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GRAPHIC REPRESENTATIONS OF SEA SURFACE TEMPERATURE DATA FROM THE 1976 SOUTHEAST ALASKA TROLL LOGBOOK PROGRAM

by
James R. Hastings

AUGUST 1977

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GRAPHIC REPRESENTATIONS OF SEA SURFACE
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INTRODUCTION

In early 1976 the Alaska Trollers Association, the University of Alaska Sea Grant Program, the National Marine Fisheries Service, and the Alaska Department of Fish and Game jointly undertook a troll logbook program for the southeast Alaska troll fishery. The Alaska Trollers Association began distributing logbooks to southeast Alaska trollers in April of 1976, although several trollers began their actual recordings in February of 1976.

Although 14 separate areas were outlined by several members of the Alaska Trollers Association as representing relatively discrete troll fisheries in the southeast Alaska area, 9 areas were subsequently selected for data summaries. Observations from these areas, as recorded in the logbooks, include troll locations, sea surface temperatures, marine mammal sightings, salmon and bottom fish catches, and salmon feed species. The sea surface temperature observations are summarized in this report.

DATA ANALYSIS

Temperature data from the Alaska Trollers Association logbooks have been plotted using the joint numerical processing facilities of the Resource Ecology Task (REFM, NWAFC), and the University of Washington Academic Computer Center. These data have been converted to proper machine-readable format, averaged over small areas (when necessary), and plotted on a computer-generated Mercator chart of the study area (Figures 1 and 2).

These temperature data were sorted as to date and location. Because of the extensive data obtained from May to September, it was not possible nor desirable to plot all data for an entire month on one chart. Data for these five months were sorted into three distinct time periods: the first ten days of each month, days 11-20, and days 21 through the end of the month, and then plotted on separate Mercator charts in three latitudinal bands: $54^{\circ} - 56^{\circ}\text{N}$, $56^{\circ} - 58^{\circ}\text{N}$, and $58^{\circ} - 60^{\circ}\text{N}$; by separating the data in this manner and producing 9 separate charts for each month a more meaningful and readable product was produced. For those months when few temperature readings were recorded (February, March, April; October, November, December (Figure 3)), all data for the entire month were plotted on one chart.

In many instances several temperature recordings were taken at the same location and an averaging technique was devised to average all data within a finite latitude-longitude box. The data were sorted in ascending order according to latitude and longitude for each time period, and all data within a given $.05^{\circ}$ lat. - $.10^{\circ}$ long. were tabulated. At the latitude of this study, a box of this size is approximately three nautical miles on a side. Thus, this averaging technique will yield new positions which are never greater than 1.5 nautical miles from the initial position taken from the logbook. If a

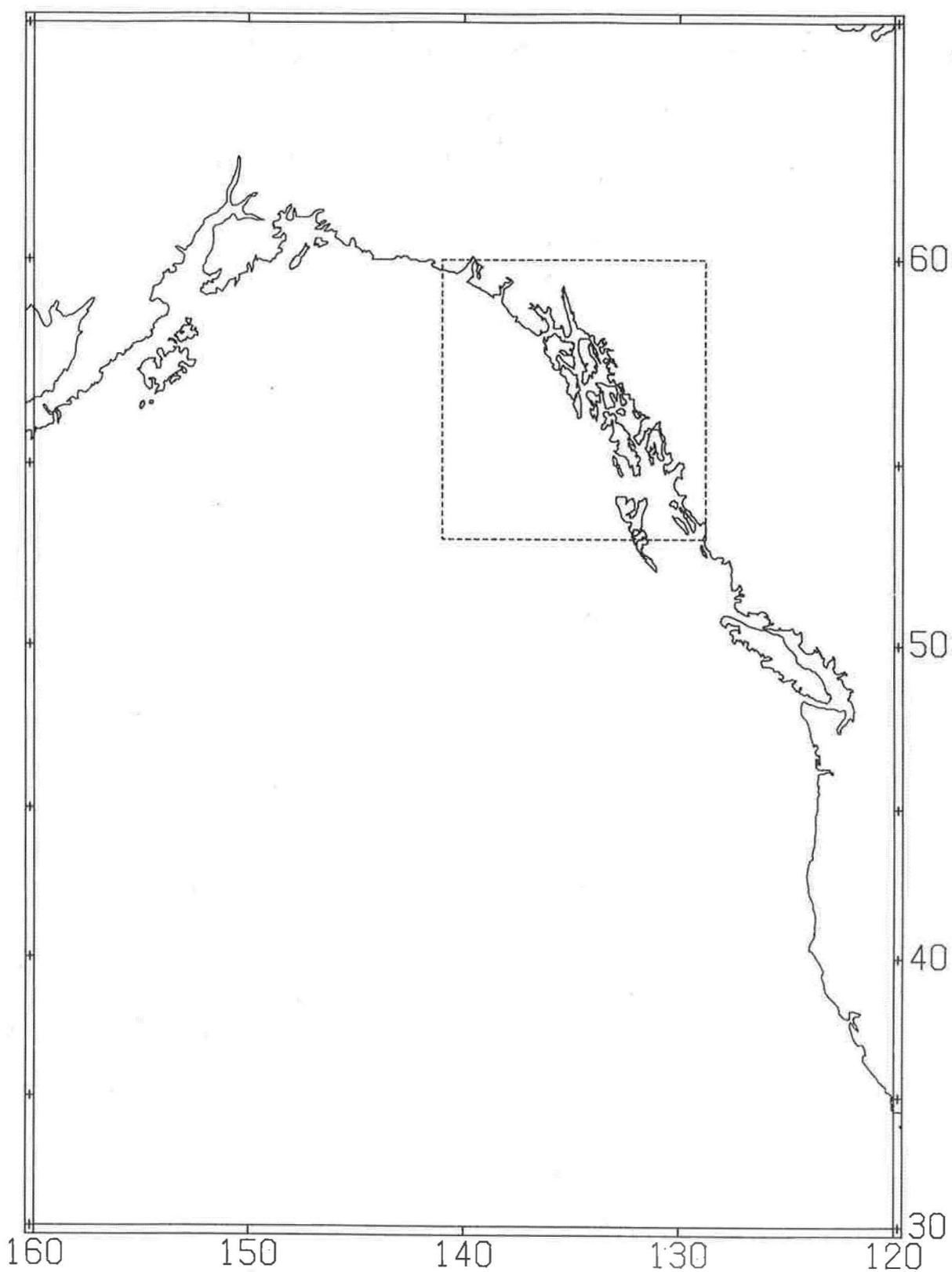


Figure 1.--A computer-generated Mercator chart of the North Pacific coastline, from 120°W to 160°W. The rectangular area outlined by the dashed lines (54°-60°N, 130°-140°W) shows the area of the southeast Alaska troll fishery logbook program for 1976.

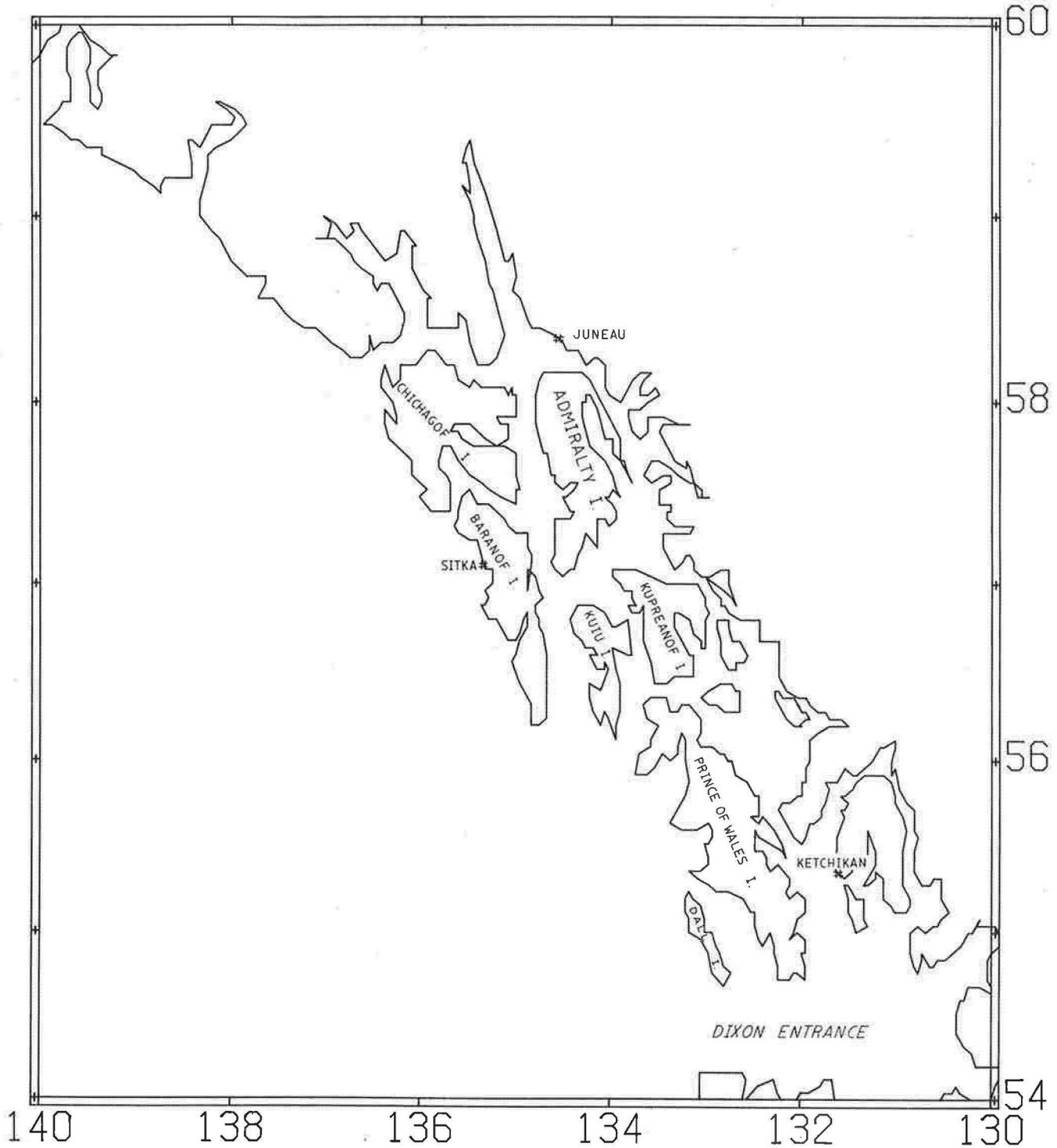


Figure 2.--A computer-generated Mercator chart of the area of the southeast Alaska troll fishery logbook program for 1976.

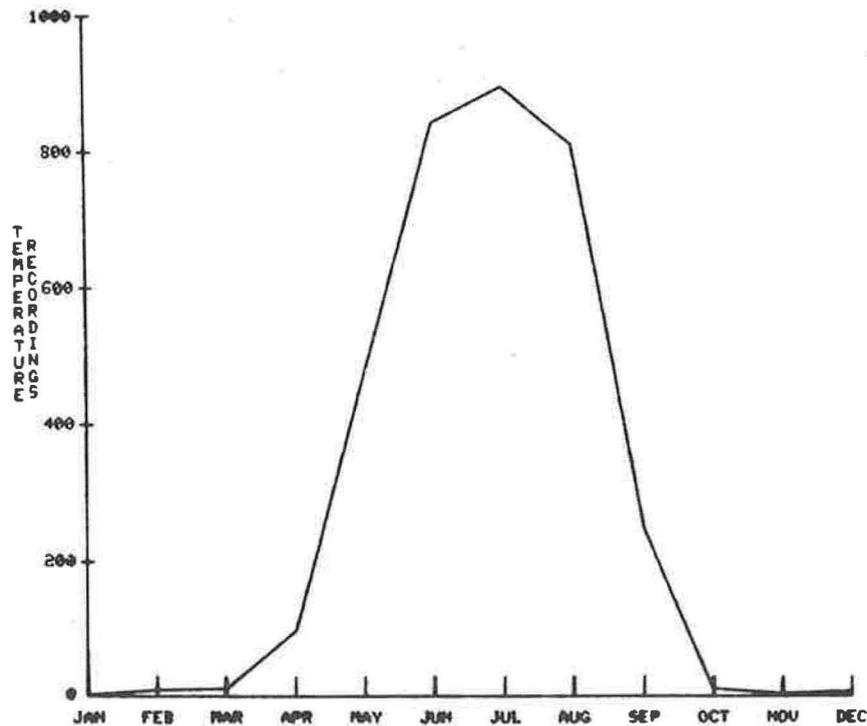


Figure 3.--Frequency of surface temperature recordings by months, 1976.

box contained more than one temperature recording, the recordings were averaged and the average value assigned to that particular box was plotted. If only one temperature was reported within a particular box, the actual value was plotted. These plots are found in the Appendix.

MONTHLY TEMPERATURE CONTOUR CHARTS - MAY THROUGH SEPTEMBER

Temperature contour charts on two-degree intervals ($^{\circ}\text{F}$) were generated for May through September. These contour charts represent all data obtained during a particular month, and should not be interpreted as a mean condition for the month, but rather as a composite of all those temperatures recorded during that month and are biased by fishing intensity during the month. The charts of May and September are less complete than those of June, July, and August because there were fewer values on which this interpretation could be based.

Data for May indicate two temperature maxima greater than 50°F , off the west coast of Chichagof Island and between southeast Baranof Island and the southwest coast of Kuiu Island (Figure 4). Two major temperature minima less than 40°F occurred off the west coast of Prince of Wales Island.

In June, the maxima off the west coast of Chichagof Island increased two degrees, to greater than 52°F , and temperatures of greater than 54°F are in evidence off the coast of the Alaska mainland near 59°N (Figure 5). A large gradient of greater than 8°F was evident between southeast Baranof Island and the southwest coast of Kuiu Island. Temperatures less than 42°F occurred off the southwest coast of Prince of Wales Island, while a maximum of 56°F occurred just south of Ketchikan.

In July, an increase in temperature, compared to the previous month, was evident off the coast of the Alaska mainland near 59°N (Figure 6). A large gradient, from less than 50°F to greater than 58°F , that was not present in June was apparent between the Alaska mainland and the northern coast of Chichagof Island. Two temperature minima of less than 50°F were evident between the southern tip of Chichagof Island and the northern coast of Baranof Island, and off the southern tip of Baranof Island. A large area with temperatures greater than 56°F existed just west of Sitka. Along the northwest coast of Prince of Wales Island, a sharp gradient of greater than 12° occurred, with temperatures ranging from 50°F to 62°F . Temperatures of less than 50°F occurred off the southern tip of Prince of Wales Island, whereas temperatures of 56°F were encountered south of Ketchikan.

Most of the major features of the previous month were still in evidence during August (Figure 7). A cold patch of less than 48°F water occurred

southwest of Juneau, and the low temperatures off the southern coast of Baranof Island increased in areal extent. Several patches of high temperature water, in excess of 62°F , were reported off the west coast of Prince of Wales Island.

Temperatures during September (Figure 8) continued to show the general patterns exhibited during August.

In general, the open ocean temperatures increased during July and August, with temperatures of greater than 62°F reported only off the west coast of Prince of Wales Island. The water temperatures in the inside waters were generally colder than those in the open ocean areas, indicating the effects of tidal mixing and river and glacier runoff on the surface water temperature within this area.

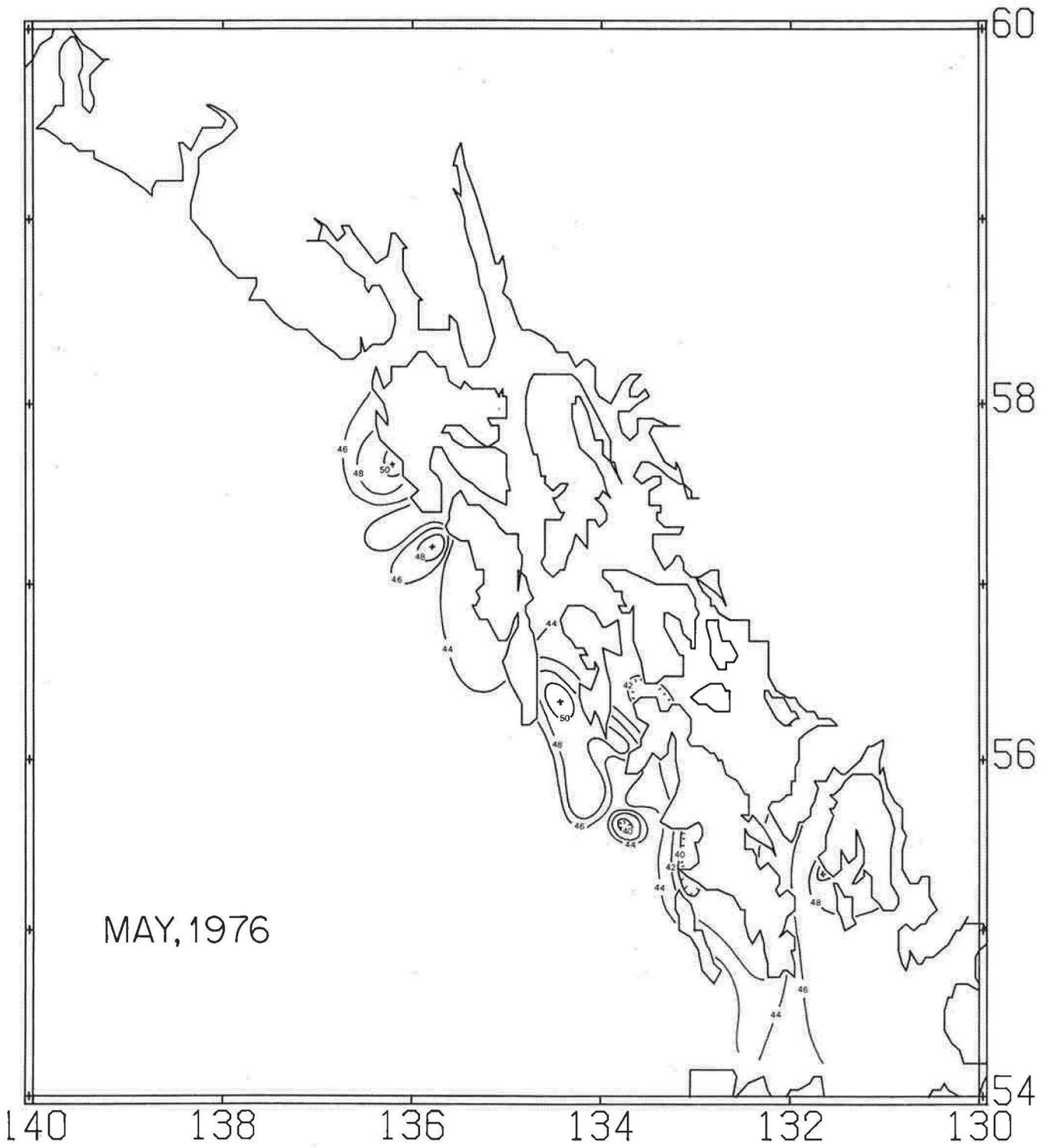


Figure 4.--Contours (2°F) of surface temperature, May 1976.

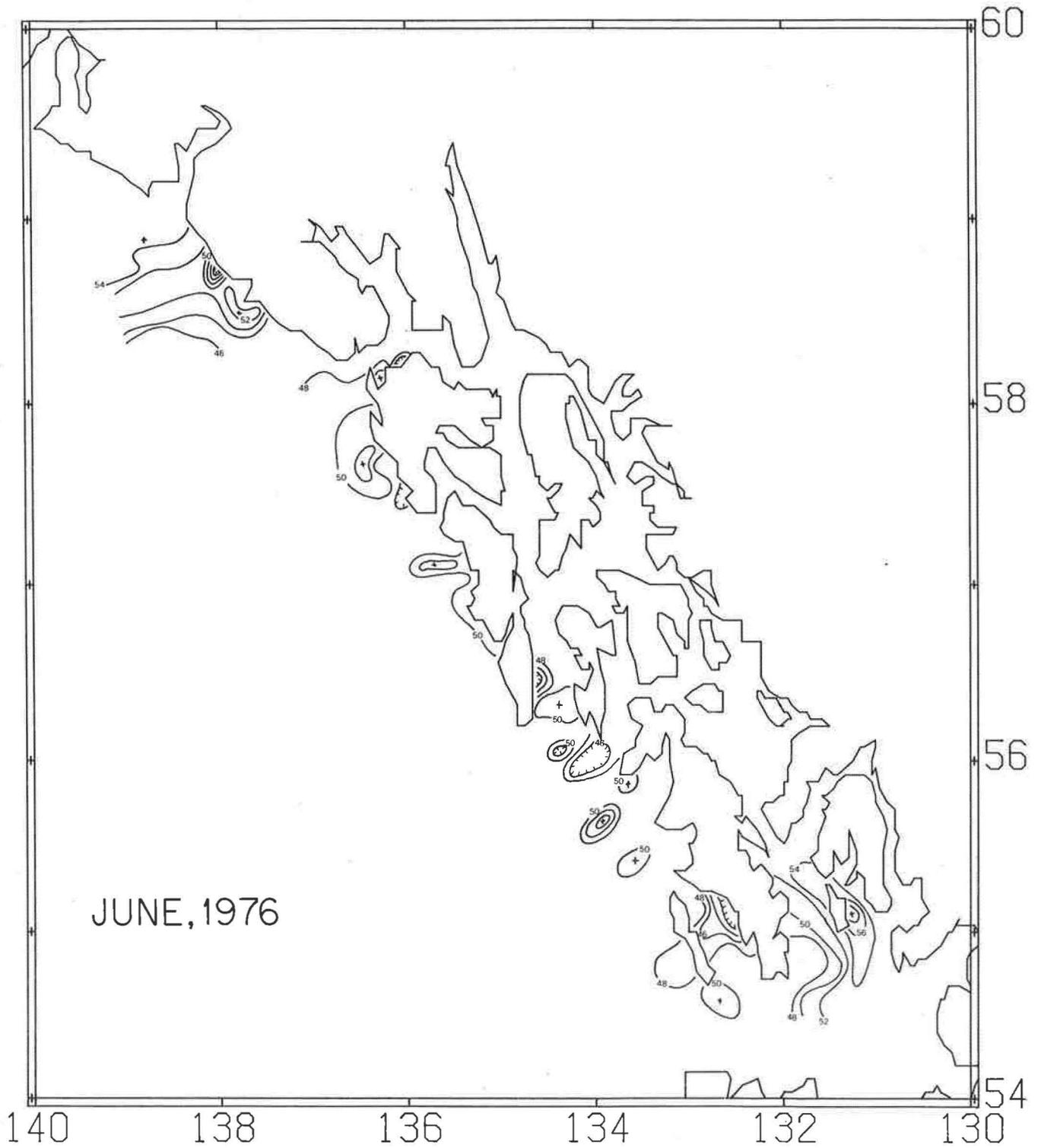


Figure 5.--Contours (2°F) of surface temperature, June 1976.

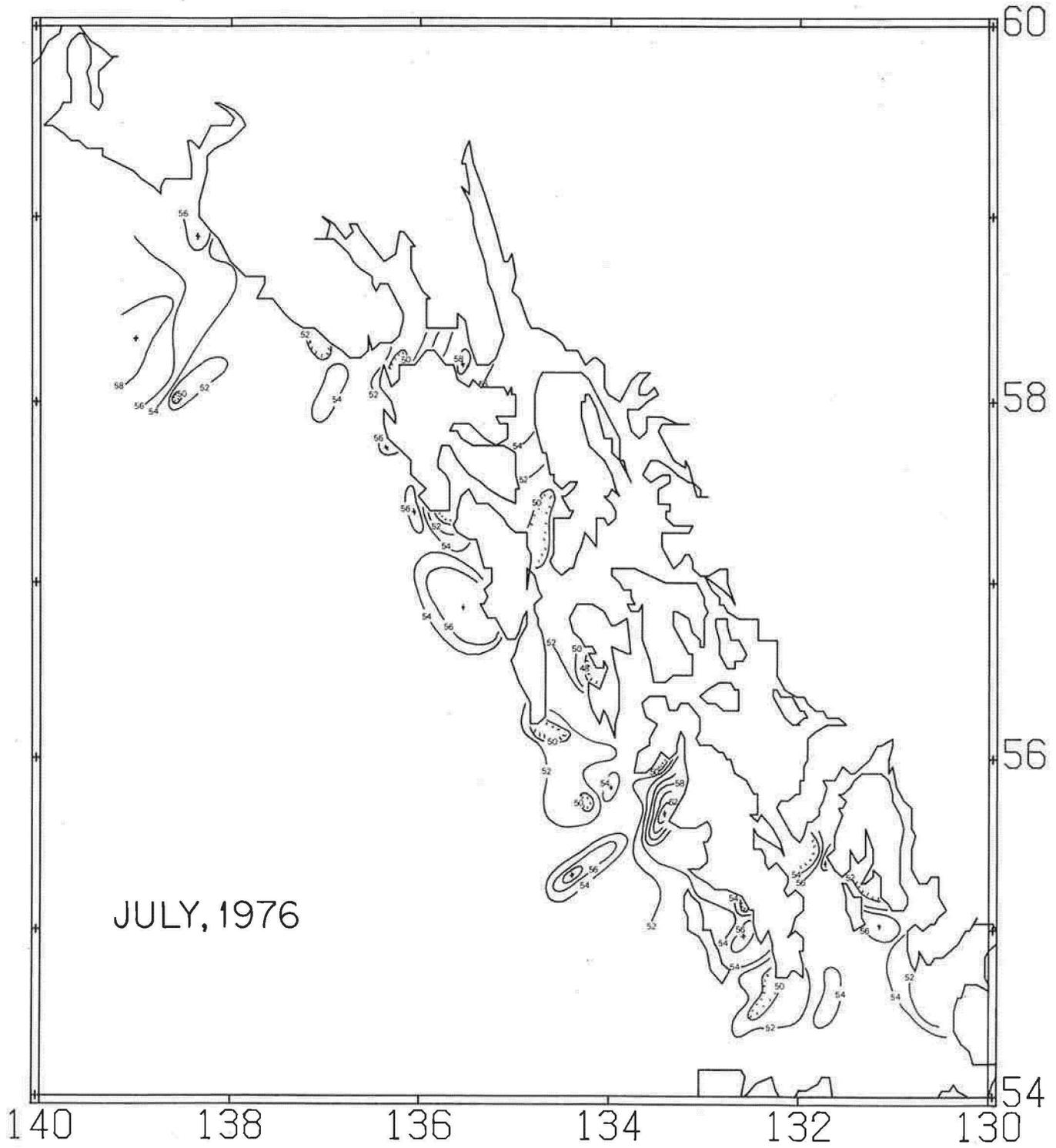


Figure 6.--Contours (2°F) of surface temperature, July 1976.

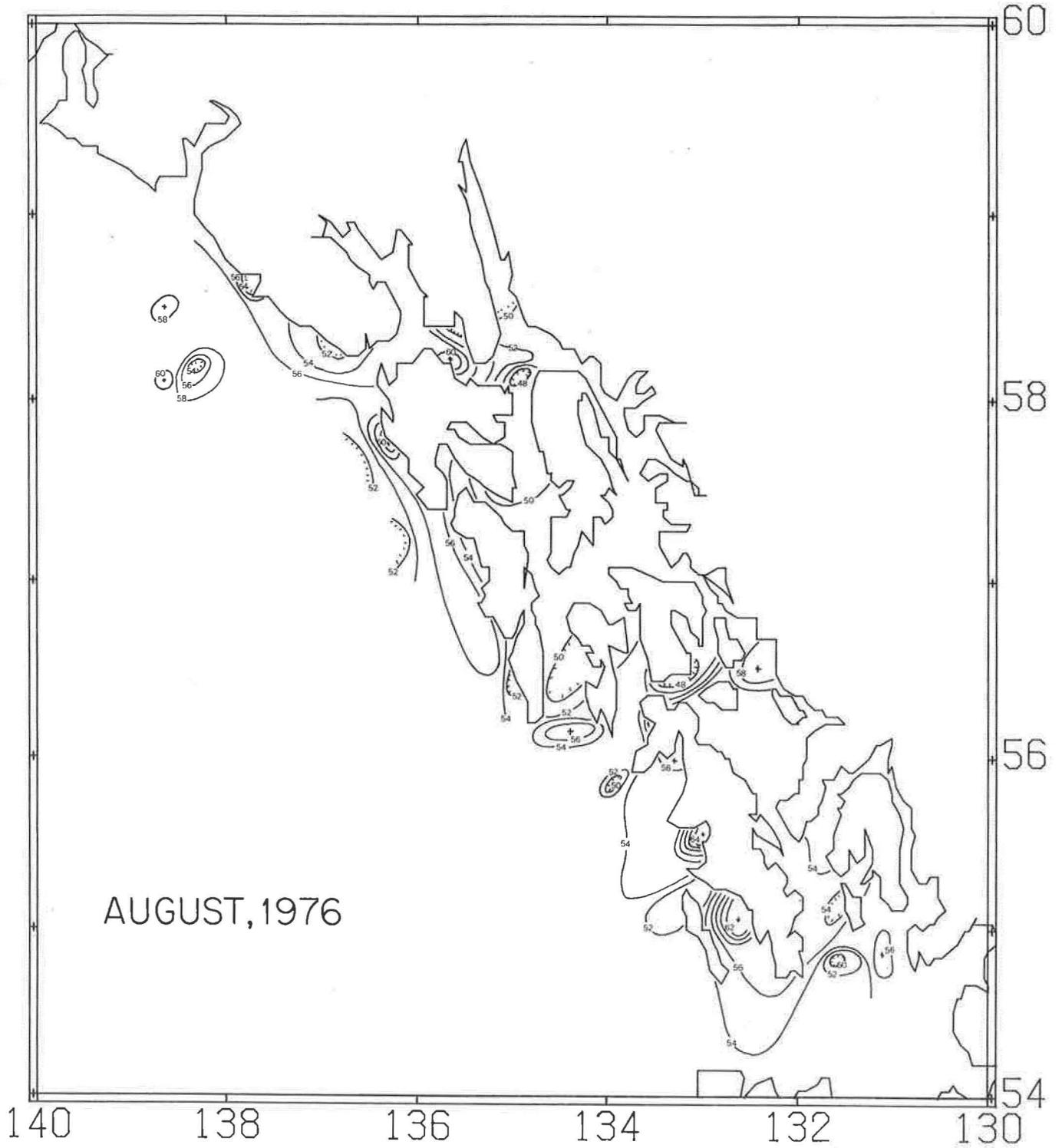


Figure 7.--Contours (2° F) of surface temperature, August 1976.

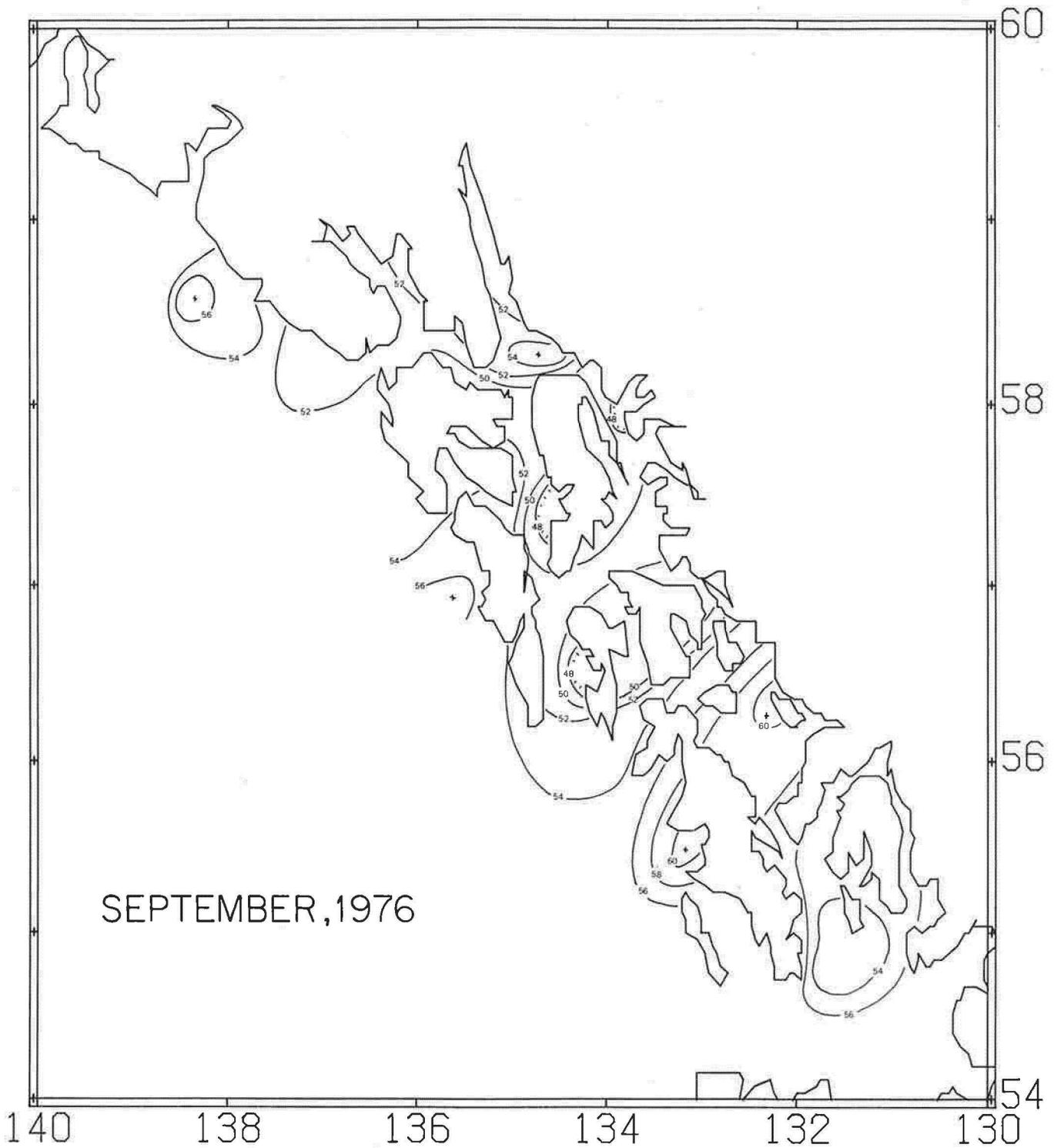


Figure 8.--Contours (2°F) of surface temperature, September 1976.

RECOMMENDATIONS

The first year of this cooperative logbook survey has been remarkably successful, but there are problems which are evident both in the collection and in the interpretation of the data recorded in the logbooks. If useful and coherent findings are to be returned to the ultimate users, the southeast Alaska trollers themselves, there are certain areas which have room for improvement and/or enlargement.

The calibration of the temperature recording instruments needs to be checked constantly using one standard in order to insure the collection of temperature information which is valid and accurate within the bounds of the survey. Working with these temperature data, it was apparent that data in one logbook continually indicated significantly lower temperature readings than others reported in the same area. This discrepancy hints at a recording instrument which differs significantly from the other instruments in use. Calibration checks on all recording instruments at various times during the survey would be desirable.

The geographical data base which permits computer-generated representation of land areas is insufficient for a study of this type. This geographical data base was intended for use in producing charts of large areas, and there is little detail for small area reproductions. A future consideration would be to create a new, more complete geographical representation of this area, for use in computer graphics charting of this area of the North Pacific.

As a greater density of observations and greater accuracy in the recording of geographic location are obtained, it may be possible to analyze surface temperature data on a weekly basis, thus providing considerably more insight into the fluctuations of temperatures within this area. Environmental data of this type would be extremely useful in research in this area of Alaska.

As this logbook survey proceeds, a method of more closely coordinating all phases of the study will be necessary. Although the raw data from the logbooks are given in one form, the resultant products from environmental scientists, fishery biologists, and marine mammal specialists may emerge in a variety of different formats. The usefulness of these products needs to be closely reviewed and guidance given as to products which would be most useful to the ultimate user of the data, the southeast Alaska troller.

ACKNOWLEDGMENTS

Dr. Bruce L. Wing of the NWAFC Auke Bay Laboratory and Ivan Frohne of the Alaska Department of Fish and Game were responsible for providing these data. Dr. Felix Favorite, Task Leader, and Zelda Zabinsky, Mathematician, of the Resource Ecology Task, NWAFC, gave needed advice and assistance in the formatting and computer graphic output of the data. Technical assistance in preparing this report for publication was also given by Carol Oswald and Marjorie Gregory, NWAFC.

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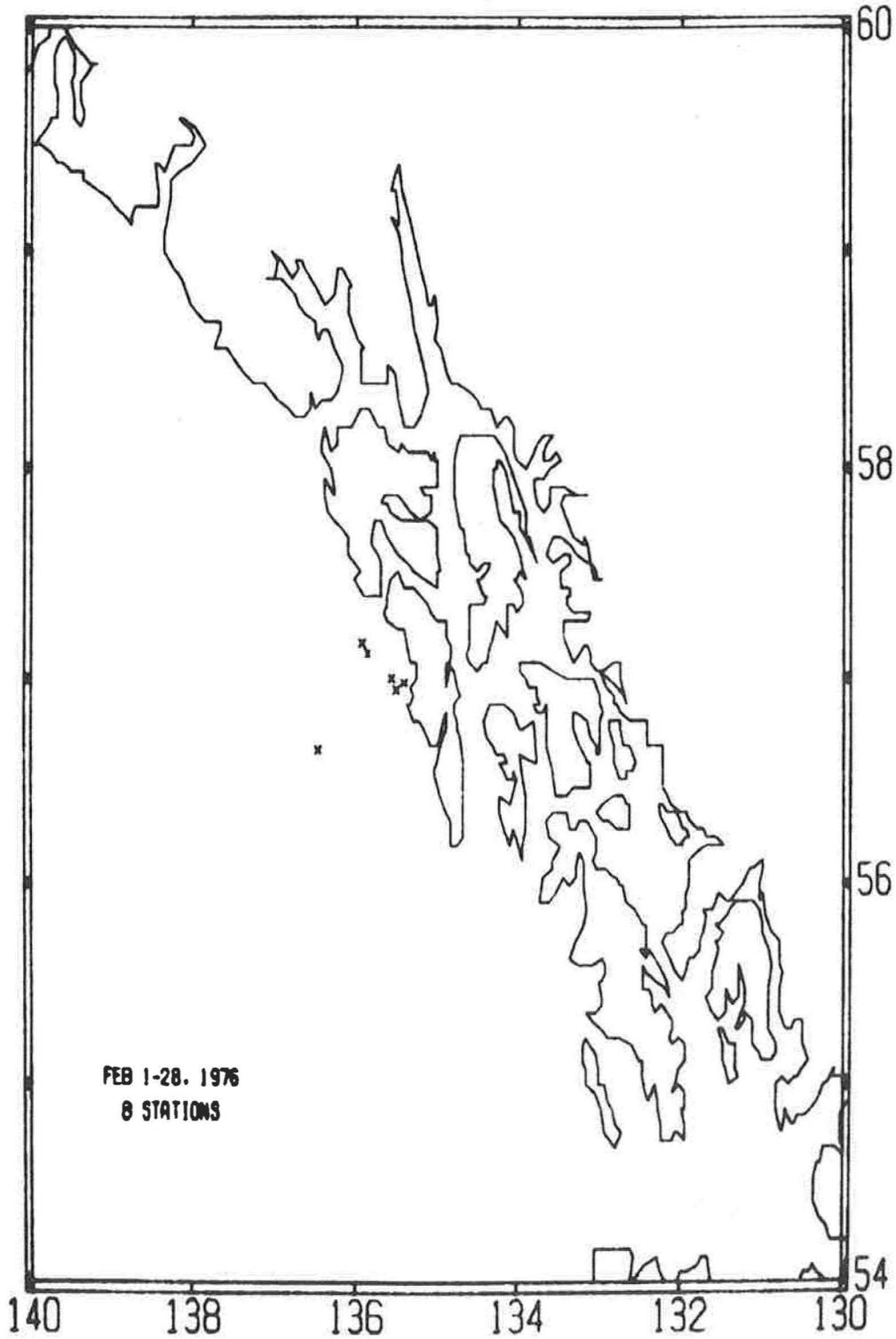
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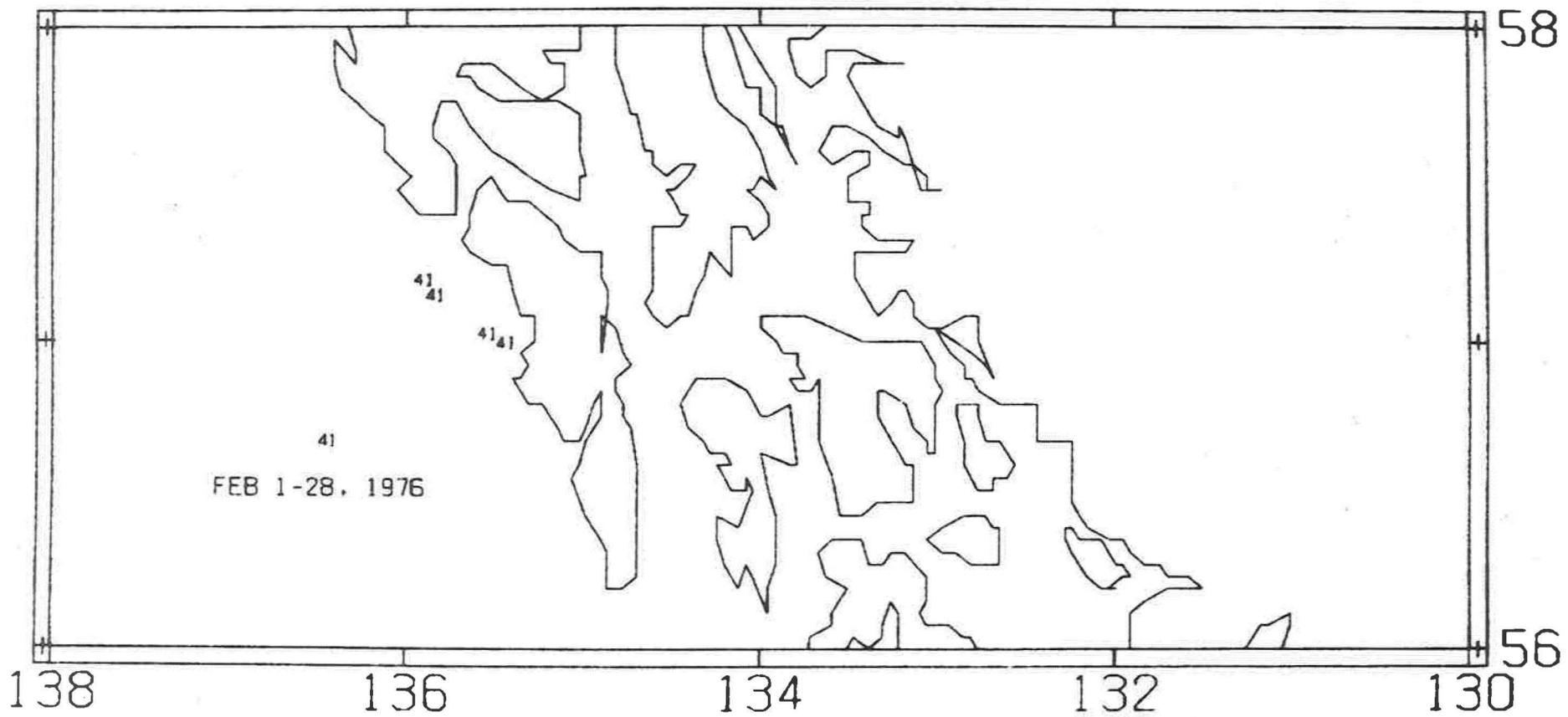
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KETCHIKAN TROLLERS LOGBOOK SURVEY

STATION LOCATIONS

FEB. 1976

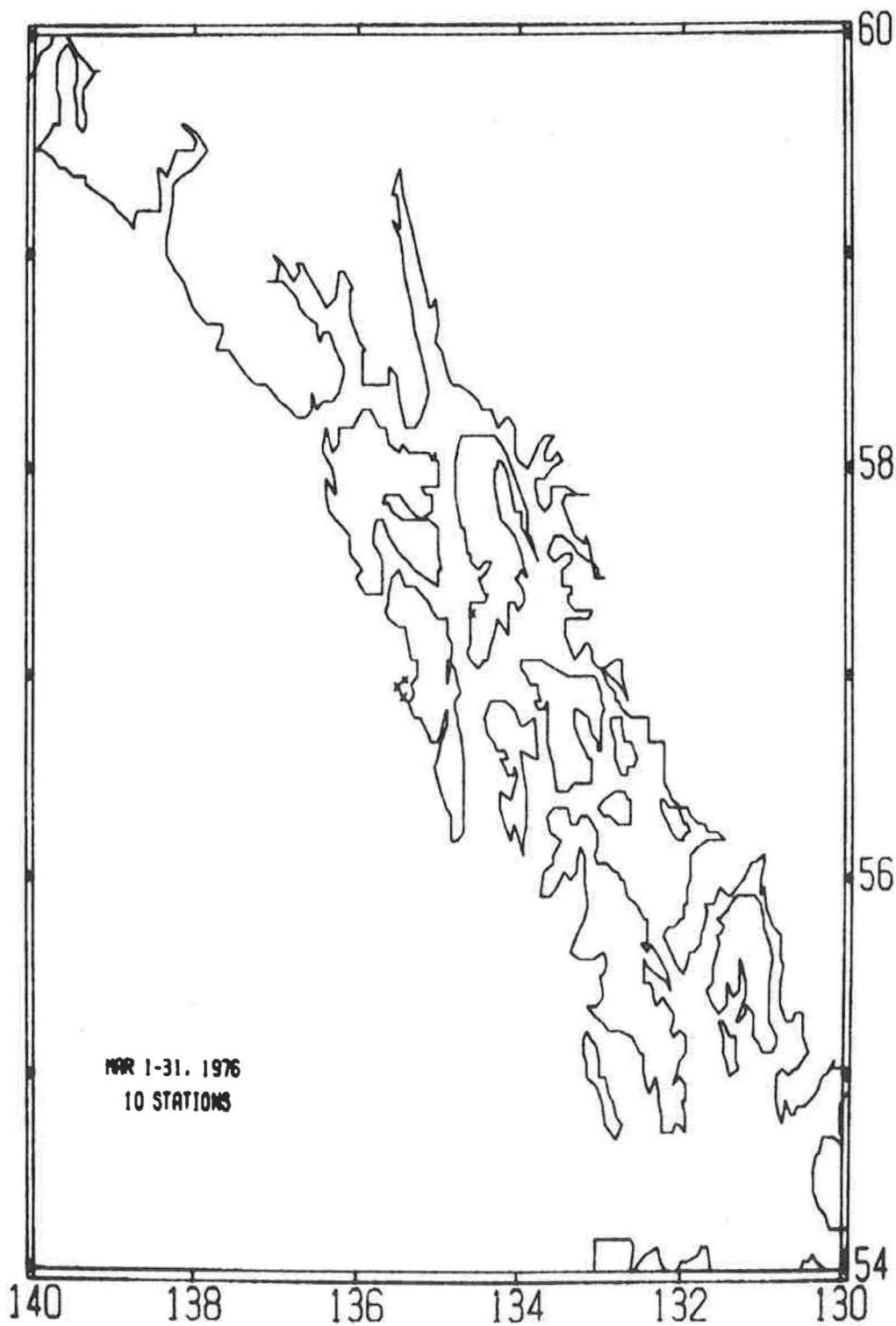




KETCHIKAN TROLLERS LOGBOOK SURVEY

STATION LOCATIONS

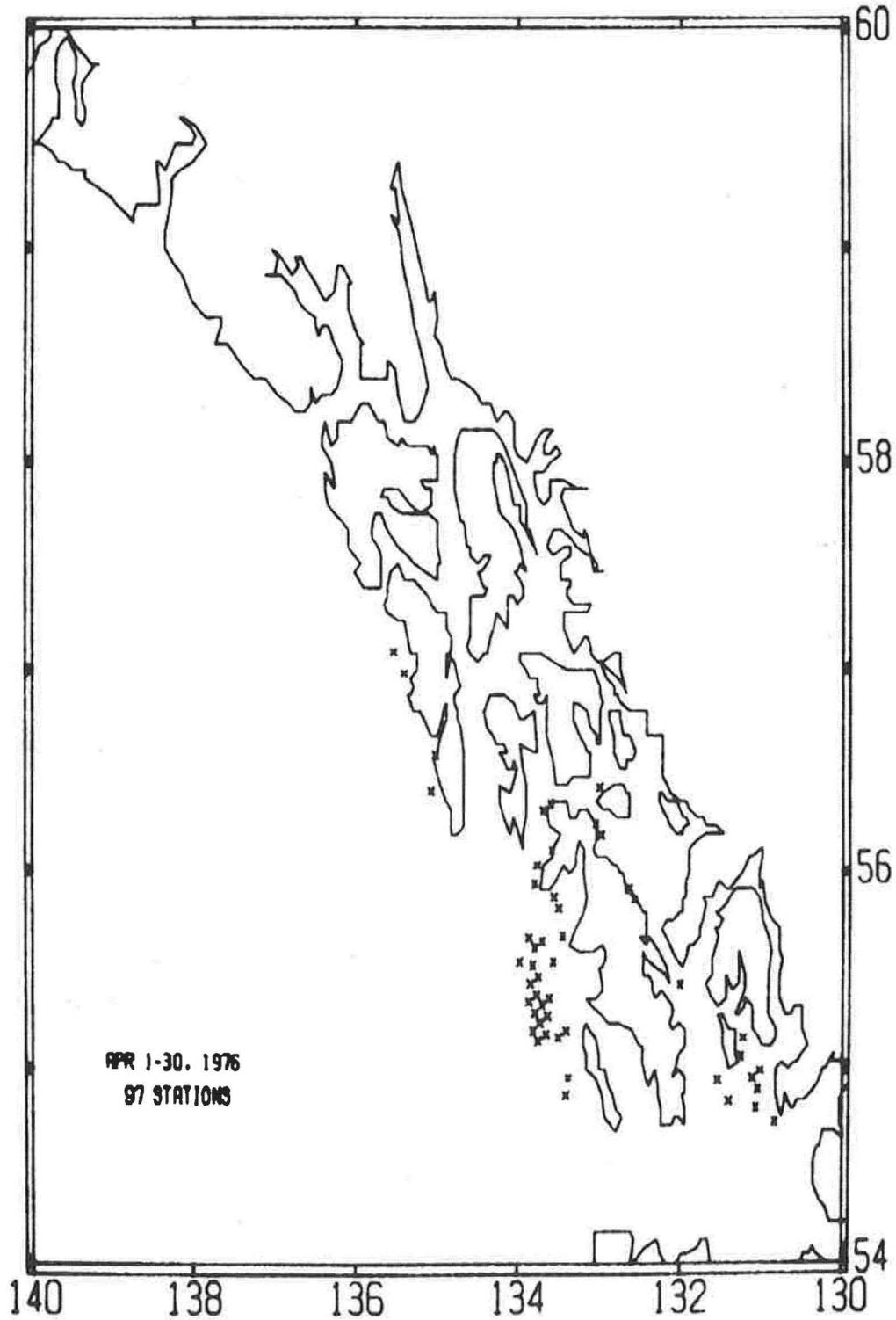
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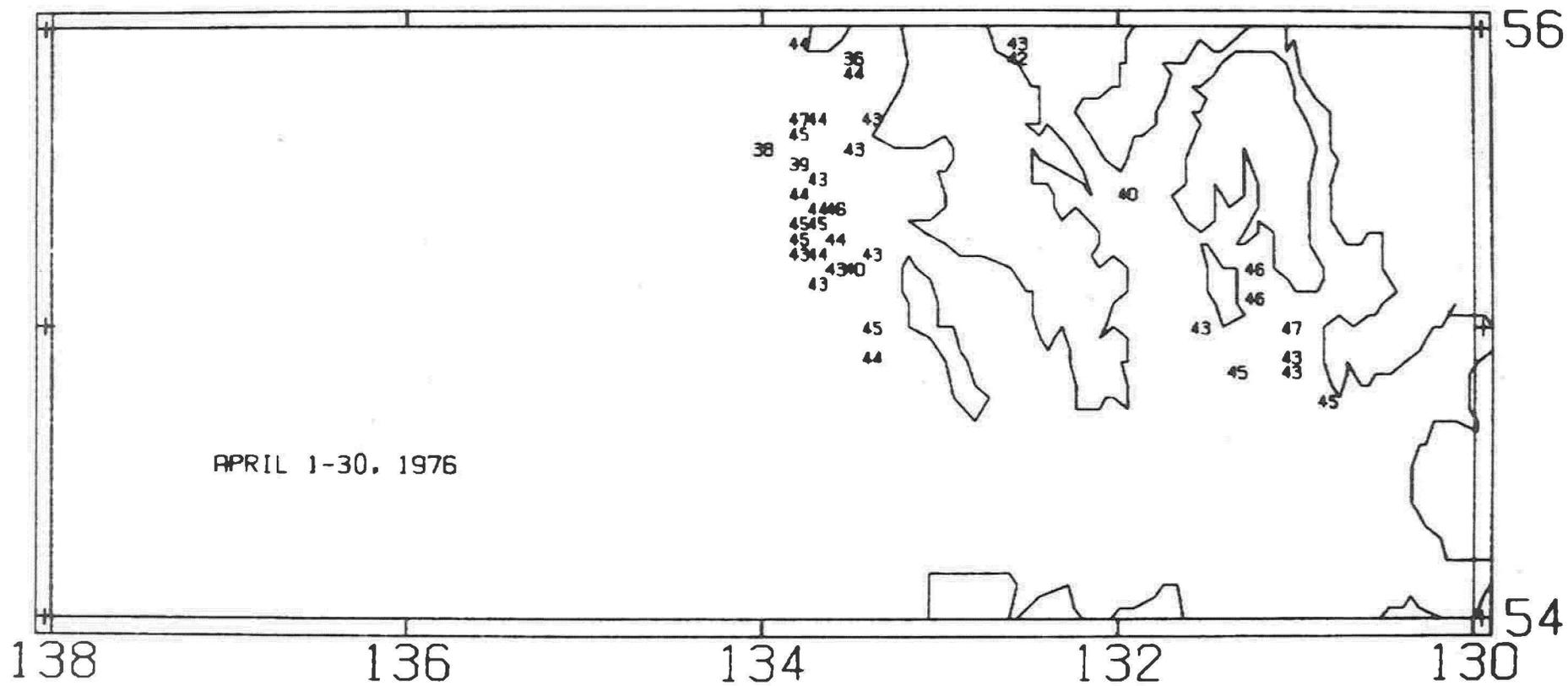


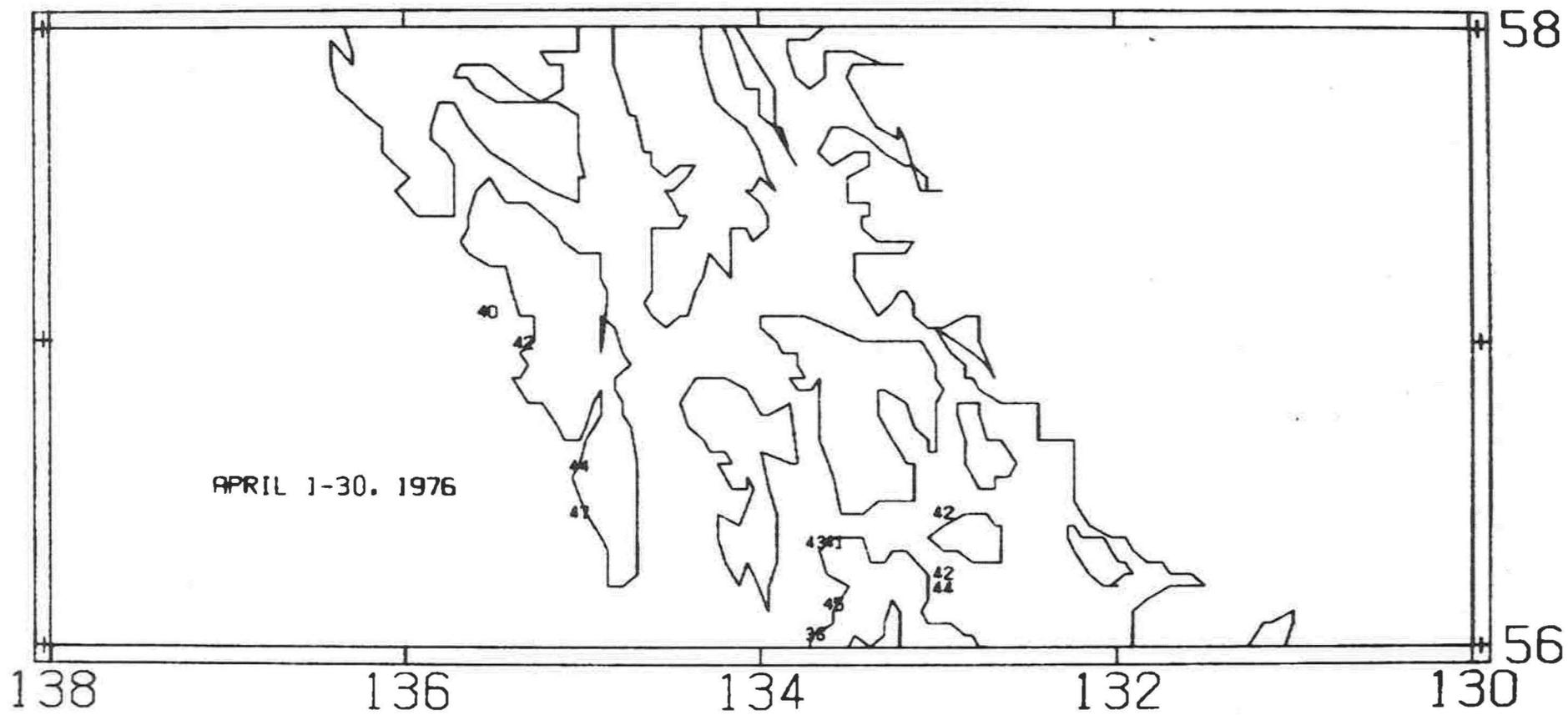
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STATION LOCATIONS

APR. 1976



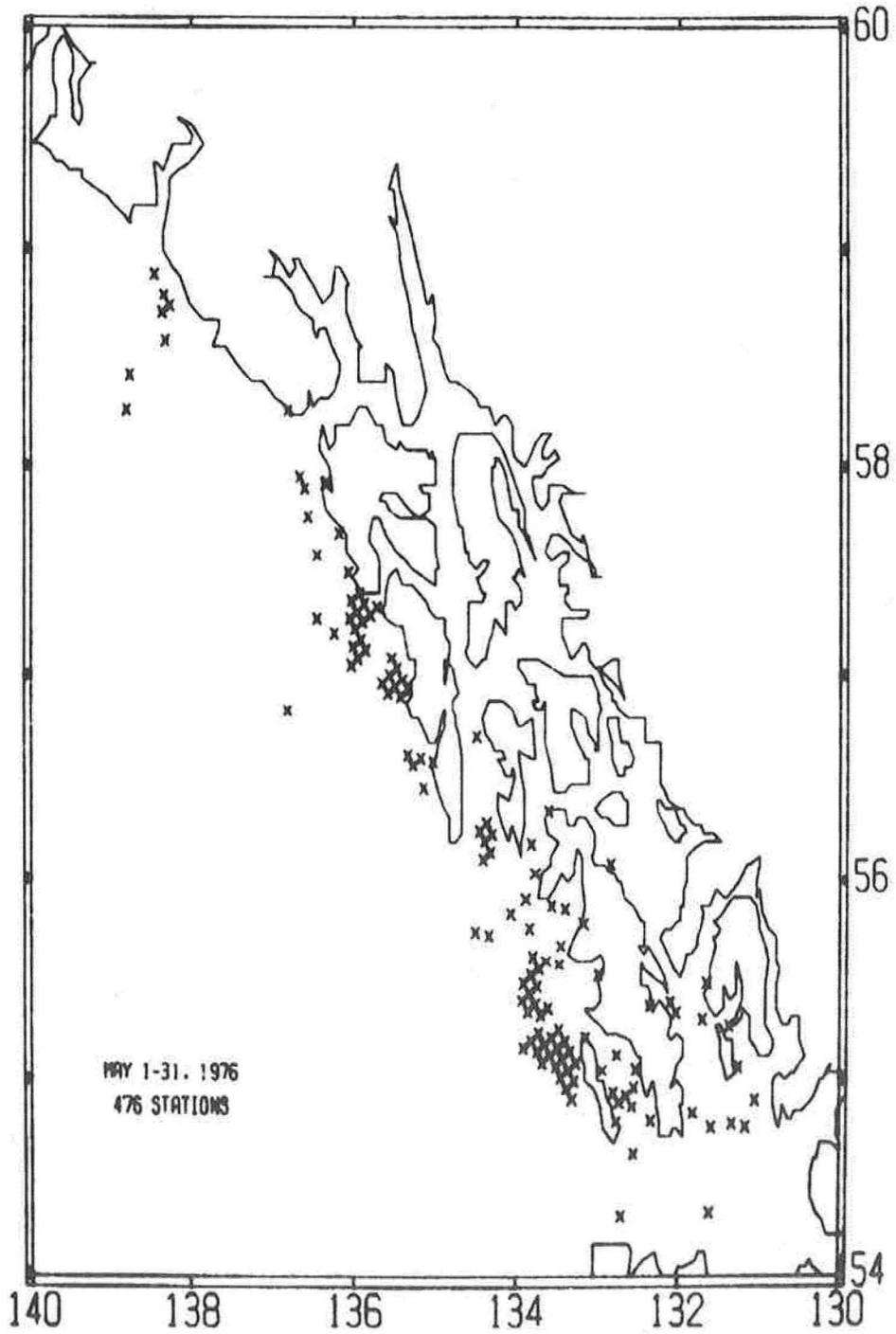


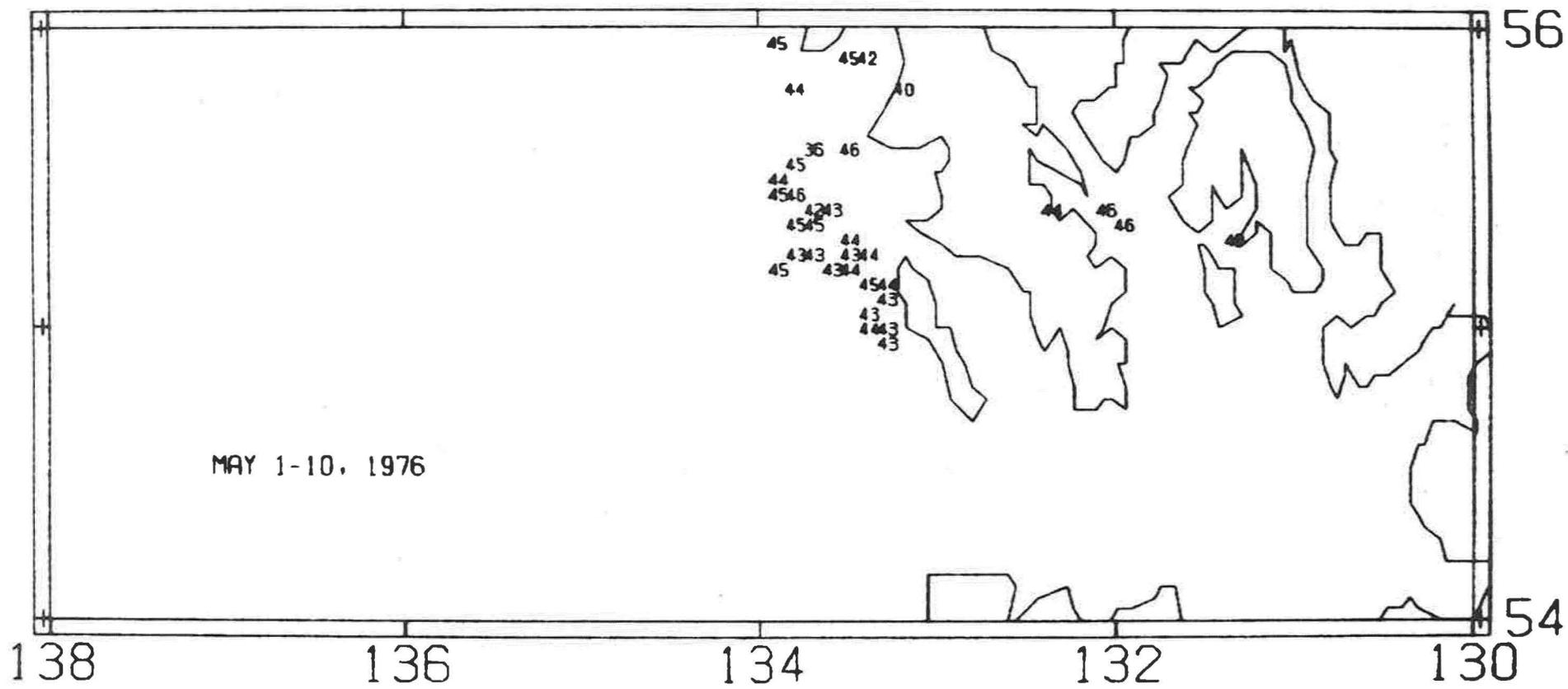


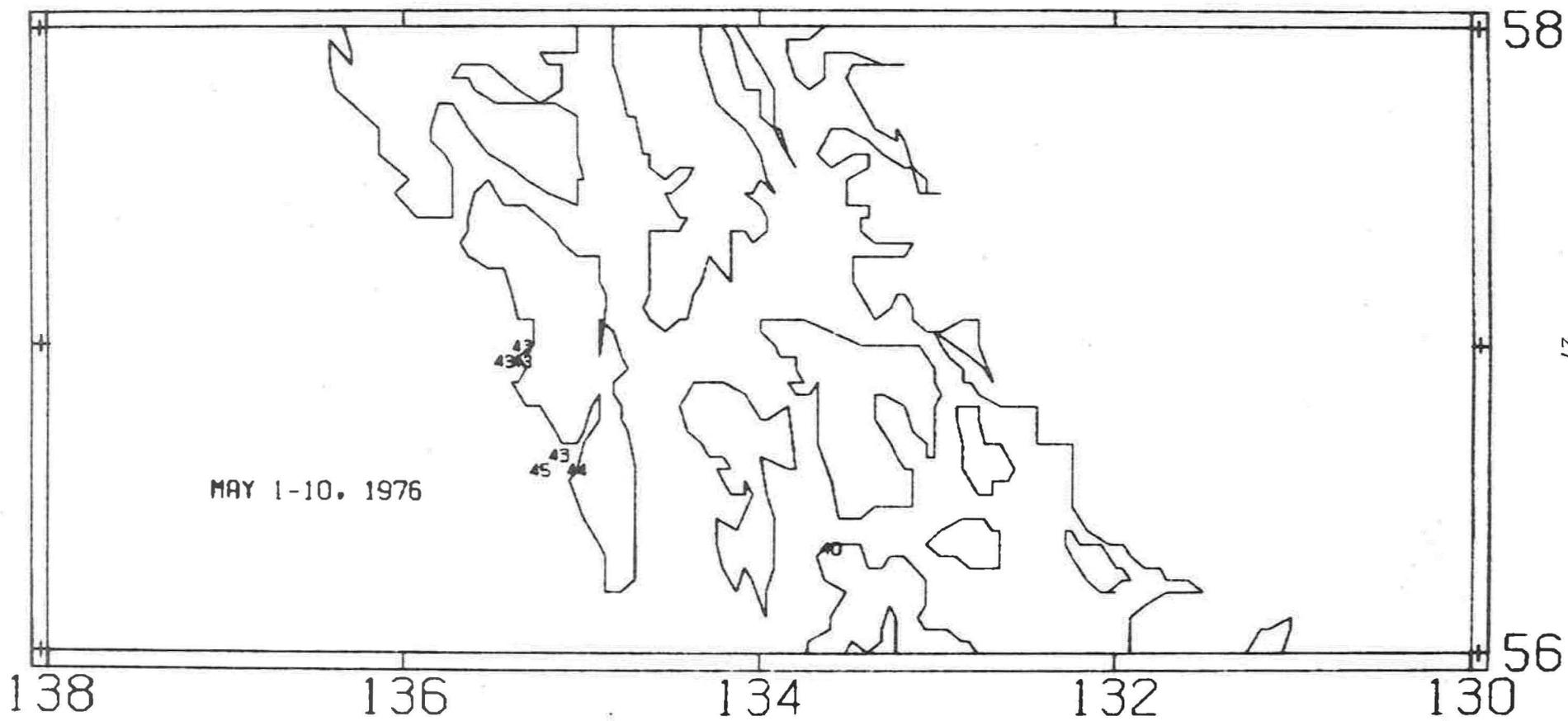
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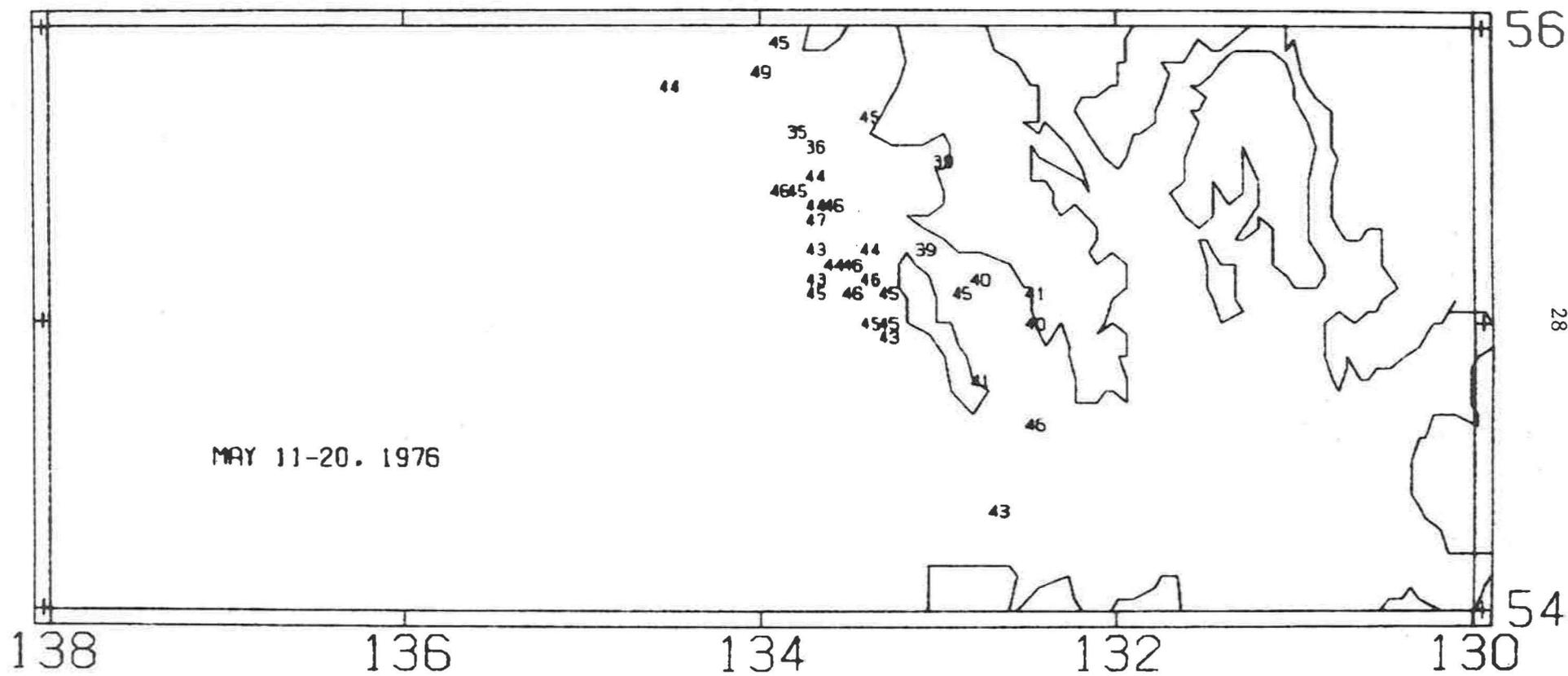
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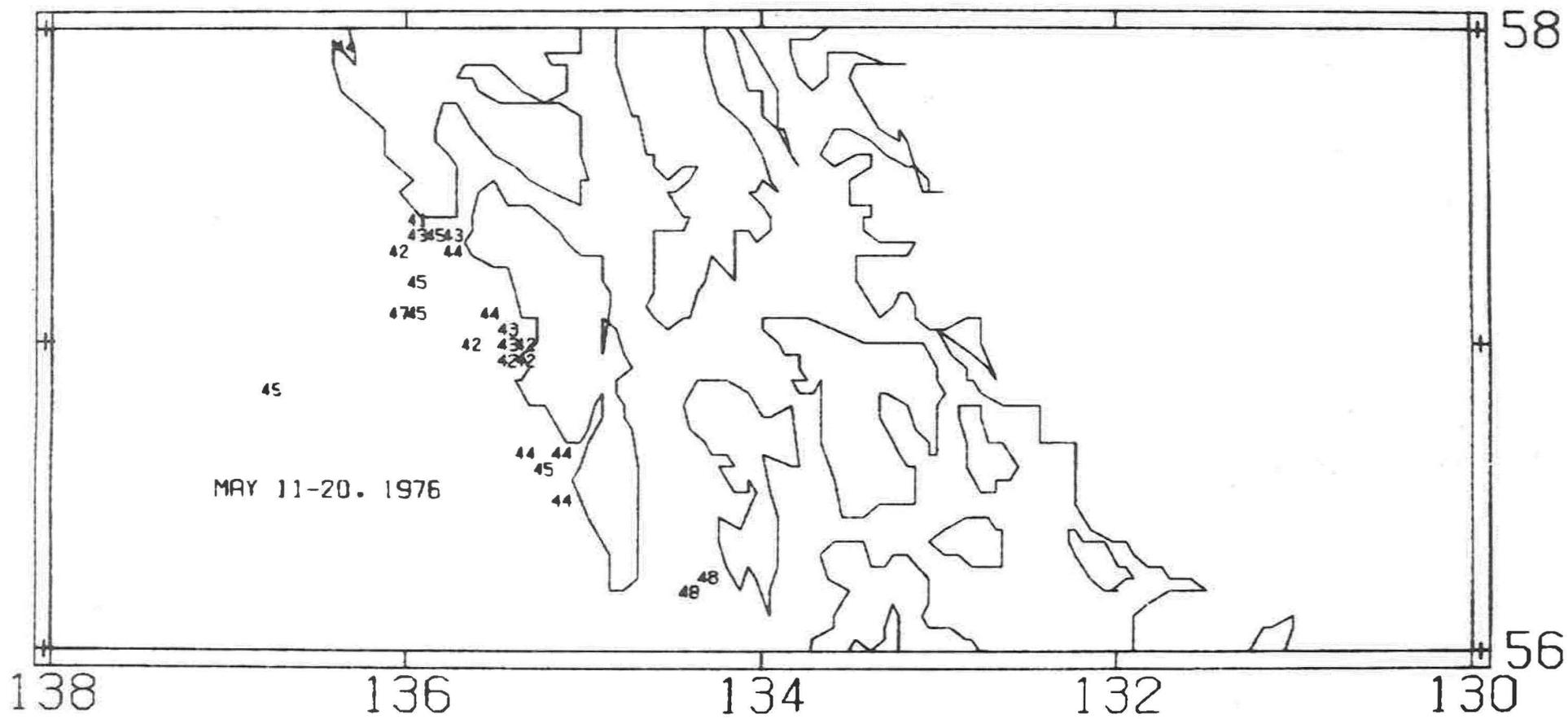
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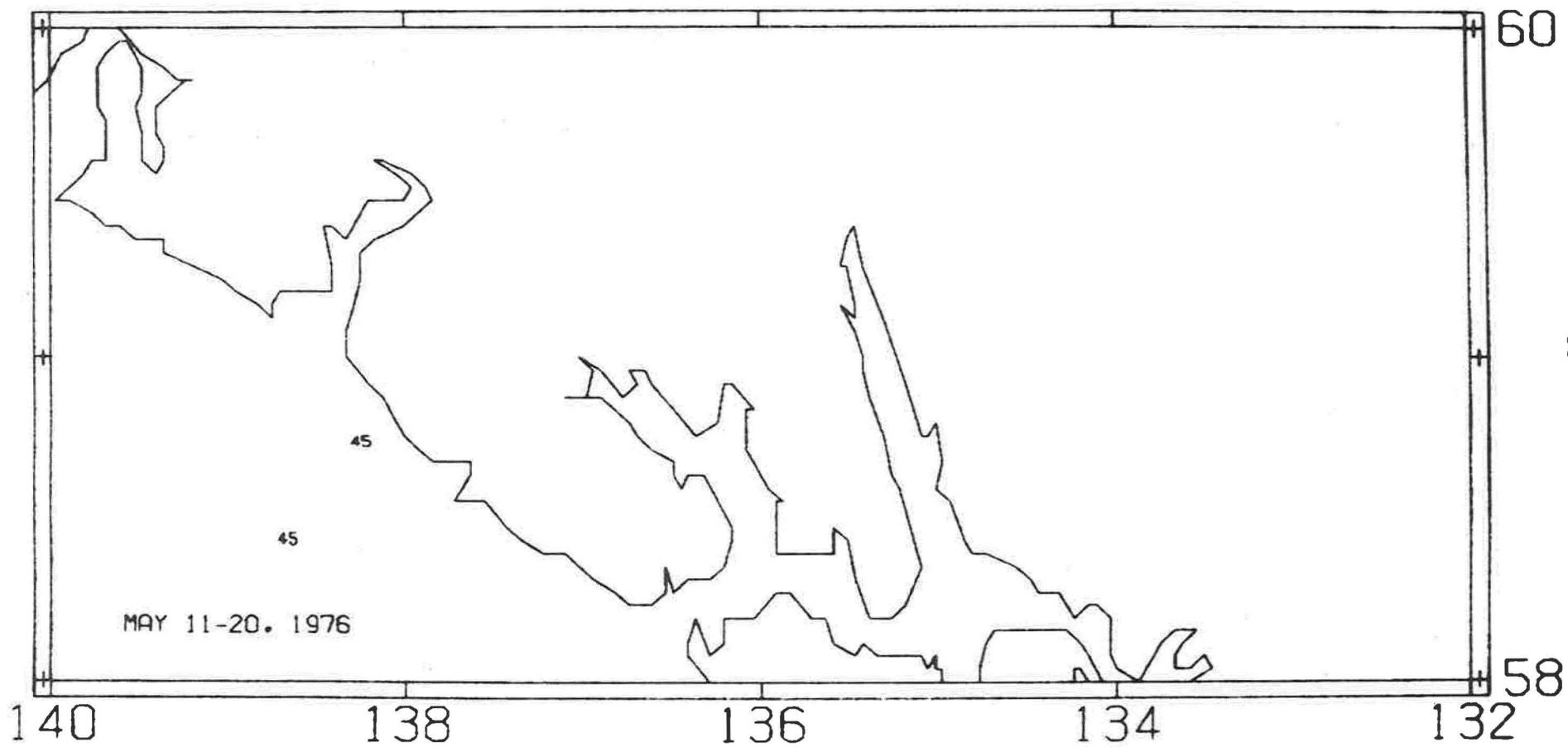


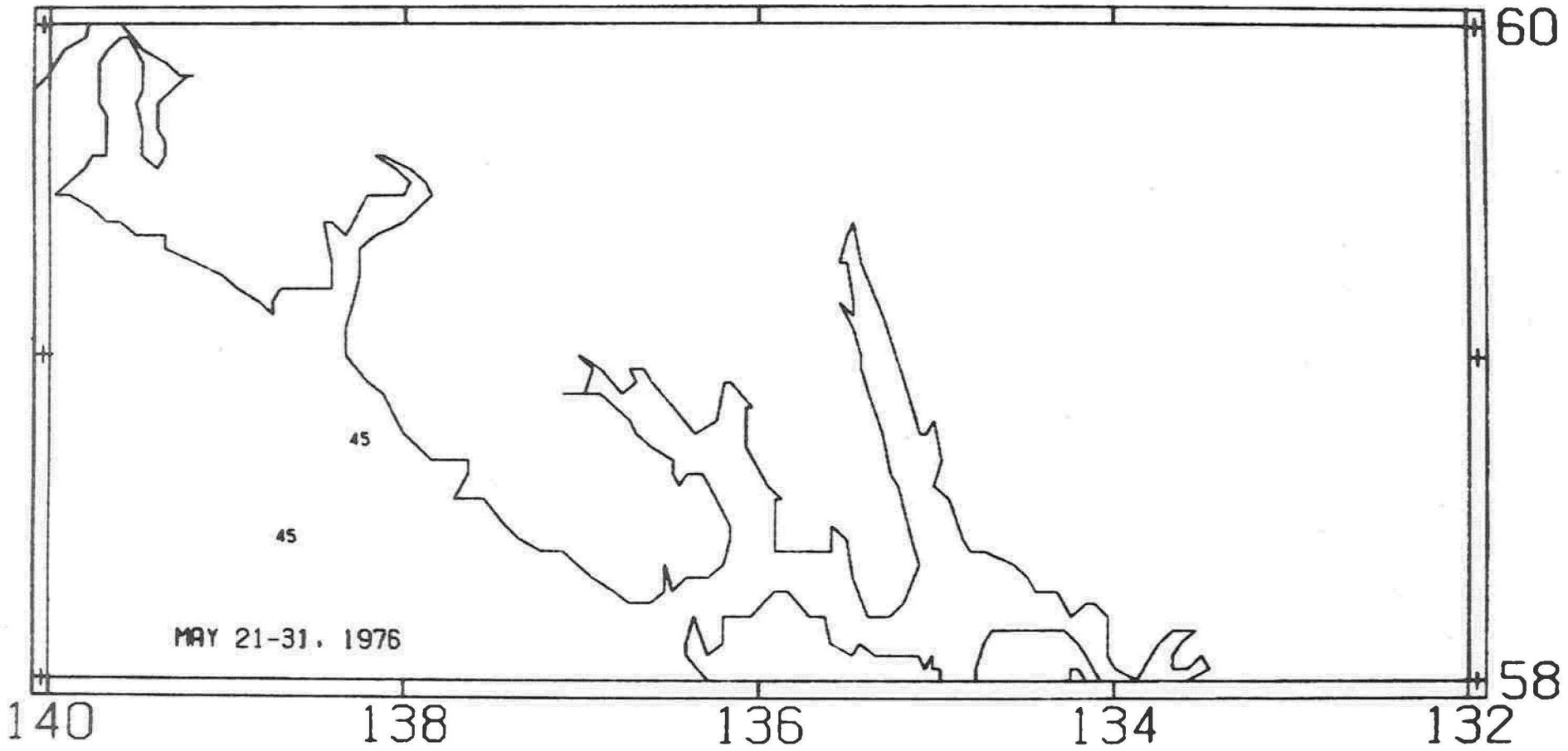










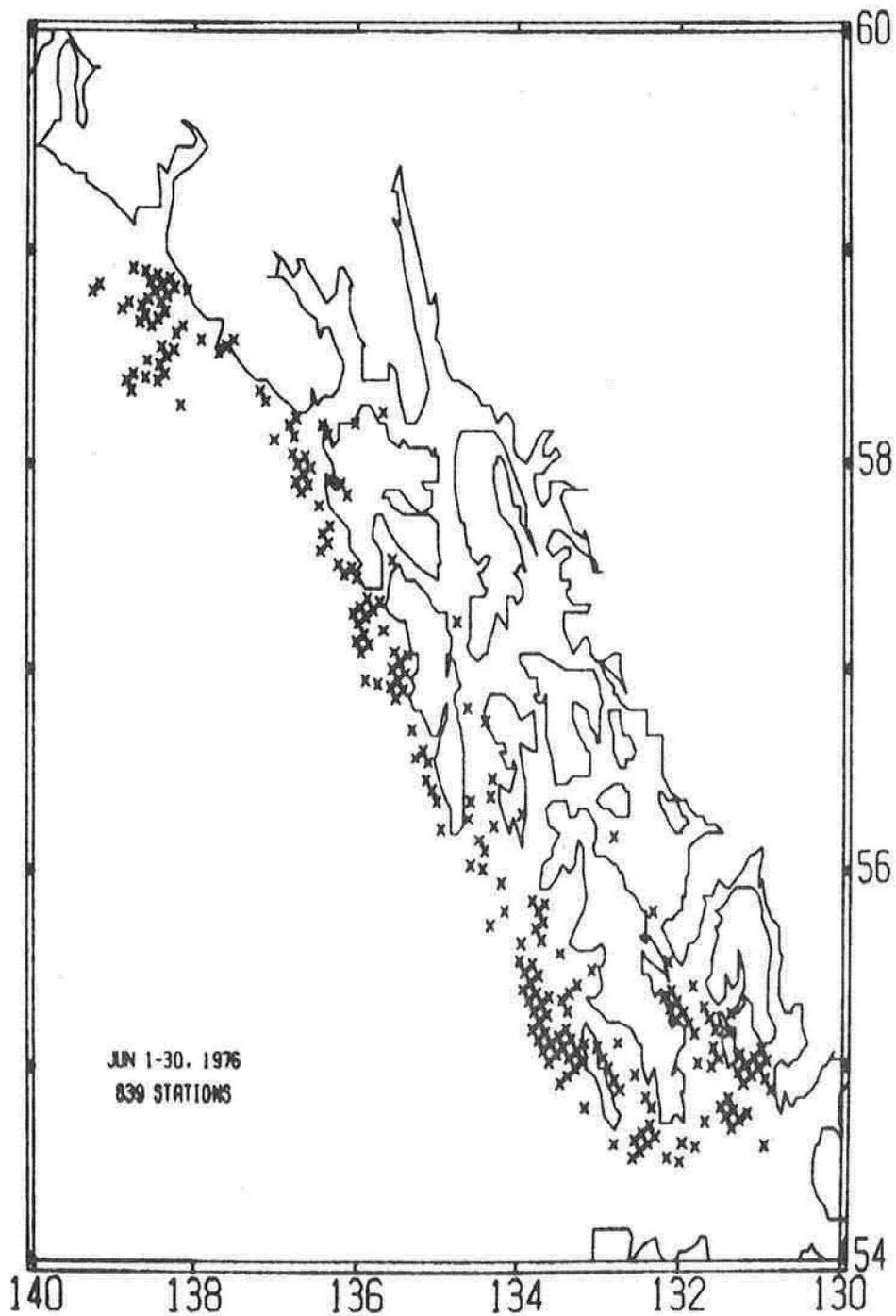


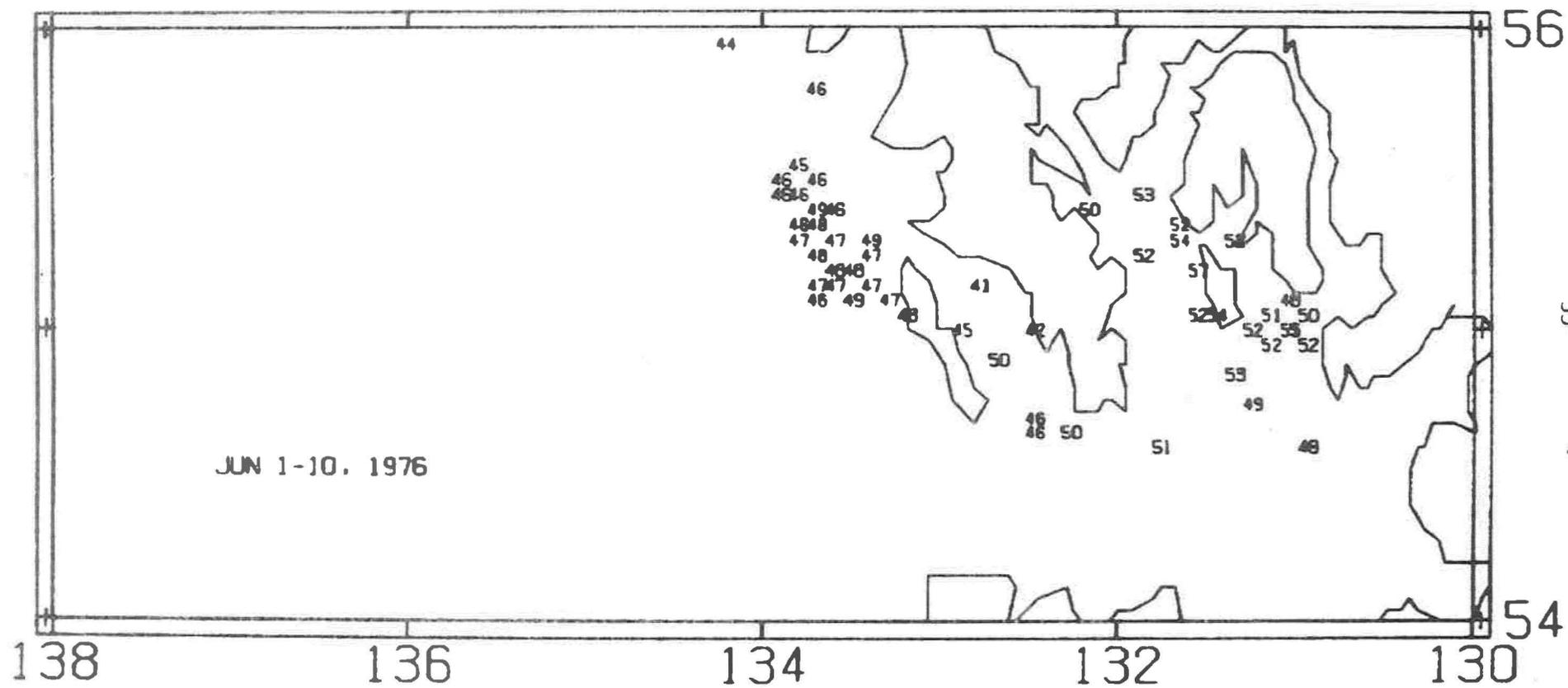
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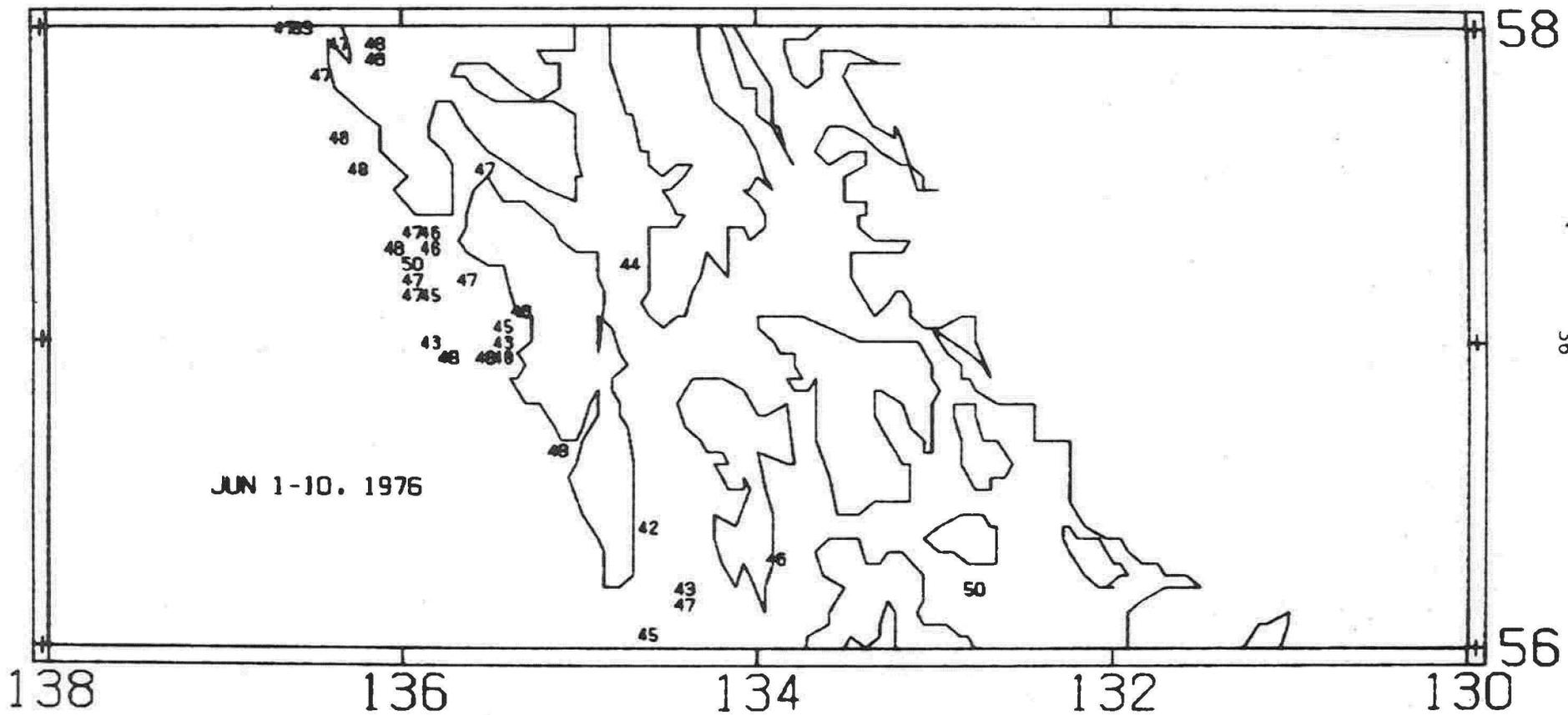
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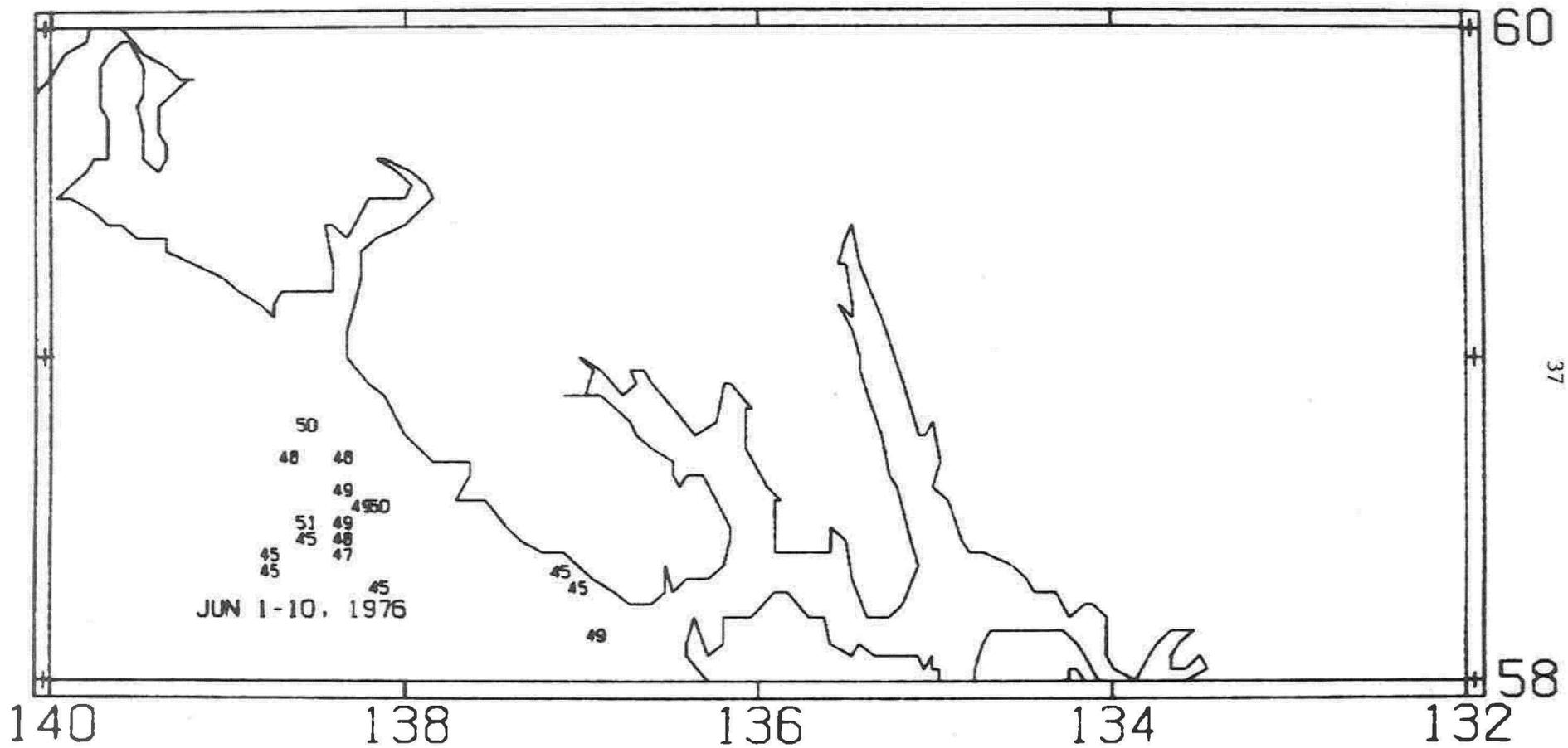
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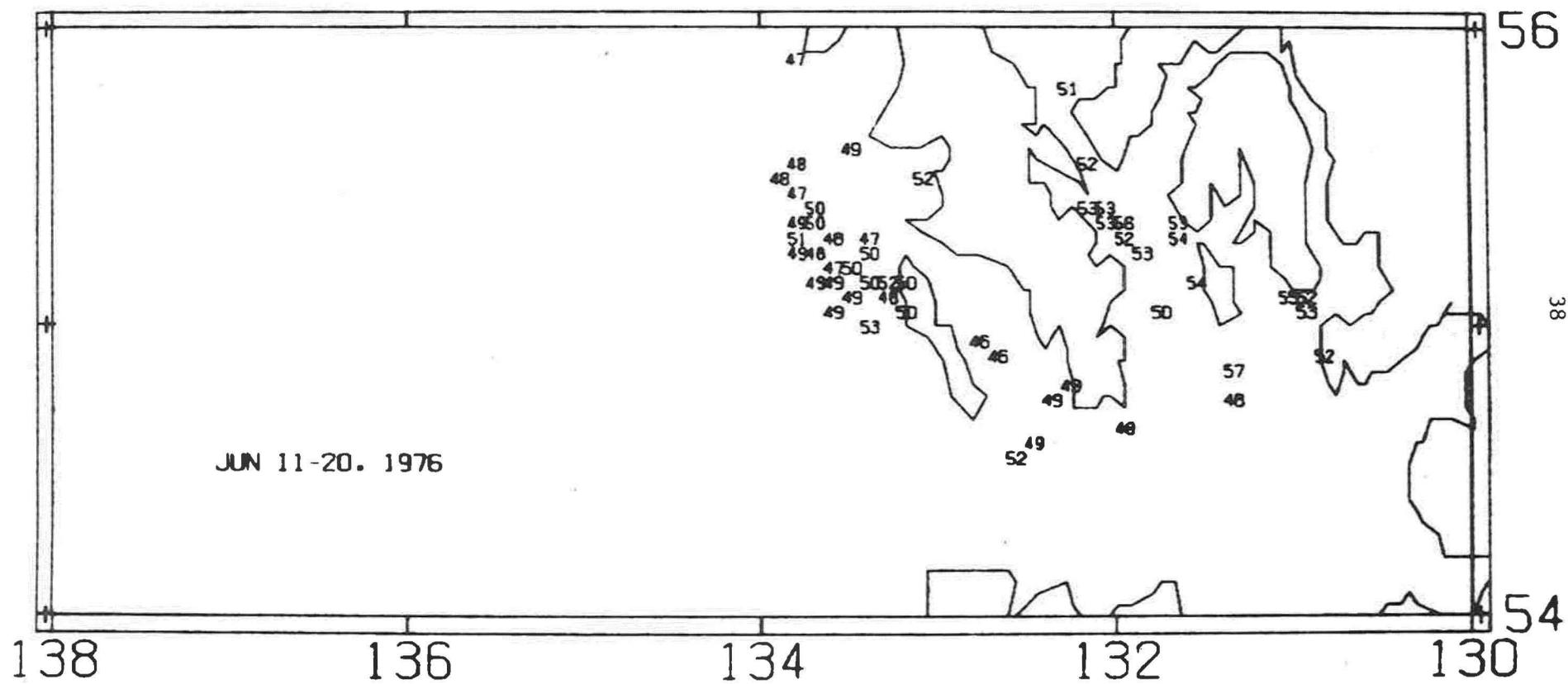
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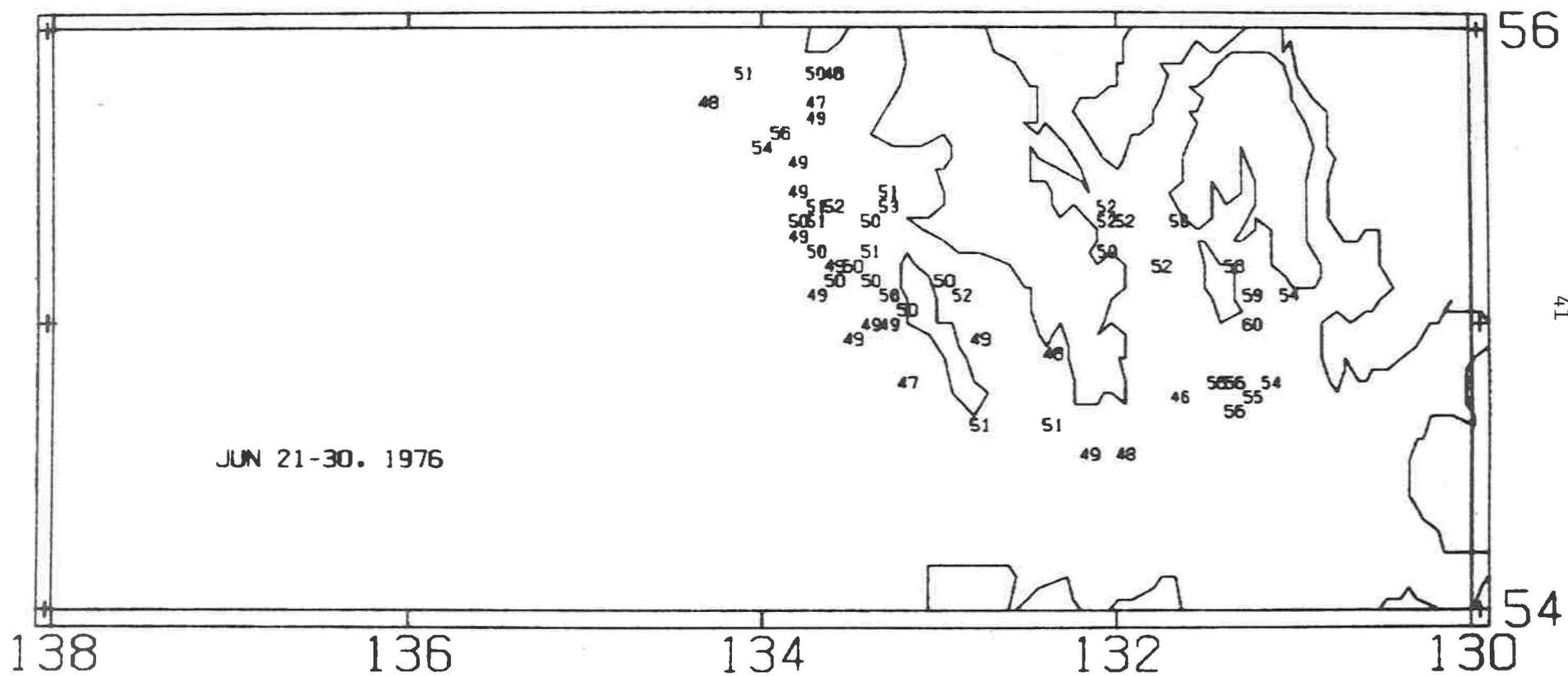


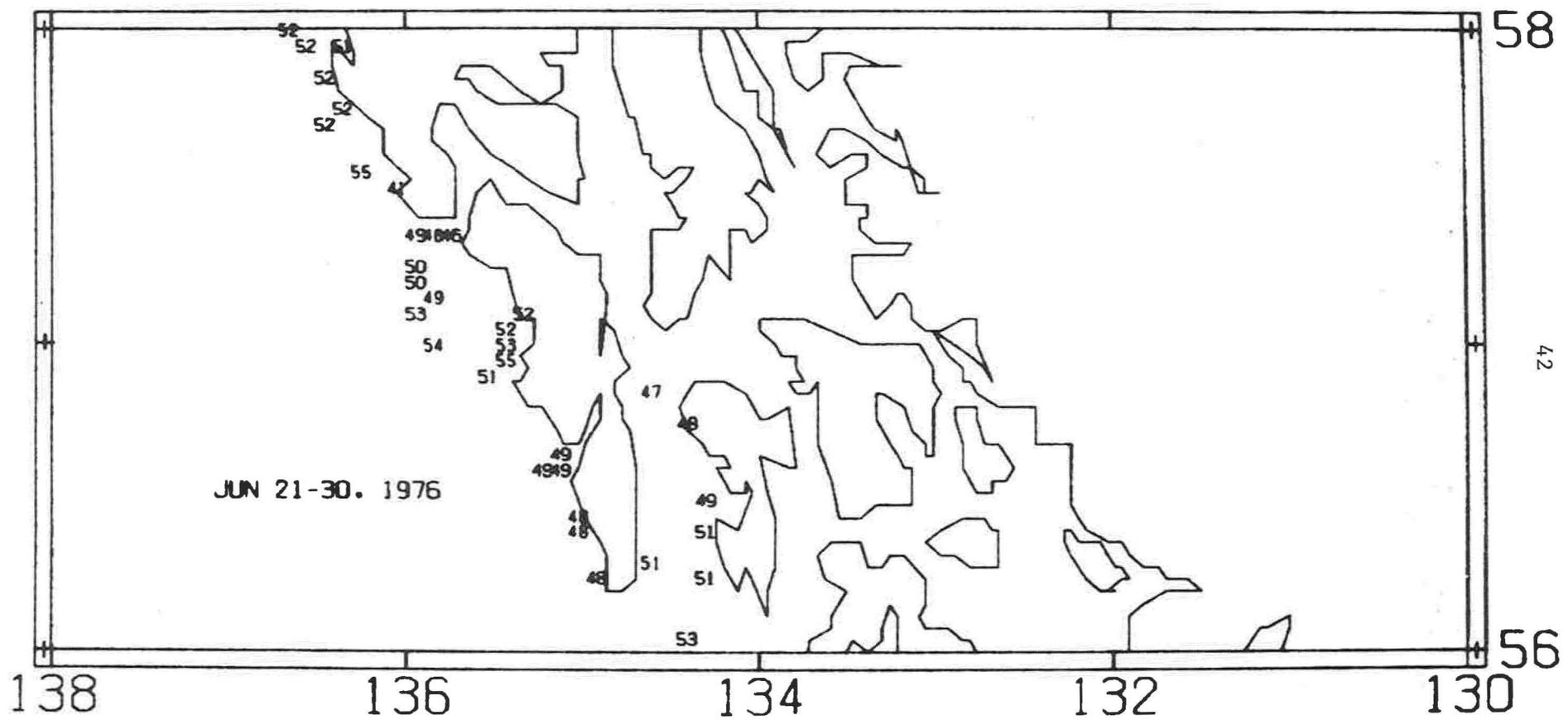


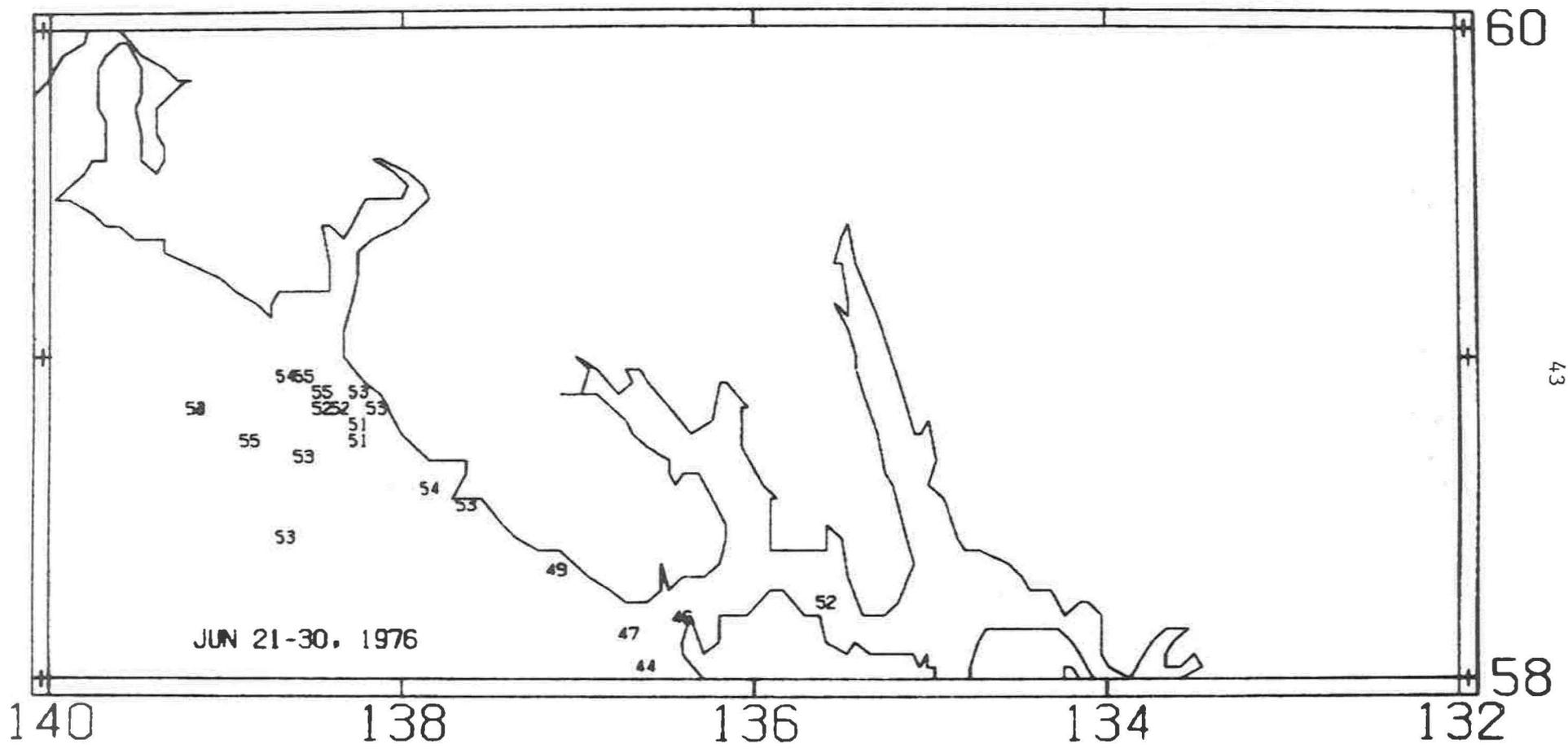








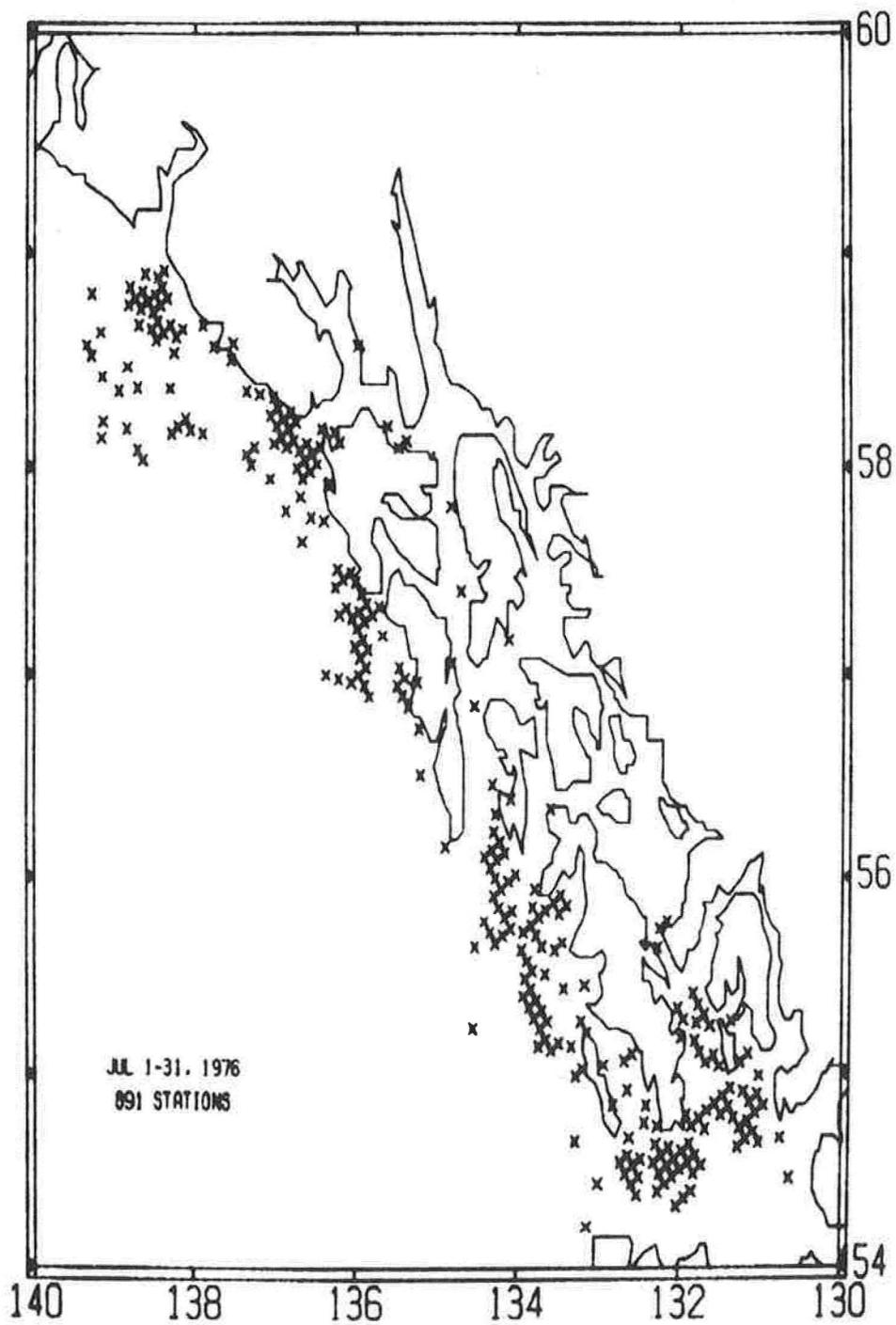


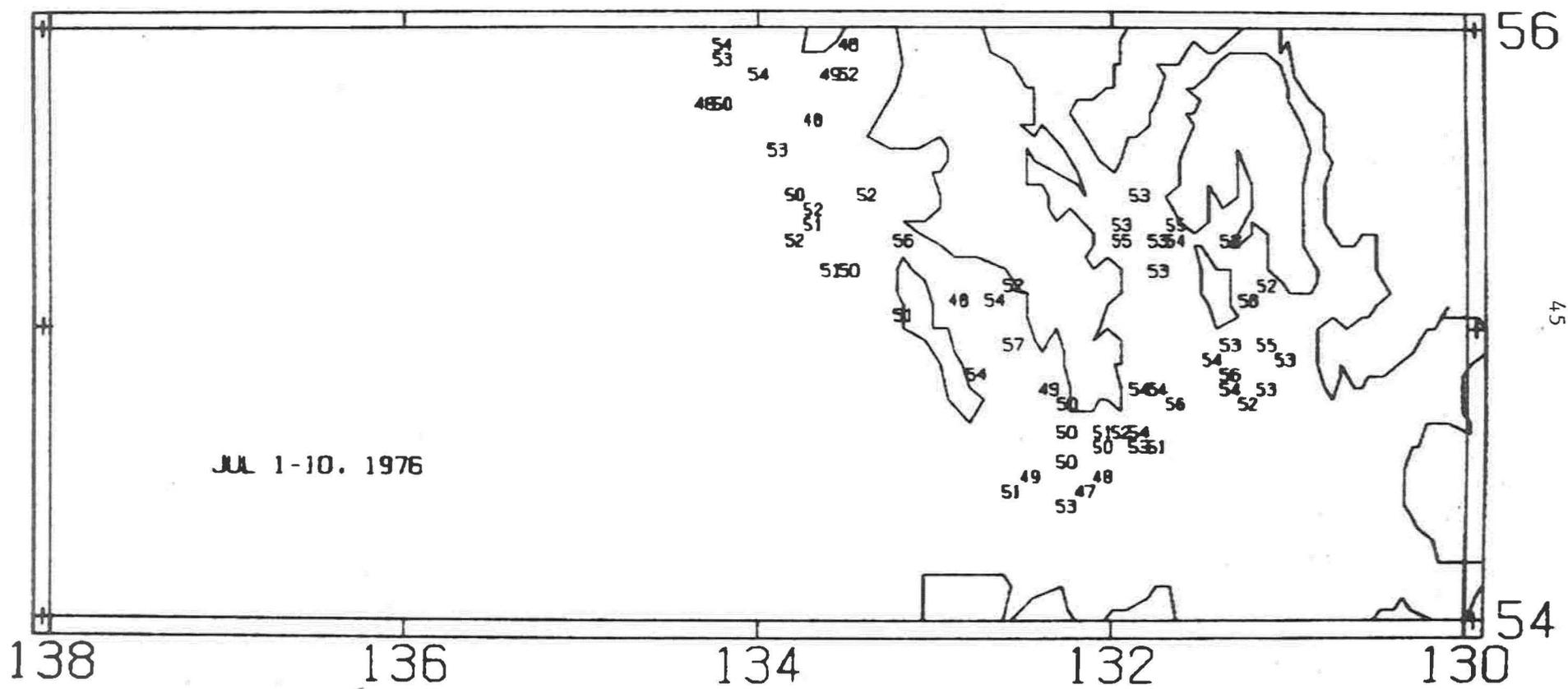


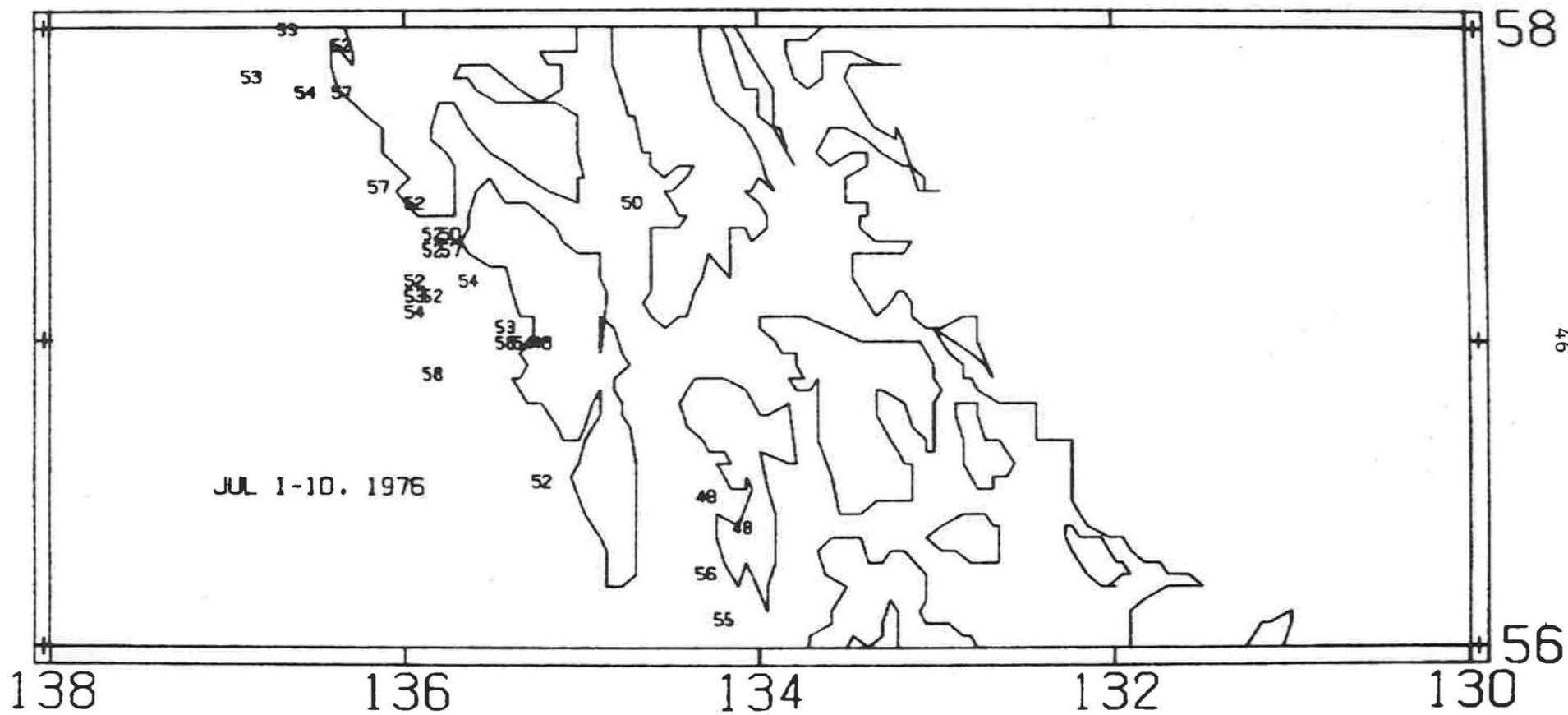
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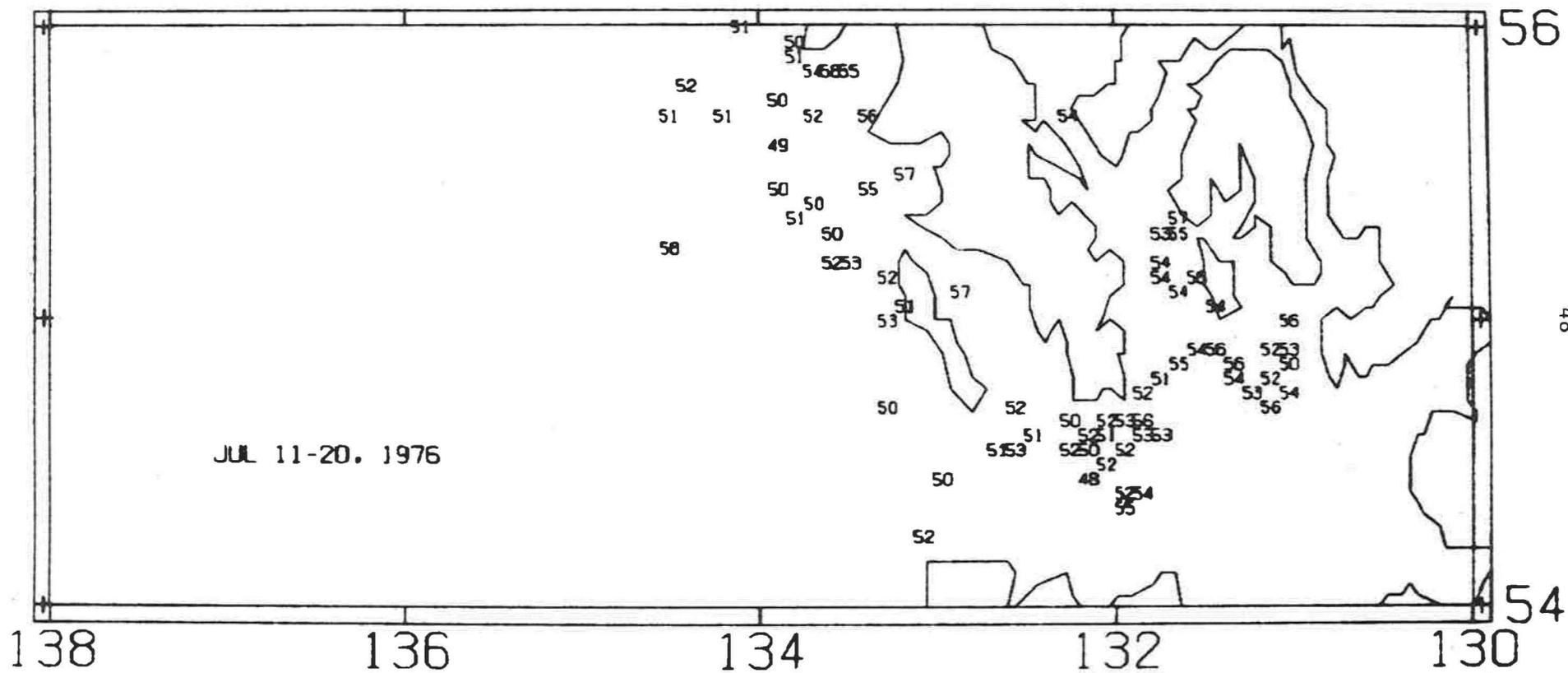
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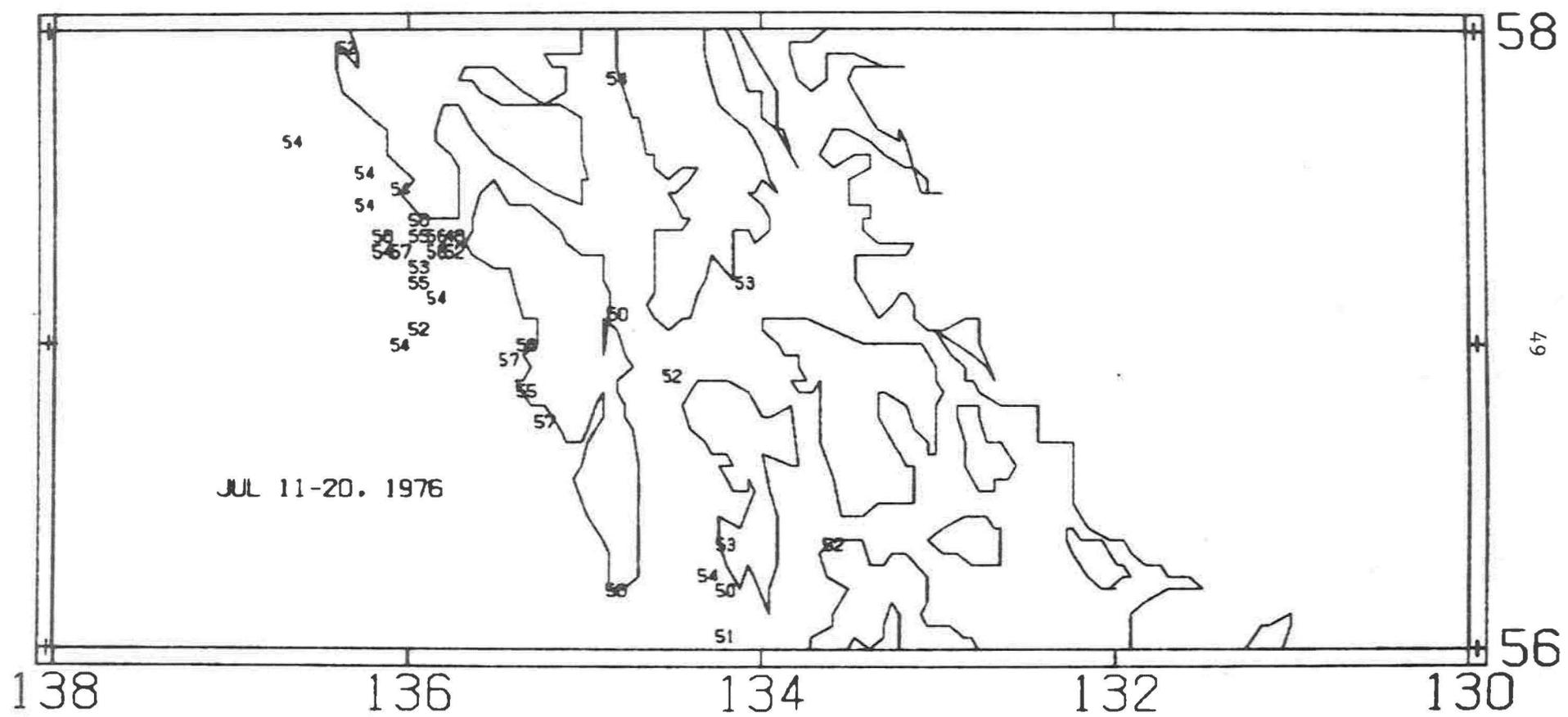
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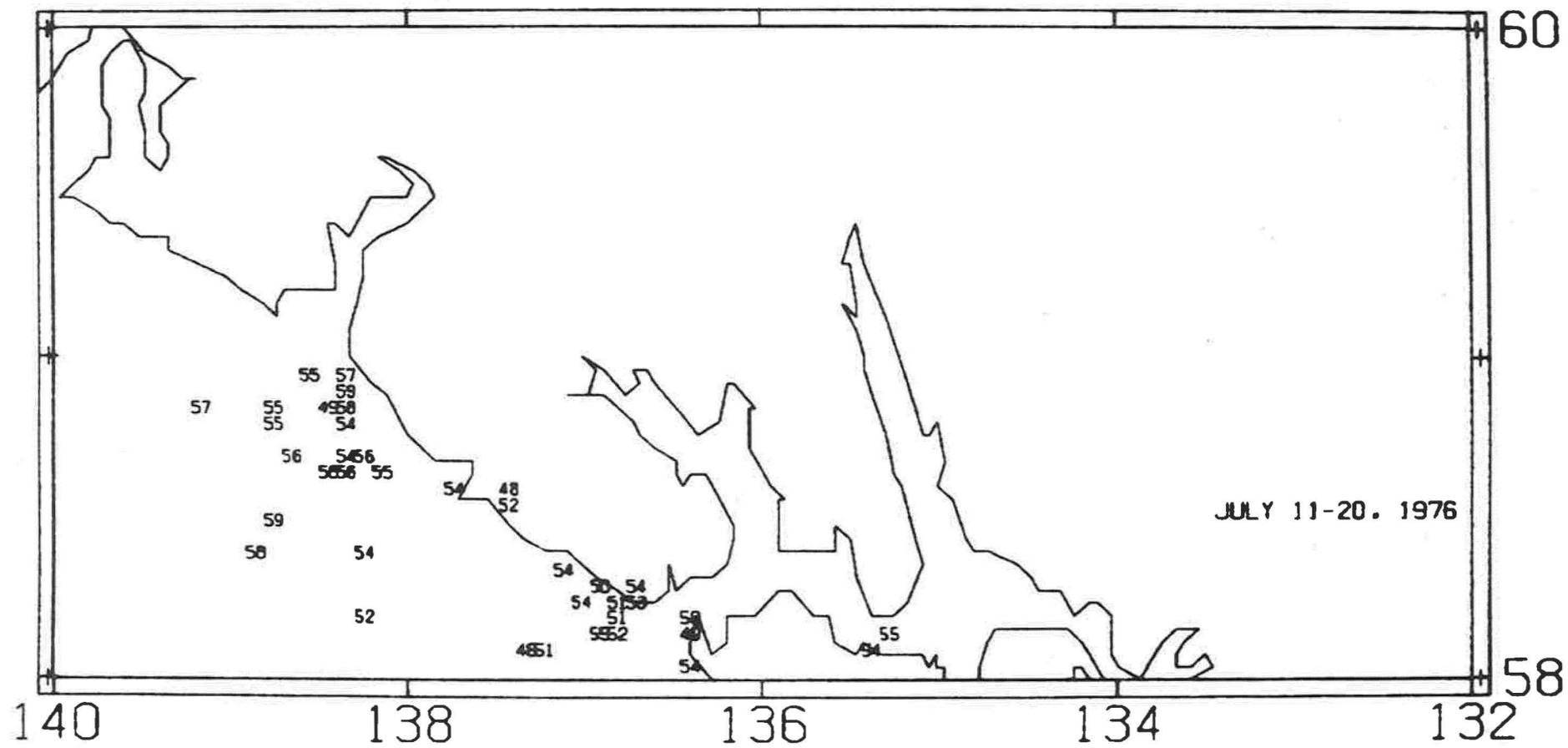


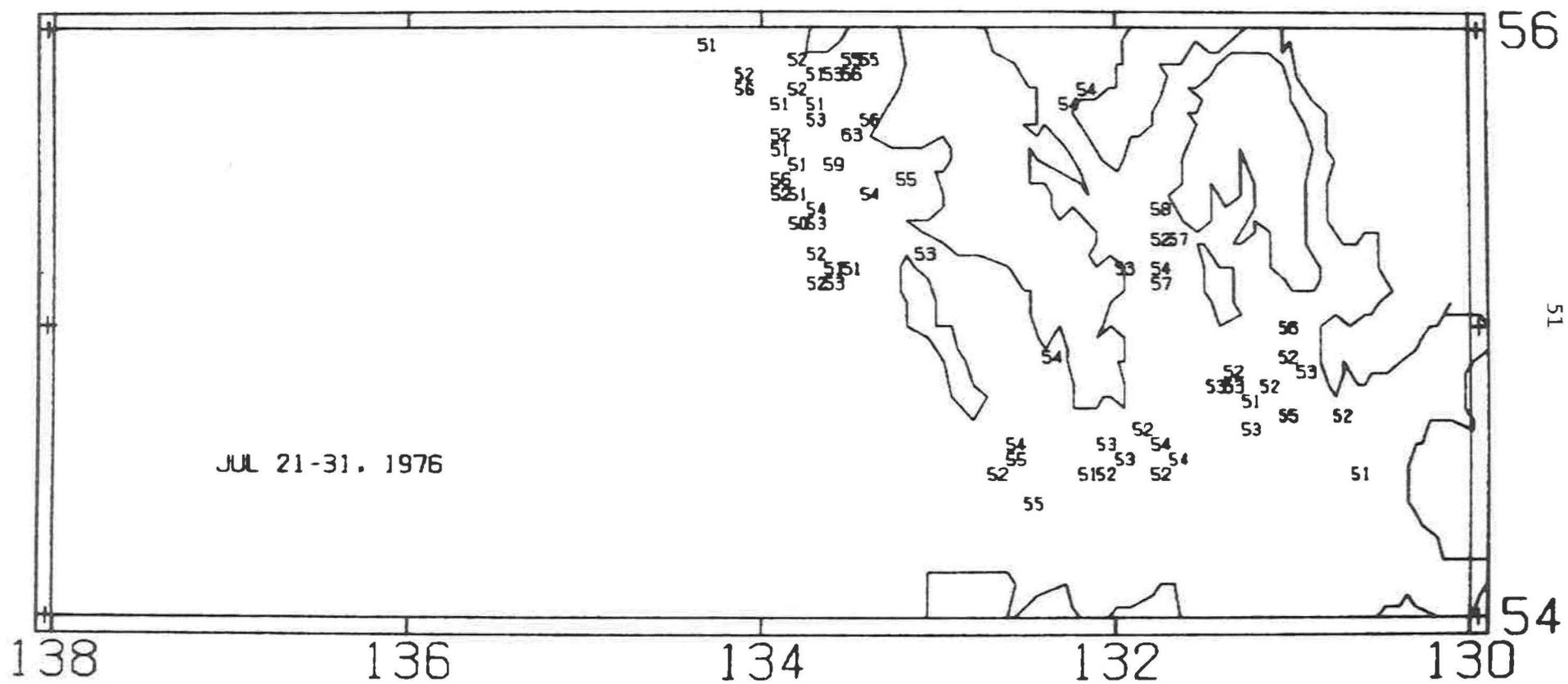


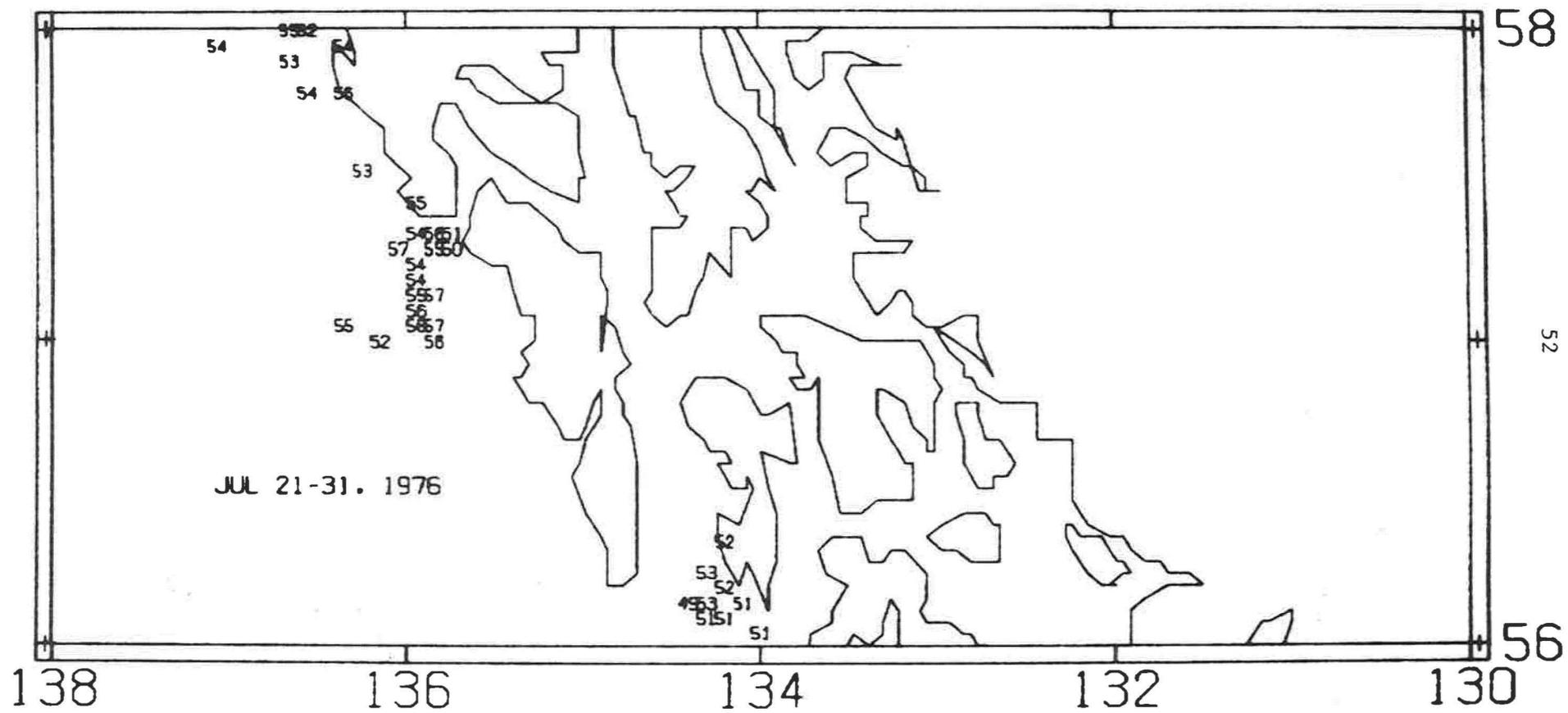




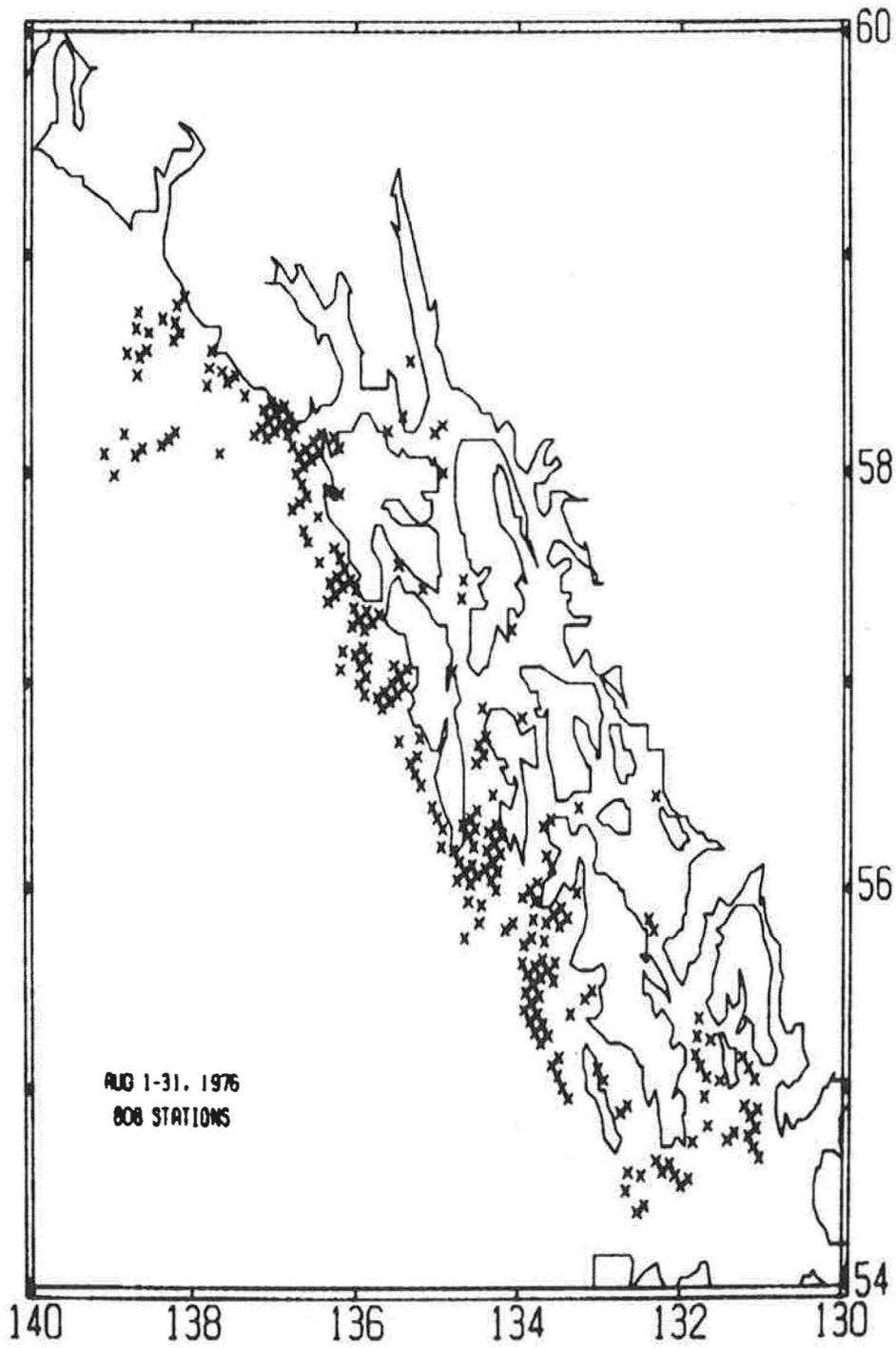


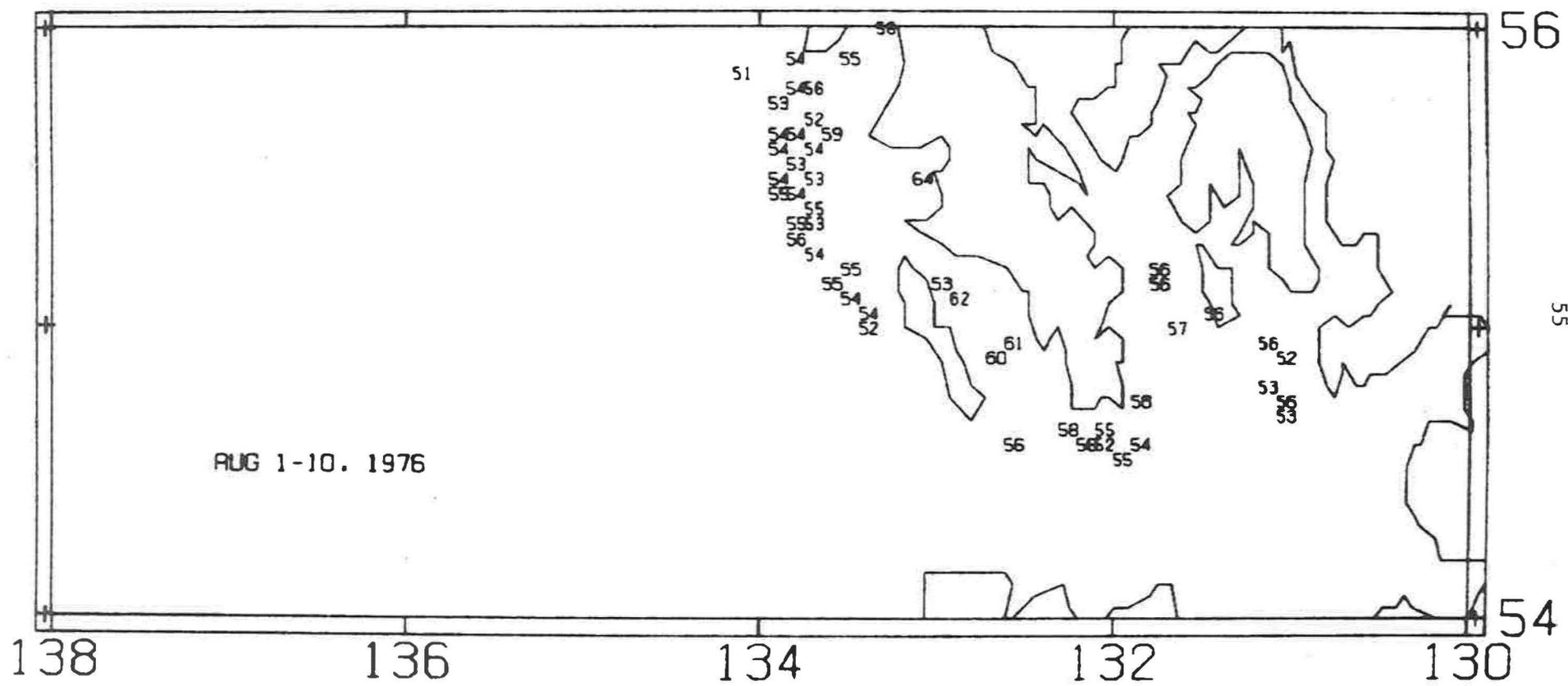


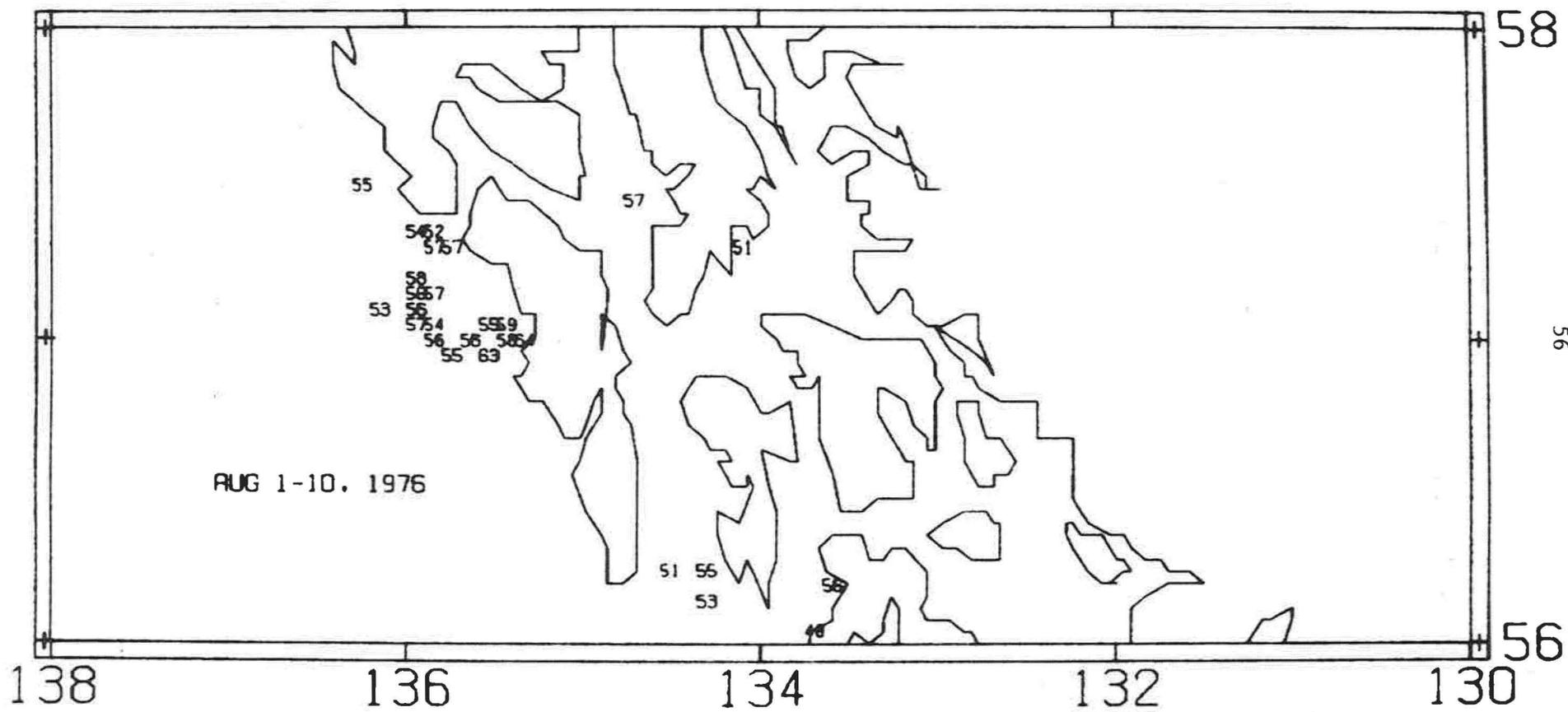


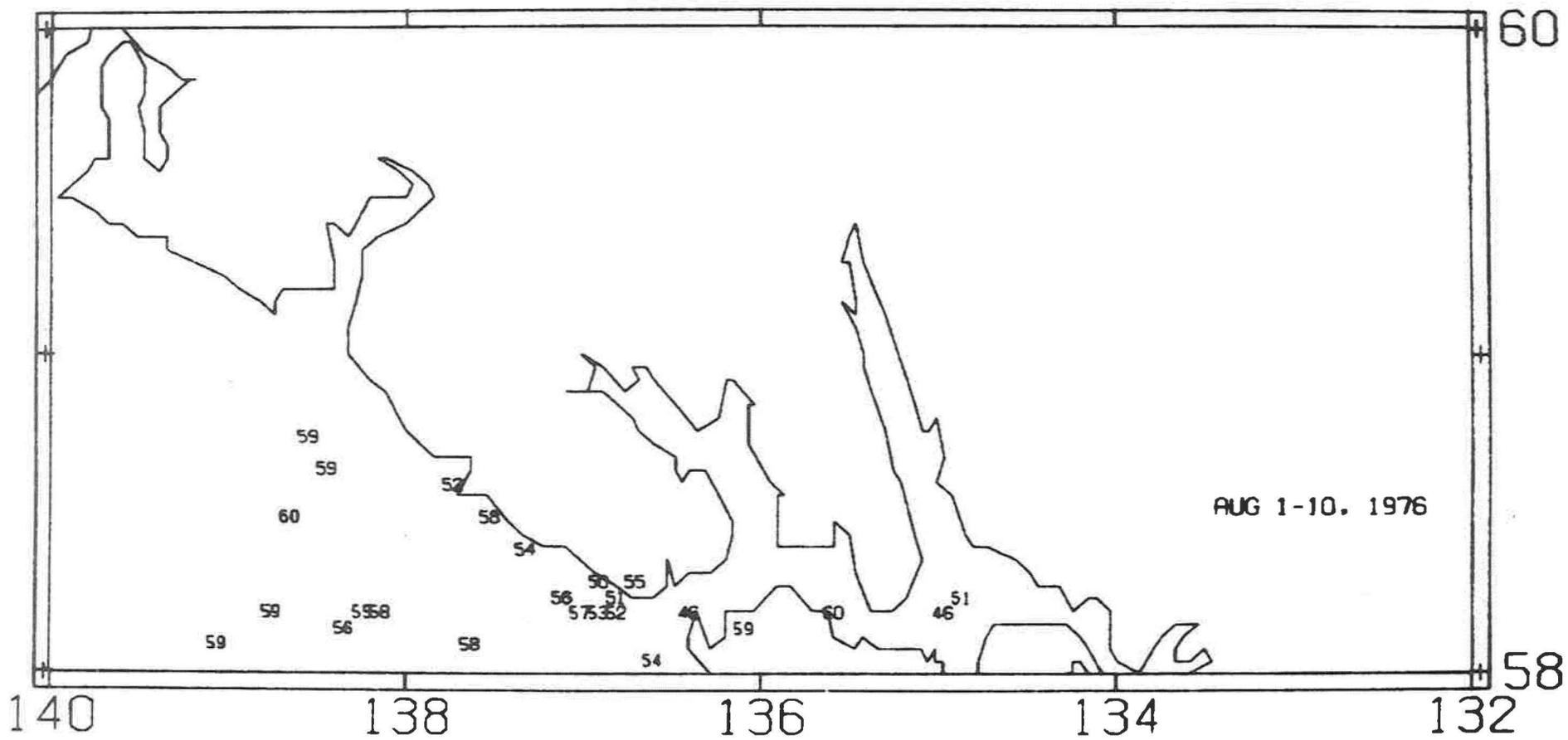


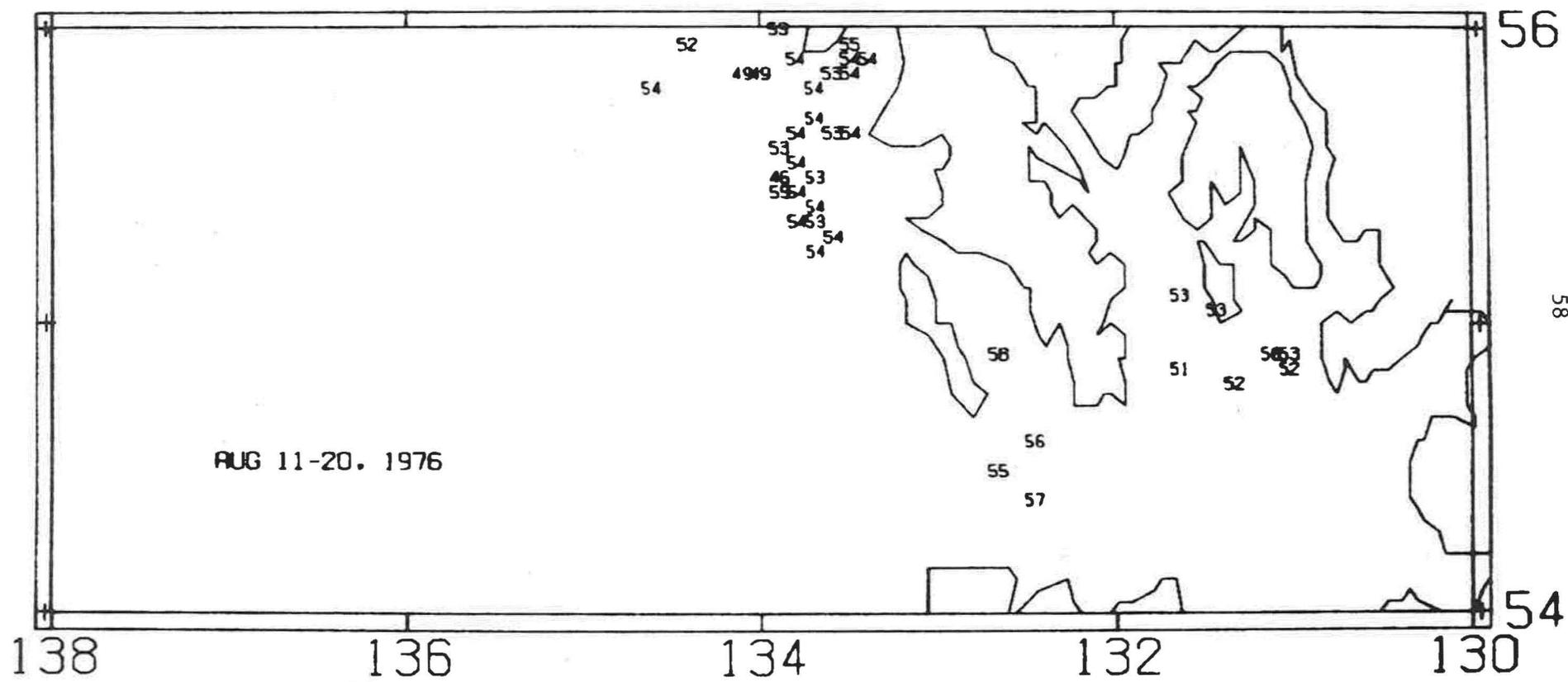
KETCHIKAN TROLLERS LOGBOOK SURVEY
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AUG, 1976

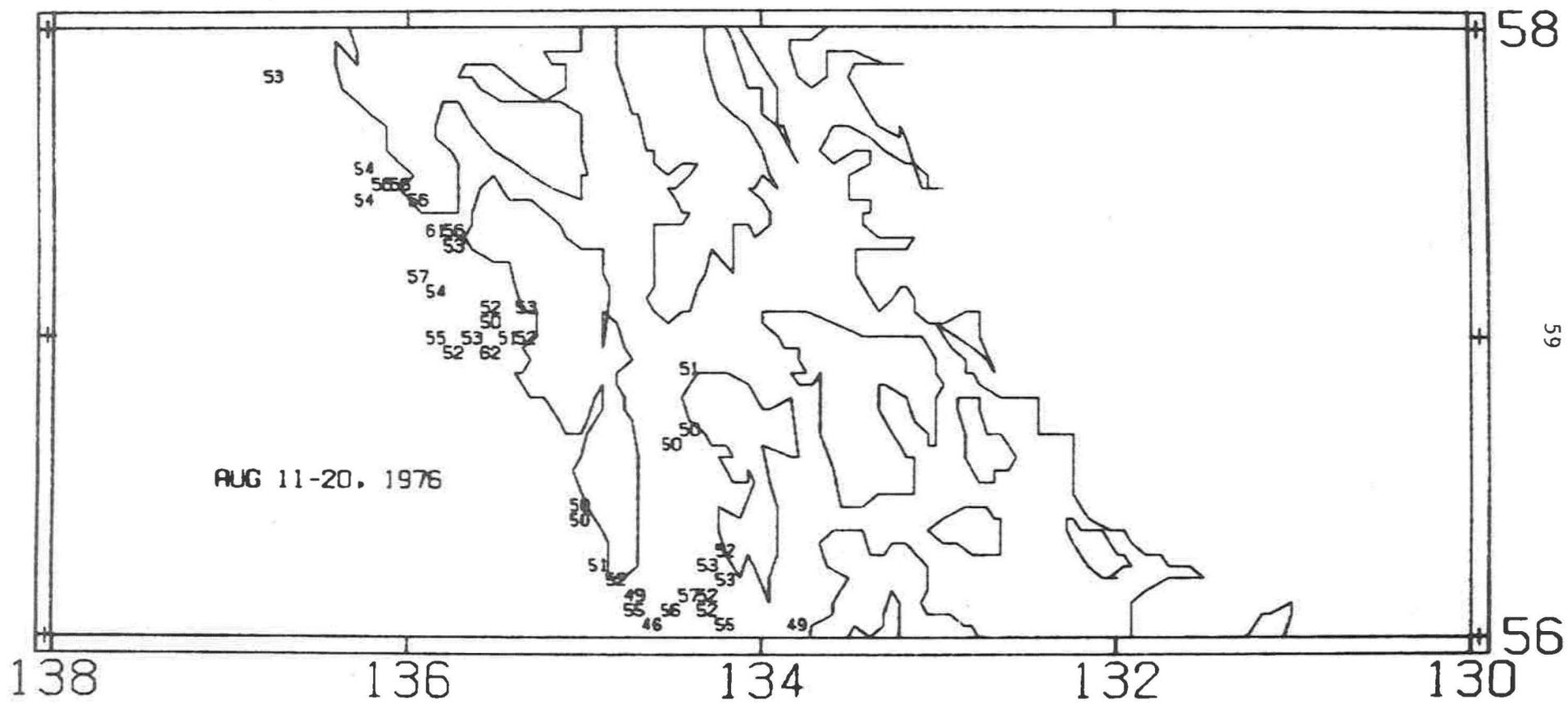


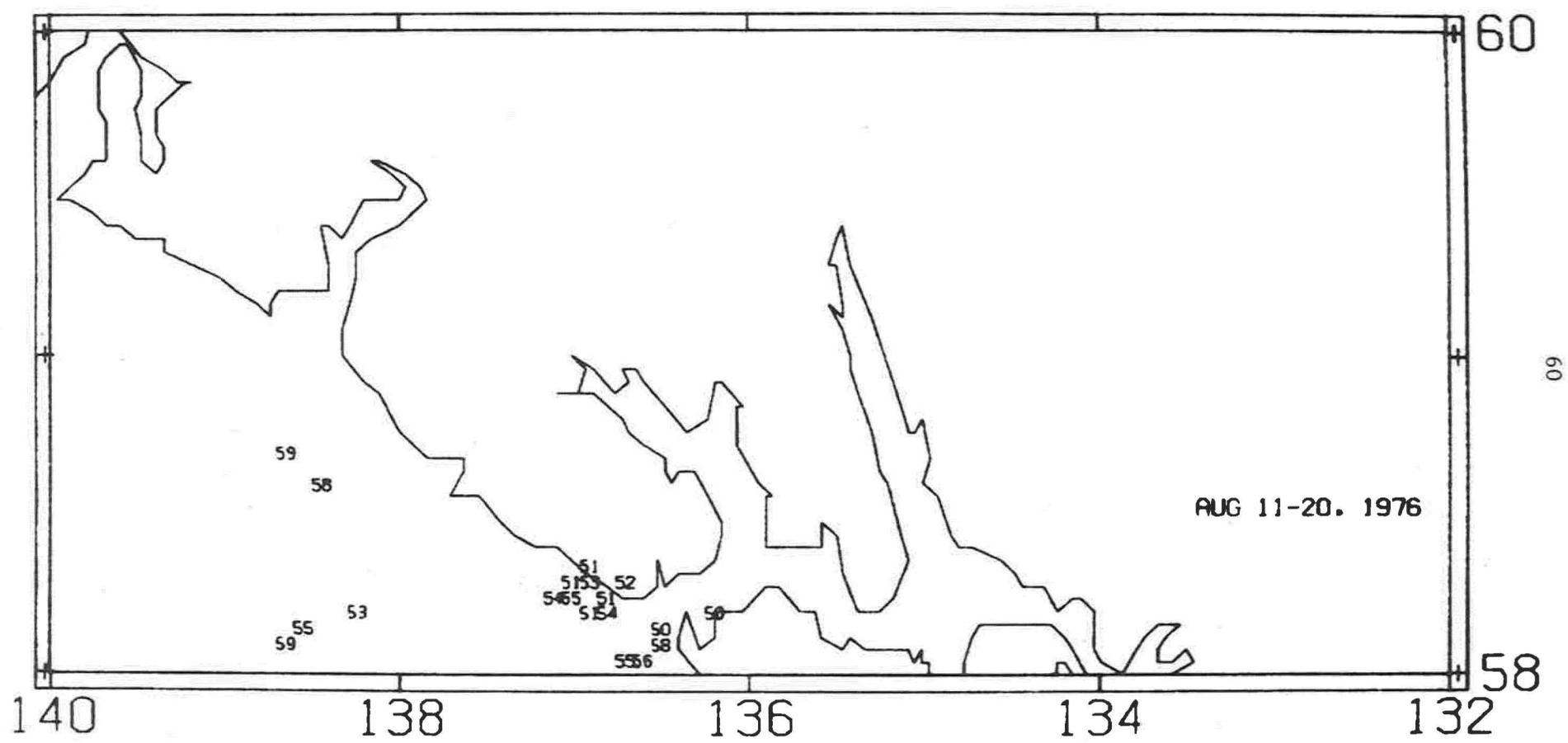


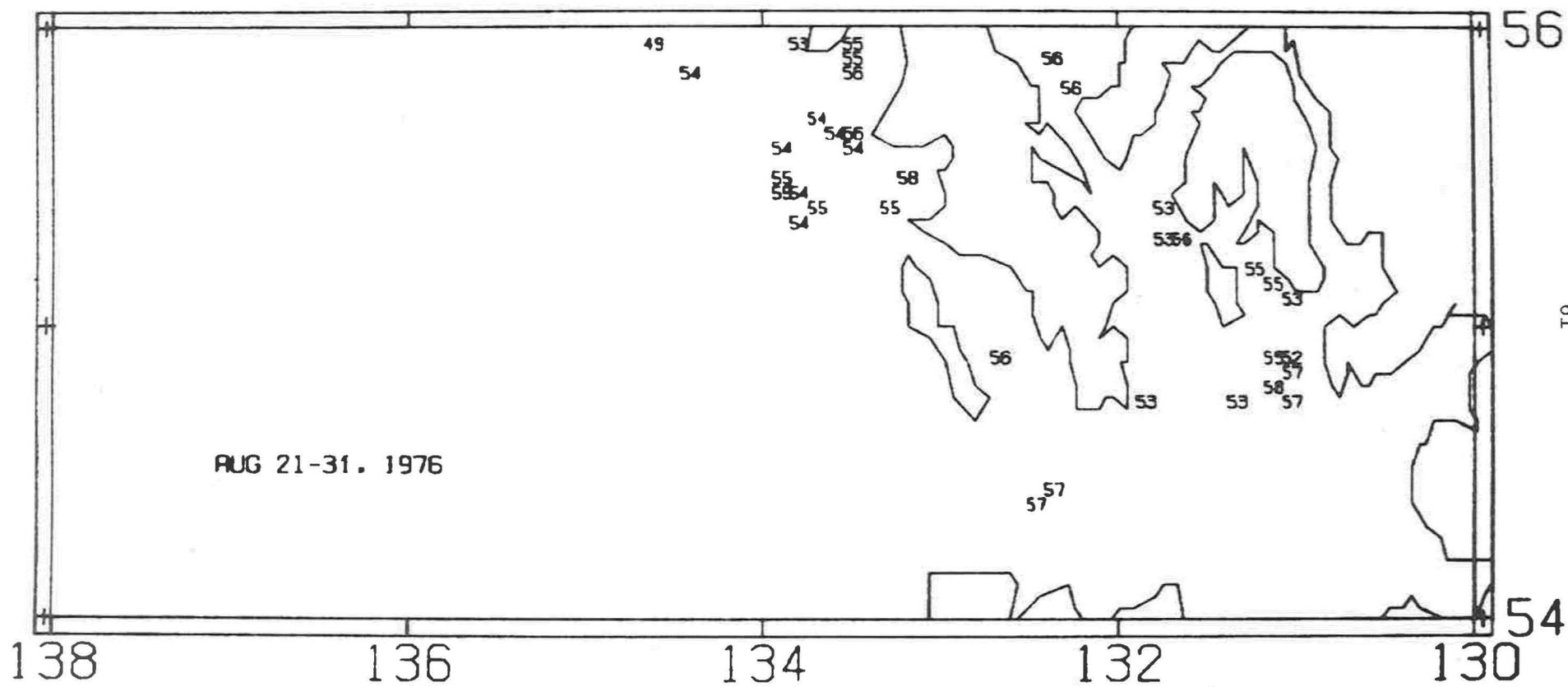


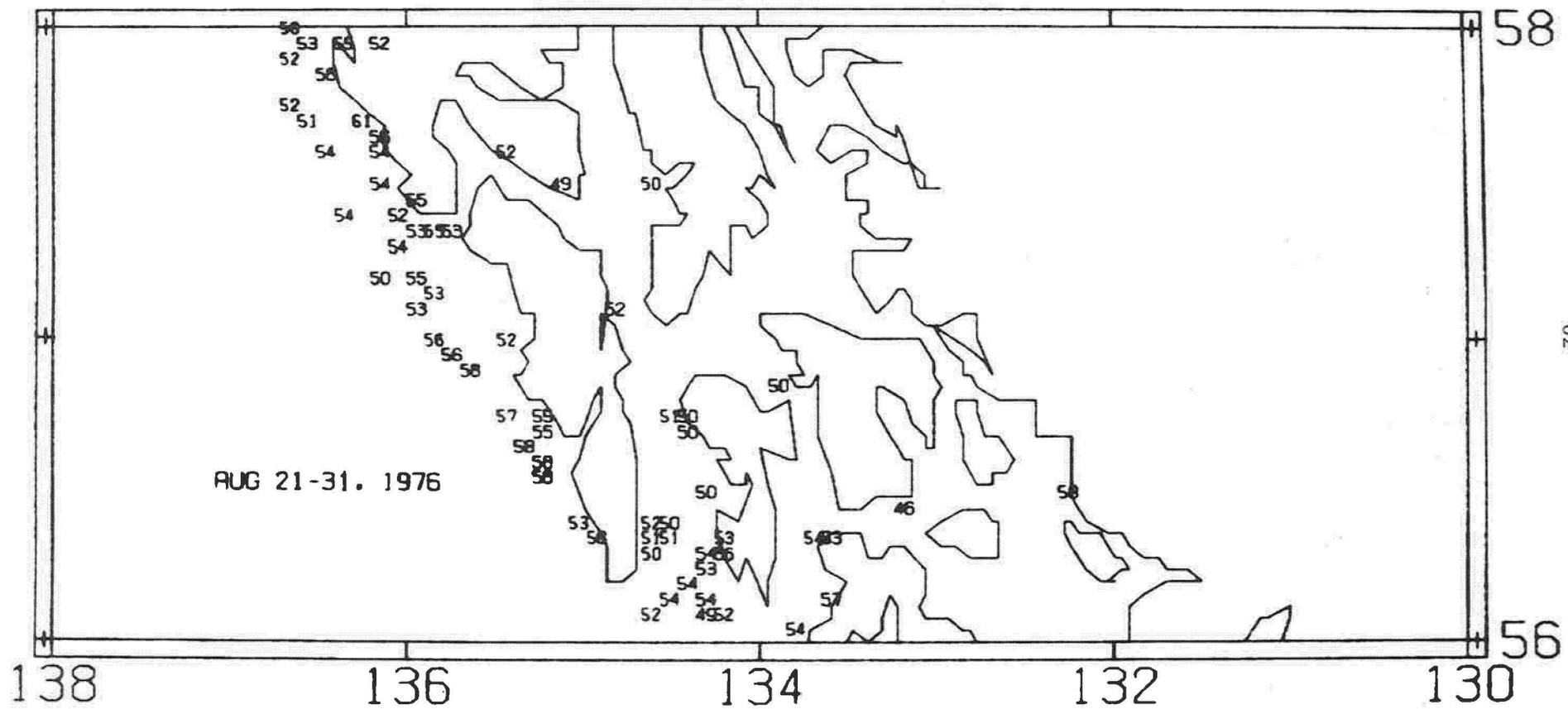


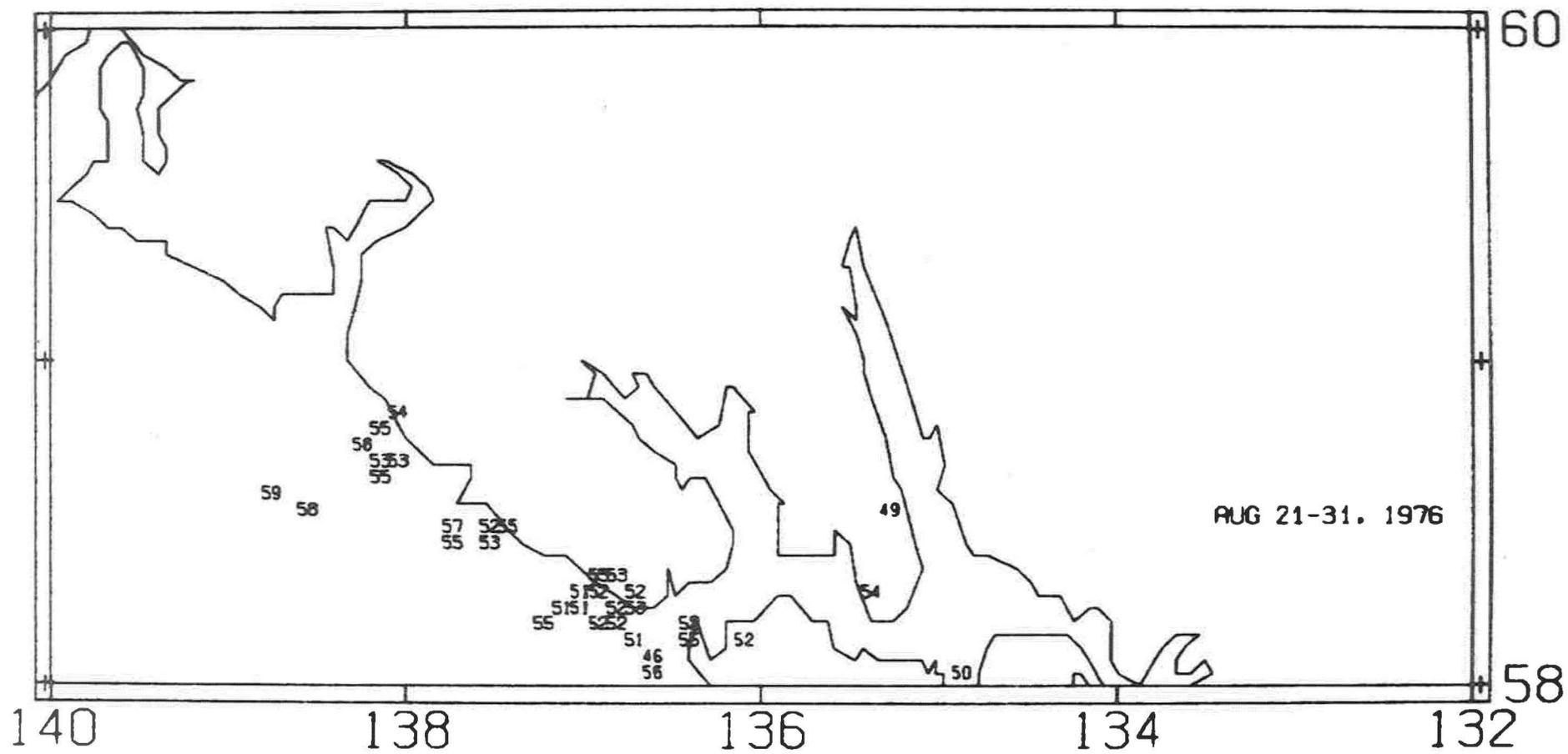








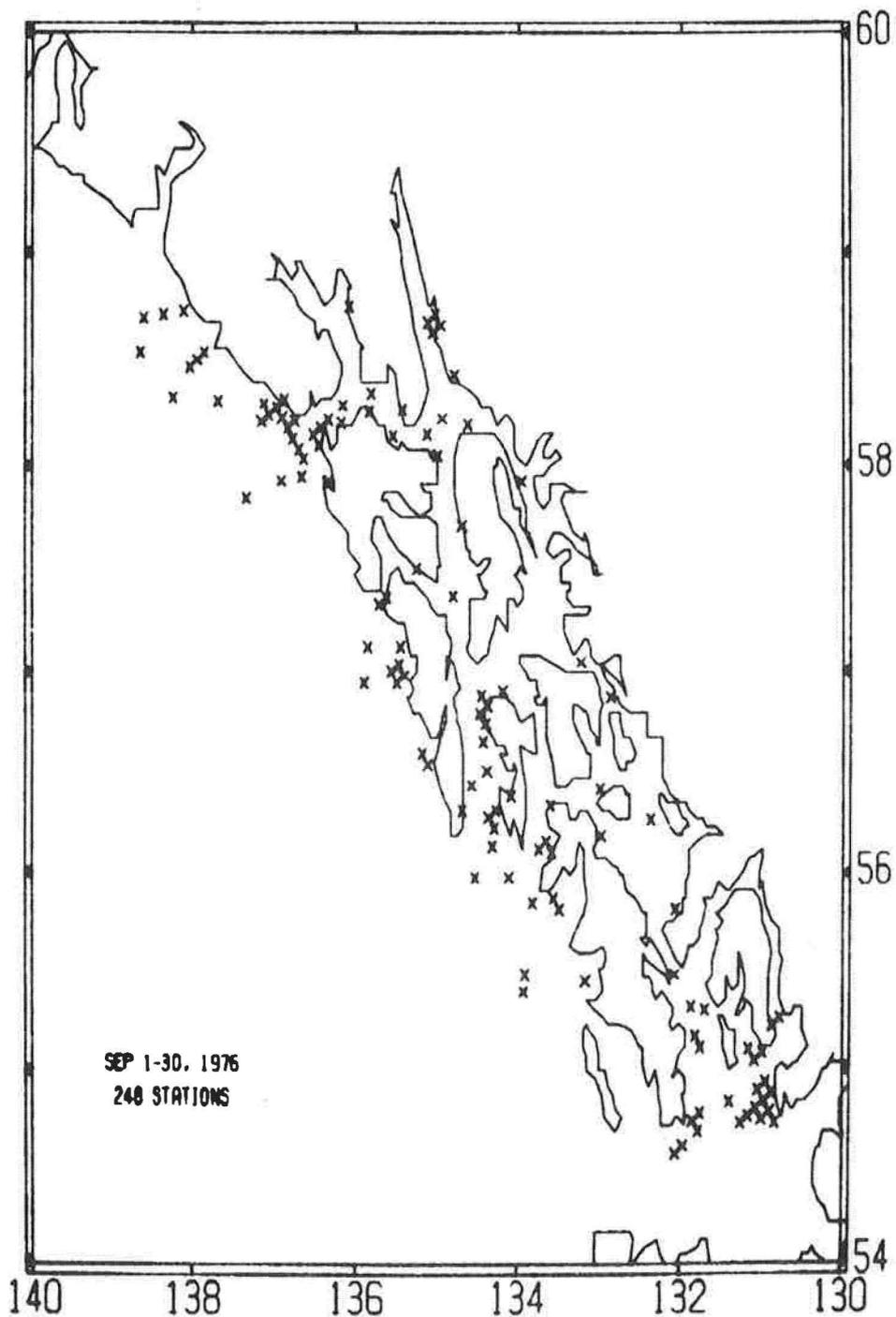


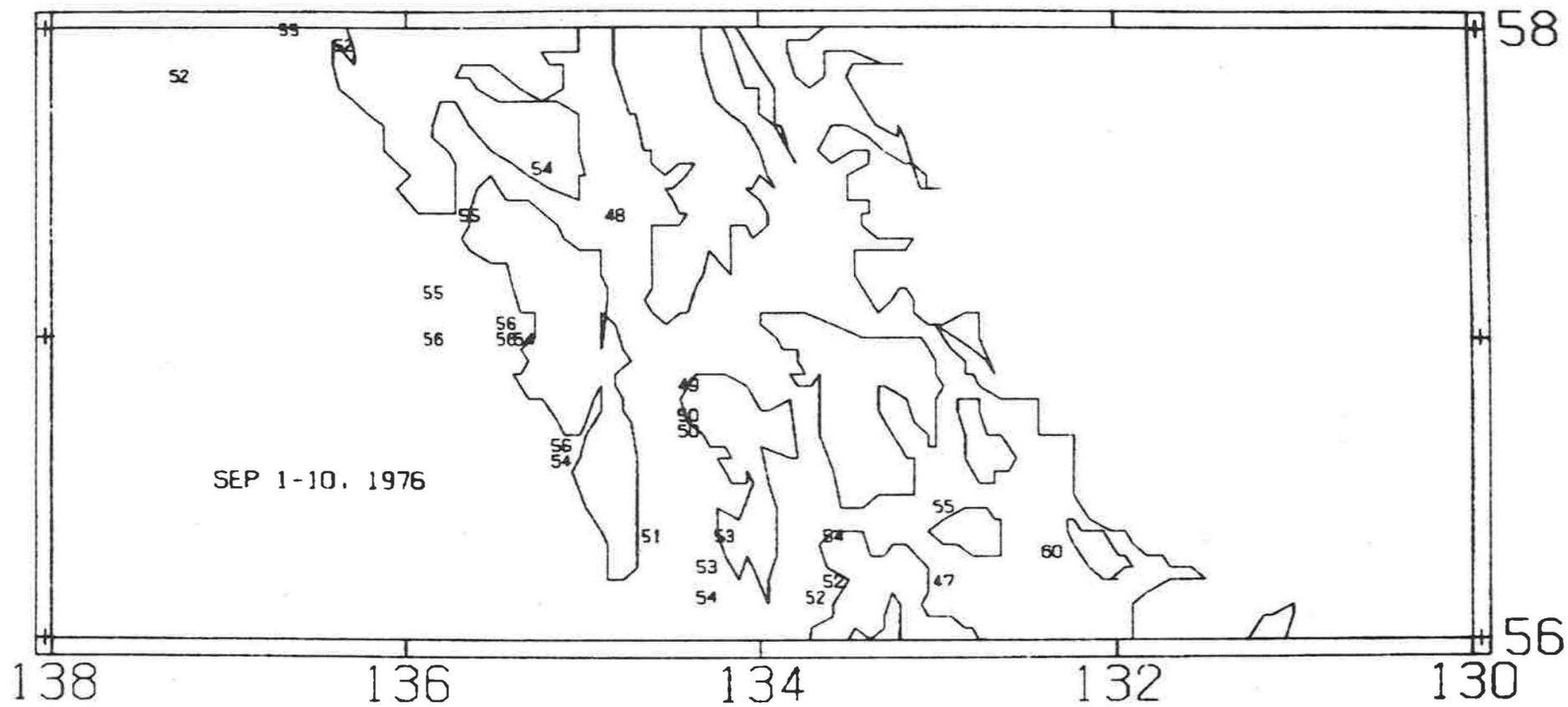


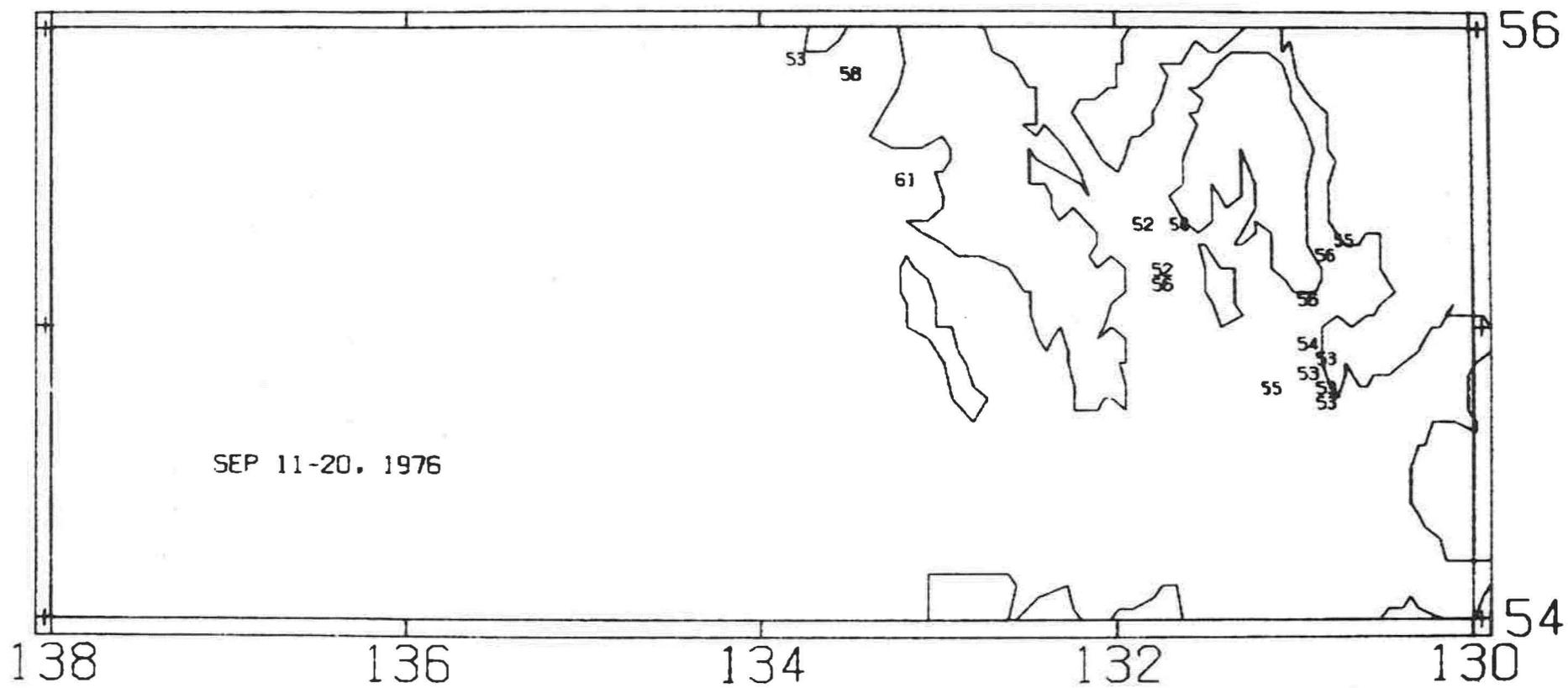
KETCHIKAN TROLLERS LOGBOOK SURVEY

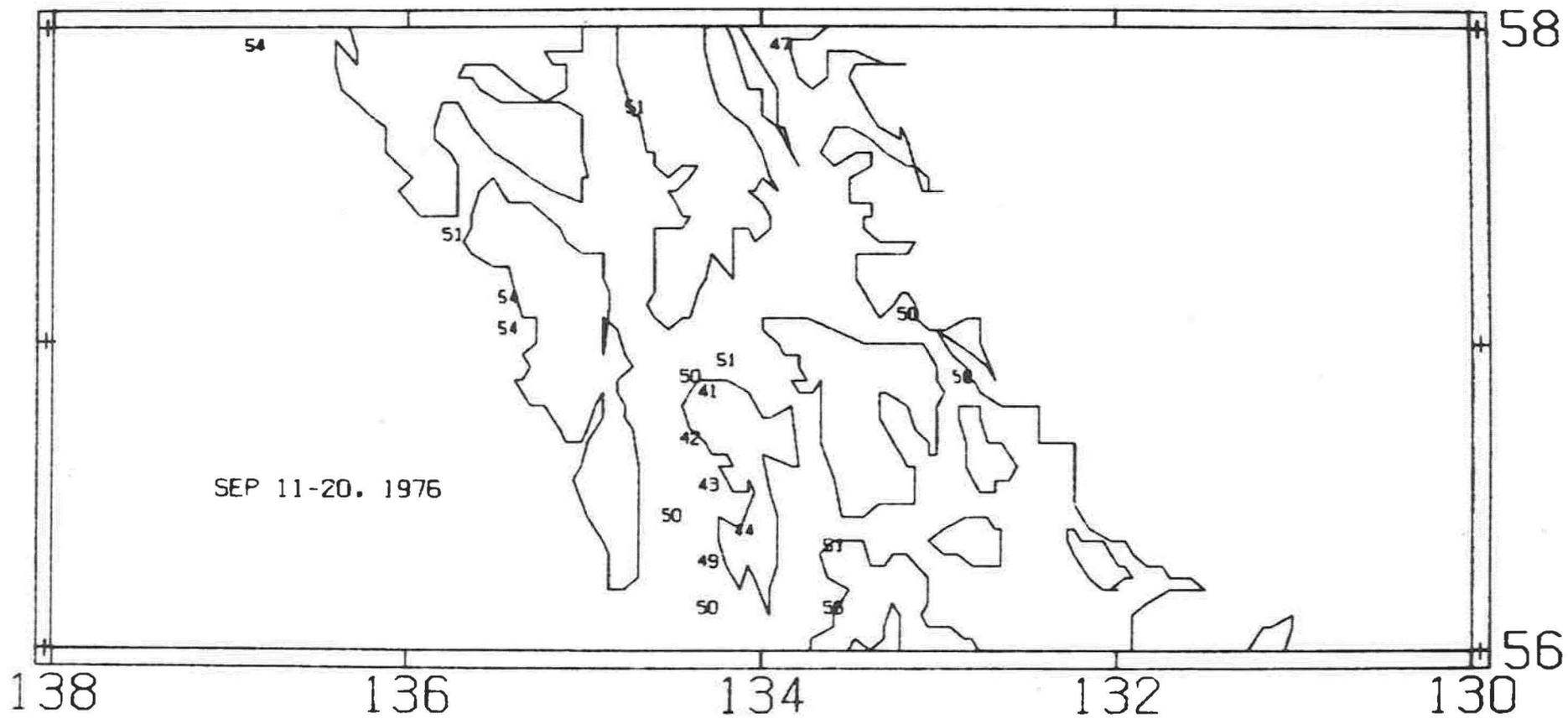
TROLL LOCATIONS

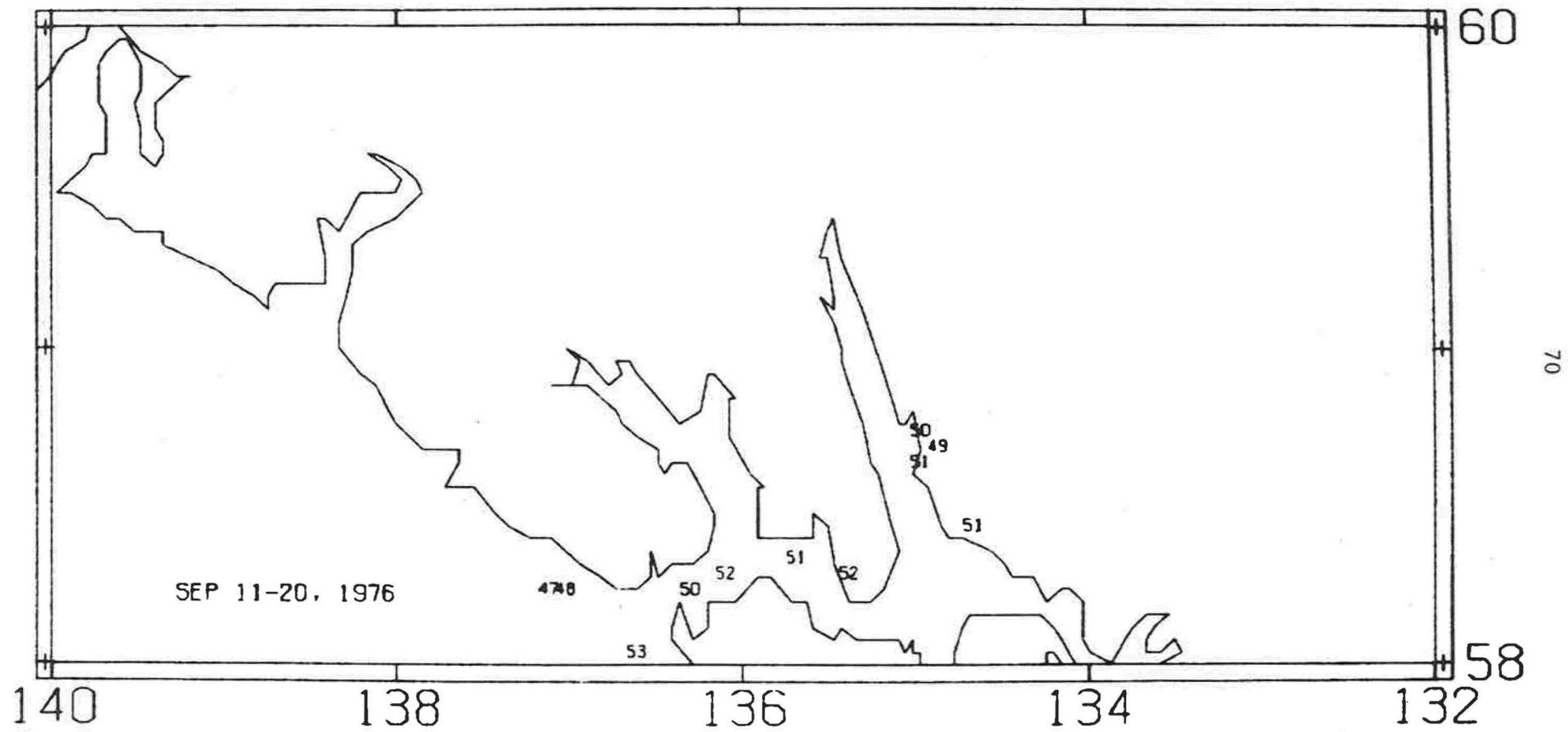
SEP. 1976

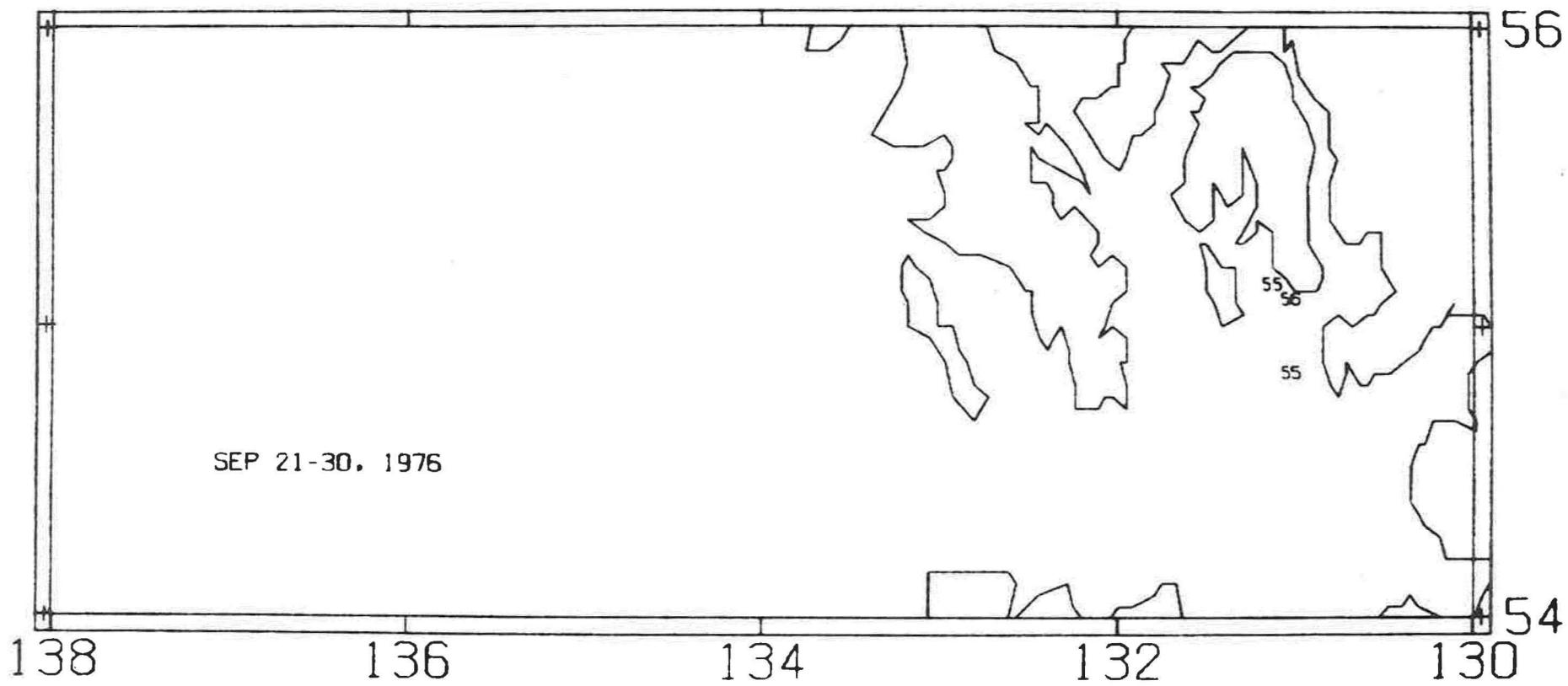


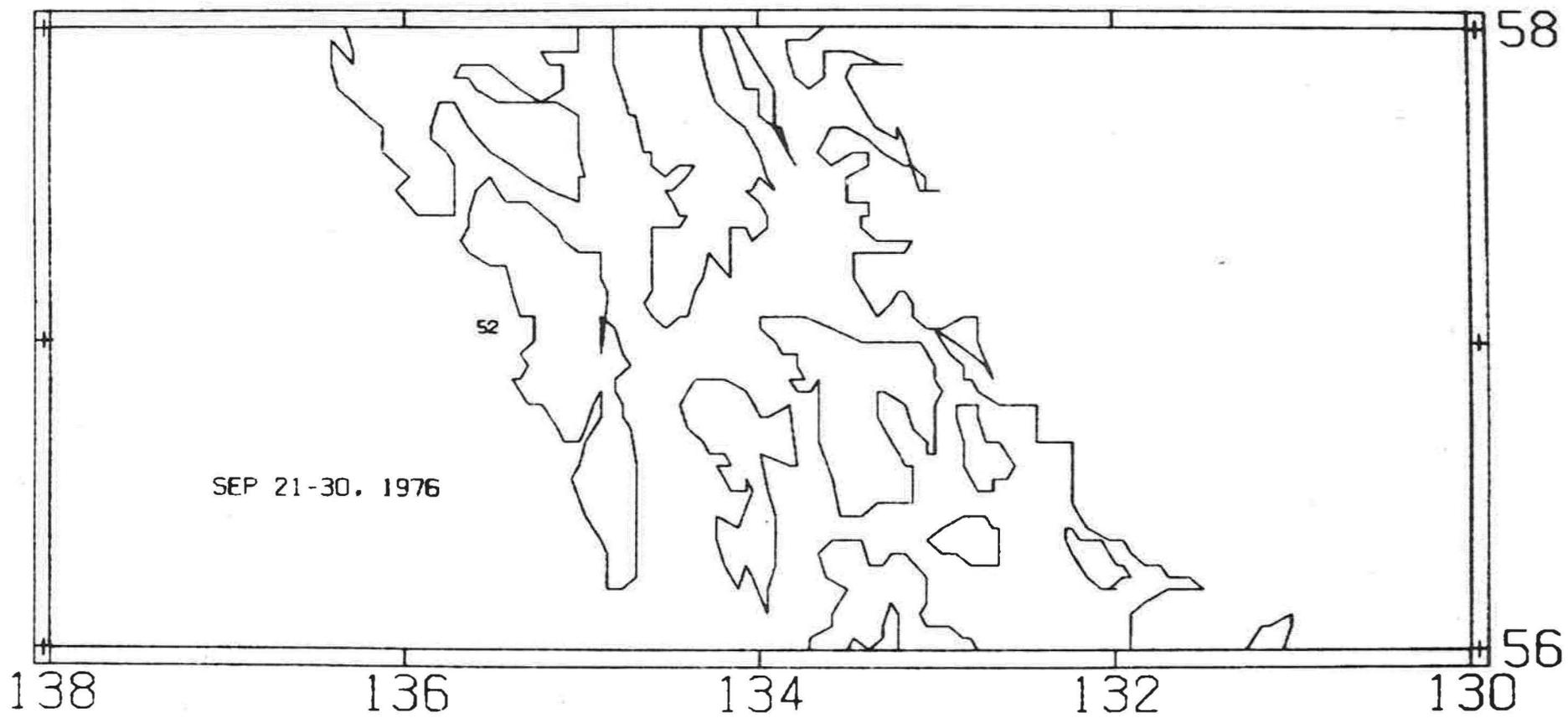








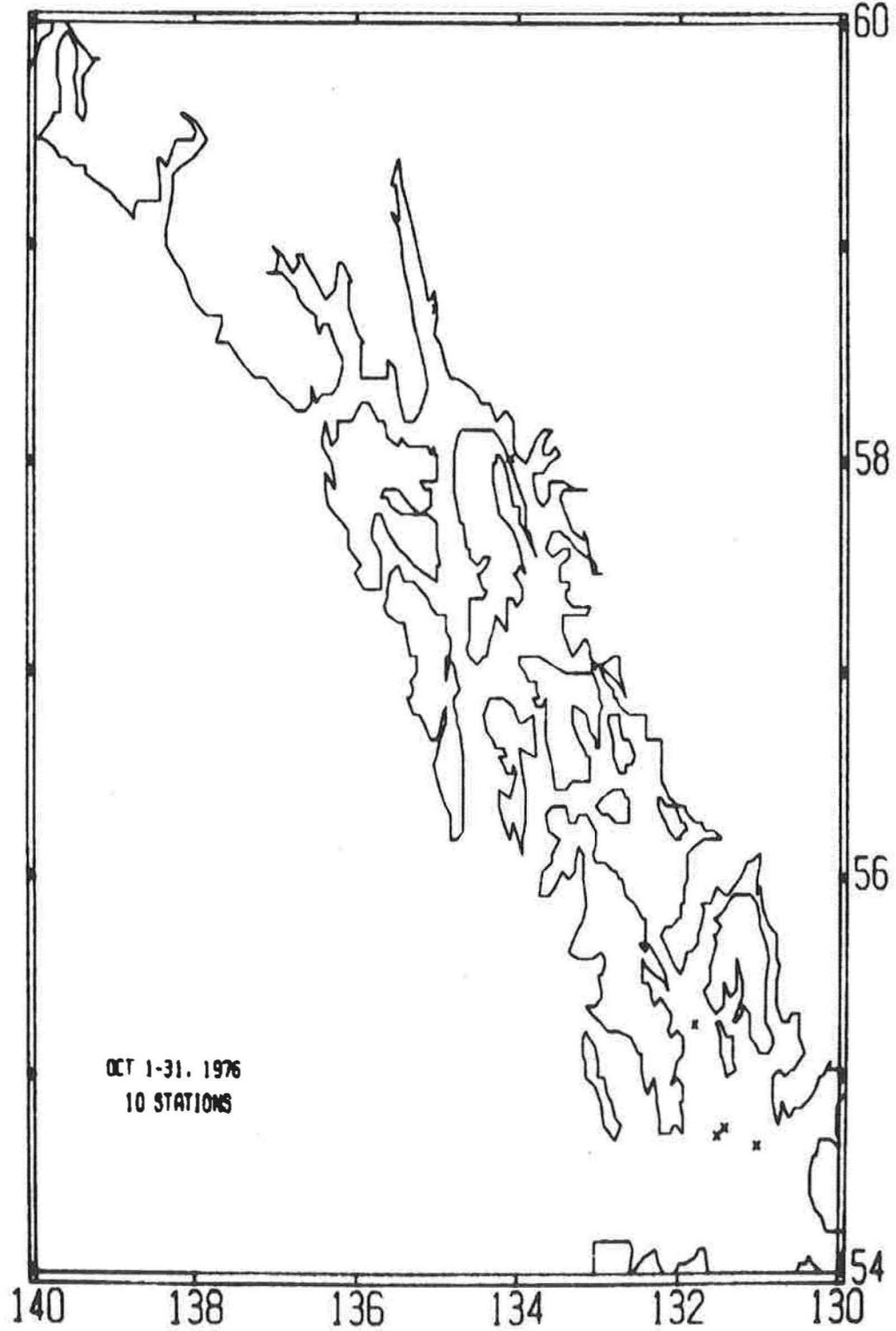


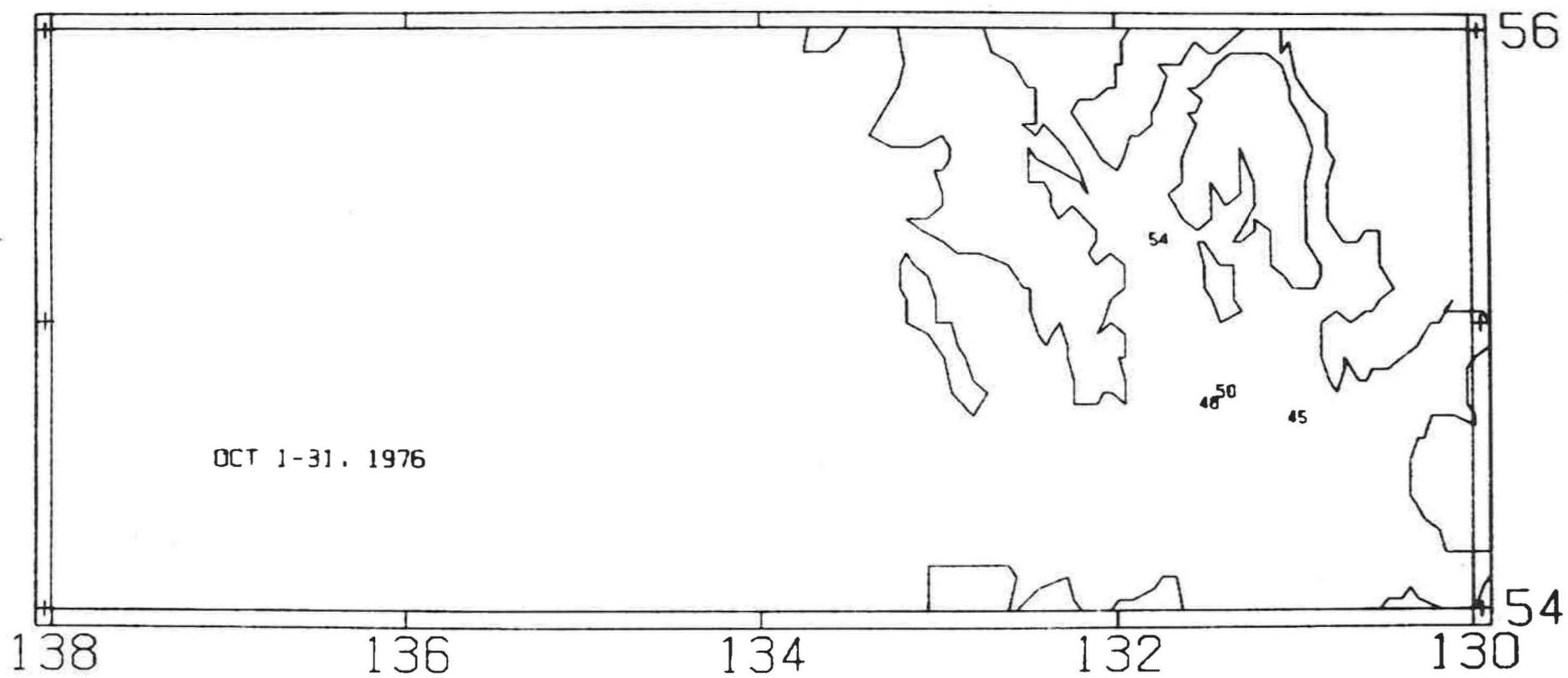


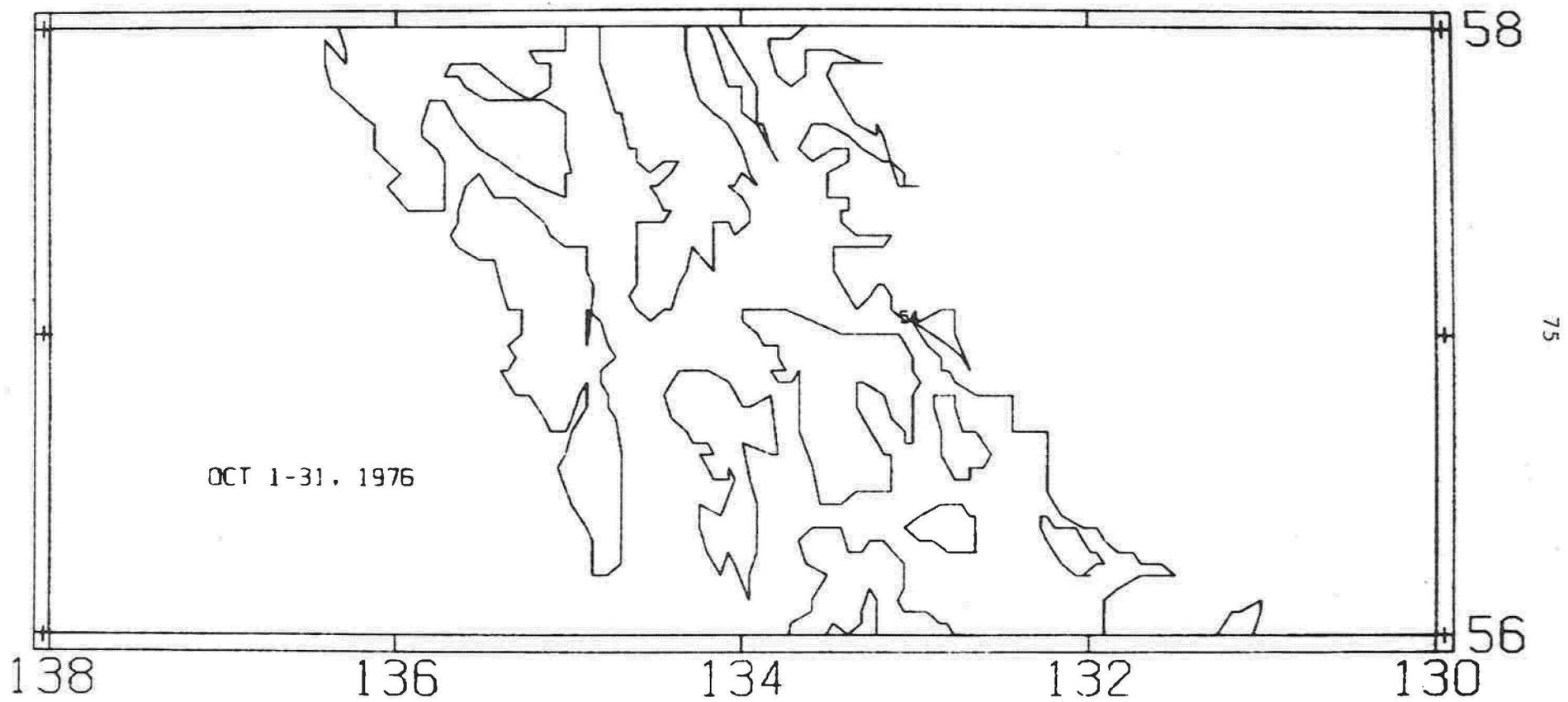
KETCHIKAN TROLLERS LOGBOOK SURVEY

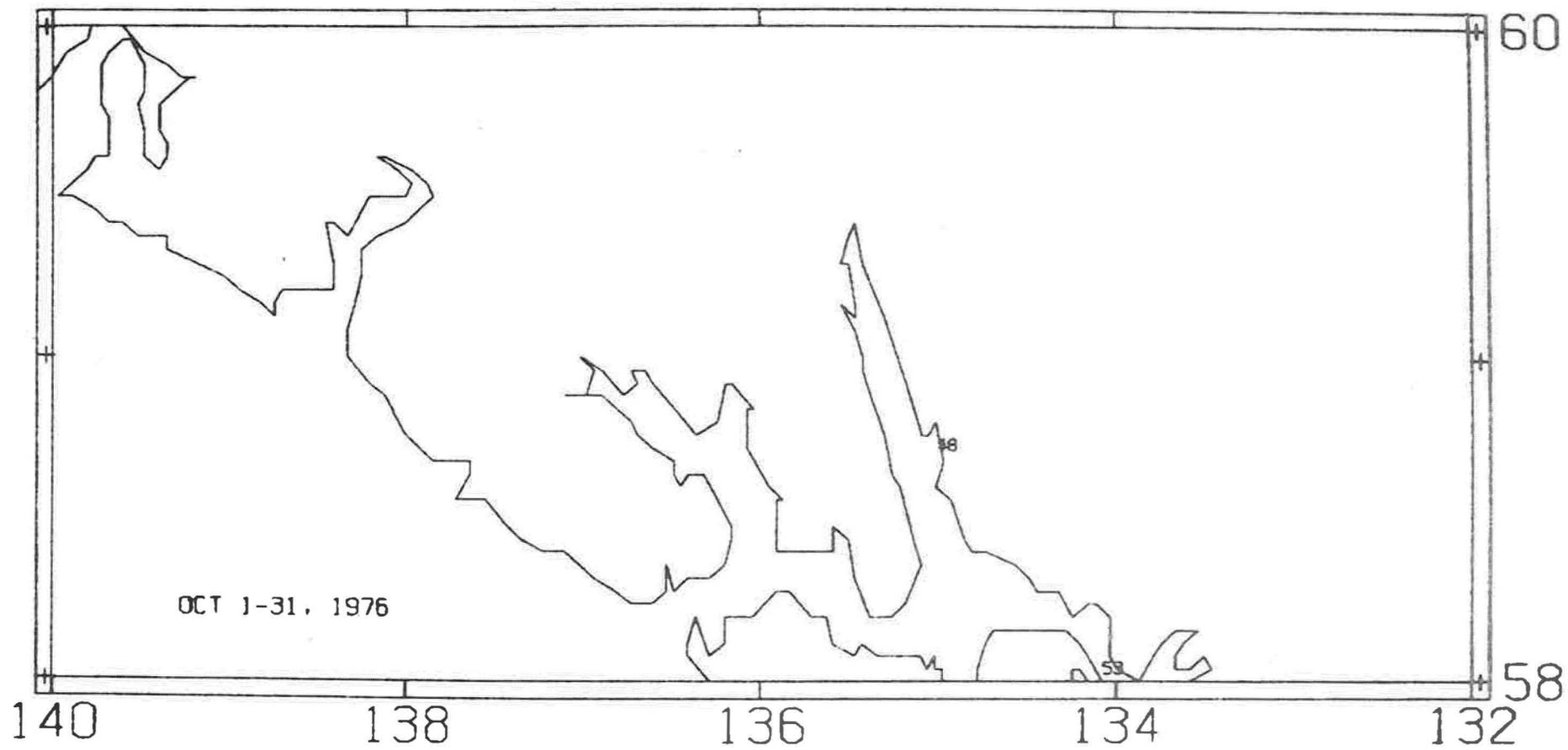
STATION LOCATIONS

OCT. 1976





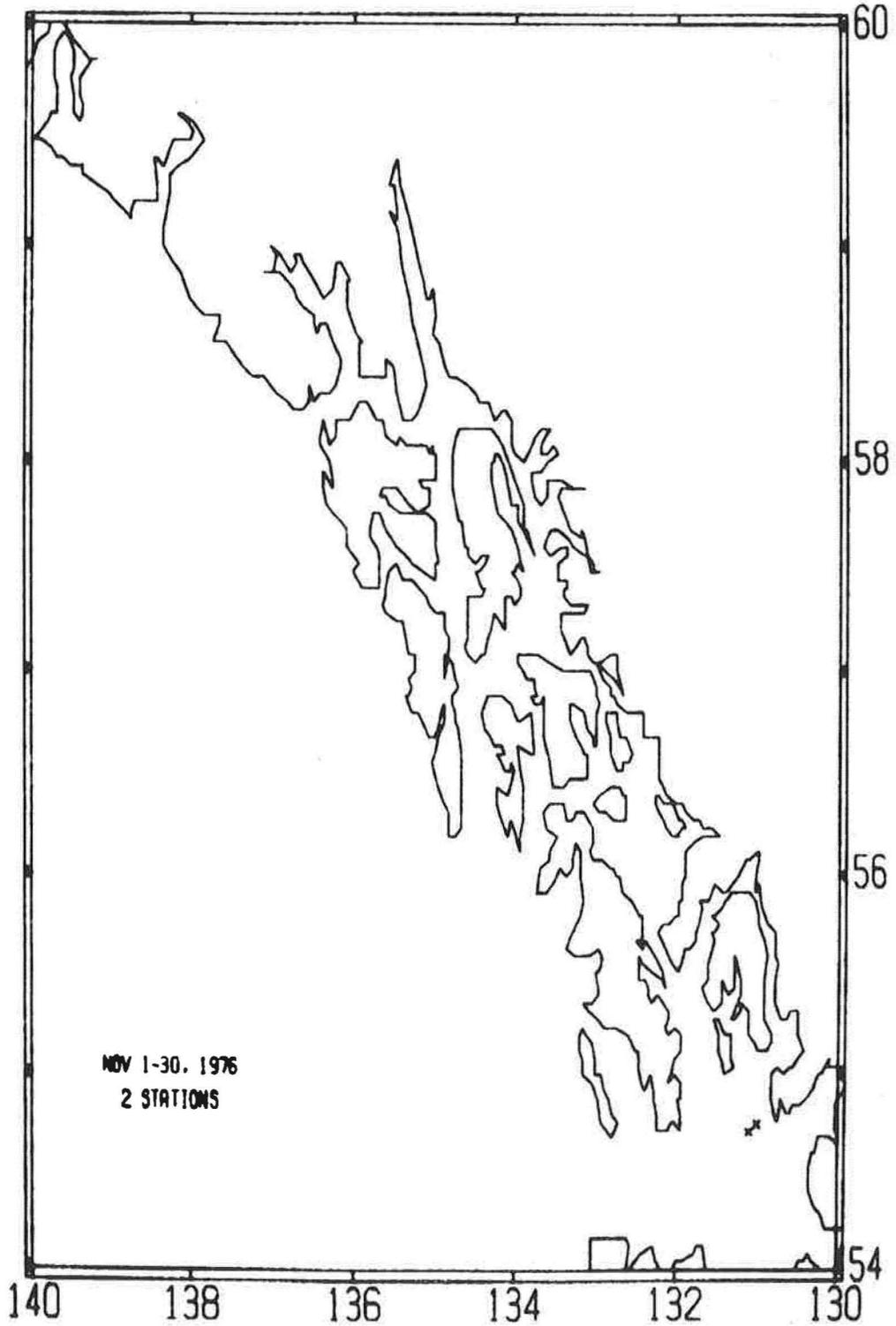


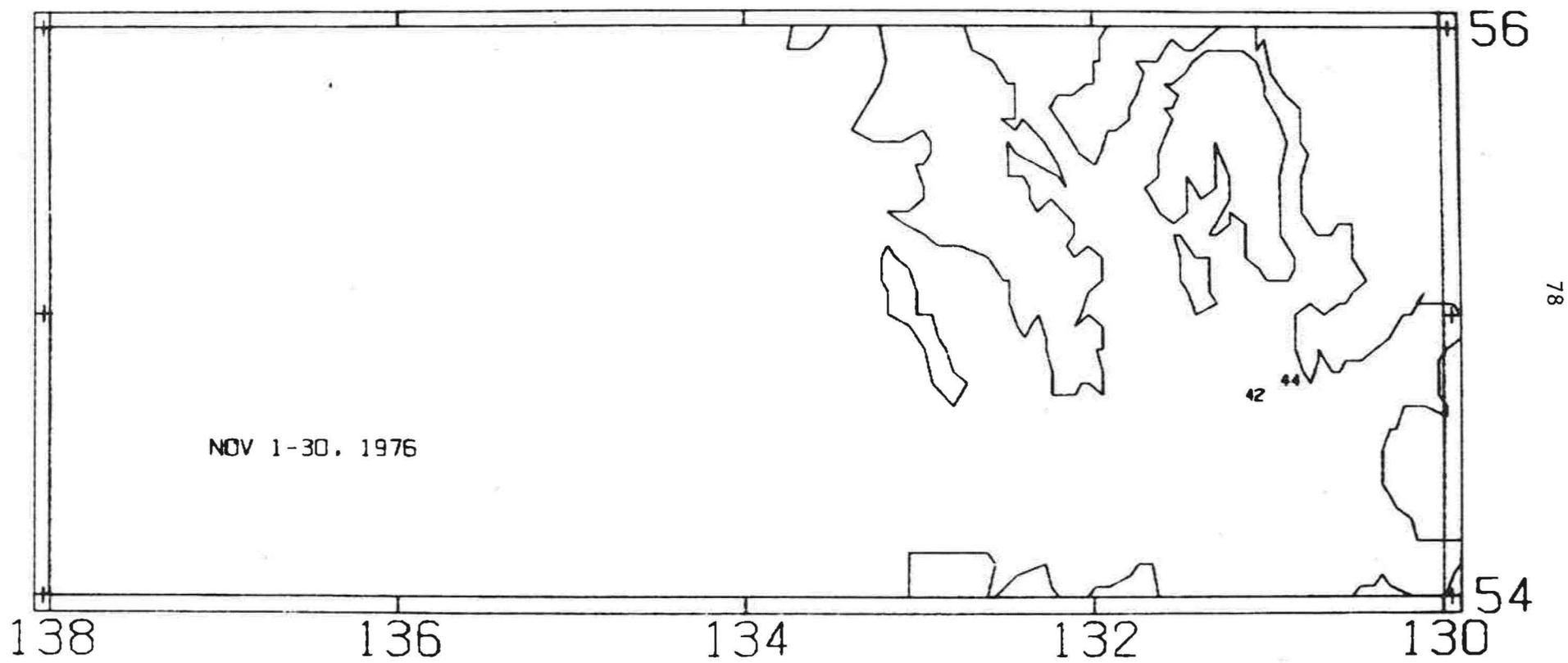


KETCHIKAN TROLLERS LOGBOOK SURVEY

STATION LOCATIONS

NOV. 1976





KETCHIKAN TROLLERS LOGBOOK SURVEY
STATION LOCATIONS
DEC. 1976

