SALTON SEA JOB PERFORMANCE REPORT

STATE:	California		
PROJECT TITLE:	Salton Sea Sport Fish Study	**PROJECT NUMBER:**	F-48-R-l
STUDY TITLE:	Salton Sea Sport Fish Eggs and Larval Distribution	**STUDY NUMBER:**	III
JOB TITLE:	Relationship Between Water Quality and the Distribution and Abundance of Viable Eggs and Larvae of Salton Sea Sport Fish	**JOB NUMBER:**	II
PERIOD COVERED:	July 1, 1987 through June 30, 1988		

I. SUMMARY

The total dissolved solid levels at the Salton Sea have fluctuated seasonally between 38 ppt to 41 ppt from January 1987 through May 1988. Although previous investigators (Lasker 1972, May 1975, and Brocksen and Cole 1972) found that while 40 ppt exceeded the upper tolerance limits of Salton Sea during embryonic and larval development, the fluctuating levels apparently have not inhibited the production of ichthyoplankton in the Salton Sea. Water quality parameters, other than those analyzed, need to be addressed to determine if they have an impact upon the spawning of Salton Sea sportfish.

II. BACKGROUND

Previous studies by Brocksen and Cole (1972). Lasker (1972) and Hay (1975) found that 40 ppt salinity exceeded the upper salinity tolerance limits of Salton Sea fish during embryonic and larval development. The salinity of the Salton Sea is currently 38 to 41 ppt and our ichthyoplankton collections indicate that the Salton Sea fishery is still extremely productive. Water quality parameters associated with spawning areas need to be identified.

III. OBJECTIVES

Determine what Salton Sea water quality parameters are common to the distribution and abundance of viable eggs and larvae of Salton Sea sportfish.

IV. PROCEDURES

At each of the designated stations (Fig. 1), a Surveyor II (Hydrolab) environmental sensor was used to record dissolved oxygen, pH, electrical conductivity, water temperature, and depth. The hydrolab was deployed at each of the stations during each monthly survey and readings were recorded every meter in depth.

V. FINDINGS

Analysis of the Hydrolab data which was collected monthly at each of the predesignated stations by comparison of mean values for each physical parameter comparing stations near major river outflow (outflow stations Alamo River, New River, and Whitewater River) to non-outflow stations (which include San Felipe Creek and Salt Creek that provide periodic flow into the Sea and other stations not directly adjacent to a tributary). Comparisons

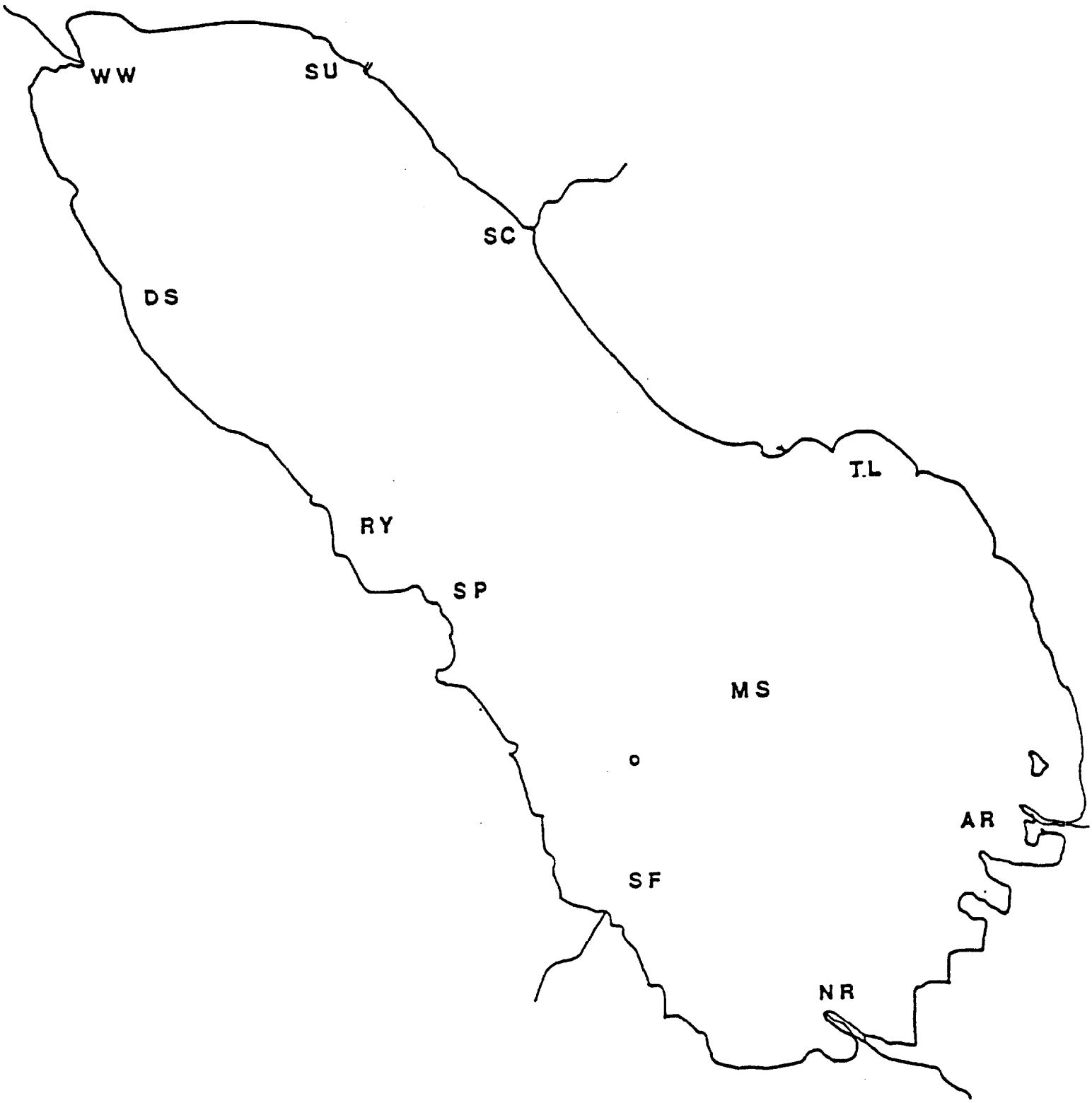

Figure 1. Salton Sea Sampling Stations.

of nearshore stations (less than two meters in depth) and offshore stations (greater than two m in depth) during the 18 months of sampling (January 1987 through June 1988) indicates:

1. That there was not a significant difference in the temperature regime when comparing outflow to non-outflow stations throughout the 18 months (Fig. 2). A seasonal trend of increasing temperatures from late spring through early fall appears to have been much more pronounced during 1987 as compared to the first half of 1988. Comparing nearshore to offshore stations showed the same general trends with only slight variations in the comparison (Fig. 3).

2. The average pH values were to be found slightly higher in the non-outflow stations than the outflow stations, however, they *were* not significantly different. The range of values throughout the year remained within a *narrow range* showing very little seasonal variation (Fig. 4). A comparison of pH values for nearshore and offshore stations showed the same general trend with very little variation from the narrow range of values (Fig. 5).

3. The dissolved oxygen values recorded at the Salton Sea in both outflow and non-outflow stations as well as nearshore and offshore stations were very high (Fig. 6 and Fig. 7). Carpelan (1961) found that saturation values for oxygen in Salton Sea water were approximately 5 mg/L at 20°C and 4 mg/L at 30°C. Our values were significantly higher throughout the year and generally at all stations. Phil Gruenberg (Regional Water Qualilty Control Board, pers. comm.) also has found very similar data. The Salton Sea is a eutrophic body of water, extremely nutrient rich and plankton blooms combined with the effects of winds can cause such high readings. Slightly higher values were found at the non-outflow stations than the outflow stations, however, all stations had saturated values

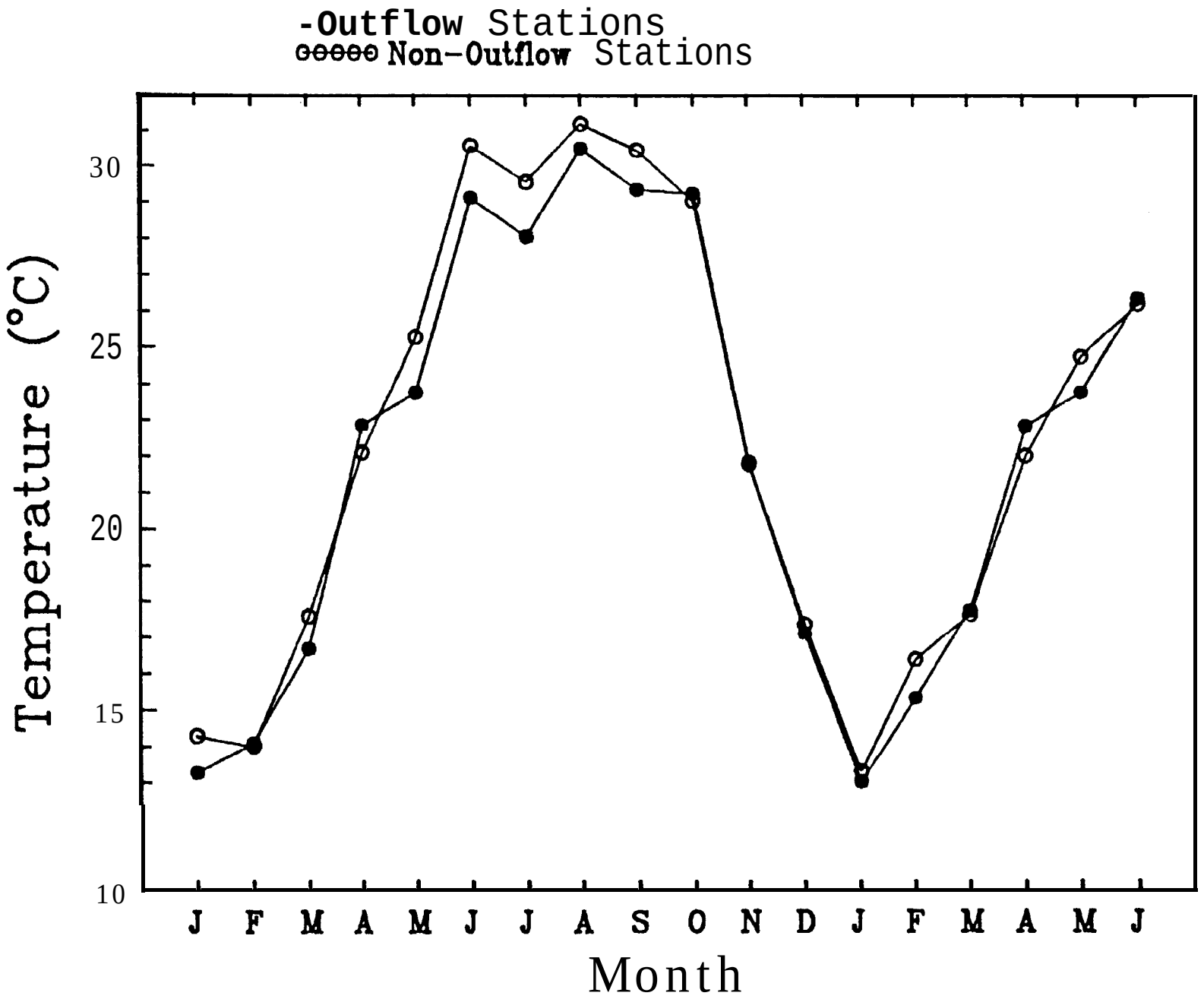

Figure 2. Seasonal Temperature Fluctuations Comparing Outflow and Non-Outflow Stations.

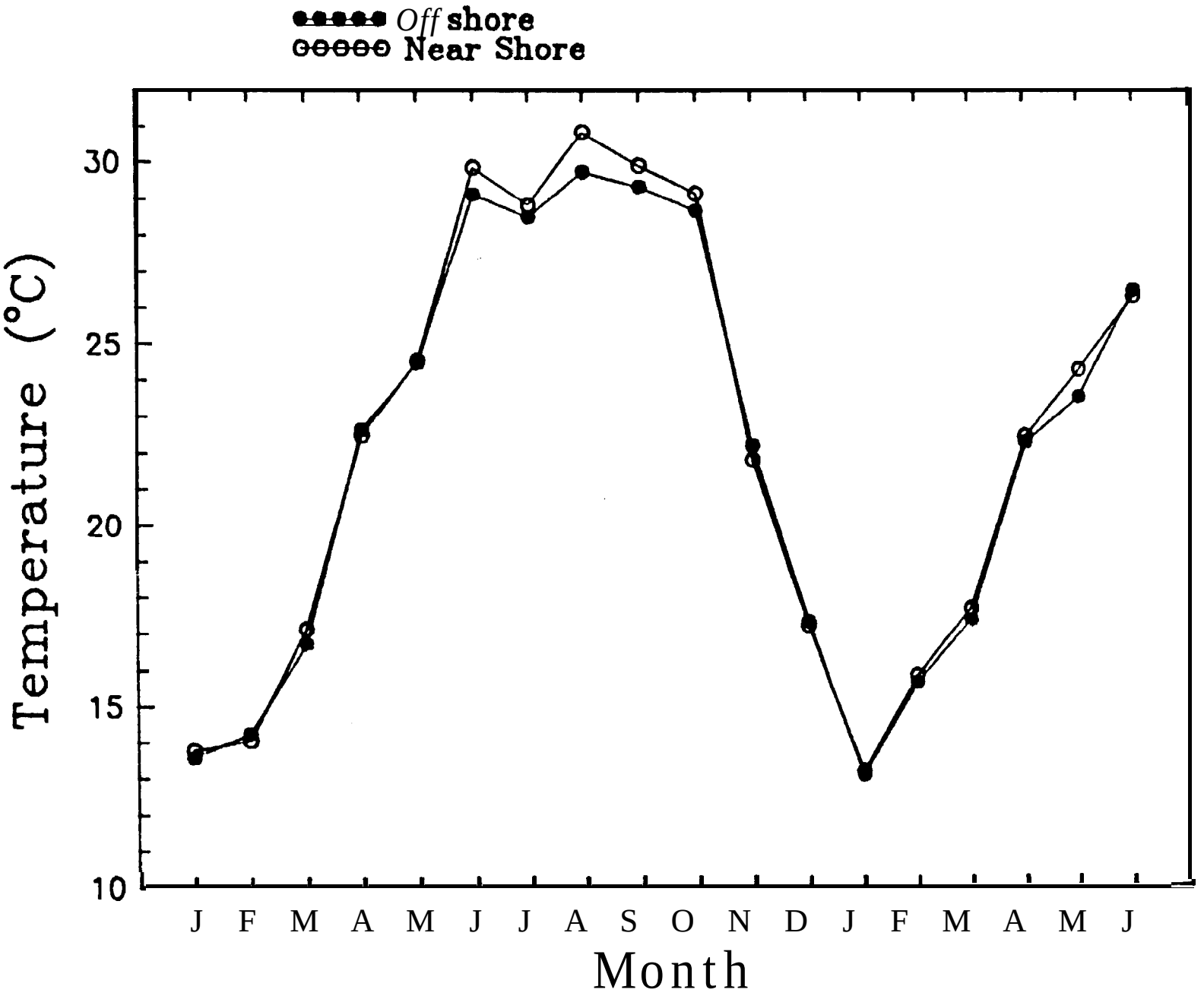

Figure 3. Seasonal Temperature Fluctuation of Nearshore and Offshore Stations.

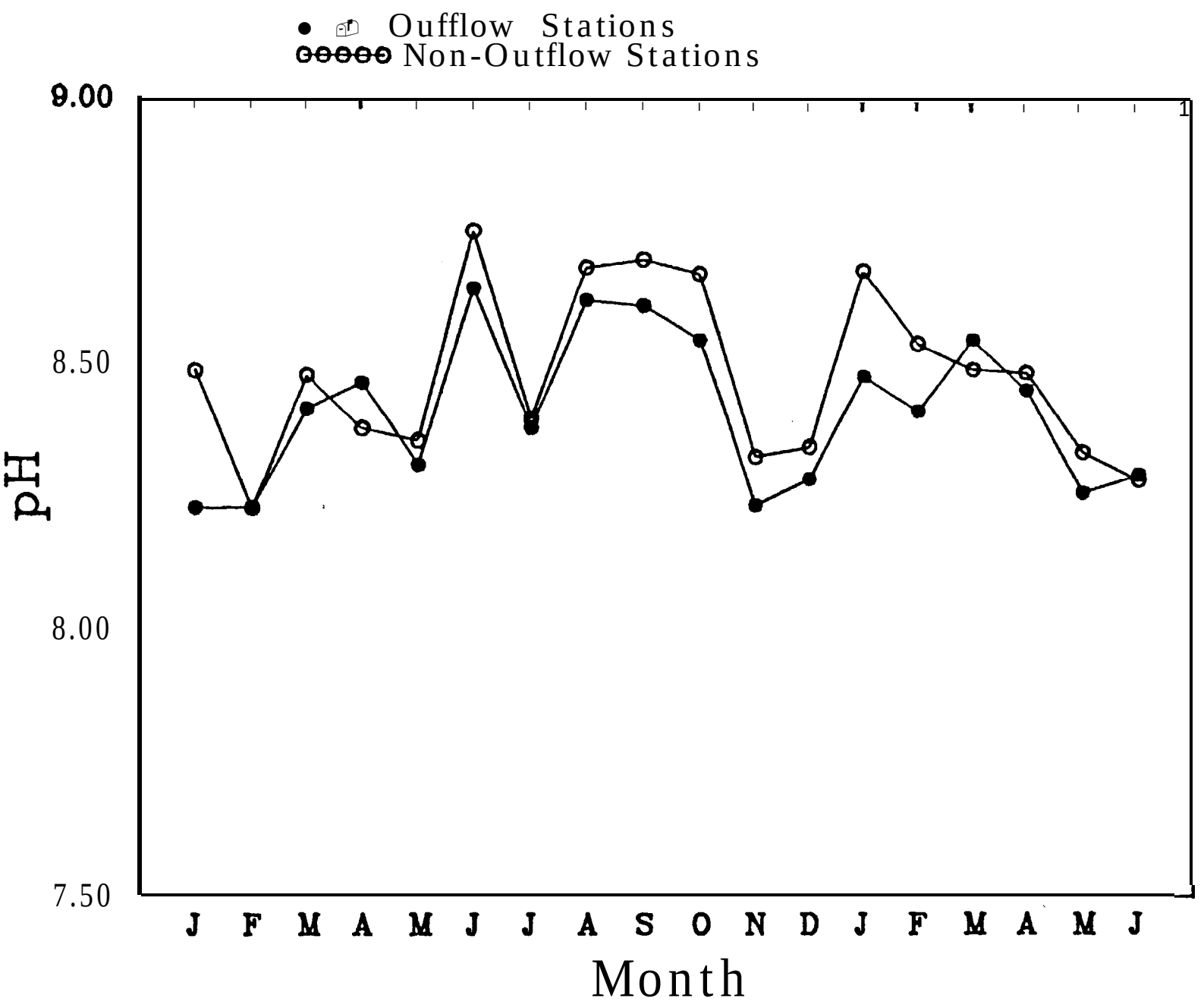

Figure 4. Seasonal Fluctuation of pH Comparing Outflow to Non-Outflow Station.

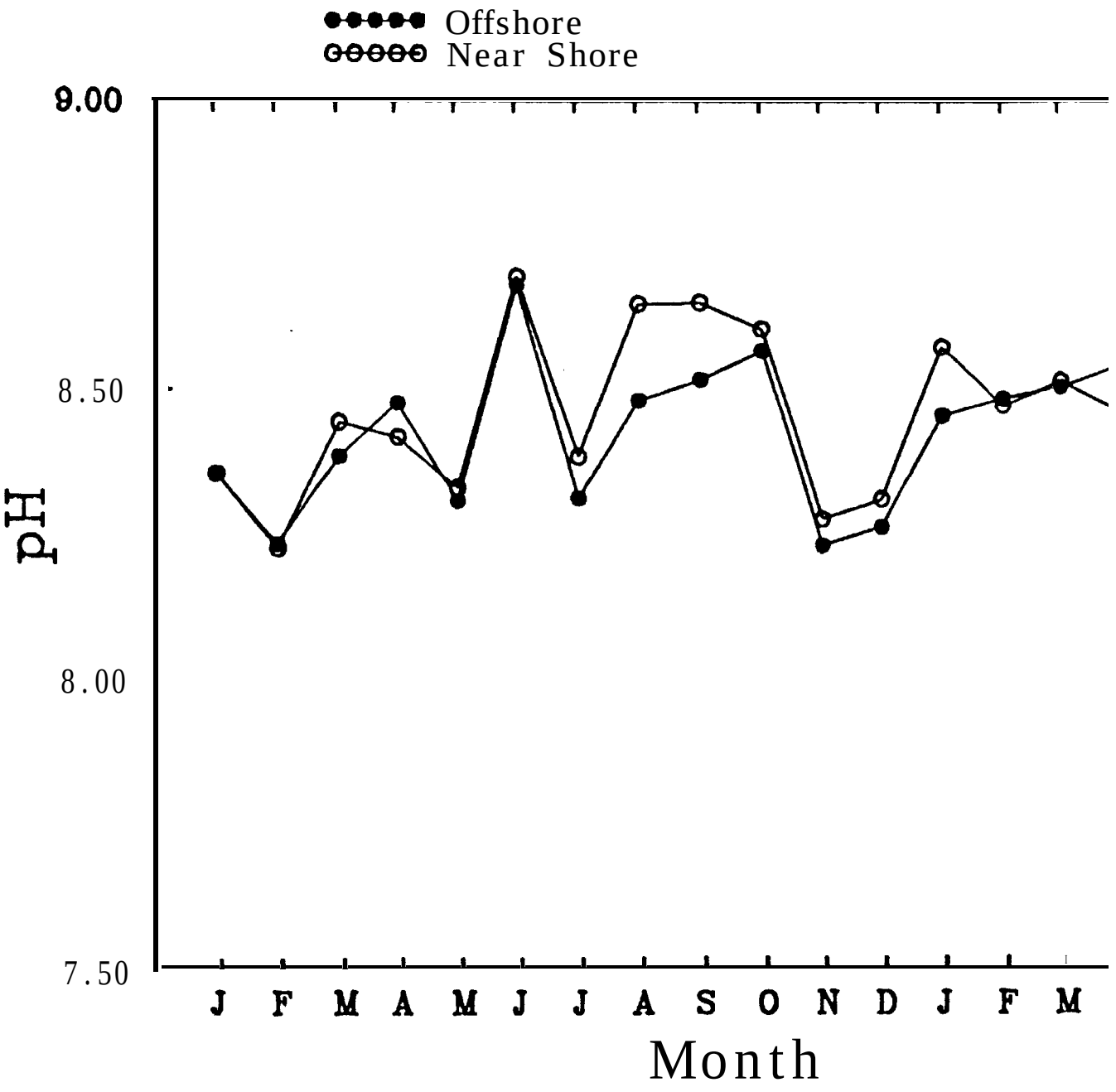

Figure 5. Seasonal_ Fluctuations of p!! Comparing Nearshore and Offs

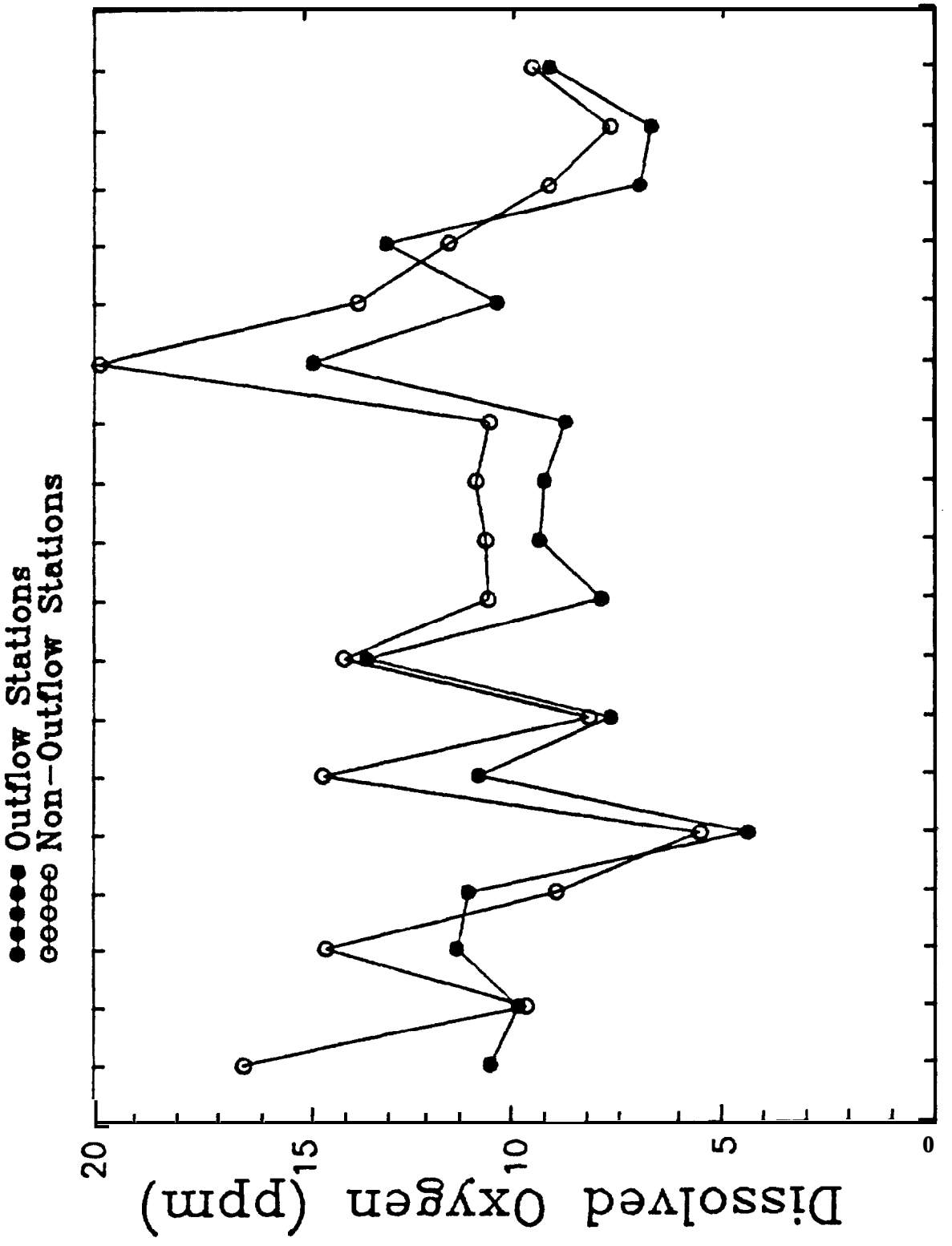

Figure 6. Seasonal Dissolved Oxygen Fluctuation Comparing Outflow and Non-Outflow Stations.

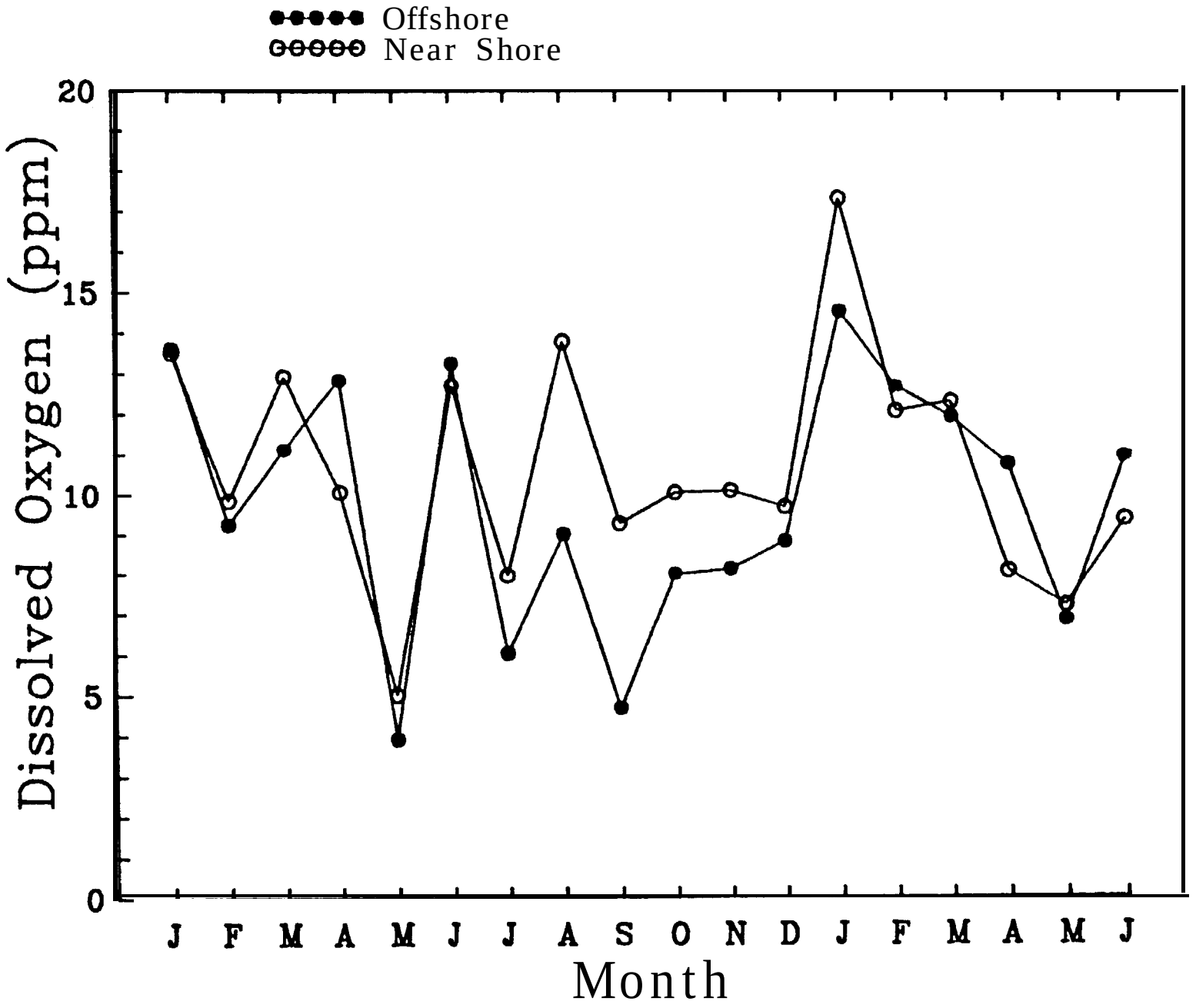

Figure 7. Seasonal Dissolved Oxygen Fluctuation Comparing Nearshore and Offshore Stations.

throughout the year regardless of the increased water temperature during the summer months.

4. The total dissolved solid levels have fluctuated within a narrow range 38 ppt to 41 ppt within the 18 months of the field study. No general increase in total dissolved solid levels can be detected from the current data. The fluctuations may be due to rainfall, irrigation runoff and evaporation (Fig. 8).

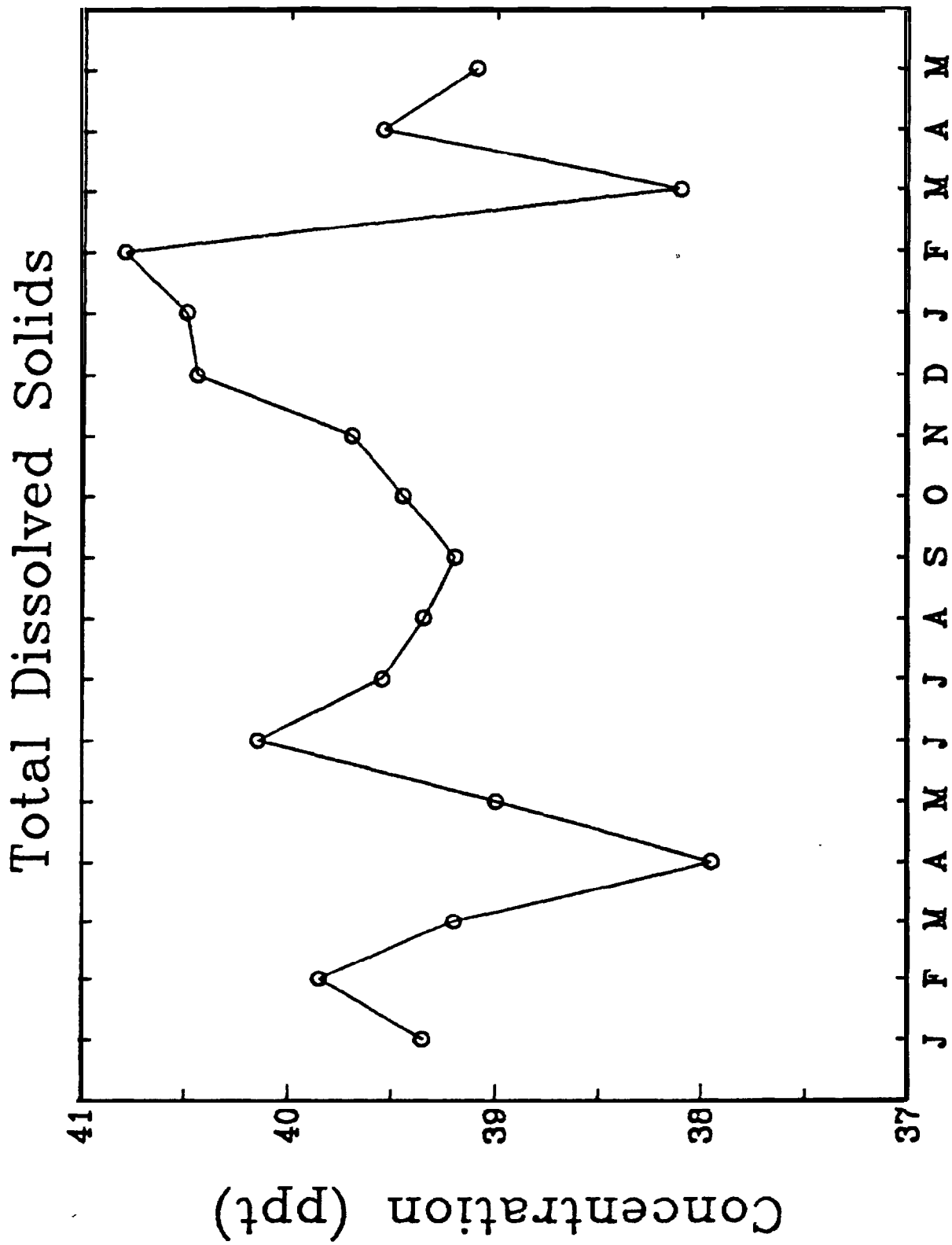

Figure 8. Seasonal Fluctuation of Total Dissolved Solids.

VI. RECOMMENDATIONS

1. Although Brocksen and Cole (1972), Lasker (1972) and May (1975) found that 40 ppt salinity exceeded the upper tolerance limits of Salton Sea fish during embryonic and larval development, the total dissolved solid levels while fluctuating between 38 and 41 ppt apparently have not inhibited the production of ichthyoplankton in the Salton Sea.

2. Analyses of the water quality parameters for outflow and non-outflow stations as well as nearshore and offshore stations indicate that there were no significant differences between stations. The distribution of early stage eggs for Anisotremus and the sciaenids do not appear to be random. As previously mentioned, Anisotremus appears to be associated with area which have submerged structures, Sunken City (SU); Salt Creek (SC); Treeline (TL), and Riviera Yacht Club (RY) (Fig. 9). The early stage sciaenid eggs were predominantly found on the westernside of the Sea, Riviera Yacht Club (RY); Sandy Point (SP) and San Felipe Creek (SF), at the Middle of the Sea (MS) station, and on the easternside of the Sea Salt Creek (SC). The 1987 and 1988 data for Anisotremus early stage egg distributions were comparable, however, all analyses for sciaenid eggs are not complete. It is of interest that 92.1% of the Anisotremus early stage eggs and 81.1% of the early stage sciaenid eggs were collected at non-outflow stations, although large numbers of the gravid adults can be collected near the outflow stations.

3. Water quality parameters other than those which are currently being measured should be analyzed to determine their affect on the viability and reproductive capabilities of the sportfishery. The Toxic Substance Monitoring Program has determined that selenium, zinc, copper, cadmium

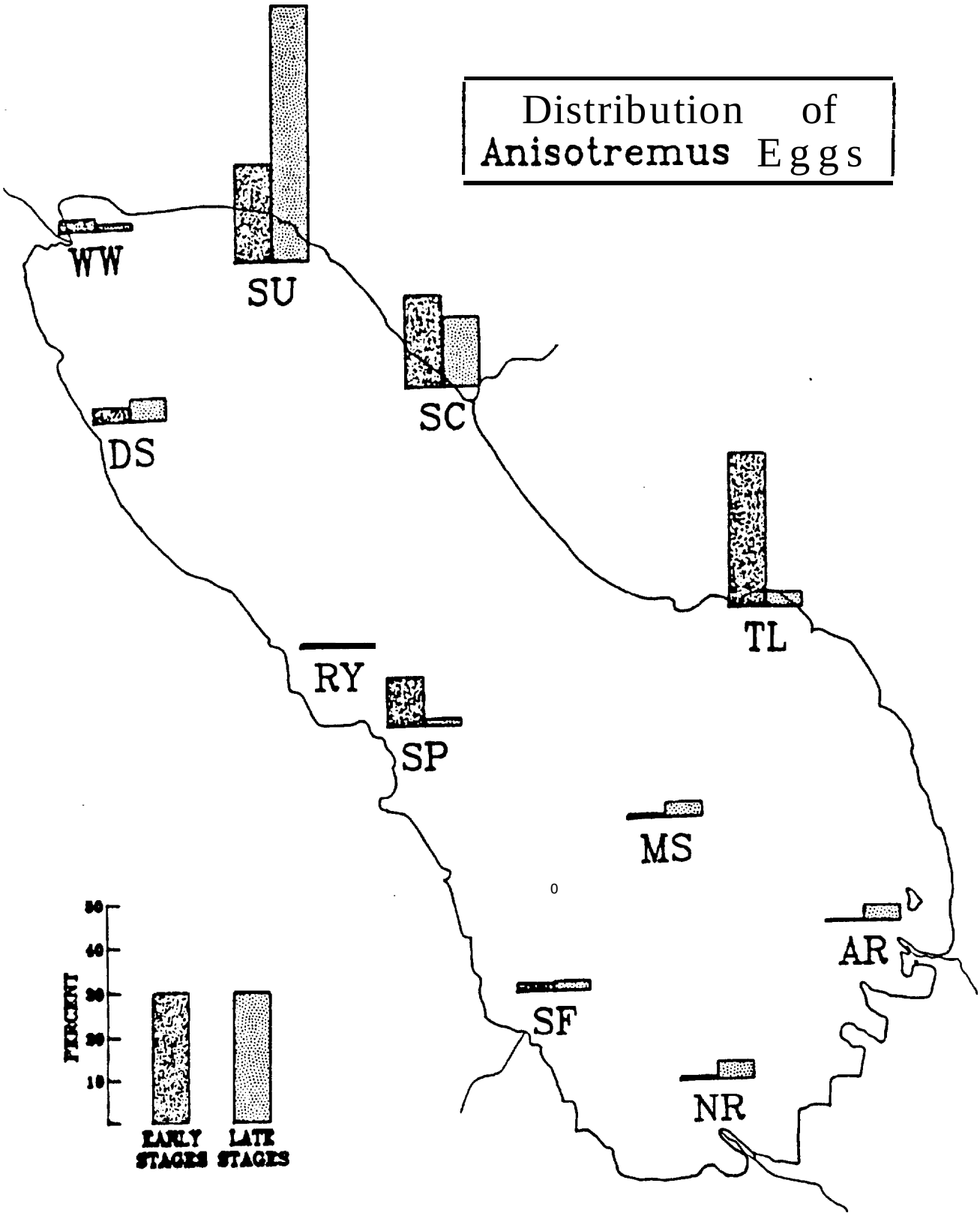

Figure 9. Distribution of Developmental Stages of Anisotremus davidsonii

and arsenic levels were relatively high in the muscle tissues of some of the Salton Sea sportfish. The effects of these heavy metals and various combinations of temperature and increased levels of total dissolved solids is unknown. Analyses of ovaries, ichthyoplankton, juvenile fish, zooplankton, water and sediment samples should be conducted to determine existing levels of heavy metals and to determine if biomagnification does occur. In addition to the salinity bioassays, heavy metal bioassays should be conducted to determine the effects of each metal on the reproductive capabilities of the Salton Sea sportfish. Other water quality parameters that could affect reproduction and survival of Salton Sea sportfish, their eggs and larvae are pesticides and herbicides.

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