THE CATALOGUE OF OCEANOGRAPHIC PROFILES OF THE WESTERN GULF OF THAILAND AND EASTERN PENINSULAR MALAYSIA IN SEPTEMBER 1995

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TD/RES/37

December 1995

C.3

Contents

Preface

This catalogue contains some parts of the oceanographic data collected on board the M.V. Seafdec Cruise Number 26-8/1995 between 4 September and 4 October 1995. The survey areas were the western part of the Gulf of Thailand within the exclusive economic zone of Thailand and the eastern Peninsular Malaysia within the exclusive economic zone of Malaysia. This cruise was the first research cruise under the collaborative research project between SEAFDEC's Training Department (TD) in Thailand and Marine Fisheries Resources Development and Management Department (MFRDMD) in Malaysia.

The result reported in this catalogue is divided into four sections, each begins with a short description of methodologies and equipment used. For readers who may need numerical data of variables listed in this catalogue, please make inquiries to Research Division, Training Department, SEAFDEC, P.O. Box 97, Phrasamutchedi, Samut Prakan, Thailand 10290. When making inquiries, please specify the variables and format of data files (preferably Microsoft Excel or ASCII formats). Also in the future, these data will be available through the SEAFDEC Secretariat Office, 24th fl., Unit B, Charn Issara Tower II, 2922/278 New Petchburi Road, Bangkok, Thailand 10310.

Oceanographic and Laboratory Personnel on board the M.V. Seafdec

Winch and A-frame operators

Satien Phetrasatien

Chainarong Chaopaknam

Suchart Kijsamut

CTD and water sampler control

Penjan Rochana-anawat

Light intensity profiling

Penjan Rochana-anawat

Panitnard Weerawat

Chainarong Chaopaknam

Suchart Kijsamut

Taweekiat Amonpiyakrit

Water sampling

Panitnard Weerawat

Taweekiat Amonpiyakrit

Penjan Rochana-anawat

Atsumu Terai

Mohd Sukri Yusoff

Juan Relox Jr.

Dao Manh Son

Water filtration

Panitnard Weerawat

Taweekiat Amonpiyakrit

Penjan Rochana-anawat

Jutamas Jiwaluk

Juan Relox Jr.

pH and alkalinity

Panitnard Weerawat

Taweekiat Amonpiyakrit

Penjan Rochana-anawat

Charumas Chareonpanich

Photosynthetic pigment analysis

Penjan Rochana-anawat

Juan Relox Jr.

Technicon Autoanalyzer II

Charumas Chareonpanich

Suwimol Sae-koe

Anond Snidvongs

Data entry and processing

Penjan Rochana-anawat

Wirote Laongmanee

General supervisor

Anond Snidvongs

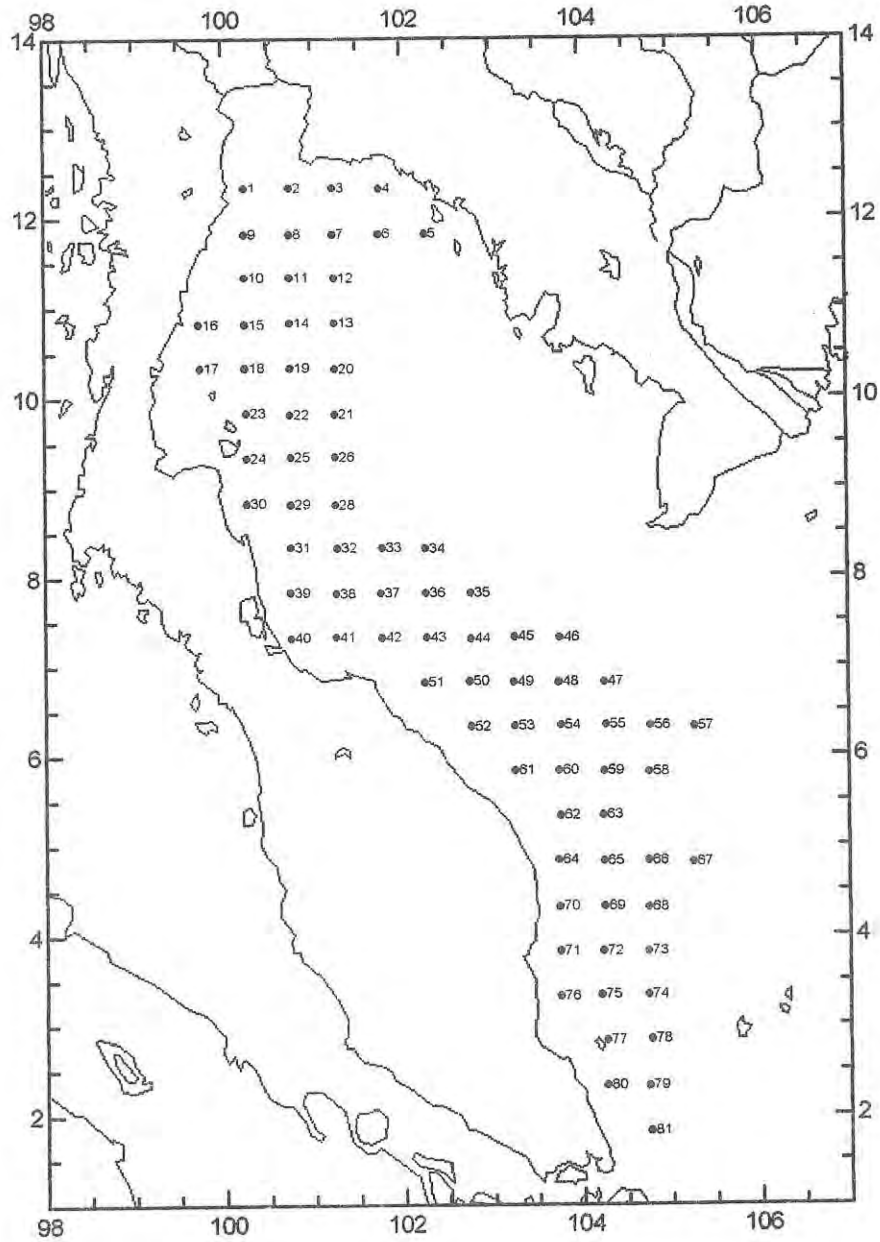


Figure 1. Survey area and sampling stations

Table 1. Partial details of sampling stations

Station	Date	Time	Lat			Long			Depth
			Deg	Min	Sec	Deg	Min	Sec	m
1	05-Sep-95	6:36:37	12	20	0	100	15	0	27
2	05-Sep-95	11:09:41	12	20	0	100	45	0	30
3	05-Sep-95	15:42:01	12	20	0	101	14	0	31
4	05-Sep-95	19:38:01	12	19	26	101	45	32	23
5	06-Sep-95	7:00:28	11	49	0	102	16	0	34
6	06-Sep-95	11:08:05	11	49	0	101	45	0	51
7	06-Sep-95	15:12:45	11	49	0	101	14	0	54
8	06-Sep-95	19:18:30	11	49	0	100	45	0	40
9	07-Sep-95	6:49:40	11	49	0	100	15	0	36
10	07-Sep-95	11:00:16	11	20	0	100	15	0	48
11	07-Sep-95	15:14:14	11	20	0	100	45	0	54
12	07-Sep-95	19:04:39	11	19	48	101	15	0	58
13	08-Sep-95	6:41:58	10	50	0	101	15	0	62
14	08-Sep-95	13:12:28	10	50	0	100	45	0	61
15	08-Sep-95	17:11:24	10	49	0	100	15	0	56
16	08-Sep-95	21:25:52	10	49	0	99	44	0	50
17	09-Sep-95	7:07:19	10	20	0	99	45	0	46
18	09-Sep-95	12:05:04	10	20	0	100	15	0	61
19	09-Sep-95	16:43:14	10	20	0	100	45	0	63
20	09-Sep-95	20:48:07	10	19	24.6	101	15	0	71
21	10-Sep-95	6:43:28	9	49	13.8	101	15	0	69
22	10-Sep-95	10:51:45	9	49	0	100	44	50.4	59
23	10-Sep-95	15:06:08	9	50	0	100	15	50.4	34
24	10-Sep-95	19:13:00	9	20	0	100	15	50.4	29
25	12-Sep-95	6:46:53	9	20	33.6	100	45	11.4	40
26	12-Sep-95	11:32:29	9	20	44.4	101	15	8.4	66
28	12-Sep-95	16:11:43	8	48	46.2	101	15	0	58
29	12-Sep-95	20:14:27	8	48	54	100	45	0	32
30	13-Sep-95	6:43:02	8	49	38.4	100	15	48	24
31	13-Sep-95	12:14:10	8	19	57.6	100	45	9.6	29
32	13-Sep-95	16:18:33	8	19	31.8	101	16	15.6	55
33	13-Sep-95	20:31:14	8	19	32.4	101	46	15.6	73
34	14-Sep-95	6:26:30	8	19	4.8	102	15	34.2	78
35	14-Sep-95	12:56:41	7	49	6.6	102	45	39.6	72
36	14-Sep-95	17:24:25	7	49	14.4	102	15	39.6	72
37	14-Sep-95	21:51:01	7	49	7.2	101	45	3	58
38	15-Sep-95	6:29:48	7	48	54.59	101	15	25	49
39	15-Sep-95	10:43:30	7	49	38.4	100	44	46	28
40	15-Sep-95	14:47:10	7	19	9.6	100	44	54	22

Table 1. (continued)

Station	Date	Time	Lat			Long			Depth
			Deg	Min	Sec	Deg	Min	Sec	m
41	15-Sep-95	18:48:57	7	19	41.4	101	15	0.6	41
42	17-Sep-95	9:46:47	7	19	15	101	45	45.6	49
43	17-Sep-95	13:57:45	7	19	18	102	15	54.6	51
44	17-Sep-95	18:18:43	7	18	36	102	45	43.2	56
45	18-Sep-95	6:29:30	7	19	31.8	103	15	13.8	57
46	18-Sep-95	11:25:06	7	19	5.4	103	45	28	52
47	18-Sep-95	16:41:59	6	49	8.4	104	15	22.8	60
48	18-Sep-95	23:21:44	6	49	6.6	103	44	48.6	58
49	19-Sep-95	6:27:36	6	49	14.39	103	14	48	56
50	19-Sep-95	11:15:59	6	49	49.8	102	44	49.2	51
51	19-Sep-95	15:31:42	6	49	12.6	102	14	36.2	48
52	19-Sep-95	21:08:13	6	19	40.2	102	45	40.2	39
53	20-Sep-95	6:31:03	6	19	57	103	15	19.2	53
54	20-Sep-95	10:51:31	6	20	14.4	103	46	6.6	61
55	20-Sep-95	15:36:55	6	20	30	104	16	28.8	61
56	20-Sep-95	19:51:05	6	19	55.8	104	46	29.4	58
57	21-Sep-95	6:14:10	6	18	57.6	105	16	4.8	62
58	21-Sep-95	11:42:16	5	48	57	104	45	24.6	62
59	21-Sep-95	16:19:36	5	49	39	104	15	7.8	64
60	21-Sep-95	20:42:44	5	50	2.4	103	44	36	57
61	23-Sep-95	6:24:43	5	50	10.2	103	15	11.4	52
62	23-Sep-95	13:01:38	5	19	45	103	45	45.6	61
63	23-Sep-95	17:07:19	5	20	9	104	14	29.4	64
64	23-Sep-95	22:48:35	4	50	6.6	103	44	8.4	59
65	24-Sep-95	9:51:47	4	49	29.4	104	14	42	66
66	24-Sep-95	14:11:47	4	49	39.6	104	44	54.6	73
67	24-Sep-95	18:29:11	4	48	24	105	15	0	76
68	25-Sep-95	6:35:01	4	18	37.8	104	44	28.8	71
69	25-Sep-95	11:11:06	4	19	25.2	104	14	58.2	67
70	25-Sep-95	15:26:07	4	19	15	103	44	24	39
71	25-Sep-95	19:42:02	3	49	19.8	103	45	6	35
72	26-Sep-95	6:26:45	3	49	16.79	104	13	48	55
73	26-Sep-95	11:06:24	3	49	4.2	104	44	15.6	72
74	26-Sep-95	15:20:33	3	20	0	104	44	15.6	72
75	26-Sep-95	19:26:21	3	20	1.8	104	12	18	50
76	27-Sep-95	6:11:45	3	19	12.6	103	44	48	25
77	27-Sep-95	11:35:02	2	49	42	104	16	12	48
78	27-Sep-95	15:48:54	2	50	11.4	104	46	12	65
79	27-Sep-95	20:10:53	2	19	1.2	104	44	21	59
80	28-Sep-95	5:55:40	2	19	36	104	16	1.8	34
81	28-Sep-95	11:22:44	1	48	54	104	45	26.4	51

Temperature, Salinity, Dissolved Oxygen Contents and Fluorescense

These four variables were measured *in situ* using a Falmouth Scientific CTD system integrated with a Beckman polarographic oxygen sensor and a submersible fluorometer unit. Unfortinately the pH sensor (Innovative Sensors, Inc.) was not function properly during this cruise and the continuous pH profile was not available.

Real time data were recorded by an on-board PC at the data sampling rate of 25 Hz. Both down-casting and up-casting data were saved but only down-casting data, which were not interrupted during water sampling, of 80 stations (Station 27 excluded) were processed and presented in this report.

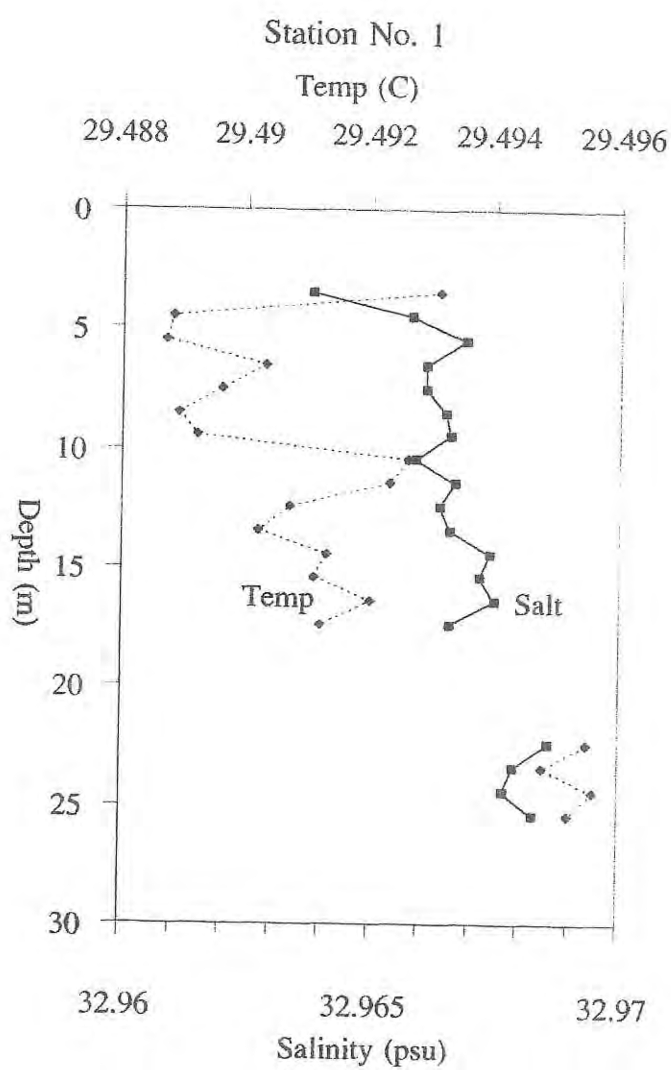
Raw data was processed by the EG&G Marine Instruments software. Data was averaged at every one meter interval. Depth was calculated from pressure and density of water. Temperature was recorded directly. Salinity was calculated from temperature, conductivity and pressure according to the Unesco/IOC PSS-78 scale.

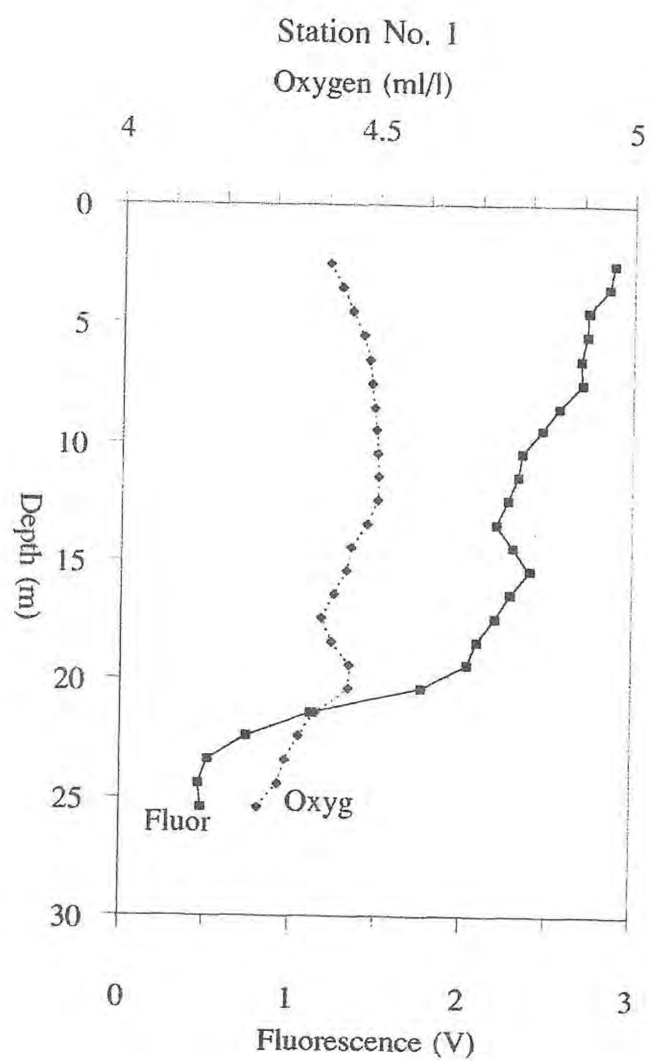
Oxygen content was calculated from oxygen current and temperature also by the same software but the results were found to be unrealistic and the day-to-day drift was unacceptably large. This was apparently due to the age of the oxygen sensing electrode and has to be replaced. To correct the oxygen results, we recalibrated the oxygen content based on the result obtained by Winkler titration of some water samples. When the titration oxygen contents were compared with the *in situ* profile, it was clearly seen that all the surface concentrations of oxygen were in equlibrium with atmosphere and this offset was also the same for the oxygen depleted layers of the same profile. Thus the drifting of data appeared to be linear and was not a function of oxygen concentration.

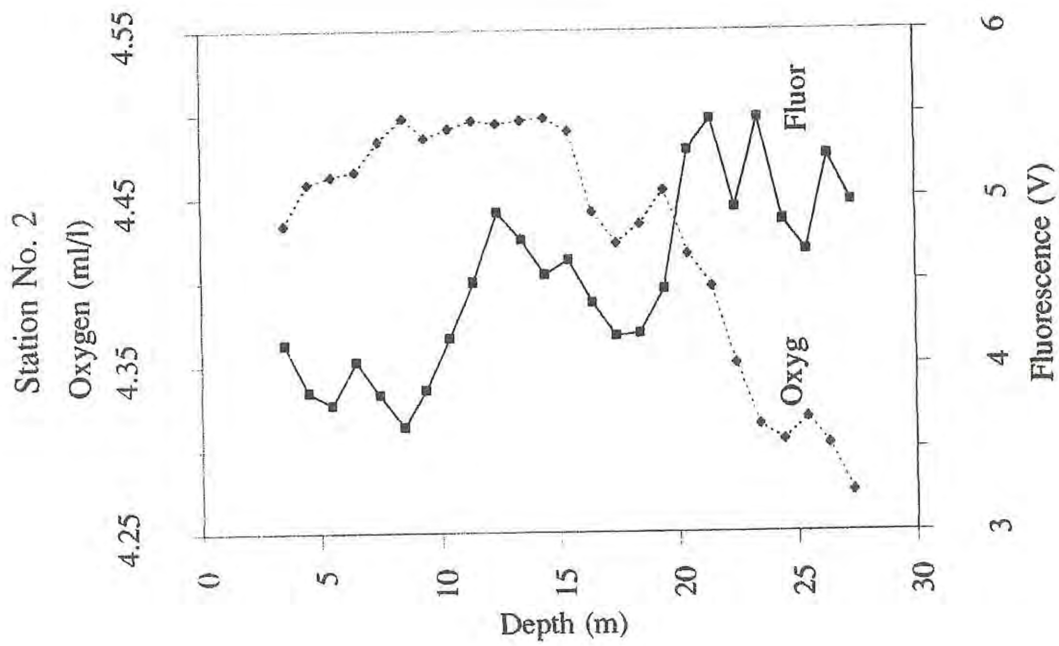
Fluorescense profiles are shown in this report as uncalibrated data (F) in volt unit. However, if desire, these data can be converted to photosynthetic pigment concentration in mg m^{-3} by:

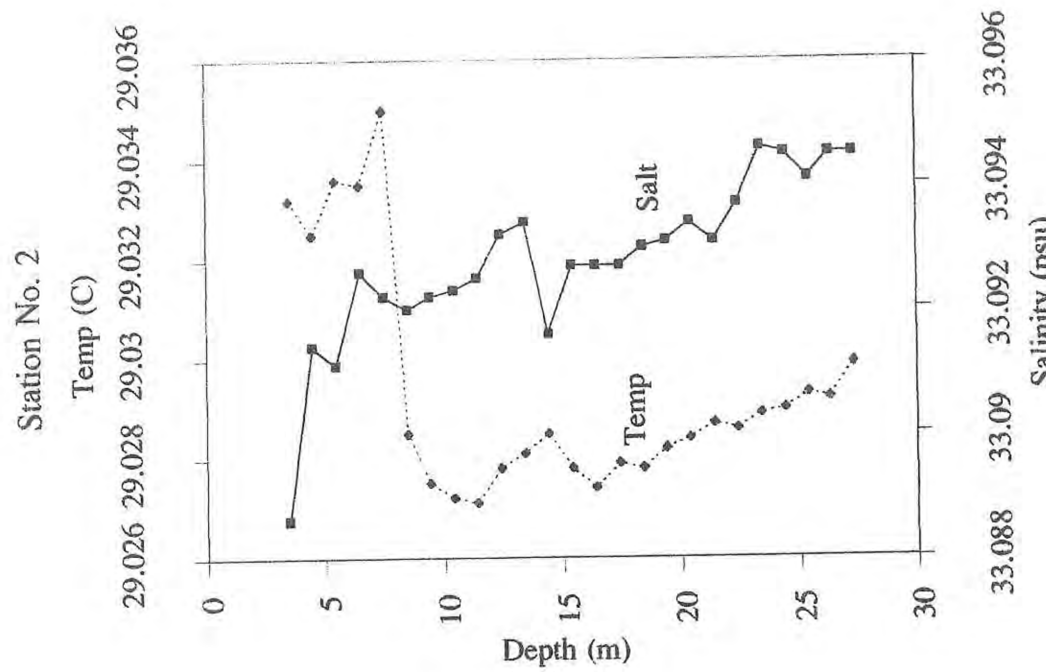
for chlorophyll *a*:	Chl $a = 0.0146*F + 0.037$ ($r^2 = 0.175$)
for chlorophyll *b*:	Chl $b = 0.2887*F + 0.150$ ($r^2 = 0.814$)
for chlorophyll *c*:	Chl $c = 0.0388*F + 0.055$ ($r^2 = 0.110$)
for total chlorophyll (*a*+*b*+*c*):	Total Chl $= 0.3552*F + 0.221$ ($r^2 = 0.694$)
for carotenoid:	Carot $= 0.0430*F - 0.077$ ($r^2 = 0.271$)

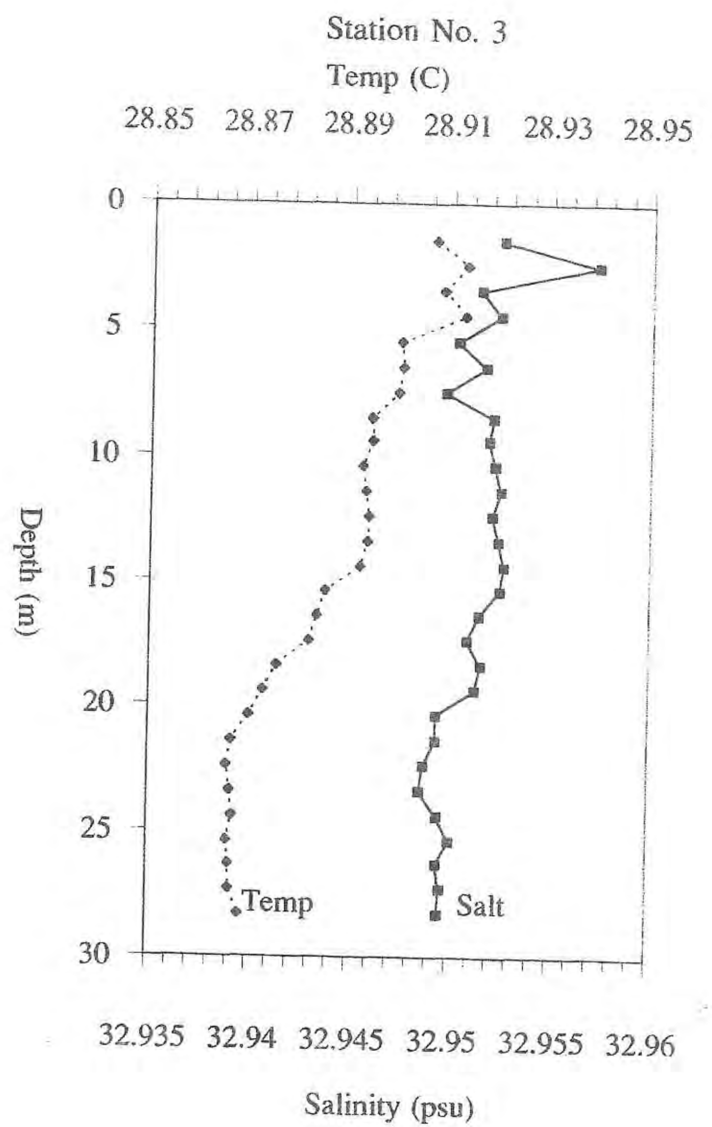
Seventy six water samples containing different pigment concentrations that covered the range of observed pigment during this cruise were used to obtained these regression equations. Water samples were filtered as soon as possible after collection (normally within one hour while keeping in the dark). Pigments were extrated by acetone and determined spectrophotometrically on board. Equations of Parsons *et al.* (1984) were used to estimate the pigment concentrations.

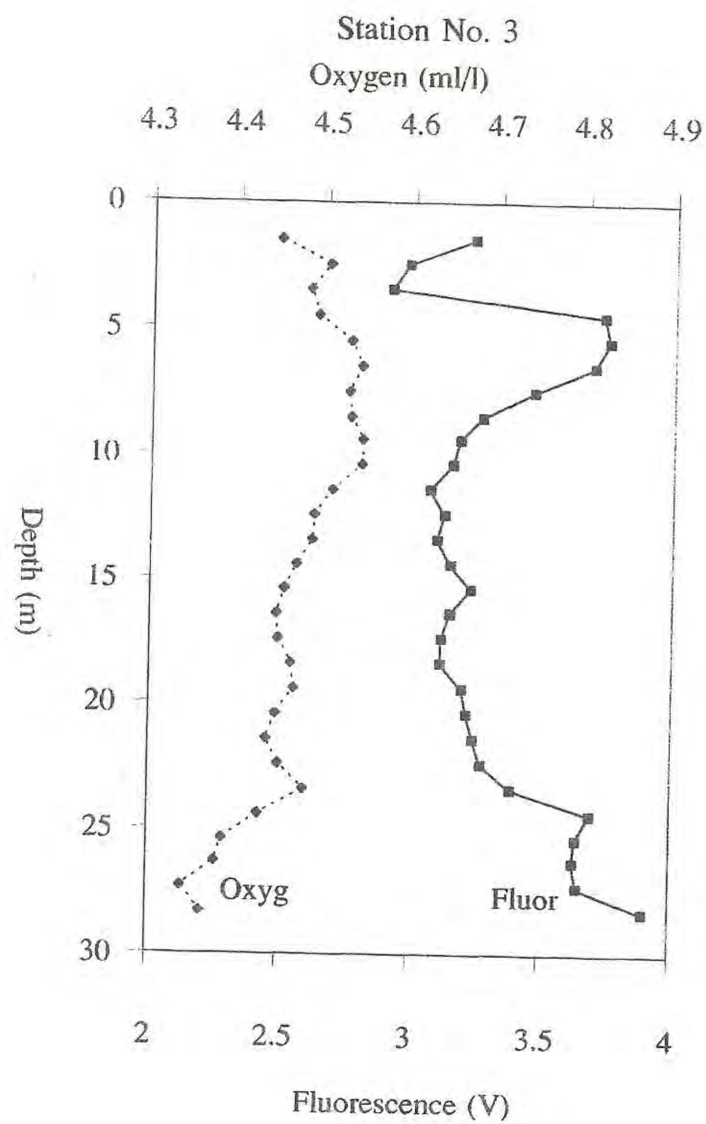

Station No. 1
Temp (C)
29.488
29.49
29.492
29.494
29.496
Depth (m)
0
5
10
15
20
25
30
Temp
Salt
32.96
32.965
32.97
Salinity (psu)

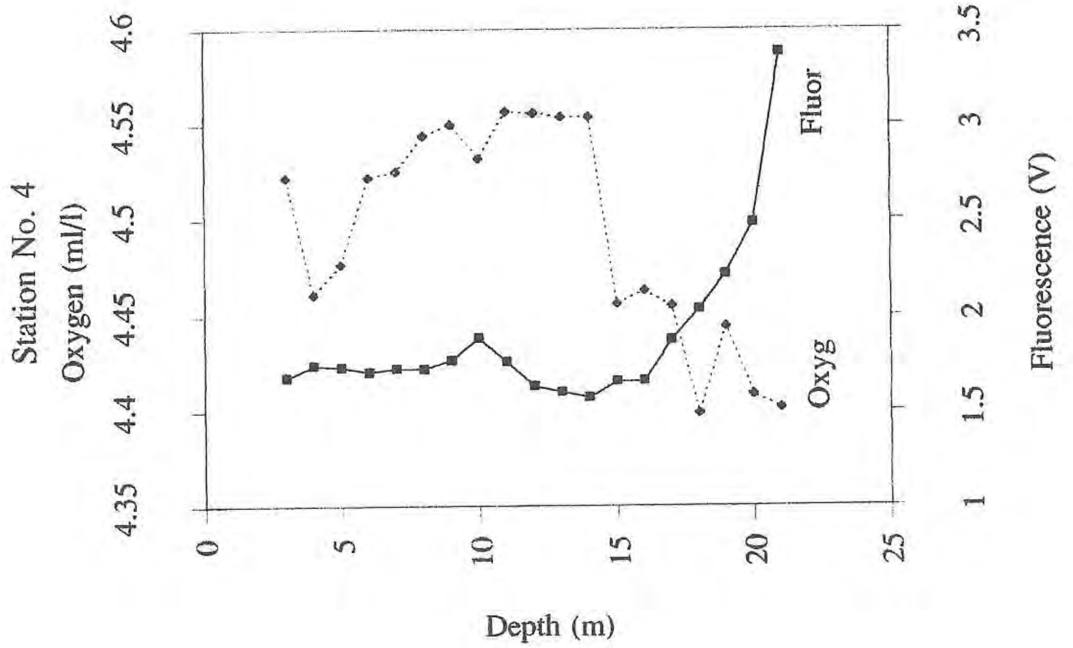

Station No. 1
Oxygen (ml/l)
4
4.5
5
Depth (m)
0
5
10
15
20
25
30
Oxyg
Fluor
0
1
2
3
Fluorescence (V)


Station No. 2
Oxygen (ml/l)
4.25 4.35 4.45 4.55
Fluor
Oxyg
0 5 10 15 20 25 30
Depth (m)
3 4 5 6
Fluorescence (V)

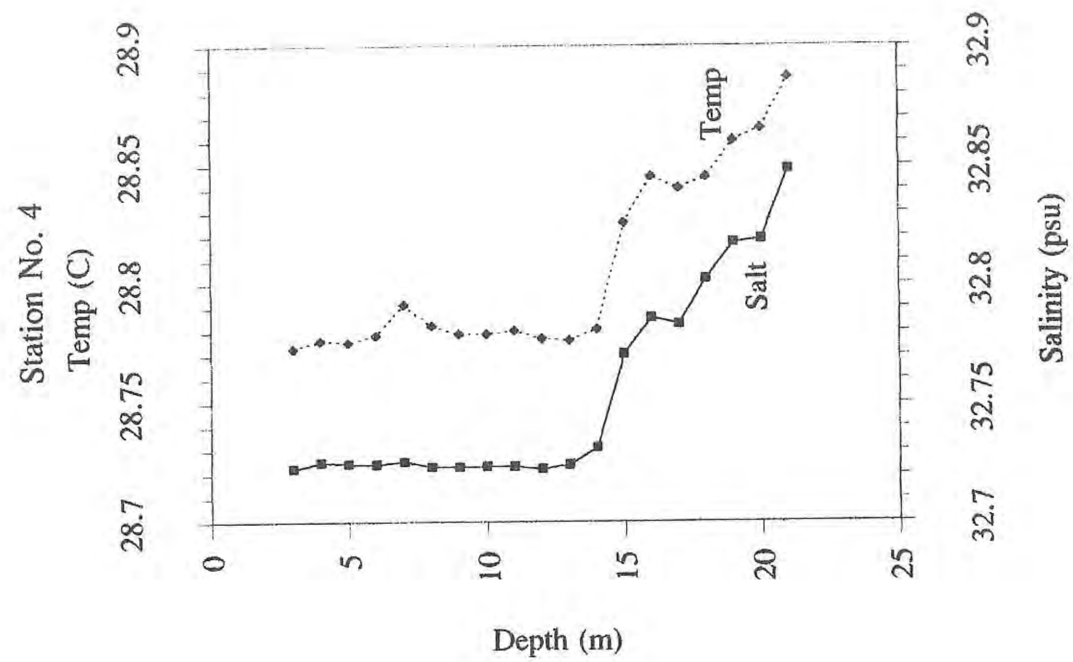

Station No. 2
Temp (C)
29.026 29.028 29.03 29.032 29.034 29.036
Salt
Temp
0 5 10 15 20 25 30
Depth (m)
33.088 33.09 33.092 33.094 33.096
Salinity (psu)


Station No. 3
Temp (C)
28.85 28.87 28.89 28.91 28.93 28.95
0
5
10
15
20
25
30
Depth (m)
Temp
Salt
32.935 32.94 32.945 32.95 32.955 32.96
Salinity (psu)

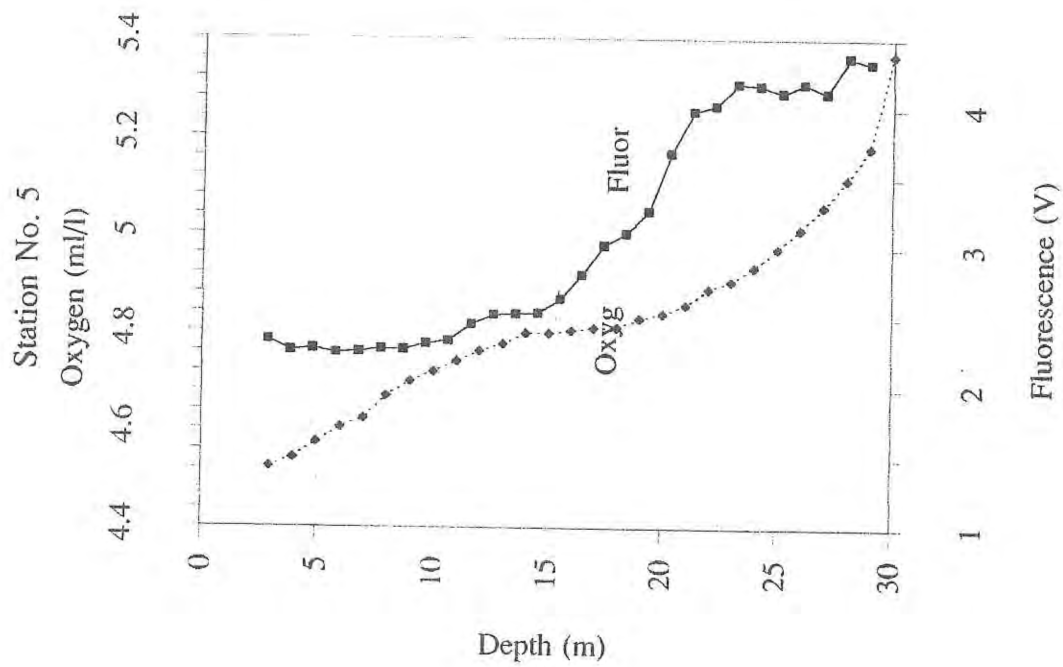

Station No. 3
Oxygen (ml/l)
4.3 4.4 4.5 4.6 4.7 4.8 4.9
0
5
10
15
20
25
30
Depth (m)
Oxyg
Fluor
2 2.5 3 3.5 4
Fluorescence (V)

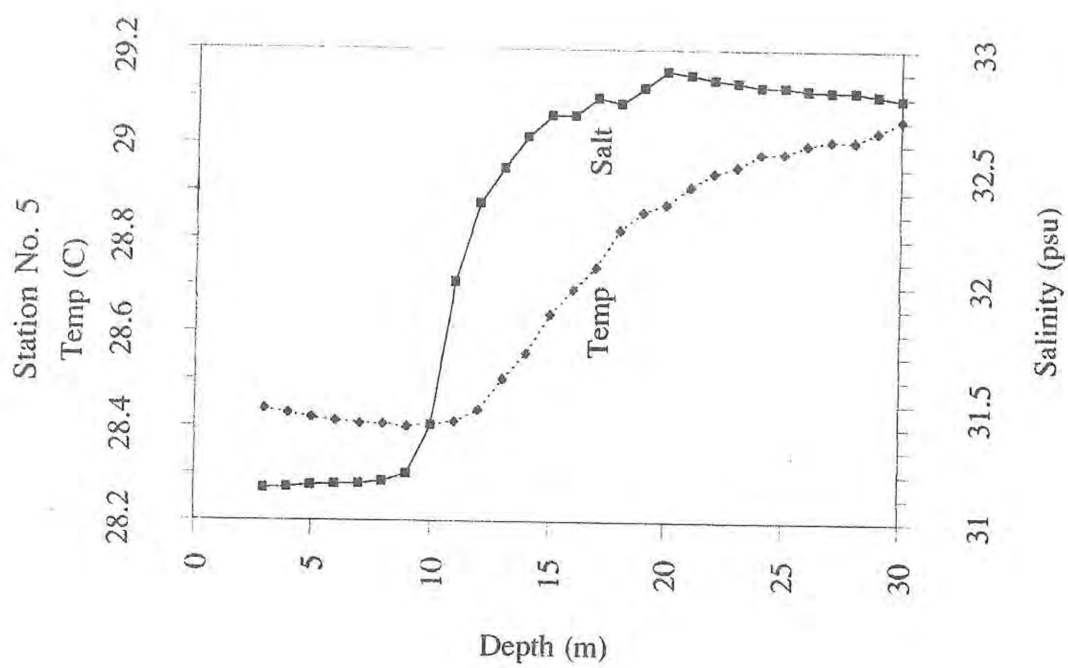


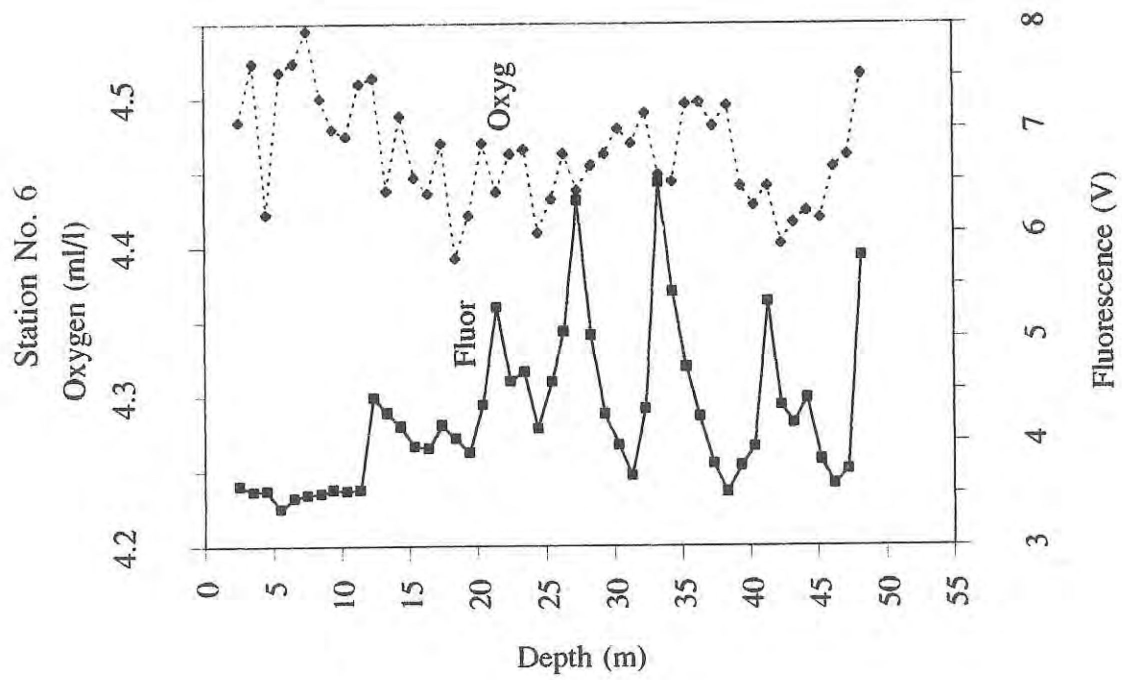
Station No. 4
Oxygen (ml/l)
4.35
4.4
4.45
4.5
4.55
4.6
Fluor
Oxyg
0
5
10
15
20
25
Depth (m)
1
1.5
2
2.5
3
3.5
Fluorescence (V)

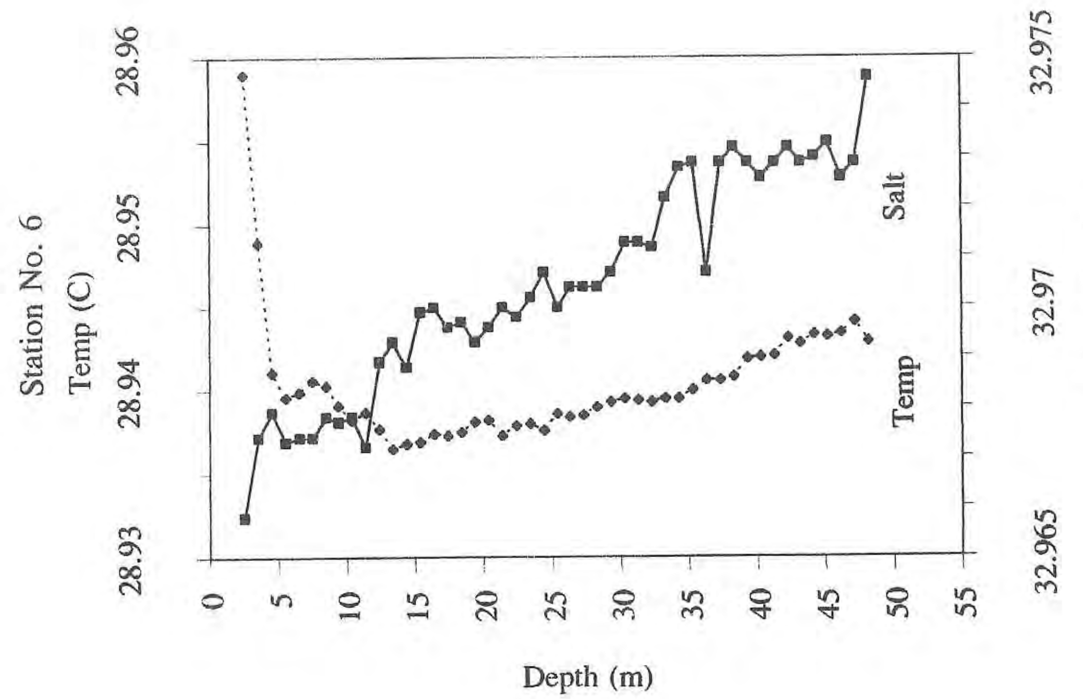


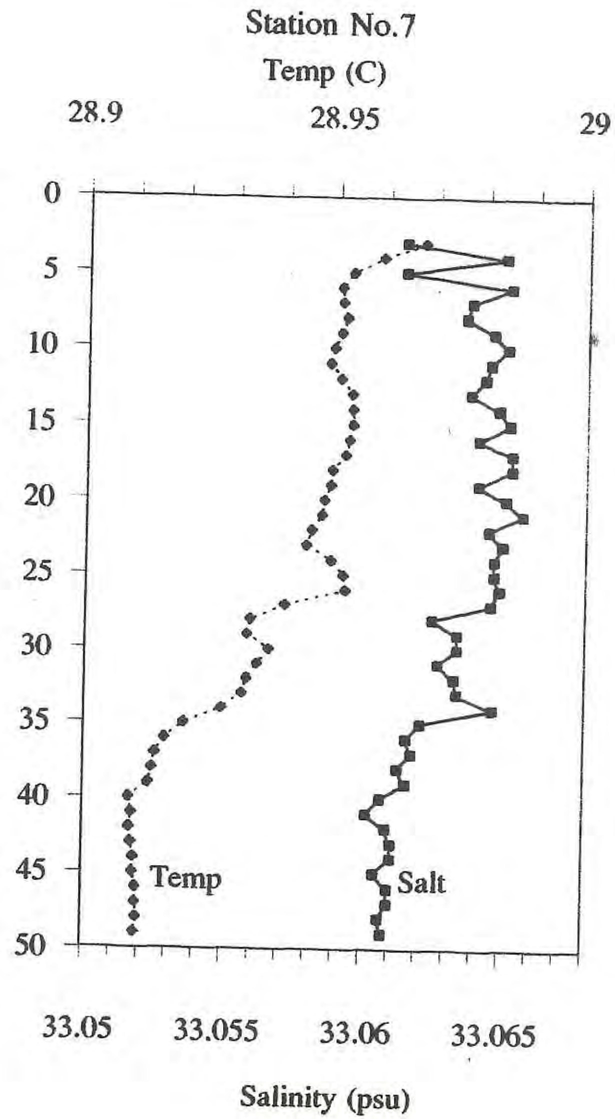
Station No. 4
Temp (C)
28.7
28.75
28.8
28.85
28.9
Temp
Salt
0
5
10
15
20
25
Depth (m)
32.7
32.75
32.8
32.85
32.9
Salinity (psu)

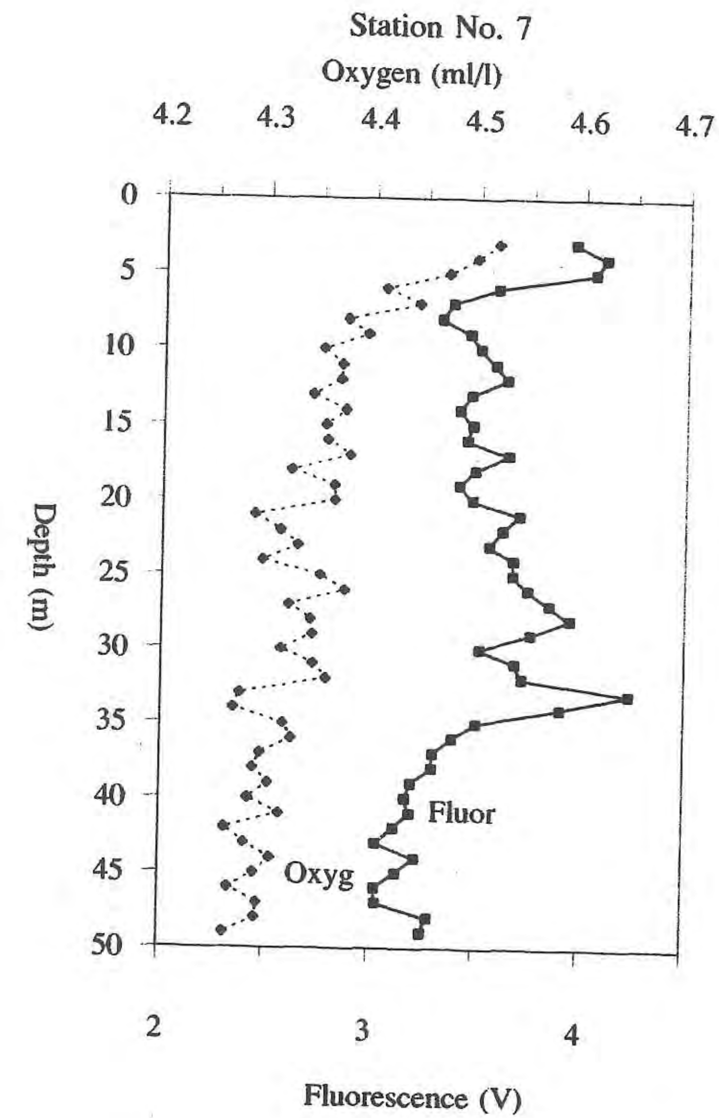

Station No. 5
Oxygen (ml/l)
4.4
4.6
4.8
5
5.2
5.4
Fluor
Oxyg
Depth (m)
0
5
10
15
20
25
30
Fluorescence (V)
1
2
3
4

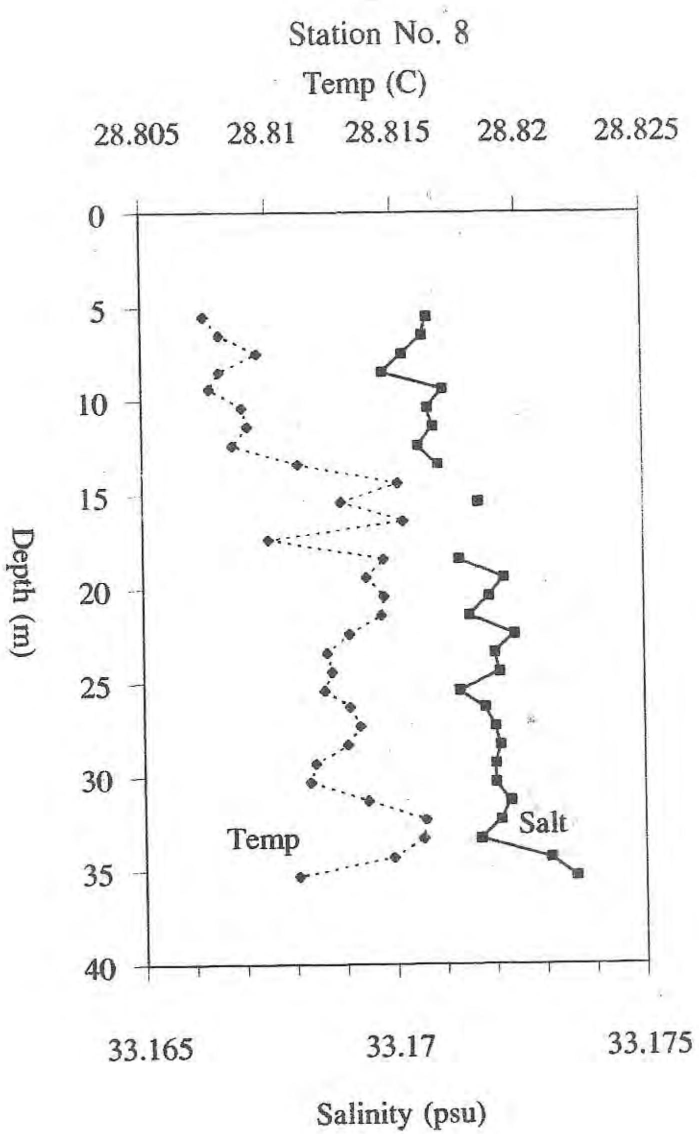

Station No. 5
Temp (C)
28.2
28.4
28.6
28.8
29
29.2
Salt
Temp
Depth (m)
0
5
10
15
20
25
30
Salinity (psu)
31
31.5
32
32.5
33

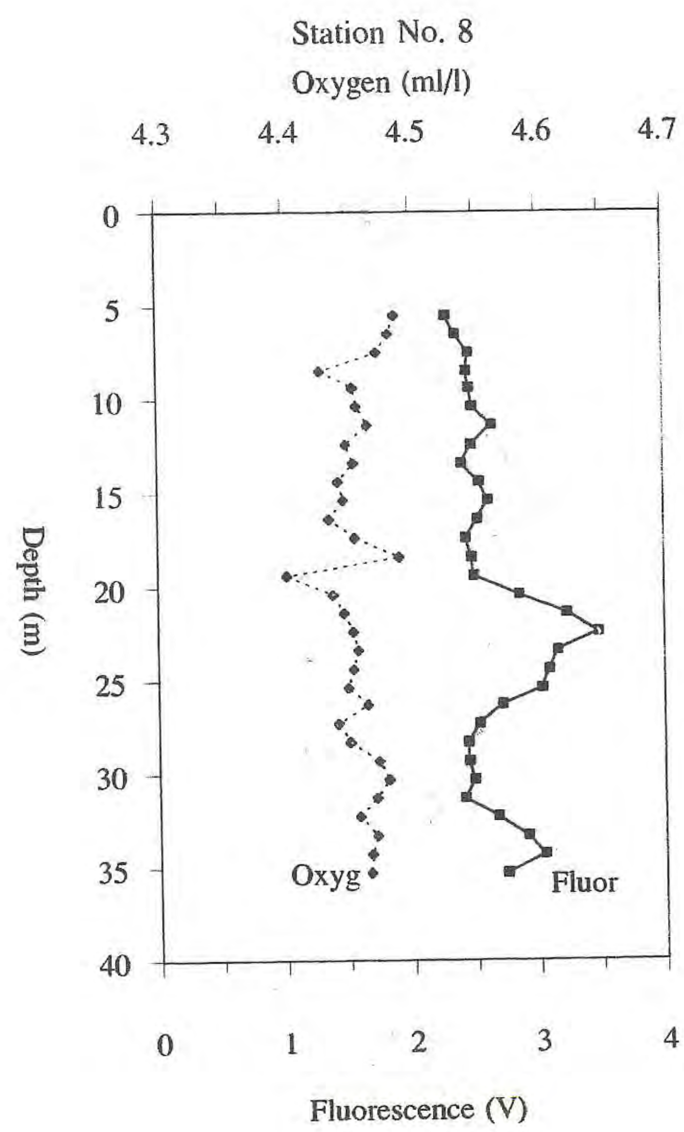

Station No. 6
Oxygen (ml/l)
4.2
4.3
4.4
4.5
Oxyg
Fluor
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m)
3
4
5
6
7
8
Fluorescence (V)

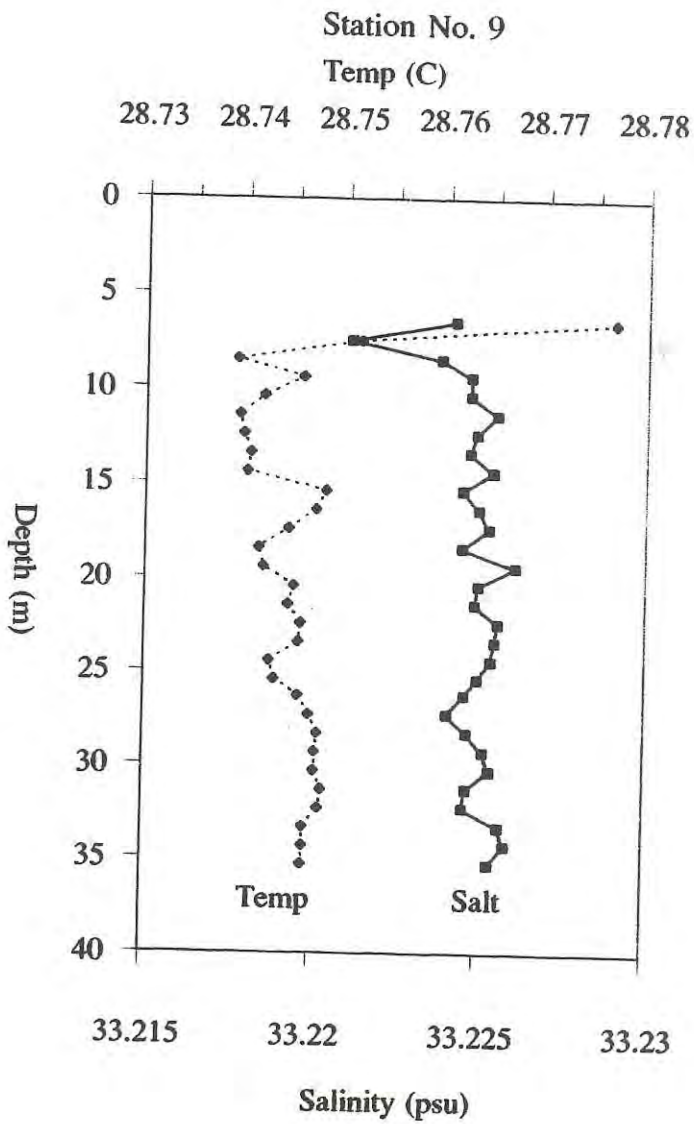

Station No. 6
Temp (C)
28.93
28.94
28.95
28.96
Salt
Temp
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m)
32.965
32.97
32.975
Salinity (psu)

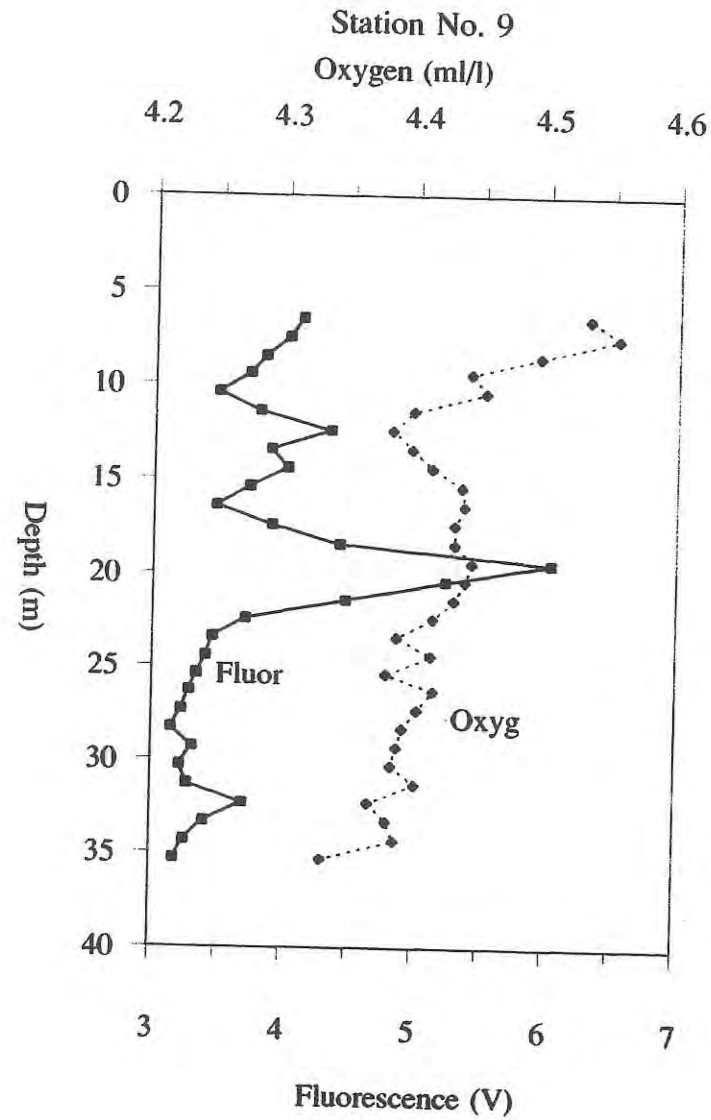

Station No.7
Temp (C)
28.9
28.95
29
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
Temp
Salt
33.05
33.055
33.06
33.065
Salinity (psu)

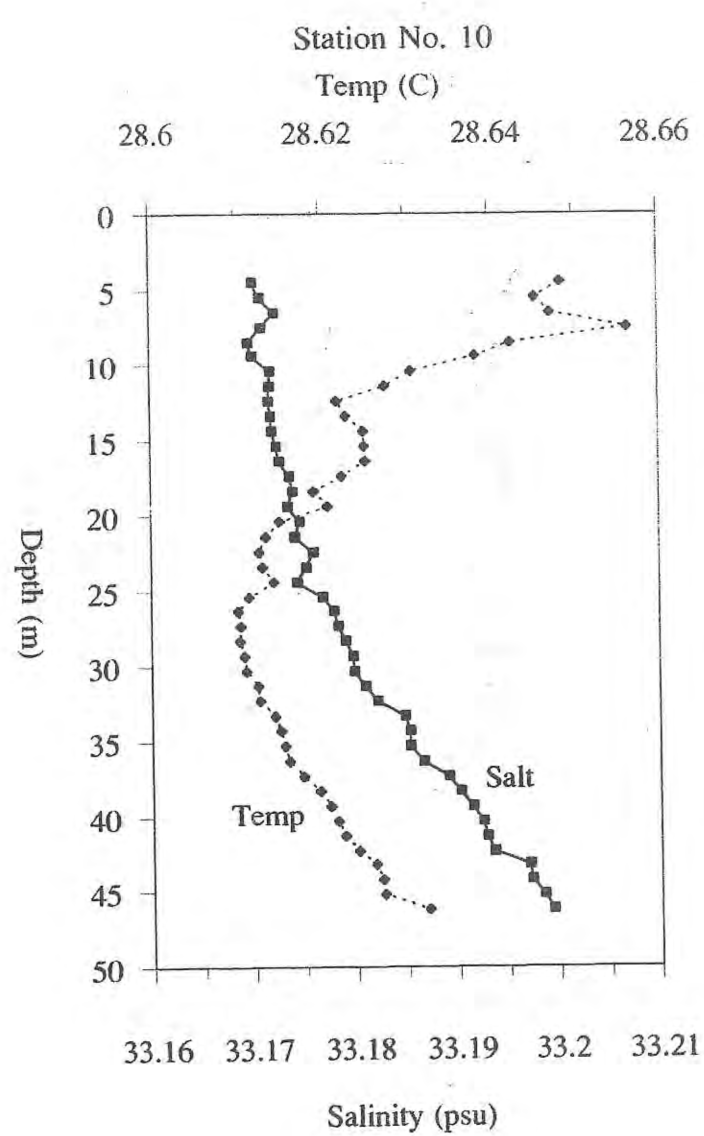

Station No. 7
Oxygen (ml/l)
4.2
4.3
4.4
4.5
4.6
4.7
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
Fluor
Oxyg
2
3
4
Fluorescence (V)

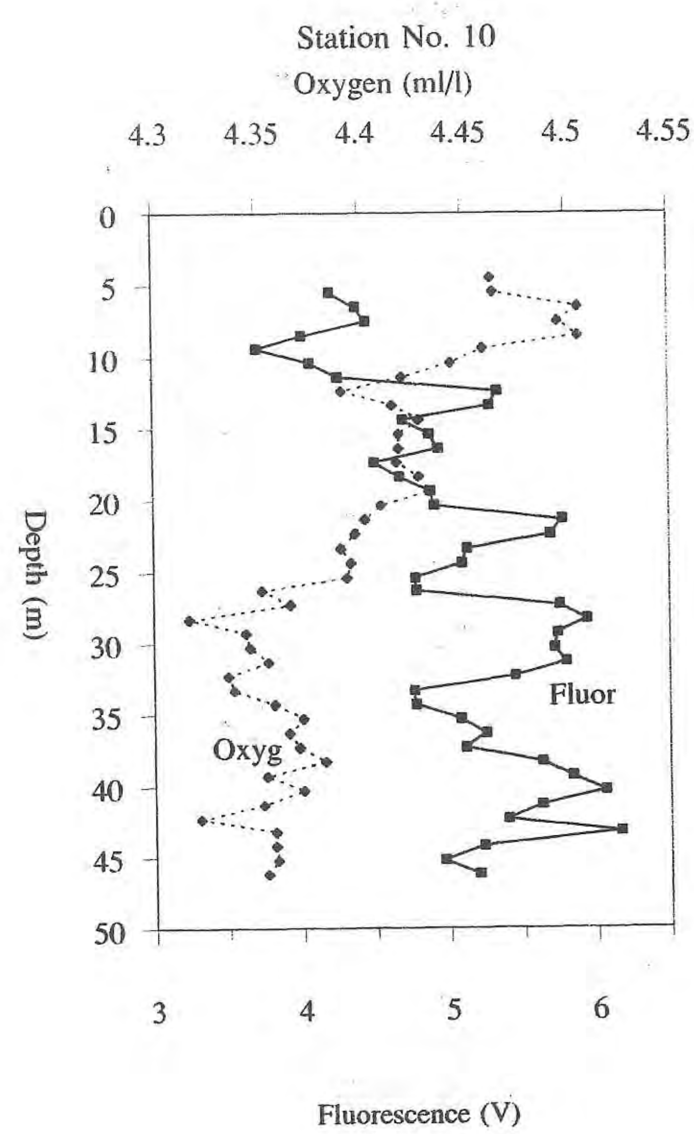

Station No. 8
Temp (C)
28.805
28.81
28.815
28.82
28.825
Depth (m)
0
5
10
15
20
25
30
35
40
Temp
Salt
33.165
33.17
33.175
Salinity (psu)

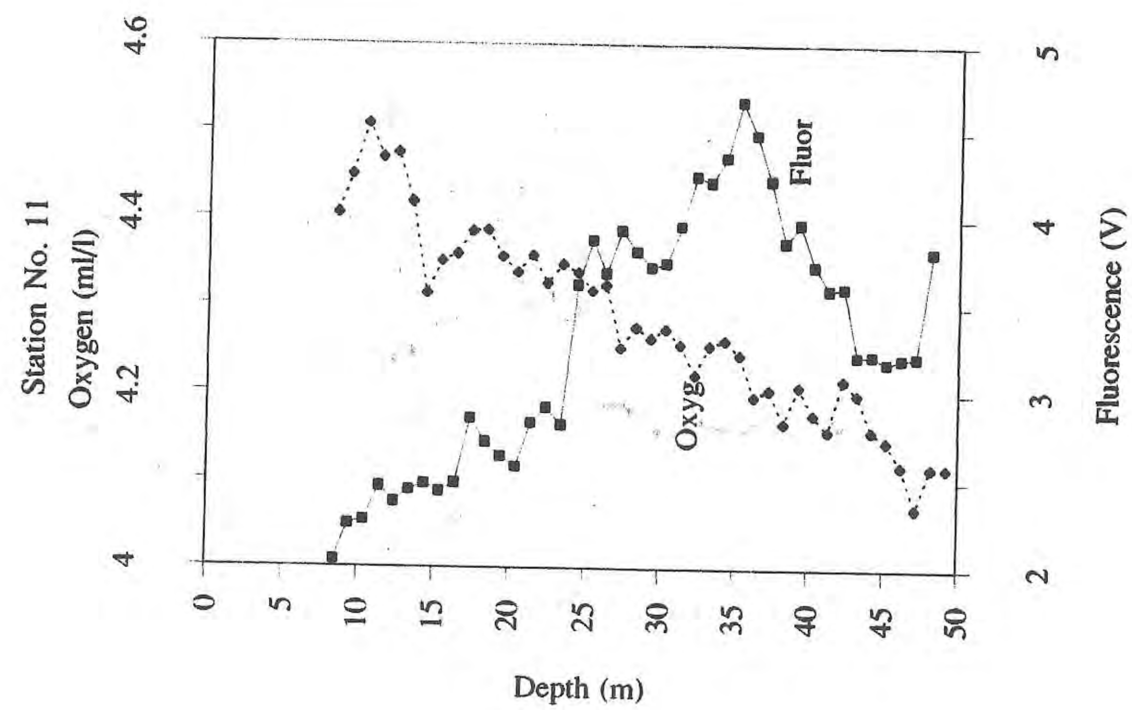

Station No. 8
Oxygen (ml/l)
4.3
4.4
4.5
4.6
4.7
Depth (m)
0
5
10
15
20
25
30
35
40
Oxyg
Fluor
0
1
2
3
4
Fluorescence (V)

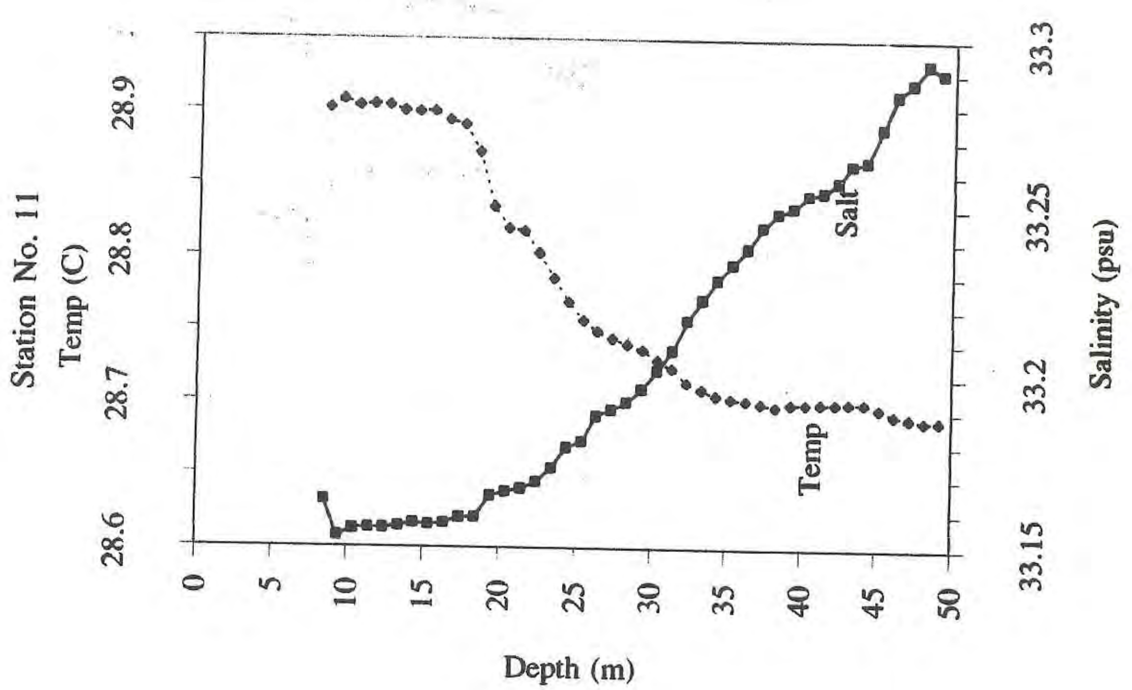

Station No. 9
Temp (C)
28.73 28.74 28.75 28.76 28.77 28.78
Depth (m)
0
5
10
15
20
25
30
35
40
Temp
Salt
33.215 33.22 33.225 33.23
Salinity (psu)

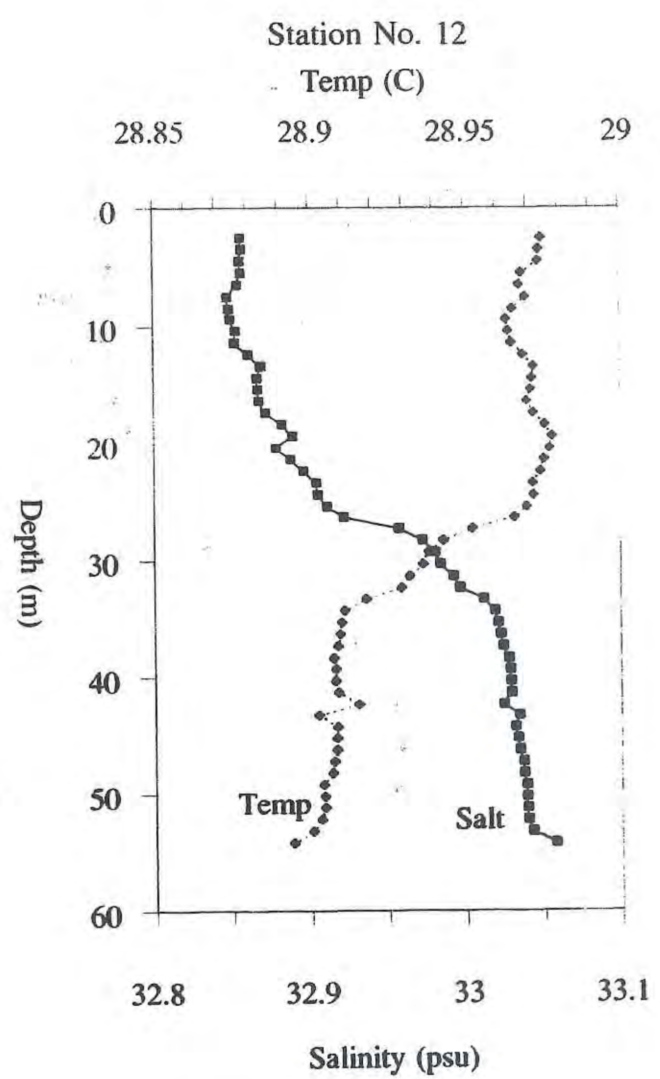

Station No. 9
Oxygen (ml/l)
4.2 4.3 4.4 4.5 4.6
Depth (m)
0
5
10
15
20
25
30
35
40
Fluor
Oxyg
3 4 5 6 7
Fluorescence (V)

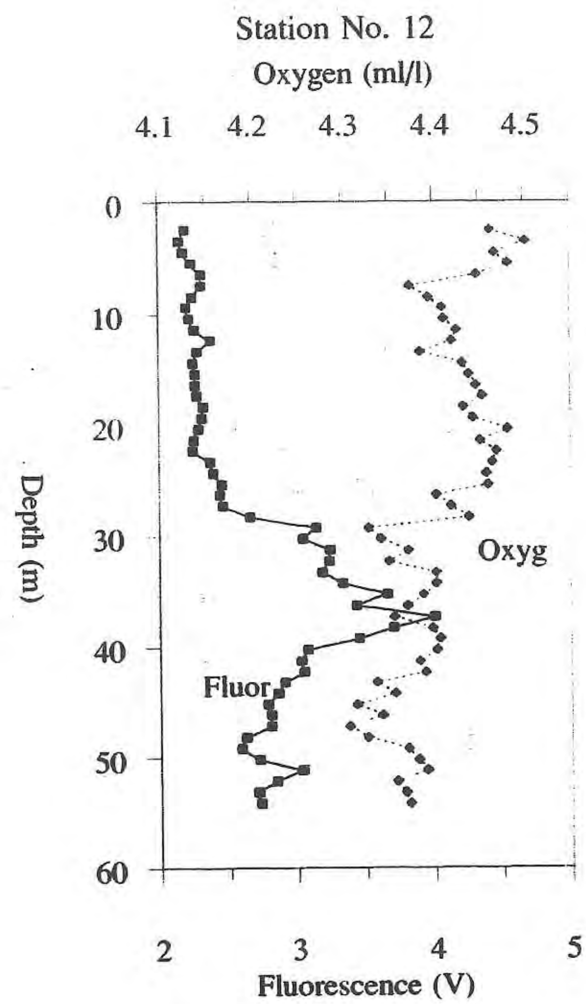

Station No. 10
Temp (C)
28.6
28.62
28.64
28.66
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
Salt
Temp
33.16
33.17
33.18
33.19
33.2
33.21
Salinity (psu)

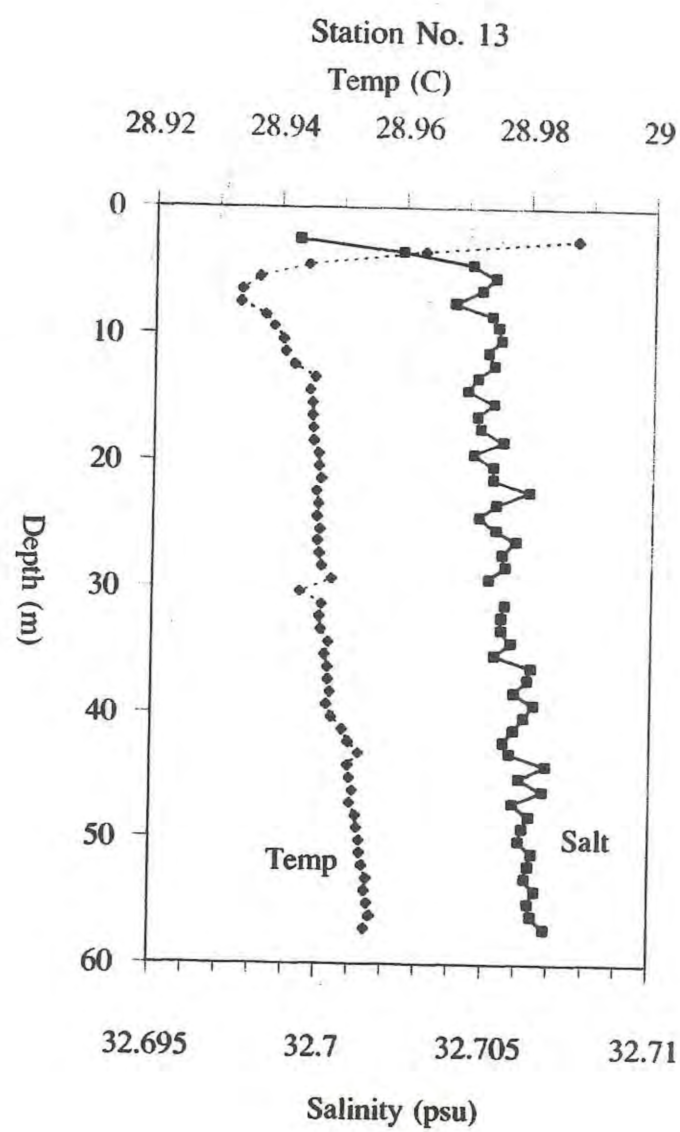

Station No. 10
Oxygen (ml/l)
4.3
4.35
4.4
4.45
4.5
4.55
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
Fluor
Oxyg
3
4
5
6
Fluorescence (V)

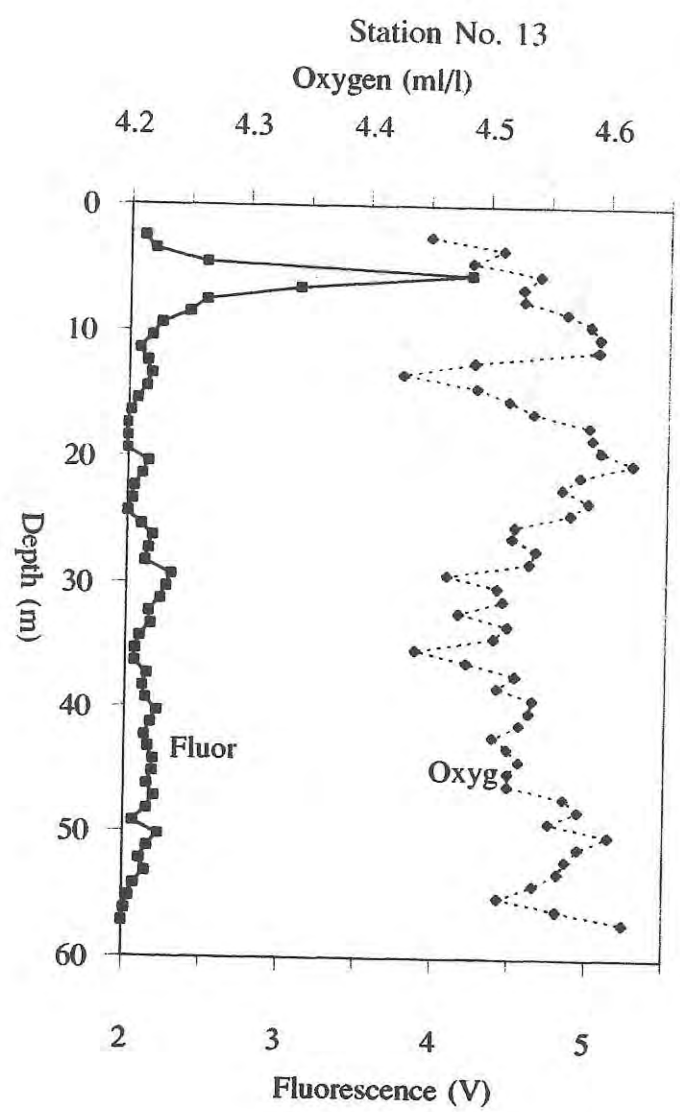

Station No. 11
Oxygen (ml/l)
4
4.2
4.4
4.6
Oxyg
Fluor
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
Fluorescence (V)
2
3
4
5

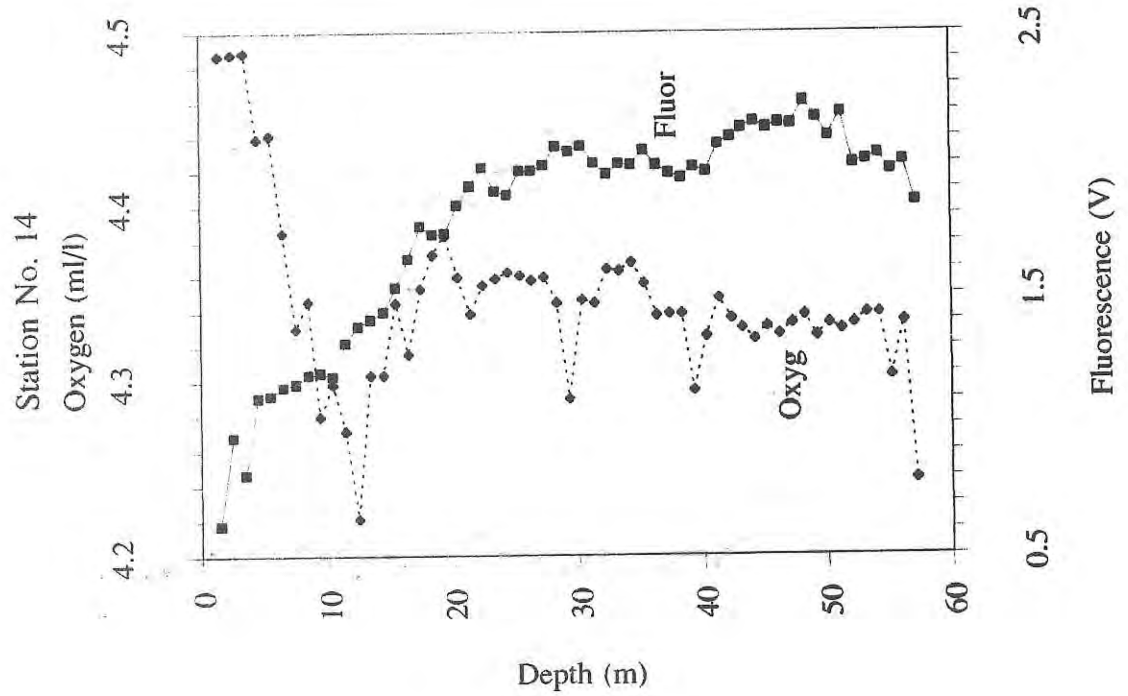

Station No. 11
Temp (C)
28.6
28.7
28.8
28.9
Temp
Salt
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
Salinity (psu)
33.15
33.2
33.25
33.3

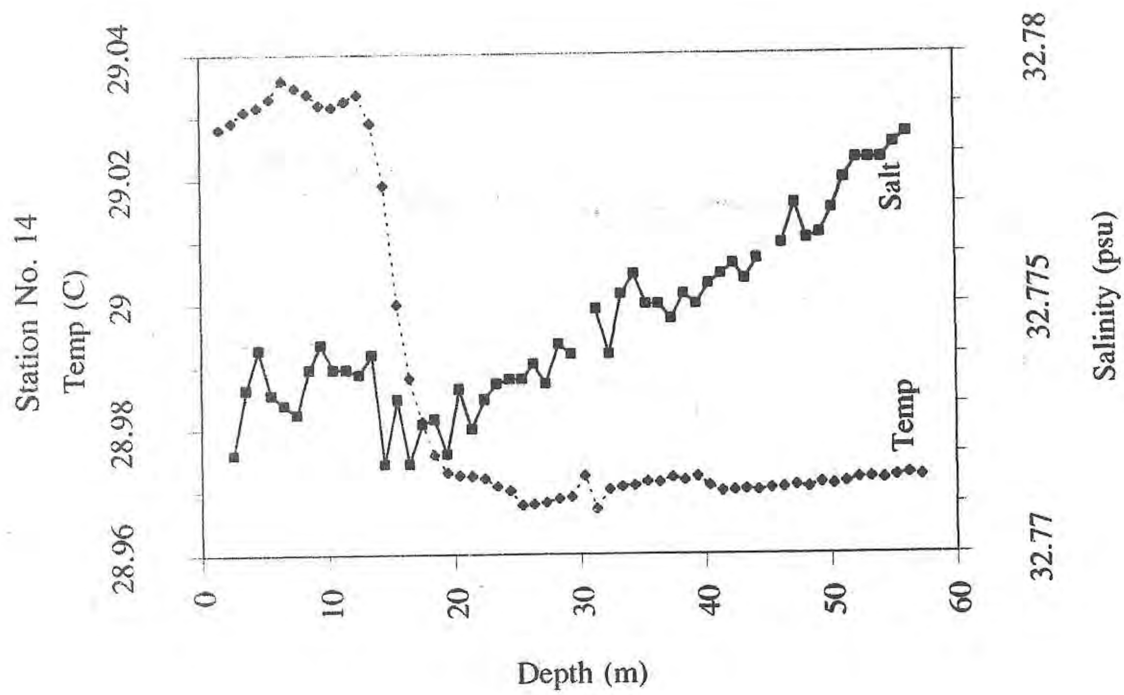

Station No. 12
Temp (C)
28.85
28.9
28.95
29
Depth (m)
0
10
20
30
40
50
60
Temp
Salt
32.8
32.9
33
33.1
Salinity (psu)

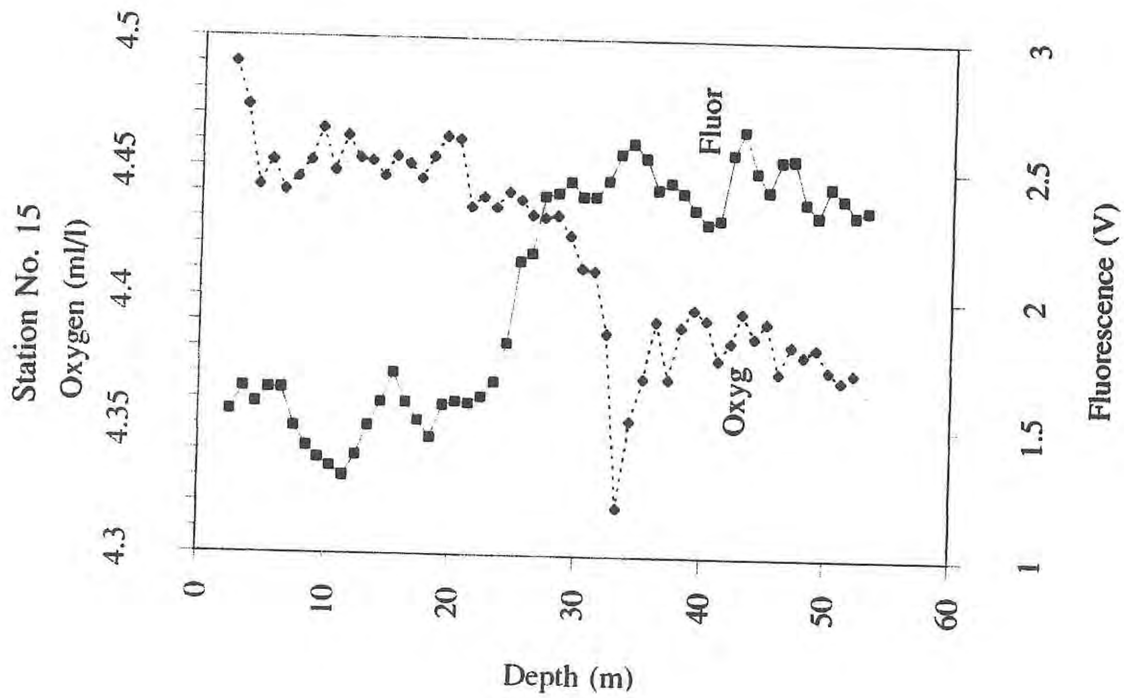

Station No. 12
Oxygen (ml/l)
4.1
4.2
4.3
4.4
4.5
Depth (m)
0
10
20
30
40
50
60
Oxyg
Fluor
2
3
4
5
Fluorescence (V)

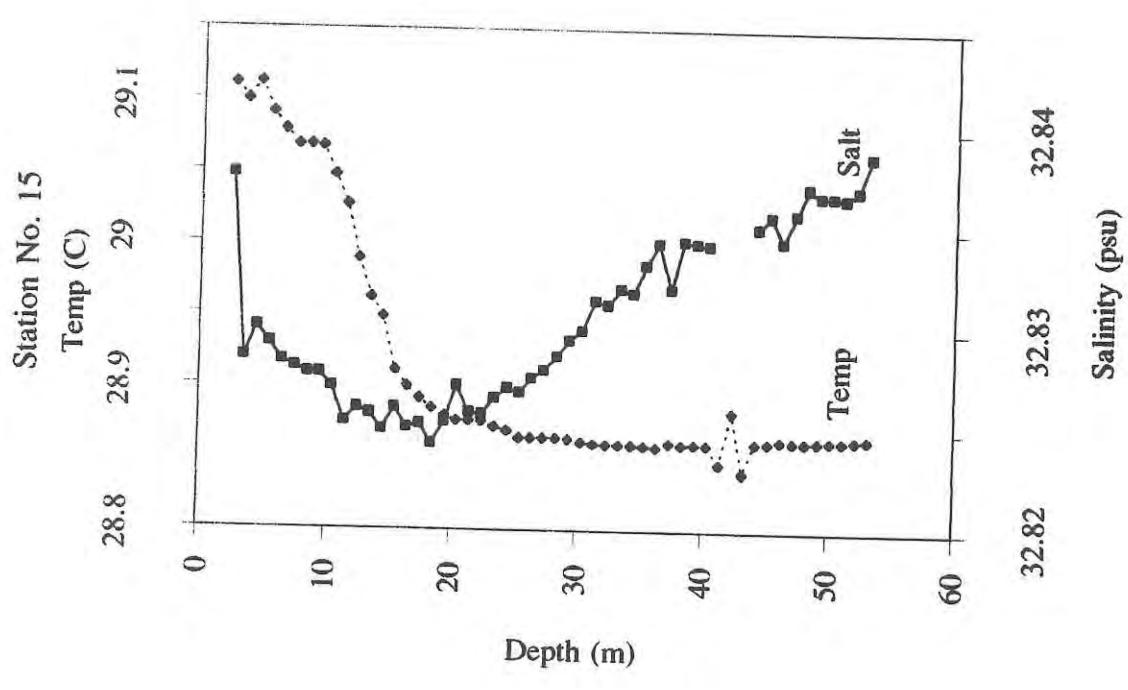

Station No. 13
Temp (C)
28.92
28.94
28.96
28.98
29
0
10
20
30
40
50
60
Depth (m)
Temp
Salt
32.695
32.7
32.705
32.71
Salinity (psu)

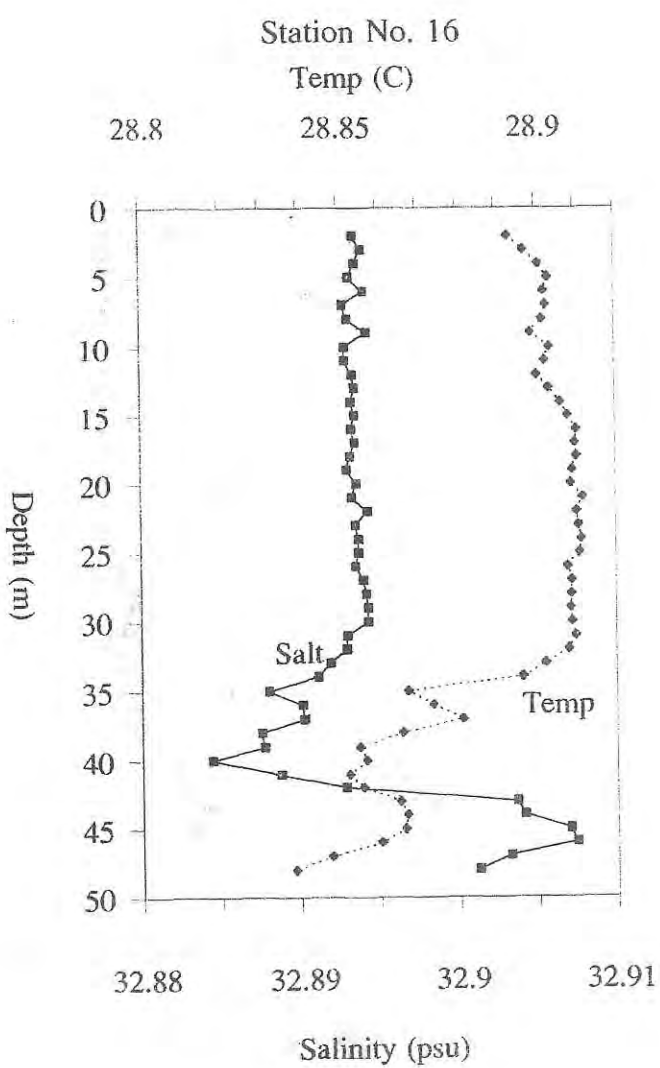

Station No. 13
Oxygen (ml/l)
4.2
4.3
4.4
4.5
4.6
0
10
20
30
40
50
60
Depth (m)
Fluor
Oxyg
2
3
4
5
Fluorescence (V)

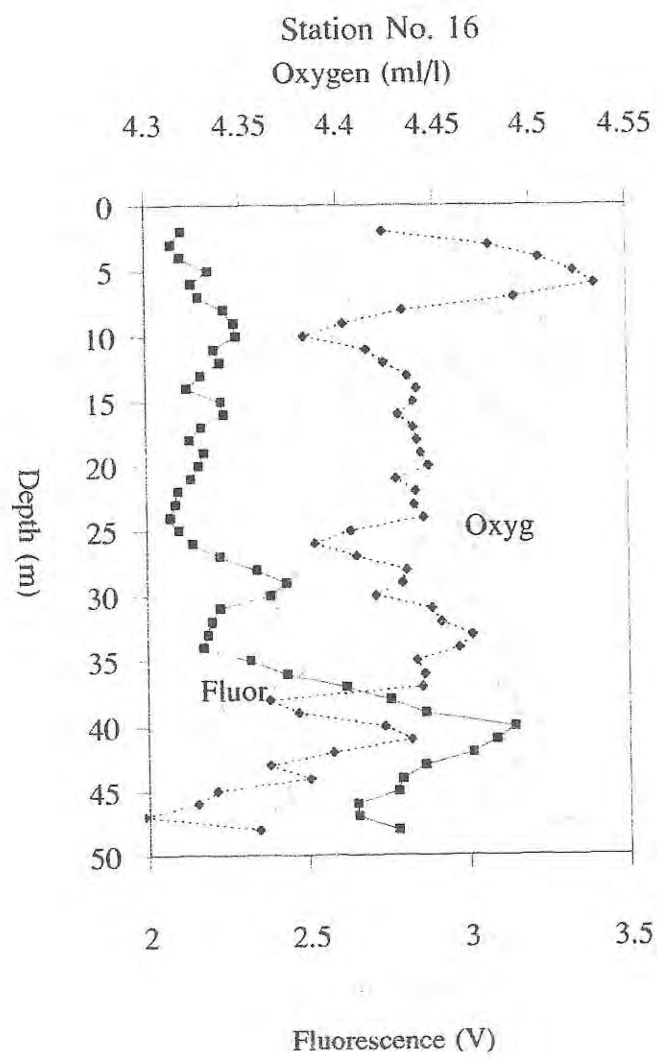

Station No. 14
Oxygen (ml/l)
4.2
4.3
4.4
4.5
Fluor
Oxyg
0
10
20
30
40
50
60
Depth (m)
0.5
1.5
2.5
Fluorescence (V)

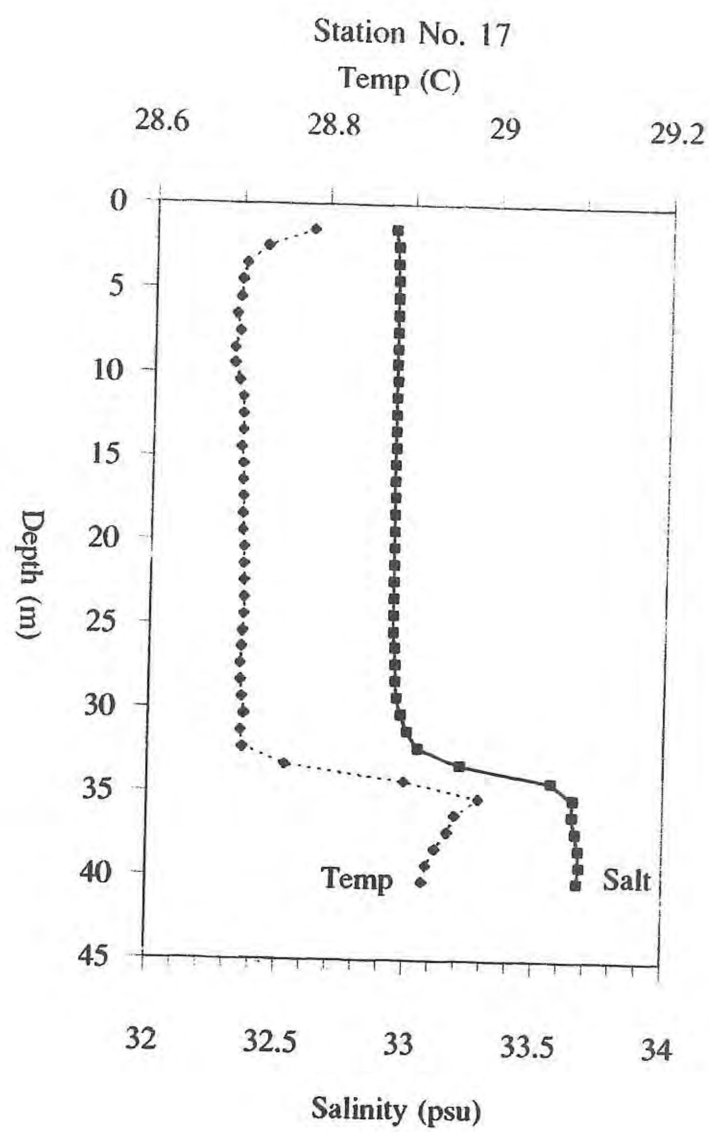

Station No. 14
Temp (C)
28.96
28.98
29
29.02
29.04
Salt
Temp
0
10
20
30
40
50
60
Depth (m)
32.77
32.775
32.78
Salinity (psu)

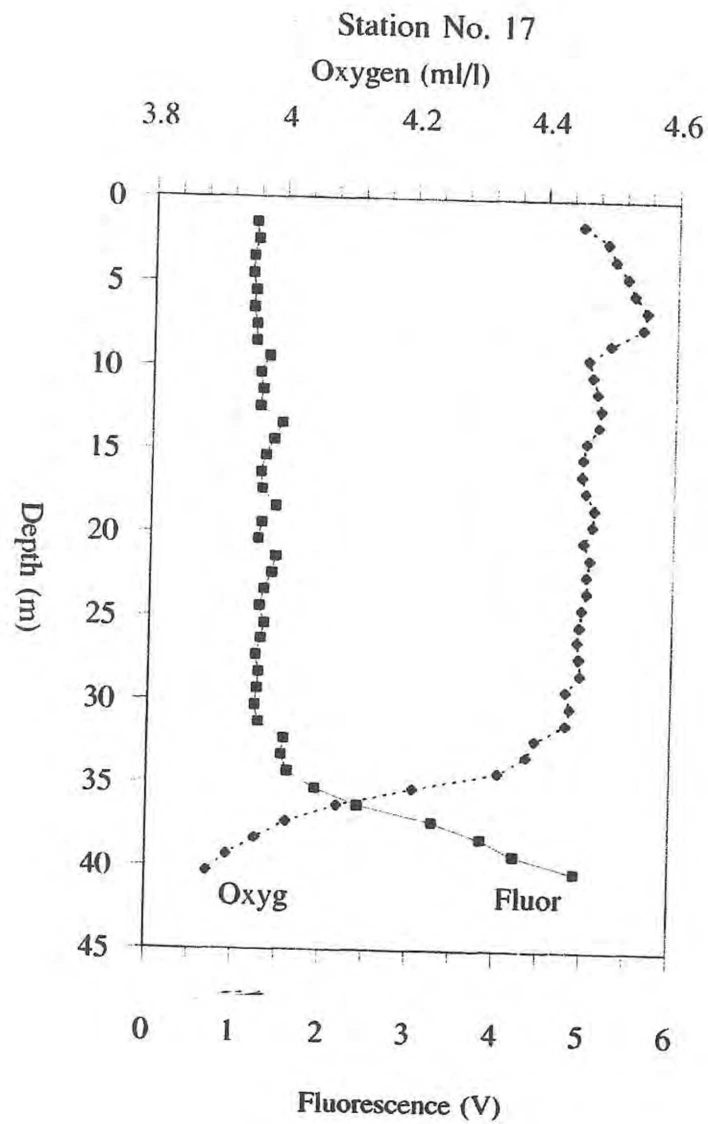

Station No. 15
Oxygen (ml/l)
4.3
4.35
4.4
4.45
4.5
Fluor
Oxyg
0
10
20
30
40
50
60
Depth (m)
1
1.5
2
2.5
3
Fluorescence (V)

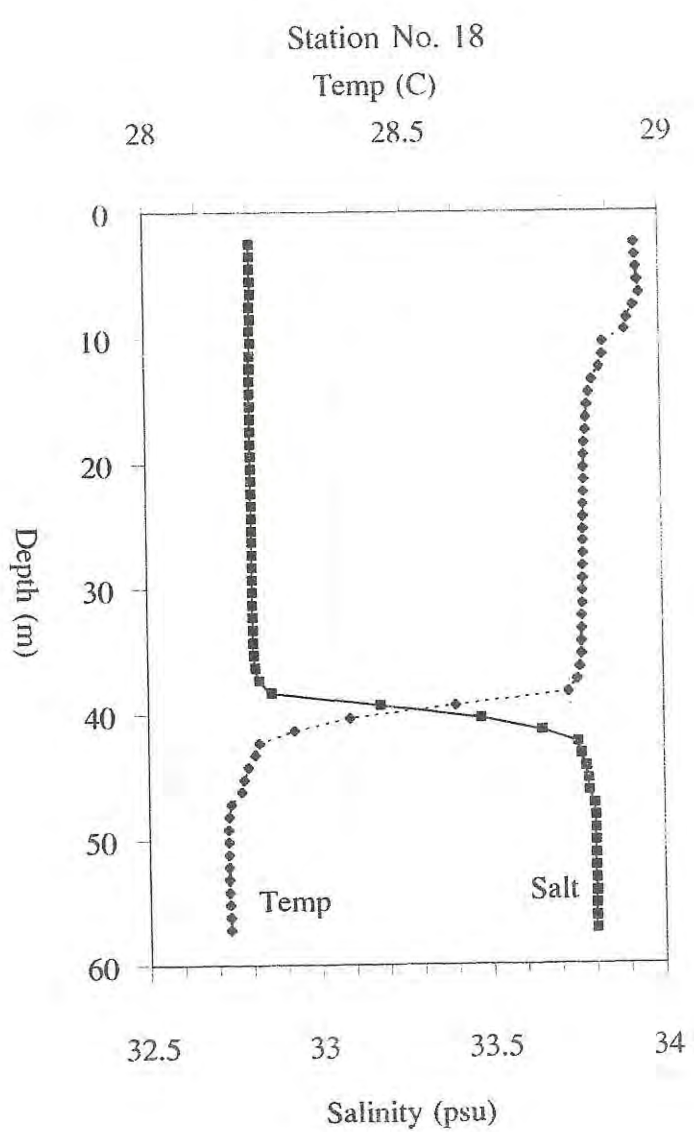

Station No. 15
Temp (C)
28.8
28.9
29
29.1
Salt
Temp
0
10
20
30
40
50
60
Depth (m)
32.82
32.83
32.84
Salinity (psu)

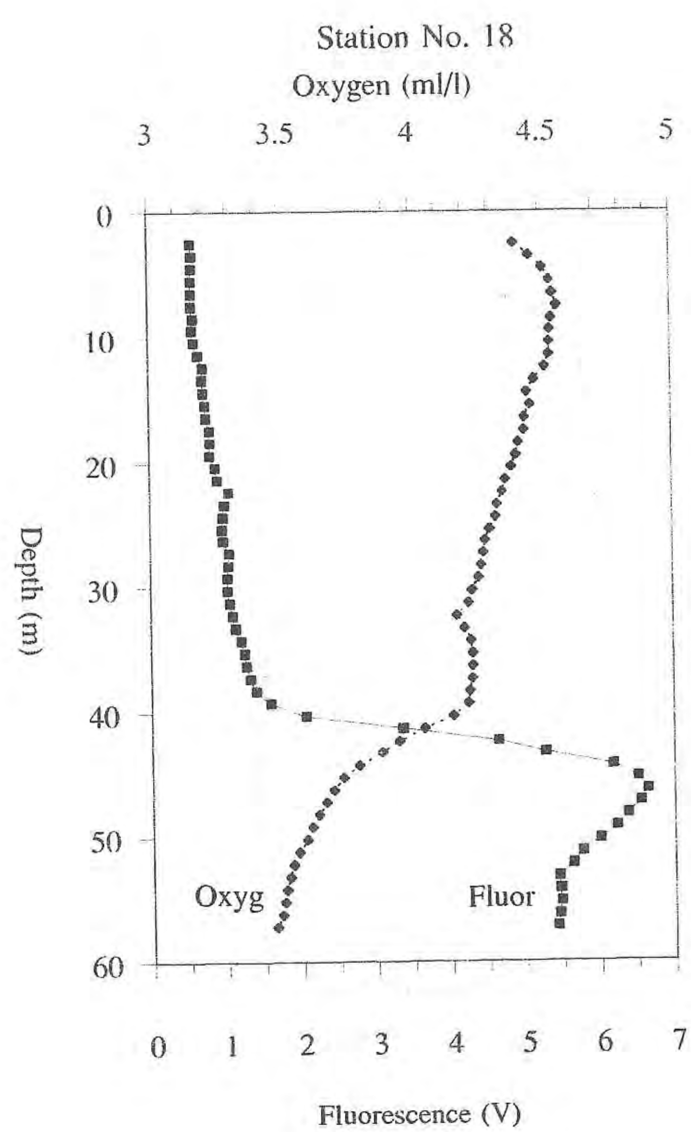

Station No. 16
Temp (C)
28.8
28.85
28.9
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
Salt
Temp
32.88
32.89
32.9
32.91
Salinity (psu)

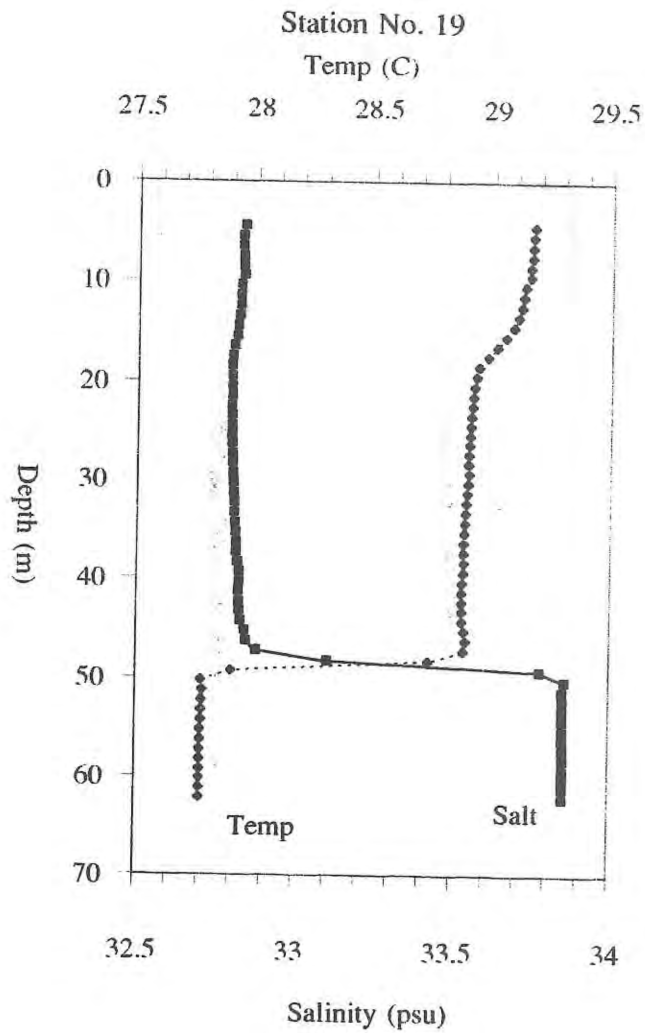

Station No. 16
Oxygen (ml/l)
4.3
4.35
4.4
4.45
4.5
4.55
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
Oxyg
Fluor
2
2.5
3
3.5
Fluorescence (V)

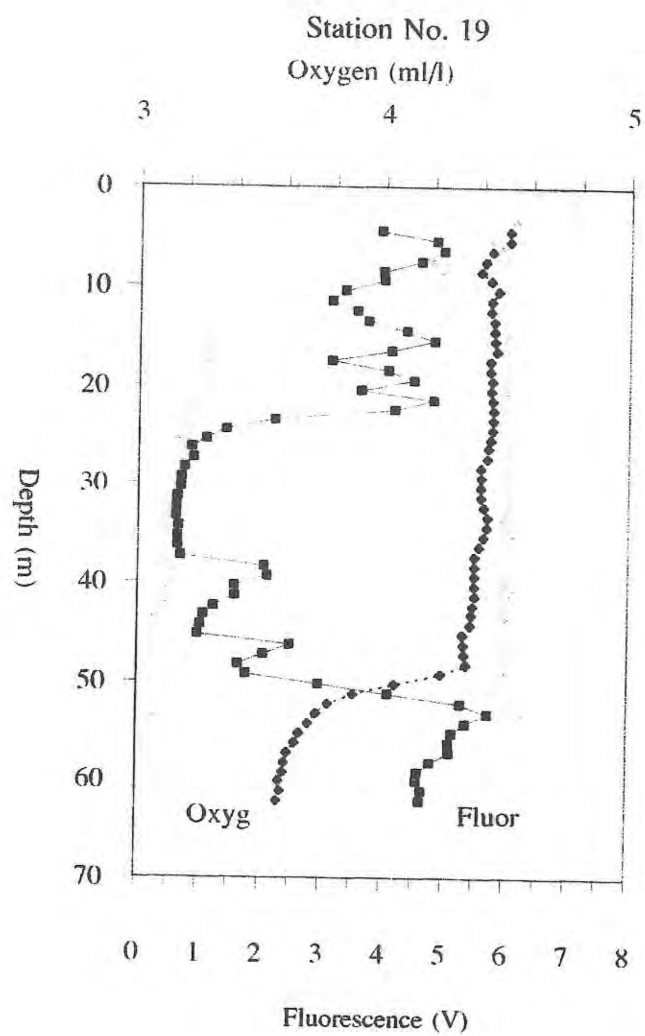

Station No. 17
Temp (C)
28.6
28.8
29
29.2
0
5
10
15
20
25
30
35
40
45
Depth (m)
Temp
Salt
32
32.5
33
33.5
34
Salinity (psu)

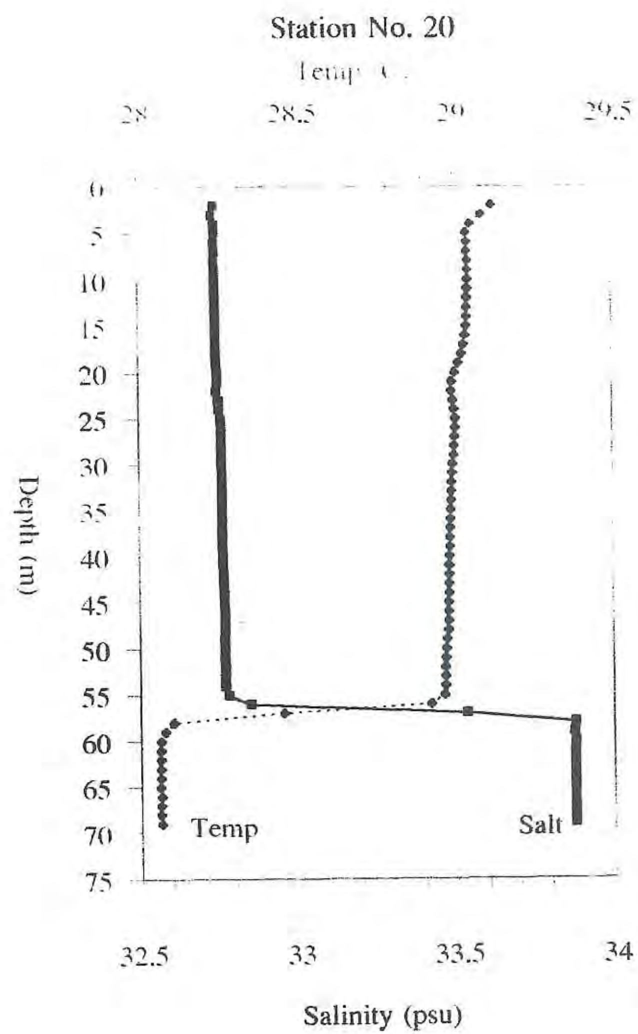

Station No. 17
Oxygen (ml/l)
3.8
4
4.2
4.4
4.6
0
5
10
15
20
25
30
35
40
45
Depth (m)
Oxyg
Fluor
0
1
2
3
4
5
6
Fluorescence (V)

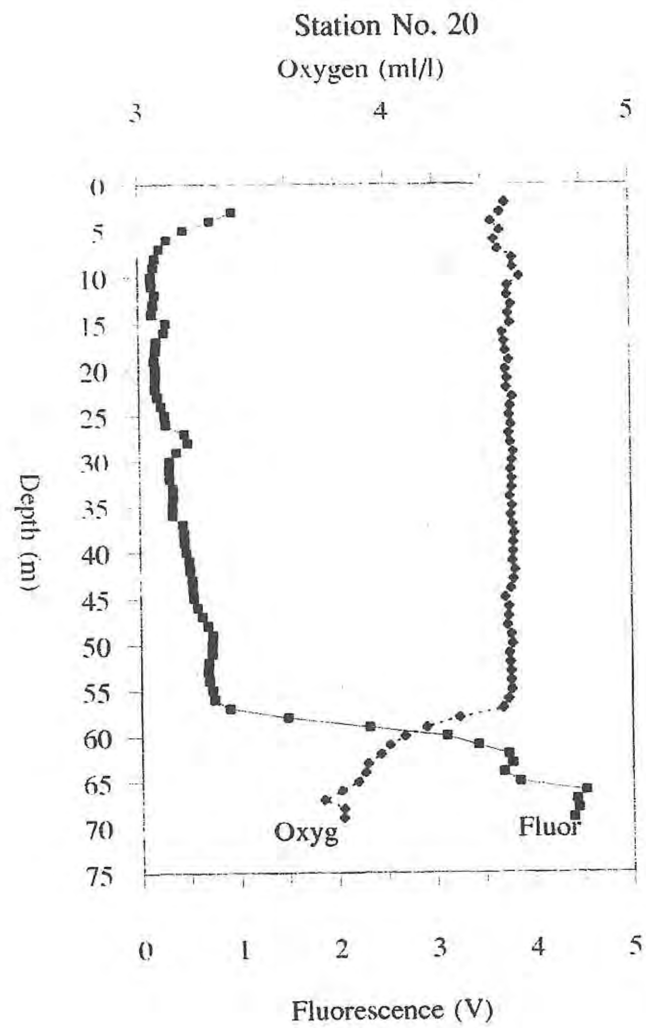

Station No. 18
Temp (C)
28
28.5
29
0
10
20
30
40
50
60
Depth (m)
Temp
Salt
32.5
33
33.5
34
Salinity (psu)

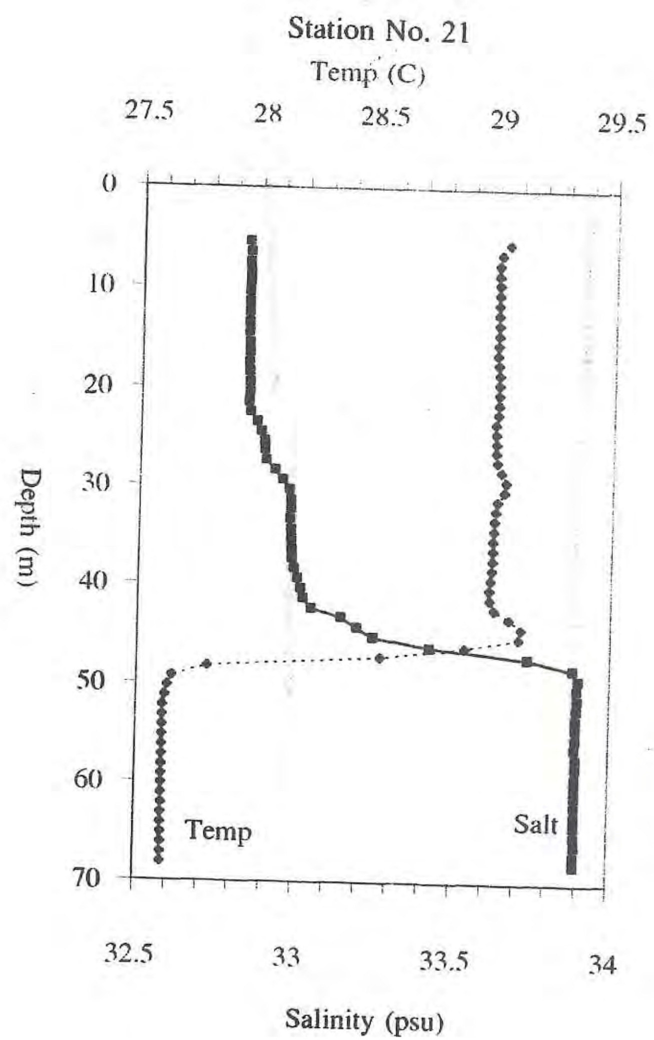

Station No. 18
Oxygen (ml/l)
3
3.5
4
4.5
5
0
10
20
30
40
50
60
Depth (m)
Oxyg
Fluor
0
1
2
3
4
5
6
7
Fluorescence (V)

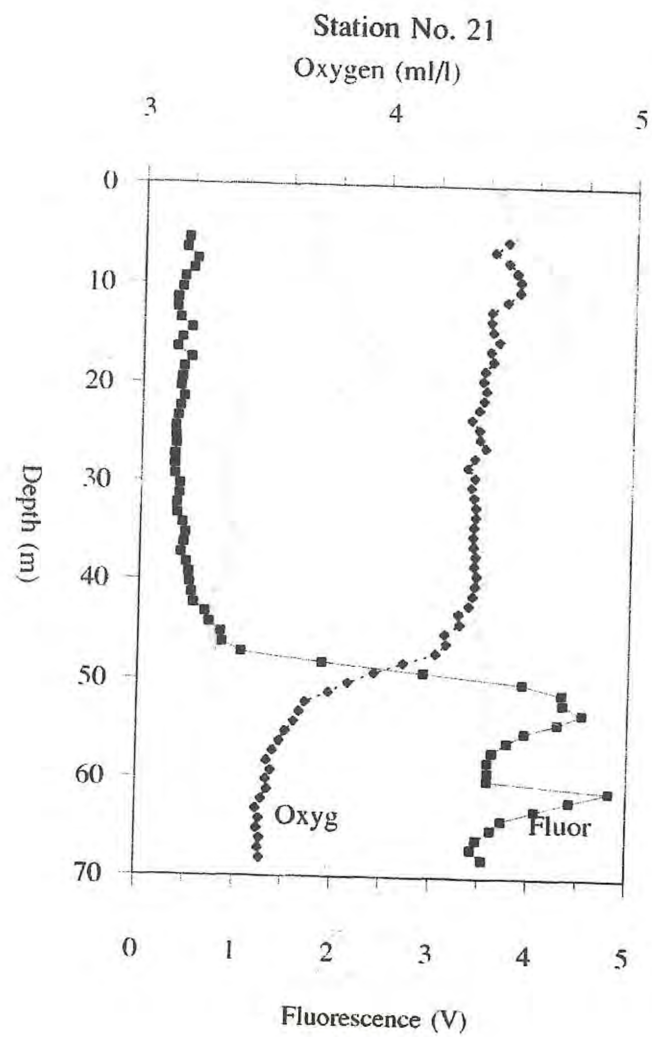

Station No. 19
Temp (C)
27.5
28
28.5
29
29.5
Depth (m)
0
10
20
30
40
50
60
70
Temp
Salt
32.5
33
33.5
34
Salinity (psu)

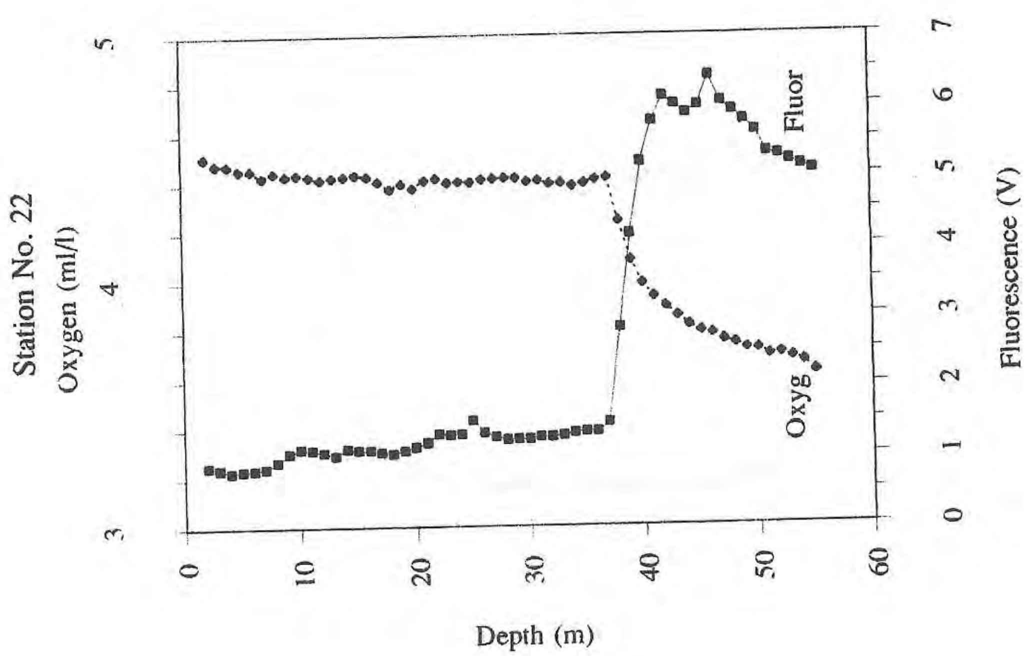

Station No. 19
Oxygen (ml/l)
3
4
5
Depth (m)
0
10
20
30
40
50
60
70
Oxyg
Fluor
0
1
2
3
4
5
6
7
8
Fluorescence (V)

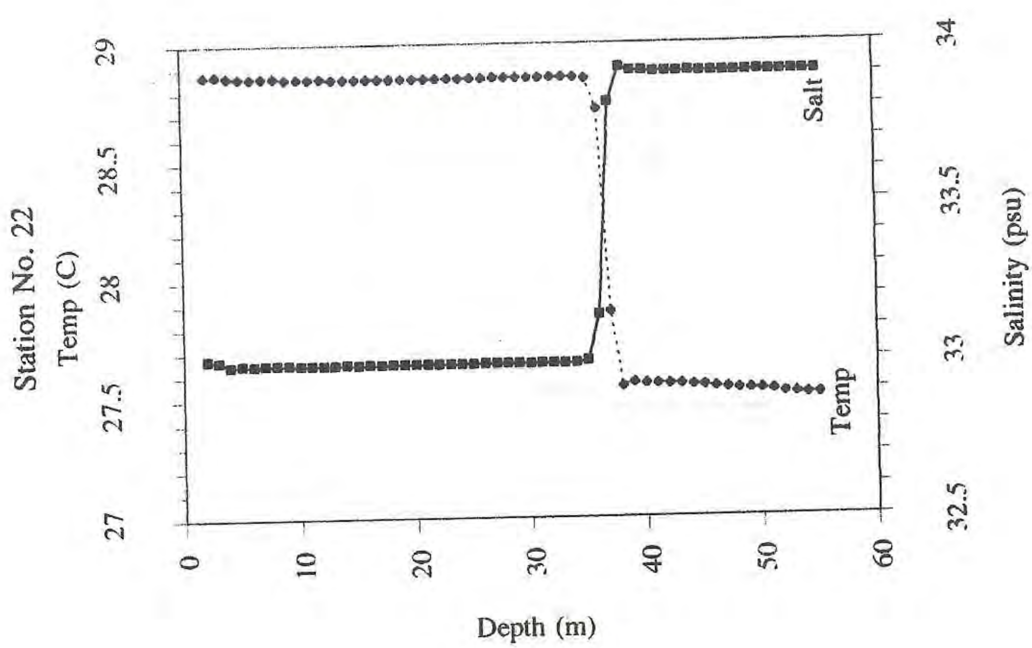

Station No. 20
Temp (C)
28
28.5
29
29.5
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Temp
Salt
32.5
33
33.5
34
Salinity (psu)

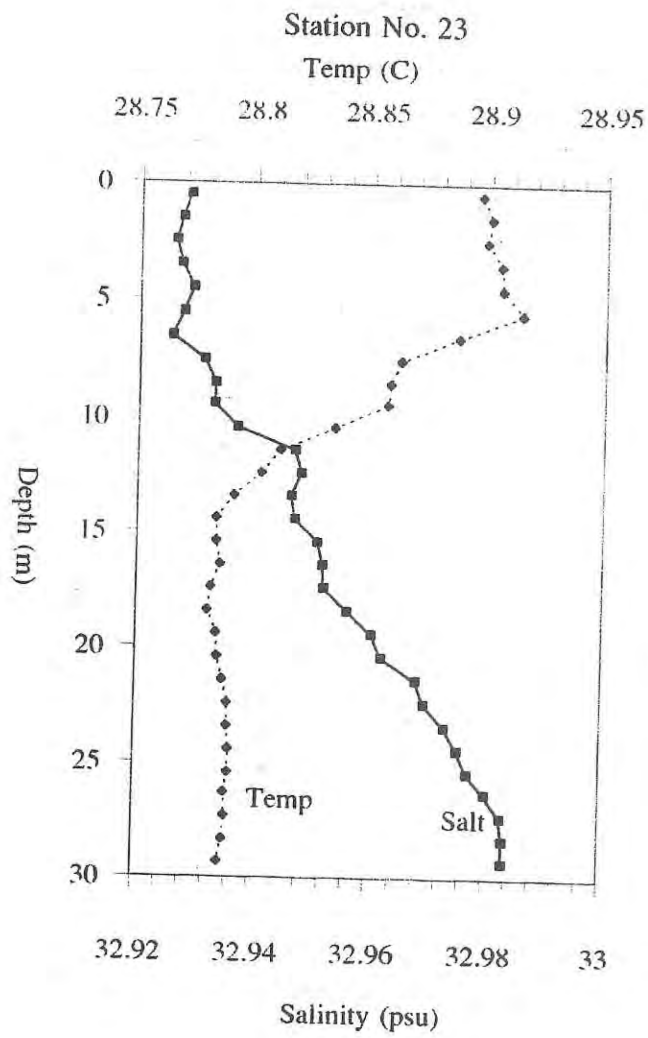

Station No. 20
Oxygen (ml/l)
3
4
5
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Oxyg
Fluor
0
1
2
3
4
5
Fluorescence (V)


Station No. 21
Temp (C)
27.5
28
28.5
29
29.5
Depth (m)
0
10
20
30
40
50
60
70
Temp
Salt
32.5
33
33.5
34
Salinity (psu)

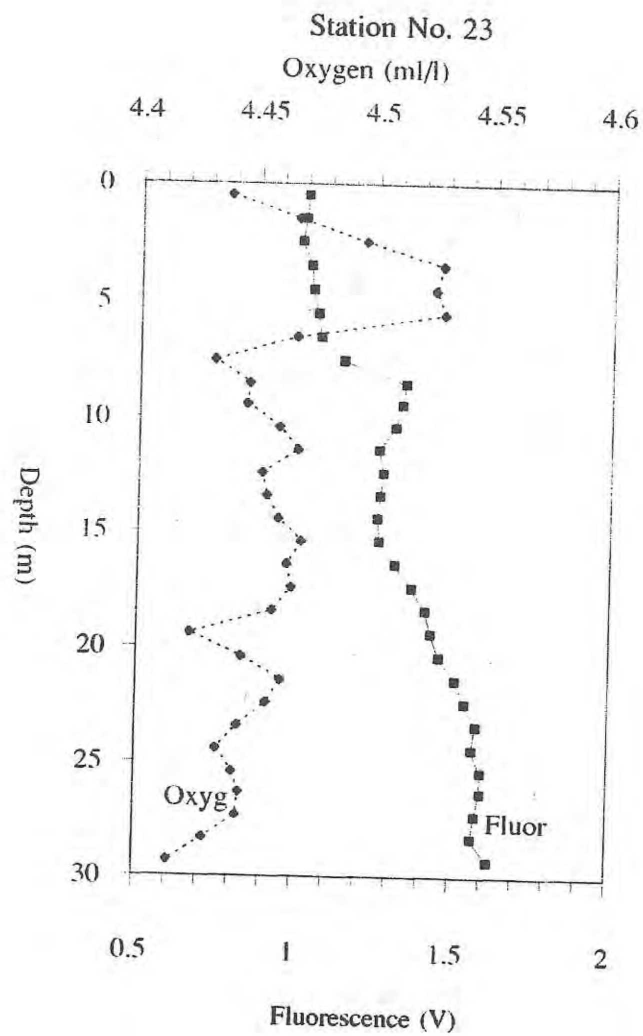

Station No. 21
Oxygen (ml/l)
3
4
5
Depth (m)
0
10
20
30
40
50
60
70
Oxyg
Fluor
0
1
2
3
4
5
Fluorescence (V)


Station No. 22
Oxygen (ml/l)
Fluorescence (V)
Depth (m)
Fluor
Oxyg

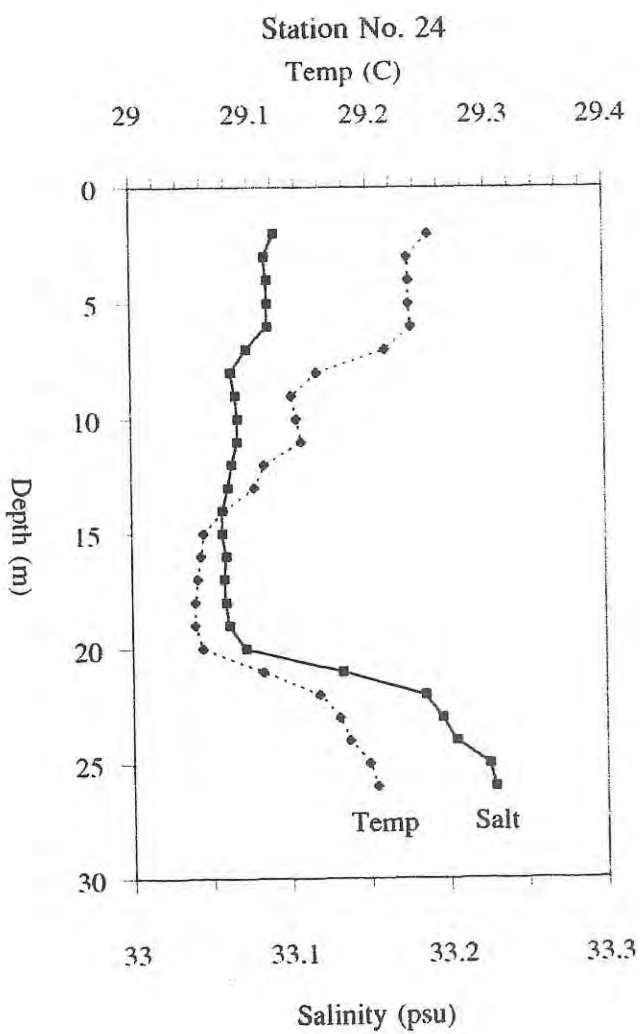

Station No. 22
Temp (C)
Salinity (psu)
Depth (m)
Salt
Temp

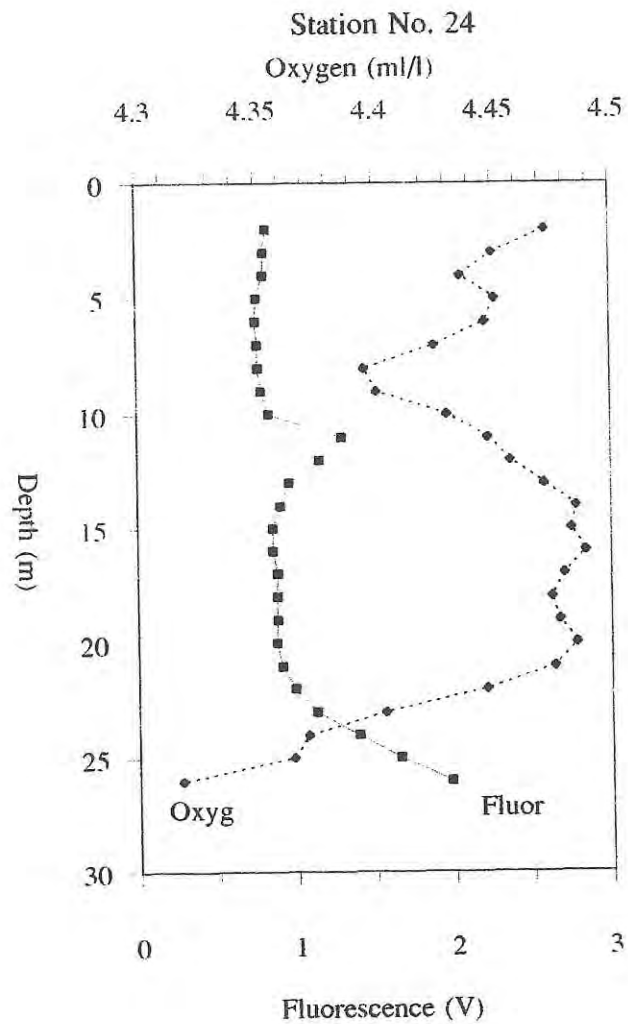


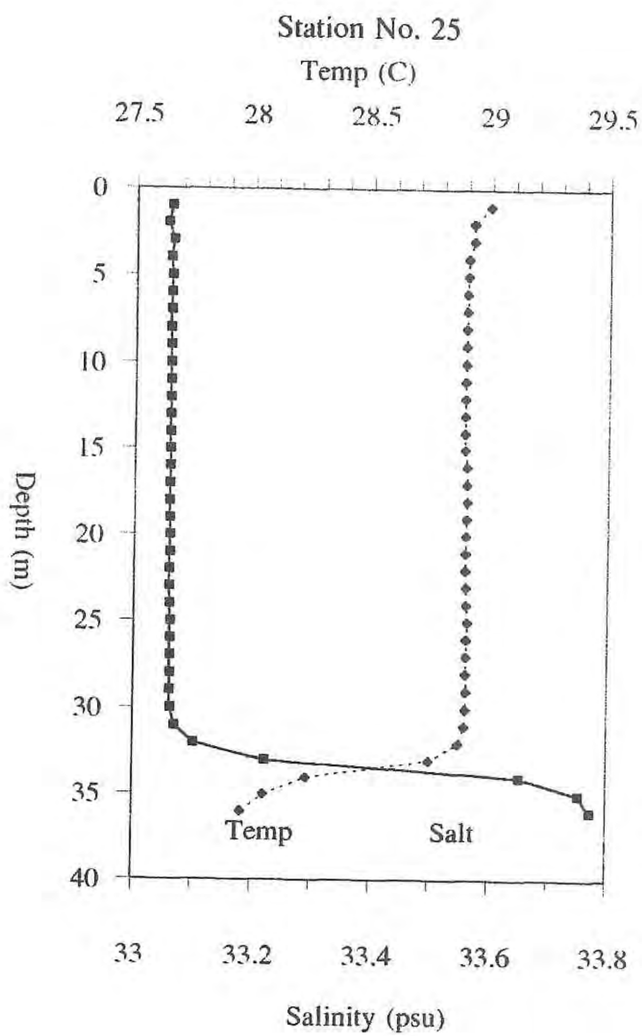
Station No. 23
Temp (C)
28.75
28.8
28.85
28.9
28.95
0
5
10
15
20
25
30
Depth (m)
Temp
Salt
32.92
32.94
32.96
32.98
33
Salinity (psu)

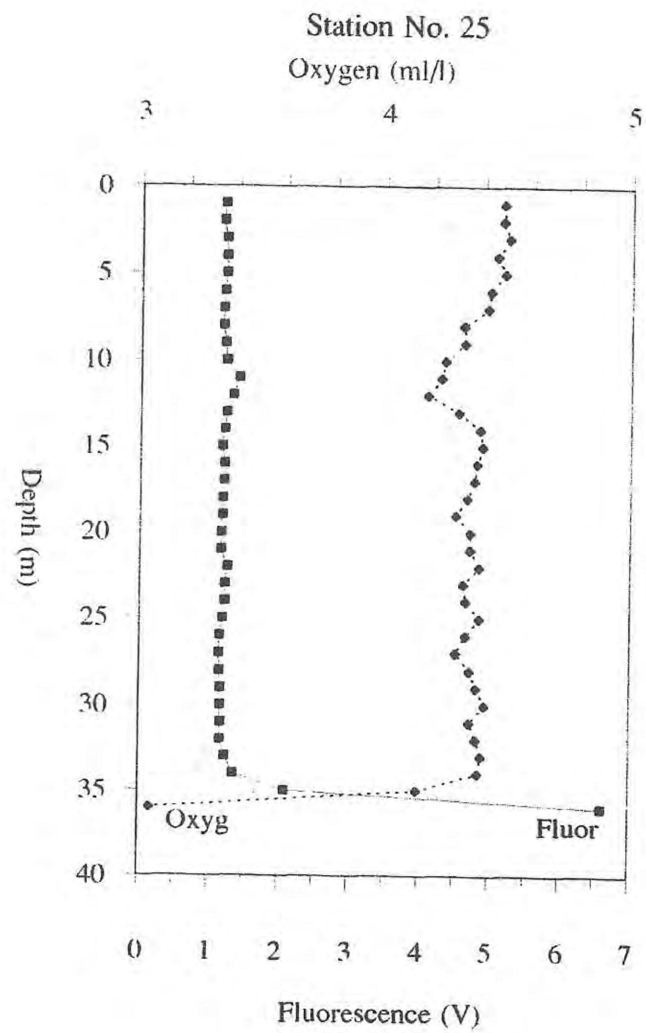


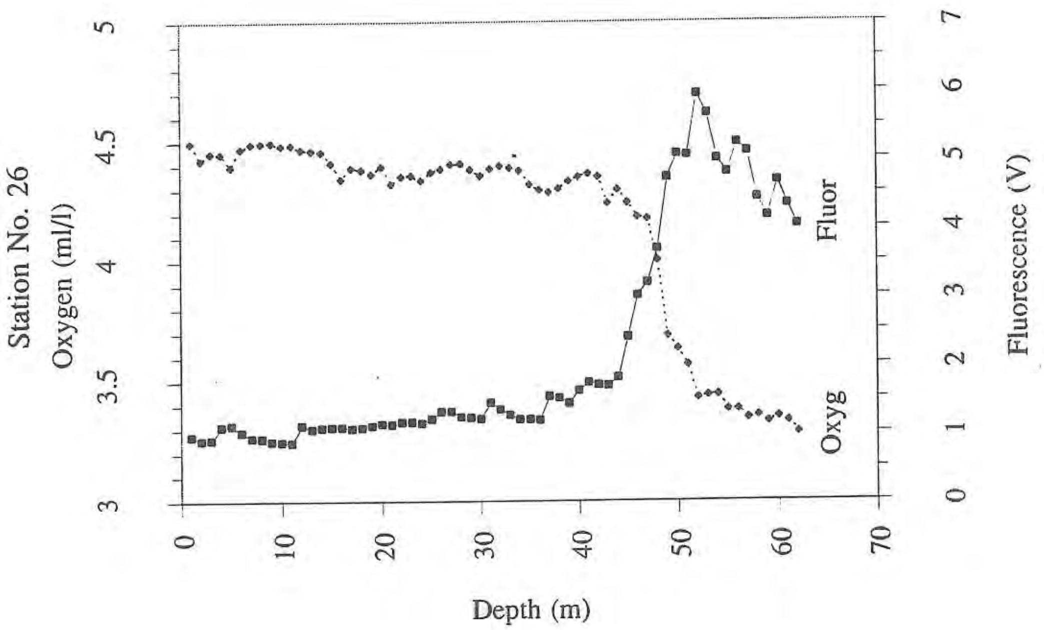
Station No. 23
Oxygen (ml/l)
4.4
4.45
4.5
4.55
4.6
0
5
10
15
20
25
30
Depth (m)
Oxyg
Fluor
0.5
1
1.5
2
Fluorescence (V)

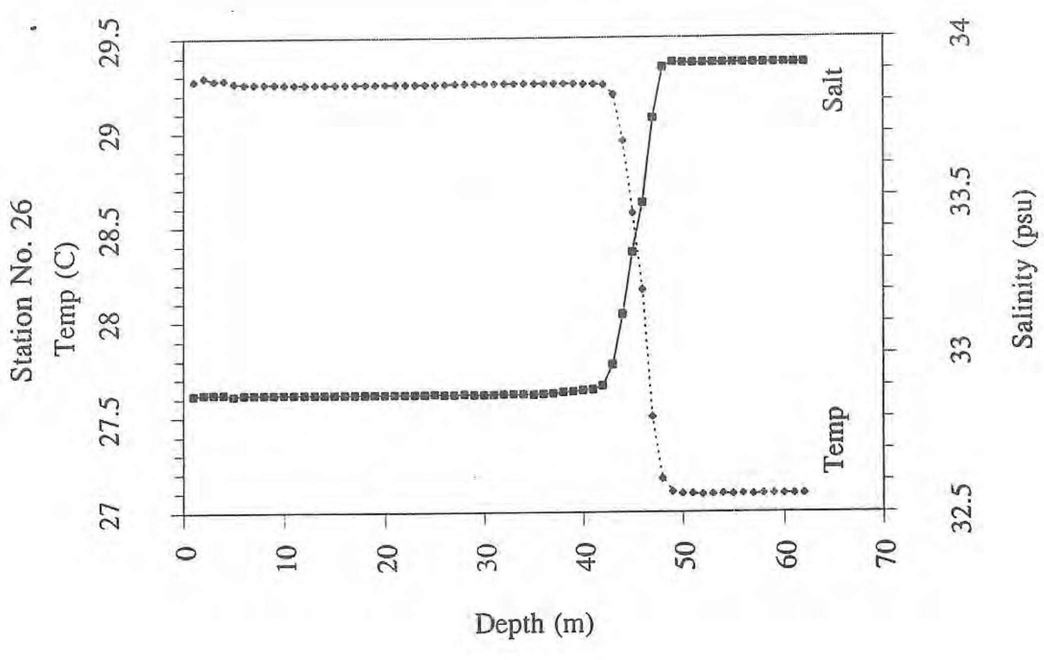

Station No. 24
Temp (C)
29
29.1
29.2
29.3
29.4
Depth (m)
0
5
10
15
20
25
30
Temp
Salt
33
33.1
33.2
33.3
Salinity (psu)

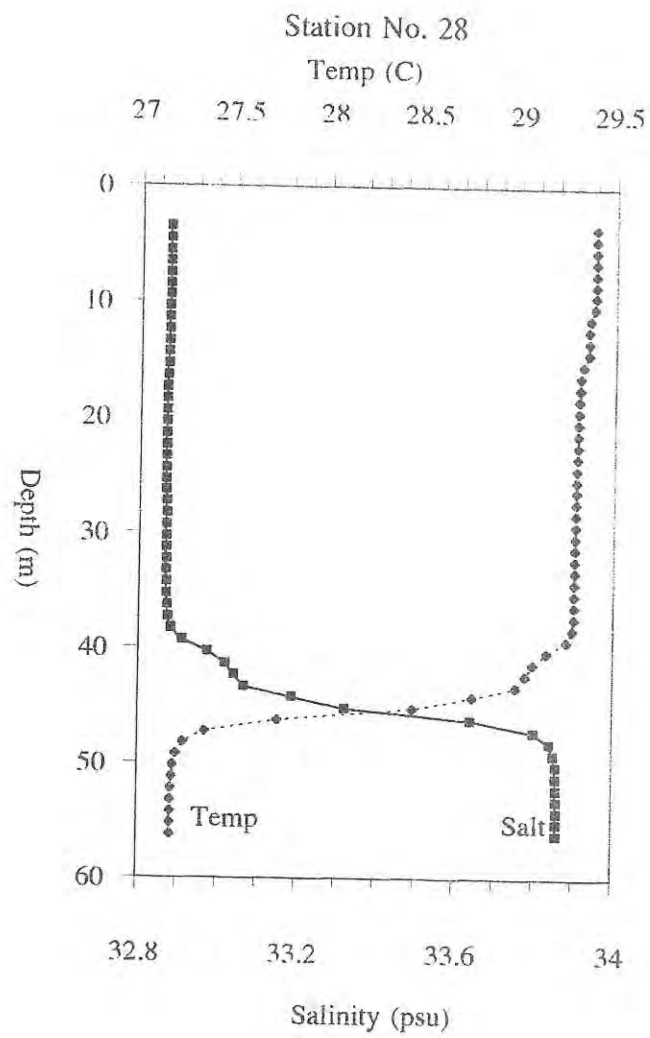

Station No. 24
Oxygen (ml/l)
4.3
4.35
4.4
4.45
4.5
Depth (m)
0
5
10
15
20
25
30
Oxyg
Fluor
0
1
2
3
Fluorescence (V)

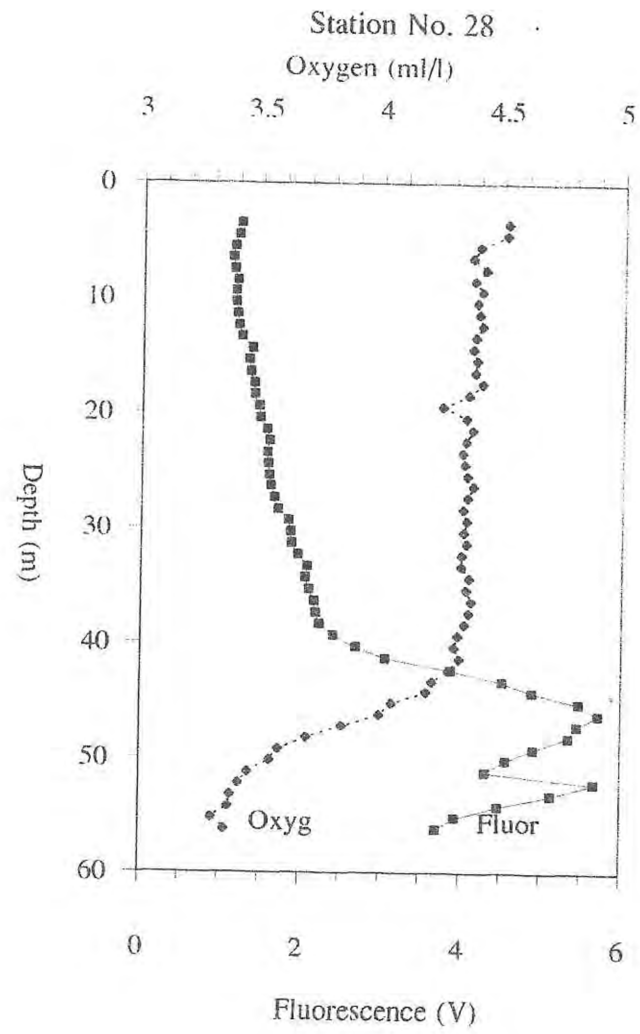

Station No. 25
Temp (C)
27.5
28
28.5
29
29.5
0
5
10
15
20
25
30
35
40
Depth (m)
Temp
Salt
33
33.2
33.4
33.6
33.8
Salinity (psu)

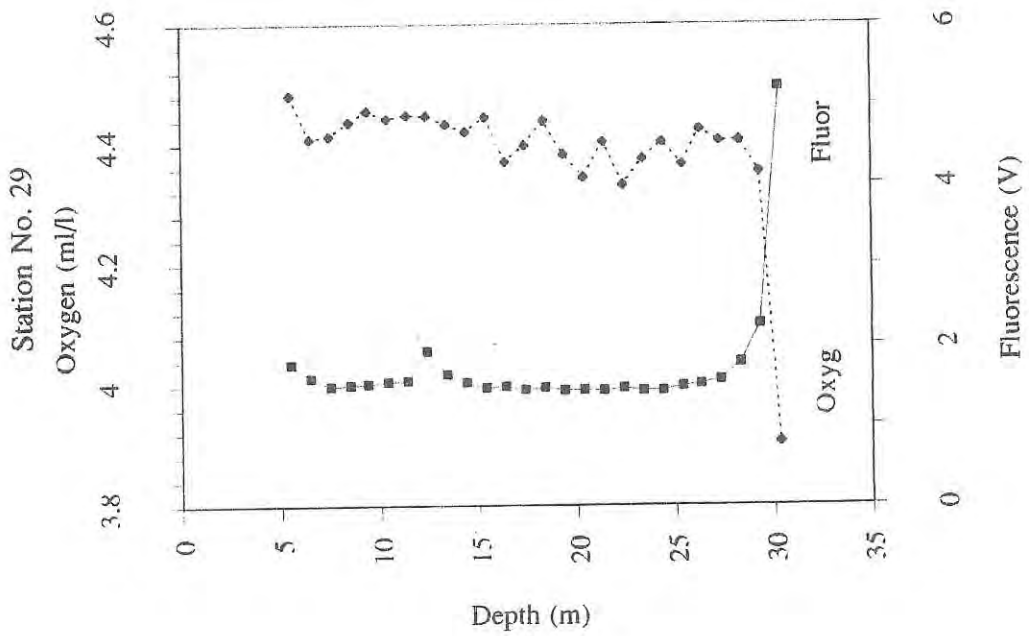

Station No. 25
Oxygen (ml/l)
3
4
5
0
5
10
15
20
25
30
35
40
Depth (m)
Oxyg
Fluor
0
1
2
3
4
5
6
7
Fluorescence (V)


Station No. 26
Oxygen (ml/l)
Fluorescence (V)
Depth (m)
Fluor
Oxyg

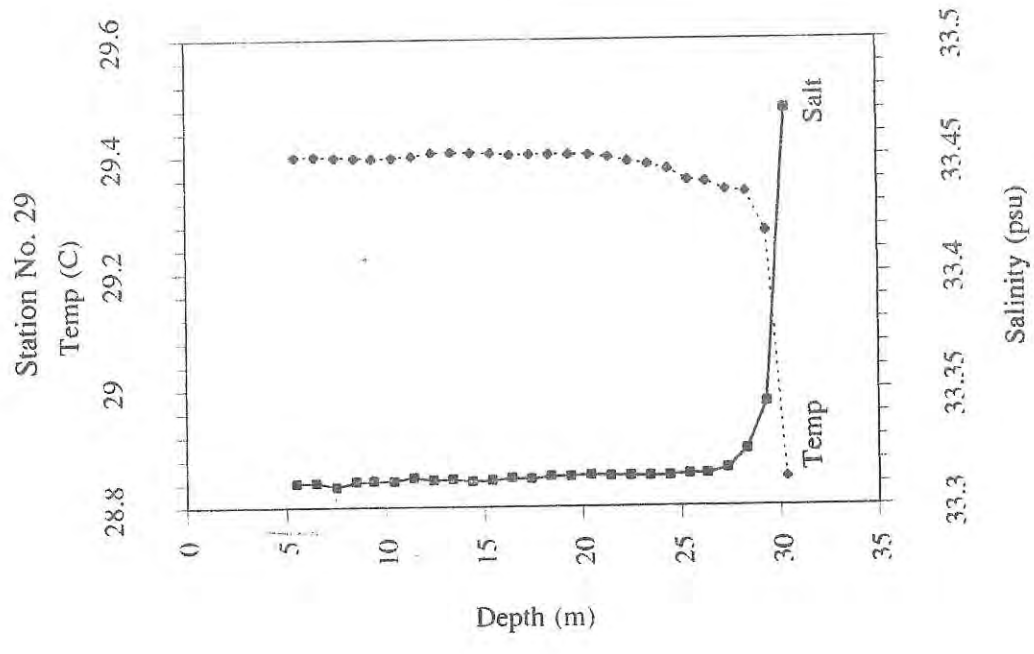

Station No. 26
Temp (C)
Salinity (psu)
Depth (m)
Salt
Temp


Station No. 28
Temp (C)
27
27.5
28
28.5
29
29.5
Depth (m)
0
10
20
30
40
50
60
Temp
Salt
32.8
33.2
33.6
34
Salinity (psu)

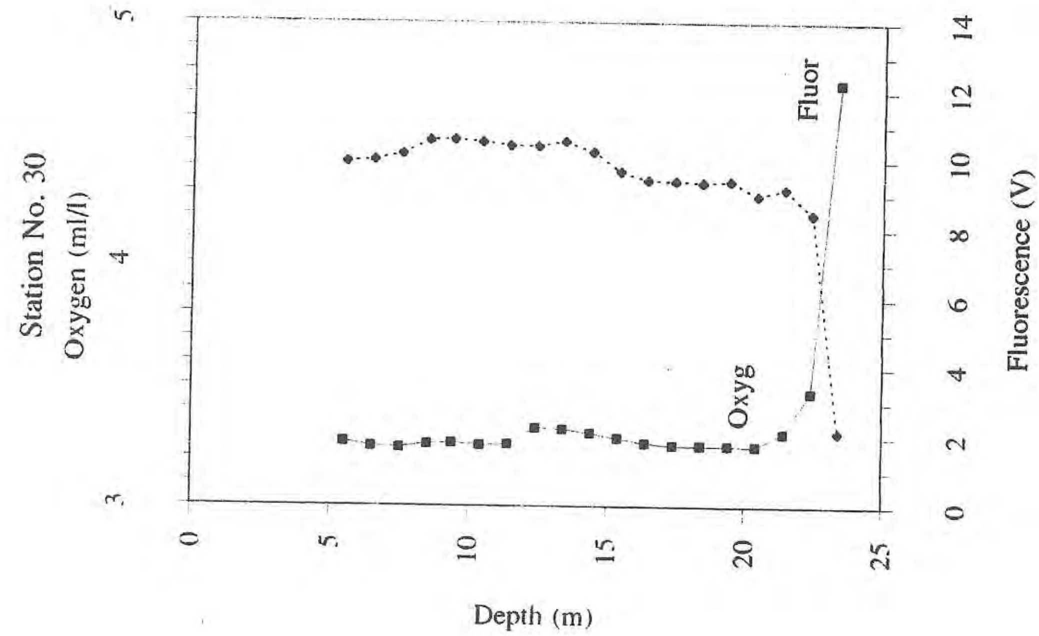

Station No. 28
Oxygen (ml/l)
3
3.5
4
4.5
5
Depth (m)
0
10
20
30
40
50
60
Oxyg
Fluor
0
2
4
6
Fluorescence (V)

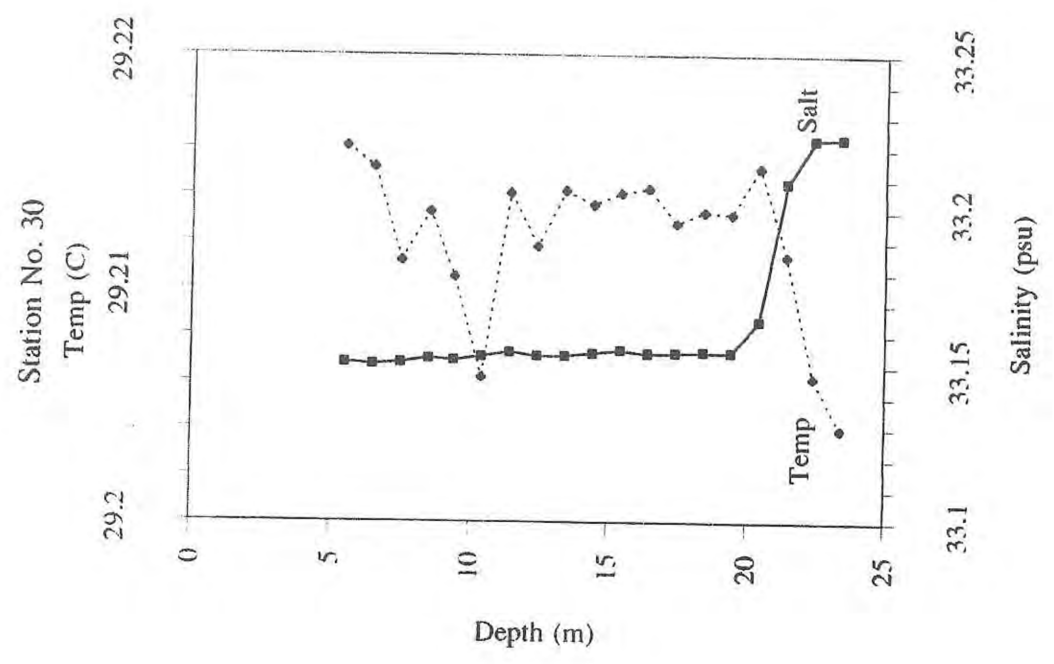


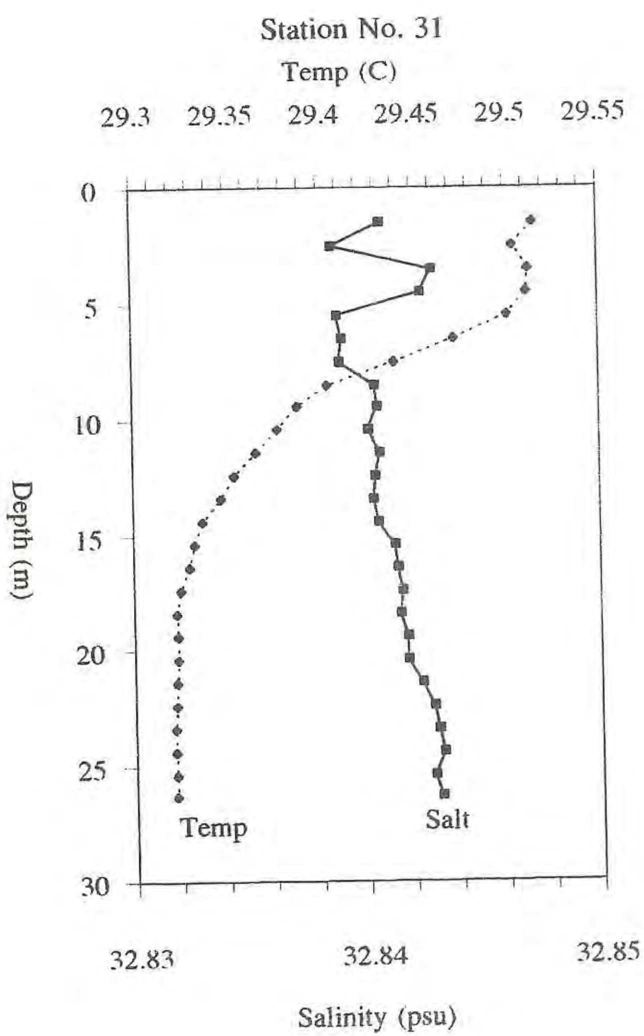
Station No. 29
Oxygen (ml/l)
3.8
4
4.2
4.4
4.6
Fluor
Oxyg
0
2
4
6
Fluorescence (V)
0
5
10
15
20
25
30
35
Depth (m)

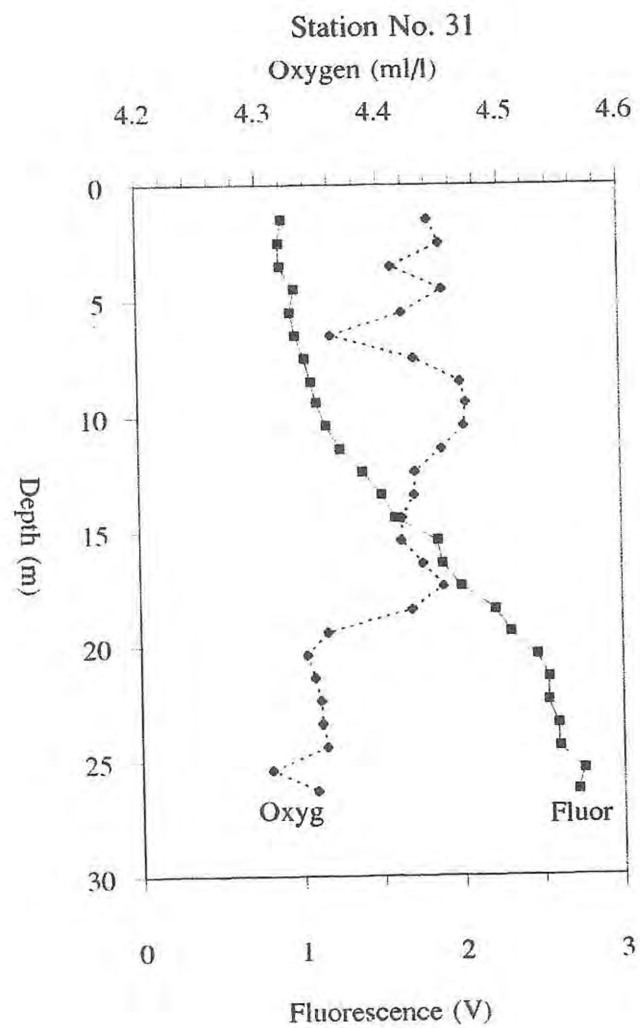


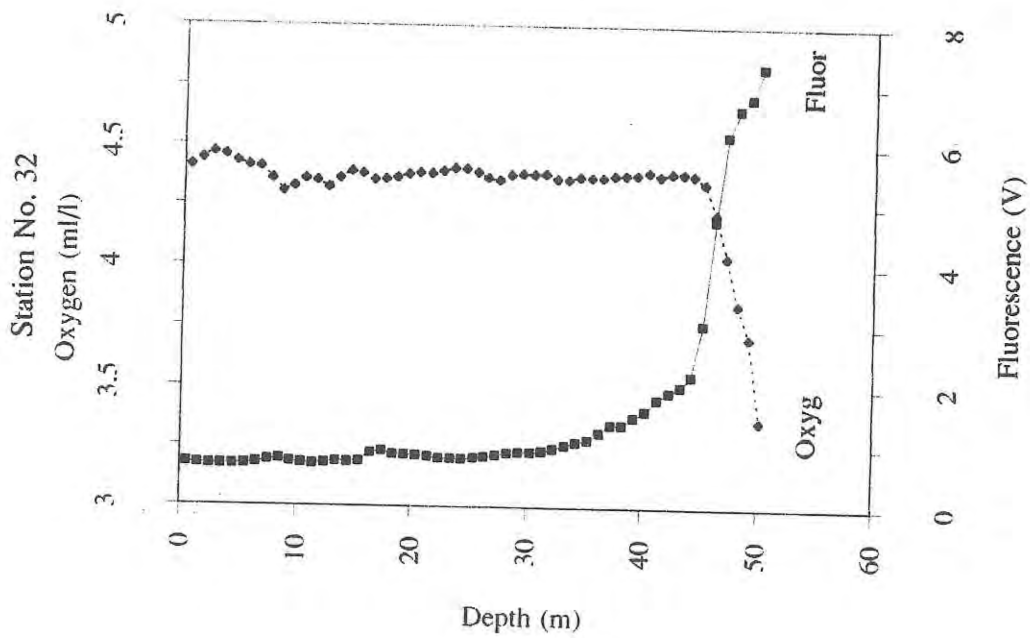
Station No. 29
Temp (C)
28.8
29
29.2
29.4
29.6
Salt
Temp
33.3
33.35
33.4
33.45
33.5
Salinity (psu)
0
5
10
15
20
25
30
35
Depth (m)

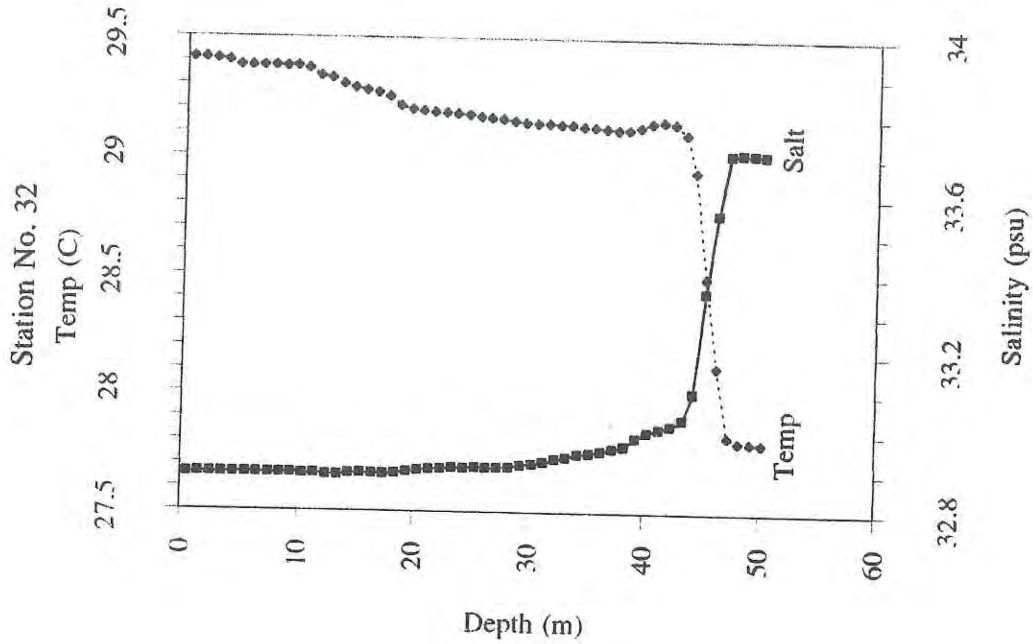

Station No. 30
Oxygen (ml/l)
3
4
5
Depth (m)
0
5
10
15
20
25
Fluorescence (V)
0
2
4
6
8
10
12
14
Fluor
Oxyg

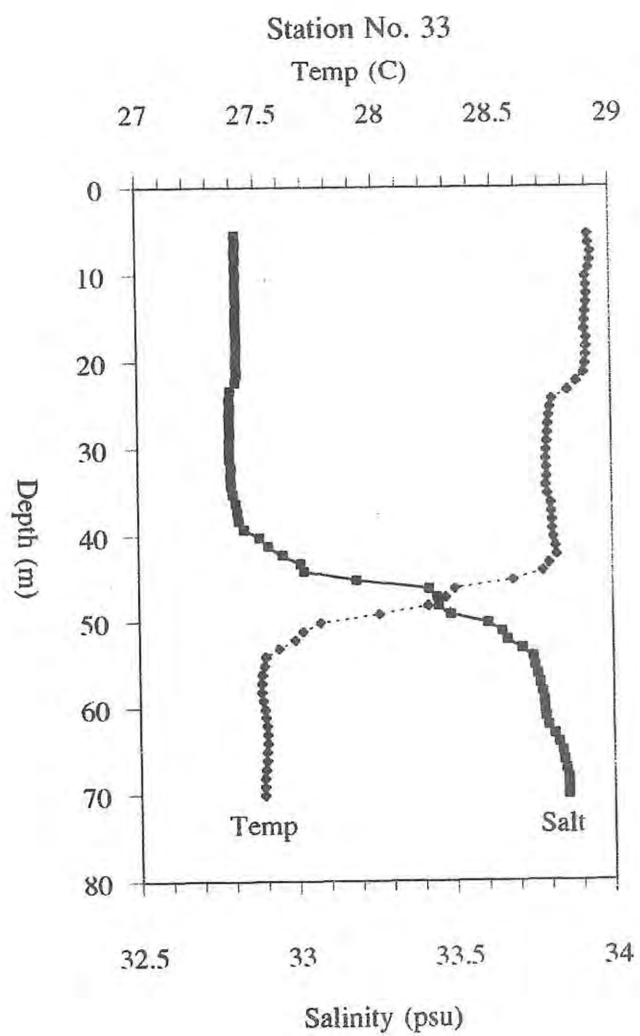

Station No. 30
Temp (C)
29.2
29.21
29.22
Depth (m)
0
5
10
15
20
25
Salinity (psu)
33.1
33.15
33.2
33.25
Salt
Temp

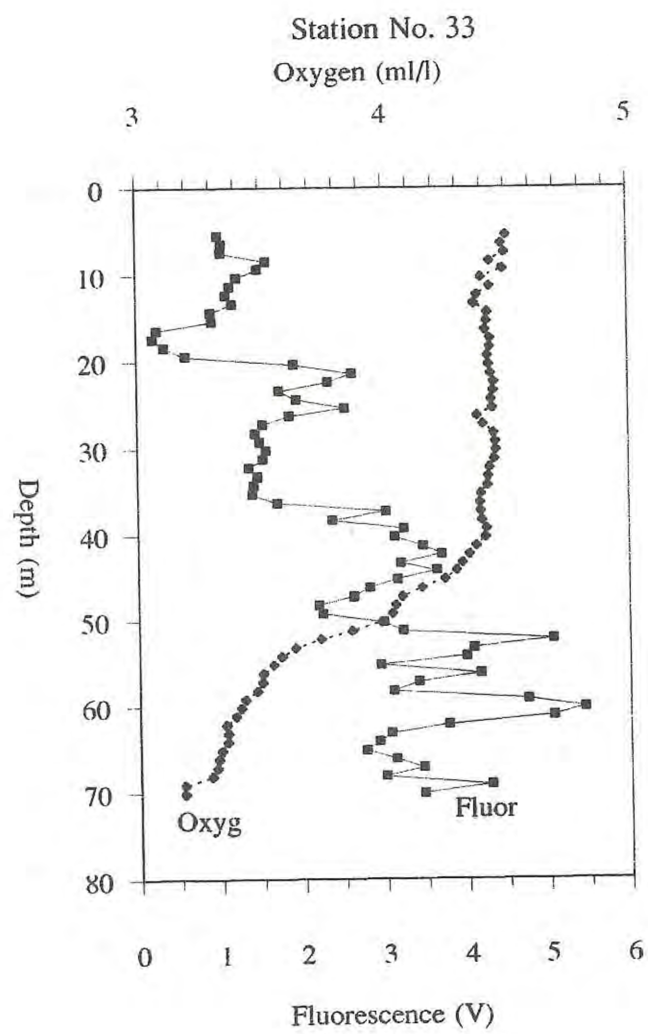

Station No. 31
Temp (C)
29.3 29.35 29.4 29.45 29.5 29.55
Depth (m)
0 5 10 15 20 25 30
Temp
Salt
32.83 32.84 32.85
Salinity (psu)

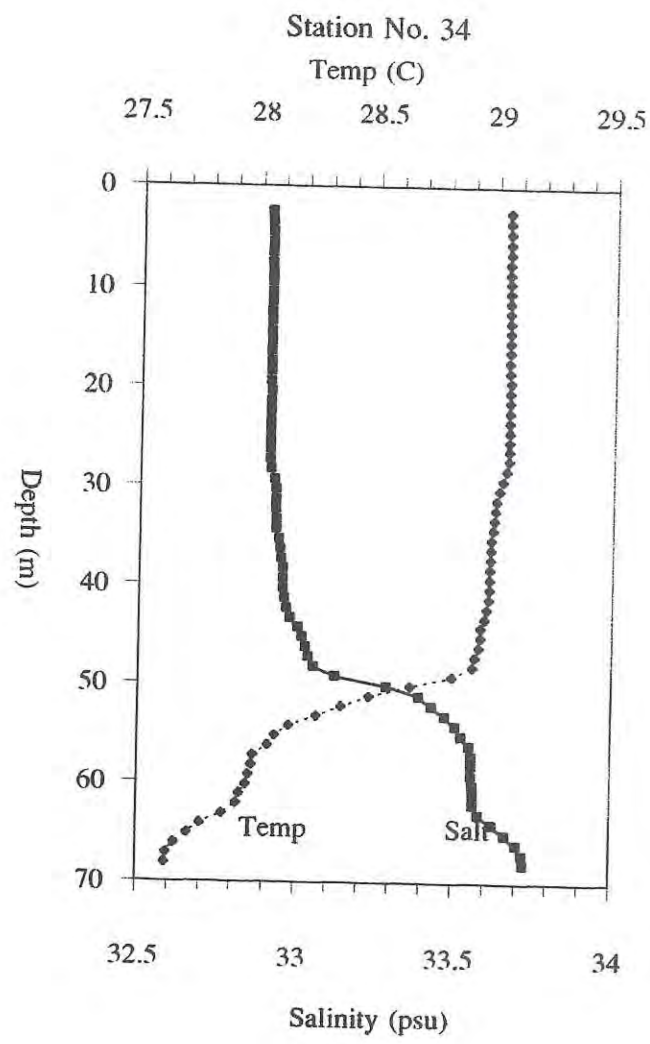

Station No. 31
Oxygen (ml/l)
4.2 4.3 4.4 4.5 4.6
Depth (m)
0 5 10 15 20 25 30
Oxyg
Fluor
0 1 2 3
Fluorescence (V)

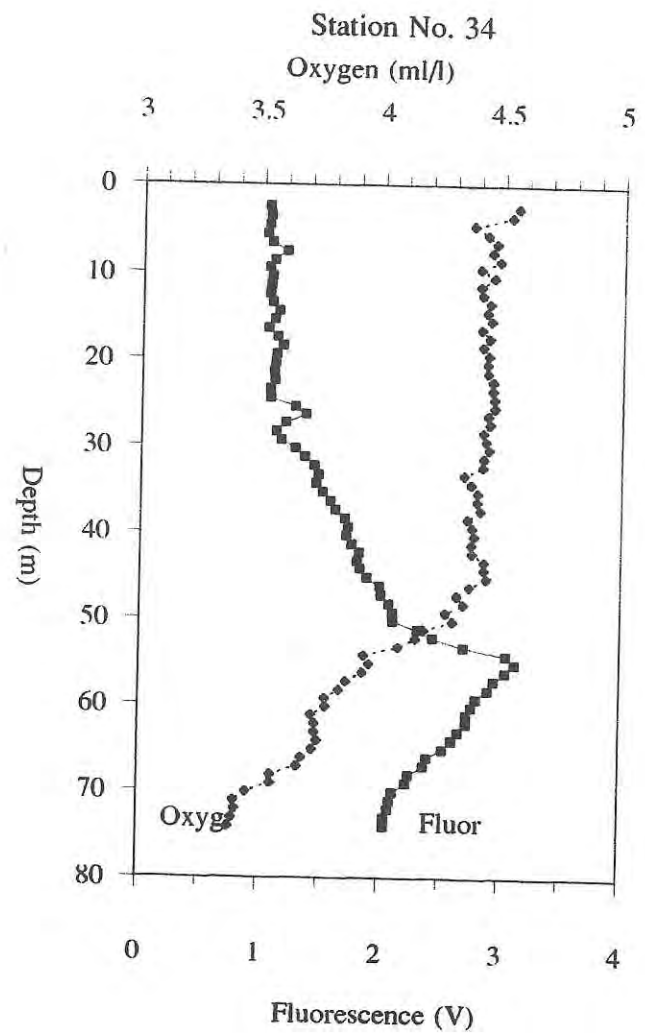

Station No. 32
Oxygen (ml/l)
3
3.5
4
4.5
5
Fluor
Oxyg
Fluorescence (V)
0
2
4
6
8
Depth (m)
0
10
20
30
40
50
60

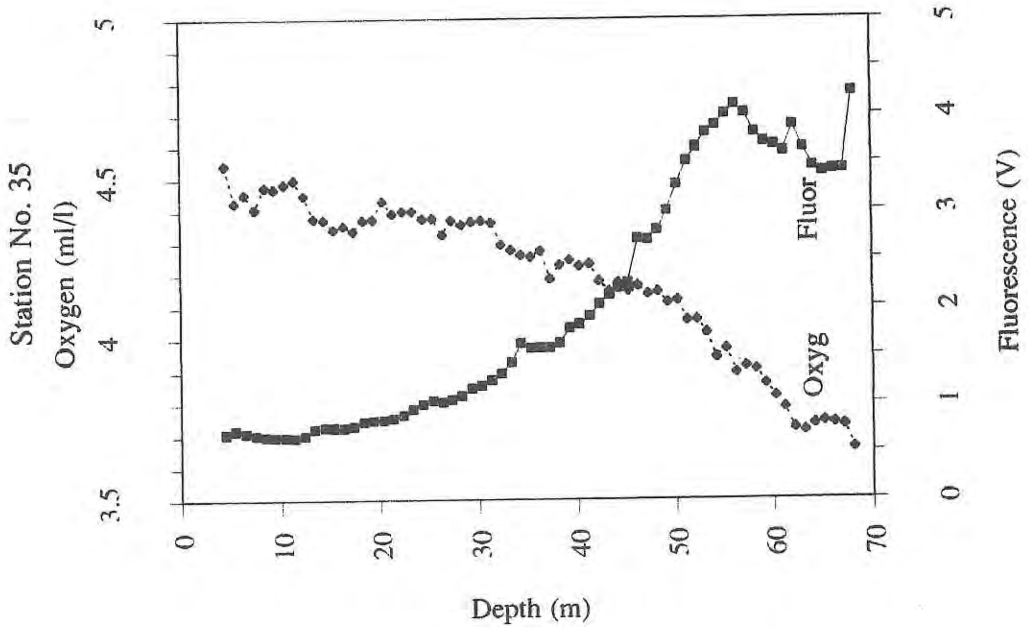

Station No. 32
Temp (C)
27.5
28
28.5
29
29.5
Salt
Temp
Salinity (psu)
32.8
33.2
33.6
34
Depth (m)
0
10
20
30
40
50
60

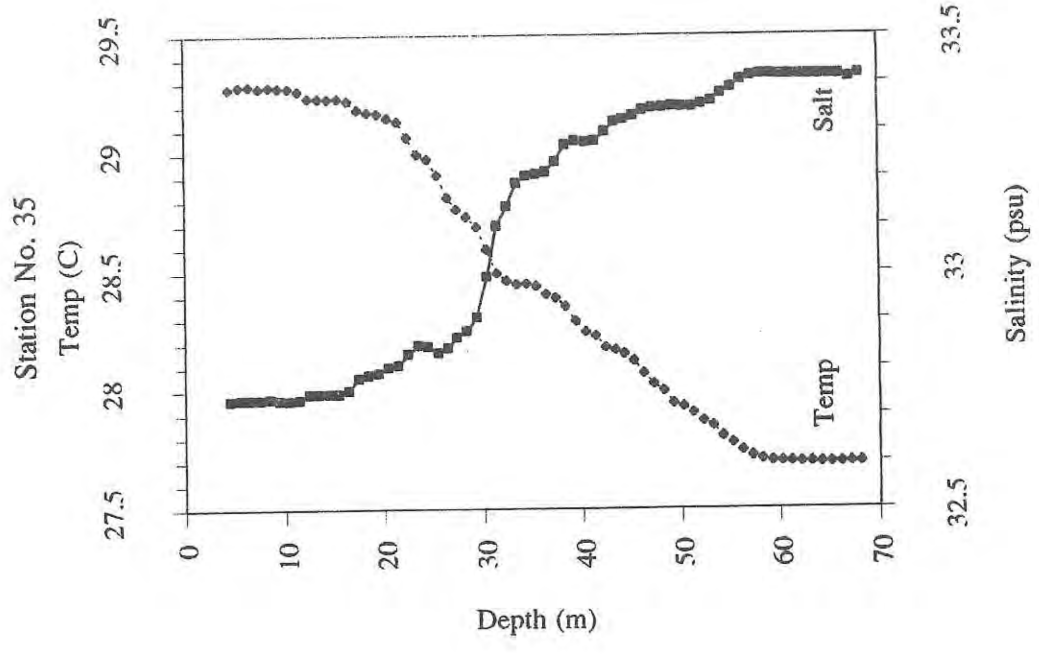

Station No. 33
Temp (C)
27
27.5
28
28.5
29
Depth (m)
0
10
20
30
40
50
60
70
80
Temp
Salt
32.5
33
33.5
34
Salinity (psu)

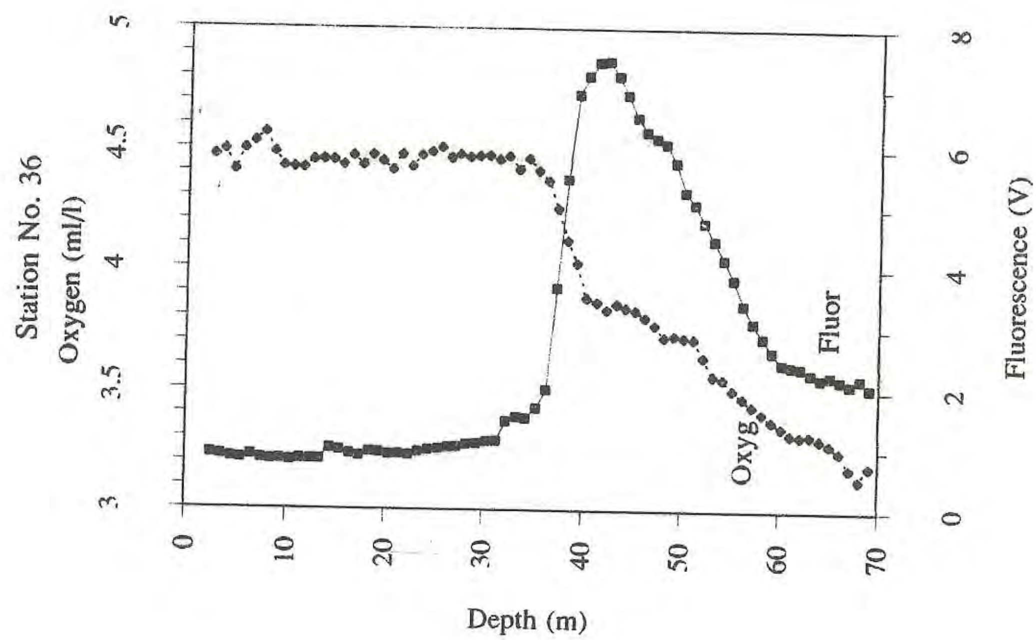

Station No. 33
Oxygen (ml/l)
3
4
5
Depth (m)
0
10
20
30
40
50
60
70
80
Oxyg
Fluor
0
1
2
3
4
5
6
Fluorescence (V)

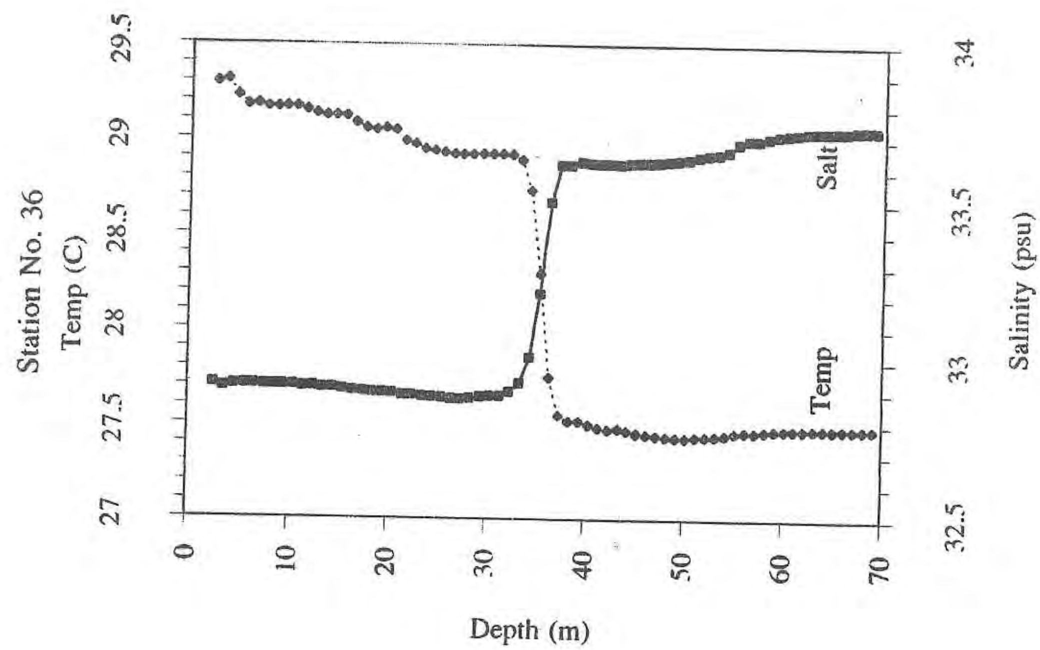

Station No. 34
Temp (C)
27.5
28
28.5
29
29.5
Depth (m)
0
10
20
30
40
50
60
70
Temp
Salt
32.5
33
33.5
34
Salinity (psu)

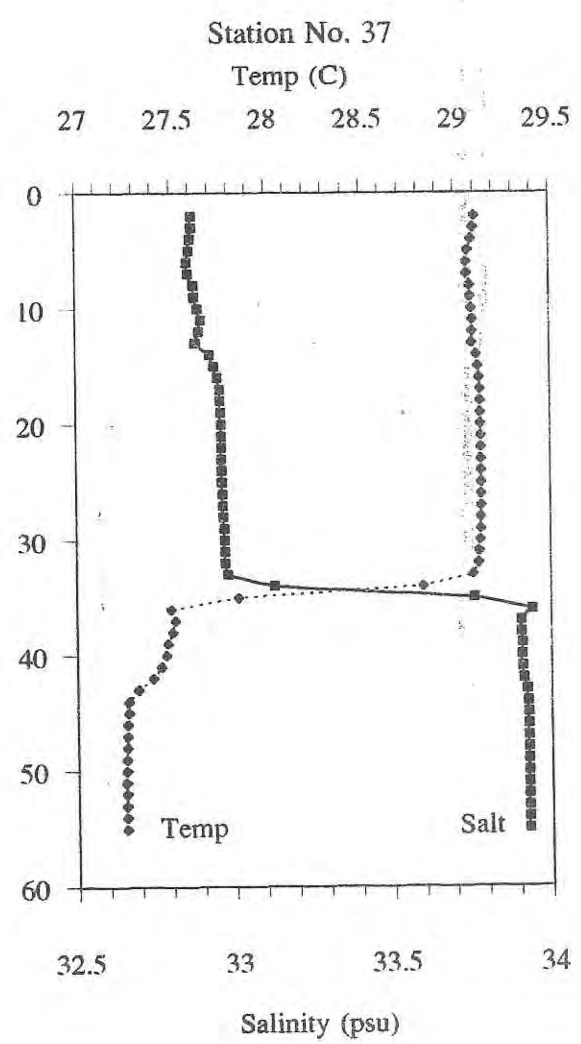

Station No. 34
Oxygen (ml/l)
3
3.5
4
4.5
5
Depth (m)
0
10
20
30
40
50
60
70
80
Oxyg
Fluor
0
1
2
3
4
Fluorescence (V)

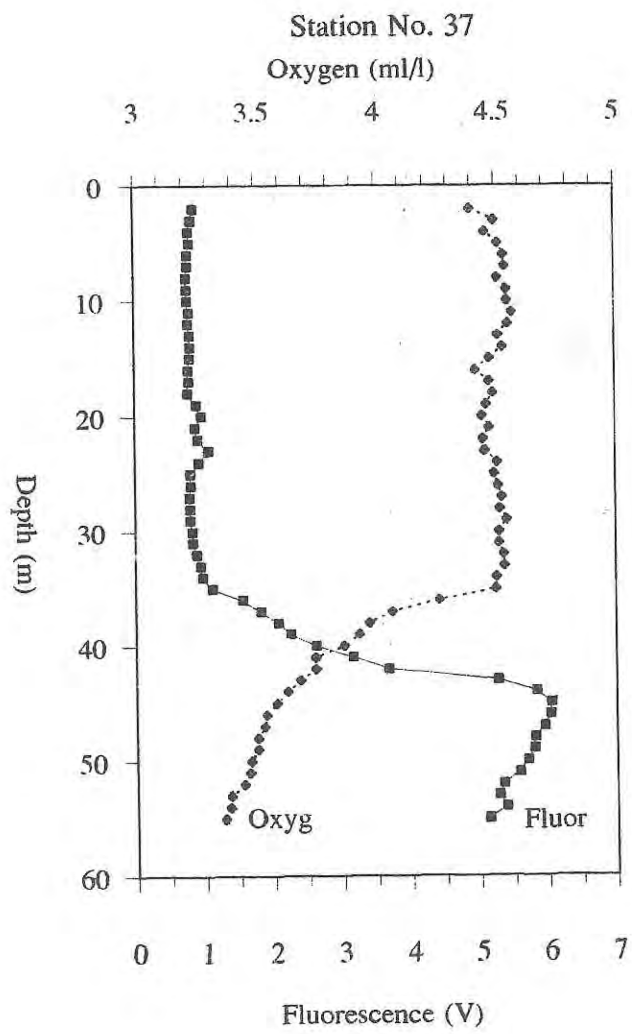

Station No. 35
Oxygen (ml/l)
3.5
4
4.5
5
Fluor
Oxyg
0
10
20
30
40
50
60
70
Depth (m)
0
1
2
3
4
5
Fluorescence (V)

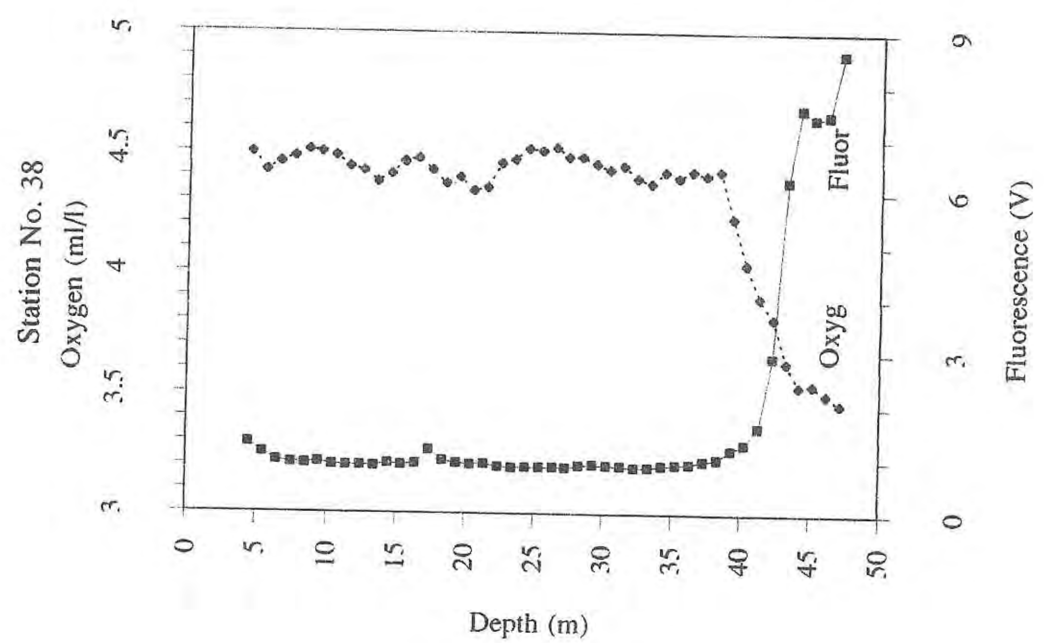

Station No. 35
Temp (C)
27.5
28
28.5
29
29.5
Salt
Temp
0
10
20
30
40
50
60
70
Depth (m)
32.5
33
33.5
Salinity (psu)

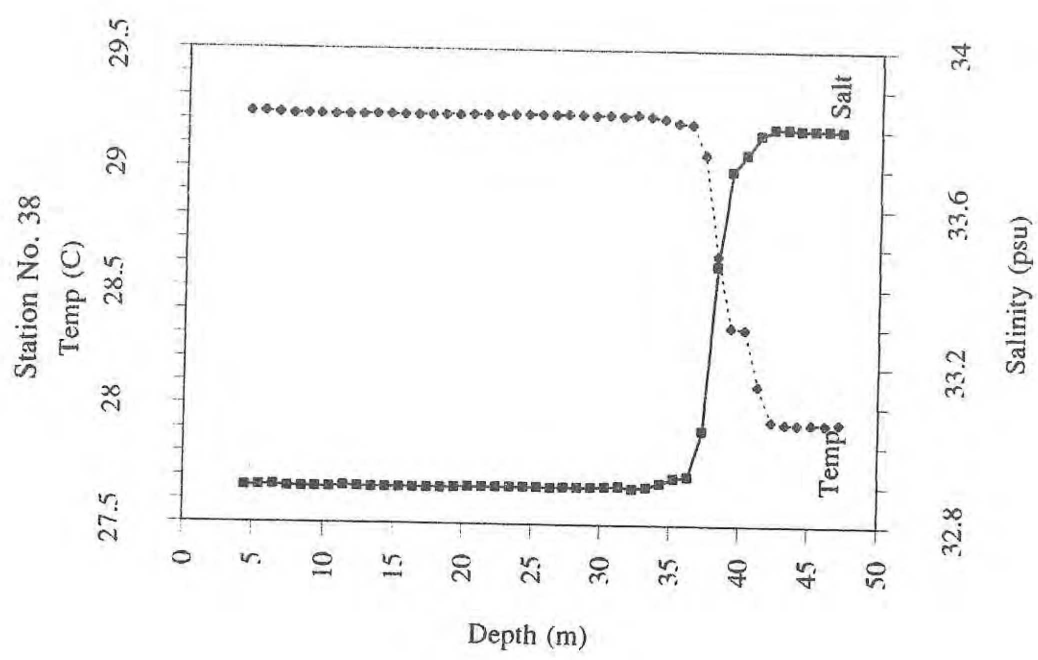

Station No. 36
Oxygen (ml/l)
3
3.5
4
4.5
5
Fluor
Oxyg
0
10
20
30
40
50
60
70
Depth (m)
0
2
4
6
8
Fluorescence (V)

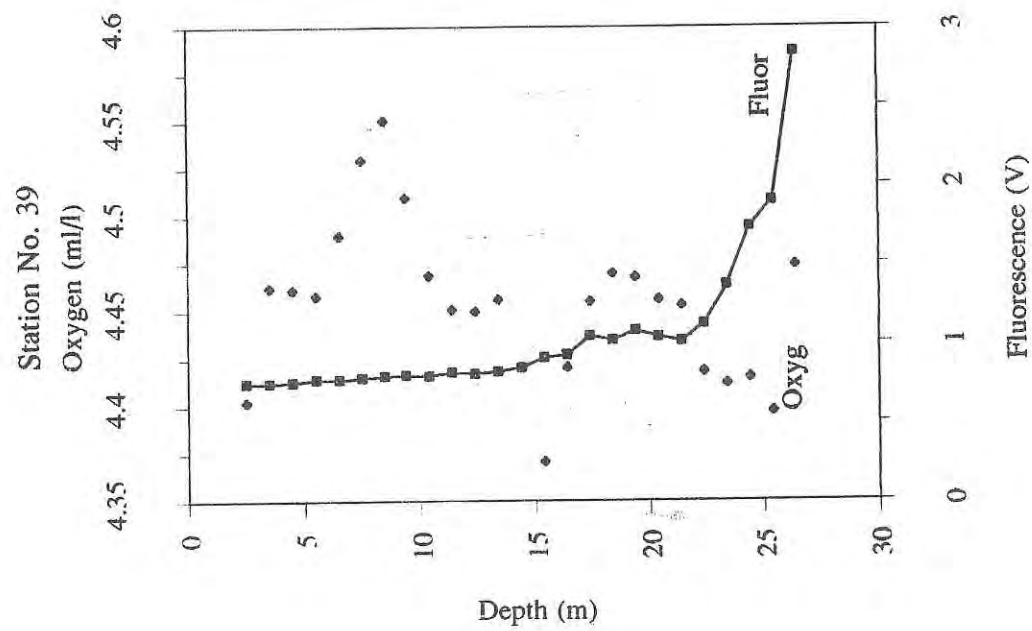

Station No. 36
Temp (C)
27
27.5
28
28.5
29
29.5
Salt
Temp
0
10
20
30
40
50
60
70
Depth (m)
32.5
33
33.5
34
Salinity (psu)

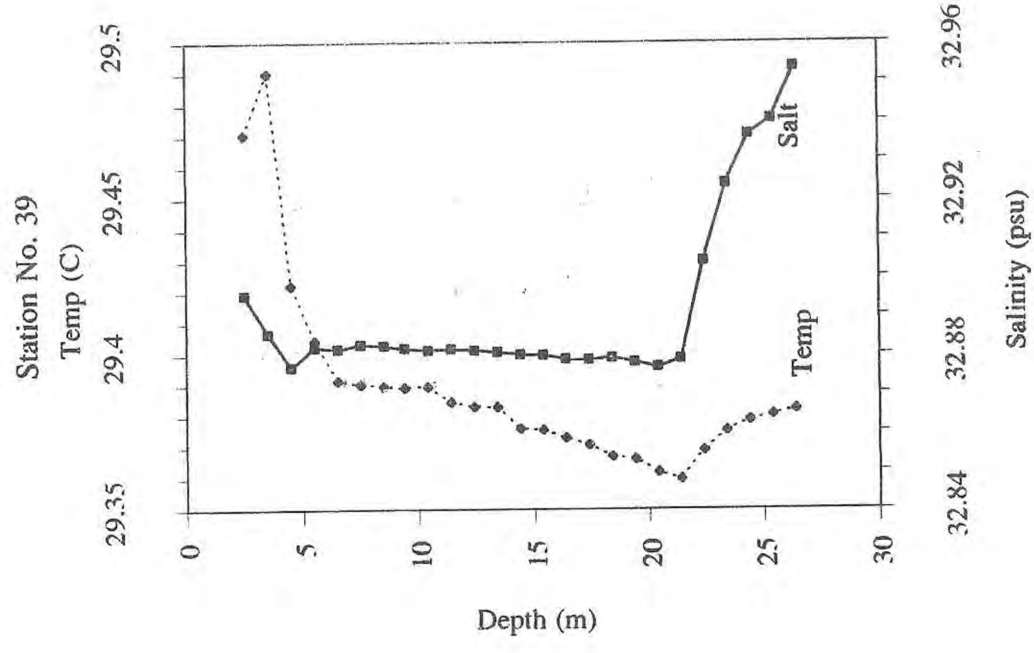

Station No. 37
Temp (C)
27
27.5
28
28.5
29
29.5
Depth (m)
0
10
20
30
40
50
60
Temp
Salt
32.5
33
33.5
34
Salinity (psu)

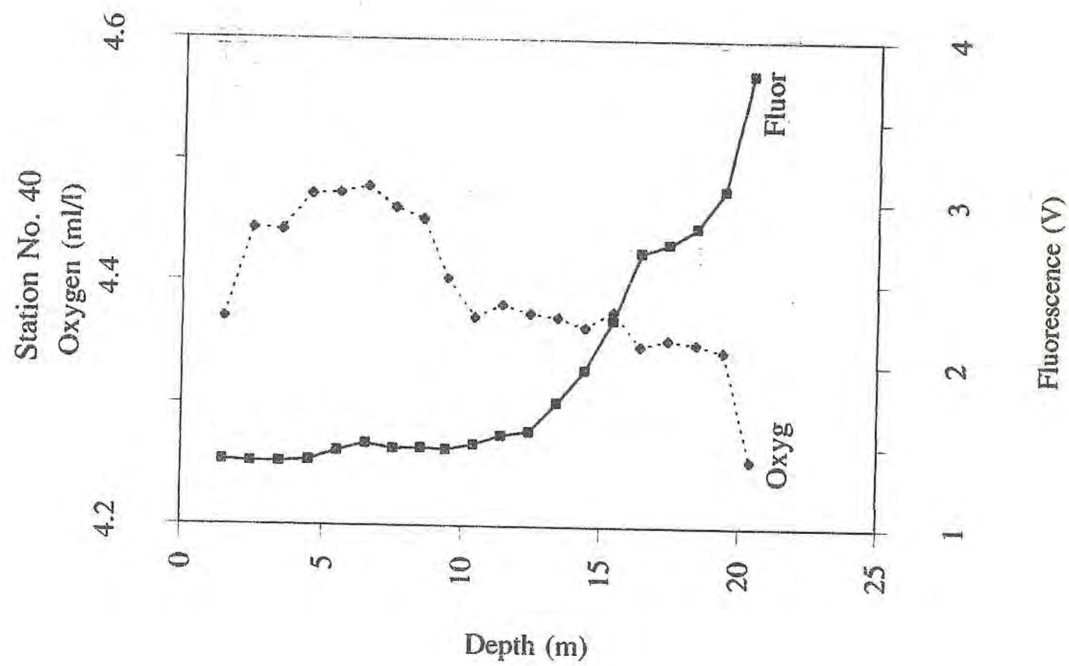

Station No. 37
Oxygen (ml/l)
3
3.5
4
4.5
5
Depth (m)
0
10
20
30
40
50
60
Oxyg
Fluor
0
1
2
3
4
5
6
7
Fluorescence (V)

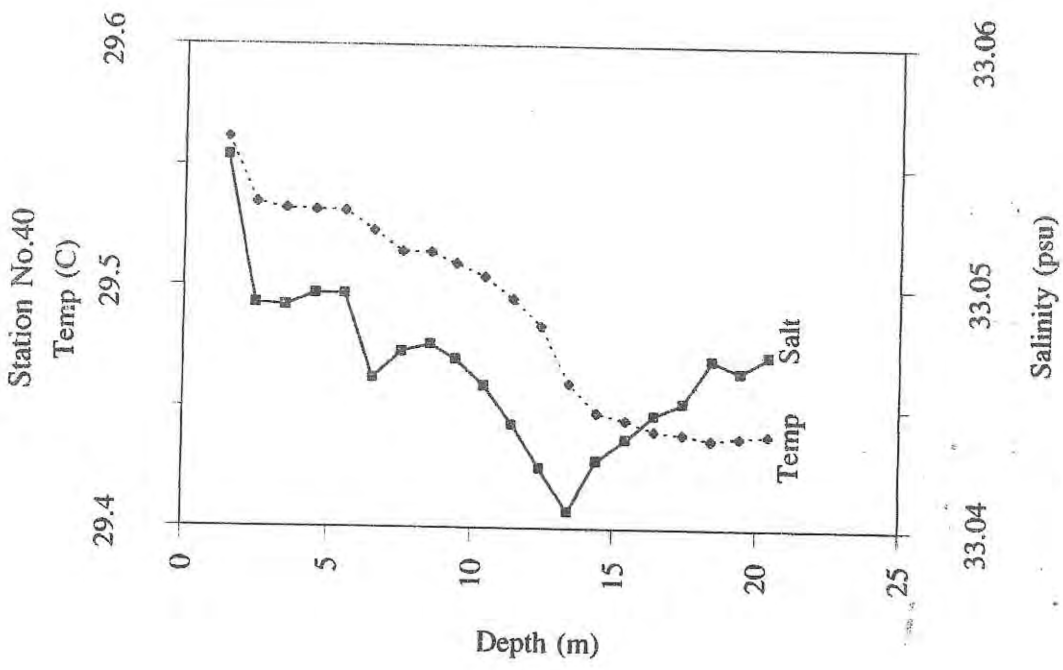

Station No. 38
Oxygen (ml/l)
3
3.5
4
4.5
5
Fluor
Oxyg
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
0
3
6
9
Fluorescence (V)

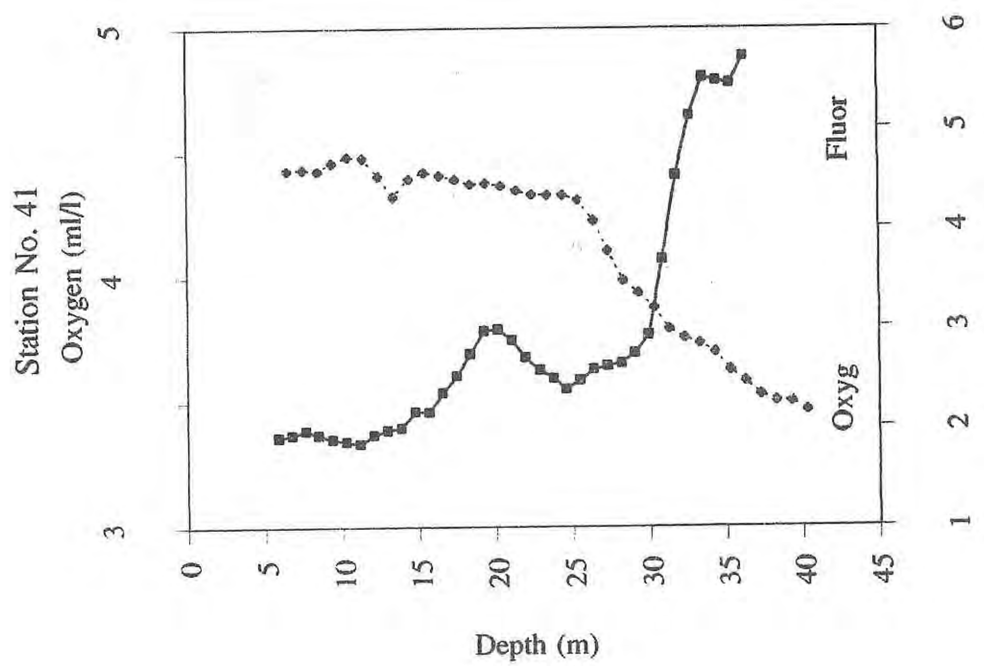

Station No. 38
Temp (C)
27.5
28
28.5
29
29.5
Salt
Temp
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
32.8
33.2
33.6
34
Salinity (psu)


Station No. 39
Oxygen (ml/l)
4.35
4.4
4.45
4.5
4.55
4.6
Fluor
Oxyg
0
5
10
15
20
25
30
Depth (m)
0
1
2
3
Fluorescence (V)

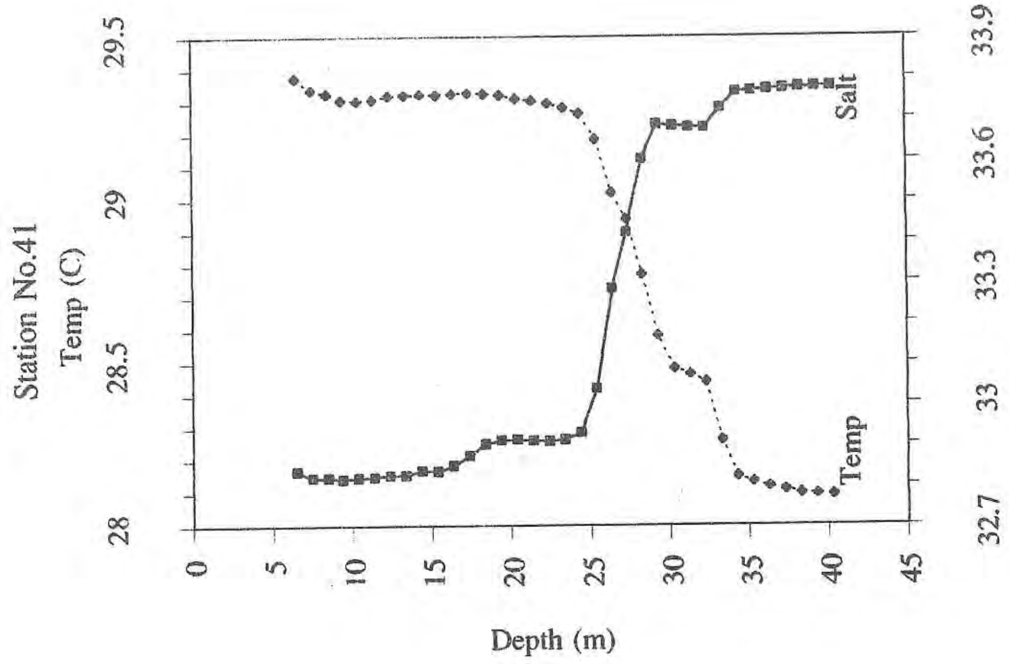

Station No. 39
Temp (C)
29.35
29.4
29.45
29.5
Salt
Temp
0
5
10
15
20
25
30
Depth (m)
32.84
32.88
32.92
32.96
Salinity (psu)


Station No. 40
Oxygen (ml/l)
4.2
4.4
4.6
Fluor
Oxyg
0
5
10
15
20
25
Depth (m)
1
2
3
4
Fluorescence (V)

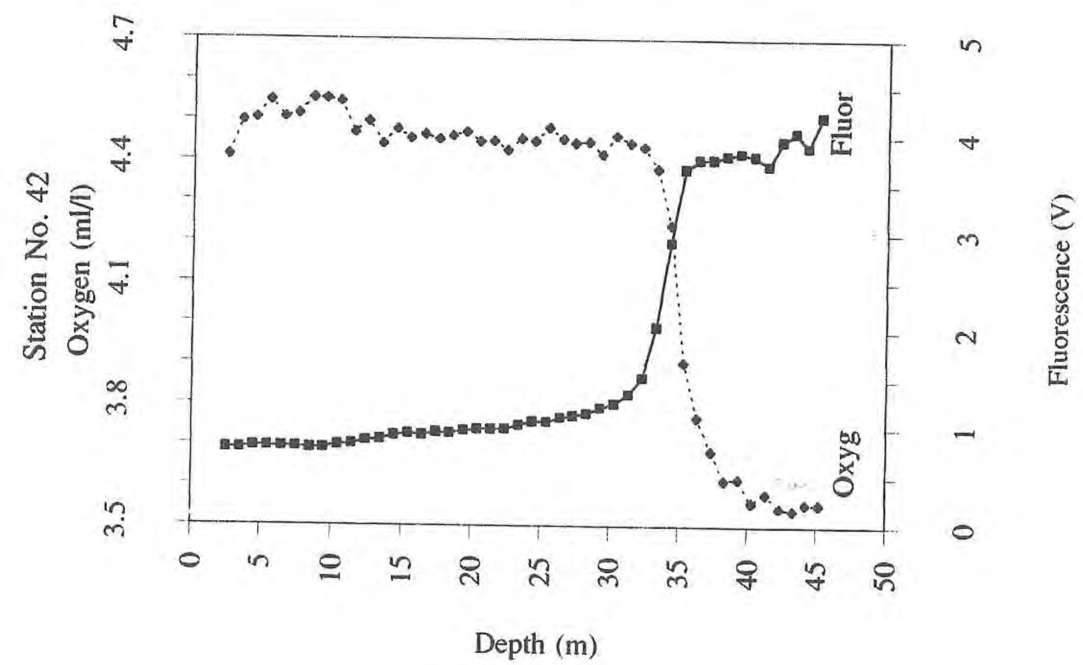

Station No.40
Temp (C)
29.4
29.5
29.6
Salt
Temp
0
5
10
15
20
25
Depth (m)
33.04
33.05
33.06
Salinity (psu)

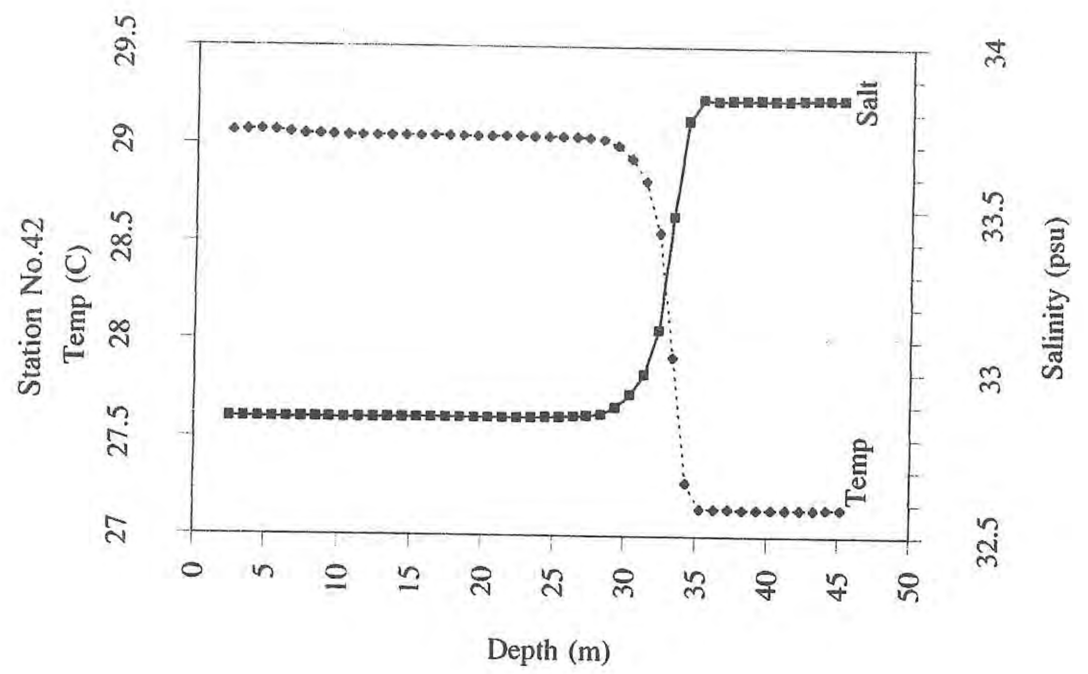


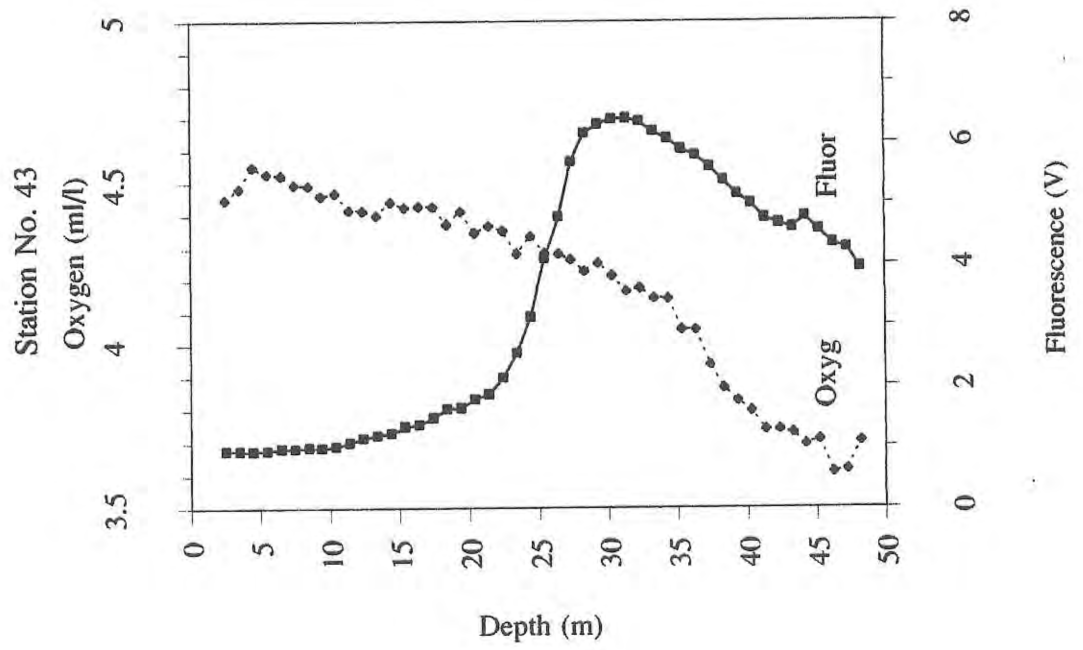
Station No. 41
Oxygen (ml/l)
3
4
5
Oxyg
Fluor
Depth (m)
0
5
10
15
20
25
30
35
40
45
Fluorescence (V)
1
2
3
4
5
6

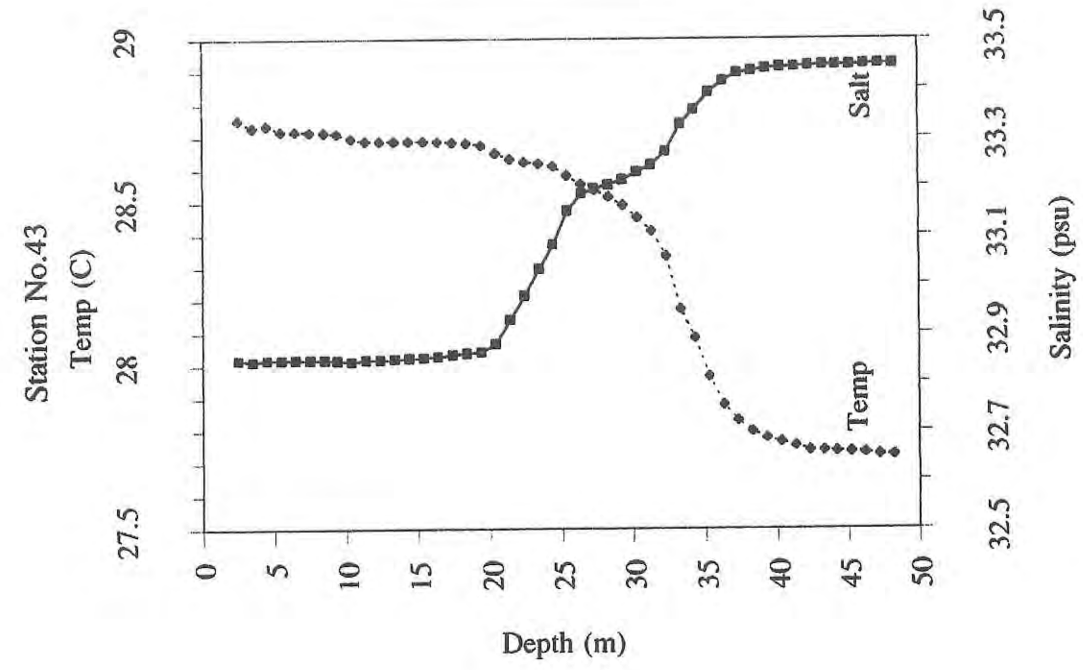


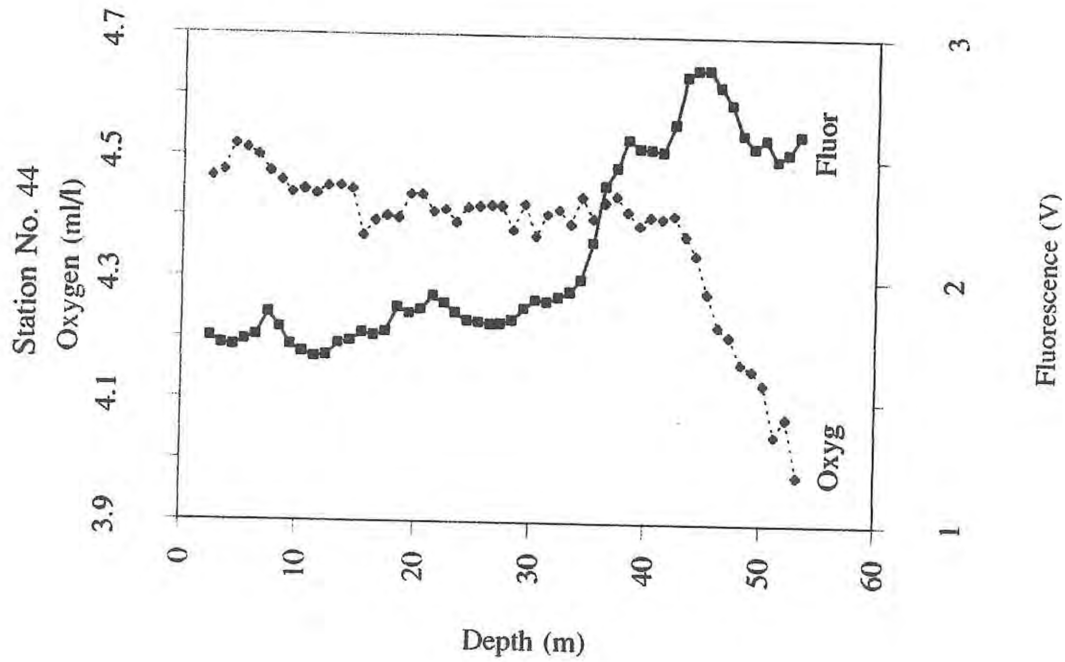
Station No.41
Temp (C)
28
28.5
29
29.5
Temp
Salt
Depth (m)
0
5
10
15
20
25
30
35
40
45
Salinity (psu)
32.7
33
33.3
33.6
33.9

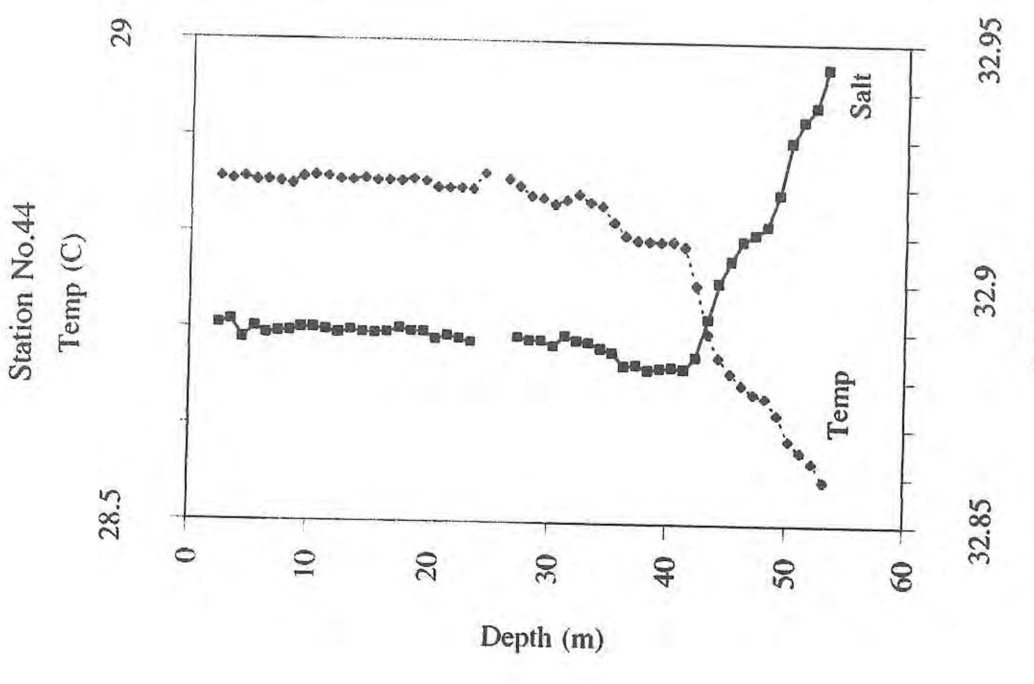

Station No. 42
Oxygen (ml/l)
Fluorescence (V)
Depth (m)
Fluor
Oxyg

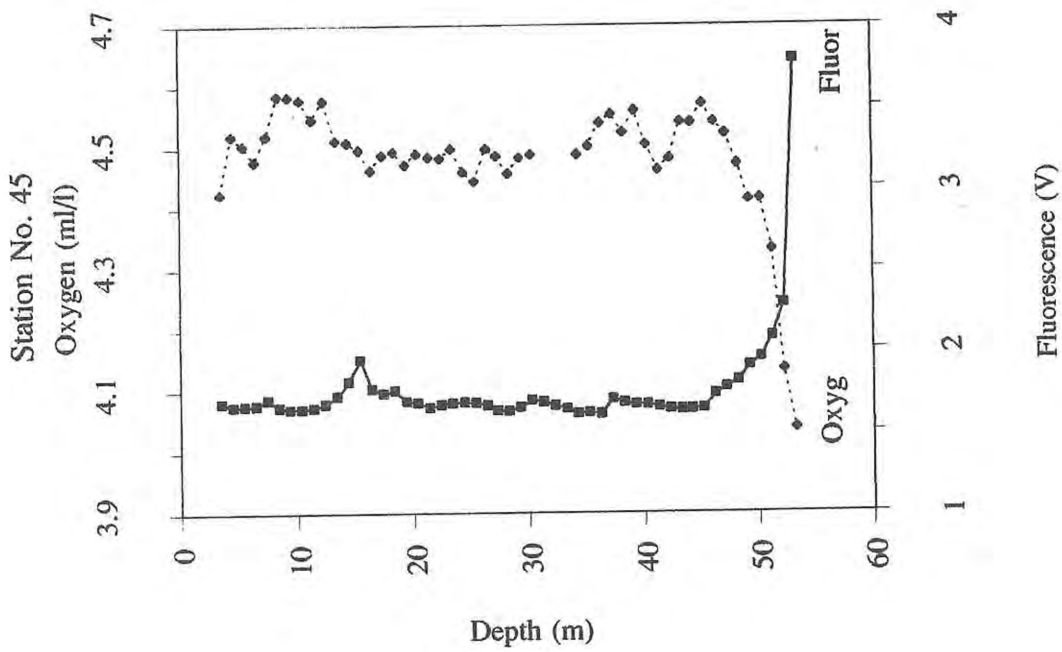

Station No.42
Temp (C)
Salinity (psu)
Depth (m)
Salt
Temp

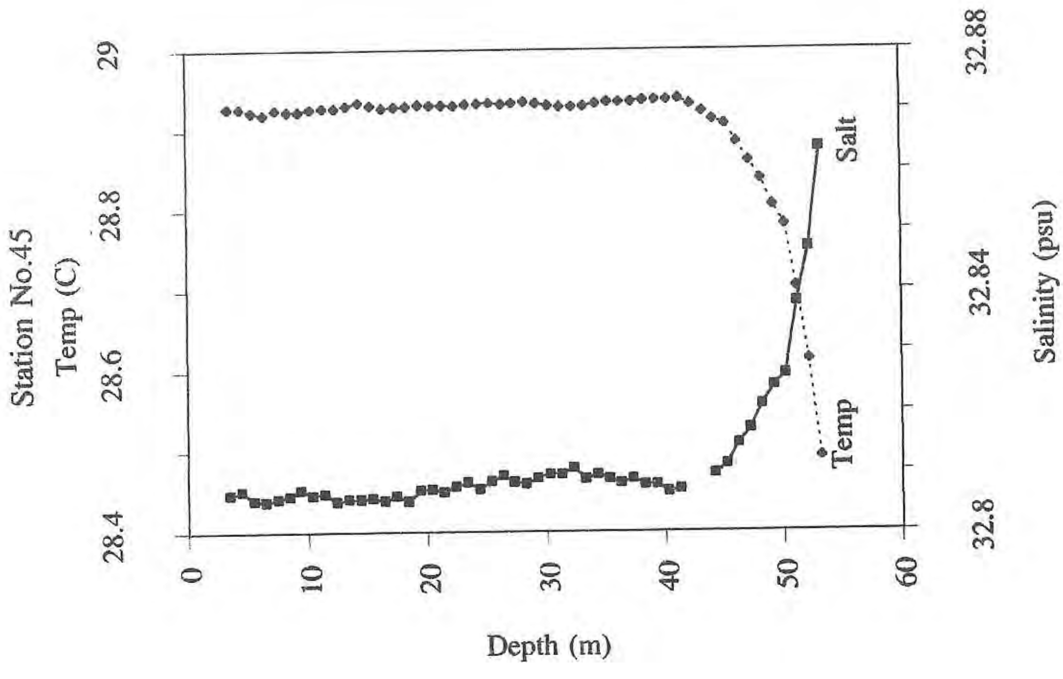

Station No. 43
Oxygen (ml/l)
3.5
4
4.5
5
Fluor
Oxyg
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
0
2
4
6
8
Fluorescence (V)

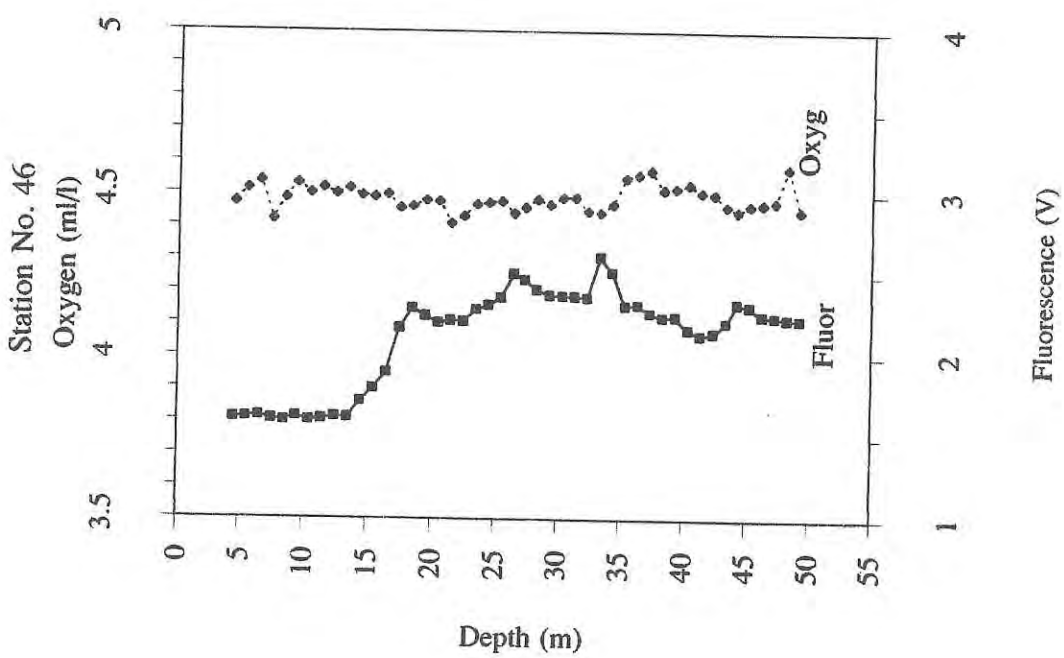

Station No.43
Temp (C)
27.5
28
28.5
29
Salt
Temp
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
32.5
32.7
32.9
33.1
33.3
33.5
Salinity (psu)

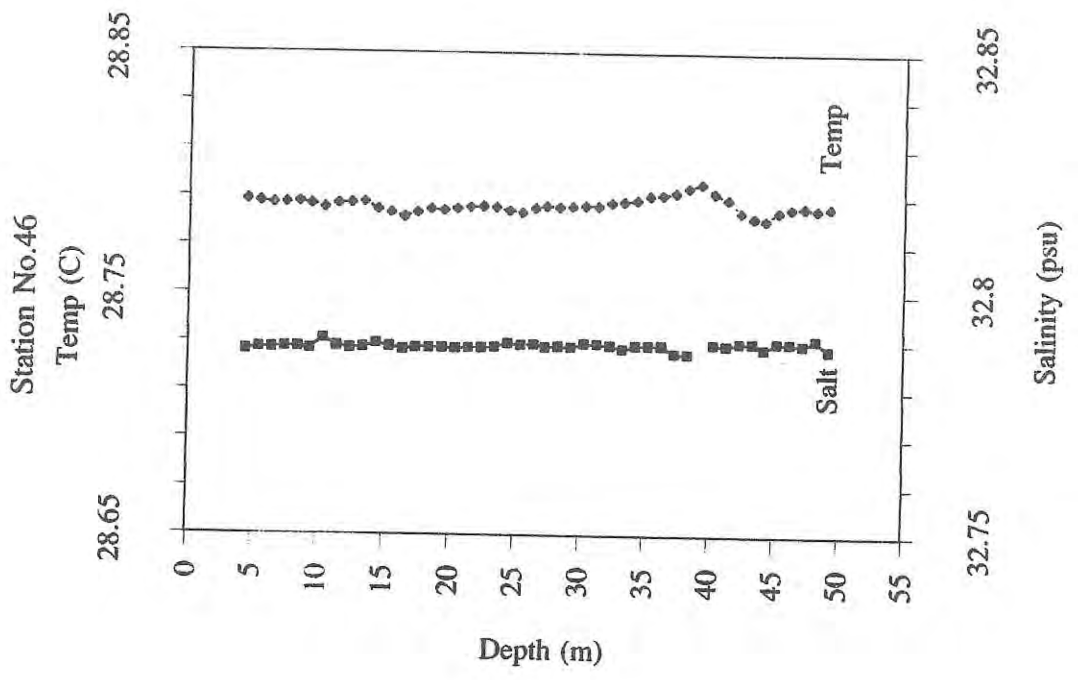

Station No. 44
Oxygen (ml/l)
3.9
4.1
4.3
4.5
4.7
Fluor
Oxyg
0
10
20
30
40
50
60
Depth (m)
1
2
3
Fluorescence (V)

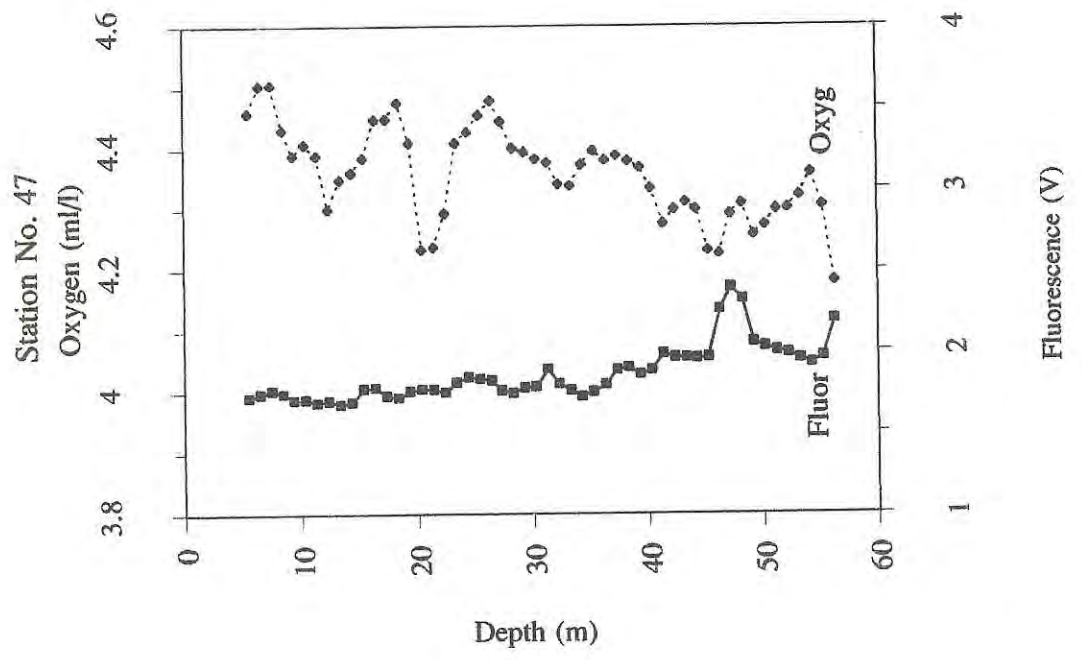

Station No.44
Temp (C)
28.5
29
Salt
Temp
0
10
20
30
40
50
60
Depth (m)
32.85
32.9
32.95
Salinity (psu)

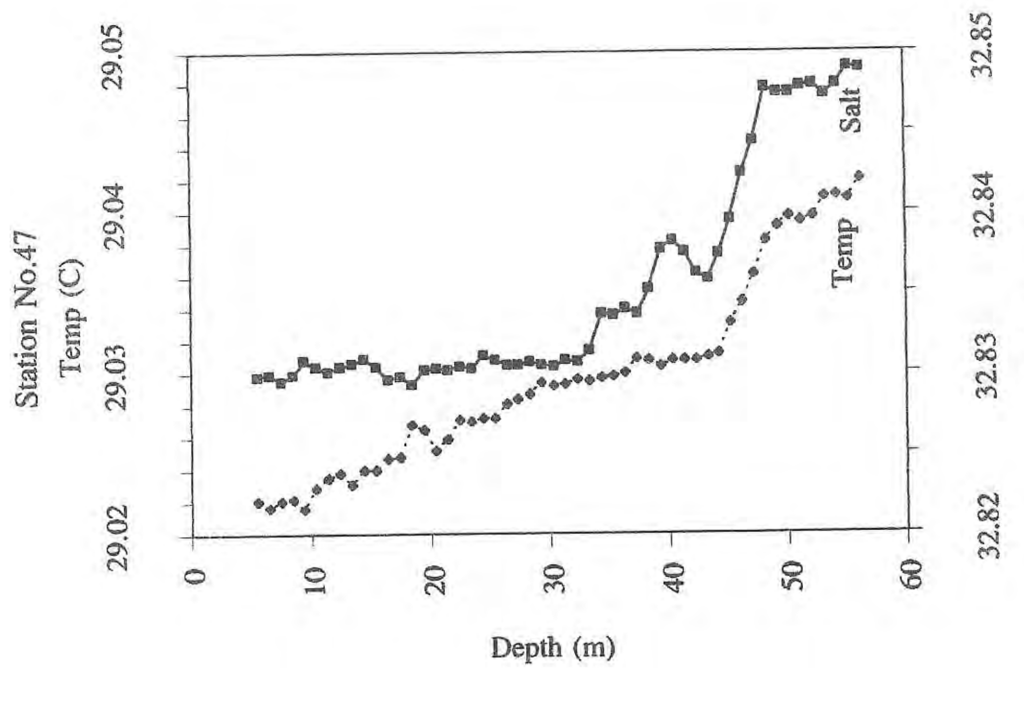

Station No. 45
Oxygen (ml/l)
3.9
4.1
4.3
4.5
4.7
Fluor
Oxyg
0
10
20
30
40
50
60
Depth (m)
1
2
3
4
Fluorescence (V)

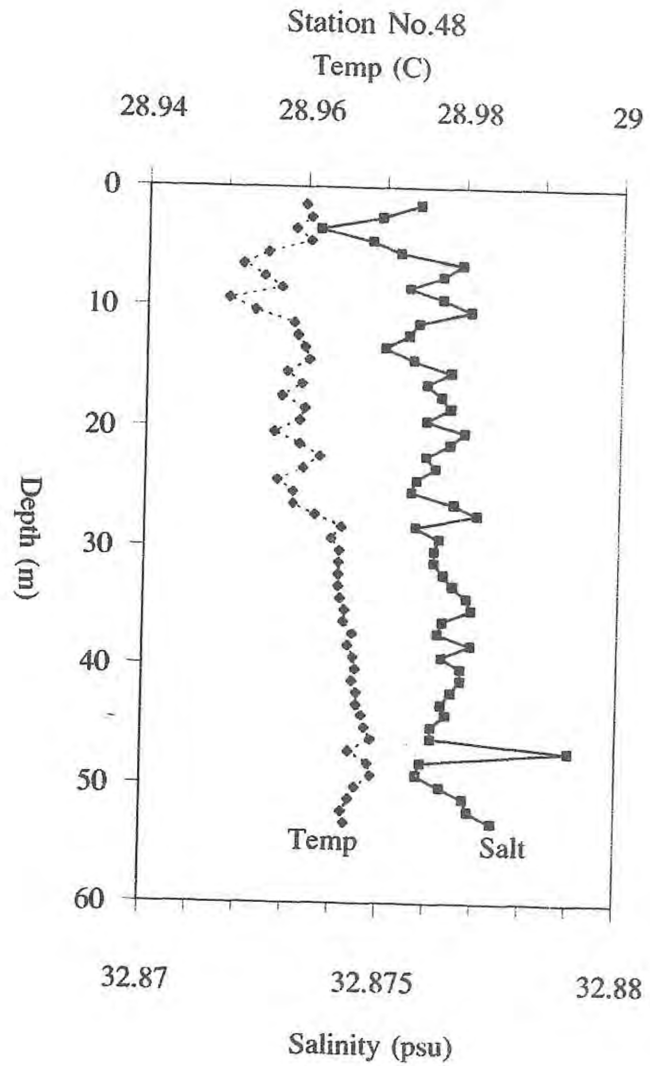

Station No.45
Temp (C)
28.4
28.6
28.8
29
Salt
Temp
0
10
20
30
40
50
60
Depth (m)
32.8
32.84
32.88
Salinity (psu)

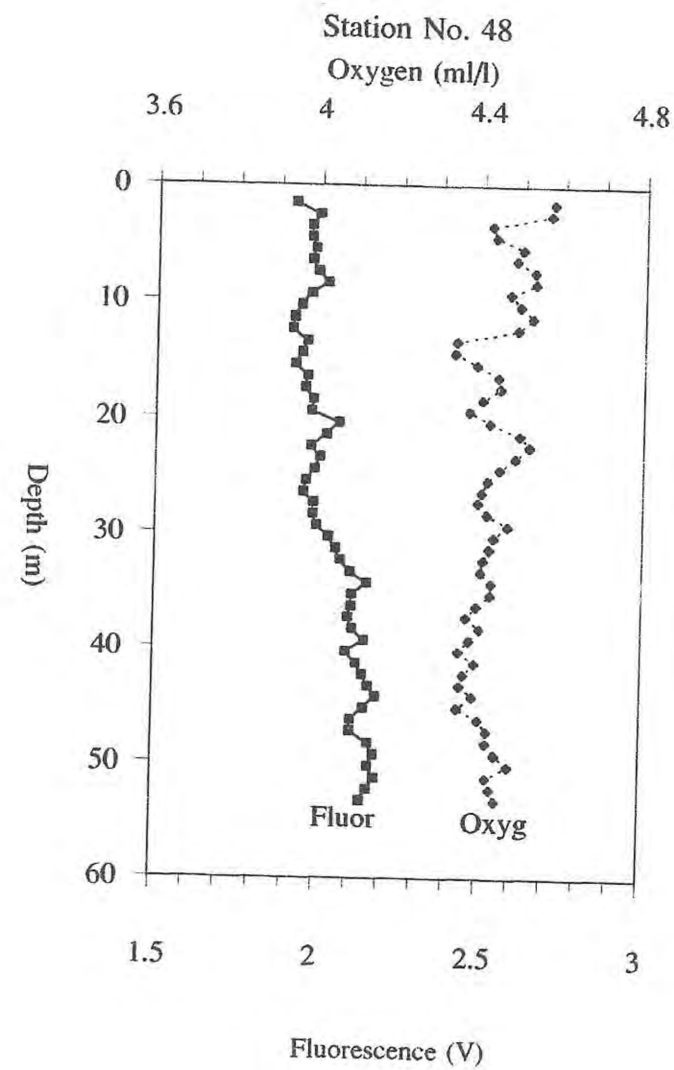

Station No. 46
Oxygen (ml/l)
3.5
4
4.5
5
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m)
Oxyg
Fluor
1
2
3
4
Fluorescence (V)

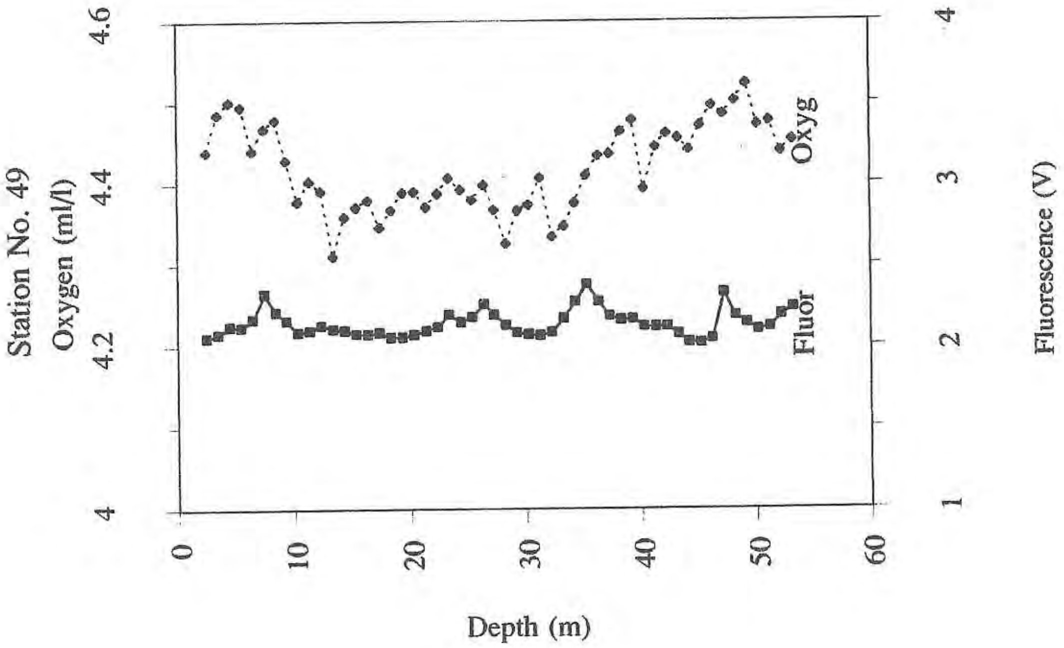

Station No.46
Temp (C)
28.65
28.75
28.85
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m)
Temp
Salt
32.75
32.8
32.85
Salinity (psu)

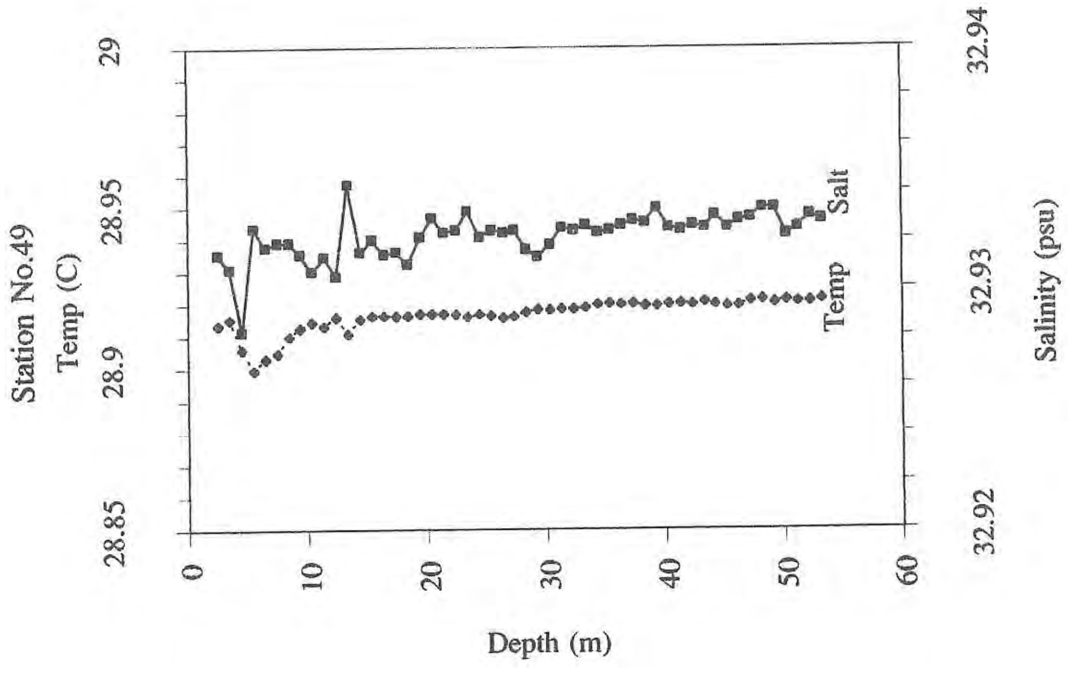

Station No. 47
Oxygen (ml/l)
3.8
4
4.2
4.4
4.6
Oxyg
Fluor
Fluorescence (V)
1
2
3
4
Depth (m)
0
10
20
30
40
50
60

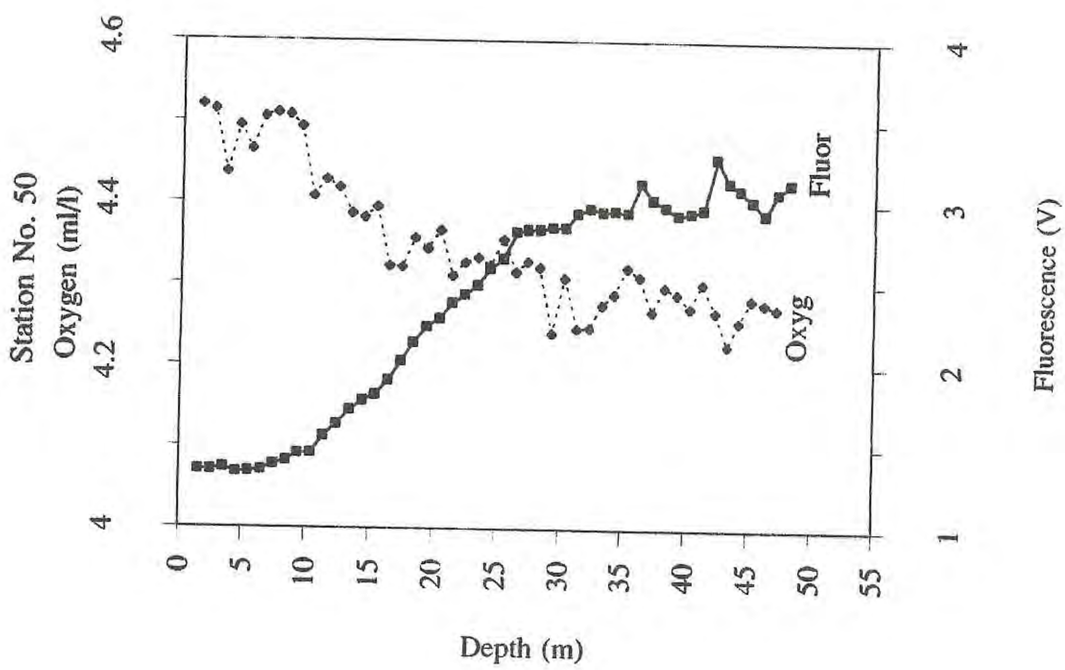

Station No.47
Temp (C)
29.02
29.03
29.04
29.05
Salt
Temp
Salinity (psu)
32.82
32.83
32.84
32.85
Depth (m)
0
10
20
30
40
50
60

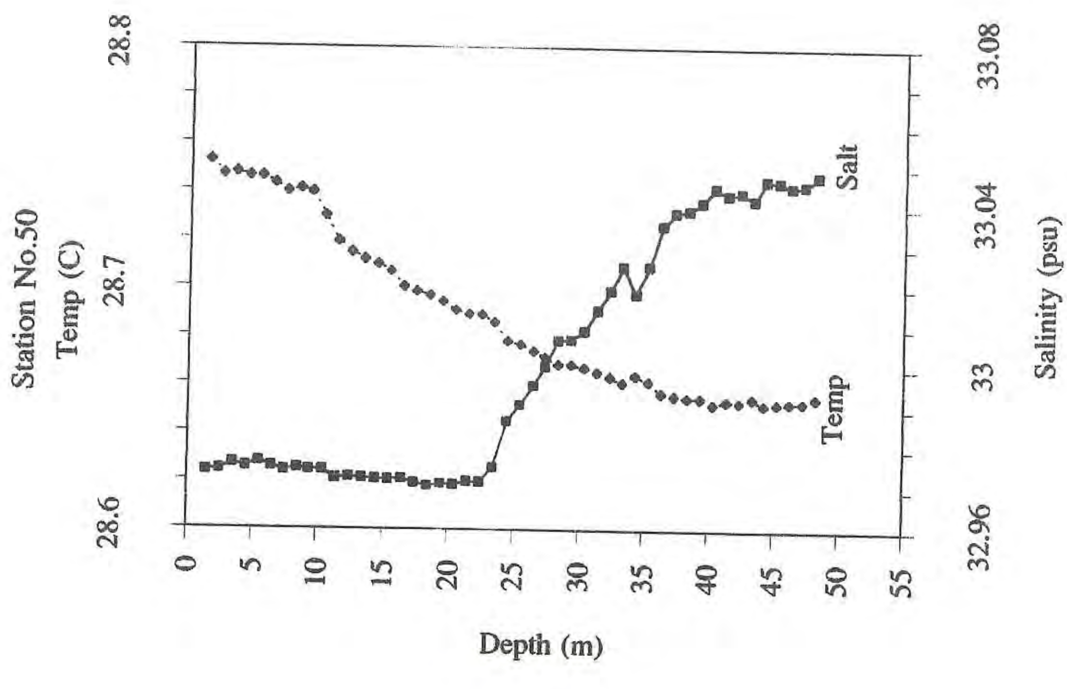

Station No.48
Temp (C)
28.94
28.96
28.98
29
0
10
20
30
40
50
60
Depth (m)
Temp
Salt
32.87
32.875
32.88
Salinity (psu)

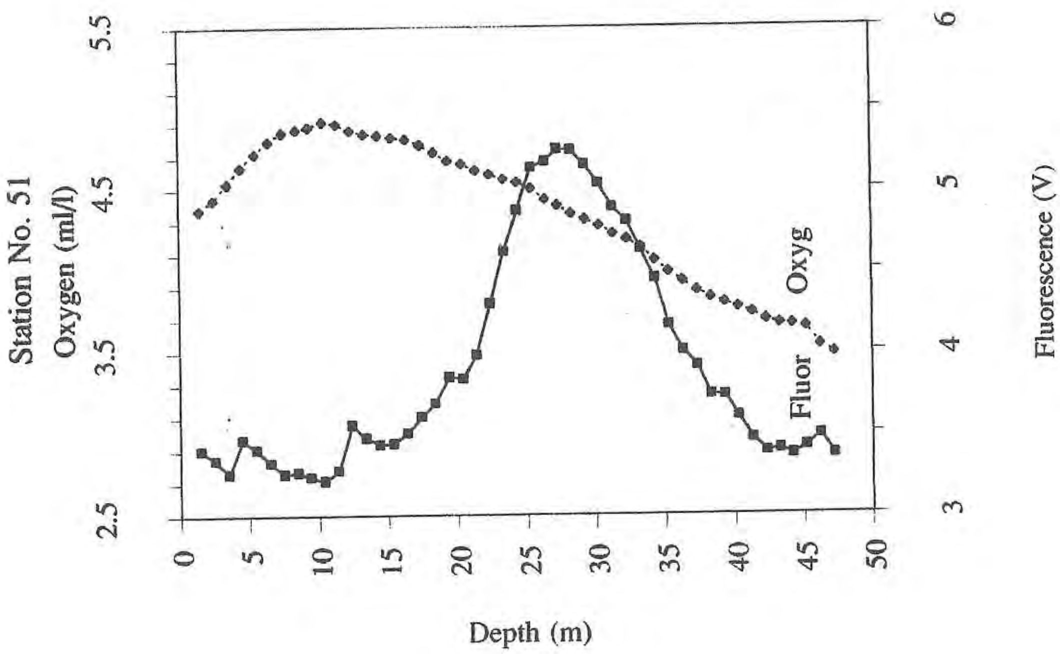

Station No. 48
Oxygen (ml/l)
3.6
4
4.4
4.8
0
10
20
30
40
50
60
Depth (m)
Fluor
Oxyg
1.5
2
2.5
3
Fluorescence (V)

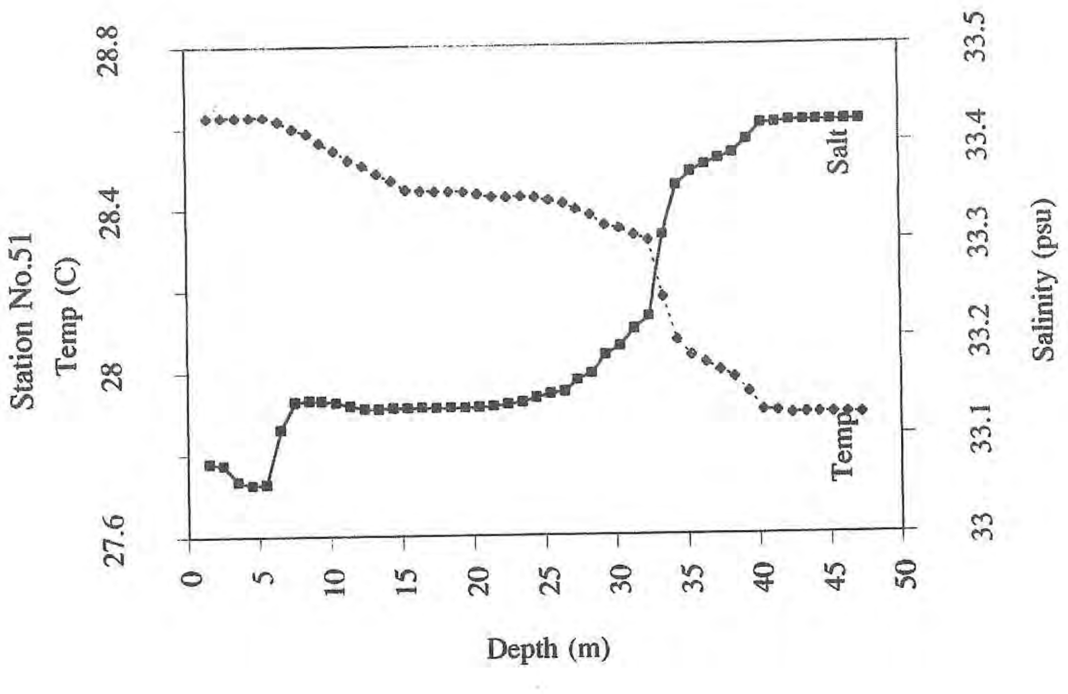

Station No. 49
Oxygen (ml/l)
4
4.2
4.4
4.6
Oxyg
Fluor
0
10
20
30
40
50
60
Depth (m)
1
2
3
4
Fluorescence (V)

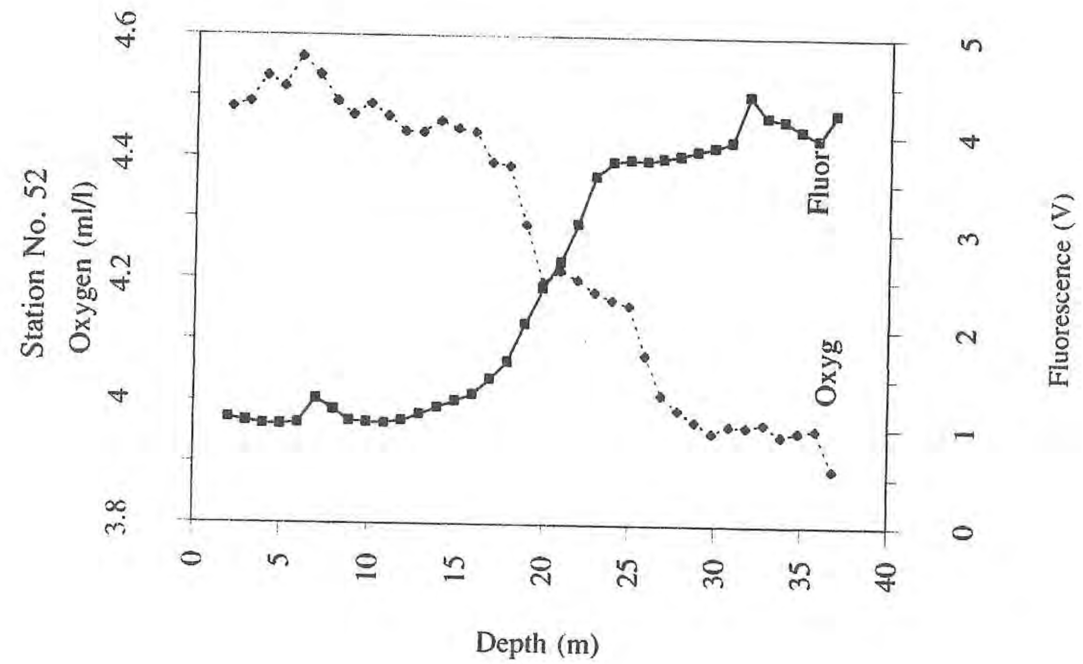

Station No.49
Temp (C)
28.85
28.9
28.95
29
Salt
Temp
0
10
20
30
40
50
60
Depth (m)
32.92
32.93
32.94
Salinity (psu)

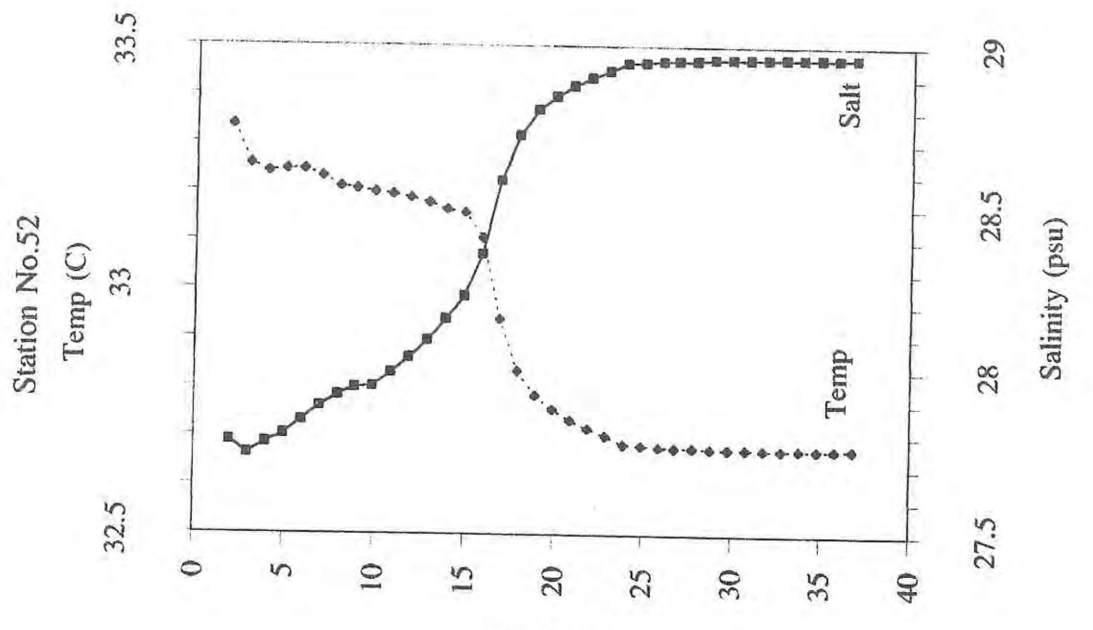

Station No. 50
Oxygen (ml/l)
4
4.2
4.4
4.6
Fluor
Oxyg
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m)
1
2
3
4
Fluorescence (V)

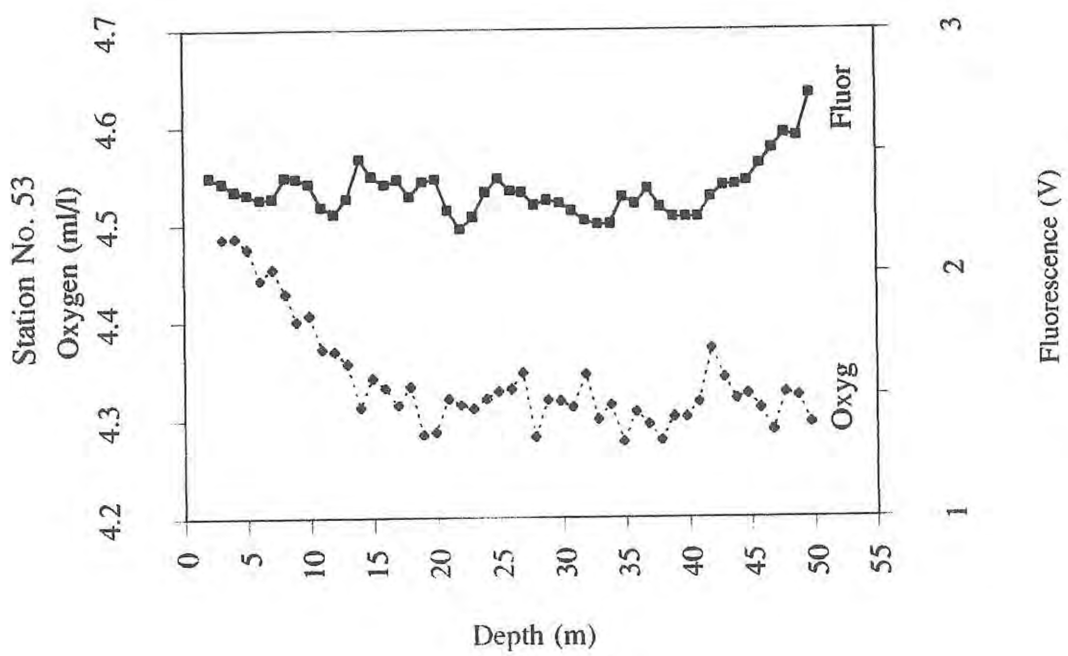

Station No.50
Temp (C)
28.6
28.7
28.8
Salt
Temp
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m)
32.96
33
33.04
33.08
Salinity (psu)

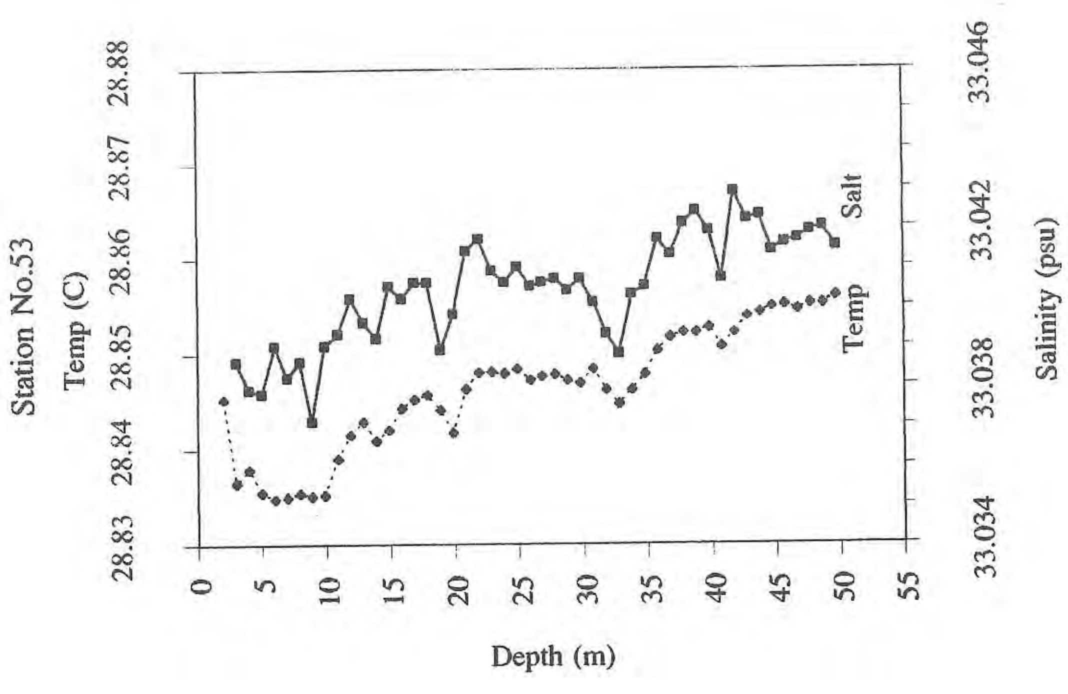

Station No. 51
Oxygen (ml/l)
2.5
3.5
4.5
5.5
Fluorescence (V)
3
4
5
6
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
Oxyg
Fluor

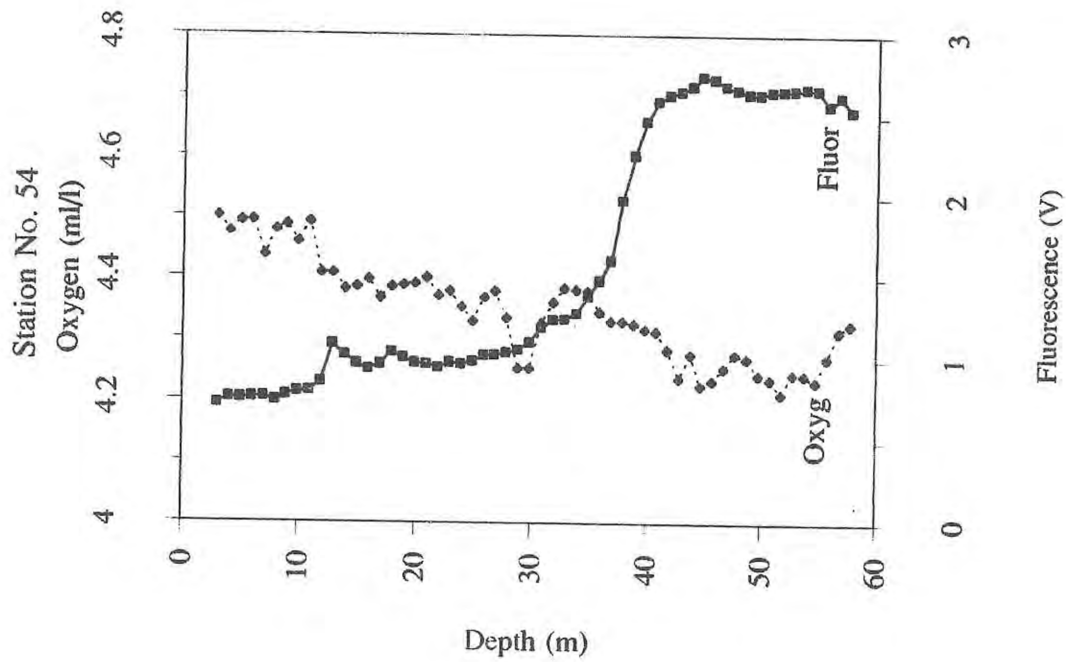

Station No.51
Temp (C)
27.6
28
28.4
28.8
Salinity (psu)
33
33.1
33.2
33.3
33.4
33.5
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
Salt
Temp

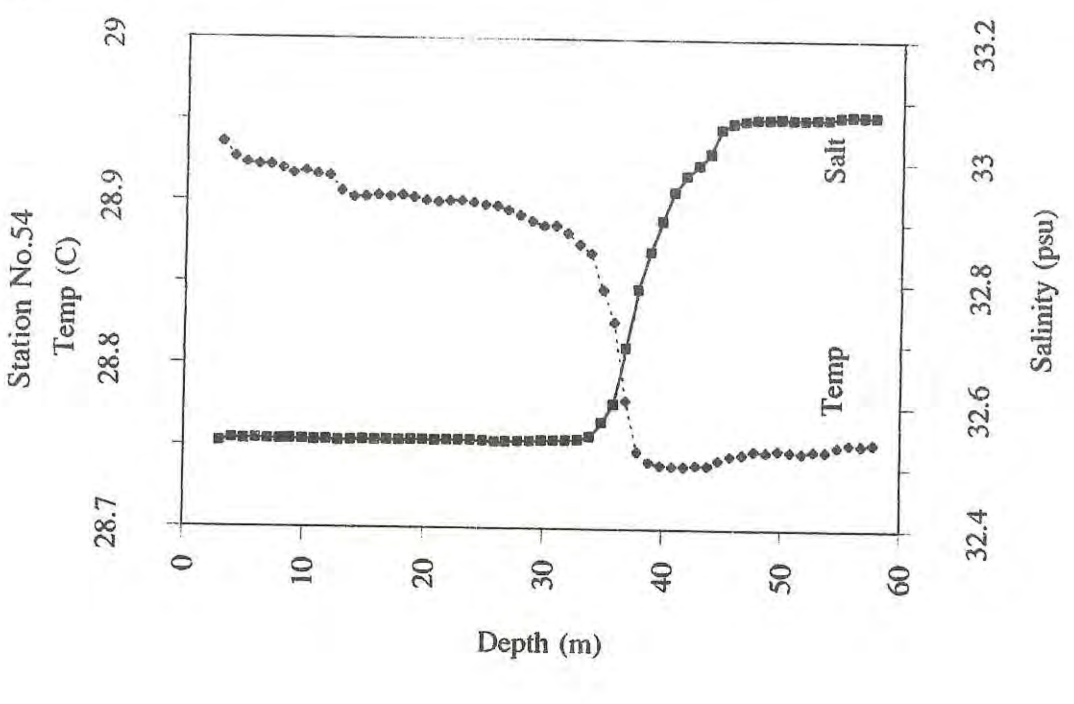

Station No. 52
Oxygen (ml/l)
3.8
4
4.2
4.4
4.6
Fluor
Oxyg
0
5
10
15
20
25
30
35
40
Depth (m)
0
1
2
3
4
5
Fluorescence (V)

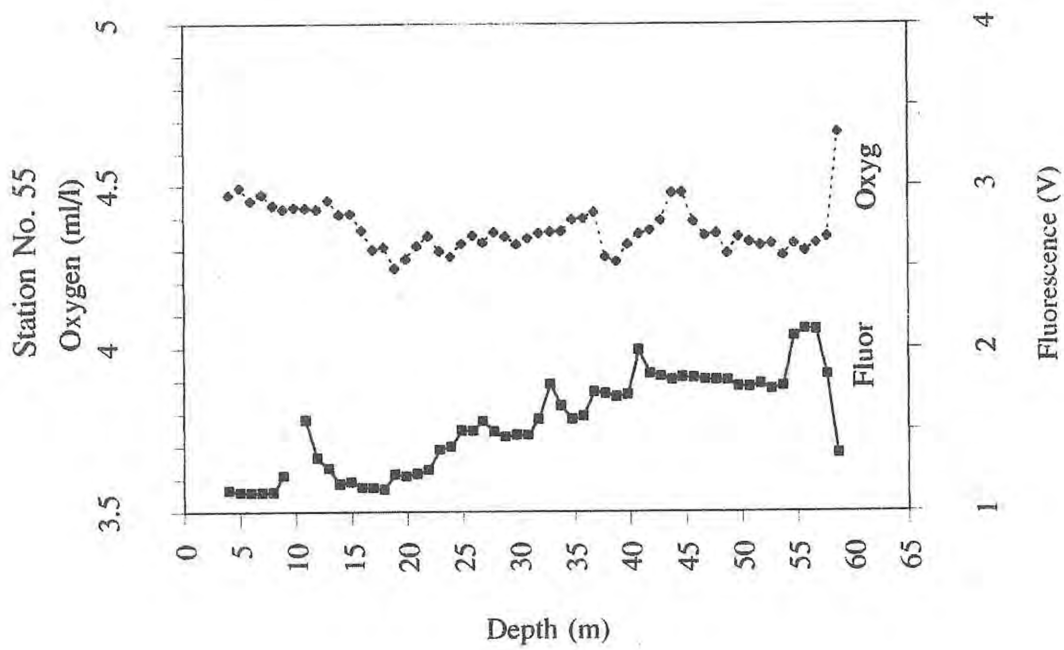

Station No.52
Temp (C)
32.5
33
33.5
Salt
Temp
0
5
10
15
20
25
30
35
40
Depth (m)
27.5
28
28.5
29
Salinity (psu)

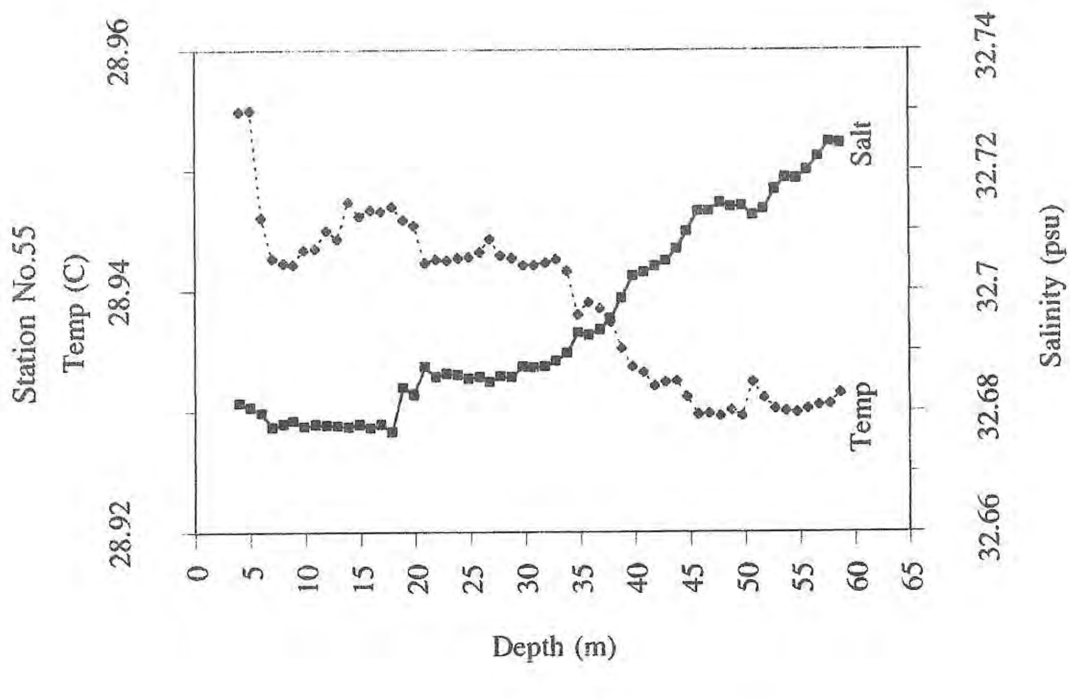

Station No. 53
Oxygen (ml/l)
4.2
4.3
4.4
4.5
4.6
4.7
Fluor
Oxyg
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m)
1
2
3
Fluorescence (V)

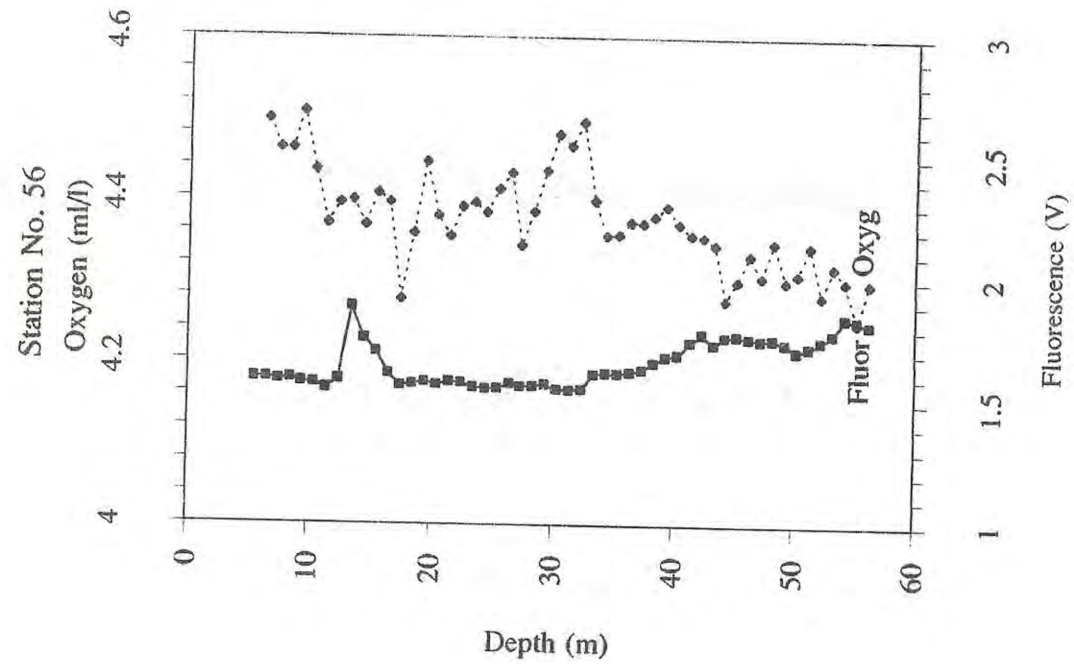

Station No.53
Temp (C)
28.83
28.84
28.85
28.86
28.87
28.88
Salt
Temp
0
5
10
15
20
25
30
35
40
45
50
55
Depth (m)
33.034
33.038
33.042
33.046
Salinity (psu)

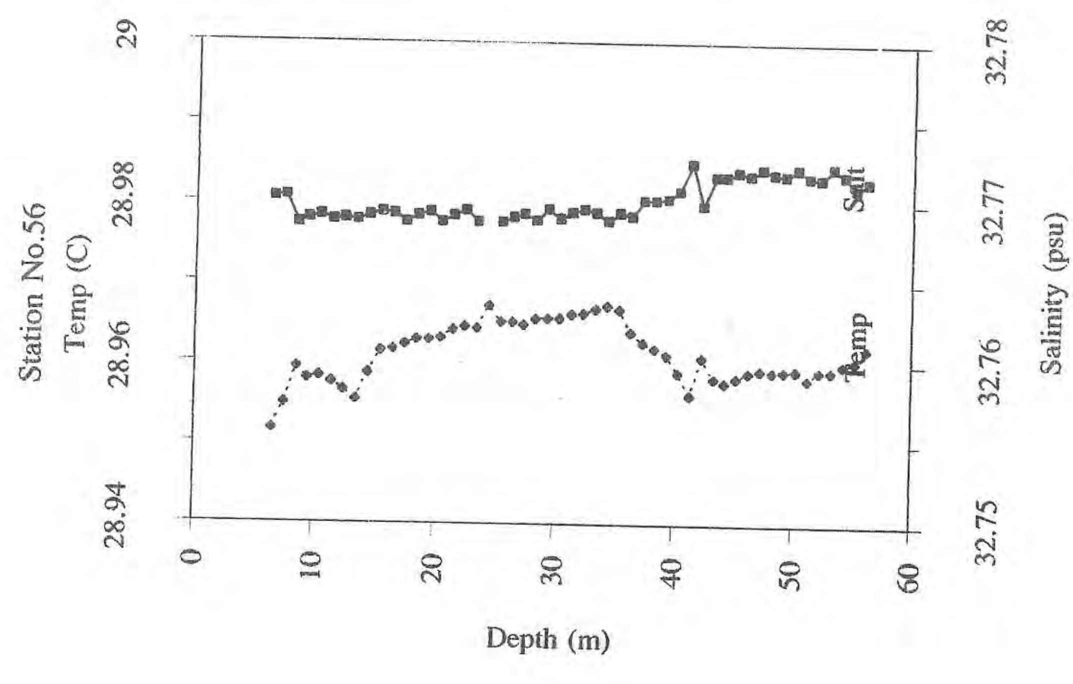

Station No. 54
Oxygen (ml/l)
4
4.2
4.4
4.6
4.8
Fluor
Oxyg
0
10
20
30
40
50
60
Depth (m)
0
1
2
3
Fluorescence (V)

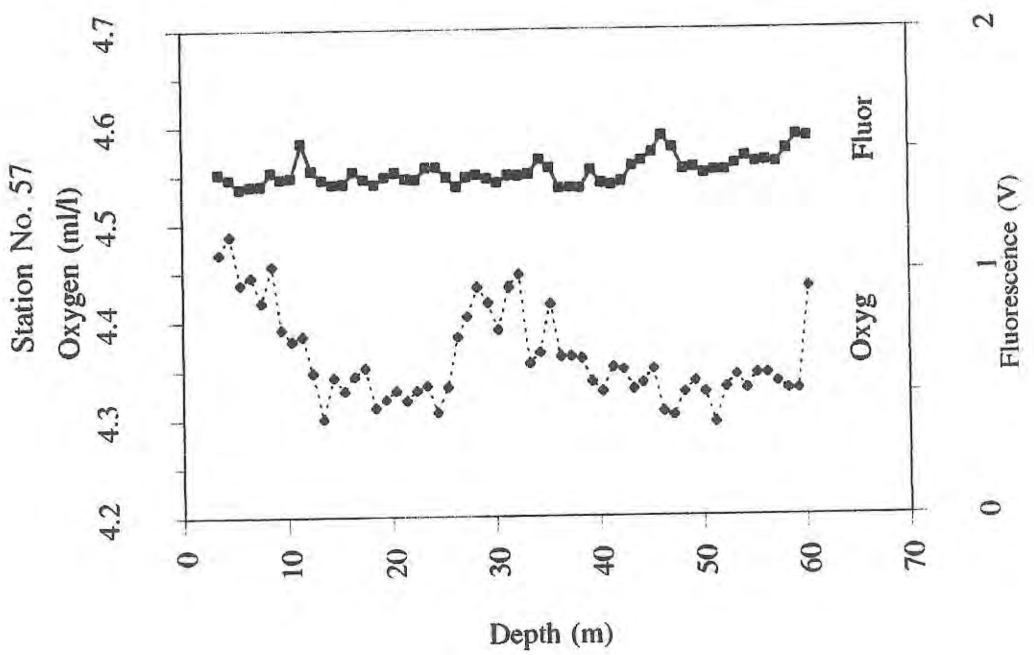

Station No.54
Temp (C)
28.7
28.8
28.9
29
Salt
Temp
0
10
20
30
40
50
60
Depth (m)
32.4
32.6
32.8
33
33.2
Salinity (psu)

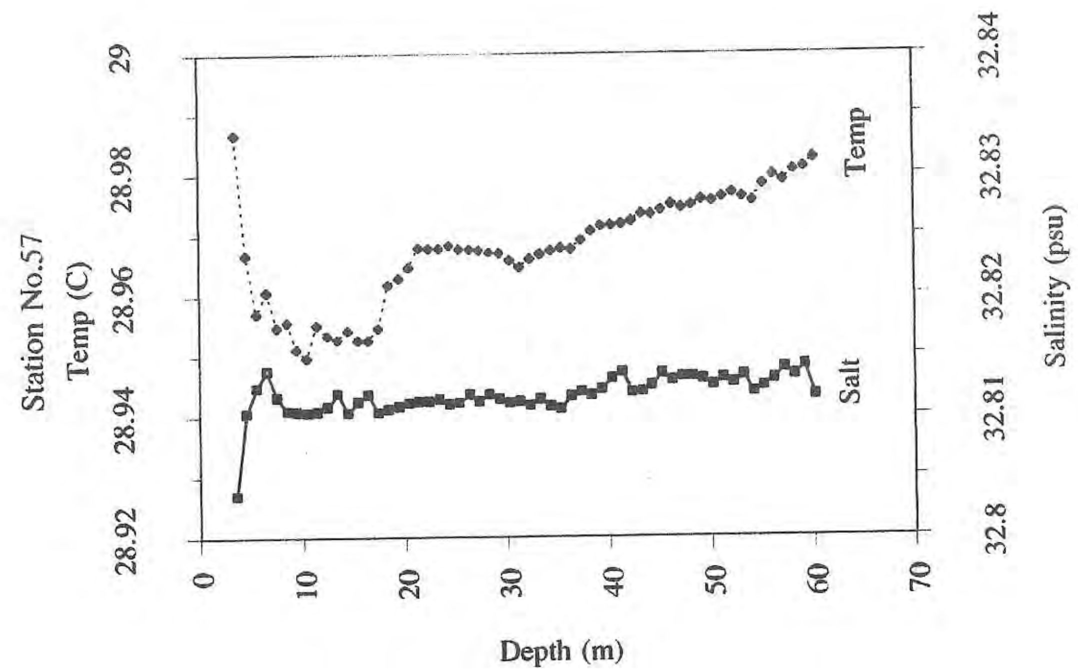

Station No. 55
Oxygen (ml/l)
3.5
4
4.5
5
Oxyg
Fluor
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Depth (m)
1
2
3
4
Fluorescence (V)


Station No.55
Temp (C)
28.92
28.94
28.96
Salt
Temp
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Depth (m)
32.66
32.68
32.7
32.72
32.74
Salinity (psu)

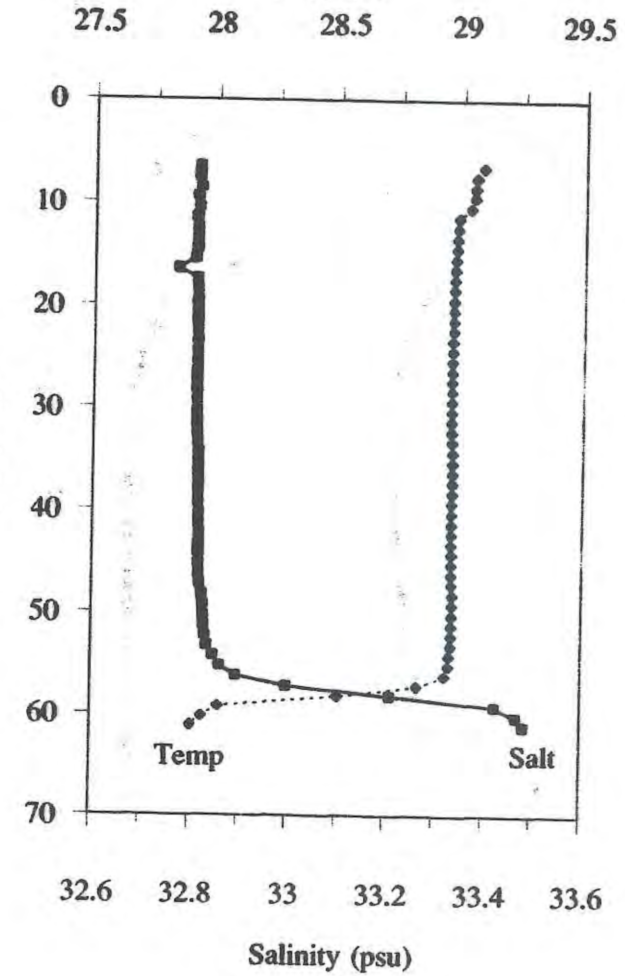

Station No. 56
Oxygen (ml/l)
4
4.2
4.4
4.6
Fluorescence (V)
1
1.5
2
2.5
3
Depth (m)
0
10
20
30
40
50
60
Fluor
Oxyg


Station No.56
Temp (C)
28.94
28.96
28.98
29
Salinity (psu)
32.75
32.76
32.77
32.78
Depth (m)
0
10
20
30
40
50
60
Temp
Salt

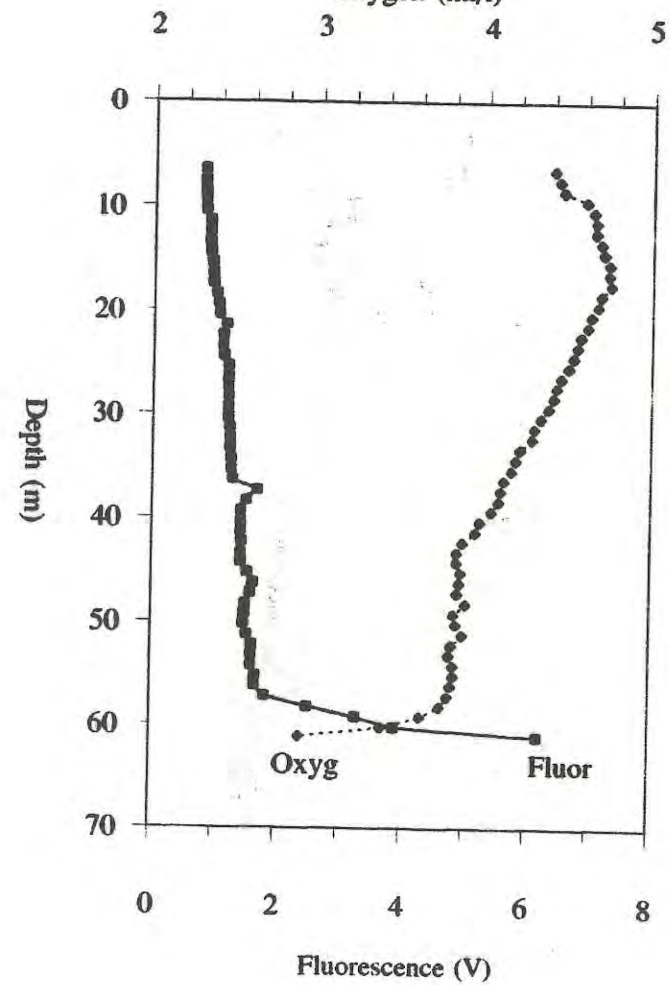

Station No. 57
Oxygen (ml/l)
4.2
4.3
4.4
4.5
4.6
4.7
Fluor
Oxyg
0
1
2
Fluorescence (V)
0
10
20
30
40
50
60
70
Depth (m)

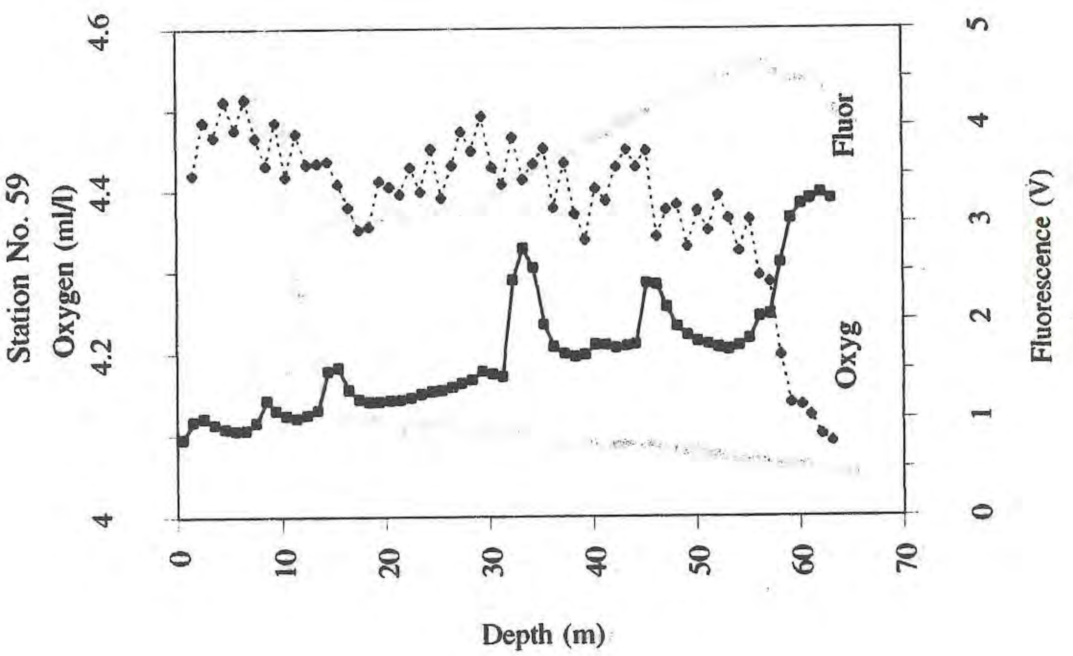

Station No.57
Temp (C)
28.92
28.94
28.96
28.98
29
Temp
Salt
32.8
32.81
32.82
32.83
32.84
Salinity (psu)
0
10
20
30
40
50
60
70
Depth (m)

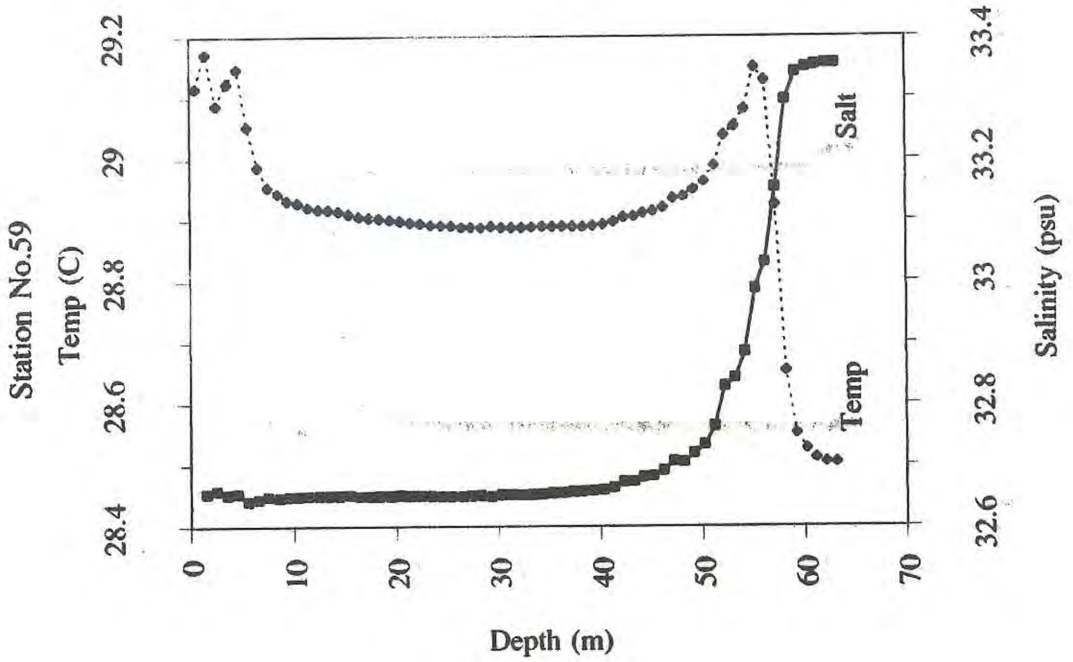
Station No.58

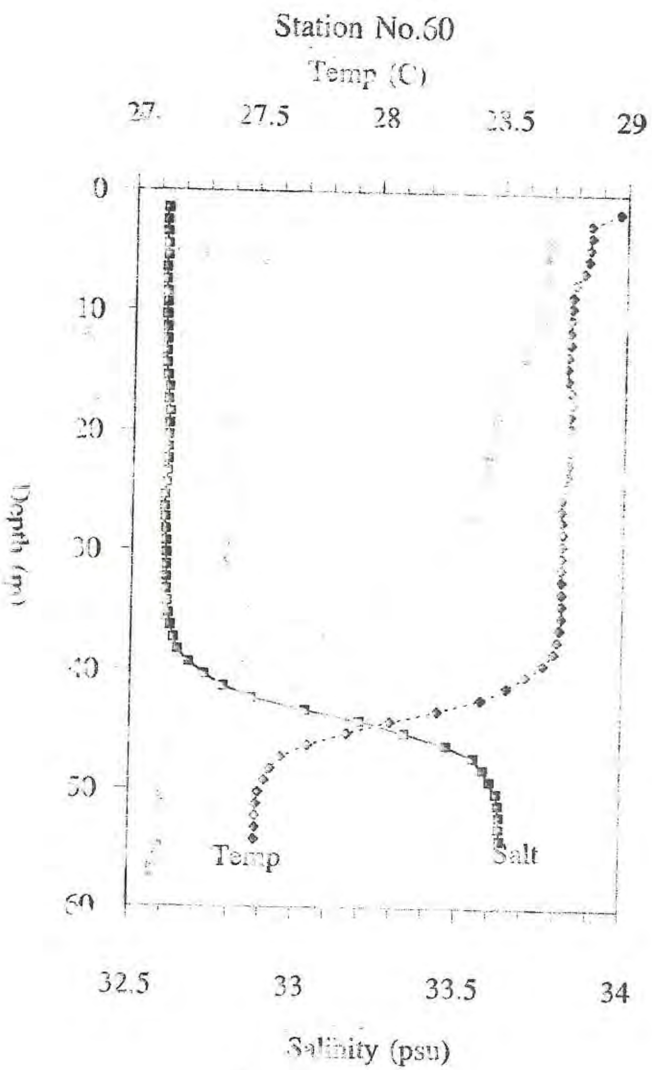


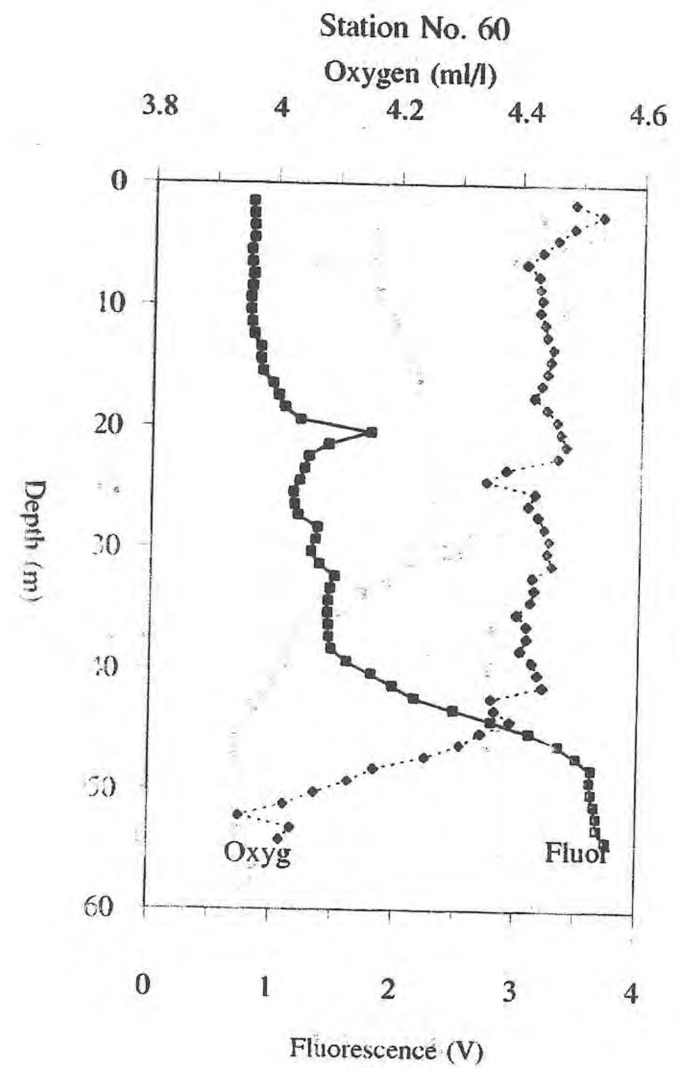
Station No. 58

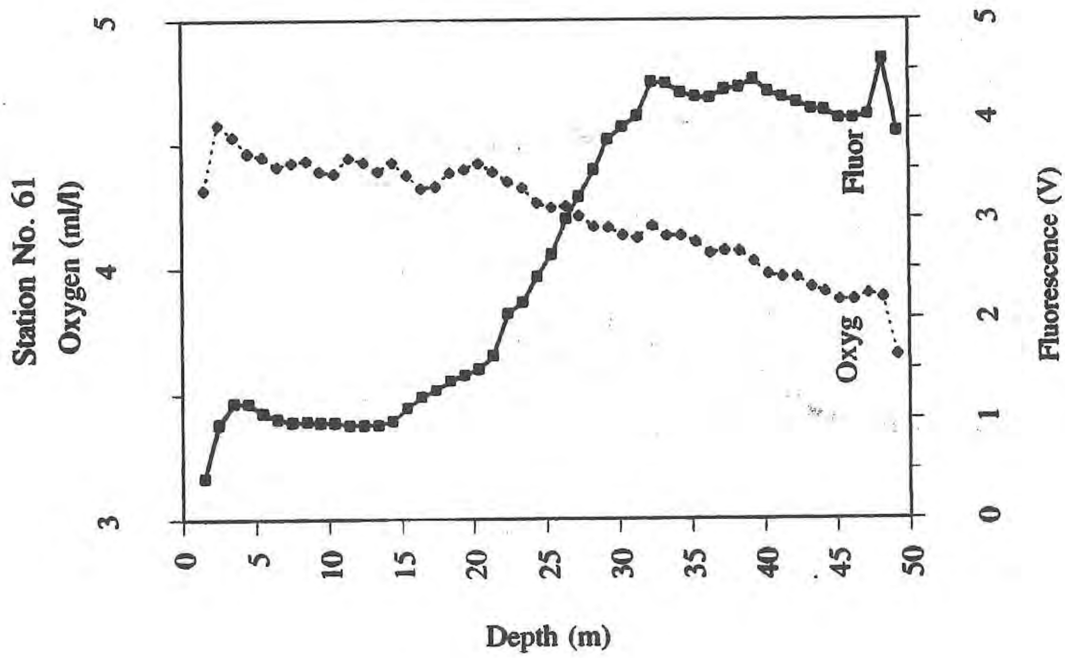


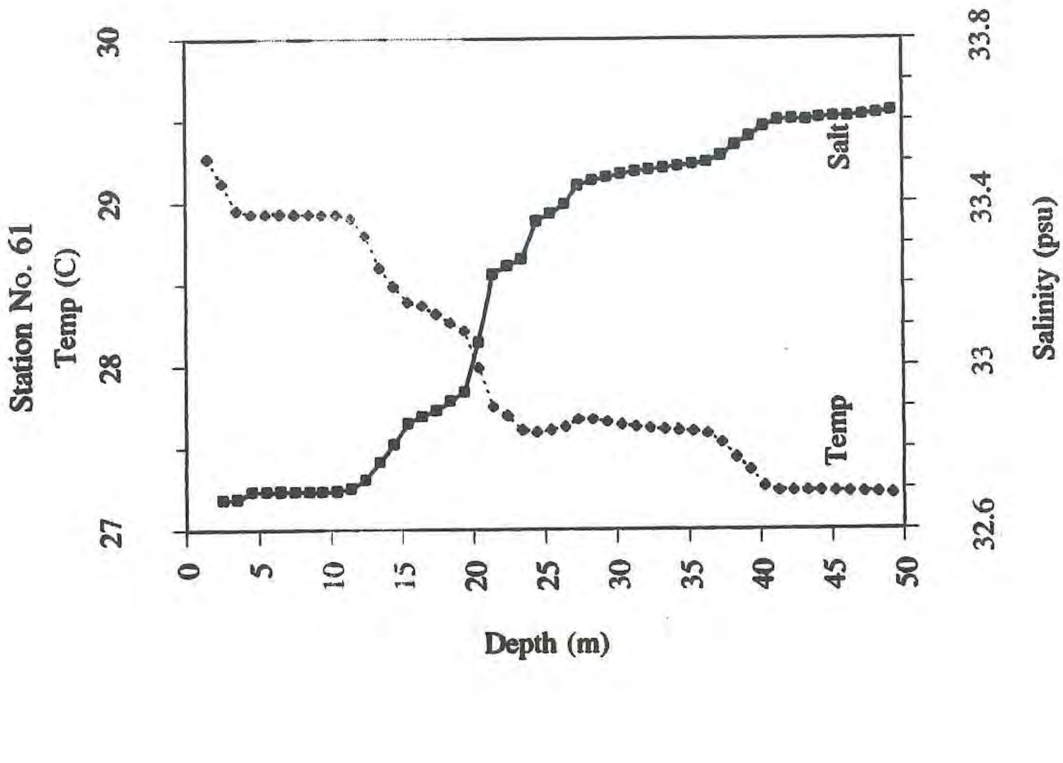

Station No. 59
Oxygen (ml/l)
4
4.2
4.4
4.6
Fluor
Oxyg
Fluorescence (V)
0
1
2
3
4
5
0
10
20
30
40
50
60
70
Depth (m)

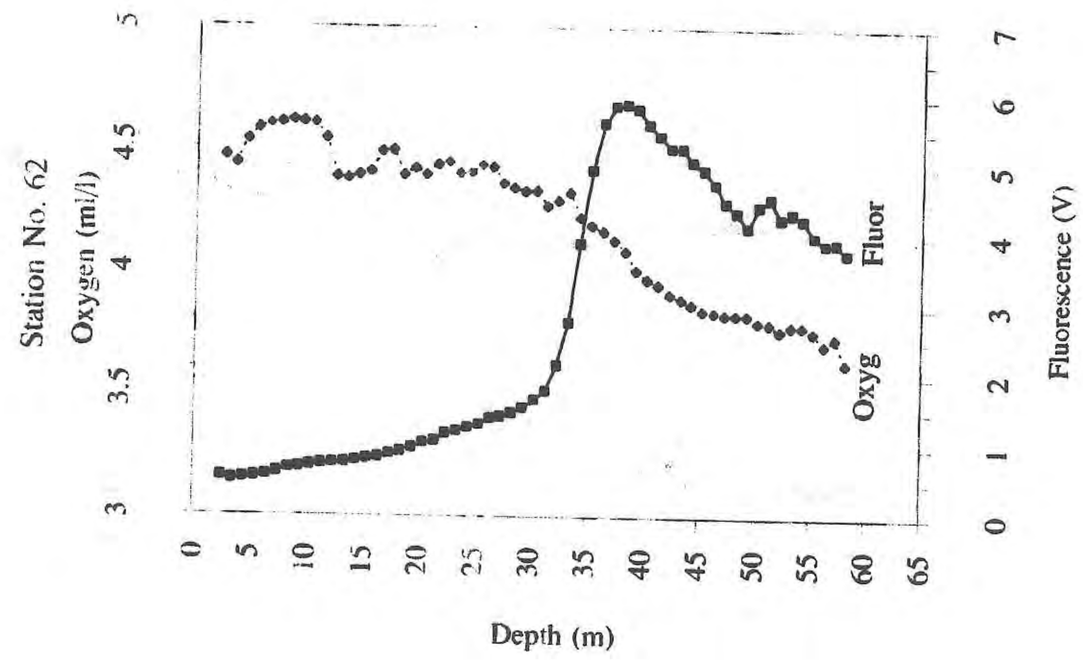

Station No.59
Temp (C)
28.4
28.6
28.8
29
29.2
Salt
Temp
Salinity (psu)
32.6
32.8
33
33.2
33.4
0
10
20
30
40
50
60
70
Depth (m)

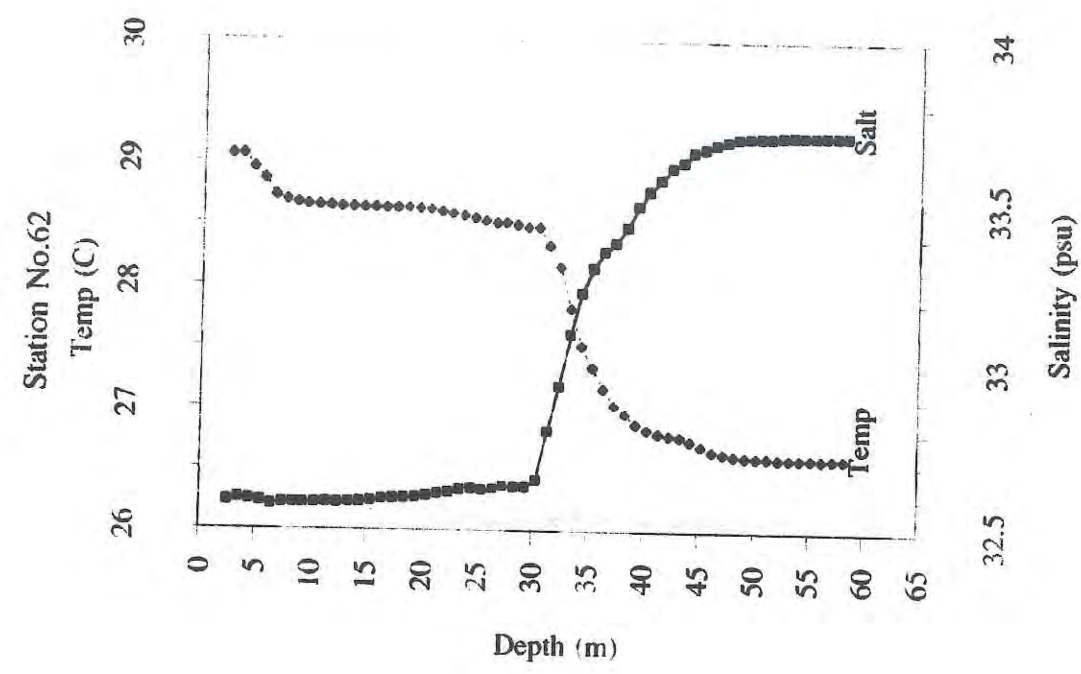

Station No.60
Temp (C)
27.5
28
29
Depth (m)
0
10
20
30
50
Temp
Salt
32.5
33
33.5
34
Salinity (psu)

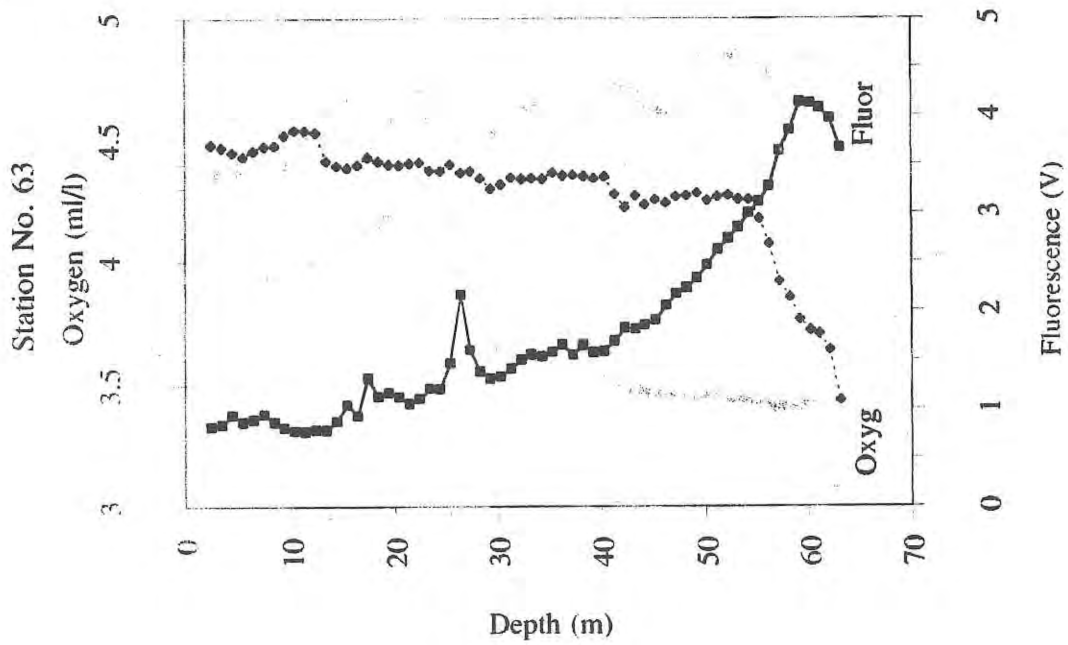

Station No. 60
Oxygen (ml/l)
3.8
4
4.2
4.4
4.6
Depth (m)
0
10
20
30
60
Oxyg
Fluor
0
1
2
3
4
Fluorescence (V)


Station No. 61
Oxygen (ml/l)
Fluorescence (V)
Depth (m)
Fluor
Oxyg

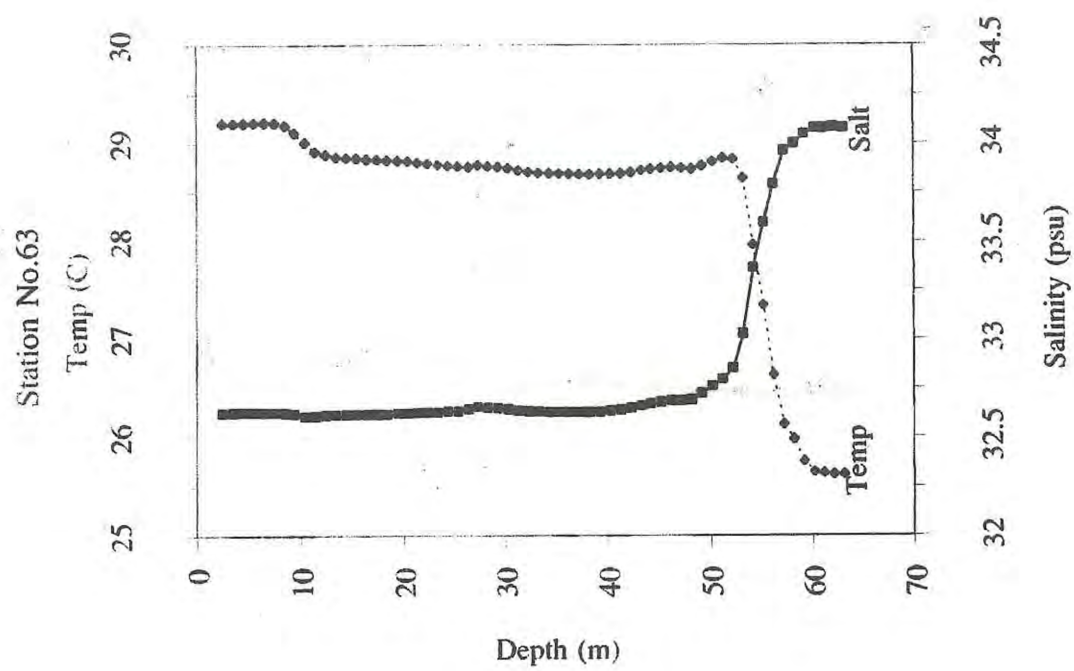

Station No. 61
Temp (C)
Salinity (psu)
Depth (m)
Salt
Temp


Station No. 62
Oxygen (ml/l)
3
3.5
4
4.5
5
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Fluor
Oxyg
Fluorescence (V)
0
1
2
3
4
5
6
7

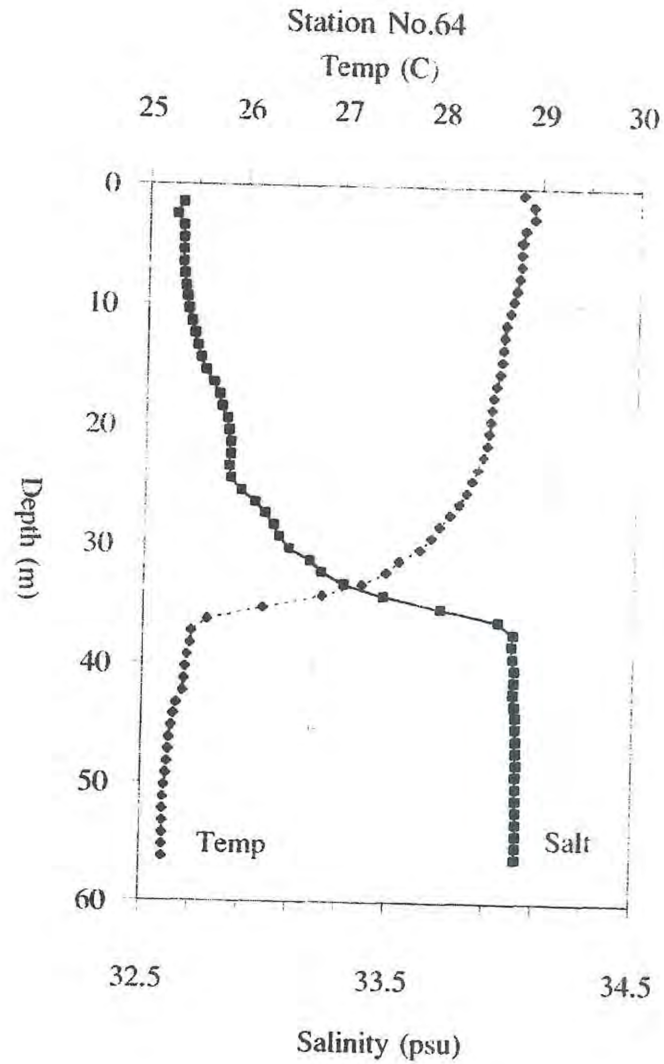

Station No.62
Temp (C)
26
27
28
29
30
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Salt
Temp
Salinity (psu)
32.5
33
33.5
34

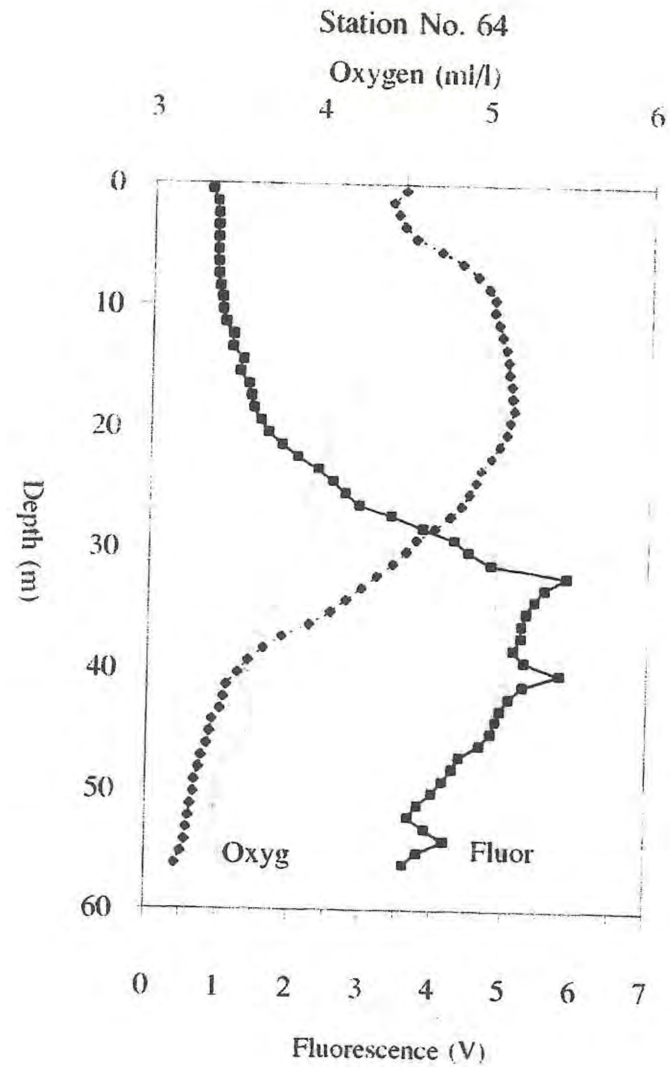


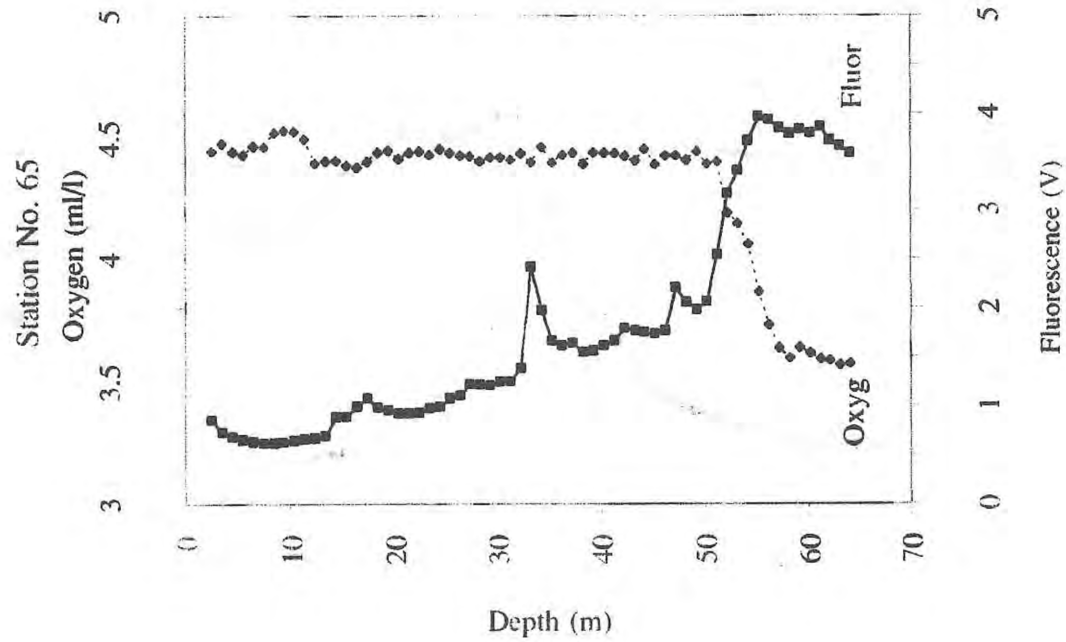
Station No. 63
Oxygen (ml/l)
3
3.5
4
4.5
5
Fluor
Oxyg
0
10
20
30
40
50
60
70
Depth (m)
0
1
2
3
4
5
Fluorescence (V)

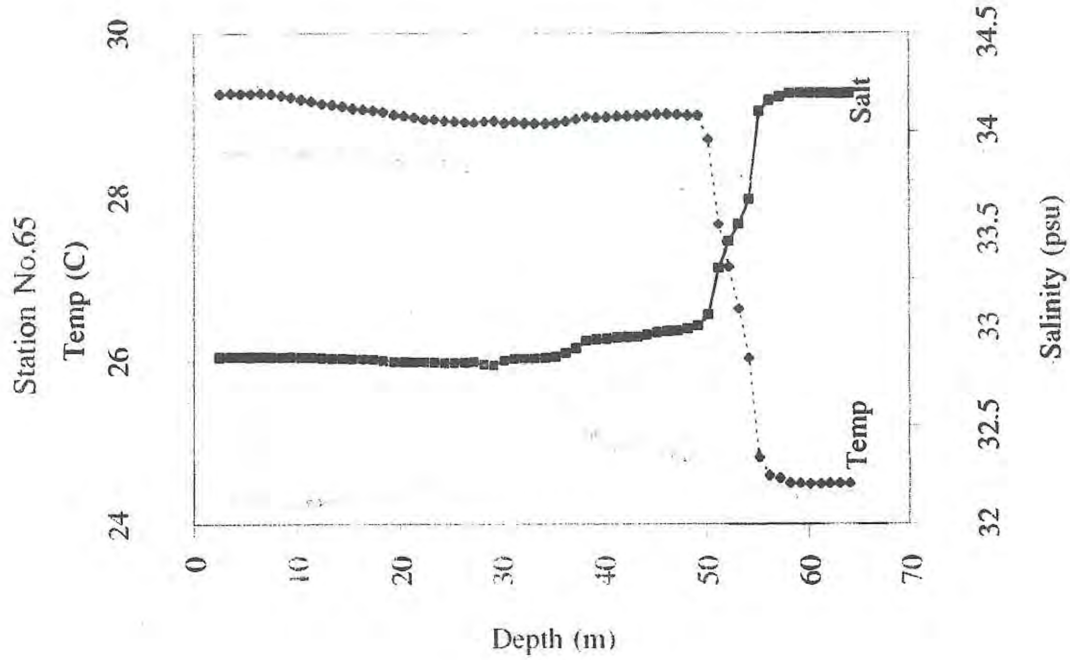


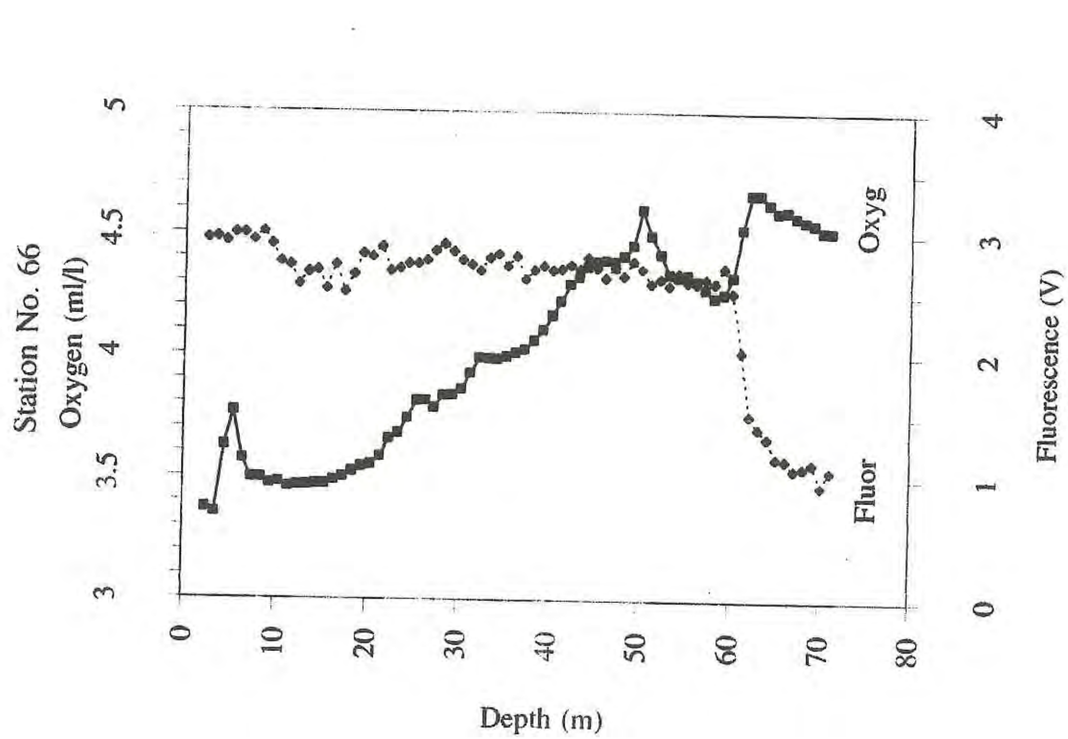
Station No.63
Temp (C)
25
26
27
28
29
30
Salt
Temp
0
10
20
30
40
50
60
70
Depth (m)
32
32.5
33
33.5
34
34.5
Salinity (psu)

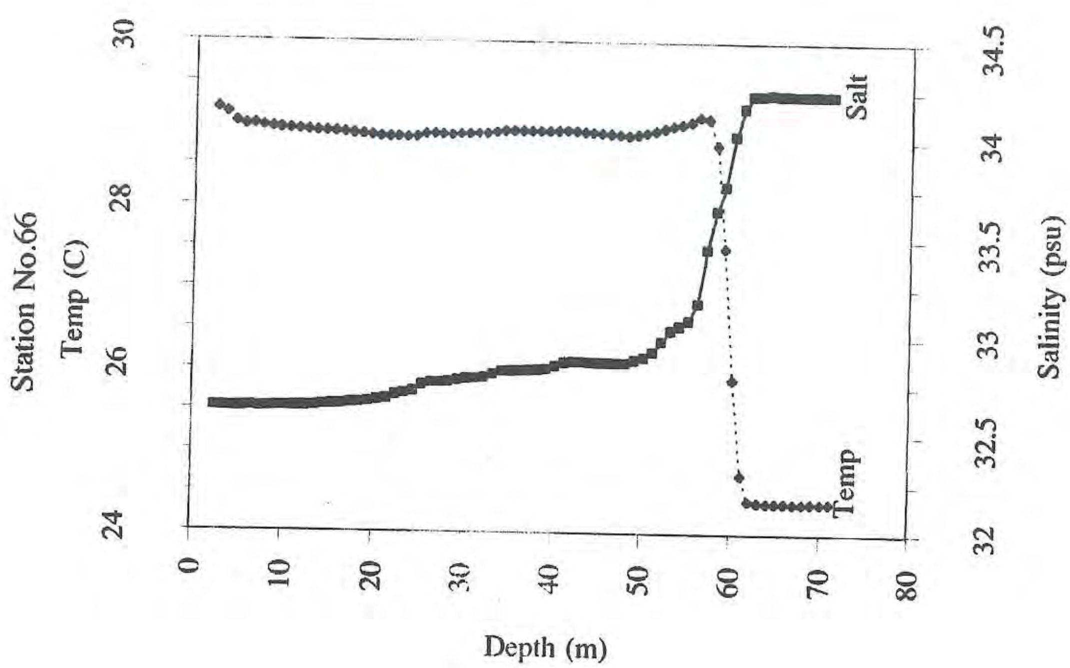

Station No.64
Temp (C)
25
26
27
28
29
30
0
10
20
30
40
50
60
Depth (m)
Temp
Salt
32.5
33.5
34.5
Salinity (psu)

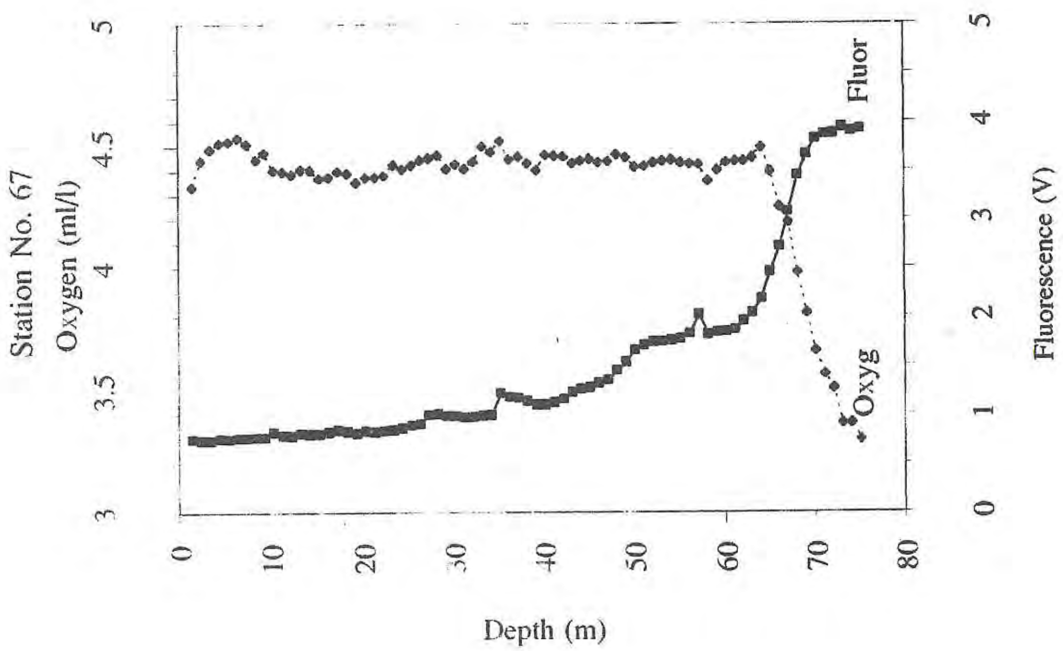

Station No. 64
Oxygen (ml/l)
3
4
5
6
0
10
20
30
40
50
60
Depth (m)
Oxyg
Fluor
0
1
2
3
4
5
6
7
Fluorescence (V)

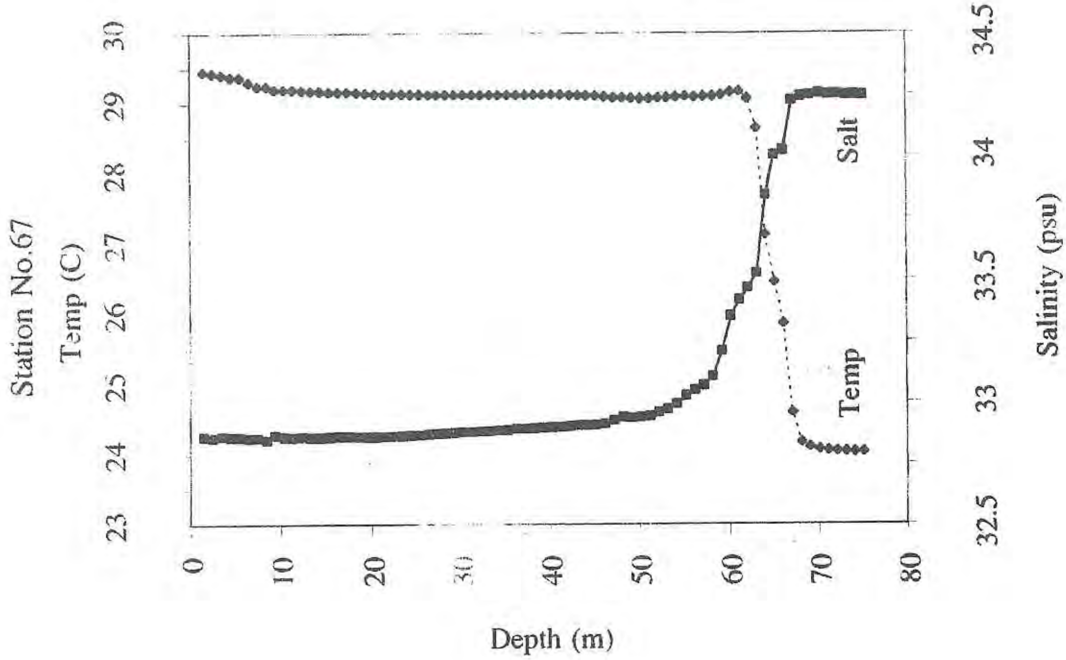

Station No. 65
Oxygen (ml/l)
3
3.5
4
4.5
5
Fluor
Oxyg
0
10
20
30
40
50
60
70
Depth (m)
0
1
2
3
4
5
Fluorescence (V)

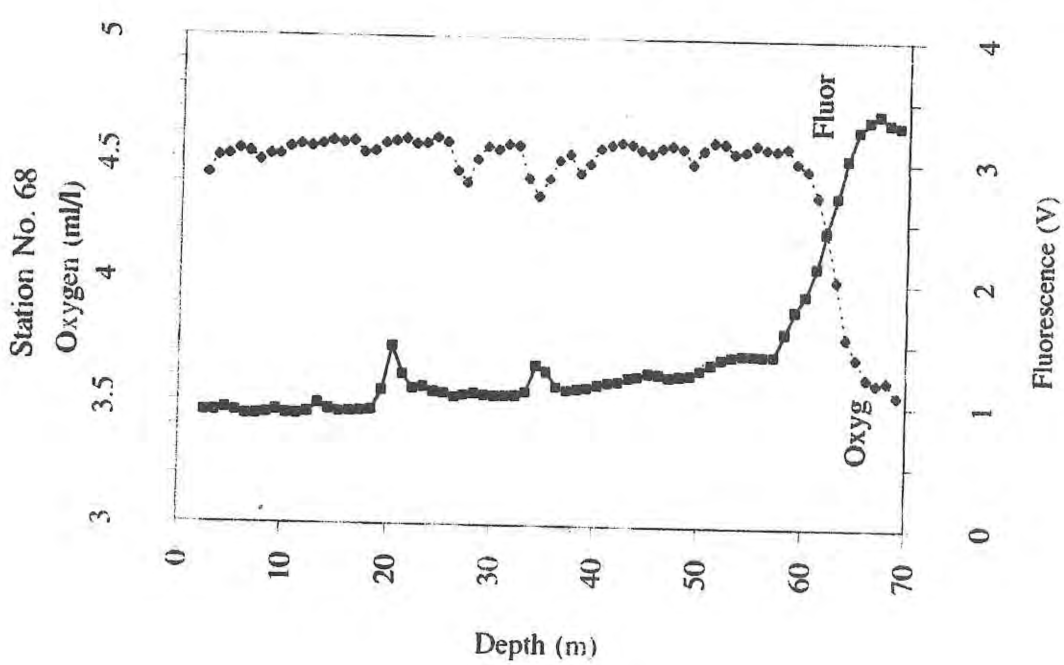

Station No.65
Temp (C)
24
26
28
30
Salt
Temp
0
10
20
30
40
50
60
70
Depth (m)
32
32.5
33
33.5
34
34.5
Salinity (psu)

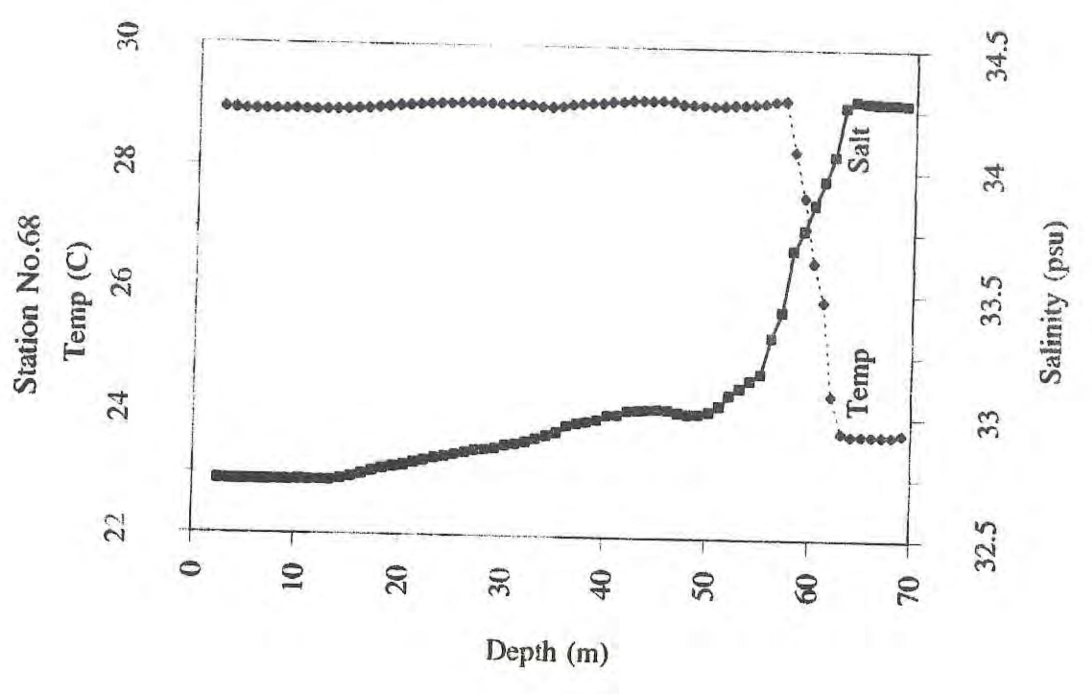

Station No. 66
Oxygen (ml/l)
3
3.5
4
4.5
5
Oxyg
Fluor
0
1
2
3
4
Fluorescence (V)
0
10
20
30
40
50
60
70
80
Depth (m)

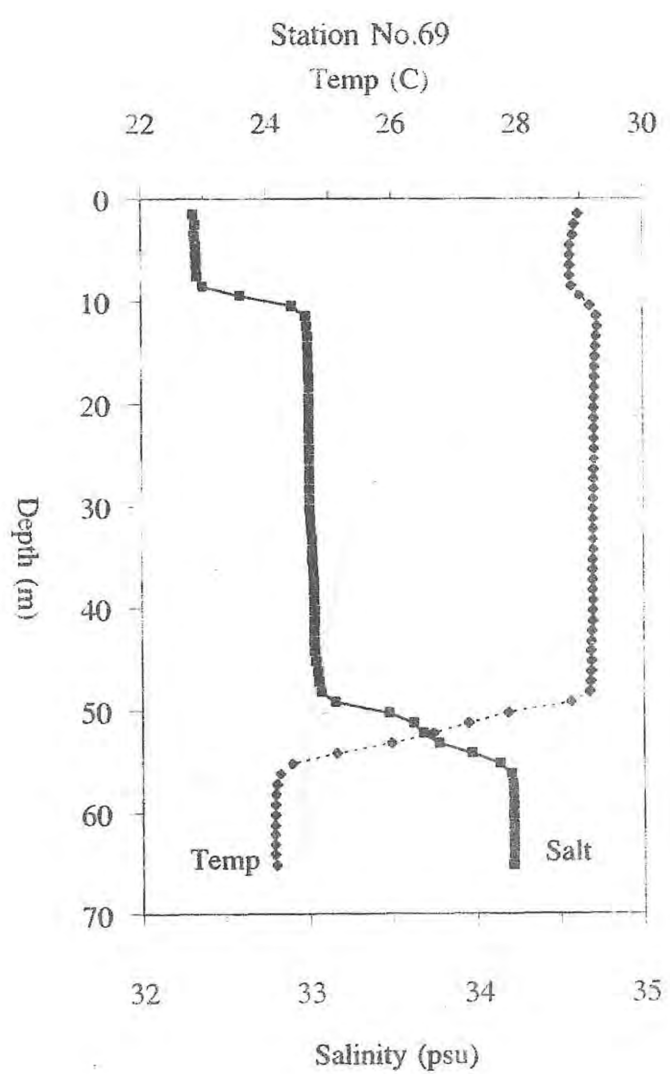

Station No.66
Temp (C)
24
26
28
30
Salt
Temp
32
32.5
33
33.5
34
34.5
Salinity (psu)
0
10
20
30
40
50
60
70
80
Depth (m)

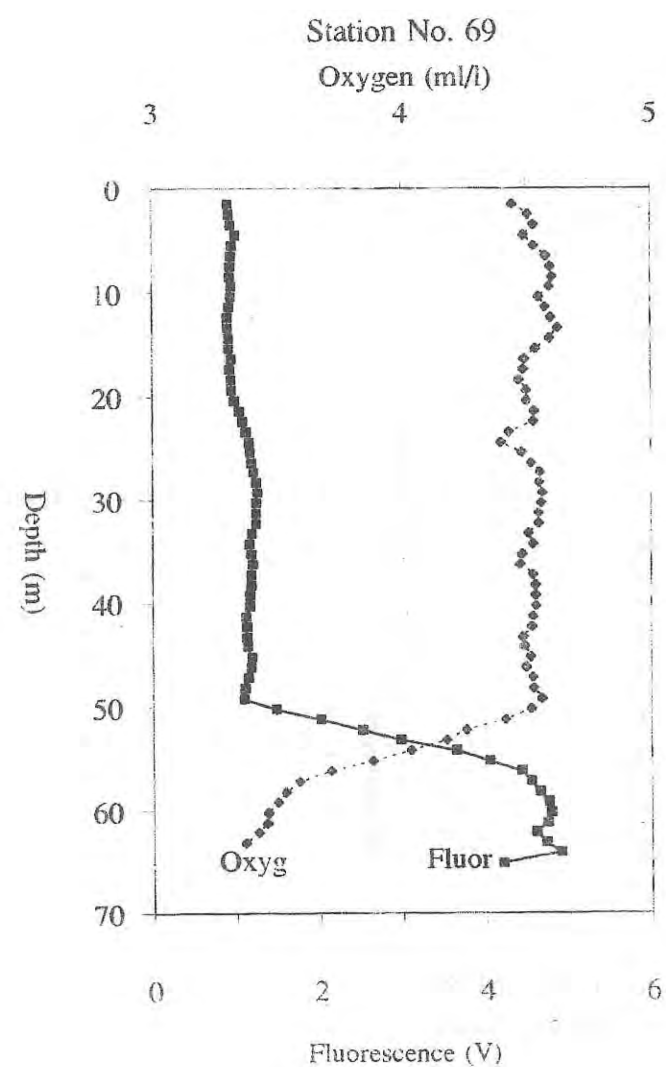

Station No. 67
Oxygen (ml/l)
Fluorescence (V)
Depth (m)
Fluor
Oxyg

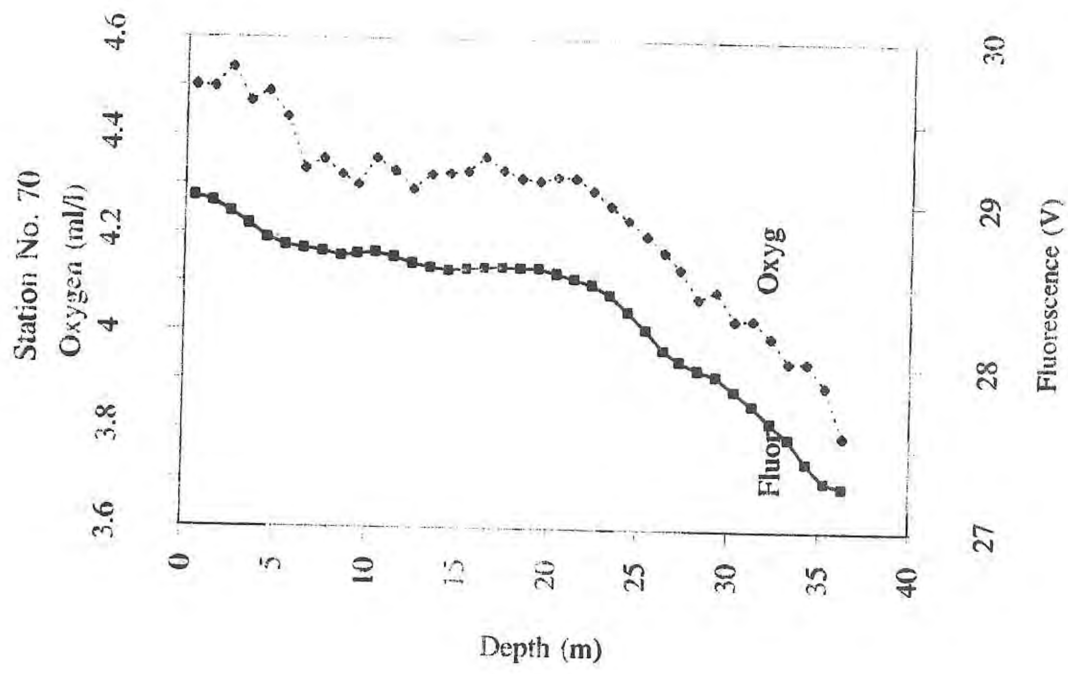

Station No.67
Temp (C)
Salinity (psu)
Depth (m)
Salt
Temp

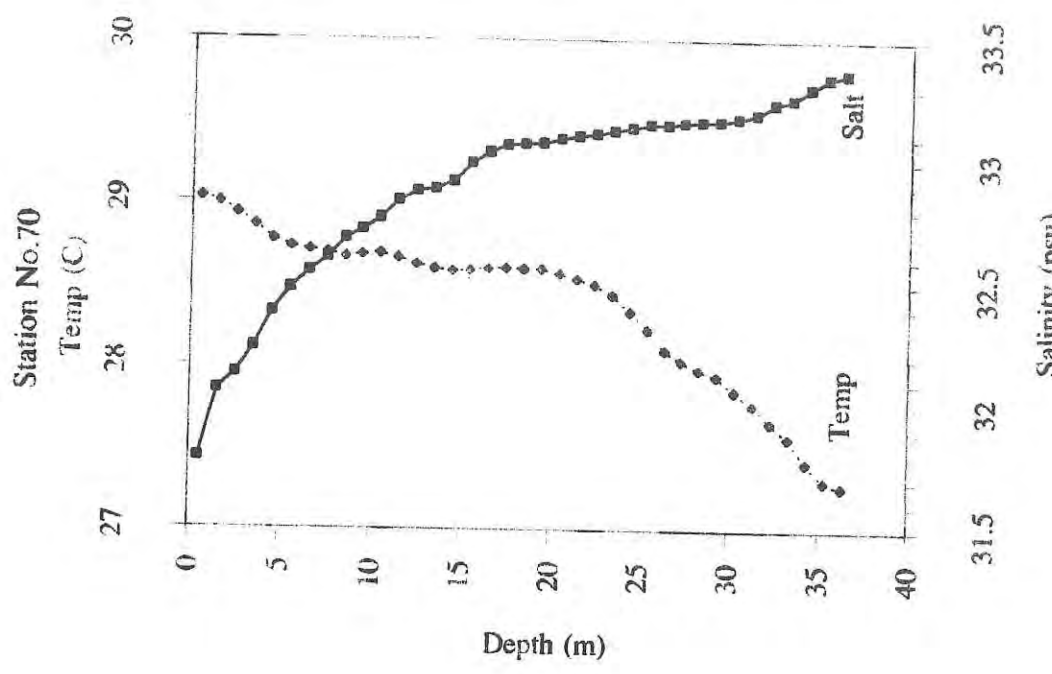

Station No. 68
Oxygen (ml/l)
3
3.5
4
4.5
5
Fluor
Oxyg
0
1
2
3
4
Fluorescence (V)
0
10
20
30
40
50
60
70
Depth (m)

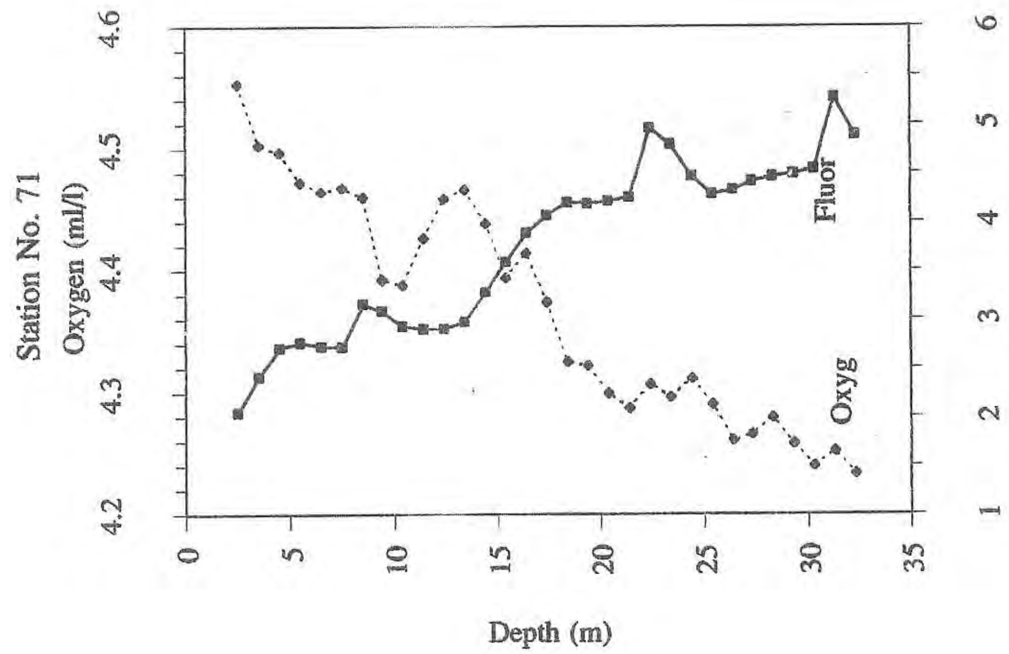

Station No.68
Temp (C)
22
24
26
28
30
Salt
Temp
32.5
33
33.5
34
34.5
Salinity (psu)
0
10
20
30
40
50
60
70
Depth (m)

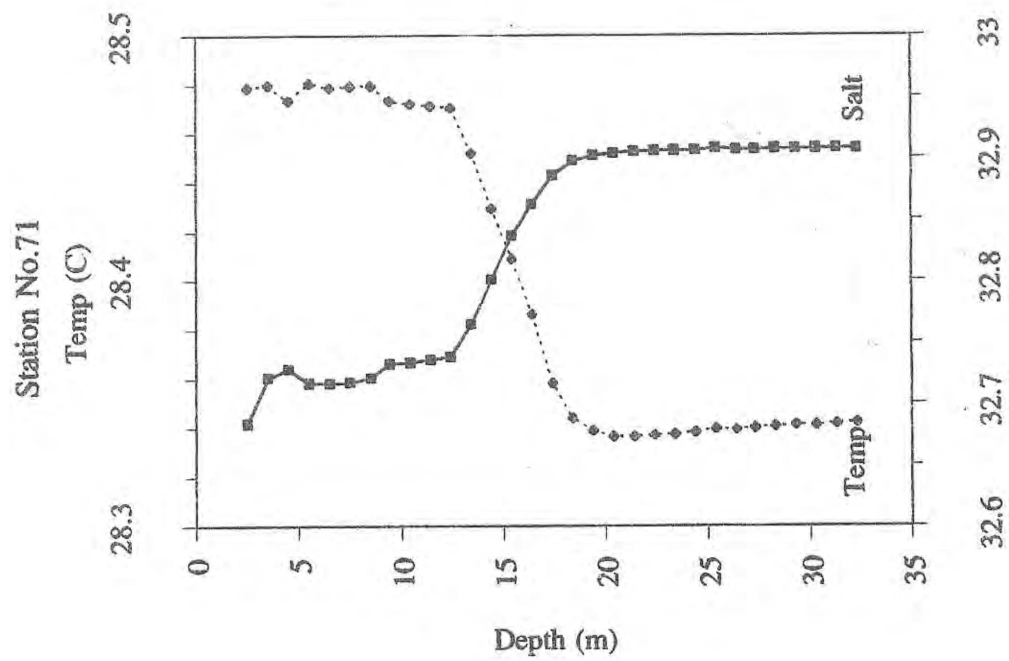

Station No.69
Temp (C)
22
24
26
28
30
Depth (m)
0
10
20
30
40
50
60
70
Temp
Salt
32
33
34
35
Salinity (psu)

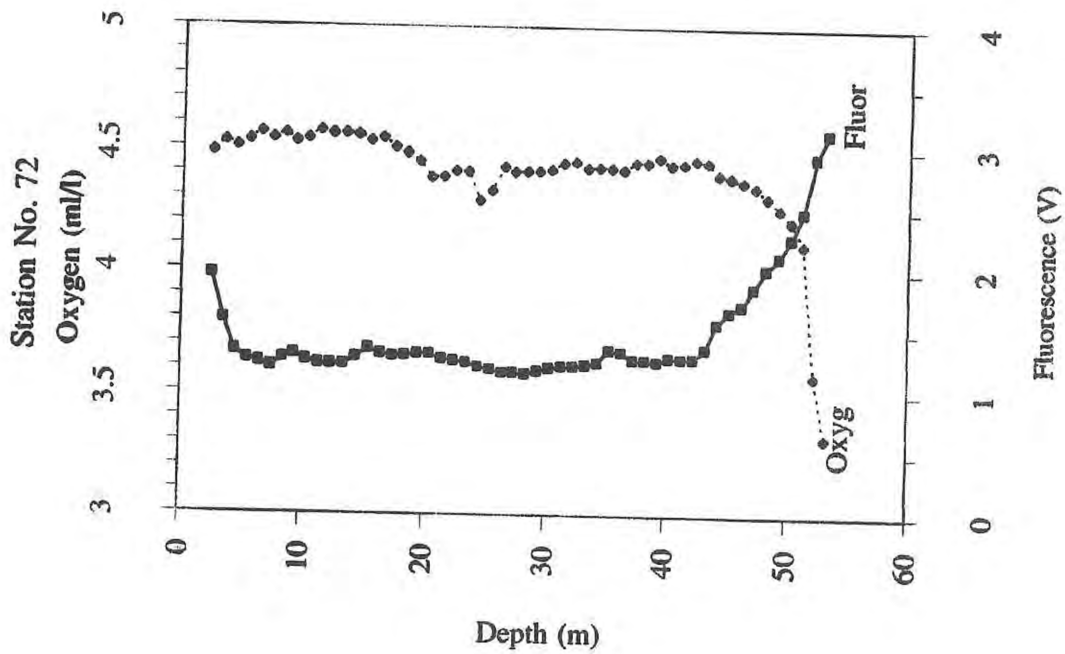

Station No. 69
Oxygen (ml/l)
3
4
5
Depth (m)
0
10
20
30
40
50
60
70
Oxyg
Fluor
0
2
4
6
Fluorescence (V)

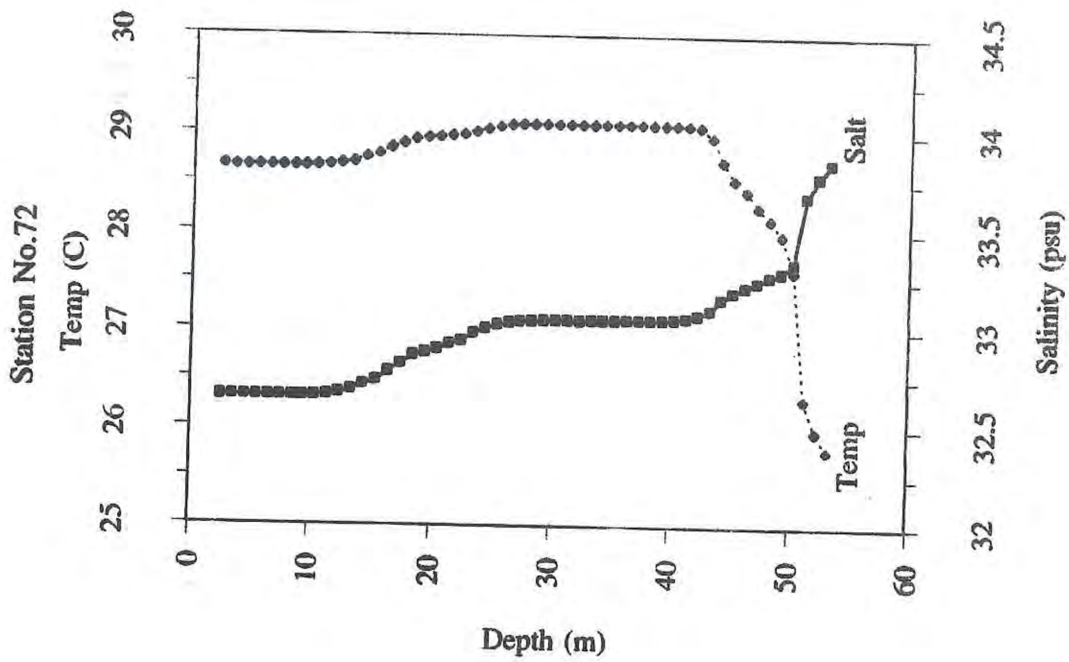

Station No. 70
Oxygen (ml/l)
3.6
3.8
4
4.2
4.4
4.6
Oxyg
Fluor
27
28
29
30
Fluorescence (V)
0
5
10
15
20
25
30
35
40
Depth (m)

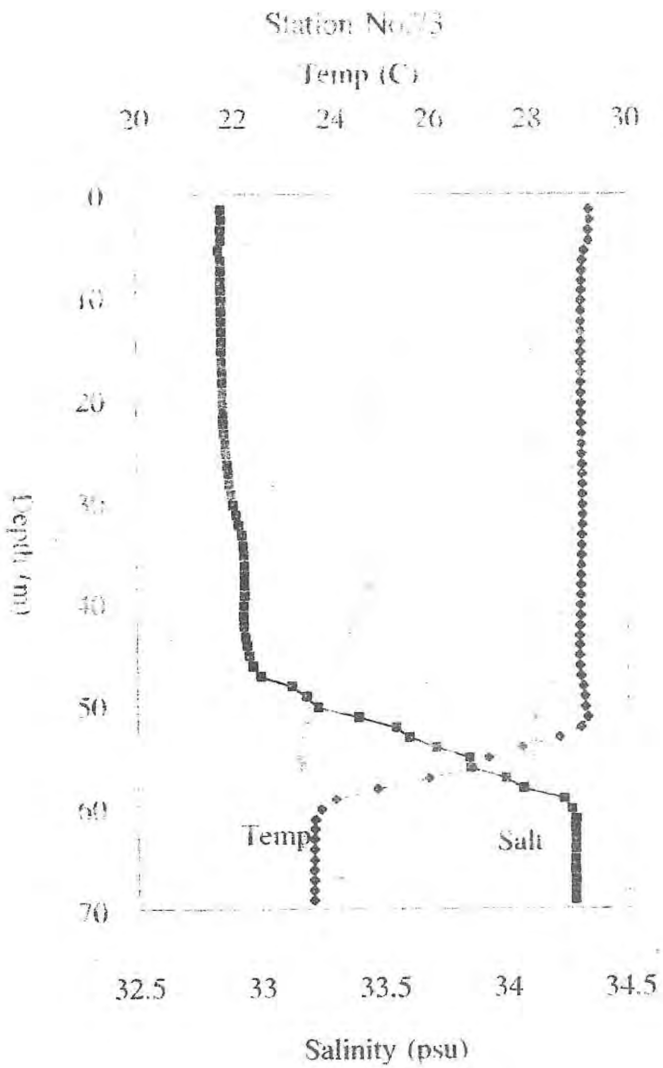

Station No.70
Temp (C)
27
28
29
30
Salt
Temp
31.5
32
32.5
33
33.5
Salinity (psu)
0
5
10
15
20
25
30
35
40
Depth (m)

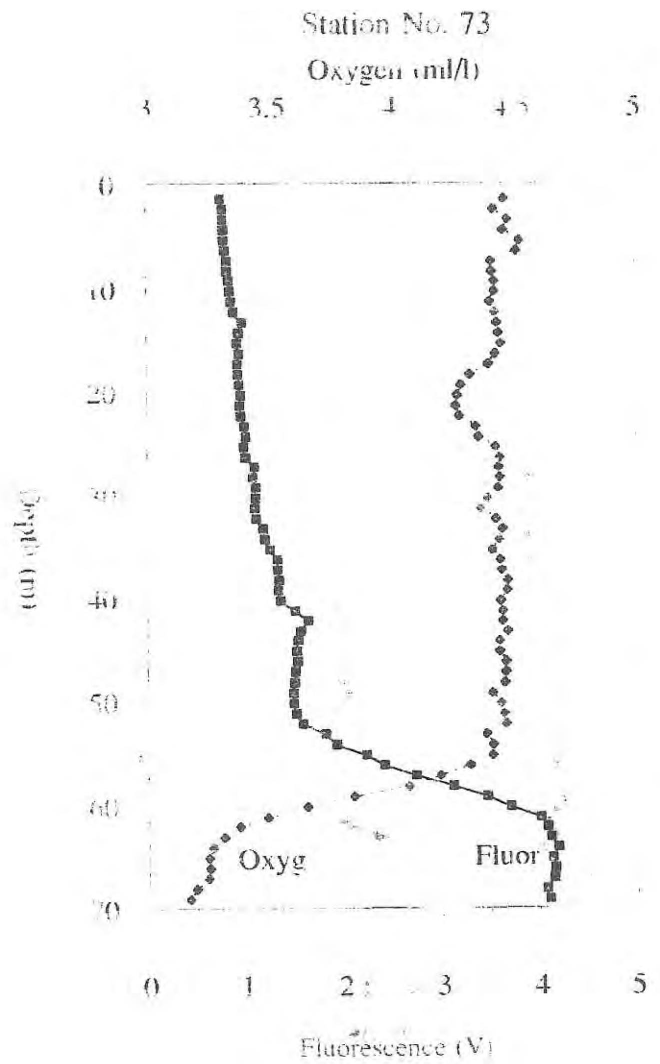

Station No. 71
Oxygen (ml/l)
4.2
4.3
4.4
4.5
4.6
Fluor
Oxyg
0
5
10
15
20
25
30
35
Depth (m)
1
2
3
4
5
6
Fluorescence (V)

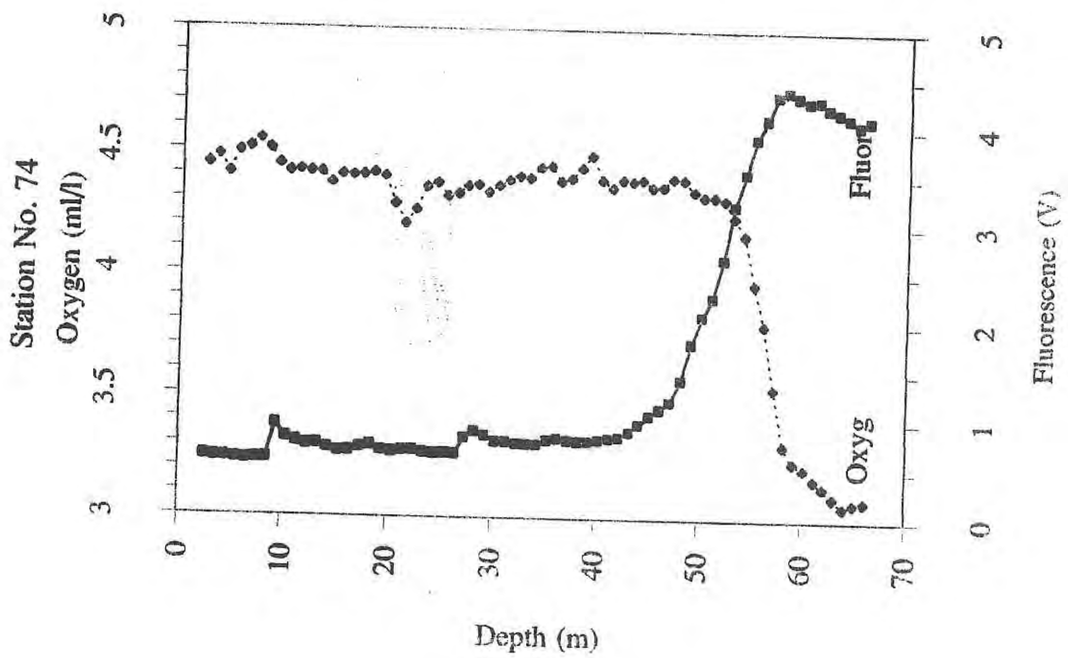

Station No.71
Temp (C)
28.3
28.4
28.5
Salt
Temp
0
5
10
15
20
25
30
35
Depth (m)
32.6
32.7
32.8
32.9
33
Salinity (psu)

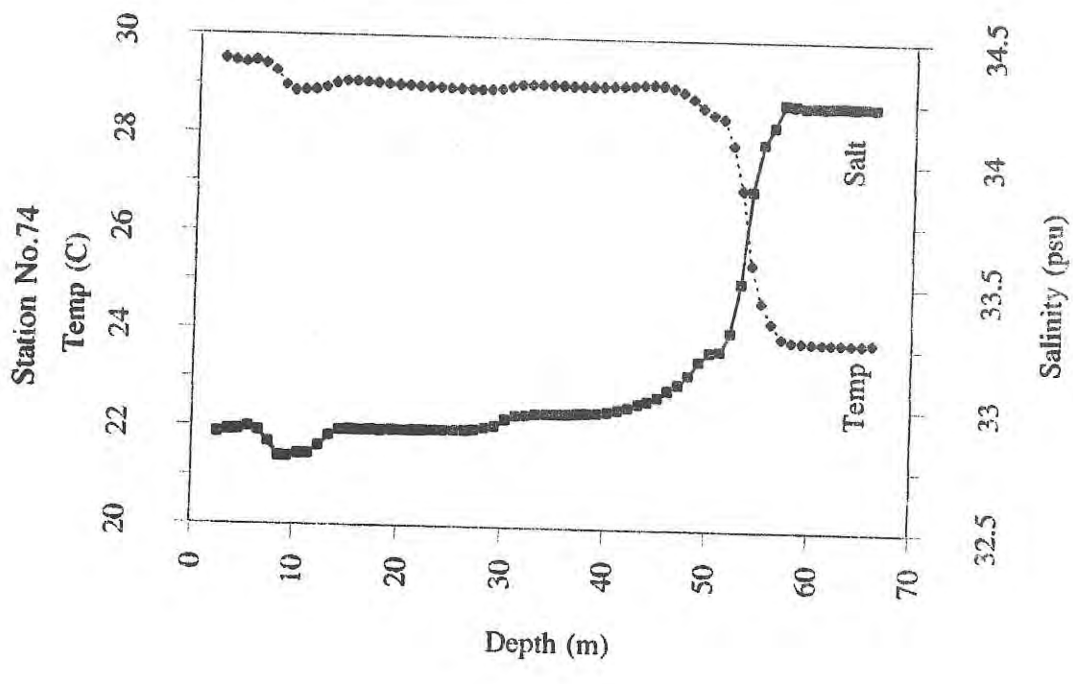

Station No. 72
Oxygen (ml/l)
3
3.5
4
4.5
5
Fluor
Oxyg
0
1
2
3
4
Fluorescence (V)
0
10
20
30
40
50
60
Depth (m)

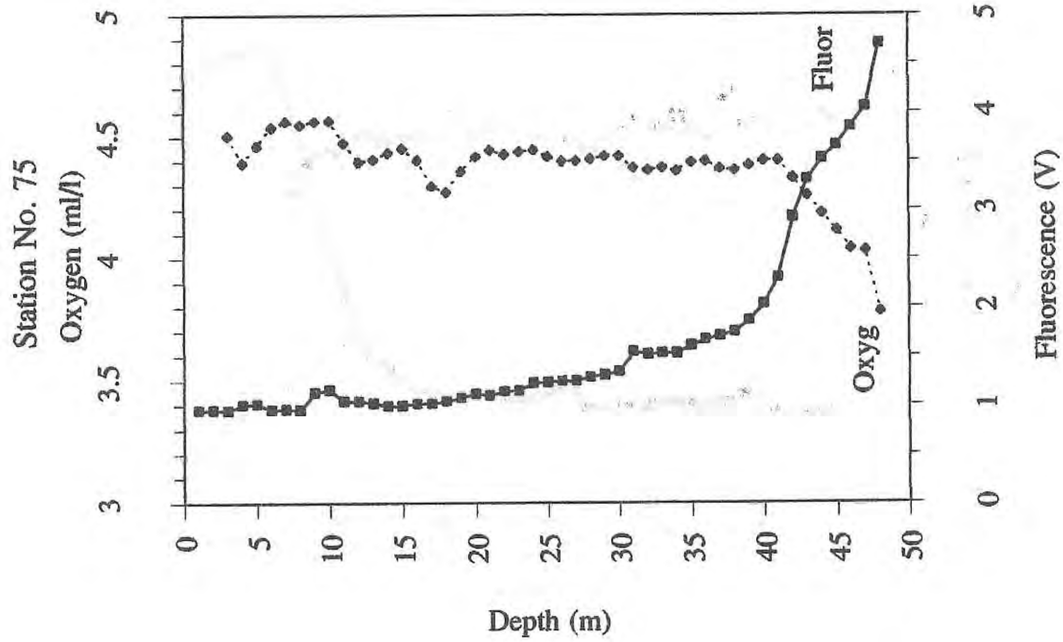

Station No.72
Temp (C)
25
26
27
28
29
30
Salt
Temp
32
32.5
33
33.5
34
34.5
Salinity (psu)
0
10
20
30
40
50
60
Depth (m)

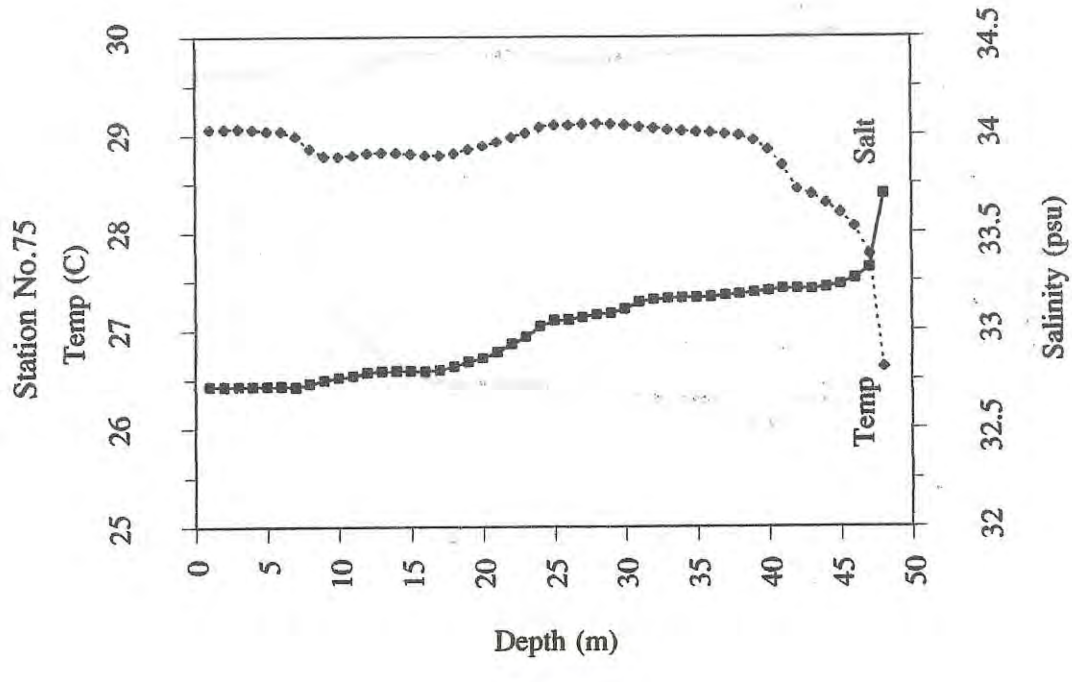

Station No.73
Temp (C)
20
22
24
26
28
30
Depth (m)
0
10
20
30
40
50
60
70
Temp
Salt
32.5
33
33.5
34
34.5
Salinity (psu)

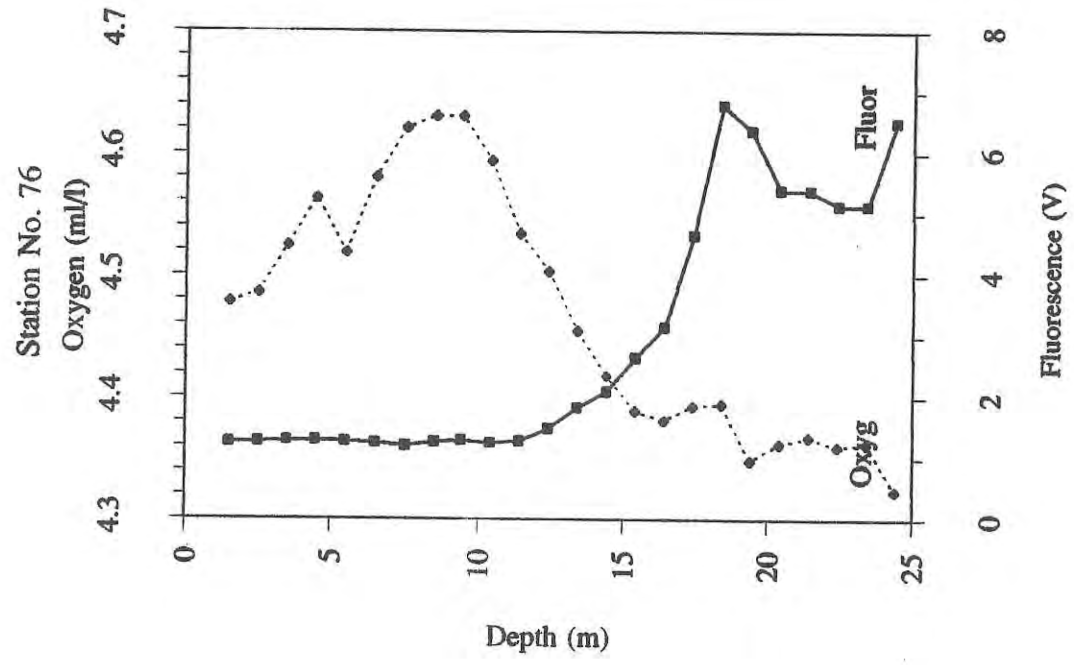

Station No. 73
Oxygen (ml/l)
3.5
4
5
Depth (m)
0
20
40
50
70
Oxyg
Fluor
0
1
2
3
4
5
Fluorescence (V)


Station No. 74
Oxygen (ml/l)
3
3.5
4
4.5
5
0
10
20
30
40
50
60
70
Depth (m)
0
1
2
3
4
5
Fluorescence (V)
Fluor
Oxyg

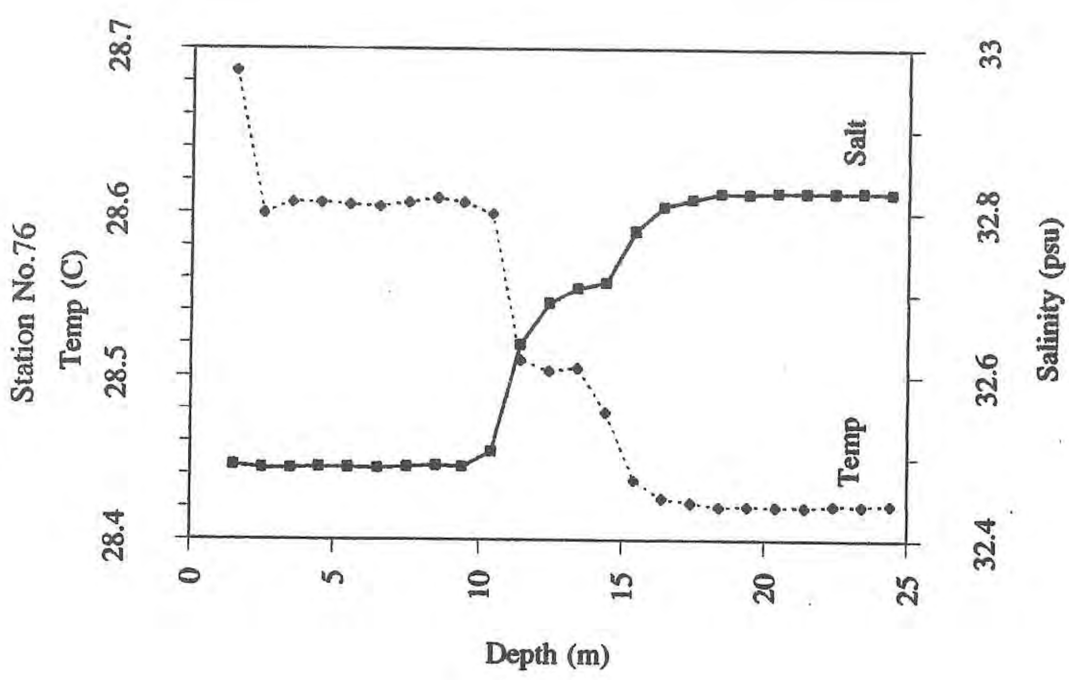

Station No.74
Temp (C)
20
22
24
26
28
30
0
10
20
30
40
50
60
70
Depth (m)
32.5
33
33.5
34
34.5
Salinity (psu)
Salt
Temp


Station No. 75
Oxygen (ml/l)
3
3.5
4
4.5
5
Fluor
Oxyg
0
1
2
3
4
5
Fluorescence (V)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)

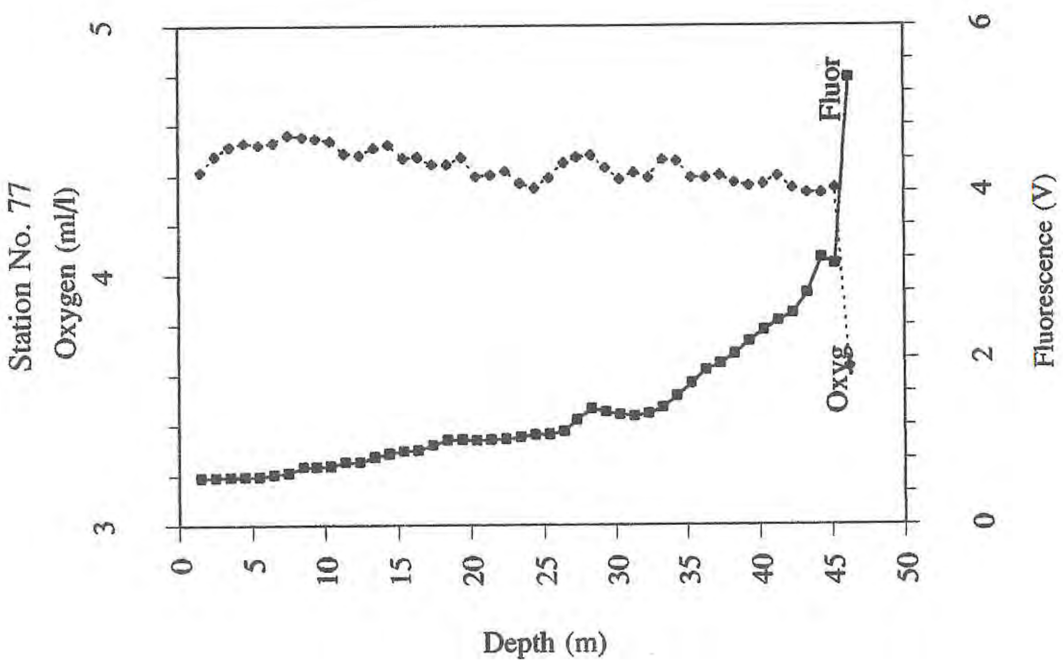

Station No.75
Temp (C)
25
26
27
28
29
30
Salt
Temp
32
32.5
33
33.5
34
34.5
Salinity (psu)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)



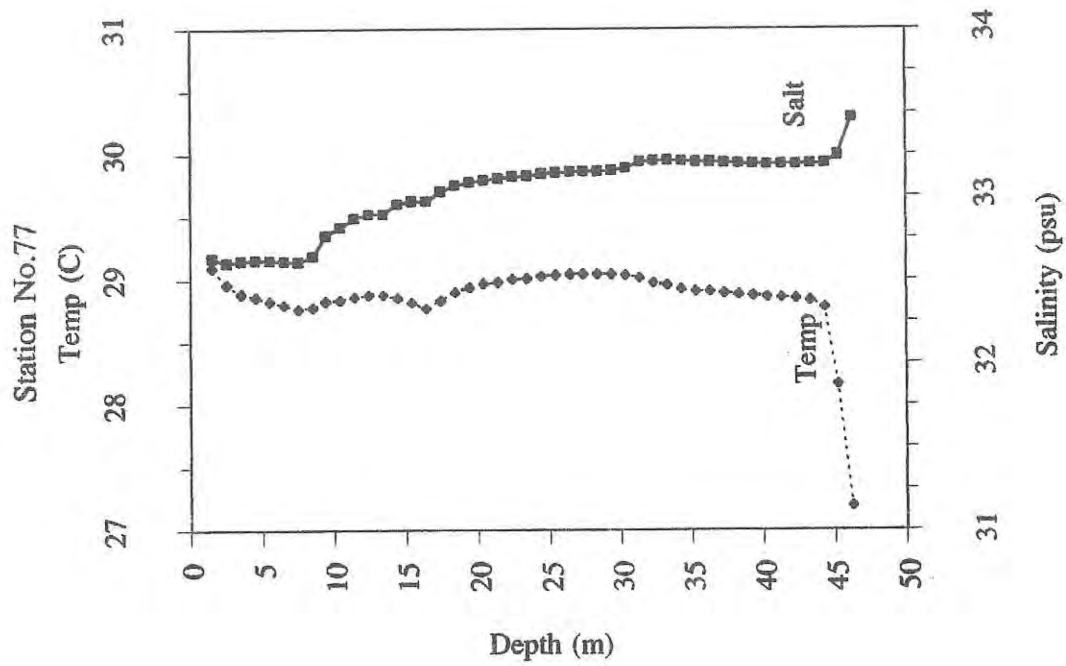
Station No. 76
Oxygen (ml/l)
4.3
4.4
4.5
4.6
4.7
Fluor
Oxyg
0
5
10
15
20
25
Depth (m)
0
2
4
6
8
Fluorescence (V)



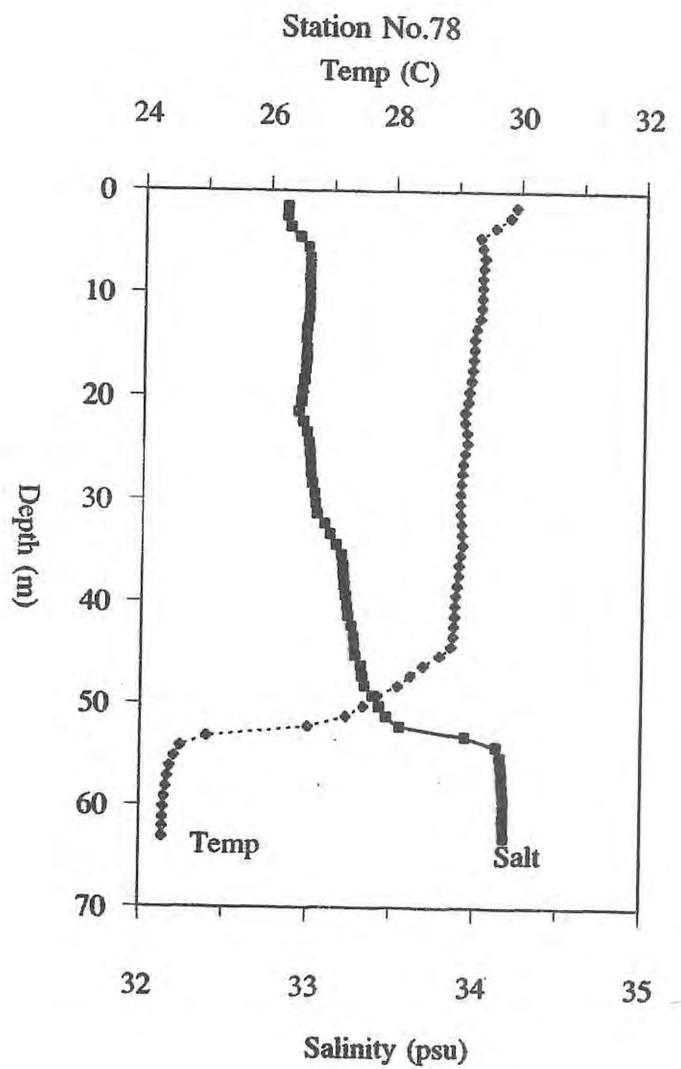
Station No.76
Temp (C)
28.4
28.5
28.6
28.7
Salt
Temp
0
5
10
15
20
25
Depth (m)
32.4
32.6
32.8
33
Salinity (psu)

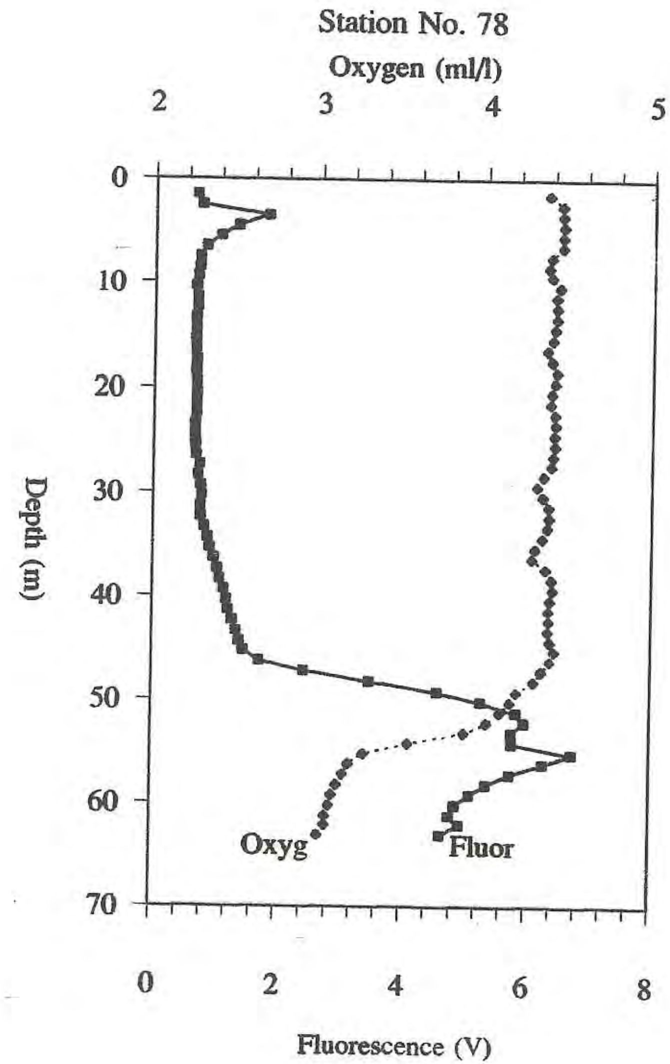


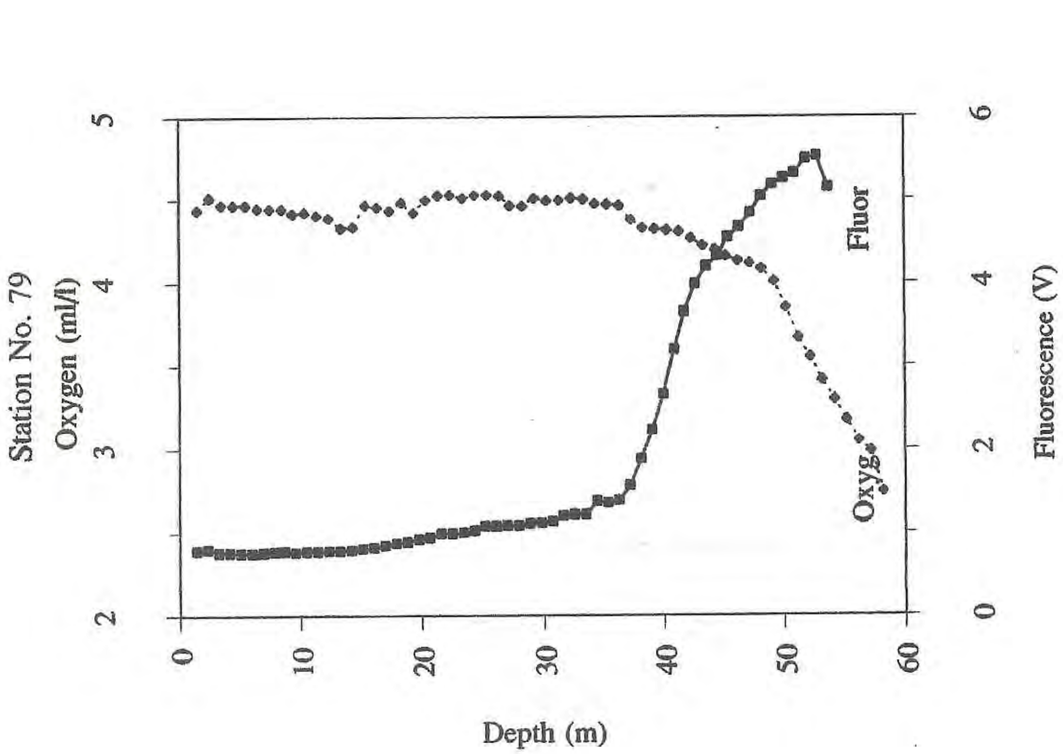
Station No. 77
Oxygen (ml/l)
Fluorescence (V)
Depth (m)
Fluor
Oxyg
3
4
5
0
2
4
6
0
5
10
15
20
25
30
35
40
45
50

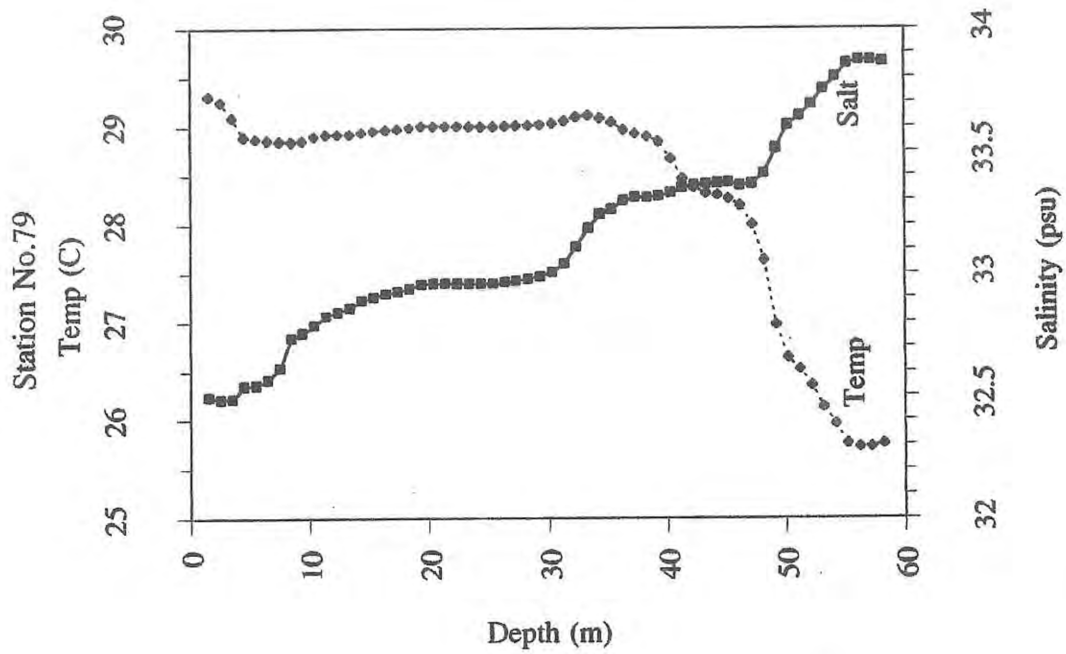


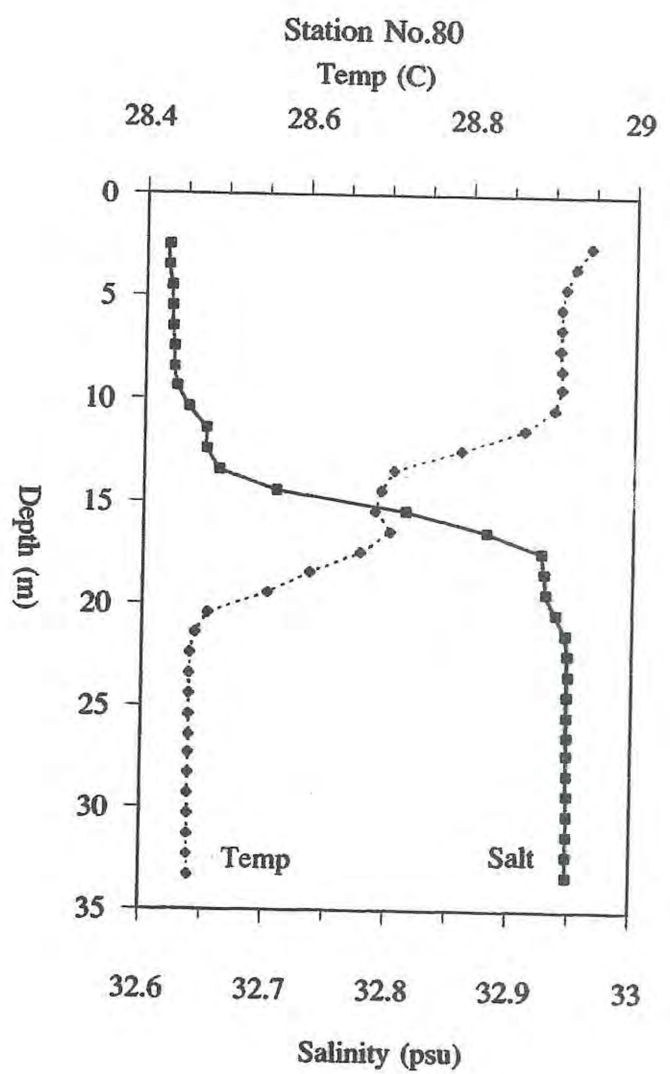
Station No.77
Temp (C)
Salinity (psu)
Depth (m)
Salt
Temp
27
28
29
30
31
31
32
33
34
0
5
10
15
20
25
30
35
40
45
50

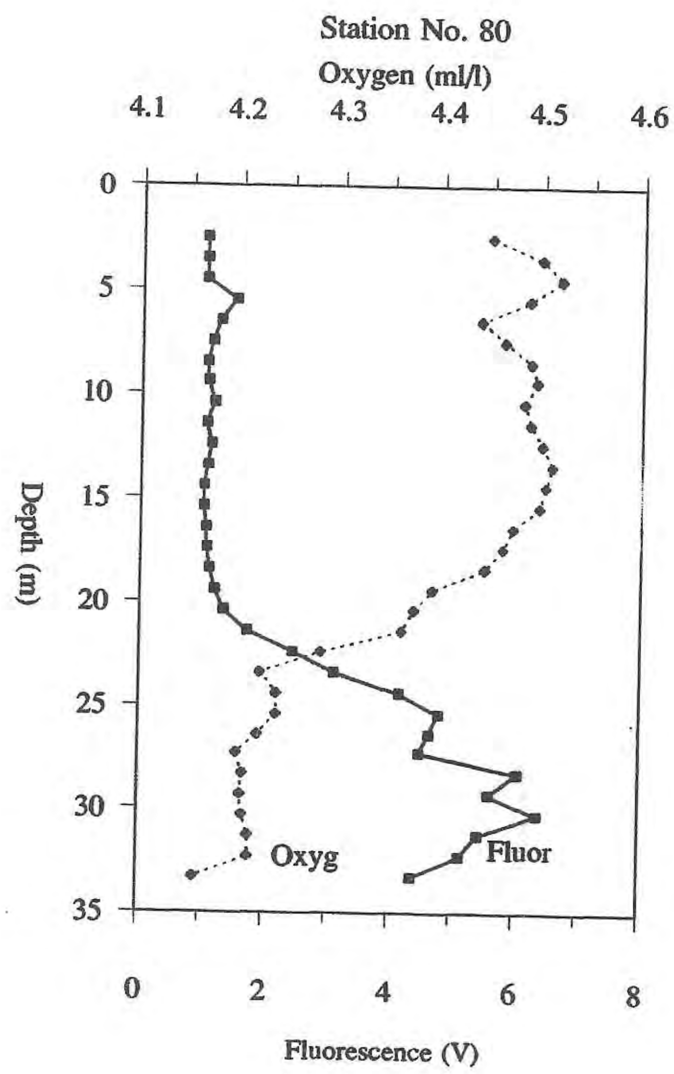

Station No.78
Temp (C)
24
26
28
30
32
Depth (m)
0
10
20
30
40
50
60
70
Temp
Salt
32
33
34
35
Salinity (psu)

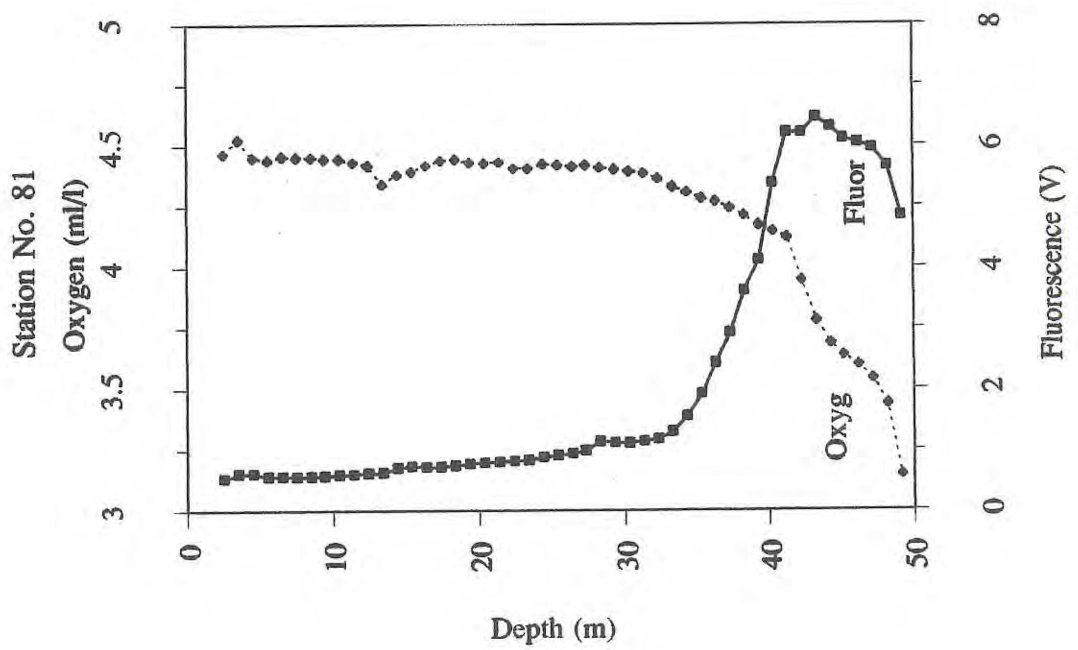

Station No. 78
Oxygen (ml/l)
2
3
4
5
Depth (m)
0
10
20
30
40
50
60
70
Oxyg
Fluor
0
2
4
6
8
Fluorescence (V)

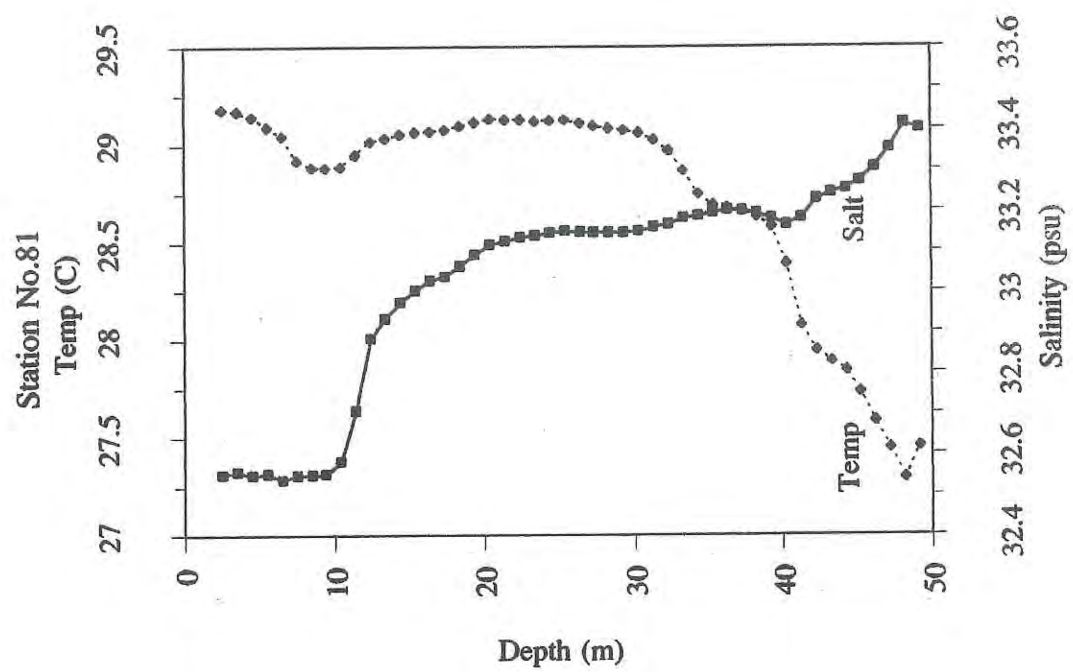

Station No. 79
Oxygen (ml/l)
Fluorescence (V)
Depth (m)
Fluor
Oxyg.


Station No.79
Temp (C)
Salinity (psu)
Depth (m)
Salt
Temp


Station No.80
Temp (C)
28.4
28.6
28.8
29
0
5
10
15
20
25
30
35
Depth (m)
Temp
Salt
32.6
32.7
32.8
32.9
33
Salinity (psu)


Station No. 80
Oxygen (ml/l)
4.1
4.2
4.3
4.4
4.5
4.6
0
5
10
15
20
25
30
35
Depth (m)
Oxyg
Fluor
0
2
4
6
8
Fluorescence (V)


Station No. 81
Oxygen (ml/l)
3
3.5
4
4.5
5
0
10
20
30
40
50
Depth (m)
Fluor
Oxyg
0
2
4
6
8
Fluorescence (V)


Station No.81
Temp (C)
27
27.5
28
28.5
29
29.5
0
10
20
30
40
50
Depth (m)
Salt
Temp
32.4
32.6
32.8
33
33.2
33.4
33.6
Salinity (psu)

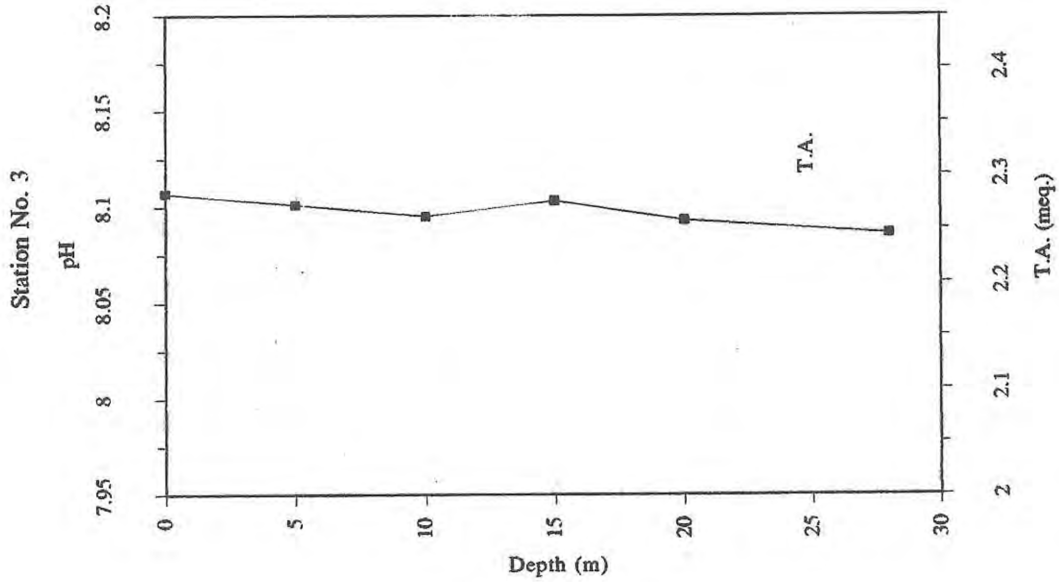
pH and Total Alkalinity

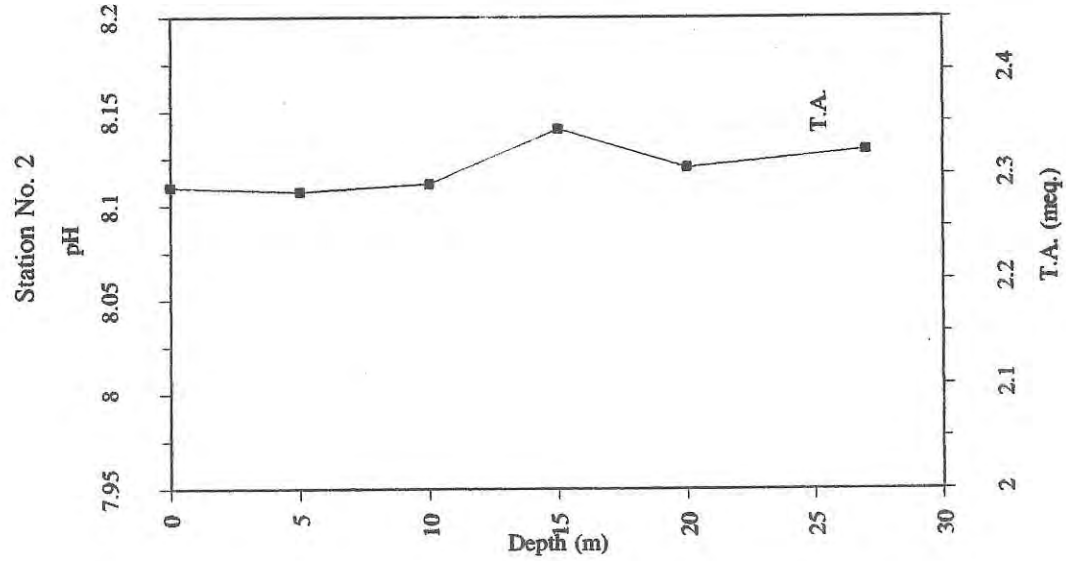
The pH of unfiltered seawater collected by rosette sampler at discrete depths was measured immediately after collection by using a Fisher Accumet 1002 pH meter which has a readability to 0.001. The meter was calibrated once a day against NBS pH 4 and 7 standard buffers and the electrode was stored in seawater which its pH was adjusted to about 7 in order to optimize the response time of the electrode.

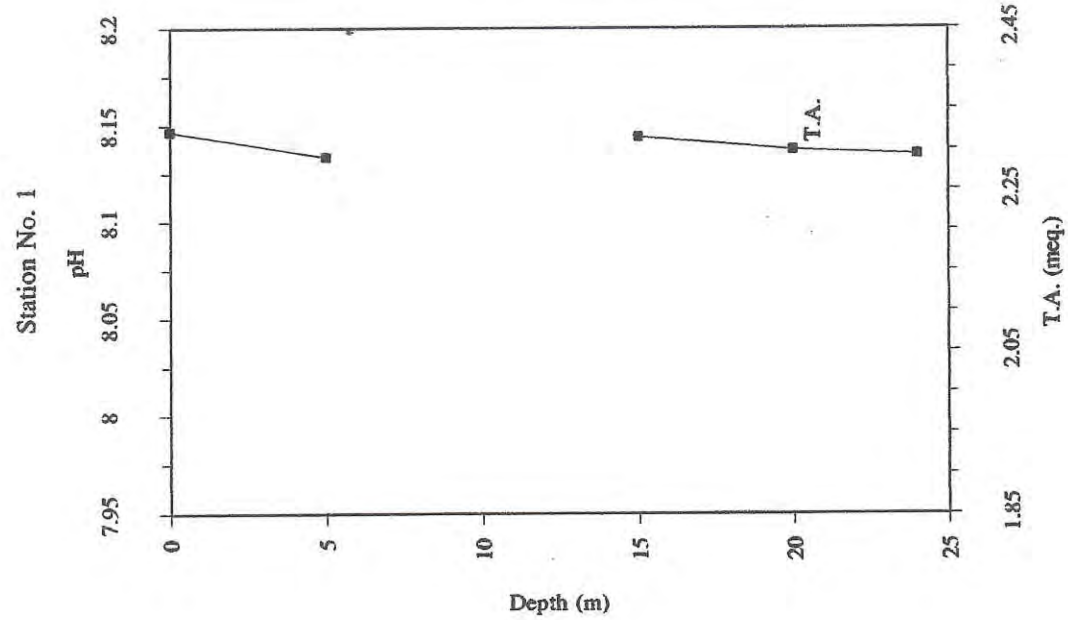
The total alkalinity (T.A.) was determined by adding 12.5 ml of 0.0100 N HCl to 50 ml of filtered (Whatman GF/C, 1.2 μm) seawater samples. The samples were shaken vigorously and the final pH (below 4) was recorded by the same meter described previously for pH measurement. The activity coefficient of H^+ under the temperature and salinity of our samples was assumed to be 0.755 (Strickland and Parsons, 1972). Thus, from the H^+ mass balance:

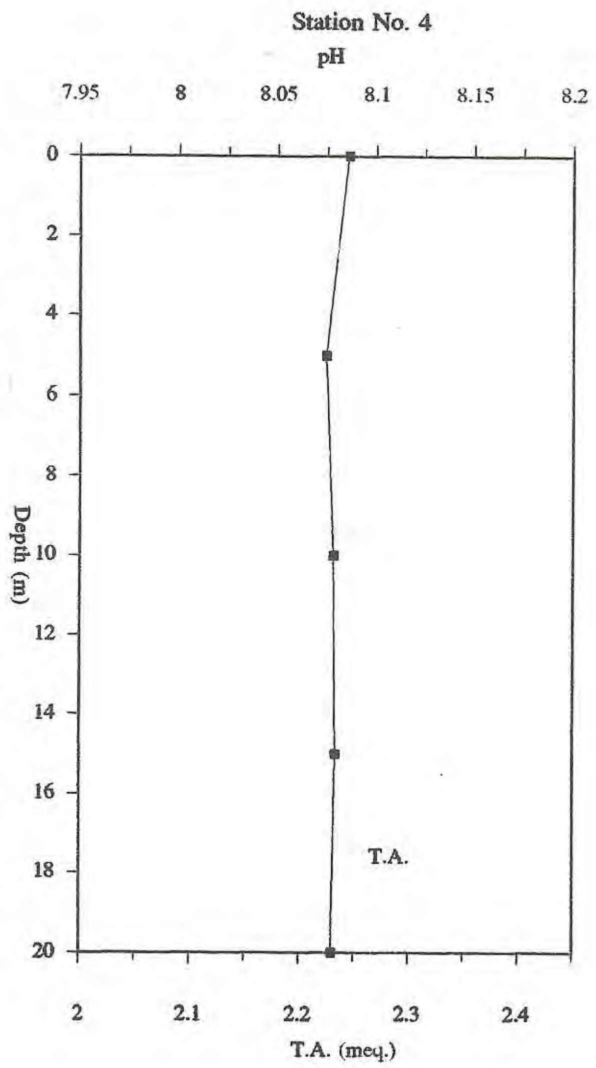
Total H^+ added = H^+ used to titrate all HCO_3^- and CO_3^{2-} in sample + excess H^+ remained in final solution

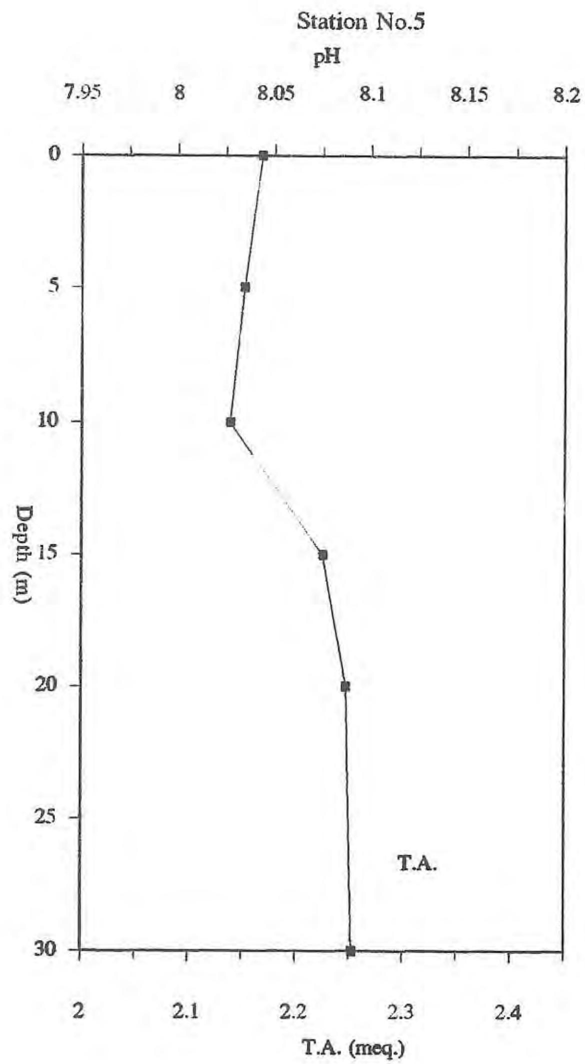
The left side of this equation was obtained from the concentration and volume of HCl used. The second term on the right hand side was known from the final pH, final volume and activity coefficient of H^+. The remaining term when divided by the starting sample volume is, by definition, the total alkalinity.

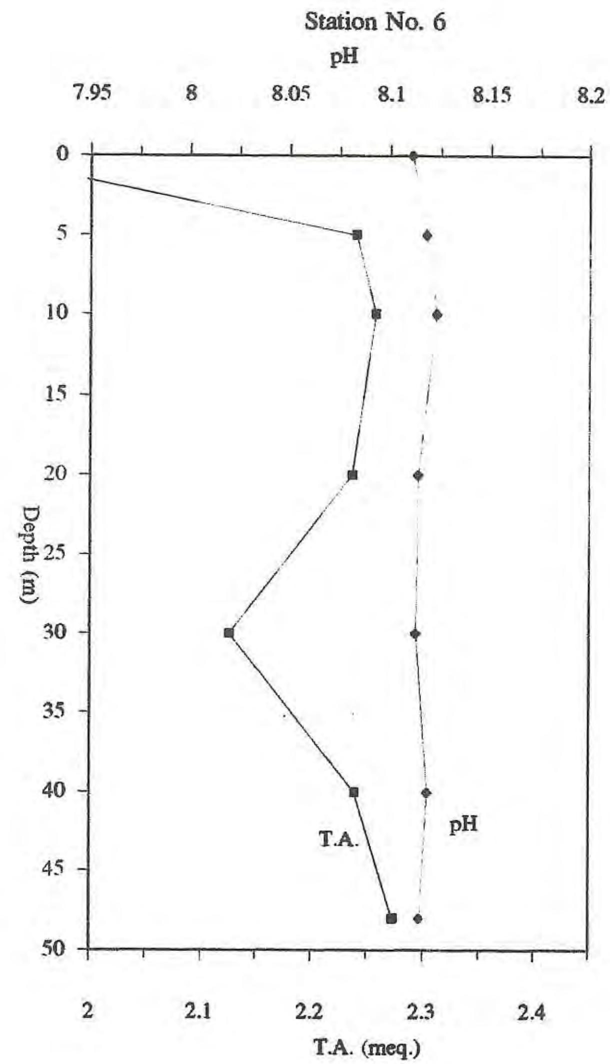

Station No. 3
pH
T.A.
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30

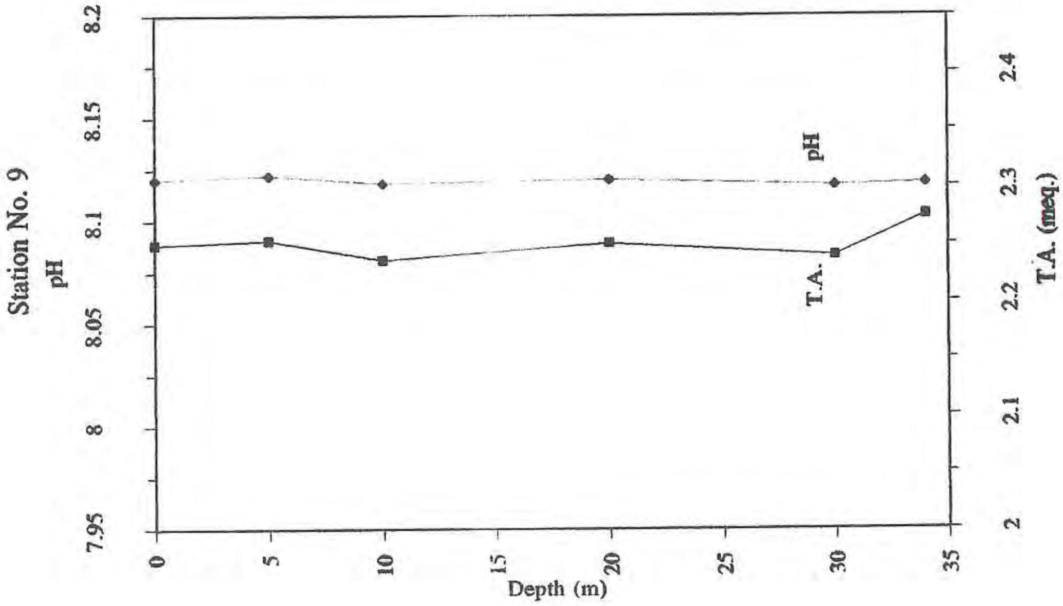

Station No. 2
pH
T.A.
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30

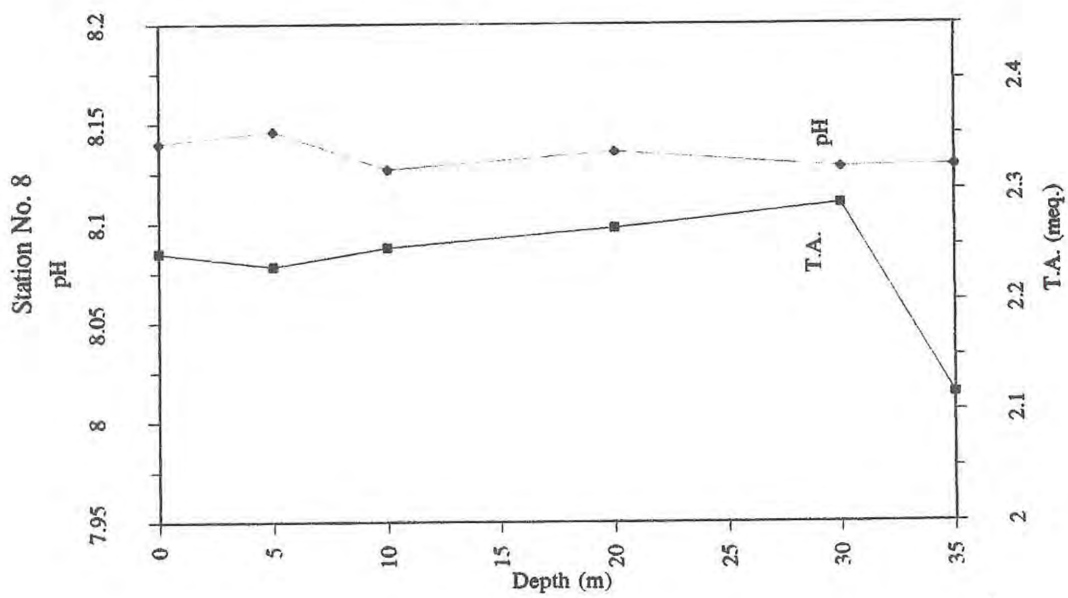

Station No. 1
pH
T.A.
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
1.85
2.05
2.25
2.45
0
5
10
15
20
25

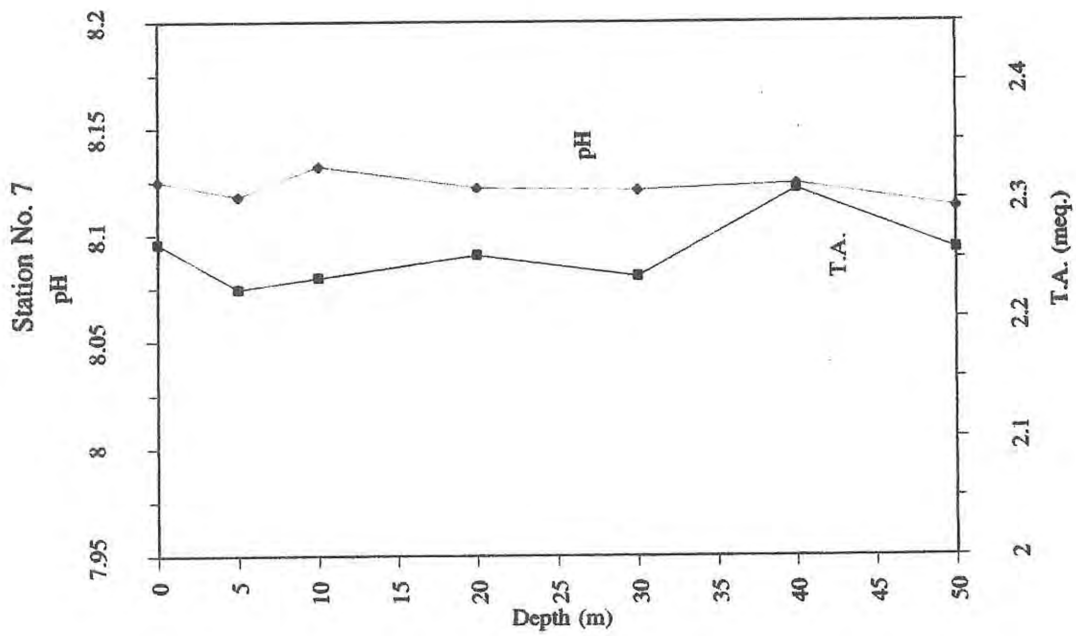

Station No. 4
pH
7.95
8
8.05
8.1
8.15
8.2
Depth (m)
0
2
4
6
8
10
12
14
16
18
20
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)

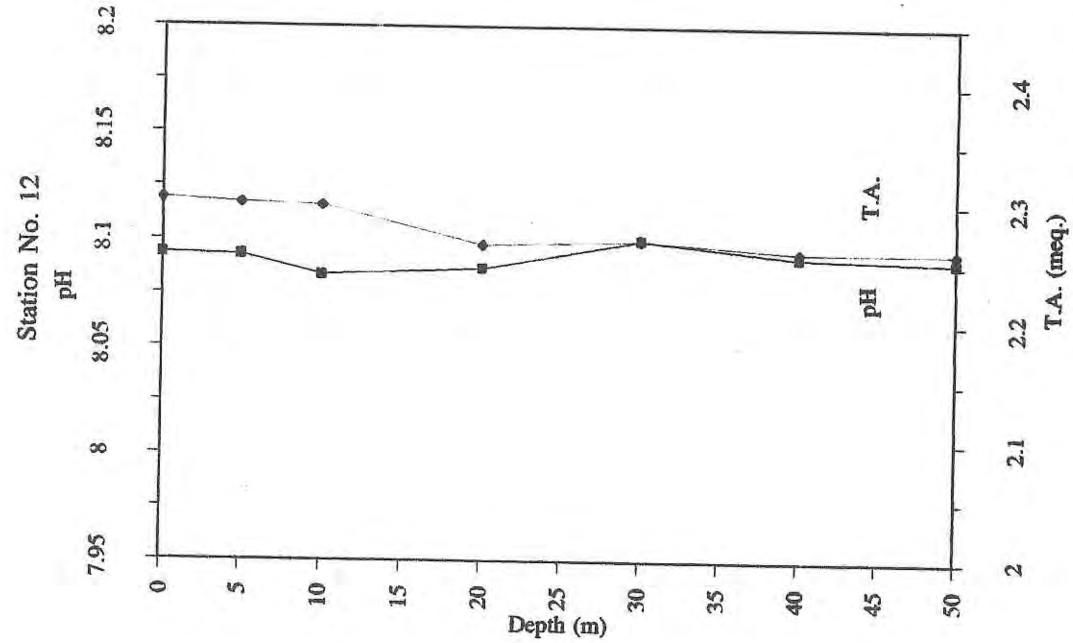

Station No.5
pH
7.95
8
8.05
8.1
8.15
8.2
Depth (m)
0
5
10
15
20
25
30
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)

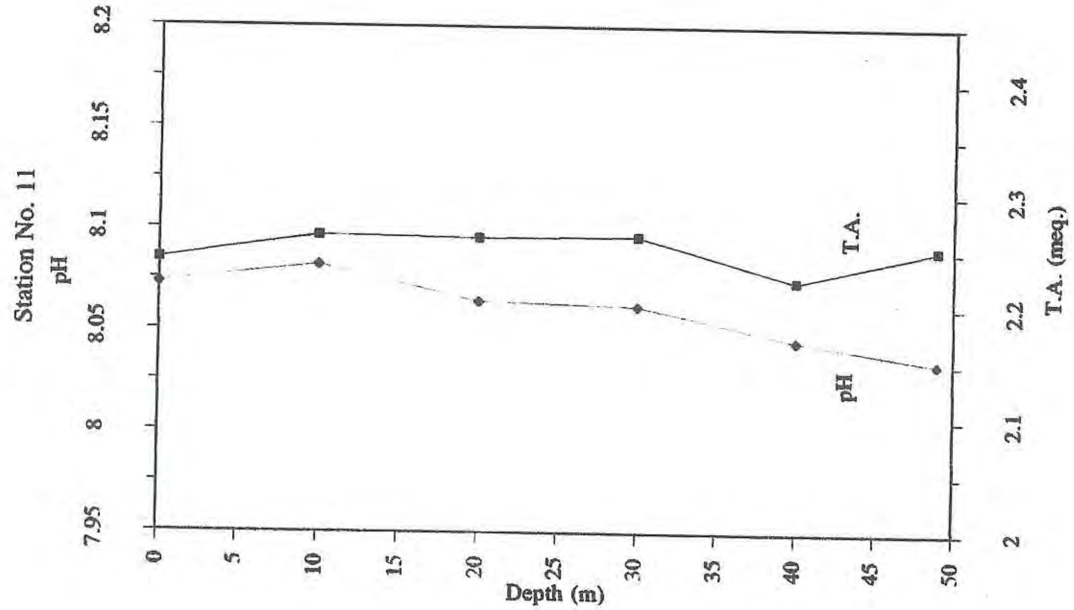

Station No. 6
pH
7.95
8
8.05
8.1
8.15
8.2
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
T.A.
pH
2
2.1
2.2
2.3
2.4
T.A. (meq.)

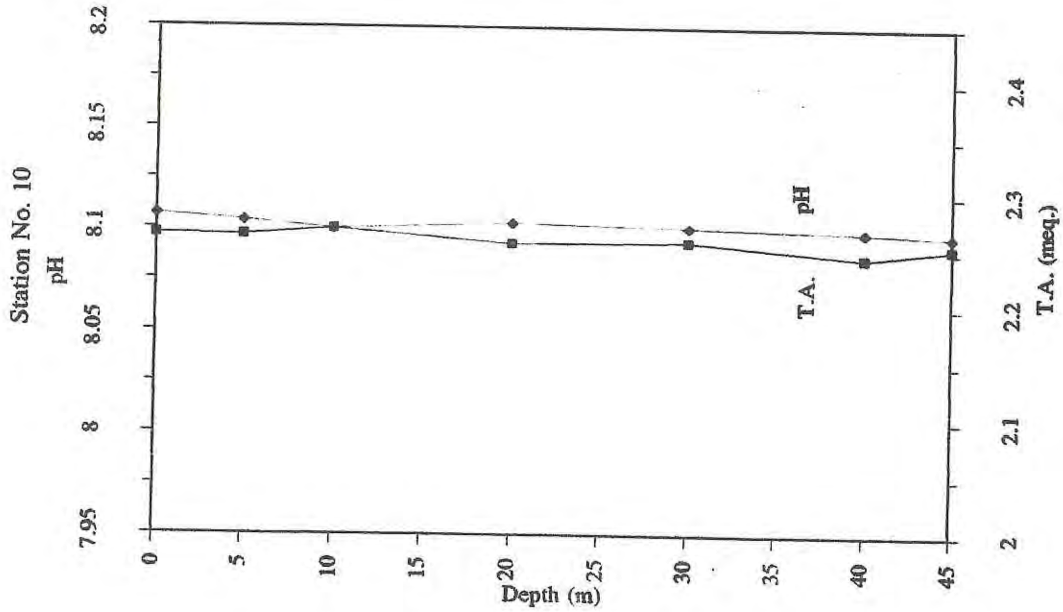

Station No. 9
pH
8.2
8.15
8.1
8.05
8
7.95
2.4
2.3
2.2
2.1
2
T.A. (meq.)
pH
T.A.
0
5
10
15
20
25
30
35
Depth (m)

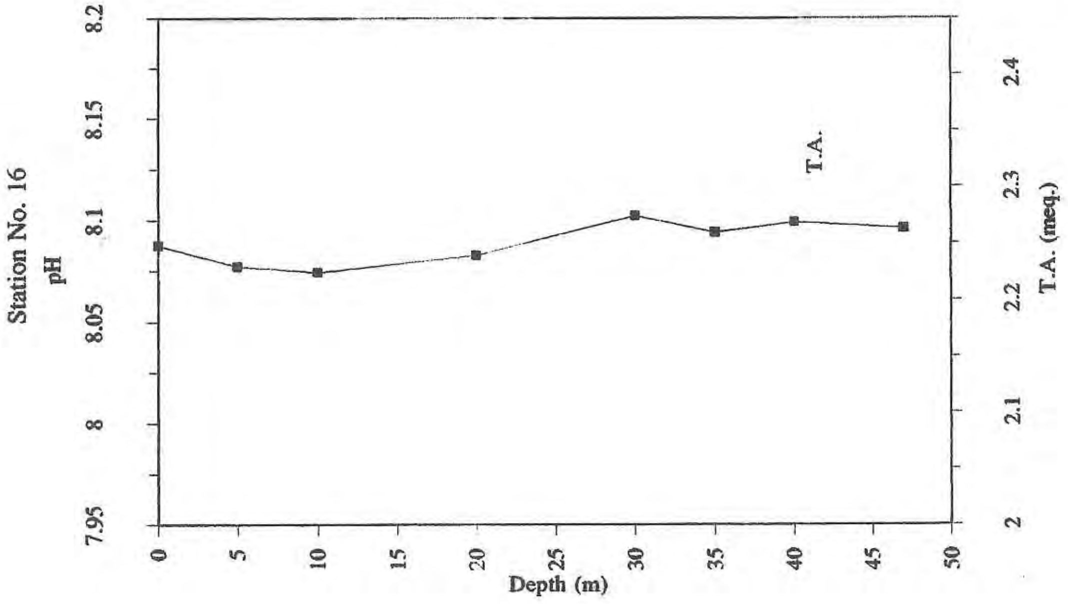

Station No. 8
pH
8.2
8.15
8.1
8.05
8
7.95
2.4
2.3
2.2
2.1
2
T.A. (meq.)
pH
T.A.
0
5
10
15
20
25
30
35
Depth (m)

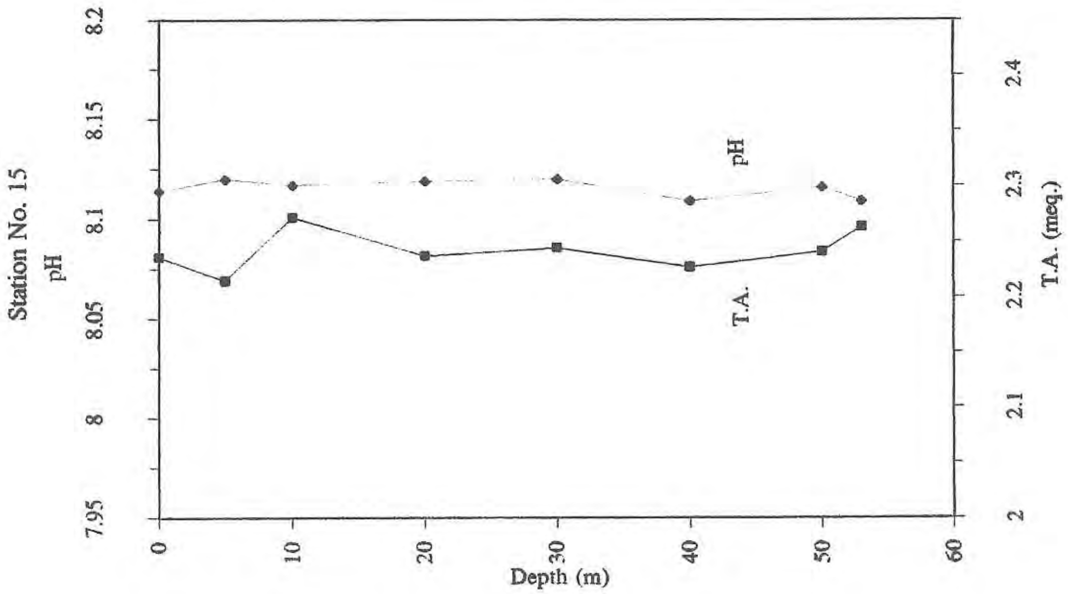

Station No. 7
pH
8.2
8.15
8.1
8.05
8
7.95
2.4
2.3
2.2
2.1
2
T.A. (meq.)
pH
T.A.
0
5
10
15
20
25
30
35
40
45
50
Depth (m)

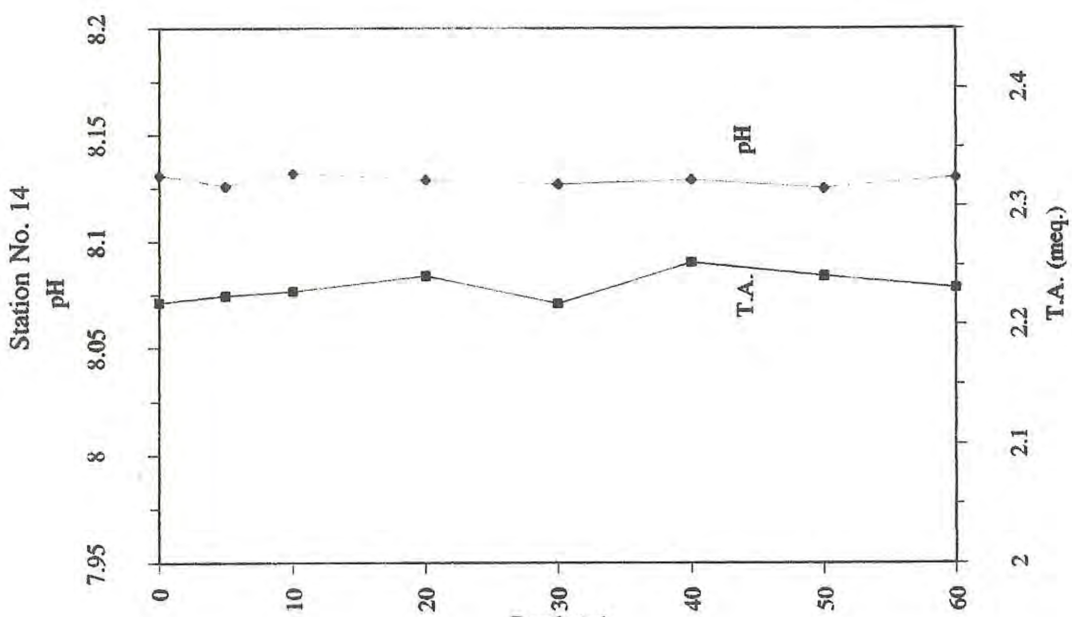

Station No. 12
pH
8.2
8.15
8.1
8.05
8
7.95
T.A.
pH
2.4
2.3
2.2
2.1
2
T.A. (meq.)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)

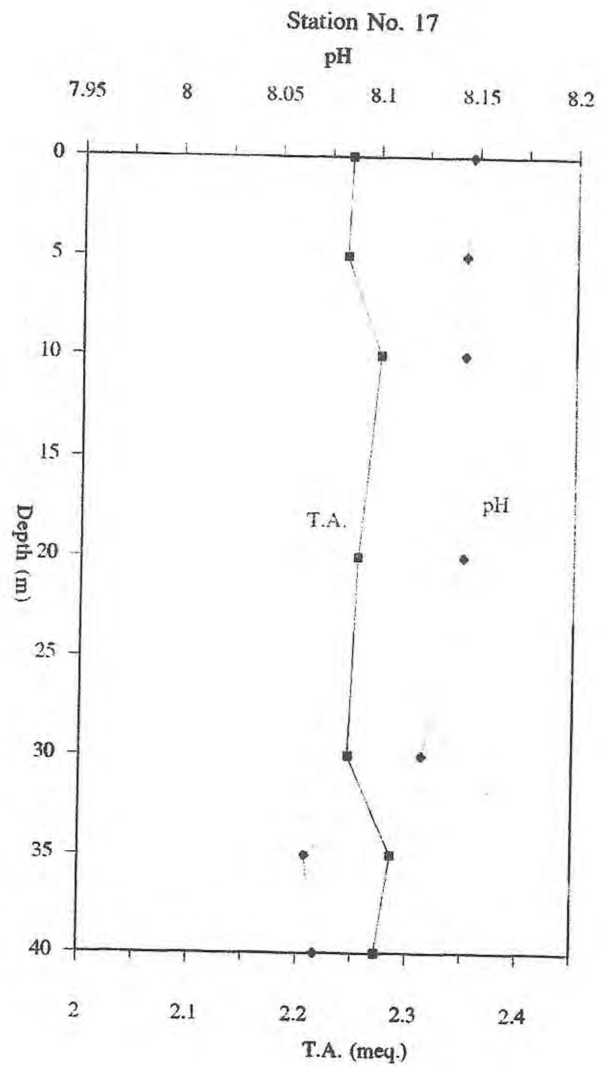

Station No. 11
pH
8.2
8.15
8.1
8.05
8
7.95
T.A.
pH
2.4
2.3
2.2
2.1
2
T.A. (meq.)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)

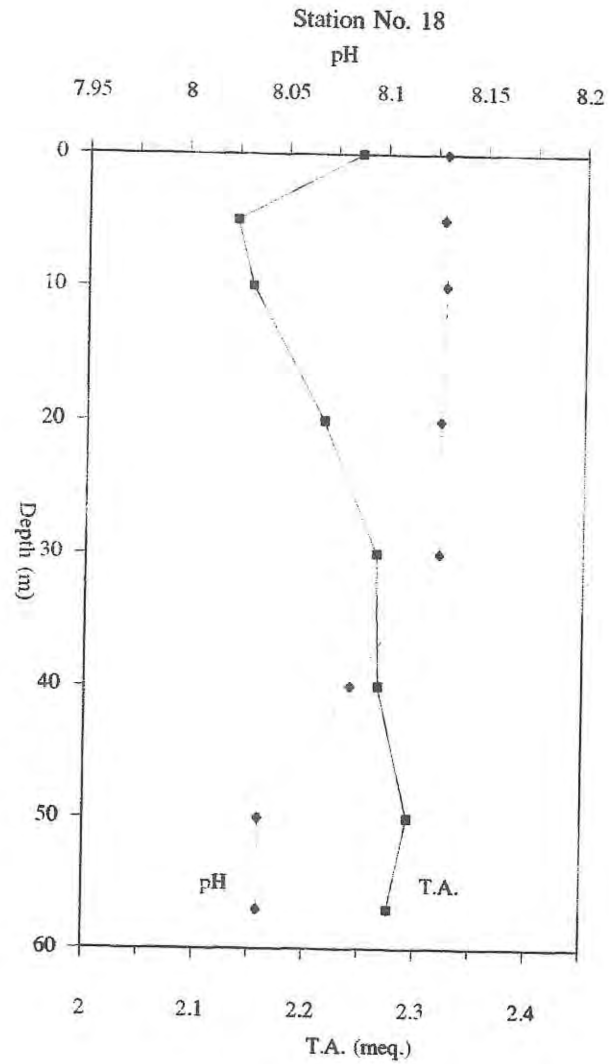

Station No. 10
pH
8.2
8.15
8.1
8.05
8
7.95
pH
T.A.
2.4
2.3
2.2
2.1
2
T.A. (meq.)
0
5
10
15
20
25
30
35
40
45
Depth (m)

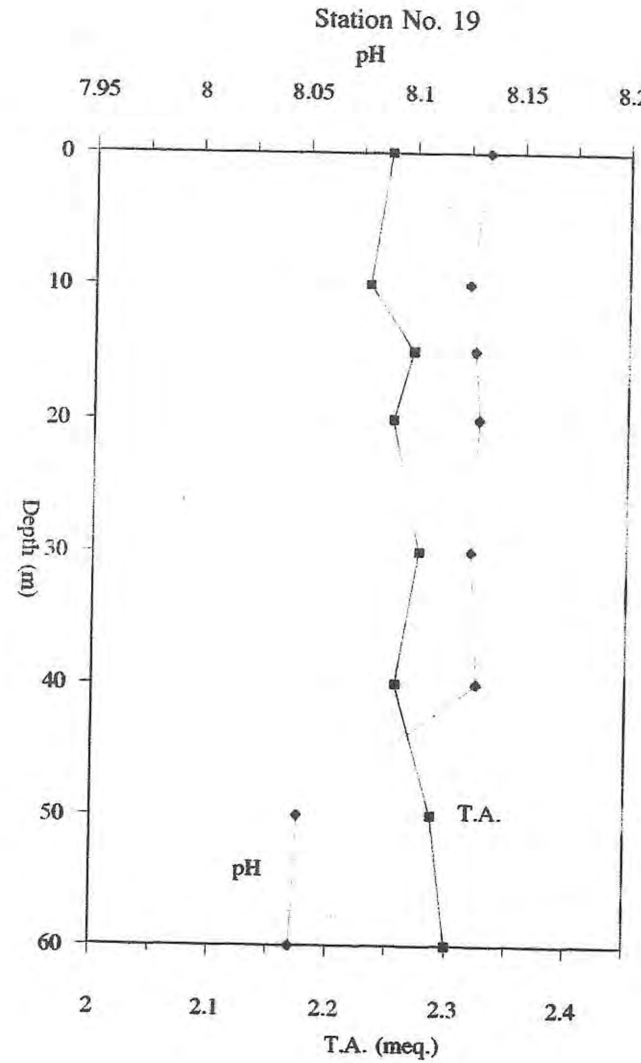

Station No. 16
pH
T.A.
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30
35
40
45
50

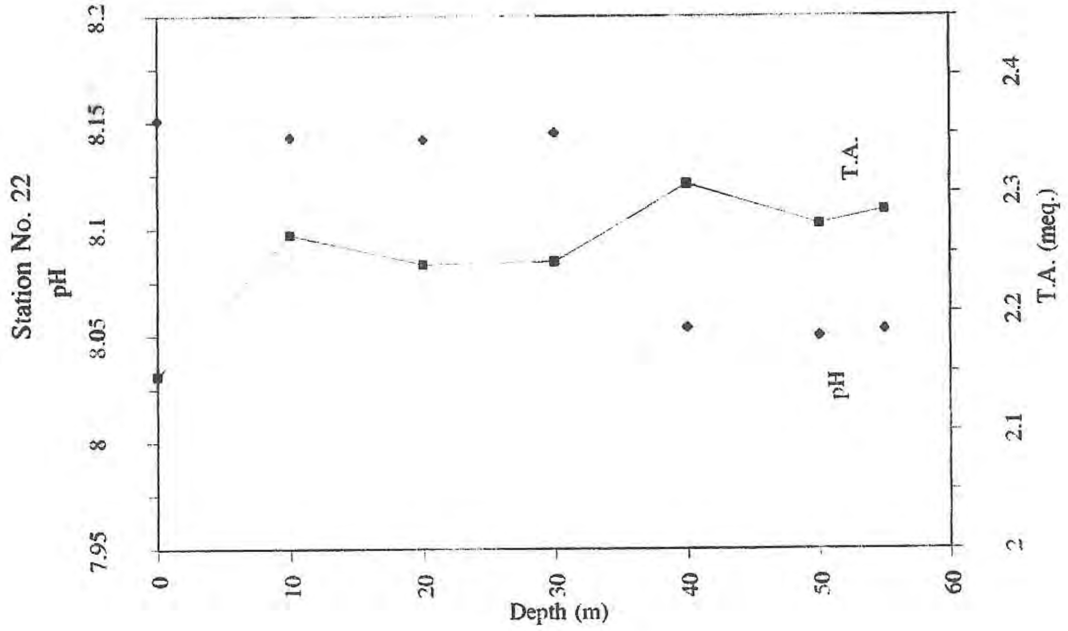

Station No. 15
pH
pH
T.A.
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
10
20
30
40
50
60

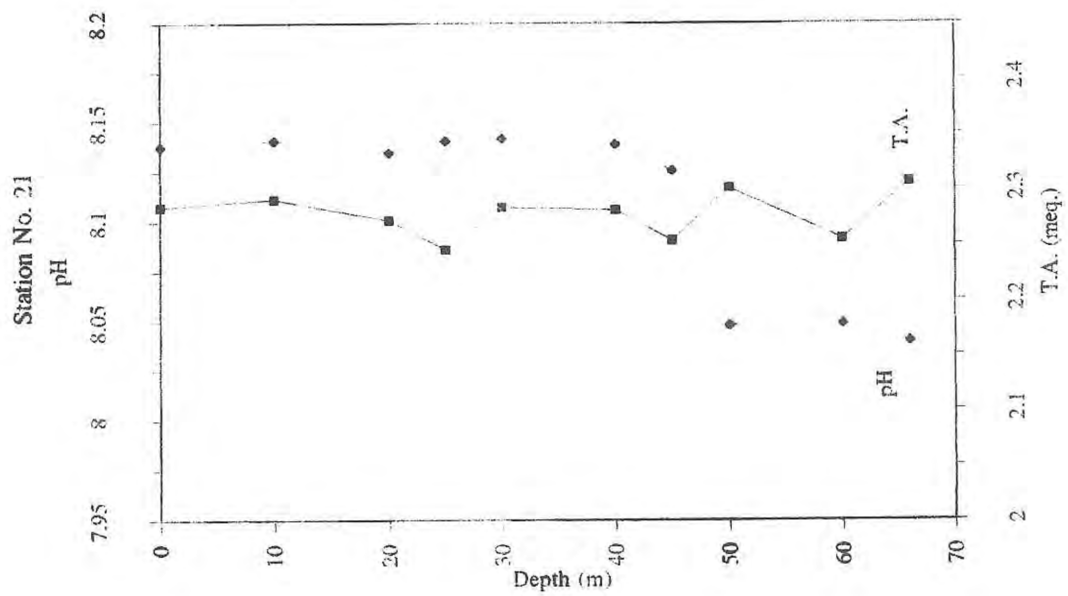

Station No. 14
pH
pH
T.A.
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
10
20
30
40
50
60

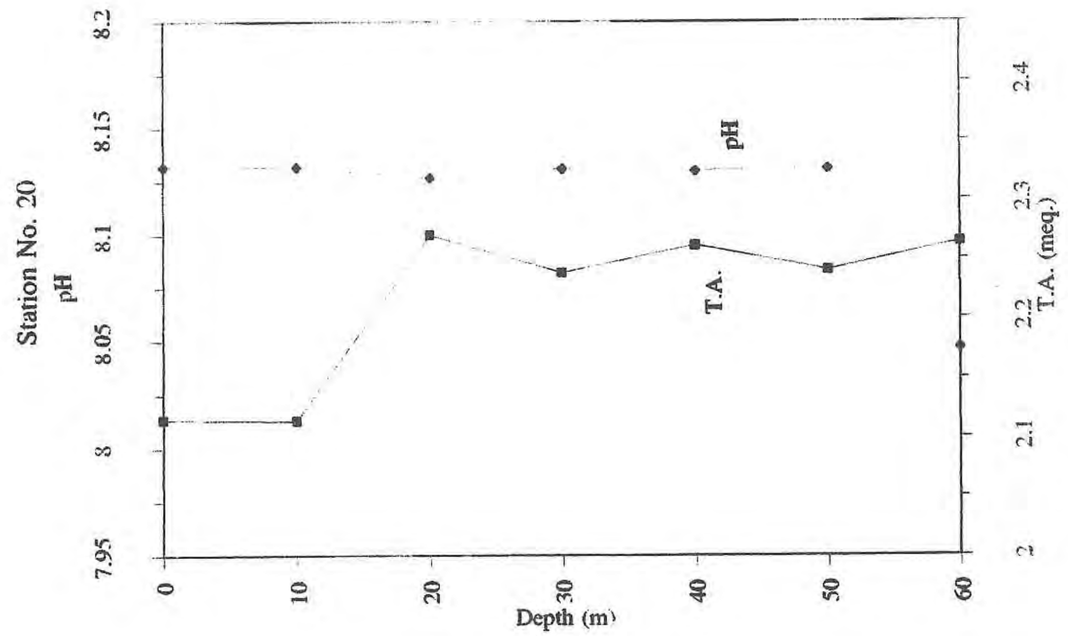

Station No. 17
pH
7.95
8
8.05
8.1
8.15
8.2
0
5
10
15
20
25
30
35
40
Depth (m)
T.A.
pH
2
2.1
2.2
2.3
2.4
T.A. (meq.)

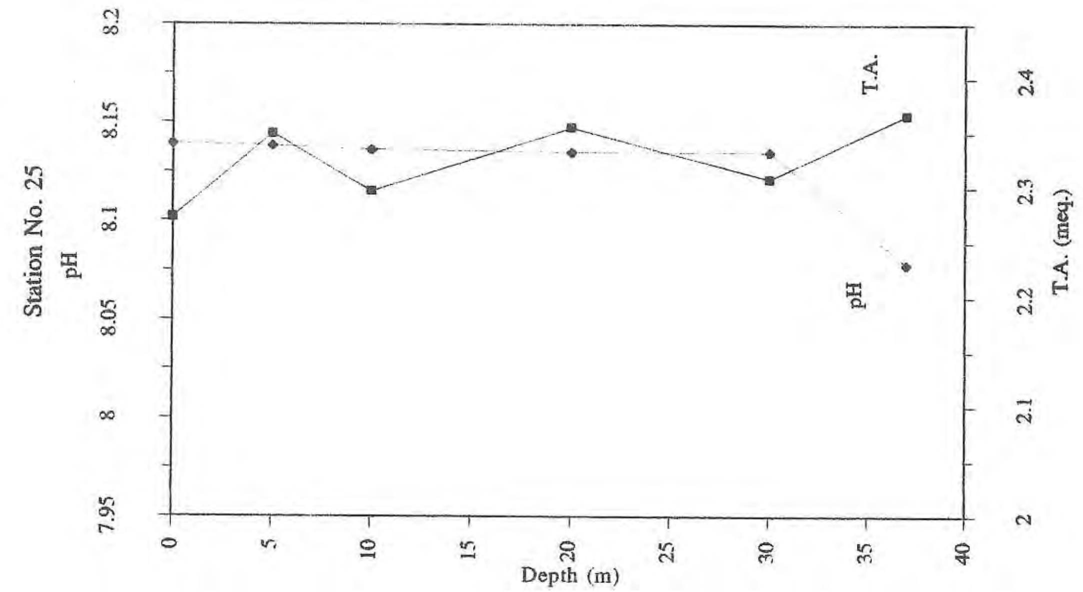

Station No. 18
pH
7.95
8
8.05
8.1
8.15
8.2
0
10
20
30
40
50
60
Depth (m)
pH
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)

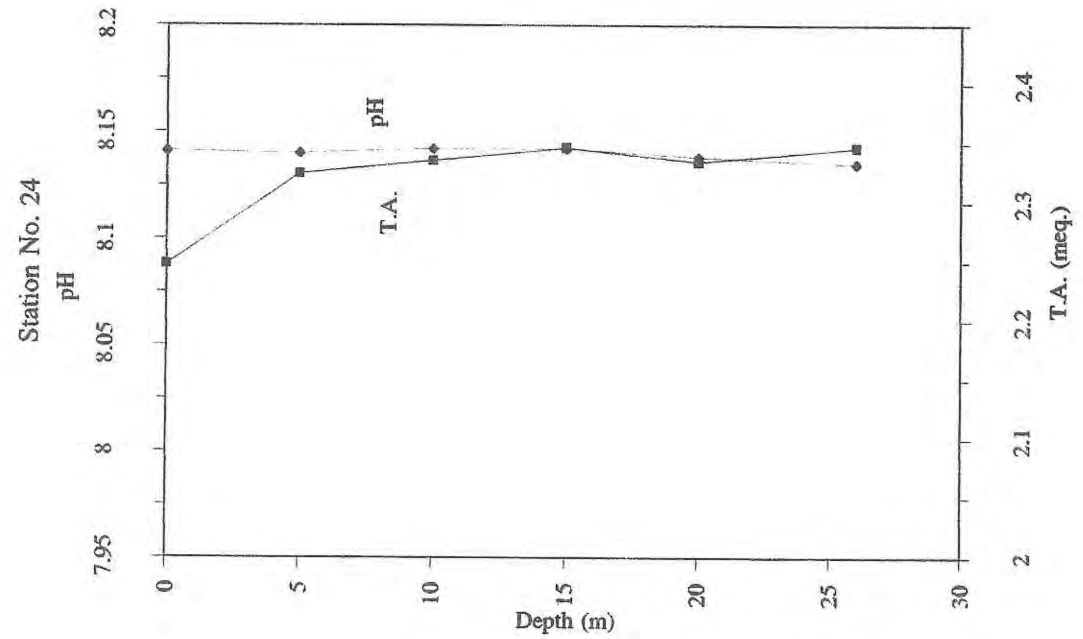

Station No. 19
pH
7.95
8
8.05
8.1
8.15
8.2
0
10
20
30
40
50
60
Depth (m)
T.A.
pH
2
2.1
2.2
2.3
2.4
T.A. (meq.)

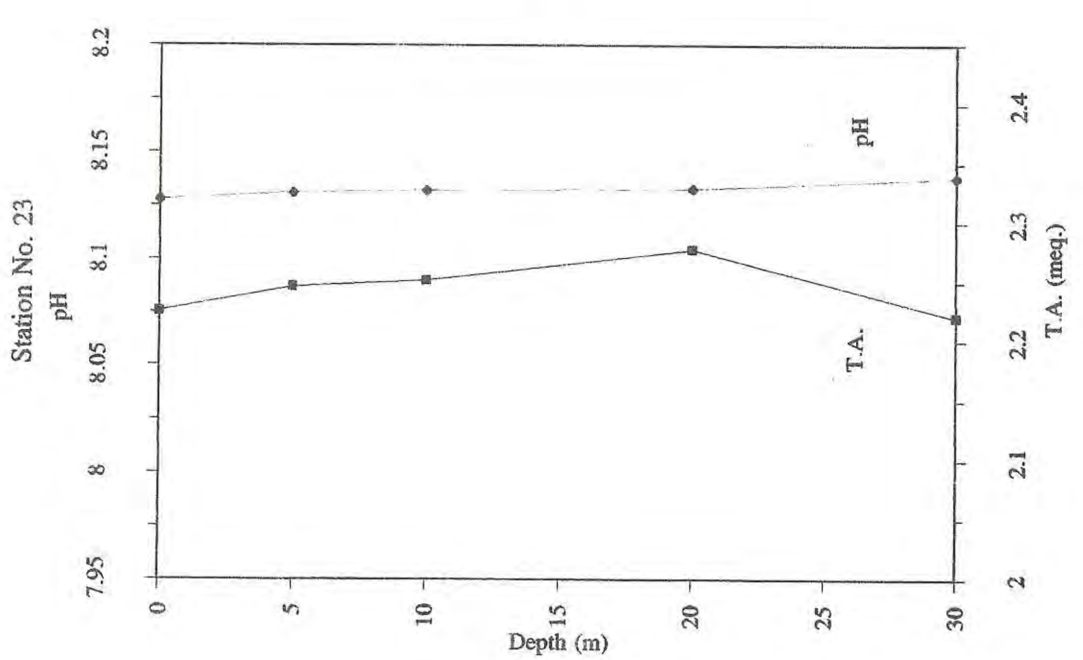

Station No. 22
pH
7.95
8
8.05
8.1
8.15
8.2
T.A.
pH
2
2.1
2.2
2.3
2.4
T.A. (meq.)
0
10
20
30
40
50
60
Depth (m)


Station No. 21
pH
7.95
8
8.05
8.1
8.15
8.2
T.A.
pH
2
2.1
2.2
2.3
2.4
T.A. (meq.)
0
10
20
30
40
50
60
70
Depth (m)

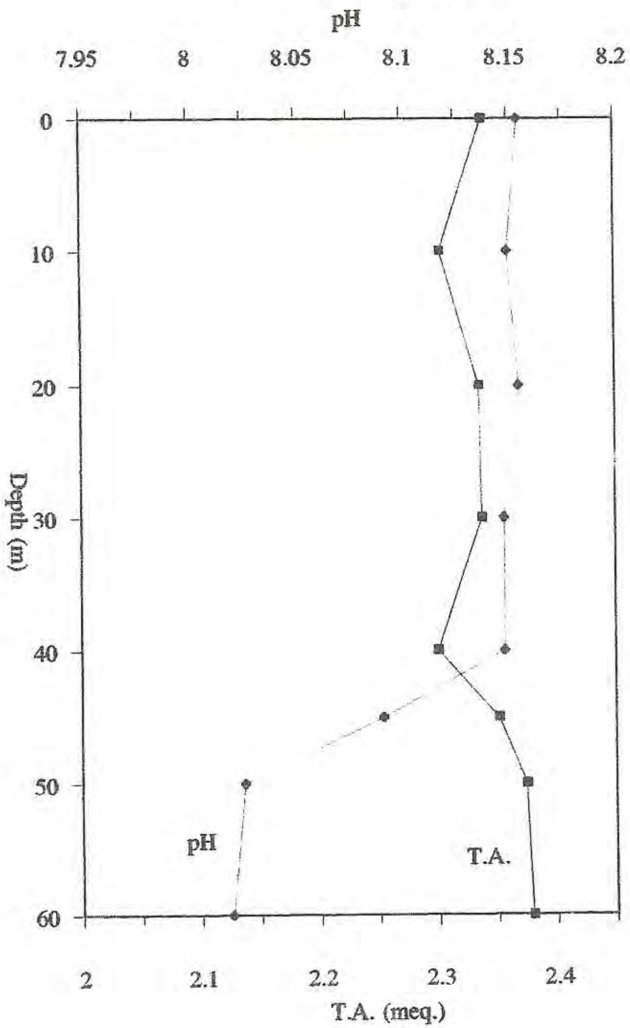

Station No. 20
pH
7.95
8
8.05
8.1
8.15
8.2
pH
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)
0
10
20
30
40
50
60
Depth (m)


Station No. 25
pH
T.A.
pH
Depth (m)
T.A. (meq.)

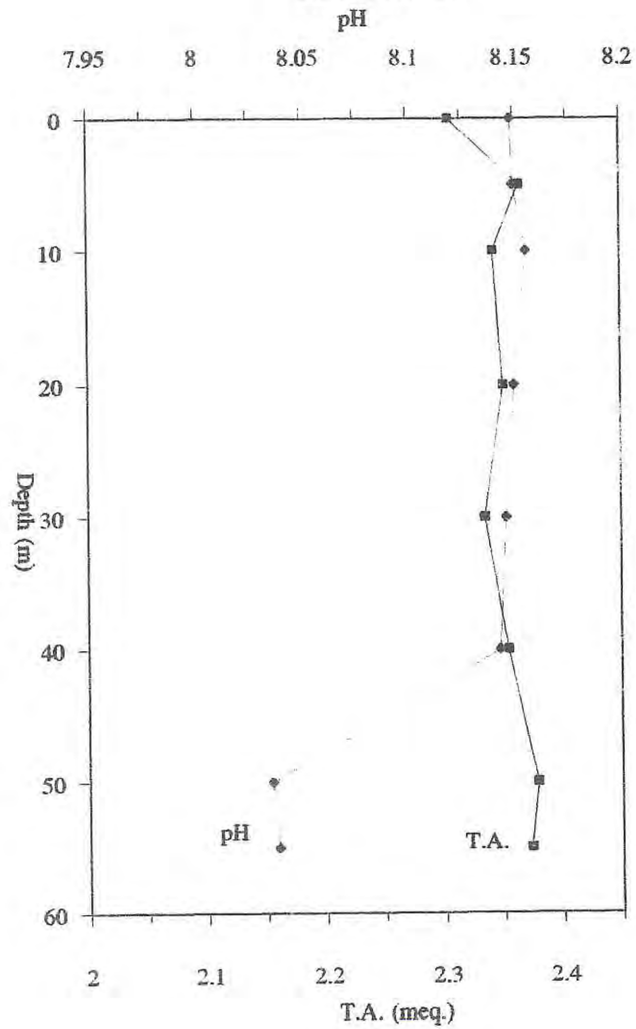

Station No. 24
pH
pH
T.A.
Depth (m)
T.A. (meq.)


Station No. 23
pH
pH
T.A.
Depth (m)
T.A. (meq.)

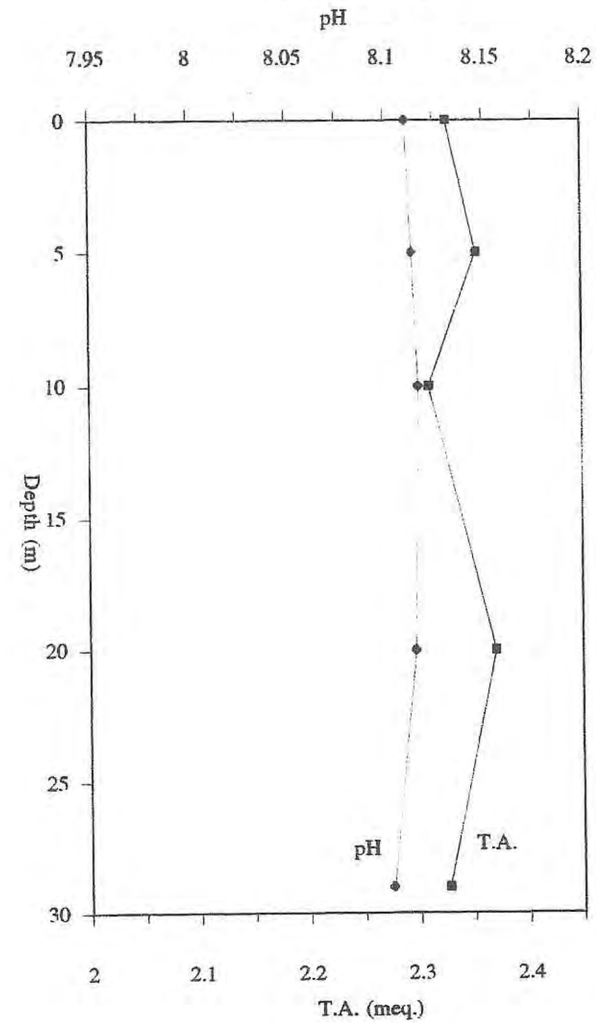
Station No. 26

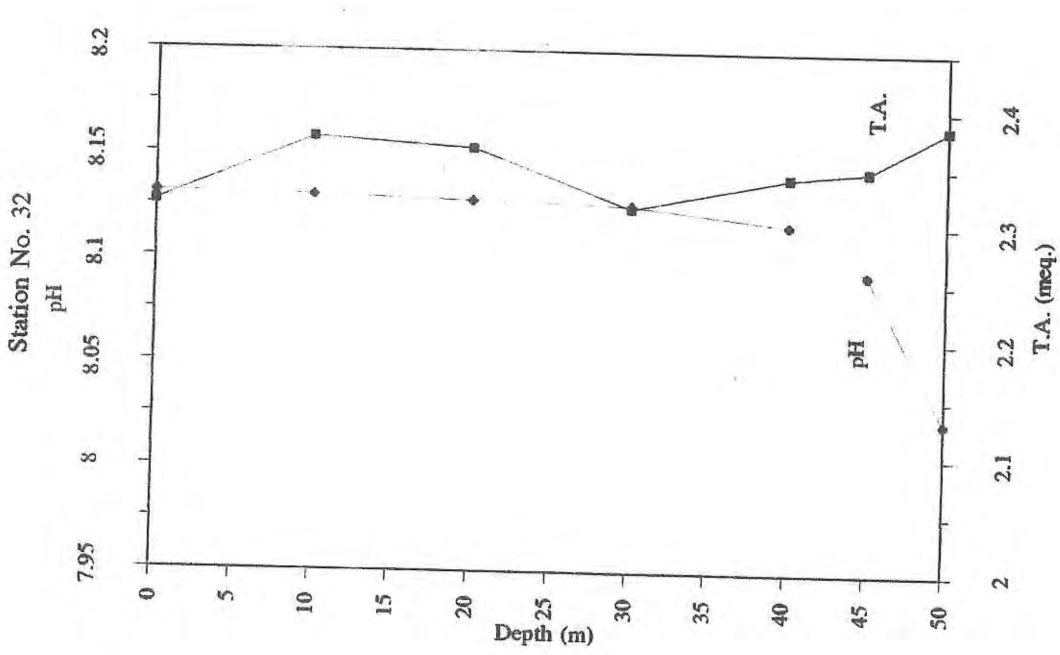


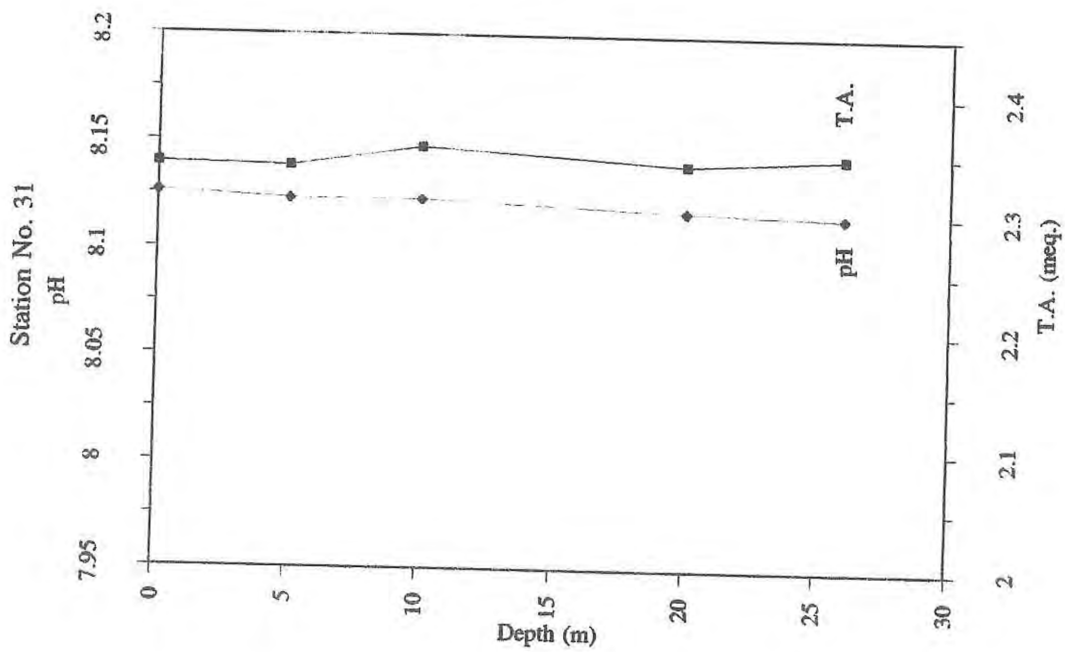
Station No. 28

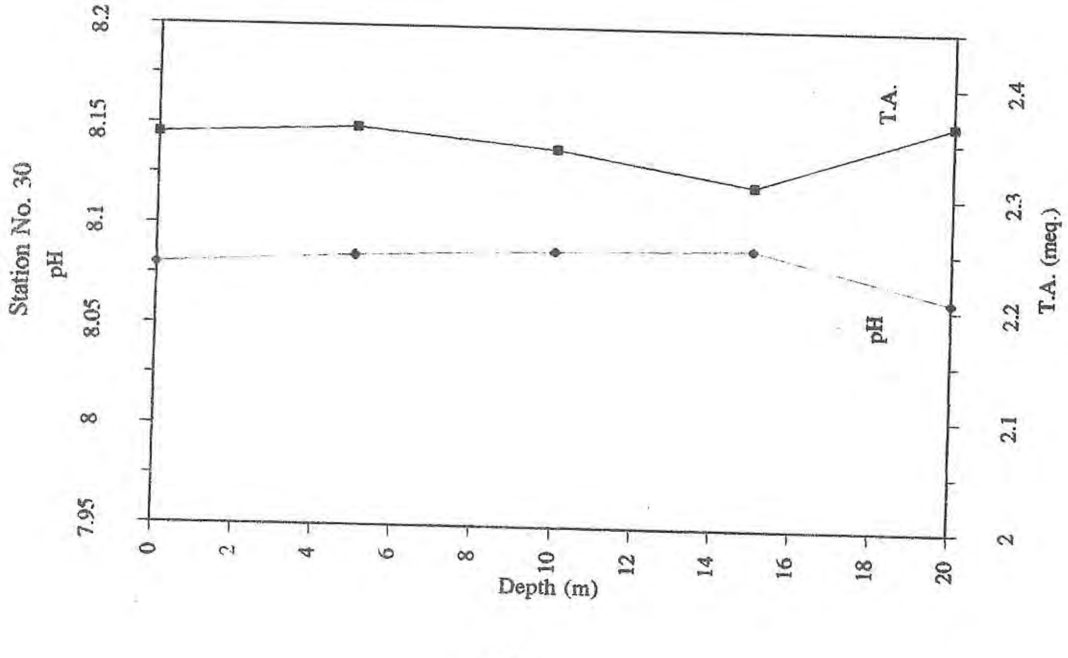


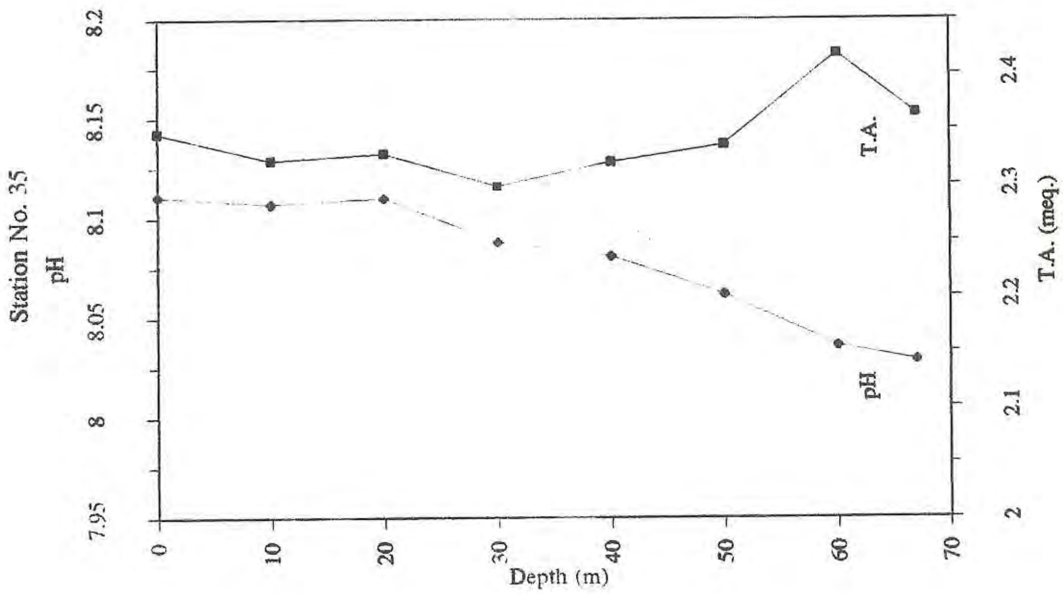
Station No. 29

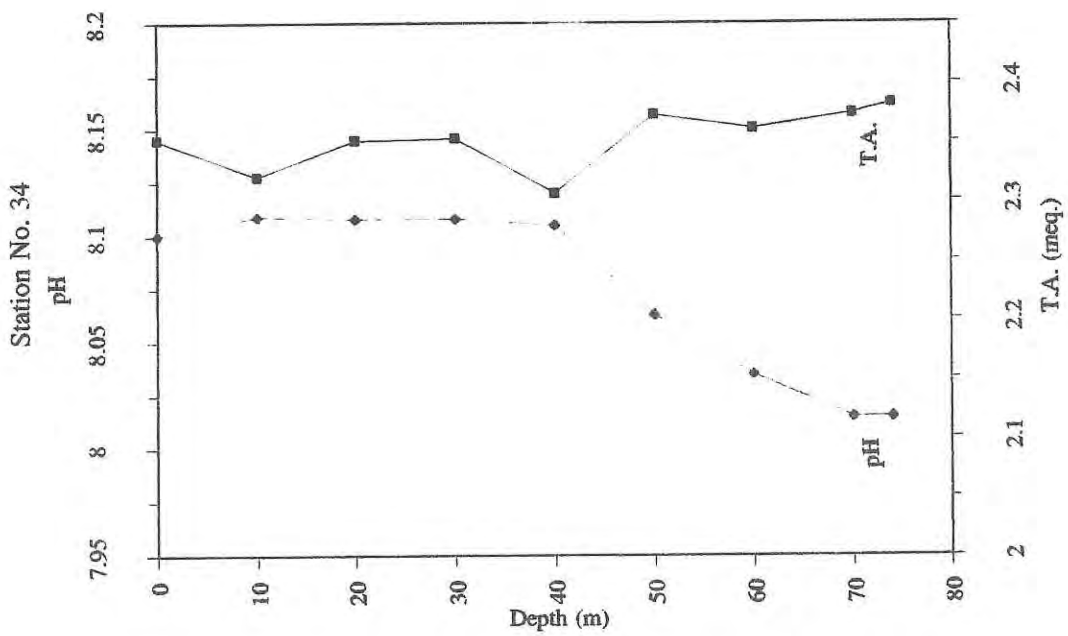


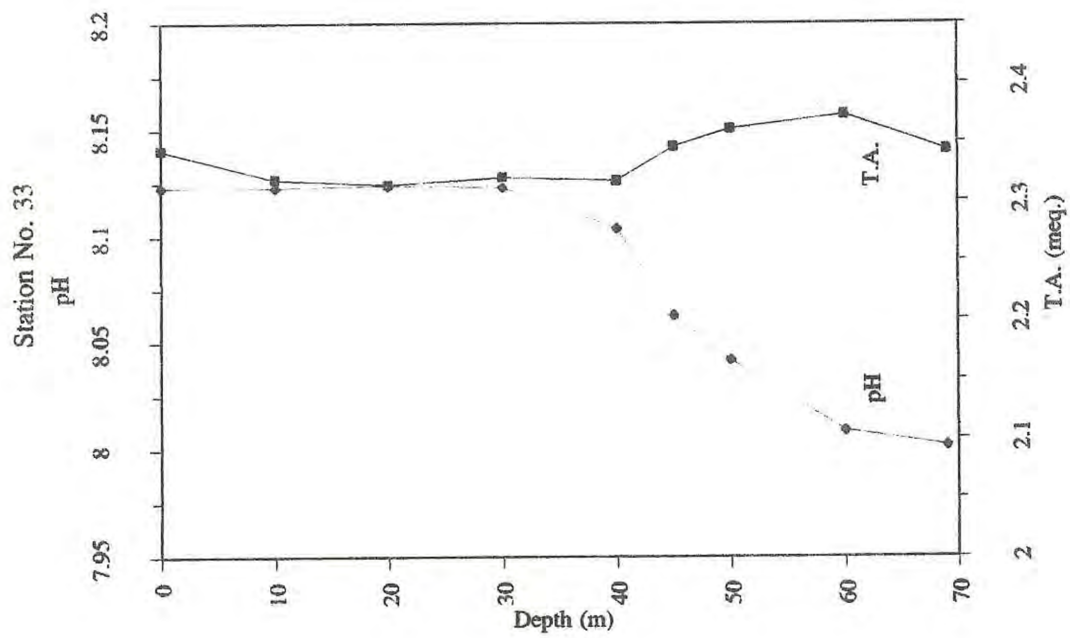

Station No. 32
pH
T.A.
pH
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30
35
40
45
50

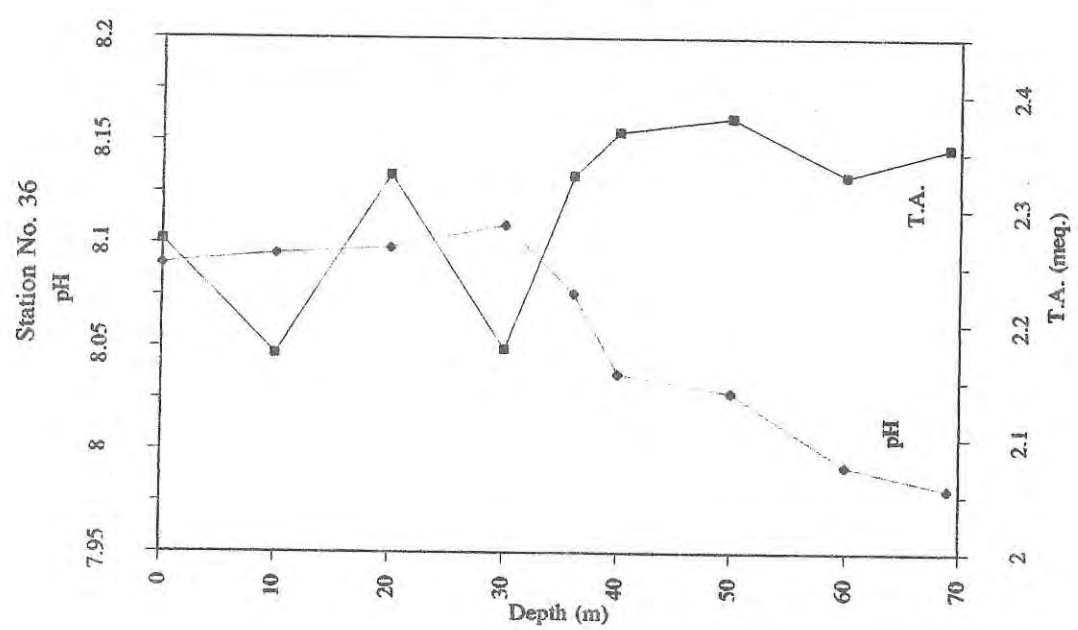

Station No. 31
pH
T.A.
pH
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30


Station No. 30
pH
T.A.
pH
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
2
4
6
8
10
12
14
16
18
20

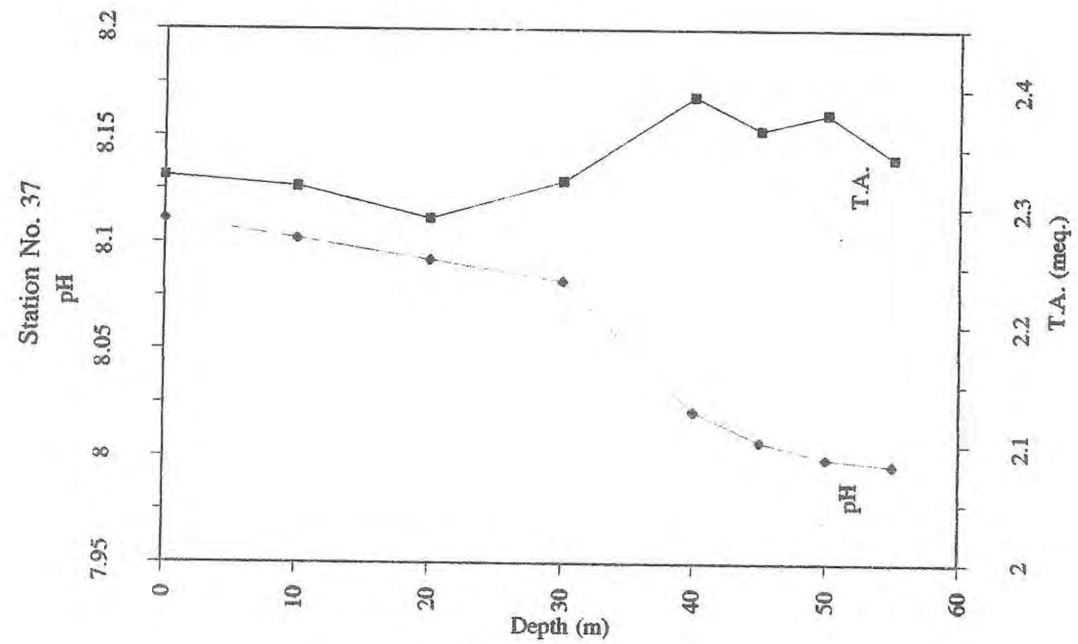

Station No. 35
pH
T.A.
pH
T.A. (meq.)
Depth (m)
8.2
8.15
8.1
8.05
8
7.95
2.4
2.3
2.2
2.1
2
0
10
20
30
40
50
60
70


Station No. 34
pH
T.A.
pH
T.A. (meq.)
Depth (m)
8.2
8.15
8.1
8.05
8
7.95
2.4
2.3
2.2
2.1
2
0
10
20
30
40
50
60
70
80

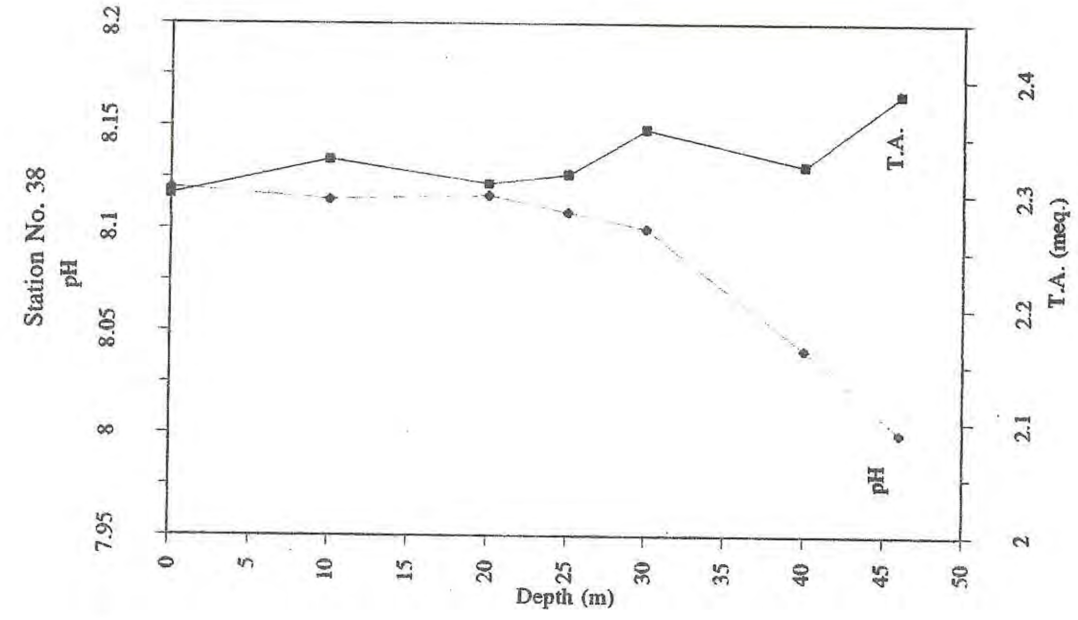

Station No. 33
pH
T.A.
pH
T.A. (meq.)
Depth (m)
8.2
8.15
8.1
8.05
8
7.95
2.4
2.3
2.2
2.1
2
0
10
20
30
40
50
60
70



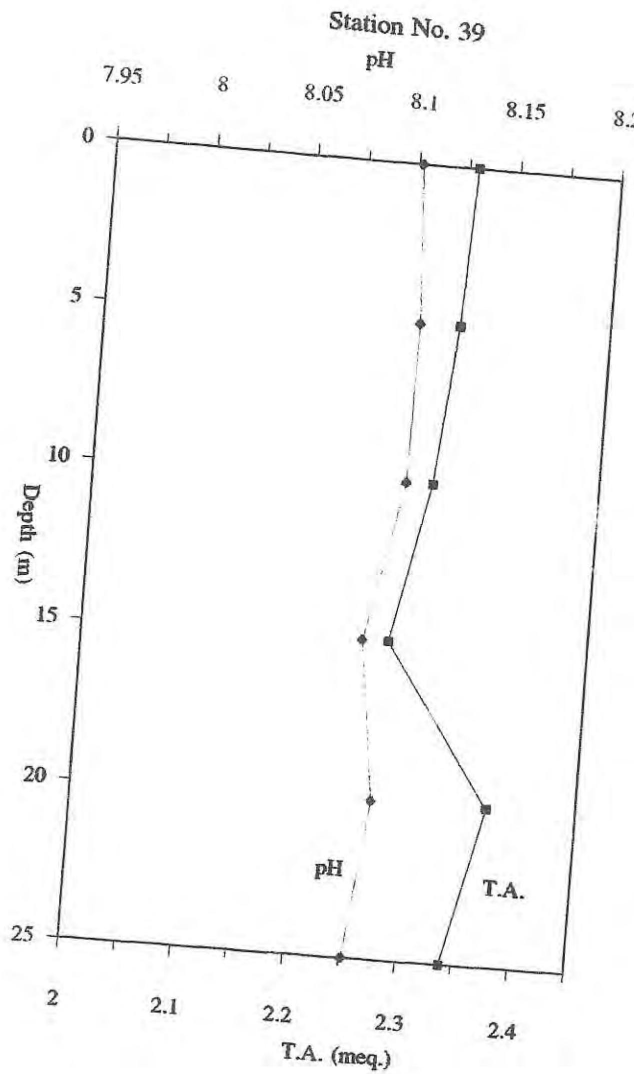
Station No. 36
pH
T.A. (meq.)
Depth (m)
T.A.
pH
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
10
20
30
40
50
60
70

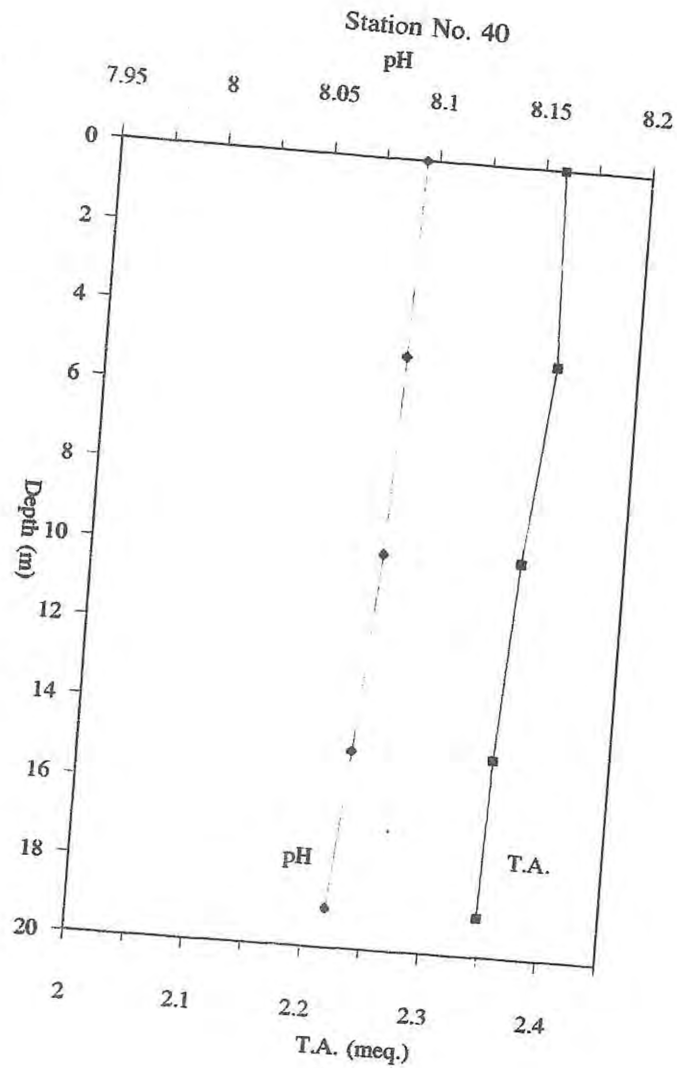


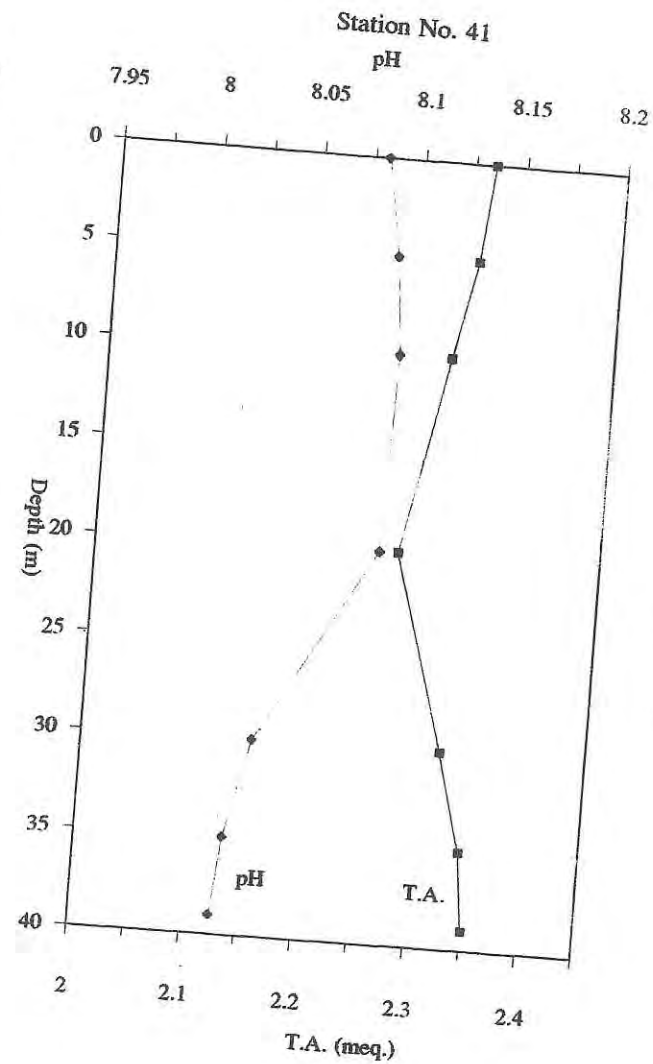
Station No. 37
pH
T.A. (meq.)
Depth (m)
T.A.
pH
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
10
20
30
40
50
60

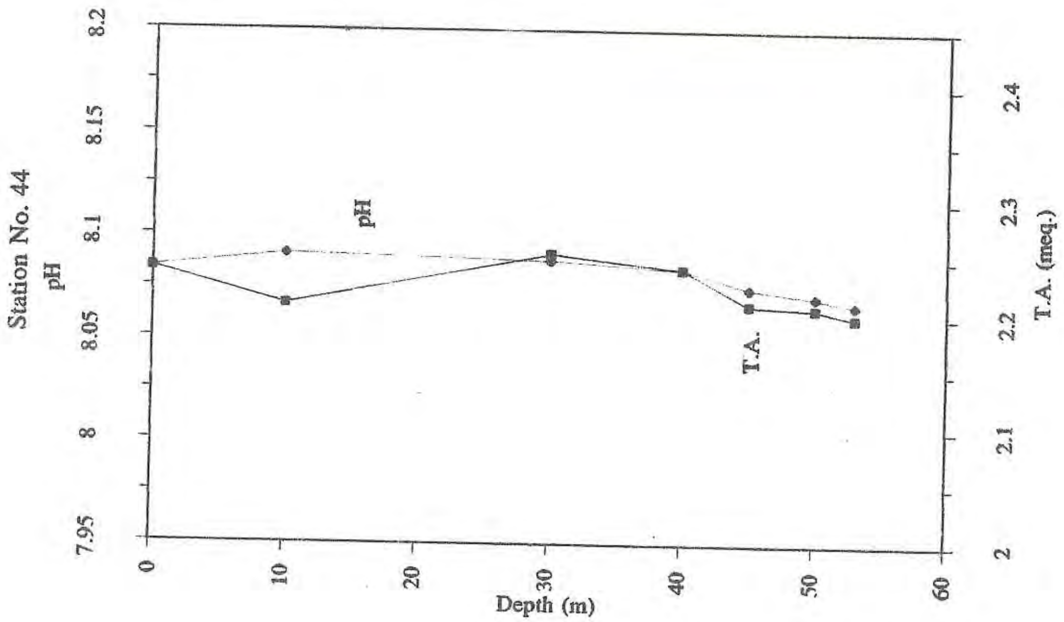


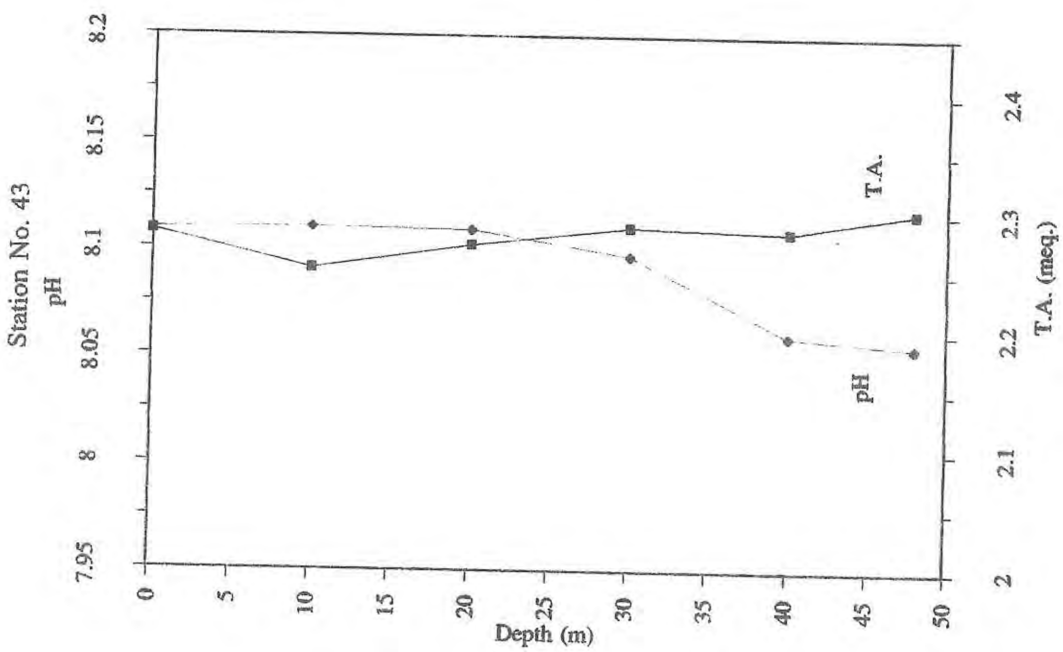
Station No. 38
pH
T.A. (meq.)
Depth (m)
T.A.
pH
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30
35
40
45
50

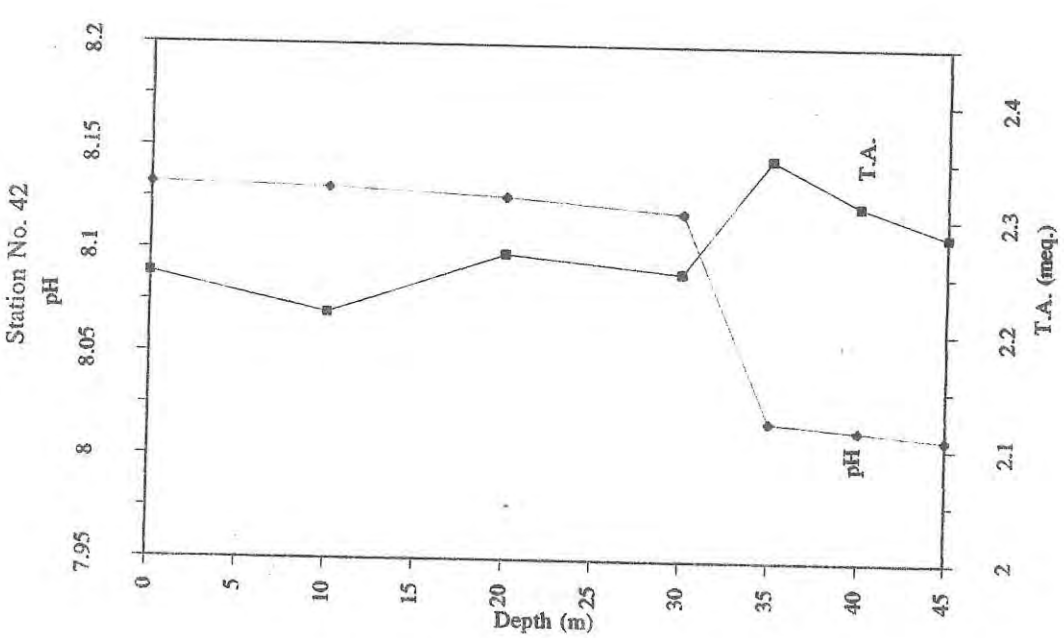

Station No. 39
pH
7.95
8
8.05
8.1
8.15
8.2
0
5
10
15
20
25
Depth (m)
pH
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)

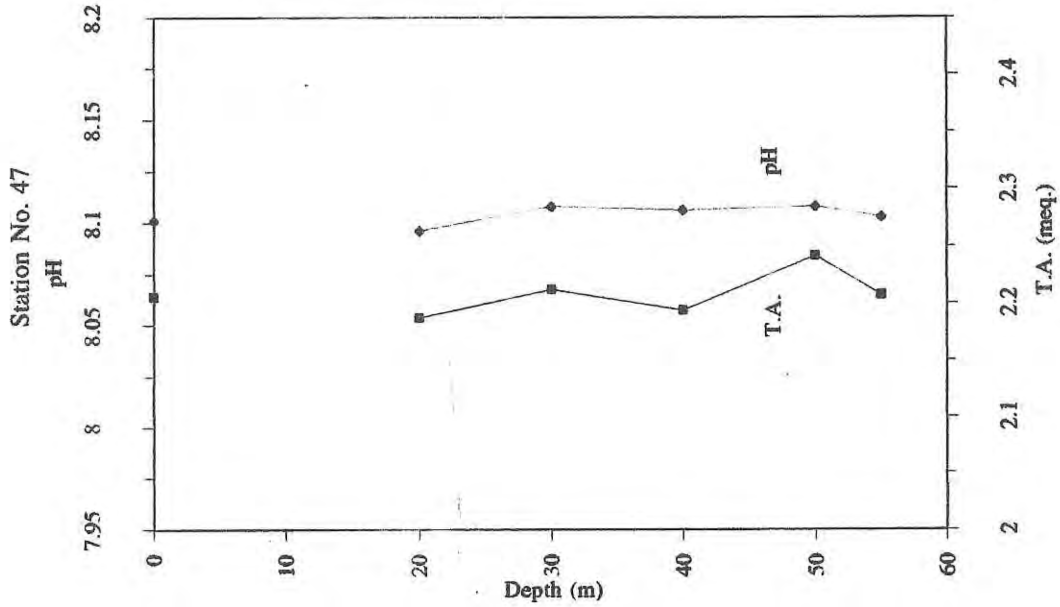

Station No. 40
pH
7.95
8
8.05
8.1
8.15
8.2
0
2
4
6
8
10
12
14
16
18
20
Depth (m)
pH
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)


Station No. 41
pH
7.95
8
8.05
8.1
8.15
8.2
0
5
10
15
20
25
30
35
40
Depth (m)
pH
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)

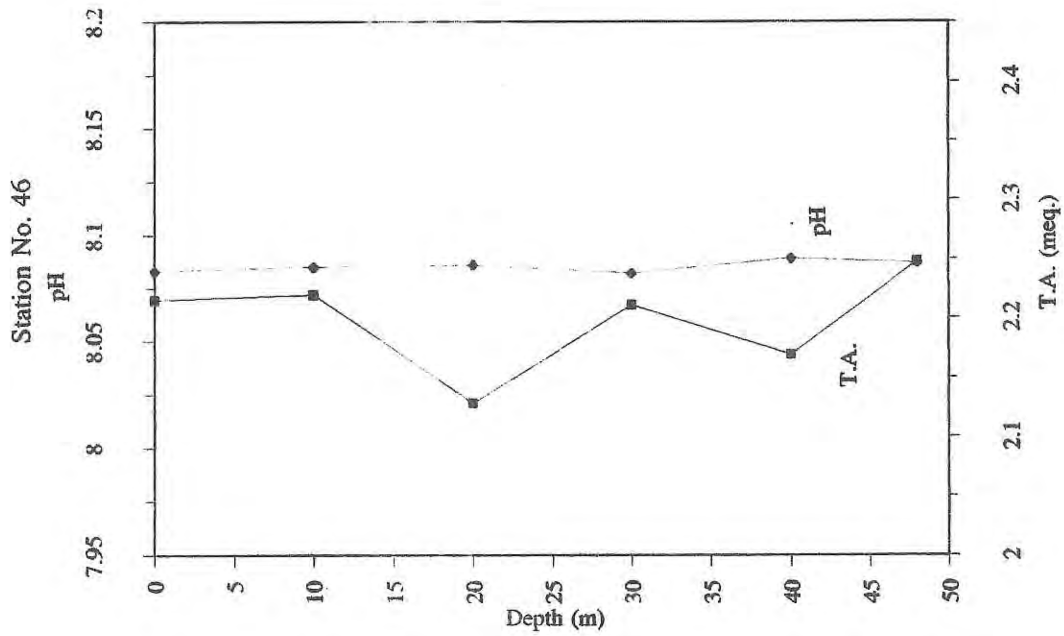

Station No. 44
pH
T.A.
pH
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
10
20
30
40
50
60


Station No. 43
pH
T.A.
pH
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30
35
40
45
50

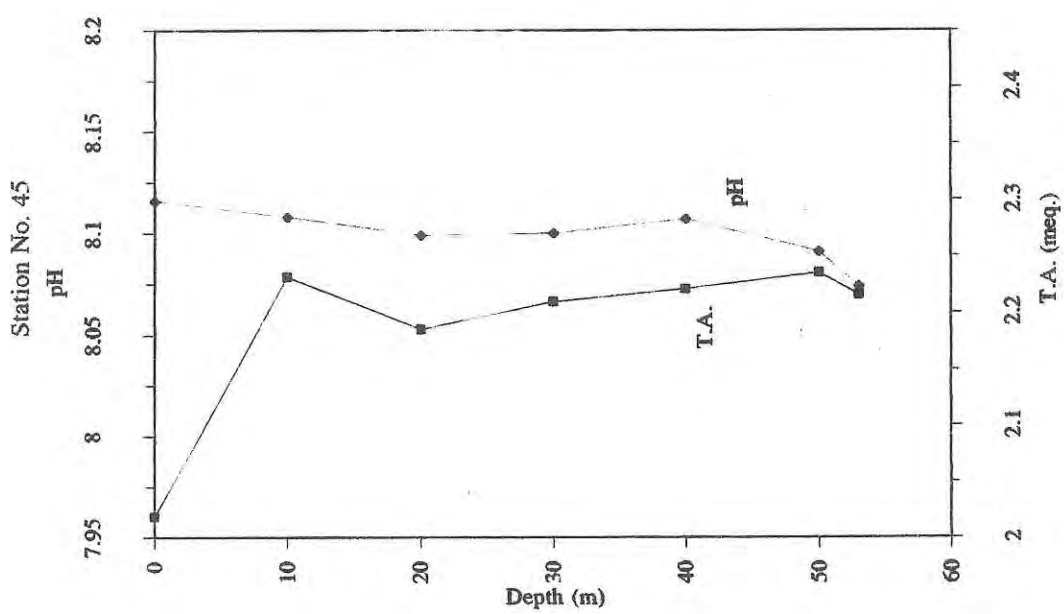

Station No. 42
pH
T.A.
pH
T.A. (meq.)
Depth (m)
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30
35
40
45



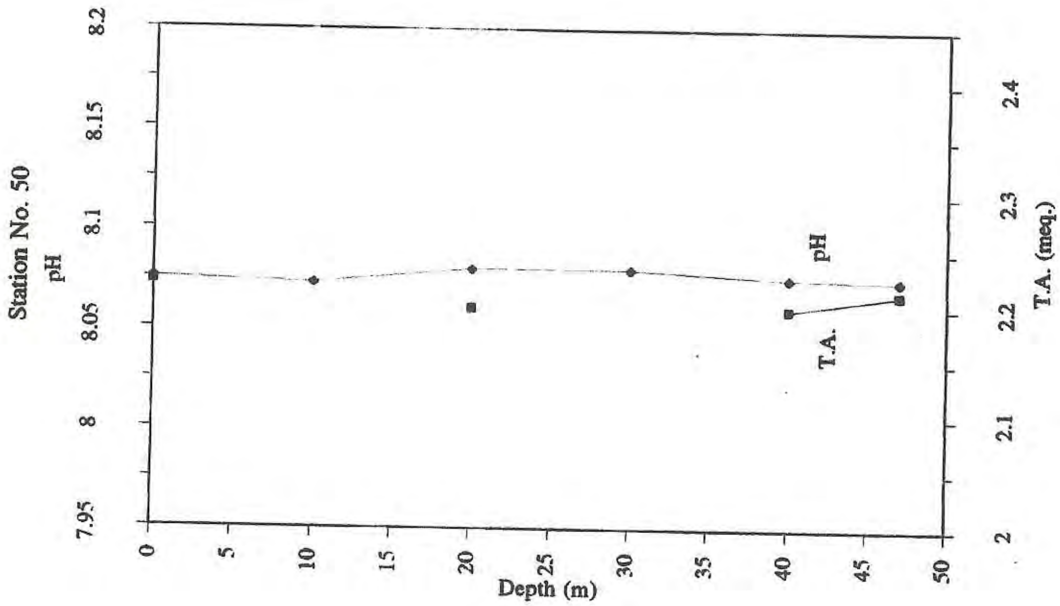
Station No. 47
pH
T.A. (meq.)
Depth (m)
pH
T.A.
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
10
20
30
40
50
60

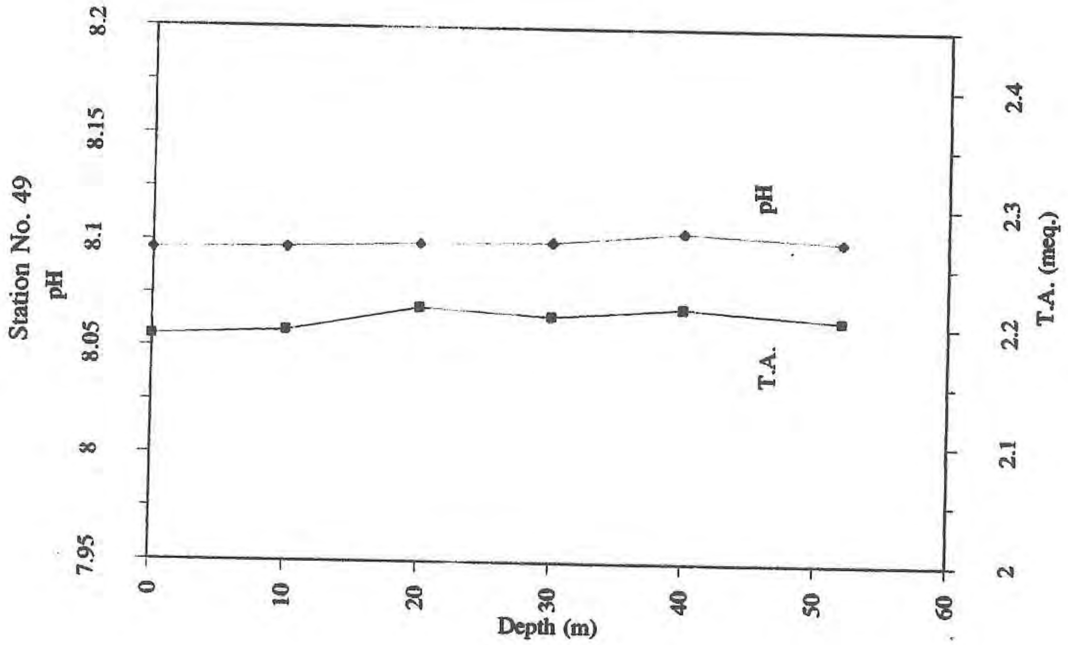


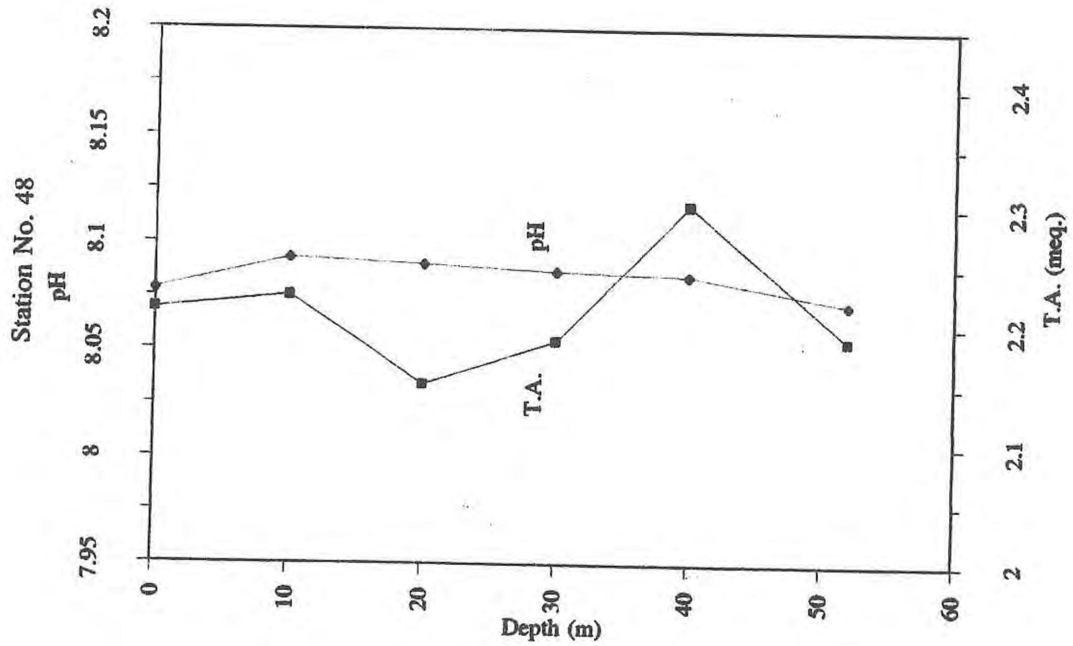
Station No. 46
pH
T.A. (meq.)
Depth (m)
pH
T.A.
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30
35
40
45
50

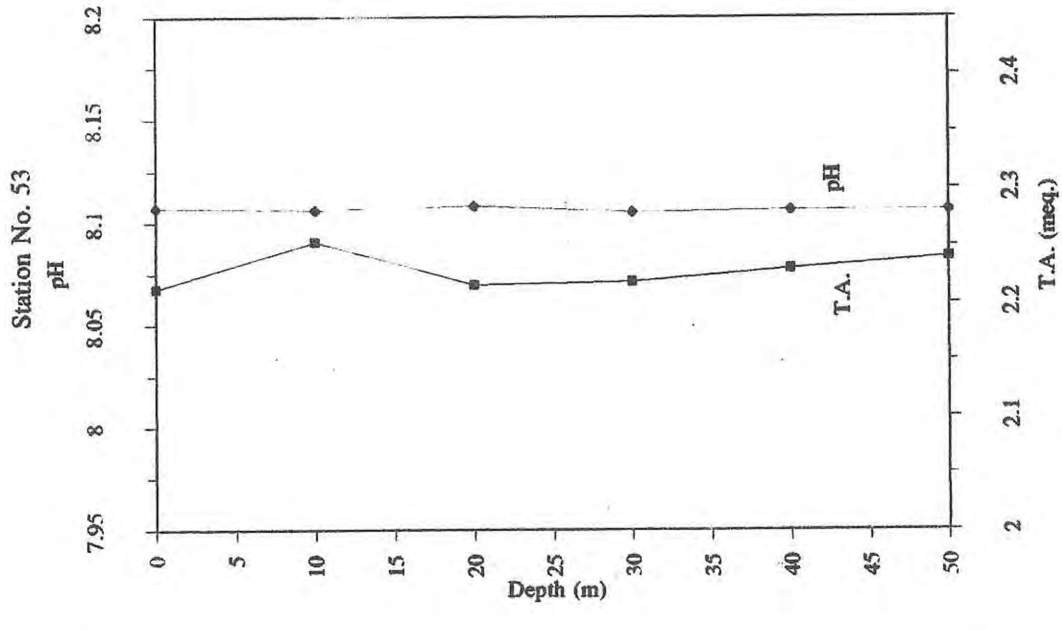


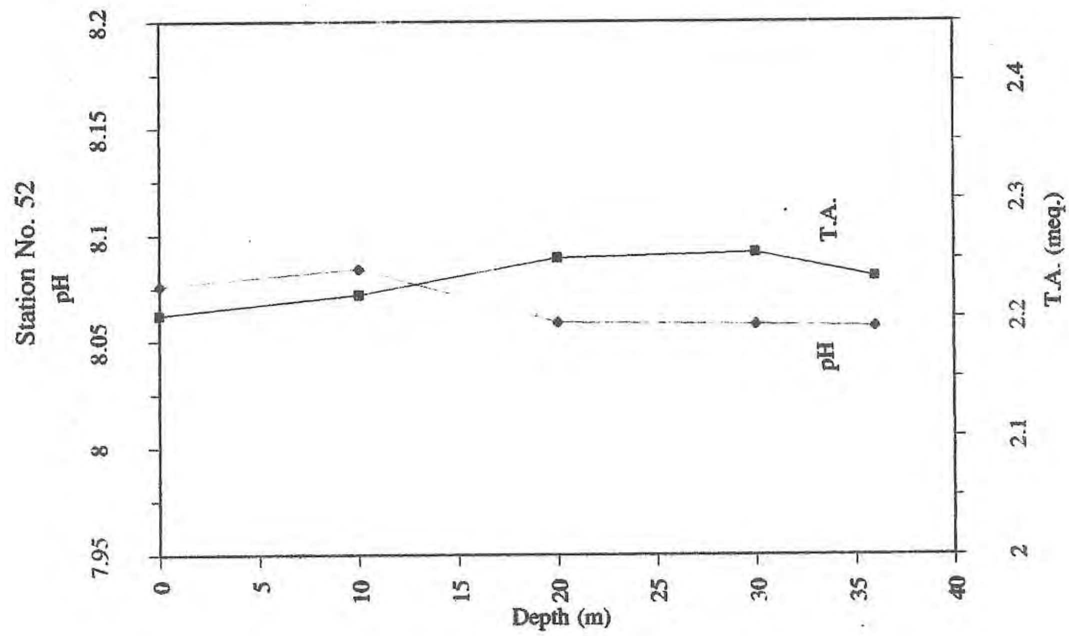
Station No. 45
pH
T.A. (meq.)
Depth (m)
pH
T.A.
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
10
20
30
40
50
60

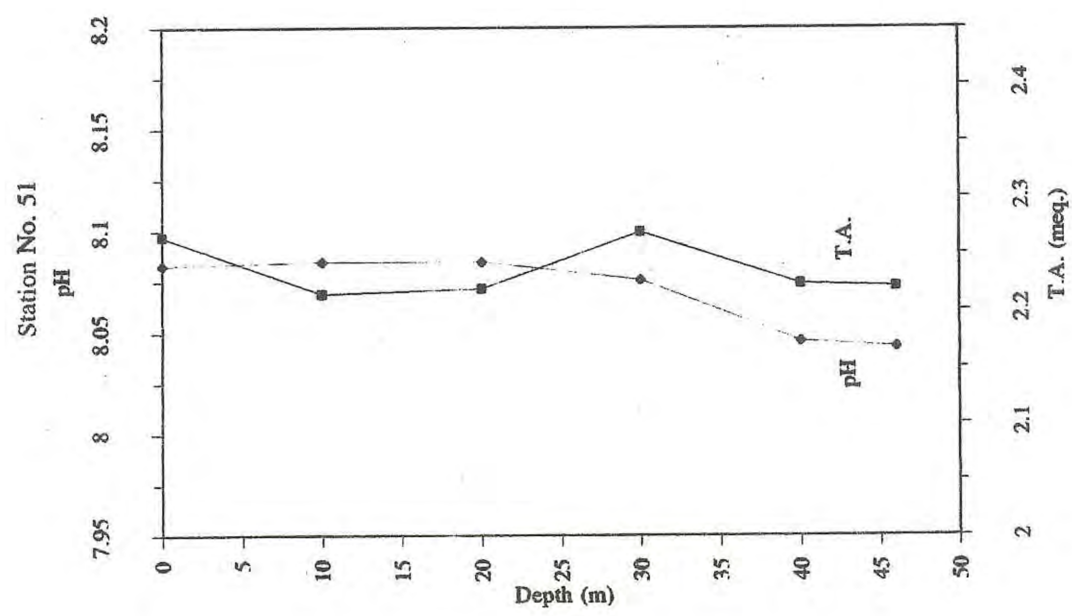

Station No. 50
pH
T.A.
Depth (m)
T.A. (meq.)
7.95
8
8.05
8.1
8.15
8.2
0
5
10
15
20
25
30
35
40
45
50
2
2.1
2.2
2.3
2.4

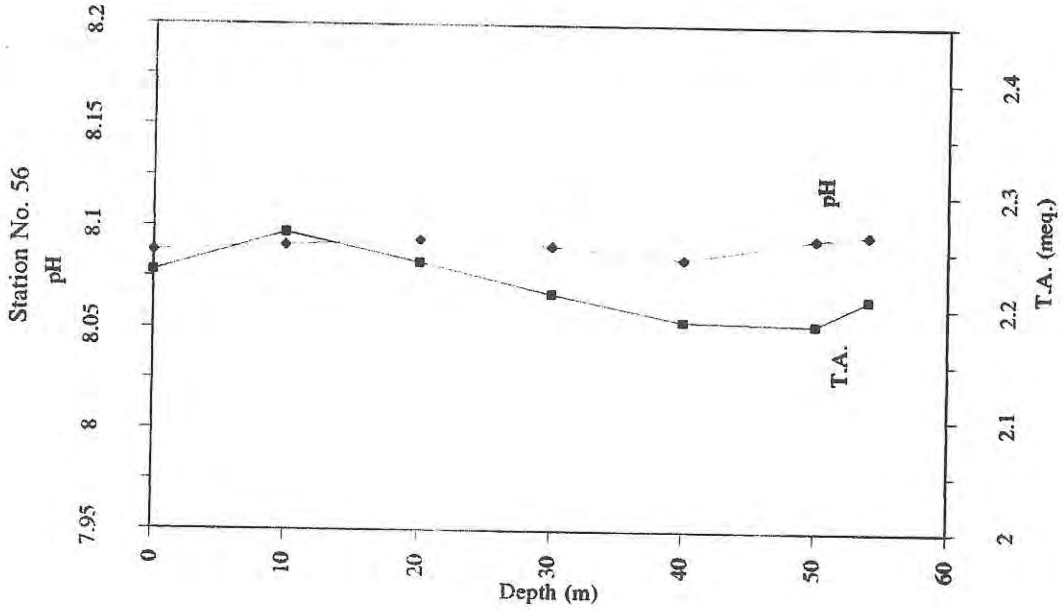

Station No. 49
pH
T.A.
Depth (m)
T.A. (meq.)
7.95
8
8.05
8.1
8.15
8.2
0
10
20
30
40
50
60
2
2.1
2.2
2.3
2.4


Station No. 48
pH
T.A.
Depth (m)
T.A. (meq.)
7.95
8
8.05
8.1
8.15
8.2
0
10
20
30
40
50
60
2
2.1
2.2
2.3
2.4

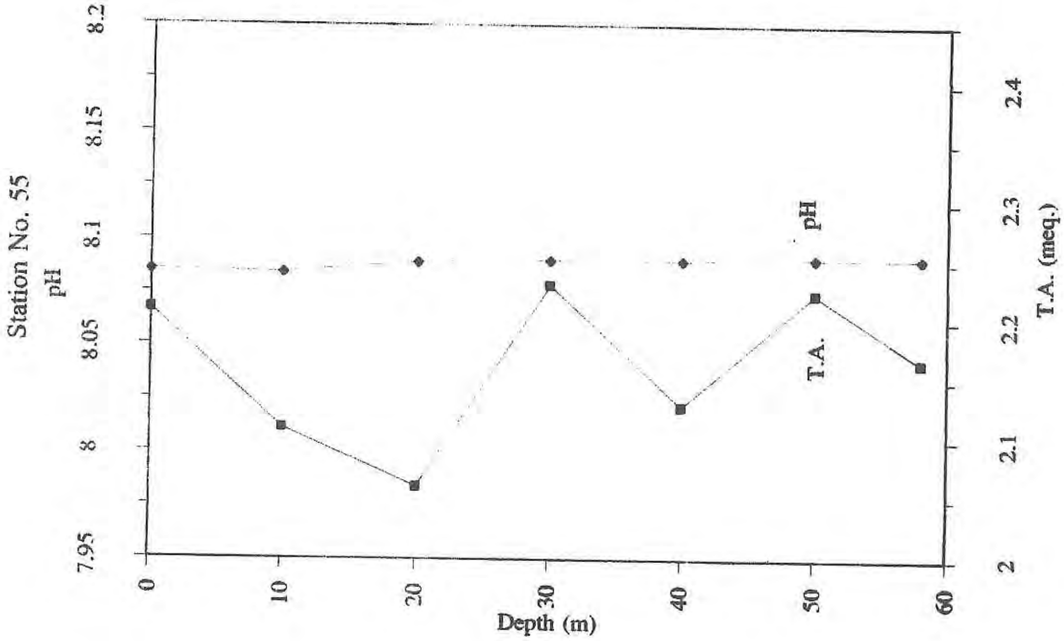

Station No. 53
pH
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
T.A. (meq.)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
pH
T.A.


Station No. 52
pH
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
T.A. (meq.)
0
5
10
15
20
25
30
35
40
Depth (m)
T.A.
pH

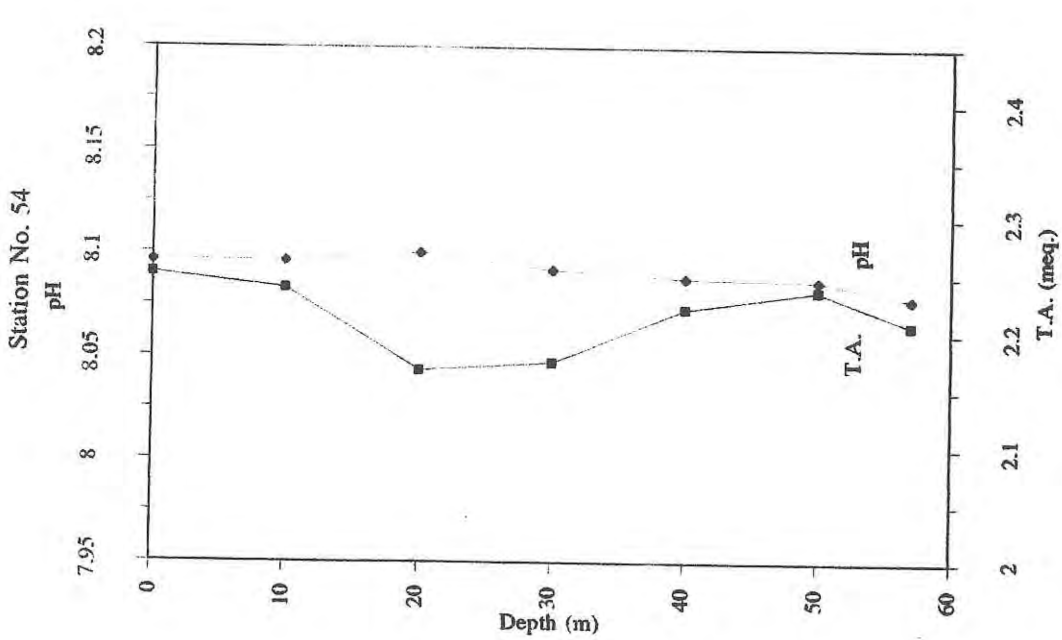

Station No. 51
pH
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
T.A. (meq.)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
T.A.
pH



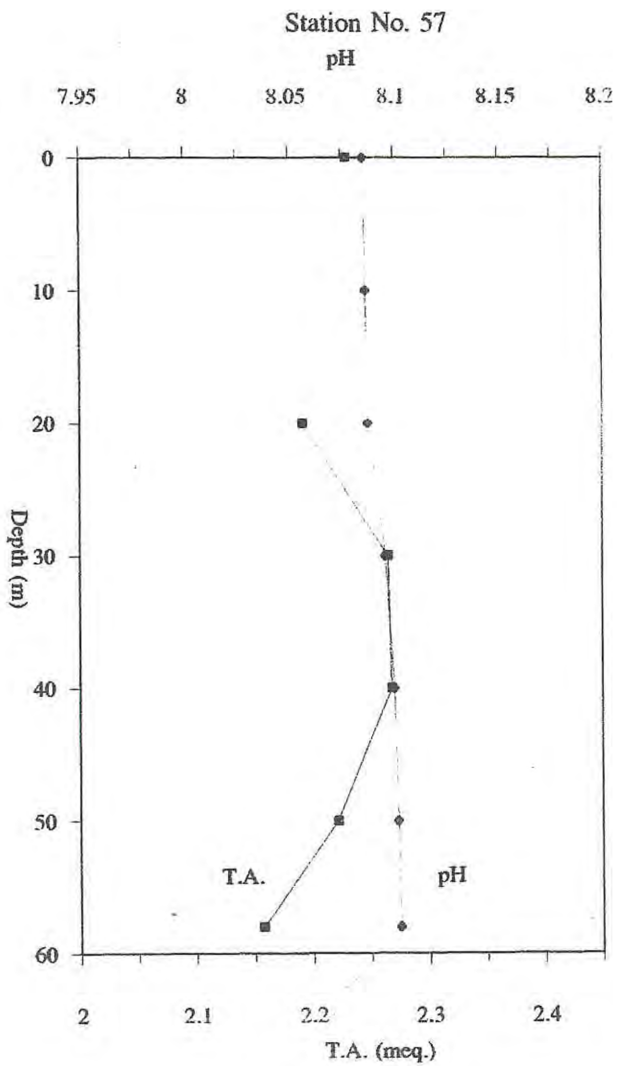
Station No. 56
pH
8.2
8.15
8.1
8.05
8
7.95
pH
T.A.
2.4
2.3
2.2
2.1
2
T.A. (meq.)
0
10
20
30
40
50
60
Depth (m)

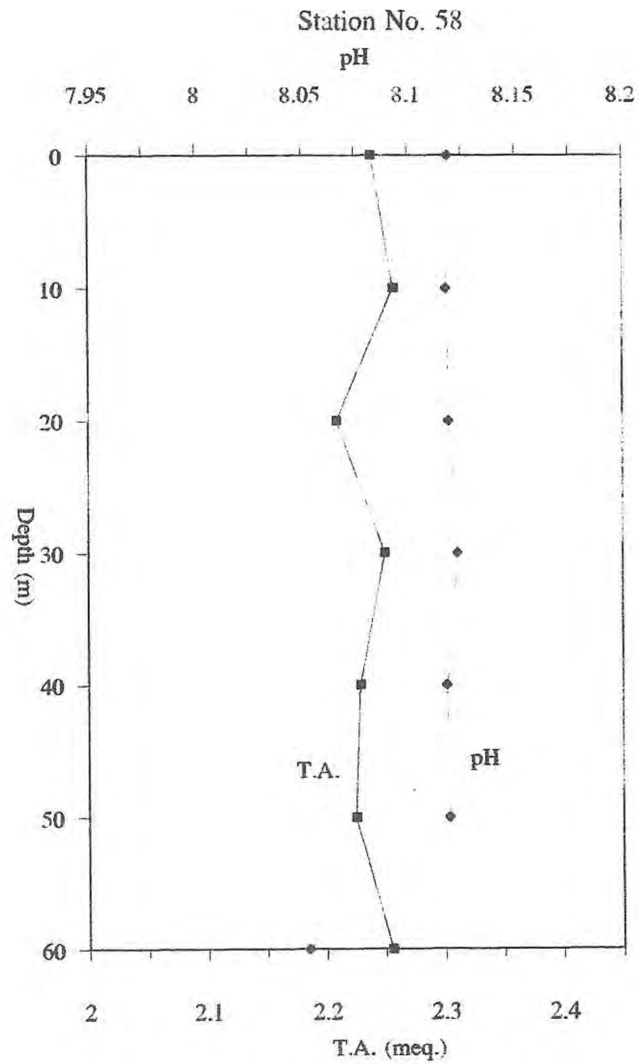


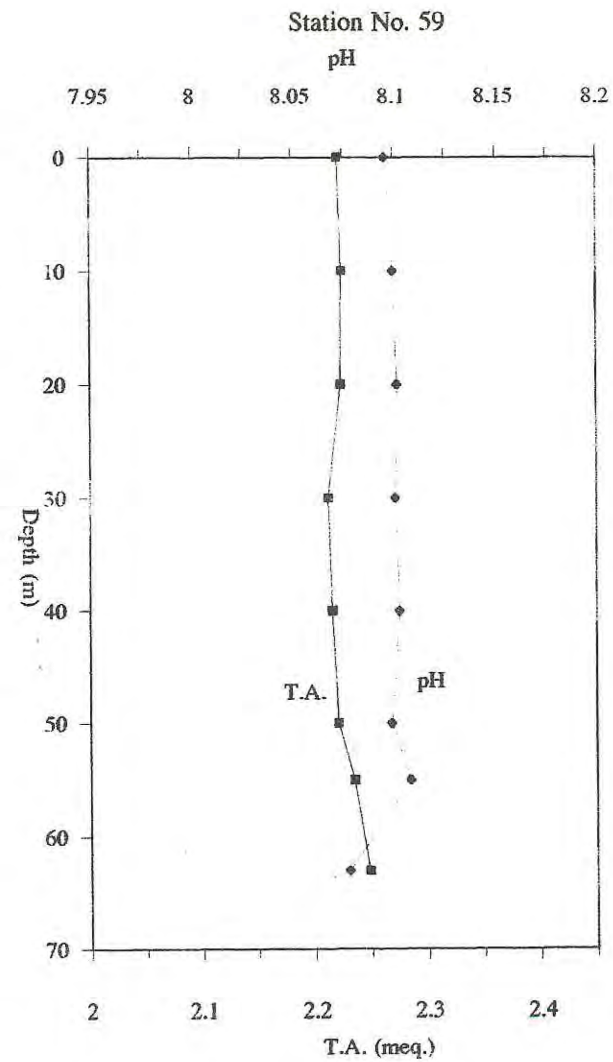
Station No. 55
pH
8.2
8.15
8.1
8.05
8
7.95
pH
T.A.
2.4
2.3
2.2
2.1
2
T.A. (meq.)
0
10
20
30
40
50
60
Depth (m)



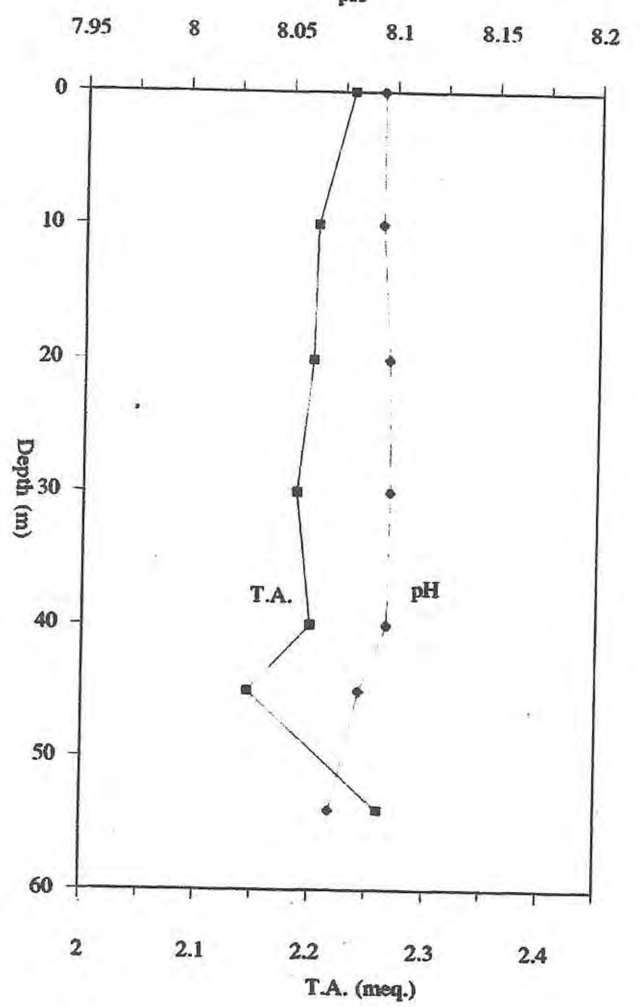
Station No. 54
pH
8.2
8.15
8.1
8.05
8
7.95
pH
T.A.
2.4
2.3
2.2
2.1
2
T.A. (meq.)
0
10
20
30
40
50
60
Depth (m)


Station No. 57
pH
7.95
8
8.05
8.1
8.15
8.2
Depth (m)
0
10
20
30
40
50
60
T.A.
pH
2
2.1
2.2
2.3
2.4
T.A. (meq.)

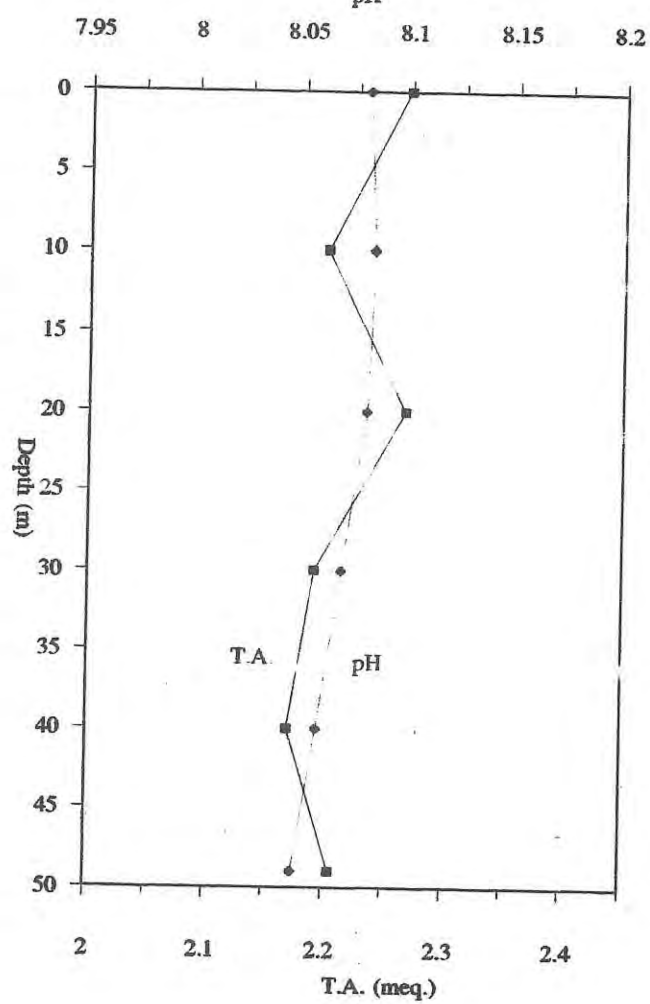

Station No. 58
pH
7.95
8
8.05
8.1
8.15
8.2
Depth (m)
0
10
20
30
40
50
60
T.A.
pH
2
2.1
2.2
2.3
2.4
T.A. (meq.)


Station No. 59
pH
7.95
8
8.05
8.1
8.15
8.2
Depth (m)
0
10
20
30
40
50
60
70
T.A.
pH
2
2.1
2.2
2.3
2.4
T.A. (meq.)

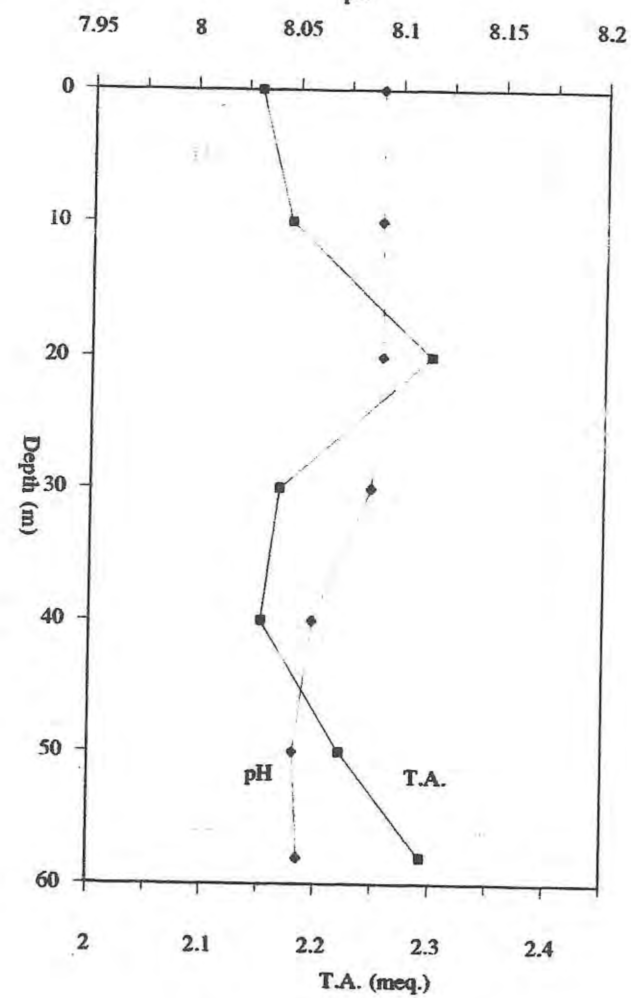
Station No. 60

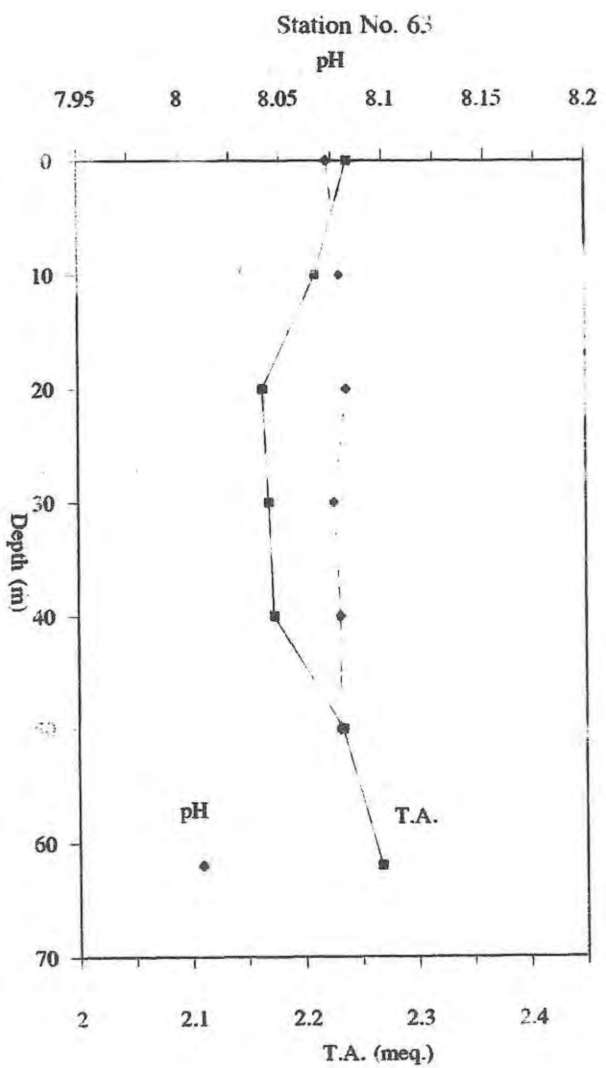


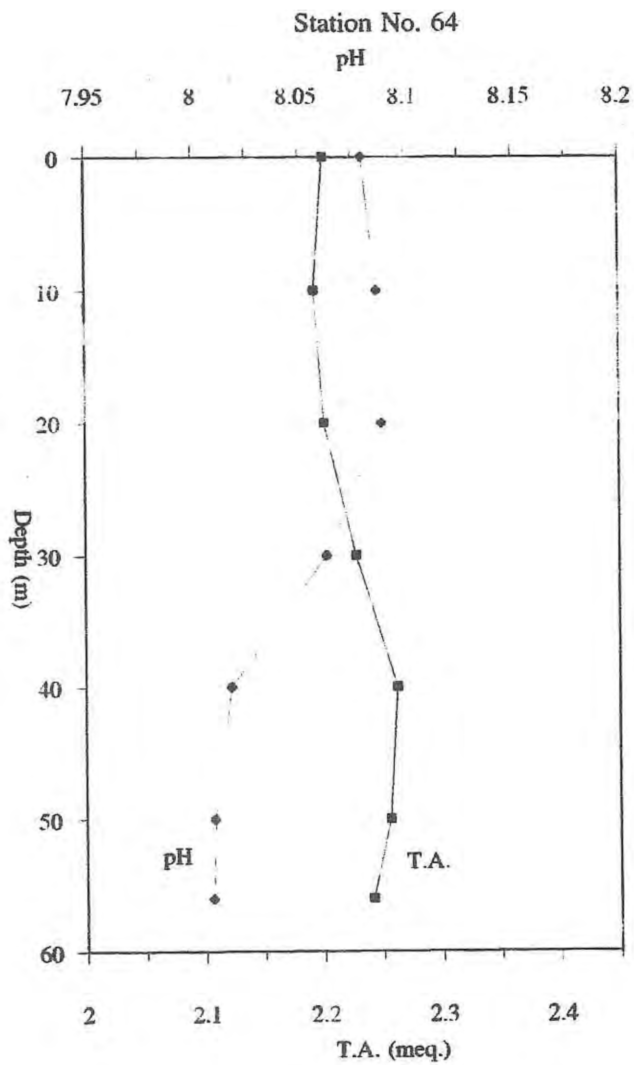
Station No. 61

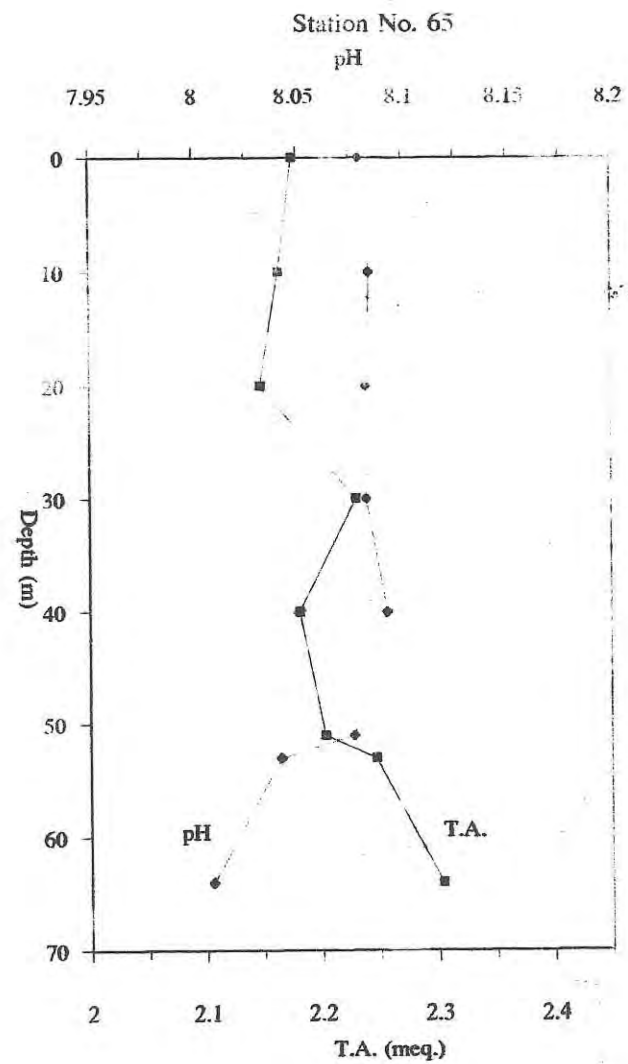


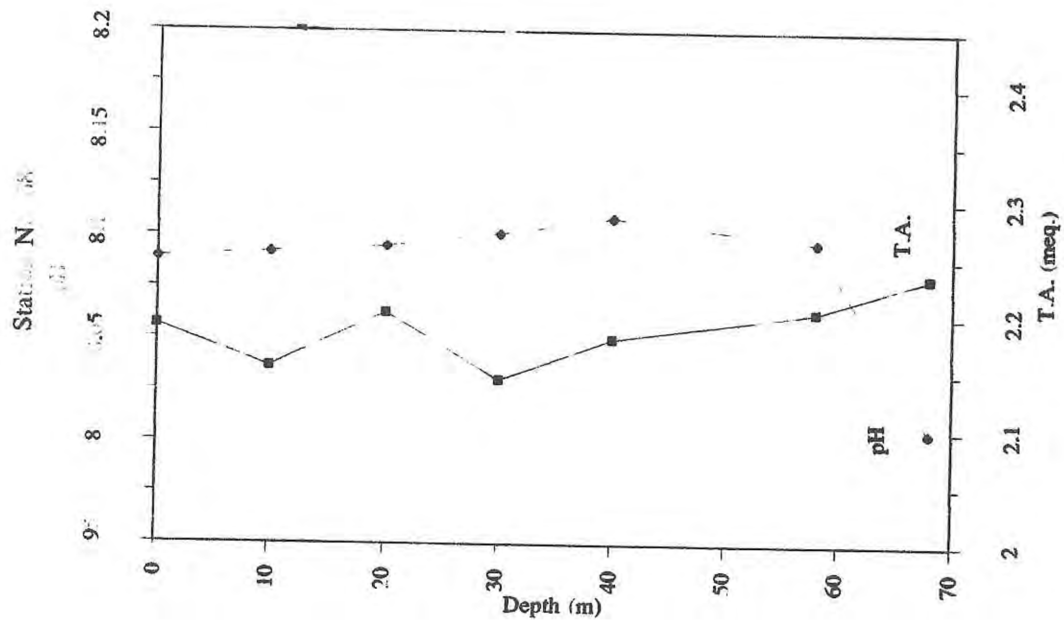
Station No. 62



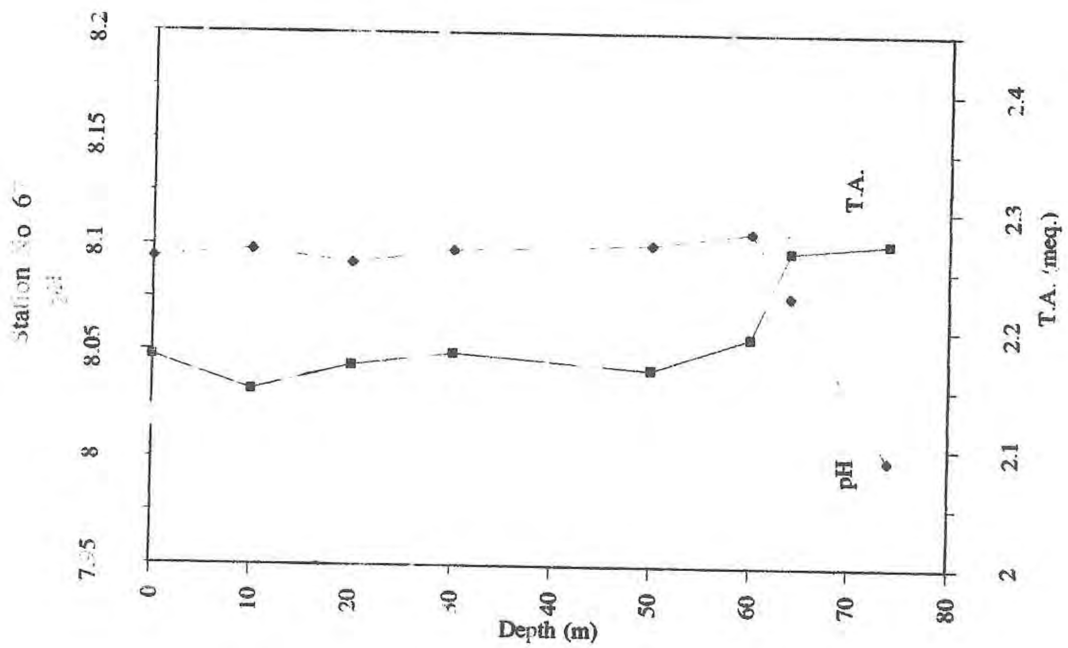

Station No. 63
pH
7.95
8
8.05
8.1
8.15
8.2
Depth (m)
0
10
20
30
40
60
70
pH
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)


Station No. 64
pH
7.95
8
8.05
8.1
8.15
8.2
Depth (m)
0
10
20
30
40
50
60
pH
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)

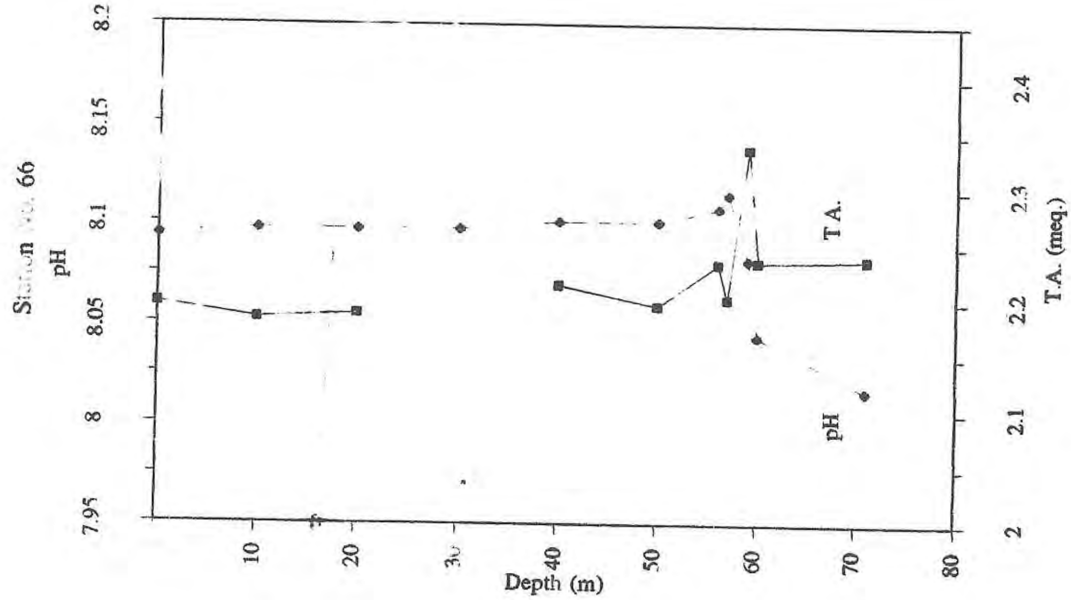

Station No. 65
pH
7.95
8
8.05
8.1
8.2
Depth (m)
0
10
30
40
50
60
70
pH
T.A.
2
2.1
2.2
2.3
2.4
T.A. (meq.)



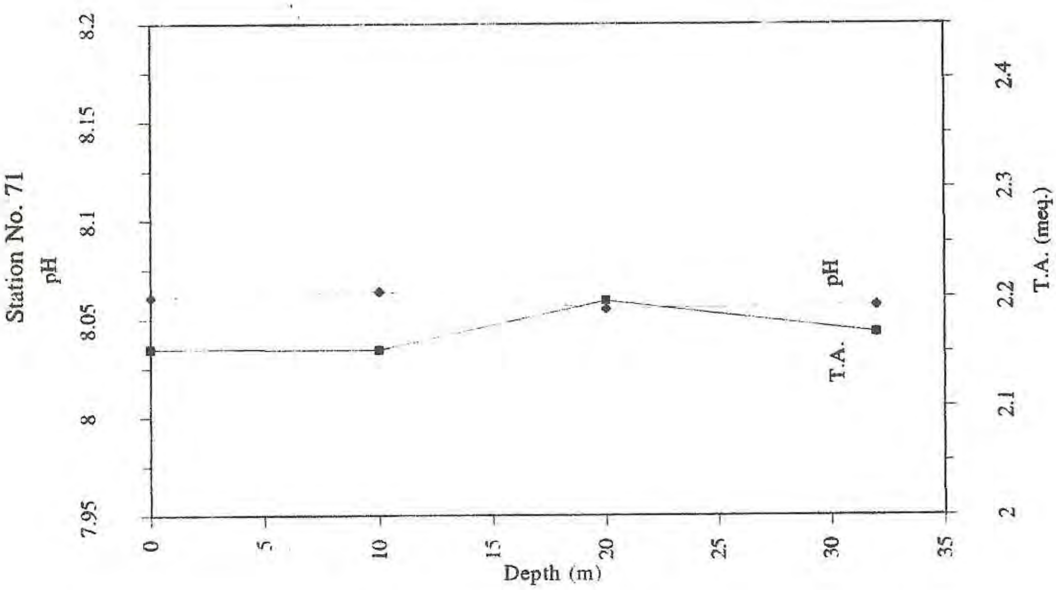
Station No. 68
pH
T.A.
pH
Depth (m)
T.A. (meq.)

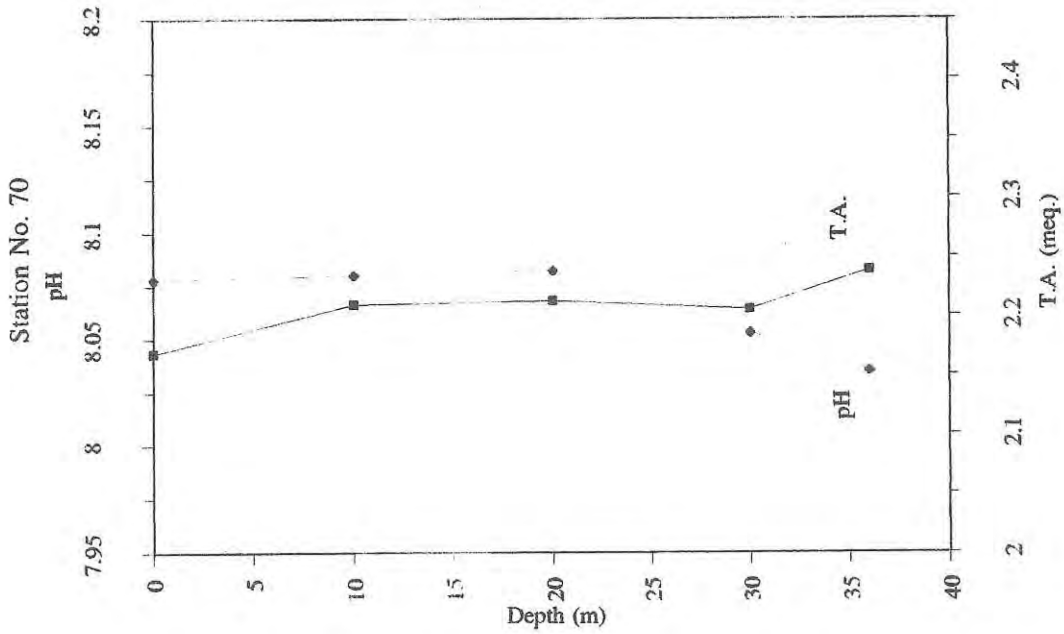


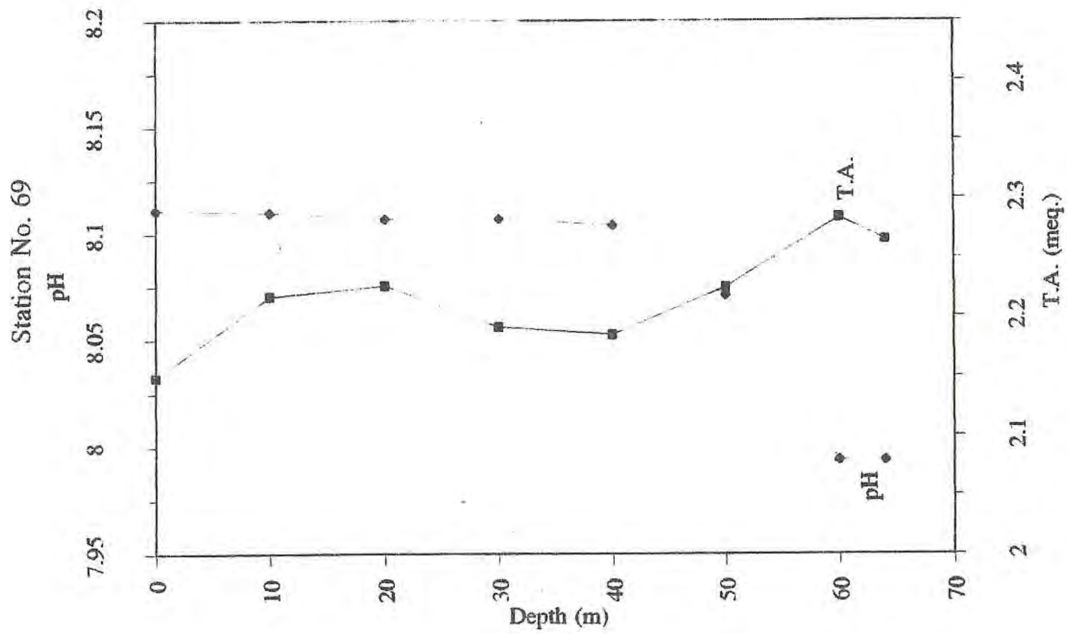
Station No 67
pH
T.A.
pH
Depth (m)
T.A. (meq.)

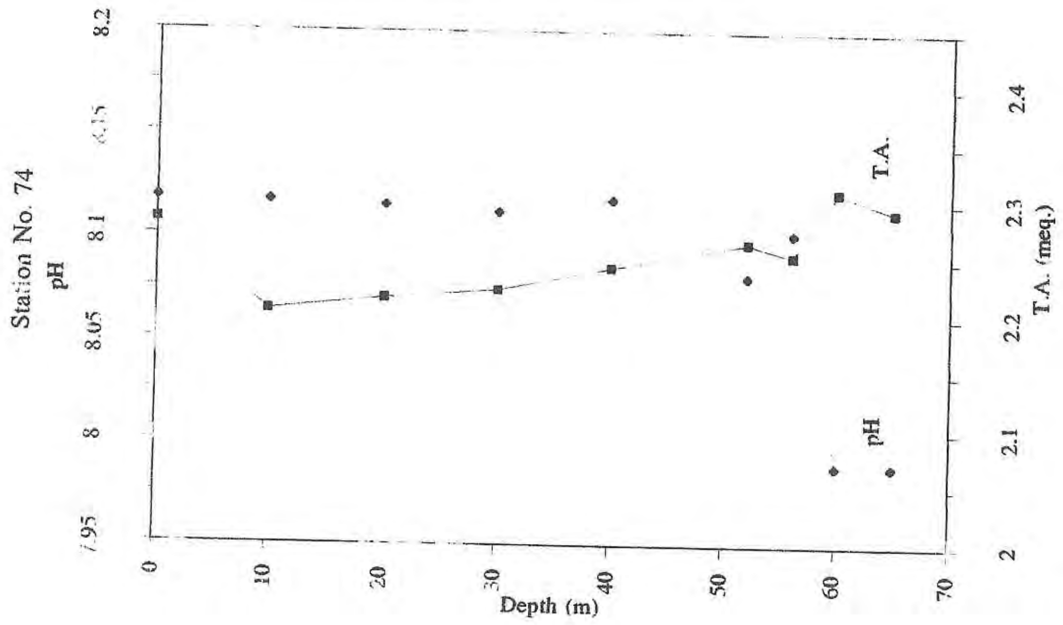


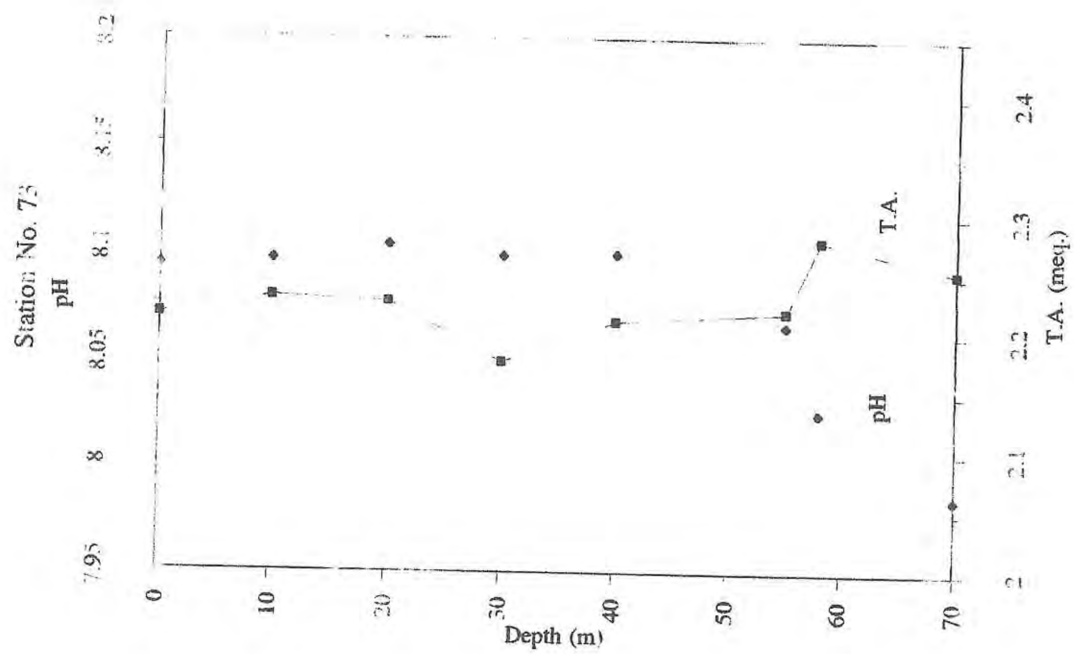
Station No. 66
pH
T.A.
pH
Depth (m)
T.A. (meq.)

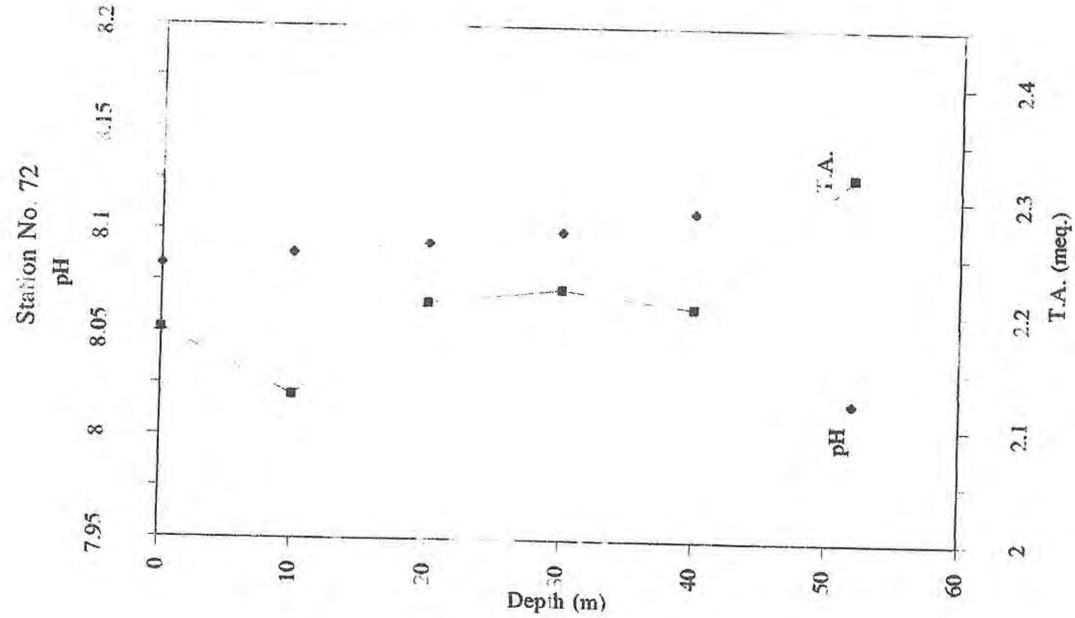

Station No. 71
pH
T.A.
Depth (m)
T.A. (meq.)

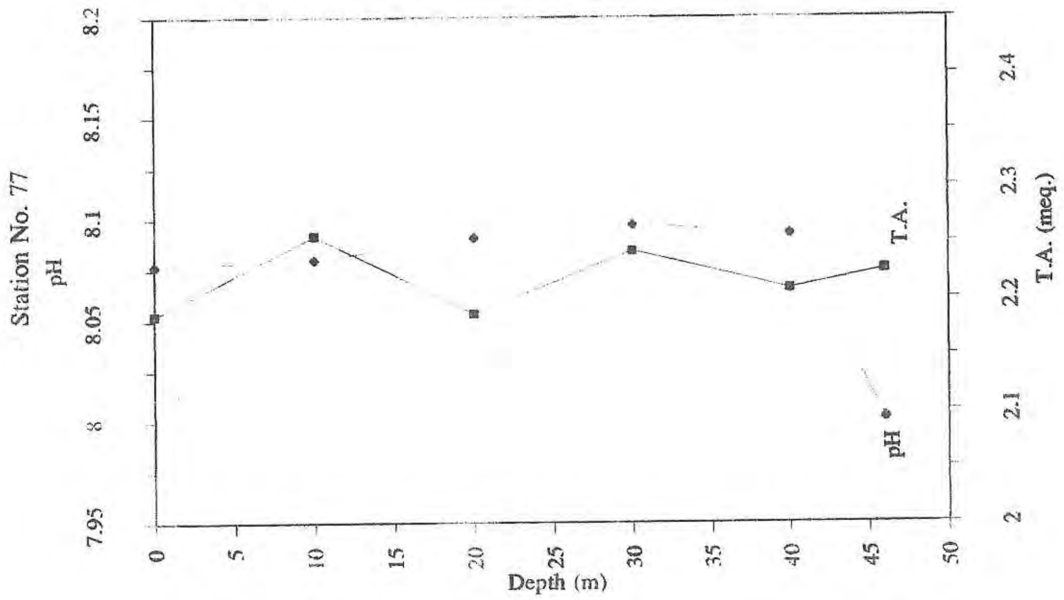

Station No. 70
pH
T.A.
Depth (m)
T.A. (meq.)

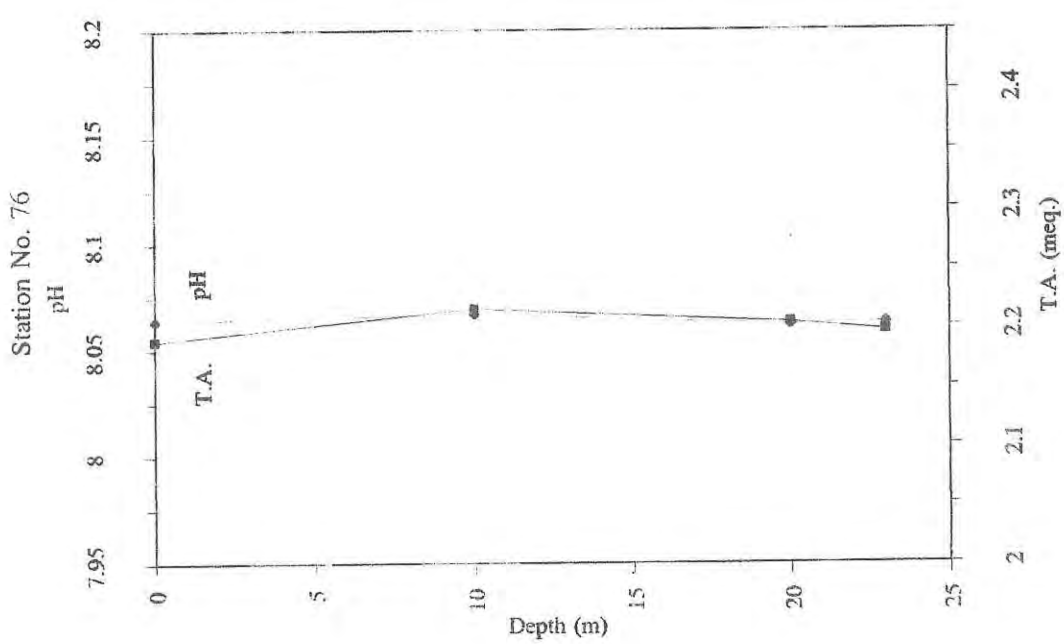

Station No. 69
pH
T.A.
Depth (m)
T.A. (meq.)

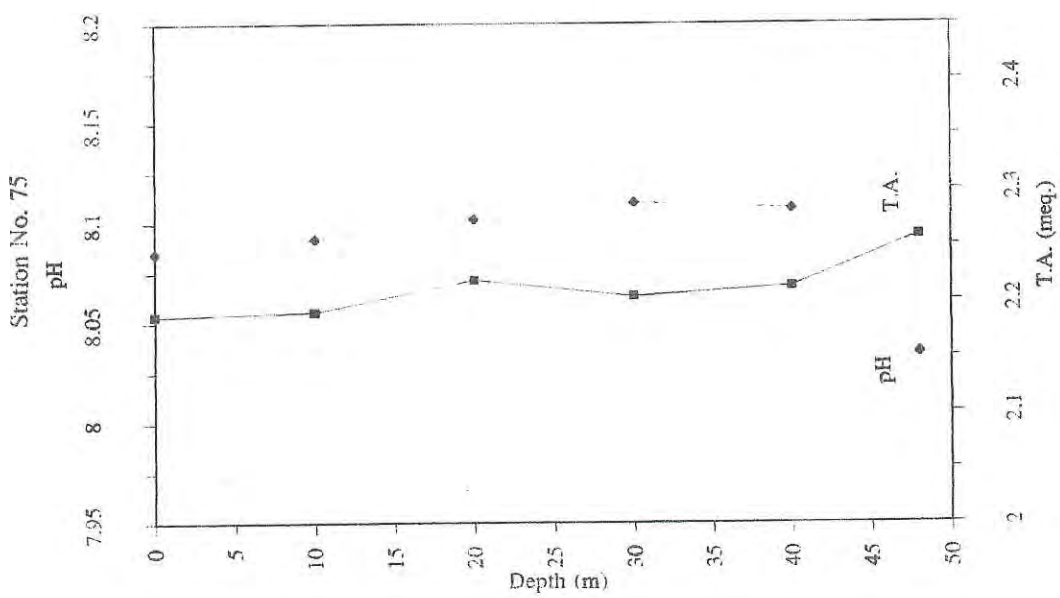

Station No. 74
pH
T.A.
pH
Depth (m)
T.A. (meq.)

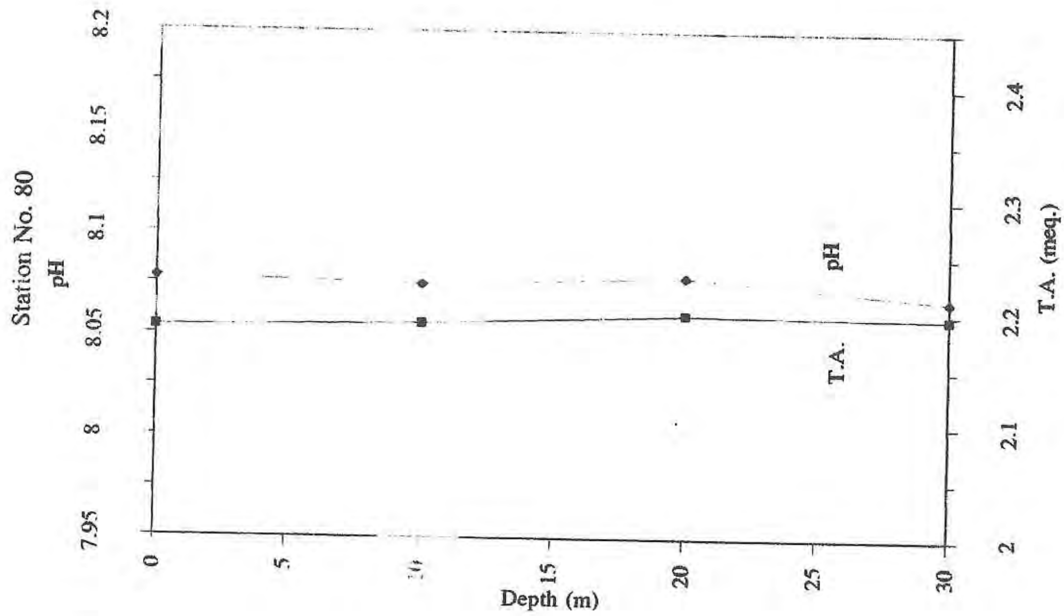

Station No. 73
pH
T.A.
pH
Depth (m)
T.A. (meq.)

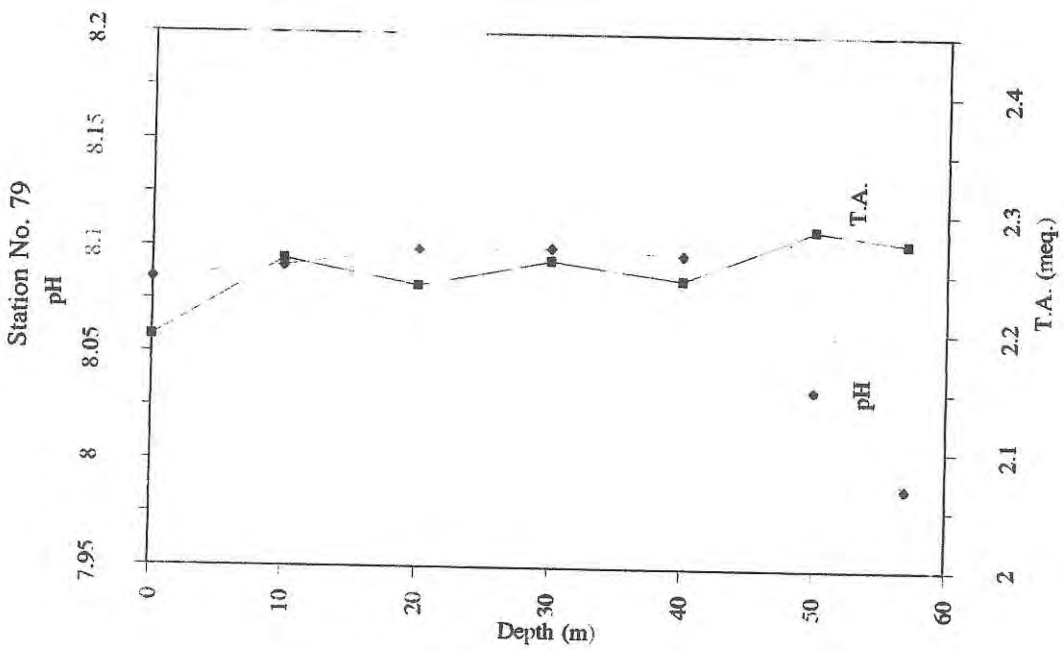

Station No. 72
pH
T.A.
pH
Depth (m)
T.A. (meq.)

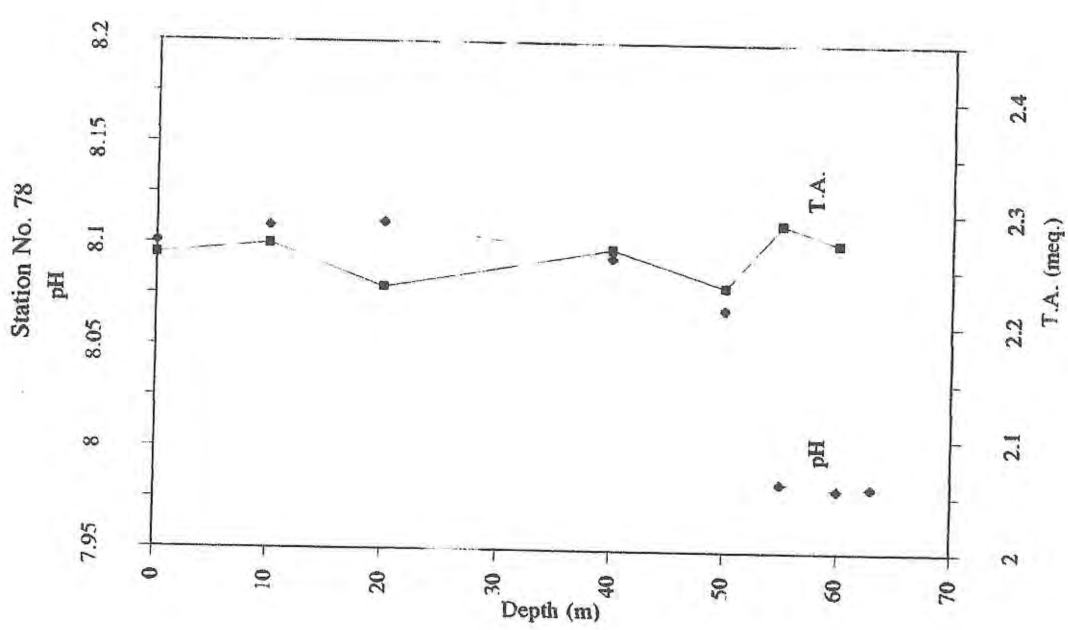

Station No. 77
pH
T.A. (meq.)
Depth (m)
T.A.
pH
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30
35
40
45
50

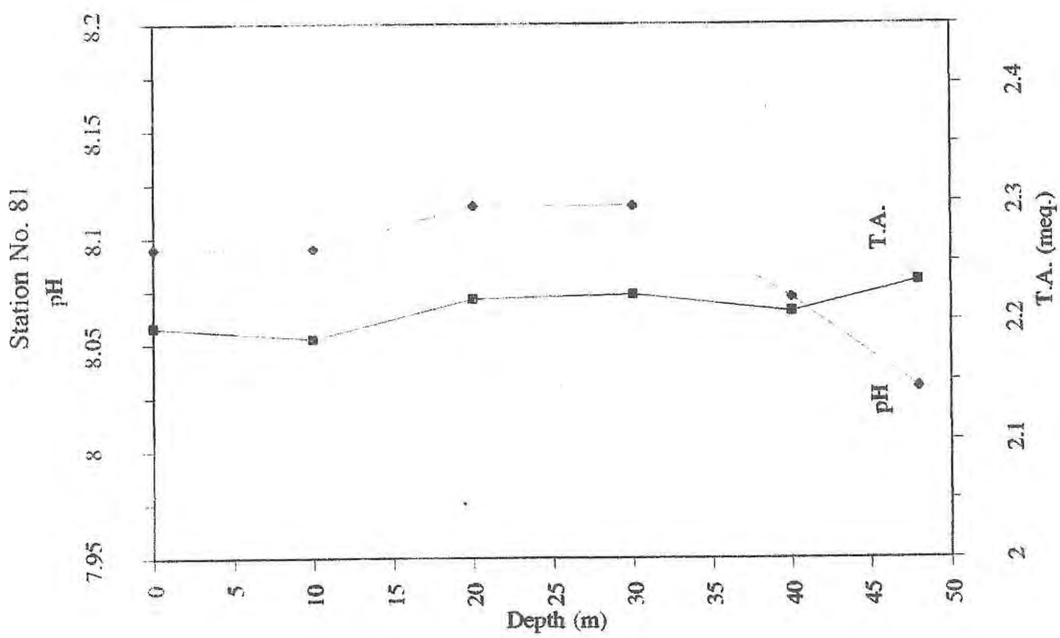

Station No. 76
pH
T.A. (meq.)
Depth (m)
pH
T.A.
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25


Station No. 75
pH
T.A. (meq.)
Depth (m)
T.A.
pH
7.95
8
8.05
8.1
8.15
8.2
2
2.1
2.2
2.3
2.4
0
5
10
15
20
25
30
35
40
45
50


Station No. 80
pH
T.A.
Depth (m)
T.A. (meq.)
7.95
8
8.05
8.1
8.15
8.2
0
5
15
20
25
30
2
2.1
2.2
2.3
2.4


Station No. 79
pH
T.A.
Depth (m)
T.A. (meq.)
7.95
8
8.05
8.15
8.2
0
10
20
30
40
50
60
2
2.1
2.2
2.3
2.4

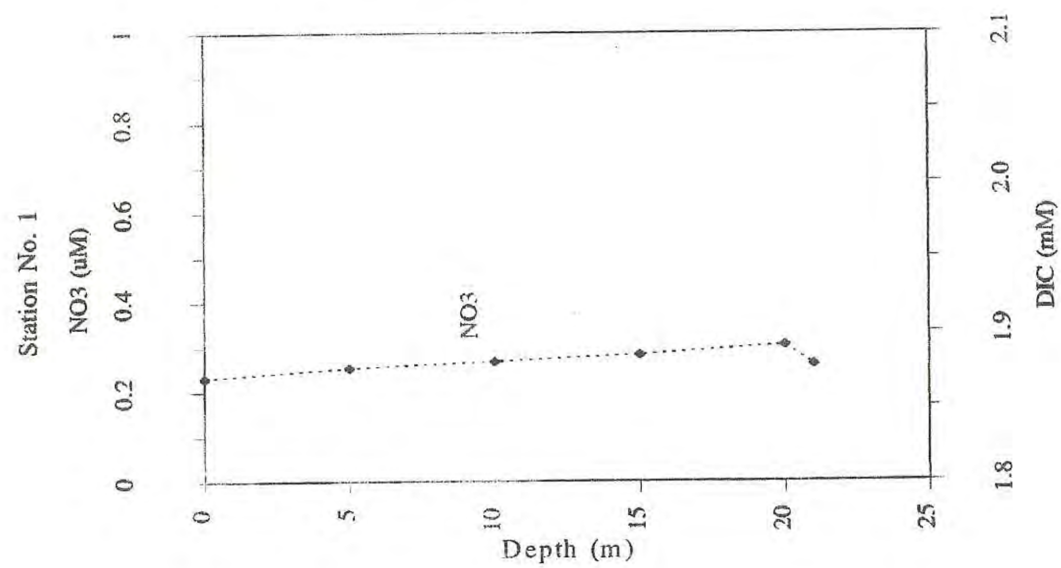

Station No. 78
pH
T.A.
Depth (m)
T.A. (meq.)
7.95
8
8.05
8.1
8.15
8.2
0
10
20
30
40
50
60
70
2
2.1
2.2
2.3
2.4

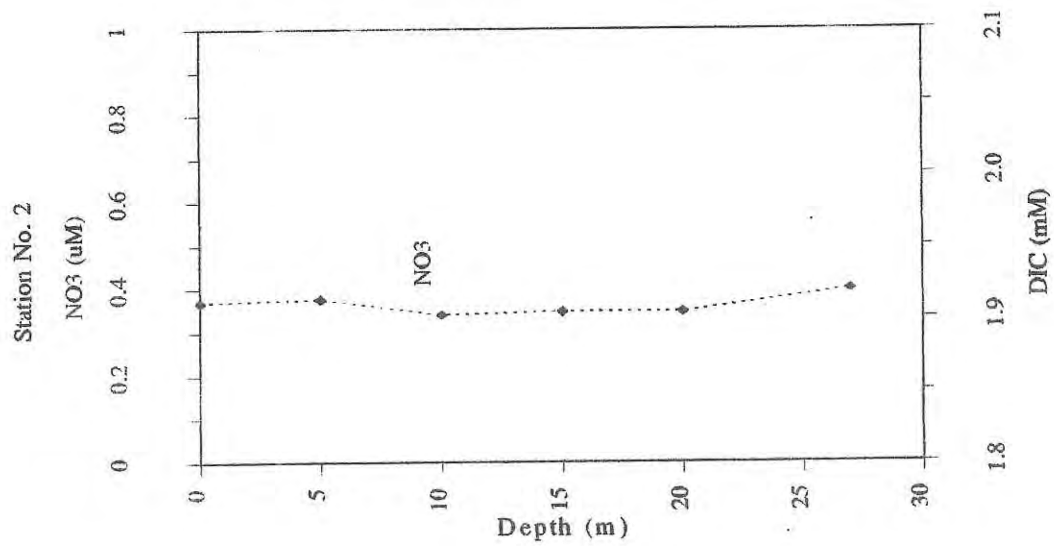

Station No. 81
pH
T.A.
pH
Depth (m)
T.A. (meq.)
7.95
8
8.05
8.1
8.15
8.2
0
5
10
15
20
25
30
35
40
45
50
2
2.1
2.2
2.3
2.4

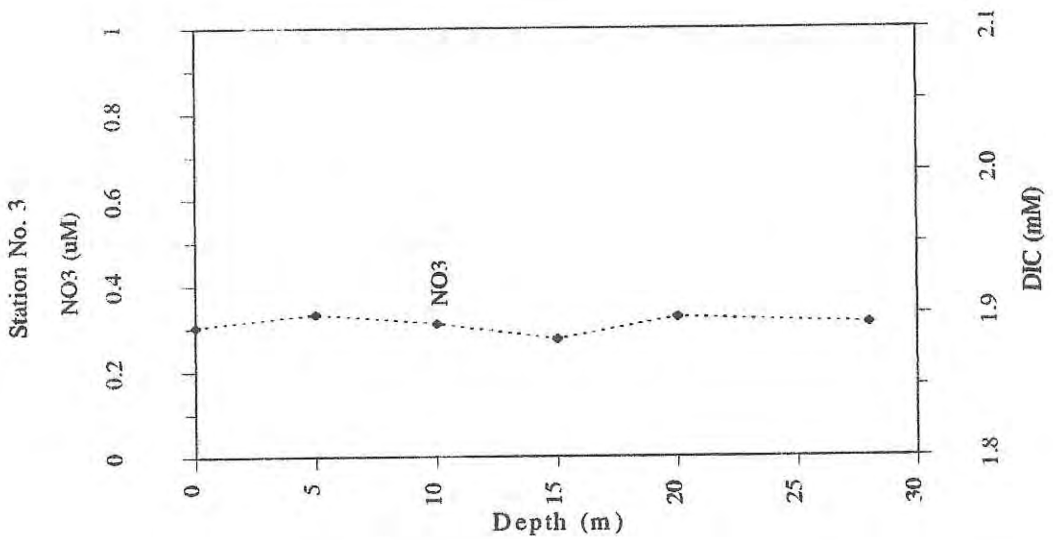
Nitrate and Dissolved Inorganic Carbon

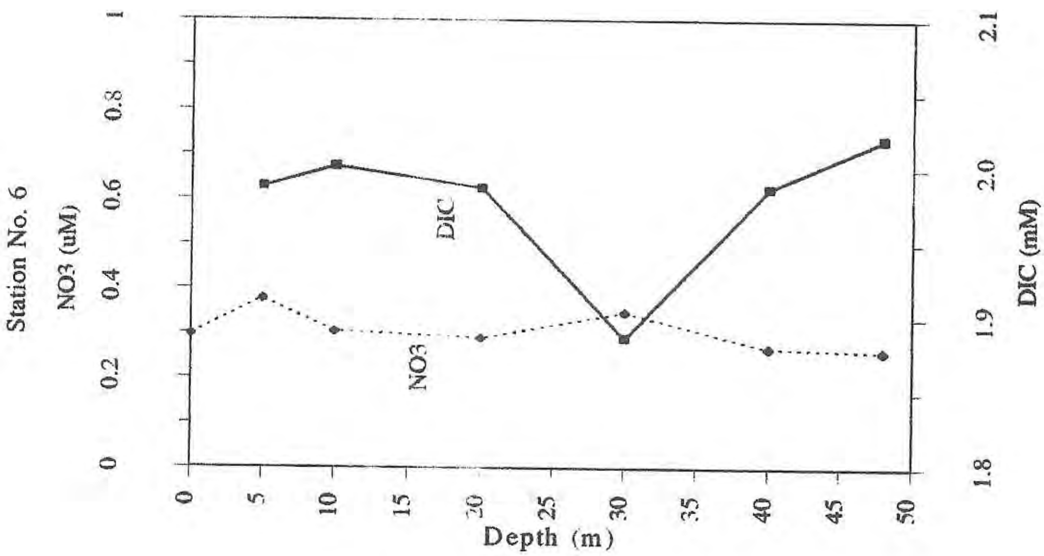
Dissolved nitrate concentration was determined on board the research vessel in filtered seawater samples (Whatman GF/C, 1.2 µm pore-size). The segmented flow Technicon Autoanalyzer II (Bran-Lubbe) equipped with 2 cm flow cells was used. The analytical procedure was provided by the manufacturer but more acid was added to the color reagent to prevent precipitation of $CaCO_3$ in the mixing coils. The absorbance was recorded as peak height by a pen-plotter. The nitrate concentration was obtained by calibrating sample peaks with those of secondary standards prepared from distilled water. The actual concentration in these secondary standards were occasionally verified against IOC-WESTPAC Standards (Government Chemical Laboratory, Queensland, Australia) and CSK Standards (Sagami Chemical Research Center, Japan). The acceptable precision of determination of samples was 10% (2 replicates) and samples with unacceptable outliers were always reanalyzed.

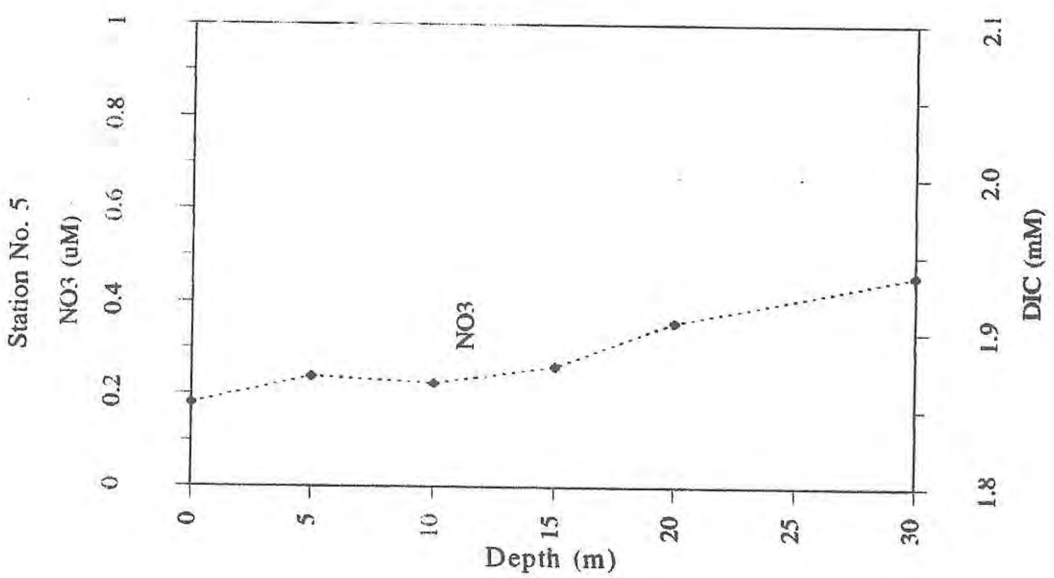
Dissolved inorganic carbon (DIC) is defined as the sum of bicarbonate (HCO_3^-) and carbonate (CO_3^{2-}) because, at the pH of seawater, more than 99% of undissociated species (CO_2 and H_2CO_3) are converted to HCO_3^- and subsequently to CO_3^{2-}. DIC was calculated from the sample pH and carbonate alkalinity. The latter was estimated by substract the borate alkalinity from total alkalinity. Total boron in seawater was estimated to be 0.33 mM. Borate and carbonate dissociation constants in seawater were taken from Stumm and Maorgan (1981).

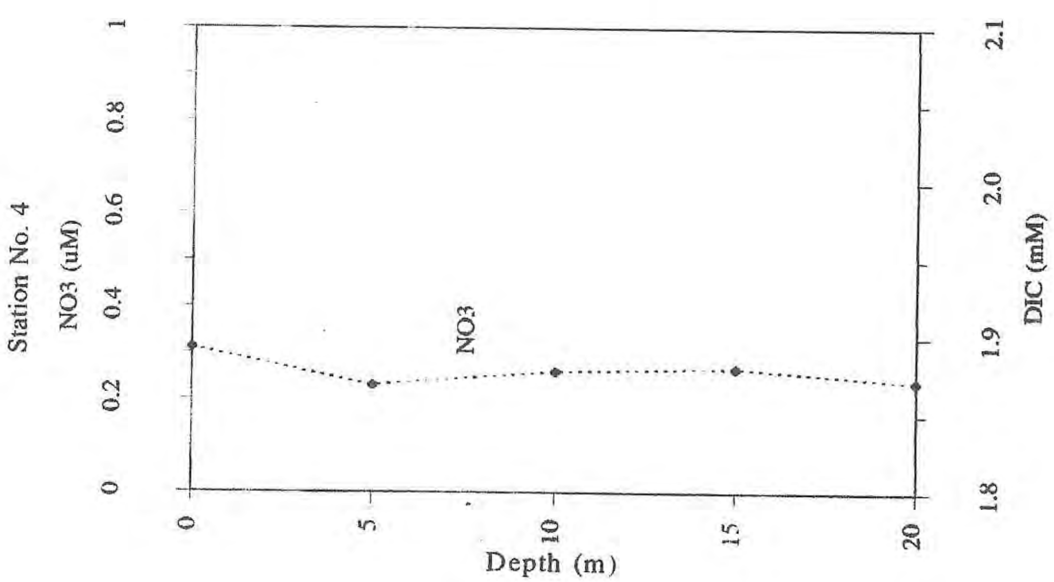

Station No. 1
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
NO3
0
5
10
15
20
25
Depth (m)
1.8
1.9
2.0
2.1
DIC (mM)

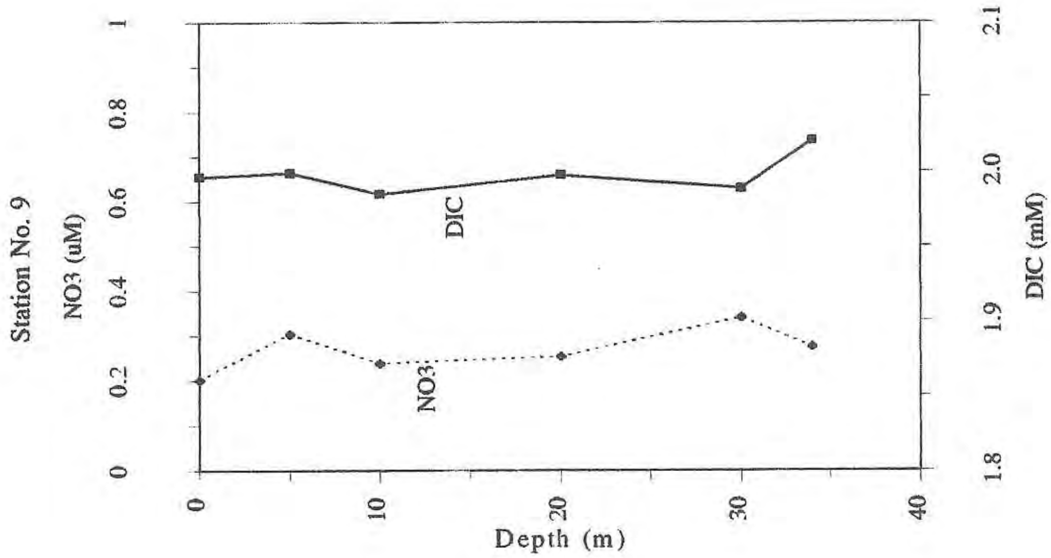

Station No. 2
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
NO3
0
5
10
15
20
25
30
Depth (m)
1.8
1.9
2.0
2.1
DIC (mM)


Station No. 3
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
NO3
0
5
10
15
20
25
30
Depth (m)
1.8
1.9
2.0
2.1
DIC (mM)

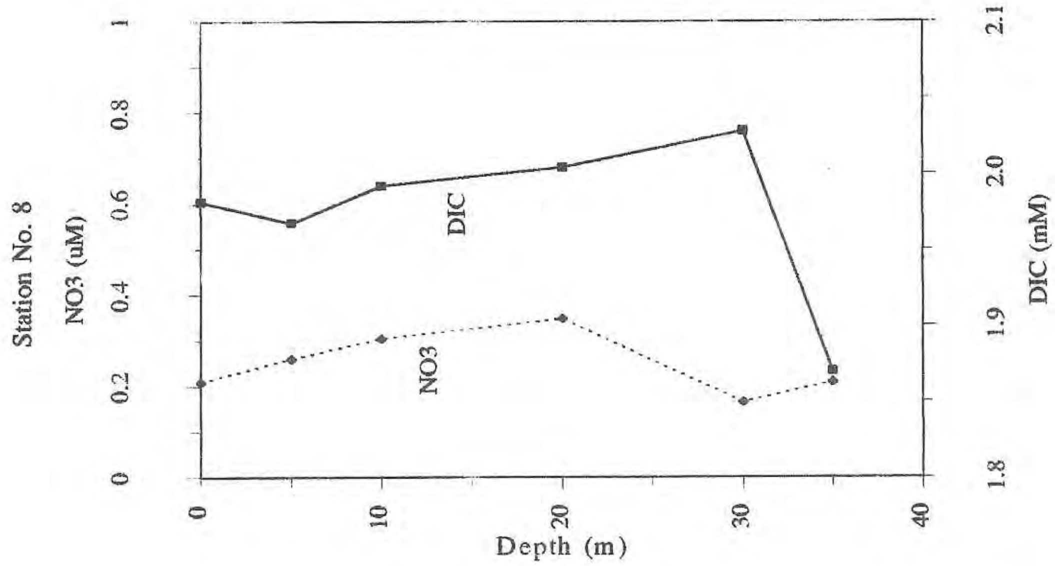

Station No. 6
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
DIC
NO3
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
1.8
1.9
2.0
2.1
DIC (mM)


Station No. 5
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
NO3
0
5
10
15
20
25
30
Depth (m)
1.8
1.9
2.0
2.1
DIC (mM)

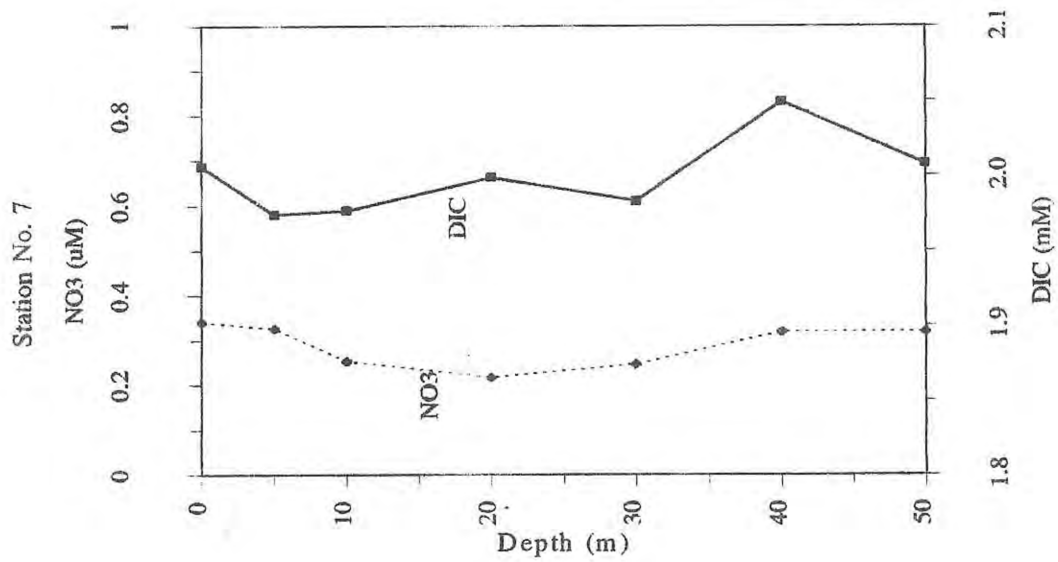

Station No. 4
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
NO3
0
5
10
15
20
Depth (m)
1.8
1.9
2.0
2.1
DIC (mM)



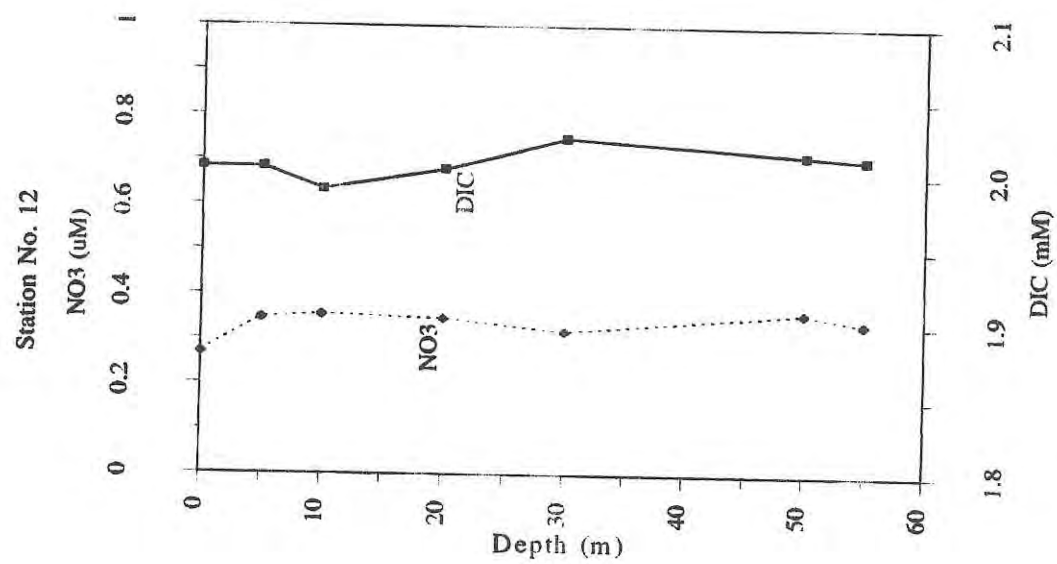
Station No. 9
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)
0
10
20
30
40
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1

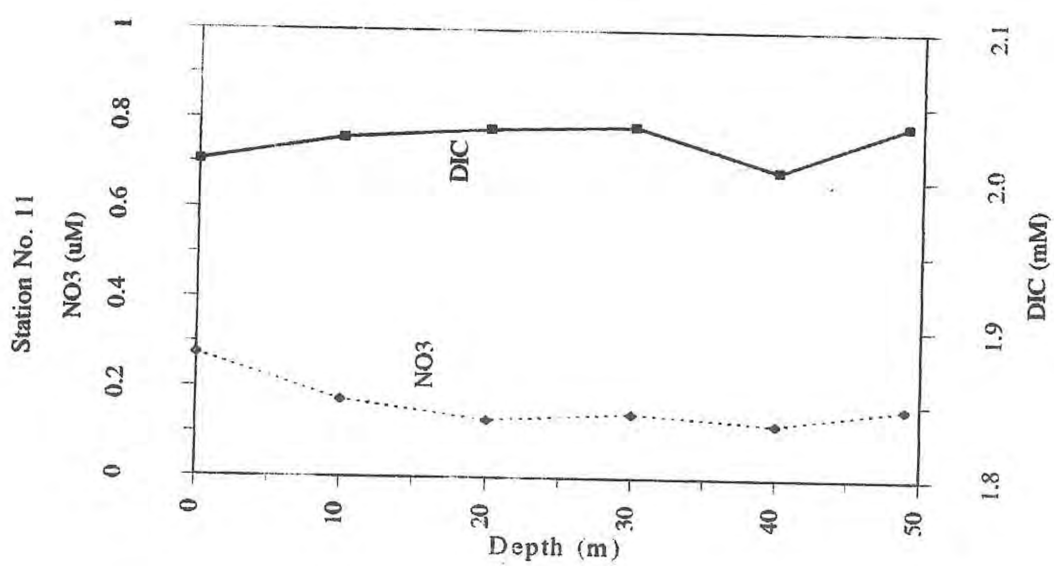


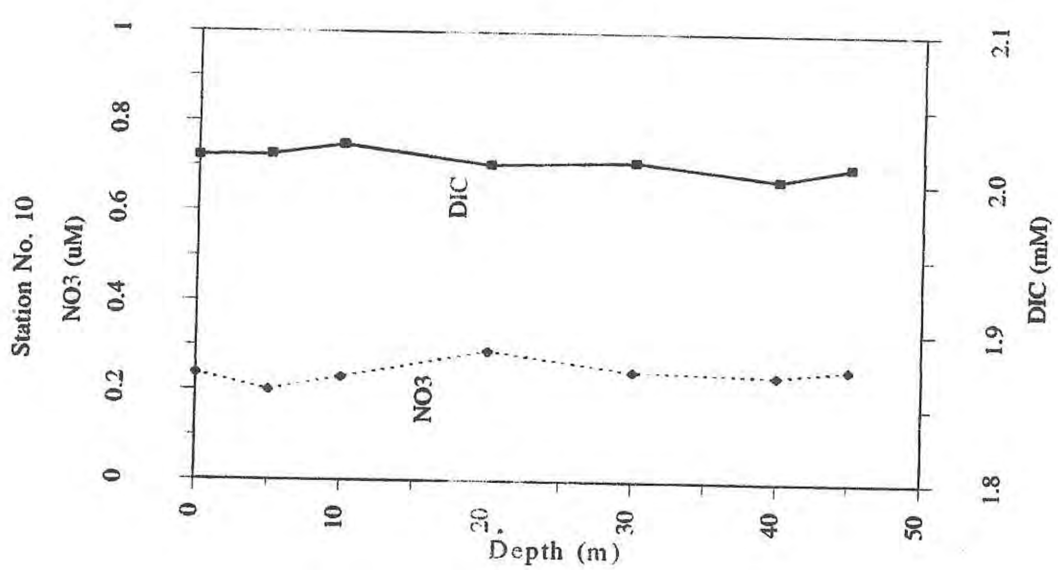
Station No. 8
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)
0
10
20
30
40
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1

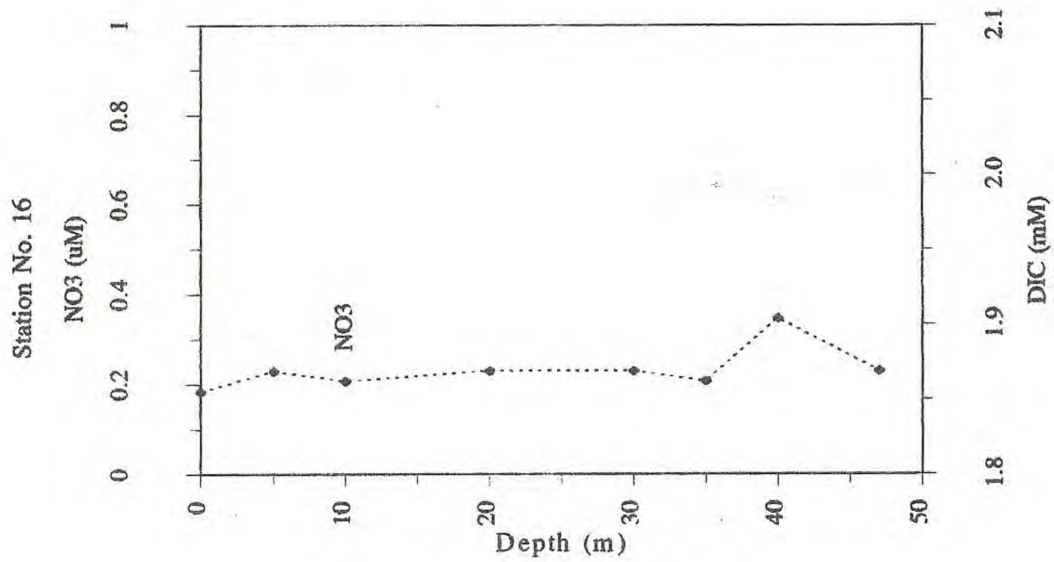


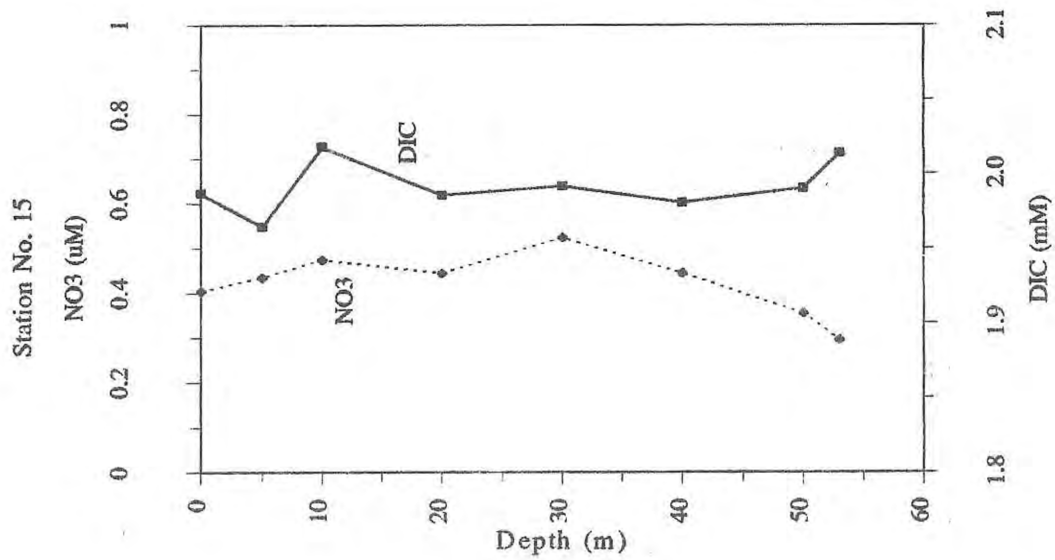
Station No. 7
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)
0
10
20
30
40
50
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1

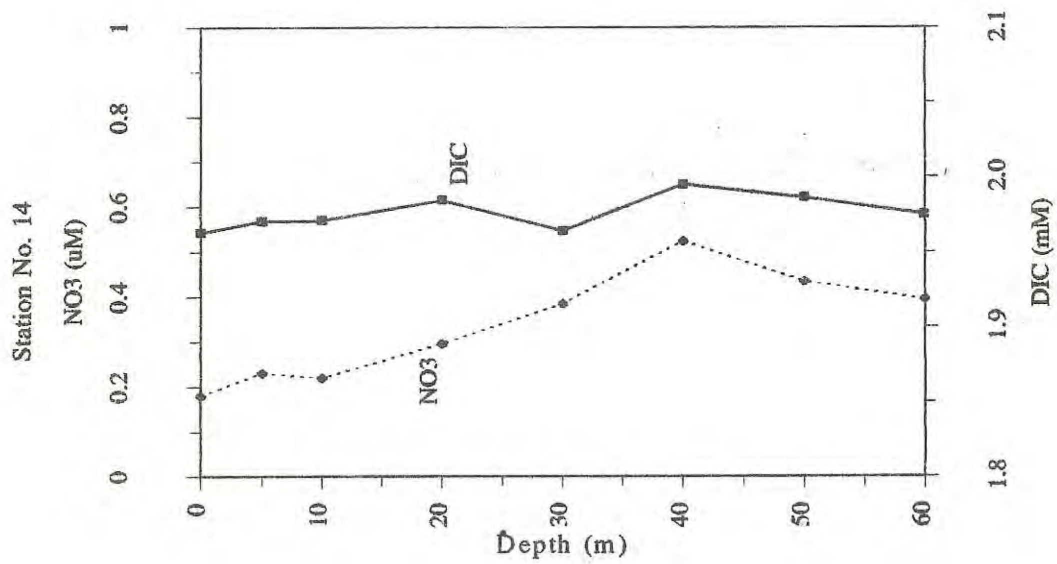

Station No. 12
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1
0
10
20
30
40
50
60

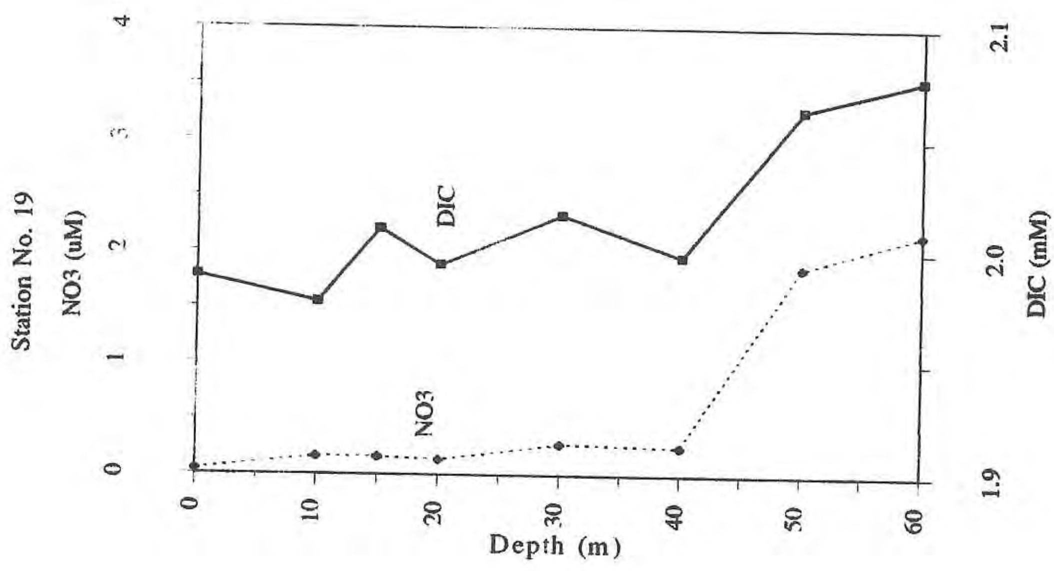

Station No. 11
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1
0
10
20
30
40
50


Station No. 10
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1
0
10
20
30
40
50

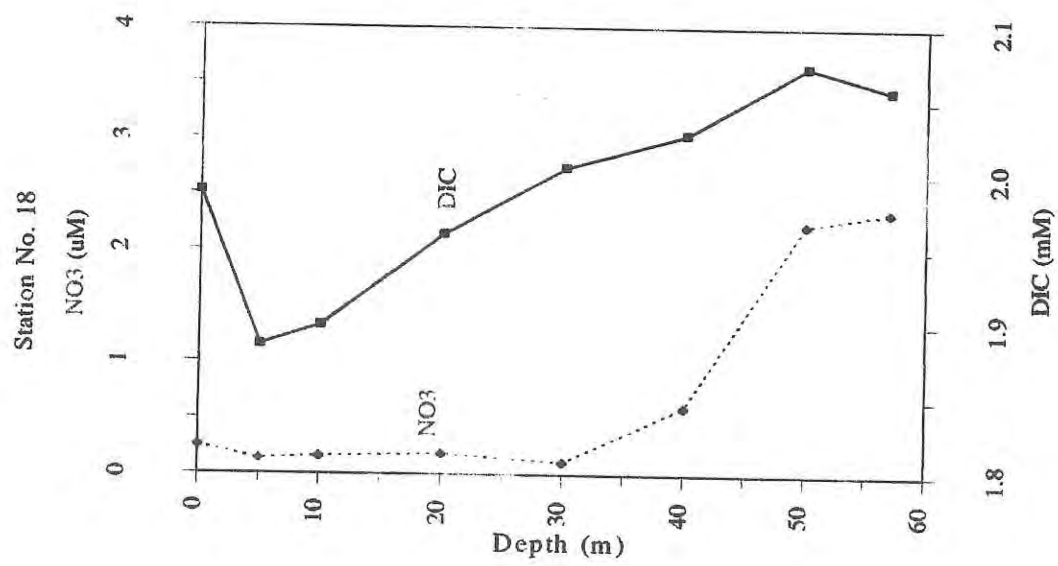

Station No. 16
NO3 (uM)
DIC (mM)
NO3
Depth (m)
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1
0
10
20
30
40
50


Station No. 15
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1
0
10
20
30
40
50
60

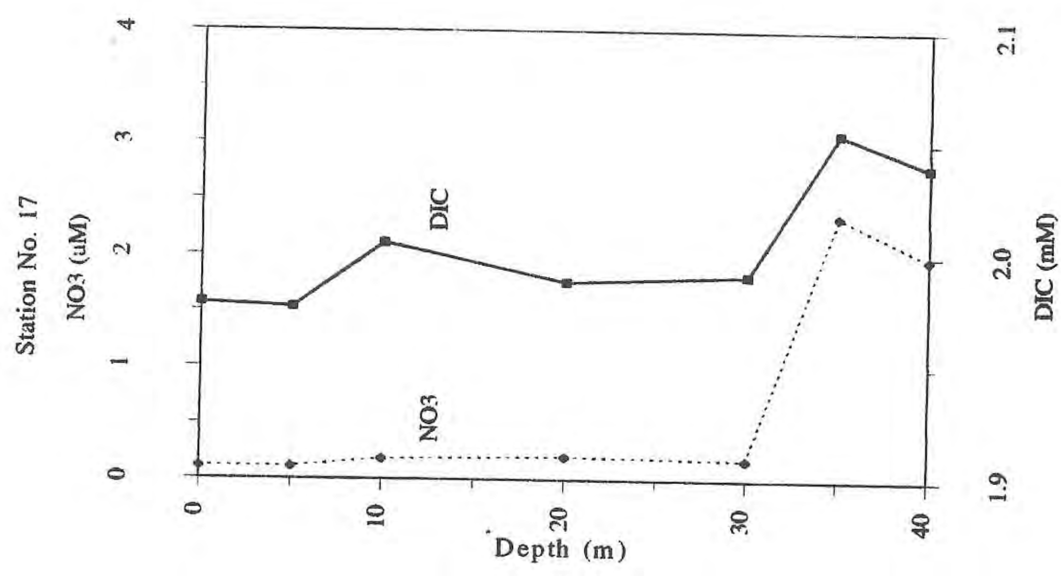

Station No. 14
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1
0
10
20
30
40
50
60



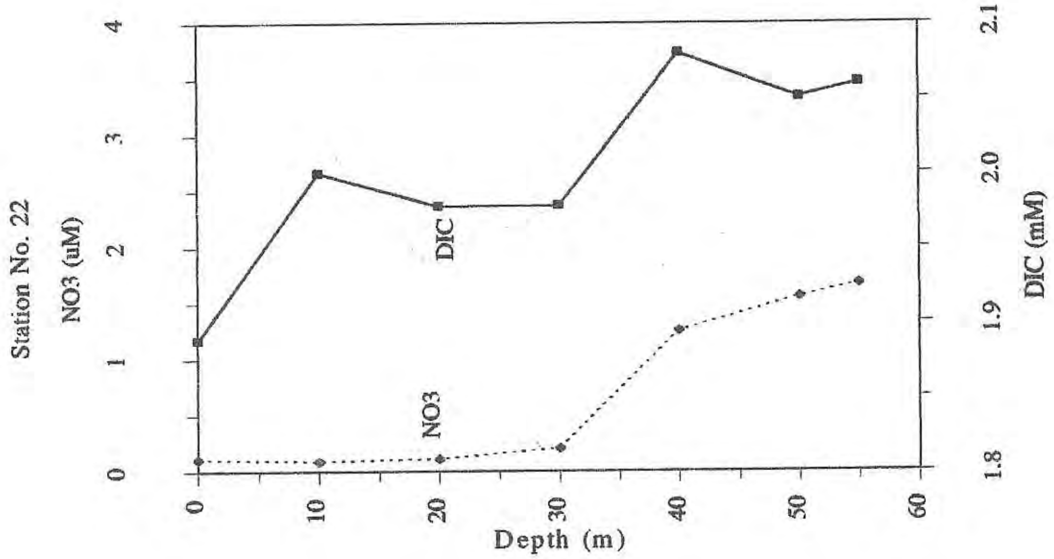
Station No. 19
NO3 (uM)
0
1
2
3
4
DIC
NO3
0
10
20
30
40
50
60
Depth (m)
1.9
2.0
2.1
DIC (mM)

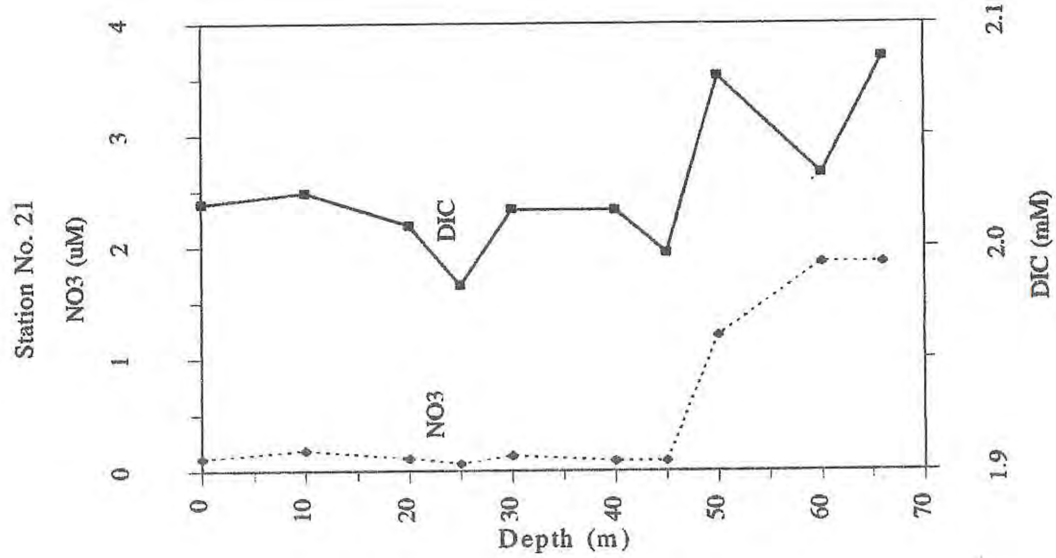


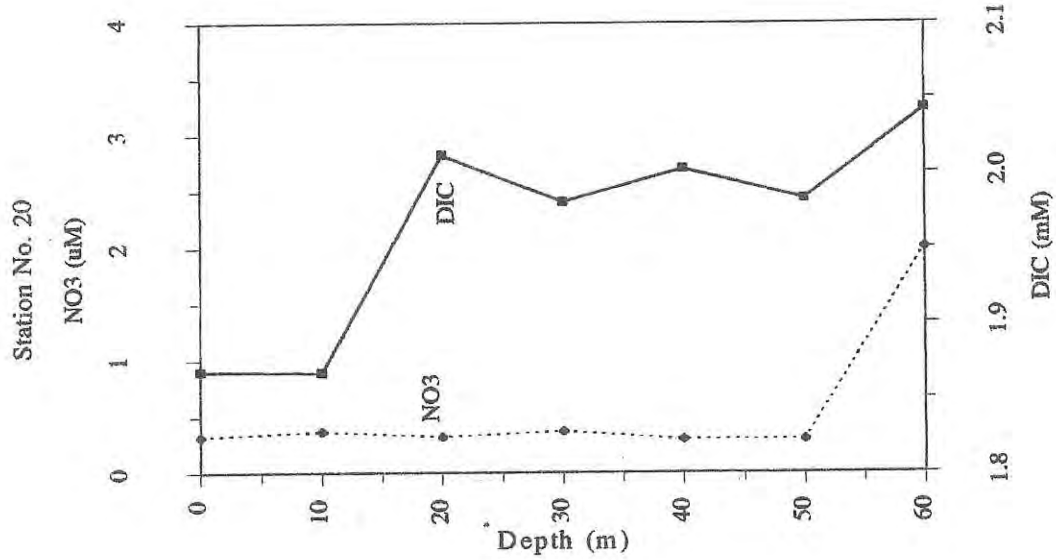
Station No. 18
NO3 (uM)
0
1
2
3
4
DIC
NO3
0
10
20
30
40
50
60
Depth (m)
1.8
1.9
2.0
2.1
DIC (mM)

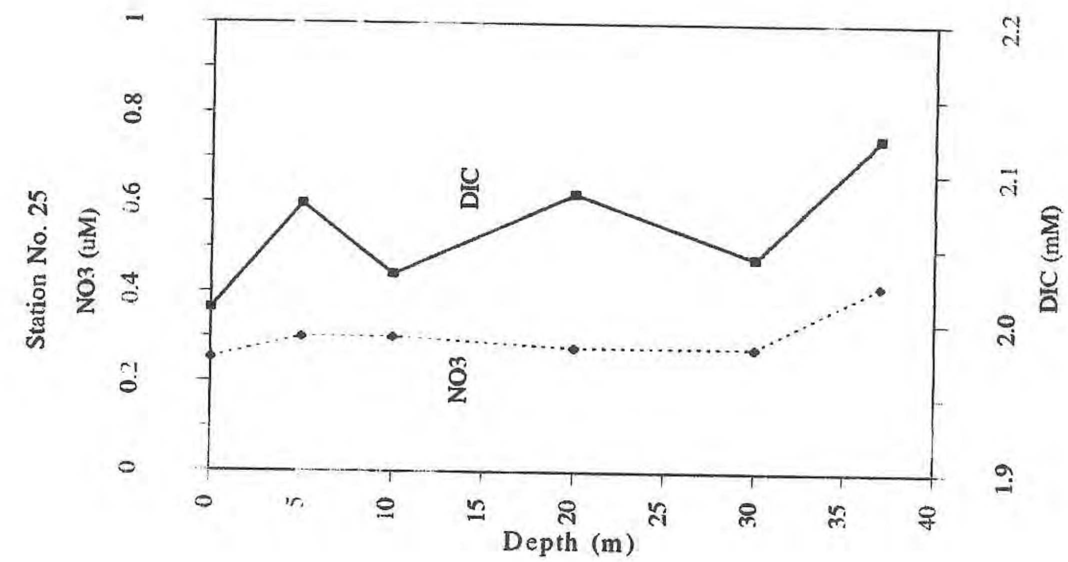


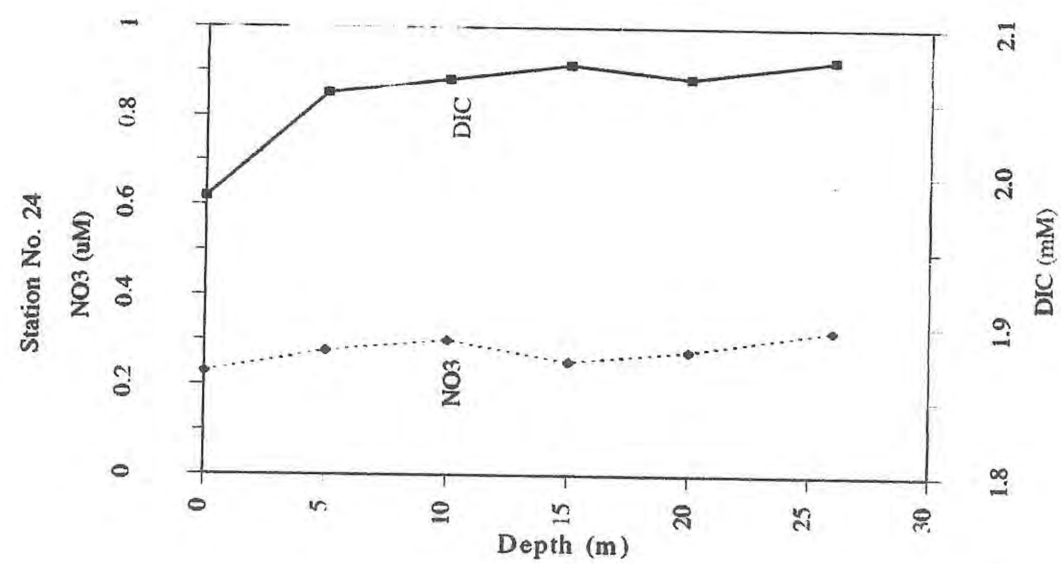
Station No. 17
NO3 (uM)
0
1
2
3
4
DIC
NO3
0
10
20
30
40
Depth (m)
1.9
2.0
2.1
DIC (mM)

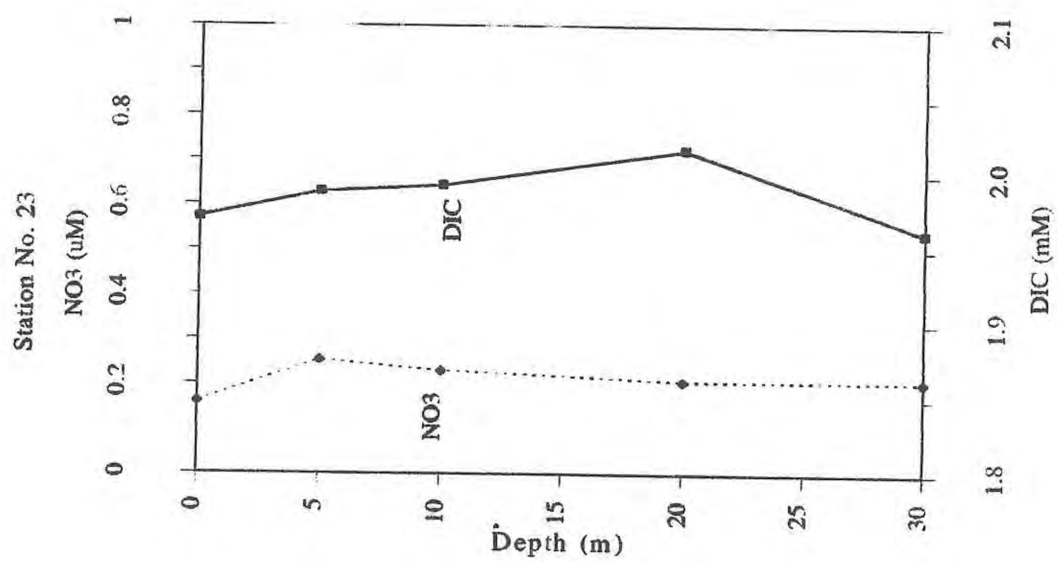

Station No. 22
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

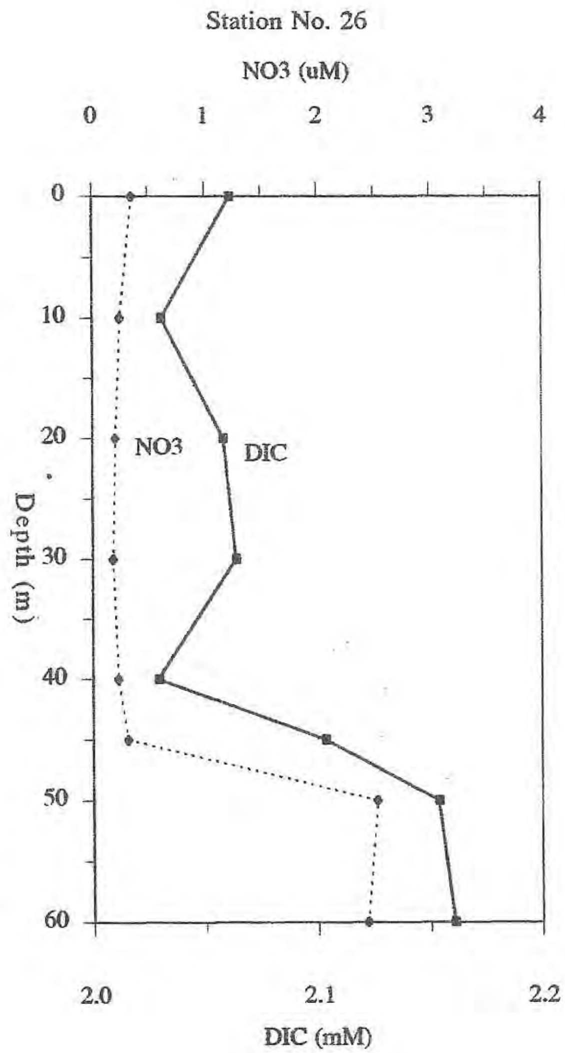

Station No. 21
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

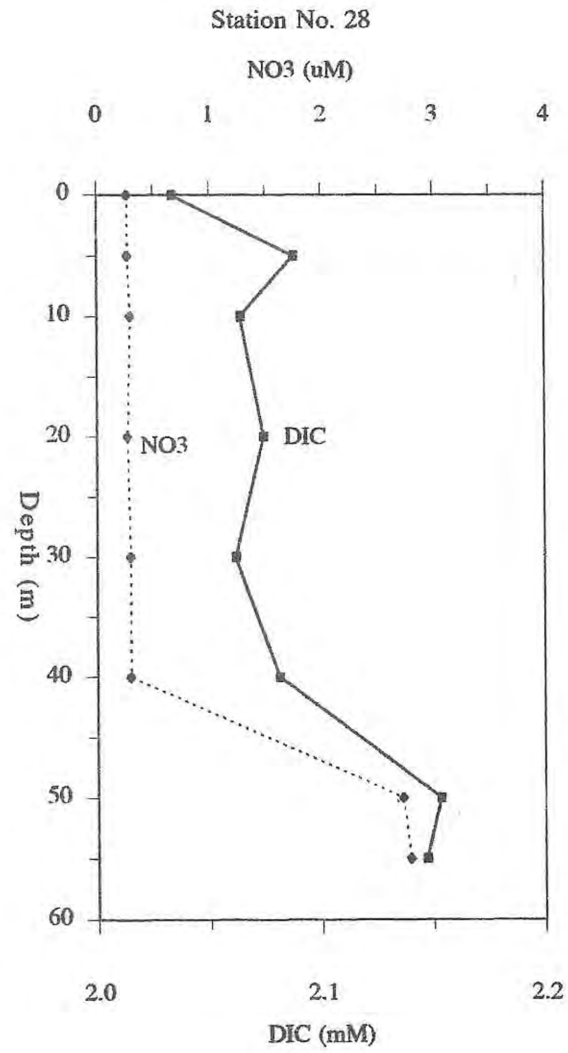

Station No. 20
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

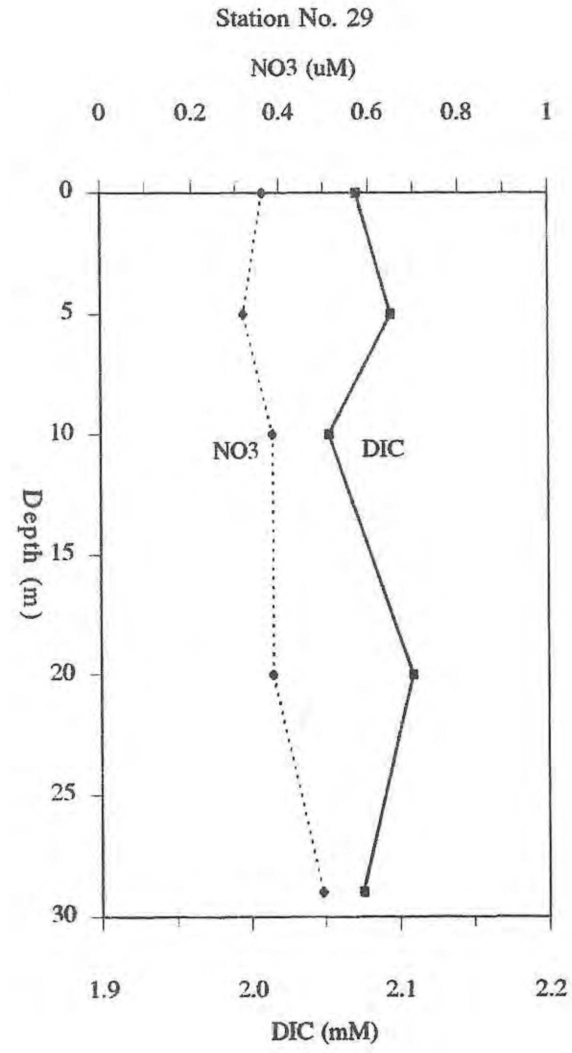

Station No. 25
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

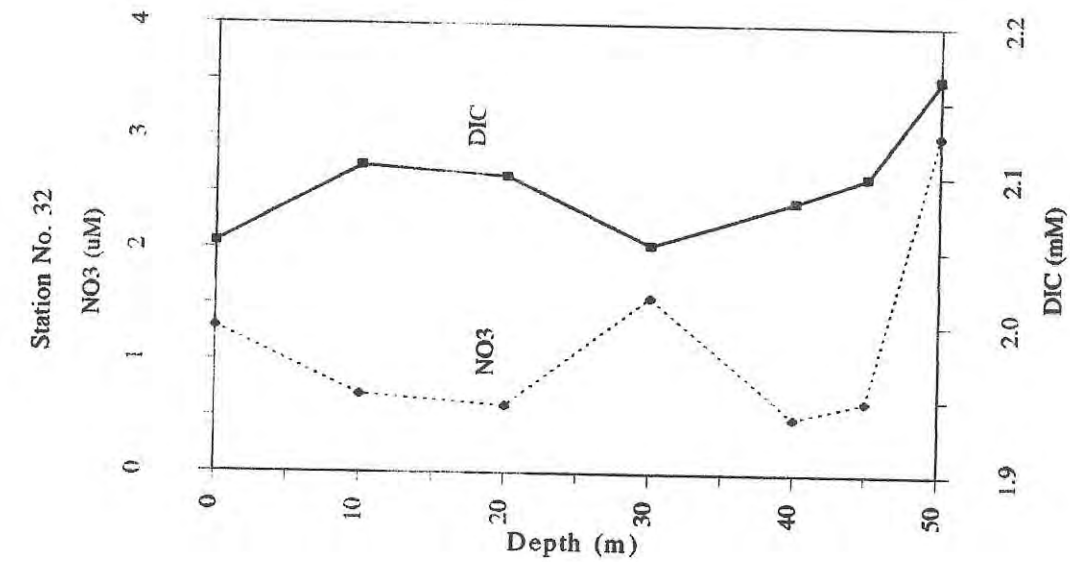

Station No. 24
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

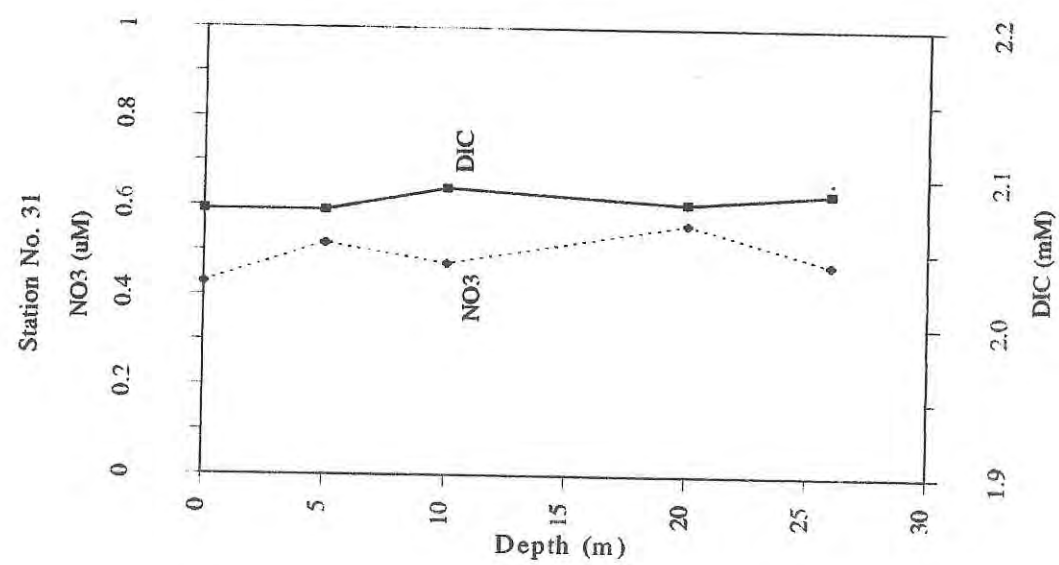

Station No. 23
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

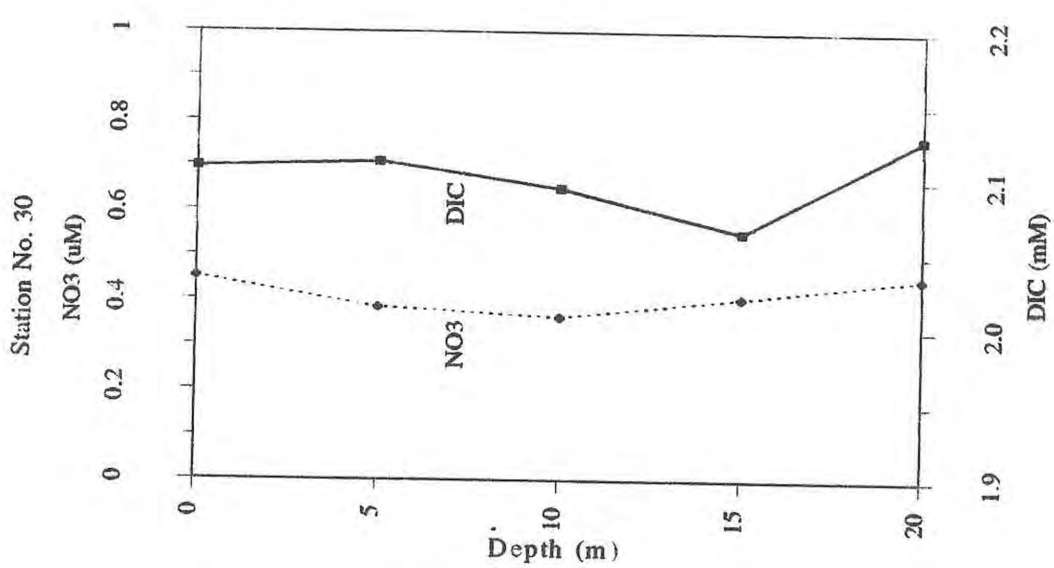

Station No. 26
NO3 (uM)
0
1
2
3
4
Depth (m)
0
10
20
30
40
50
60
NO3
DIC
2.0
2.1
2.2
DIC (mM)

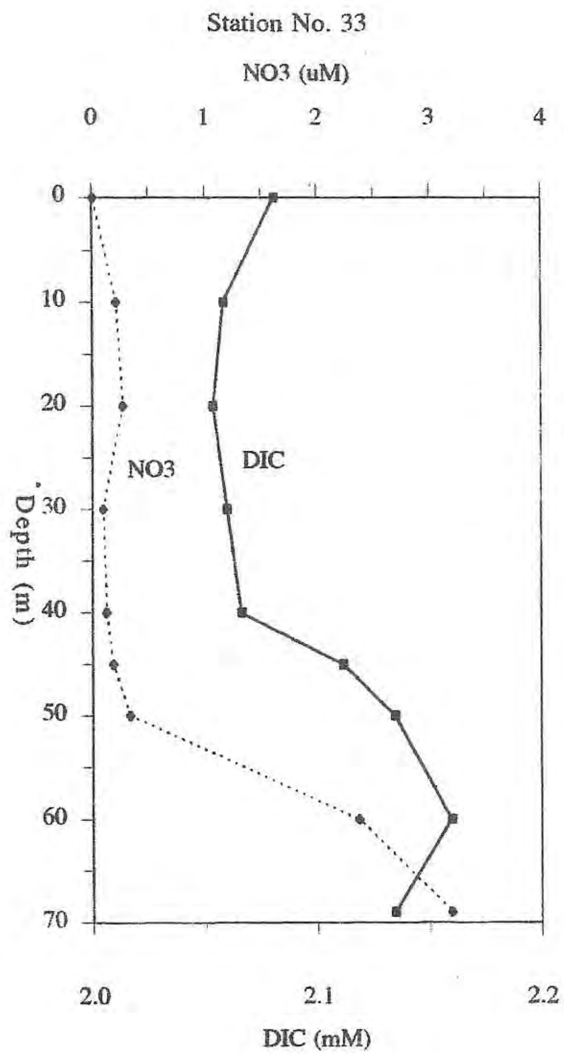

Station No. 28
NO3 (uM)
0
1
2
3
4
Depth (m)
0
10
20
30
40
50
60
NO3
DIC
2.0
2.1
2.2
DIC (mM)

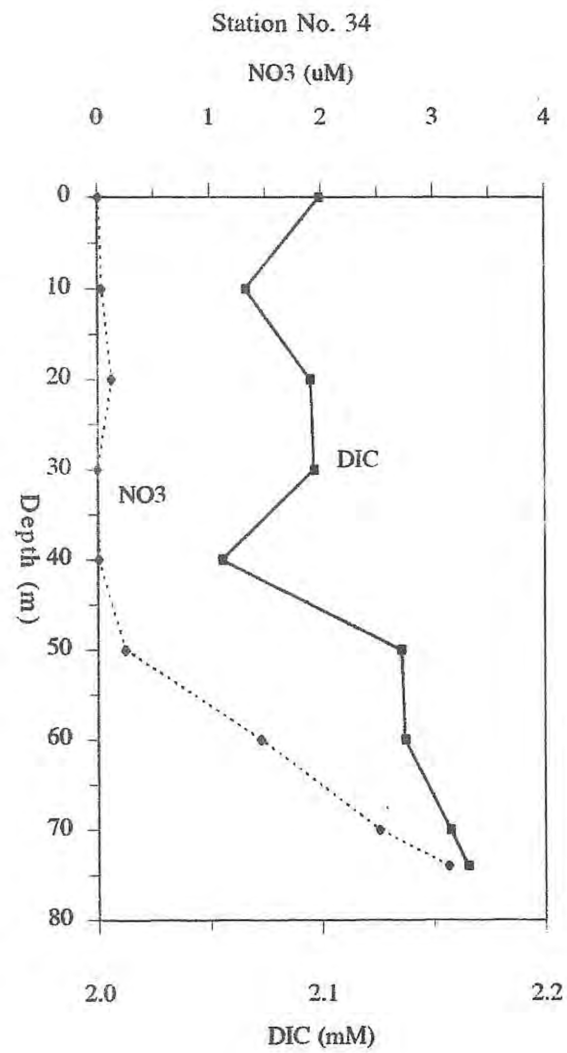

Station No. 29
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
Depth (m)
0
5
10
15
20
25
30
NO3
DIC
1.9
2.0
2.1
2.2
DIC (mM)

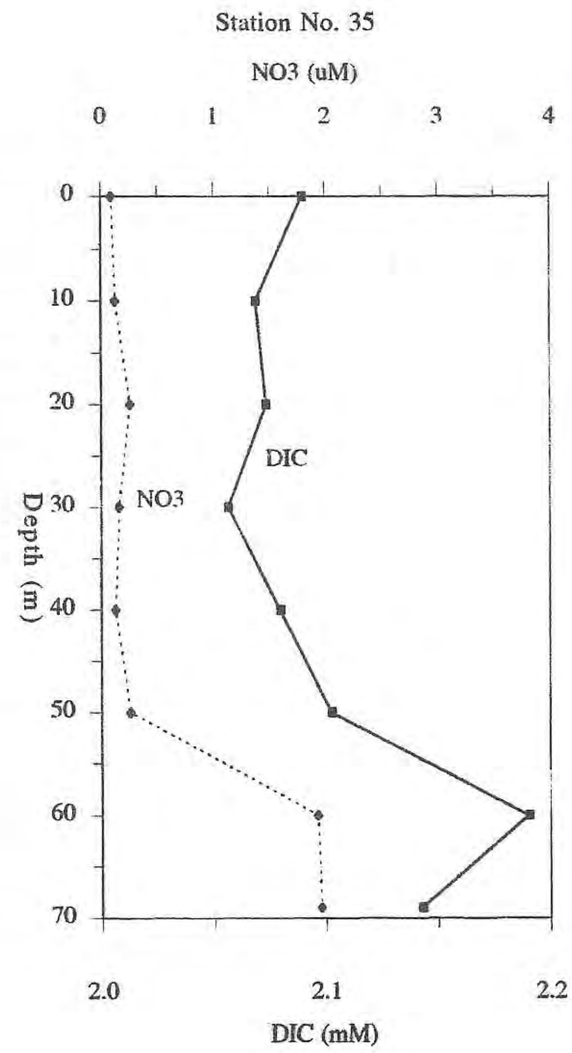

Station No. 32
NO3 (uM)
DIC
NO3
Depth (m)
DIC (mM)
0
1
2
3
4
0
10
20
30
40
50
1.9
2.0
2.1
2.2

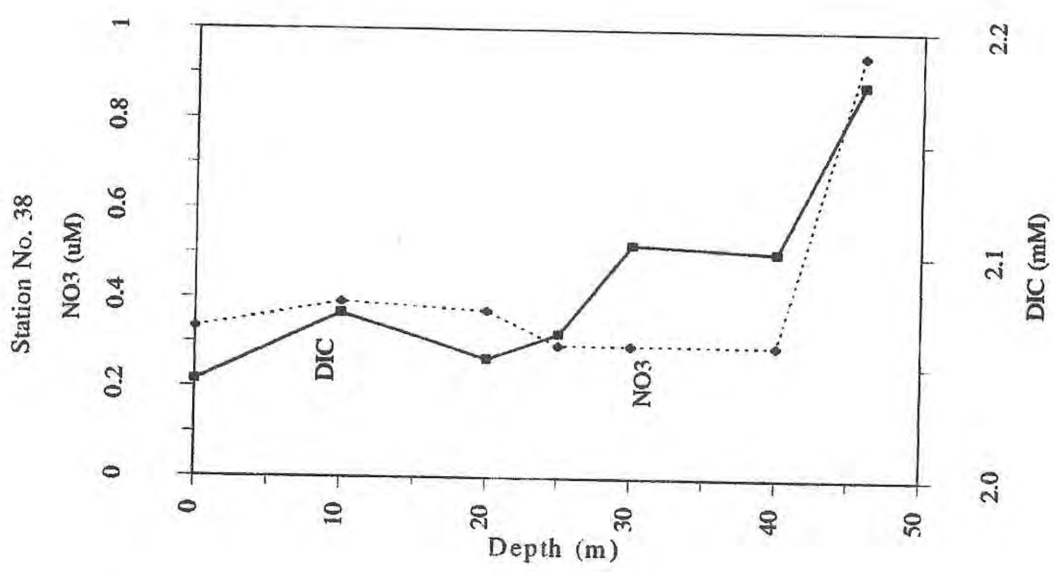

Station No. 31
NO3 (uM)
DIC
NO3
Depth (m)
DIC (mM)
0
0.2
0.4
0.6
0.8
1
0
5
10
15
20
25
30
1.9
2.0
2.1
2.2


Station No. 30
NO3 (uM)
DIC
NO3
Depth (m)
DIC (mM)
0
0.2
0.4
0.6
0.8
1
0
5
10
15
20
1.9
2.0
2.1
2.2

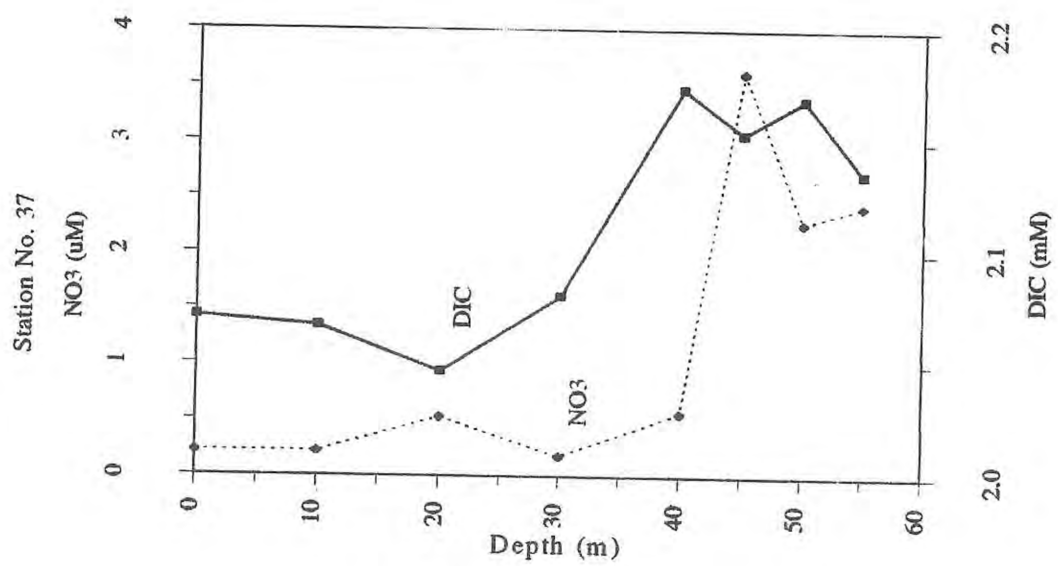

Station No. 33
NO3 (uM)
0 1 2 3 4
Depth (m)
0 10 20 30 40 50 60 70
NO3
DIC
2.0 2.1 2.2
DIC (mM)


Station No. 34
NO3 (uM)
0 1 2 3 4
Depth (m)
0 10 20 30 40 50 60 70 80
NO3
DIC
2.0 2.1 2.2
DIC (mM)

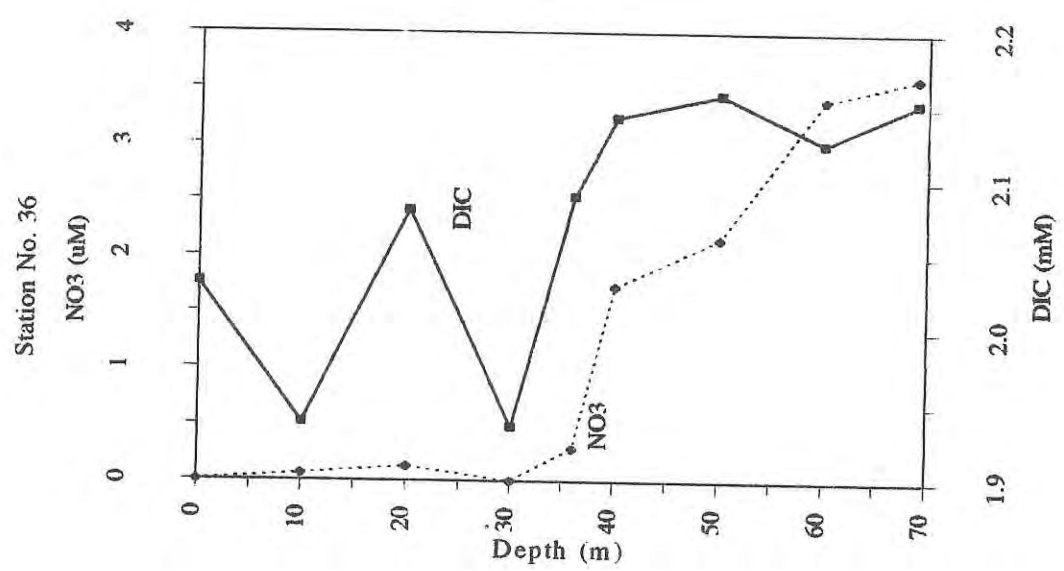

Station No. 35
NO3 (uM)
0 1 2 3 4
Depth (m)
0 10 20 30 40 50 60 70
NO3
DIC
2.0 2.1 2.2
DIC (mM)



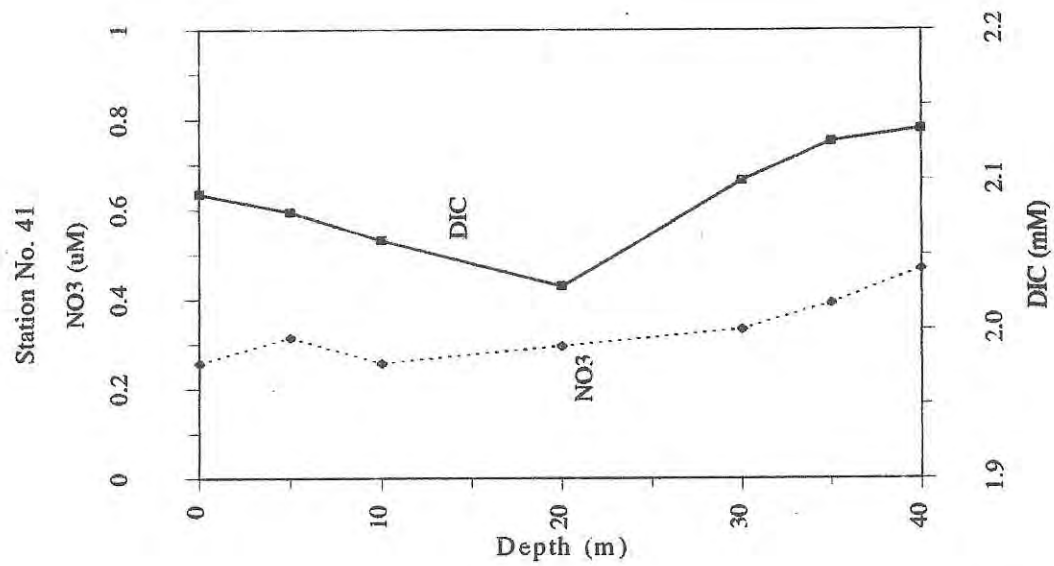
Station No. 38
NO3 (uM)
0 0.2 0.4 0.6 0.8 1
DIC
NO3
0 10 20 30 40 50
Depth (m)
2.0 2.1 2.2
DIC (mM)

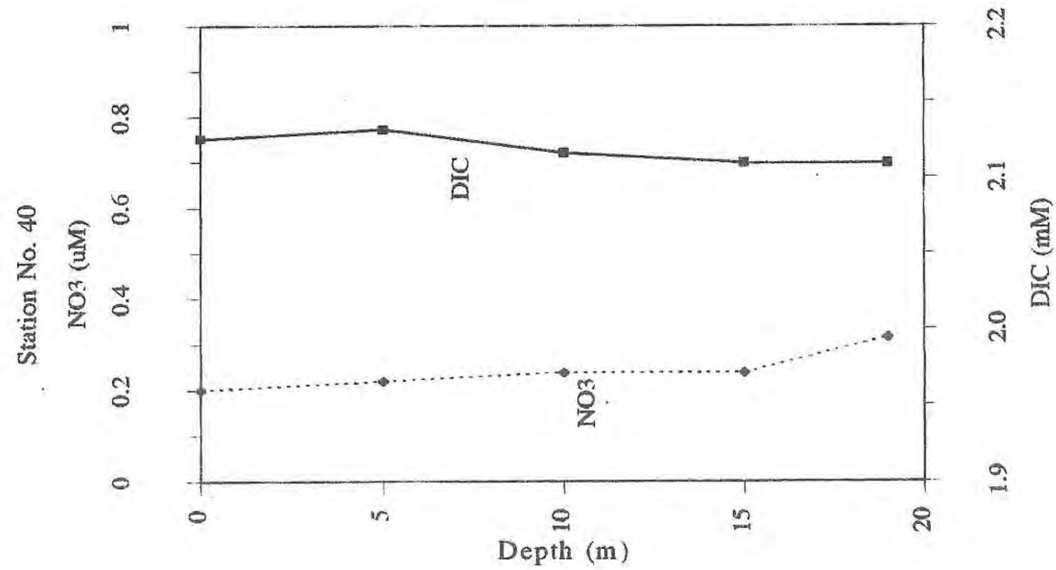


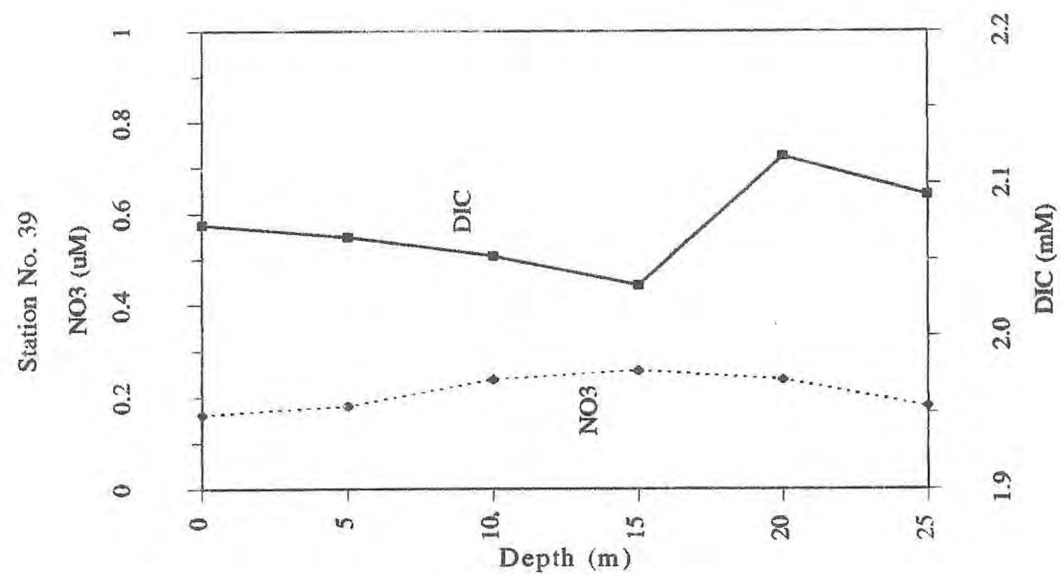
Station No. 37
NO3 (uM)
0 1 2 3 4
DIC
NO3
0 10 20 30 40 50 60
Depth (m)
2.0 2.1 2.2
DIC (mM)

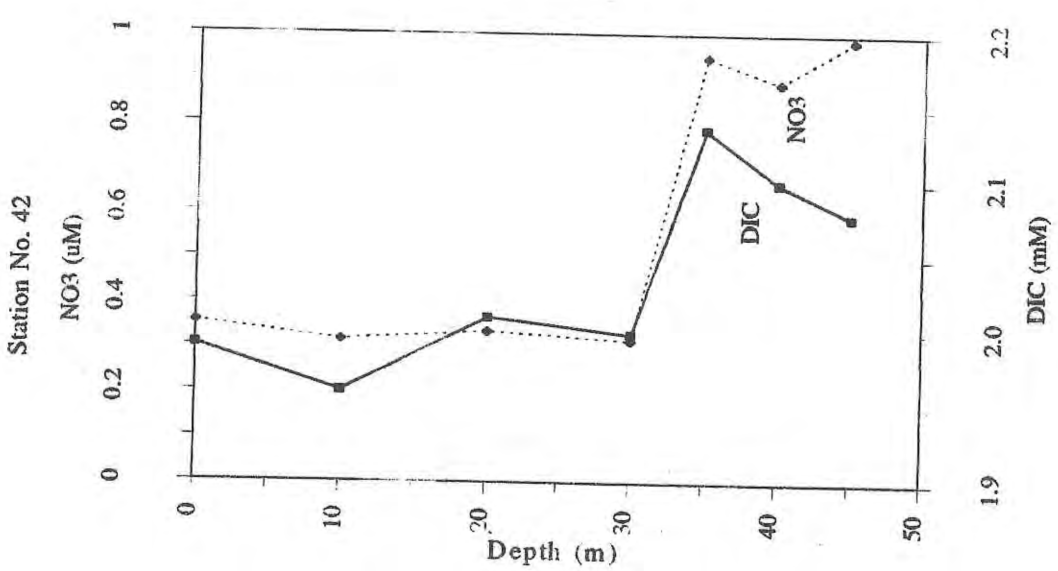


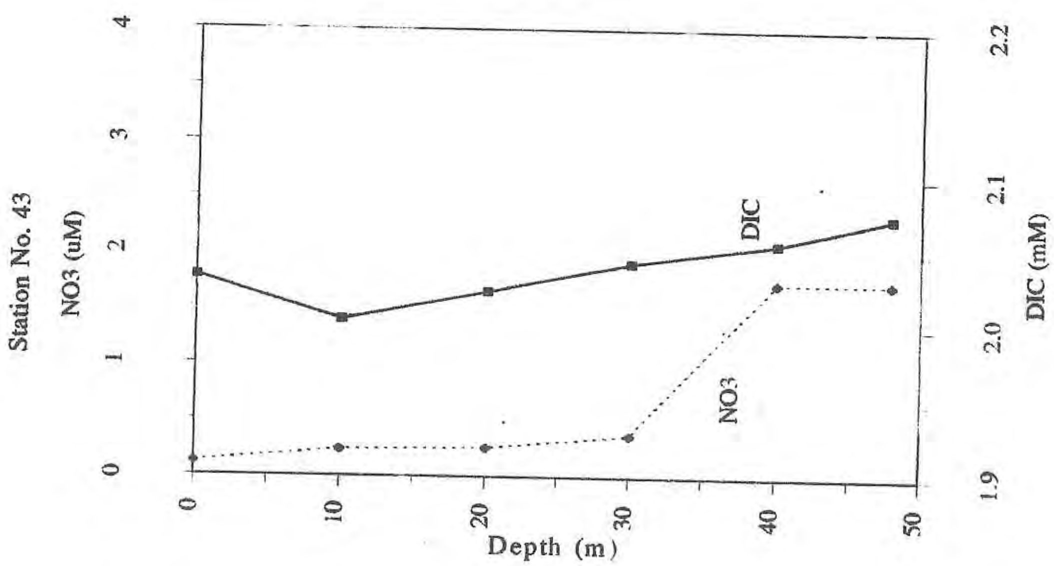
Station No. 36
NO3 (uM)
0 1 2 3 4
DIC
NO3
0 10 20 30 40 50 60 70
Depth (m)
1.9 2.0 2.1 2.2
DIC (mM)

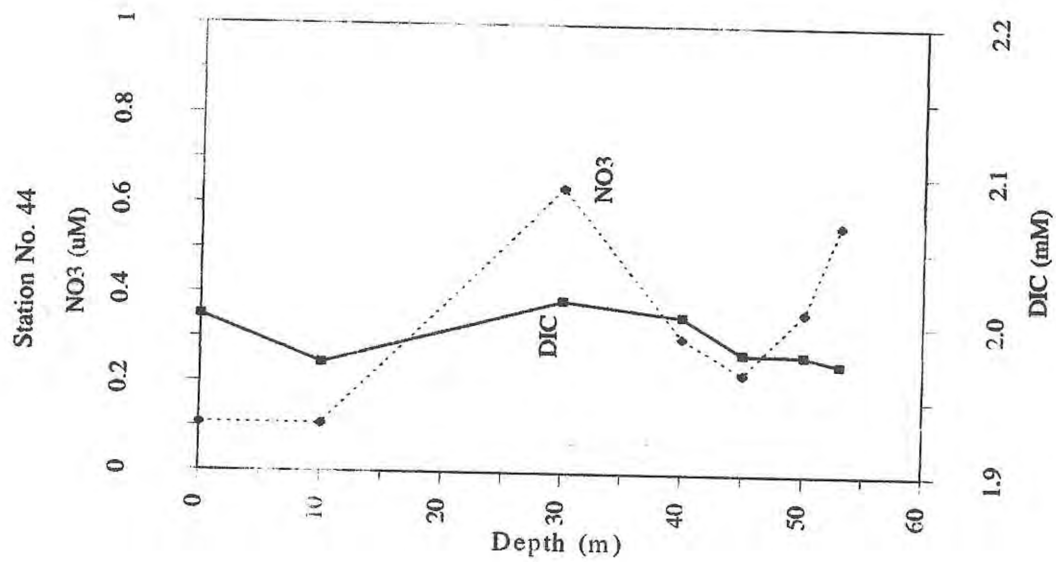

Station No. 41
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3
0
0.2
0.4
0.6
0.8
1
1.9
2.0
2.1
2.2
0
10
20
30
40

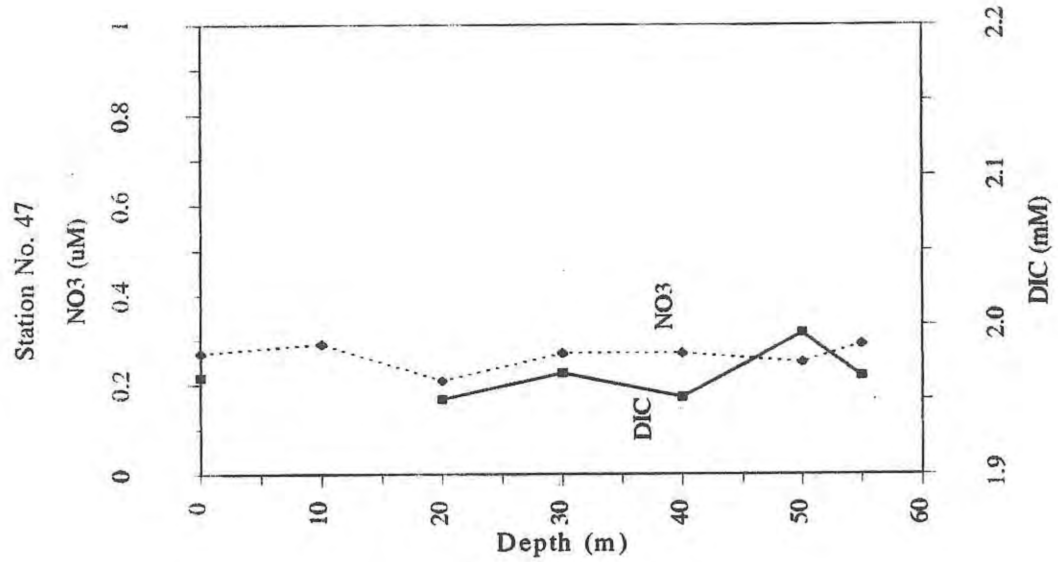

Station No. 40
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3
0
0.2
0.4
0.6
0.8
1
1.9
2.0
2.1
2.2
0
5
10
15
20

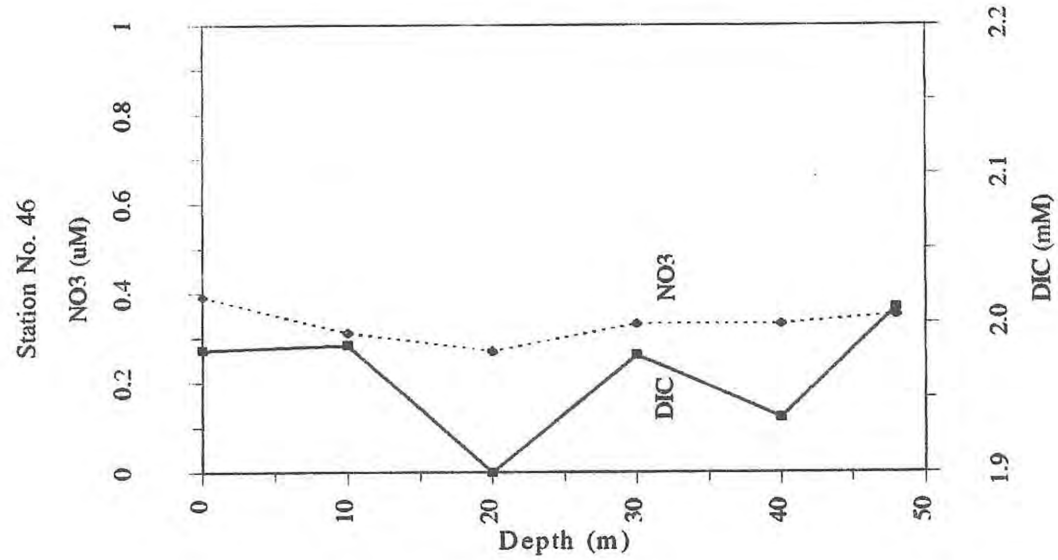

Station No. 39
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3
0
0.2
0.4
0.6
0.8
1
1.9
2.0
2.1
2.2
0
5
10
15
20
25

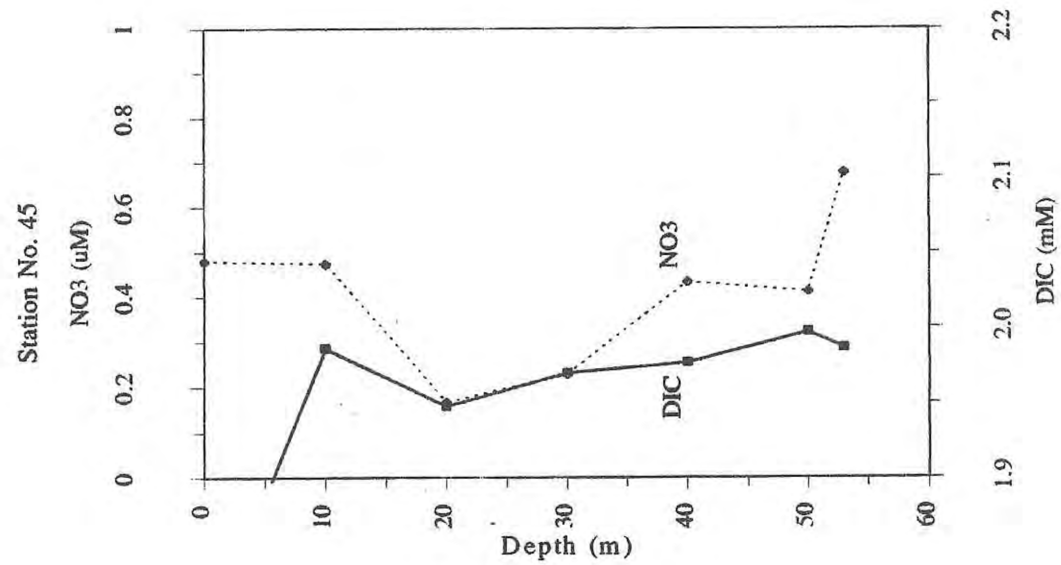

Station No. 42
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

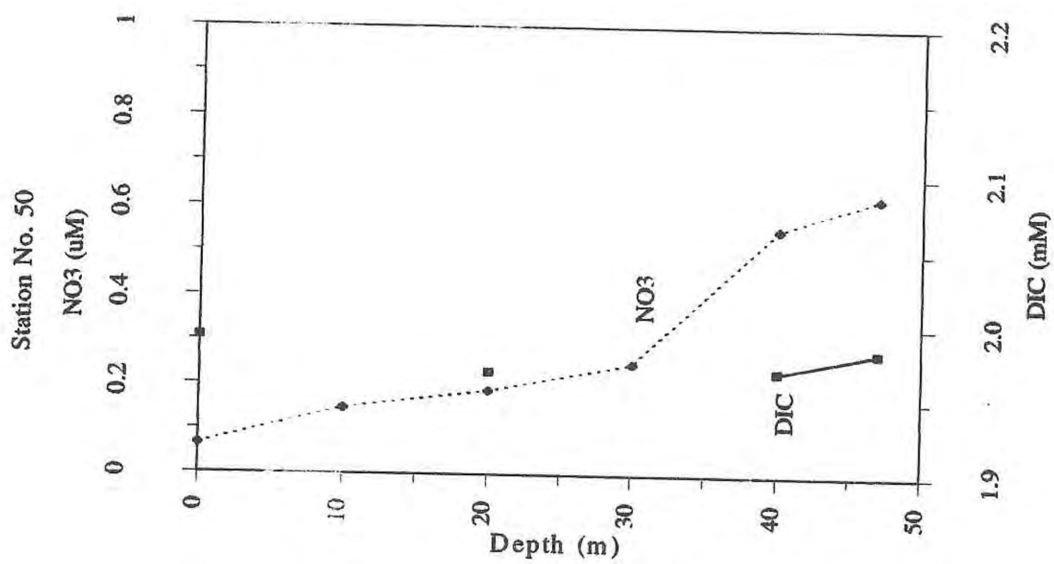

Station No. 43
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

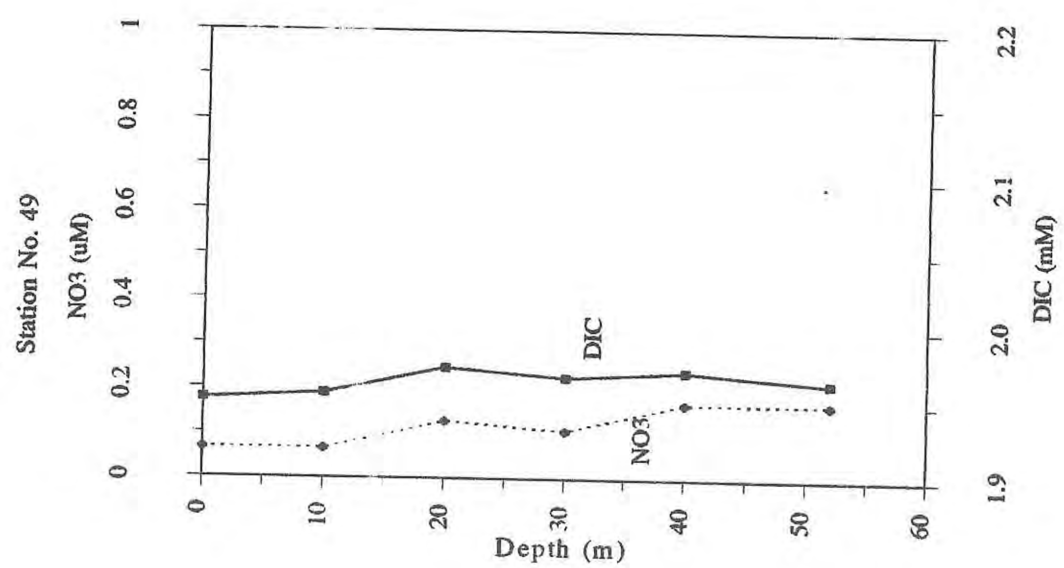

Station No. 44
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

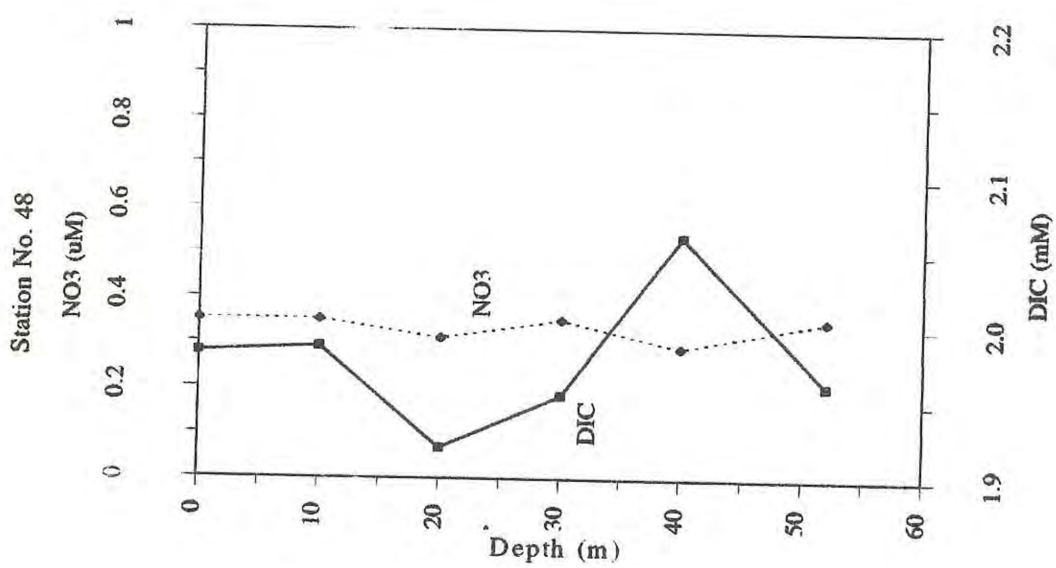

Station No. 47
NO3 (uM)
DIC (mM)
Depth (m)
NO3
DIC
0
0.2
0.4
0.6
0.8
1
1.9
2.0
2.1
2.2
0
10
20
30
40
50
60

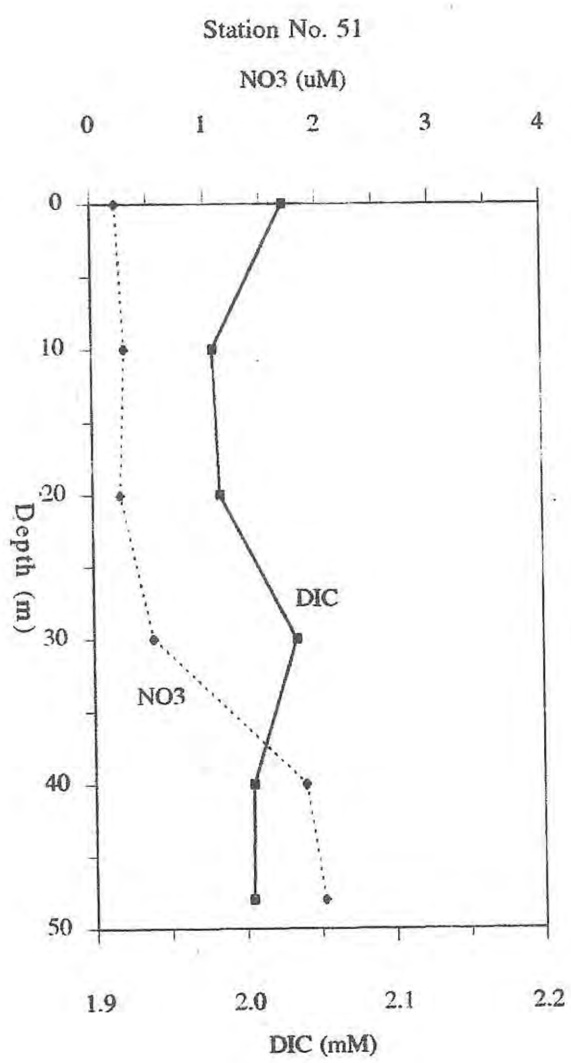

Station No. 46
NO3 (uM)
DIC (mM)
Depth (m)
NO3
DIC
0
0.2
0.4
0.6
0.8
1
1.9
2.0
2.1
2.2
0
10
20
30
40
50

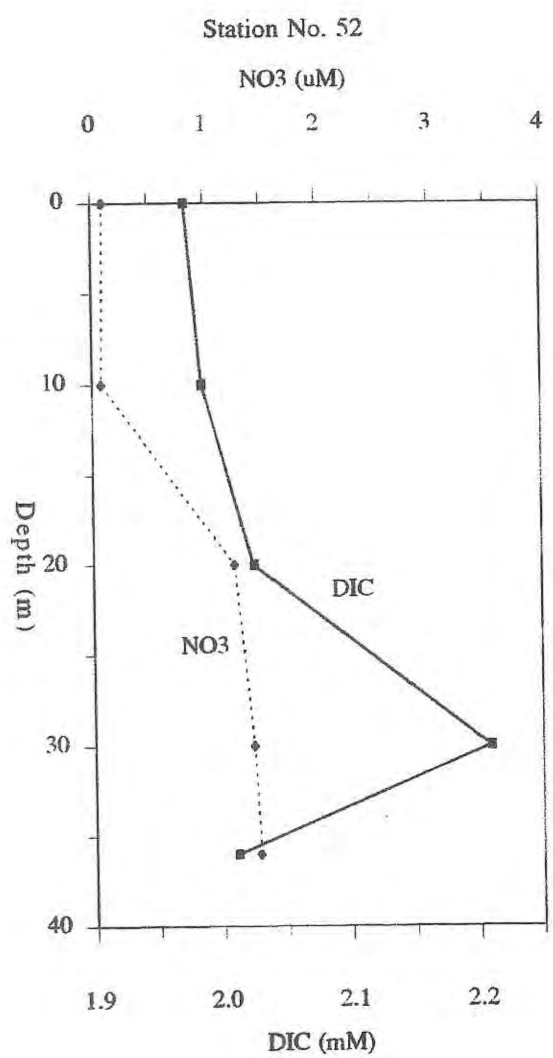

Station No. 45
NO3 (uM)
DIC (mM)
Depth (m)
NO3
DIC
0
0.2
0.4
0.6
0.8
1
1.9
2.0
2.1
2.2
0
10
20
30
40
50
60

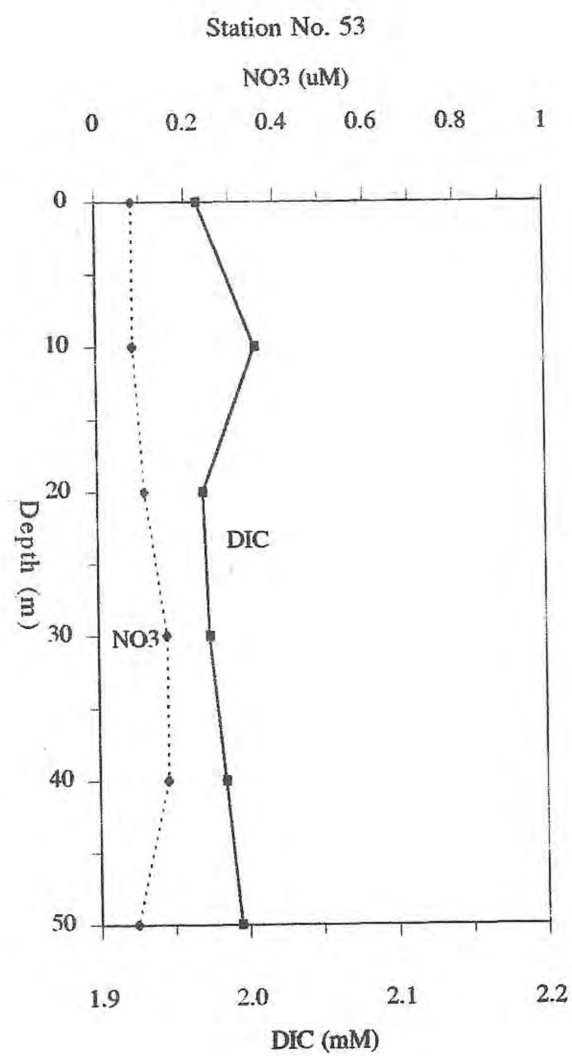

Station No. 50
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
NO3
DIC
0
10
20
30
40
50
Depth (m)
1.9
2.0
2.1
2.2
DIC (mM)

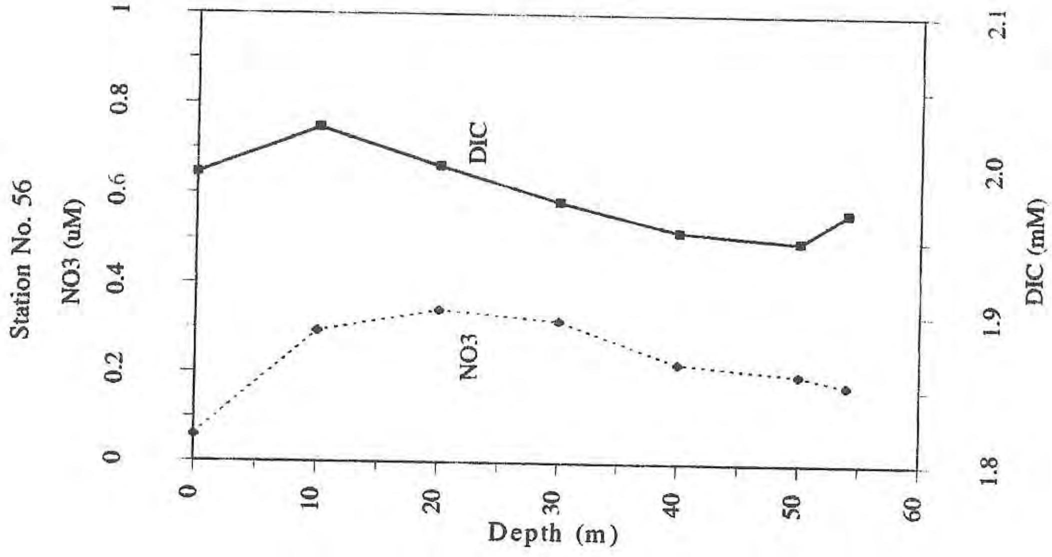

Station No. 49
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
DIC
NO3
0
10
20
30
40
50
60
Depth (m)
1.9
2.0
2.1
2.2
DIC (mM)

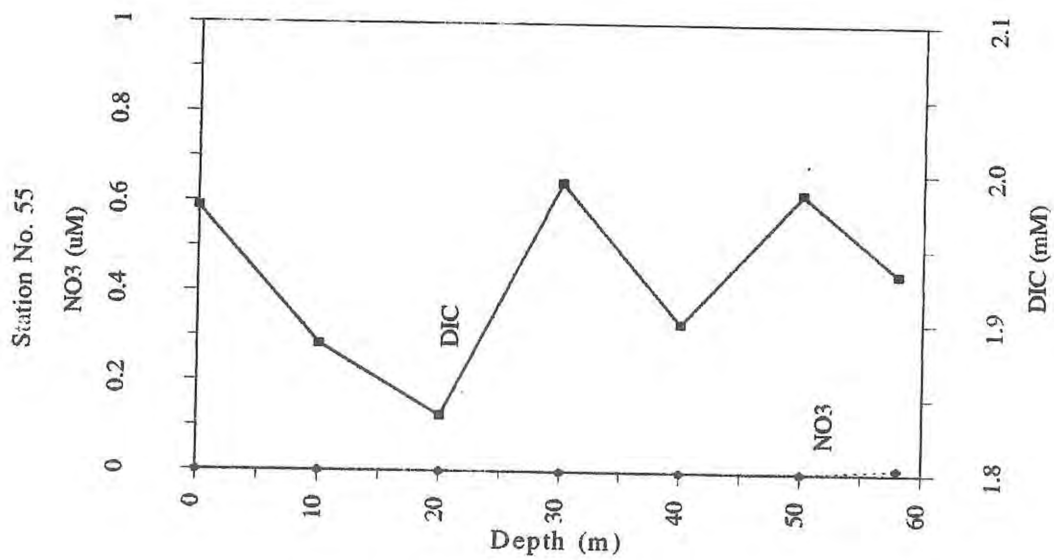

Station No. 48
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
NO3
DIC
0
10
20
30
40
50
60
Depth (m)
1.9
2.0
2.1
2.2
DIC (mM)

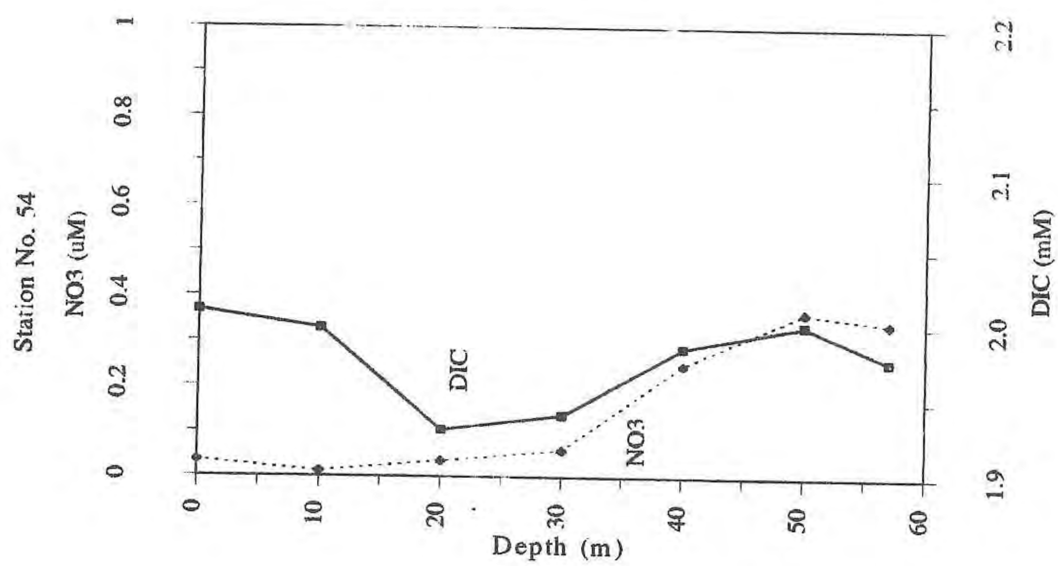

Station No. 51
NO3 (uM)
0
1
2
3
4
Depth (m)
0
10
20
30
40
50
DIC
NO3
1.9
2.0
2.1
2.2
DIC (mM)

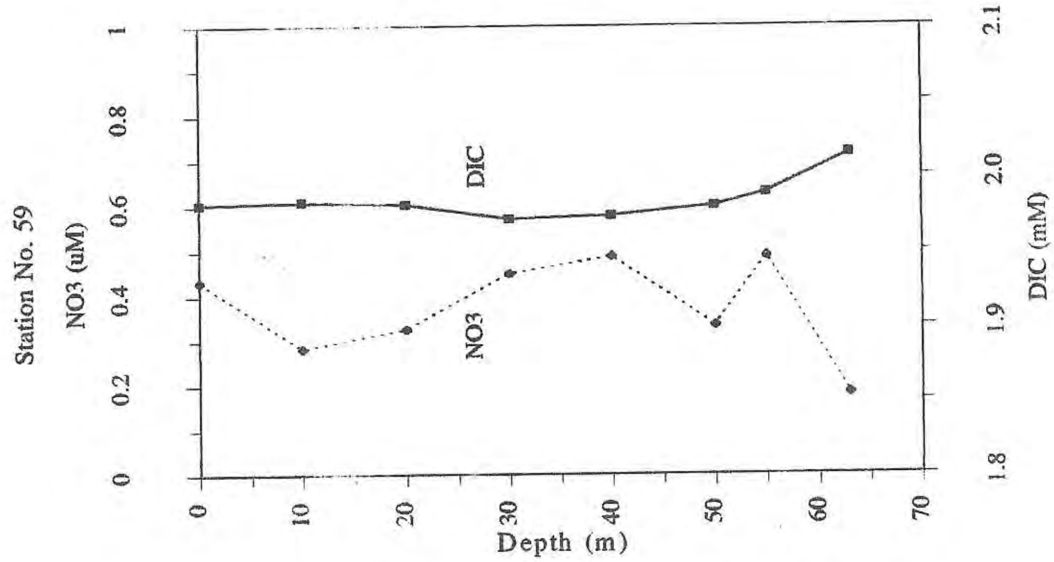

Station No. 52
NO3 (uM)
0
1
2
3
4
Depth (m)
0
10
20
30
40
DIC
NO3
1.9
2.0
2.1
2.2
DIC (mM)

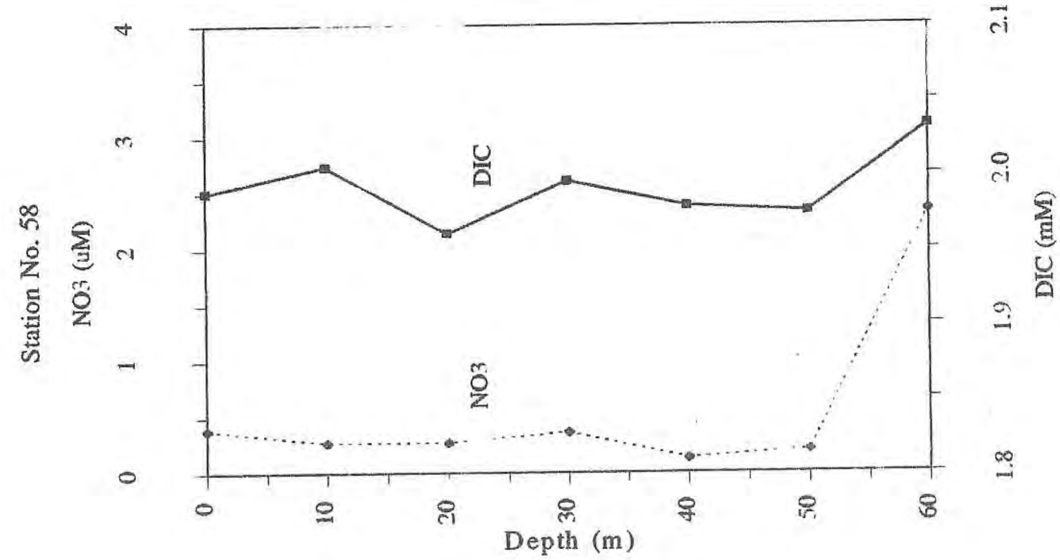

Station No. 53
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
Depth (m)
0
10
20
30
40
50
DIC
NO3
1.9
2.0
2.1
2.2
DIC (mM)

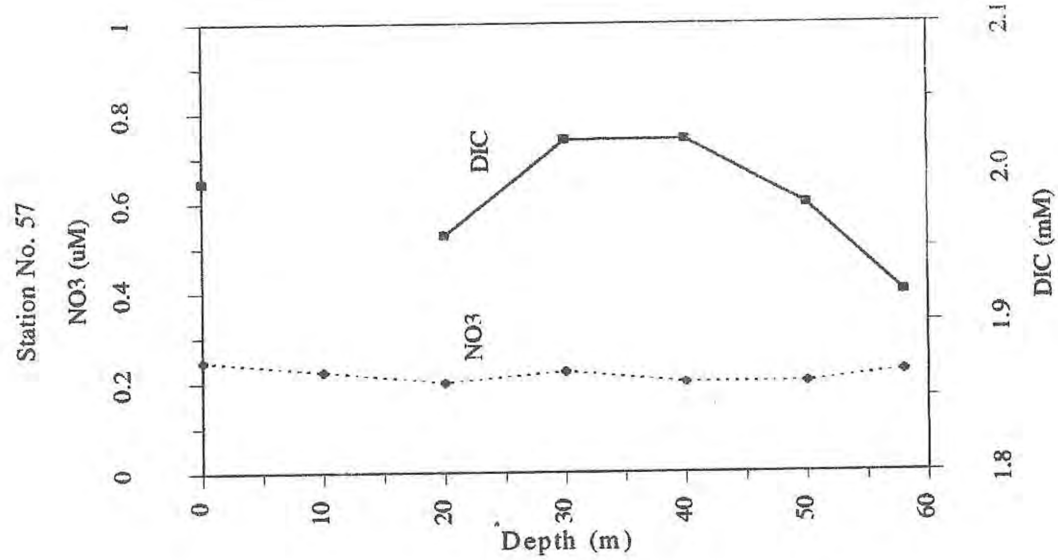

Station No. 56
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

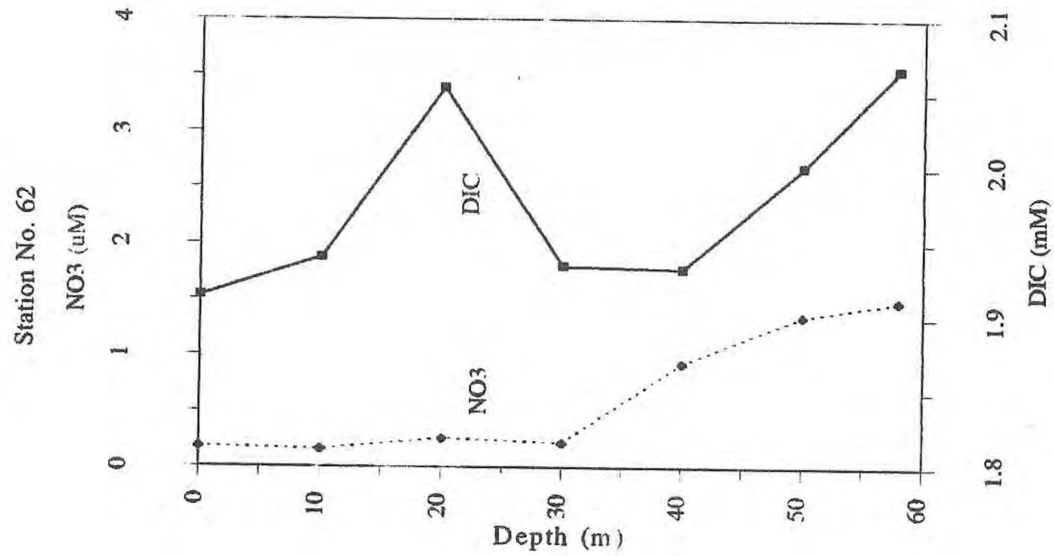

Station No. 55
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

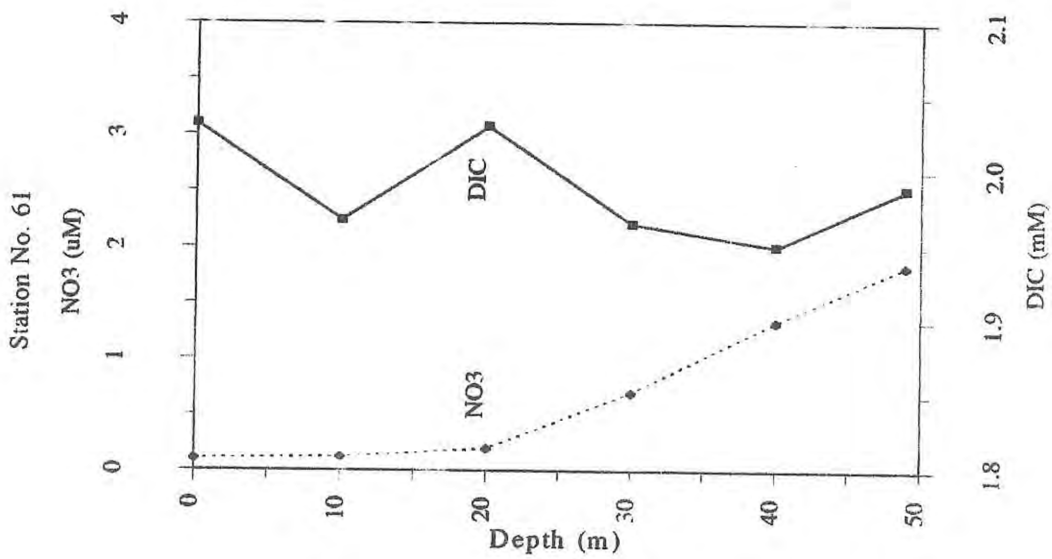

Station No. 54
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

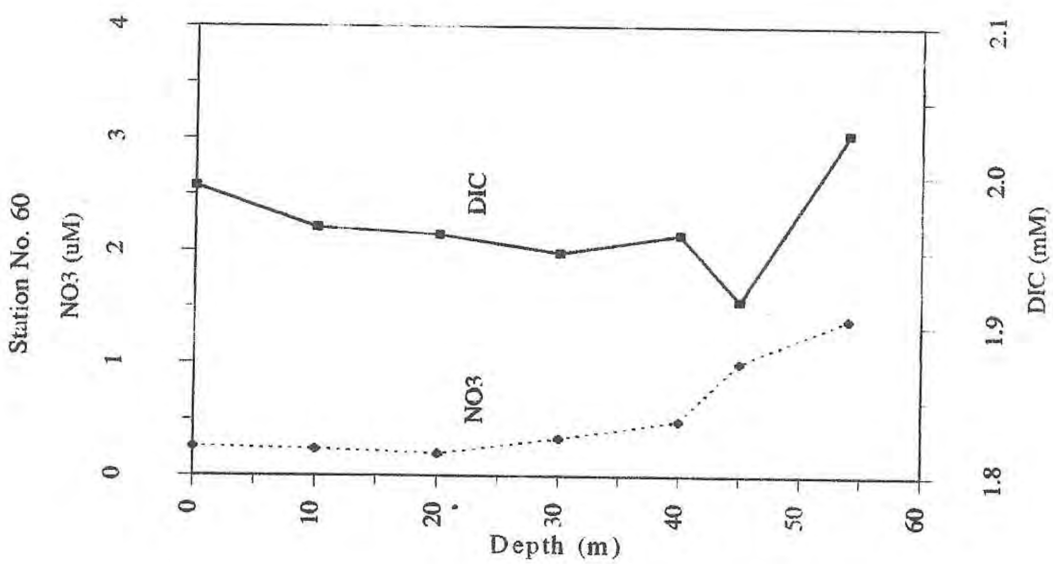

Station No. 59
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1
0
10
20
30
40
50
60
70

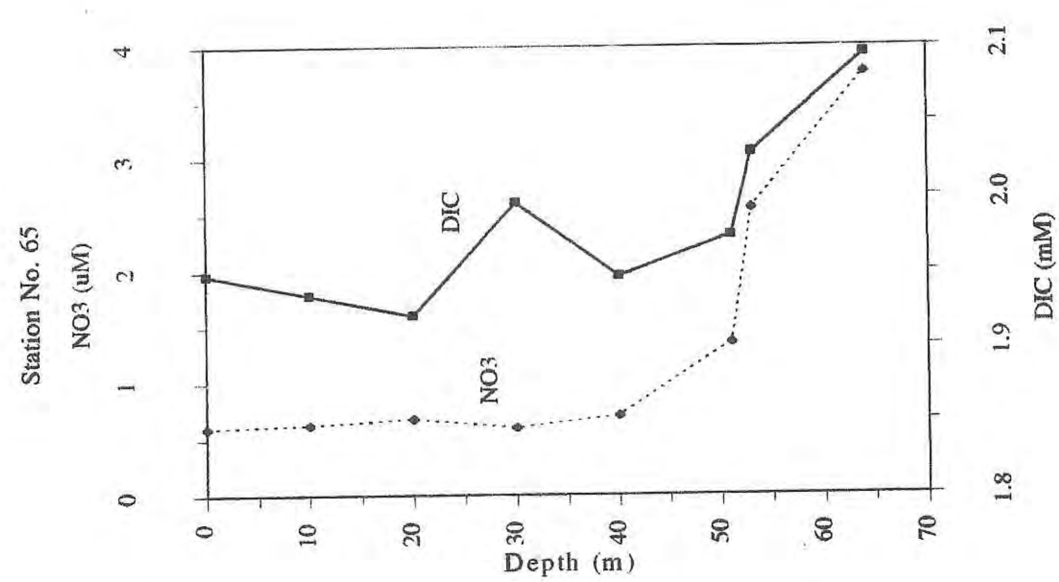

Station No. 58
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)
0
1
2
3
4
1.8
1.9
2.0
2.1
0
10
20
30
40
50
60

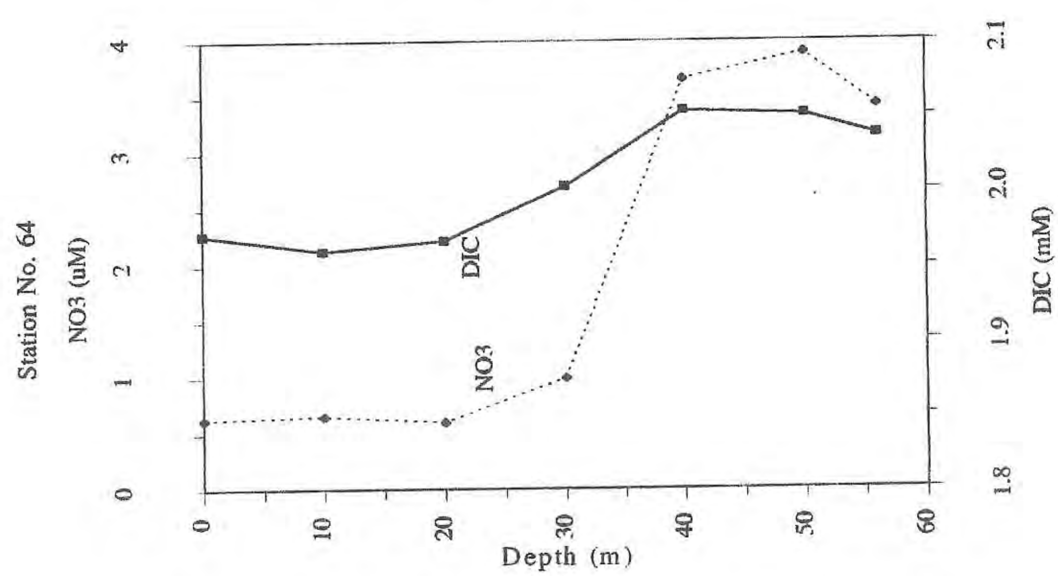

Station No. 57
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)
0
0.2
0.4
0.6
0.8
1
1.8
1.9
2.0
2.1
0
10
20
30
40
50
60

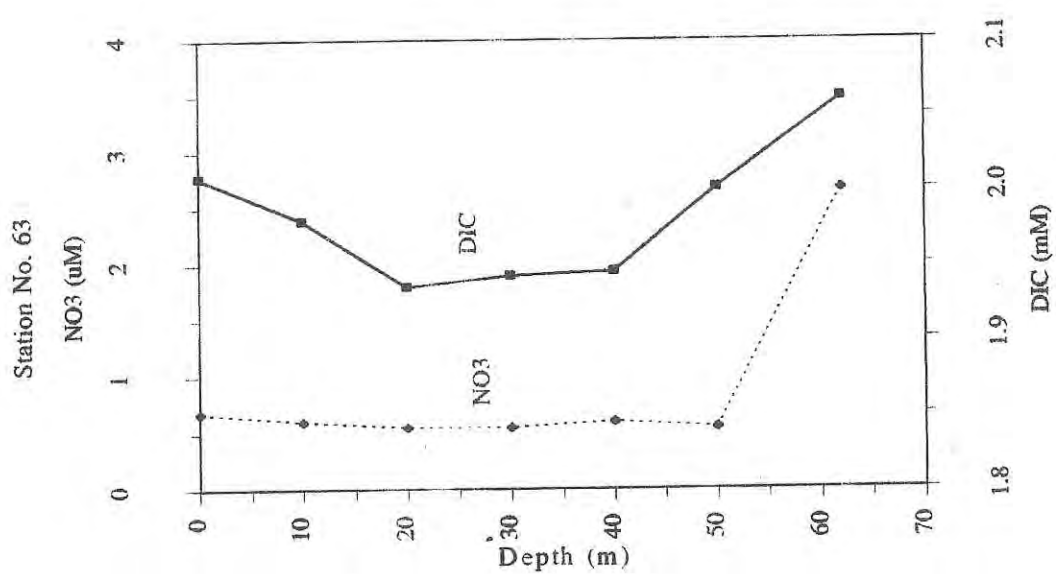

Station No. 62
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

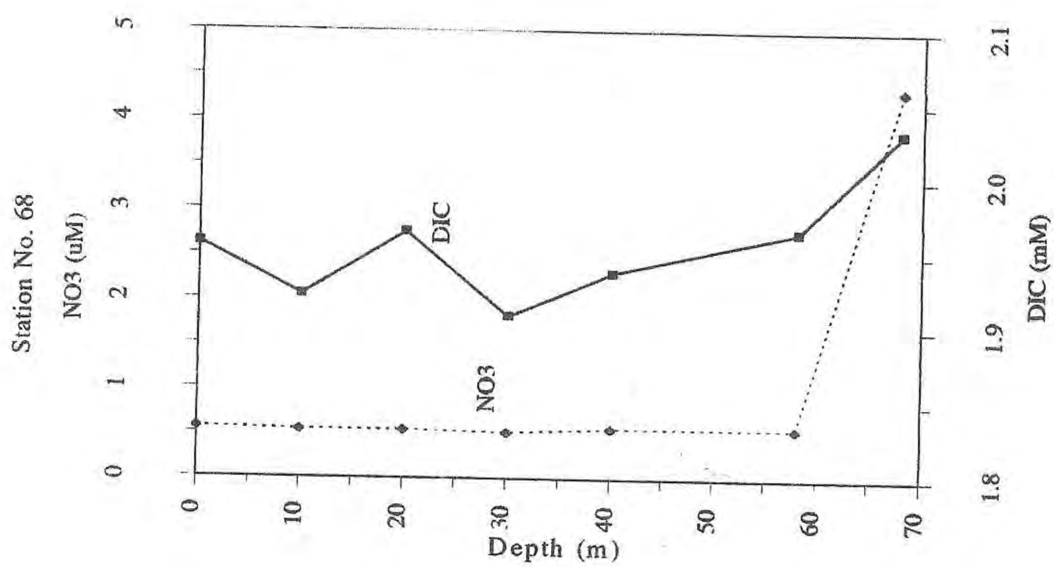

Station No. 61
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

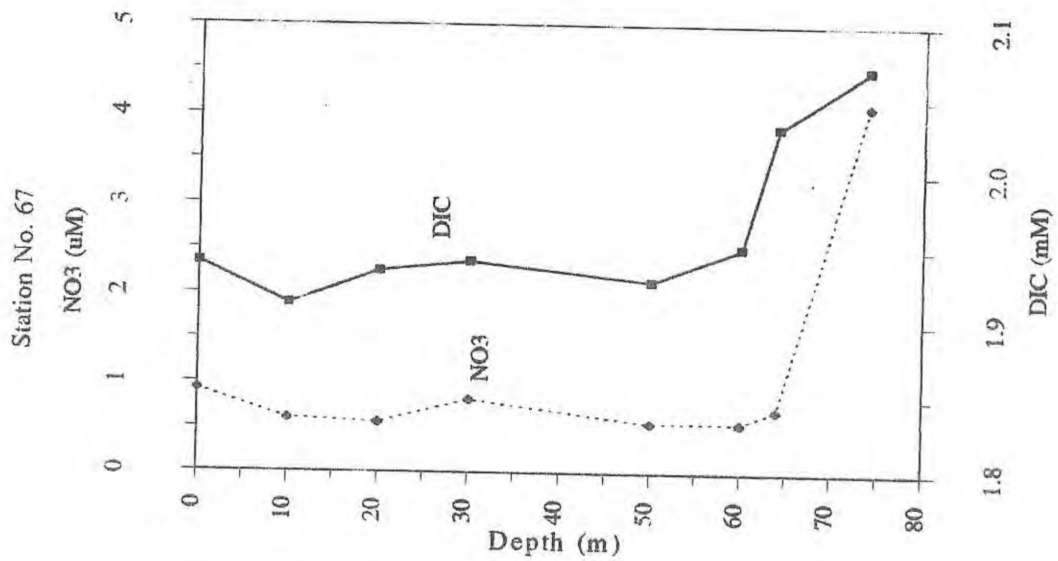

Station No. 60
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

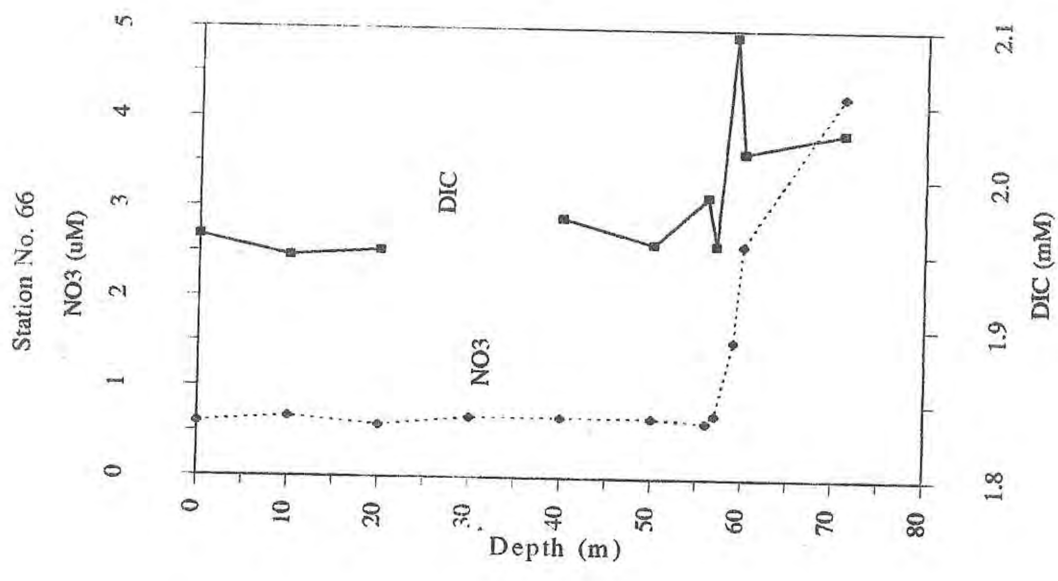

Station No. 65
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

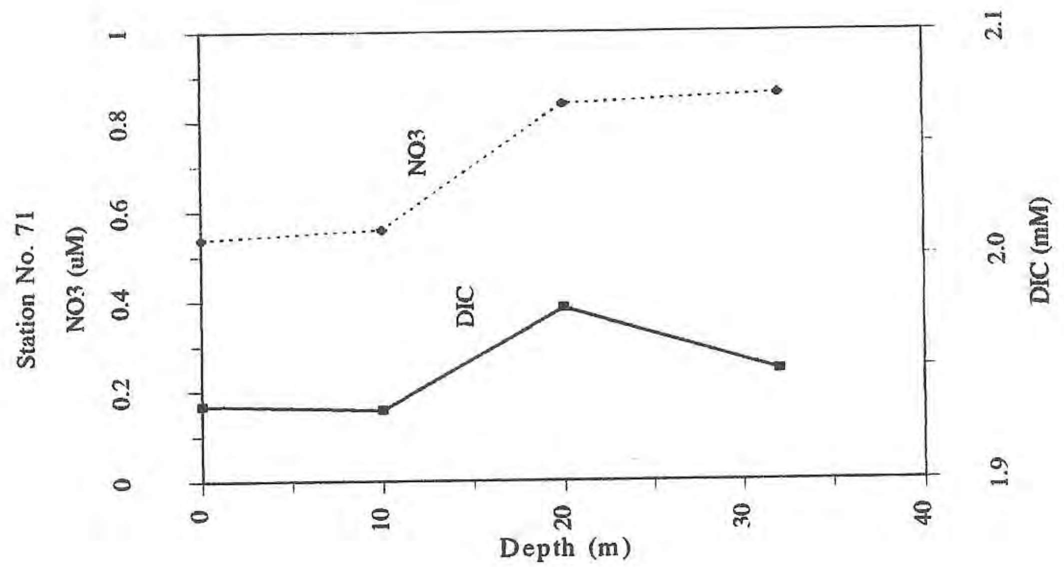

Station No. 64
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

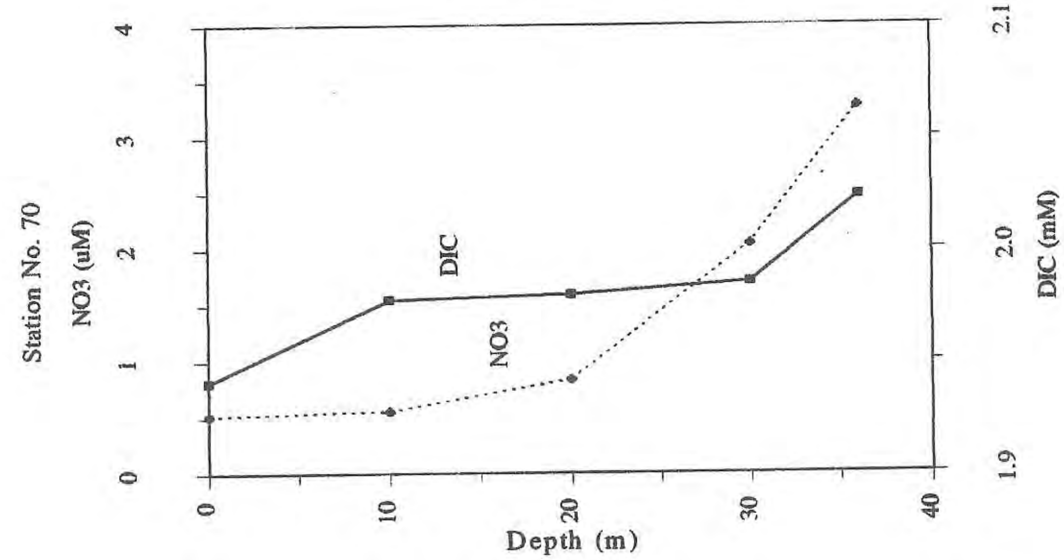

Station No. 63
NO3 (uM)
DIC (mM)
DIC
NO3
Depth (m)

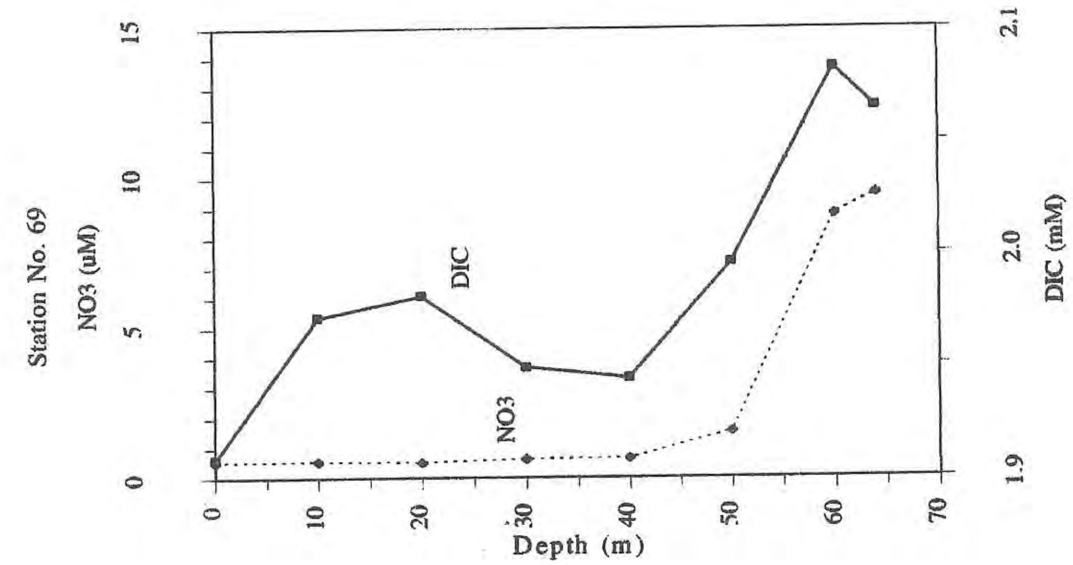

Station No. 68
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

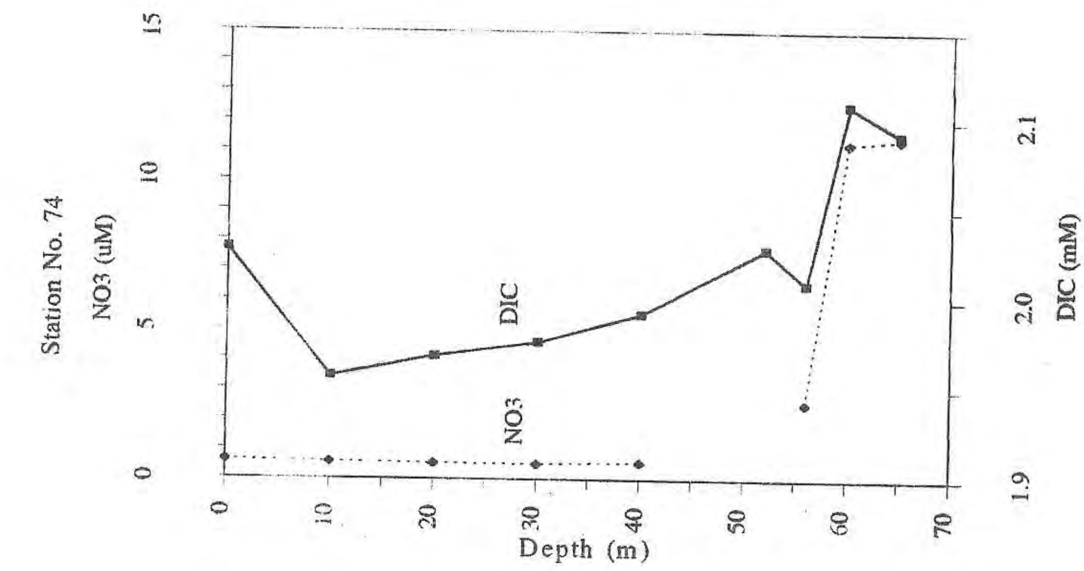

Station No. 67
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

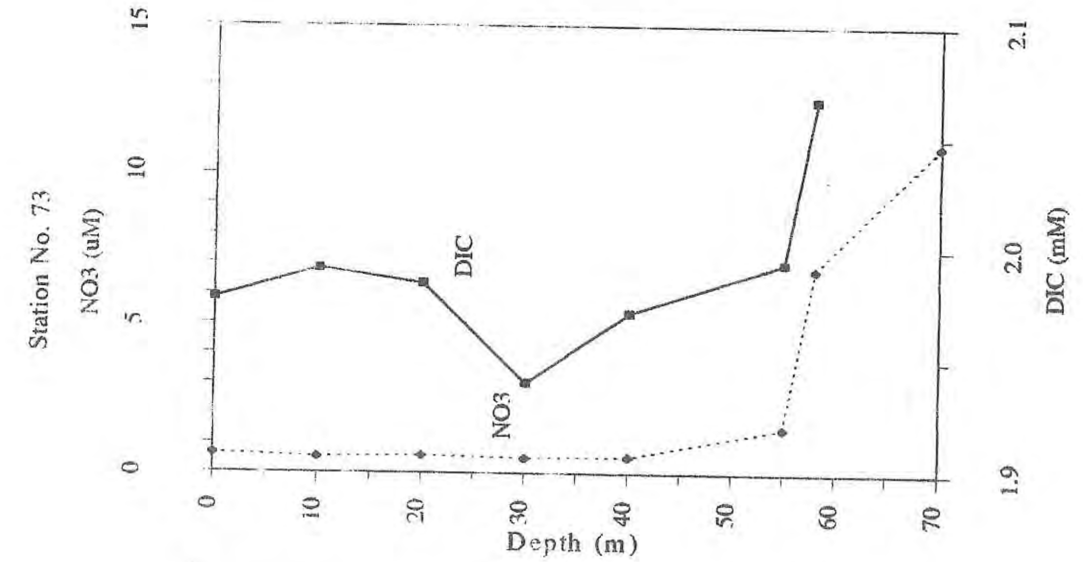

Station No. 66
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3

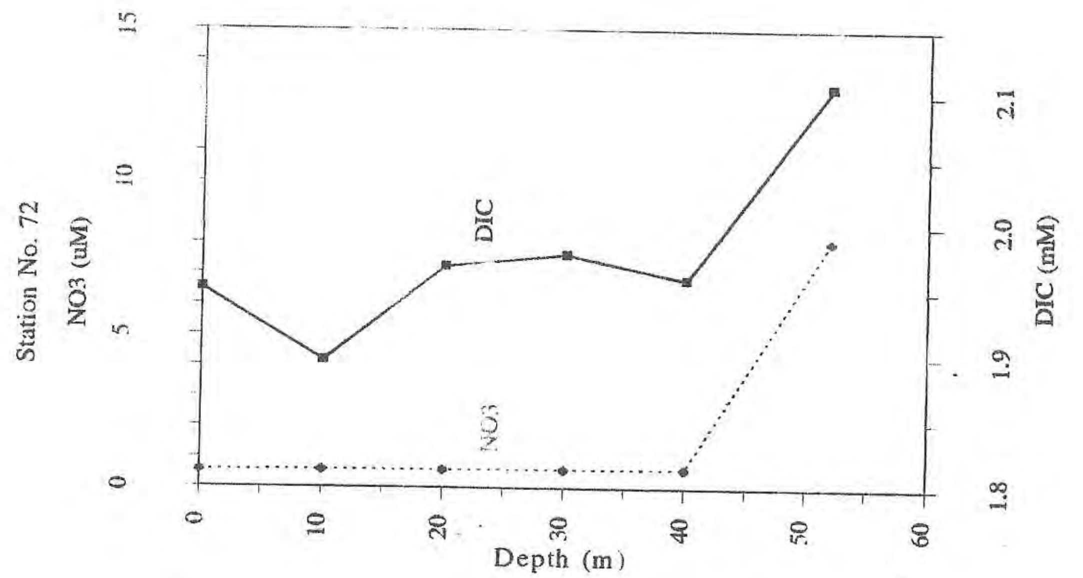

Station No. 71
NO3 (uM)
DIC (mM)
Depth (m)
NO3
DIC
0 0.2 0.4 0.6 0.8 1
1.9 2.0 2.1
0 10 20 30 40

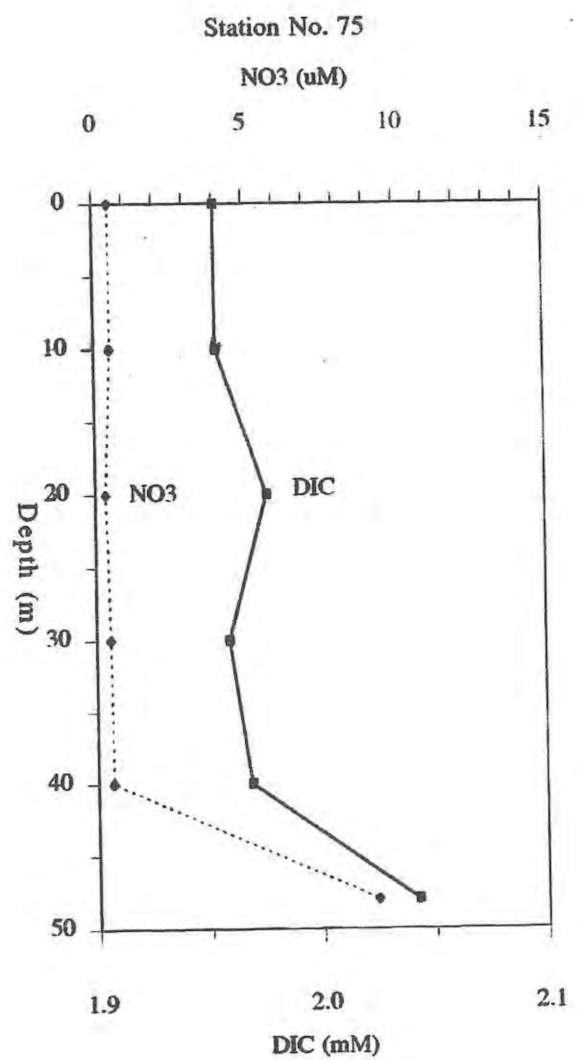

Station No. 70
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3
0 1 2 3 4
1.9 2.0 2.1
0 10 20 30 40

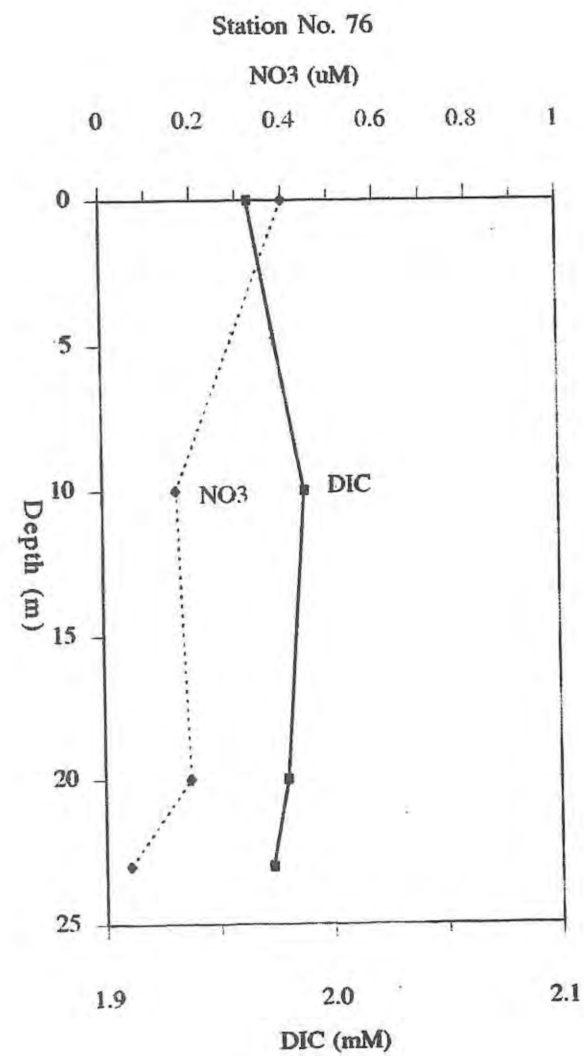

Station No. 69
NO3 (uM)
DIC (mM)
Depth (m)
DIC
NO3
0 5 10 15
1.9 2.0 2.1
0 10 20 30 40 50 60 70

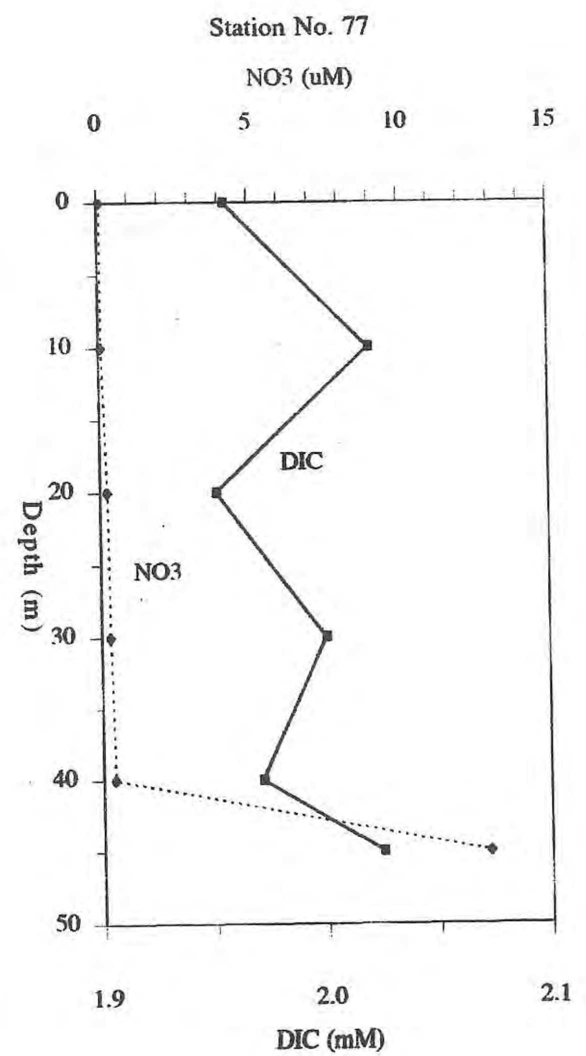

Station No. 74
NO3 (uM)
DIC
NO3
Depth (m)
DIC (mM)
0
5
10
15
0
10
20
30
40
50
60
70
1.9
2.0
2.1

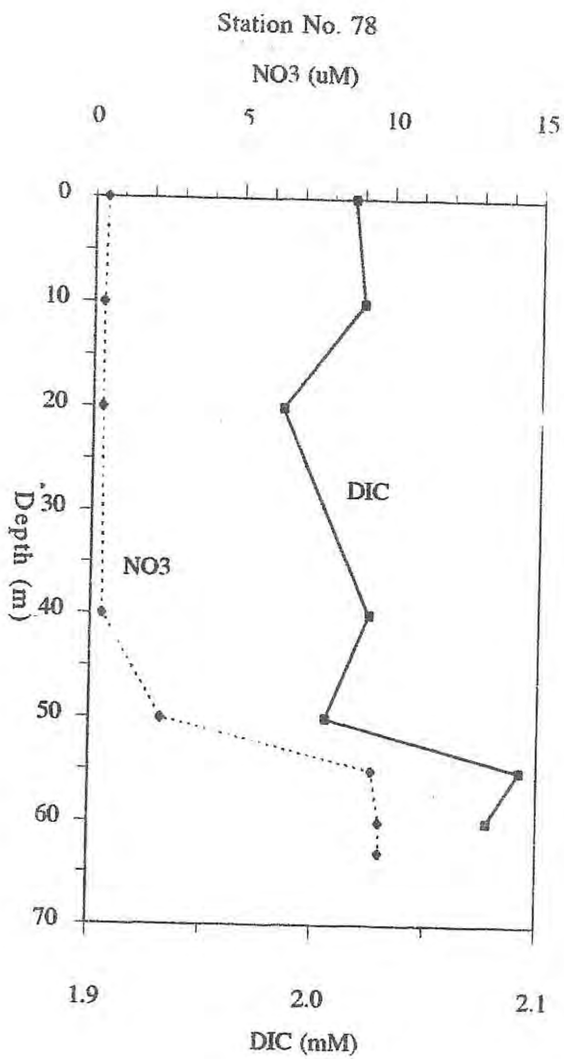

Station No. 73
NO3 (uM)
DIC
NO3
Depth (m)
DIC (mM)
0
5
10
15
0
10
20
30
40
50
60
70
1.9
2.0
2.1

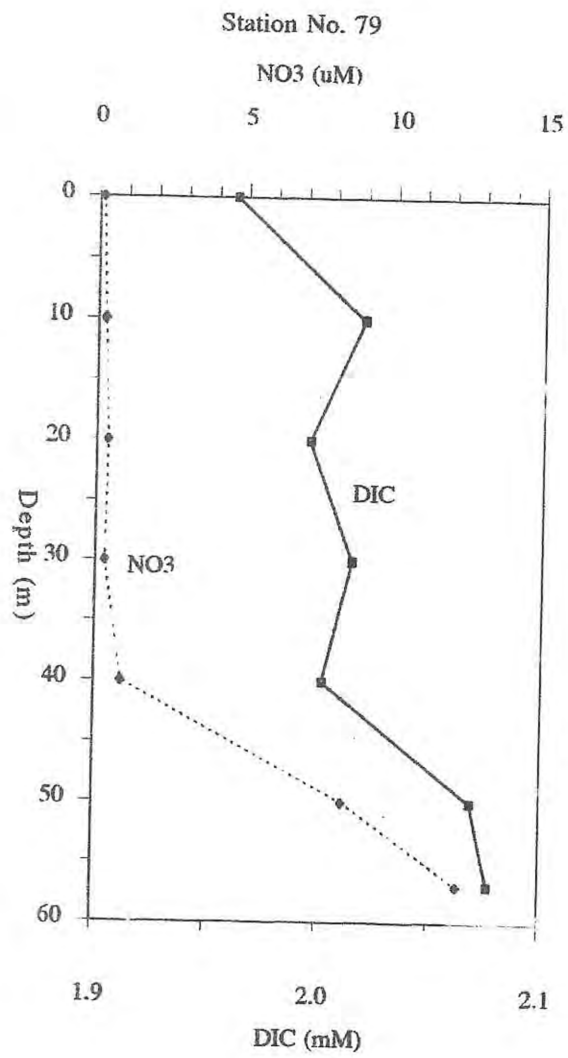

Station No. 72
NO3 (uM)
DIC
NO3
Depth (m)
DIC (mM)
0
5
10
15
0
10
20
30
40
50
60
1.8
1.9
2.0
2.1

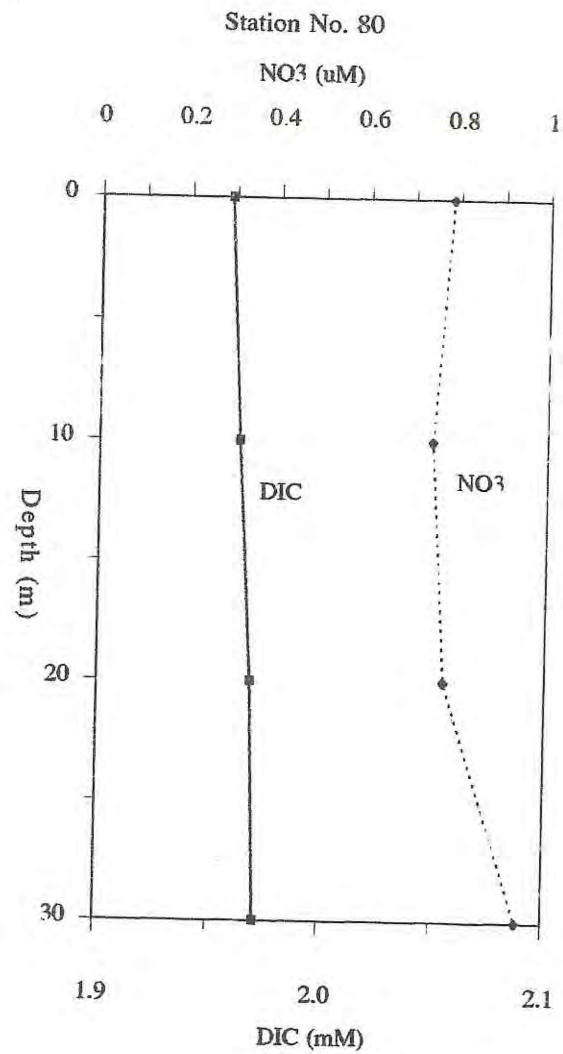

Station No. 75
NO3 (uM)
0
5
10
15
Depth (m)
0
10
20
30
40
50
NO3
DIC
1.9
2.0
2.1
DIC (mM)

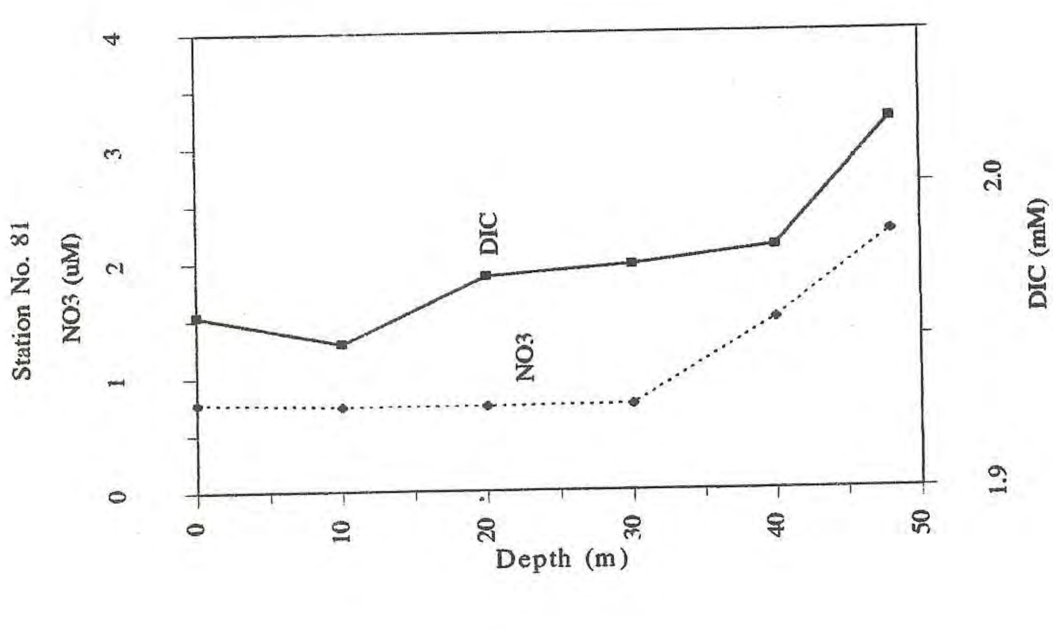

Station No. 76
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
Depth (m)
0
5
10
15
20
25
NO3
DIC
1.9
2.0
2.1
DIC (mM)


Station No. 77
NO3 (uM)
0
5
10
15
Depth (m)
0
10
20
30
40
50
DIC
NO3
1.9
2.0
2.1
DIC (mM)


Station No. 78
NO3 (uM)
0
5
10
15
0
10
20
30
40
50
60
70
Depth (m)
DIC
NO3
1.9
2.0
2.1
DIC (mM)


Station No. 79
NO3 (uM)
0
5
10
15
0
10
20
30
40
50
60
Depth (m)
DIC
NO3
1.9
2.0
2.1
DIC (mM)


Station No. 80
NO3 (uM)
0
0.2
0.4
0.6
0.8
1
0
10
20
30
Depth (m)
DIC
NO3
1.9
2.0
2.1
DIC (mM)


Station No. 81
NO3 (uM)
0
1
2
3
4
DIC
NO3
Depth (m)
0
10
20
30
40
50
DIC (mM)
1.9
2.0

Light Intensity

Ideally, Light intensity profile of a homogeneous water body should observed the equation

$$dI/dZ = -KI$$

(e.g. Tyler and Preisendorfer 1960). However when we tried to fit the integral form of the above equation to the observed data obtained from this cruise, the goodness of fit was not satisfactory at several stations. To correct the discrepancy the differential equation that describe the light intensity profile in the Gulf of Thailand and the east coast of Peninsular Malaysia was modified to:

$$dI/dz = -kI + a$$

where I = light intensity (lux)

z = depth (meter)

k = "decay" factor

a = arbitrary constant

This modified equation, even though is not valid at z approaches infinity, it does fit with the data very well for the range of observed z where light intensity was mostly between 10-100 % of intensity at sea surface.

The solution of this equation is therefore:

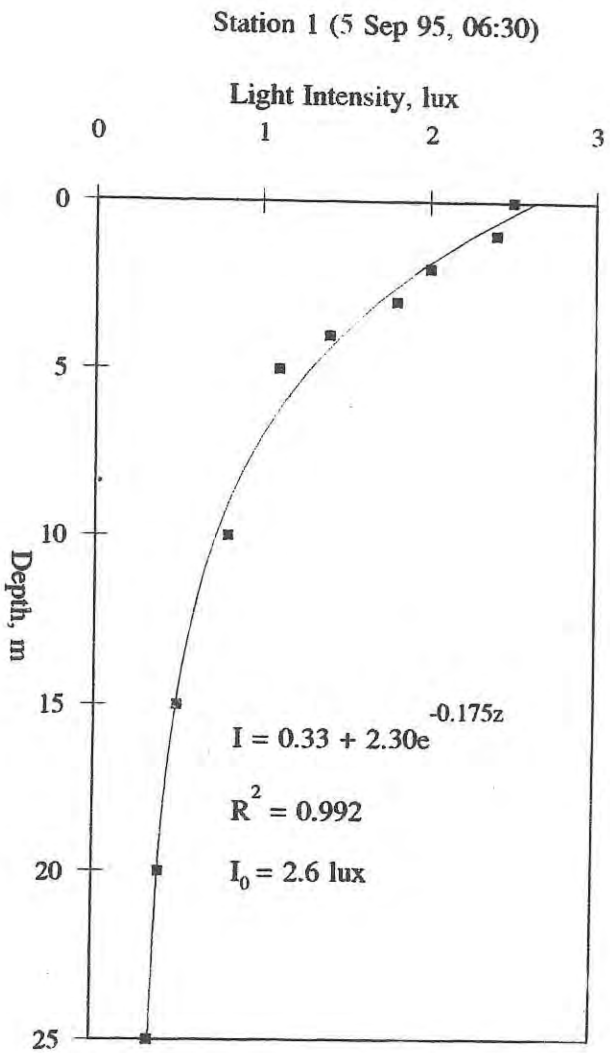
$$I = b + ce^{-kz}$$

when b = asymtotic intensity = a/k

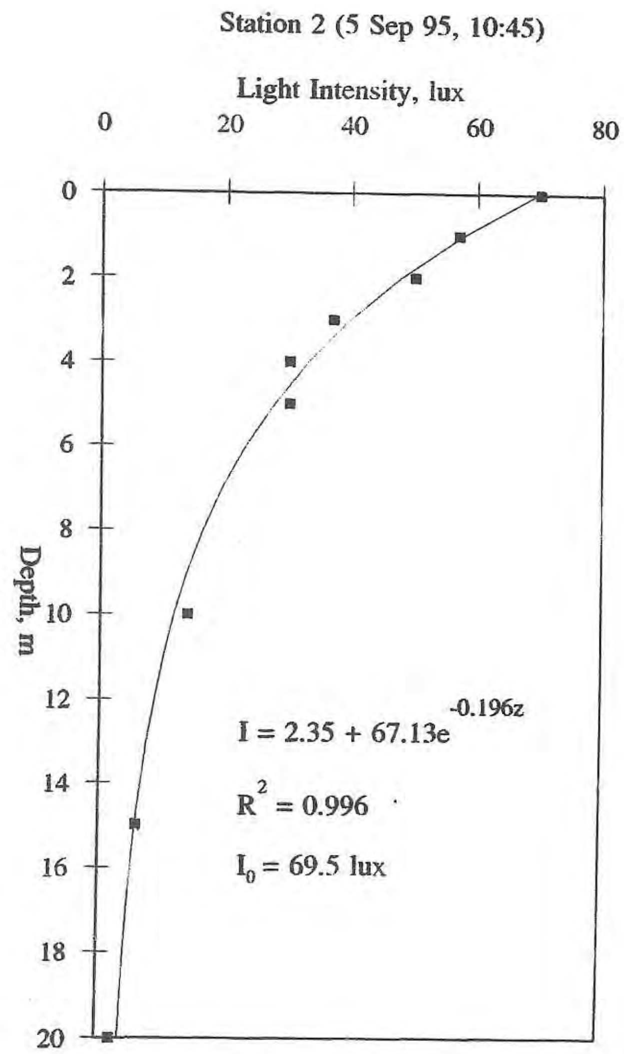
c = integration constant

From the last equation, the surface light intensity (I_0) can be extrapolated by:

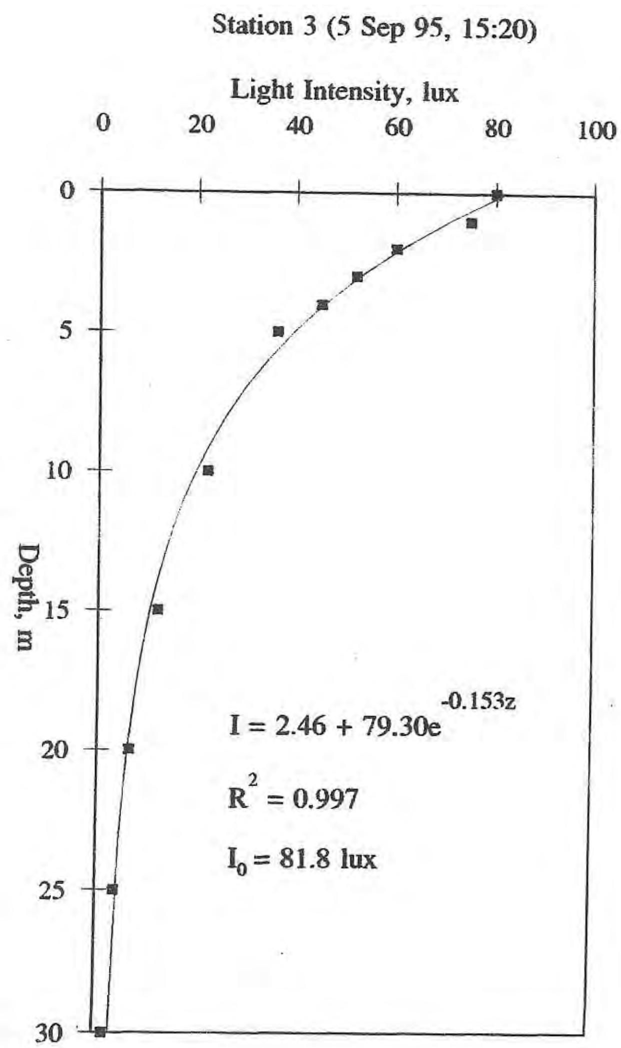
$$I_0 = a/k + c$$



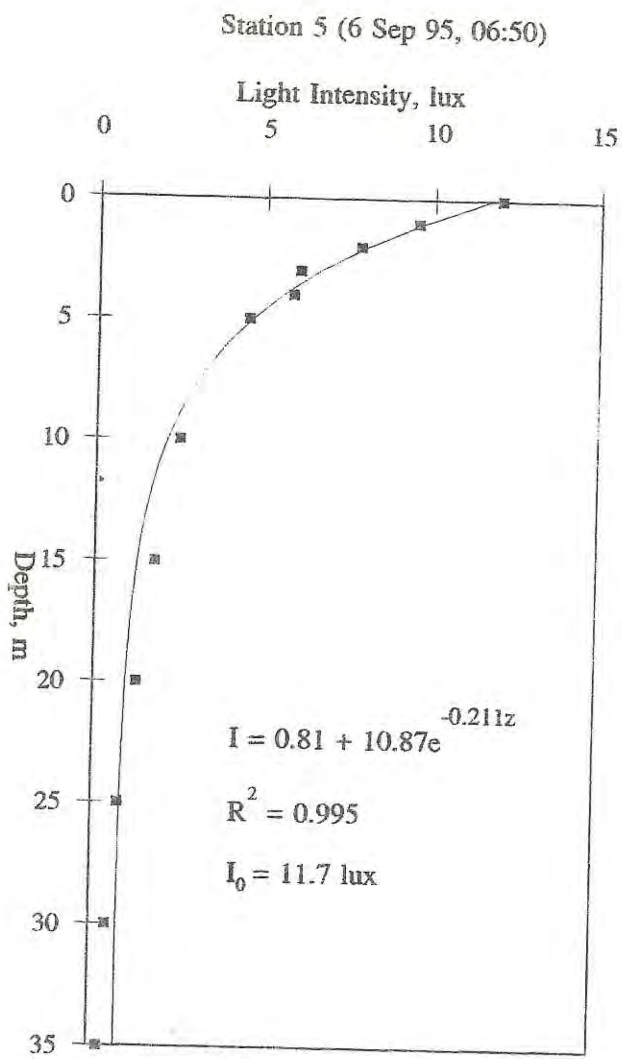
Station 1 (5 Sep 95, 06:30)
Light Intensity, lux
Depth, m
I = 0.33 + 2.30e^-0.175z
R^2 = 0.992
I0 = 2.6 lux

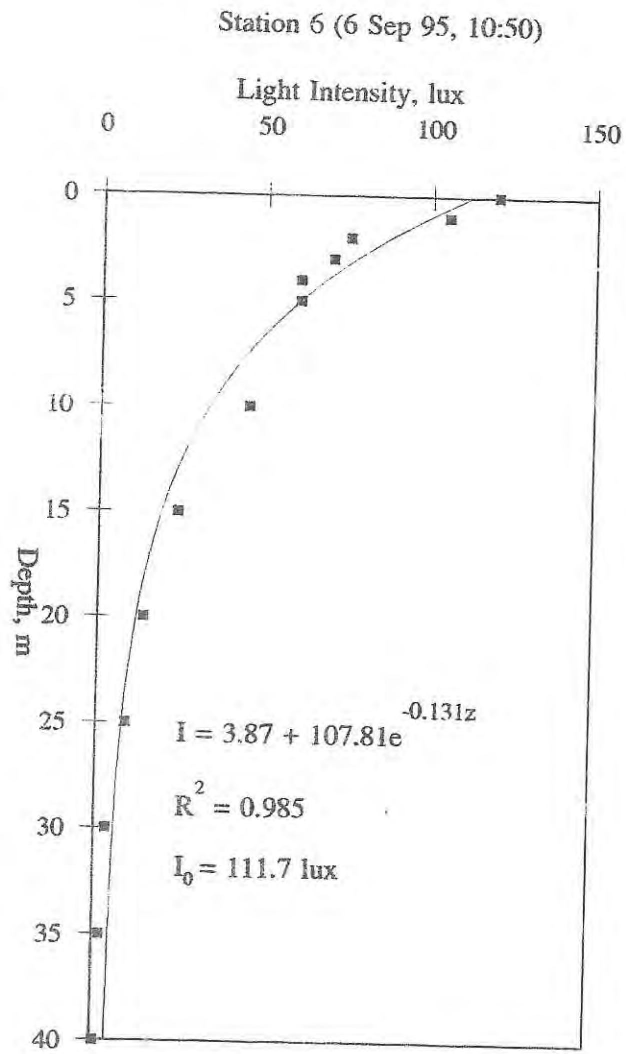


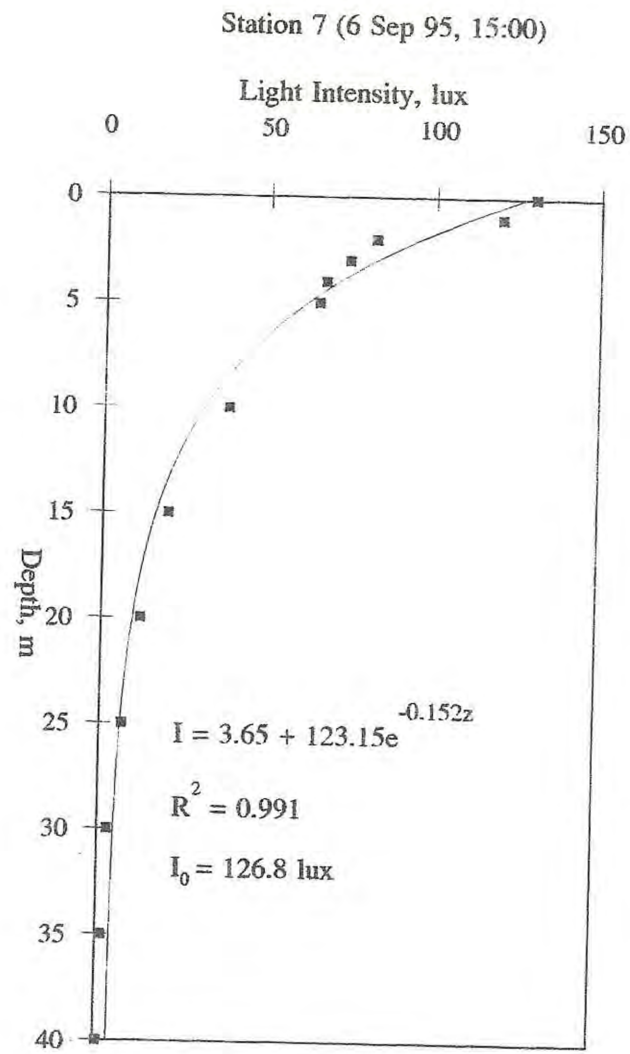
Station 2 (5 Sep 95, 10:45)
Light Intensity, lux
Depth, m
I = 2.35 + 67.13e^-0.196z
R^2 = 0.996
I0 = 69.5 lux



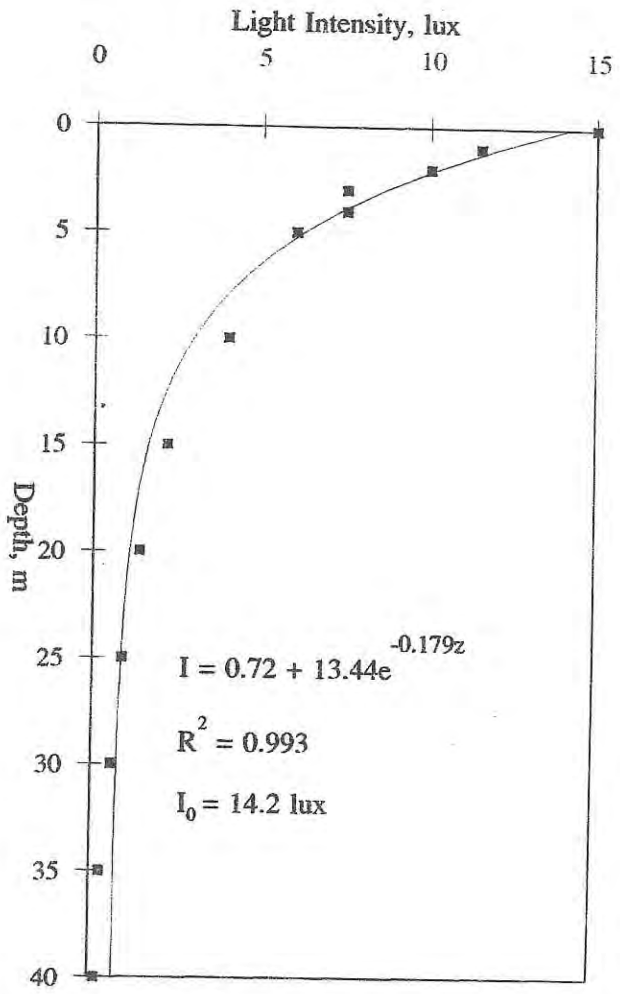
Station 3 (5 Sep 95, 15:20)
Light Intensity, lux
Depth, m
I = 2.46 + 79.30e^-0.153z
R^2 = 0.997
I0 = 81.8 lux


Station 5 (6 Sep 95, 06:50)
Light Intensity, lux
0
5
10
15
Depth, m
0
5
10
15
20
25
30
35
$I = 0.81 + 10.87e^{-0.211z}$
$R^2 = 0.995$
$I_0 = 11.7$ lux

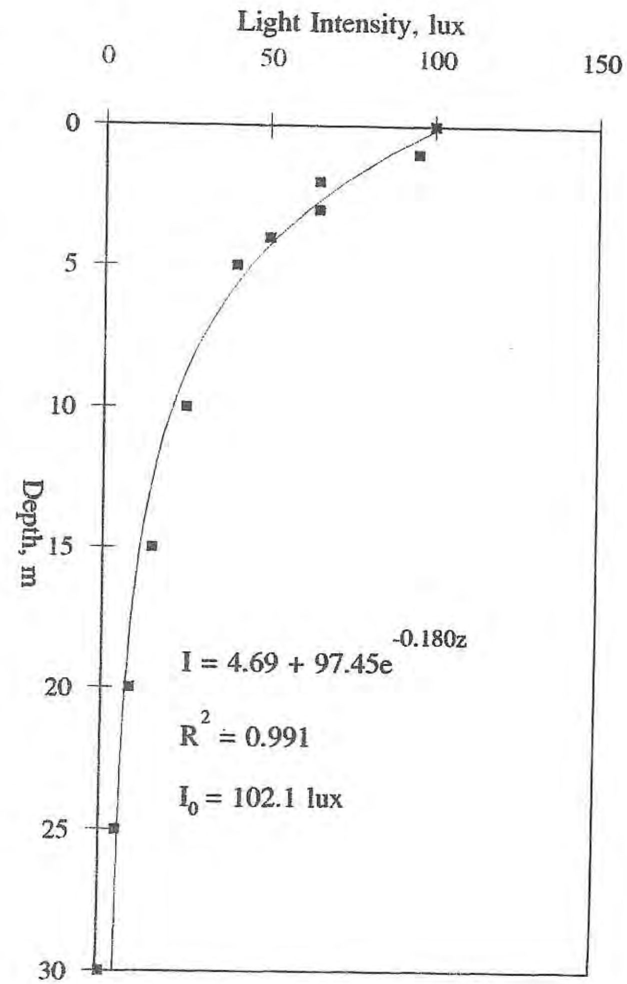

Station 6 (6 Sep 95, 10:50)
Light Intensity, lux
0
50
100
150
Depth, m
0
5
10
15
20
25
30
35
40
$I = 3.87 + 107.81e^{-0.131z}$
$R^2 = 0.985$
$I_0 = 111.7$ lux


Station 7 (6 Sep 95, 15:00)
Light Intensity, lux
0
50
100
150
Depth, m
0
5
10
15
20
25
30
35
40
$I = 3.65 + 123.15e^{-0.152z}$
$R^2 = 0.991$
$I_0 = 126.8$ lux

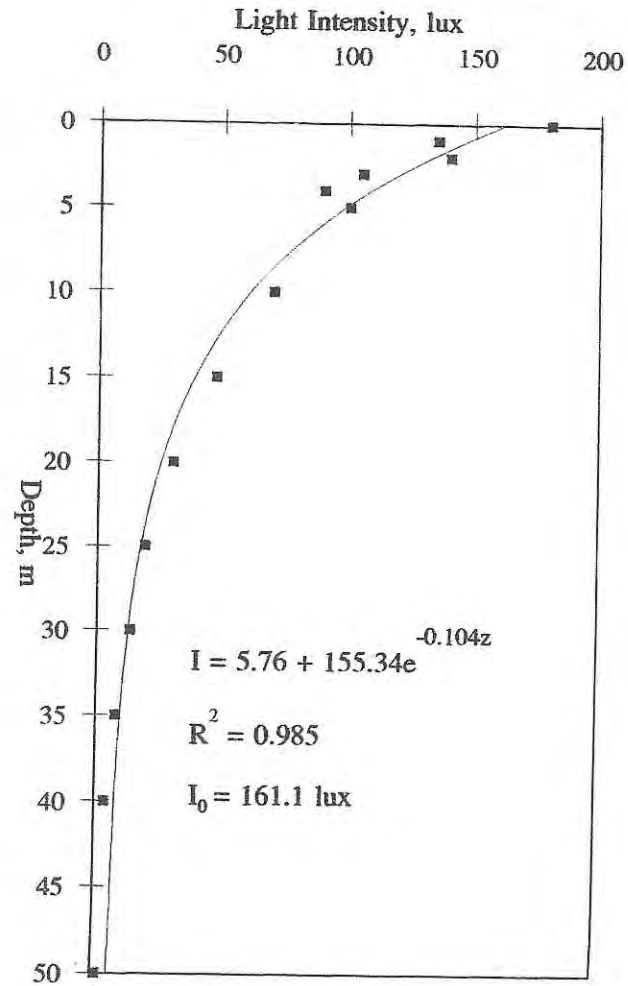
Station 9 (7 Sep 95, 06:30)



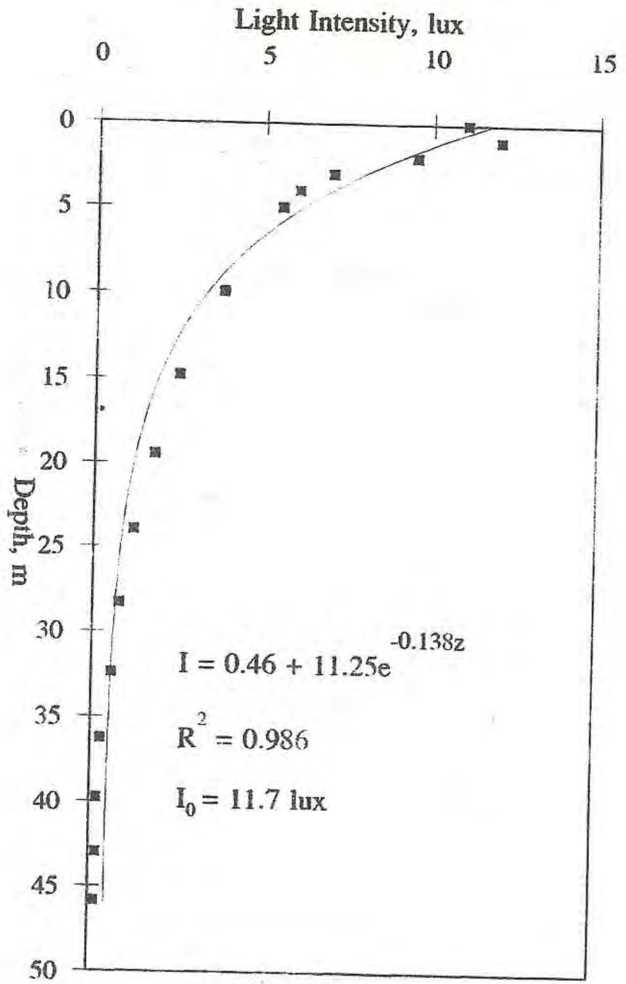
Station 10 (7 Sep 95, 10:50)



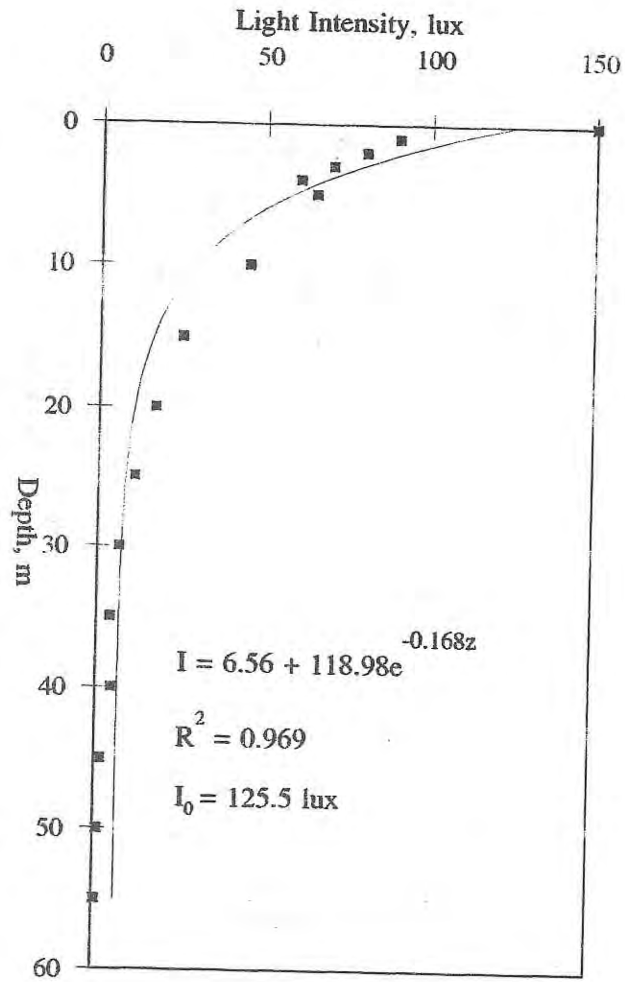
Station 11 (7 Sep 95, 15:00)



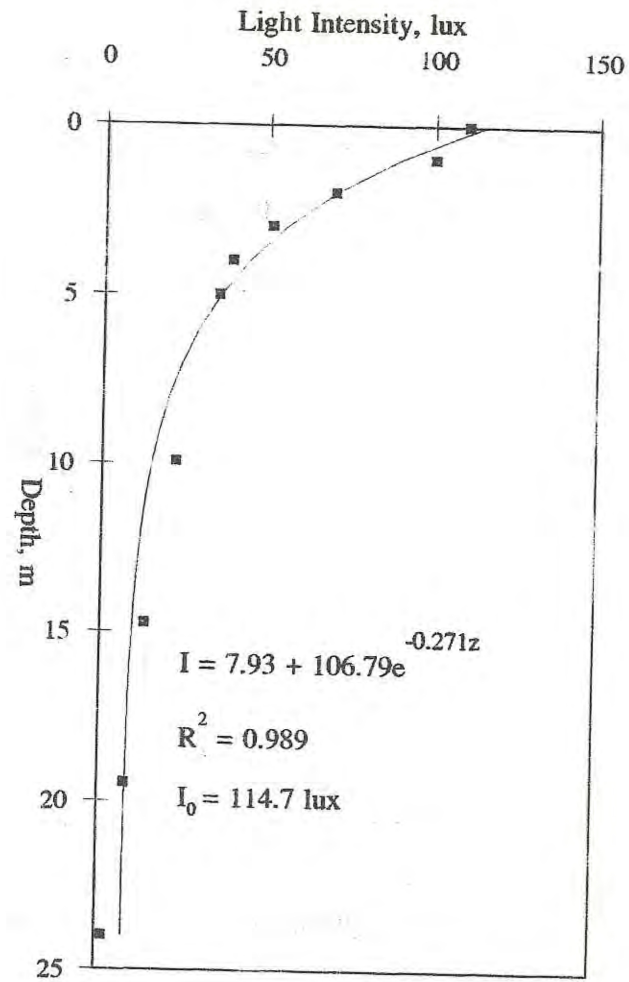
Station 13 (8 Sep 95, 07:00)

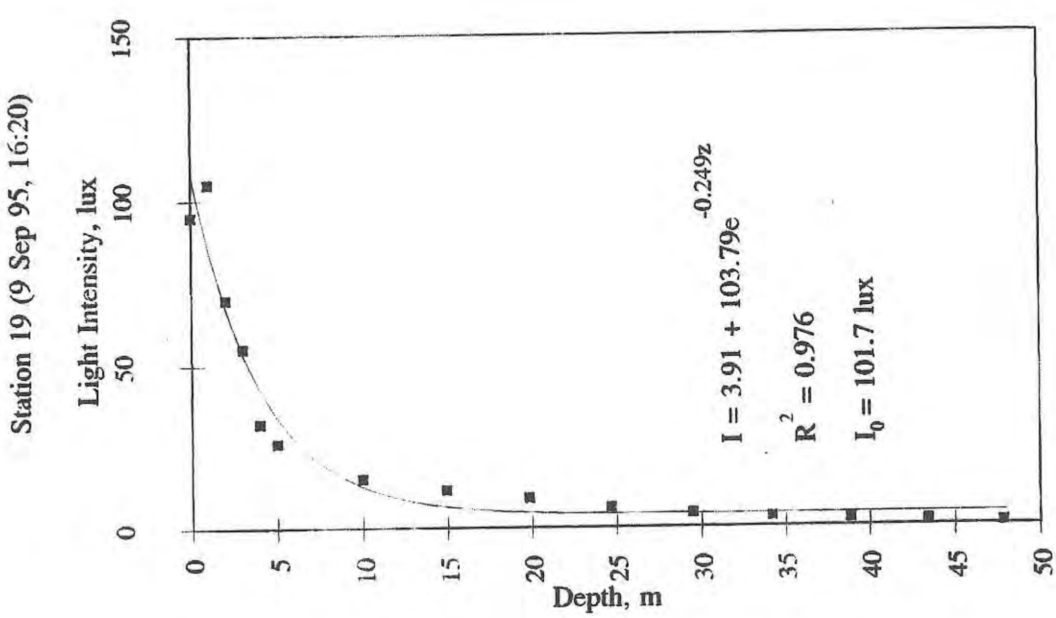


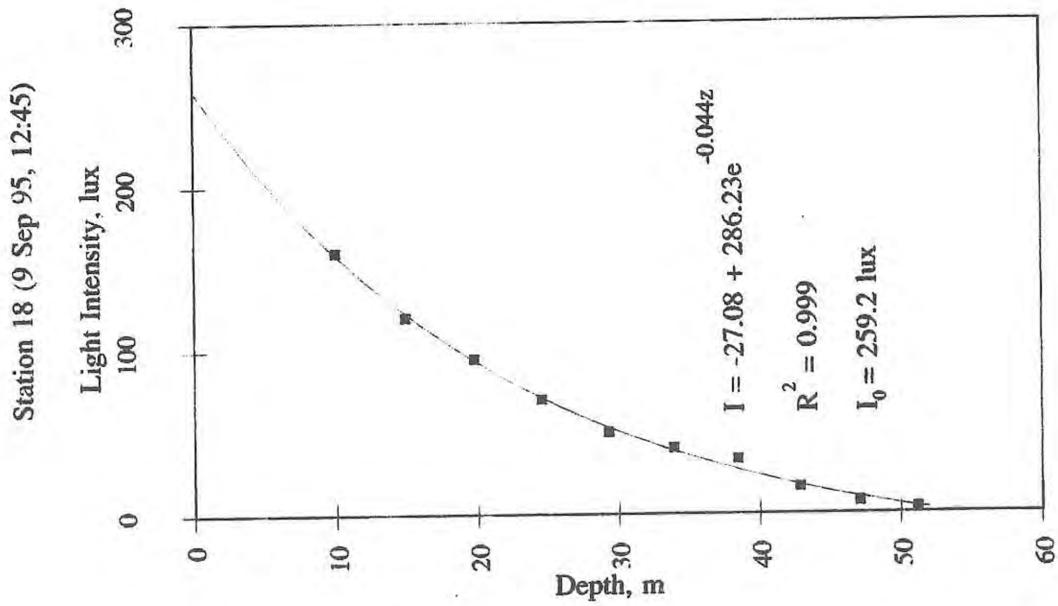
Station 14 (8 Sep 95, 12:35)

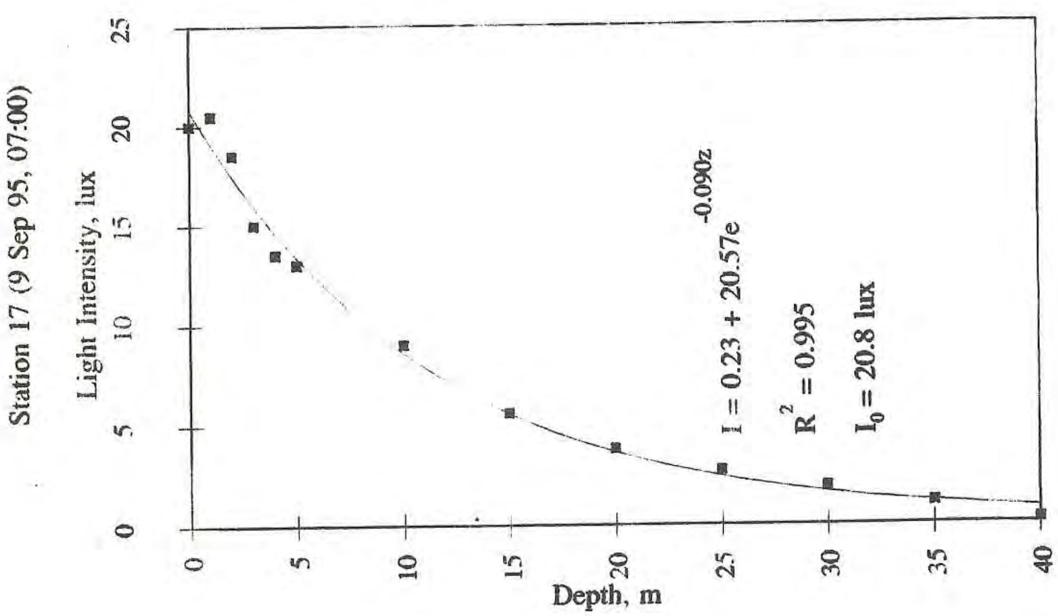


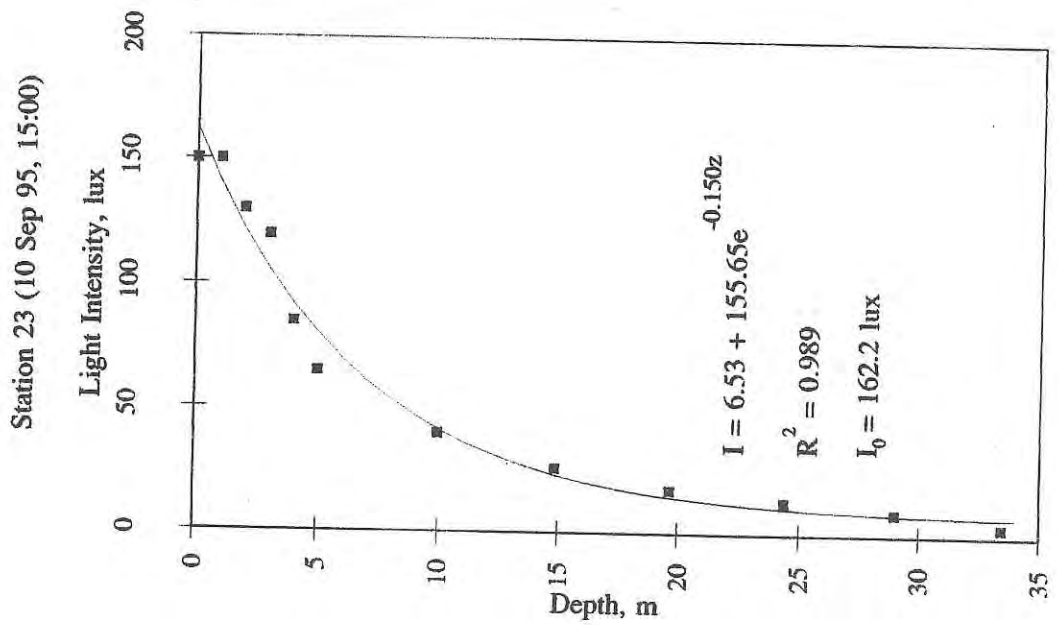
Station 15 (8 Sep 95, 17:00)



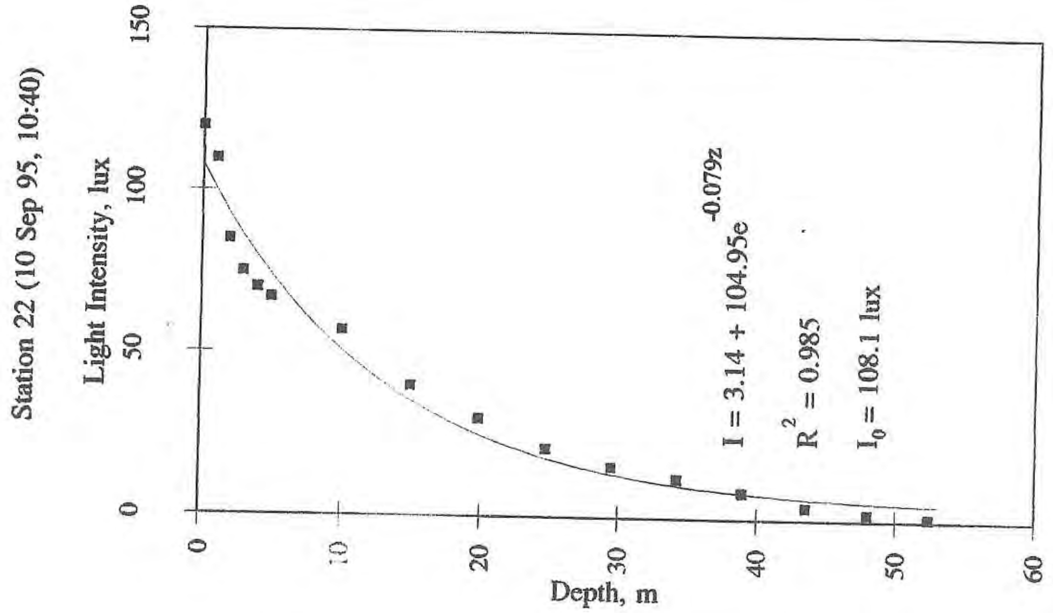

Station 19 (9 Sep 95, 16:20)
Light Intensity, lux
Depth, m
I = 3.91 + 103.79e -0.249z
R 2 = 0.976
I0 = 101.7 lux


Station 18 (9 Sep 95, 12:45)
Light Intensity, lux
Depth, m
I = -27.08 + 286.23e -0.044z
R 2 = 0.999
I0 = 259.2 lux

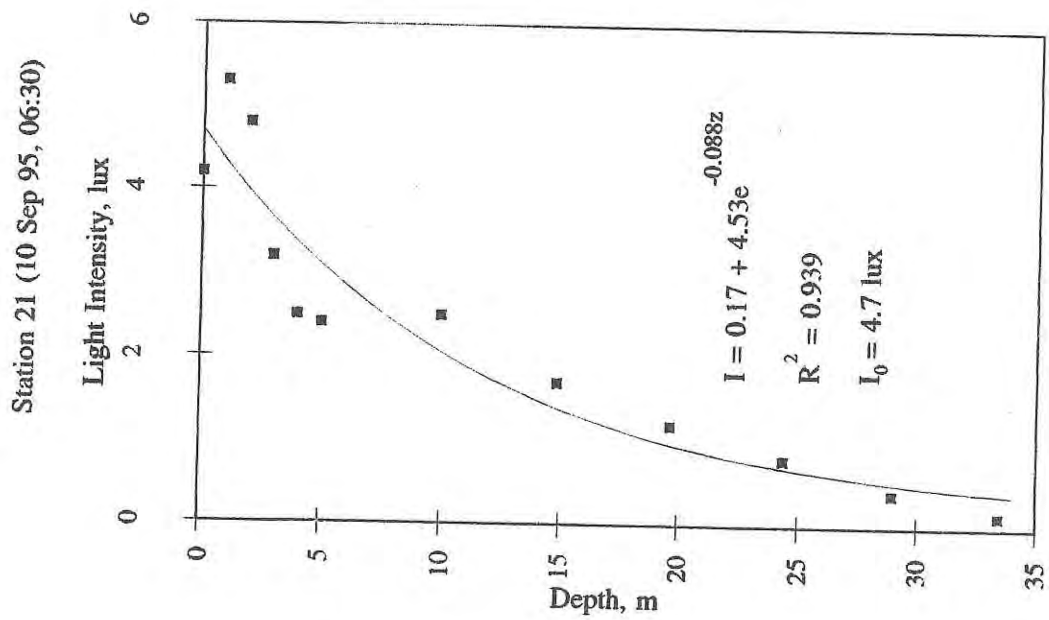

Station 17 (9 Sep 95, 07:00)
Light Intensity, lux
Depth, m
I = 0.23 + 20.57e -0.090z
R 2 = 0.995
I0 = 20.8 lux



Station 23 (10 Sep 95, 15:00)
Light Intensity, lux
Depth, m
I = 6.53 + 155.65e^-0.150z
R^2 = 0.989
I_0 = 162.2 lux

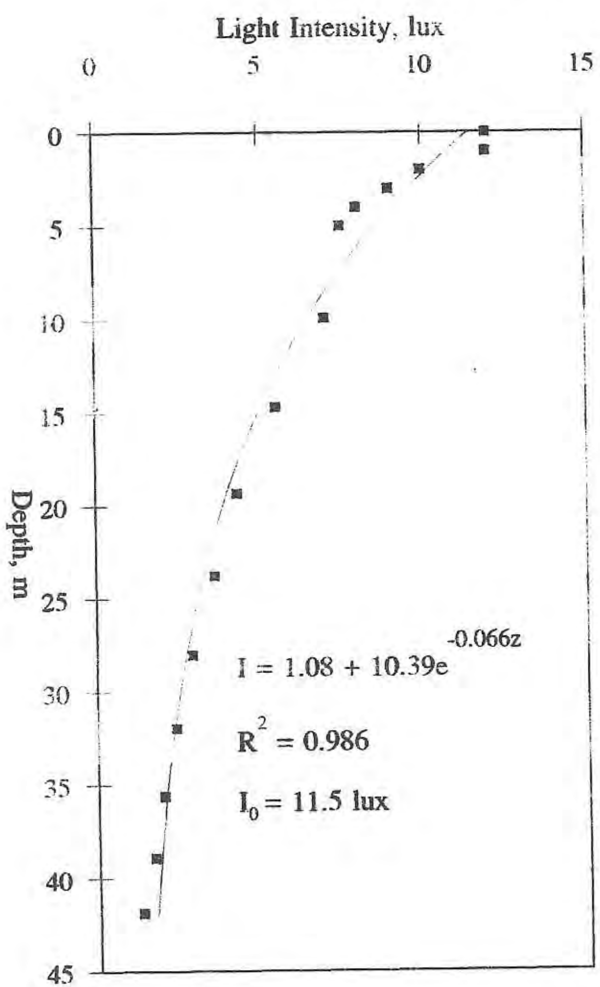


Station 22 (10 Sep 95, 10:40)
Light Intensity, lux
Depth, m
I = 3.14 + 104.95e^-0.079z
R^2 = 0.985
I_0 = 108.1 lux

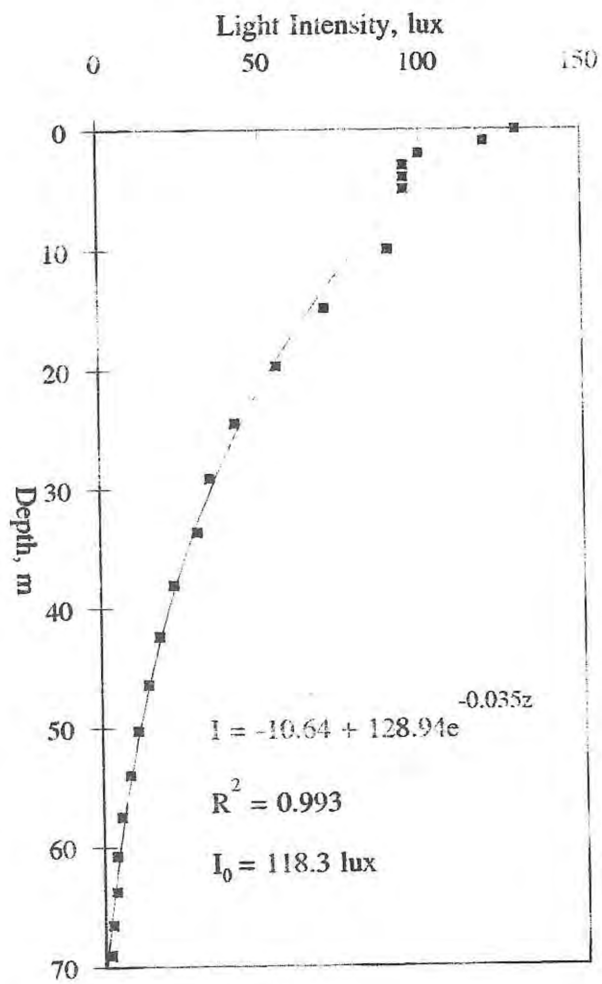


Station 21 (10 Sep 95, 06:30)
Light Intensity, lux
Depth, m
I = 0.17 + 4.53e^-0.088z
R^2 = 0.939
I_0 = 4.7 lux

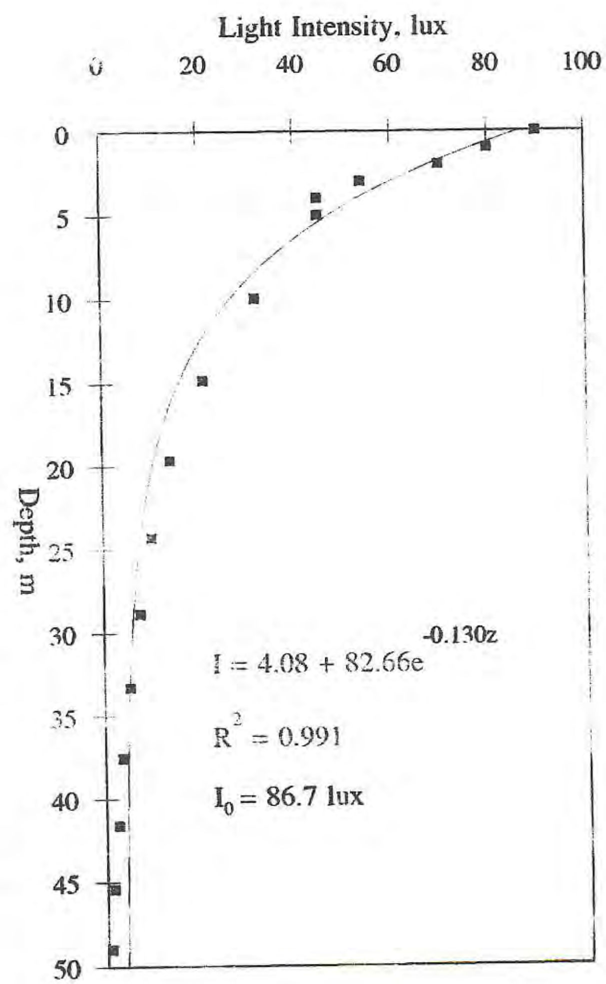
Station 25 (12 Sep 95, 06:45)



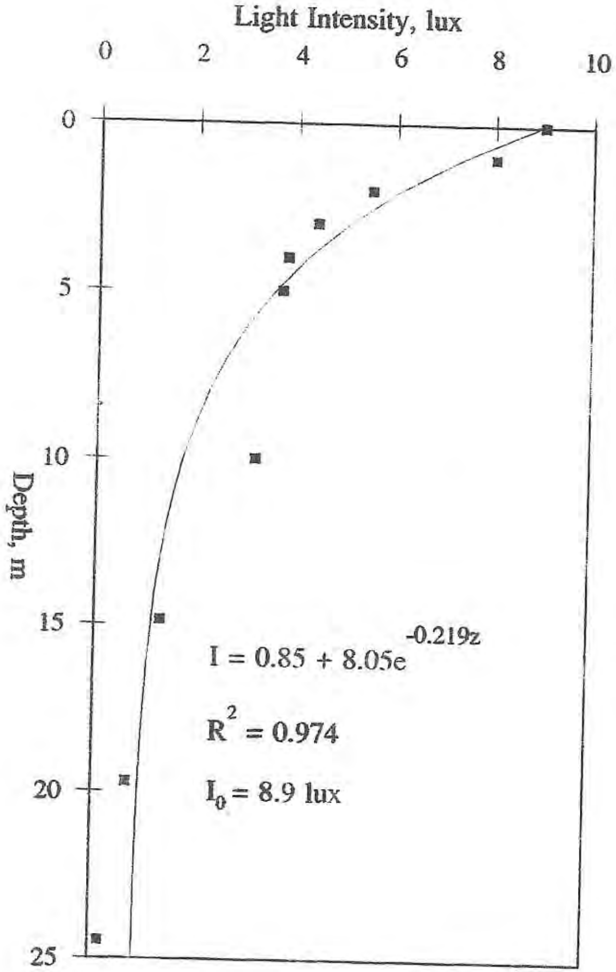
Station 26 (12 Sep 95, 11:10)



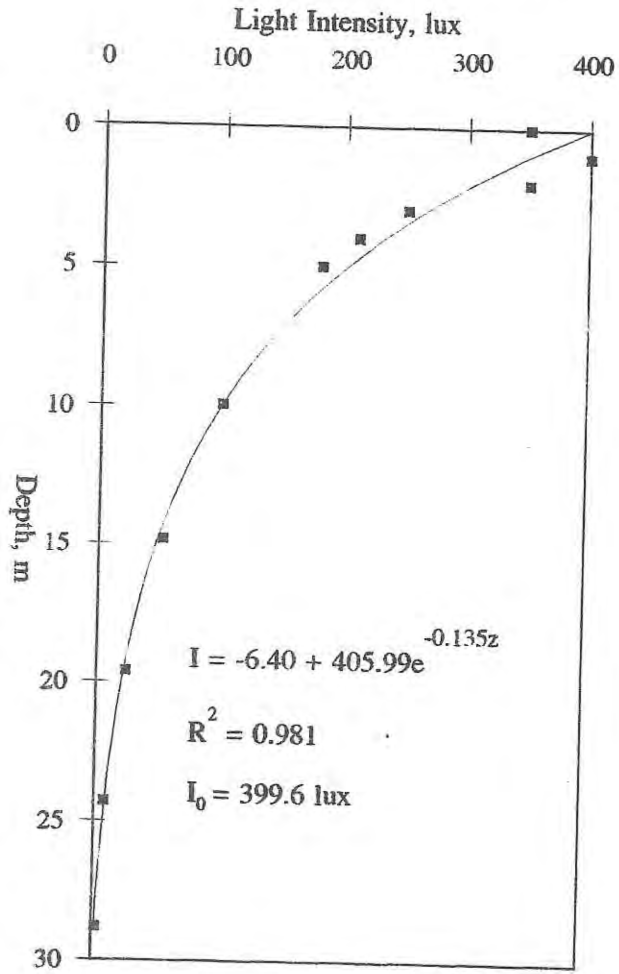
Station 28 (12 Sep 95, 16:00)



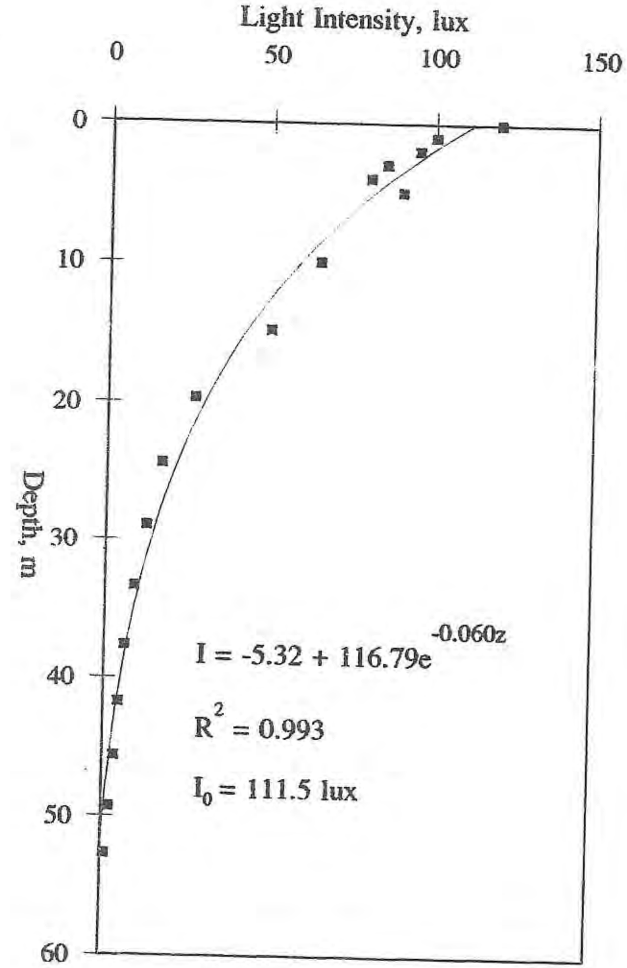
Station 30 (13 Sep 95, 06:30)

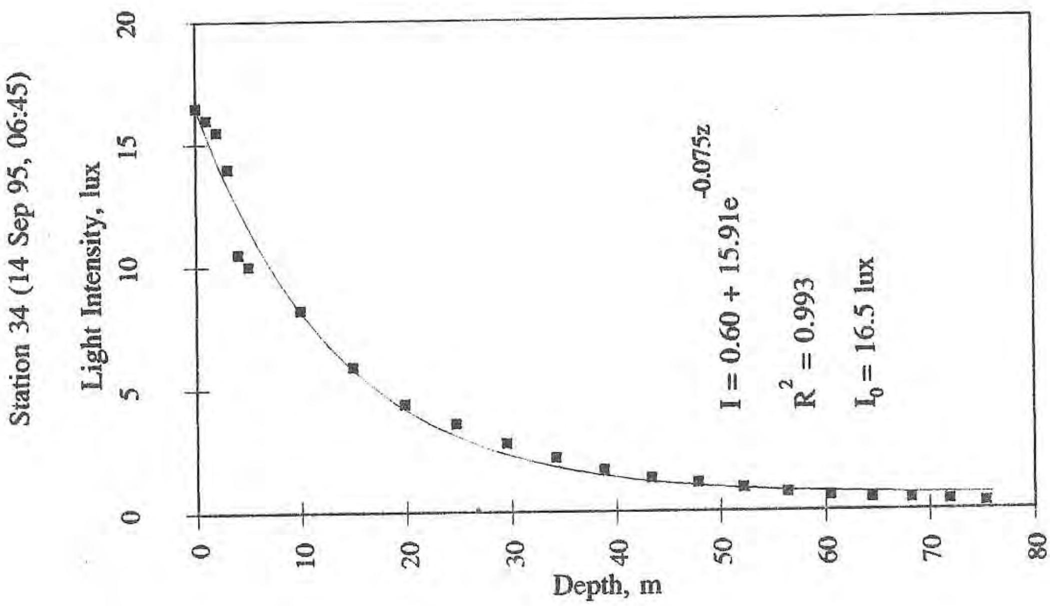


Station 31 (13 Sep 95, 12:10)

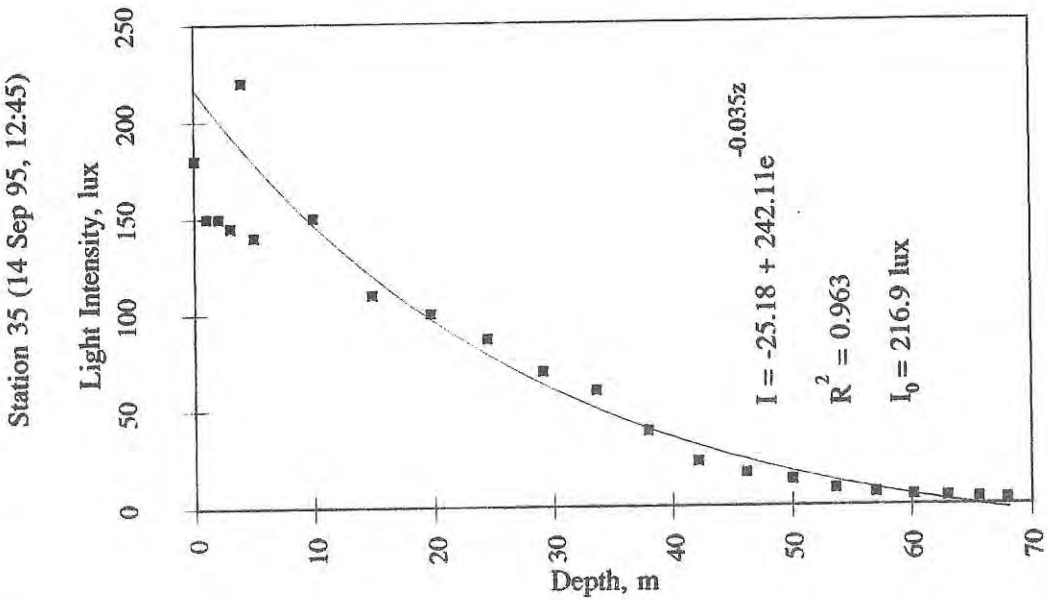


Station 32 (13 Sep 95, 16:00)

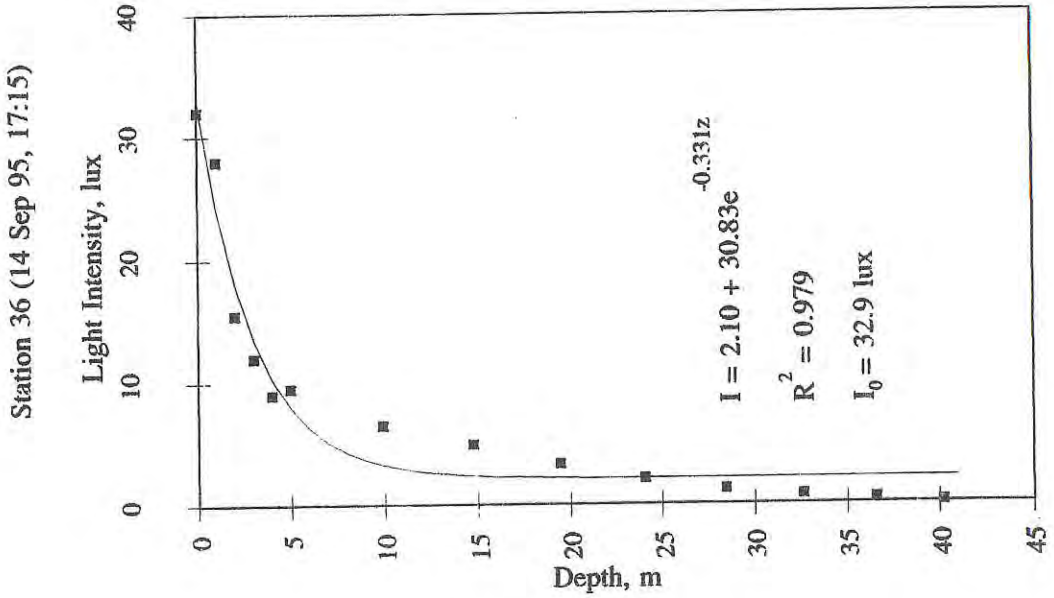




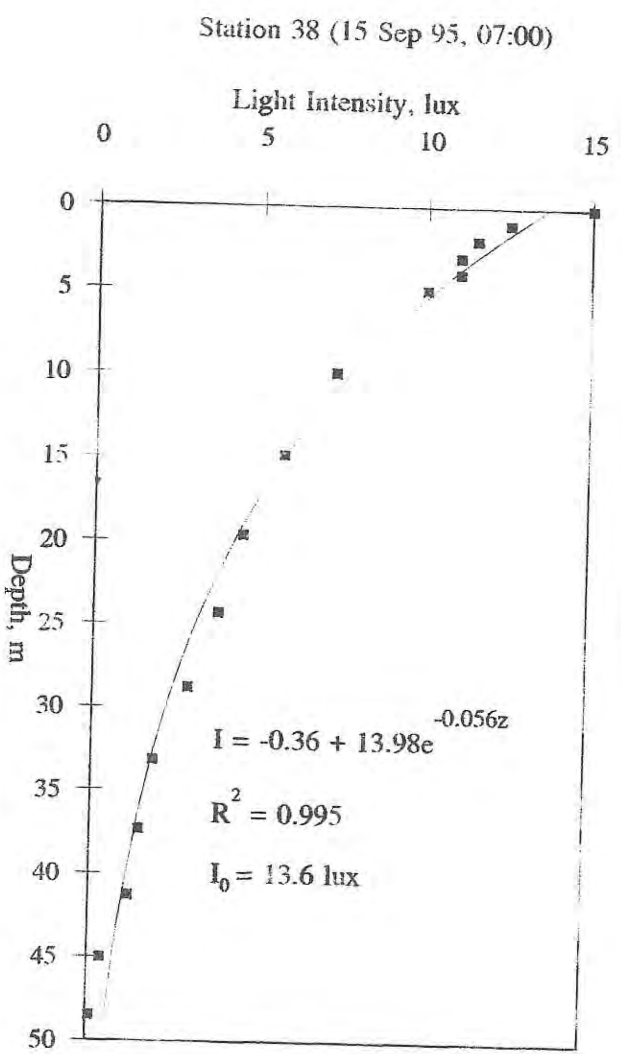
Station 34 (14 Sep 95, 06:45)
Light Intensity, lux
Depth, m
$I = 0.60 + 15.91e^{-0.075z}$
$R^2 = 0.993$
$I_0 = 16.5$ lux

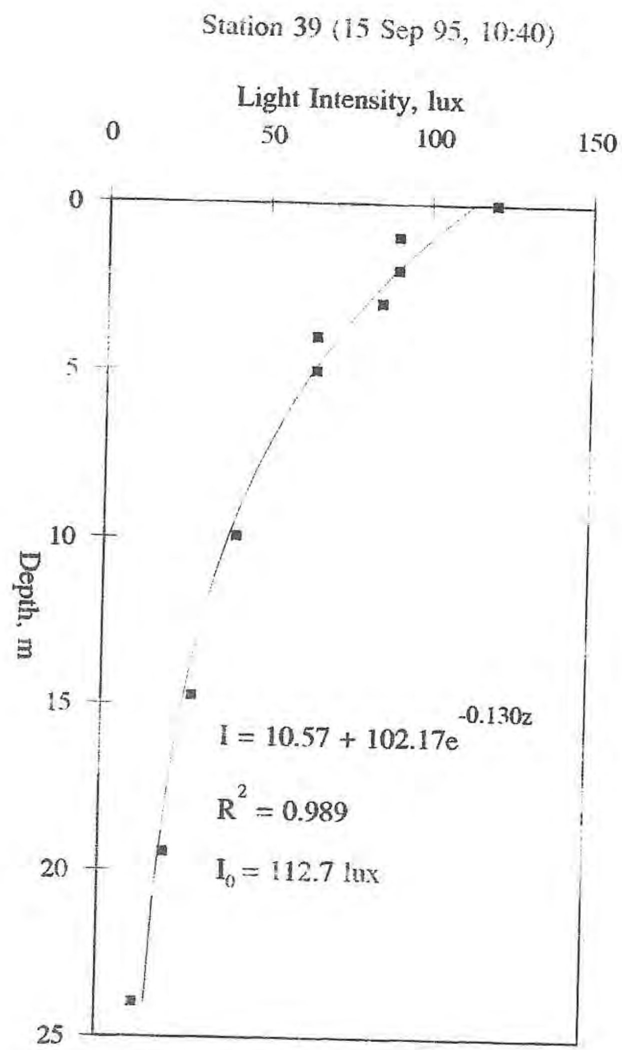


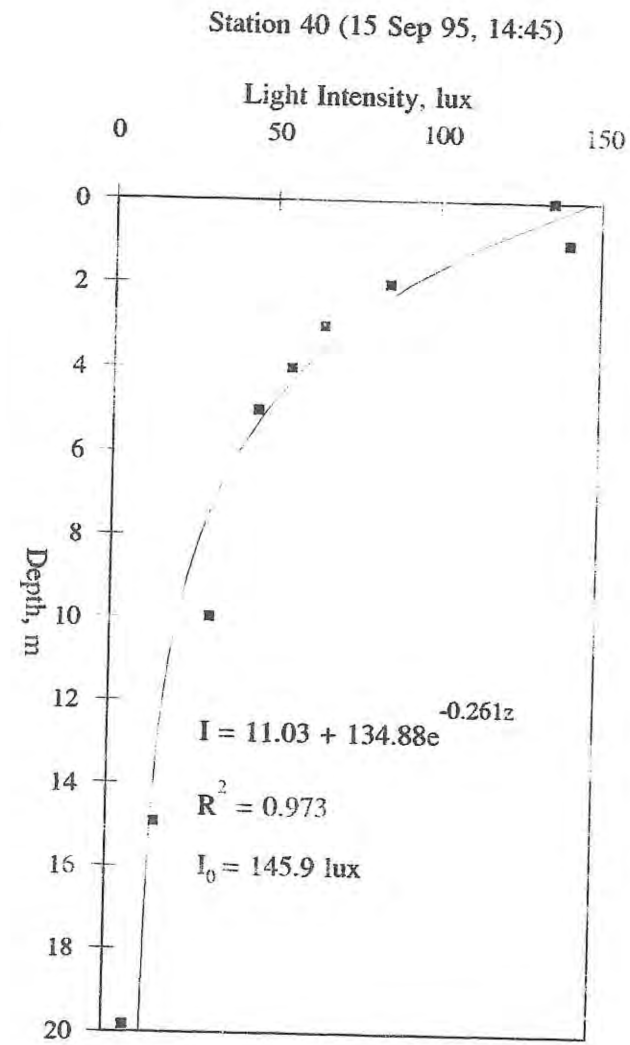
Station 35 (14 Sep 95, 12:45)
Light Intensity, lux
Depth, m
$I = -25.18 + 242.11e^{-0.035z}$
$R^2 = 0.963$
$I_0 = 216.9$ lux



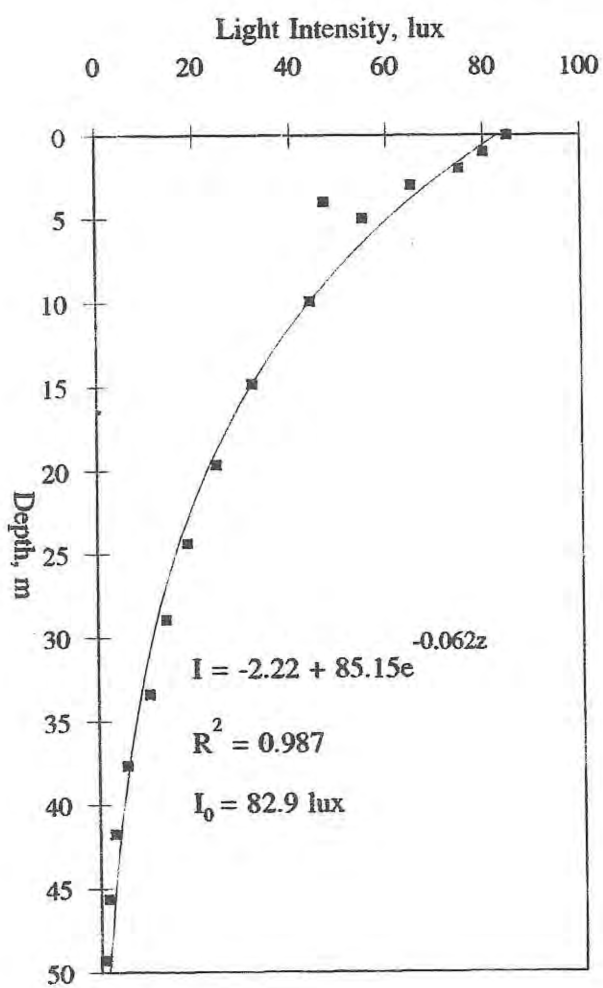
Station 36 (14 Sep 95, 17:15)
Light Intensity, lux
Depth, m
$I = 2.10 + 30.83e^{-0.331z}$
$R^2 = 0.979$
$I_0 = 32.9$ lux


Station 38 (15 Sep 95, 07:00)
Light Intensity, lux
Depth, m
I = -0.36 + 13.98e -0.056z
R 2 = 0.995
I0 = 13.6 lux

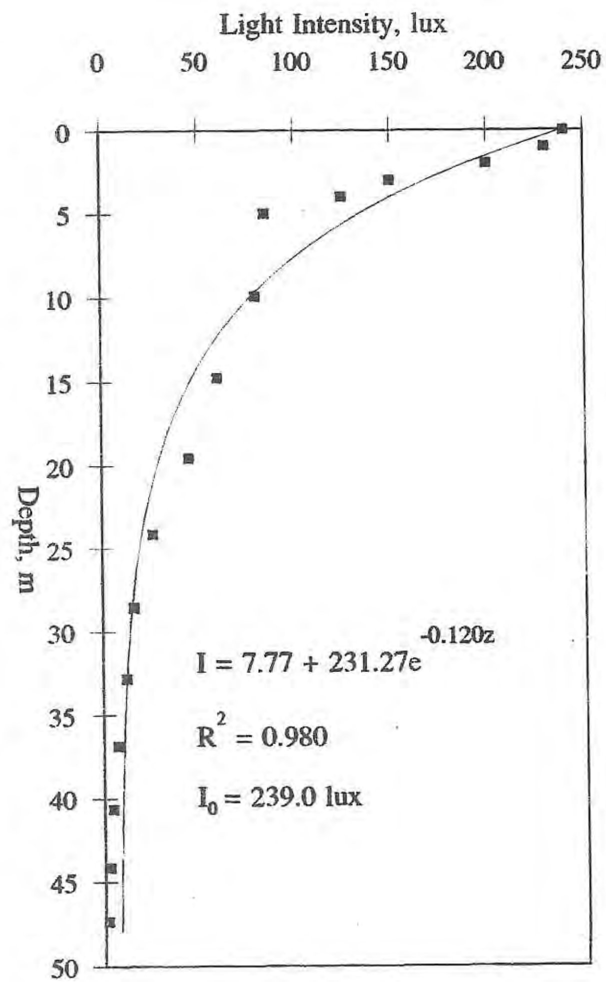

Station 39 (15 Sep 95, 10:40)
Light Intensity, lux
Depth, m
I = 10.57 + 102.17e -0.130z
R 2 = 0.989
I0 = 112.7 lux


Station 40 (15 Sep 95, 14:45)
Light Intensity, lux
Depth, m
I = 11.03 + 134.88e -0.261z
R 2 = 0.973
I0 = 145.9 lux

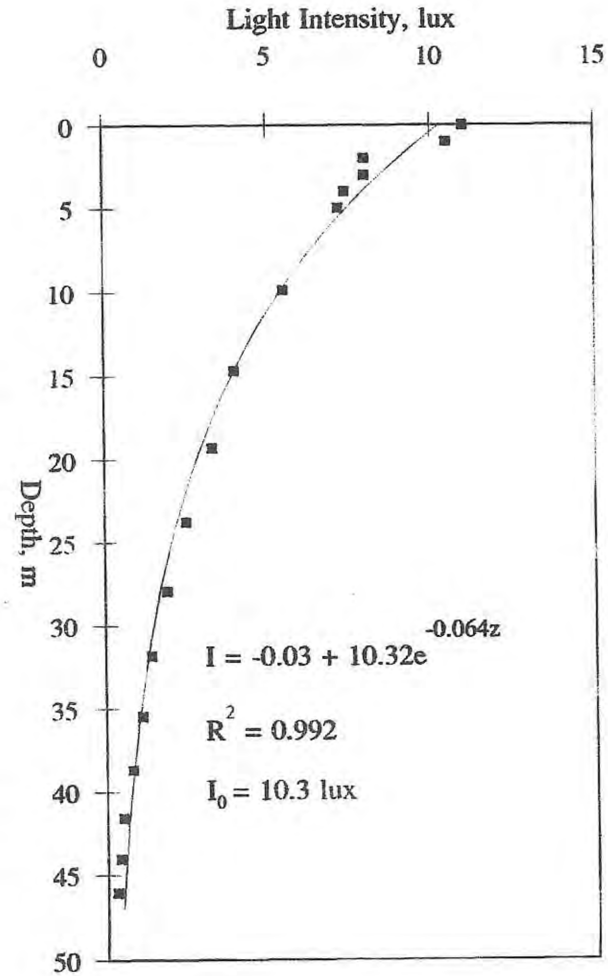
Station 42 (17 Sep 95, 09:30)



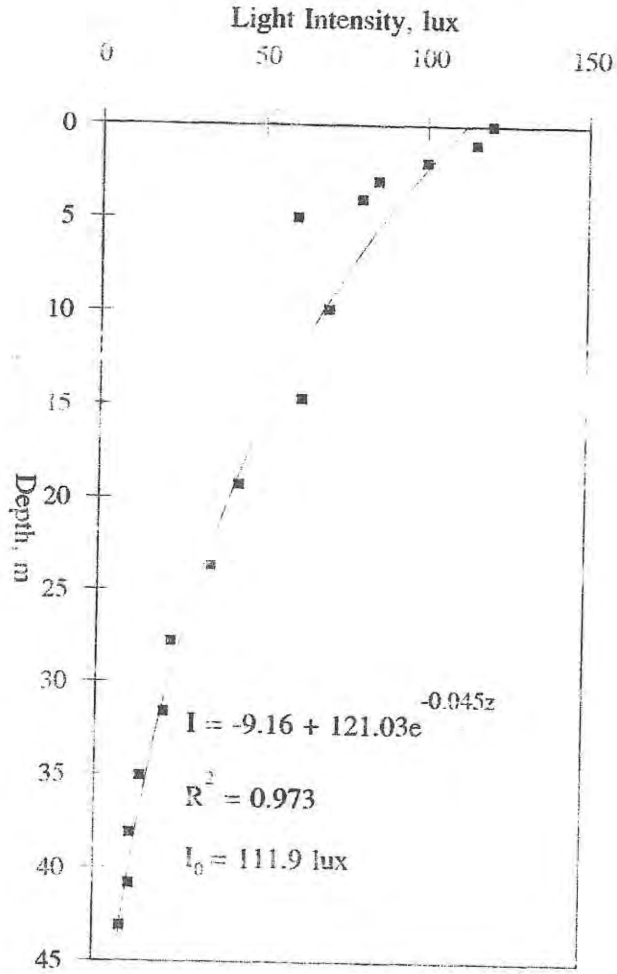
Station 43 (17 Sep 95, 13:50)



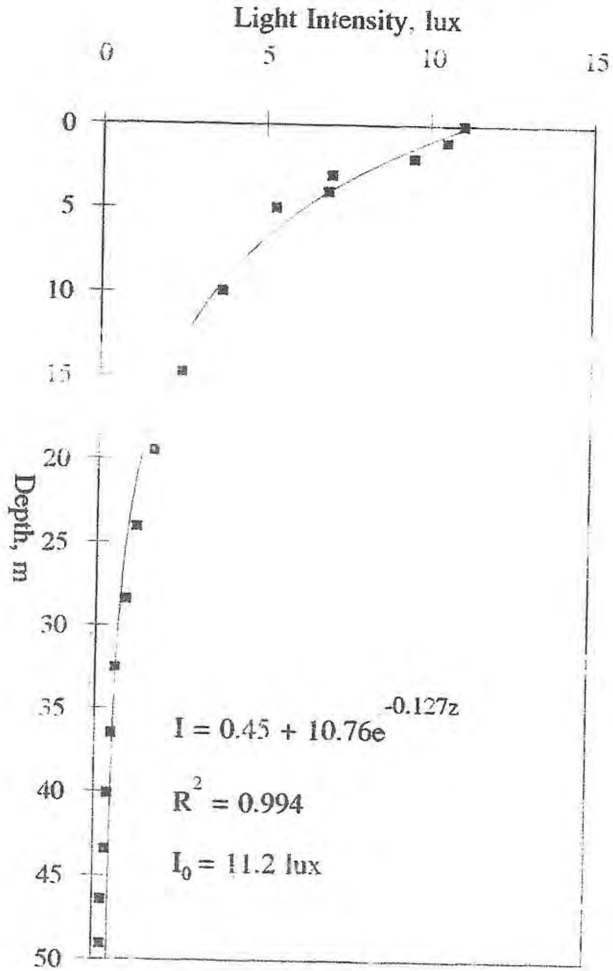
Station 45 (18 Sep 95, 06:50)



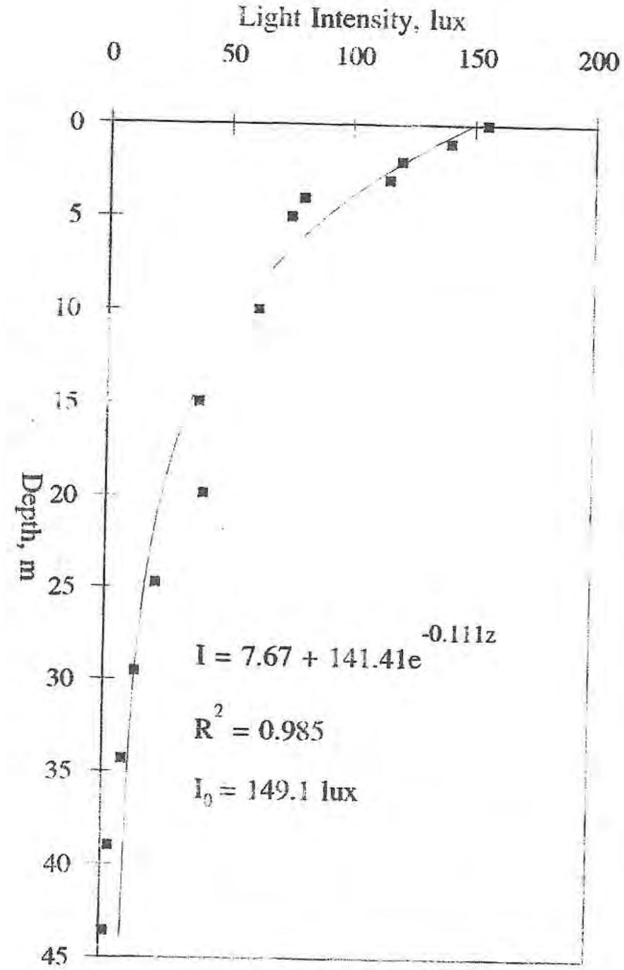
Station 46 (18 Sep 95, 11:20)

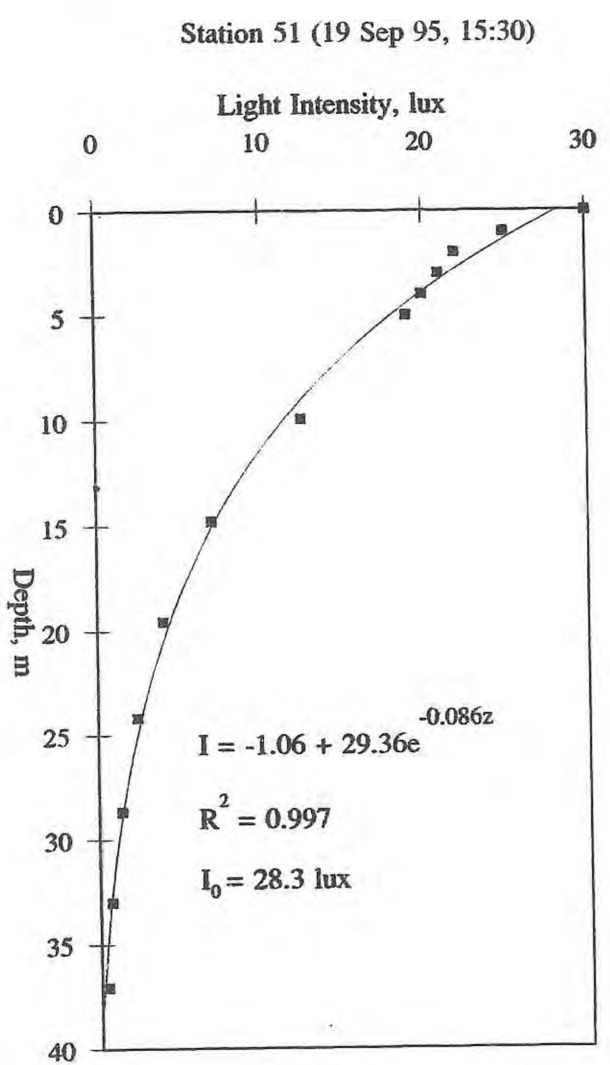


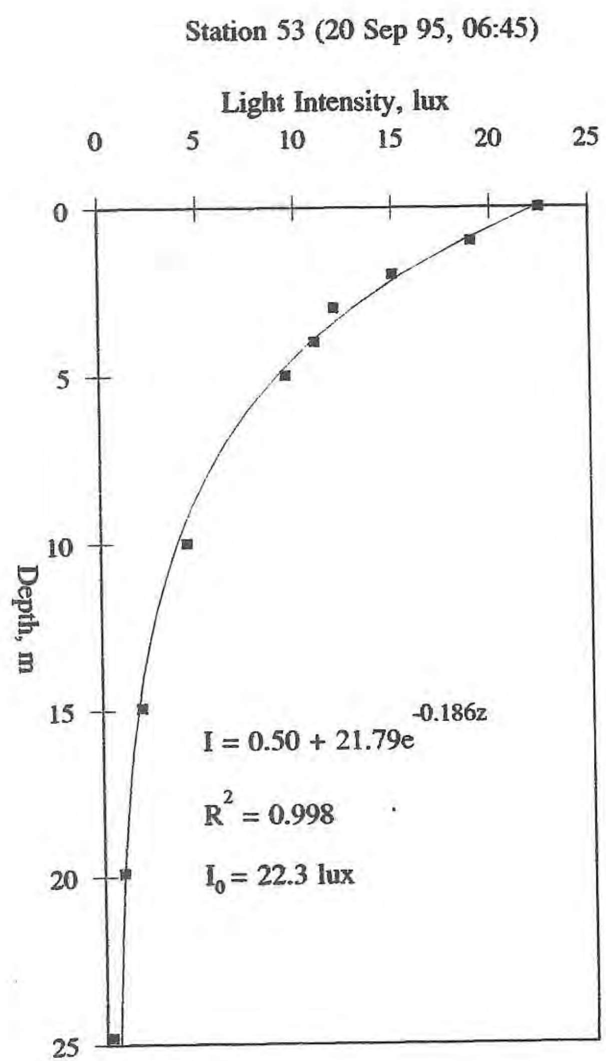
Station 49 (19 Sep 95, 06:45)

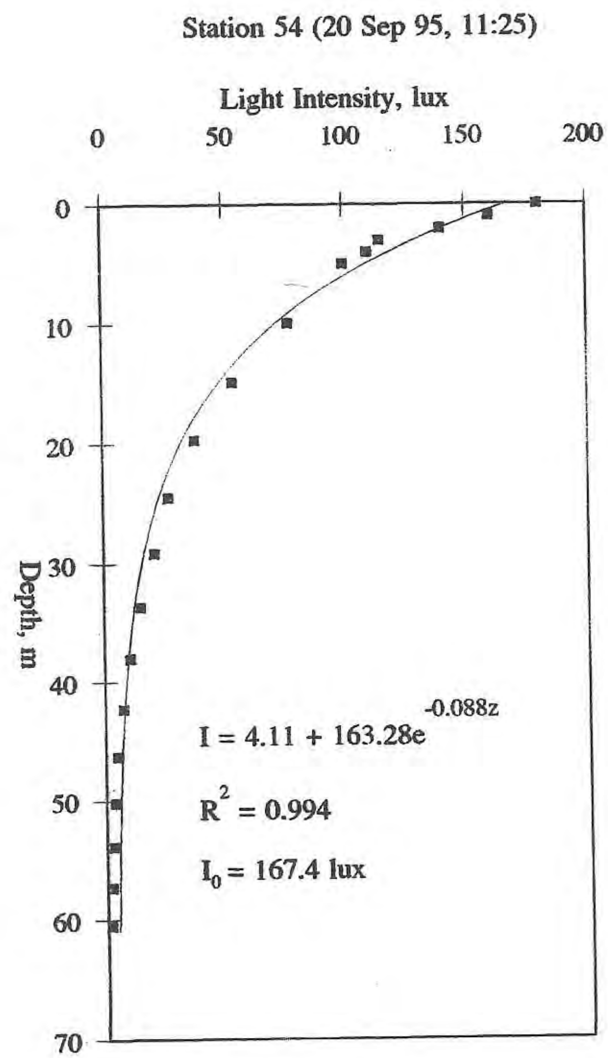


Station 50 (19 Sep 95, 11:15)

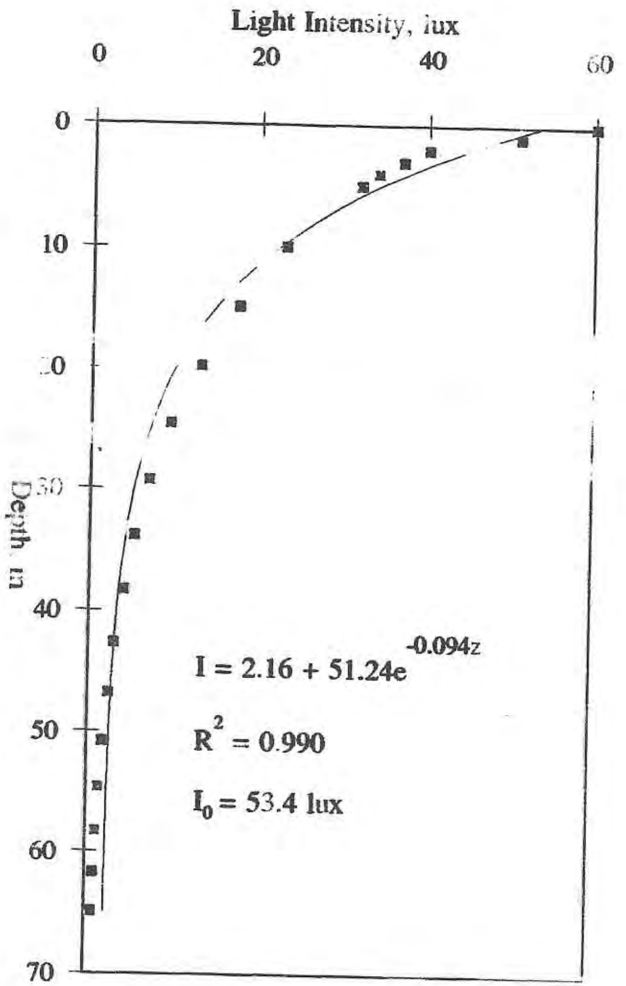



Station 51 (19 Sep 95, 15:30)
Light Intensity, lux
0
10
20
30
Depth, m
0
5
10
15
20
25
30
35
40
I = -1.06 + 29.36e^-0.086z
R^2 = 0.997
I0 = 28.3 lux

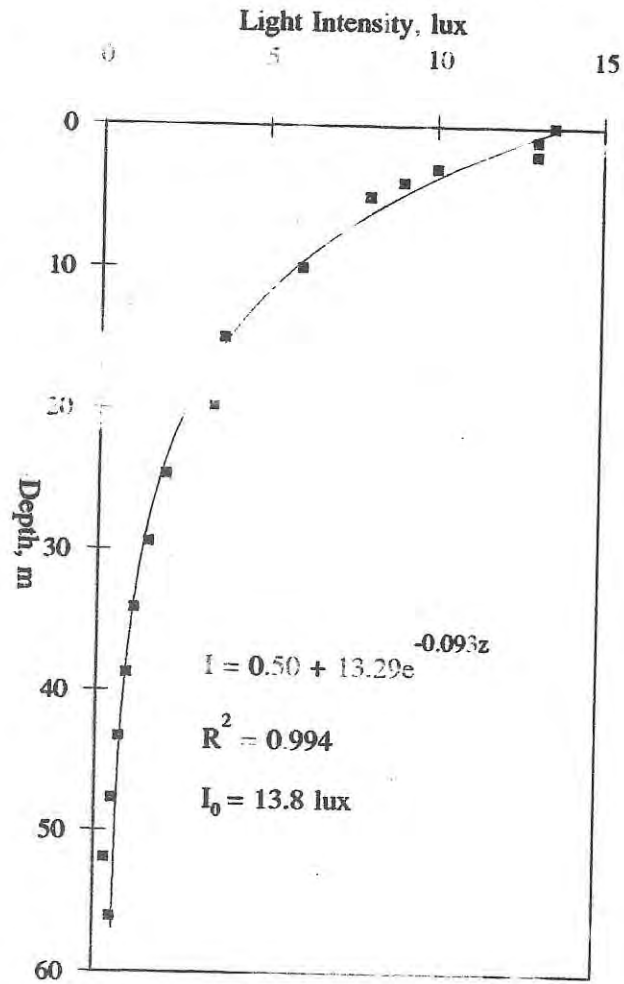

Station 53 (20 Sep 95, 06:45)
Light Intensity, lux
0
5
10
15
20
25
Depth, m
0
5
10
15
20
25
I = 0.50 + 21.79e^-0.186z
R^2 = 0.998
I0 = 22.3 lux


Station 54 (20 Sep 95, 11:25)
Light Intensity, lux
0
50
100
150
200
Depth, m
0
10
20
30
40
50
60
70
I = 4.11 + 163.28e^-0.088z
R^2 = 0.994
I0 = 167.4 lux

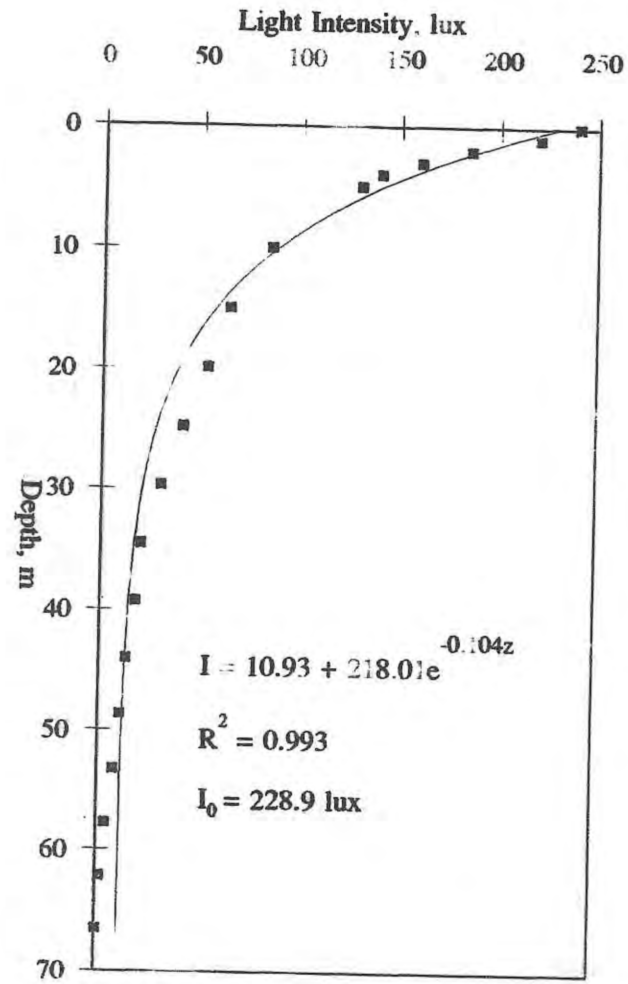
Station 55 (20 Sep 95, 15:30)

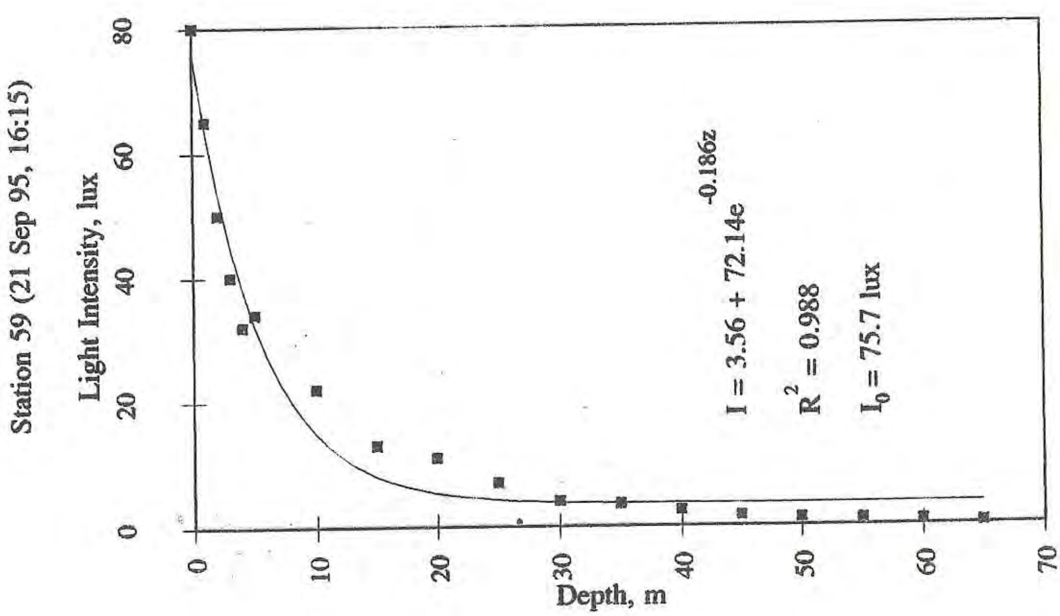


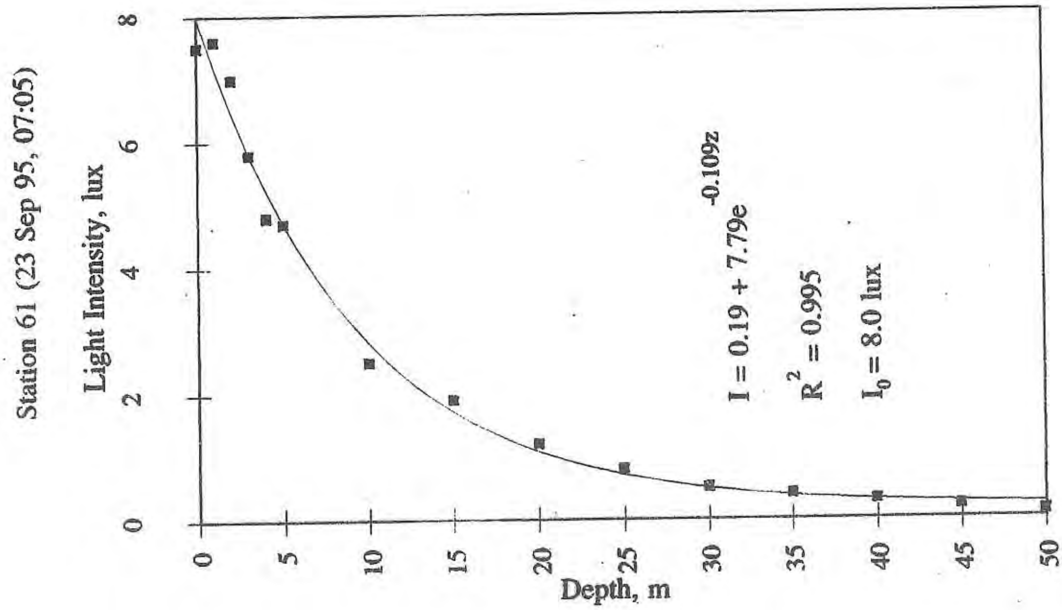
Station 57 (21 Sep 95, 06:35)

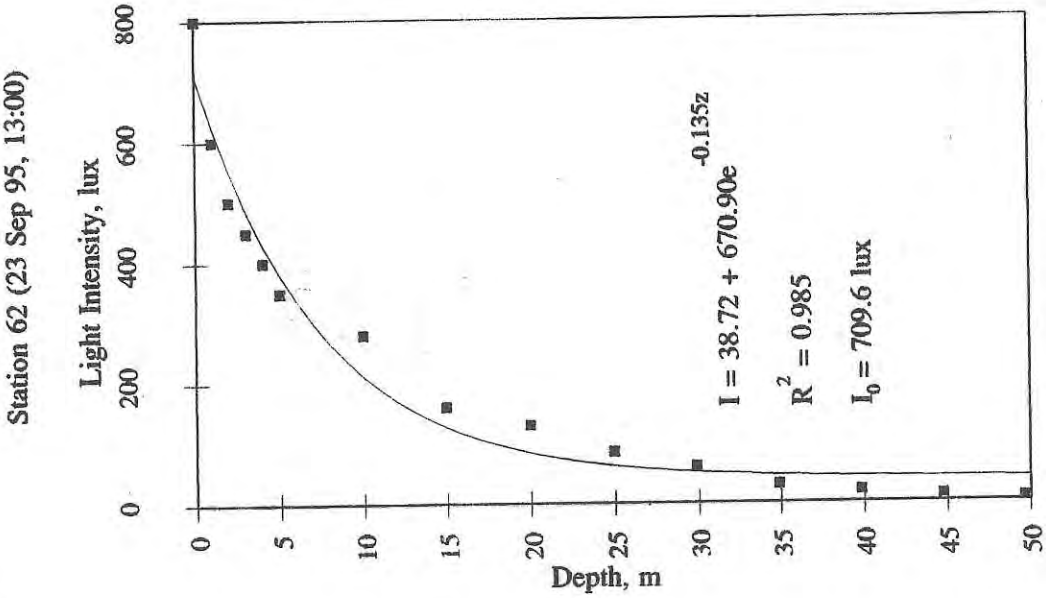


Station 58 (21 Sep 95, 12:10)

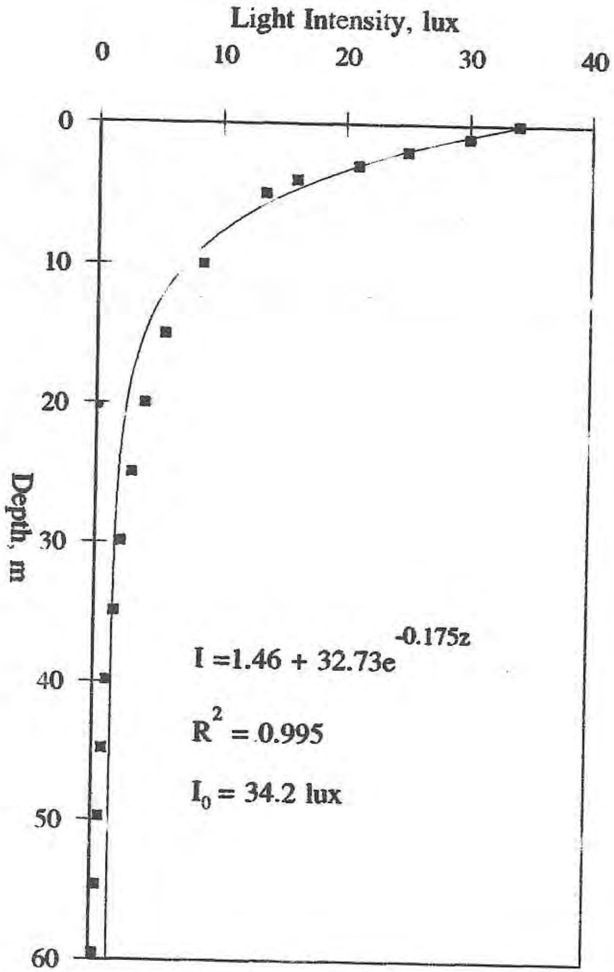



Station 59 (21 Sep 95, 16:15)
Light Intensity, lux
Depth, m
$I = 3.56 + 72.14e^{-0.186z}$
$R^2 = 0.988$
$I_0 = 75.7$ lux

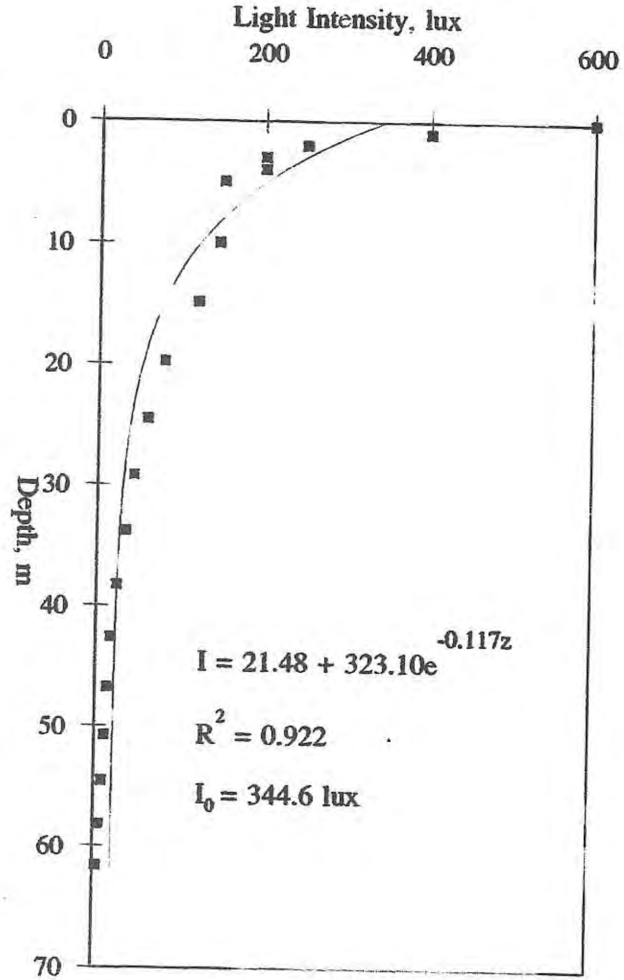

Station 61 (23 Sep 95, 07:05)
Light Intensity, lux
Depth, m
$I = 0.19 + 7.79e^{-0.109z}$
$R^2 = 0.995$
$I_0 = 8.0$ lux


Station 62 (23 Sep 95, 13:00)
Light Intensity, lux
Depth, m
$I = 38.72 + 670.90e^{-0.135z}$
$R^2 = 0.985$
$I_0 = 709.6$ lux

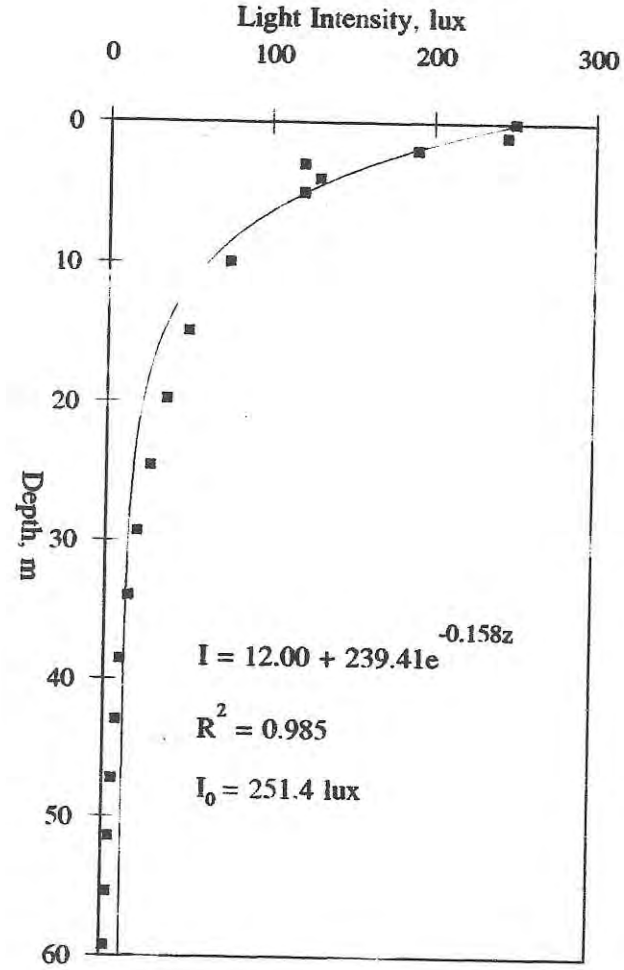
Station 63 (23 Sep 95, 17:00)



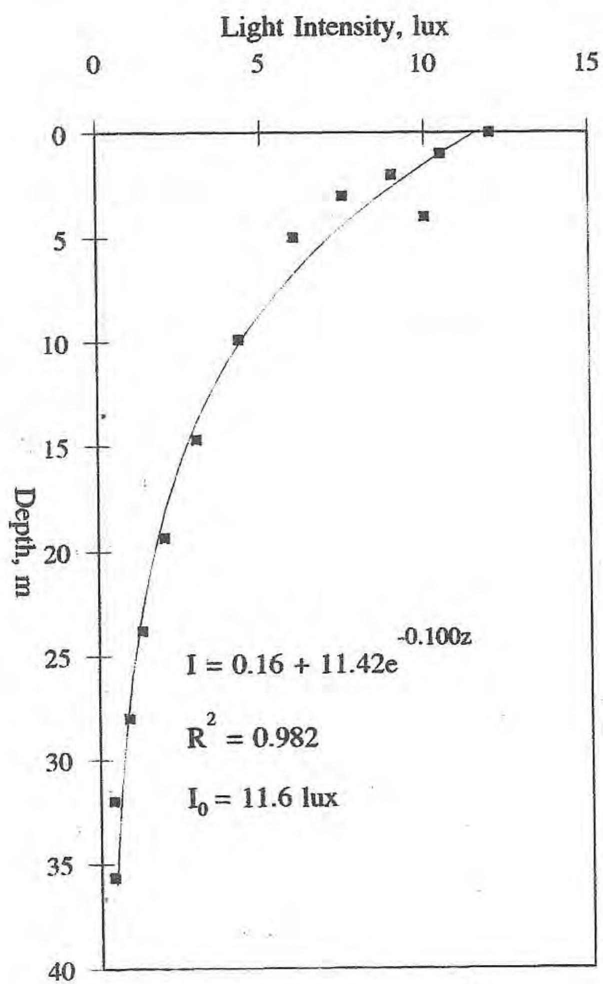
Station 65 (24 Sep 95, 09:45)



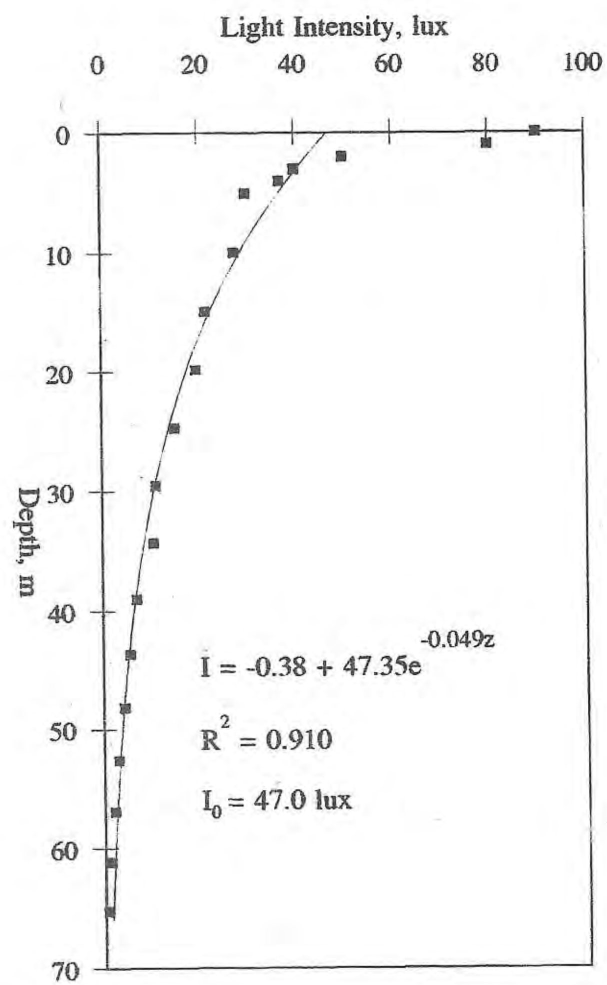
Station 66 (24 Sep 95, 13:10)



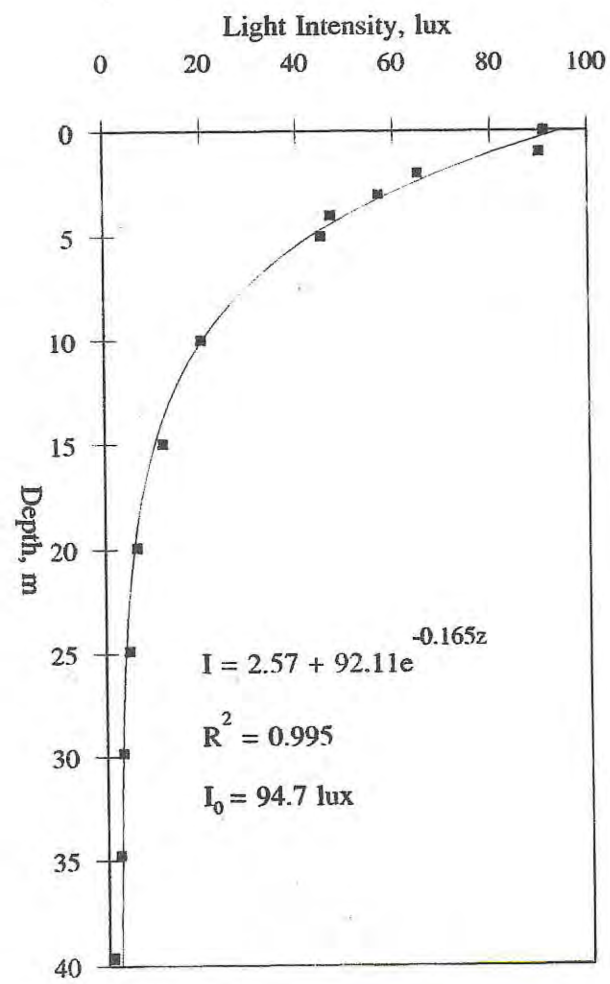
Station 68 (25 Sep 95, 06:47)

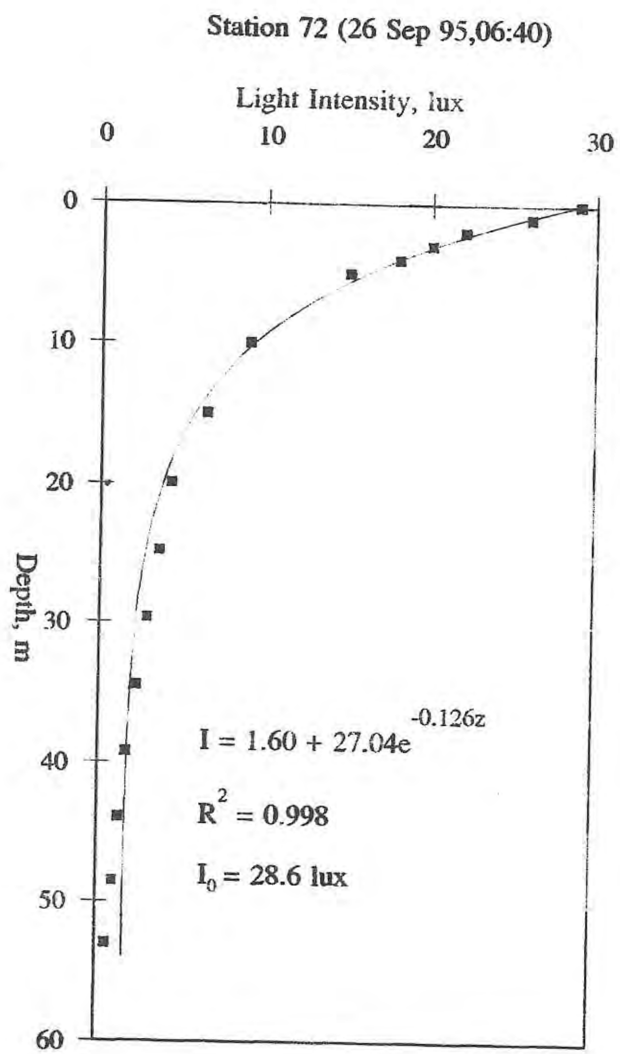


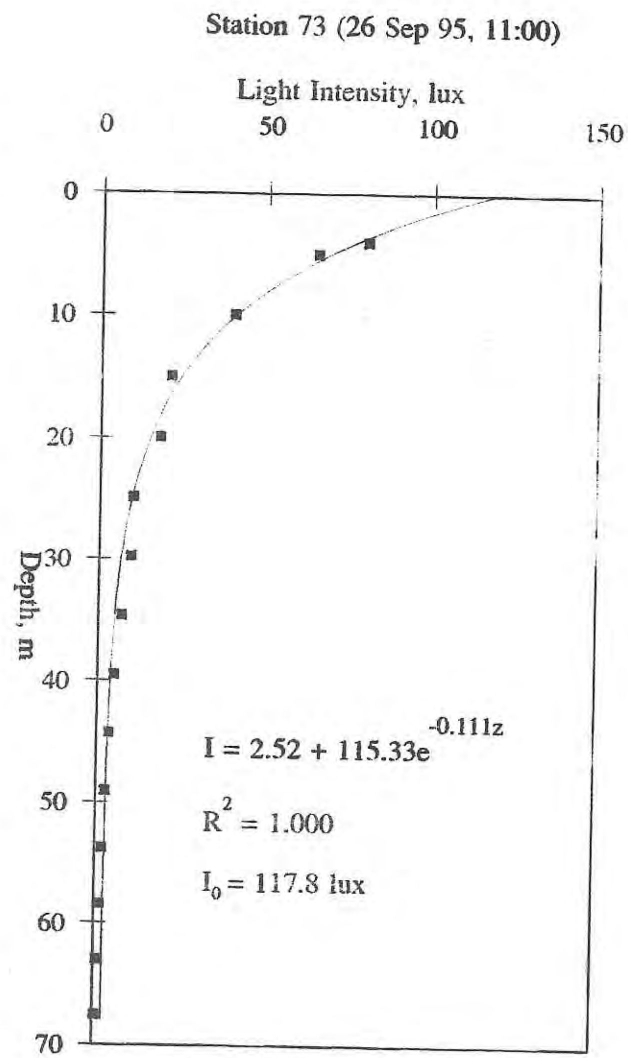
Station 69 (25 Sep 95, 11:00)

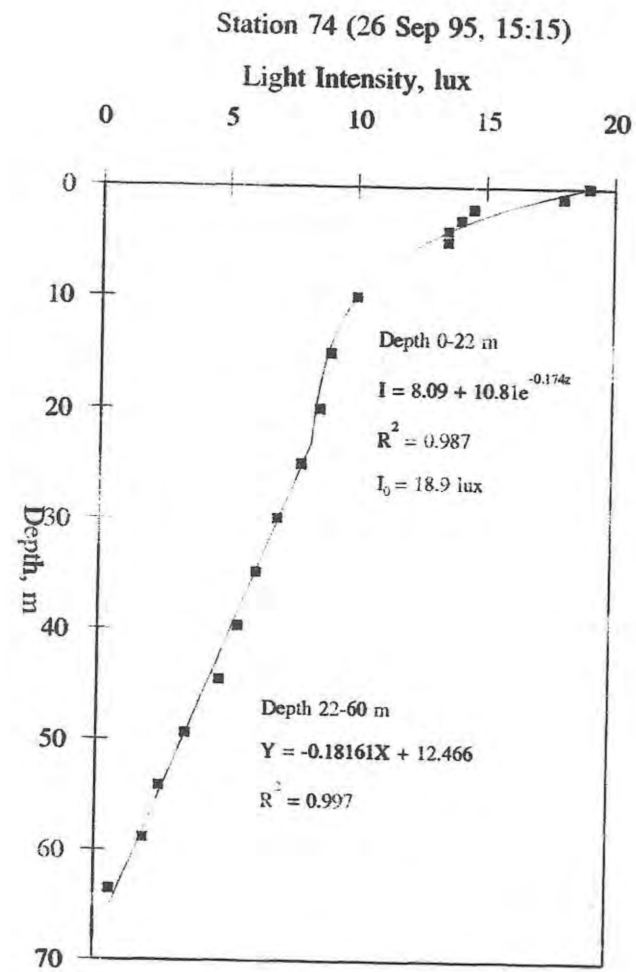


Station 70 (25 Sep 95, 15:20)

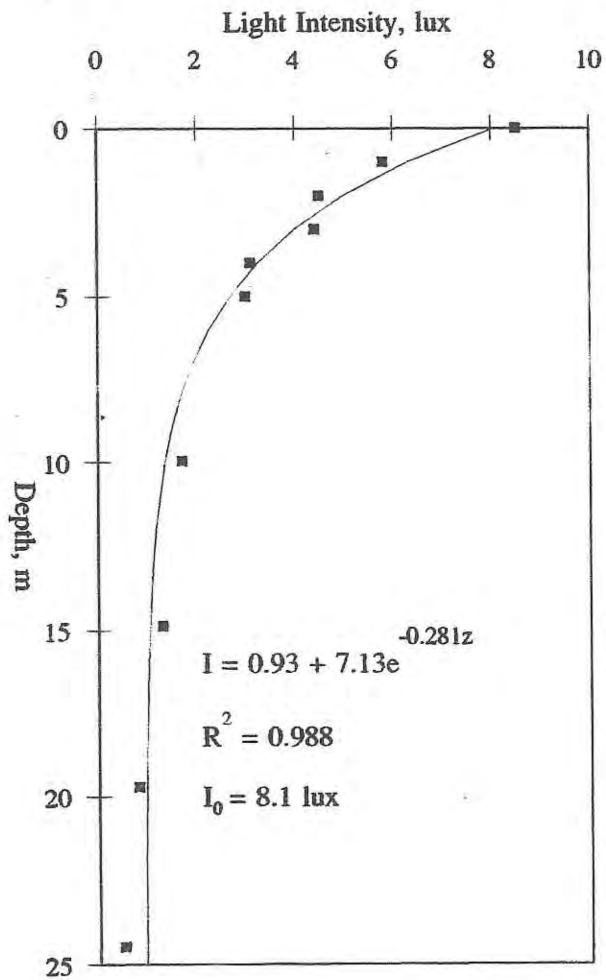



Station 72 (26 Sep 95,06:40)
Light Intensity, lux
0
10
20
30
Depth, m
0
10
20
30
40
50
60
I = 1.60 + 27.04e^-0.126z
R^2 = 0.998
I0 = 28.6 lux

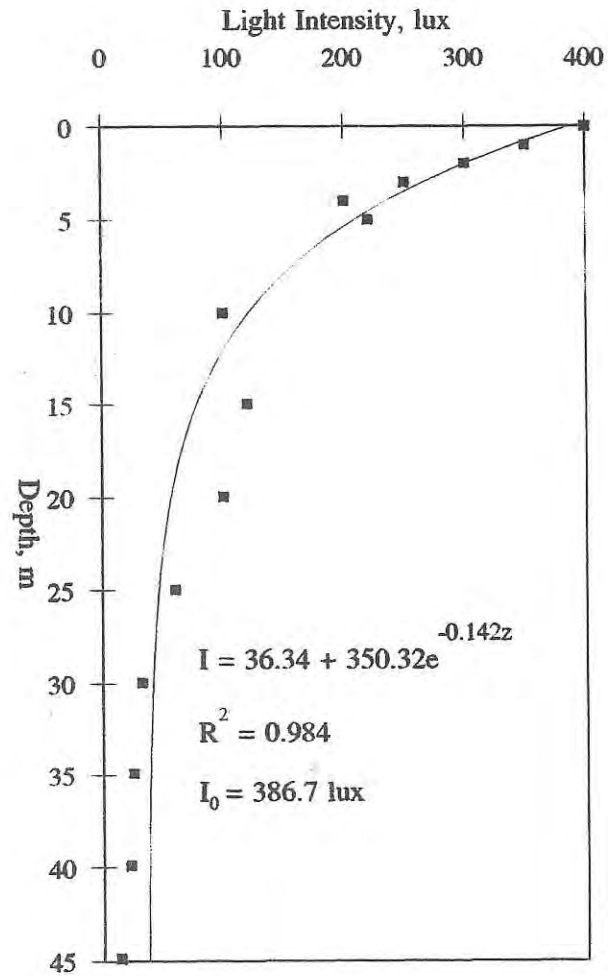

Station 73 (26 Sep 95, 11:00)
Light Intensity, lux
0
50
100
150
Depth, m
0
10
20
30
40
50
60
70
I = 2.52 + 115.33e^-0.111z
R^2 = 1.000
I0 = 117.8 lux


Station 74 (26 Sep 95, 15:15)
Light Intensity, lux
0
5
10
15
20
Depth, m
0
10
20
30
40
50
60
70
Depth 0-22 m
I = 8.09 + 10.81e^-0.174z
R^2 = 0.987
I0 = 18.9 lux
Depth 22-60 m
Y = -0.18161X + 12.466
R^2 = 0.997

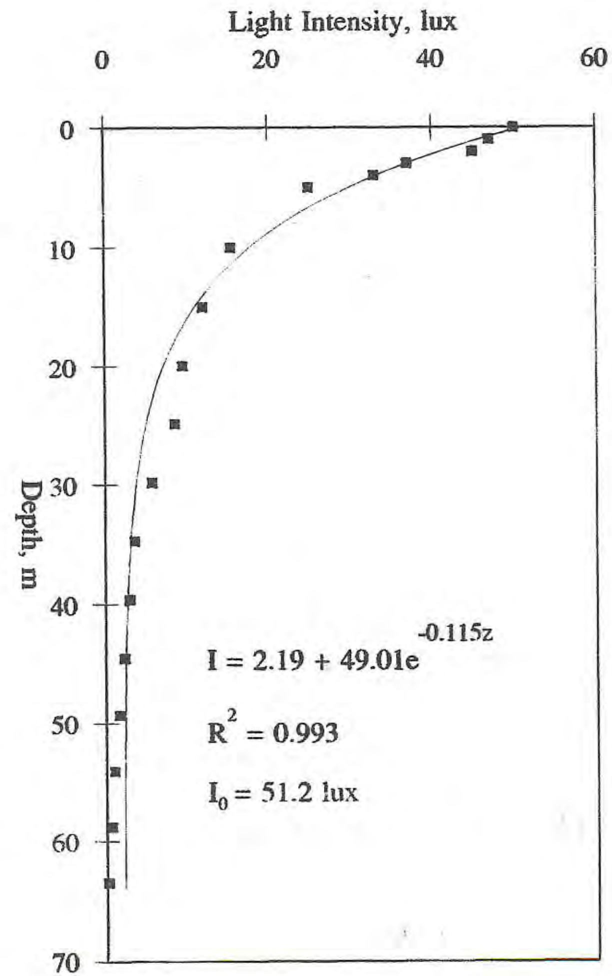
Station 76 (27 Sep 95, 06:30)



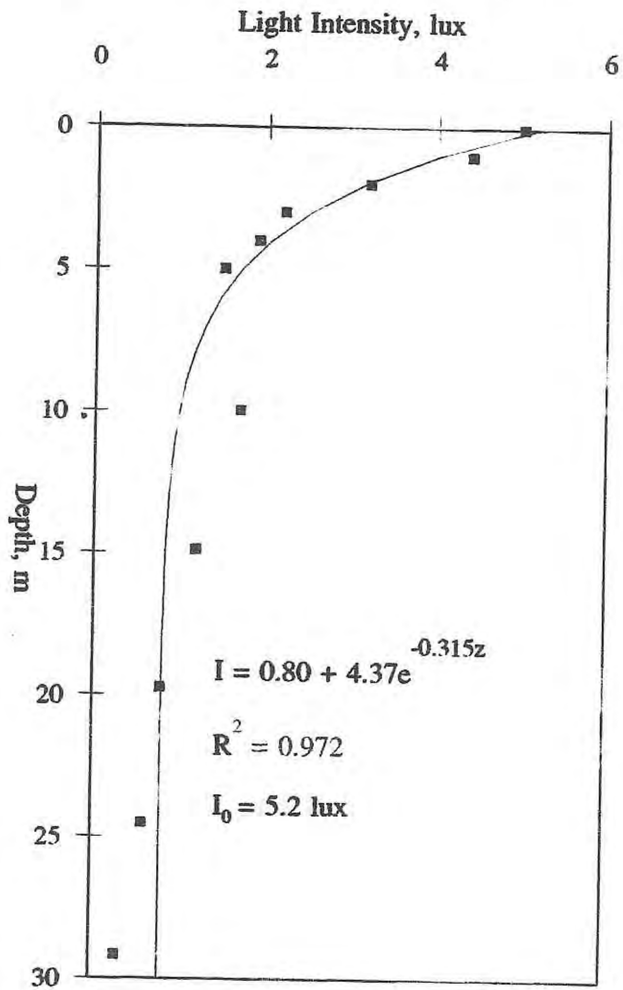
Station 77 (27 Sep 95, 11:35)



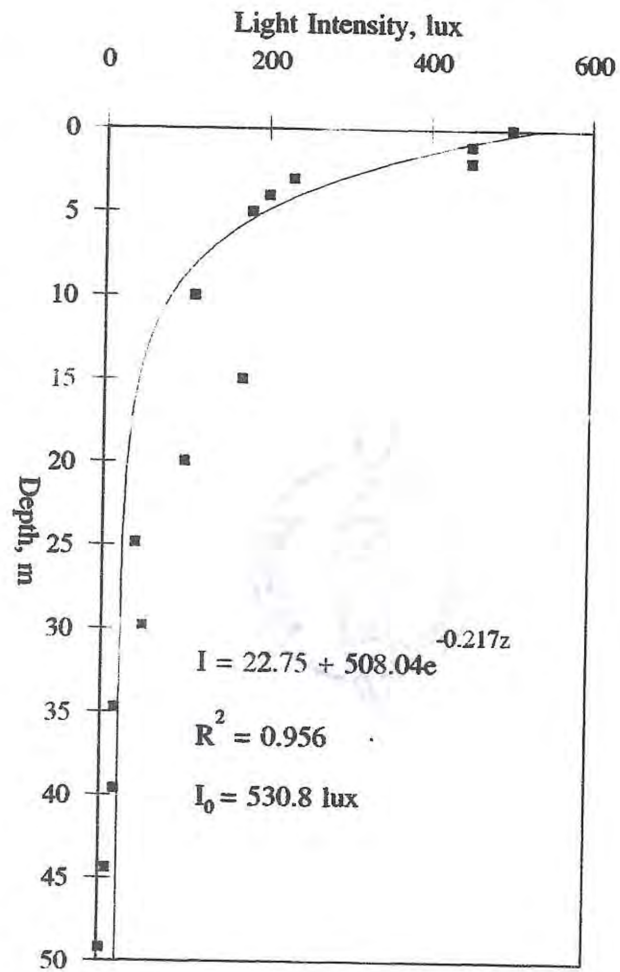
Station 78 (27 Sep 95, 15:45)



Station 80 (28 Sep 95, 06:17)



Station 81 (28 Sep 95, 11:15)



References

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Strickland, J. D. H. and Parsons, T. R. 1972. A Practical Handbook of Seawater Analysis. Fisk. Res. Bd. Can. Bull. 167, 310 pp.