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Temperature, Salinity and Sigma-t at Station 27 (47°33' N, 52°35' W), 1950-1959

By

A. Huyer & A. Verney
Marine Environmental Data Service
Environment Canada
Ottawa

MARINE ENVIRONMENTAL DATA SERVICE

TECHNICAL REPORT NO. 3

Temperature, Salinity and Sigma-t at Station 27 (47° 33′ N, 52° 35′ W), 1950-1959

Adriana Huyer and Andrew Verney

DEPARTMENT OF THE ENVIRONMENT
OTTAWA, CANADA

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ABSTRACT

Temperature, salinity and sigma-t observations at Station 27 for the period 1950-1959 are presented graphically, relative to the time-depth plane, as well as individual functions of time at each depth. Their ten-year seasonal means are similarly displayed, and these could serve as base period values at Station 27.

RESUME

Les observations de température, salinité et sigma-t à la station 27 pour les années 1950-1959 sont présentées graphiquement, relatives au temps et à la profondeur, ainsi que comme fonctions de temps à chaque profondeur. Leurs moyennes saisonnières pour les dix années sont presentées de la même façon et ceux-ci pourraient servir comme valeurs de base à la station 27.

CONTENTS

INTRODUCTION

As regional data centre for physical oceanographic observations of the International Commission for the Northwest Atlantic Fisheries, the Marine Environmental Data Service (MEDS) has undertaken to study the time and space variability of physical parameters in the ICNAF area. Station 27, at 47° 33'N, 52° 35'W (Figure 1) is one of a number of stations in the ICNAF area that has been occupied at fairly regular intervals since the late 1940's.

This report presents graphically the results of the observations between 1950 and 1959. The data, both for each year and for the ten-year means, are presented in the time-depth plane, and also as individual functions of time for each depth. Although presenting the results two ways is technically redundant, the two presentations stress different aspects of the data; therefore, both are more informative. Obviously erroneous data were omitted from the figures, although they remain in the MEDS data bank. A list of stations containing anomulous data which were considered erroneous is given in Table 1.

The time series plots were generated completely by computer. Computer plots were also used to display the data on the time-depth plane, but the contouring was done by hand. The 10 year means were also calculated and plotted by computer. A brief description and a listing of the programs are given in the appendix.

This report contains no description nor discussion of the results; it is only an early step in the analysis of the data. Templeman (1965) and Burmakin (1972) have discussed the temperature observations, which are of obvious interest to fisheries, but make no mention of the salinity or the sigma-t data.

Salinity is useful in identifying water sources: for example, the warm temperatures observed at the surface in summer are always associated with low salinities, and therefore likely river outflow. Sigma-t is useful because it is an indicator of the stability of the water column, and hence of vertical nutrient transports and plankton distributions. The ten-year means could be used as base-line values to determine whether present and future observations are significantly different from normal while the ship is still on site.

Table 1

Occupations of Station 27 which in our judgment contain at least one erroneous data point.

Date	Cruise Reference Number	Consecutive Station Number	Erroneous Parameter and Depth
3 Feb. 1950	116	2	all data
29 Apr. 1950	116	23	temperature, 50 m
25 Jan. 1950	116	1	salinity, all depths
9 June 1950	116	39	salinity, 180 m
20 July 1951	128	43	salinity, 50 m
6 May 1952	142	58	temperature, 175 m
28 June 1952	142	61	salinity, 100 m
26 July 1952	142	62	salinity, 175 m
17 June 1953	162	49	salinity, 100 m
9 Sept 1955	196	62	salinity, 180 m
18 Apr. 1956	208	2	salinity, 150, 170 m

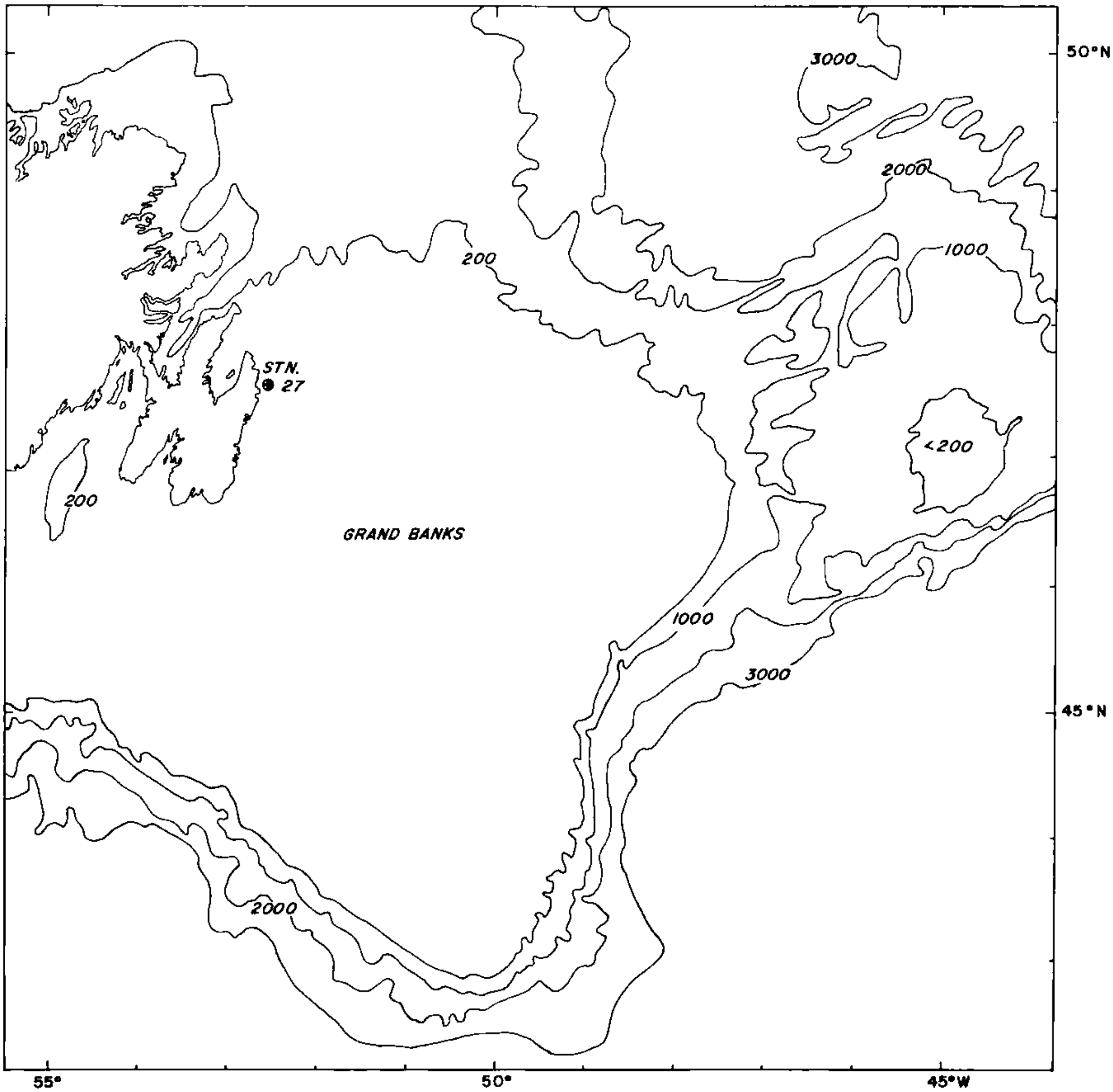


Figure 1. Location of Station 27.
(Depth contours are in meters)

ACKNOWLEDGEMENTS

Mr. Jean Gagnon prepared some of the figures, and Mrs. Gwladys Mowbray prepared the report for publication. Both made many suggestions which improved the presentation of the data.

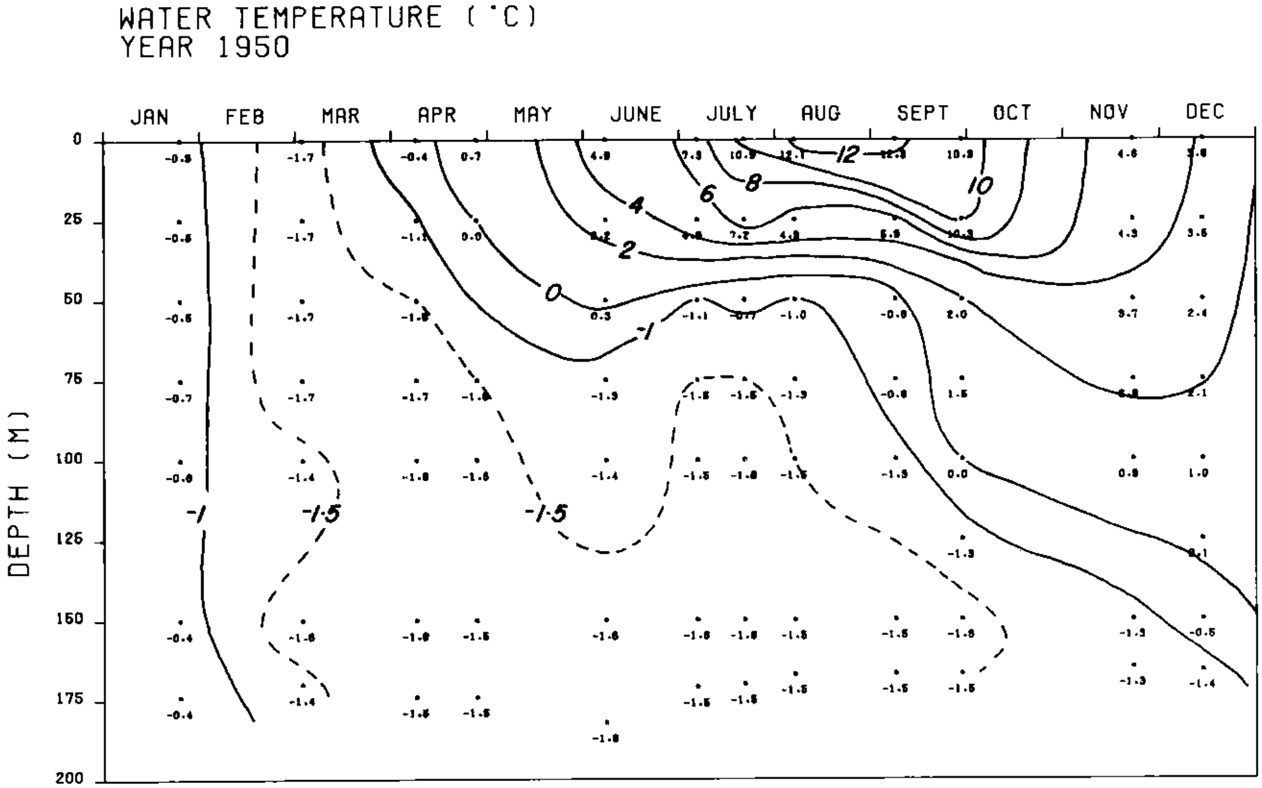
REFERENCES

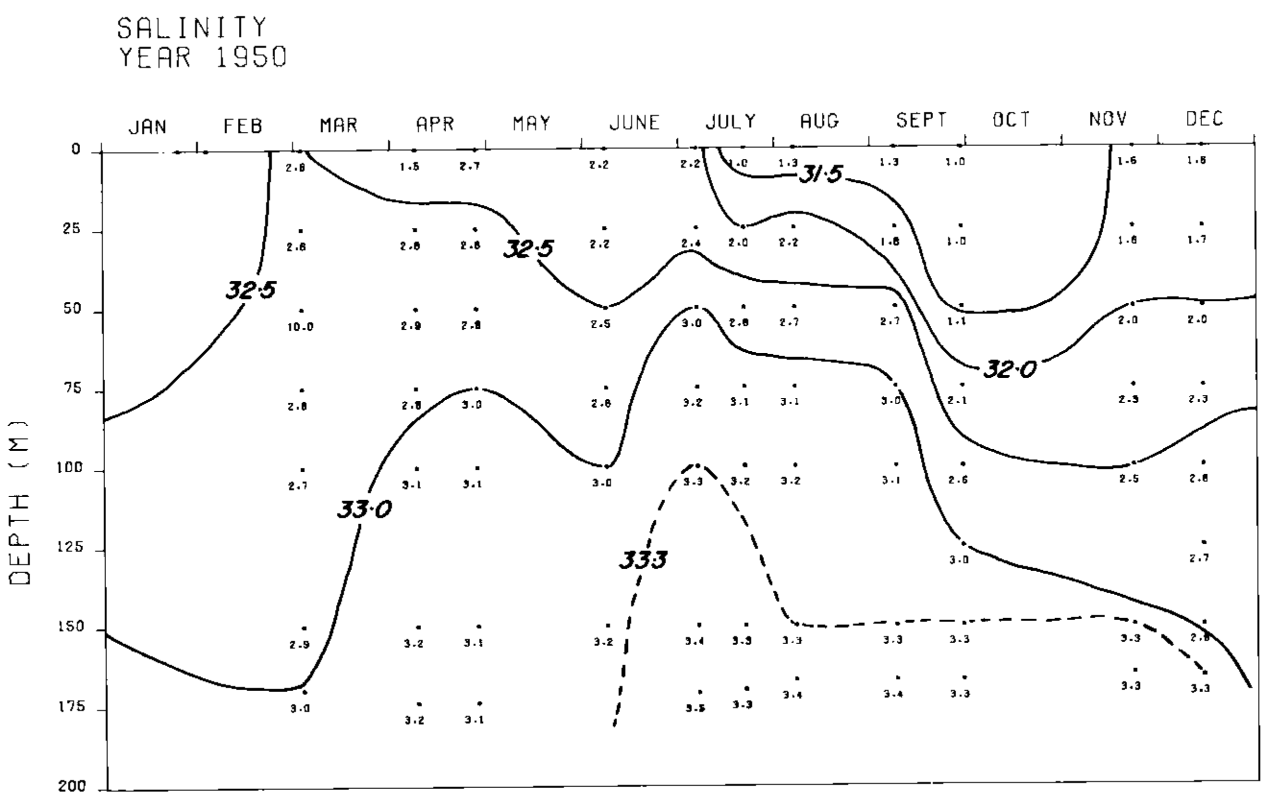
Burmakin, V.V. 1972. Seasonal and year to year variations in water temperature in the Labrador and Newfoundland areas. ICNAF Special Publication No. 8: 63-70.

Sweers, H.E. 1971. A comparison of methods used to calculate sigma-t, specific volume anomaly and dynamic height. Mar. Tech. Soc. Jour. 5(3): 7-26.

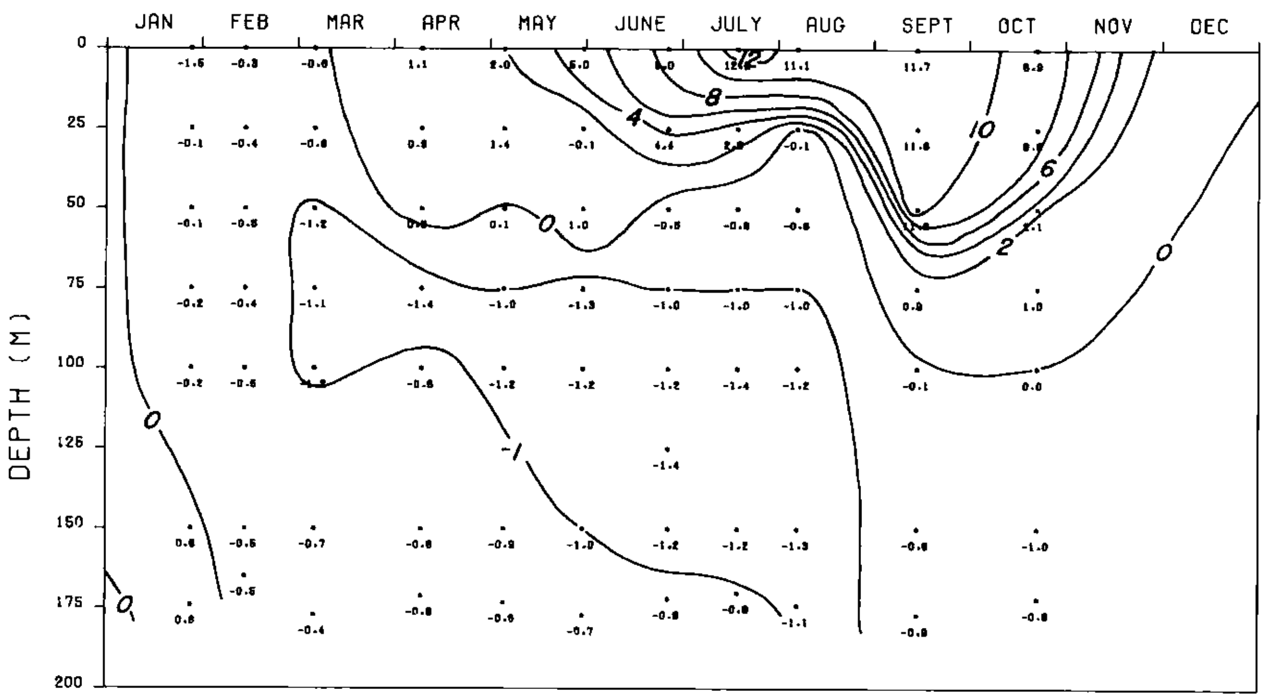
Templeman, W. 1965. Anomalies of sea temperature at Station 27 off Cape Spear and of air temperature at Torbay - St. John's. ICNAF Special Publication No. 6: 795-806.

Yearly
Time-Depth Distribution
of
Temperature (° C)
and
Salinity (‰)
1950-1959

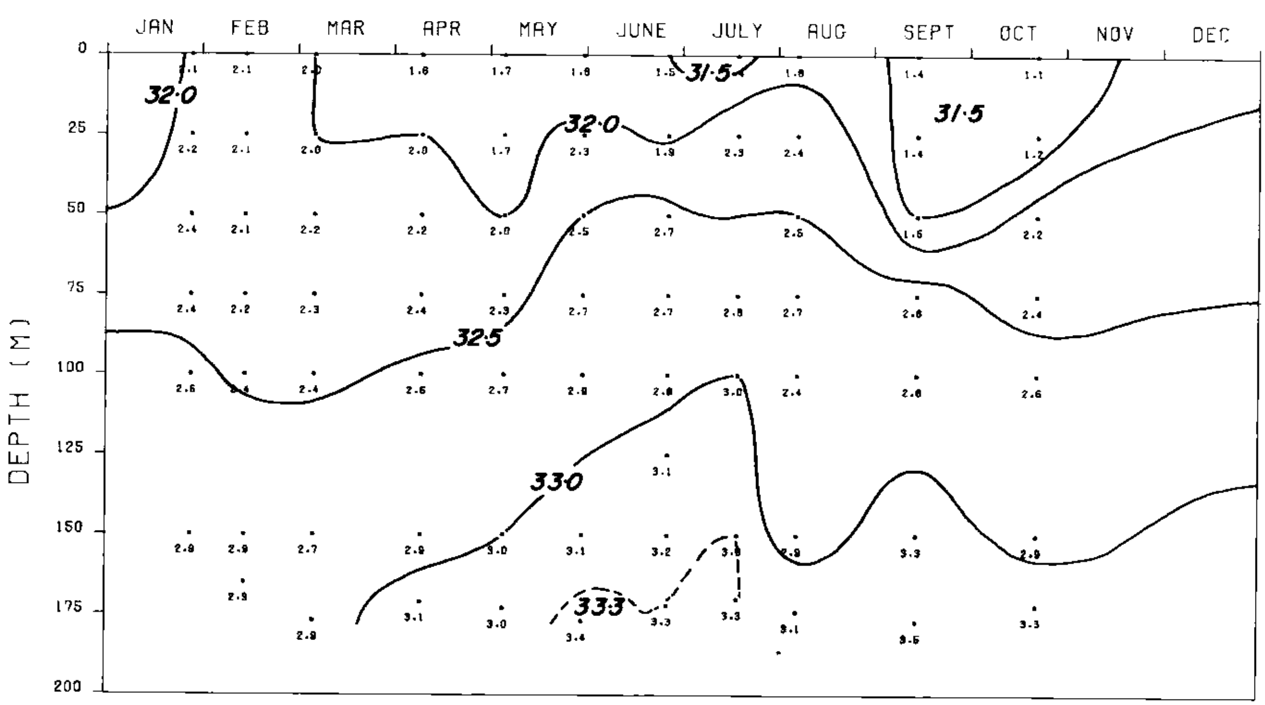

WATER TEMPERATURE (°C)
YEAR 1950
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
DEPTH (M)
0
25
50
75
100
125
150
175
200
-1
-1.5
-1.5
0
-1
2
4
6
8
10
12


SALINITY
YEAR 1950
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
DEPTH (M)
0
25
50
75
100
125
150
175
200
32.5
32.5
31.5
32.0
33.0
33.3

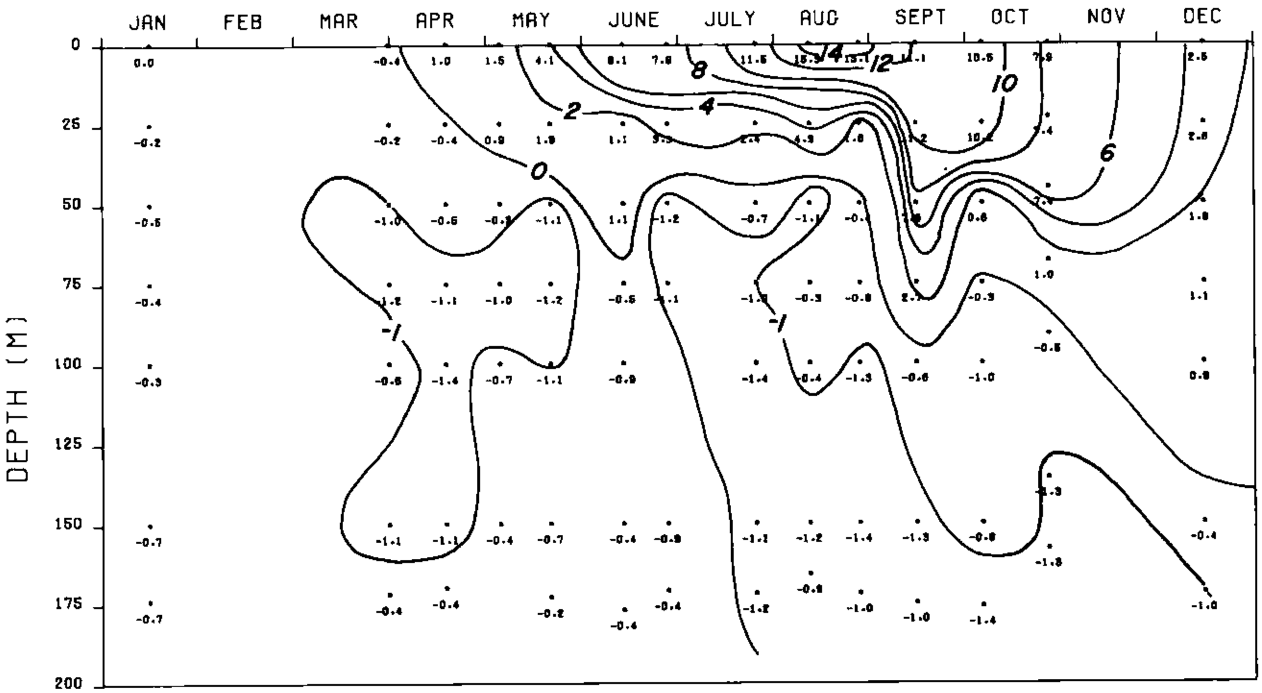
WATER TEMPERATURE (°C)
YEAR 1951



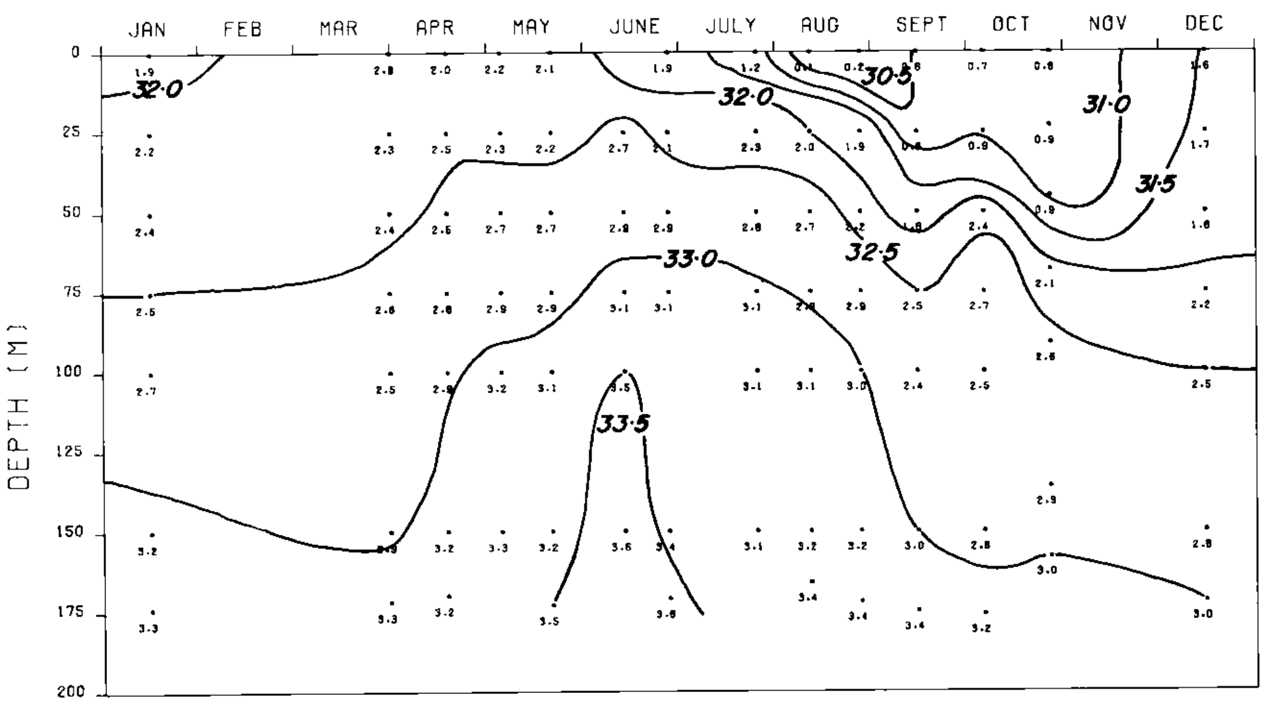
SALINITY
YEAR 1951



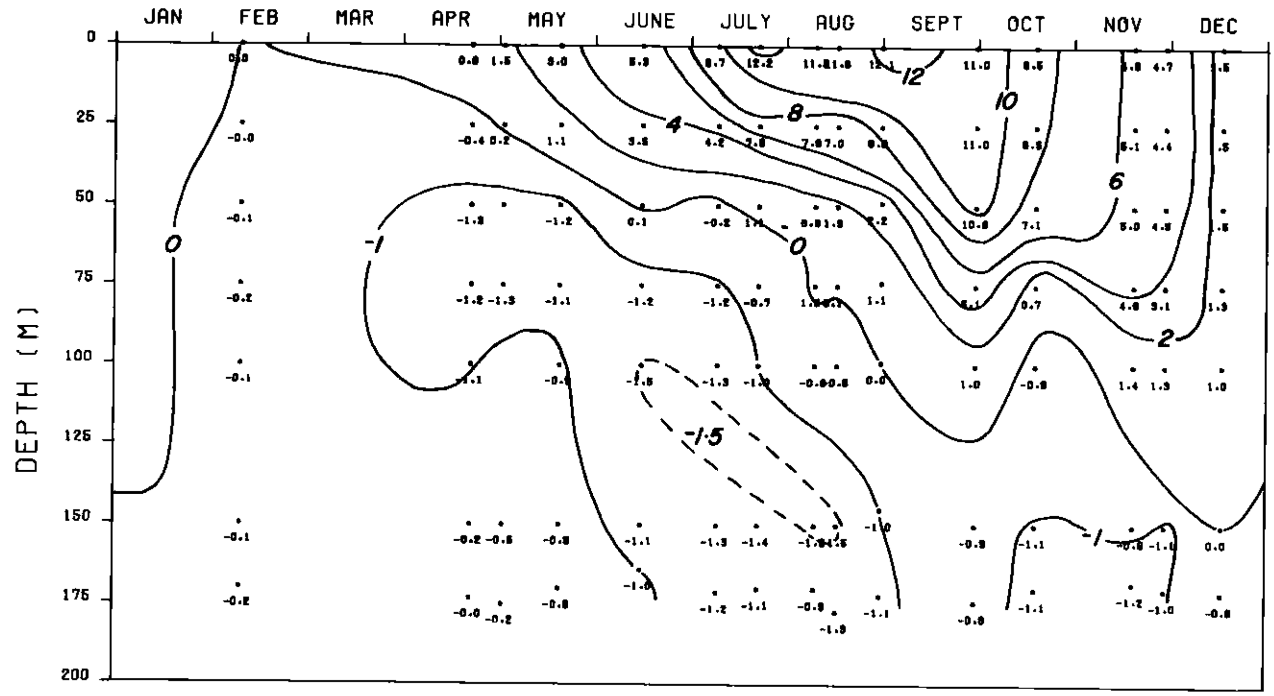
WATER TEMPERATURE (°C)
YEAR 1952



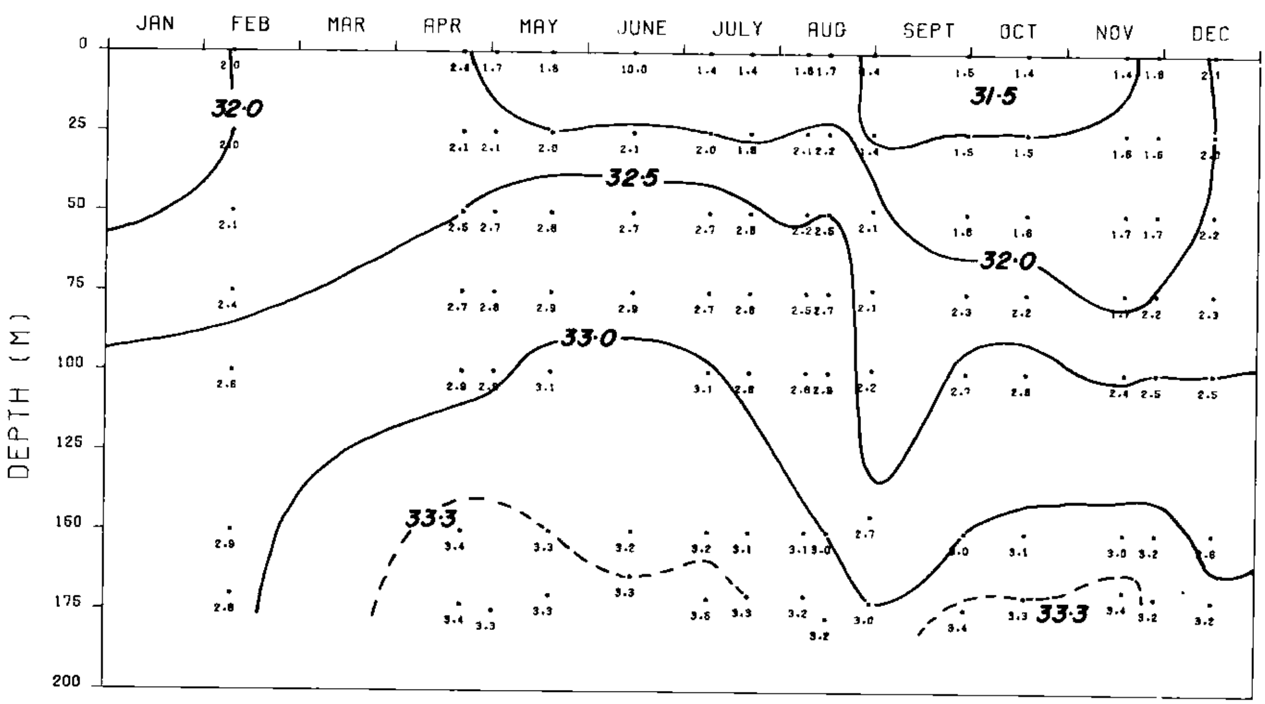
SALINITY
YEAR 1952



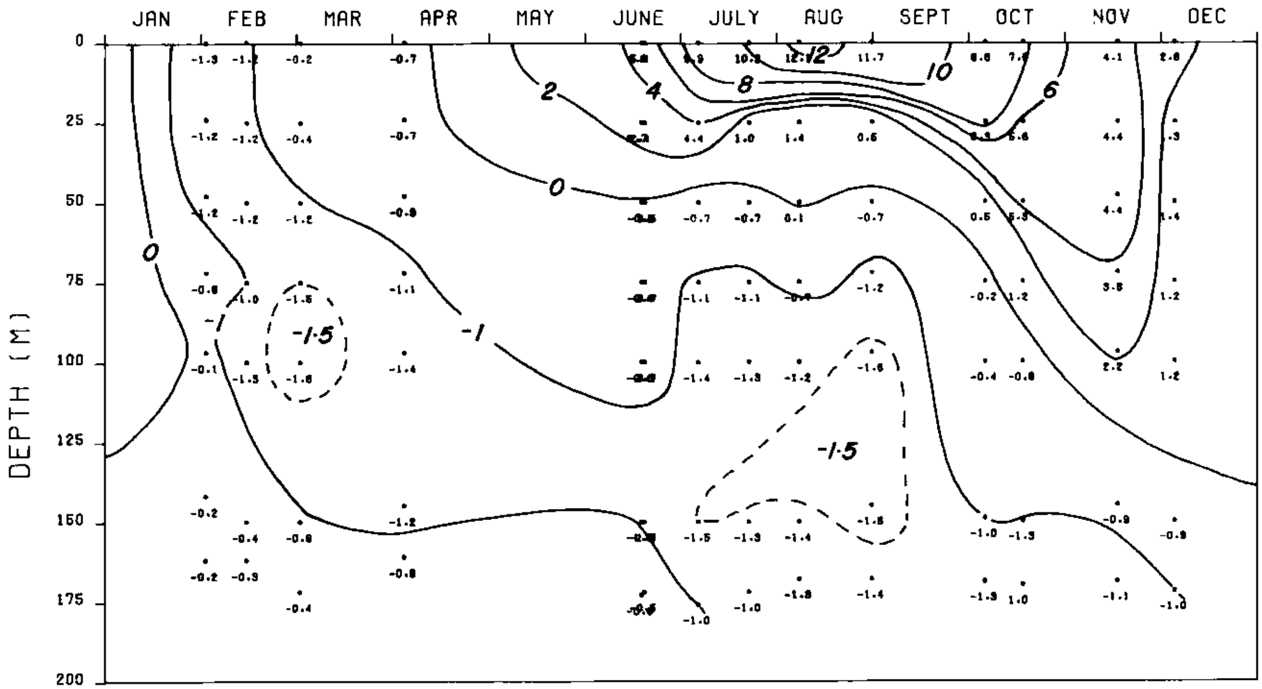
WATER TEMPERATURE (°C)
YEAR 1953



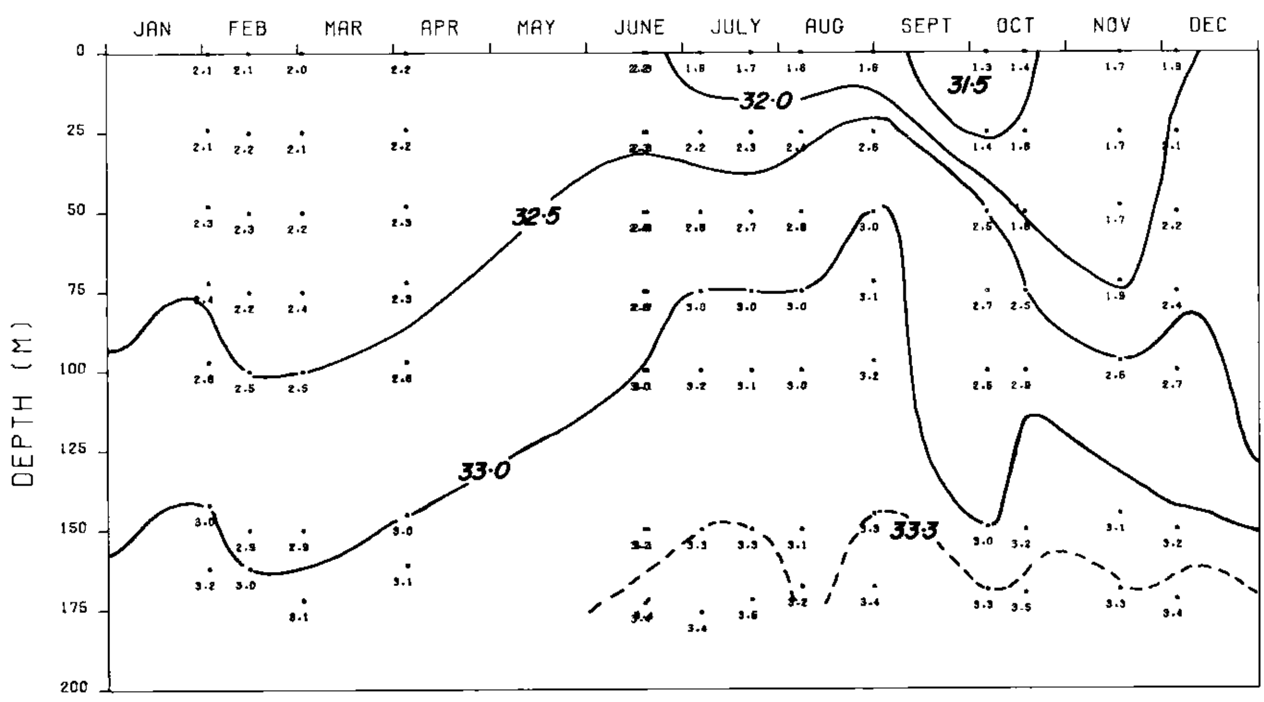
SALINITY
YEAR 1953



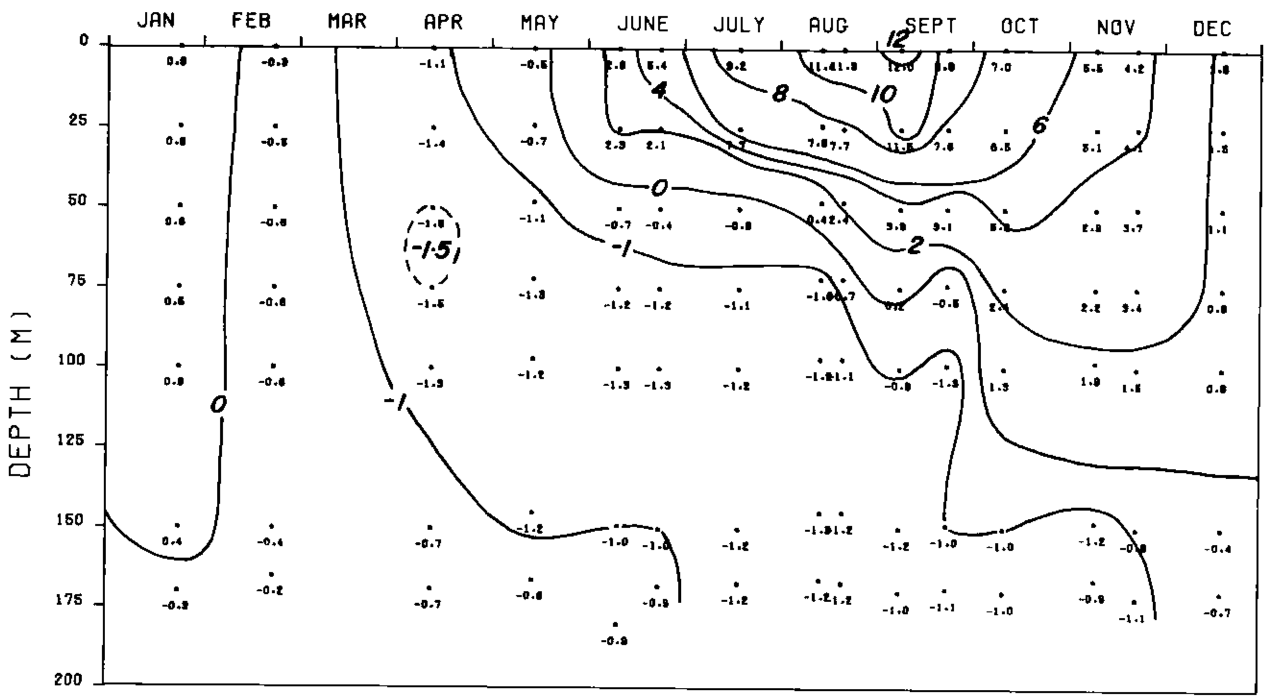
WATER TEMPERATURE (°C)
YEAR 1954



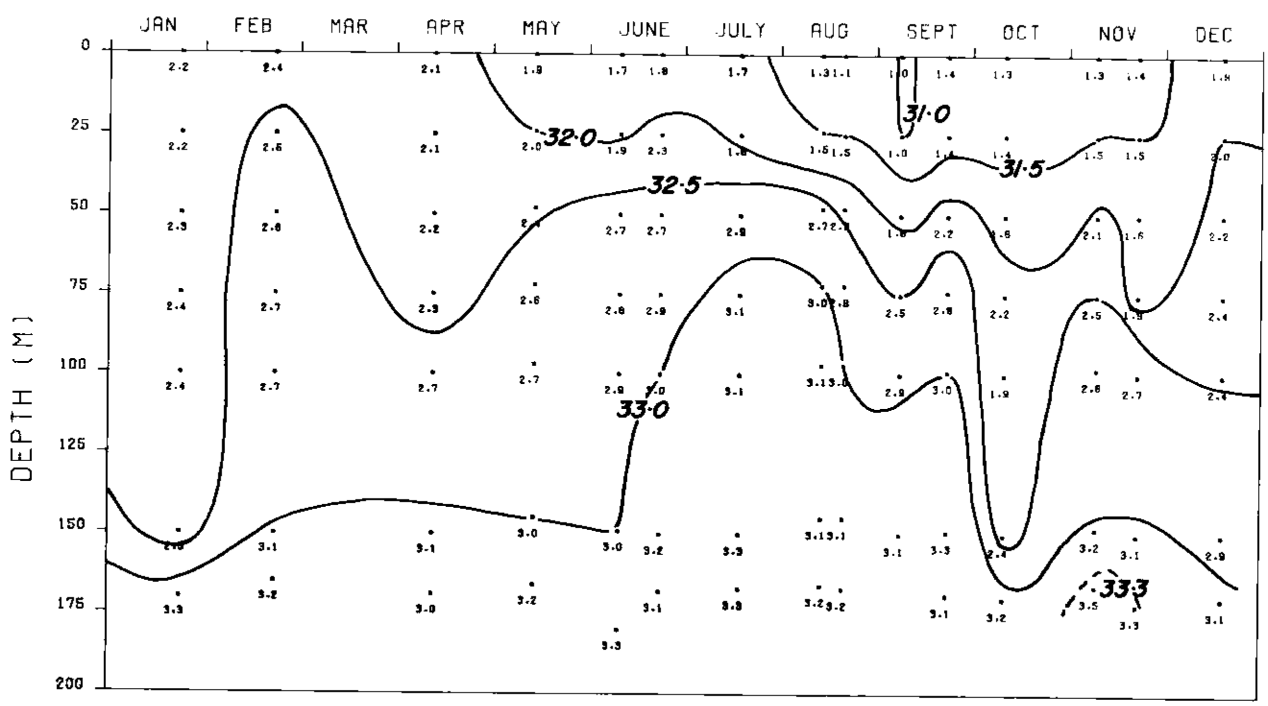
SALINITY
YEAR 1954



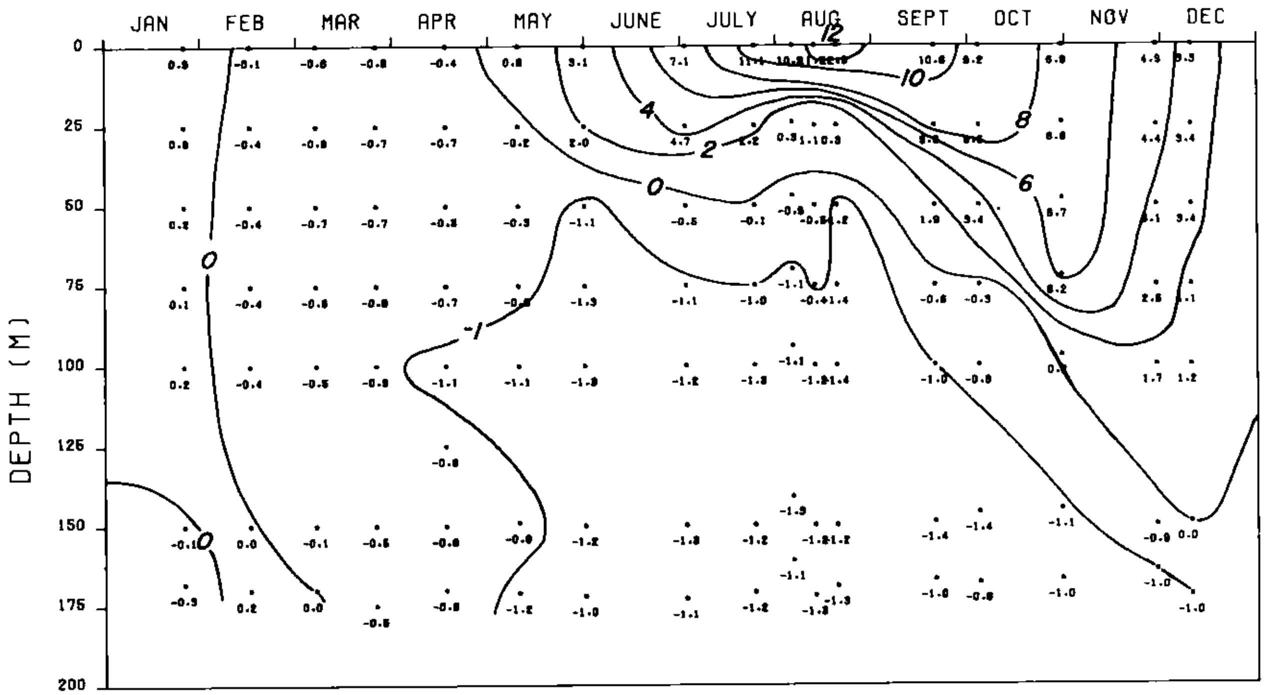
WATER TEMPERATURE (°C)
YEAR 1955



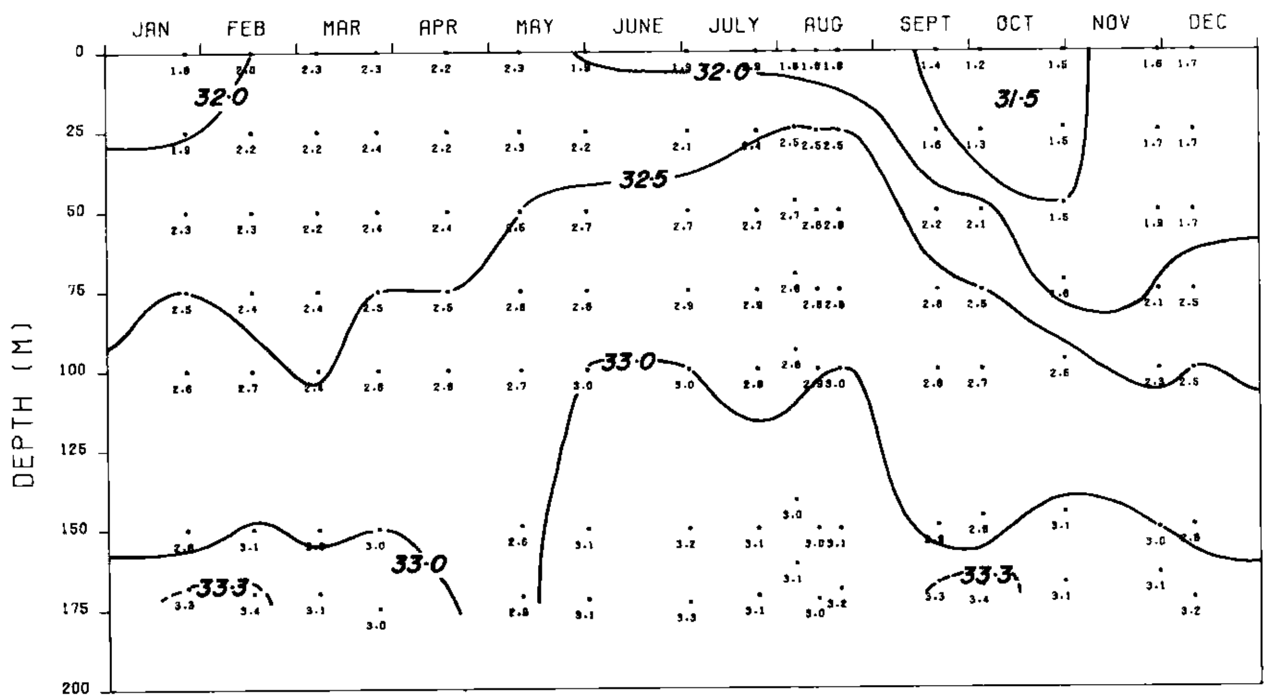
SALINITY
YEAR 1955



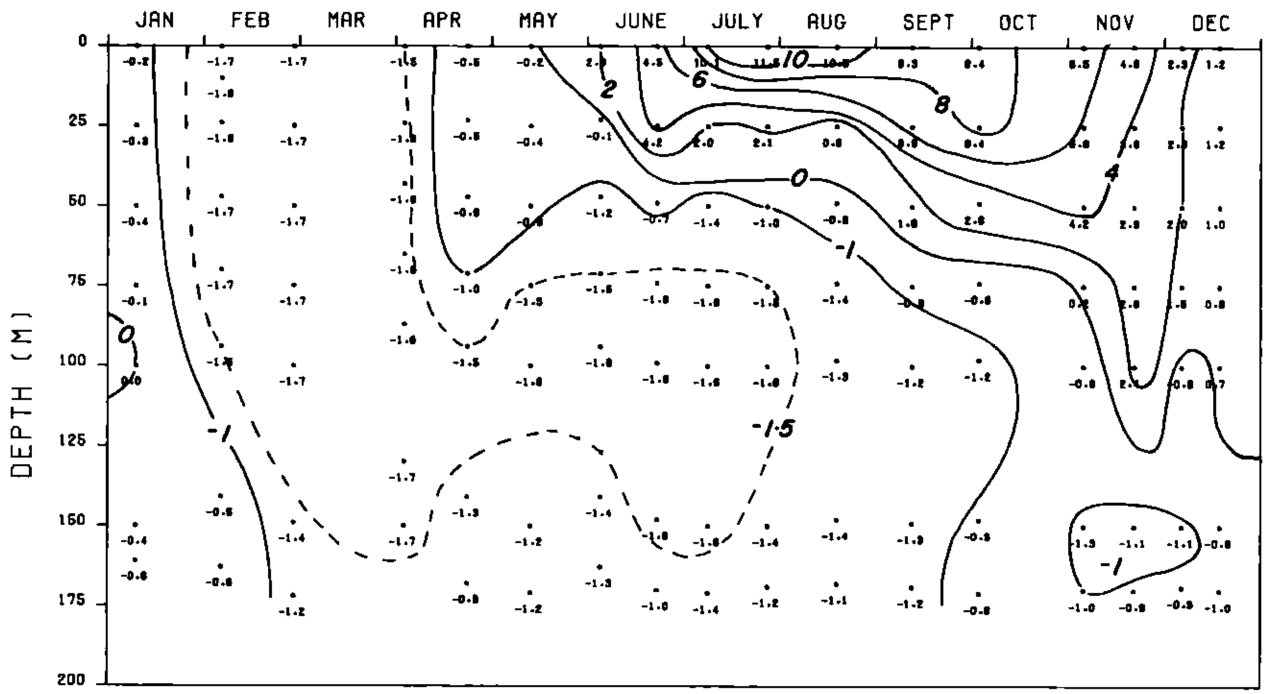
WATER TEMPERATURE (°C)
YEAR 1956



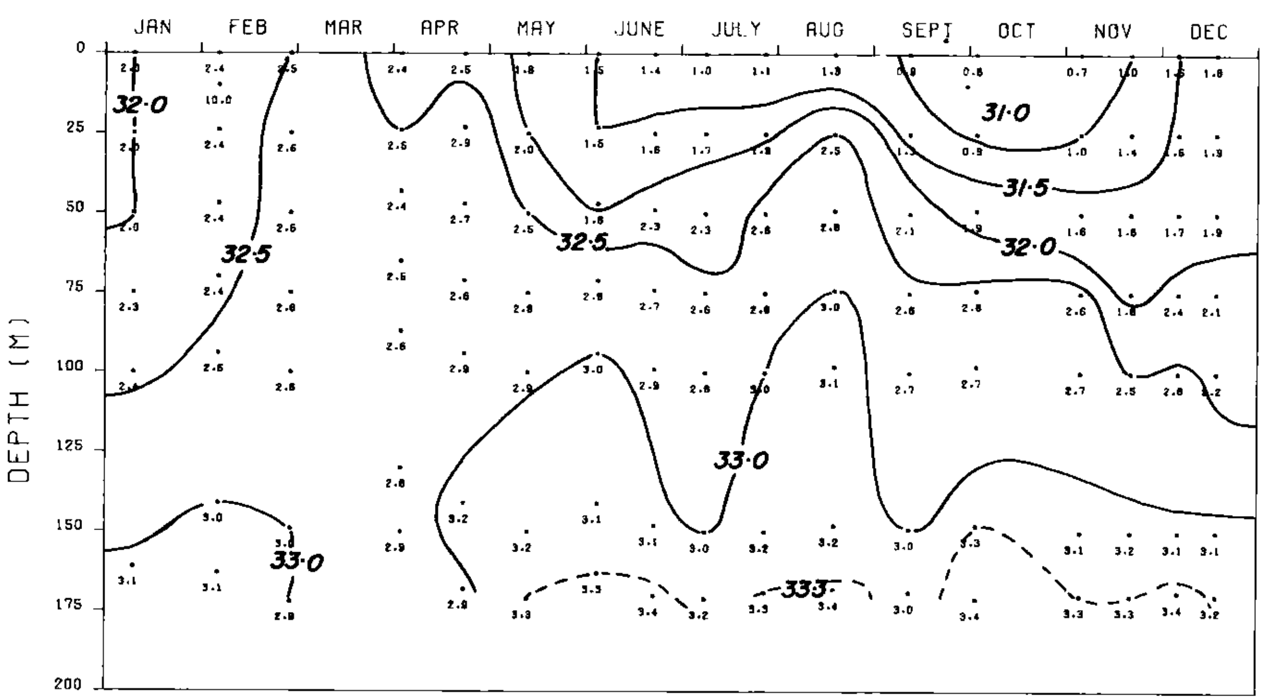
SALINITY
YEAR 1956



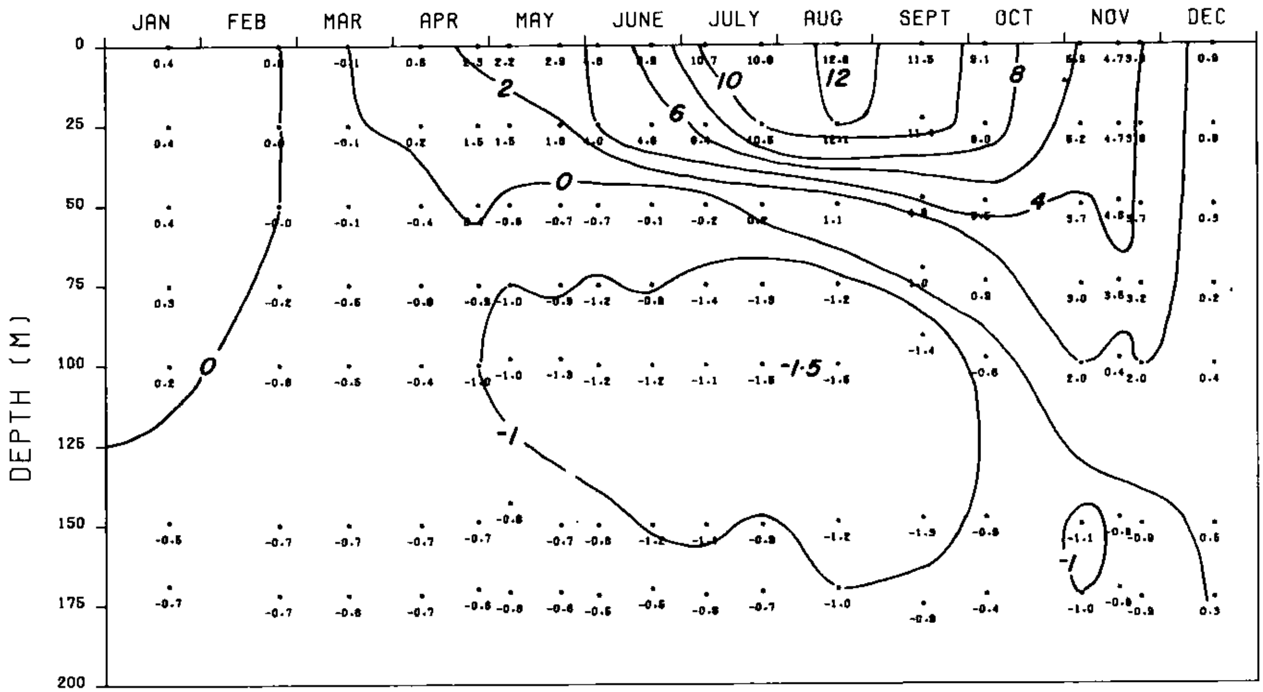
WATER TEMPERATURE (°C)
YEAR 1957



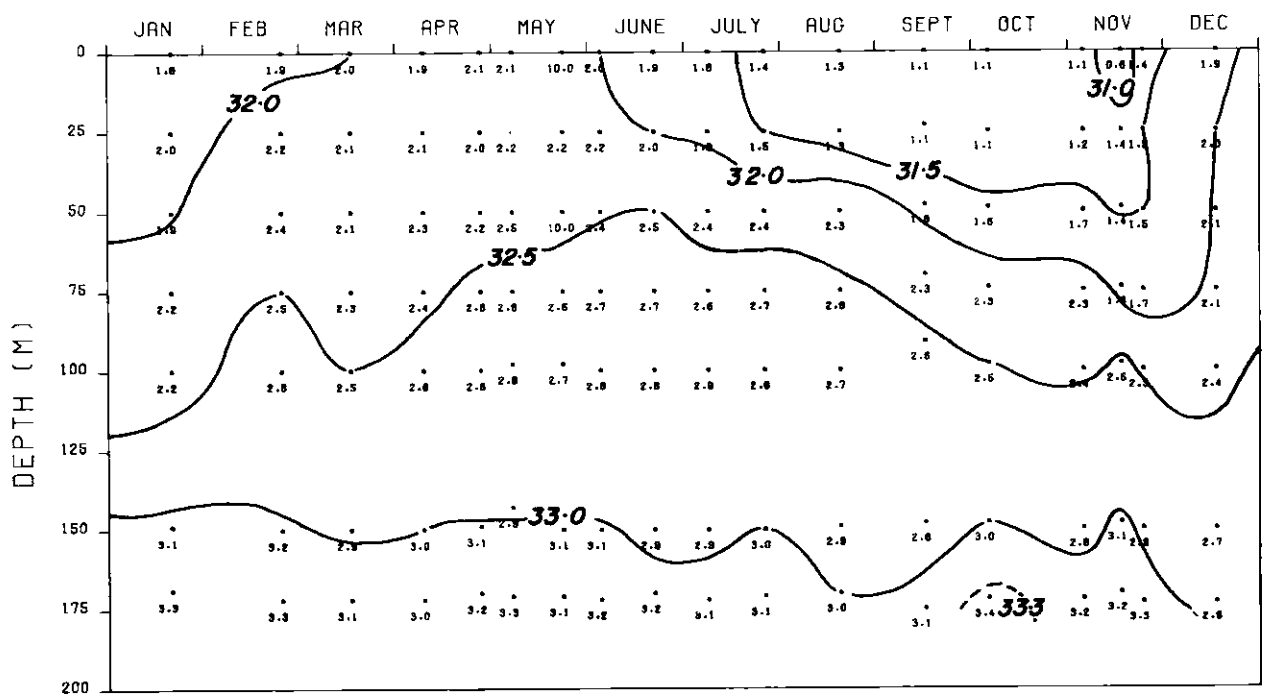
SALINITY
YEAR 1957



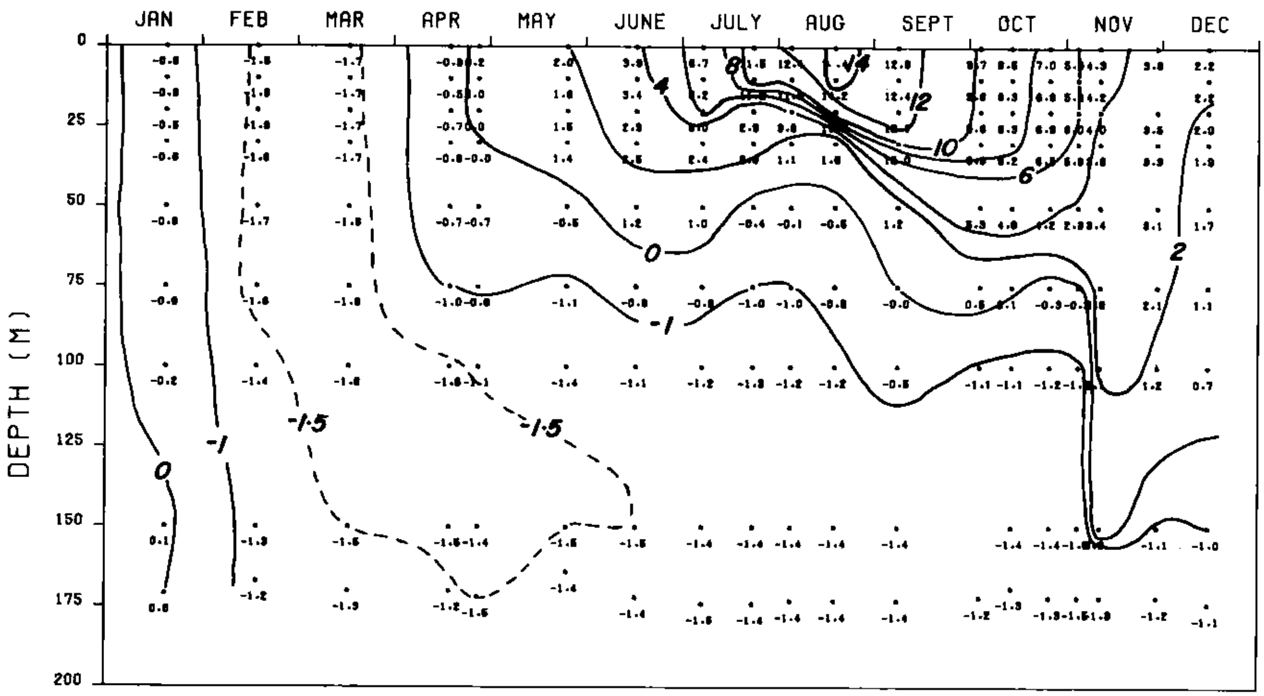
WATER TEMPERATURE (°C)
YEAR 1958



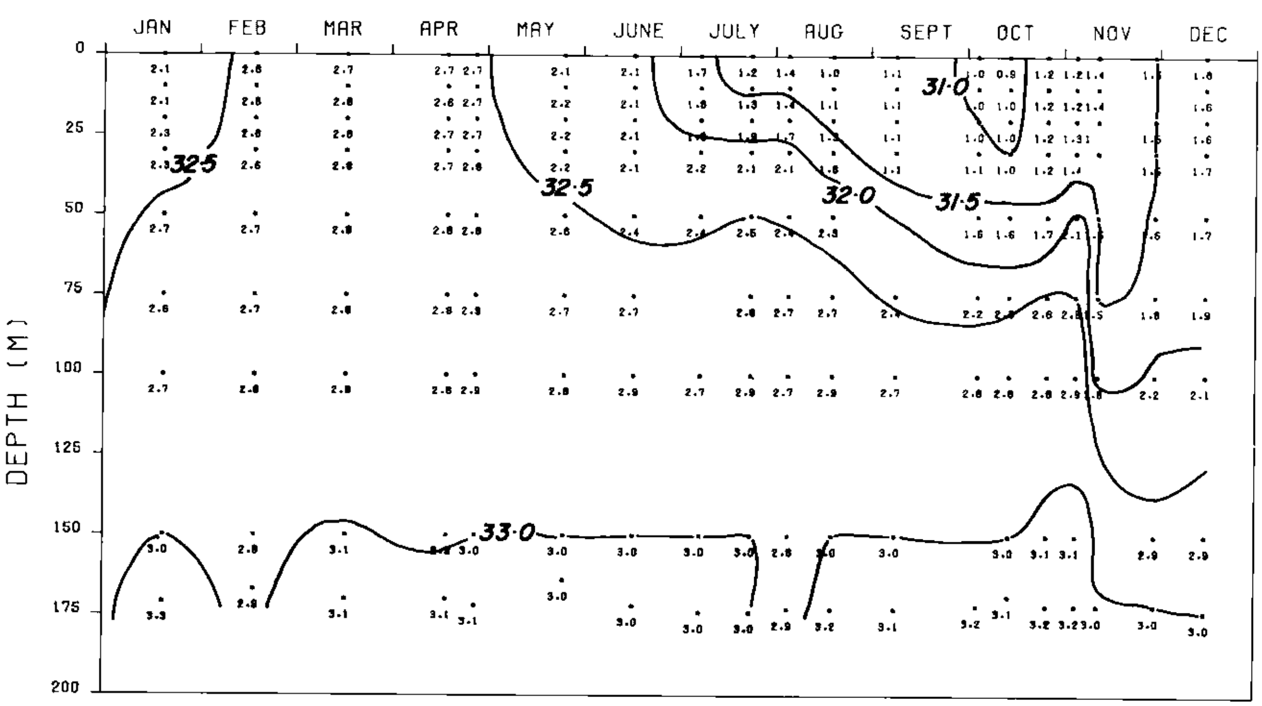
SALINITY
YEAR 1958



WATER TEMPERATURE (°C)
YEAR 1959

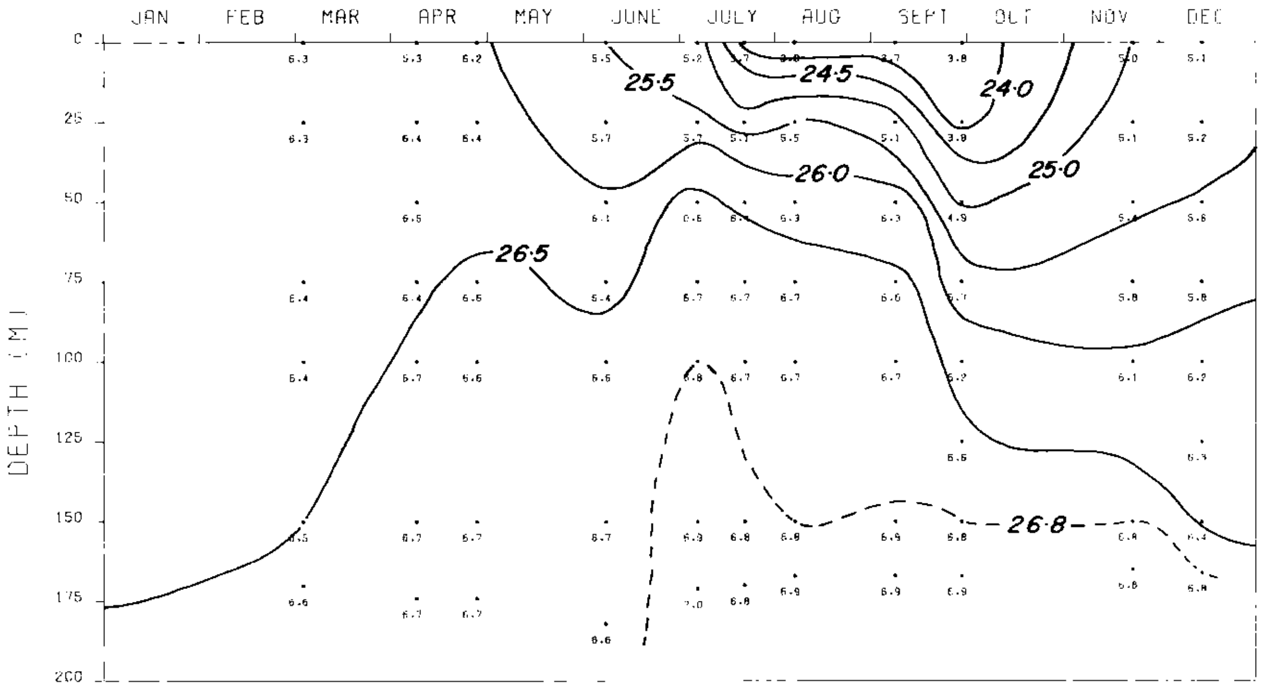


SALINITY
YEAR 1959

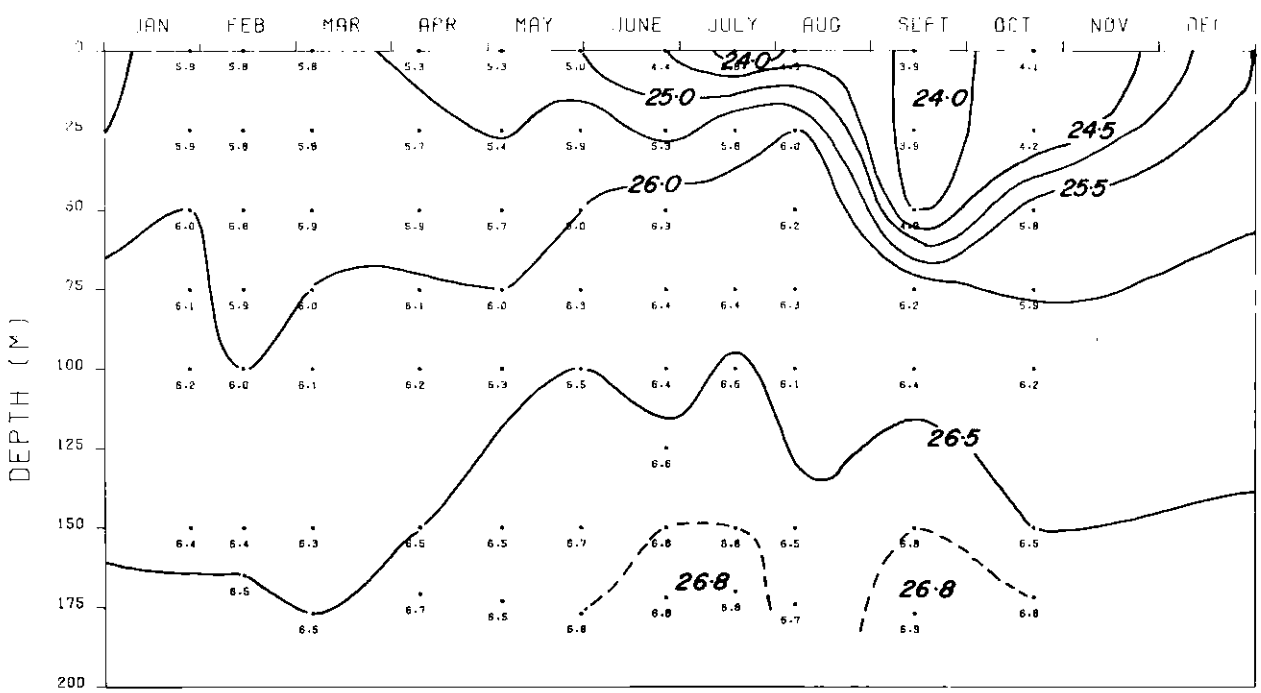


Yearly
Time-Depth Distribution
of Sigma-t
1950-1959

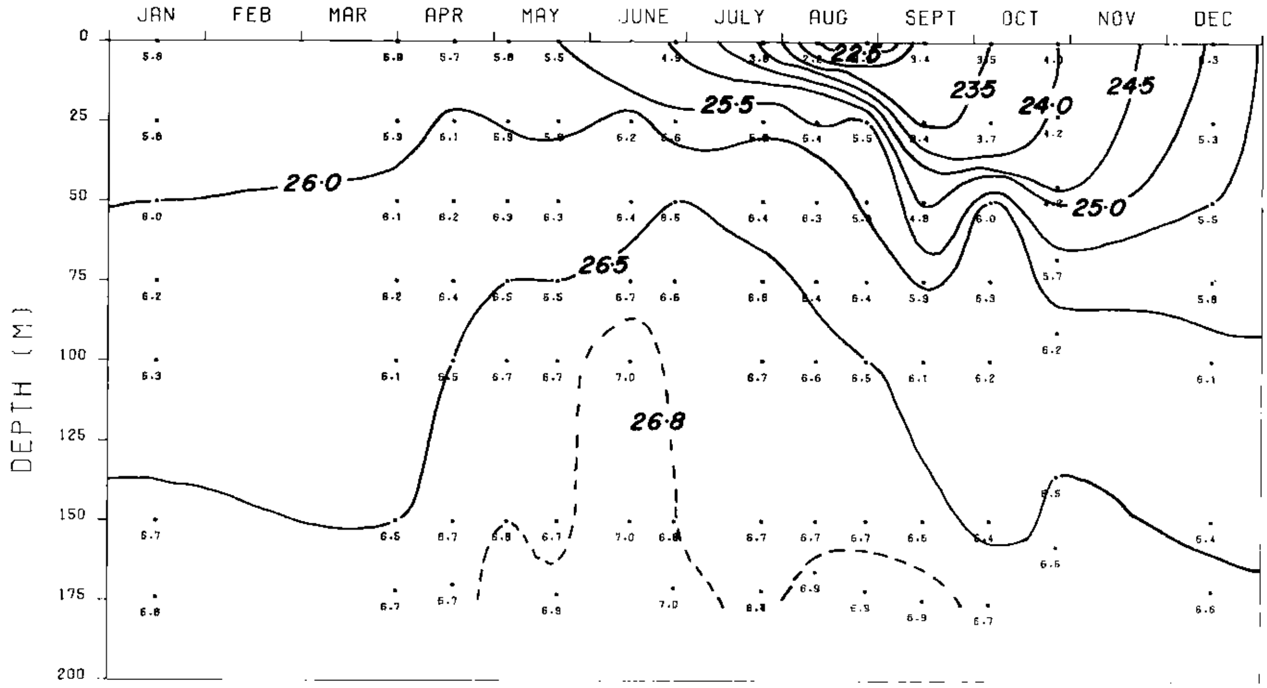
SIGMA T
YEAR 1950



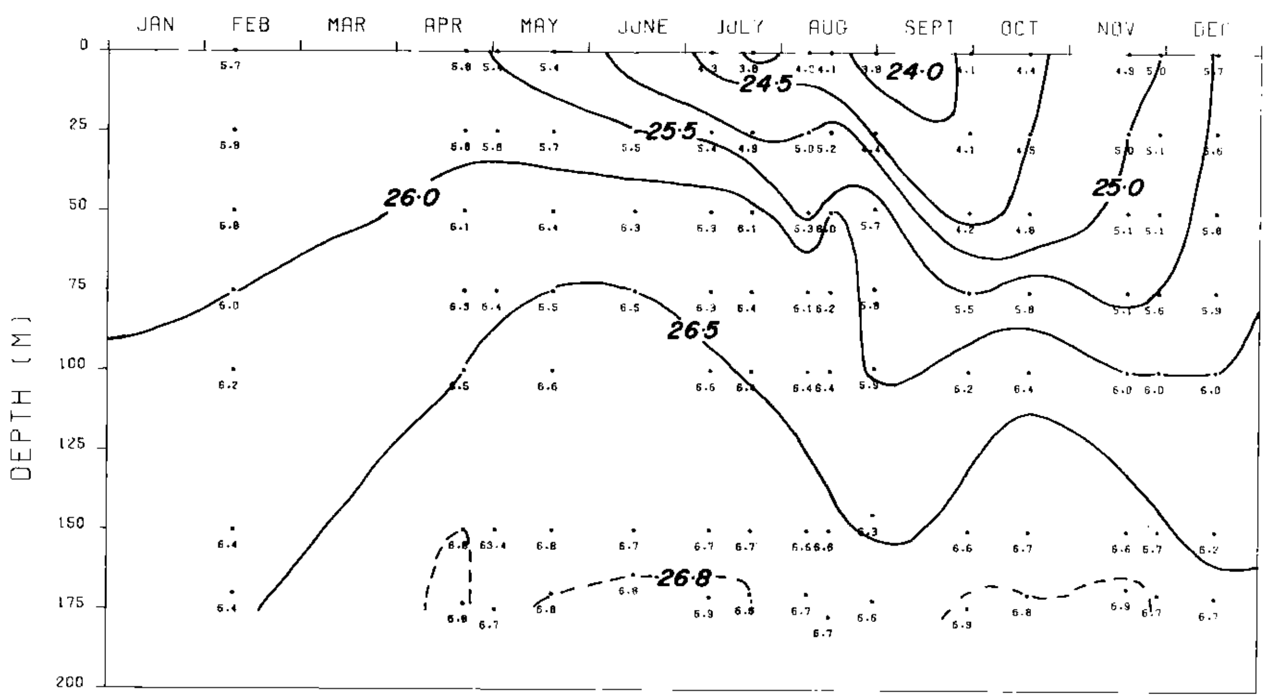
SIGMA T
YEAR 1951

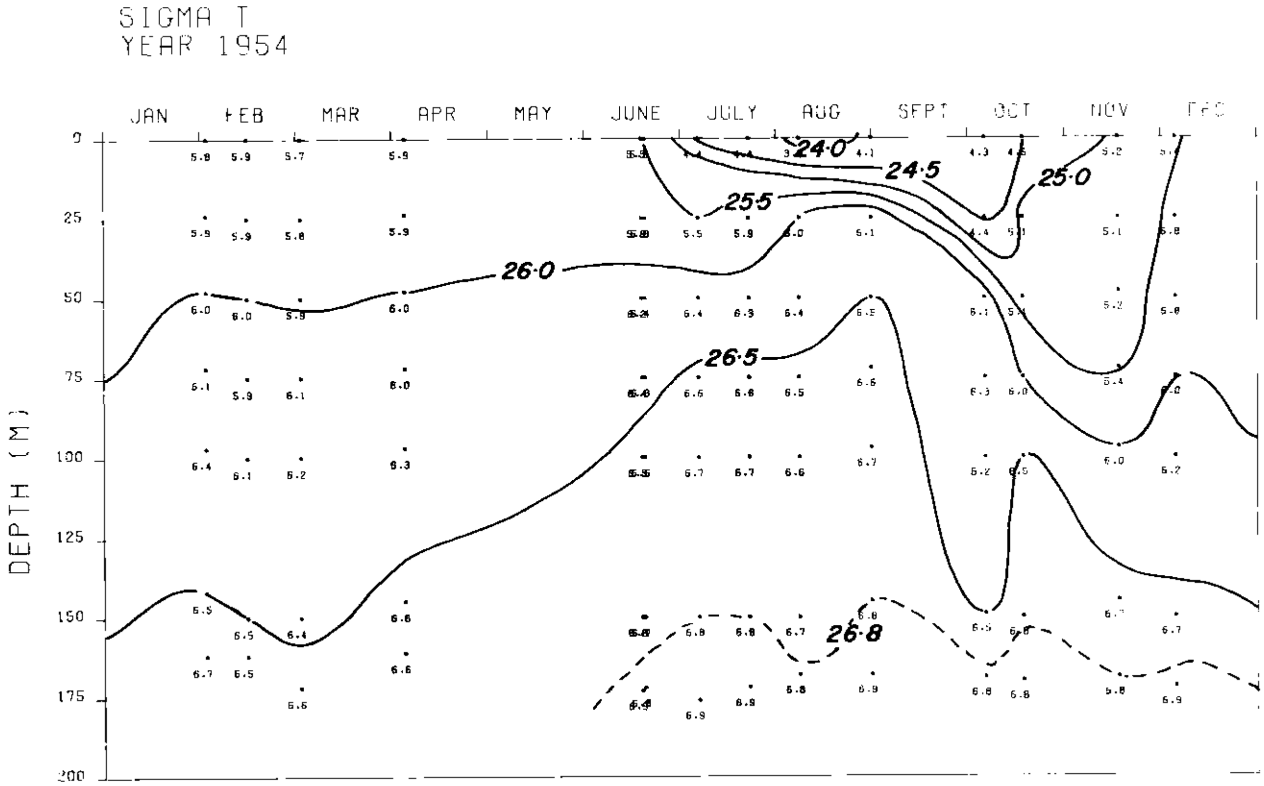


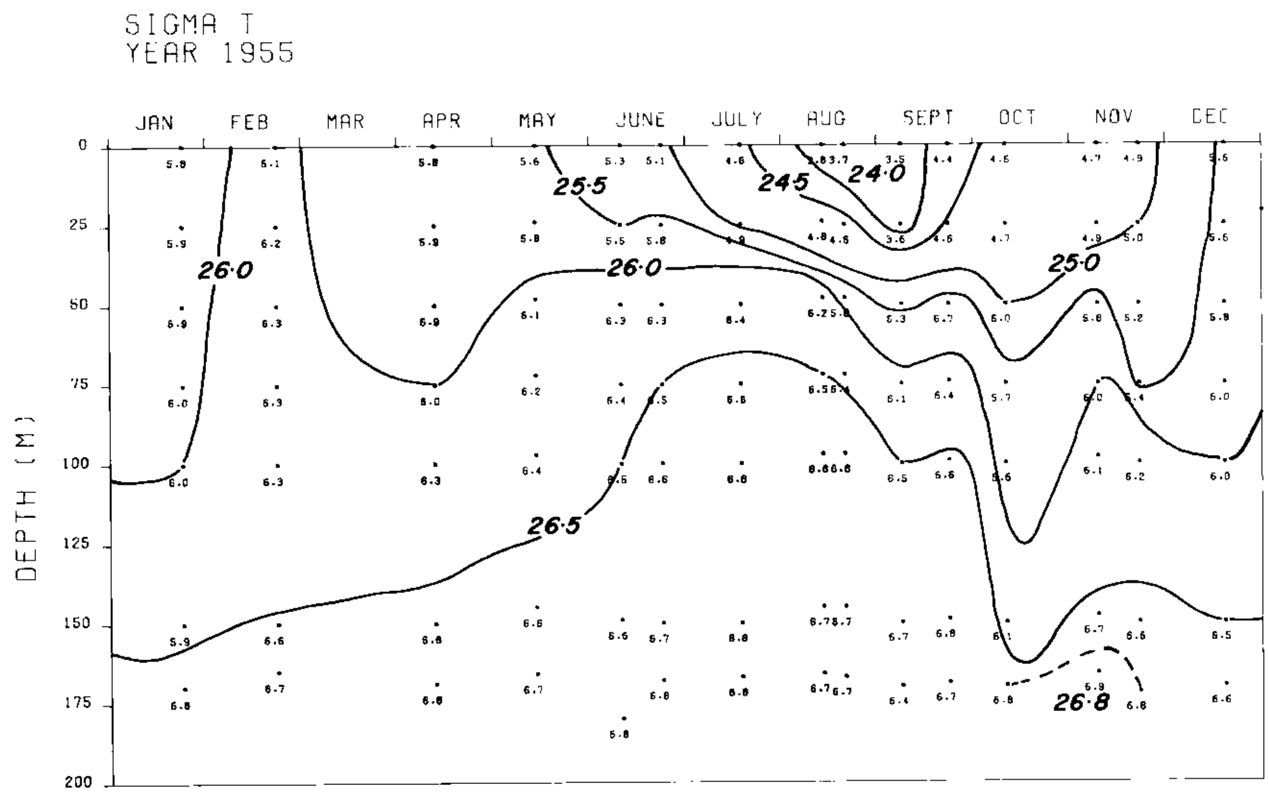
SIGMA T
YEAR 1952



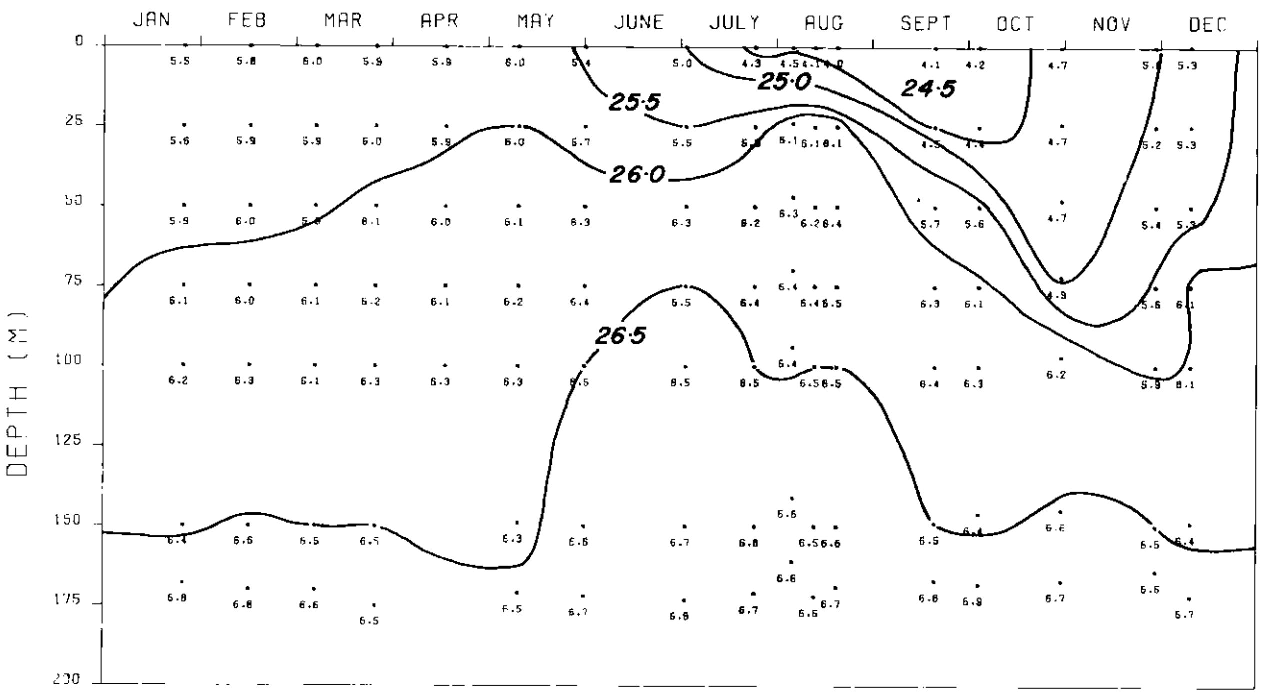
SIGMA T
YEAR 1953



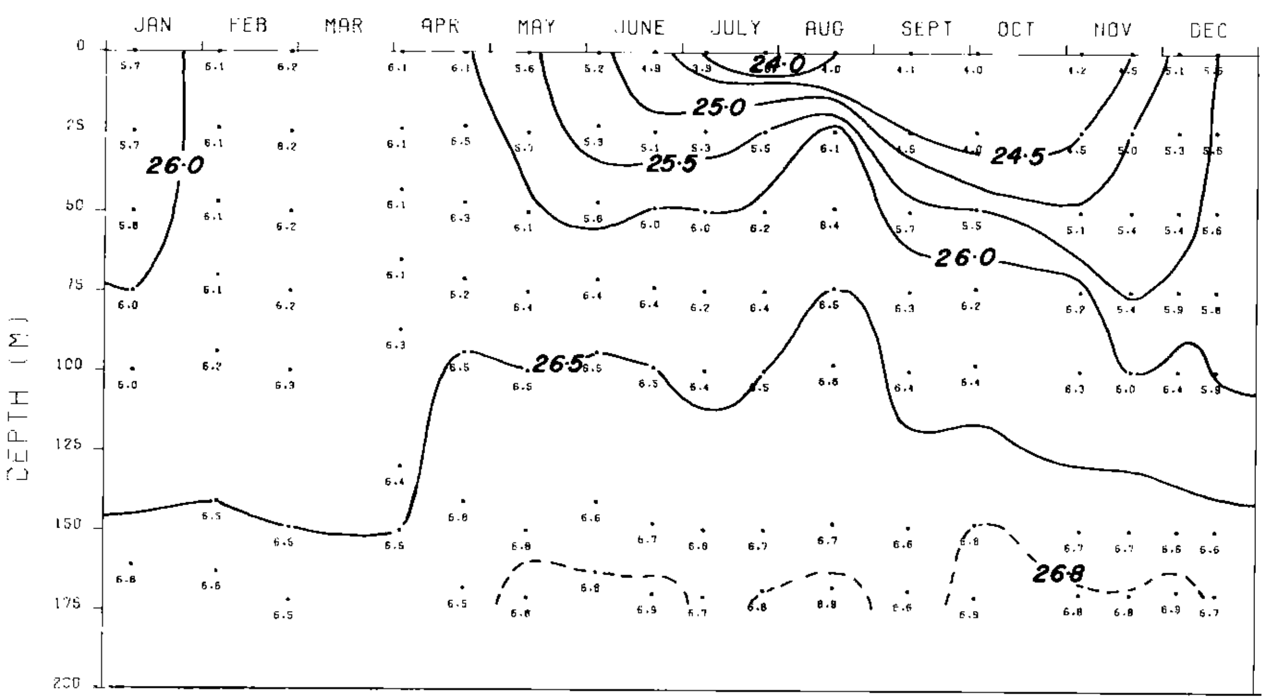

SIGMA T
YEAR 1954
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
DEPTH (M)
0
25
50
75
100
125
150
175
200
24·0
24·5
25·0
25·5
26·0
26·5
26·8


SIGMA T
YEAR 1955
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
DEPTH (M)
0
25
50
75
100
125
150
175
200
24·0
24·5
25·0
25·5
26·0
26·5
26·8

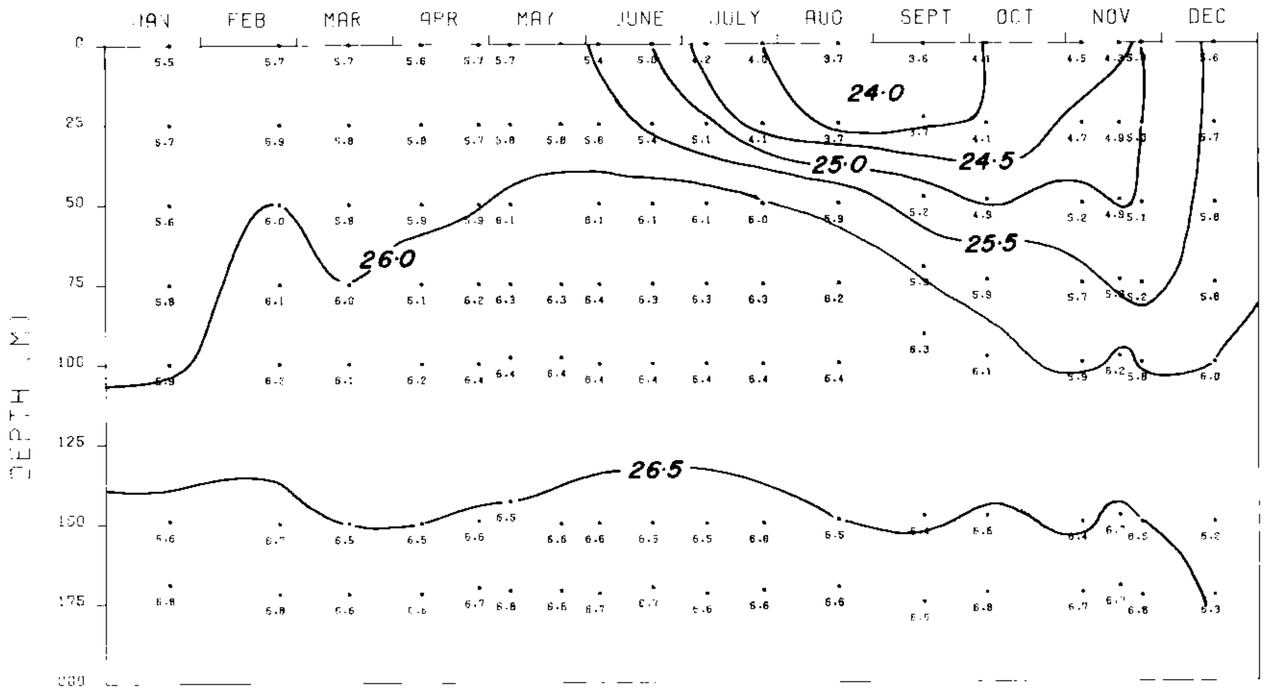
SIGMA T
YEAR 1956



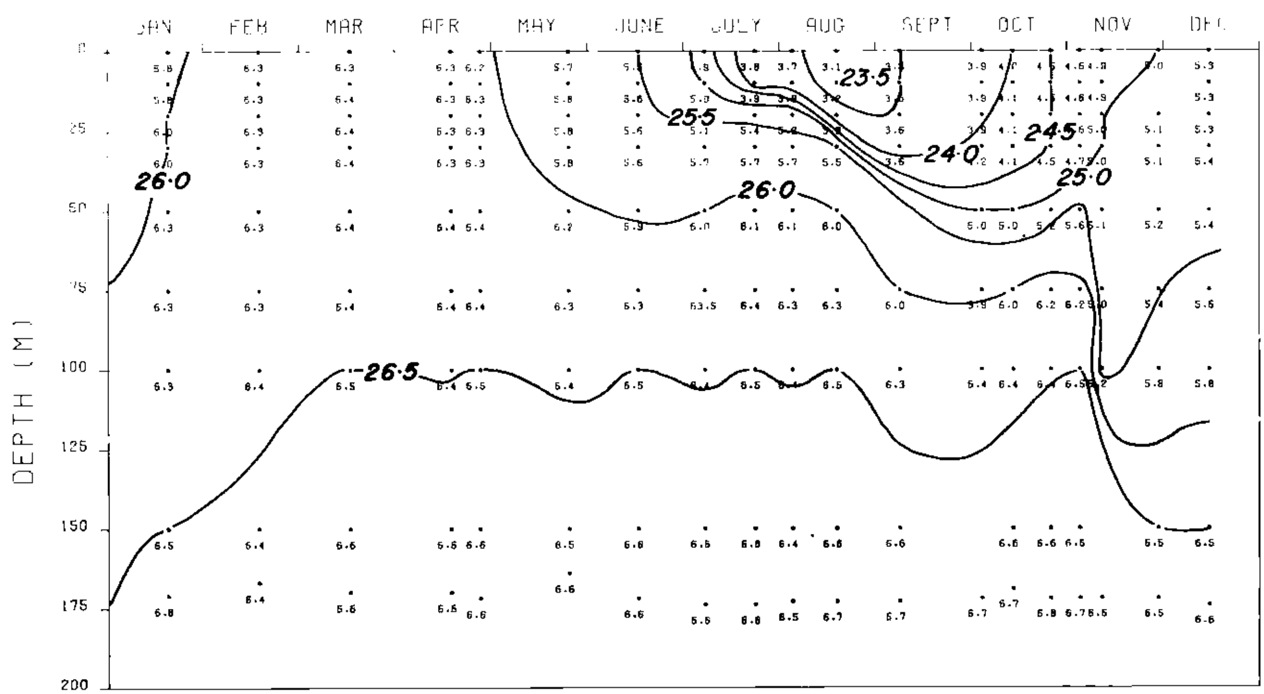
SIGMA T
YEAR 1957



SIGMA T
YEAR 1958

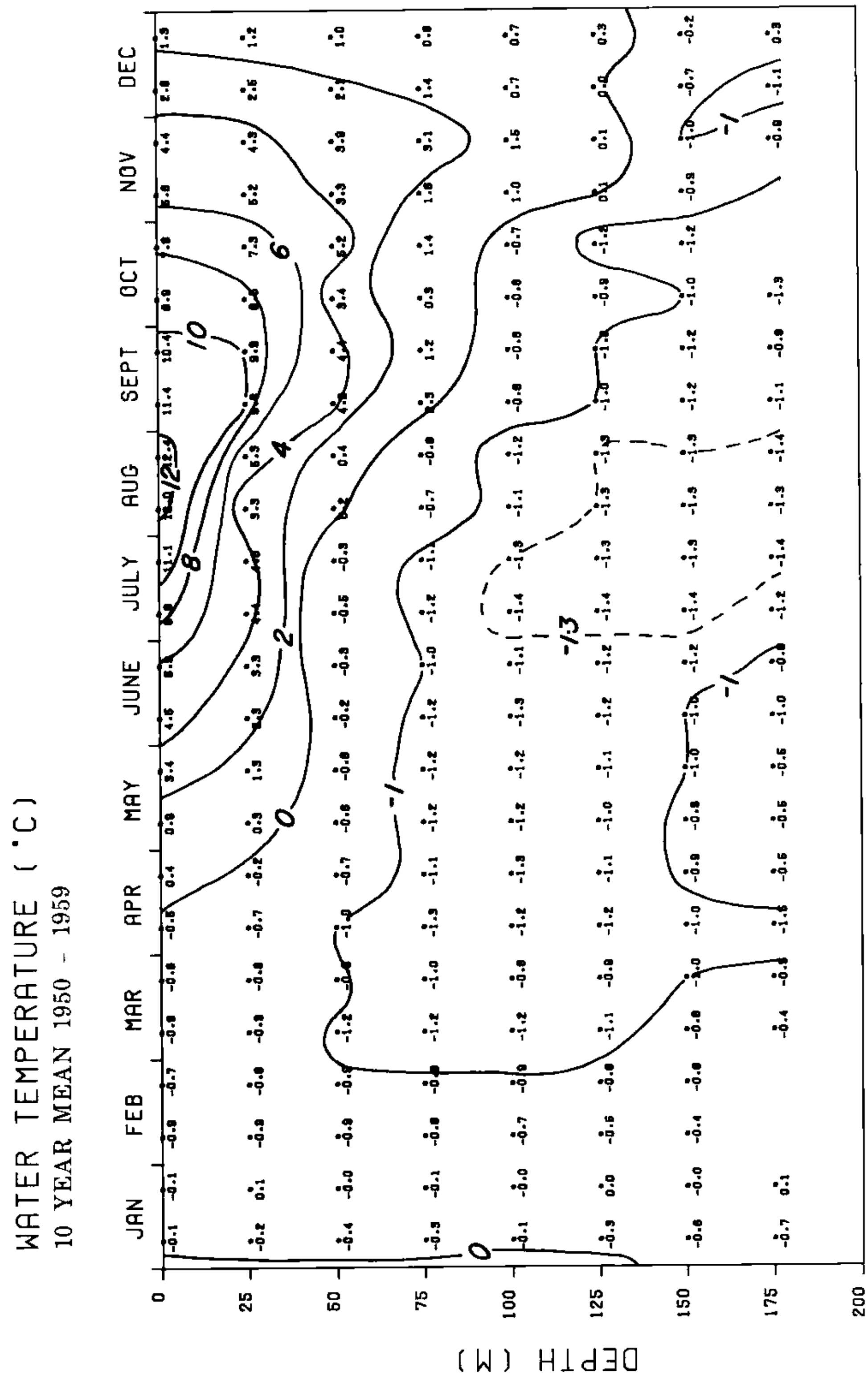


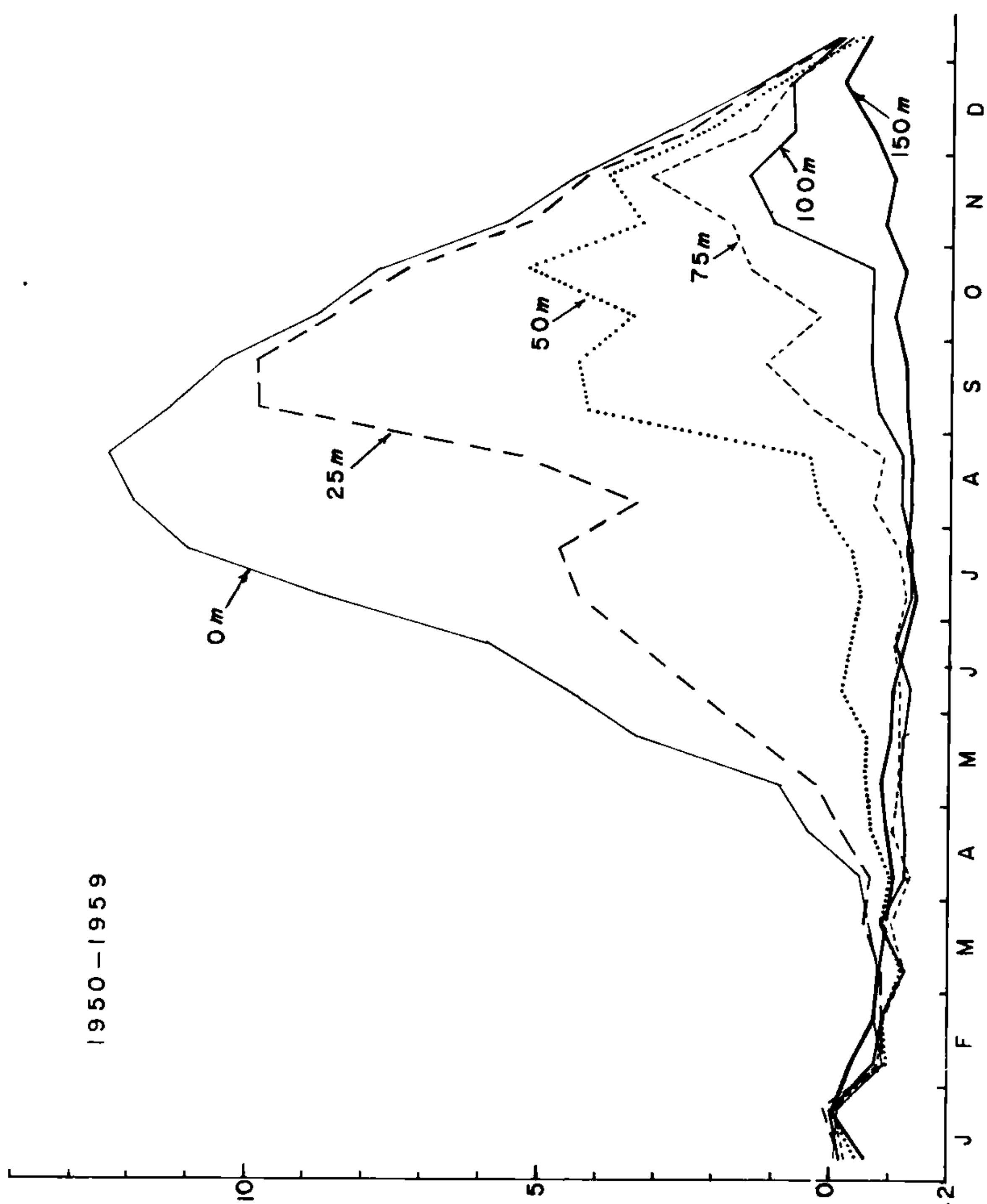
SIGMA T
YEAR 1959



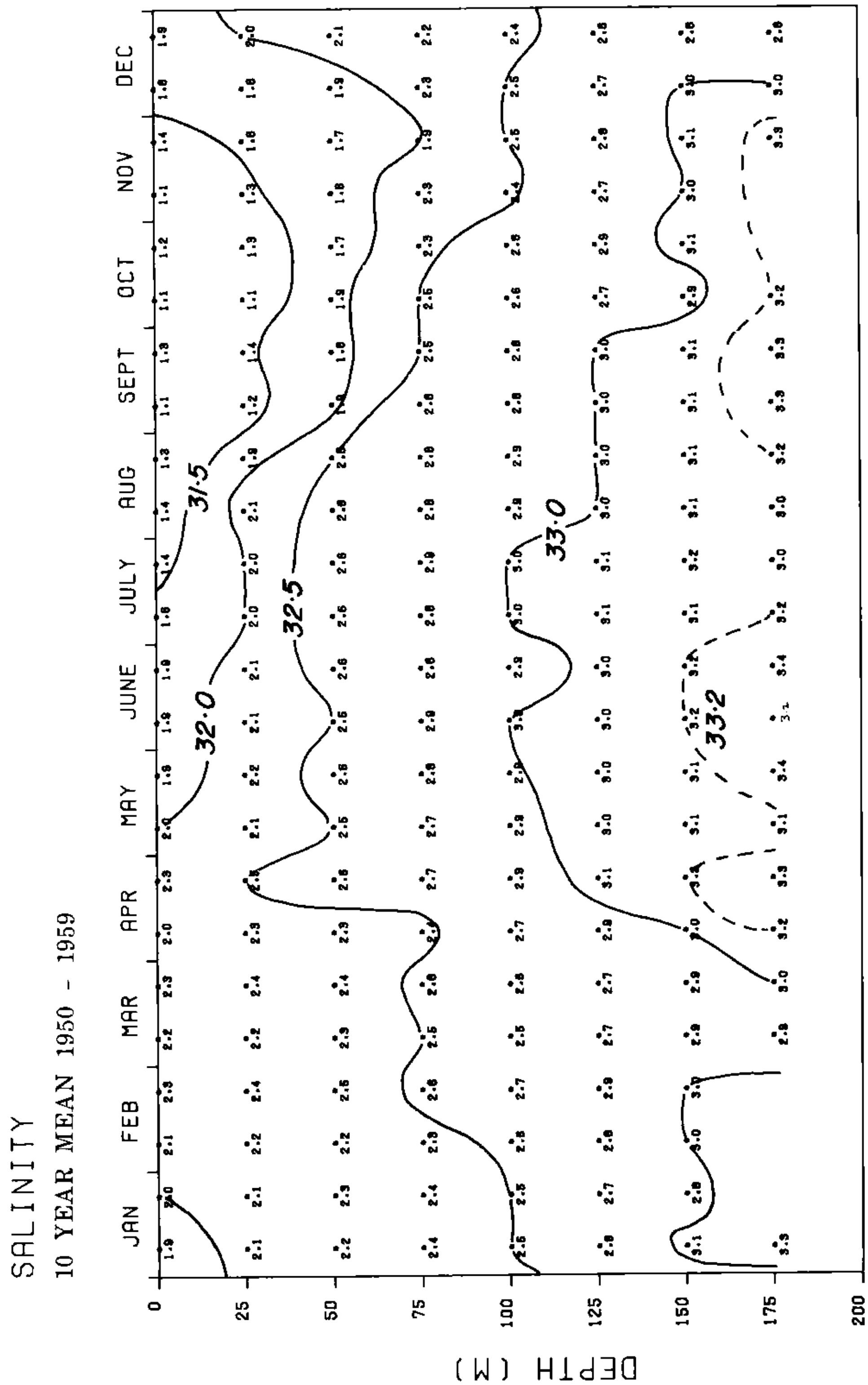
Mean Seasonal Variation of
Temperature (° C), Salinity (‰) and Sigma–t

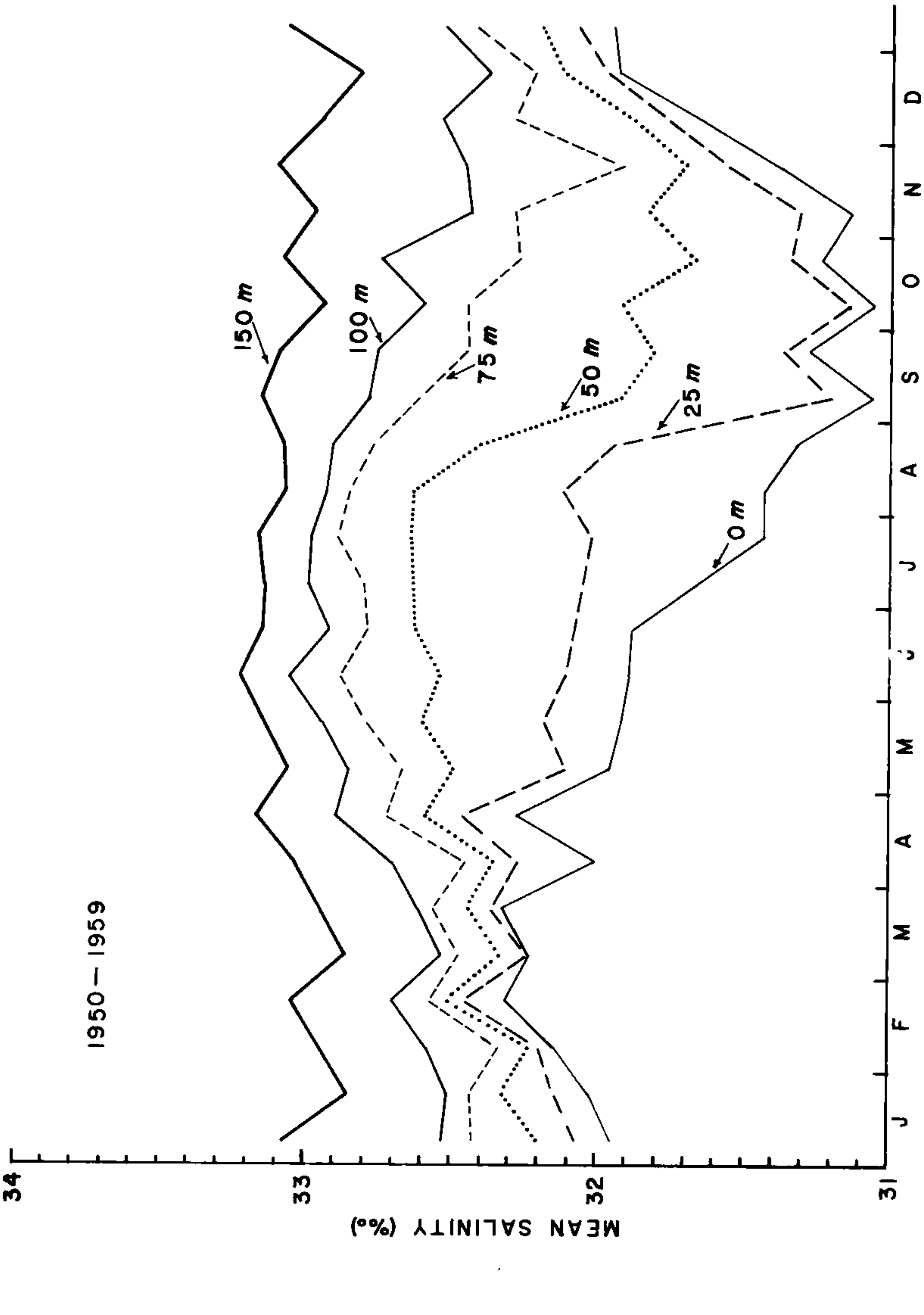
The mean seasonal cycle of each parameter was computed as follows. For each station the data were linearly interpolated at 25 m intervals (i.e. at 0, 25, 50, 75, 100, 125, 150 and 175 m). The year was divided into 24 equal intervals. For each depth and interval, we averaged all values at that depth within the half month time interval. The mean seasonal cycle of a particular parameter was thus defined by 24 semi-monthly intervals. The mean annual cycle is shown both on the time-depth plane and as time series at particular depths for each parameter.


WATER TEMPERATURE (°C)
10 YEAR MEAN 1950 - 1959
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
0
25
50
75
100
125
150
175
200
DEPTH (M)

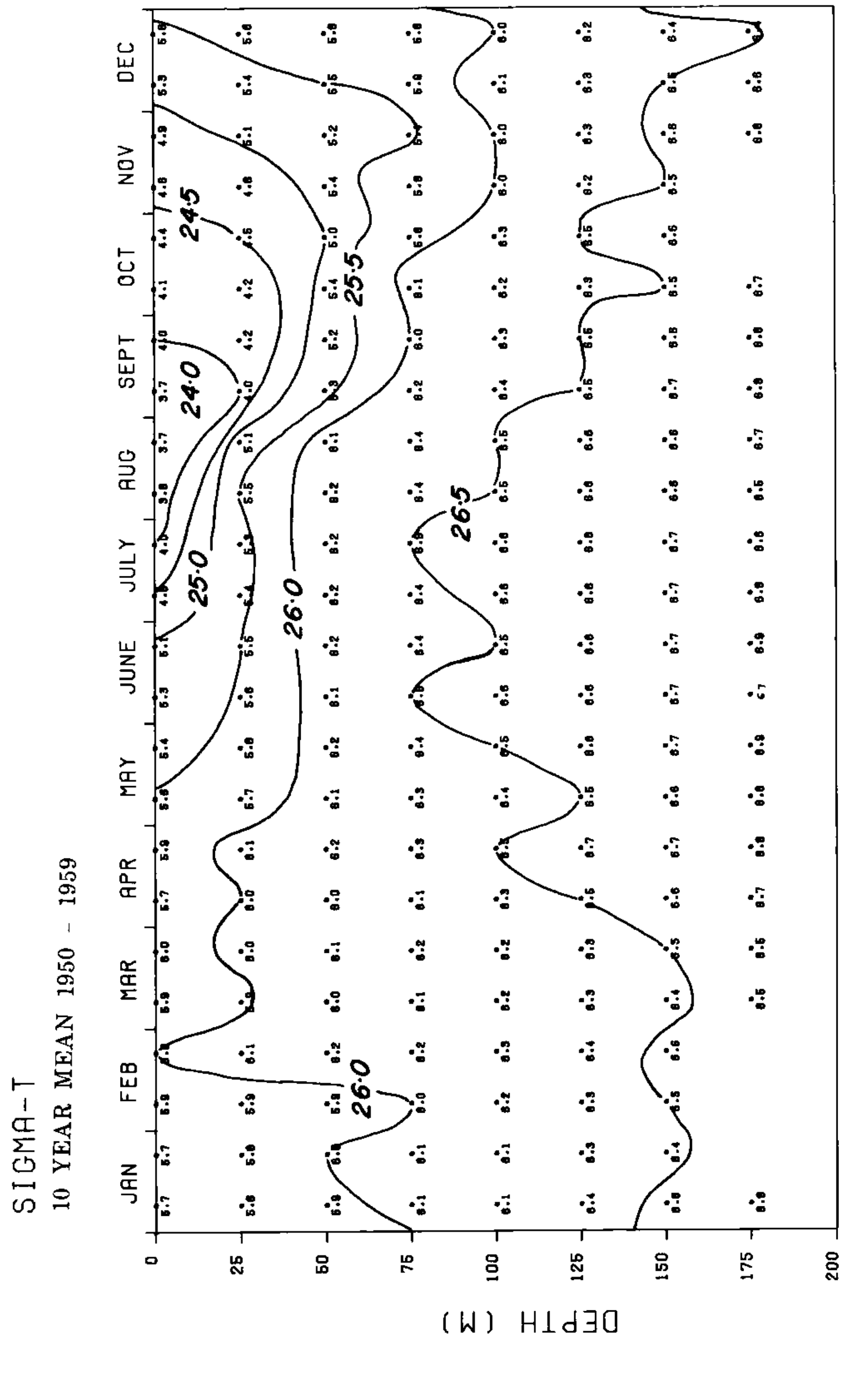

1950–1959
MEAN TEMPERATURES (°C)
10
5
0
-2
J
F
M
A
M
J
J
A
S
O
N
D
0 m
25 m
50 m
75 m
100 m
150 m

C 4

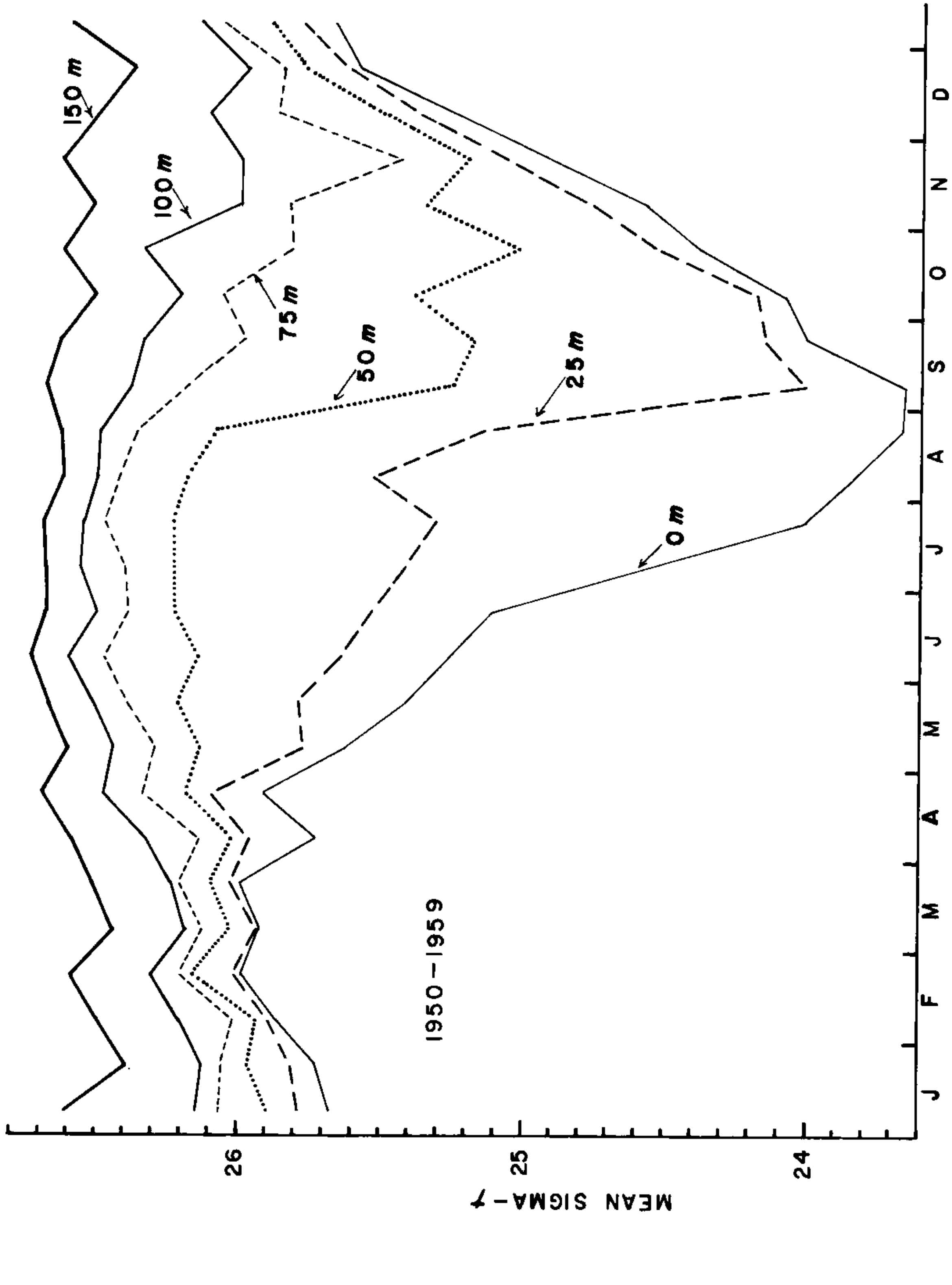

SALINITY
10 YEAR MEAN 1950 - 1959
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
DEPTH (M)
0
25
50
75
100
125
150
175
200
31·5
32·0
32·5
33·0
33·2


1950 — 1959
150 m
100 m
75 m
50 m
25 m
0 m
J
F
M
A
M
J
J
A
S
O
N
D
34
33
32
31
MEAN SALINITY (‰)

C 6



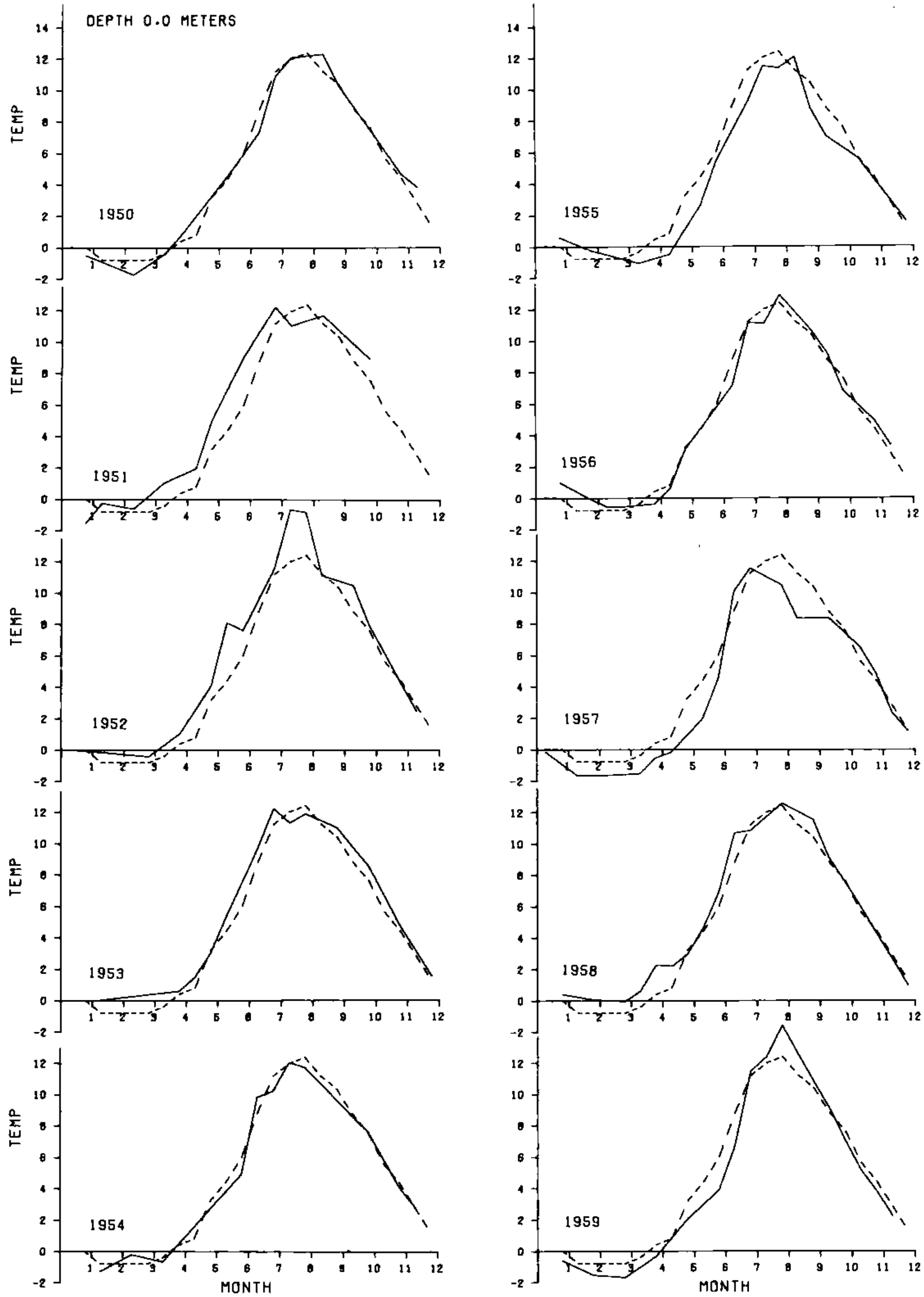
SIGMA-T
10 YEAR MEAN 1950 - 1959
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
24·0
24·5
25·0
25·5
26·0
26·5
0
25
50
75
100
125
150
175
200
DEPTH (M)

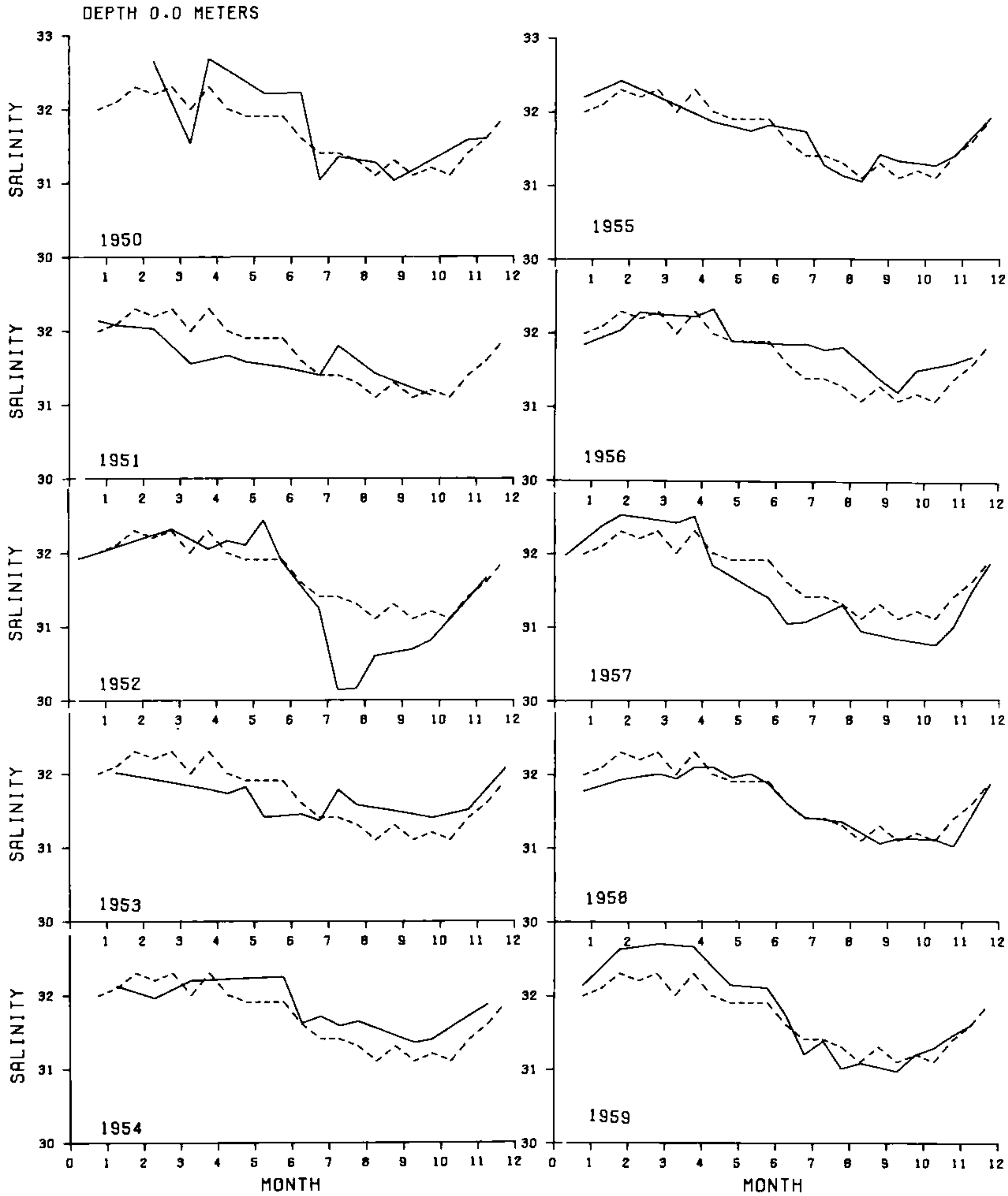

150 m
100 m
75 m
50 m
25 m
0 m
1950-1959
J F M A M J J A S O N D
26
25
24
MEAN SIGMA-t

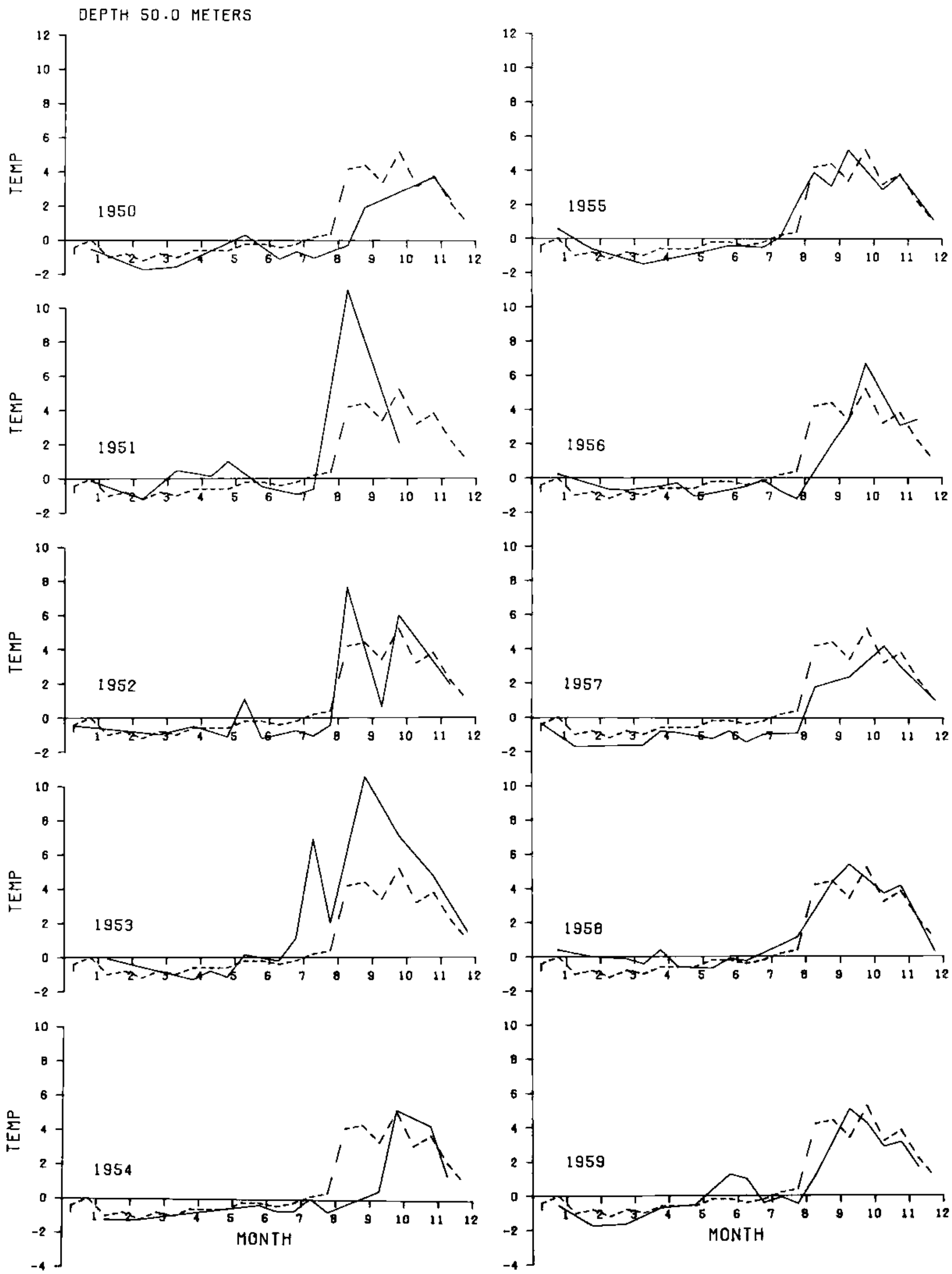
C 8

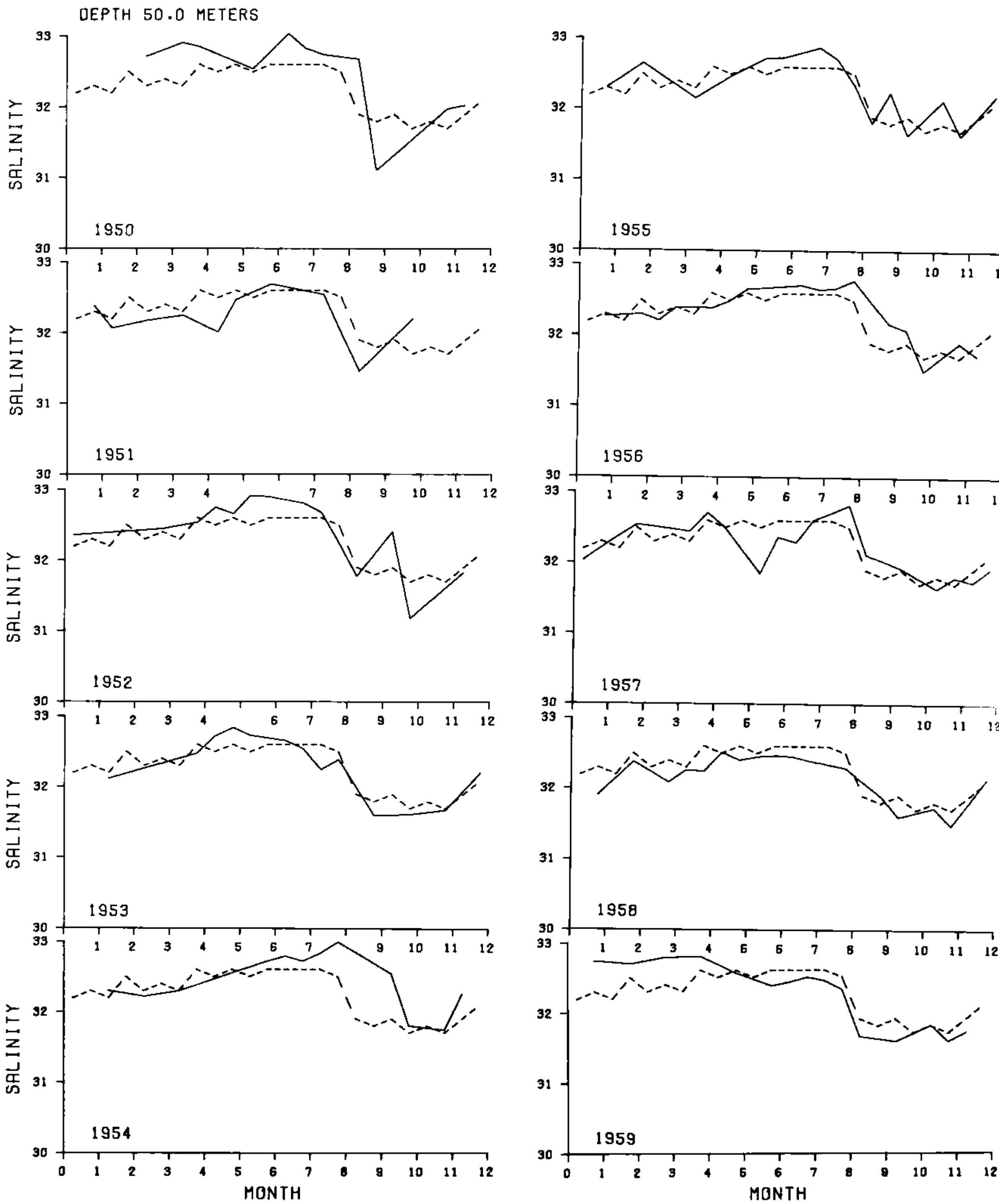
Time Series of
Temperature (° C), Salinity (‰) and Sigma-t
at 0, 50, 100 and 150 m

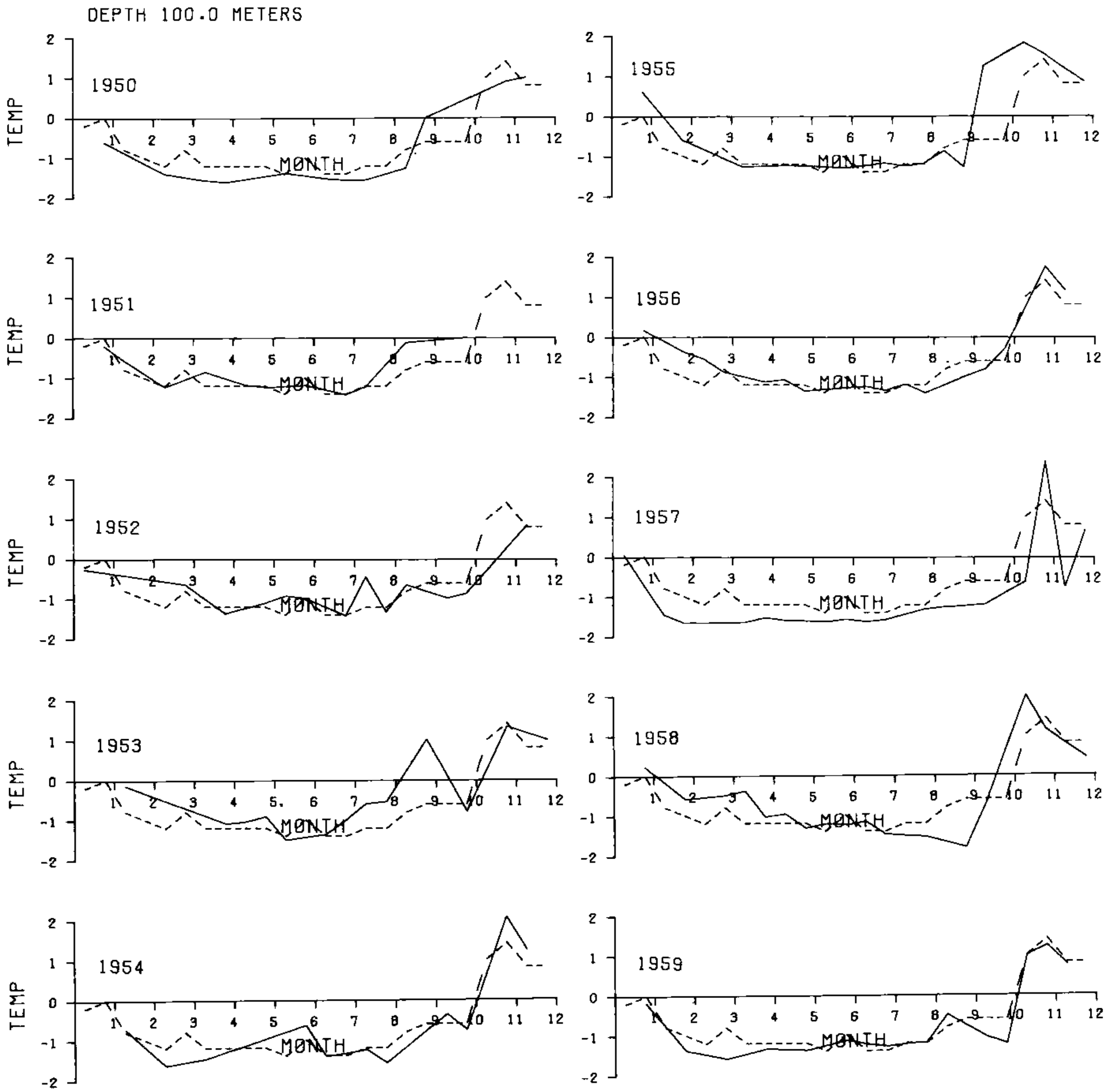
The data from each year are displayed as functions of time for particular depths 0, 50, 100 and 150 m, with the mean annual cycle for that depth. This emphasizes differences from the mean, and also shows the variability from year to year. Temperature and salinity observations from the same depth are shown on facing pages; sigma-t data are shown at the end of the section.

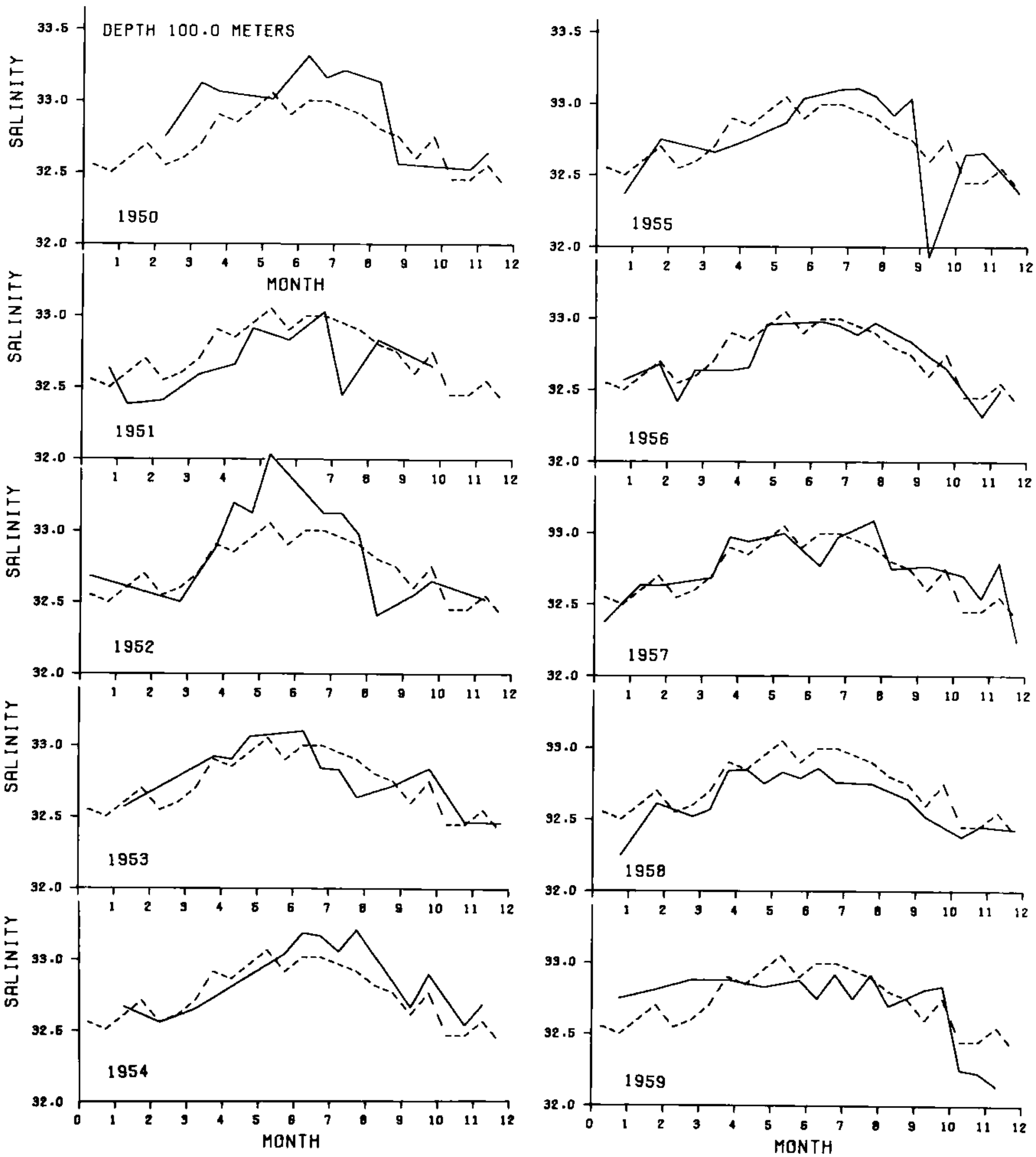

DEPTH 0.0 METERS
TEMP
MONTH
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959


DEPTH 0.0 METERS
SALINITY
MONTH
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959

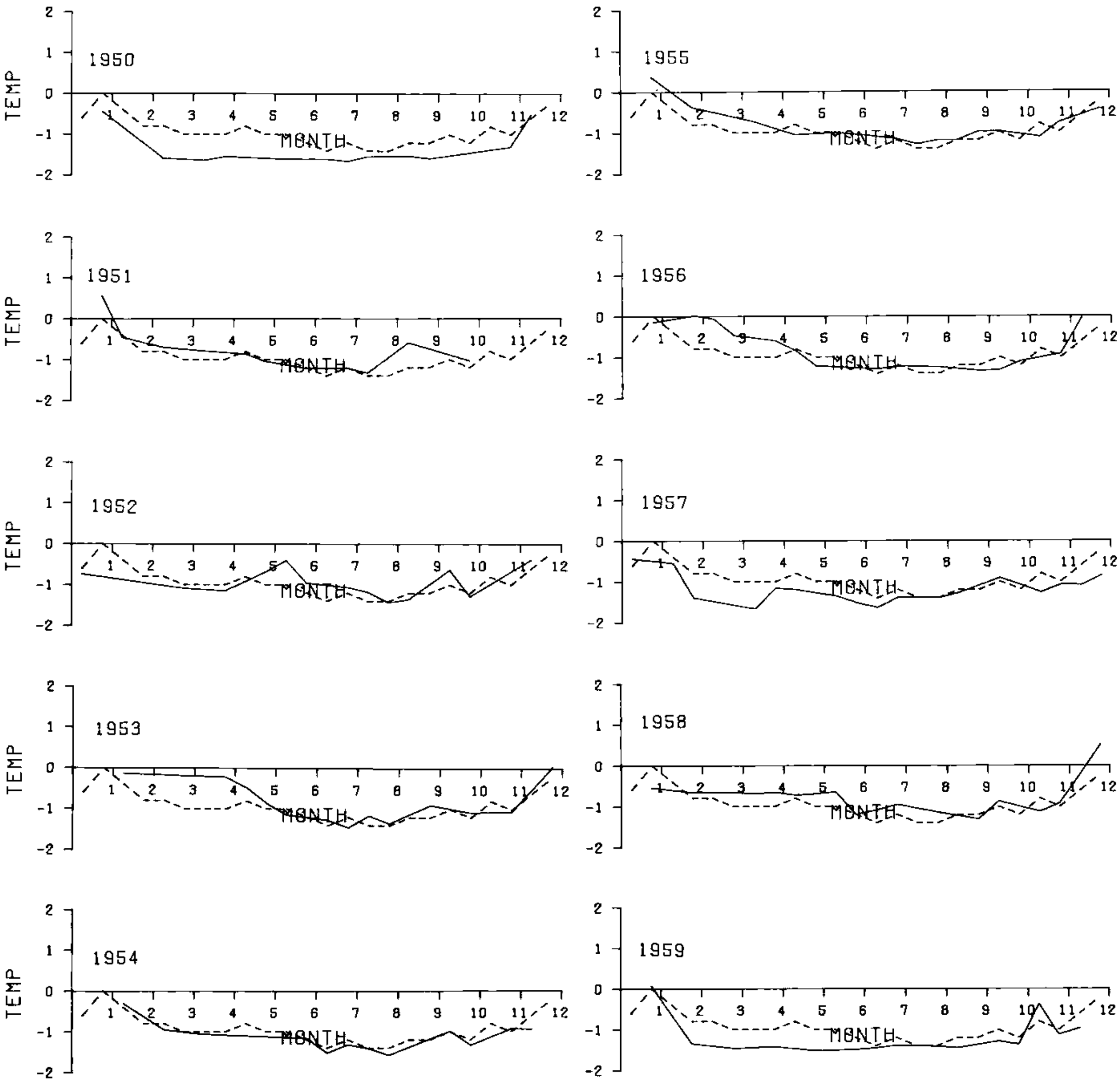

DEPTH 50.0 METERS
TEMP
MONTH
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959

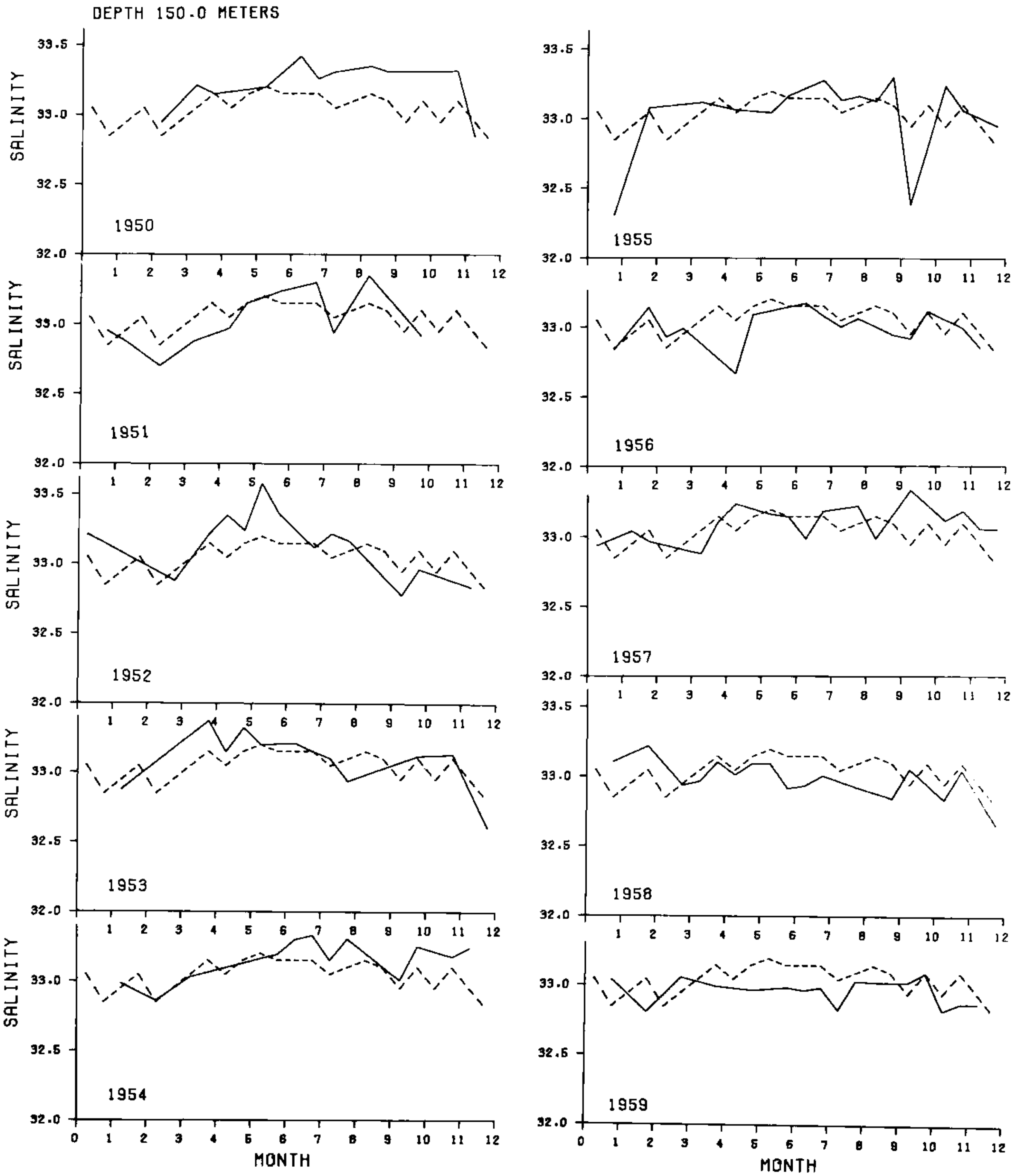

DEPTH 50.0 METERS
SALINITY
MONTH
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959

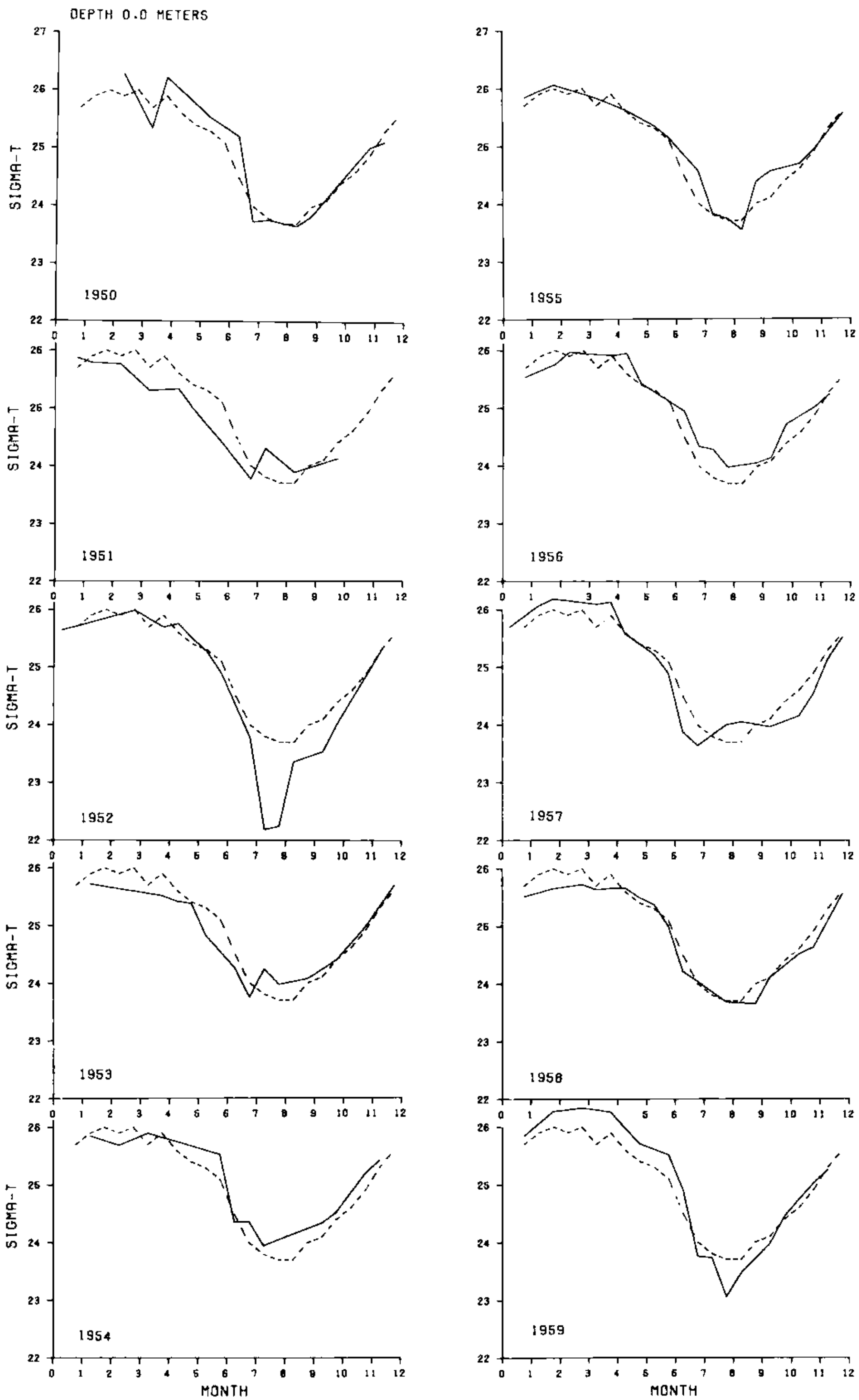

DEPTH 100.0 METERS
TEMP
MONTH
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959

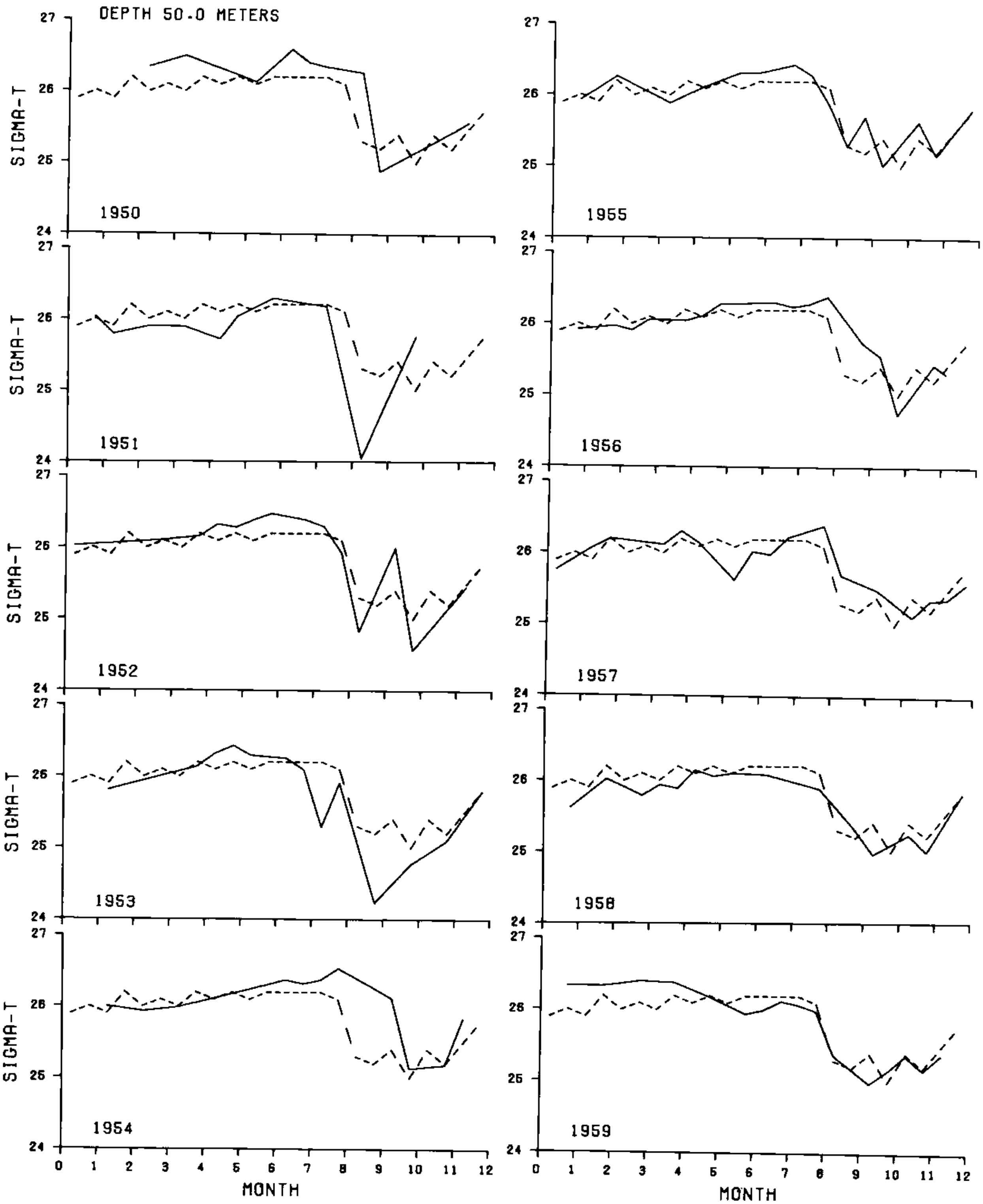

DEPTH 100.0 METERS
SALINITY
33.5
33.0
32.5
32.0
MONTH
0 1 2 3 4 5 6 7 8 9 10 11 12
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959

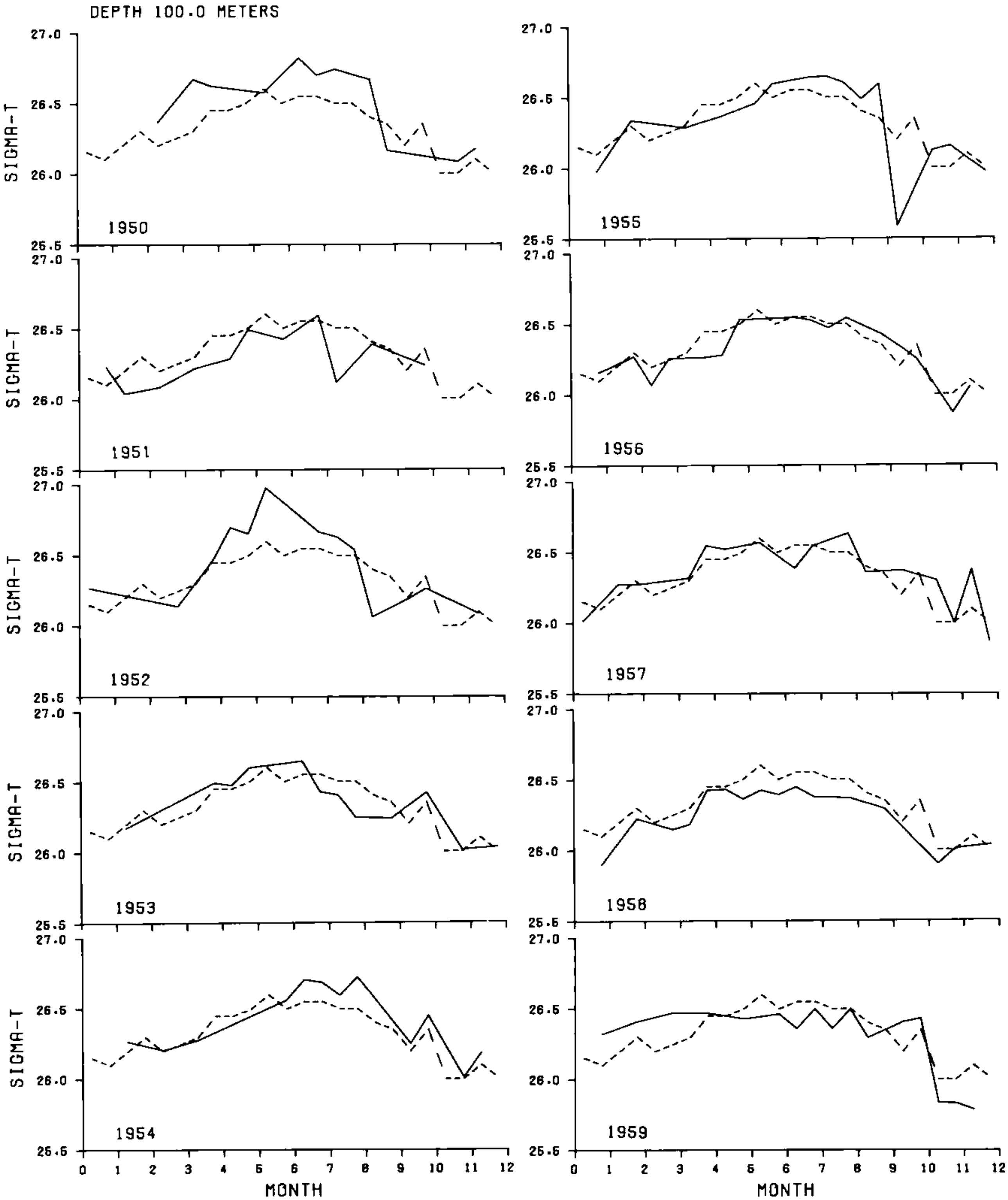
DEPTH 150.0 METERS

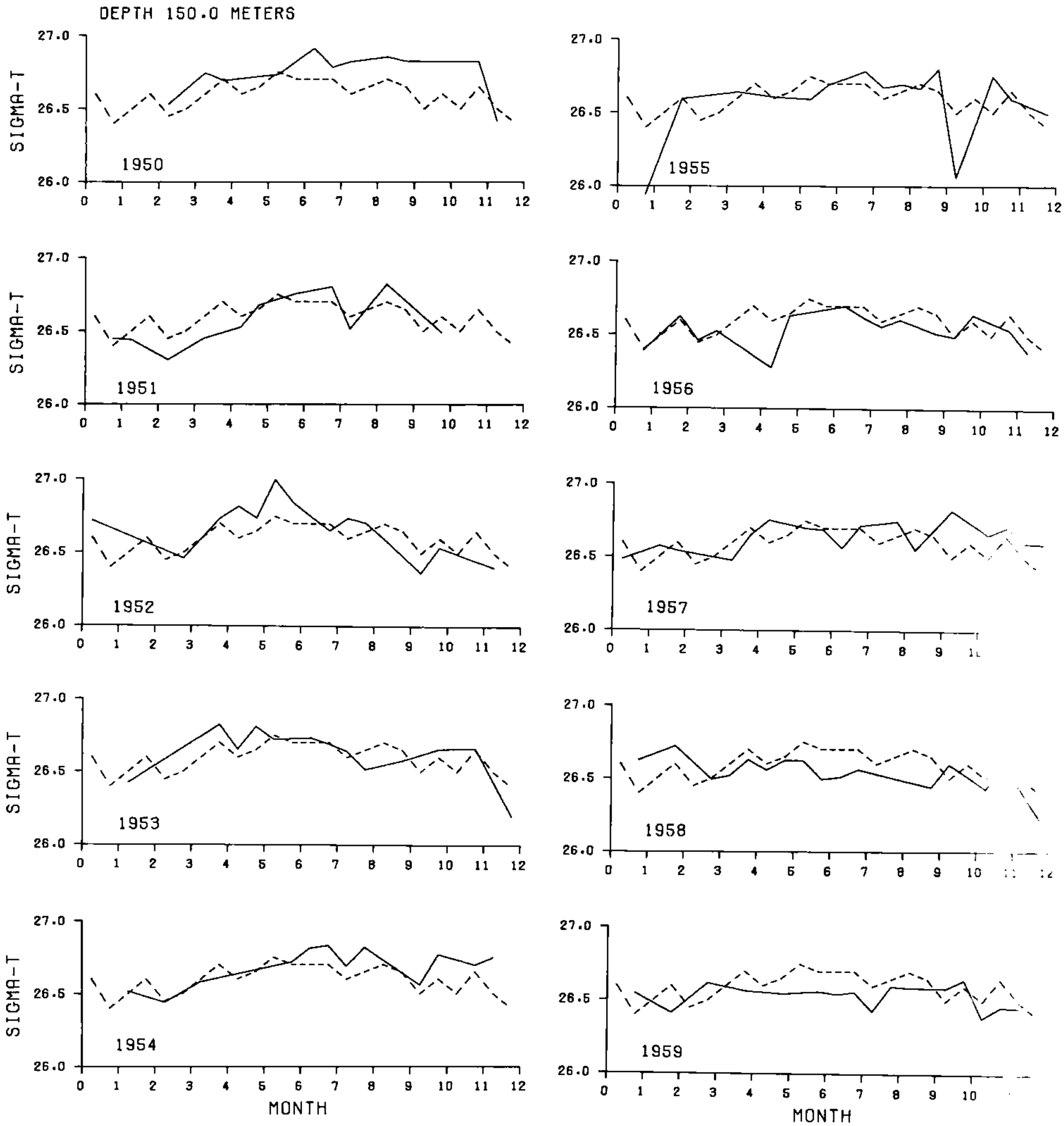



DEPTH 150.0 METERS
SALINITY
33.5
33.0
32.5
32.0
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
0 1 2 3 4 5 6 7 8 9 10 11 12
MONTH
MONTH


DEPTH 0.0 METERS
SIGMA-T
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
MONTH
MONTH


DEPTH 50.0 METERS
SIGMA-T
27
26
25
24
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
0 1 2 3 4 5 6 7 8 9 10 11 12
MONTH


DEPTH 100.0 METERS
SIGMA-T
27.0
26.5
26.0
25.5
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
0 1 2 3 4 5 6 7 8 9 10 11 12
MONTH


DEPTH 150.0 METERS
SIGMA-T
27.0
26.5
26.0
0 1 2 3 4 5 6 7 8 9 10 11 12
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
MONTH

APPENDIX

Programming Analysis

There were four programs written to plot the data received from Station 27. Each of the programs would handle either temperature, salinity or sigma-t, depending on which was requested. A different deletion subroutine was set up for each parameter (temperature, salinity and sigma-t). The four programs consisted of:

1. a yearly plot of all depths of the data as listed, with the contour lines drawn by hand;
2. a mean of (1) using data interpolated to standard depths of 25 m intervals;
3. a plot of the data at the standard depths by year, and
4. a plot of the mean data at the standard depths.

Method

Shown here is the program that produces plots of the data at standard depths by year. The other programs used the same method with some modifications in the output. As the data from each station were being read, the program would check them for errors and delete the bad data using subroutine DEL REC. All the good data from the stations would be stored in an array that was one year long (in half-month intervals) and as deep as there were standard depths, i.e. 24 columns by 8 rows. When the yearly buffer was filled, as decided by the program in line 77 (the input data being in chronological order, the program checked for a year change), the buffer would be plotted, or the succeeding year's data would be added to it to find the mean. Plotting of the data by depth could be done as shown in the example, or the whole year's data at all depths could be plotted, as in the report, with the interpolations hand drawn. In the plot at different depths, differing scales were allowed for in the axis routine and in the data using the variable SCL. Storing the data semi-monthly was accomplished by dividing the number of days between the date and the beginning of the year by 365/24 and incrementing by one so that the buffer ranged from 1 to 24. The mean was found in the usual way by adding the data and dividing by the number of occurrences of that data. Finally, sigma-t was calculated using Knudsen's formula (Sweers 1971).

The programs were run on a Control Data Cyber 74 computer. Typical maximum central processor time was 45 seconds. The plots were run on a Calcomp 1136 plotter taking about 10 minutes per year of data.

```
      PROGRAM TIMBT(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE7,TAPE8,
     CTAPE9,TAPE1)


      TAPE1 HAS THE MEAN DATA FOR PLOTTING AGAINST THE YEARLY DATA.

       PROGRAM PRODUCES PLOTS FROM OCEANS 4 FORMATTED DATA OF TEMPERATURE
       VERSUS TIME YEARLY AT FIXED DEPTH INTERVALS.  THE INTERPOLATED
       DATA IS BEST.

      DIMENSION XTIT(1),YTIT(1)
      DIMENSION IWRD(  10),DEPTH( 8),IBUF(1),XDEP(15),XTEMP(15),
     CTOT(8,24),TEMP(8,24),NCNT(8,24),TOTM(8,24)
      DIMENSION LD(12)
      INTEGER PRTYP
      DATA DEPTH/0.,25.,50.,75.,100.,125.,150.,175./,NDEP/8/
      DATA LD/0,31,59,90,120,151,181,212,243,273,304,334/
      JD1900(IDY,MONTH,IYEAR)=IDY + LD(MONTH) + 365*IYEAR + IYEAR/4
     1 -MOD(MOD(MOD(IYEAR + 1,4),3),2)*(2/MONTH - 1/MONTH)
      LP = 6
      NPT = 0
      LAST = 0
      NUM = 0
      IN = 4HINTR

       MEAN DATA FILE READ AND STORED
      DO 38 KK=1,24
   38 READ(1,4001) (TOTM(II,KK),II=1,8)
 4001 FORMAT(8F5.1)

      DO 42 II =1,9
      DO 42 KK=1,24
      NCNT(II,KK) = 0.
      TEMP(II,KK) = 0.
   42 TOT(II,KK) = 0.
      CALL PLOTS(IBUF,100,7)

       INPUT DATA READ

    5 READ(8,151) (IWRD(I),I=1,8)
  151 FORMAT(8A10)
      IF(EOF(8)) 12,6

       DECODE FOR DATA OR HEADER CARD
    6 DECODE(  80,2001,IWRD(1)) ITYPE
 2001 FORMAT(79X,I1)
      NC = NC + 1
      GO TO (91,17,19,91),ITYPE
   12 LAST = 1

       HEADER CARD FOUND
   17 NUM = NUM + 1
      K = NPT
      IF(K.GT.KMAX) KMAX = K
      IF(NC.GT.1) 27,8
   27 IF(IYR.EQ.50.AND.IMO.EQ.02.AND.IDAY.EQ.03) GO TO 8
      IF(IHR.EQ.1106) GO TO 8

       IF ONE STATION HAS BEEN PROCESSED , GO AND FILL ONE COLUMN OF
       TOT(II,KK), OR ADD TO IT

      GO TO 39
    8 NPT = 0
      ITYPE = 2 SO DECODE HEADER FOR DATE
```

```
      ILYR = IYR
    7 DECODE(37,2005,IWRD(1)) IST,IYR,IMO,IDAY,IHR
 2005 FORMAT(9X,I3,15X,3I2,I4)
      WRITE(6,131) IHR,IDAY,IMO,IYR
  131 FORMAT(' ',4I5)
      IF(NC.EQ.1) 15,16
   15 ISD = IDAY
      ISM = IMO
      ISY = IYR
      SDATE = JD1900(1,1,ISY)
      GO TO 5
   16 IF(IYR.NE.ILYR) 20,21
       AXIS PLOT
   20 CONTINUE
   44 DO 43 II=1,9
   43 WRITE(6,454)(TOT(II,KK),KK=1,24),(TEMP(II,KK),KK=1,24),
     1(NCNT(II,KK),KK=1,24)
  454 FORMAT(' TOT',24F5.1/' TEMP',24F5.1/' NCNT',24I5)
      REWIND 9
      DO 60 II=1,8
    1 READ(9,150) XL,XR,YL,YH,XINC,YINC,XNK,YNK,IPR,JPR,NXDEC,NYDEC,
     CTICK,THT
      READ(9,152) XTIT(1),YTIT(1),NXT,NYT,SCL
  150 FORMAT(8F5.2,4I5,2F5.2)
  152 FORMAT(A10,10X,A10,10X,2I5,F5.2)

       USE OF AXIS PROGRAM MADE HERE.  SEE AVAXIS,ID=MEDS.

      CALL MEDSAX(XL,XR,YL,YH,XINC,YINC,XNK,YNK,IPR,JPR,NXDEC,NYDEC,
     CTICK,THT,XTIT,YTIT ,NXT,NYT)
      YZ = YL/2. + ABS(YL/2.)
      THH = YINC *(YH-YZ)/YNK + 0.45
      TH2 = THH - 0.22
      XYR = ILYR
      CALL SYMBOL (0.2,THH,0.15, 7HYEAR 19,0.0,7)
      CALL NUMBER(999.,999.,0.15, XYR,0.0,-1)
      CALL SYMBOL(0.2,TH2,0.15,6HDEPTH ,0.0,6)
      CALL NUMBER(999.,999.,0.15,DEPTH(II),0.0,1)
      CALL SYMBOL(999.,999.,0.15,7H METERS,0.0,7)
      IPEN = 3
      DO 61 KK=1,24
      IF(NCNT(II,KK).EQ.0)  61,63
   63 TOT(II,KK) = (TOT(II,KK)/NCNT(II,KK) - YZ) * SCL
      IF (TOT(II,KK).LT.-3.) GO TO 61

       DATA PLOTTED
      CALL PLOT(KK/4.-0.12,TOT(II,KK),IPEN)
      IPEN = 2
   61 CONTINUE
      IPEN = 3

       MEAN DATA PLOTTED
      CALL PLOT( 1/4.-0.12,TOTM(II, 1),IPEN)
      DO 62 KK=1,24
      IF (TOTM(II,KK).LT.-3.) GO TO 62
      IF (TOTM(II,KK).GT.60.) GO TO 62
      CALL DASH(KK/4.-0.12,TOTM(II,KK)/2.)
      IPEN = 2
   62 CONTINUE
      IF(II.EQ.4.OR.II.EQ.8)  68,69
   68 CALL PLOT(9.,-24.,-3)
      GO TO 60
   69 CALL PLOT(0.,8.,-3)
   60 CONTINUE
```

```
      DO 72 II=1,9
      DO 72 KK=1,24
      NCNT(II,KK) = 0.
      TEMP(II,KK) = 0.
   72 TOT(II,KK) = 0.
      SDATE = JD1900(1,1,IYR)
   21 IF(LAST.EQ.1) 90,5

       DATA CARD FOUND BY DECODE

   19 NPT = NPT + 1
      DECODE(48,2002,IWRD(1)) JHR,JMIN,JDEPTH,JTEMP,INSW,JSAL
 2002 FORMAT(12X,I2,I2,I5,6X,I5,1X,A4,6X,I5)
      XDEP(NPT) = JDEPTH/10.
      IF(INSW.NE.IN) GO TO 10

       CHECK FOR BAD DATA AND DELETE

      IF(IYR.LE.56) CALL DELREC(IYR,IMO,IDAY,NPT,ISWT,XDEP,PRTYP)
      IF(ISWT.EQ.1) GO TO 11

       PRTYP INDICATES PARAMETER TO BE PLOTTED.
      GO TO (23,24,25), PRTYP
   23 XTEMP(NPT) = JTEMP/1000.
      GO TO 5
   24 XTEMP(NPT) = JSAL/1000.
      GO TO 5
   25 ZZ = JTEMP/1000.
      YYY = JSAL/1000.
      XTEMP(NPT) = SIGMATK(ZZ,YYY)
      GO TO 5
   10 NPT = NPT - 1
      GO TO 5
   11 XTEMP(NPT) = 99.0
      WRITE(6,523) IYR,IMO,IDAY,XDEP(NPT)
  523 FORMAT("  RECORD DELETED DATE ",3I3," AT DEPTH ",F6.1)
      ISWT = 0
      GO TO 5

   39 CONTINUE
      TIM = JD1900(IDAY,IMO,IYR) - SDATE
      XPT = TIM * 12./365.
      IT = (TIM/15.21) + 1
      DO 40 I=1,K
      L = 1
   31 IF ((DEPTH(L)-5.).LT.XDEP(I).AND.(DEPTH(L)+5.).GT.XDEP(I))  32,33
   33 L = L + 1
      IF (L.GT.9) GO TO 37
      GO TO 31
   32 TEMP(L,IT) = XTEMP(I)
      IF(XTEMP(I).GT.60.) GO TO 40

       STATION DATA (XTEMP(I)) STORED IN YEARLY BUFFER (TOT(L,IT))

      TOT(L,IT) = TEMP(L,IT) + TOT(L,IT)
      NCNT(L,IT) = NCNT(L,IT) + 1
   37 CONTINUE
   40 CONTINUE
      IF(LAST.EQ.1) GO TO 44
      GO TO 8
   91 WRITE(LP,103)
  103 FORMAT(//17H CARD TYPE ERROR.)
   90 WRITE(LP,102)
  102 FORMAT(//12H END OF FILE)
```

```
    WRITE(6,104) ISD,ISM,ISY
104 FORMAT(" START DATE ",2I3,I5)
    WRITE(6,123) IHR,IDAY,IMO,IYR
123 FORMAT(" LAST DATE ",I5,2I3,I5)
    WRITE(6,124) KMAX,NC
124 FORMAT(" MAXIMUM NUMBER OF DATA CARDS- ",I5/" NUMBER OF BT S-",I6)
999 CALL PLOT(10.,0.,999)
    STOP
    END


    FUNCTION SIGMATK(T,S)
    SS0=-9.344586324E-2
    SS1=8.14876576925E-1*S
    SS2=-4.824961403E-4*S*S
    SS3=6.767861356E-6*S**3
    SIGM=SS0+SS1+SS2+SS3
    A=4.7867E-3*T-9.8185E-5*T*T+1.0843E-6*T**3
    B=1.803E-5*T-8.164E-7*T*T+1.667E-8*T**3
    CT=-1*(T-3.98)**2*(T+283.)/(503.57*(T+67.26))
    C0=0.1324
    SIGMATK=(SIGM+C0)*(1-A+B*(SIGM-C0))+CT
    RETURN
    END


    SUBROUTINE DASH(X,Y)
    THIS DASH LINE ROUTINE ASSUMES PEN DOWN
    CALL WHERE(X1,Y1,RFACT)
    CALL PLOT(X1+((X-X1)/4.),Y1+((Y-Y1)/4.),2)
    CALL PLOT(X1+((X-X1)/2.),Y1+((Y-Y1)/2.),3)
    CALL PLOT(X1+3.*((X-X1)/4.),Y1+3.*((Y-Y1)/4.),2)
    CALL PLOT(X,Y,3)
    RETURN
    END


    SUBROUTINE DELREC(IYR,IMO,IDAY,NPT,ISWT,XDEP,JPTYP)
    DIMENSION XDEP(1)
    IF(IYR.EQ.50.AND.IMO.EQ.4.AND.IDAY.EQ.29.AND.XDEP(NPT).GT.49..AND.
   1XDEP(NPT).LT.51.) ISWT = 1
    IF(IYR.EQ.52.AND.IMO.EQ.5.AND.IDAY.EQ.6.AND.XDEP(NPT).LT.160.)
   1  ISWT = 1
    JPTYP = 1
    RETURN
    END
```