	8.39	851	8.81	112.5
M7	11.1	26.42	8.37	845	8.71	110.6
M7	12.1	25.65	8.36	820	8.63	108.1
M7	13.1	24.55	8.3	798	8.32	102.1
M7	14.9	22.7	8.18	790	7.8	92.5
M7	16	22.29	8.15	787	7.71	90.7
M7	17	22.22	8.13	786	7.65	89.9
M7	18.2	21.65	8.13	786	7.65	89
M7	19.6	21.51	8.12	786	7.65	88.6
M7	21.9	21.14	8.11	786	7.66	88.1
M7	24.4	20.73	8.09	790	7.55	86.2
M7	26.3	19.04	8.01	816	6.76	74.6
M7	28.7	17.74	7.96	863	6.41	68.9
M7	30.1	16.76	7.94	894	6.45	67.9
M7	35.1	14.9	7.96	909	7.06	71.5
M7	39	14.34	7.97	899	7.36	73.6
M7	44.8	13.8	7.97	887	7.51	74.3
M7	51.5	13.4	7.97	882	7.57	74.2
M7	56.5	13.14	7.96	878	7.53	73.4
M7	61.2	12.92	7.96	878	7.44	72.1
M7	66.9	12.77	7.95	879	7.24	70
M7	70.1	12.72	7.94	881	7.06	68.1
M7	75.7	12.58	7.93	887	6.75	65
M7	86	12.48	7.9	895	6.4	61.5

M7	96.3	12.5	7.89	903	6.23	59.8
M8	1	28.64	8.51	842	9.24	122.1
M8	2.1	28.65	8.51	846	9.34	123.5
M8	3	28.64	8.51	846	9.37	123.9
M8	4	28.62	8.52	847	9.42	124.5
M8	5	28.58	8.52	846	9.45	124.8
M8	6	28.56	8.52	845	9.47	125
M8	7.1	28.52	8.52	843	9.52	125.6
M8	8	28.42	8.51	845	9.53	125.5
M8	9	28.12	8.5	845	9.58	125.5
M8	10	27.61	8.49	831	9.61	124.7
M8	11	26.05	8.45	813	9.33	117.8
M8	12	25.2	8.42	806	9.25	114.9
M8	13	24.79	8.39	805	9.12	112.5
M8	14	24.01	8.3	796	8.34	101.4
M8	14.9	23.46	8.25	794	8.18	98.4
M8	16	22.91	8.23	794	8.18	97.3
M8	16.9	22.69	8.2	791	8.07	95.7
M8	17.9	22.48	8.18	789	7.96	94
M8	19	22.3	8.18	790	8	94.1
M8	20.1	22.11	8.18	789	8.04	94.2
M8	22.1	21.79	8.16	787	7.99	93.1
M8	24.1	21.31	8.14	786	7.89	91.1
M8	26	20.29	8.09	791	7.51	85
M8	27.9	19.92	8.05	796	7.2	80.9
M8	29.8	18.66	7.98	810	6.67	73.1
M8	34.7	15.43	7.96	880	7.1	72.7
M8	40.5	14.31	7.97	886	7.45	74.5
M8	44.5	13.79	7.96	873	7.34	72.5
M8	50.2	13.47	7.95	871	7.22	70.9
M8	54.9	13.2	7.94	869	7.15	69.8
M8	59.9	12.87	7.93	868	7.18	69.5
M8	65.4	12.69	7.92	868	6.75	65.1
M8	70.2	12.56	7.91	870	6.73	64.7
M8	75.5	12.48	7.91	871	6.8	65.3
M8	81	12.4	7.88	876	6.32	60.5
M8	83.2	12.39	7.84	882	5.2	49.8
M9	0.9	28.18	8.52	799	9.4	123.3
M9	1.6	28.18	8.52	801	9.43	123.6
M9	2.8	28.16	8.52	801	9.5	124.6
M9	4.3	27.71	8.51	799	9.65	125.5
M9	5.9	20.59	8.13	795	8.04	91.5
M9	6.9	20.14	8.07	794	7.71	87
M9	7.2	20.12	8.05	793	7.49	84.5
M9	9.6	19.75	8.01	796	7.39	82.7
M9	12.5	19.7	8	797	7.25	81.1
M9	14.4	19.63	7.96	806	6.91	77.2
M10	1.1	29.59	8.45	944	8.49	114.2
M10	2.7	29.57	8.46	944	8.59	115.5
M10	4.9	29.53	8.46	945	8.61	115.7

M10	6.9	29.13	8.46	941	8.78	117.1
M10	8.9	28.94	8.46	938	8.85	117.7
M10	10.8	28.75	8.45	937	8.93	118.4
M10	13	28.25	8.43	939	8.85	116.3
M10	14.8	27.62	8.39	929	8.66	112.5
M10	16.1	26.12	8.3	903	8.21	103.8
M10	19.3	22.83	8.12	845	7.44	88.5
M10	21.8	21.32	8.06	866	7.11	82.1
M10	25.3	19.77	8.01	906	6.73	75.4
M10	28.1	18.52	7.97	930	6.42	70.2
M10	33.5	16.43	7.94	973	6.38	66.8
M10	42	14.69	7.91	995	6.42	64.7
M10	50.7	13.95	7.89	996	6.44	63.9
M10	60.2	13.6	7.88	994	6.42	63.2
M10	72.3	13.33	7.88	988	6.57	64.3
M10	80.2	13.06	7.9	983	6.84	66.6
M10	96.6	12.76	7.91	980	7	67.7
M11	2.2	29.14	8.43	974	8.2	109.5
M11	3.6	29.14	8.43	978	8.21	109.5
M11	6	29.14	8.43	981	8.2	109.4
M11	8	29.14	8.43	981	8.2	109.4
M11	10.2	29.14	8.43	982	8.2	109.5
M11	11.9	29.12	8.42	983	8.04	107.3
M11	13.5	28.61	8.31	986	7.28	96.3
M11	16.2	28.28	8.25	985	6.83	89.8
M11	17.1	27.73	8.12	982	5.84	76
M11	17.9	25.02	8.04	930	6.19	76.7
M11	18.9	23.36	8.05	897	6.78	81.4
M11	19.8	22.63	8.03	896	6.59	78
M11	21.1	22.03	7.98	908	6.14	71.9
M11	22	21.4	7.93	926	5.43	62.8
M11	24.8	20.19	7.94	944	5.95	67.2
M11	27.9	18.86	7.91	973	5.71	62.8
M11	30.5	18.02	7.9	988	5.55	60
M11	35.9	16.24	7.85	1015	5.08	52.9
M11	41	15.25	7.76	1027	2.73	27.9
M11	41.5	15.19	7.74	1027	2.55	26

Table e. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for November 1996.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
M1	1	17.78	8.01	979	7.91	86.9
M1	1.7	17.78	8.01	982	7.87	86.4
M1	4.3	17.77	8	984	7.86	86.3
M1	6.6	17.72	8	985	7.85	86.1
M1	8.6	17.7	8	985	7.83	85.9
M1	10.6	17.7	8	986	7.82	85.8
M1	12.8	17.66	8	987	7.83	85.8
M1	14.8	17.66	8	987	7.82	85.7
M1	17	17.65	8	987	7.81	85.6
M1	19.3	17.65	8	987	7.81	85.5
M1	20.7	17.63	8	987	7.82	85.6
M1	23.1	17.63	8.01	986	7.83	85.8
M1	24.8	17.63	8.01	986	7.84	85.9
M1	26.9	17.63	8.01	986	7.84	85.9
M1	28.4	17.63	8.01	986	7.85	85.9
M1	29.9	17.63	8.01	986	7.85	85.9
M1	35.8	17.42	7.95	988	7.81	85.1
M1	40.5	16.22	7.72	983	6.12	65
M1	45.2	15.49	7.68	977	5.37	56.2
M1	51.8	14.81	7.66	977	5.23	53.9
M1	56.2	14.46	7.67	976	5.26	53.8
M1	61.2	14.11	7.67	973	5.51	56
M1	65.4	13.89	7.68	973	5.66	57.2
M1	70.7	13.63	7.68	973	5.77	58.1
M1	75.1	13.39	7.68	974	5.87	58.7
M1	80.1	13.18	7.68	973	5.95	59.2
M1	85.3	13.12	7.67	977	5.93	58.9
M1	90.9	13.02	7.66	980	5.87	58.2
M2	1	17.55	8.08	987	8.23	90
M2	1.8	17.57	8.07	989	8.26	90.4
M2	4.3	17.57	8.07	988	8.29	90.7
M2	5.8	17.57	8.07	988	8.3	90.8
M2	8.4	17.57	8.07	989	8.3	90.8
M2	10.5	17.57	8.07	989	8.3	90.8
M2	12.8	17.57	8.07	988	8.3	90.8
M2	15.3	17.57	8.07	990	8.3	90.8
M2	16.2	17.54	8.07	989	8.3	90.7
M2	18.4	17.5	8.06	990	8.26	90.3
M2	20.1	17.47	8.06	991	8.24	89.9
M2	22.6	17.44	8.06	993	8.23	89.8
M2	24.4	17.44	8.06	994	8.22	89.7
M2	26.6	17.43	8.06	994	8.22	89.7
M2	29.5	17.42	8.06	998	8.21	89.5
M2	30.7	17.4	8.05	999	8.2	89.3

M2	34.9	17.35	8.04	1009	8.15	88.8
M2	40.7	17.42	7.99	1095	8.04	87.7
M2	42.9	17.49	7.96	1142	7.69	84
M3	1.1	17.8	8.12	968	8.18	89.9
M3	1.9	17.77	8.12	968	8.12	89.2
M3	4.3	17.75	8.11	970	8.1	88.9
M3	6.1	17.76	8.11	969	8.08	88.8
M3	8.3	17.73	8.11	970	8.08	88.6
M3	10.3	17.74	8.1	971	8.06	88.5
M3	12.1	17.73	8.1	971	8.06	88.4
M3	13.9	17.72	8.1	970	8.05	88.3
M3	16.2	17.74	8.1	971	8.05	88.3
M3	18.1	17.73	8.09	971	8.04	88.2
M3	20.3	17.74	8.09	971	8.03	88.2
M3	22.2	17.74	8.09	971	8.02	88.1
M3	24.2	17.72	8.09	971	8.03	88.1
M3	26.2	17.73	8.09	971	8.02	88
M3	28.1	17.73	8.09	971	8.01	87.9
M3	29.9	17.73	8.08	971	8	87.8
M3	35	17.71	8.08	972	7.99	87.7
M3	40.1	17.49	8.01	975	7.57	82.7
M3	45.1	15.23	7.78	955	6.19	64.5
M3	50.2	14.63	7.74	961	5.64	58
M3	54.9	14.34	7.73	960	5.75	58.7
M3	60.4	14.07	7.72	964	5.85	59.4
M3	65.1	13.82	7.74	960	6.01	60.7
M3	70.3	13.6	7.74	960	6.16	61.9
M3	75.2	13.48	7.74	965	6.22	62.4
M3	80.1	13.31	7.74	961	6.27	62.6
M3	85.2	13.12	7.73	963	6.2	61.7
M3	89.4	13	7.72	965	6.08	60.2
M3	94.7	12.94	7.71	968	5.88	58.2
M4	2.2	17.76	8.09	935	8.15	89.5
M4	4.3	17.76	8.09	936	7.99	87.7
M4	5.9	17.77	8.09	937	7.97	87.5
M4	8.1	17.77	8.08	937	7.95	87.3
M4	10	17.74	8.08	936	7.96	87.3
M4	11.9	17.75	8.08	936	7.96	87.3
M4	14.2	17.73	8.08	935	7.95	87.2
M4	16	17.73	8.08	935	7.94	87.1
M4	17.9	17.73	8.08	935	7.92	86.9
M4	20.1	17.7	8.08	932	7.9	86.6
M4	22	17.66	8.08	928	7.89	86.4
M4	24	17.63	8.08	925	7.88	86.3
M4	26	17.58	8.08	920	7.91	86.5
M4	28	17.56	8.08	919	7.93	86.7
M4	29.9	17.56	8.08	918	7.94	86.8
M4	35.1	17.28	8.04	912	7.65	83.1
M4	40	16.75	7.94	911	6.99	75.1
M4	45.1	15.66	7.78	934	5.83	61.3

M4	50.1	14.74	7.74	950	5.47	56.3
M4	55	14.28	7.72	954	5.57	56.8
M4	59.8	14	7.72	955	5.74	58.2
M4	65.3	13.7	7.73	956	5.96	60
M4	69.8	13.49	7.74	954	6.12	61.3
M4	75	13.27	7.74	951	6.21	62
M4	79.5	13.07	7.73	949	6.21	61.7
M4	84.9	12.93	7.72	954	6.12	60.6
M4	90.1	12.9	7.71	959	5.96	58.9
M4	95.1	12.86	7.68	969	5.69	56.3
M4	98.9	12.84	7.67	974	5.52	54.5
M5	2	17.4	8.18	876	8.57	93.4
M5	4	17.32	8.18	879	8.5	92.5
M5	6.3	17.28	8.17	879	8.49	92.3
M5	8.1	17.25	8.17	879	8.51	92.4
M5	10.3	17.24	8.17	880	8.51	92.4
M5	12	17.23	8.17	880	8.49	92.2
M5	14.1	17.23	8.17	881	8.48	92.1
M5	16.2	17.23	8.16	880	8.47	92
M5	17.9	17.23	8.16	881	8.45	91.8
M5	20.1	17.23	8.16	881	8.45	91.8
M5	22	17.23	8.16	880	8.45	91.7
M5	24.1	17.22	8.16	881	8.45	91.7
M5	26.1	17.23	8.16	881	8.43	91.6
M5	28	17.22	8.16	881	8.44	91.6
M5	30.1	17.21	8.16	881	8.44	91.6
M5	34.9	17.22	8.16	881	8.43	91.5
M5	40.1	17.18	8.14	883	8.34	90.5
M5	44.6	15.82	7.81	911	5.99	63.1
M5	49.5	14.84	7.72	941	5.26	54.3
M5	54.3	14.57	7.7	942	5.25	53.9
M5	59.9	14.21	7.69	944	5.32	54.2
M5	65.2	13.74	7.71	936	5.51	55.6
M5	70.2	13.53	7.71	933	5.8	58.2
M5	75.1	13.38	7.72	949	6	60
M5	80	13.27	7.72	946	6.07	60.6
M5	85.1	13.15	7.72	945	6.09	60.6
M5	90.1	13.02	7.72	944	6.15	61
M5	95	12.93	7.72	946	6.1	60.4
M6	2	17.65	8.17	855	8.55	93.6
M6	4.1	17.48	8.17	858	8.48	92.6
M6	5.8	17.47	8.17	856	8.47	92.4
M6	7.8	17.43	8.16	858	8.46	92.2
M6	10	17.43	8.16	856	8.42	91.8
M6	11.8	17.41	8.16	858	8.38	91.3
M6	14	17.41	8.15	858	8.35	91
M6	16.1	17.4	8.15	858	8.34	90.9
M6	18	17.4	8.15	858	8.31	90.6
M6	20	17.4	8.15	859	8.3	90.5
M6	22.3	17.4	8.15	859	8.3	90.4

M6	24.1	17.4	8.15	857	8.3	90.4
M6	26.1	17.4	8.15	857	8.3	90.4
M6	27.9	17.39	8.14	859	8.27	90.1
M6	29.9	17.37	8.14	858	8.25	89.8
M6	35.2	16.91	8.01	864	7.5	80.9
M6	40	15.96	7.92	837	6.92	73.2
M6	45.1	14.82	7.86	845	6.76	69.8
M6	50.2	14.4	7.8	857	6.44	65.9
M6	54.9	14.2	7.73	895	5.95	60.6
M6	60	14	7.73	892	6.02	61
M6	65	13.79	7.73	892	6.09	61.5
M6	69.9	13.46	7.73	879	6.2	62.1
M6	75	13.22	7.71	872	6.16	61.4
M6	79.9	12.94	7.69	870	5.97	59.1
M6	85	12.83	7.67	880	5.62	55.5
M6	90.1	12.72	7.67	885	5.56	54.8
M6	95.1	12.68	7.65	898	5.43	53.4
M6	97.4	12.67	7.65	901	5.3	52.2
M7	2.1	17.45	8.19	836	8.46	92.3
M7	4	17.4	8.19	836	8.39	91.4
M7	6	17.39	8.19	838	8.36	91
M7	7.9	17.4	8.19	838	8.35	90.9
M7	9.9	17.39	8.19	839	8.35	90.9
M7	12	17.39	8.19	839	8.35	90.9
M7	14.1	17.39	8.18	838	8.34	90.8
M7	16	17.39	8.18	839	8.33	90.7
M7	18.1	17.39	8.18	839	8.32	90.6
M7	20.1	17.38	8.18	839	8.31	90.6
M7	21.9	17.38	8.18	839	8.3	90.4
M7	23.9	17.38	8.18	839	8.29	90.3
M7	26	17.38	8.18	839	8.29	90.2
M7	28	17.35	8.17	839	8.22	89.5
M7	29.9	17.35	8.16	838	8.18	89
M7	35	16.49	8.13	808	8.06	86.1
M7	40	15.7	8.15	805	8.4	88.3
M7	45	14.78	8.12	800	8.53	87.8
M7	50.4	14.25	8.08	802	8.57	87.3
M7	54.9	13.81	7.87	831	7.49	75.6
M7	60.2	13.65	7.78	842	6.36	63.9
M7	65.1	13.24	7.73	851	5.96	59.4
M7	70	12.98	7.69	854	5.57	55.2
M7	75	12.76	7.65	864	5.06	49.8
M7	80	12.67	7.65	881	5.1	50.2
M7	85.1	12.64	7.65	889	5.18	50.9
M7	90	12.61	7.65	894	5.2	51.1
M7	95	12.61	7.64	896	5.09	50
M7	98.1	12.61	7.63	896	4.94	48.6
M8	2.3	17.72	8.24	815	8.77	96.2
M8	4.3	17.62	8.25	816	8.85	96.8
M8	6.1	17.58	8.26	818	8.87	97

M8	8	17.55	8.26	818	8.85	96.7
M8	10.1	17.54	8.25	818	8.81	96.2
M8	11.9	17.52	8.25	818	8.75	95.6
M8	14	17.52	8.25	818	8.74	95.4
M8	16	17.52	8.25	819	8.74	95.4
M8	18	17.52	8.25	818	8.74	95.4
M8	20	17.51	8.26	819	8.75	95.6
M8	22	17.5	8.26	819	8.76	95.6
M8	24	17.47	8.25	818	8.69	94.8
M8	26	17	8.18	810	8.36	90.3
M8	28	16.74	8.18	811	8.47	91
M8	29.8	16.58	8.2	811	8.68	92.9
M8	34.9	15.66	8.16	804	8.75	91.9
M8	39.9	15.04	8.14	799	8.91	92.3
M8	45.2	14.64	8.13	796	9.07	93.2
M8	50.3	14.2	8.08	797	8.89	90.5
M8	55.2	14.01	8.09	792	9.05	91.7
M8	60.1	13.82	8.01	798	8.57	86.5
M8	60.2	13.82	8.01	798	8.62	87
M8	65.3	13.48	7.74	841	6.27	62.8
M8	70	13.12	7.68	843	5.72	56.9
M8	75	12.94	7.62	843	5.27	52.2
M8	79.9	12.83	7.58	845	4.72	46.6
M8	84	12.74	7.51	847	3.84	37.8
M9	2.3	14.16	8.28	801	9.94	101
M9	4	13.27	8.14	784	9.45	94.2
M9	6.1	13	8.08	784	8.93	88.5
M9	8	12.76	8.03	782	8.66	85.3
M9	10	12.63	8.02	778	8.94	87.8
M9	11.9	12.45	8.02	776	9.2	90
M9	13.9	12.14	8.04	775	9.49	92.2
M9	15.9	12.04	8.04	774	9.54	92.5
M9	18.1	11.84	8.04	778	9.52	91.9
M9	18.4	11.87	8.03	777	9.48	91.6
M10	1	17.11	8.17	872	8.62	93.4
M10	2	17.11	8.17	872	8.63	93.4
M10	4.4	17.11	8.18	875	8.62	93.4
M10	6.2	17.11	8.18	875	8.62	93.4
M10	9.3	17.11	8.18	877	8.61	93.3
M10	11.1	17.13	8.18	877	8.61	93.3
M10	13.6	17.13	8.18	877	8.59	93.1
M10	14.3	17.13	8.18	877	8.6	93.1
M10	17.6	17.13	8.17	877	8.59	93.1
M10	18.6	17.13	8.17	878	8.59	93.1
M10	21.2	17.11	8.17	878	8.58	93
M10	23.3	17.11	8.17	878	8.57	92.8
M10	27.2	17.1	8.17	881	8.55	92.5
M10	29.7	17.05	8.16	885	8.51	92.1
M10	32.2	17.03	8.16	887	8.47	91.6
M10	32.2	17.03	8.15	888	8.45	91.4

M10	35.7	17	8.15	891	8.45	91.3
M10	40.2	16.91	8.13	902	8.36	90.2
M10	48.9	15.13	7.82	937	8.06	83.7
M10	51.8	14.6	7.76	940	6.25	64.2
M10	57.2	14.22	7.74	941	5.62	57.3
M10	61.5	13.97	7.73	941	5.43	55
M10	65.8	13.84	7.71	940	5.44	55
M10	70.6	13.55	7.71	940	5.47	54.9
M10	79.6	13.3	7.71	937	5.55	55.4
M10	82	13.26	7.71	938	5.59	55.7
M10	87	13.11	7.71	938	5.68	56.5
M10	86	13.12	7.71	937	5.7	56.7
M11	2	17.22	8.13	930	8.65	93.9
M11	4.1	16.95	8.12	928	8.64	93.2
M11	6	16.86	8.12	928	8.63	93
M11	7.8	16.83	8.11	927	8.6	92.6
M11	10	16.81	8.11	928	8.57	92.3
M11	12	16.8	8.1	929	8.56	92.1
M11	14	16.8	8.1	929	8.53	91.7
M11	16	16.78	8.1	929	8.51	91.6
M11	18	16.8	8.1	935	8.5	91.4
M11	20	16.78	8.1	937	8.48	91.3
M11	22.1	16.78	8.1	937	8.48	91.2
M11	24	16.78	8.1	938	8.47	91.1
M11	25.9	16.76	8.1	938	8.47	91.1
M11	27.9	16.76	8.1	938	8.46	91
M11	30.1	16.76	8.09	939	8.43	90.6
M11	34.8	16.68	8.09	946	8.42	90.4
M11	39.9	16.1	8.1	959	8.6	91.2
M11	43.4	16.04	8.1	953	8.6	91.1

Table f. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for January 1997.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
M1	1.2	13.25	8.14	975	8.4	87.3
M1	3	13.24	8.14	976	8.44	87.7
M1	6.2	13.1	8.13	977	8.43	87.4
M1	9.9	13.04	8.13	978	8.41	87.1
M1	14.9	12.98	8.09	978	8.25	85.3
M1	19.4	12.97	8.08	978	8.09	83.6
M1	24.7	12.94	8.07	978	8.01	82.7
M1	30.5	12.94	8.07	979	7.96	82.2
M1	35.4	12.94	8.07	979	7.95	82.1
M1	39.7	12.93	8.06	979	7.93	81.9
M1	45.4	12.92	8.06	979	7.89	81.5
M1	50.7	12.91	8.06	980	7.87	81.2
M1	55	12.91	8.05	980	7.85	81.1
M1	60.6	12.91	8.05	980	7.81	80.6
M1	65.8	12.91	8.05	980	7.78	80.2
M1	69.9	12.91	8.05	980	7.77	80.2
M1	76.5	12.91	8.04	981	7.74	79.9
M1	86.1	12.91	8.04	982	7.69	79.4
M1	98.4	12.9	8.04	982	7.66	79
M2	1.6	13.42	8.15	968	8.65	90.3
M2	3.2	13.37	8.15	985	8.67	90.4
M2	5	13.08	8.16	986	8.66	89.7
M2	7.1	13.04	8.15	985	8.65	89.5
M2	9.1	13	8.15	985	8.65	89.4
M2	11	12.99	8.15	984	8.64	89.3
M2	13	12.98	8.15	984	8.6	88.9
M2	15.1	12.98	8.15	984	8.61	89
M2	16.9	12.94	8.14	984	8.57	88.6
M2	18.8	12.94	8.13	984	8.53	88
M2	21	12.93	8.13	985	8.51	87.8
M2	24	12.93	8.13	984	8.48	87.5
M2	26	12.92	8.13	985	8.47	87.4
M2	28	12.93	8.12	985	8.43	87
M2	30.2	12.93	8.12	985	8.42	86.9
M2	32.2	12.93	8.12	985	8.42	86.9
M2	34.5	12.91	8.12	986	8.41	86.8
M2	36.4	12.91	8.12	986	8.4	86.7
M2	39	12.91	8.12	986	8.39	86.6
M2	41.8	12.91	8.12	986	8.38	86.5
M2	44.5	12.93	8.12	988	8.36	86.4
M2	47	13.24	8.08	1083	8.16	84.9
M2	49.1	14.2	7.98	1386	7.8	82.9
M2	49.6	14.21	7.97	1393	7.48	79.6
M3	1.3	13.84	8.14	952	8.42	88.7

M3	2.1	13.33	8.14	959	8.44	87.9
M3	4.1	13.08	8.14	960	8.5	88.1
M3	6.2	13.05	8.14	961	8.44	87.4
M3	8.1	13.02	8.13	962	8.4	86.9
M3	10.3	13.02	8.12	962	8.34	86.3
M3	12.4	13.01	8.12	962	8.29	85.7
M3	14.9	13.01	8.11	963	8.27	85.5
M3	20	12.99	8.1	963	8.18	84.6
M3	25	12.98	8.08	964	8.02	82.9
M3	30.1	12.91	8.05	966	7.71	79.5
M3	35	12.91	8.04	967	7.64	78.8
M3	40.3	12.91	8.03	968	7.63	78.7
M3	45.1	12.91	8.03	970	7.62	78.7
M3	50.3	12.88	8.03	972	7.56	78
M3	54.9	12.88	8.03	974	7.56	77.9
M3	60.1	12.88	8.03	974	7.57	78
M3	64.9	12.86	8.03	974	7.55	77.9
M3	69.8	12.88	8.04	977	7.62	78.6
M3	75	12.86	8.03	977	7.6	78.3
M3	79.8	12.84	8.04	975	7.61	78.4
M3	86.9	12.79	8.04	970	7.58	78.1
M3	92.9	12.66	8.04	951	7.53	77.2
M3	98.7	12.53	8.06	935	7.58	77.5
M4	1.7	13.27	8.16	931	8.54	88.9
M4	3.8	12.92	8.15	937	8.23	85
M4	6	12.89	8.15	938	8.07	83.2
M4	8.1	12.87	8.14	938	8.04	82.9
M4	11.8	12.86	8.12	938	7.99	82.3
M4	14.9	12.86	8.12	939	7.95	81.9
M4	20	12.86	8.12	939	8	82.4
M4	24.9	12.86	8.12	940	7.97	82.2
M4	29.9	12.85	8.12	940	7.97	82.1
M4	35.2	12.82	8.08	945	7.71	79.4
M4	40.3	12.63	8.1	926	7.77	79.7
M4	45.2	12.6	8.11	922	7.81	80
M4	50.1	12.53	8.12	916	7.9	80.9
M4	54.9	12.5	8.14	913	8.03	82.1
M4	59.8	12.47	8.14	913	8.07	82.4
M4	65.6	12.43	8.16	912	8.2	83.7
M4	69.3	12.42	8.16	911	8.25	84.2
M4	75.4	12.4	8.16	911	8.26	84.3
M4	80.1	12.38	8.16	911	8.26	84.2
M4	85.1	12.32	8.17	911	8.28	84.3
M4	90.2	12.24	8.17	912	8.3	84.3
M4	98.3	12.1	8.18	915	8.33	84.4
M5	0.9	12.94	8.21	898	8.96	92.5
M5	2.2	12.92	8.21	900	8.95	92.4
M5	4.4	12.9	8.21	903	8.96	92.5
M5	6.7	12.83	8.21	905	8.96	92.3
M5	8.3	12.78	8.21	906	8.95	92.1

M5	10.1	12.71	8.21	906	8.94	91.8
M5	12.7	12.6	8.19	907	8.81	90.2
M5	15	12.57	8.18	908	8.73	89.4
M5	18.2	12.56	8.17	908	8.68	88.8
M5	21.2	12.55	8.16	908	8.62	88.2
M5	24.8	12.53	8.16	908	8.58	87.8
M5	30	12.53	8.15	908	8.55	87.4
M5	35.2	12.52	8.15	908	8.54	87.3
M5	40.3	12.52	8.15	908	8.53	87.2
M5	45.1	12.52	8.15	909	8.52	87.1
M5	50	12.5	8.15	909	8.51	87
M5	55.5	12.47	8.15	909	8.47	86.6
M5	60	12.43	8.14	909	8.41	85.8
M5	65.1	12.35	8.15	909	8.4	85.6
M5	70.3	12.15	8.15	909	8.43	85.5
M5	75.9	11.88	8.16	888	8.52	85.9
M5	79.8	11.81	8.17	882	8.54	85.9
M5	85.1	11.76	8.17	876	8.54	85.9
M5	91.8	11.63	8.17	862	8.56	85.8
M5	98.5	11.68	8.17	875	8.56	85.9
M6	0.9	12.88	8.18	861	8.91	91.8
M6	2.1	12.9	8.18	863	8.9	91.8
M6	4.4	12.88	8.17	866	8.91	91.8
M6	6.4	12.83	8.17	867	8.9	91.7
M6	9.4	12.64	8.17	868	8.93	91.6
M6	10.9	12.55	8.16	867	8.89	91
M6	12.7	12.5	8.15	865	8.81	90.1
M6	15.4	12.48	8.14	867	8.72	89.1
M6	15.8	12.48	8.14	869	8.64	88.3
M6	18.4	12.48	8.14	870	8.63	88.1
M6	19.9	12.47	8.14	871	8.62	88
M6	25.4	12.45	8.13	870	8.57	87.5
M6	30.6	12.34	8.12	862	8.53	86.9
M6	35.9	12.33	8.11	870	8.39	85.5
M6	40.8	12.32	8.11	877	8.34	85
M6	45.4	12.27	8.11	878	8.32	84.7
M6	51	12.09	8.11	858	8.36	84.6
M6	56.5	11.96	8.12	843	8.38	84.6
M6	60.1	11.92	8.12	842	8.43	85.1
M6	65.2	11.86	8.13	839	8.46	85.2
M6	70.2	11.76	8.13	830	8.48	85.2
M6	76.7	11.6	8.14	811	8.52	85.3
M6	81.7	11.42	8.14	799	8.56	85.4
M6	85.8	11	8.15	777	8.64	85.4
M6	90.2	10.93	8.15	775	8.76	86.3
M6	96.5	10.91	8.15	775	8.84	87.1
M6	98.1	10.91	8.15	775	8.85	87.2
M7	1.1	12.99	8.2	829	9.04	93.4
M7	1.7	12.98	8.2	845	9.04	93.4
M7	4.6	12.94	8.2	847	9.04	93.3

M7	6.4	12.86	8.2	846	9.03	93
M7	9.1	12.63	8.2	847	9.04	92.7
M7	10.9	12.59	8.19	848	9	92.2
M7	13.3	12.52	8.17	848	8.99	91.9
M7	14.5	12.5	8.16	848	8.79	89.8
M7	16.7	12.48	8.16	848	8.73	89.2
M7	18.4	12.42	8.15	846	8.69	88.7
M7	20.1	12.35	8.13	846	8.56	87.2
M7	25	12.29	8.12	844	8.38	85.3
M7	30	12.25	8.12	843	8.36	84.9
M7	34.1	12.21	8.11	841	8.34	84.7
M7	40	12.1	8.11	836	8.35	84.6
M7	45.9	12.01	8.12	827	8.37	84.6
M7	50.8	11.89	8.13	820	8.39	84.6
M7	55.4	11.84	8.13	816	8.44	85
M7	61.9	11.6	8.16	800	8.52	85.3
M7	65.1	11.48	8.16	793	8.74	87.3
M7	70.4	11.34	8.17	787	8.81	87.7
M7	76.5	11.16	8.17	780	8.94	88.6
M7	81.1	11.05	8.17	777	8.93	88.3
M7	85.5	10.98	8.16	775	8.94	88.2
M7	90.4	10.92	8.16	772	8.96	88.3
M7	95.7	10.89	8.16	771	8.97	88.4
M8	1	13.46	8.3	800	9.26	96.7
M8	2.8	13.09	8.31	807	9.33	96.6
M8	4.1	12.81	8.31	808	9.29	95.6
M8	6	12.52	8.3	808	9.33	95.4
M8	8.2	12.34	8.28	808	9.25	94.2
M8	10.7	12.29	8.26	809	9.07	92.2
M8	13.2	12.22	8.25	808	9.03	91.6
M8	14.1	12.2	8.24	807	8.9	90.4
M8	16.2	12.18	8.24	807	8.88	90.1
M8	18.8	12.16	8.24	806	8.84	89.6
M8	21.8	12.15	8.23	807	8.83	89.5
M8	26.4	12.08	8.23	805	8.82	89.3
M8	30.1	12.1	8.22	812	8.74	88.6
M8	35.8	12.03	8.2	812	8.72	88.1
M8	40.5	11.77	8.22	795	8.71	87.5
M8	45.5	11.66	8.21	792	8.8	88.2
M8	50.5	11.42	8.21	777	8.9	88.7
M8	55.2	11.09	8.2	755	9.03	89.3
M8	60.1	10.97	8.18	762	9.17	90.5
M8	65.6	10.84	8.18	761	9.1	89.5
M8	70.4	10.76	8.17	757	9.09	89.3
M8	75.5	10.68	8.17	757	9.1	89.2
M8	80.5	10.63	8.17	759	9.09	89
M8	83	10.58	8.15	764	8.9	87
M9	1	12.55	8.23	730	9.88	101.1
M9	2.7	11.64	8.24	733	10.06	100.8
M9	4.4	10.94	8.24	733	10.07	99.3

M9	6.3	10.63	8.23	736	10.02	98.1
M9	8.6	10.55	8.19	734	9.81	95.8
M9	10.1	10.41	8.19	736	9.72	94.7
M9	12	10.17	8.18	741	9.59	92.9
M9	13.9	10.09	8.17	746	9.54	92.2
M9	16.4	9.93	8.16	749	9.49	91.4
M9	18.1	9.88	8.15	746	9.26	89.1
M10	1.1	12.45	8.25	895	8.76	89.5
M10	1.9	12.45	8.25	898	8.77	89.5
M10	4	12.43	8.25	897	8.77	89.5
M10	6.4	12.43	8.25	898	8.76	89.4
M10	8.3	12.43	8.25	898	8.76	89.4
M10	10.6	12.43	8.25	898	8.76	89.4
M10	12.6	12.42	8.25	899	8.76	89.4
M10	14.4	12.42	8.25	898	8.75	89.3
M10	16.5	12.43	8.25	898	8.75	89.3
M10	18.6	12.43	8.25	898	8.74	89.3
M10	21.6	12.43	8.25	899	8.74	89.2
M10	25.7	12.42	8.24	899	8.73	89.1
M10	30.3	12.42	8.21	907	8.59	87.7
M10	35.8	12.35	8.21	905	8.48	86.4
M10	41	12.28	8.22	903	8.51	86.6
M10	45.4	12.27	8.22	904	8.53	86.8
M10	51.6	12.19	8.23	906	8.55	86.8
M10	54.9	12.01	8.24	912	8.68	87.8
M10	61	11.97	8.24	914	8.72	88.1
M10	65.3	11.96	8.24	914	8.74	88.3
M10	71.4	11.91	8.25	916	8.74	88.2
M10	76.7	11.85	8.25	919	8.74	88
M10	80.8	11.84	8.25	919	8.75	88.1
M10	85.8	11.79	8.25	921	8.75	88
M10	90.9	11.74	8.25	923	8.76	88
M10	95.7	11.73	8.25	924	8.76	88
M11	1.1	12.05	8.3	914	9.15	92.6
M11	2.6	12.07	8.3	916	9.14	92.5
M11	4.2	12.06	8.3	917	9.16	92.8
M11	6.5	12.09	8.3	918	9.17	92.9
M11	8.6	12.07	8.3	918	9.18	93
M11	9.3	12.08	8.3	918	9.18	92.9
M11	12.7	12.05	8.3	917	9.18	92.9
M11	14.5	12.03	8.3	917	9.16	92.7
M11	16.5	12.01	8.29	918	9.15	92.5
M11	18.7	11.87	8.29	921	9.15	92.2
M11	20.5	11.81	8.28	923	9.1	91.6
M11	25.2	11.75	8.27	924	9.02	90.6
M11	30.9	11.71	8.27	924	8.97	90.1
M11	35.3	11.7	8.26	925	8.9	89.4
M11	41.4	11.67	8.24	956	8.88	89.2
M11	43.5	11.66	8.2	1037	8.46	84.9

Table g. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for May 1997.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
M1	1.0	18.63	8.31	1009	9.02	106.6
M1	5.0	17.93	8.31	1010	9.17	106.9
M1	10.5	17.15	8.30	1010	9.31	106.8
M1	15.3	16.48	8.28	1011	9.36	105.9
M1	20.2	15.61	8.23	1010	9.27	103.0
M1	25.2	14.49	8.16	1011	9.09	98.6
M1	31.0	13.67	8.10	1013	8.96	95.5
M1	34.9	13.56	8.07	1011	8.63	91.7
M1	40.0	13.11	8.03	1007	8.53	89.7
M1	45.3	12.85	8.01	1003	8.53	89.2
M1	51.0	12.51	8.01	996	8.54	88.6
M1	54.6	12.44	8.00	993	8.55	88.6
M1	59.9	12.41	8.00	989	8.54	88.4
M1	64.7	12.32	8.00	983	8.53	88.1
M1	70.4	12.27	8.00	980	8.53	88.0
M1	75.4	12.14	8.01	968	8.55	88.0
M1	79.7	12.10	8.02	965	8.56	88.0
M1	85.1	12.07	8.02	963	8.54	87.7
M1	90.2	12.07	8.02	963	8.52	87.5
M1	95.3	12.05	8.02	961	8.51	87.3
M1	98.7	12.06	8.02	961	8.51	87.4
M2	2.4	19.45	8.39	1048	9.32	112.1
M2	5.1	18.24	8.38	1052	9.53	111.8
M2	7.6	17.30	8.34	1032	9.32	107.3
M2	9.5	16.74	8.32	1043	9.42	107.2
M2	11.8	16.30	8.29	1042	9.42	106.2
M2	14.2	16.14	8.28	1055	9.38	105.4
M2	17.1	15.73	8.22	1075	9.10	101.4
M2	19.4	15.42	8.15	1109	8.77	97.1
M2	21.3	15.08	8.11	1091	8.47	93.1
M2	24.8	14.84	8.07	1101	8.25	90.2
M2	28.1	14.33	8.00	1100	7.85	84.8
M2	31.3	14.07	7.95	1101	7.63	82.0
M2	33.2	14.01	7.96	1085	7.54	80.9
M2	36.2	13.70	7.95	1068	7.62	81.3
M2	39.0	13.20	7.94	1037	7.65	80.6
M2	43.7	12.81	7.95	1015	7.80	81.5
M2	48.2	12.62	7.95	1001	7.92	82.3
M2	51.5	12.55	7.95	997	8.00	83.1
M2	52.1	12.55	7.95	998	7.98	82.9
M2	52.1	12.54	7.95	998	7.98	82.9
M3	1.1	20.70	8.33	1002	8.81	108.6
M3	5.1	17.92	8.34	1003	9.20	107.3
M3	9.8	17.30	8.33	1008	9.25	106.4
M3	15.1	16.39	8.30	999	9.37	105.9

M3	19.9	14.89	8.21	999	9.26	101.3
M3	25.2	14.05	8.13	1005	8.92	95.8
M3	30.0	13.72	8.09	1006	8.69	92.6
M3	35.4	13.01	8.03	1003	8.53	89.5
M3	40.4	12.79	8.01	1000	8.48	88.6
M3	45.2	12.69	8.01	1000	8.49	88.5
M3	50.6	12.58	8.01	996	8.53	88.7
M3	55.0	12.52	8.00	995	8.53	88.6
M3	60.8	12.48	8.00	994	8.52	88.4
M3	65.0	12.41	8.01	988	8.51	88.1
M3	70.1	12.39	8.01	987	8.52	88.2
M3	75.5	12.34	8.01	984	8.52	88.1
M3	80.3	12.33	8.01	983	8.52	88.0
M3	85.2	12.31	8.01	980	8.51	87.9
M3	90.6	12.23	8.01	977	8.52	87.9
M3	95.0	12.22	8.02	973	8.51	87.8
M3	99.1	12.14	8.02	965	8.52	87.7
M4	1.4	18.59	8.34	982	8.99	106.3
M4	3.5	18.09	8.35	987	9.13	106.8
M4	5.7	17.89	8.35	985	9.15	106.6
M4	8.3	17.62	8.35	978	9.19	106.5
M4	11.1	16.42	8.35	947	9.30	105.1
M4	13.5	15.77	8.34	935	9.44	105.2
M4	17.3	14.92	8.31	934	9.49	103.8
M4	19.9	14.17	8.27	935	9.35	100.7
M4	24.3	13.21	8.19	939	9.13	96.2
M4	29.2	13.01	8.17	938	9.04	94.8
M4	33.4	12.68	8.14	937	8.96	93.4
M4	36.8	12.58	8.13	937	8.96	93.1
M4	40.5	12.44	8.12	936	8.94	92.6
M4	46.5	12.36	8.11	935	8.89	91.9
M4	51.6	12.30	8.11	936	8.89	91.8
M4	57.7	12.22	8.10	936	8.89	91.6
M4	64.8	12.16	8.10	938	8.87	91.3
M4	70.4	12.13	8.09	939	8.85	91.1
M4	79.0	12.08	8.09	938	8.84	90.9
M4	85.0	12.02	8.09	935	8.84	90.7
M4	98.7	11.88	8.09	931	8.84	90.4
M5	1.5	19.48	8.34	924	9.20	110.6
M5	4.5	15.73	8.32	931	9.56	106.4
M5	7.8	15.20	8.29	930	9.56	105.2
M5	11.7	15.06	8.28	928	9.46	103.8
M5	16.1	14.88	8.27	925	9.46	103.4
M5	20.4	14.57	8.25	929	9.46	102.7
M5	27.1	14.21	8.22	923	9.42	101.4
M5	32.0	13.68	8.19	921	9.35	99.6
M5	37.7	13.41	8.17	926	9.29	98.4
M5	43.8	13.02	8.14	921	9.21	96.7
M5	49.0	12.72	8.12	926	9.12	95.1
M5	56.1	12.35	8.09	926	9.08	93.9

M5	63.6	12.19	8.08	927	9.05	93.2
M5	70.5	12.03	8.07	922	9.03	92.7
M5	75.8	11.96	8.06	924	9.02	92.5
M5	82.1	11.83	8.06	919	9.03	92.3
M5	91.2	11.75	8.05	913	9.04	92.2
M5	97.8	11.74	8.05	913	9.00	91.7
M6	1.1	17.95	8.37	863	9.13	106.5
M6	1.7	17.75	8.37	862	9.13	106.0
M6	4.3	17.53	8.37	862	9.21	106.4
M6	6.2	16.83	8.37	865	9.32	106.2
M6	8.2	16.63	8.36	867	9.36	106.2
M6	10.0	16.35	8.35	869	9.39	105.9
M6	15.1	15.84	8.33	881	9.46	105.6
M6	20.2	15.42	8.30	892	9.47	104.7
M6	25.1	13.70	8.16	852	9.22	98.2
M6	30.6	12.97	8.11	845	9.21	96.5
M6	35.2	12.71	8.10	855	9.14	95.2
M6	40.1	12.44	8.09	857	9.10	94.3
M6	45.1	12.08	8.07	855	9.02	92.6
M6	50.0	11.85	8.06	847	9.01	92.1
M6	54.9	11.76	8.06	848	8.98	91.6
M6	60.2	11.66	8.05	846	8.95	91.0
M6	65.1	11.61	8.04	845	8.93	90.8
M6	70.2	11.55	8.04	843	8.91	90.4
M6	75.0	11.49	8.04	842	8.91	90.3
M6	79.9	11.47	8.03	841	8.90	90.1
M6	85.1	11.45	8.03	840	8.89	90.0
M6	89.7	11.42	8.03	838	8.88	89.8
M6	95.3	11.40	8.03	838	8.87	89.7
M6	97.3	11.41	8.03	838	8.85	89.5
M7	1.3	18.32	8.35	848	9.18	107.8
M7	2.8	18.24	8.35	849	9.15	107.3
M7	3.4	18.15	8.35	848	9.22	107.9
M7	5.1	17.91	8.34	849	9.26	107.9
M7	7.8	17.25	8.32	848	9.36	107.6
M7	9.5	17.06	8.31	848	9.41	107.7
M7	11.8	16.49	8.29	849	9.44	106.8
M7	14.0	15.38	8.22	860	9.43	104.2
M7	16.8	14.96	8.18	851	9.38	102.6
M7	20.1	14.72	8.16	851	9.38	102.1
M7	24.3	14.35	8.15	851	9.35	101.0
M7	27.4	13.80	8.13	850	9.33	99.6
M7	33.1	13.00	8.11	847	9.35	98.0
M7	39.9	12.66	8.10	844	9.35	97.3
M7	44.0	12.41	8.09	838	9.31	96.4
M7	47.7	12.28	8.08	836	9.29	95.8
M7	53.3	12.03	8.07	830	9.26	95.0
M7	59.7	11.74	8.07	825	9.25	94.3
M7	70.1	11.41	8.05	817	9.14	92.4
M7	75.8	11.36	8.03	815	9.05	91.4

M7	81.7	11.31	8.03	815	8.99	90.7
M7	87.4	11.30	8.02	815	8.93	90.1
M7	95.4	11.29	8.02	814	8.89	89.7
M8	1.2	17.93	8.38	864	8.96	104.5
M8	1.5	18.18	8.40	842	9.05	106.0
M8	3.0	17.90	8.40	844	9.10	106.0
M8	6.3	17.59	8.38	845	9.08	105.1
M8	10.5	16.93	8.36	847	9.19	104.9
M8	13.9	16.19	8.31	849	9.31	104.7
M8	17.8	15.03	8.22	850	9.30	101.9
M8	21.1	14.45	8.18	853	9.31	100.8
M8	24.1	14.11	8.17	853	9.33	100.2
M8	28.7	13.83	8.15	853	9.36	99.9
M8	33.4	13.49	8.14	852	9.34	99.1
M8	38.8	12.98	8.13	850	9.39	98.4
M8	44.7	12.72	8.12	847	9.35	97.4
M8	49.7	12.22	8.10	837	9.30	95.8
M8	55.0	11.83	8.08	828	9.25	94.4
M8	61.7	11.58	8.07	821	9.20	93.4
M8	66.8	11.44	8.05	819	9.11	92.3
M8	72.1	11.35	8.04	817	9.01	91.0
M8	77.0	11.27	8.03	815	8.97	90.4
M8	82.9	11.23	8.00	815	8.78	88.5
M8	85.5	11.23	7.98	816	8.57	86.4
M9	1.4	15.32	8.23	852	9.39	103.6
M9	4.5	15.31	8.22	852	9.47	104.4
M9	8.5	15.19	8.20	852	9.42	103.7
M9	12.4	14.64	8.15	854	9.08	98.7
M9	17.7	13.56	8.01	857	8.14	86.4
M9	21.0	13.15	7.95	858	7.73	81.3
M10	1.4	19.23	8.35	931	9.13	109.3
M10	4.1	17.64	8.36	929	9.42	109.1
M10	7.8	17.23	8.35	928	9.51	109.3
M10	12.0	16.91	8.34	928	9.47	108.0
M10	16.3	16.61	8.32	933	9.44	107.0
M10	21.7	15.83	8.30	941	9.48	105.8
M10	27.7	13.09	8.17	942	9.30	97.8
M10	33.7	12.86	8.14	936	9.16	95.8
M10	41.1	12.57	8.11	935	9.08	94.3
M10	46.9	12.54	8.10	934	9.05	94.0
M10	54.3	12.50	8.10	932	9.05	93.9
M10	60.7	12.45	8.09	932	9.03	93.6
M10	64.8	12.44	8.09	932	9.01	93.3
M10	72.1	12.19	8.08	925	9.01	92.8
M10	78.9	11.88	8.07	916	9.02	92.3
M10	84.9	11.86	8.07	915	9.03	92.3
M10	92.2	11.82	8.06	914	9.00	92.0
M10	98.6	11.80	8.06	914	8.97	91.6
M11	1.3	16.81	8.38	957	9.27	105.6
M11	3.4	16.80	8.38	957	9.38	106.8

M11	6.3	16.77	8.38	957	9.39	106.8
M11	9.4	16.73	8.38	958	9.39	106.7
M11	13.3	16.47	8.38	959	9.41	106.5
M11	17.3	15.82	8.34	973	9.37	104.6
M11	20.3	15.68	8.34	969	9.37	104.2
M11	23.0	14.24	8.27	977	9.22	99.4
M11	25.5	14.02	8.24	982	9.09	97.5
M11	28.3	13.44	8.20	971	9.01	95.4
M11	31.2	13.17	8.18	968	8.90	93.7
M11	34.3	12.98	8.17	962	8.81	92.4
M11	37.5	12.83	8.14	962	8.78	91.7
M11	40.6	12.67	8.10	965	8.65	90.1
M11	45.4	12.60	8.06	964	8.29	86.2
M11	45.9	12.59	8.04	964	8.07	83.8

Table h. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for August 1997.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%saturation)
M1	1.3	29.38	8.27	981	7.98	114.1
M1	4.0	28.64	8.32	982	7.99	112.5
M1	6.3	28.22	8.37	982	8.31	116.1
M1	7.5	27.69	8.42	981	8.42	116.6
M1	9.1	27.45	8.43	981	8.52	117.5
M1	12.5	27.22	8.40	982	8.46	116.1
M1	13.6	27.05	8.35	975	8.40	115.0
M1	14.9	23.05	8.32	918	8.69	110.5
M1	17.4	20.22	8.47	927	9.15	112.1
M1	20.7	18.65	8.22	935	9.21	107.4
M1	23.8	17.66	8.18	943	9.03	104.7
M1	27.6	16.79	8.13	965	8.76	98.3
M1	35.7	15.83	8.09	975	8.06	88.6
M1	39.1	15.22	7.92	980	7.35	79.8
M1	43.9	14.39	7.84	983	7.08	75.5
M1	45.9	13.57	7.94	972	7.31	76.6
M1	51.4	13.02	7.95	969	7.55	78.1
M1	59.7	12.69	7.96	982	7.73	79.4
M1	73.8	12.41	7.96	996	7.95	81.1
M1	85.0	12.25	7.96	996	8.01	81.5
M1	91.1	12.14	7.97	999	8.05	81.7
M1	105.0	12.10	7.95	1004	8.09	81.9
M1	111.3	12.05	7.95	1007	8.04	81.4
M1	122.7	12.00	7.90	1011	7.87	79.6
M1	135.2	11.99	7.84	1014	7.66	77.4
M1	145.4	11.99	7.81	1017	7.46	75.2
M1	147.4	12.00	7.80	1017	7.42	75.0
M2	1.5	31.95	8.75	996	10.25	150.3
M2	4.0	29.74	8.64	1000	11.96	170.0
M2	4.9	28.84	8.71	992	10.13	143.1
M2	8.4	27.76	8.49	1030	9.81	135.9
M2	9.6	27.59	8.42	1082	8.96	123.3
M2	11.0	26.92	8.25	1251	8.31	113.5
M2	12.0	26.31	7.75	1177	5.05	68.2
M2	14.5	25.00	7.84	1053	4.82	63.6
M2	16.7	23.15	8.01	965	5.87	74.8
M2	17.1	20.96	8.14	970	7.24	88.4
M2	24.4	18.91	7.70	985	6.22	71.5
M2	27.4	17.67	7.63	989	4.94	56.4
M2	31.2	16.42	7.59	1006	4.78	52.3
M2	35.6	15.32	7.64	1011	4.21	45.9
M2	37.5	14.75	7.69	1004	4.40	47.3
M2	42.4	14.18	7.69	1003	4.62	49.0
M2	50.1	13.71	7.69	1007	4.95	52.0

M2	51.1	13.49	7.74	1009	4.93	51.6
M2	54.5	13.28	7.62	1064	4.89	50.9
M3	2.4	29.61	8.38	966	8.16	116.8
M3	3.1	29.16	8.41	970	8.14	115.6
M3	5.2	28.45	8.41	975	8.41	118.1
M3	7.6	28.03	8.39	975	8.42	116.8
M3	9.0	27.73	8.38	973	8.47	117.3
M3	11.2	27.03	8.35	960	8.56	117.4
M3	14.2	25.22	8.33	958	8.60	113.9
M3	17.0	23.09	8.25	896	8.71	110.8
M3	17.5	21.96	8.24	872	8.92	111.0
M3	20.3	19.60	8.17	879	8.60	102.2
M3	22.4	17.86	8.15	884	8.55	98.1
M3	24.5	17.16	8.21	937	8.26	94.4
M3	28.1	16.84	8.05	926	8.36	93.9
M3	30.4	16.08	8.04	941	8.17	91.4
M3	34.1	15.85	7.91	954	7.86	85.5
M3	37.4	15.03	7.88	960	7.40	78.8
M3	43.9	14.17	7.86	963	7.18	76.2
M3	46.9	13.71	7.89	951	7.30	76.5
M3	61.7	12.68	7.95	965	7.84	80.5
M3	67.2	12.64	7.96	952	7.92	81.2
M3	72.2	12.40	7.97	957	8.14	83.1
M3	87.6	12.22	7.96	976	8.24	83.6
M3	93.1	12.09	7.95	974	8.28	83.8
M3	104.1	11.99	7.94	983	8.24	83.5
M3	113.4	11.98	7.93	990	8.20	82.9
M3	116.8	12.01	7.91	991	8.09	81.8
M4	1.0	29.23	8.38	919	8.00	113.7
M4	4.5	28.91	8.35	919	7.97	112.6
M4	6.5	28.63	8.36	936	8.21	115.9
M4	8.9	28.04	8.49	942	8.36	116.5
M4	9.1	27.22	8.52	961	8.64	118.6
M4	11.8	26.58	8.47	959	8.66	117.6
M4	13.5	25.92	8.46	936	9.05	119.0
M4	15.7	24.77	8.17	840	8.75	114.8
M4	16.5	21.61	8.22	845	8.61	105.5
M4	20.2	18.02	8.05	828	7.94	91.4
M4	21.2	19.02	7.93	830	7.98	93.7
M4	22.2	17.61	8.06	831	7.75	90.2
M4	25.5	16.55	8.03	858	7.52	86.0
M4	27.9	16.07	8.05	876	7.50	82.9
M4	33.7	15.48	8.13	905	7.57	81.7
M4	38.4	14.98	8.20	903	7.51	81.1
M4	41.7	14.11	8.11	911	7.56	80.1
M4	51.1	13.45	7.91	926	7.78	81.2
M4	52.9	13.23	8.05	928	7.92	82.3
M4	58.9	12.76	8.04	933	8.00	82.3
M4	68.8	12.62	7.97	939	8.18	84.0
M4	73.2	12.34	8.07	941	8.35	85.1

M4	84.8	12.15	8.04	944	8.47	85.8
M4	92.5	11.95	8.04	949	8.52	86.0
M4	100.6	11.88	7.98	951	8.46	85.3
M4	110.9	11.83	7.95	959	8.34	84.0
M4	115.9	11.84	7.90	959	8.27	83.3
M5	0.9	28.25	8.71	906	7.89	110.3
M5	2.1	27.71	8.46	905	7.98	110.5
M5	4.0	27.56	8.38	907	8.08	111.6
M5	5.9	27.44	8.38	905	8.03	110.7
M5	8.0	27.39	8.38	905	8.08	111.2
M5	10.0	27.32	8.38	904	8.11	111.4
M5	13.2	27.19	8.37	843	8.10	111.1
M5	16.2	22.36	8.19	836	8.62	108.1
M5	16.8	21.03	8.17	811	8.41	105.2
M5	19.9	19.72	8.05	811	8.22	97.9
M5	22.0	18.88	8.00	804	8.19	95.9
M5	23.7	17.95	7.97	815	8.05	92.0
M5	25.7	17.60	7.96	812	7.99	91.2
M5	26.0	17.22	7.96	815	7.75	87.8
M5	30.1	16.40	7.94	859	7.68	85.4
M5	32.8	16.25	7.93	899	7.81	84.4
M5	36.6	14.76	7.94	908	7.64	82.1
M5	42.0	13.85	7.96	917	7.74	81.6
M5	44.4	13.23	7.96	922	7.93	82.4
M5	52.6	12.93	7.98	926	8.10	83.6
M5	59.0	12.72	7.98	928	8.22	84.3
M5	63.3	12.54	7.99	933	8.21	84.0
M5	69.6	12.38	8.00	933	8.29	84.5
M5	75.8	12.21	7.98	921	8.36	85.0
M5	80.6	12.12	7.98	944	8.43	85.3
M5	84.5	11.97	7.98	942	8.41	85.2
M5	88.7	11.94	7.97	948	8.46	85.4
M5	94.9	11.84	7.96	950	8.44	85.0
M5	96.4	11.87	7.97	946	8.44	85.1
M5	100.8	11.83	7.94	954	8.43	84.9
M5	101.7	11.87	7.87	952	8.41	84.8
M6	2.2	27.86	8.38	898	8.13	112.9
M6	2.3	27.86	8.38	898	8.16	113.2
M6	4.0	27.83	8.39	898	8.14	113.0
M6	8.0	27.79	8.38	902	8.16	112.9
M6	8.7	27.69	8.38	897	8.11	112.2
M6	11.0	26.58	8.36	874	8.20	113.8
M6	12.5	25.02	8.37	831	8.83	116.4
M6	15.8	23.06	8.18	787	8.78	111.8
M6	18.4	21.17	8.09	777	8.50	106.3
M6	20.2	20.40	8.00	780	8.25	99.6
M6	21.0	18.55	8.00	782	8.00	93.1
M6	26.9	17.43	7.90	808	7.83	88.0
M6	28.5	16.44	7.89	836	7.41	82.5
M6	33.5	15.64	7.89	876	7.29	79.8

M6	39.8	14.46	7.91	888	7.33	78.3
M6	41.4	13.85	7.93	880	7.46	78.6
M6	48.2	13.20	7.94	875	7.64	79.3
M6	54.9	12.59	7.96	867	7.84	80.3
M6	57.9	12.48	7.96	865	7.97	81.4
M6	59.9	12.26	7.98	867	8.07	81.7
M6	69.7	12.08	7.96	861	8.13	82.0
M6	75.3	11.84	7.94	856	8.11	81.7
M6	84.2	11.61	7.95	861	8.13	81.4
M6	90.2	11.56	7.95	870	8.06	80.7
M6	99.3	11.56	7.95	894	7.99	80.2
M6	103.0	11.60	7.95	912	7.99	80.3
M6	109.1	11.66	7.93	920	7.93	79.5
M6	113.8	11.69	7.67	927	7.27	73.0
M7	0.3	28.64	8.41	877	8.16	114.8
M7	2.1	28.63	8.47	877	8.08	113.8
M7	2.2	28.48	8.42	875	8.16	114.4
M7	5.9	27.77	8.43	868	8.41	116.5
M7	7.7	27.43	8.46	863	8.58	118.2
M7	8.4	27.01	8.40	865	8.78	120.0
M7	9.4	25.70	8.40	856	8.98	119.9
M7	10.5	24.84	8.43	808	9.10	119.8
M7	13.5	23.45	8.13	779	8.72	111.6
M7	15.1	20.13	8.11	775	8.47	101.6
M7	15.4	20.15	8.11	774	8.67	104.1
M7	17.0	19.34	8.06	773	8.28	97.8
M7	18.1	18.86	8.06	767	8.32	97.4
M7	21.2	18.67	8.03	772	8.16	94.9
M7	23.3	18.43	8.03	773	8.08	93.7
M7	24.3	18.44	8.01	772	8.08	93.8
M7	26.6	18.18	8.02	774	7.99	92.2
M7	29.6	16.85	7.95	827	7.90	89.5
M7	40.0	14.34	7.89	861	7.62	81.1
M7	44.9	13.54	7.94	855	7.84	82.0
M7	48.0	13.18	7.96	851	8.01	83.1
M7	52.3	12.72	7.98	843	8.17	83.9
M7	54.1	12.46	7.98	851	8.31	84.9
M7	60.9	12.26	7.97	845	8.43	85.7
M7	67.5	11.78	7.91	844	8.20	82.5
M7	72.6	11.70	7.87	846	8.05	81.5
M7	75.1	11.66	7.86	848	7.95	79.7
M7	88.8	11.60	7.84	854	7.85	78.6
M7	97.9	11.60	7.84	857	7.76	77.7
M7	100.1	11.58	7.81	859	7.64	76.4
M7	100.1	11.60	7.59	862	7.26	72.7
M8	0.3	29.54	8.49	803	9.09	129.9
M8	0.7	29.82	8.51	791	8.41	121.9
M8	2.1	28.65	8.46	838	8.59	120.3
M8	7.1	27.77	8.49	843	9.11	126.2
M8	9.6	26.04	8.46	818	9.25	124.3

M8	10.4	23.54	8.41	758	9.32	123.6
M8	14.1	21.43	8.15	776	8.84	108.9
M8	14.5	20.31	8.15	768	8.70	104.8
M8	19.6	19.03	8.06	770	8.33	98.5
M8	23.8	18.51	8.09	770	8.39	97.5
M8	25.5	18.37	8.08	772	8.46	98.1
M8	31.9	18.19	8.06	769	8.25	95.2
M8	37.2	16.30	7.95	821	7.85	87.2
M8	43.3	13.88	7.99	844	8.03	84.7
M8	46.0	12.80	7.99	836	8.38	86.2
M8	56.4	12.51	7.97	840	8.48	86.4
M8	61.5	12.27	7.97	839	8.41	85.5
M8	63.9	11.94	7.95	838	8.36	84.4
M8	67.8	11.76	7.95	841	8.38	84.2
M8	80.2	11.63	7.93	843	8.35	83.7
M8	84.2	11.54	7.87	849	7.55	75.5
M8	85.8	11.54	7.83	850	8.31	83.1
M9	0.3	29.52	8.49	802	8.40	120.0
M9	2.9	28.75	8.56	807	8.66	122.2
M9	3.1	29.40	8.50	801	8.37	119.3
M9	4.3	27.32	8.46	757	8.59	123.8
M9	5.6	24.84	8.40	771	9.02	118.5
M9	6.0	23.13	8.29	753	8.93	113.6
M9	8.2	19.22	7.98	769	8.89	104.8
M9	9.5	18.46	7.87	772	8.69	100.9
M9	12.7	18.01	7.93	772	8.11	93.2
M9	14.3	17.72	7.96	775	7.92	91.6
M9	17.5	17.50	7.64	785	7.20	82.0
M9	17.9	17.24	7.73	794	5.88	66.1
M9	20.1	16.36	7.31	806	2.42	26.9
M9	21.0	15.91	7.29	810	1.62	17.9
M10	2.1	28.11	8.32	924	8.19	114.2
M10	2.3	28.69	8.34	920	8.06	113.6
M10	4.2	28.08	8.32	920	8.13	113.3
M10	5.0	27.92	8.33	914	8.09	113.4
M10	7.9	27.45	8.30	911	8.25	112.8
M10	9.3	26.51	8.28	893	8.16	110.6
M10	10.1	25.86	8.27	885	8.47	111.7
M10	12.3	24.90	8.24	852	8.56	110.8
M10	14.5	22.56	8.22	804	8.60	108.2
M10	16.4	20.40	8.06	781	8.43	101.8
M10	16.6	21.65	8.05	787	8.49	105.0
M10	18.6	19.30	8.07	788	8.18	96.6
M10	22.2	18.69	7.99	800	8.00	92.8
M10	24.9	17.61	8.02	841	7.77	88.7
M10	29.3	17.00	7.85	895	7.54	85.2
M10	31.8	15.03	7.95	904	7.32	80.2
M10	38.0	14.54	7.93	912	7.34	78.5
M10	43.4	13.90	7.82	920	7.42	77.7
M10	48.3	13.13	7.89	916	7.35	76.2

M10	53.4	12.74	7.91	919	7.60	78.2
M10	59.0	12.65	7.90	918	7.66	78.7
M10	62.6	12.46	7.90	925	7.80	79.5
M10	68.6	12.45	7.91	927	7.85	80.0
M10	73.7	12.27	7.91	928	7.95	80.7
M10	88.4	12.04	7.93	929	8.12	82.2
M10	95.5	11.95	7.93	931	8.22	83.0
M10	100.7	11.85	7.89	933	8.22	82.8
M10	100.7	11.88	7.89	935	8.17	82.4
M11	1.3	31.63	8.34	951	7.67	112.6
M11	3.6	29.36	8.37	948	7.94	113.2
M11	5.1	28.80	8.38	949	7.97	112.6
M11	7.2	28.61	8.37	946	8.08	113.6
M11	9.6	28.04	8.20	882	8.05	109.7
M11	11.4	23.97	8.18	852	7.37	95.4
M11	14.6	20.88	8.17	843	8.16	98.5
M11	15.6	20.42	8.15	836	8.16	98.5
M11	17.0	19.55	8.13	854	8.13	96.2
M11	18.1	19.23	8.11	858	7.95	93.7
M11	20.7	18.88	8.08	869	7.87	92.2
M11	20.7	18.86	8.19	867	7.69	90.0
M11	26.1	18.06	8.00	909	7.54	86.9
M11	29.2	16.22	7.92	936	7.15	80.3
M11	33.0	15.43	7.87	944	6.50	72.6
M11	36.8	14.59	7.80	948	5.99	64.2
M11	43.4	13.83	7.73	952	5.97	63.9
M11	45.6	13.74	7.65	955	5.29	55.6

Table i. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for November 1997.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)
M1	0.8	19.8	7.8	951	7.87
M1	1.9	19.7	7.8	951	7.77
M1	4	19.67	7.8	952	7.72
M1	6.1	19.63	7.8	951	7.69
M1	8	19.65	7.8	951.0	7.67
M1	10	19.65	7.79	952.0	7.65
M1	12	19.65	7.79	952.0	7.62
M1	14.1	19.61	7.79	952.0	7.62
M1	15.9	19.63	7.79	953.0	7.6
M1	17.9	19.63	7.79	953.0	7.59
M1	20	19.61	7.78	953.0	7.55
M1	22.1	19.61	7.78	953.0	7.5
M1	24	19.59	7.77	953.0	7.46
M1	25.9	19.56	7.73	951.0	7.23
M1	28.1	19.34	7.6	949.0	6.46
M1	31	18.70	7.4	899.0	5.42
M1	34.9	17.41	7.3	909.0	4.93
M1	39.6	16.5	7.28	936	4.9
M1	44.9	15.52	7.26	954.0	4.86
M1	49.8	14.72	7.28	954.0	5.1
M1	55.2	13.93	7.31	955.0	5.56
M1	60.7	13.40	7.35	947.0	6.01
M1	69.7	12.99	7.4	940.0	6.48
M1	79.6	12.66	7.44	933.0	6.82
M1	89.6	12.46	7.42	941.0	6.8
M1	99.3	12.36	7.43	943.0	6.76
M1	109.6	12.30	7.43	944.0	6.78
M1	120	12.23	7.39	949.0	6.5
M1	140	12.23	7.39	949.0	6.5
M3	0.6	20.38	7.8	944.0	7.9
M3	1.1	20.31	7.8	943.0	7.88
M3	2	20.03	7.8	945.0	7.85
M3	4	19.92	7.8	944.0	7.83
M3	6.1	19.89	7.8	945.0	7.81
M3	8	19.87	7.79	945.0	7.8
M3	10.1	19.87	7.79	946.0	7.79
M3	11.8	19.86	7.79	945.0	7.78
M3	14.1	19.84	7.78	945.0	7.74
M3	16.3	19.84	7.78	945.0	7.69
M3	18.1	19.82	7.78	945.0	7.67
M3	19.9	19.82	7.77	946.0	7.63
M3	22.1	19.73	7.73	943.0	7.48
M3	24.1	19.39	7.57	916.0	6.59
M3	26	18.69	7.34	857.0	5.47

M3	28.1	18.43	7.29	852.0	5.21
M3	30.1	17.97	7.29	850.0	5.25
M3	32	17.7	7.28	859	5.2
M3	34.9	17.22	7.27	872	5.22
M3	39.9	16.44	7.27	905.0	5.17
M3	45.1	15.48	7.26	927.0	5.22
M3	50.1	14.52	7.27	936.0	5.47
M3	55.5	13.73	7.31	933.0	5.97
M3	60.4	13.30	7.35	926.0	6.16
M3	65.1	13.09	7.37	923.0	6.58
M3	70.2	12.91	7.37	922.0	6.7
M3	80.3	12.61	7.39	921.0	6.81
M3	90.2	12.41	7.39	921.0	6.82
M3	99.9	12.30	7.39	925.0	6.86
M3	109.9	12.23	7.38	927.0	6.81
M3	117	12.23	7.36	930.0	6.63
M4	0.7	19.5	7.84	885	8.05
M4	1	19.44	7.83	886	8.03
M4	2	19.44	7.83	888	7.98
M4	3.2	19.5	7.83	889	7.96
M4	3.9	19.5	7.83	889	7.94
M4	5.9	19.44	7.83	890.0	7.93
M4	8	19.42	7.83	888.0	7.91
M4	10	19.42	7.83	890.0	7.9
M4	12	19.41	7.82	889.0	7.87
M4	14.1	19.39	7.82	889.0	7.87
M4	16	19.38	7.82	889.0	7.85
M4	18	19.29	7.8	884.0	7.77
M4	20.4	19.17	7.79	882.0	7.7
M4	22.2	19.11	7.79	881.0	7.68
M4	24.2	18.94	7.73	872.0	7.42
M4	26.1	18.76	7.69	866.0	7.27
M4	28.1	18.36	7.55	836.0	6.64
M4	30.1	17.89	7.43	821.0	6.17
M4	32.4	17.45	7.38	826.0	5.77
M4	35.1	17.1	7.36	840	5.55
M4	40	15.72	7.35	880.0	5.53
M4	45.3	14.85	7.36	902.0	5.64
M4	50.1	14.41	7.36	907.0	5.79
M4	55.3	14.01	7.37	913.0	5.92
M4	60.2	13.63	7.38	914.0	6.05
M4	64.9	13.28	7.4	915.0	6.32
M4	69.6	13.0	7.42	919	6.53
M4	80	12.63	7.45	912	6.92
M4	90.3	12.31	7.46	905.0	7.13
M4	100.2	12.17	7.45	901	7.06
M4	110	12.2	7.42	915	6.82
M4	120	12.1	7.41	918	6.66
M4	130	12.08	7.4	916	6.53
M5	0.5	19.5	7.78	874	8.31

M5	1	19.5	7.81	874	8.28
M5	1.9	19.49	7.81	874	8.26
M5	2.8	19.49	7.8	874	8.21
M5	3.9	19.44	7.81	874.0	8.2
M5	5.1	19.39	7.81	875.0	8.17
M5	6.1	19.4	7.81	874	8.14
M5	7.2	19.36	7.8	874.0	8.13
M5	8.1	19.34	7.8	874.0	8.11
M5	9.1	19.32	7.8	874.0	8.04
M5	10	19.25	7.78	873.0	7.93
M5	11.8	19.24	7.78	873.0	7.94
M5	13.8	19.20	7.78	873.0	7.95
M5	16	19.18	7.78	871.0	7.97
M5	18	19.17	7.78	868.0	7.99
M5	20	19.17	7.79	867.0	8
M5	22.1	19.13	7.78	866.0	8.02
M5	23.6	19.13	7.78	866.0	8.02
M5	26	19.11	7.78	867.0	7.99
M5	28	19.10	7.77	869.0	7.93
M5	30.1	18.84	7.69	869.0	7.14
M5	32.1	17.51	7.41	834.0	6.25
M5	35.1	16.82	7.33	844.0	5.64
M5	40.1	16.10	7.31	867.0	5.55
M5	44.8	15.33	7.31	882.0	5.61
M5	50	14.49	7.3	901.0	5.64
M5	55.1	14.01	7.3	903.0	5.72
M5	60.1	13.61	7.33	918.0	6.06
M5	64.9	13.30	7.34	908.0	6.19
M5	69.8	13.02	7.36	907.0	6.39
M5	81.1	12.61	7.39	905.0	6.77
M5	90.2	12.26	7.38	890.0	6.83
M5	100	12.13	7.39	901.0	6.86
M5	109.7	12.1	7.37	899	6.66
M5	117	12.1	7.36	899	6.58
M6	0.7	20.27	7.83	853.0	8
M6	1.3	19.73	7.84	858.0	8.07
M6	2.2	19.54	7.84	860.0	8.09
M6	4.1	19.44	7.84	861.0	8.1
M6	6.3	19.39	7.84	862.0	8.09
M6	8	19.39	7.84	862.0	8.08
M6	10.2	19.36	7.83	862.0	8.05
M6	12.1	19.36	7.83	861.0	8.03
M6	14.3	19.34	7.83	862.0	8
M6	16.2	19.34	7.82	862.0	7.96
M6	18.1	19.34	7.82	861.0	7.95
M6	20	19.32	7.81	862.0	7.87
M6	21.9	19.15	7.76	861.0	7.66
M6	24	19.10	7.76	863.0	7.67
M6	26.2	18.99	7.73	860.0	7.58
M6	27.9	18.53	7.63	837.0	7.23

M6	29.7	17.95	7.57	806.0	7.2
M6	32	17.53	7.59	804.0	7.42
M6	34.8	17.06	7.61	803.0	7.54
M6	40.2	15.83	7.61	803.0	7.74
M6	45.1	15.0	7.5	819	7.27
M6	50	14.49	7.36	873.0	6.04
M6	55.4	13.65	7.36	873.0	6.19
M6	60.9	13.20	7.37	865.0	6.39
M6	64.9	12.88	7.38	856.0	6.51
M6	70.2	12.60	7.38	848.0	6.65
M6	76.3	12.33	7.36	842.0	6.6
M6	80.1	12.25	7.36	842.0	6.51
M6	90.3	12.03	7.34	844.0	6.37
M6	99.7	11.97	7.33	853.0	6.17
M6	103.3	11.97	7.32	858.0	6.06
M7	0.9	19.87	7.86	857.0	8.29
M7	3	19.86	7.86	858.0	8.25
M7	3.8	19.81	7.85	858.0	8.22
M7	6	19.60	7.86	859.0	8.23
M7	8.2	19.60	7.86	859.0	8.16
M7	10	19.58	7.85	860.0	8.13
M7	12	19.56	7.85	859.0	8.1
M7	13.8	19.54	7.85	859.0	8.07
M7	16.1	19.5	7.84	859	8.01
M7	18.1	19.54	7.84	859.0	8
M7	20.2	18.98	7.66	833.0	7.37
M7	22.4	18.76	7.64	819.0	7.35
M7	26.4	18.16	7.66	807.0	7.45
M7	28.1	17.79	7.67	803.0	7.69
M7	29.7	17.53	7.69	804.0	7.89
M7	32	17.14	7.72	804.0	8.01
M7	35	16.71	7.7	801.0	8.11
M7	39.6	16.12	7.68	797.0	8.23
M7	44.7	15	7.63	796	8.15
M7	49.1	14.6	7.61	797	8.17
M7	56	13.9	7.46	821	7.24
M7	61.1	13.22	7.37	838	6.56
M7	66.3	12.87	7.36	837	6.53
M7	69.6	12.61	7.35	835.0	6.47
M7	80.6	12.18	7.29	833.0	6.04
M7	90.5	12.08	7.25	836.0	5.57
M7	100.1	11.97	7.27	845.0	5.64
M7	103.5	11.99	7.23	846.0	5.48
M8	0.7	20.05	7.93	838.0	8.3
M8	2.1	19.84	7.93	840.0	8.38
M8	4	19.73	7.93	846.0	8.4
M8	6.2	19.70	7.92	846.0	8.35
M8	8	19.68	7.91	846.0	8.26
M8	9.9	19.65	7.9	846.0	8.13
M8	12.2	19.58	7.91	846.0	8.14

M8	13.9	19.58	7.91	845.0	8.17
M8	16	19.54	7.89	844.0	8.16
M8	18	19.5	7.87	840	8
M8	20	18.41	7.65	803	7.42
M8	21.9	18.04	7.7	806.0	7.66
M8	24.1	17.67	7.71	805.0	7.8
M8	25.9	17.45	7.76	810.0	8.03
M8	28.1	17.23	7.74	805.0	8.09
M8	29.9	16.99	7.77	808.0	8.14
M8	33.1	16.57	7.79	808.0	8.41
M8	35.1	16.40	7.78	804.0	8.42
M8	40.1	15.65	7.7	796.0	8.36
M8	44.8	15.25	7.67	794.0	8.31
M8	50	14.79	7.65	795.0	8.33
M8	55	14.34	7.62	799.0	8.35
M8	60	14.0	7.57	800	7.9
M8	64.9	13.04	7.36	837.0	6.45
M8	69.8	12.64	7.34	832.0	6.33
M8	80.3	12.23	7.33	829.0	6.21
M8	87.7	12.07	7.2	828.0	5.06
M8	90	12.08	7.06	833.0	3.62
M9	0.6	18.74	8.01	838.0	9.16
M9	2.1	18.57	8.01	840.0	9.16
M9	3.9	18.14	8.02	841.0	9.27
M9	6.1	17.9	7.96	835	8.99
M9	8	15.38	7.58	780.0	7.99
M9	9.9	14.07	7.6	772.0	8.42
M9	12.1	13.76	7.61	771.0	8.59
M9	14.3	13.61	7.62	770.0	8.8
M9	16	13.50	7.62	770.0	8.93
M9	19	13.37	7.62	771.0	8.97
M9	21.7	13.17	7.6	774.0	8.68
M9	23.8	13.09	7.6	771.0	8.64
M10	0.6	18.88	7.77	866	8.26
M10	1.1	18.9	7.77	866	8.22
M10	1.9	18.9	7.77	866	8.21
M10	2.8	18.89	7.77	867	8.17
M10	4	18.89	7.77	867	8.13
M10	5.9	18.9	7.77	868	8.11
M10	8.1	18.9	7.75	871	8.02
M10	9.8	18.9	7.75	872	7.99
M10	12.1	18.8	7.75	872	7.98
M10	14.1	18.8	7.75	872	7.96
M10	16.1	18.8	7.75	872	7.96
M10	18	18.8	7.75	872	7.93
M10	20.1	18.8	7.75	872	7.92
M10	22	18.8	7.75	872	7.91
M10	24.2	18.8	7.74	872	7.9
M10	26	18.8	7.74	874	7.86
M10	28	18.8	7.74	875	7.87

M10	30.1	17.73	7.46	849	6.32
M10	30.2	17.7	7.46	850	6.61
M10	32.5	17.04	7.36	848	5.9
M10	35.1	16.52	7.36	840	5.99
M10	40.4	16.2	7.34	851	5.82
M10	45.3	15.3	7.31	884	5.53
M10	50.1	14.31	7.3	895	5.53
M10	55.1	13.7	7.3	899	5.62
M10	59.8	13.4	7.31	901	5.76
M10	64.9	13.17	7.31	902	5.85
M10	70	12.9	7.32	900	6.07
M10	75	12.77	7.34	897	6.25
M10	80.1	12.58	7.36	896	6.47
M10	90.5	12.25	7.37	891	6.68
M10	100.4	12.1	7.37	892	6.64
M10	102.9	12.15	7.36	892	6.58
M10	102.9	12.3	7.37	889	6.56
M11	0.8	18.95	7.76	914	8.03
M11	1.8	18.98	7.76	915	7.98
M11	3.1	19.0	7.76	915	7.94
M11	4.2	18.98	7.76	915	7.92
M11	5	18.95	7.75	915	7.88
M11	6	18.9	7.75	917	7.83
M11	7.1	18.9	7.75	918	7.82
M11	8.1	18.9	7.75	919	7.82
M11	10	18.89	7.75	918	7.76
M11	11.9	18.88	7.74	922	7.66
M11	14.2	18.9	7.74	925	7.62
M11	16.2	18.85	7.74	926	7.62
M11	18.2	18.86	7.74	925	7.61
M11	18.3	18.9	7.74	926	7.62
M11	20.1	18.8	7.74	926	7.61
M11	22.1	18.82	7.73	925	7.56
M11	23.9	18.74	7.67	923	7.14
M11	26	18.5	7.56	929	6.48
M11	28.2	18.1	7.47	909	5.92
M11	30.1	17.8	7.39	887	5.46
M11	34.2	17.0	7.29	884	4.86
M11	39	16.4	7.26	893	4.56
M11	44.1	15.23	7.19	917	3.92
M11	47.4	14.7	7.16	921	3.46
M11	47.5	14.6	7.15	922	3.34

Table j. Water quality profiles for Hydroacoustic sampling stations on Lake Mead for January 1998.

Station	Depth (m)	Temperature (Centigrade)	pH	Conductance (us/cm)	Dissolved Oxygen (mg/L)
M1	1.8	12.76	7.52	948	8.56
M1	2.8	12.76	7.52	948	8.47
M1	4.7	12.77	7.53	948	8.47
M1	8.2	12.76	7.53	948	8.43
M1	11.1	12.76	7.52	948	8.38
M1	15.1	12.76	7.53	948	8.33
M1	20.7	12.74	7.52	948	8.29
M1	26.1	12.73	7.51	948	8.19
M1	29.5	12.67	7.49	950	8.02
M1	35.3	12.62	7.46	951	7.64
M1	40.2	12.59	7.44	950	7.52
M1	45.9	12.56	7.43	948	7.37
M1	51.0	12.47	7.40	938	7.01
M1	59.8	12.33	7.36	926	6.54
M1	70.3	12.25	7.34	924	6.38
M1	79.2	12.22	7.32	925	6.17
M1	90.2	12.18	7.30	933	6.01
M1	100.6	12.17	7.30	935	5.99
M1	109.4	12.16	7.30	937	5.97
M1	117.2	12.14	7.29	939	5.93
M1	130.9	12.13	7.28	945	5.77
M1	138.7	12.11	7.26	948	5.65
M2	1.4	12.77	7.60	949	9.01
M2	3.1	12.77	7.60	949	9.01
M2	6.1	12.77	7.60	949	9.04
M2	9.0	12.77	7.60	949	9.02
M2	12.0	12.77	7.60	949	9.00
M2	14.9	12.77	7.60	949	8.99
M2	18.3	12.77	7.60	949	8.96
M2	21.0	12.76	7.60	949	8.95
M2	24.4	12.76	7.60	949	8.94
M2	27.5	12.76	7.60	949	8.95
M2	30.0	12.76	7.60	949	8.93
M2	35.0	12.75	7.60	949	8.94
M2	40.0	12.70	7.59	955	8.90
M2	45.0	12.69	7.59	959	8.86
M2	49.7	12.67	7.58	962	8.81
M2	54.9	12.69	7.57	979	8.74
M2	59.0	12.84	7.54	1036	8.64
M3	0.3	12.75	7.58	947	8.76
M3	2.0	12.77	7.57	947	8.78
M3	4.1	12.76	7.57	947	8.79
M3	6.0	12.77	7.57	947	8.79
M3	10.0	12.77	7.57	948	8.78

M3	15.1	12.77	7.57	948	8.77
M3	20.1	12.78	7.57	948	8.74
M3	25.0	12.78	7.57	948	8.72
M3	31.8	12.78	7.57	948	8.71
M3	35.0	12.78	7.57	949	8.71
M3	40.2	12.78	7.57	949	8.66
M3	45.2	12.78	7.56	950	8.62
M3	50.0	12.78	7.56	950	8.59
M3	59.9	12.77	7.56	951	8.56
M3	70.1	12.70	7.54	948	8.36
M3	80.1	12.41	7.41	922	7.13
M3	90.3	12.31	7.39	917	6.99
M3	99.6	12.16	7.42	913	7.12
M3	109.7	12.11	7.43	915	7.29
M3	119.7	12.09	7.31	938	6.13
M3	120.0	12.09	7.31	938	6.09
M4	0.6	12.81	7.58	930	8.81
M4	2.1	12.85	7.58	931	8.79
M4	4.2	12.85	7.58	931	8.80
M4	6.0	12.85	7.58	931	8.80
M4	8.1	12.84	7.58	932	8.79
M4	10.0	12.85	7.57	932	8.79
M4	14.7	12.84	7.57	932	8.78
M4	20.3	12.84	7.58	932	8.76
M4	25.1	12.85	7.58	932	8.72
M4	30.3	12.85	7.58	932	8.72
M4	35.3	12.85	7.57	933	8.68
M4	40.6	12.81	7.55	934	8.49
M4	45.0	12.81	7.53	941	8.29
M4	50.1	12.57	7.52	910	8.15
M4	60.1	12.33	7.55	901	8.30
M4	70.2	12.24	7.56	898	8.44
M4	81.7	12.10	7.56	896	8.42
M4	89.9	12.05	7.56	895	8.45
M4	101.3	11.98	7.57	897	8.51
M4	110.4	11.97	7.58	897	8.54
M4	120.8	11.98	7.58	897	8.54
M4	130.7	11.97	7.58	897	8.52
M4	139.8	11.97	7.58	899	8.51
M4	140.4	11.97	7.58	898	8.51
M5	1.2	12.49	7.63	899	9.01
M5	2.3	12.49	7.63	900	9.00
M5	4.8	12.49	7.63	900	9.02
M5	6.0	12.49	7.63	900	9.02
M5	10.9	12.48	7.63	898	9.04
M5	14.9	12.46	7.63	897	9.02
M5	20.8	12.40	7.63	892	9.02
M5	25.9	12.34	7.63	888	9.03
M5	30.4	12.32	7.63	886	9.01
M5	35.9	12.29	7.62	886	8.95

M5	40.8	12.29	7.62	888	8.91
M5	45.2	12.30	7.62	893	8.90
M5	49.9	12.28	7.62	896	8.89
M5	59.8	12.08	7.60	894	8.79
M5	71.7	12.05	7.61	903	8.76
M5	80.0	11.99	7.61	899	8.78
M5	92.0	11.99	7.62	905	8.84
M5	100.6	11.90	7.61	895	8.80
M5	109.8	11.92	7.62	902	8.80
M5	119.3	11.92	7.62	909	8.81
M5	126.0	11.93	7.62	910	8.80
M6	0.6	12.66	7.66	860	9.21
M6	2.1	12.50	7.65	861	9.22
M6	4.0	12.39	7.65	861	9.24
M6	6.0	12.35	7.65	861	9.24
M6	8.5	12.32	7.64	861	9.20
M6	10.0	12.32	7.64	860	9.14
M6	16.2	12.29	7.62	859	9.01
M6	20.1	12.28	7.61	859	8.92
M6	25.3	12.27	7.60	859	8.81
M6	30.3	12.26	7.61	859	8.86
M6	36.3	12.25	7.61	859	8.87
M6	40.4	12.25	7.62	862	8.93
M6	45.3	12.18	7.54	858	8.33
M6	50.6	12.23	7.54	891	8.37
M6	54.5	12.04	7.54	866	8.38
M6	60.7	11.76	7.55	831	8.44
M6	70.7	11.29	7.60	769	8.99
M6	80.9	11.12	7.60	757	9.10
M6	90.6	11.12	7.60	756	9.15
M6	100.8	11.12	7.60	756	9.14
M6	110.8	11.12	7.60	755	9.13
M6	113.4	11.11	7.60	755	9.13
M7	1.1	12.44	7.65	831	9.39
M7	2.2	12.37	7.64	832	9.38
M7	4.3	12.20	7.63	833	9.36
M7	5.5	12.20	7.63	833	9.34
M7	6.1	12.18	7.62	833	9.30
M7	8.7	12.17	7.62	833	9.28
M7	10.3	12.17	7.61	833	9.23
M7	15.1	12.14	7.61	833	9.16
M7	21.2	12.13	7.60	832	9.13
M7	24.8	12.12	7.59	830	9.00
M7	30.5	11.99	7.54	820	8.73
M7	35.2	11.89	7.55	810	8.69
M7	41.2	11.77	7.58	796	8.91
M7	45.2	11.72	7.59	791	9.08
M7	49.8	11.60	7.60	783	9.17
M7	55.2	11.49	7.60	775	9.26
M7	61.1	11.30	7.60	767	9.30

M7	70.5	11.04	7.60	756	9.39
M7	79.2	10.92	7.59	752	9.41
M7	91.3	10.89	7.59	752	9.42
M7	100.0	10.84	7.59	753	9.41
M7	105.4	10.84	7.51	765	9.33
M8	1.7	12.31	7.70	817	9.72
M8	4.5	12.32	7.70	816	9.70
M8	7.2	12.32	7.70	816	9.72
M8	9.5	12.31	7.70	816	9.70
M8	11.6	12.31	7.70	816	9.69
M8	15.4	12.28	7.69	816	9.66
M8	19.9	12.22	7.69	816	9.61
M8	25.3	12.10	7.68	815	9.53
M8	30.0	11.94	7.64	803	9.41
M8	35.7	11.73	7.62	786	9.30
M8	40.9	11.57	7.62	780	9.36
M8	45.9	11.45	7.61	773	9.41
M8	50.6	11.40	7.62	774	9.47
M8	55.3	11.36	7.62	775	9.51
M8	60.6	11.23	7.61	767	9.51
M8	65.5	11.17	7.61	769	9.50
M8	69.3	11.06	7.61	763	9.54
M8	75.2	10.88	7.59	753	9.52
M8	81.0	10.81	7.59	750	9.49
M8	85.9	10.59	7.59	755	9.56
M8	87.2	10.59	7.56	756	9.65
M9	0.3	10.85	7.68	717	10.50
M9	3.1	10.83	7.67	716	10.51
M9	4.7	10.63	7.66	717	10.49
M9	6.3	10.40	7.64	716	10.42
M9	8.1	10.31	7.63	716	10.28
M9	10.2	10.24	7.61	717	10.17
M9	12.3	10.18	7.59	719	10.05
M9	13.8	10.17	7.58	722	10.00
M9	16.7	10.17	7.58	732	10.10
M9	18.7	10.13	7.57	734	10.09
M9	19.0	10.12	7.57	735	10.07
M9	20.9	10.11	7.57	736	10.07
M9	23.3	10.11	7.54	741	9.97
M9	24.9	10.13	7.49	743	9.81
M11	0.5	11.99	7.69	890	9.47
M11	4.1	11.99	7.70	894	9.54
M11	6.7	11.99	7.69	894	9.54
M11	8.6	11.98	7.69	895	9.52
M11	10.1	11.99	7.70	894	9.53
M11	12.0	11.98	7.70	895	9.52
M11	14.3	11.99	7.70	895	9.52
M11	16.3	11.98	7.70	895	9.50
M11	17.9	11.98	7.70	895	9.49
M11	19.9	11.98	7.70	895	9.48

M11	25.9	11.97	7.70	896	9.46
M11	31.3	11.97	7.69	896	9.45
M11	35.3	11.97	7.69	898	9.43
M11	40.3	11.94	7.68	906	9.38
M11	47.7	11.74	7.66	932	9.32
M11	49.1	11.72	7.66	933	9.30

APPENDIX C

ZOOPLANKTON DATA

List of common zooplankton collected from Lakes Powell and Mead.

CLADOCERA

Bosmina	*longirostris*
Ceriodaphnia	
Daphnia	*pulex*
Diaphanosoma	*brachyurum*
Immature	
Pleuroxus	
Chydorus	*sphaericus*
Leptodora	*kindtii*
Alona	*guttata*
Ilyocryptus	
Daphnia	*rosea*
Daphnia	*laevis*
Macrothrix	*laticornis*
Leydigia	
Daphnia	*lumholtzi?*

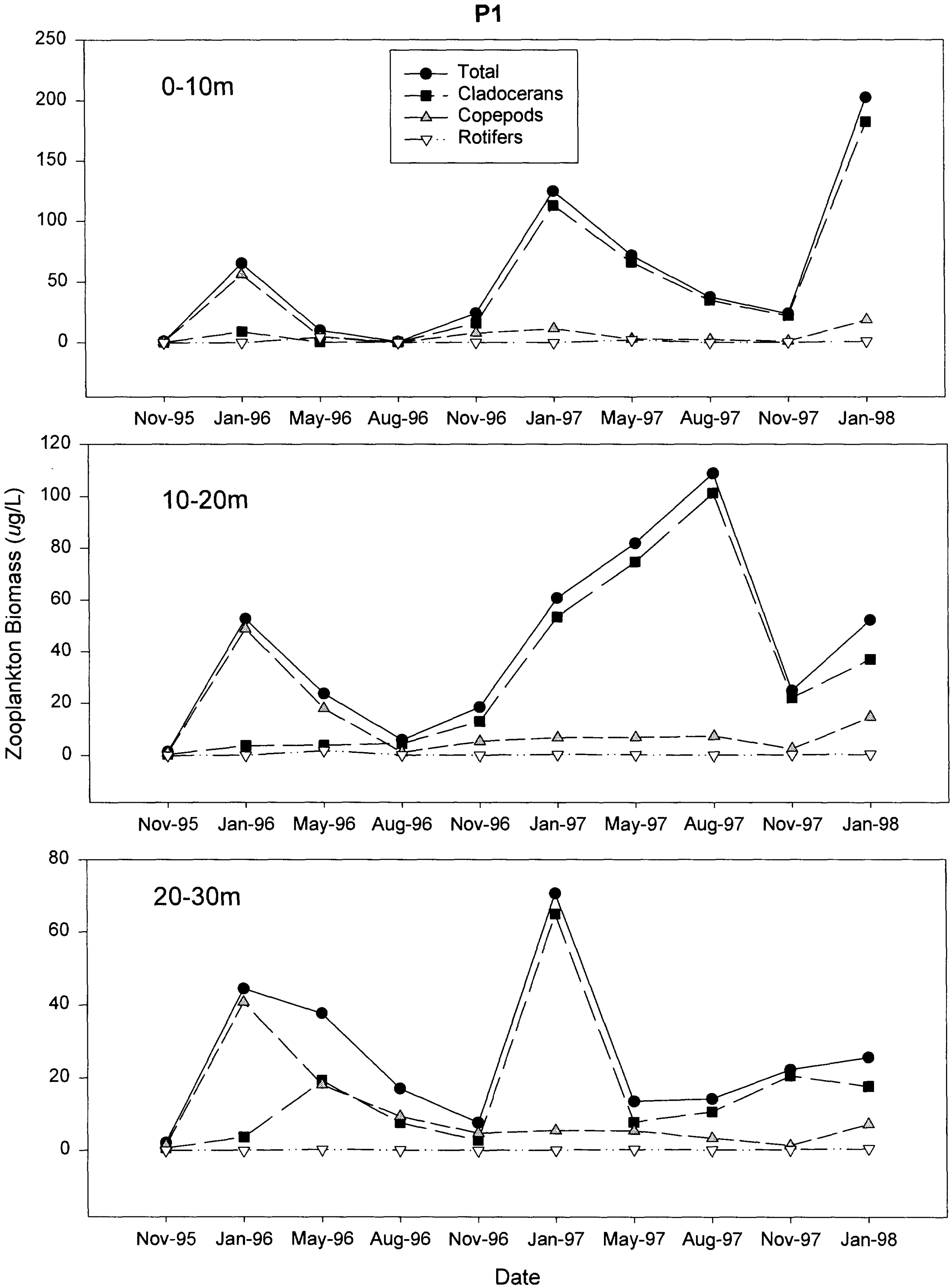
COPEPODA

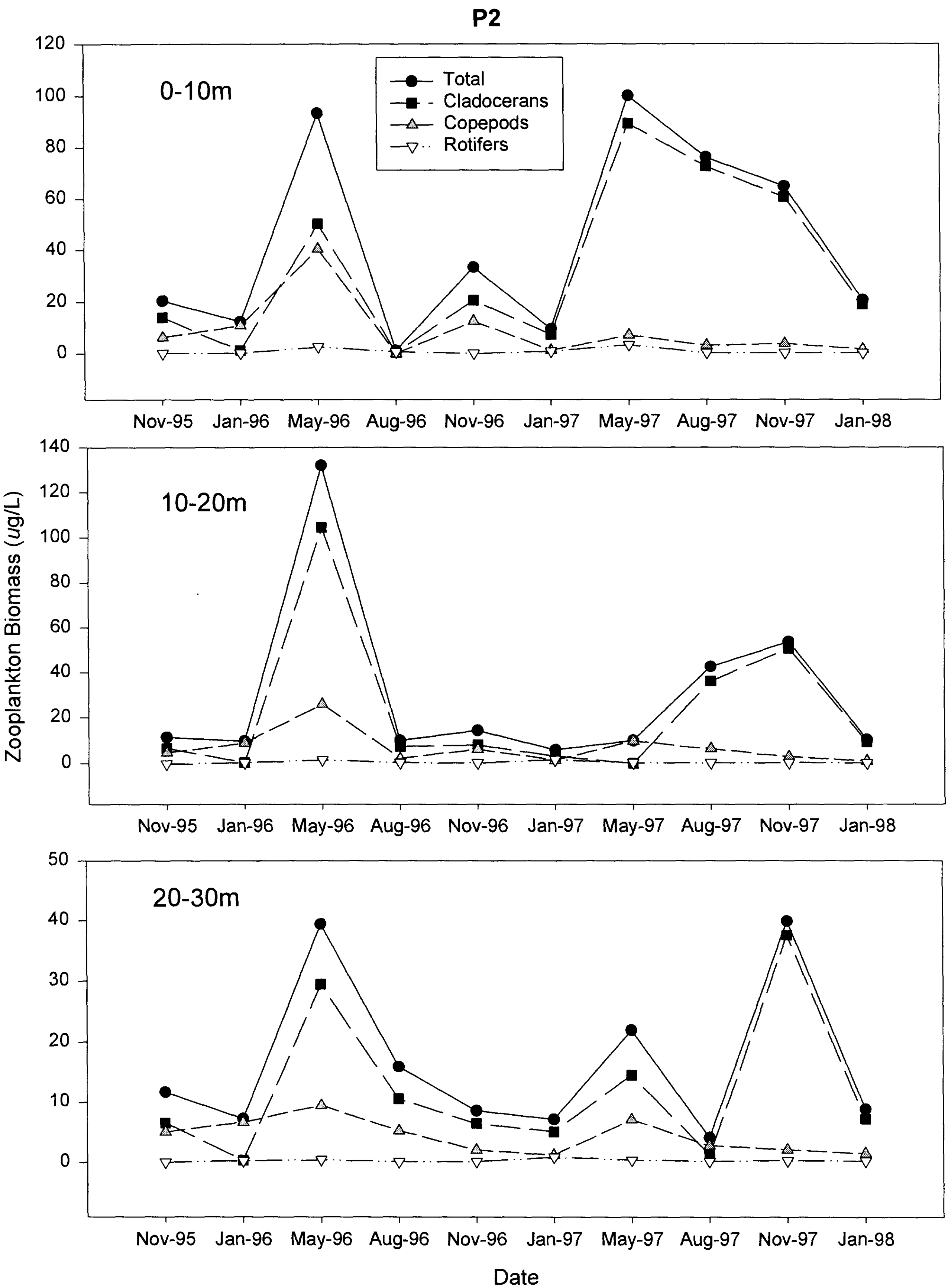
Leptodiaptomus	*ashlandi*
Harpacticoid	
Calanoid	*copepodid*
Cyclopoid	*copepodid*
Diacyclops	*thomasi*
Mesocyclops	*tenuis*
Nauplii	
Epischura	
Eurytemora	*affinis*
Tropocyclops	*prasinus*
Acanthocyclops	*vernalis*

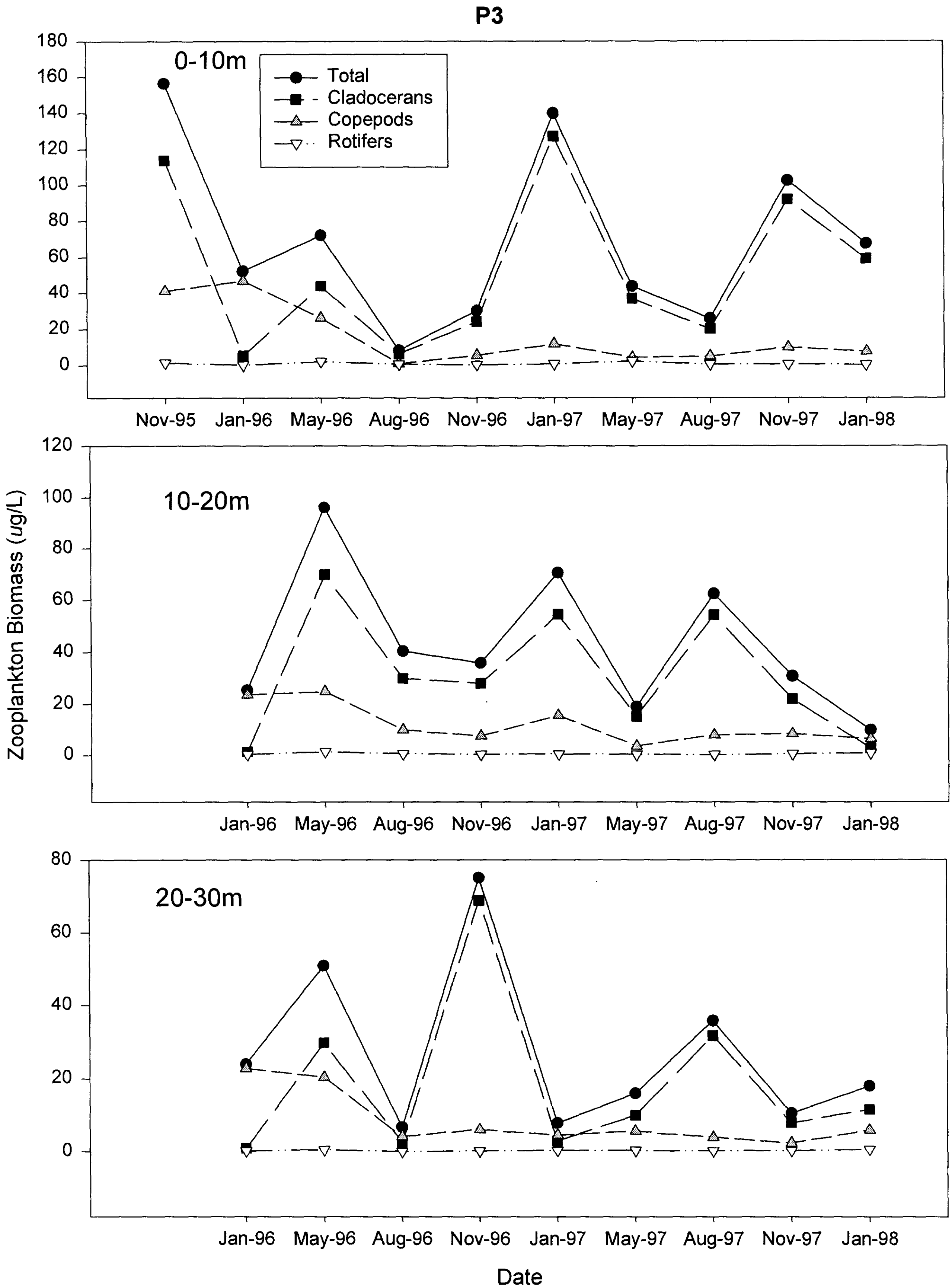
ROTIFERA

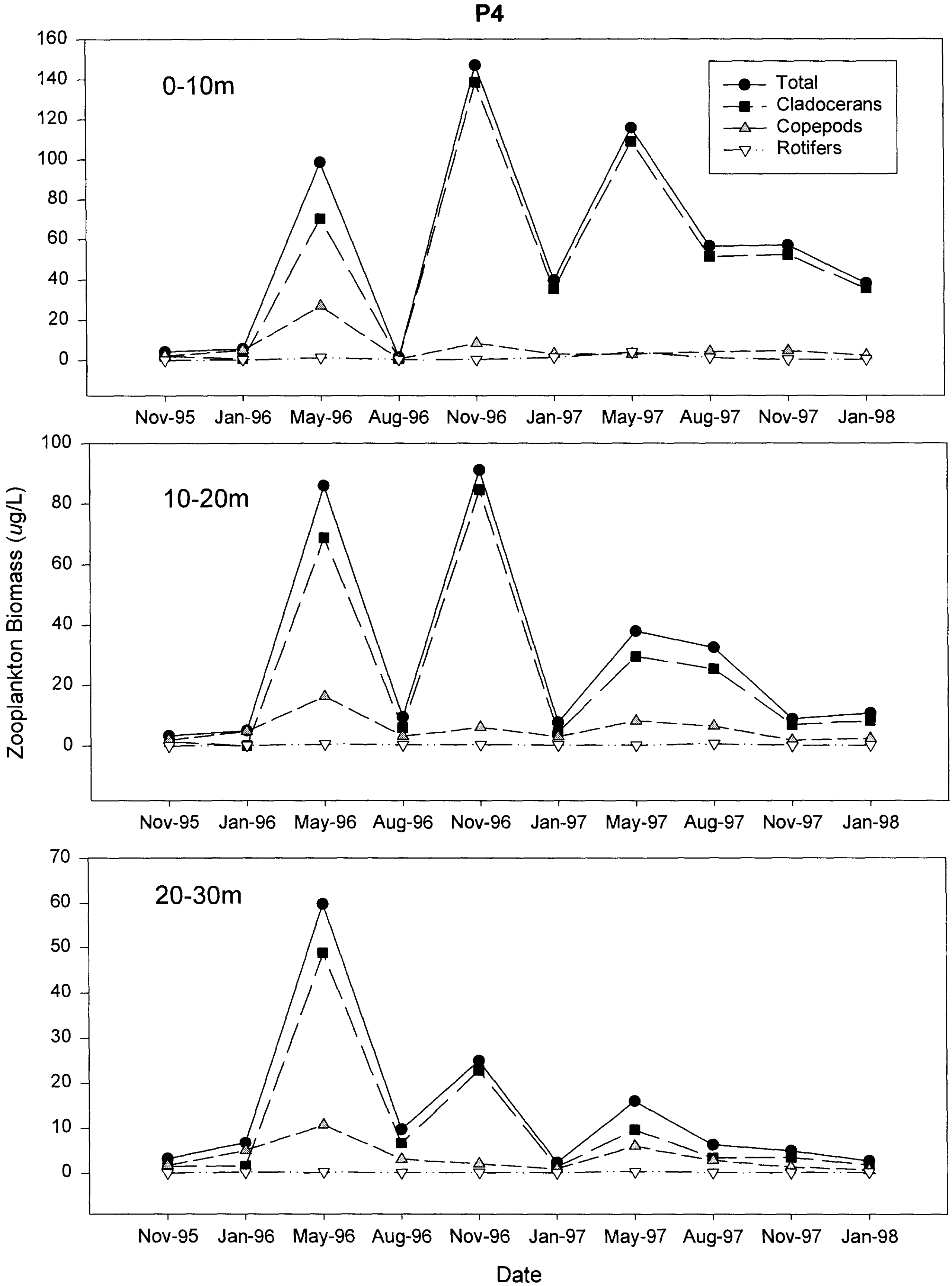
Asplanchna	*girodi*
Brachionus	*havenesis*
Brachionus	*quadradentatus*
Conochiloides	
Conochilus	*unicornis*
Epiphanes	*brachionus*
Euchlanis	

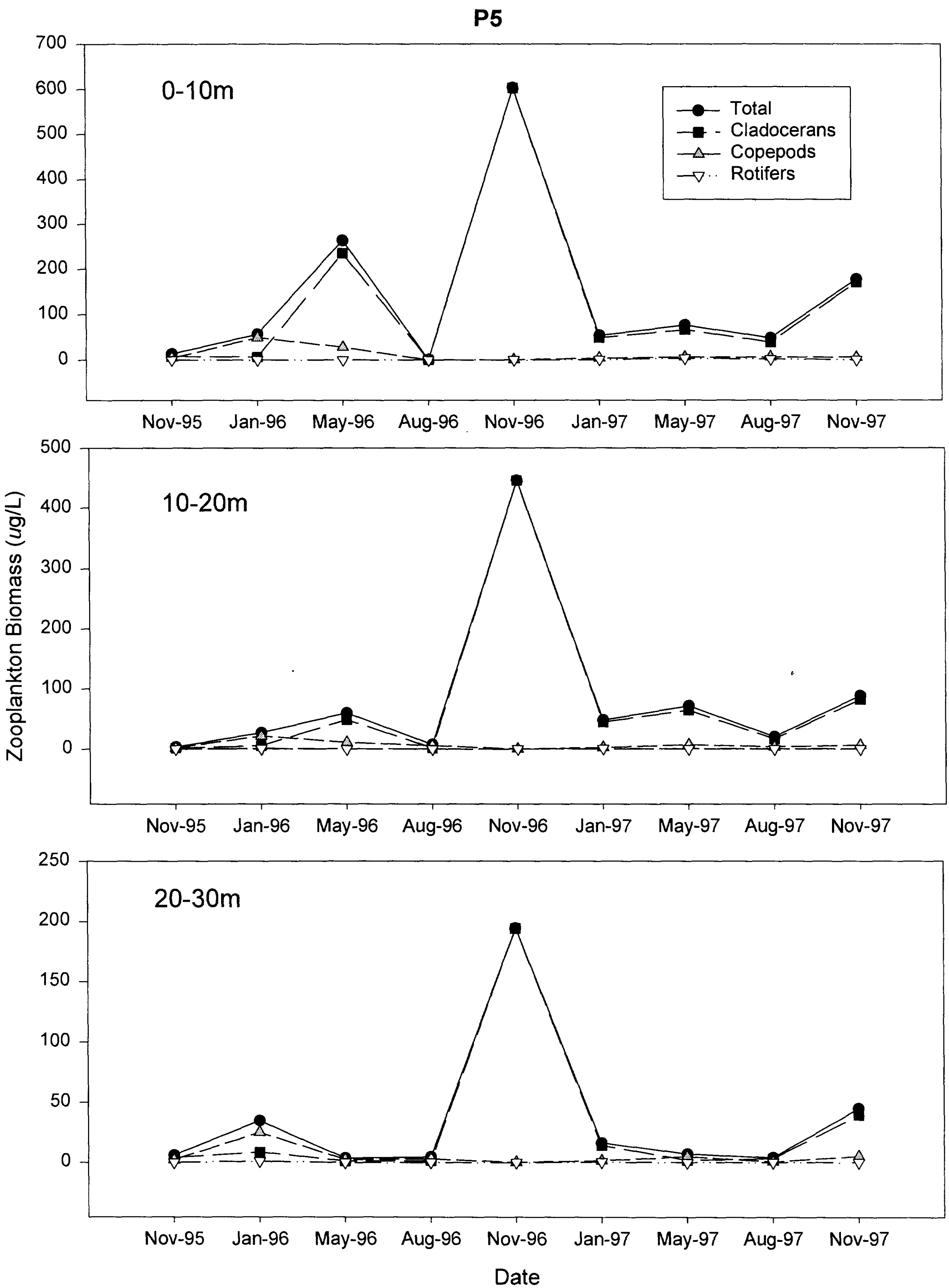
Filinia	
Keratella	*cochlearis*
Lecane	*crenata*
Polyarthra	*vulgaris*
Pompholyx	*sulcata*
Synchaeta	*pectinata*
Trichocerca	*pusilla*
Brachionus	*patulus*
Brachionus	*angularis*
Hexarthra	*mira*
Contracted	*rotifer*
Brachionus	*calyciflorus*
Ploesoma	
Ascomorpha	*saltans*
Brachionus	*ureolaris*
Gastropus	*hypotus*
Kellicottia	*longispina*
Keratella	*quadrata*
Colletheca	*libera*
Marcochaetus	
Monostyla	
Notholca	*acuminata*
Trichotria	


P1
0-10m
Total
Cladocerans
Copepods
Rotifers
10-20m
20-30m
Zooplankton Biomass (ug/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
250
200
150
100
50
0
120
80
60
40
20

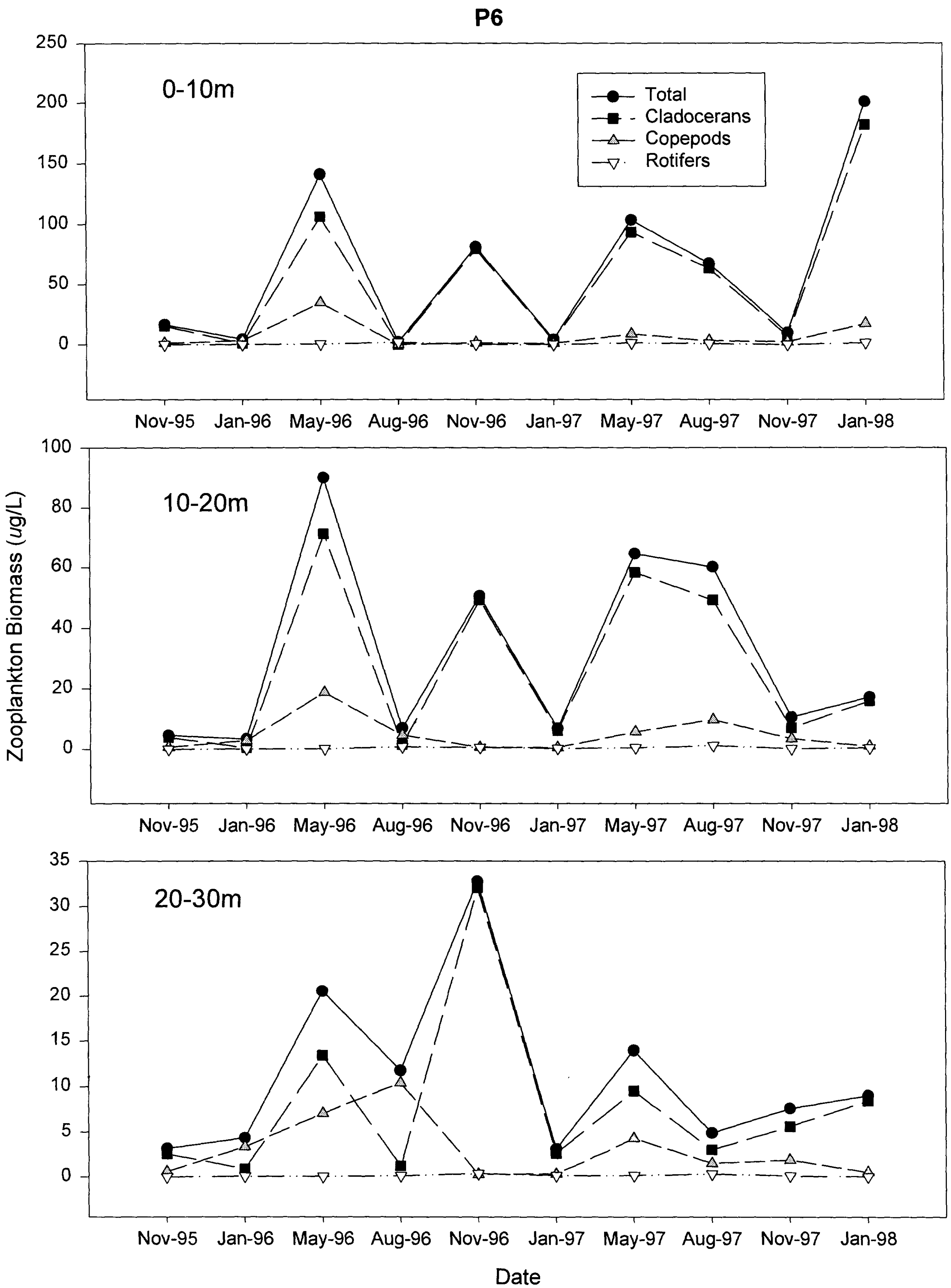

P2
0-10m
Total
Cladocerans
Copepods
Rotifers
120
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
140
120
100
80
60
40
20
0
Zooplankton Biomass (ug/L)
20-30m
50
40
30
20
10
0
Date

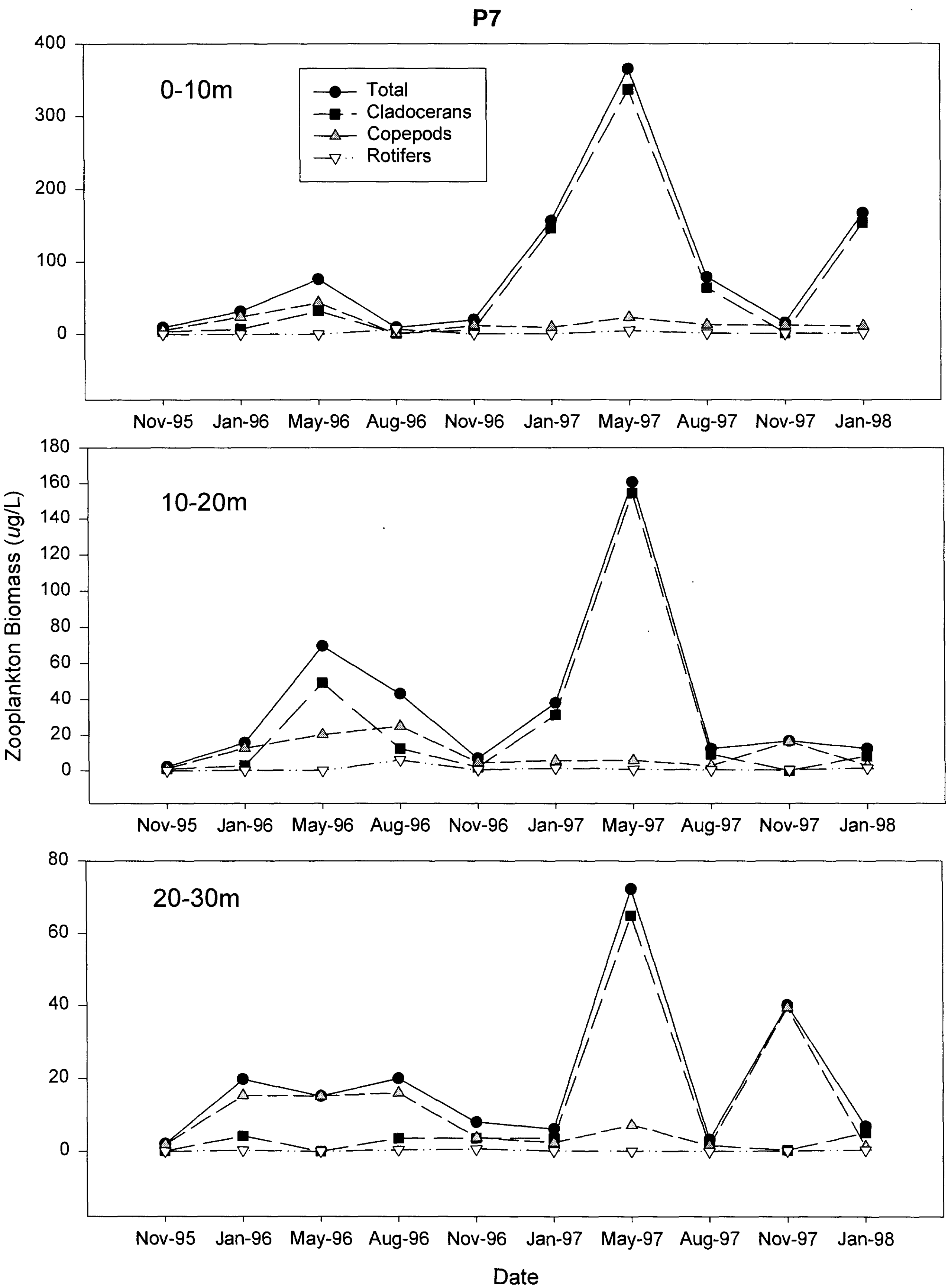

P3
0-10m
Total
Cladocerans
Copepods
Rotifers
180
160
140
120
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
120
100
80
60
40
20
0
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
20-30m
80
60
40
20
0
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Zooplankton Biomass (ug/L)
Date

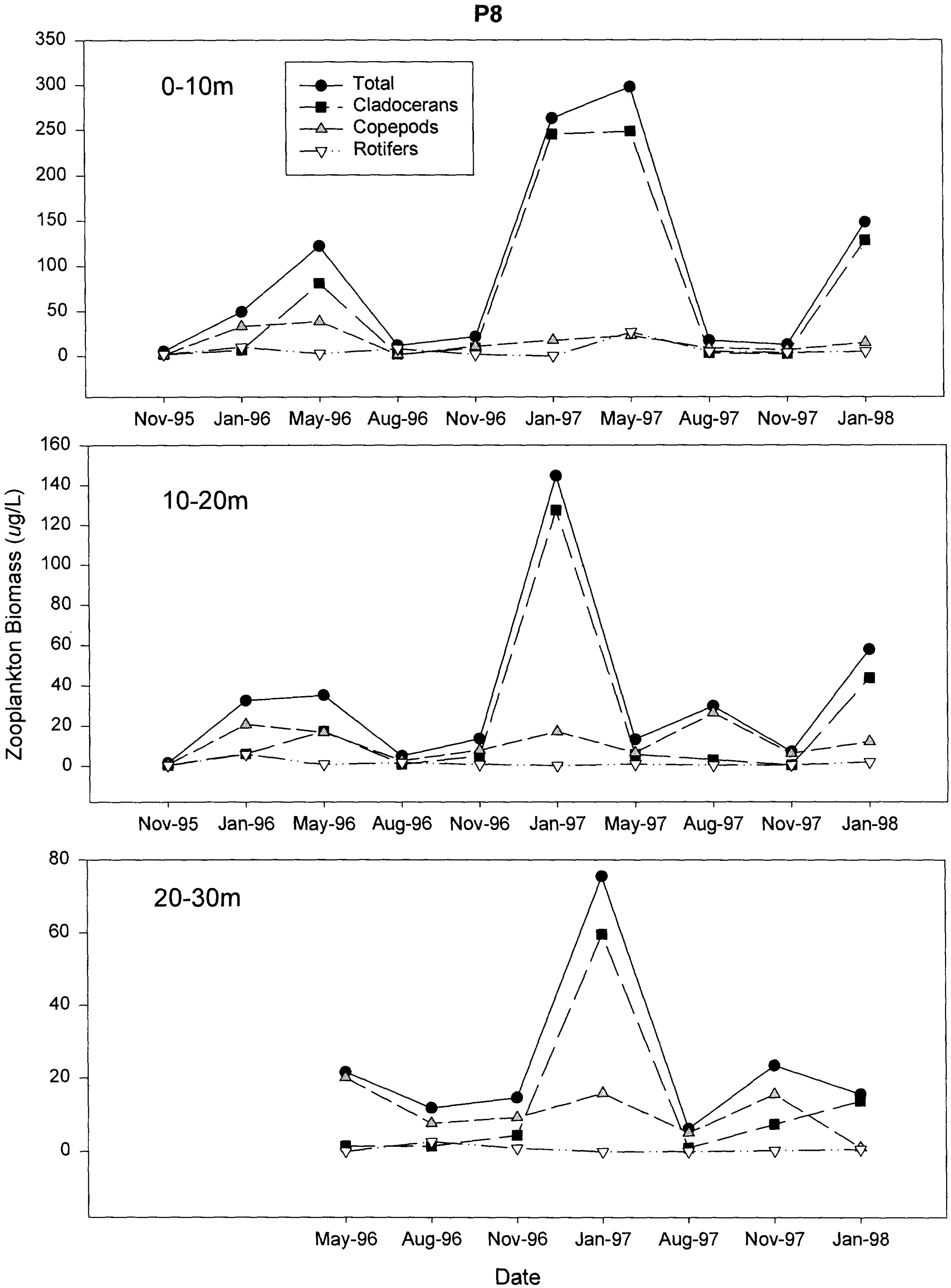

P4
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

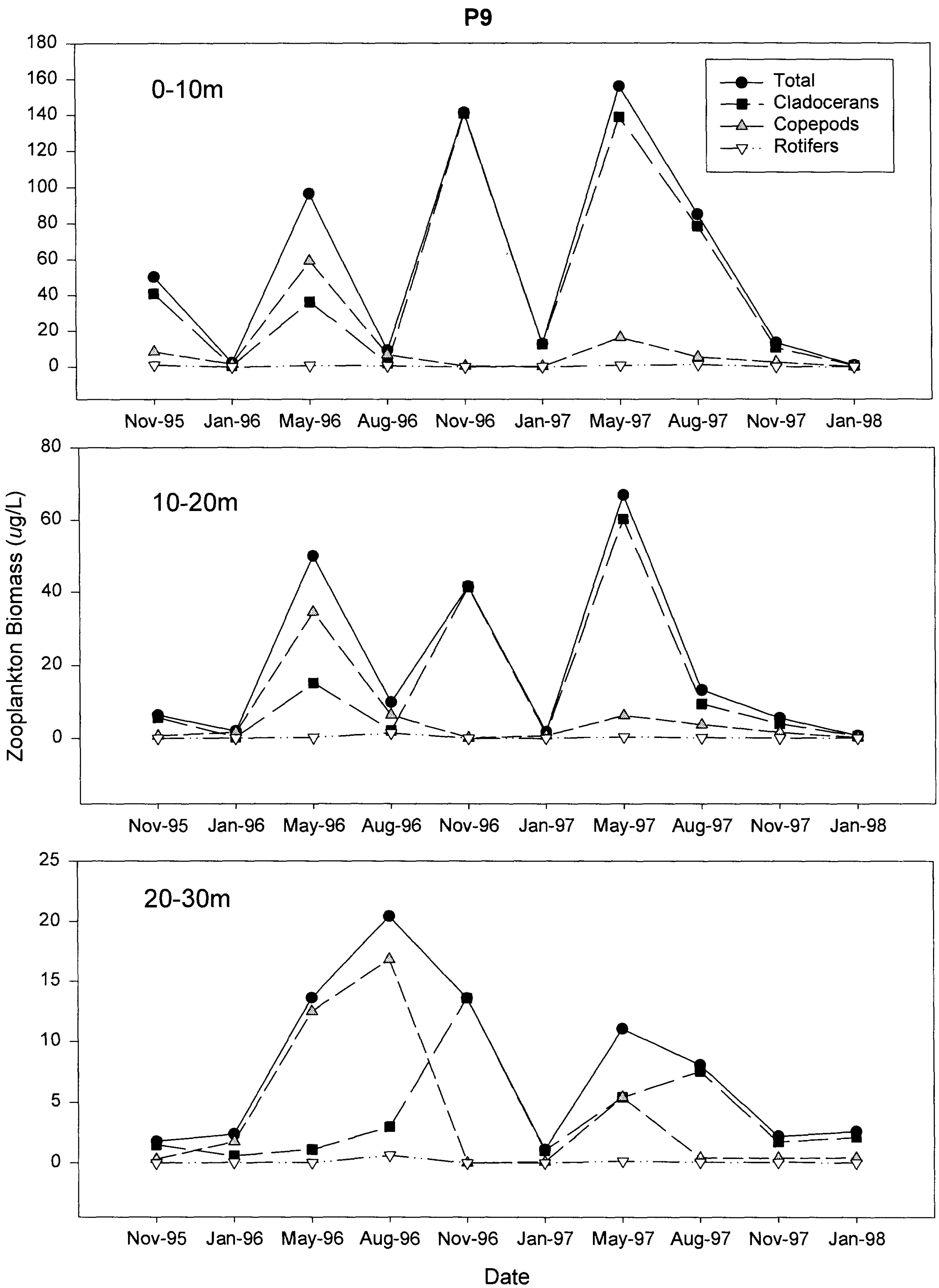


P5
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
0
100
200
300
400
500
600
700
0
50
100
150
200
250
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Date

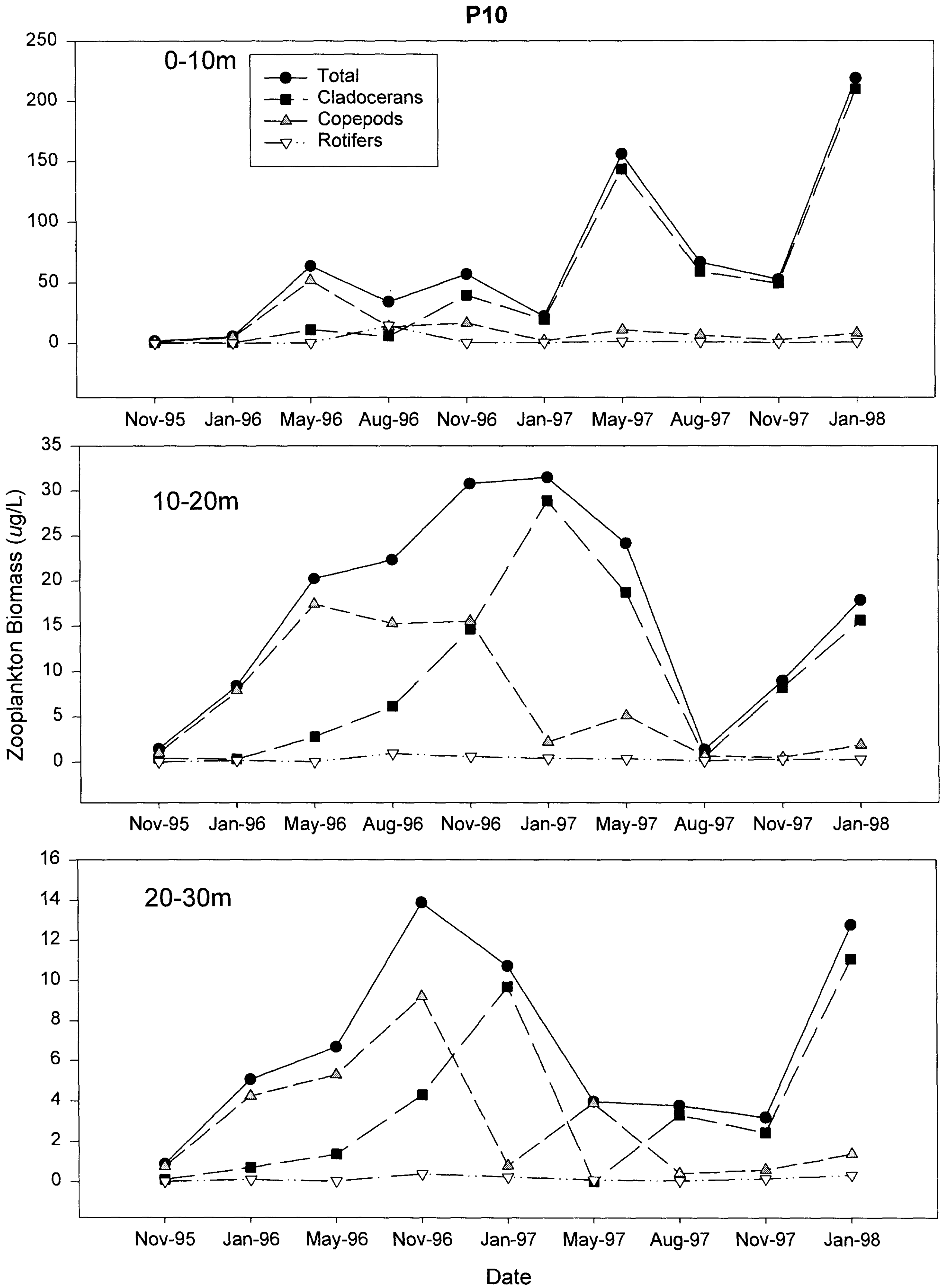

P6
0-10m
Total
Cladocerans
Copepods
Rotifers
250
200
150
100
50
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
20-30m
35
30
25
20
15
10
5
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Zooplankton Biomass (ug/L)
Date

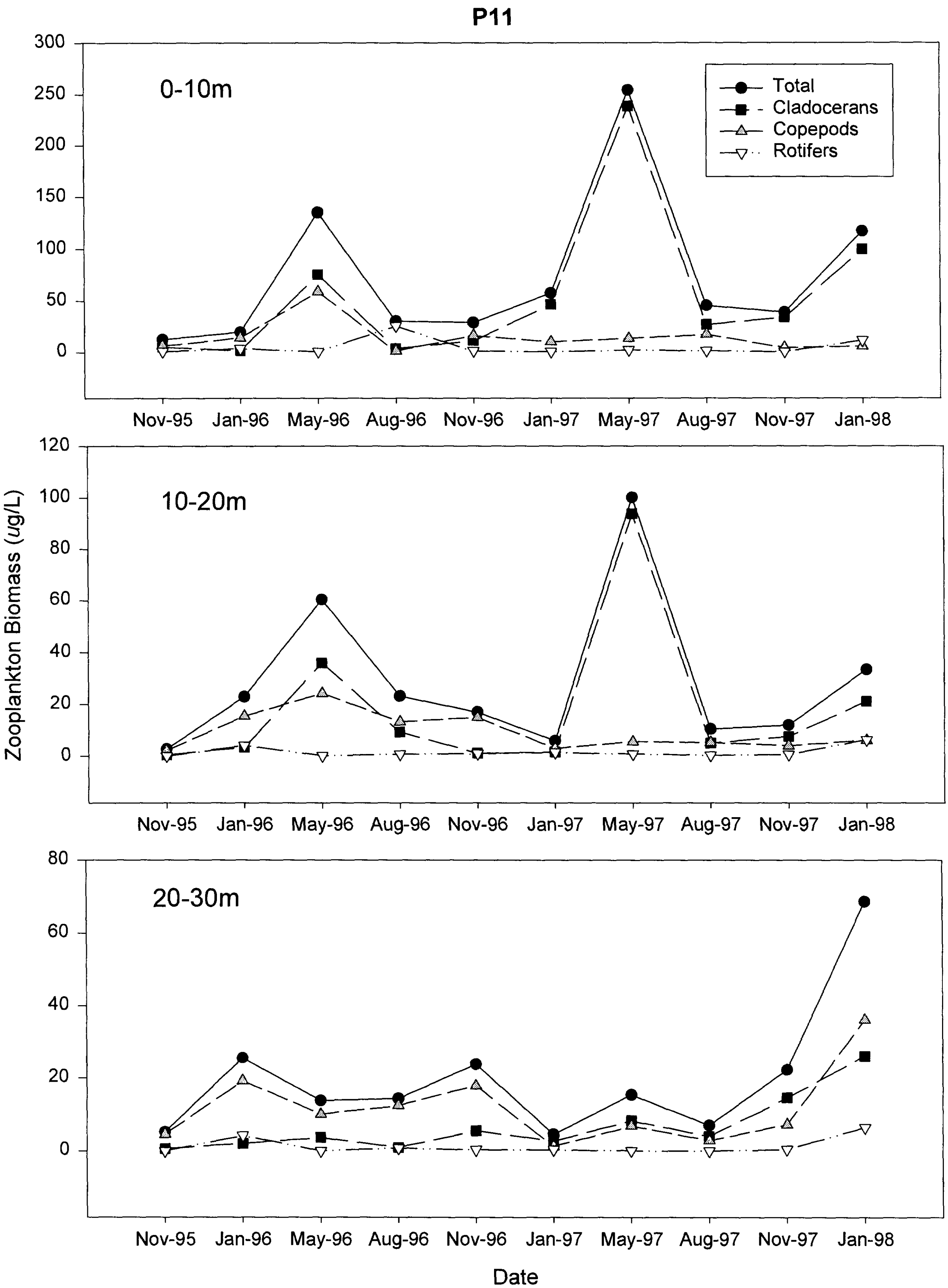

P7
0-10m
Total
Cladocerans
Copepods
Rotifers
10-20m
20-30m
Zooplankton Biomass (ug/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

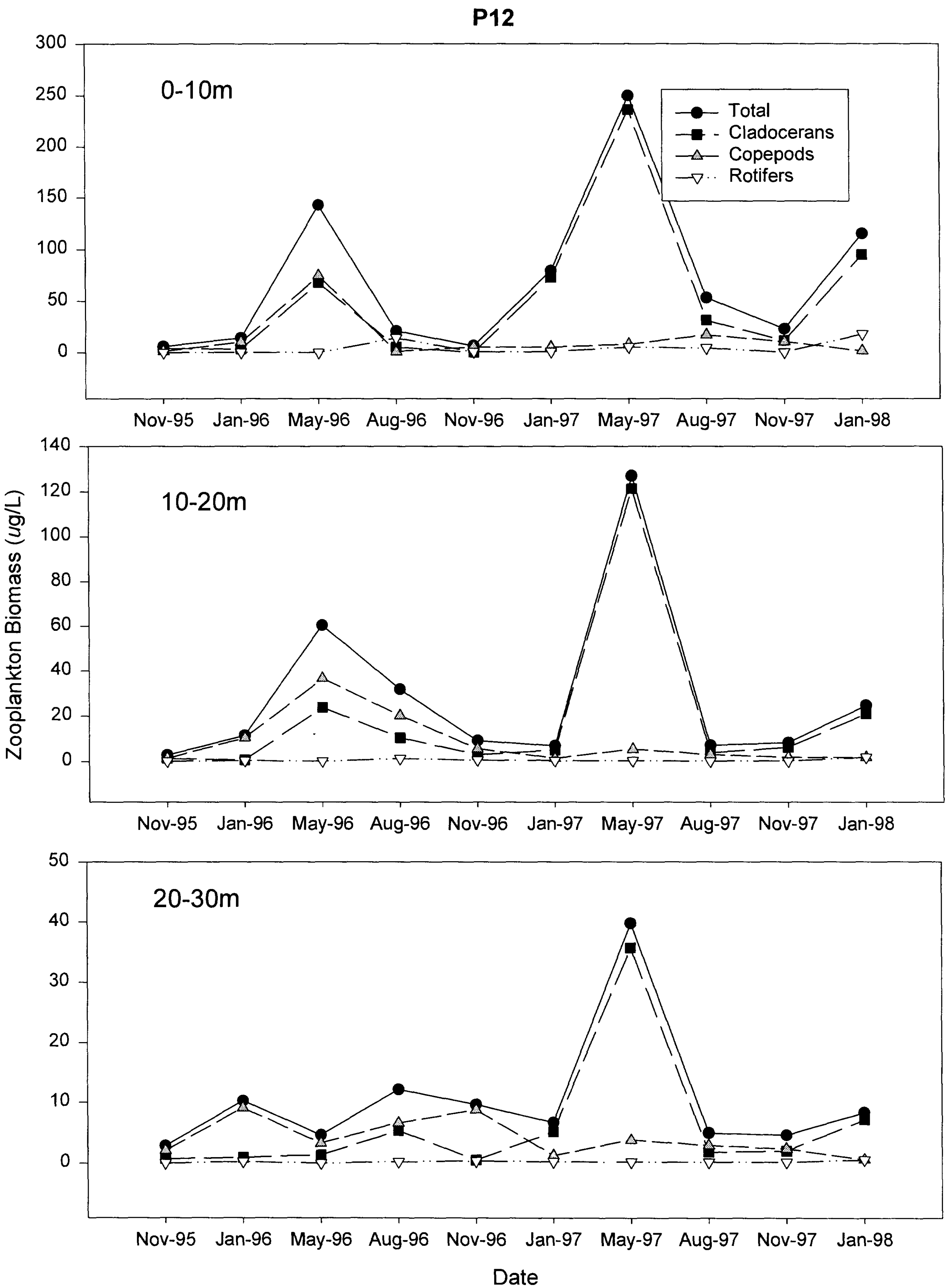

P8
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98



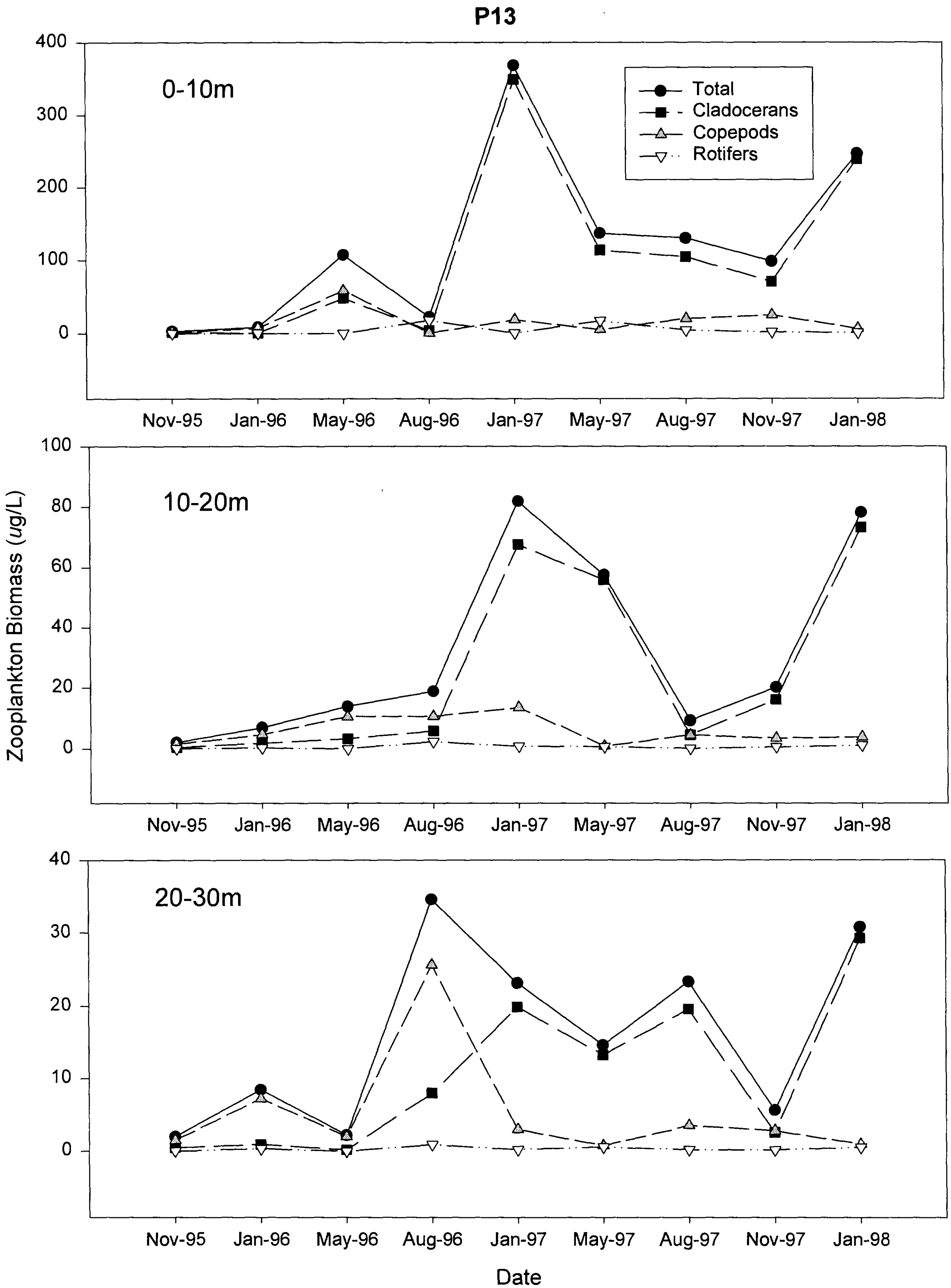
P9
0-10m
Total
Cladocerans
Copepods
Rotifers
180
160
140
120
100
80
60
40
20
0
Nov-95 Jan-96 May-96 Aug-96 Nov-96 Jan-97 May-97 Aug-97 Nov-97 Jan-98
10-20m
80
60
40
20
0
Nov-95 Jan-96 May-96 Aug-96 Nov-96 Jan-97 May-97 Aug-97 Nov-97 Jan-98
20-30m
25
20
15
10
5
0
Nov-95 Jan-96 May-96 Aug-96 Nov-96 Jan-97 May-97 Aug-97 Nov-97 Jan-98
Zooplankton Biomass (ug/L)
Date

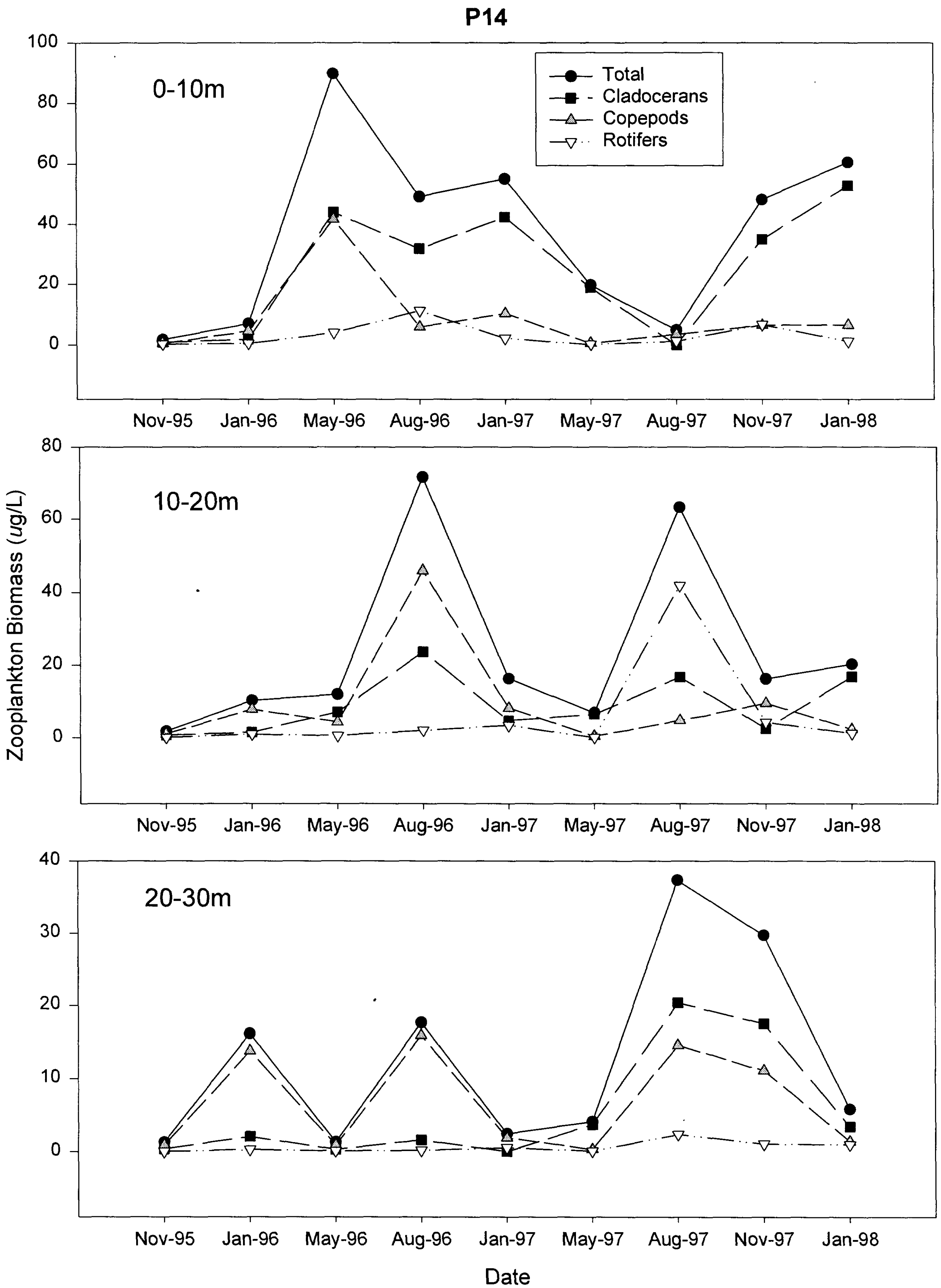

P10
0-10m
Total
Cladocerans
Copepods
Rotifers
250
200
150
100
50
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
35
30
25
20
15
10
5
0
Zooplankton Biomass (ug/L)
20-30m
16
14
12
10
8
6
4
2
Date

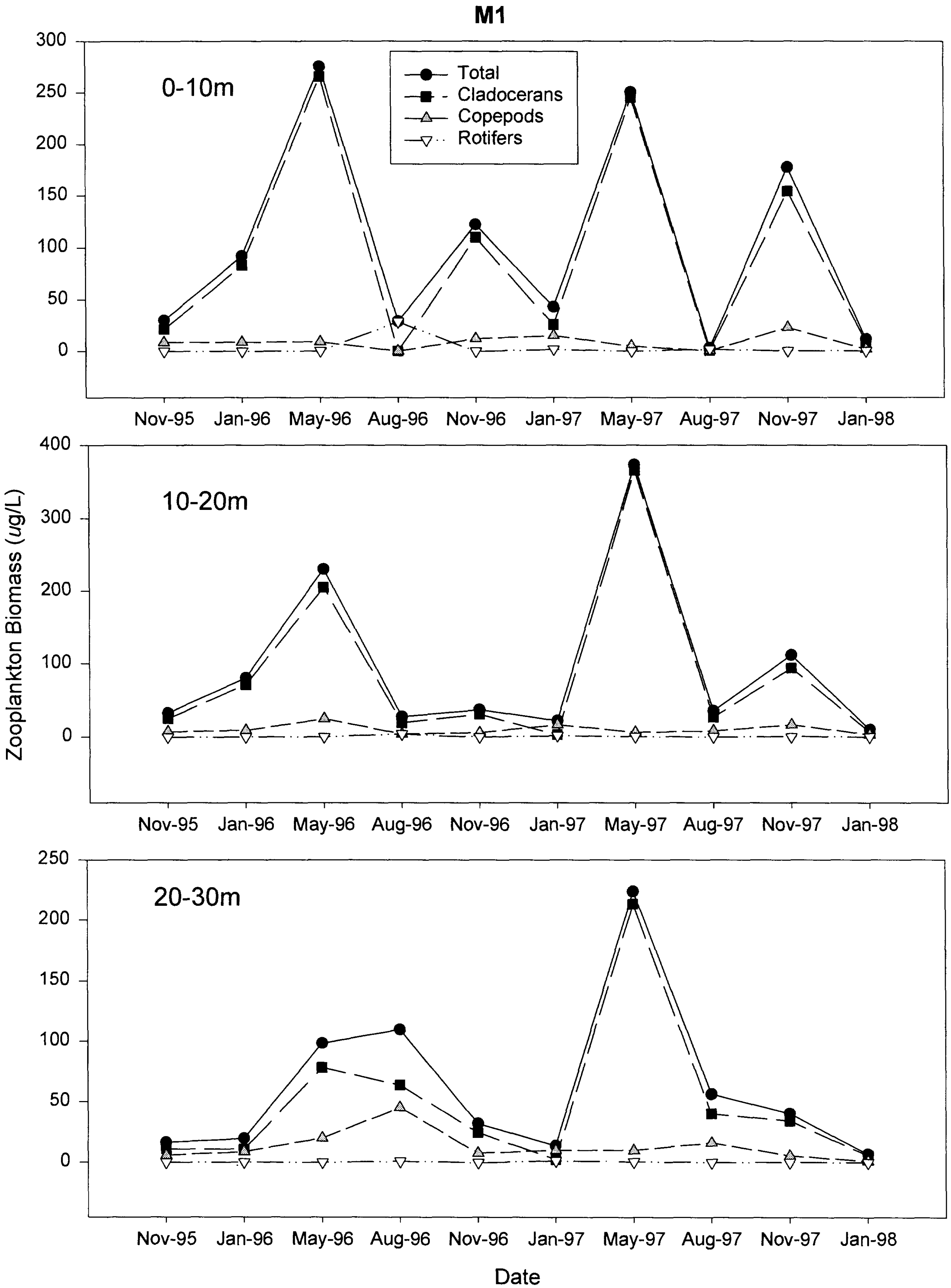

P11
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

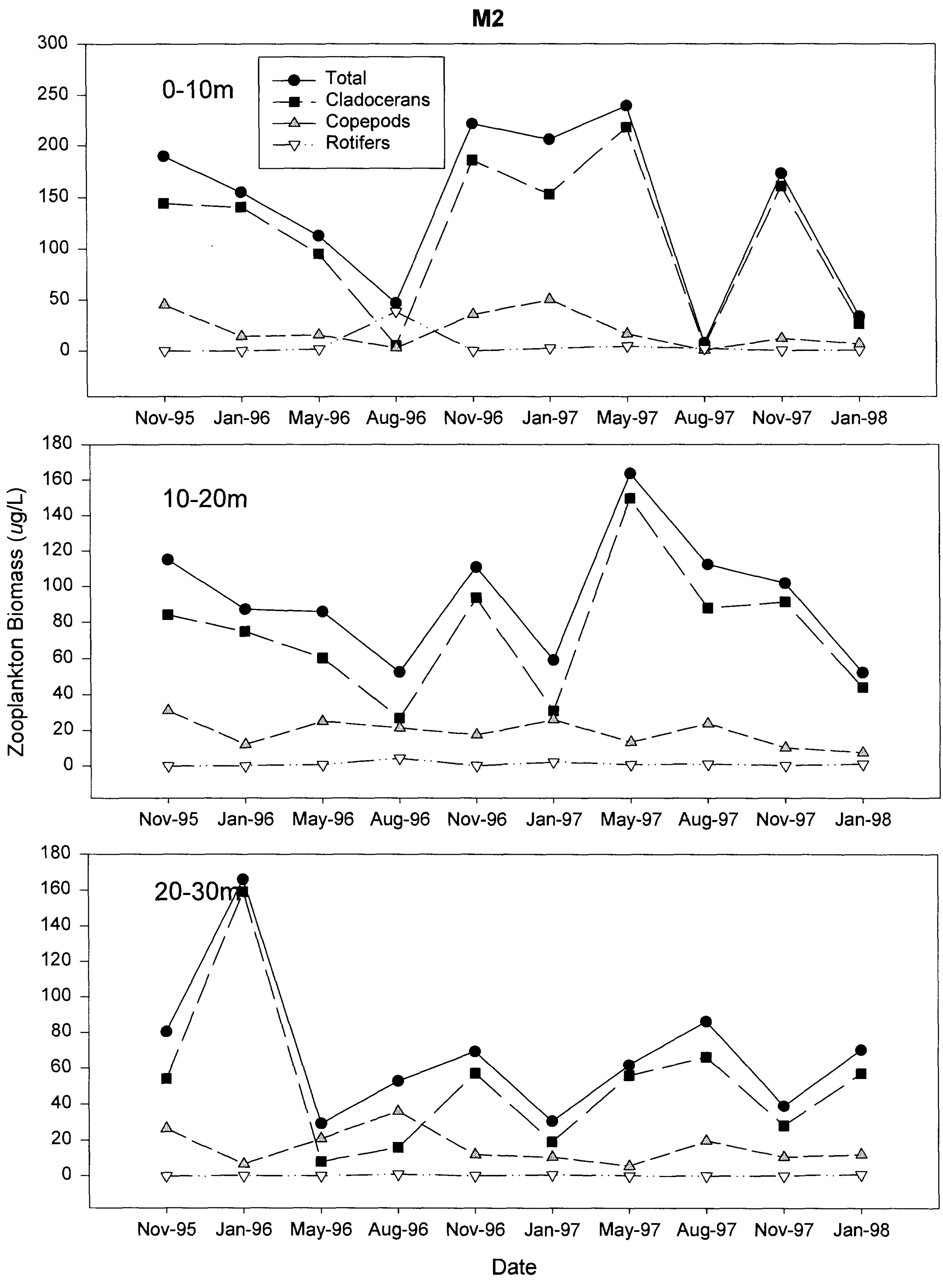


P12
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Date
300
250
200
150
100
50
0
140
120
100
80
60
40
20
0
50
40
30
20
10
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

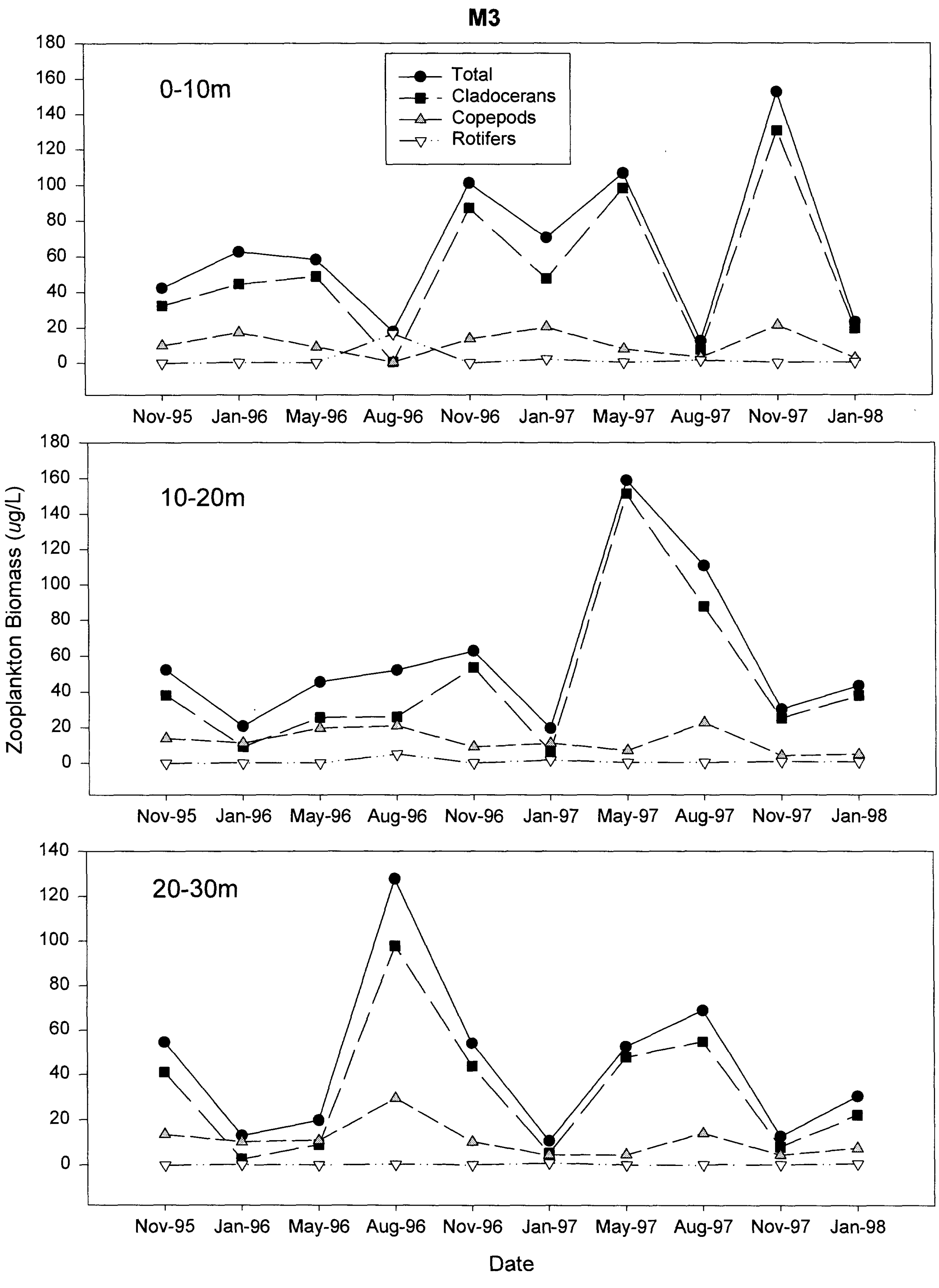

P13
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

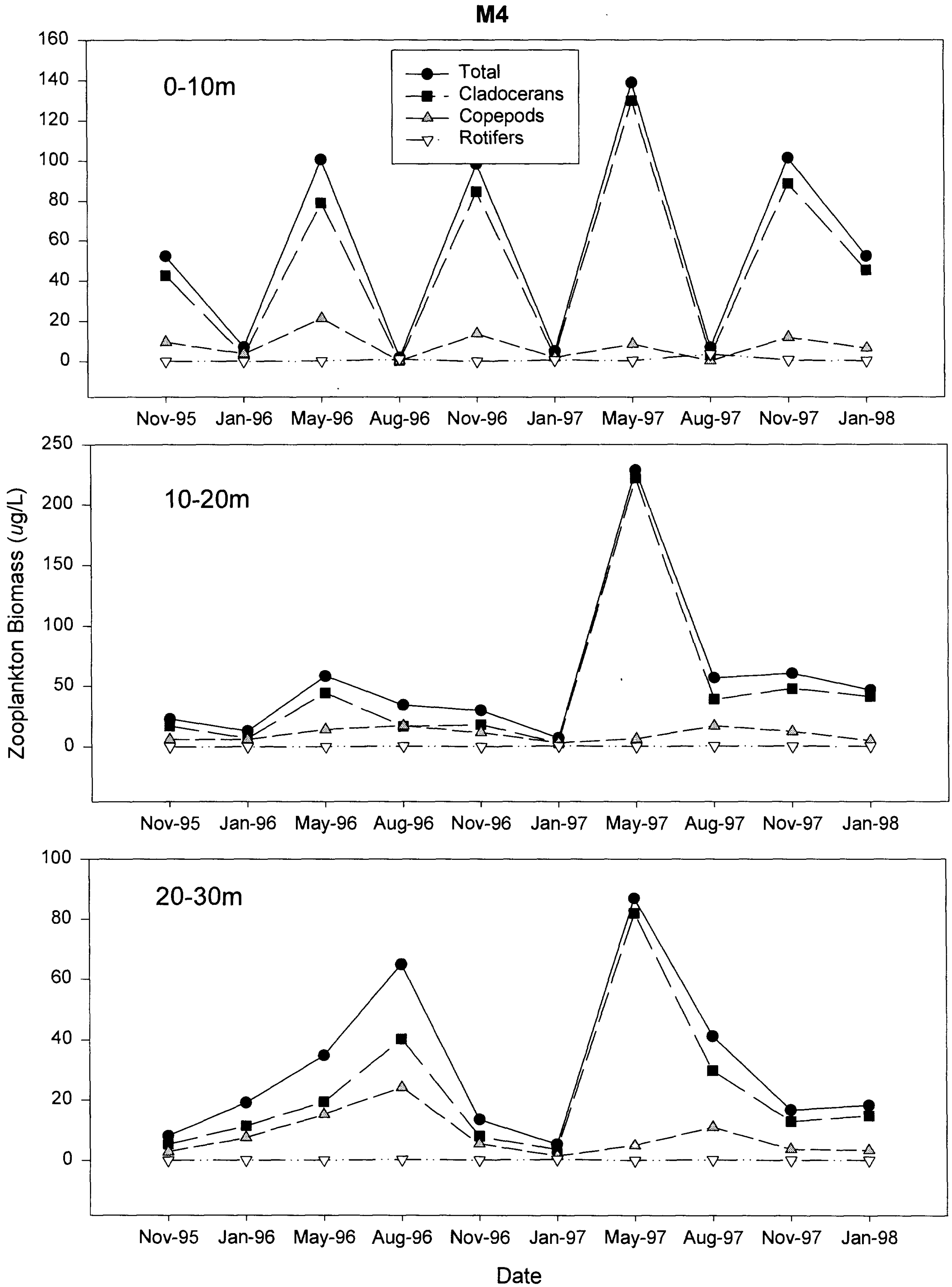

P14
0-10m
Total
Cladocerans
Copepods
Rotifers
10-20m
20-30m
Zooplankton Biomass (ug/L)
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date


M1
0-10m
Total
Cladocerans
Copepods
Rotifers
10-20m
20-30m
Zooplankton Biomass (ug/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

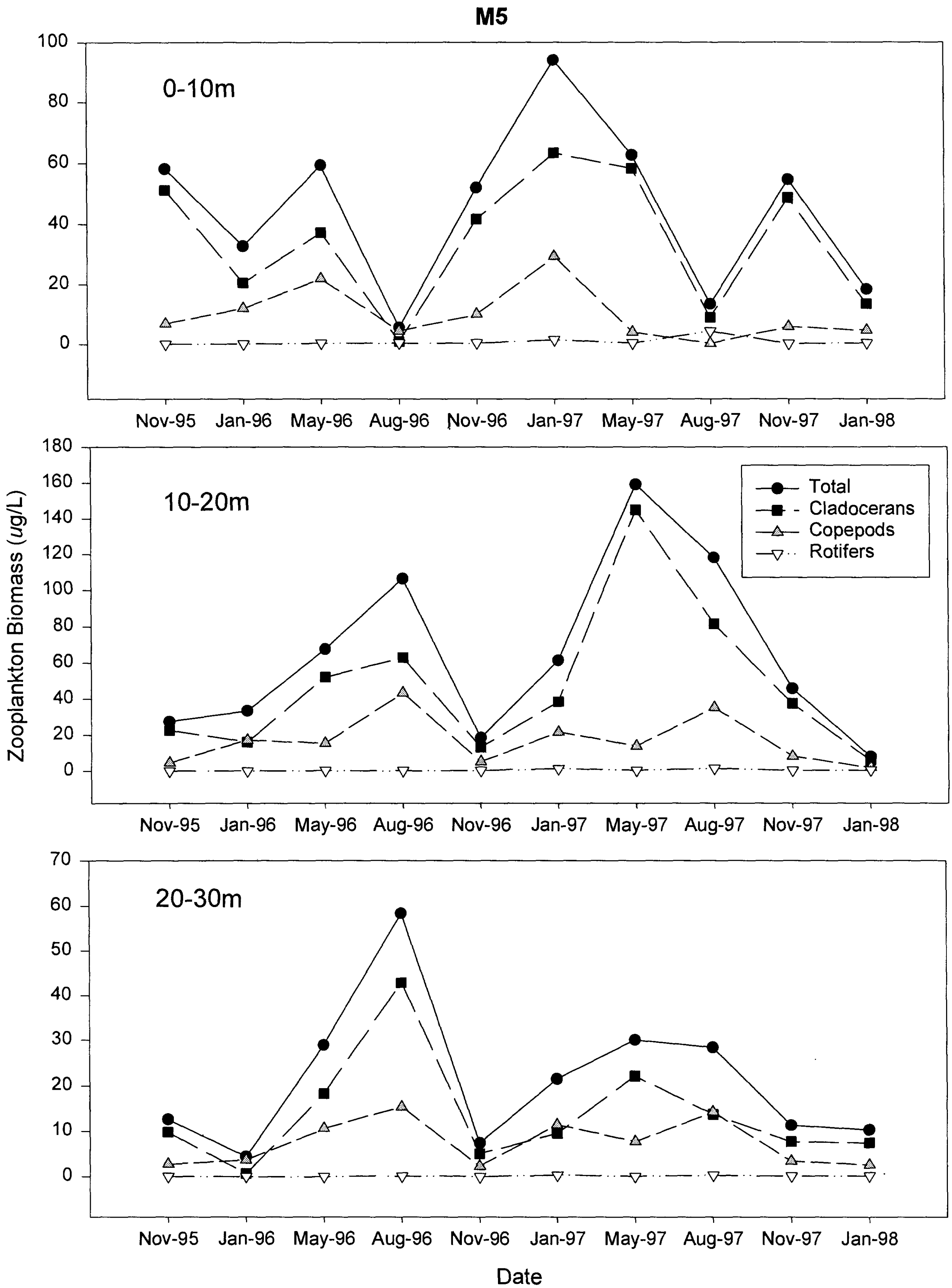


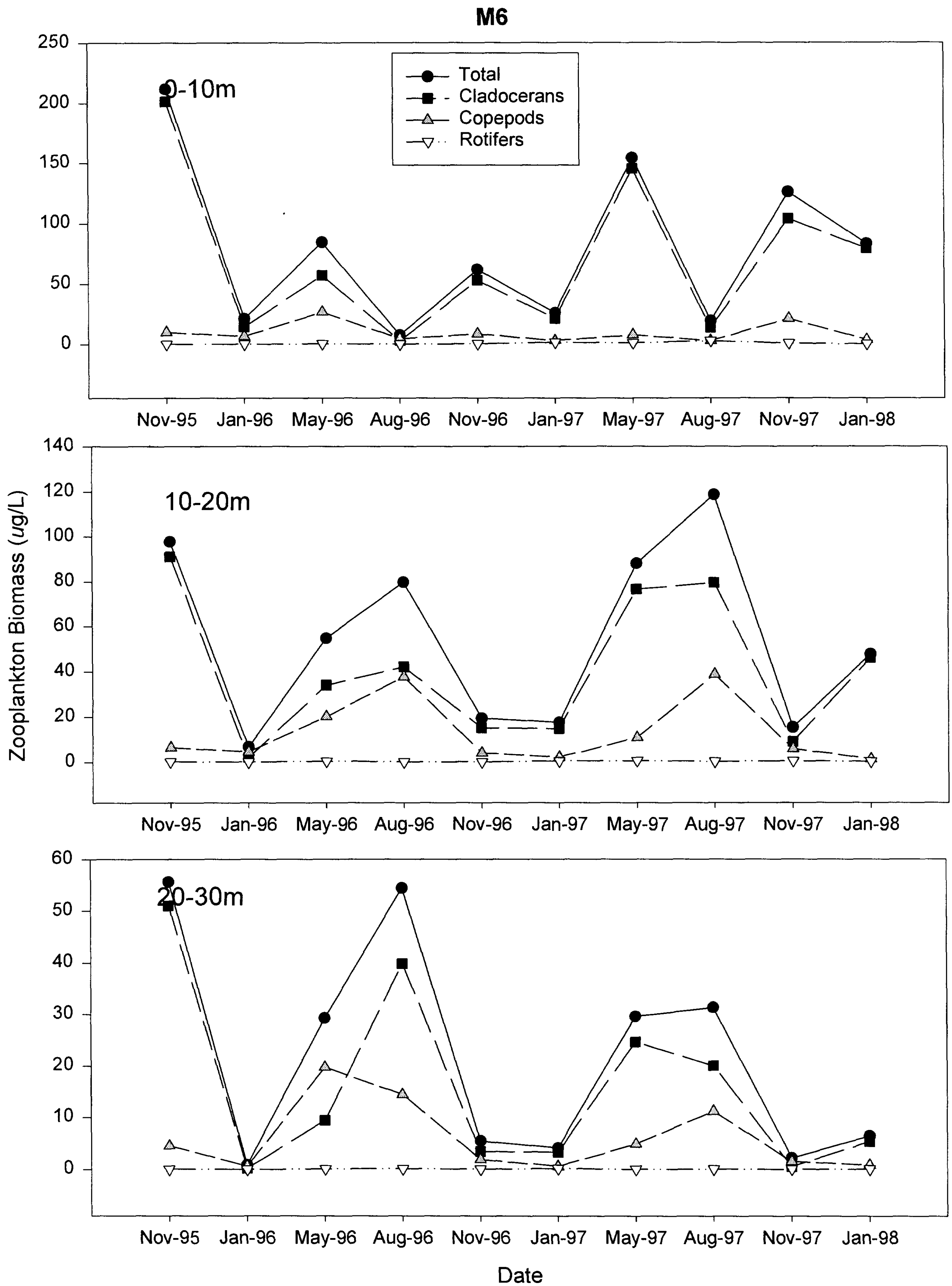
M2
0-10m
Total
Cladocerans
Copepods
Rotifers
300
250
200
150
100
50
0
Nov-95 Jan-96 May-96 Aug-96 Nov-96 Jan-97 May-97 Aug-97 Nov-97 Jan-98
10-20m
180
160
140
120
100
80
60
40
20
0
Zooplankton Biomass (ug/L)
20-30m
Date

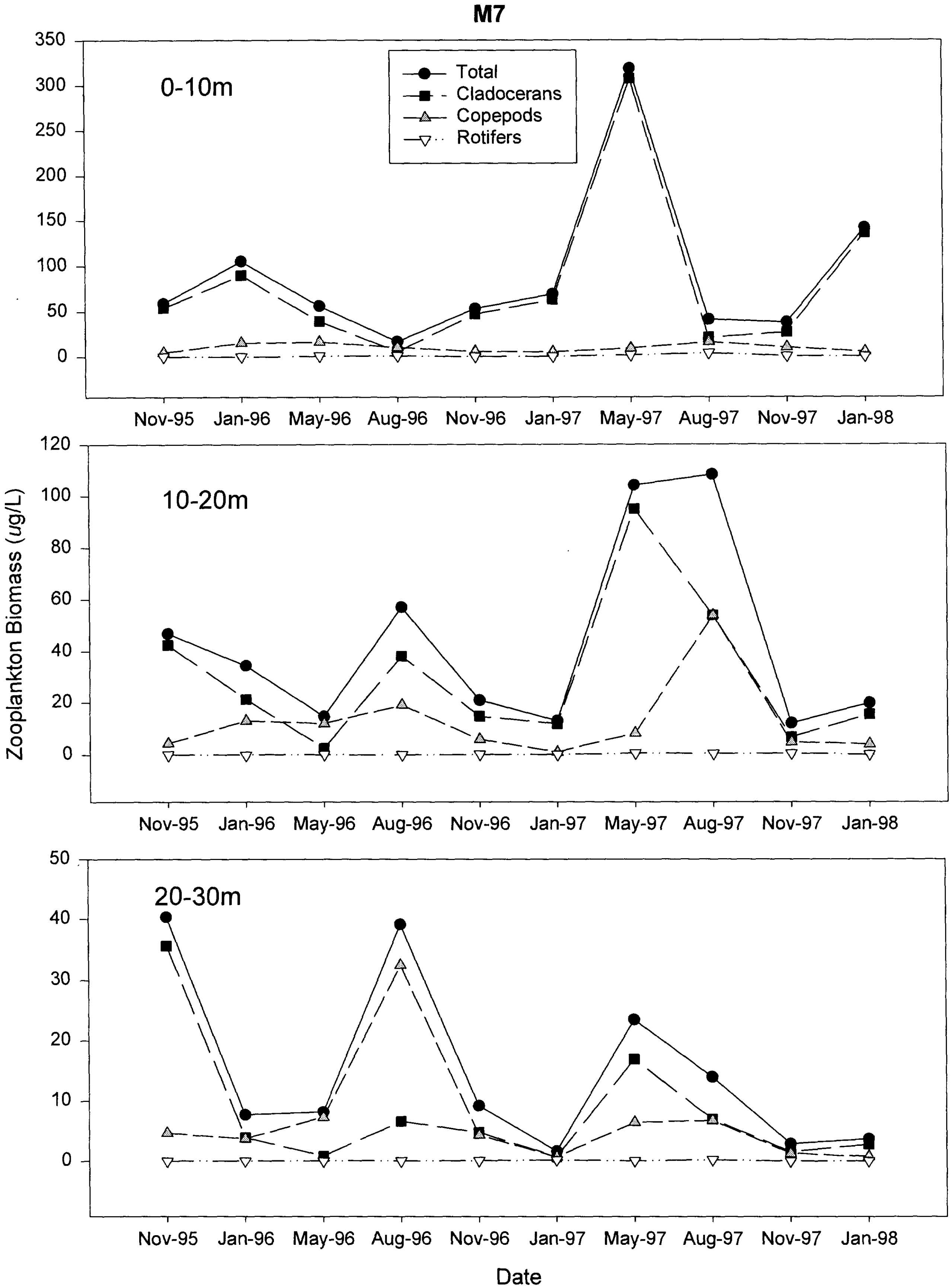

M3
0-10m
Total
Cladocerans
Copepods
Rotifers
10-20m
20-30m
Zooplankton Biomass (ug/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

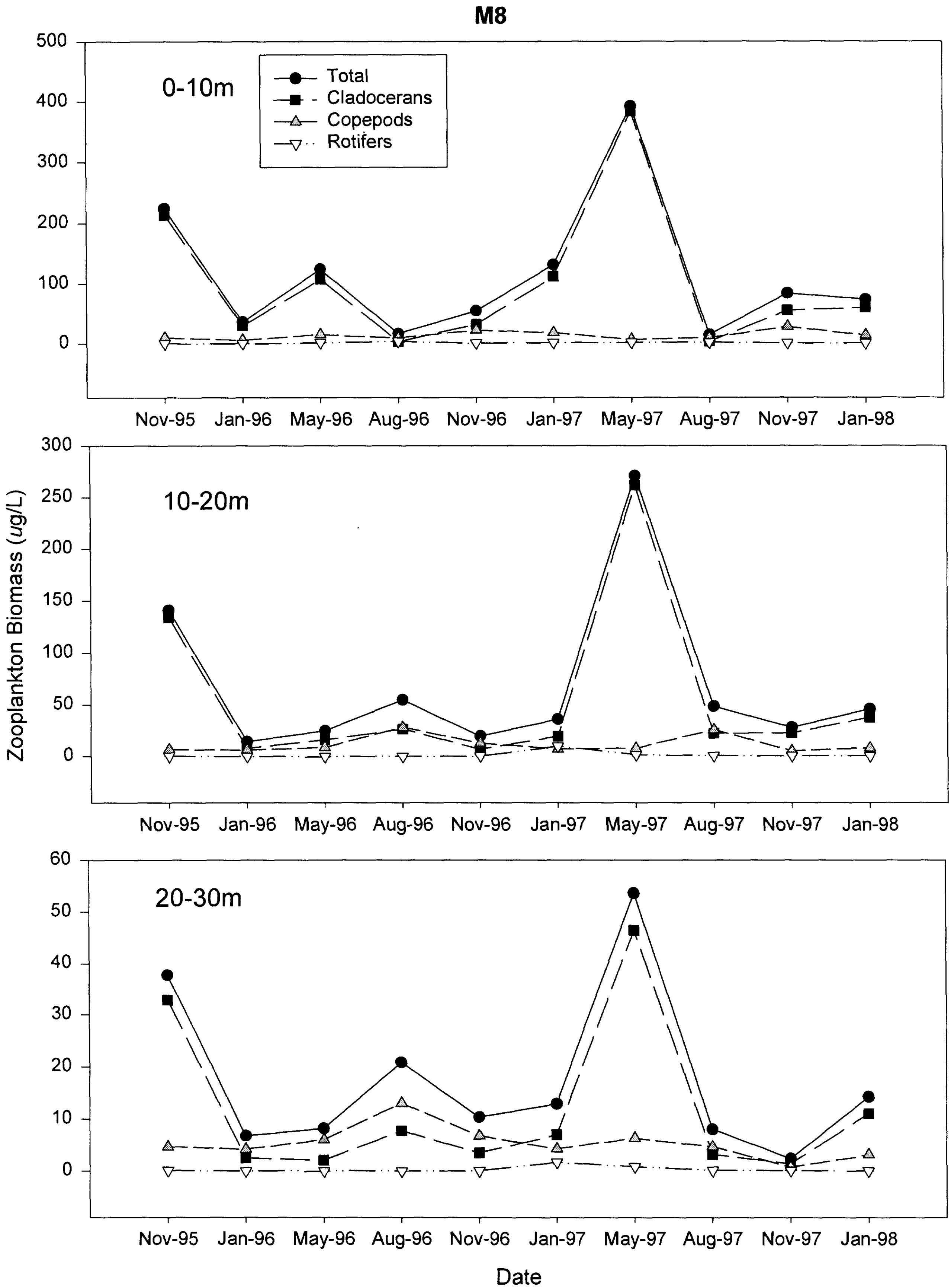


M4
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

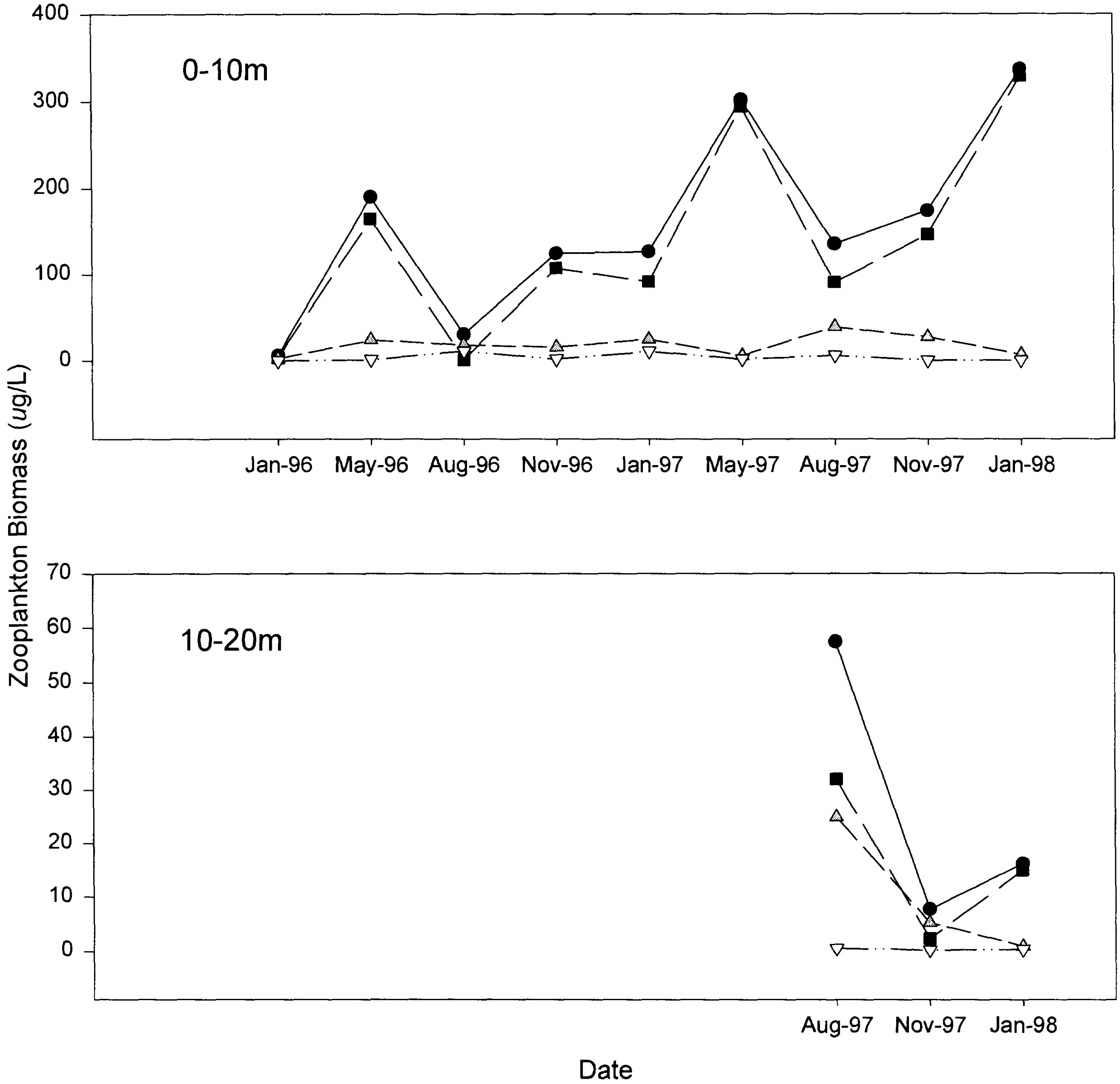

M5
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date


M6
0-10m
Total
Cladocerans
Copepods
Rotifers
250
200
150
100
50
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
140
120
100
80
60
40
20
0
20-30m
60
50
40
30
20
10
Zooplankton Biomass (ug/L)
Date

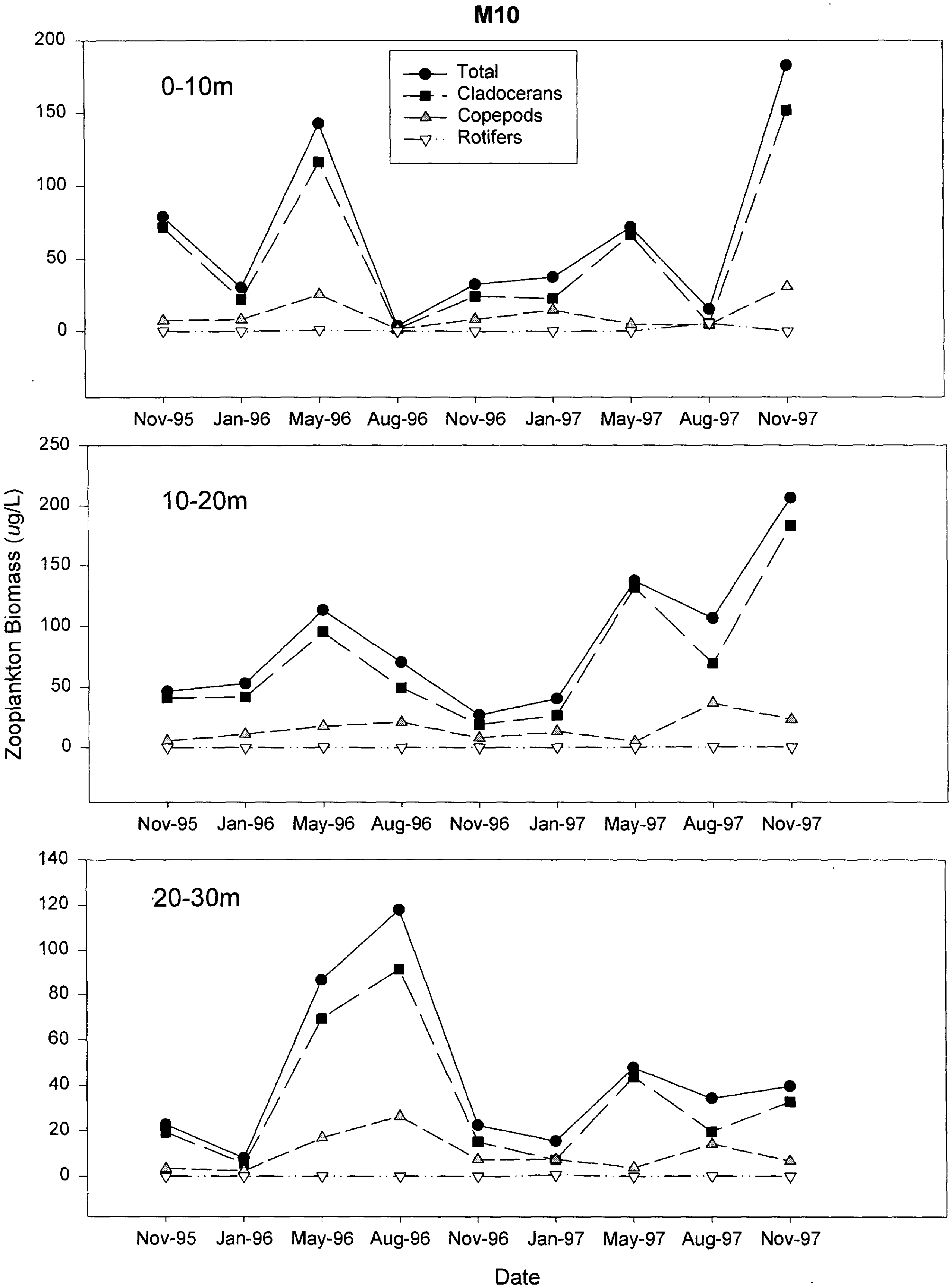

M7
0-10m
Total
Cladocerans
Copepods
Rotifers
10-20m
20-30m
Zooplankton Biomass (ug/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date


M8
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

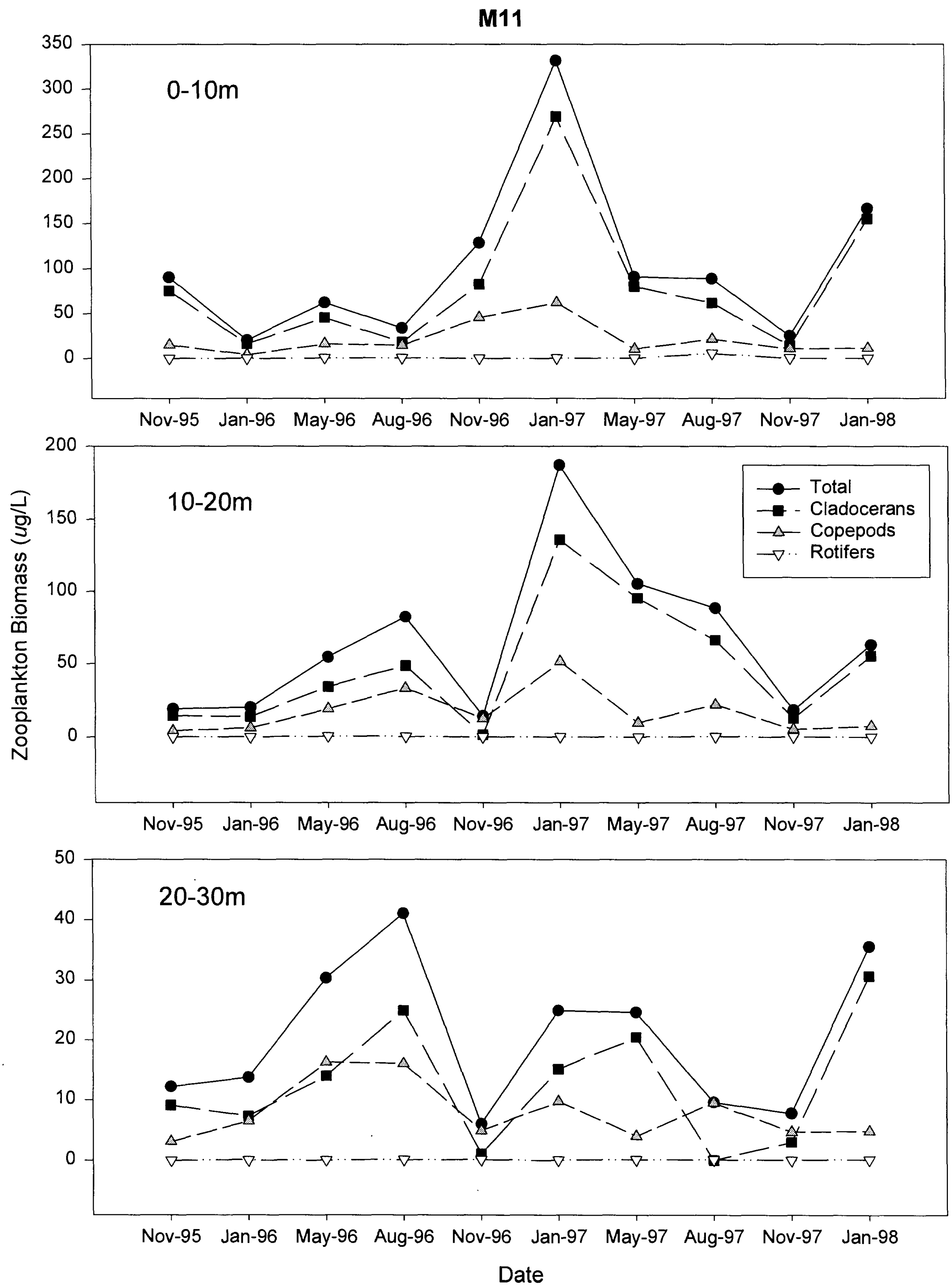
M9



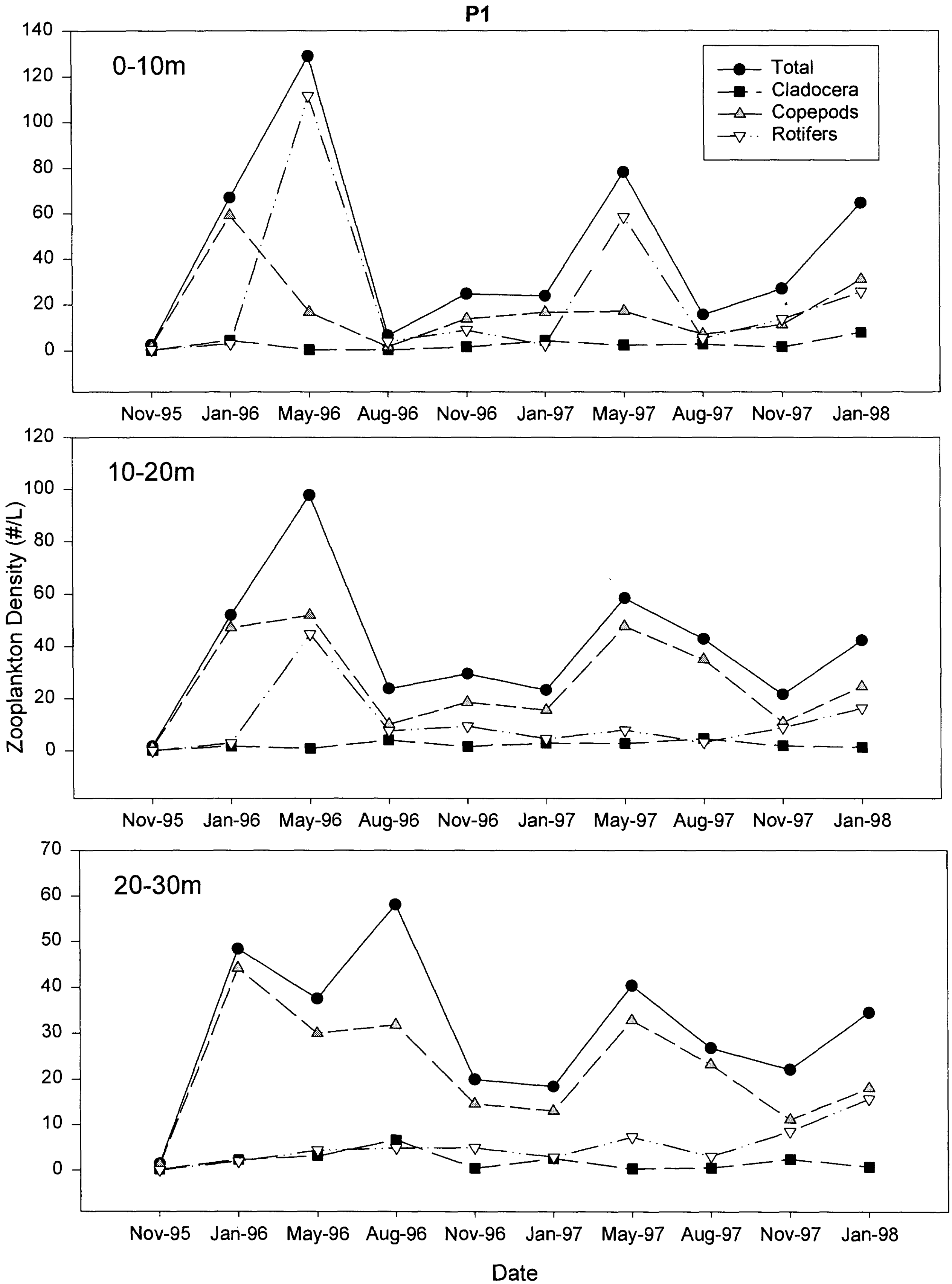
0-10m
400
300
200
100
0
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Zooplankton Biomass (ug/L)
10-20m
70
60
50
40
30
20
10
0
Aug-97
Nov-97
Jan-98
Date

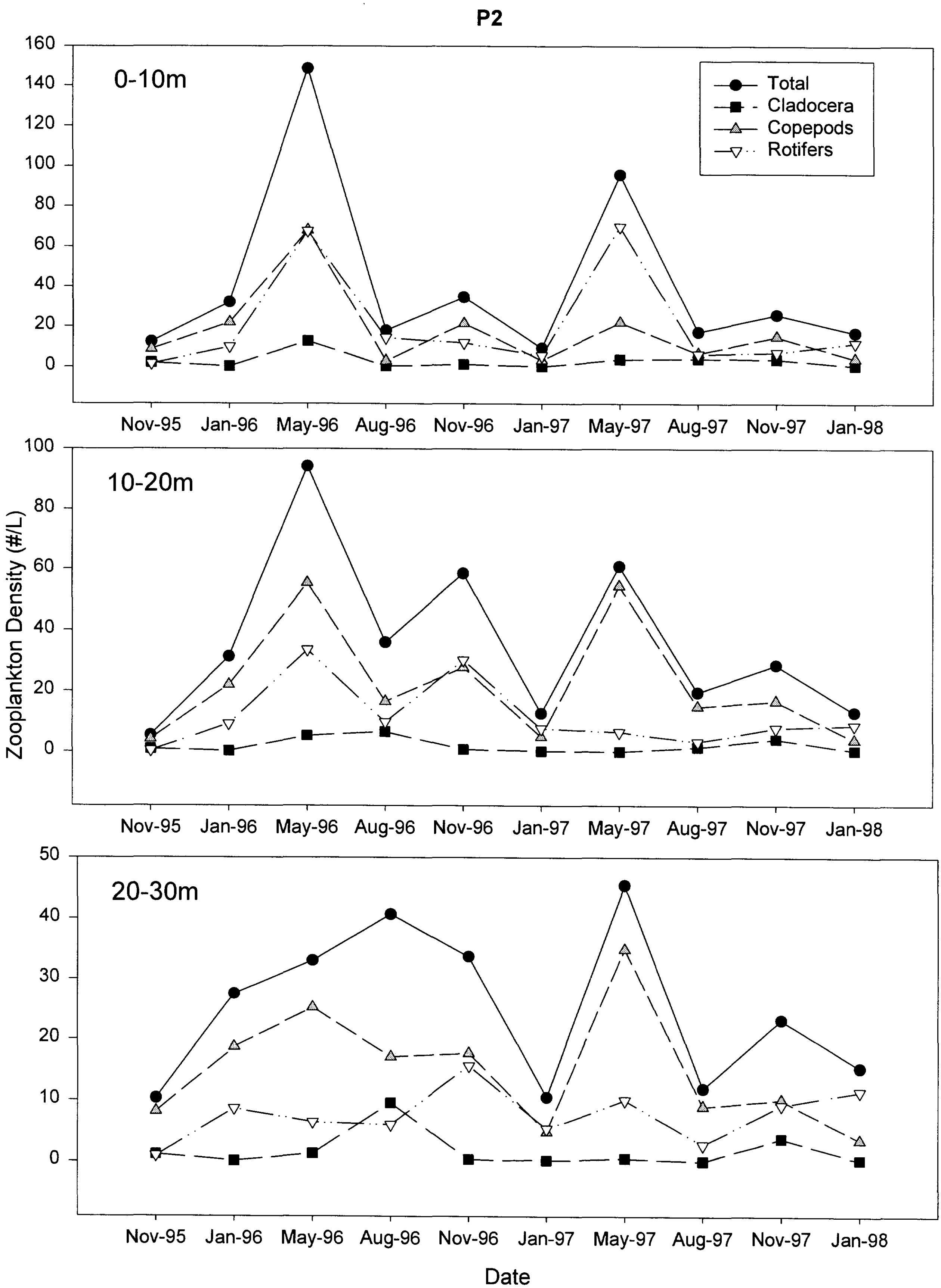


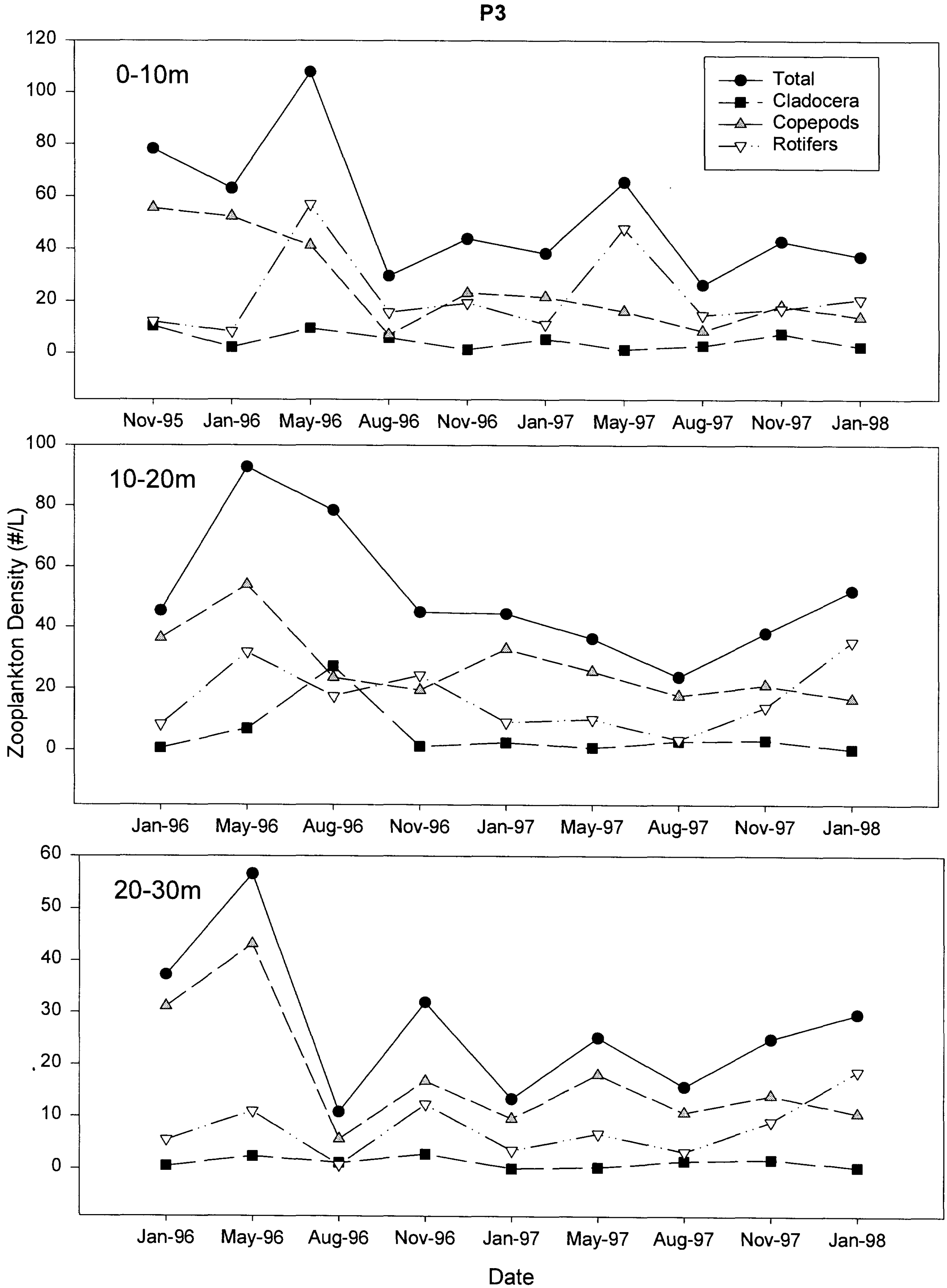
M10
0-10m
Total
Cladocerans
Copepods
Rotifers
200
150
100
50
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
10-20m
250
200
150
100
50
0
20-30m
140
120
100
80
60
40
20
0
Zooplankton Biomass (ug/L)
Date



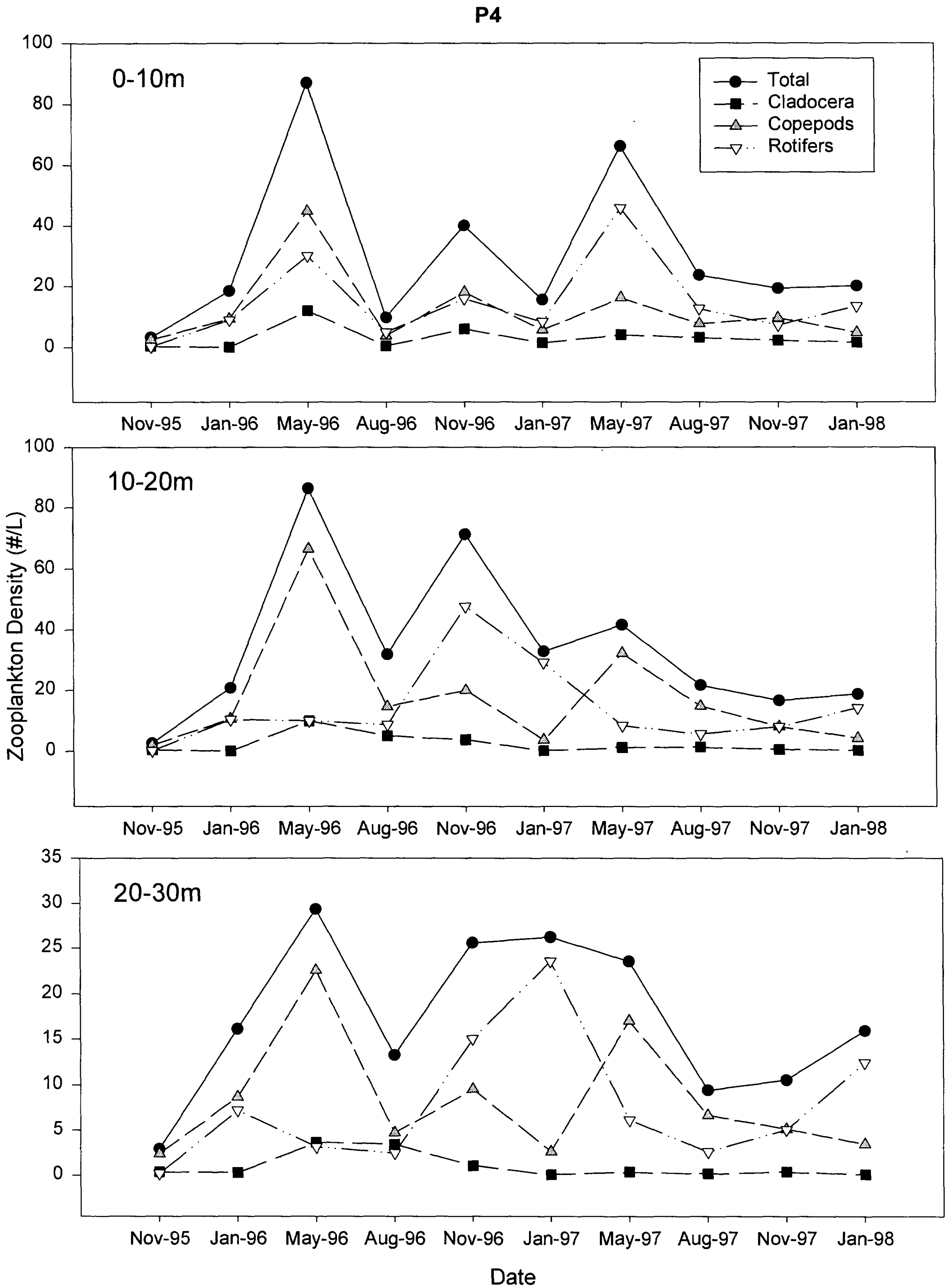
M11
0-10m
10-20m
20-30m
Total
Cladocerans
Copepods
Rotifers
Zooplankton Biomass (ug/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

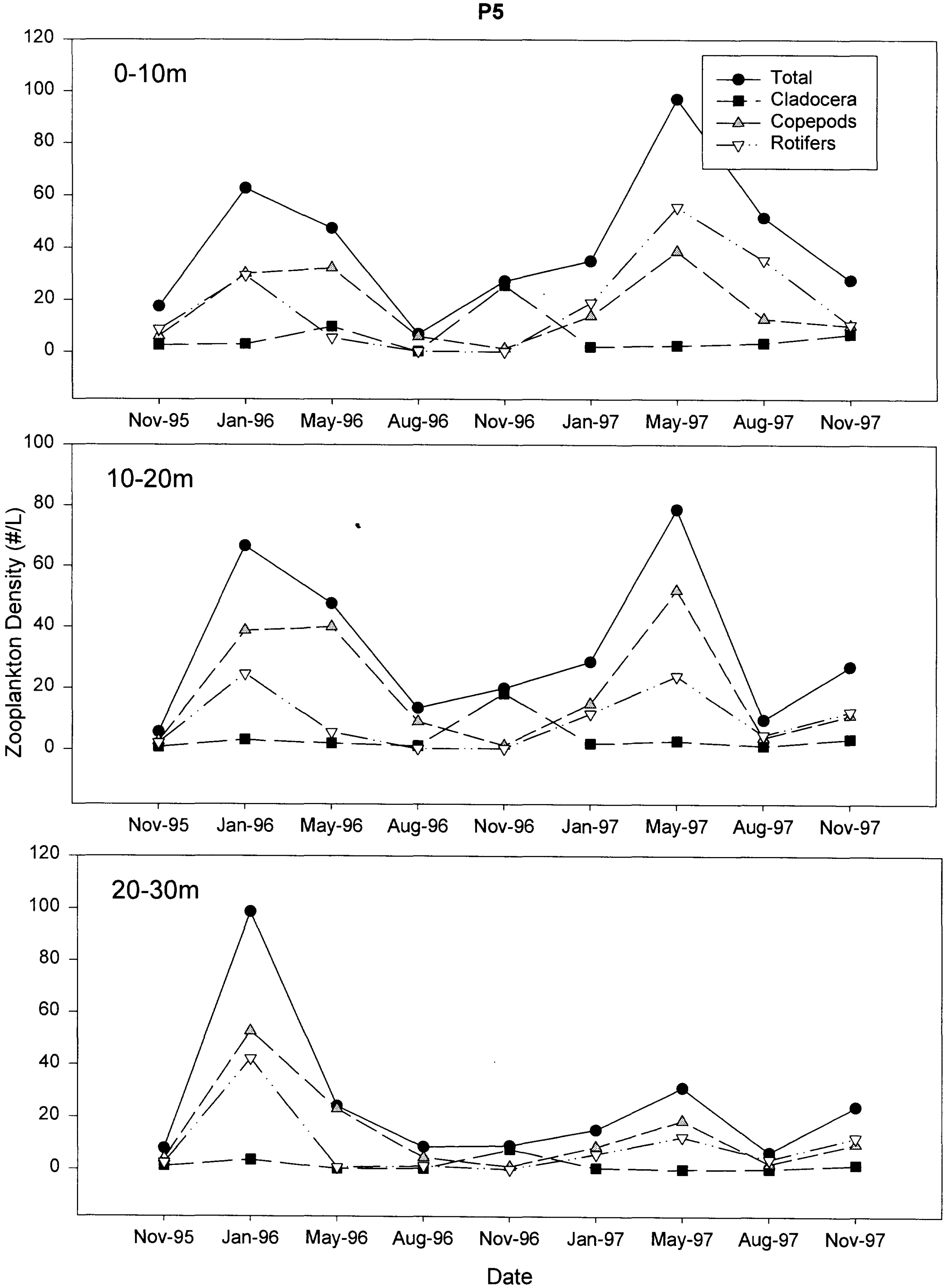

P1
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zooplankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

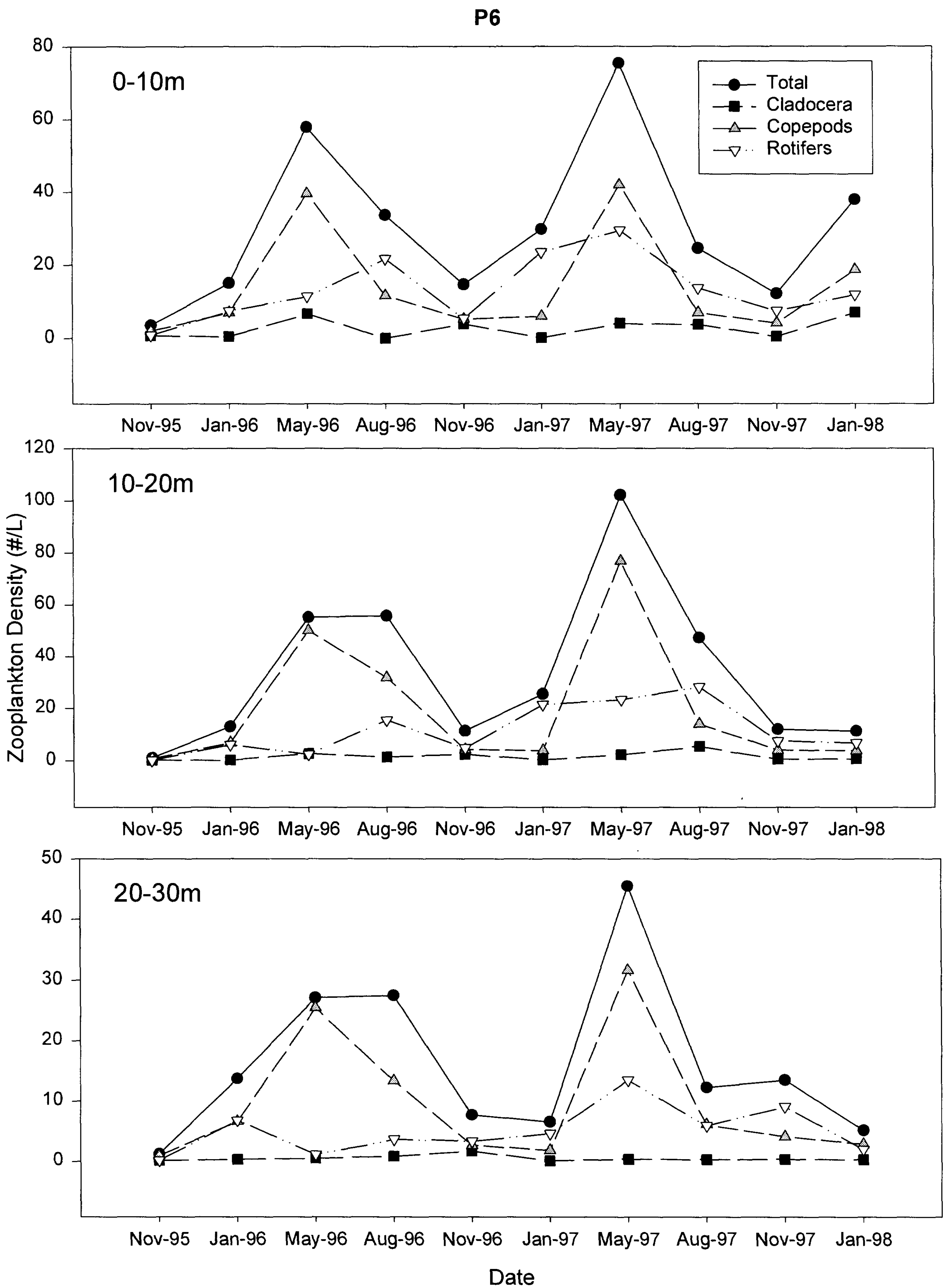

P2
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zooplankton Density (#/L)
Date
160
140
120
100
80
60
40
20
0
50
30
10
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

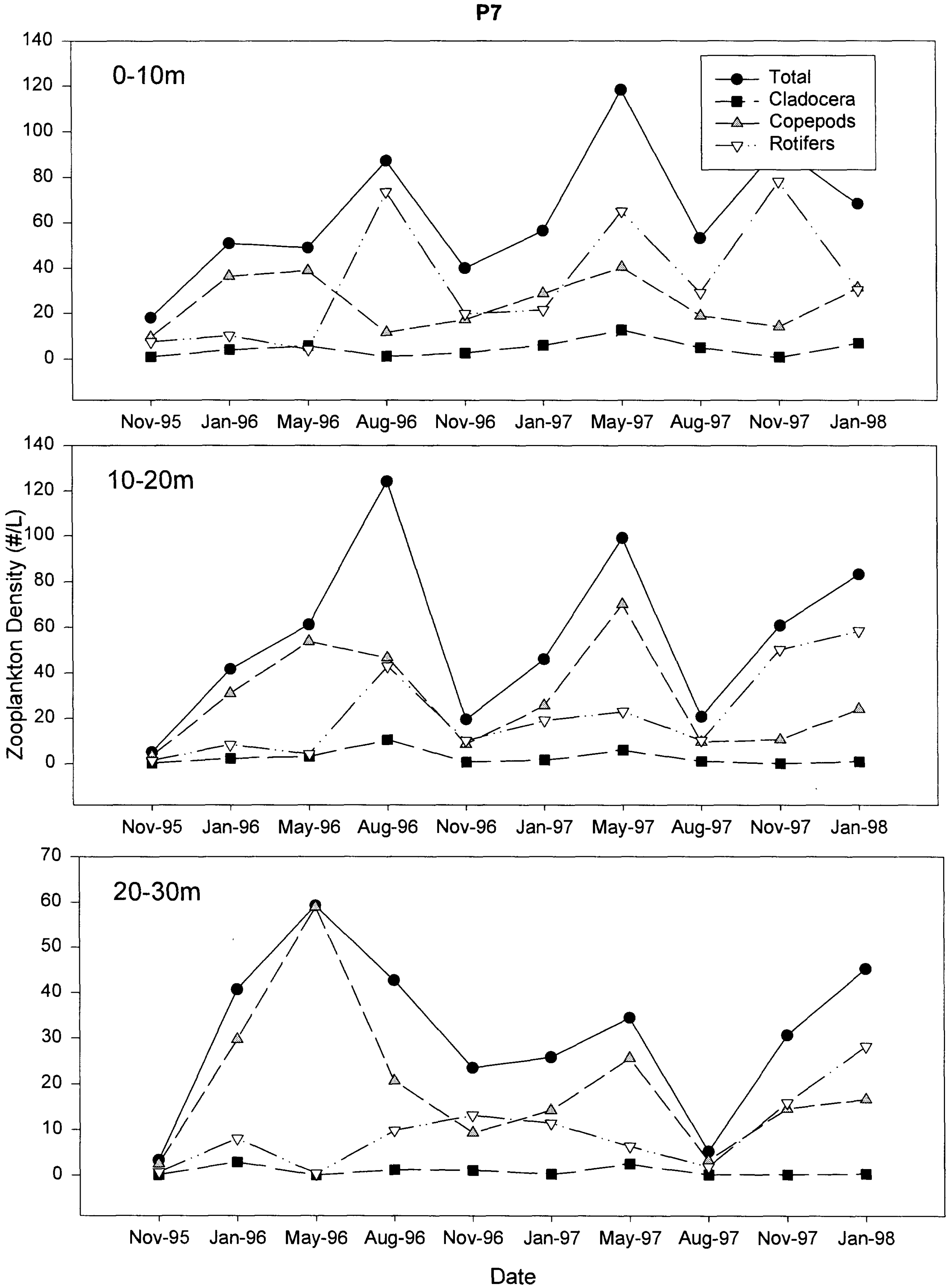


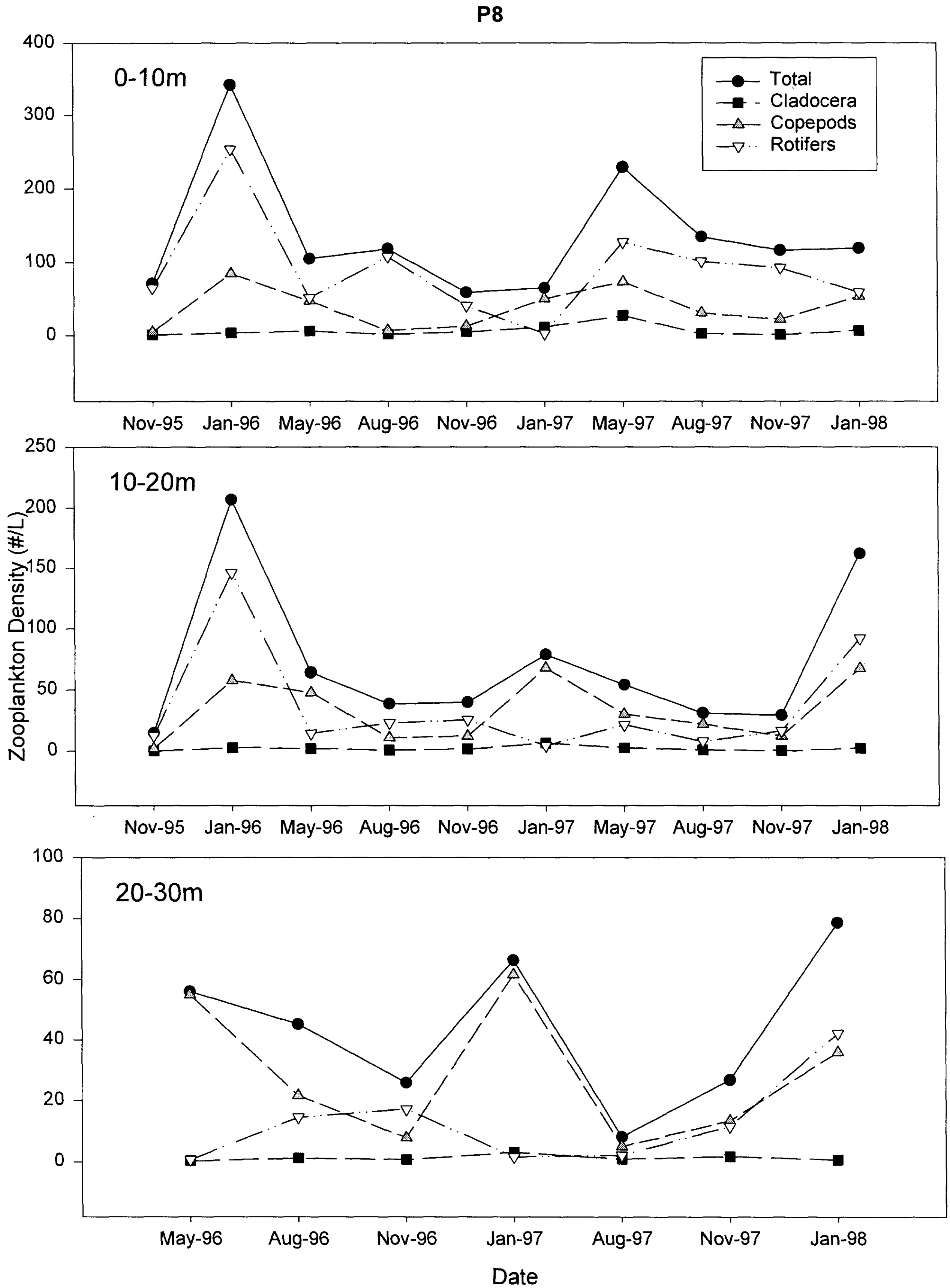
P3
0-10m
Total
Cladocera
Copepods
Rotifers
120
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
100
80
60
40
20
0
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
20-30m
60
50
40
30
20
10
0
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Zooplankton Density (#/L)
Date


P4
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zooplankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

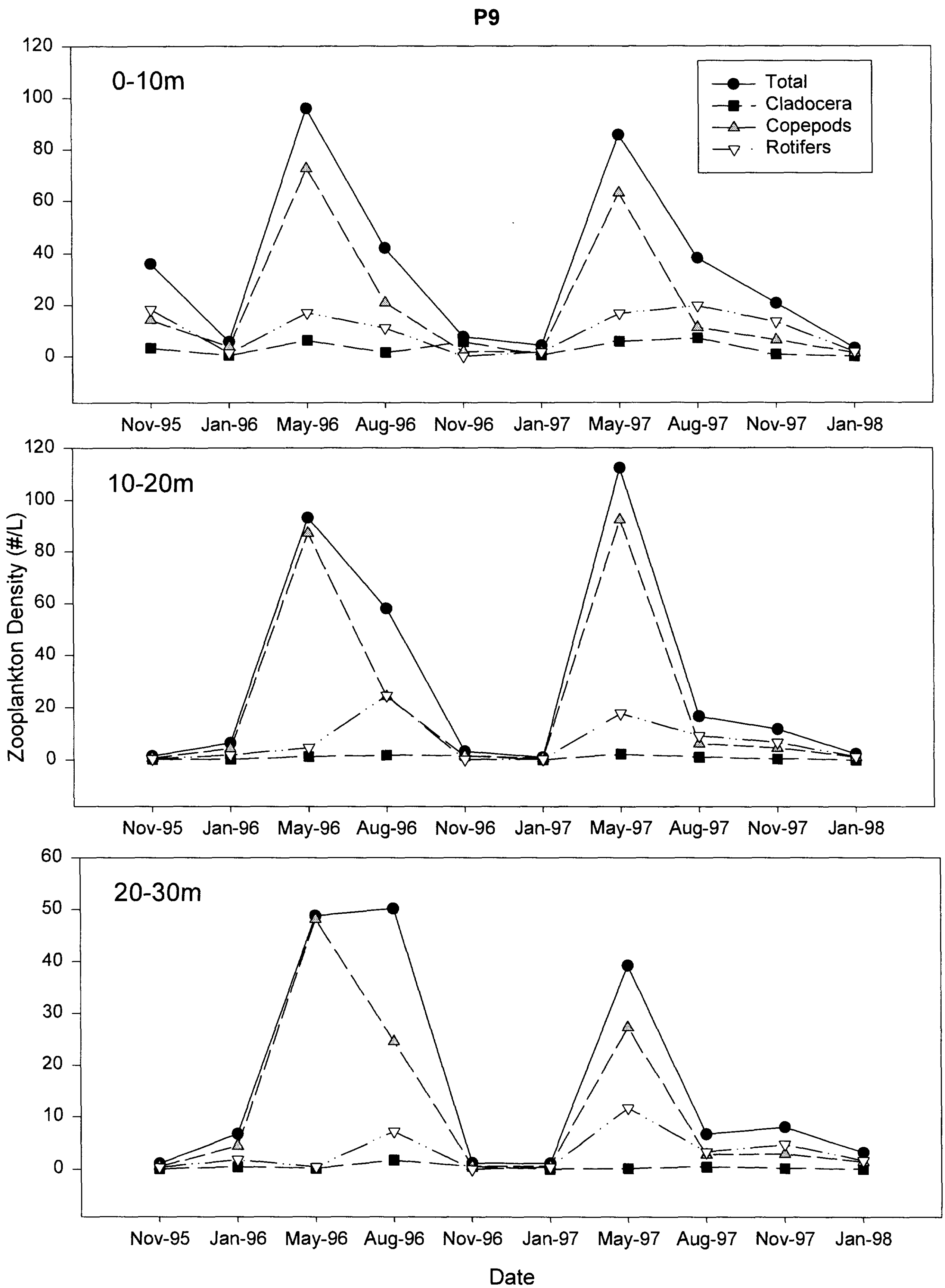

P5
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zooplankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
120
100
80
60
40
20
0


P6
0-10m
Total
Cladocera
Copepods
Rotifers
10-20m
20-30m
Zooplankton Density (#/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

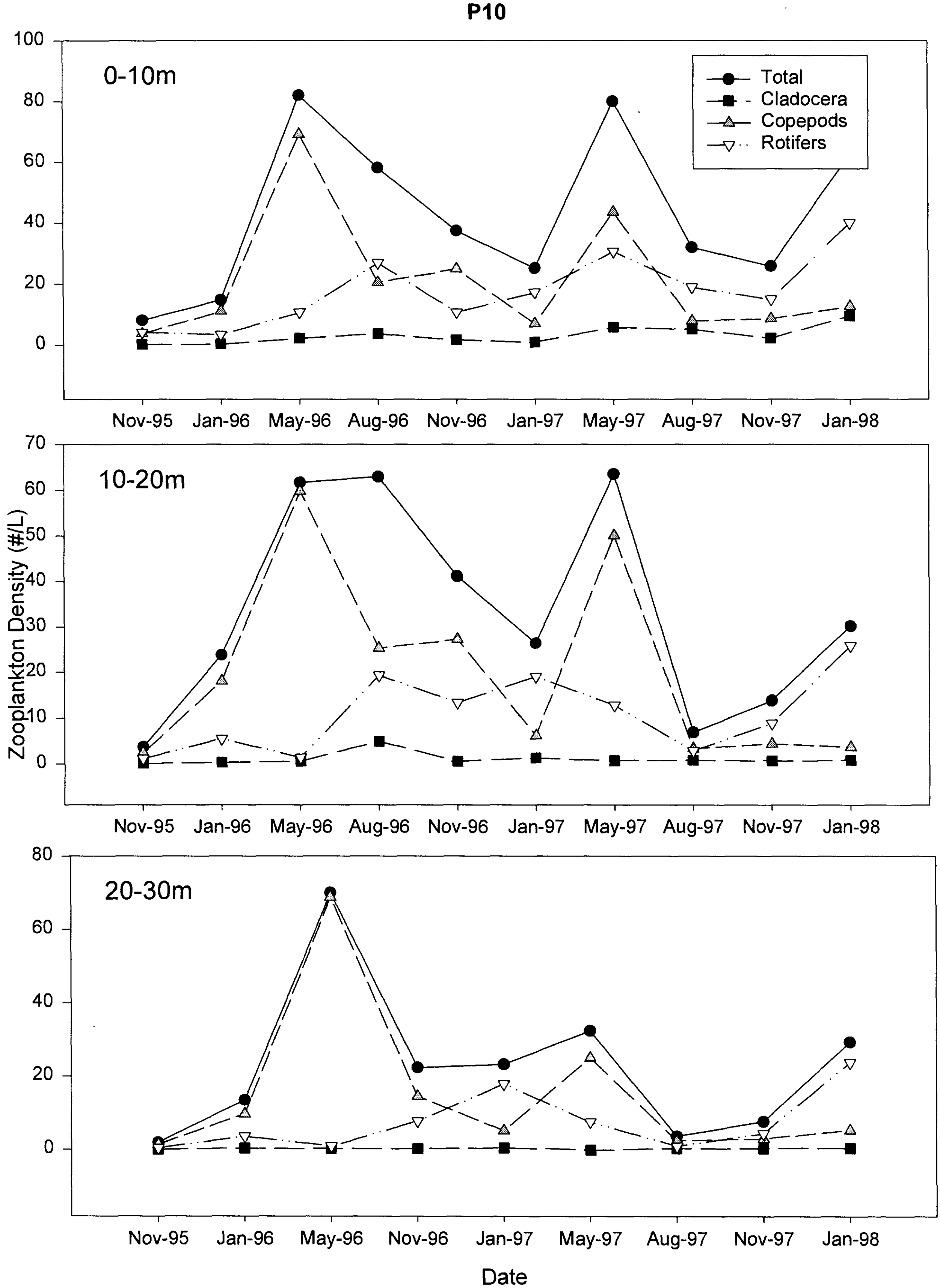

P7
0-10m
Total
Cladocera
Copepods
Rotifers
140
120
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
Zooplankton Density (#/L)
20-30m
70
60
50
40
30
20
10
Date

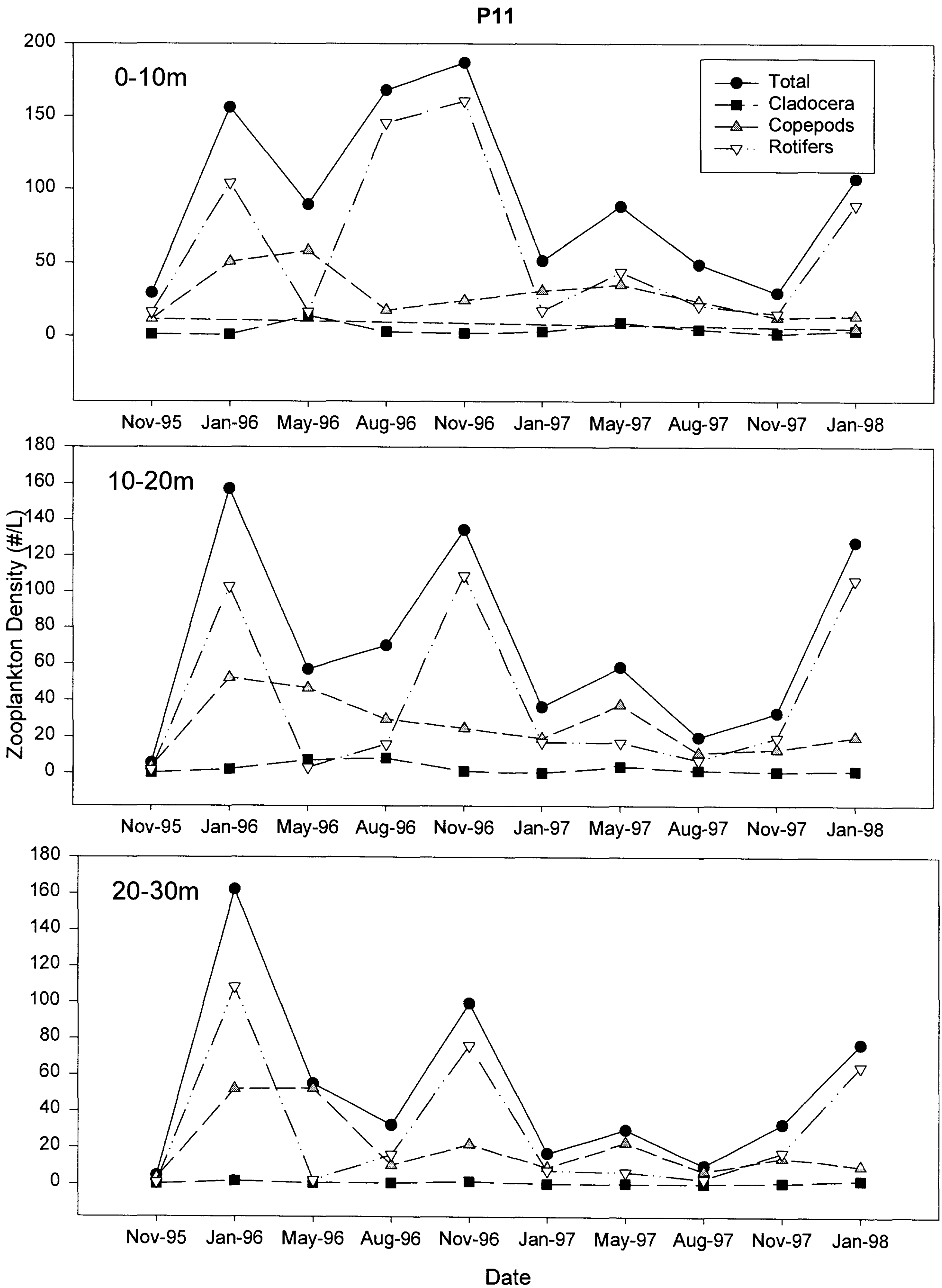


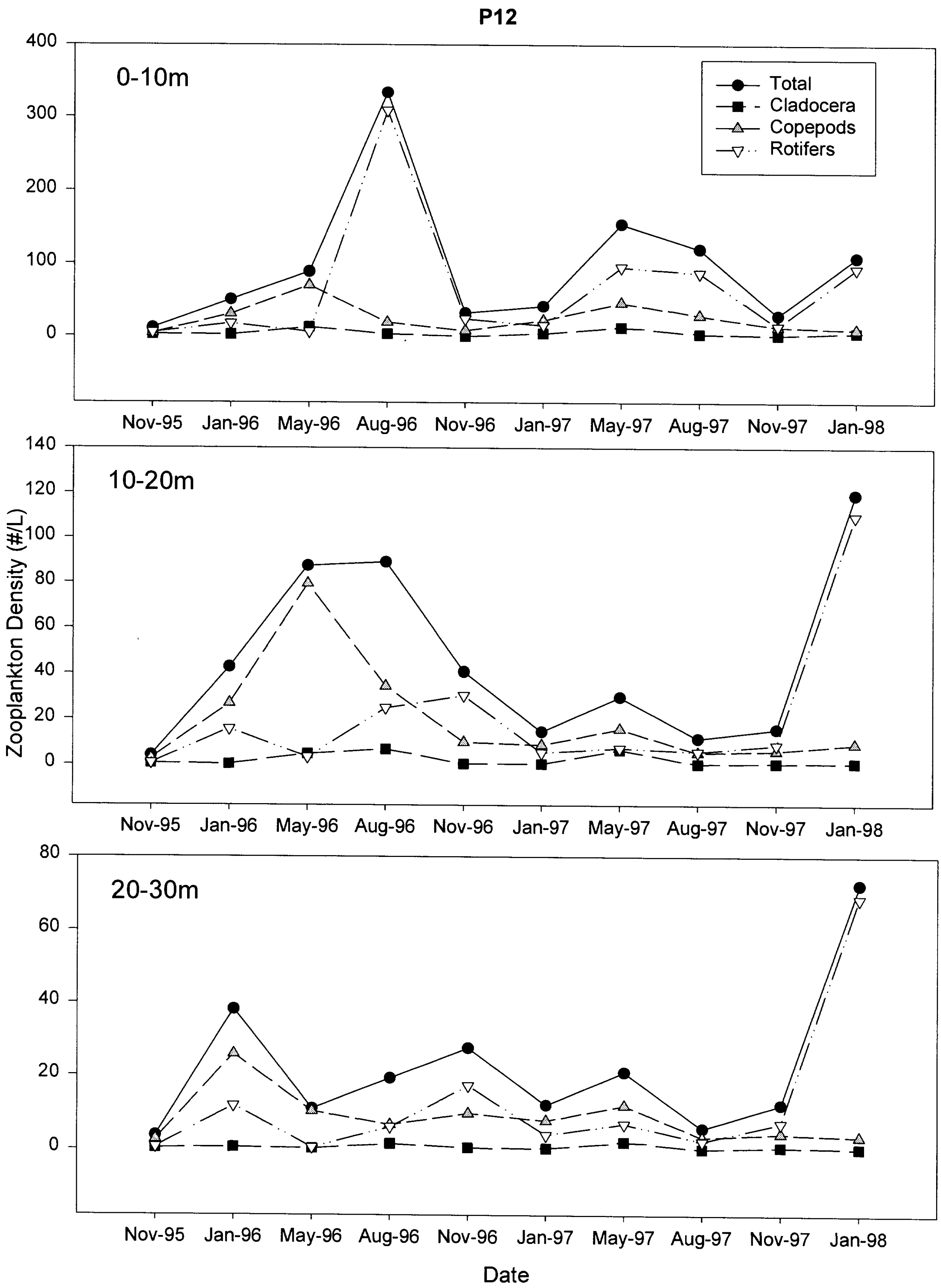
P8
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
400
300
200
100
0
250
200
150
100
50
0
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Zooplankton Density (#/L)
Date

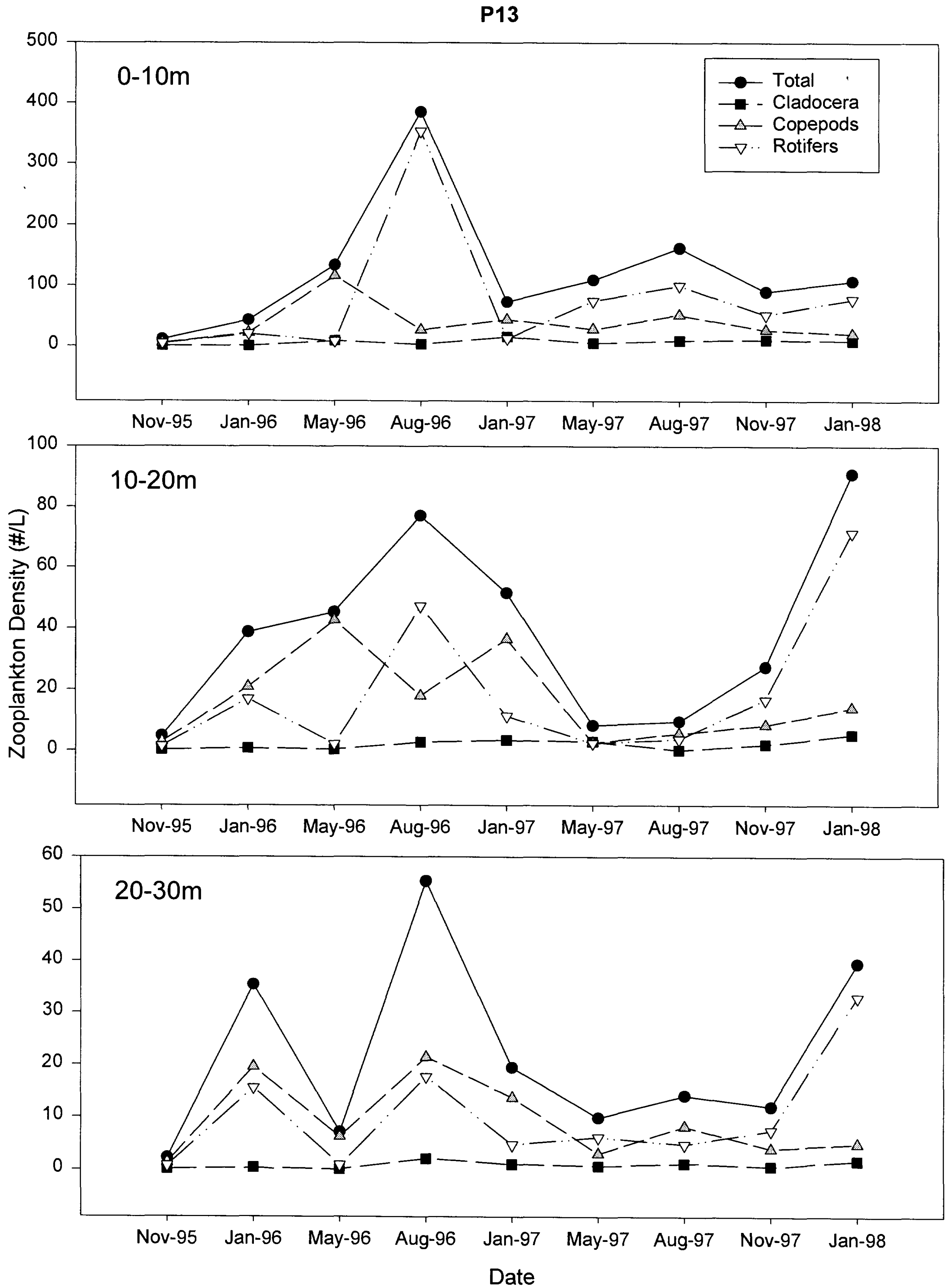


P9
0-10m
Total
Cladocera
Copepods
Rotifers
120
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
Zooplankton Density (#/L)
20-30m
60
50
40
30
10
Date

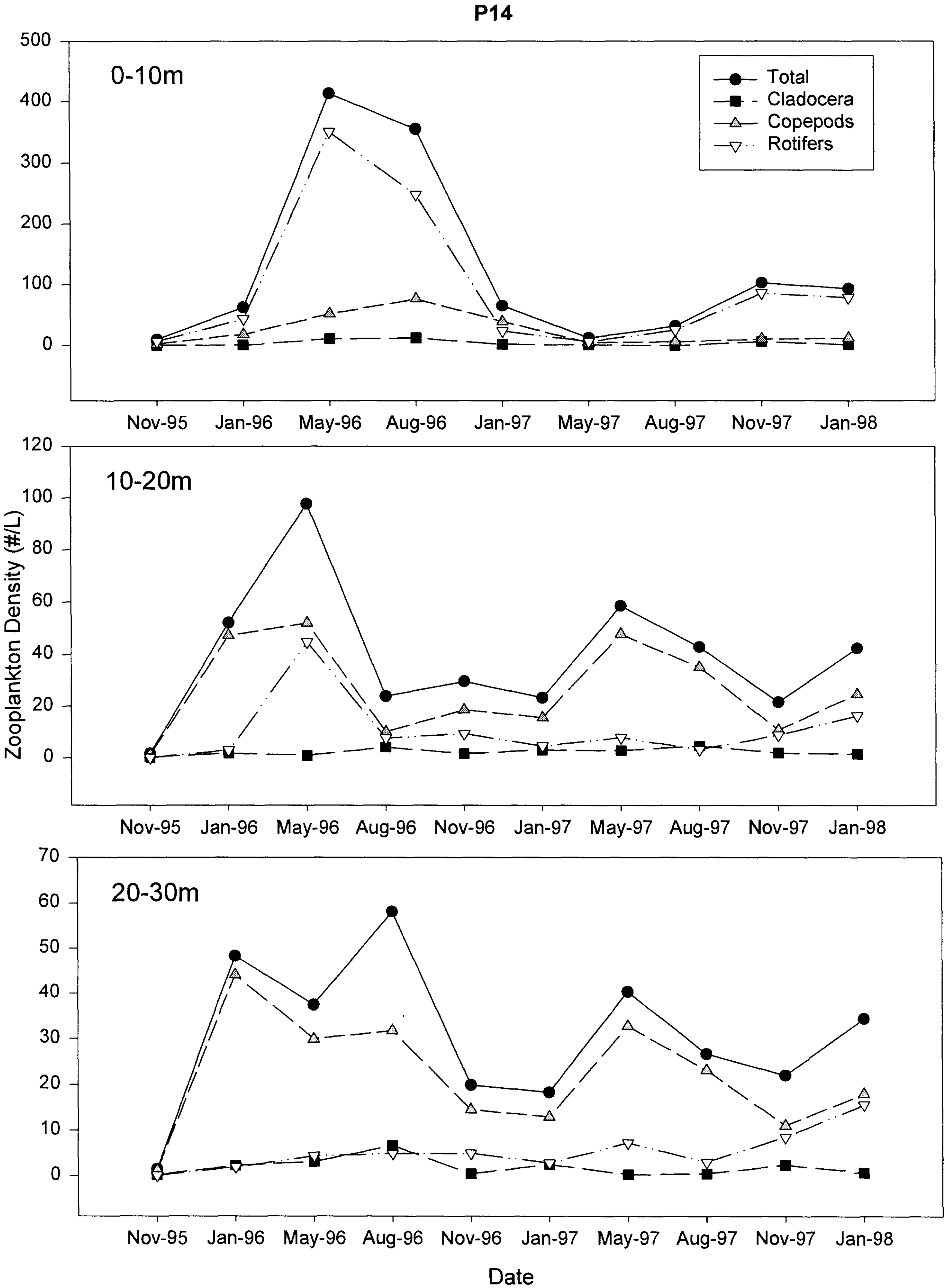

P10
0-10m
Total
Cladocera
Copepods
Rotifers
10-20m
20-30m
Zooplankton Density (#/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

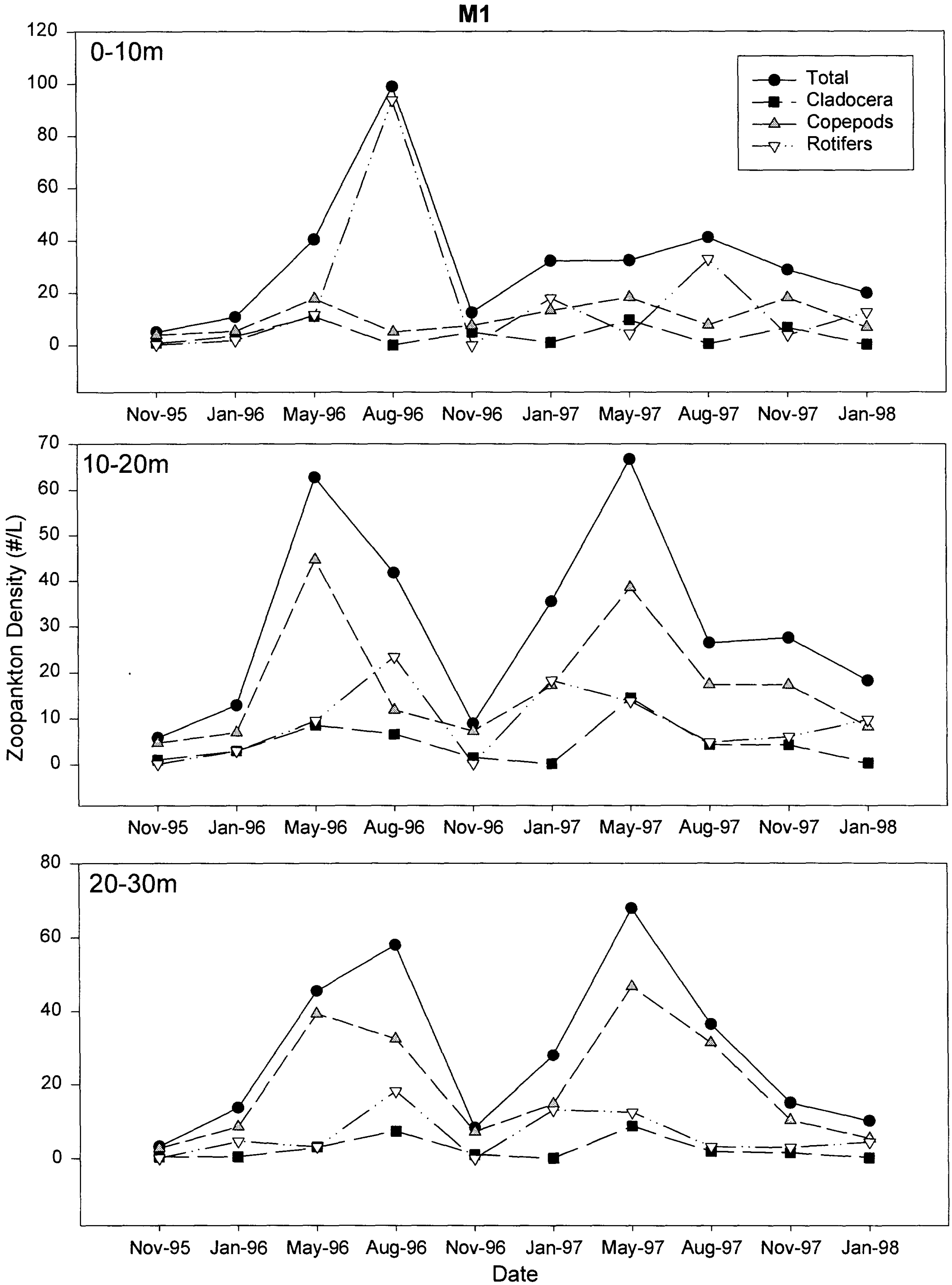

P11
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zooplankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
200
150
100
50
0
180
160
140
120
100
80
60
40
20
0

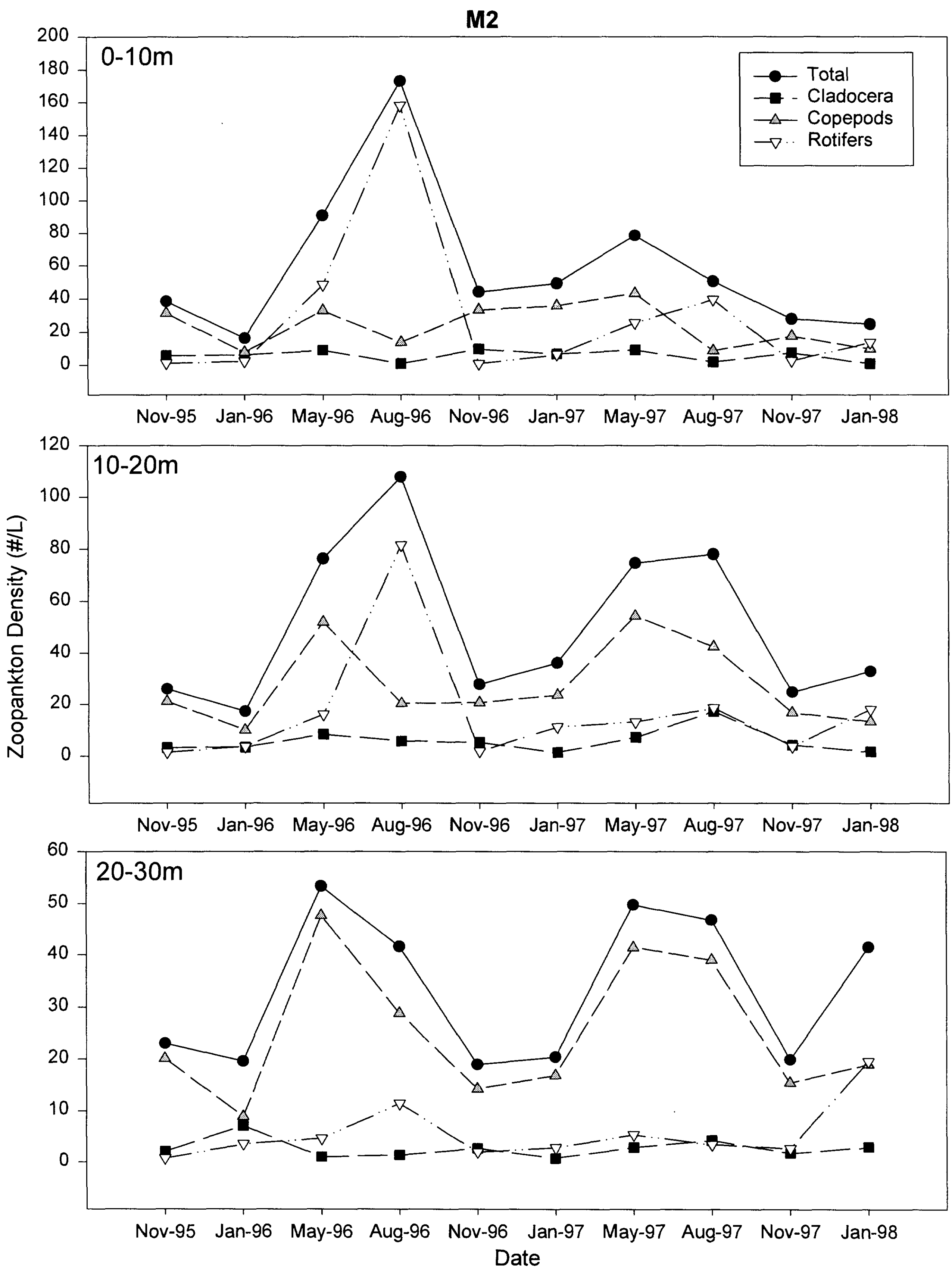

P12
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zooplankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

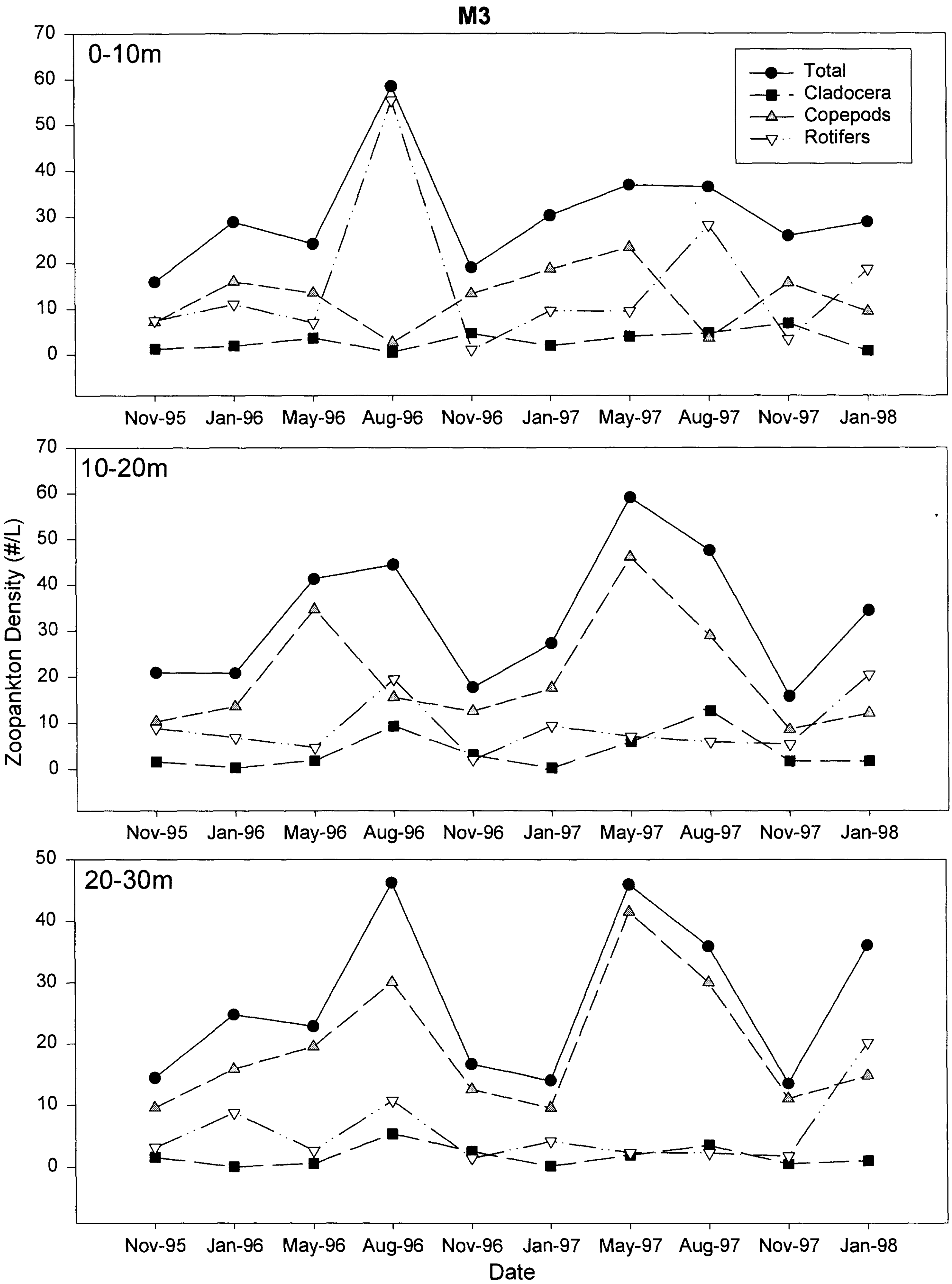


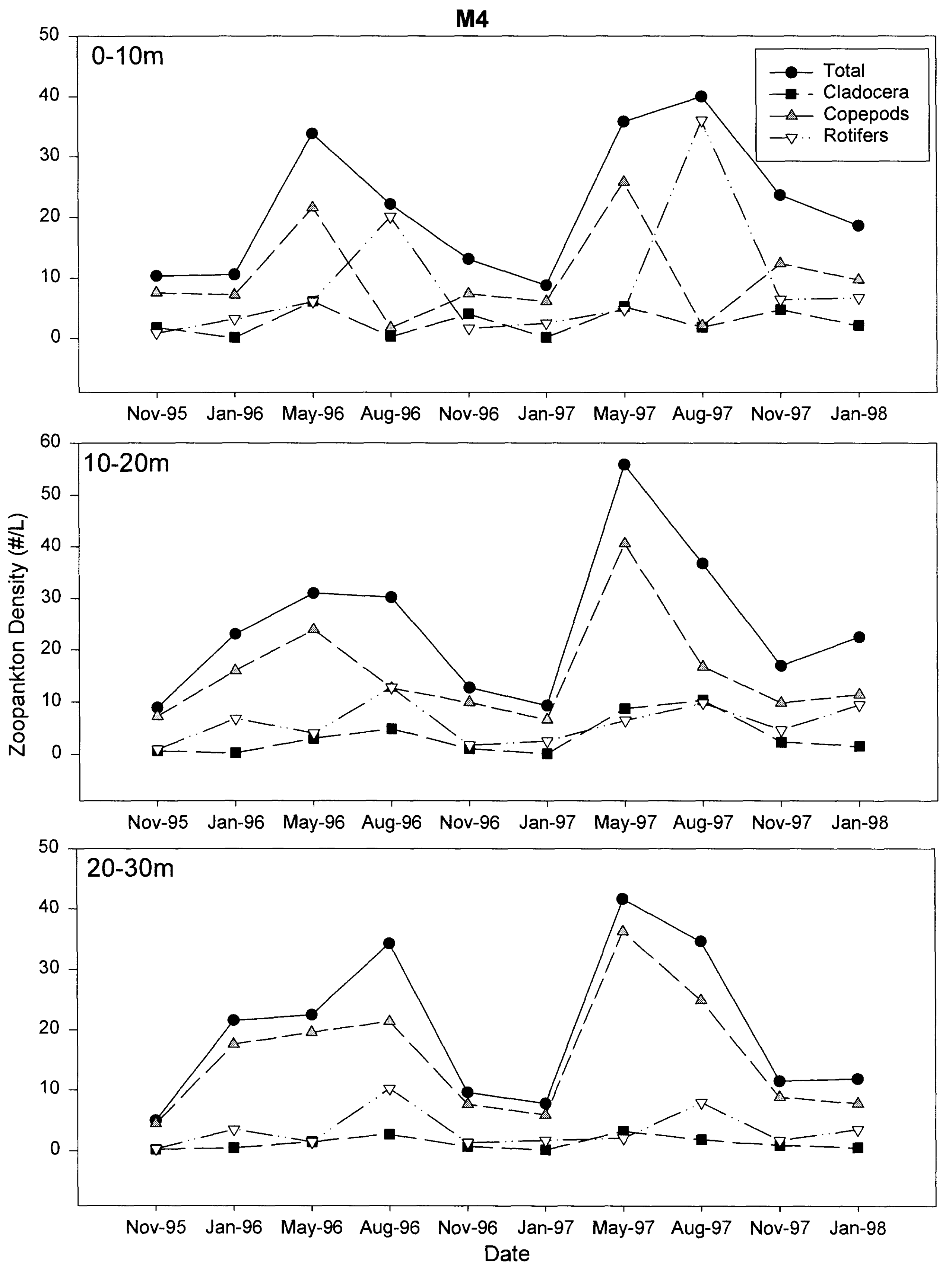
P13
0-10m
Total
Cladocera
Copepods
Rotifers
500
400
300
200
100
0
Nov-95
Jan-96
May-96
Aug-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
100
80
60
40
20
0
Zooplankton Density (#/L)
20-30m
60
50
40
30
20
10
0
Date

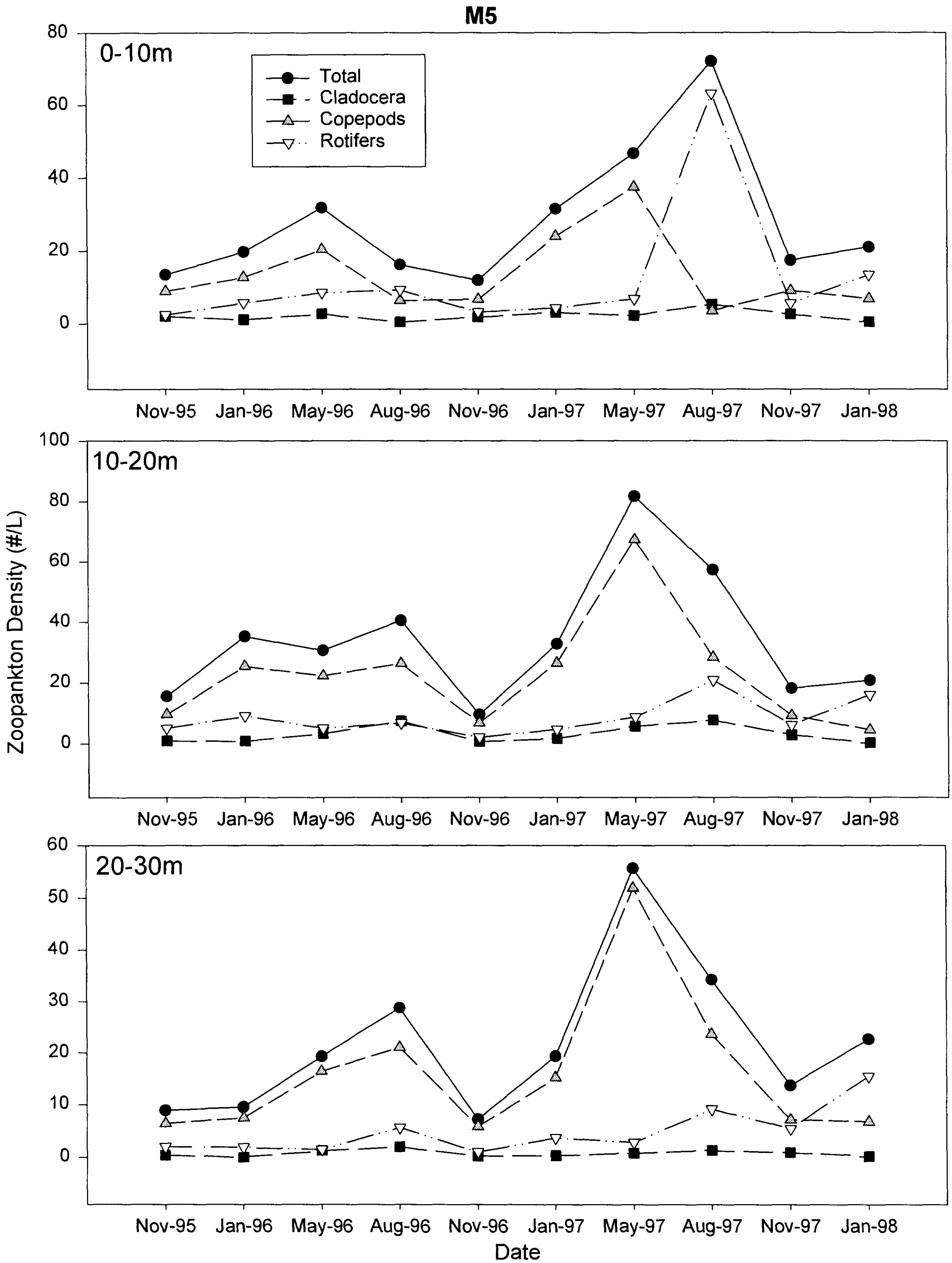

P14
0-10m
Total
Cladocera
Copepods
Rotifers
500
400
300
200
100
0
Nov-95
Jan-96
May-96
Aug-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
120
100
80
60
40
20
0
Nov-96
20-30m
70
60
50
40
30
20
10
Zooplankton Density (#/L)
Date

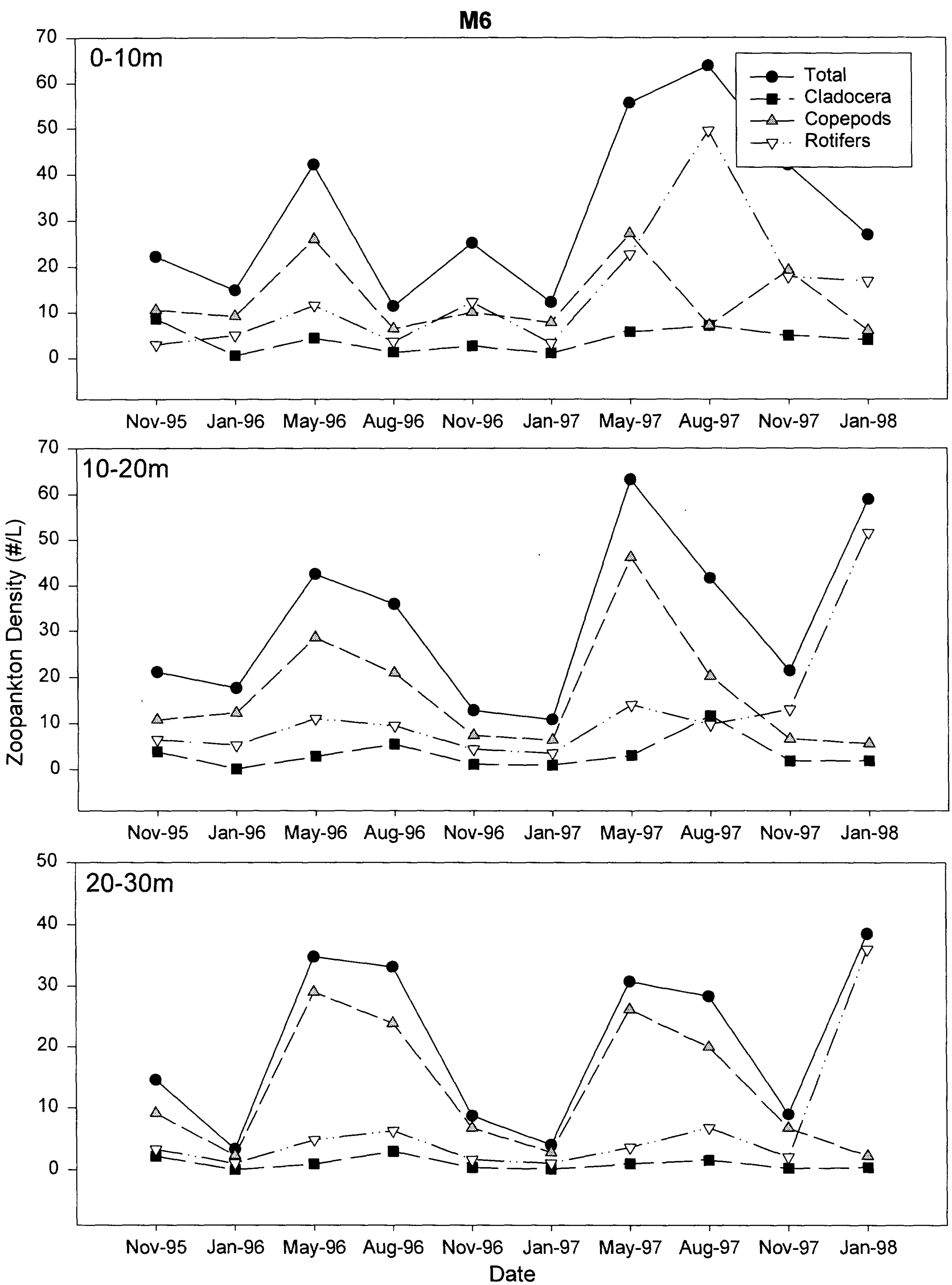

M1
0-10m
Total
Cladocera
Copepods
Rotifers
10-20m
20-30m
Zoopankton Density (#/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

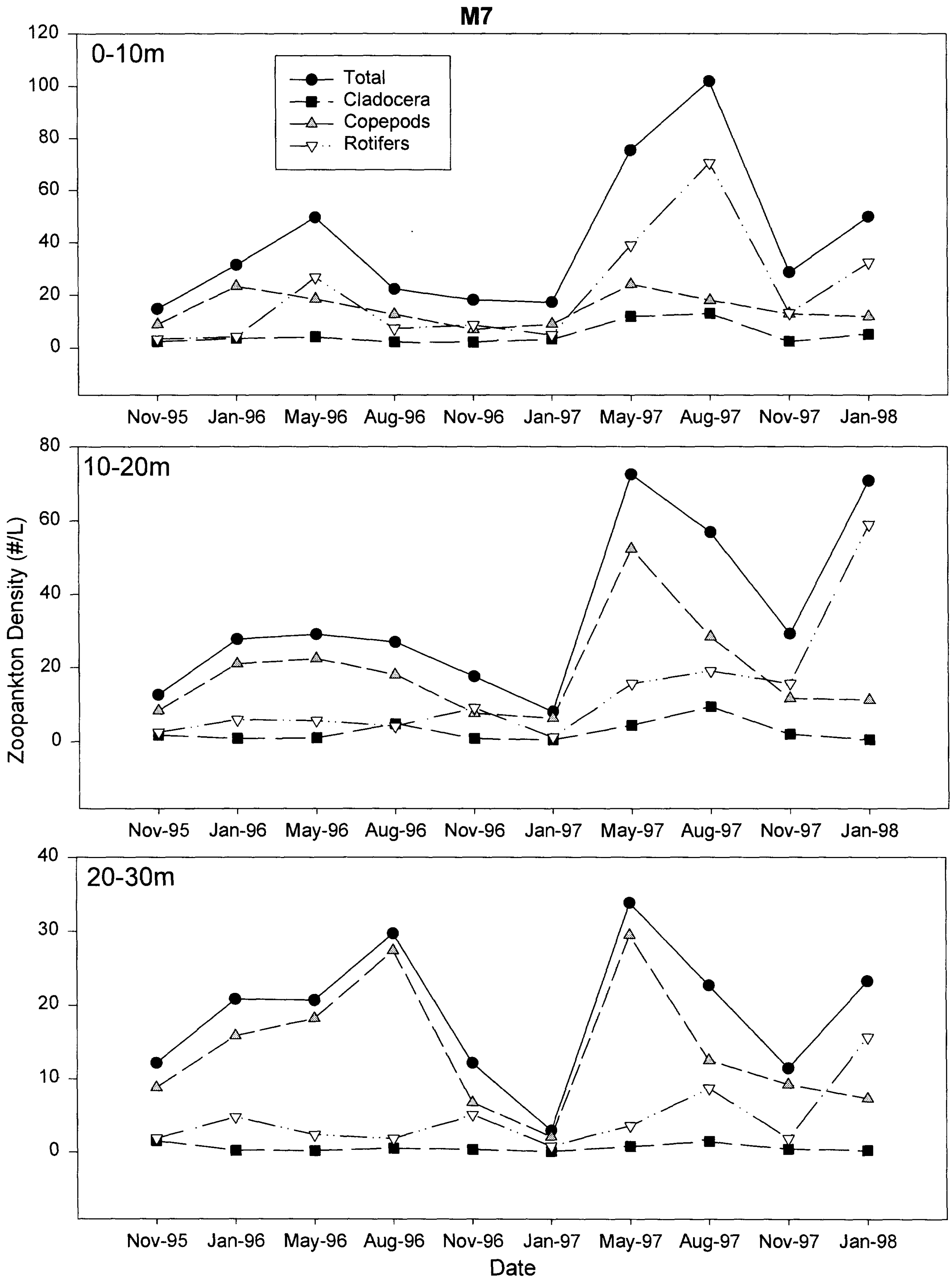

M2
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zoopankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

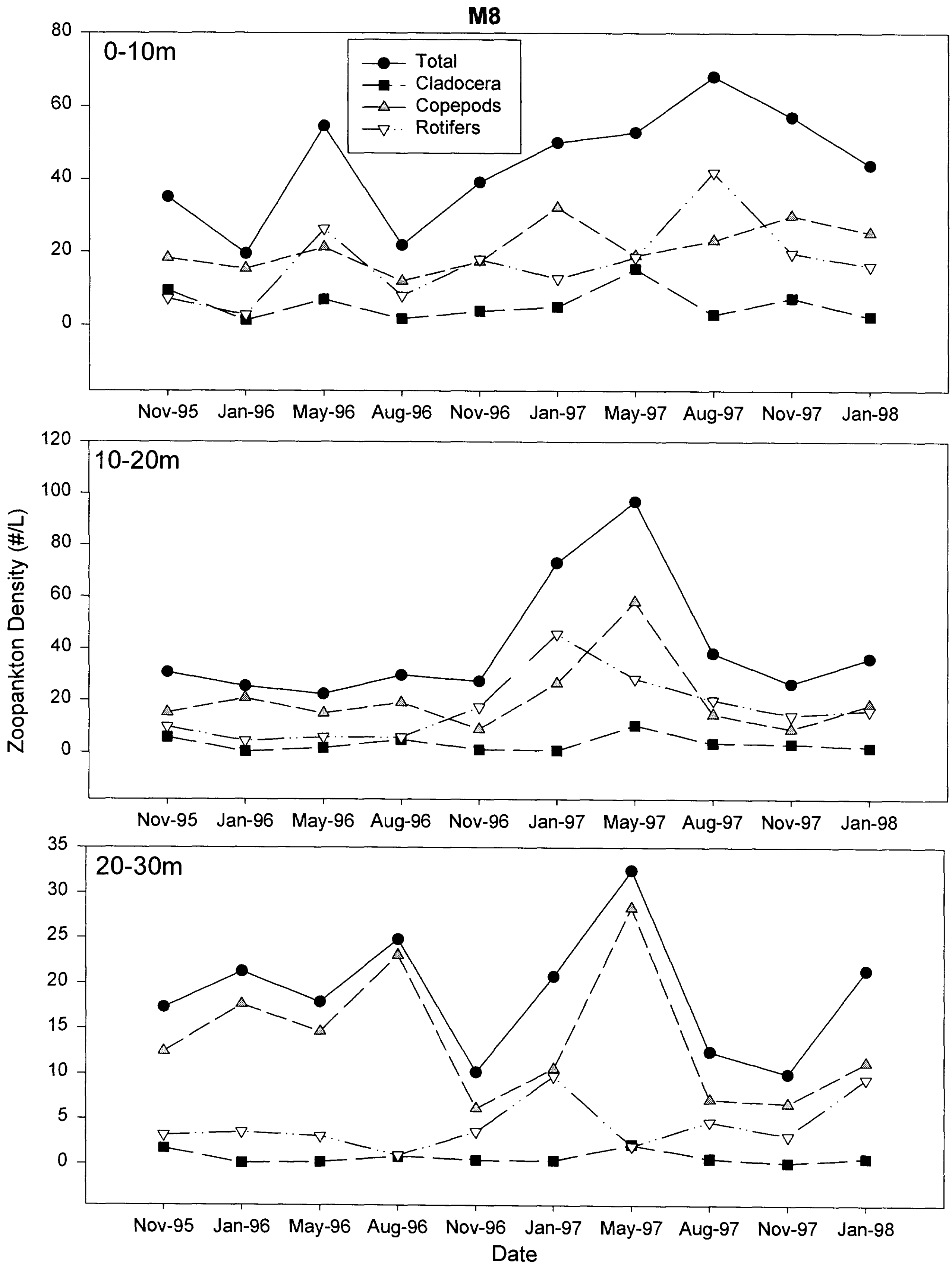

M3
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zoopankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
0
10
20
30
40
50
60
70


M4
0-10m
Total
Cladocera
Copepods
Rotifers
10-20m
20-30m
Zoopankton Density (#/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date
0
10
20
30
40
50
60

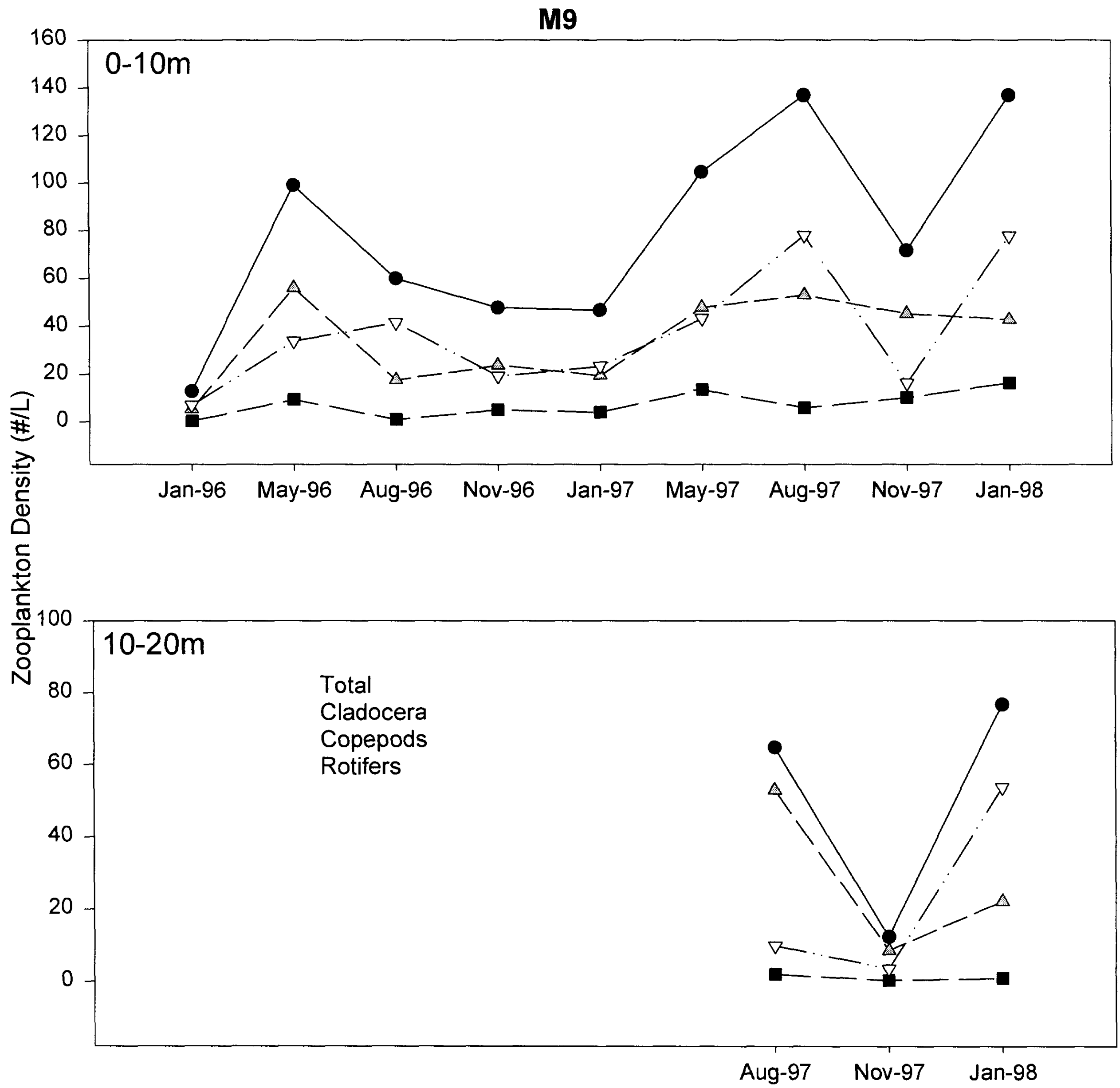

M5
0-10m
Total
Cladocera
Copepods
Rotifers
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
100
80
60
40
20
0
Zoopankton Density (#/L)
20-30m
60
50
40
30
20
10
0
Date


M6
0-10m
Total
Cladocera
Copepods
Rotifers
10-20m
20-30m
Zoopankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

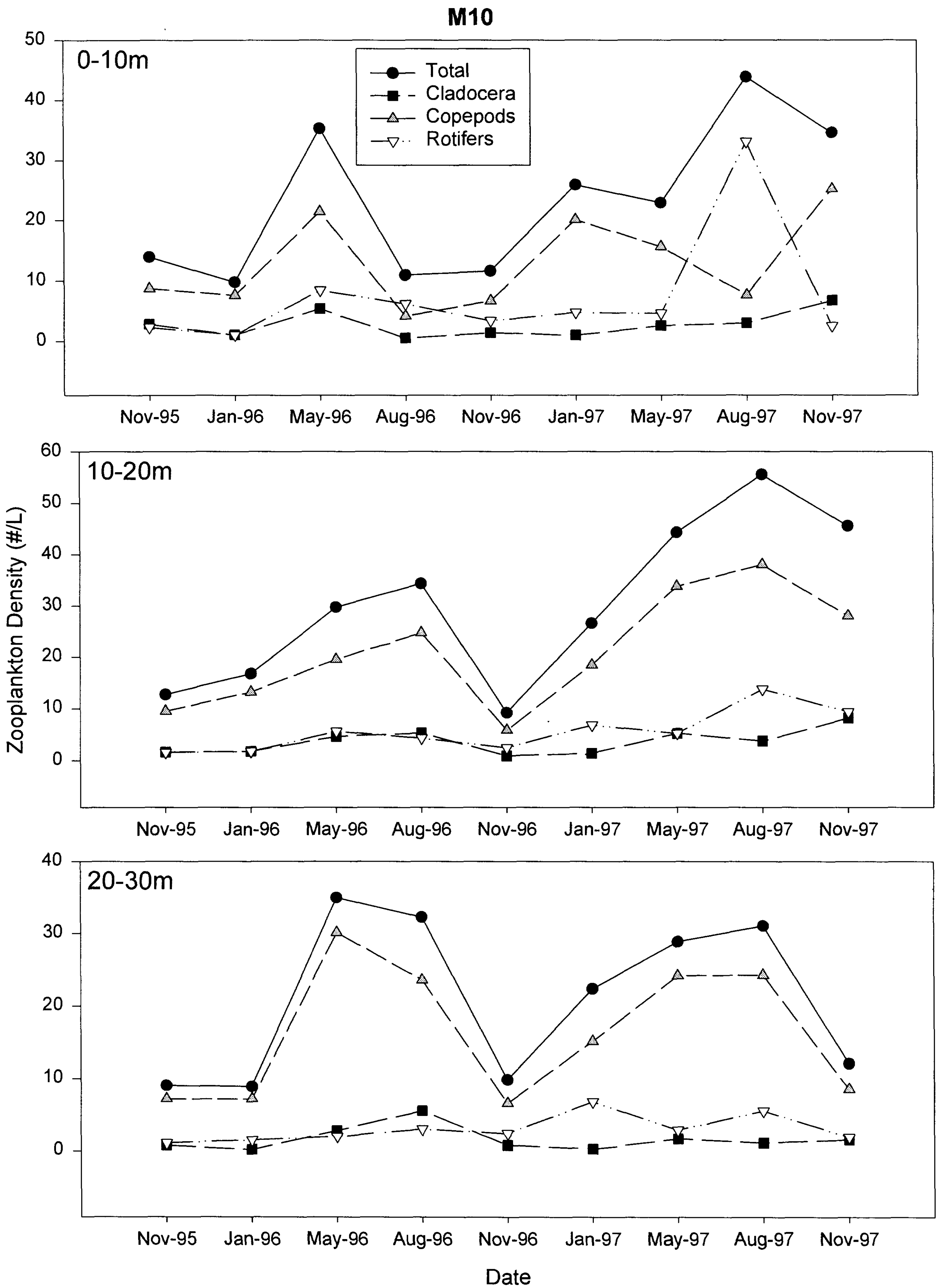

M7
0-10m
Total
Cladocera
Copepods
Rotifers
10-20m
20-30m
Zoopankton Density (#/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date



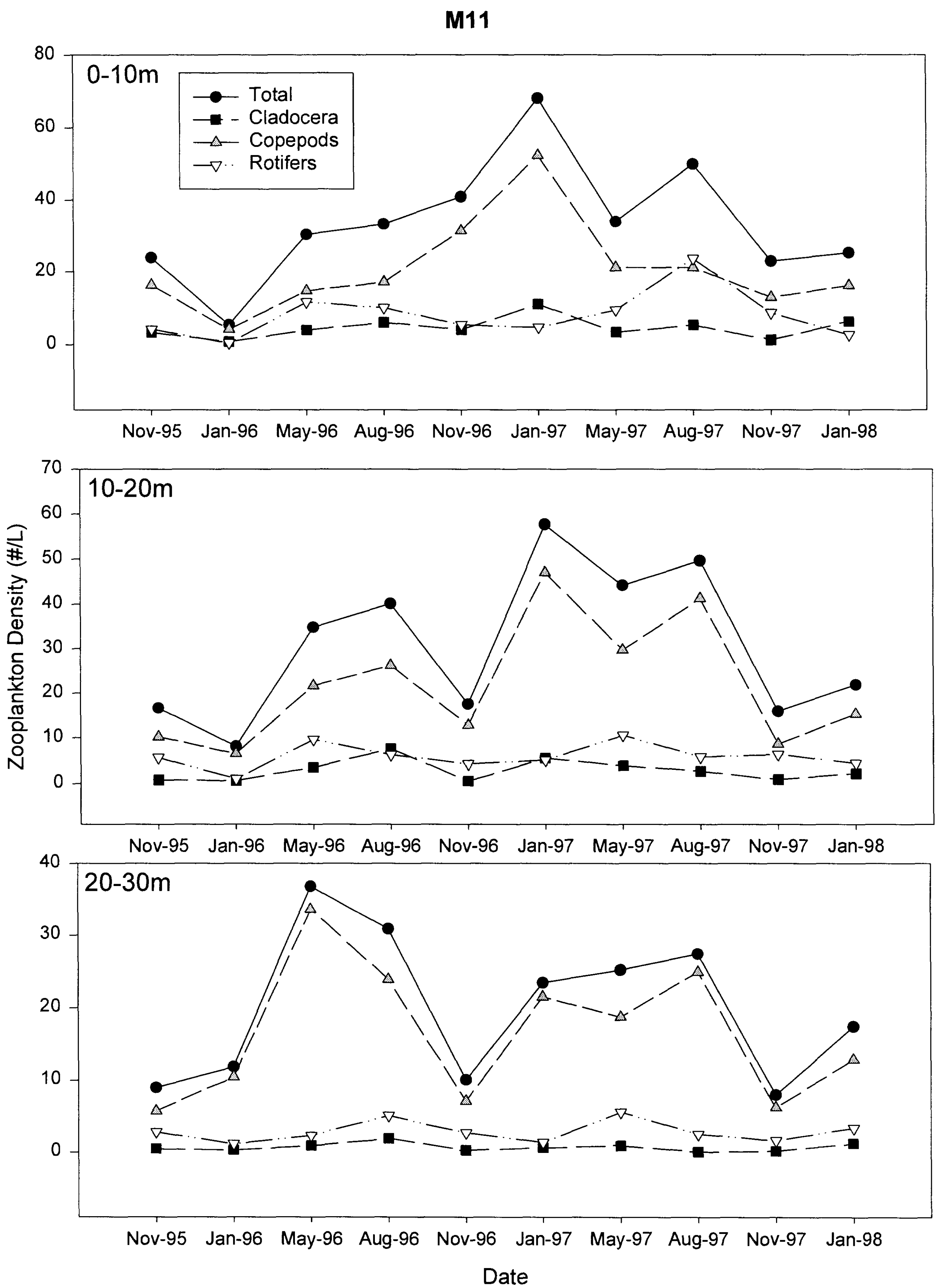
M8
0-10m
10-20m
20-30m
Total
Cladocera
Copepods
Rotifers
Zoopankton Density (#/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98



M9
0-10m
10-20m
Total
Cladocera
Copepods
Rotifers
Zooplankton Density (#/L)
160
140
120
100
80
60
40
20
0
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

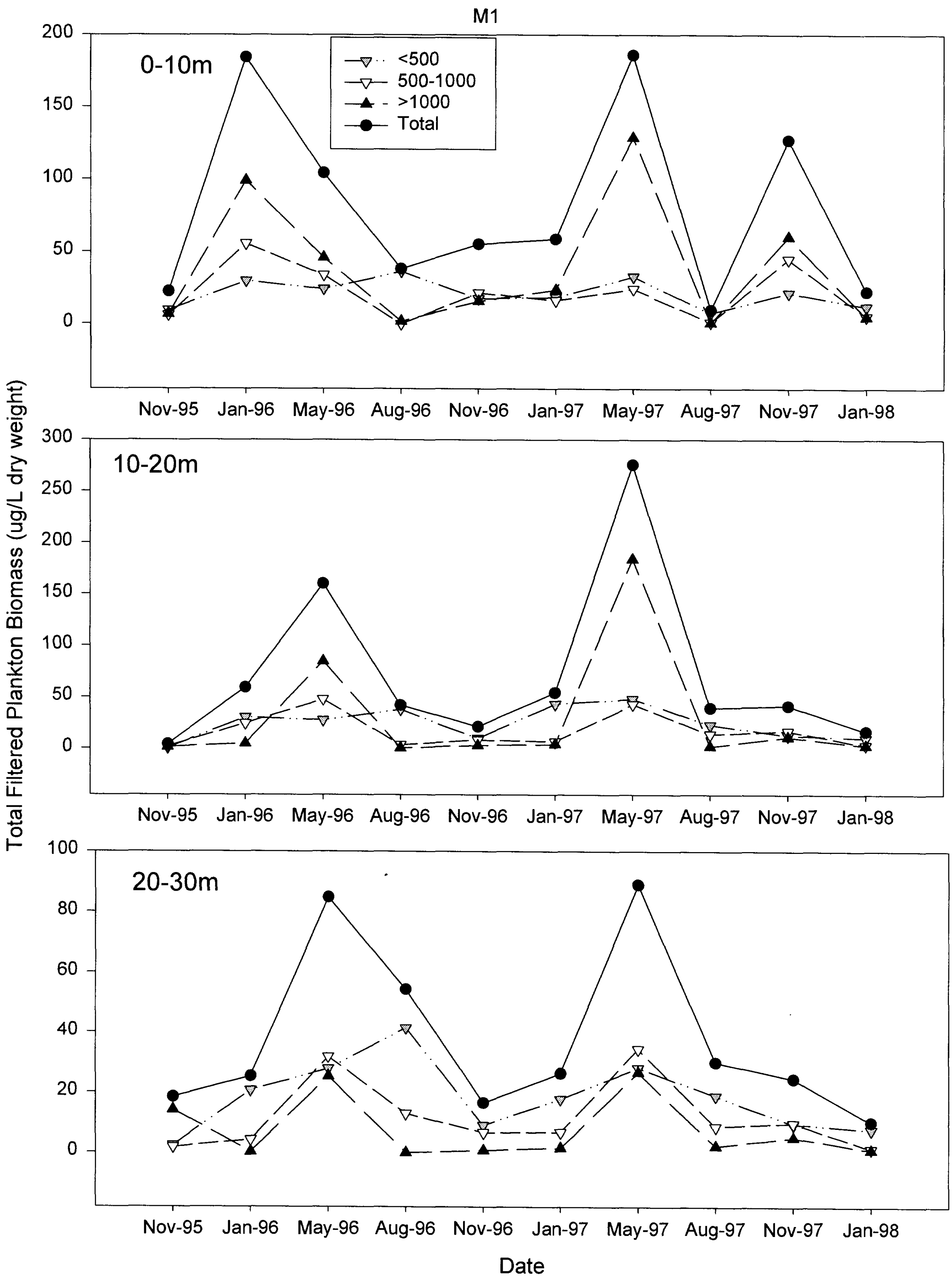


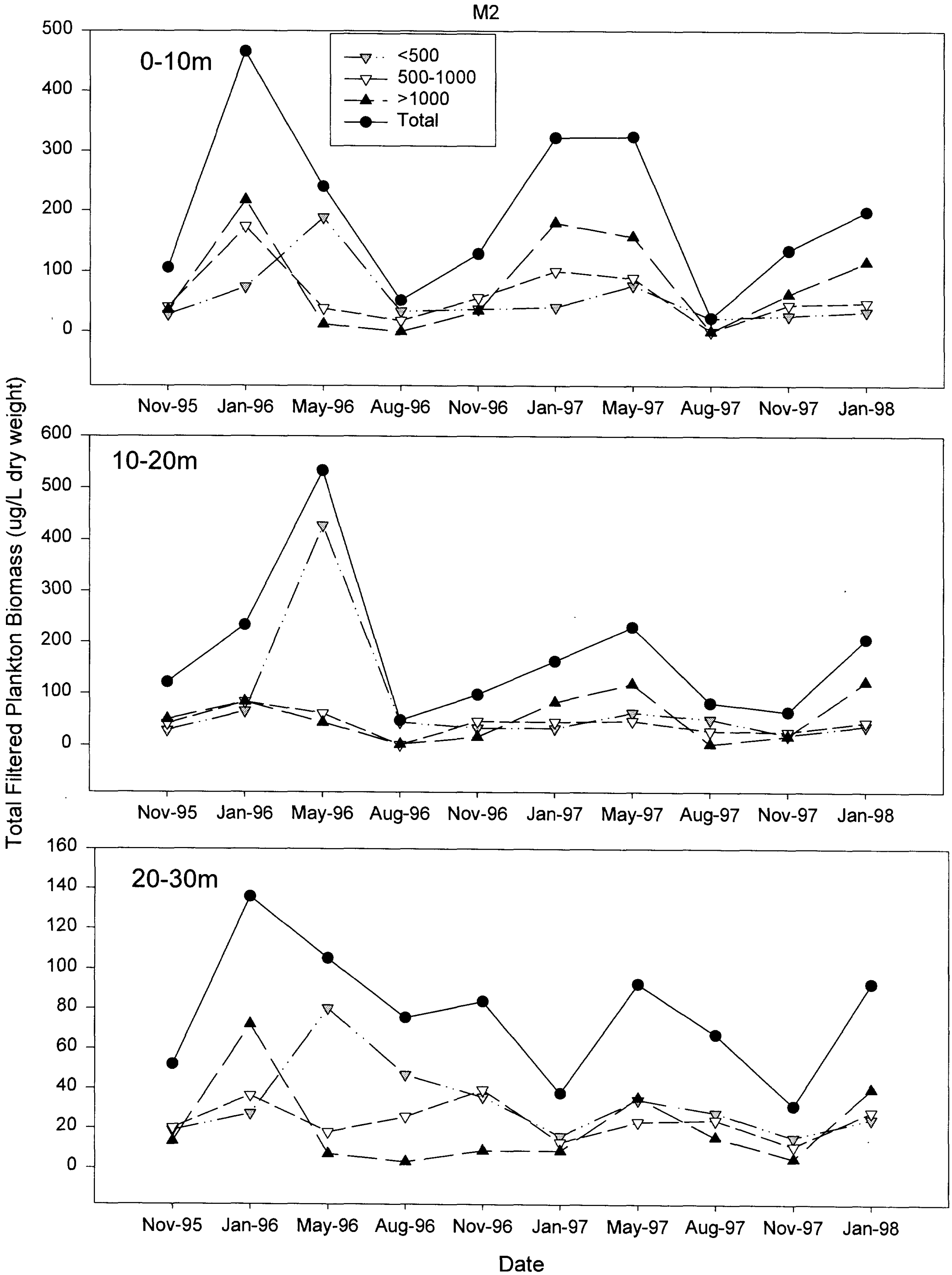
M10
0-10m
Total
Cladocera
Copepods
Rotifers
10-20m
20-30m
Zooplankton Density (#/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Date

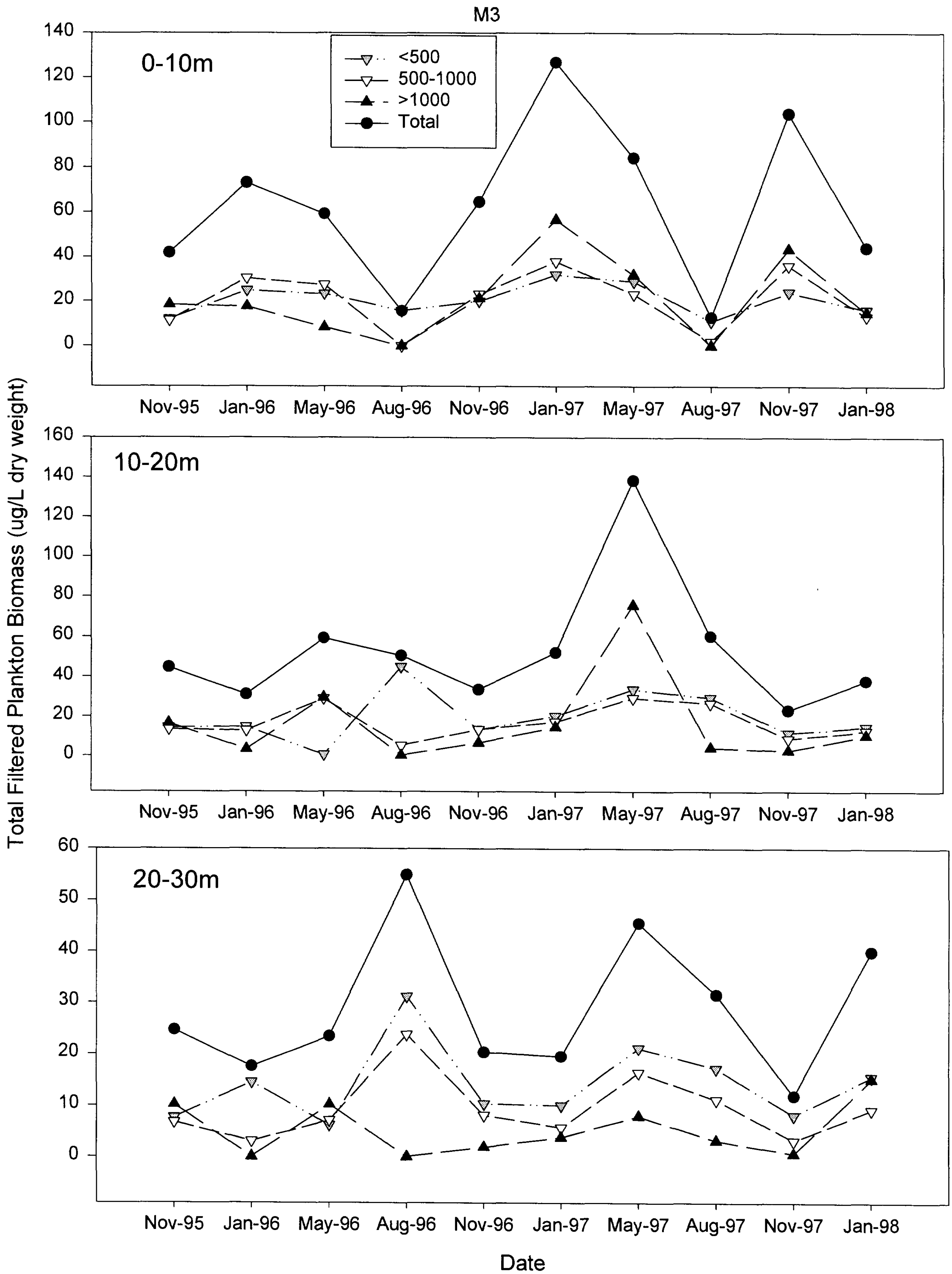

M11
0-10m
Total
Cladocera
Copepods
Rotifers
10-20m
20-30m
Zooplankton Density (#/L)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

APPENDIX D

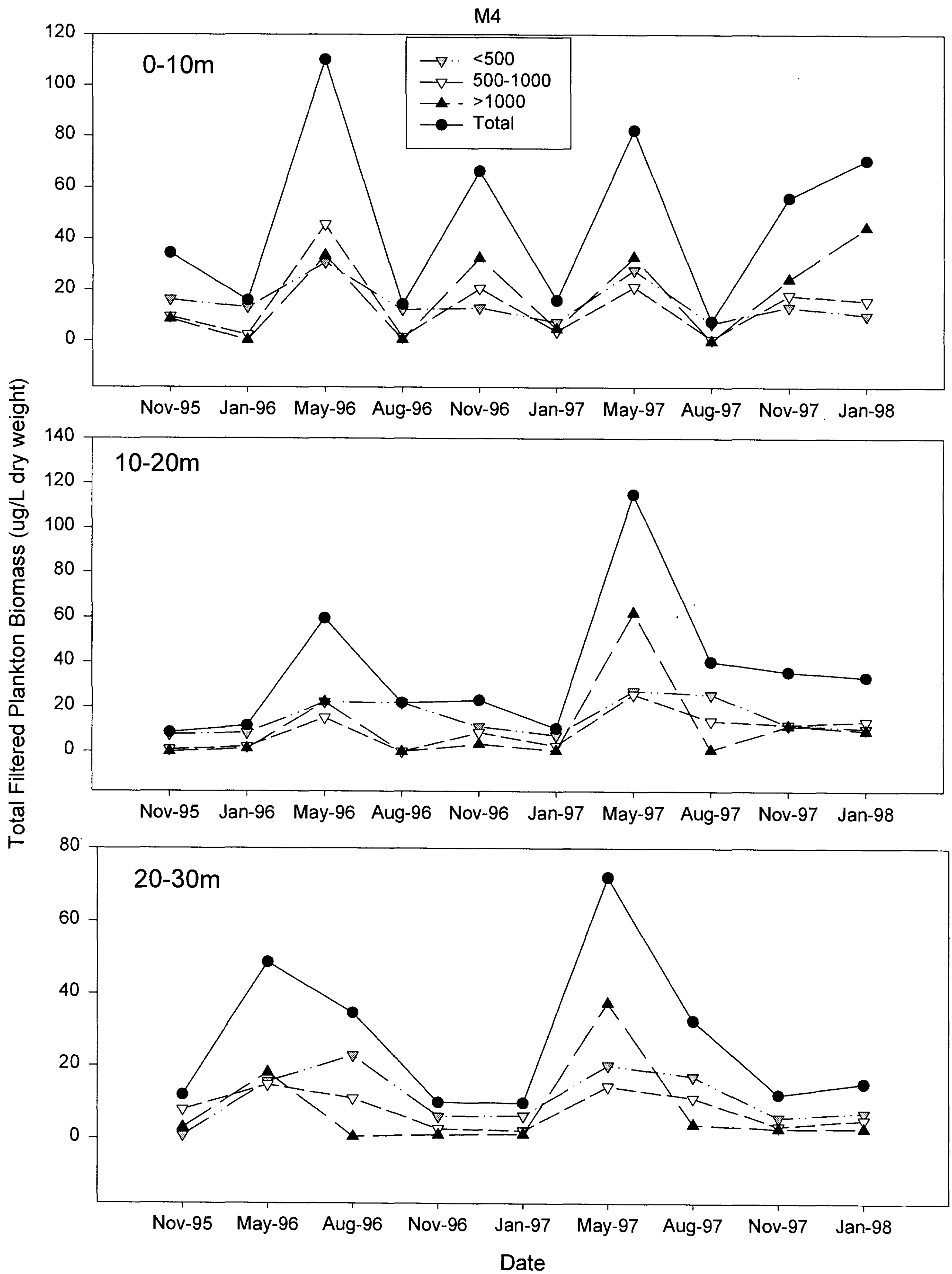
NET PLANKTON DATA

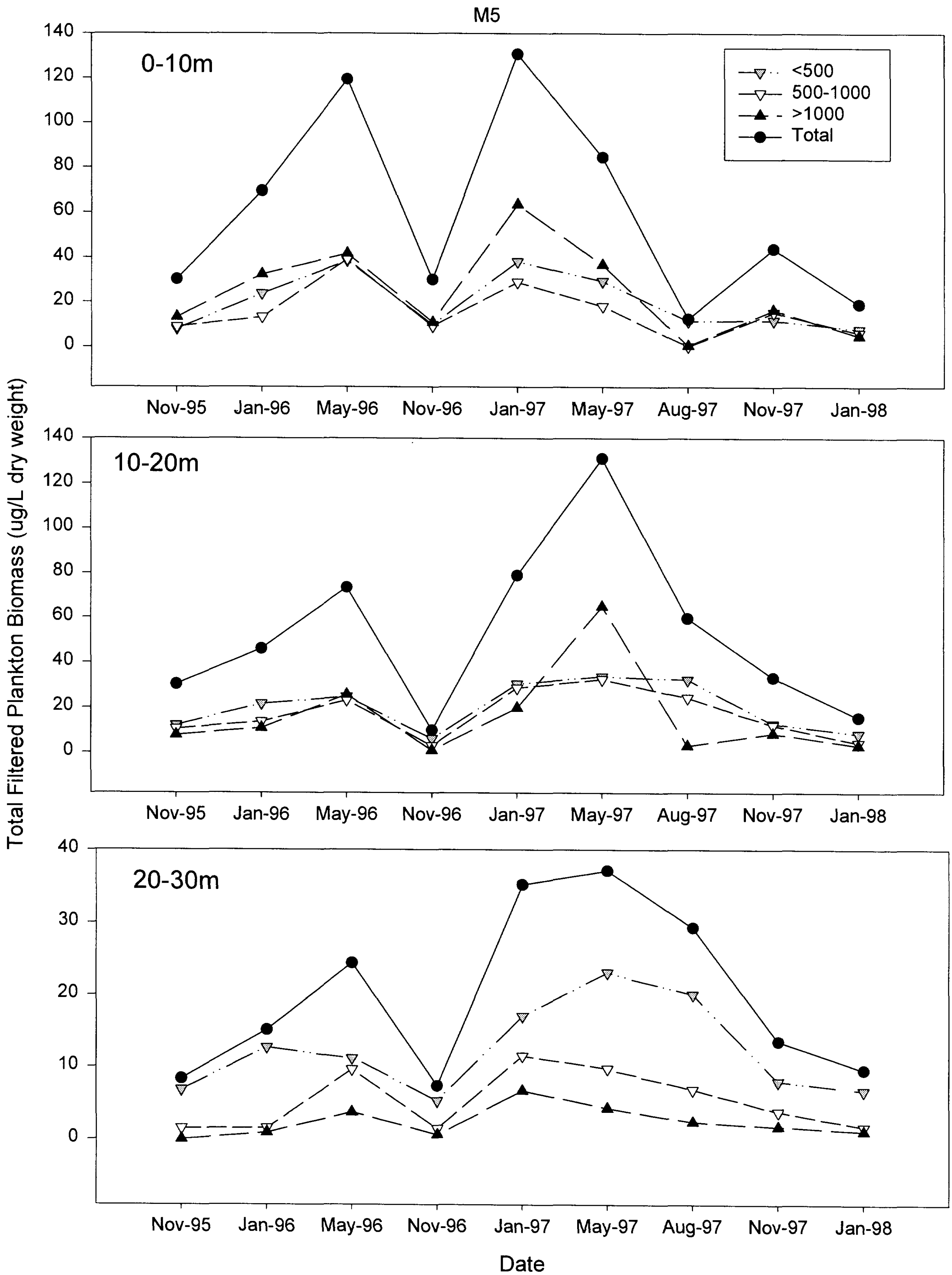

M1
0-10m
<500
500-1000
>1000
Total
10-20m
20-30m
Total Filtered Plankton Biomass (ug/L dry weight)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date


M2
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

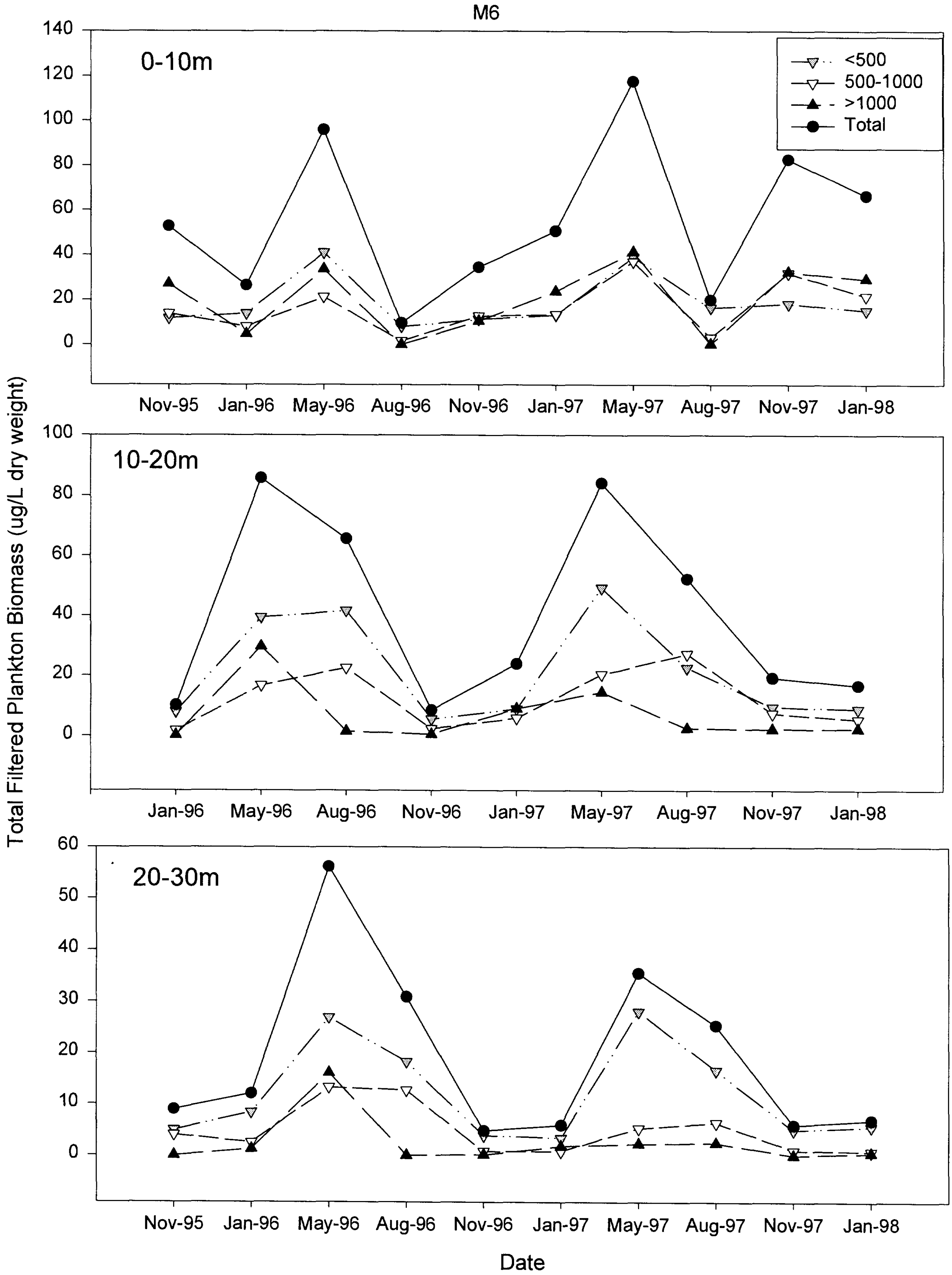


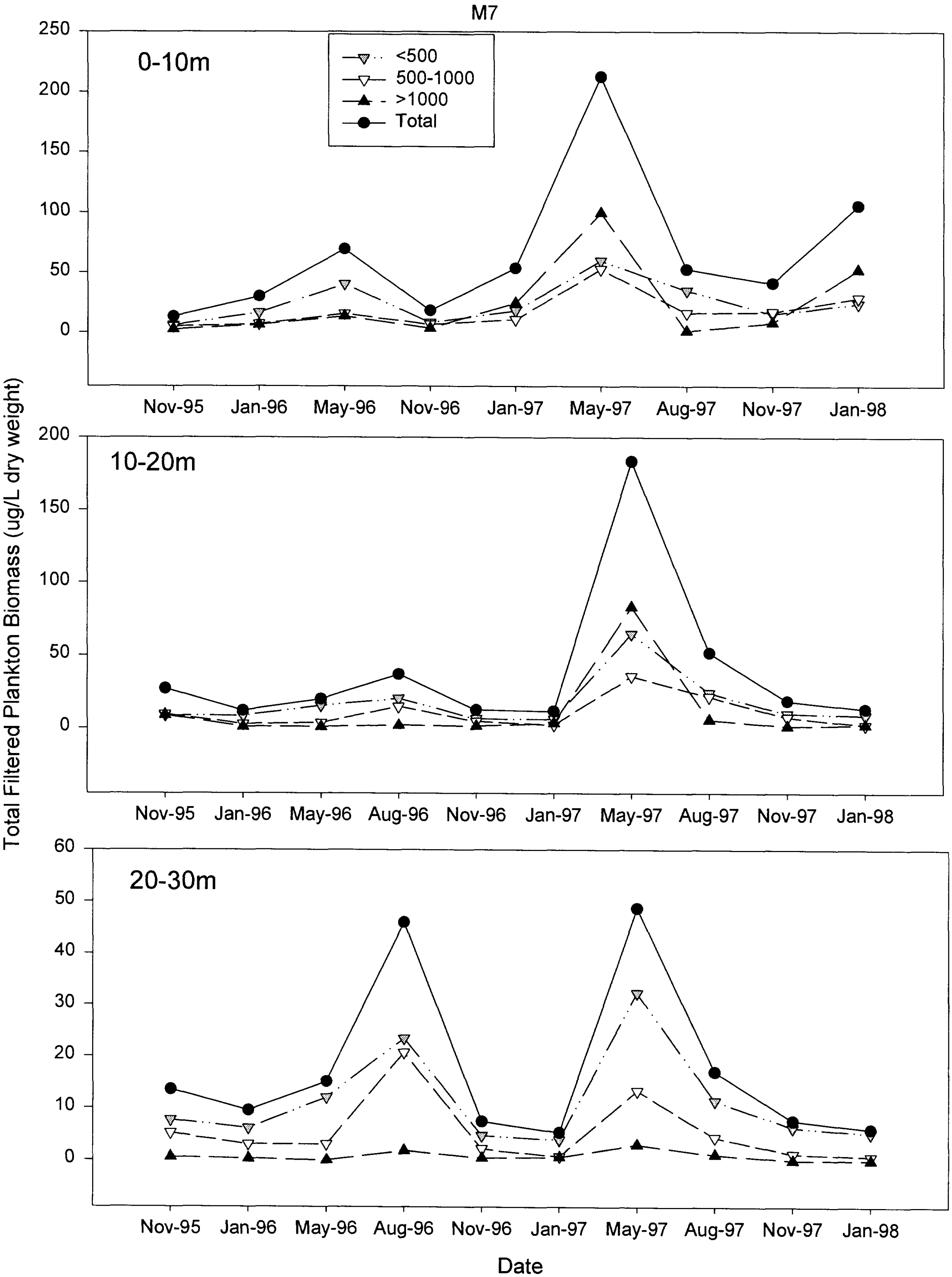
M3
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98


M4
0-10m
<500
500-1000
>1000
Total
10-20m
20-30m
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Total Filtered Plankton Biomass (ug/L dry weight)
Date

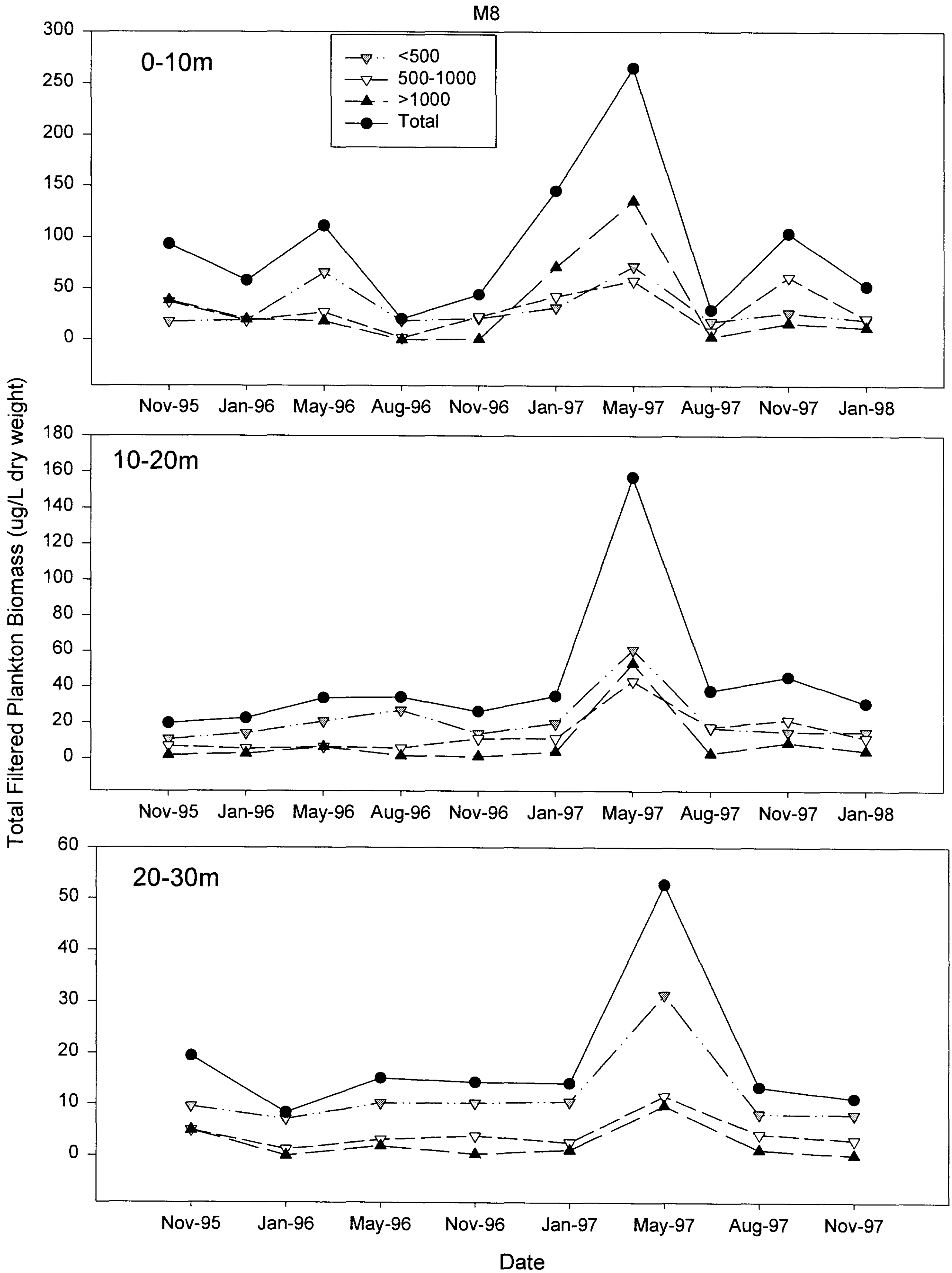


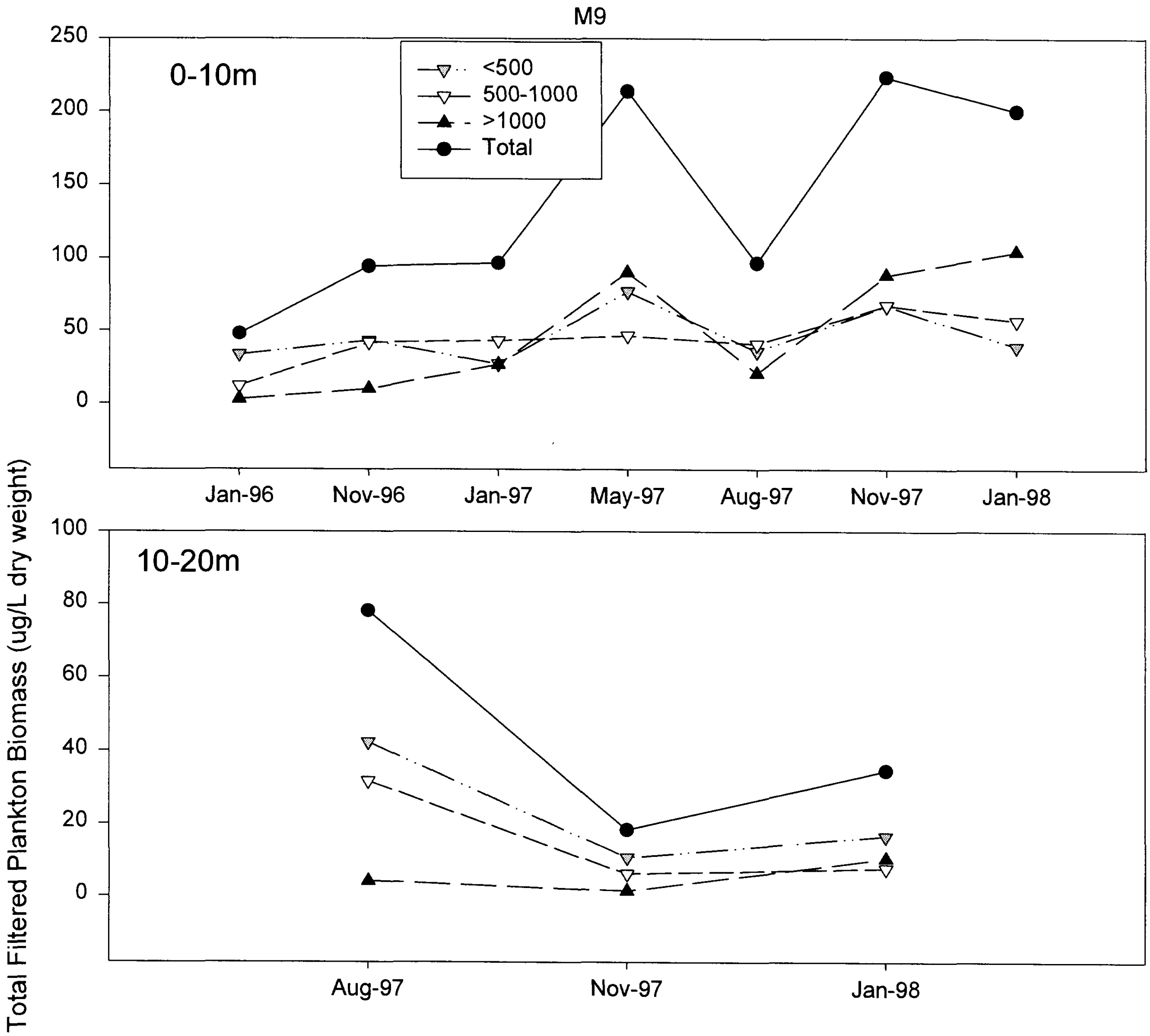
M5
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Date
Nov-95
Jan-96
May-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98

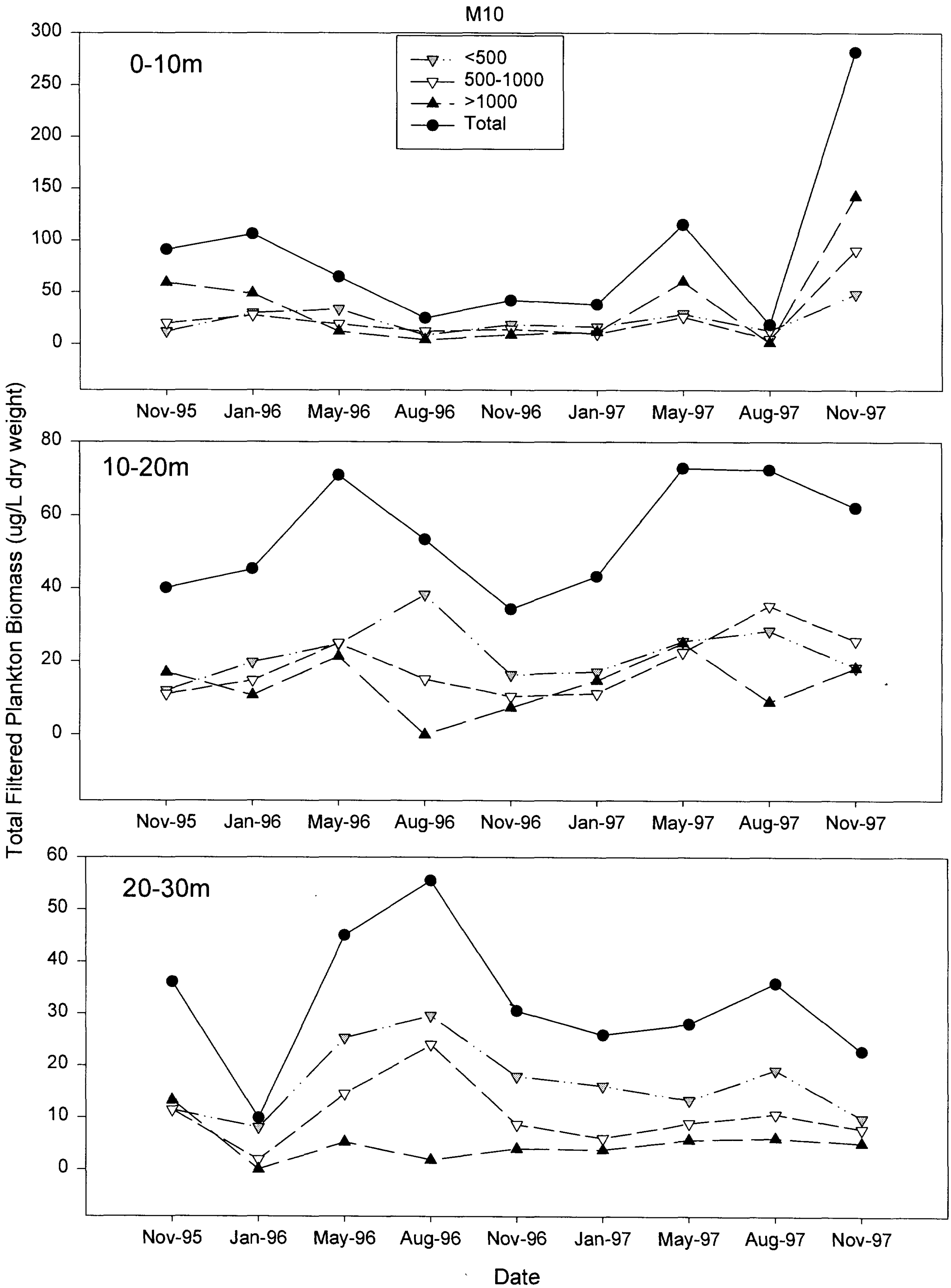

M6
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Date
140
120
100
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
50
30
10

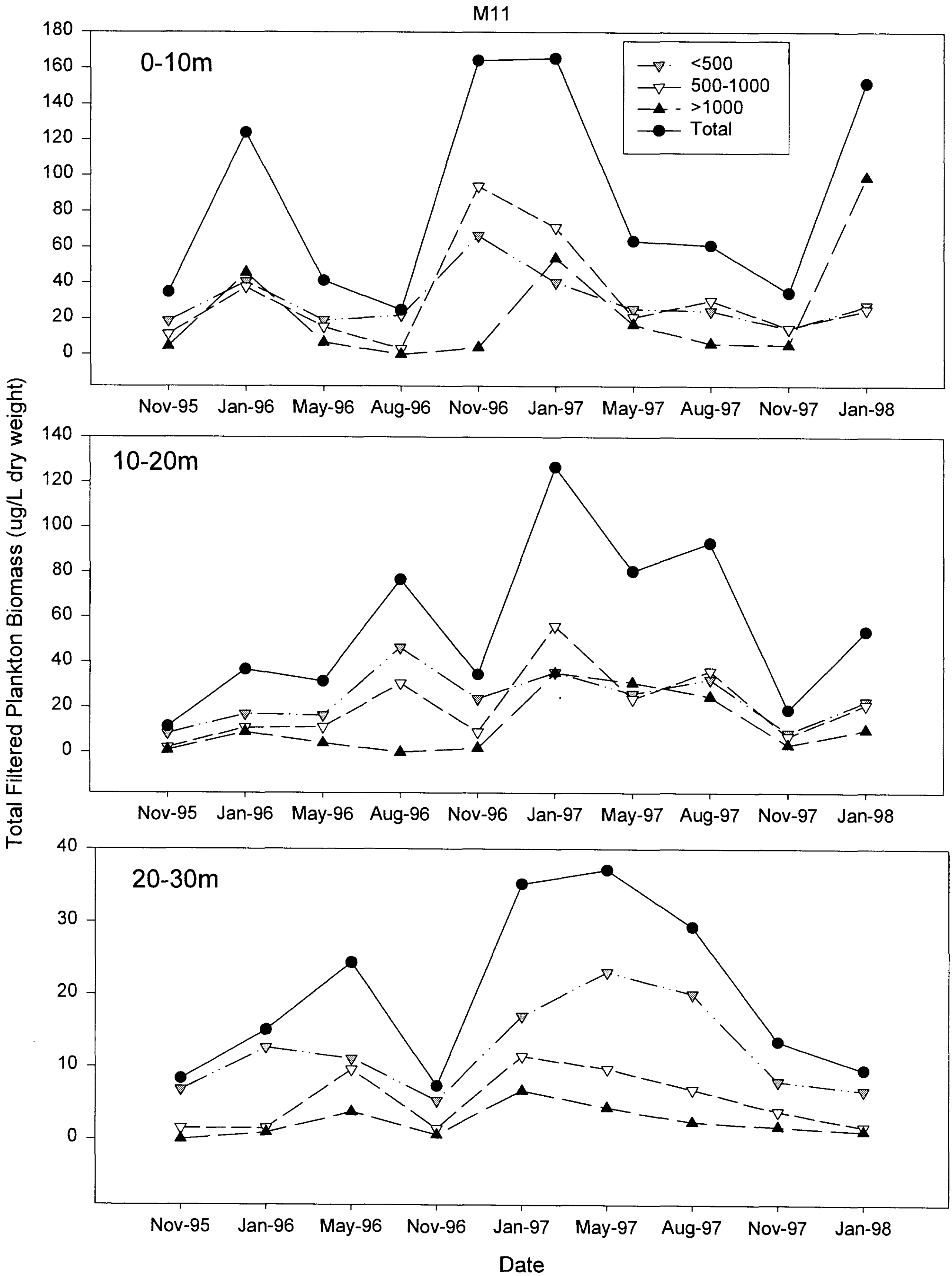


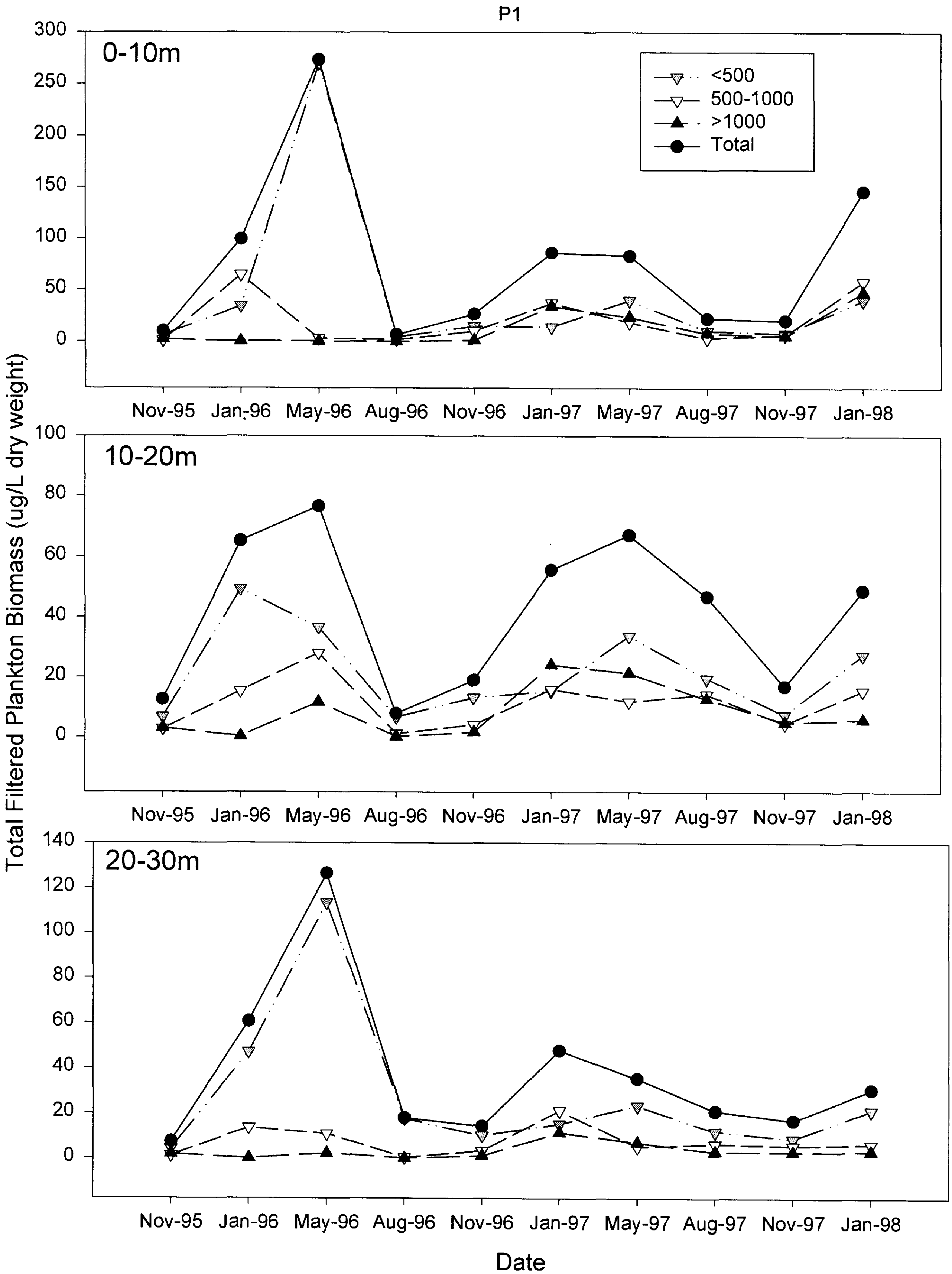
M7
0-10m
<500
500-1000
>1000
Total
250
200
150
100
50
0
Nov-95
Jan-96
May-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
200
150
100
50
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
20-30m
60
50
40
30
20
10
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Total Filtered Plankton Biomass (ug/L dry weight)
Date

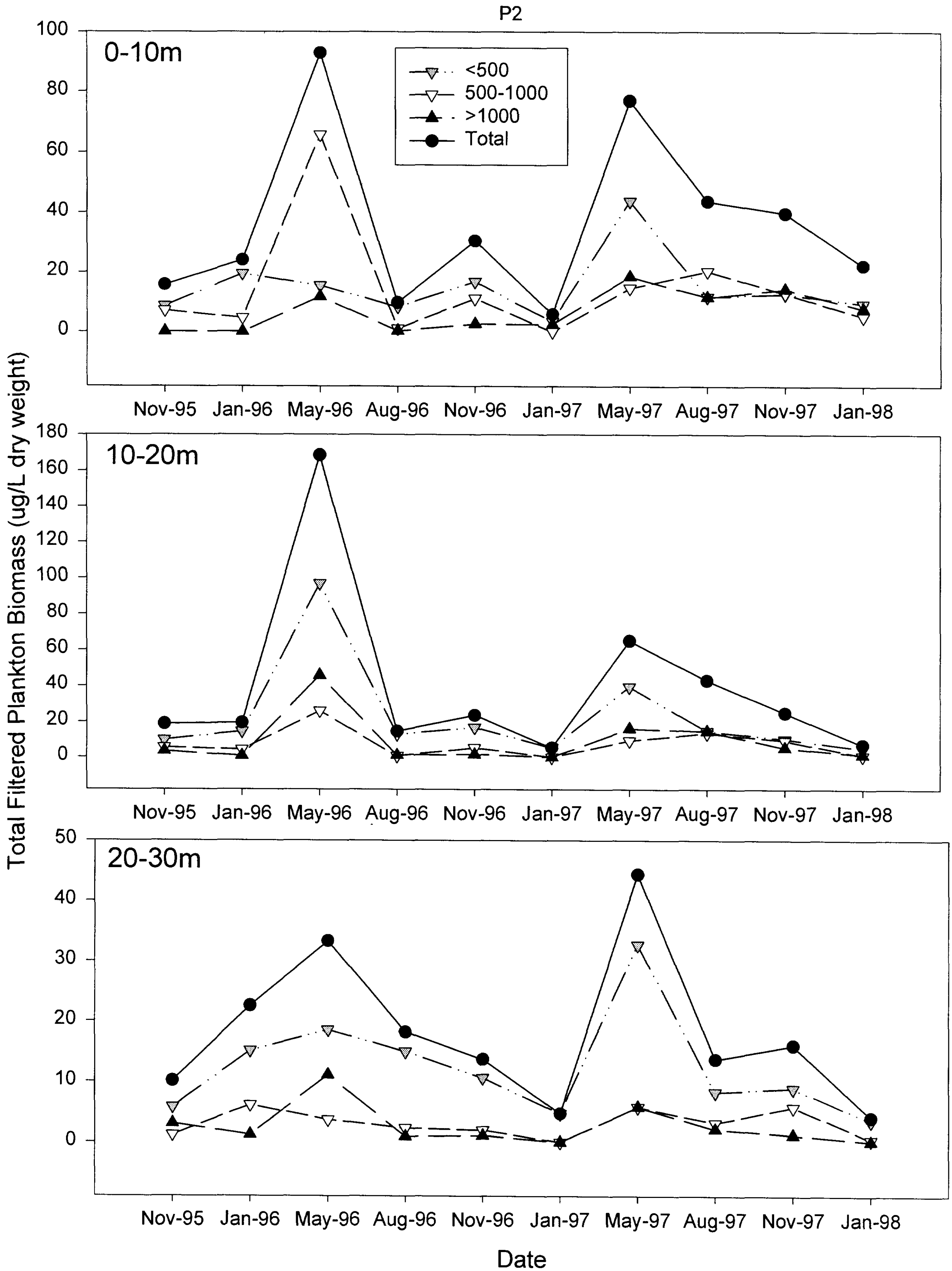

M8
0-10m
<500
500-1000
>1000
Total
300
250
200
150
100
50
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
180
160
140
120
100
80
60
40
20
0
20-30m
60
50
40
30
20
10
Total Filtered Plankton Biomass (ug/L dry weight)
Date

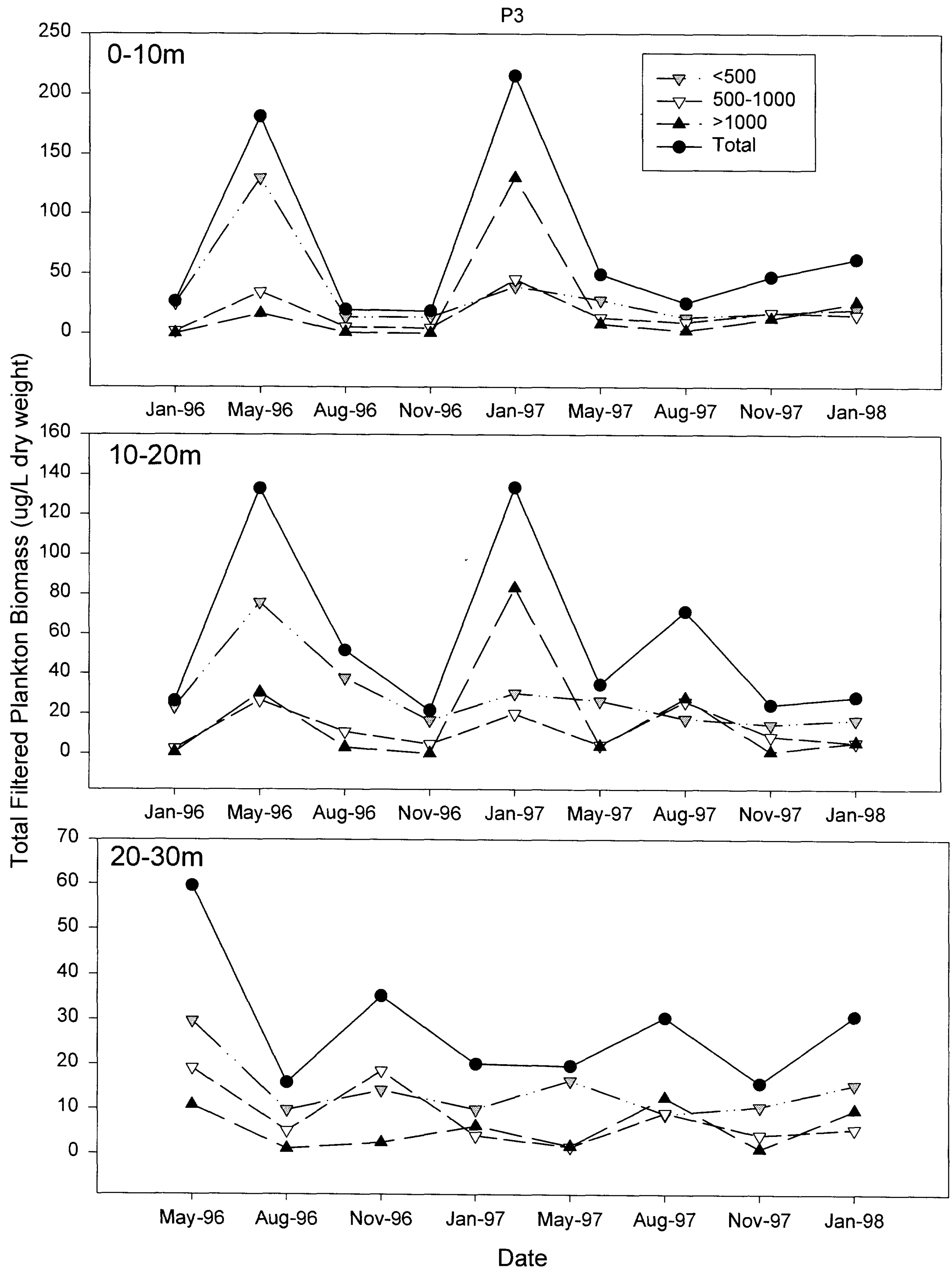

M9
0-10m
<500
500-1000
>1000
Total
250
200
150
100
50
0
Jan-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Total Filtered Plankton Biomass (ug/L dry weight)
10-20m
100
80
60
40
20
0
Aug-97
Nov-97
Jan-98


M10
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
0
50
100
150
200
250
300
20
40
60
80
10
30

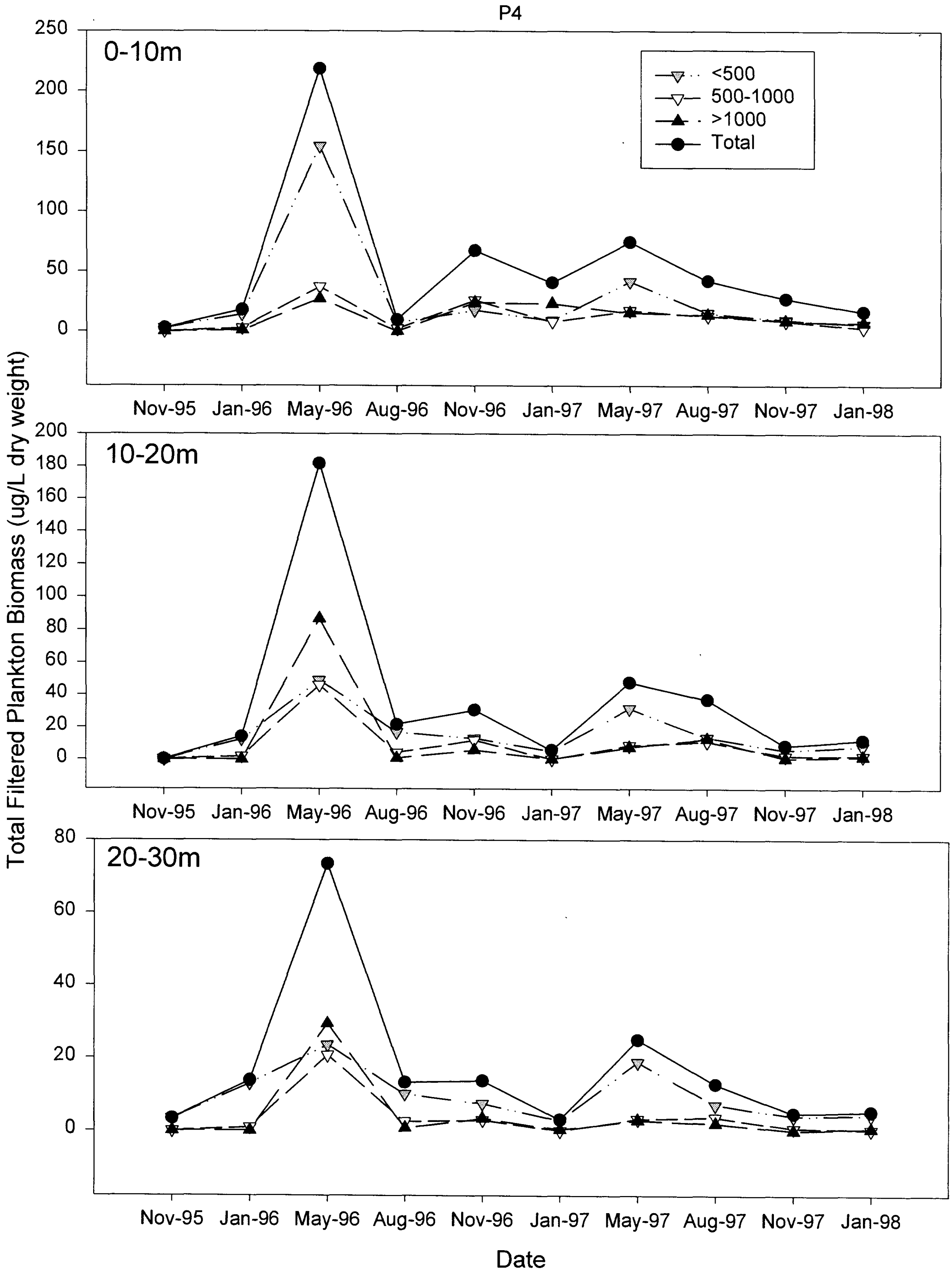

M11
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
180
160
140
120
100
80
60
40
20
0
30
10


P1
0-10m
<500
500-1000
>1000
Total
10-20m
20-30m
Total Filtered Plankton Biomass (ug/L dry weight)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

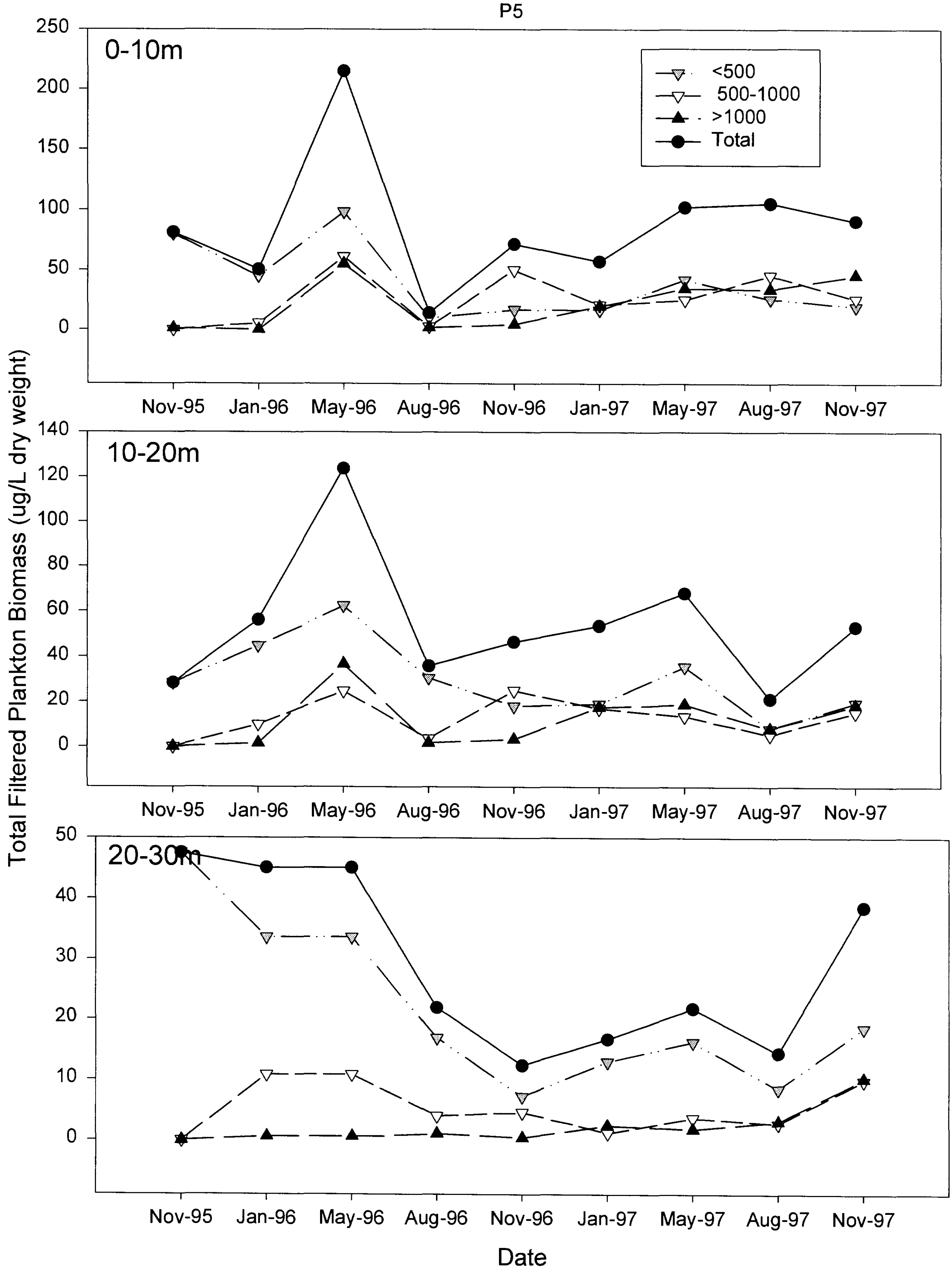

P2
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

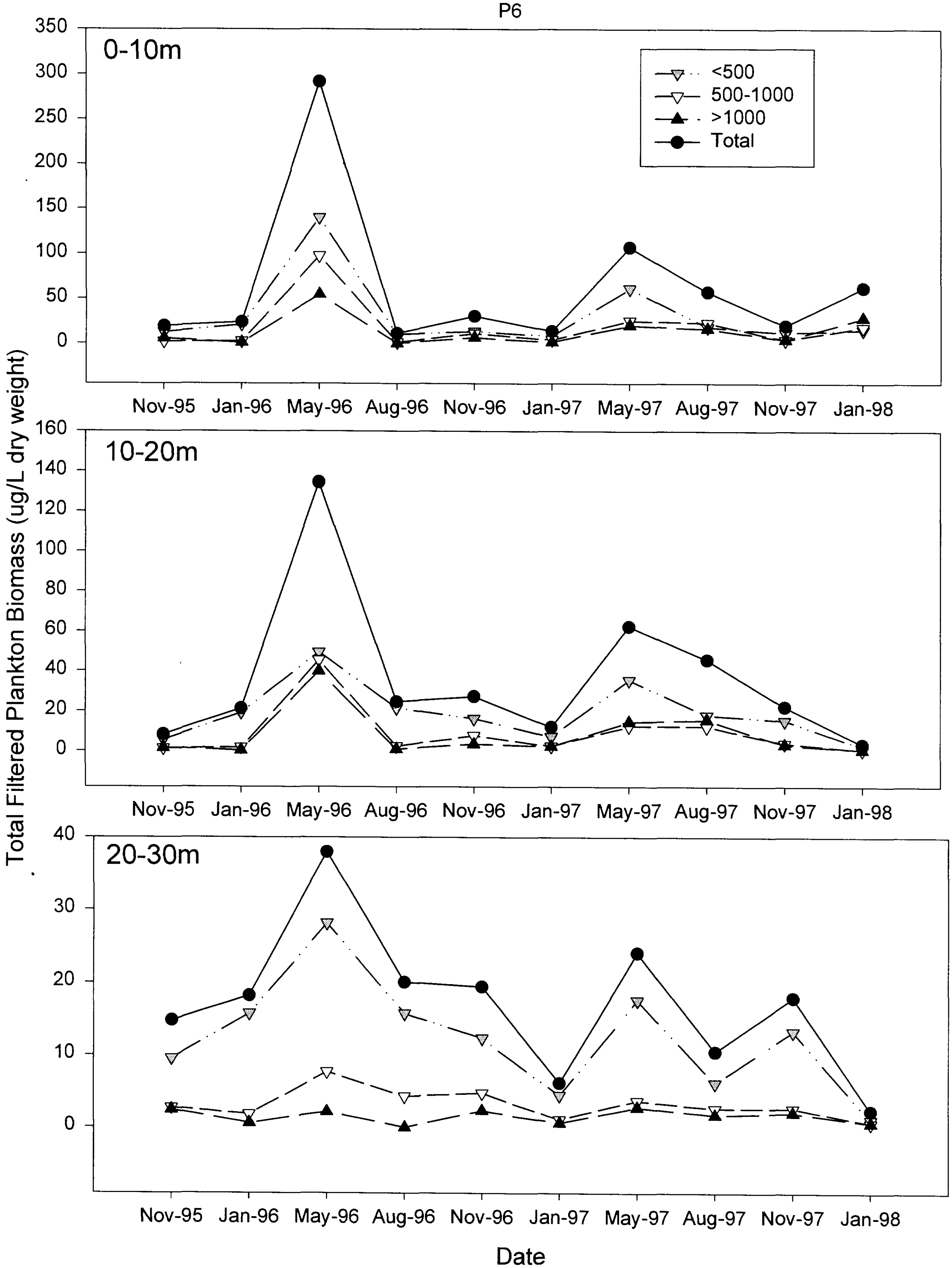


P3
0-10m
<500
500-1000
>1000
Total
250
200
150
100
50
0
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
160
140
120
100
80
60
40
20
0
Total Filtered Plankton Biomass (ug/L dry weight)
20-30m
70
60
50
40
30
20
10
0
Date

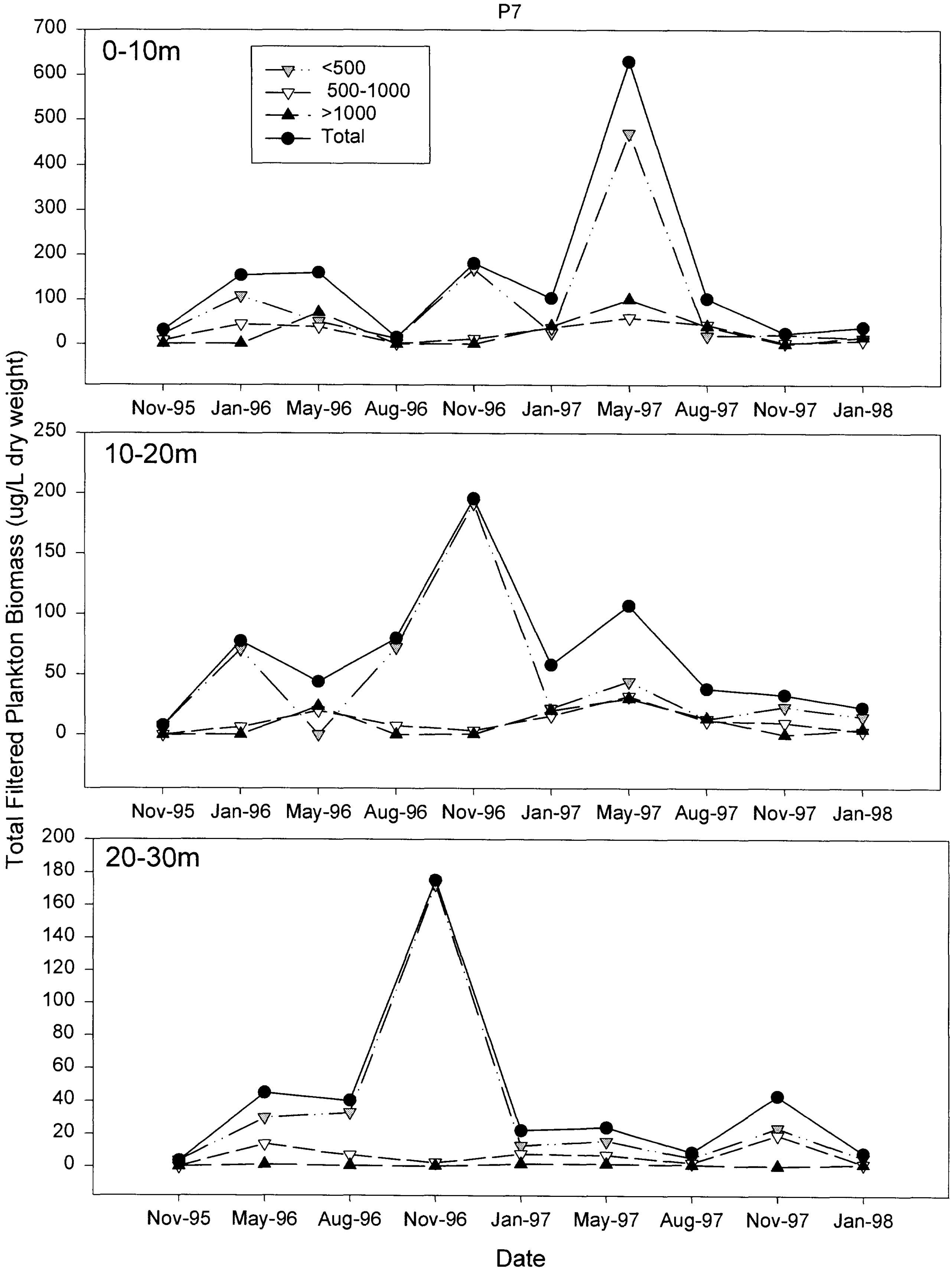


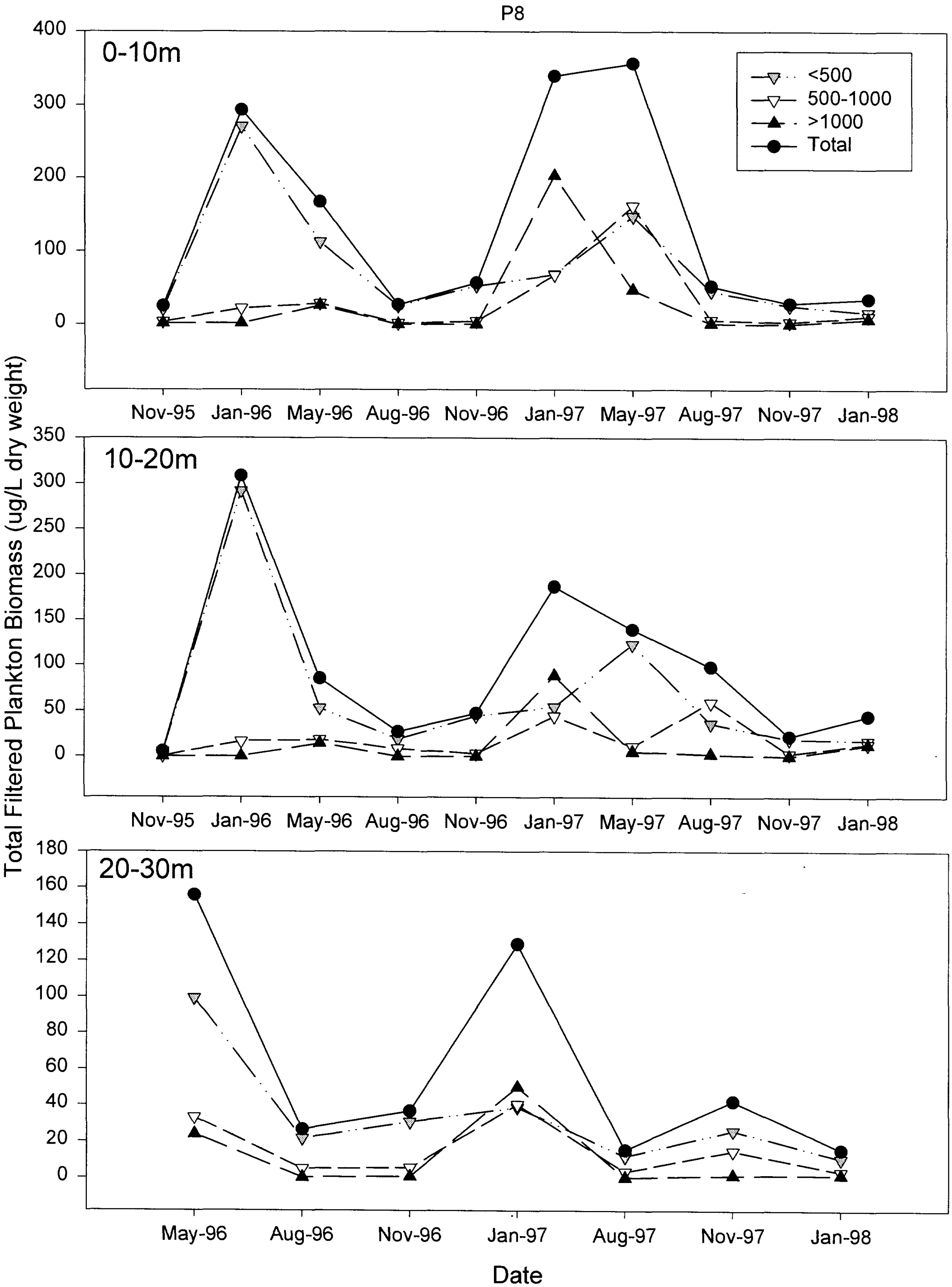
P4
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date


P5
0-10m
<500
500-1000
>1000
Total
10-20m
20-30m
Total Filtered Plankton Biomass (ug/L dry weight)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Date

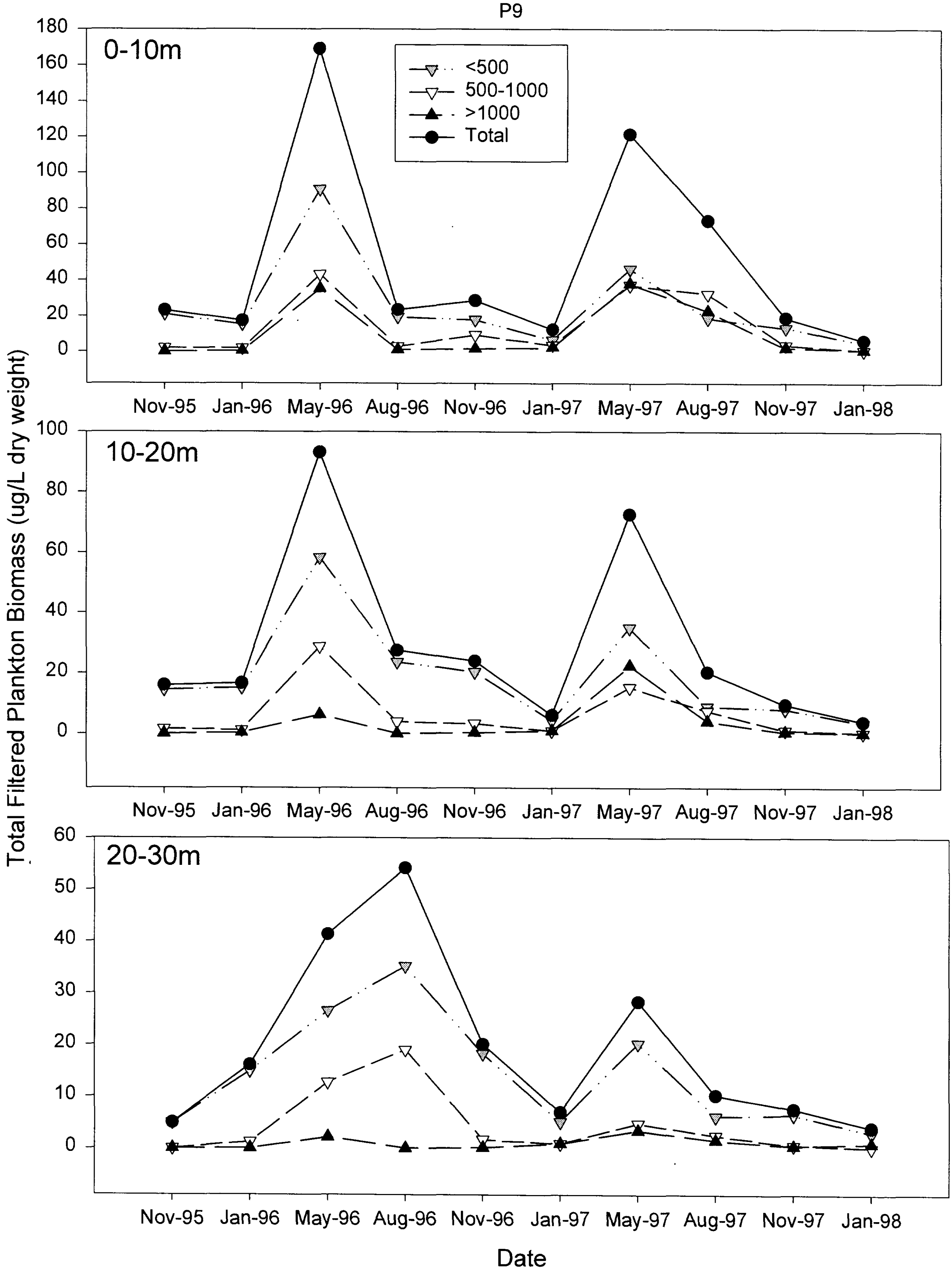


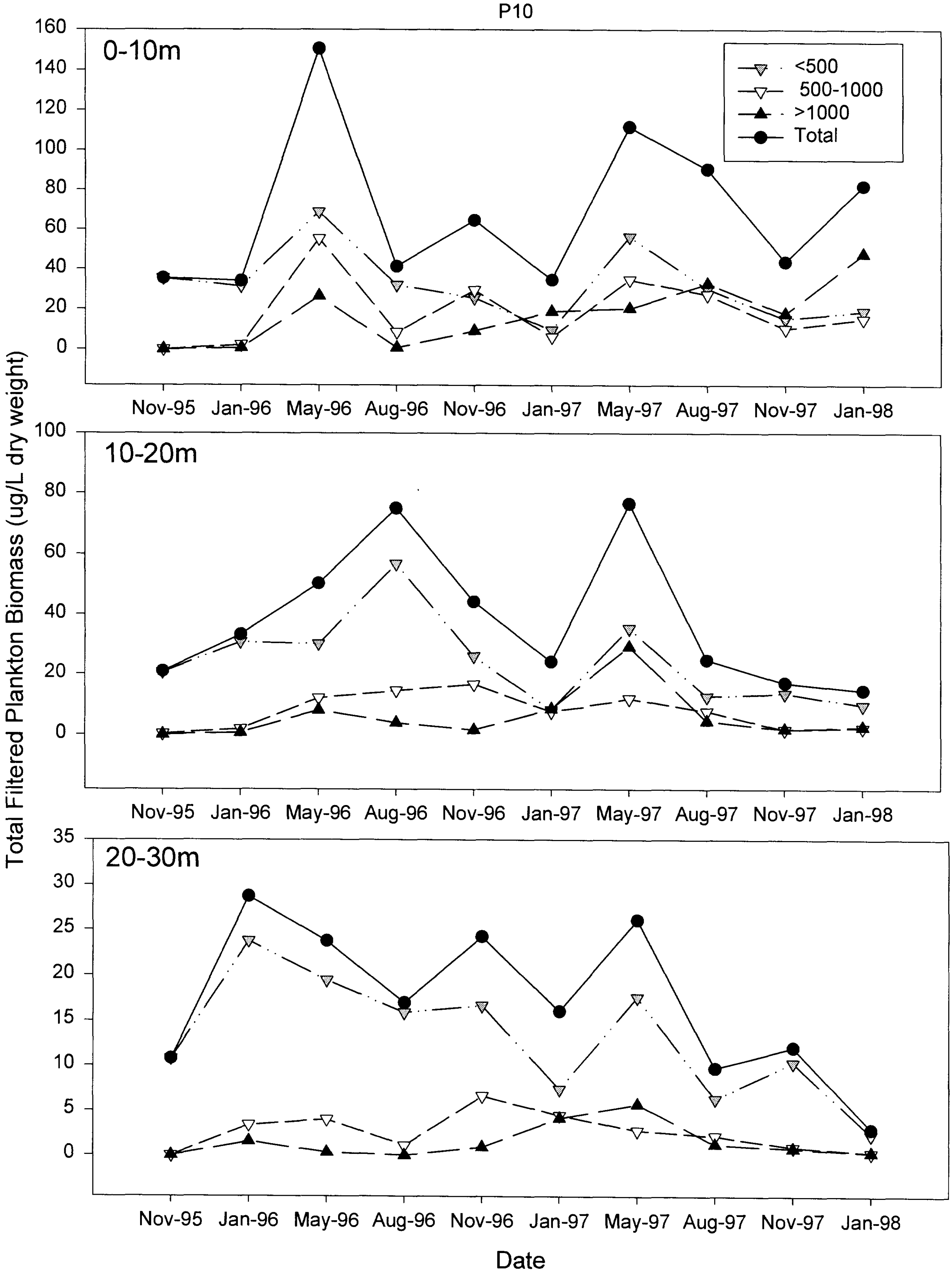
P6
0-10m
<500
500-1000
>1000
Total
10-20m
20-30m
Total Filtered Plankton Biomass (ug/L dry weight)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

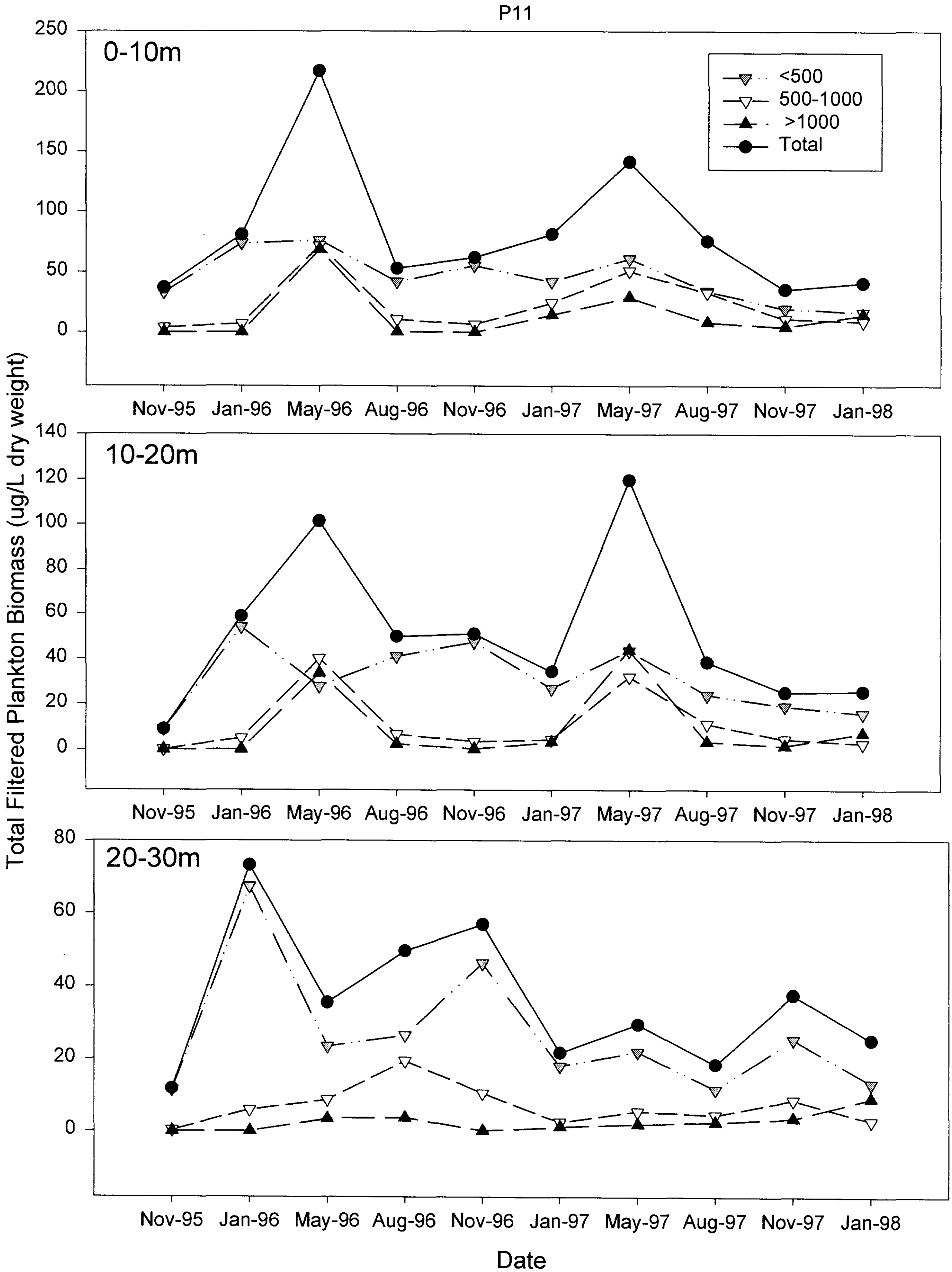

P7
0-10m
<500
500-1000
>1000
Total
700
600
500
400
300
200
100
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
250
200
150
100
50
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
20-30m
200
180
160
140
120
100
80
60
40
20
0
Nov-95
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Total Filtered Plankton Biomass (ug/L dry weight)
Date



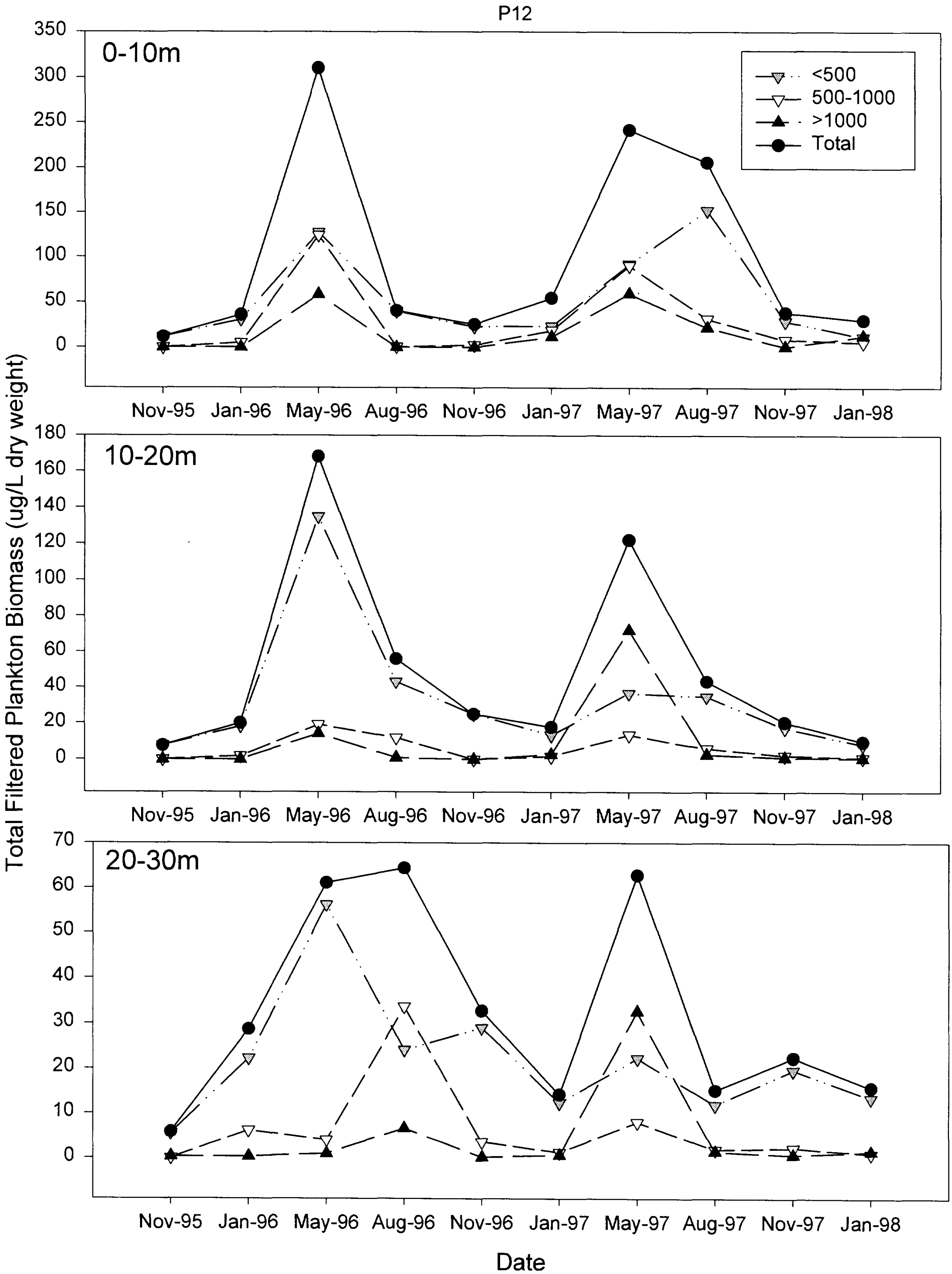
P8
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
400
300
200
100
0
350
250
150
50
180
160
140
120
80
60
40
20
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date


P9
0-10m
<500
500-1000
>1000
Total
10-20m
20-30m
Total Filtered Plankton Biomass (ug/L dry weight)
0
20
40
60
80
100
120
140
160
180
10
30
50
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date

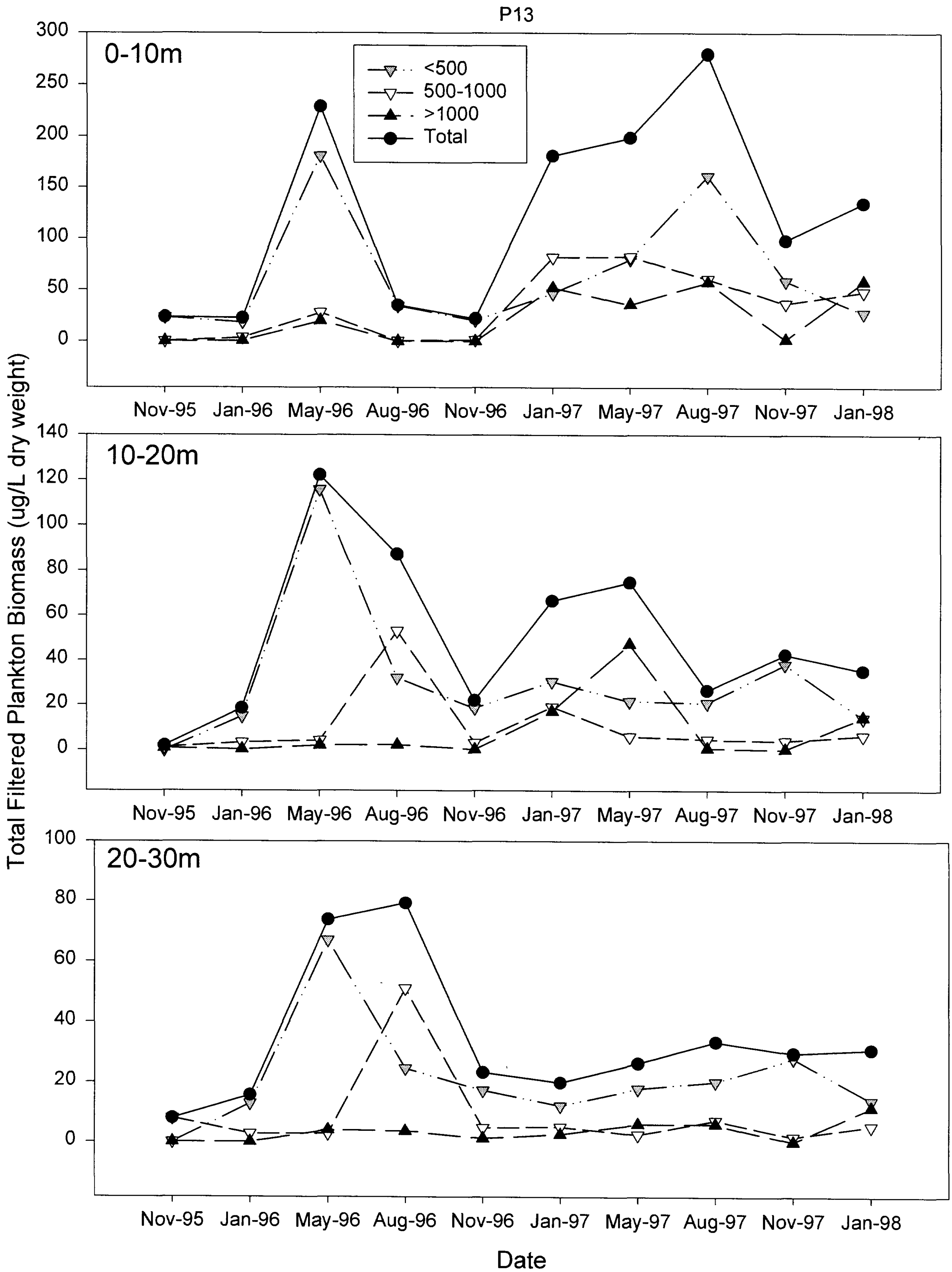

P10
0-10m
<500
500-1000
>1000
Total
10-20m
20-30m
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Total Filtered Plankton Biomass (ug/L dry weight)
Date

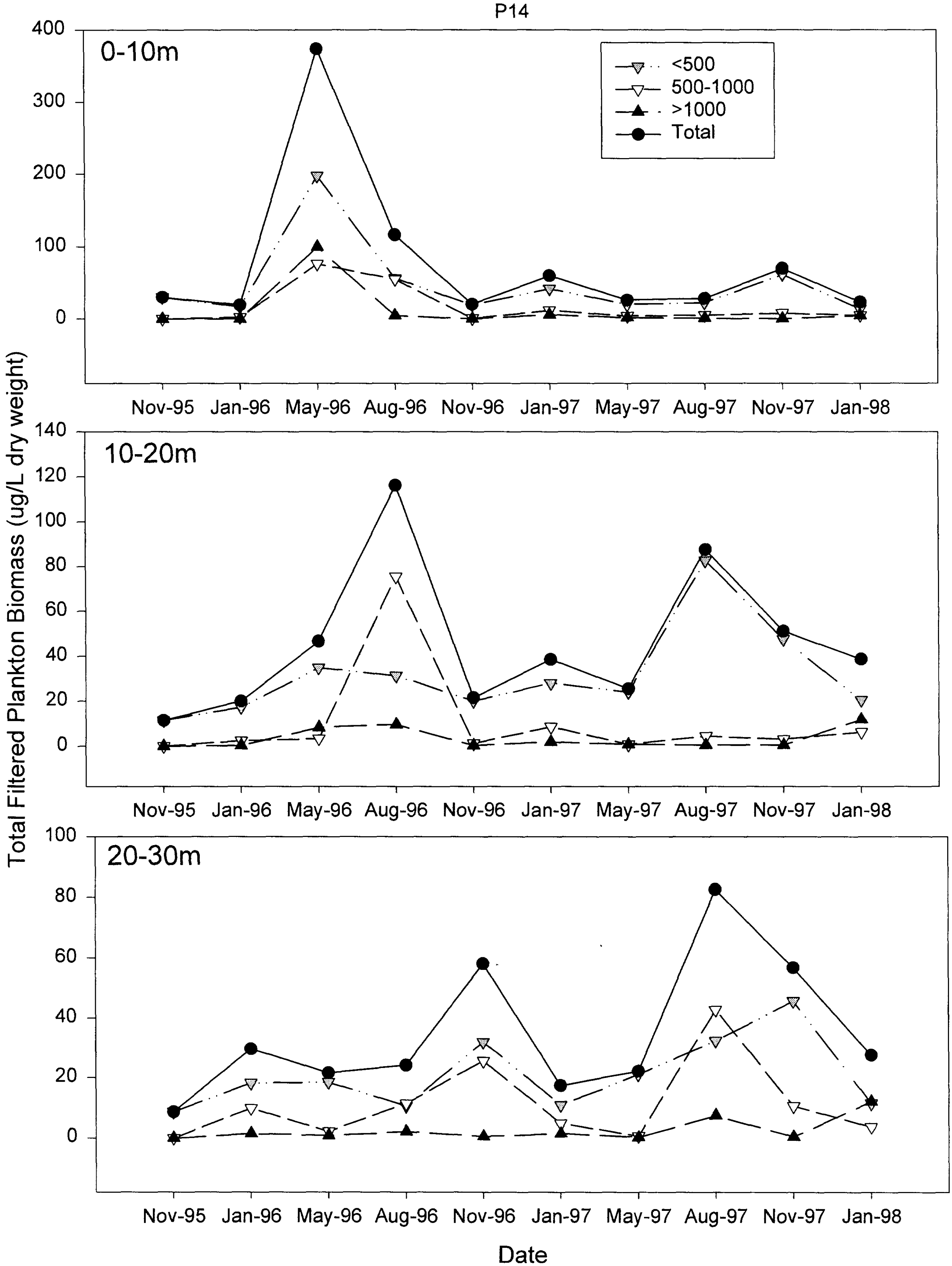


P11
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
250
200
150
100
50
0
140
120
100
80
60
40
20
0
80
60
40
20
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Total Filtered Plankton Biomass (ug/L dry weight)
Date



P12
0-10m
10-20m
20-30m
<500
500-1000
>1000
Total
Total Filtered Plankton Biomass (ug/L dry weight)
Date
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98


P13
0-10m
<500
500-1000
>1000
Total
10-20m
20-30m
Total Filtered Plankton Biomass (ug/L dry weight)
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
Date



P14
0-10m
<500
500-1000
>1000
Total
400
300
200
100
0
Nov-95
Jan-96
May-96
Aug-96
Nov-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98
10-20m
140
120
100
80
60
40
20
0
20-30m
100
80
60
40
20
0
Total Filtered Plankton Biomass (ug/L dry weight)
Date

APPENDIX E

PHYTOPLANKTON DATA

Net phtyoplankton collected from Lakes Powell and Lake Mead.

Bacillariophyta

Achnanthes spp.
Asterionella spp.
Coelastrum spp.
Closterium
Cyclotella spp.
Cymbella
Diatoma spp.
Eunotia spp.
Fragilaria spp.
Gomphonema spp.
Gyrosigma
Melosira
Navicula
Nitzschia
Pinnularia
Rhoicosphenia
Synedra
Tabellaria spp.

Chlorophyta

Ankistrodesmus spp.
Chlamydomonas spp.
Coelastrum spp.
Cosmarium spp.
Eudorina
Gloeocystis spp.
Mougeotia spp.
Oocystis spp.
Pandorina
Pediastrum
Rhizoclonium
Scenedesmus
Sphaerocystis spp.
Staurastrun
Tetraedron

Chrysophtya

Dinobryon spp.
Malllomonas Chrysophtya

Cryptophyta

Cryptomonas
Rhodomonas spp.

Cyanophyta

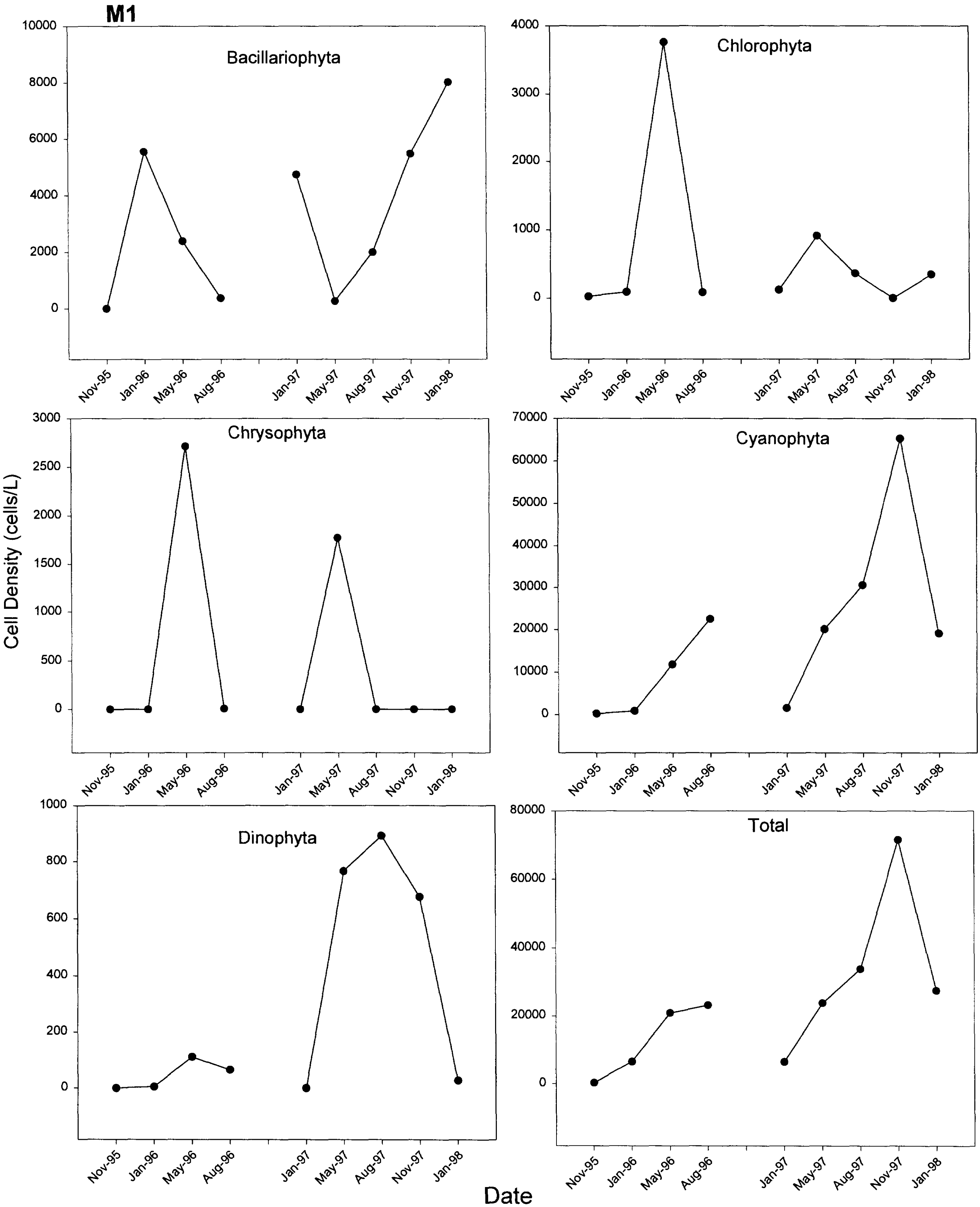
Anabaena spp.
Aphanizomenon spp.
Aphanocapsa spp.
Chroococcus spp.
Coelosphaerium
Gleocapsa
Gomphosphaeria spp.
Lyngbya spp.
Merismopedia spp.
Microcystis
Oscillatoria

Dinophyta

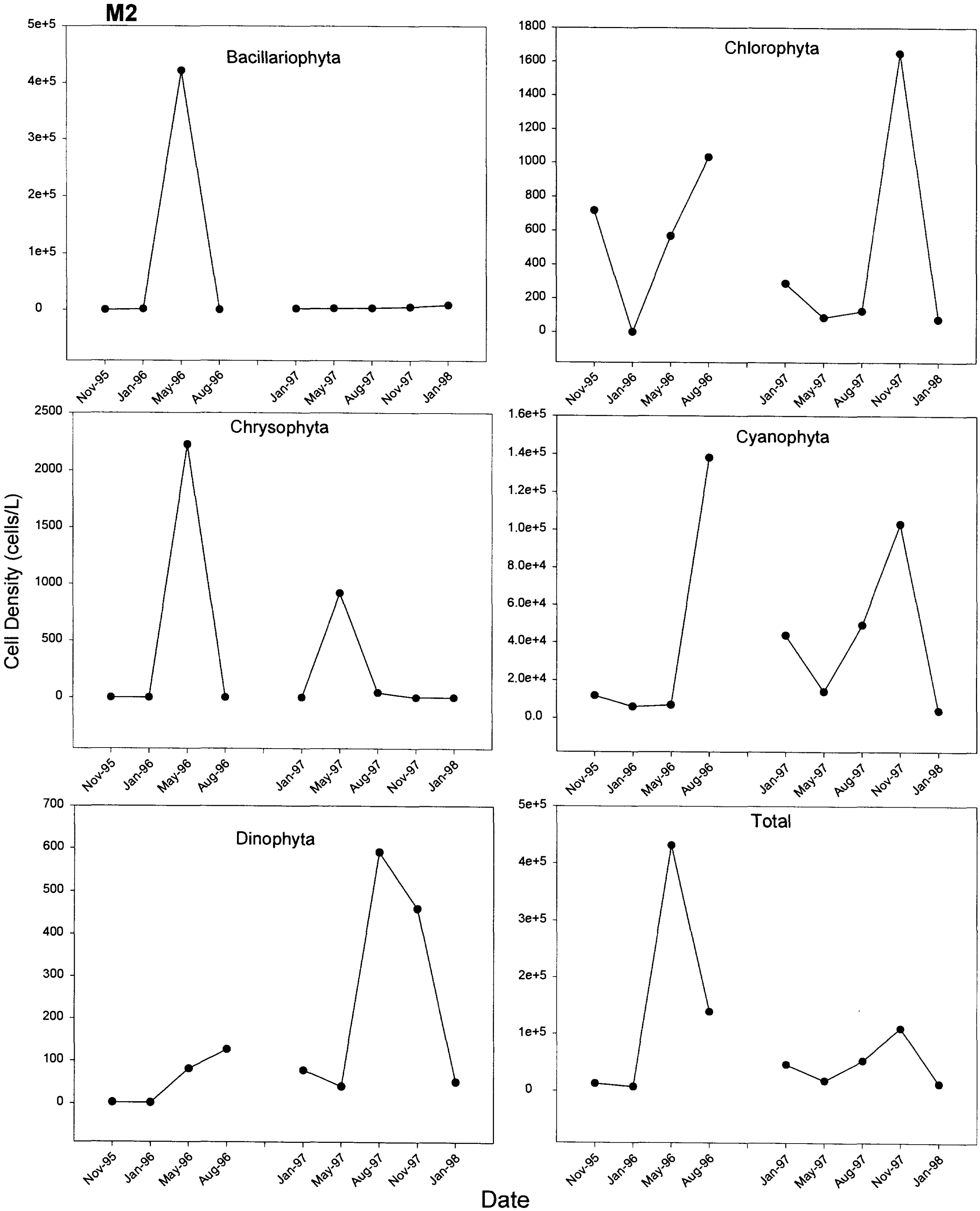
Ceratium spp.
Gymnodinium spp.
Peridinium spp.

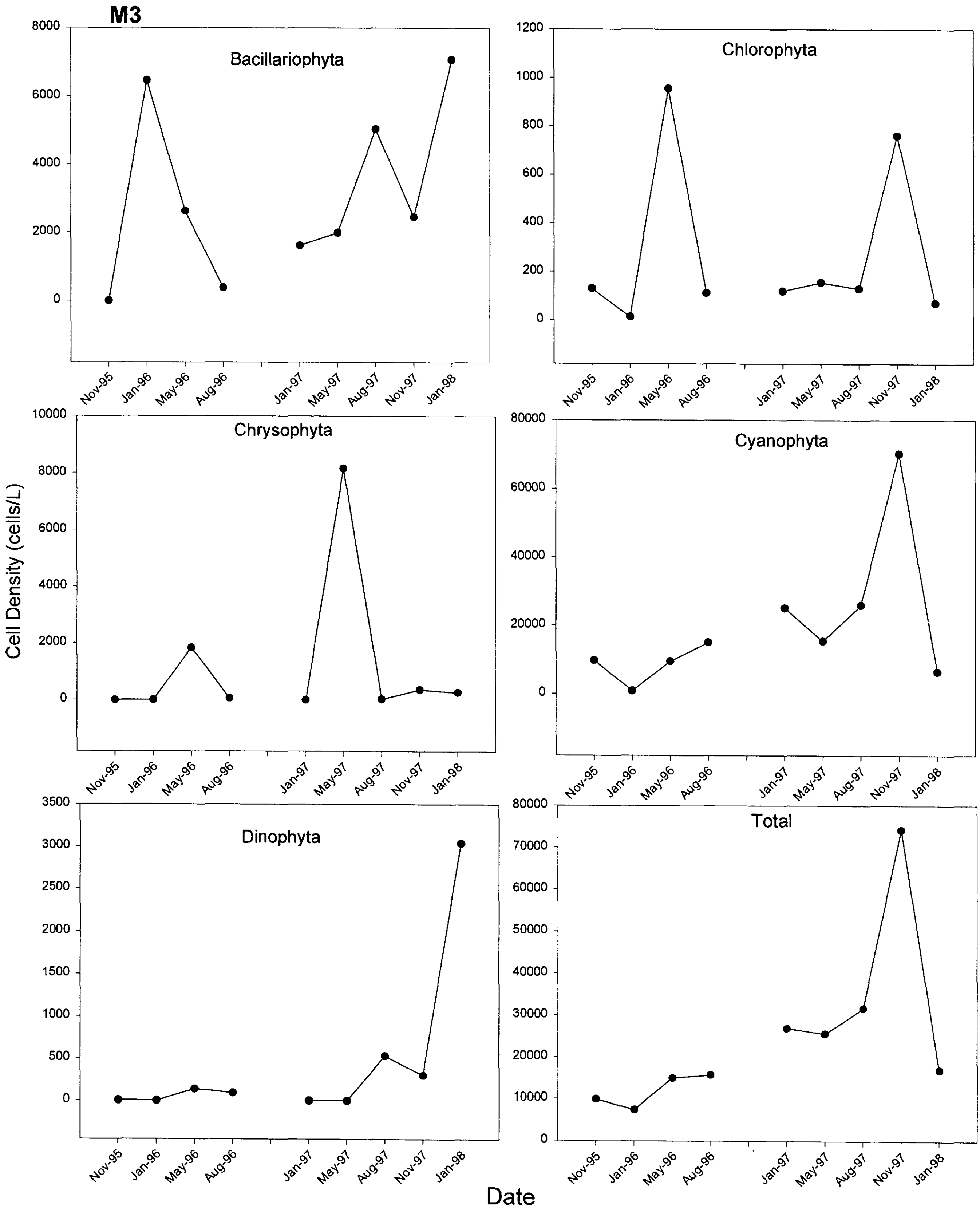
Euglenophyta

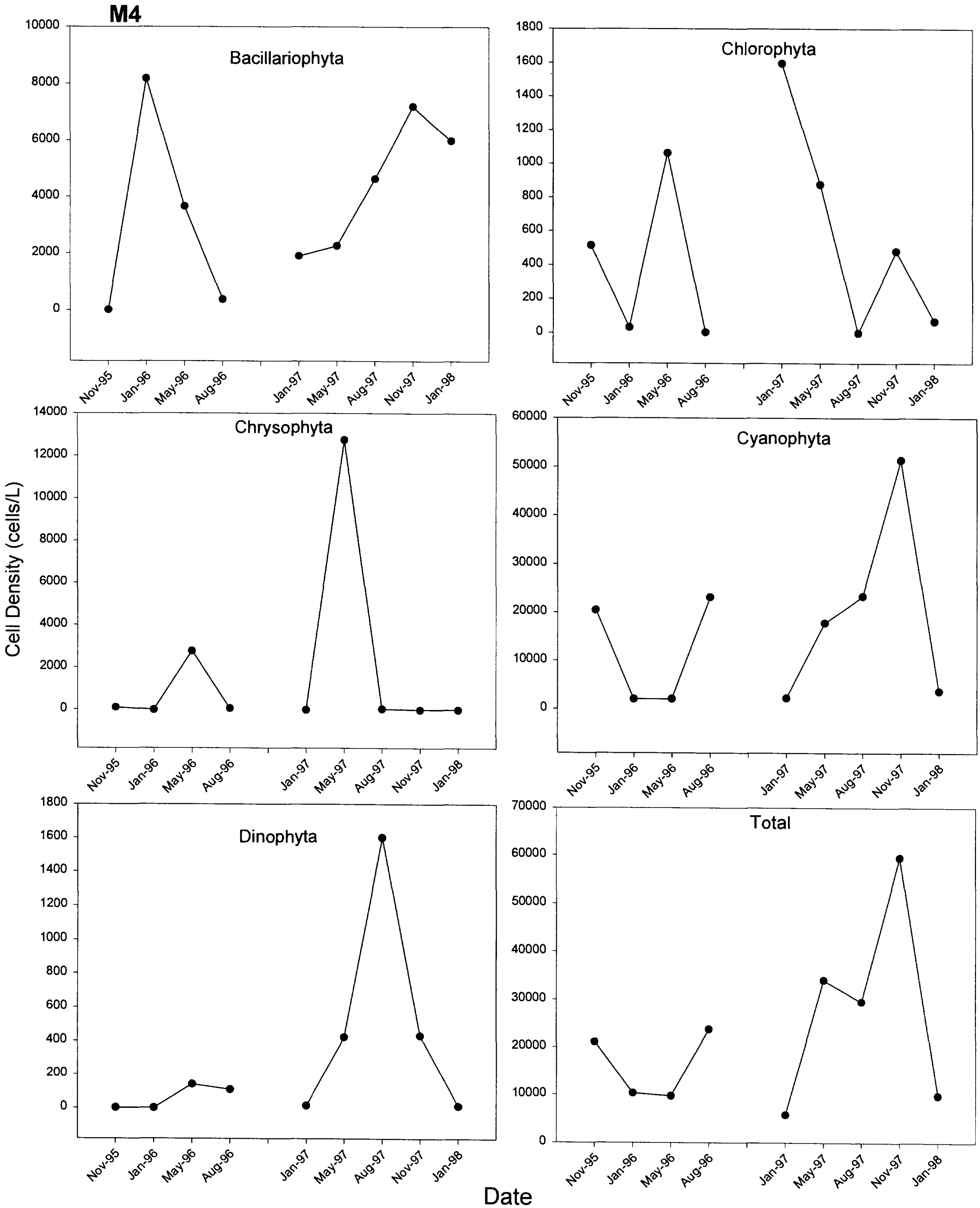
Trachelomonas



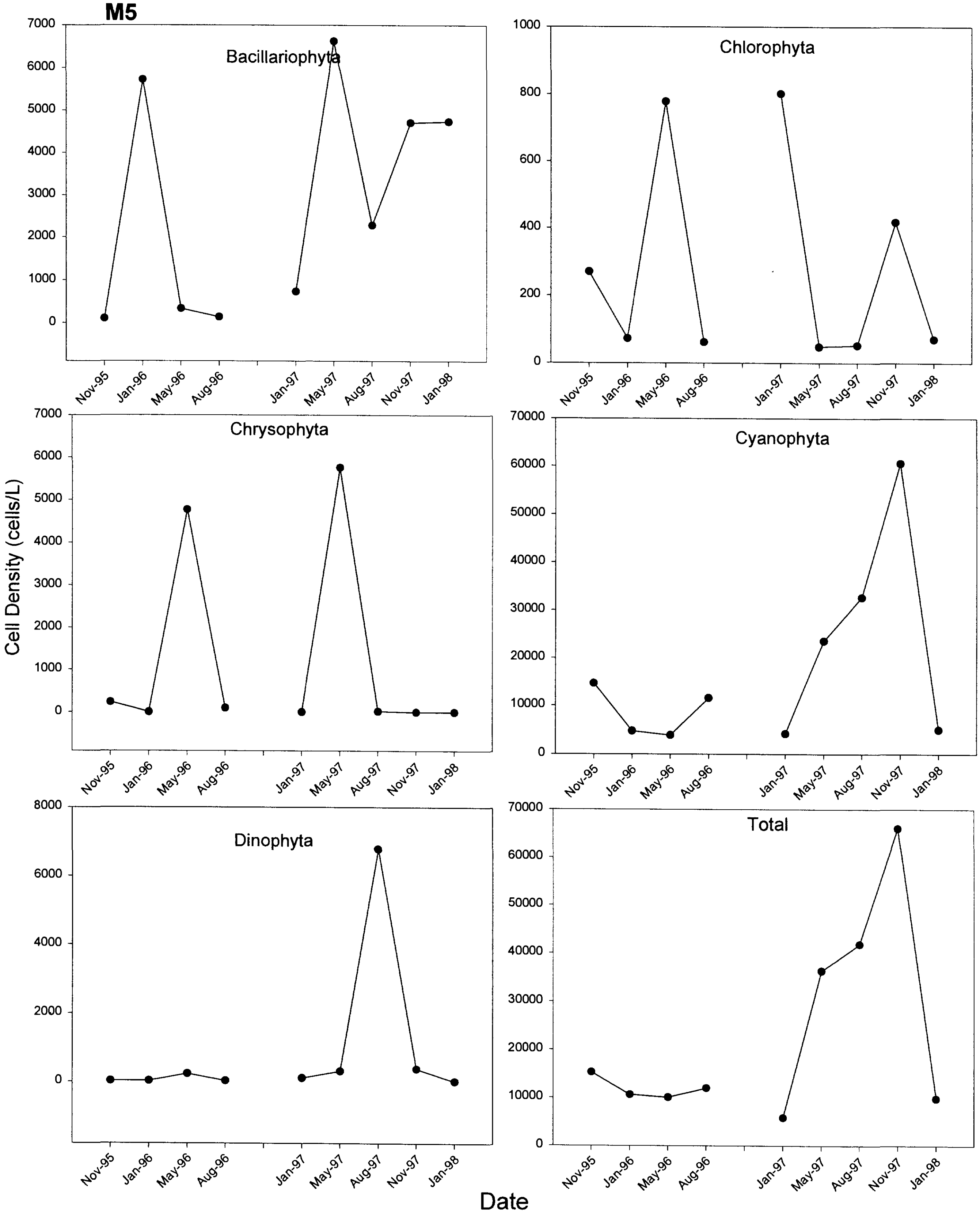
M1
Bacillariophyta
Chlorophyta
Chrysophyta
Cyanophyta
Dinophyta
Total
Cell Density (cells/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98


M2
Bacillariophyta
Chlorophyta
Chrysophyta
Cyanophyta
Dinophyta
Total
Cell Density (cells/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98


M3
Bacillariophyta
Chlorophyta
Chrysophyta
Cyanophyta
Dinophyta
Total
Cell Density (cells/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98



M4
Bacillariophyta
Chlorophyta
Chrysophyta
Cyanophyta
Dinophyta
Total
Cell Density (cells/L)
Date
Nov-95
Jan-96
May-96
Aug-96
Jan-97
May-97
Aug-97
Nov-97
Jan-98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Cyanophyta
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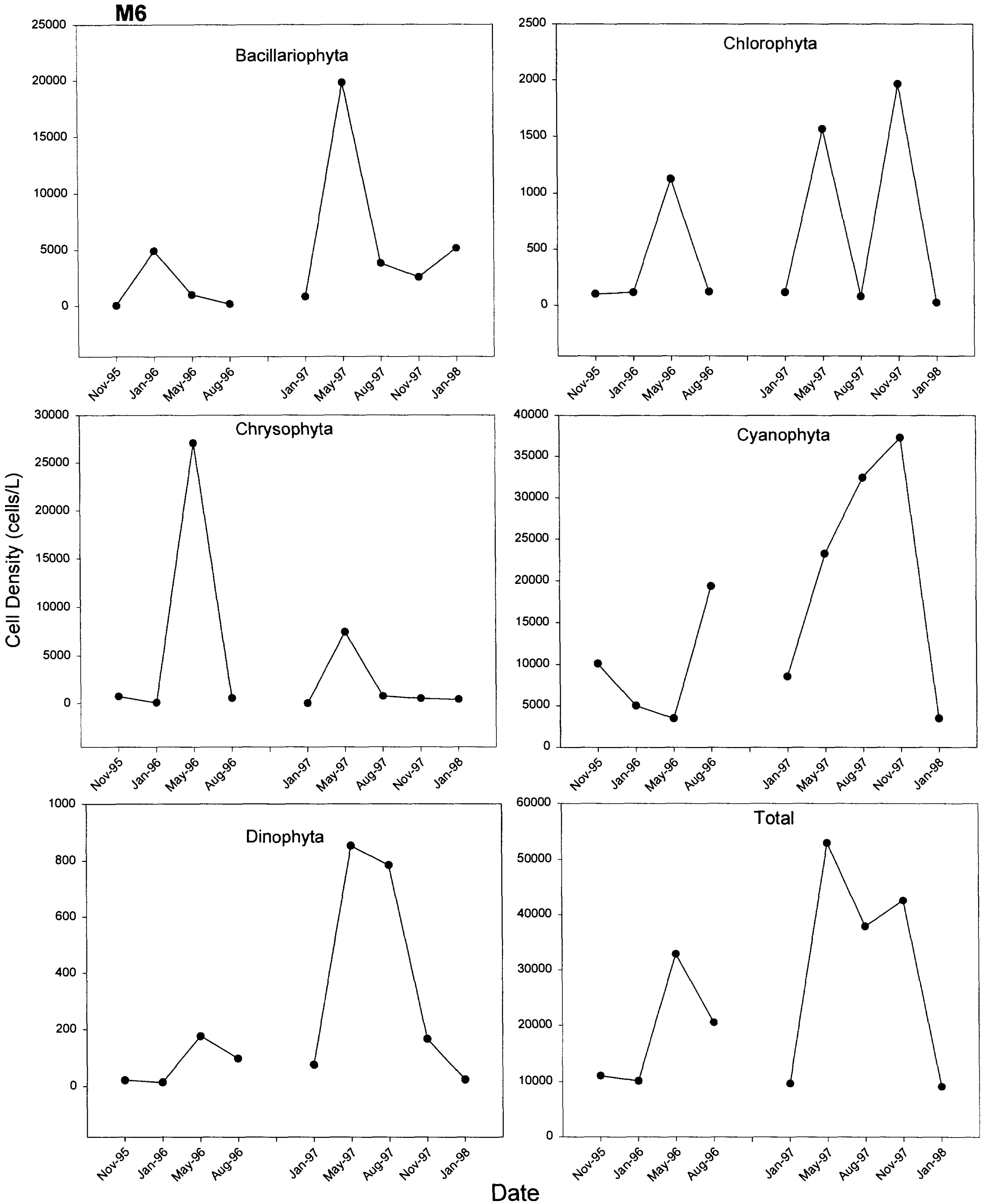
Jan-98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Aug-97
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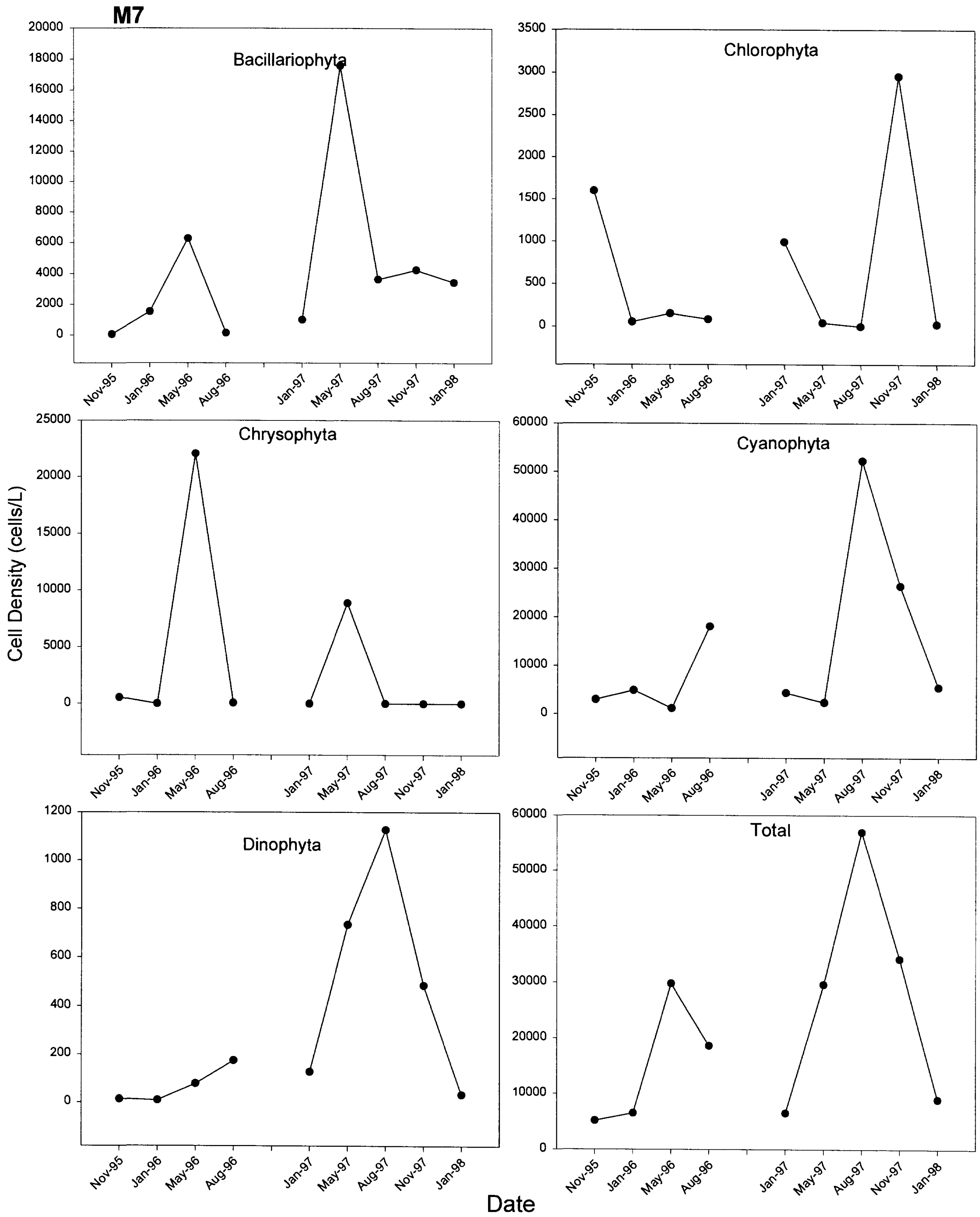
Jan-98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Aug-96
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May-97
Aug-97
Nov-97
Jan-98
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6000
8000
10000
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14000
16000
18000
20000
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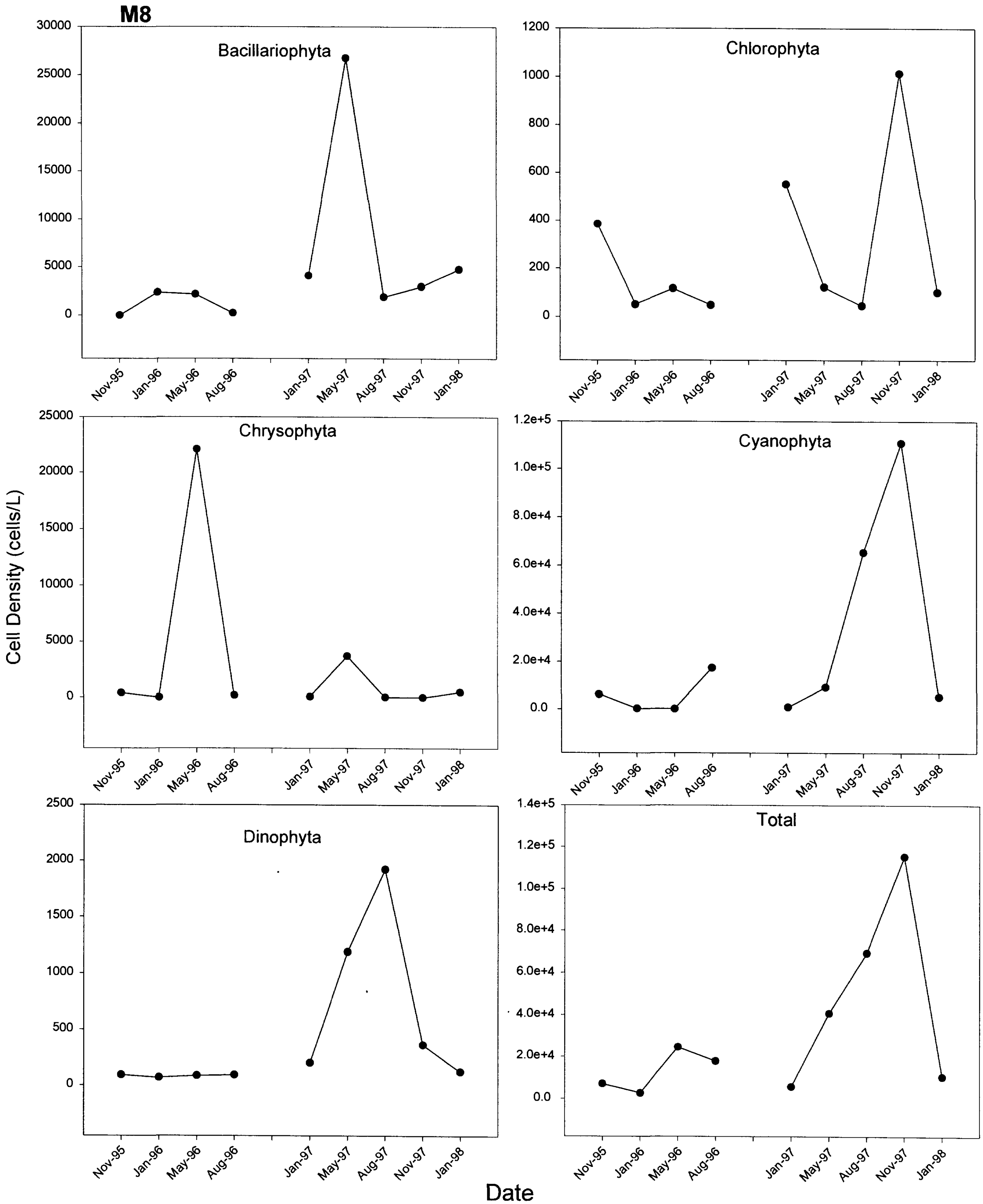
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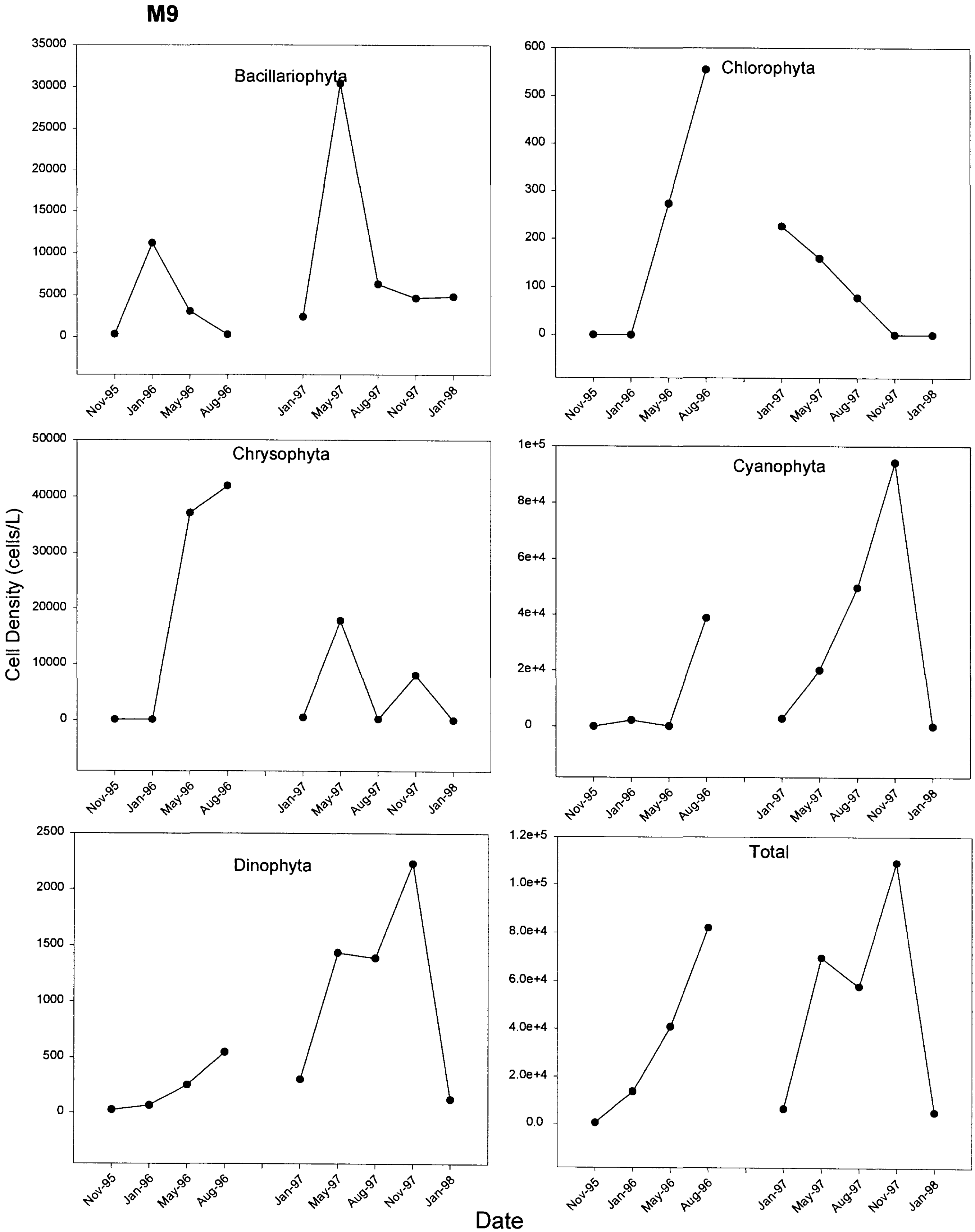
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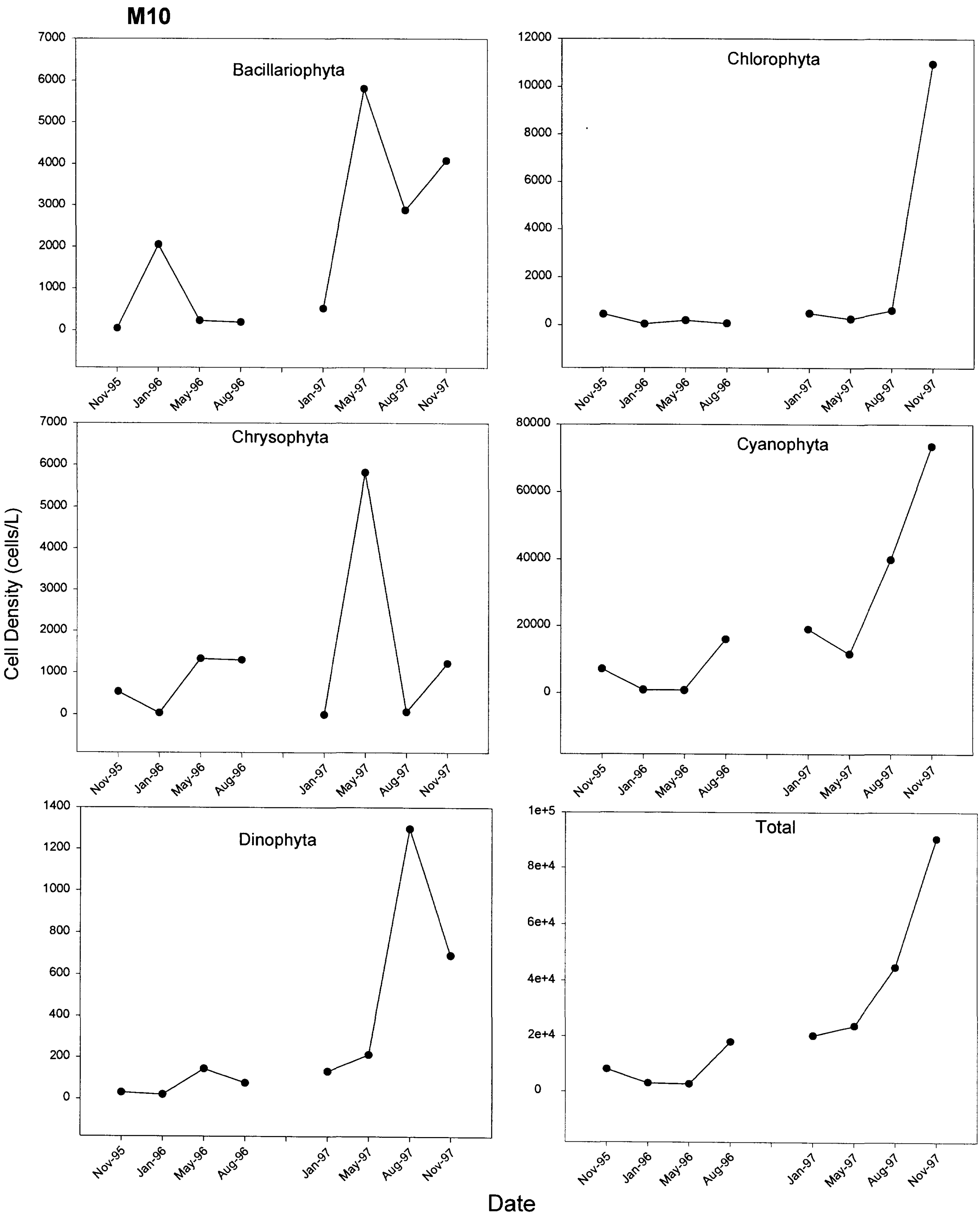
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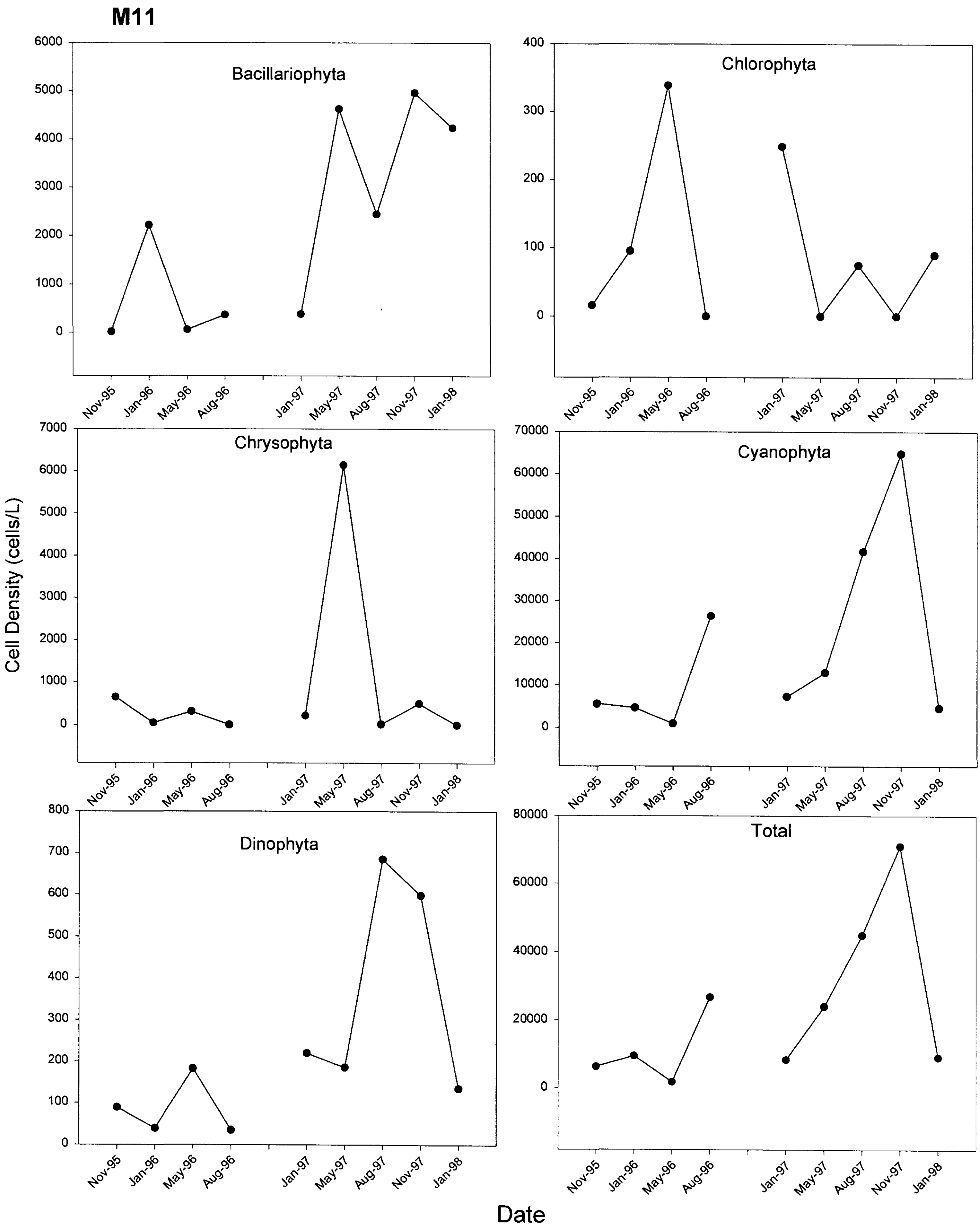
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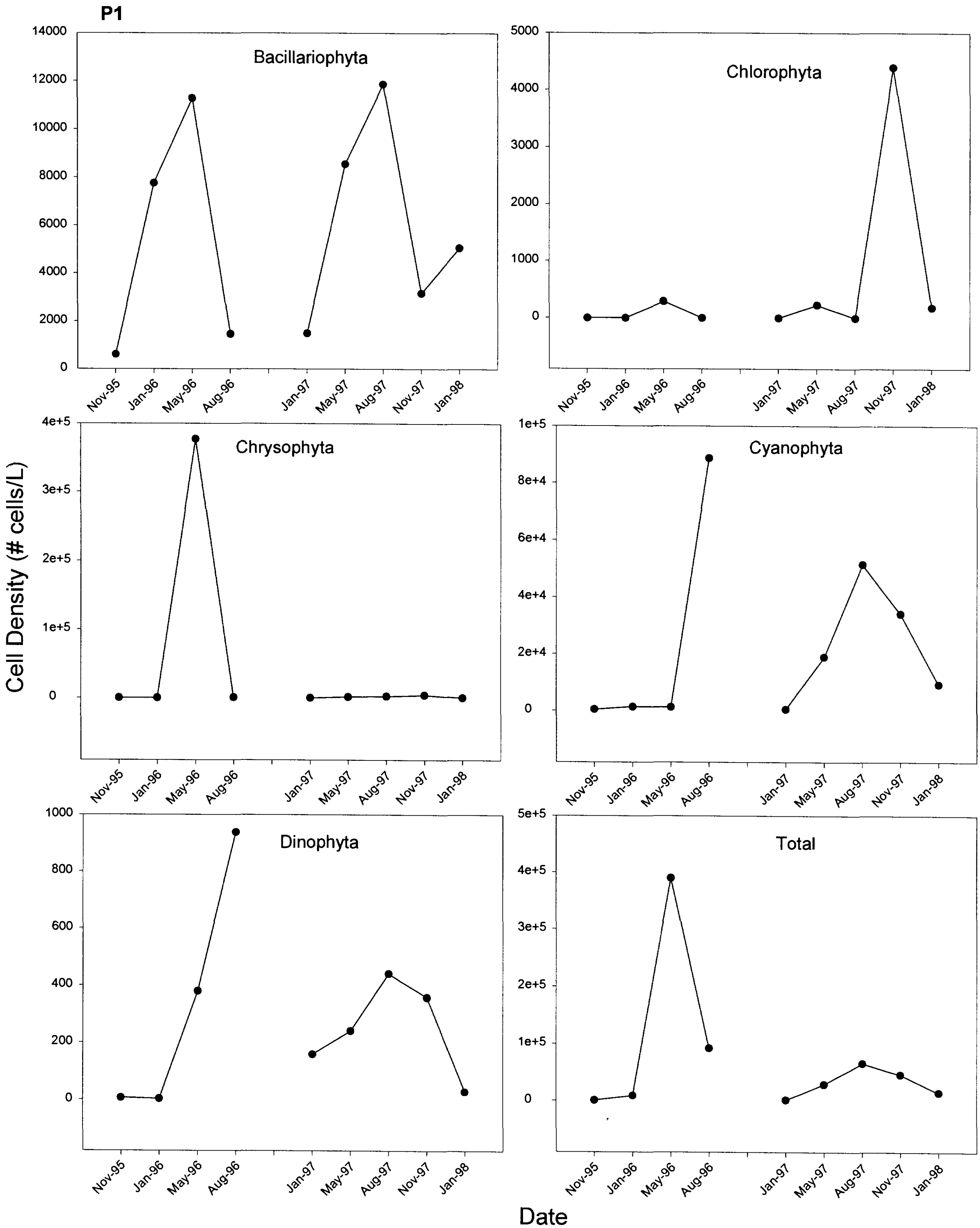
Nov-97
Jan-98



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Cell Density (# cells/L)
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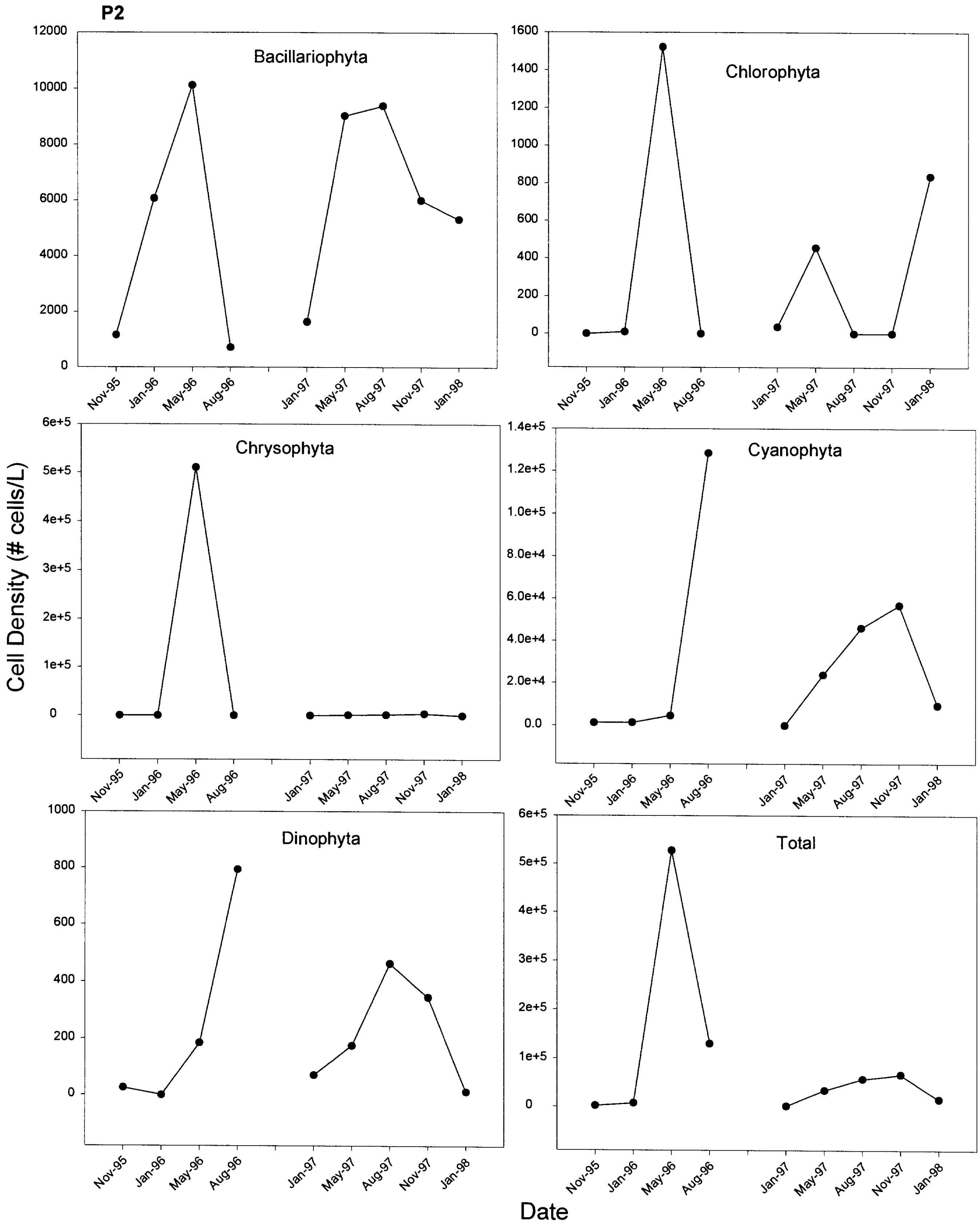
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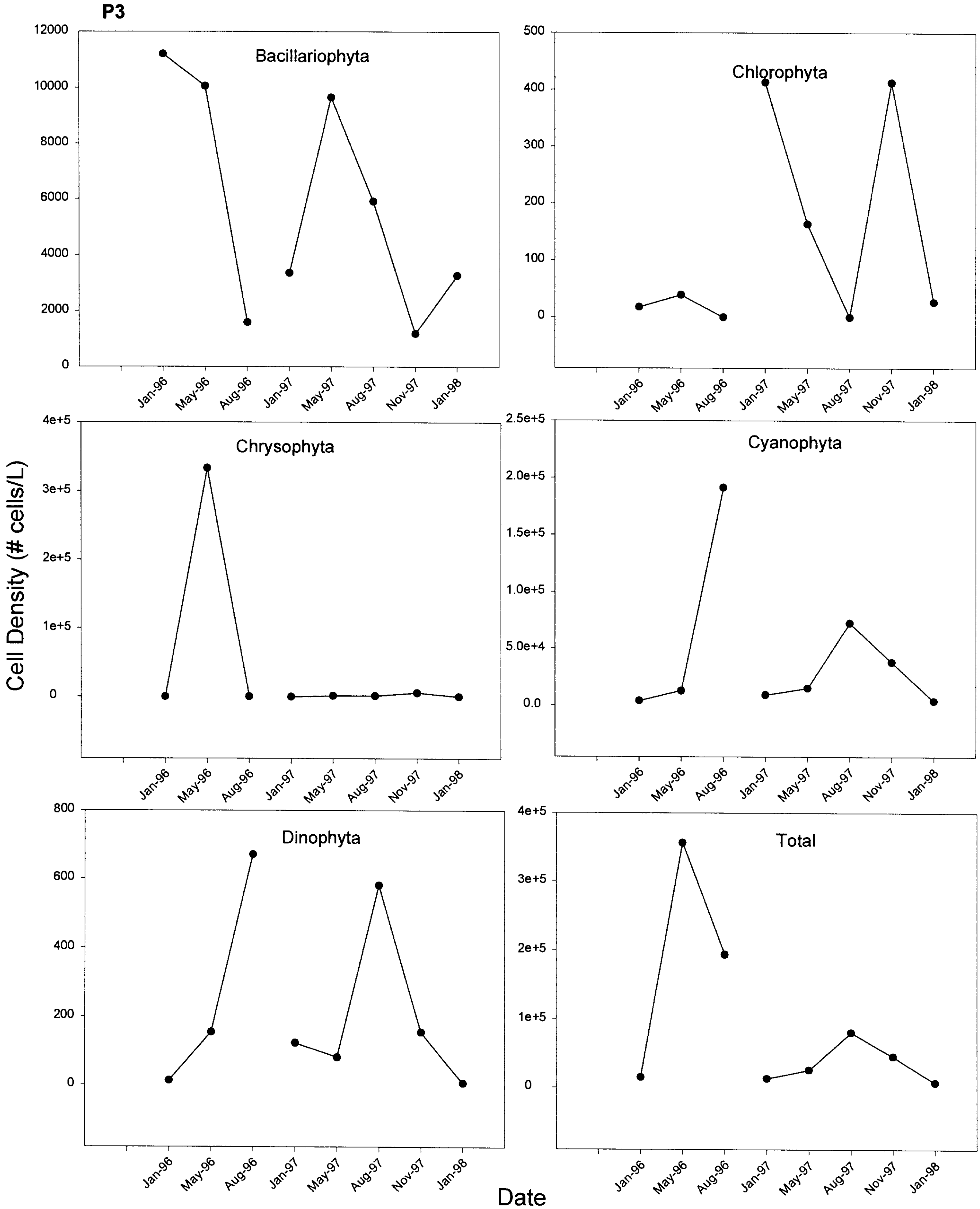
Nov-97
Jan-98



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Cell Density (# cells/L)
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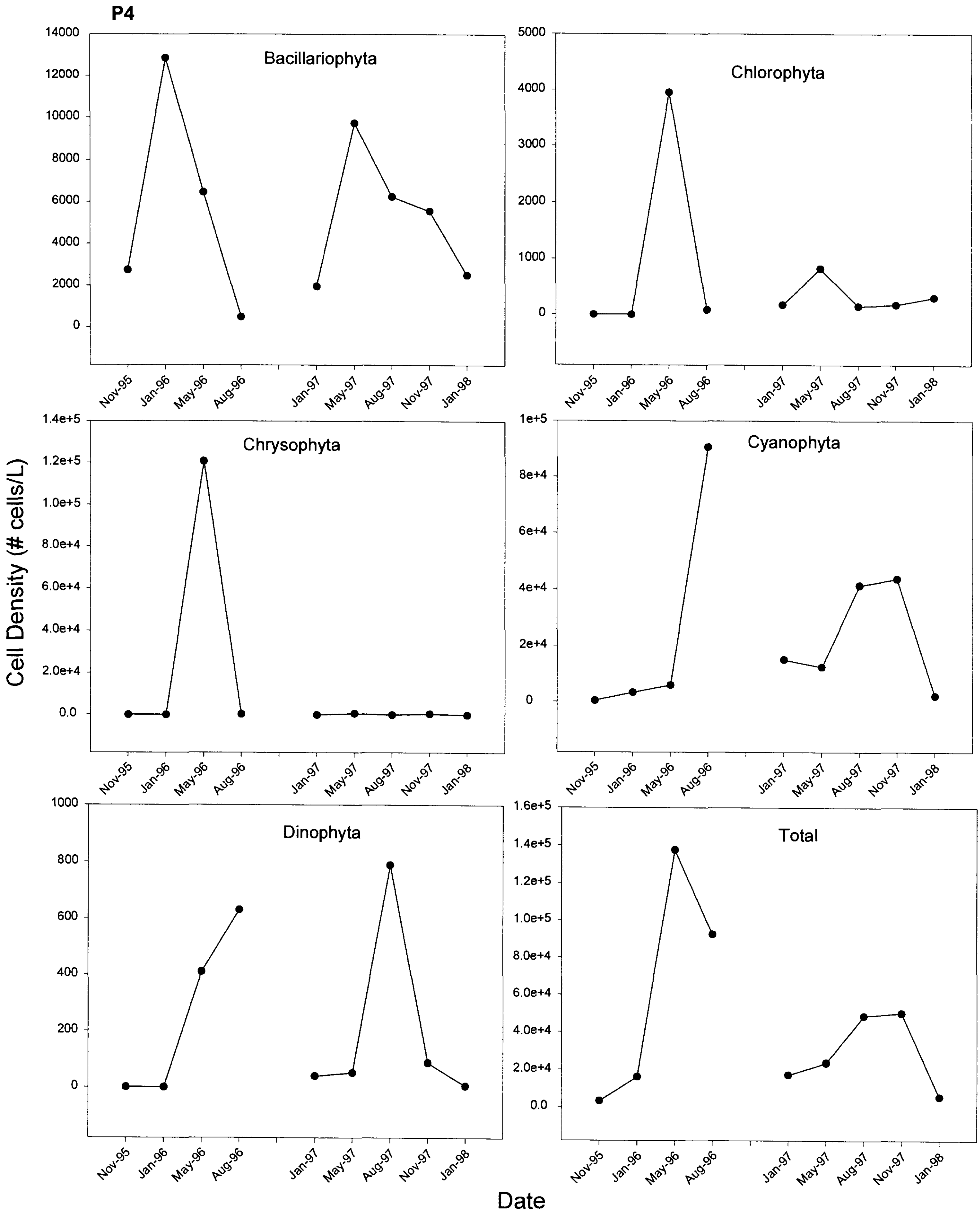
Jan-98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Cyanophyta
Dinophyta
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Cell Density (# cells/L)
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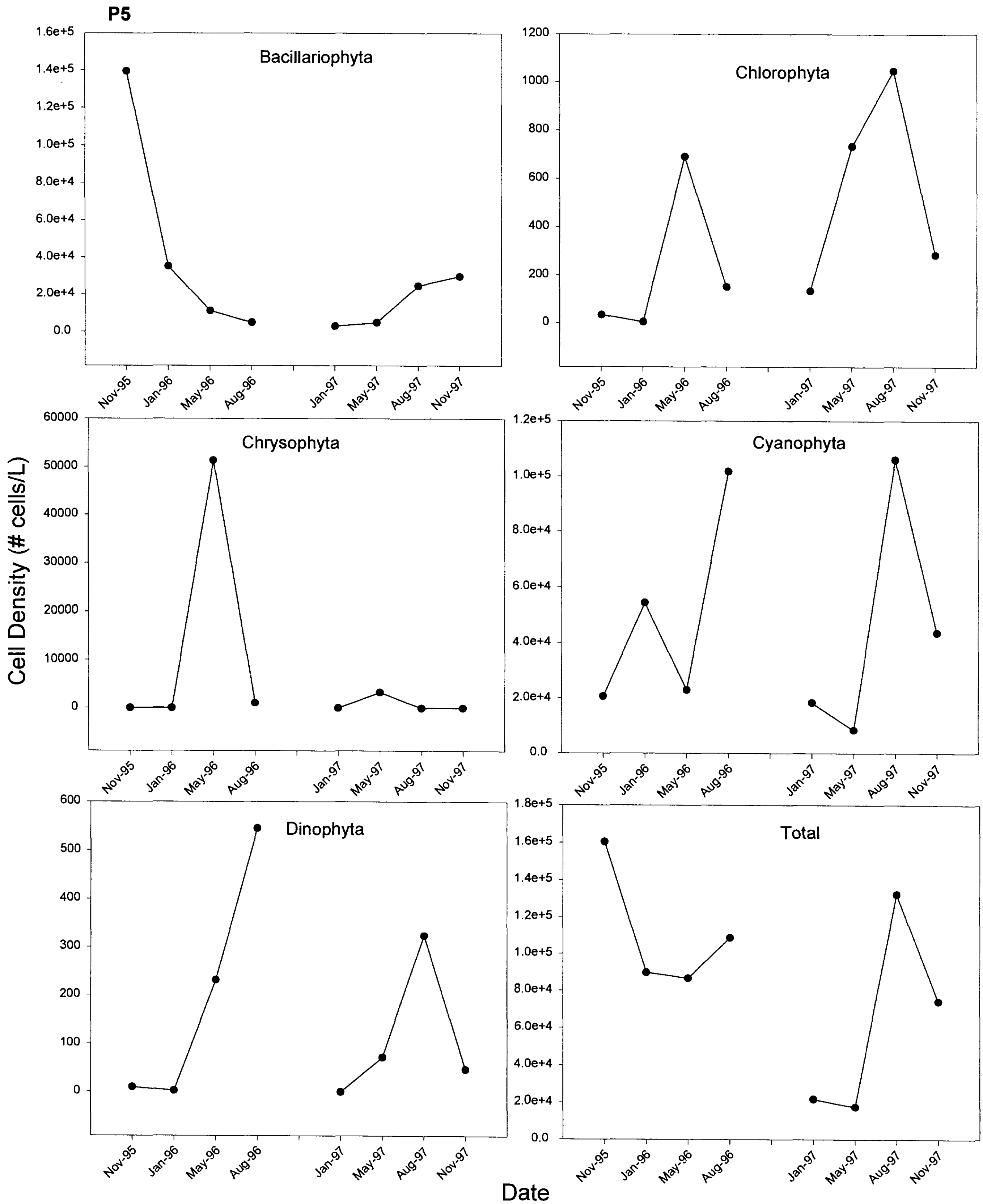
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Cyanophyta
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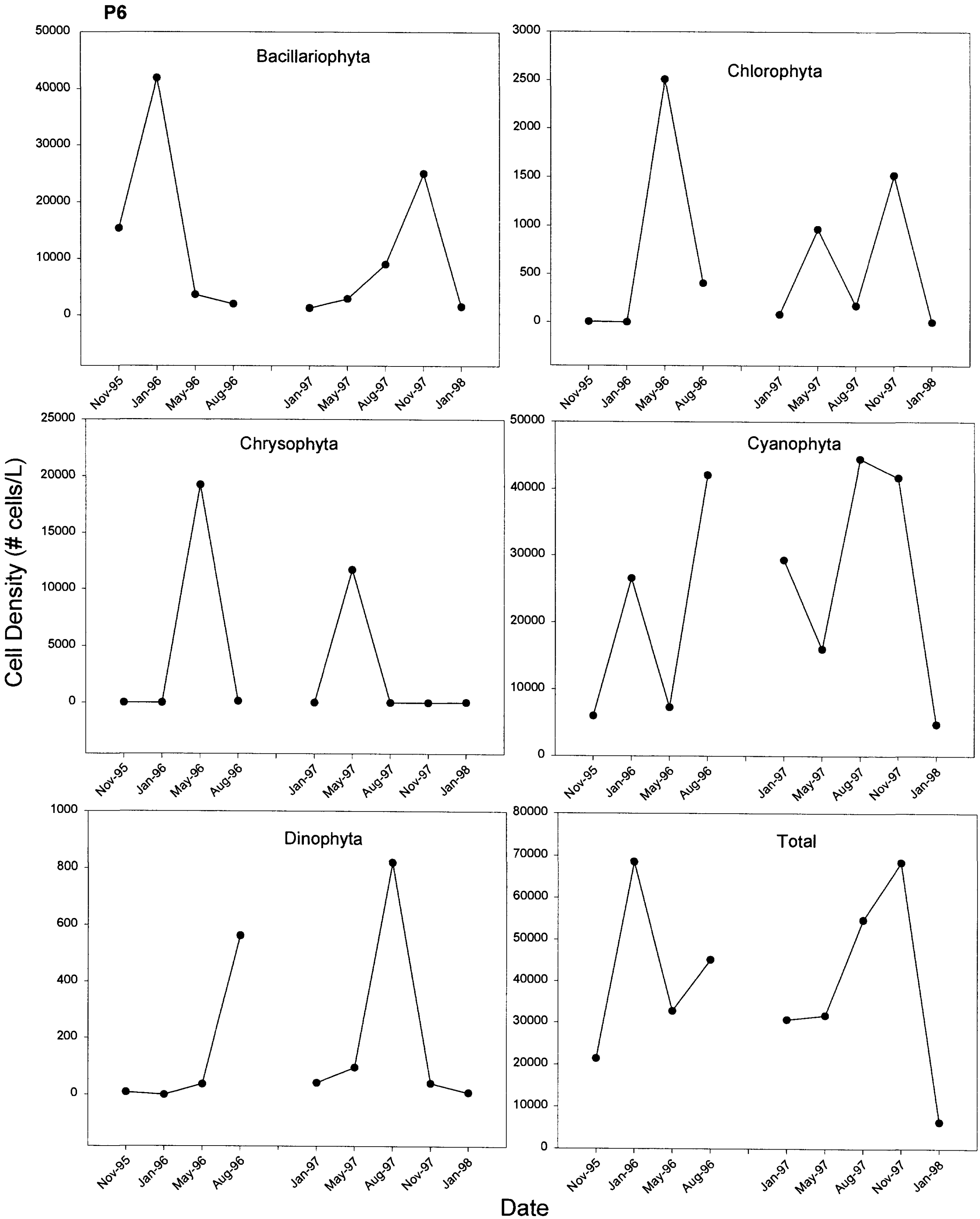
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Cyanophyta
Dinophyta
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Cell Density (# cells/L)
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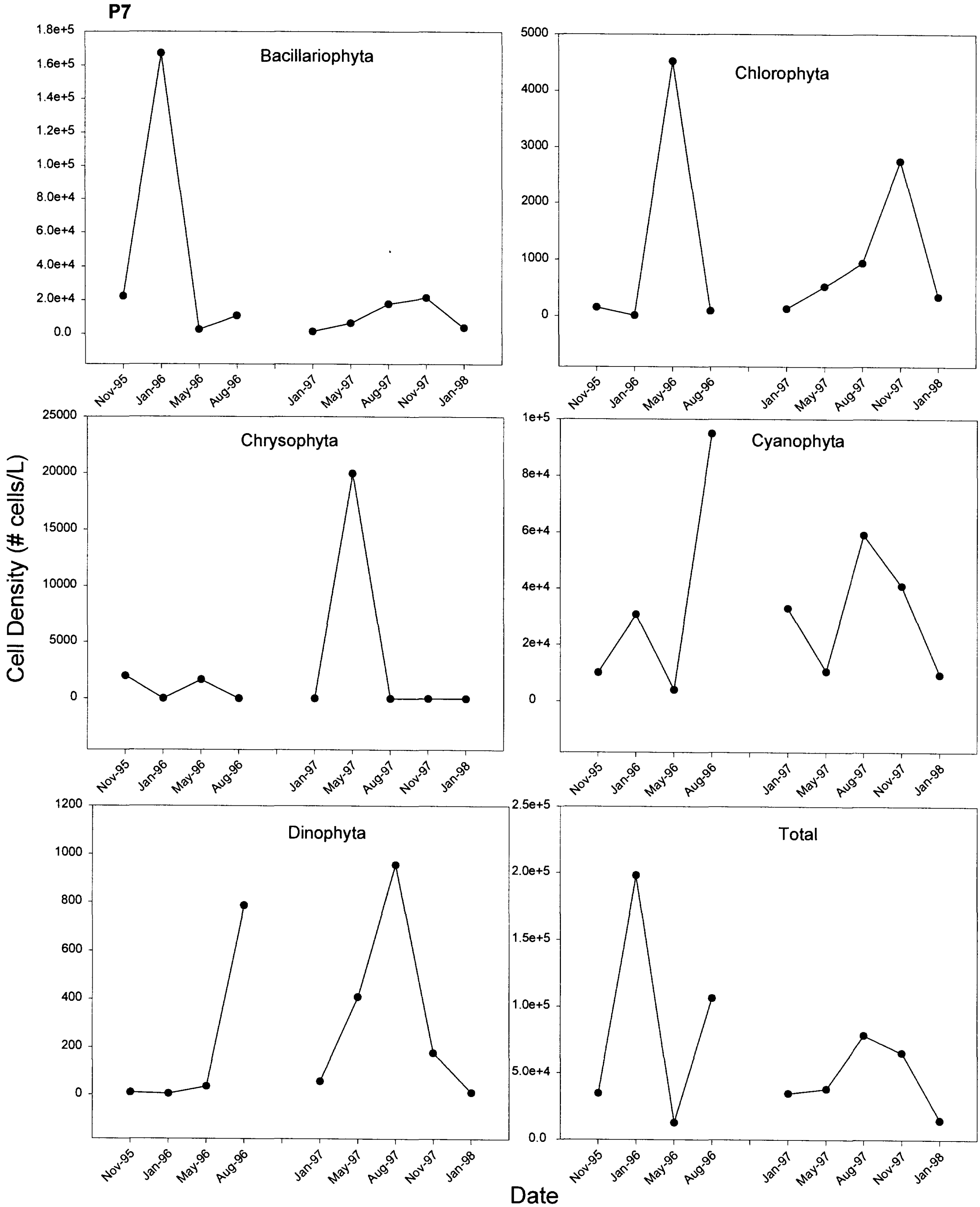
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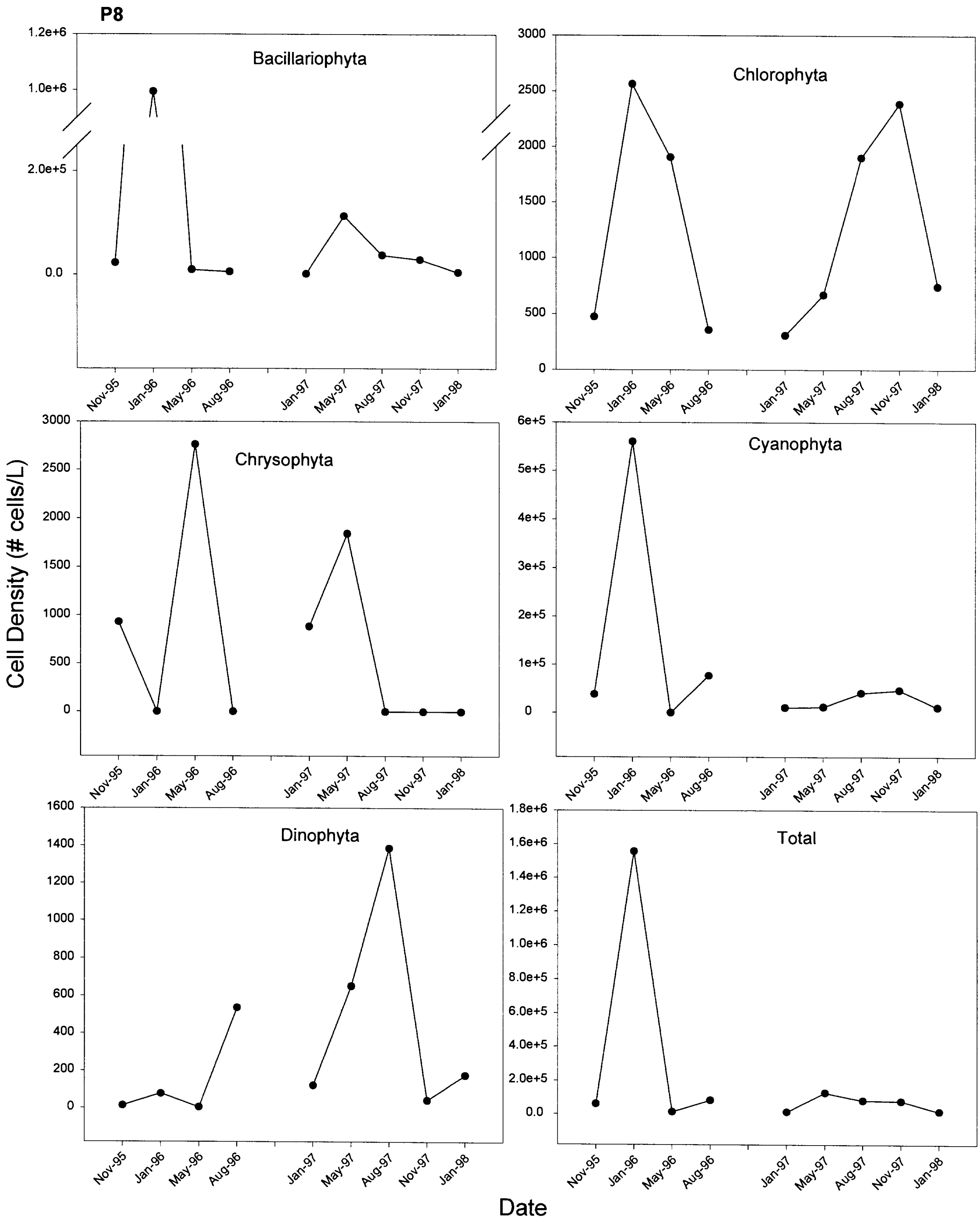
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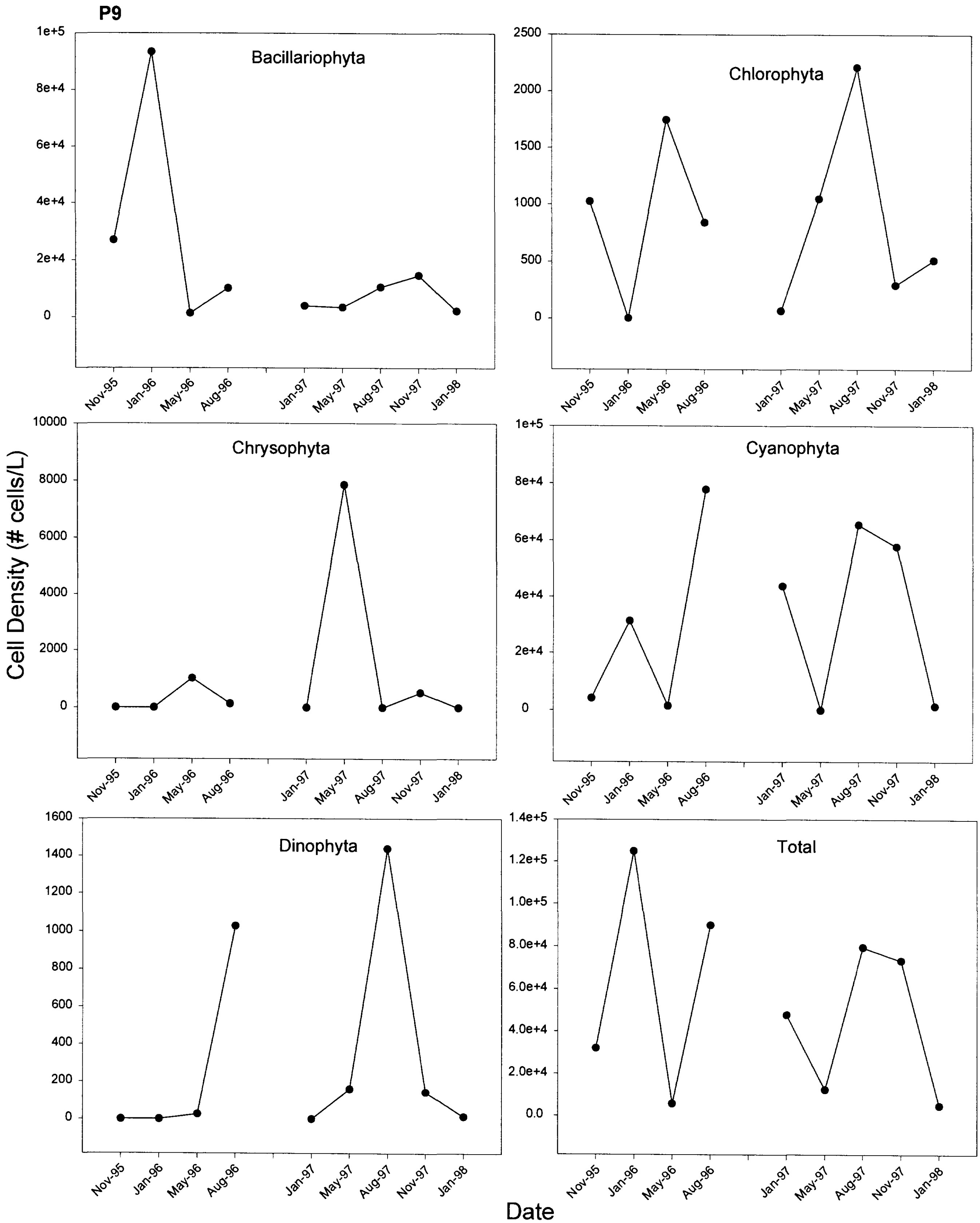
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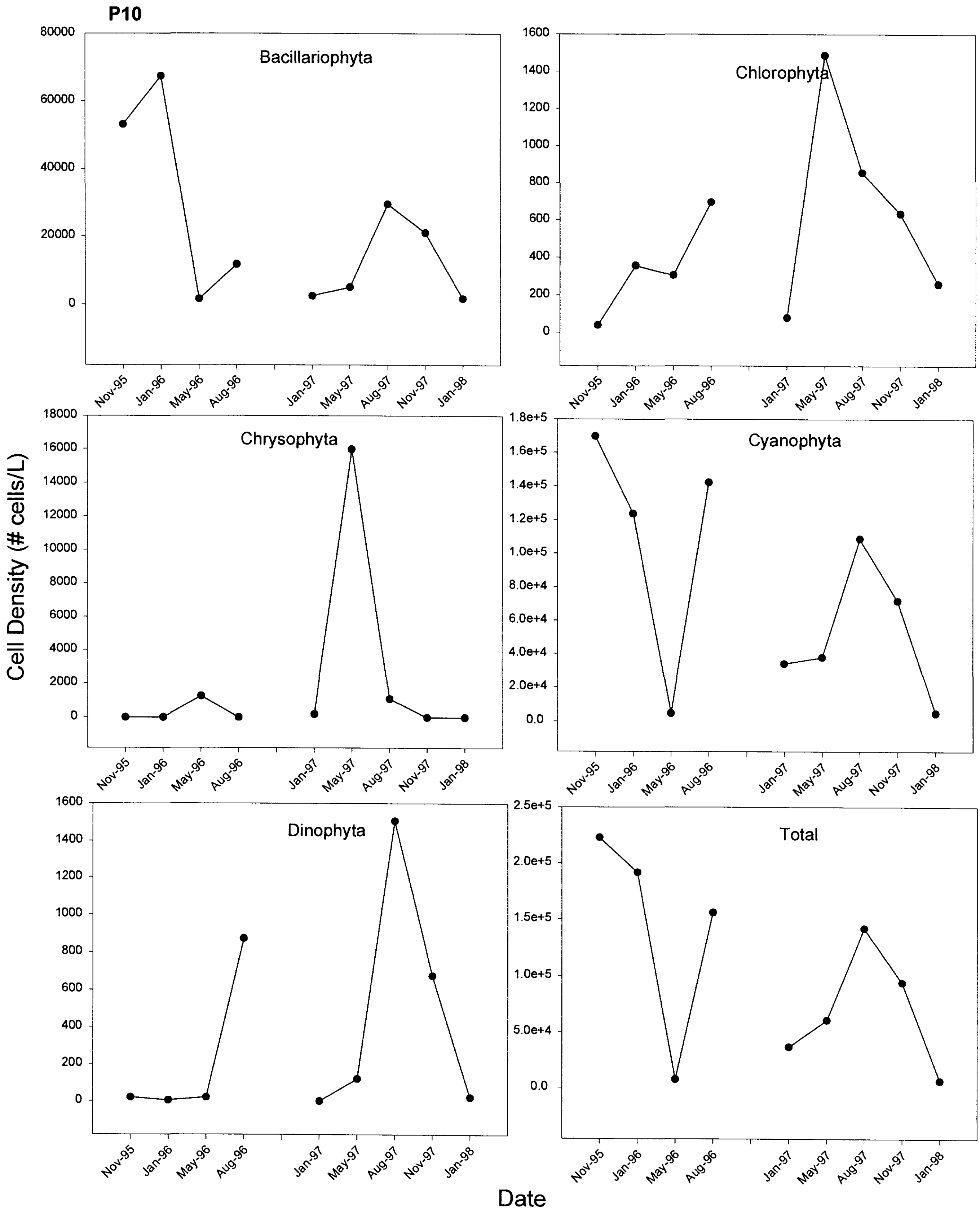

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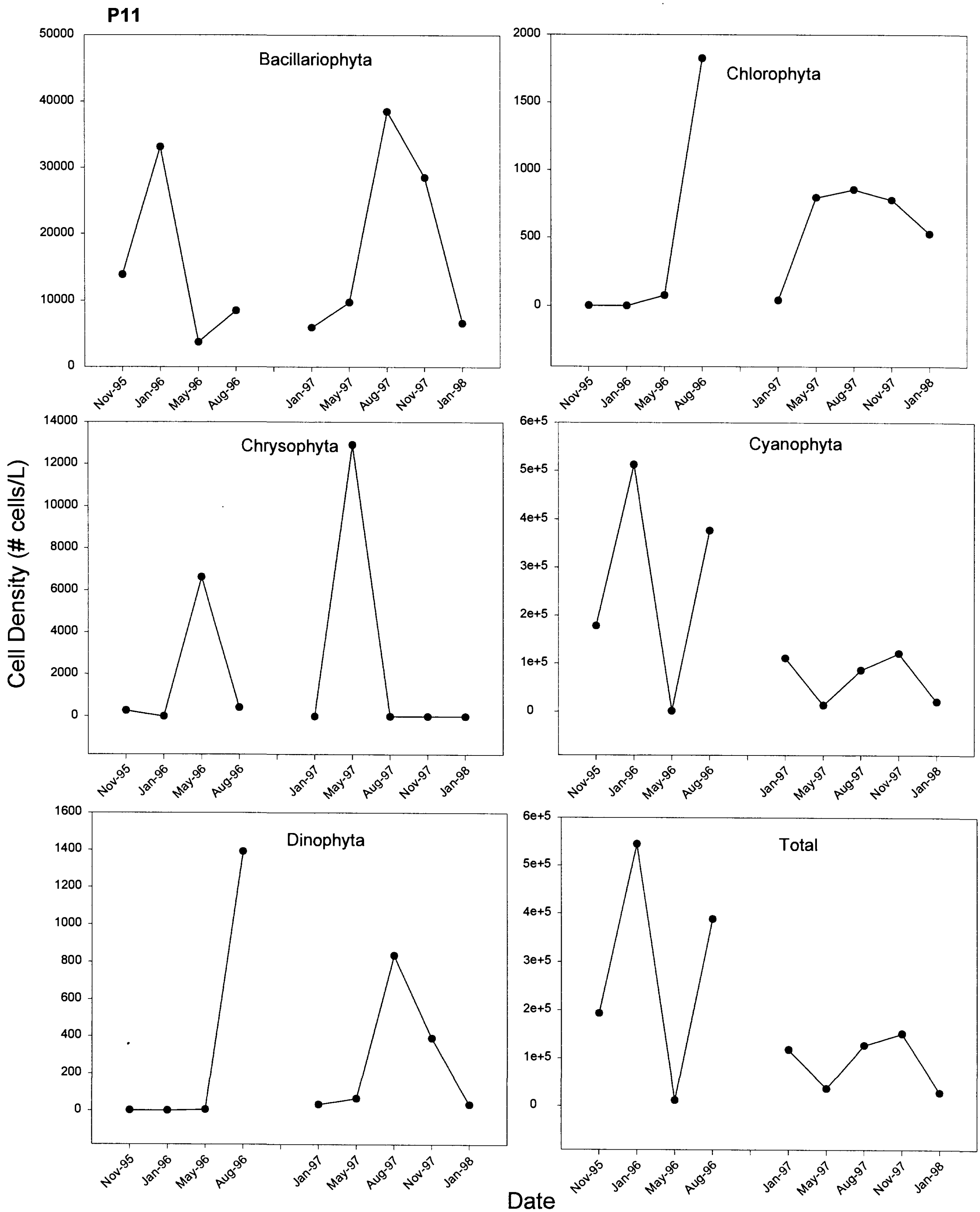
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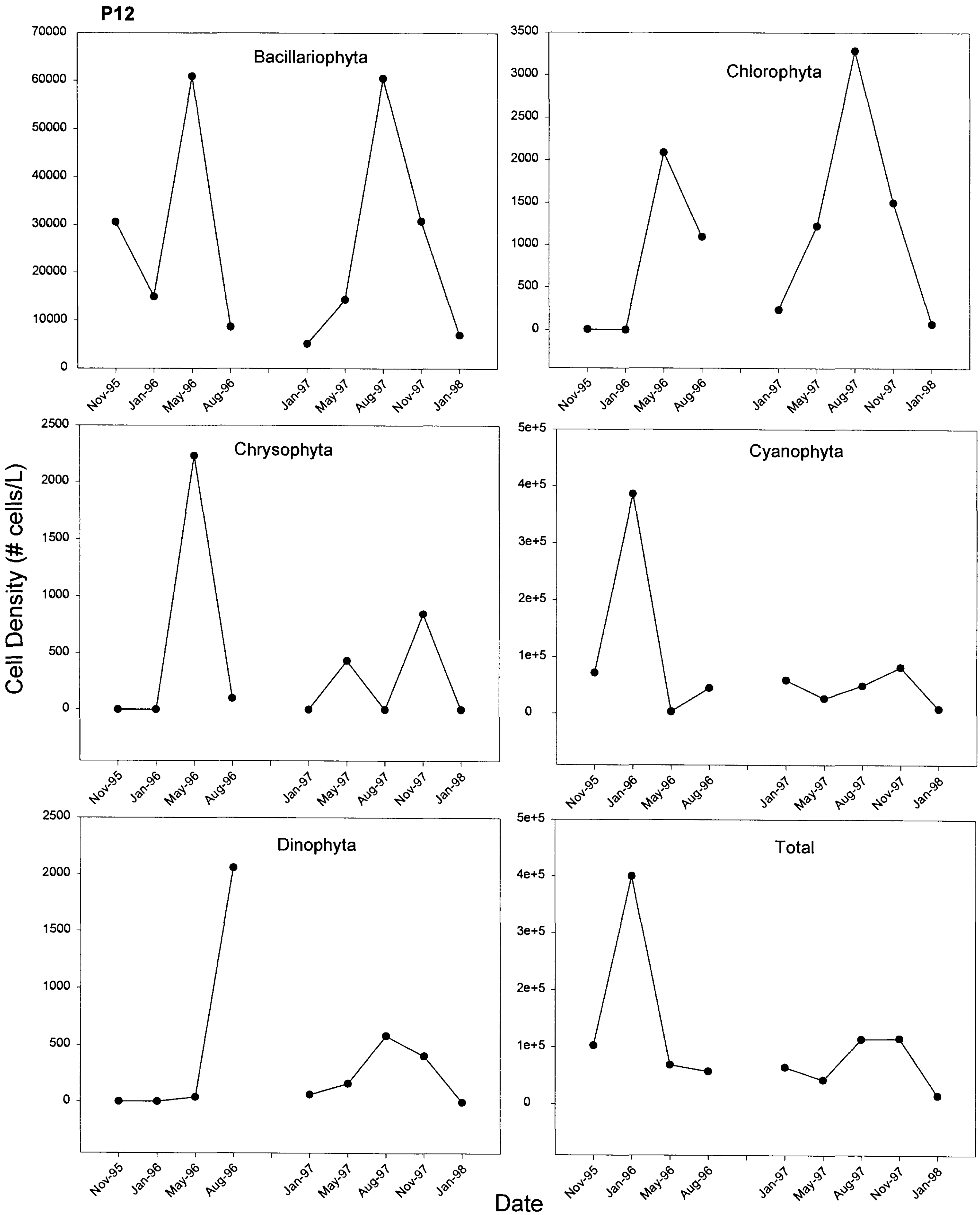

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Aug-97
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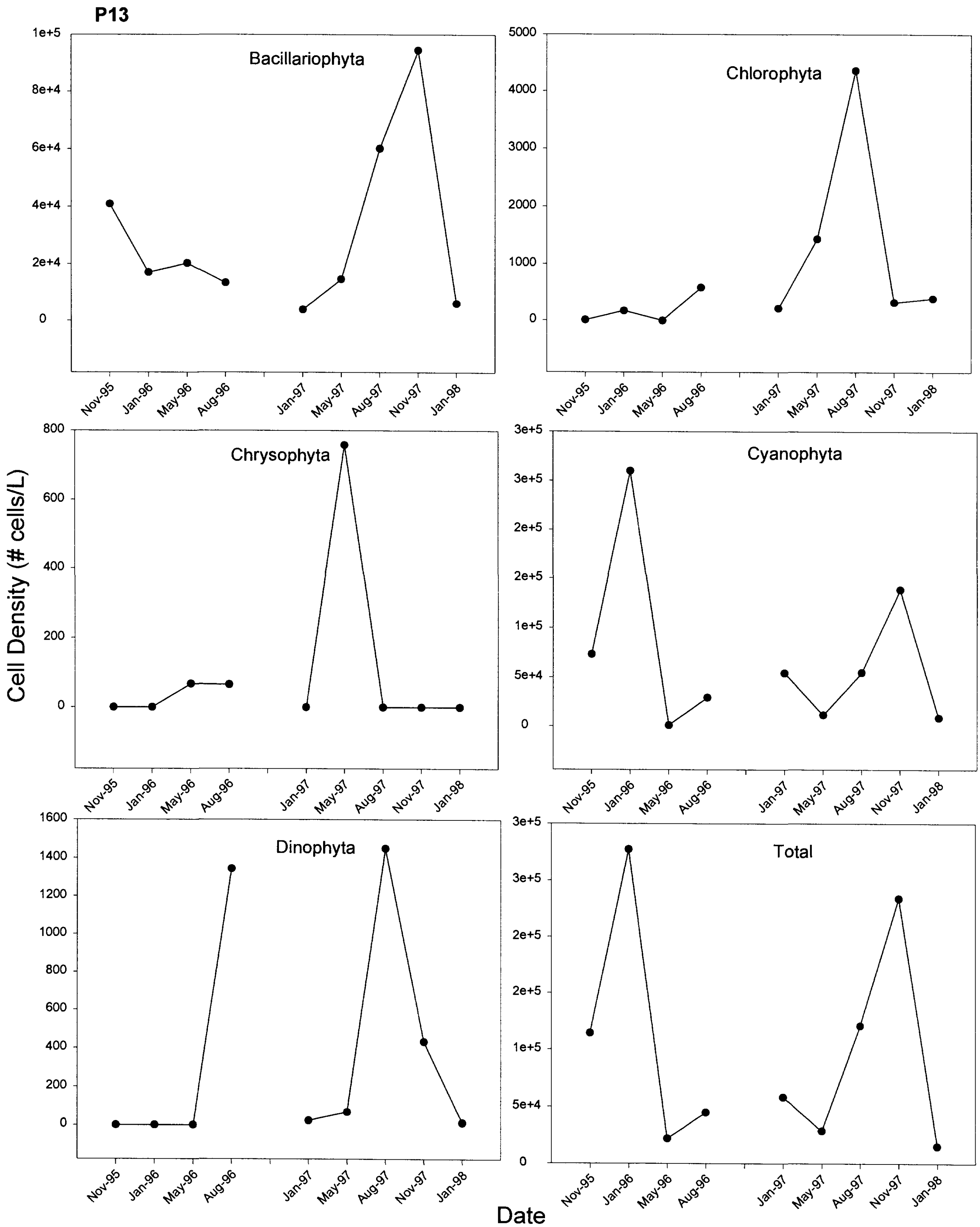
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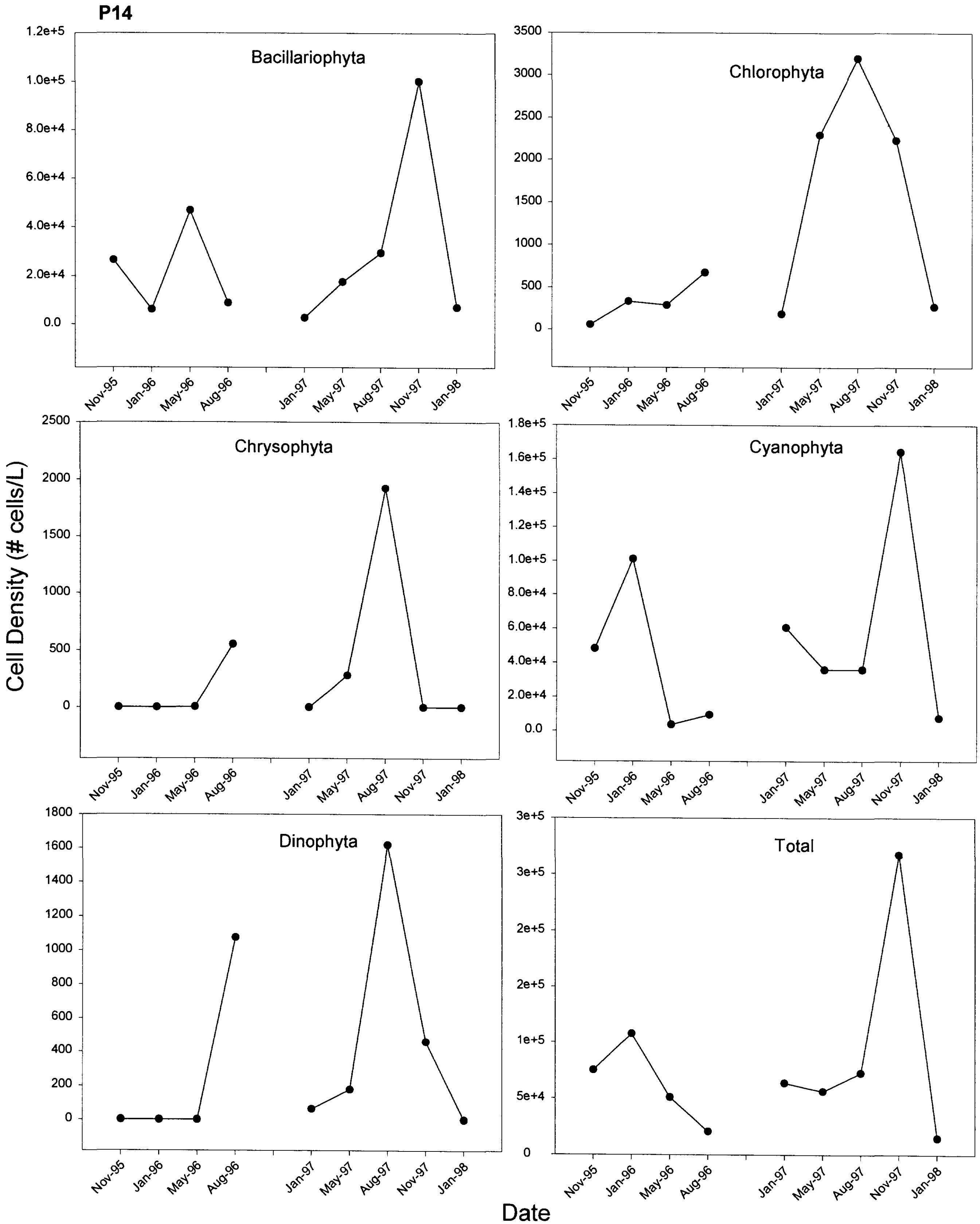
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Aug-96
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Aug-97
Nov-97
Jan-98

APPENDIX F

NETTED FISH DATA
Species Composition
Individual Fish Data
Length-Weight Regressions

Lake Powell -- Species Composition -- November 1995-January 1998

Species	C Catfish	Carp	Threadfin	Strip Bass	Walleye
Avg TL	285	470	103	467	422
Max	350	575	155	622	503
Min	155	410	86	165	268
Avg Wght	202	1342	9	1259	961
Max	330	2100	32	2300	1400
Min	34	860	4	36	640
Fish #	4	36	57	136	7

Lake Mead -- Species Composition -- November 1995-January 1998

Species	C Catfish	Carp	Threadfin	Strip Bass	RB Trout
Avg TL	338	453	115	409	252
Max	420	473	195	772	
Min	285	422	85	218	
Avg Wght	384	1149	15	765	320
Max	540	1330	60	2230	
Min	228	986	4	100	
Fish #	3	7	105	93	1

Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
m03	02/05/96	34	ccf	310	228	1.25	35
m05	11/30/95	30	ccf	285		1	37
m08	11/28/95		tfs	100		0.5	39
m08	11/28/95		tfs	165		0.5	39
m08	11/28/95		tfs	100		0.5	39
m08	11/28/95	7	stb	430	900	1.25	39
m08	11/28/95	18	stb	320	500	1.25	39
m08	11/28/95		tfs	105		0.5	39
m08	11/28/95	19	tfs	108		0.5	39
m08	11/28/95	23	stb	350	600	1.25	39
m08	11/28/95		tfs	140		0.5	39
m08	11/28/95	24	stb	385	700	1.25	39
m08	11/28/95		tfs	105		0.5	39
m08	11/28/95		tfs	95		0.5	39
m08	11/28/95		tfs	110		0.5	39
m08	11/28/95		tfs	150		0.5	39
m08	11/28/95	12	stb	370	700	1.25	39
m08	11/28/95	24	stb	520	1400	2	39
m08	11/28/95	23	stb	445	900	1.6	39
m08	11/28/95	22	stb	485	1200	1.6	39
m08	11/28/95	32	stb	505	1300	2	39
m08	11/28/95	7	stb	470	1000	1.25	39
m08	11/28/95	23	stb	535	1400	2	39
m08	11/28/95	35	stb	375	700	0.5	39
m08	11/28/95	25	stb	500	1200	1.6	39
m08	11/28/95	14	stb	335	500	1.25	39
m08	11/28/95	24	stb	455	800	1.6	39
m08	11/28/95	34	stb	475	1100	1.6	39
m08	11/28/95	23	stb	460	1000	1.6	39
m08	11/28/95	35	stb	425	800	1.6	39
m08	02/06/96	11	stb	477	948	1.6	40
m08	02/06/96	22	stb	376	498	1.6	40
m08	02/06/96	12	stb	343	350	1.25	40
m08	02/06/96	24	stb	447	898	1.6	40
m08	02/06/96	32	stb	320	290	1.25	40
m08	02/06/96	32	stb	316	264	1.25	40
m08	02/06/96	22	tfs	161	36	0.5	40
m08	02/06/96	24	stb	385	588	1.6	40
m08	02/06/96	7	stb	338	344	1.25	40
m08	02/06/96	24	stb	430	698	1.6	40
m08	08/26/96	10	tfs	150		0.5	30
m08	11/20/96	30	stb	500	1180	2	18
m08	11/20/96	30	stb	410	850	1.6	23
m08	11/20/96	30	stb	473	1100	1.6	5
m08	11/20/96	30	stb	476	1150	1.6	23
m08	11/20/96	30	stb	218	100	1	27
m08	11/20/96	30	stb	468	1008	2	22
m08	11/20/96	30	stb	350	600	1.2	2
m08	11/20/96	30	stb	501	1150	2	28
m08	04/28/97	25	stb	448	365	1.2	8
m08	04/28/97	25	rbt	252	320	1.2	18
m08	04/28/97	25	stb	772	445	1.6	12

Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
m08	08/05/97	35	ccf	420	540	1.6	2
m08	08/05/97	35	carp	470	1212	1.2	4
m08	08/05/97	35	carp	470	1272	2	6
m08	08/05/97	35	tfs	138	26	0.7	8
m08	08/05/97	35	carp	460	1046	1.2	33
m08	08/05/97	35	tfs	145	26	0.7	31
m08	08/05/97	35	tfs	155	38	0.7	33
m08	11/04/97	25	tfs	114	8	0.5	24
m08	11/04/97	25	stb	492	1024	1.2	9
m08	11/04/97	25	carp	422	986	2.5	20
m08	11/04/97	25	carp	473	1330	2	8
m08	11/04/97	25	stb	488	1100	2	13
m08	11/04/97	25	tfs	156	38	0.5	12
m10	02/07/96	17	stb	330	282	1.25	40
m10	02/07/96	16	stb	325	274	1.25	40
m10	02/07/96	11	tfs	104	8	0.5	40
m10	02/07/96	27	tfs	146	28	0.5	40
m10	02/07/96	28	stb	525	1320	1.6	40
m10	02/07/96	26	stb	391	482	1.6	40
m10	02/07/96	32	stb	382	462	1.6	40
m10	02/07/96	34	tfs	100	8	0.5	40
m10	02/07/96	11	tfs	105	8	0.5	40
m10	02/07/96	27	tfs	106	8	0.5	40
m10	02/07/96	25	stb	305	238	1.25	40
m10	02/07/96	21	tfs	105	6	0.5	40
m11	11/29/95	12	stb	290	400	1.25	40
m11	11/29/95	23	stb	385		1.6	40
m11	11/29/95	20	stb	495		1.6	40
m11	11/29/95	29	tfs	100		0.5	40
m11	11/29/95	13	stb	235	500	1.25	40
m11	11/29/95	3	stb	355	600	1.25	40
m11	11/29/95	2	stb	310	400	1.25	40
m11	11/29/95	7	tfs	150		0.5	40
m11	11/29/95	2	stb	315	400	1.25	40
m11	11/29/95	35	tfs	97		0.5	40
m11	11/29/95	23	stb	420		1.6	40
m11	11/29/95	29	tfs	100		0.5	40
m11	11/29/95	26	tfs	125		0.5	40
m11	11/29/95	27	stb	315	400	1.25	40
m11	11/29/95	24	tfs	90		0.5	40
m11	11/29/95	34	tfs	90		0.5	40
m11	11/29/95	24	tfs	105		0.5	40
m11	11/29/95	22	tfs	105		0.5	40
m11	11/29/95	23	tfs	107		0.5	40
m11	11/29/95	19	tfs	160		0.5	40
m11	11/29/95	26	tfs	100		0.5	40
m11	11/29/95	23	tfs	110		0.5	40
m11	11/29/95	17	tfs	150		0.5	40
m11	11/29/95	19	tfs	145		0.5	40
m11	11/29/95	19	tfs	155		0.5	40
m11	11/29/95	12	tfs	162		0.5	40
m11	11/29/95	21	tfs	150		0.5	40

Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
m11	11/29/95	21	tfs	112		0.5	40
m11	11/29/95	32	tfs	95		0.5	40
m11	11/29/95	29	tfs	100		0.5	40
m11	11/29/95	26	tfs	105		0.5	40
m11	11/29/95	26	tfs	95		0.5	40
m11	11/29/95	17	stb	450		1.6	40
m11	11/29/95	23	tfs	107		0.5	40
m11	11/29/95	29	tfs	100		0.5	40
m11	11/29/95	19	tfs	155		0.5	40
m11	11/29/95	23	stb	450		1.6	40
m11	11/29/95	29	tfs	125		0.5	40
m11	11/29/95	22	stb	425	900	1.25	40
m11	11/29/95	33	tfs	95		0.5	40
m11	11/29/95	9	stb	440		1.6	40
m11	11/29/95	5	stb	310	400	1.25	40
m11	11/29/95	17	stb	455		1.6	40
m11	11/29/95	8	stb	420		1.6	40
m11	11/29/95	30	tfs	105		0.5	40
m11	11/29/95	21	tfs	160		0.5	40
m11	11/29/95	29	tfs	107		0.5	40
m11	11/29/95	30	tfs	90		0.5	40
m11	11/29/95	32	stb	450		1.6	40
m11	11/29/95	29	tfs	95		0.5	40
m11	11/29/95	23	tfs	85		0.5	40
m11	11/29/95	29	tfs	97		0.5	40
m11	11/29/95	4	stb	305	400	1.25	40
m11	11/29/95	33	tfs	95		0.5	40
m11	11/29/95	10	stb	415		1.6	40
m11	11/29/95	24	stb	455		1.6	40
m11	11/29/95	34	tfs	108		0.5	40
m11	11/29/95	3	stb	285		1	40
m11	11/29/95	30	stb	435		1.6	40
m11	11/29/95	26	stb	275		0.5	40
m11	11/29/95	30	stb	470		1.6	40
m11	11/29/95	23	tfs	100		0.5	40
m11	11/29/95	36	tfs	87		0.5	40
m11	11/29/95	36	stb	400		1.6	40
m11	11/29/95	3	stb	330		1	40
m11	11/29/95	11	stb	285		0.5	40
m11	11/29/95	29	tfs	100		0.5	40
m11	11/29/95	27	stb	365	700	1.25	40
m11	11/29/95	23	stb	440		1.6	40
m11	11/29/95	11	stb	250		0.5	40
m11	11/29/95	32	stb	425		1.6	40
m11	11/29/95	28	carp			2	40
m11	11/29/95	29	stb	285		0.5	40
m11	11/29/95	5	stb	255		1	40
m11	11/29/95	32	stb	420		1.6	40
m11	11/21/96	28	stb	503	1208	2	20
m11	11/21/96	28	tfs	185	56	1	13
m11	11/21/96	28	stb	428	814	1.6	13
m11	11/21/96	28	tfs	101	8	0.5	25

Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
m11	11/21/96	28	tfs	97	6	0.5	15
m11	11/21/96	28	tfs	100	8	0.5	24
m11	11/21/96	28	stb	462	922	1.6	3
m11	11/21/96	28	stb	385	534	1.6	18
m11	11/21/96	28	stb	366	484	1.6	3
m11	11/21/96	28	tfs	102	8	0.5	15
m11	11/21/96	28	stb	401	596	1.6	18
m11	11/21/96	28	stb	405	566	1	13
m11	11/21/96	28	stb	450	628	1.6	13
m11	11/21/96	28	tfs	192	68	1	11
m11	04/29/97	35	tfs	100	4	0.5	18
m11	04/29/97	35	stb	475	1050	2	10
m11	04/29/97	35	stb	595	2230	2.5	17
m11	04/29/97	35	tfs	100	4	0.5	21
m11	04/29/97	35	carp	425	1050	2.5	7
m11	11/03/97	33	tfs	103	6	0.5	29
m11	11/03/97	33	tfs	103	8	0.5	25
m11	11/03/97	33	tfs	100	6	0.5	30
m11	11/03/97	33	stb	505	1104	2	
m11	11/03/97	33	tfs	102	8	0.5	25
m11	11/03/97	33	tfs	96	8	0.5	25
m11	11/03/97	33	tfs	104	8	0.5	23
m11	11/03/97	33	tfs	146	28	0.5	12
m11	11/03/97	33	tfs	102	8	0.5	21
m11	11/03/97	33	tfs	103	8	0.5	24
m11	11/03/97	33	stb	575	1638	2	
m11	11/03/97	33	tfs	100	4	0.5	29
m11	11/03/97	33	tfs	96	8	0.5	19
m11	11/03/97	33	tfs	94	4	0.5	28
m11	11/03/97	33	stb	470	860	1.6	5
m11	11/03/97	33	tfs	105	8	0.5	28
m11	11/03/97	33	tfs	100	8	0.5	25
m11	11/03/97	33	stb	322	322	1.2	4
m11	11/03/97	33	tfs	95	6	0.5	25
m11	11/03/97	33	tfs	195	68	1	15
m11	11/03/97	33	tfs	106	8	0.5	25
m11	11/03/97	33	tfs	96	8	0.5	23
m11	11/03/97	33	tfs	105	8	0.5	24
m11	11/03/97	33	tfs	103	10	0.5	18
m11	11/03/97	33	tfs	144	26	0.5	12
m11	11/03/97	33	tfs	114	10	0.5	8
m11	11/03/97	33	tfs	100	6	0.5	20
m11	11/03/97	33	tfs	100	8	0.5	21
m11	11/03/97	33	tfs	102	8	0.5	25
m11	11/03/97	33	tfs	101	8	0.5	8
m11	11/03/97	33	tfs	100	8	0.5	14
m11	11/03/97	33	tfs	172	44	0.5	14
m11	11/03/97	33	tfs	98	8	0.5	25
m11	11/03/97	33	tfs	108	8	0.5	24
m11	11/03/97	33	tfs	109	8	0.5	19
m11	11/03/97	33	tfs	104	10	0.5	16
m11	11/03/97	33	tfs	106	8	0.5	18

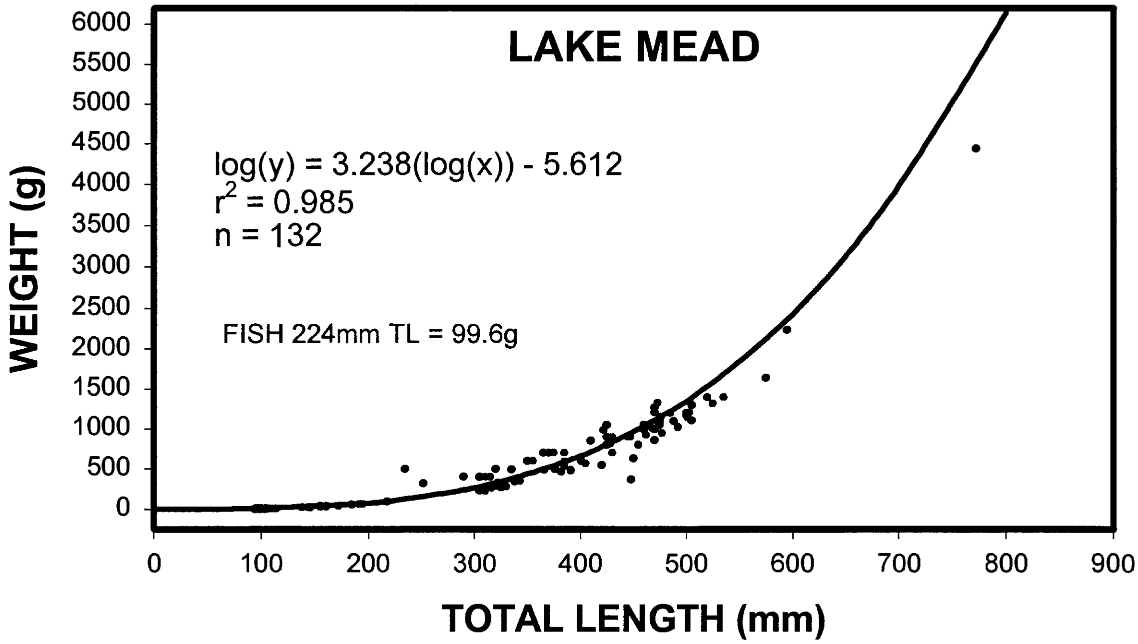
Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
m11	11/03/97	33	tfs	106	8	0.5	18
p04	01/24/96	16	tfs	100	6	0.5	30
p04	08/08/96	11	tfs	105	10	0.5	40
p04	08/08/96	8	tfs	105	10	0.5	40
p05	11/03/95	12	tfs	97		0.5	31
p05	11/03/95	12	tfs	110		0.5	31
p05	11/03/95	12	tfs	107		0.5	31
p05	11/03/95	13	tfs	112		0.5	31
p05	11/03/95	16	tfs	105		0.5	31
p05	11/03/95	29	wal	503	1400	2	31
p05	11/03/95	20	tfs	153		0.5	31
p05	11/03/95	2	wal	268		1	31
p05	11/03/95	17	tfs	100		0.5	31
p05	11/03/95	16	tfs	107		0.5	31
p05	11/03/95	17	tfs	94		0.5	31
p05	11/03/95	30	tfs	97		0.5	31
p05	11/03/95	13	tfs	114		0.5	31
p05	11/03/95	14	tfs	102		0.5	31
p05	11/03/95	14	tfs	113		0.5	31
p05	11/03/95	13	tfs	102		0.5	31
p05	11/03/95	17	tfs	97		0.5	31
p05	11/03/95	15	tfs	103		0.5	31
p05	11/03/95	14	tfs	93		0.5	31
p05	11/03/95	15	tfs	100		0.5	31
p05	11/03/95	25	tfs	97		0.5	31
p05	11/03/95	16	tfs	107		0.5	31
p05	11/03/95	15	tfs	95		0.5	31
p05	11/03/95	19	tfs	98		0.5	31
p05	11/03/95	15	tfs	112		0.5	31
p05	11/03/95	13	tfs	108		0.5	31
p05	01/23/96	25	stb	165	36	0.5	30
p05	08/12/96	8	ccf	350	330	1.6	25
p05	05/08/97	30	stb	605	1912	2	1
p07	11/02/95	2	tfs	95		0.5	15
p07	01/20/96	13	stb	555	1700	2	40
p07	01/20/96	12	stb	525	1500	2.5	40
p07	01/20/96	6	stb	515	1260	2	40
p07	01/20/96	13	stb	560	1800	2.5	40
p07	01/20/96	23	stb	560	1775	2.5	40
p07	01/20/96	13	stb	540	1725	2.5	40
p07	01/20/96	8	stb	545	1580	2.5	40
p07	01/20/96	8	stb	545	1530	2.5	40
p07	01/20/96	8	stb	555	2030	2.5	40
p07	01/20/96	22	stb	570	1600	2.5	40
p07	01/20/96	12	stb	570	1750	2	40
p07	08/09/96	22	carp	480	1400	2.5	30
p07	08/09/96	15	carp	575	2100	2.5	30
p07	08/09/96	20	carp	480	1500	2.5	30
p07	11/03/96	35	carp	480	1400	1.6	19
p07	11/03/96	35	tfs	105		0.5	12
p07	08/21/97	35	carp	490	1394	2.5	1
p07	10/31/97	35	stb	260	194	1.2	3

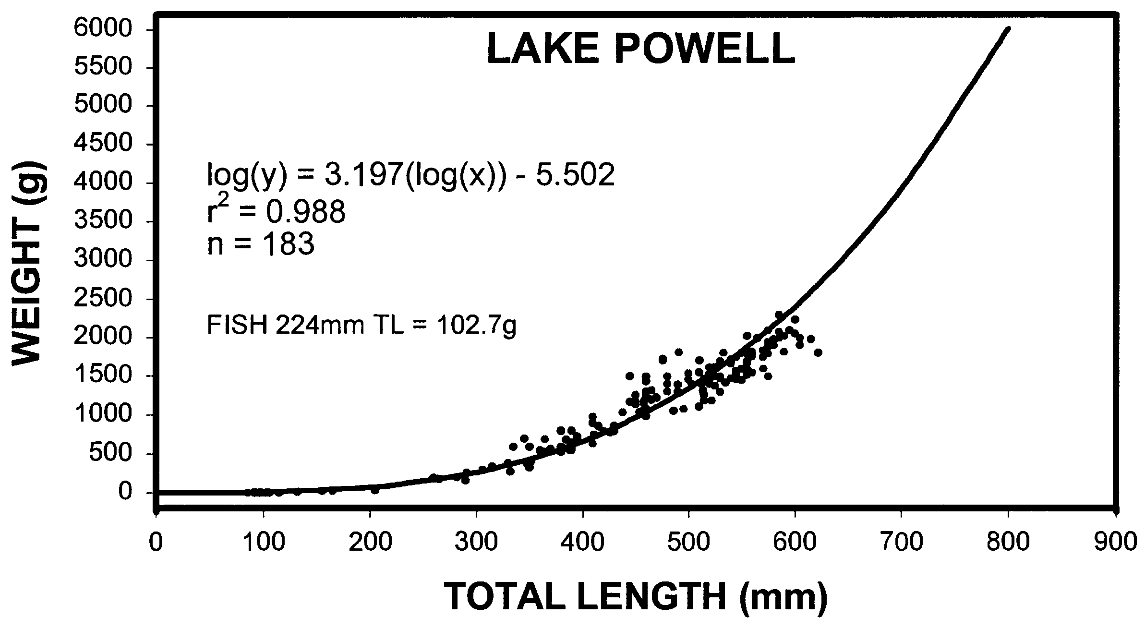
Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
p07	10/31/97	35	tfs	100	6	0.5	23
p07	10/31/97	35	carp	415	860	2	13
p07	10/31/97	35	stb	350	380	1.2	4
p07	10/31/97	35	carp	555	1680	2.5	26
p07	10/31/97	35	carp	500	1460	2.5	27
p07	10/31/97	35	carp	470	1224	2.5	28
p07	10/31/97	35	carp	465	1320	2.5	28
p07	10/31/97	35	stb	390	580	1.2	16
p07	10/31/97	35	tfs	100	6	0.5	26
p07	01/29/98	33	stb	575	1446	2.5	2
p07	01/29/98	33	tfs	90	4	0.5	22
p09	11/06/96	30	ccf	290	165	1.5	14
p10	11/05/95	2	stb	261		1.25	33
p10	11/05/95	2.5	stb	335		1.25	33
p10	11/05/95	28	ccf	297		1.6	33
p10	11/05/95	8	crp	400		2	33
p10	05/06/96	18	ccf	155	34	0.75	40
p10	08/10/96	17	stb	585	2300	2.5	30
p10	08/10/96	16	carp	460	1500	2.5	30
p10	08/10/96	2	stb	315	344	1	30
p10	11/04/96	40	stb	510	1110	2	3
p10	08/22/97	30	stb	380	530	1.6	2
p10	08/22/97	30	carp	460	1300	2	24
p10	08/22/97	30	tfs	105	12	0.7	3
p10	08/22/97	30	stb	265	186	0.7	1
p10	08/22/97	30	tfs	95	10	0.7	6
p10	08/22/97	30	stb	348	372	1.2	1
p10	08/22/97	30	tfs	98	10	0.7	9
p10	10/29/97	32	carp	445	1500	1.6	18
p10	01/29/98	40	tfs	95	4	0.5	19
p13	11/06/95	2	stb	350	600	1.6	40
p13	11/06/95	13	stb	555	1800	2	40
p13	11/06/95	4	stb	380	800	1.6	40
p13	11/06/95	12	stb	380		1	40
p13	11/06/95	3	stb	365	700	1.6	40
p13	11/06/95	5	stb	343		1.25	40
p13	11/06/95	12	tfs	87		0.5	40
p13	11/06/95	12	stb	575	2100	2	40
p13	11/06/95	15	stb	550	1600	2.5	40
p13	11/06/95	5	stb	370		1	40
p13	11/06/95	5	stb	365		1.25	40
p13	11/06/95	2	stb	340		1.25	40
p13	11/06/95	2	stb	340		1.25	40
p13	11/06/95	6	stb	395	700	1.6	40
p13	11/06/95	8	stb	342		1.25	40
p13	11/06/95	2	stb	335	600	1.6	40
p13	11/06/95	8	stb	530	1700	2	40
p13	11/06/95	12	stb	512	1400	1.6	40
p13	11/06/95	2.5	stb	338		1	40
p13	11/06/95	2	stb	345	700	1.6	40
p13	11/06/95	23	stb	410		1.6	40
p13	11/06/95	21	wal	430	800	1.6	40

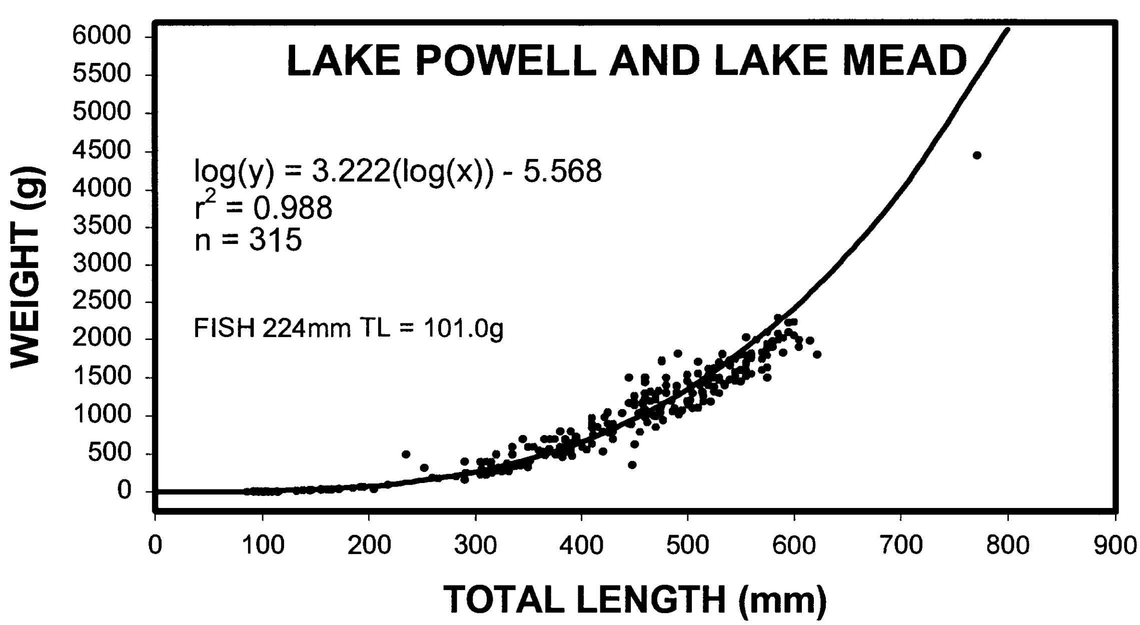
Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
p13	11/06/95	18	wal	410	900	1.6	40
p13	11/06/95	7	stb	365	700	1.6	40
p13	11/06/95	15	stb	560	1800	2	40
p13	11/06/95	11	stb	530	1500	2	40
p13	11/06/95	39	wal	430	800	1.6	40
p13	11/06/95	20	wal	465	1200	2	40
p13	11/06/95	12	stb	595	2100	2.5	40
p13	11/06/95	2	stb	365		1.25	40
p13	11/06/95	7	stb	390	800	1.6	40
p13	01/21/96	4	stb	385	690	1.6	30
p13	01/21/96	17	tfs	115	6	0.5	30
p13	01/21/96	6	stb	525	1630	2.5	30
p13	01/21/96	17	stb	600	2060	2	30
p13	01/21/96	4	stb	360	550	1.6	30
p13	01/21/96	6	stb	390		1.6	30
p13	01/21/96	23	stb	520	1470	2.5	30
p13	01/21/96	18	stb	545	1750	2	30
p13	01/21/96	5	stb	390	650	1.6	30
p13	01/21/96	11	stb	365	540	1.6	30
p13	01/21/96	5	stb	575	1890	2	30
p13	01/21/96	13	stb	520	1620	2.5	30
p13	01/21/96	12	stb	520	1400	2.5	30
p13	01/21/96	15	stb	395	730	1.6	30
p13	01/21/96	11	stb	555	1600	2.5	30
p13	01/21/96	7	stb	370	540	1.6	30
p13	01/21/96	17	stb	590	2030	2	30
p13	01/21/96	8	stb	370	570	1.6	30
p13	01/21/96	12	stb	560	1824	2	30
p13	01/21/96	17	stb	540	1668	2	30
p13	05/07/96	10	carp	450	1140	2.5	40
p13	05/07/96	10	carp	445	1170	2.5	40
p13	05/07/96	7	carp	458	1180	2	40
p13	05/07/96	7	carp	457	1050	2	40
p13	05/07/96	9	carp	460	1440	2.5	40
p13	05/07/96	10	carp	450	1180	2.5	40
p13	05/07/96	7	carp	458	1160	2	40
p13	05/07/96	14	carp	450	1260	1.6	40
p13	08/11/96	22	stb	560	1550	2	35
p13	08/11/96	11	stb	575	1500	2.5	35
p13	08/11/96	19	stb	530	1470	2.5	35
p13	08/11/96	1	stb	330	385	1	35
p13	08/11/96	17	stb	550	1455	2	35
p13	08/11/96	17	stb	420	796	1.25	35
p13	08/11/96	26	stb	590	1830	2.5	35
p13	08/11/96	22	stb	575	1950	1.6	35
p13	08/11/96	21	stb	530	1300	2	35
p13	08/11/96	22	stb	575		2	35
p13	08/11/96	22	stb	580	1980	2	35
p13	08/11/96	26	stb	555	1520	1.6	35
p13	08/11/96	10	stb	554	1610	2.5	35
p13	08/11/96	7	stb	540	1480	2	35
p13	08/11/96	31	stb	560	1760	2.5	35

Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
p13	08/11/96	14	stb	535	1418	2	35
p13	08/11/96	13	stb	585	2000	2	35
p13	08/11/96	15	stb	545	1460	2	35
p13	08/11/96	19	stb	605	2004	2	35
p13	08/11/96	22	stb	500	1540	1.25	35
p13	08/11/96	13	stb	515	1190	2	35
p13	08/11/96	6	tfs	155	32	0.5	35
p13	08/11/96	28	carp	550	1810	2.5	35
p13	08/11/96	25	stb	525	1380		35
p13	08/11/96	17	stb	615	1990	2.5	35
p13	08/11/96	28	stb	510	1710	2.5	35
p13	11/05/96	30	stb	480	1304	2	5
p13	11/05/96	30	stb	575	1800	2.5	18
p13	11/05/96	30	stb	430	860	1.6	29
p13	11/05/96	30	stb	585	2085	2.5	12
p13	11/05/96	30	stb	540	1680	2.5	22
p13	11/05/96	30	stb	600	2240	2.5	5
p13	11/05/96	30	stb	570	1845	2.5	7
p13	11/05/96	30	stb	580	1910	2.5	13
p13	11/05/96	30	stb	510	1558	2	7
p13	11/05/96	30	stb	565	2000	2.5	22
p13	11/05/96	30	tfs	100	8	0.5	21
p13	11/05/96	30	stb	460	1084	2	24
p13	11/05/96	30	stb	520	1538	2	14
p13	11/05/96	30	tfs	95	8	0.5	20
p13	11/05/96	30	wal	410	640	1.6	29
p13	11/05/96	30	tfs	97	8	0.5	23
p13	11/05/96	30	stb	580	1986	2.5	27
p13	11/05/96	30	stb	490	1306	2	7
p13	11/05/96	30	stb	515	1466	2	5
p13	11/05/96	30	wal	460	990	1.6	15
p13	05/07/97	40	carp	476	1716	2.5	6
p13	05/07/97	40	carp	460	1234	2.5	2
p13	05/07/97	40	carp	533	1811	2.5	9
p13	05/07/97	40	stb	590		2.5	2
p13	05/07/97	40	stb	205	40	1	8
p13	05/07/97	40	carp	454	1036	2.5	2
p13	05/07/97	40	carp	438	1039	2.5	6
p13	05/07/97	40	stb	491	1818	2	4
p13	05/07/97	40	carp	410	976	2.5	2
p13	05/07/97	40	carp	476	1734	2.5	2
p13	08/23/97	30	tfs	92	10	0.5	1
p13	08/23/97	30	stb	291	262	1.2	1
p13	08/23/97	30	carp	486	1060	2.5	18
p13	08/23/97	30	stb	352	420	1	1
p13	08/23/97	30	ccf	332	278	1.2	12
p13	08/23/97	30	stb	350		1	17
p13	08/23/97	30	stb	495	1076	2	27
p13	08/23/97	30	stb	522	1188	1.6	11
p13	08/23/97	30	stb	350		0.5	1
p13	08/23/97	30	stb	622	1810	2	20
p13	08/23/97	30	tfs	86	8	0.5	1

Location	Date	Set Depth	Species	TL (mm)	Weight (g)	Mesh	Capt. Dep.
p13	10/30/97	32	tfs	100	6	0.5	28
p13	10/30/97	32	tfs	98	6	0.5	13
p13	10/30/97	32	tfs	100	8	0.5	7
p13	10/30/97	32	tfs	92	6	0.5	12
p13	10/30/97	32	tfs	104	6	0.5	12
p13	10/30/97	32	stb	388	558	1.6	2
p13	10/30/97	32	tfs	98	8	0.5	1
p13	10/30/97	32	tfs	100	6	0.5	7
p13	10/30/97	32	stb	390	608	1.6	2
p13	10/30/97	32	stb	514	1316	2	14
p13	10/30/97	32	stb	390	556	1.6	8
p13	10/30/97	32	tfs	104	10	0.5	13
p13	10/30/97	32	stb	390	640	1.6	30
p13	10/30/97	32	tfs	132	18	0.5	1
p13	10/30/97	32	stb	380	596	1.6	2
p13	10/30/97	32	stb	380	530	1.2	1
p13	10/30/97	32	stb	382	574	1.6	10
p13	10/30/97	32	stb	306	304	1	2
p13	10/30/97	32	tfs	102	6	0.5	11
p13	10/30/97	32	stb	426	784	1.2	2
p13	10/30/97	32	stb	411	756	1.2	1
p13	10/30/97	32	tfs	100	6	0.5	20
p13	10/30/97	32	stb	282	206	1	6
p13	10/30/97	32	tfs	98	4	0.5	24
p13	10/30/97	32	tfs	106	8	0.5	8
p13	10/30/97	32	stb	555	1556	2	13
p13	01/31/98	32	carp	440	1138	2.5	2
p13	01/31/98	32	carp	422	1118	2.5	2
p13	01/31/98	32	carp	470	1475	2.5	1
p13	01/31/98	32	carp	472	1412	2.5	1
p13	01/31/98	32	stb	372	524	1.6	21
p13	01/31/98	32	stb	426	814	1.6	21
p13	01/31/98	32	carp	460	1202	2.5	4


LAKE MEAD
log(y) = 3.238(log(x)) - 5.612
r2 = 0.985
n = 132
FISH 224mm TL = 99.6g
WEIGHT (g)
TOTAL LENGTH (mm)


LAKE POWELL
log(y) = 3.197(log(x)) - 5.502
r2 = 0.988
n = 183
FISH 224mm TL = 102.7g
WEIGHT (g)
TOTAL LENGTH (mm)


LAKE POWELL AND LAKE MEAD
log(y) = 3.222(log(x)) - 5.568
r2 = 0.988
n = 315
FISH 224mm TL = 101.0g
WEIGHT (g)
TOTAL LENGTH (mm)

APPENDIX G

ECHO-INTEGRATION ANALYSIS
STANDING CROP DATA AND STATISTICS

DESCRIPTION OF THE DT ANALYSIS REPORT FORMAT

(Echo integration)

DT ANALYSIS REPORT,

DATAFILE INFORMATION,

---,

Analysis Version:, Visual Analyzer Version 2.1.1,
File Name:, E:\P02A.DT4,
Data Threshold:, -70.00, dB,
Threshold Type:, squared, **Information pertaining to equipment and conditions**
Ping Rate:, 2.00, pps,
Collection Range:, 0.98, to, 142.63, m,
Pulse Width:, 0.40, ms,
Absorption Coefficient:, 0.036372, dB/m,
Salinity:, 0.00, ppt,
Water Temperature:, 20.00, deg C,
Sound Velocity:, 1522.16, m/s,

TRANSDUCER INFORMATION,

---,

Serial Number:, 49526,
Beam Width:, 6.00, deg, **Equipment specification**
Transmit Frequency:, 420000, Hz,
Transmit Source Level:, 219.00, dB//uPa,
Receive Sensitivity:, -52.00, dBC/uPa,
Calibration Correction Narrow Beam:, -30.000, dB, **A calibration setting used to amplify targets**
Beam Pattern Factor:, 0.000991,

ANALYSIS PARAMETERS,

---,

Analyzed As: Single-Beam
Ping Range:, 10, to, 1950,
Sample Range:, 12.0, to, 42.0, m, **Depth of analysis**
Data Threshold:, -60.00, dB,
Number Strata:, 3, **Number of depth increments**
Number Reports:, 1,
Density Scaling Constant:, 1.052194e-014,

BOTTOM TRACKER PARAMETERS AND RESULTS,

---,

Bottom Threshold:, -3.00, dB,
Bottom Width:, 0.09, m,
Blanking Threshold:, -60.00, dB,
Blanking Zone:, 0.23, m,
Blanking Type:, CUMULATIVE
Alarm limit:, 05, pings,
Tracking Window:, 1.79, m,

Number processed:, 1941, pings, **Number of samples or pings examined**

Number found:, 1941, pings,
Find rate:, 100.00%,

VERTICAL INTEGRATION RESULTS,

--,

STRATA, TOP , BOTTOM, Sv (dB) , Applied Sigma, FPCM,

------, ------, ------, -------------, -------------, -------------,

1, 12.0, 22.0, -4.299652e+001, 6.000000e-002, 8.359816e-004, **Fish Per Cubic Meter**
2, 22.0, 32.0, -4.539699e+001, 6.000000e-002, 4.810048e-004,
3, 32.0, 42.0, -5.585411e+001, 6.000000e-002, 4.329502e-005,

HORIZONTAL INTEGRATION RESULTS,

--,

REPORT, TIME AND DATE, Depth, Latitude, Longitude, Sv (dB) , Applied Sigma,
FPUA,

------, --------------------, -------, --------------------, --------------------, -------------, -------------, -------------,

1, 08/08/96 23:35:59, 136.9, 0° 0.000' N, 0° 0.000' E, -4.565341e+001, 6.000000e-002,
1.360257e-002, **Fish per unit (m^2) area (x 10,000 = fish/ha^2)**

VOLUME BACKSCATTERING STRENGTH (dB),

--,

REPORT 1,

--------------,

STRATA 1, -4.300e+001,
STRATA 2, -4.540e+001,
STRATA 3, -5.585e+001,

ABSOLUTE DENSITY DISTRIBUTION MATRIX (IN NUMBER PER CUBIC METER),

--,

REPORT 1,

--------------,

STRATA 1, 8.360e-004, **Fish Per Cubic Meter**
STRATA 2, 4.810e-004,
STRATA 3, 4.330e-005,

PERCENT INTEGRATED MATRIX,

--,

REPORT 1,

----------,

STRATA 1, 100.000, **% of strata that was water versus bottom**
STRATA 2, 100.000,
STRATA 3, 99.404,

Lake Powell - Pelagic Fish Study - ECHO-INTEGRATION
Oct-95

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 3700 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
P01	3	0		1.50	0.10	2.12	9.47	219.76	220 +/- 660	22 +/- 66
P02	0						0	3032.68		
P03								7175.85		
P04	132	43	130	101.67	10.17	50.82	85.67	16520.51	1679591 +/- 1470314	167959 +/- 147031
P05	161	356	99	205.33	20.53	134.11	226.09	6019.73	1236049 +/- 1547039	123605 +/- 154704
P06		90	2	46.00	4.60	62.23	277.80	1905.65	87660 +/- 167694	8766 +/- 16769
P07	1197	1746	1025	1322.67	132.27	376.57	634.84	2265.72	2996800 +/- 1633556	299680 +/- 163356
P08								2087.90		
P09	99	31		65.00	6.50	48.08	214.67	1583.65	102937 +/- 107682	10294 +/- 10768
P10	476	789	513	592.67	59.27	171.03	288.34	5264.42	3120048 +/- 1647697	312005 +/- 164770
P11	597	1803	340	913.33	91.33	781.12	1316.85	6150.90	5617820 +/- 8998624	561782 +/- 899862
P12	3089	1468	1579	2045.33	204.53	905.54	1526.62	4424.08	9048704 +/- 7171098	904870 +/- 717110
P13	972	5337	5791	4033.33	403.33	2660.89	4485.88	4353.64	17559667 +/- 20980290	1755967 +/- 2098029
P14	2879	1510	4483	2957.33	295.73	1488.05	2508.63	2889.24	8544436 +/- 8589721	854444 +/- 858972
				1116.70 avg.	111.67 avg.	607.29 avg.	964.6 avg.	63894 Total	49993931 +/- 52314375 Total	4999394 +/- 5231437 Total

Average Fish Weight = 0.1 kg
Average Fish Length = 22.4 cm
Confidence Level = .90 %

Lake Powell - Pelagic Fish Study - ECHO-INTEGRATION
Feb-96

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 3700 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
P01	1	214	1	72.00	7.20	122.98	207.32	219.76	15823 +/- 46809	1582 +/- 4681
P02	0		114	57.00	3.80	80.61	110.96	3032.68	115242 +/- 345726	11524 +/- 34573
P03	490	802	622	638.00	63.80	156.61	264.03	7175.85	4578192 +/- 2238736	457819 +/- 223874
P04		98	35	66.50	4.43	44.55	83.72	16520.51	732409 +/- 1619137	73241 +/- 161914
P05	45	285	83	137.67	13.77	129.00	217.48	6019.73	828716 +/- 1444701	82872 +/- 144470
P06	85	44	1770	633.00	63.30	984.88	1660.37	1905.65	1206276 +/- 3289153	120628 +/- 328915
P07								2265.72		
P08								2087.90		
P09	236	252		244.00	24.40	11.31	50.51	1583.65	386411 +/- 25349	38641 +/- 2535
P10	25	47	17	29.67	2.97	15.53	26.19	5264.42	156178 +/- 157912	15618 +/- 15791
P11	1083	990	3499	1857.33	185.73	1422.49	2398.10	6150.90	11424269 +/- 15431904	1142427 +/- 1543190
P12	195	137	126	152.67	15.27	37.07	62.50	4424.08	675410 +/- 305218	67541 +/- 30522
P13	156	83	67	102.00	10.20	47.44	79.98	4353.64	444071 +/- 387452	44407 +/- 38745
P14	285	464	497	415.33	41.53	114.07	192.31	2889.24	1199998 +/- 612479	120000 +/- 61248
				363.67 avg.	36.37 avg.	263.07 avg.	446.12 avg.	63894 Total	21762995 +/- 25904576 Total	2176300 +/- 2590458 Total

Average Fish Weight = 0.1 kg
Average Fish Length = 22.4 cm
Confidence Level = .90 %

Lake Powell - Pelagic Fish Study - ECHO-INTEGRATION
May-96

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 3700 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
P01	9	301	416	242.00	24.20	209.82	353.72	219.76	53182 +/- 89441	5318 +/- 8944
P02	3	26	40	23.00	2.30	18.68	31.49	3032.68	69752 +/- 112210	6975 +/- 11221
P03	70	95	155	106.67	10.67	43.68	73.65	7175.85	765448 +/- 609909	76545 +/- 60995
P04	41	12	71	41.33	4.13	29.50	49.74	16520.51	682793 +/- 974687	68279 +/- 97471
P05	53	27	12	30.67	3.07	20.74	34.97	6019.73	184625 +/- 246807	18463 +/- 24681
P06	10	147	9	55.33	5.53	79.39	133.84	1905.65	105440 +/- 262978	10544 +/- 26298
P07	17	11	7	11.67	1.17	5.03	8.49	2265.72	26441 +/- 63440	2644 +/- 6344
P08	4	13	8	8.33	0.83	4.51	7.60	2087.90	17392 +/- 18790	1739 +/- 1879
P09	86	17		51.50	5.15	48.79	217.82	1583.65	81558 +/- 109271	81558 +/- 10927
P10	1	11	26	12.67	1.27	12.58	21.21	5264.42	66700 +/- 131612	6670 +/- 13161
P11	39	290	18	115.67	11.57	151.34	255.14	6150.90	711475 +/- 1673033	71147 +/- 167304
P12	11	60	14	28.33	2.83	27.47	46.30	4424.08	125334 +/- 216778	12533 +/- 21678
P13	214	39	50	101.00	10.10	98.02	165.24	4353.64	439718 +/- 761899	43972 +/- 76189
P14	264	131	90	161.67	16.17	90.96	153.35	2889.24	467103 +/- 502743	46710 +/- 50273
				70.7 avg.	7.07 avg.	60.04 avg.	110.90 avg.	63894 Total	3796960 +/- 5773598 Total	453097 +/- 577365 Total

Average Fish Weight = 0.1 kg
Average Fish Length = 22.4 cm
Confidence Level = .90 %

Lake Powell - Pelagic Fish Study - ECHO-INTEGRATION
Aug-96

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 3700 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
P01	1382	1139	1570	1363.67	136.37	216.08	364.29	219.76	299679 +/- 94728	29968 +/- 9472
P02	136	319	183	212.67	21.27	95.04	160.22	3032.68	644951 +/- 554980	64495 +/- 55497
P03	2269	1330	1566	1721.67	172.17	488.47	823.49	7175.85	12354424 +/- 6738103	1235442 +/- 673812
P04	911	828	607	782.00	78.20	157.13	264.90	16520.51	12919039 +/- 5021630	1291904 +/- 502223
P05	674	961	766	800.33	80.03	146.55	247.06	6019.73	4817790 +/- 1727659	481779 +/- 172766
P06	1357	2078	1684	1706.33	170.63	361.02	608.62	1905.65	3251673 +/- 1373832	325167 +/- 137397
P07	588	573	465	542.00	54.20	67.10	113.13	2265.72	1228020 +/- 278638	122802 +/- 27868
P08	1928	2175	3100	2401.00	240.10	617.82	1041.56	2087.90	5013048 +/- 2446869	501305 +/- 244702
P09	1361	1296		1328.50	132.85	45.96	205.20	1583.65	2103879 +/- 102880	210388 +/- 10294
P10	2772	2237	3160	2723.00	272.30	463.45	781.30	5264.42	14335016 +/- 4858137	1433502 +/- 485906
P11	499	106	406	337.00	33.70	205.39	346.25	6150.90	2072853 +/- 2425238	207285 +/- 241730
P12	763	3534	5196	3164.33	316.43	2239.50	3775.47	4424.08	13999262 +/- 19612966	1399926 +/- 1961196
P13	2806	3795	3724	3441.67	344.17	551.65	930.00	4353.64	14983779 +/- 4306338	1498378 +/- 430575
P14	7632	6864	6794	7096.67	709.67	464.93	783.81	2889.24	20503974 +/- 2421519	2050397 +/- 242118
				1972.92 avg.	197.29 avg.	437.15 avg.	746.09 avg.	63894 Total	108527387 +/- 51963517 Total	10852738 +/- 5195556 Total

Average Fish Weight = 0.1 kg
Average Fish Length = 22.4 cm
Confidence Level = .90 %

Lake Powell - Pelagic Fish Study - ECHO-INTEGRATION
May-97

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 3700 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
P01	13			13.00	1.30			219.76	2857 +/- 2857	286 +/- 286
P02			0					3032.68		
P03	15		24	19.50	1.95	6.36	28.41	7175.85	139929 +/- 198246	13993 +/- 6458
P04	0	36	0	12.00	1.20	20.78	35.04	16520.51	198246 +/- 594738	19825 +/- 59474
P05	13	0	1	4.67	0.47	7.23	12.20	6019.73	28112 +/- 78255	2811 +/- 7826
P06		6	5	5.50	0.55	0.71	3.16	1905.65	10481 +/- 1905	1048 +/- 191
P07	18	4	7	9.67	0.97	7.37	12.43	2265.72	21909 +/- 31719	2191 +/- 3172
P08	32	30	23	28.33	2.83	4.73	7.97	2087.90	59150 +/- 18792	5915 +/- 1879
P09	54	39		46.50	4.65	10.61	47.35	1583.65	73640 +/- 23756	7364 +/- 2376
P10	1	7	6	4.67	0.47	3.21	5.42	5264.42	24585 +/- 31587	2458 +/- 3159
P11	2	2	2	2.00	0.20	0.00	0	6150.90	12302 +/- 0	1230 +/- 2460
P12	68	105	182	118.33	11.83	58.16	98.05	4424.08	523501 +/- 504341	52350 +/- 50434
P13	192	52	72	105.33	10.53	75.72	127.65	4353.64	458569 +/- 609484	45857 +/- 60948
P14	36		12	24.00	2.40	16.97	75.76	2889.24	69342 +/- 104013	6934 +/- 10401
				30.27 avg.	3.03 avg.	17.65 avg.	37.80 avg.	63894 Total	1619767 +/- 2063167 Total	162262 +/- 209064 Total

Average Fish Weight = 0.1 kg
Average Fish Length = 22.4 cm
Confidence Level = .90 %

Lake Powell - Pelagic Fish Study - ECHO-INTEGRATION
Aug-97

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 3700 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
P01	2	8		5.00	0.50	4.24	18.94	219.76	1099 +/- 1319	110 +/- 132
P02	4		31	17.50	1.75	19.09	85.24	3032.68	53072 +/- 81885	5307 +/- 8188
P03	30	17	39	28.67	2.87	11.06	18.65	7175.85	205710 +/- 157841	20571 +/- 15784
P04	1	17	14	10.67	1.07	8.50	14.34	16520.51	176224 +/- 264248	17622 +/- 26425
P05	5	22	66	31.00	3.10	31.48	53.07	6019.73	186612 +/- 367196	18661 +/- 36720
P06	28	1	6	11.67	1.17	14.36	24.22	1905.65	22233 +/- 51438	2223 +/- 5144
P07	86	34	15	45.00	4.50	36.76	61.97	2265.72	101957 +/- 160868	10196 +/- 16087
P08	2810	1661	390	1620.33	162.03	1210.51	2040.75	2087.90	3383024 +/- 5052546	338302 +/- 505255
P09	91	2		46.50	4.65	62.93	280.96	1583.65	73640 +/- 140947	7364 +/- 14095
P10	94			94.00	9.40			5264.42	494855 +/- 0	49485 +/- 0
P11	336	158	252	248.67	24.87	89.05	150.12	6150.90	1529544 +/- 1094848	152954 +/- 109485
P12	208	728	206	380.67	38.07	300.80	507.11	4424.08	1684114 +/- 2309427	168411 +/- 230943
P13	1141	1085	728	984.67	98.47	224.04	377.69	4353.64	4286899 +/- 1797925	428690 +/- 179793
P14	3893	3816	3282	3663.67	366.37	332.77	561.00	2889.24	10585309 +/- 1765629	1058531 +/- 176563
				513.43 avg.	51.34 avg.	180.43 avg.	322.62 avg.	63894 Total	22784293 +/- 13246117 Total	2228942 +/- 1324614 Total

Average Fish Weight = 0.1 kg
Average Fish Length = 22.4 cm
Confidence Level = .90 %

Lake Powell - Pelagic Fish Study - ECHO-INTEGRATION
Oct-97

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 3700 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
P01		9		9.00	0.90	0.00		219.76	1978 +/- 0	198 +/- 0
P02	2	0	0	0.67	0.07	1.15	1.95	3032.68	2022 +/- 6036	202 +/- 604
P03	69	50	218	112.33	11.23	92.00	155.10	7175.85	806087 +/- 1205584	80609 +/- 120558
P04	0	5	0	1.67	0.17	2.89	4.87	16520.51	27535 +/- 82440	2753 +/- 8244
P05	18	14	5	12.33	1.23	6.66	11.22	6019.73	74243 +/- 78274	7424 +/- 7827
P06	7	27	6	13.33	1.33	11.85	19.97	1905.65	25409 +/- 40029	2541 +/- 4003
P07	587	684	1954	1075.00	107.50	762.78	1285.94	2265.72	2435649 +/- 3097171	243565 +/- 309717
P08	552	515	723	596.67	59.67	110.96	187.06	2087.90	1245780 +/- 434279	124578 +/- 43428
P09	18	7		12.50	1.25	7.78	34.73	1583.65	19796 +/- 17420	1980 +/- 1742
P10	16	6	8	10.00	1.00	5.29	8.92	5264.42	52644 +/- 52644	5264 +/- 5264
P11	87	65	29	60.33	6.03	29.28	49.36	6150.90	371104 +/- 356779	37110 +/- 35678
P12	365	284	113	254.00	25.40	128.65	216.89	4424.08	1123716 +/- 1114839	112372 +/- 111484
P13	407	123	262	264.00	26.40	142.01	239.41	4353.64	1149361 +/- 1236368	114936 +/- 123637
P14	970	486	376	610.67	61.07	316.01	532.76	2889.24	1764363 +/- 1716196	176436 +/- 171620
				216.61 avg.	21.66 avg.	115.52 avg.	211.4 avg.	63894 Total	9099686 +/- 9438059 Total	909770 +/- 943806 Total

Average Fish Weight = 0.1 kg
Average Fish Length = 22.4 cm
Confidence Level = .90 %

Lake Powell - Pelagic Fish Study - ECHO-INTEGRATION
Jan-98

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 3700 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
P01	9	70		39.50	3.95	43.13	192.57	219.76	8681 +/- 13406	868 +/- 1341
P02	13	1	4	6.00	0.60	6.24	10.53	3032.68	18196 +/- 36392	1820 +/- 3639
P03	31	6	20	19.00	1.90	12.53	21.12	7175.85	136341 +/- 179397	13634 +/- 17940
P04	14			14.00	1.40			16520.51		
P05	2		3	2.50	0.25	0.71	3.16	6019.73	15049 +/- 6020	1505 +/- 602
P06	11	4	13	9.33	0.93	4.73	7.97	1905.65	17786 +/- 17156	1779 +/- 1716
P07	54	45	38	45.67	4.57	8.02	13.52	2265.72	103468 +/- 36245	10347 +/- 3624
P08	149	123	43	105.00	10.50	55.24	93.13	2087.90	219230 +/- 221313	21923 +/- 22131
P09	20	11		15.50	1.55	6.36	28.41	1583.65	24547 +/- 14252	2455 +/- 1425
P10	11	18	11	13.33	1.33	4.04	6.81	5264.42	70192 +/- 36858	7019 +/- 3686
P11	4	5	39	16.00	1.60	19.92	33.59	6150.90	98414 +/- 215281	9841 +/- 21528
P12	16	25	25	22.00	2.20	5.20	8.76	4424.08	97330 +/- 39818	9733 +/- 3982
P13	192	91	83	122.00	12.20	60.75	102.42	4353.64	531144 +/- 474524	53114 +/- 47452
P14	91	38	24	51.00	5.10	35.34	59.58	2889.24	147351 +/- 193575	14735 +/- 19358
				34.35 avg.	3.43 avg.	20.17 avg.	44.74 avg.	63894 Total	1487729 +/- 1484237 Total	148773 +/- 148424 Total

Average Fish Weight = 0.1 kg
Average Fish Length = 22.4 cm
Confidence Level = .90 %

Lake Mead - Pelagic Fish Study - ECHO-INTEGRATION
Oct-95

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 1210 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
M01	0	0						121.41		
M02	272	212	412	298.67	29.87	102.63	173.02	2922.74	872925 +/- 584511	87293 +/- 58451
M03		1	11	4.00	0.40	6.08	31.57	10329.16	41317 +/- 103293	4132 +/- 10329
M04	16	3	6	8.33	0.83	6.81	11.48	1190.22	9918 +/- 15478	992 +/- 1548
M05		12	0	6.00	0.60	8.49	37.88	16021.67	96130 +/- 192260	9613 +/- 19226
M06	0		11	5.50	0.55	7.78	34.73	5163.16	28397 +/- 56794	2840 +/- 5679
M07	17	4	15	12.00	1.20	7.00	11.80	645.90	7751 +/- 8397	775 +/- 840
M08	72	63	1045	393.33	39.33	564.38	951.46	4038.10	1588319 +/- 3965397	158832 +/- 396540
M09	517	82	83	227.33	22.73	250.86	422.91	3461.00	786801 +/- 1505544	78680 +/- 150554
M10	29		1	15.00	1.50	19.80	88.39	2983.45	44752 +/- 83539	4475 +/- 8354
M11	190	358	519	355.67	35.57	164.51	277.34	12801.47	4553057 +/- 4211578	455306 +/- 421158
				133 avg.	13.26 avg.	113.83 avg.	204.06 avg.	59678 Total	8029366 +/- 10726790 Total	802938 +/- 1072679 Total

Average Fish Weight = 0.1kg
Average Fish Length = 22.4 cm
Confidence Level = 0.90

Lake Mead - Pelagic Fish Study - ECHO-INTEGRATION
Feb-96

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 1210 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
M01	22	8		15	15.00	9.90	44.20	121.41	1821 +/- 1700	182 +/- 170
M02	542	730	699	657	657.00	100.79	169.92	2922.74	1920240 +/- 549381	192024 +/- 54938
M03	0	5	1	2	2.00	2.65	4.46	10329.16	20658 +/- 41316	2066 +/- 4132
M04	0	13	2	5	5.00	7.00	11.80	1190.22	5951 +/- 13092	595 +/- 1309
M05	0	3	0	1	1.00	1.73	2.92	16021.67	16022 +/- 48065	1602 +/- 4806
M06		0		0		0.00	0.00	5163.16		
M07	19	42	25	29	28.67	11.93	20.11	645.90	18518 +/- 14855	1852 +/- 1485
M08	80	94	84	86	86.00	7.21	12.16	4038.10	347276 +/- 56537	34728 +/- 5654
M09	95	29	20	48	48.00	40.95	69.04	3461.00	166128 +/- 259575	16613 +/- 25957
M10	9	5	11	8	8.33	3.06	5.15	2983.45	24852 +/- 17901	2485 +/- 1790
M11	78	84	132	98	98.00	29.60	49.90	12801.47	1254544 +/- 691254	125454 +/- 69125
				86 avg.	94.90 avg.	19.53 avg.	35.42 avg.	59678 Total	3776011 +/- 1693676 Total	377601 +/- 169366 Total

Average Fish Weight = 0.1kg
Average Fish Length = 22.4 cm
Confidence Level = 0.90

Lake Mead - Pelagic Fish Study - ECHO-INTEGRATION
May-96

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 1210 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
M01	71	9		40.00	4.00	43.84	195.73	121.41	4856 +/- 7527	486 +/- 753
M02	91	287	105	161.00	16.10	109.34	184.34	2922.74	470561 +/- 572861	47056 +/- 57286
M03	10	43	5	19.33	1.93	20.65	34.81	10329.16	199663 +/- 392497	19966 +/- 39250
M04	34	40	31	35.00	3.50	4.58	7.73	1190.22	41658 +/- 10710	4166 +/- 1071
M05	12	9	36	19.00	1.90	14.80	24.95	16021.67	304412 +/- 432569	30441 +/- 43257
M06	6	9	2	5.67	0.57	3.51	5.92	5163.16	29275 +/- 36143	2928 +/- 3614
M07	23	46	9	26.00	2.60	18.68	31.49	645.90	16793 +/- 23899	1679 +/- 2390
M08	9	6	21	12.00	1.20	7.94	13.38	4038.10	48457 +/- 60572	4846 +/- 6057
M09	272	223	434	309.67	30.97	110.43	186.17	3461.00	1071768 +/- 730303	107177 +/- 73030
M10	18	1	10	9.67	0.96	8.50	14.34	2983.45	28850 +/- 50718	2885 +/- 5072
M11	75	70	31	58.67	5.86	24.09	40.61	12801.47	751062 +/- 563222	75106 +/- 56322
				63.27 avg.	6.33 avg.	33.31 avg.	67.22 avg.	59678 Total	2967355 +/- 2881020 Total	296736 +/- 288102 Total

Average Fish Weight = 0.1kg
Average Fish Length = 22.4 cm
Confidence Level = 0.90

Lake Mead - Pelagic Fish Study - ECHO-INTEGRATION
Aug-96

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 1210 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
M01	216	333		274.50	27.45	82.73	369.35	121.41	33327 +/- 14231	3333 +/- 1420
M02	716	1087	457	753.33	75.33	316.65	533.83	2922.74	2201788 +/- 1841355	220179 +/- 184133
M03	170	500	276	315.33	31.53	168.48	284.03	10329.16	3257094 +/- 3408549	325709 +/- 340862
M04	172	114	616	300.67	30.07	274.62	462.97	1190.22	357863 +/- 597488	35786 +/- 59749
M05	21	28	78	42.33	4.23	31.09	52.41	16021.67	678197 +/- 913192	678197 +/- 91324
M06	234	73	155	154.00	15.40	80.50	135.72	5163.16	795127 +/- 831226	79513 +/- 83127
M07	80	67	71	72.67	7.27	6.66	11.23	645.90	46938 +/- 8397	4694 +/- 840
M08	212	296	324	277.33	27.73	58.29	98.26	4038.10	1119886 +/- 452210	111989 +/- 45227
M09	813	808	845	822.00	82.20	20.07	33.84	3461.00	2844942 +/- 128022	284494 +/- 12806
M10	24	73	72	56.33	5.63	28.01	47.21	2983.45	168058 +/- 146194	16806 +/- 14619
M11	143	100	146	129.67	12.97	25.74	43.39	12801.47	1659967 +/- 588790	165997 +/- 58887
				290.74 avg.	29.07 avg.	99.35 avg.	188.38 avg.	59678 Total	13163186 +/- 8929654 Total	1926697 +/- 892994 Total

Average Fish Weight = 0.1kg
Average Fish Length = 22.4 cm
Confidence Level = 0.90

Lake Mead - Pelagic Fish Study - ECHO-INTEGRATION
May-97

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 1210 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
M01	0	11		5.50	0.55	7.78	34.73	121.41	668 +/- 1336	67 +/- 134
M02	11	139	108	86.00	8.60	66.78	112.57	2922.74	251356 +/- 374118	25136 +/- 37412
M03	0	0	0	0.00		0.00	0	10329.16		
M04		7		7.00	0.70	0.00		1190.22	8332 +/- 8332	833 +/- 833
M05		0		0.00		0.00	0	16021.67		
M06	1	0	1	0.67	0.07	0.58	0.97	5163.16	3442 +/- 5137	344 +/- 514
M07	1	2	9	4.00	0.40	4.36	7.35	645.90	2584 +/- 5168	258 +/- 517
M08	25	13	9	15.67	1.57	8.33	14.04	4038.10	63264 +/- 64599	6326 +/- 6460
M09	196	117	20	111.00	11.10	88.15	148.61	3461.00	384171 +/- 609141	38417 +/- 60914
M10	50	7	5	20.67	2.07	25.42	42.86	2983.45	61658 +/- 134236	6166 +/- 13424
M11	19	17	19	18.33	1.83	1.15	1.95	12801.47	234693 +/- 25605	23469 +/- 2560
				24.44 avg.	2.99 avg.	18.41 avg.	36.31 avg.	59678 Total	1010167 +/- 1227672 Total	101016 +/- 122768 Total

Average Fish Weight = 0.1kg
Average Fish Length = 22.4 cm
Confidence Level = 0.90

Lake Mead - Pelagic Fish Study - ECHO-INTEGRATION
Aug-97

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 1210 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
M01	511	549		530.00	53.00	26.87	119.96	121.41	64347 +/- 4614	6435 +/- 461
M02	3254	2246	3256	2918.67	291.87	582.55	982.09	2922.74	8530601 +/- 2951588	853060 +/- 295159
M03	23	43	47	37.67	3.77	12.86	21.68	10329.16	389068 +/- 247875	38907 +/- 24788
M04	79	434	718	410.33	41.03	320.16	539.74	1190.22	488383 +/- 760559	48838 +/- 76056
M05	14	26	58	32.67	3.27	22.74	38.34	16021.67	523380 +/- 704888	52338 +/- 70489
M06	20	35	5	20.00	2.00	15.00	25.29	5163.16	103263 +/- 154895	10326 +/- 15489
M07	119	79	2	66.67	6.67	59.47	100.25	645.90	43060 +/- 75566	4306 +/- 7557
M08	228	212	215	218.33	21.83	8.50	14.34	4038.10	881638 +/- 64624	88164 +/- 6462
M09	391	1490	576	819.00	81.90	588.42	991.99	3461.00	2834559 +/- 3803695	283456 +/- 380369
M10	5	53	26	28.00	2.80	24.06	40.57	2983.45	83537 +/- 143207	8354 +/- 14321
M11	76	35	31	47.33	4.73	24.91	41.99	12801.47	605936 +/- 576124	60594 +/- 57612
				466.24 avg.	46.62 avg.	153.23 avg.	265.11 avg.	59678 Total	14547773 +/- 9487635 Total	1454778 +/- 948763 Total

Average Fish Weight = 0.1kg
Average Fish Length = 22.4 cm
Confidence Level = 0.90

Lake Mead - Pelagic Fish Study - ECHO-INTEGRATION
Oct-97

Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 1210 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
M01	0	0		0.00			0	121.41		
M02	29	43	435	169.00	16.90	230.47	388.54	2922.74	493943 +/- 1215841	49394 +/- 121584
M03	1	0		0.50	0.05	0.71	3.16	10329.16	5165 +/- 10329	516 +/- 1033
M04		0	5	2.50	0.25	3.54	15.78	1190.22	2975 +/- 5951	298 +/- 595
M05								16021.67		
M06	6	19	2	9.00	0.90	8.89	14.98	5163.16	46468 +/- 87774	4647 +/- 8777
M07	72	49	39	53.33	5.33	16.92	28.53	645.90	34448 +/- 21316	3445 +/- 2132
M08	159	138	213	170.00	17.00	38.69	65.23	4038.10	686477 +/- 302874	68648 +/- 30287
M09	280	554	407	413.67	41.37	137.12	231.17	3461.00	1431712 +/- 948366	143171 +/- 94837
M10								2983.45		
M11	64	154	70	96.00	9.60	50.32	84.83	12801.47	1228941 +/- 1152132	122894 +/- 115213
				101.56 avg.	11.43 avg.	60.83 avg.	104.03 avg.	59678 Total	3930129 +/- 3744583 Total	393013 +/- 374458 Total

Average Fish Weight = 0.1kg
Average Fish Length = 22.4 cm
Confidence Level = 0.90

Lake Mead - Pelagic Fish Study - ECHO-INTEGRATION
Jan-98

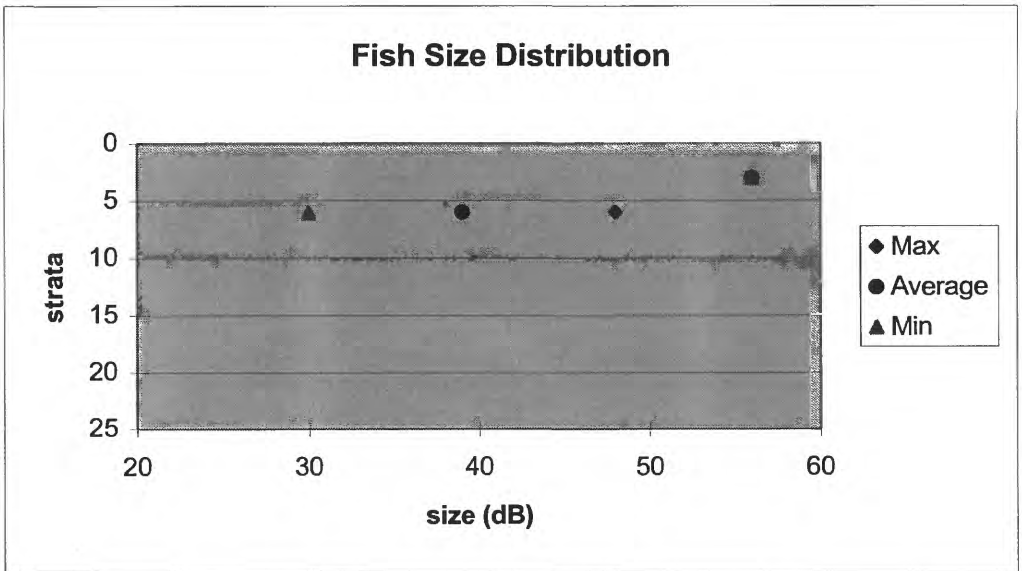
Site #	Transects A	B	C	Mean Fish/ha	Biomass Kg/ha	Standard Deviation	Standard Confidence Level	Surface Area @ 1210 El. Hectares	Total Fish / Zone +/- Range	Total Boimass Kg/zone +/- Range
M01								121.41		
M02	34	27	27	29.33	2.93	4.04	6.81	2922.74	85734 +/- 20465	8573 +/- 2046
M03	4	6		5.00	0.50	1.41	6.31	10329.16	51646 +/- 20658	5165 +/- 2066
M04	0	0	0					1190.22		
M05	14	1		7.50	0.75	9.19	41.04	16021.67	120163 +/- 208278	12016 +/- 20828
M06	2			2.00	0.20			5163.16		
M07	20	11	4	11.67	1.17	8.02	13.52	645.90	7536 +/- 10331	754 +/- 754
M08	55	34	43	44.00	4.40	10.54	17.76	4038.10	177676 +/- 84805	17768 +/- 8480
M09	47	156	80	94.33	9.43	55.90	94.23	3461.00	326488 +/- 377256	32649 +/- 37726
M10								2983.45		
M11	12	6	1	6.33	0.63	5.51	9.28	12801.47	81076 +/- 140893	8108 +/- 14089
				25.02 avg.	2.50 avg.	13.51 avg.	26.99 avg.	59678 Total	107580 +/- 123241 Total	85033 +/- 86268 Total

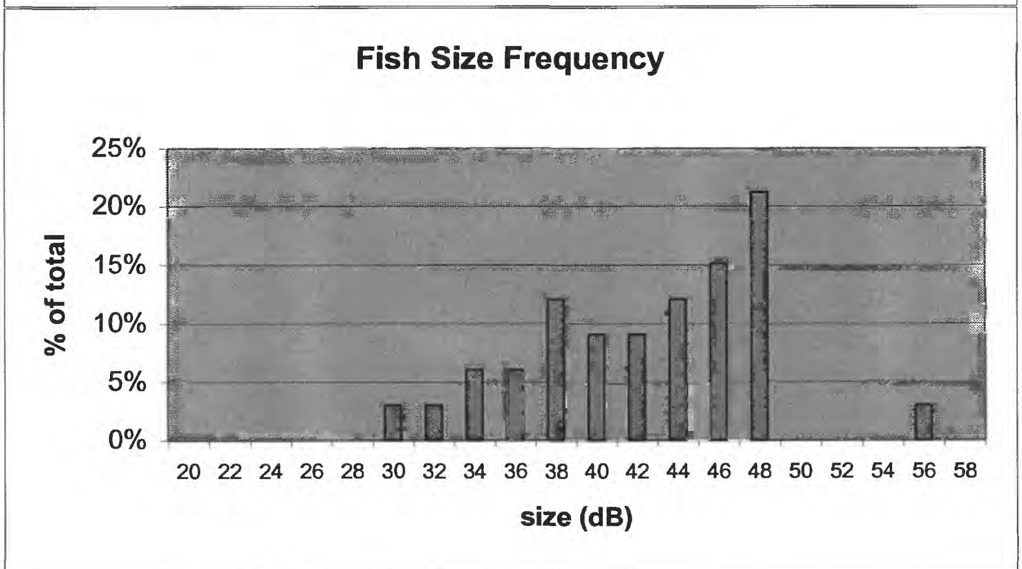
Average Fish Weight = 0.1kg
Average Fish Length = 22.4 cm
Confidence Level = 0.90

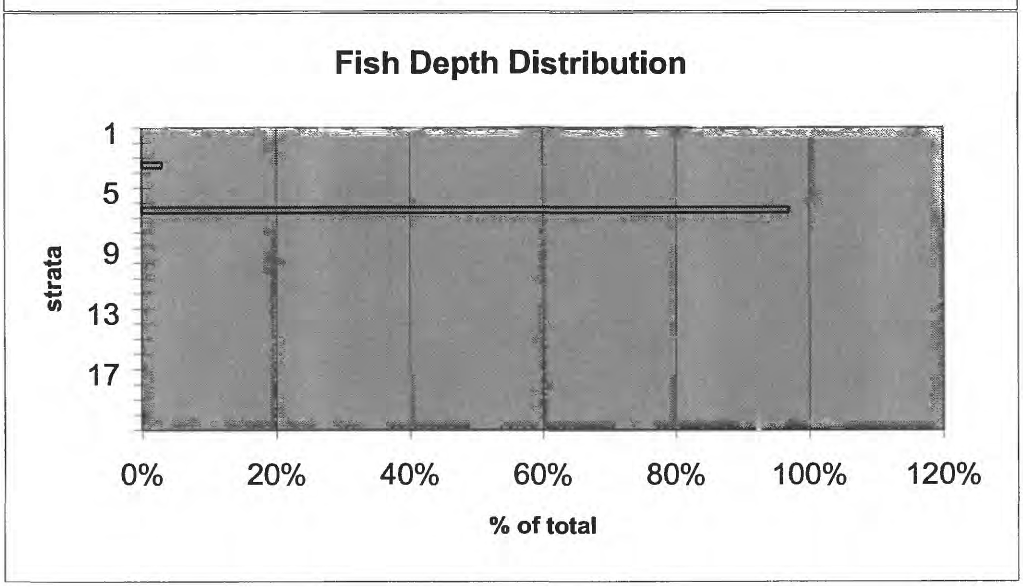
APPENDIX H

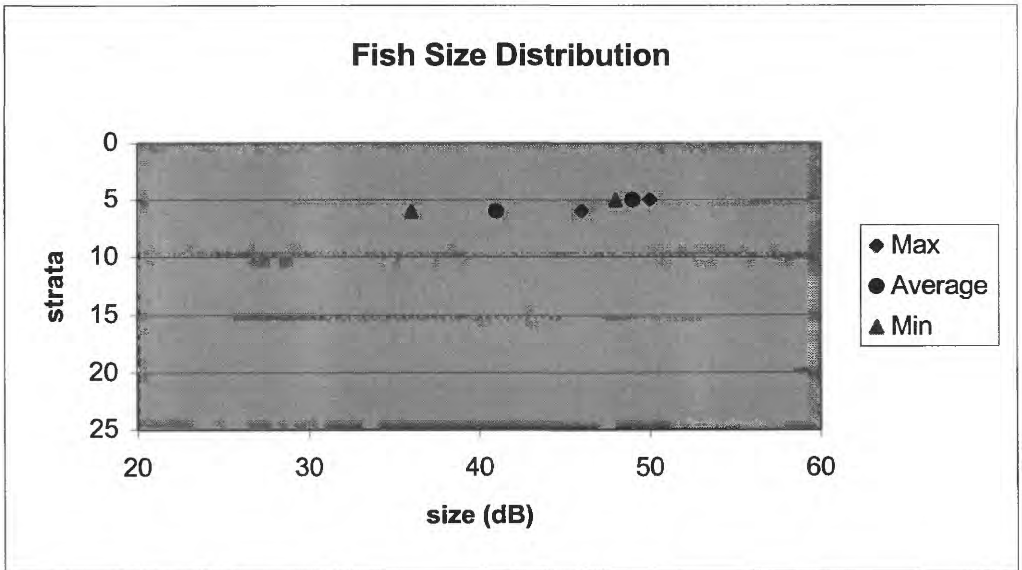
FISH SIZE AND DEPTH DISTRIBUTION

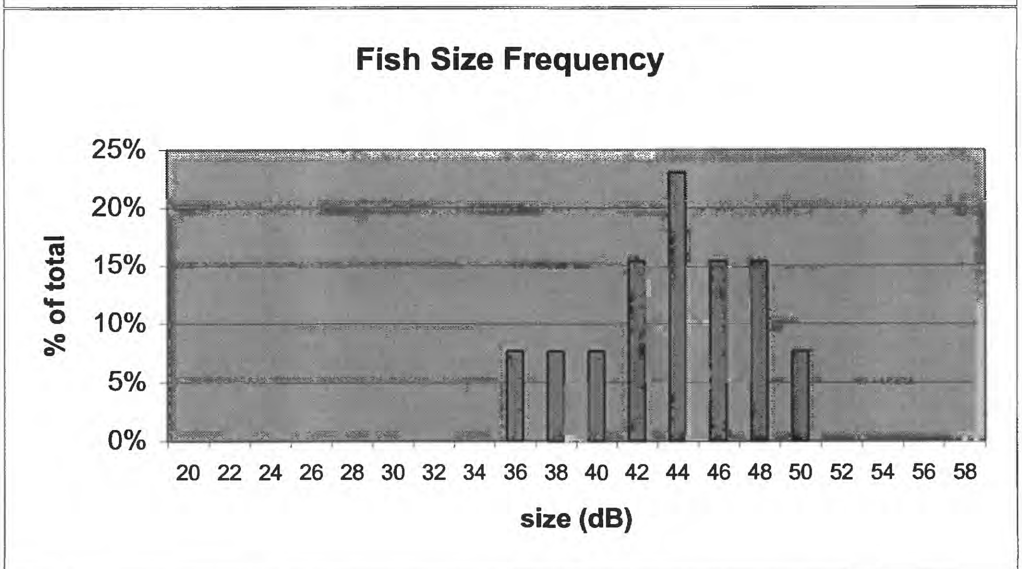
Inflow Areas For:
August 1996 and 1997

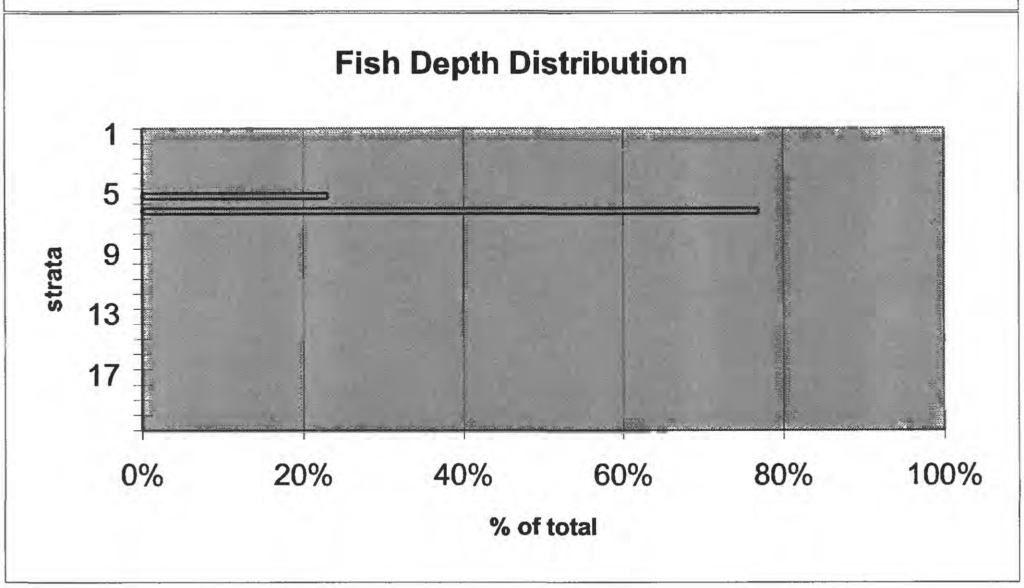

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
25%
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

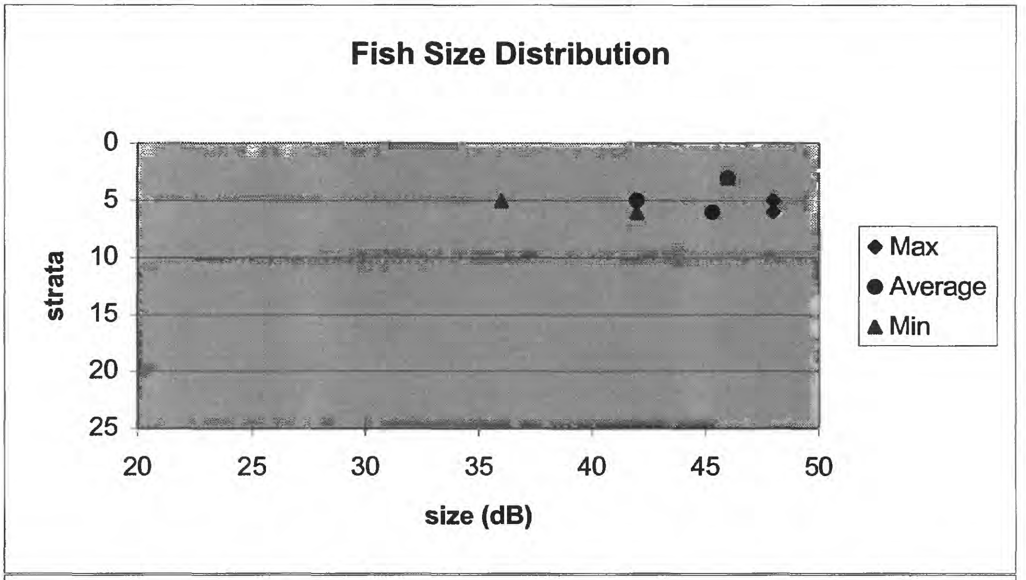

Fish Depth Distribution
1
5
9
13
17
strata
0%
20%
40%
60%
80%
100%
120%
% of total

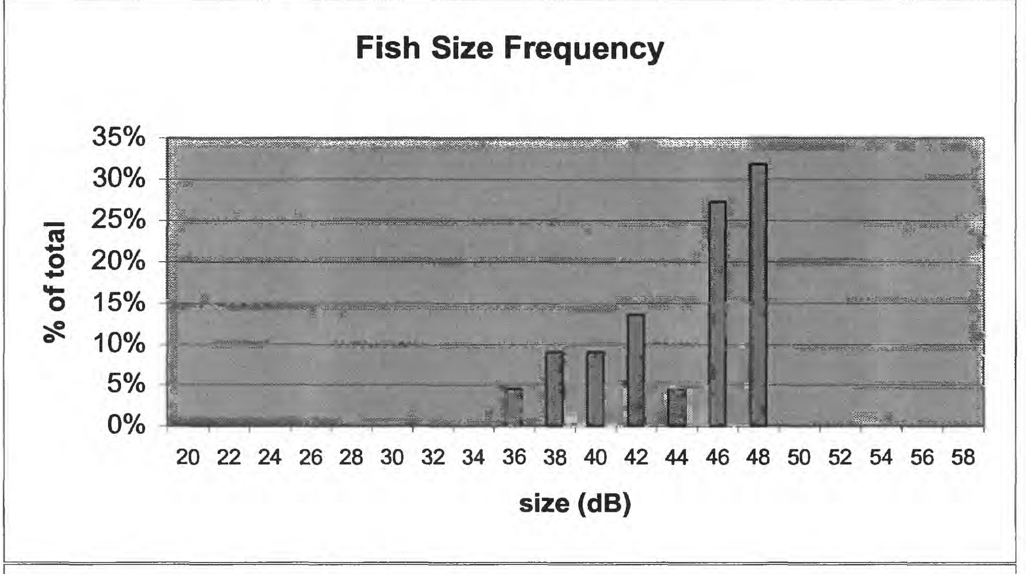

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

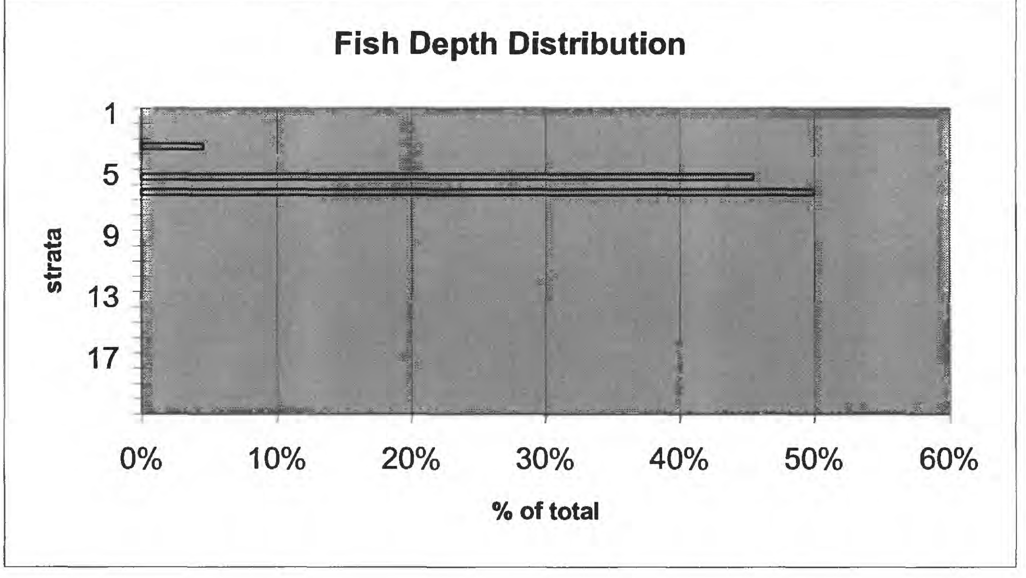

Fish Size Frequency
25%
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

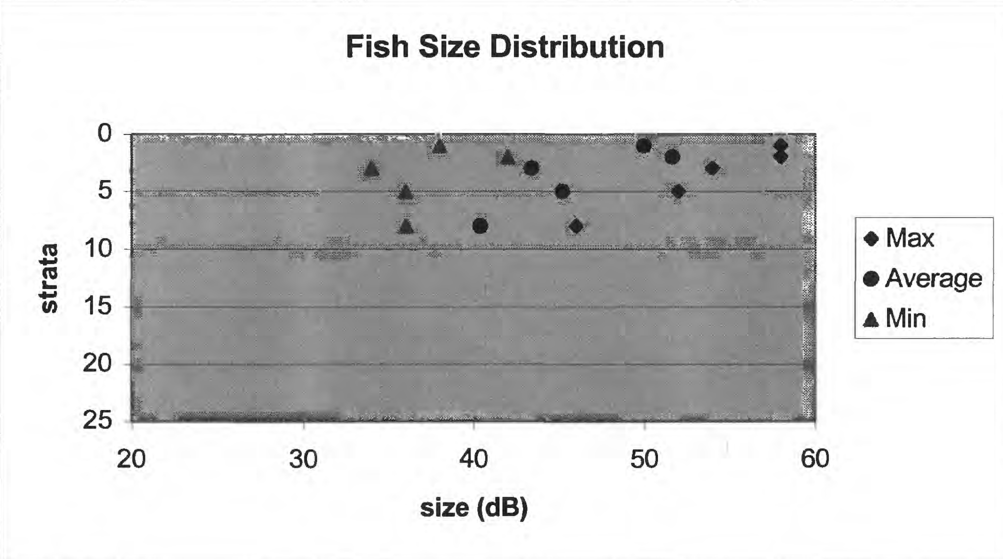

Fish Depth Distribution
1
5
9
13
17
strata
0%
20%
40%
60%
80%
100%
% of total

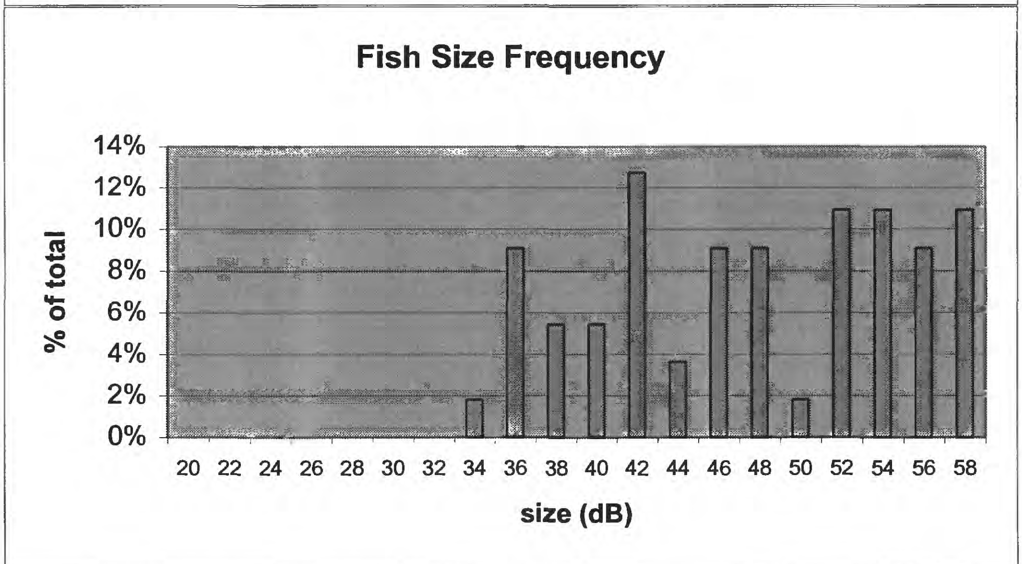
Lake Powell May 1996
P08 C

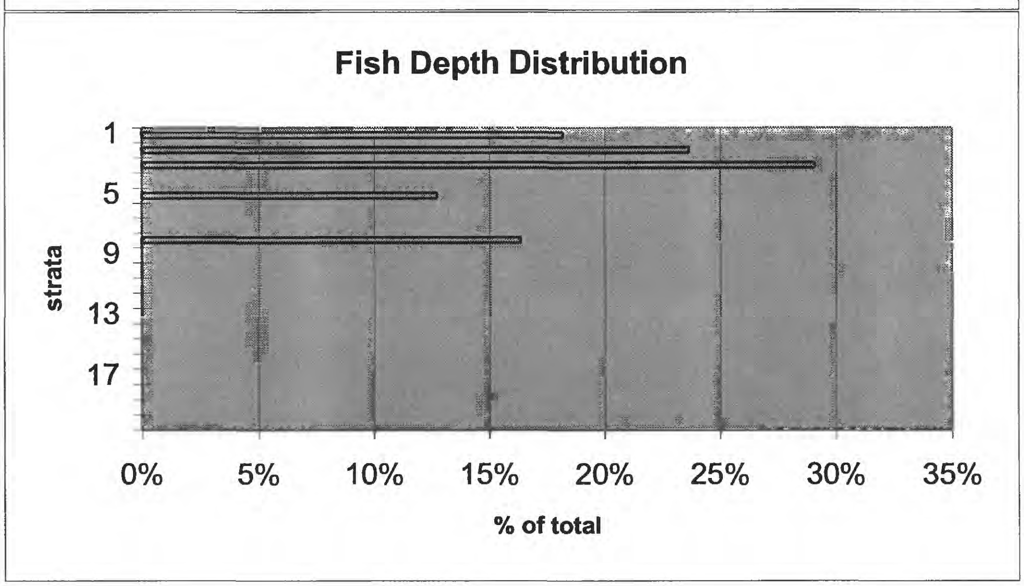




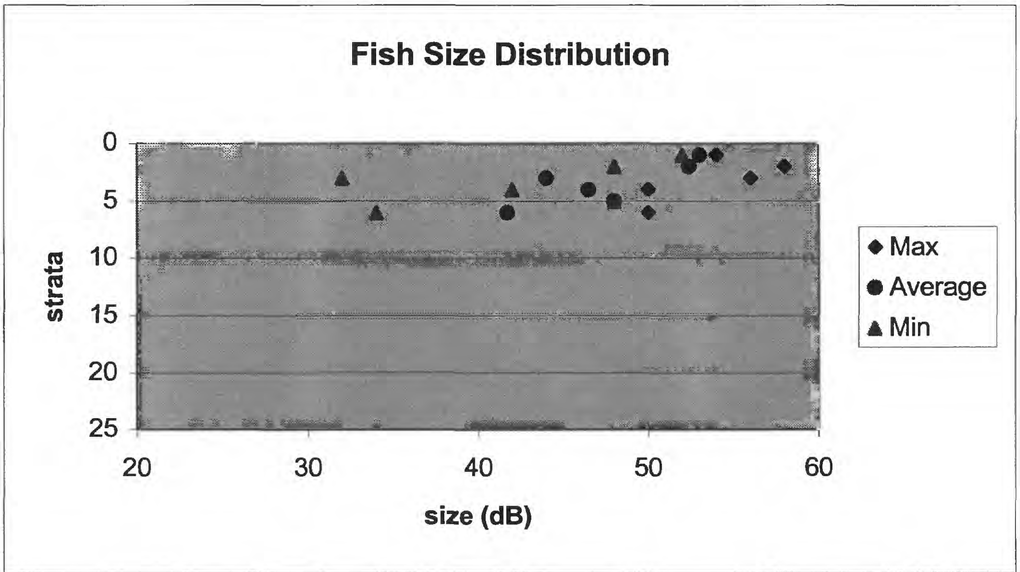


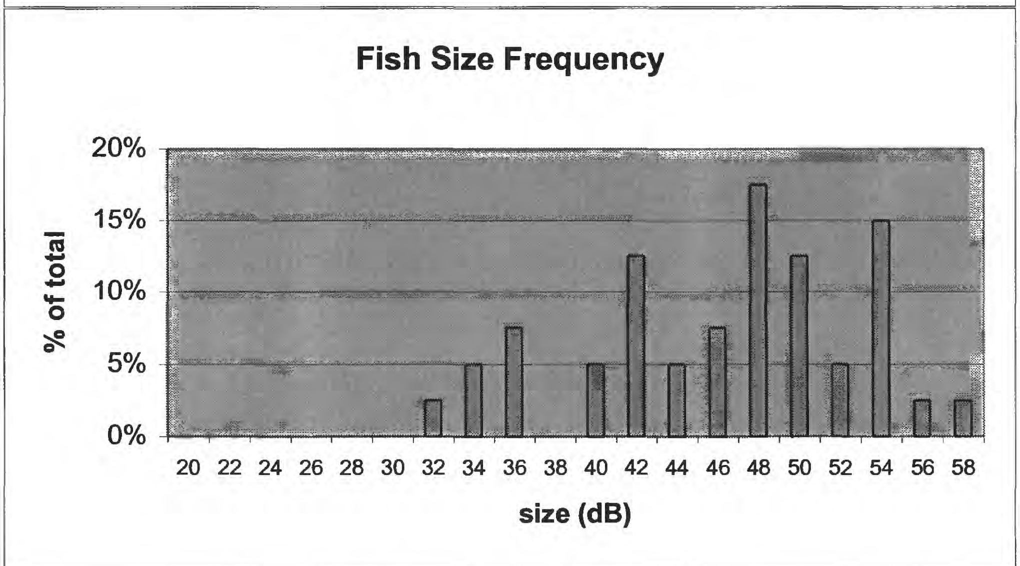

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

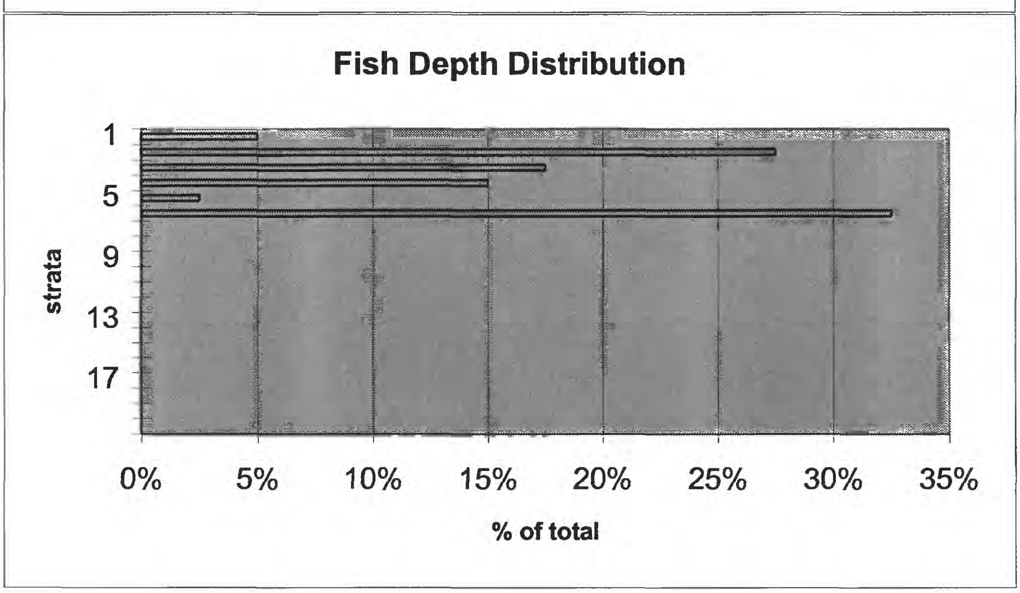

Fish Size Frequency
14%
12%
10%
8%
6%
4%
2%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

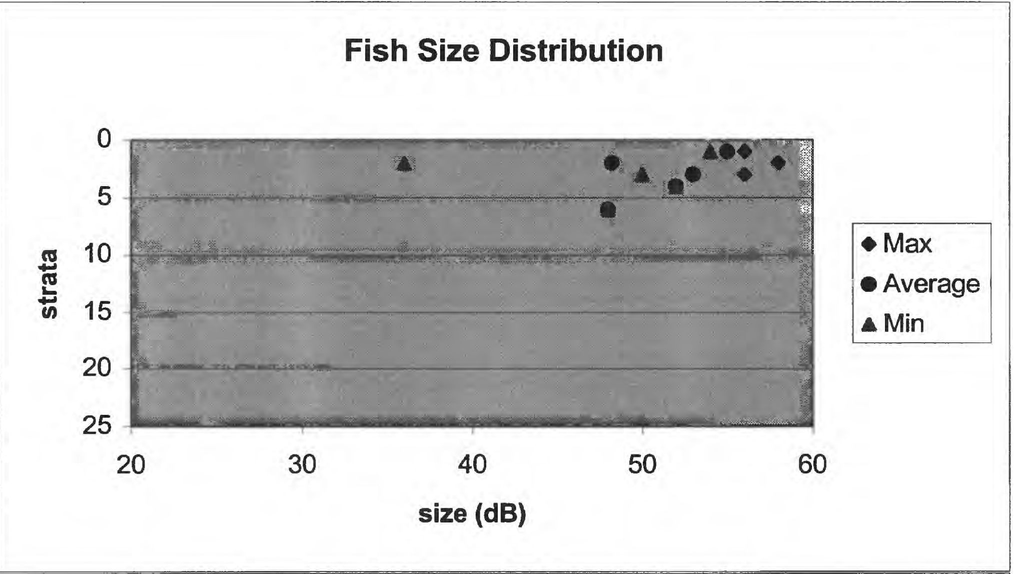

Fish Depth Distribution
1
5
9
13
17
strata
0% 5% 10% 15% 20% 25% 30% 35%
% of total

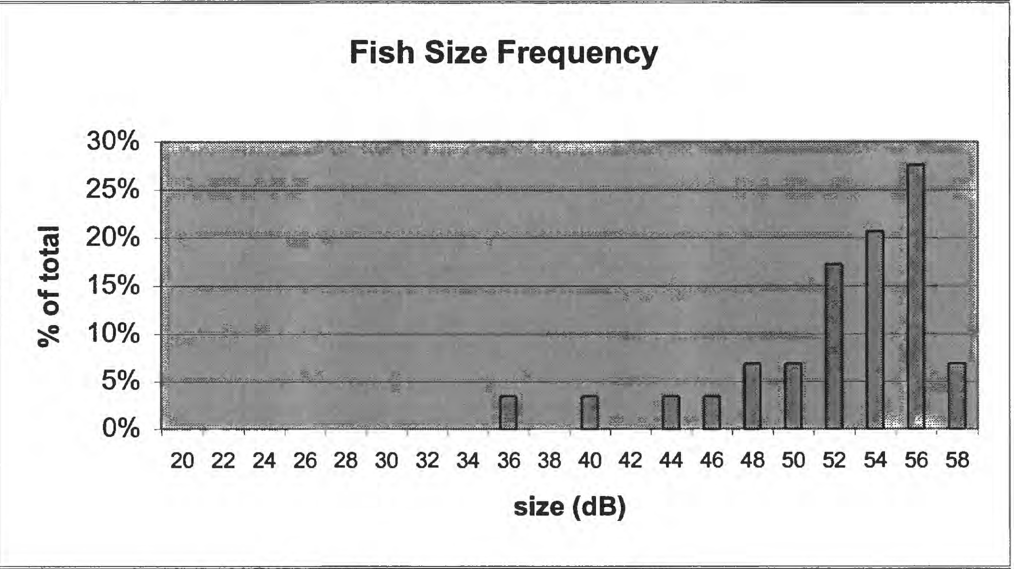
Lake Powell May 1996
P14 B

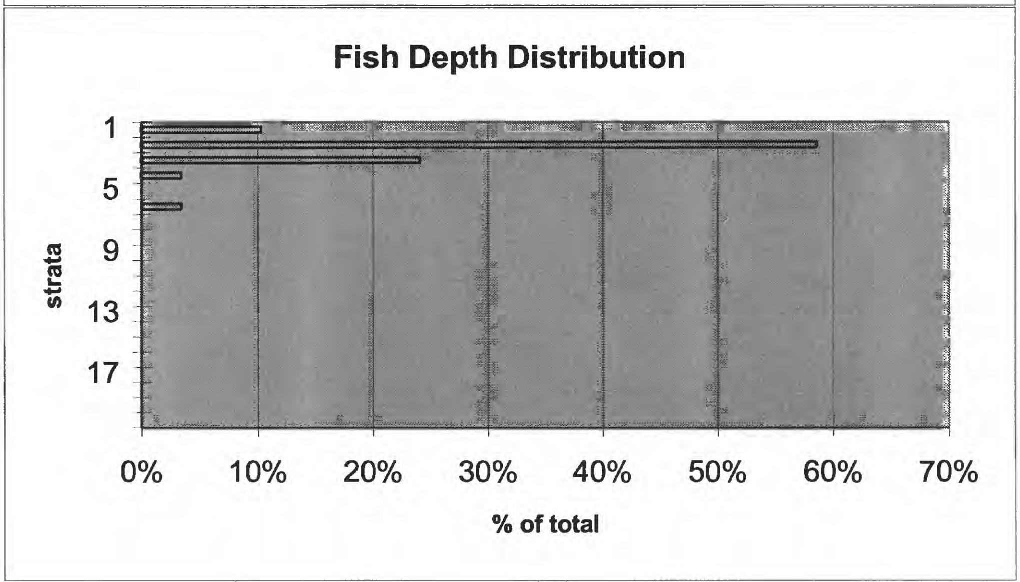


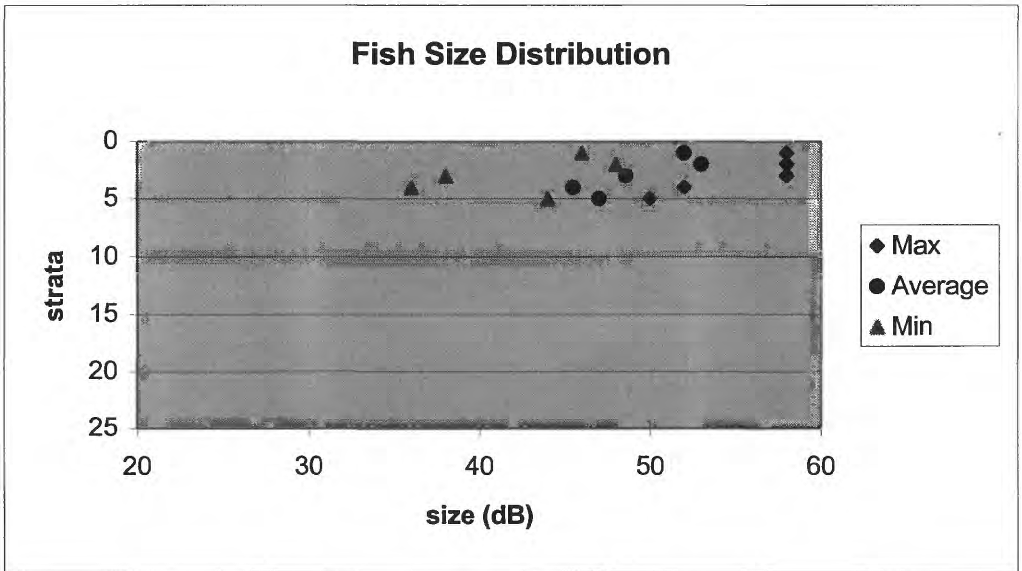


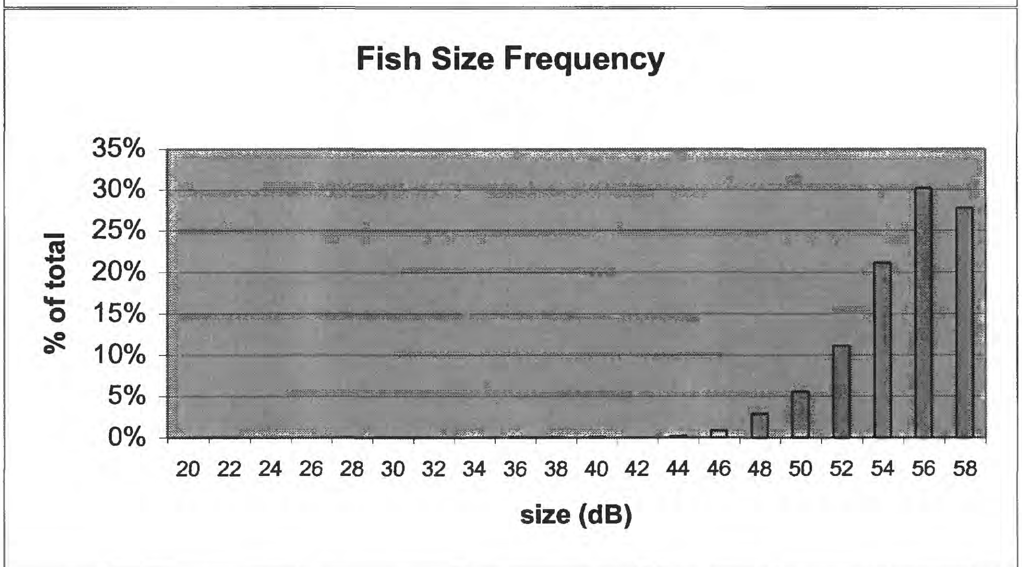


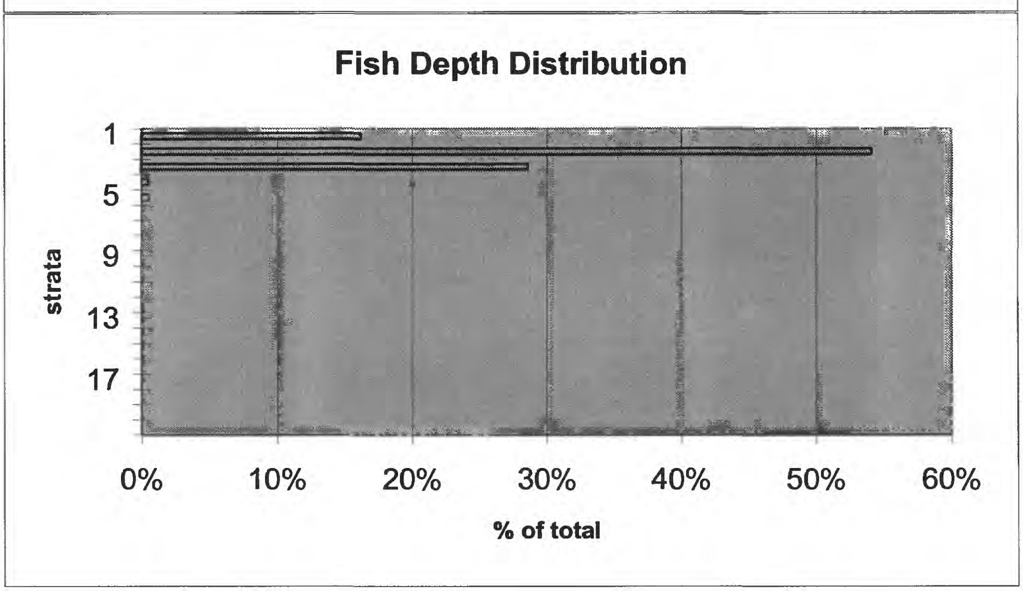

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
30%
25%
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

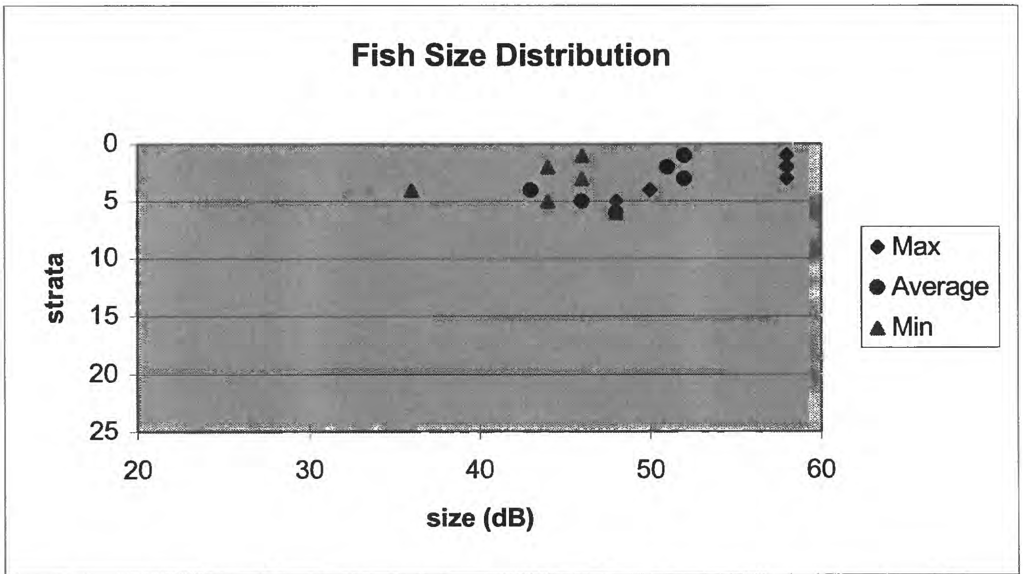

Fish Depth Distribution
1
5
9
13
17
strata
0% 10% 20% 30% 40% 50% 60% 70%
% of total

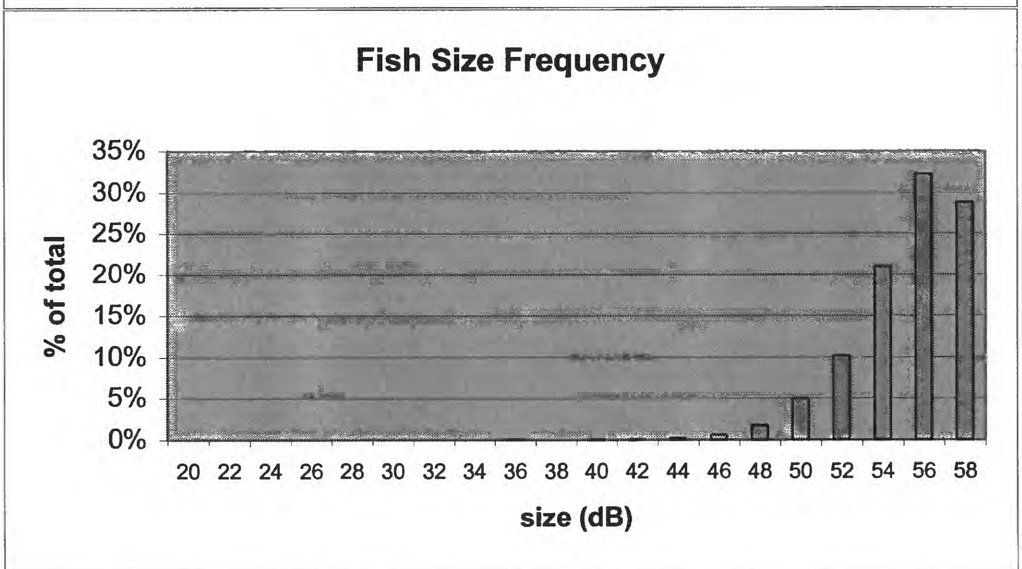

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

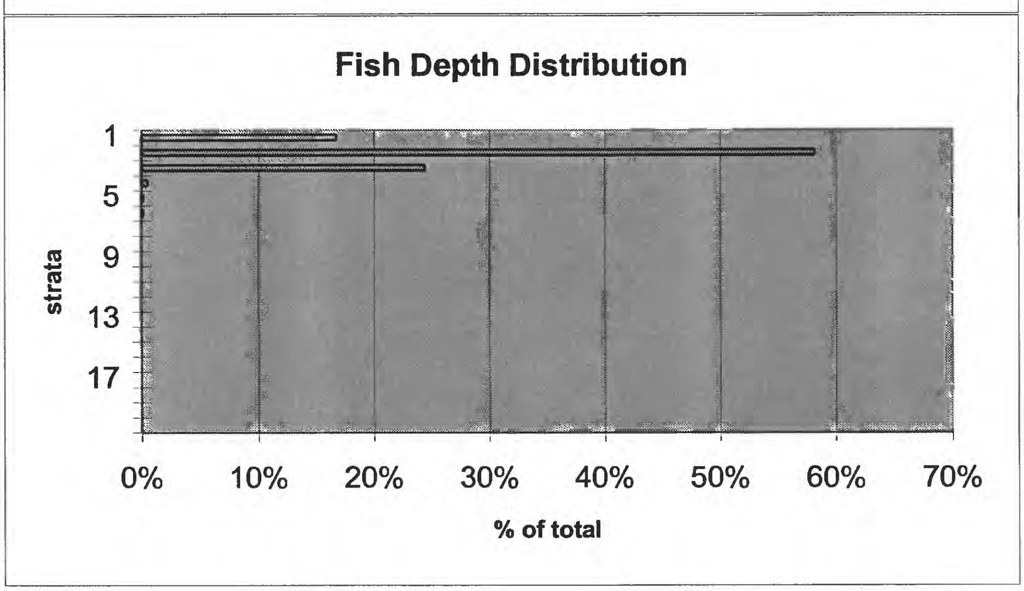

Fish Size Frequency
35%
30%
25%
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
1
5
9
13
17
strata
0%
10%
20%
30%
40%
50%
60%
% of total

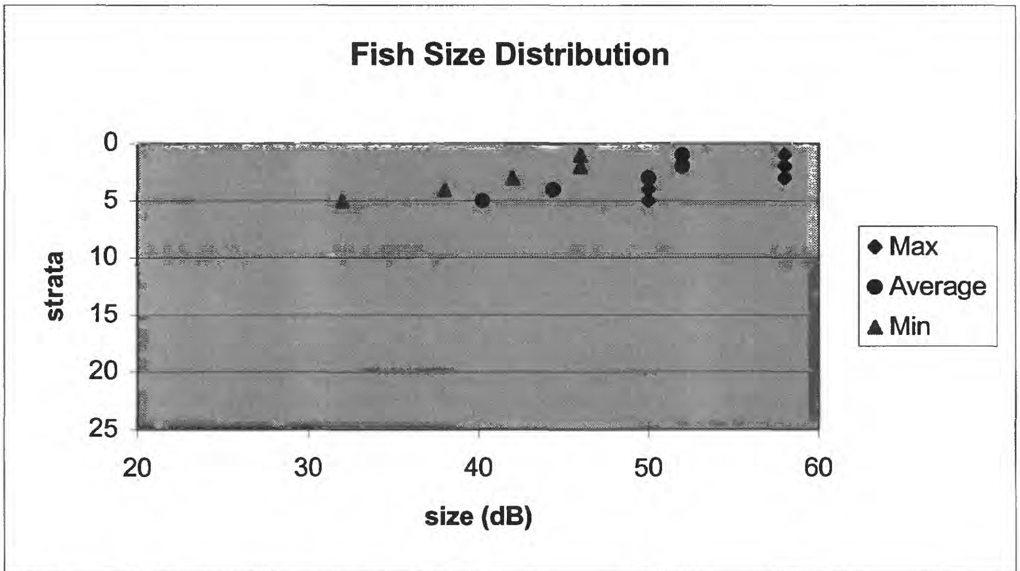
Lake Powell August 1996
P08 B

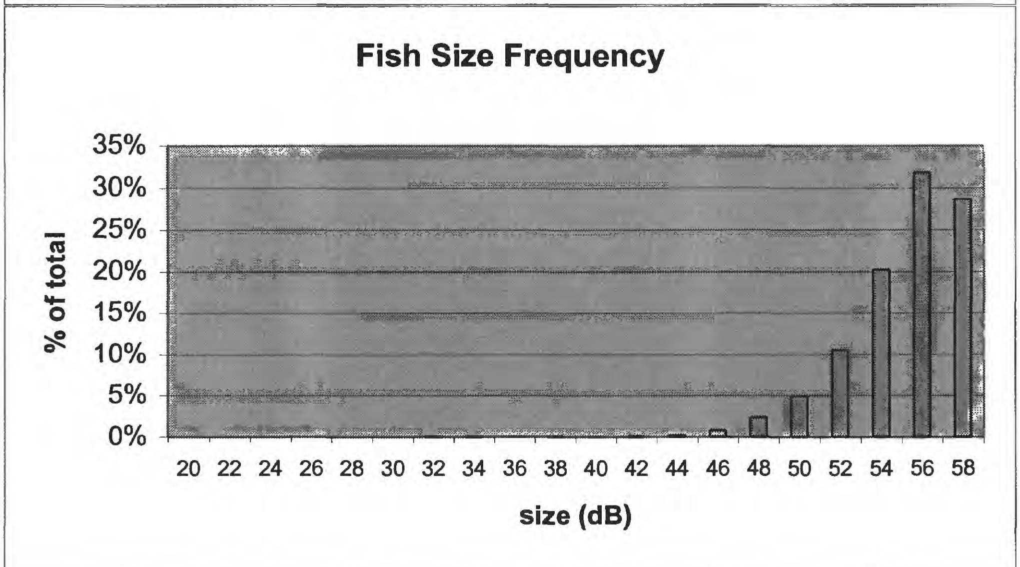


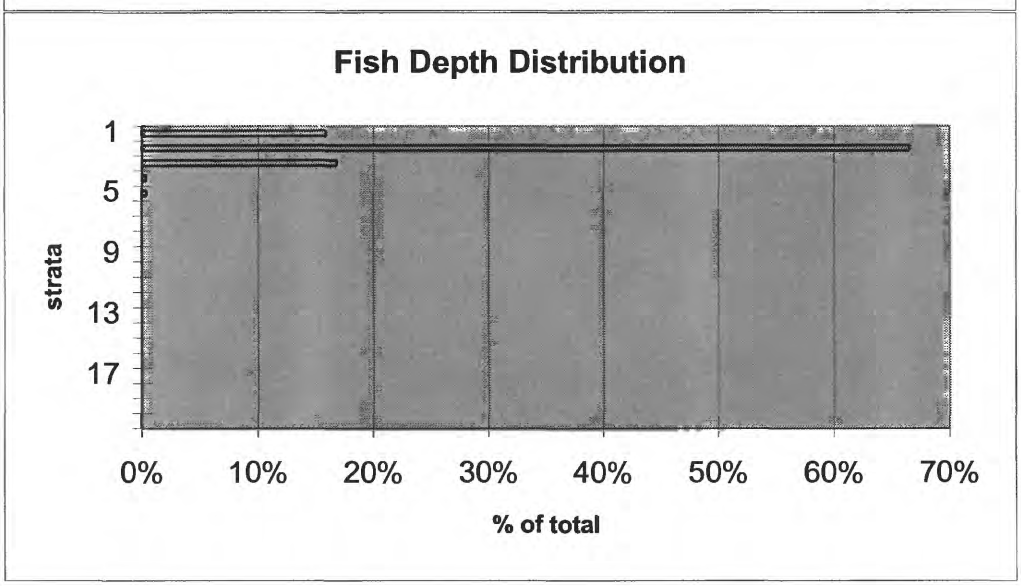


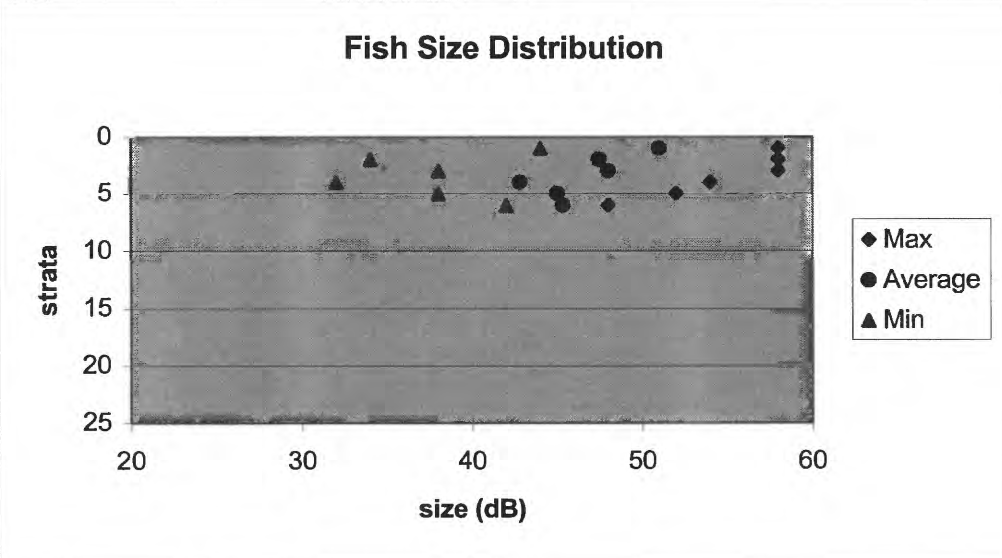


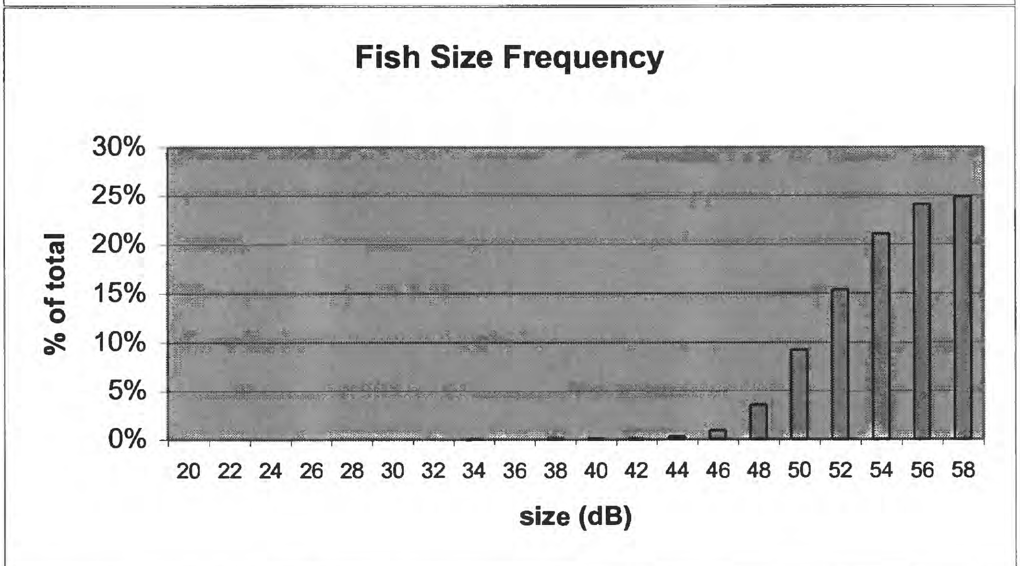
Lake Powell August 1996
P08 C

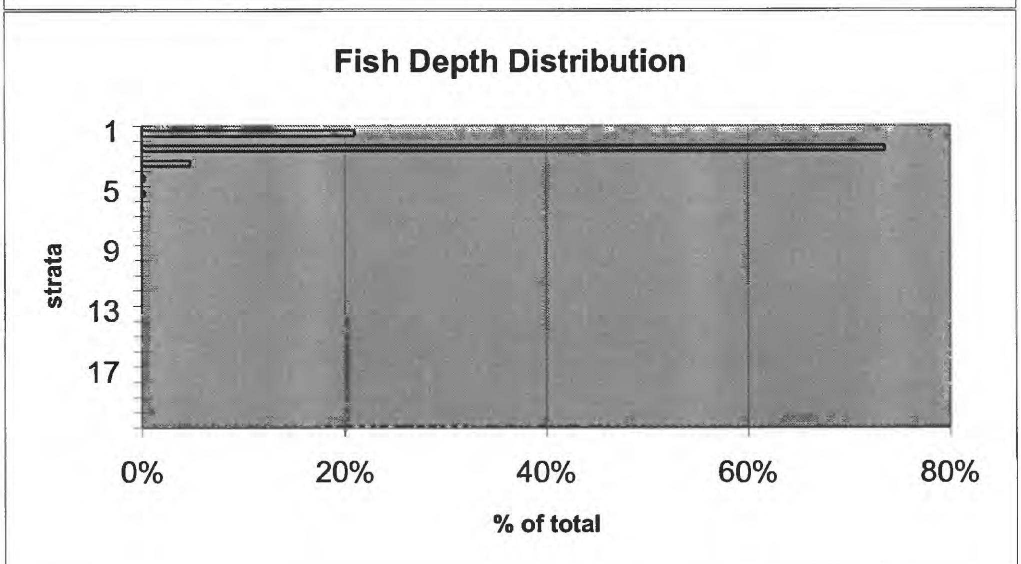


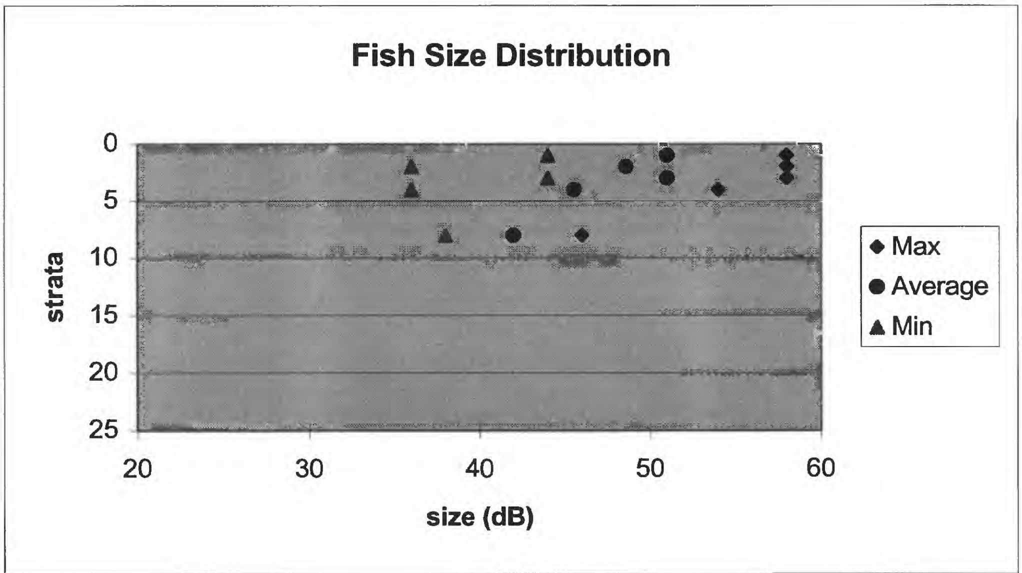





Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
30%
25%
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
1
5
9
13
17
strata
0%
20%
40%
60%
80%
% of total


Fish Size Distribution
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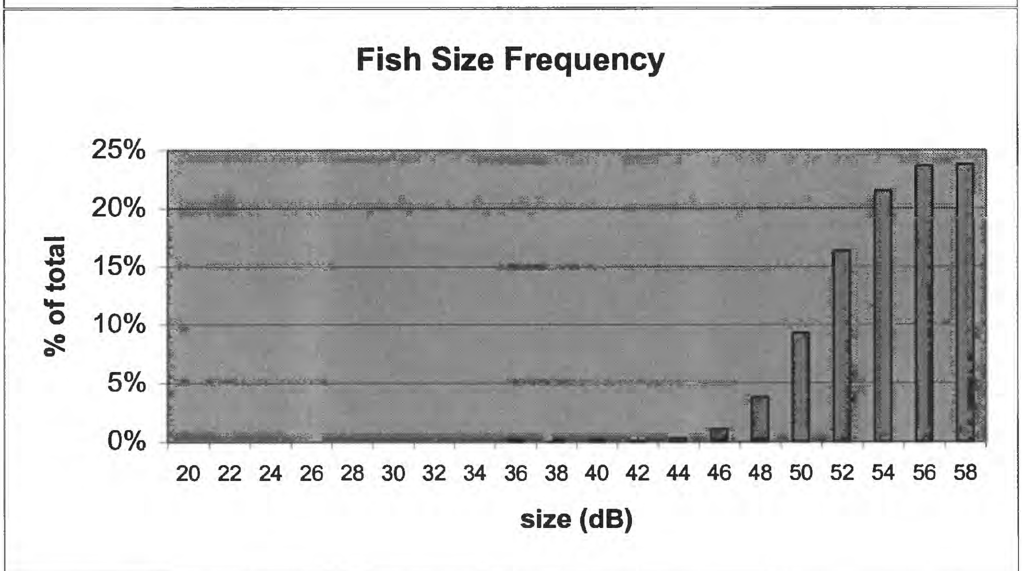
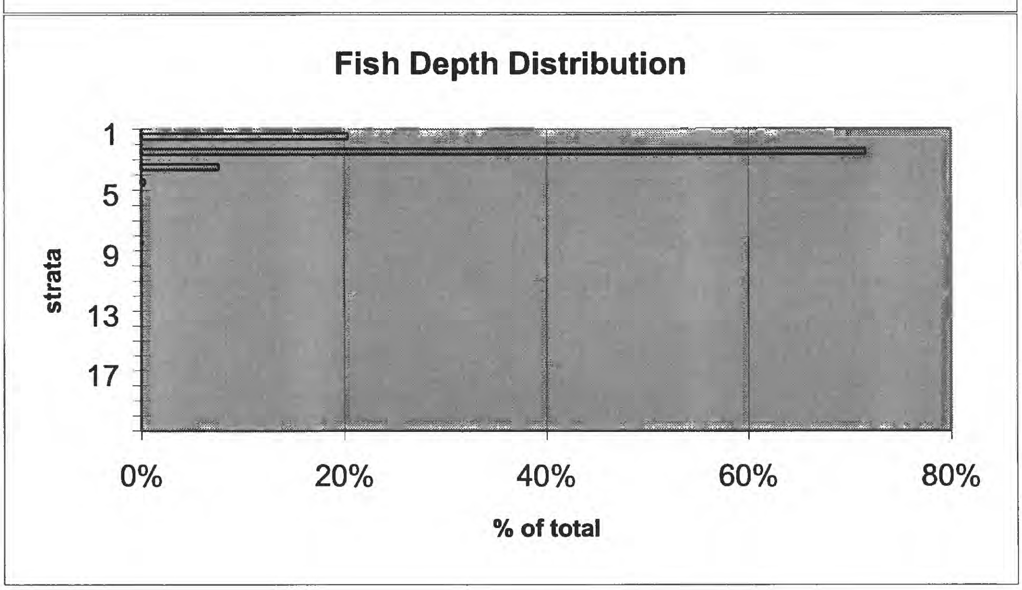
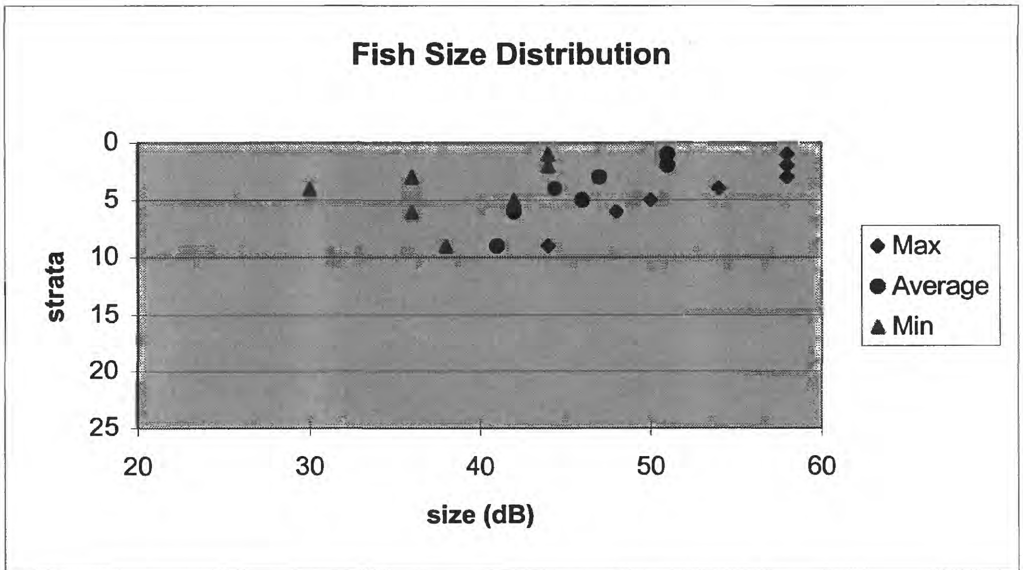
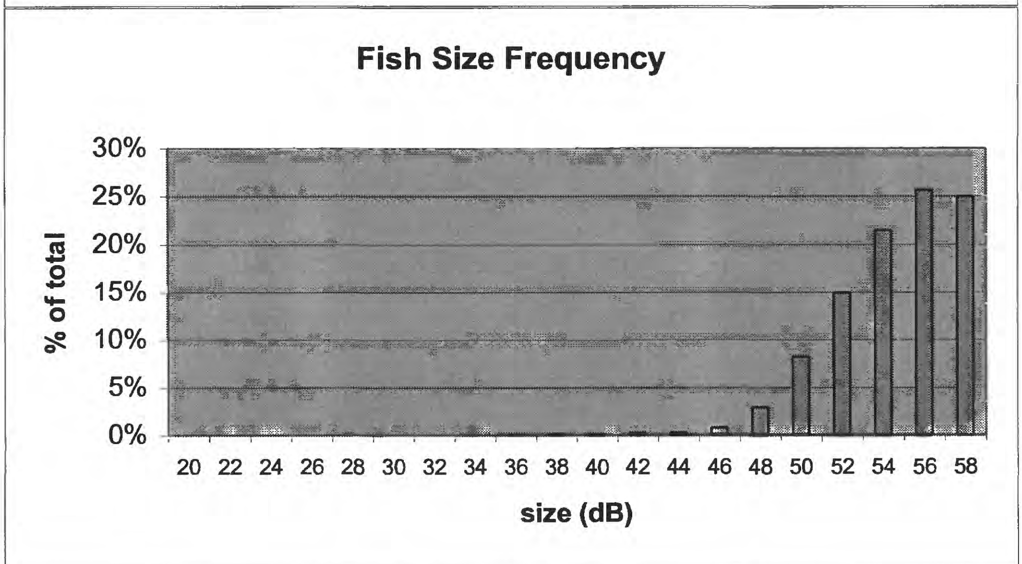
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

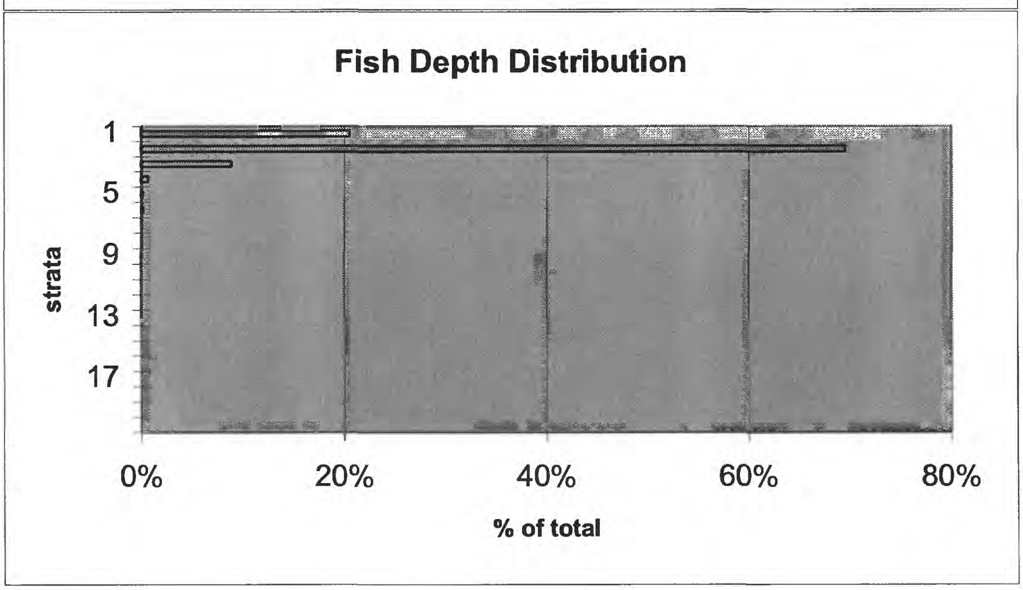

Fish Size Frequency
25%
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

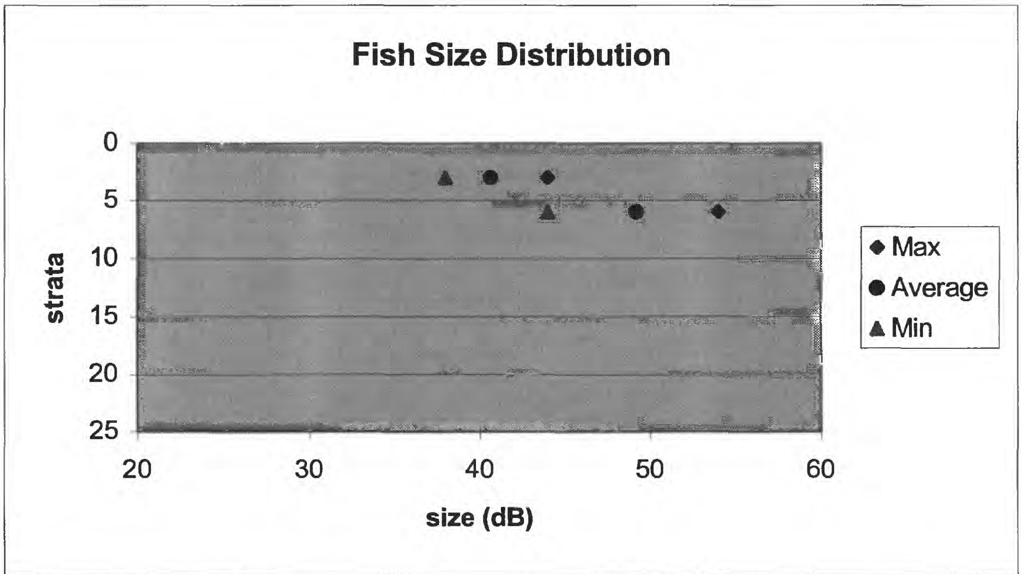

Fish Depth Distribution
1
5
9
13
17
strata
0%
20%
40%
60%
80%
% of total

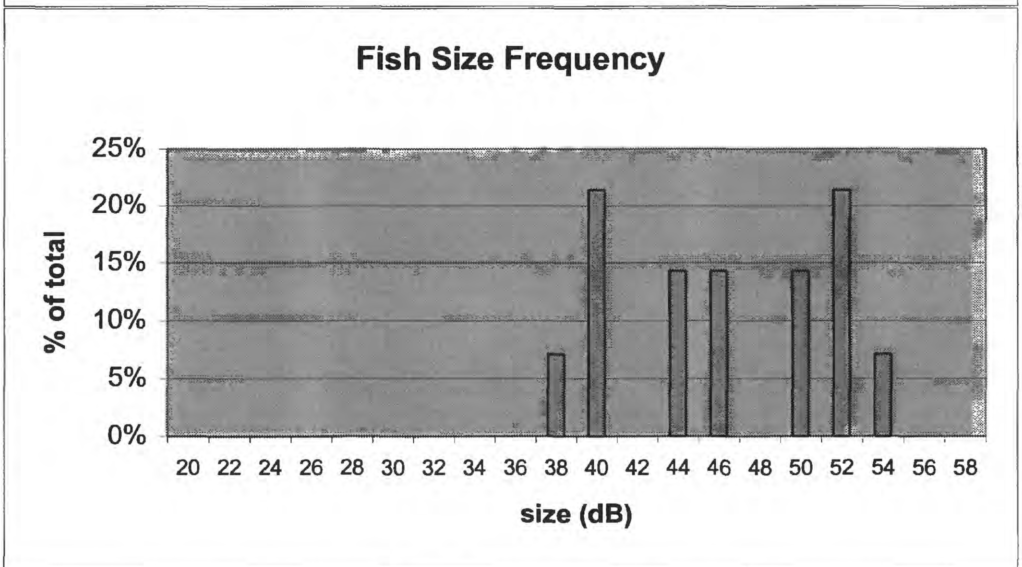
Lake Powell August 1996
P14 C








Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
% of total
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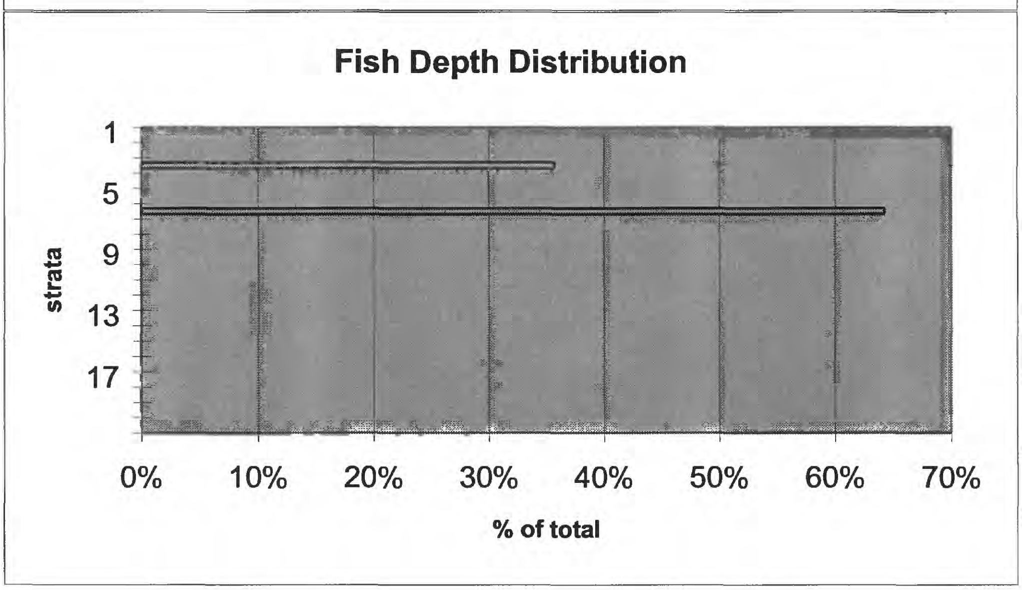
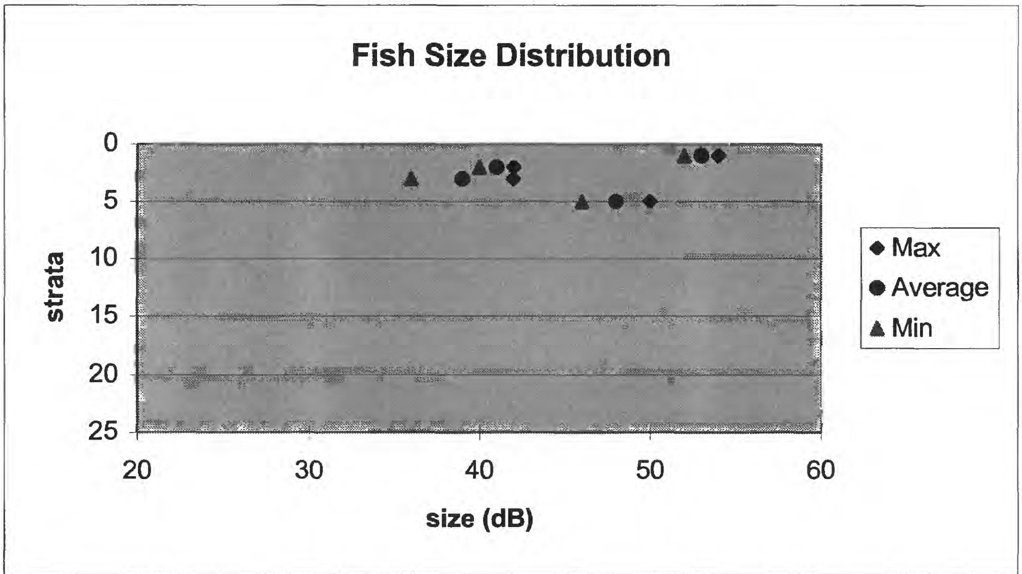
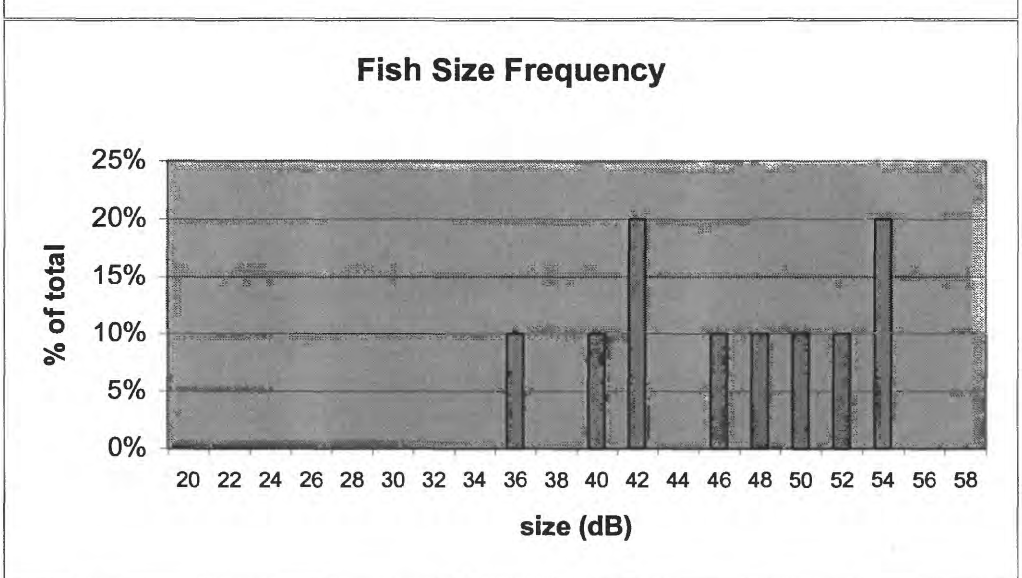
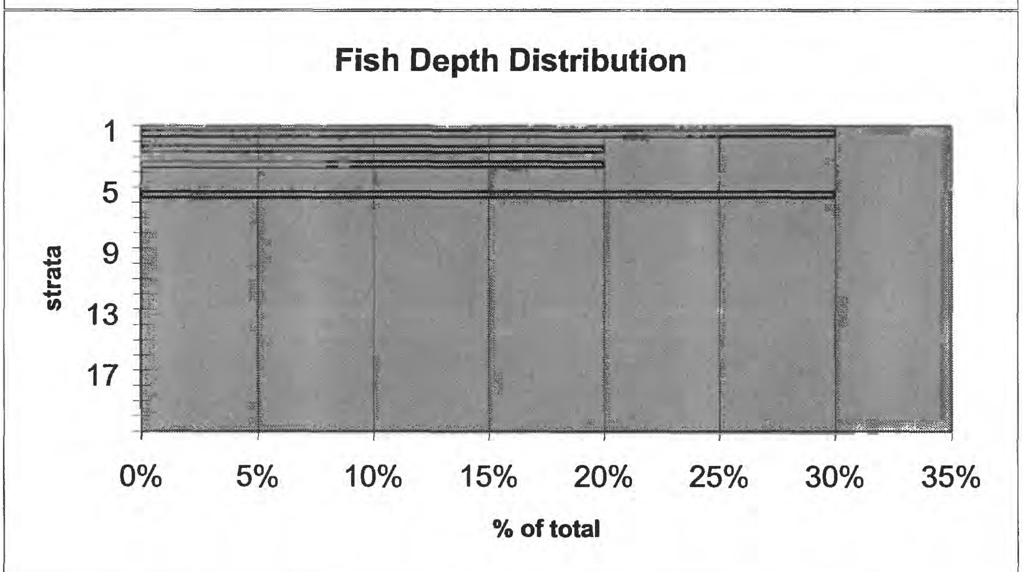
20%
15%
10%
5%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
strata
1
5
9
13
17
0%
10%
20%
30%
40%
50%
60%
70%
% of total

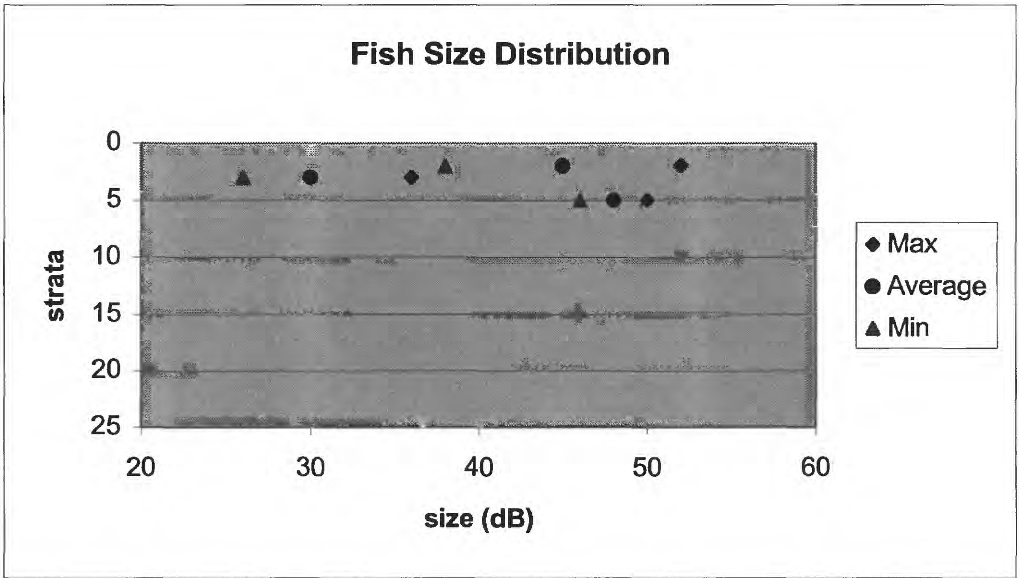
Lake Powell May 1997
P08 B

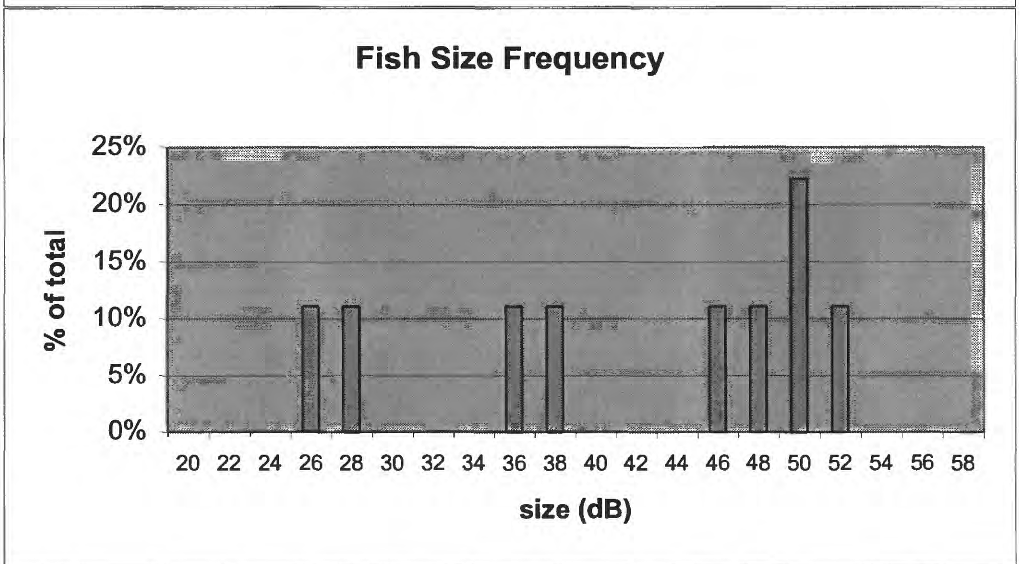


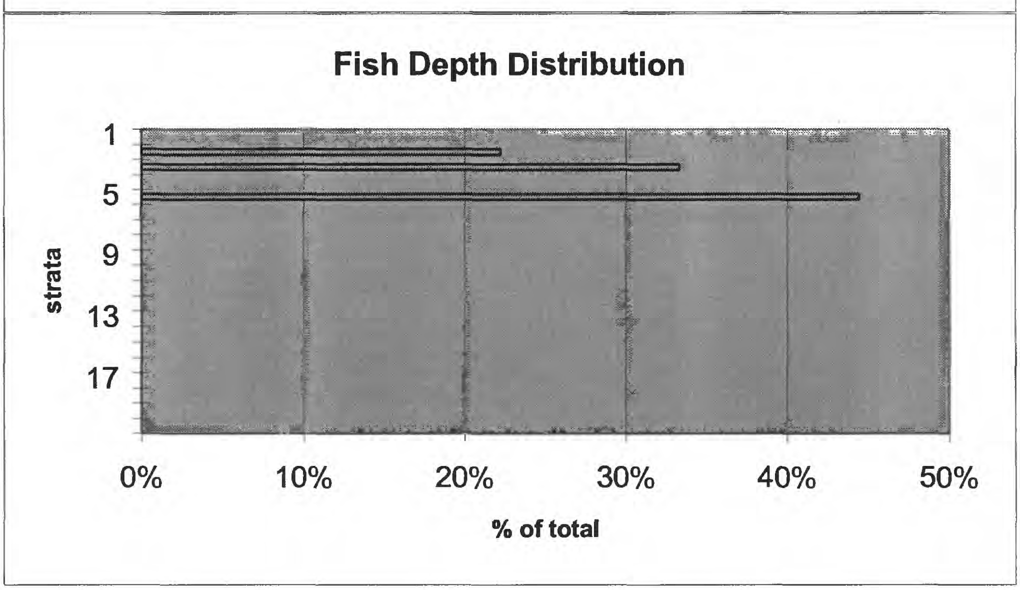


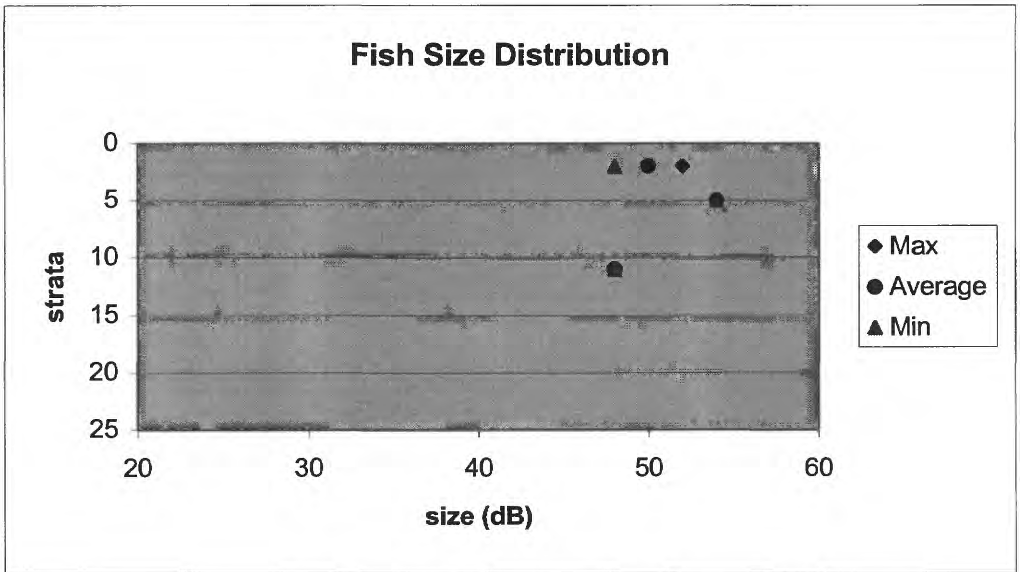


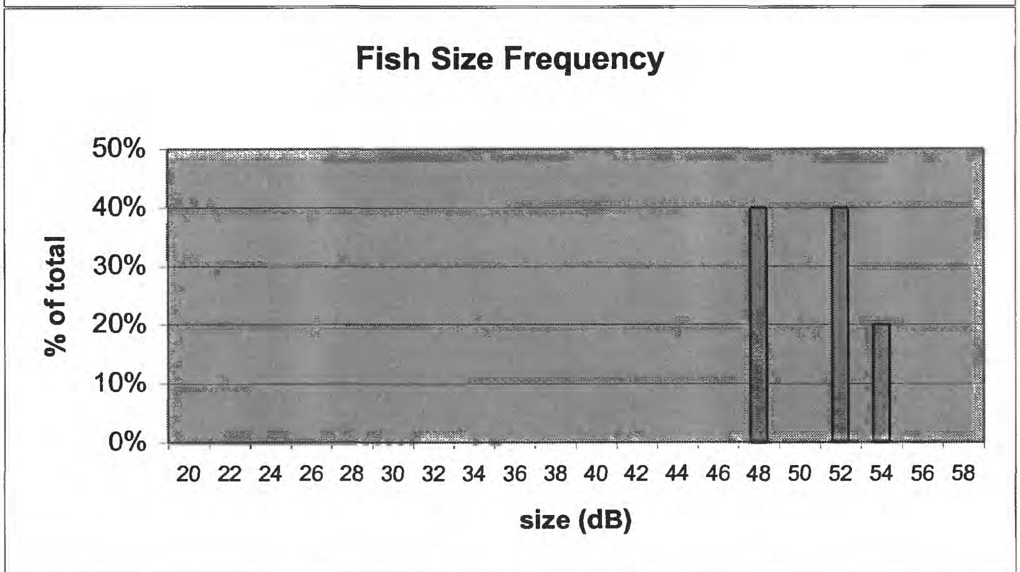
Lake Powell May 1997
P08 C

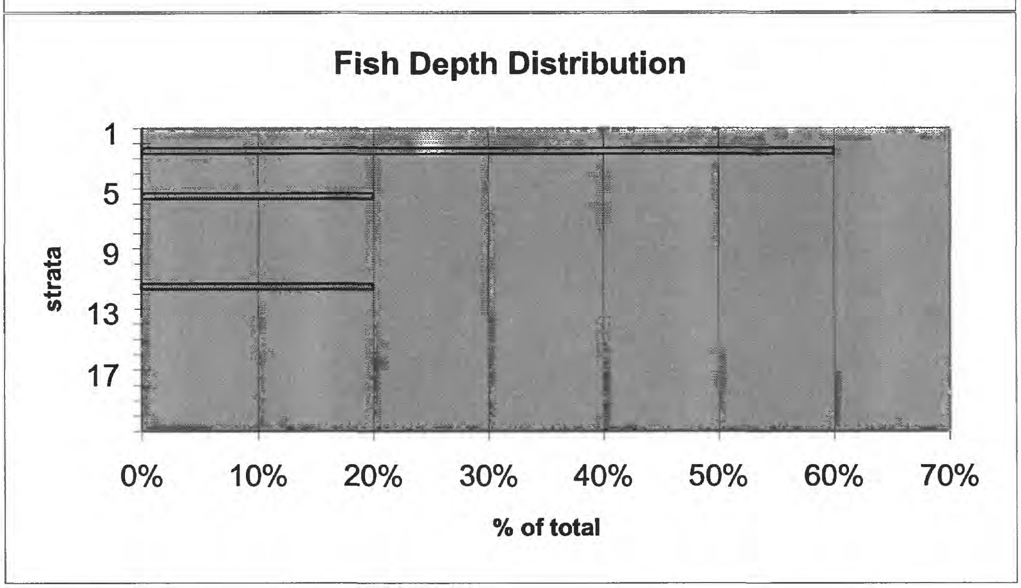




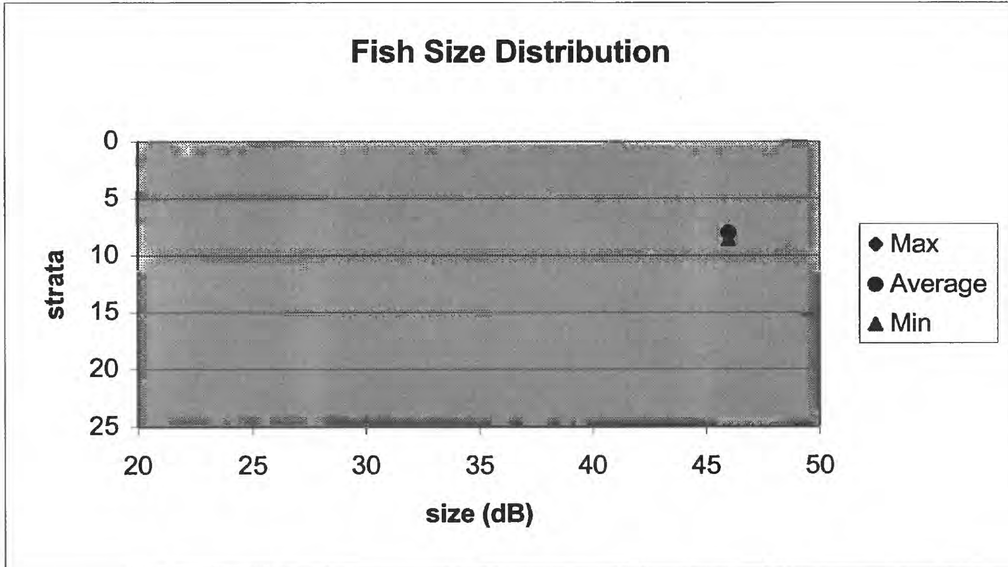


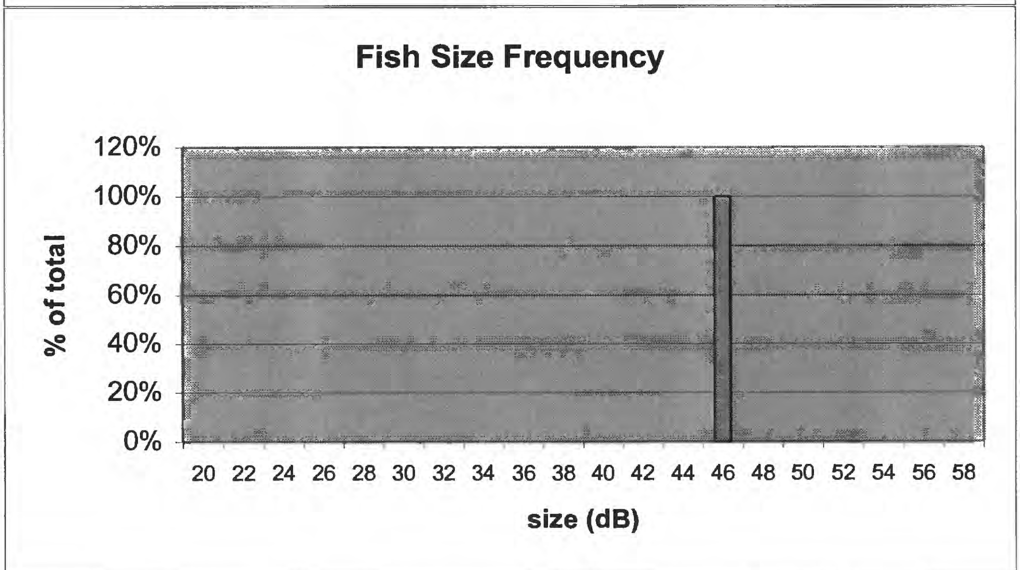

Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min

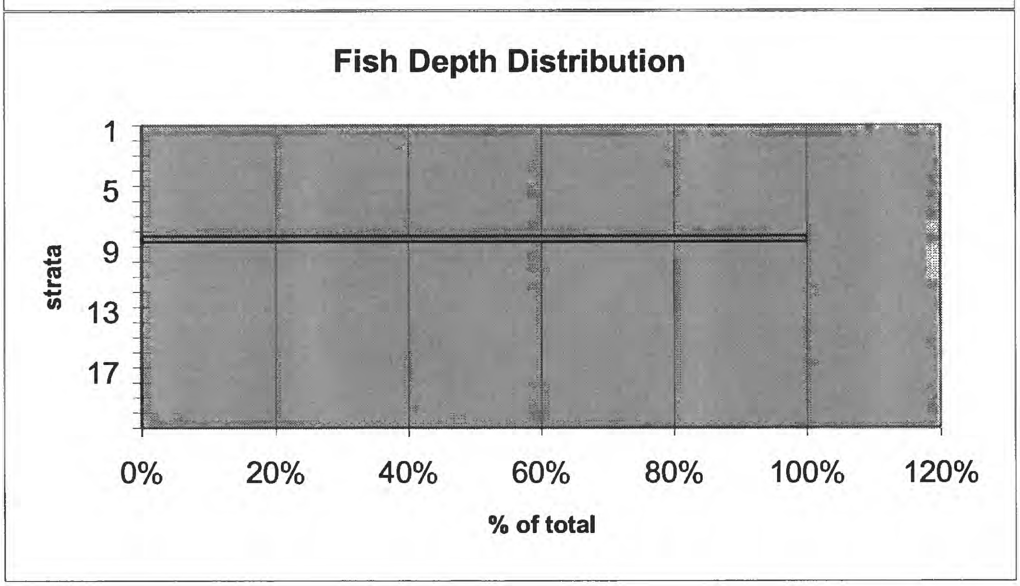

Fish Size Frequency
% of total
50%
40%
30%
20%
10%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

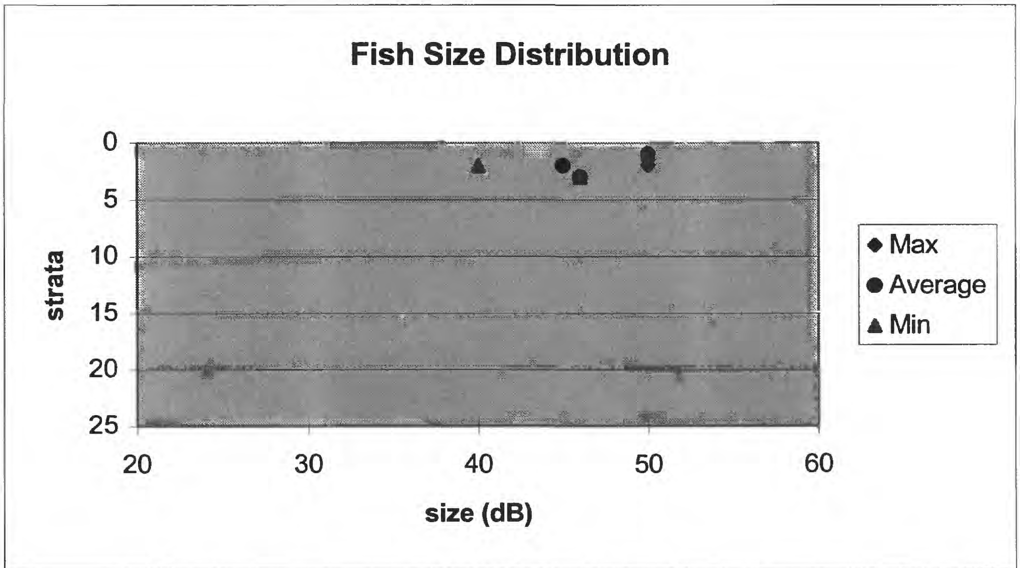

Fish Depth Distribution
strata
1
5
9
13
17
0% 10% 20% 30% 40% 50% 60% 70%
% of total

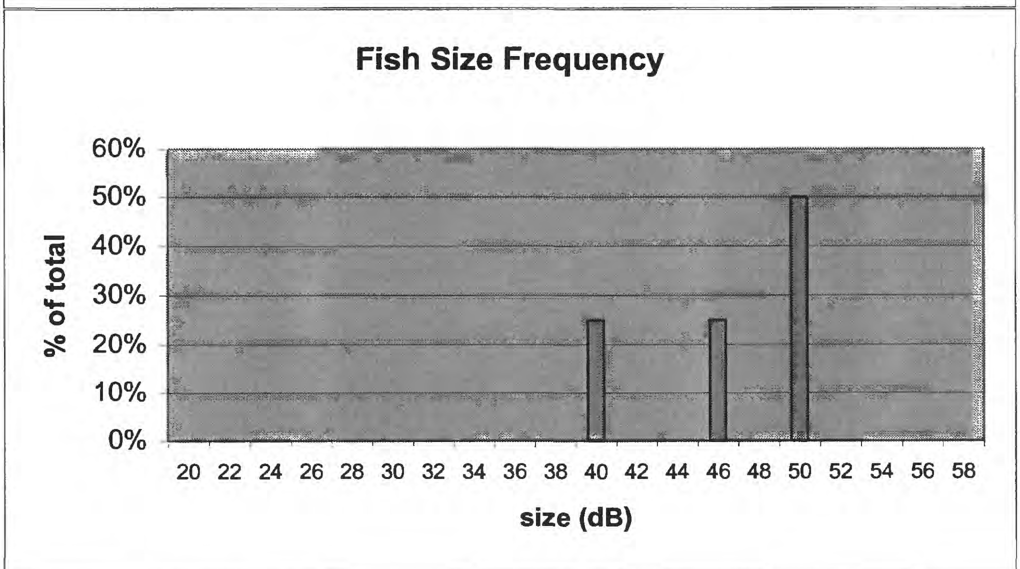
Lake Powell May 1997
P14 B

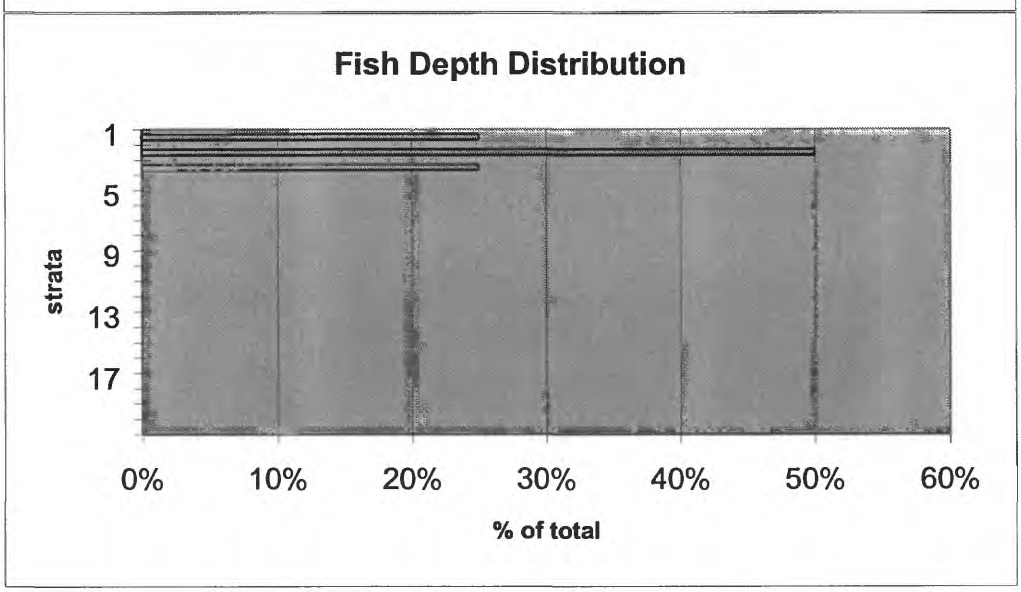


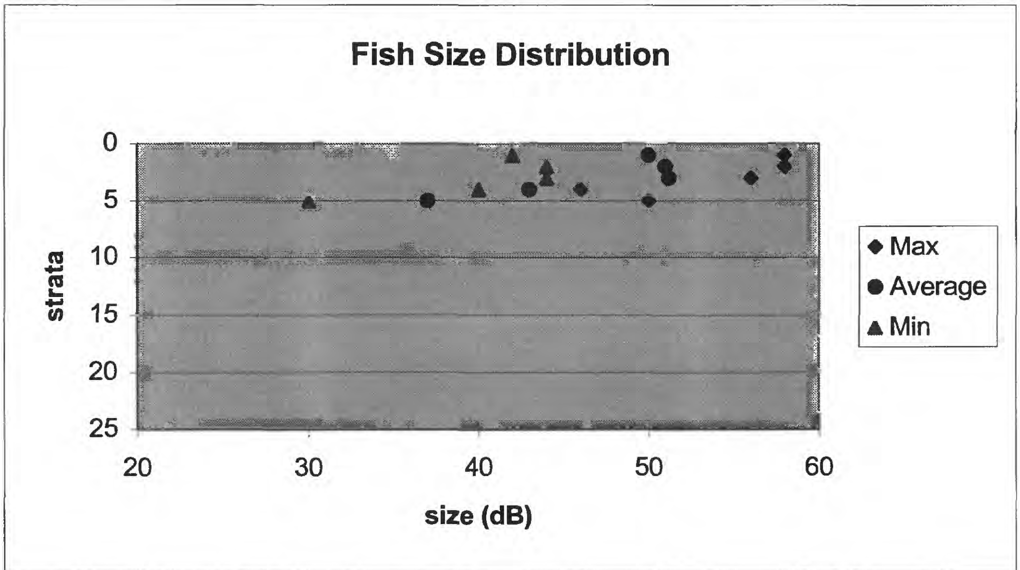





Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
% of total
60%
50%
40%
30%
20%
10%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
strata
1
5
9
13
17
0%
10%
20%
30%
40%
50%
60%
% of total


Fish Size Distribution
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strata
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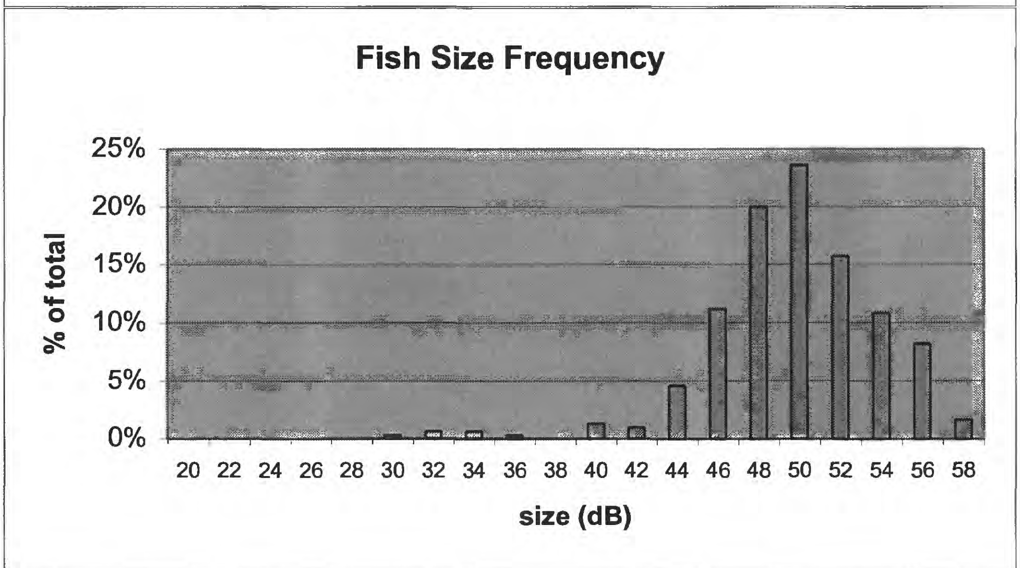
60
size (dB)
Max
Average
Min


Fish Size Frequency
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% of total
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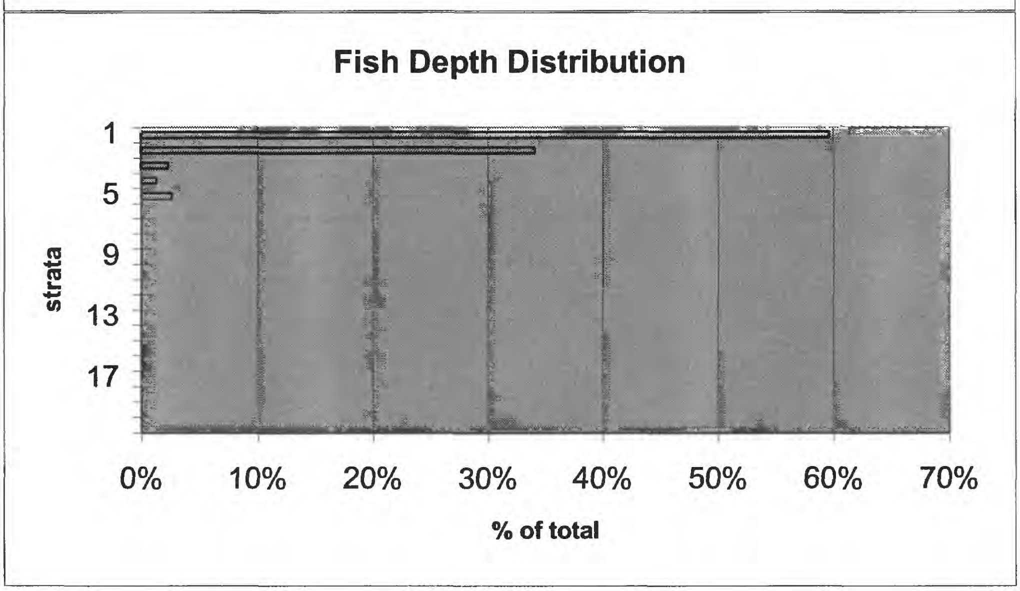
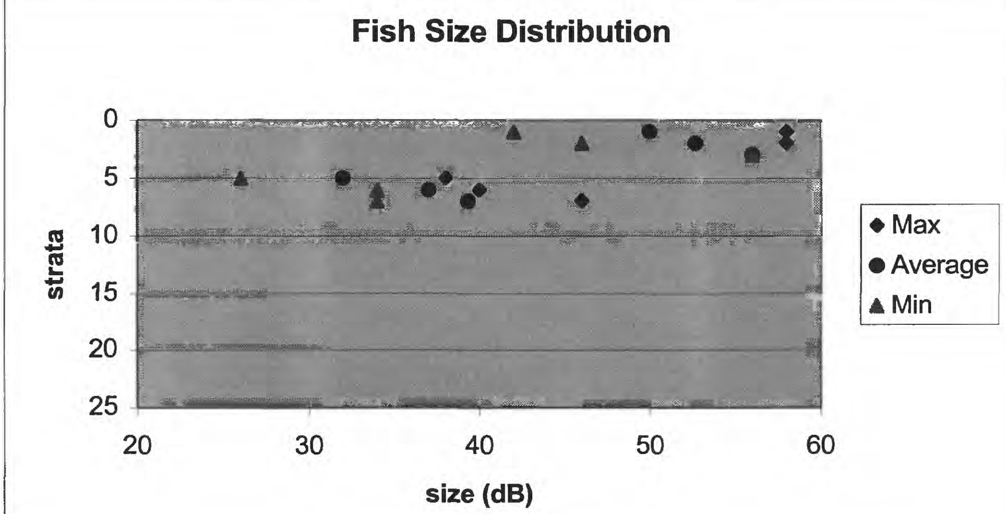
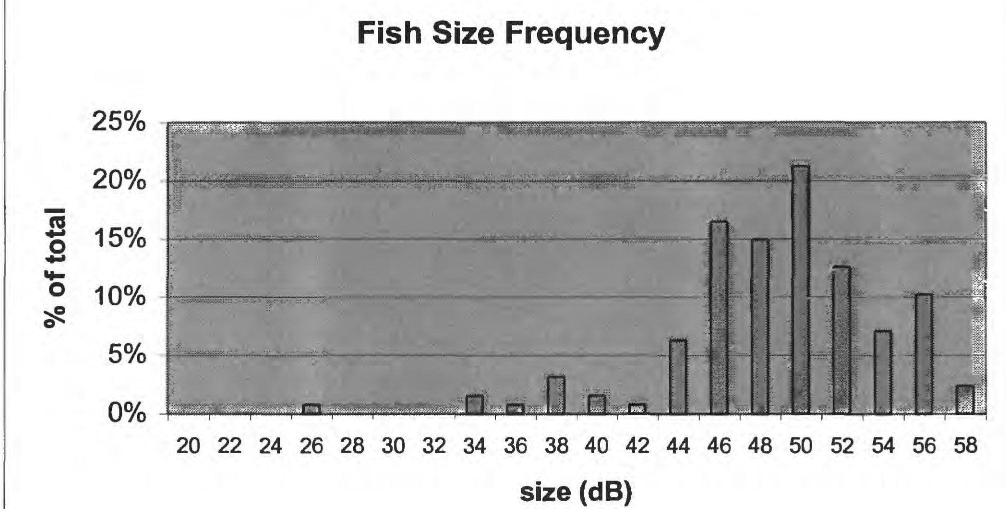
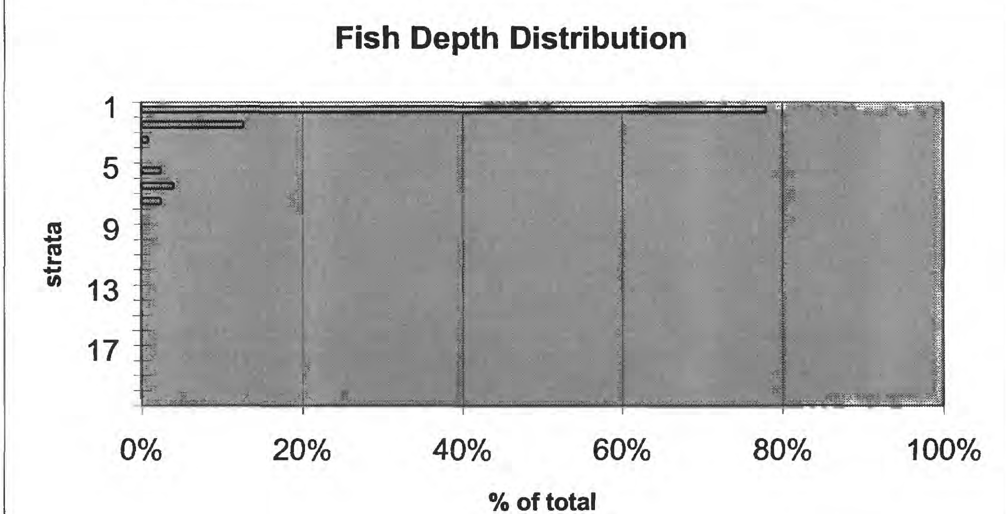
size (dB)


Fish Depth Distribution
1
5
9
13
17
strata
0% 10% 20% 30% 40% 50% 60% 70%
% of total

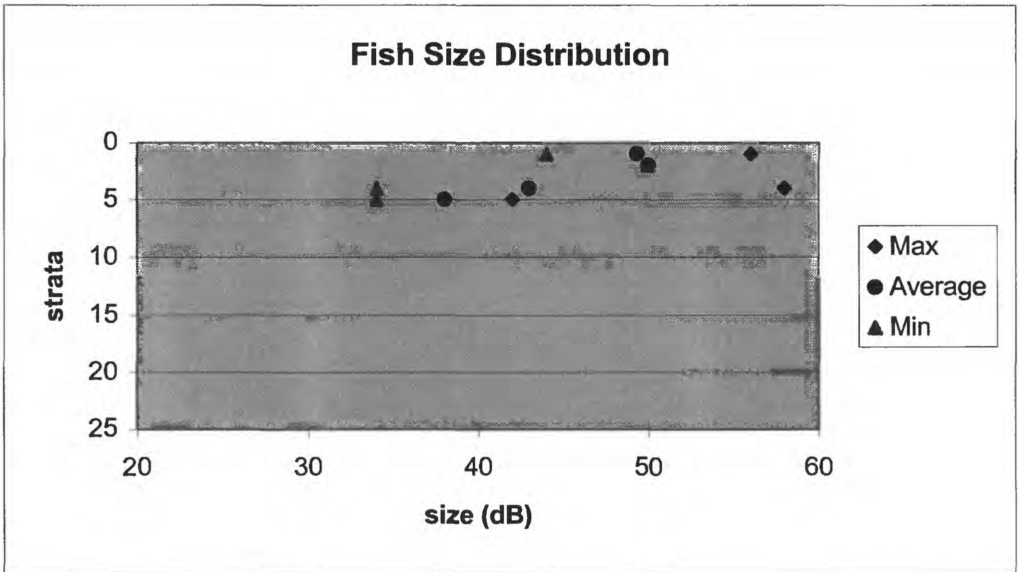
Lake Powell August 1997
P08 B

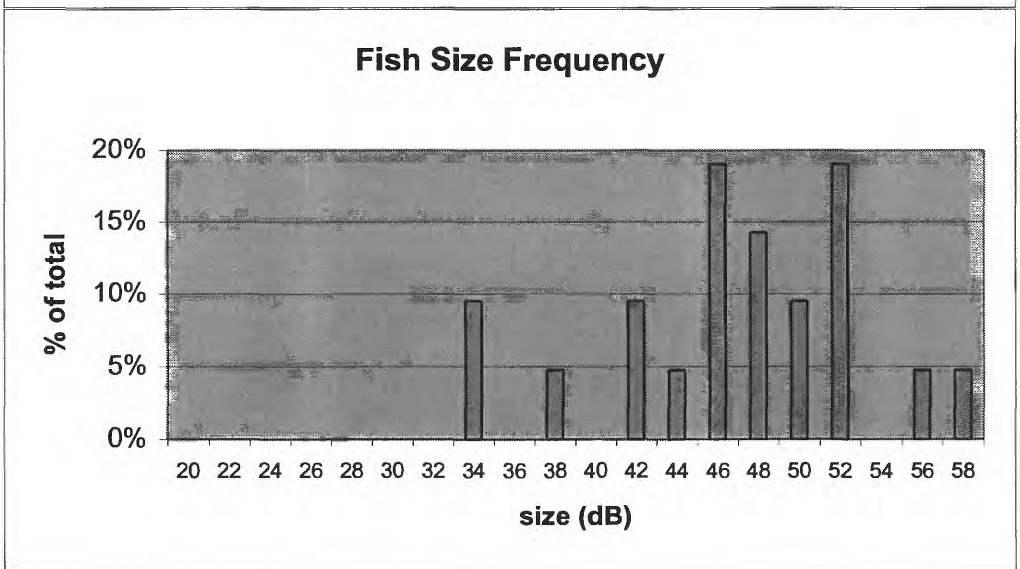


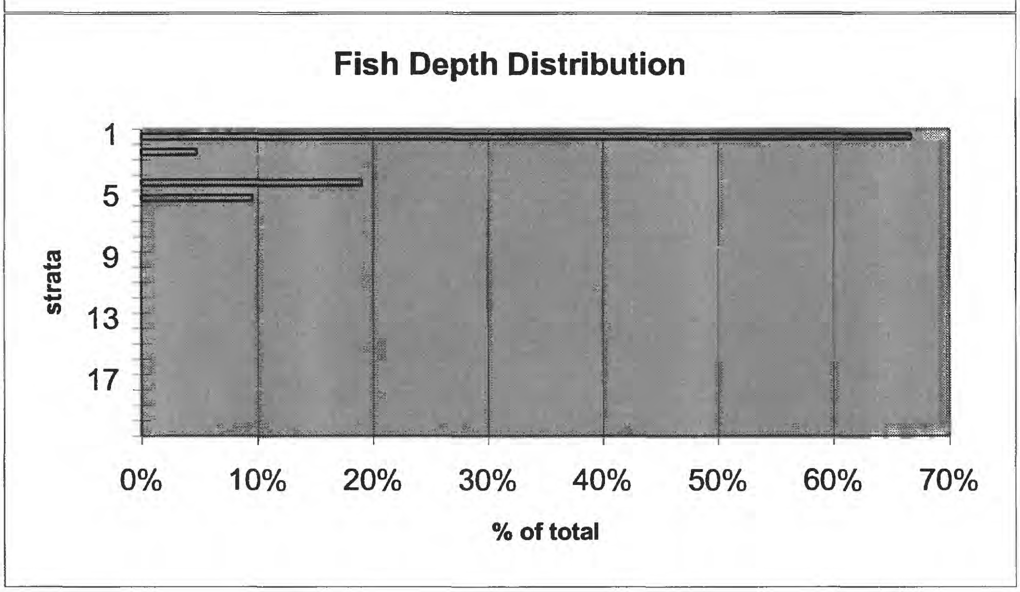


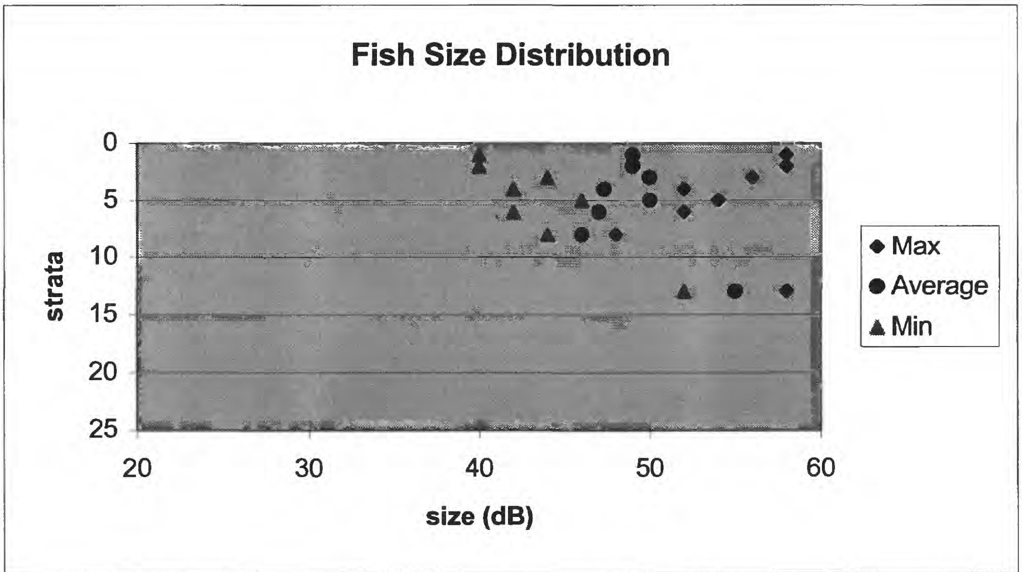


Lake Powell August 1997
P08 C








Fish Size Distribution
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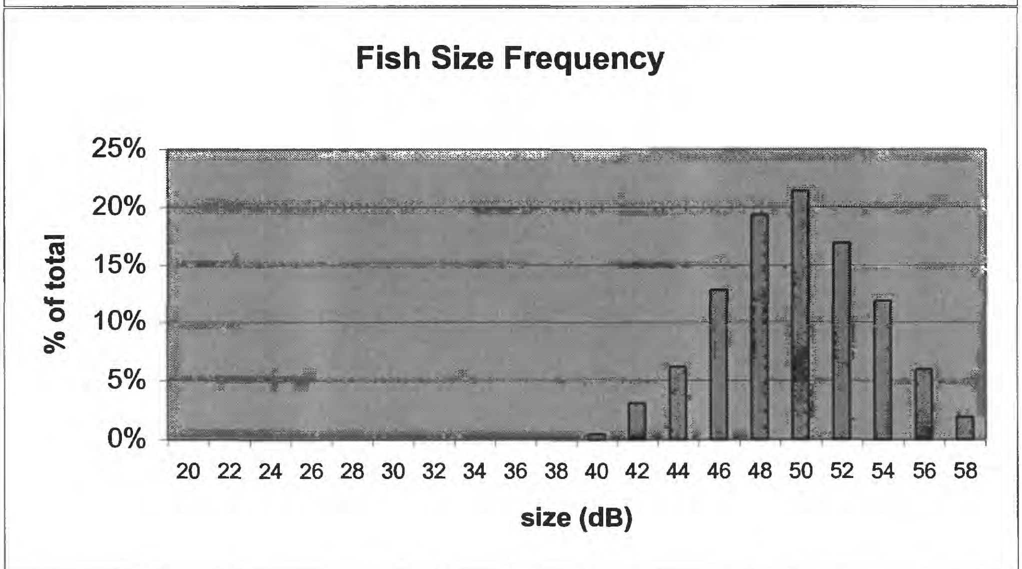
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
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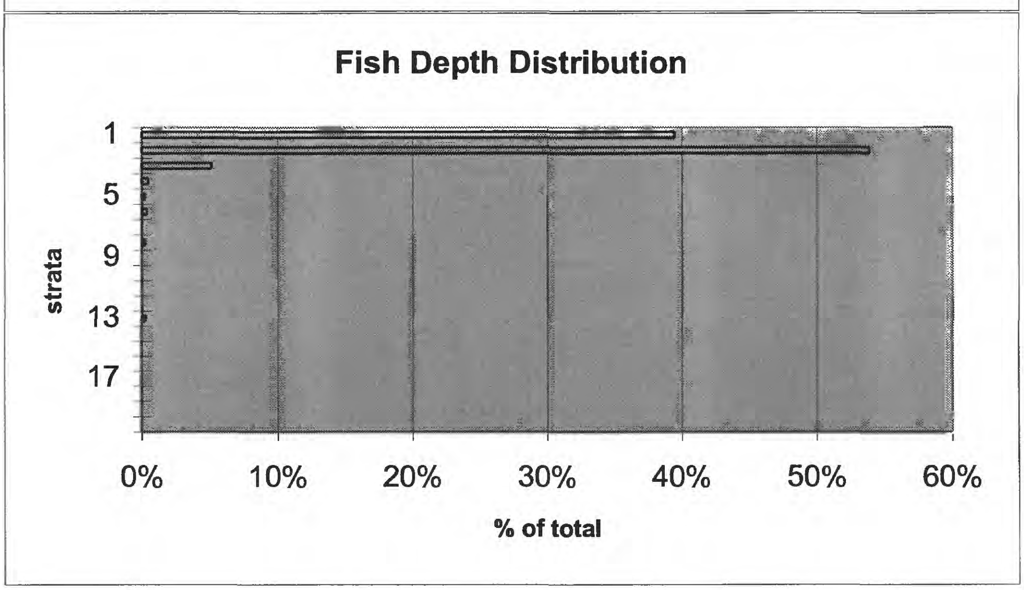
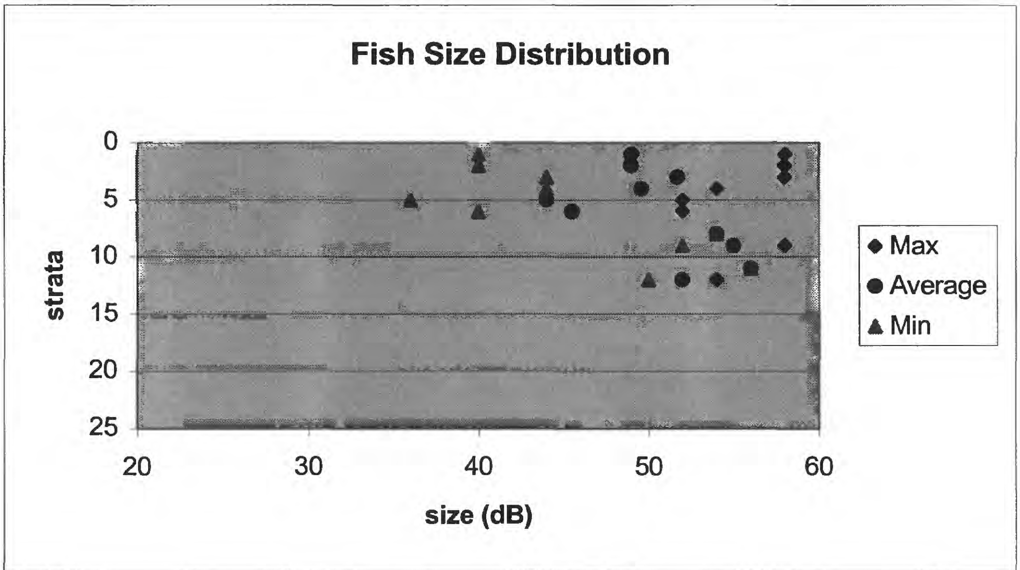
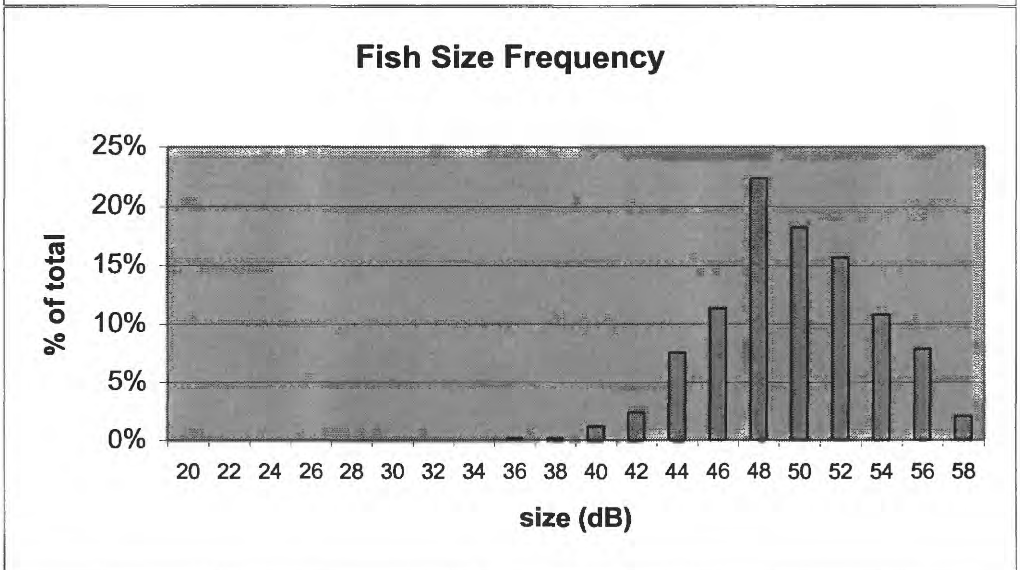
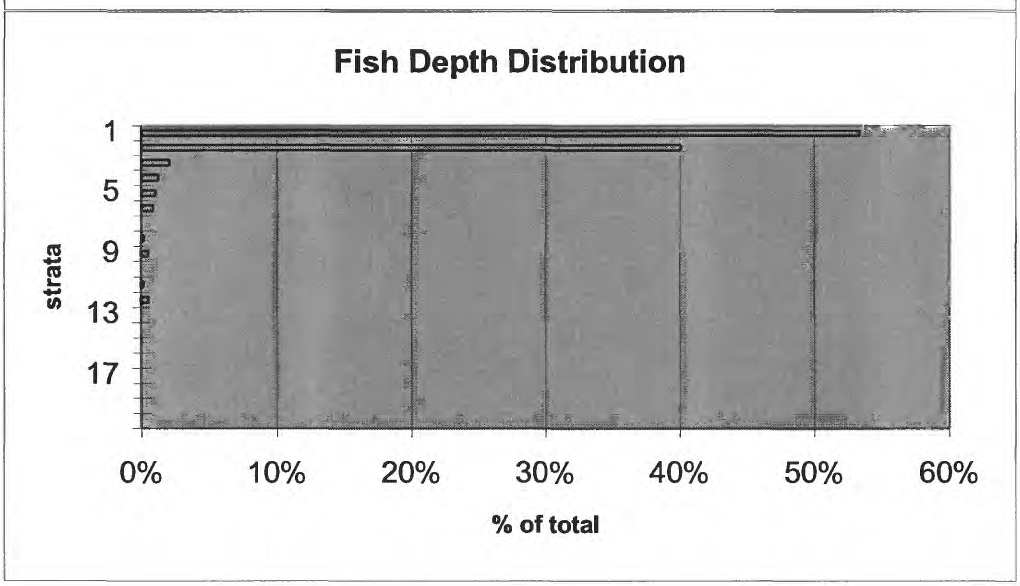
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
1
5
9
13
17
strata
0%
10%
20%
30%
40%
50%
60%
% of total

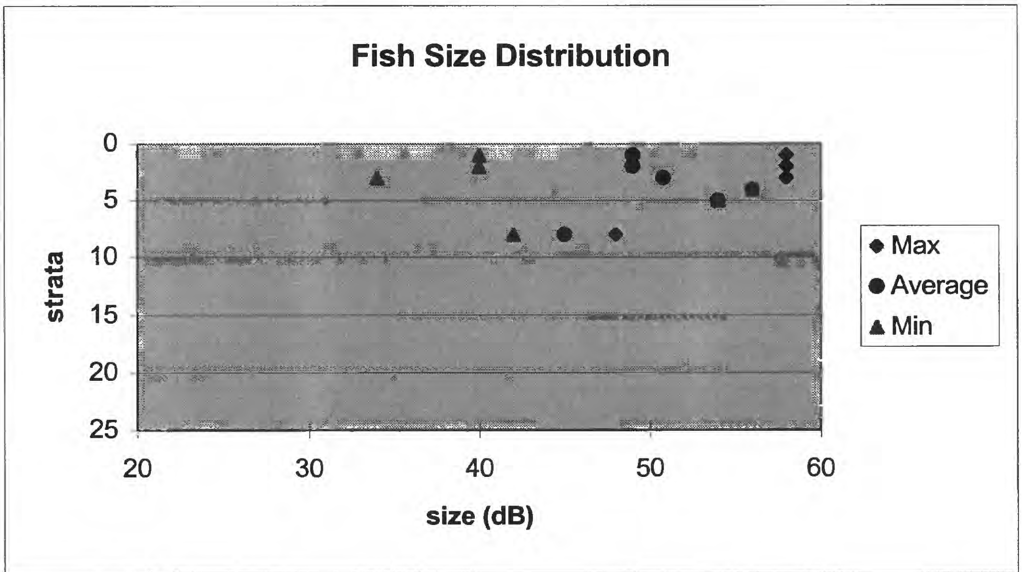
Lake Powell August 1997
P14 B

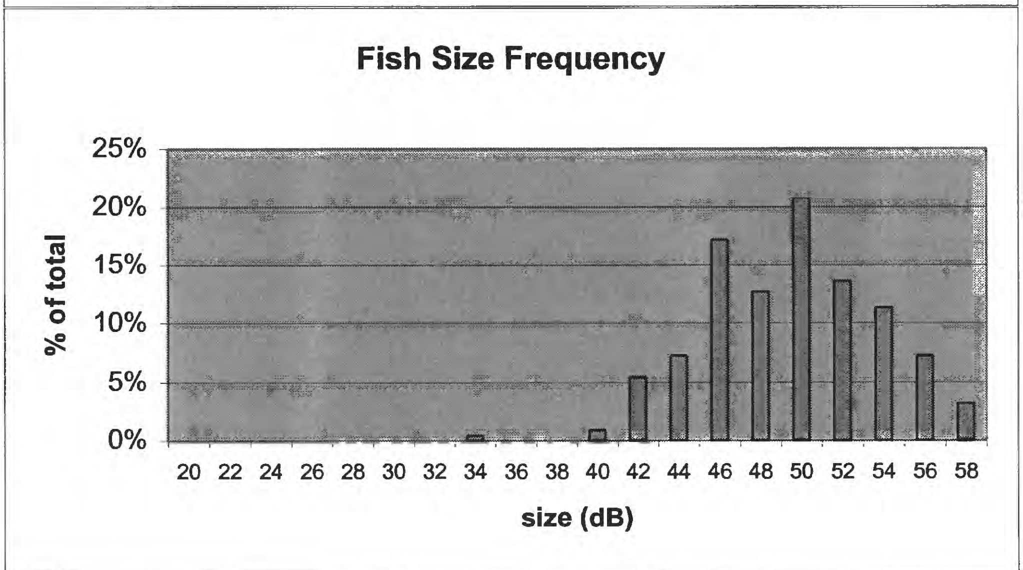


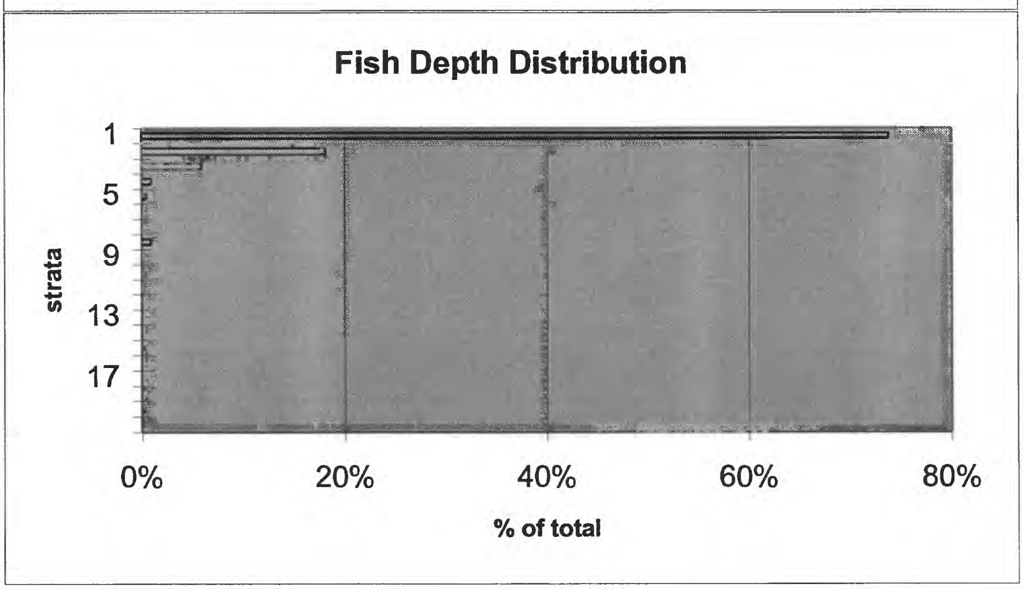




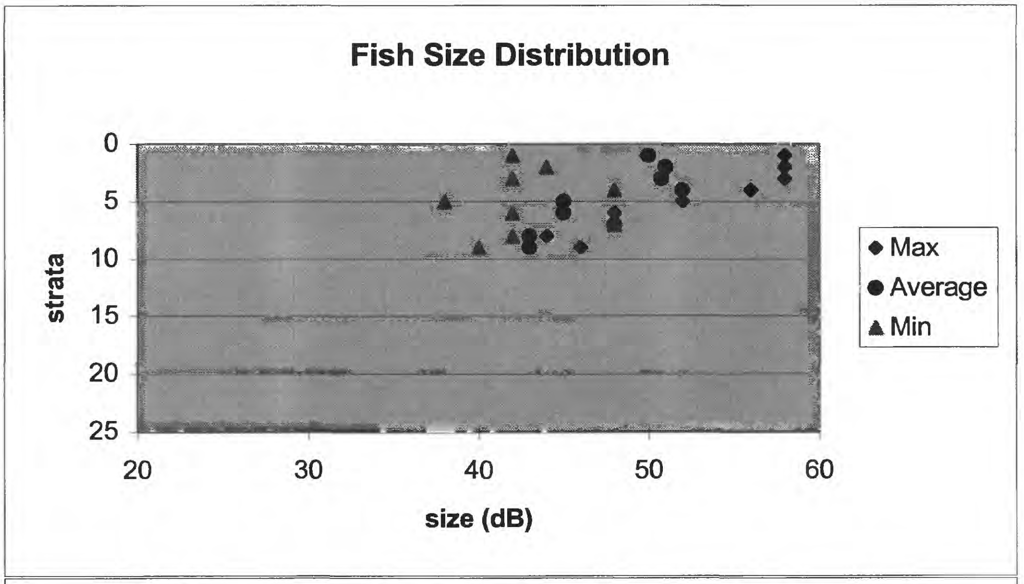
Lake Powell August 1997
P14 C

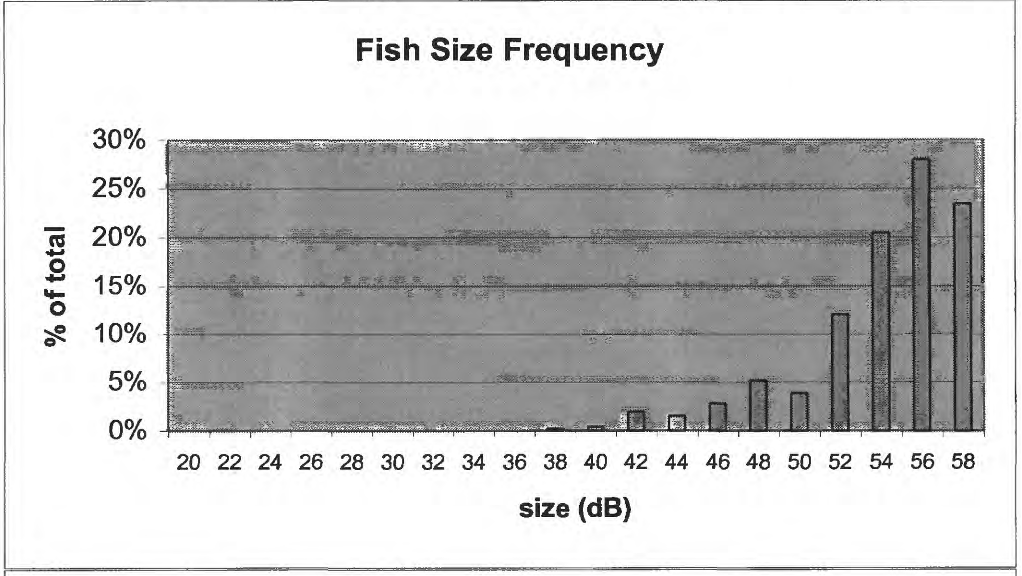


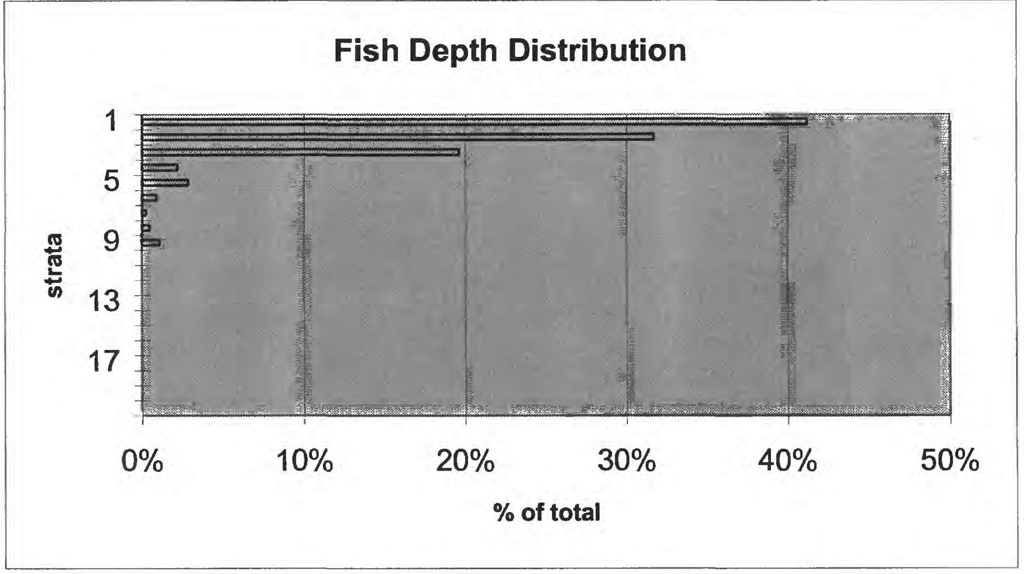




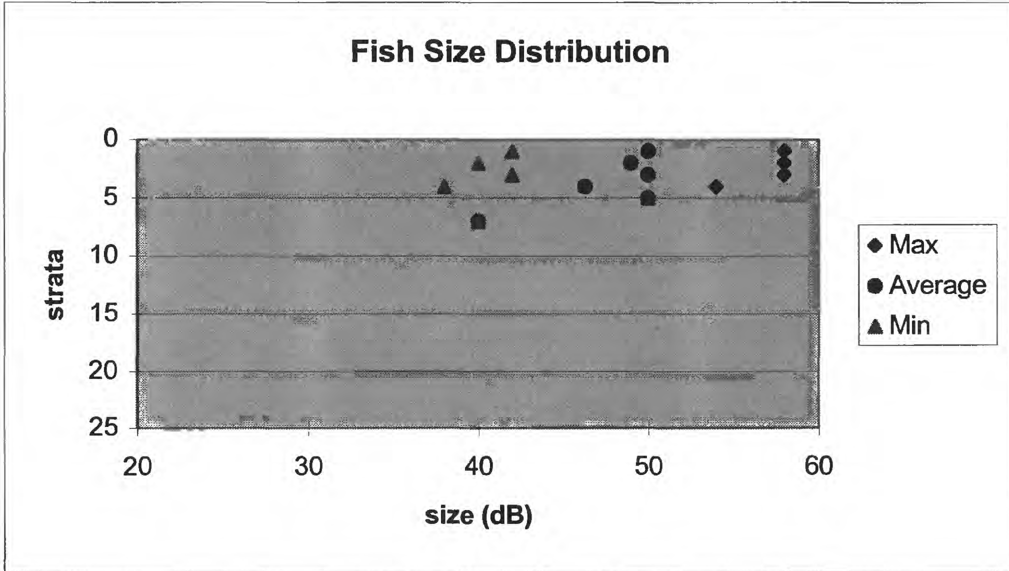
Lake Mead May 1996
M02 A

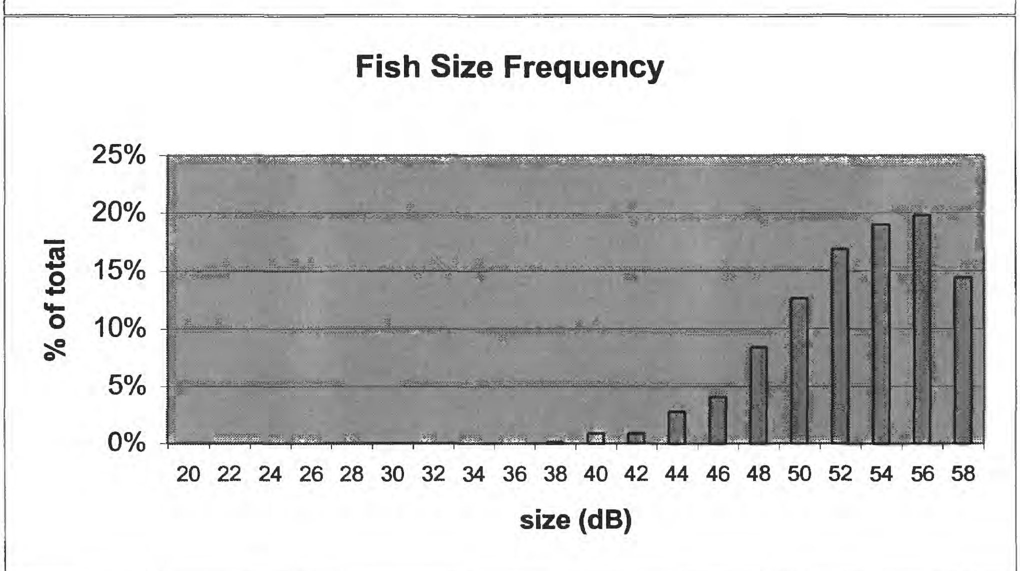


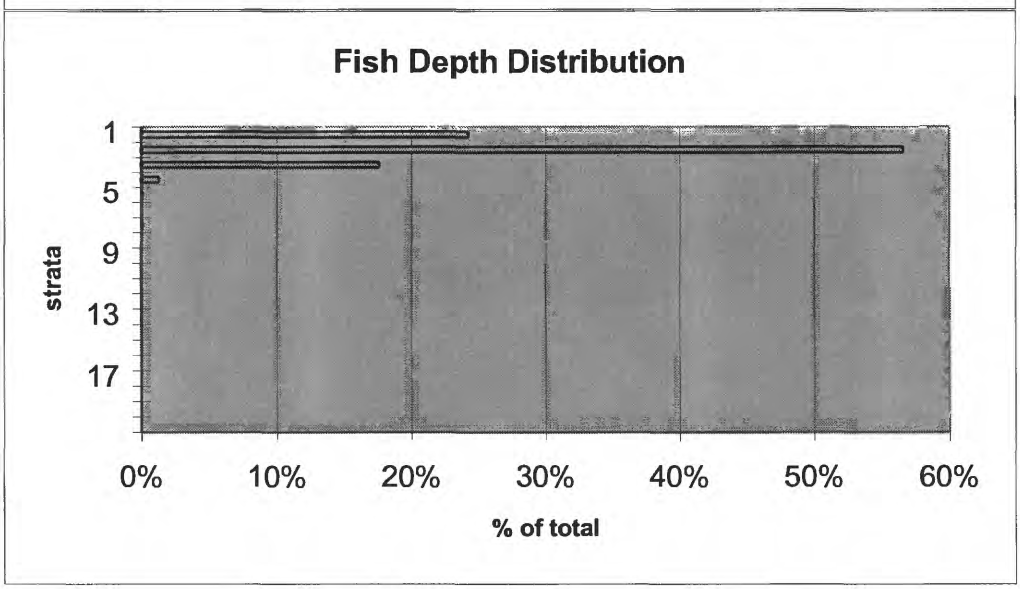




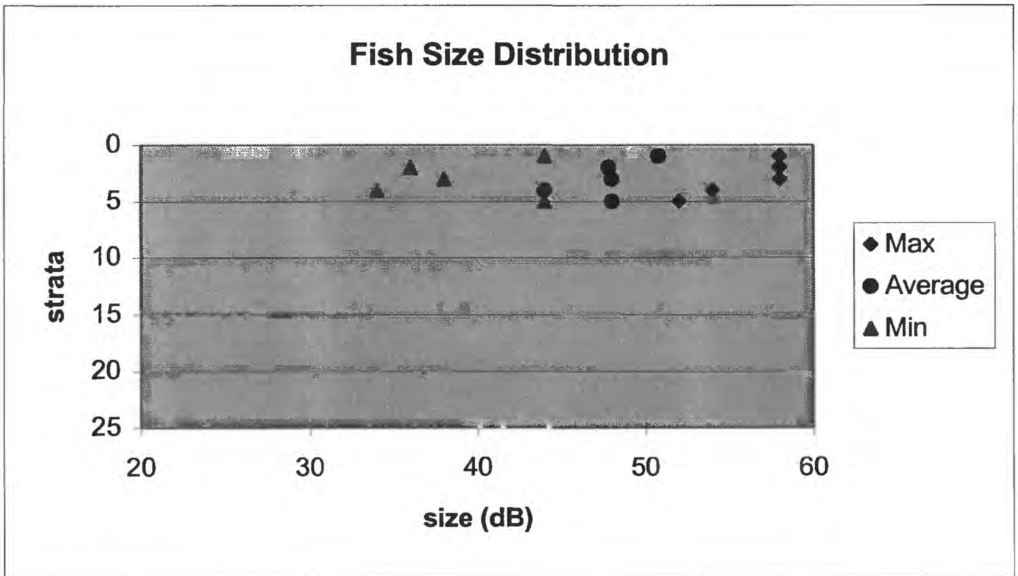
Lake Mead May 1996
M02 B

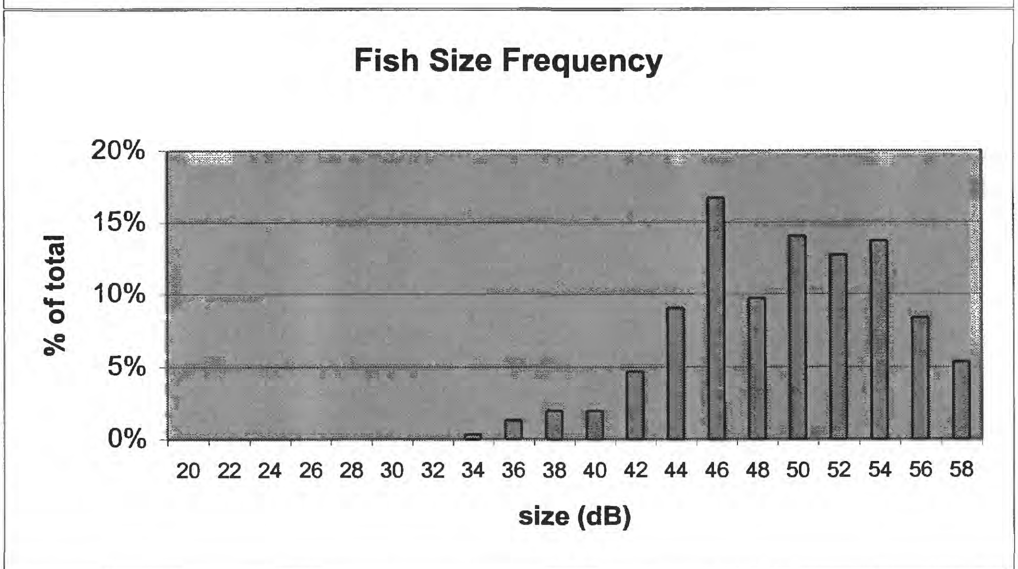


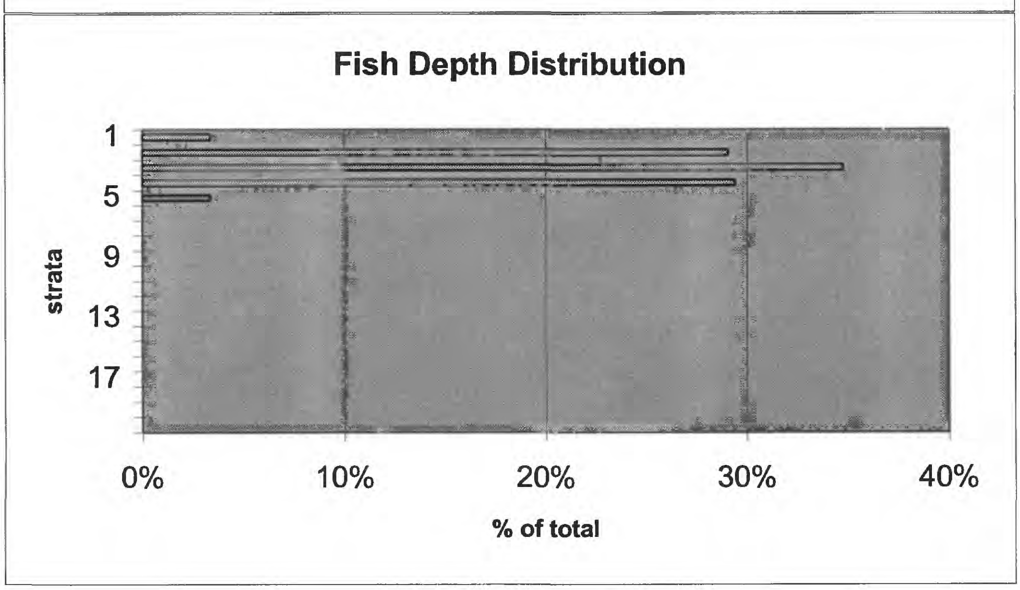




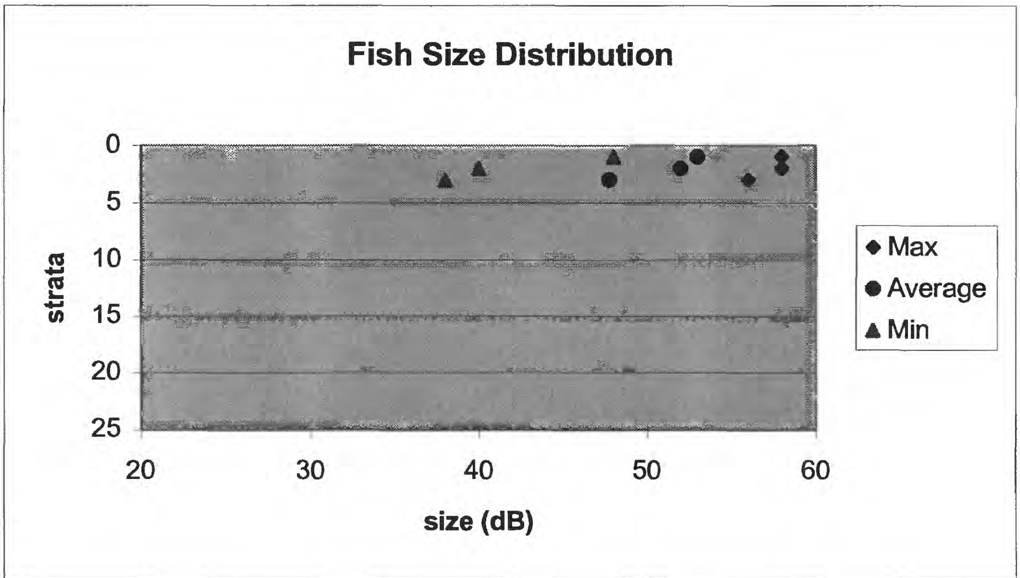
Lake Mead May 1996
M02 C

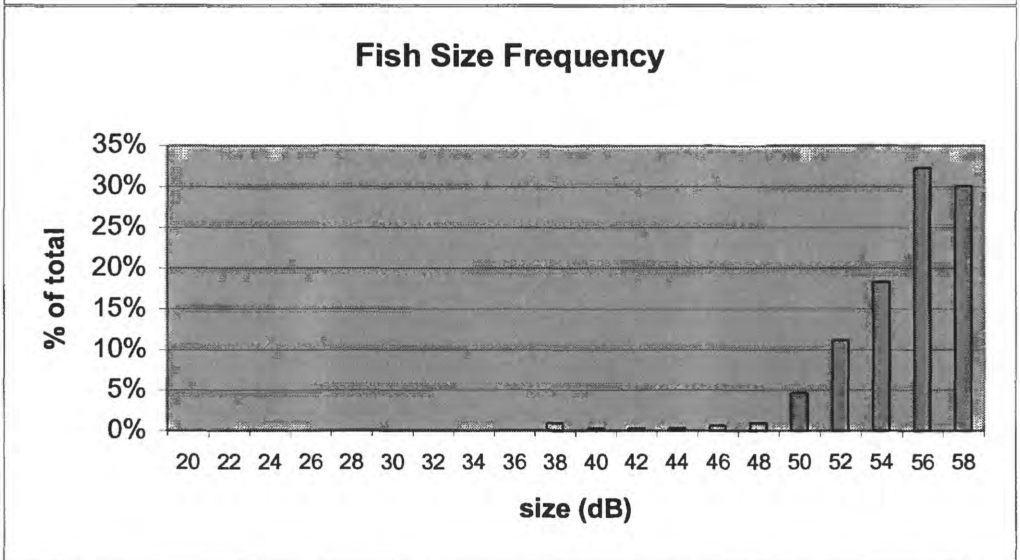


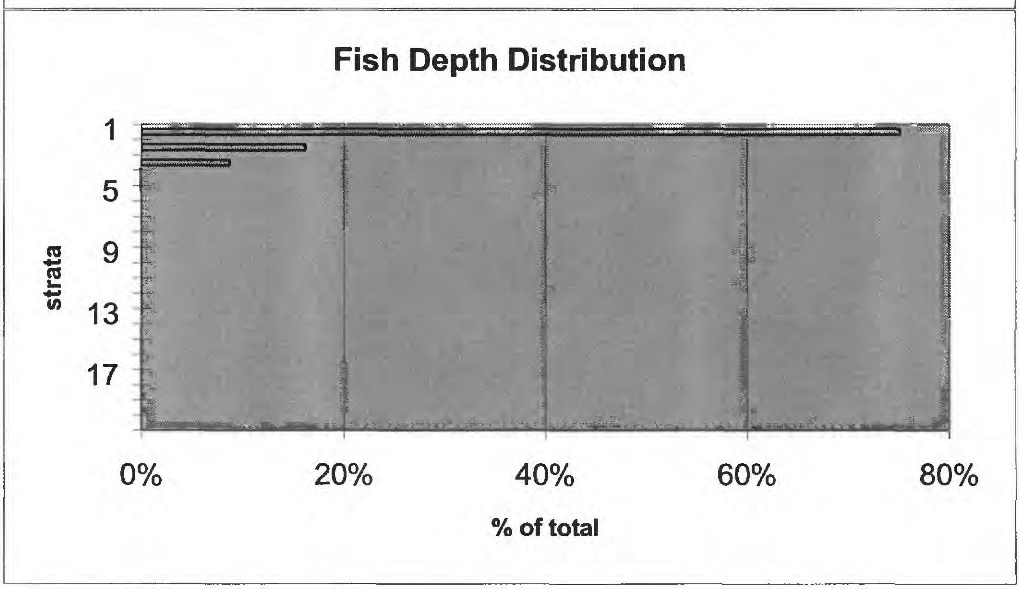




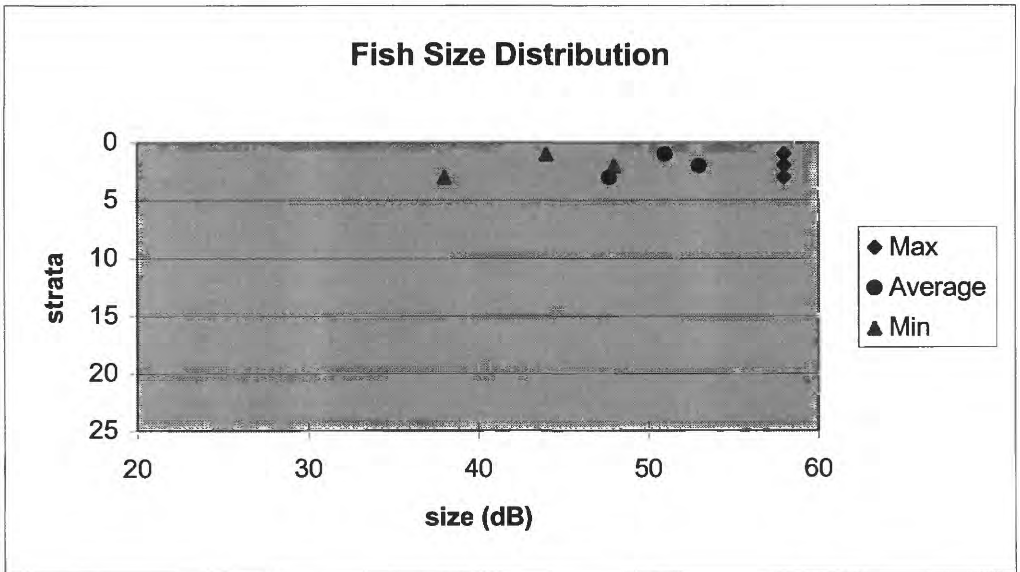
Lake Mead May 1996
M09 A

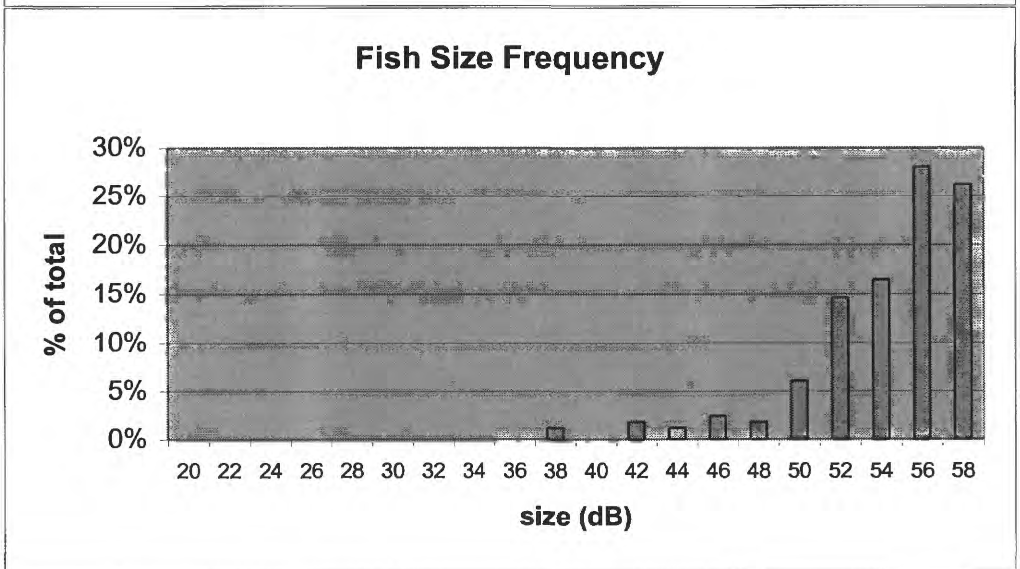


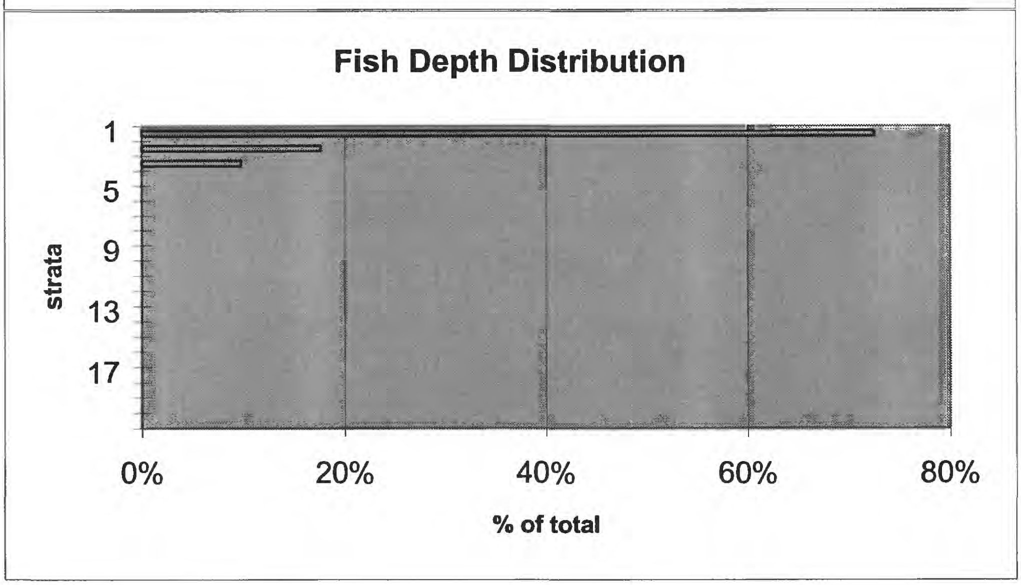


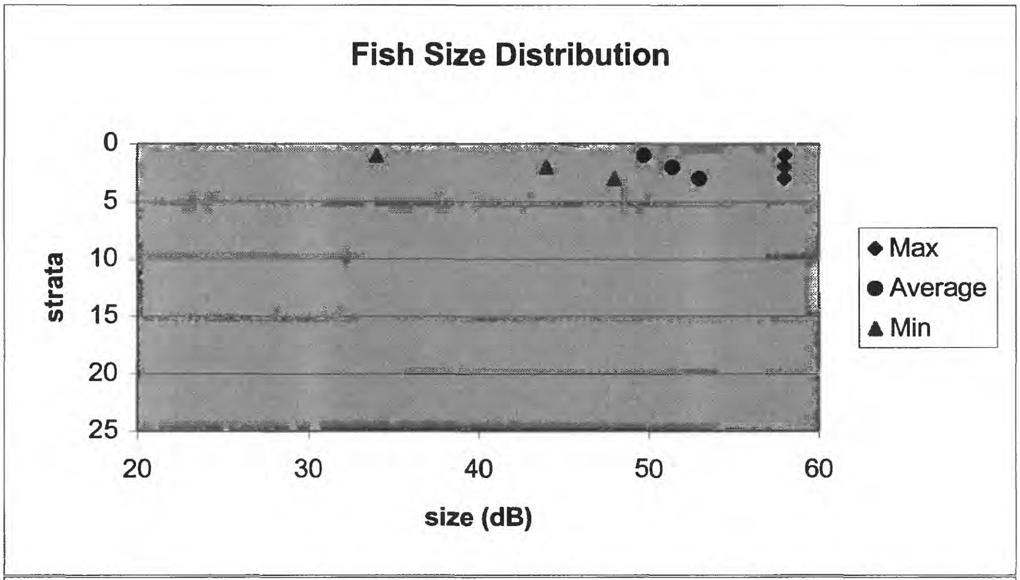


Lake Mead May 1996
M09 B








Fish Size Distribution
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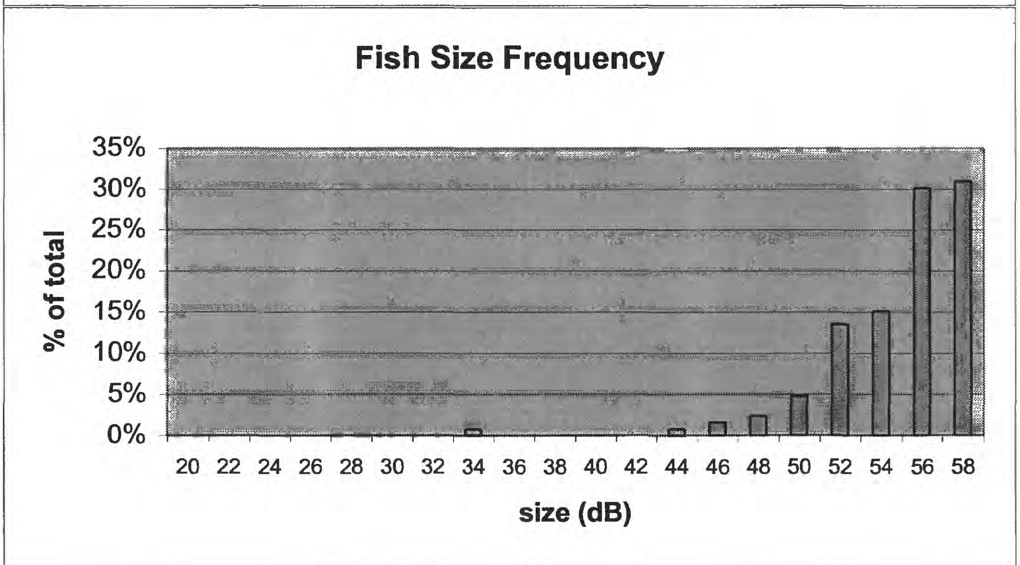
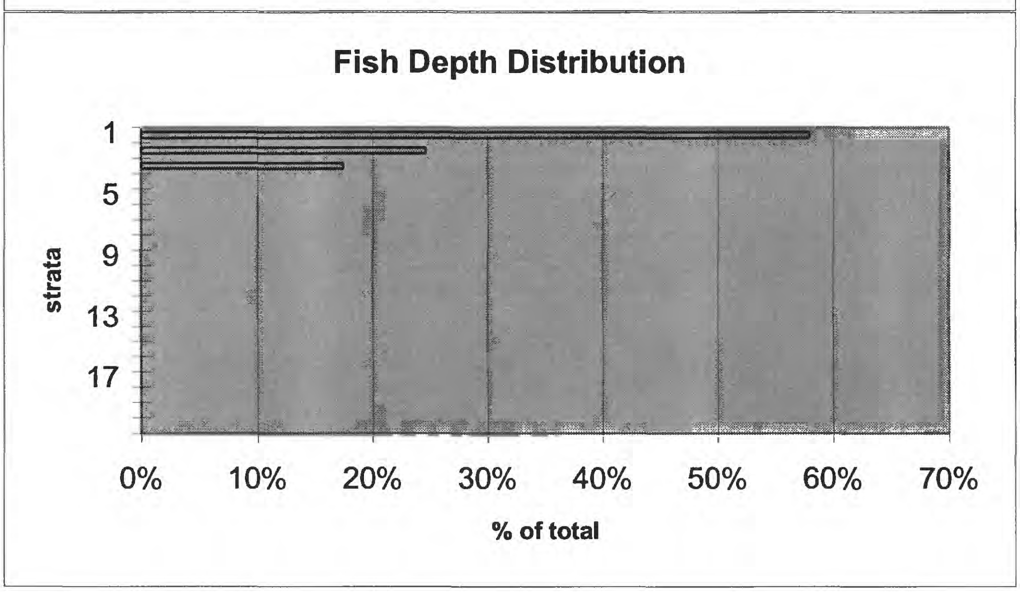
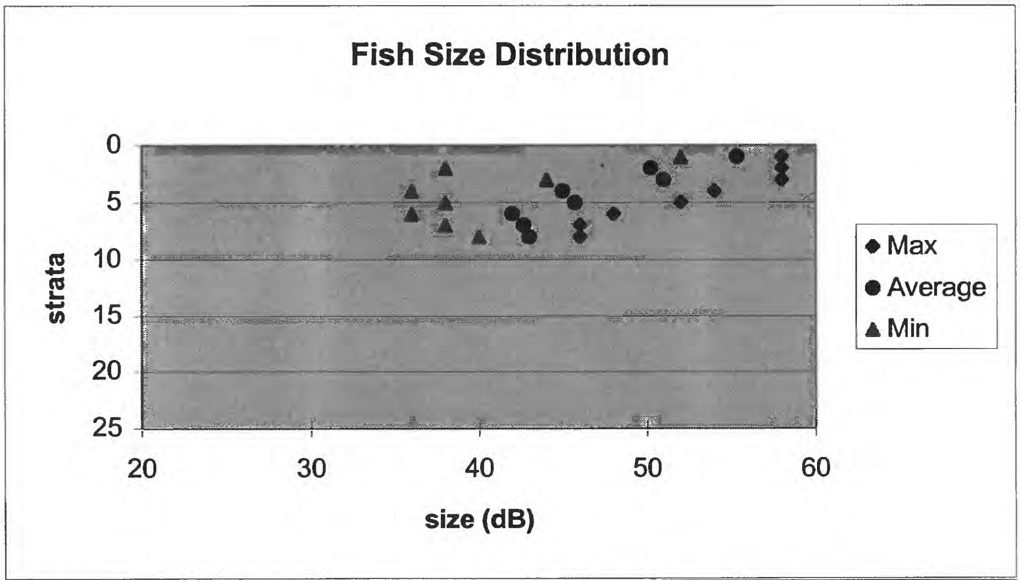
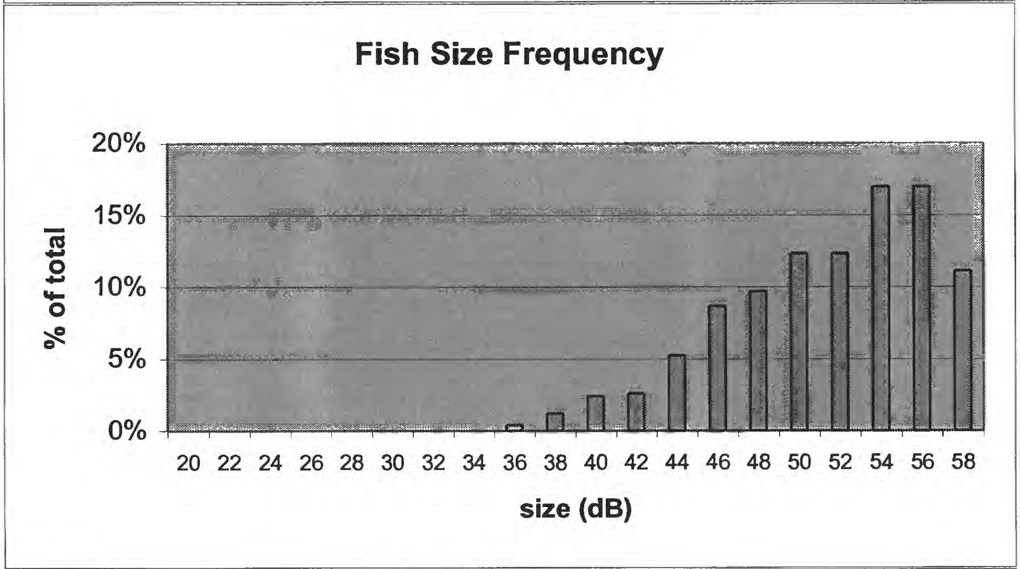
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

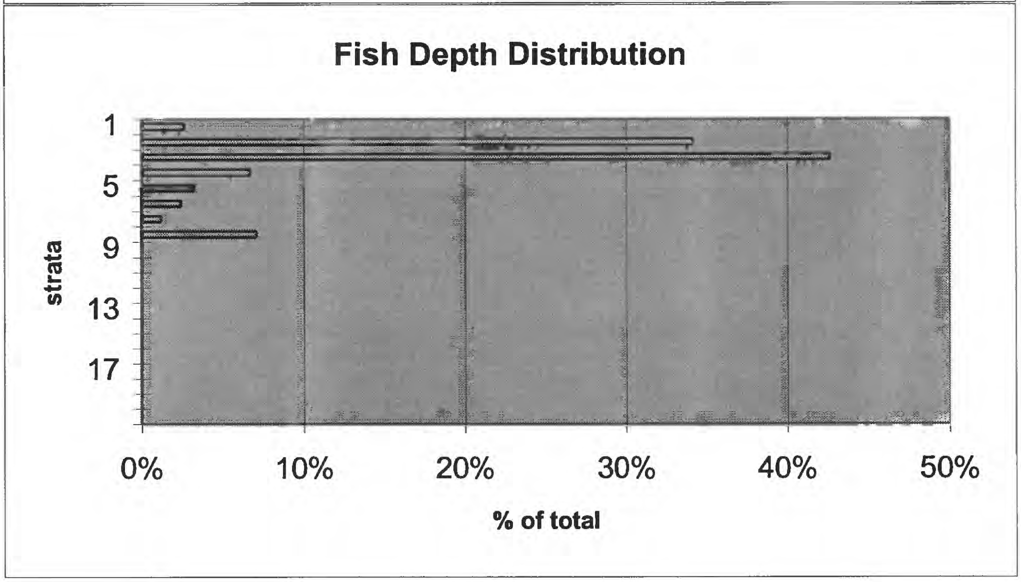

Fish Size Frequency
35%
30%
25%
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

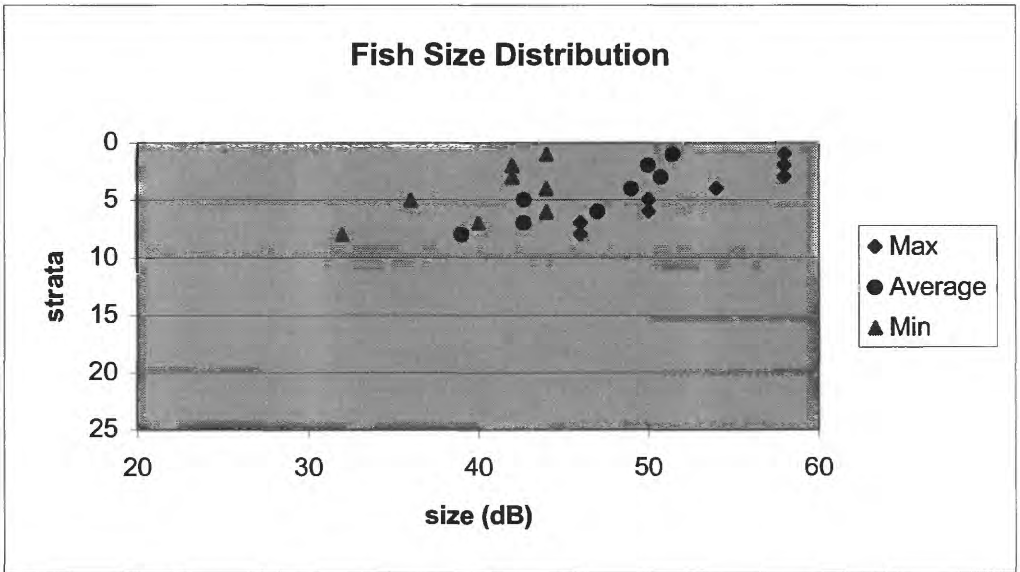

Fish Depth Distribution
1
5
9
13
17
strata
0%
10%
20%
30%
40%
50%
60%
70%
% of total

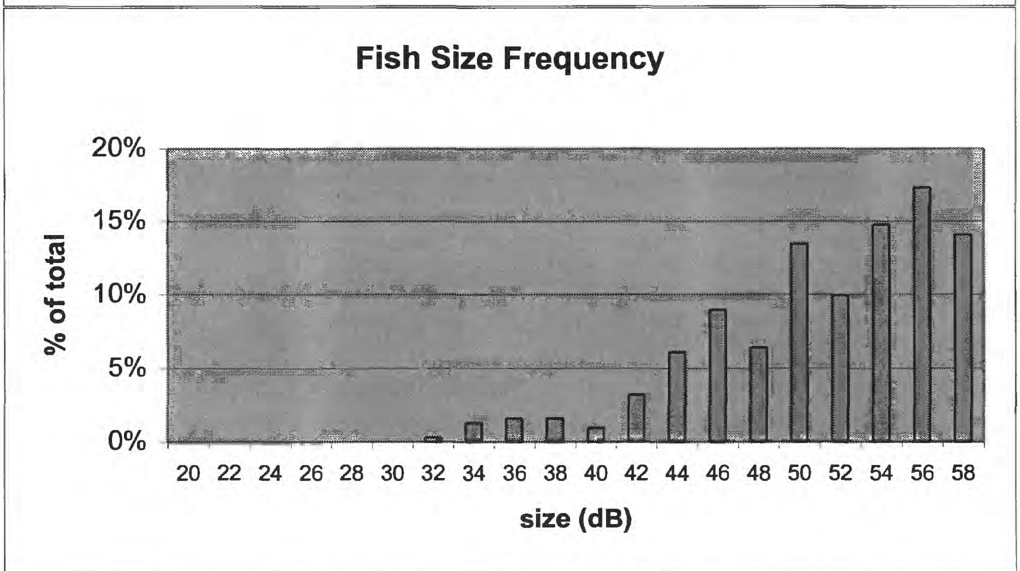
Lake Mead May 1996
M11 A

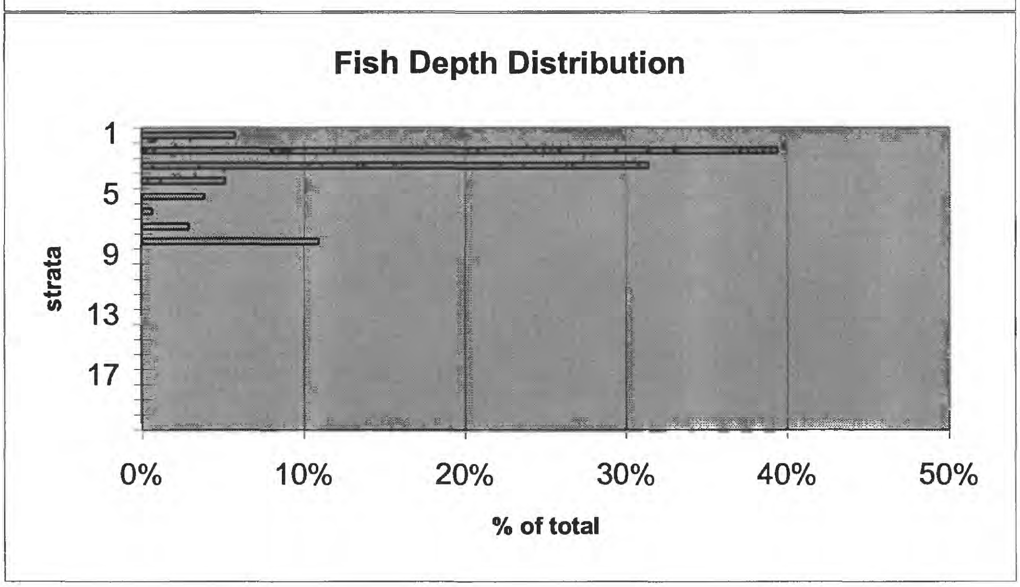




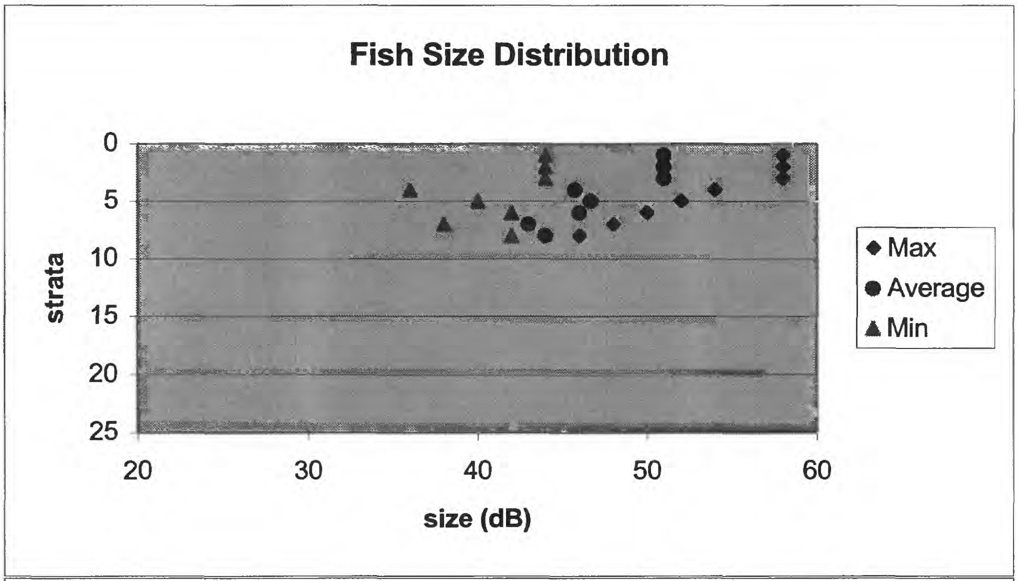


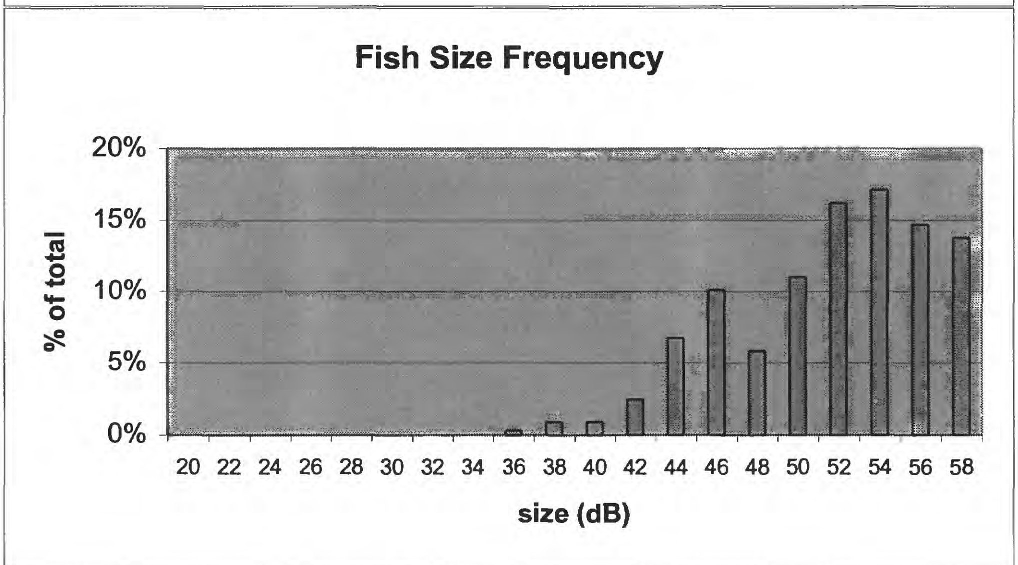

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

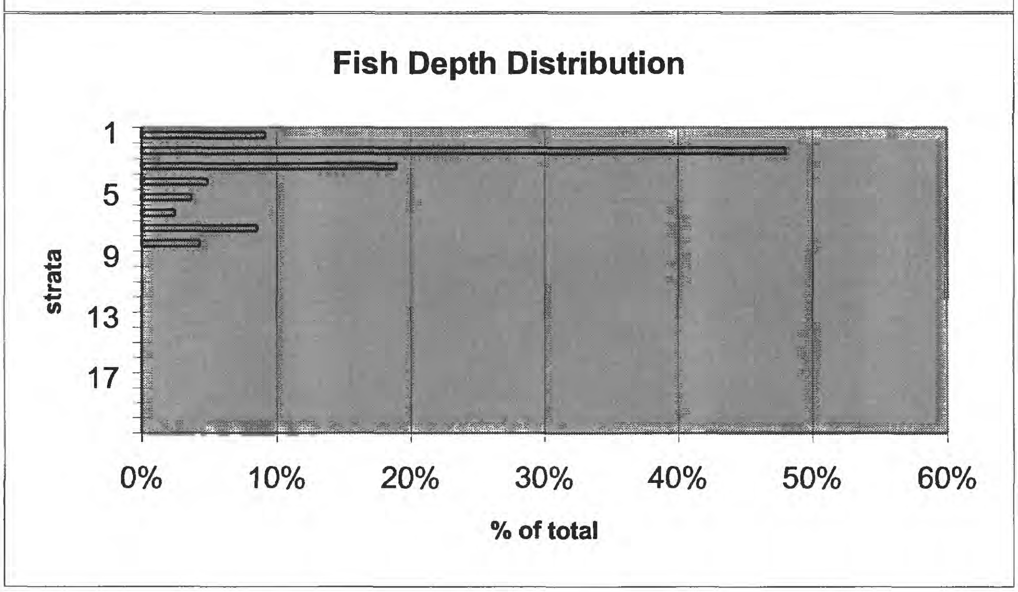

Fish Size Frequency
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

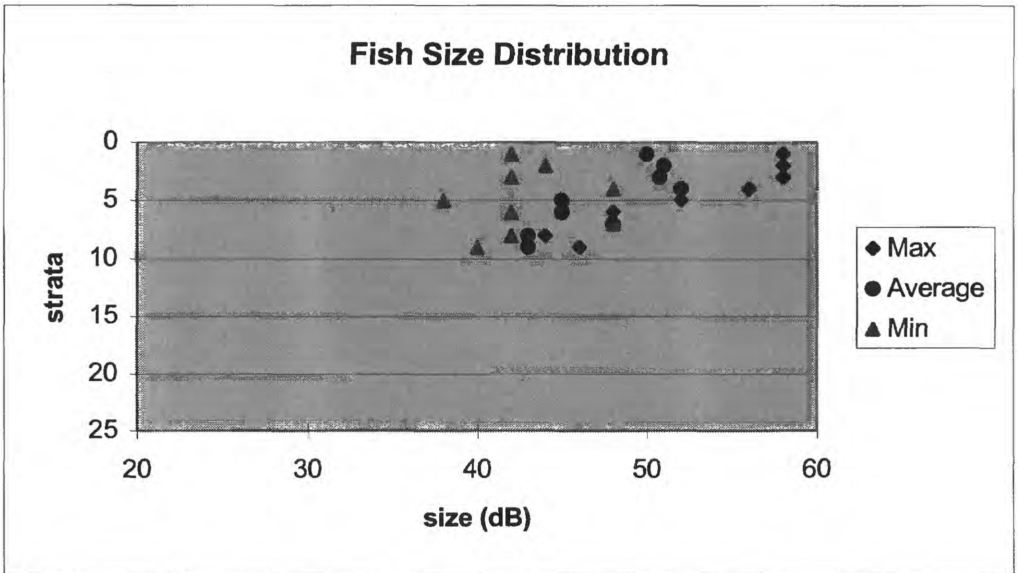

Fish Depth Distribution
1
5
9
13
17
strata
0%
10%
20%
30%
40%
50%
% of total

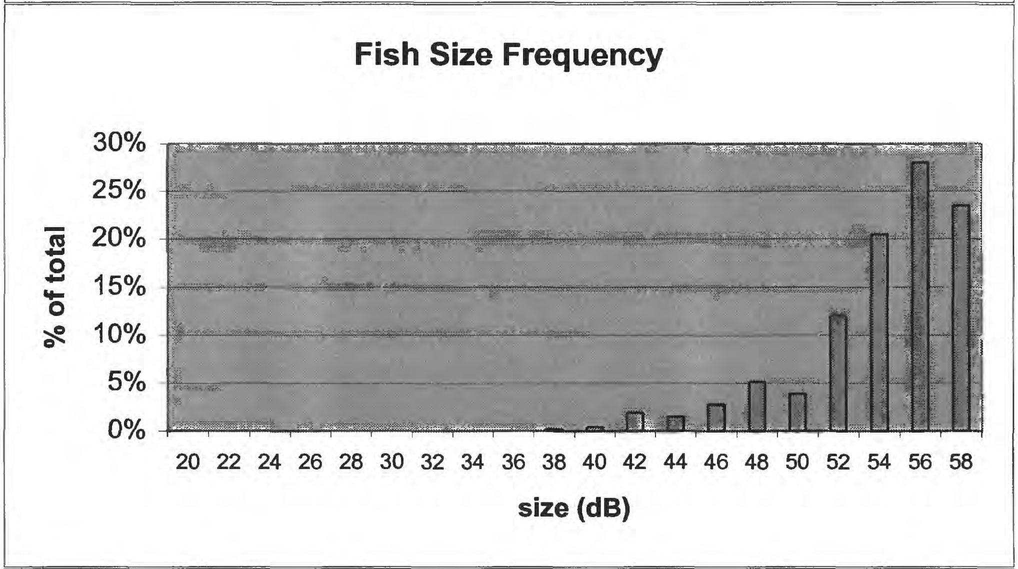
Lake Mead May 1996
M11 C

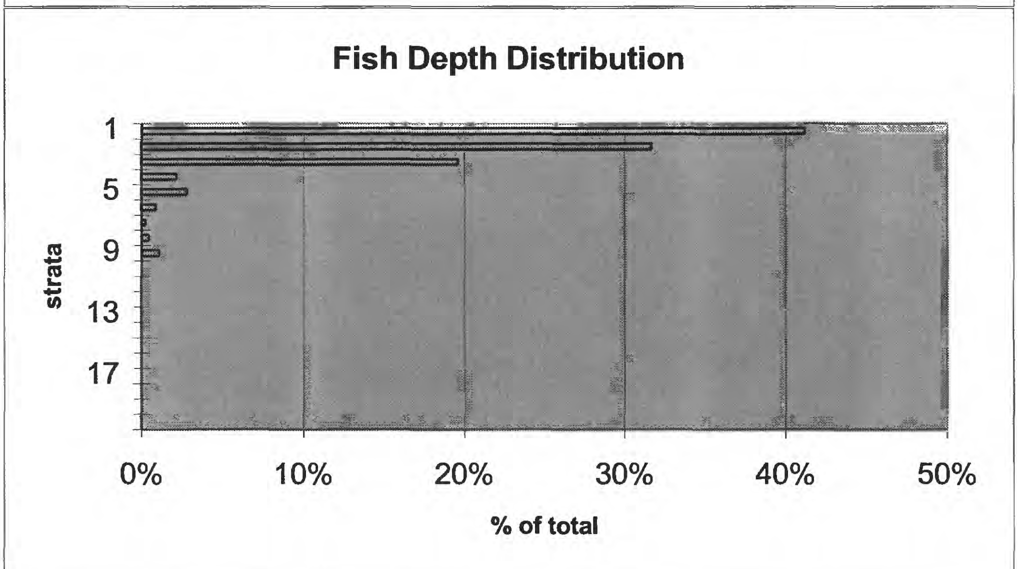




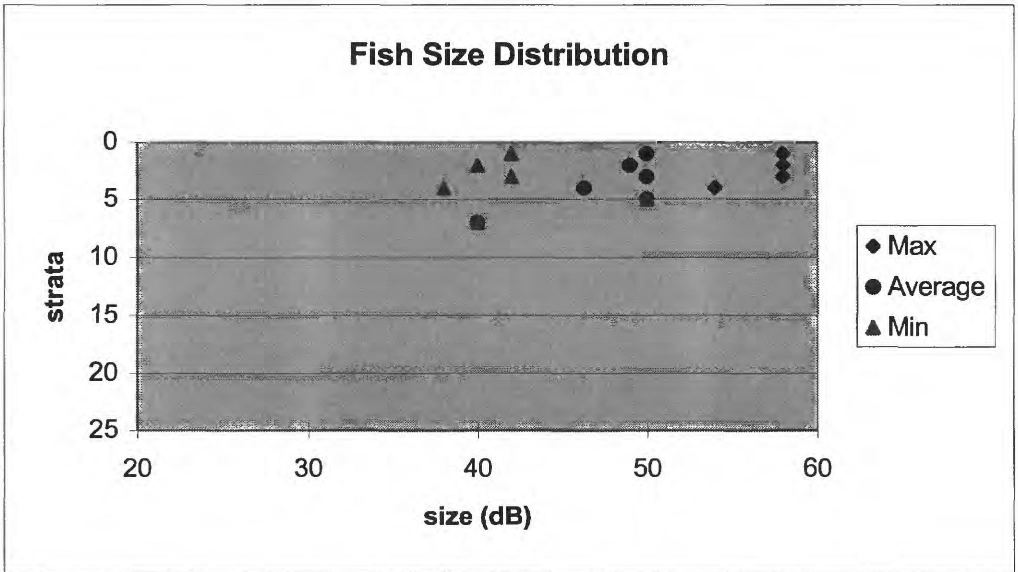


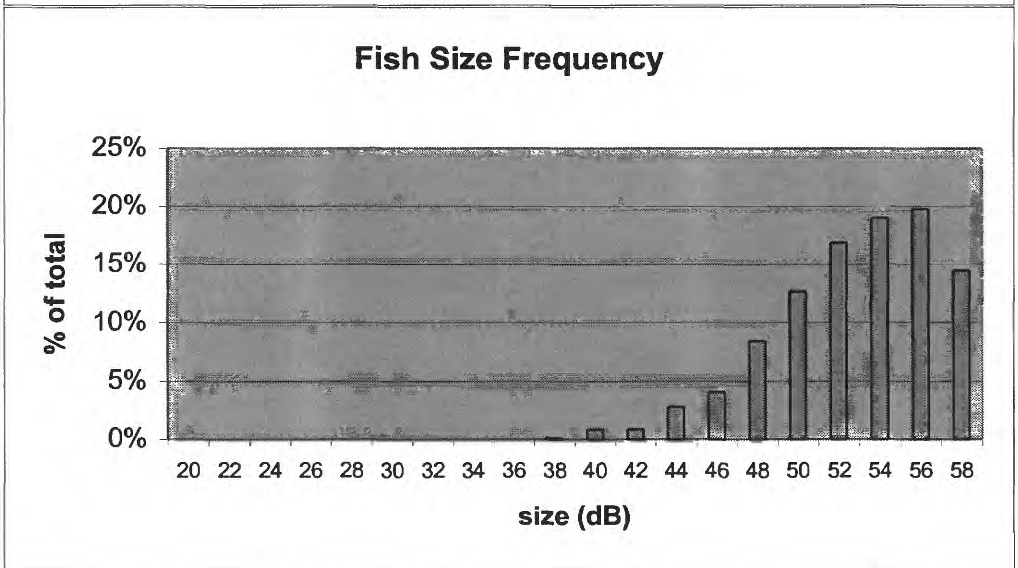

Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min

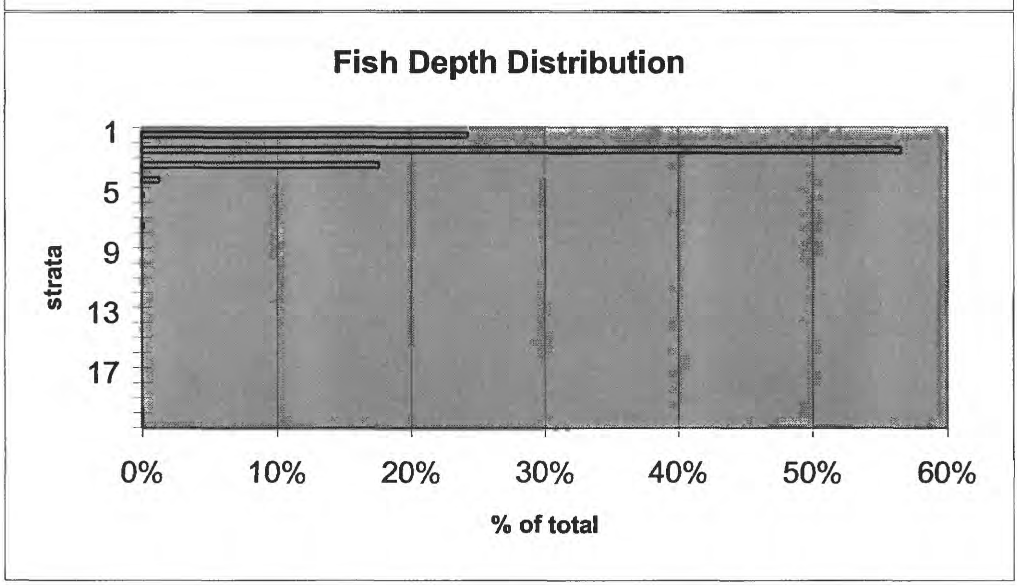

Fish Size Frequency
% of total
30%
25%
20%
15%
10%
5%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
strata
1
5
9
13
17
0%
10%
20%
30%
40%
50%
% of total

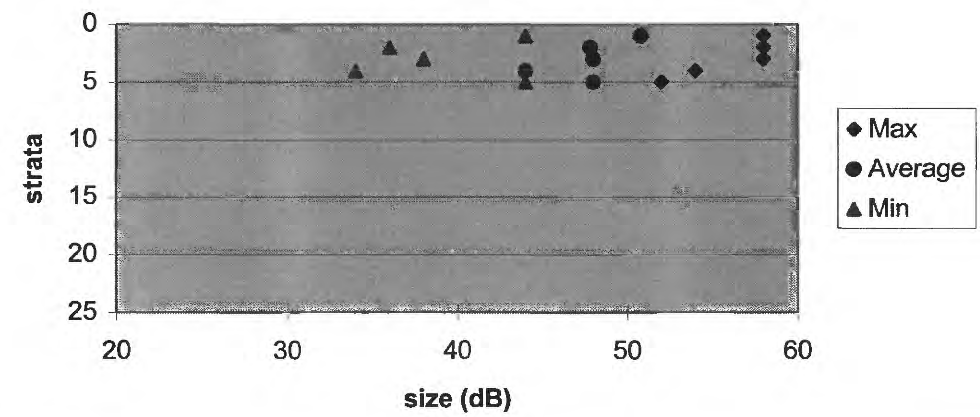
Lake Mead August 1996
M02 B



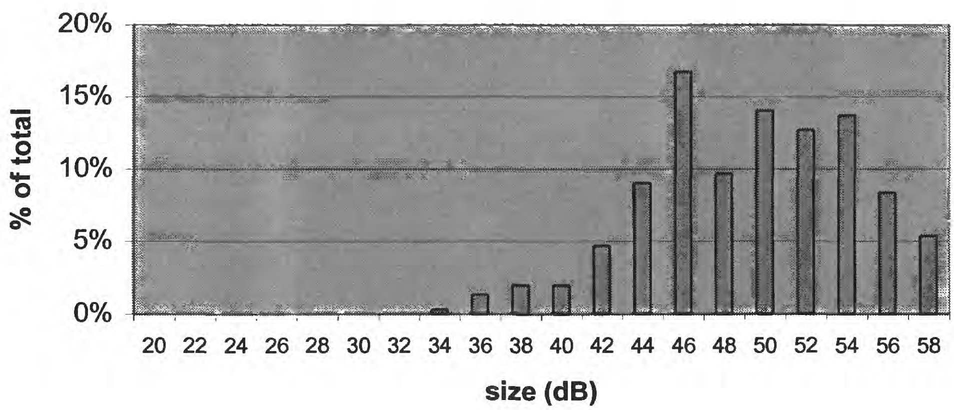




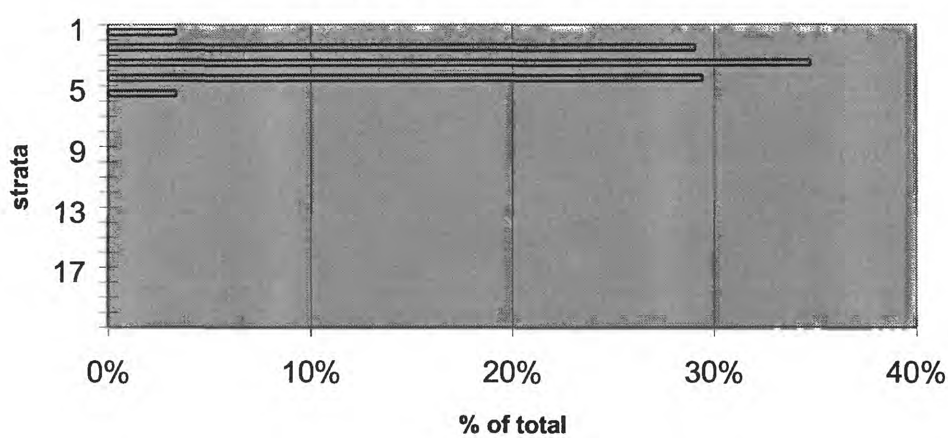
Fish Size Distribution



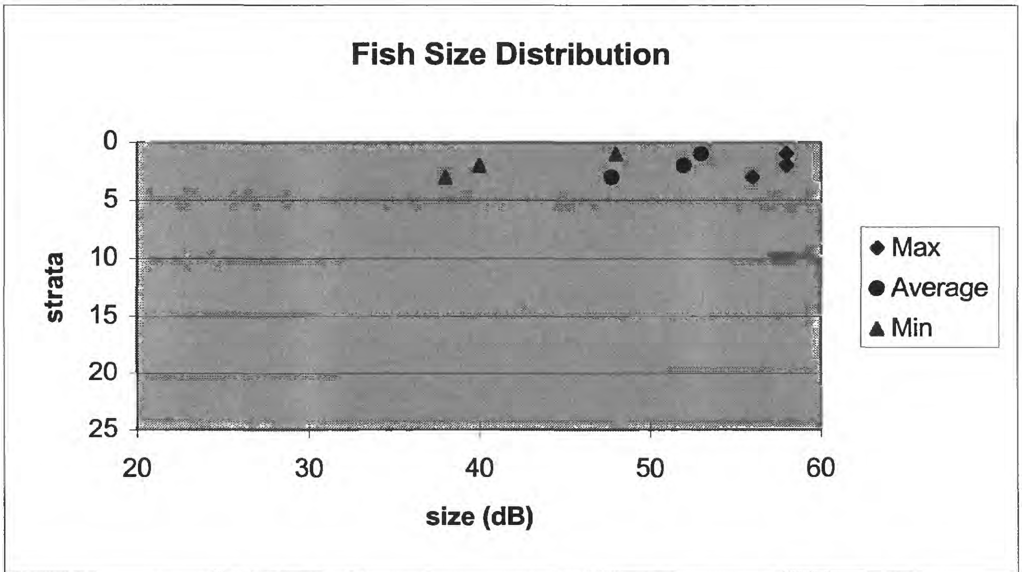
Fish Size Frequency

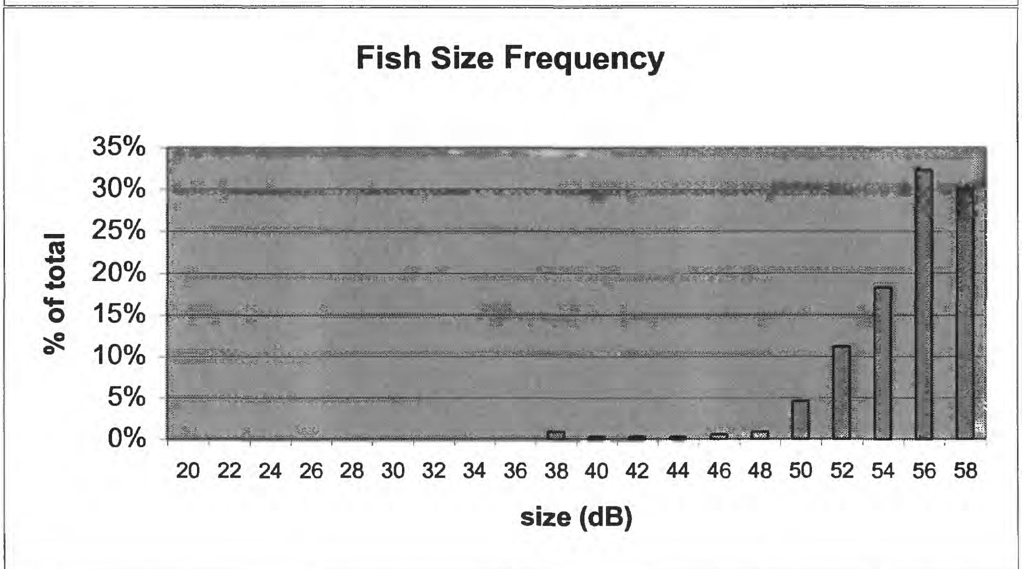


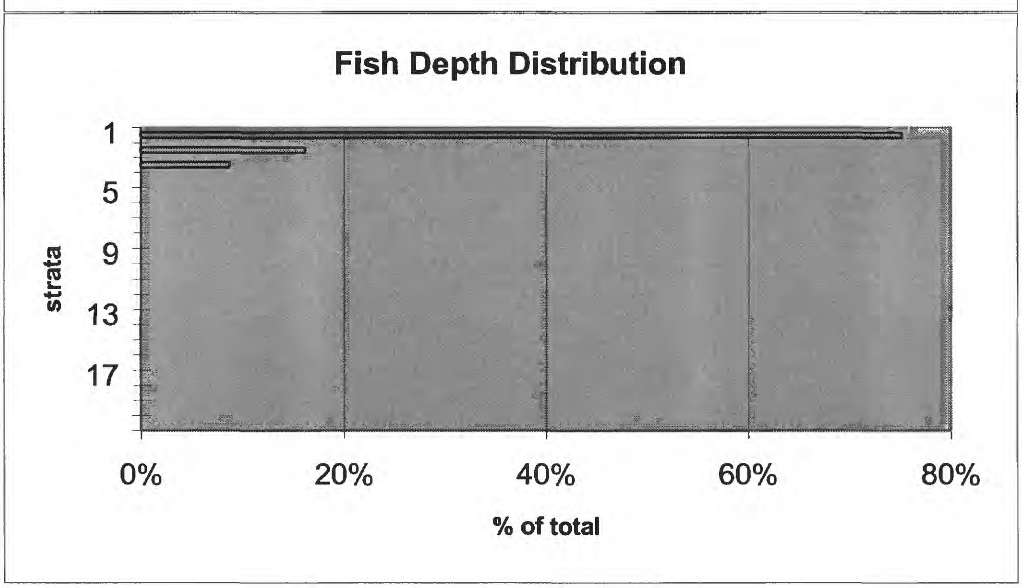
Fish Depth Distribution

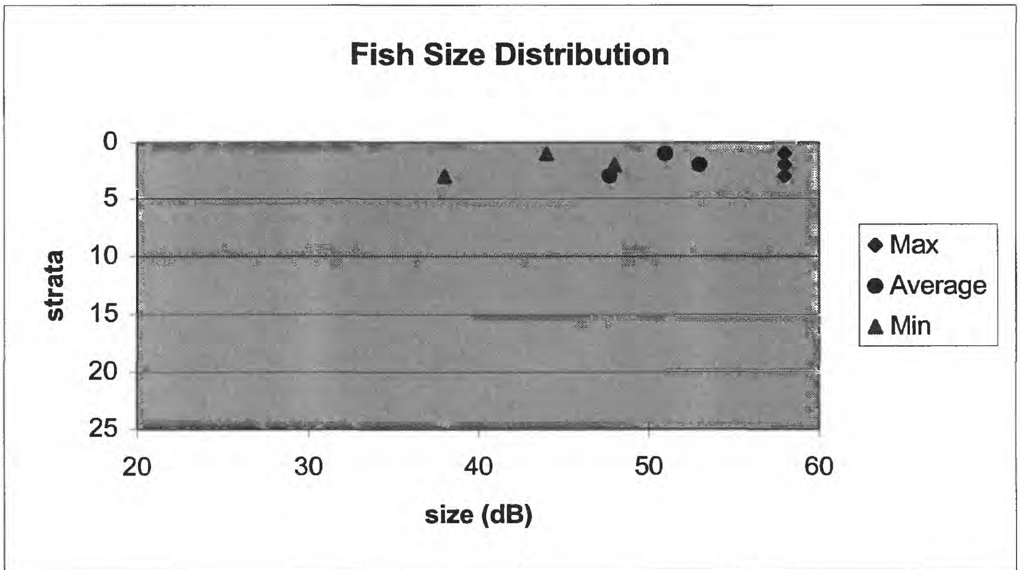


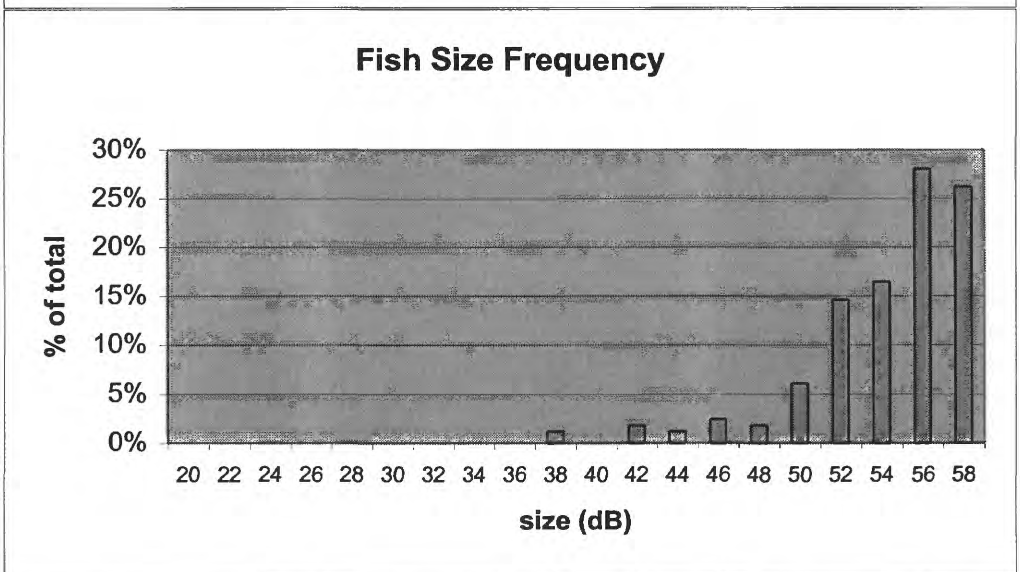
Lake Mead August 1996
M09 A

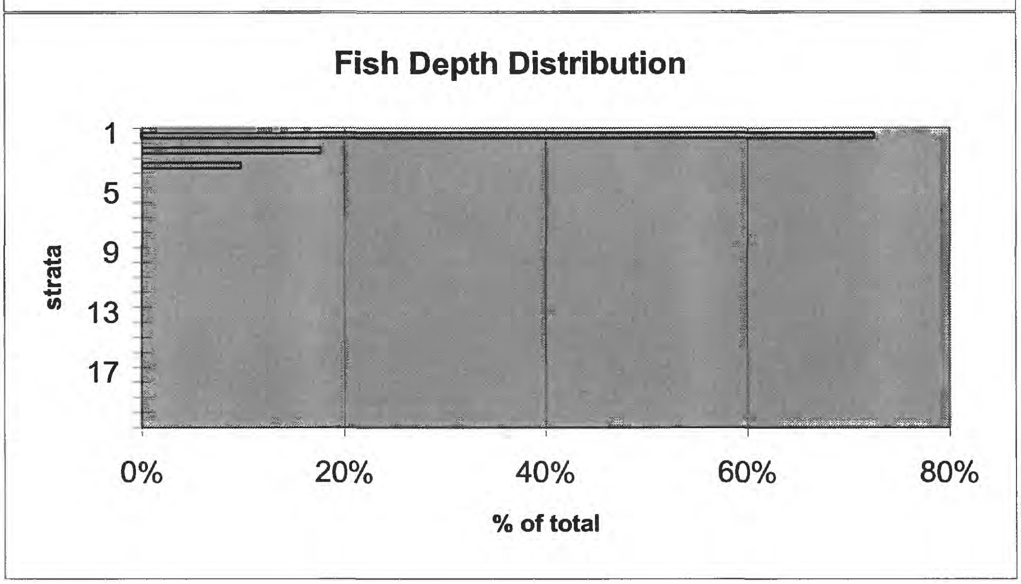


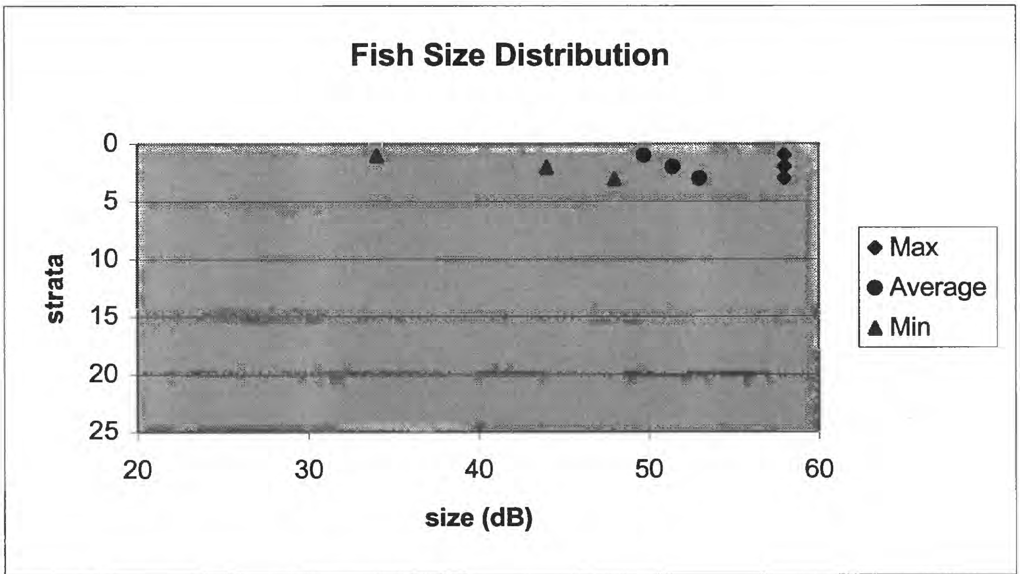


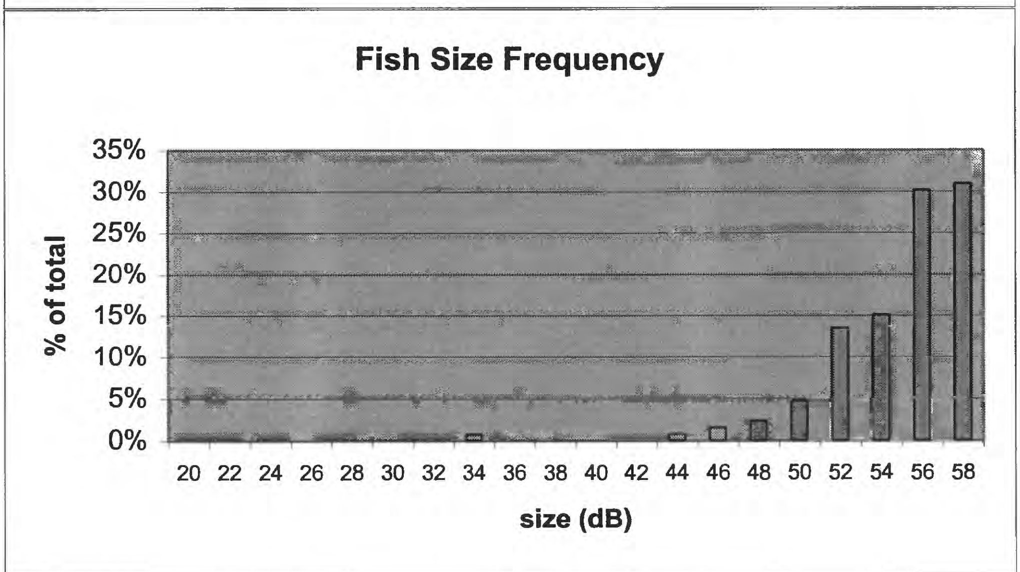


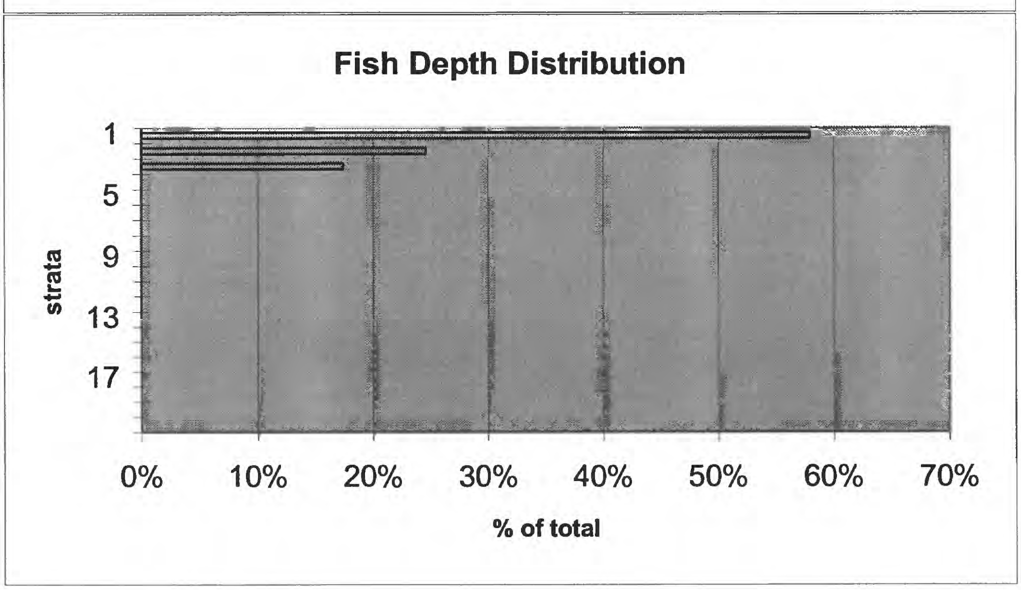

Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
% of total
30%
25%
20%
15%
10%
5%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

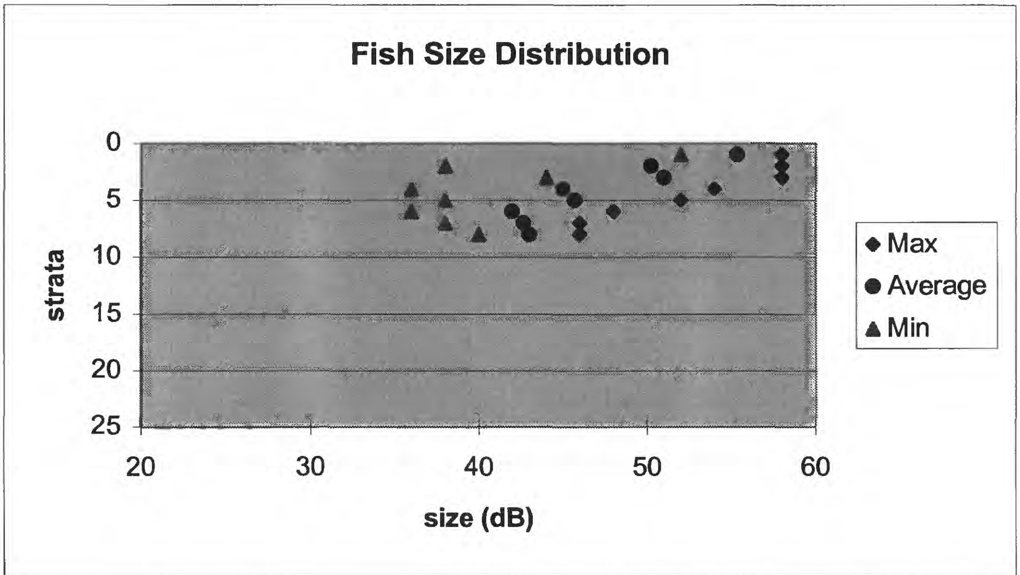

Fish Depth Distribution
strata
1
5
9
13
17
0%
20%
40%
60%
80%
% of total

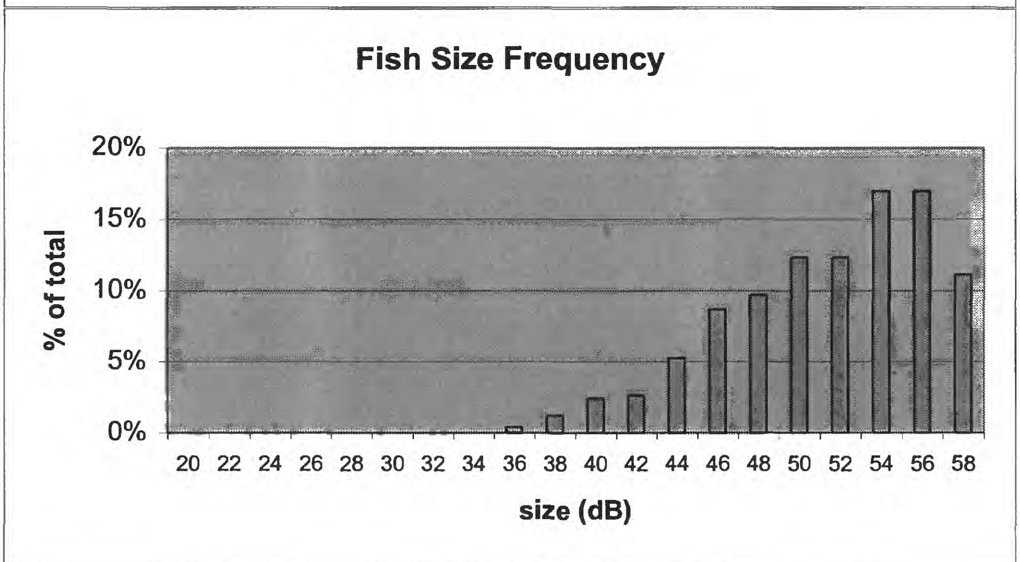

Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min

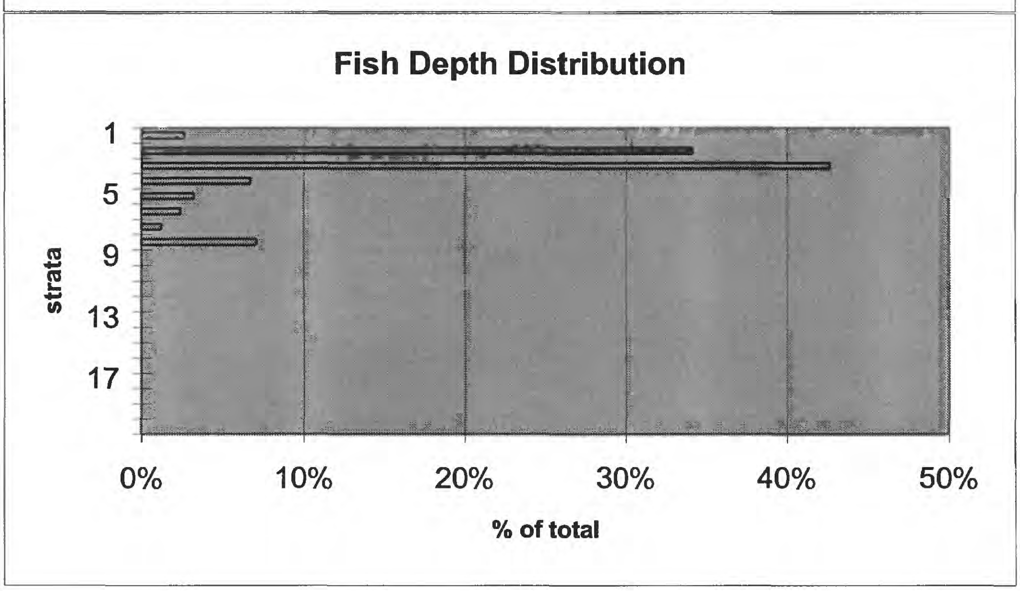

Fish Size Frequency
% of total
35%
30%
25%
20%
15%
10%
5%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

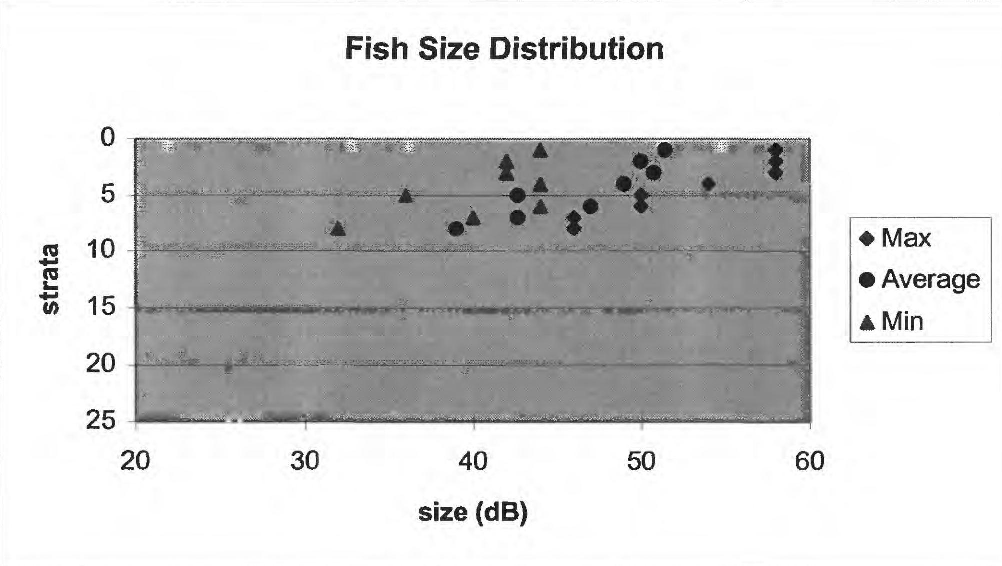

Fish Depth Distribution
strata
1
5
9
13
17
0%
10%
20%
30%
40%
50%
60%
70%
% of total

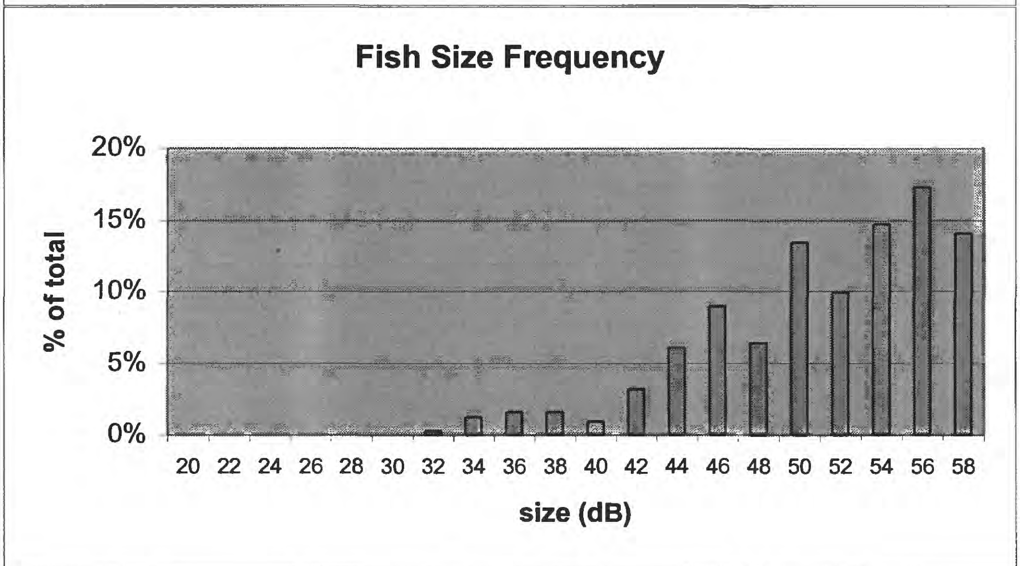
Lake Mead August 1996
M11 A

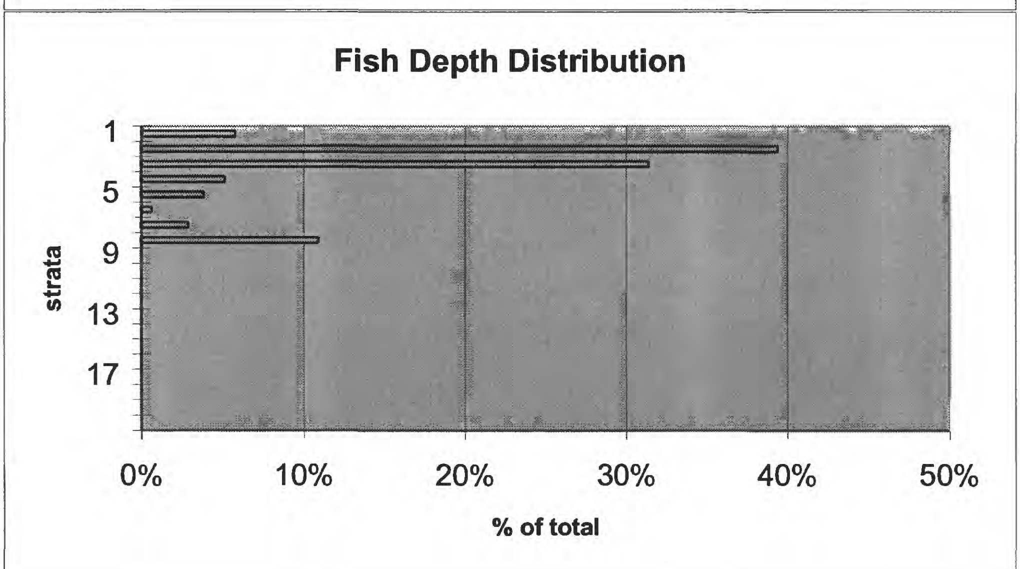


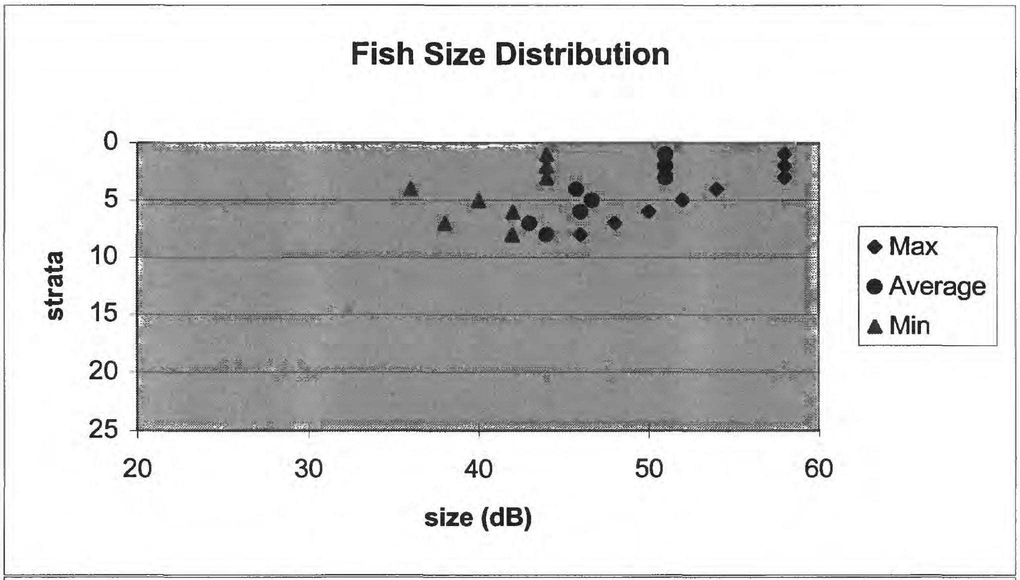


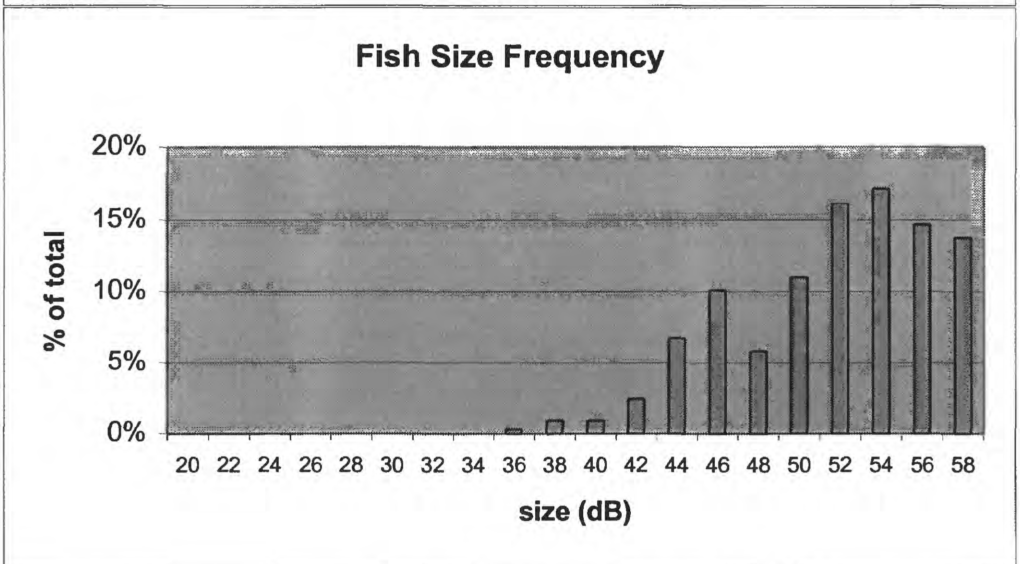


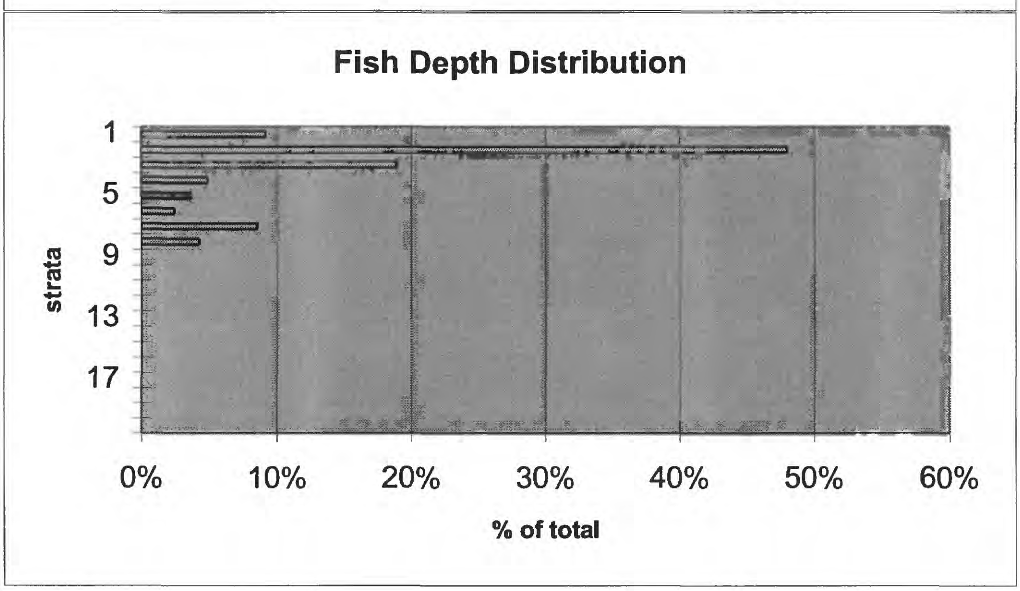

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

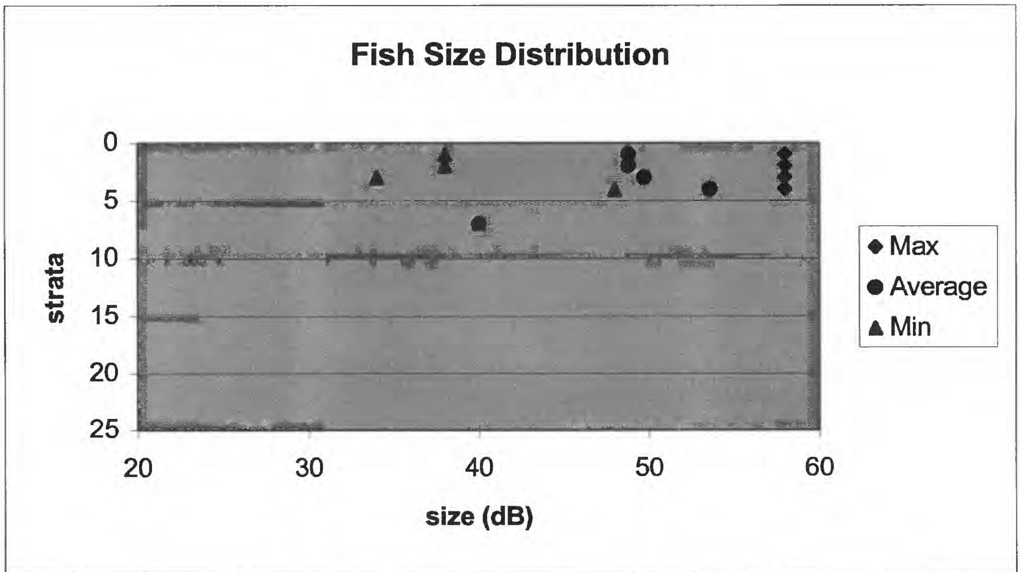

Fish Depth Distribution
1
5
9
13
17
strata
0%
10%
20%
30%
40%
50%
% of total

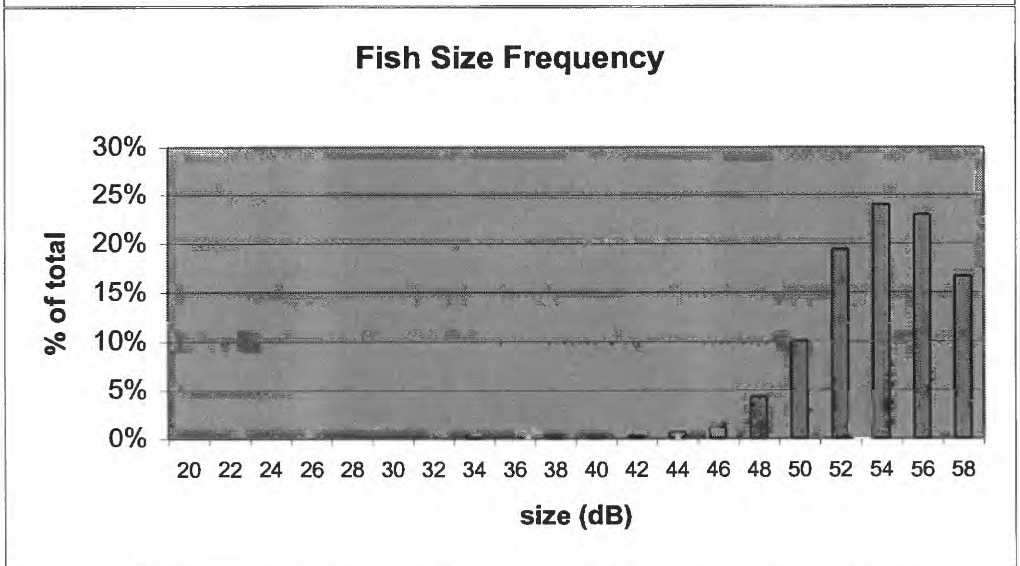

Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min

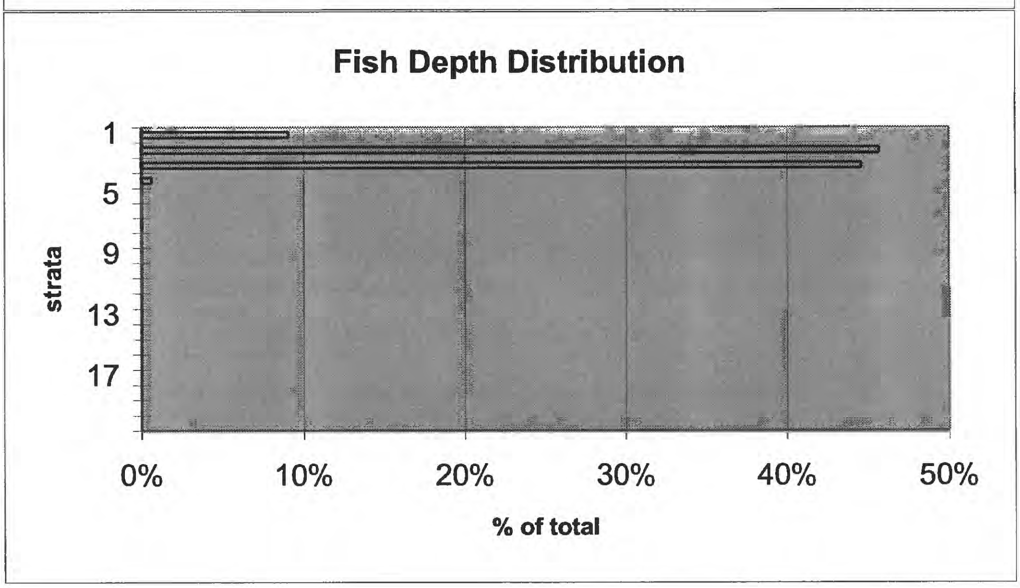

Fish Size Frequency
% of total
20%
15%
10%
5%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

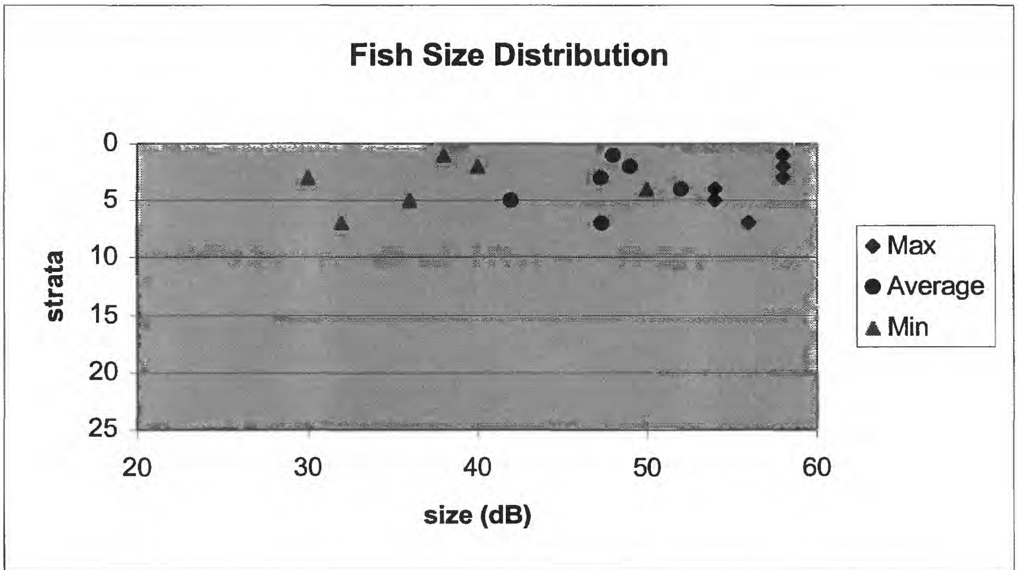

Fish Depth Distribution
strata
1
5
9
13
17
0%
10%
20%
30%
40%
50%
60%
% of total

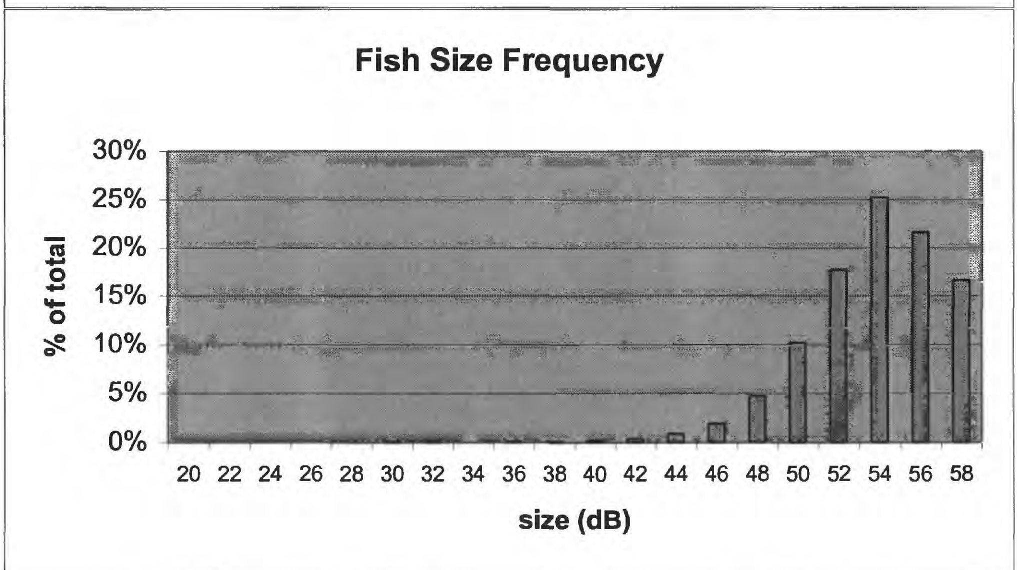
Lake Mead May 1997
M02 A

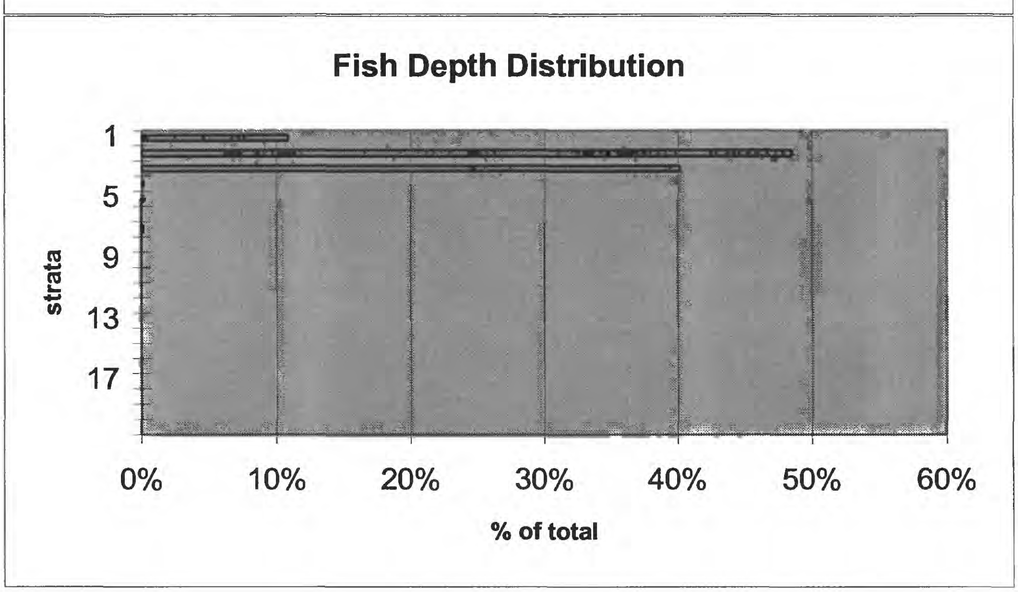




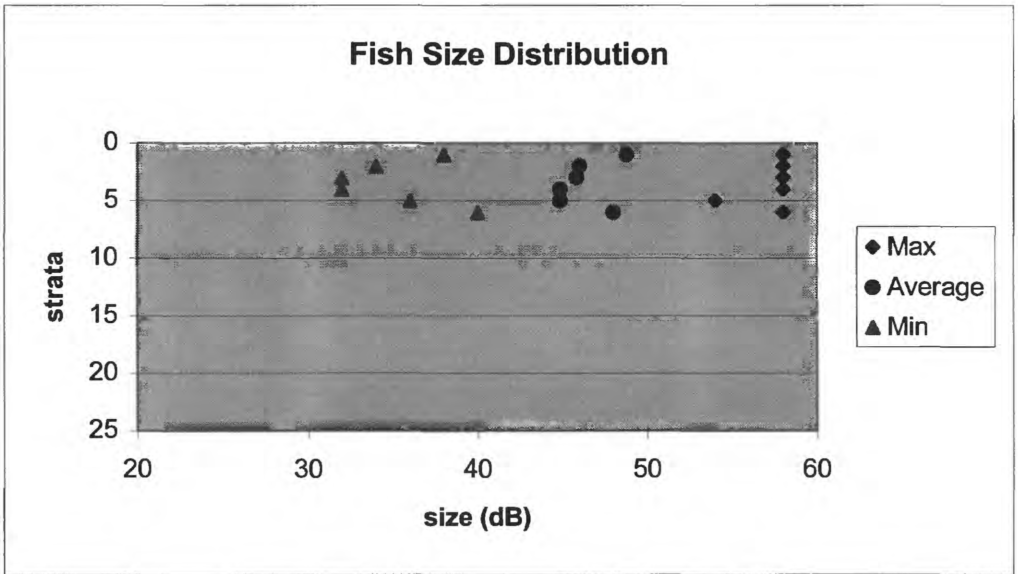


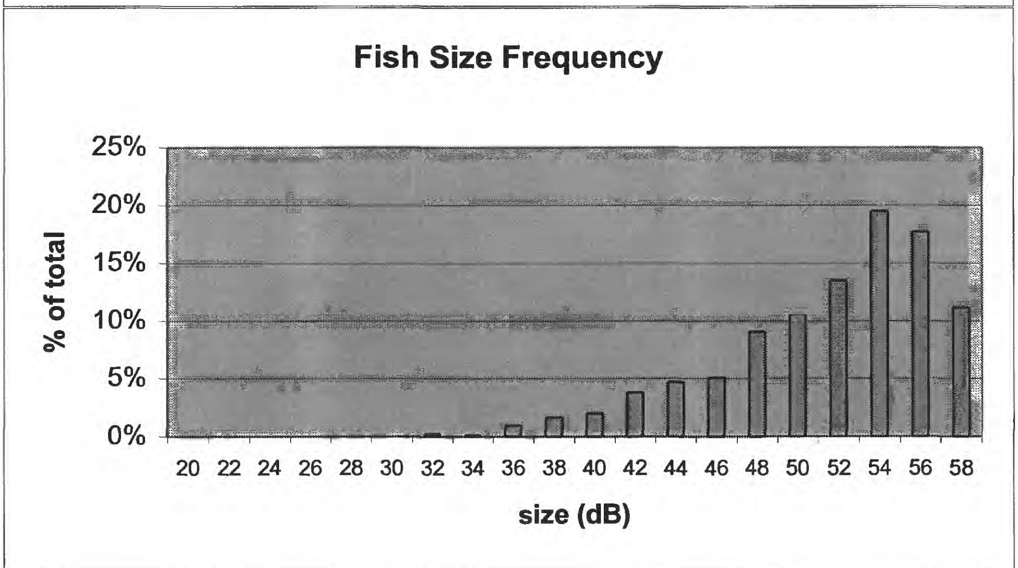

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

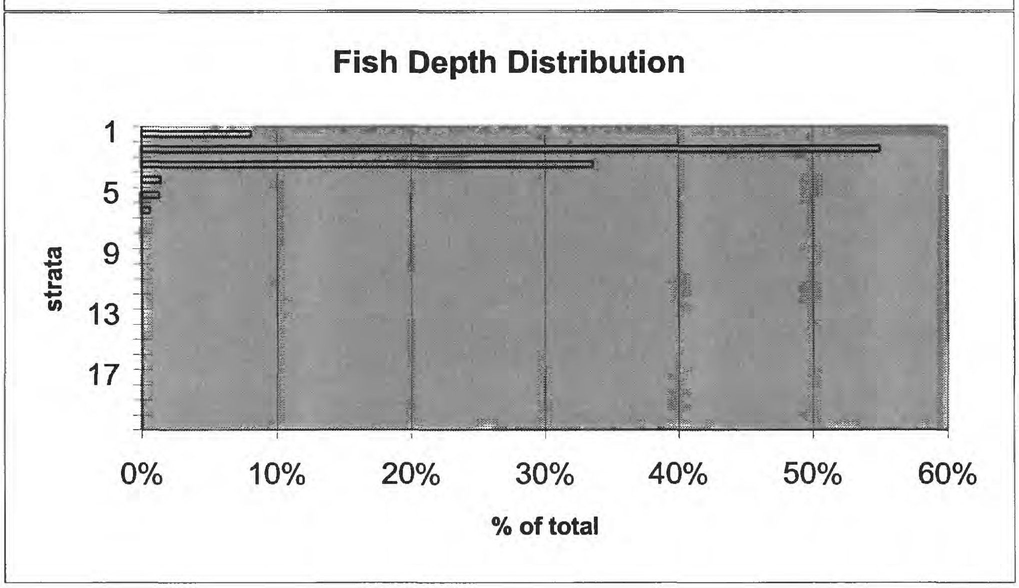

Fish Size Frequency
30%
25%
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
1
5
9
13
17
strata
0%
10%
20%
30%
40%
50%
60%
% of total

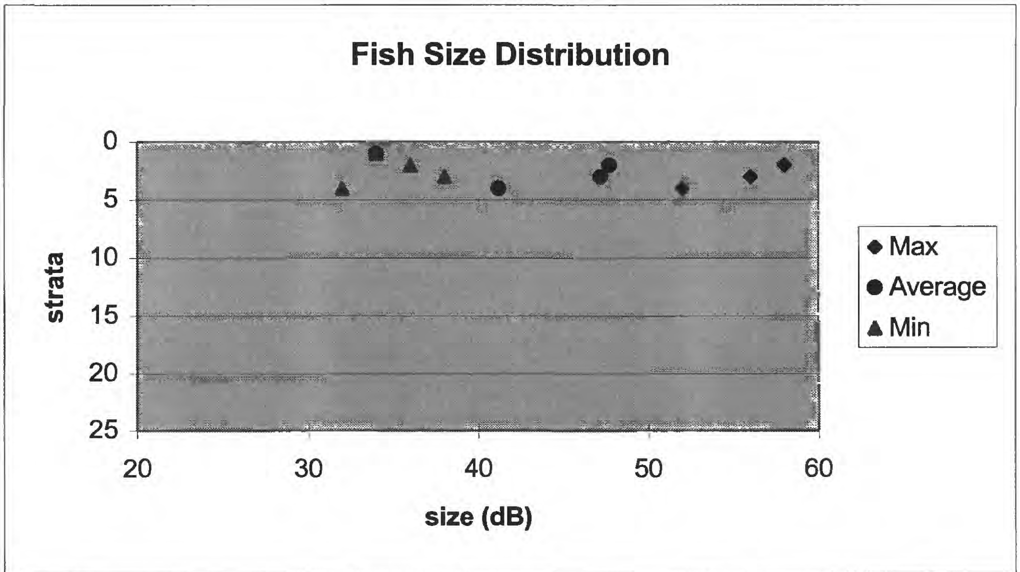
Lake Mead May 1997
M02 C

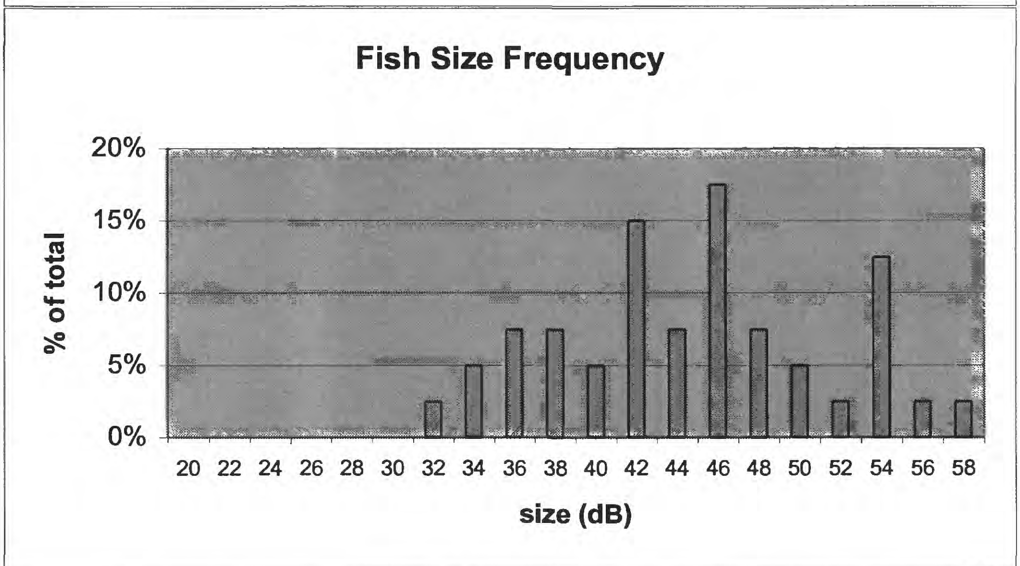


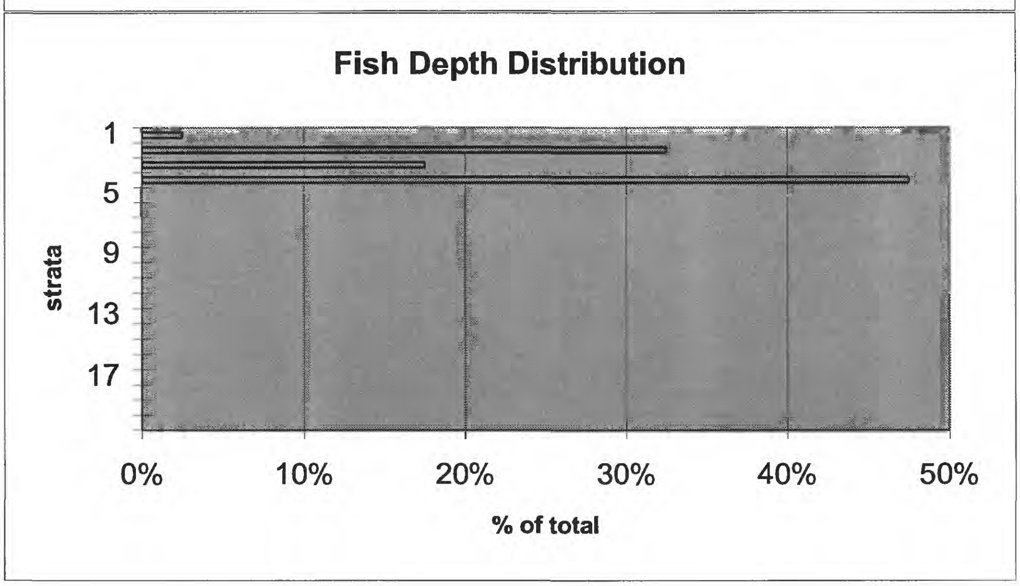




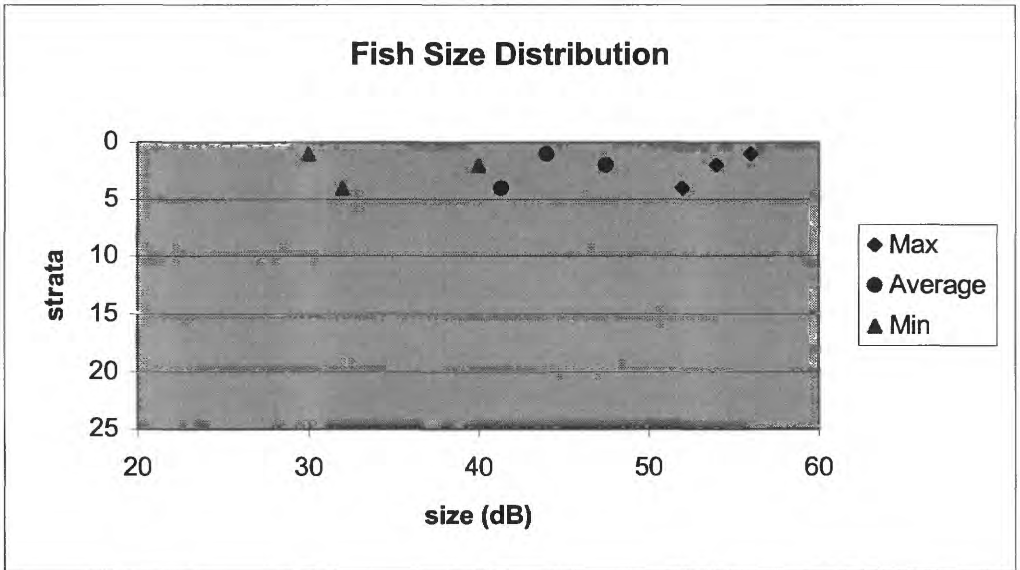
Lake Mead May 1997
M09 A

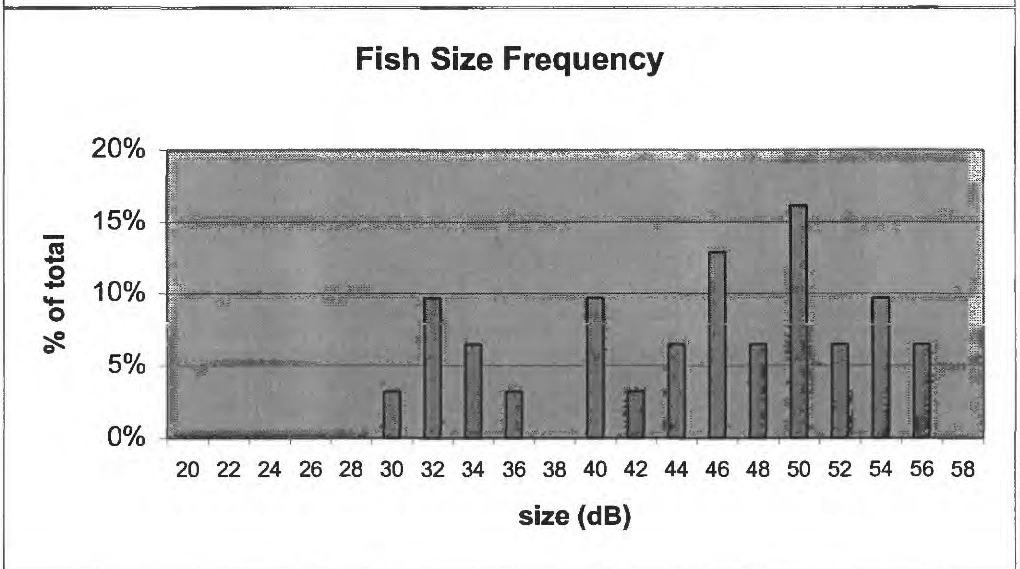


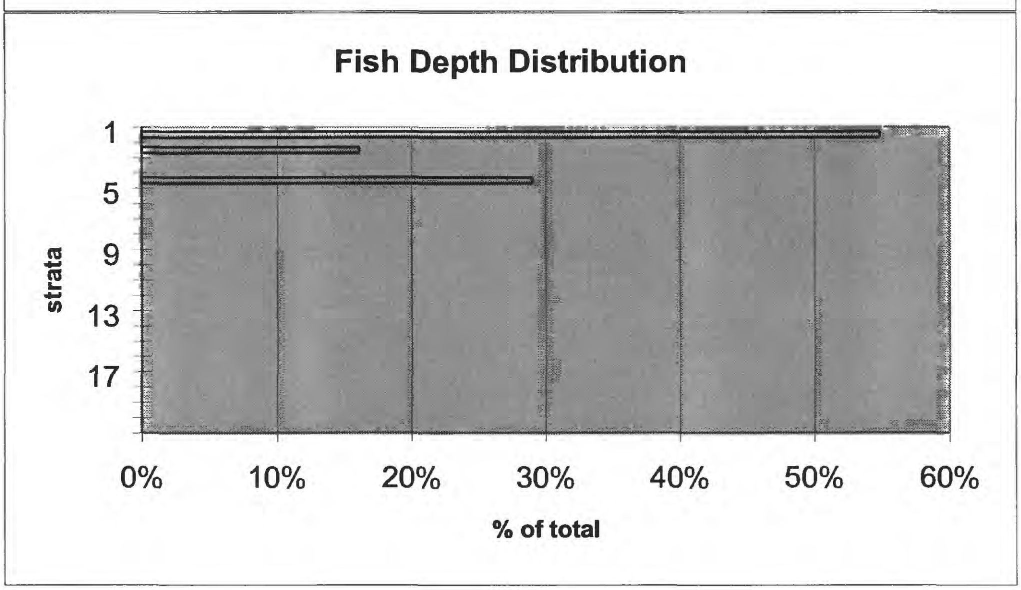




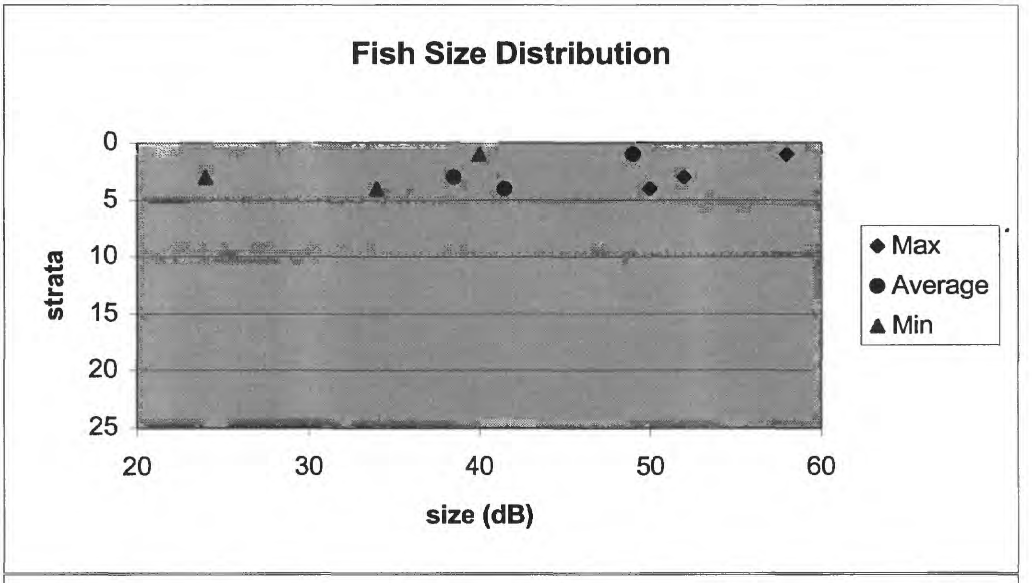
Lake Mead May 1997
M09 B

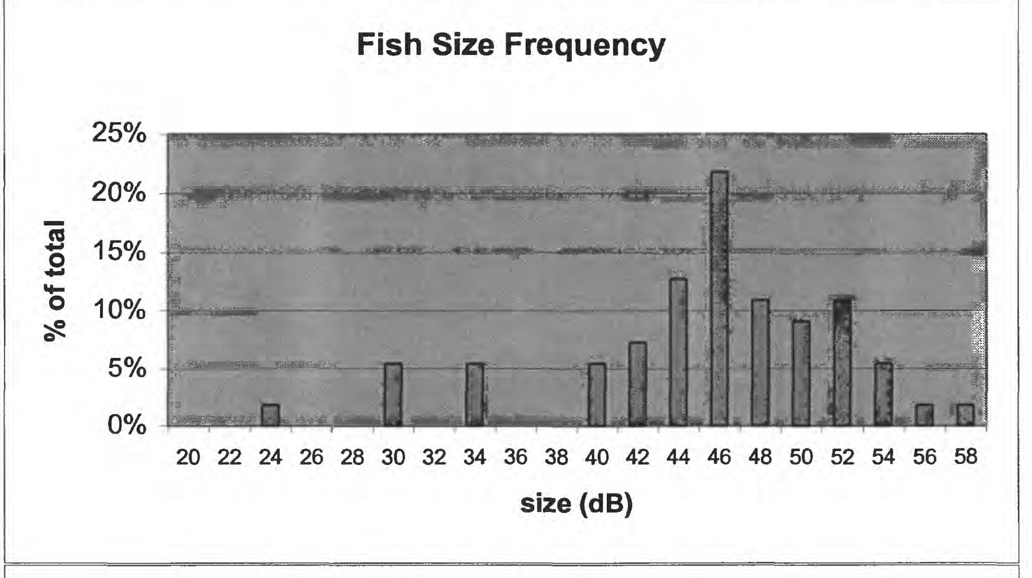


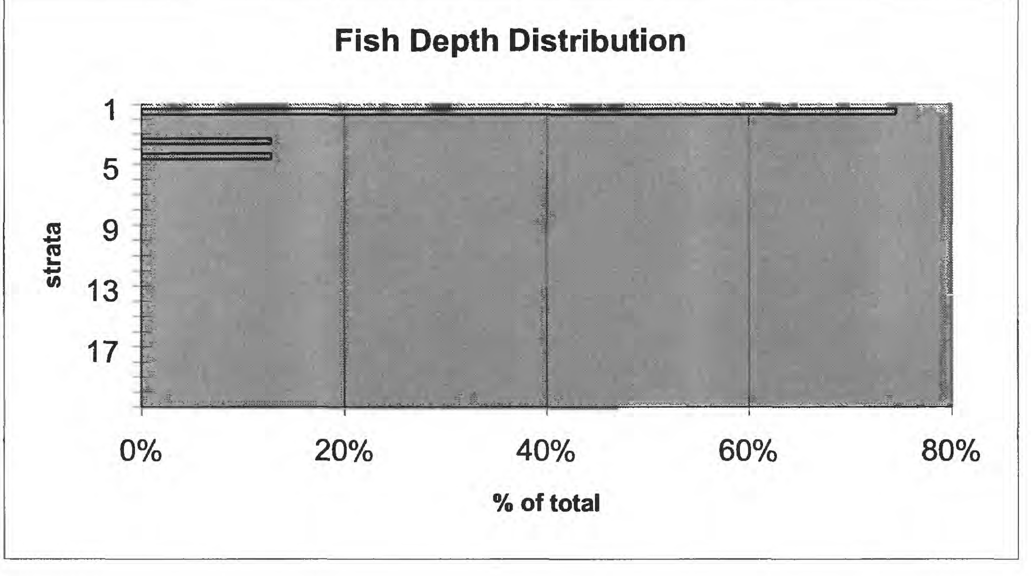


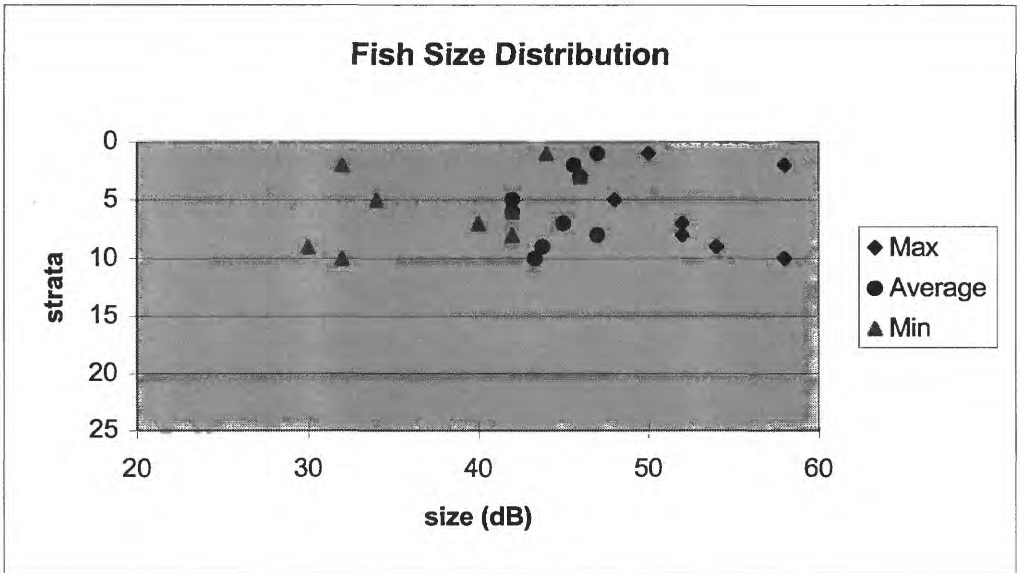


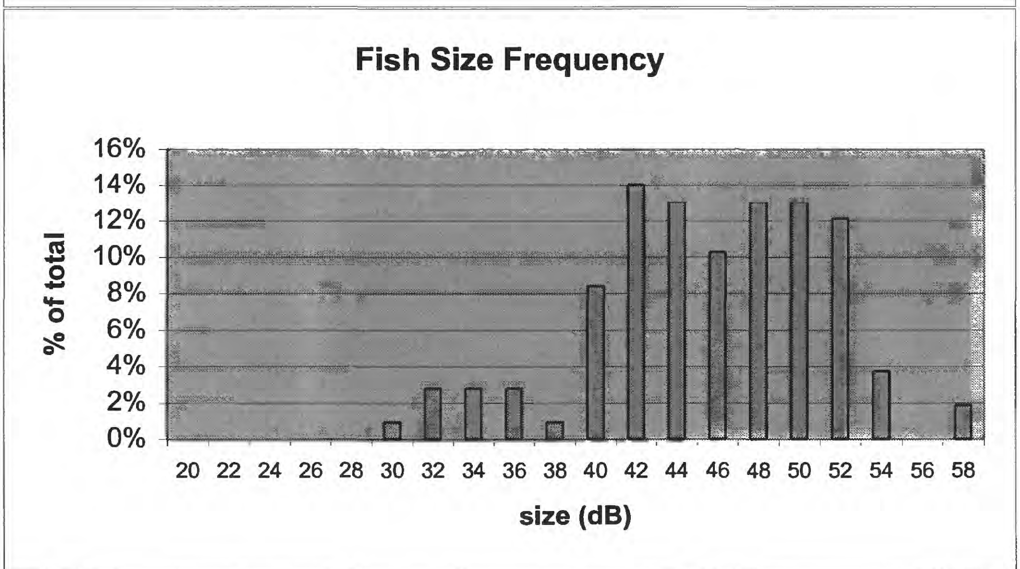
Lake Mead May 1997
M09 C

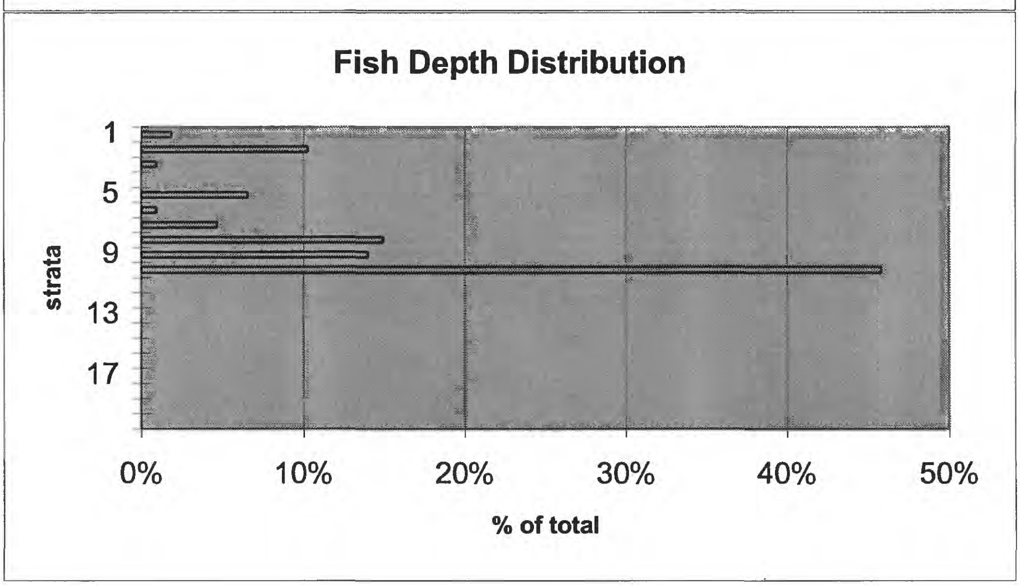




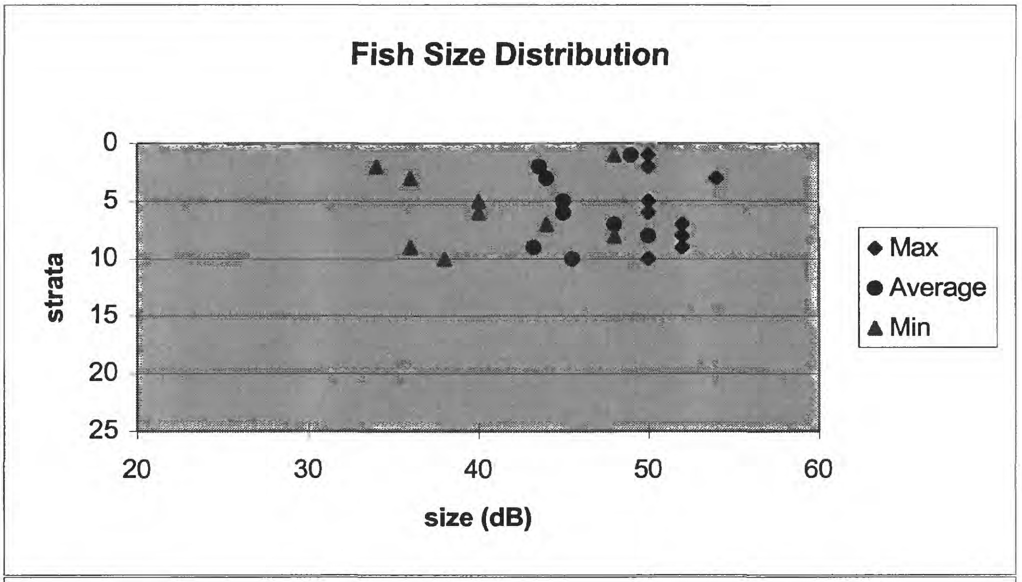


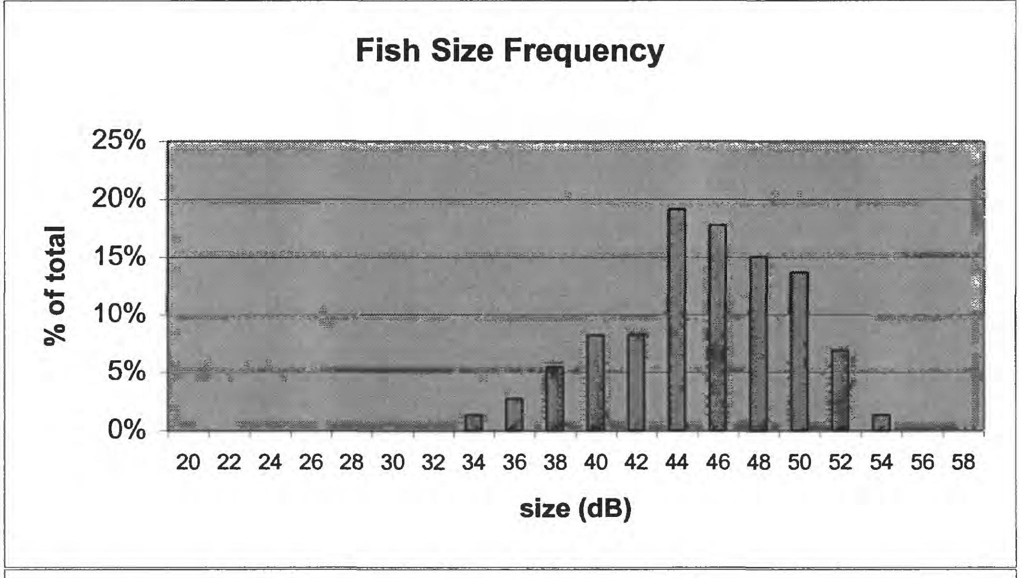

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

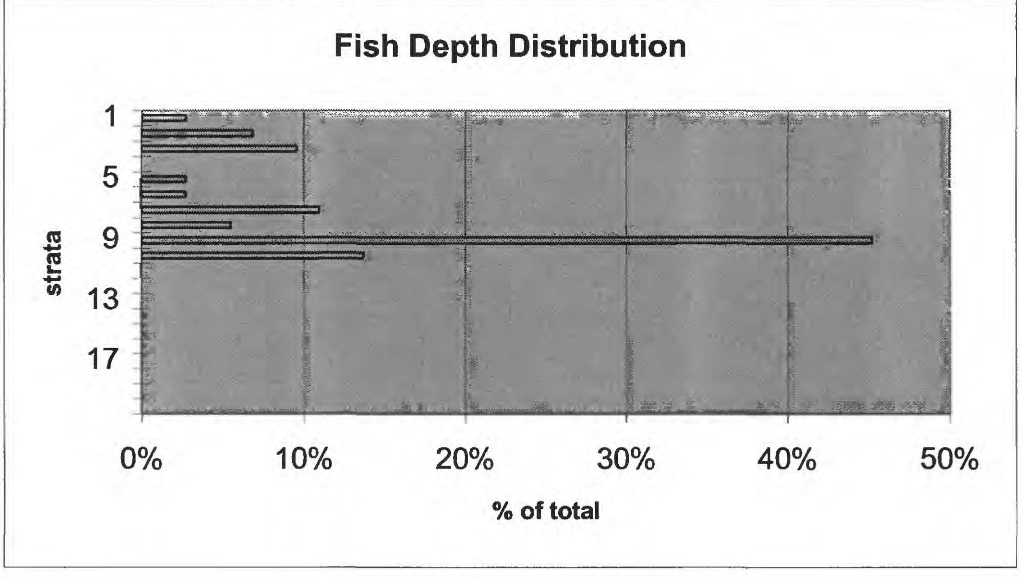

Fish Size Frequency
16%
14%
12%
10%
8%
6%
4%
2%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
1
5
9
13
17
strata
0%
10%
20%
30%
40%
50%
% of total

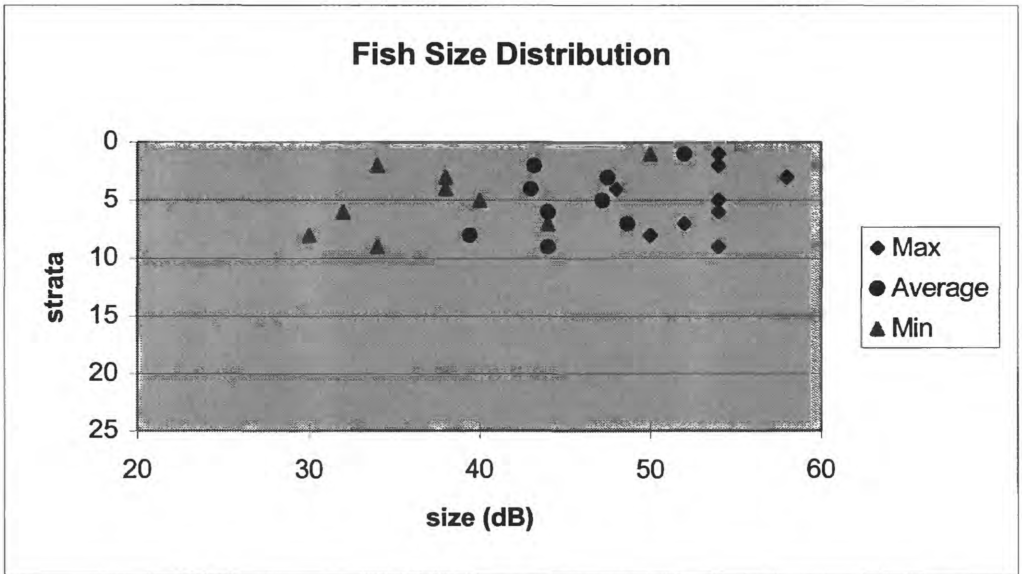
Lake Mead May 1997
M11 B

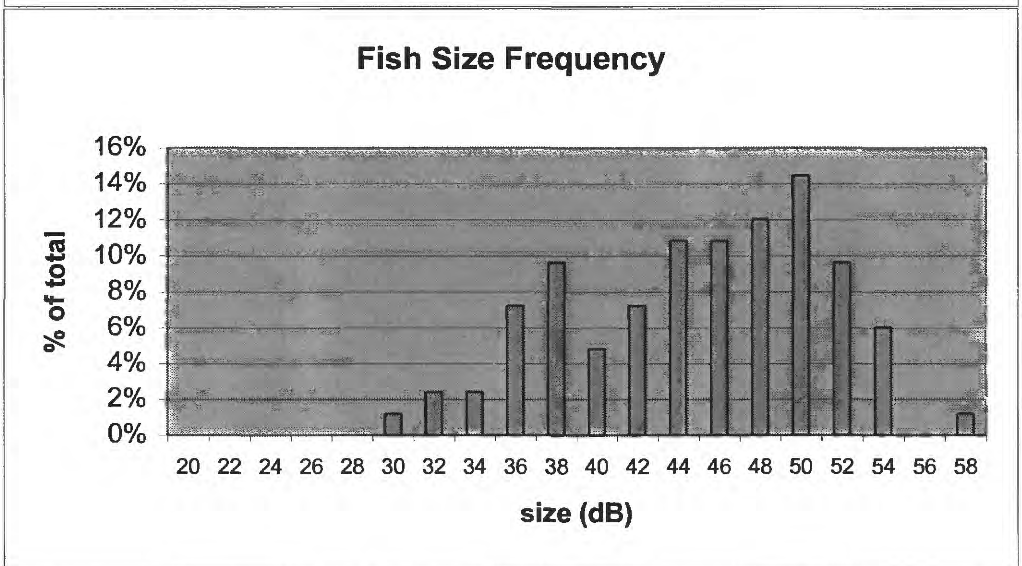


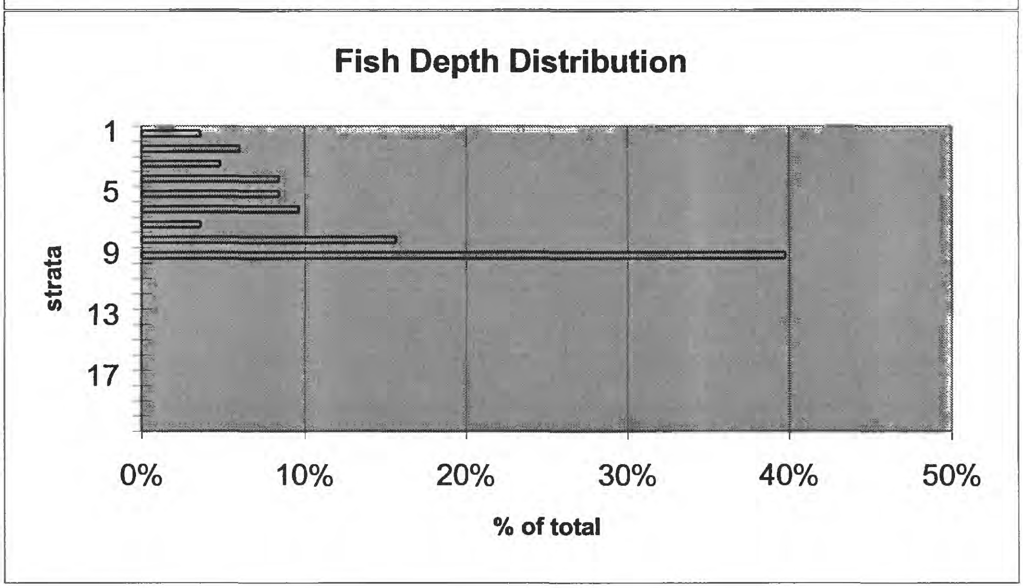


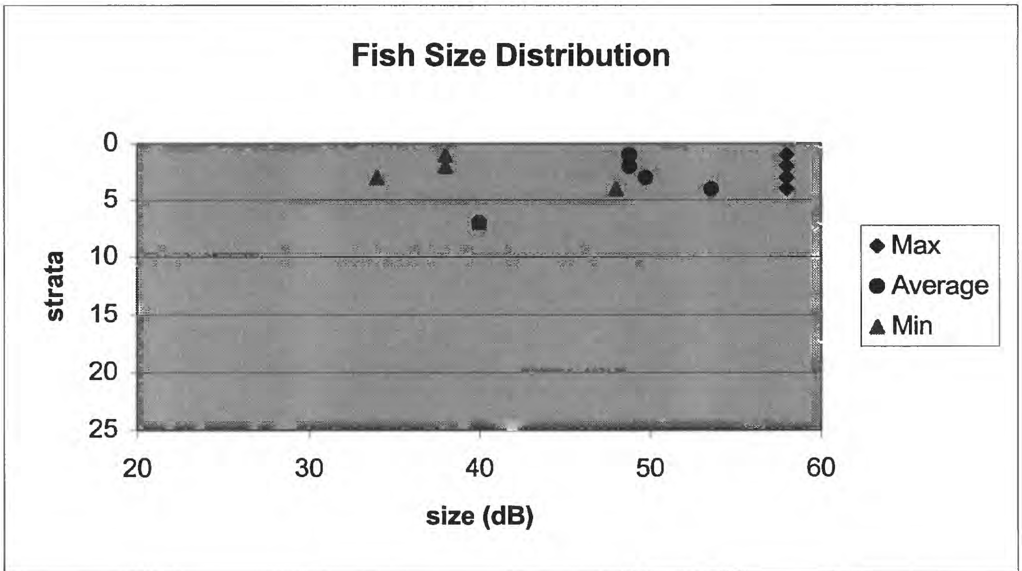


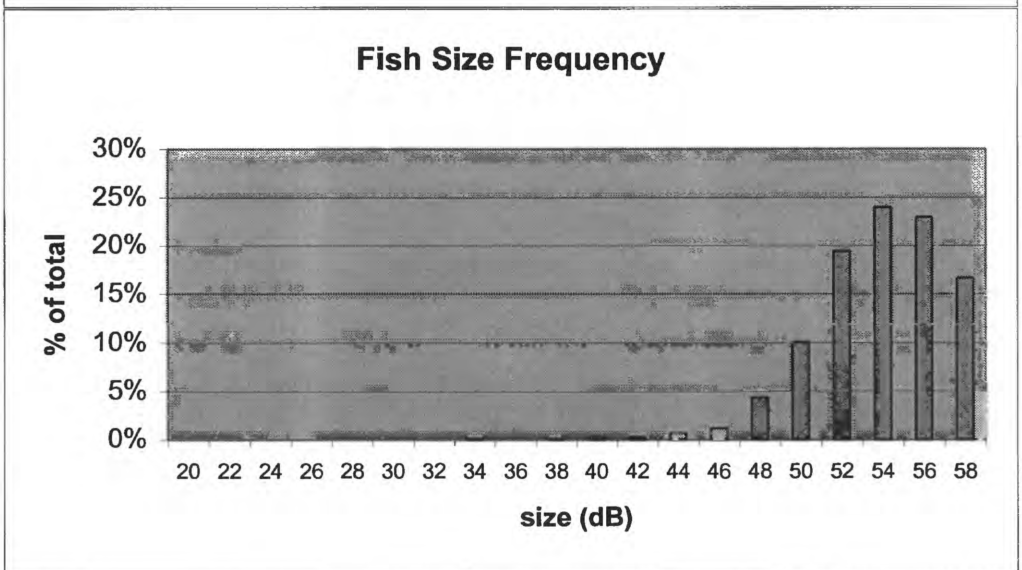
Lake Mead May 1997
M11 C

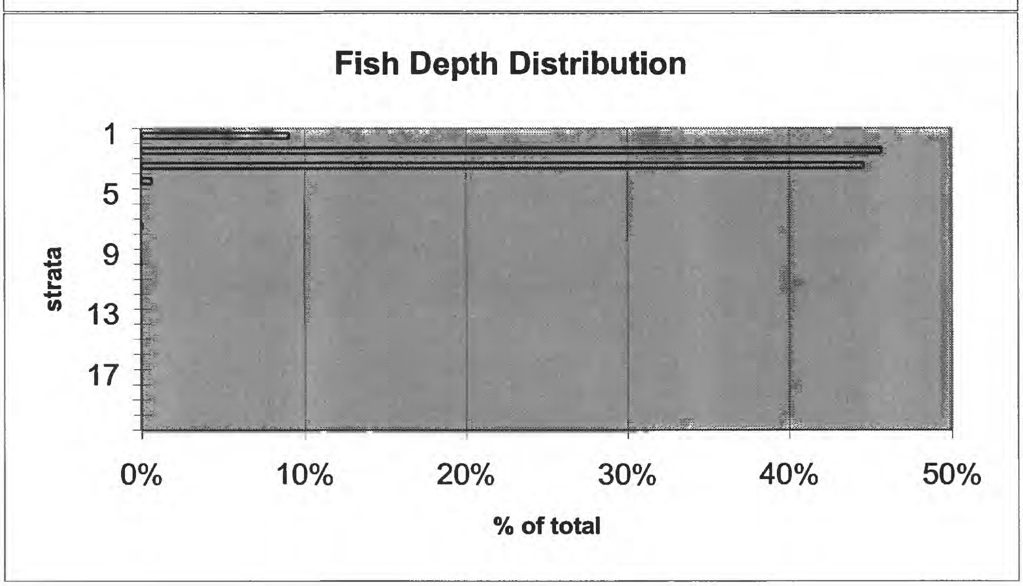




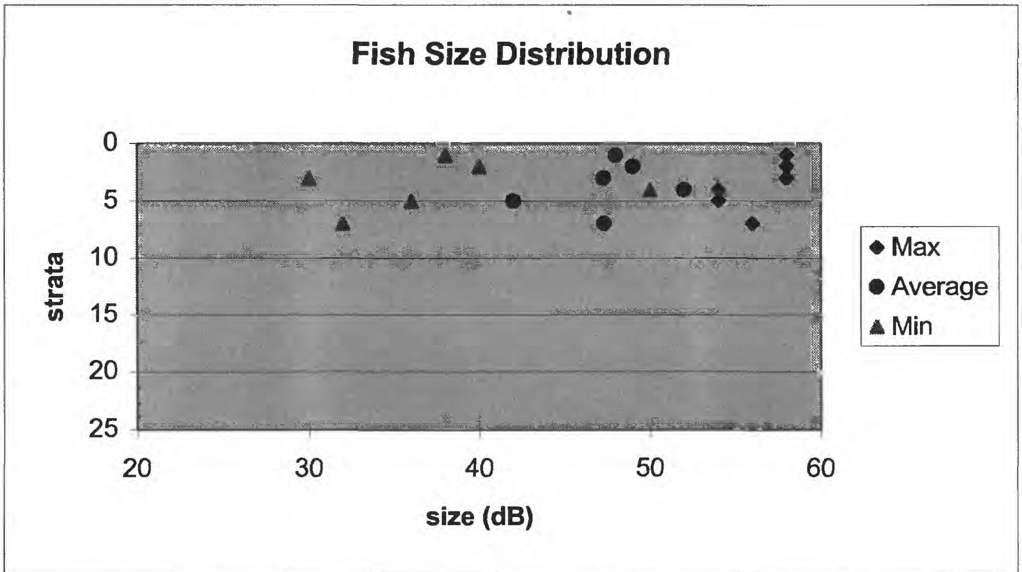


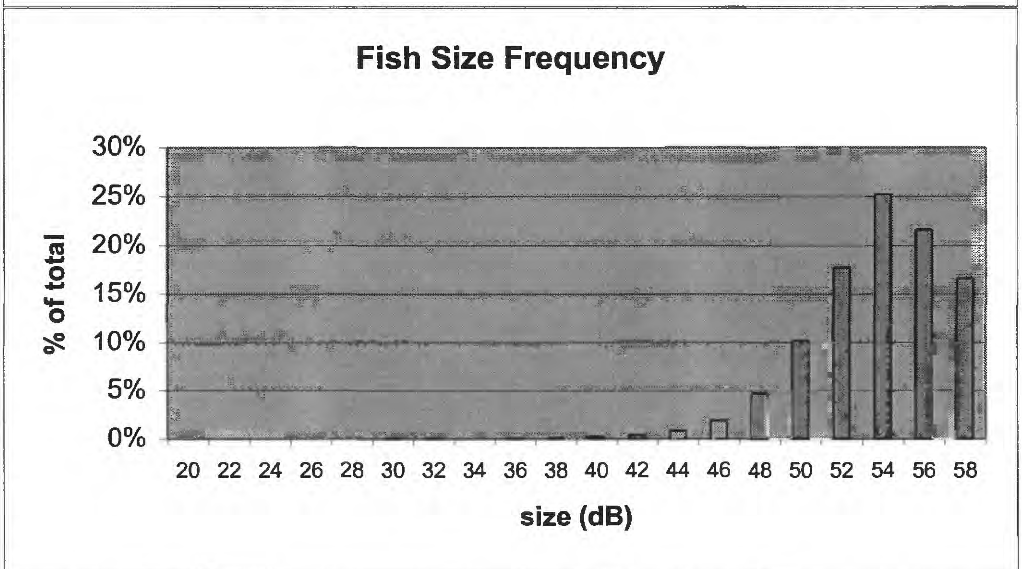

Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min

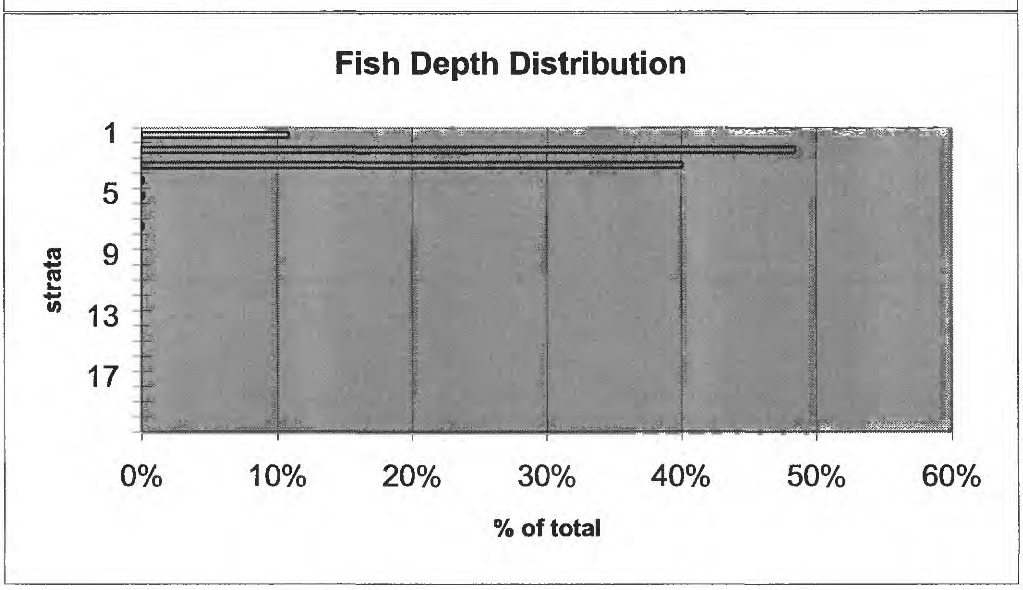

Fish Size Frequency
% of total
30%
25%
20%
15%
10%
5%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
strata
1
5
9
13
17
0%
10%
20%
30%
40%
50%
% of total

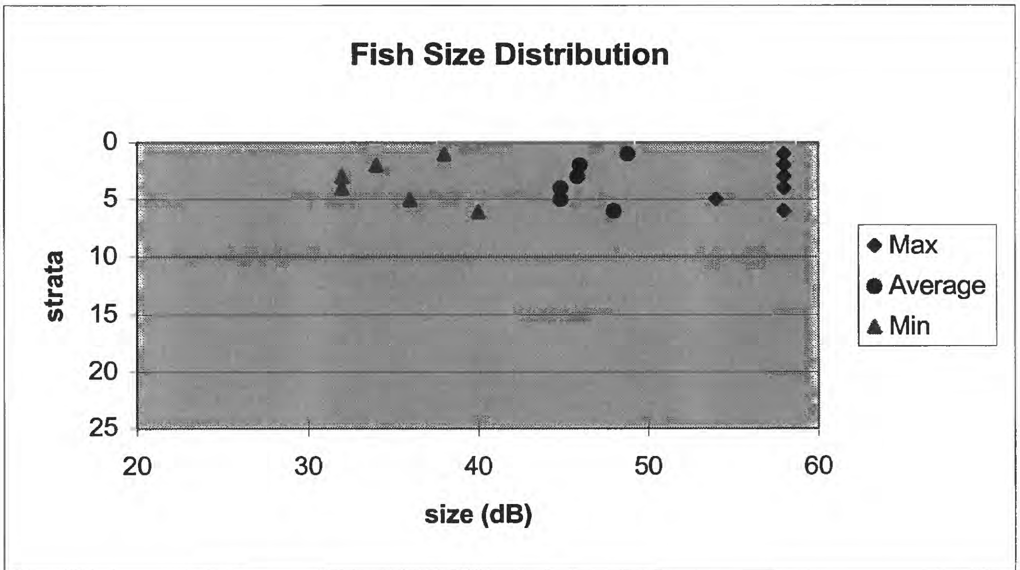
Lake Mead August 1997
M02 B

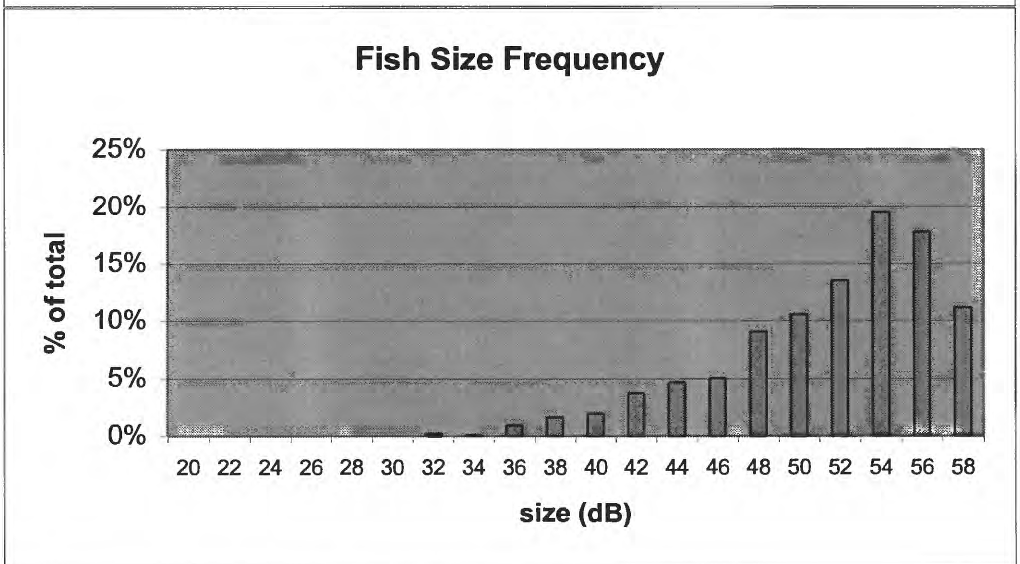


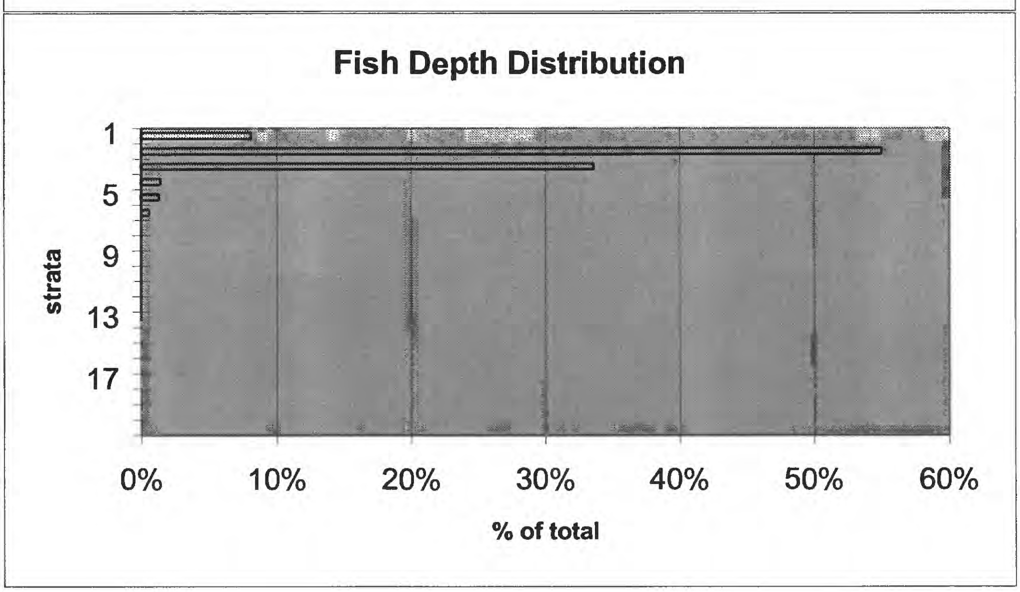


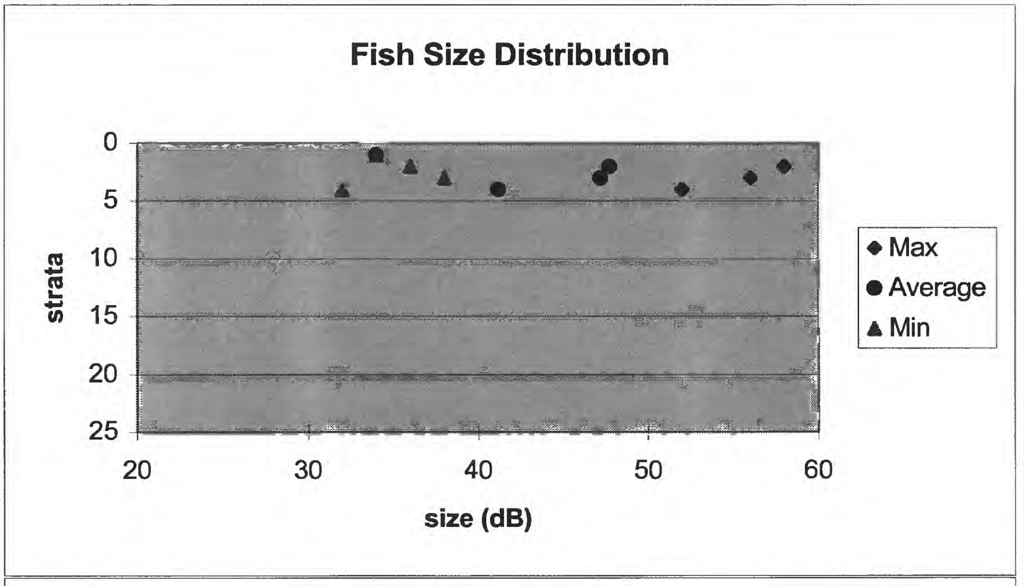


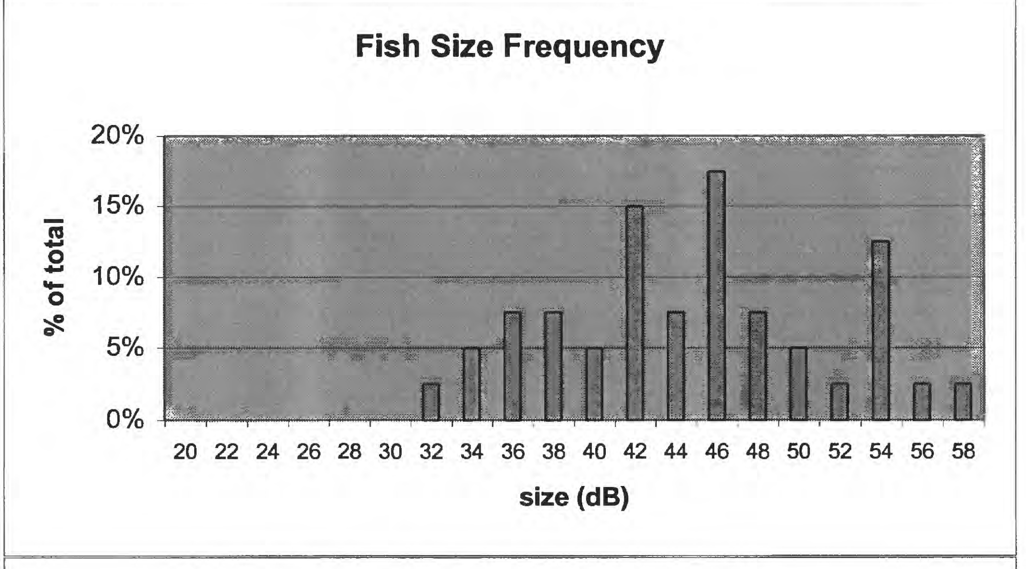
Lake Mead August 1997
M02 C

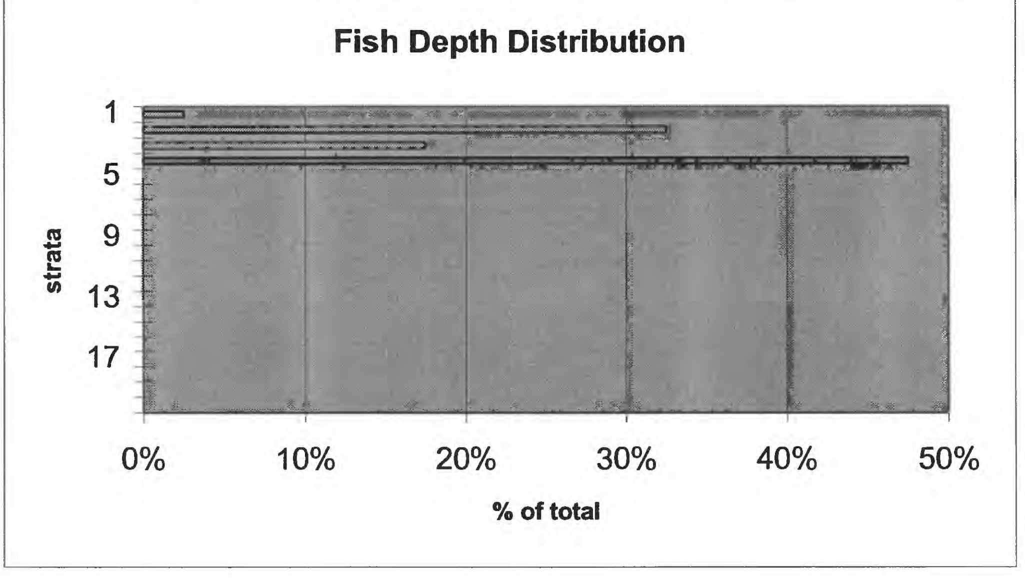




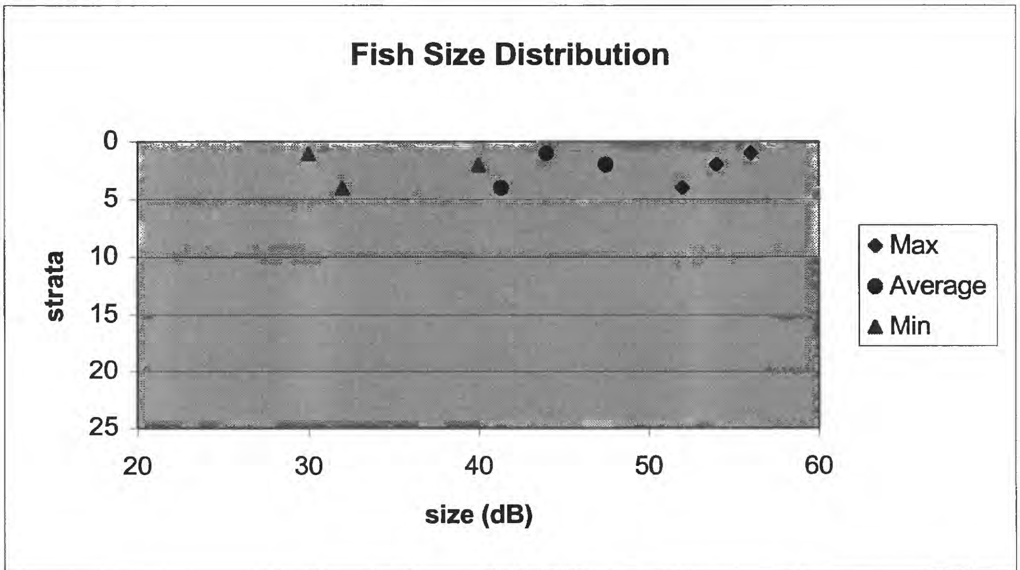


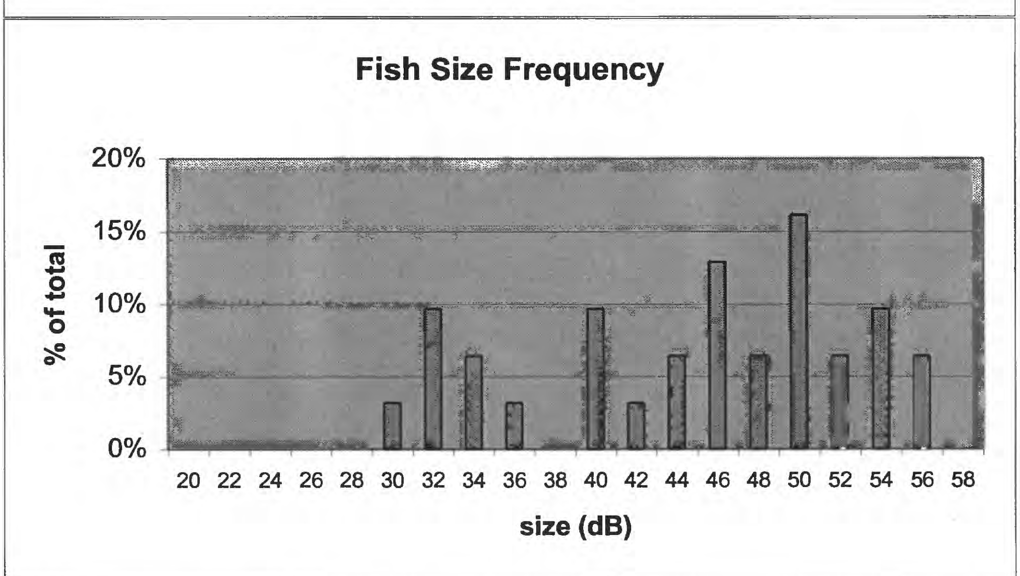

Fish Size Distribution
0
5
10
15
20
25
strata
20
30
40
50
60
size (dB)
Max
Average
Min

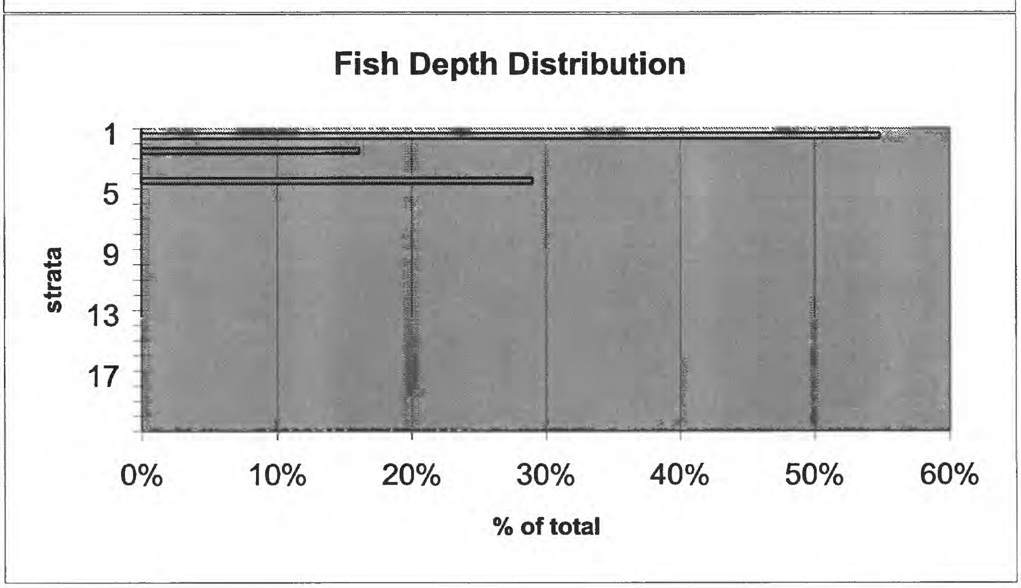

Fish Size Frequency
20%
15%
10%
5%
0%
% of total
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
1
5
9
13
17
strata
0%
10%
20%
30%
40%
50%
% of total

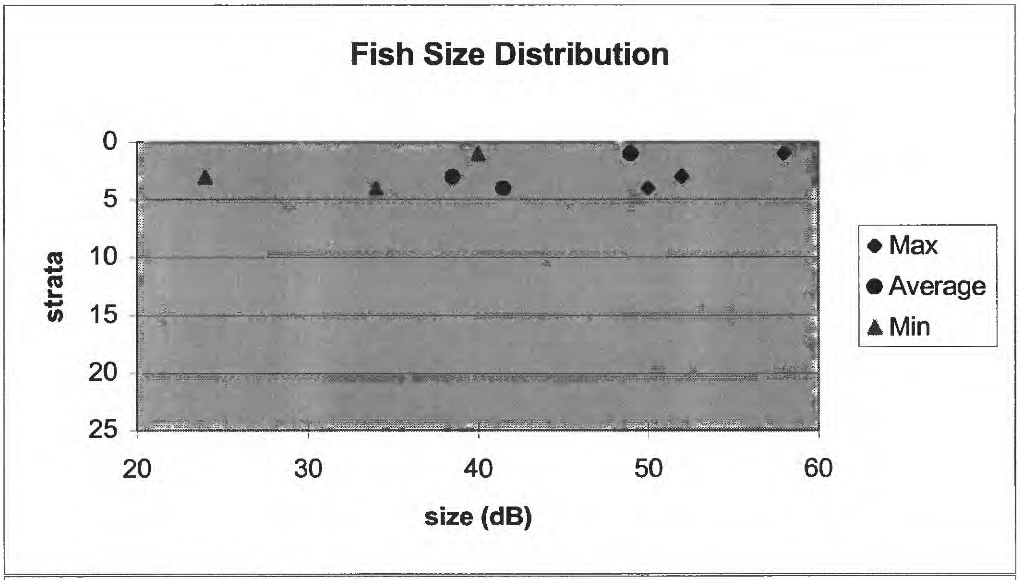
Lake Mead August 1997
M09 B

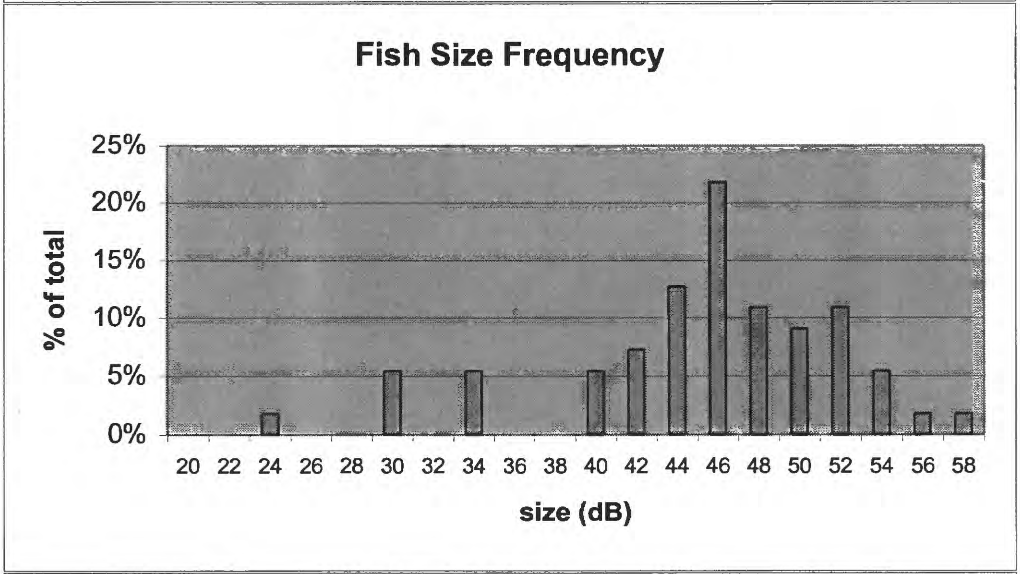


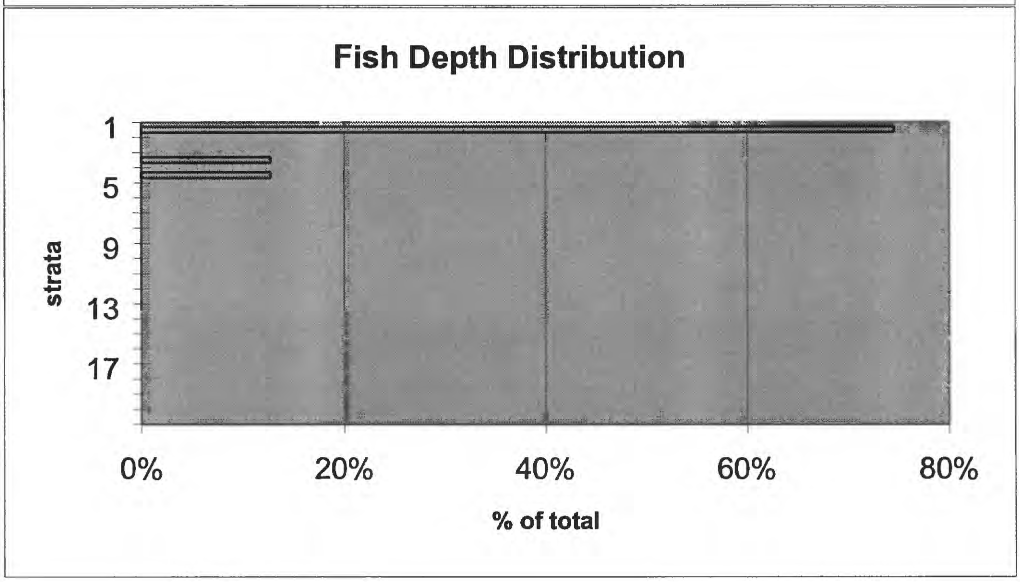


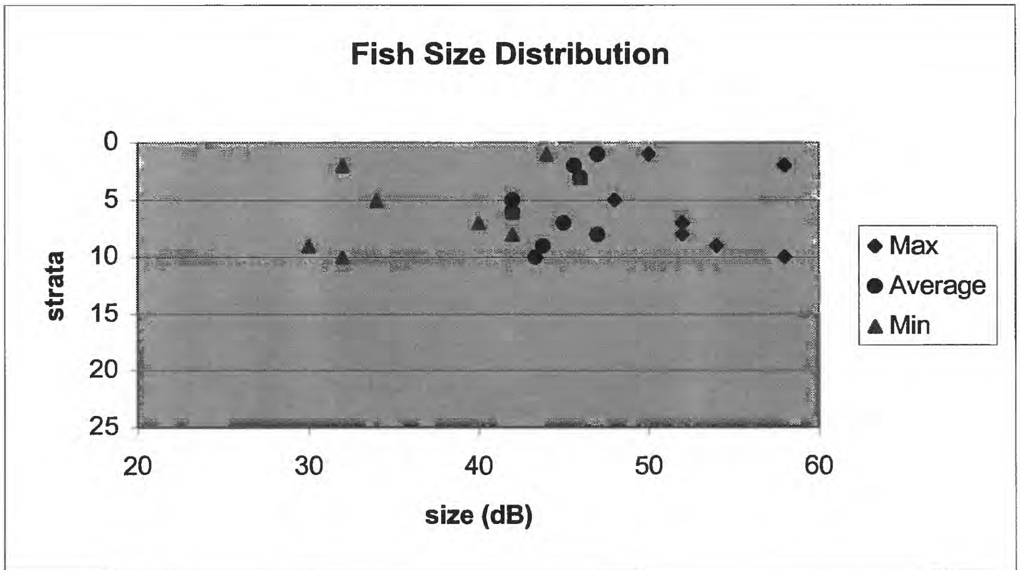


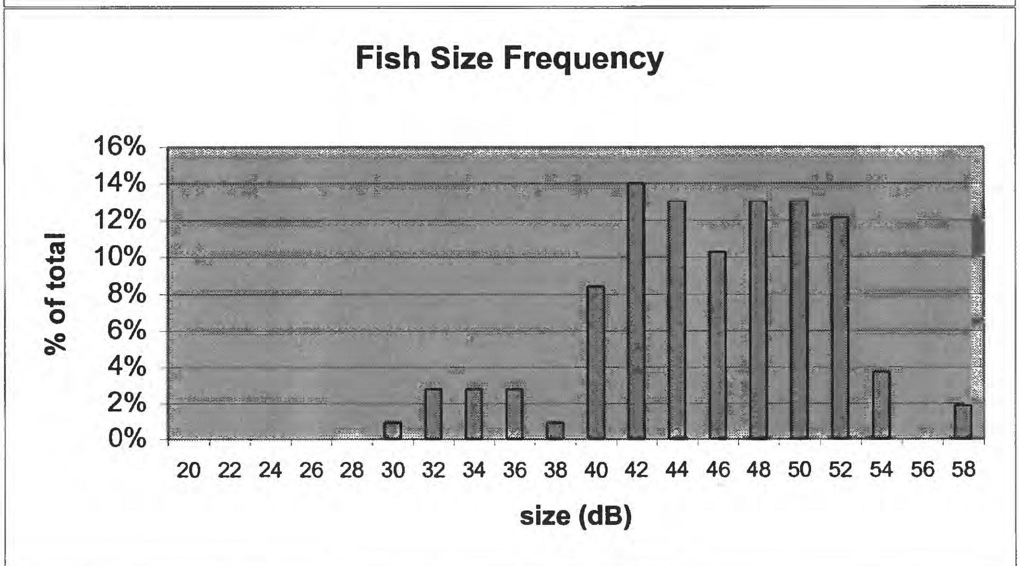
Lake Mead August 1997
M09 C

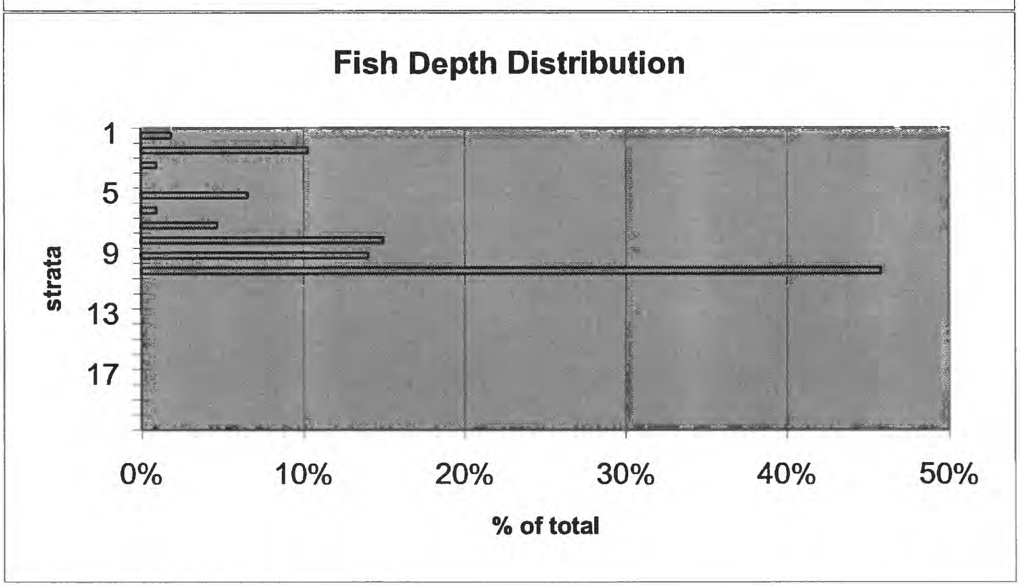


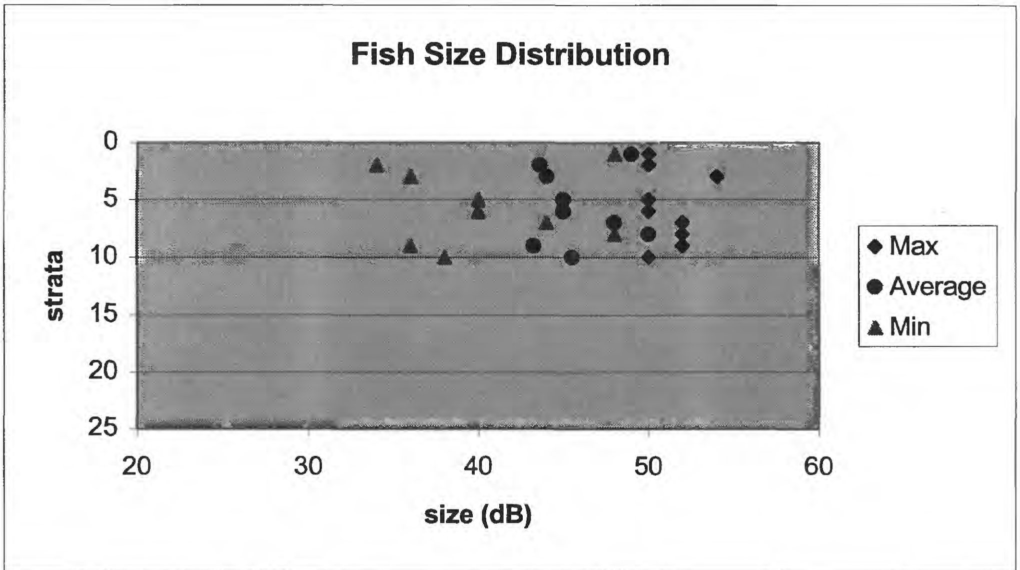


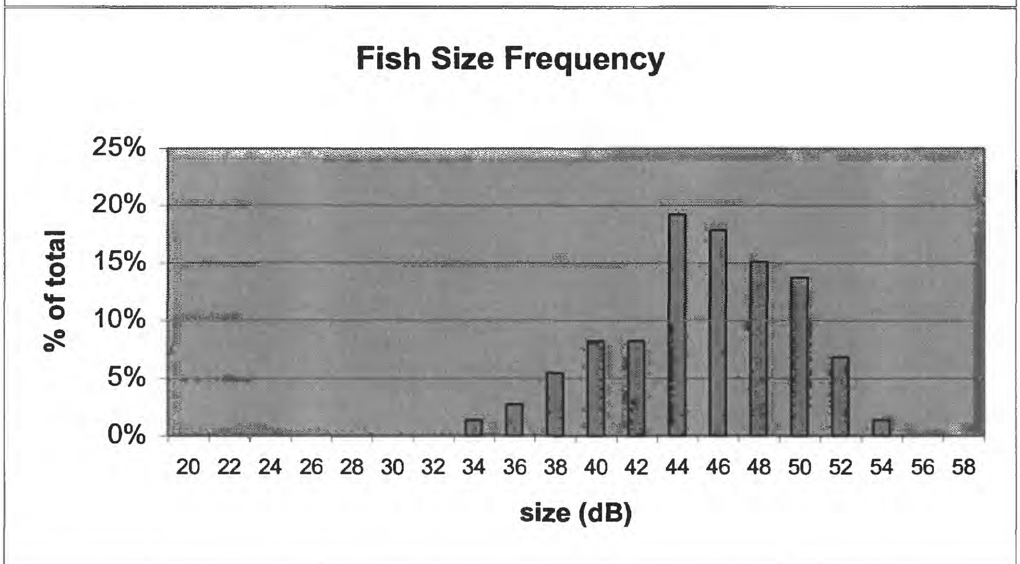


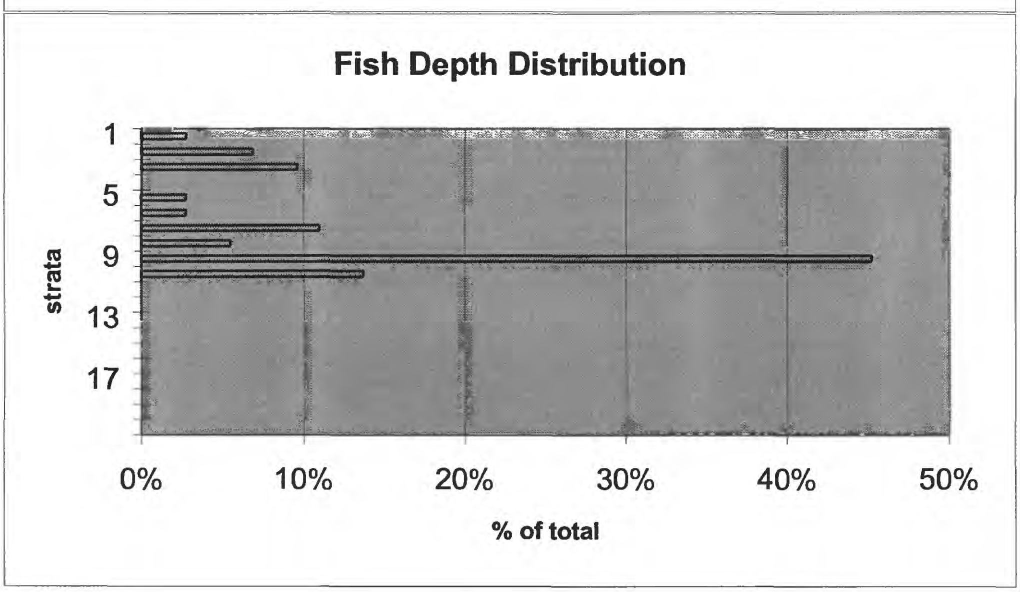

Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min


Fish Size Frequency
% of total
16%
14%
12%
10%
8%
6%
4%
2%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)

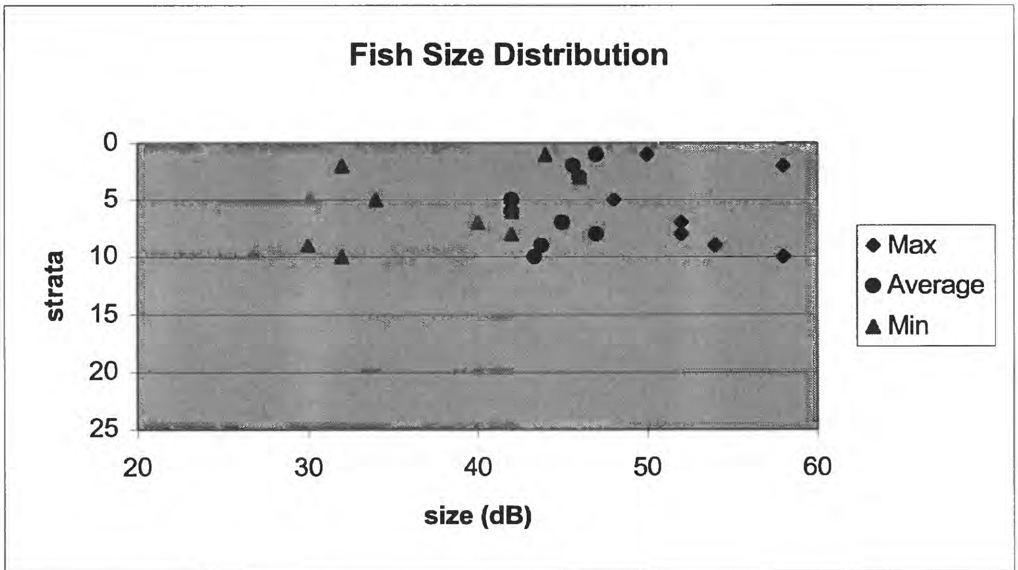

Fish Depth Distribution
strata
1
5
9
13
17
0%
10%
20%
30%
40%
50%
% of total

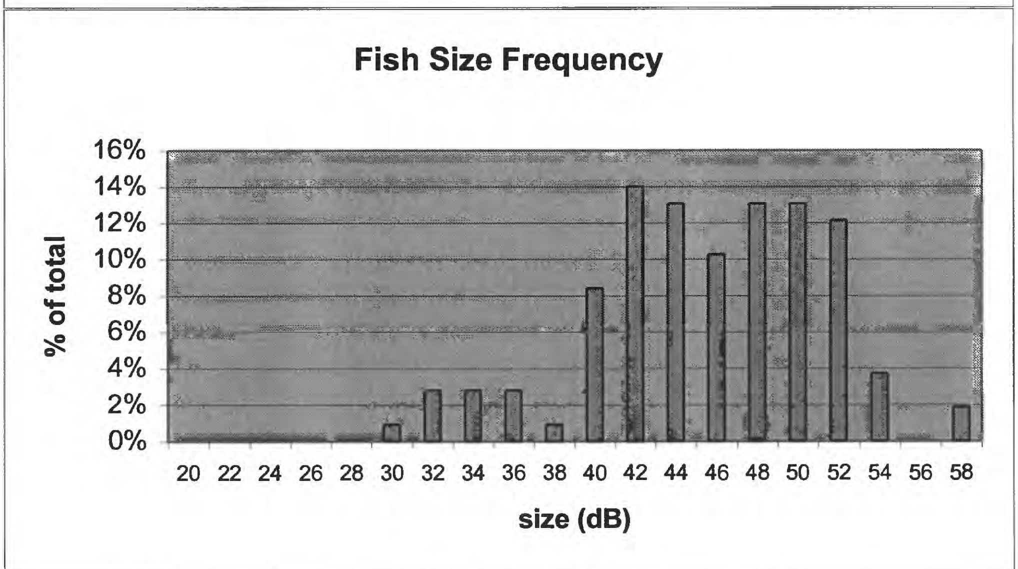

Fish Size Distribution
strata
0
5
10
15
20
25
20
30
40
50
60
size (dB)
Max
Average
Min

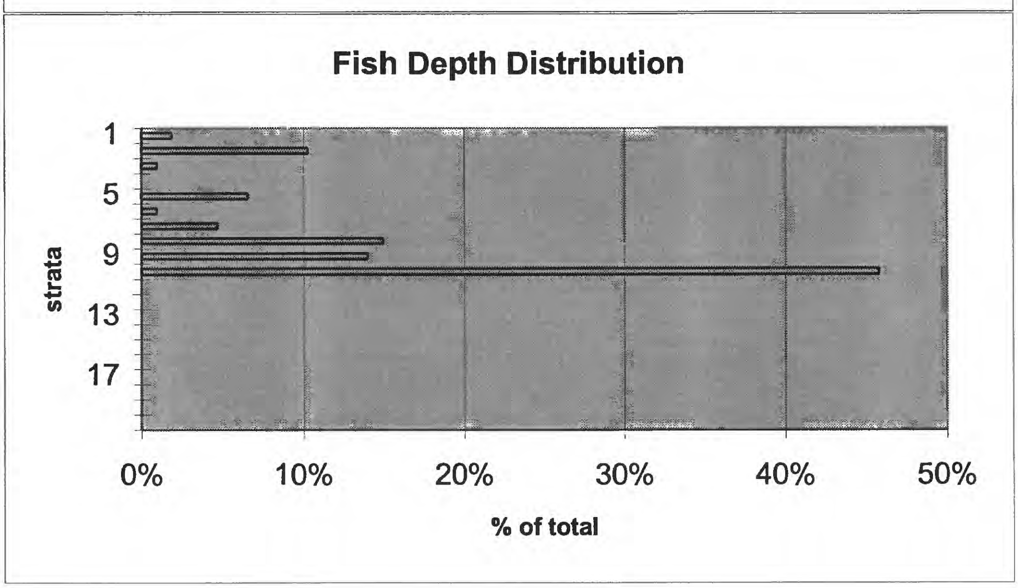

Fish Size Frequency
% of total
25%
20%
15%
10%
5%
0%
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
size (dB)


Fish Depth Distribution
strata
1
5
9
13
17
0%
10%
20%
30%
40%
50%
% of total

Lake Mead August 1997
M11 C







APPENDIX I

ECHO-COUNTING ANALYSIS
FISH DENSITY DATA AND STATISTICS

Lake Powell Pelagic Fish Study
1995 - November
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Le
P01		0.84	1.6	1.22	0.38	219.76	268 + / - 527
P02	0.2	0.5	2.1	0.93	0.59	3032.68	2820 + / - 5216
P03						7175.85	NA
P04	11.6	10.8	19.5	13.97	2.78	16520.51	230791 + / - 133981
P05	60.3	96.6	61.4	72.77	11.92	6019.73	438056 + / - 209547
P06		105.7	6.8	56.25	49.45	1905.65	107193 + / - 594963
P07	751.3	567.1	403.1	573.83	100.57	2265.72	1300138 + / - 665374
P08						2087.90	NA
P09	128.5	69.8		99.15	29.35	1583.65	157019 + / - 293466
P10	110.3	193.7	153.9	152.63	24.08	5264.42	803508 + / - 370194
P11	317	522.2	176.5	338.57	100.38	6150.90	2082510 + / - 1802829
P12	850.5	666.7	436.3	651.17	119.82	4424.08	2880828 + / - 1547897
P13	687.7	1182.5	1990.2	1286.8	379.6	4353.64	5602264 + / - 4825662
P14	1074.7	976.3	1435.5	1162.17	139.6	2889.24	3357788 + / - 1177654
				367.45 avg.	79.88 avg.	63894 Total	16963184 + / - 11627310 Total

Lake Powell Pelagic Fish Study
1996 - January
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Le
P01	18.62	44.35		31.48	18.19	219.76	6919 + / - 17850
P02	12.28	0	13.15	8.48	7.35	3032.68	25707 + / - 37598
P03	5041.52	6407.37	3391.19	4946.69	1510.32	7175.85	35496727 + / - 18271063
P04	0	11.09	7.69	6.26	5.68	16520.51	103418 + / - 158240
P05	69.54	624.39	94.92	262.95	313.27	6019.73	1582888 + / - 3179222
P06	41.64	22.75	27.93	30.77	9.76	1905.65	58643 + / - 31357
P07						2265.72	NA
P08						2087.90	NA
P09	69.62	61.73		65.67	5.58	1583.65	104006 + / - 39445
P10	69.63	46.11	100.73	72.16	27.4	5264.42	379863 + / - 243154
P11	505.74	354.99	315	391.91	100.59	6150.90	2410599 + / - 1043040
P12	80.93		48.68	64.8	22.8	4424.08	286702 + / - 450412
P13	440.91	188.32	87.04	238.76	182.25	4353.64	1039403 + / - 1337620
P14	1047.74	1804.66	2423.43	1758.61	689	2889.24	5081046 + / - 3356011
				656.54 avg.	241.02 avg.	63894 Total	46575921 + / - 28165012 Total

Lake Powell Pelagic Fish Study
1996 - May
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Le
P01	6.8	795.8	287.3	363.3	230.91	219.76	79839 + / - 148175
P02	16.9	11	30.2	19.37	5.68	3032.68	58743 + / - 50282
P03	365.3	1075.3	1942.3	1127.63	456	7175.85	8091704 + / - 9554644
P04	175.4	23.9	82.7	94	44.1	16520.51	1552928 + / - 2127181
P05	27.4	232.8	170.2	143.47	60.78	6019.73	863651 + / - 1068382
P06	0	47.4	90.1	45.83	26.02	1905.65	87336 + / - 144791
P07	24.7	0.7	0	8.47	8.12	2265.72	19191 + / - 53720
P08	29.1	13.7	24.4	22.4	4.56	2087.90	46769 + / - 27769
P09	76.6	53.5		65.05	11.55	1583.65	103016 + / - 115480
P10	7.3	6.7	0	4.67	2.34	5264.42	24585 + / - 35956
P11	32.6	139.1	81.3	84.33	30.78	6150.90	518705 + / - 552843
P12	5.3	27.3	11.9	14.83	6.52	4424.08	65609 + / - 84190
P13	421.1	24.8	70.6	172.17	125.17	4353.64	749566 + / - 1591212
P14	870.6	294.2	448.3	537.7	172.29	2889.24	1553544 + / - 1453577
				193.1 avg.	84.63 avg.	63894 Total	13815186 + / - 17008202 Total

Lake Powell Pelagic Fish Study
1996 - August
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Le
P01	2892.5	3332.4	2777.8	3000.9	169.02	219.76	659478 + / - 108462
P02	4976.9	2090.8	2316.5	3128.07	926.71	3032.68	9486435 + / - 2810415
P03	25380.1	33023.2	30564.3	29655.87	2252.64	7175.85	212806075 + / - 47200445
P04	24082.3	24039.8	20377.9	22833.33	1227.78	16520.51	377218257 + / - 59227680
P05	6675	7829.5	13104.3	9202.93	1978.95	6019.73	55399154 + / - 34785010
P06	3948.1	4787.8	6279.9	5005.27	681.86	1905.65	9538293 + / - 3794187
P07	12453.2	10071.1	9505.9	10676.73	903.1	2265.72	24190481 + / - 5974749
P08	41148.7	46392.5	62738.3	50093.2	6501.25	2087.90	104589592 + / - 39635817
P09	2301.6	3274.1		2787.85	486.25	1583.65	4414979 + / - 4861900
P10	47559.3	46220.8	77696.1	57158.73	10275.95	5264.42	300907561 + / - 157962291
P11	748.6	620.4	610.8	659.93	44.42	6150.90	4059163 + / - 797772
P12	1993.1	2811.5	4250.9	3018.5	659.94	4424.08	13354085 + / - 8525246
P13	37190.8	46628.3	50421	44746.7	3933.4	4353.64	194811023 + / - 50003602
P14	125601.2	117655.5	130747.1	124667.9	3807.92	2889.24	360195483 + / - 32125662
				26188.3 avg.	2417.8 avg.	63894 Total	1630059 + / - 447813238 Total

Lake Powell Pelagic Fish Study
1997 - May
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Le
P01	14.68	1.45		8.06	9.35	219.76	1772 + / - 9178
P02	0.82		0.38	0.6	0.31	3032.68	1820 + / - 4212
P03	17.14		14.02	15.58	2.21	7175.85	111800 + / - 70678
P04	0	7.24	0.21	2.48	4.12	16520.51	41026 + / - 114767
P05	8.05	0	0	2.68	4.65	6019.73	16153 + / - 47166
P06	0	7.97	22.07	10.01	11.17	1905.65	19082 + / - 35904
P07	5.44	7.93	18.72	10.7	7.06	2265.72	24236 + / - 26962
P08	39.57	666.73	64.16	256.82	355.2	2087.90	536214 + / - 1250286
P09	10.96	12.08		11.52	0.79	1583.65	18244 + / - 5599
P10	2.81	5.32	14.52	7.55	6.16	5264.42	39746 + / - 54717
P11	0	0	0	0	0	6150.90	NA
P12	111.75	151.14	218.42	160.44	53.94	4424.08	709785 + / - 402298
P13	406.54	244.2	291.65	314.13	83.47	4353.64	1367609 + / - 612652
P14	25.6	0.49	151.37	59.15	80.84	2889.24	170908 + / - 393772
				61.41 avg.	44.23 avg.	63894 Total	3058395 + / - 3028191 Total

Lake Powell Pelagic Fish Study
1997 - August
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Le
P01	0.84	80		40.42	39.58	219.76	8883 +/- 54918
P02	3.1		7.6	5.35	2.25	3032.68	16225 + / - 43064
P03	111.3	19.7	109.3	80.1	30.2	7175.85	574786 + / - 632910
P04	0.7	2.3	7.1	3.37	1.92	16520.51	55674 + / - 92680
P05	54.8	11.9	105.1	57.27	26.93	6019.73	344750 + / - 473392
P06	15.1	0	112.4	42.5	35.22	1905.65	80990 + / - 195977
P07	67.6	26	4.2	32.6	19	2265.72	73862 + / - 123029
P08	36746.5	20279.4	2966	19997.3	9752.61	2087.90	41752363 + / - 59458172
P09	25.1	0.5		12.8	12.3	1583.65	20271 + / - 122986
P10	25.4			25.4	0	5264.42	133716 + / - NA
P11	141.3	139.3	240	173.53	33.24	6150.90	1067366 + / - 596945
P12	44.7	41.7	219.1	101.83	58.64	4424.08	450504 + / - 757535
P13	9832.6	9225.6	4815.9	7958.03	1580.81	4353.64	34646398 + / - 20096141
P14	46353.2	49480.3	24171.2	40001.57	7966.5	2889.24	115574136 + / - 67209674
				4895.15 avg.	1397.1 avg.	63894 Total	4799923 + / - 149857423 Total

Lake Powell Pelagic Fish Study
1997 - November
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Le
P01	1.33	0		0.66	0.94	219.76	146 + / - 923
P02	15.07	0.16	1	5.41	8.38	3032.68	16407 + / - 42825
P03	64.14	105.71	113.67	94.5	26.6	7175.85	678166 + / - 321765
P04	4.55	5.89	3.11	4.52	1.39	16520.51	74618 + / - 38721
P05	13.21	7.47	12.96	11.21	3.24	6019.73	67501 + / - 32928
P06	4.08	6.95	8.14	6.39	2.09	1905.65	12177 + / - 6705
P07	3498.06	4440.92	11708.19	6549.06	4492.74	2265.72	14838336 + / - 17160824
P08	518.56	455.76	458.14	477.49	35.59	2087.90	996944 + / - 125274
P09	9.96	9.56		9.76	0.28	1583.65	15456 + / - 2000
P10	8.75	26.52	21.01	18.76	9.1	5264.42	98760 + / - 80729
P11	119.87	248.51	144.76	171.05	68.23	6150.90	1052091 + / - 707511
P12	189.05	254.61	281.91	241.86	47.72	4424.08	1069993 + / - 355954
P13	2208.17	2367.28	2251.6	2275.68	82.24	4353.64	9907504 + / - 603636
P14	1415.27	2564.56	1676.19	1885.34	602.51	2889.24	5447200 + / - 2934757
				839.41 avg.	384.36 avg.	63894 Total	34275299 + / - 22414552 Total

Lake Powell Pelagic Fish Study
1998 - January
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Le
P01	9.13	17.7		13.41	4.28	219.76	2947 + / - 5944
P02	9.5	3.3	4.9	5.9	1.86	3032.68	17893 + / - 16467
P03	101.6	50.8		76.2	25.4	7175.85	546800 + / - 1150791
P04	8.9	3.6	3.2	5.23	1.84	16520.51	86402 + / - 88550
P05	12.7	8.6	9.3	10.2	1.27	6019.73	61401 + / - 22273
P06	18.4	15.5	21.5	18.47	1.73	1905.65	35197 + / - 9643
P07	106.7	107.9	81.4	98.67	8.64	2265.72	223559 + / - 57164
P08	381.9	209.2	25.8	205.63	102.81	2087.90	429335 + / - 626808
P09	140.2	186		163.1	22.9	1583.65	258293 + / - 228964
P10	67.2	43.5	70.8	60.5	8.56	5264.42	318497 + / - 131610
P11	18.2	22.1	26.2	22.17	2.31	6150.90	136365 + / - 41457
P12	31.4	36.5	43.1	37	3.4	4424.08	163691 + / - 43754
P13	215.7	216.1	56.8	162.87	53.03	4353.64	709077 + / - 674205
P14	71.9	84.6	65.9	74.13	5.51	2889.24	214179 + / - 46517
				68.1 avg.	17.4 avg.	63894 Total	3203638 + / - 3144147 Total

Lake Mead Pelagic Fish Study
1995 - November
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 1210 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Level
M01	12.3	0		6.15	6.15	121.4	747 + / - 4714
M02	22.5	39	309.8	123.77	93.14	2922.74	361747 + / - 794868
M03	3.7	2.7	5.6	4	0.85	10329.16	41317 + / - 25616
M04	45.8		6.5	26.15	19.65	1190.22	31124 + / - 147706
M05	0.3	7.2	0	2.5	2.35	16021.67	40054 + / - 110071
M06	0	0.3	9.3	3.2	3.05	5163.16	16522 + / - 46004
M07	9.5	1.9	19.1	10.17	4.98	645.90	6569 + / - 9385
M08	56.8	14.8	51.4	41	13.19	4038.10	165562 + / - 155548
M09	1247	407.3	7.1	553.8	365.35	3461.00	1916702 + / - 362229
M10	15.2	0.5	3	6.23	4.54	2983.45	18587 + / - 39560
M11	118	90.4	41.4	83.27	22.4	12801.47	1065978 + / - 837216
				78.2 avg.	48.7 avg.	59678 Total	3664909 + / - 2532917 Total

Lake Mead Pelagic Fish Study
1996 - January
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 1210 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Level
M01	691.3	41.2		366.25	325.05	121.4	44466 + / - 249170
M02	745.5	771.9	352.2	623.2	135.71	2922.74	1821452 + / - 1158223
M03	0	0		0	0	10329.16	NA
M04	0	727.7	0	242.57	242.57	1190.22	288712 + / - 843021
M05	0	3.9		1.95	1.95	16021.67	31242 + / - 197227
M06	0.3	0	0	0.1	0.1	5163.16	516 + / - 1497
M07	35.6	11.3	1.1	16	10.23	645.90	10334 + / - 19299
M08	143.8	226.2	211.9	193.97	25.42	4038.10	783270 + / - 299748
M09	977.5		660.7	819.1	158.4	3461.00	2834905 + / - 3461346
M10	119.3	8.4	59.7	62.47	32.04	2983.45	186376 + / - 279161
M11	158.8	225.7	196.4	193.63	19.36	12801.47	2478749 + / - 723795
				229.02 avg.	86.44 avg.	59678 Total	8480023 + / - 7232487 Total

Lake Mead Pelagic Fish Study
1996 - May
ECHO-COUNTING

	Transects			Mean	Standard	Surface Area @ 1210 El.	Total Fish Estimates
				Fish / ha.	Deviation	Hectares	Total # Fish + / - Confidence Level
Lake Segment #	A	B	C				
M01	36.7	17.4		27.05	9.65	121.41	3284 + / - 7397
M02	919.7	586.2	226.3	577.4	200.22	2922.74	1687590 + / - 1708721
M03	6.6	63.3	14.5	28.13	17.73	10329.16	290559 + / - 534741
M04	20.4	11.1	14.3	15.27	2.73	1190.22	18175 + / - 9474
M05	14.3	8.2	7.7	10.07	2.12	16021.67	161338 + / - 99174
M06	87.1	9.6	0.3	32.33	27.51	5163.16	166925 + / - 414808
M07	22	134.6	18.1	58.23	38.2	645.90	37611 + / - 72044
M08	12.2	21.8	24.9	19.63	3.82	4038.10	79268 + / - 45065
M09	956.3	1285.5	526.9	922.9	219.62	3461.00	3194157 + / - 2219539
M10	23.7	1.9	49.8	25.13	13.85	2983.45	74974 + / - 120621
M11	2379	73.2	217.2	889.8	745.76	12801.47	11390748 + / - 27876609
				236.9 avg.	116.47 avg.	59678 Total	17104629 + / - 33108193 Total

Lake Mead Pelagic Fish Study
1996 - August
ECHO-COUNTING

	Transects			Mean	Standard	Surface Area @ 1210 El.	Total Fish Estimates
				Fish / ha.	Deviation	Hectares	Total # Fish + / - Confidence Level
Lake Segment #	A	B	C				
M01	529.92	662.31		596.12	93.61	121.41	72375 + / - 50742
M02	11124.12	12919.14	1024.52	8355.93	6412.31	2922.74	24422211 + / - 31595462
M03	644.29	1141.46	752.56	846.1	261.45	10329.16	8739502 + / - 4552784
M04	315.11	696.06	2269.47	1093.55	1036.04	1190.22	1301565 + / - 2078850
M05	111.75	242.39	1259.63	537.92	628.42	16021.67	8618377 + / - 16973838
M06	2946.43	574.11	1745.99	1755.51	1186.19	5163.16	9063979 + / - 10324978
M07	299.98	451.12	671.45	474.18	186.81	645.90	306273 + / - 203413
M08	1786.26	2650.19		2218.23	610.89	4038.10	8957435 + / - 11013191
M09	13777.44	8158.47	4519.61	8818.51	4664.07	3461.00	30520863 + / - 27213705
M10	230.87	579.17	695.74	501.93	241.87	2983.45	1497483 + / - 1216532
M11	1256.3	912.79	1387.67	1185.59	245.21	12801.47	15177295 + / - 5292000
				2398.51 avg.	1415.17 avg.	59678 Total	108677358 + / - 110515495 Total

Lake Mead Pelagic Fish Study
1997 - May
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 1210 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Level
M01	0.62	4.34		2.48	2.63	121.41	301 + / - 1425
M02	90.59	107.52	279.46	159.19	104.5	2922.74	465271 + / - 514899
M03	0	1.07	0	0.36	0.62	10329.16	3677 + / - 10757
M04	0	0	0.21	0.07	0.12	1190.22	83 + / - 243
M05			0.49	0.49	NA	16021.67	7851 + / - NA
M06	0.31	4.95	0.04	1.77	2.76	5163.16	9121 + / - 24009
M07	4.6	305.2	13.93	107.91	170.92	645.90	69699 + / - 186116
M08	11.06	7.01	10.15	9.41	2.12	4038.10	37998 + / - 14465
M09	1196.01	2350.22	542.25	1362.83	915.46	3461.00	4716755 + / - 5341453
M10	16.51	8.8	3.44	9.58	43.17	2983.45	28591 + / - 33045
M11	99.59	181.38	0	93.66	90.83	12801.47	1198943 + / - 1960358
				158.89 avg.	133.31 avg.	59678 Total	6538290 + / - 8086770 Total

Lake Mead Pelagic Fish Study
1997 - August
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 1210 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Level
M01	0.9	0		0.45	0.64	121.41	55 + / - 345
M02	19455.76	19381.77	6556.6	15131.38	7426.07	2922.74	44225080 + / - 36590585
M03	52.86	11.91	71.86	45.54	30.64	10329.16	470424 + / - 533501
M04	27.74	553.3	559.26	380.1	305.17	1190.22	452403 + / - 612332
M05	127.68	143.85	286.21	185.91	87.23	16021.67	2978642 + / - 2356147
M06	121.84	30.04	36.88	62.92	51.14	5163.16	324866 + / - 445146
M07	60.56	710.53	0.39	257.16	393.78	645.90	166100 + / - 428786
M08	1268.05	2084.2	2719.71	2024	727.7	4038.10	8173061 + / - 4953934
M09	215.84	1802.65	3571.45	1863.31	1678.63	3461.00	6448927 + / - 9794363
M10	4.52	253.86	151.46	136.61	125.33	2983.45	407579 + / - 630373
M11	168.31	110.92	163.5	147.58	31.84	12801.47	1889199 + / - 687079
				1839.54 avg.	987.11 avg.	59678 Total	65536336 + / - 57032591 Total

Lake Mead Pelagic Fish Study
1997 - November
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 1210 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Level
M01	0.94	0.18		0.56	0.54	121.41	68 + / - 291
M02	17.56	10.2	48.98	25.58	20.6	2922.74	74764 + / - 101477
M03	6.17	0.75	3.65	3.52	2.71	10329.16	36393 + / - 47229
M04	3.2	4.36	4	3.85	0.59	1190.22	4586 + / - 1191
M05	1.49	1.87	1.12	1.49	0.37	16021.67	23926 + / - 10129
M06	2.11	1.03	8	3.71	3.75	5163.16	19172 + / - 32654
M07	43.71	40.89	41.03	41.88	1.59	645.90	27048 + / - 1730
M08	1498.46	906.95	1147.08	1184.16	297.5	4038.10	4781770 + / - 2025228
M09	324.84	216.37	217.94	253.05	62.18	3461.00	875806 + / - 362782
M10	0.81	5.74	1.08	2.54	2.77	2983.45	7588 + / - 13941
M11	479.32	709.61	791.34	660.09	161.8	12801.47	8450122 + / - 3491812
				198.22 avg.	50.4 avg.	59678 Total	14301243 + / - 6088464 Total

Lake Mead Pelagic Fish Study
1998 - January
ECHO-COUNTING

Lake Segment #	Transects A	B	C	Mean Fish / ha.	Standard Deviation	Surface Area @ 1210 El. Hectares	Total Fish Estimates Total # Fish + / - Confidence Level
M01	2.6	1.2		1.9	0.7	121.41	231 + / - 537
M02	86.8	91.3	65.8	81.3	7.86	2922.74	237619 + / - 67077
M03	10.8	17.3		14.05	3.25	10329.16	145125 + / - 211954
M04	2.1	1.6	0.4	1.37	0.5	1190.22	1631 + / - 1750
M05	0.6	1.0		0.8	0.2	16021.67	12817 + / - 20187
M06	5.3	2.5		3.9	1.4	5163.16	20136 + / - 45642
M07	30.3	18.5	15.0	21.27	4.63	645.90	13738 + / - 8726
M08	152.5	125.4	103.5	127.13	14.17	4038.10	513364 + / - 167097
M09	183.7	119.8		151.75	31.95	3461.00	525207 + / - 698153
M10				NA	NA	2983.45	NA
M11	23.1	16	3.8	14.3	5.64	12801.47	183061 + / - 210712
				41.78 avg.	7.03 avg.	59678 Total	1652928 + / - 1431835 Total

APPENDIX J

LARGE FISH (>16 CM) ANALYSIS
STRIPED BASS POPULATION ESTIMATES AND STATISTICS

Lake Powell Pelagic Fish Study
1996 - August
ECHO-COUNTING -- LARGE FISH (>16 C

Lake Segment #	Transects (Fish/Ha.) A	B	C	Mean Fish / Surface ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total # Large Fish	Striped Bass Estimates Total # Striped Bass
P01	58.65	20.26	47.12	42	19.69	219.76	9232	6859.47
P02	61	34.98	72.55	56	19.24	3032.68	170376	126589.34
P03	104.43	98.01	97.75	100	3.78	7175.85	718016	533485.55
P04	1.68	5.85	5.68	4	2.36	16520.51	72690	54008.85
P05	5.18	2.38	10.13	6	3.92	6019.73	35516	26388.69
P06	127.77	261.63	25.82	138	118.26	1905.65	263761	195974.44
P07	10.42	14.94	1.86	9	6.64	2265.72	20550	15268.71
P08	19.13	4.39	9.61	11	7.47	2087.90	23050	17126.46
P09	99.79	11.36	0	37	54.63	1583.65	58674	43594.95
P10	5.09	10.56	6.69	7	2.81	5264.42	39220	29140.41
P11	19.32	2.7	23.06	15	10.84	6150.90	92448	68688.89
P12	50.81	129.19	303.87	161	129.55	4424.08	713560	530174.98
P13	54.34	22.7	55.79	44	18.7	4353.64	192779	143234.93
P14	44.55	11.99	27.87	28	16.28	2889.24	81303	60408.29
				47.16 avg.	29.58 avg.	63894 Total	2491176 Total	1850943.95

Lake Powell Pelagic Fish Study
1997 - August
ECHO-COUNTING -- LARGE FISH (>16 C

Lake Segment #	Transects (Fish/Ha.) A	B	C	Mean Fish / Surface ha.	Standard Deviation	Surface Area @ 3700 El. Hectares	Total # Large Fish	Striped Bass Estimates Total # Striped Bass
P01	0.18	0	0	0.06	0.1	219.76	13.18	9.79
P02	NA	3.05	3.22	3.13	0.12	3032.68	9492.29	7052.77
P03	98.57	5.59	8.27	37.48	52.92	7175.85	268950.86	199830.49
P04	0.72	2.25	4.12	2.36	1.7	16520.51	38988.4	28968.38
P05	54.21	7.55	94.35	52.04	43.44	6019.73	313266.75	232757.20
P06	13.46	0	2.28	5.25	7.2	1905.65	10004.66	7433.46
P07	23	12.06	3.99	13.02	9.54	2265.72	29499.67	21918.25
P08	24.81	13.99	9.64	16.15	7.81	2087.90	33719.58	25053.65
P09	8.63	0	NA	4.31	6.1	1583.65	6825.53	5071.37
P10	17.93	NA	NA	17.93	NA	5264.42	94391.05	70132.55
P11	46.56	28.01	139.22	71.26	59.58	6150.90	438313.13	325666.66
P12	18.73	5.41	3.07	9.07	8.45	4424.08	40126.41	29813.92
P13	554.61	389.31	324.76	422.89	118.55	4353.64	1841110.82	1367945.34
P14	260.74	594.55	156.46	337 25	228.85	2889.24	974396.19	723976.37
				70.87 avg.	41.87 avg.	63894 Total	4099098 Total	3045630.20

Lake Mead Pelagic Fish Study
1996 - August

ECHO-COUNTING -- LARGE FISH (>16 C Lake Segment #	Transects A	(Fish/Ha.) B	 C	Mean Fish / Surface ha.	Standard Deviation	Surface Area @ 1210 El. Hectares	Total # Large Fish	Striped Bass Estimates Total # Striped Bass +/- Confidence Level (90%)
M01	1.57	3.58	NA	2.57	1.42	121.4	312.02	278.95
M02	1.34	18.42	25.71	15.16	12.51	2922.74	44308.74	39612.01
M03	0.91	4.31	112.38	39.2	63.4	10329.16	404903.07	361983.34
M04	0.83	1.54	8.21	3.53	4.07	1190.22	4201.48	3756.12
M05	1.82	1.68	21.91	8.47	11.64	16021.67	135703.54	121318.96
M06	27.08	2.44	1.2	10.24	14.6	5163.16	52870.76	47266.46
M07	1.85	2.55	6.84	3.75	2.7	645.90	2422.12	2165.38
M08	6.72	2.07	NA	4.39	3.29	4038.10	17727.26	15848.17
M09	10.34	4.48	56.88	23.9	28.71	3461.00	82717.89	73949.79
M10	0.09	36	4.53	13.54	19.58	2983.45	40395.91	36113.94
M11	10.32	1.52	2.02	4.62	4.94	12801.47	59142.79	52873.65
				11.76 avg.	15.17 avg.	59678 Total	844706 Total	755166.79

Lake Mead Pelagic Fish Study
1997 - August

ECHO-COUNTING -- LARGE FISH (>16 C Lake Segment #	Transects A	(Fish/Ha.) B	 C	Mean Fish / Surface ha.	Standard Deviation	Surface Area @ 1210 El. Hectares	Total # Large Fish	Striped Bass Estimates Total # Striped Bass +/- Confidence Level (90%)
M01	0	0	NA	0	0	121.4	0	0
M02	77.96	131.07	167.79	125.61	45.16	2922.74	287991.07	257464.02
M03	0.77	7.17	0.95	2.96	3.64	10329.16	30574.31	27333.43
M04	0	5.4	19.87	8.42	10.27	1190.22	10021.65	8959.36
M05	1.48	1.03	0.14	0.88	0.68	16021.67	14099.07	12604.57
M06	3.44	5	0	2.81	2.56	5163.16	14508.48	12970.58
M07	17	7.06	0.39	8.15	8.36	645.90	5264.08	4706.09
M08	46.94	74.06	47.46	56.15	15.51	4038.10	226739.31	202704.94
M09	103.89	412.03	99.3	205.07	179.24	3461.00	709747.27	634514.06
M10	0.54	0.66	8.95	3.38	4.82	2983.45	10084.06	9015.15
M11	16.3	10.66	16.02	14.33	3.18	12801.47	183445.06	163999.88
				38.89 avg.	24.86 avg.	59678 Total	1492474 Total	1334272.08