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# BIOLOGICAL OCEANOGRAPHY CRUISE REPORT
LF 20/99

**17 – 19 May 1999**

**Including data report from cruises:**

**LF 15/99, 14 – 15 April 1999**
**LF 16/99, 18 – 20 April 1999**
**LF 19/99, 9 – 11 May 1999**

**PERSONNEL**

B Stewart (SIC), SSO, DANI.
P Elliott SO, DANI.
S Bloomfield ASO, DANI

**OBJECTIVES**

i. To assess zooplankton populations at stations 38A and 47

ii. To assess temperature, salinity and nutrient distributions over depth at stations 38A and 47.

ii. To acquire daily sub surface samples using an automated sampler attached to a guard buoy.

**CRUISE NARRATIVE**

Sunday 16 May 1999

In preparation for the cruise, all DANI scientific crew were onboard by 2000 hrs when moorings and instrumentation were prepared for deployment. Following a talk on ship's safety and a demonstration of personal life saving equipment, the RV Lough Foyle departed Belfast at 2200 hrs and sailed overnight in a light easterly wind to the mooring site.

Monday 17 May 1999

The vessel arrived on the mooring site before dawn at 0600 hrs and confirmed that the warning beacons on both buoys were functioning satisfactorily. The weather was dry and bright with a fresh easterly breeze when work for the day commenced at 0800 hrs. The instrument mooring was successfully recovered to shipdeck at 0830 hrs. The mooring components were inspected for corrosion and replaced where necessary. Both biological and nutrient water samplers were removed, serviced and

reprogrammed before attachment to the mooring wire. An additional nutrient water sampler, encased by for protection with robust plastic sheeting was incorporated into the steel structure below the guard buoy. The mooring complete with three McLane water samplers was successfully redeployed at 1330 hrs on position $53^0$ $46^l$.868N $5^0$ $38^l$.072W. Following deployment of the rosette water sampler, zooplankton net and sediment corer, the ship sailed to coastal station 47 in Dundalk Bay where water samples and zooplankton net hauls were taken. Work on the station was completed at 1645 hrs and the vessel sailed to dock in Belfast at 0100 hrs.

Tuesday 18 May 1999

Work commenced at 0800 hrs with scientific crew removing samples, scientific instruments and mooring equipment from the vessel to AESD.

**MOORING REDESIGN**

In a further attempt to acquire samples close to the surface, a water sampler was again deployed attached to the steel structure below the guard buoy. On this occasion the fragile components of the sampler were protected from the effects of wave action by encasing the sampler with reinforced plastic sheeting prior to deployment.
An additional sampler was positioned below the sub surface buoy and redeployed at depth 14m on an anchored wire.

**PARAMETERS MONITORED**

The CTD/rosette water sampler was deployed at stations 38A and 47 to acquire nutrient, chlorophyll *a*, temperature and salinity data from the depth profile. The Bowers & Connelly mini-corer was deployed at station 38A, but a damaged closer bar on the equipment prevented successful sampling of the sea bed. Three zooplankton net hauls were taken at both stations 38A & 47.

**SUMMARY OF RESULTS**

Station 38A is located in an area of low tidal current and during spring and summer months, reduced wind velocity and warming of surface layers, promotes thermal stratification of the water column. During the period 14 April to17 May 1999, temperature data from CTD profiles clearly demonstrate the build up of stratification at station 38A with the formation of a stable thermocline at depth 20m (Figs. 1a, 1b, 1c & 1d). With increasing water temperature and additional daylight available, the process of primary production progressively depletes nutrients from the photobathic zone of the water column. Figure 2, illustrates the uptake of inorganic nitrogen observed during four cruises for the period 14 April to17 May 1999. From the initial cruise dated 14 April 1999, nutrient uptake by biological species has already reduced winter surface concentrations from typically 9 to 3 micromoles inorganic N $l^{-1}$. In the subsequent three cruises, the process of nutrient uptake in the surface layer, appears to outweigh the process of nutrient upwelling as the surface depleted layer expands in

depth while the nutrient concentration of the bottom layer becomes progressively depleted. From the four CTD profiles (Figs. 1a, 1b, 1c & 1d), the depth of the peak fluorescence signal increases with time during the survey period. This demonstrates the movement of the primary production process from a nutrient depleted to a nutrient rich region of the photic zone.
At the coastal station 47, the four CTD profiles (Figs. 3a, 3b, 3c & 3d) show a similar if less well defined trend to that observed at station 38A. The shallow nature of this station means surface warming readily increases the temperature of the entire water column. Primary production coupled with nutrient uptake occurs throughout the water column reducing inorganic nitrogen levels to between 0.5 – 1.0 micromoles inorganic N $l^{-1}$ .

**McLane water sampler**
The McLane "large volume" water sampler operated successfully sampling every other day during the period 8 April – 16 May 1999. The 20 samples, preserved with Lugol's solution were removed and stored for a future assessment of biological content.
The "small volume" water sampler also operated successfully by sampling daily during the period 20 April – 17 May 1999. The 28 samples preserved *in-situ* with mercuric chloride solution were removed and stored for nutrient analysis.
Figure 4. shows inorganic N analysis of the McLane samples. Also included are daily sub-surface samples taken by the Mclane sampler during the period 11 – 28 March 1999, when the sampler was built into the steel structure directly below the guard buoy. During this period the progressive depletion of inorganic nitrogen from the surface layer can readily observed.

**HOTEL REPORT & OPERATIONAL ASPECTS OF THE SHIP**

During the cruise the A-frame, main trawl winches, both hydrographic winches and the ship's clean sea-water supply were used. No problems were encountered with any of the ship's equipment nor indeed with any of the scientific equipment. The hotel and catering service was of the usual high standard and there was a good working relationship between the scientists and the ship's crew. Prior to the ship departing Belfast a comprehensive and detailed safety briefing was delivered to the scientific crew.

**ACKNOWLEDGEMENTS**
I am indebted the deck crew of the RV Lough Foyle for their co-operation and assistance during the mooring recovery and deployment operation. The ship's master, officers, engineers and catering staff are also thanked for their co-operation during this cruise.

B M STEWART
2 June 1999

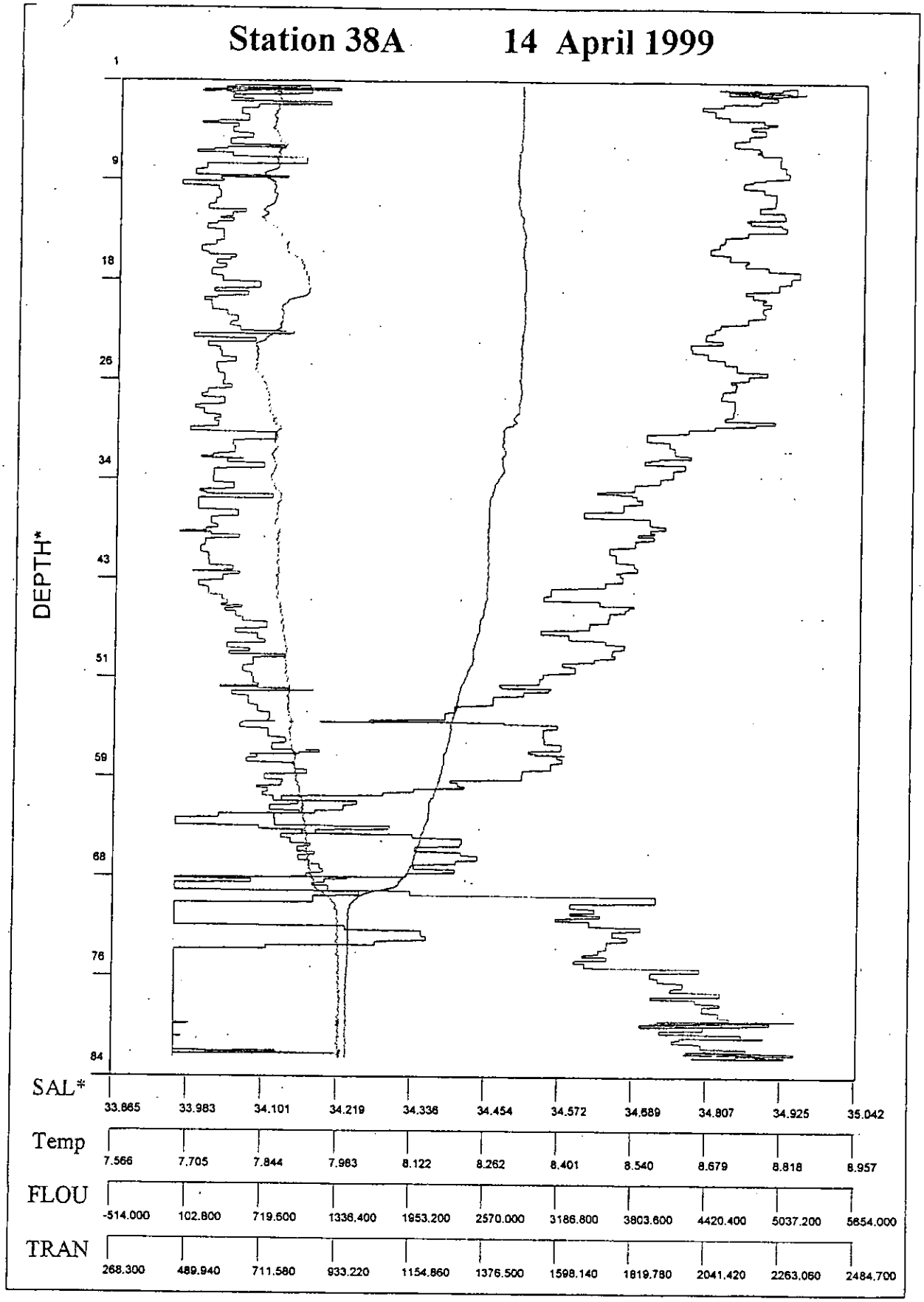

Station 38A 14 April 1999
DEPTH*
1
9
18
26
34
43
51
59
68
76
84
SAL*
33.865 33.983 34.101 34.219 34.336 34.454 34.572 34.689 34.807 34.925 35.042
Temp
7.566 7.705 7.844 7.983 8.122 8.262 8.401 8.540 8.679 8.818 8.957
FLOU
-514.000 102.800 719.600 1336.400 1953.200 2570.000 3186.800 3803.600 4420.400 5037.200 5654.000
TRAN
268.300 489.940 711.580 933.220 1154.860 1376.500 1598.140 1819.780 2041.420 2263.060 2484.700



Fig 1a.

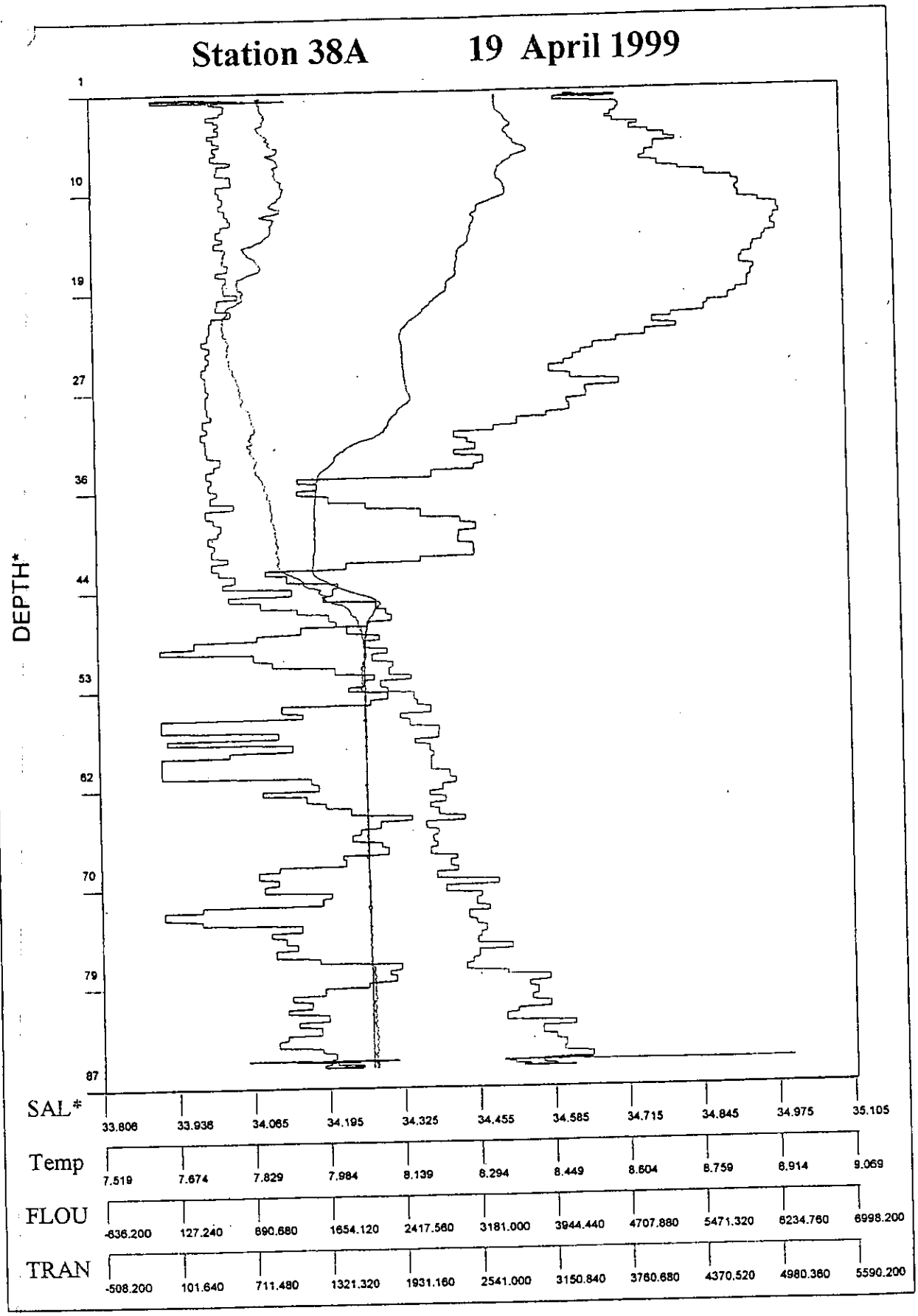

Station 38A
19 April 1999
DEPTH*
1
10
19
27
36
44
53
62
70
79
87
SAL*
33.806
33.936
34.065
34.195
34.325
34.455
34.585
34.715
34.845
34.975
35.105
Temp
7.519
7.674
7.829
7.984
8.139
8.294
8.449
8.604
8.759
8.914
9.069
FLOU
-636.200
127.240
890.680
1654.120
2417.560
3181.000
3944.440
4707.880
5471.320
6234.760
6998.200
TRAN
-508.200
101.640
711.480
1321.320
1931.160
2541.000
3150.840
3760.680
4370.520
4980.360
5590.200



Fig 1b.

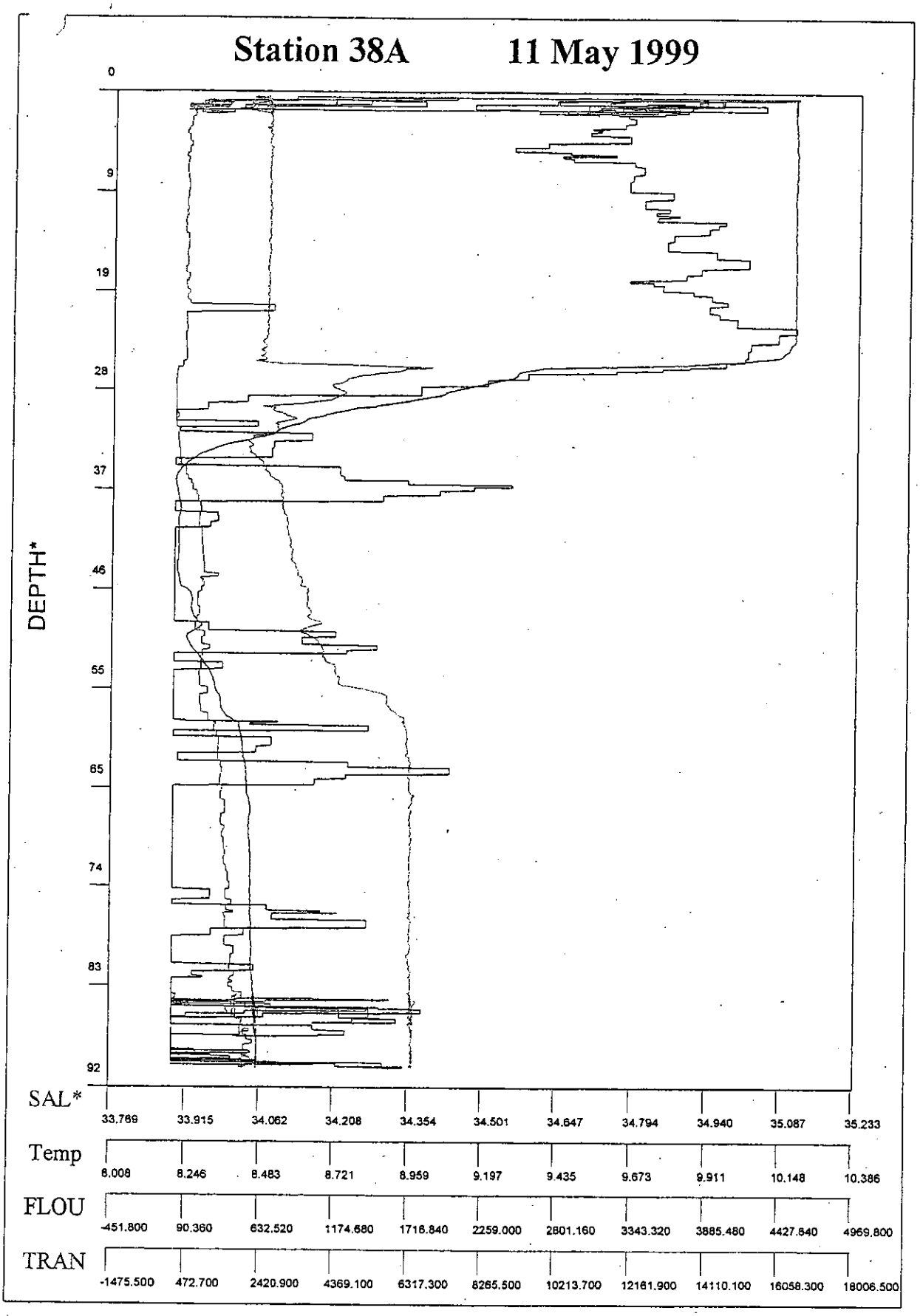

Station 38A 11 May 1999
DEPTH*
0
9
19
28
37
46
55
65
74
83
92
SAL*
33.769 33.915 34.062 34.208 34.354 34.501 34.647 34.794 34.940 35.087 35.233
Temp
8.008 8.246 8.483 8.721 8.959 9.197 9.435 9.673 9.911 10.148 10.386
FLOU
-451.800 90.360 632.520 1174.680 1716.840 2259.000 2801.160 3343.320 3885.480 4427.640 4969.800
TRAN
-1475.500 472.700 2420.900 4369.100 6317.300 8265.500 10213.700 12161.900 14110.100 16058.300 18006.500



Fig 1c.

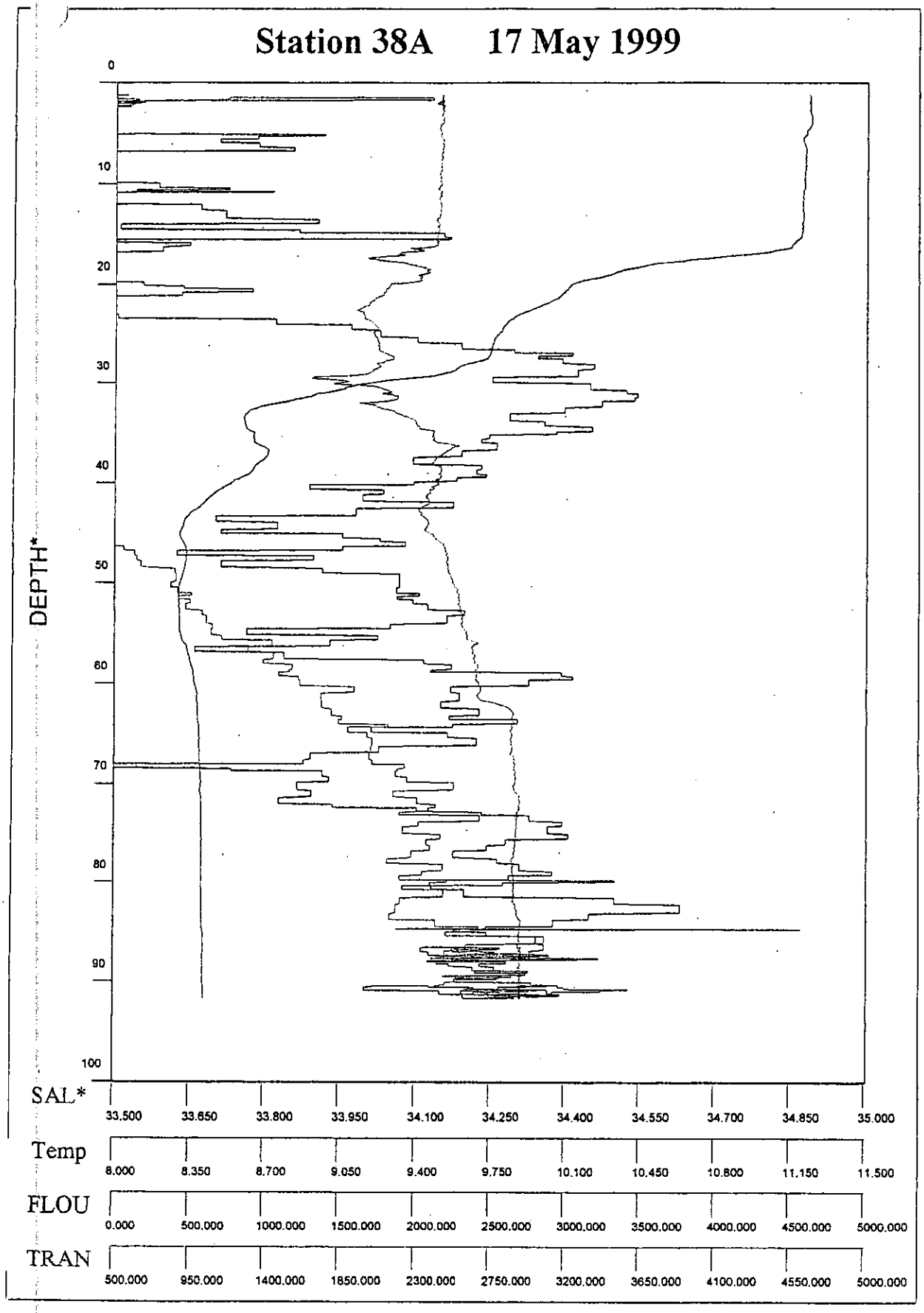
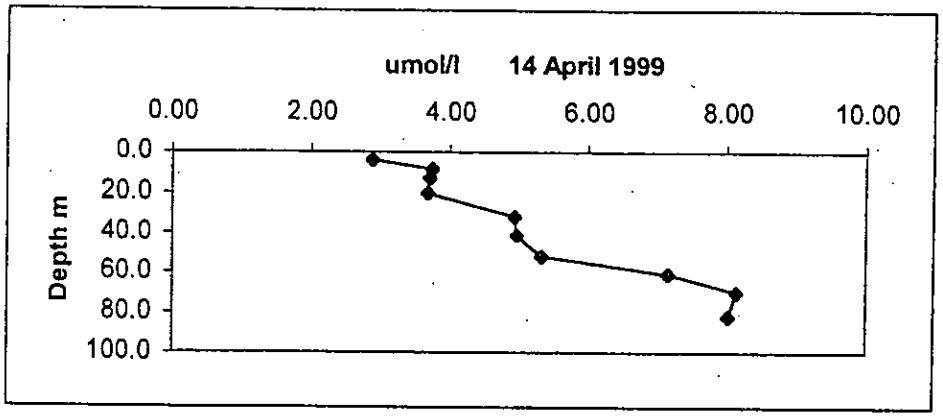
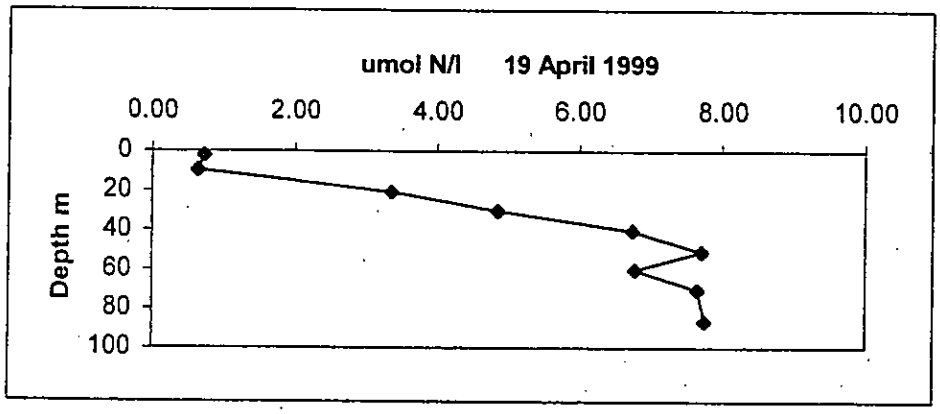

Station 38A 17 May 1999
DEPTH*
0
10
20
30
40
50
60
70
80
90
100
SAL*
33.500 33.650 33.800 33.950 34.100 34.250 34.400 34.550 34.700 34.850 35.000
Temp
8.000 8.350 8.700 9.050 9.400 9.750 10.100 10.450 10.800 11.150 11.500
FLOU
0.000 500.000 1000.000 1500.000 2000.000 2500.000 3000.000 3500.000 4000.000 4500.000 5000.000
TRAN
500.000 950.000 1400.000 1850.000 2300.000 2750.000 3200.000 3650.000 4100.000 4550.000 5000.000

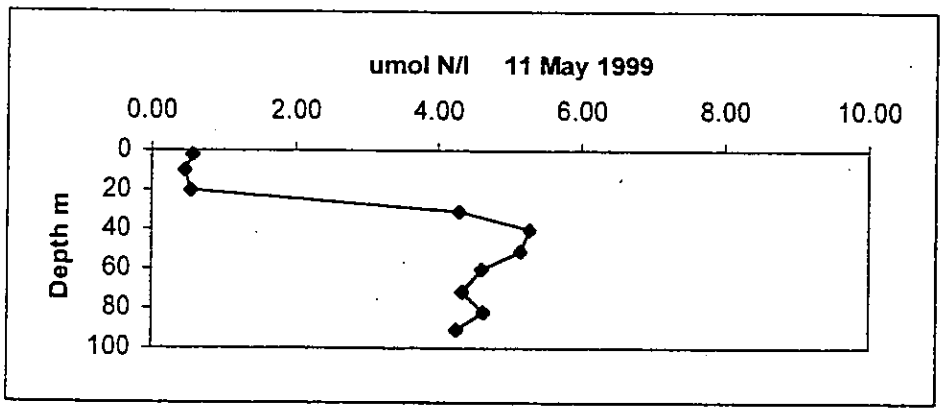


Fig 1d.

Station 38A Inorganic Nitrogen



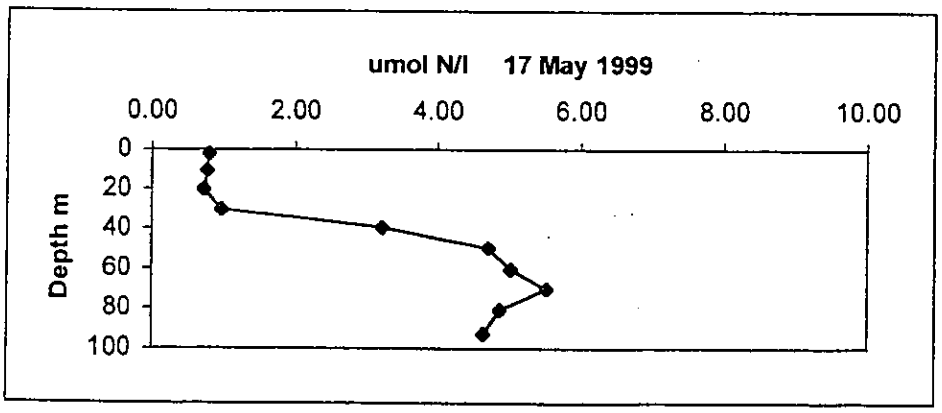




Fig. 2.

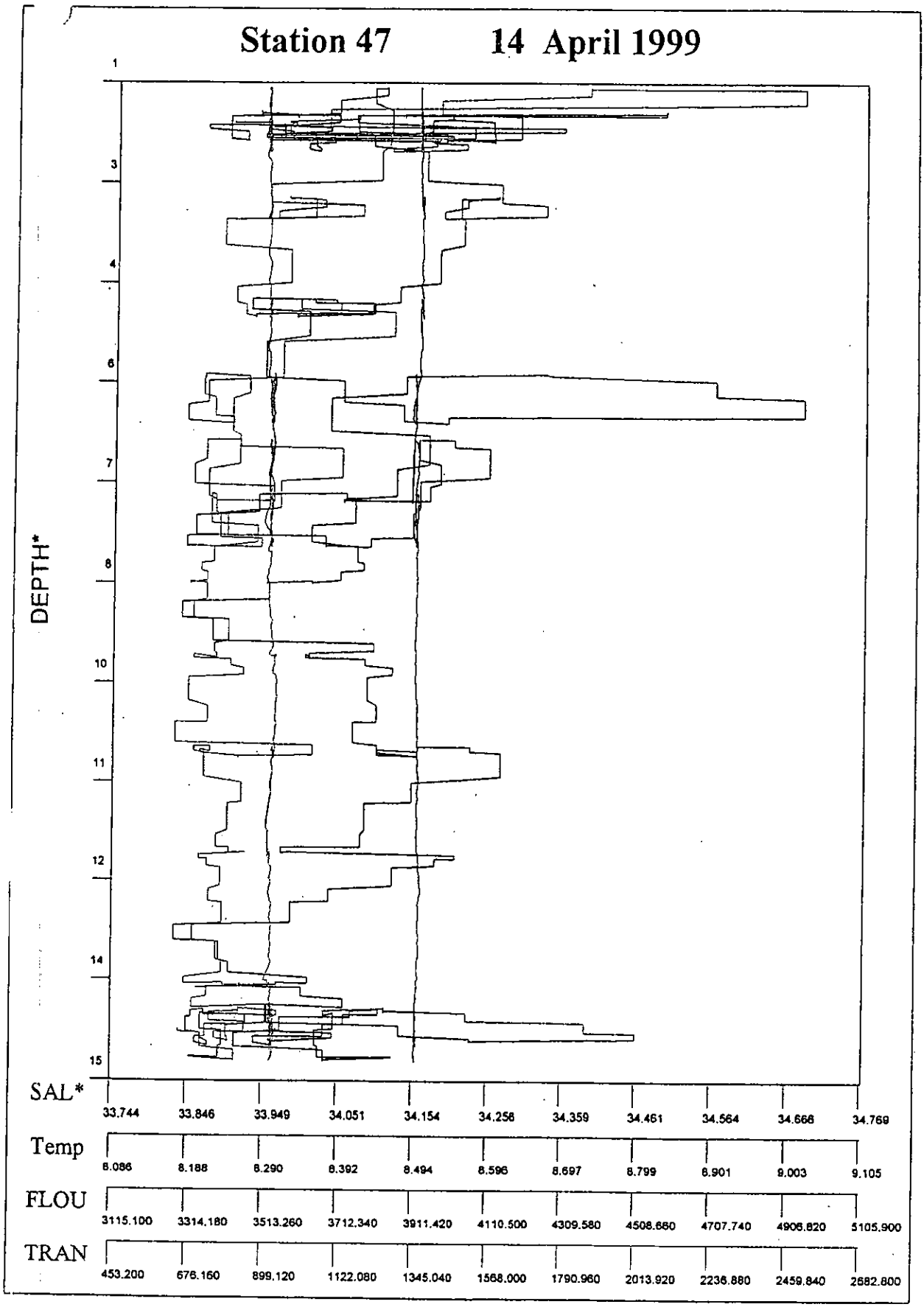

Station 47 14 April 1999
DEPTH*
1
3
4
6
7
8
10
11
12
14
15
SAL*
33.744 33.846 33.949 34.051 34.154 34.256 34.359 34.461 34.564 34.666 34.769
Temp
8.086 8.188 8.290 8.392 8.494 8.596 8.697 8.799 8.901 9.003 9.105
FLOU
3115.100 3314.180 3513.260 3712.340 3911.420 4110.500 4309.580 4508.660 4707.740 4906.820 5105.900
TRAN
453.200 676.160 899.120 1122.080 1345.040 1568.000 1790.960 2013.920 2236.880 2459.840 2682.800



Fig 3a.

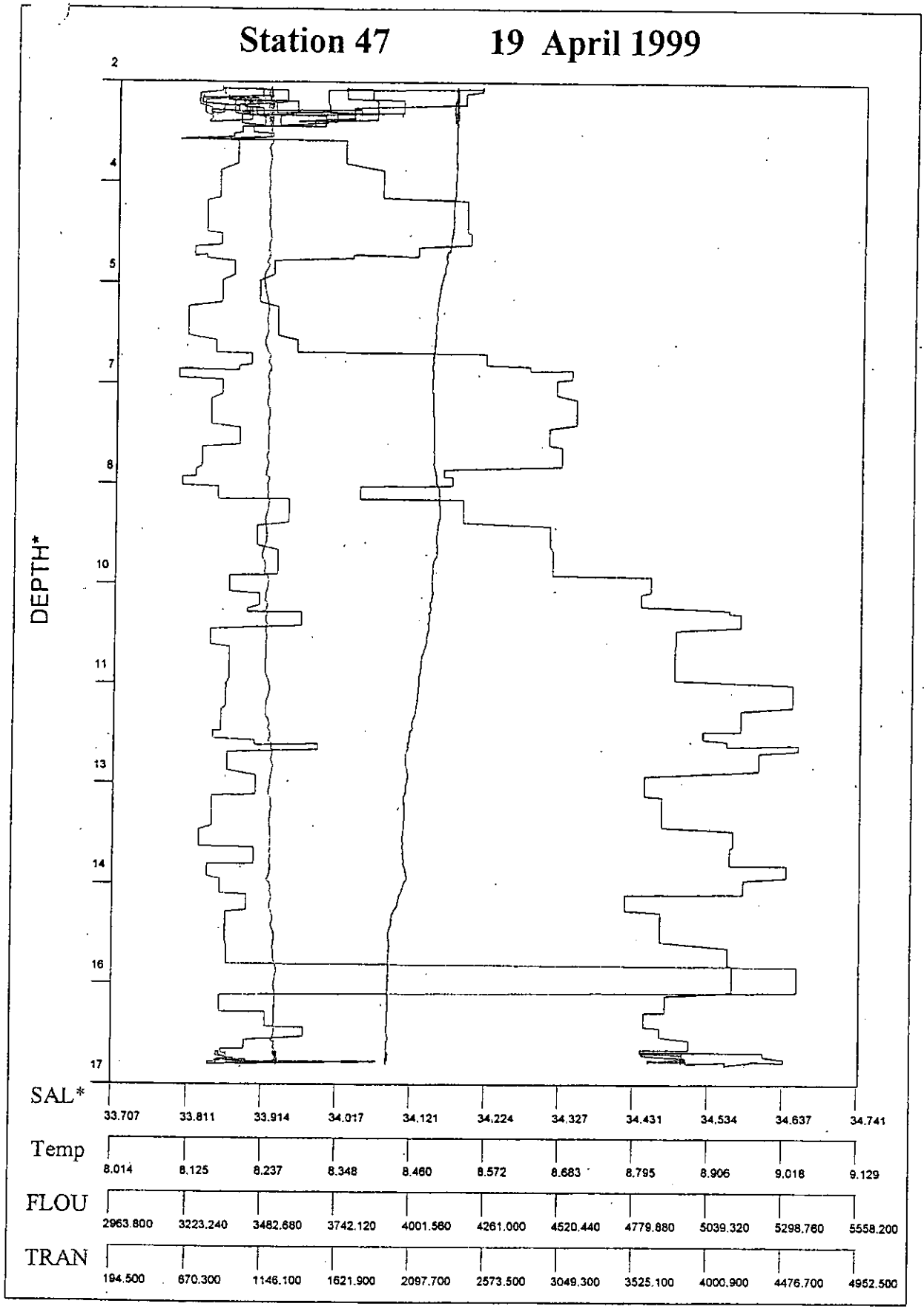

Station 47 19 April 1999
DEPTH*
2
4
5
7
8
10
11
13
14
16
17
SAL*
33.707 33.811 33.914 34.017 34.121 34.224 34.327 34.431 34.534 34.637 34.741
Temp
8.014 8.125 8.237 8.348 8.460 8.572 8.683 8.795 8.906 9.018 9.129
FLOU
2963.800 3223.240 3482.680 3742.120 4001.560 4261.000 4520.440 4779.880 5039.320 5298.760 5558.200
TRAN
194.500 670.300 1146.100 1621.900 2097.700 2573.500 3049.300 3525.100 4000.900 4476.700 4952.500



Fig. 3b.

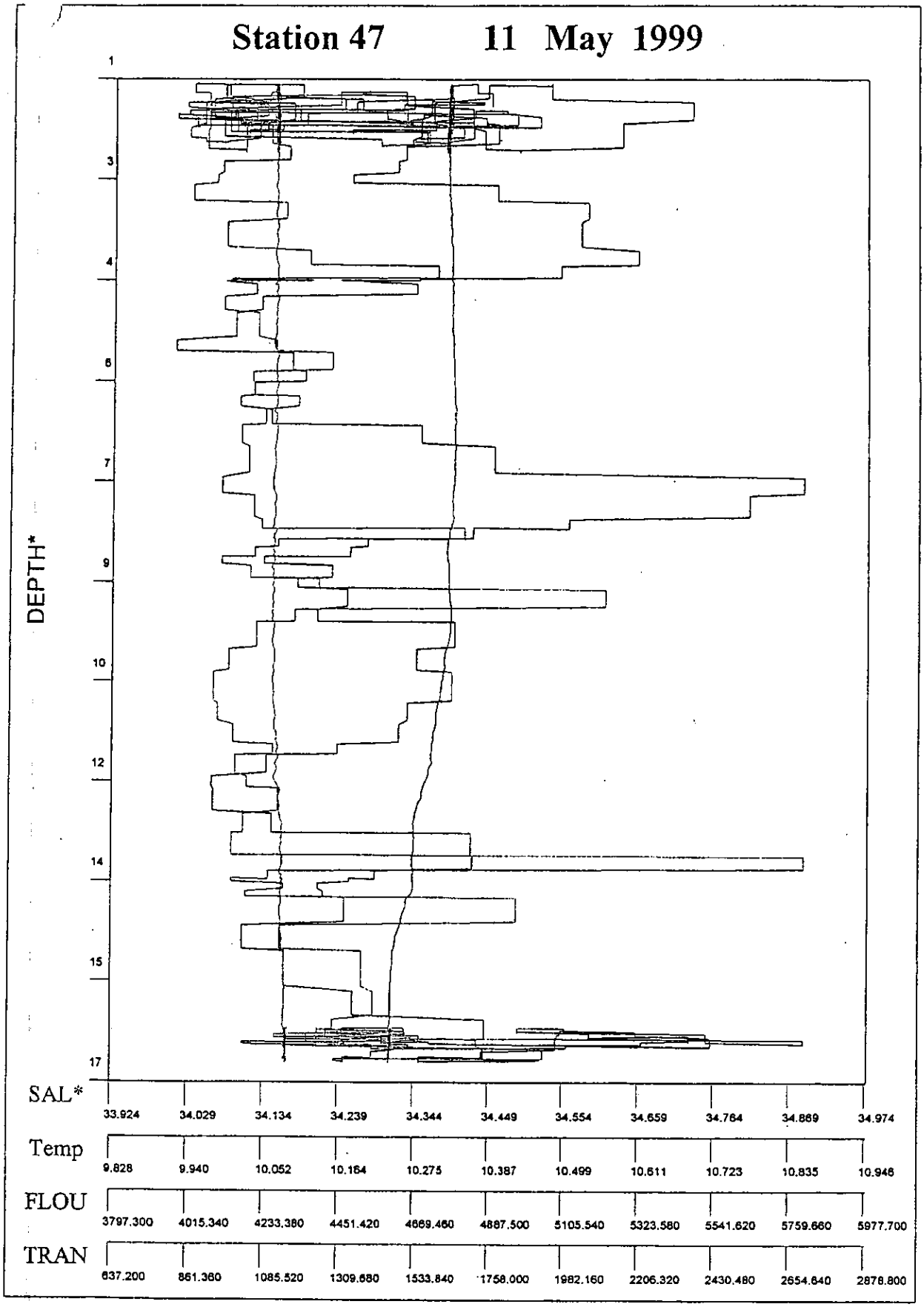

Station 47 11 May 1999
DEPTH*
1
3
4
6
7
9
10
12
14
15
17
SAL*
33.924 34.029 34.134 34.239 34.344 34.449 34.554 34.659 34.764 34.869 34.974
Temp
9.828 9.940 10.052 10.164 10.275 10.387 10.499 10.611 10.723 10.835 10.946
FLOU
3797.300 4015.340 4233.380 4451.420 4669.460 4887.500 5105.540 5323.580 5541.620 5759.660 5977.700
TRAN
637.200 861.360 1085.520 1309.680 1533.840 1758.000 1982.160 2206.320 2430.480 2654.640 2878.800



Fig. 3c.

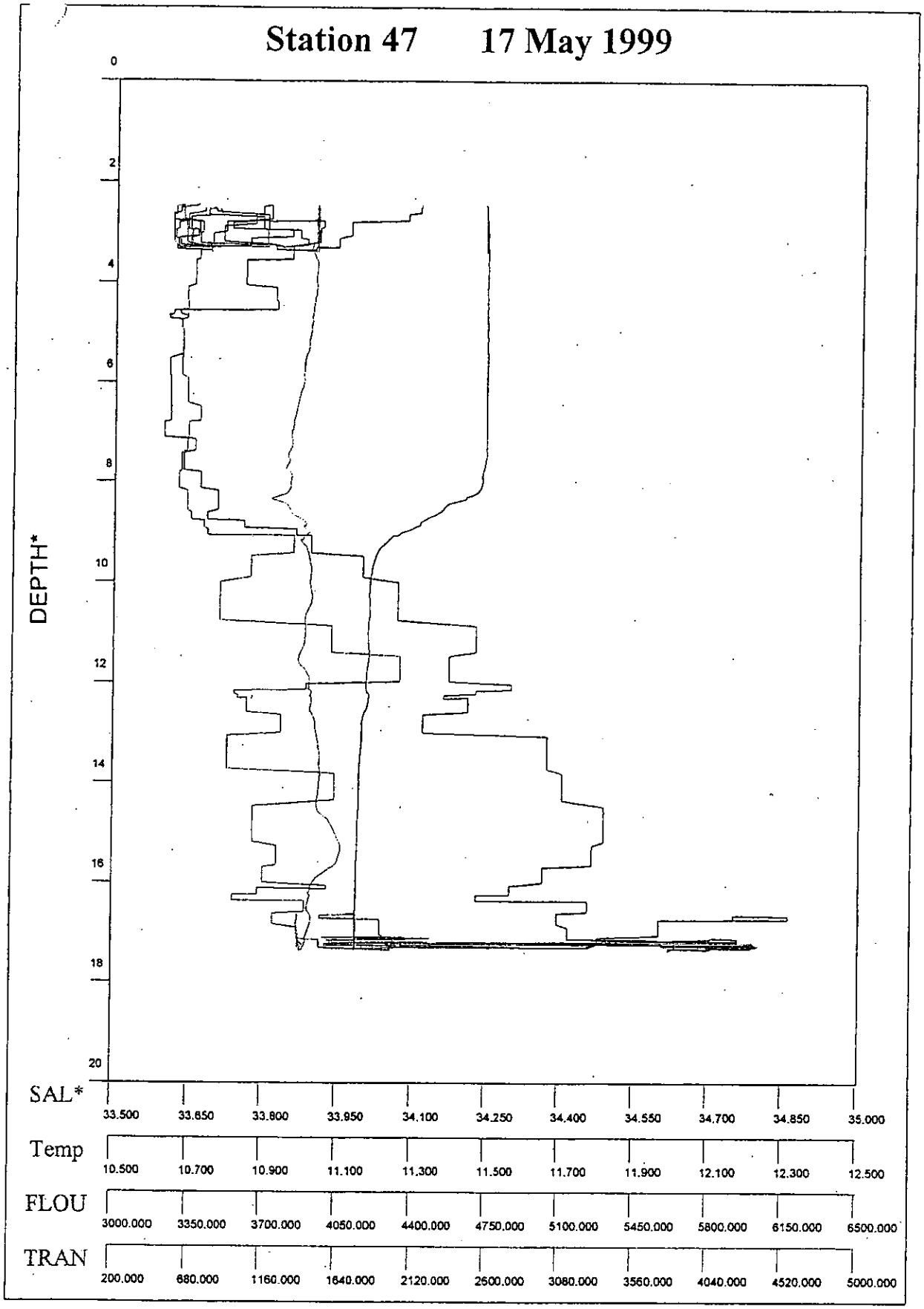

Station 47 17 May 1999
DEPTH*
0
2
4
6
8
10
12
14
16
18
20
SAL*
33.500 33.650 33.800 33.950 34.100 34.250 34.400 34.550 34.700 34.850 35.000
Temp
10.500 10.700 10.900 11.100 11.300 11.500 11.700 11.900 12.100 12.300 12.500
FLOU
3000.000 3350.000 3700.000 4050.000 4400.000 4750.000 5100.000 5450.000 5800.000 6150.000 6500.000
TRAN
200.000 680.000 1160.000 1640.000 2120.000 2600.000 3080.000 3560.000 4040.000 4520.000 5000.000



Fig. 3d.

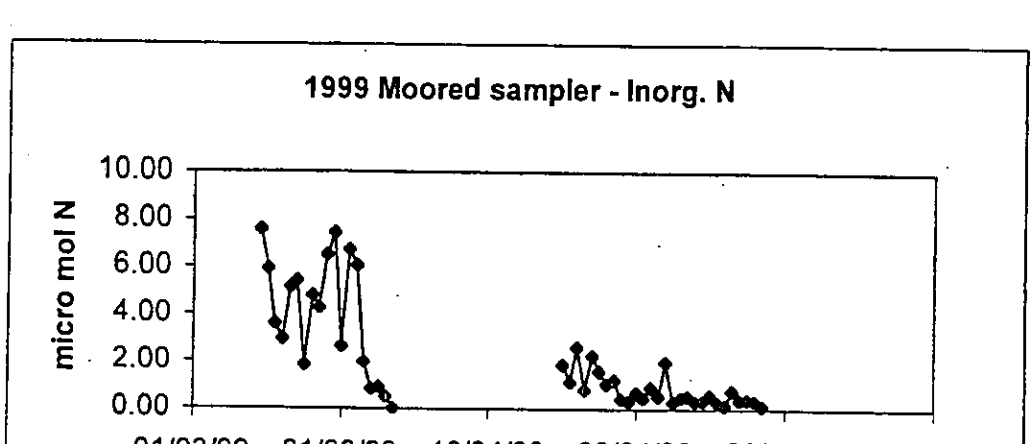

1999 Moored sampler - Inorg. N
micro mol N
10.00
8.00
6.00
4.00
2.00
0.00
01/03/99
21/03/99
10/04/99
30/04/99
20/05/99
09/06/99



Fig. 4