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BIOLOGICAL OCEANOGRAPHY CRUISE REPORT

LF 35 2001

27 – 31 August 2001

PERSONNEL

B Stewart	(SIC), SSO, DARDNI.
R Gowen	SSO, DARDNI.
C Smyth	Temp. SO, DARDNI
J O'Meara	Temp. ASO, DARDNI
S Gens	Res. Assist., QUB

OBJECTIVES

i. To maintain a nutrient monitoring programme at station 38A.

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

iii. To assess nutrient, chlorophyll, salinity distributions across the frontal region in the north western Irish Sea.

CRUISE NARRATIVE

Sunday 26 August 2001

In preparation for the cruise, all DANI scientific crew were onboard by 1900 hrs when mooring components and the automated sampler 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 2000 hrs and sailed overnight in a light breeze to the mooring site at station 38A.

Monday 27 August 2001

The vessel arrived on the mooring site at 0600 hrs. The weather was dry with only a light breeze. Work for the day commenced at 0650hrs with deployment of the rosette water sampler and zooplankton nets. After breakfast work continued with the recovery of the instrument mooring. The mooring components were inspected for corrosion and replaced where necessary. The thermistor chain and fluorometer/CTD was removed from the mooring wire and data downloaded. The automated water sampler was removed and replaced with a similar pre programmed unit. The biological water sampler was removed and stored for return to AESD. The mooring components and thermistors were then reassembled and the unit was successfully redeployed at

1915 hrs on position 53^0 46^1.90N 5^0 38^1.05W. During the period of the mooring service the vessel sailed to frontal stations F1 to F5, where the rosette/water sampler and zooplankton nets were deployed. The vessel then continued in a westerly direction to station 47 on the Drogheda fore shore where it anchored overnight. Work for the day finished at 1915 hrs.

Tuesday 28 August 2001

Work for the day commenced at station 47 at 0650 hrs with the deployment of the water sampler and zooplankton nets. Afterwards both the northern and southern frontal grids were surface mapped with scientific personnel working a rota system

Wednesday 29 August 2001

With surface mapping completed at 0800 hrs the vessel sailed to dock in Belfast at 1500 hrs.

Thursday 30 August 2001

The scientific crew returned to the vessel at 0900 hrs and removed samples, scientific instruments and mooring equipment to AESD.

McLane moored water sampler

The two McLane automated water samplers recovered from the Irish Sea had operated as programmed. The "nutrient" sampler was removed and replaced by an identical unit, programmed to take duplicate samples every third day during the period of deployment. The "biological" sampler was removed from the mooring and returned to AESD.

PARAMETERS MONITORED

The CTD/rosette water sampler was deployed at stations 38A, 47, F1, F2, F3, F4 and F5 to acquire temperature, light and salinity data from the depth profile. Samples taken were processed and stored for nutrient, chlorophyll, suspended solids, algal organic carbon and total nitrogen. Three zooplankton net hauls were taken at stations 38A, 47, F1, F2, F3, F4 and F5. Samples were taken from the clean seawater supply for chlorophyll and nutrient determination during surface mapping of the northern and southern grids of the frontal regions.

SUMMARY OF RESULTS FOR SUMMER CRUISES LF 26 2001 & LF 35 2001

Trends in data from both cruises are similar and have been summarised together as typical "summer" values.

Data produced from surface mapping surveys, 26 – 27 June, are typical for summer months and illustrate the near surface distribution of temperature, salinity and chlorophyll in the vicinity of the western Irish Sea front (Fig 2). The frontal boundary

can be identified from the temperature distribution and approximates a line from the southern tip of the Isle of Man to Dublin Bay. A series of CTD profiles from a thermally mixed area, station F3, through frontal stations with varying degrees of thermal stratification, F5, F1 and F4 to a stratified area station F2 are shown in Figures 3,4,5,6 &7. Again this is typical for the summer period and compliments the data in Figure 2, as it demonstrates an increase in surface warming from thermally mixed through frontal to the stratified stations. The CTD profile at station 38A now shows significant levels of thermal stratification (Fig. 8), while the shallow coastal station 47 remains reasonably well mixed (Fig. 9).
Nutrient data for stations F1 – F5, 38A and 47 are shown in figures 10,11,12,13,14,15 &16. A typical summer pattern is observed where nutrient depletion of surface layers (inorganic nitrogen in particular) is closely related to the degree of thermal stratification. Only station F3 in a thermally mixed region exhibits similar inorganic nitrogen concentrations throughout the depth profile.
Finally, fine scale resolution nutrient data from the moored water sampler is shown in figure 17. A warm, calm period during the third week in May provided ideal conditions to trigger the spring bloom, with depletion of inorganic nitrogen from the surface layers occurring within a period of two days.

HOTEL REPORT & OPERATIONAL ASPECTS OF THE SHIP

During the cruise the A-frame, main trawl winches, both hydrographic winches and the ship's clean seawater 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.

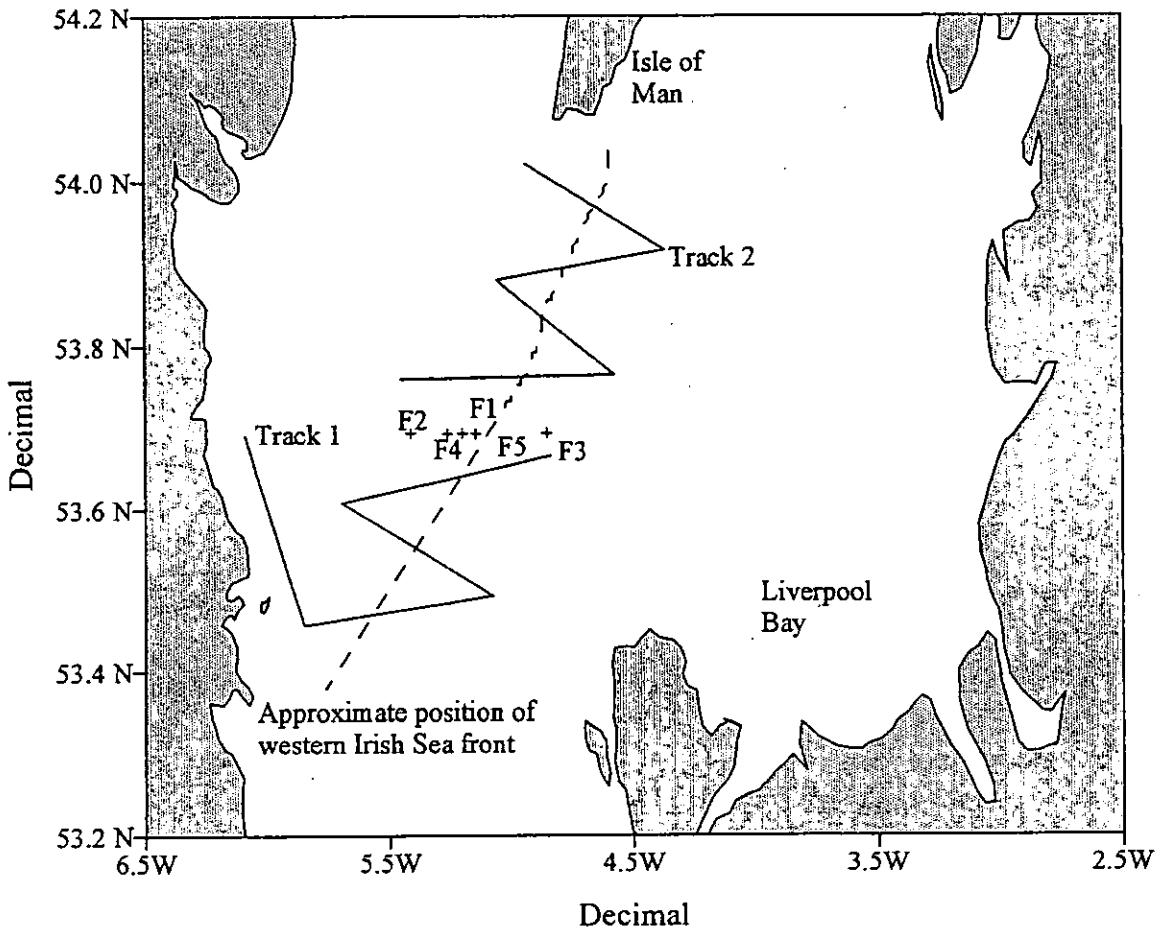
ACKNOWLEDGEMENTS

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

11 October 2001

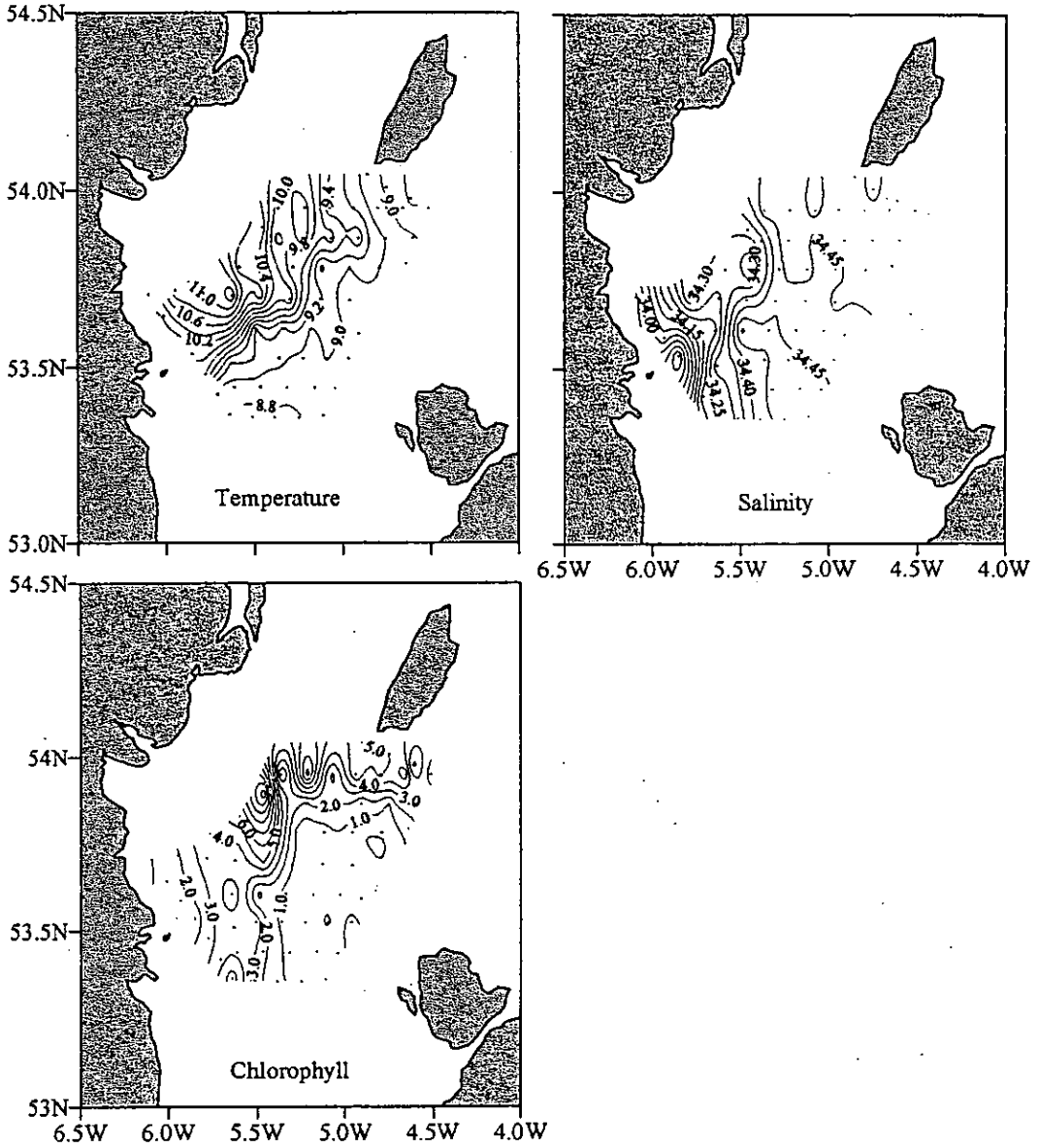
Figure 1.



Lat and Long (degrees and minutes)

F1: 53 41.62 N 05 12.01 W
F2: 53 41.62 N 05 24.80 W
F3: 53 41.62 N 04 51.04 W
F4: 53 41.62 N 05 15.75 W
F5: 53 41.62 N 05 08.65 W

Figura 1.


54.5N
54.0N
53.5N
53.0N
Temperature
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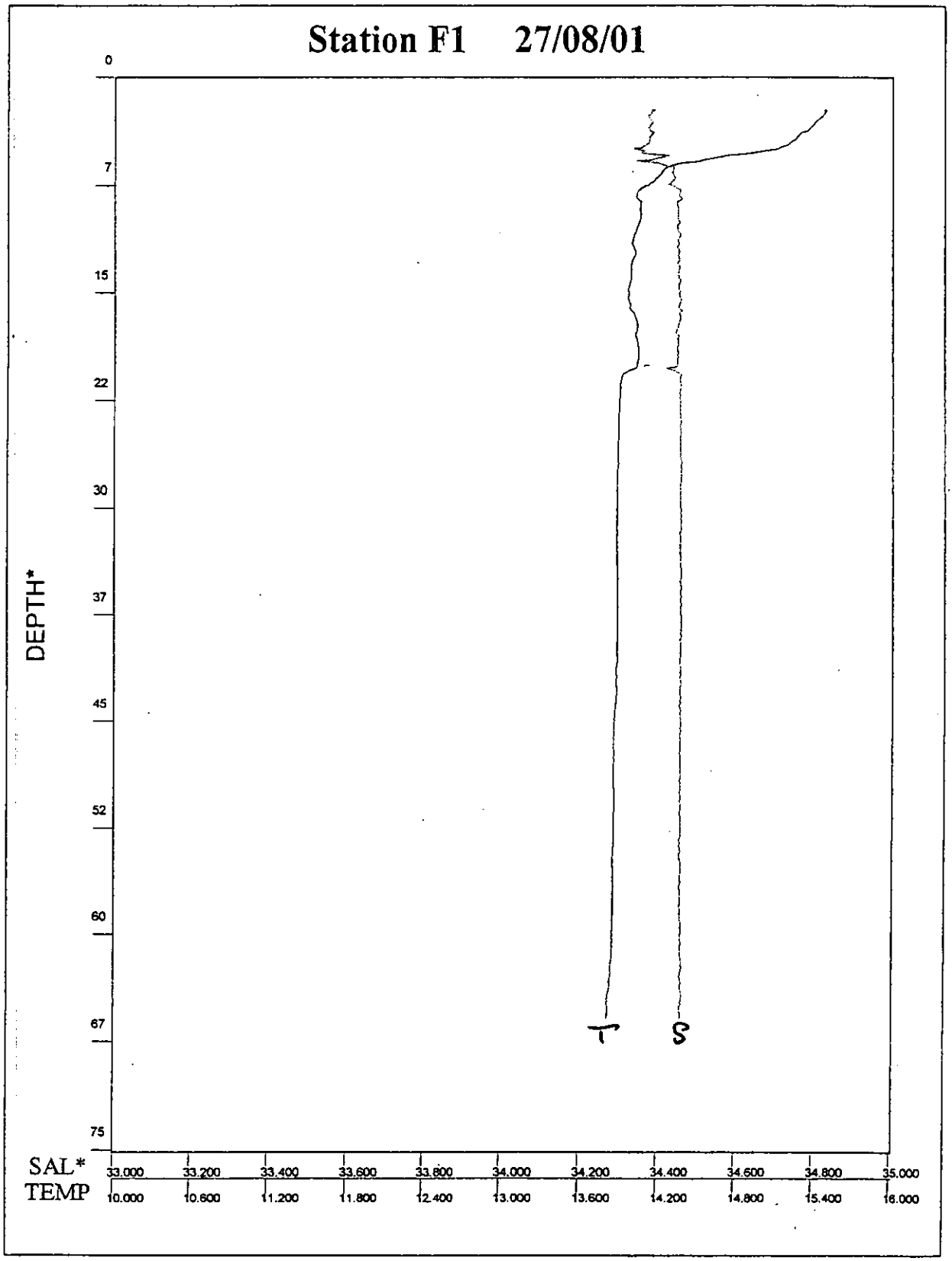
10.6
10.2
10.1
10.0
9.8
9.6
9.4
9.2
9.0
8.8
Salinity
34.45
34.30
34.15
34.00
34.40
34.25
6.5W
6.0W
5.5W
5.0W
4.5W
4.0W
54.5N
54N
53.5N
53N
Chlorophyll
5.0
4.0
3.0
2.0
1.0
6.5W
6.0W
5.5W
5.0W
4.5W
4.0W

Figure 2.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DEPTH*
0
7
15
22
30
37
45
52
60
67
75
T
S
SAL*
33.000
33.200
33.400
33.600
33.800
34.000
34.200
34.400
34.600
34.800
35.000
TEMP
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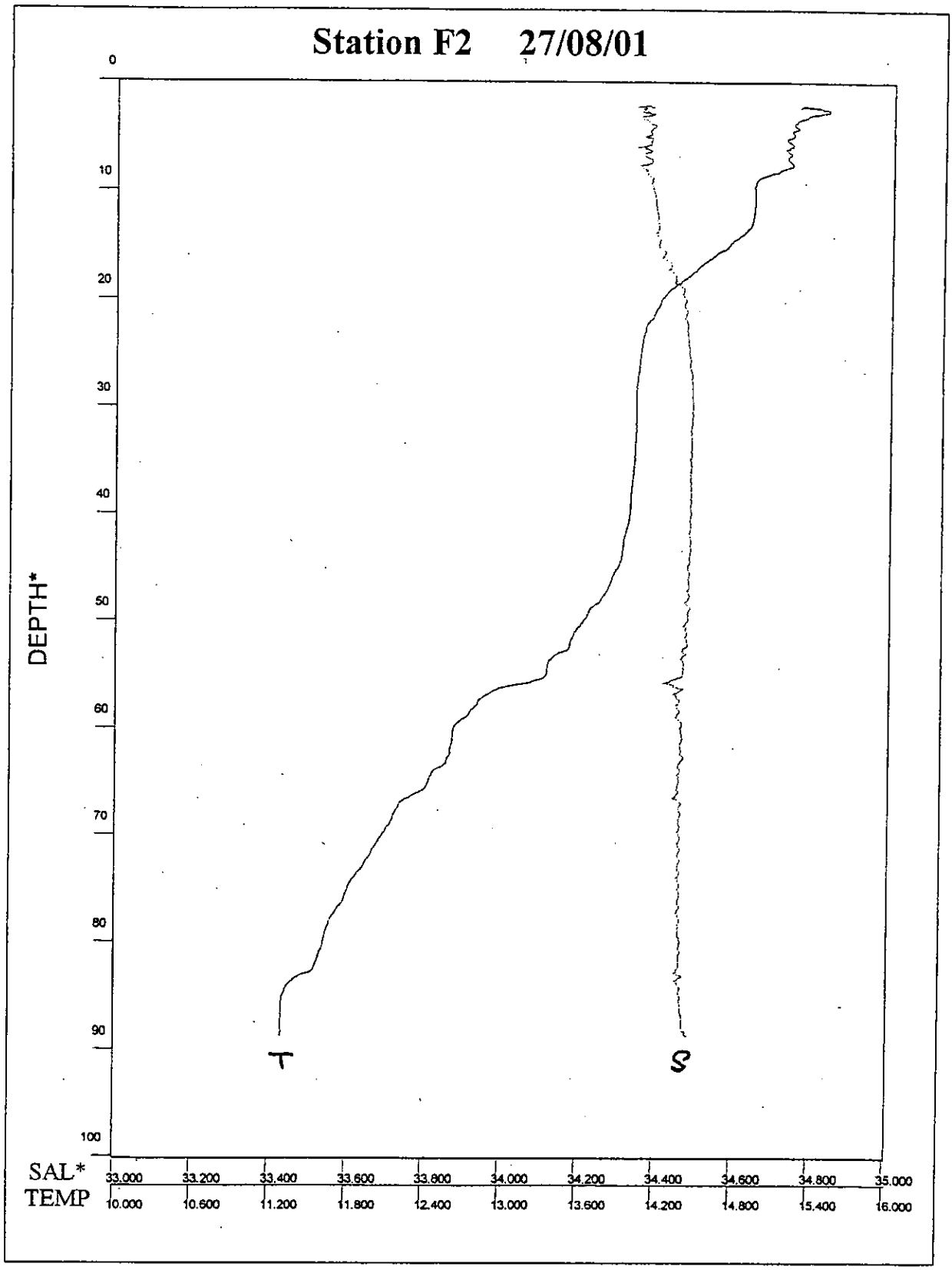
11.800
12.400
13.000
13.600
14.200
14.800
15.400
16.000

Figure 3.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DEPTH*
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10
20
30
40
50
60
70
80
90
100
T
S
SAL*
33.000
33.200
33.400
33.600
33.800
34.000
34.200
34.400
34.600
34.800
35.000
TEMP
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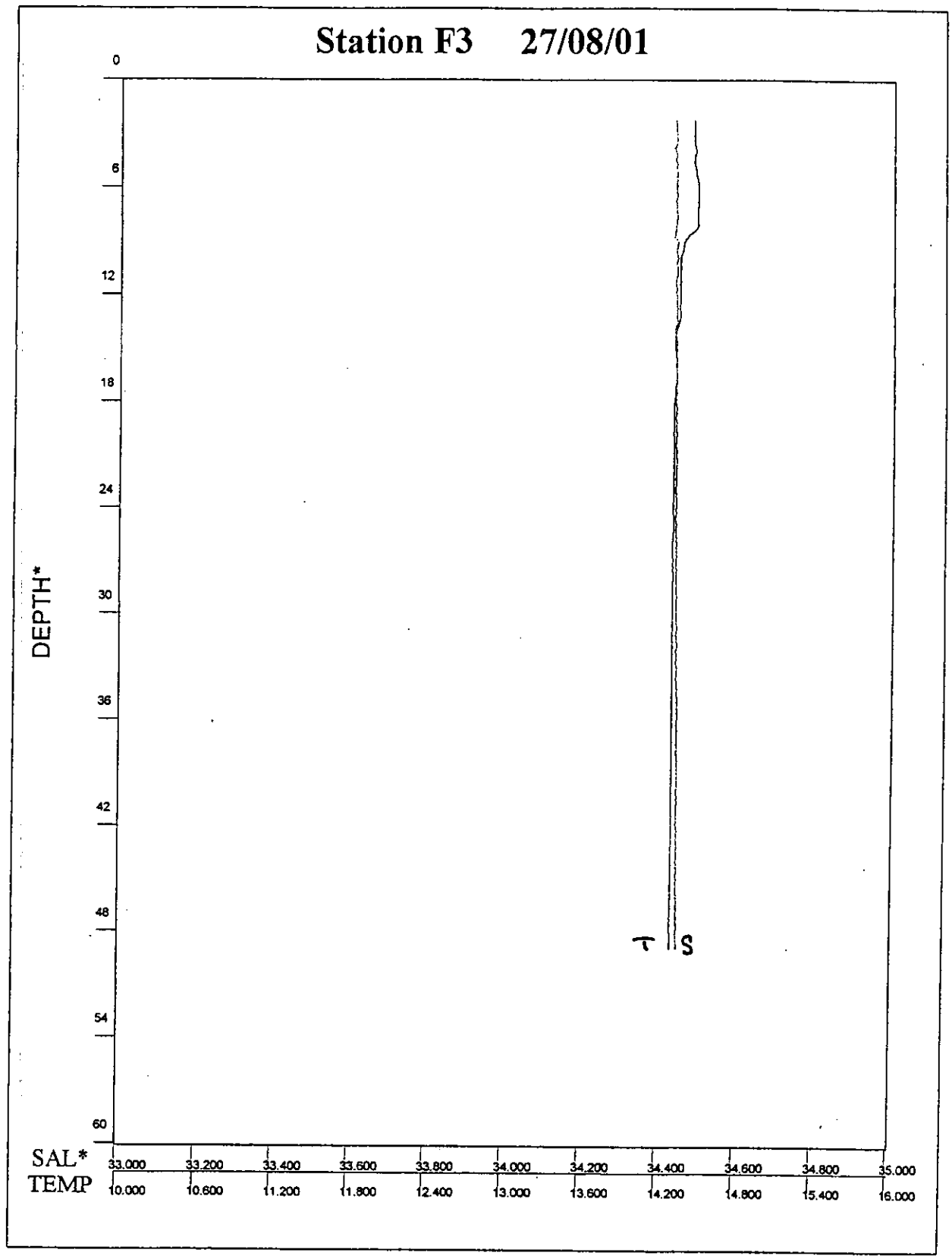
11.800
12.400
13.000
13.600
14.200
14.800
15.400
16.000

Figura 4


Station F3 27/08/01
DEPTH*
0
6
12
18
24
30
36
42
48
54
60
T
S
SAL*
33.000
33.200
33.400
33.600
33.800
34.000
34.200
34.400
34.600
34.800
35.000
TEMP
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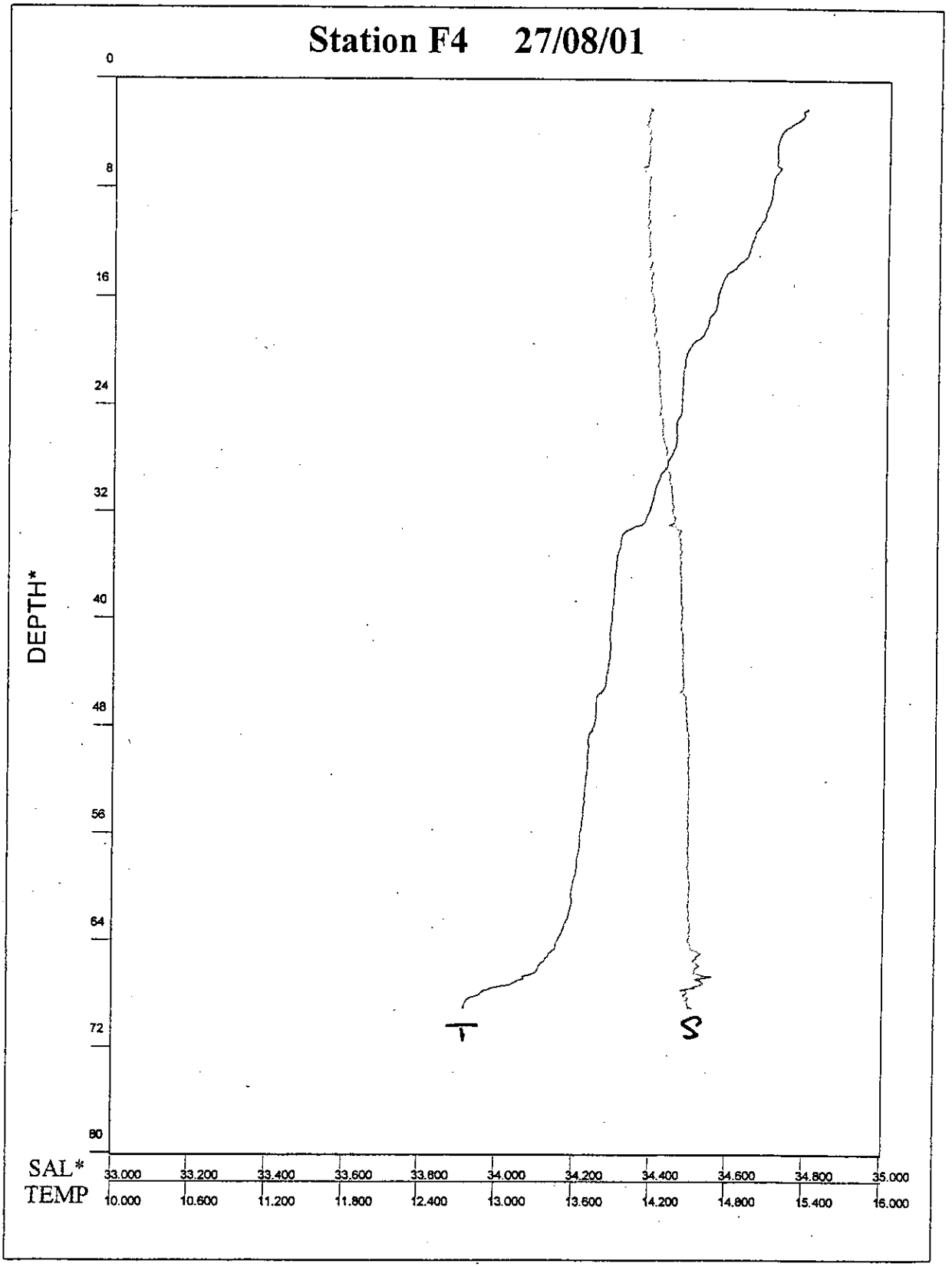
12.400
13.000
13.600
14.200
14.800
15.400
16.000

Figure 5.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16
24
32
40
48
56
64
72
80
T
S
SAL*
33.000
33.200
33.400
33.600
33.800
34.000
34.200
34.400
34.600
34.800
35.000
TEMP
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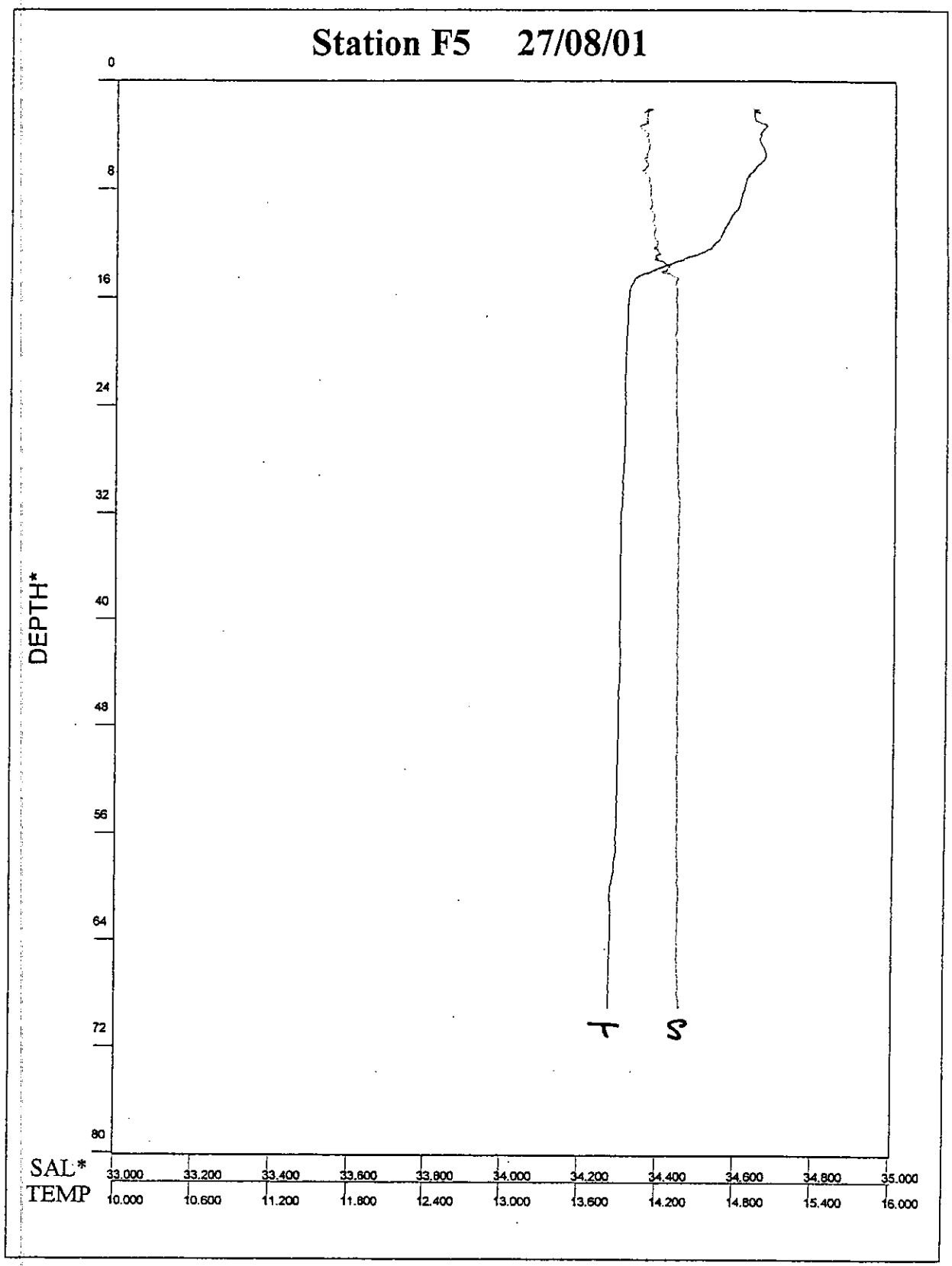
12.400
13.000
13.600
14.200
14.800
15.400
16.000

Figure 6.


Station F5 27/08/01
DEPTH*
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8
16
24
32
40
48
56
64
72
80
T
S
SAL*
33.000
33.200
33.400
33.600
33.800
34.000
34.200
34.400
34.600
34.800
35.000
TEMP
10.000
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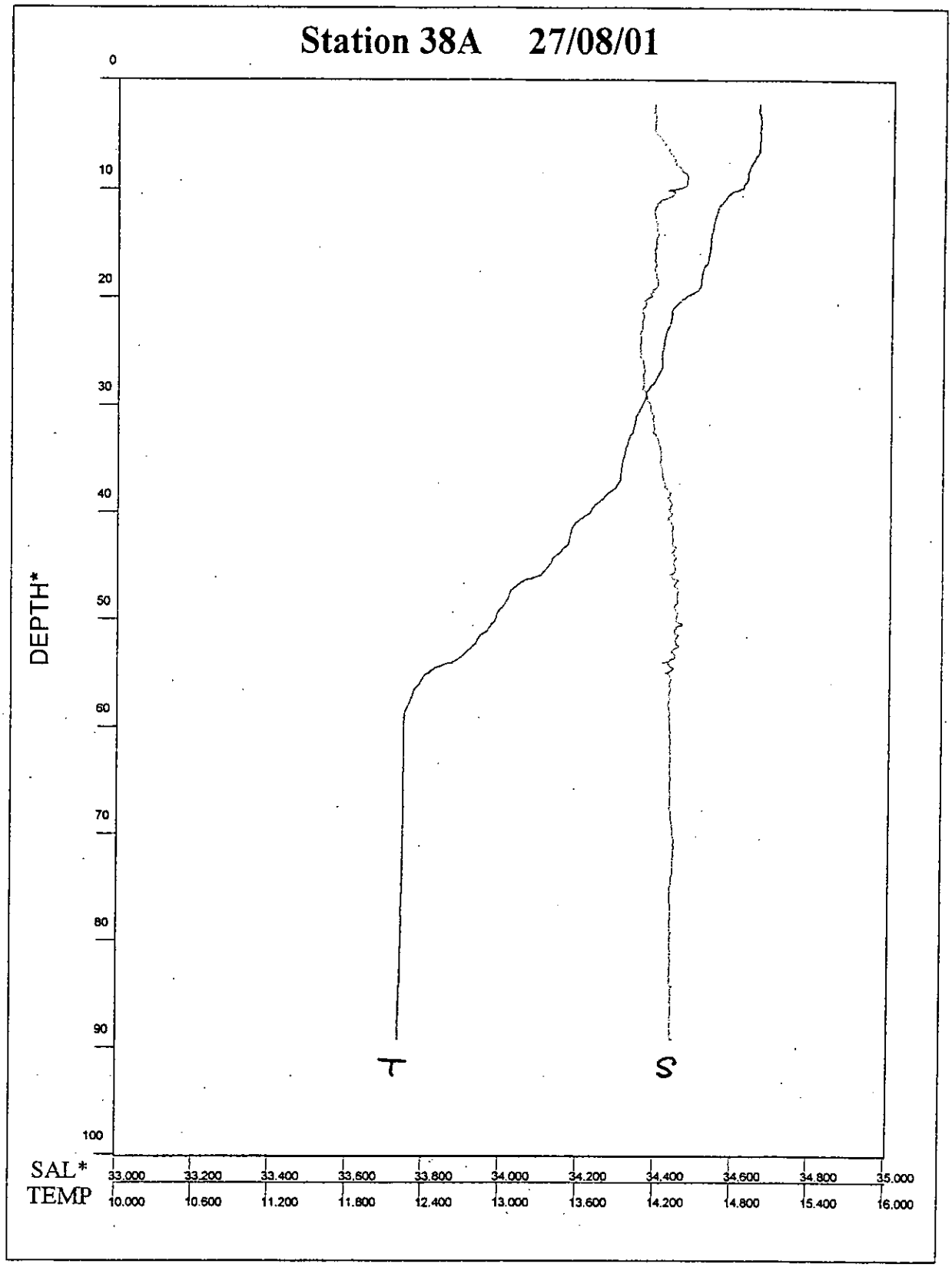
11.200
11.800
12.400
13.000
13.600
14.200
14.800
15.400
16.000

Figure 7.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DEPTH*
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10
20
30
40
50
60
70
80
90
100
T
S
SAL*
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33.200
33.400
33.600
33.800
34.000
34.200
34.400
34.600
34.800
35.000
TEMP
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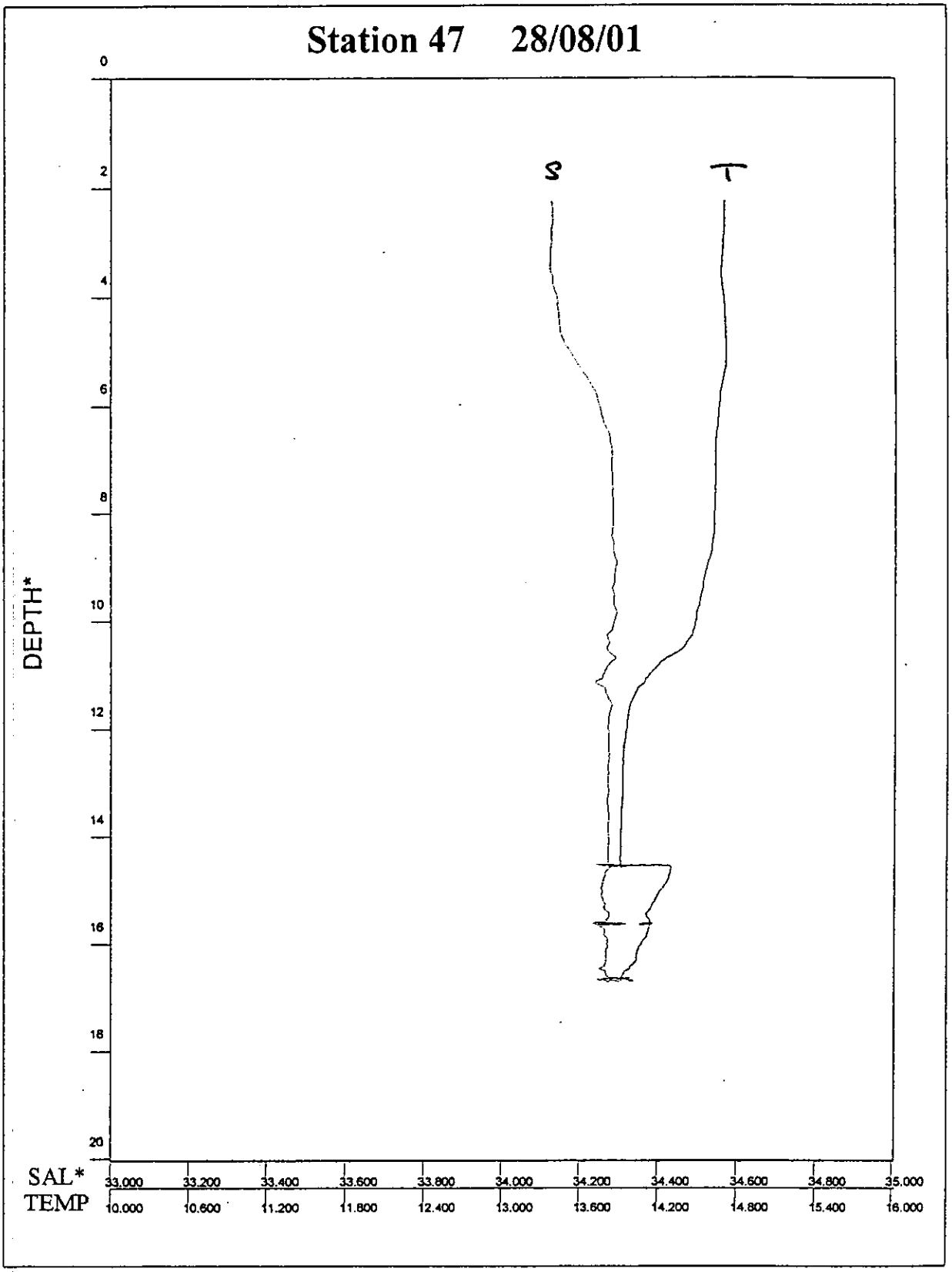
12.400
13.000
13.600
14.200
14.800
15.400
16.000

Figure 8.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2
4
6
8
10
12
14
16
18
20
S
T
SAL*
33.000
33.200
33.400
33.600
33.800
34.000
34.200
34.400
34.600
34.800
35.000
TEMP
10.000
10.600
11.200
11.800
12.400
13.000
13.600
14.200
14.800
15.400
16.000

Figure 9.

IRISH SEA OCEANOGRAPHY 2001

Depth profile samples (27 August 2001)

STATION	DATE	DEPTH M	AMMONIA µm N l^{-1}	PHOSPHATE µm P l^{-1}	INORG N µm N l^{-1}	SILICA µm SiO_2 l^{-1}	UREA µm N l^{-1}	NITRITE µm N l^{-1}	CHL	PHAEO	ACID RATIO
F1	27/08/01	3.1	0.46	0.38	1.08	1.26		0.10	1.12	0.12	1.88
F1	27/08/01	9.3	0.29	0.08	0.71	1.08		0.01	1.67	0.11	1.91
F1	27/08/01	13.6	0.54	0.16	2.74	1.59		0.38	3.09	0.42	1.93
F1	27/08/01	26.8	0.61	0.23	4.93	1.94		0.69	0.70	0.20	1.76
F1	27/08/01	41.1	0.57	0.24	2.94	1.95		0.69	0.67	0.14	1.81
F1	27/08/01	65.8	0.66	0.26	4.61	2.04		0.68	0.58	0.20	1.72

465

Figure 10.

IRISH SEA OCEANOGRAPHY 2001

Depth profile samples (27 August 2001)

STATION	DATE	DEPTH M	AMMONIA $\mu m\ N\ l^{-1}$	PHOSPHATE $\mu m\ P\ l^{-1}$	INORG N $\mu m\ N\ l^{-1}$	SILICA $\mu m\ SiO_2\ l^{-1}$	UREA $\mu m\ N\ l^{-1}$	NITRITE $\mu m\ N\ l^{-1}$	CHL	PHAEO	ACID RATIO
F2	27/08/01	3.2	0.08	0.06	0.22	1.04		0.01	1.09	0.15	1.85
F2	27/08/01	12.0	0.97	0.09	9.77	1.07		0.05	1.83	0.32	1.83
F2	27/08/01	22.0	0.17	0.20	3.58	1.76		0.66	0.99	0.25	1.77
F2	27/08/01	31.9	0.14	0.23	4.85	1.76		0.76	0.57	0.20	1.72
F2	27/08/01	41.8	0.44	0.26	3.76	1.87		0.69	0.47	0.18	1.70
F2	27/08/01	61.6	0.01	0.35	5.07	2.31		0.04	0.12	0.09	1.54
F2	27/08/01	88.6	0.20	0.54	7.92	4.72		0.05	0.14	0.16	1.45

595

IRISH SEA OCEANOGRAPHY 2001

Depth profile samples (27 August 2001)

STATION	DATE	DEPTH M	AMMONIA $\mu m\ N\ l^{-1}$	PHOSPHATE $\mu m\ P\ l^{-1}$	INORG N $\mu m\ N\ l^{-1}$	SILICA $\mu m\ SiO_2\ l^{-1}$	UREA $\mu m\ N\ l^{-1}$	NITRITE $\mu m\ N\ l^{-1}$	CHL	PHAEO	ACID RATIO
F3	27/08/01	3.5	1.07	0.22	4.64	1.78		0.61	1.06	0.06	1.92
F3	27/08/01	12.6	1.04	0.21	3.10	1.81		0.62	0.99	0.13	1.86
F3	27/08/01	22.3	1.04	0.21	3.51	1.81		0.62	0.86	0.19	1.79
F3	27/08/01	32.3	1.01	0.21	4.13	1.78		0.63	0.99	0.09	1.89
F3	27/08/01	48.8	0.96	0.22	2.73	1.79		0.63	0.86	0.16	1.82

965

Figure 12.

IRISH SEA OCEANOGRAPHY 2001

Depth profile samples (27 August 2001)

STATION	DATE	DEPTH M	AMMONIA $\mu m\ N\ l^{-1}$	PHOSPHATE $\mu m\ P\ l^{-1}$	INORG N $\mu m\ N\ l^{-1}$	SILICA $\mu m\ SiO_2\ l^{-1}$	UREA $\mu m\ N\ l^{-1}$	NITRITE $\mu m\ N\ l^{-1}$	CHL	PHAEO	ACID RATIO
F4	27/08/01	2.8	0.40	0.05	0.18	0.92		0.02	1.83	0.10	1.92
F4	27/08/01	12.1	0.47	0.05	1.26	0.99		0.03	4.19	0.37	1.97
F4	27/08/01	22.0	0.48	0.20	1.84	1.52		0.22	2.24	0.27	1.86
F4	27/08/01	32.0	0.54	0.19	3.44	1.76		0.44	0.96	0.28	1.75
F4	27/08/01	46.8	0.17	0.28	3.95	2.30		0.61	0.58	0.20	1.72
F4	27/08/01	69.1	0.39	0.34	4.29	2.97		0.26	0.40	0.24	1.61

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Figure 13.

IRISH SEA OCEANOGRAPHY 2001

Depth profile samples (27 August 2001)

STATION	DATE	DEPTH M	AMMONIA µm N l^{-1}	PHOSPHATE µm P l^{-1}	INORG N µm N l^{-1}	SILICA µm SiO_2 l^{-1}	UREA µm N l^{-1}	NITRITE µm N l^{-1}	CHL	PHAEO	ACID RATIO
F5	27/08/01	3.1	0.47	0.06	1.25	0.99		0.01	1.47	0.05	1.94
F5	27/08/01	6.4	0.21	0.02	0.27	1.10		0.01	1.63	0.01	1.96
F5	27/08/01	12.7	1.31	0.09	2.19	1.17		0.03	4.19	0.25	2.00
F5	27/08/01	27.0	0.38	0.19	2.90	1.96		0.59	0.86	0.10	1.87
F5	27/08/01	41.9	0.51	0.28	2.95	1.97		0.63	0.69	0.21	1.75
F5	27/08/01	69.3	0.51	0.23	3.27	2.06		0.67	0.56	0.21	1.70

865

Figure 14

IRISH SEA OCEANOGRAPHY 2001

Depth profile samples (27 August 2001)

STATION	DATE	DEPTH M	AMMONIA µm N l^{-1}	PHOSPHATE µm P l^{-1}	INORG N µm N l^{-1}	SILICA µm SiO_2 l^{-1}	UREA µm N l^{-1}	NITRITE µm N l^{-1}	CHL	PHAEO	ACID RATIO
38A	27/08/01	3.3	0.59	0.06	1.08	0.88		0.01	1.31	0.08	1.91
38A	27/08/01	12.2	0.51	0.05	0.84	0.82		0.01	2.37	0.15	1.91
38A	27/08/01	17.2	0.51	0.04	1.62	1.02		0.01	2.24	0.21	1.89
38A	27/08/01	27.1	0.42	0.10	2.73	1.54		0.13	1.47	0.17	1.87
38A	27/08/01	36.9	0.26	0.17	2.43	1.29		0.30	0.70	0.13	1.81
38A	27/08/01	46.8	0.20	0.31	4.18	2.12		0.12	0.19	0.10	1.64
38A	27/08/01	61.7	0.51	0.40	4.90	3.27		0.11	0.10	0.09	1.50
38A	27/08/01	89.1	0.81	0.44	5.81	3.48		0.16	0.10	0.10	1.48

665

Figure 15

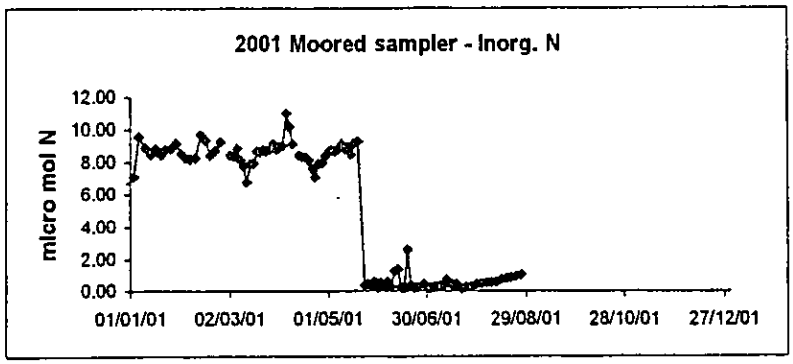
IRISH SEA OCEANOGRAPHY 2001

Depth profile samples (28 August 2001)

STATION	DATE	DEPTH M	AMMONIA µm N l^{-1}	PHOSPHATE µm P l^{-1}	INORG N µm N l^{-1}	SILICA µm SiO_2 l^{-1}	UREA µm N l^{-1}	NITRITE µm N l^{-1}	CHL	PHAEO	ACID RATIO
47	28/08/01	2.1	0.33	0.25	0.64	4.33		0.01	0.83	0.19	1.79
47	28/08/01	8.9	0.43	0.24	0.42	4.29		0.02	1.51	0.17	1.87
47	28/08/01	11.9	0.72	0.35	0.22	5.10		0.01	2.87	0.52	1.90
47	28/08/01	16.6	0.88	0.29	2.84	4.99		0.00	1.73	0.17	1.89

009

Figure 16.


2001 Moored sampler - Inorg. N
micro mol N
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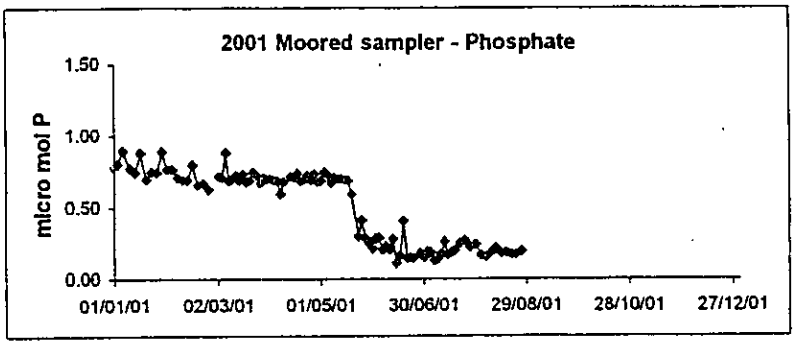
8.00
6.00
4.00
2.00
0.00
01/01/01
02/03/01
01/05/01
30/06/01
29/08/01
28/10/01
27/12/01


2001 Moored sampler - Phosphate
micro mol P
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0.50
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28/10/01
27/12/01

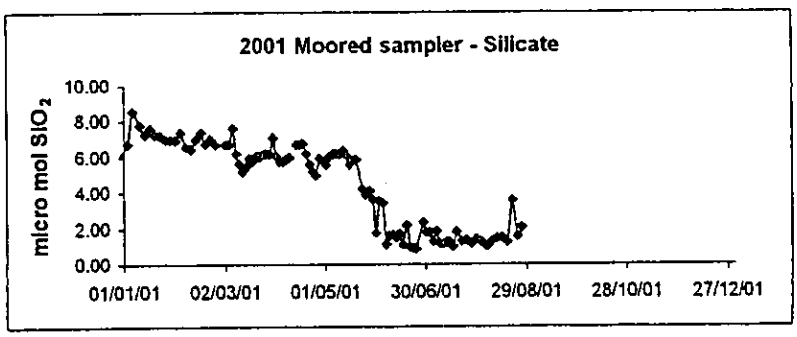
2001 Moored sampler - Silicate
micro mol SiO2
10.00
8.00
6.00
4.00
2.00
0.00
01/01/01
02/03/01
01/05/01
30/06/01
29/08/01
28/10/01
27/12/01

Figure 17.