APPENDIX TO

WATER QUALITY MONITORING IN MASSACHUSETTS AND CAPE COD BAYS: ANNUAL REPORT FOR 1992

for

MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129

Prepared by

John R. Kelly
Carl S. Albro

Battelle Ocean Sciences
397 Washington Street
Duxbury, MA 02332

May 14, 1993

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citation:

Kelly, J. and C. Albro. 1993. **Appendices to Report No. 93-16 "Water quality monitoring in Massachusetts and Cape Cod Bays: annual report for 1992."** MWRA Enviro. Quality Dept. Miscellaneous Report No. ms-16. Massachusetts Water Resources Authority, Boston, MA. 173 pp.

This Appendix contains graphs of selected stations from the nearfield and farfield sampling regions including:

F01P (given as F01 in graph headings)
F02P (given as F02 in graph headings)
F04
F08
F12
F13P (given as F13 in graph headings)
F17P
F19
F20
F21
F22
F23P (given as F23 in graph headings)
F24
F25
N01P (given as N01 in graph headings)
N04P (given as N04 in graph headings)
N07P (given as N07 in graph headings)
N08
N09
N10P (given as N10 in graph headings)
N11
N12
N16P (given as N16 in graph headings)
N20P (given as N20 in graph headings)

The parameters shown in contoured time plots are given for the set of stations in the following sequence:

Chlorophyll
Dissolved oxygen
Dissolved inorganic nitrogen
Phosphate
Silicate
Temperature
Salinity
Density

Note that any of the stations/parameters shown in the associated text report are not repeated here.

The data for chlorophyll, dissolved oxygen, temperature, and salinity, are 0.5-m averages derived from vertical profiles performed during the surveys. A string of vertical dots shows the depth positions for these data at each survey.

For farfield stations, 6 surveys were conducted. For nearfield stations, the graphs use data from 14 nearfield surveys, six of which immediately followed the farfield surveys. Some stations were not sampled during each of these surveys and the dissolved oxygen sensor malfunctioned during March, so there are only 5 farfield surveys available for dissolved oxygen.

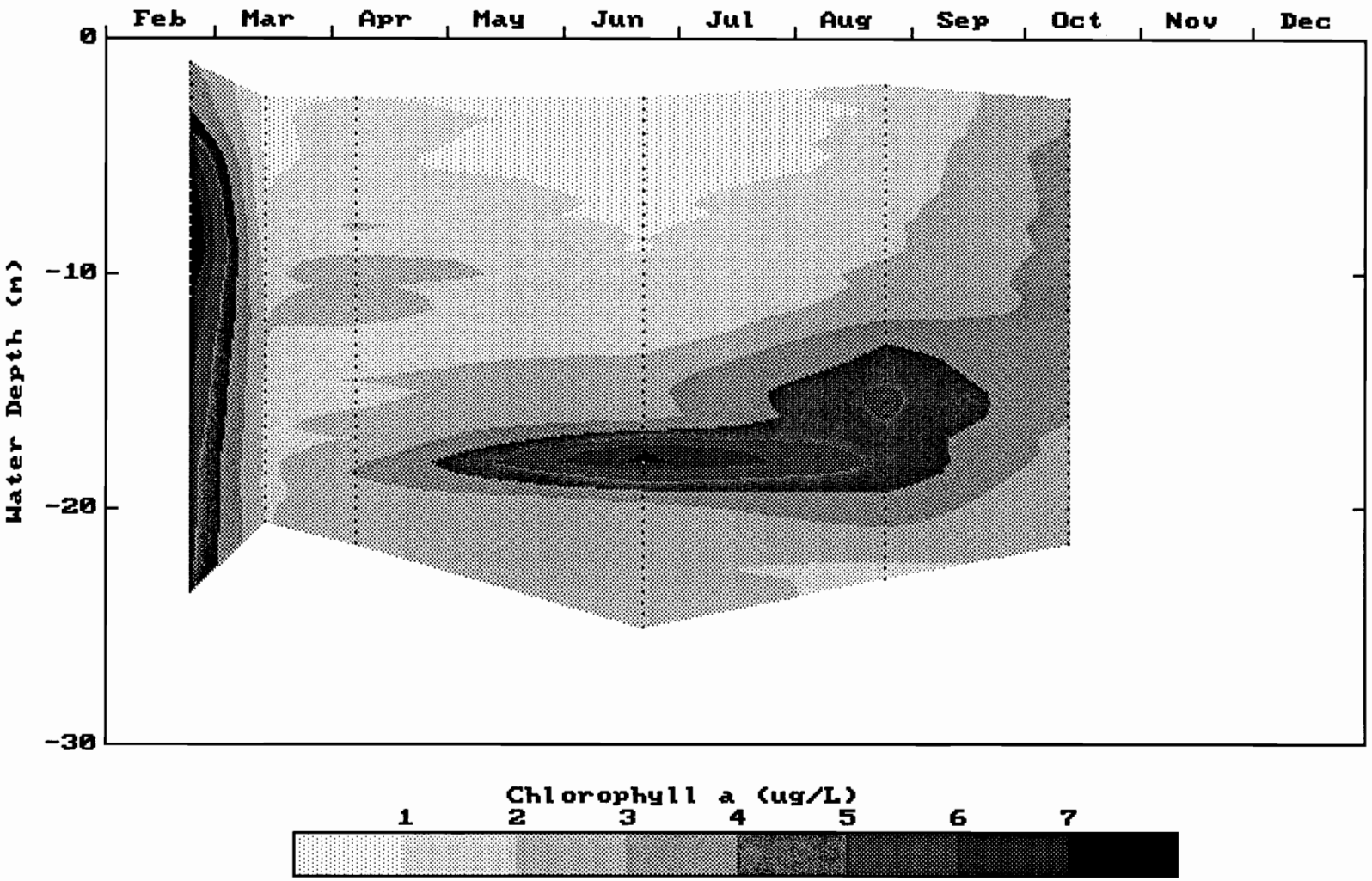
The data for nutrients includes data where vertical profile/Niskin-bottle sampling was performed at a station; the depth of samples are shown by the string of 5 (usually) vertical dots over depth at each survey. Data for nutrients includes repeated sampling at nearfield "P" stations during combined farfield-nearfield surveys, so there are more than 14 points in time for some stations.

Contouring was done by proprietary software developed at Battelle Ocean Sciences. Contours are based on a two-pass interpolation scheme. The first pass interpolates vertically at each survey, using linear interpolation between points to fill each pixel. The second pass interpolates horizontally (across surveys) at each vertical pixel level, again filling pixels by linear interpolation between points. The contouring is performed to the shallowest and deepest depth of the actual data collected across all surveys at a station, then the data are blocked to the actual depth range sampled at each survey.

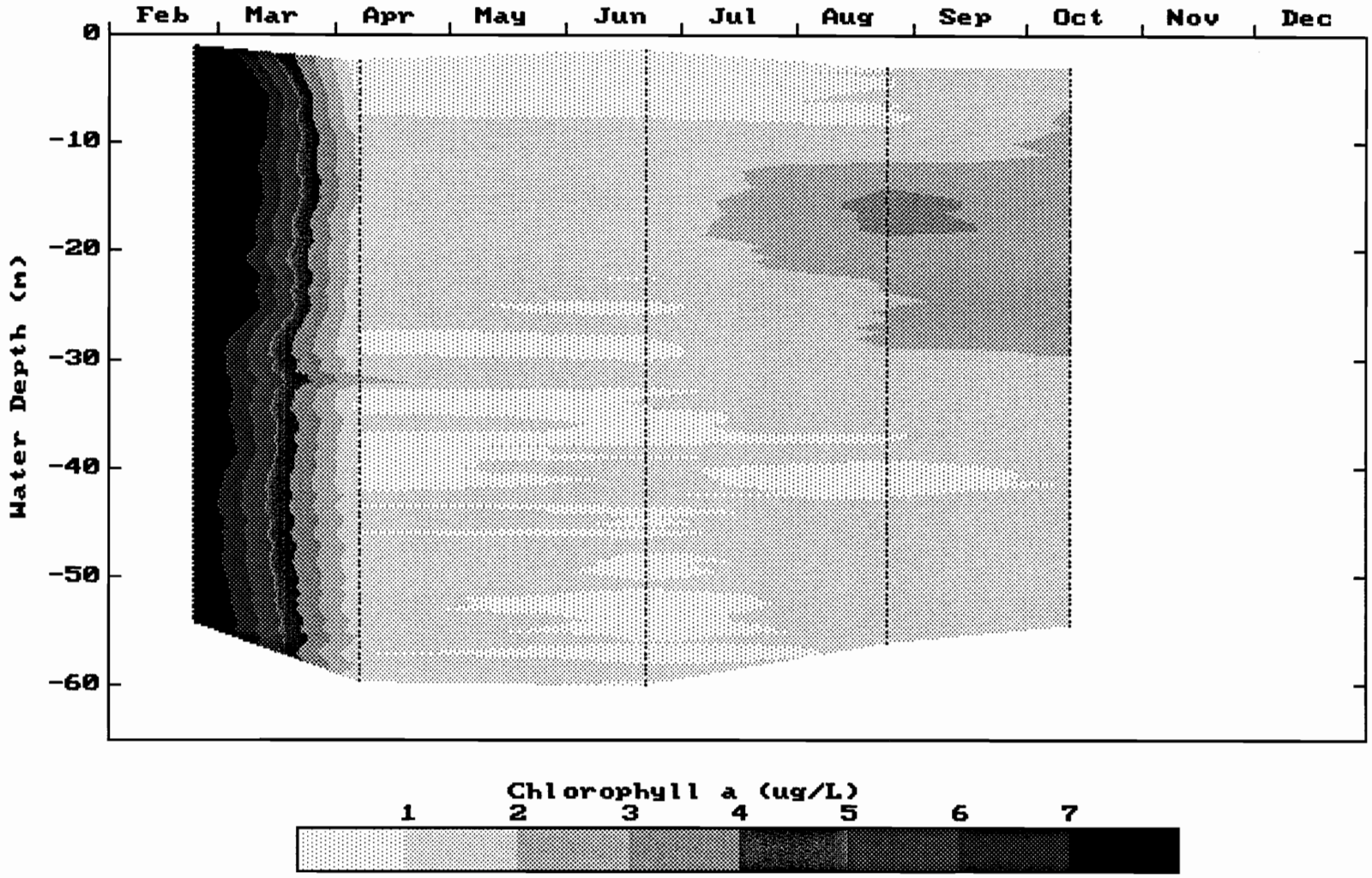
Concentration intervals were spread across the available 8 grey-tones, after inspection of the ranges of each parameter observed for the entire year.

Chlorophyll

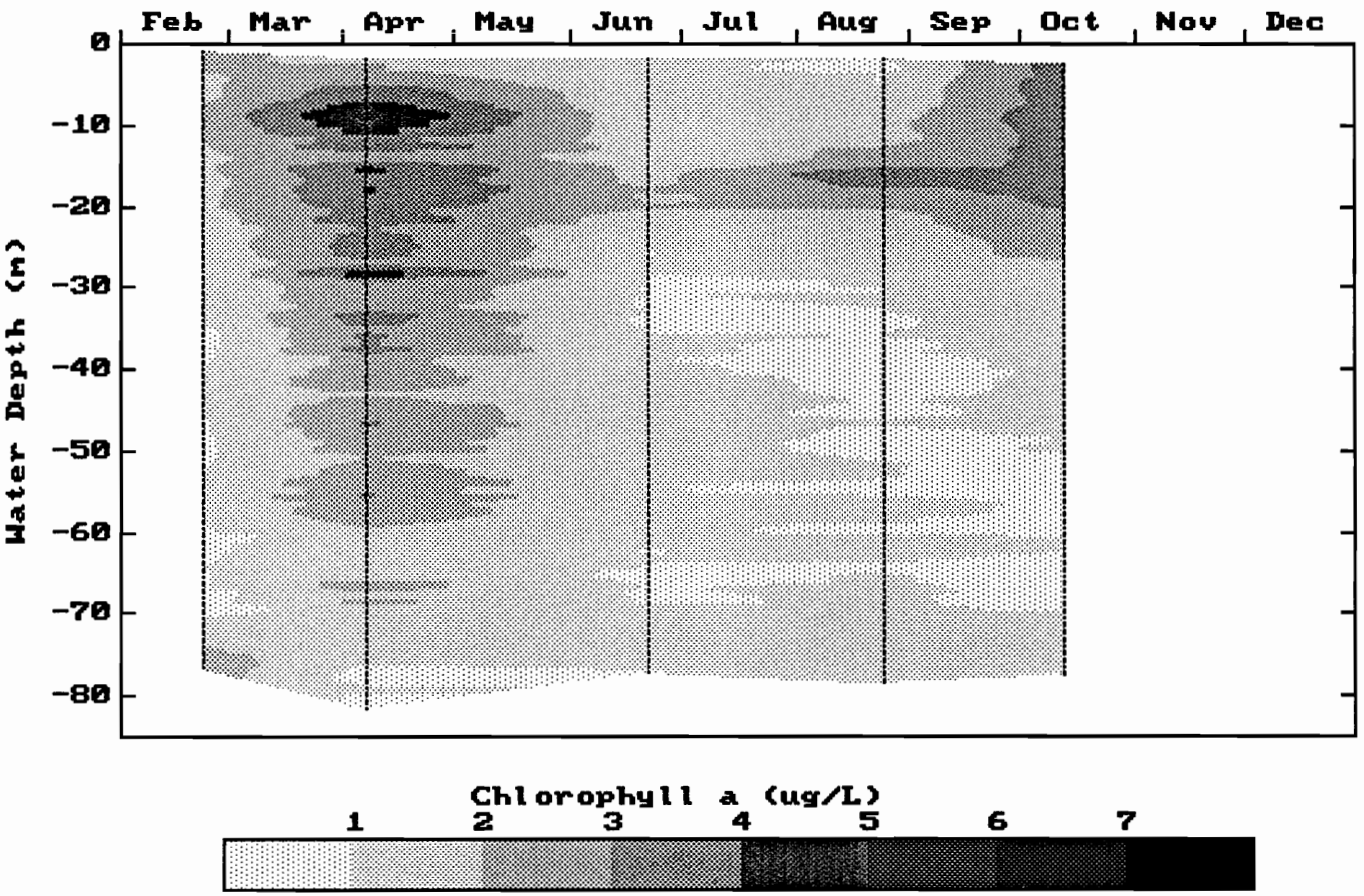
Station F01 during 1992



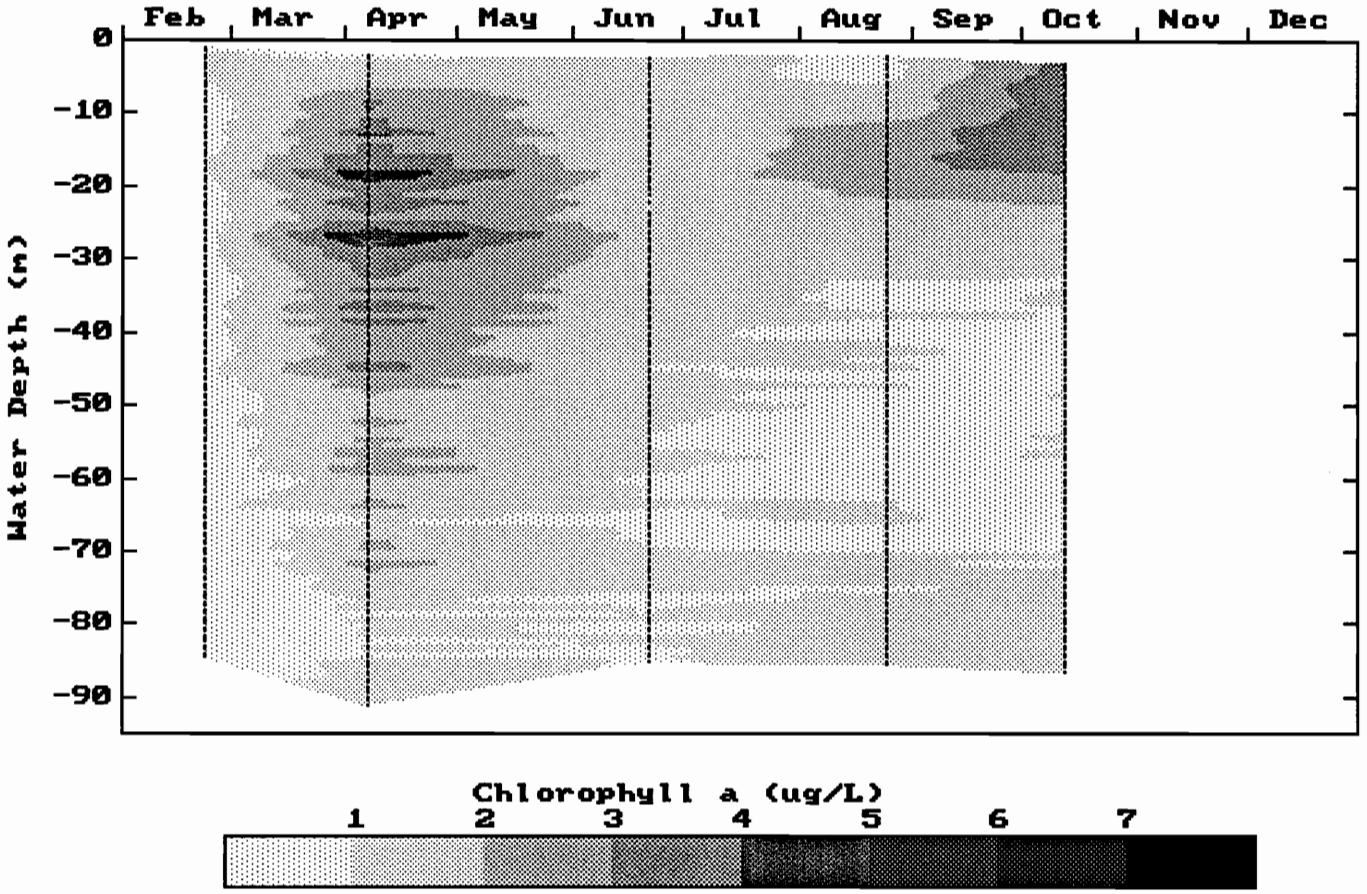
Station F04 during 1992



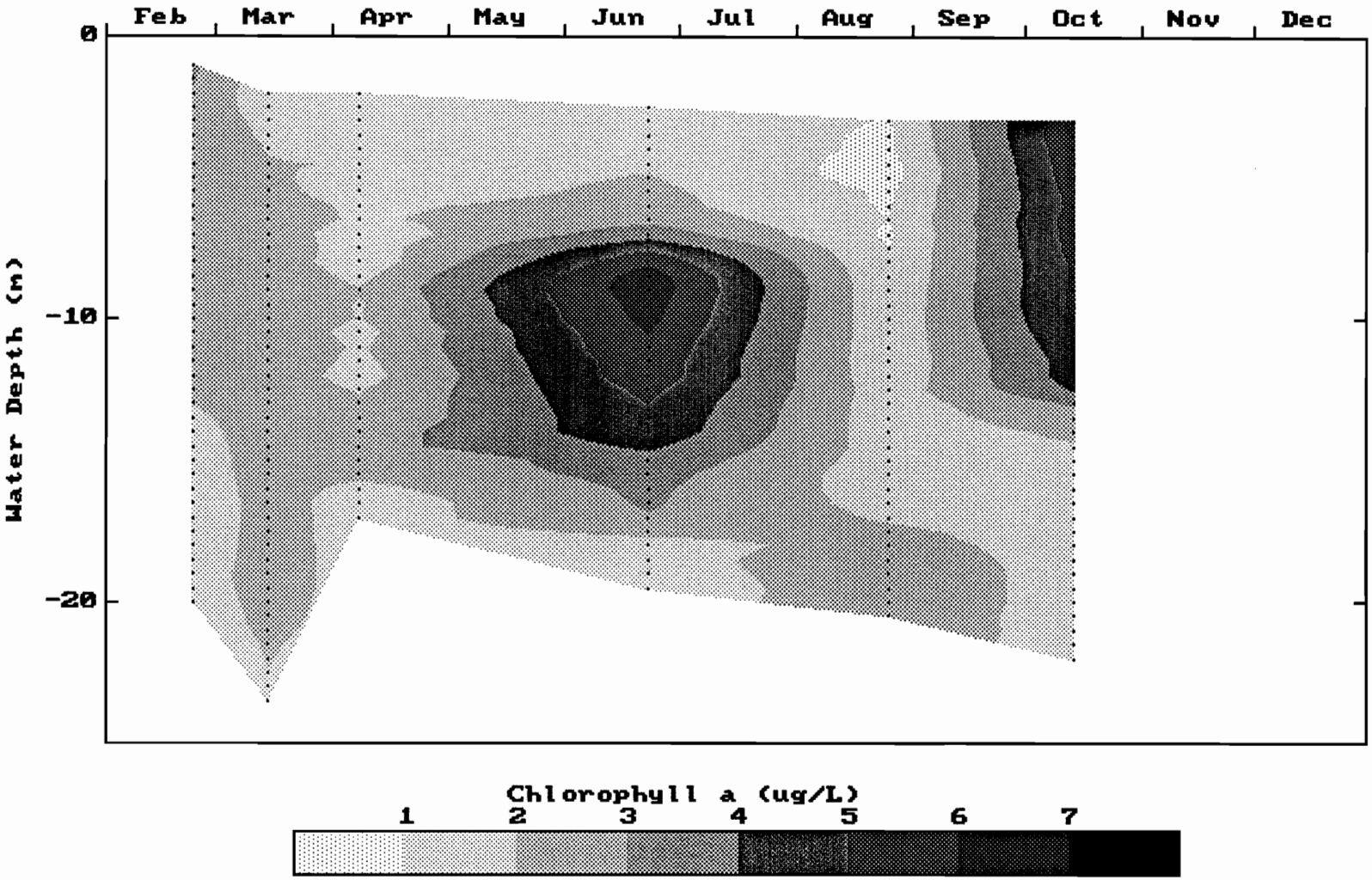
Station F08 during 1992



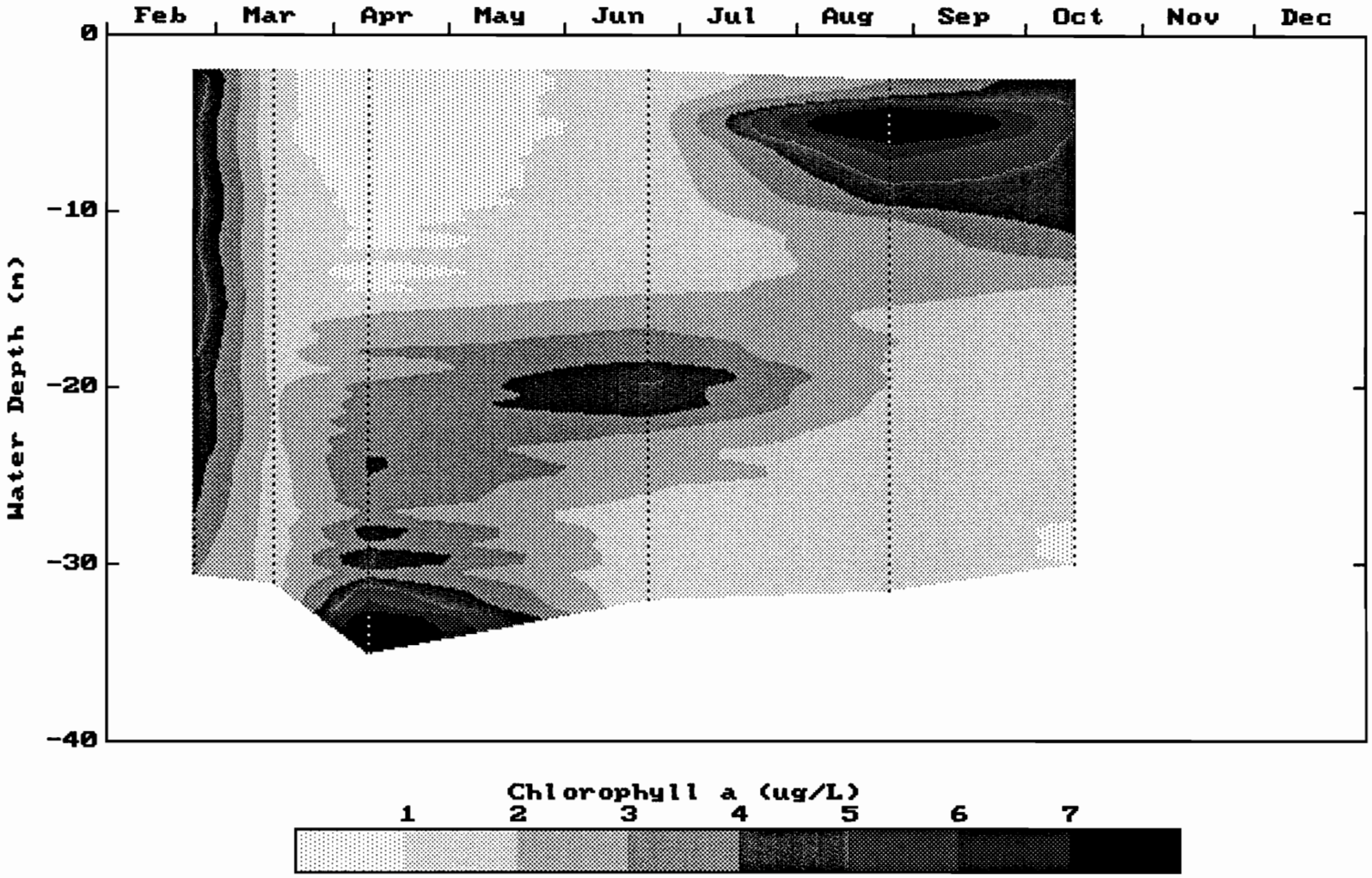
Station F12 during 1992



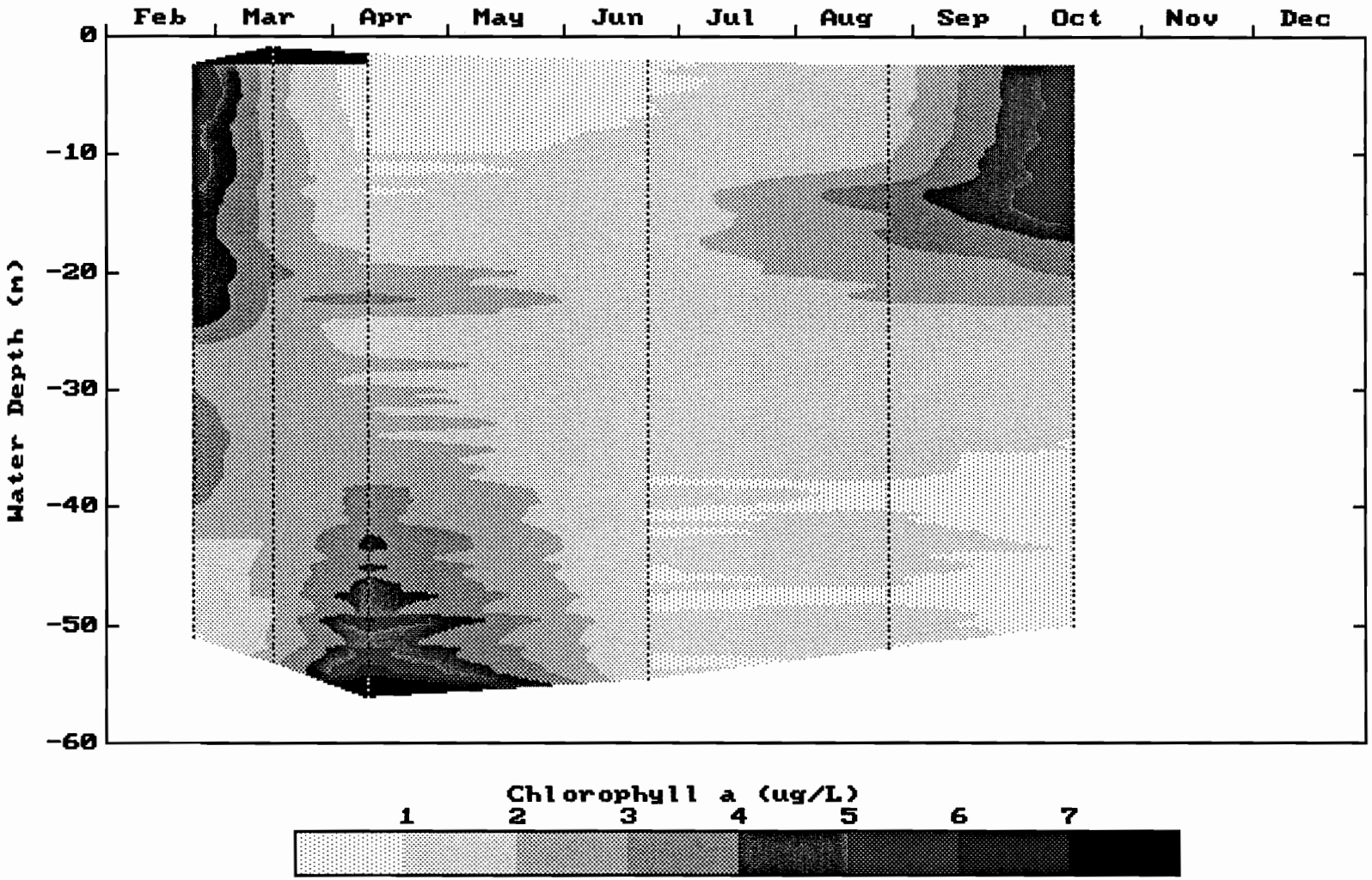
Station F13 during 1992



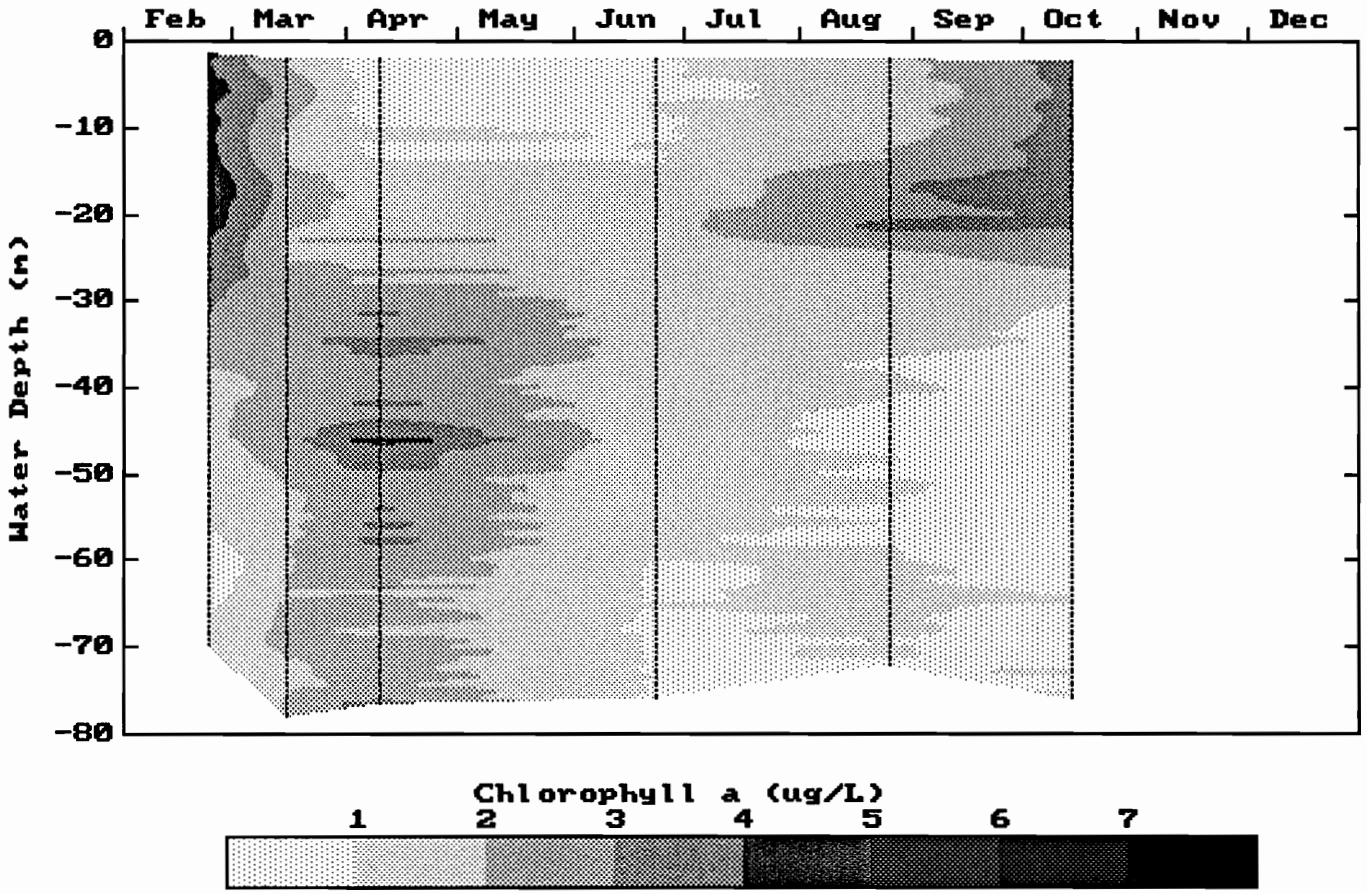
Station F20 during 1992



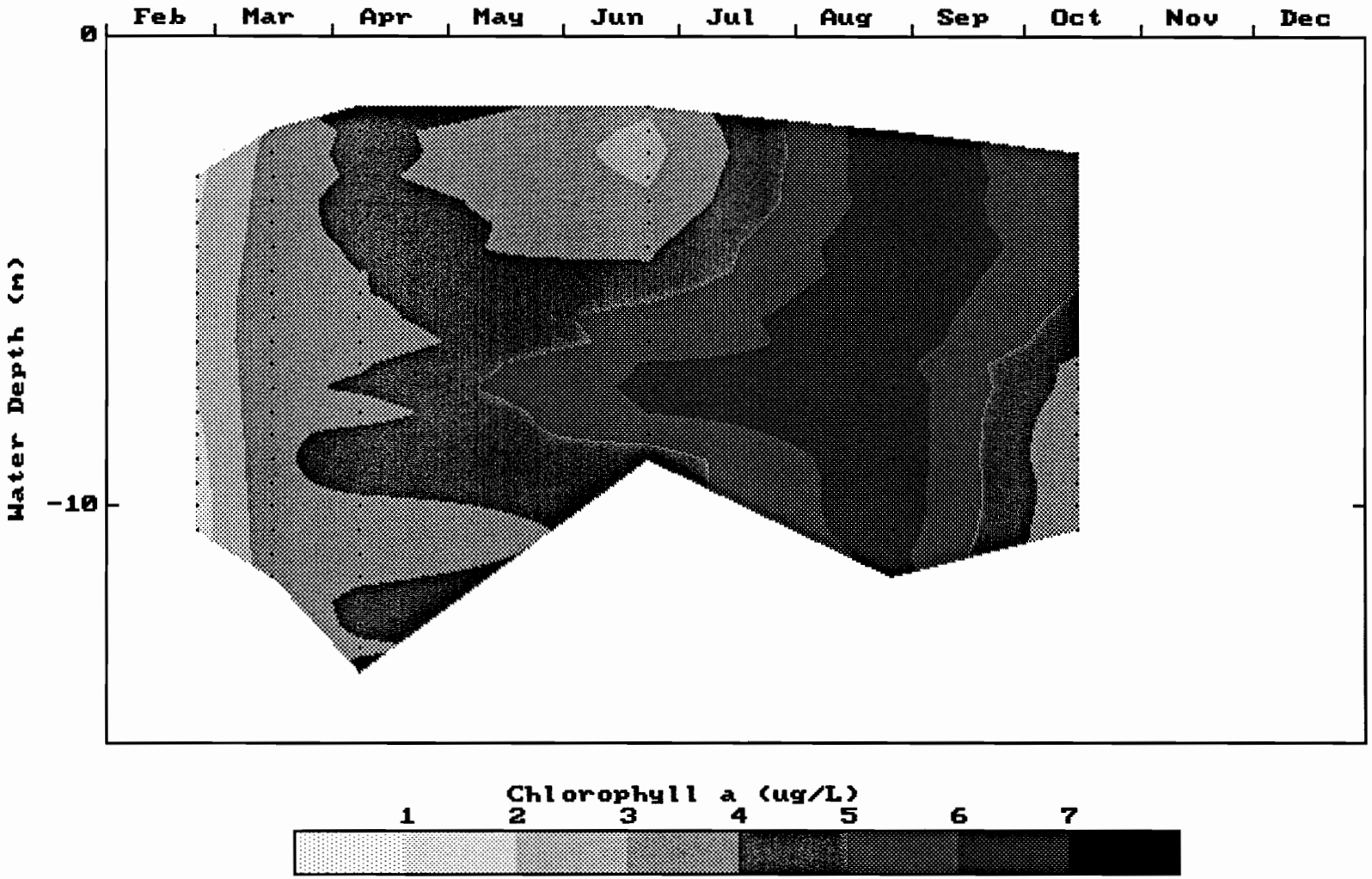
Station F21 during 1992



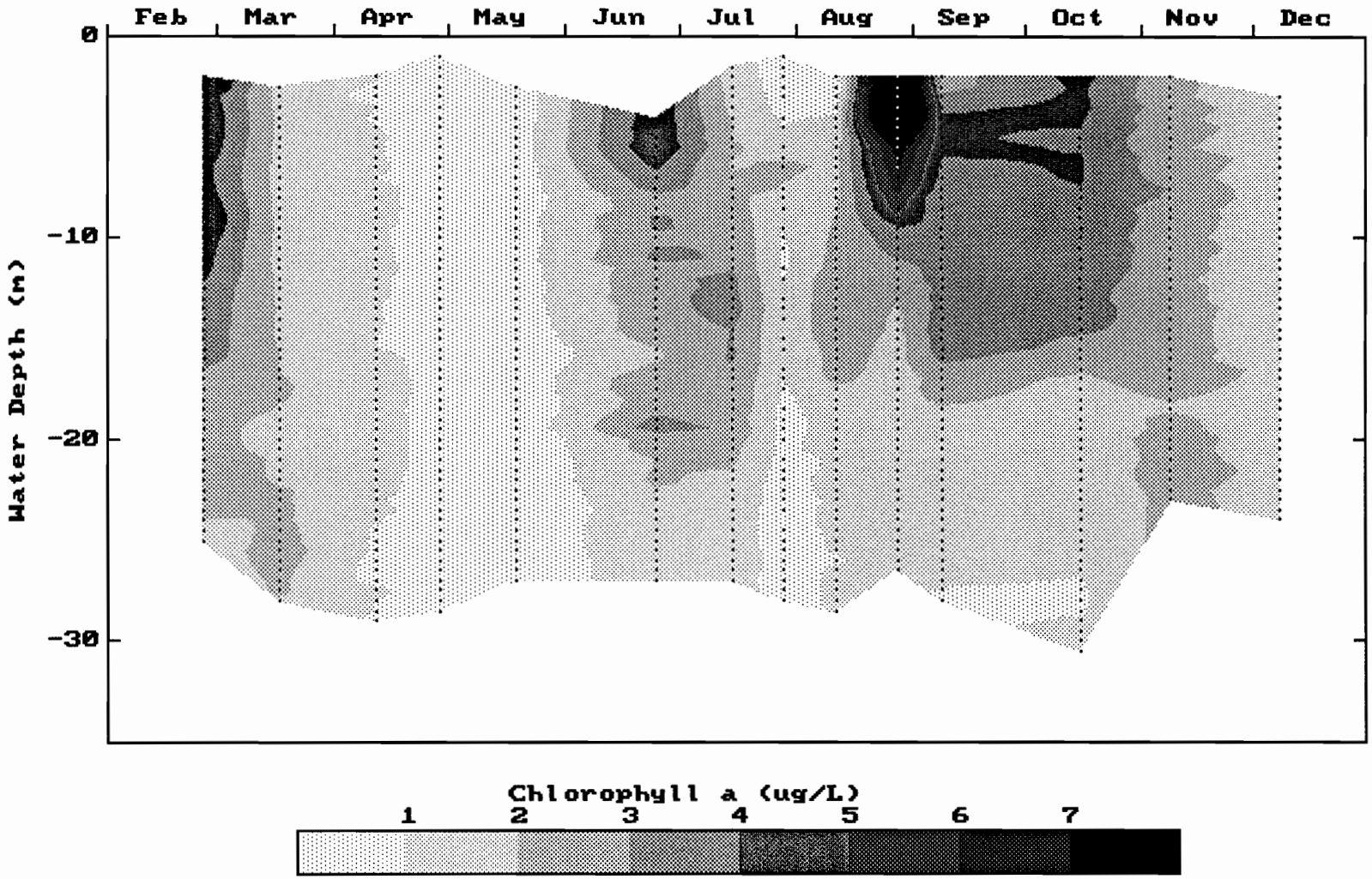
Station F22 during 1992



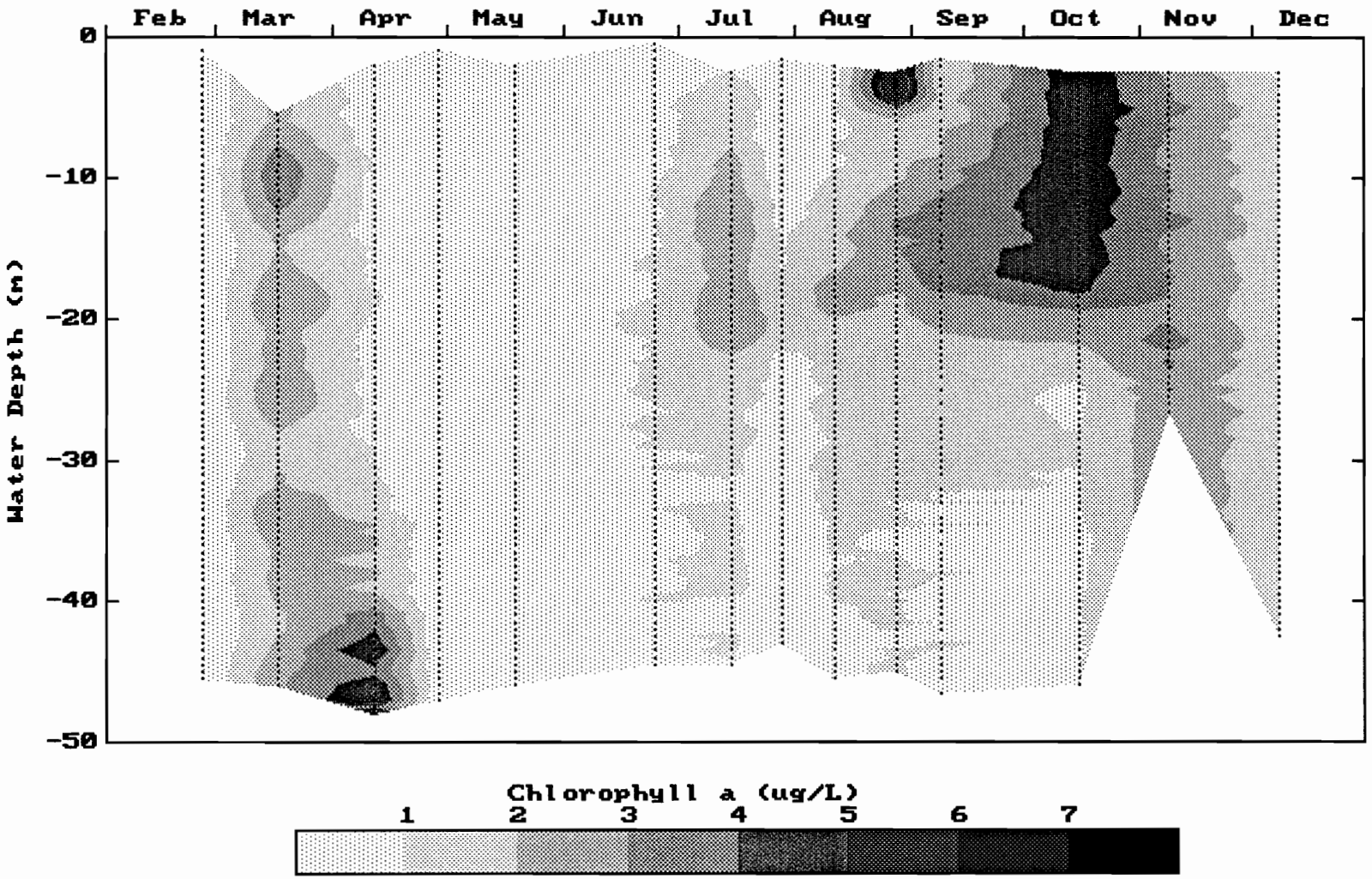
Station F25 during 1992



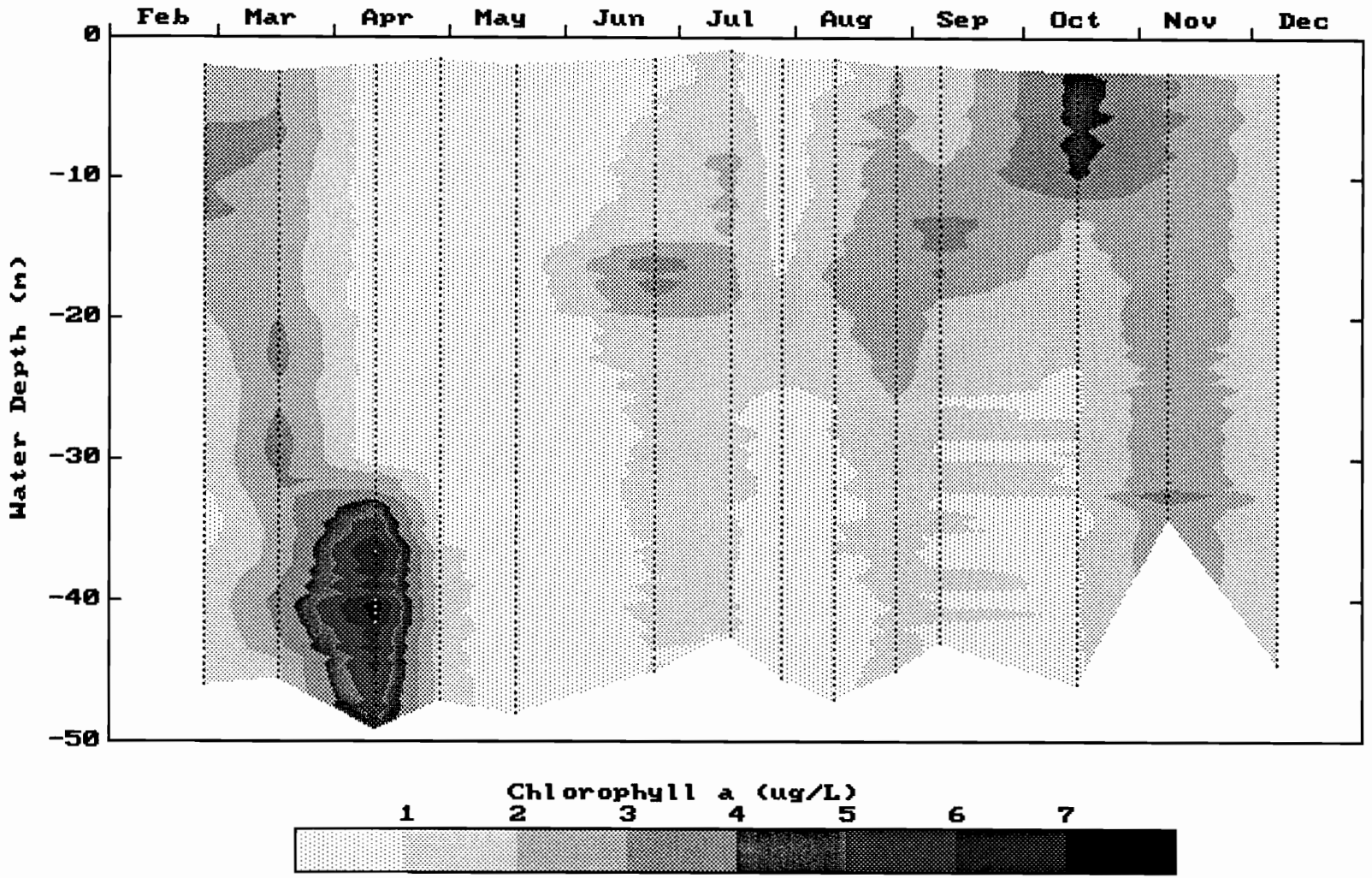
Station N01 during 1992



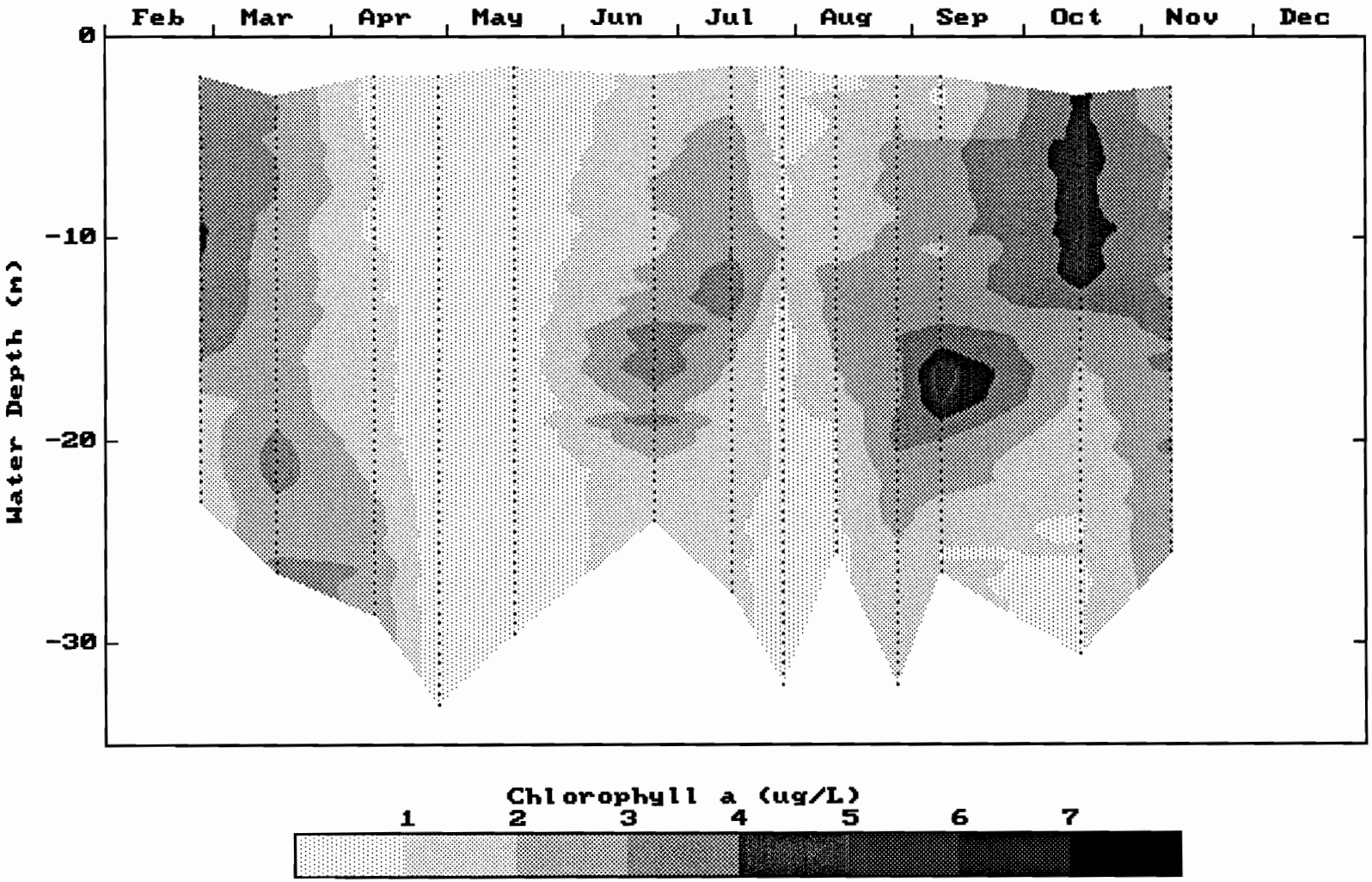
Station N04 during 1992



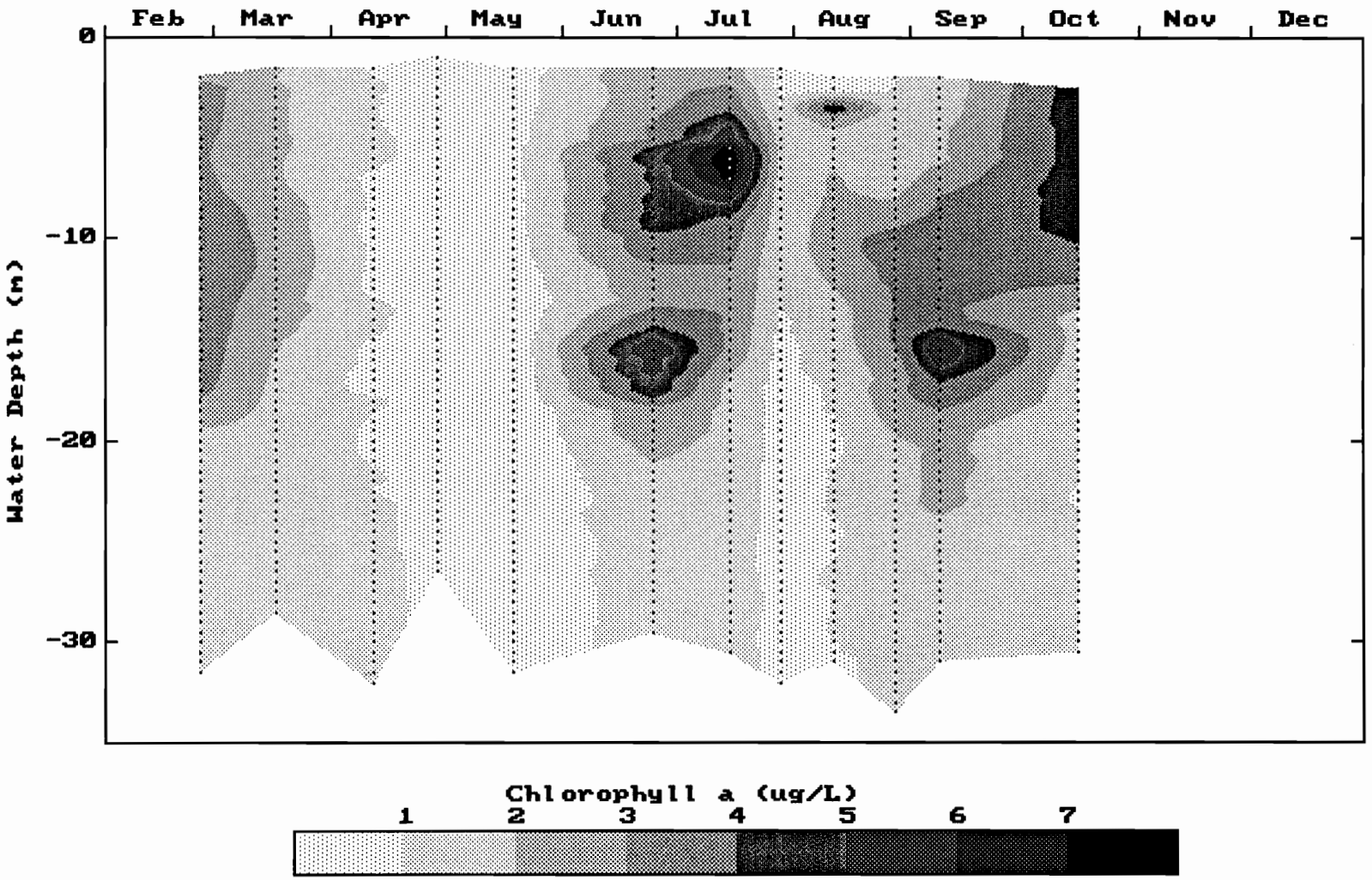
Station N07 during 1992



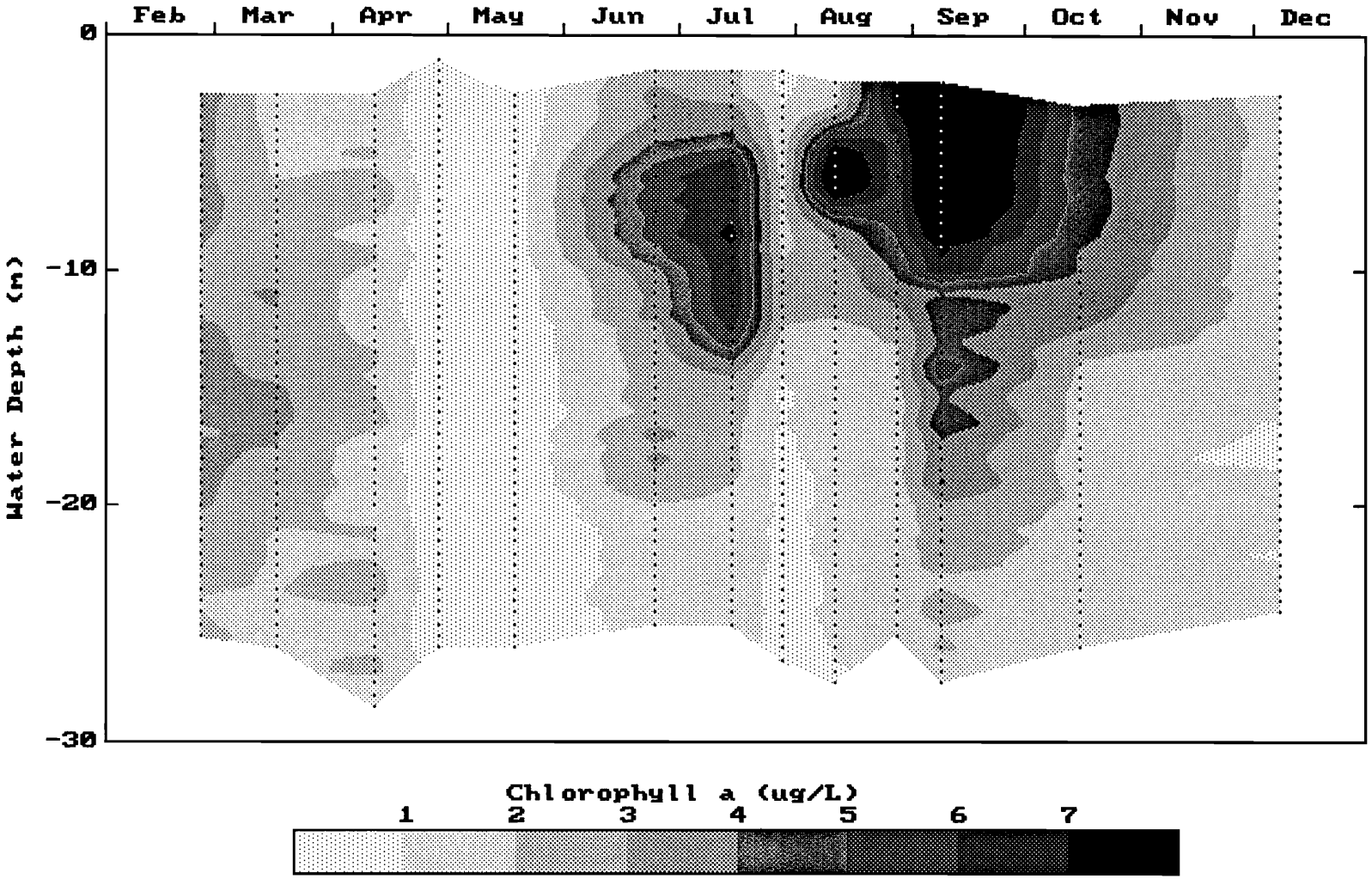
Station N08 during 1992



Station N09 during 1992

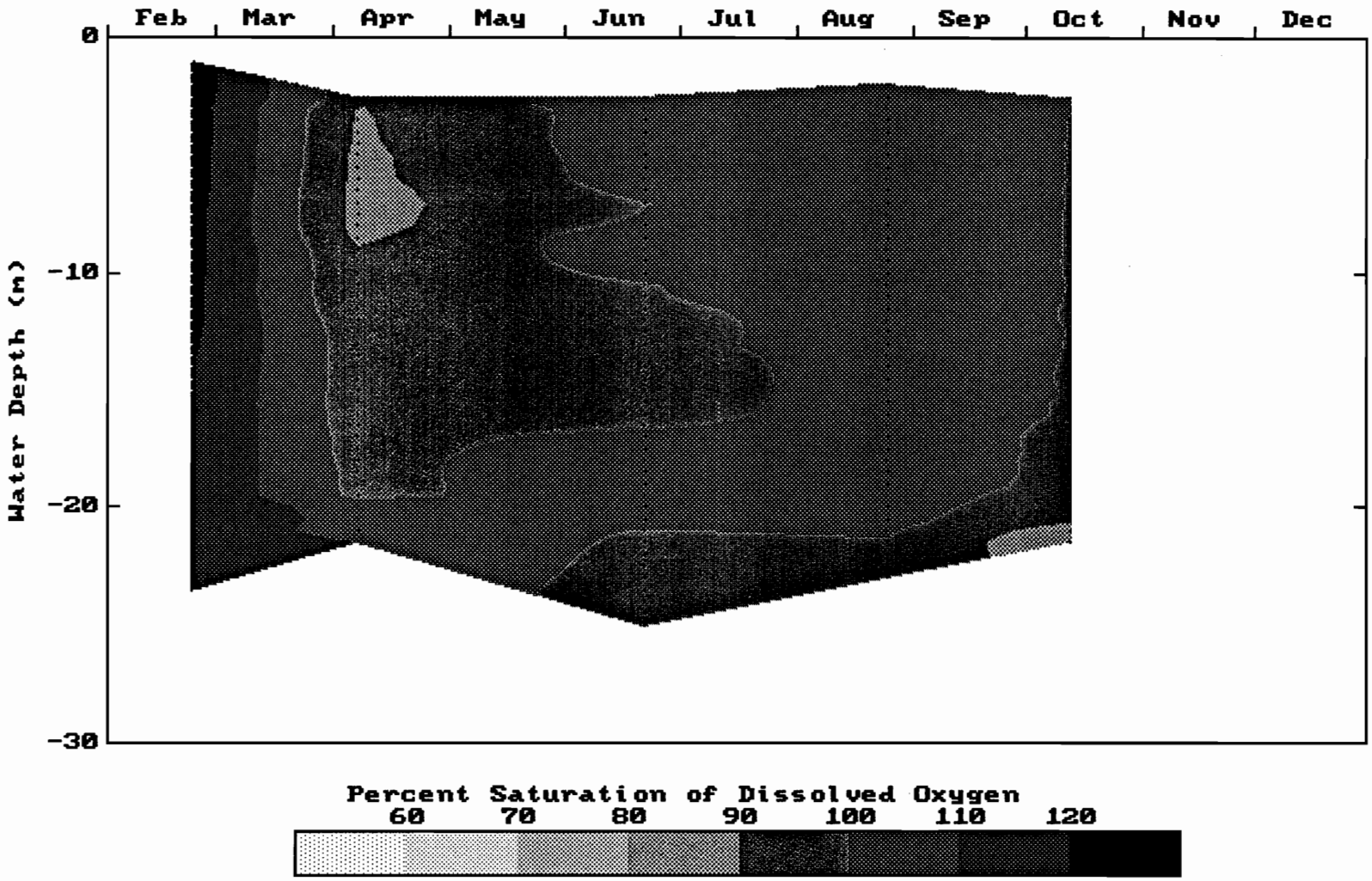


Station N11 during 1992

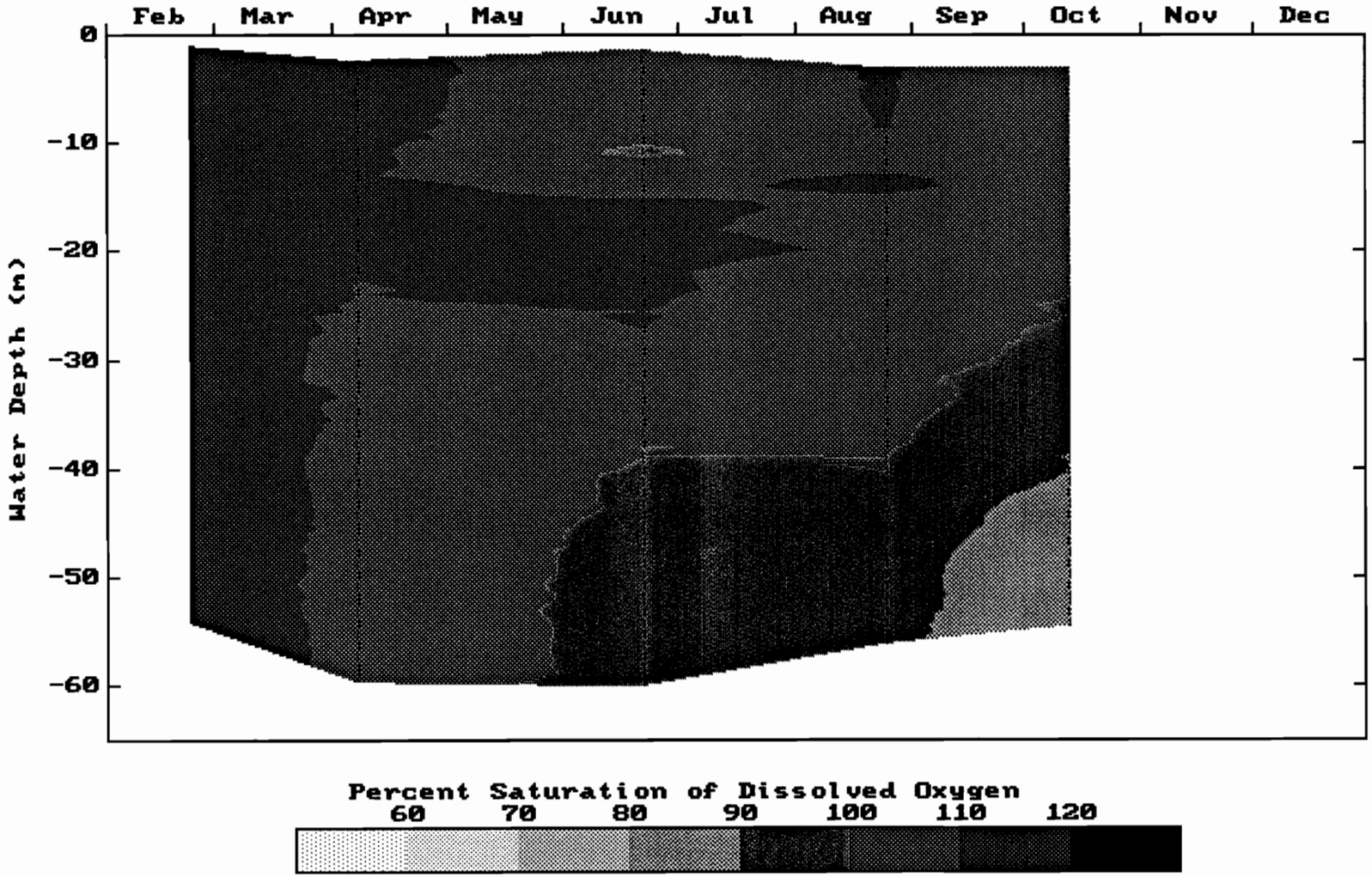


Dissolved oxygen

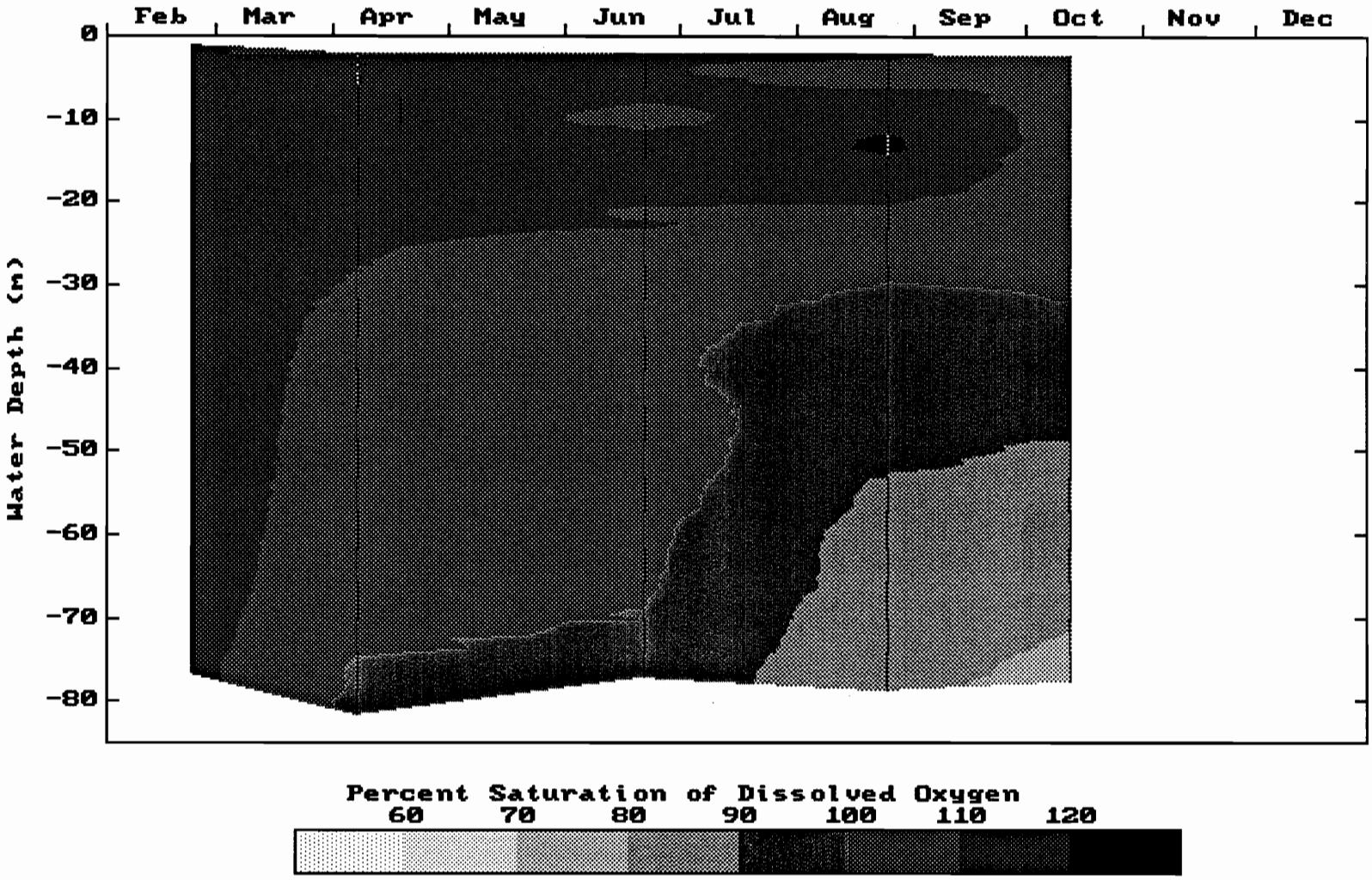
Station F01 during 1992



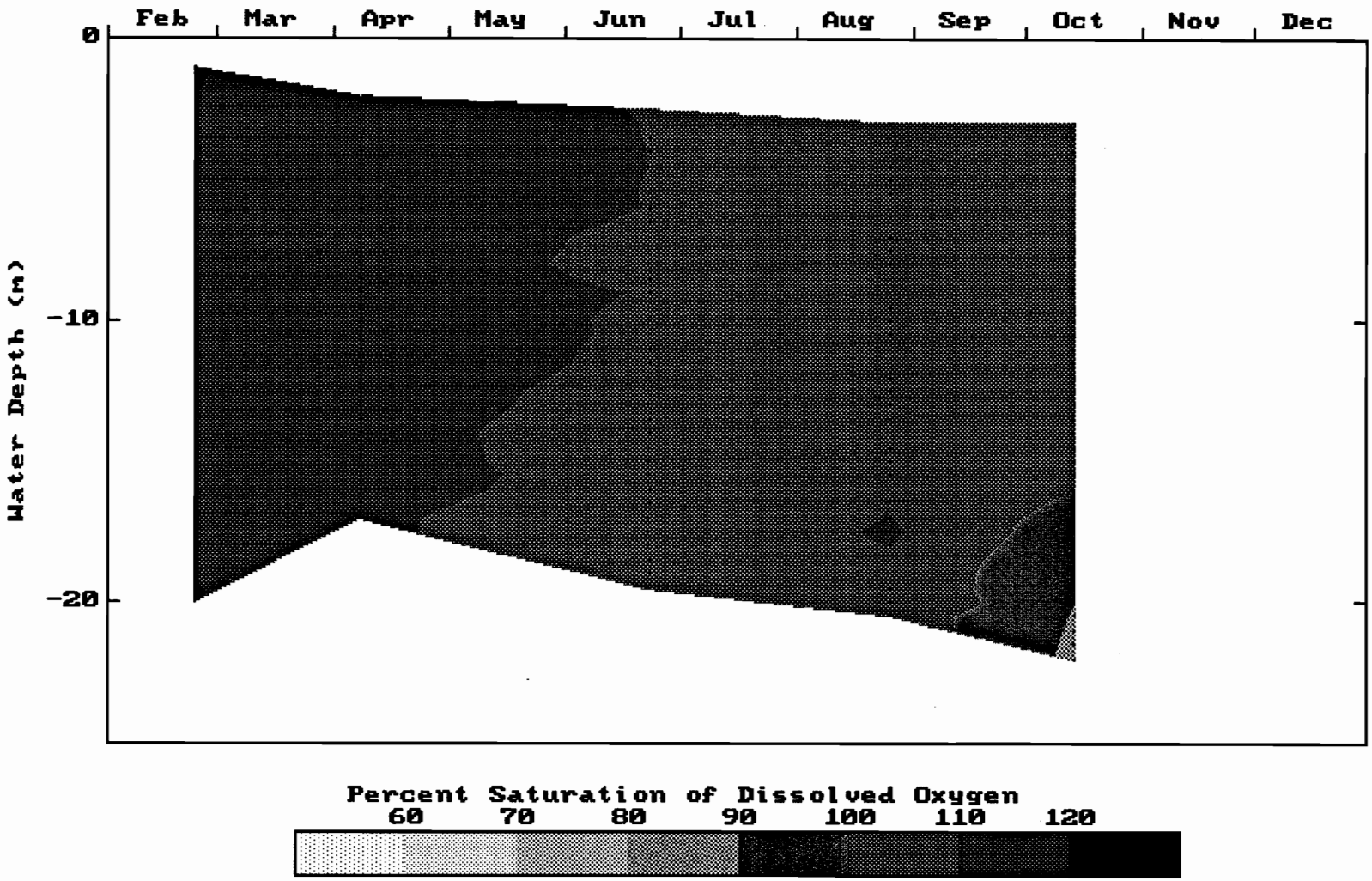
Station F04 during 1992



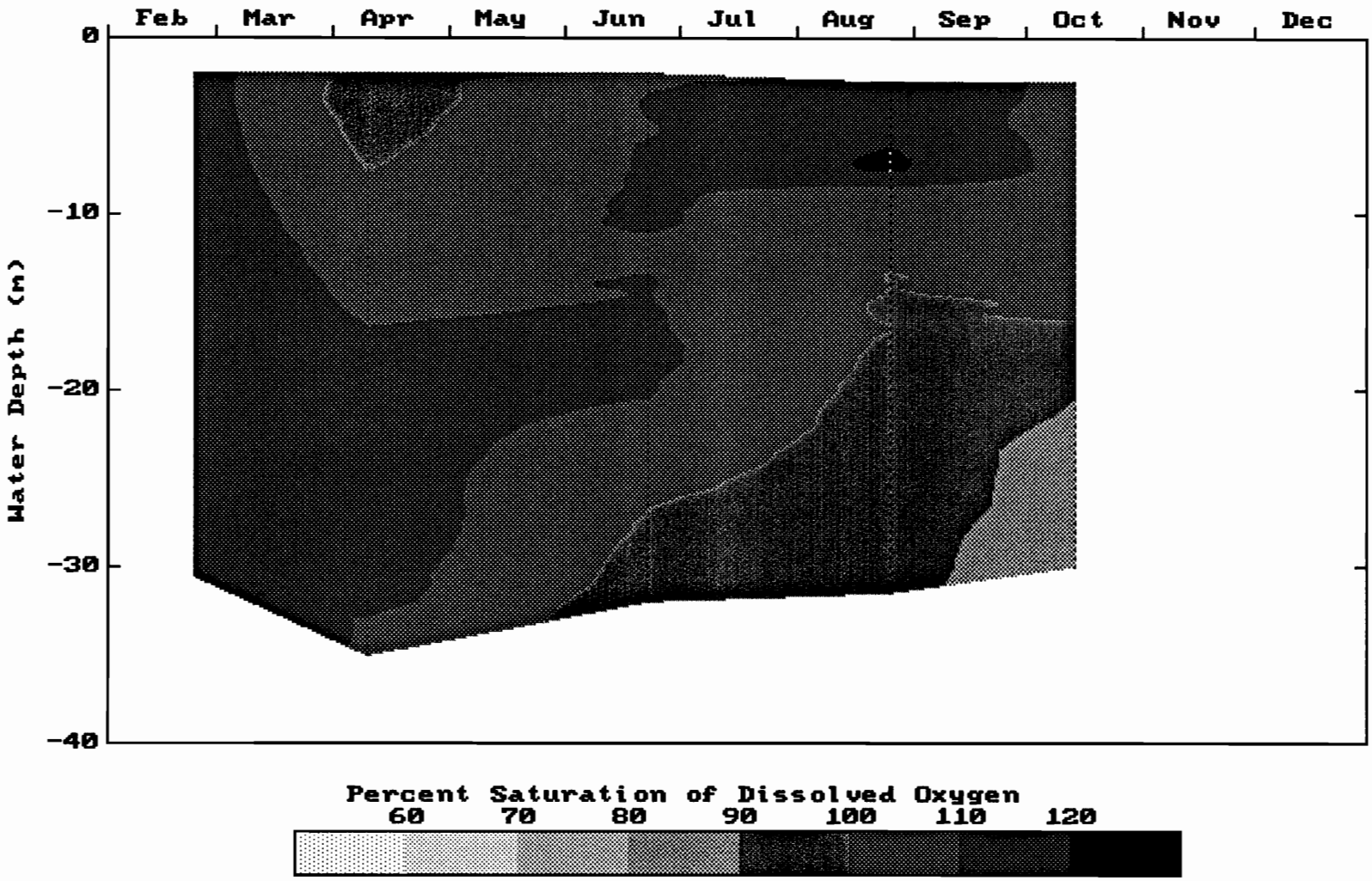
Station F08 during 1992



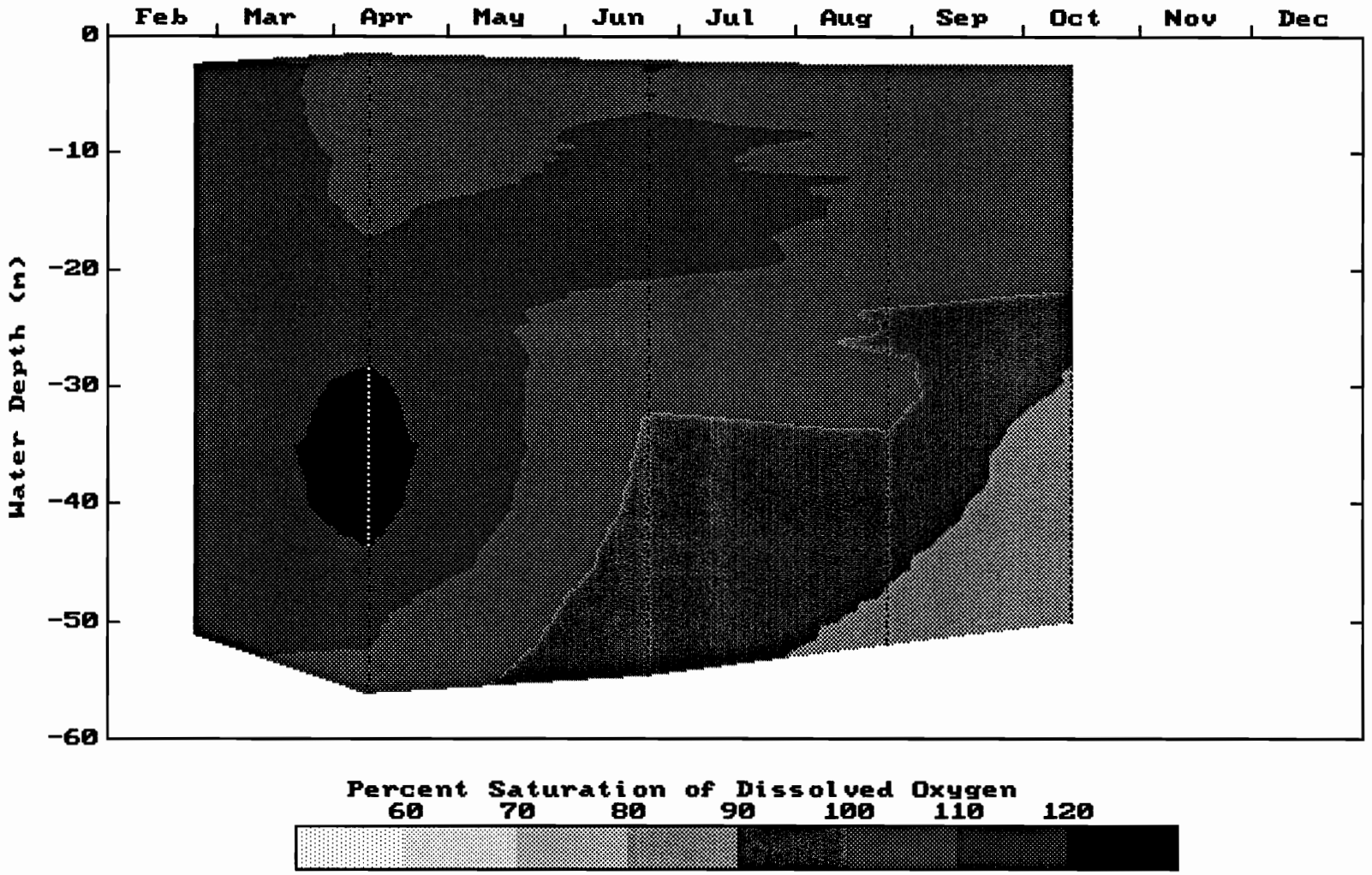
Station F13 during 1992



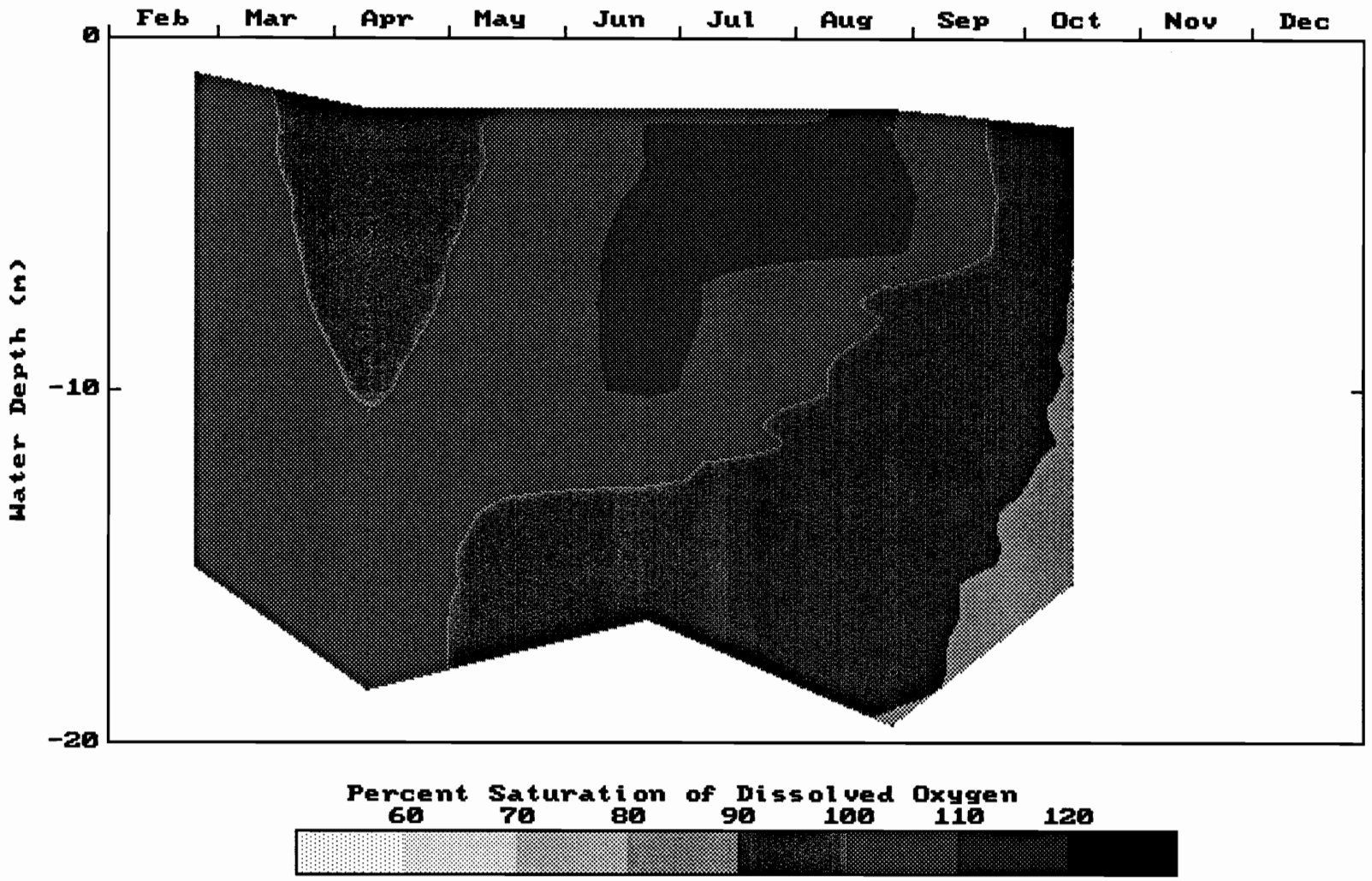
Station F20 during 1992



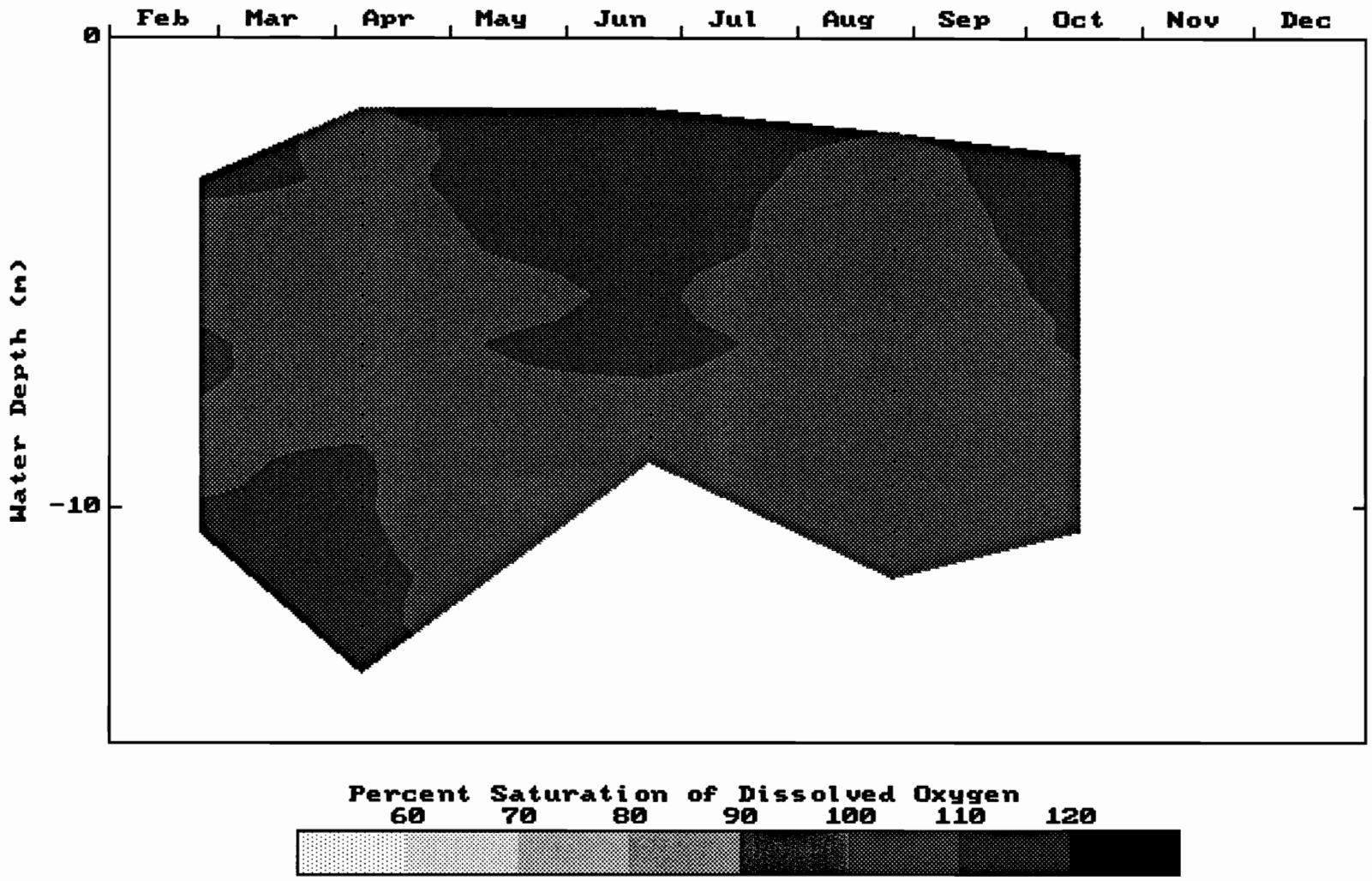
Station F21 during 1992



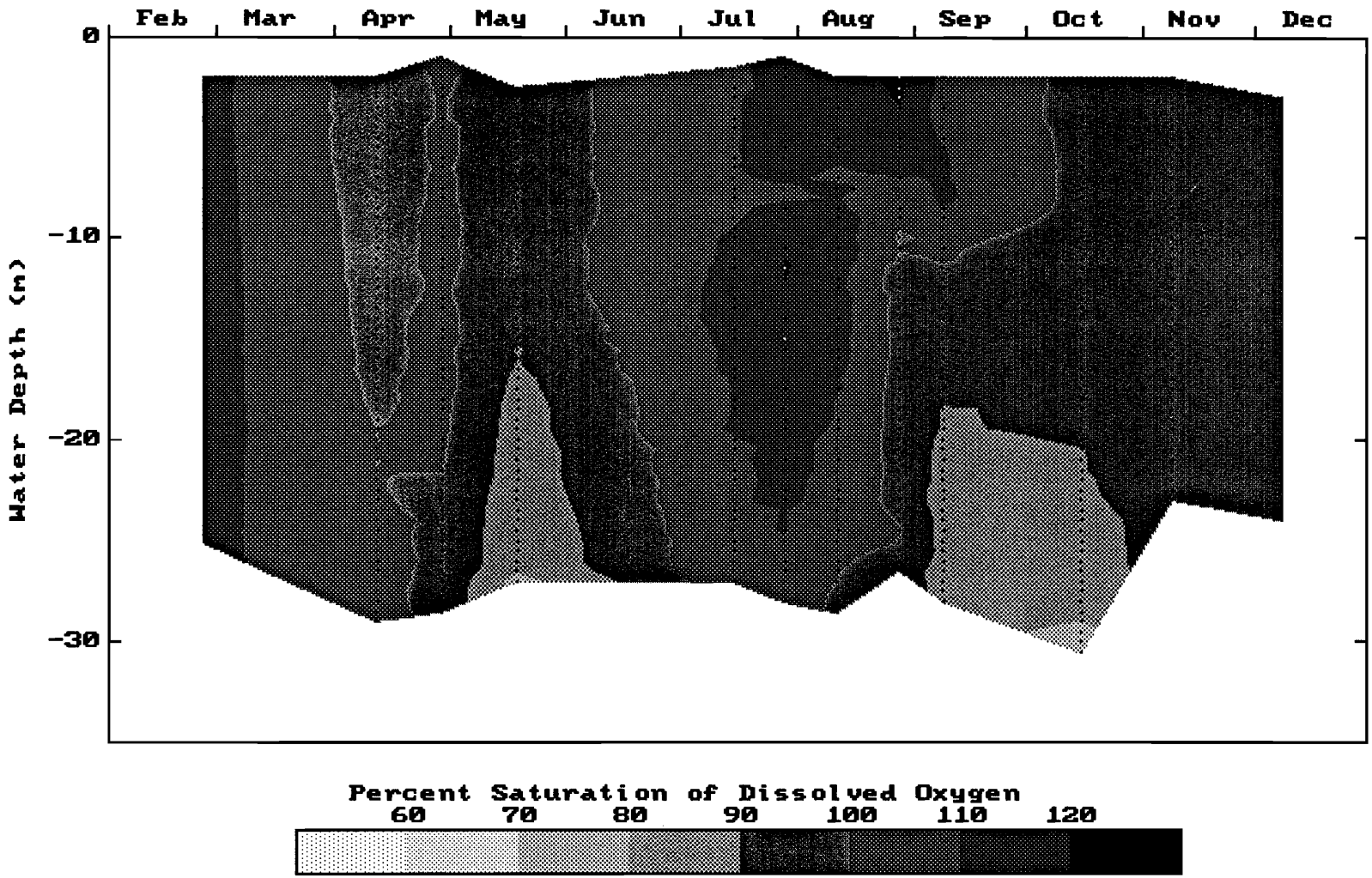
Station F24 during 1992



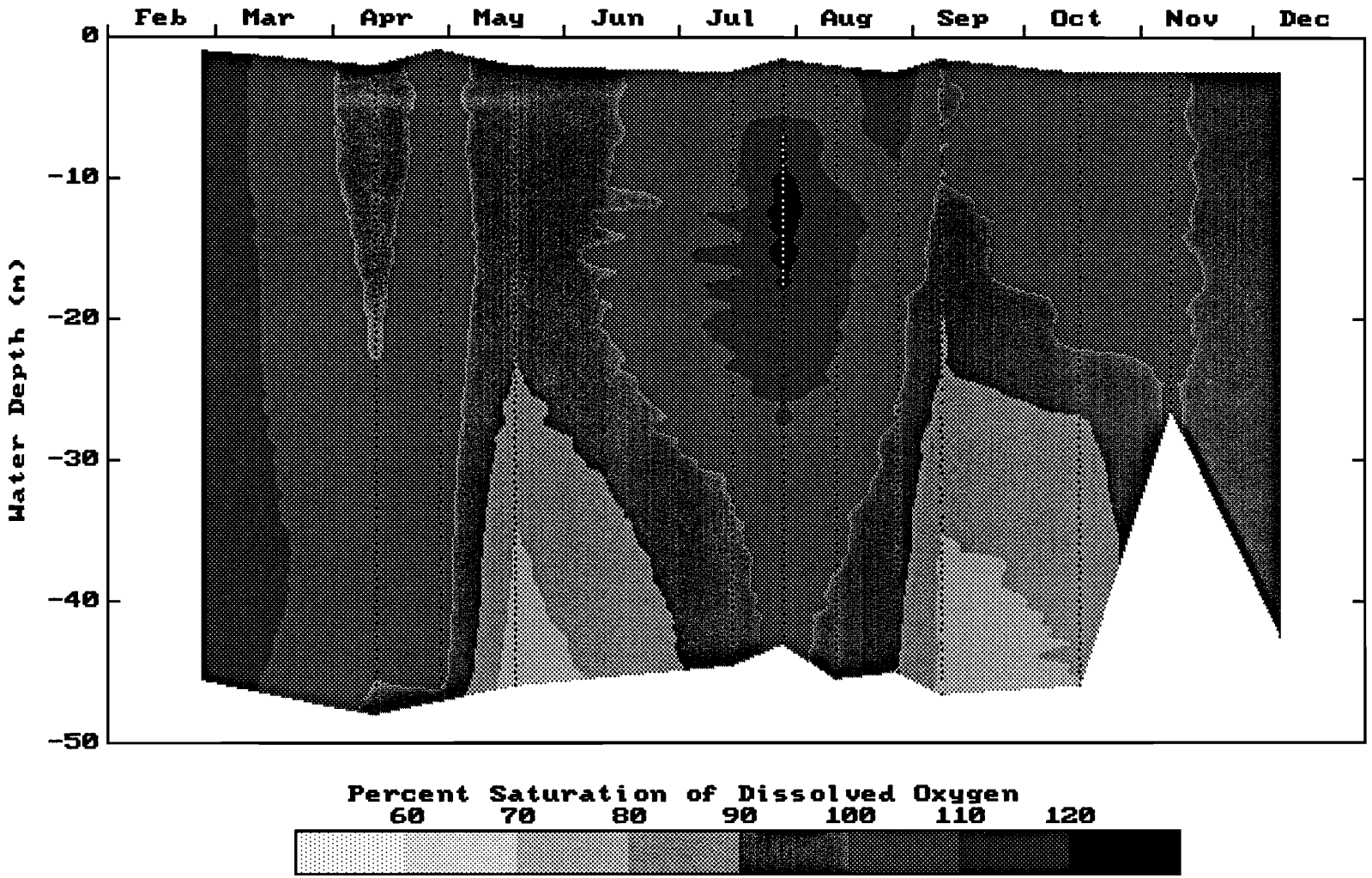
Station F25 during 1992



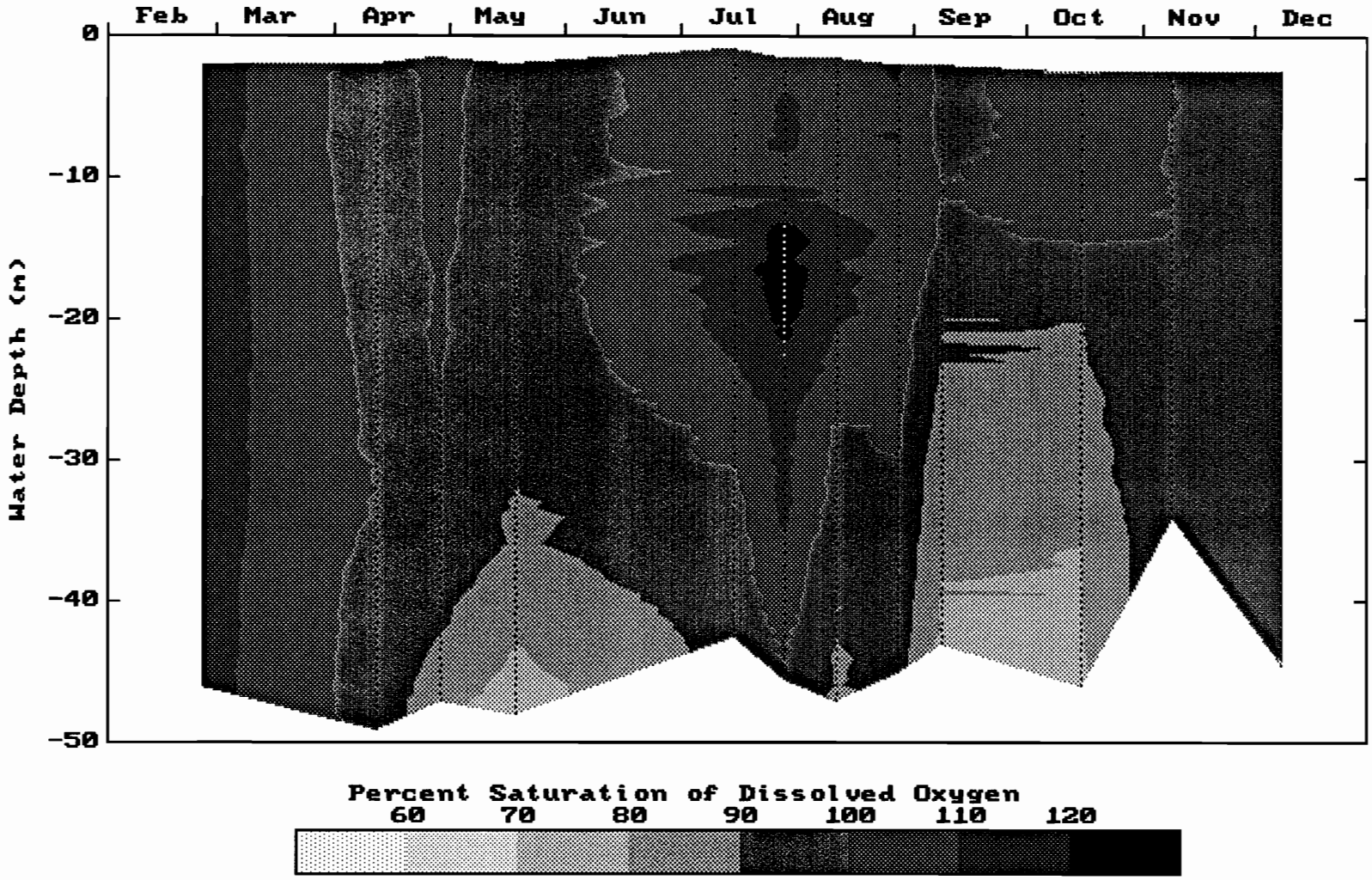
Station N01 during 1992



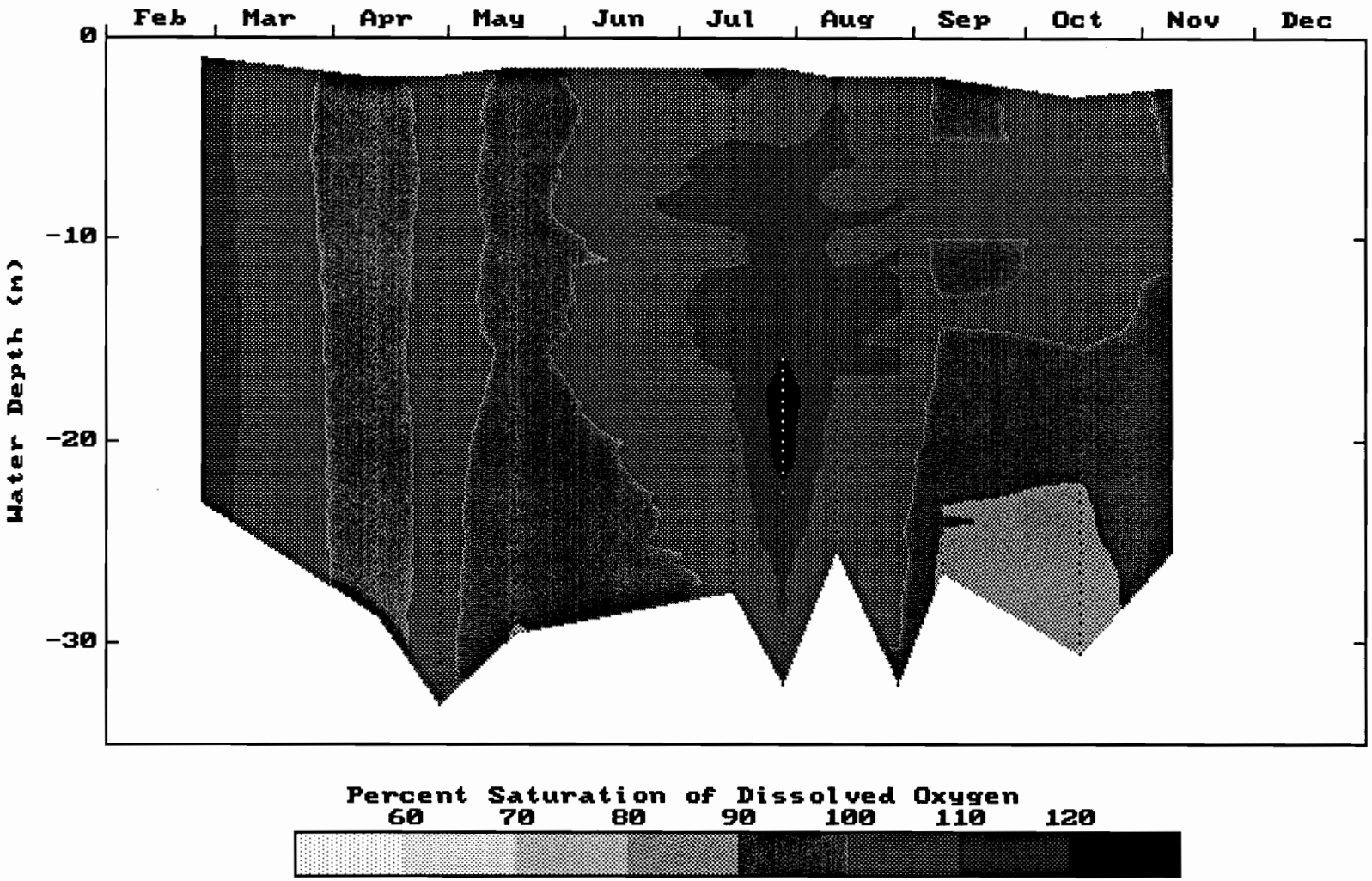
Station N04 during 1992



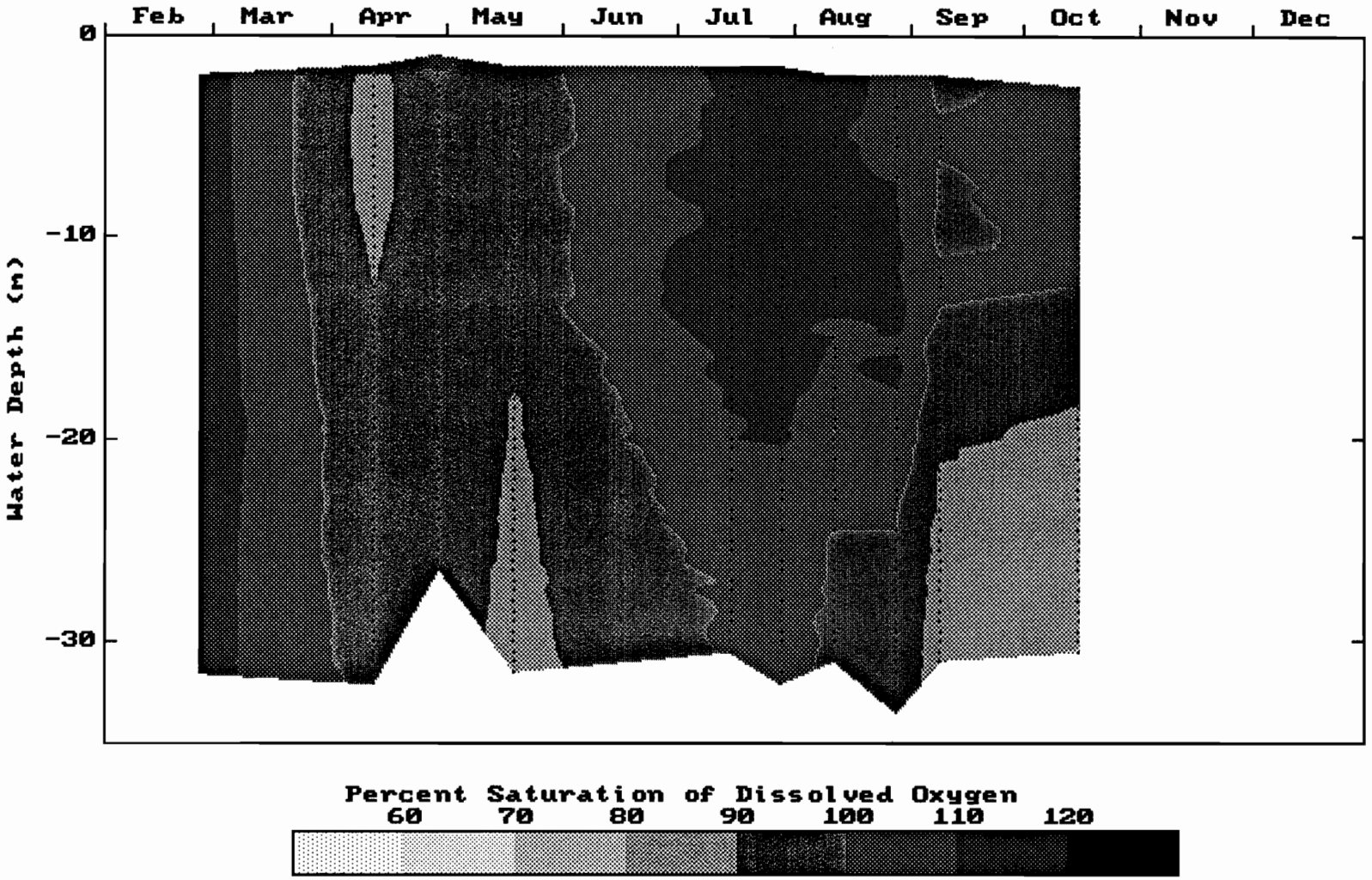
Station N07 during 1992



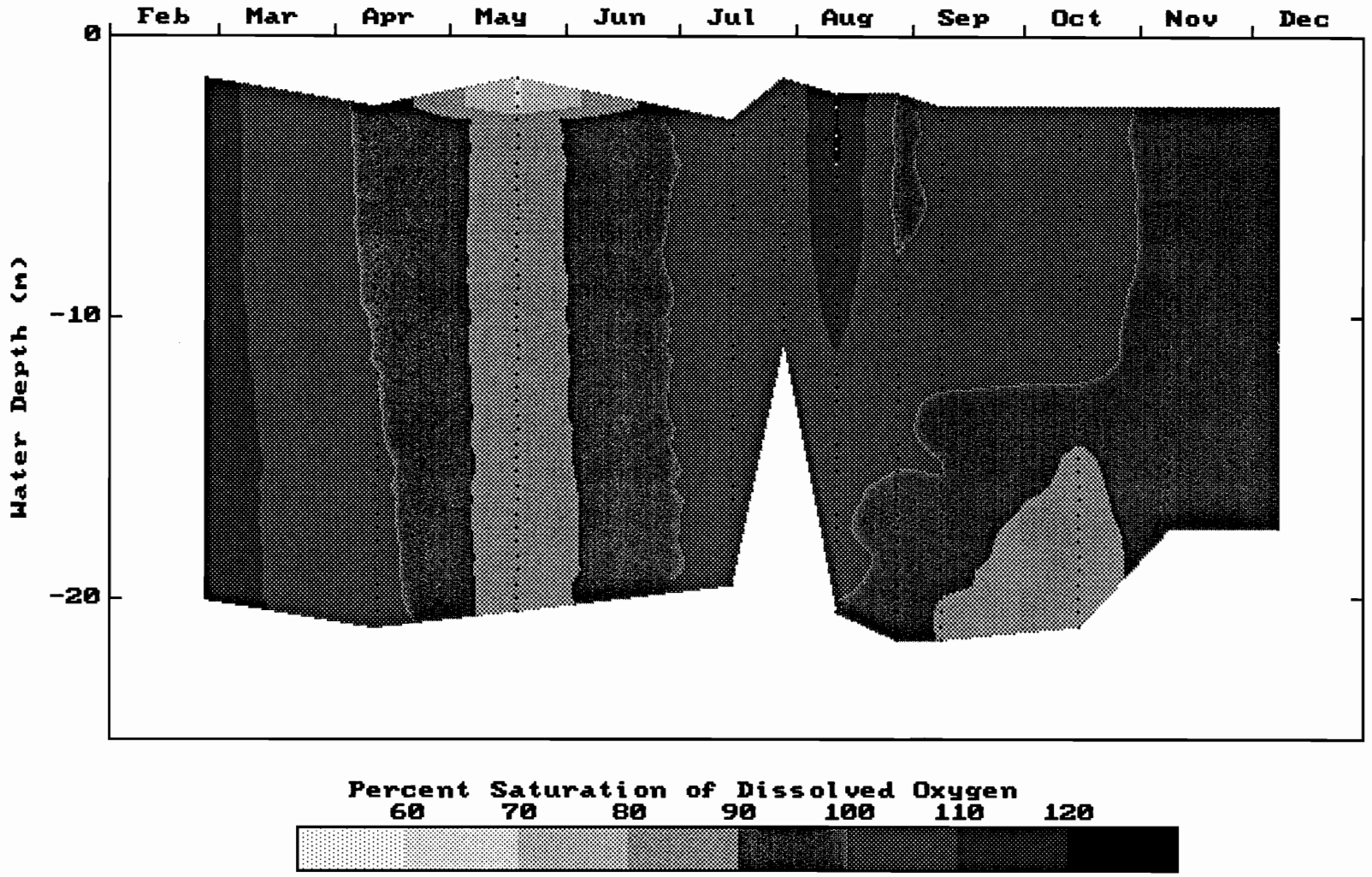
Station N08 during 1992



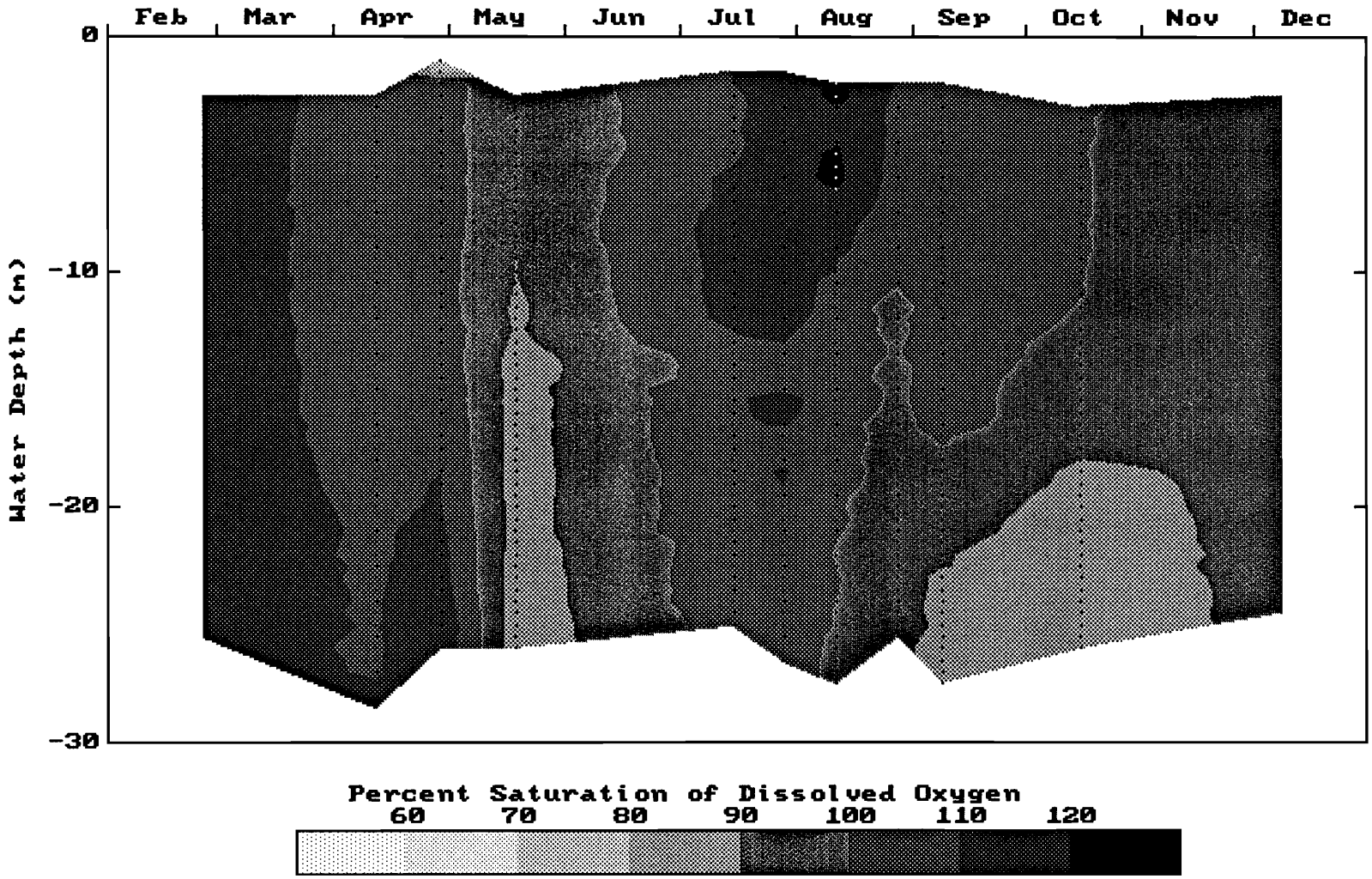
Station N09 during 1992



Station N10 during 1992

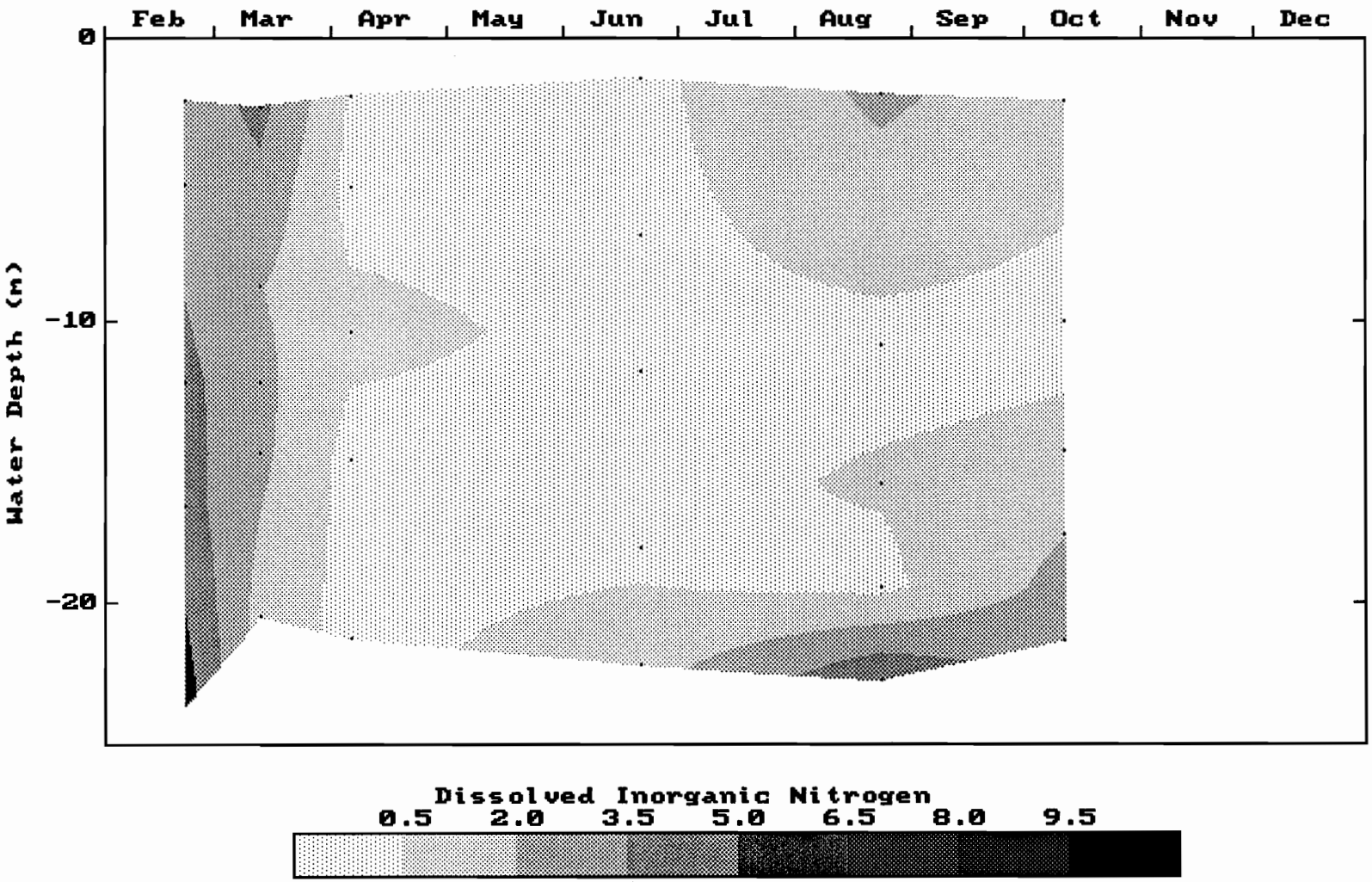


Station N11 during 1992

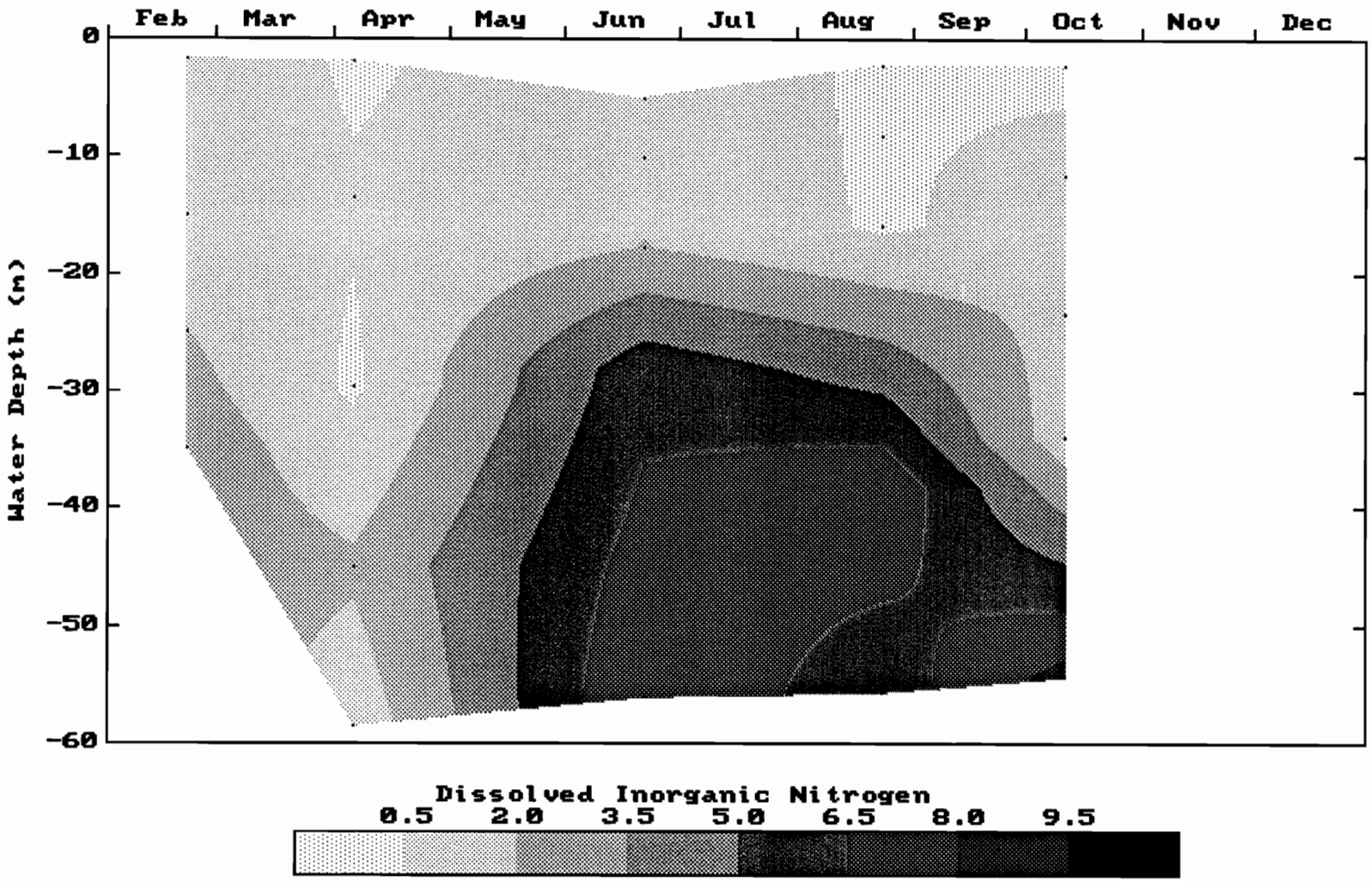


Dissolved inorganic nitrogen

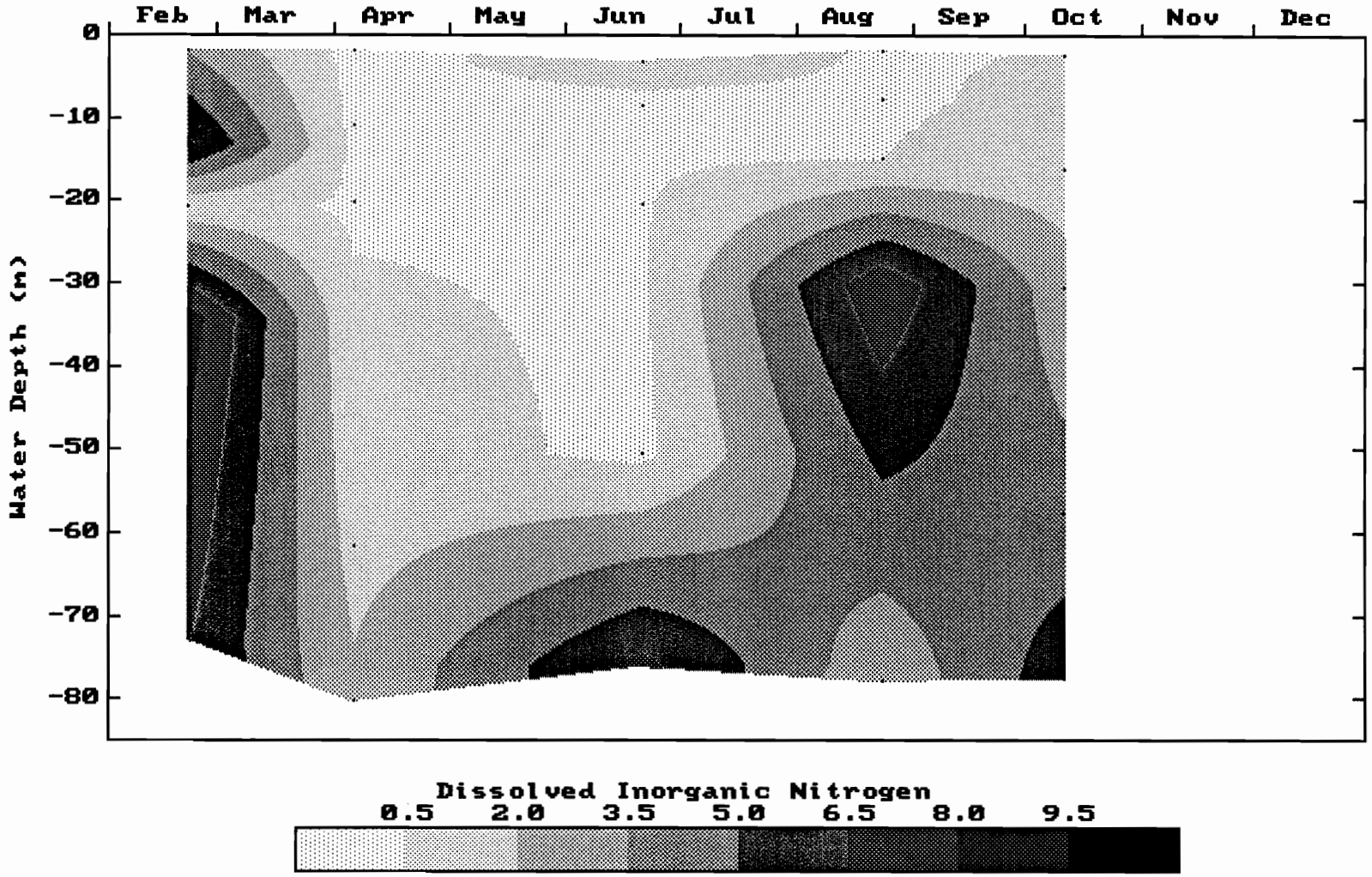
Station F01 during 1992



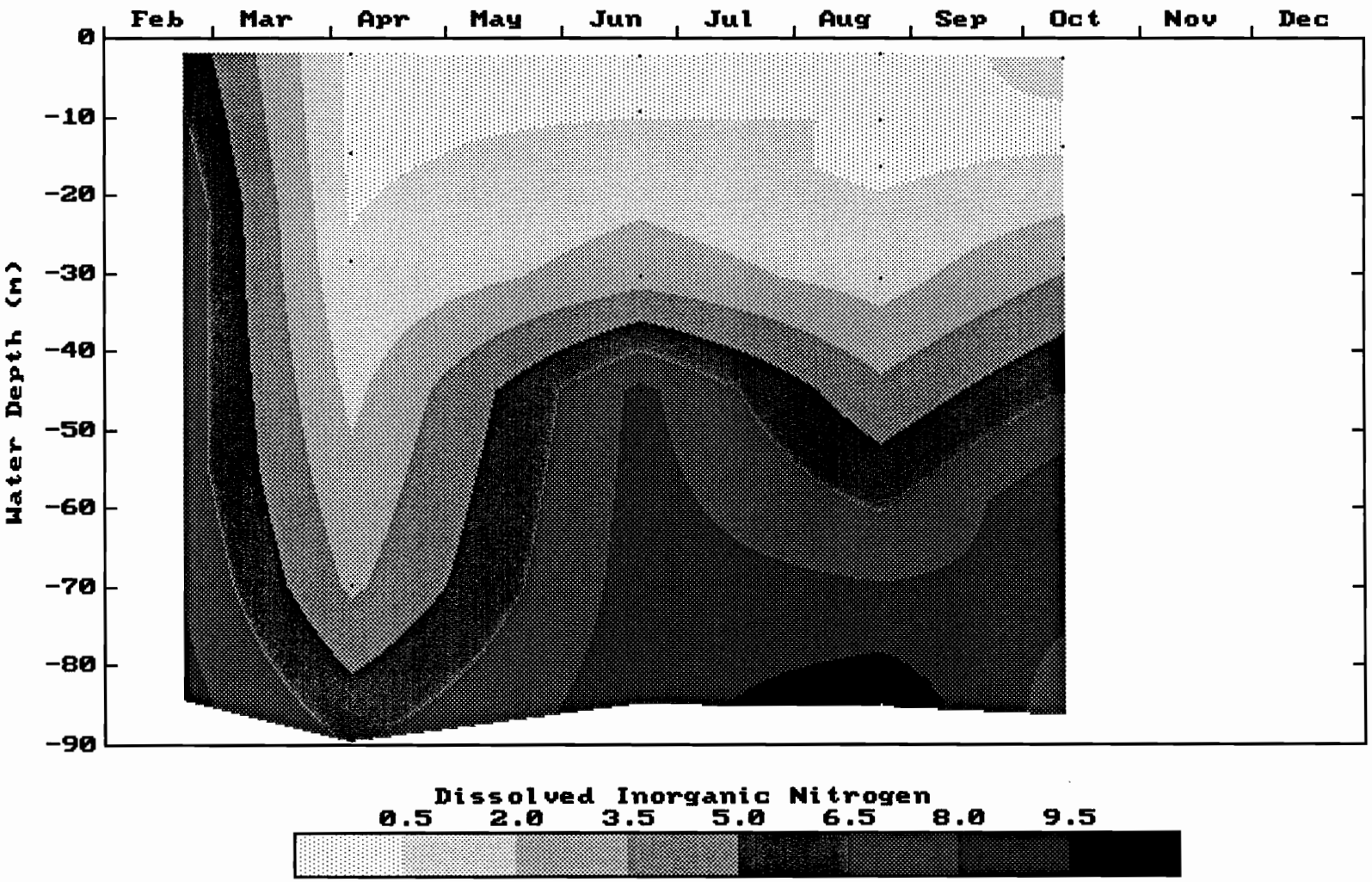
Station F04 during 1992



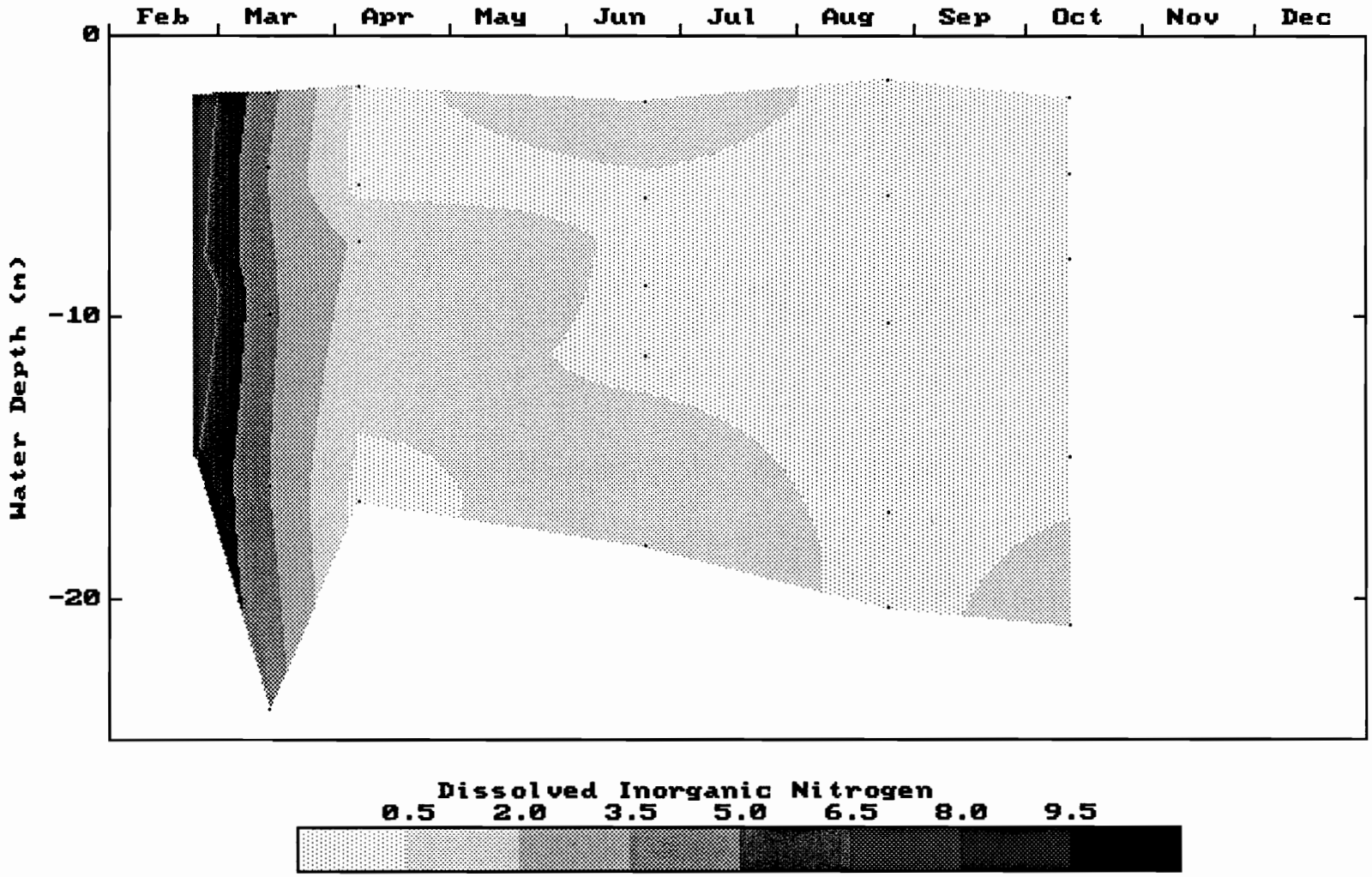
Station F08 during 1992



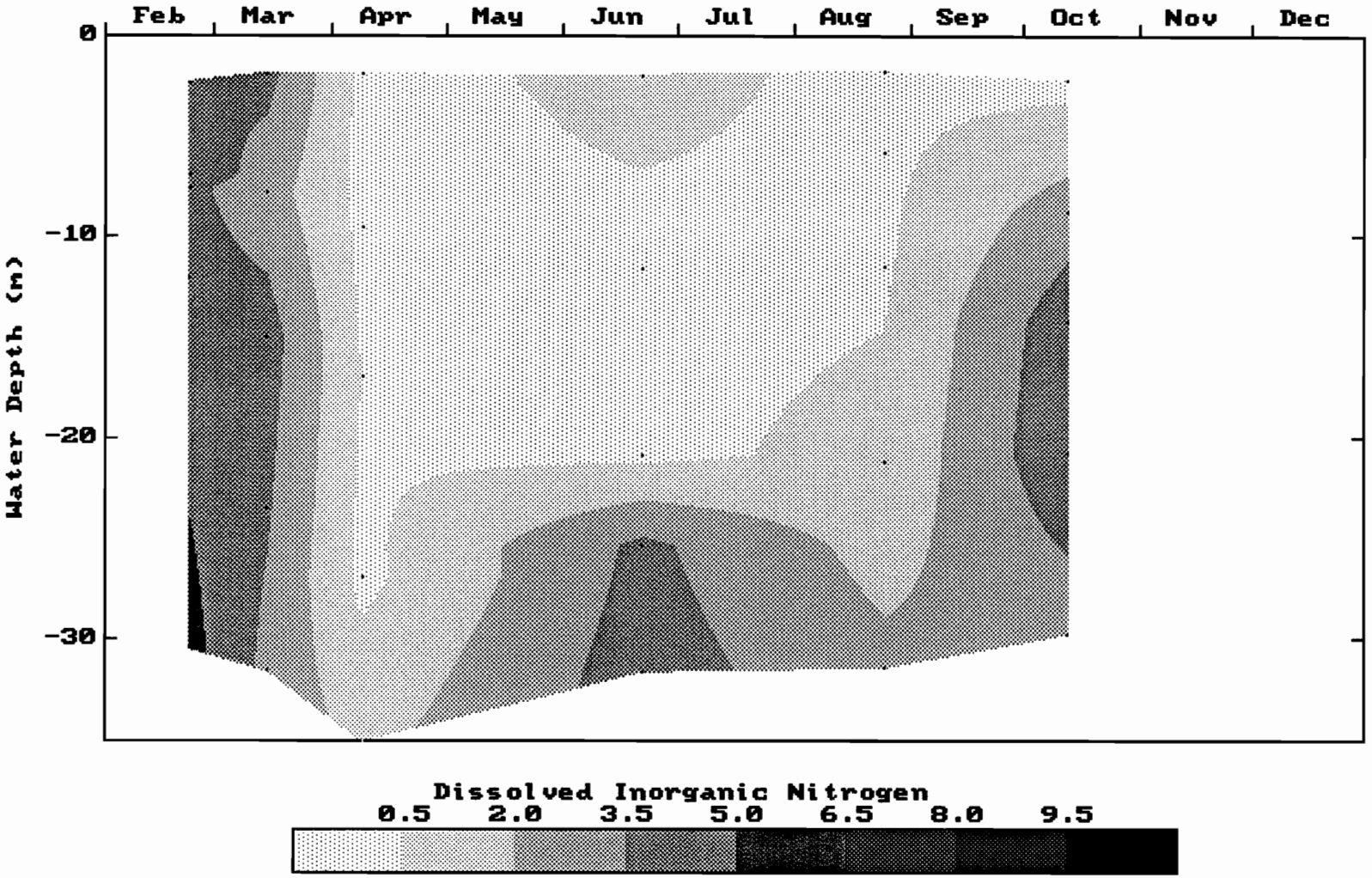
Station F12 during 1992



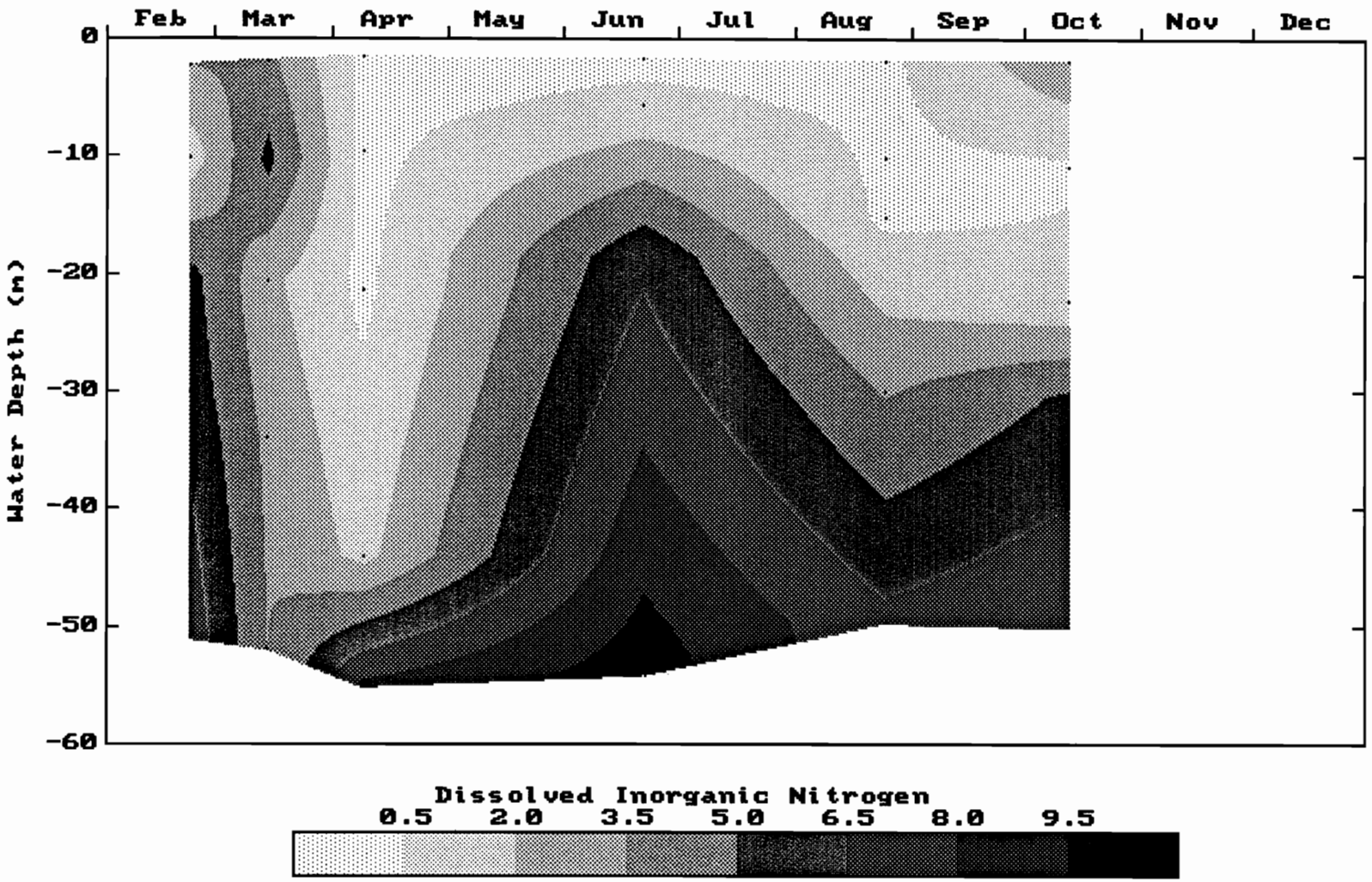
Station F13 during 1992



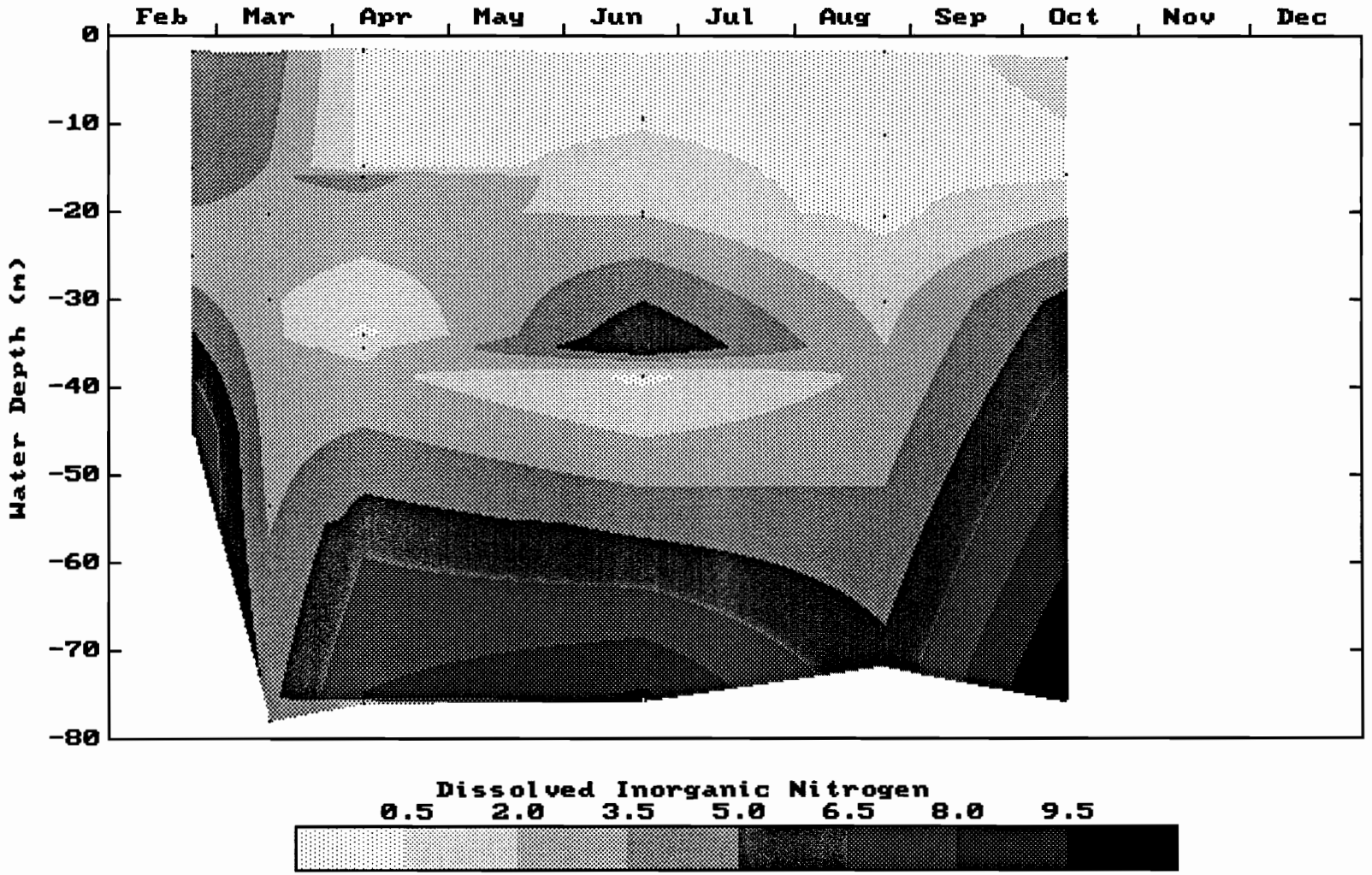
Station F20 during 1992



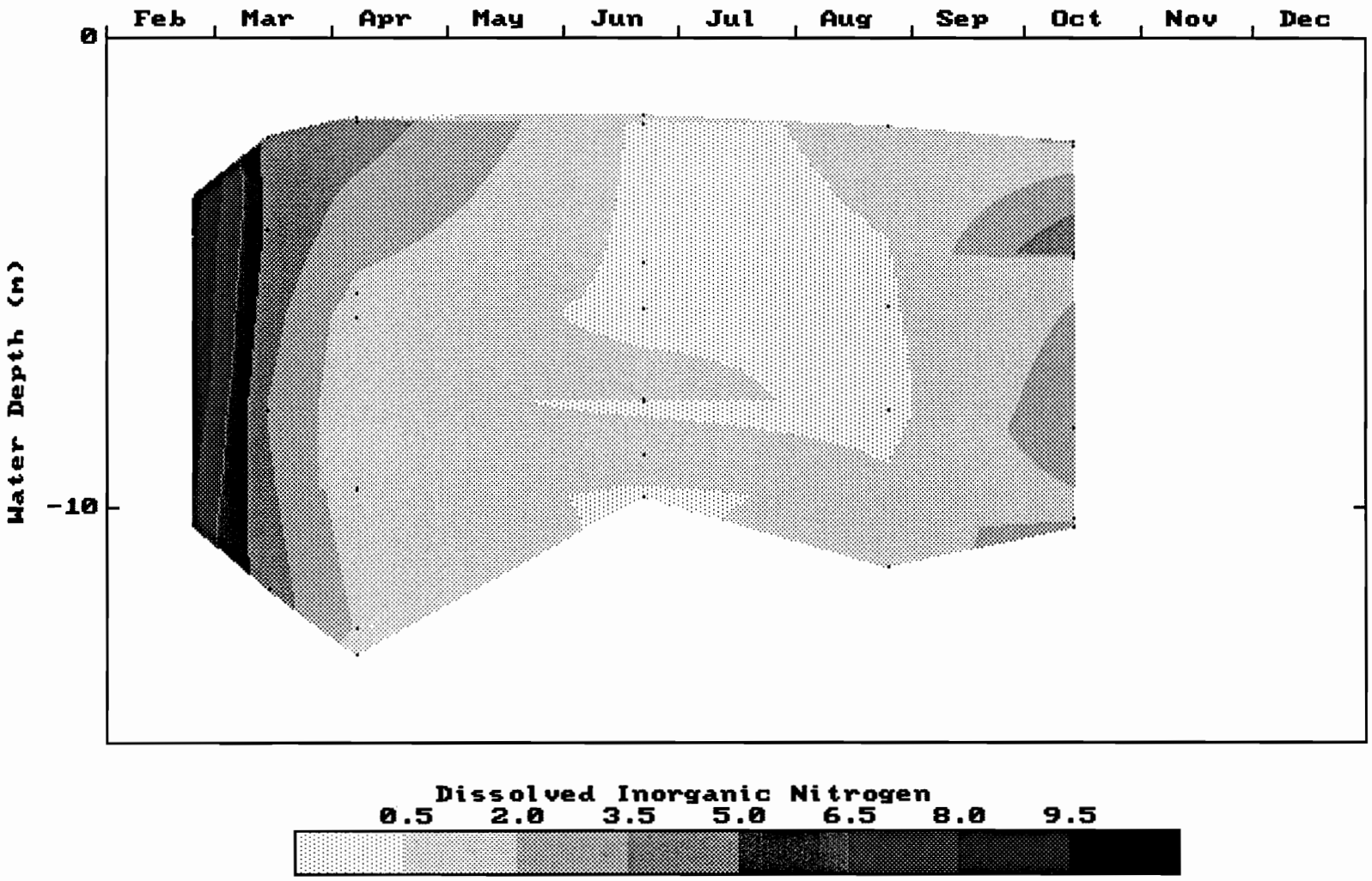
Station F21 during 1992



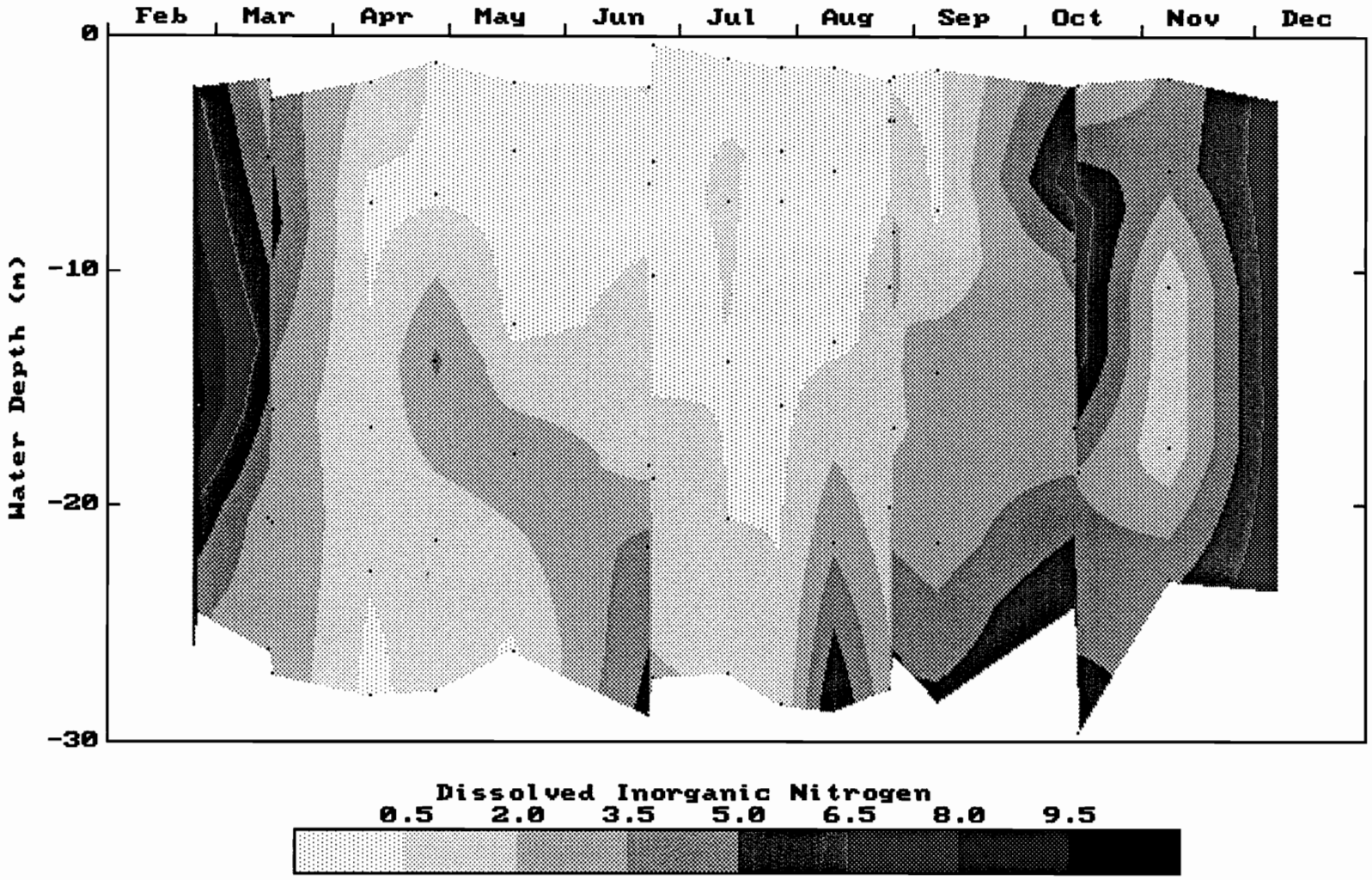
Station F22 during 1992



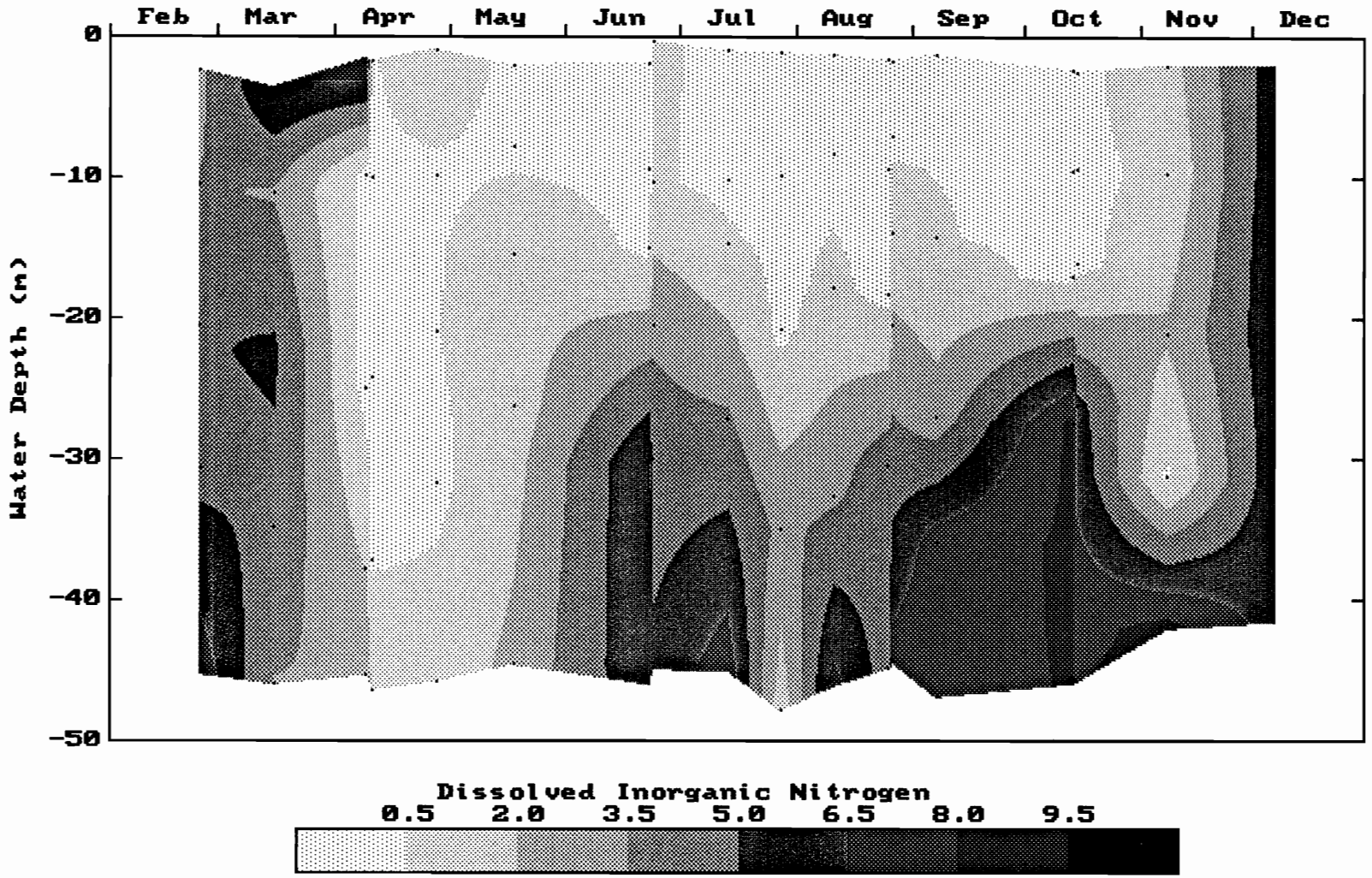
Station F25 during 1992



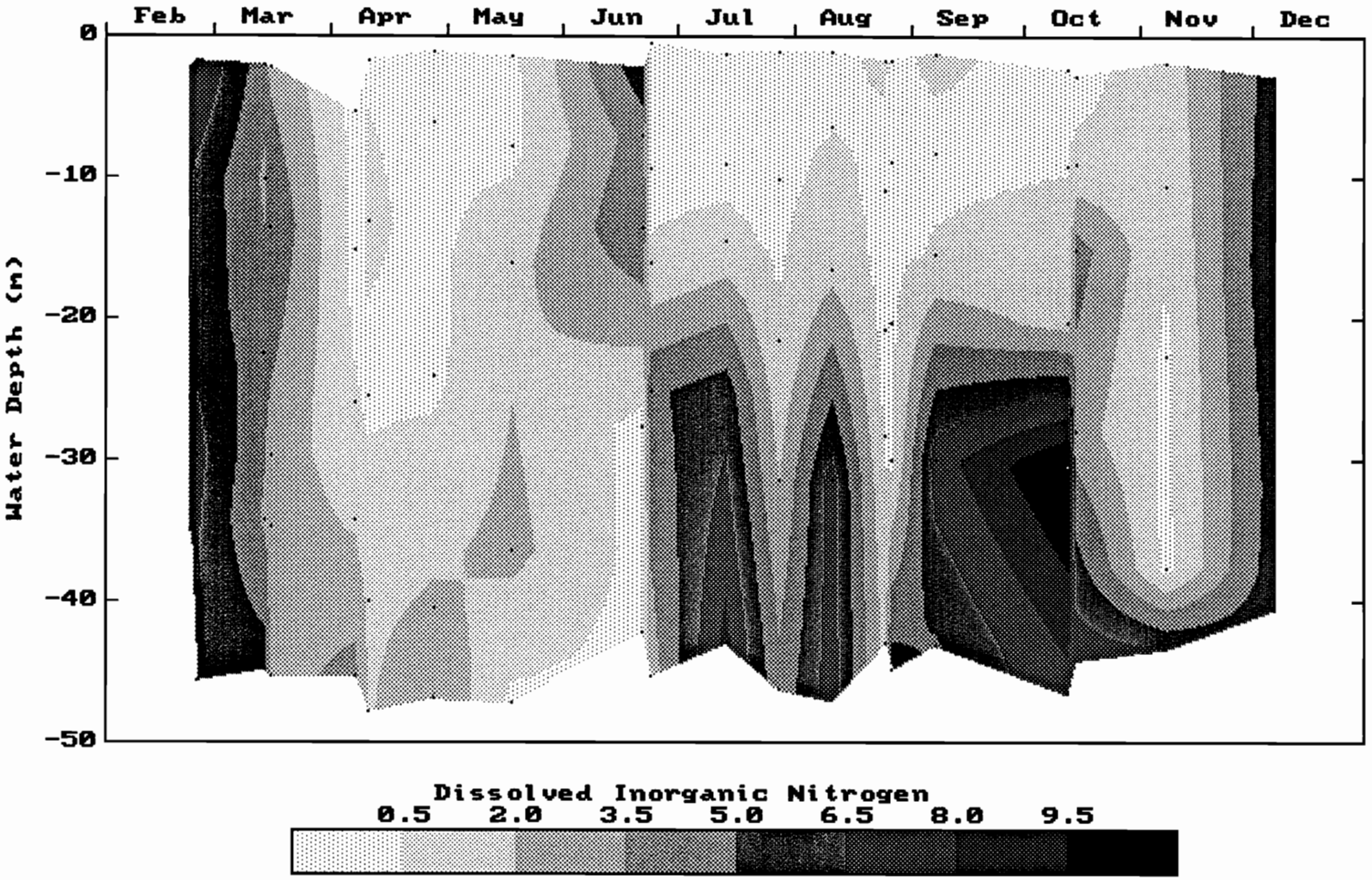
Station N01 during 1992



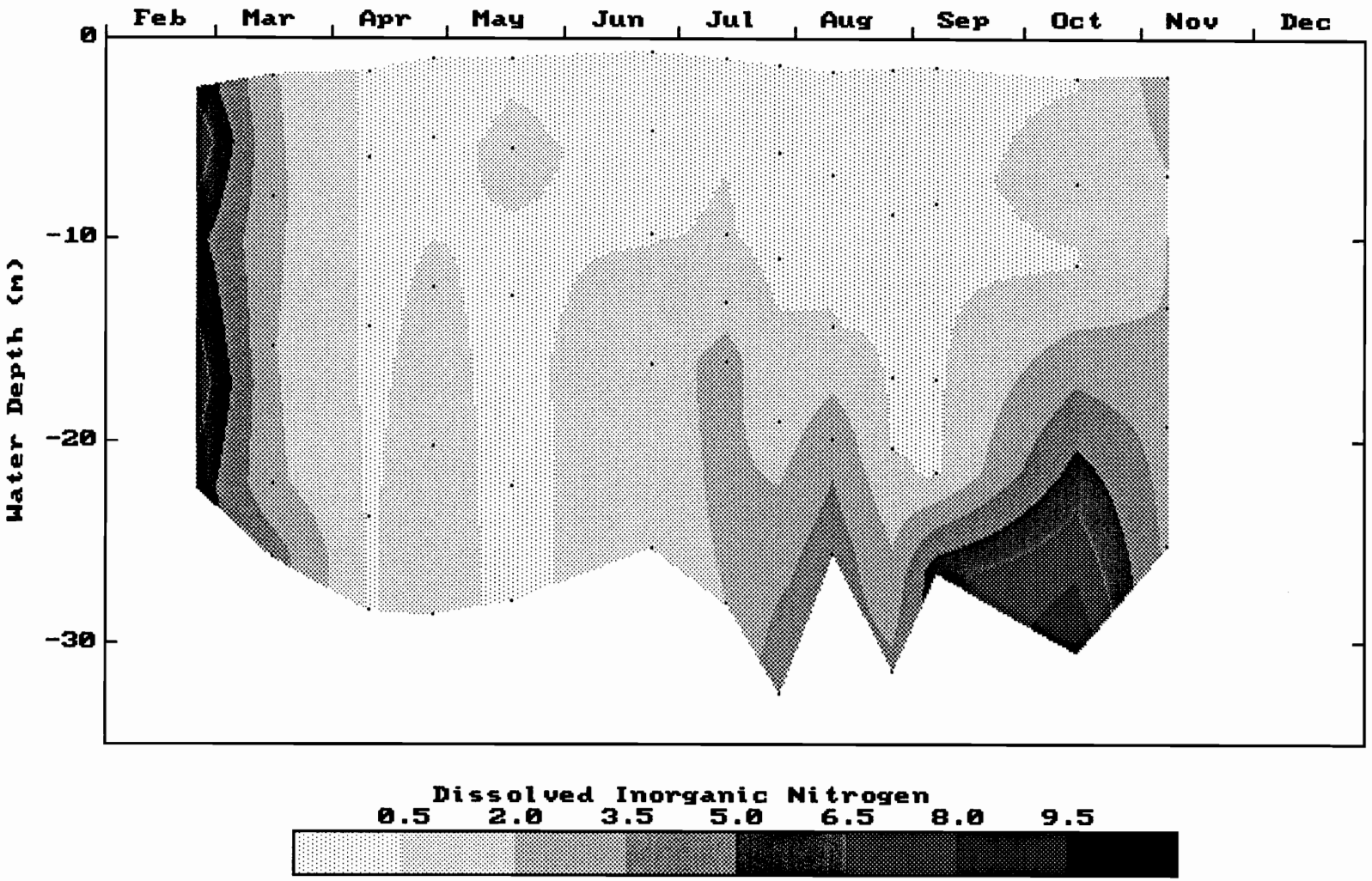
Station N04 during 1992



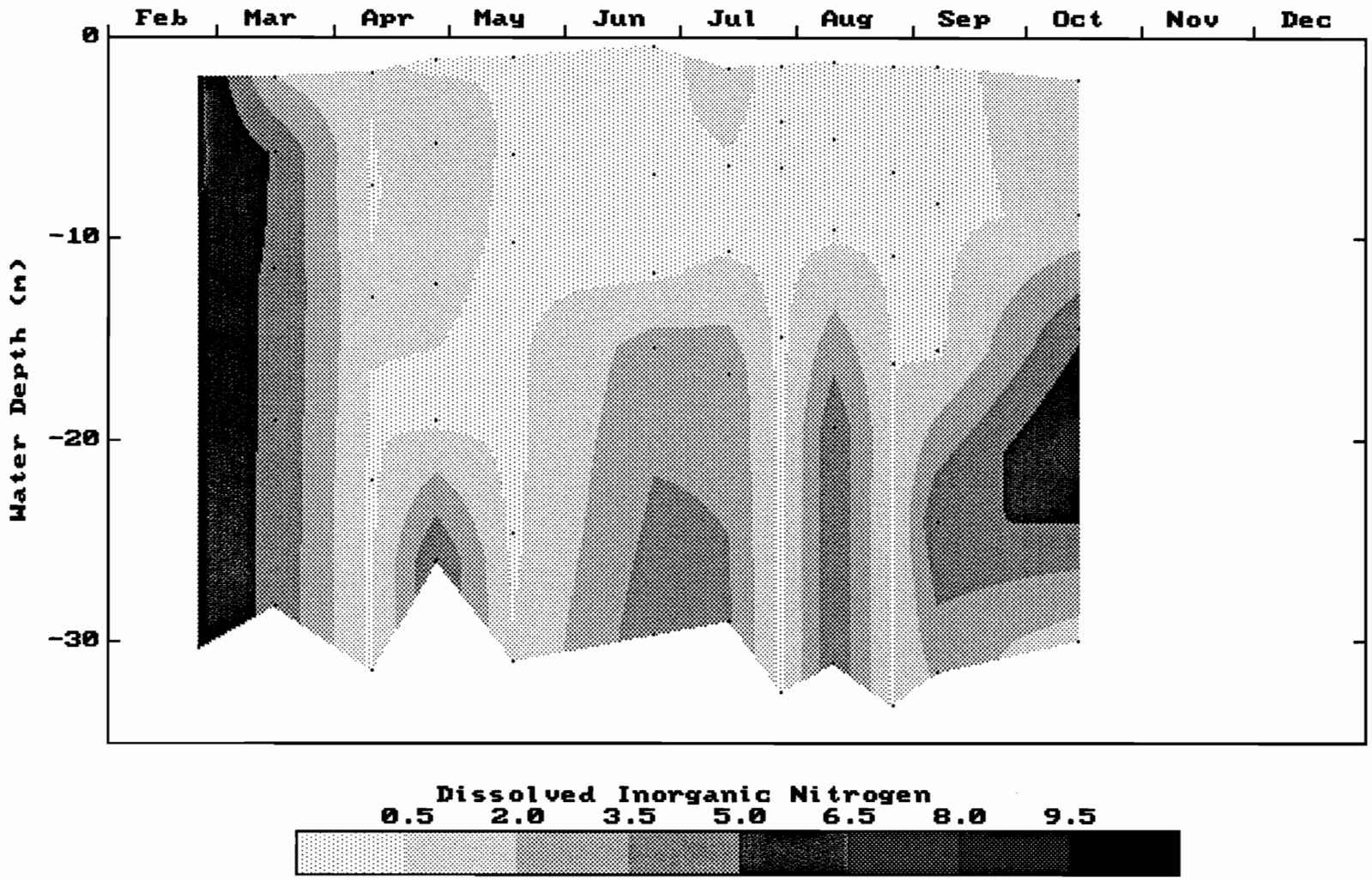
Station N07 during 1992



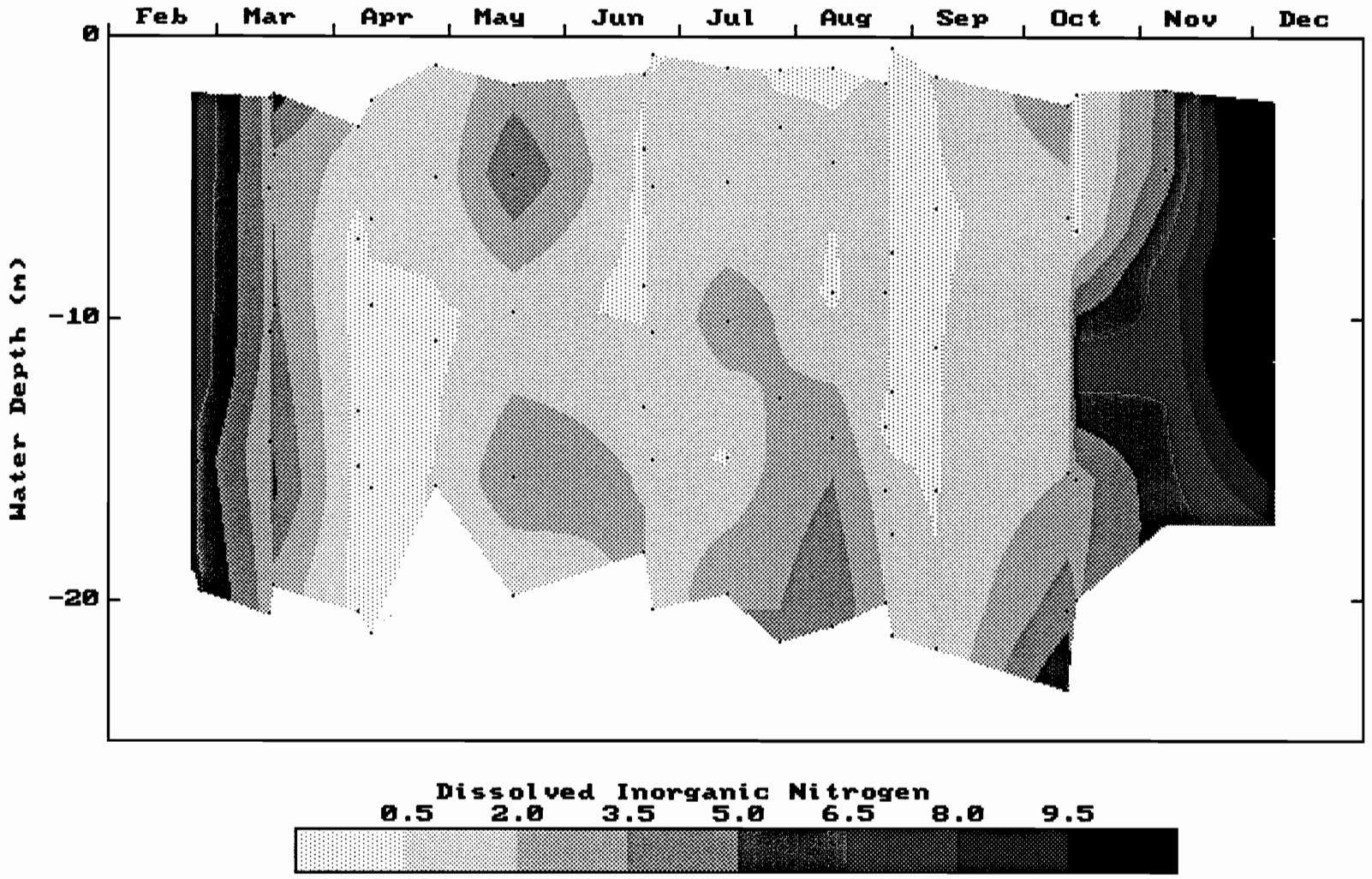
Station N08 during 1992



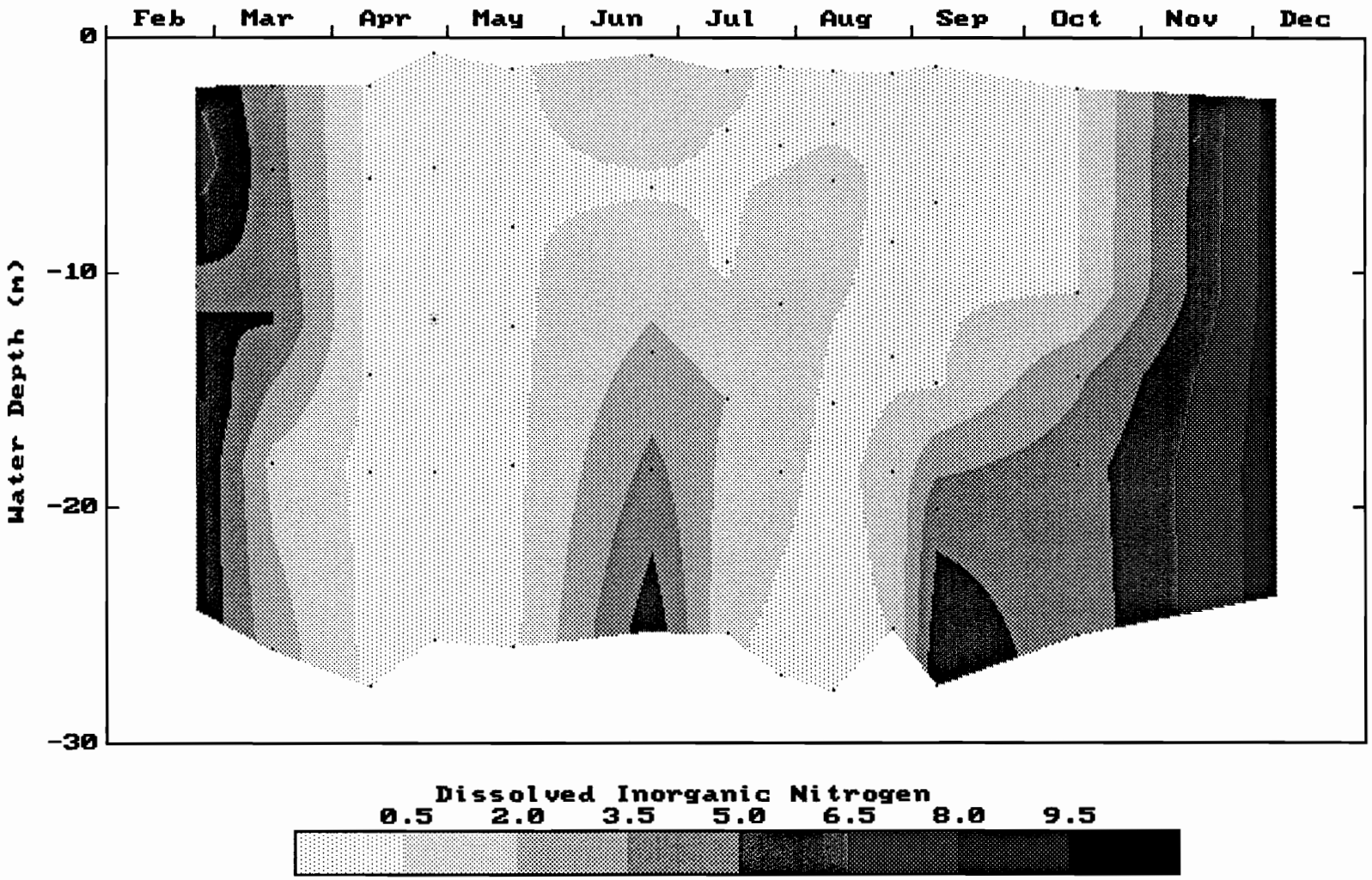
Station N09 during 1992



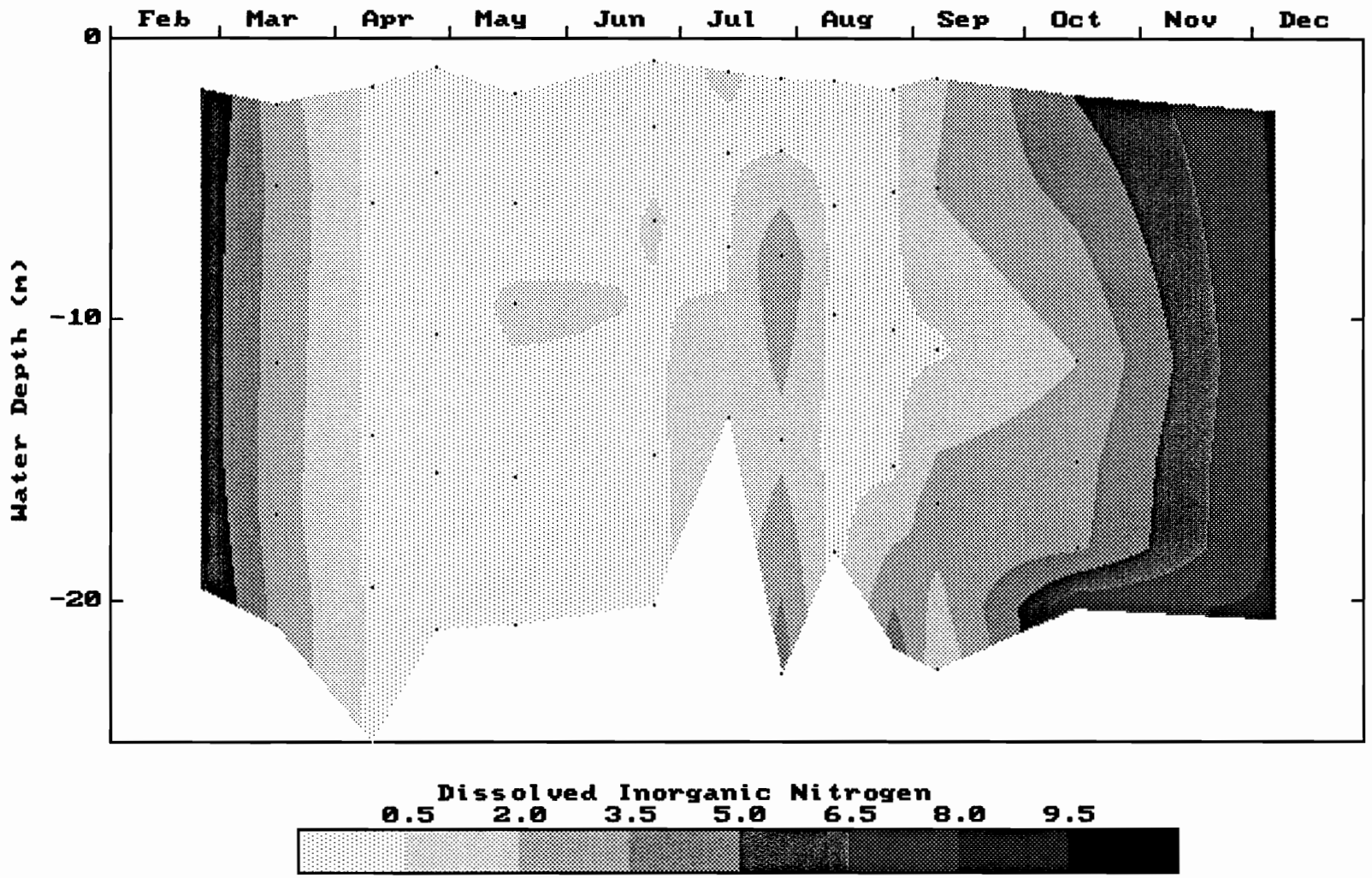
Station N10 during 1992



Station N11 during 1992

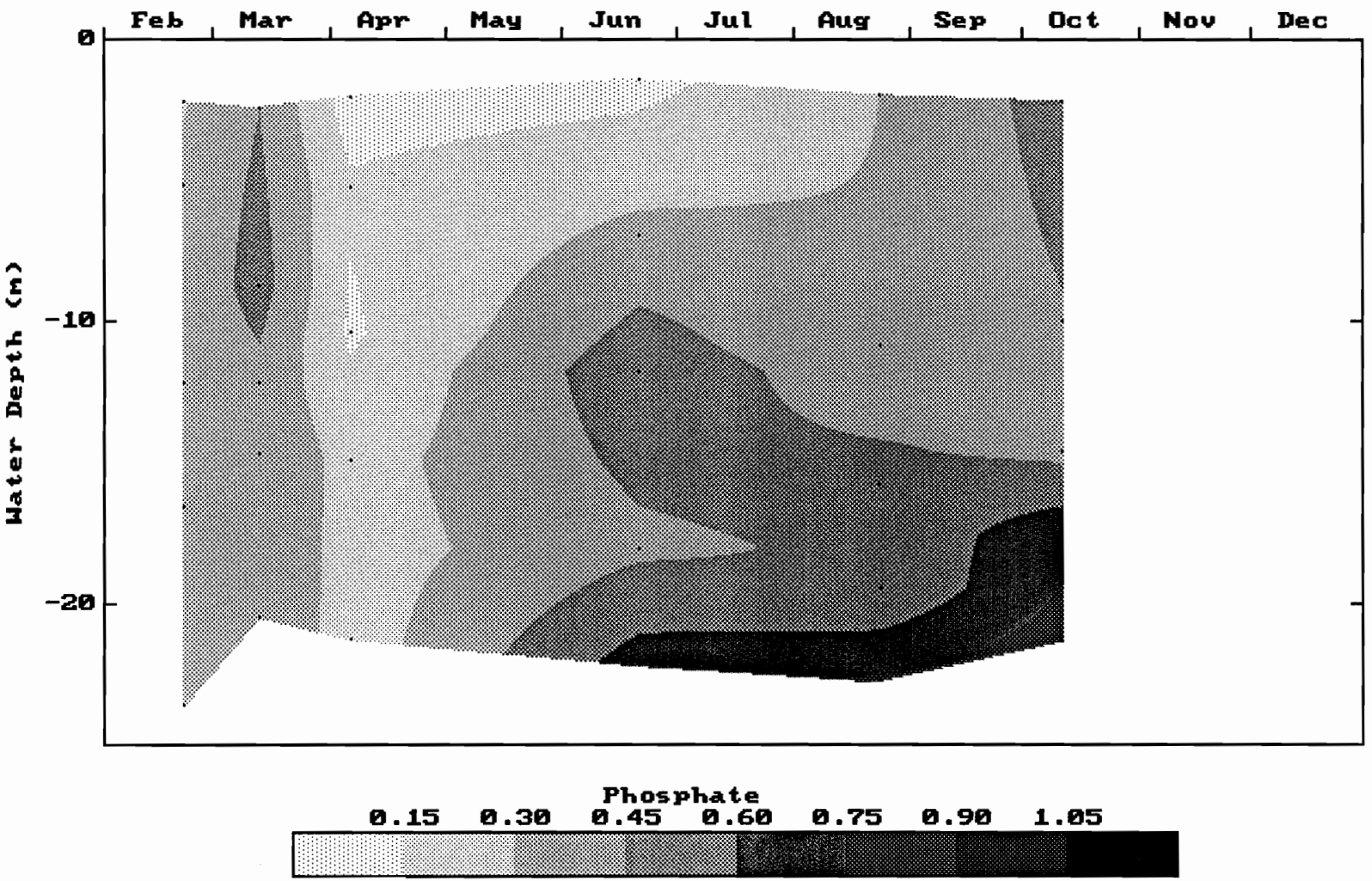


Station N12 during 1992

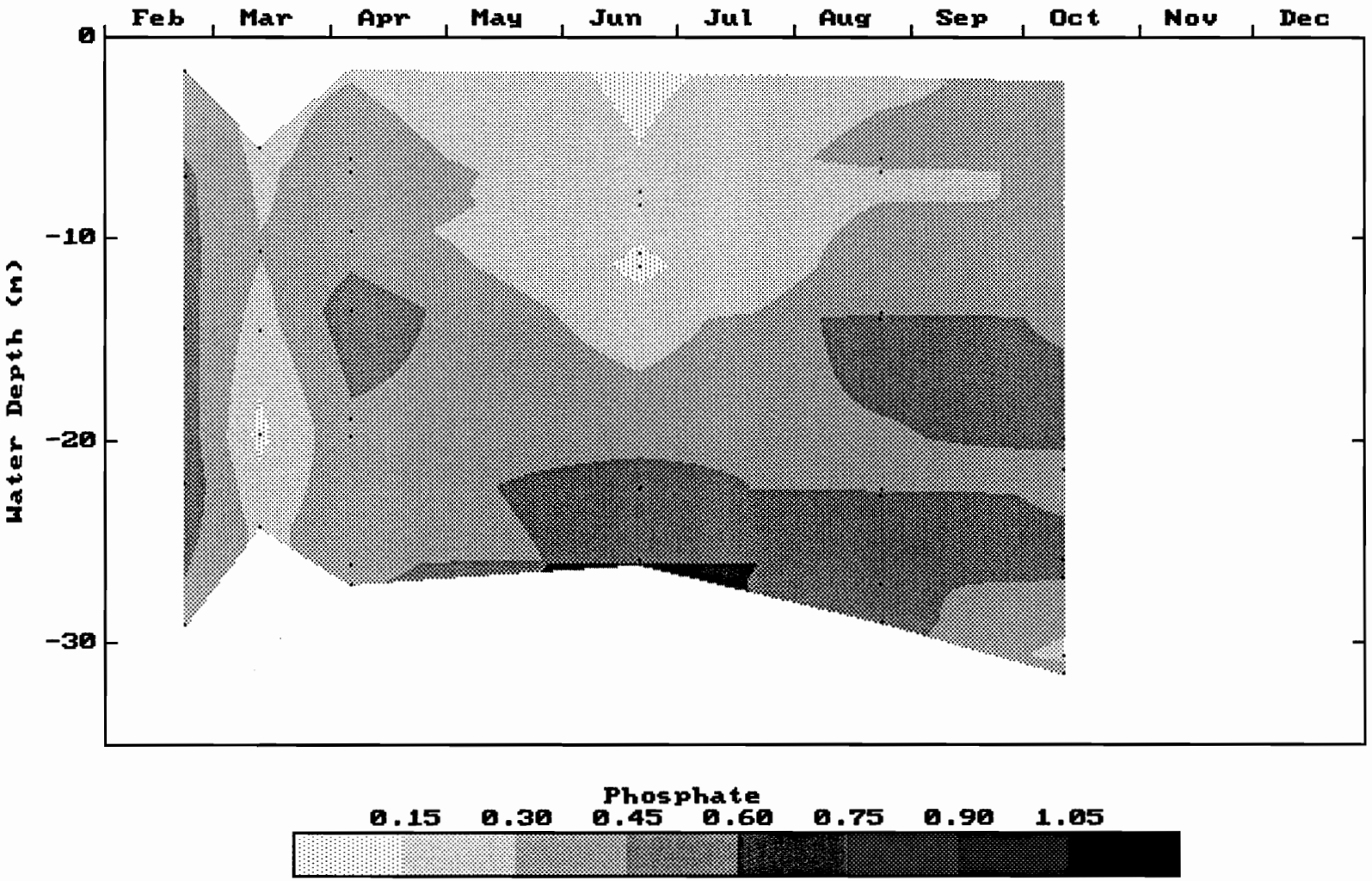


Phosphate

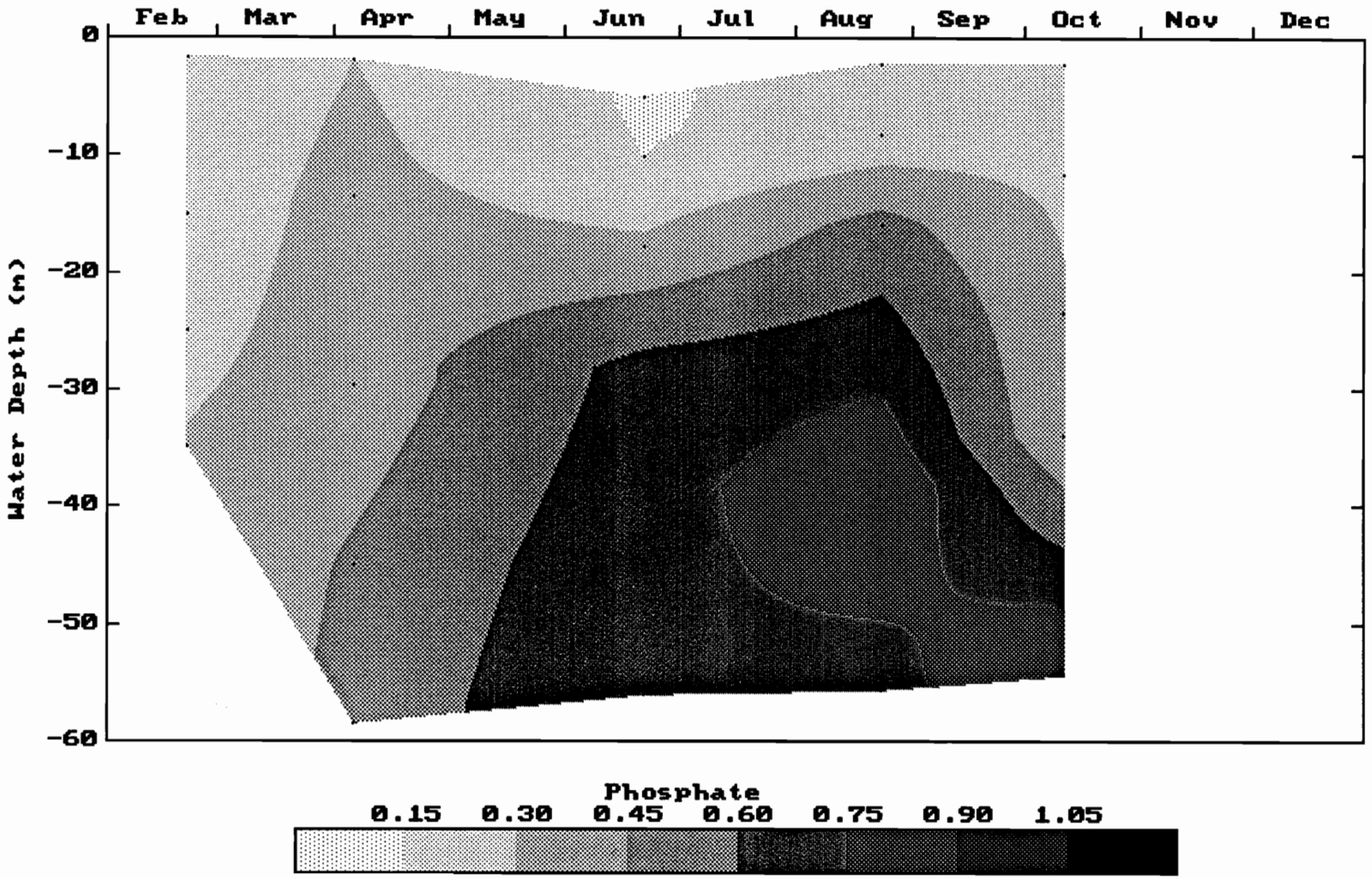
Station F01 during 1992



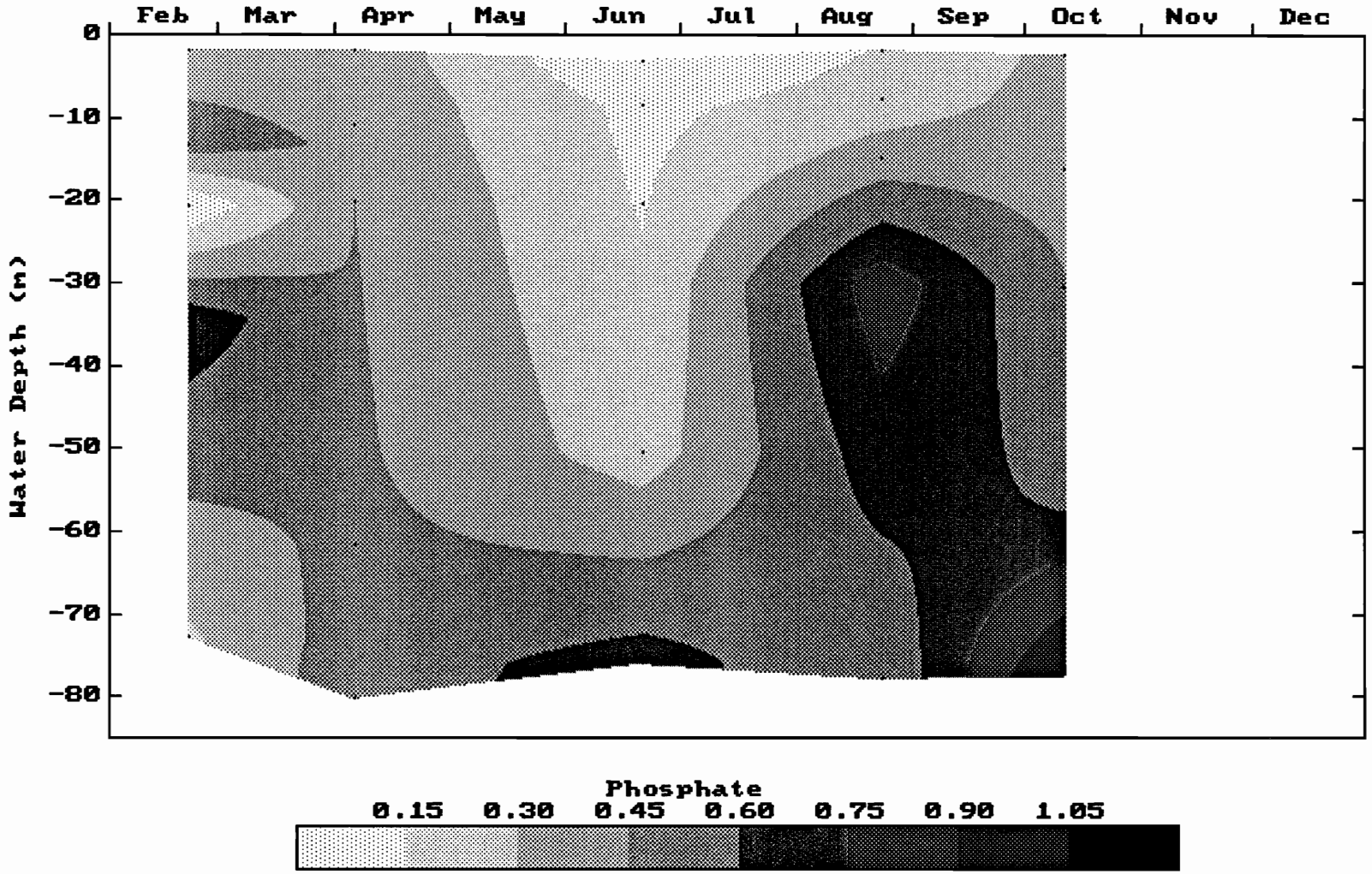
Station F02 during 1992



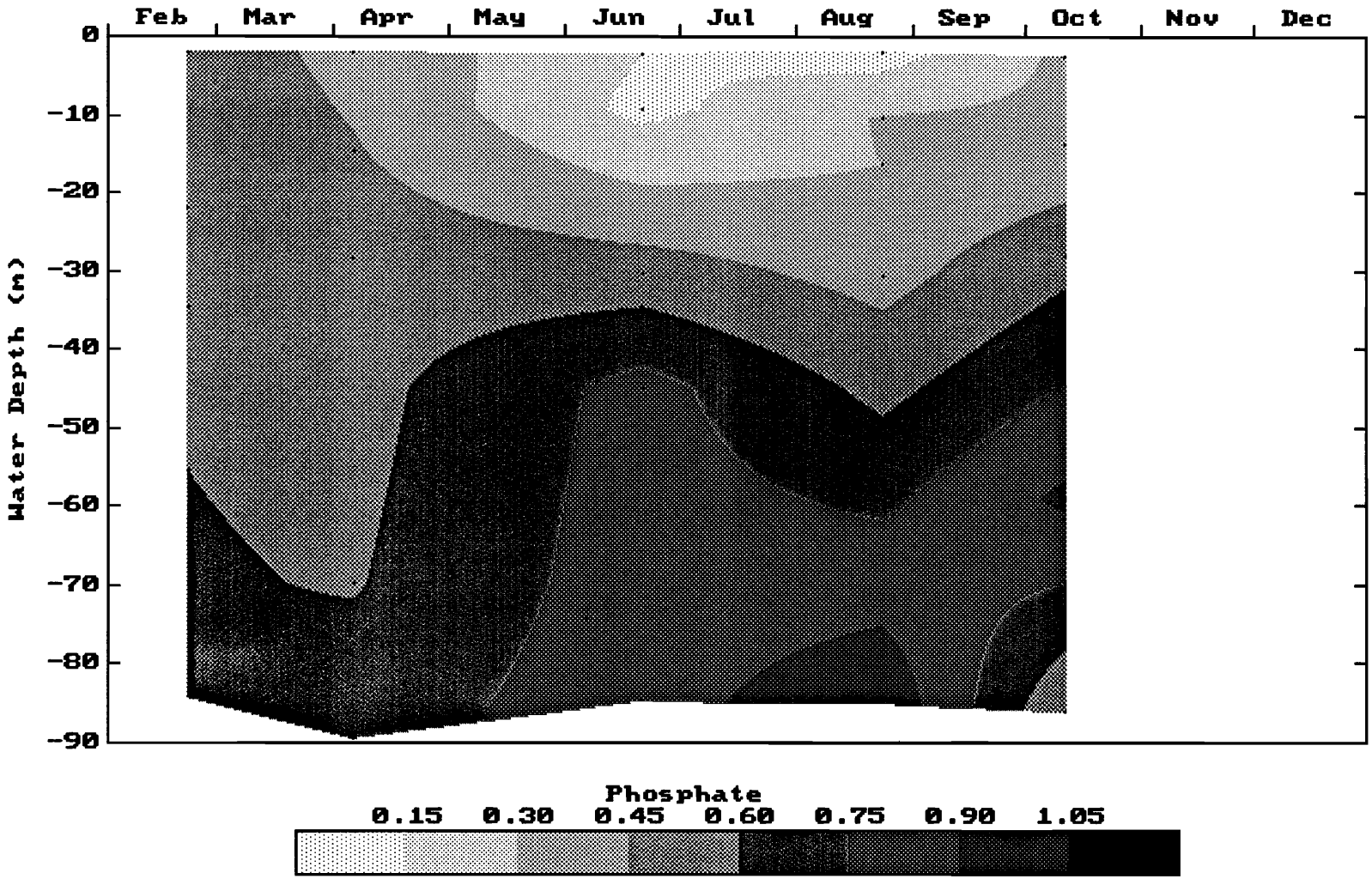
Station F04 during 1992



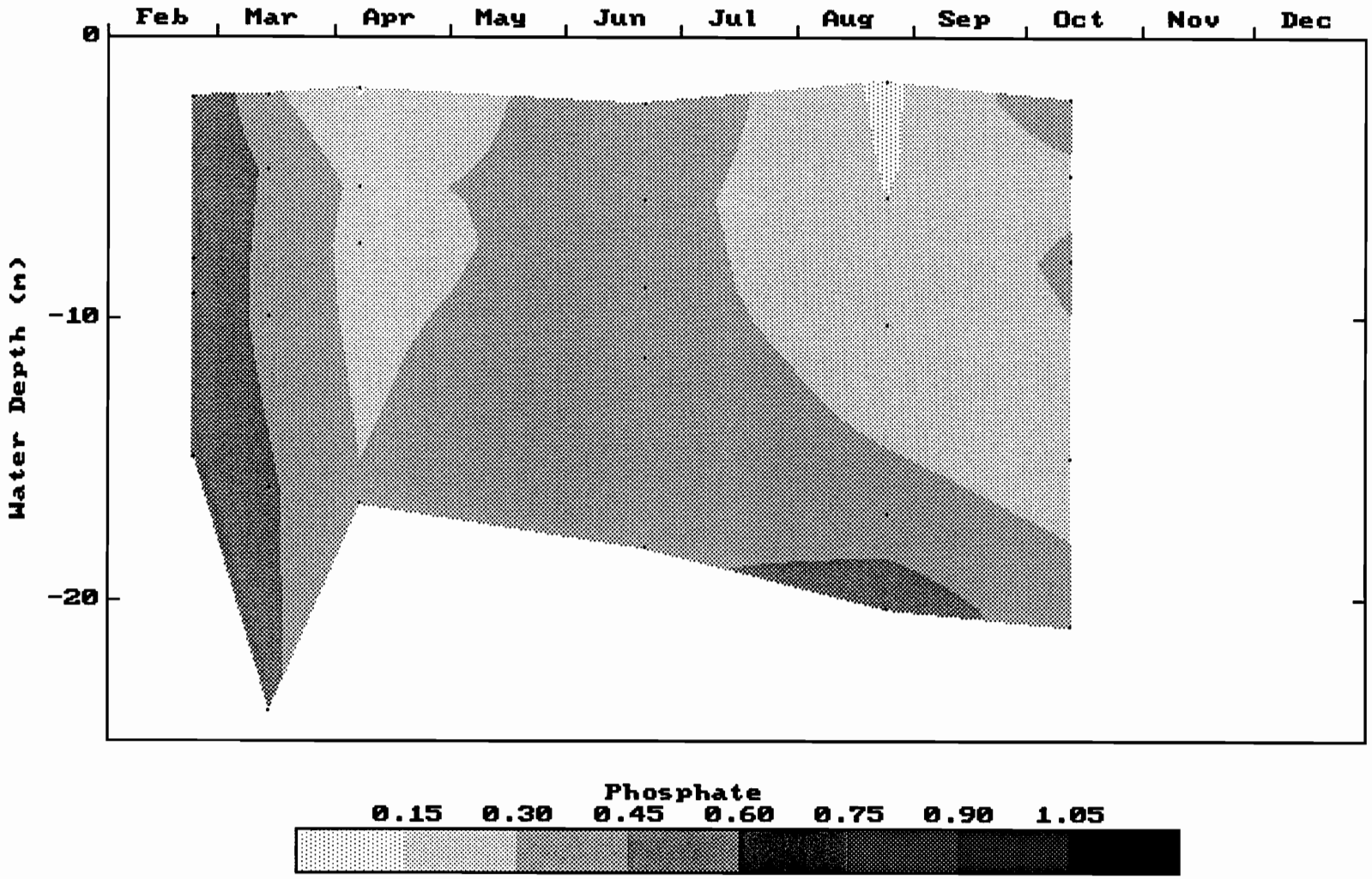
Station F08 during 1992



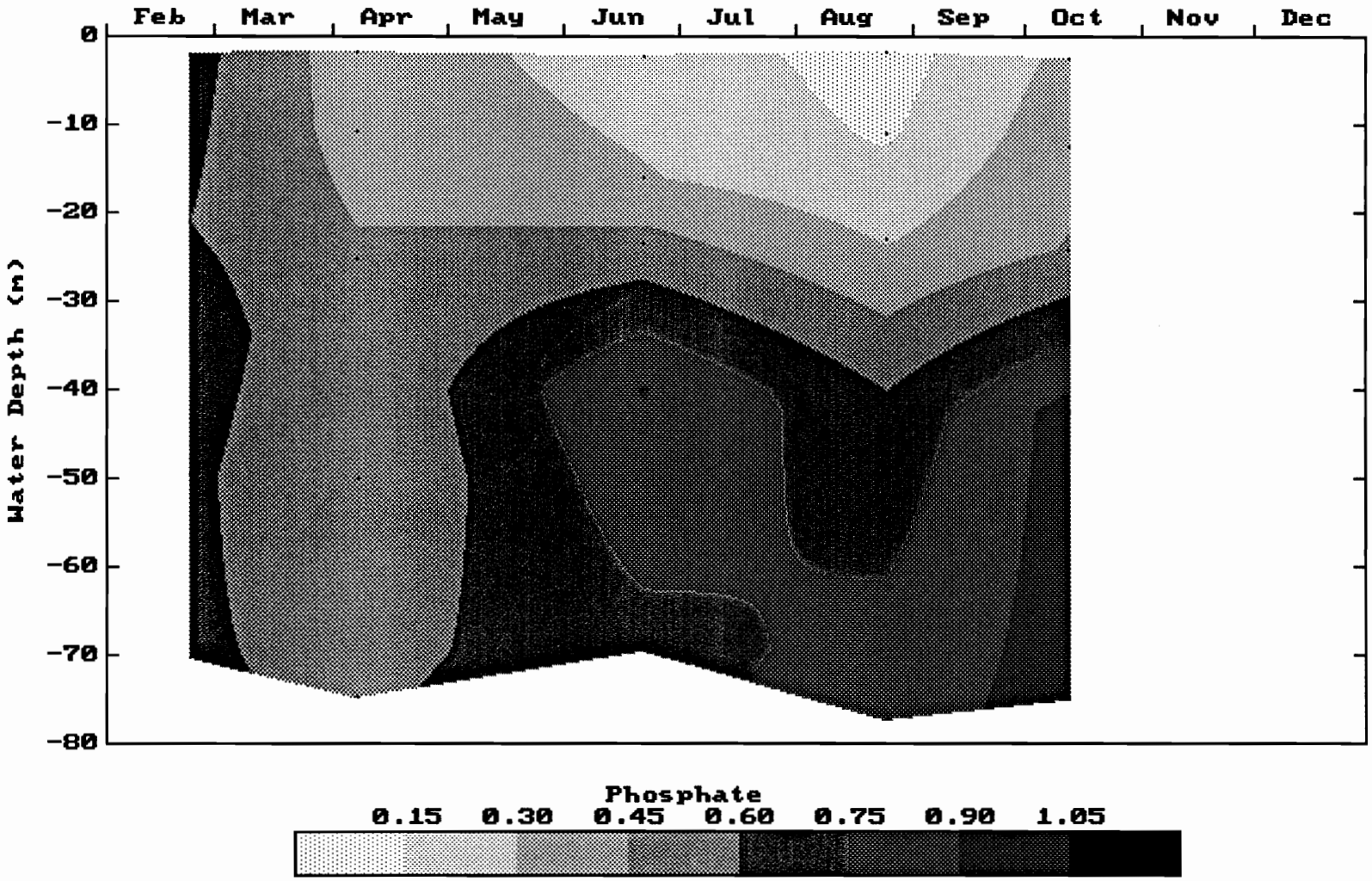
Station F12 during 1992



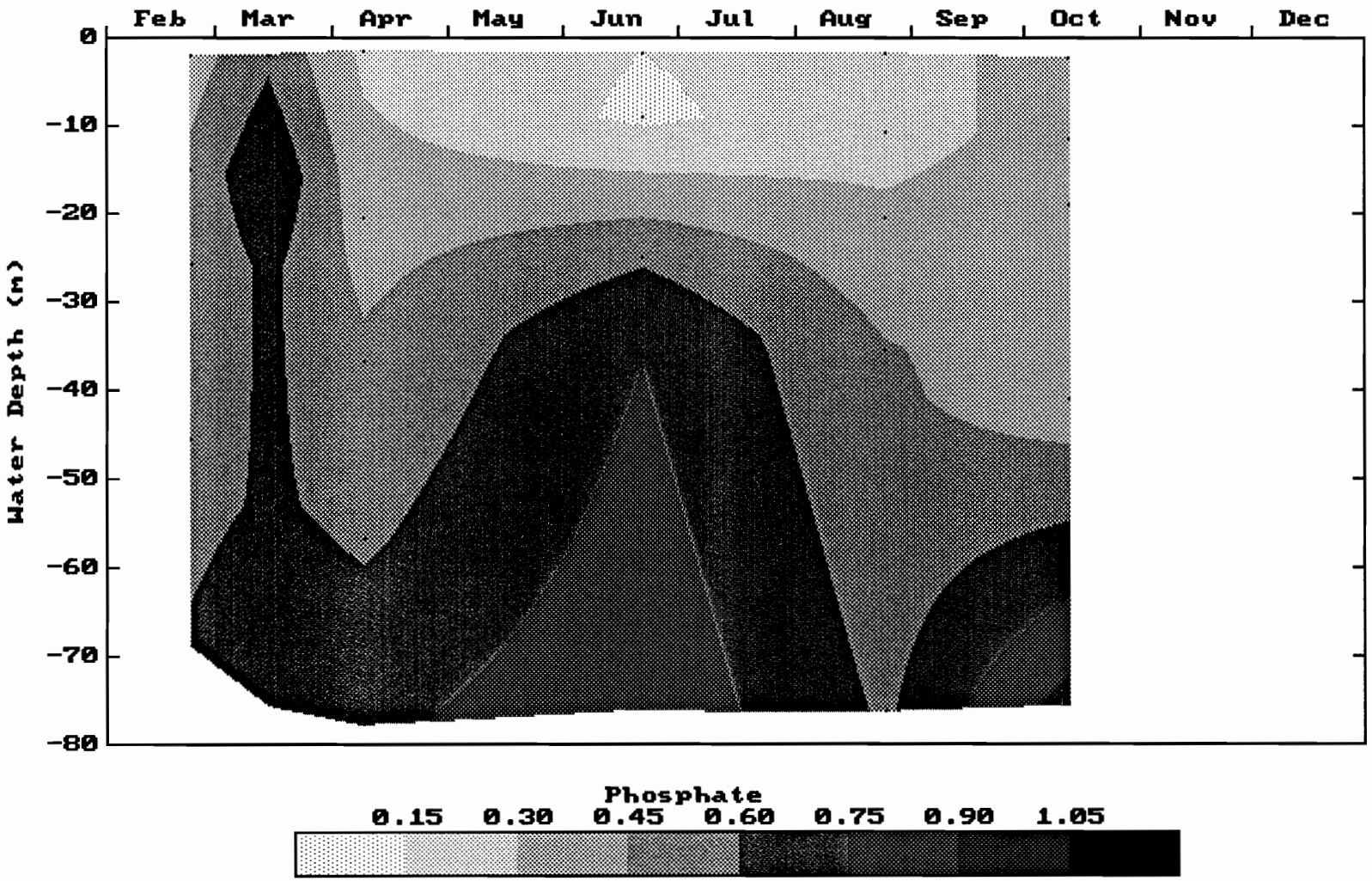
Station F13 during 1992



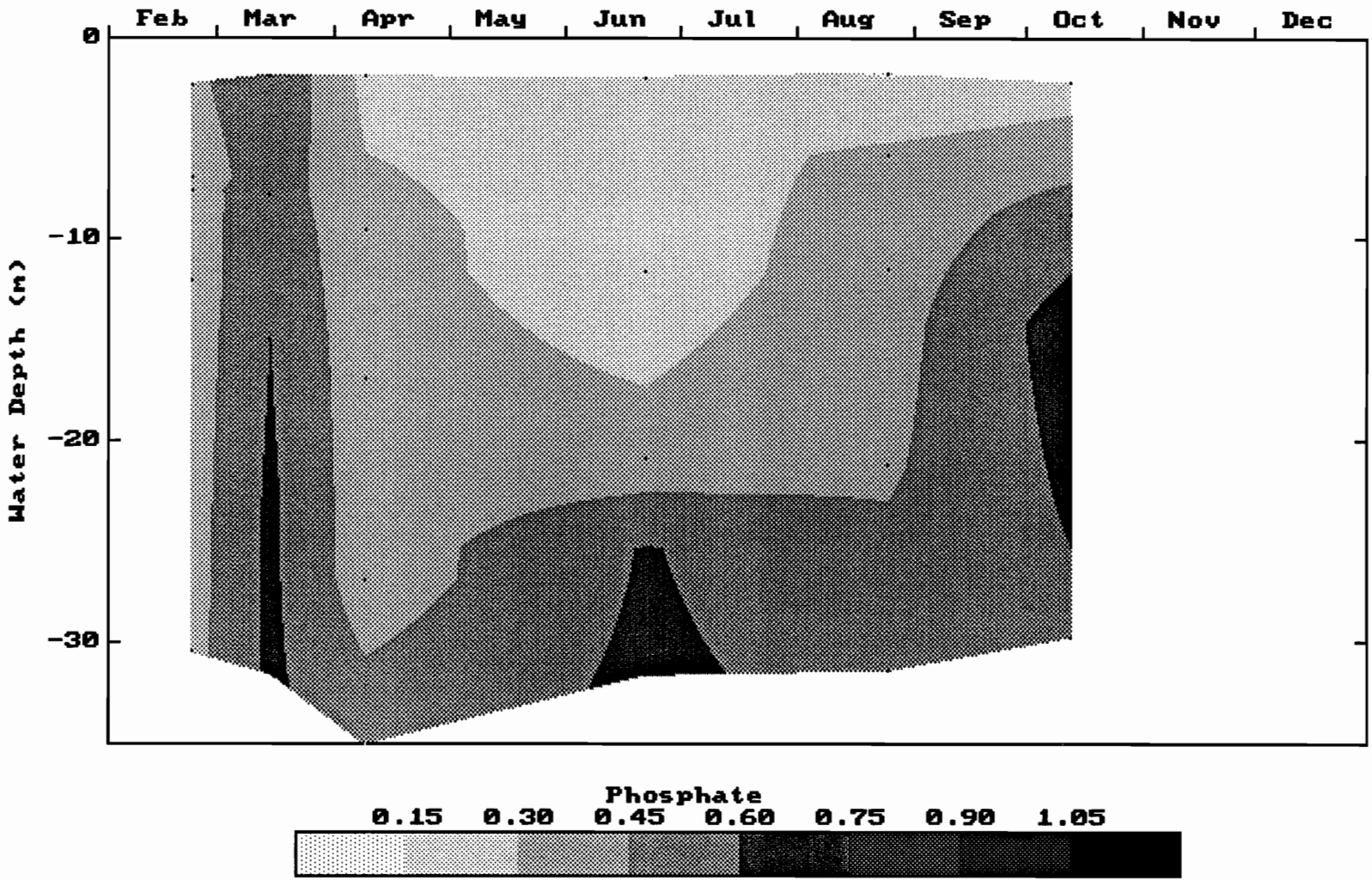
Station F17 during 1992



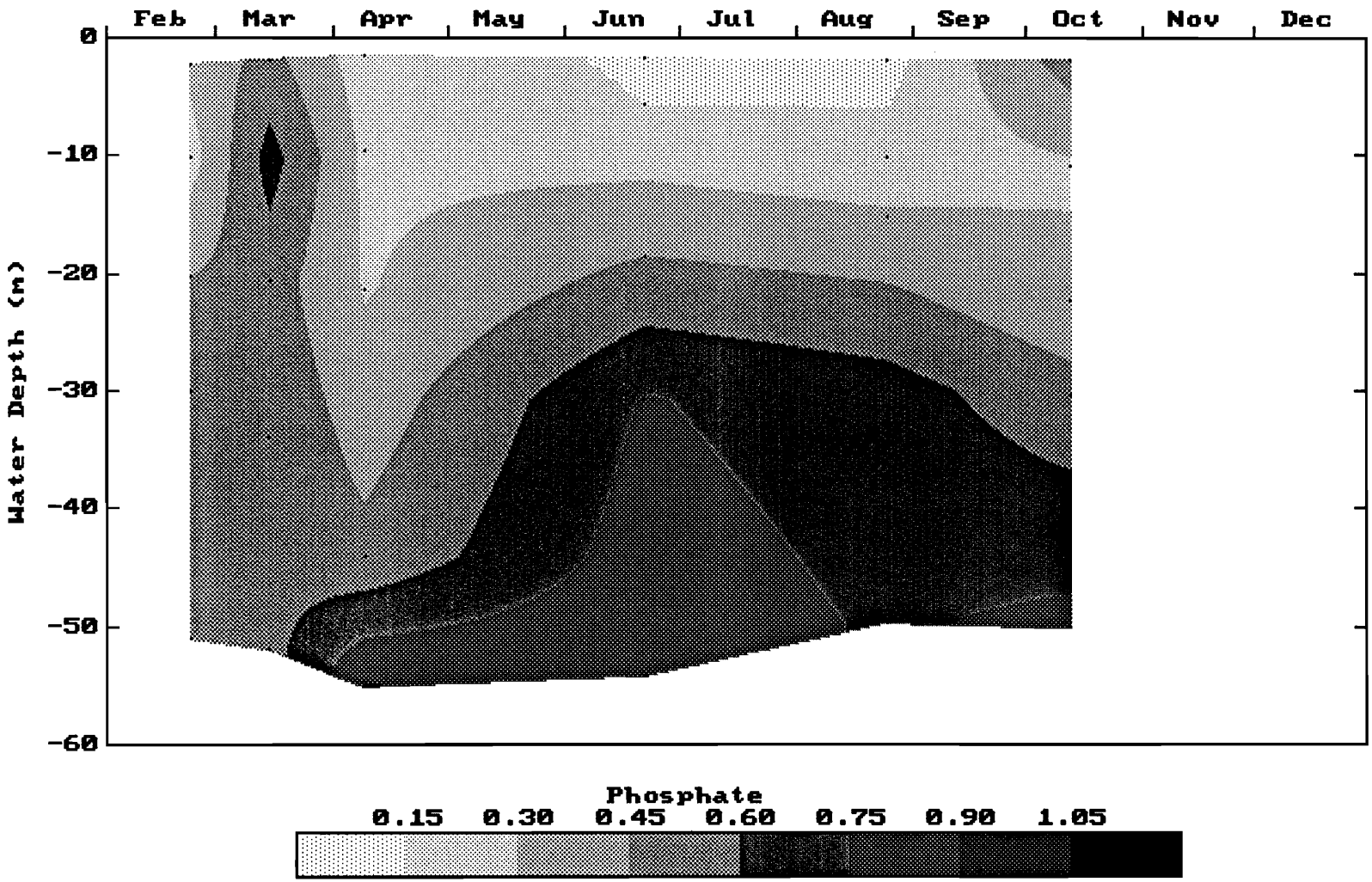
Station F19 during 1992



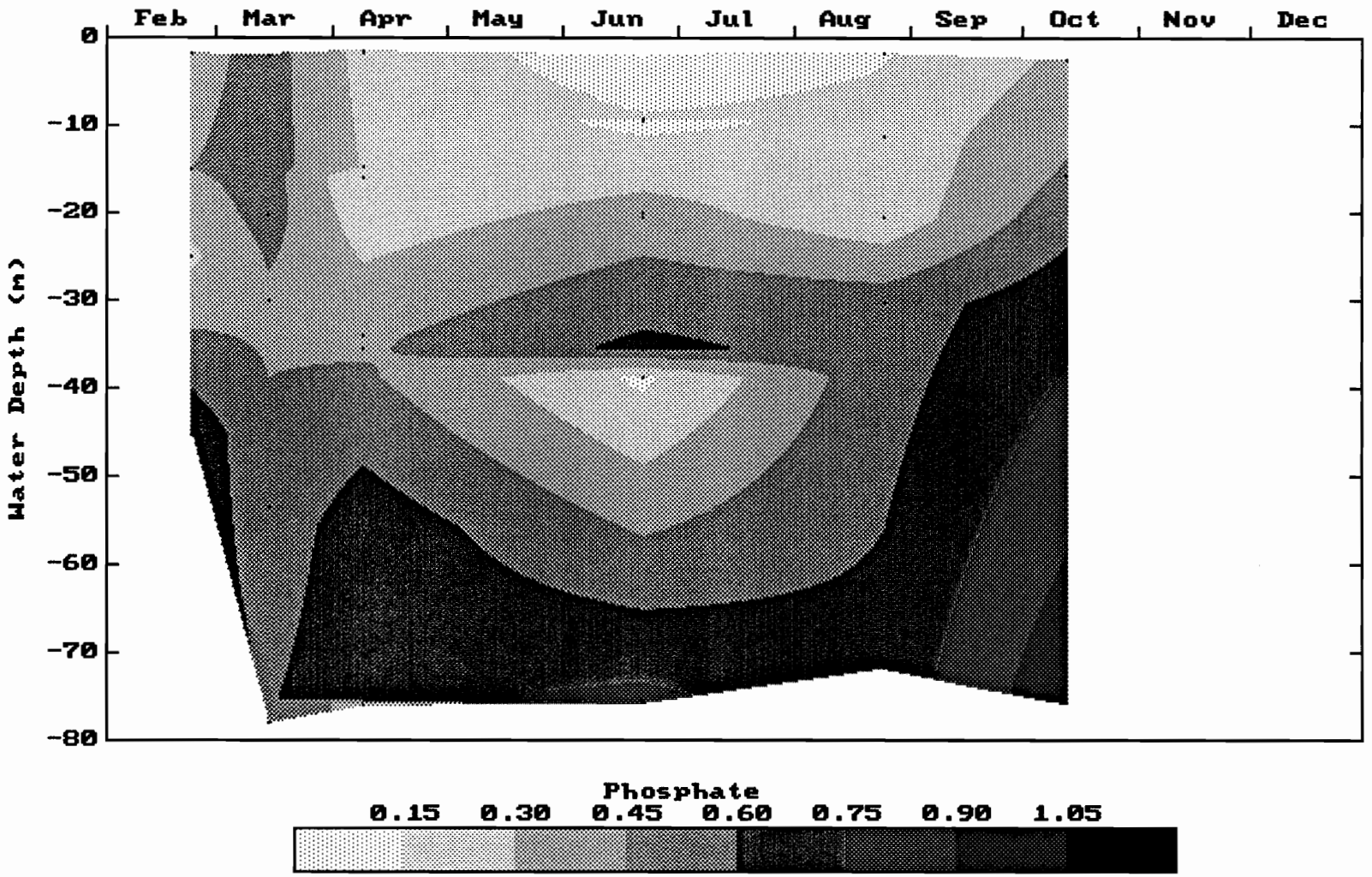
Station F20 during 1992



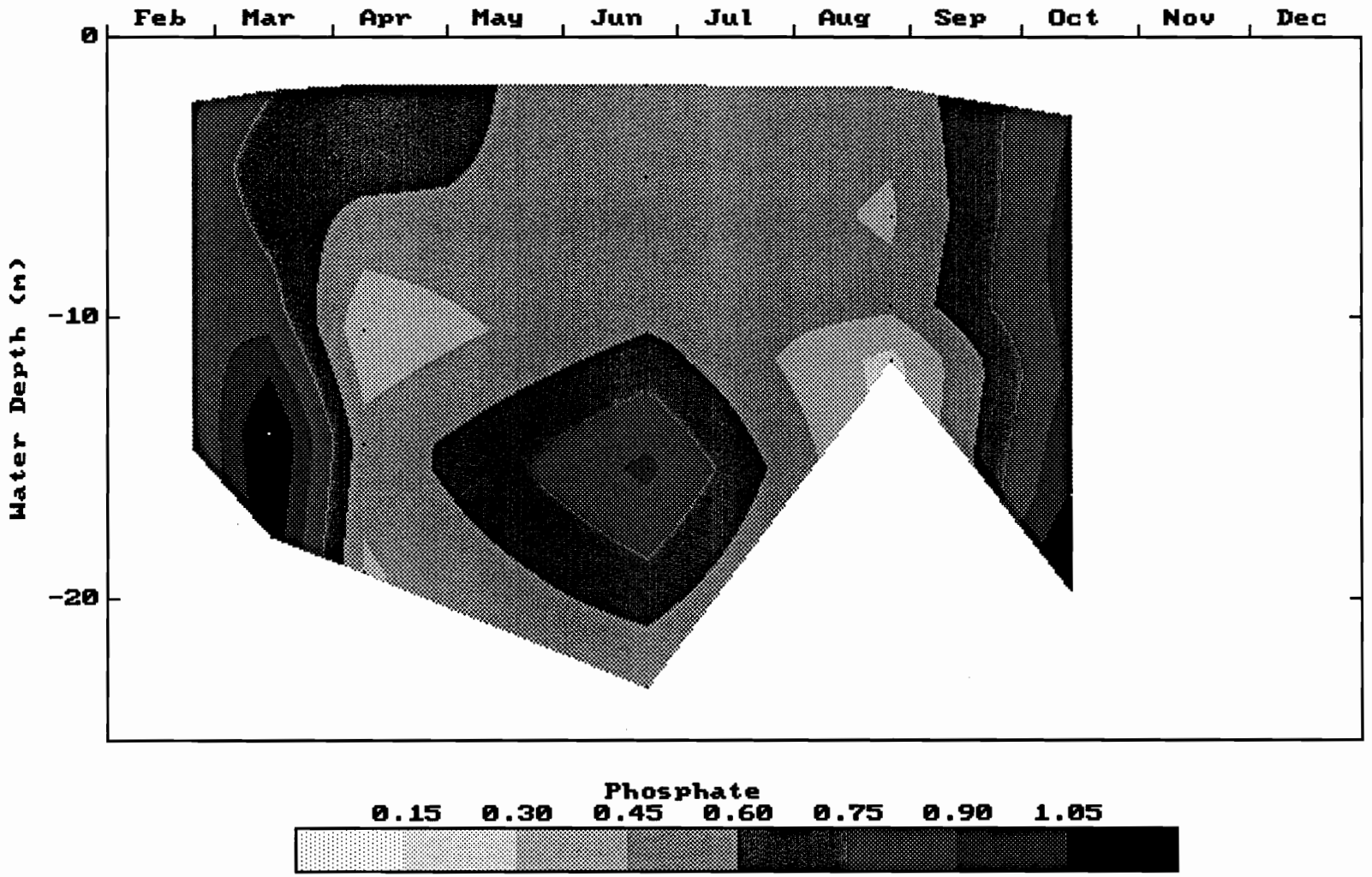
Station F21 during 1992



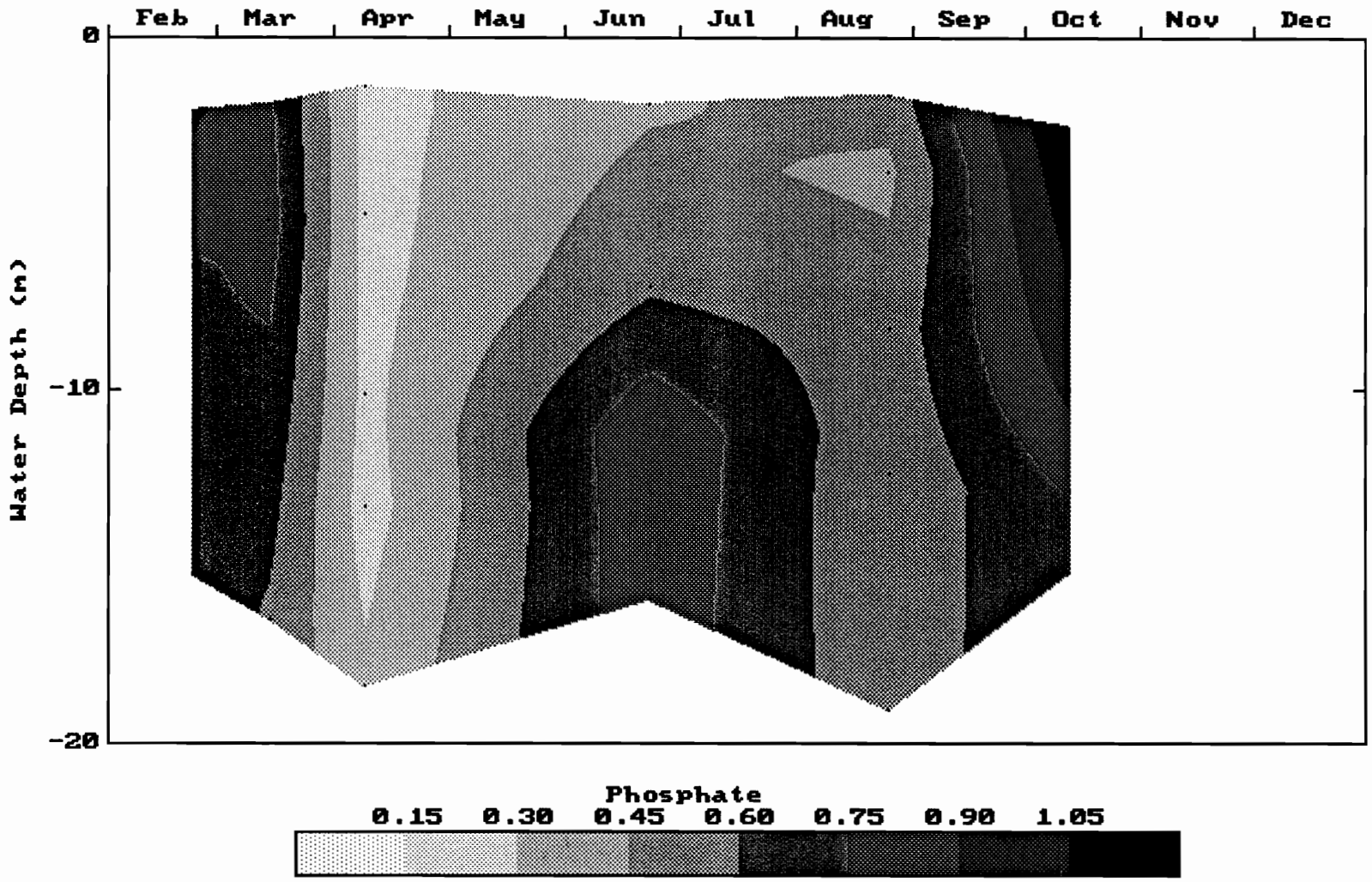
Station F22 during 1992



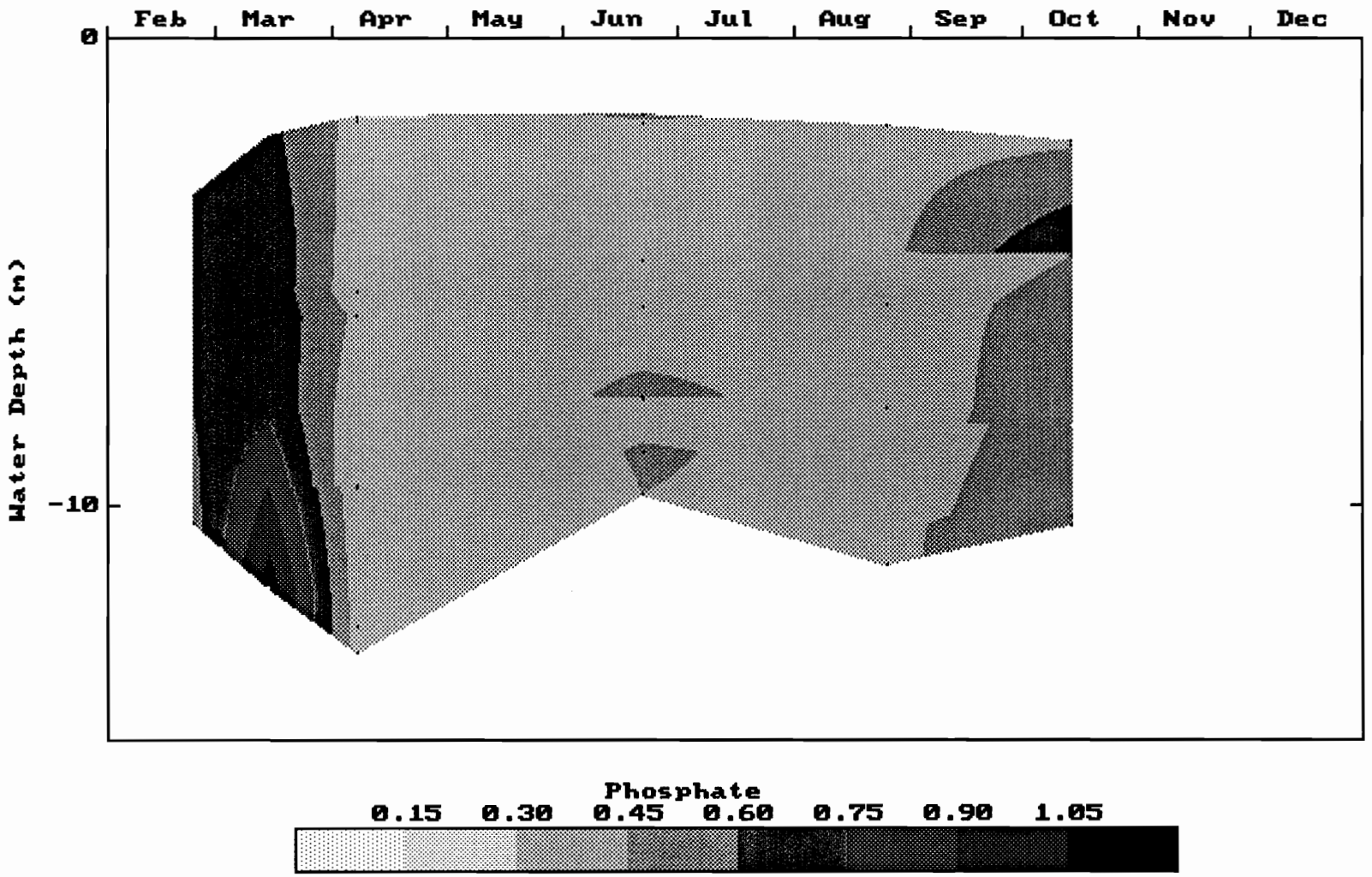
Station F23 during 1992



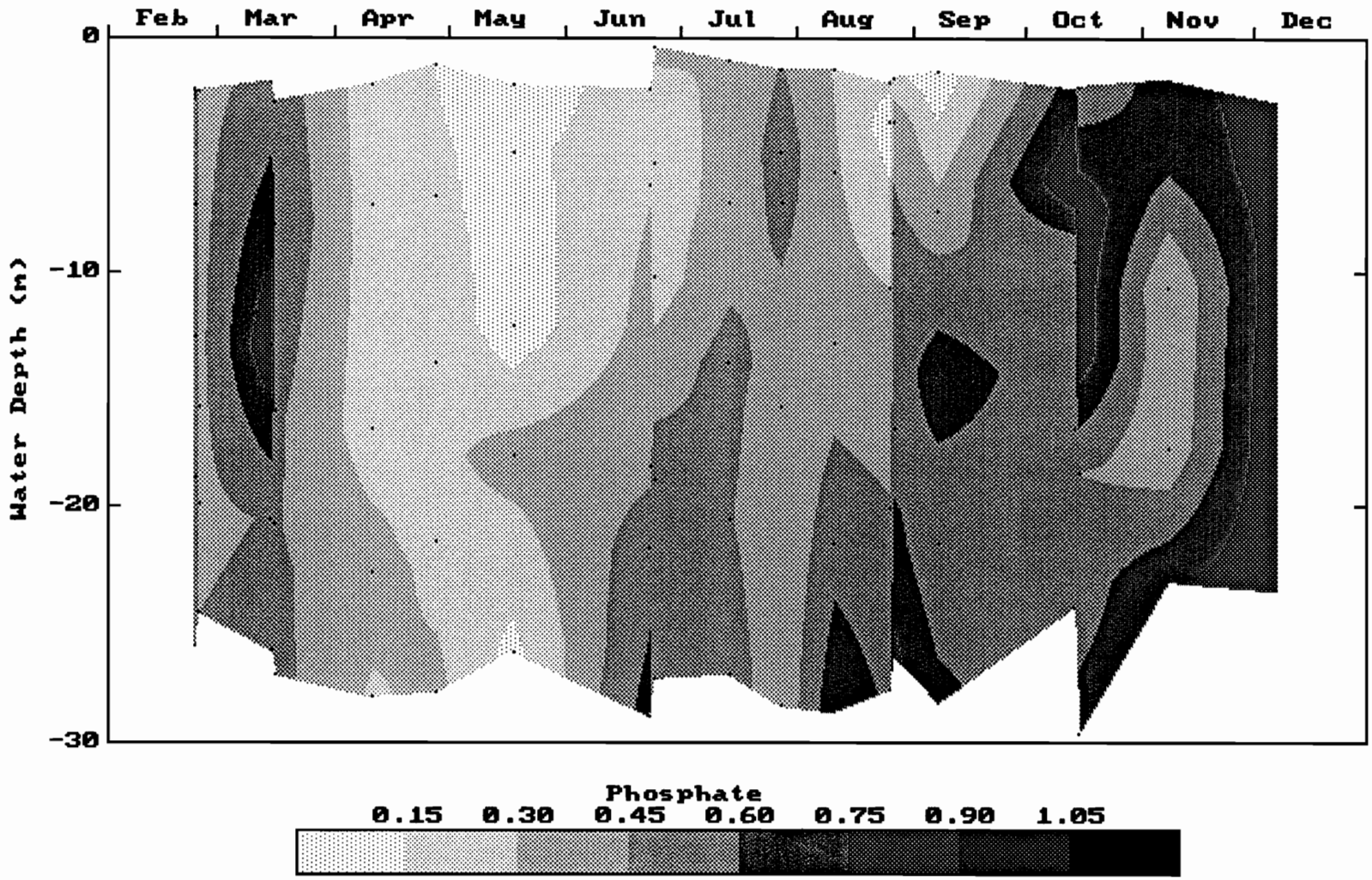
Station F24 during 1992



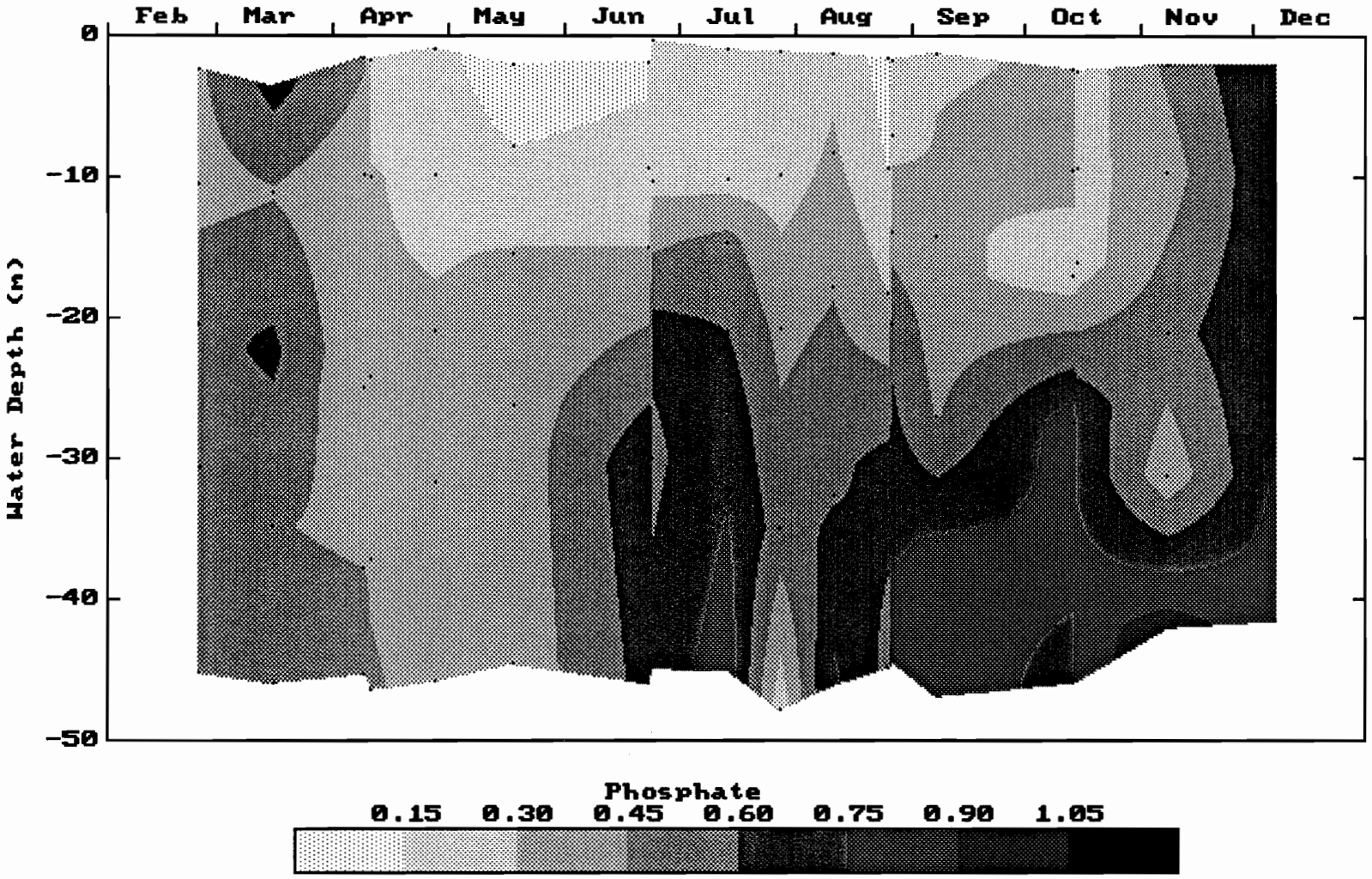
Station F25 during 1992



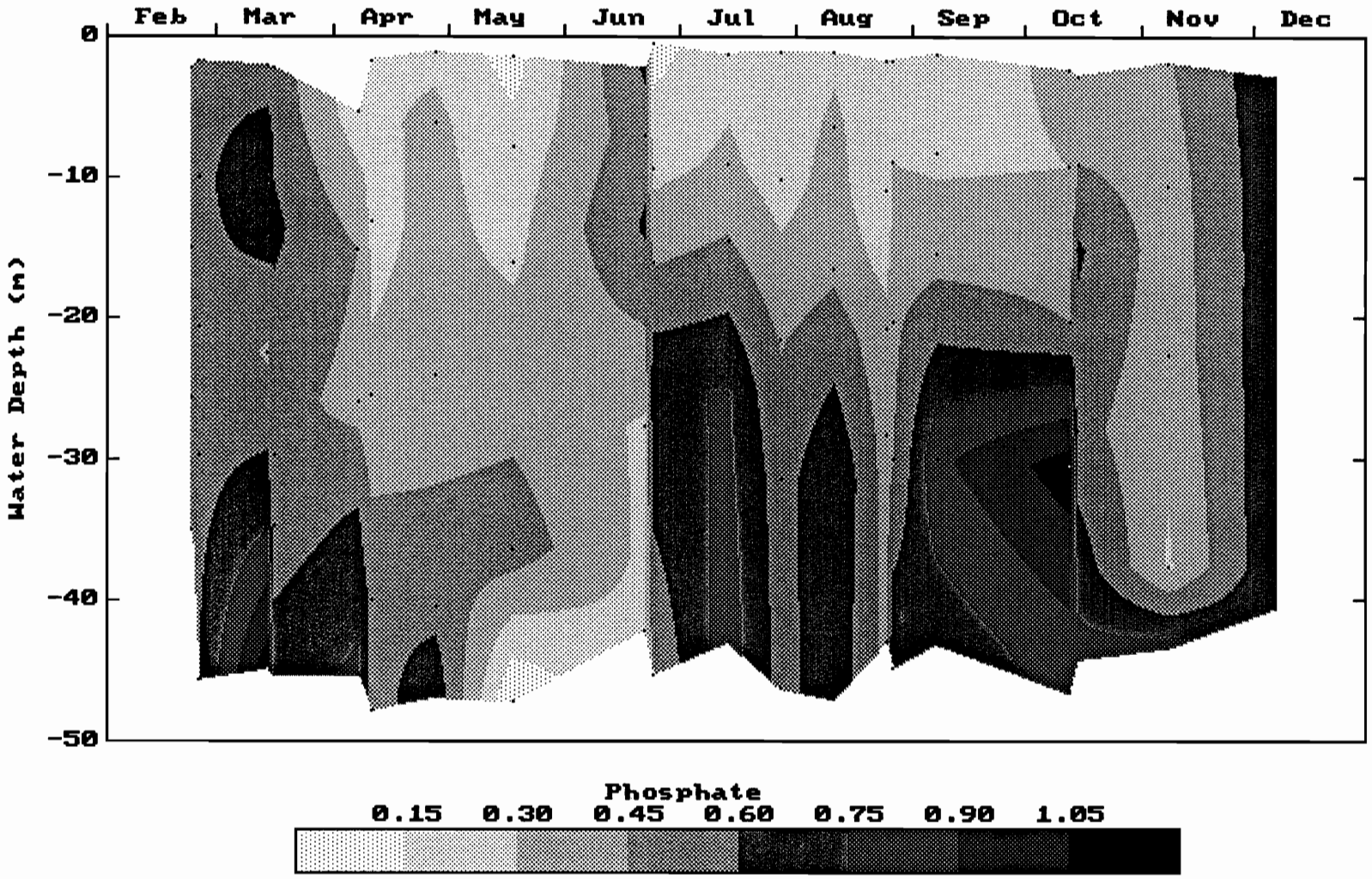
Station N01 during 1992



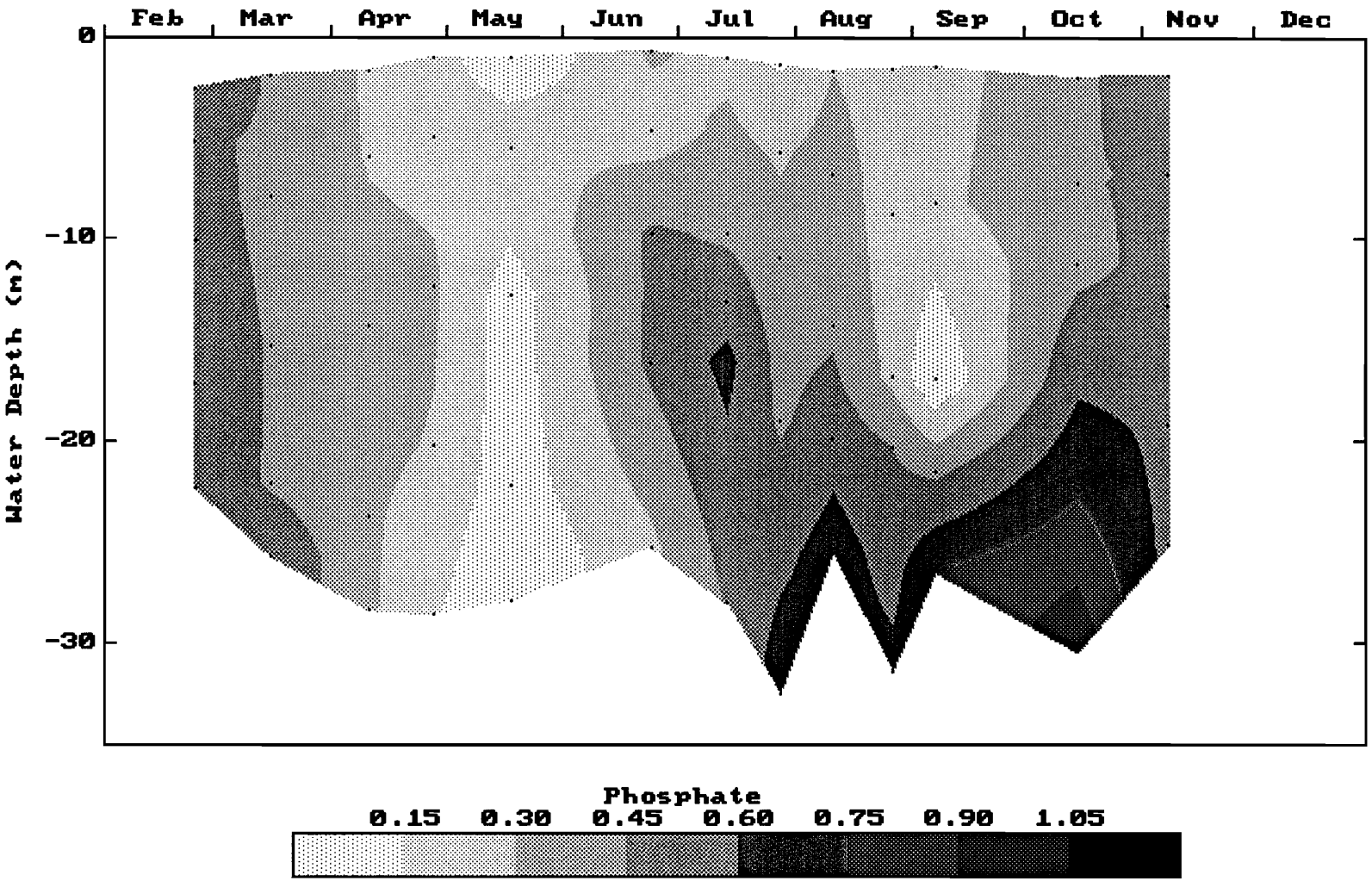
Station N04 during 1992



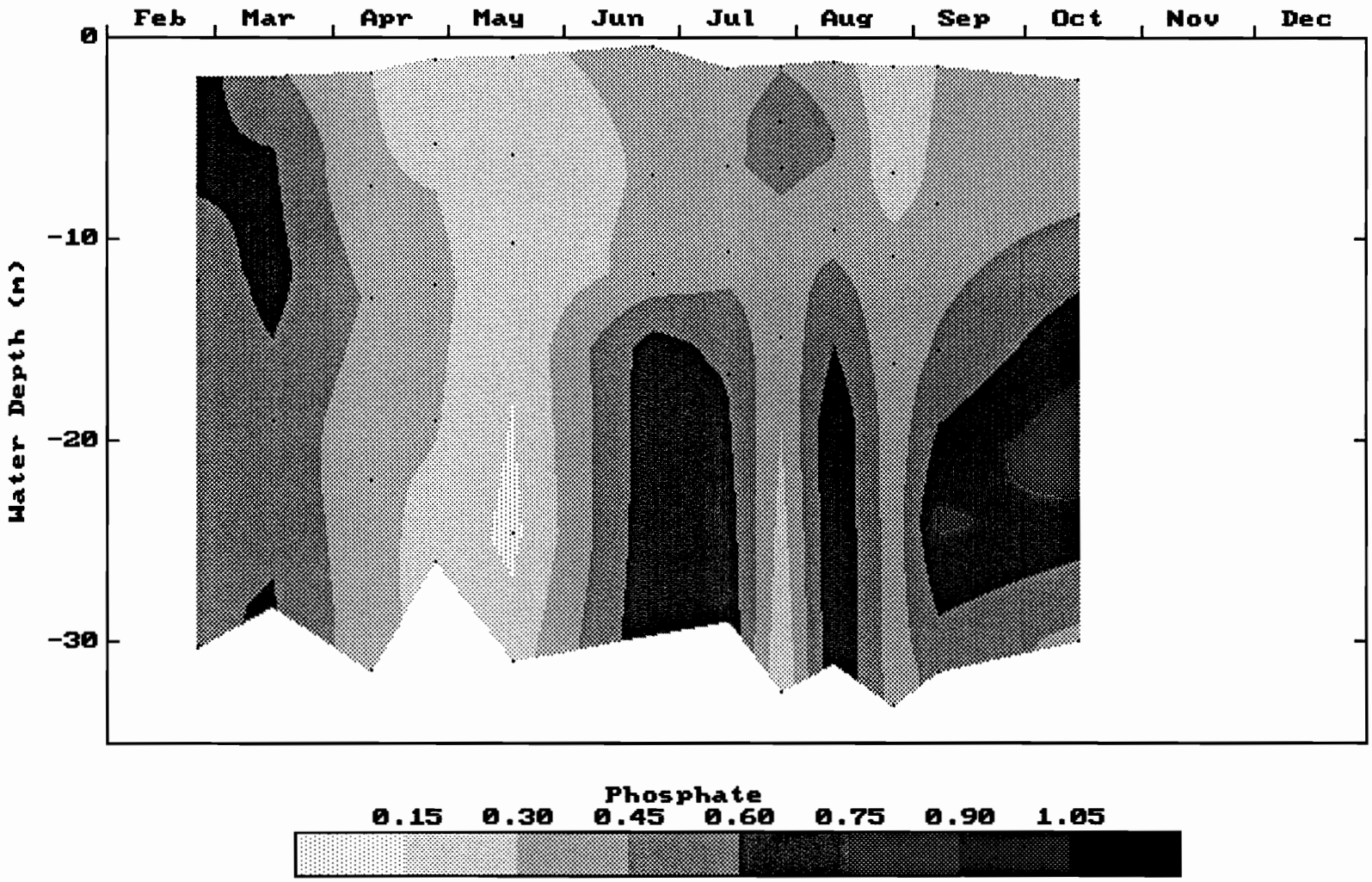
Station N07 during 1992



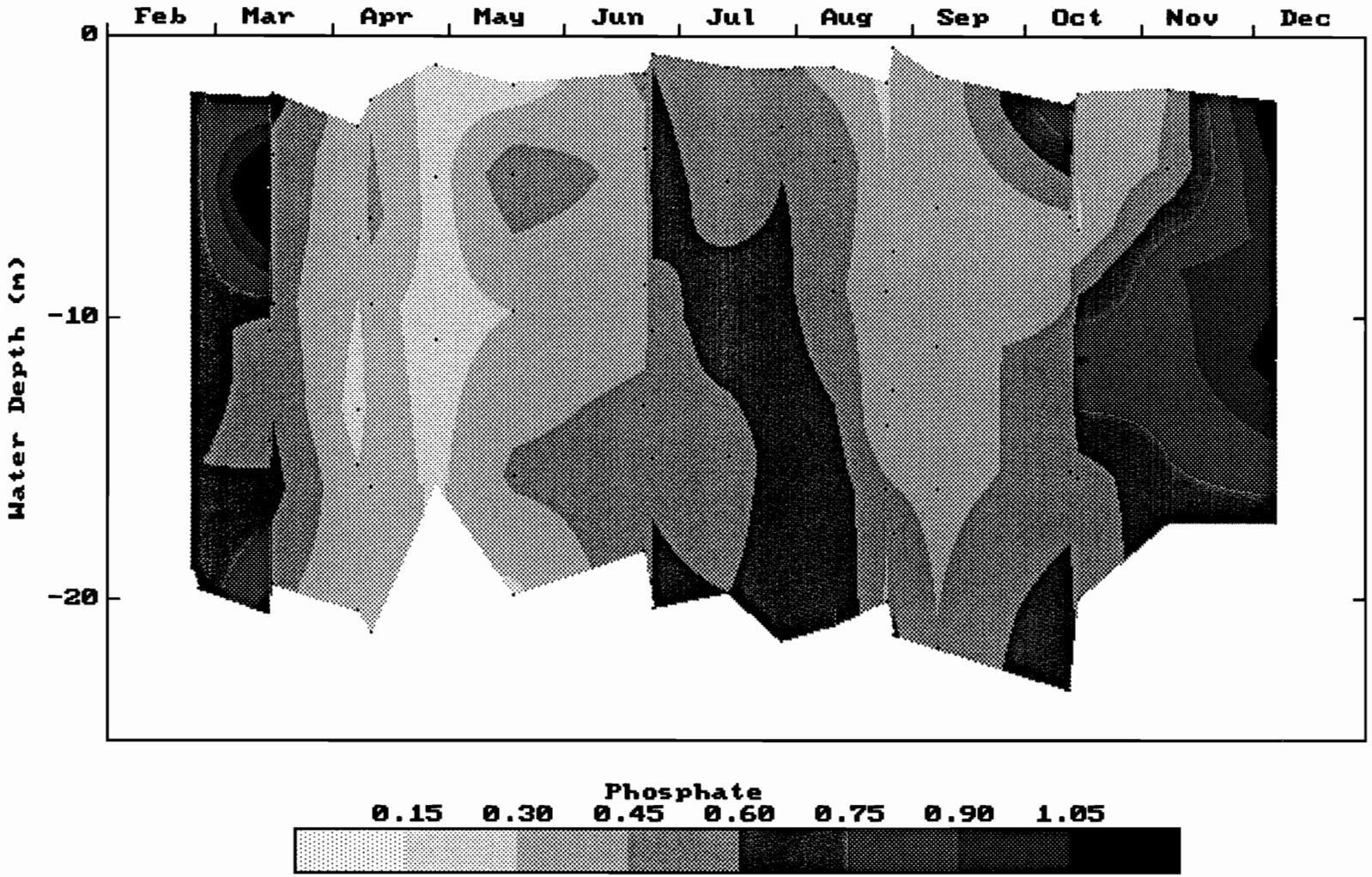
Station N08 during 1992



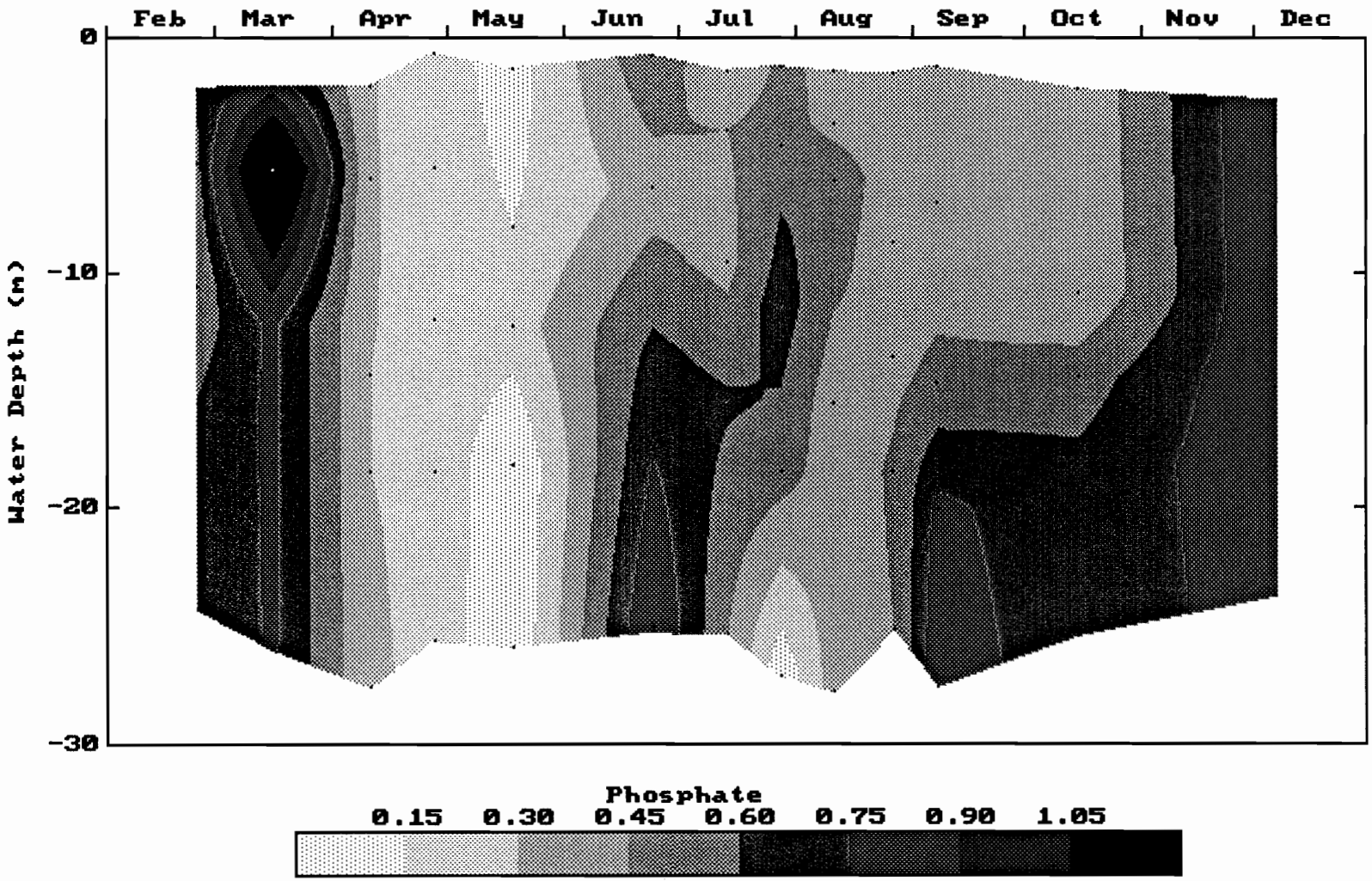
Station N09 during 1992



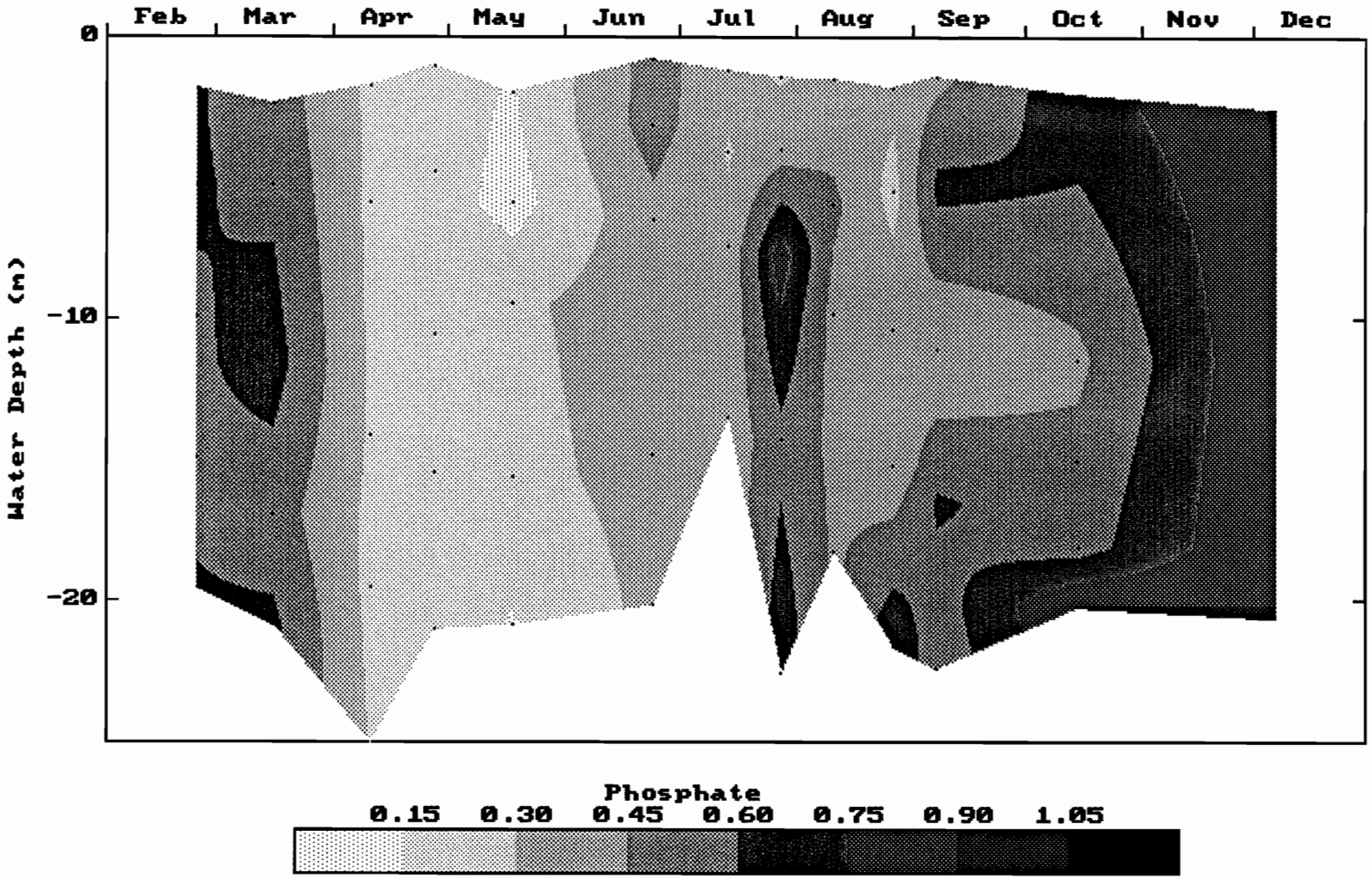
Station N10 during 1992



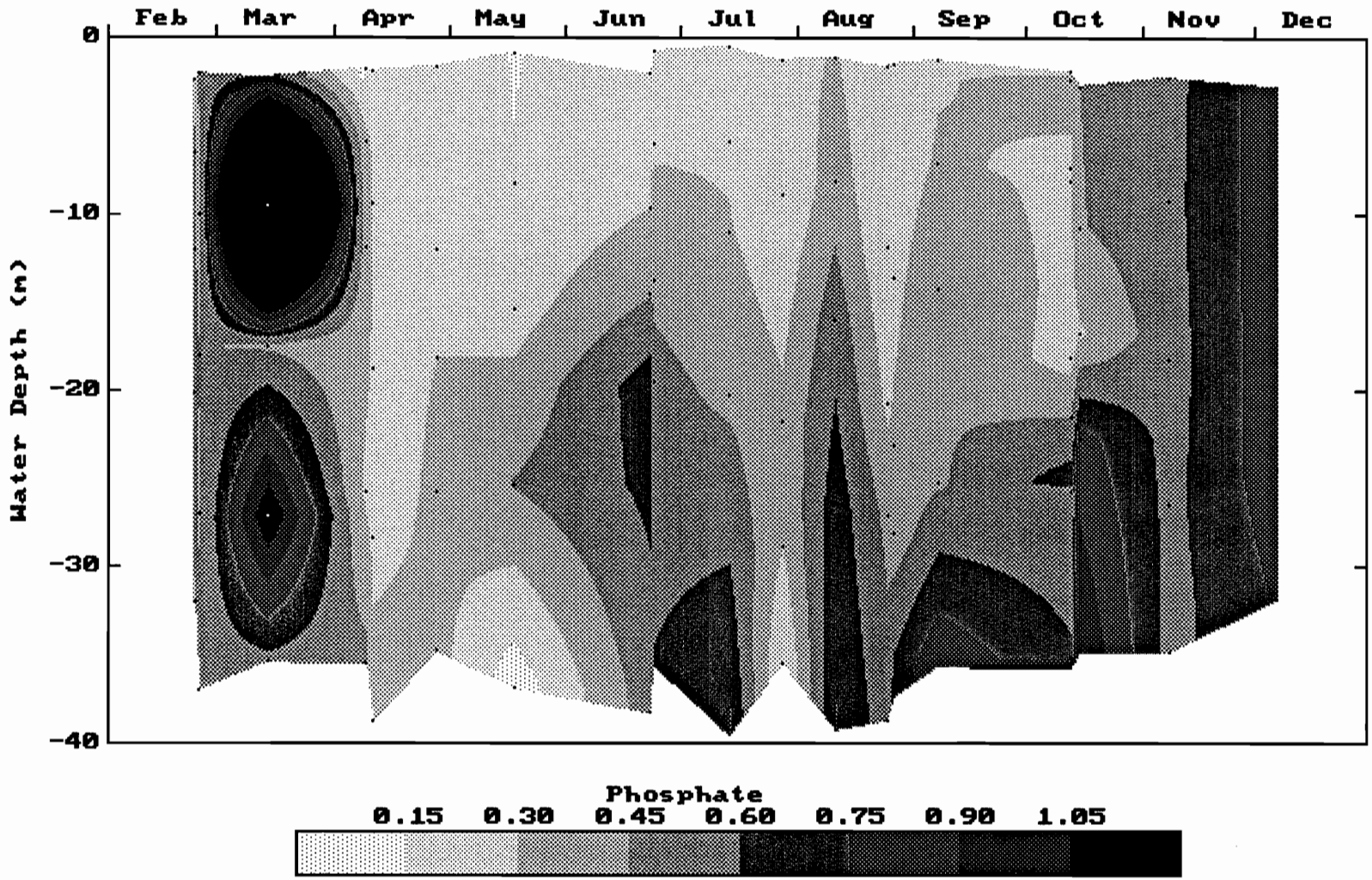
Station N11 during 1992



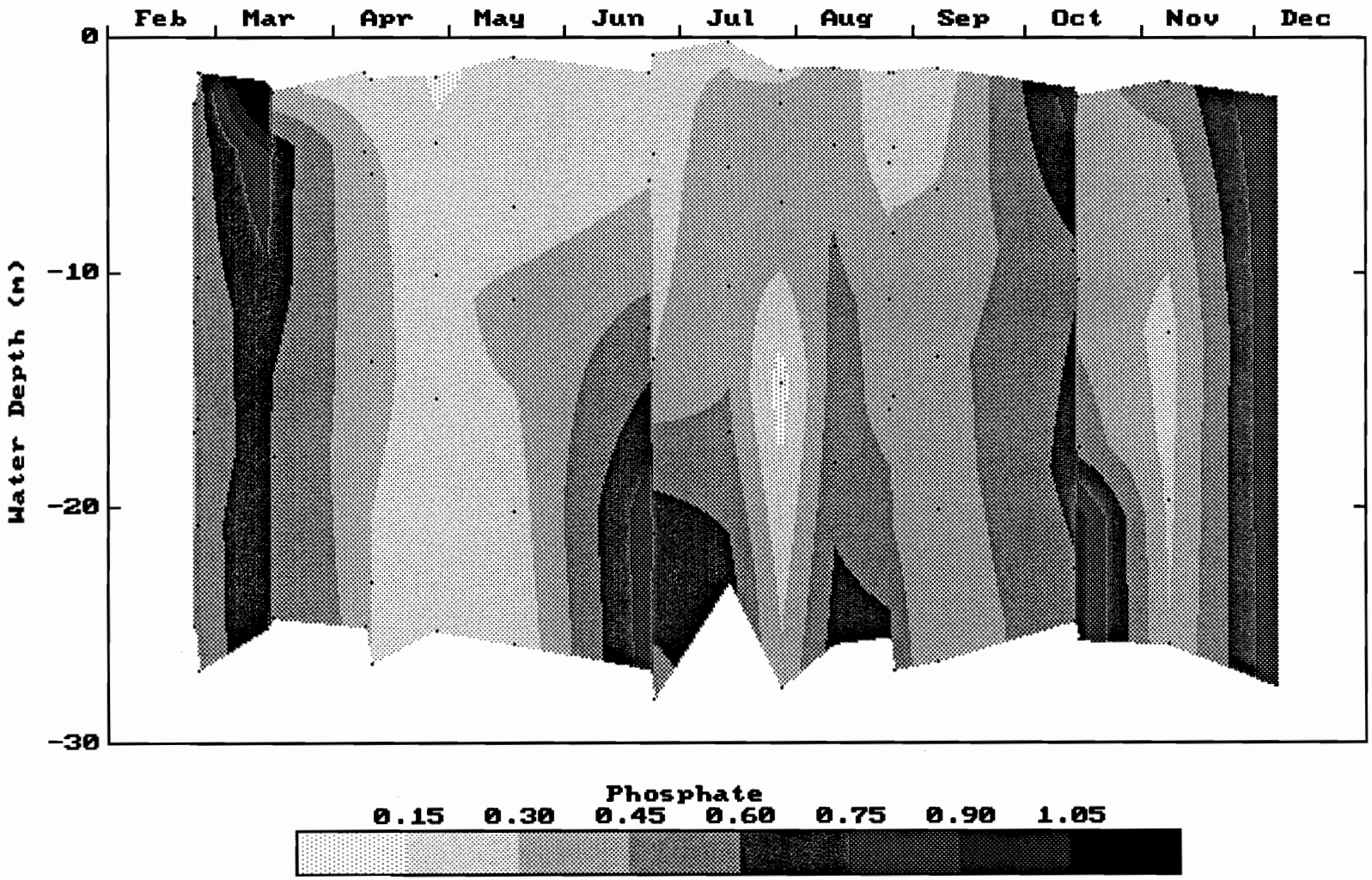
Station N12 during 1992



Station N16 during 1992

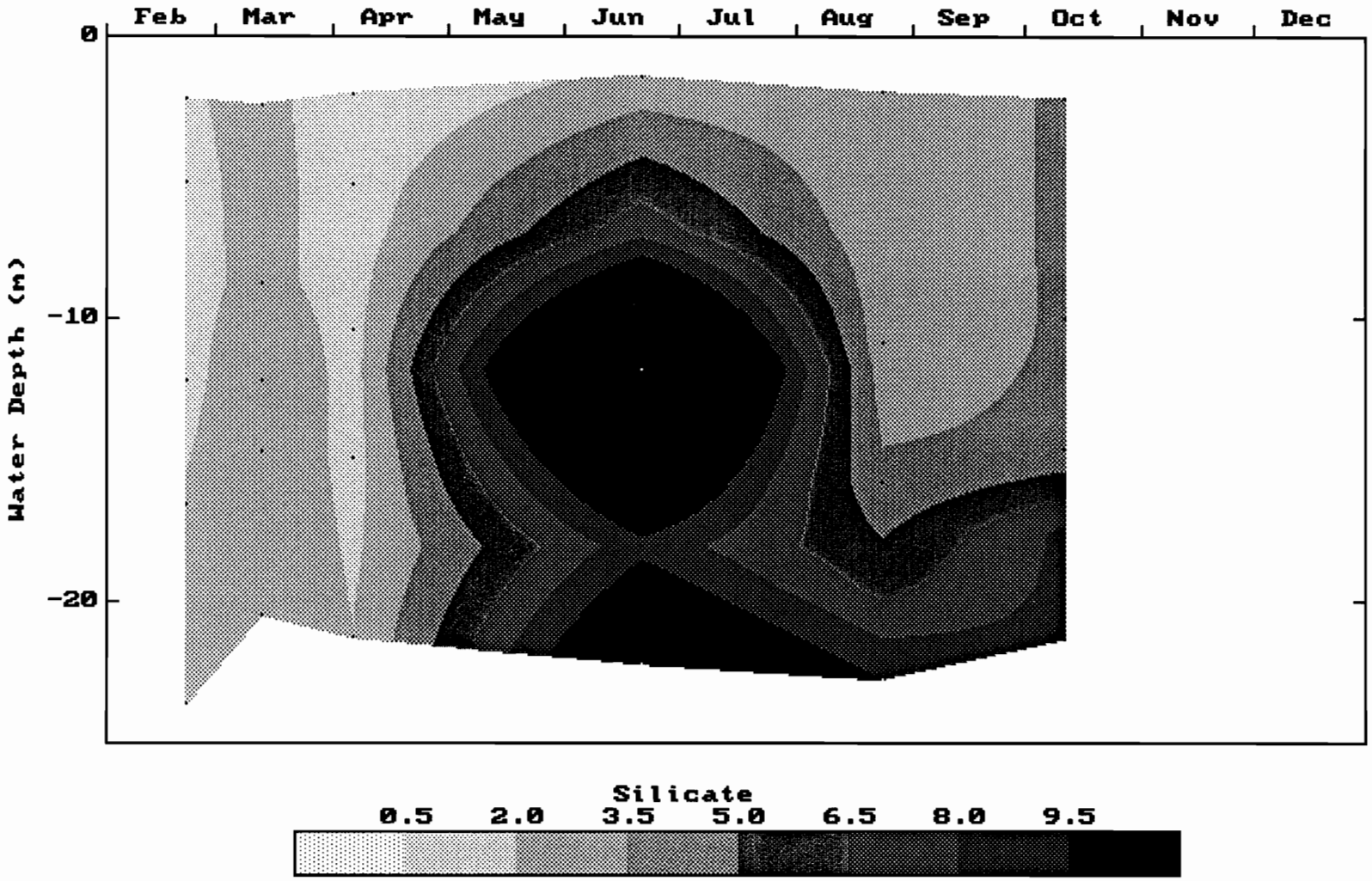


Station N20 during 1992

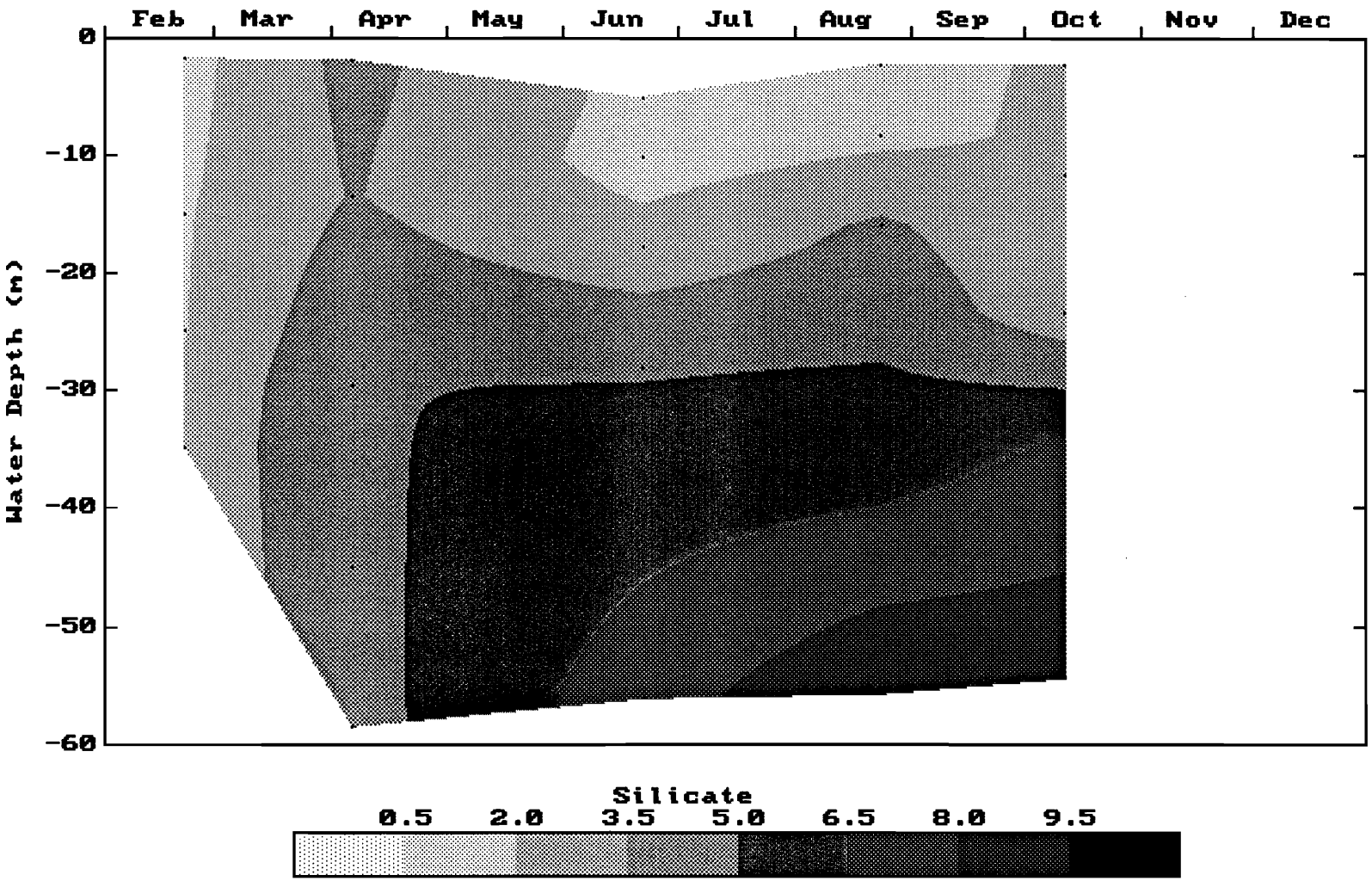


Silicate

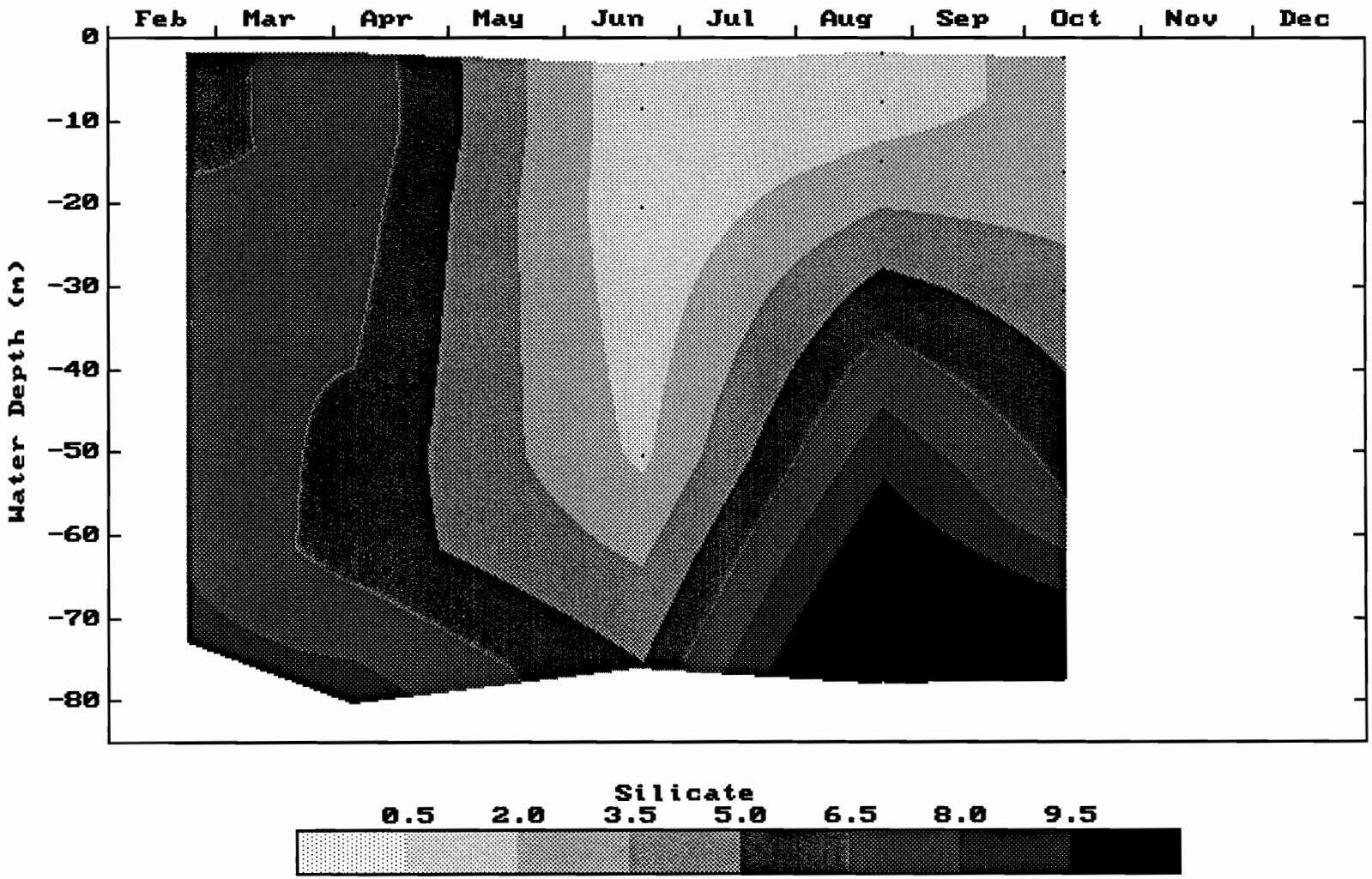
Station F01 during 1992



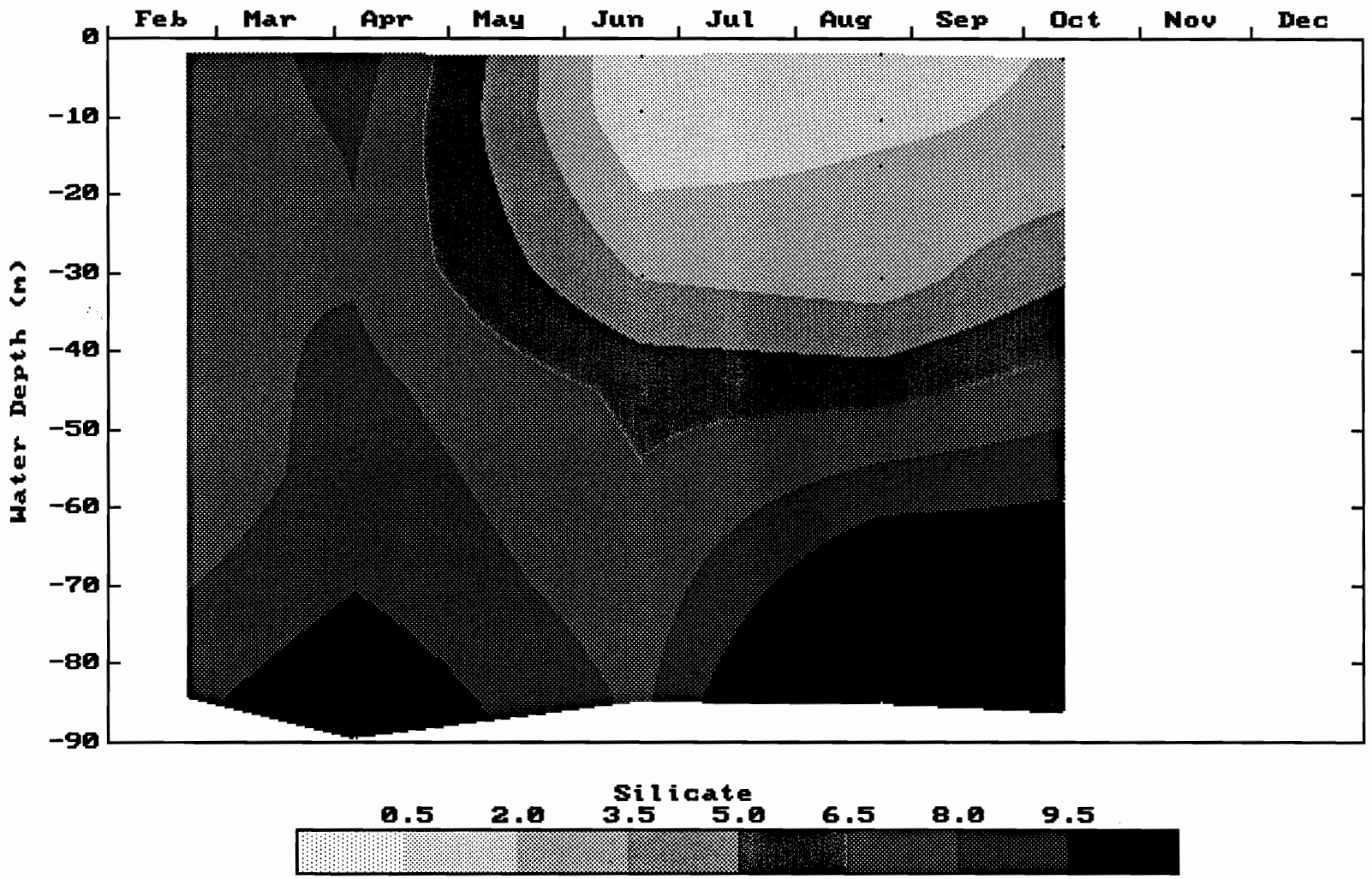
Station F04 during 1992



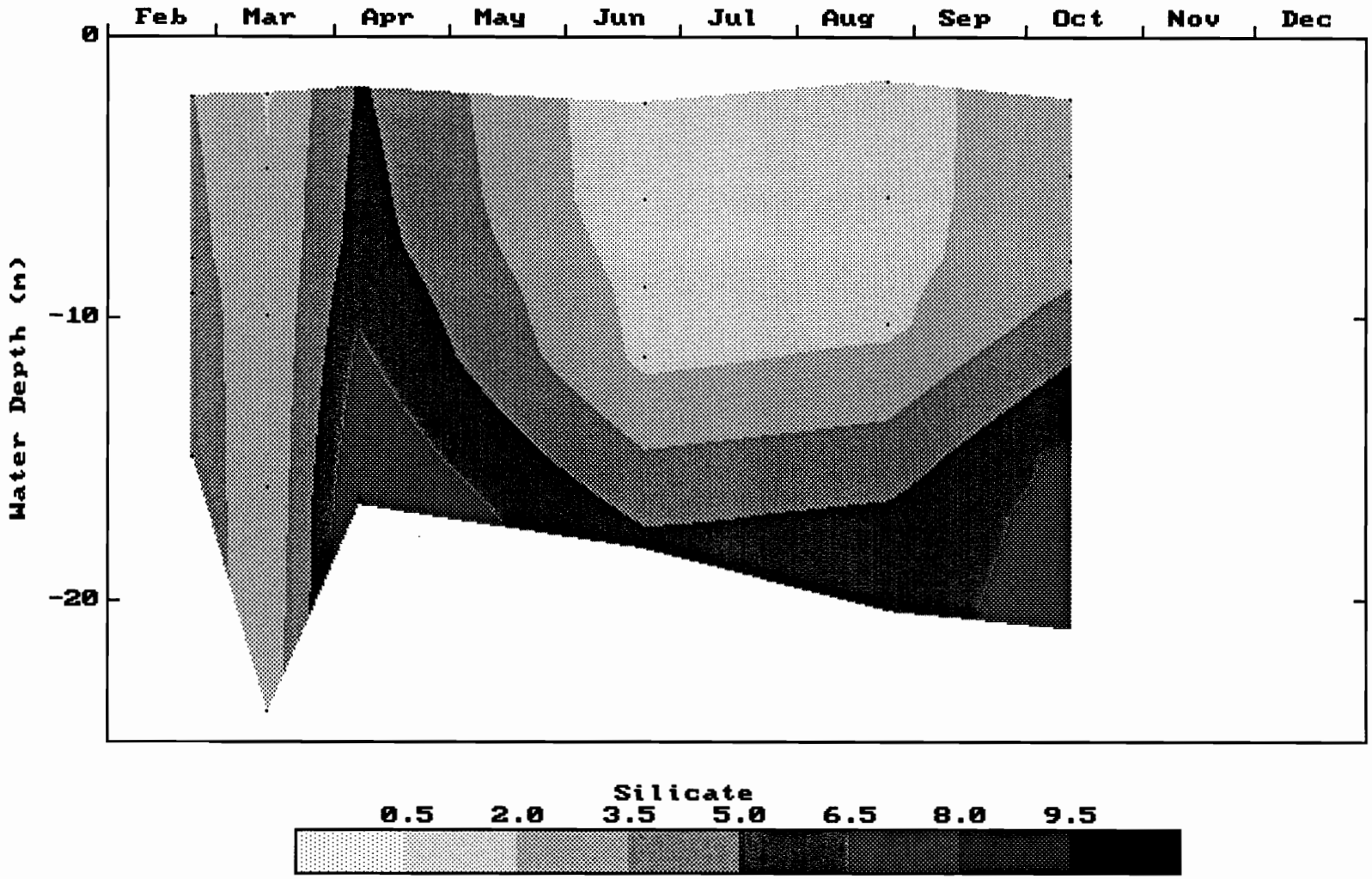
Station F08 during 1992



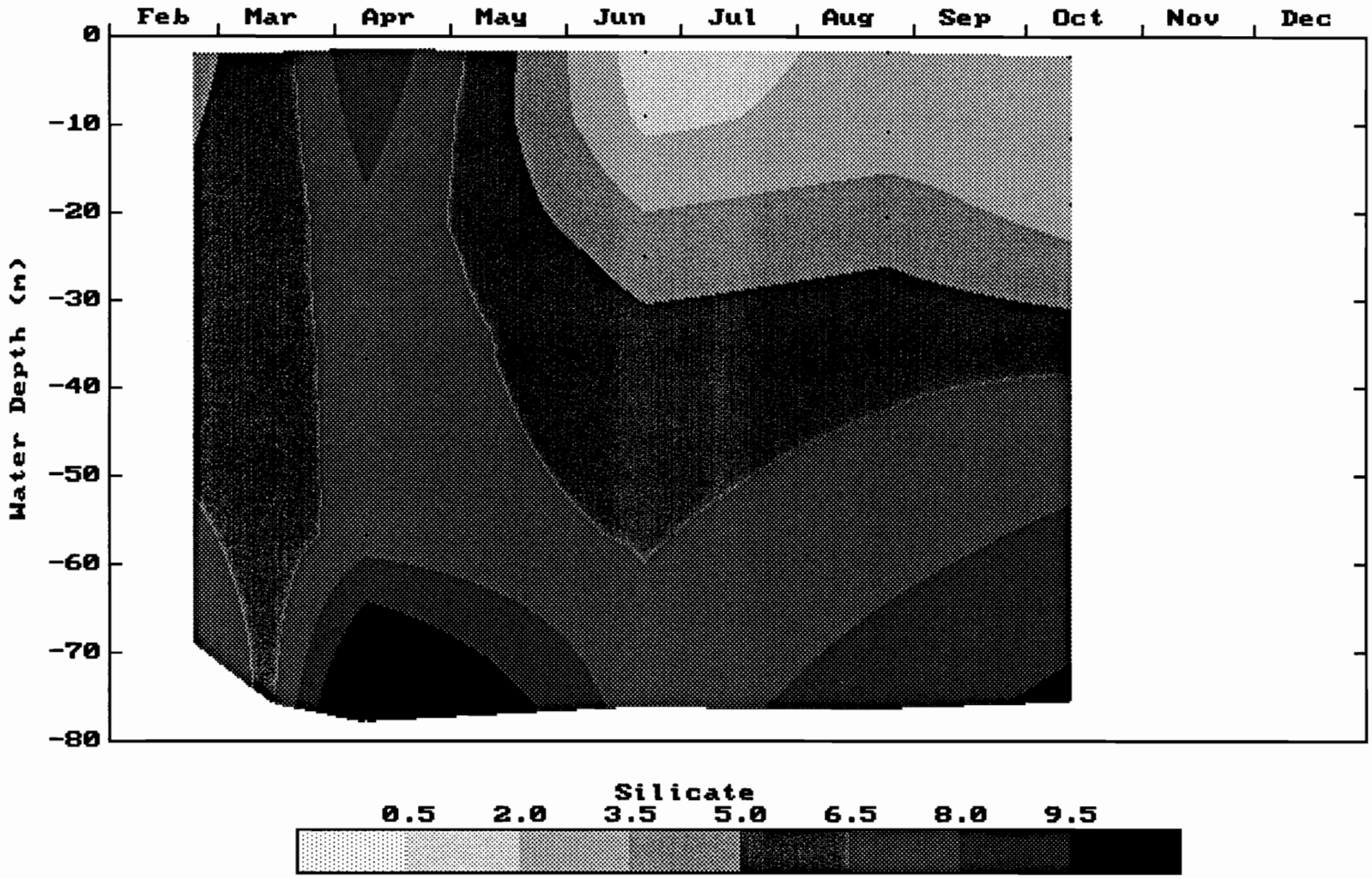
Station F12 during 1992



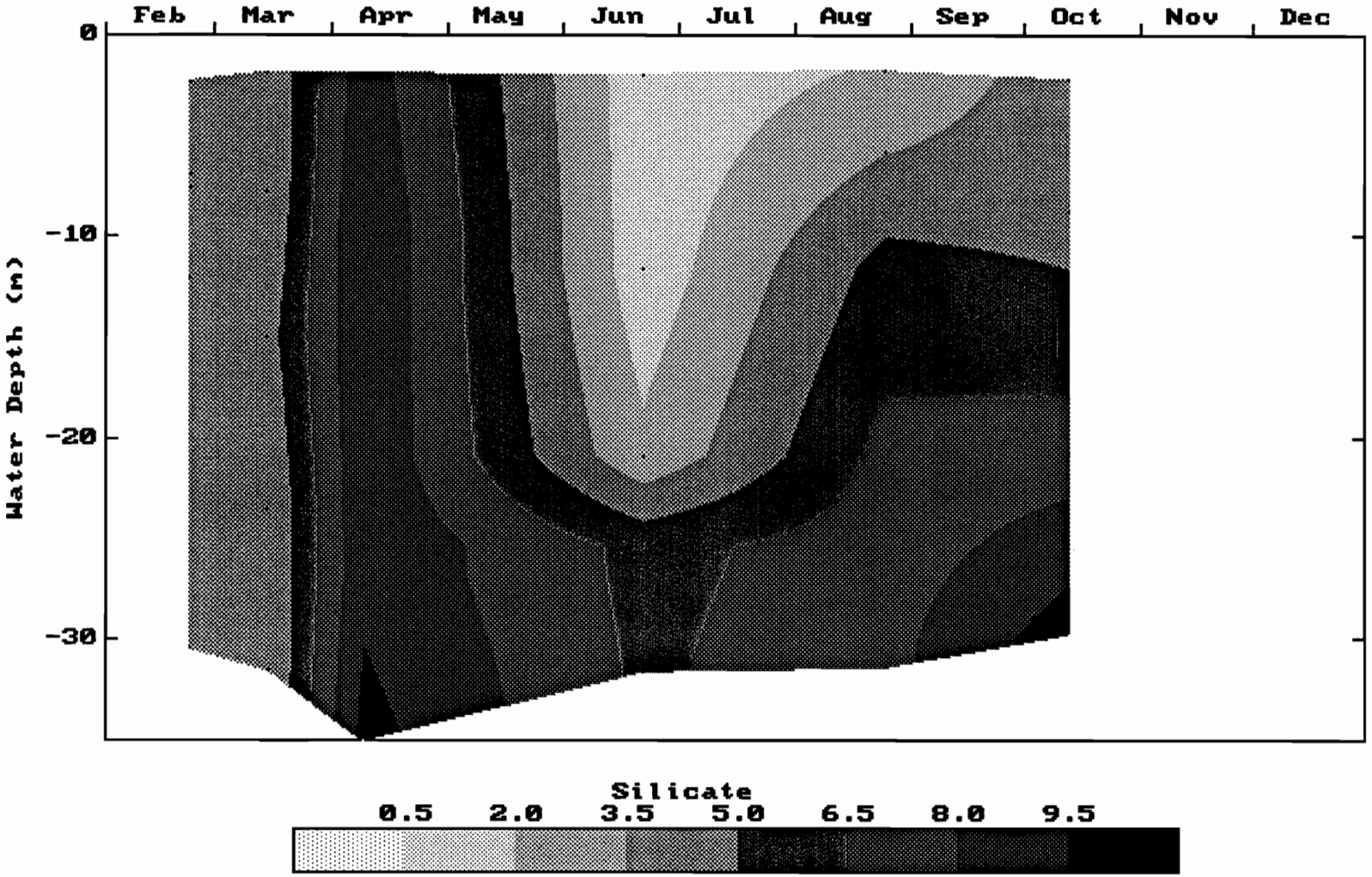
Station F13 during 1992



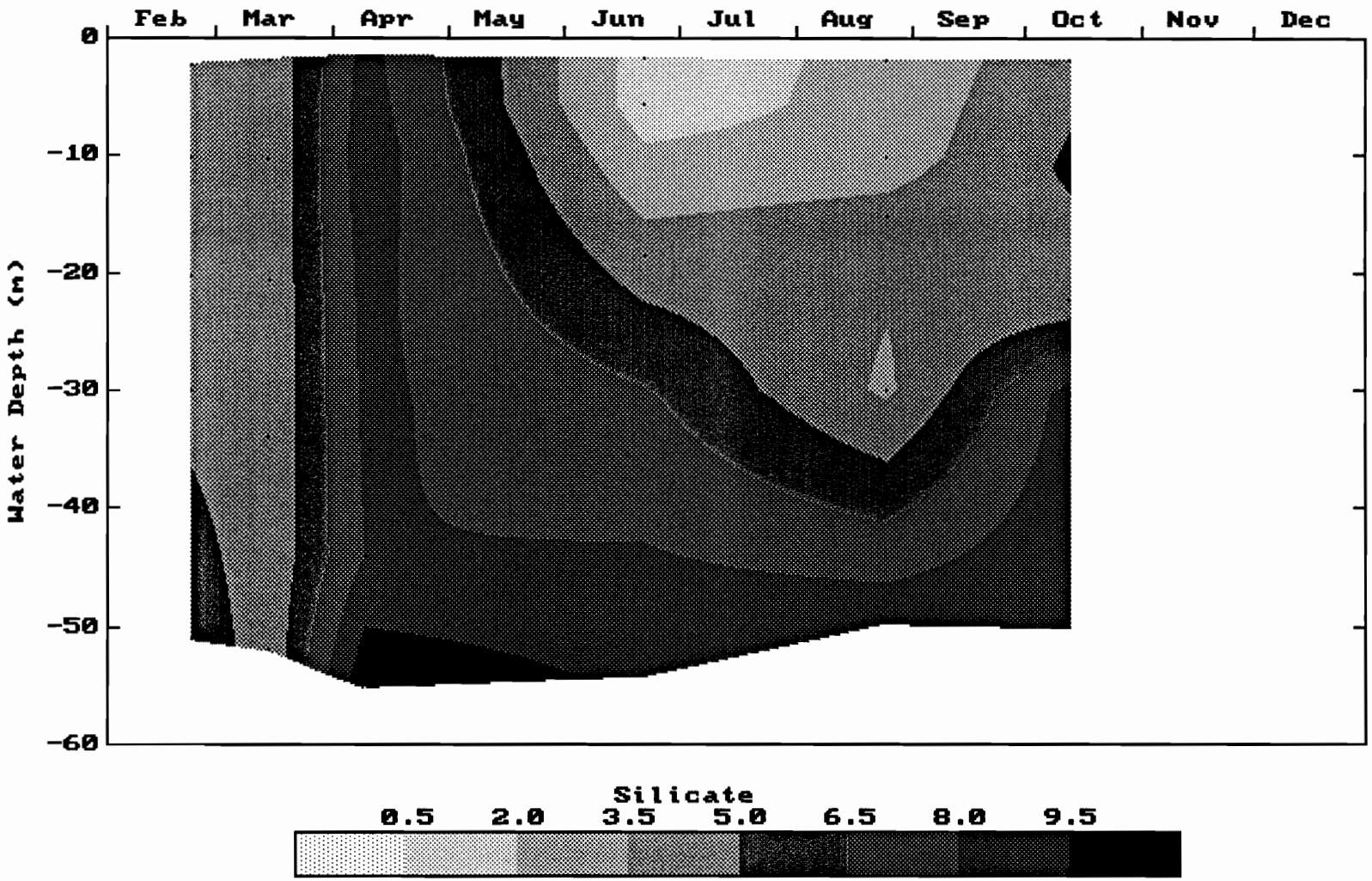
Station F19 during 1992



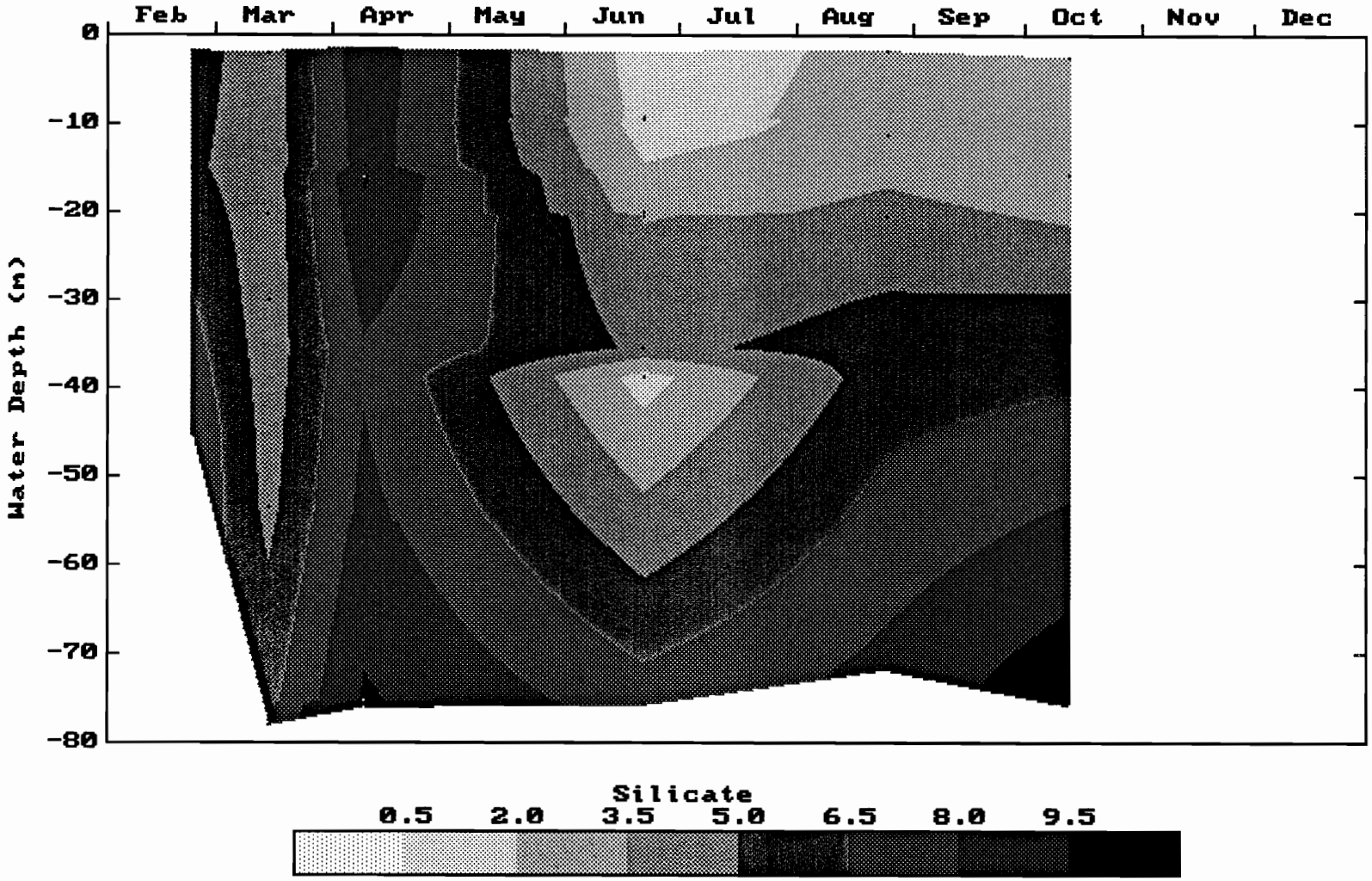
Station F20 during 1992



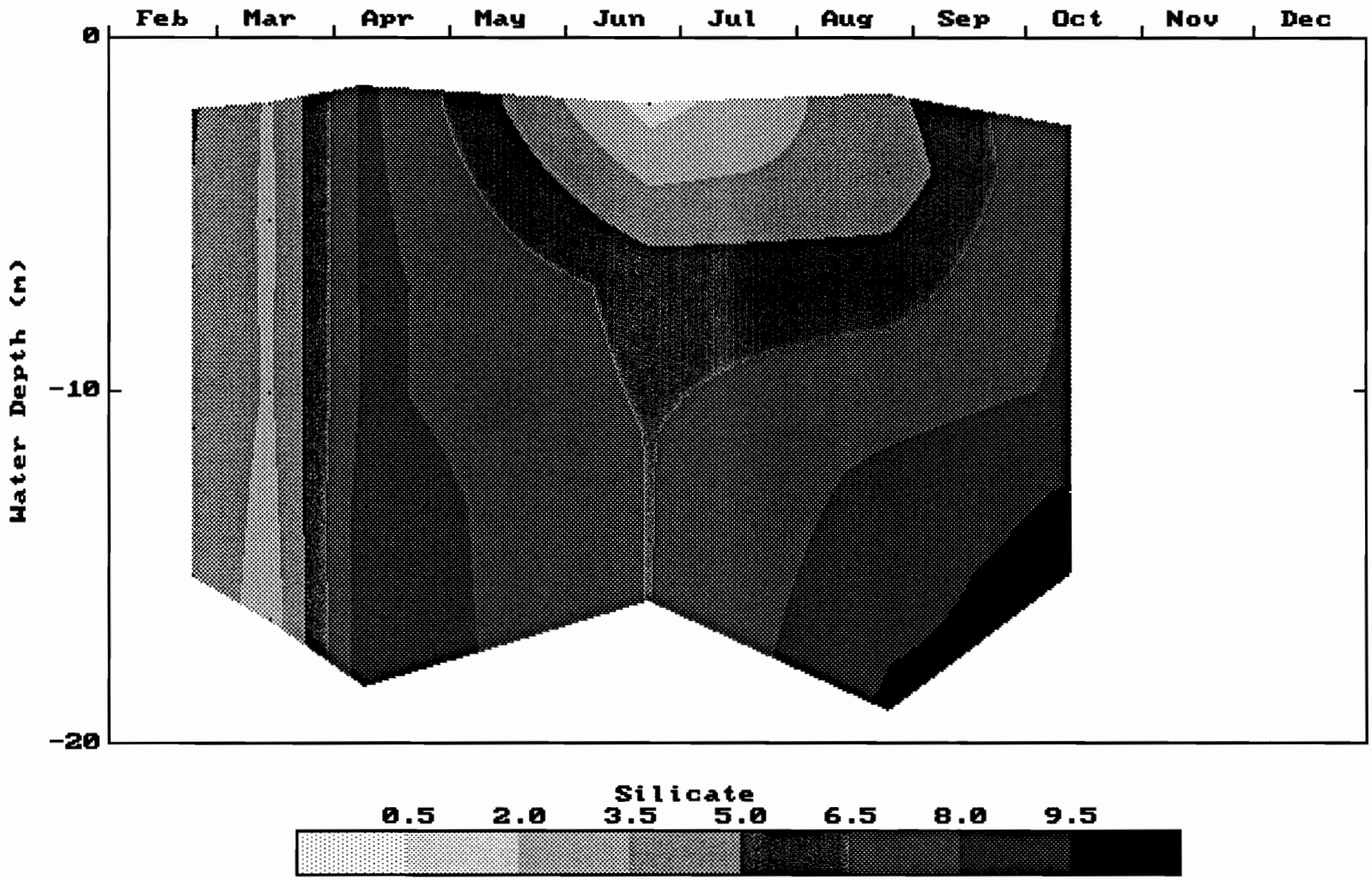
Station F21 during 1992



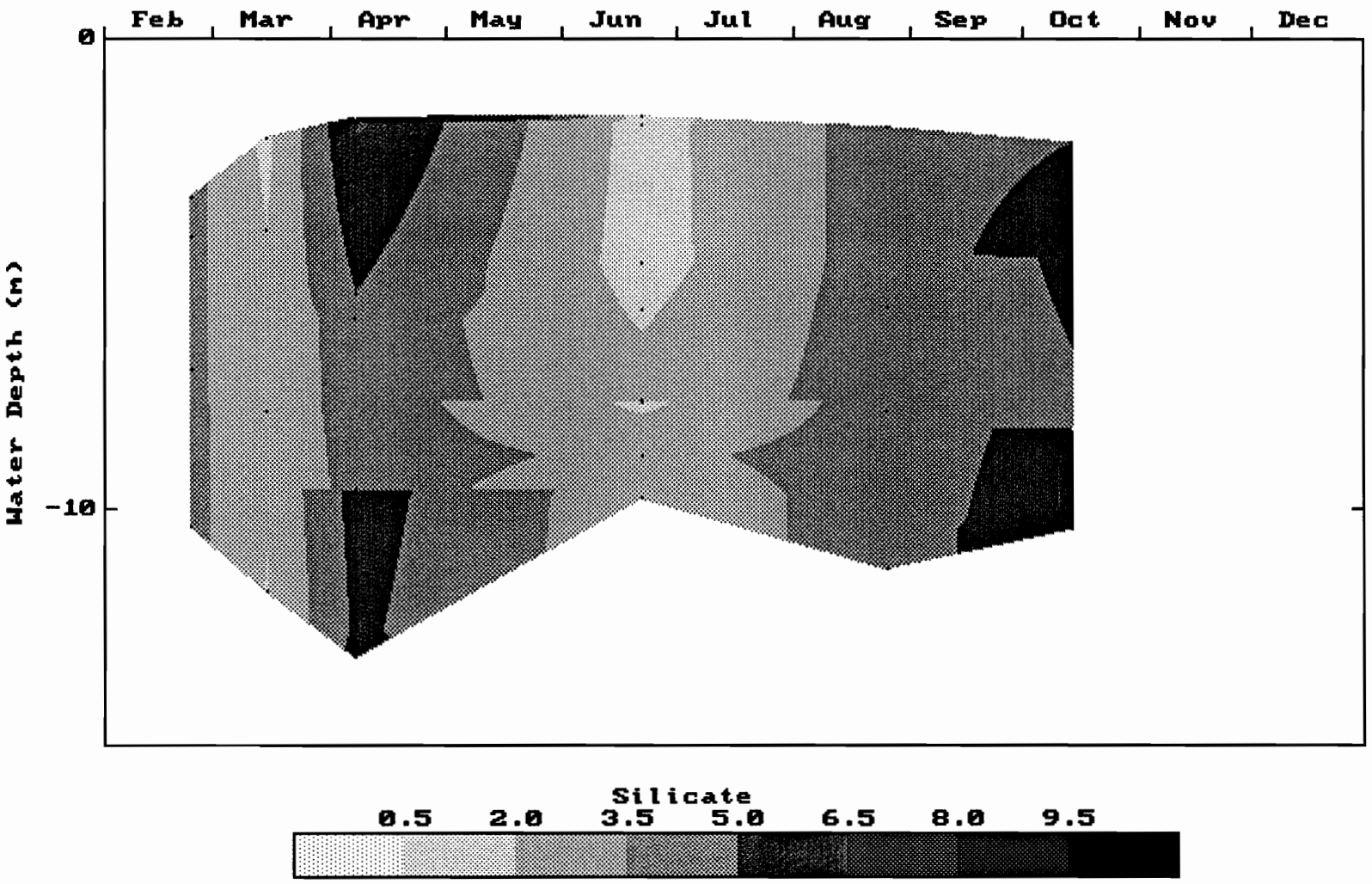
Station F22 during 1992



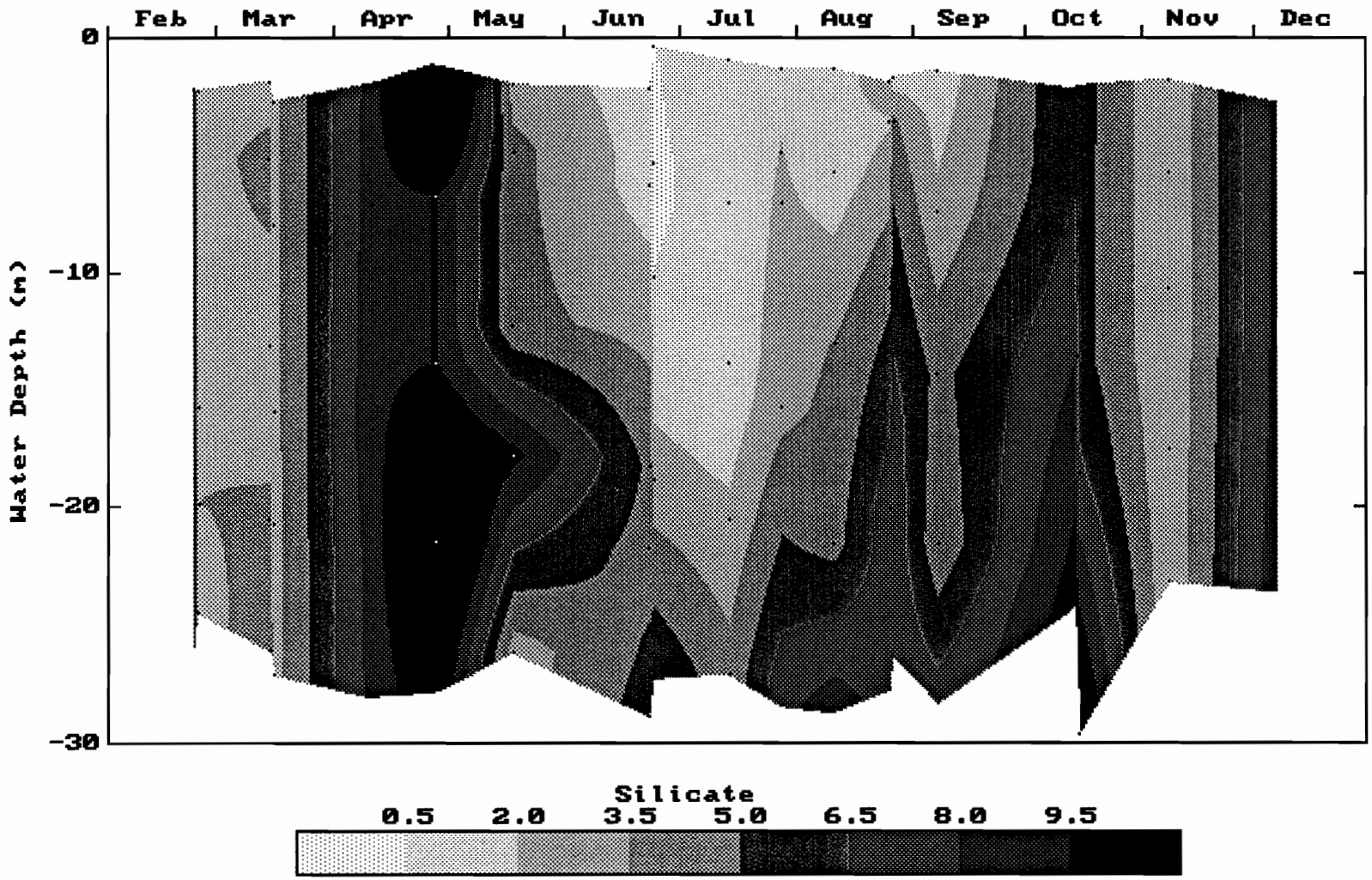
Station F24 during 1992



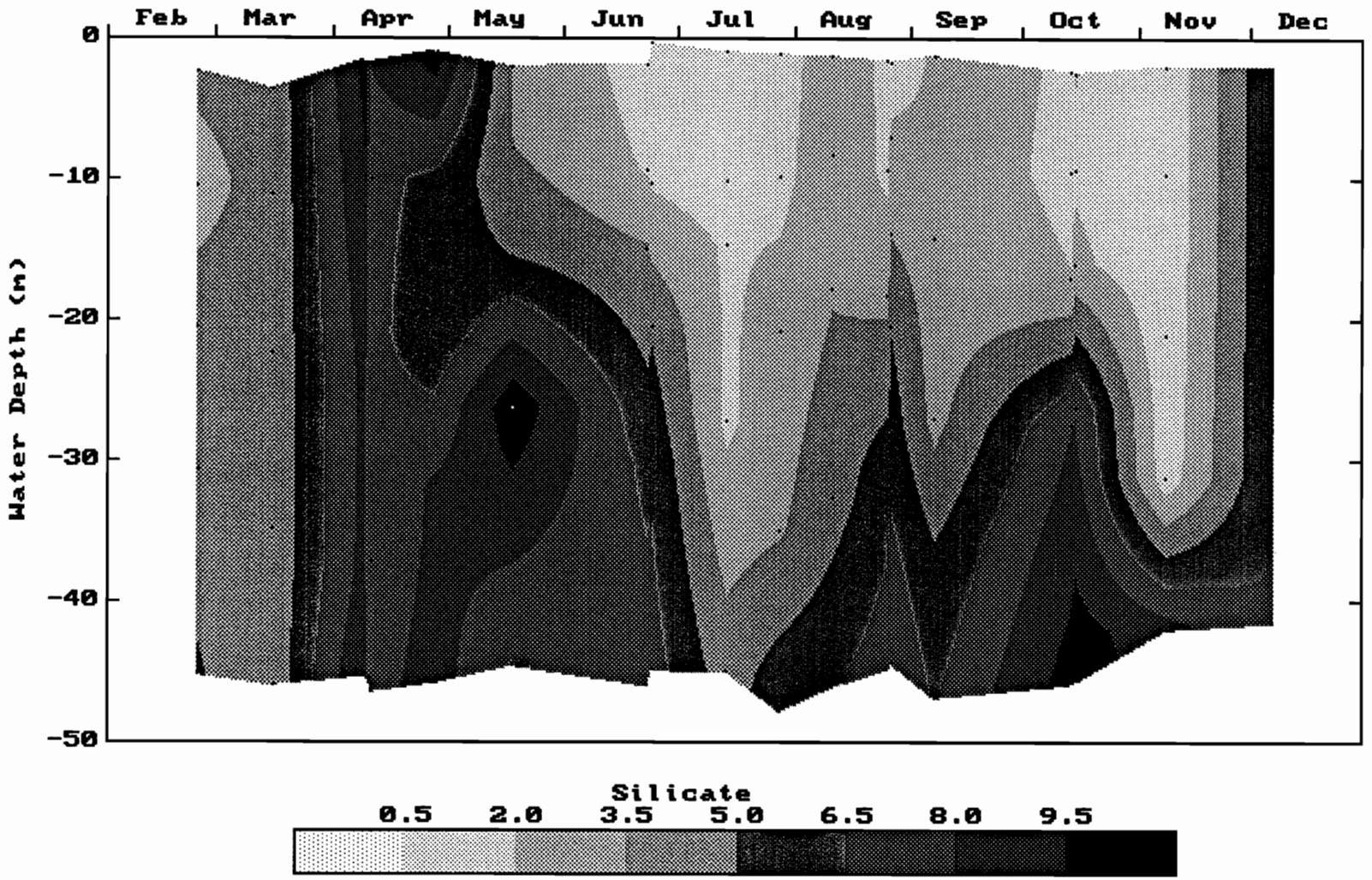
Station F25 during 1992



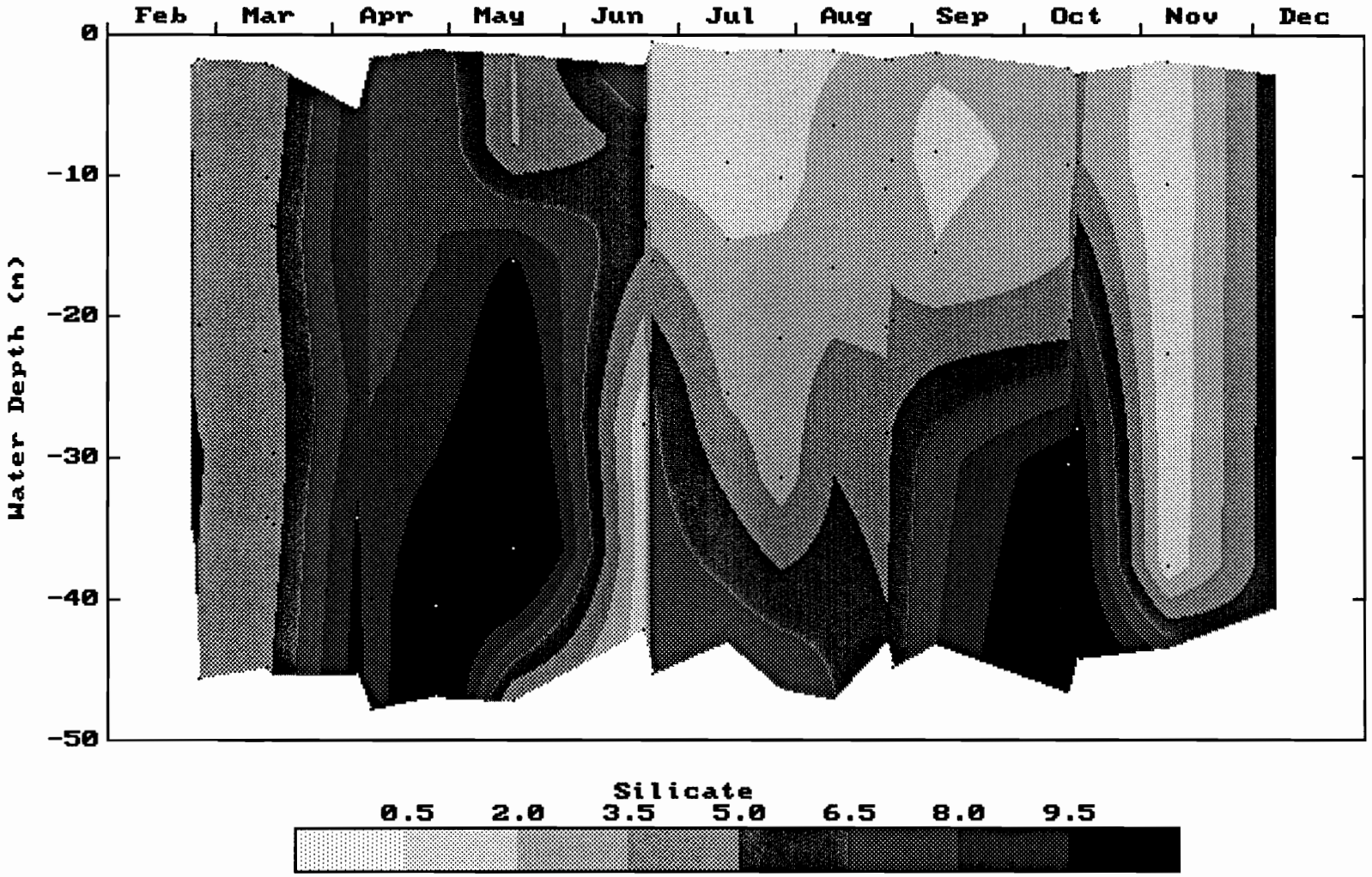
Station N01 during 1992



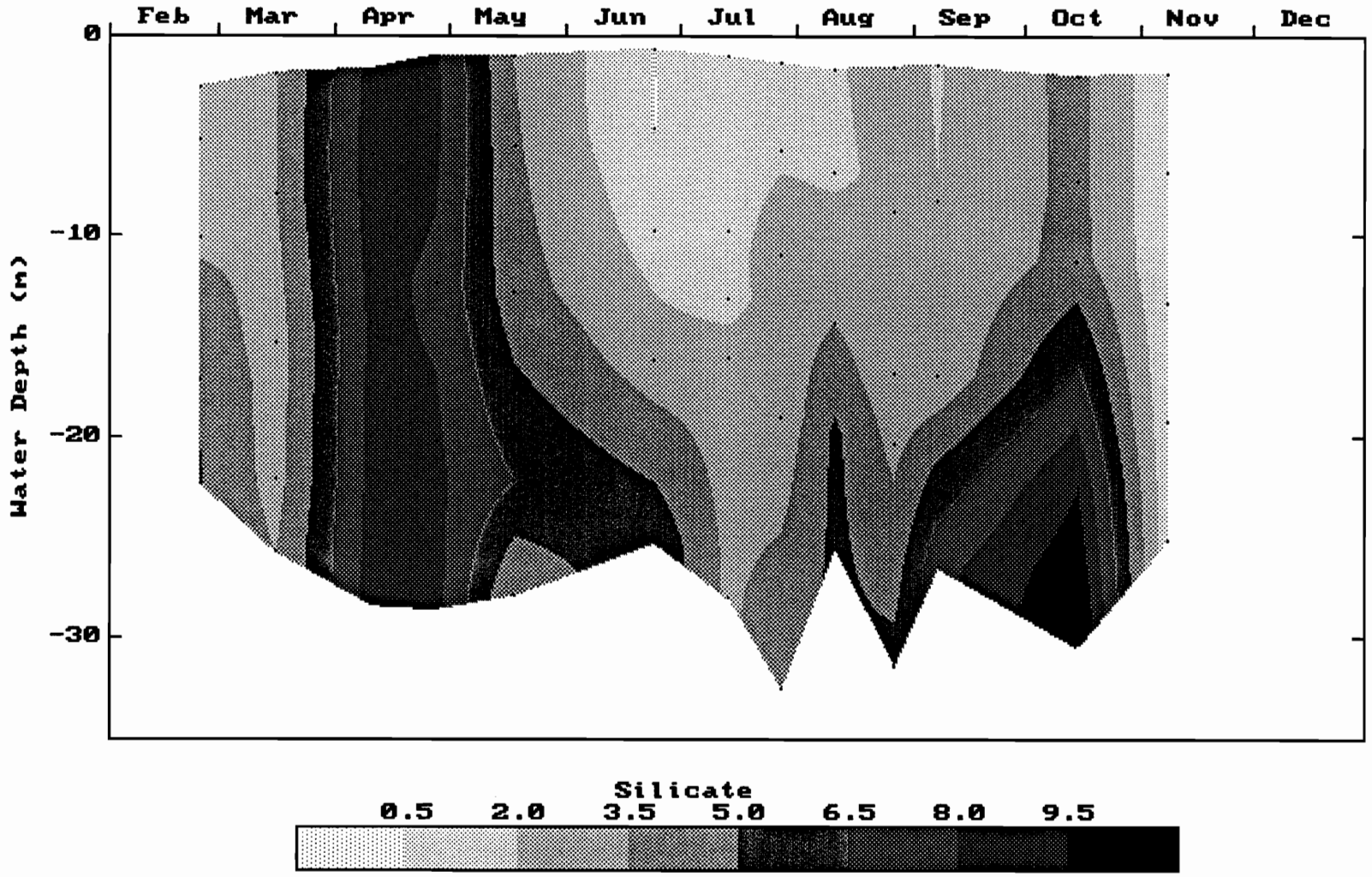
Station N04 during 1992



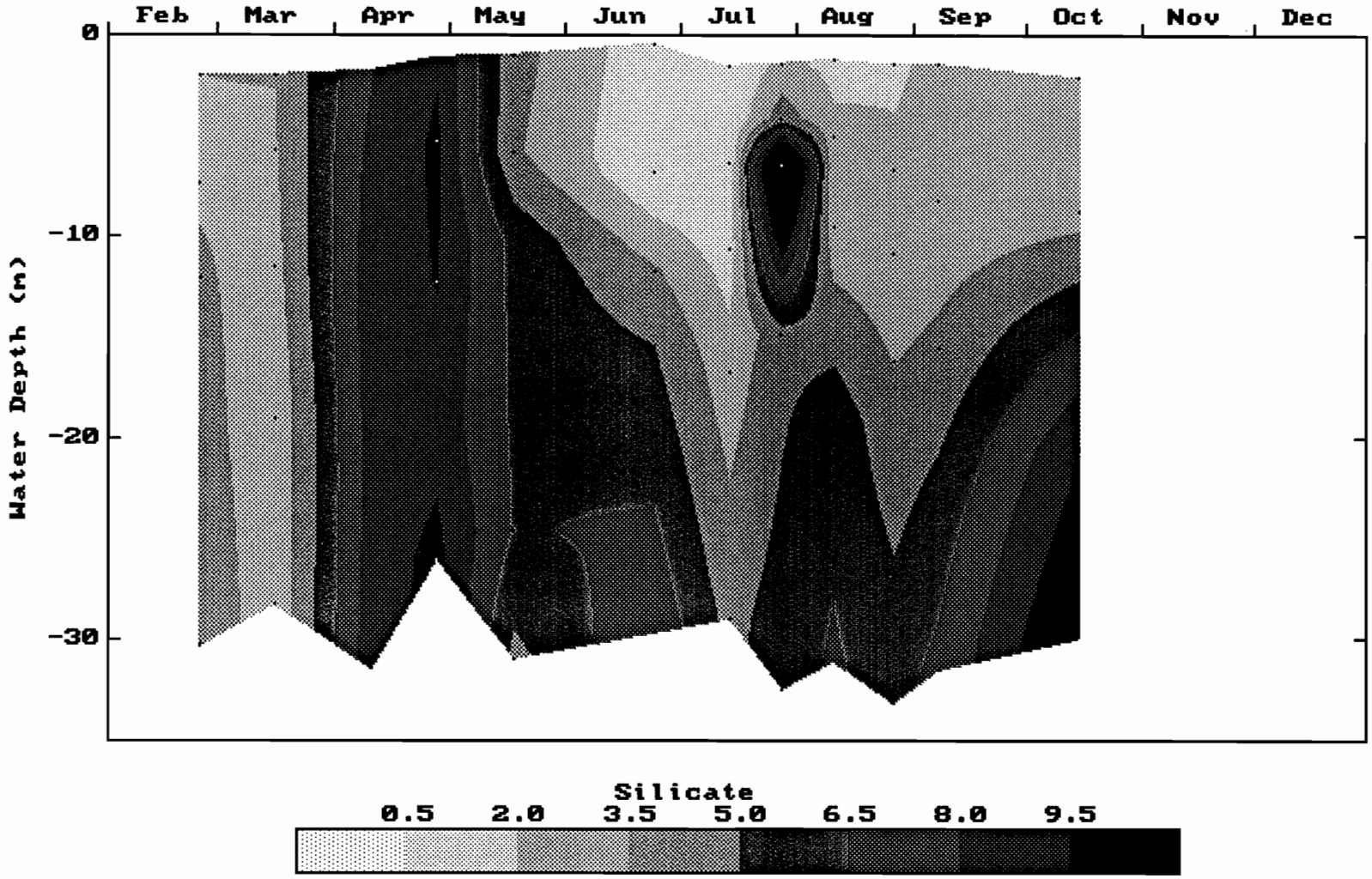
Station N07 during 1992



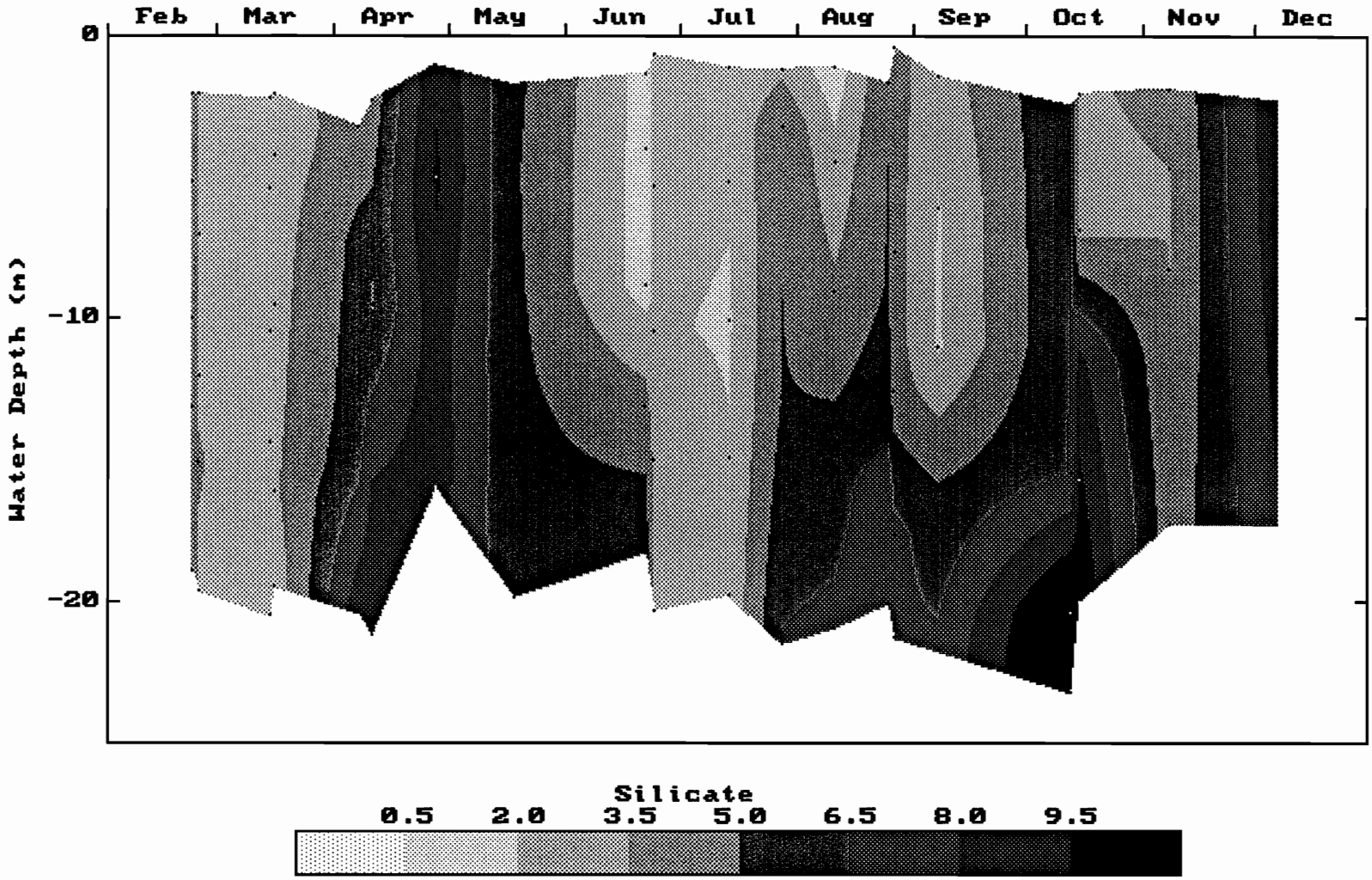
Station N08 during 1992



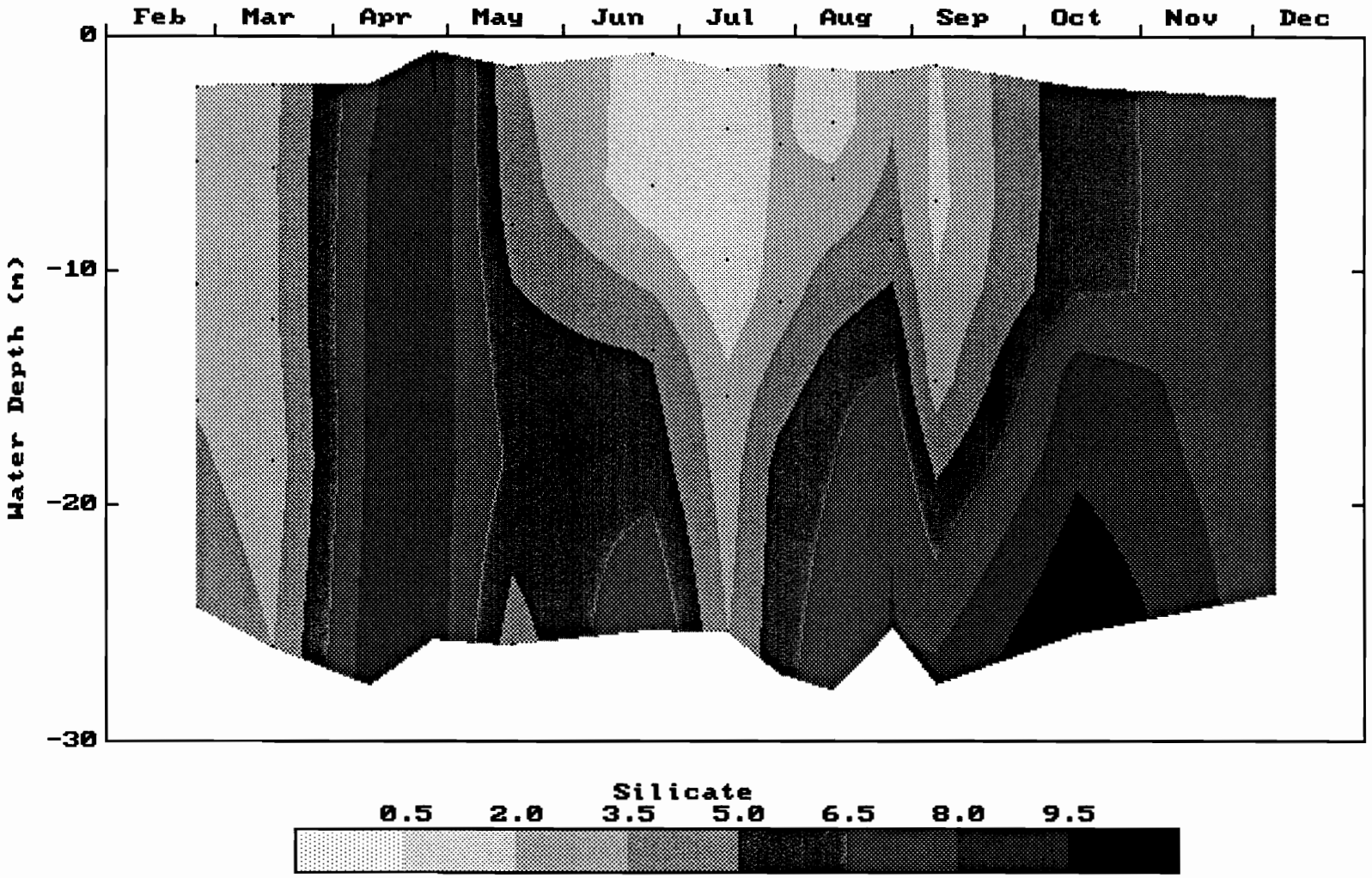
Station N09 during 1992



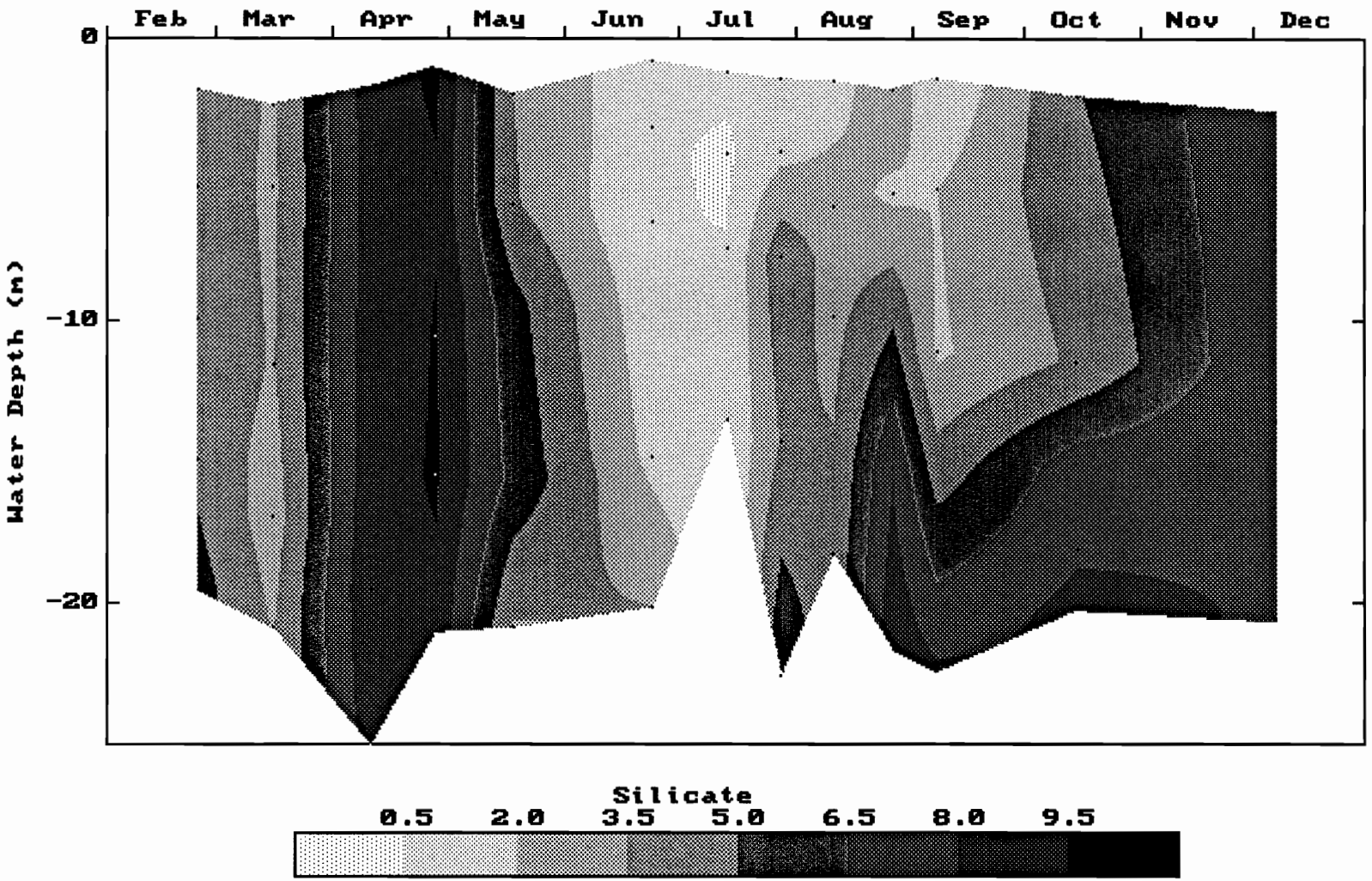
Station N10 during 1992



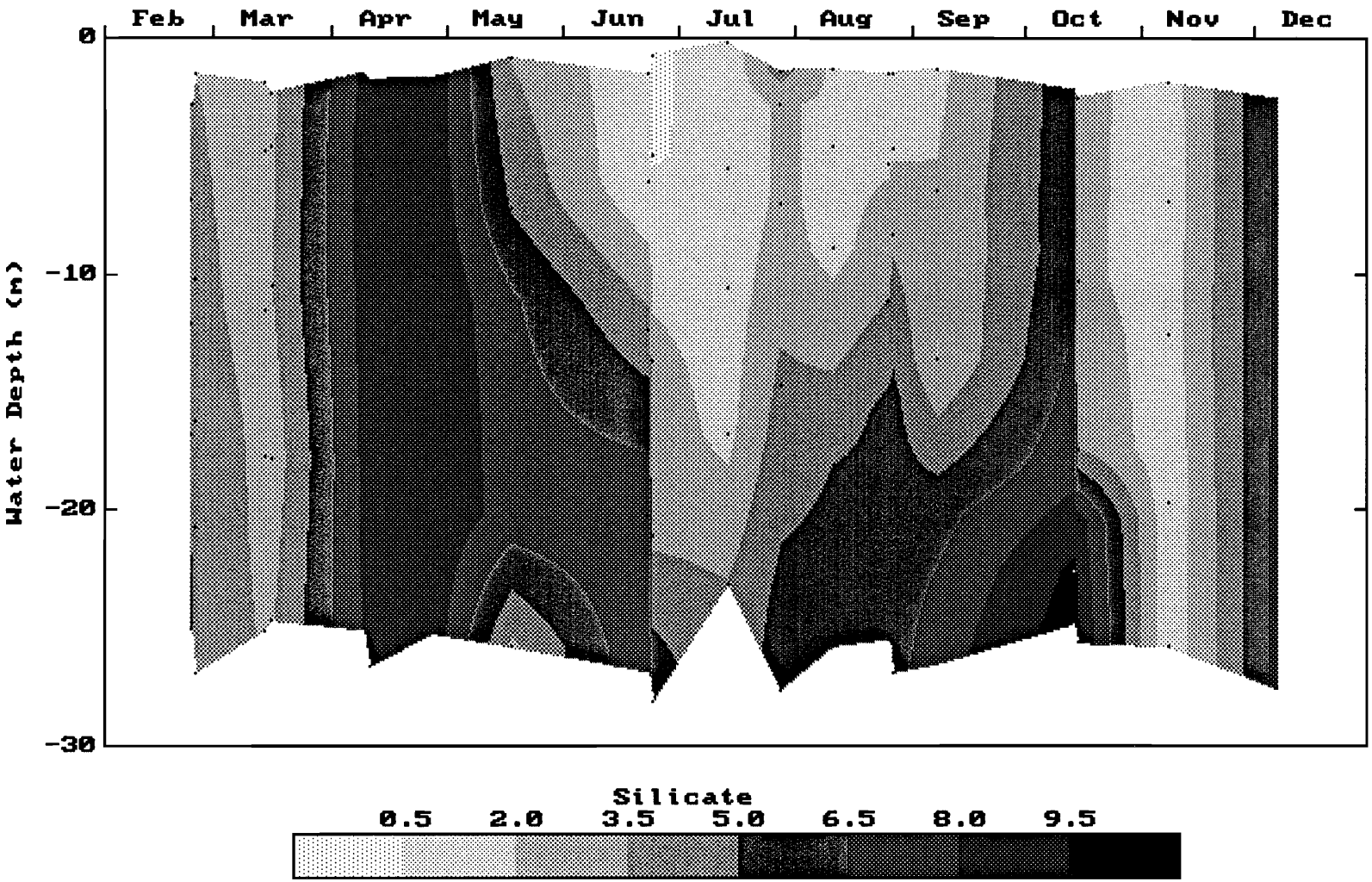
Station N11 during 1992



Station N12 during 1992

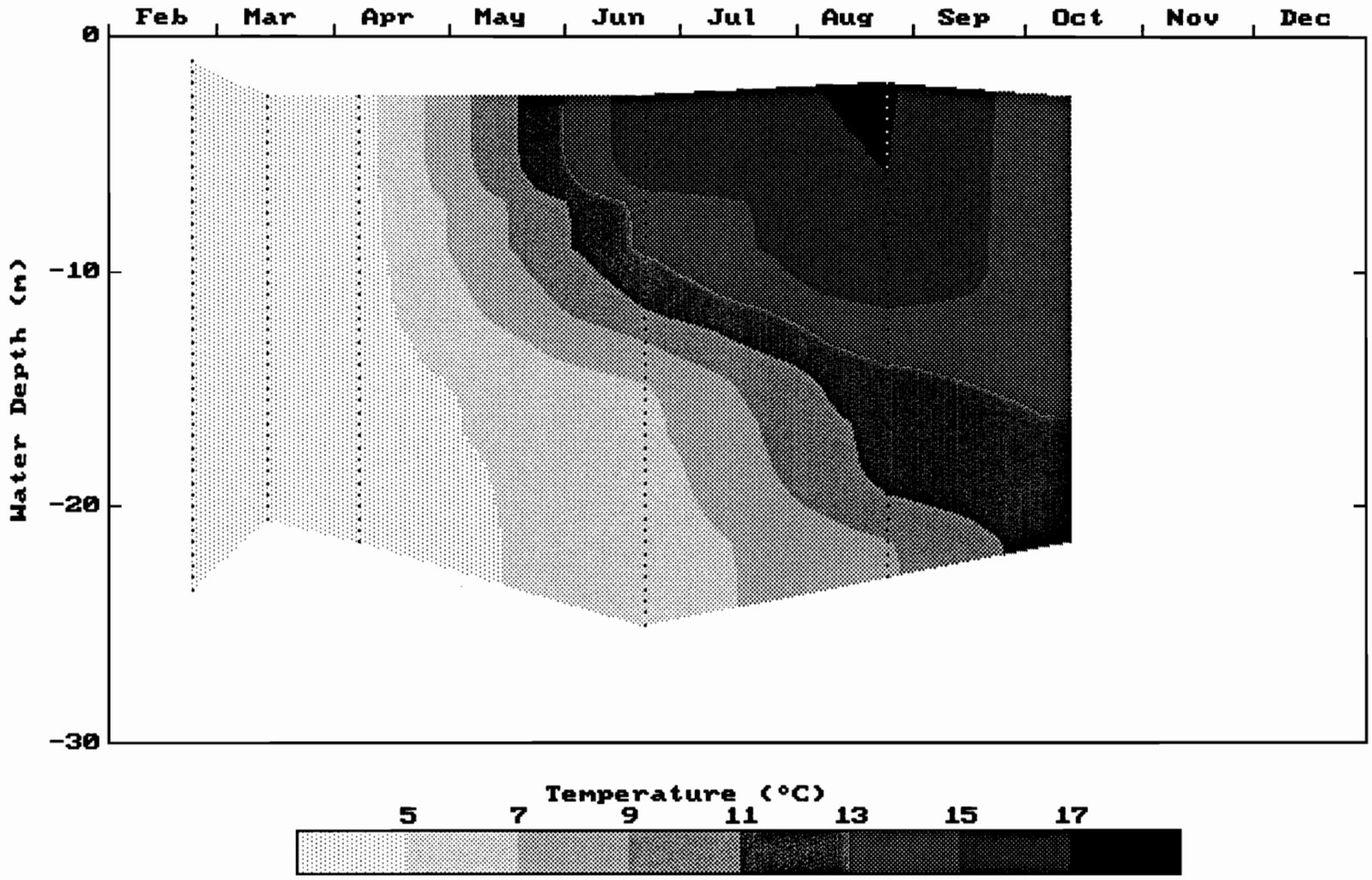


Station N20 during 1992

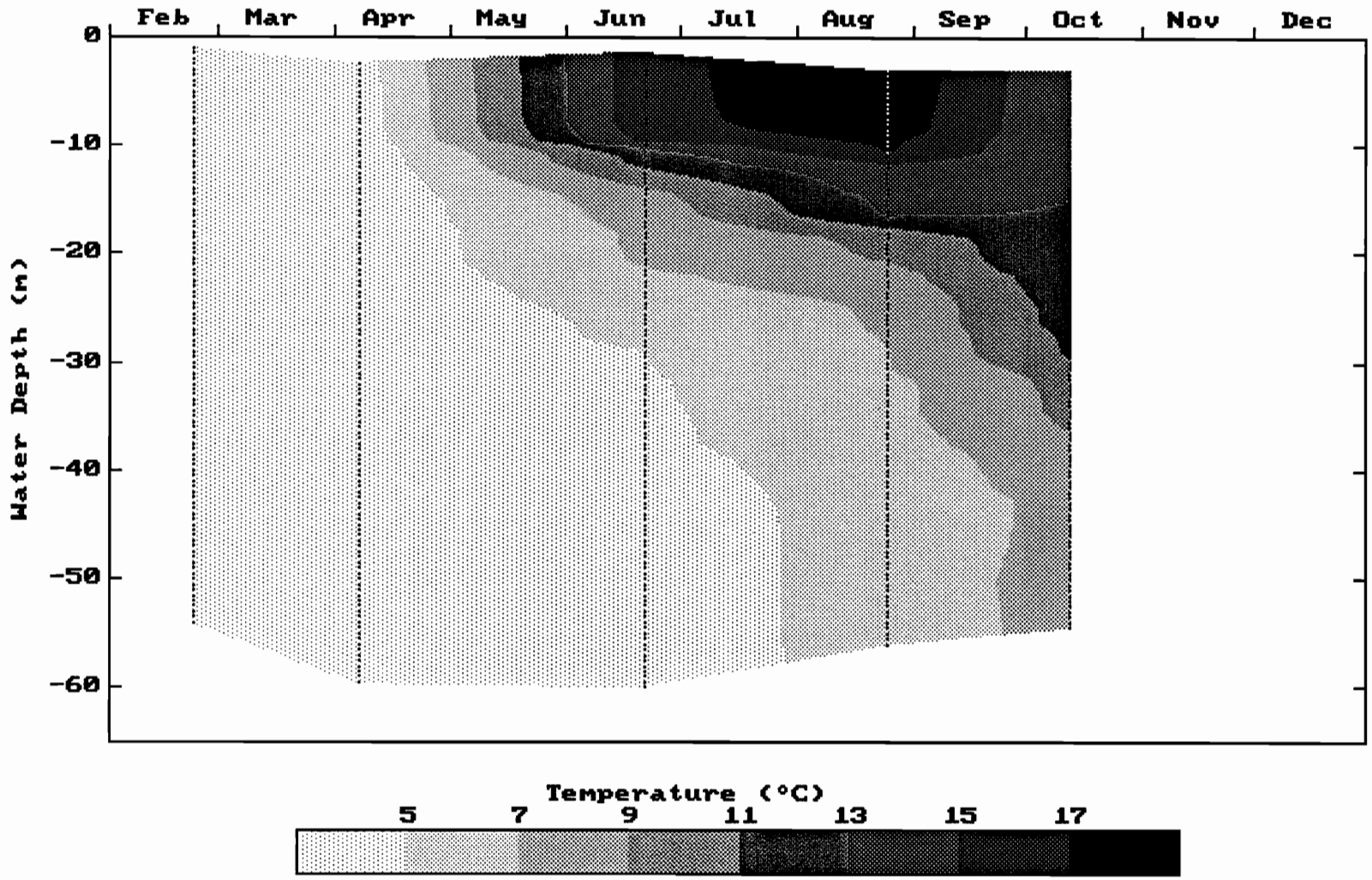


Temperature

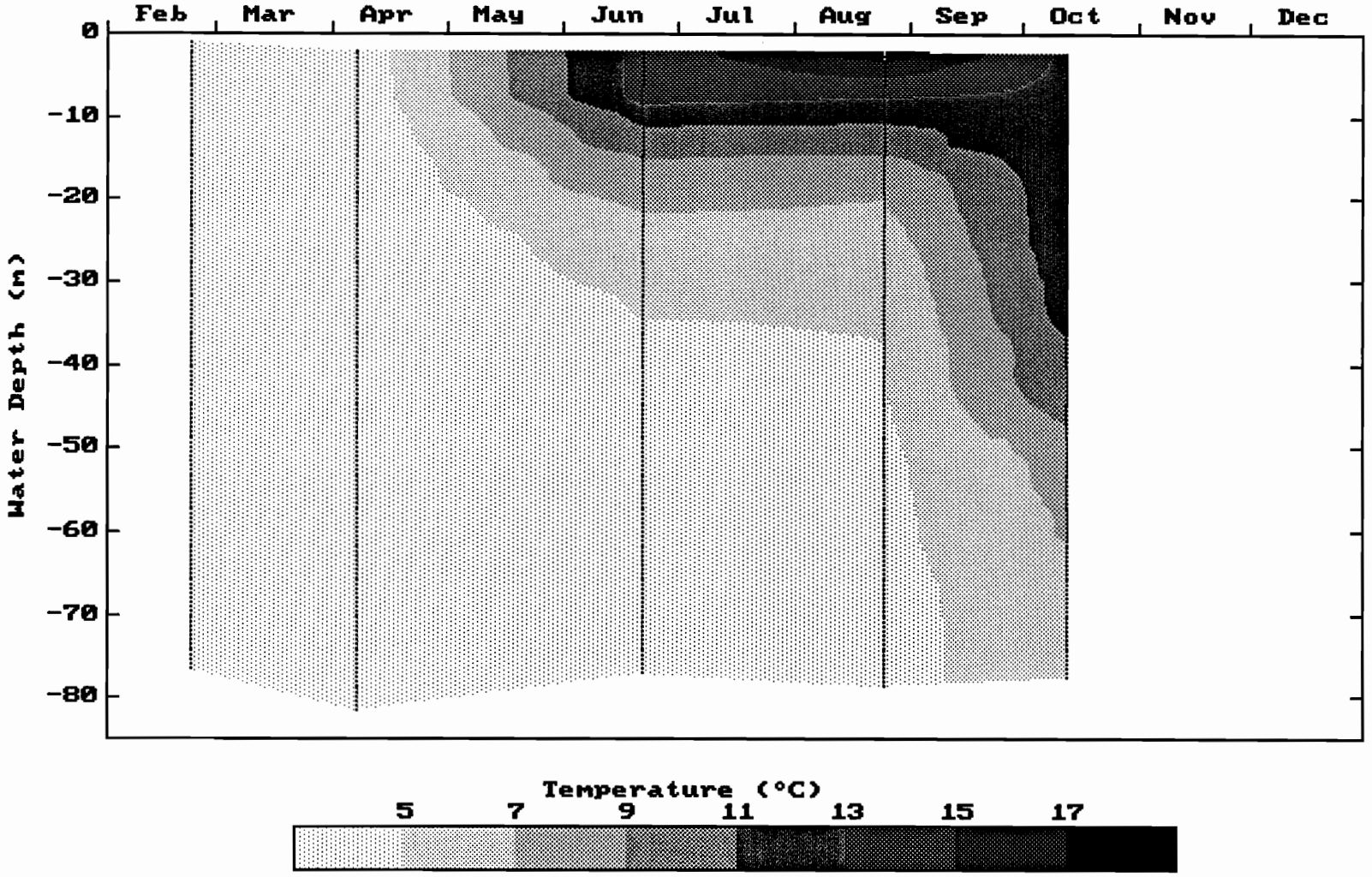
Station F01 during 1992



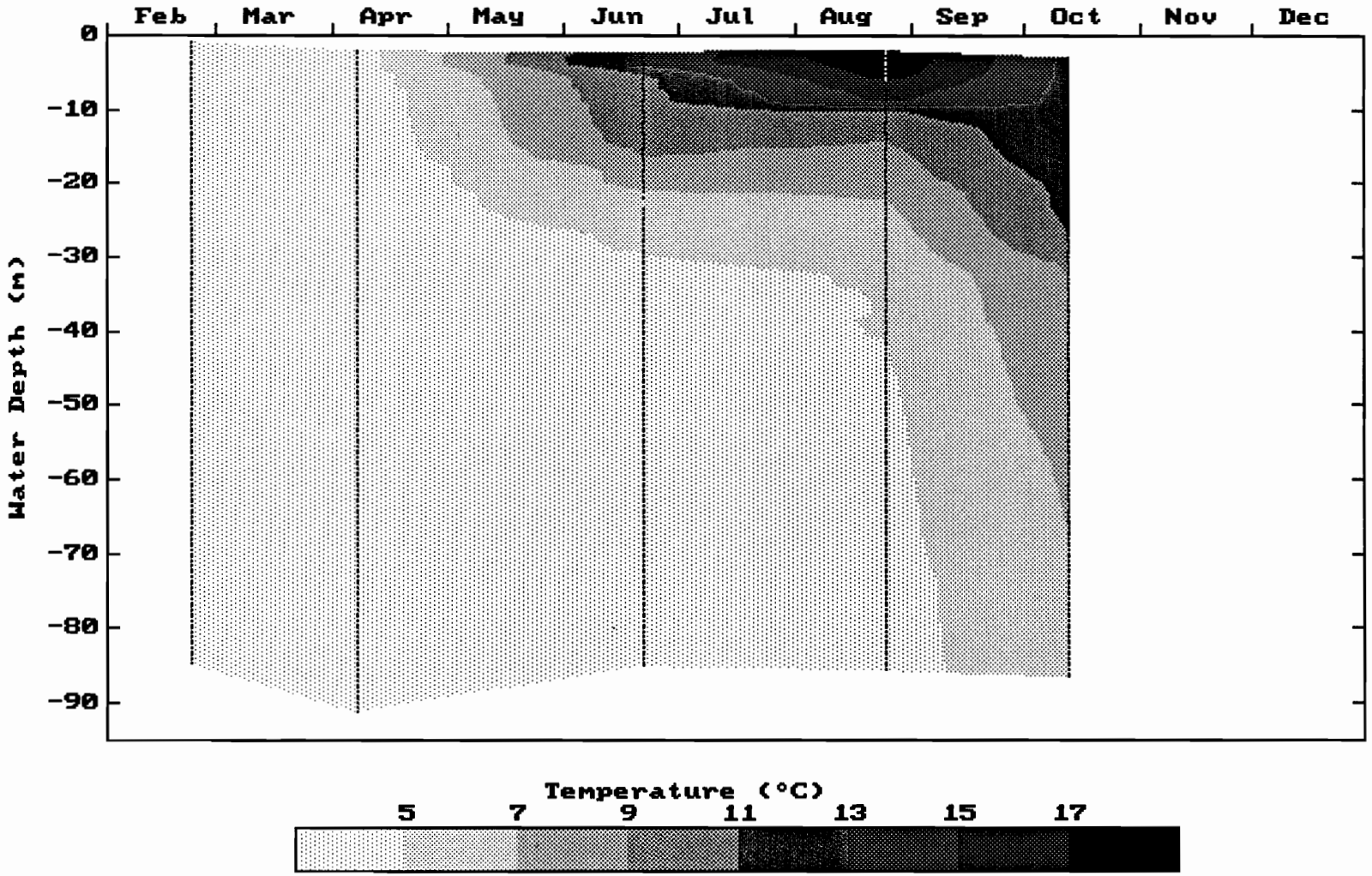
Station F04 during 1992



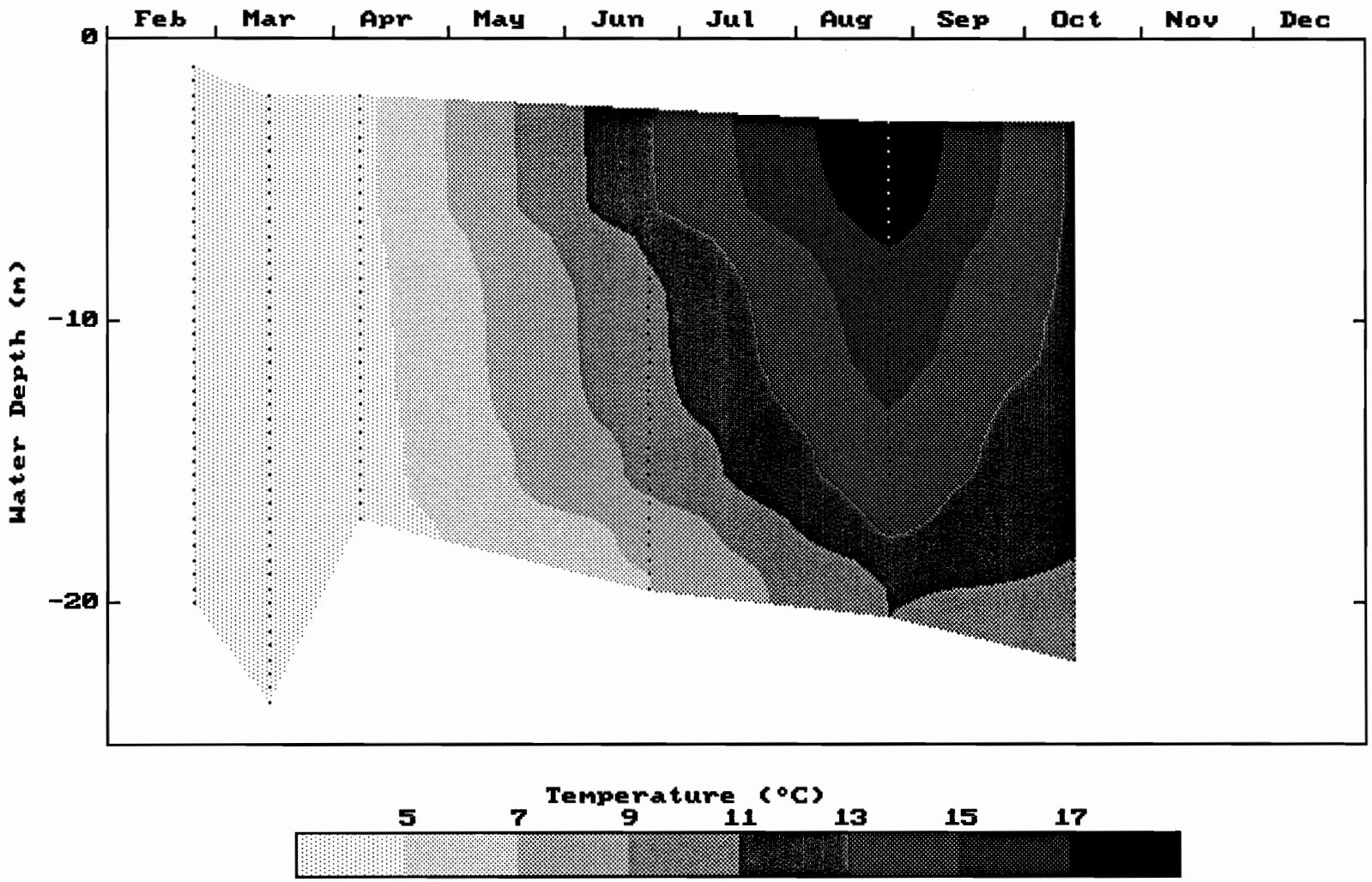
Station F08 during 1992



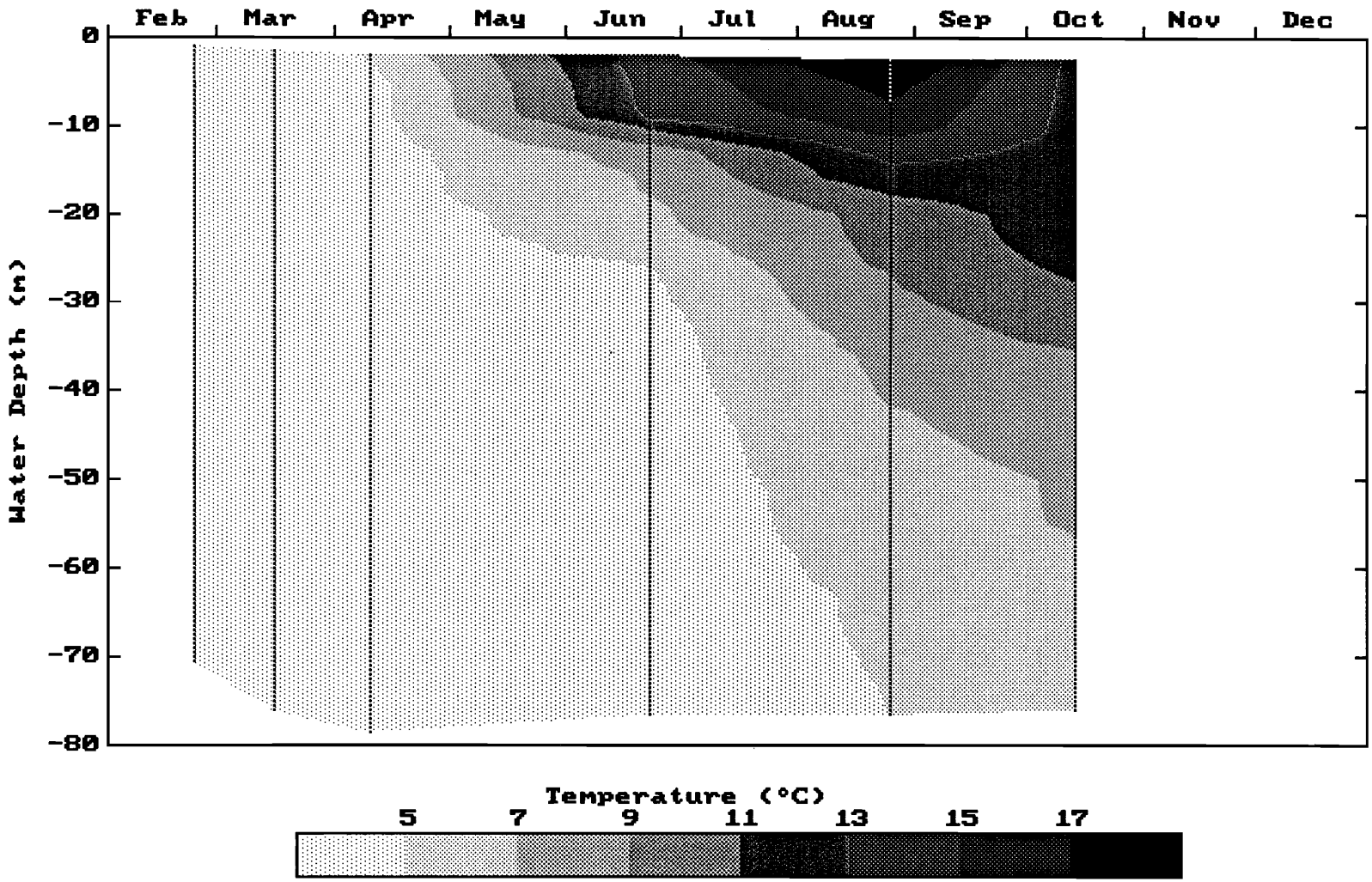
Station F12 during 1992



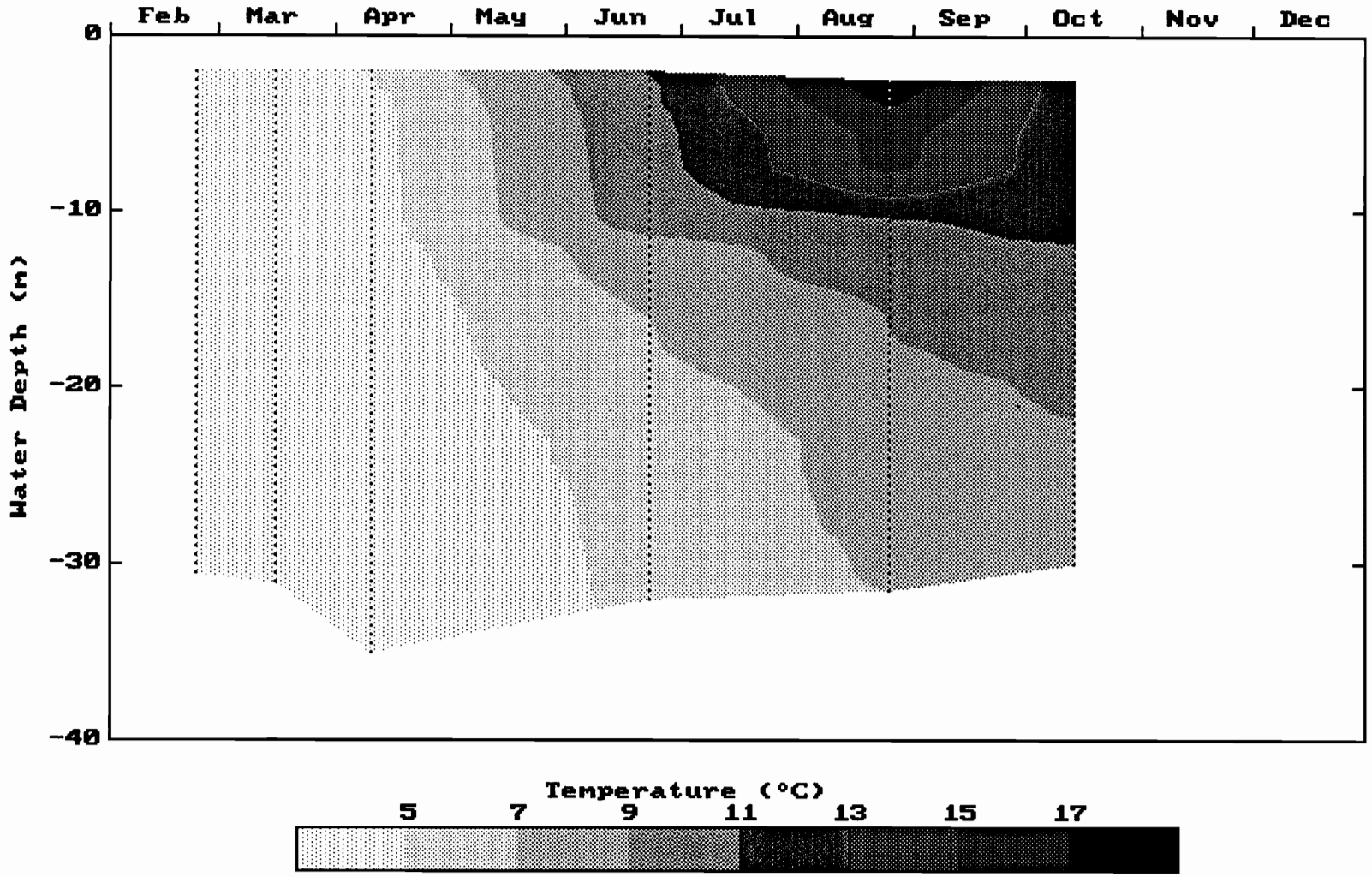
Station F13 during 1992



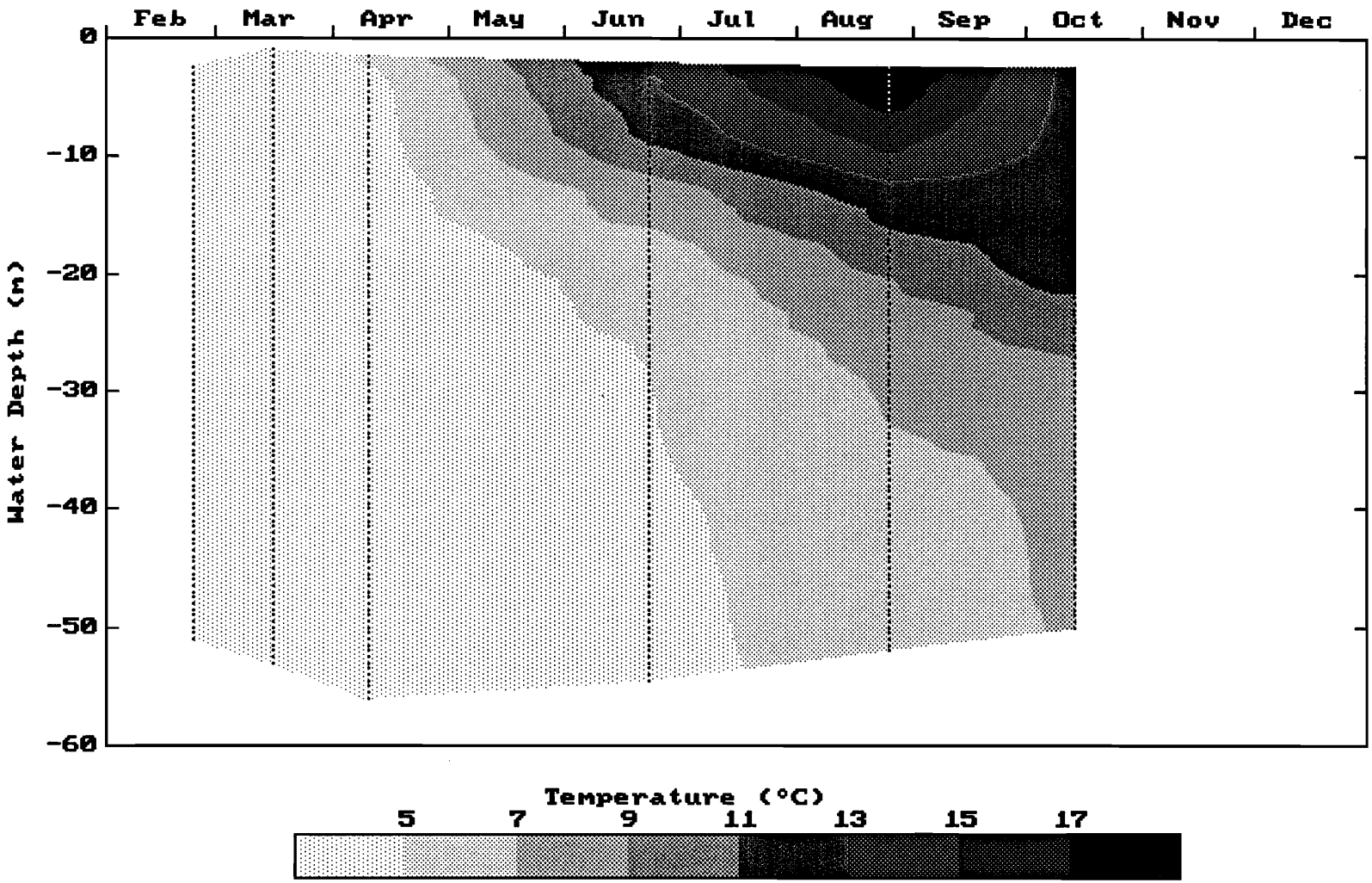
Station F19 during 1992



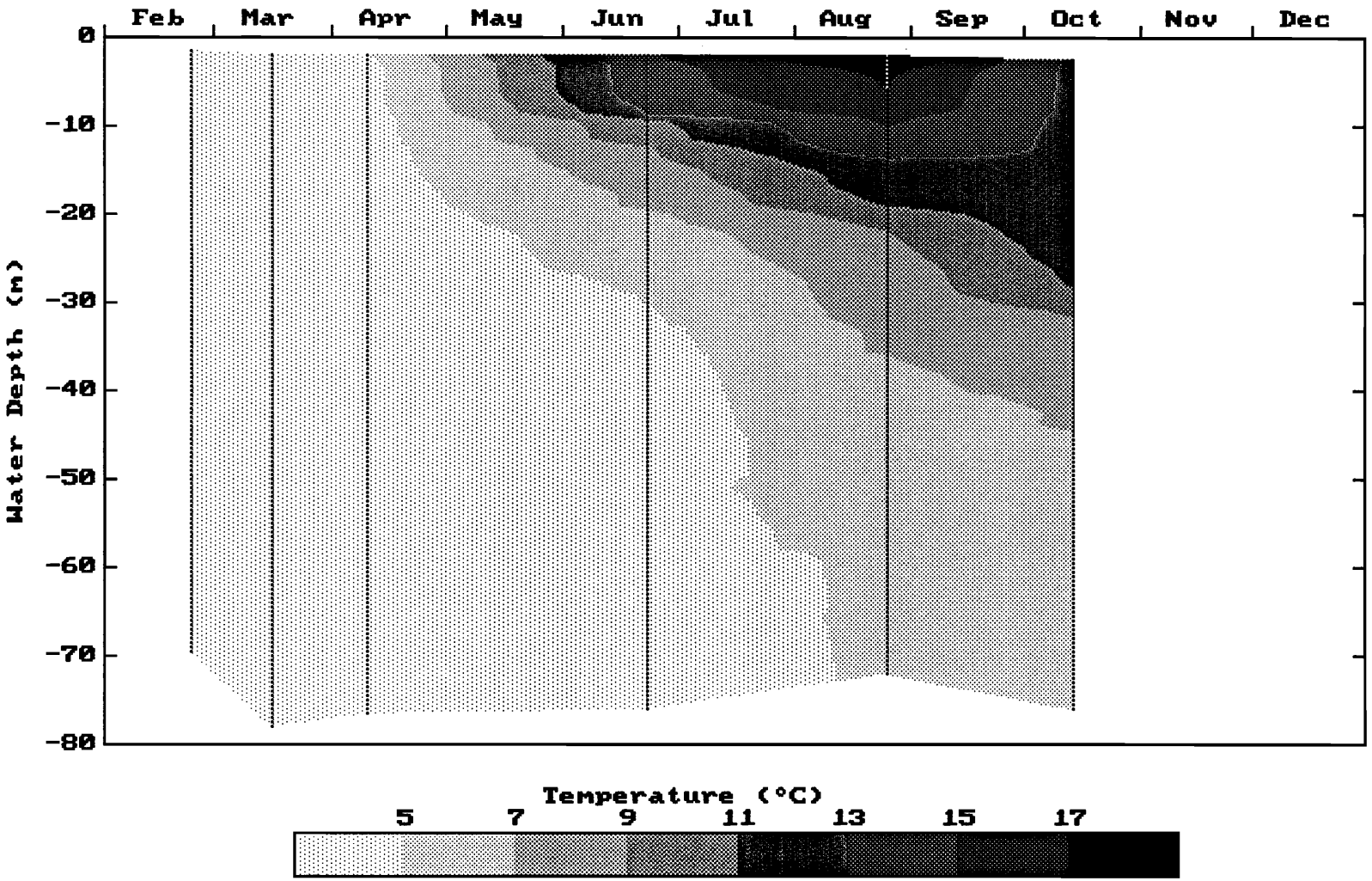
Station F20 during 1992



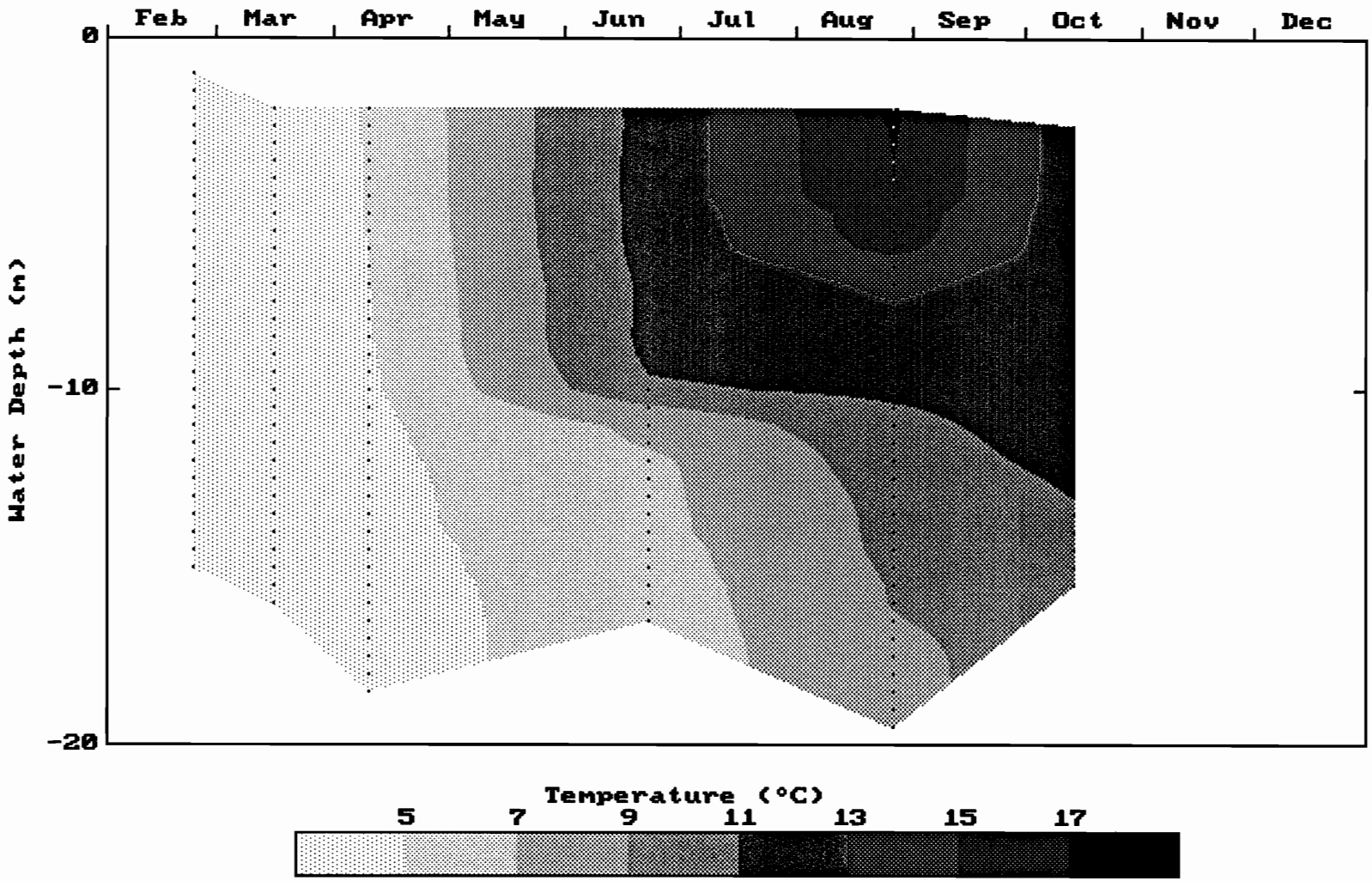
Station FZ1 during 1992



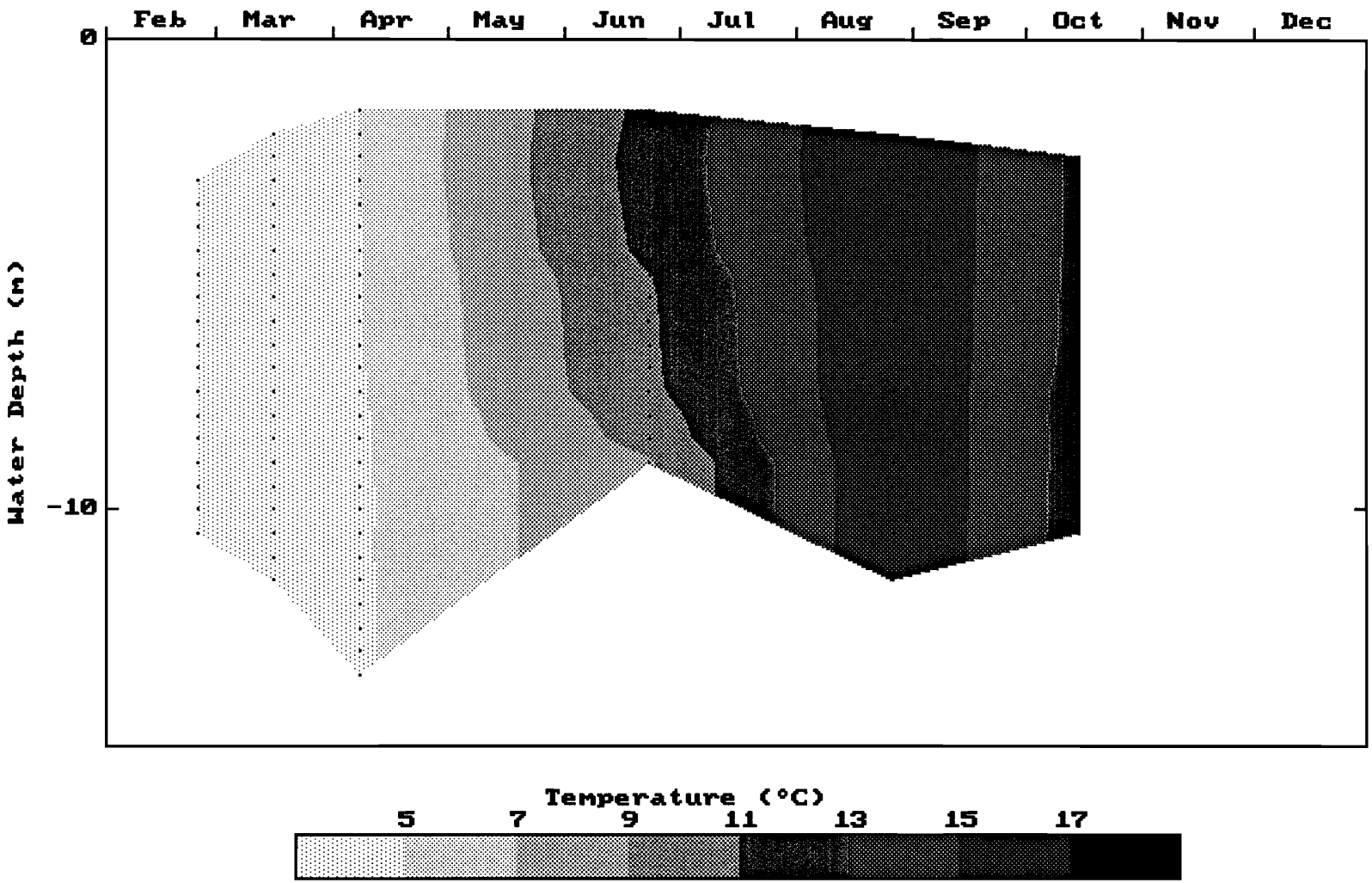
Station F22 during 1992



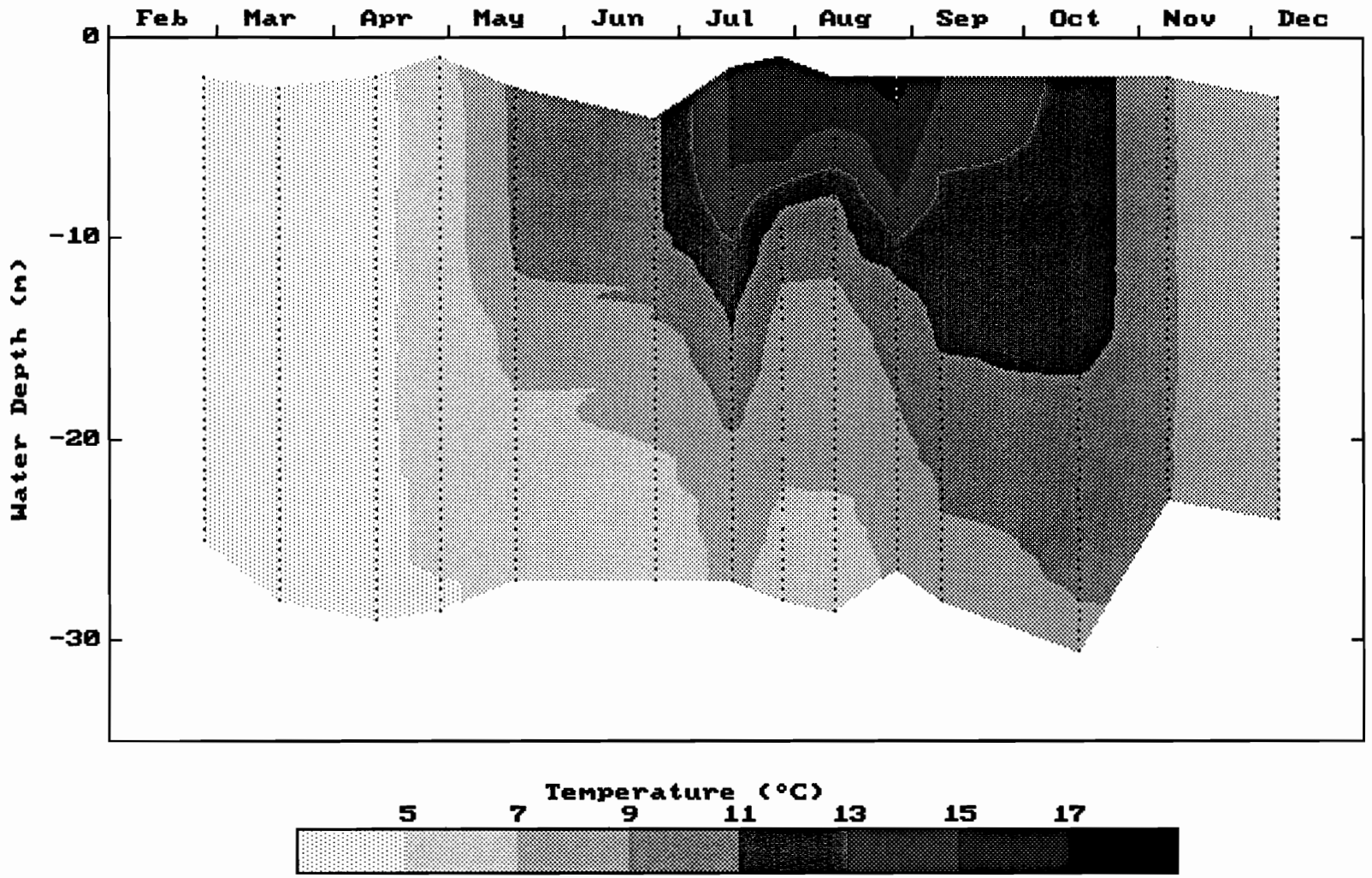
Station F24 during 1992



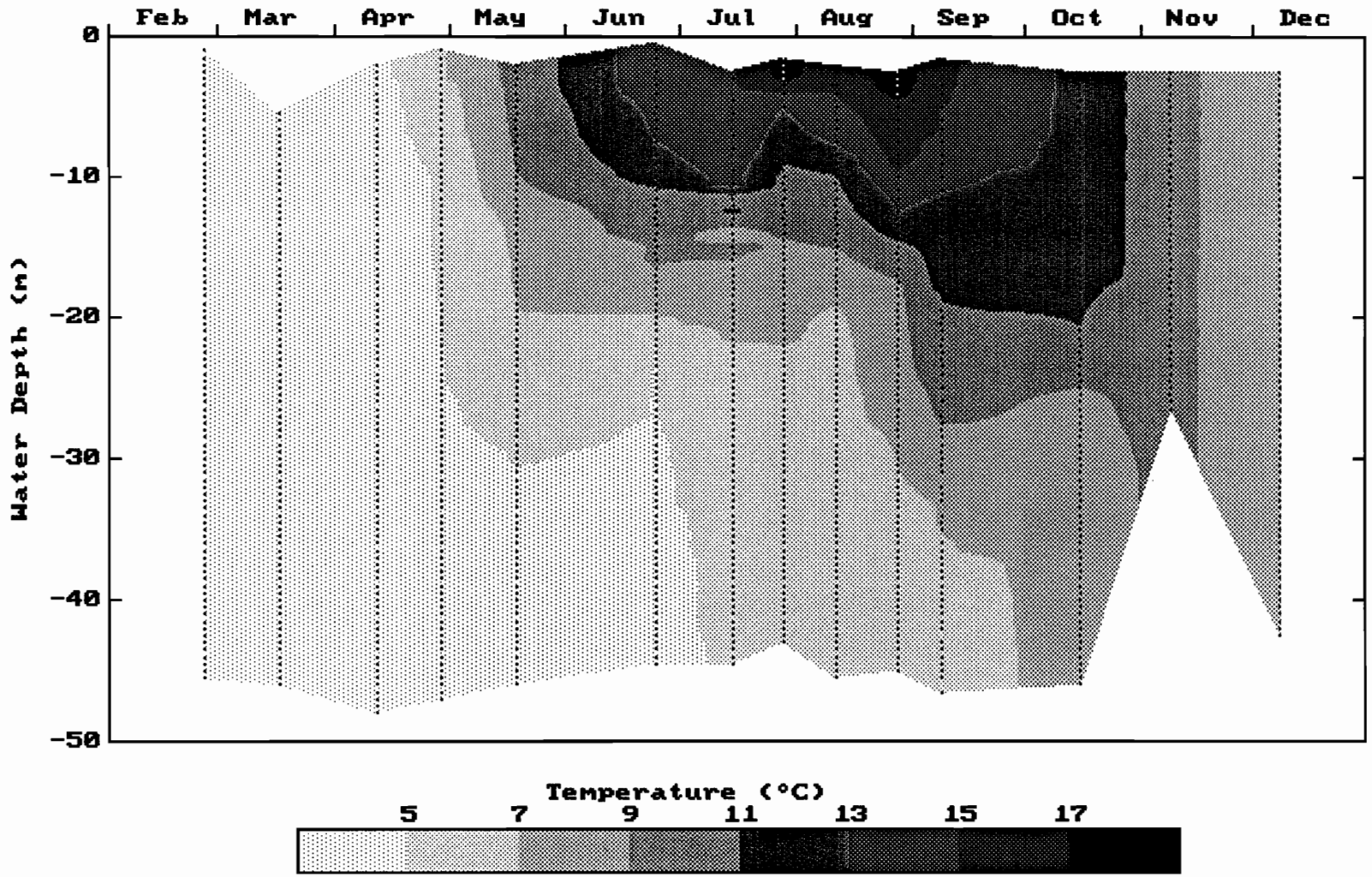
Station F25 during 1992



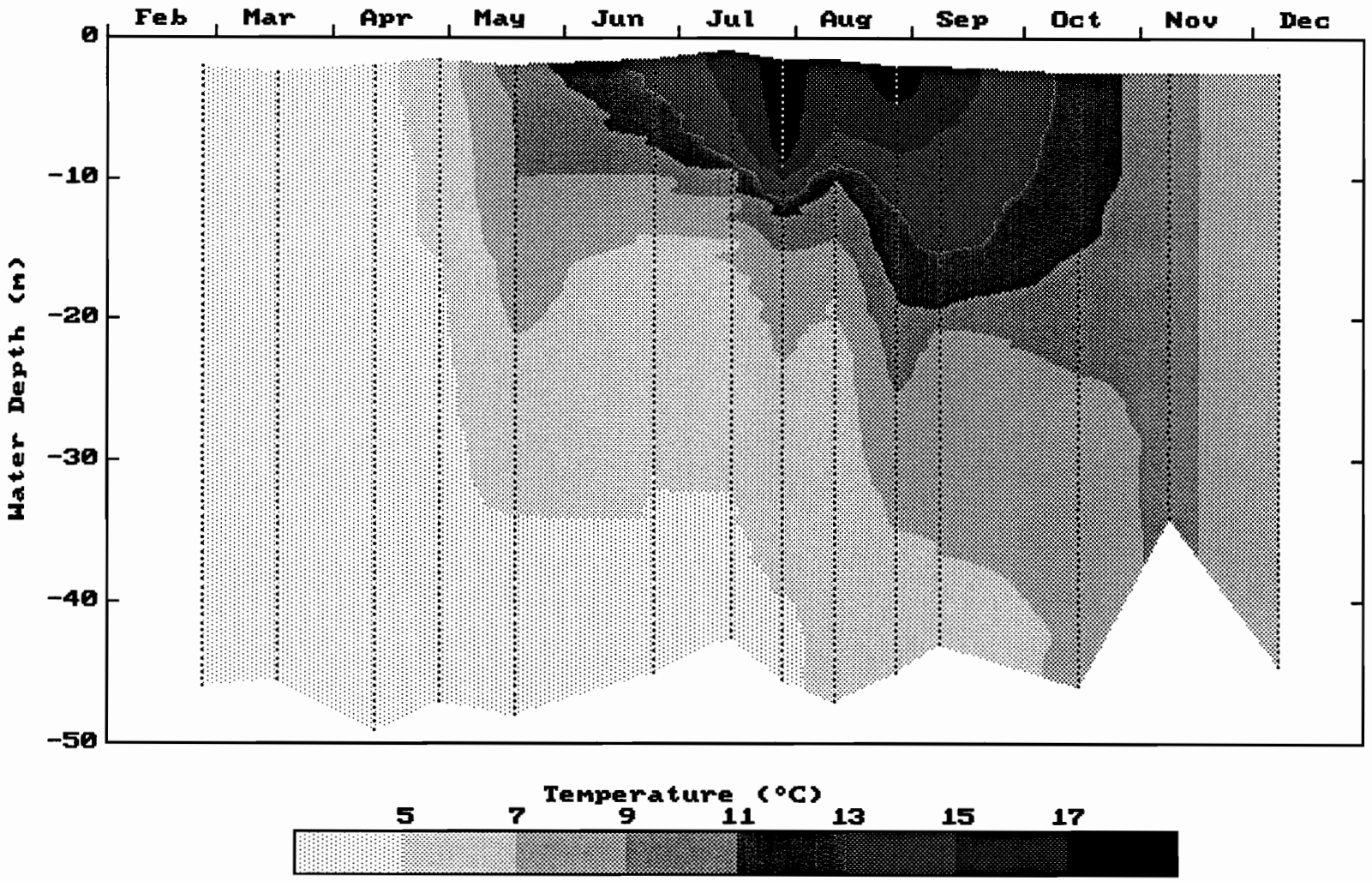
Station N01 during 1992



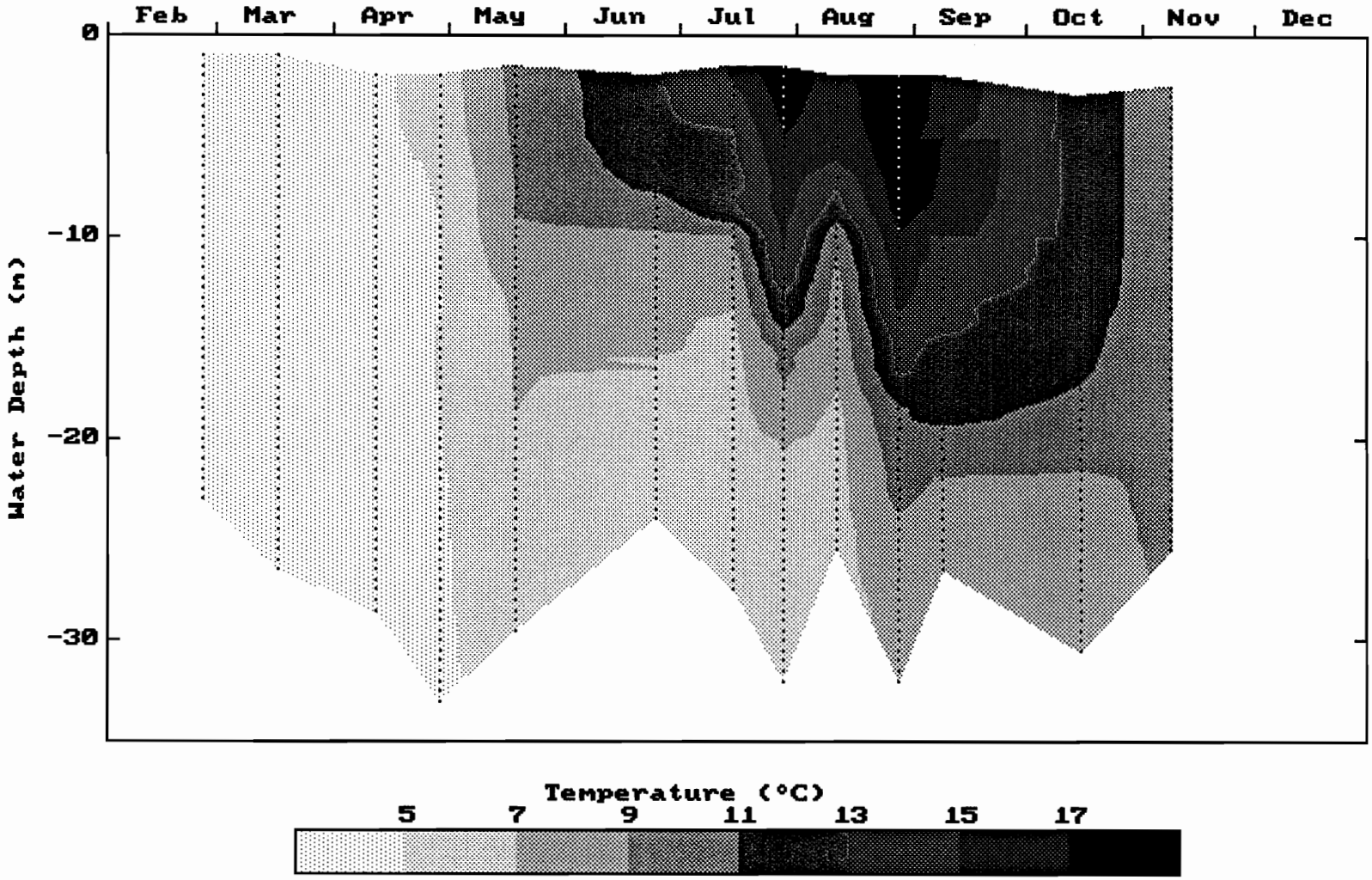
Station N04 during 1992



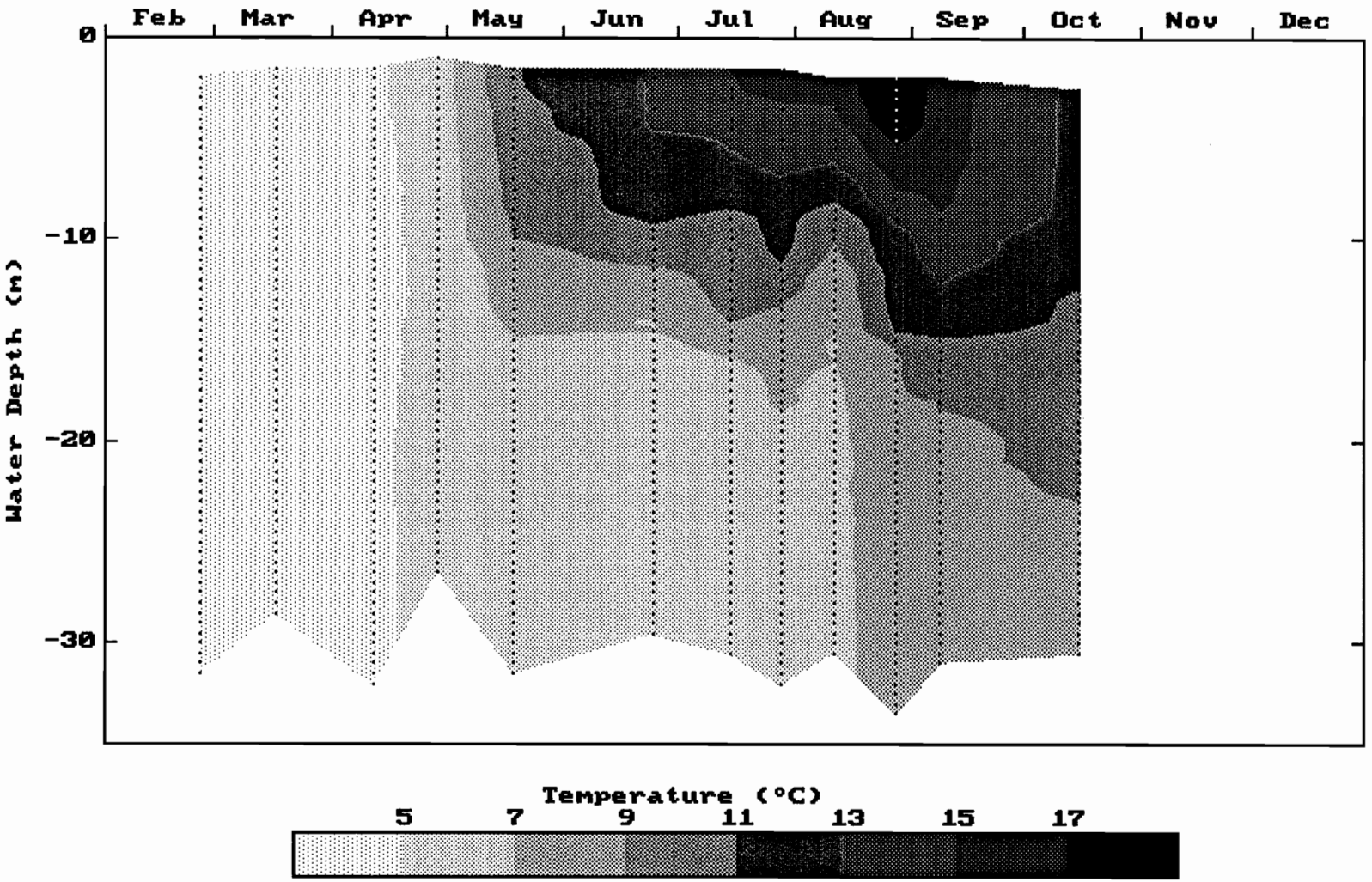
Station N07 during 1992

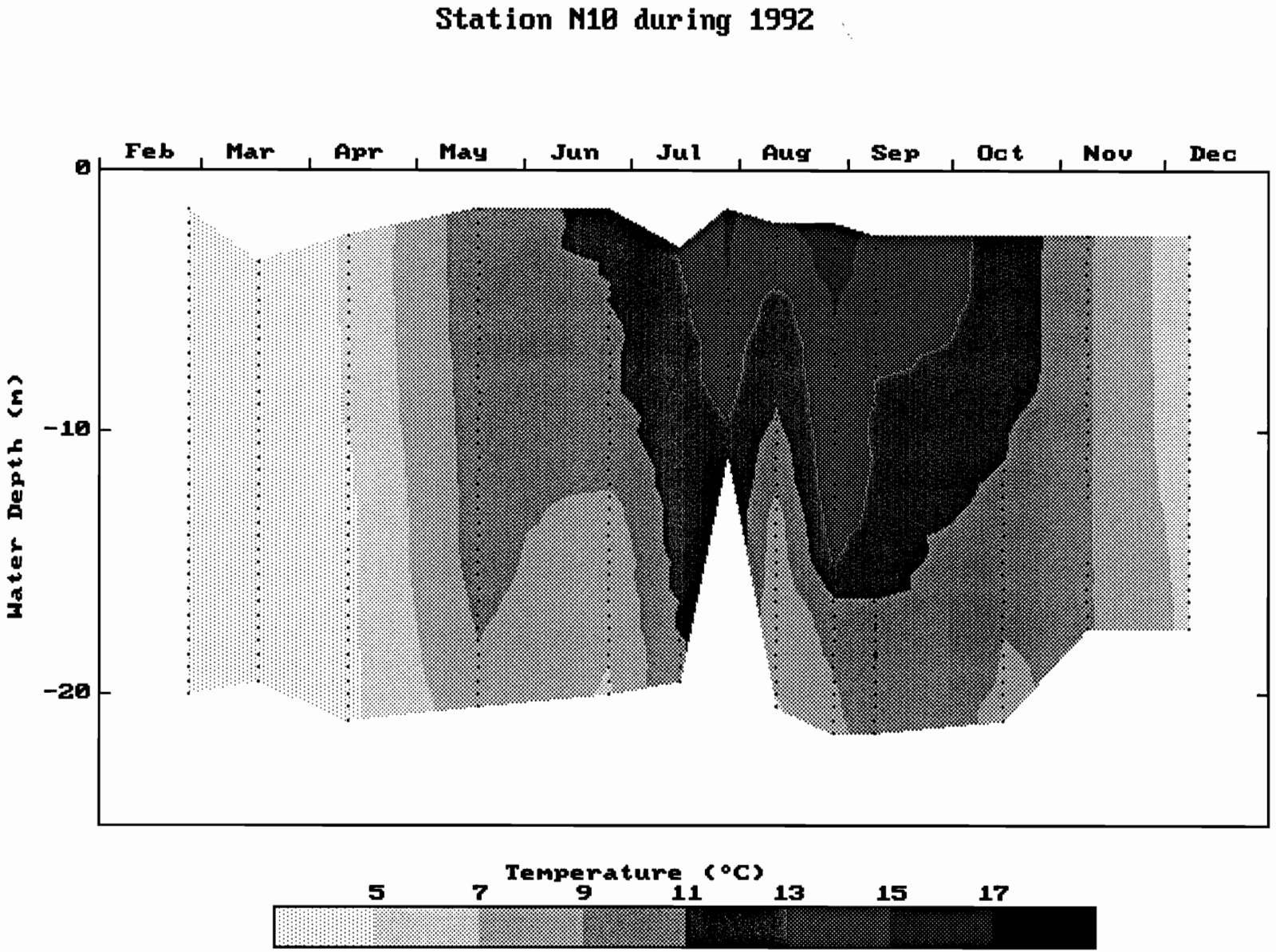


Station N08 during 1992

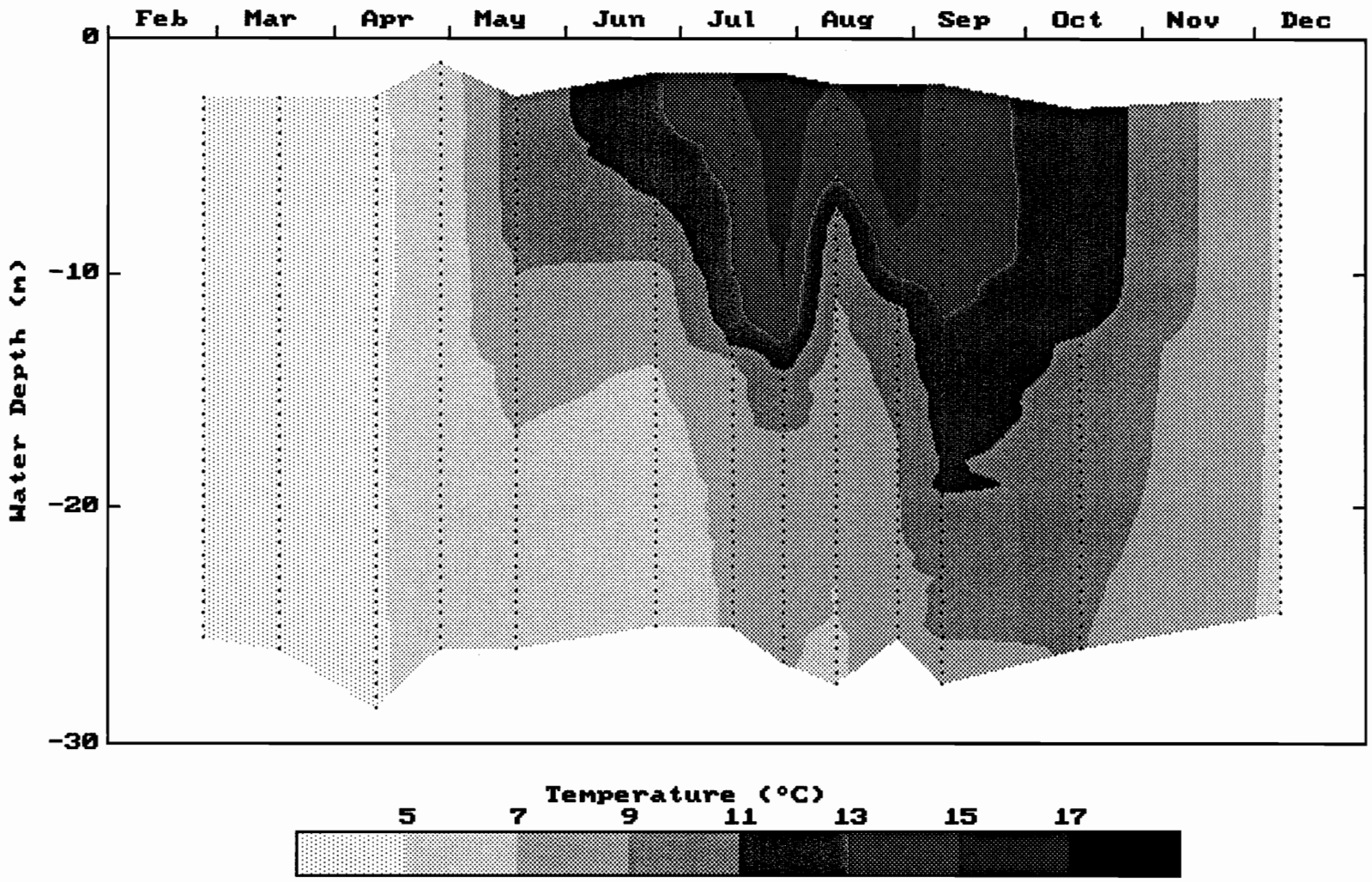


Station N09 during 1992

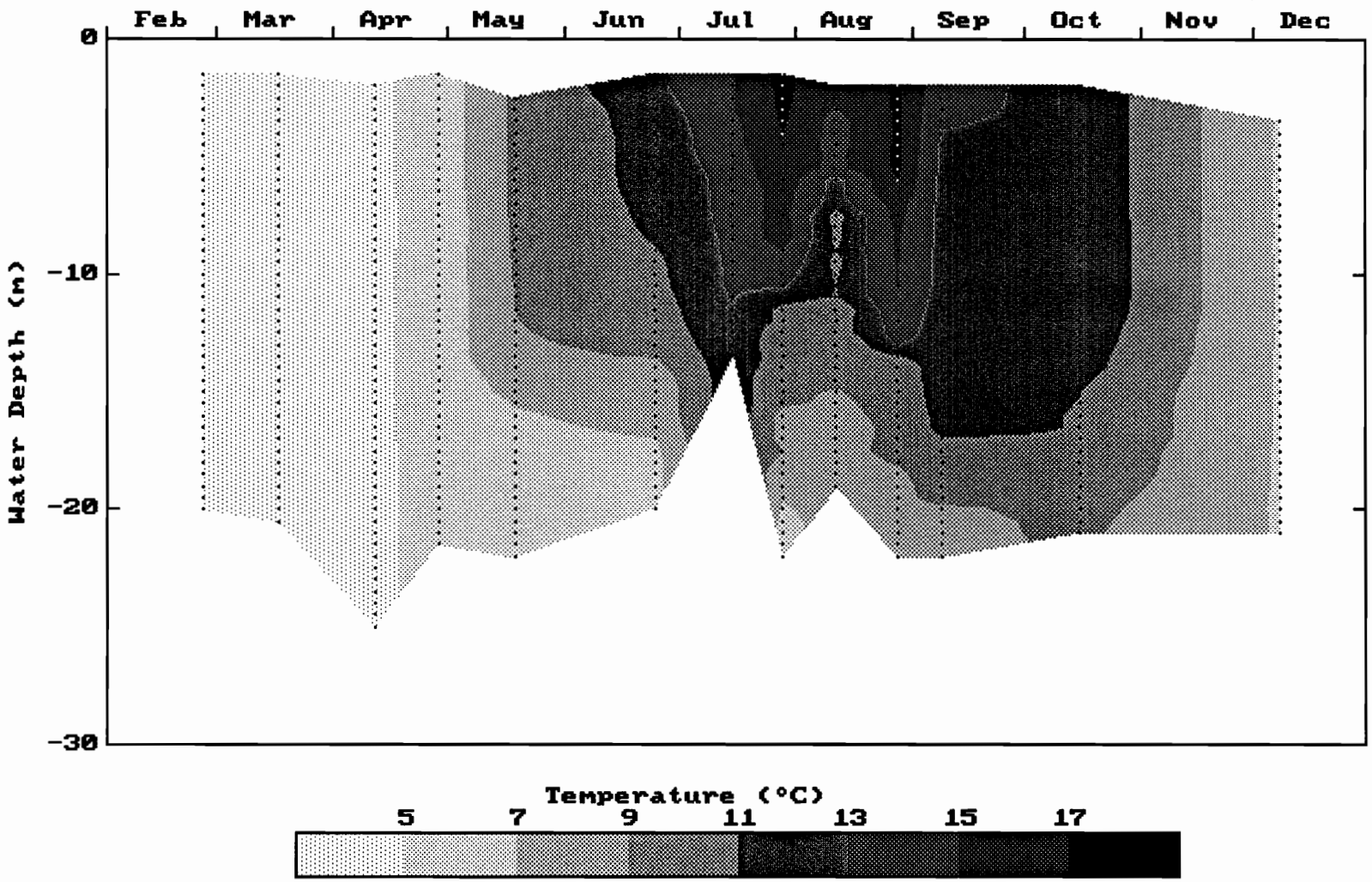



Station N10 during 1992
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0
-10
-20
Water Depth (m)
Temperature (°C)
5
7
9
11
13
15
17

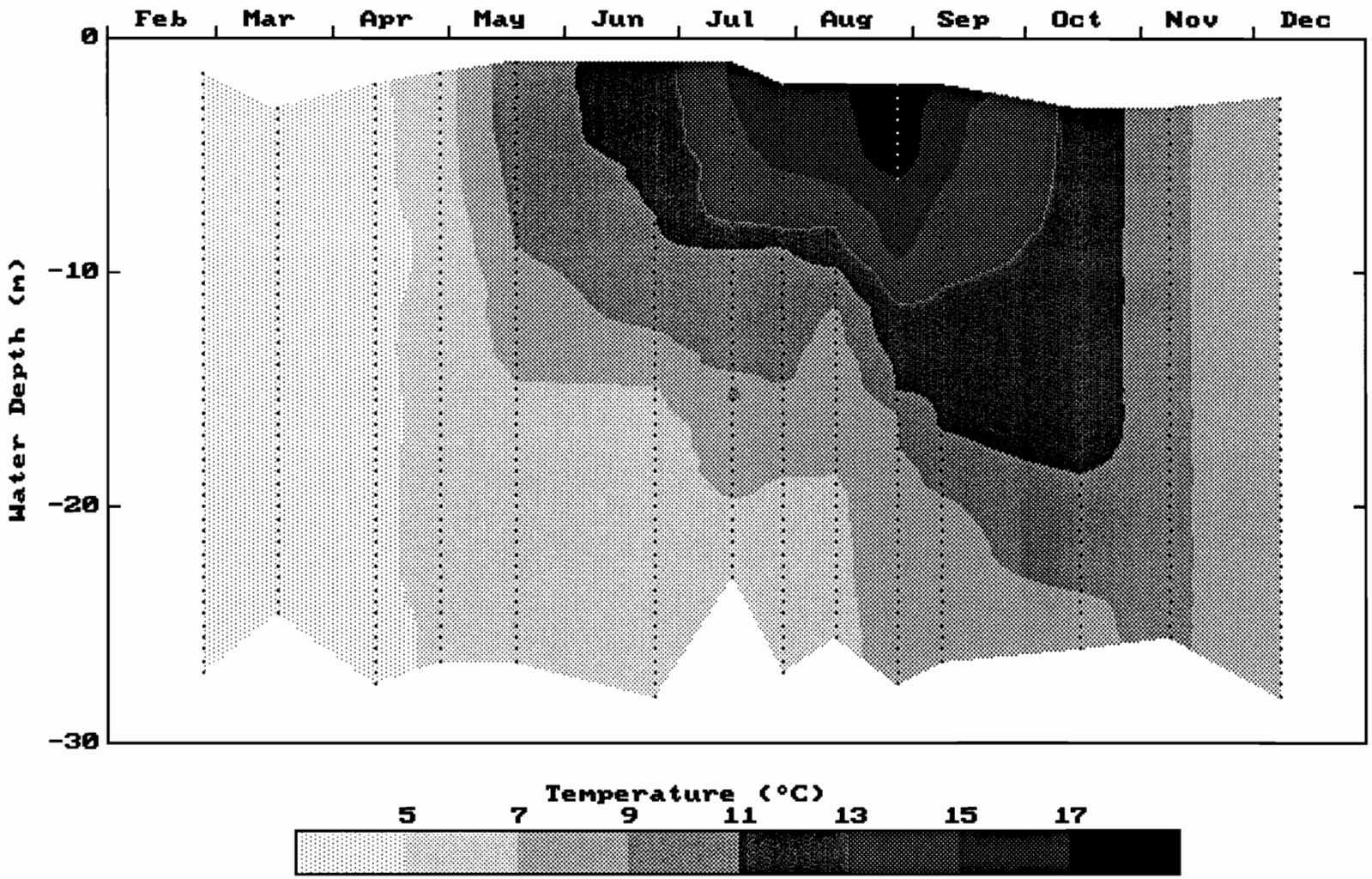
Station N11 during 1992



Station N12 during 1992

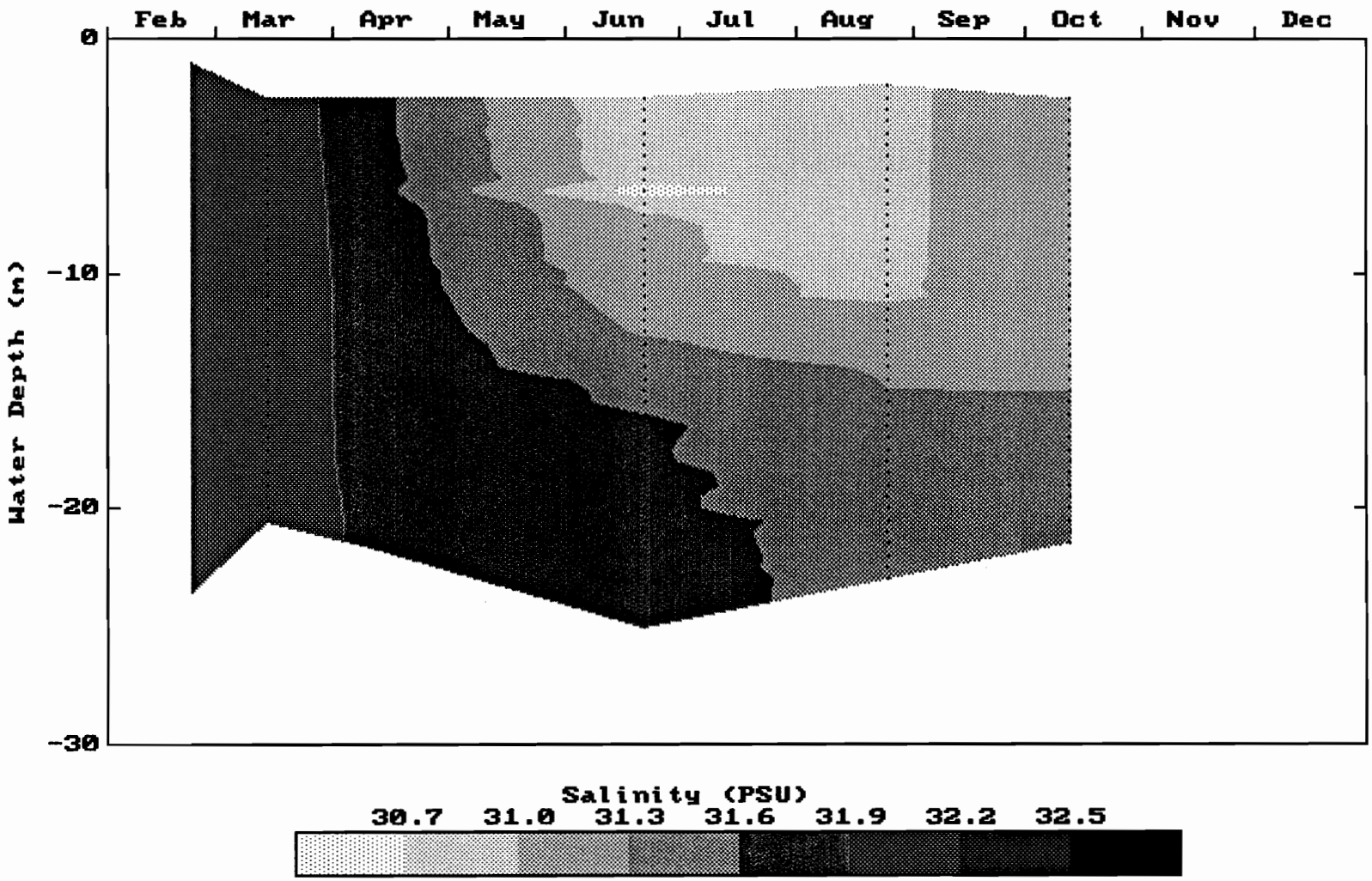


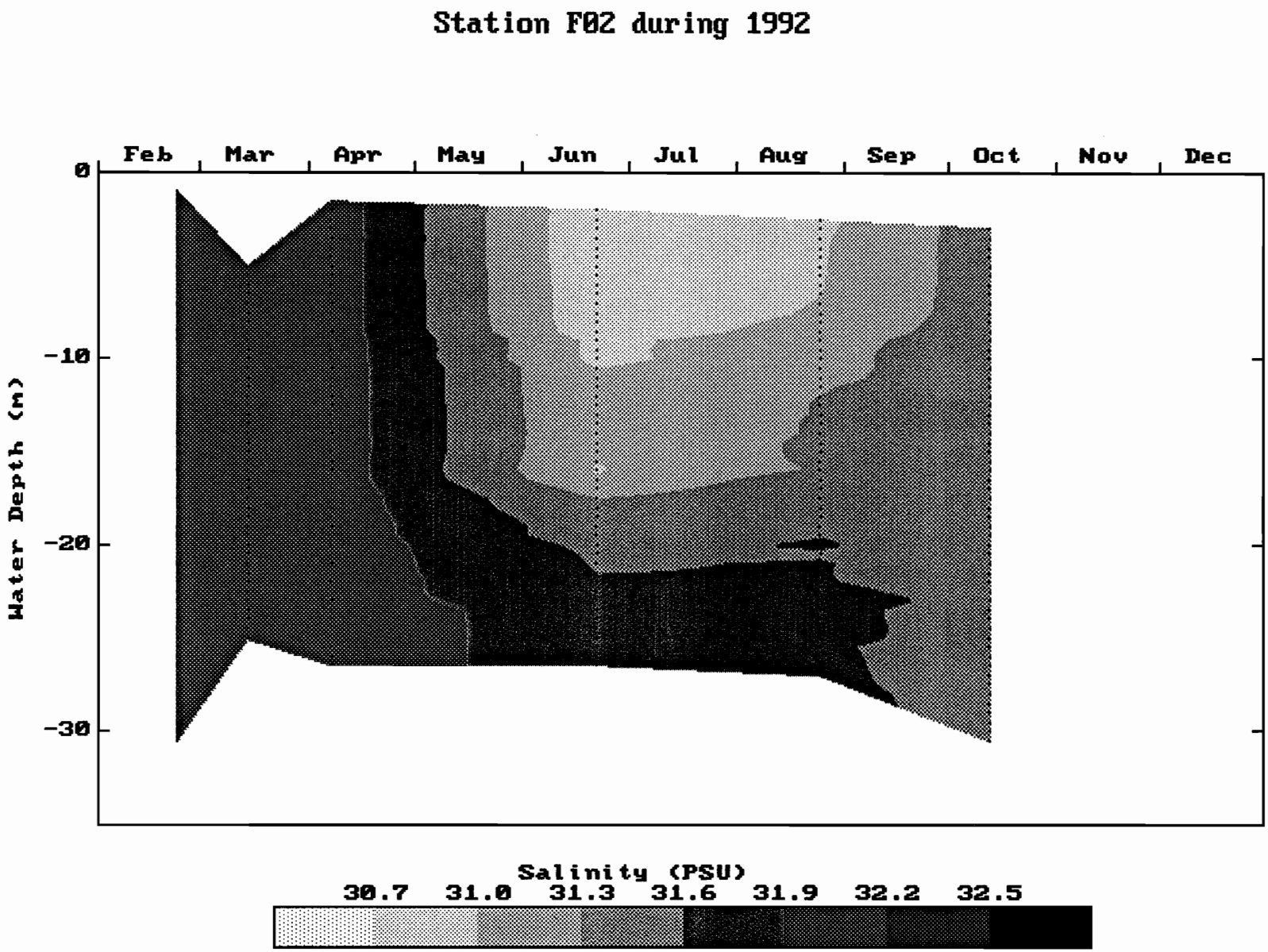
Station N20 during 1992



Salinity

Station F01 during 1992




Station F02 during 1992
Feb
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Apr
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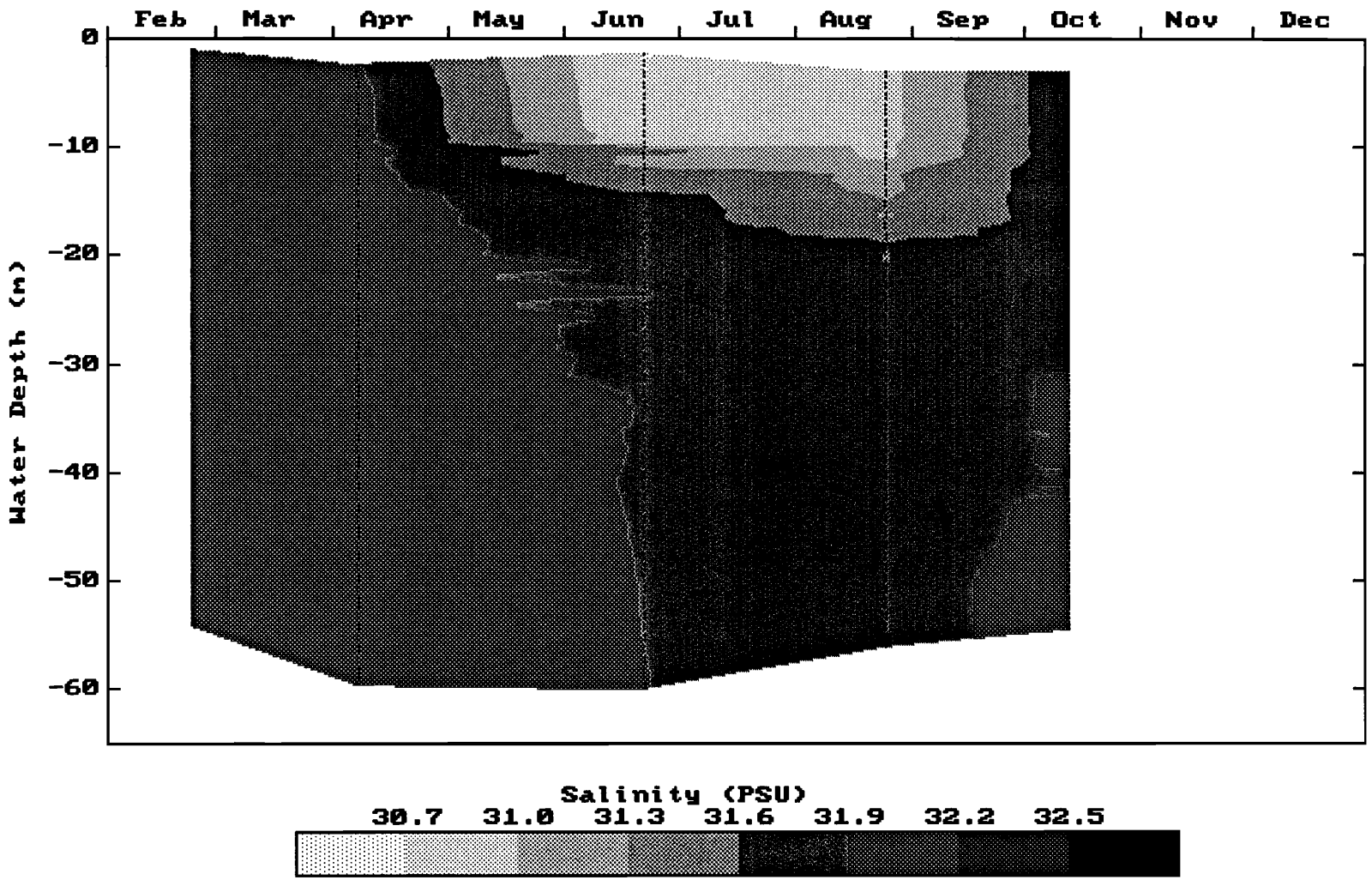
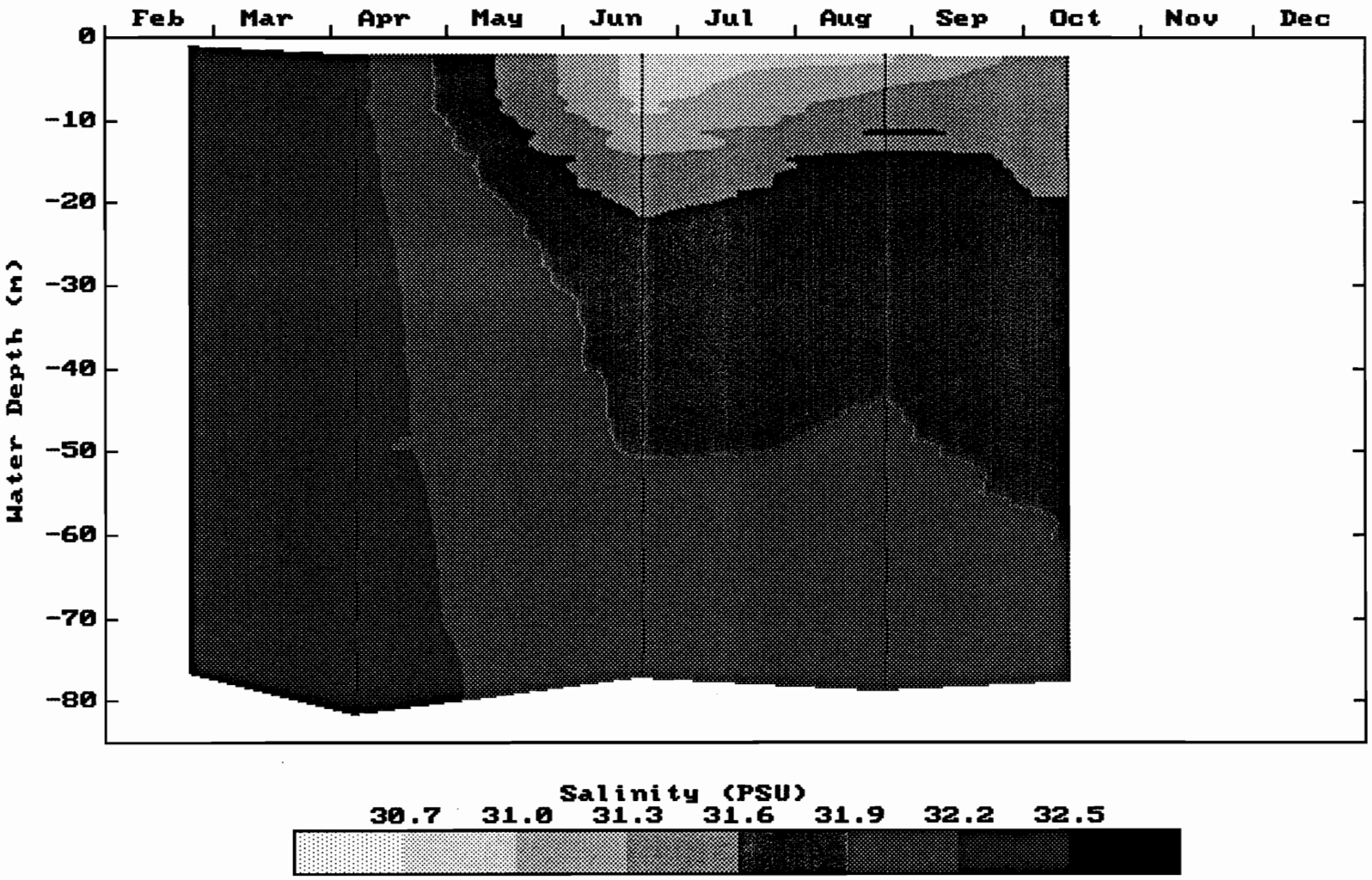
Oct
Nov
Dec
0
-10
-20
-30
Water Depth (m)
Salinity (PSU)
30.7
31.0
31.3
31.6
31.9
32.2
32.5

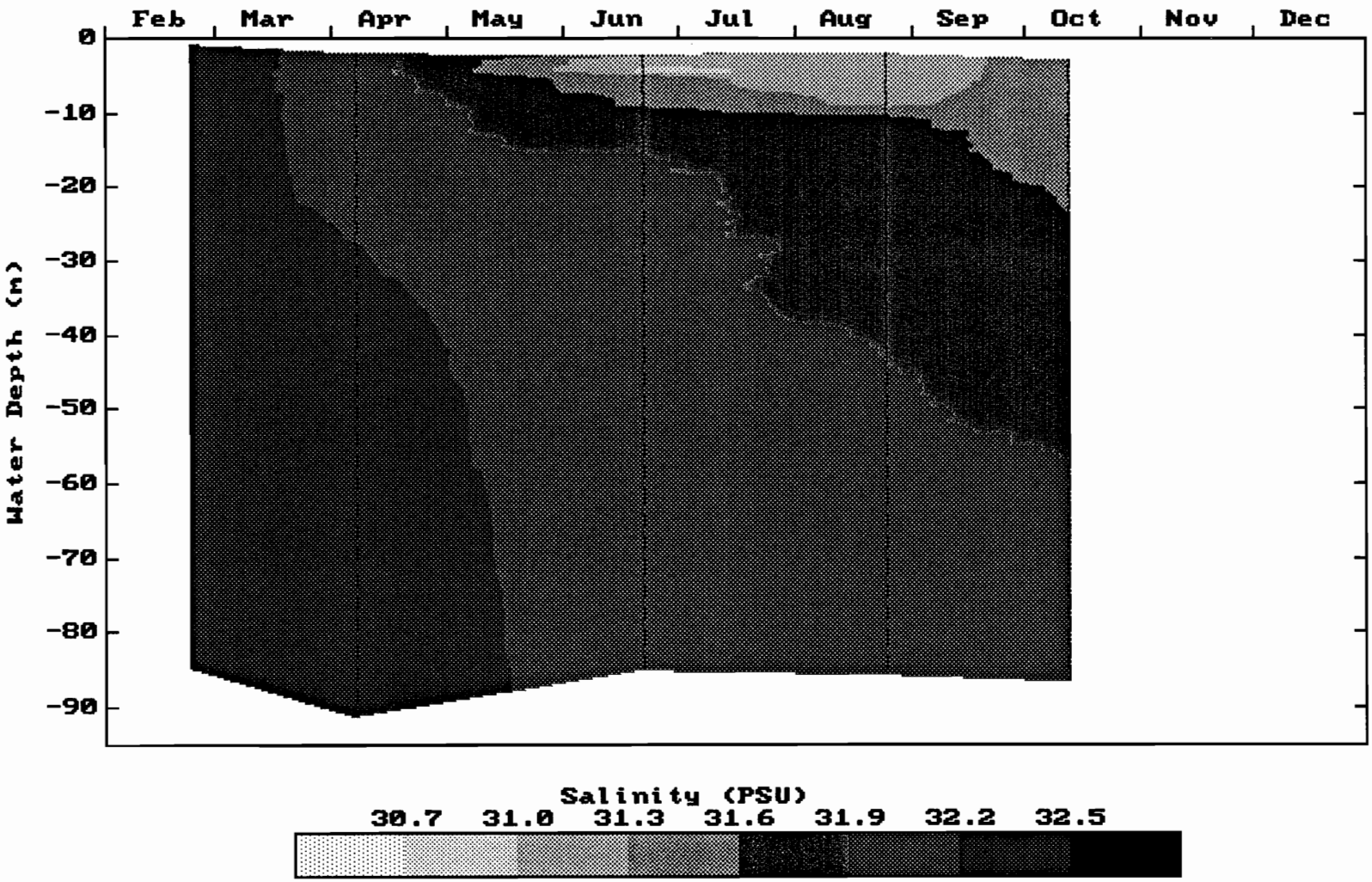
Station F04 during 1992



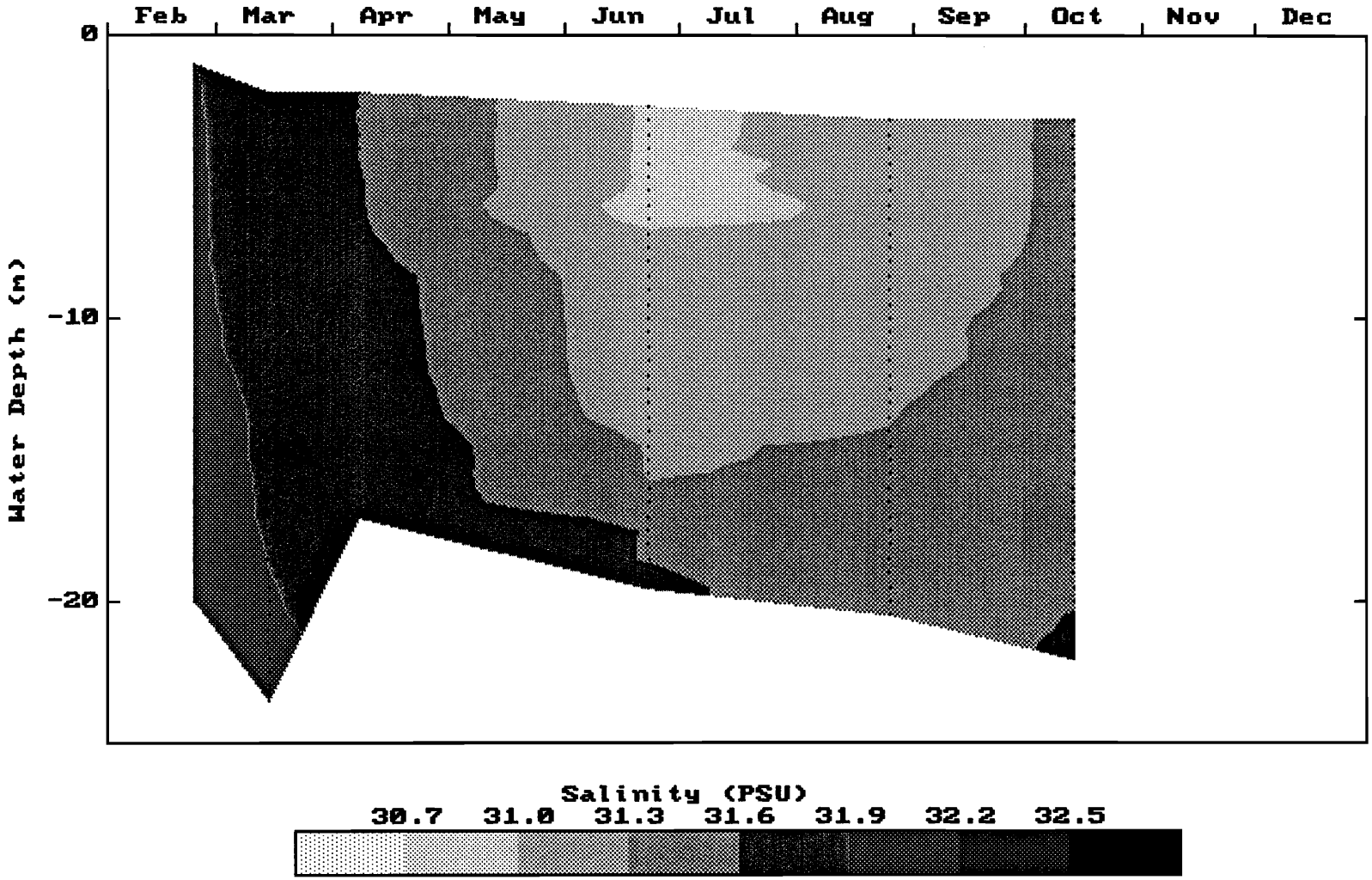
Station F08 during 1992



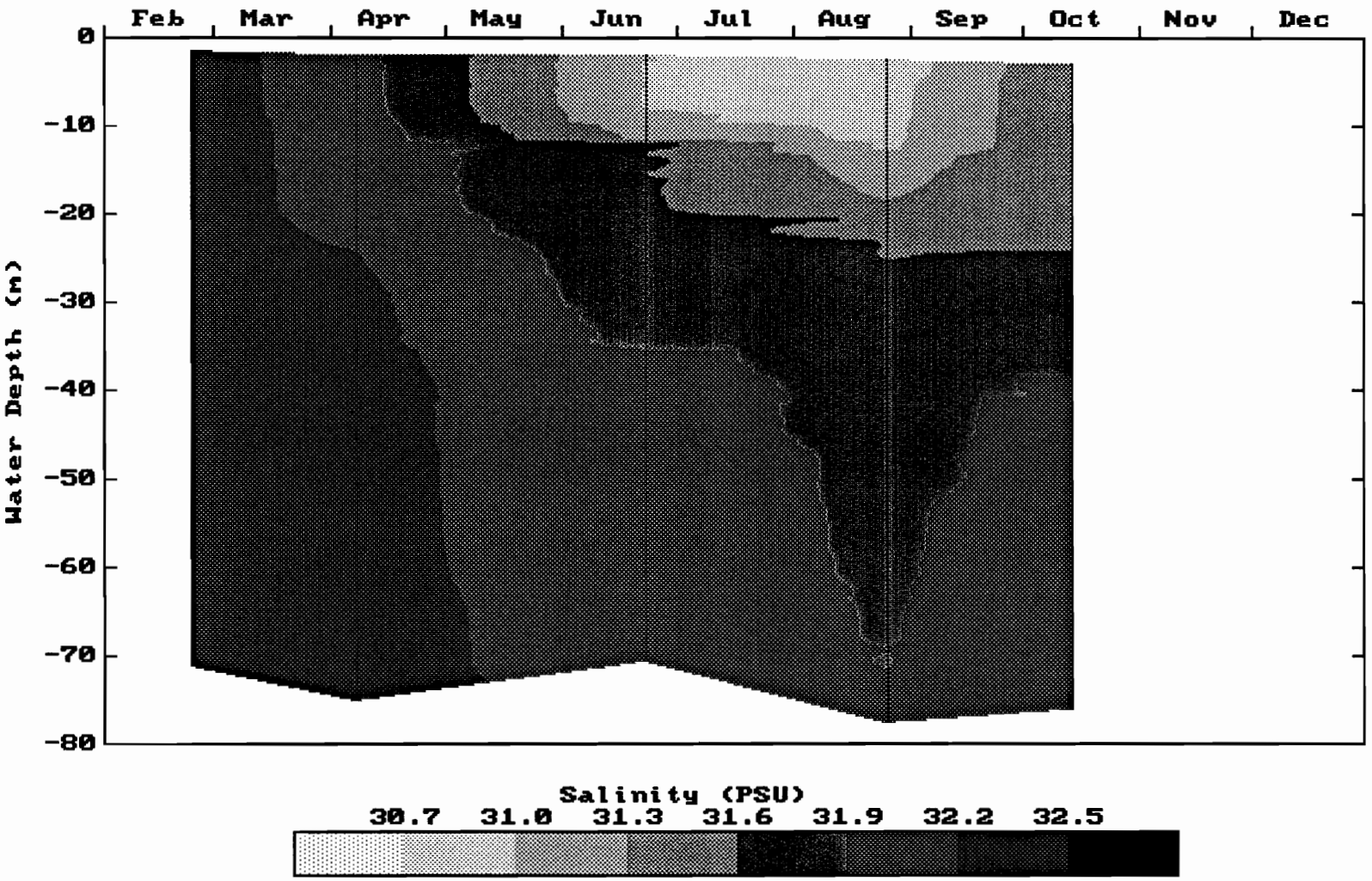
Station F12 during 1992



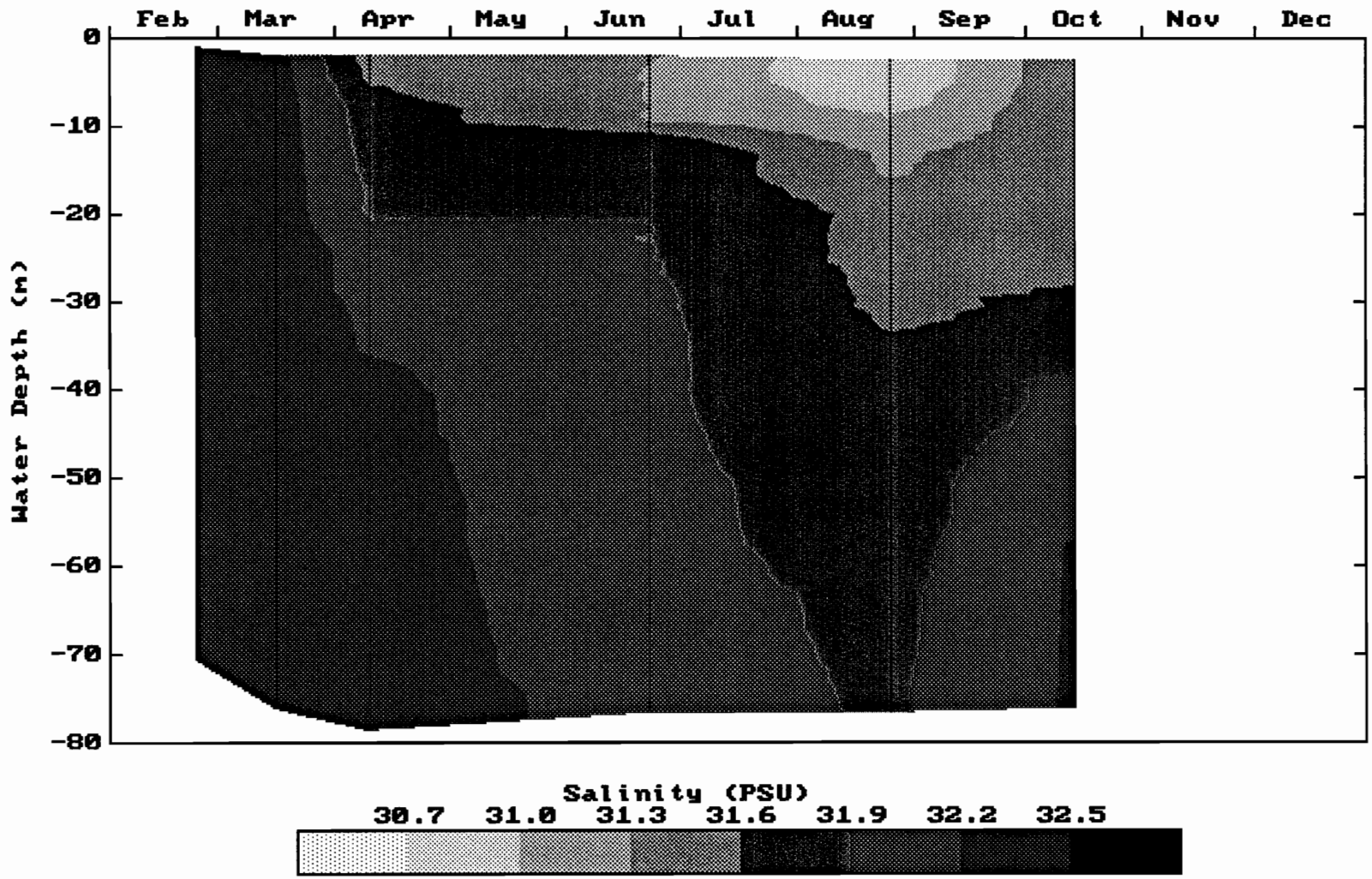
Station F13 during 1992



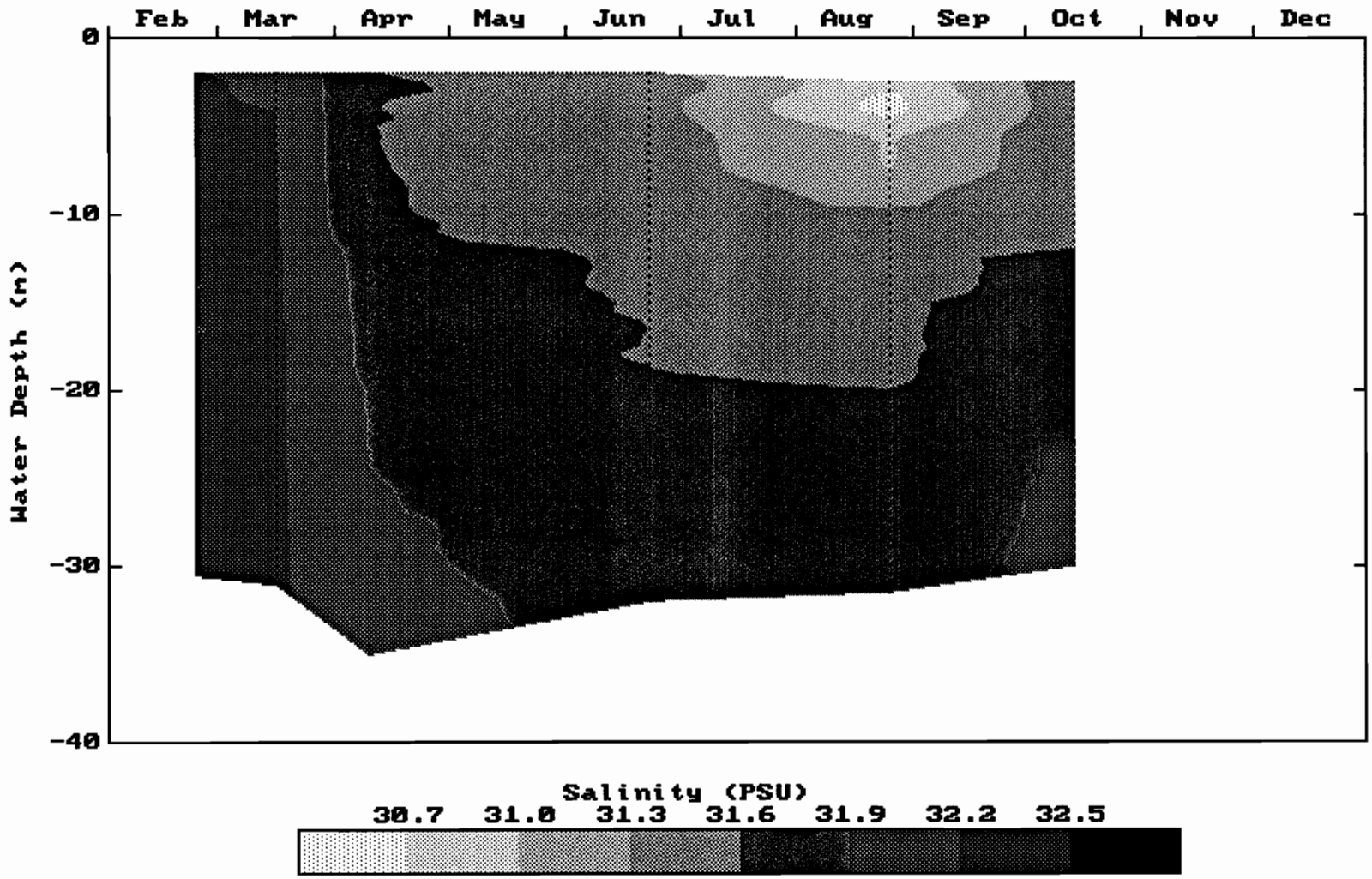
Station F17 during 1992



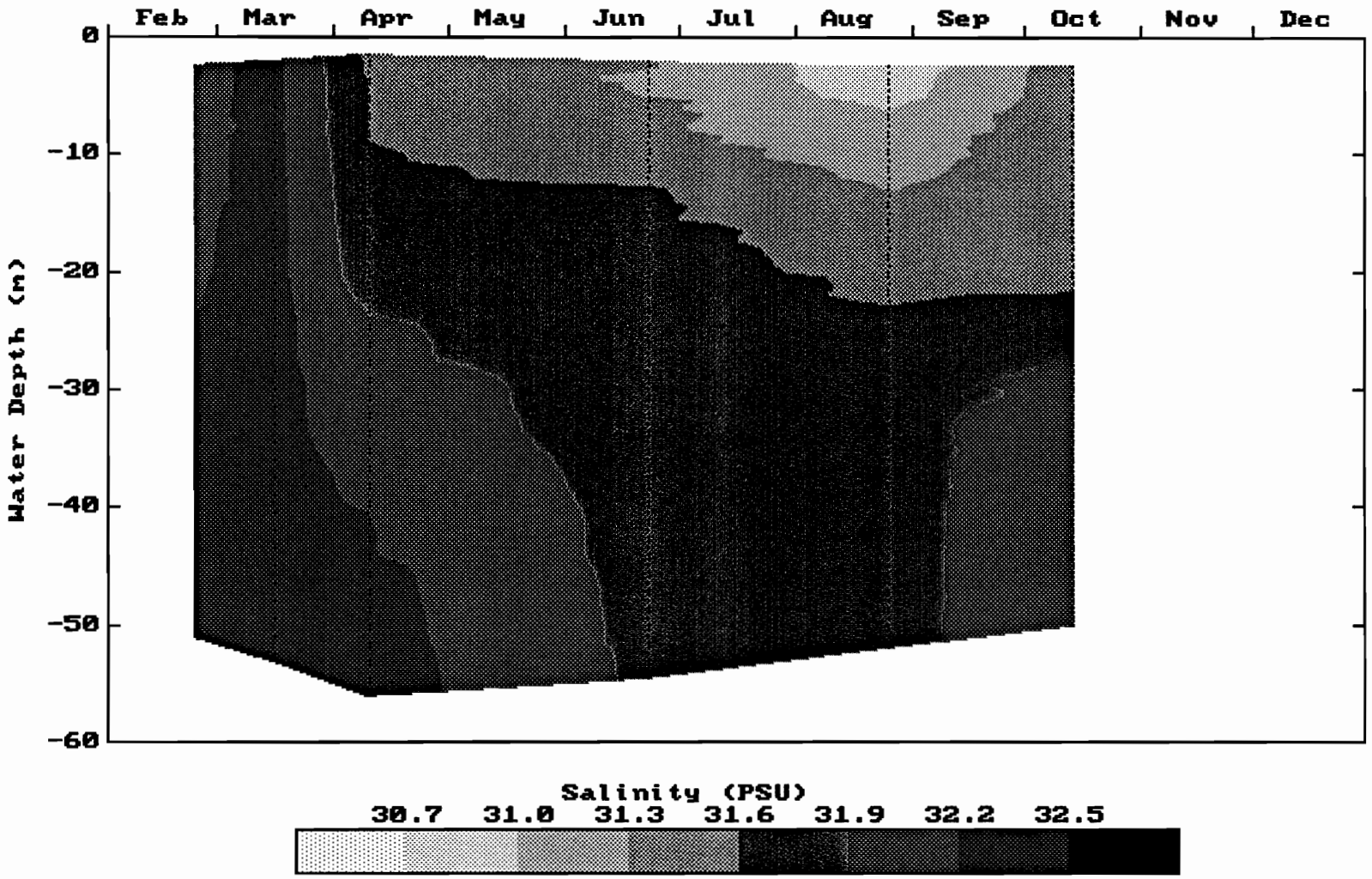
Station F19 during 1992



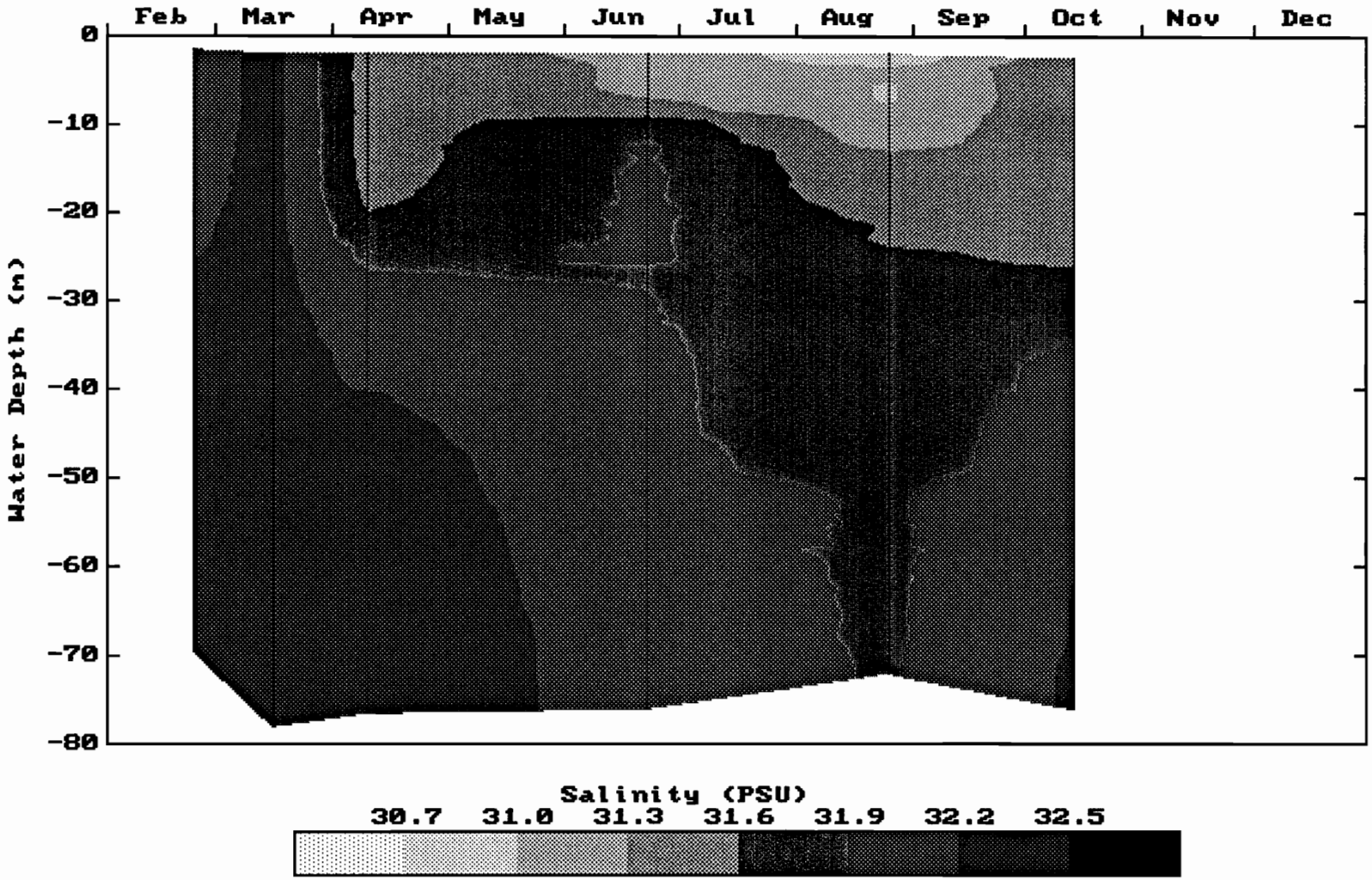
Station F20 during 1992



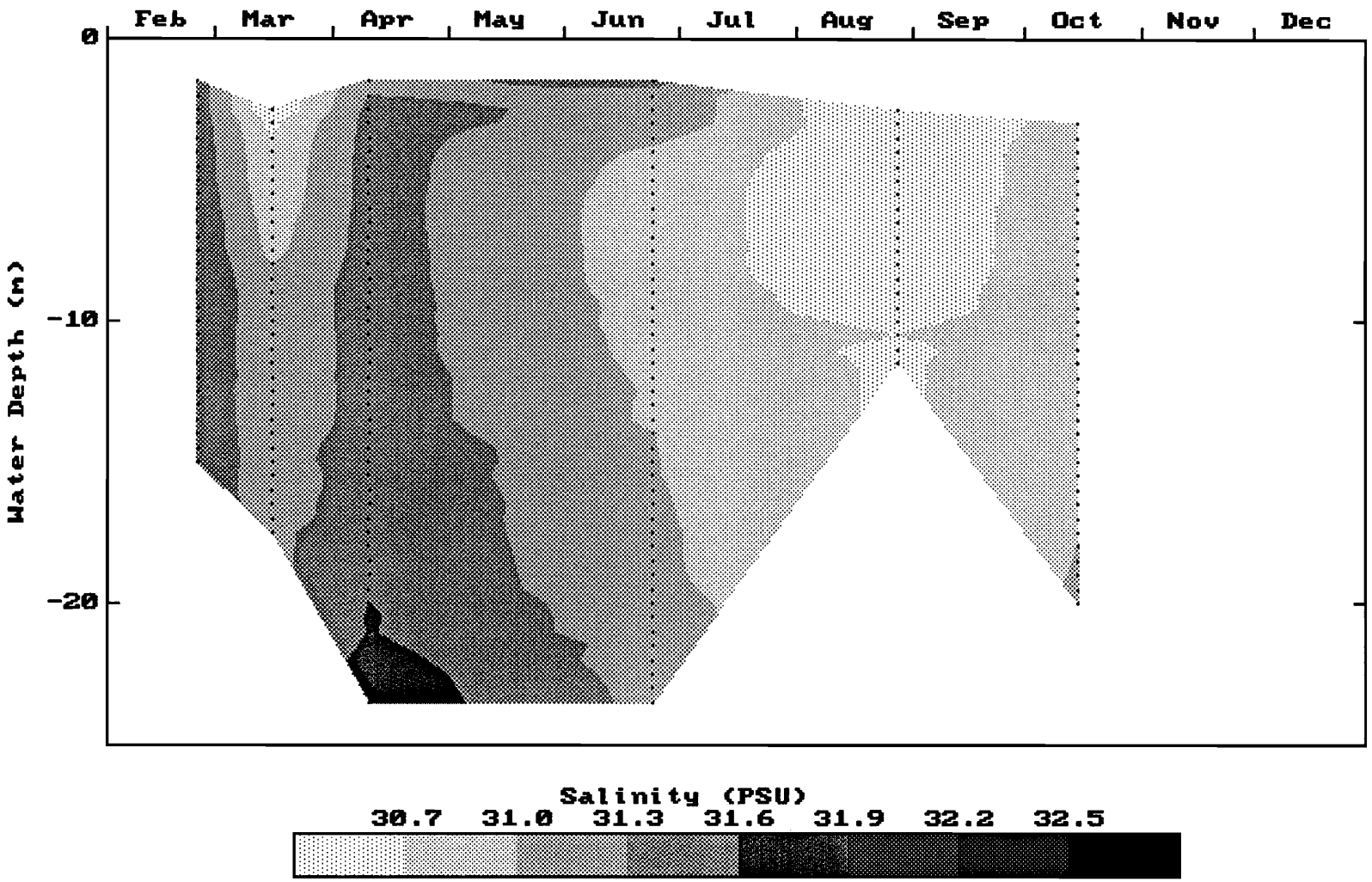
Station F21 during 1992



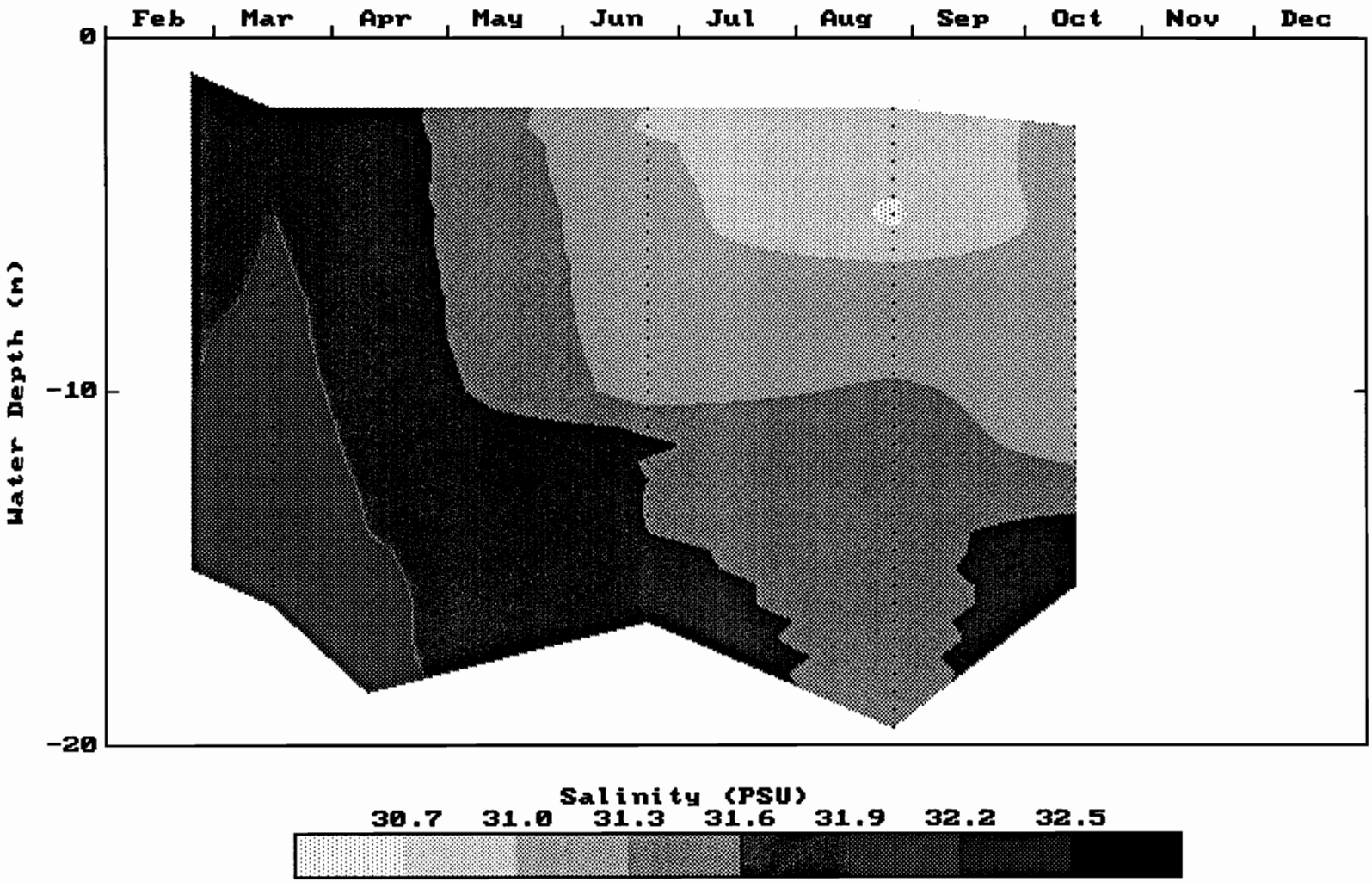
Station F22 during 1992



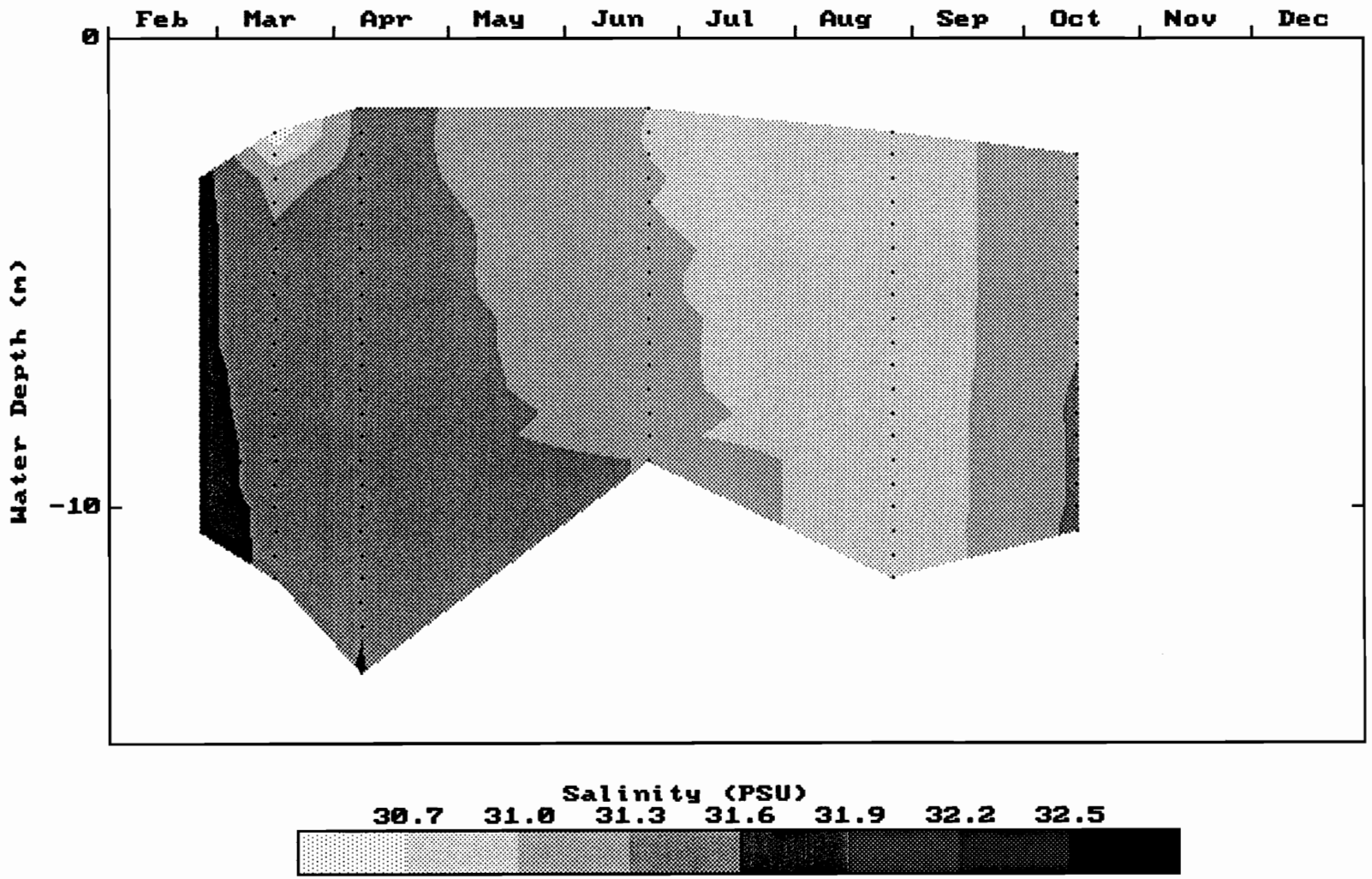
Station F23 during 1992



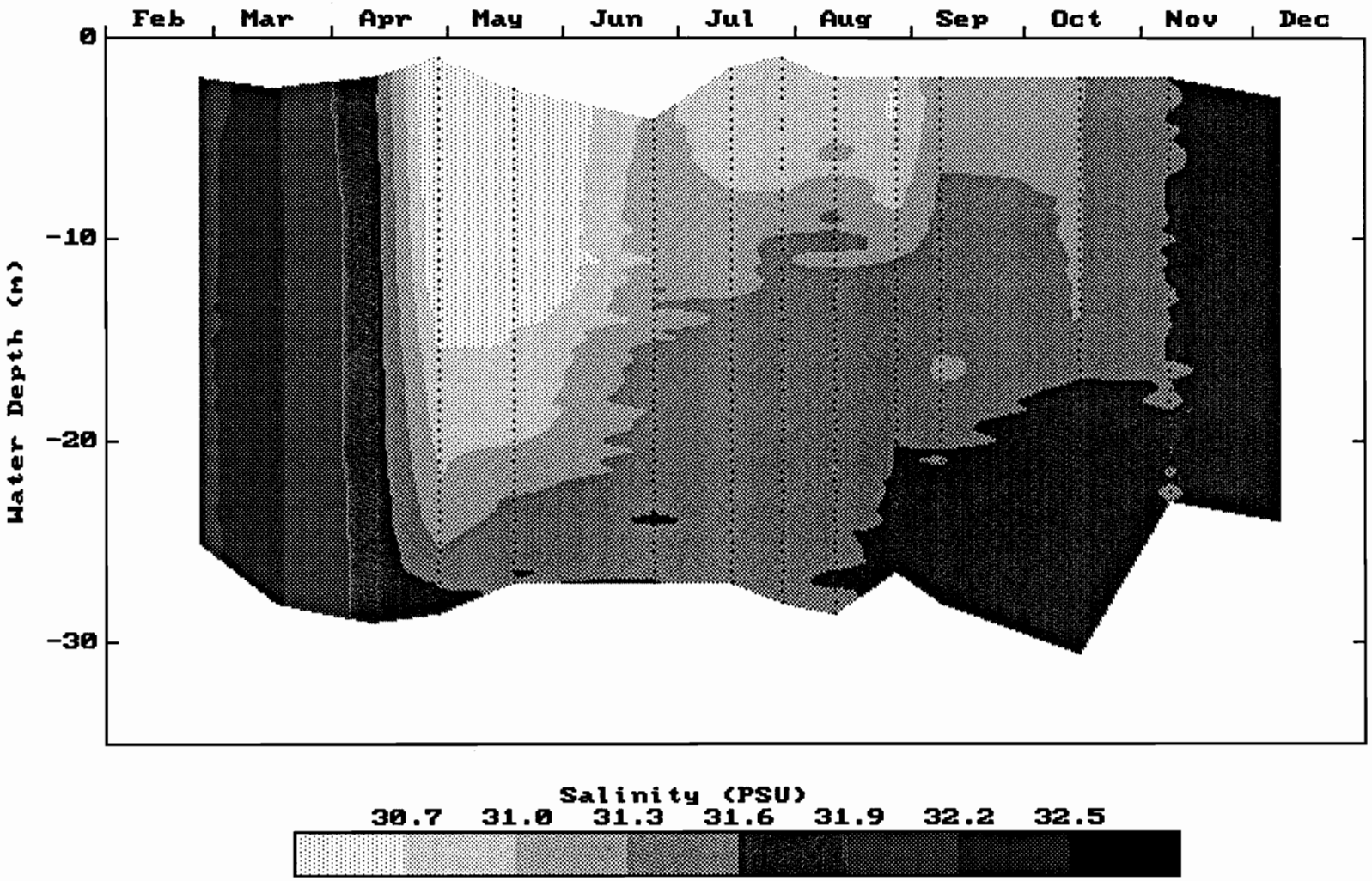
Station F24 during 1992



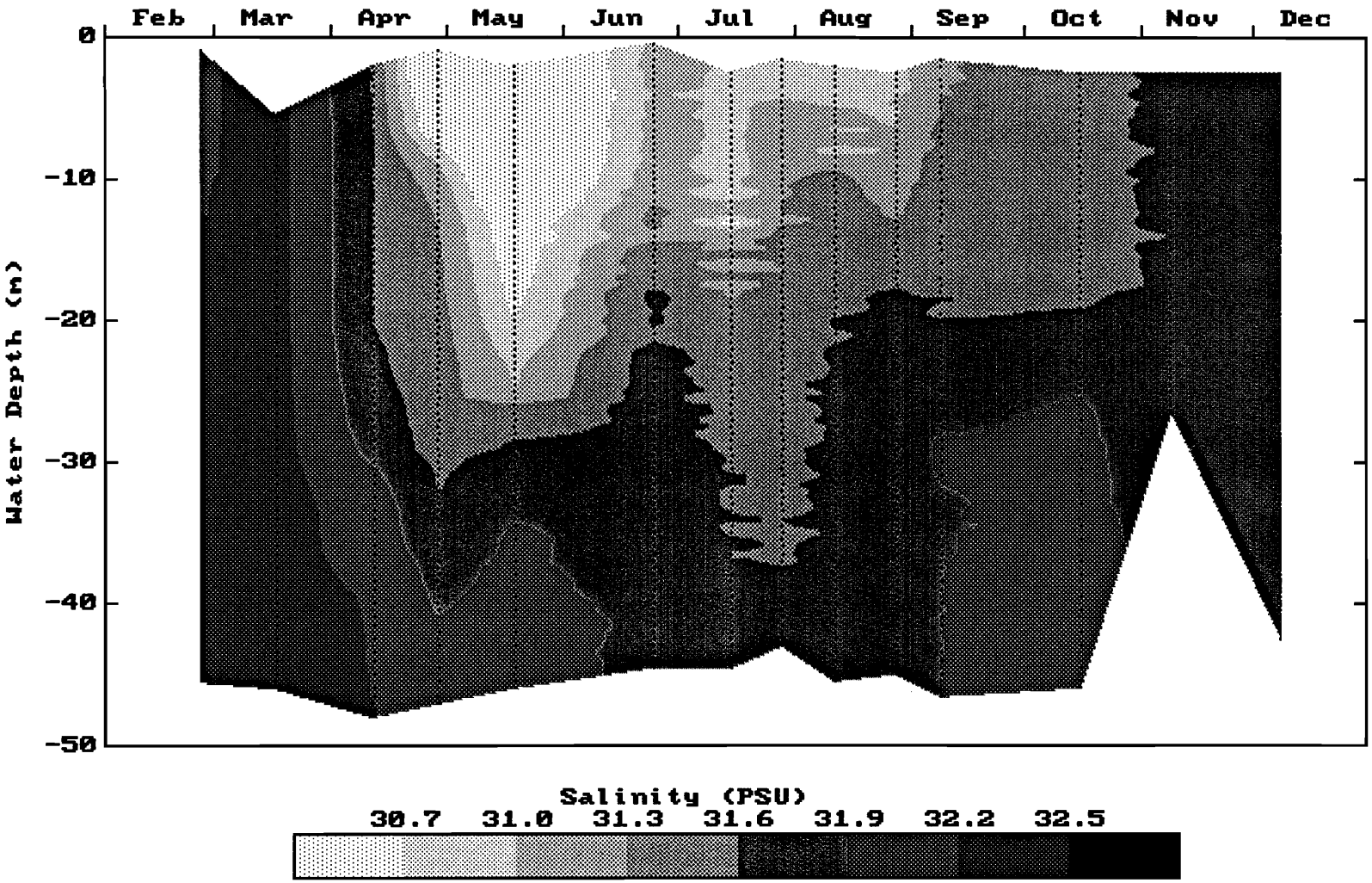
Station F25 during 1992



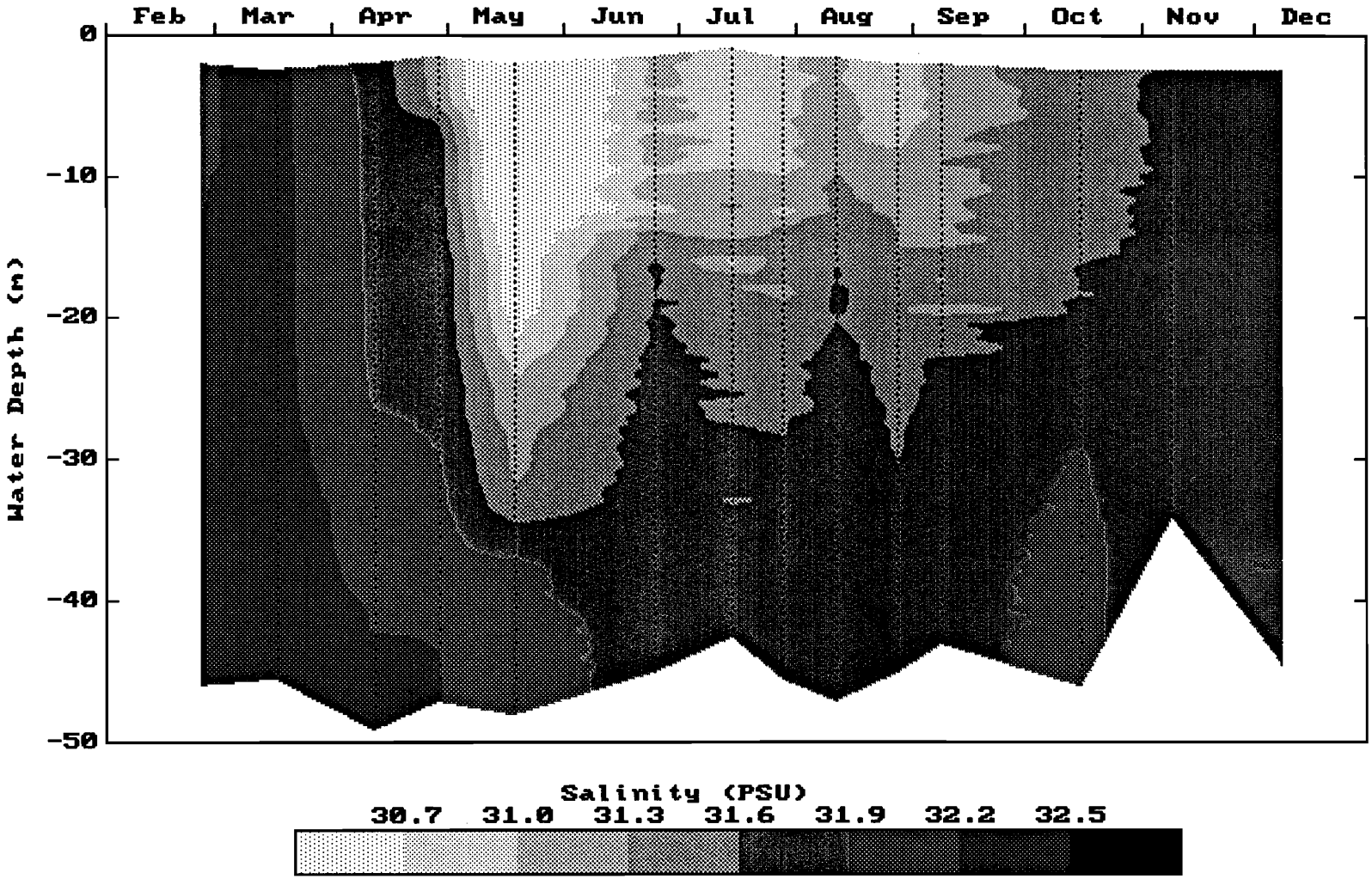
Station N01 during 1992



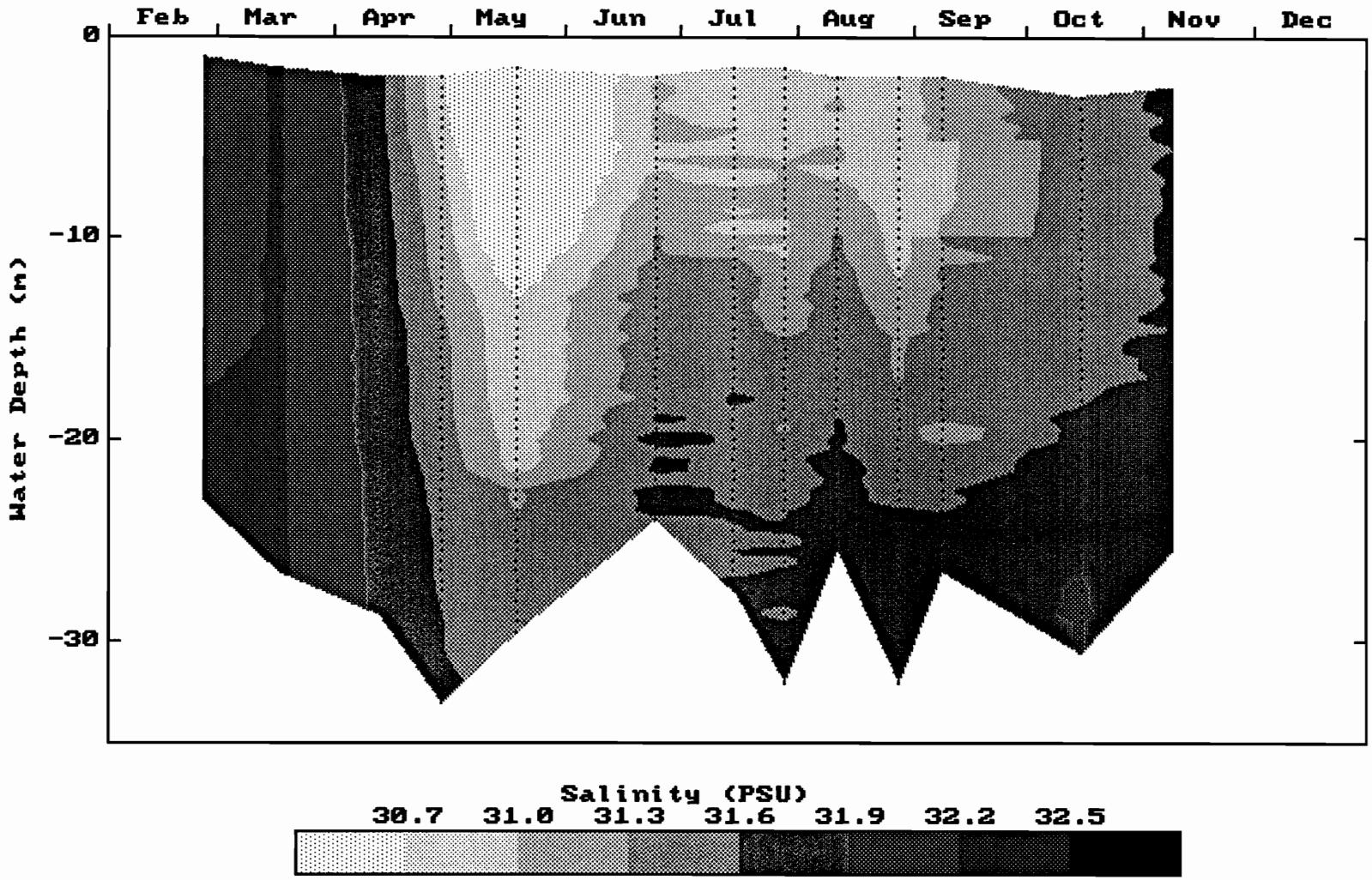
Station N04 during 1992



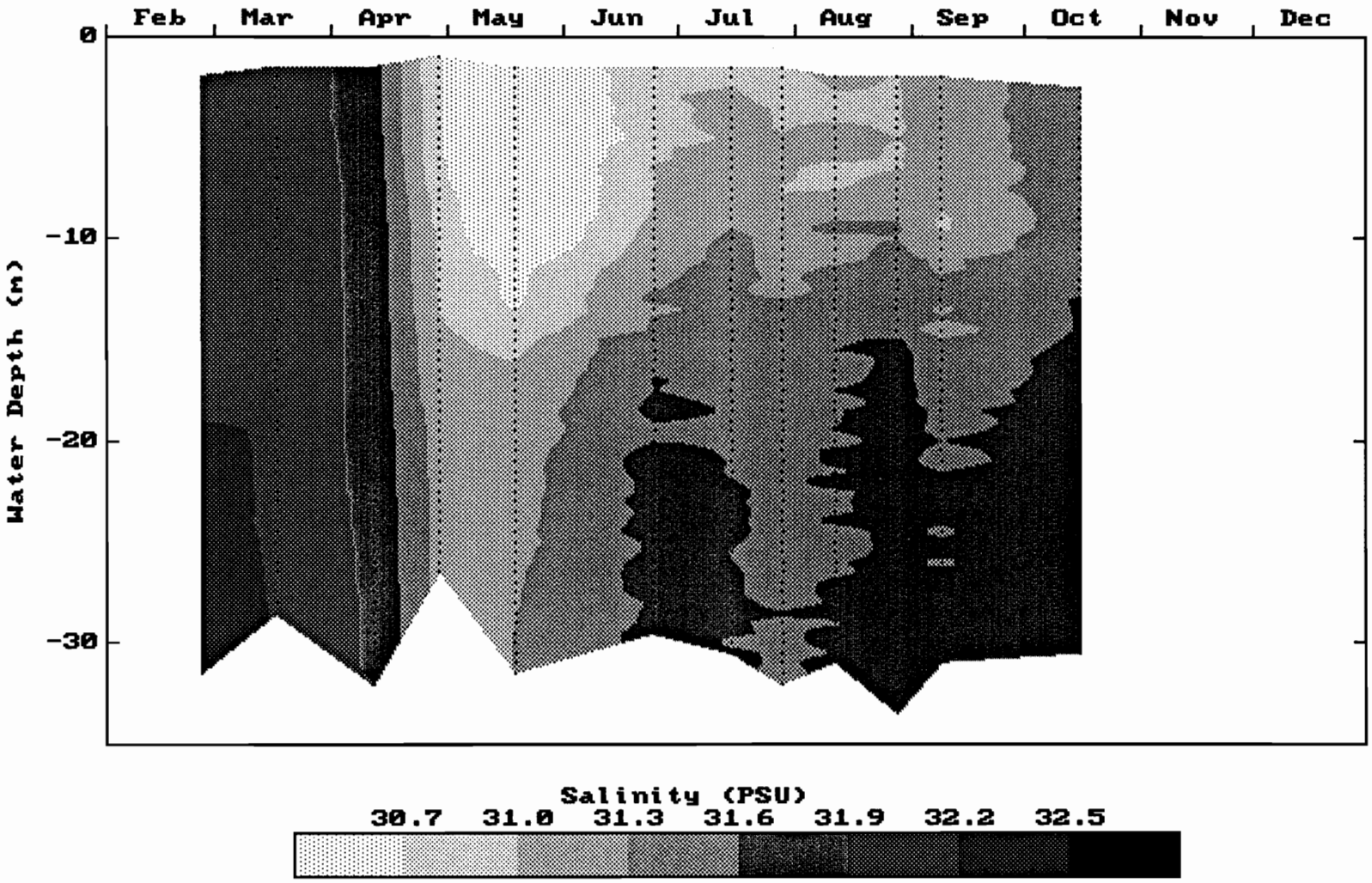
Station N07 during 1992



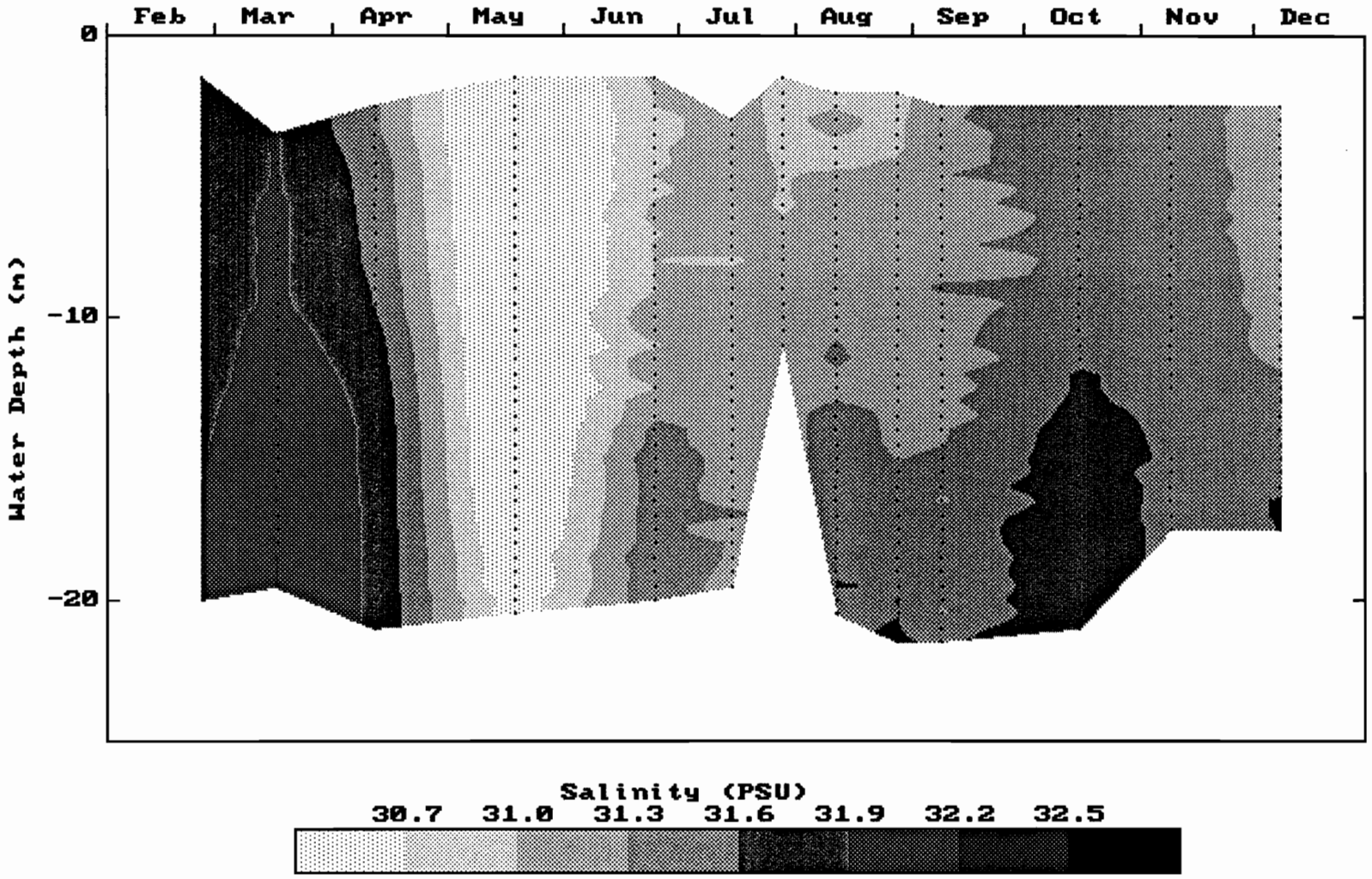
Station N08 during 1992



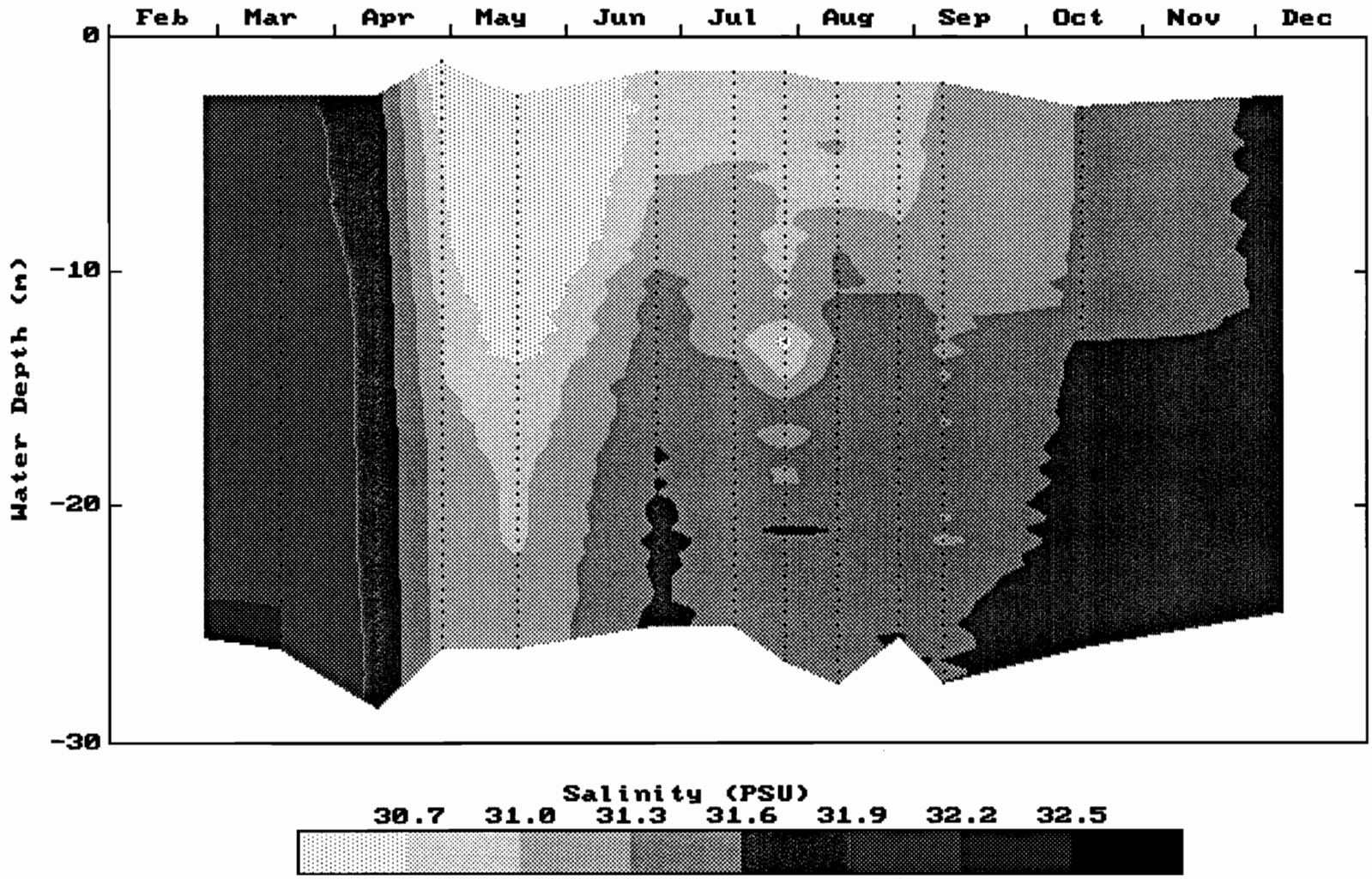
Station N09 during 1992

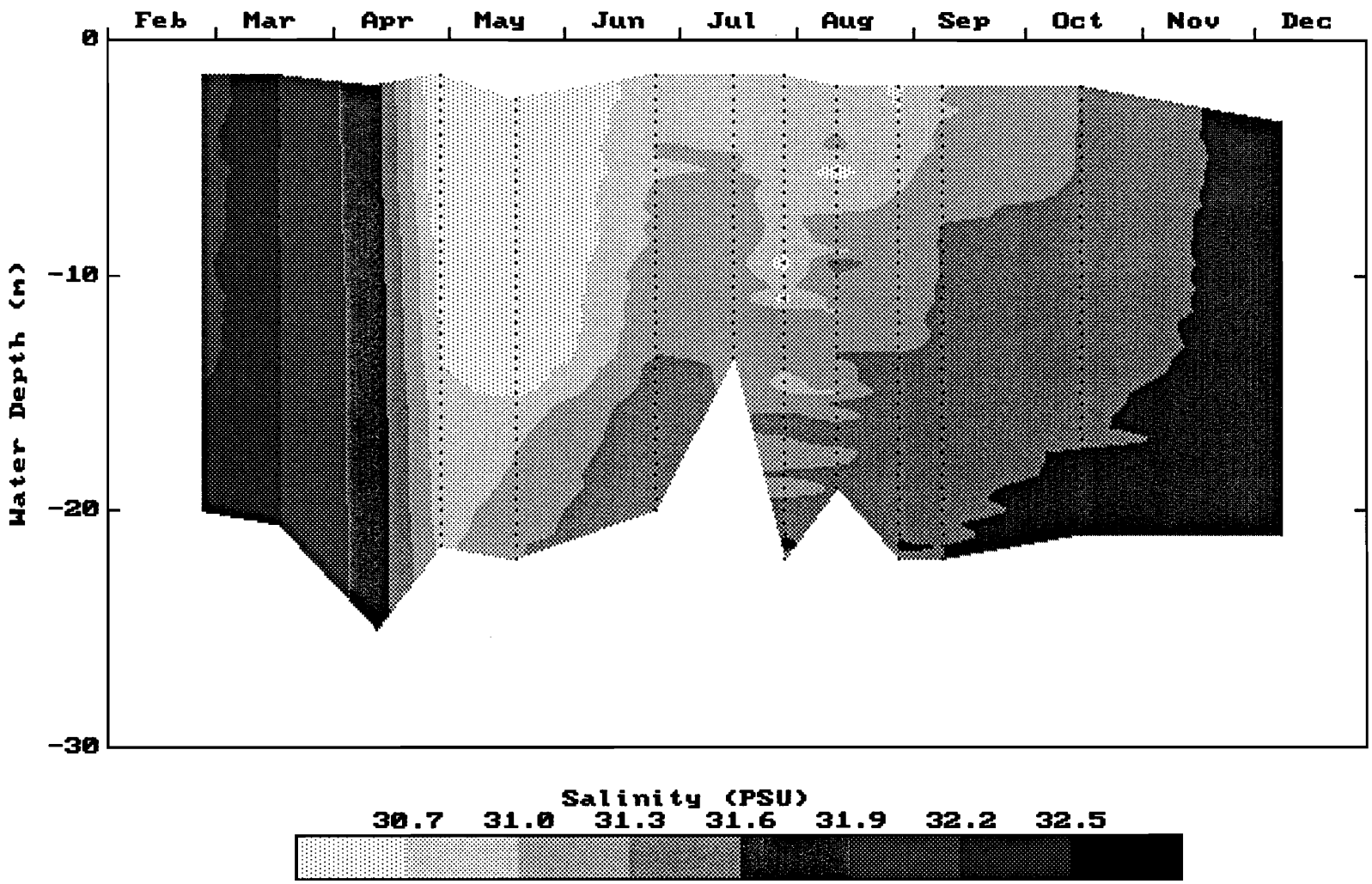


Station N10 during 1992



Station N11 during 1992




Station N12 during 1992
Feb
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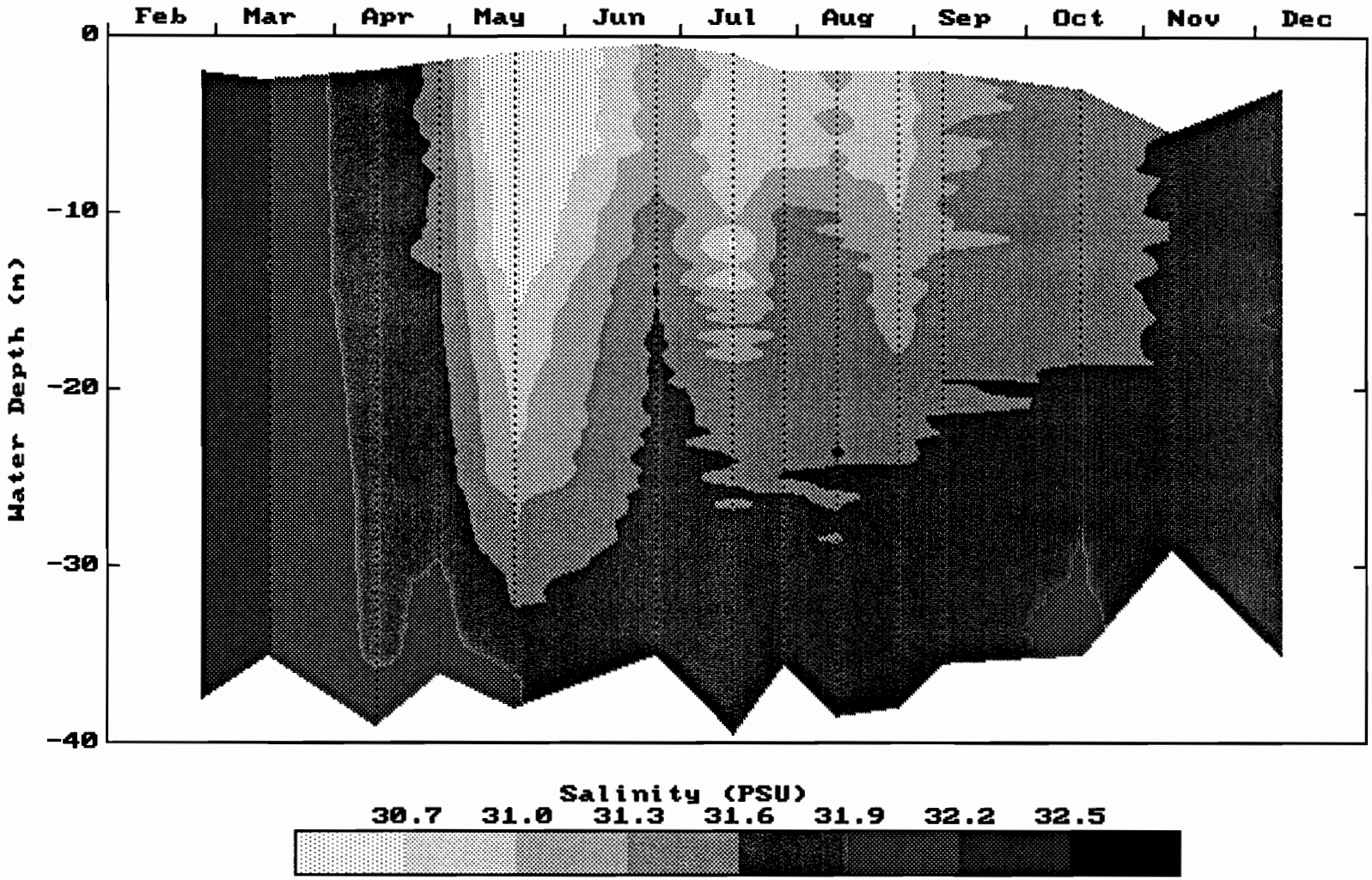
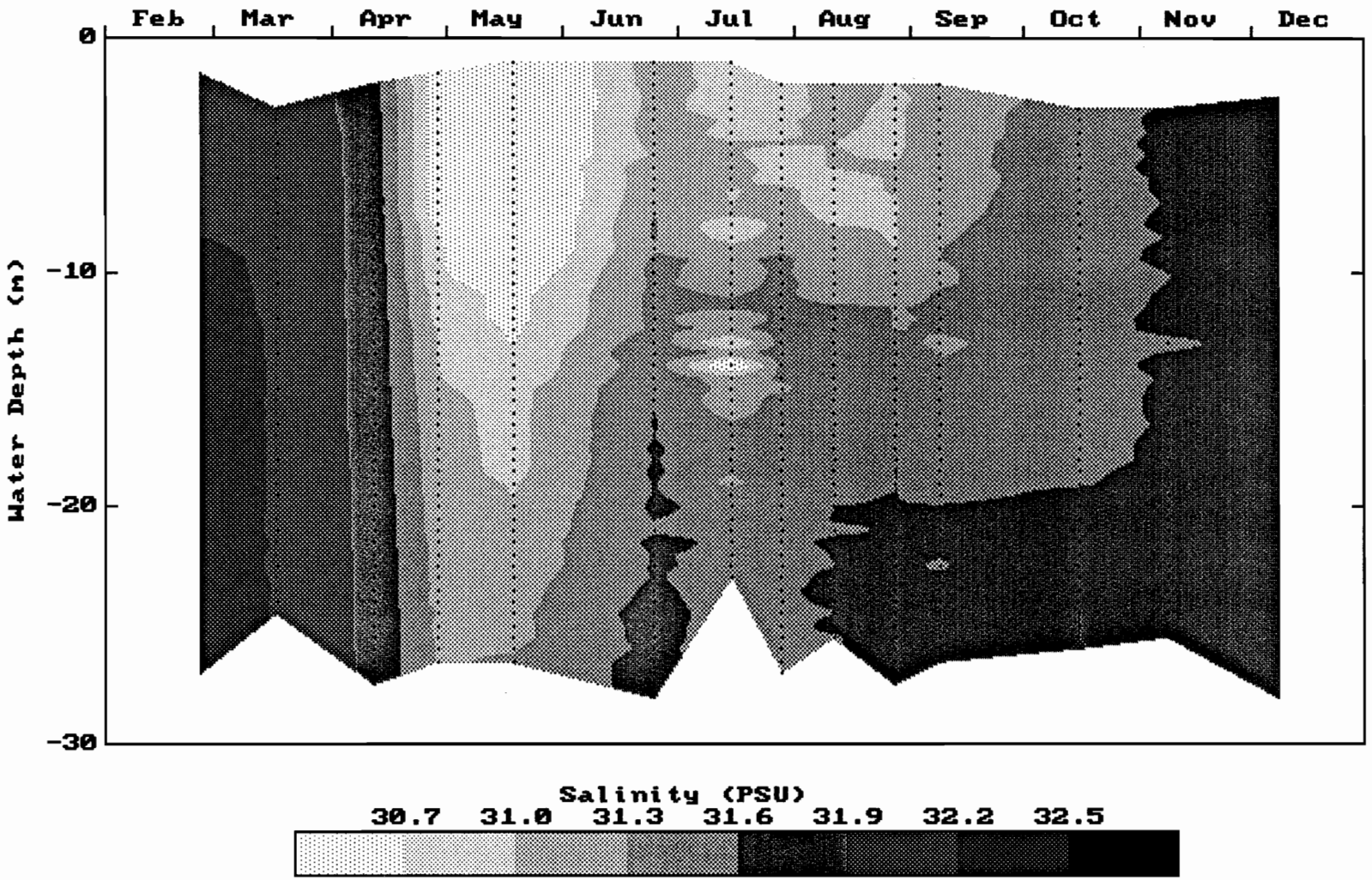
0
-10
-20
-30
Water Depth (m)
Salinity (PSU)
30.7
31.0
31.3
31.6
31.9
32.2
32.5

Station N16 during 1992

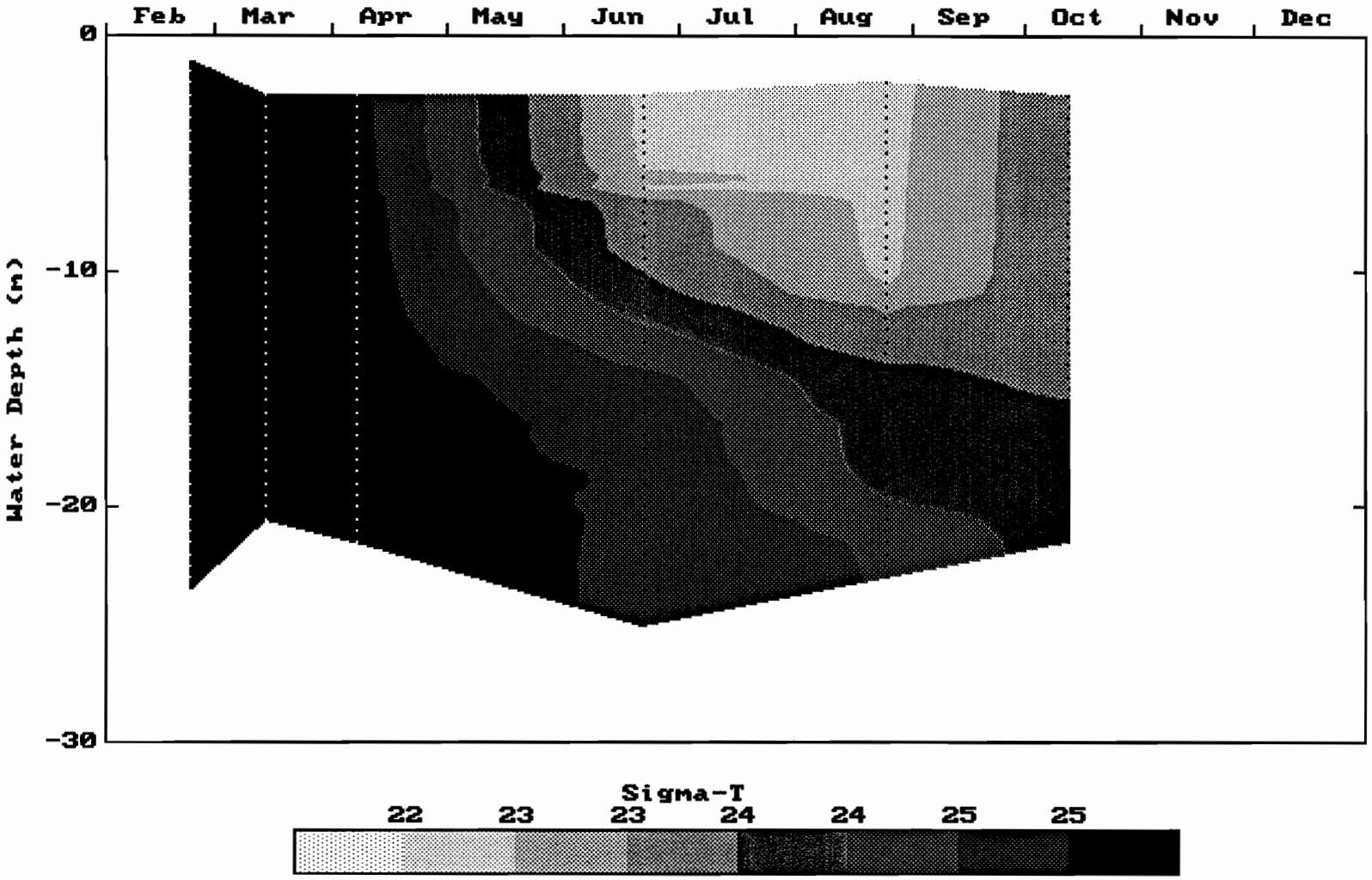


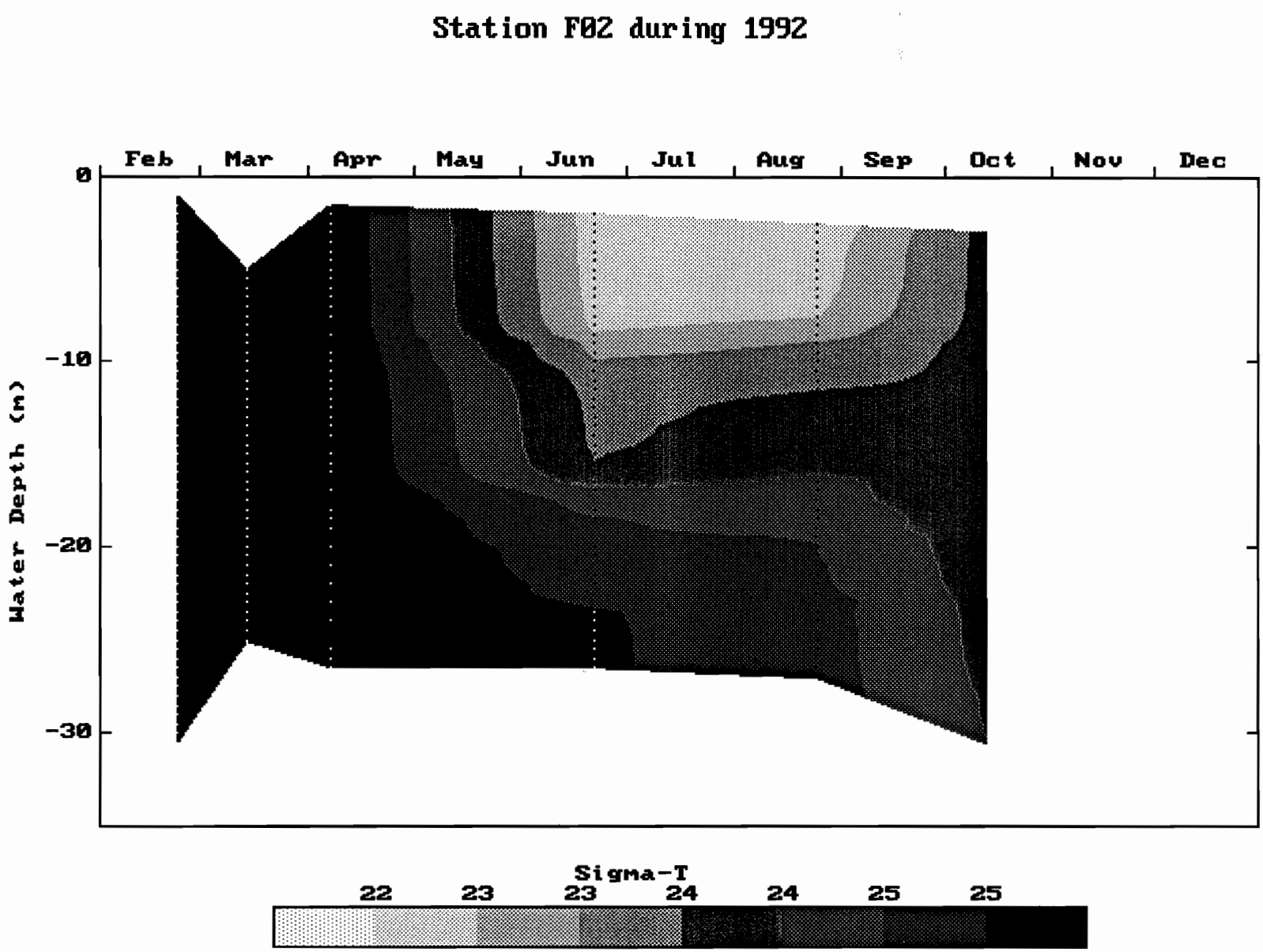
Station N20 during 1992



Density

Station F01 during 1992




Station F02 during 1992
Feb
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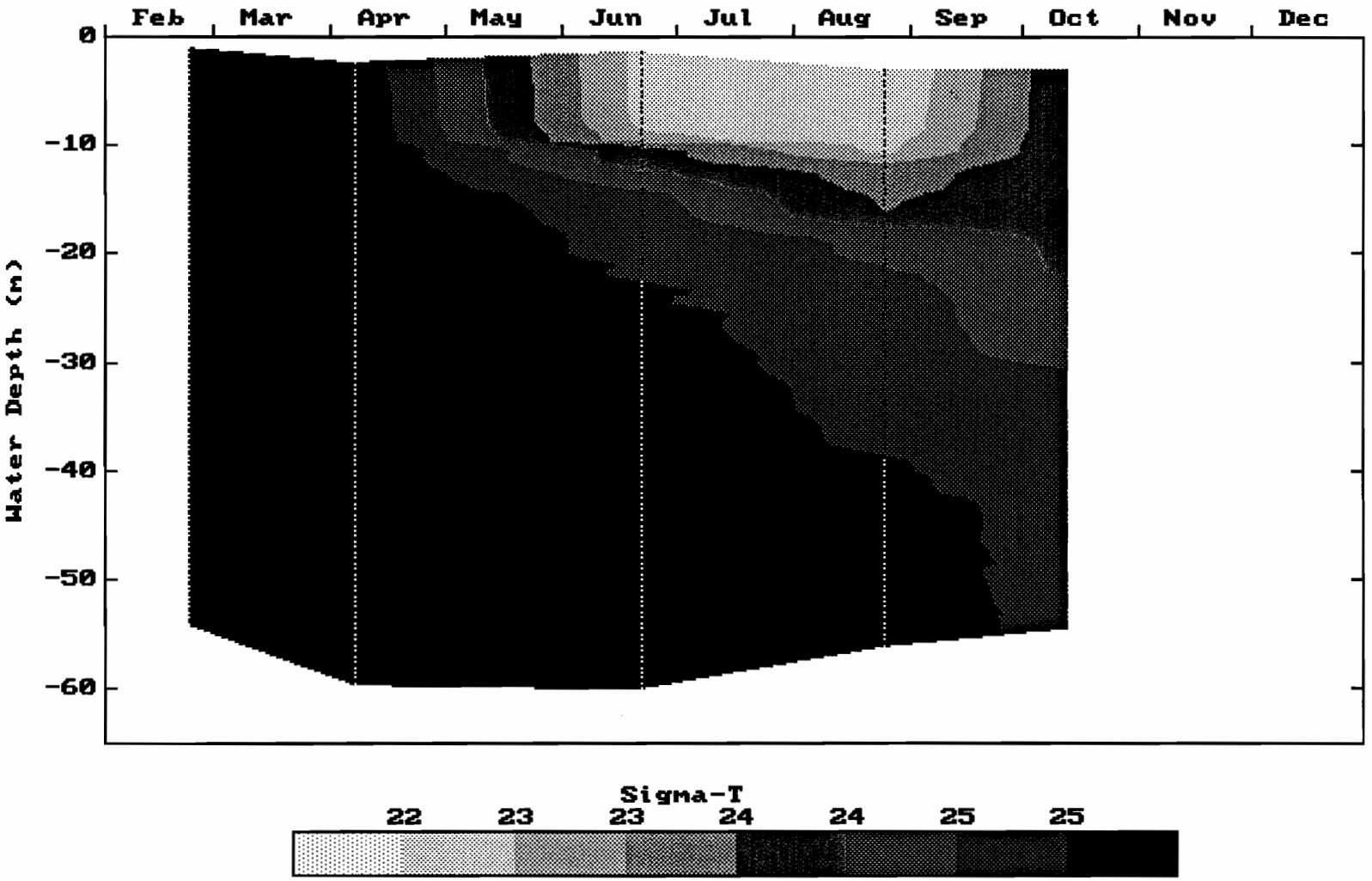
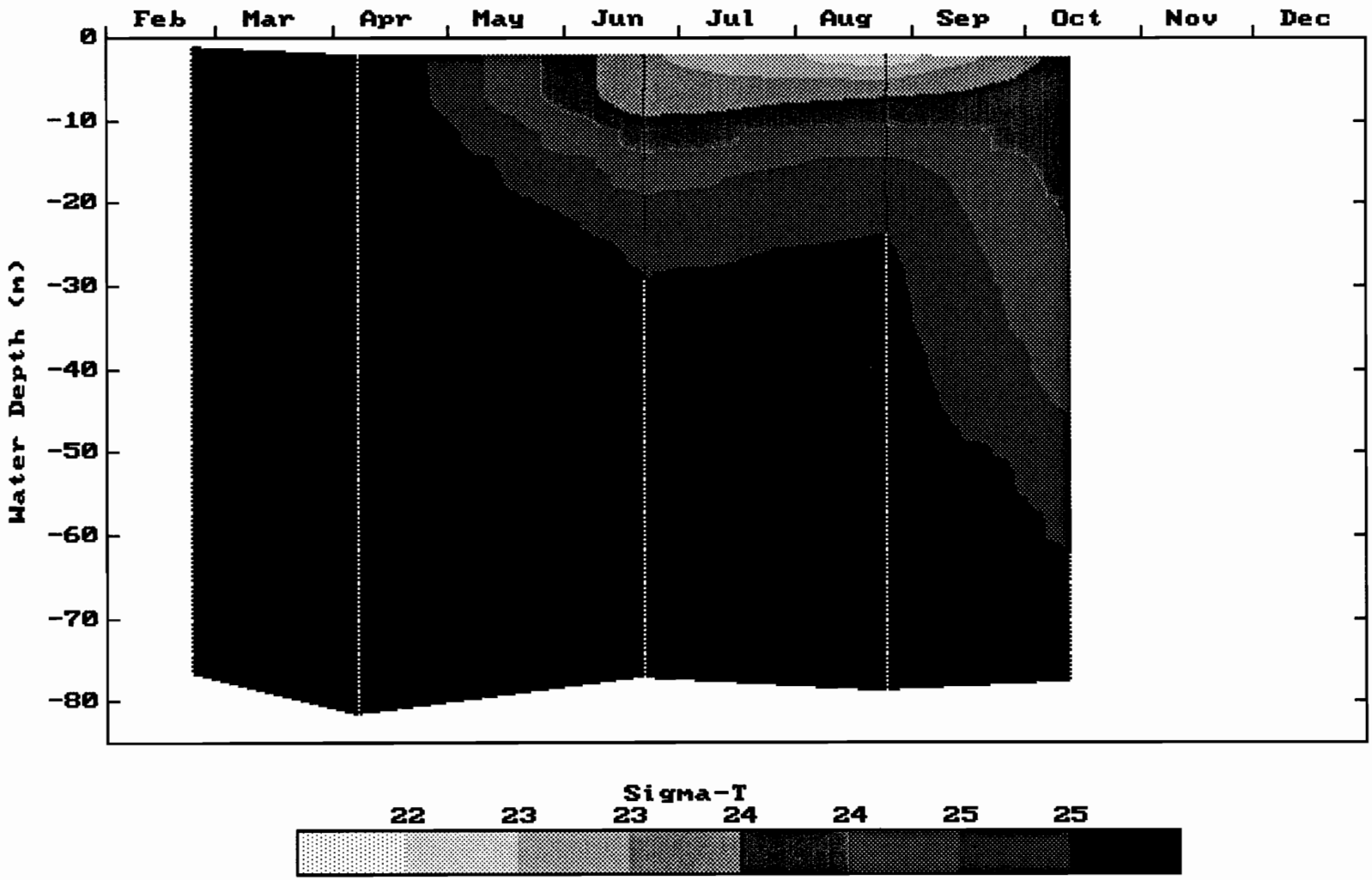
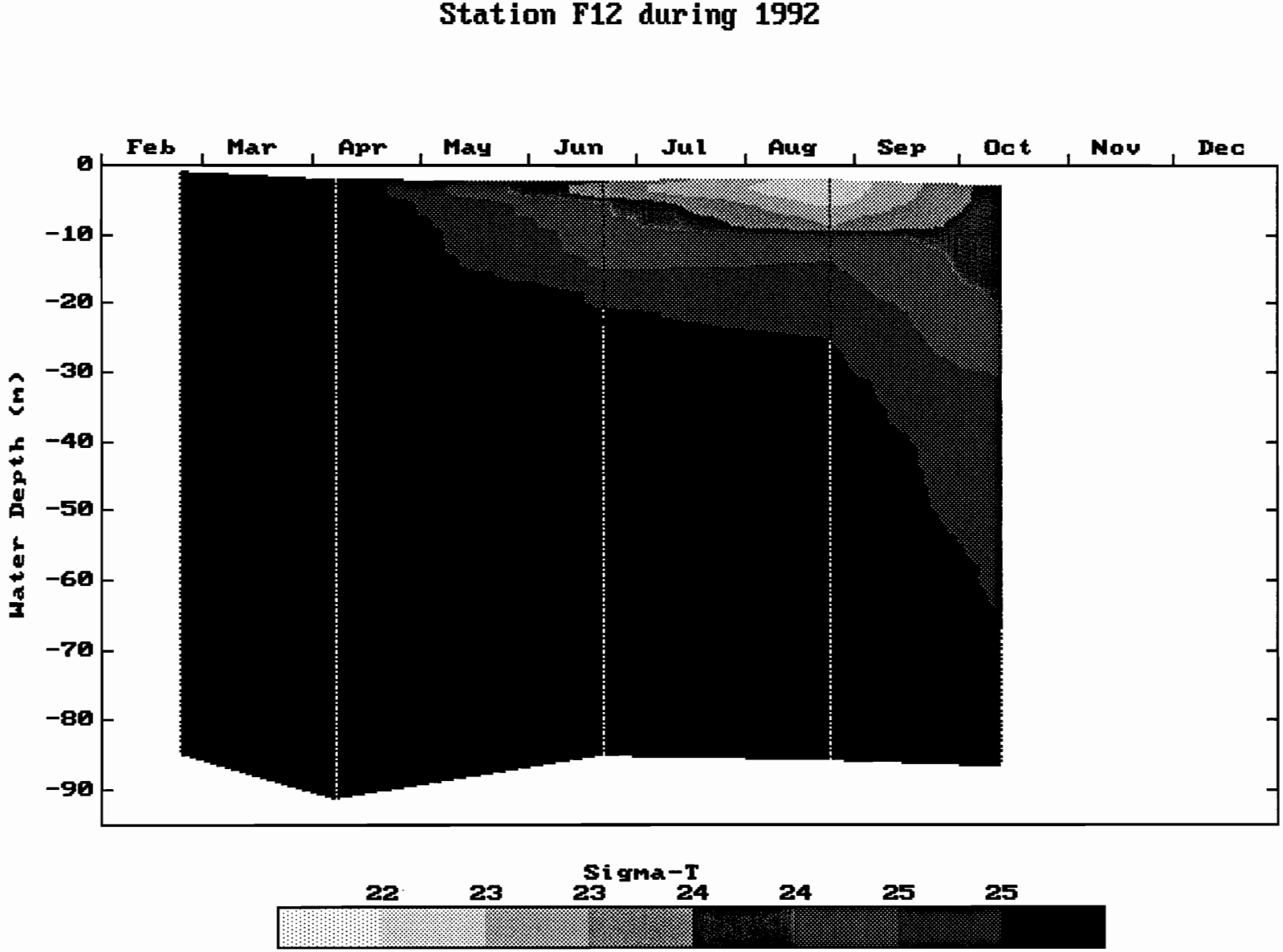
0
-10
-20
-30
Water Depth (m)
Sigma-T
22
23
23
24
24
25
25

Station F04 during 1992



Station F08 during 1992




Station F12 during 1992
Feb
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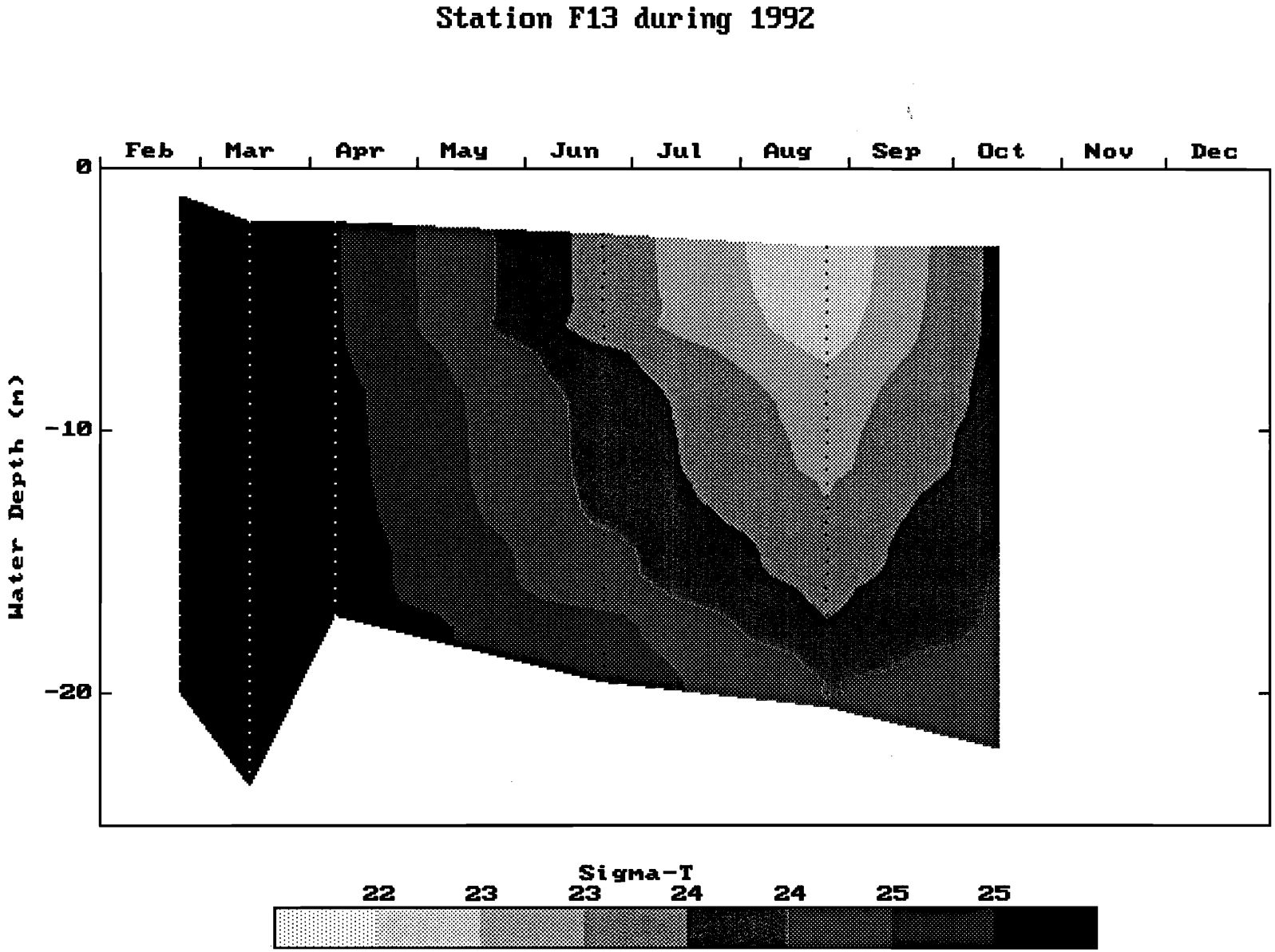
-10
-20
-30
-40
-50
-60
-70
-80
-90
Water Depth (m)
Sigma-T
22
23
23
24
24
25
25


Station F13 during 1992
Feb
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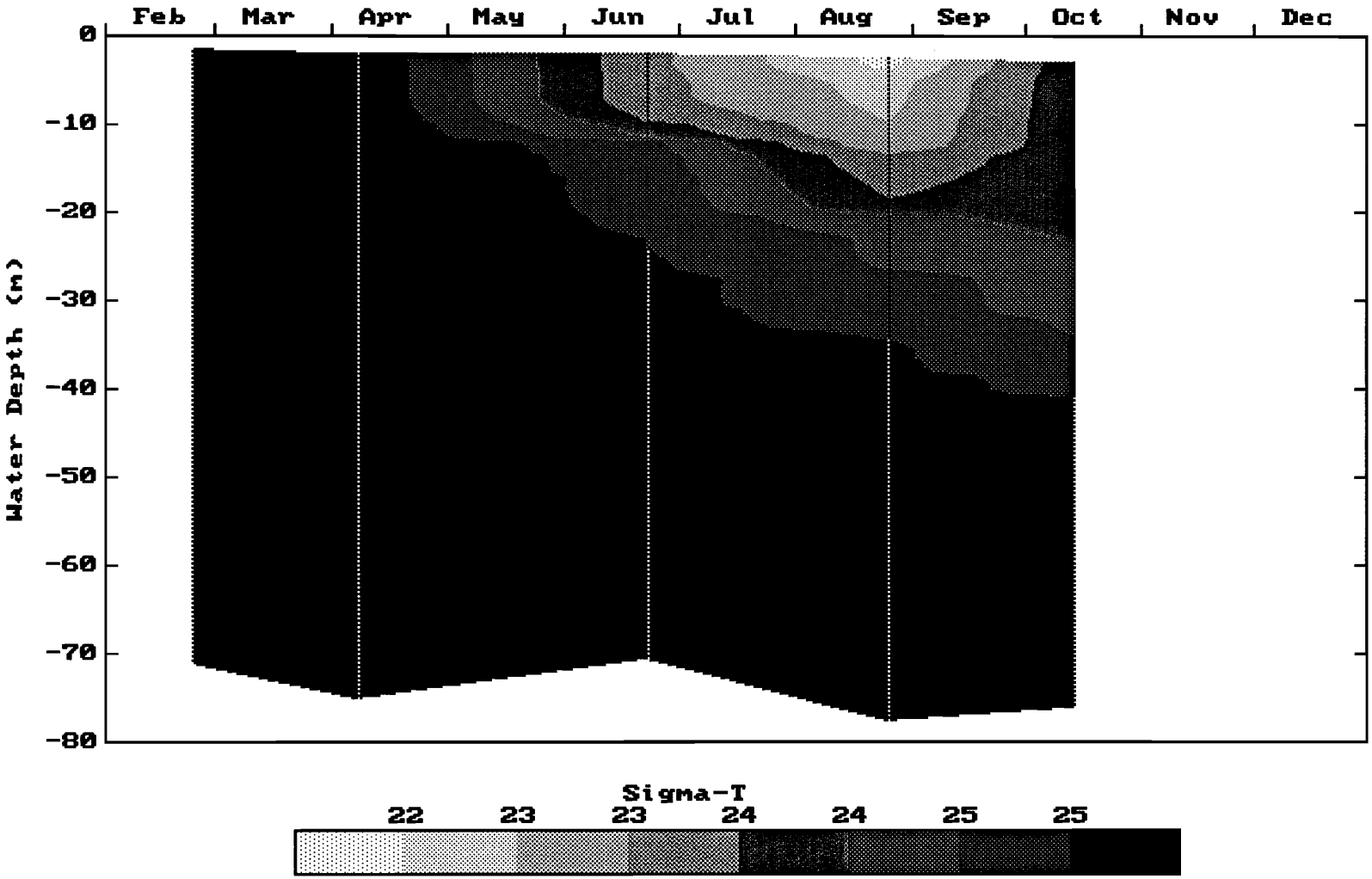
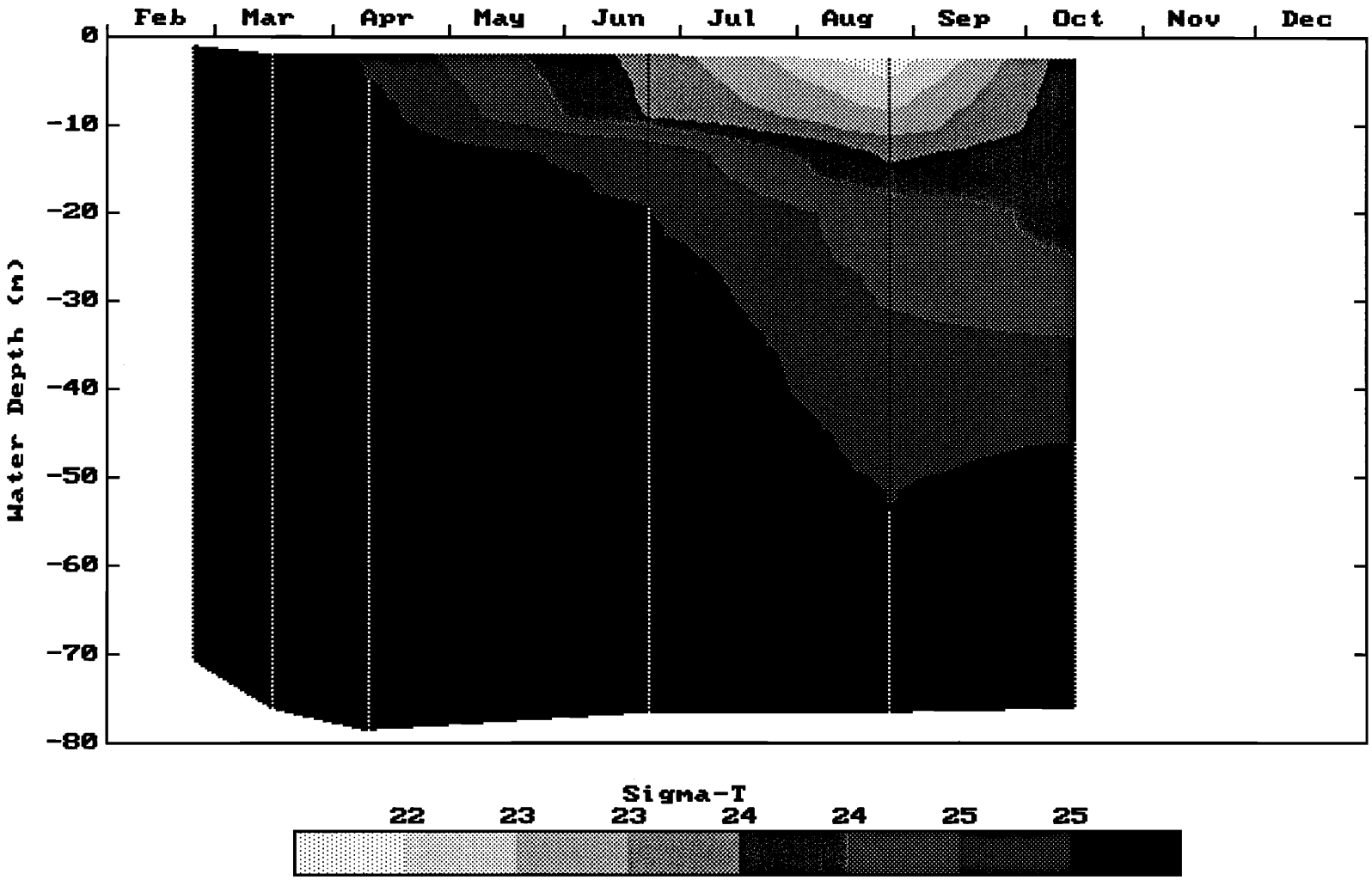
0
-10
-20
Water Depth (m)
Sigma-T
22
23
23
24
24
25
25

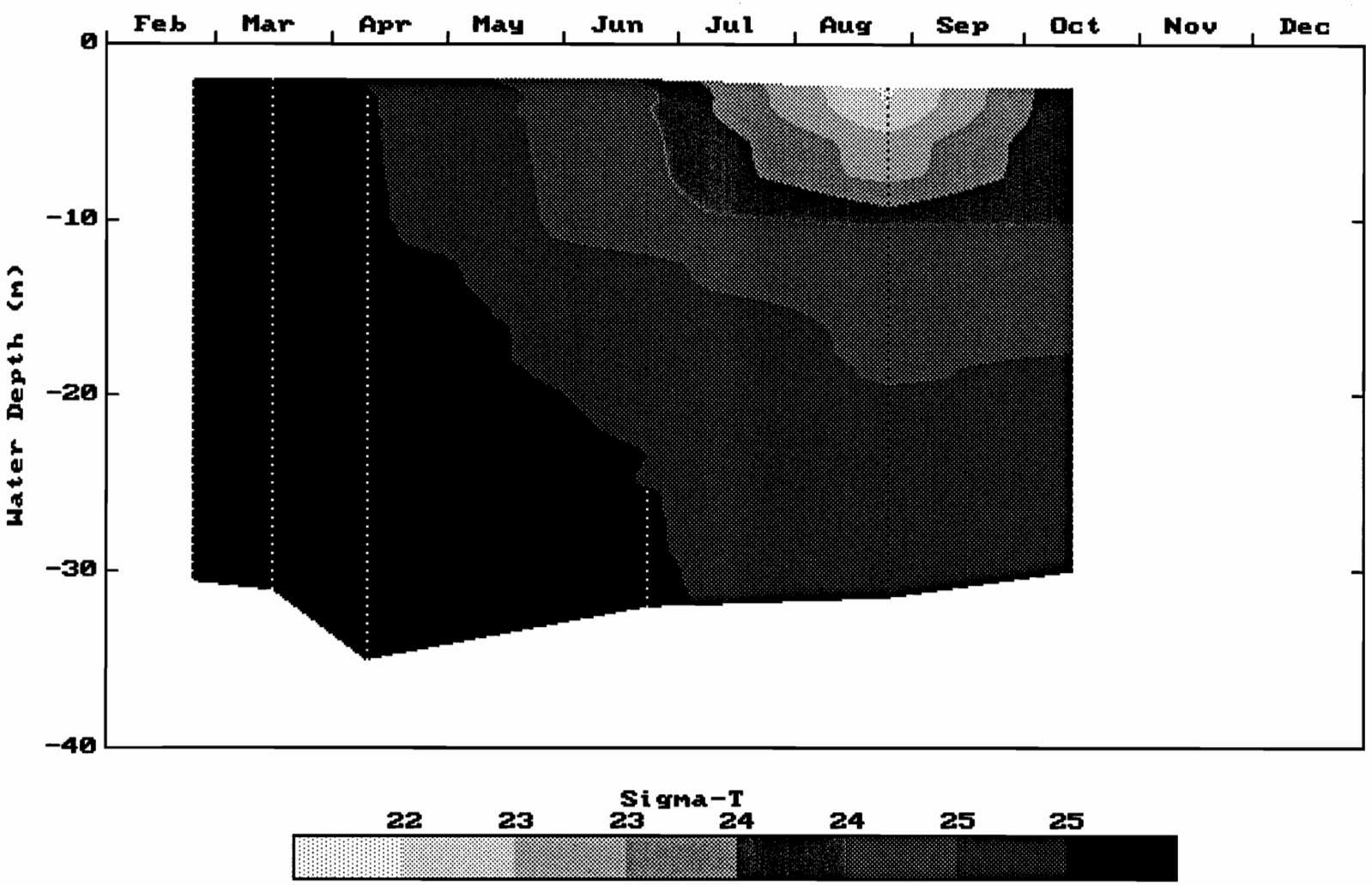
Station F17 during 1992



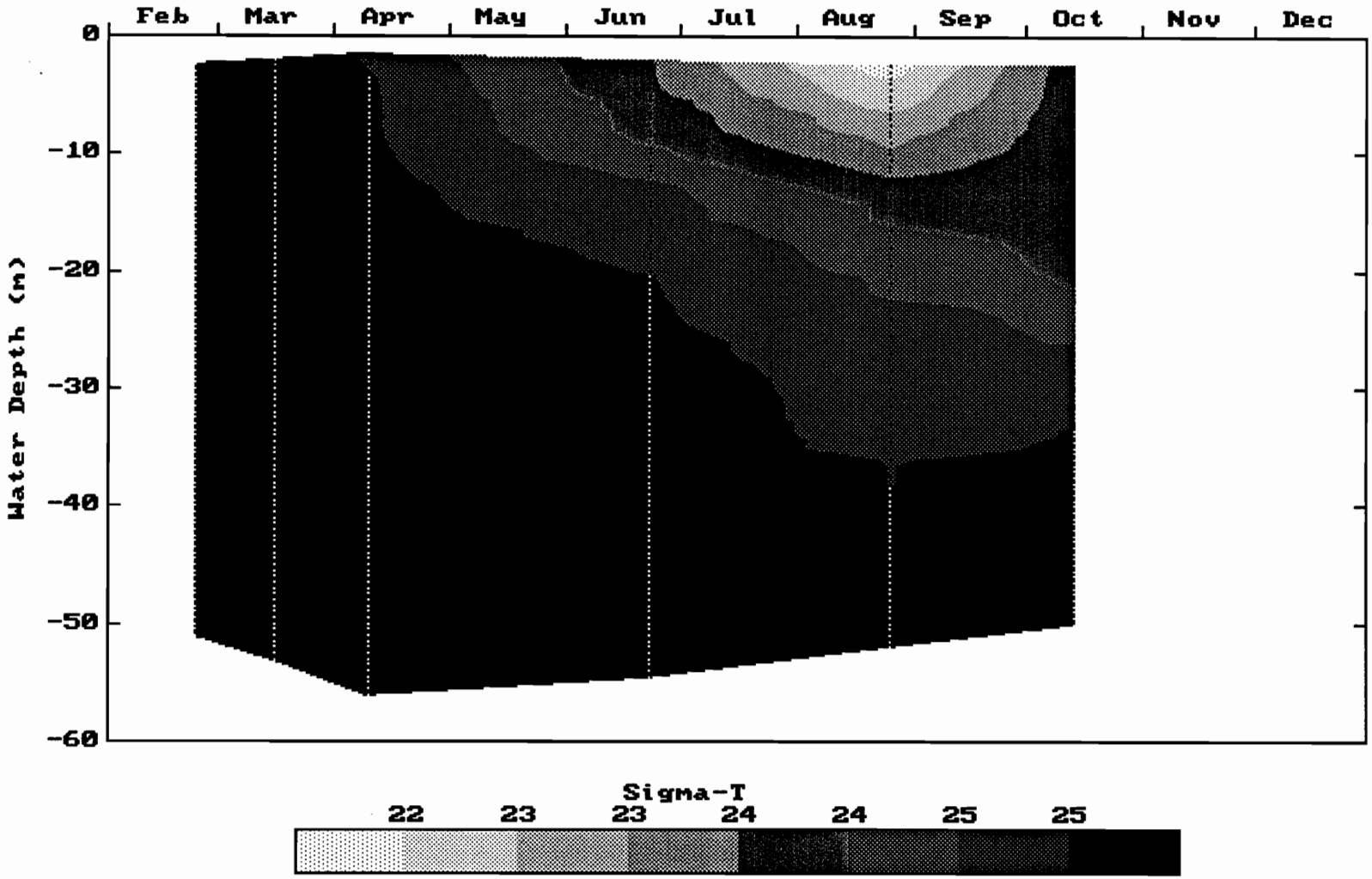
Station F19 during 1992



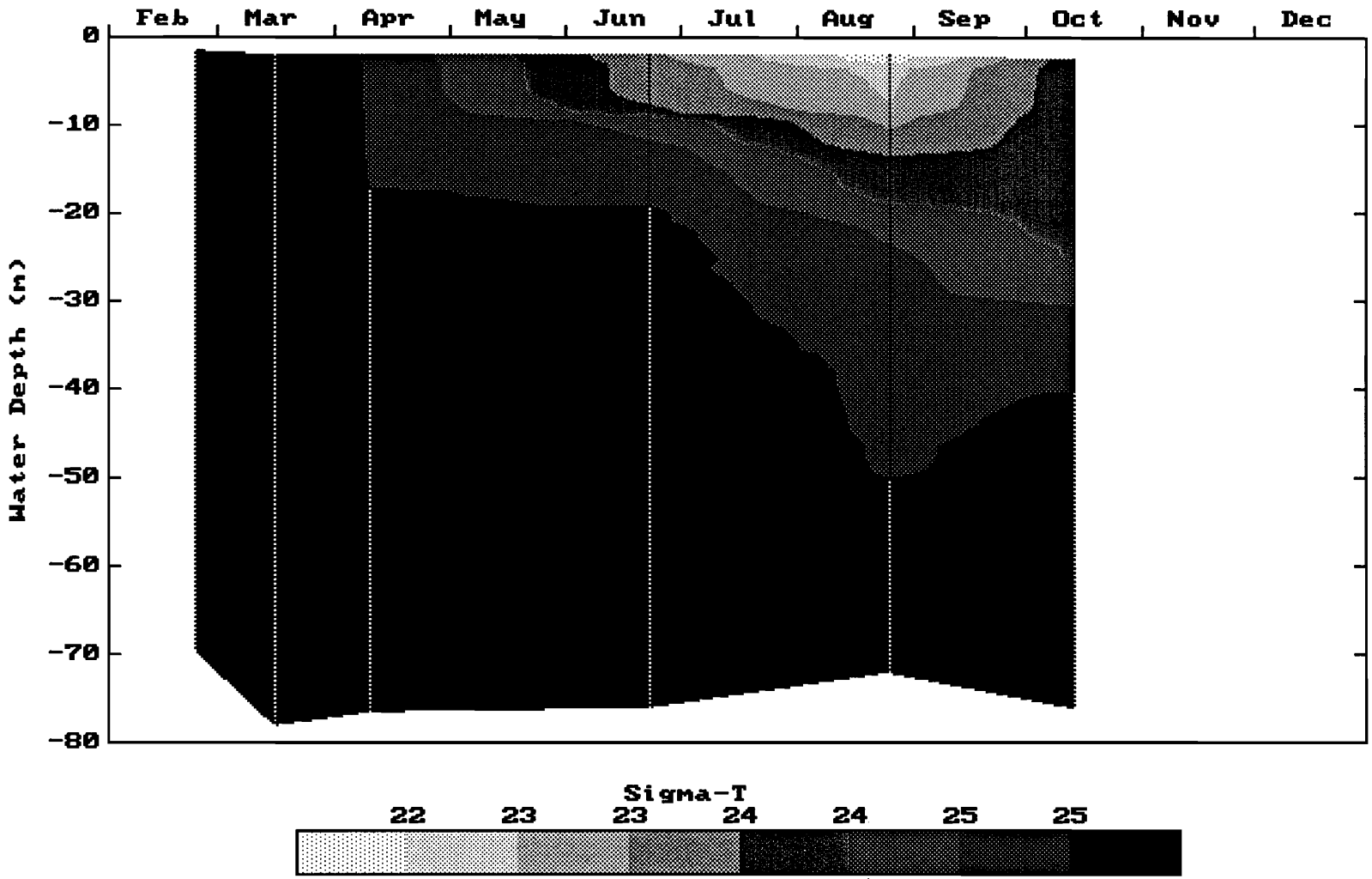
Station F20 during 1992



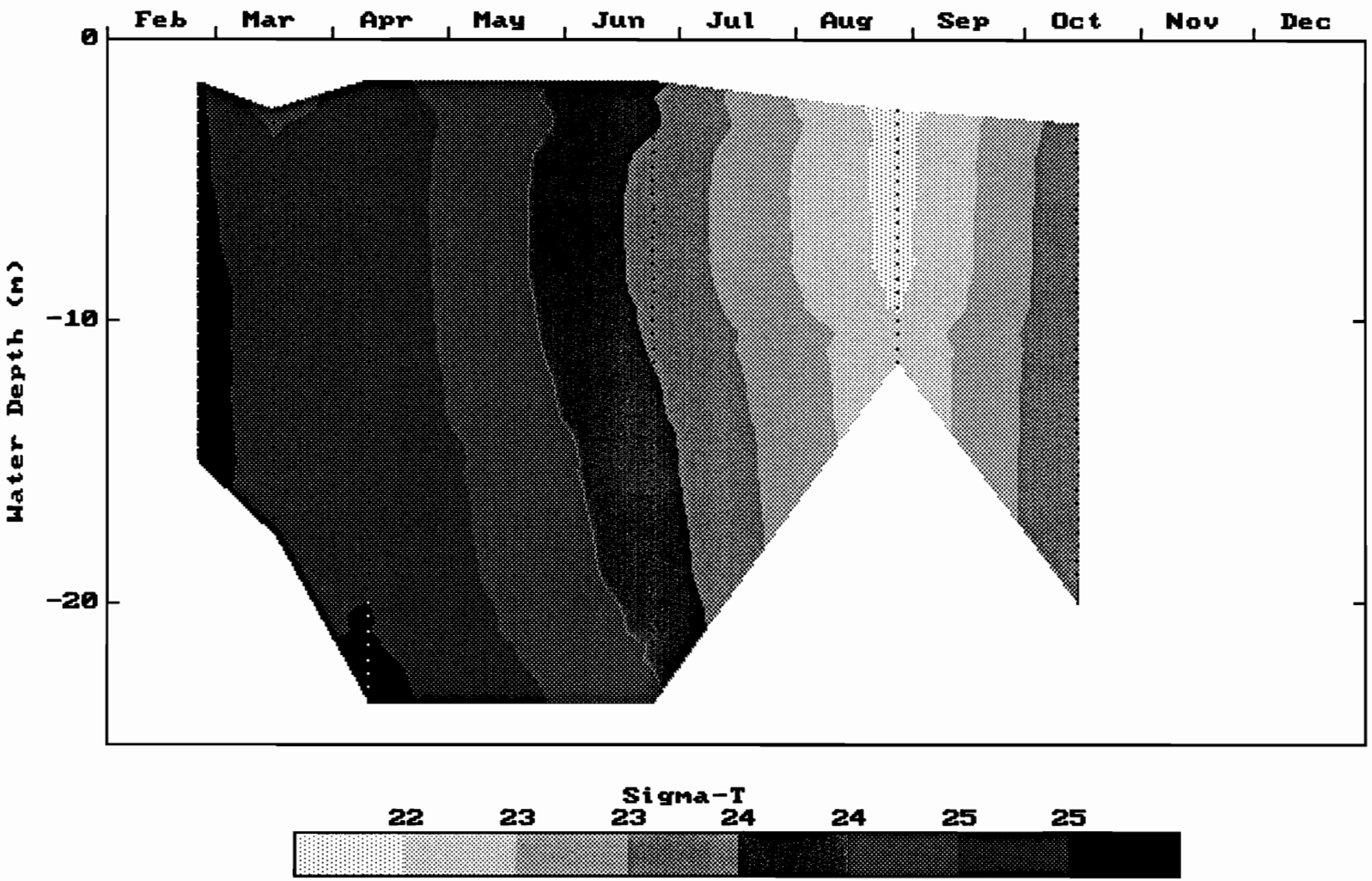
Station F21 during 1992



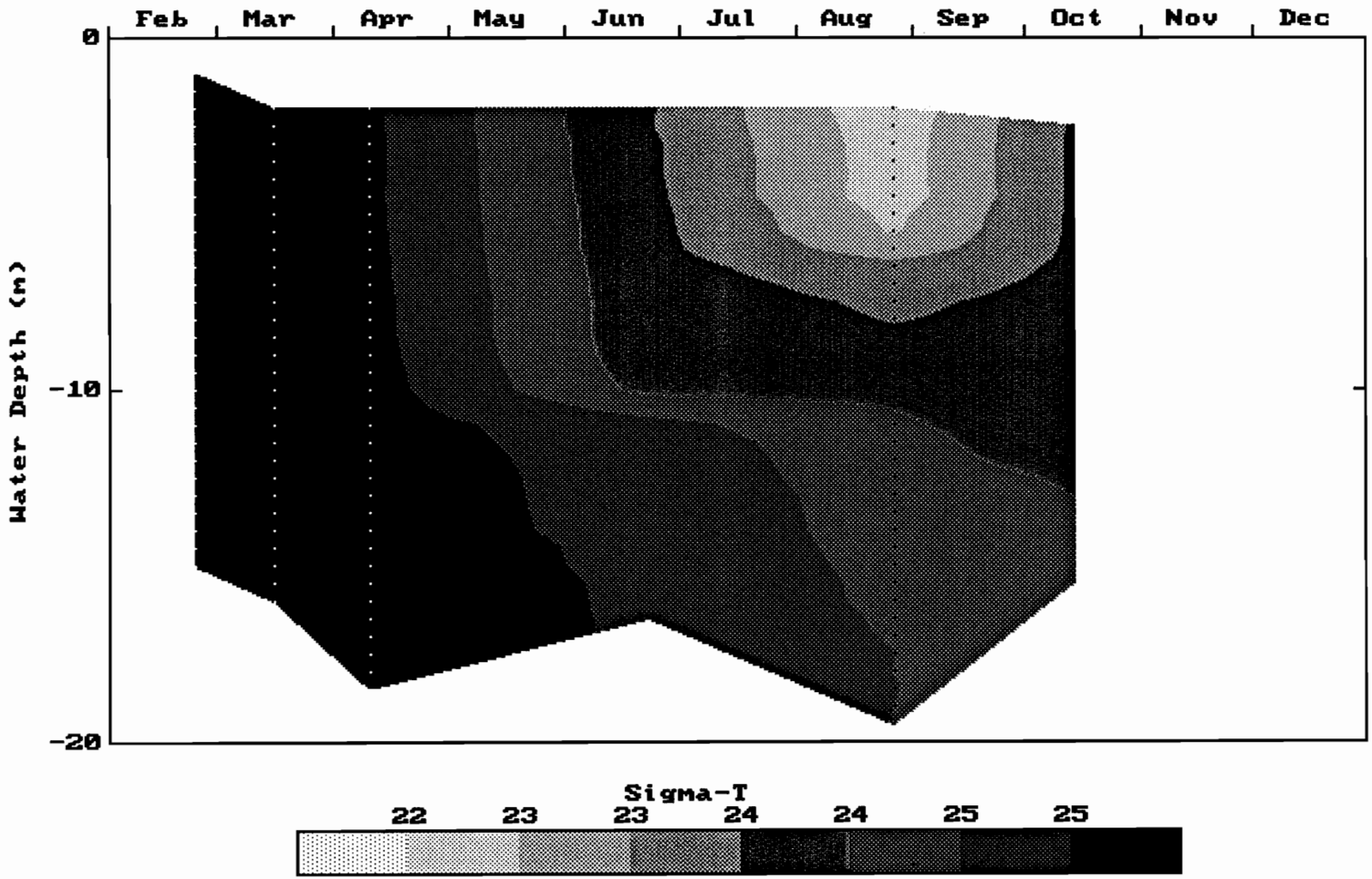
Station F22 during 1992



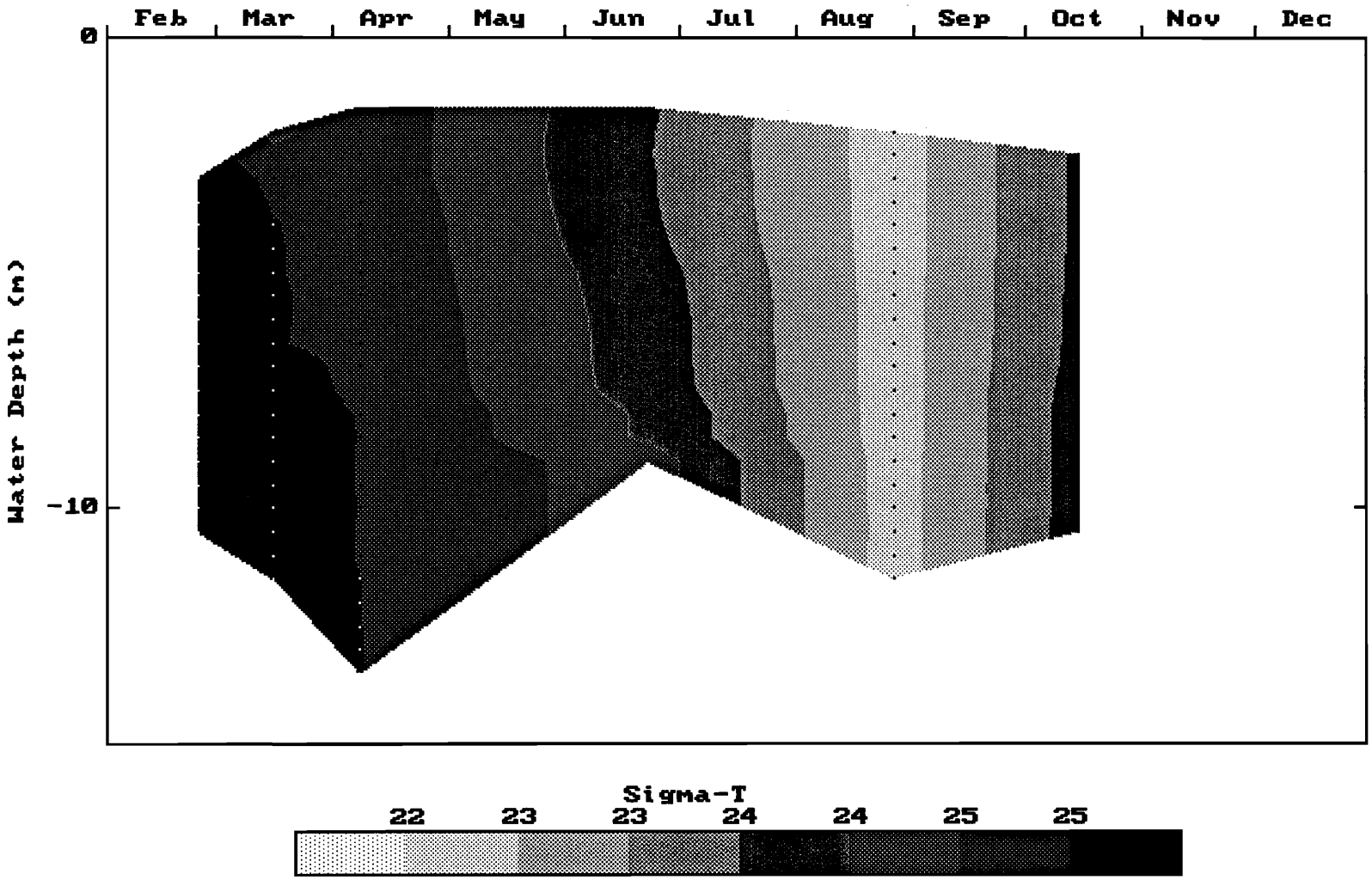
Station F23 during 1992



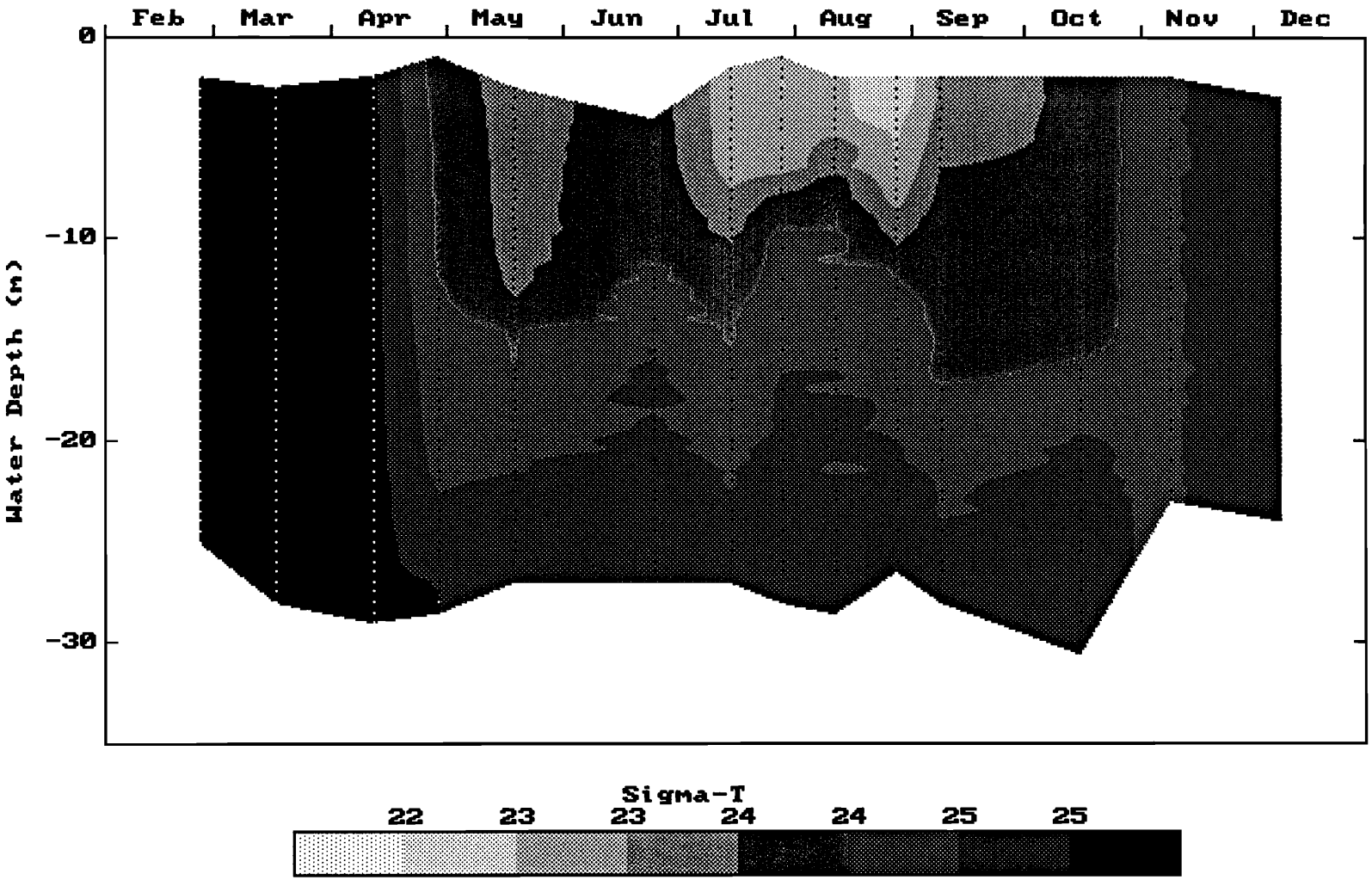
Station F24 during 1992

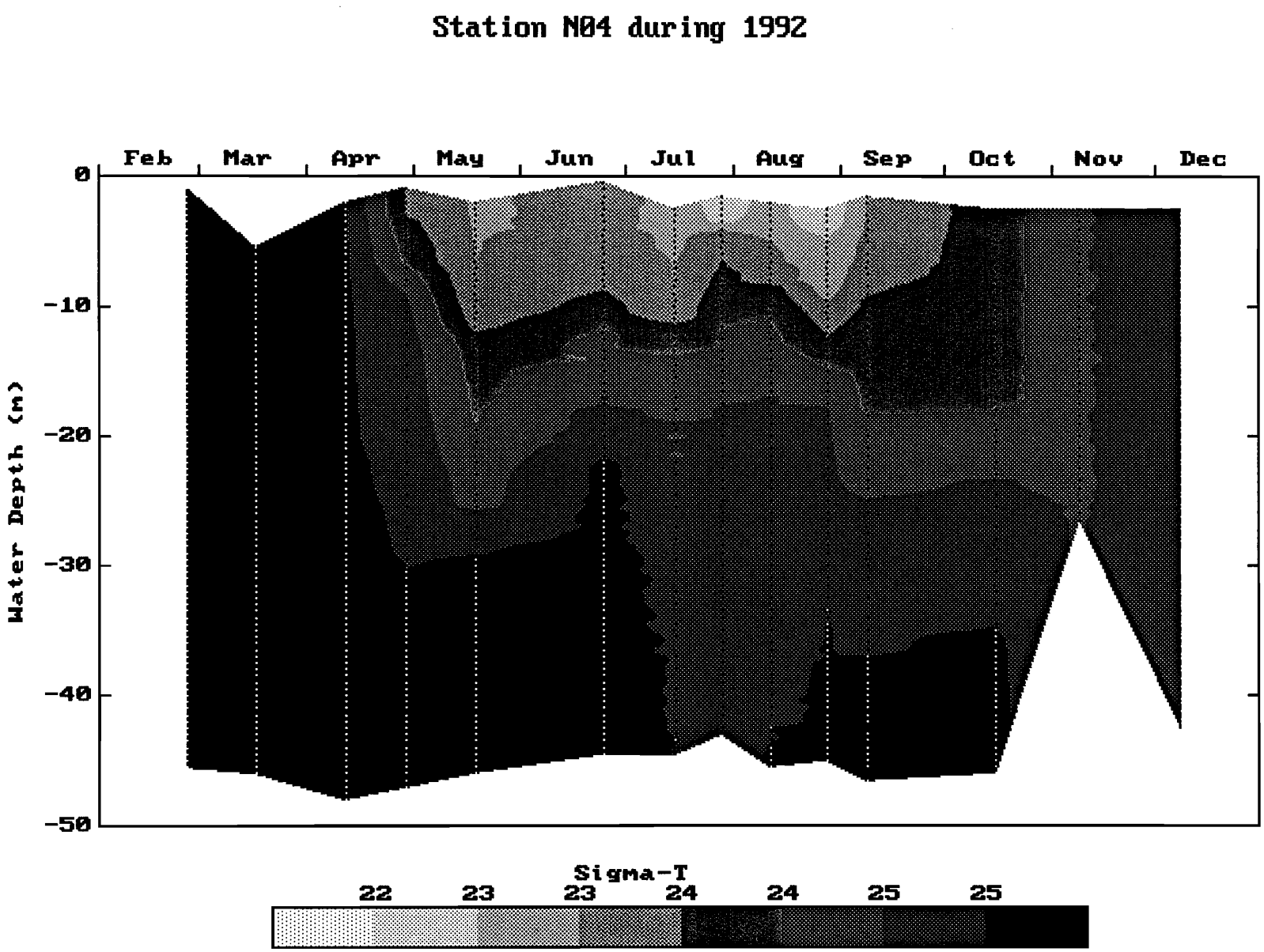


Station F25 during 1992



Station N01 during 1992




Station N04 during 1992
Feb
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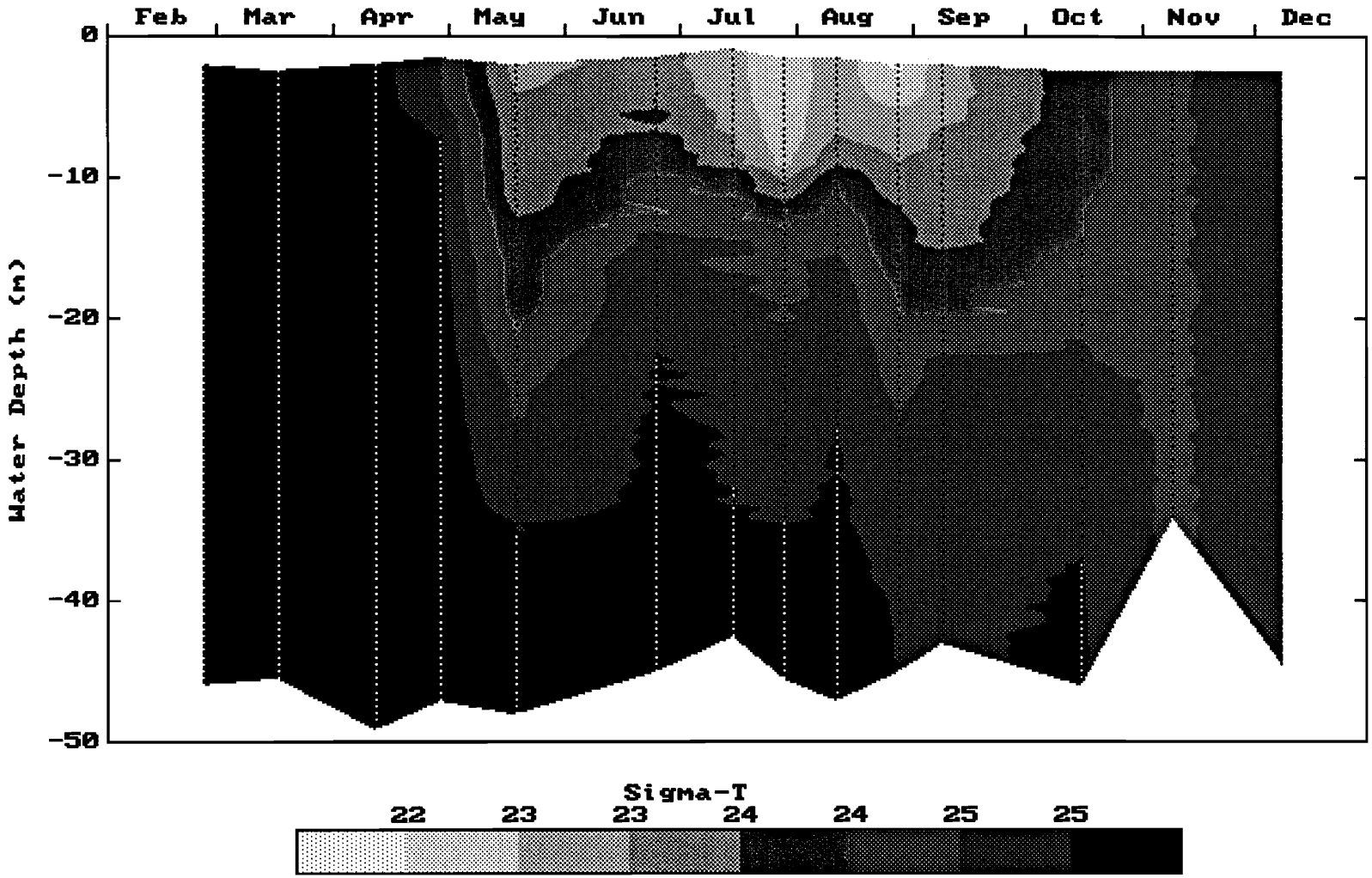
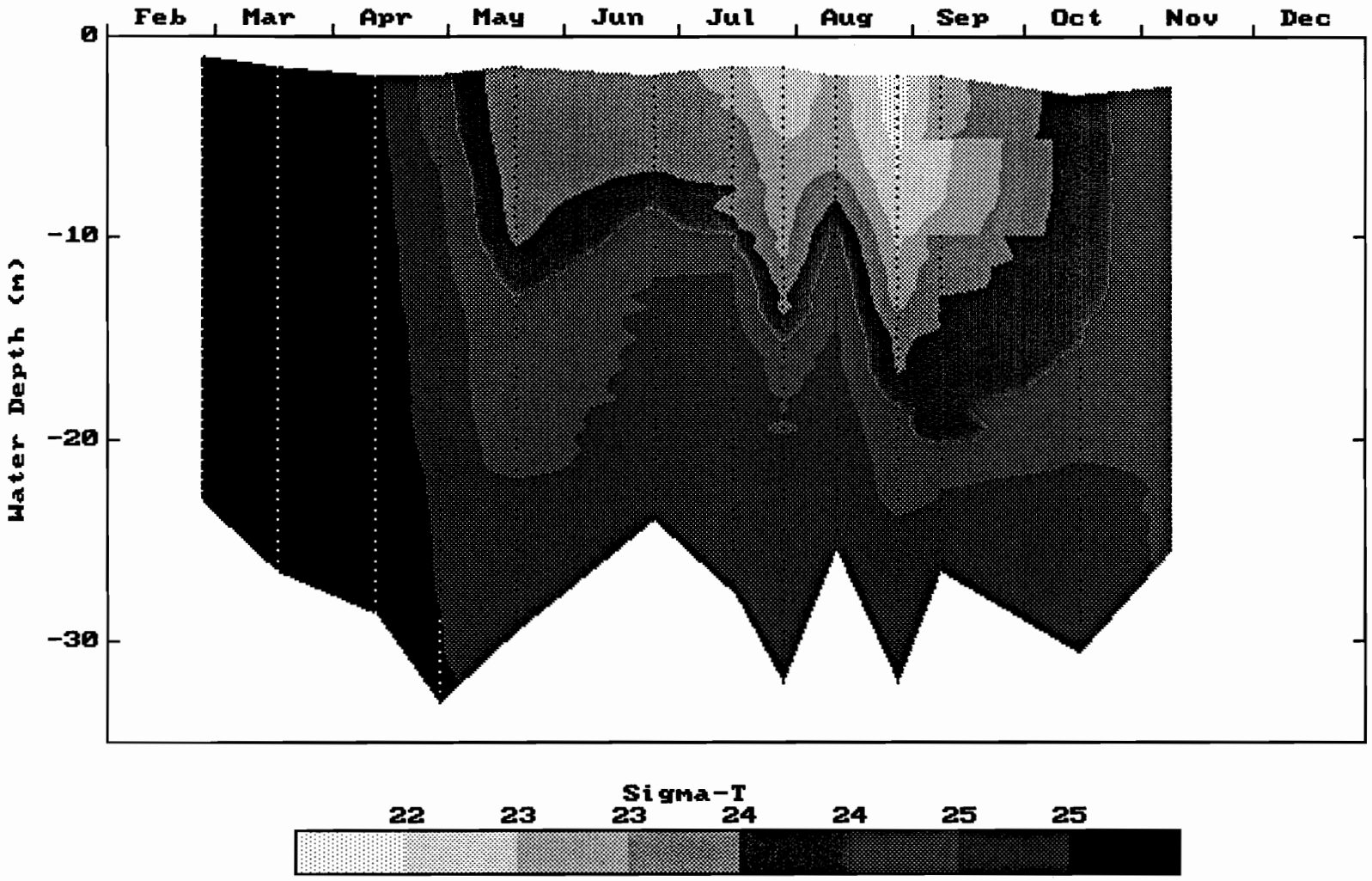
0
-10
-20
-30
-40
-50
Water Depth (m)
Sigma-T
22
23
23
24
24
25
25

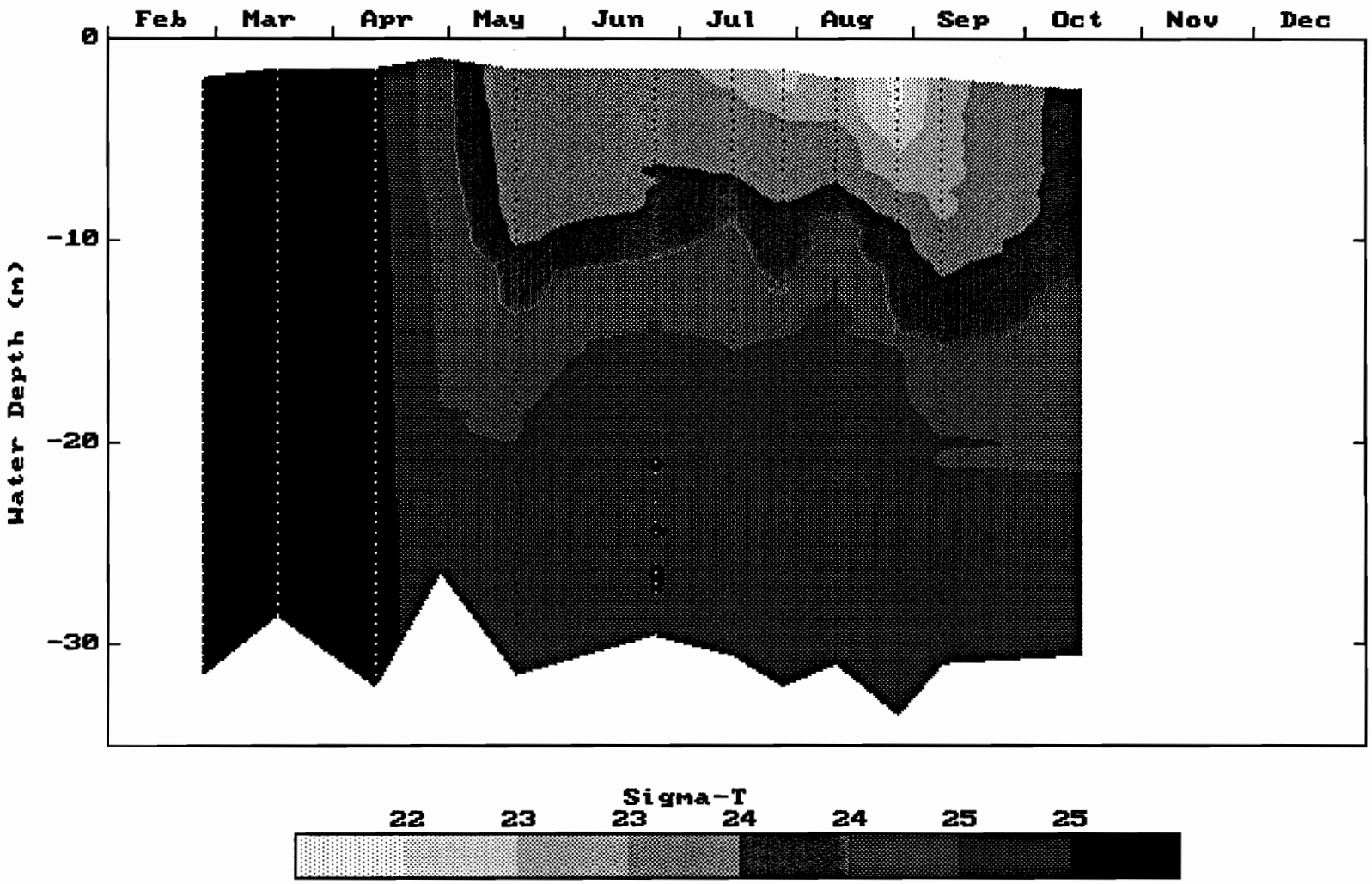
Station N07 during 1992

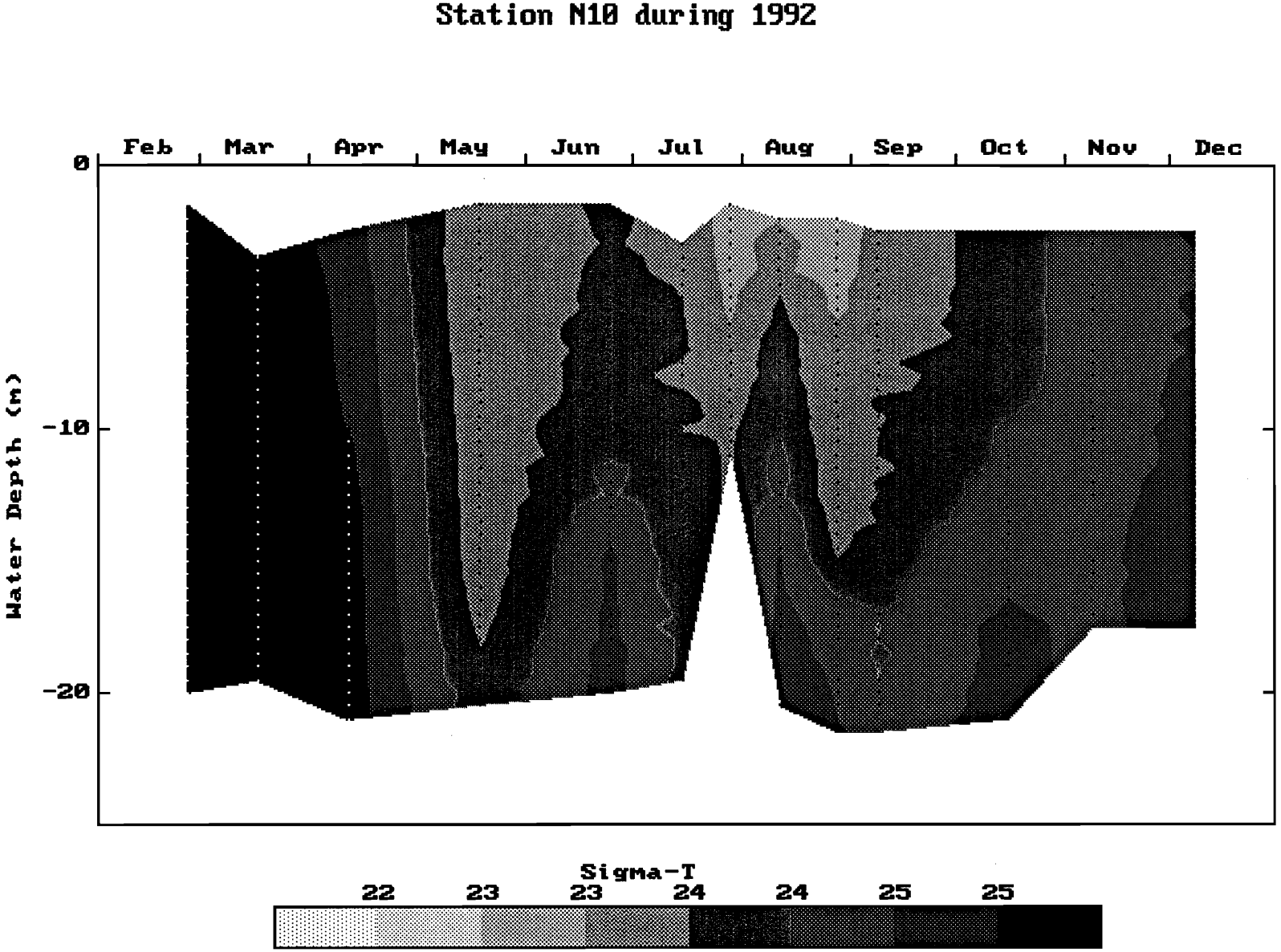


Station N08 during 1992



Station N09 during 1992




Station N10 during 1992
Feb
Mar
Apr
May
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Nov
Dec
0
-10
-20
Water Depth (m)
Sigma-T
22
23
23
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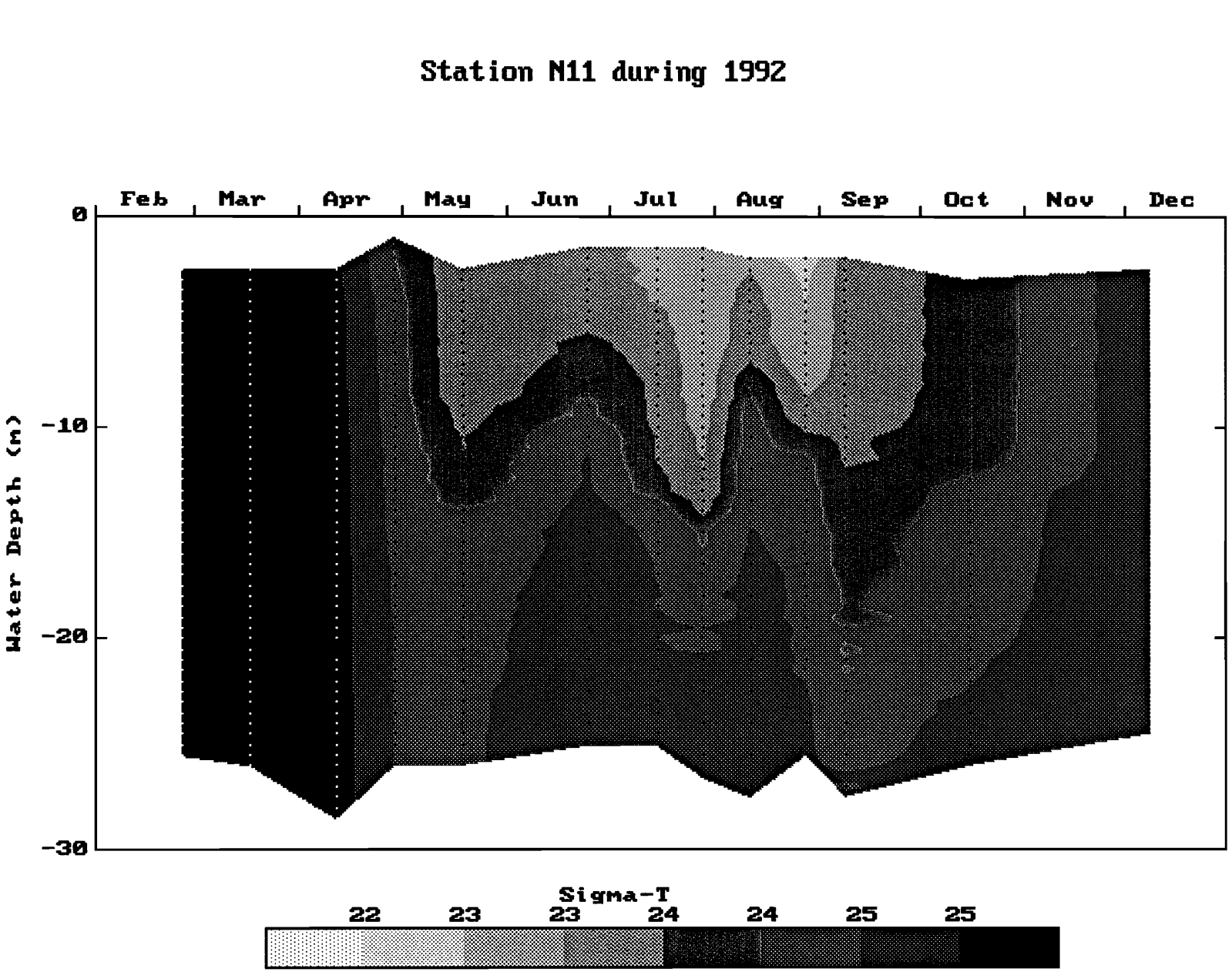
Station N11 during 1992
Feb
Mar
Apr
May
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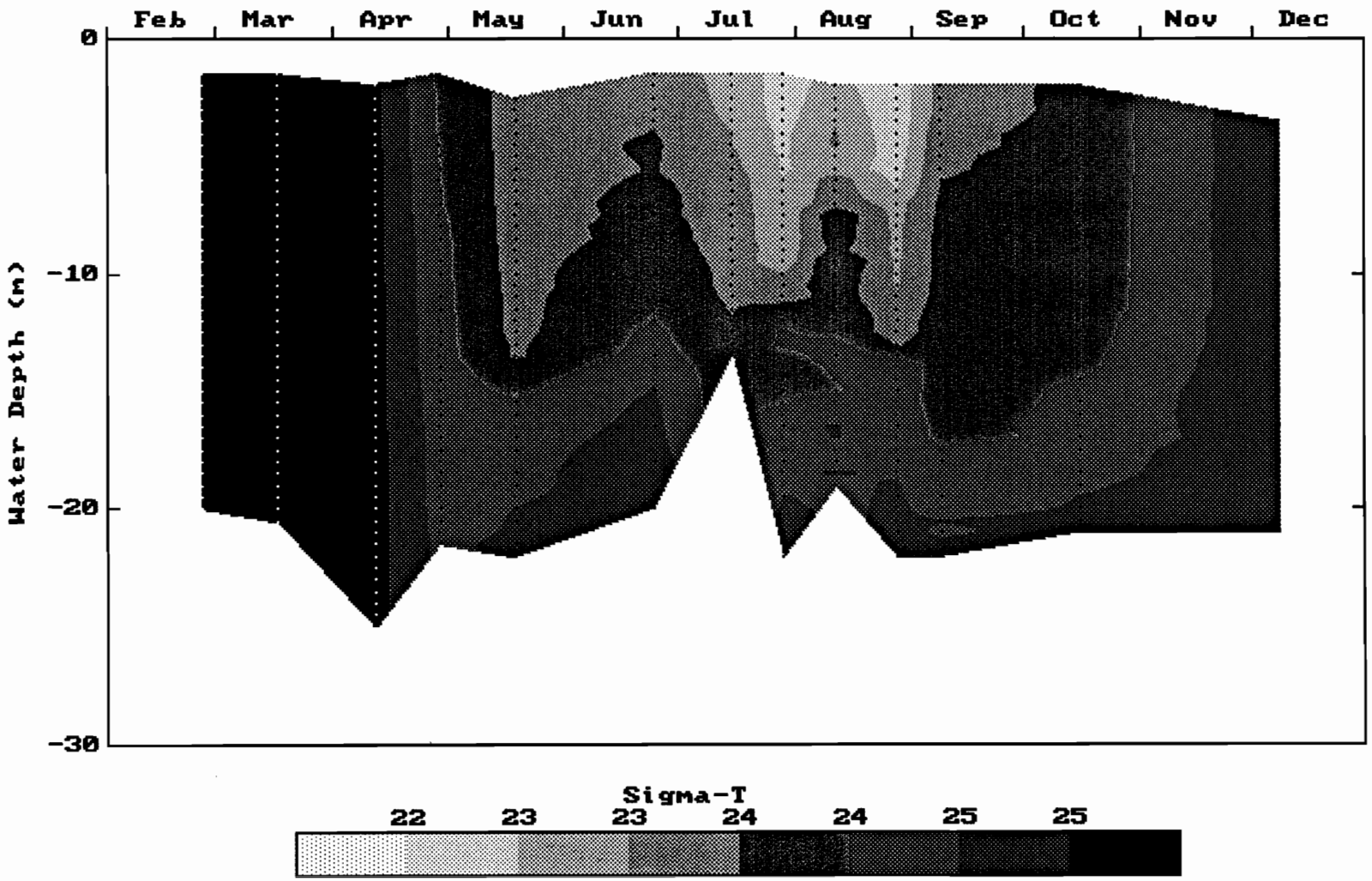
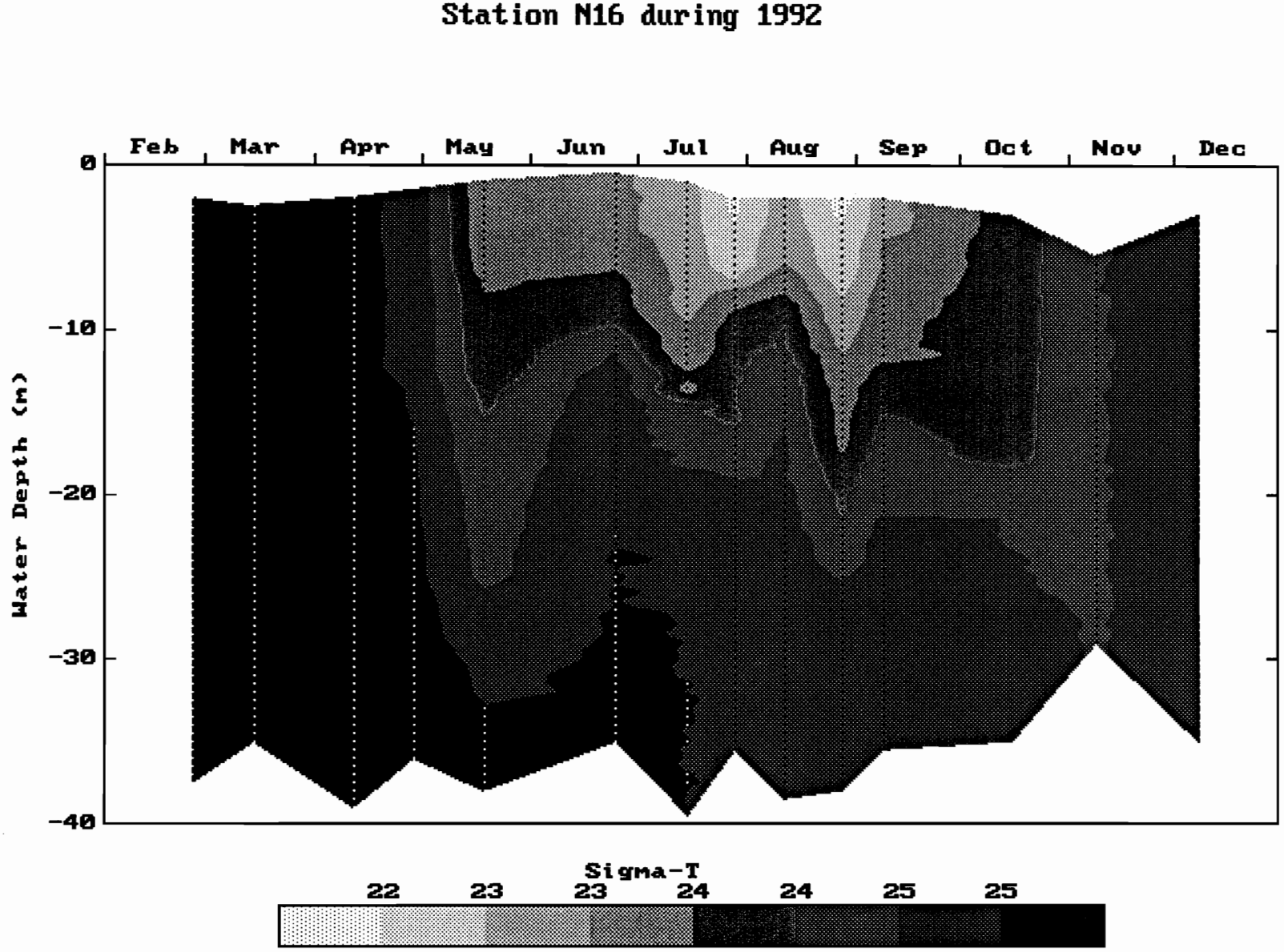
Nov
Dec
0
-10
-20
-30
Water Depth (m)
Sigma-T
22
23
23
24
24
25
25

Station N12 during 1992




Station N16 during 1992
Feb
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Apr
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Oct
Nov
Dec
0
-10
-20
-30
-40
Water Depth (m)
Sigma-T
22
23
23
24
24
25
25

Station N20 during 1992