NOGAP B.6; VOLUME 5: CHEMICAL DATA COLLECTED IN THE BEAUFORT SEA AND MACKENZIE RIVER DELTA, MARCH-JULY 1987

by

R.W. Macdonald, K. Iseki, M.C. O'Brien, F.A. McLaughlin, D. McCullough, D.M. Macdonald, E.C. Carmack, M. Yunker, S. Buckingham and G. Miskulin

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Abstract

Macdonald, R.W., K. Iseki, M.C. O'Brien, F.A. McLaughlin, D. McCullough, D.M. Macdonald, E.C. Carmack, M. Yunker, S. Buckingham and G. Miskulin, 1988, NOGAP B.6; Volume 5: Chemical data collected in the Beaufort Sea and Mackenzie River Delta, March-July 1987. *Can. Data Rep. Hydrogr. Ocean Sci.:* **60**, 56 pp

As part of the NOGAP B.6 program, with major objectives to determine hydrocarbon pathways and primary productivity of the waters overlying the Mackenzie Shelf. we measured water properties (biological. chemical and physical) on a transect out from Tuktoyaktuk to the shelf break. These measurements were made from early spring (March 1987) through to breakup (May 1987). We report here the chemical measurements made on water samples including salinity, dissolved oxygen, phosphate, nitrate, reactive silicate, chlorophyll *a*, total suspended solids, particulate organic carbon and nitrogen. Also included are the chemical measurements made on pumped samples collected during 2 trips to the Mackenzie River Delta in June and July, 1987.

Key words: Arctic, chlorophyll *a*, coastal zone, nutrients, oceanography, POC, PON, salinity, total suspended solids.

Résumé

Macdonald, R.W., K. Iseki, M.C. O'Brien, F.A. McLaughlin, D. McCullough, D.M. Macdonald, E.C. Carmack, M. Yunker, S. Buckingham and G. Miskulin, 1988, NOGAP B.6: Volume 5: Chemical data collected in the Beaufort Sea and Mackenzie River Delta, March-July 1987. *Can. Data Rep. Hydrogr. Ocean Sci.:* **60**, 56 pp

Dans le cadre du programme NOGAP B.6, portant principalement sur la dètermination des trajectoires des hydrocarbures et de la production primaire des eaux au-dessus du plateau continental Beaufort. nous avons mesuré les propriétés de l'eau (biologiques, chimiques, physiques) sur une ligne étendant de Tuktoyaktuk jusqu'á la dénivellation du plateau continental. Des mesures ont été prises du début du printemps (mars 1987) à la débâcle des glaces (mai 1987). Nous reportons ici sur les analyses chimiques des échantillons d'eau, en comprenant la salinité, l'oxygène dissolu, le phosphate, le nitrate, le silicate réactif, le chlorophyll *a*, les sédiments transportés en suspension au total, et les particules de carbone organique et d'azote. Les résultats de mesures chimiques effectuées sur des échantillons obtenus en juin et en juillet, 1987 avec une pompe à l'occasion de deux missions sur le delta de la rivière Mackenzie sont ègalement inclus.

Mots-clés: 56 Arctique, chlorophyll *a*, zone côtière, nutriments, océanographie, POC, PON, salinité, température, sédiments en suspension au total.

Acknowledgements

This work was funded by **Indian and Northern Affairs, Canada**, as part of the *Northern Oil and Gas Action Program*. The Frozen Sea group have over the years developed an impressive combination of personnel and equipment at the Institute of Ocean Sciences for working from the ice; thanks in particular are due to Ron Cooke and Syd Moorhouse for helping us get started. We are grateful for the support provided by Polar Continental Shelf Project; our program, along with many others, would have been impossible without them. We thank the pilots, H. Hanlon and R. Bolton, for getting us down on the ice safely and for their willing assistance which went far beyond the call of duty. Sample handling and preparation was greatly facilitated by the Winnipeg DFO laboratory at Tuk; we thank M. Lawrence for freely sharing his space with us. S. Thomson assisted with advice on style, and with final text-editing of this report. A. Ages translated the abstract into French. The manuscript was prepared using LaTeX.

1 INTRODUCTION

As part of a major inter-disciplinary study (NOGAP-B.6) to measure the transport and fate of hydrocarbons over the Beaufort Shelf and the primary productivity of these coastal waters we conducted a spring sampling program. This was operated out of Tuktoyaktuk, Polar Continental Shelf Project, and used fixed-wing and rotary-wing support vehicles to carry out the sampling. The Mackenzie River Delta sampling, performed by Seakem Oceanography Ltd., was carried out during two 10-day trips from Inuvik in June and July using the "R-28", a 10 m aluminum workboat. To complete the field program, a cruise was carried out on the C.S.S. *John P. Tully* in the summer of 1987.

The primary logistic goals (1987) for the work done by Institute of Ocean Sciences staff were as follows:

- Collect time series measurements from late winter through to late summer for physical, chemical and biological properties on a transect extending from Kugmallit Bay (Mackenzie River) to the Shelf edge. This would include short-term sediment trap and current meter moorings, and *in situ* pump deployment.
- Deploy and recover moorings at the shelf edge (4 sites) to measure currents, light transmissivity, and sedimentation throughout the entire season (March 1987 - March 1988).
- Make measurements to delineate plume structure in the near-shore zone with and without ice-cover.

These measurements are augmented with satellite imagery, and Mackenzie River source functions for water flow, sediment discharge, and hydrocarbon content.

In this document we report the supporting chemical oceanographic data collected during the **spring ice program.** A brief overview of the samples collected from the ice is given below: **bold** font is used for data which have been fully analyzed and are reported here in the accompanying tables, normal font is used for data which have been collected concurrently and are, or will be, available elsewhere. *Canadian Data Reports of Hydrography and Ocean Sciences* available in the NOGAP B.6 series are listed inside the back cover.

- Water samples (hydrocasts, pumping); **salinity, dissolved oxygen, nutrients (reactive silicate, phosphate, nitrate plus nitrite)**, oxygen isotopes, **total suspended solids, particulate organic carbon and nitrogen, chlorophyll** *a*, pigments by HPLC, ^{14}C productivity, **total carbon dioxide**, total organic carbon, phytoplankton, particle identification by scanning electron microscopy, and particulate organic carbon and nitrogen, isotopic composition (^{13}C, ^{15}N).
- Radium isotopes.
- Water samples (Seastar Pump and large volume filtration); for hydrocarbons, particulate and dissolved.
- Zooplankton (vertical net hauls; 300 μm mesh, 0.45 m diameter, 1.5 m length, preserved in buffered formalin).
- Conductivity, Temperature, % Transmission and Pressure; Applied Microsystem and Guildline CTTD systems [*McCullough et al*, 1988].

- Light intensity; Photosynthetically Active Radiation (PAR) was measured continuously at PCSP, Tuktoyaktuk (LI-COR quantum sensor LI-192SA), and with vertical under-ice profiles (LI-COR underwater spherical quantum sensor LI-193SB) and albedo of the ice.
- Ice algae
- Ice cores for particulate and dissolved hydrocarbons and for salinity and δ^{18} measurements.
- Satellite imagery; temperature, turbidity, and ice distribution.
- Short-term (5-day) sediment trap (bongo) moorings.
- AML (vector averaging) current meter, R.D. Instruments doppler current meter measurements.
- Wind and weather records (logged at Tuktoyaktuk and at a fixed station on the ice).

1.1 Stations

1.1.1 Station Nomenclature

Each station has been given a two-part designation; xP-yQ, where x and y are numbers and P and Q are letters. The alpha-numeric *before* the hyphen refers to location; this is simply a number for planned stations on the main transect(s) across the shelf and a number followed by a letter for stations which were added on site (to trace interesting water features or substituted due to inability to land at the chosen site). For a few stations, the letter precedes the number; these are either the 4 'SS' stations at which we placed sequential trap/current meter moorings or near-shore transects which were added to the program in the field to delineate the plume structure (mostly CTTD work). The Mackenzie River Delta samples are named according to the channel where the sampling took place: MM, MR, and ME refer to sampling in the Middle, Reindeer and East Channels respectively. The alpha-numeric *after* the hyphen refers to time period (see itemized list below) and sequential visit to a station within time period (letter). An example of a typical station number would be 5A-2B; this refers to station 5A (close to station 5), the second sampling period (late April), and the third time within that period that we visited the station. Dates and locations for all stations are given in the Table headers. Data collection periods for the 1987 NOGAP B.6 arctic program are listed below, with **bold** font used for the chemical data presented in this report.

1. **March 30 - April 11 (ice work)**
2. **April 23 - May 6 (ice work)**
3. **May 21 - May 30 (ice work)**
4. **June 2 - July 30** (ice work (CTD only), **Mackenzie River sampling**)
5. July 31 - August 30 (C.S.S. *John P. Tully*, shore peat sampling)
6. Aug 31 - Sept 9 (C.S.S. *John P. Tully*)

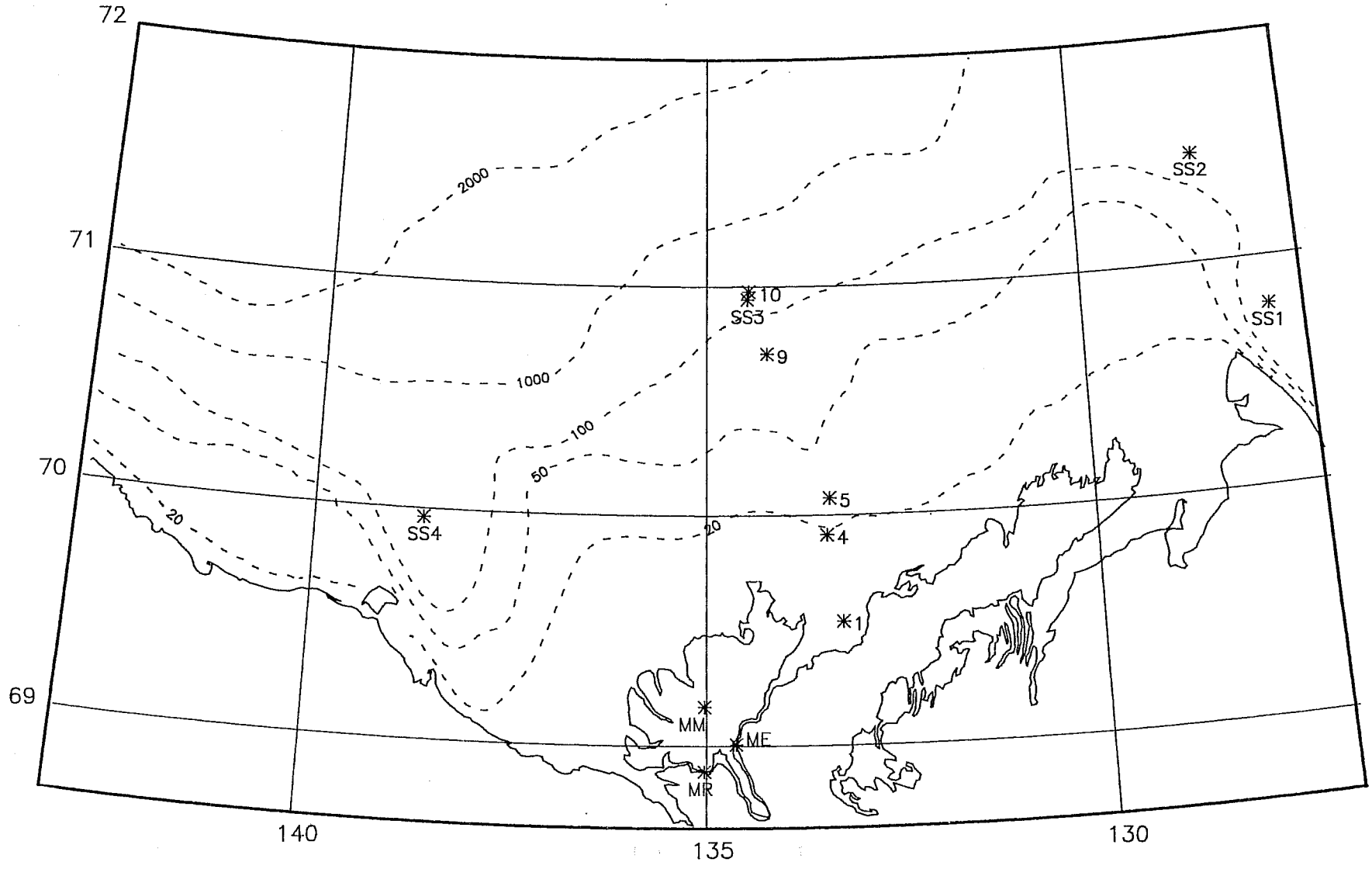

Figure 1: Station locations

1.1.2 Station Locations

Figure 1 shows the station locations for the sampling periods included in this report. The main station locations were predetermined using hydrographic charts and modified in the field where required. For each site, the pilot would navigate to the chosen area using a Global Navigation GNS 500 VLF/Omega positioning system. Past experience shows that these avionics can place the aircraft inside a radius of 1000m from the true position. The avionics were shut down with the aircraft and re-initialized after start-up when sampling was complete.

2 METHODS

2.1 Field Sampling

Sampling equipment and personnel were flown from PCSP in Tuktoyaktuk to the selected site by fixed wing aircraft (Twin Otter) or helicopter (Bell 206L Long Ranger). A 25 cm hole was augered in the ice, and a Hurry-Tent set up over it. Sampling equipment including hand winch, meter block, Go-Flo bottles and large volume pump systems, were deployed inside the tent to protect them and collected samples from freezing; heat was supplied by a kerosene-fueled Master Heater. The large-volume submersible pump system was constructed of 316 stainless steel with a magnetically coupled impellor (Ryton gears, Teflon 'O' rings).

Samples were collected with multiple casts, usually only one or two depths being sampled per cast. Subsampling from the bottles followed the normal oceanographic procedure of dissolved oxygen and total CO_2 first, followed by salinity, nutrients (subsequently placed outside the tent to freeze them), total organic carbon, and oxygen isotopes. (Alternatively, water was pumped to the surface through an armoured Teflon TFE hose; the free-flowing pump delivery ($6l$/min) was then subsampled into appropriate containers with a small latex rubber tube.) The remaining contents of the water bottle were drained into a large (25 l) twice-rinsed polyethylene carboy via a polyethylene funnel. These carboys were protected from light and temperature changes with insulated container boxes. All samples were then returned as quickly as possible to the DFO laboratory at Tuktoyaktuk; generally 1-6 hours lapsed before samples could be further processed.

The large-volume carboys were subsampled at the laboratory for total suspended particulates (TSS), particulate organic carbon and nitrogen (POC/PON), particulate organic carbon and nitrogen isotopic composition (δ^{13}C, δ^{15}N), chlorophyll a, pigments by HPLC, phytoplankton identification and samples for productivity incubations. During the subsampling process, care was taken to agitate the carboys gently to resuspend particles, and homogenize samples.

Oceanographic thermometers were not used due to the difficulty of manipulating them through an ice hole, and the rough treatment they would receive in the field. Further, we wanted to sample for particulates which required inversion of sampling bottles, a process particularly hard on high-performance reversing thermometers. Temperatures are generally available from CTD casts carried out at the same location; these data are reported elsewhere [*Macdonald et al*; 1988].

Mackenzie River Delta water samples were collected with a pumping system constructed to allow collection of trace hydrocarbon samples. The pump (see above) was suspended from the bow of the sampling vessel at a nominal depth <30% of channel depth at that station (i.e. moored at East Channel < 1.5m; Middle Channel <2m; Reindeer channel <2m). Water was drawn through a Teflon mesh (297 μm), pumped through the Teflon hose to a distribution system on board and sampled into a $4l$ bottle. Samples were filtered and treated within 15 minutes.

Table 1: Estimates of error: basis of calculation and error models are given in the text.

measurement	units	precision (s_p)	Standard Reference Material
Salinity	psu	0.006	IAPSO Seawater
$\delta^{18}O$	$^o/_{oo}$	0.11	V-SMOW
Silicate	mmol m^{-3}	1.3	Sagami
Nitrate	mmol m^{-3}	0.5	Sagami
Phosphate	mmol m^{-3}	0.14	Sagami
Dissolved O_2	mmol m^{-3}	3.5	Sagami KIO_3
TSS	mg l^{-1}	0.015 or 4.4%†	No SRM available
POC	μg l^{-1}	1.2	Acetanilide
PON	μg l^{-1}	0.6	Acetanilide
Chl *a*	mg m^{-3}	0.23 - 0.01†	No SRM available

† Varies with concentration of the sample - see text.

2.2 Laboratory Methods

Errors for the various methods reported here are expressed as precision and accuracy as summarized in Table 1. Pooled variance, s_p, is calculated as

$$s_p = \sqrt{\frac{\nu_1 s_1^2 + \cdots + \nu_i s_i^2}{\nu_1 + \cdots + \nu_i}}$$

where $\nu_i = n_i - 1$ degrees of freedom, and the n_i and s_i refer to the number of replicates and their standard deviation for the individual components used in the pooled standard deviation calculation.

2.3 Salinity

Salinity samples were drawn into 200 m*l* salinity bottles after 3 rinses from 10 *l* Go-Flo bottles or by pumping. The samples were then capped tightly and care was taken to avoid freezing during sampling or transport.

The salinities were analyzed at the DFO laboratory in Tuk on a Guildline Autosal (Model 8400A) instrument; data are reported in practical salinity units (psu) [see *Lewis and Perkin*; 1978]. During analyses the instrument was standardized against Standard Sea Water of Chlorinity 19.373 ($K_{15} = 0.99997$). The Standard Sea Water was obtained from Standard Seawater Service, Institute of Oceanography, Wormley, Godalming, Surrey, England (P95, 8/3 1983). Precision of the analysis was evaluated from 16 independent duplicates. Four of these were drawn from Go-Flos and the remainder were sampled with the aid of a submersible pump. The duplicate taken at Station 9-1, 50m was eliminated because the large salinity difference (0.14) can be explained environmentally (separate casts); the other 3 were "within bottle" duplicates. The pooled standard deviation was $s_p = 0.006, \Sigma\nu = 15$.

2.4 Dissolved Oxygen

Dissolved oxygen samples were "pickled" immediately in the field, protected from freezing, and returned to the Tuktoyaktuk laboratory for determination by the "Micro-Winkler" technique. Analyses were carried out within 24 hours of collection. Calibration of the thiosulphate solution was

carried out with each titration set (daily) by using Sagami primary standard KIO_3. Precision of the method was routinely monitored with blind replicate samples drawn at a frequency of about 25% from the Go-Flos or pumping system. For the data reported here, the pooled standard deviation was $s_p = 3.5$ mmolm^{-3}, $\Sigma\nu = 35$.

2.5 Nutrients

Samples for nutrient determination were collected into twice- rinsed glass and polystyrene test tubes (2 glass and 2 polystyrene tubes per sample), placed upright in the snow to freeze before being transported back to the lab in Tuk where they were stored in a freezer. During sampling period 3 (May 21- May 30) the samples were no longer freezing outside. Therefore, the samples were placed in a cooler when possible or buried upright in the snow until transported to Tuk where they were frozen upright. Frozen samples were air-transported to the Institute of Ocean Sciences in coolers lined with ice packs; on some trips partial thawing occured before getting the samples into the freezer at the Institute of Ocean Sciences. Where there was visible turbidity, the samples were not subsampled in the field but rather from the large volume carboys. The water was filtered through a washed (200ml) Millipore 0.45 μm type HA membrane filter in the lab at Tuk before being subsampled into tubes and frozen. Mackenzie River Delta samples were filtered through nuclepore filters and either frozen or acidified and stored at room temperature.

Nutrient determinations were performed using Technicon Autoanalyzer II components. Reactive silicate and nitrate plus nitrite were determined according to Technicon Industrial Methods No. 186-72 W and 158-71 W respectively, and soluble orthophosphate was determined using a modified Technicon method [*Brynjolfson;* 1973]. Sagami standards, prepared in 30.5°/$_{oo}$ NaCl solutions, were used to calibrate secondary standards which were prepared daily.

The samples were analyzed in duplicate (different days), 17% of which were relabelled and analyzed as blind replicates. Phosphate concentrations were determined on samples thawed and analyzed immediately. The silicate and nitrate concentrations were determined on samples thawed for 24 hours [see *Macdonald et al;* 1986] before analysis. Nutrient concentrations listed in the data tables are the average value of the duplicate analyses. Silicate values reported for the following samples are from the analysis of acidified and refrigerated samples: 33, 34, 37, 38, 71, 72, 75, 76, ME-4, MM-4, and MR-4. The remainder are from the analysis of frozen samples.

The precision of the methods based on blind replicates and control samples was found to be: silicate, $s_p = 1.3$ mmol m^{-3}, $\Sigma\nu = 105$; phosphate, $s_p = 0.14$ mmol m^{-3}, $\Sigma\nu = 111$; nitrate, $s_p = 0.5$ mmol m^{-3}, $\Sigma\nu = 110$.

2.6 Total Suspended Solids

Sampling and analytical methods are detailed in an Ocean Chemistry protocol [*Macdonald et al.*;1983], and are described briefly below.

Following gentle shaking of the polyethylene carboy, volumes of water ranging from 1 l to 4 l were subsampled into 2 l polybottles. As much water as possible (depending on particle loading) was then filtered through a pre- washed, acid-cleaned, and pre-weighed 0.45 μm, 47 mm Nuclepore filter using polycarbonate castles mounted on a vacuum manifold. The volume filtered was recorded to the nearest 10 ml. After the filtered water had passed through the filter, it was rinsed with three 10 ml portions of 3% ammonium carbonate in Double Milli-Q water followed by three small rinses around the filter perimeter after the castle had been removed. Blanks were prepared by periodically placing a second filter underneath. All filters were stored in acid-cleaned petri slides in a freezer and returned to the Institute of Ocean Sciences. The Mackenzie River Delta samples were filtered through a Millipore stainless steel apparatus; otherwise they were treated identically.

Filters were dried at 40°C overnight and weighed on a Mettler M3 autobalance to the nearest 0.001 mg. Calibration was carried out with an internal 100 mg weight. The instrument is linear, and calibration does not appear to contribute significantly to error; the major weighing problem is static, and this was controlled with a Po α-source static eliminator. For the data reported here, the average blank was found to be 0.019 mg/l, s=0.010, $\Sigma\nu$ =20. The pooled standard deviation of replicate determinations is as follows: for samples lower than 1 mg/l at deep stations (< 0.25mg/l), s_p = 0.015 mg/l, $\Sigma\nu$ = 15; for all samples < 1mg/l, s_p = 0.041, $\Sigma\nu$ = 20. For samples < 5 mg/l, s_p = 0.075, $\Sigma\nu$ = 26, and for samples > 50 mg/l, CV_p = 4.4%, n = 7. In general, precision is estimated as ±)0.015 mg/l or ±4.4% whichever is the larger.

Repeatability of deep water measurements where particle concentrations are very low suggest that the precision of the method, including errors of sampling, sample handling, blank correction and weighing, is less than ±0.05 mg/l (1 σ). Absolute accuracy of the balance has been established to be better than ±0.01 mg by reference to the class 5 NBS weights; absolute accuracy of the method of filtration is defined by the operation of passing through a 0.45 μm filter [see *Brewer et al.*; 1976].

2.7 Particulate Organic Carbon and Nitrogen

Water samples (1-6 l) were vacuum filtered ($\leq$ 150 mm Hg) through single 47 mm diameter pre-combusted (500°C, 1hr) Whatman GF/F glassfiber filters. The residue on each filter was rinsed with 10 ml, 3% NaCl solution. Filters were then stored inside pre-combusted aluminum foil in a deep freezer (- 20°C) until analysis. Blank filters were prepared by treating them like sample filters without filtering a water sample. For the Mackenzie River Delta samples, 250 ml were filtered through precombusted Whatman GF/C glassfiber filters and rinsed with 10 ml, 3% NaCl solution. Filters were dried at 50°C overnight and treated with concentrated HCl vapour in a closed container for 8 hours to remove inorganic carbon. After the filters were dried again at 50°C for several hours, organic carbon and nitrogen on the filters were analyzed using a Perkin-Elmer Model 240 elemental analyzer. The analytical error of individual determinations varied according to the volume of water filtered. Blanks were equivalent to 0.0μgN/l (s = 0.6μgN/l, n=7) and 9.2 μgC/l (s = 1.2μgC/l, n=7) for a one l sample. [see also *Iseki et al.*;1987]. Acetanilide was used to standardize the instrument for carbon and nitrogen. Precision for the method was estimated from the regression on the calibration curve, and the standard deviation around the blanks.

2.8 Chlorophyll *a*

Water samples (0.25-1.0 l) were filtered through 24-mm diameter Whatman GF/F glass fiber filters. Approximately 1 ml of 1% $MgCO_3$ solution was added to the samples just before filtration was complete. The inside of the filtration funnel was rinsed with about 10 ml of filtered sea water while continuing the filtration. After filtration, the filters were folded in half, placed in filter paper folded into quarters, labelled, and stored frozen in a dark bottle with silica-gel in a deep freezer. Chlorophyll *a* was determined fluorometrically with a Turner Design fluorometer [*Strickland and Parsons*; 1972]. Blanks were estimated from deep-water samples (where chlorophyll concentrations are known to be low) to be less than $\bar{X}$ = 0.014 mg m^{-3} (s= 0.008, n=15), and pooled standard deviation of replicates was s_p = 0.23 mg m^{-3}, (n=10).

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4 APPENDIX 1; DATA TABLES

4.1 Footnotes to the TABLES

a Possible analytical problems with oxygen and phosphate values for station SS3-1, 90 meters.

b Silicate values are from samples that were acidified and refrigerated (not frozen). Applies to sample numbers 33, 34, 37, 38, 71, 72, 75, 76, and 120 and Mackenzie River samples ME-4, MM-4, MR-4.

c Two holes drilled for PAR measurements, ice depths are 1.9 and 2.5 meters.

d No fix taken but should be very close to stations 1-1 and 1-3.

e Station originally named 4-2′, information on this station is incomplete. Record shows that there were water samples taken at 0.5 and 7 metres and also that an ice algae sample was taken. The POC and PON results are included in the tables. TCO2 samples were collected at 0.5, 3, and 8 meters to augment the productivity data for station 4-2 (30/04/87) but the data are not reported here. Data available for the ice algae sample are as follows : Subsample 1 - Sampled in the field. - (POC - 12900 $\mu g/l$; PON - 20018 $\mu g/l$ (50 ml filtered))
Subsample 2 - Frozen and sampled fall 1988. - (POC - 12926 $\mu g/l$; PON - 1848 $\mu g/l$; TSS - 61.37 mg/l; CHLa - 701.9 mg/m^3).

f GNS not working well for this fix.

g Samples 116 and 117 have only frozen silicate values available (low salinity samples).

h O16/O18 value for station ME-3 is an average of two values (20.4 and 20.0) – *Delta 18 values are not reported here.*

i The POC and PON values for the Mackenzie Delta samples are actually averages of two to four separate samples.

STATION: 1-1

DATE:	11/04/87	TIME:	1415 (Z+7)
DEPTH:	2 m	ICE THICK:	1.40 m
LATITUDE:	69 32 N	LONGITUDE:	133 17 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	37	0.16	395	0.02	68.4[b]	8.9
1.5	38	0.16	392	0.01	68.4[b]	9.4

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	37	176.4		22.0		0.115		3.11
1.5	38	91.2		10.5		0.113		2.69

b:- see footnotes, page 9.

STATION: 4-1

DATE:	09/04/87	TIME:	1607 (Z+7)
DEPTH:	13 m	ICE THICK:	1.40 m
LATITUDE:	69 53.3 N	LONGITUDE:	133 24.0 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	33	9.61	487	0.11	64.1[b]	4.8
3	34	13.29	439	0.24	57.1[b]	6.8
8	35	30.42	346	0.94	19.5	5.6
12	36	30.48	349	1.11	19.3	5.5

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	33	97.3		13.6		0.633		0.54
3	34	70.8		8.6		0.472		0.61
8	35	43.7		6.7		0.133		0.75
12	36	142.3		18.8		0.084		2.34

b :- see footnotes, page 9.

STATION: 5-1A

DATE:	07/04/87	TIME:	1042 (Z+7)
DEPTH:	28 m	ICE THICK:	1.38 m
LATITUDE:	70 02.6 N	LONGITUDE:	133 26.3 W

DEPTH	SAMPLE	SALINITY	OXYGEN	PHOSPHATE	SILICATE	NITRATE
m	#	X10^3	mmol/m3	mmol/m3	mmol/m3	mmol/m3
0	30	30.07	389	0.90	20.7	5.2
3	31	30.05	388	0.99	21.1	5.3
8	32	30.30	381	0.87	18.4	4.8

DEPTH	SAMPLE	POC CAST 1	POC CAST 2	PON CAST 1	PON CAST 2	CHLa CAST 1	CHLa CAST 2	TSS
m	#	ug/L	ug/L	ug/L	ug/L	mg/m3	mg/m3	mg/L
0	30	79.1		8.8		0.160		0.37
3	31	48.0		5.4		0.085		0.22
8	32	39.8		4.8		0.044		0.29

STATION: 5-1

DATE:	05/04/87	TIME:	1111 (Z+7)
DEPTH:	28 m	ICE THICK:	1.38 m
LATITUDE:	70 02.6 N	LONGITUDE:	133 26.3 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	25	30.14	386	0.86	19.6	5.3
3	26	30.12	385	0.74	19.7	5.2
8	27	30.72	381	0.96	16.8	4.8
20	28	31.26	374	0.87	16.4	4.6
25	29	31.29	374	0.94	16.3	4.8

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	25	119.3		15.4				0.53
3	26	58.3		7.4		0.053		0.21
8	27	57.3		8.2		0.037		0.38
20	28	65.7		9.1		0.033		0.66
25	29	131.0		20.6		0.038		1.21

STATION: 9-1

DATE:	03/04/87	TIME:	1049 (Z+7)
DEPTH:	67 m	ICE THICK:	1.08 m
LATITUDE:	70 44.0 N	LONGITUDE:	134 12.3 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	19	30.66	399	1.01	7.3	1.5
3	20	30.66	405	0.96	6.9	1.9
8	21	30.67	399	0.91	7.2	1.5
20	22	30.69	396	0.76	6.1	1.6
30	23	30.67	440	0.77	6.4	1.8
50	24	32.17	341	1.31	17.2	7.3

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	19	27.7		3.9		0.080		0.08
3	20	32.2		4.1		0.069		0.07
8	21	45.3		4.7		0.050		0.09
20	22	20.3		2.2		0.018		0.06
30	23	37.1		3.7		0.028		0.11
50	24	35.3		3.6		0.014		0.10

STATION: SS1-1

DATE:	30/03/87	TIME:	1226 (Z+7)
DEPTH:	157 m	ICE THICK:	1.00 m
LATITUDE:	70 47.5 N	LONGITUDE:	127 30.8 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	1	31.07	395	0.85	8.4	2.1
3	2	31.03	395	0.91	8.1	2.4
8	3	31.07	397	1.05	9.0	2.5
20	4	31.12	393	1.11	8.8	2.7
30	5	31.40	383	1.07	10.7	3.0
50	6	32.28	330	1.32	19.6	8.5
75	7	32.64	309	1.79	26.7	12.9
100	8	32.99	287	1.91	31.4	15.9
125	9	33.31	273	1.96	33.6	15.8
150	10	33.69	256	1.81	34.1	16.7

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	1	38.2		5.5		0.069		0.10
3	2	32.3		5.5		0.080		0.06
8	3	35.0		5.2		0.097		0.07
20	4	39.1		6.3		0.085		0.13
30	5	35.7		4.8		0.029		0.25
50	6	43.6		5.8		0.012		0.18
75	7	59.2		9.5		0.011		0.20
100	8	40.1		6.5		0.008		0.12
125	9	64.2		9.3		0.008		0.21
150	10	35.7		6.6		0.008		0.27

STATION: SS3-1

DATE:	01/04/87	TIME:	1120 (Z+7)
DEPTH:	92 m	ICE THICK:	1.50 m
LATITUDE:	70 56.7 N	LONGITUDE:	134 27.5 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	16	30.65	404	1.06	5.8	2.0
3	17	30.65	404	0.70	5.8	1.1
8	18	30.65	403	0.74	6.0	1.2
20	14	30.65	402	0.72	5.6	1.5
30	15	30.66	401	0.68	5.6	1.1
50	11	31.70	393	1.49	7.5	2.8
75	12	32.30	332	1.26	18.9	9.0
90	13	32.53	207[a]	0.96[a]	23.5	11.1

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	16	86.6		9.0		0.073		0.11
3	17	51.8		6.1		0.062		
8	18	59.6		4.5		0.059		0.07
20	14	29.3		4.0		0.072		0.06
30	15	23.1		3.7		0.079		0.11
50	11	47.9		6.8		0.022		0.07
75	12	50.6		4.7		0.004		0.12
90	13	33.5		4.1		0.013		0.09

a :- see footnotes, page 9.

STATION: 1-2

DATE: 05/05/87
DEPTH: 2 m
LATITUDE: [d]

TIME: 1230 (Z+7)
ICE THICK: 1.70 m
LONGITUDE:

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	75	0.15	390		63.0 [b]	8.7
1.5	76	0.15	389		63.4 [b]	8.7

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	75	87.7		11.1		0.345		2.99
1.5	76	90.9		12.0		0.290		2.79

b,d :- see footnotes, page 9.

STATION: 4-2A[e]

DATE: 06/05/87 TIME:
DEPTH: 15 m ICE THICK: 1.60 m
LATITUDE: 69 53.5 N LONGITUDE: 133 24.0 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5						
7						

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5		81.5		15.0				
7		27.4		4.0				

e:- see footnotes, page 9.

STATION: 4-2

DATE:	30/04/87	TIME:	1100 (Z+7)
DEPTH:	15 m	ICE THICK:	1.60 m
LATITUDE:	69 53.5 N	LONGITUDE:	133 24.0 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	71	8.15	466	0.08	62.8[b]	7.1
3	72	10.07	493	0.08	60.0[b]	6.0
8	73	30.70	352	1.04	20.8	5.9
13	74	30.88	352	1.04	19.6	5.8

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	71	59.6		9.3		0.450		0.51
3	72	54.2		7.4		0.315		0.40
8	73	35.6		4.7		0.051		0.97
13	74	54.3		6.6		0.033		2.06

b:- see footnotes, page 9.

STATION: 5-2

DATE:	28/04/87	TIME:	1224 (Z+7)
DEPTH:	33 m	ICE THICK:	1.90 m
LATITUDE:	70 02.7 N	LONGITUDE:	133 21.5 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	66	29.59	391	0.85	20.6	4.9
3	67	29.74		0.94	21.0	5.2
8	68	31.04	369	1.03	14.6	4.0
15	69	31.26	362	1.16	18.4	5.0
25	70	31.64	341	1.13	22.4	6.6

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	66	43.6		7.7		0.079		0.14
3	67	30.4		5.5		0.072		0.17
8	68	26.6		5.4		0.023		0.25
15	69	26.5		4.1		0.021		0.34
25	70	42.4		5.6		0.023		0.64

STATION: 9-2

DATE:	23/04/87	TIME:	1218 (Z+7)
DEPTH:	60 m	ICE THICK:	1.20 m
LATITUDE:	70 40.0 N	LONGITUDE:	134 13.5 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	39	30.94	401	0.87	7.8	2.1
3	40	30.94	397	0.85	7.7	2.1
8	41	30.94	397	0.98	7.6	2.2
15	42	30.94	395	0.85	8.2	2.2
30	43	31.13	385	1.01	10.5	3.0
50	44	32.13	342	1.27	17.3	7.1
58	45	32.41	306	1.51	29.1	11.0

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	39	16.8		2.9		0.148		0.04
3	40	17.1		2.8		0.141		0.06
8	41	15.1		2.7		0.130		0.04
15	42	19.7		4.6		0.105		0.04
30	43	41.0		7.1		0.030		0.07
50	44	51.2		7.8		0.021		0.07
58	45	81.0		15.1		0.023		0.24

STATION: 10-2

DATE: 25/04/87 TIME: 1111 (Z+7)
DEPTH: 131 m ICE THICK: 1.90 m[c]
LATITUDE: 70 57.7 N LONGITUDE: 134 27.5 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	46	30.96	407	0.87	5.1	1.1
3	47	30.97	407	0.90	5.4	1.1
8	48	30.98	406	0.88	4.8	1.1
15	49	31.05	403	0.96	5.5	1.2
30	50	31.11	408	0.90	4.9	1.2
50	51	31.15	411	0.89	4.8	1.1
75	52	32.17	345	1.41	15.4	6.6
100	53	32.52	310	1.68	25.9	11.6
125	54	33.75	260	1.81	32.9	16.5

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	46	16.6		2.7		0.210		0.04
3	47	15.9		2.8		0.205		0.04
8	48	16.2		3.0		0.190		0.04
15	49	12.3		3.0		0.151		0.02
30	50	47.6		6.1		0.170		0.08
50	51	33.4		4.5		0.143		0.06
75	52	32.7		4.7		0.014		0.08
100	53	80.8		4.9		0.012		0.19
125	54	44.9		6.3		0.008		0.20

c:- see footnotes, page 9.

STATION: SS4-2

DATE: 27/04/87 TIME: 1100 (Z+7)
DEPTH: 268 m ICE THICK: 1.50 m
LATITUDE: 69 57.8 N LONGITUDE: 138 36.6 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	55	30.54	400	0.83	5.3	1.0
3	56	30.55	400	0.78	5.4	1.1
8	57	30.56	400	0.87	5.0	1.0
15	58	30.58	401	0.87	5.3	1.1
30	59	30.58	402	0.84	5.4	1.0
50	60	31.94	362	1.14	13.8	5.6
75	61	32.52	315	1.44	23.2	10.6
100	62	32.98	286	1.69	29.5	13.8
125	63	33.57	269	1.85	32.8	16.0
150	64	34.14	271	1.29	22.8	14.0
200	65	34.64	286	1.08	12.4	12.7

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	55	17.4		2.9		0.175		0.05
3	56	14.6		2.2		0.150		0.04
8	57	18.6		4.0		0.155		0.04
15	58	18.2		3.6		0.153		0.05
30	59	25.3		3.8		0.155		0.06
50	60	19.3		3.3		0.043		0.07
75	61	24.5		3.9		0.033		0.10
100	62	17.1		2.8		0.031		0.10
125	63	24.6		3.9		0.007		0.10
150	64	36.0		4.8		0.013		0.11
200	65	19.9		2.5		0.029		0.12

STATION: SS2-3

DATE: 21/05/87 TIME: 1530 (Z+7)
DEPTH: 160 m ICE THICK: 1.95 m
LATITUDE: 71 28.5 N LONGITUDE: 128 20.5 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	80	31.32		0.91	7.0	1.0
3	81	31.32	407	0.87	7.3	1.1
8	82	31.32	406	0.94	8.4	1.1
15	83	31.32	407	0.95	7.3	1.1
30	84	31.32	406	0.92	8.8	1.2
50	85	31.92	357	1.26	15.4	6.1
75	86	32.44	315	1.65	24.0	10.7
100	87	32.76	295	1.83	28.8	13.0
125	88	33.48	254	1.91	33.3	15.0
155	89	34.24	245	1.53	28.4	16.3

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	80	38.7		7.9		0.561		0.11
3	81	43.1		7.0		0.488		0.12
8	82	39.4		7.1		0.418		0.09
15	83	58.4		9.3		0.458		0.15
30	84	66.3		9.3		0.425		0.16
50	85	36.7		5.0		0.066		0.14
75	86	28.2		2.2		0.021		0.18
100	87	28.6		3.1		0.016		
125	88	52.4		7.1		0.021		0.25
155	89	50.2		6.1		0.022		0.38

STATION: 1-3

DATE:	30/05/87	TIME:	1543 (Z+7)
DEPTH:	5 m	ICE THICK:	1.50 m
LATITUDE:	69 32.7 N	LONGITUDE:	133 16.5 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	120	0.11	382	0.05	65.1[b]	4.1

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	120	1219.0		136.3		0.914	0.937	64.55

b:- see footnotes, page 9.

STATION: 4-3

DATE:	29/05/87	TIME:	1045 (Z+7)
DEPTH:	17 m	ICE THICK:	1.48 m
LATITUDE:	69 57.81 N	LONGITUDE:	138 35.44 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
1	116	6.16	433	0.03	59.4[g]	7.9
3.5	117	6.72	436	0.05	58.9[g]	7.9
8.5	118	29.19	373	0.77	20.1	4.9
12.5	119	31.01	353	1.02	22.0	5.6

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
1	116	82.2		11.6		2.227	1.526	0.81
3.5	117	69.7		10.3		1.434	1.404	0.29
8.5	118	71.5		8.9		0.161	0.135	2.81
12.5	119	93.6		12.1		0.069		4.42

g:- see footnotes, page 9.

STATION: 5-3

DATE: 26/05/87 TIME: 1815 (Z+7)
DEPTH: 32 m ICE THICK: 1.60 m
LATITUDE: 70 08 N[f] LONGITUDE: 134 28 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.9	111	23.93	464	0.53	31.7	4.1
3.4	112	29.42	375	0.93	22.3	4.9
8.4	113	29.65	381	0.83	21.9	5.0
15	114	31.35	366	0.90	21.8	5.2
25	115	31.98	330	1.26	24.6	7.5

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.9	111	43.0		6.0		0.175		0.18
3.4	112	37.8		5.5		0.084		0.63
8.4	113	39.7		6.5		0.080		0.80
15	114	29.3		3.9		0.077		0.51
25	115	44.7		5.6		0.046		1.32

f:- see footnotes, page 9.

STATION: 9-3

DATE: 24/05/87 TIME: 1434 (Z+7)
DEPTH: 59 m ICE THICK: 1.35 m
LATITUDE: 70 43.5 N LONGITUDE: 134 11.0 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
1.15	101	31.06	406	0.79	6.9	1.3
3.65	102	31.06	404	0.73	7.3	1.1
8.65	103	31.06	404	0.73	7.3	1.2
15.7	104	31.06	405	0.85	7.5	1.2
31	105	31.23	384	0.98	9.5	1.9
51	106	31.96	350	1.20	16.3	5.7

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
1.15	101	26.4		4.3		0.360		0.07
3.65	102	27.8		4.4		0.365		0.08
8.65	103	30.5		5.6		0.350		0.06
15.7	104	28.6		5.7		0.320		0.07
31	105	53.4		9.0		0.100		0.33
51	106	57.4		9.5		0.034		0.21

STATION: 9A-3A

DATE:	25/05/87	TIME:	1100 (Z+7)
DEPTH:	59 m	ICE THICK:	1.35 m
LATITUDE:	70 40.5 N	LONGITUDE:	134 21.6 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	107					
3	108					
8	109					
39	110					

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	107	33.0		5.0		0.336		0.07
3	108	24.5		2.9		0.313		0.05
8	109	28.2		5.0		0.313		0.06
39	110	10.8		2.5				0.07

STATION: 10-3

DATE: 23/05/87 TIME: 1130 (Z+7)
DEPTH: ICE THICK: 1.92 m
LATITUDE: 70 59.7 N LONGITUDE: 134 25.3 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
0.5	90	31.25	403	0.95	6.7	1.2
3	91	31.25	403	0.94	6.6	1.2
8	92	31.25	404	0.95	6.7	1.2
15	93	31.25	403	0.94	6.4	1.2
30	94	31.30	393	0.99	7.0	1.3
50	95	31.57		0.99	9.9	2.9
75	96	32.37	323	1.52	21.9	10.0
100	97	32.81	292	1.76	27.8	12.7
125	98	33.19	275	1.77	31.7	14.5
150	99	33.53	263	1.79	32.4	15.3
175	100	34.25	251	1.17	27.4	15.9

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
0.5	90	39.4		8.5		0.519		0.08
3	91	38.5		7.1		0.442		0.10
8	92	33.6		6.0		0.519		0.08
15	93	51.2		7.7		0.320		0.11
30	94	32.1		5.0		0.160		0.09
50	95	21.5		3.4		0.029		0.07
75	96	63.2		7.2		0.035		0.15
100	97	41.3		5.7		0.007		0.17
125	98	25.0		3.1		0.007		0.10
150	99	32.1		3.7		0.014		0.09
175	100	26.5		3.2		0.016		0.10

STATION: ME-3

DATE:	23/06/87	TIME:	1600 (Z+7)
DEPTH:	3 m	ICE THICK:	0.00 m
LATITUDE:	69 0.4 N	LONGITUDE:	134 38.0 W

DEPTH	SAMPLE	SALINITY	OXYGEN	PHOSPHATE	SILICATE	NITRATE
m	#	X10^3	mmol/m3	mmol/m3	mmol/m3	mmol/m3
1				0.15[i]		2.0[i]

DEPTH	SAMPLE	POC CAST 1	POC CAST 2	PON CAST 1	PON CAST 2	CHLa CAST 1	CHLa CAST 2	TSS
m	#	ug/L	ug/L	ug/L	ug/L	mg/m3	mg/m3	mg/L
1		2414.4[i]		258.0[i]		3.700	3.670	204.80

i :- see footnotes, page 9.

STATION: MM-3

DATE: 25/06/87 TIME: 1730 (Z+7)
DEPTH: 6 m ICE THICK: 0.00 m
LATITUDE: 69 10.2 N LONGITUDE: 135 1.6 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
1				0.15[i]		2.0[i]

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
1		3165.8[i]		317.9[i]		3.780	3.850	188.95

i :- see footnotes, page 9.

STATION: MR-3

DATE:	26/06/87	TIME:	1000 (Z+7)
DEPTH:	7 m	ICE THICK:	0.00 m
LATITUDE:	68 53.4 N	LONGITUDE:	135 1.8 W

DEPTH m	SAMPLE #	SALINITY X10^3	OXYGEN mmol/m3	PHOSPHATE mmol/m3	SILICATE mmol/m3	NITRATE mmol/m3
1						1.7[i]

DEPTH m	SAMPLE #	POC CAST 1 ug/L	POC CAST 2 ug/L	PON CAST 1 ug/L	PON CAST 2 ug/L	CHLa CAST 1 mg/m3	CHLa CAST 2 mg/m3	TSS mg/L
1		7931.9[i]		463.6[i]		2.590	2.660	243.90

i :- see footnotes, page 9.

STATION: ME-4

DATE:	29/07/87	TIME:	1200 (Z+7)
DEPTH:	3 m	ICE THICK:	0.00 m
LATITUDE:	69 0.4 N	LONGITUDE:	134 38.0 W

DEPTH	SAMPLE	SALINITY	OXYGEN	PHOSPHATE	SILICATE	NITRATE
m	#	X10^3	mmol/m3	mmol/m3	mmol/m3	mmol/m3
1				0.31[i]	56.4[b,i]	1.9[i]

DEPTH	SAMPLE	POC CAST 1	POC CAST 2	PON CAST 1	PON CAST 2	CHLa CAST 1	CHLa CAST 2	TSS
m	#	ug/L	ug/L	ug/L	ug/L	mg/m3	mg/m3	mg/L
1		868.8[i]		104.9[i]		5.151	5.559	50.60

b,i :- see footnotes, page 9.

STATION: MM-4

DATE:	27/07/87	TIME:	1600 (Z+7)
DEPTH:	6 m	ICE THICK:	0.00 m
LATITUDE:	69 10.2 N	LONGITUDE:	135 1.6 W

DEPTH	SAMPLE	SALINITY	OXYGEN	PHOSPHATE	SILICATE	NITRATE
m	#	X10^3	mmol/m3	mmol/m3	mmol/m3	mmol/m3
1				0.14[i]	49.8[b,i]	3.3[i]

DEPTH	SAMPLE	POC CAST 1	POC CAST 2	PON CAST 1	PON CAST 2	CHLa CAST 1	CHLa CAST 2	TSS
m	#	ug/L	ug/L	ug/L	ug/L	mg/m3	mg/m3	mg/L
1		1709.3[i]		174.8[i]		3.056	2.440	103.34

b,i :- see footnotes, page 9.

STATION: MR-4

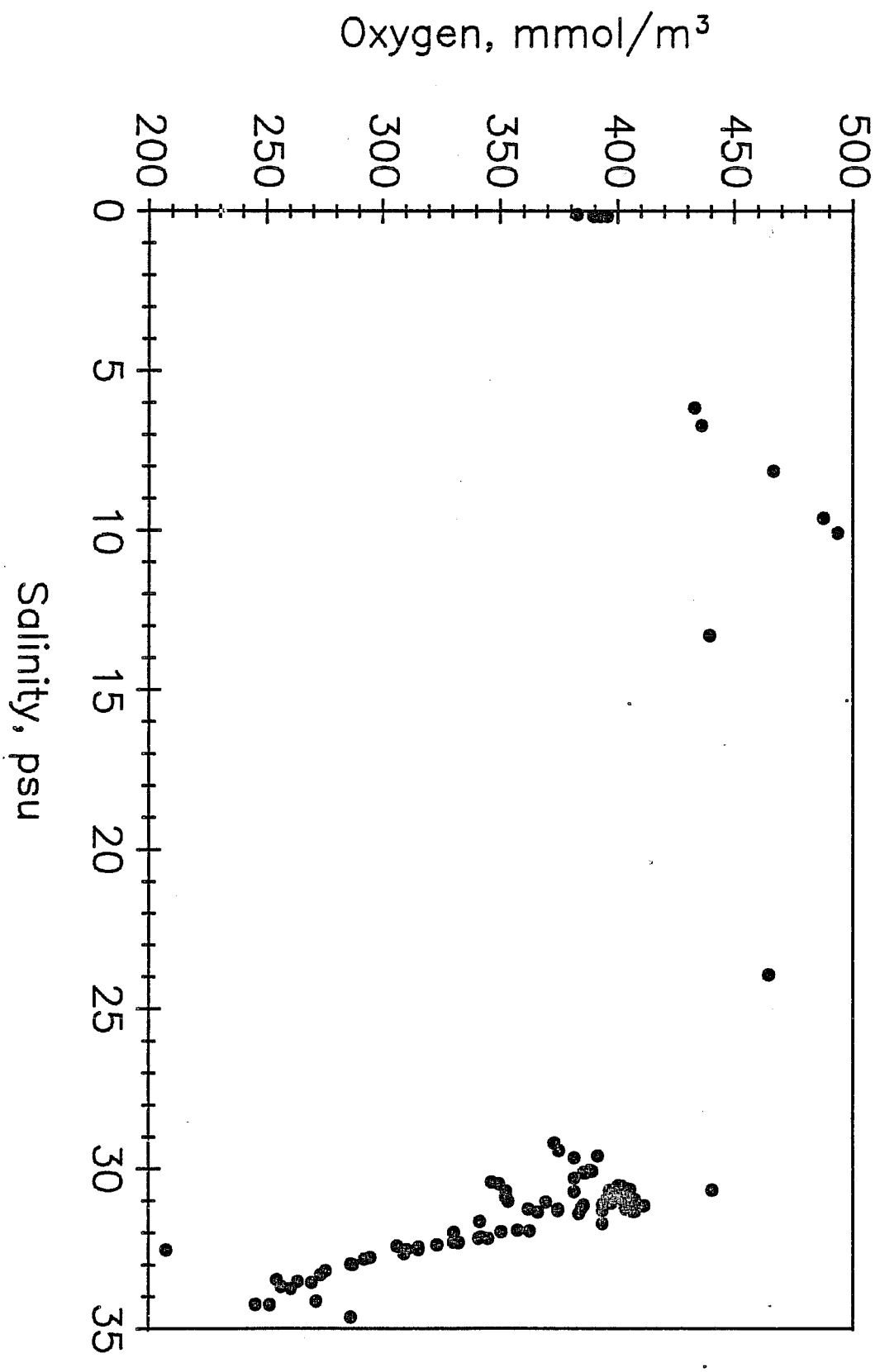
DATE:	25/07/87	TIME:	2000 (Z+7)
DEPTH:	7 m	ICE THICK:	0.00 m
LATITUDE:	68 53.4 N	LONGITUDE:	135 1.8 W

DEPTH	SAMPLE	SALINITY	OXYGEN	PHOSPHATE	SILICATE	NITRATE
m	#	X10^3	mmol/m3	mmol/m3	mmol/m3	mmol/m3
1				0.02[i]	58.2[b,i]	4.9[i]

DEPTH	SAMPLE	POC CAST 1	POC CAST 2	PON CAST 1	PON CAST 2	CHLa CAST 1	CHLa CAST 2	TSS
m	#	ug/L	ug/L	ug/L	ug/L	mg/m3	mg/m3	mg/L
1		2485.7[i]		259.9[i]		4.894	4.814	175.87

b,i :- see footnotes, page 9.

5 APPENDIX 2; SCATTER PLOTS


Oxygen, mmol/m³
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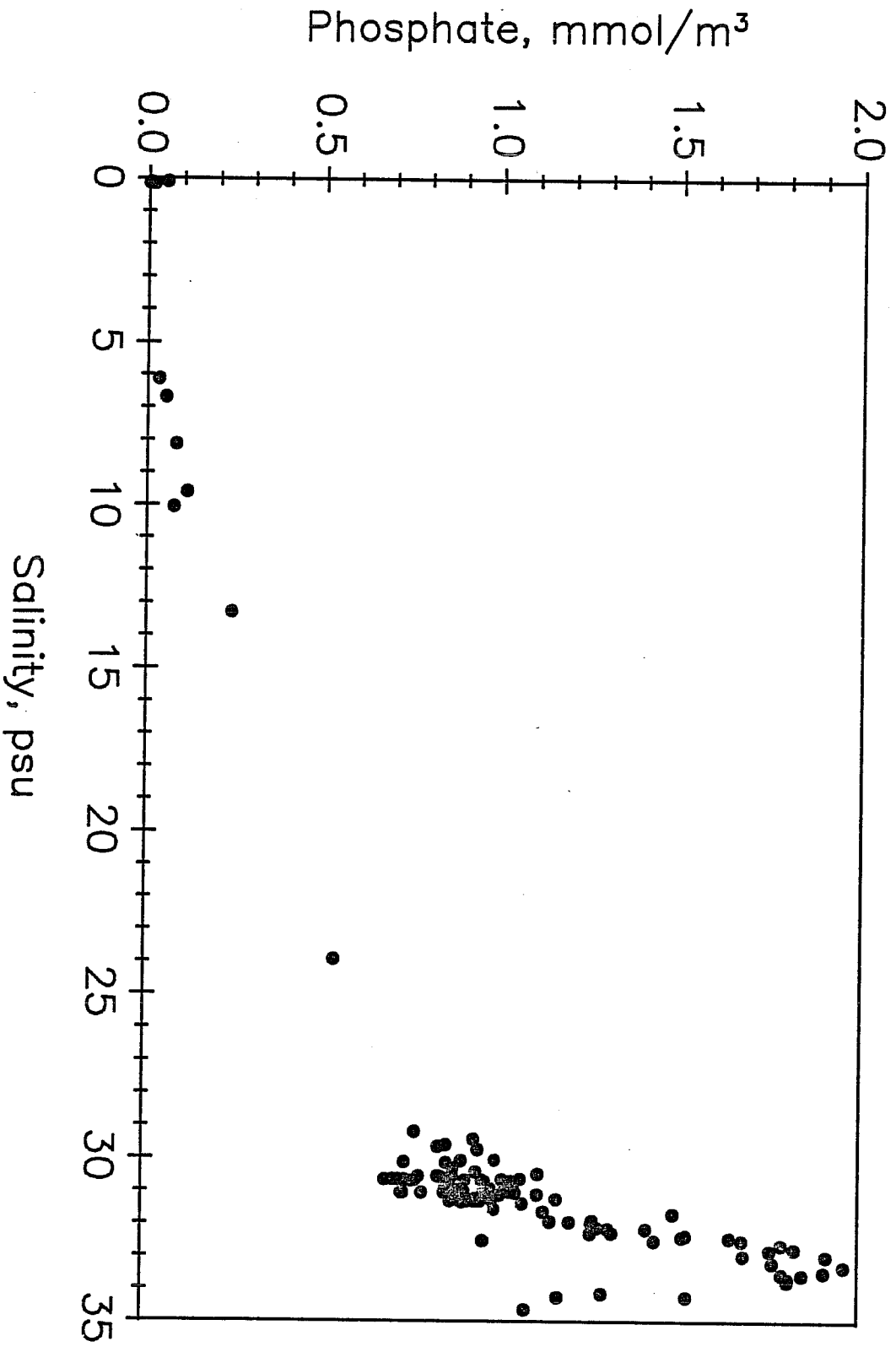
250
300
350
400
450
500
0
5
10
15
20
25
30
35
Salinity, psu


Phosphate, mmol/m³
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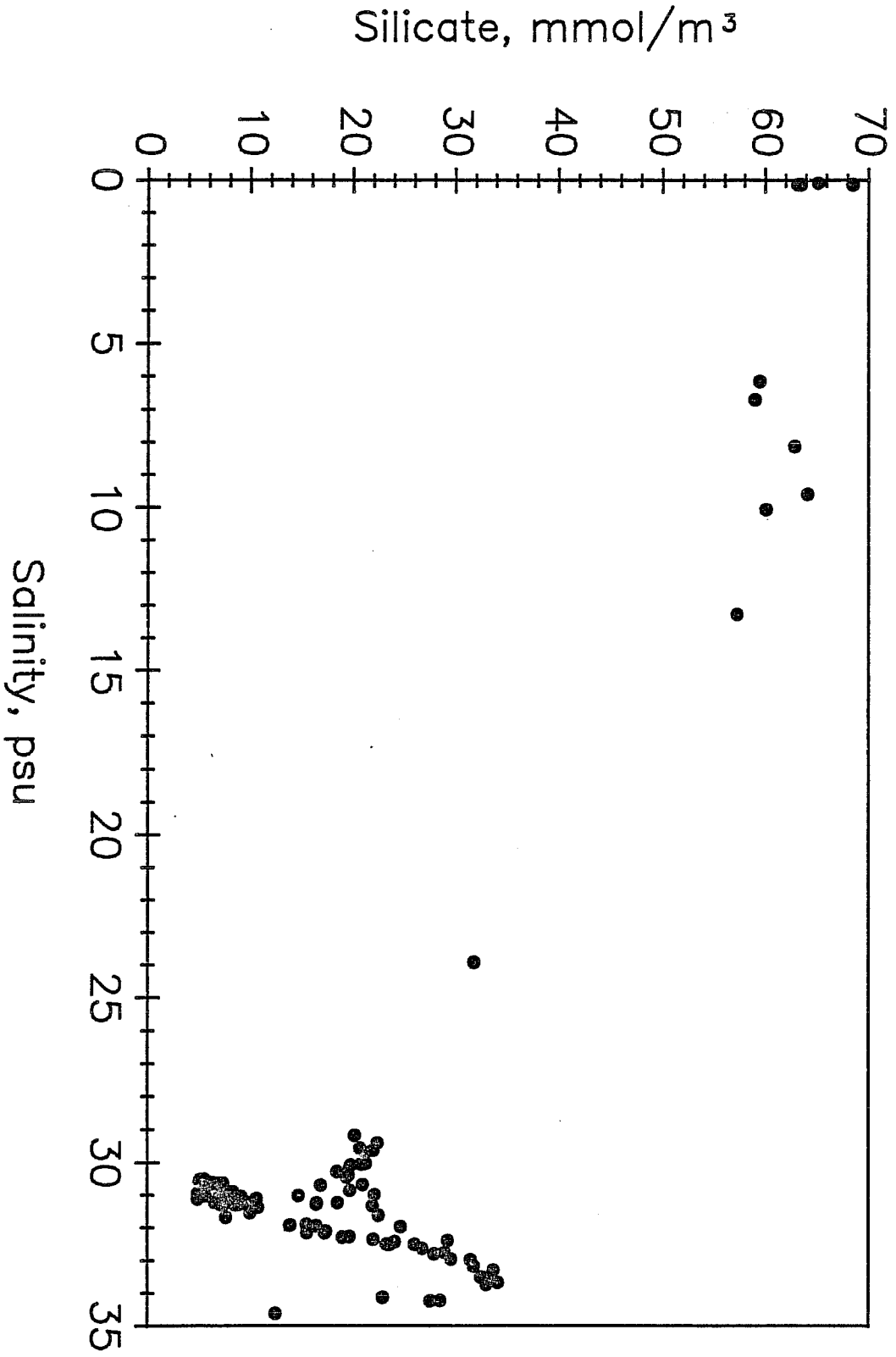
1.0
1.5
2.0
0
5
10
15
20
25
30
35
Salinity, psu


Silicate, mmol/m3
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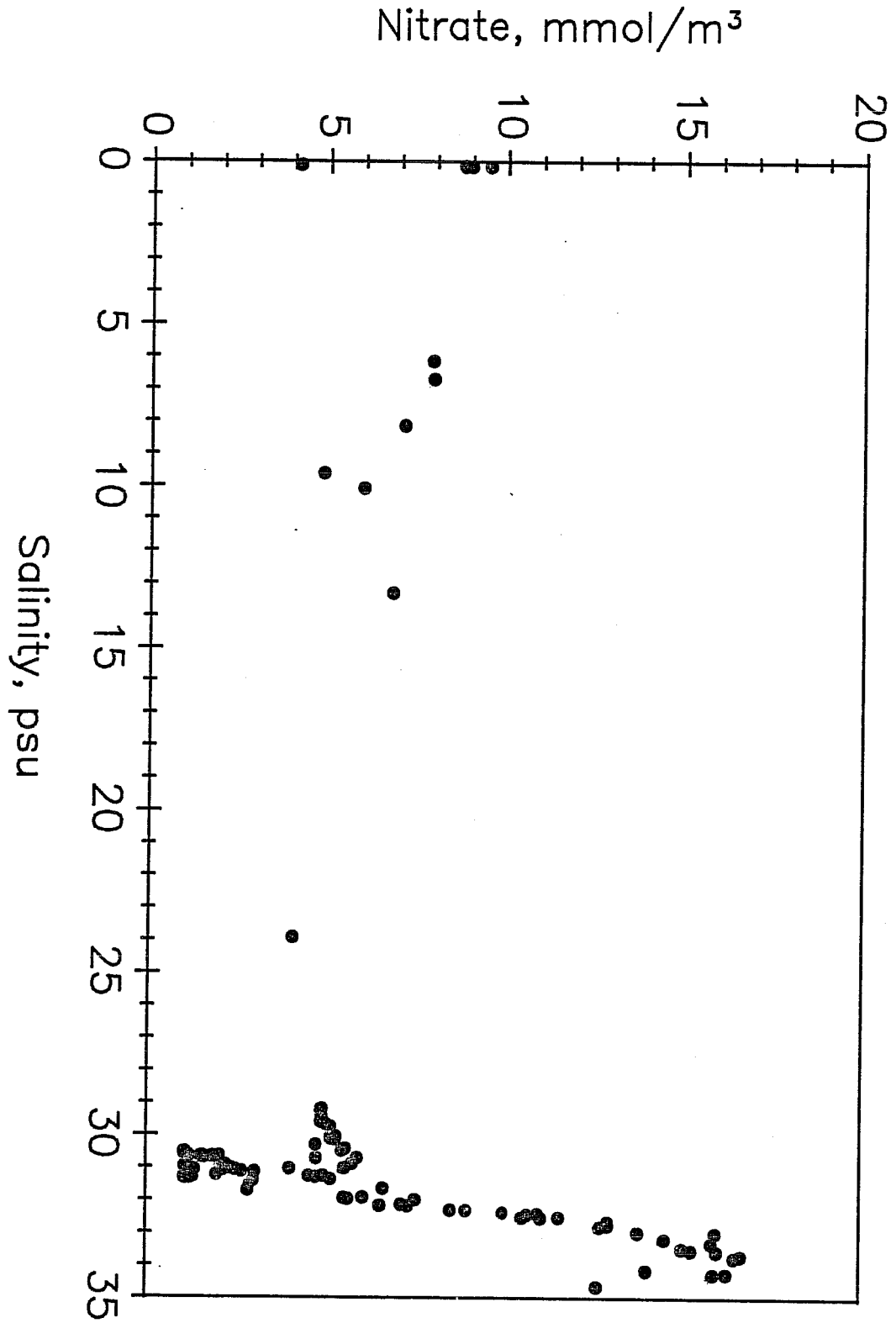
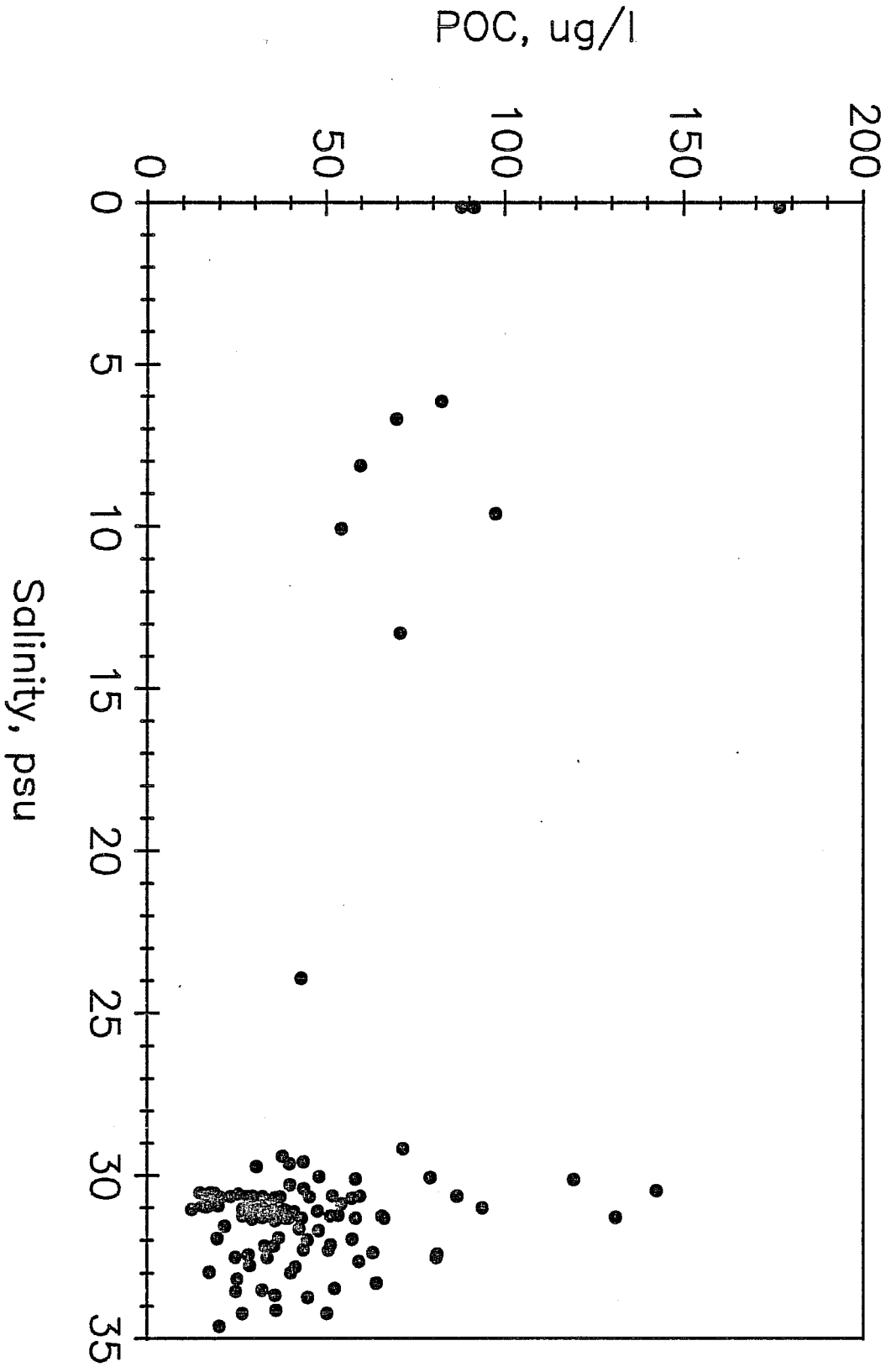
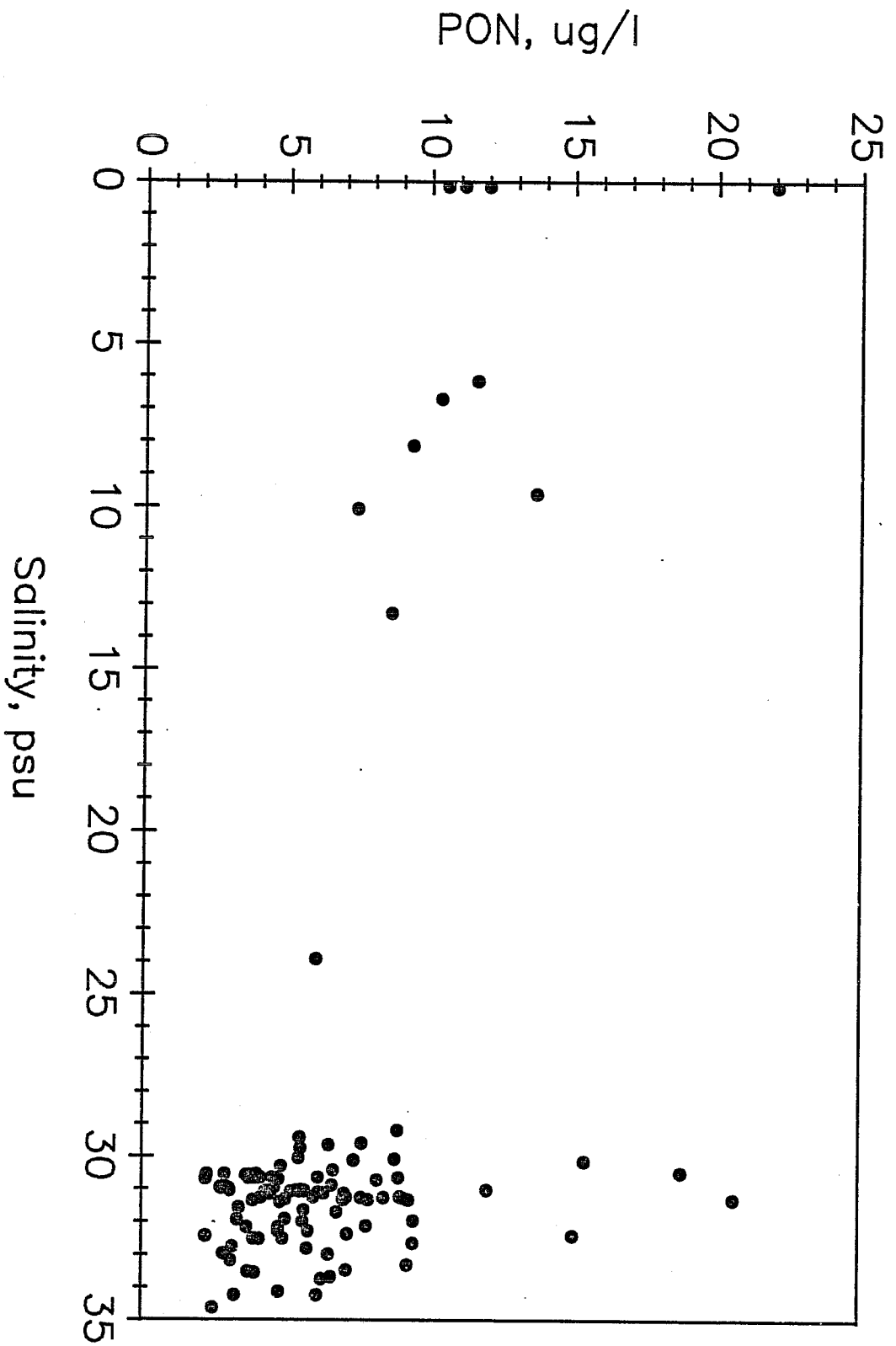
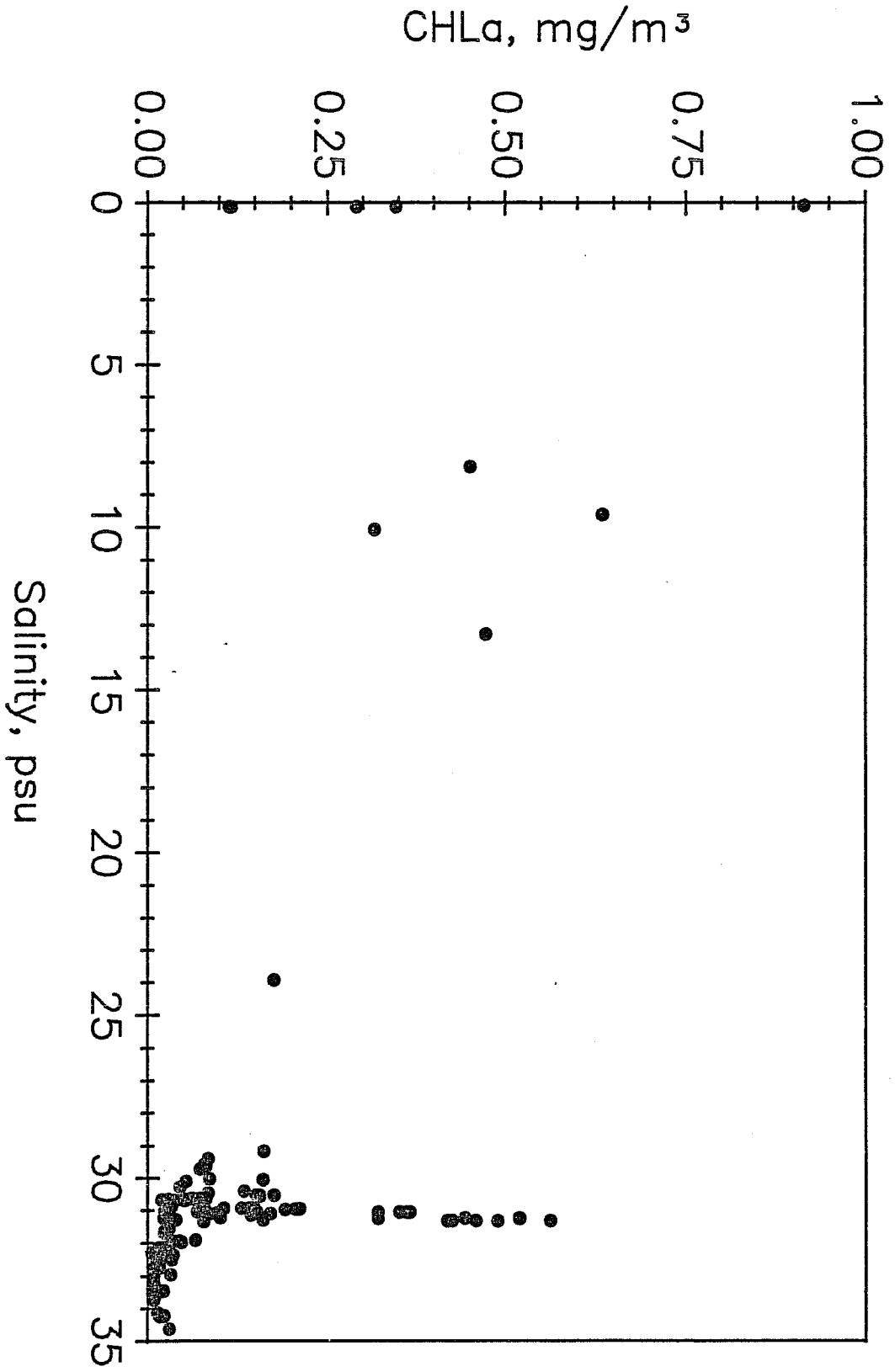
20
30
40
50
60
70
Salinity, psu
0
5
10
15
20
25
30
35


Nitrate, mmol/m³
0
5
10
15
20
Salinity, psu
0
5
10
15
20
25
30
35


POC, ug/l
0
50
100
150
200
Salinity, psu
0
5
10
15
20
25
30
35


PON, ug/l
0
5
10
15
20
25
Salinity, psu
0
5
10
15
20
25
30
35


CHLa, mg/m³
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0.25
0.50
0.75
1.00
Salinity, psu
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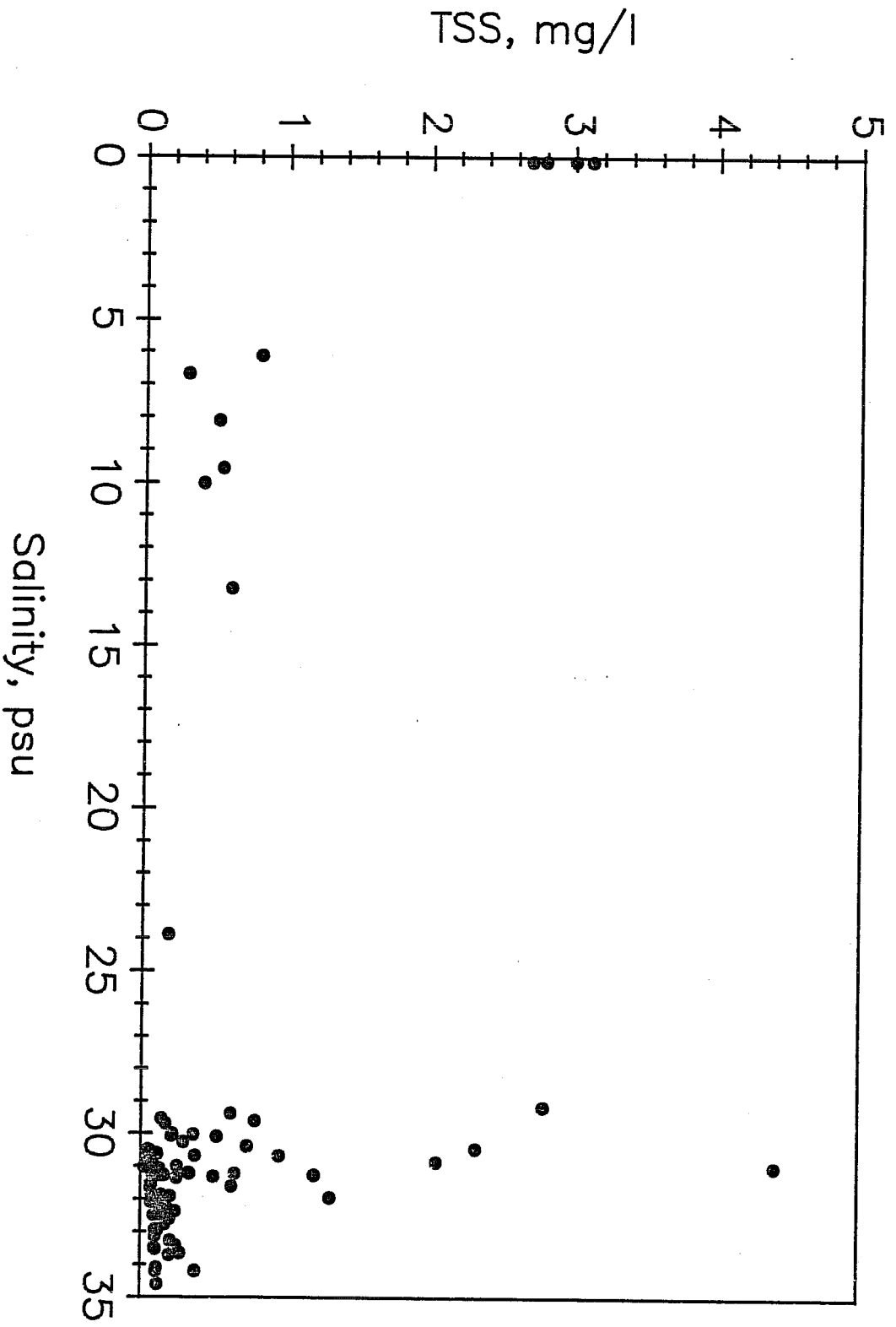
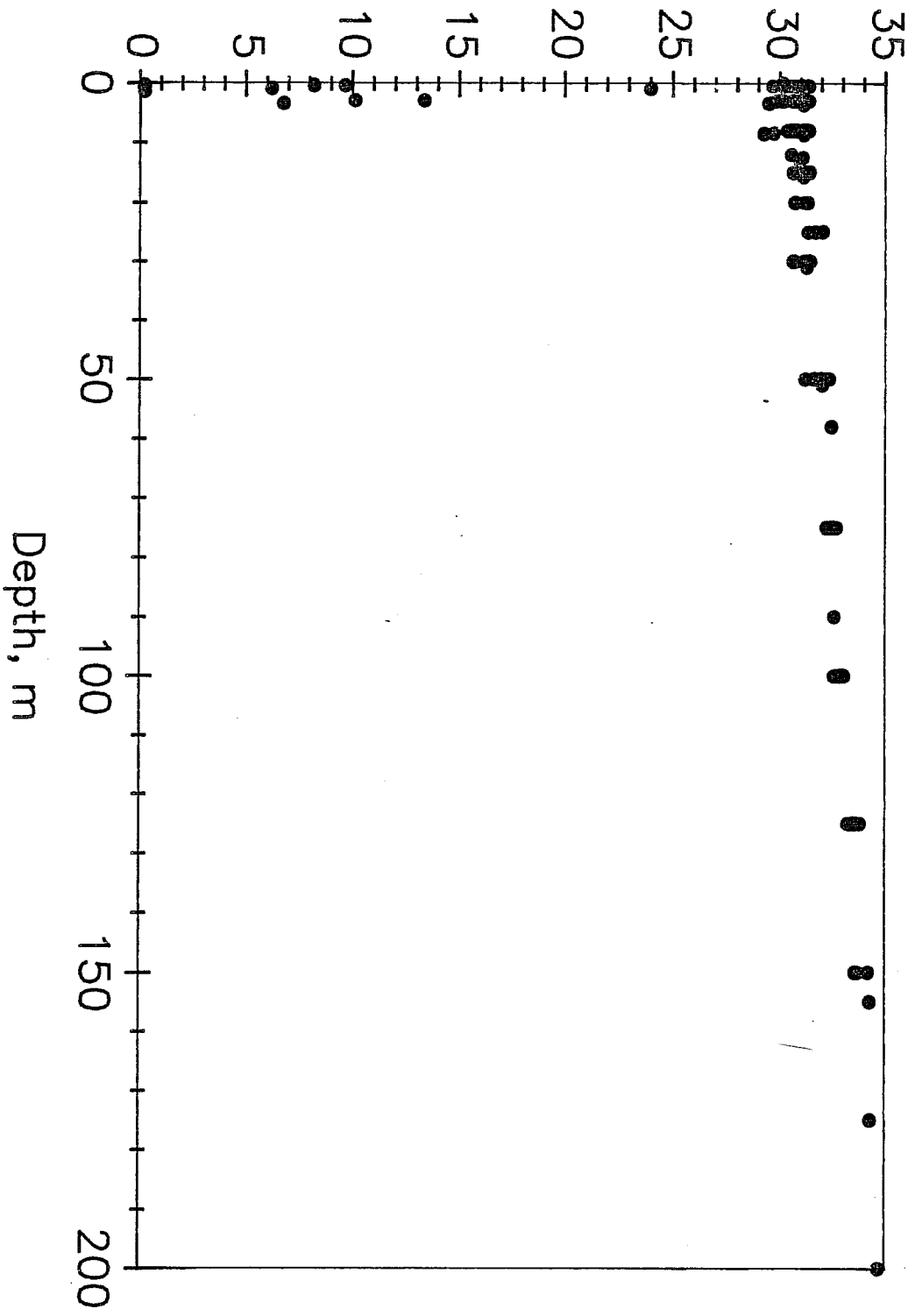
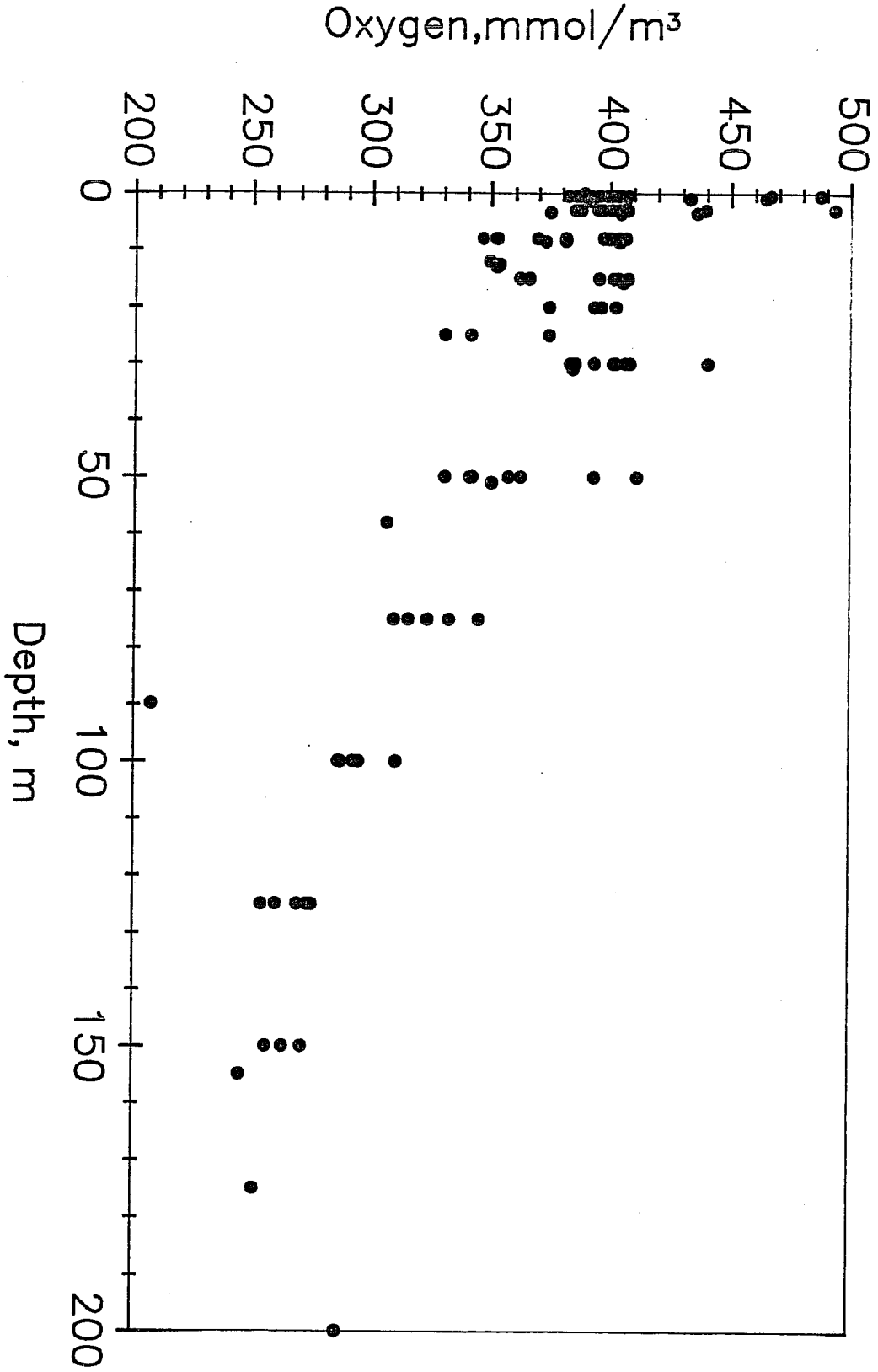
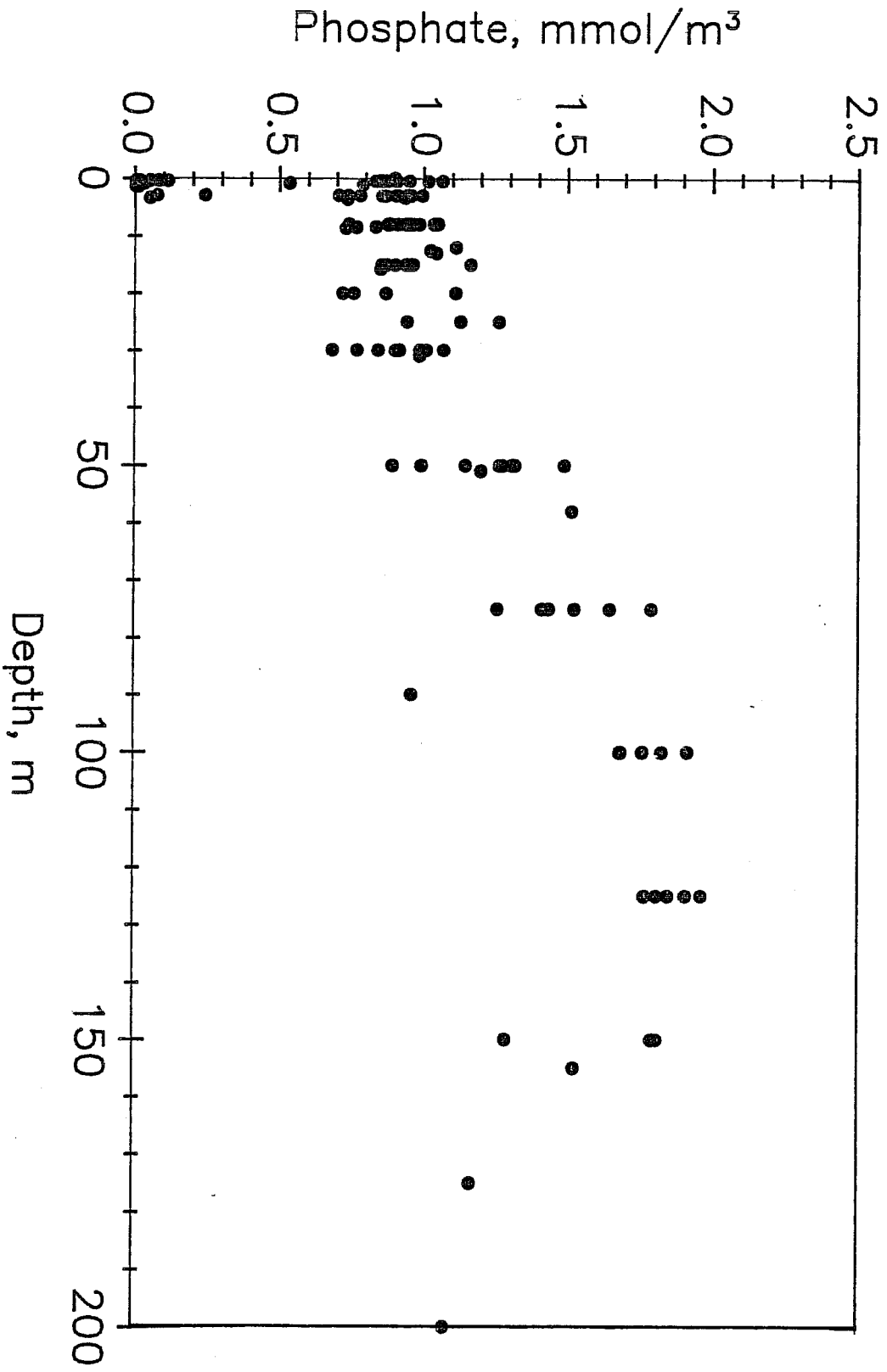
5
10
15
20
25
30
35


TSS, mg/l
0
1
2
3
4
5
Salinity, psu
0
5
10
15
20
25
30
35


Salinity, psu
0
5
10
15
20
25
30
35
Depth, m
0
50
100
150
200


Oxygen,mmol/m³
200
250
300
350
400
450
500
0
50
100
150
200
Depth, m


Phosphate, mmol/m3
0.0
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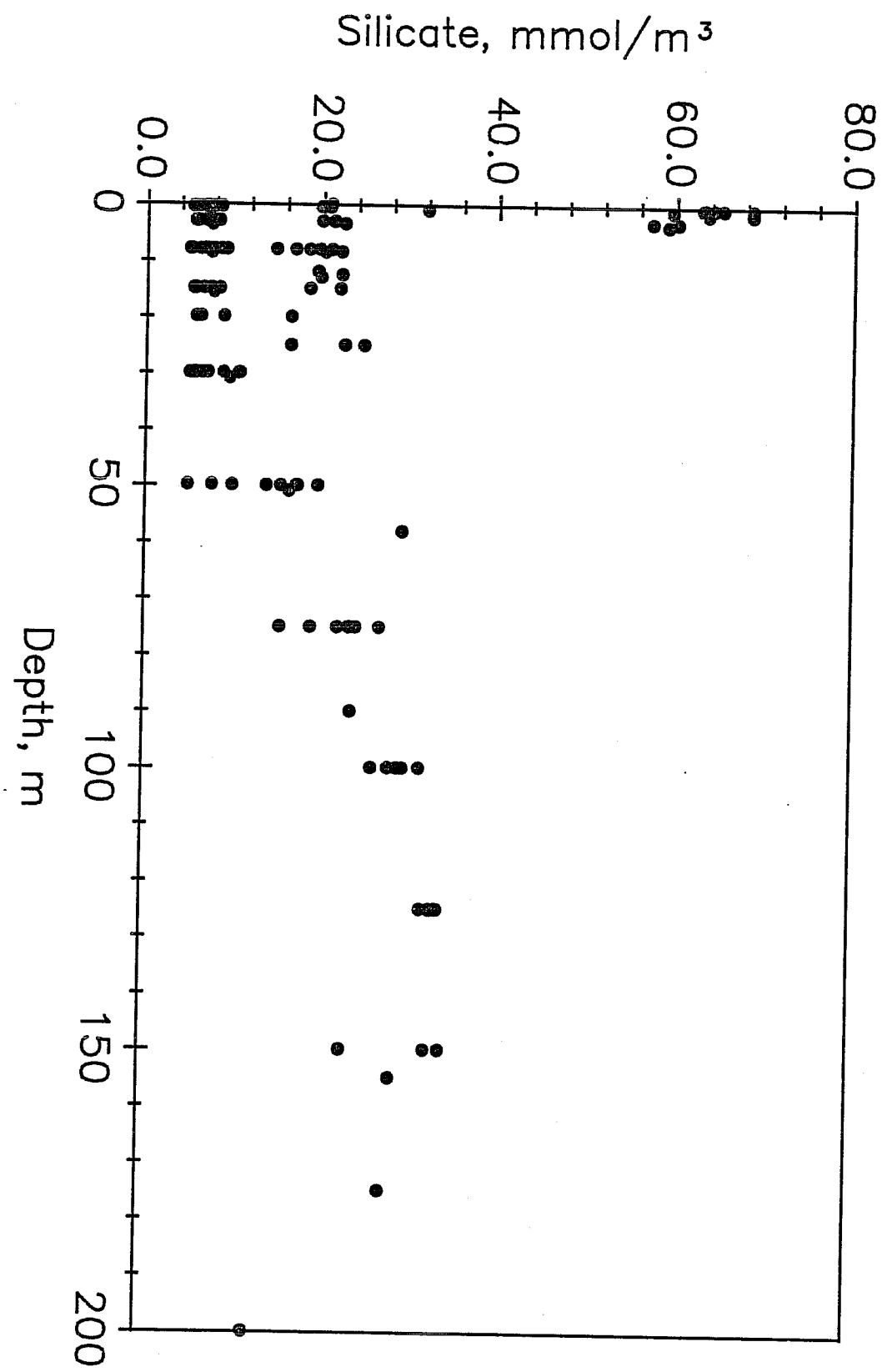
1.0
1.5
2.0
2.5
0
50
100
150
200
Depth, m


Silicate, mmol/m³
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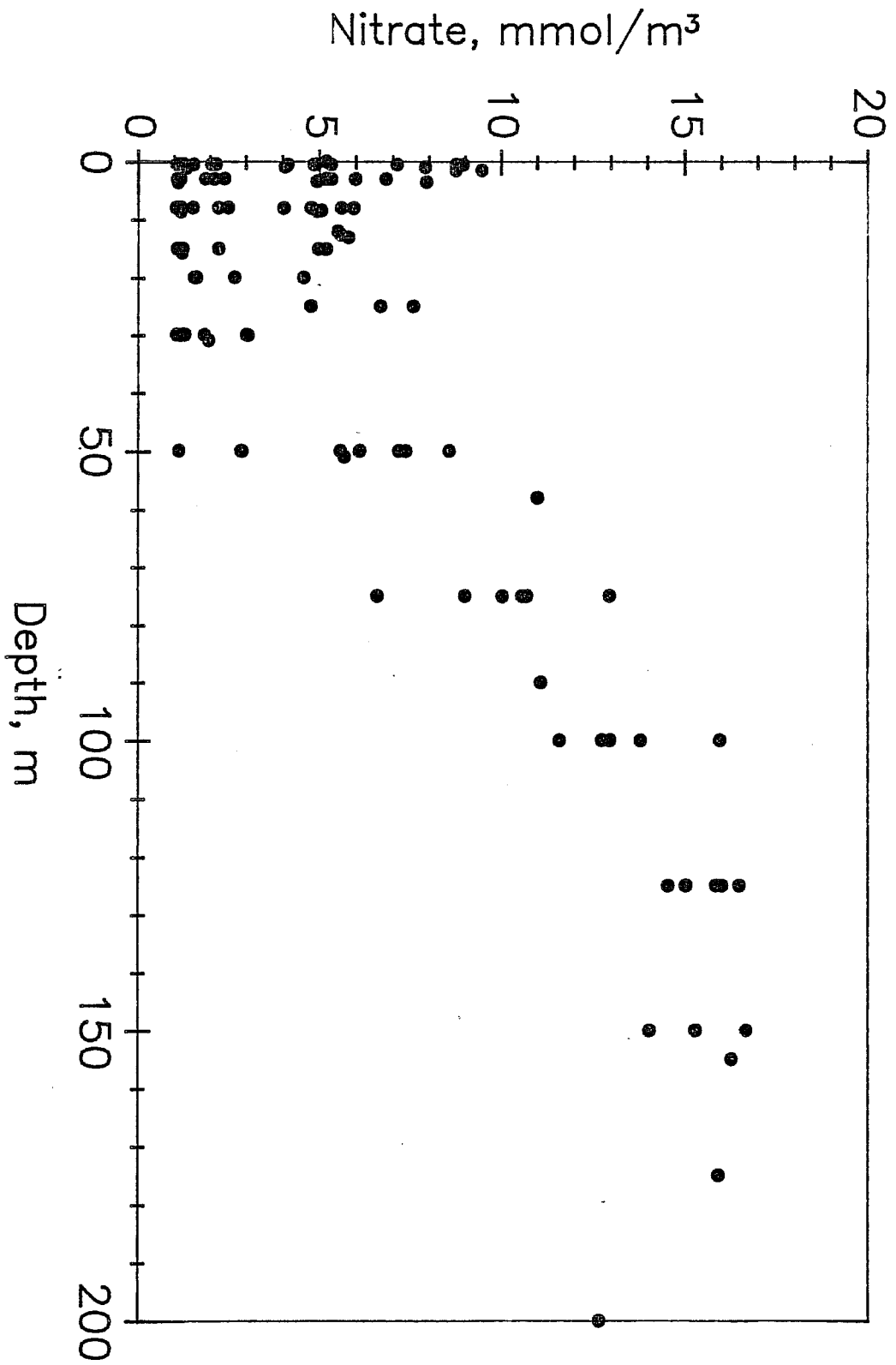
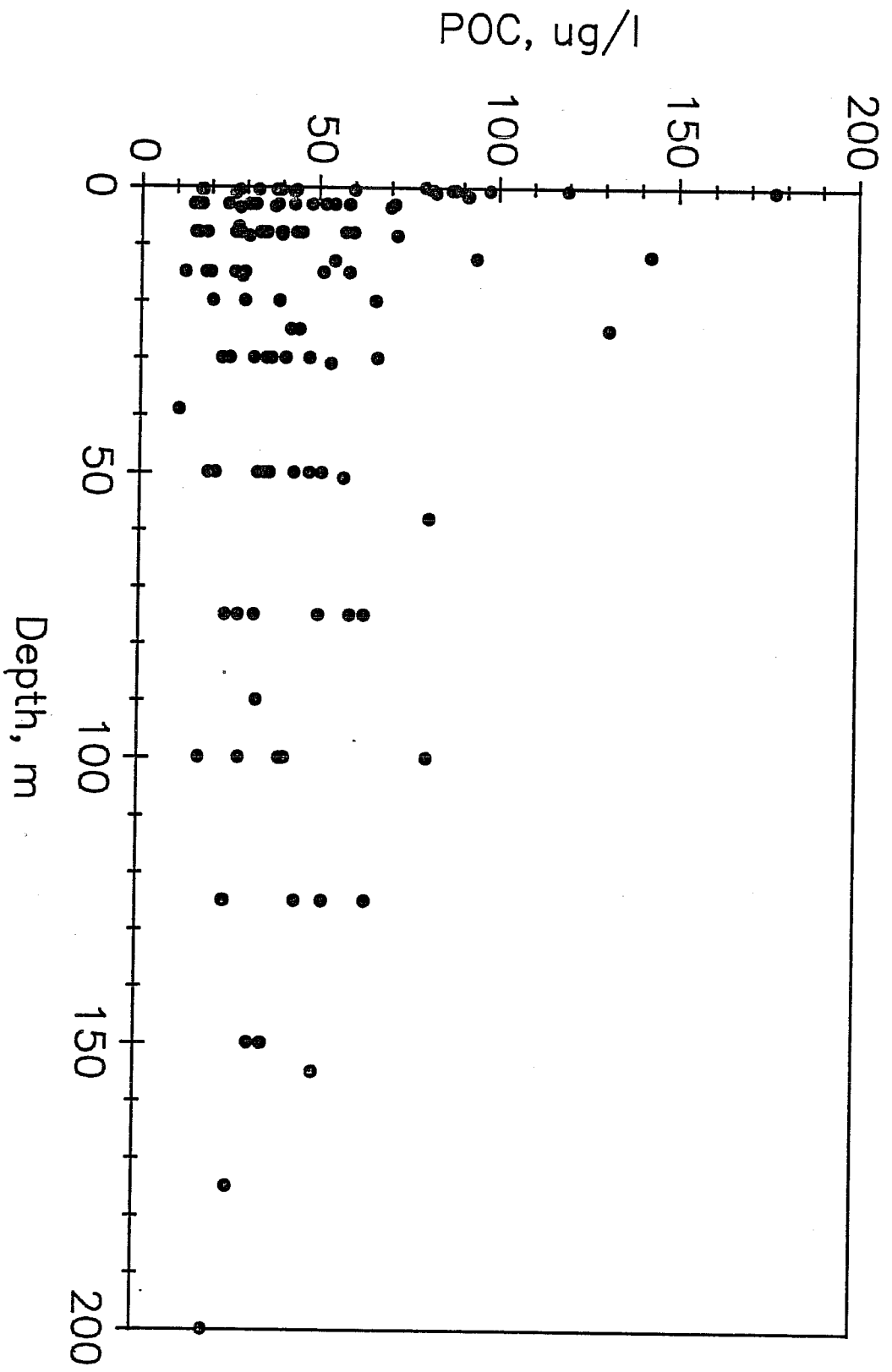
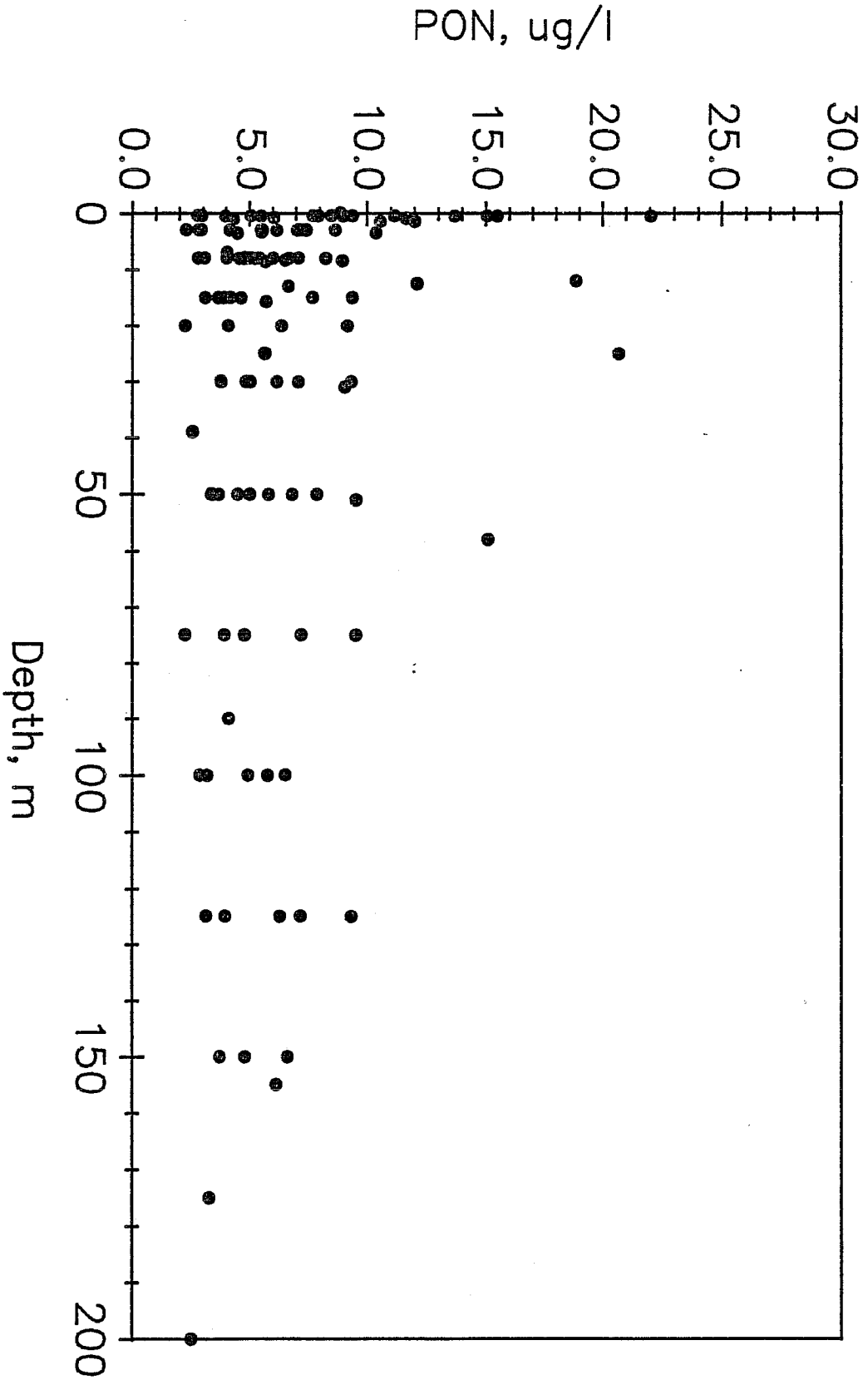
20.0
40.0
60.0
80.0
0
50
100
150
200
Depth, m


Nitrate, mmol/m³
0
5
10
15
20
Depth, m
0
50
100
150
200


POC, ug/l
0
50
100
150
200
Depth, m
0
50
100
150
200


PON, ug/l
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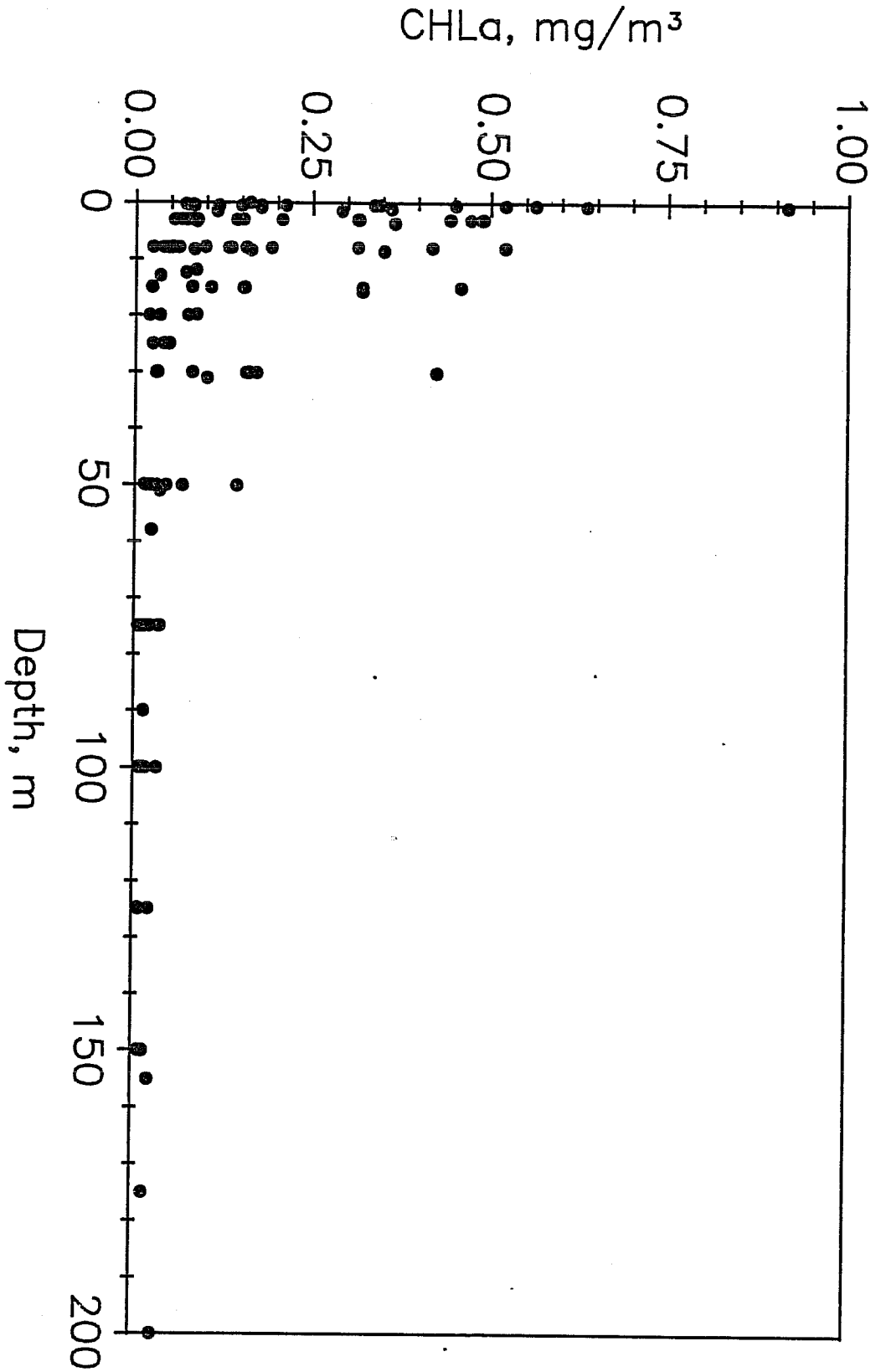
10.0
15.0
20.0
25.0
30.0
0
50
100
150
200
Depth, m


CHLa, mg/m³
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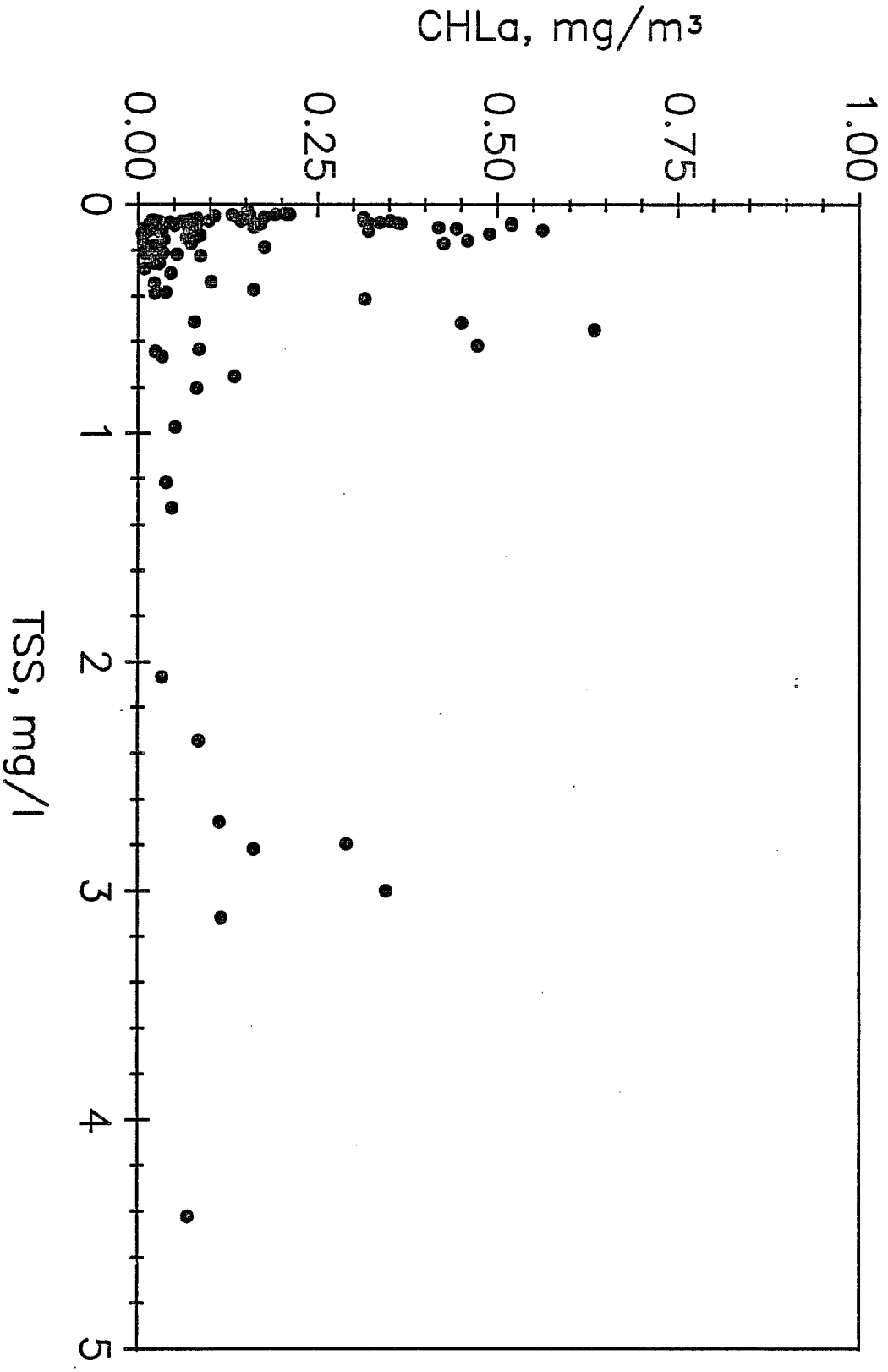
0.50
0.75
1.00
0
50
100
150
200
Depth, m


CHLa, mg/m3
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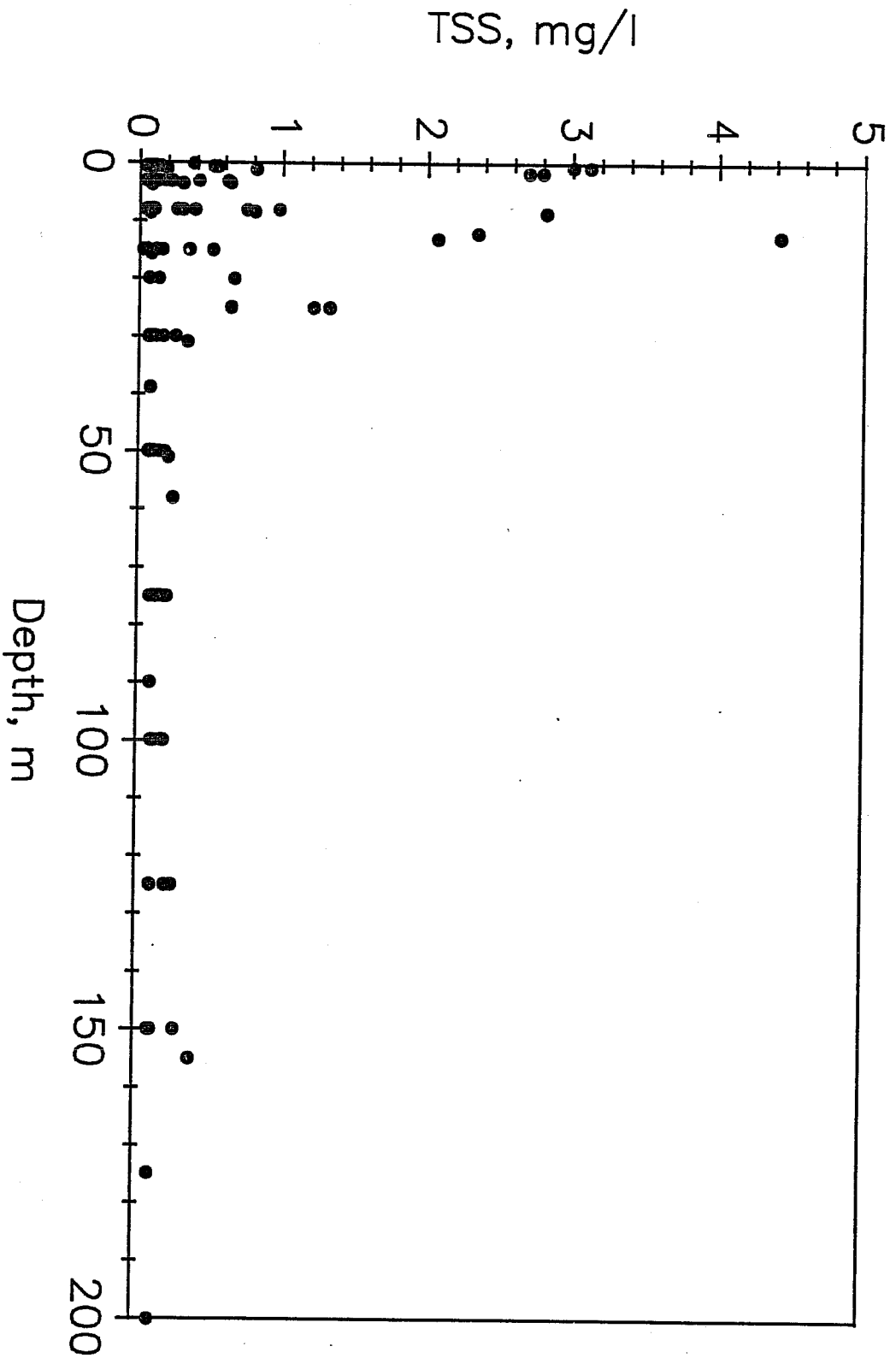
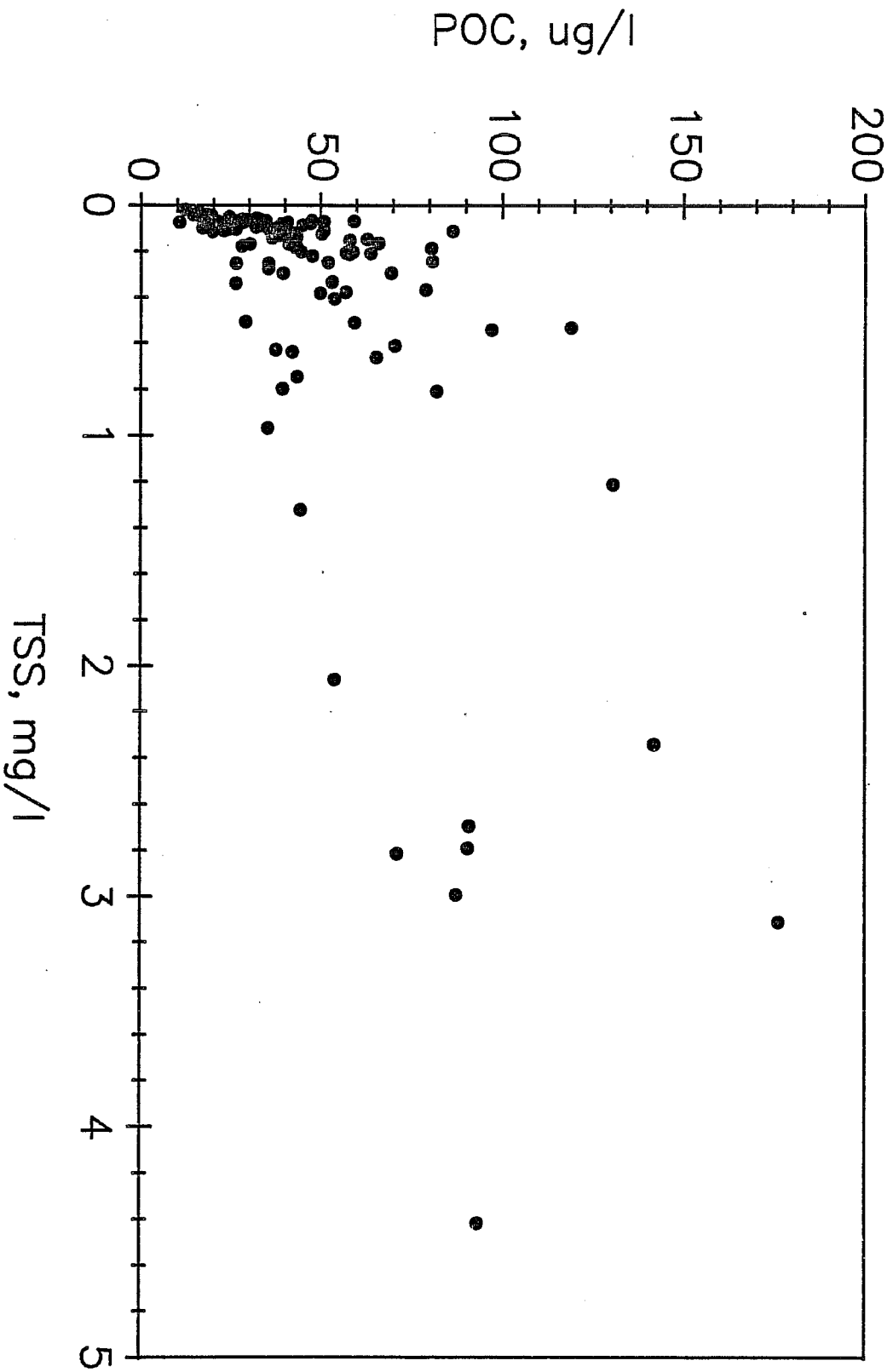
0.50
0.75
1.00
0
1
2
3
4
5
TSS, mg/l


TSS, mg/l
0
1
2
3
4
5
0
50
100
150
200
Depth, m


POC, ug/l
0
50
100
150
200
TSS, mg/l
0
1
2
3
4
5

NOGAP B.6 Data Reports in the Canadian Data Report of Hydrography and Ocean Sciences Series

Macdonald, R.W., K. Iseki, E.C. Carmack, D.M. Macdonald, M.C. O'Brien, and F.A. McLaughlin, 1988. Data Report: NOGAP B.6; Beaufort Sea Oceanography, September, 1986. *Can. Data Rep. Hydrogr. Ocean Sci.:* **58**, 68pp.

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McCullough, D., R.W. Macdonald, K. Iseki, and E.C. Carmack, 1988. NOGAP B.6; Volume 3: Beaufort Sea current measurements, September, 1987 - March, 1988. *Can. Data Rep. Hydrogr. Ocean Sci.*: **60**, 37pp.

R.W. Macdonald, K. Iseki, M.C. O'Brien, F.A. McLaughlin, D. McCullough, D.M. Macdonald, E.C. Carmack, H. Adams, M. Yunker, G. Miskulin and S. Buckingham, 1988. NOGAP B.6; Volume 4: Chemical data collected in the Beaufort Sea, Summer 1987. *Can. Data Rep. Hydrogr. Ocean Sci*: **60**, 103pp.