5729

2. Dr McMurray

This report is an innovative piece of detective work to track down the cause of contamination of remotely sampled waters. There appears to be good evidence that in situ structures are associated with local elevated levels of excretion & regeneration but which are not seen at only 3m distance. These results allow us to reconfigure the sampling device to remove this source of local perturbation. Duncan Hz 4/8

BIOLOGICAL OCEANOGRAPHY CRUISE REPORT

LF 26/98

21 - 23 June 1998

PERSONNEL

B Stewart	(SIC), SSO, DANI.
P Elliott	SO, DANI.
S Bloomfield	ASO, DANI
C McAtamney	Res. Ass., QUB
J McGinley	Student, Univ. Ulster

OBJECTIVES

i. To assess the effect of tidal current on nutrient concentrations in the immediate environment of the moored water sampler.

ii. To assess the possibility of a nutrient rich environment caused by fish and other species gathering around the shelter of the moored water sampler.

iii. To deploy a moored sampler best configured to minimise contamination from fish and other species in the immediate environment of the sampler.

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

CRUISE NARRATIVE

Sunday 21 June 1998

In preparation for the cruise, all DANI scientific crew were onboard by 2000 hrs when mooring instrumentation was programmed, tested and confirmed to be functioning properly. Following a talk on ship safety and a demonstration of personal life saving equipment, the RV Lough Foyle departed Belfast at 2200 hrs and sailed overnight in a light northerly wind to station 38A, the DANI mooring site.

Monday 22 June 1998

The ship arrived on station 38A at 0600 hrs. The weather was dry and bright with a light northerly wind. Work on the moorings commenced at 0800 hrs with the instrument mooring and buoy (id No.1) being recovered to shipdeck at 0830 hrs. The instrument leg, sampler, anchor and ground line were removed from the mooring. The

guard buoy and anchor only then were successfully redeployed at 0930 hrs on position $53^0\ 46^1.74N\ \ 5^0\ 38^1.02W$. The instrument mooring and buoy (id No.3) were then recovered to shipdeck at 1000 hrs. The McLane water samplers were serviced, thermistors down loaded and reprogrammed, mooring components inspected for corrosion and replaced where necessary. Following the onboard analysis of samples from both McLane water samples, a decision was made on the appropriate sampler configuration that would eliminate contamination from fish and other species in the immediate environment of the water sampler. The mooring with water samples attached was then successfully redeployed at 1830 hrs on position $53^0\ 47^1.09N$ $5^0\ 38^1.08W$. The Irish Marine Emergency Service was informed of the change in position of the moorings and requested to modify their navigation warning broadcasts accordingly.
Following deployment of the rosette water sampler and zooplankton net, work for the day finished at 2130 hrs. The ship sailed to anchor overnight at coastal station 47 in Dundalk Bay.

Tuesday 23 June 1998

In a moderate to fresh easterly breeze, work for the day commenced at 0800 hrs on station 47 with the deployment of the rosette water sampler and zooplankton net. Sampling was successfully completed at 0830 and the vessel sailed to dock in Belfast at 1630 hrs. All scientific crew had disembarked by 1730 hrs.

Wednesday 24 June 1998

Scientific crew returned to the vessel at 0900 hrs to remove samples, scientific instruments and mooring equipment.

PARAMETERS MONITORED

The CTD/rosette water sampler was deployed at station 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 where sediment samples were subsampled for carbon & nitrogen, chlorophyll *a*.

Study of possible factors effecting nutrient concentrations in the immediate environment of the moored water samplers
Two moored water samplers deployed on 12 May 1998 were successfully recovered and samples were removed and analysed for nutrients onboard ship.
In the laboratory and under closely controlled conditions, the sampler faithfully produces the results obtained by other methods. However, in the sea, the samples frequently contain anomalously high concentrations of both phosphorus and ammonia. The concentrations encountered are considerably higher than normal so that upwelling or advection are not tenable explanations. Possible explanations are that they arise from the excretion of animals during the diel migration of zooplankton or from the excretion of fish being attracted to the shelter of the sampler package.

To investigate these possibilities, one water sampler was programmed to sample alternate days at minimum and maximum tidal current. At maximum current the tidal flush should remove any excretion products from the area around the sampler. The second water sampler was programmed to sample at slack tide but with an extended sample intake tube so that the sample was taken at least 3 metres remote from the sampler package and away from the possible effect of fish sheltering around the sampler package.
During the period of the study 40 samples were successfully taken by each sampler. Early results show that typical ammonia (1-2 micro mol N) and phosphate levels (0.3-0.7 micro mol P) were obtained using the sampler with an extended sample intake tube. Two anomalous values are observed for ammonia on 29 May & 14 June and for phosphate on 7 & 14 June but in all previous routine data, a high proportion (~ 17%) of samples were enriched with P and all were enriched with NH_4. Ammonia and phosphate concentrations obtained at times of minimum and maximum current using the sampler fitted with a conventional short length sample intake tube were both enriched, with higher concentrations observed at minimum current.
For total oxidised nitrogen, agreement between the various sampling arrangements was disappointing; for silicate, good agreement was observed.
The nutrient data from the samples is shown in Figure 1.
For future work the sampler fitted with the extended sample tube will be adopted. This configuration is successful in greatly reducing the number of anomalous ammonia and phosphate values and demonstrates the best agreement with typical concentrations of samples taken by the rosette water sampler,

SUMMARY OF RESULTS

The CTD profile from station 38A showed a typical well defined thermocline at 20 metres with surface and bottom temperature and salinity 12.5 °C / 34.5 ppt and 10.8 °C / 34.8 ppt respectively (Figure 2). Inorganic nitrogen values were depleted to 0.14 - 1.76 micromoles N l^{-1} from surface to bottom and zero silica concentrations observed above the thermocline. These results are consistent with nutrient data acquired from daily samples taken and preserved *in situ* by the moored sampler at 20 metres which was fitted with the extended sample intake tube.(Fig. 1).
In Dundalk Bay at Station 47 the profile was mixed with temperature and salinity 13.1 °C and 34.2 ppt respectively but high fluorescence values indicated major plankton activity throughout the water column. (Fig. 3.). Trace levels of inorganic nitrogen (0.2 - 0.4 micromoles N l^{-1}) and almost zero silica concentration suggested substantial nutrient uptake by both dinoflagellates and diatoms.

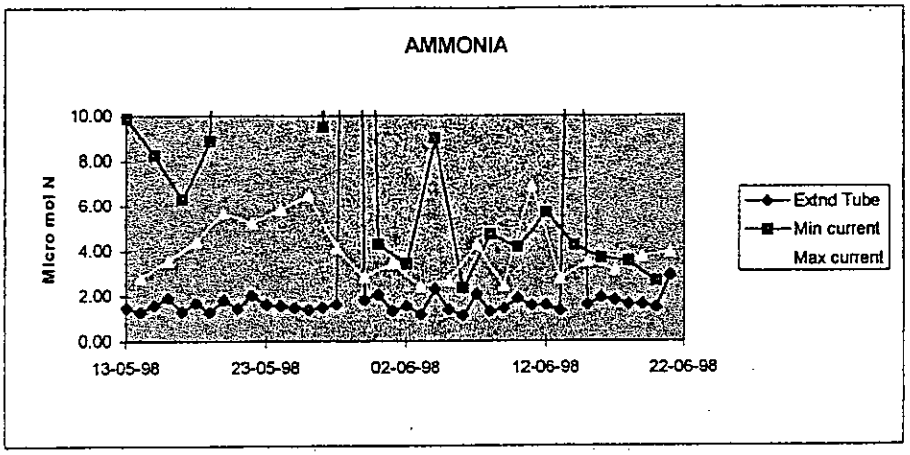
HOTEL REPORT & OPERATIONAL ASPECTS OF THE SHIP

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 grateful to Ms Claire McAtamney for the ship board analysis of samples. 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
9 July 1998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Micro mol N
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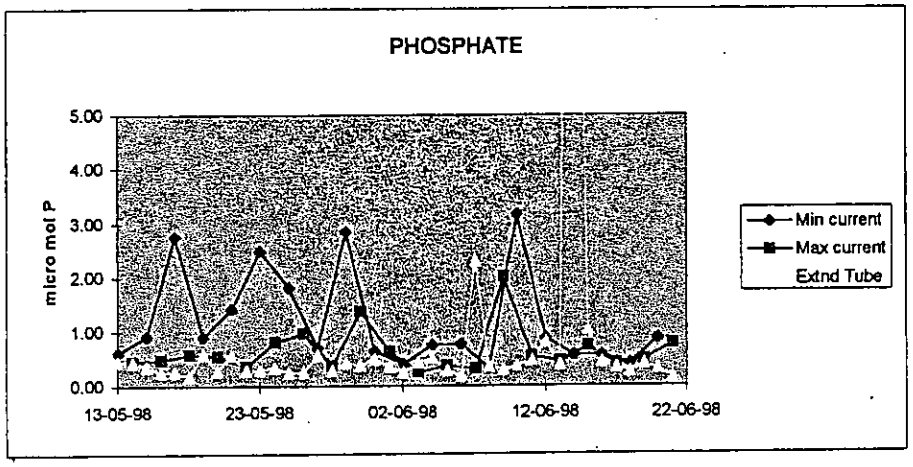
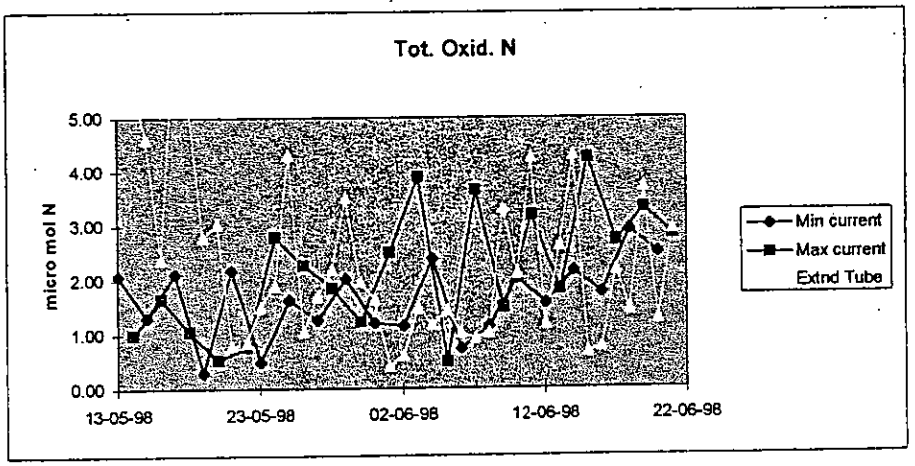
8.00
6.00
4.00
2.00
0.00
13-05-98
23-05-98
02-06-98
12-06-98
22-06-98
Extnd Tube
Min current
Max current


PHOSPHATE
micro mol P
5.00
4.00
3.00
2.00
1.00
0.00
13-05-98
23-05-98
02-06-98
12-06-98
22-06-98
Min current
Max current
Extnd Tube


Tot. Oxid. N
micro mol N
5.00
4.00
3.00
2.00
1.00
0.00
13-05-98
23-05-98
02-06-98
12-06-98
22-06-98
Min current
Max current
Extnd Tube

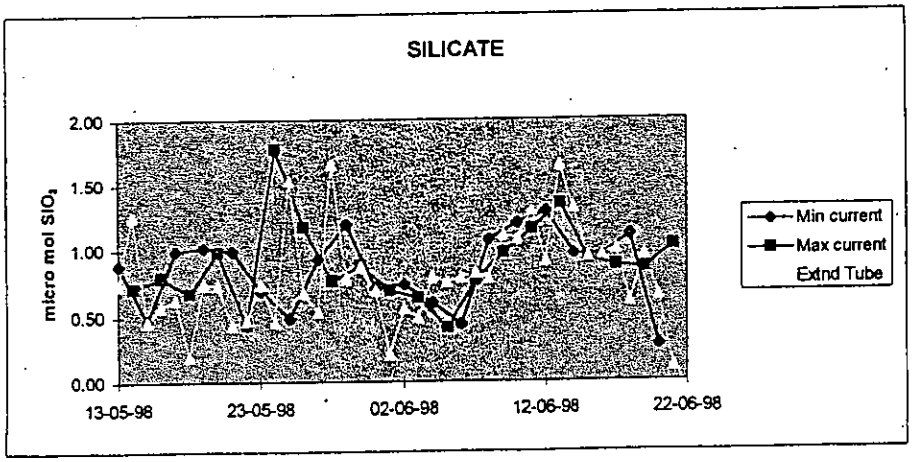

SILICATE
micro mol SiO3
2.00
1.50
1.00
0.50
0.00
13-05-98
23-05-98
02-06-98
12-06-98
22-06-98
Min current
Max current
Extnd Tube

Figure 1.

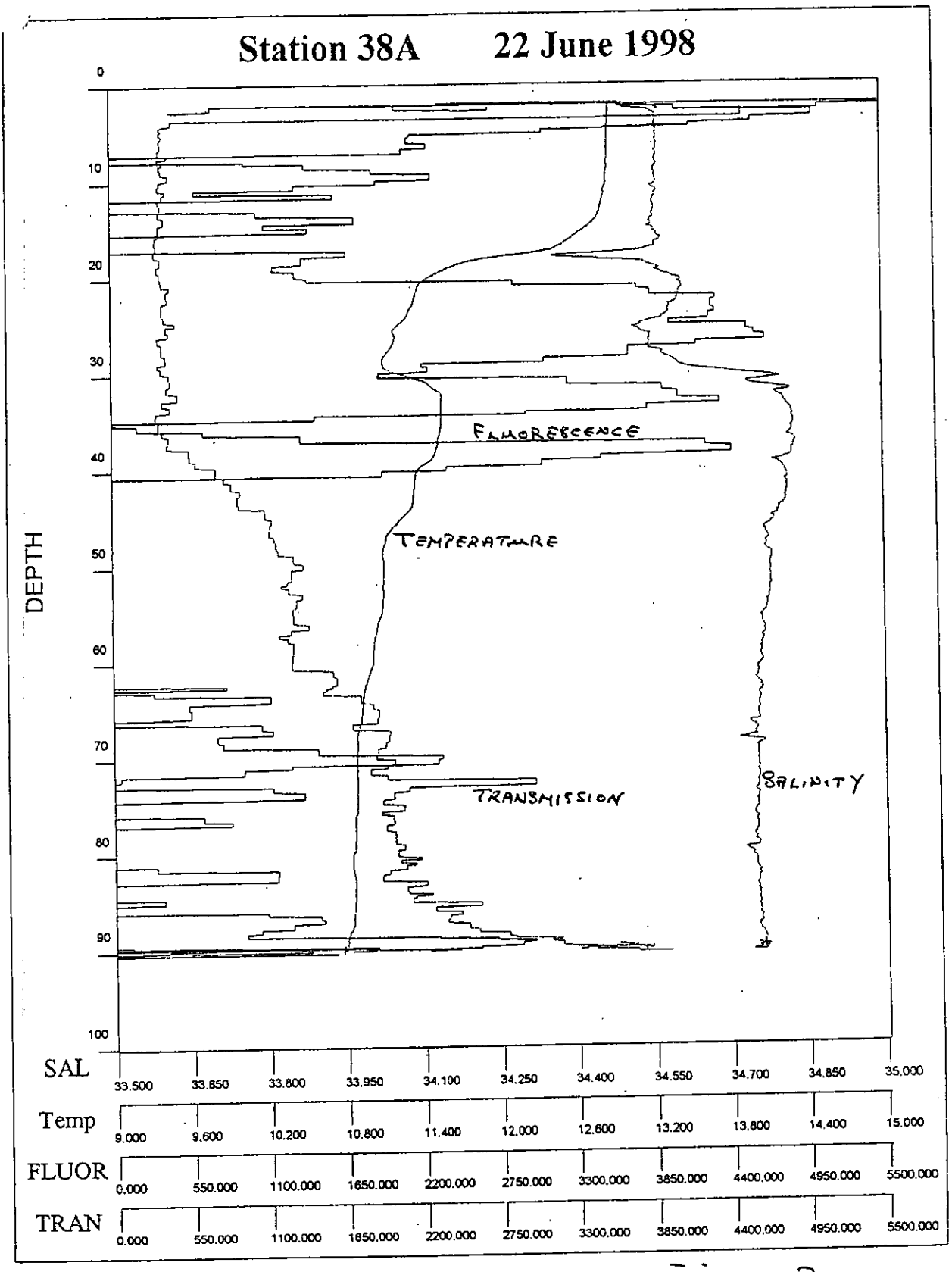

Station 38A 22 June 1998
DEPTH
0
10
20
30
40
50
60
70
80
90
100
FLUORESCENCE
TEMPERATURE
TRANSMISSION
SALINITY
SAL
33.500 33.650 33.800 33.950 34.100 34.250 34.400 34.550 34.700 34.850 35.000
Temp
9.000 9.600 10.200 10.800 11.400 12.000 12.600 13.200 13.800 14.400 15.000
FLUOR
0.000 550.000 1100.000 1650.000 2200.000 2750.000 3300.000 3850.000 4400.000 4950.000 5500.000
TRAN
0.000 550.000 1100.000 1650.000 2200.000 2750.000 3300.000 3850.000 4400.000 4950.000 5500.000

Figure 2.

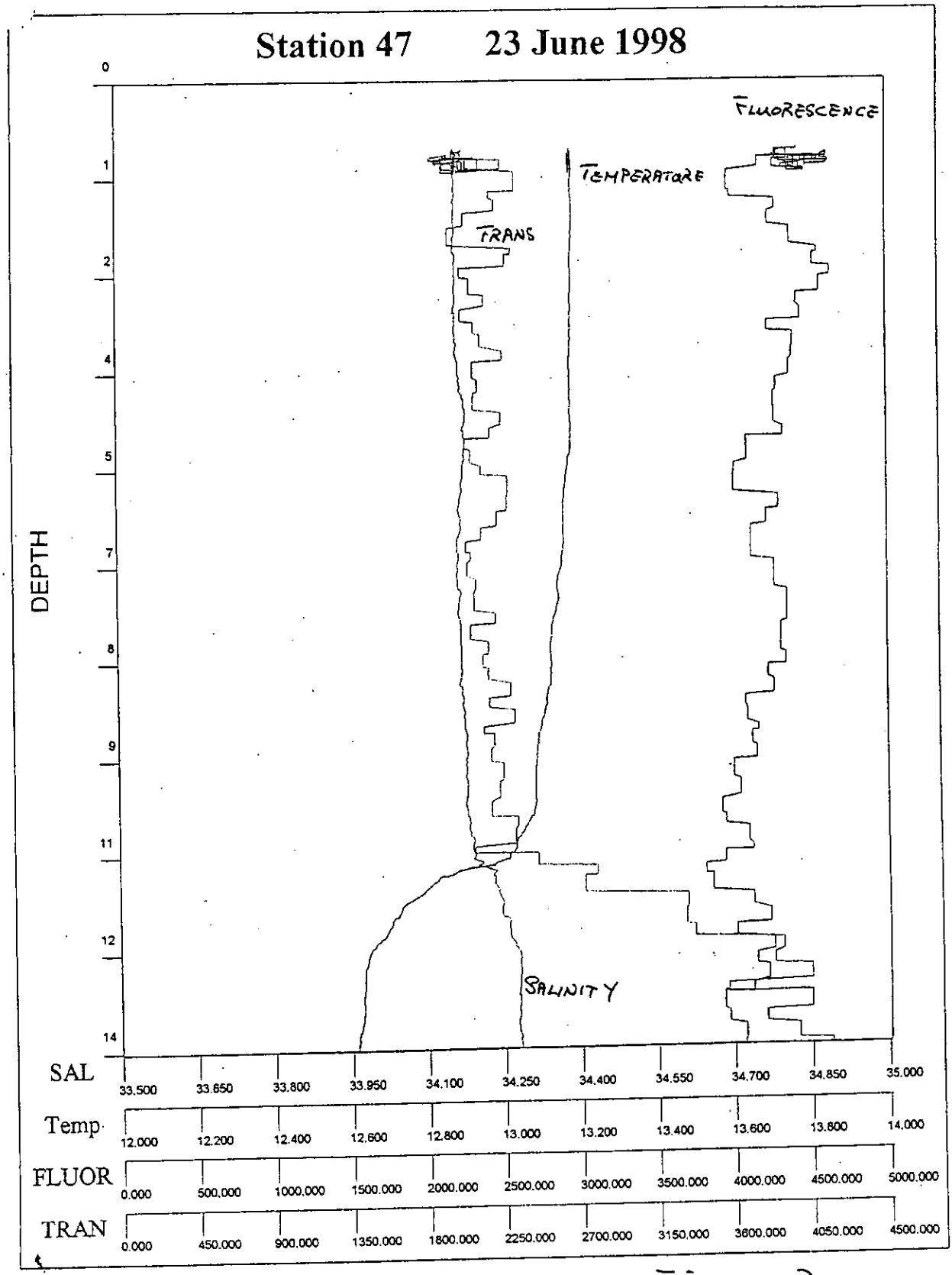

Station 47 23 June 1998
DEPTH
0
1
2
4
5
7
8
9
11
12
14
FLUORESCENCE
TEMPERATURE
TRANS
SALINITY
SAL
33.500 33.650 33.800 33.950 34.100 34.250 34.400 34.550 34.700 34.850 35.000
Temp
12.000 12.200 12.400 12.600 12.800 13.000 13.200 13.400 13.600 13.800 14.000
FLUOR
0.000 500.000 1000.000 1500.000 2000.000 2500.000 3000.000 3500.000 4000.000 4500.000 5000.000
TRAN
0.000 450.000 900.000 1350.000 1800.000 2250.000 2700.000 3150.000 3600.000 4050.000 4500.000

Figure 3.