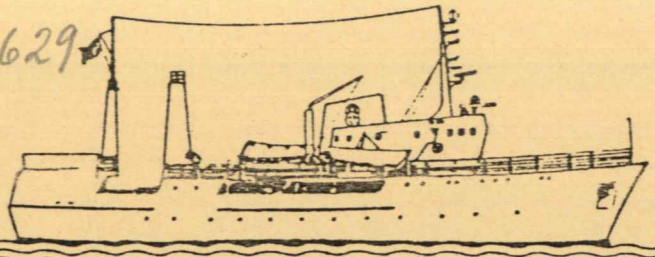


Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY CRUISE REPORT ON CRUISE NOS. 1 AND 2 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

19 January - 11 February 1977

Odd Nakken

Karachi, 11 February 1977

Institute of Marine Research, Bergen

PRELIMINARY CRUISE REPORT ON CRUISE NOS 1 AND 2 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

INTRODUCTION

This report covers the first complete coverage of the Pakistan waters during this project.

Daparture:	Karachi, 19 January 1977.
Arrival:	Karachi, 27 January 1977.
Scientific staff:	S. Qureshi, M. Khaliluddin, S. Amjad (Department of Fisheries)
	S. Saifullah, S. Huda, S. Sardar Alam (Institute of Marine Biology)
	O. Nakken, S. Lygren, O. Knutsen, Ø. Trogersen (Institute of Marine Research)
Departure:	Karachi, 29 January 1977.
Arrival:	Karachi, 11 February 1977.
Scientific staff:	S. Qureshi, Irshad Begum, Farkunda Jabeen (Department of Fisheries)
	S. Barkati, M. Mozzam Khan, S.H. Niaz Rizvi (Institute of Marine Biology)
	O. Nakken, S. Lygren, O. Knutsen, Ø. Trogersen (Institute of Marine Research)

Survey grid and stations are shown in Fig. 1. The most offshore station in section IX (Ras Ormara) was not occupied due to lack of time.

WORKING SCHEME

The standard hydrographic/plankton stations were worked as follows:

1. 2 and 4 litre samples with Nansen bottles from 0, 10 and 30 m for filtration.

2. Nansen bottles at standard depths to bottom or 500 m. These samples (observations) were taken: temperature and salinity at all standard depths: 0-10-20-30-50-75-100-125-150-200-250-300-400-500 m. Oxygen at: 10-20-30-50-75-100-150-200-300 m. Nutrients at: (depths as for oxygen) selected sections. Phytoplankton: 0-10-20 m.

3. Bathythermograph 0-250 m.

4. Phytoplankton net - 40 µ mesh size - vertical 0-50 m, horizontal tow at the surface for 5 minutes.

5. Bongo net (with flowmeter) - 180 µ mesh size - oblique 0-35 m (50 m wire), horizontal at the surface for 5 minutes or less, dependent on clogging.

6. Petersen grab when shallower than 150 m.

The salinity and oxygen samples were analysed onboard and sections and maps demonstrating the horizontal and vertical distribution of temperature, salinity and oxygen were drawn at the end of the second cruise.

The nutrient samples and the filter papers were frozen immediately and will be analuzed at the Institute of Marine Biology. The phytoplankton samples were preserved in formalin and will be analyzed at the Institute of Marine Biology. The Bongo net samples were preserved in formalin and will be analyzed both at the Institute of Marine Biology and the Department of Fisheries.

Continuous watch was kept on the acoustic equipment. Two echo sounders were run continuously as follows:

38 kHz, 0-250 m + 250 m, 120 kHz, 0-100 m. The echo integrators were connected to the 38 kHz sounder and adjusted to depth slices: 6-50 m, 50-100 m, 100-250 m, 250-500 m. The sonar was mainly used in the 1250 m range mode, but in shallow waters the 500 m range mode was operated.

Fishing stations were carried out whenever "fishable recordings" occurred on the echo recorder, or when the recording changed its

character. The fish was sorted according to species and measurements of length, volume/weight and maturity stage were carried out for the most abundant species in the catches.

Samples for further studies ashore were frozen or preserved in formalin.

All data log sheets were copied and Mr. Qureshi and Mr. Barkati received the copies for the two participating Pakistani institutions.

RESULTS

Distribution and abundance of pelagic fish

The distribution of pelagic fish species is shown in Fig. 2. The number within each square is the average integrator reading within that square and thus a measure of abundance (density/unit area). The observed abundance were generally low; higher values were found in an area south of Karachi and in Sonmiani Bay. South of Karachi species of anchovy (ENGRAULIDAE: Engraulis sp. and Thryssa sp.) dominated in the recordings, while westward along the Mekran coast, sardines (CLUPEIDAE: Sardinella sp. and Dussumieria acuta) were more common. The catch rates of pelagic fish were low (Table 1).

Distribution and abundance of demersal fish

The distribution of demersal fish is shown in Fig. 3. The highest abundances were found in Sonmiani Bay. Catfish (Arius sp.) dominated the catches and catch rates up to 6 tonnes/hour were obtained. Croakers (SCIAENIDAE), grunts (POMADASYIDAE) and pomfrets (Pampus sp.) were present in the catches in waters shallower than 50 m. In deeper waters, the threadfin bream (Nemipterus japonicus) was frequently caught.

Comments

The number of fishing stations is too small to indicate with any

certainty the species composition and the obtainable catch rates within the survey area. In the next cruises, the fishing time will be considerably increased in order to have more and better data on species composition, distribution and abundance.

Mesopelagic fish

The distribution of the mesopelagic fish layer (DSL) is shown in Fig. 4. The layer consisted mainly of lantern fish (MYCTOPHIDAE) and was most dense just off the continental shelf of the western Mekran coast. It stayed at depths between 150 and 300 m during the day and ascended, as usually, to the surface at sunset.

Plankton

The echo recordings originating from planktonic scatterers including Euphausiids, small squids, jellyfish and fish larvae, is shown in Fig. 5.

Hydrography

The distribution of temperature, salinity and oxygen are shown in Figs 6-21. Two features are clearly noticed from these figures:

1. The sinking of "Winter water" downward along the shelf, which brings high oxygen water masses down to depths between 150 and 200 m. This water is formed by cooling (heat loss to the cold air masses) in the near-shore, shallow water areas.

2. The pronounced intermediate salinity minimum which occurs in most sections between 100 and 200 m depth.

REMARKS

Except for minor faults which were repaired during the cruise, the equipment worked satisfactorily. The working capacity and qualifications of the staff members were excellent.

"Dr. Fridtjof Nansen" will depart from Karachi on 13 February, at 1600 hrs.

Karachi, 11 February 1977.

Odd Nakken

Copies to: The Director,
Institute of Marine Biology,
University of Karachi.

The Director,
Department of Fisheries,
Karachi.

The Director,
Institute of Marine Research,
Bergen.

Table 1.
R/V "Dr. Fridtjof Nansen". Record of fishing operations. BTR: bottom trawl, SPT: small pelagic trawl.
Fish names: FAO Species Identification Sheets for Fishery Purposes and Munro.

Date	Time start GMT	Stn No	Gear type	Bottom depth m	Gear depth m	Position north	Position east	Total catch kg	Catch per hour kg	Dominant species
22.1	1345	01	KTR	2025	60-75	23°37'	67°24'	29.5.	59.0	Leiognathus sp.
23.1	1118	02	BTR	57	57	23°53'	67°07'	45.0	56.3	Pomadasys maculatus Pomadasys hasta Sphyraena jello Decapterus macrosoma
25.1	1210	03	BTR	95	95	24°01'	66°32'	318.3	238.7	Nemipterus japonicus Ilisha megaloptera E. chlorostigma Carangoides malabaricus Cuttlefish
26.1	0205	04	BTR	67	67	24°12'	66°48'	503.5	503.5	Trichiurus lepturus Scoliodon sp. Rays Pomadasys maculatus Pomadasys hasta P. argenteus L. argentimaculatus
26.1	0455	05	BTR	55	55	24°14'	66°52'	159.4	159.4	P. argenteus L. argentimaculatus P. maculatus
26.1	1140	06	BTR	20	20	24°28'	66°56'	41.3	99.1	Thryssa hamiltonii Pomadasys hasta
31.1	1655	07	SPT	2450	12	23°45'	44°46'	25.0	50.0	Diaphus splendidus
1.2	0625	08	BTR	89	89	24°49'	66°16'	19.9	38.1	Chirocentrus dorab Pomadasys hasta

Date	Time start GMT	Stn No	Gear type	Bottom depth m	Gear depth m	Position north	Position east	Total catch kg	Catch per hour kg	Dominant species
1.2	1135	09	BTR	25	25	25°09'	66°30'	1039.7	3119.1	Sardinella spp. Carangoides maculatus Lactarius lactarius Squids Skates Nemipterus japonicus
1.2	1340	10	BTR	44	44-54	25°10'	66°27'	2017.7	3026.6	Arius spp. Johnius coibor Nemipterus japonicus Otolithes ruber Lactarius lactarius
2.2	0530	11	SPT	750	200	24°53'	65°52'	24.5	49.0	Lepturacanthus savala
2.2	1230	12	BTR	15	15	25°16'	65°45'	96.6	193.2	Arius spp. Lepturacanthus savala
2.2	1520	13	BTR	24	24	25°04'	65°42'	2000.0	4000.0	Arius spp. Pomadasys hasta Johnius coibor (MUNRO) Scomberoides commersonianus
3.2	0330	14	BTR	38	38-54	28°05'	65°23'	204.0	816.2	Pomadasys hasta Drepane punctata Lactarius lactarius
3.2	1620	15	SPT	420	15	25°07'	64°57'	110.0	220.0	Euphausiids
3.2	2045	16	BTR	15	15	25°08'	64°44'	3080.2	6160.4	Arius spp. Rays Trichiurus lepturus
4.2	0625	17	SPT	450	45	24°58'	64°24'	160.7	482.2	Megalaspis cordyla
4.2	1400	18	SPT	157	0-15	25°06'	64°02'	289.1	867.3	Tenualosa sinensis (MUNRO)

Date	Time start GMT	Stn No	Gear type	Bottom depth m	Gear depth m	Position north	Position east	Total catch kg	Catch per hour kg	Dominant species
4.2	1800	19	SPT	2200	15	24°35'	63°57'	6.3	12.6	Diaphus splendidus
6.2	1310	20	BTR	12	12	24°08'	63°11'	119.1	198.6	Lethrinus mohsenoides (MUNRO) Plectorhynchus crassispina Thrissocles dussumeiri (MUNRO)
7.2	1350	21	SPT	3600	15	23°48'	62°28'	9.0	18.0	Diaphus splendidus
8.2	1055	22	BTR	22	22	25°03'	62°51'	386.6	773.3	Arius spp. Pomadasys hasta P. argenteus Pseudopristipoma niger (MUNRO)
8.2	1635	23	SPT	15	84	24°57'	62°12'	122.0	244.0	Dussumieria acuta

OBS: Bottom & Gear depths at Stn No 23 (?)

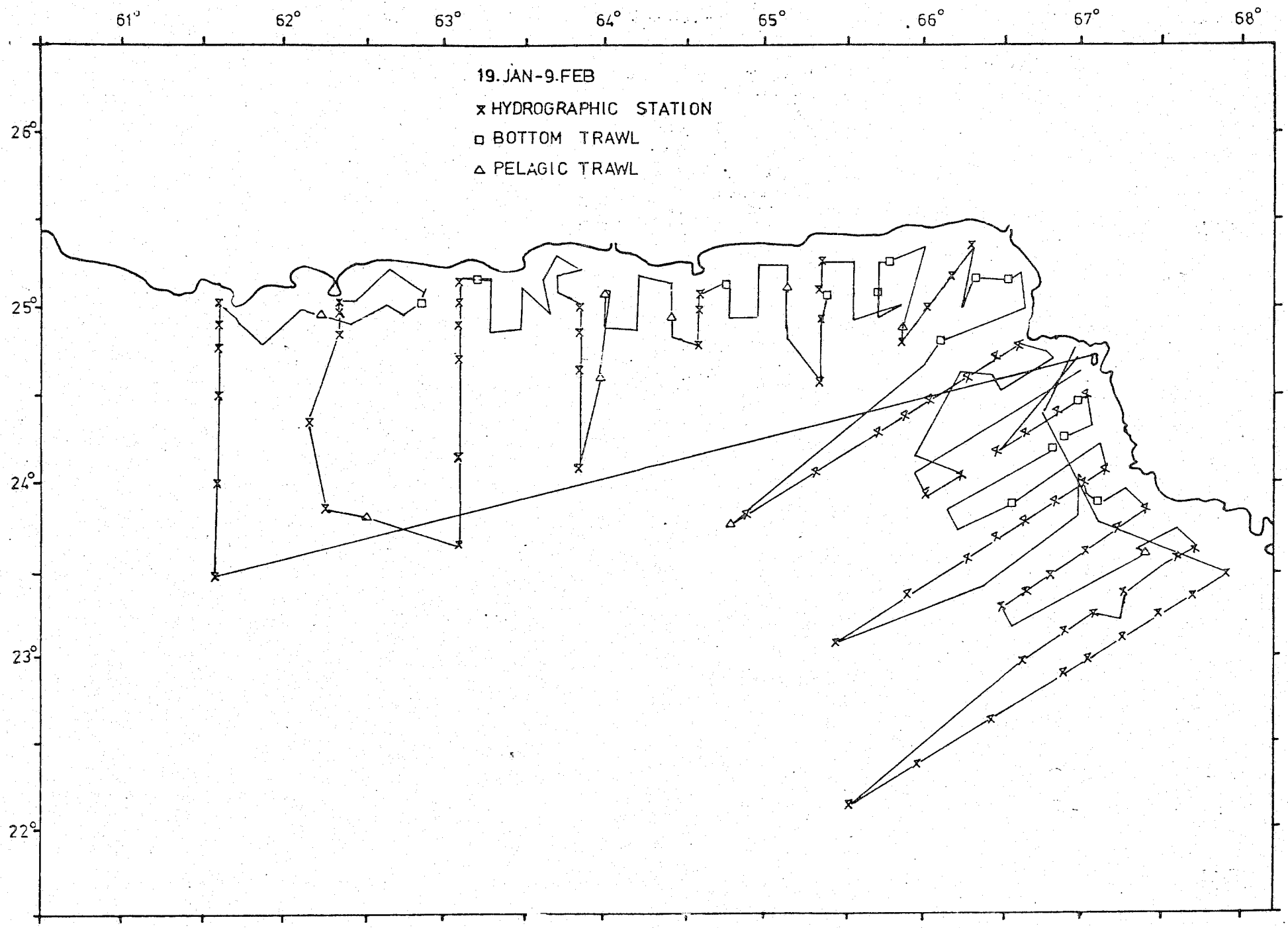
Table 3. Length- and maturity frequency distributions

SMALL FISH CR. 1+2

SPECIES	St.nos	Length in cm (below)																N	Maturity stage						
		≤5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>20		1	2	3	4	5	6	7
Dussumiera acuta	23								40	50	10							30		37	30	23	10		
Sardinella sindensis (day)	20							8	16	20	44	8	4					25	8	32	4	56			
Sardinella sp.	09-18						2	30	59	4	6							55	53	27	20				
Thryssa mystax	10-12-23						3	5	21	7	25	18	16	3	2	2		73		4	8	29	42	17	
Thryssa malabarica	12							8	12	24	28	8	0	16	4			25		16	12	24	24	24	
Thryssa dussumieri	12-20					37	47	16										56			18	33	39	10	
Thryssa hamiltonii	05										21	12	32	24		12		34		20	0	0	80		
Decapterus russellii	06			12	40	32	8	8										25		15	39	46			
Stolephorus sp.	06			4	0	40	24	12	8	8	0	0	4					25	30	30	20	10	10		
Lactarius lactarius	05-06-14				5	25	28	3	7	16	7	6						75	10	35	33	20	3		
Nemipterus japonicus	03								2	9	13	9	9	17	19	15	9	47		51	40	9			
Therapon jarbua	13										23	31	15	15	0	8	8	13					31	62	8

Table 3. Length and maturity frequency distributions. Cruise Nos 1 + 2. LARGE FISH.

Species	Stn Nos	Length in cm (below)									Maturity stage						
		10	15	20	25	30	35	40	45	N	1	2	3	4	5	6	7
Pomadasys hasta	04-13-14-20-22					8	36	16	40	54		16	12	8	40	24	
Pomadasys maculatus	04	14	49	34	3					70	20	20	1	17	27	14	
Pampus argenteus	04-10-22		2	48	48	2				52	2	59	29	28	8		4
Megalaspis cordyla	17						39	61		26	4	50	46				
Johnius carutta	10	15	65	20						20	5	45	35				
Otolithes ruber	10		10	50	40					20	10	75	15				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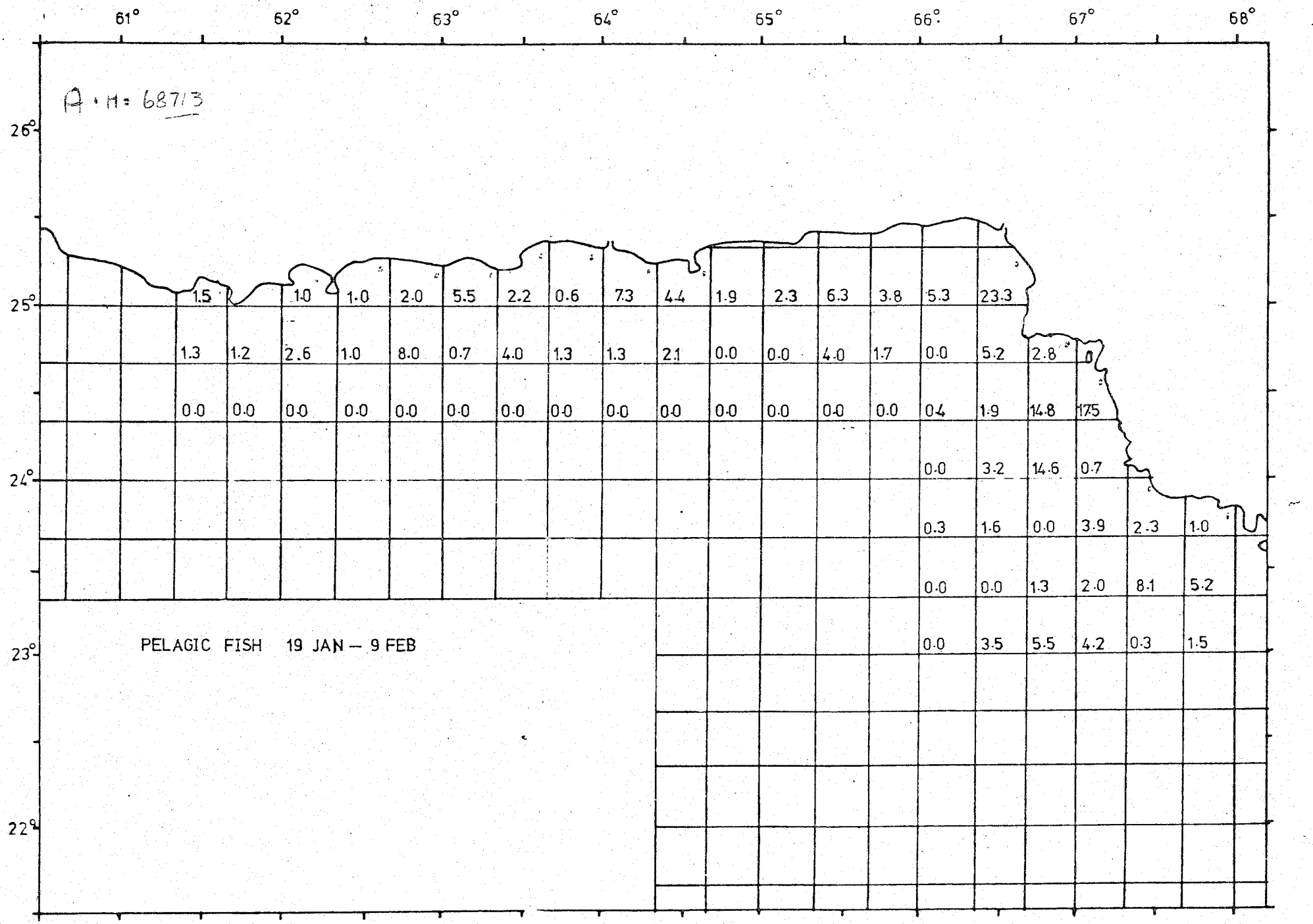
x HYDROGRAPHIC STATION
□ BOTTOM TRAWL
△ PELAGIC TRAWL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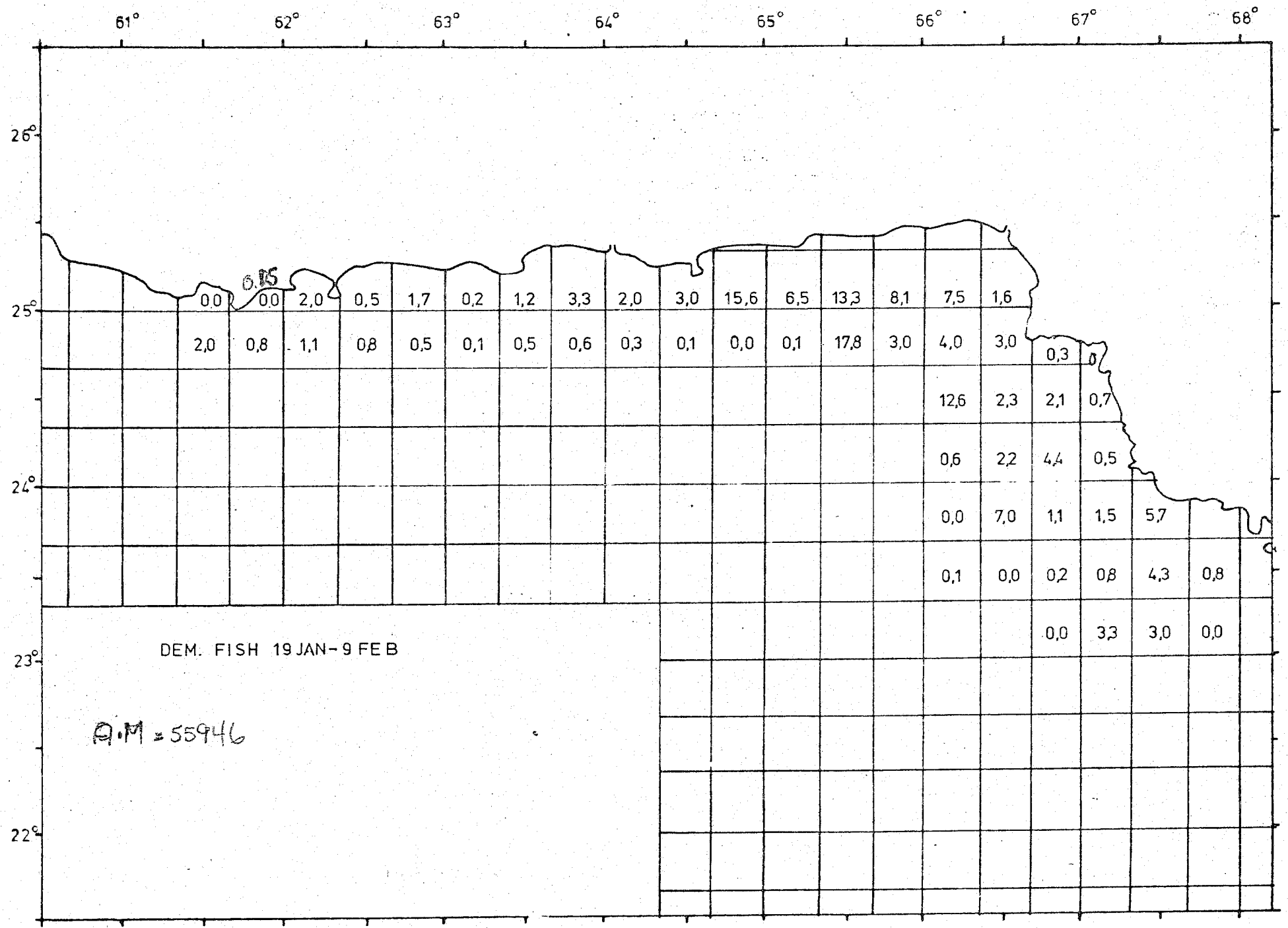
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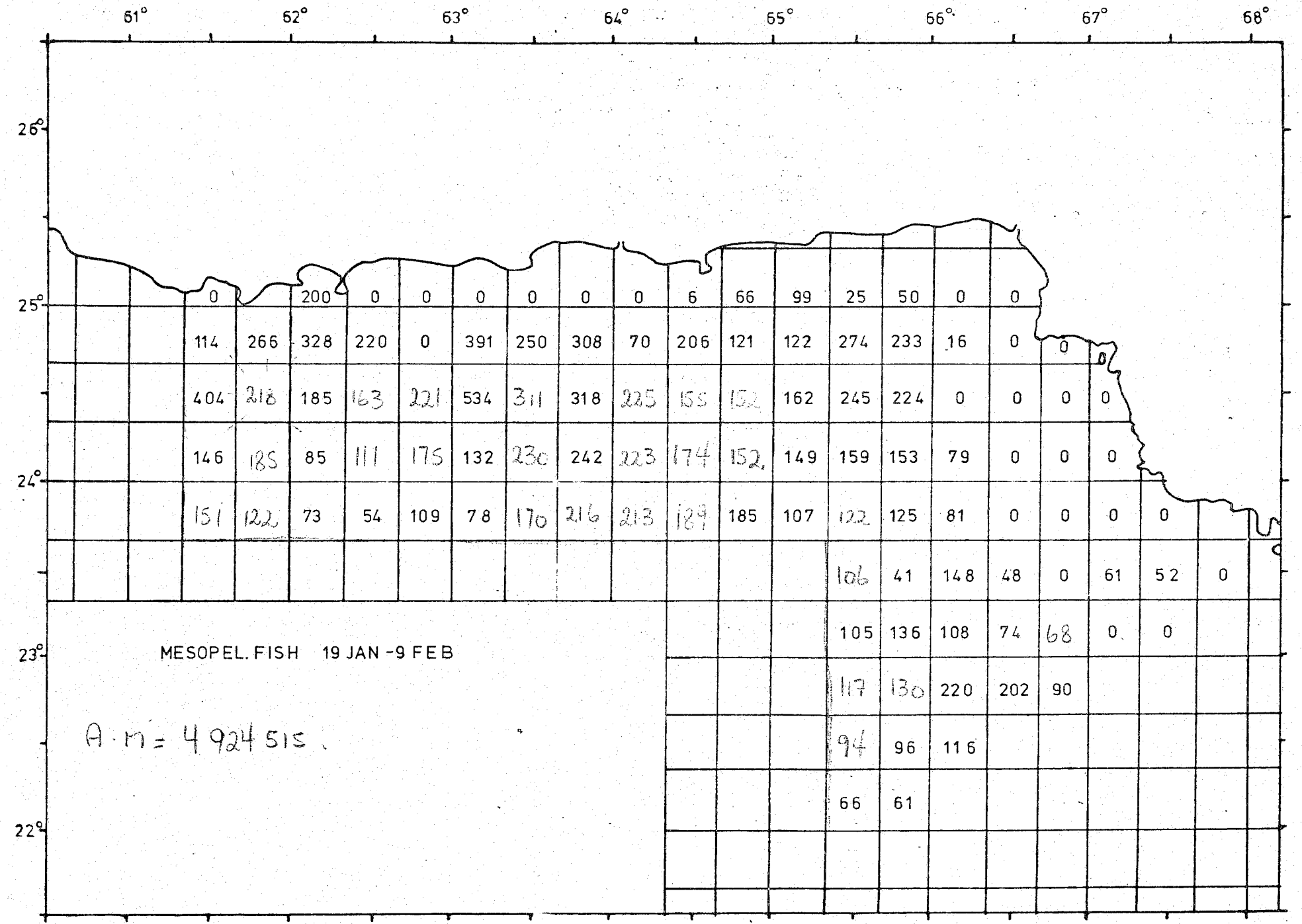
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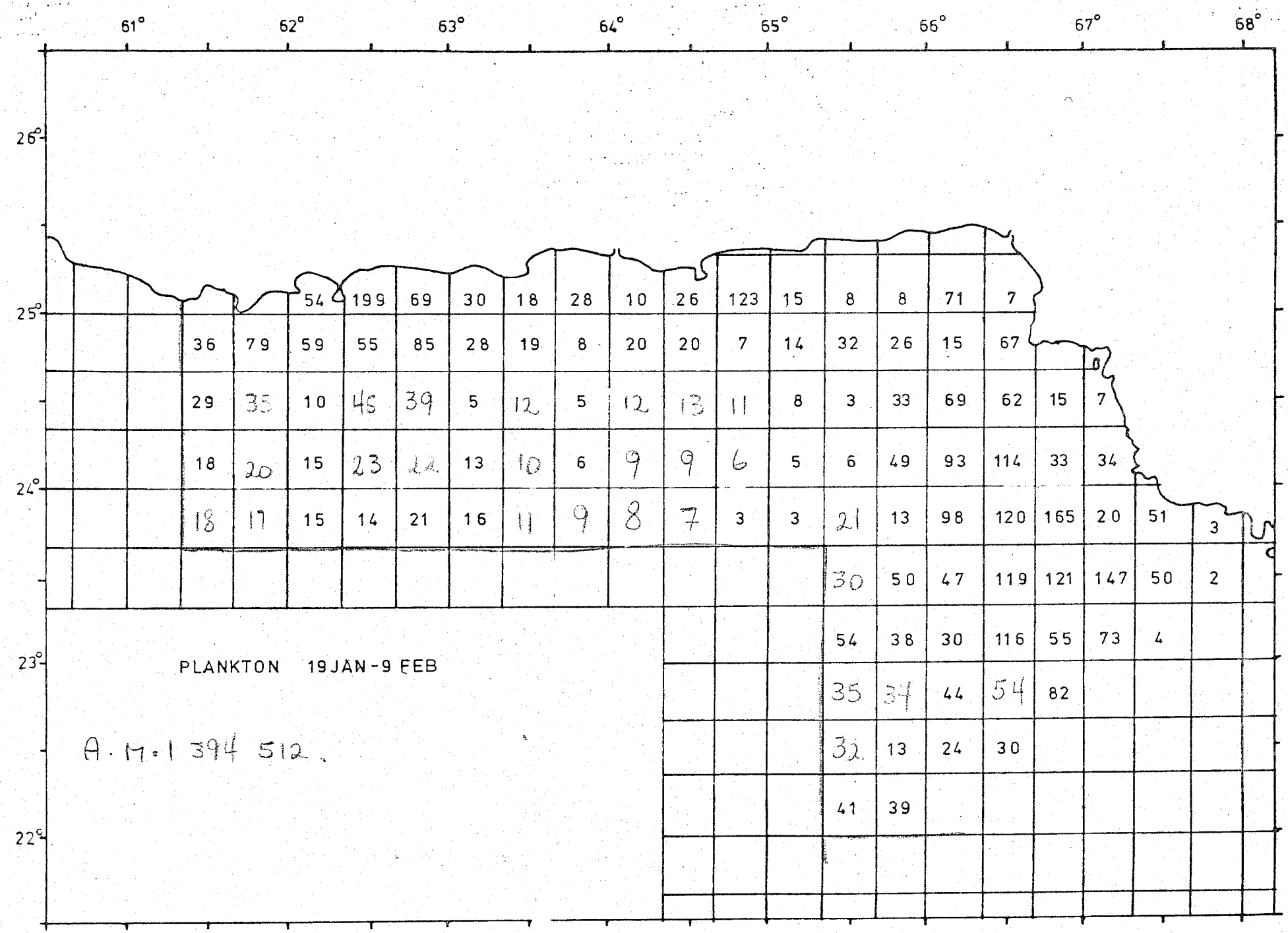
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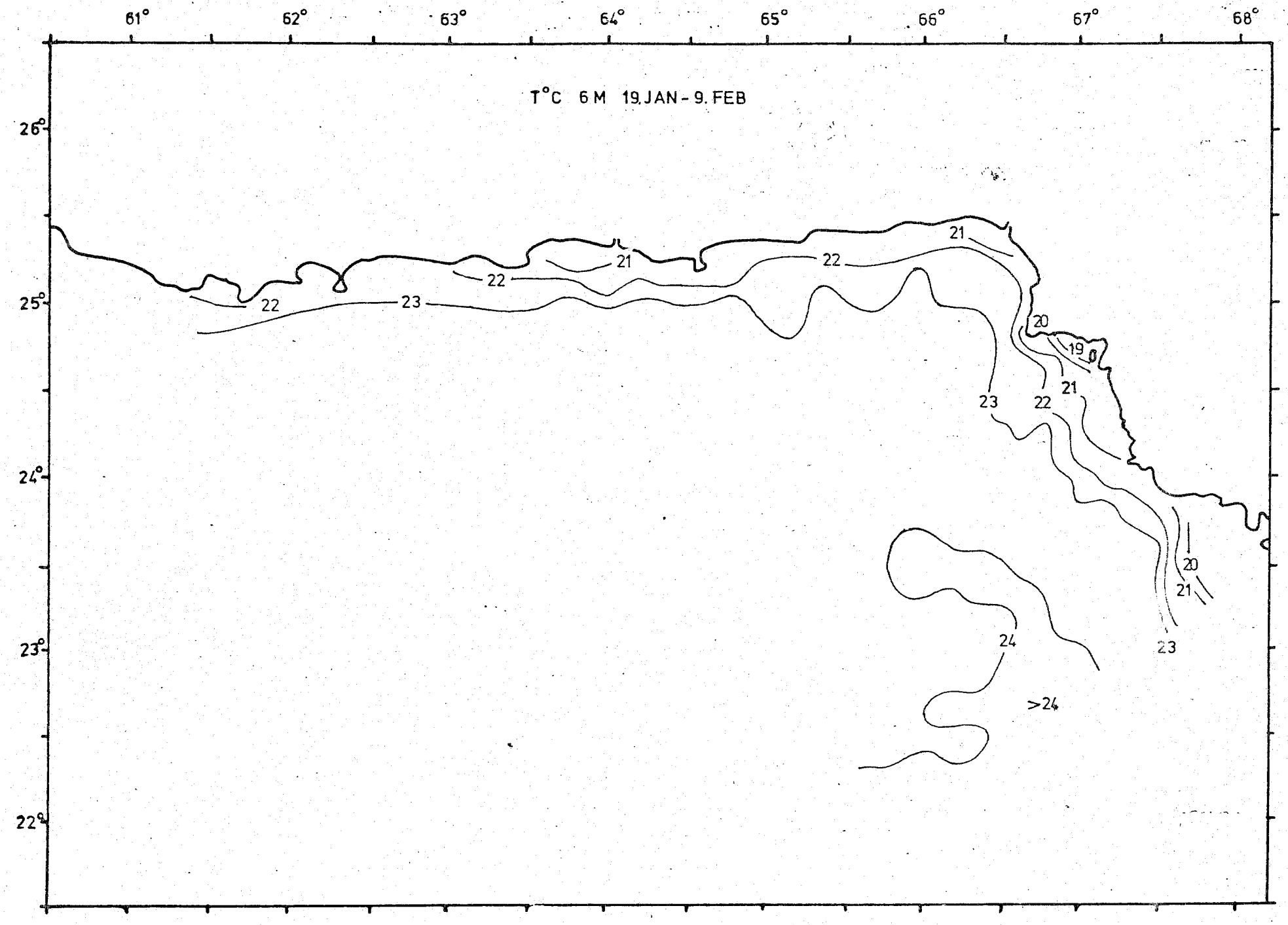
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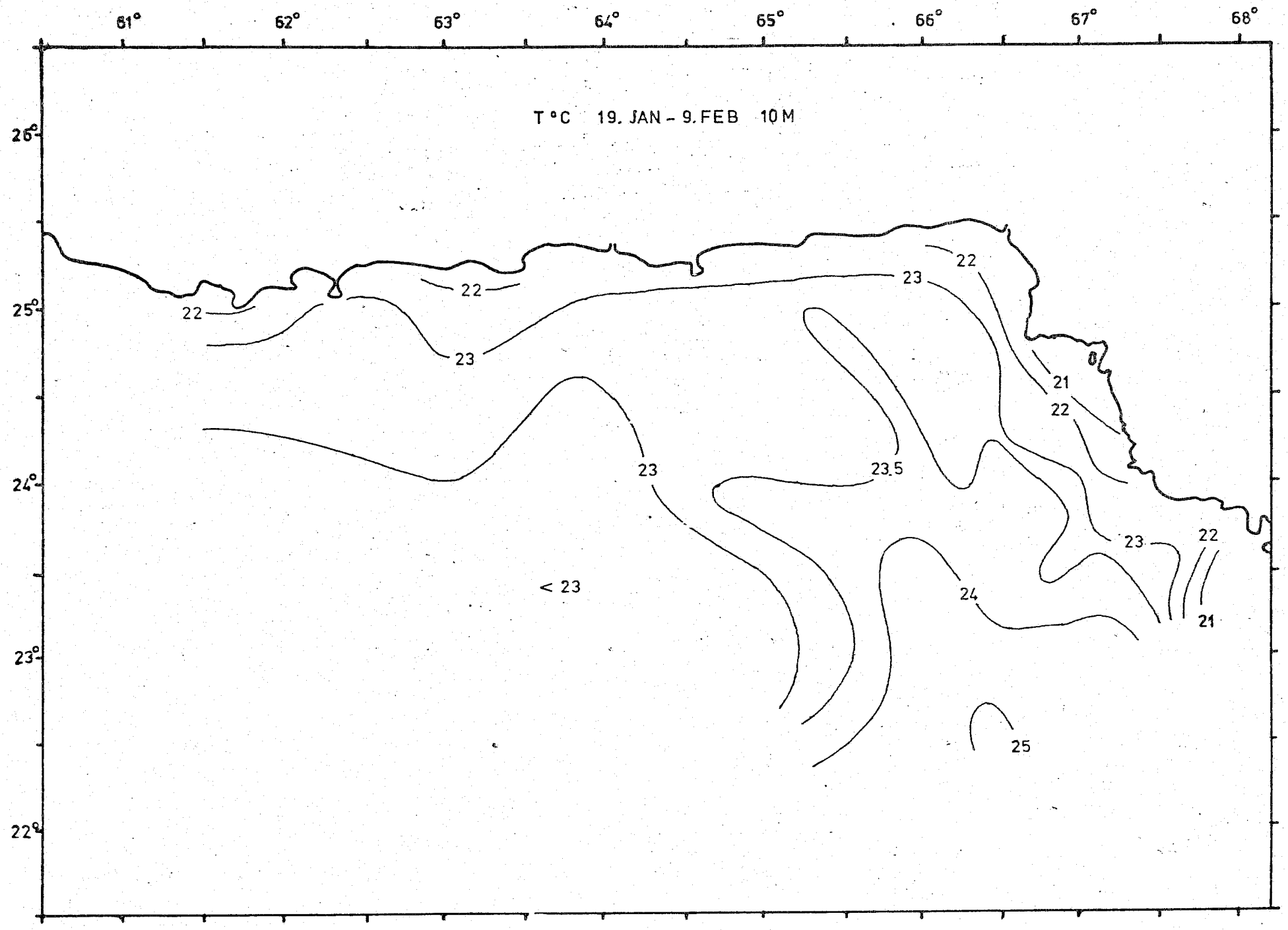
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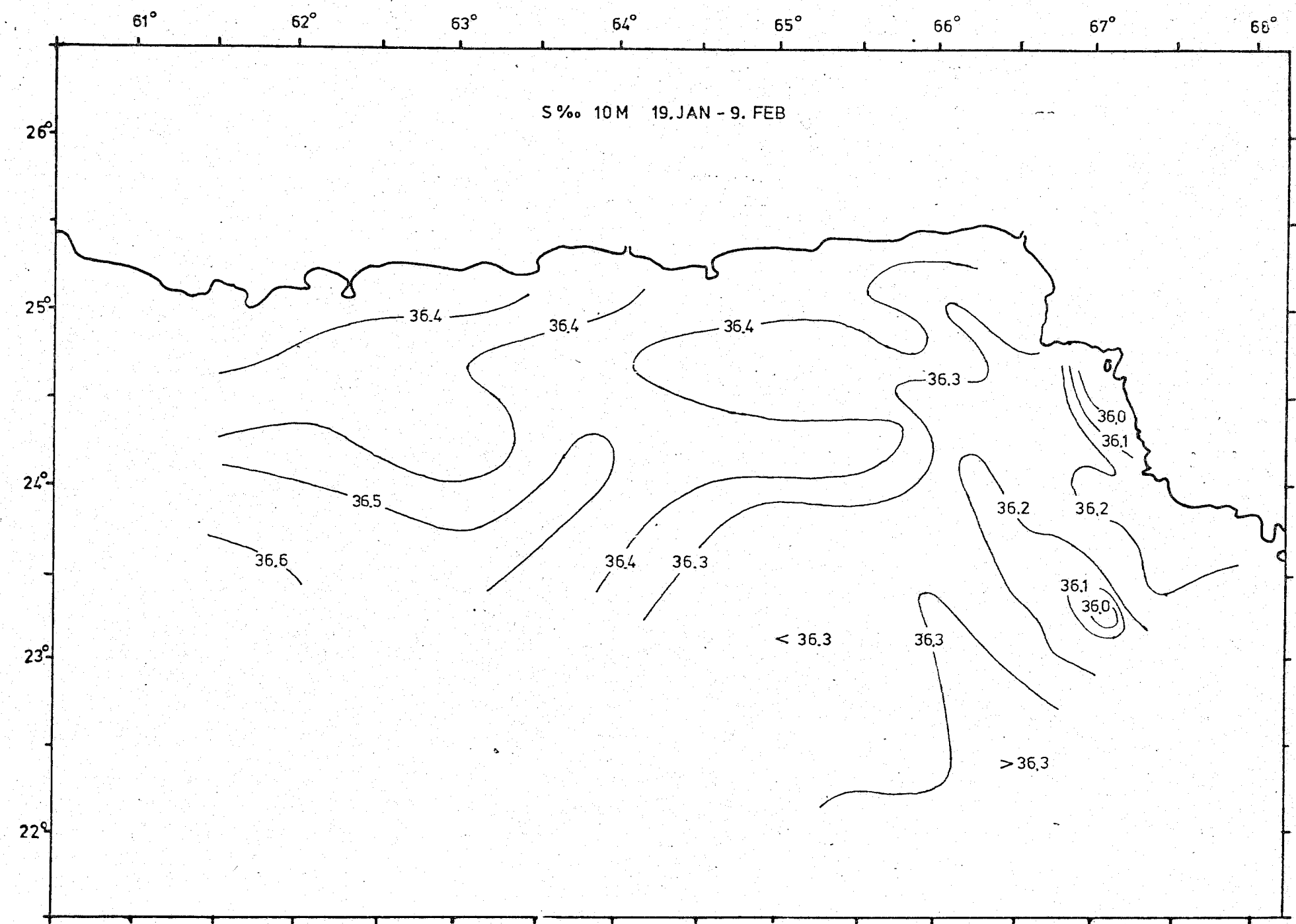
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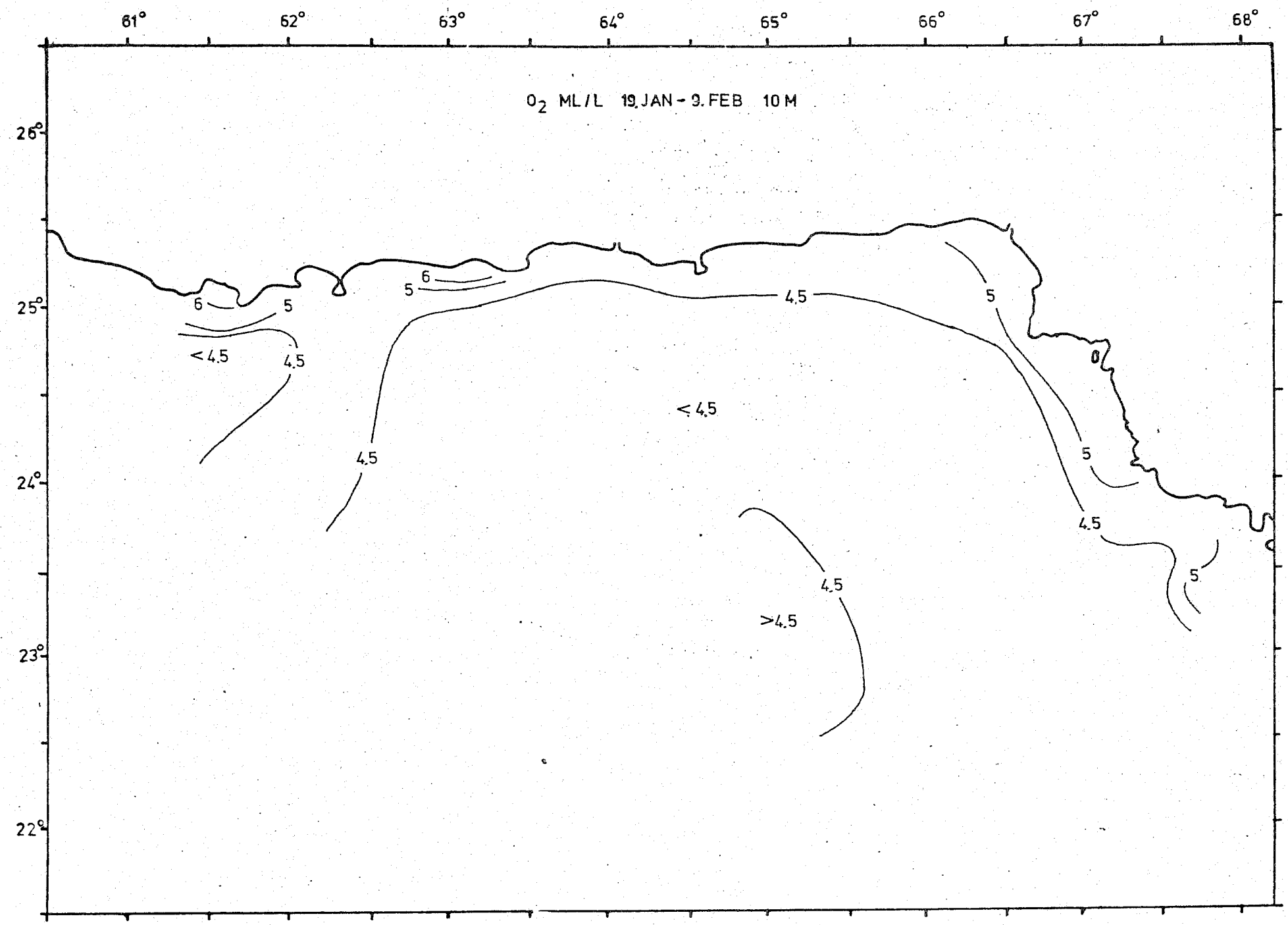
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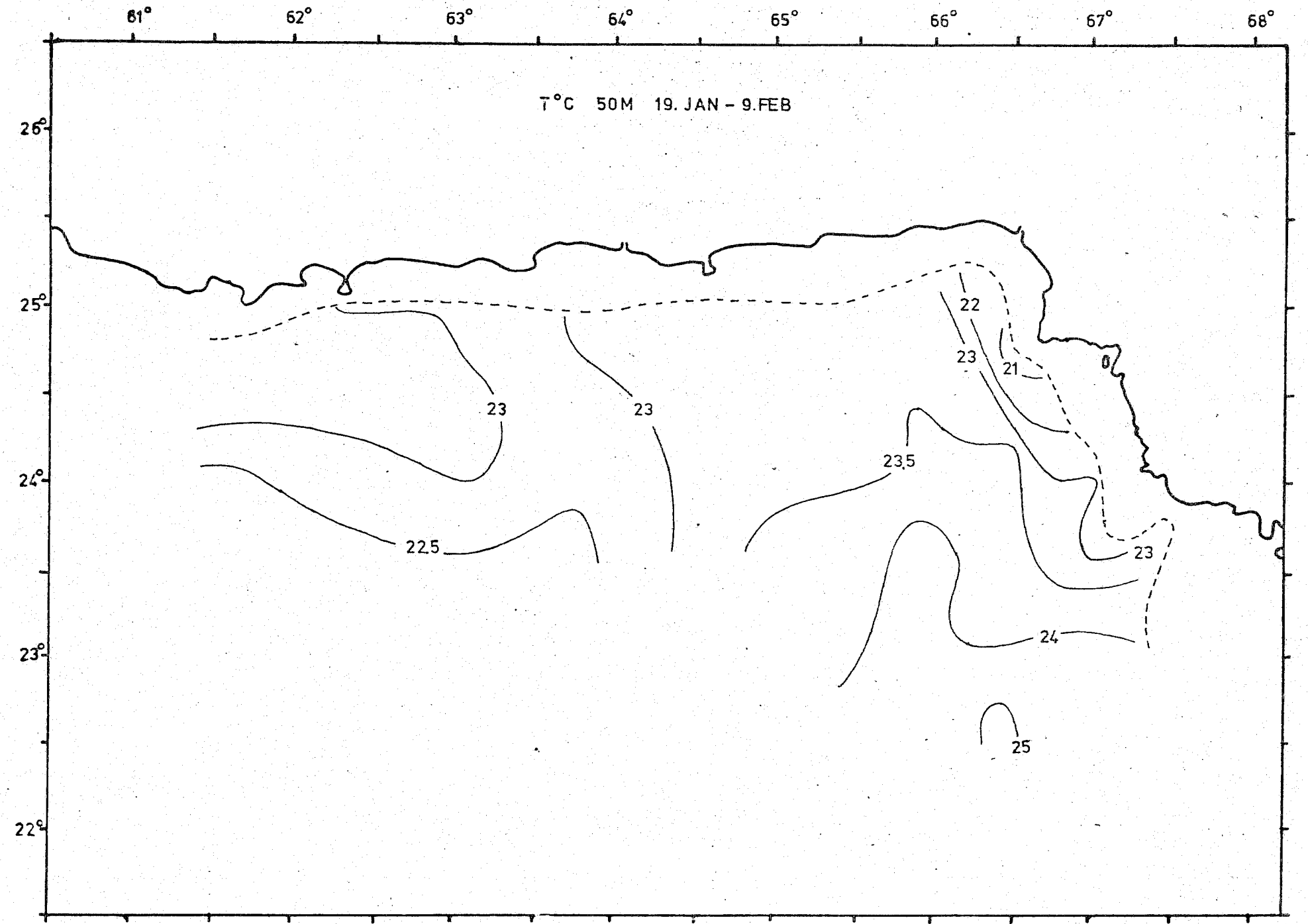
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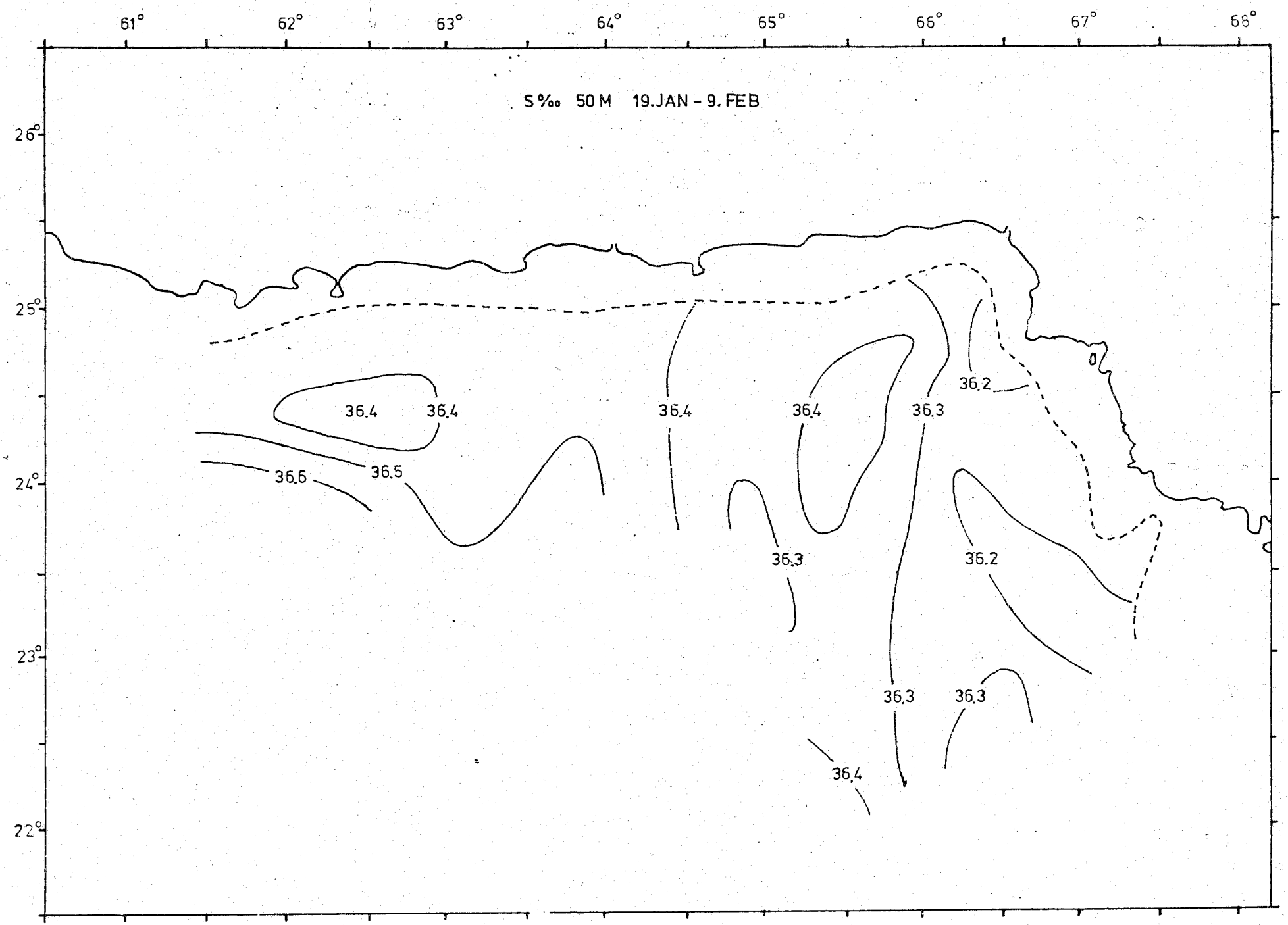
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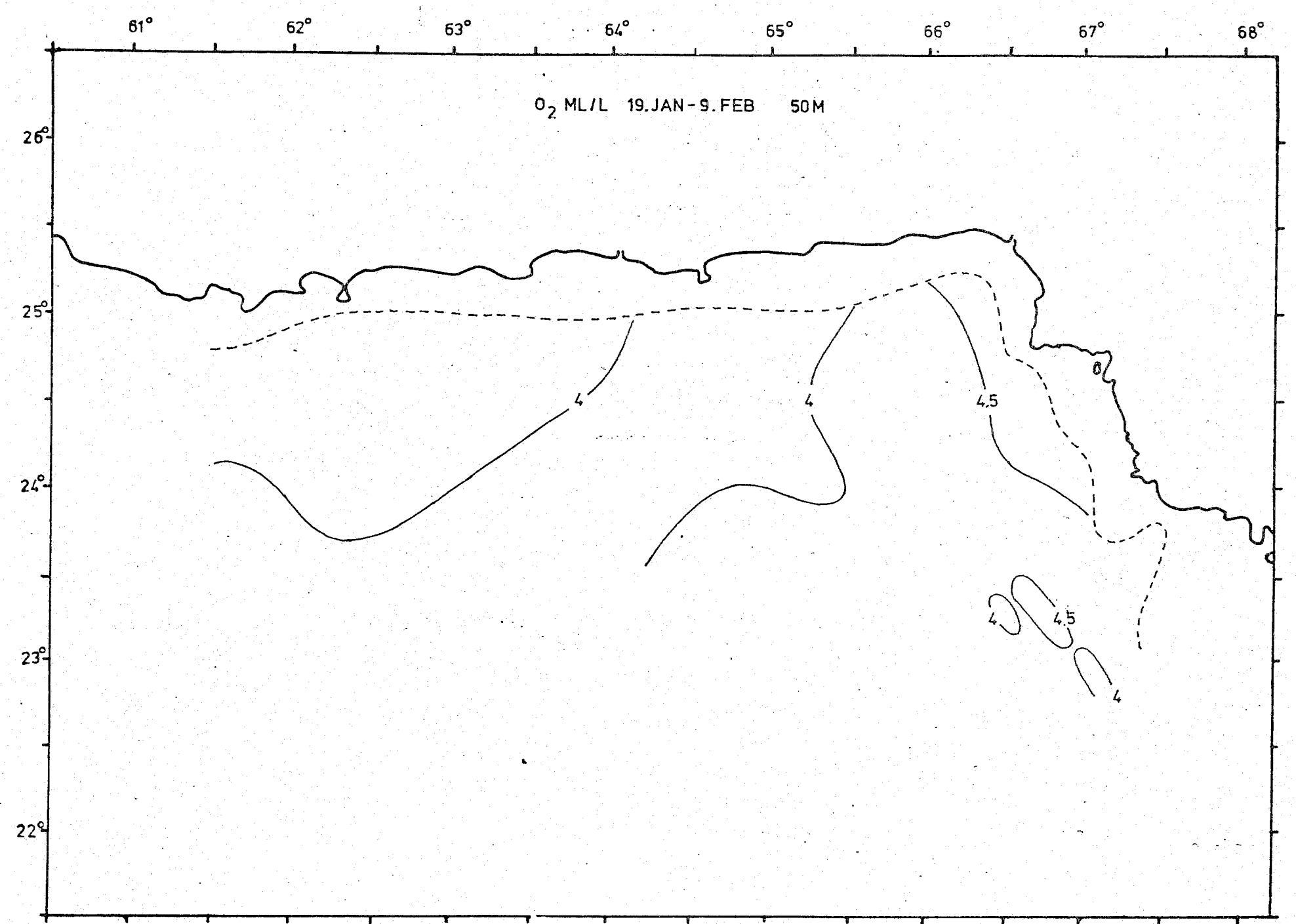
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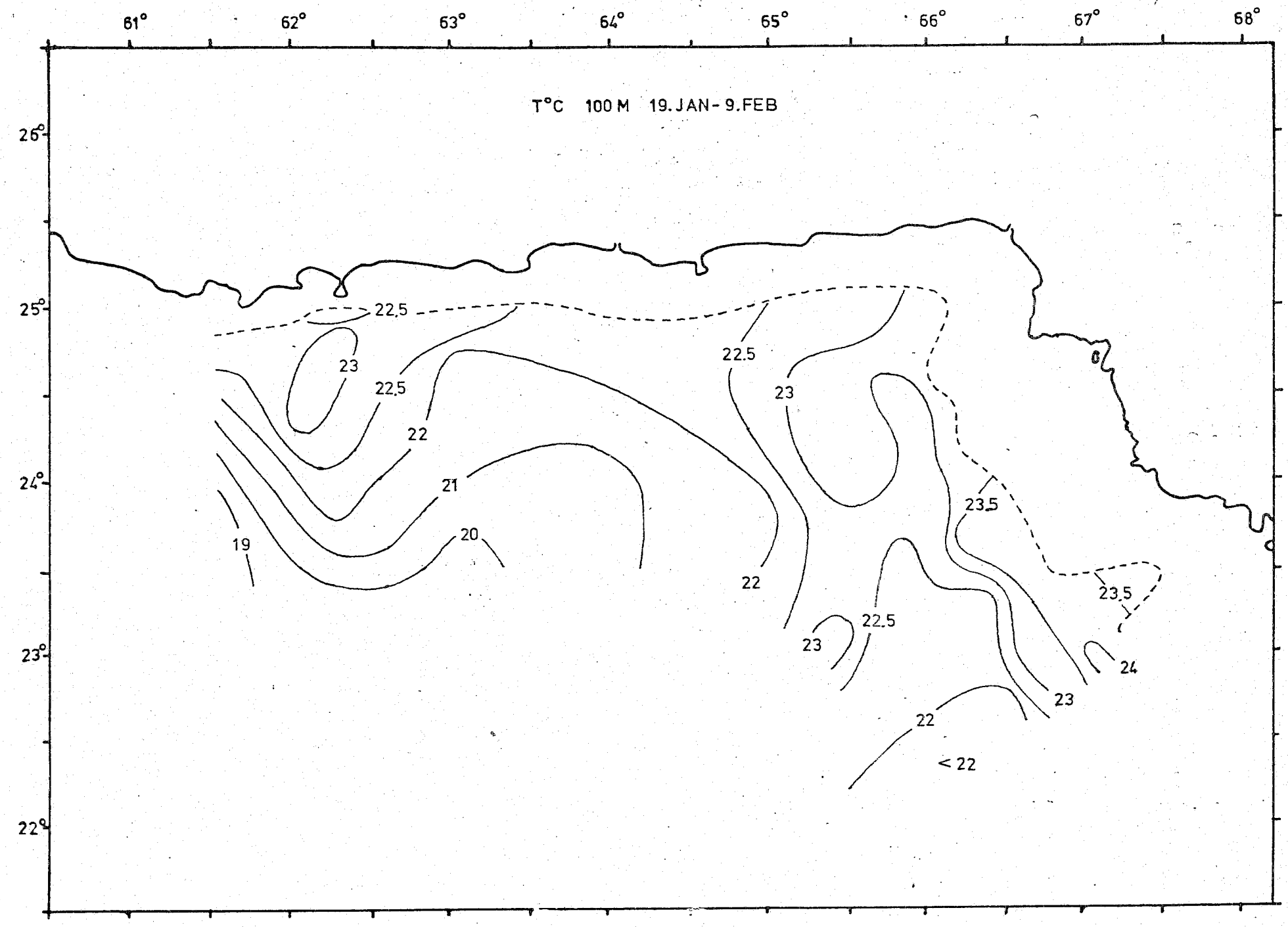
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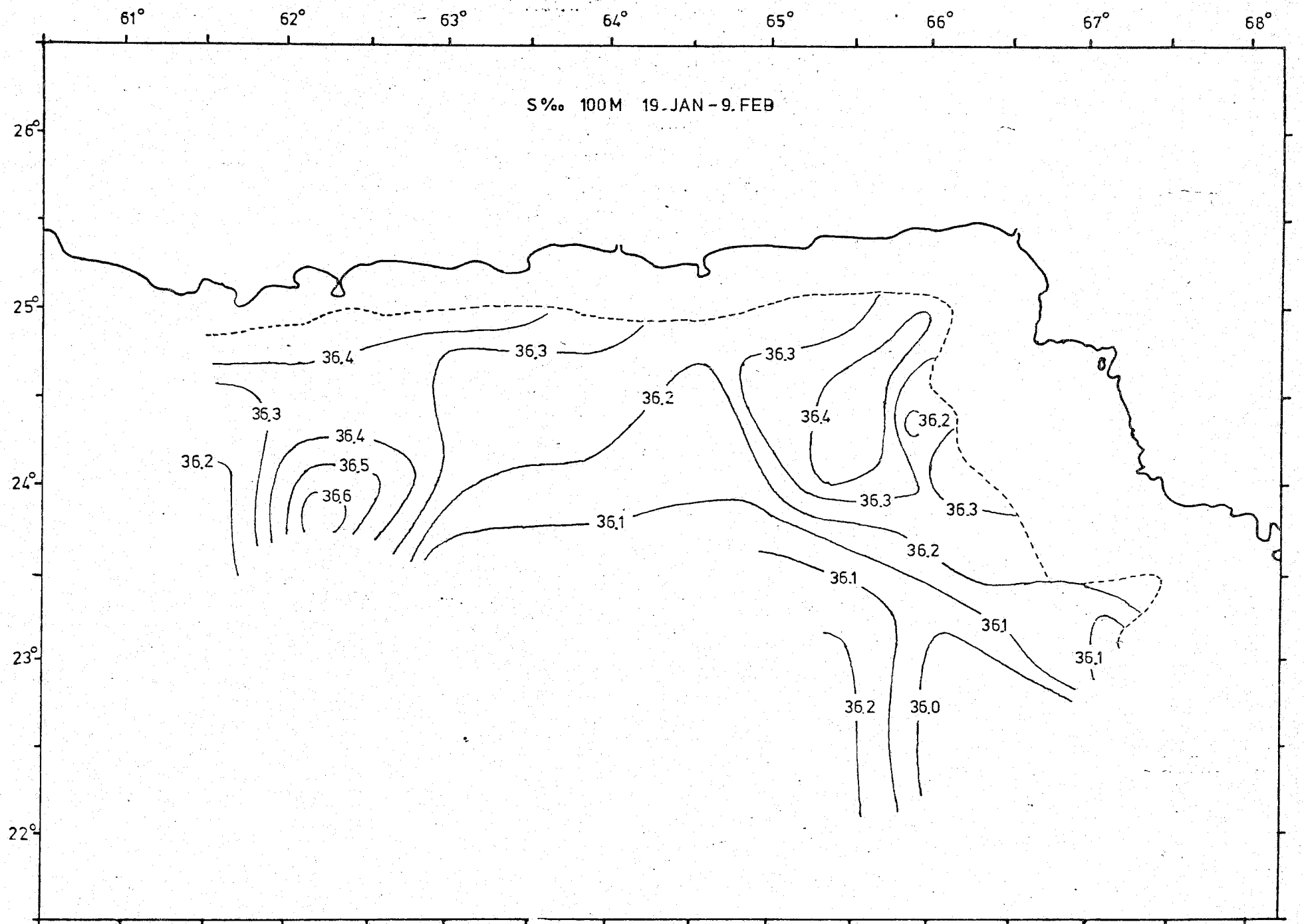
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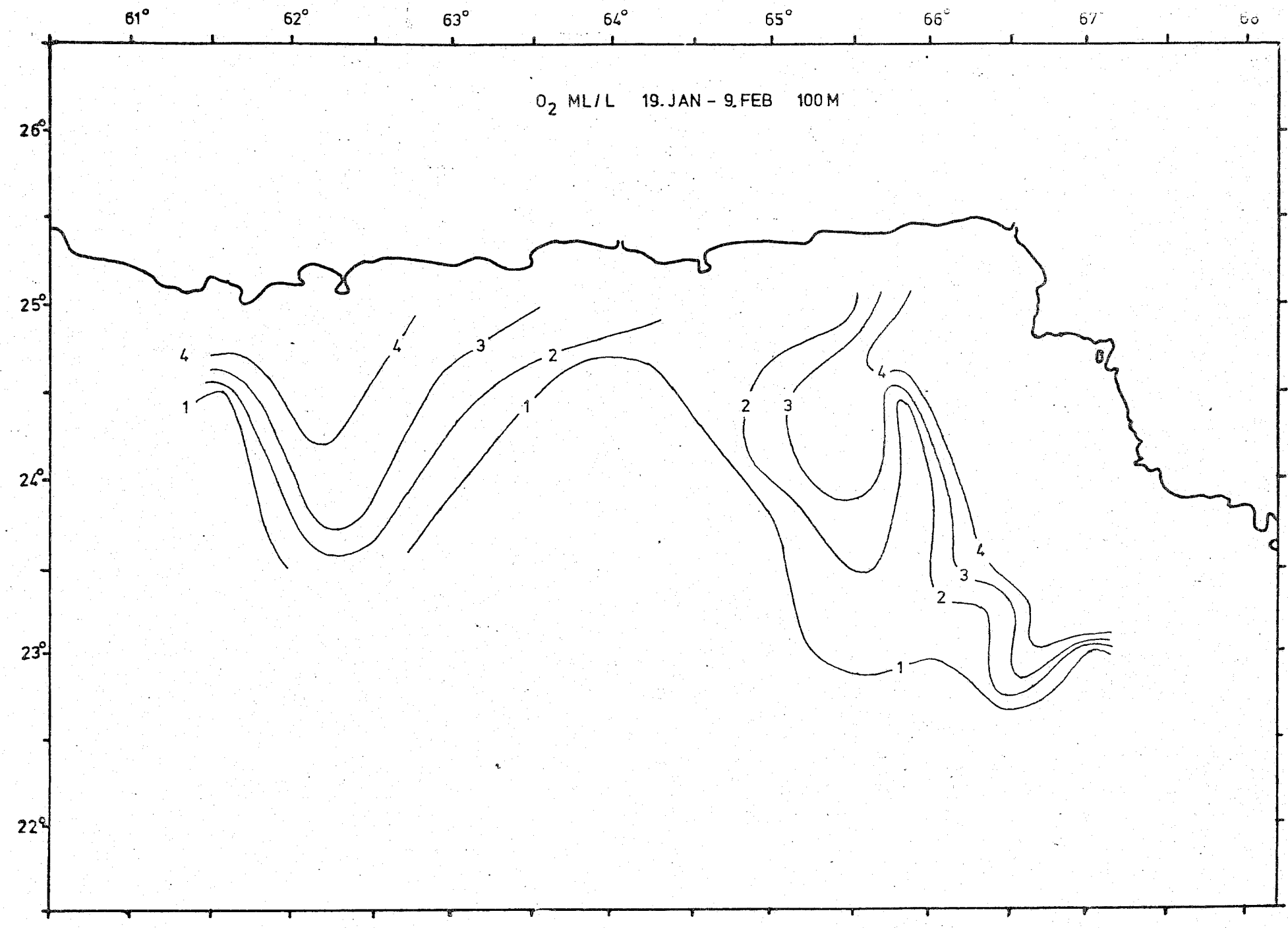
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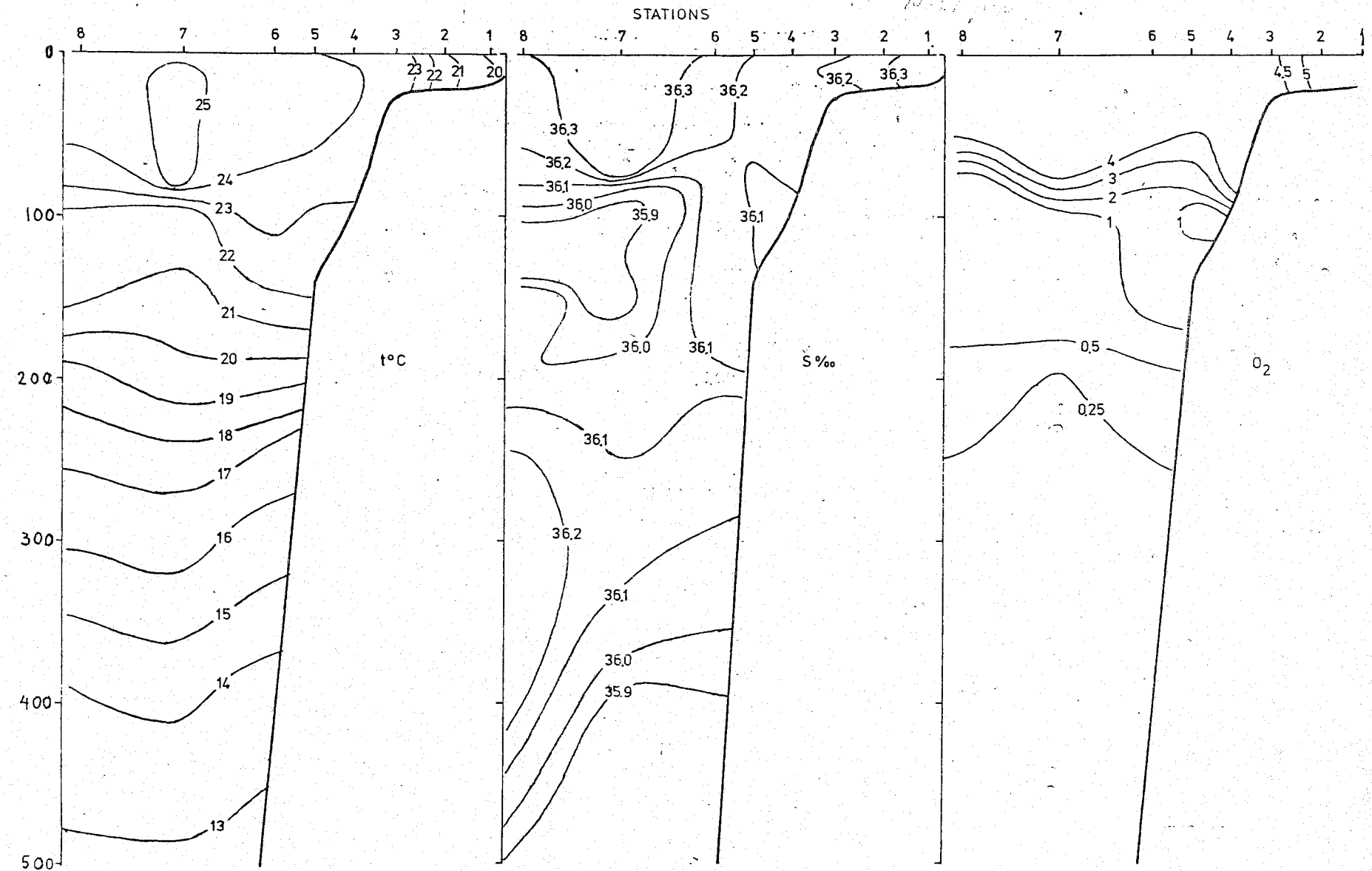
SECTION I 19-21 January 1977



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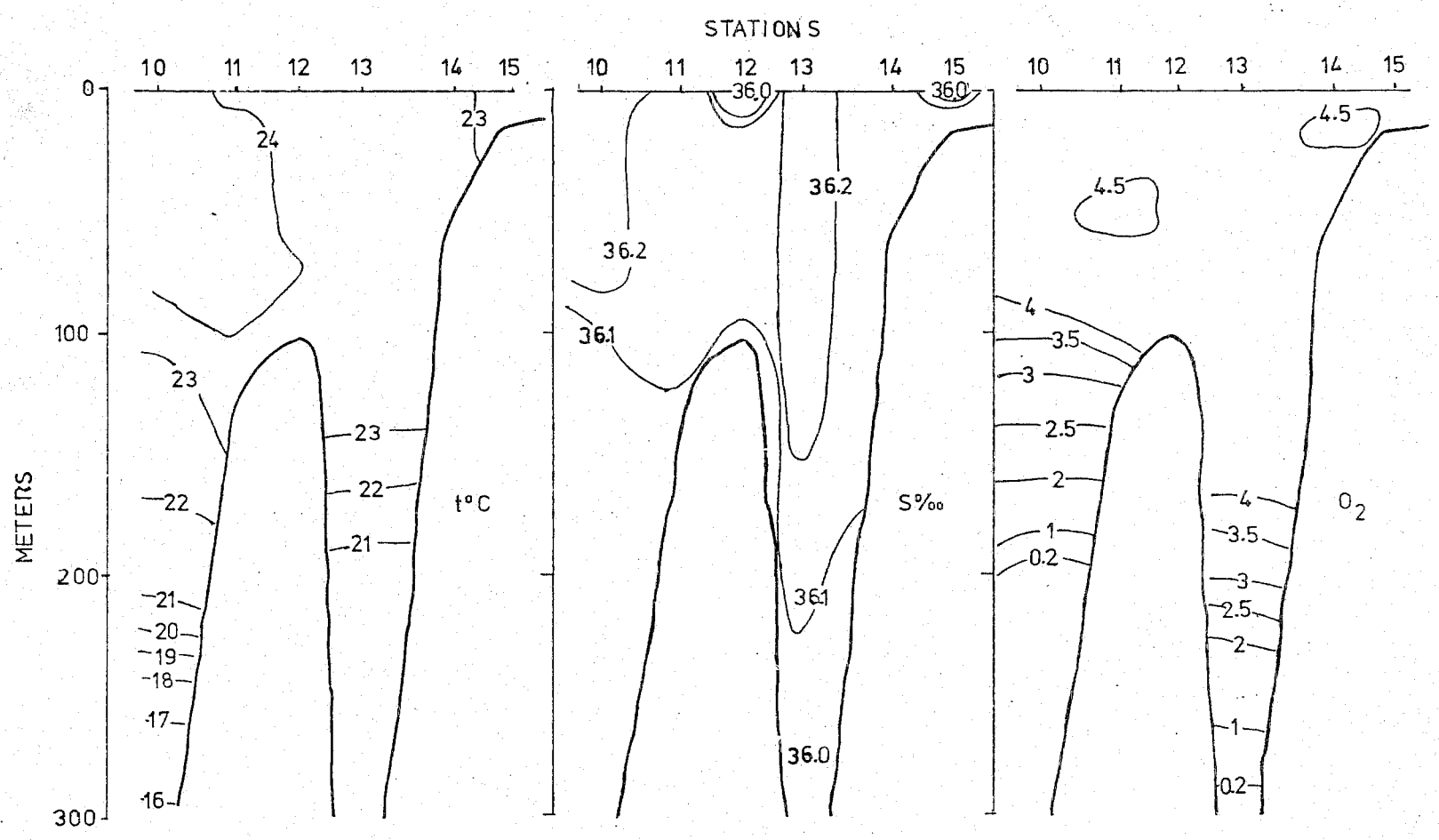

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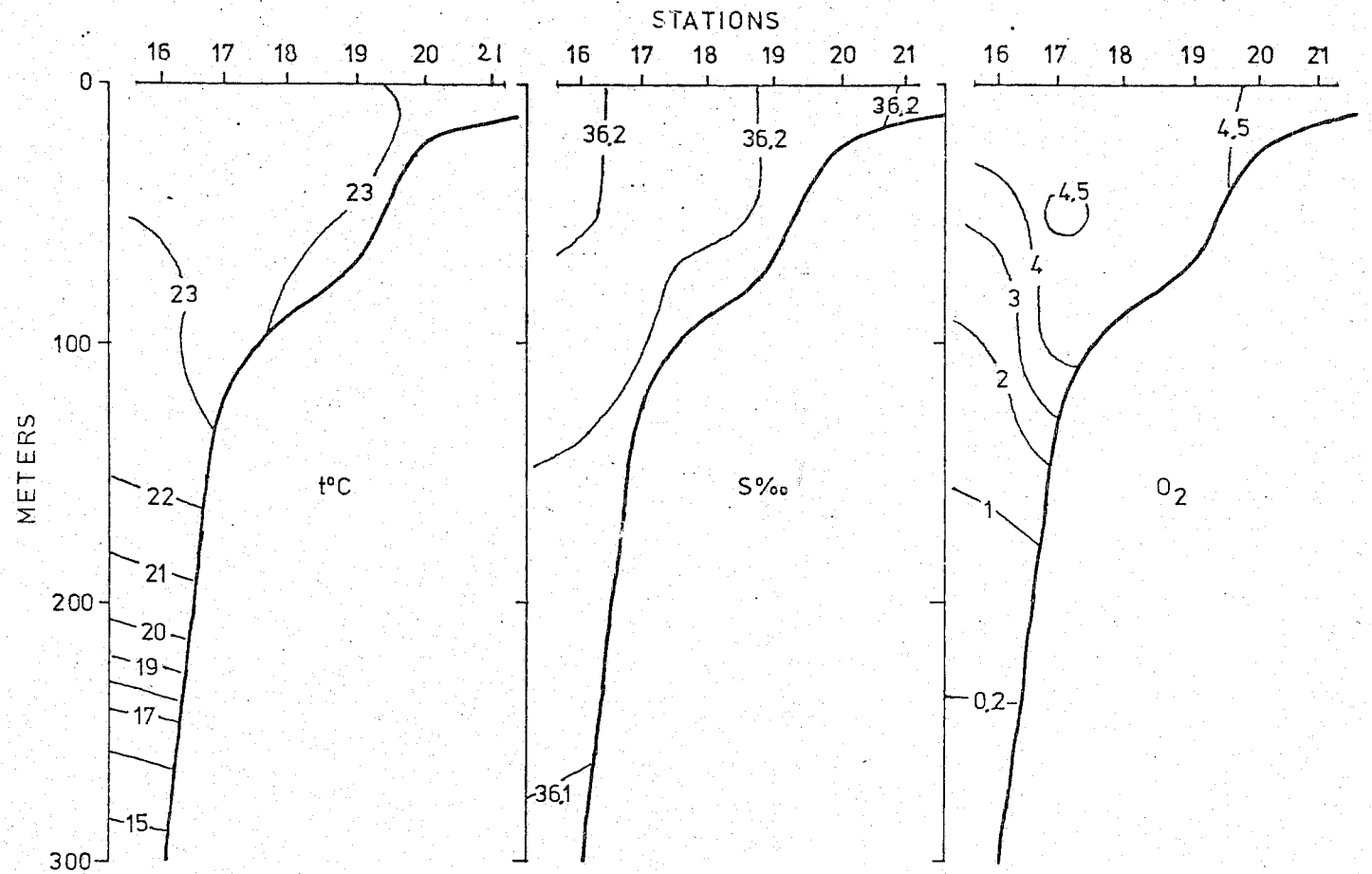

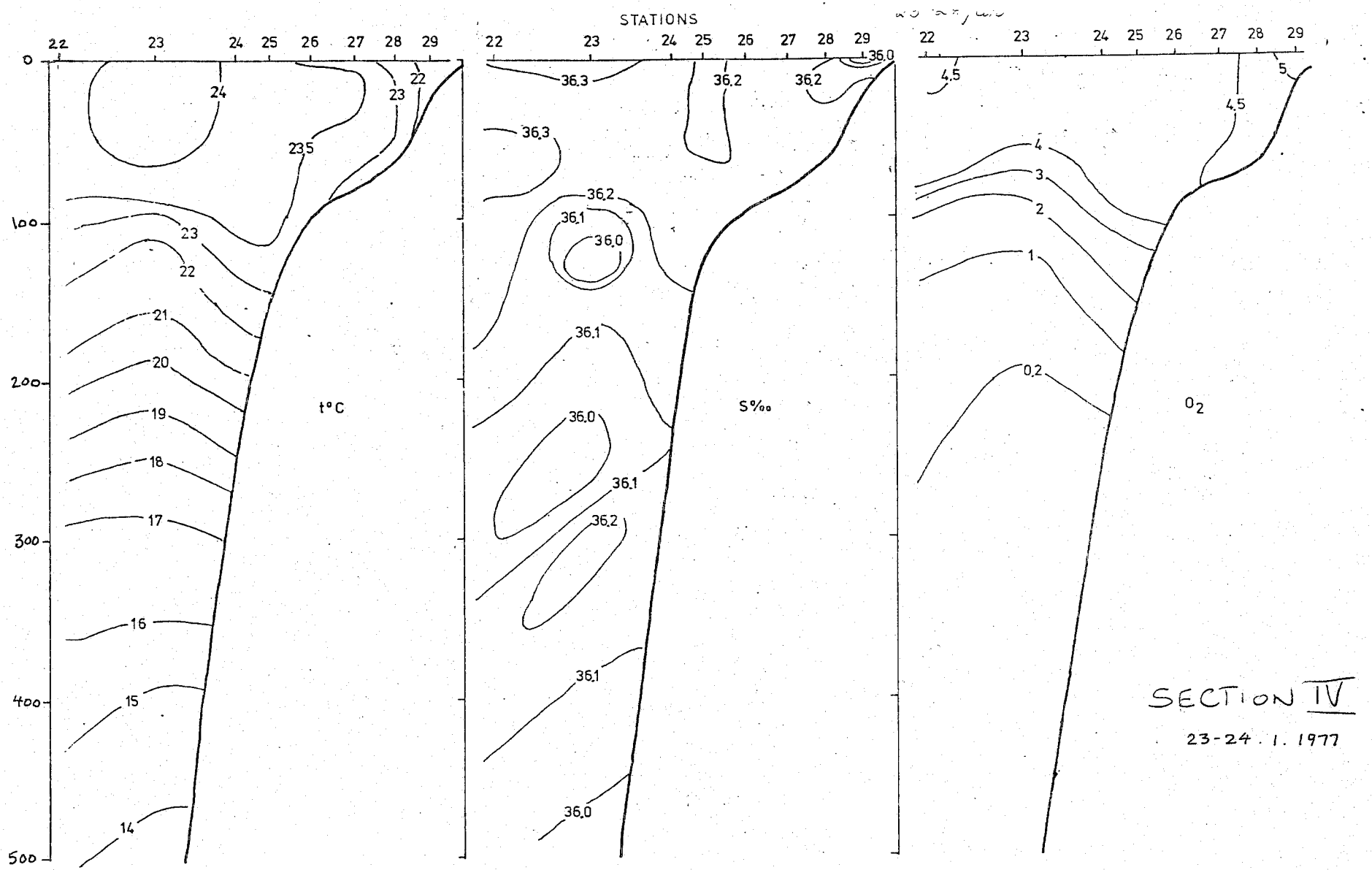
STATIONS
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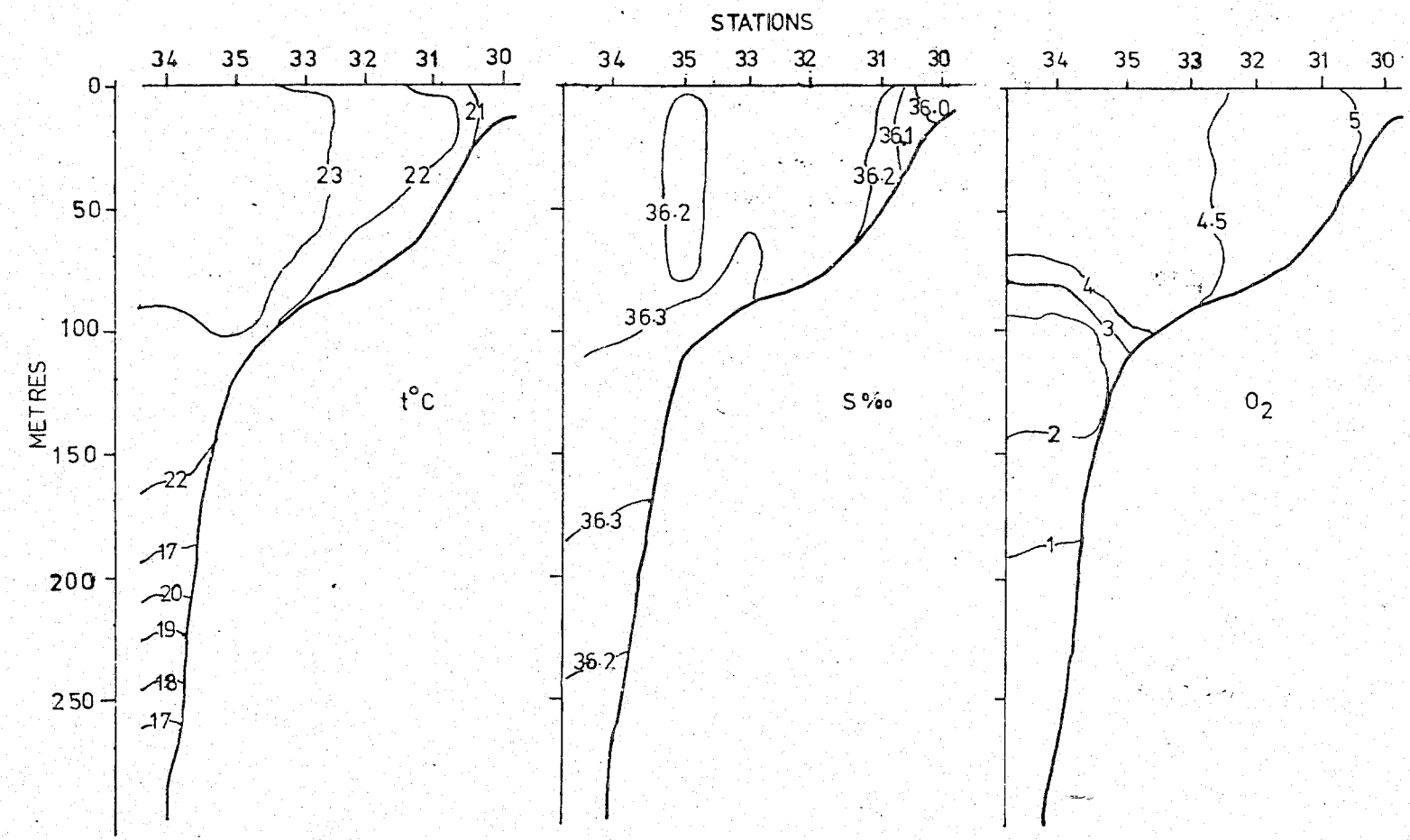
SECTION IV
23-24. 1. 1977

SECTION V 26-29 January 1977



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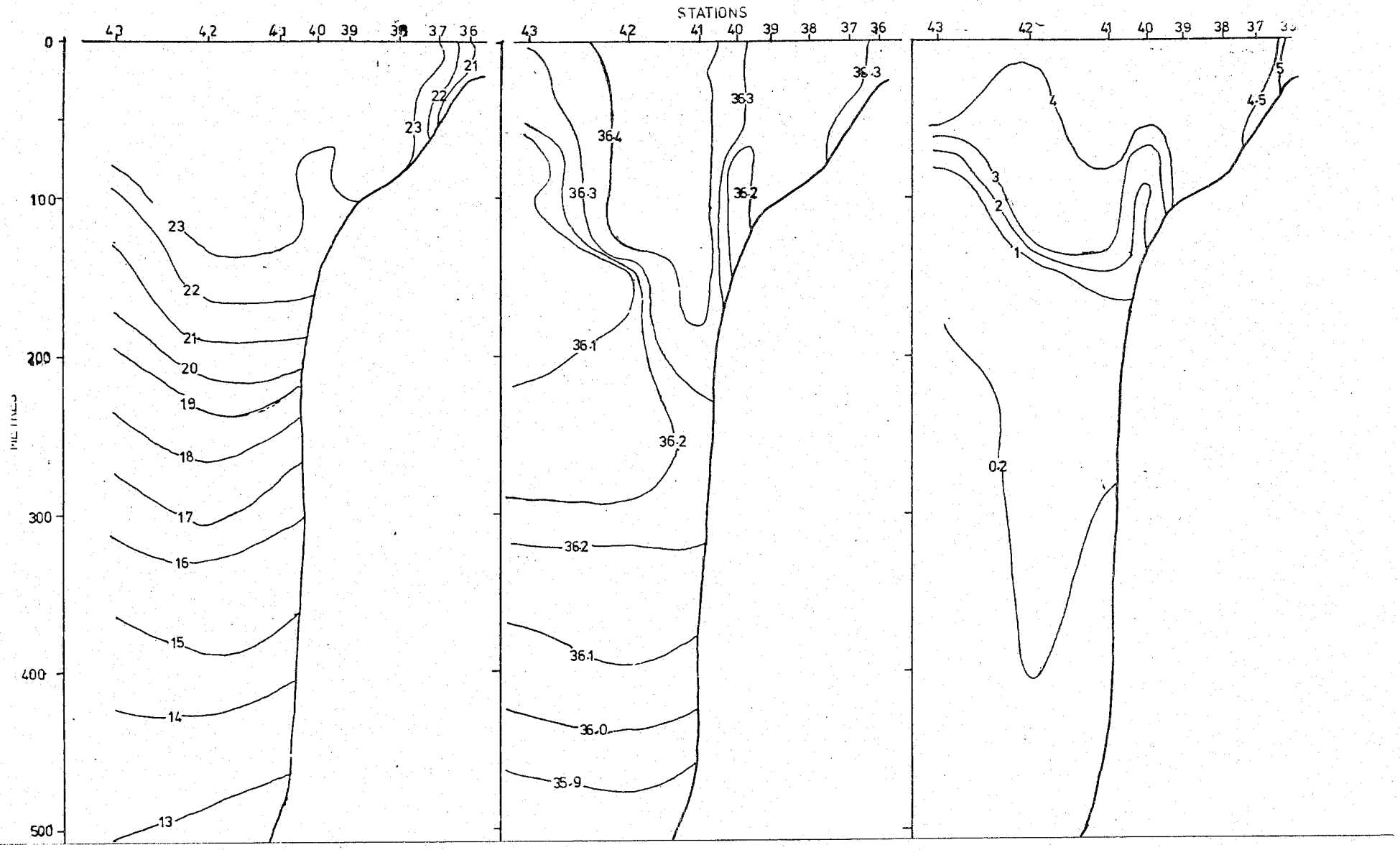

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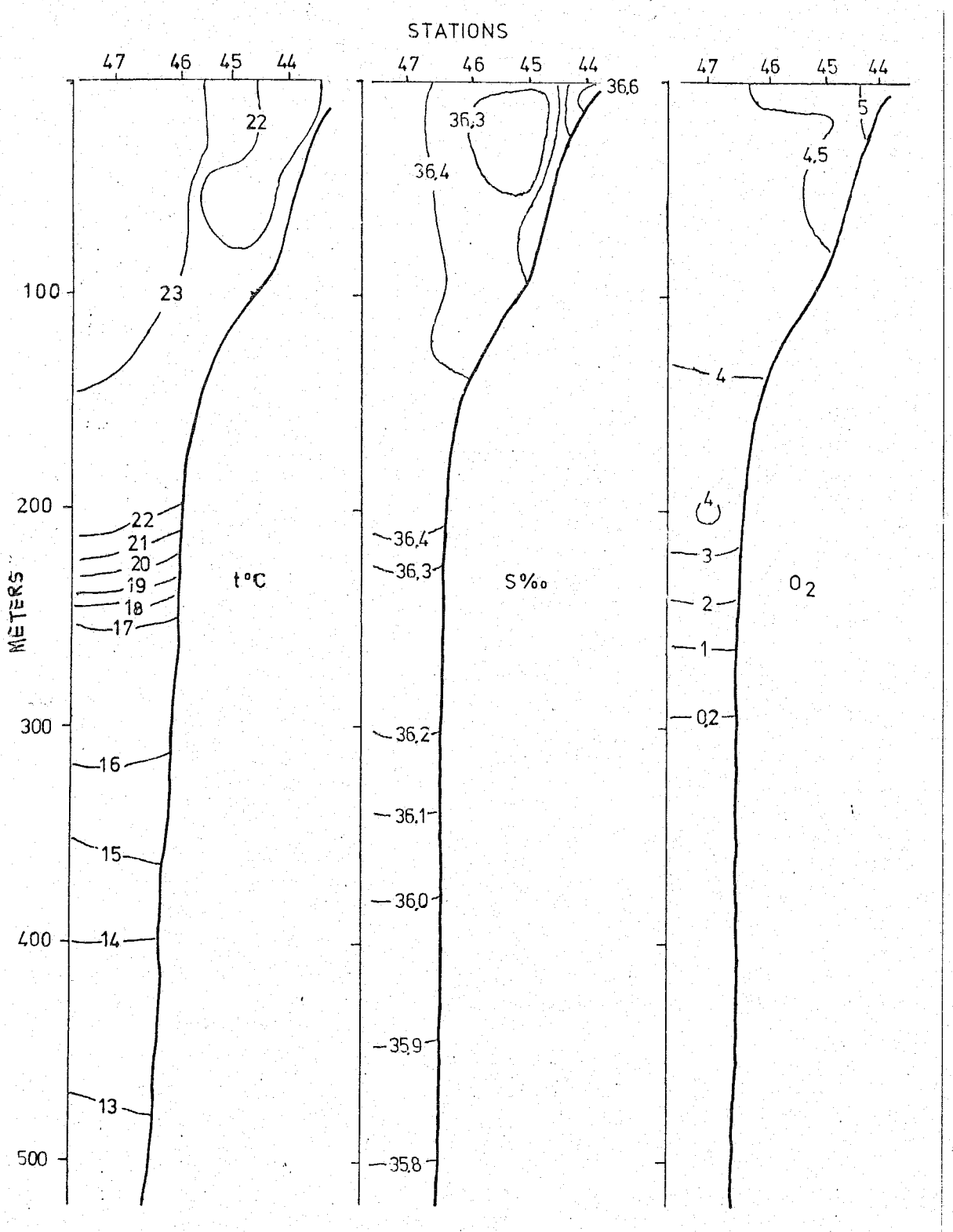

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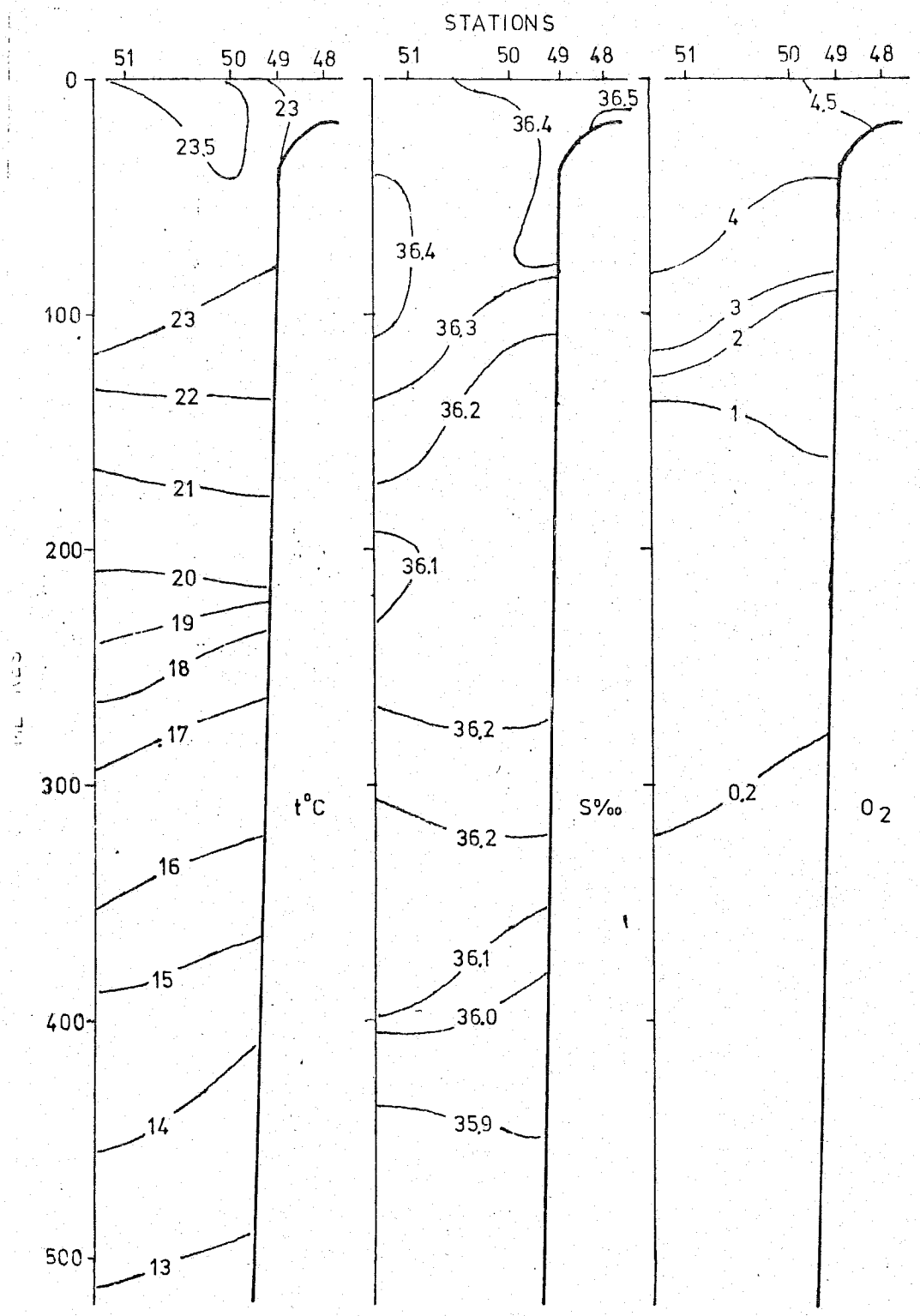

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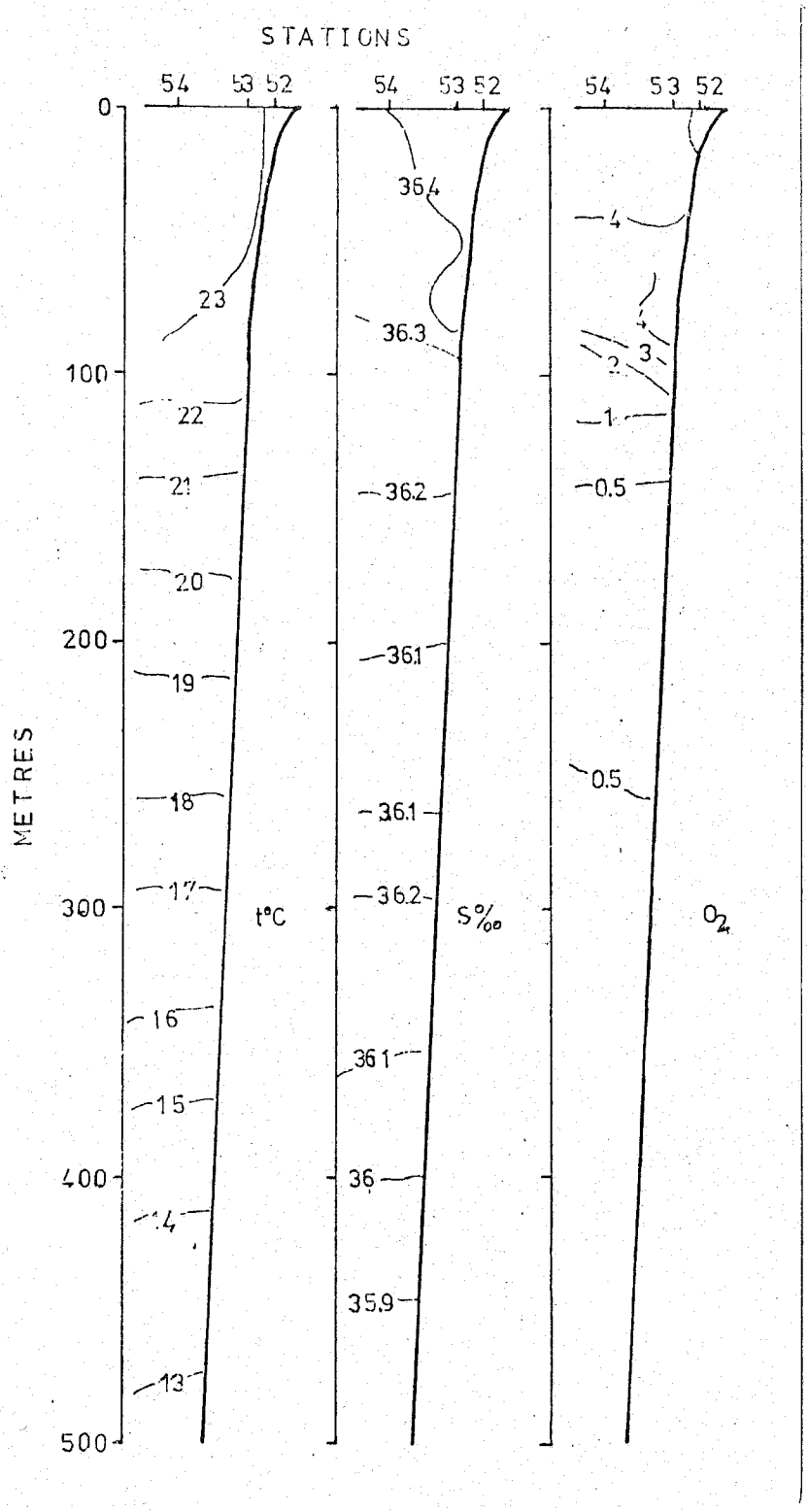

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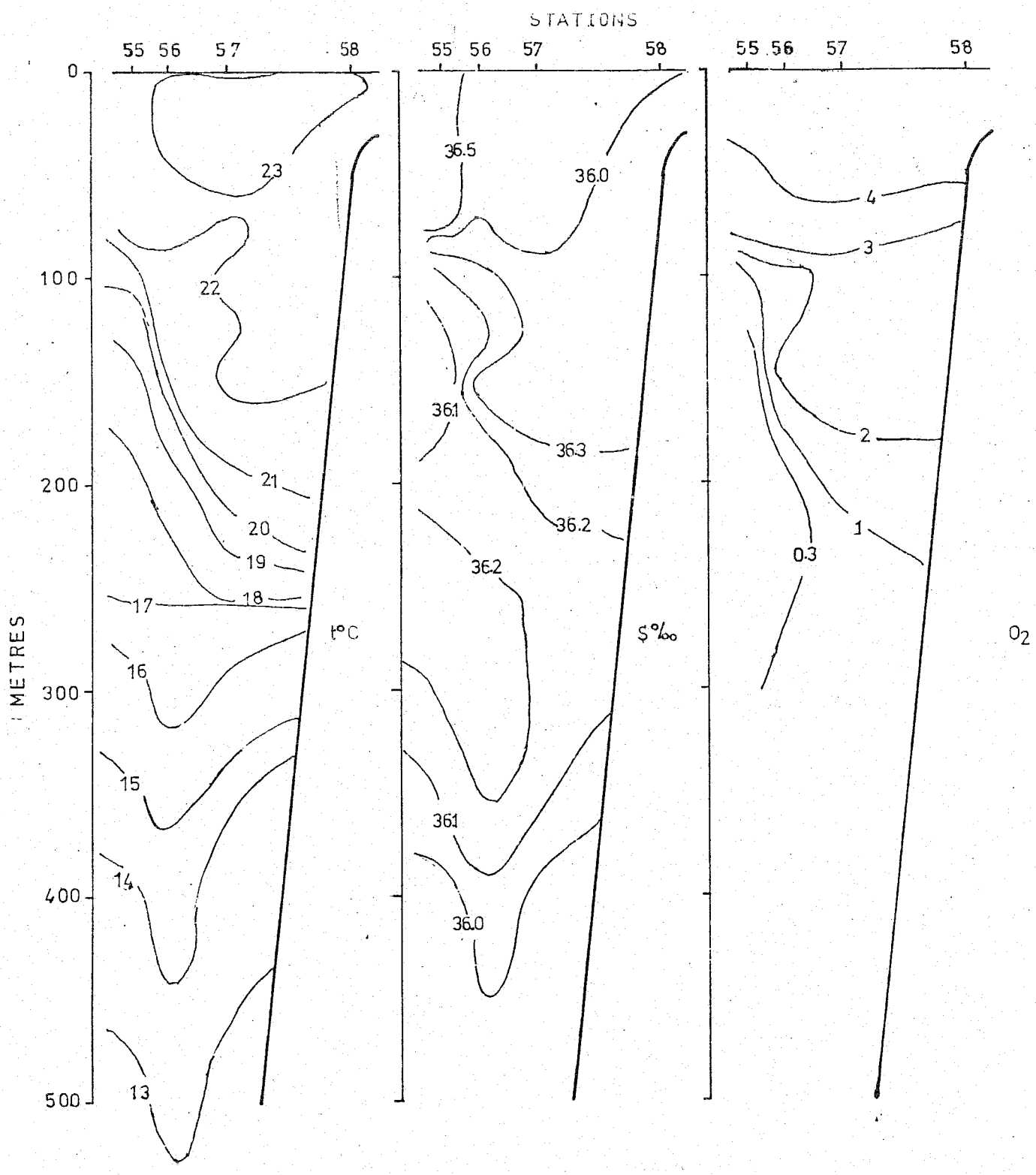

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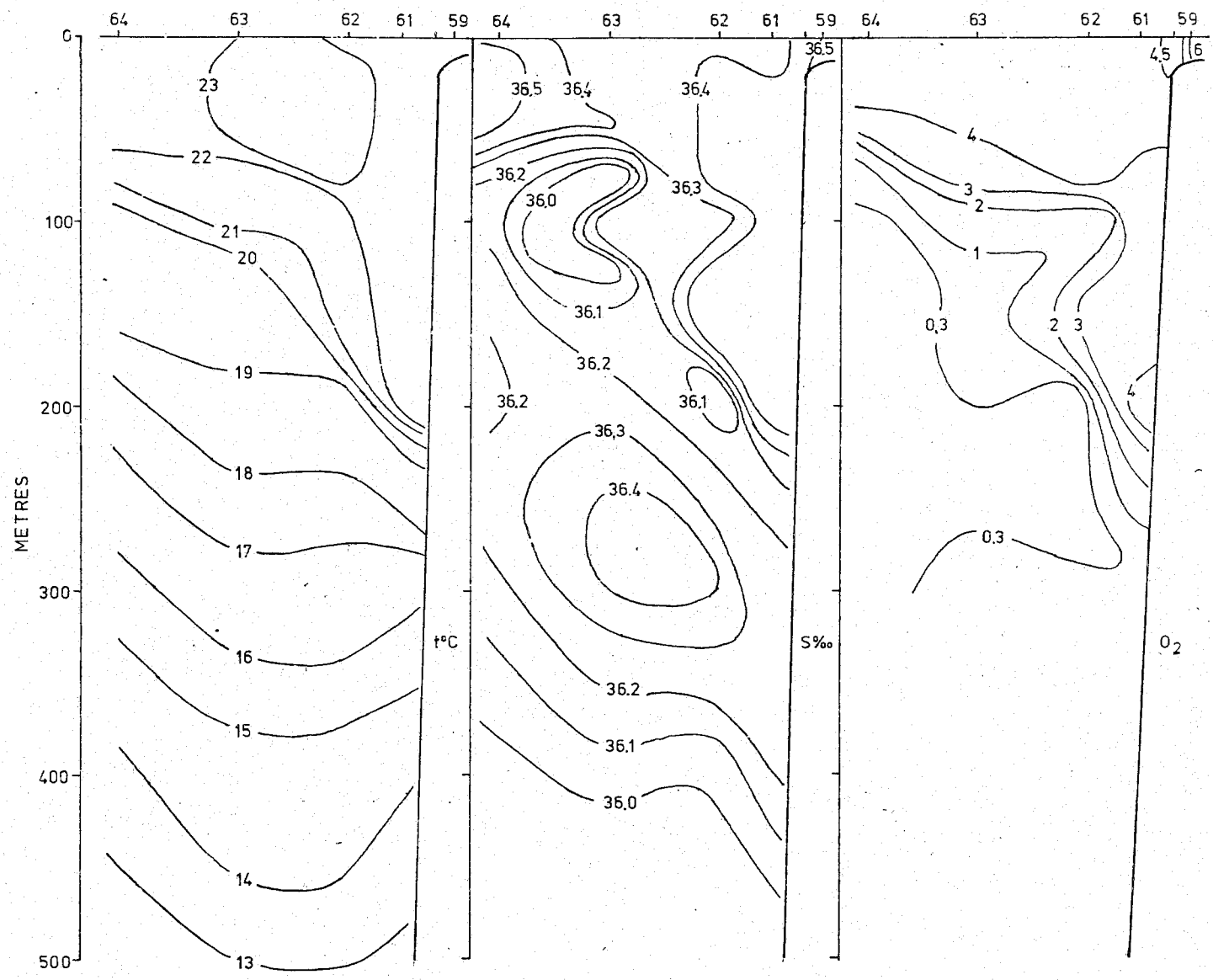

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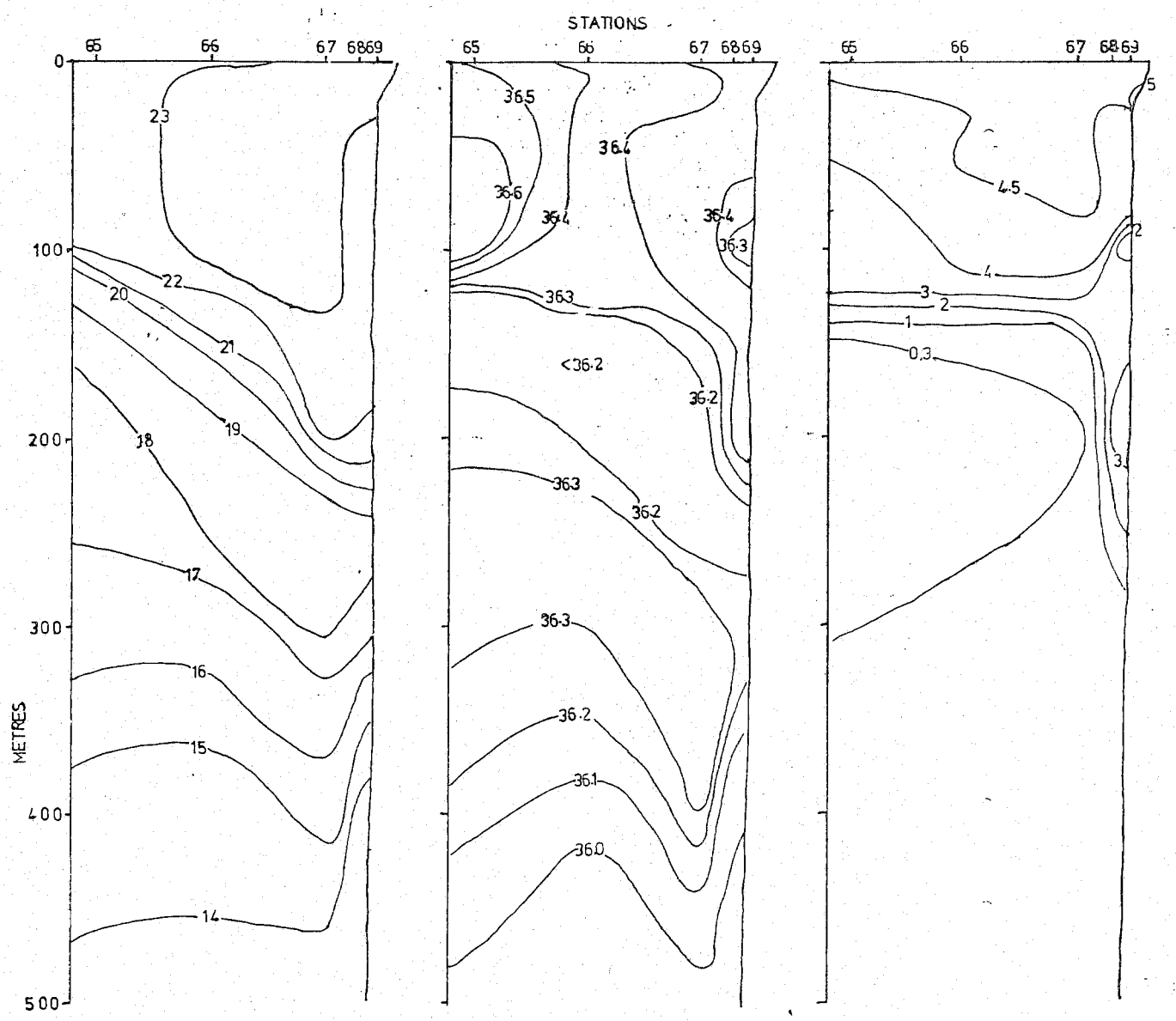

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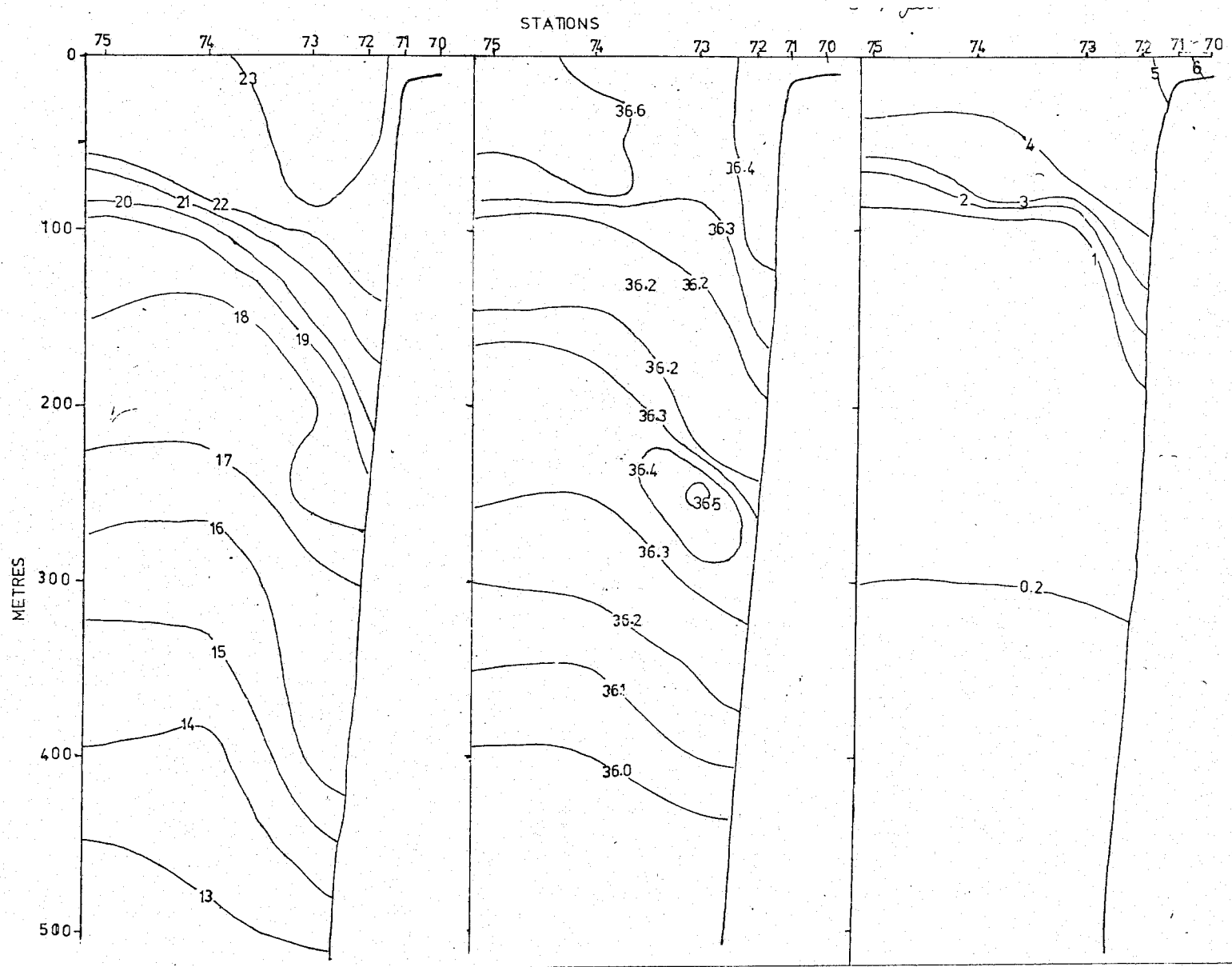
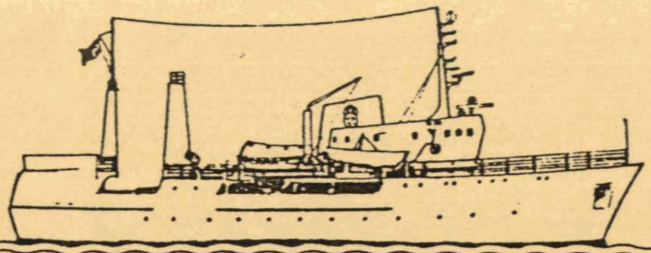


Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D.
0001	1977	119	010 23	23210	67550	15
0002	1977	120	010 08	23230	67410	18
0003	1977	120	010 11	23160	67280	20
0004	1977	120	010 13	23080	67140	75
0005	1977	120	010 17	23010	67030	125
0006	1977	120	010 19	22550	66520	400
0007	1977	121	010 00	22390	66240	500
0008	1977	121	010 05	22230	65580	500
0009	1977	121	010 09	22090	65310	500
0010	1977	121	010 18	23030	66400	500
0011	1977	121	010 22	23100	66520	125
0012	1977	122	010 00	23170	67050	95
0013	1977	122	010 05	23240	67170	500
0014	1977	122	010 07	23310	67280	30
0015	1977	122	010 09	23390	67430	10
0016	1977	122	010 21	23180	66280	300
0017	1977	122	010 23	23240	66380	115
0018	1977	123	010 02	23300	66490	75
0019	1977	123	010 04	23380	67020	60
0020	1977	123	010 06	23450	67140	20
0021	1977	123	010 08	23510	67250	10
0022	1977	124	010 04	23060	65250	500
0023	1977	124	010 09	23220	65530	500
0024	1977	124	010 13	23350	66160	230
0025	1977	124	010 15	23410	66260	110
0026	1977	124	010 17	23480	66370	75
0027	1977	124	010 19	23540	66490	75
0028	1977	124	010 21	24010	67010	60
0029	1977	124	010 23	24060	67100	15
0030	1977	126	010 09	24310	67010	10
0031	1977	126	010 13	24240	66500	40
0032	1977	126	010 17	24170	66380	75
0033	1977	126	010 19	24100	66250	75
0034	1977	129	010 19	23560	66000	250
0035	1977	129	010 22	24030	66150	95
0036	1977	130	010 16	24470	66350	20
0037	1977	130	010 18	24420	66260	50
0038	1977	130	010 21	24350	66150	80
0039	1977	130	010 23	24290	66050	95
0040	1977	131	010 02	24230	65530	125
0041	1977	131	010 05	24170	65420	400
0042	1977	131	010 10	24040	65190	500

0043	1977	131	010	18	23480	64520	500
0044	1977	201	010	18	25210	66180	10
0045	1977	201	010	21	25100	66100	65
0046	1977	201	010	24	25000	66010	115
0047	1977	202	010	02	24470	65510	500
0048	1977	202	010	24	25150	65200	15
0049	1977	203	010	02	25070	65200	30
0050	1977	203	010	05	24560	65200	500
0051	1977	203	010	09	24350	65200	500
0052	1977	203	010	23	25050	64350	10
0053	1977	204	010	00	25000	64350	75
0054	1977	204	010	02	24470	64350	500
0055	1977	204	010	22	24060	63500	500
0056	1977	205	010	03	24380	63500	500
0057	1977	205	010	06	24520	63500	500
0058	1977	205	010	08	25010	63500	45
0059	1977	206	010	17	25080	63050	10
0060	1977	206	010	19	25020	63050	20
0061	1977	206	010	21	24540	63050	500
0062	1977	206	010	24	24410	63050	500
0063	1977	207	010	04	24090	63050	500
0064	1977	207	010	09	23380	63350	500
0065	1977	207	010	16	23500	62150	500
0066	1977	207	010	20	24200	62090	500
0067	1977	208	010	02	24500	62200	500
0068	1977	208	010	04	24580	62200	500
0069	1977	208	010	06	25030	62200	20
0070	1977	208	010	22	25030	61350	10
0071	1977	208	010	23	24540	61350	10
0072	1977	209	010	01	24460	61350	225
0073	1977	209	010	03	24300	61350	500
0074	1977	209	010	08	24000	61350	500
0075	1977	209	010	13	23300	61350	500



Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY CRUISE REPORT ON CRUISE NOS. 3 AND 4 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

13 February - 6 March 1977

Odd Nakken

Karachi, 24 March 1977

Institute of Marine Research, Bergen

PRELIMINARY CRUISE REPORT ON CRUISE NOS. 3 AND 4 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

INTRODUCTION

This report covers the second complete coverage of the Pakistan waters during this project.

Departure:	Karachi, 13 February 1977.
Arrival:	Karachi, 25 February 1977.
Scientific staff:	M. Arshad, I. Ahmad, S. Amjad (Department of Fisheries). J. Ali Khan (to 18 Feb), S.H. Niaz Rizvi (to 18 Feb), A.K. Showkat (Institute of Marine Biology). O. Nakken, S. Lygren, O. Knudsen, Ø. Torgersen (Institute of Marine Research).
Departure:	Karachi, 27 February 1977.
Arrival:	Karachi, 6 March 1977.
Scientific staff:	M. Arshad, M. Khaliluddin, M.A. Wahid (Department of Fisheries). S.M. Huda, S. Barkati, M. Moazzam Khan (Institute of Marine Biology). O. Nakken, S. Lygren, O. Knudsen, Ø. Torgersen (Institute of Marine Research).

Survey grid and stations are shown in Fig. 1. The most offshore stations in Sections I, XI and XIII were not occupied due to lack of time.

WORKING SCHEME

The standard hydrographic/plankton stations were worked as previously with two exceptions:

1) The amount of filtrated seawater from 0, 10 and 30 m was reduced to 2 litres.

2) After the completion of Section I the net in the Bongo 60 was changed from 180 µ to 500 µ mesh size. The flowmeter used in the Bongo was probably not functioning properly during the first coverage. The fault was repaired and the flowmeter readings obtained with the 500 µ mesh are correct. A calibration curve for the flowmeter in use is attached.

RESULTS

Table 1 shows the particulars of the fishing stations, while Tables 2 and 3 show the length and maturity distribution of the dominant species for the two first full coverages of the coast.

Distribution and abundance of pelagic fish (Fig. 2)

The main features of the distribution pattern are similar to those observed during Cruise Nos. 1 and 2, the highest abundances were found south of Karachi and in Sonmiani Bay. In the area south of Karachi, anchovies (species of Thryssa and Stolephorus) constituted the major portions of the catches, and trawl hauls yielding 15-20 tonnes/hour were obtained. Along the Makran coast, the pelagic fish recordings were dominated by various species of sardines and anchovies. Between Astola Island and the mainland, good recordings of oil sardine (Sardinella longiceps) were observed. The fish was schooling over bottom depths of 10-15 m and the conditions seemed ideal for purse seining. A purse seine set gave, however, no catch at all, as all the fish (10-15 tonnes) jumped over the corkline during hauling of the net. The reason for this strange behaviour was probably that the fish was scared by the sand and mud whirled up by the net which dragged along the bottom. The area where these schools were found was rather limited, ca 10 square nautical miles and the number of schools counted on the paper record of the sonar amounted to 200. Some few of them exceeded 15 tonnes, but the majority were between 5 and 10 tonnes, and the total amount of schooling oil sardine in this

small area therefore hardly exceeded 2000 tonnes.

Distribution and abundance of demersal fish (Fig. 3)

The abundance appears to be lower than during the first coverage, particularly in the area between Ras Ormara and Sonmiani Bay. This is due to the absence of catfish during the present cruise. The major constituents in the catches were grunters, croakers and threadfin bream, but also hairtails and ponyfishes made significant contributions.

Mesopelagic fish (Fig. 4)

As during the previous cruises the abundance of mesopelagic fish was highest off the shelf of the Makran coast. The observed densities were slightly higher than during Cruise No. 2. The diurnal behaviour pattern was as reported earlier.

Plankton (Fig. 5)

Off the coast of Sind, the echo recordings attributed to plankton were observed to be slightly lower than during the first two cruises, while a significant increase seemed to have taken place along the Makran coast east of 63°E.

Hydrography (Figs. 6-21)

A pronounced heating of the surface layers had taken place between the two coverages. The salinity minimum in intermediate depths (100-200 m) in most of the sections, was also observed during this coverage.

REMARKS

The equipment worked satisfactorily. The working capacity of the staff was excellent.

Karachi, 24 March 1977.

Odd Nakken

Table 1. Record of fishing operations. "Dr. Fridtjof Nansen" PAK/NOR/FAO Cruise Nos. 3 and 4, 13 - 25 February 1977 and 27 February - 6 March 1977.
BT: bottom trawl, SPT: small pelagic trawl, PS: purse seine.

Date	Time	Stn No	Gear	Depth in m		Position		Total catch kg	Catch per hour kg	Dominant species
				Bottom	Gear	North	East			
14.2	0500	24	BT	98	98	23°08'	67°12'	1500	3000	Lactarius lactarius (False trevally) Leiognathus equulus (Common ponyfish)
15.2	0630	25	BT	330	330	23°08'	66°43'	182	182	Otolithes sp. (Croaker)
15.2	0836	26	SPT	365	30-50	23°08'	66°43'	37	74	Arothron sp. (Blowfish) MUNRO
17.2	0425	27	BT	202	202	23°31'	66°25'	400	2400	Epinephelus fasciatus (Grouper)
18.2	0330	28	SPT	87	38	23°49'	66°40'	8	24	Various fish, larvae mainly. Myctophidae (Lanternfishes)
18.2	0425	29	BT	81	81	23°49'	66°40'	153	459	Nemipterus japonicus (Japanese threadfin bream)
18.2	1330	30	SPT	24	0-24	24°28'	66°54'	150	280	Jellyfish, squids.
19.2	0610	31	SPT	90	70	24°40'	66°31'	25	50	Various fish larvae, mainly Myctophidae.
20.2	0525	32	BT	26	26	24°58'	66°56'	5	10	Jellyfish, 0-group fish/Decapterus sp.
20.2	0625	33	BT	22	22	24°28'	66°56'	8000	16000	Stolephorus indicus (Indian anchovy)
20.2	0940	34	BT	52	52	24°21'	66°47'	2500	5000	Squids (small) Leiognathus sp. (Ponyfish)
21.2	0345	35	BT	13	13	24°37'	66°59'	400	800	Jellyfish Thryssa mystax (Moustached thryssa)

Date	Time	Stn No	Gear	Depth in m		Position		Total catch kg	Catch per hour kg	Dominant species
				Bottom	Gear	North	East			
21.2	0720	36	BT	25	25	24°23'	66°57'	15000	30000	Thryssa setirostris (Longjaw thryssa)
21.2	1420	37	SPT	60	20	24°34'	66°31'	45	90	Fish larvae
23.2	0455	38	BT	43	43	24°55'	66°28'	220	440	Leiognathus sp. (Ponyfish)
23.2	0845	39	BT	23	23	25°10'	66°33'	270	540	Trichiurus lepturus (Largehead hairtail) Carangoides malabaricus (Malabar cavalla)
23.2	1220	40	BT	80	80	25°07'	66°16'	400	1200	Squids (small), Trichiurus lepturus (Largehead hairtail)
24.2	0345	41	BT	13	13	25°20'	65°55'	500	1000	Scomberomorus guttatus (Spanish mackerel), Trichiurus lepturus (Largehead hairtail)
28.2	0335	42	BT	14	14	25°09'	63°13'	120	240	Pomadasys hasta (Lined silver grunt)
1.3	0210	43	BT	13	13	25°09'	63°58'	210	420	Argyrops spinifer (Longspine seabream)
1.3	0455	44	BT	10	10	25°14'	63°44'	2200	4400	Sardinella longiceps (Indian oil sardine)
1.3	0826	45	PS	14	14	25°14'	63°46'	500	-	Sardinella longiceps (Indian oil sardine)
1.3	1425	46	SPT	52	15	25°01'	63°50'	25	50	Jellyfish
2.3	1830	47	SPT	18	0-15	25°02'	63°05'	400	800	Jellyfish
3.3	0315	48	BT	22	22	25°04'	63°15'	1800	3600	Rays
3.3	0756	49	SPT	29	8-23	25°02'	62°53'	No catch		-

Date	Time	Stn No	Gear	Depth in m		Position		Total catch kg	Catch per hour kg	Dominant species
				Bottom	Gear	North	East			
3.3	1120	50	BT	35	35	25°02'	62°44'	140	250	Jellyfish Pomadasys hasta (Lined silver grunt)
3.3	1745	51	SPT	26	8-20	25°02'	62°20'	1000	2000	Dussumieria acuta (Rainbow sardine) Thryssa mystax (Moustached thryssa)

Table 2. Length and maturity frequency distributions. (When samples from several stations are averaged, each station has been given equal weight.)
"Dr. Fridtjof Nansen" PAK/NOR/FAO Cruise Nos. 3 and 4, 13 February - 6 March 1977.

A:. SMALL FISH

Species	Stn.Nos.	Length in cm 05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	N	Maturity stage 1	2	3	4	5	6	7
Dussumieria acuta	30-33-36-41-51	2	2	7	44	16	1	1	4	16	5							140	80			4	16		
Sardinella longiceps	44-45									20	20	52	8					40	13	25	47	15			
Sardinella sp.	33-39-41-44			1	17	1	14	12	14	17	18	6	1					92	3	58	31	8	1		
Thryssa mystax	35-47-51						1	9	18	19	26	18	5	3				99		14	22	34	12	17	
Thryssa setirostris	35-36-47	4	20	8	1		16	25	23	3								100	50		24	12	4	10	
Thryssa vitrirostris	35-41	25	22	3				15	15	13	5	2						38	50		15	27	8		
Stolephorus indicus	33-36-41	1	25	46	28													75		25	60	15			
Stolephorus sp.	30		8	81	12													26		19	69	12			
Nemipterus japonicus	24-27-29-34-39-40-41-44-48		1	6	9	13	14	7	10	5	4	7	4	3	3	4	11	331	22	38	22	12	5	1	
Decapterus sp. (russelli)	33-44				2	27	19	2	2	10	16	18	4					49	Not observed						
Lactarius lactarius	41					8	13	17	17	8	8	13	13	4				24		29	63	8			
Carangoides malabaricus	39									25	50	25						19		5	50	45			

(continued)

Table 2 (continued)

B: LARGE FISH

Species	Stn.Nos.	Length in cm 05	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	N	Maturity stage 1	2	3	4	5	6	7
Pomadasys hasta	34-38-42-43-48-50					1	7	13	39	27	12	1						127	6	11	11	13	21	38	
Pomadasys maculatus	29			96	4													27		15	11	41	33		
Argyrops spinifer	43-48					2	18	24	34	8	10	2						50	46	36	4	12	1	1	
Scomberomorus guttatus	41							30	50	15	5							20		5	65	15	15		
Scomberomorus commersoni	41					5	75	2	10		5	5						20	Not observed						
Johnius carutta	35		84	16														25		8	56	36			
Otolithes ruber	25-34-35		18	42	28	12												70	22	48	22	4	4		
Arius sp.	41					5	50	45										20	6		20	25			
Epinephelus fasciatus	24			48	48	4												25		96	4				
Hilsa ilisha	24				80	20												15				13	13	13	

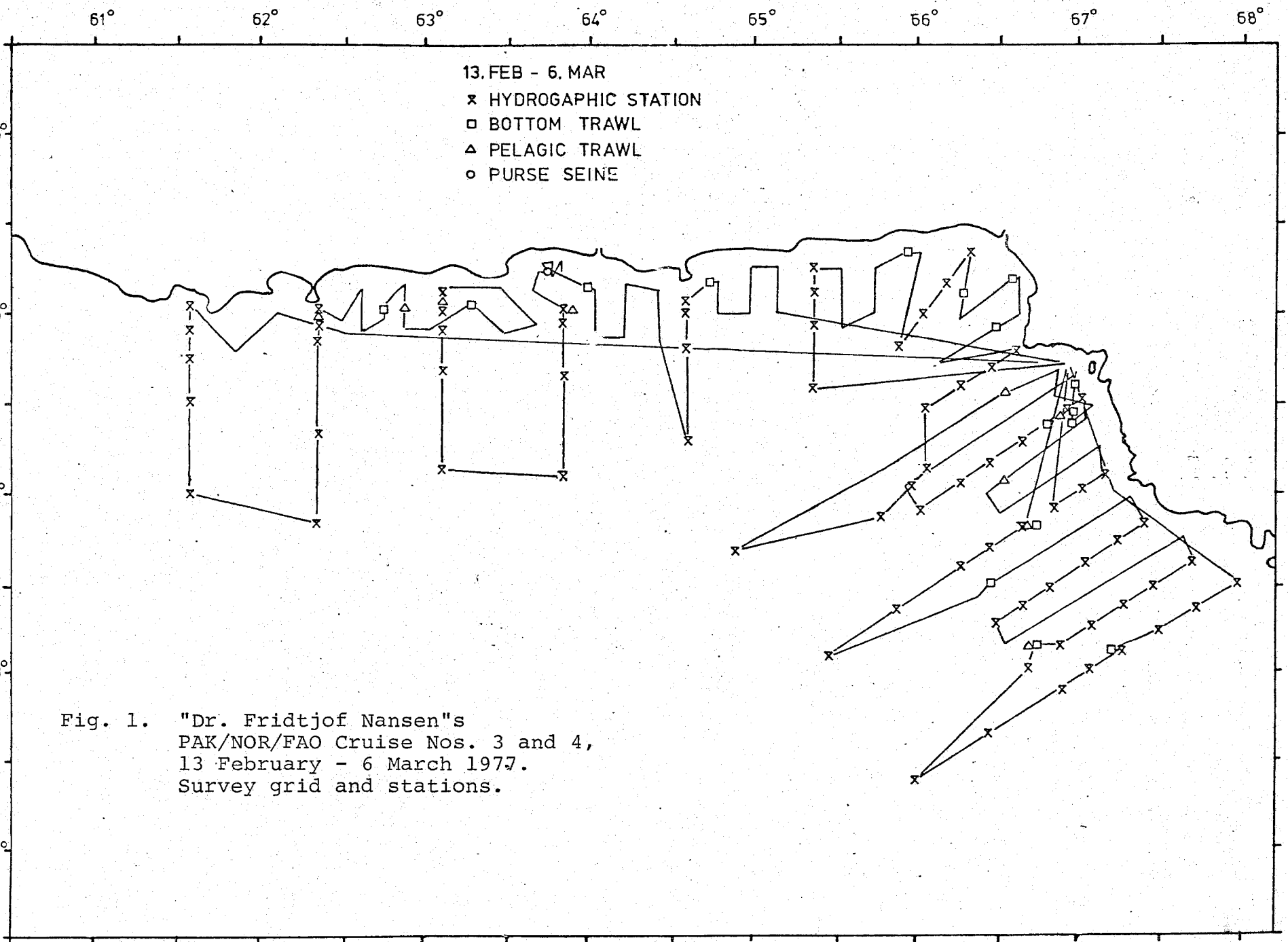
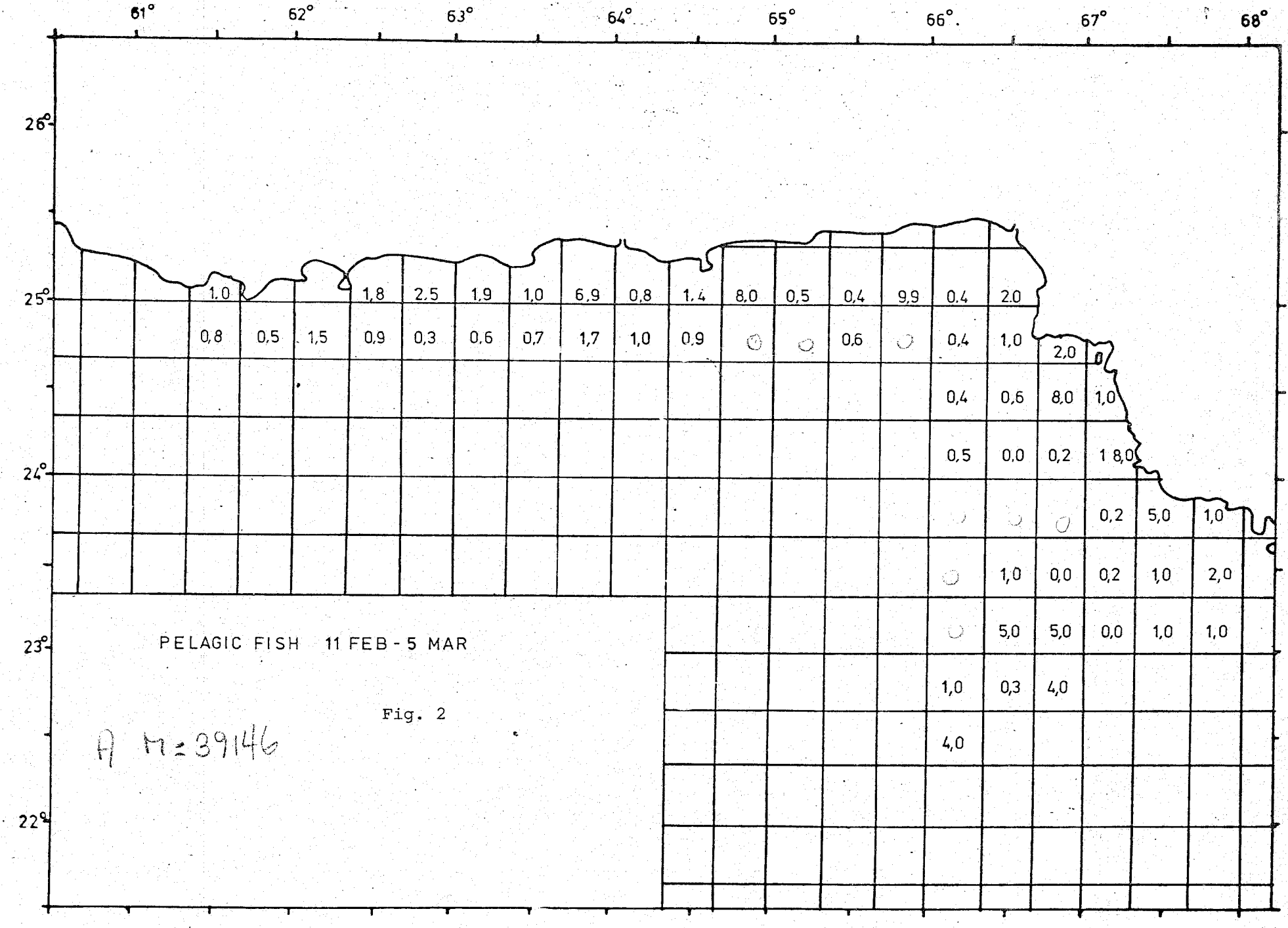


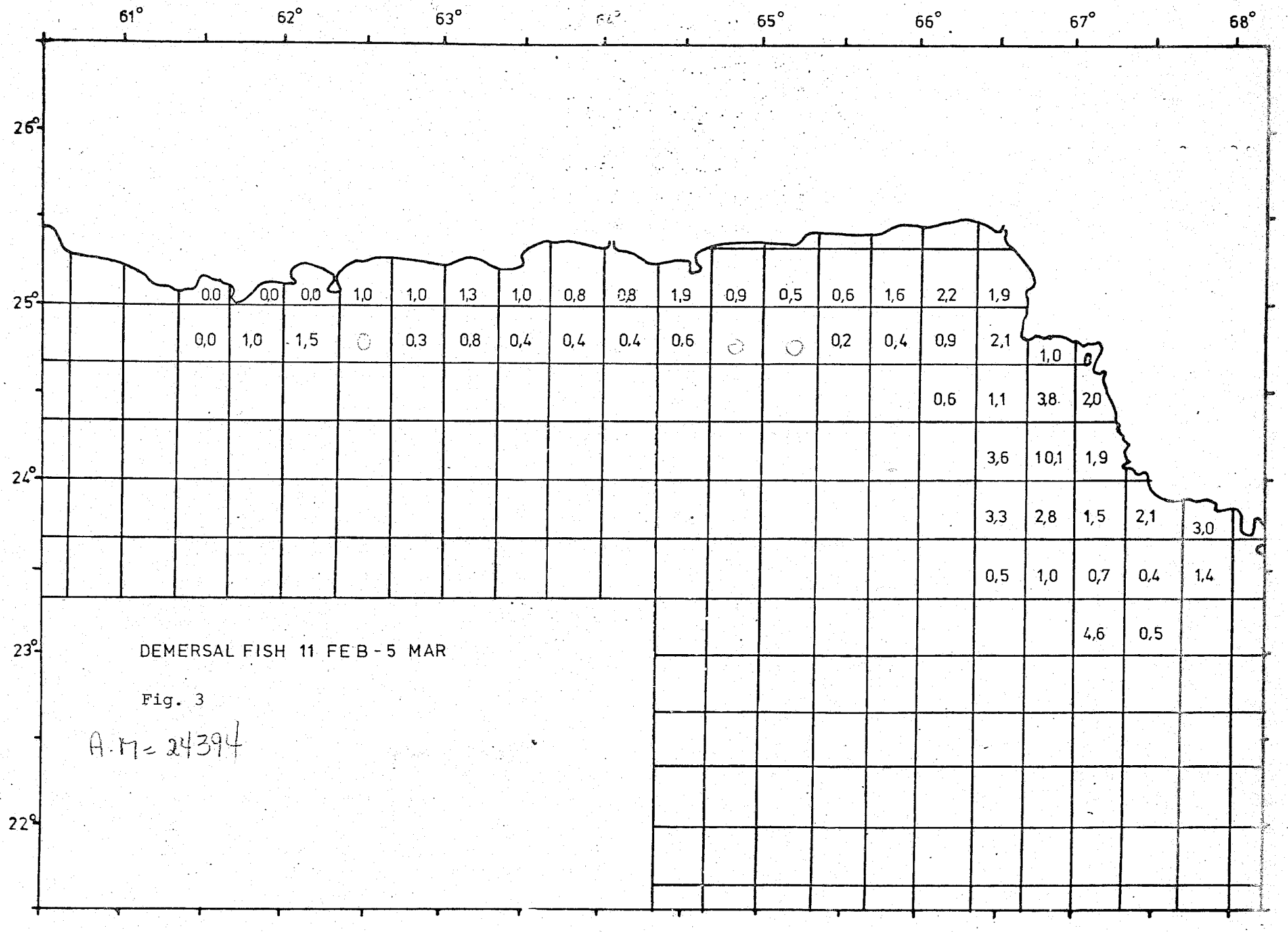
Fig. 1. "Dr. Fridtjof Nansen"s PAK/NOR/FAO Cruise Nos. 3 and 4, 13 February - 6 March 1977. Survey grid and stations.



PELAGIC FISH 11 FEB - 5 MAR

Fig. 2

A M = 39146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0,6 1,1 3,8 2,0
3,6 10,1 1,9
3,3 2,8 1,5 2,1 3,0
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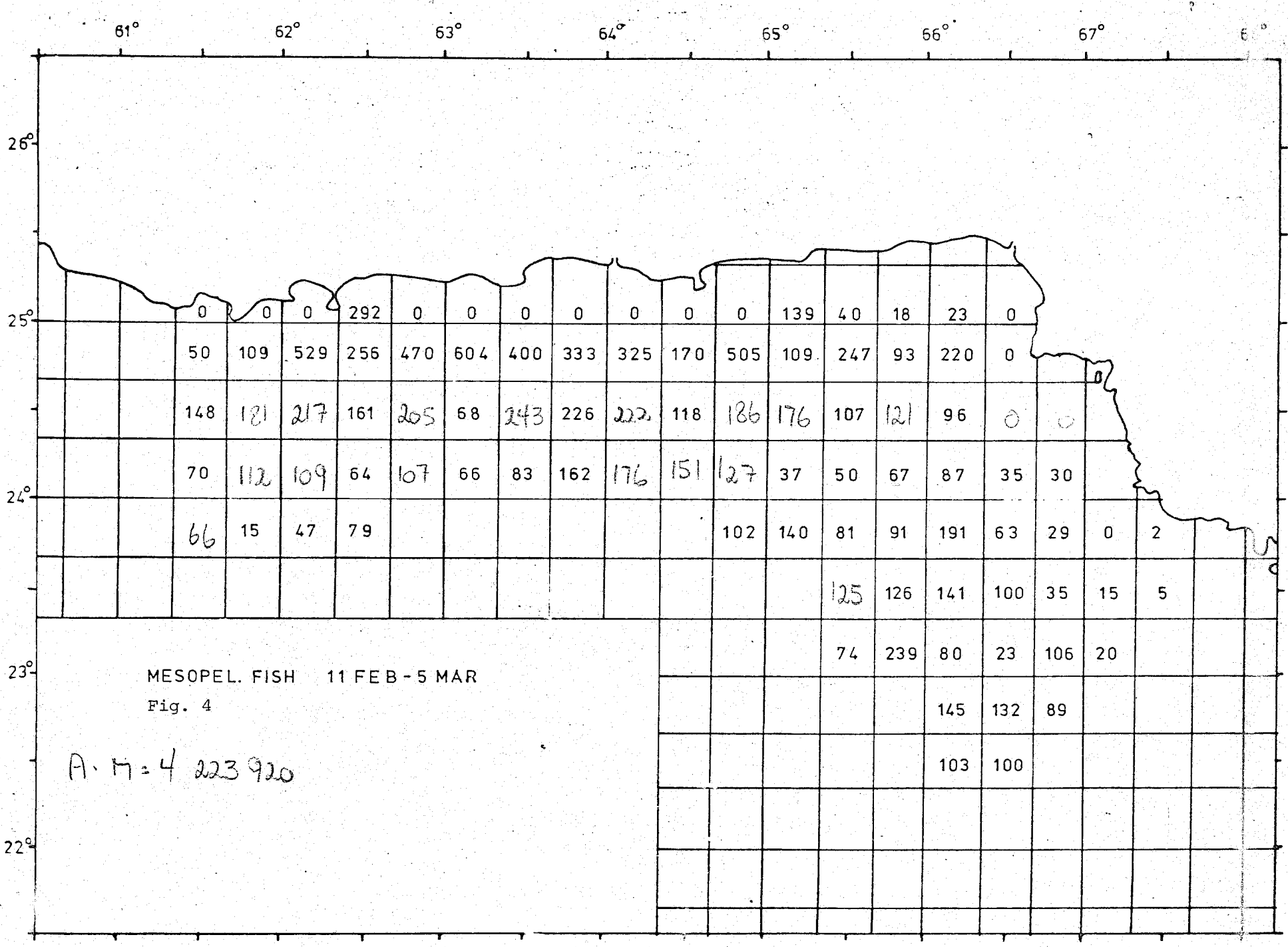
4,6 0,5
DEMERSAL FISH 11 FEB - 5 MAR
Fig. 3
A.M = 24394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70 112 109 64 107 66 83 162 176 151 127 37 50 67 87 35 30
66 15 47 79 102 140 81 91 191 63 29 0 2
125 126 141 100 35 15 5
74 239 80 23 106 20
145 132 89
103 100
MESOPEL. FISH 11 FEB - 5 MAR
Fig. 4
A. M = 4 223 920

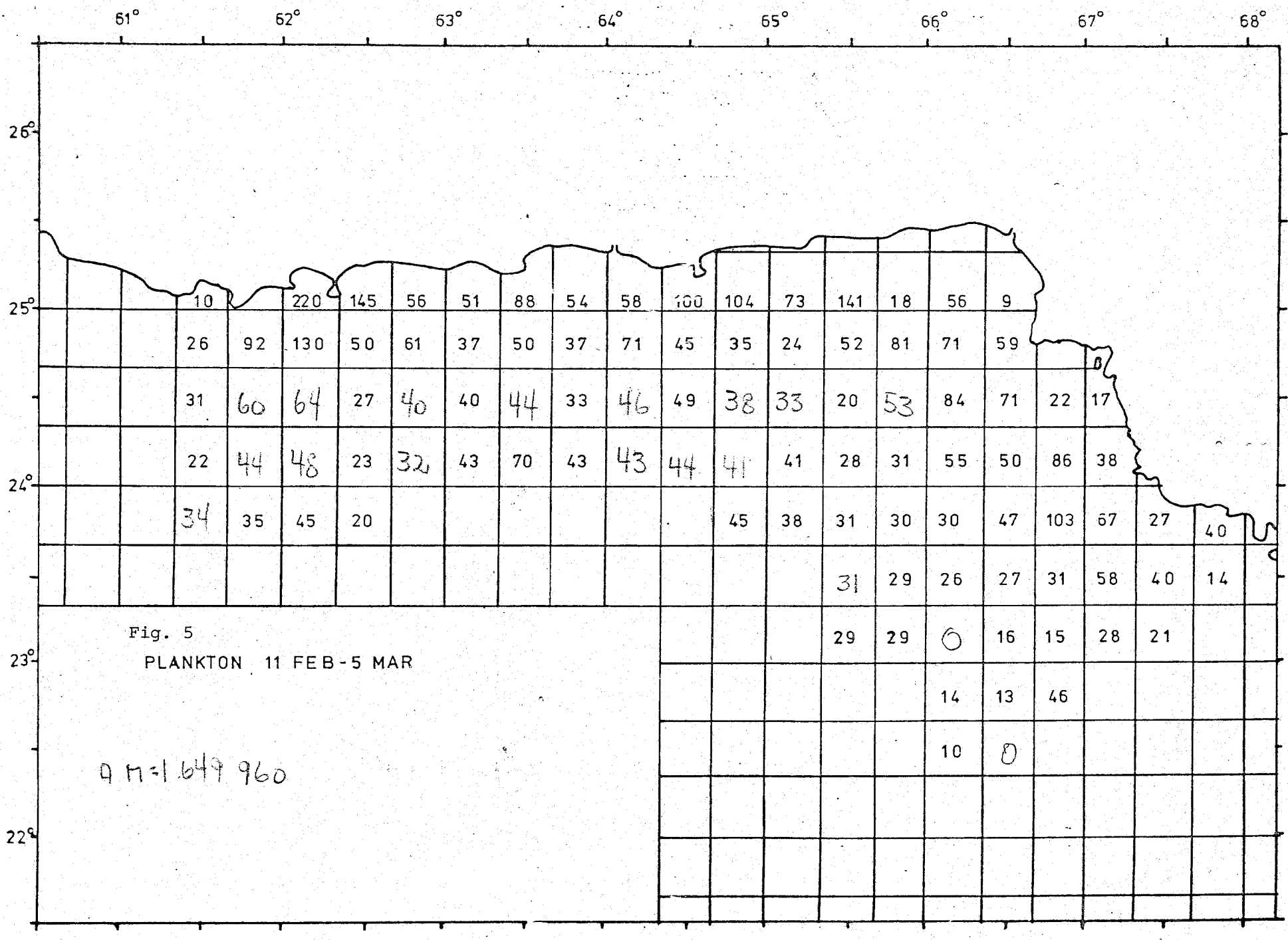
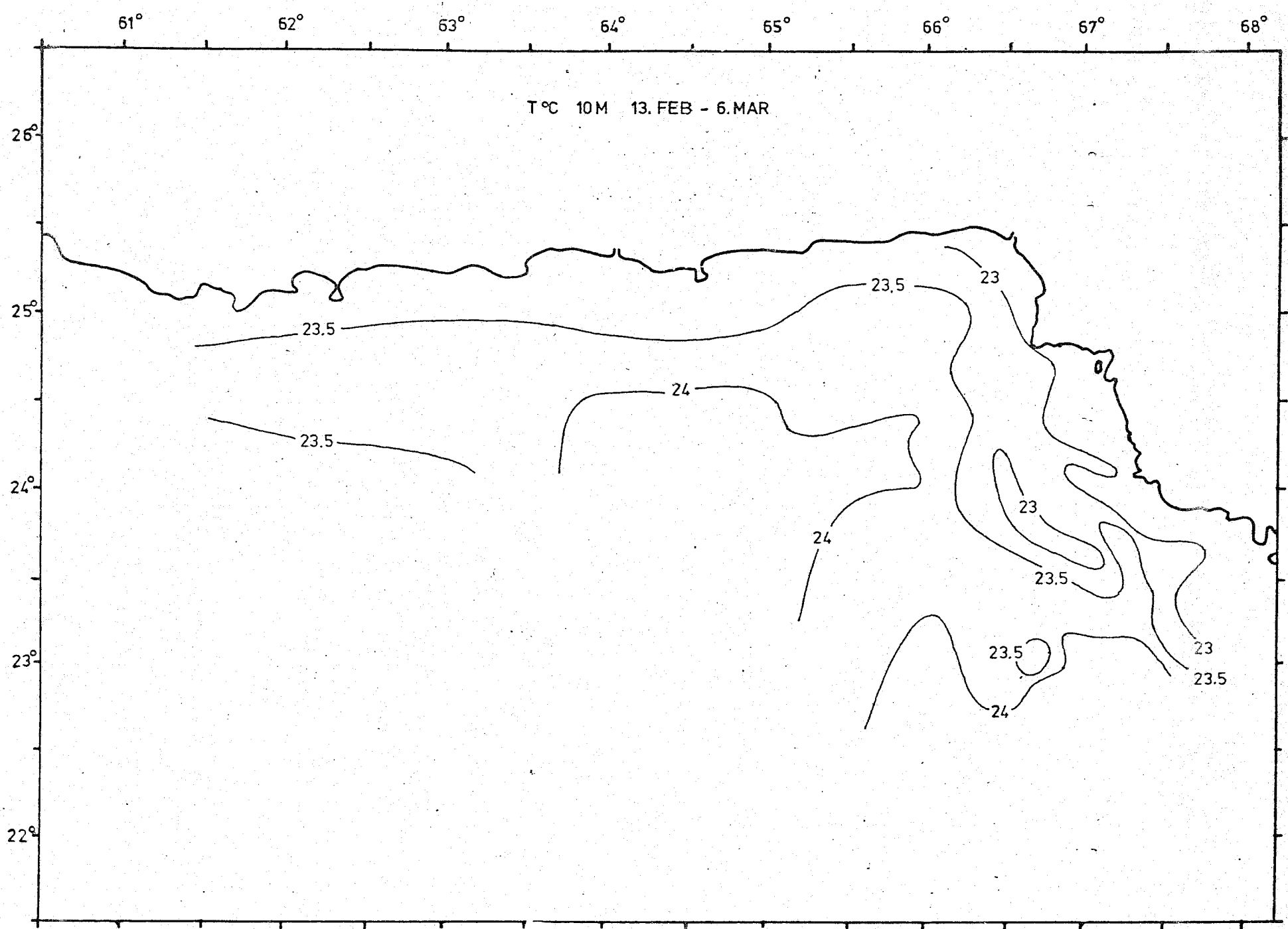


Fig. 5

PLANKTON 11 FEB-5 MAR

AM-1649 960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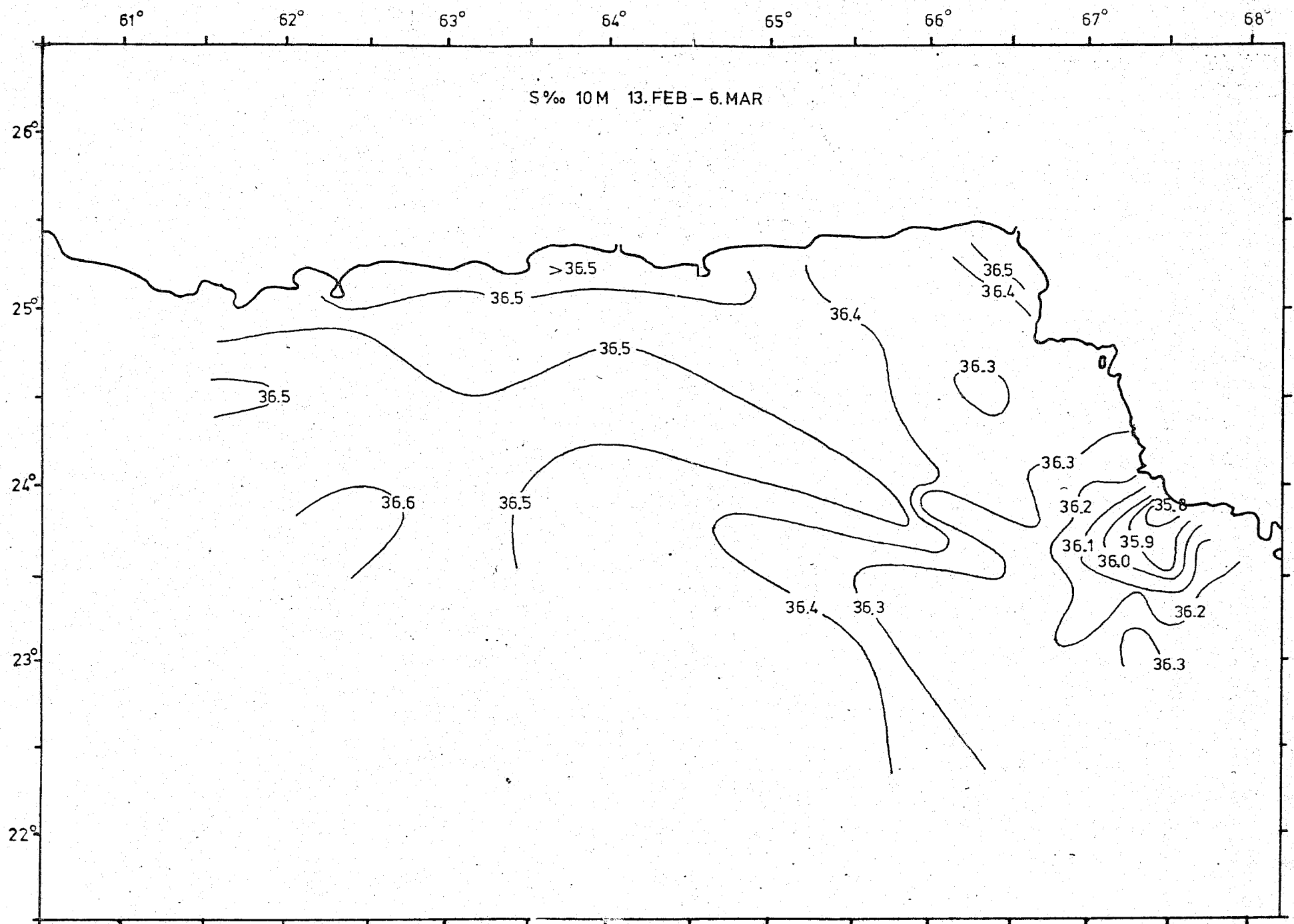
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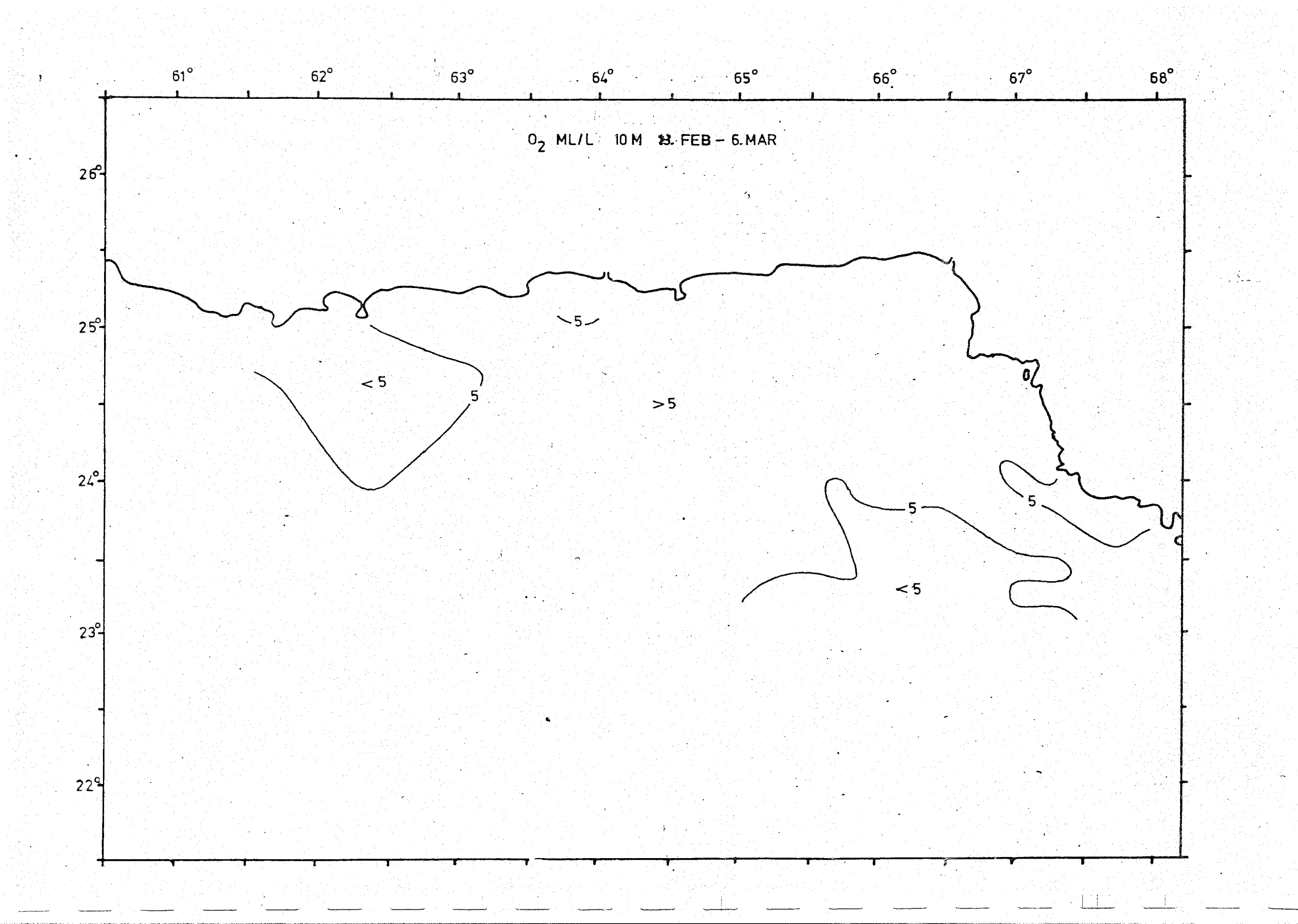
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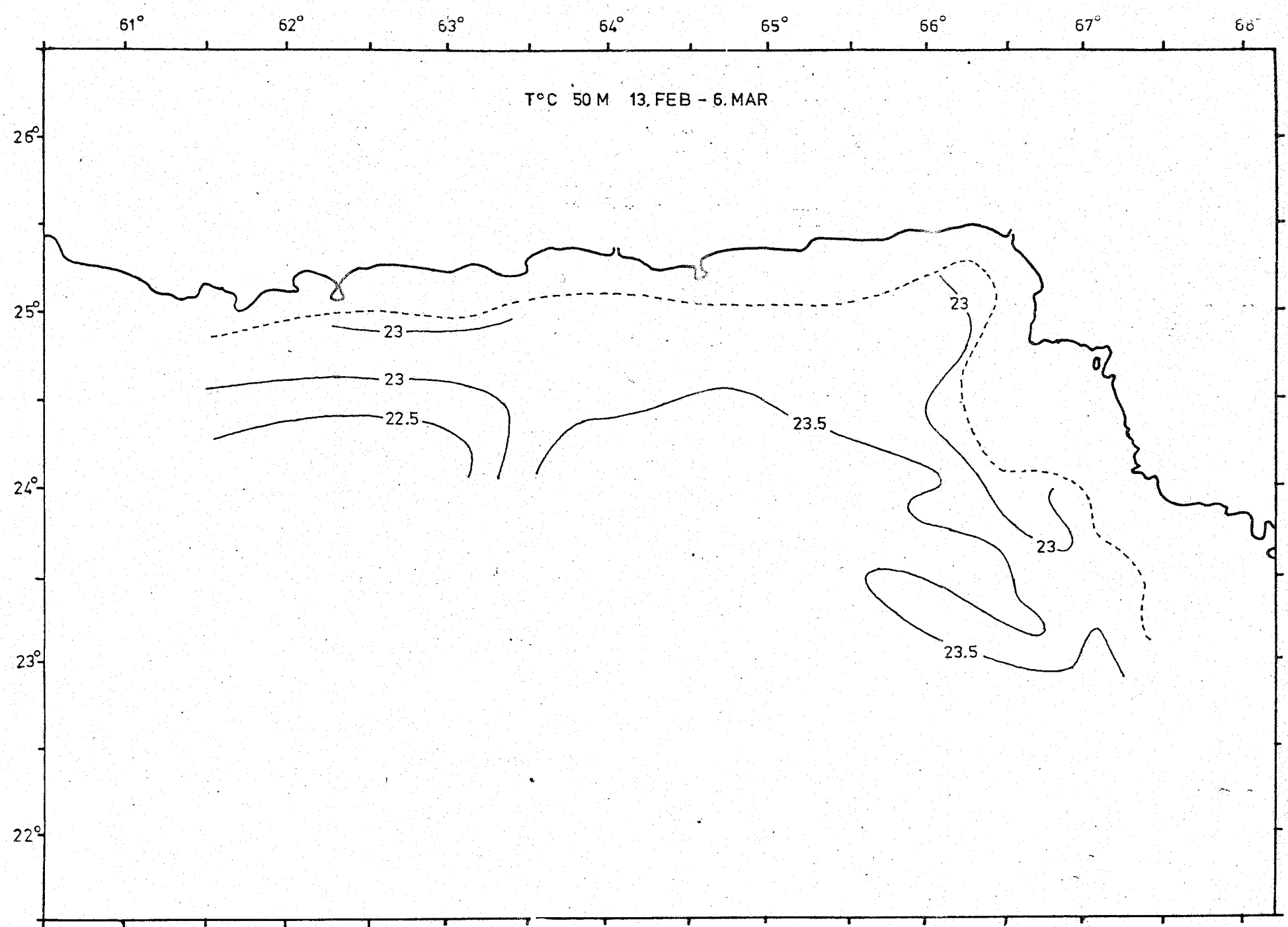
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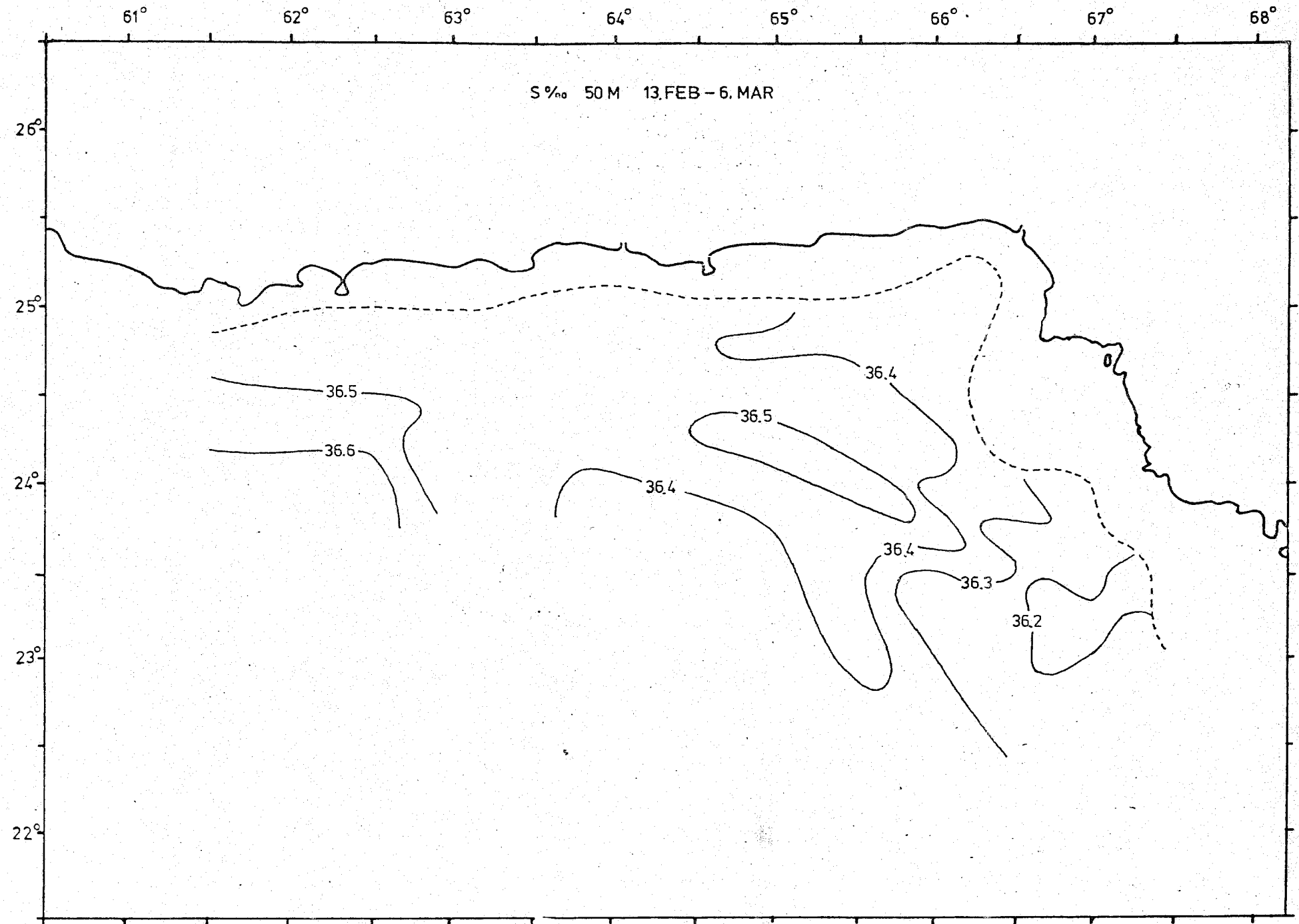
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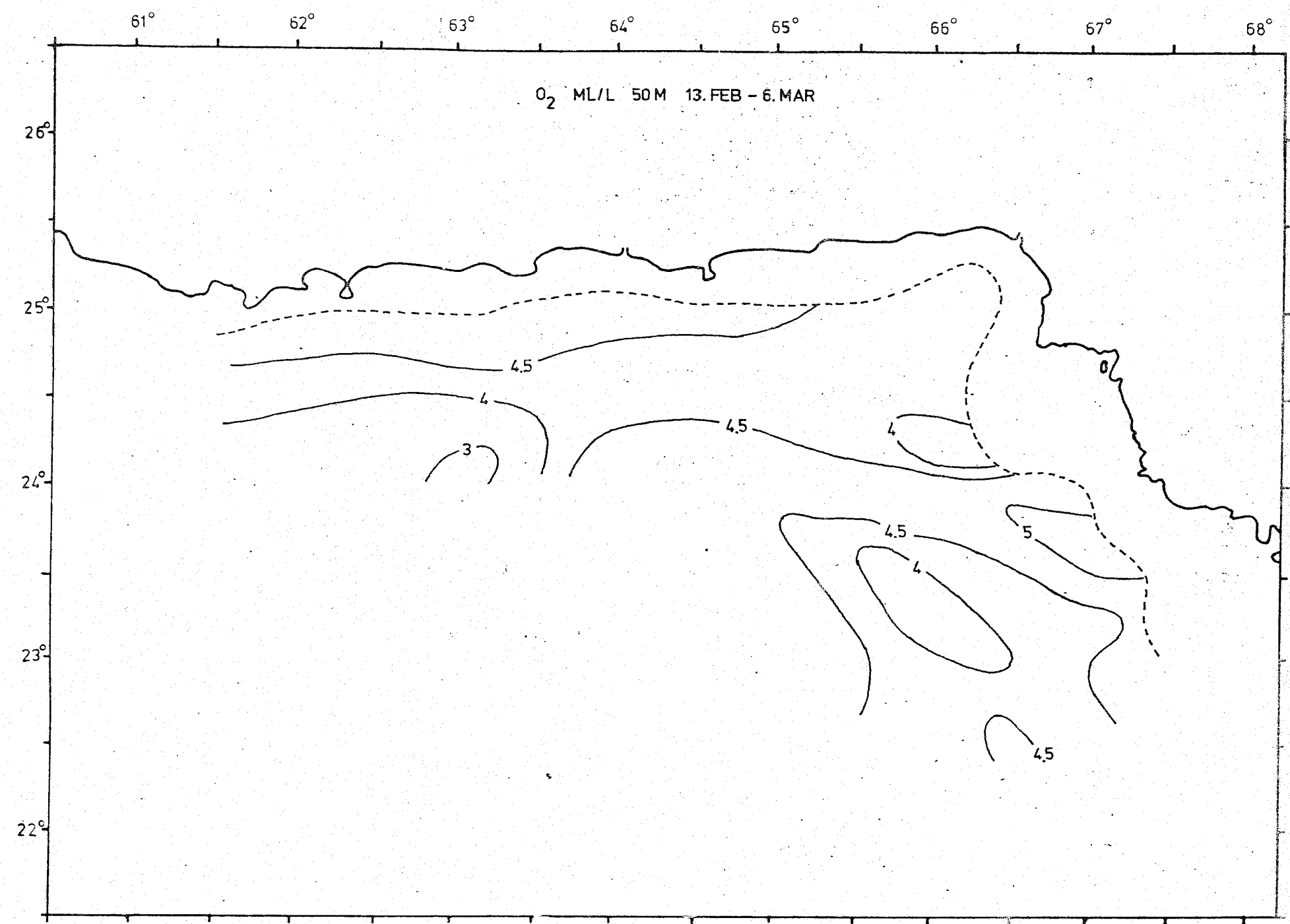
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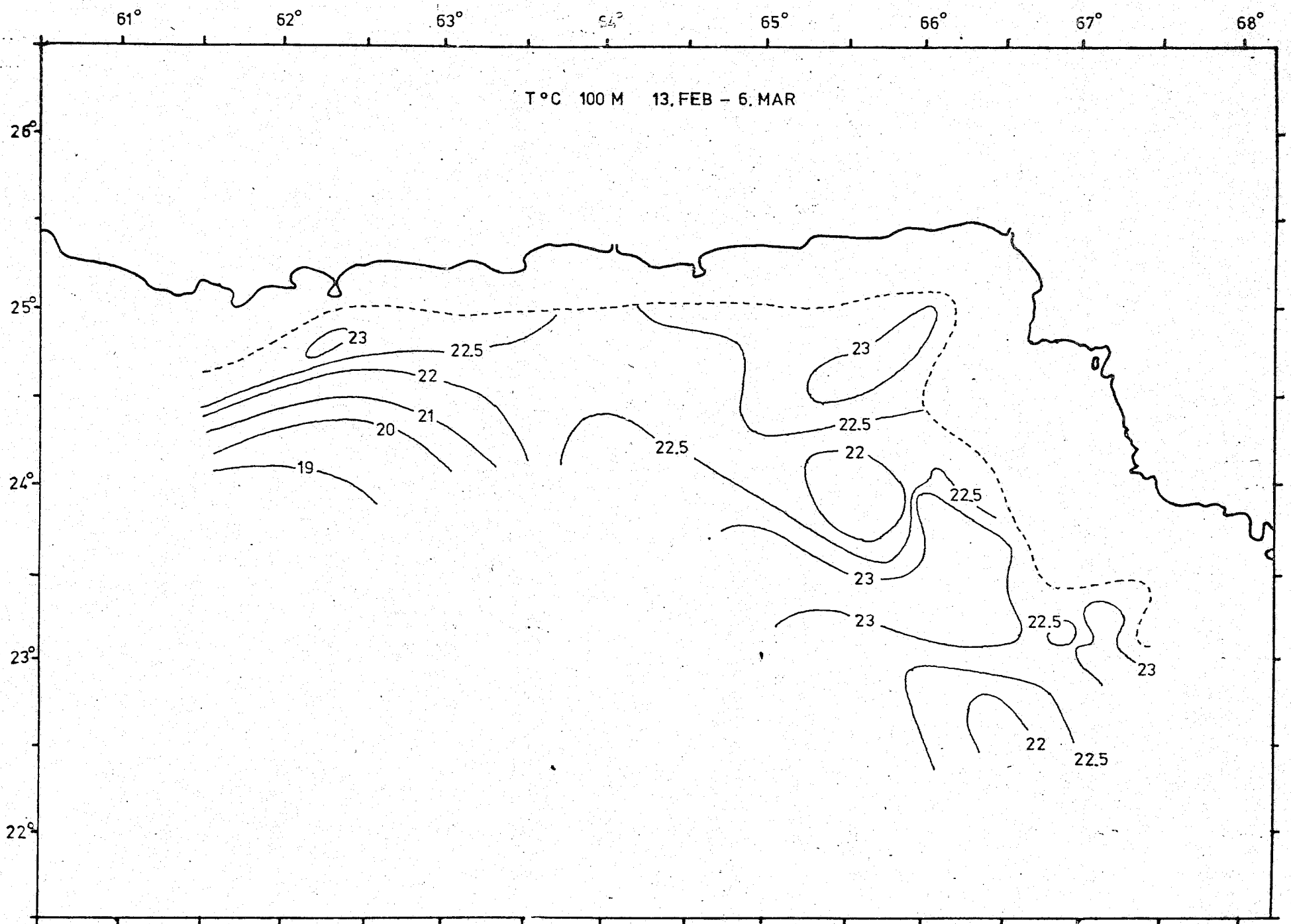
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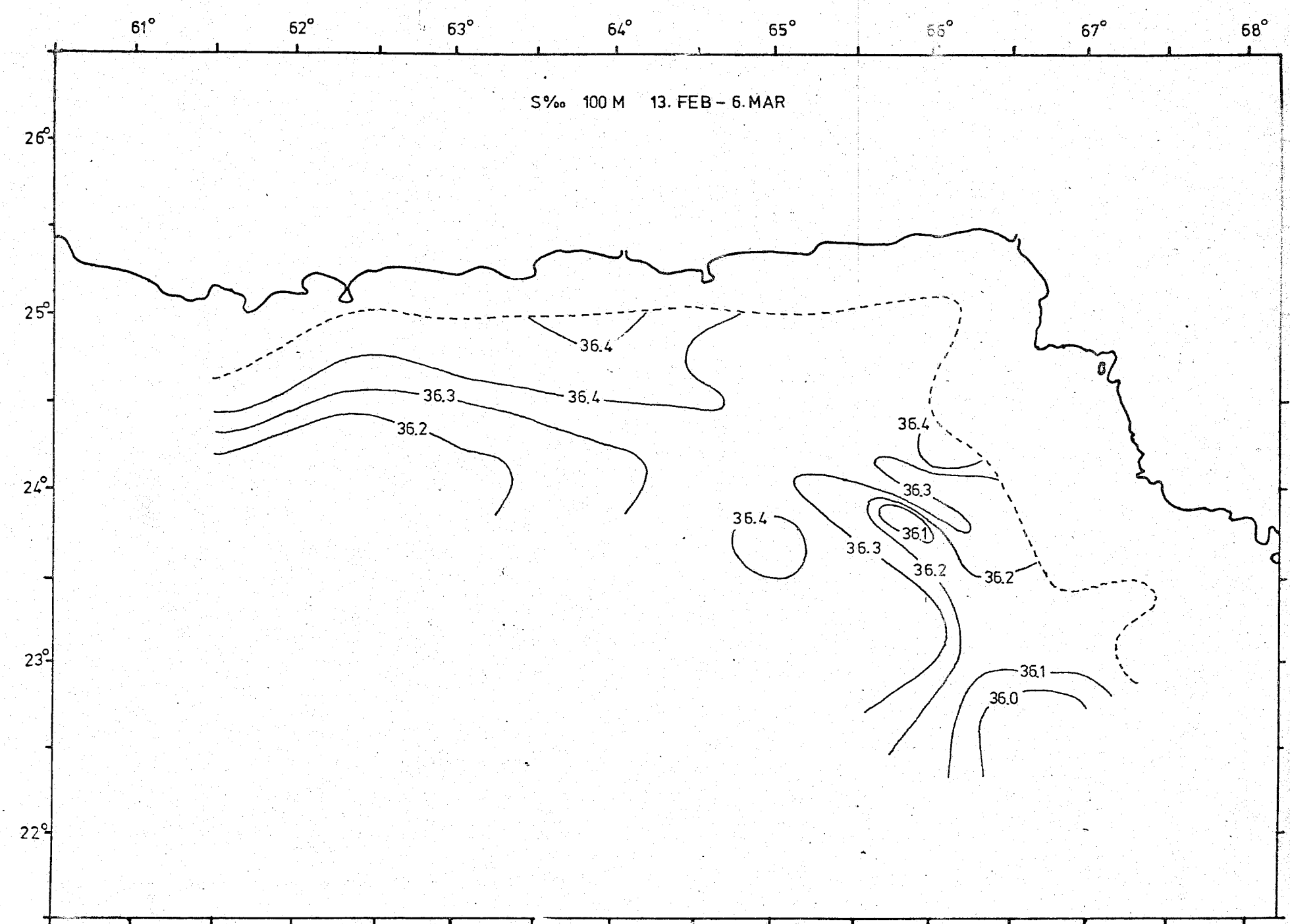
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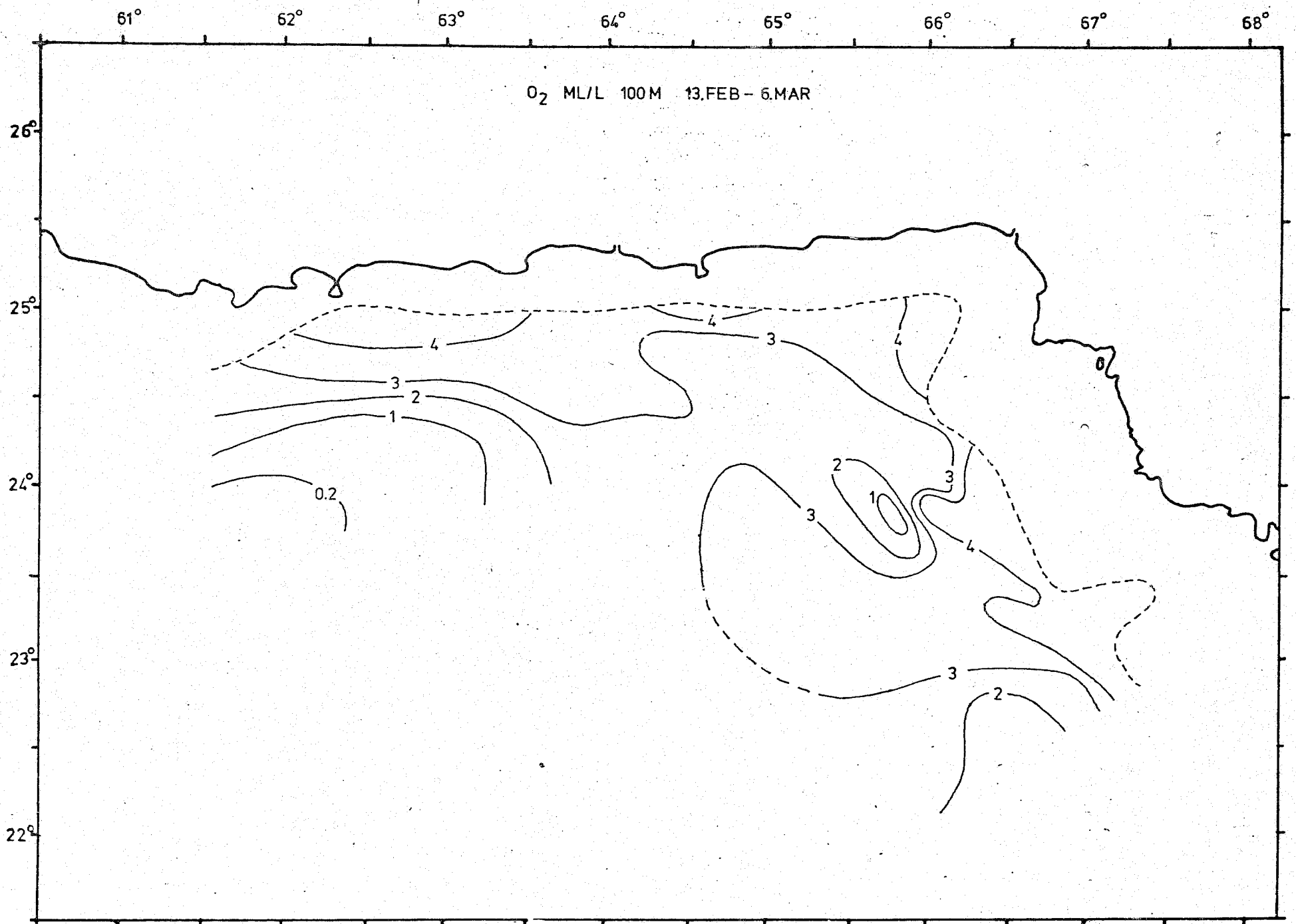
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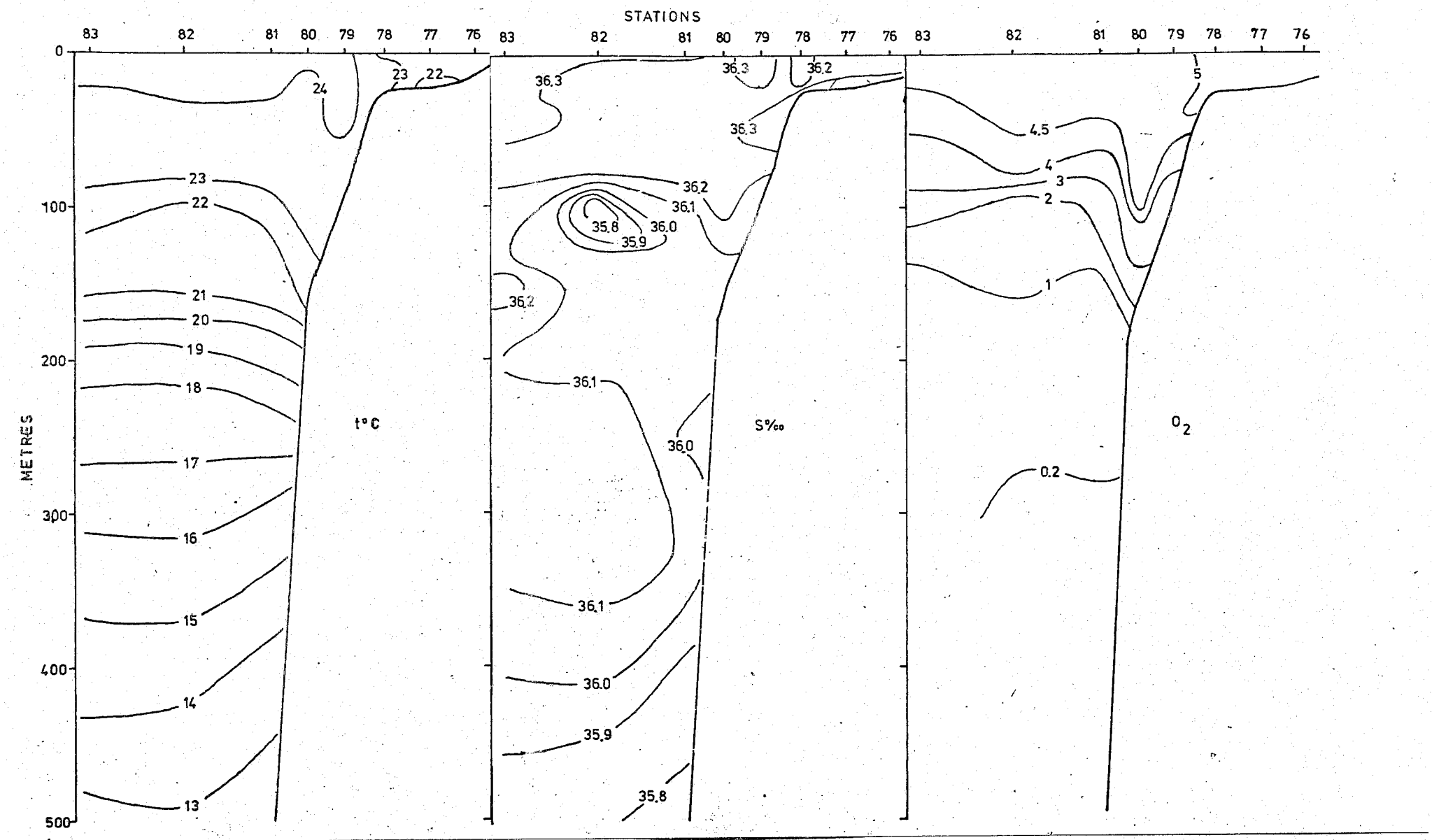
SECTION I 14-15.2.1977
STATIONS
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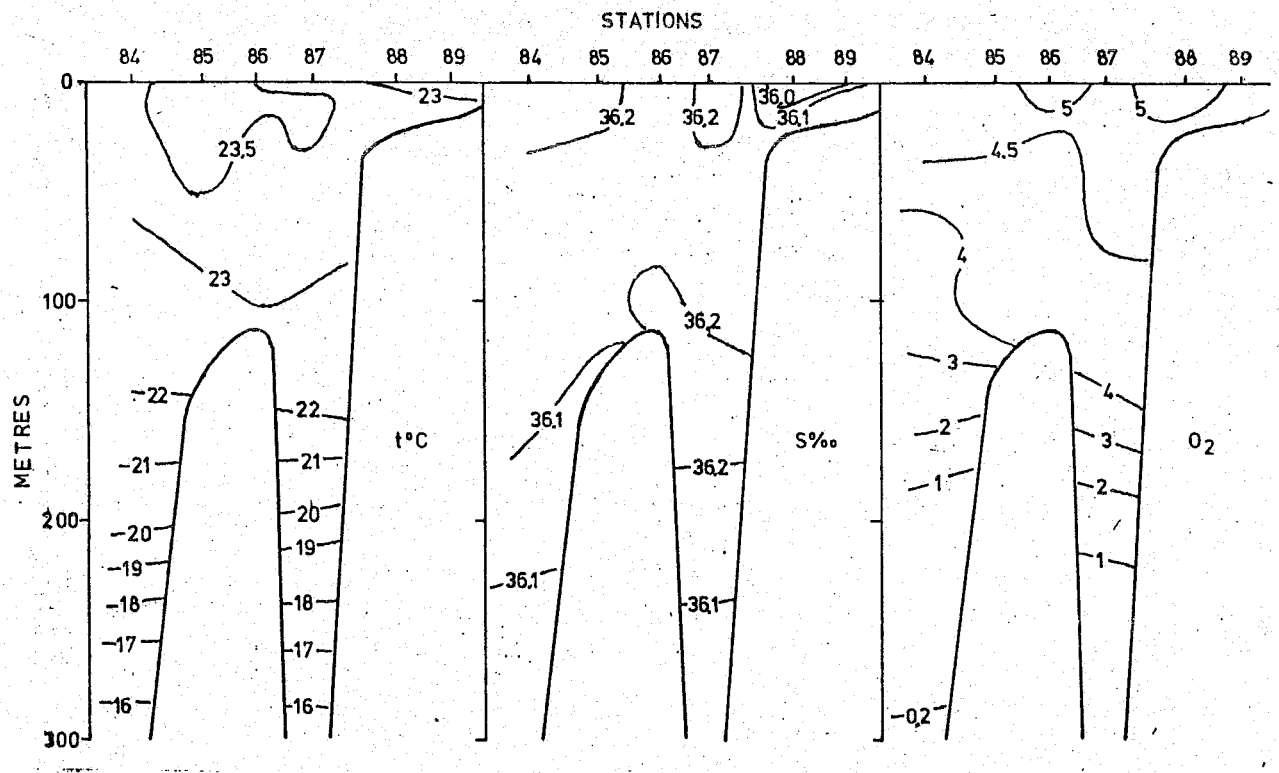

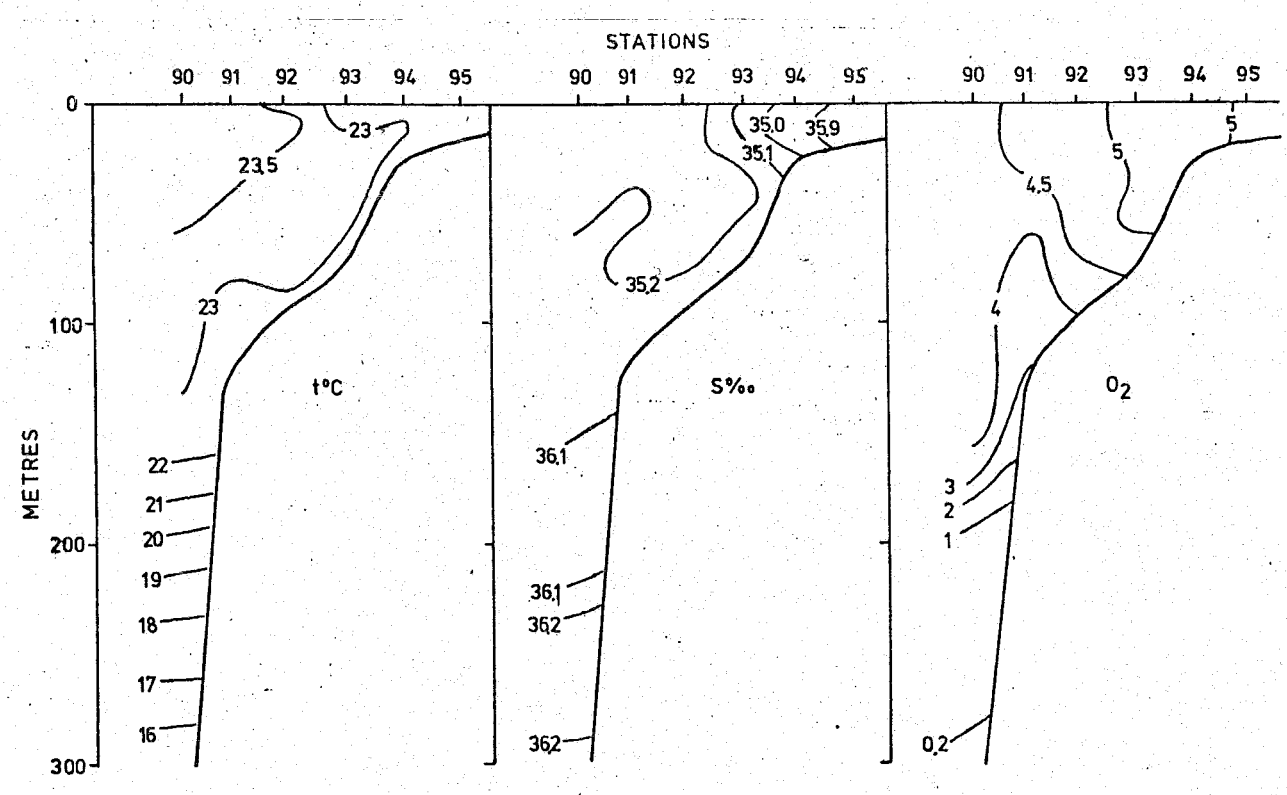

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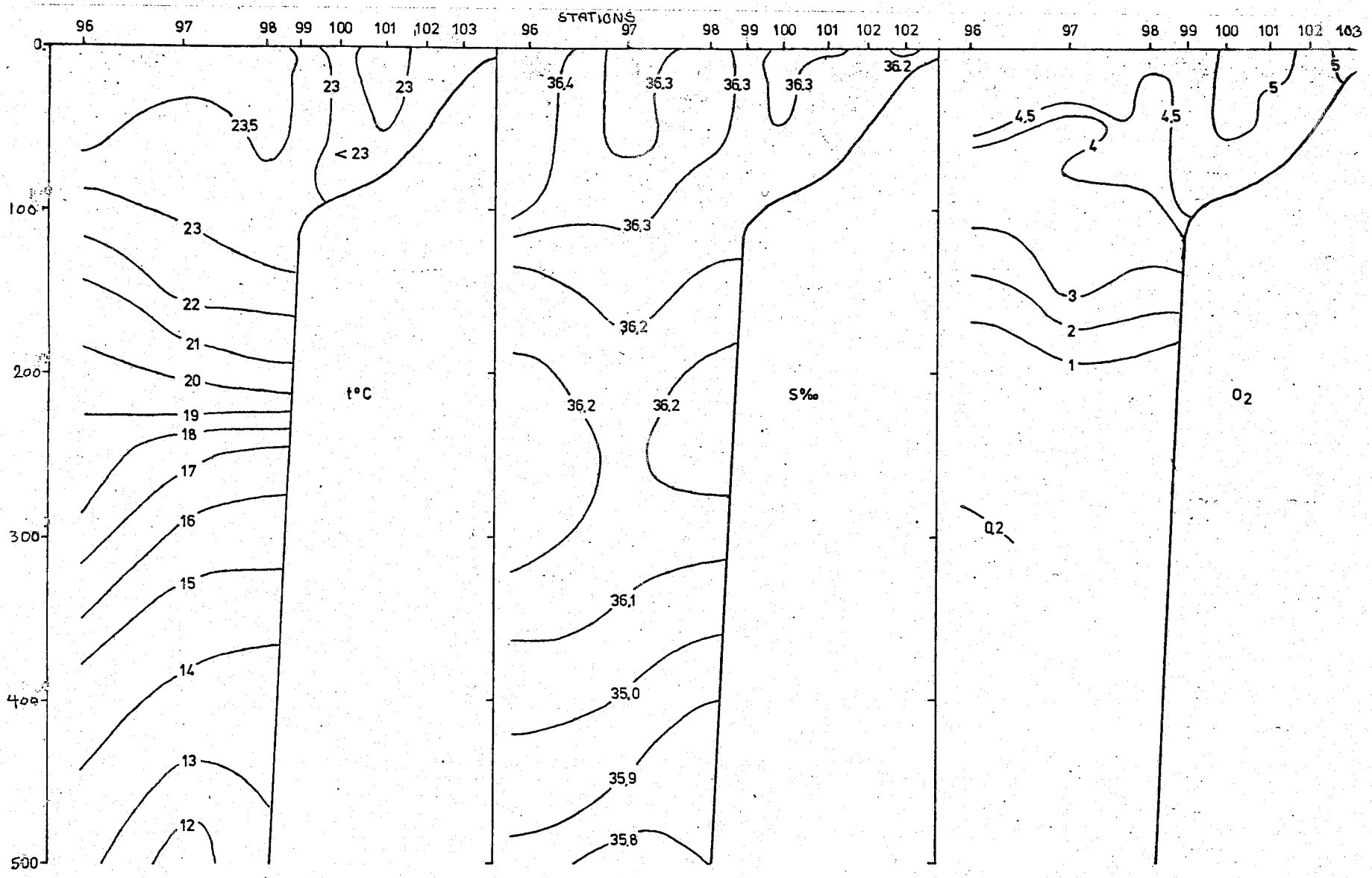

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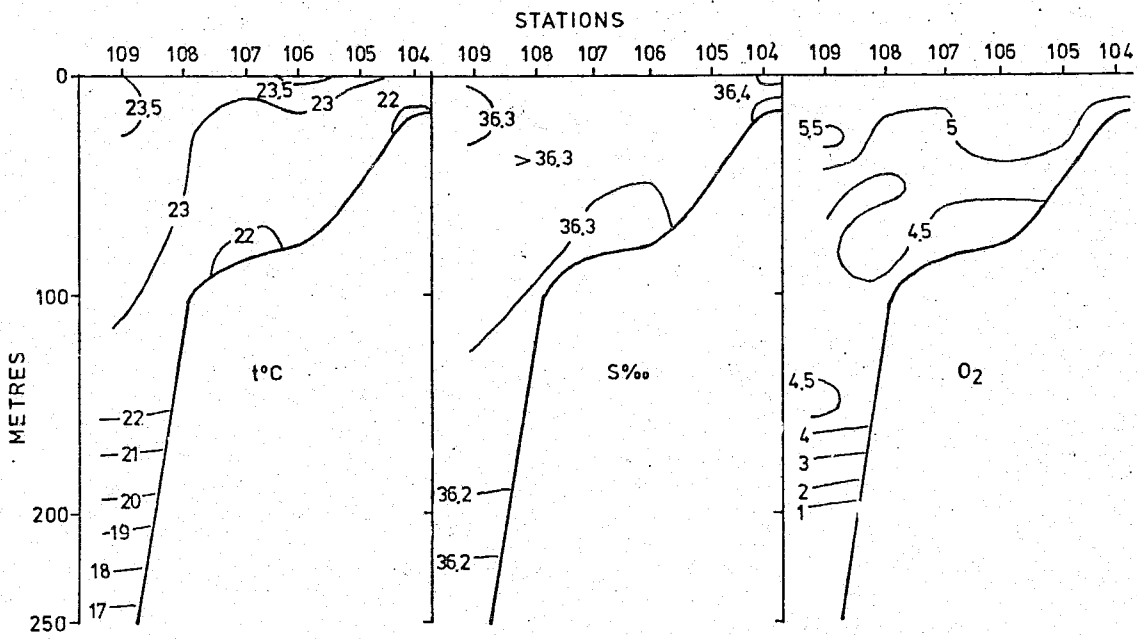

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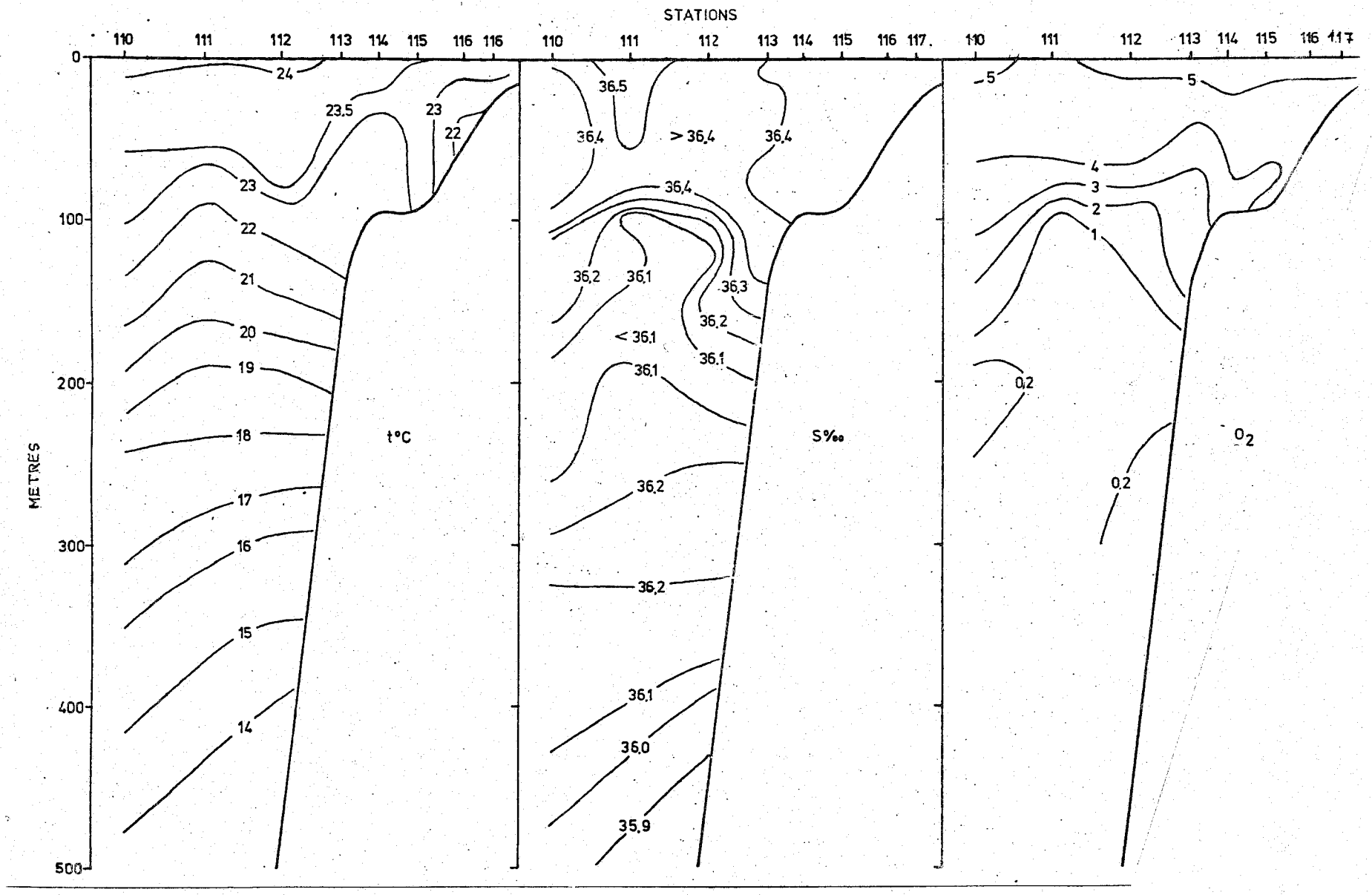

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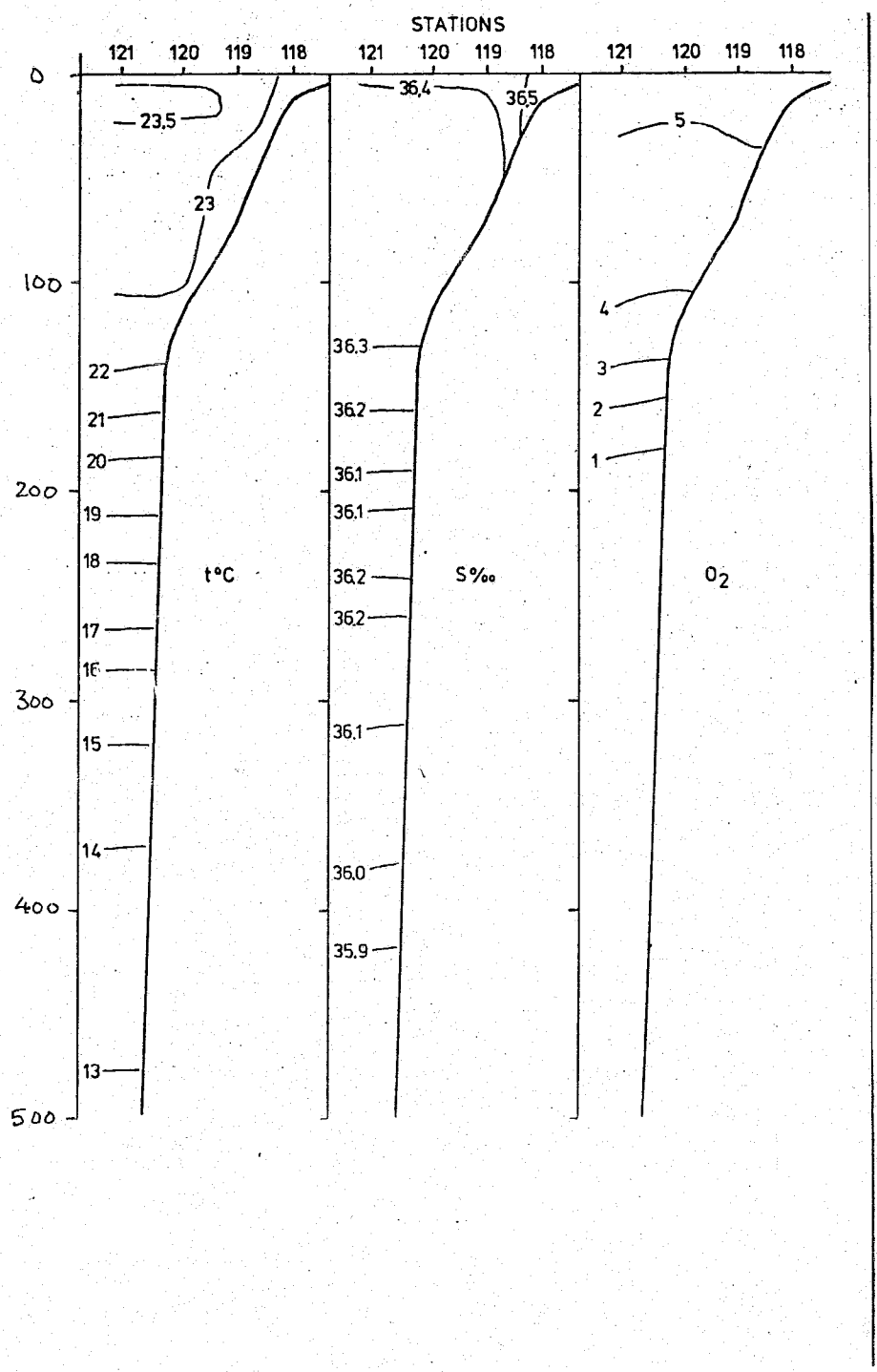

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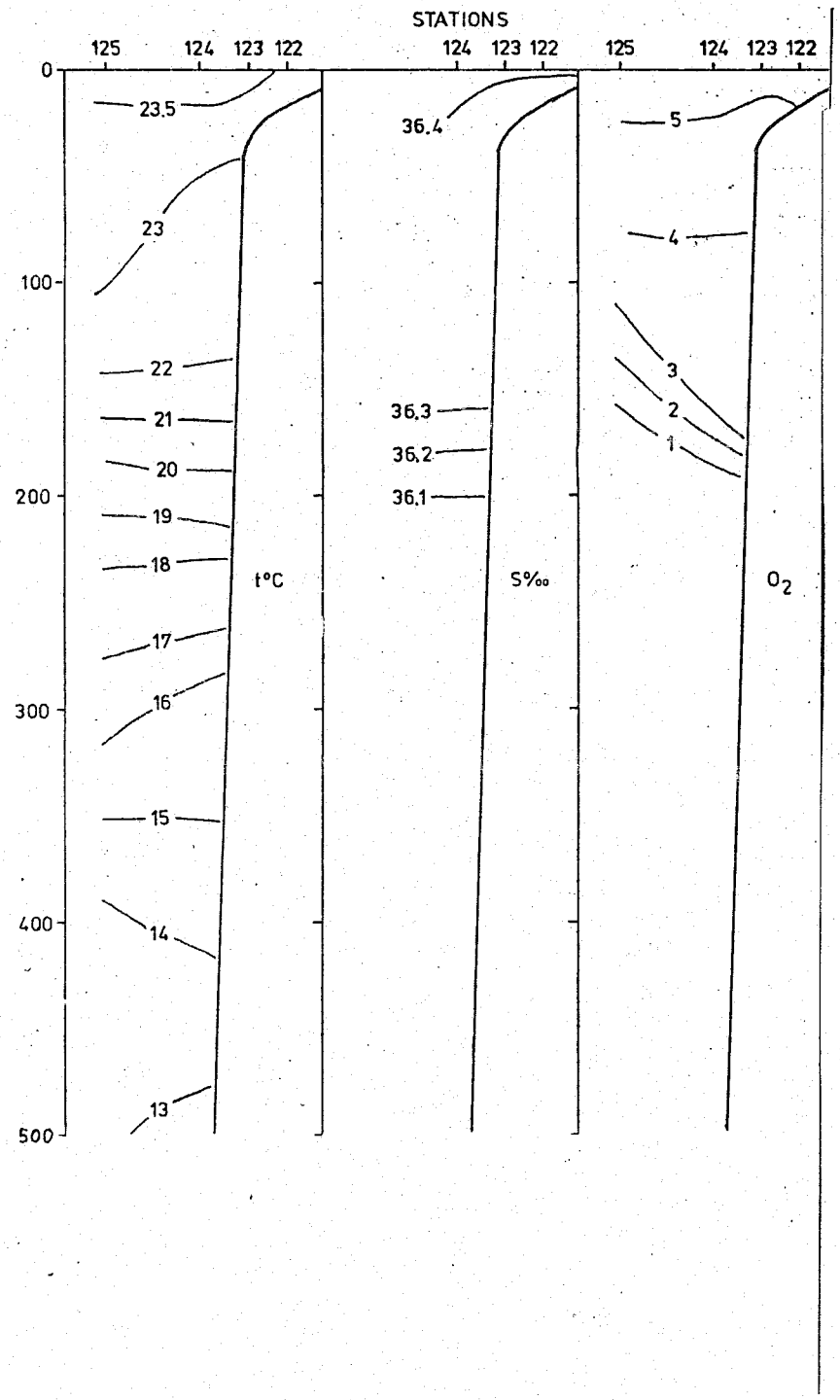

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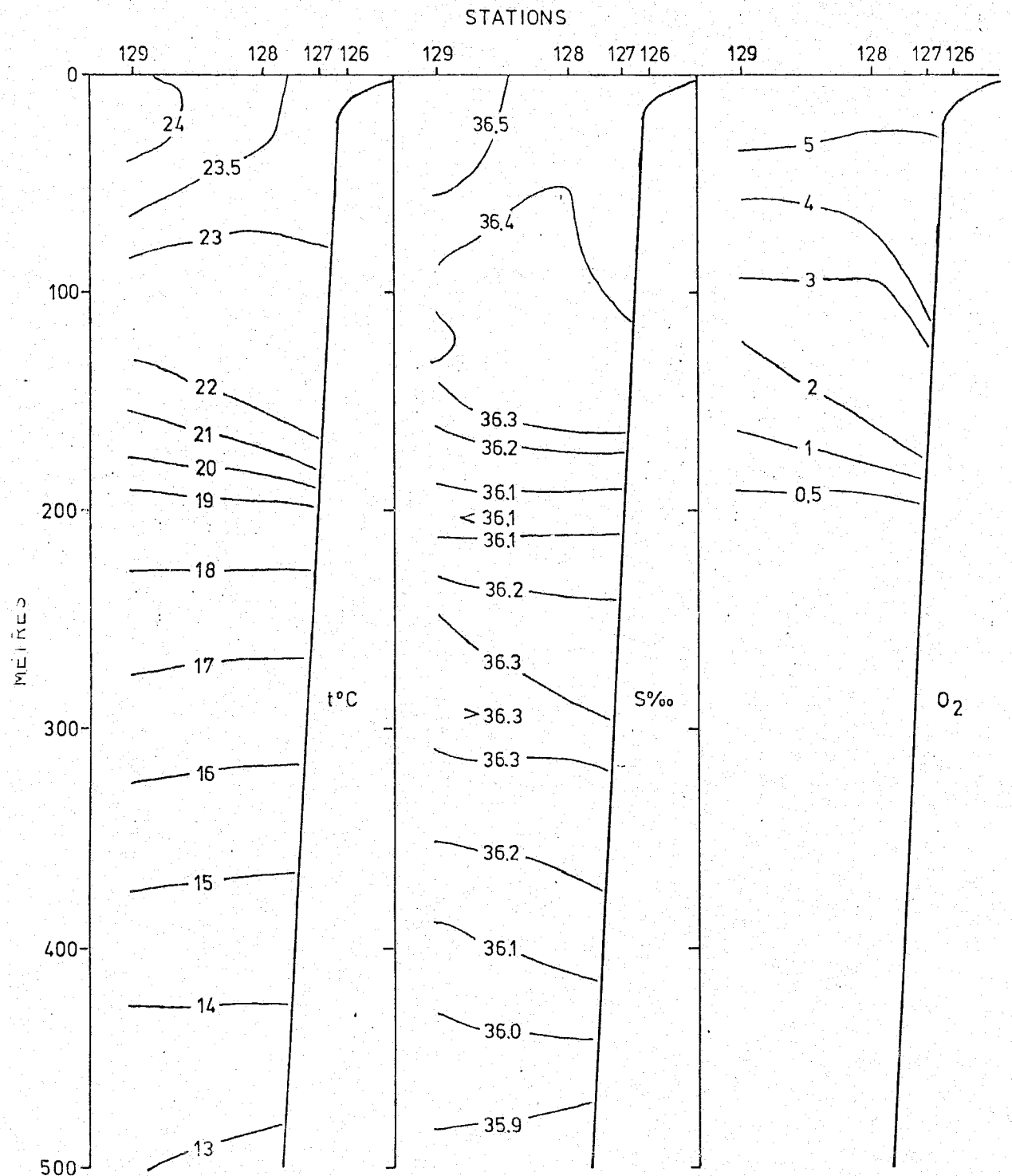

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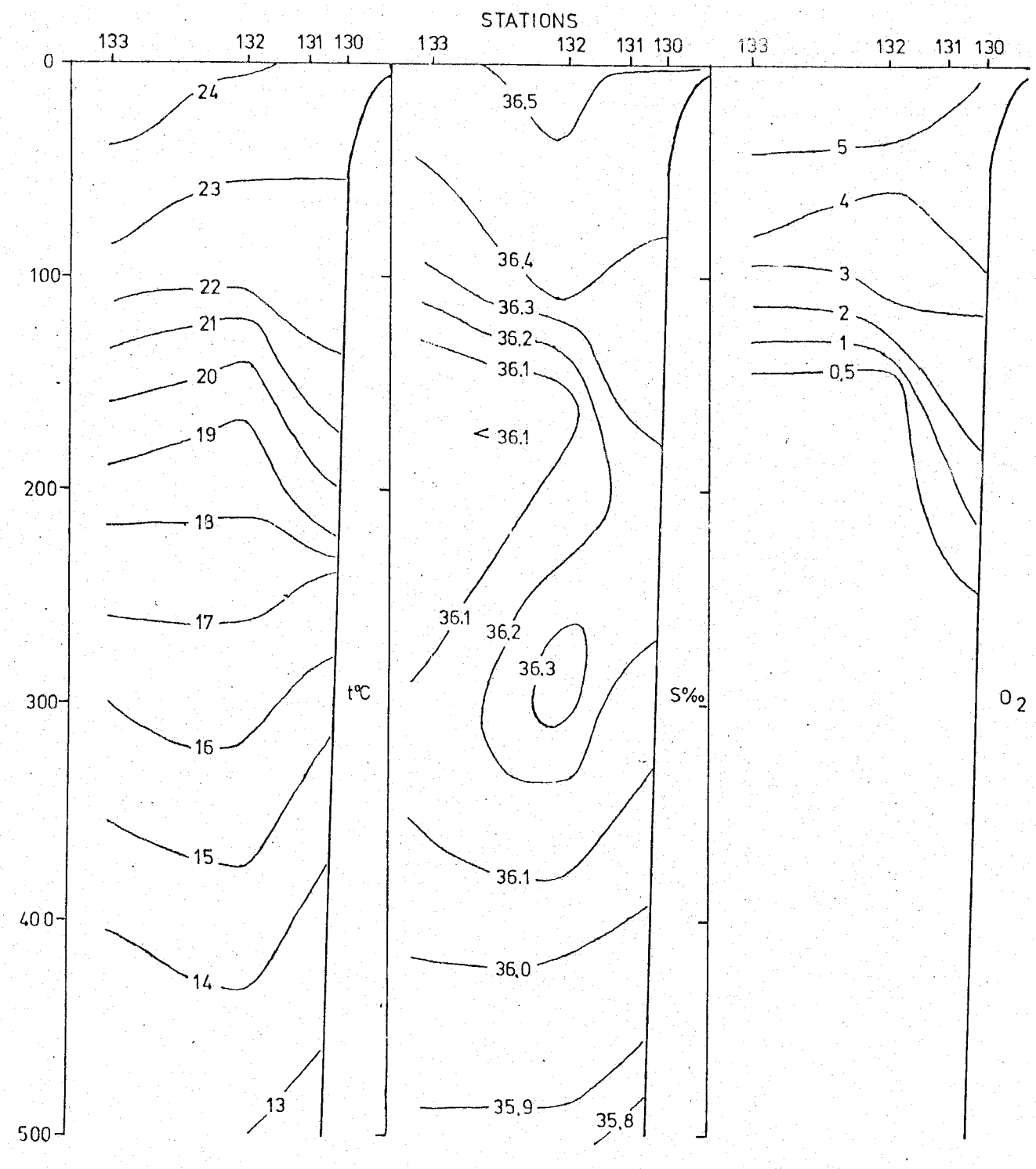

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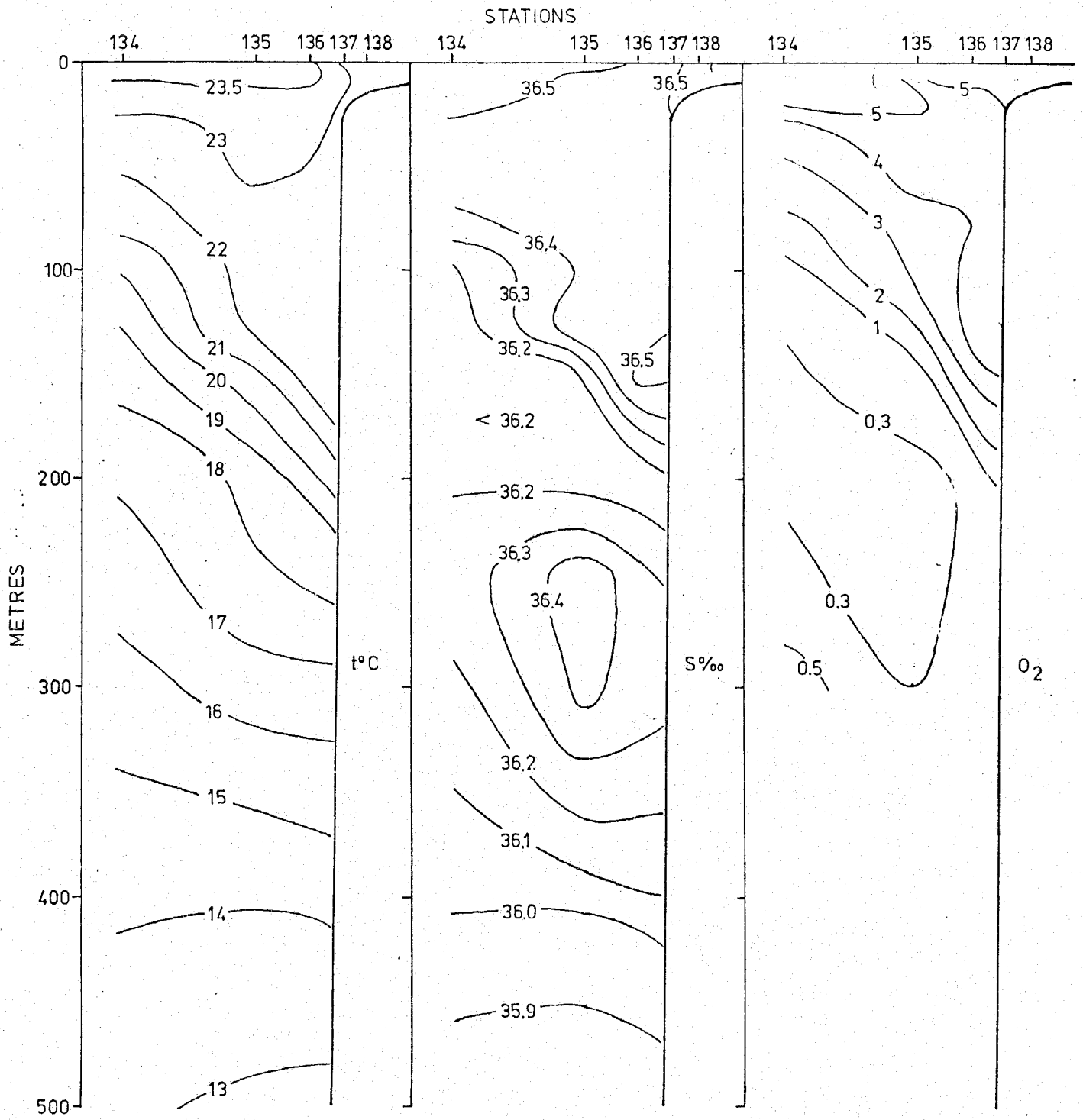

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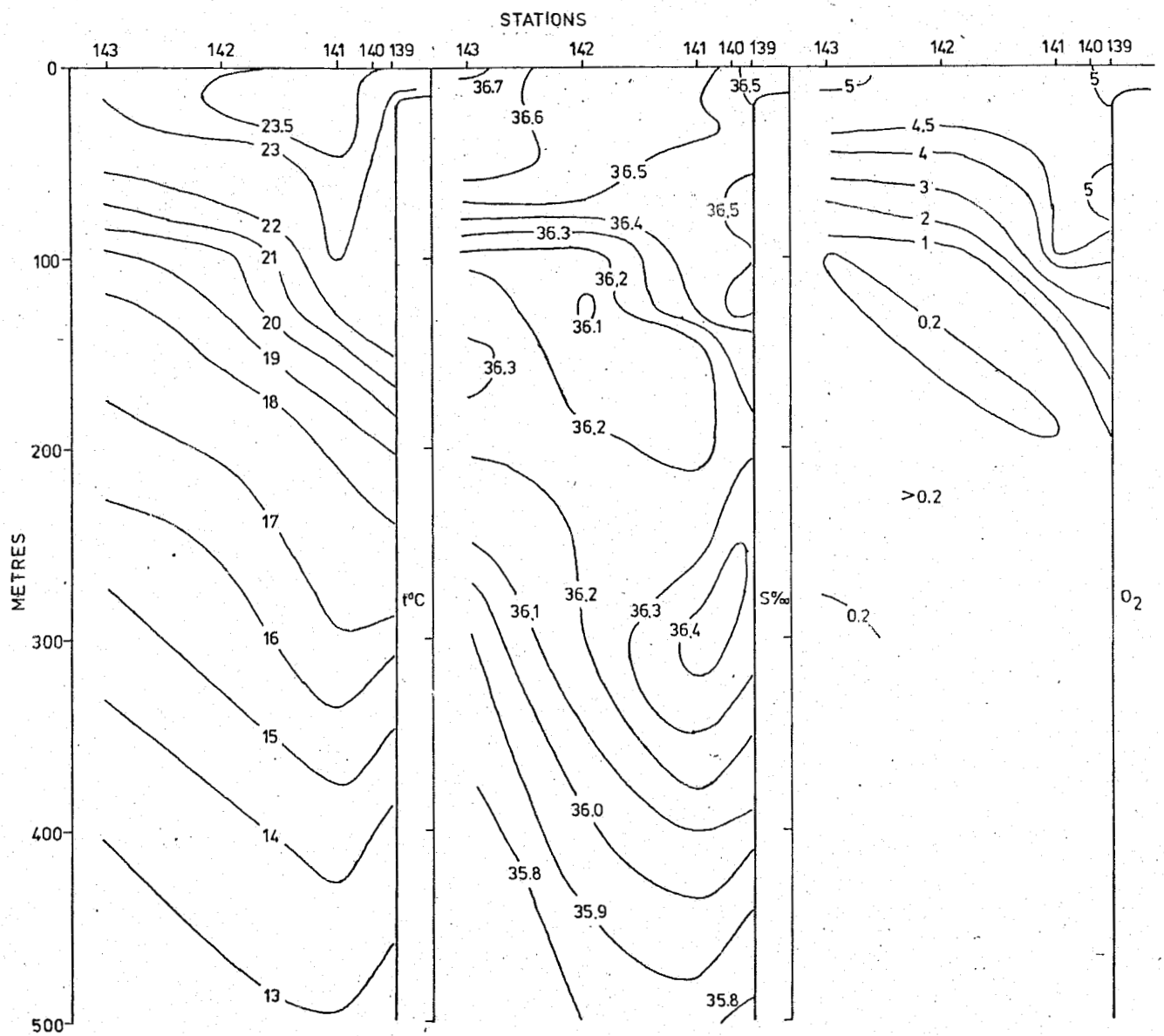

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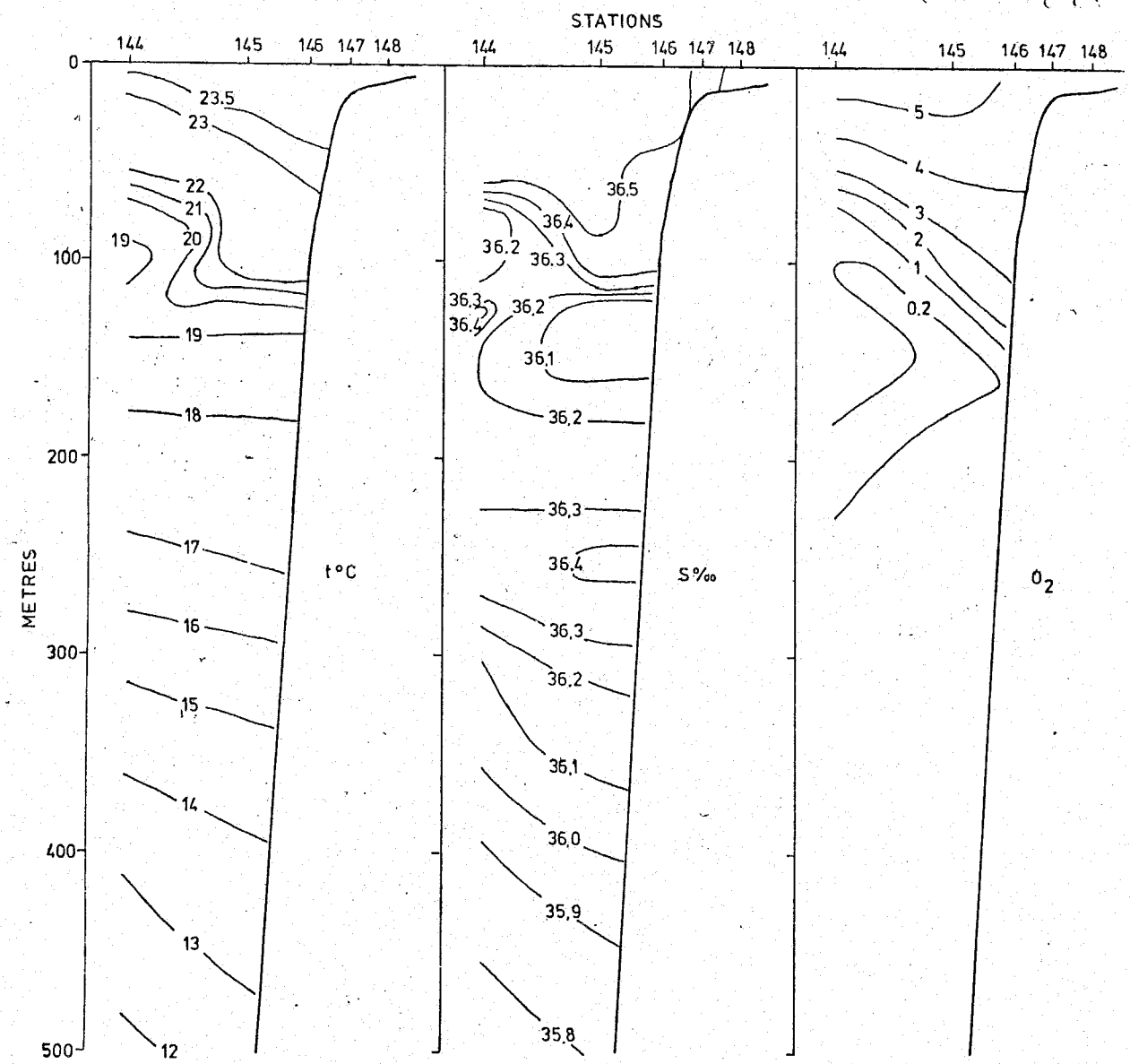

Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D.
0076	1977	213	010 21	23310	67550	15
0077	1977	213	010 24	23230	67410	20
0078	1977	214	010 02	23160	67280	20
0079	1977	214	010 06	23080	67140	85
0080	1977	214	010 09	23010	67030	150
0081	1977	214	010 11	22550	66520	500
0082	1977	214	010 15	22390	66240	500
0083	1977	214	010 20	22230	65580	500
0084	1977	215	010 03	23030	66400	500
0085	1977	215	010 11	23100	66520	125
0086	1977	215	010 13	23170	67050	100
0087	1977	215	010 16	23240	67170	500
0088	1977	215	010 18	23310	67280	20
0089	1977	215	010 21	23390	67430	15
0090	1977	216	010 06	23180	66280	500
0091	1977	216	010 10	23240	66380	115
0092	1977	216	010 12	23300	66490	85
0093	1977	216	010 15	23380	67020	60
0094	1977	216	010 19	23450	67140	20
0095	1977	216	010 21	23510	67250	15
0096	1977	217	010 11	23060	65250	500
0097	1977	217	010 18	23220	65530	500
0098	1977	217	010 20	23350	66160	500
0099	1977	217	010 24	23410	66260	100
0100	1977	218	010 02	23480	66370	85
0101	1977	218	010 18	23540	66490	75
0102	1977	218	010 20	24010	67010	40
0103	1977	218	010 22	24060	67100	15
0104	1977	220	010 04	24310	67010	15
0105	1977	220	010 08	24240	66500	40
0106	1977	220	010 11	24170	66380	70
0107	1977	220	010 14	24100	66250	75
0108	1977	220	010 16	24030	66130	100
0109	1977	220	010 19	23550	66000	250
0110	1977	222	010 02	23430	64520	500
0111	1977	222	010 07	23520	65460	500
0112	1977	222	010 11	24030	65570	450
0113	1977	222	010 15	24190	65540	125
0114	1977	222	010 17	24290	66030	85
0115	1977	222	010 19	24350	66150	85
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0119	1977	223	010 18	25100	66100	65

0120	1977	223	010	21	25000	66010	100
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0124	1977	224	010	13	24560	65200	500
0125	1977	224	010	17	24350	65200	500
0126	1977	228	010	05	25050	64350	10
0127	1977	228	010	07	25000	64350	100
0128	1977	228	010	09	24470	64350	500
0129	1977	228	010	13	24170	64350	500
0130	1977	301	010	13	25010	63500	50
0131	1977	301	010	16	24570	63500	500
0132	1977	301	010	19	24380	63500	500
0133	1977	301	010	24	24060	63500	500
0134	1977	302	010	06	24090	63050	500
0135	1977	302	010	11	24410	63050	500
0136	1977	302	010	13	24540	63050	500
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0143	1977	304	010	06	23500	62200	500
0144	1977	304	010	11	24000	61350	500
0145	1977	304	010	15	24300	61350	500
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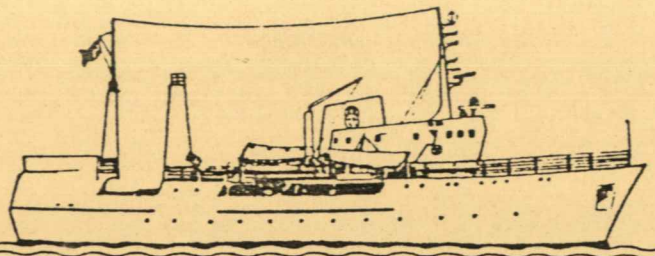


Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY CRUISE REPORT ON CRUISE NOS 5 AND 6 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

8 March - 8 April, 1977

Odd Nakken

Bergen, May 1977

Institute of Marine Research, Bergen

PRELIMINARY CRUISE REPORT ON CRUISE NOS 5 AND 6 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/ FAO FISHERIES RESEARCH PROJECT.

Introduction — This report covers the third complete coverage of the Pakistan waters during the project.

Departure — Karachi 8 March, 1977.

Arrival — Karachi 24 March, 1977.

Scientific staff — M. Hussain, Irshad Begum, Khushro Farooqui, L. Zakaria (Marine Fisheries Department)
S.A. Siddiqui, S.H. Niaz Rizvi, M. Masood (from 12 March, 1977),(Institute of Marine Biology, University of Karachi).
S. Lygren, O. Nakken, O. Knudsen, Ø. Torgersen (Institute of Marine Research).

Departure — Karachi 27 March,1977.

Arrival — Karachi 8. April, 1977.

Scientific staff — S. Qureshi, W. Malik (Marine Fisheries Department)
H. Hasan, M. Syed, M. Moazzam Khan (Institute of Marine Biology, University of Karachi).
S. Lygren, B. Myrseth, O. Nakken, O. Knudsen, Ø. Torgersen (Institute of Marine Reseach).

Survey grid and stations are shown in Fig. 1. The standard hydrographic/plankton stations were worked as described in detail in cruise report no. 1 with modifications in cruise report no. 2.

RESULTS

Table 1 shows the particulars of the fishing stations and table 2 shows the length and maturity distributions of the dominant species.

Distribution and abundance of pelagic fish (Fig. 2)

The distribution patterns are somewhat different to those observed during previous surveys with high abundances in the southern most Sind area and at the western part of the Makran coast. The tendency towards high values in Sonmiani Bay and of Karachi is however, in agreement with previous observations.

The concentrations at the southern Sind coast consisted mainly of sardinellas (Sardinella sindensis and Dussumieria acuta) but also small schools of large lysan (Scombroides commersonanus) were observed in this area. From south of Karachi to Sonmiani Bay a scattering layer of young anchovy (Stolephorus sp.) dominated the pelagic recordings. At times young scad (Decapterus sp.) 2-6 cm in length constituted a significant fraction of this layer.

Large amounts of big jellyfishes were found in shallow waters in the area south of Karachi and at times the quantity of jellyfish in the trawlcatches prevented proper sorting of the fish catch. At the Makran coast the most abundant pelagic fish species were the anchovies (Thryssa mystax, Thryssa dussumieri) and catches upto 8 tons/hour trawling were obtained. Table 2 shows the length and maturity distributions of the different fish species caught during the survey.

Distribution and abundance of demersal fish (Fig. 3)

The highest concentrations were found in 70-120 m depth in Sonmiani Bay were also the biggest catch were taken, 5 tons/hour trawling, the dominating species being croaker, pomfret and grunts. Further south threadfin bream and hairtails were frequently caught in members, while catfish and to some extent seabrams were more numerous along the western Makran coast.

Distribution and abundance of mesopelagic fish (Fig. 4)

High abundances of mesopelagic fish, mainly lantern fish (MYCTOPHIDAE) were observed off the continental shelf in the central

part of the survey area. At the end of the 6. cruise a few days were spent for fishing experiments and behaviour studies of mesopelagic fish in particular. The results of the fishing experiments are shown in table 1. The catches were generally low due to the wide spread in the vertical distribution pattern; at one station the catch amounted to 1.8 ton/hour trawling. The diurnal vertical migration pattern of the mesopelagic fish layer was a reported previously.

Plankton (Fig. 5)

The echo recordings attributed to plankton showed higher values over the shelf and the slope of the shelf than further seawards. The dominating species contributing to these recordings were - according to the trawlcatches: small squids, jellyfish, krill and different fish fry. A more comprehensive list of contributors should be made when the plankton samples are analyzed.

Hydrography (Fig. 6-21)

The heating of the surface waters, especially in the nearshore areas, had continued. The intermediate salinity minimum, in 100-200 m depth, was present in most of the vertical sections also during this coverage.

REMARKS

The equipment worked satisfactorly. The working capacity of the staff was excellent.

Bergen, May 1977

Odd Nakken

Table 1. Fishing stations carried out by R/V "Dr. Fridtjof Nansen" during her 5th and 6th cruise (8th March to 8th April 1977). BTR: bottom trawl, SPT: small pelagic trawl, KTR: krill trawl. Fish names: FAO Species Identification Sheets for Fishery Purposes.

Date	Time Start GMT	St no	Gear type	Bottom depth m	Gear depth m	Position South North	Position East	Total catch kg	Catch per hour kg	Dominant species (total catch, kg)
9.3	0140	52	SPT	18	10	23°30'	67°52'	500	750	Sardinella sindensis, Dussumieria acuta
10.3	0932	53	SPT	118	35	23°11'	66°54'	45	90	Canthigaster margaritatus (munro)
10.3	1030	54	BTR	111	11	23°14'	66°58'	400	800	Nempiterus japonicus, Sphyraena picuda
10.3	1810	55	SPT	31	19	23°32'	47°29'	45	135	Scombroides commersonianus
10.3	2142	56	BTR	13	-	23°41'	67°40'	180	360	Jellyfish, Pomadasys maculatus, Amblygaster clupeoins
11.3	0220	57	SPT	70	15	23°34'	64°10'	40	80	Jellyfish, Various fish larvae
11.3	0400	58	BTR	79	79	23°31'	47°12'	800	1200	Caranx malabaricus, Rays
11.3	1510	59	SPT	100	15	23°28'	66°44'	80	160	Jellyfish, Auxis thazard
12.3	0255	60	BTR	73	73	23°50'	67°00'	600	1020	Lepturacanthus savala, Pomadadys hasta
14.3	0315	61	SPT	70	40	24°00'	67°00'	120	240	Leiognathus spp., Squids, Jellyfish
14.3	0440	62	BTR	25	25	24°03'	67°06'	300	600	Pomadasys hasta, Trichurius spp., Scomberomorus guttatus
14.3	0715	63	BTR	17	17	24°06'	67°10'	300	600	Pomadasys hasta, Jellyfish
14.3	0923	64	BTR	22	22	24°12'	67°05'	250	500	Pseudosciaena diacanthus, Pomadasys hasta
15.3	0130	65	SPT	17	-	24°25'	67°05'	15000	30000	Jellyfish (
15.3	0455	66	BTR	23	23	24°30'	66°57'	100	200	Trichurius spp., Arius sp.
15.3	1150	67	BTR	86	86	25°10'	66°25'	204	408	Lepturacnthus savala, Pomadasys hasta, Sharks
16.3	0039	68	SPT	77	20	24°22'	66°31'	90	90	Jellyfish, Squids
16.3	0330	69	BTR	55	55	24°30'	66°47'	359	718	Trichrius spp., Lutjanus argentimaculatus

(Table 1. Continued)

Date	Time Start GMT	St no	Gear type	Bottom depth m	Gear depth m	Position South North	Position East	Total catch kg	Catch per hour kg	Dominant species (total catch, kg)
16.3	0535	70	SPT	28	12	24°32'	66°50'	200	400	Stolephorus sp.
16.3	1355	71	BTR	121	121	24°17'	65°59'	400	1600	Nemipterus japonicus, Platycephalus spp.
17.3	0950	72	BTR	460	460	24°17'	65°43'	50	50	Harpodon nerhereus
17.3	1445	73	BTR	355	355	24°19'	65°47'	40	50	Collithus lucidus
18.3	0125	74	SPT	33	20	24°46'	66°29'	40	80	Stolephorus spp., Decapus sp.
18.3	0440	75	BTR	104	104	24°45'	66°13'	5000	5000	Pseudosciana diacanthus, Pampus argenteus, Pomadasys hasta
18.3	1125	76	BTR	51	51	25°07'	66°26'	450	900	Trichurus spp., Lactarius lactarius
18.3	1335	77	SPT	72	35	25°02'	66°18'	100	200	Decapterus sp.
19.3	0355	78	BTR	98	98	25°00'	65°56'	650	1300	Rays, Pseusciana diacanthus, Pomadasys hasta
19.3	0650	79	BTR	36	36	25°10'	65°54'	225	450	Pomadasys maculatus, Pomadasys hasta
20.3	0435	80	SPT	16	12	25°15'	65°46'	100	200	Trichrius, Rays, Arius spp.
20.3	1104	81	HMB	17	-	25°13'	65°31'	24	55	Lutjanus argentimaculatus, Pomadasys hasta
20.3	1350	82	BTR	18	18	25°15'	65°21'	32	96	Pomadasys maculatus
21.3	0720	83	BTR	19	19	25°14'	65°06'	80	160	Argyrops spinifer, Rays, Drepane punctata
21.3	1315	84	BTR	16	16	25°08'	64°45'	200	270	Pomadasys hasta, Argyrops spinifer, Drepane punctata
21.3	1920	85	BTR	16	16	25°05'	64°24'	200	400	Arius sp.
22.3	0310	86	SPT	27	-	25°03'	64°02'	4	4	Rays
22.3	0625	87	BTR	11	11	25°12'	63°52'	280	300	Skates, Argyrops spinifer
28.3	1155	88	SPT	60	45	24°59'	63°50'	45	40	Megalaspis cordyla
29.3	2325	90	BTR	15	15	25°08'	63°05'	4000	8000	Thryssa mystax, Arius, Thryssa dussumieria
30.3	0215	91	BTR	15	15	25°08'	63°21'	600	1200	Arius spp., Pomadasys hasta, Pampus argenteus

(Table 1. Continued)

Date	Time Start GMT	St no	Gear type	Bottom depth m	Gear depth m	Position North	Position East	Total catch kg	Catch per hour kg	Dominant species (total catch, kg)
30.3	0918	92	BTR	24	24	25°01'	63°11'	200	400	Argyrops spinifer, Megalaspis cordyla, Pomadasys hasta
30.3	1800	93	SPT	32	08	25°03'	62°42'	300	900	Megalaspis cordyla, Decapterus russelli
31.3	0100	94	BTR	32	32	25°03'	62°20'	9	19	Argyrops spinifer, Shark
1.4	1500	95	BTR	10	10	25°03'	61°35'	207	310	Arius sp., Lepturacanthus savala, Nemipterus japonicus
1.4	1935	96	SPT	25	18	24°44'	61°50'	600	1200	Benthosema terutum
3.4	0700	97	SPT	780	200	24°50'	62°14'	73	146	Benthosema sp.
3.4	2125	98	SPT	640	70	24°54'	63°01'	-	-	-
3.4	2240	99	IKMT	780	80	24°54'	63°01'	-	1	Diaphus sp.
4.4	1240	100	SPT	-	138	24°47'	64°06'	182	365	Benthosema sp.
4.4	2123	101	APT	525	25	25°02'	64°46'	80	160	Squids, Fish larvae
5.4	0615	102	SPT	1700	168	24°51'	65°21'	1760	1760	Benthosema spp.
5.4	1635	103	SPT	750	-	24°52'	65°39'	25	51	Almus, Myctophids
5.4	1906	104	SPT	730	33	24°53'	65°43'	38	76	Benthosema
6.4	1850	105	SPT	1000	10	24°58'	65°19'	480	960	Benthosema sp.
6.4	2027	106	SPT	1050	37	24°56°	65°23'	50	100	Benthosema
7.4	0415	107	SPT	760	165	24°45'	66°00'	291	581	Benthosema sp.
7.4	0545	108	KTR	750	160	24°45'	66°00'	40	80	Benthosema

Table 2. Length frequency and maturity Cr. 5+6.

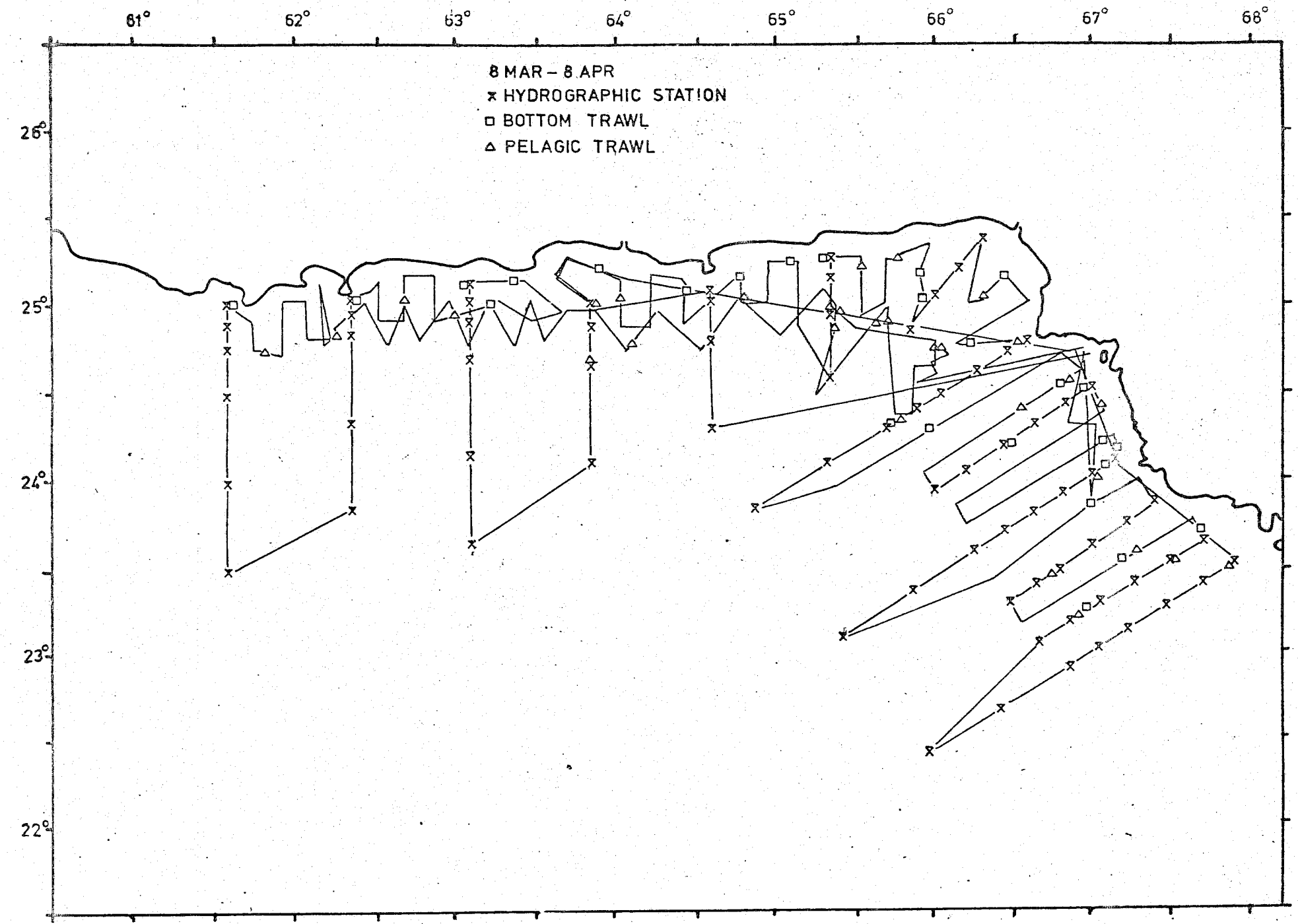
SMALL FISH

SPECIES	St.nos.	Length in cm (below) ≤2	3	4	5	6	7	8	9	10	11	12	≥13	N	Maturity stage 1	2	3	4	5	6	7
Benthosema plerotum	99-100-102	10	71	20																	
Diaphus sp.	99-98		50	0	25	29	7														
Decapterus russellii sp.	55-61-62-66-74-77-93	9	14	17	17	6	1	0	0	3	4	12	17	175		80	4	12 (only ≥10)			
Dussumieria acuta	52-91						34	13	39	9	0	2	4	43	100		(st. 52 i.e. less than 10 cm)				
Lactarius lactarius	76-78										4	8	88	50	2	4	6	34	42	12	
Nemipterus japonicus	75-95					1	0	1	3	9	11	15	61	60	12	60	16	12			
Nemipterus japonicus	54-58-60-66-62-67-71						1	7	12	8	4	7	60	150	7	23	15	4	2		
Opisthopterus tardore	91-										5	3	93	40	(st.91 only)			25	70	5	
Pomadasys maculatus	82-85												100	50	8		4	52	32	4	
Sardinella sindensis	52-56-66-85-91-95							1	2	6	11	14	66	132	21	28	13	30	9	0	
Squids	78-81-87-91-95	3	10	13	14	20	12	9	6	7	6	2	4	111							
Stolephorus indicus	55-56-74		3	21	9	0	13	51	3					75			35	65	(only st. 55 ≥7 cm)		
Thryssa dussimieri	77-85-90-91				1	1	6	2	8	29	12	14	27	113	3	8	29	29	30	1 (≥5)	
Thryssa mystax	77-85-90-91							4	27	21	2	13	34	82	25	9	4	22	41		

Table 2 . Length frequency and maturity. Cr. 5+6

LARGE FISH

SPECIES	St.nos.	Length in cm (below) ≤5	10	15	20	25	30	35	40	45	50	55	60 ≥65	N	Maturity stage 1	2	3	4	5	6	7
Arygrops spinifer	62-84-92	18	14	0	0	0	0	5	21	31	10			75	46	28	20	6			
Hilsa ilisha	78-91		24	26	40	10								50		6	12	42	30	12	
Megalaspis cordyla	88-92-93							31	55	15				73		40	50	11	(All in 2 rec.)		
Otolithes ruber	91		16	56	28									25	2	4	12	40	32	12	
Pampus argenteus	75-90-91			2	35	45	19							67		18	41	29	7		
Pomadasys hasta	90-92-95	33	0	0	13	0	0	18	24	10	2			37	6	0	7	9	29	4	(Not ≤10)
Pomadays hasta	75-78-79-82-84-85			1	19	8	7	19	23	19	24	0		160	4	26	2	18	17	(st.82-84)	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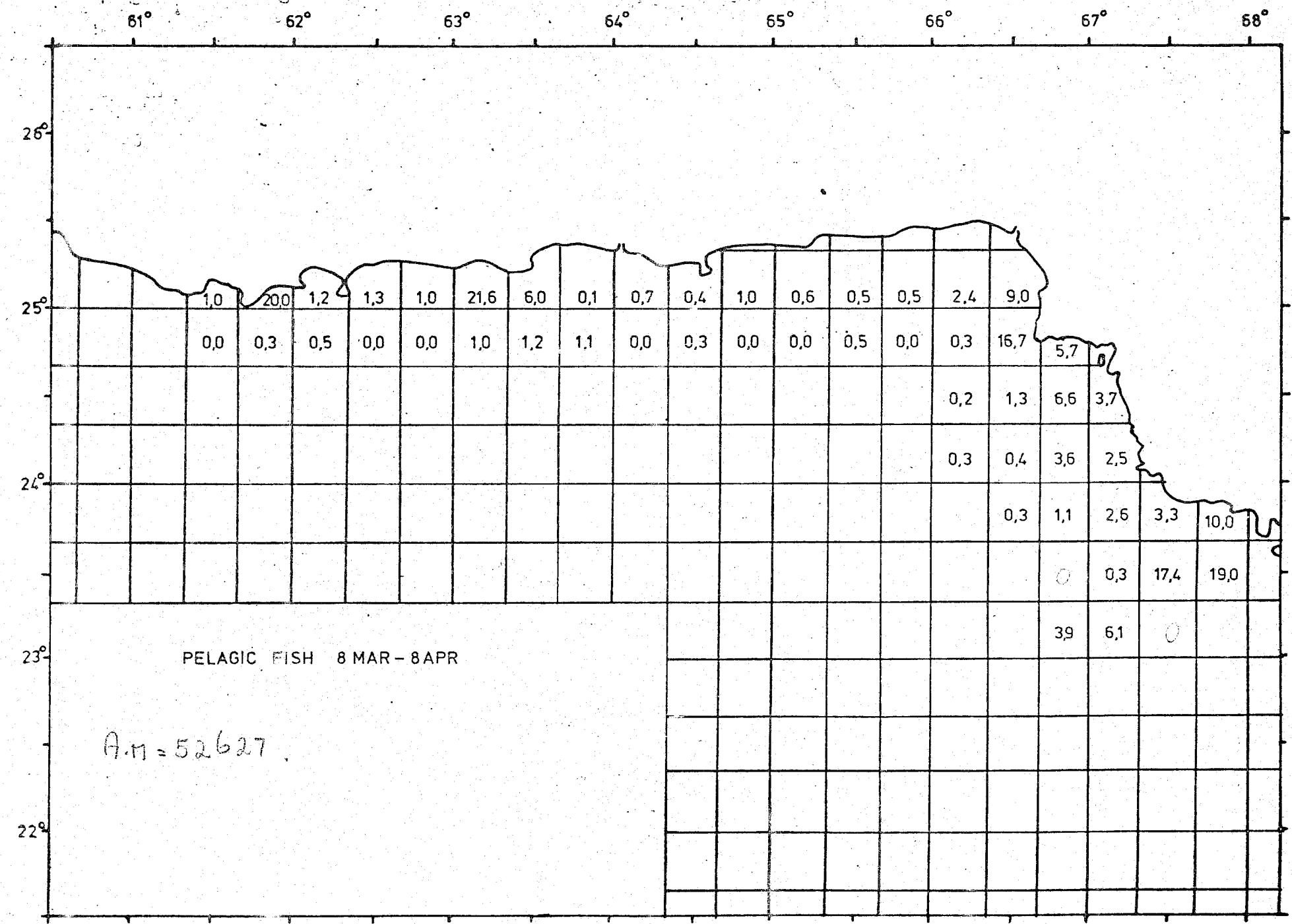
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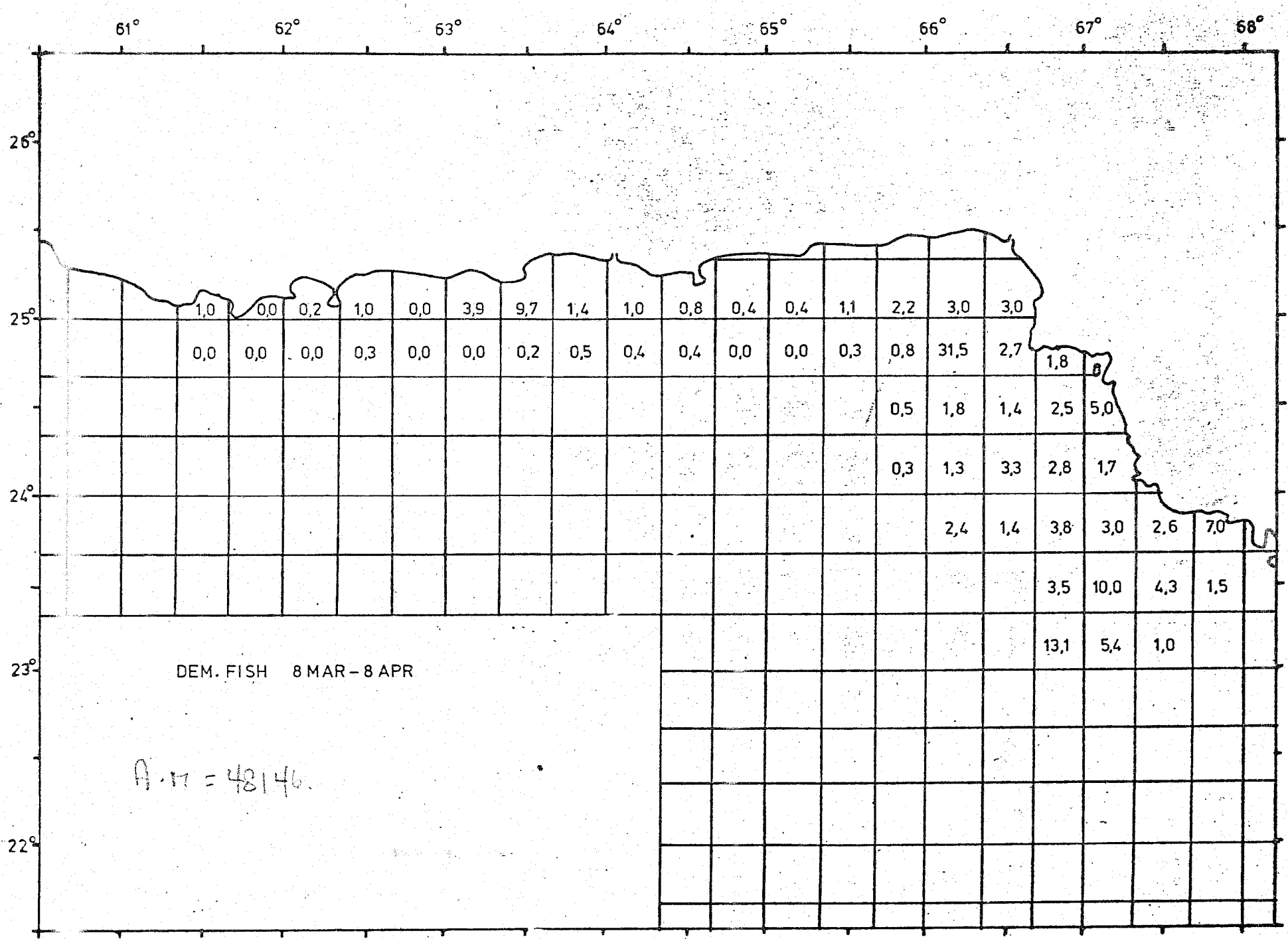
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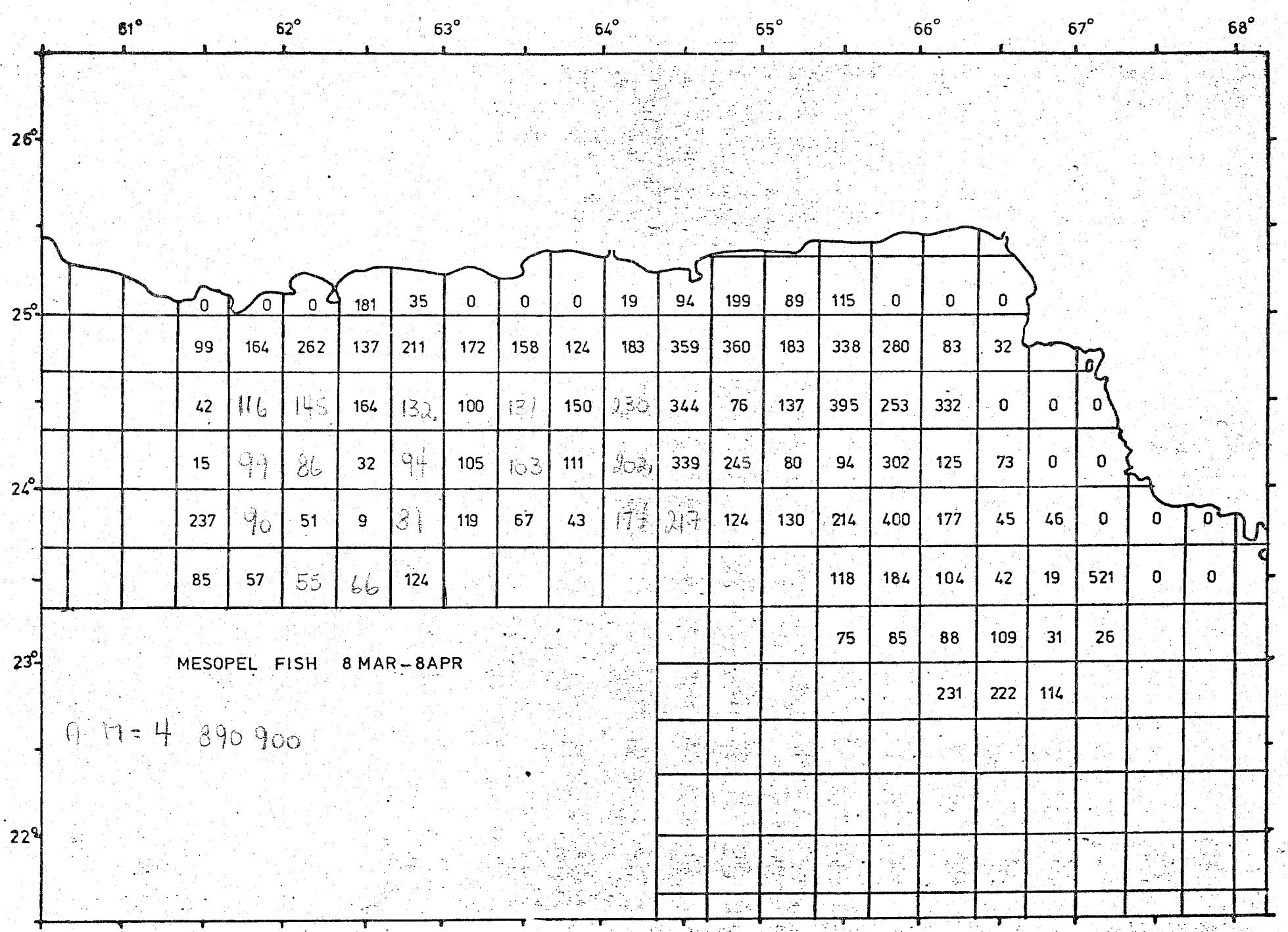
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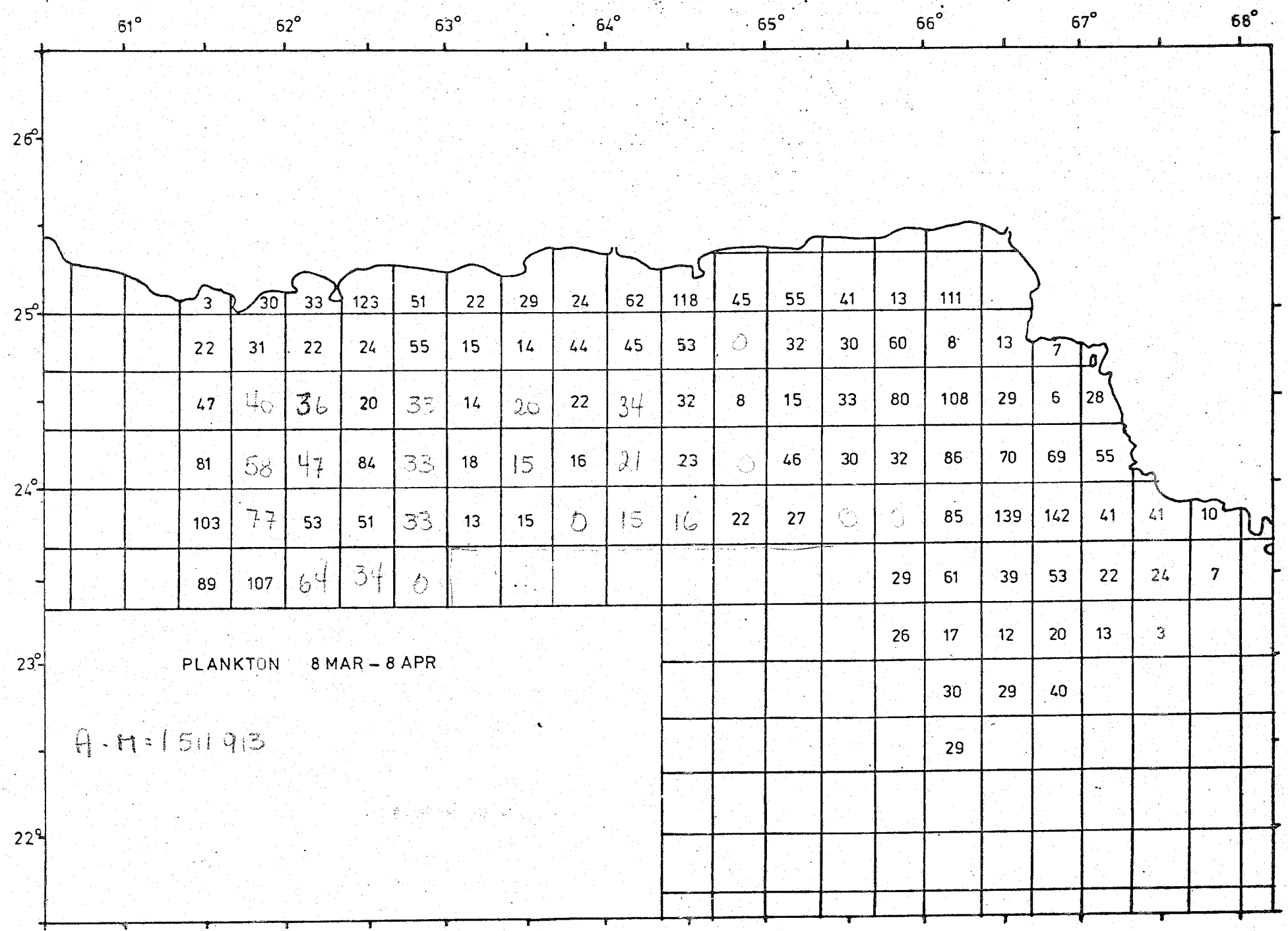
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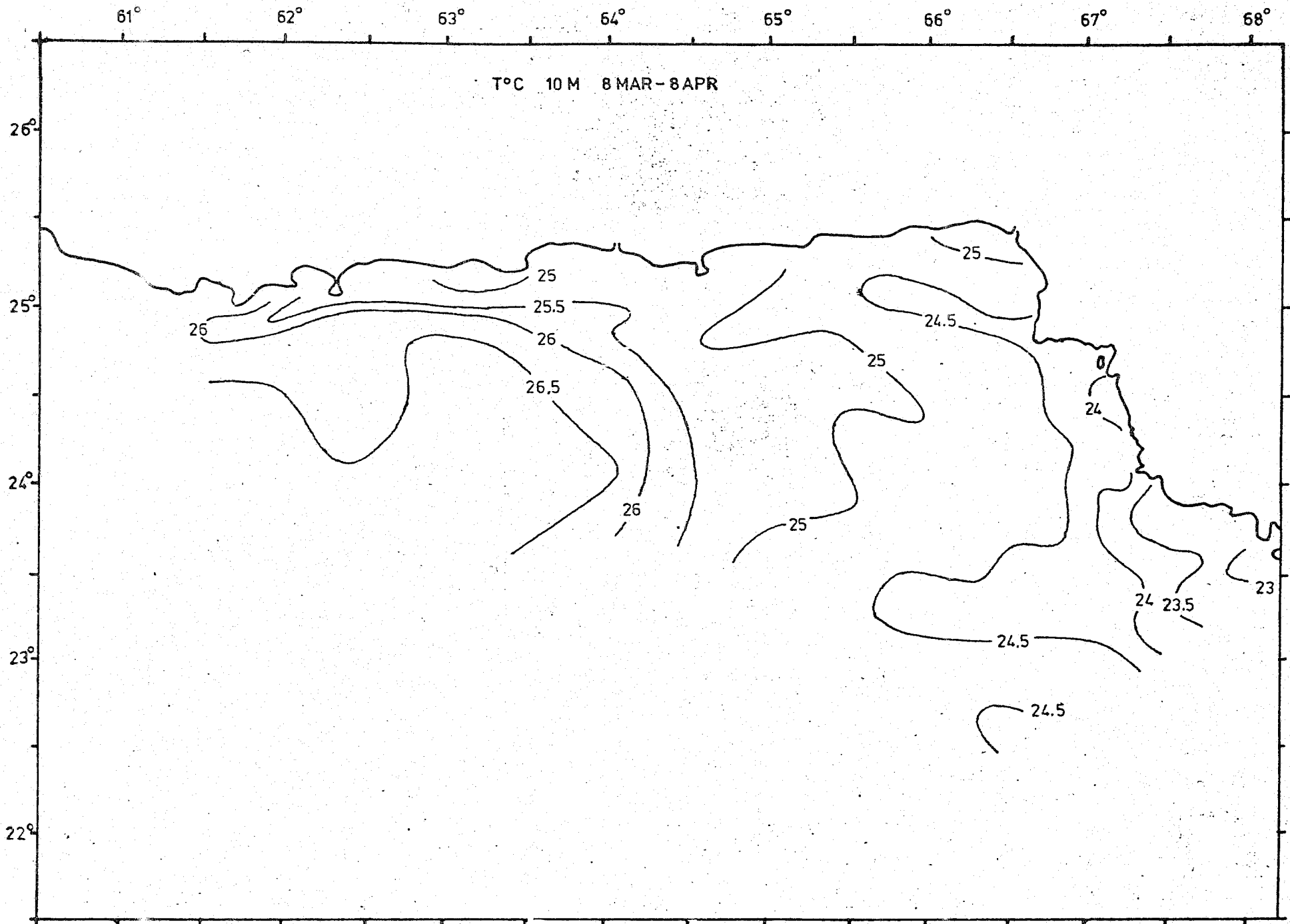
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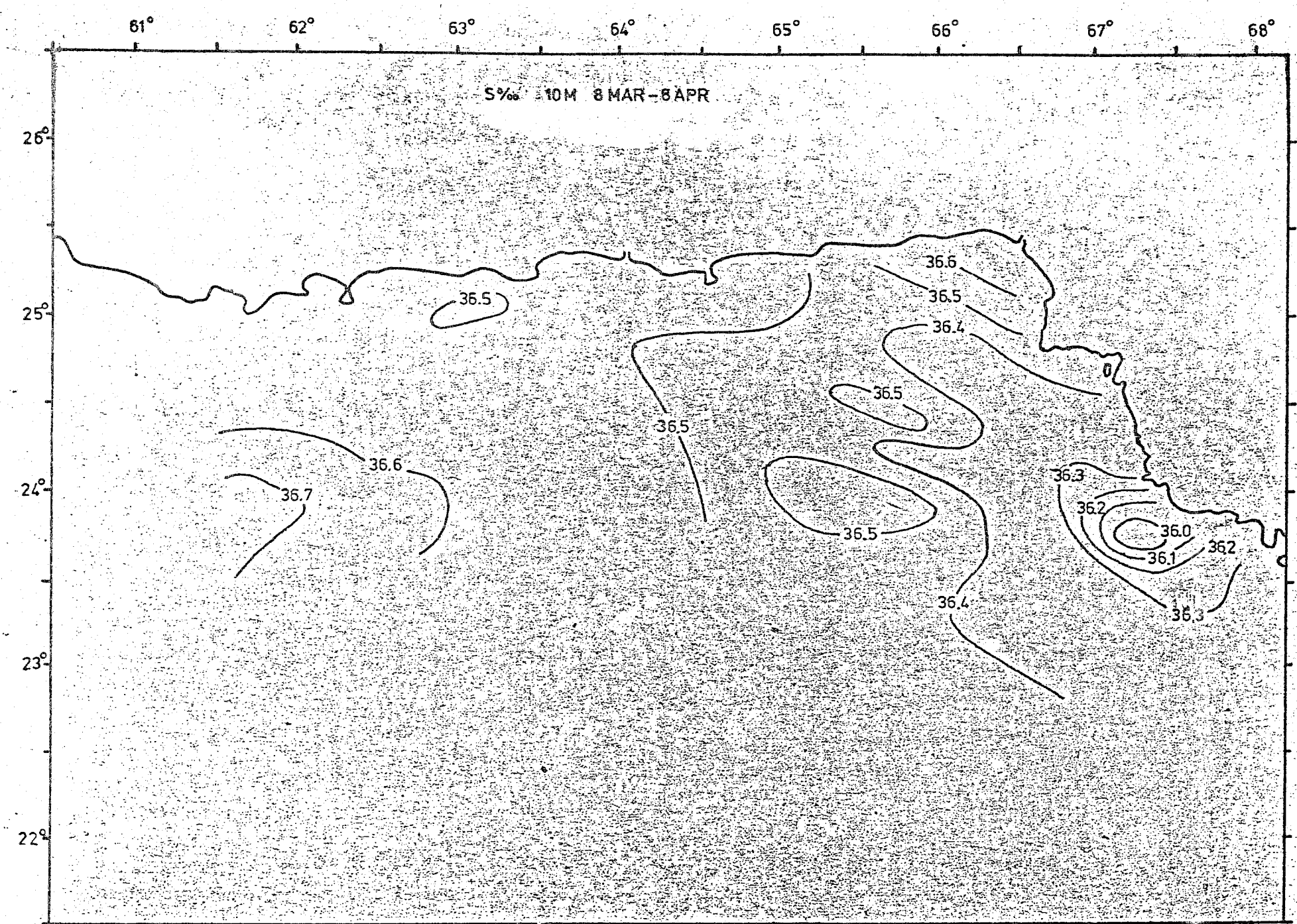
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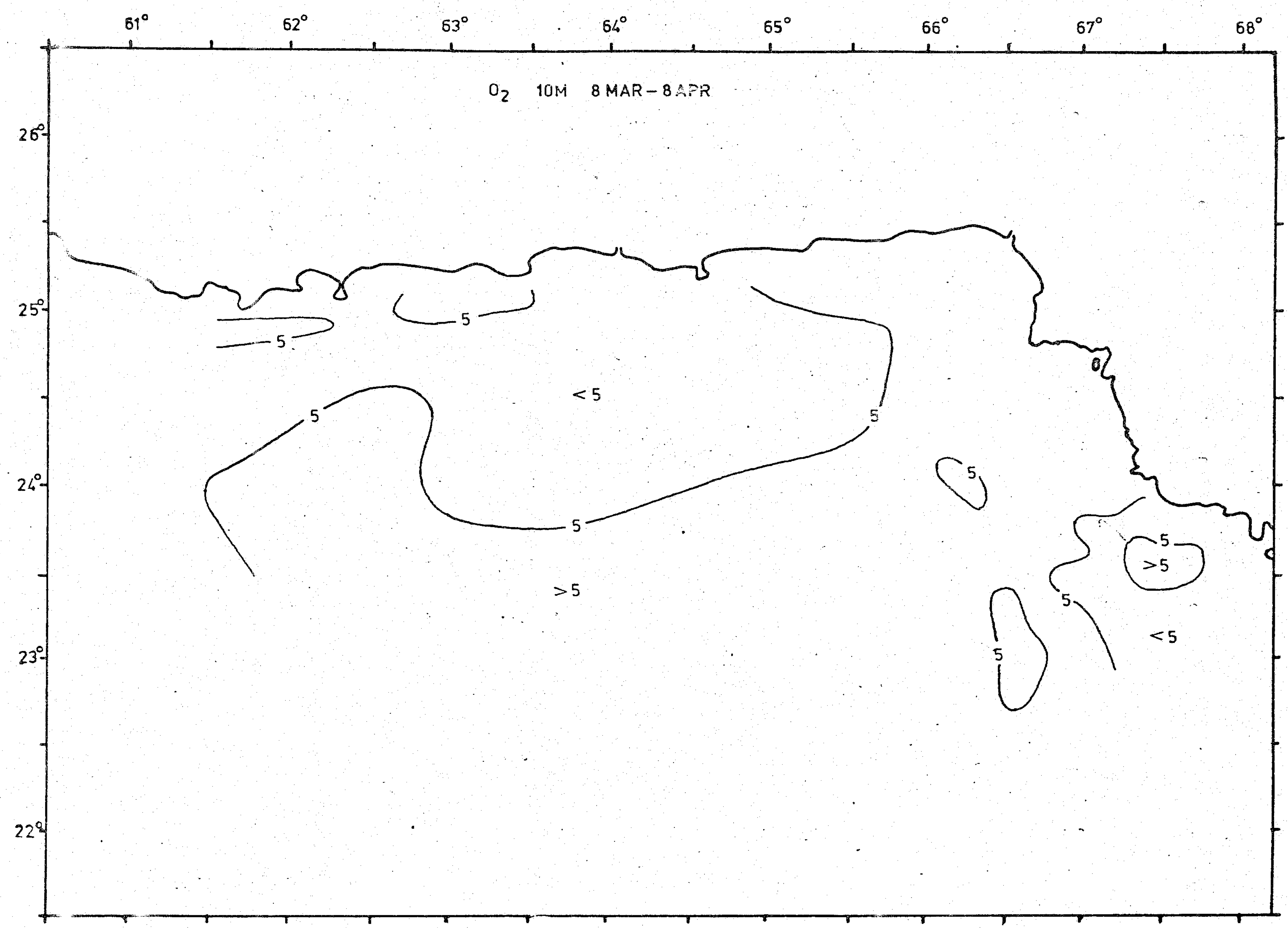
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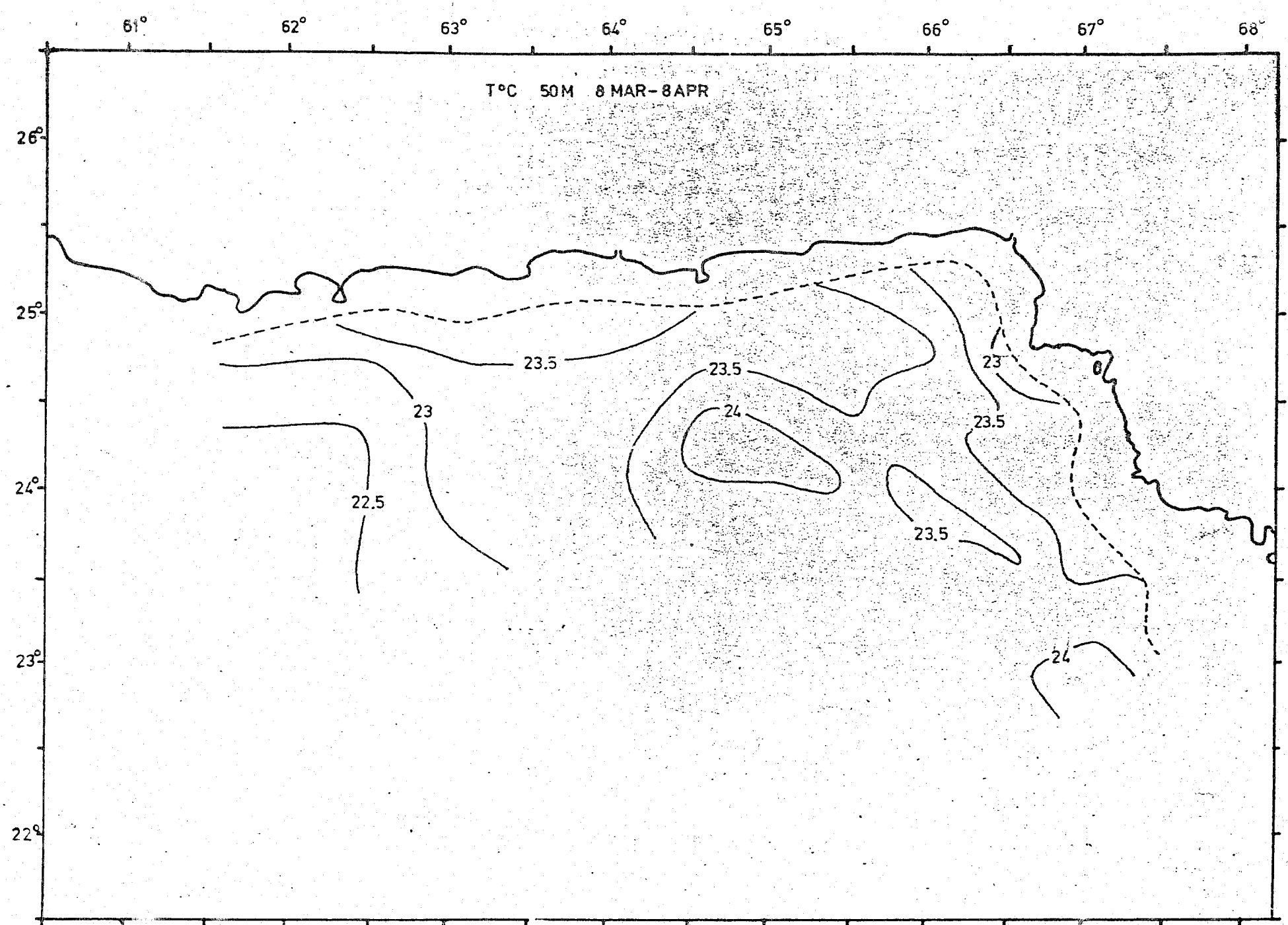
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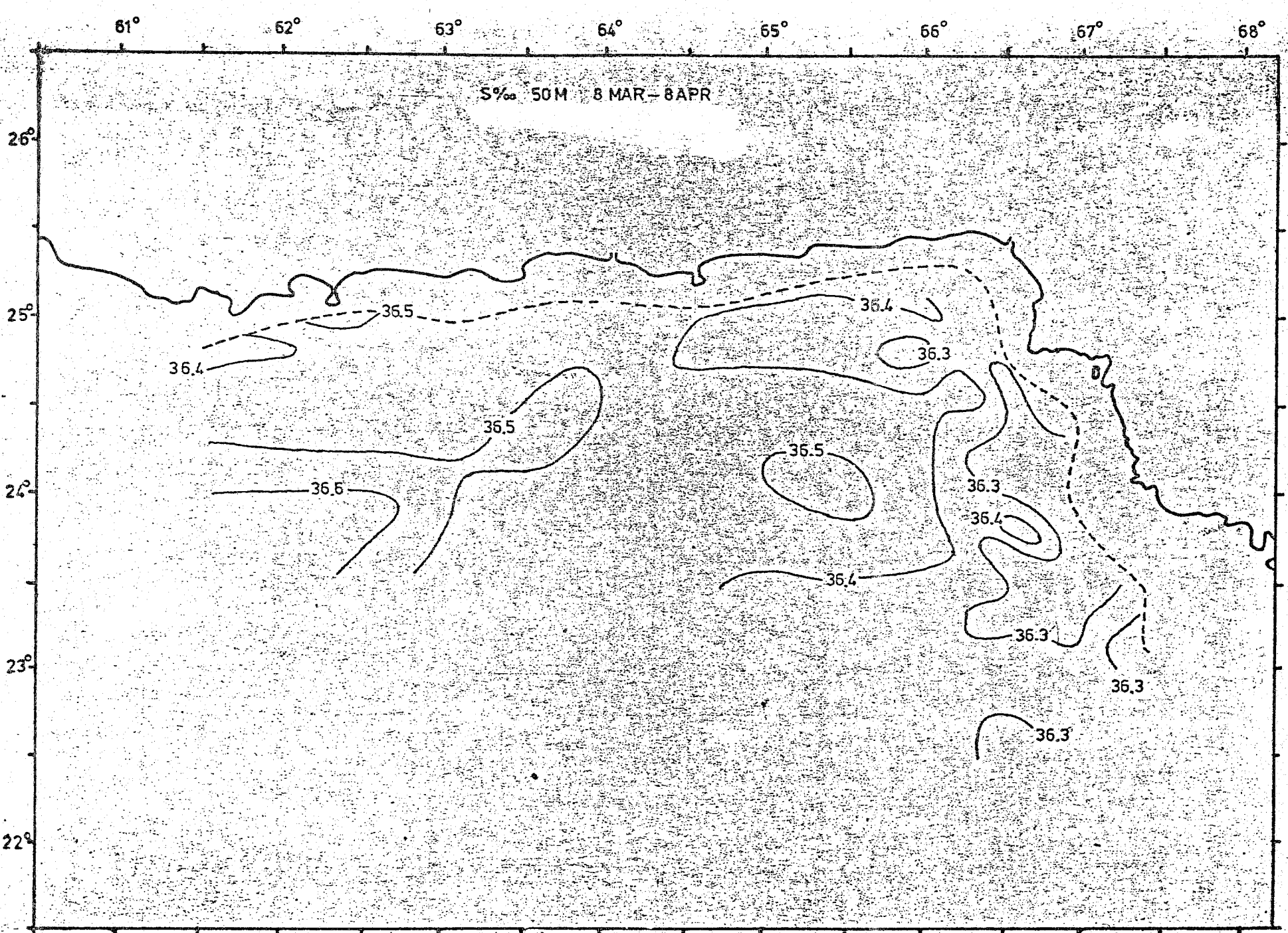
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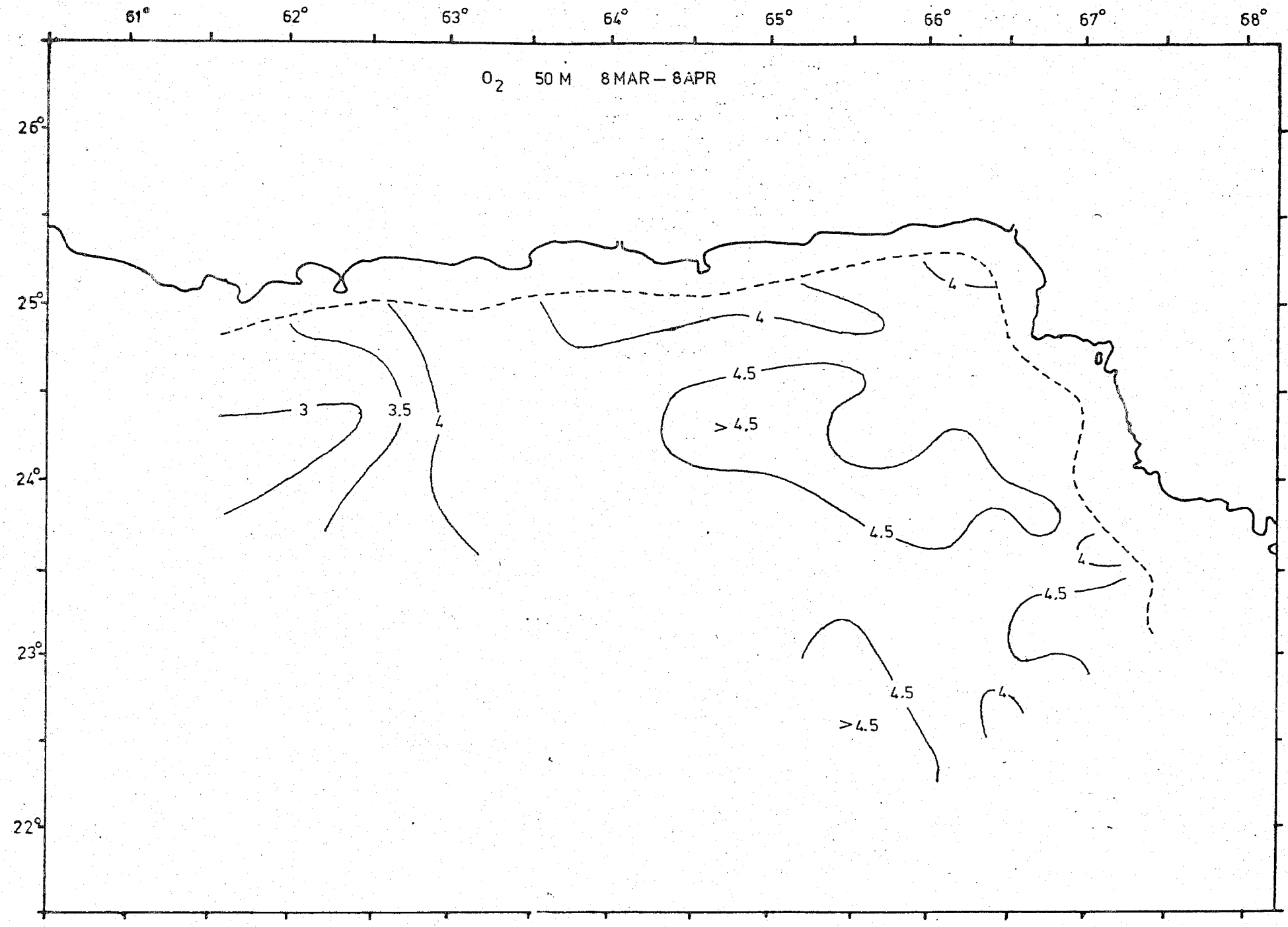
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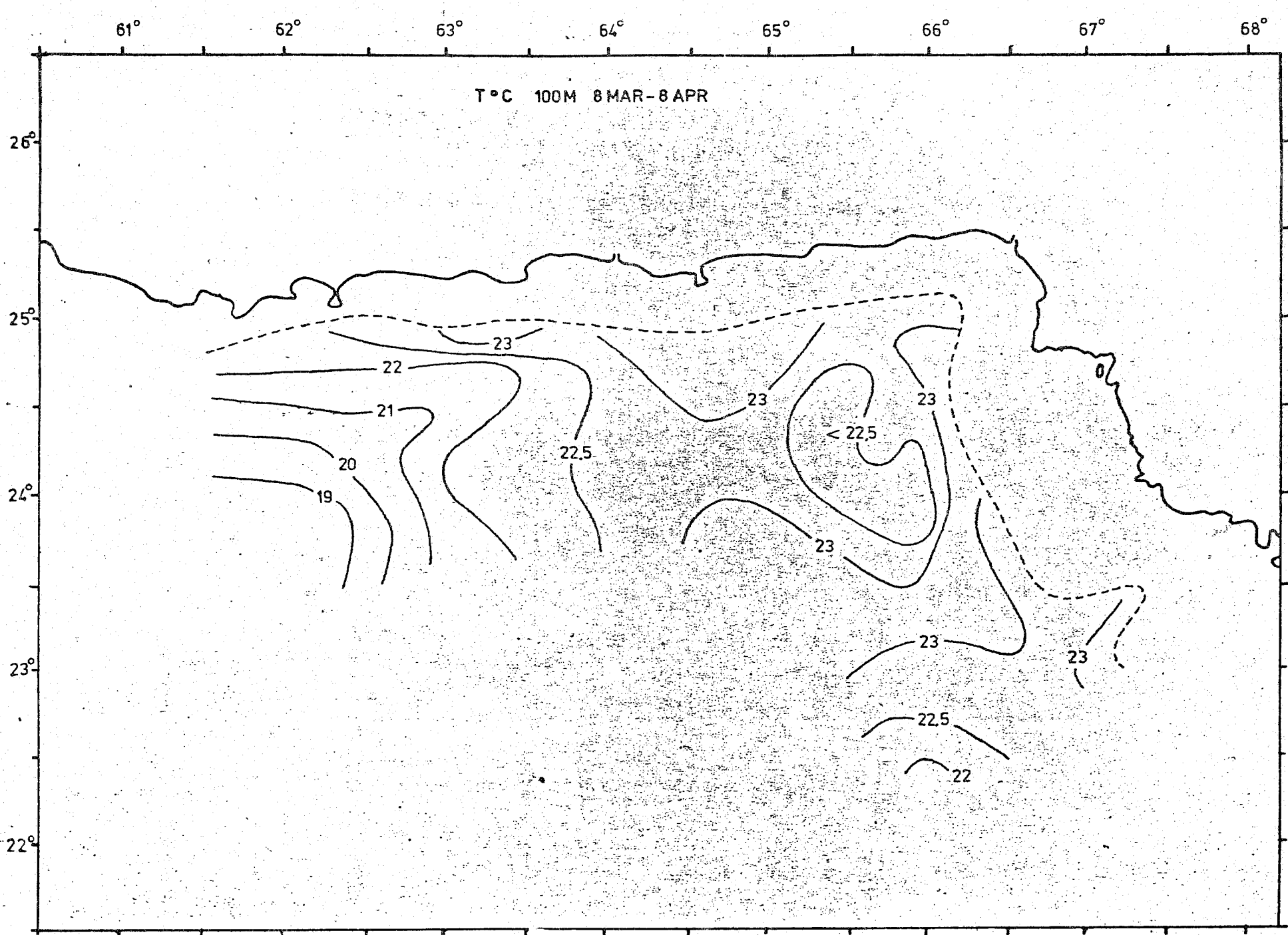
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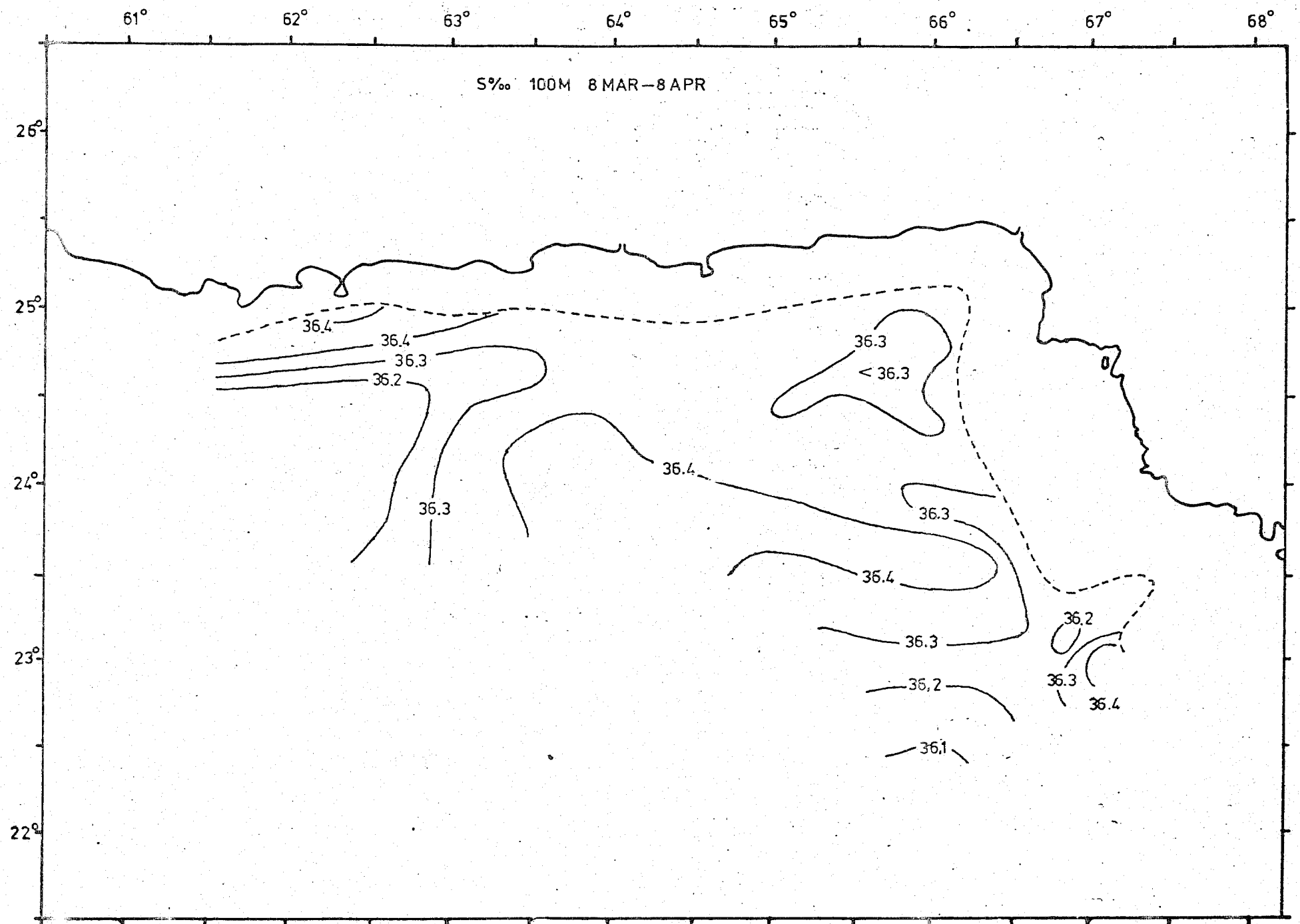
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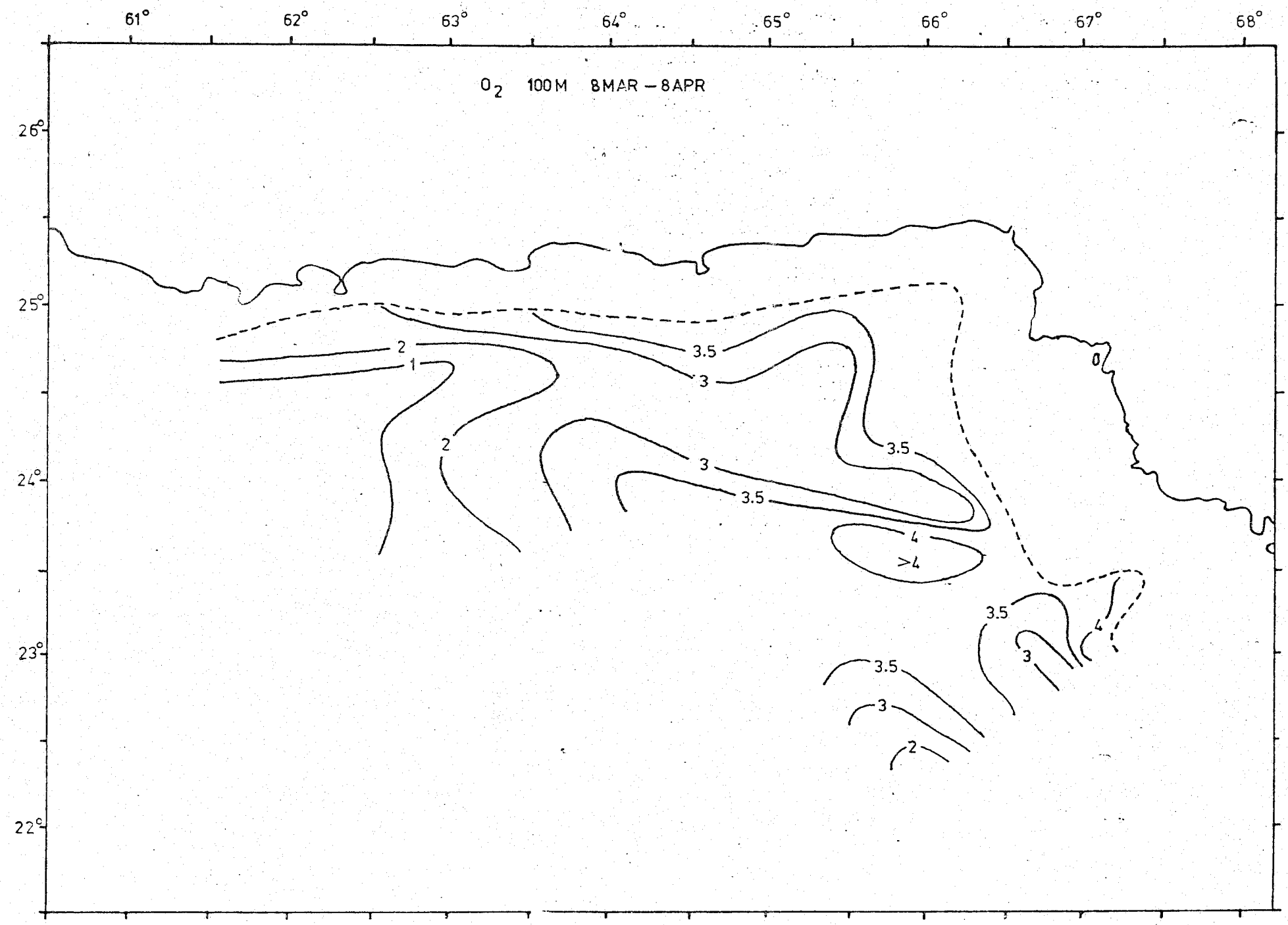
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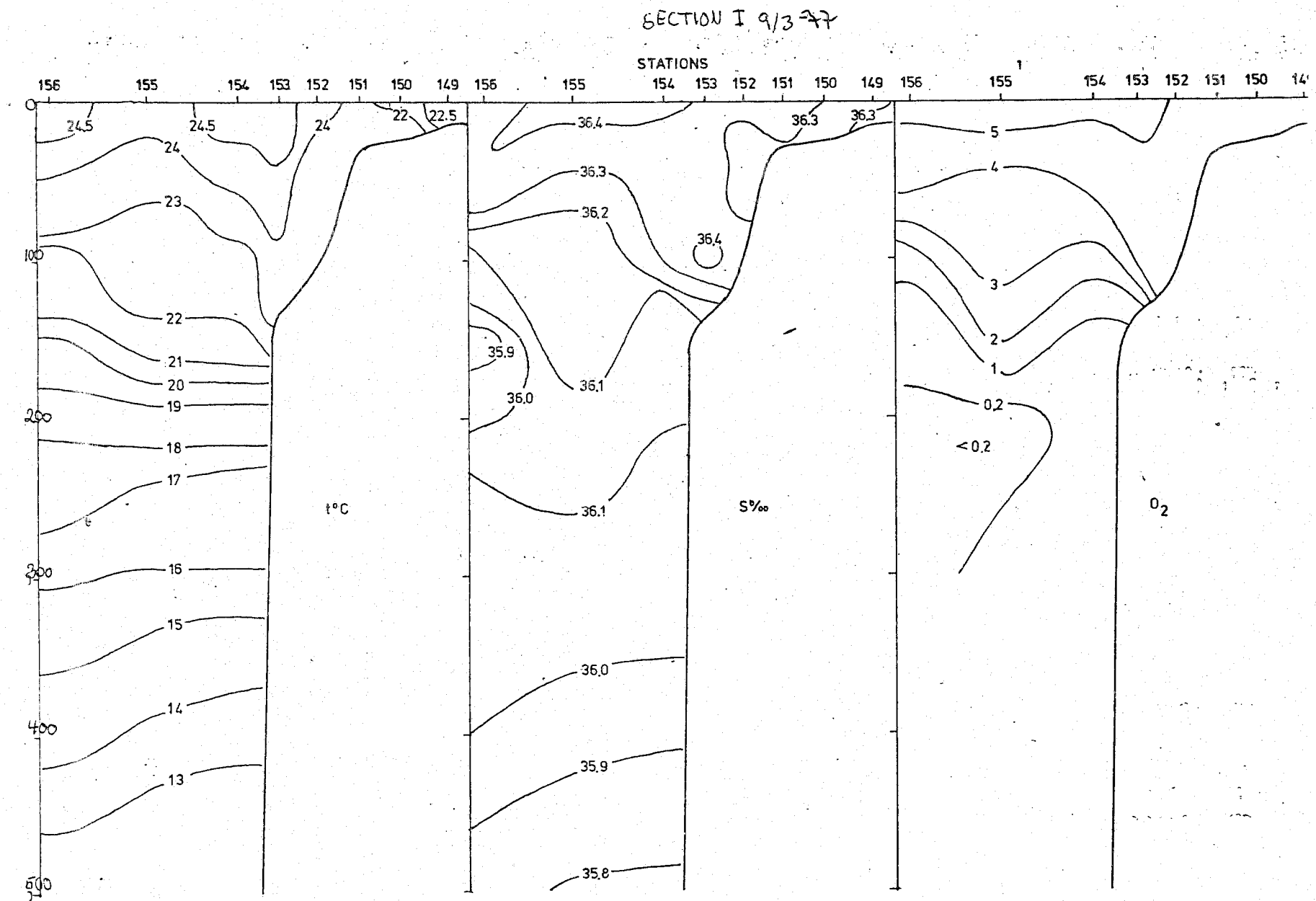
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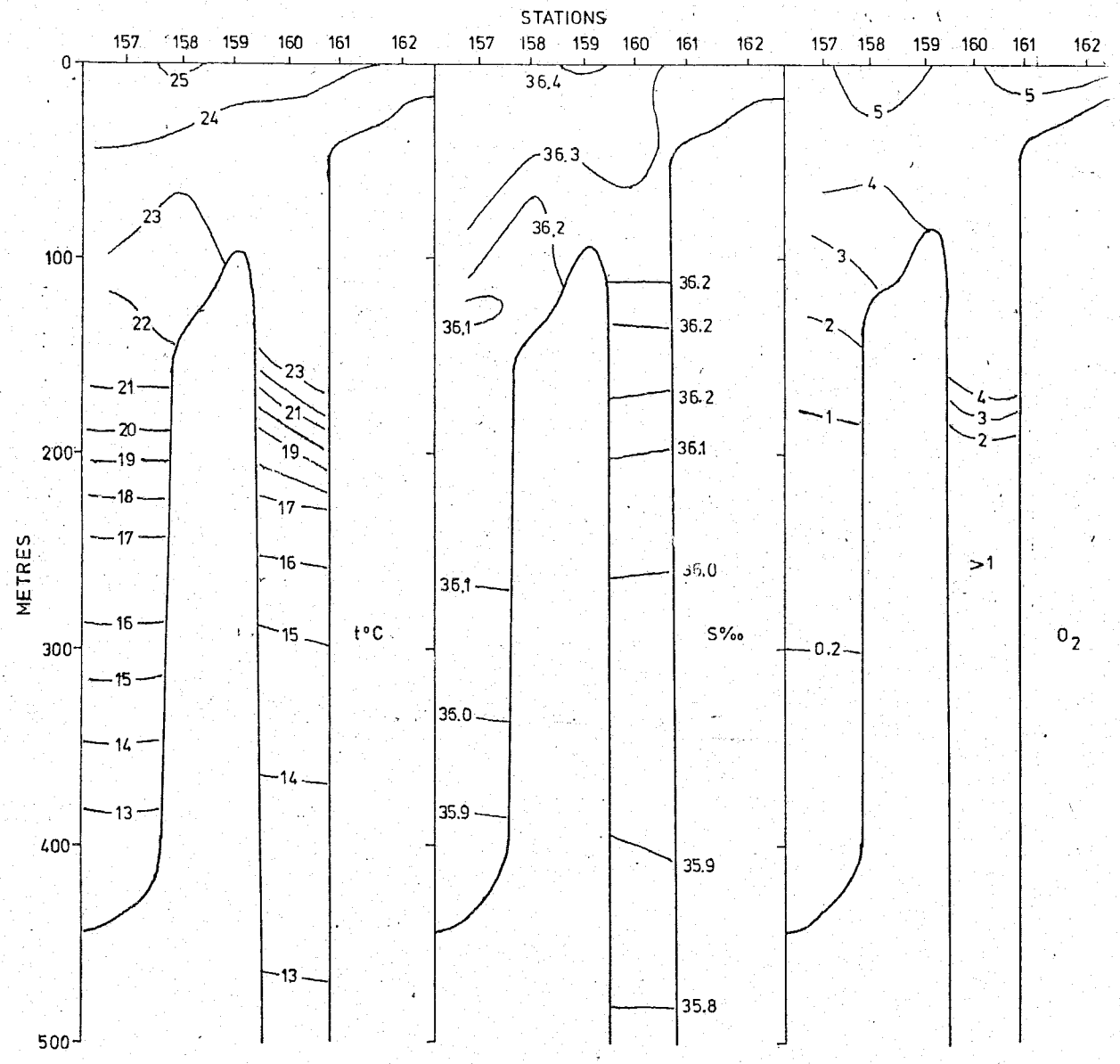
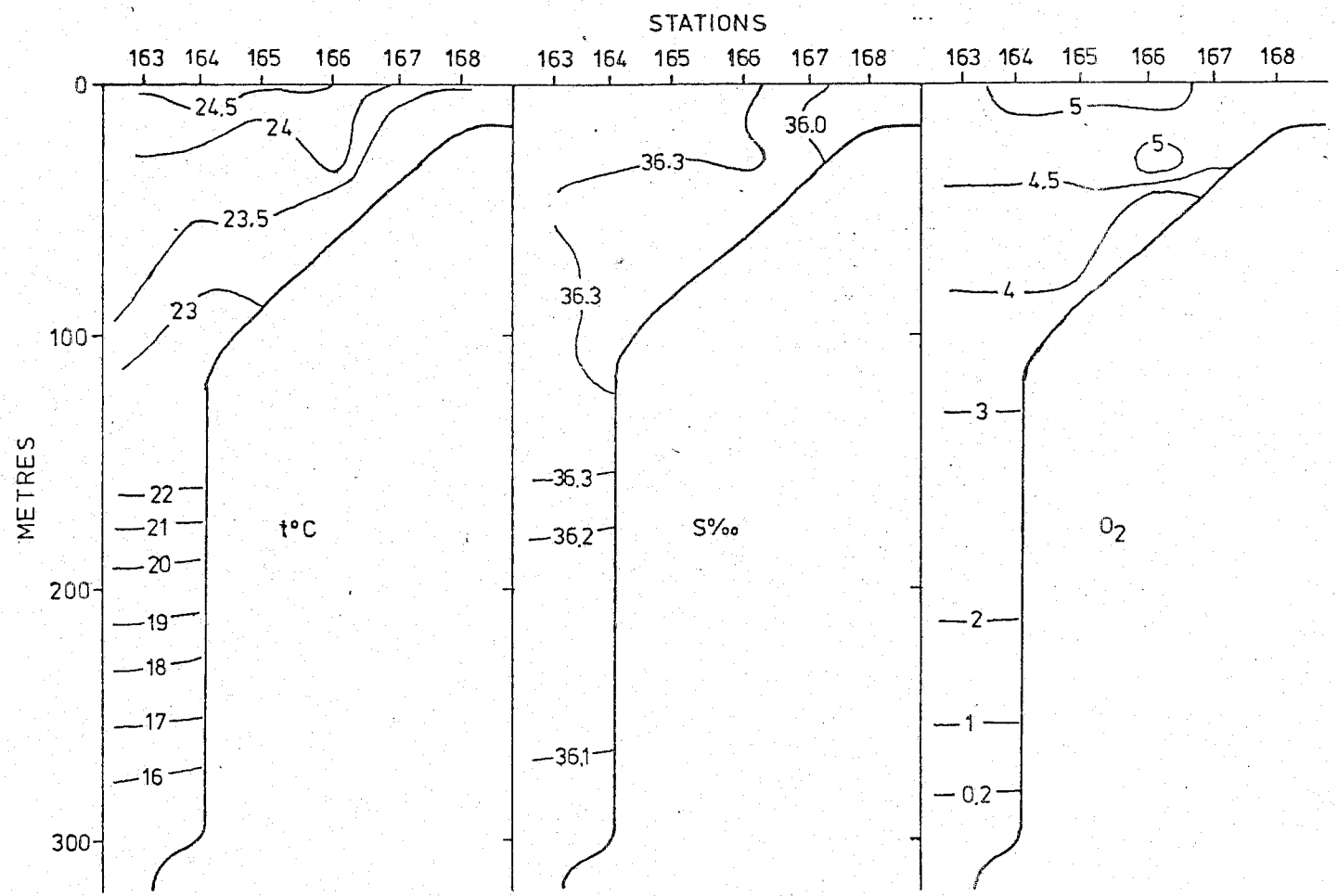
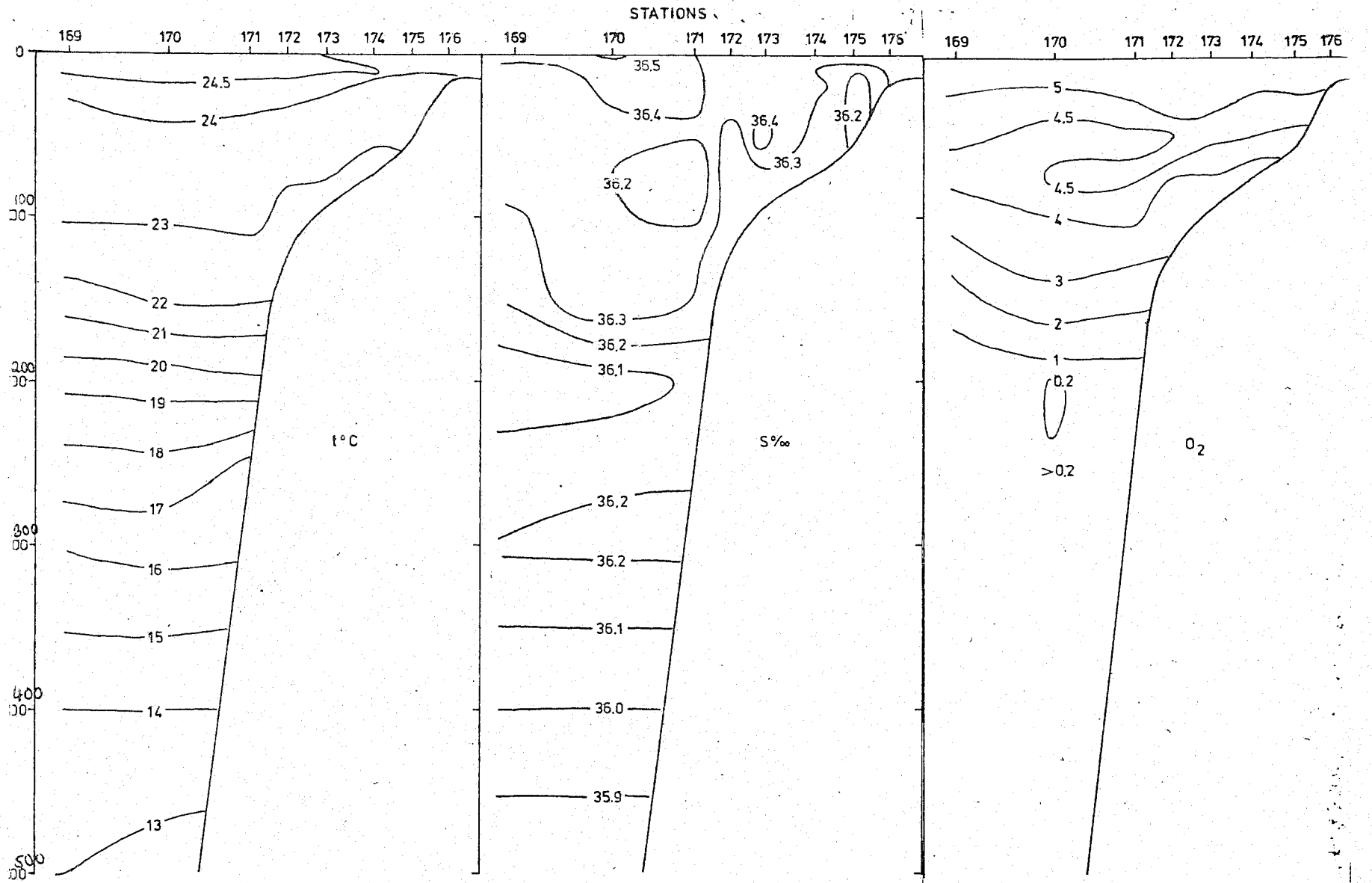
SECTION II 10/3 - 77



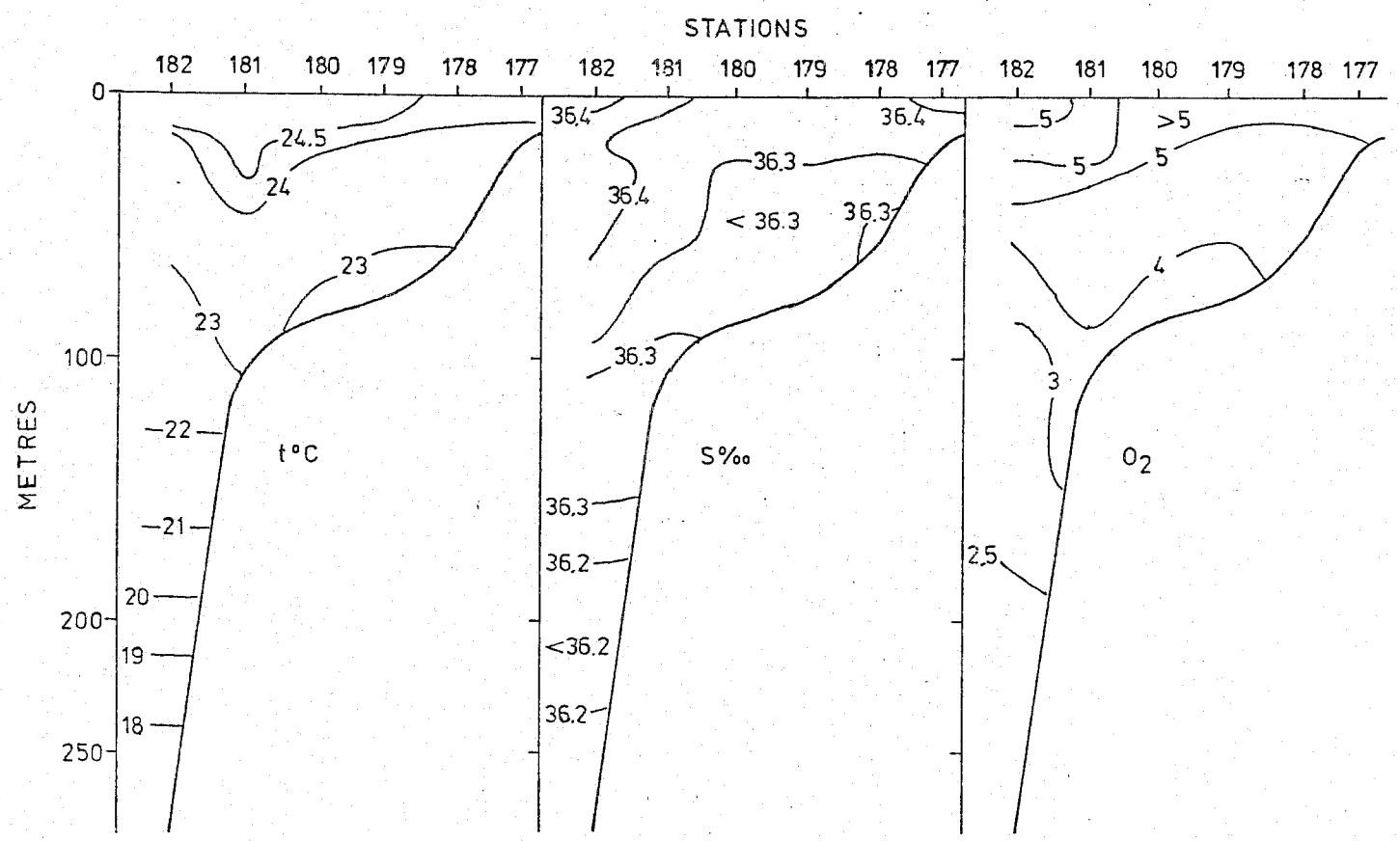
SECTION III 11/3 -77

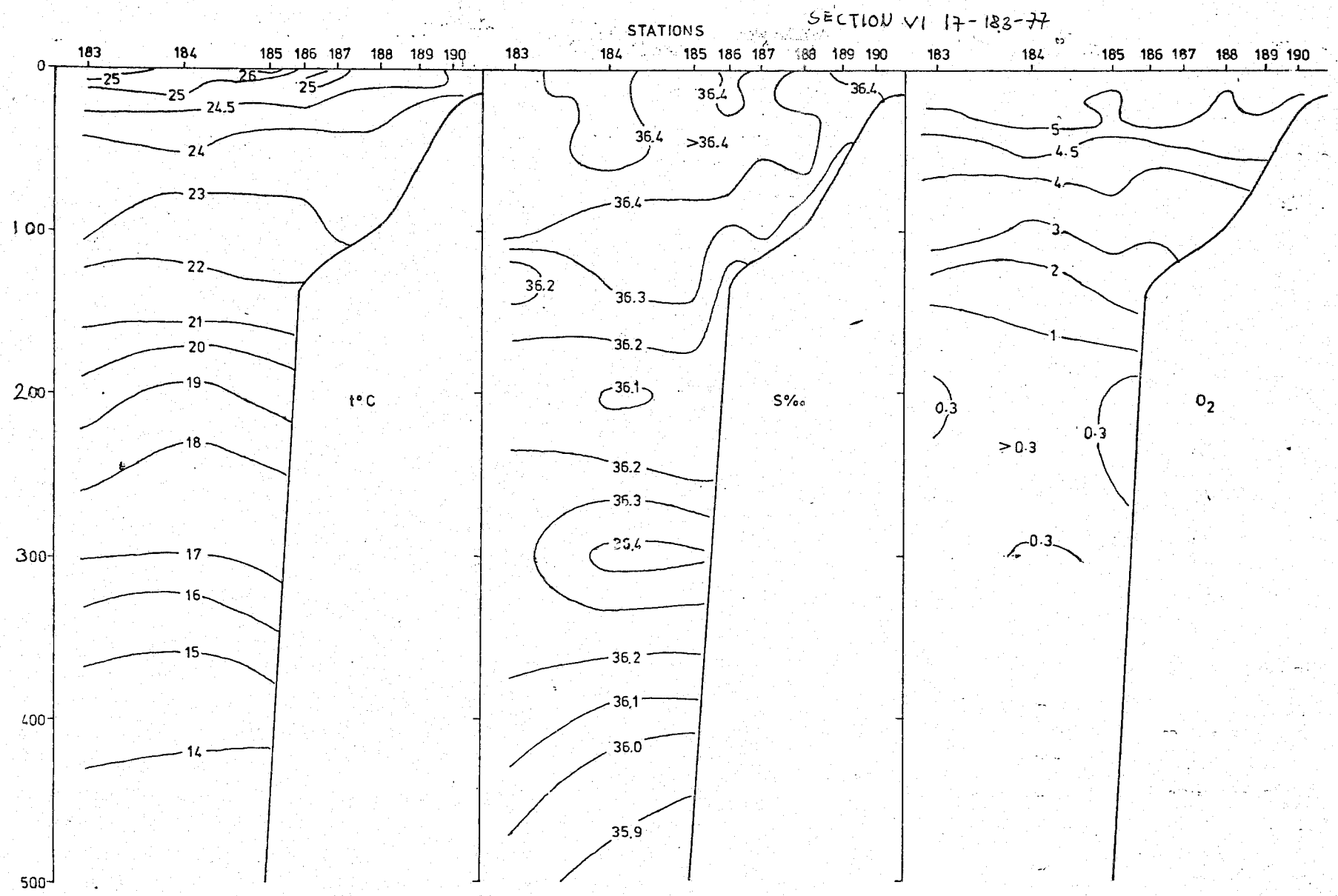


SECTION IV 13-14 March 1977



SECTION V 15/3 – 77




SECTION VI 17-183-77
STATIONS
183 184 185 186 187 188 189 190
0
100
200
300
400
500
25
25
26
25
24.5
24
23
22
21
20
19
18
17
16
15
14
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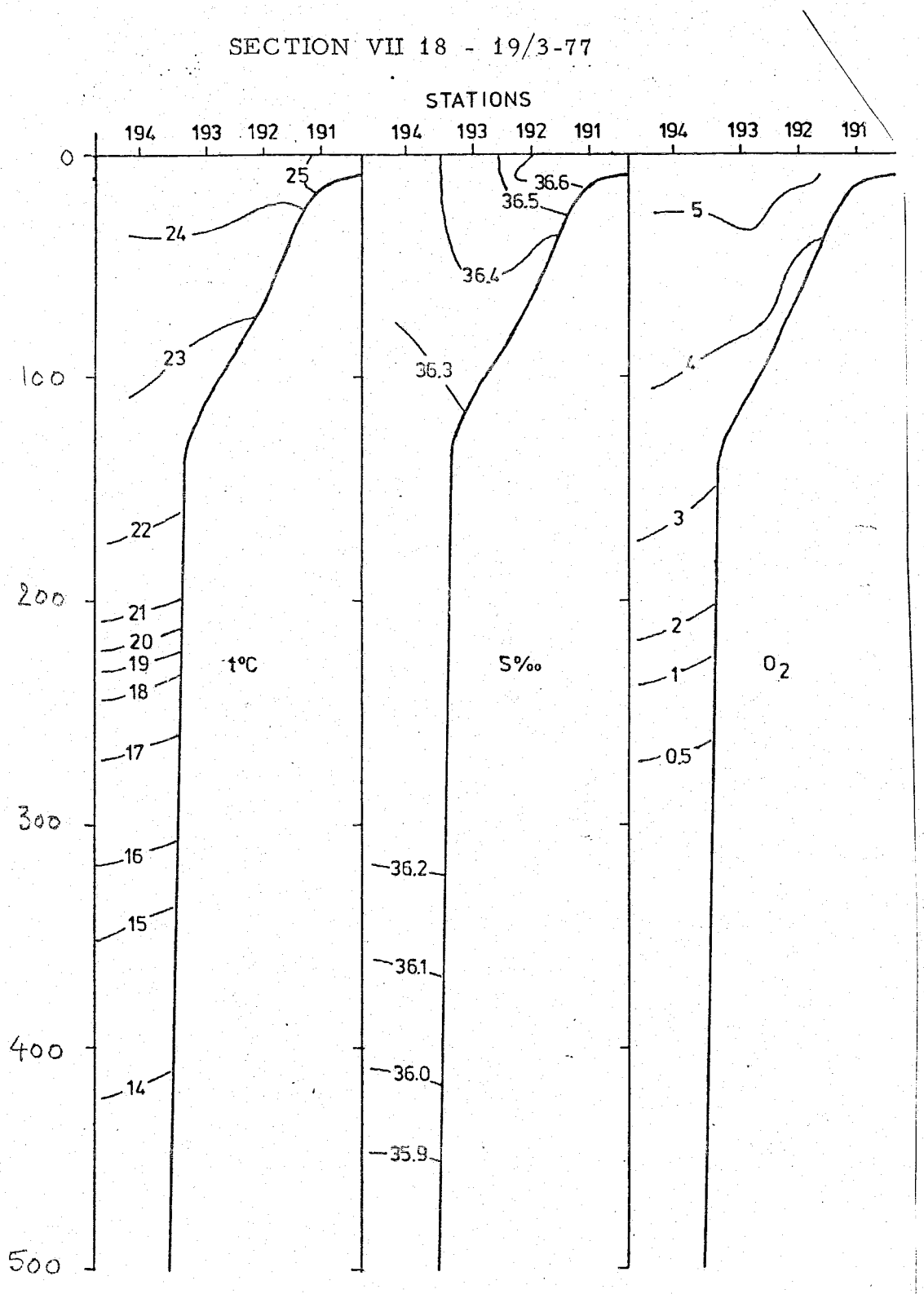
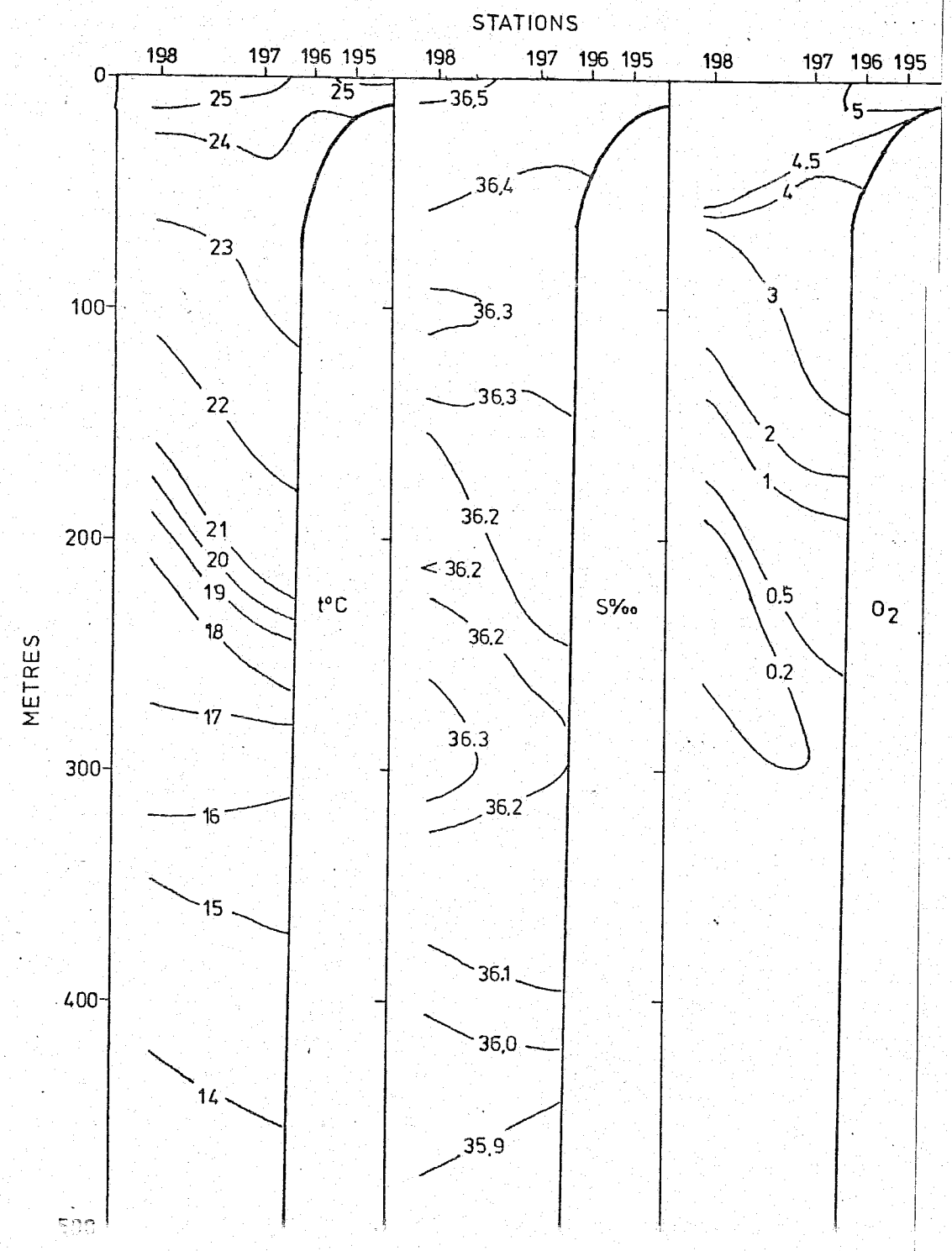
36.4
>36.4
36.4
36.2
36.3
36.2
36.1
36.2
36.3
36.4
36.2
36.1
36.0
35.9
S‰
5
4.5
4
3
2
1
0.3
0.3
>0.3
0.3
O2

SECTION VII 18 - 19/3-77




STATIONS
198 197 196 195
198 197 196 195
198 197 196 195
METRES
0
100
200
300
400
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25
24
23
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21
20
19
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< 36.2
36.2
36.3
36.2
36.1
36,0
35.9
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5
4.5
4
3
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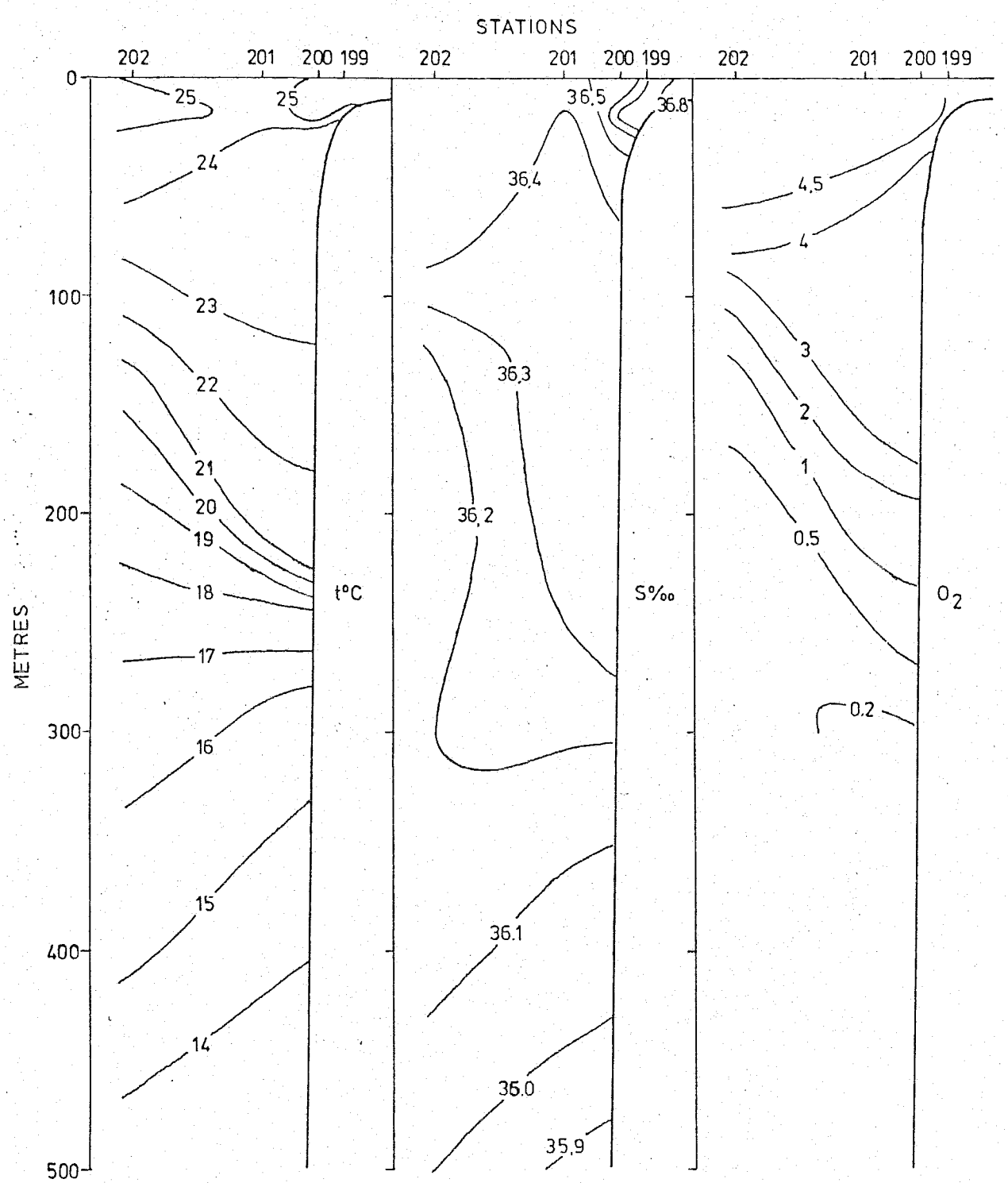
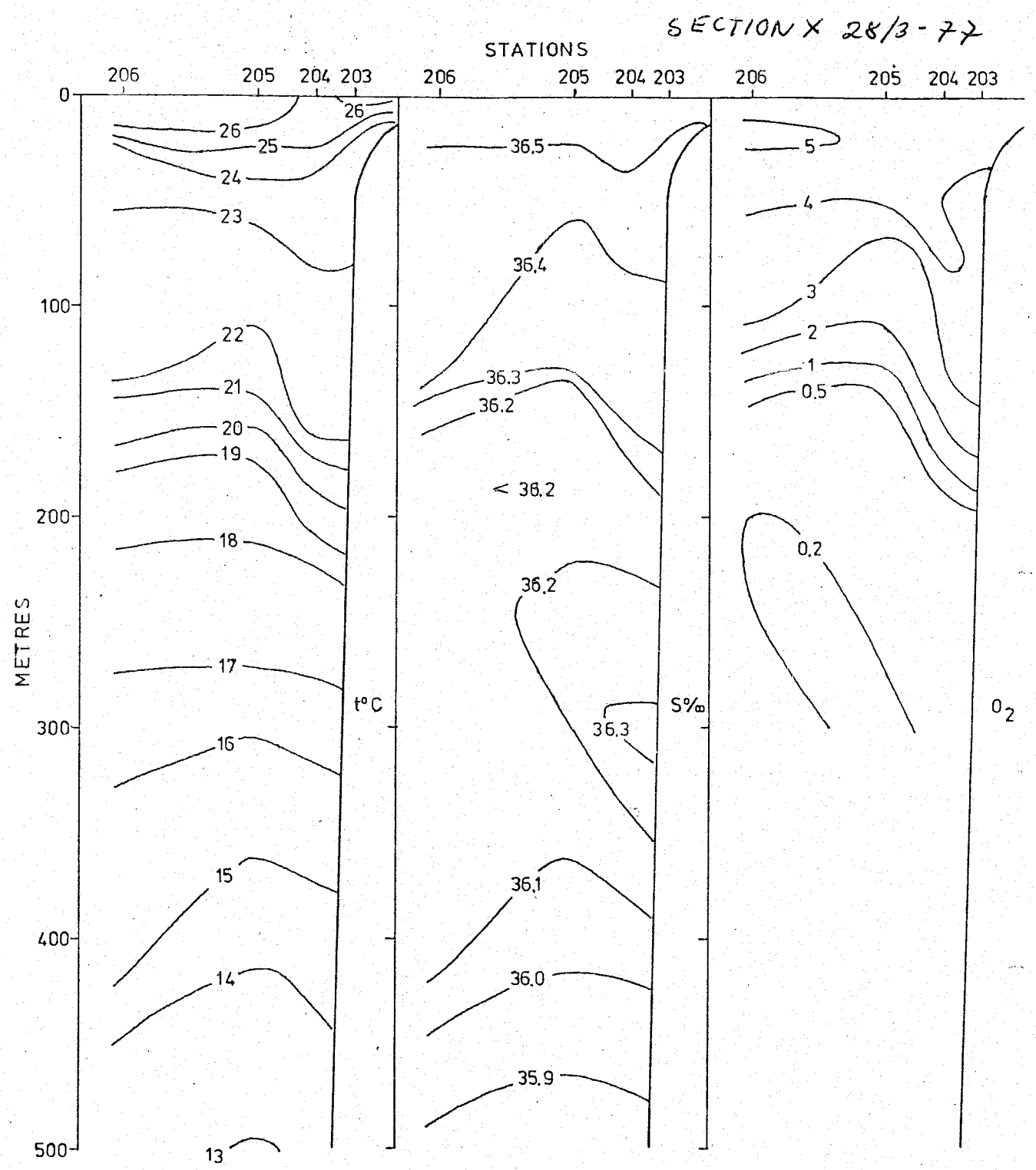
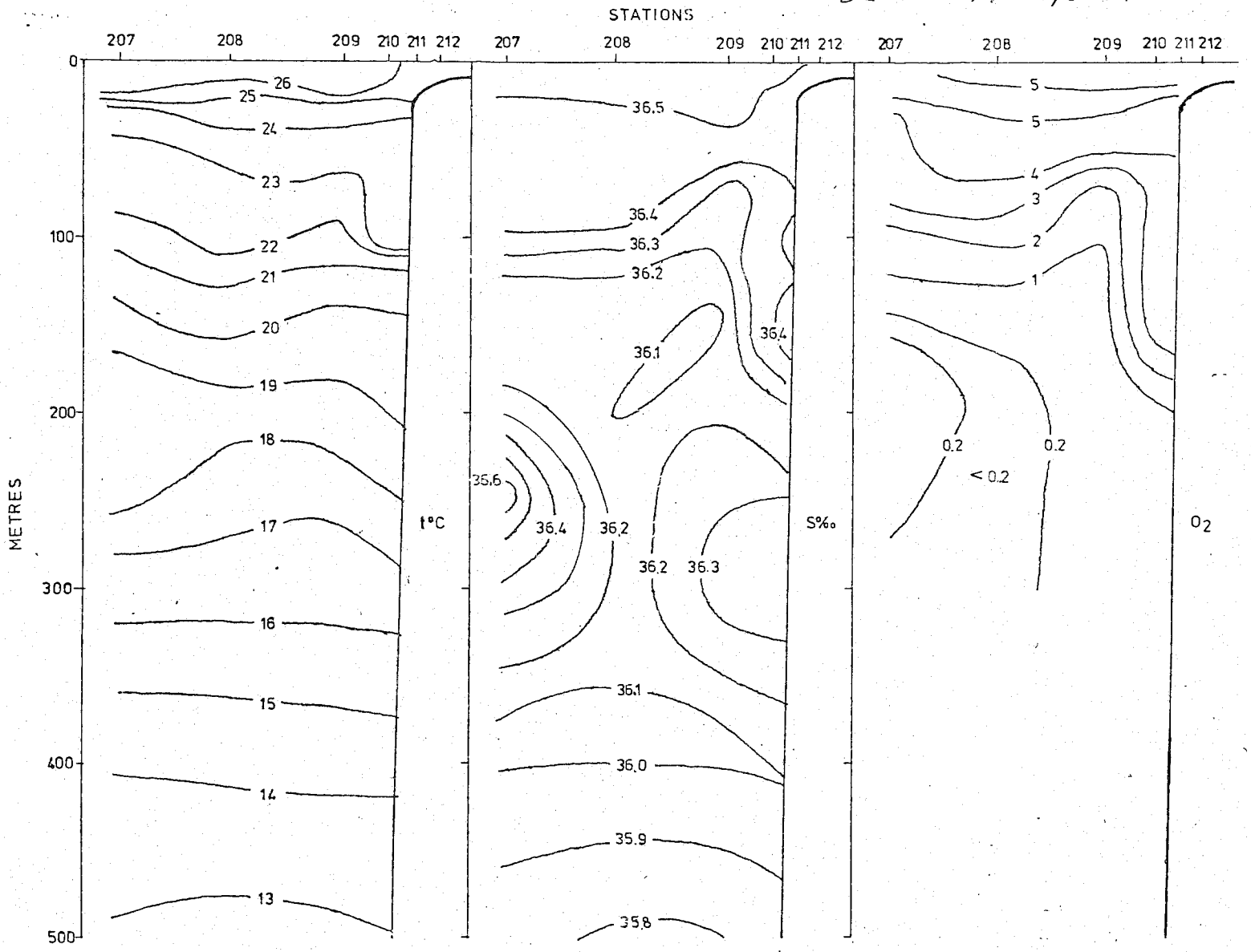
1
0.5
0.2
O2

SECTION IX 22-23/3-77

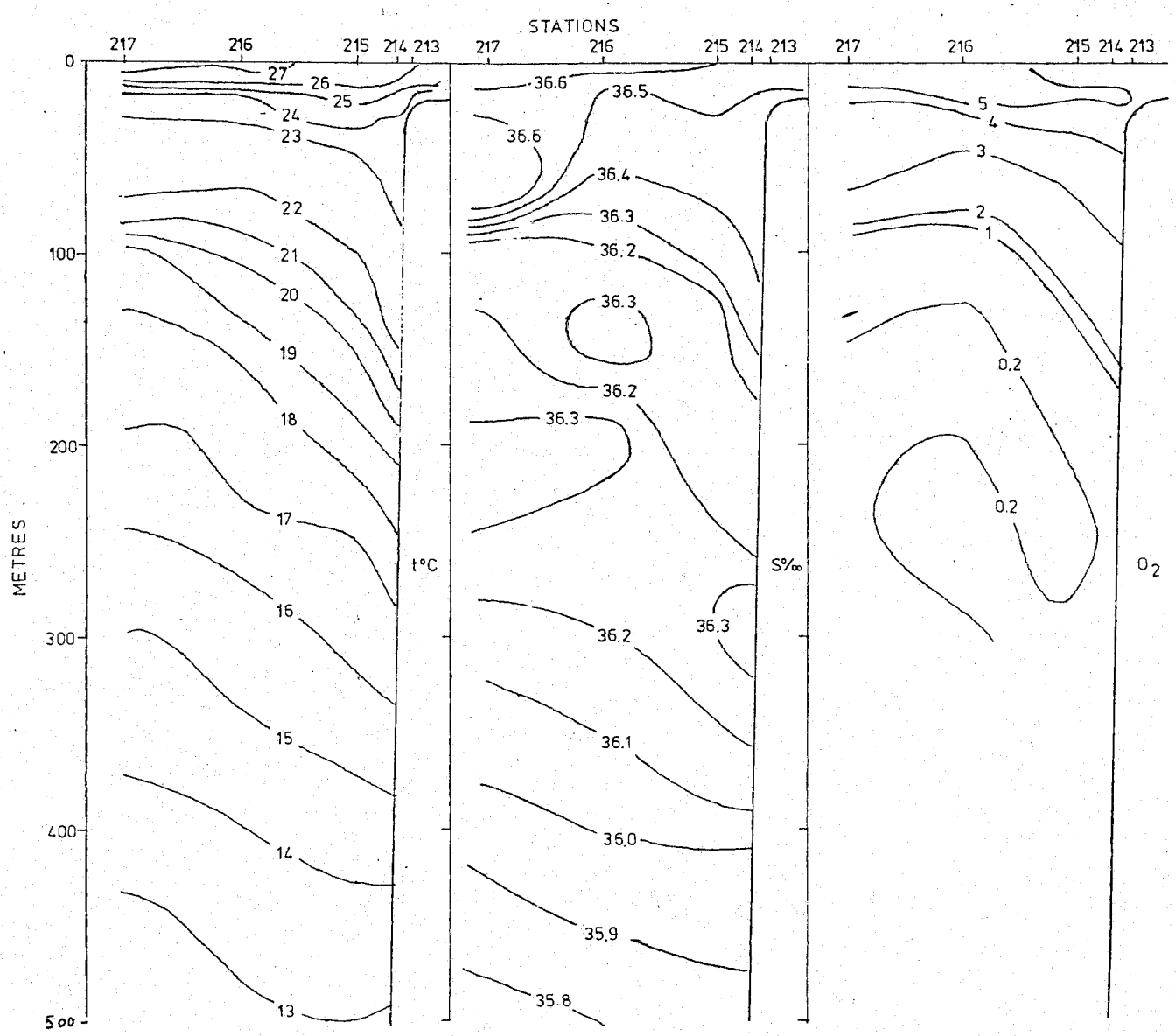


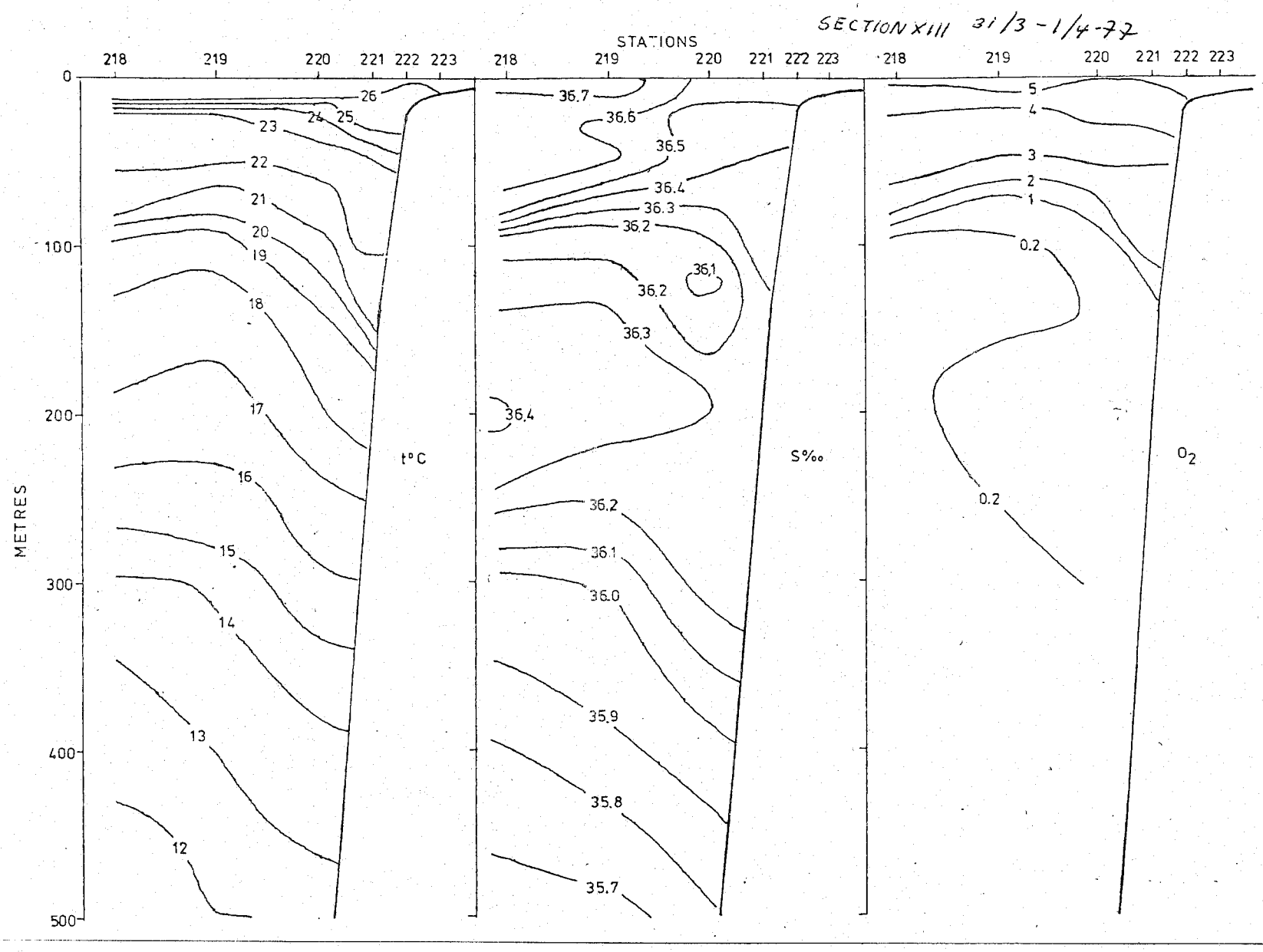

SECTION X 28/3-77
STATIONS
206
205
204
203
0
100
200
300
400
500
METRES
26
25
24
23
22
21
20
19
18
17
16
15
14
13
t°C
36.5
36.4
36.3
36.2
< 36.2
36.2
36.3
36.1
36.0
35.9
S‰
5
4
3
2
1
0.5
0.2
O_2

SECTION XI 29/3-77



SECTION XII 31/3 – 77




SECTION XIII 31/3 - 1/4-72
STATIONS
218 219 220 221 222 223
METRES
0
100
200
300
400
500
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
t°C
36.7
36.6
36.5
36.4
36.3
36.2
36.1
36.2
36.3
36.4
36.2
36.1
36.0
35.9
35.8
35.7
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3
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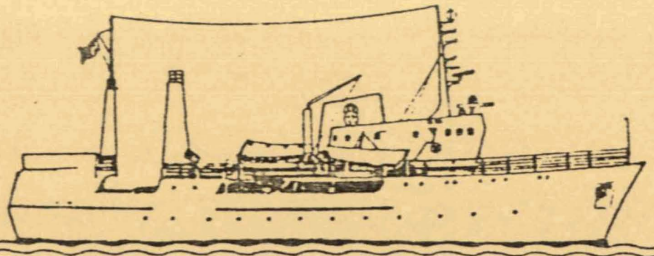
0.2
0.2
O_2

Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D.
0149	1977	309	010 00	23310	67550	10
0150	1977	309	010 04	23230	67410	20
0151	1977	309	010 06	23160	67280	20
0152	1977	309	010 08	23080	67140	85
0153	1977	309	010 11	23010	67030	125
0154	1977	309	010 13	22550	66520	500
0155	1977	309	010 18	22390	66240	500
0156	1977	309	010 22	22230	65580	500
0157	1977	310	010 05	23030	66400	400
0158	1977	310	010 07	23100	66520	125
0159	1977	310	010 12	23170	67050	85
0160	1977	310	010 14	23240	67170	500
0161	1977	310	010 17	23310	67280	30
0162	1977	310	010 21	23390	67430	10
0163	1977	311	010 11	23180	66280	290
0164	1977	311	010 13	23240	66380	100
0165	1977	311	010 16	23300	66490	75
0166	1977	311	010 19	23380	67020	50
0167	1977	311	010 21	23450	67140	30
0168	1977	311	010 22	23510	67250	10
0169	1977	313	010 08	23060	65250	500
0170	1977	313	010 13	23220	65530	500
0171	1977	313	010 16	23350	66160	250
0172	1977	313	010 19	23410	66260	120
0173	1977	313	010 21	23480	66370	85
0174	1977	313	010 23	23540	66490	65

0175	1977	314	010	05	24010	67010	45
0176	1977	314	010	06	24060	67100	15
0177	1977	315	010	04	24310	67010	15
0178	1977	315	010	07	24240	66500	50
0179	1977	315	010	09	24170	66380	70
0180	1977	315	010	13	24100	66250	75
0181	1977	315	010	15	24030	66130	100
0182	1977	315	010	18	23550	66000	250
0183	1977	317	010	00	23480	64520	500
0184	1977	317	010	05	24040	65190	500
0185	1977	317	010	12	24170	65420	460
0186	1977	317	010	17	24230	65530	125
0187	1977	317	010	19	24290	66030	100
0188	1977	317	010	21	24350	66150	90
0189	1977	317	010	22	24420	66260	50
0190	1977	318	010	00	24470	66350	20
0191	1977	318	010	18	25210	66180	10
0192	1977	318	010	19	25100	66100	55
0193	1977	318	010	21	25000	66010	100
0194	1977	319	010	00	24470	65510	500
0195	1977	320	010	13	25150	65200	10
0196	1977	320	010	18	25070	65200	45
0197	1977	320	010	20	24560	65200	500
0198	1977	321	010	00	24350	65200	500
0199	1977	322	010	17	25050	64350	10
0200	1977	322	010	18	25000	64350	65
0201	1977	322	010	20	24470	64350	500
0202	1977	323	010	00	24170	64350	500
0203	1977	328	010	10	25010	63500	40
0204	1977	328	010	14	24510	63500	500
0205	1977	328	010	17	24380	63500	500
0206	1977	328	010	23	24060	63500	500
0207	1977	329	010	07	23380	63050	500
0208	1977	329	010	11	24090	63050	500
0209	1977	329	010	17	24410	63050	500
0210	1977	329	010	19	24540	63050	500
0211	1977	329	010	21	25020	63050	15
0212	1977	329	010	23	25080	63050	10
0213	1977	331	010	00	25030	62200	20
0214	1977	331	010	02	24580	62200	500
0215	1977	331	010	05	24500	62200	500
0216	1977	331	010	09	24200	62200	500
0217	1977	331	010	14	23500	62200	500
0218	1977	331	010	21	23300	61350	500
0219	1977	401	010	01	24000	61350	500
0220	1977	401	010	06	24300	61350	500
0221	1977	401	010	11	24460	61350	125
0222	1977	401	010	12	24540	61350	10
0223	1977	401	010	14	25030	61350	10



Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY REPORT ON CRUISES NOS 7 AND 8 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

13 April - 15 May 1977

Roald Sætre

Karachi, May 1977

Institute of Marine Research, Bergen

PRELIMINARY REPORT ON CRUISES NOS 7 AND 8 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT.

Introduction	This report covers the fourth complete coverage of the Pakistani waters during the project.
Departure	Karachi, 13 April 1977.
Arrival	Karachi, 29 April 1977.
Scientific staff	M. Arshad, M. Khaliluddin, S. Amjad (Marine Fisheries Department) H. Hassan, M. Hussain, S. Barkati (Institute of Marine Biology, University of Karachi) R. Sætre, B. Myrseth, S. Brattås, E. Olsen (Institute of Marine Research).
Departure	Karachi, 1 May 1977.
Arrival	Karachi, 15 May 1977.
Scientific staff	S. Qureshi, A.H. Qureshi, M.A.S. Sajid, (Marine Fisheries Department) H. Hassan, M. Hussain, J. Mustaqim (Institute of Marine Biology, University of Karachi) R. Sætre, B. Myrseth, S. Brattås, E. Olsen (Institute of Marine Research).

Survey grid and stations are shown in Fig. 1. The standard hydrographic/plankton stations were worked out as described in detail in report No. 1 with modifications in cruise report No. 2. Due to lack of filter paper on the last part of the cruise the chlorophyll samples were not taken for the stations along the Makran coast.

RESULTS

Table 1 shows the particulars of the fishing stations and Table 2 shows the length and maturity distribution of the dominant species.

Distribution and abundance of pelagic fish (Fig. 2)

A conspicious feature of this coverage is the significant reduction of the echo abundance along the whole Pakistani coast. This reduction seems to be most pronounced along the Makran coast and the southernmost Sind coast. In accordance with previous observations, the Sonmiani Bay area seems to contribute the highest values. The reduction in echo abundance is also reflected in the trawl catches. The catches of pelagic fish were much smaller than on the previous coverage. The dominant species along the whole coast were the anchovies (Thryssa mystax, Thryssa dussumeria). Other pelagic fish occasionally caught were sardine (Sardinella spp.), rainbow sardine (Dussumeria acuta) and scad (Decapterus spp.). All the pelagic fish were caught in small numbers and mainly by bottom trawling.

Distribution and abundance of demersal fish (Fig. 3)

As on the last coverage, the highest concentrations of demersal fish were found on the Great Kori Bank and in the Sonmiani Bay area. The largest catch, 24 tons/trawl hour, was taken at 150 m depth at the western edge of The Swatch. The dominant species in this catch were the tiger-toothed croaker (Otolithes ruber) and japanese threadfin bream (Nemipterus japonicus). Catches up to 8 tons/trawl hour were obtained in the Sonmiani Bay area consisting mainly of smallhead hairtail (Lepturacanthus savala) and japanese threadfin bream. These two species dominated the trawl catches along the Sind coast and in Sonmiani Bay. Other species of commercial interest frequently occurring in the catches were croakers, grunts (Pomadasys spp.) long-spined sea bream (Argyrops spinifer) and rock cod (Epinephelus spp.).

Distribution and abundance of mesopelagic fish (Fig. 4)

The total echo abundance of mesopelagic fish was less on this coverage than on the previous one. The highest integrator values were found off the Makran coast, and the largest catch, 2.8 tons/trawl hour, was taken off the central Makran coast.

The dominant species of the surveys were lantern fish (Benthosema pterotum). Some days of this coverage were also spent on a more detailed investigation on abundance and behaviour of the mesopelagic layer off Astola Island.

Plankton (Fig. 5)

The echo abundance attributed to plankton during this coverage is on average, slightly higher than on the previous one. Similar to the previous cruises, we observed higher values at the shelf and its slope than further seawards. Large aggregates of phytoplankton were observed floating at the surface off the Makran coast covering several square nautical miles.

Hydrography (Fig. 6 - 22)

Between coverages 3 and 4 the surface layers had warmed up by about 2 - 3°C. In this layer the highest values of both temperature and salinity were found along the western Makran coast and in Sonmiani Bay. At the 100 m level this picture had reversed and the highest temperatures were found along the Sind and Karachi coasts.

Along the whole Pakistani coast there was an intermediate maximum in salinity between 200 and 300 m.

The isoline of $1^{ml}/l\ 0_2$ was usually observed between 100 and 200 m. It reached higher up in the sea along the western Makran coast.

Karachi, May 1977

Roald Sætre

Roald Sætre

Table 1. Record of fishing operations. R/V "Dr. Fridtjof Nansen"s PAK/NOR/FAO Cruise Nos. 7 and 8, 13.4 - 15.5.1977. BT: Bottom trawl, PT: Pelagic trawl. Fish names: FAO Species Identification Sheets for Fishery Purposes.

Date	Time	Stn No	Gear type	Depth in m Bot-tom	Gear	Position North	East	Total catch kg	Catch/ hour kg	Dominant species
14.4	1005	109	BT	290	290	22°55'	66°55'	154	308	Japanese threadfin bream (Nemipterus japonicus) Croaker (Collichthys lucidus)
16.4	2030	110	BT	19	19	23°34'	67°41'	98	196	Lined silver grunt (Pomadasys hasta) False trevally (Lactarius lactarius) Ponyfish (Leiognathus spp.)
17.4	0405	111	PT	250	105	23°25'	67°15	0.01	0.03	Miscellaneous fish larvae
18.4	1340	112	BT	80	80	23°37'	67°19'	5000	7000	False trevally (Lactarius lactarius) Cardinal fish (Apogon spp.) Blackspot threadfin (Polynemus sextarius)
18.4	1750	113	BT	18	18	23°50'	67°27'	550	700	Spotted croaker (Protonibea diacanthus) Smallhead hairtail (Lepturacanthus savala) Tardoore (Opisthopterus tardoore)
19.4	0645	114	BT	150	150	23°22'	66°34'	12000	24000	Tigertoothed croaker (Otolithes ruber) Japanese threadfin bream (Nemipterus japonicus) Cardinal fish (Apogon spp.)
19.4	2100	115	PT	200	10	23°28'	66°25'	3	6	Lantern fish (Benthosema pterotum)
20.4	0030	116	BT	20	20	24°05'	67°08'	270	540	Ponyfish (Leiognathus spp.) False trevally (Lactarius lactarius) Smallhead hairtail (Lepturacanthus savala)
20.4	0530	117	PT	200	50	23°59'	66°56'	64	128	Hairtail (Lepturacanthus sp. Silver pomfret (Pampus argenteus)

Table 1 (continued).

Date	Time	Stn No	Gear type	Depth in m Bot.	Depth in m Gear	Position North	Position East	Total catch	Catch/ hour	Dominant species
20.4	0940	118	BT	90	90	23°50'	66°39'	384	768	Japanese threadfin bream (Nemipterus japonicus) Greater lizardfish (Saurida tumbil) Indian driftfish (Ariomma indica)
22.4	1350	119	BT	22	22	24°14'	67°05'	450	600	Longspined seabream (Argyrops spinifer) Rays Malabar reef cod (Epinephelus malabaricus)
22.4	2350	120	PT	330	10	23°42'	66°06'	25	50	Lantern fish (Benthosema pterotum)
23.4	0450	121	BT	96	96	23°56'	66°20'	1500	2225	Japanese threadfin bream (Nemipterus japonicus) One finlet scad (Selar mate) Squids
24.4	0925	122	BT	158	158	24°00'	66°07'	600	1200	Japanese threadfin bream (Nemipterus japonicus) Squids Barracudas (Sphyraena spp.)
24.4	1530	123	PT	105	40	24°07'	66°09'	8	16	Smallhead hairtail (Lepturacanthus savala) Shark Indian driftfish (Ariomma indica)
24.4	1710	124	BT	95	95	24°09'	66°11'	400	800	Japanese threadfin bream (Nemipterus japonicus) Russell's scad (Decapterus russelli) Sharks
25.4	0525	125	BT	95	95	24°23'	66°06'	440	880	Japanese threadfin bream (Nemipterus japonicus) Greater lizardfish (Saurida tumbil) Smallhead hairtail (Lepturacanthus savala)
25.4	0810	126	PT	800	150	24°16'	65°54'	5	10	Jellyfish
25.4	1540	127	PT	300	40	23°57'	65°00'	80	96	Lanternfish (Benthosema pterotum)
25.4	2320	128	IK	800	40	24°03'	65°17'	1	2	Jellyfishes / Salps

Table 1 (continued).

Date	Time	Stn No	Gear type	Depth in m Bot.	Depth in m Gear	Position North	Position East	Total catch	Catch/ hour	Dominant species
26.4	0830	129	BT	140	140	24°18'	65°52'	445	890	Squids Japanese threadfin bream (Nemipterus japonicus) Sharks
27.4	0120	130	BT	30	30	25°00'	66°35'	570	1140	Smallhead hairtail (Lepturacanthus savala) Threadfin trevally (Alectis indicus) Lined silver grunt (Pomadasys hasta)
27.4	0420	131	BT	60	60	25°04'	66°24'	4000	8000	Smallhead hairtail (Lepturacanthus savala) Japanese threadfin bream (Nemipterus japonicus) Squids
27.4	1020	132	BT	20	20	25°19'	66°17'	272	544	False trevally (Lactarius lactarius) Smallhead hairtail (Lepturacanthus savala) Japanese threadfin bream (Nemipterus japonicus)
27.4	2150	133	PT	790	50	24°50'	65°53'	90	180	Lanternfish (Benthosema pterotum) Sharks
28.4	0140	134	PT	50	40	25°10'	65°56'	18	36	Hairtail (Lepturacanthus spp.) Sharks Hardtail scad (Megalaspis cordyla)
28.4	0530	135	BT	15	15	25°18'	65°45'	164	328	Hairtail (Lepturacanthus sp.) Rays Catfish (Arius sp.)
2.5	0120	136	BT	18	18	25°14'	65°25'	136	272	Lined silver grunt (Pomadasys hasta) Longspined seabream (Argyrops spinifer) Mangrove red snapper (Lutjanus argentimaculatus)
2.5	1520	137	PT	2000	45	24°49'	65°08'	10	20	Lanternfish (Diaphus spp.) Lanternfish (Benthosema pterotum) Cubiceps sp.
2.5	2050	138	BT	15	15	25°15'	64°59'	512	1024	

Table 1 (continued).

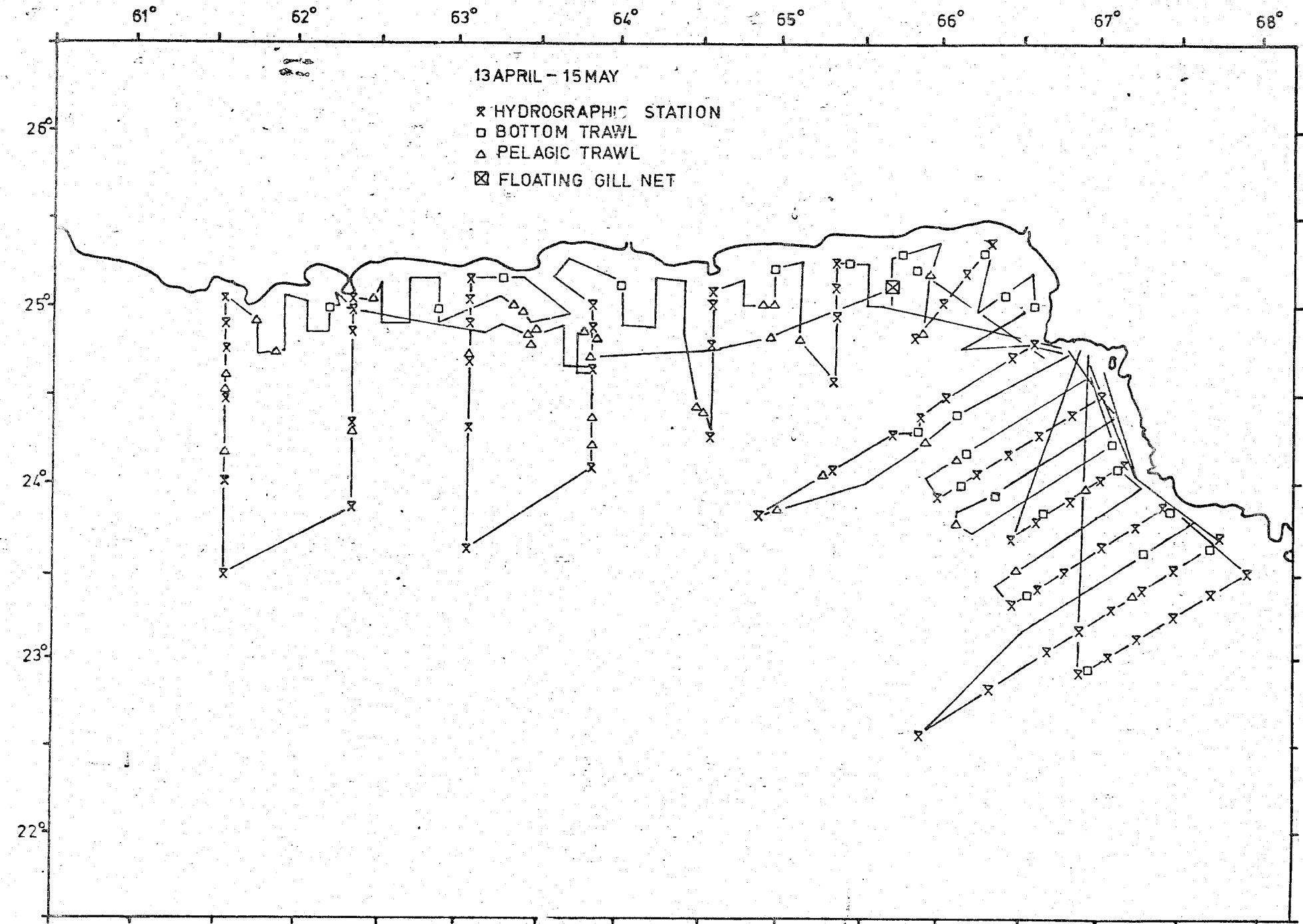
Date	Time	Stn No	Gear type	Depth in m Bot.	Depth in m Gear	Position North	Position East	Total catch	Catch/ hour	Dominant species
3.5	0000	139	PT	820	40	25°00'	64°56'	10	40	Lanternfish (Benthosema pterotum)
3.5	0125	140	PT	820	150	25°00'	64°56'	1	4	Cardinalfish (Apogon spp.) Lanternfish (Benthosema pterotum)
3.5	1623	141	PT	2900	15	24°23'	64°32'	160	320	Salps Lanternfish (Benthosema pterotum)
3.5	1821	142	PT	1450	55	24°34'	64°34'	44	59	Lanternfish (Benthosema pterotum) Smallhead hairtail (Lepturacanthus savala)
4.5	0505	143	BT	17	17	25°07'	64°02'	176	352	Longspined seabream (Argyrops spinifer) Small spotted grunt (Pomadasys opercularis) Spotted sicklefish (Drepane punctata)
4.5	1320	144	PT	500	145	24°49'	63°50'	440	880	Lanternfish (Benthosema pterotum)
5.5	0018	145	PT	3000	50	24°22'	63°50'	320	640	Lanternfish (Benthosema pterotum) Lanternfish (Benthosems fibulatum)
5.5	0410	146	PT	3200	375	24°12'	63°49'	35	35	Lanternfish (Benthosema pterotum) Lanternfish (Benthosema fibulatum)
6.5	0105	147	PT	2100	45	24°44'	63°05'	0	0	(NO CATCH)
6.5	0855	148	BT	17	17	25°02'	63°16'	489	838	Smallhead hairtail (Lepturacanthus savala) Catfish (Arius sp.) Rays
6.5	1520	149	PT	500	15	24°58'	63°22'	70	140	Lanternfish (Benthosema pterotum) Hardtail scad (Megalaspis cordyla)
6.5	1725	150	PT	23	0	25°00'	63°19'	189	378	Smallhead hairtail (Lepturacanthus savala) Moustached anchovy (Thryssa mystax) Starry trevally (Caranx stellatus)

Table 1 (continued).

Date	Time	Stn No	Gear type	Depth in m Bot.	Depth in m Gear	Position North	Position East	Total catch	Catch/ hour	Dominant species
6.5	2316	151	BT	37	37	24°59'	62°55'	298	596	Yellowstriped goatfish (Upeneus vittatus) Golden sixthread tassel (Polynemus sexfilus)
7.5	0755	152	PT	40	12	25°03'	62°28'	0	0	(NO CATCH)
8.5	1930	153	PT	2400	20	24°18'	62°20'	120	240	Lanternfish (Benthosema pterotum) Cubiceps spp.
9.5	1700	154	PT	3300	20	24°10'	61°35'	0.9	1.8	Cubiceps spp. Trachipterus spp.
10.5	0055	155	PT		50	24°32'	61°35'	0.15	0.3	Maurolicus muelleri
10.5	0405	156	PT	1100	260	24°36'	61°35'	42	54	Lanternfish (Benthosema pterotum) Lanternfish (Diaphus sp.) Lizard fish (Harpodon nehereus)
10.5	1300	157	PT	800	150	24°45'	61°46'	40	80	Lanternfish (Benthosema pterotum)
10.5	1540	158	PT	850	30	24°44'	61°53'	40	80	Lanternfish (Benthosema pterotum) Lanternfish (Benthosema fibulatum)
10.5	2315	159	BT	31	31	24°59'	62°12'	261	522	Small hairtail (Lepturacanthus sp.) Japanese threadfin bream (Nemipterus japonicus)
11.5	1715	160	PT	1150	15	24°50'	63°20'	62	74	Lanternfish (Benthosema pterotum)
11.5	1845	161	PT	1400	140	24°49'	63°28'	22	33	Jellyfishes Lanternfish (Diaphus sp.) Bregmaceros macclellandi
11.5	2100	162	PT		10	24°49'	63°30'	5	6	Lanternfish (Benthosema pterotum) Squids

Table 1 (continued).

Date	Time	Stn No	Gear type	Depth in m Bot.	Gear	Position North	East	Total catch	Catch/ hour	Dominant species
12.5	0515	163	PT	950	340	24°50'	63°50'	17	34	Lizardfish (Harpodon nehereus) Salps
13.5	0015	164	PT	1450	30	24°24'	63°50'	960	2880	Lanternfish (Benthosema pterotum) Lanternfish (Benthosema fibulatum) Bregmaceros macclellandi
13.5	1030	165	PT	1300	300	24°49'	64°57'	40	80	Lanternfish (Benthosema pterotum)
14.5	1615	166	GN	23	23	25°06'	65°42'	65	42	Sharks Bluefin tuna (Kishinoel tonggol)
14.5	0500	167	BT	18	18	25°12'	65°51'	60	62	Indopacific spanish mackerel (Scomberomorus guttatus) Lined silver grunt (Pomadasys hasta) Black pomfret (Pampus niger)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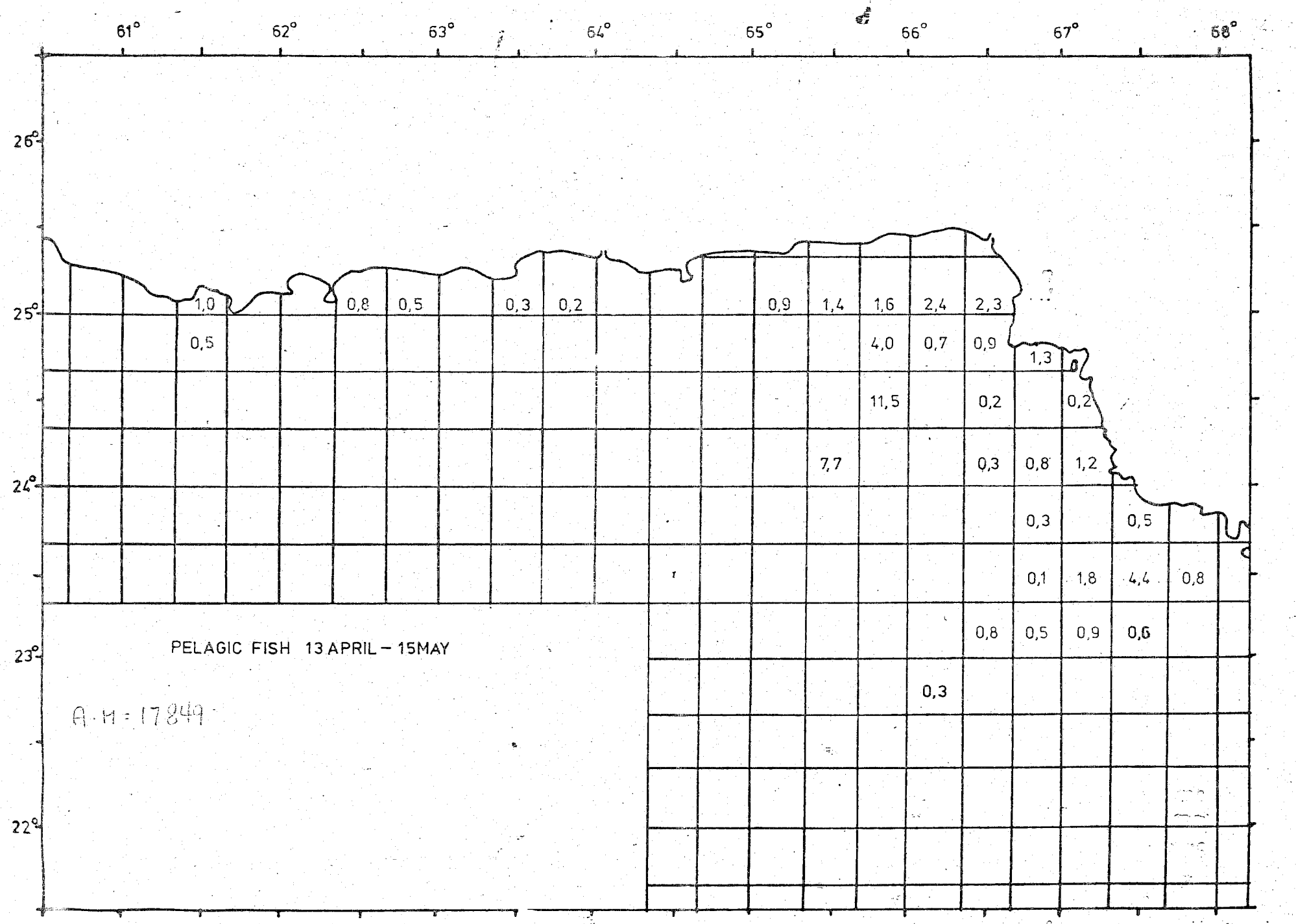
13 APRIL – 15 MAY
HYDROGRAPHIC STATION
BOTTOM TRAWL
PELAGIC TRAWL
FLOATING GILL NET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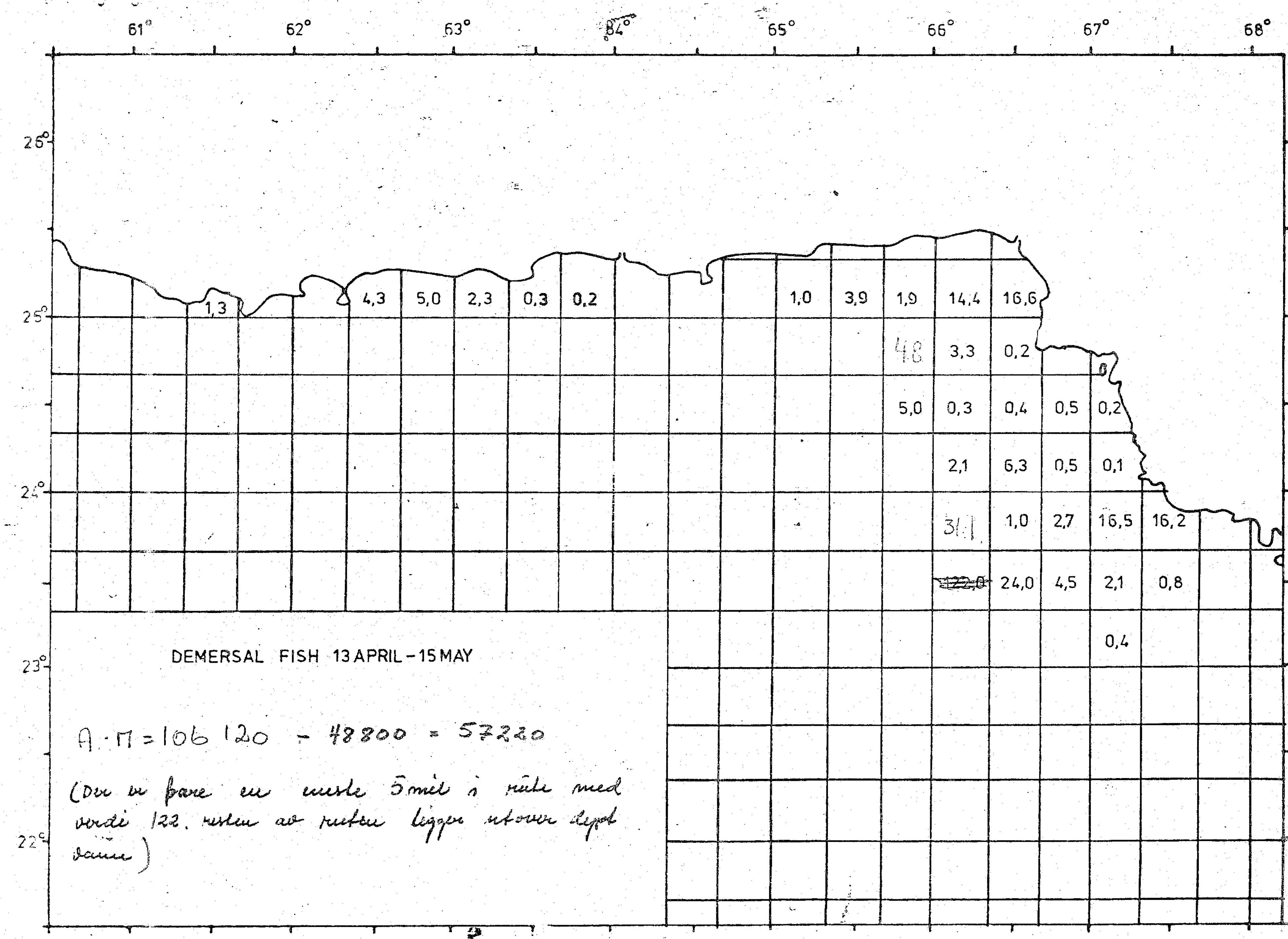

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DEMERSAL FISH 13 APRIL–15 MAY
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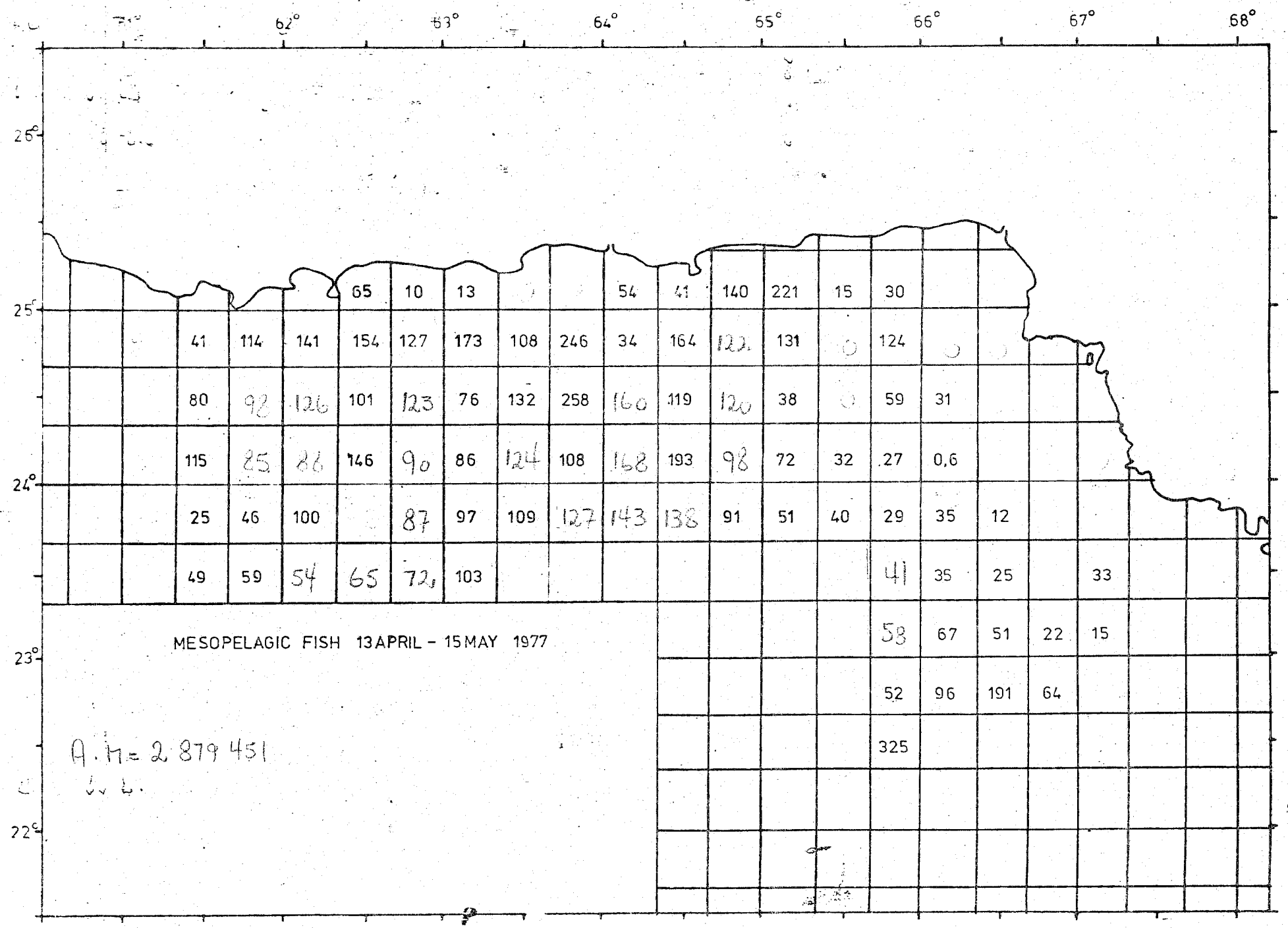
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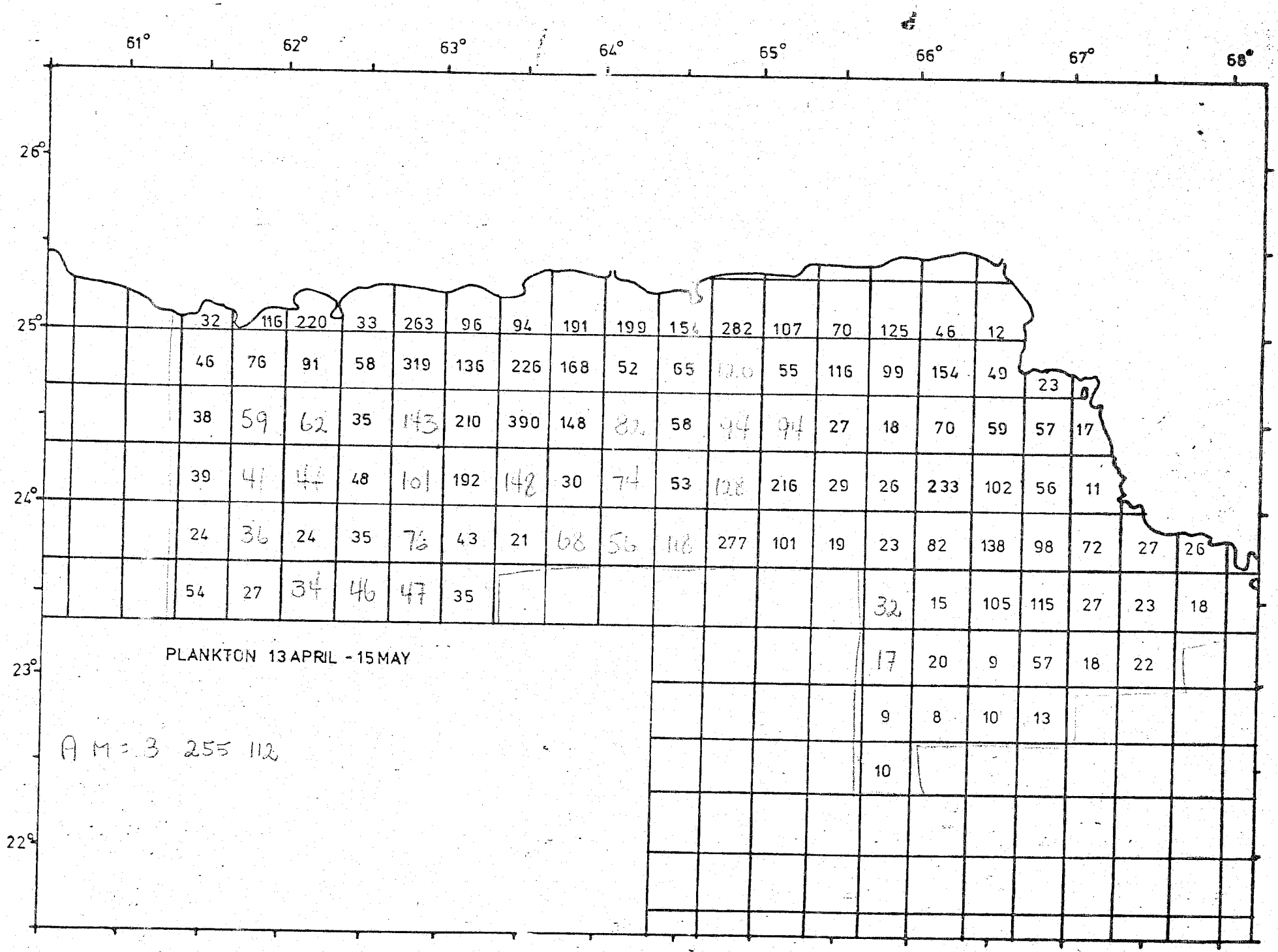
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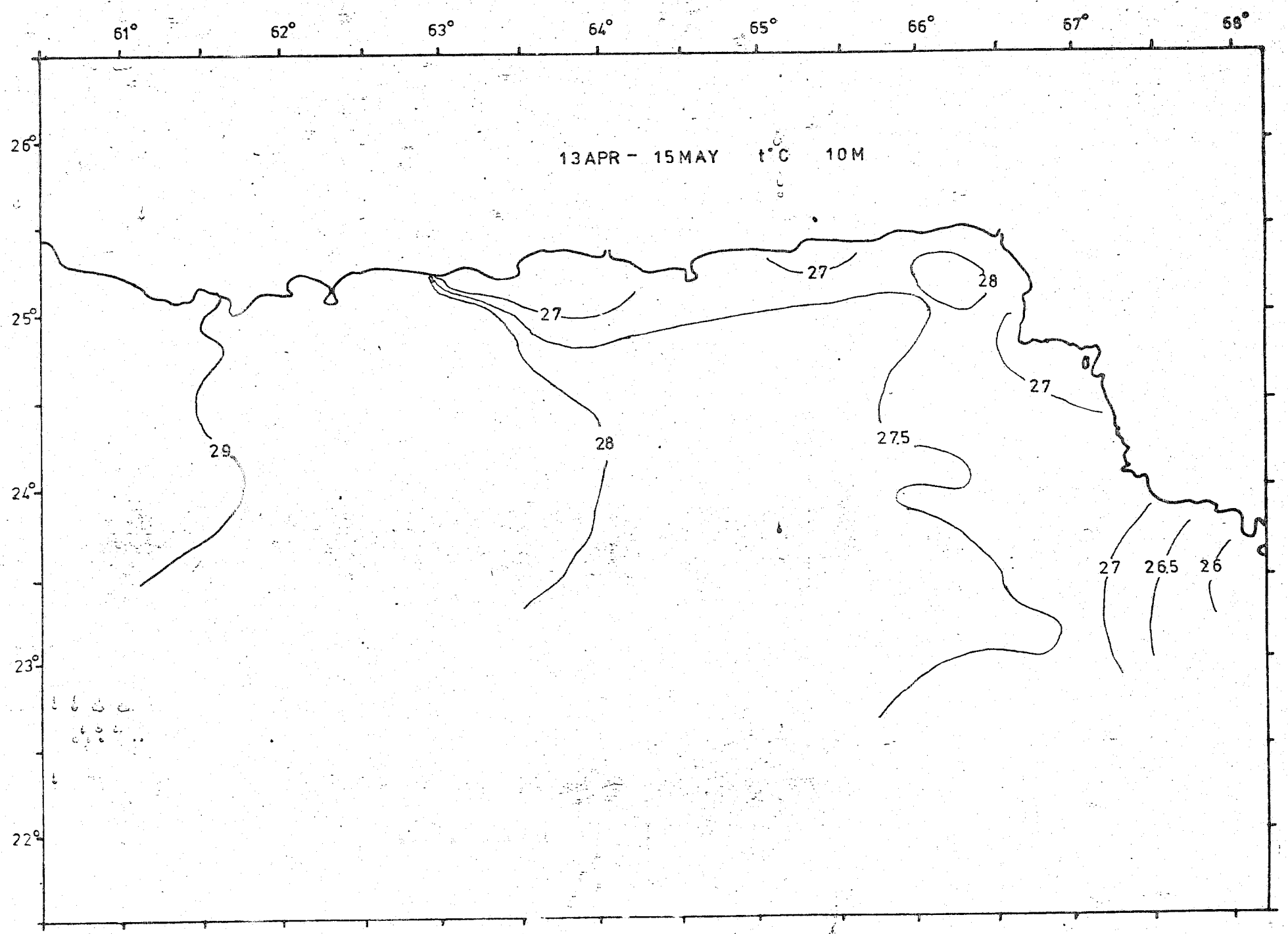
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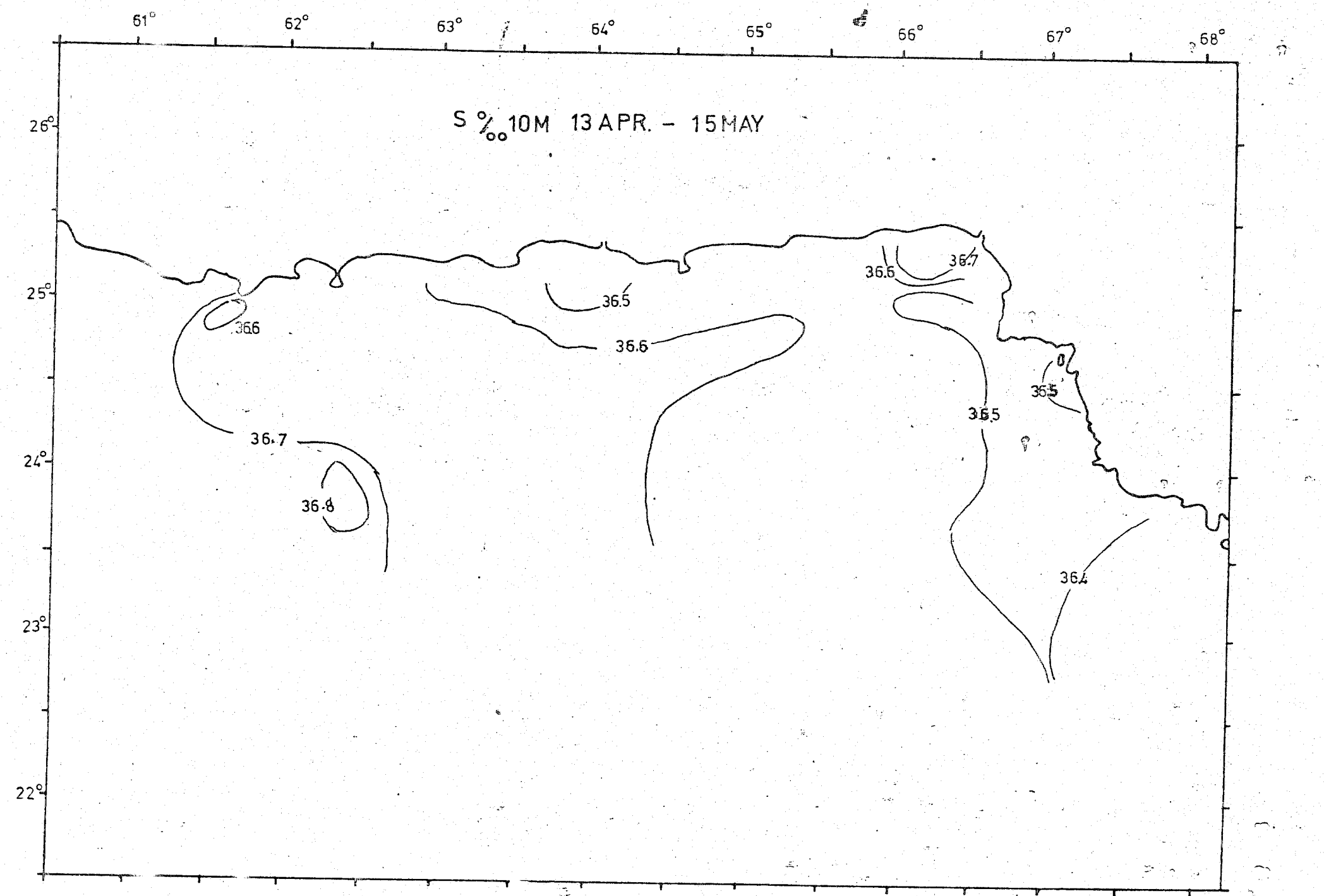
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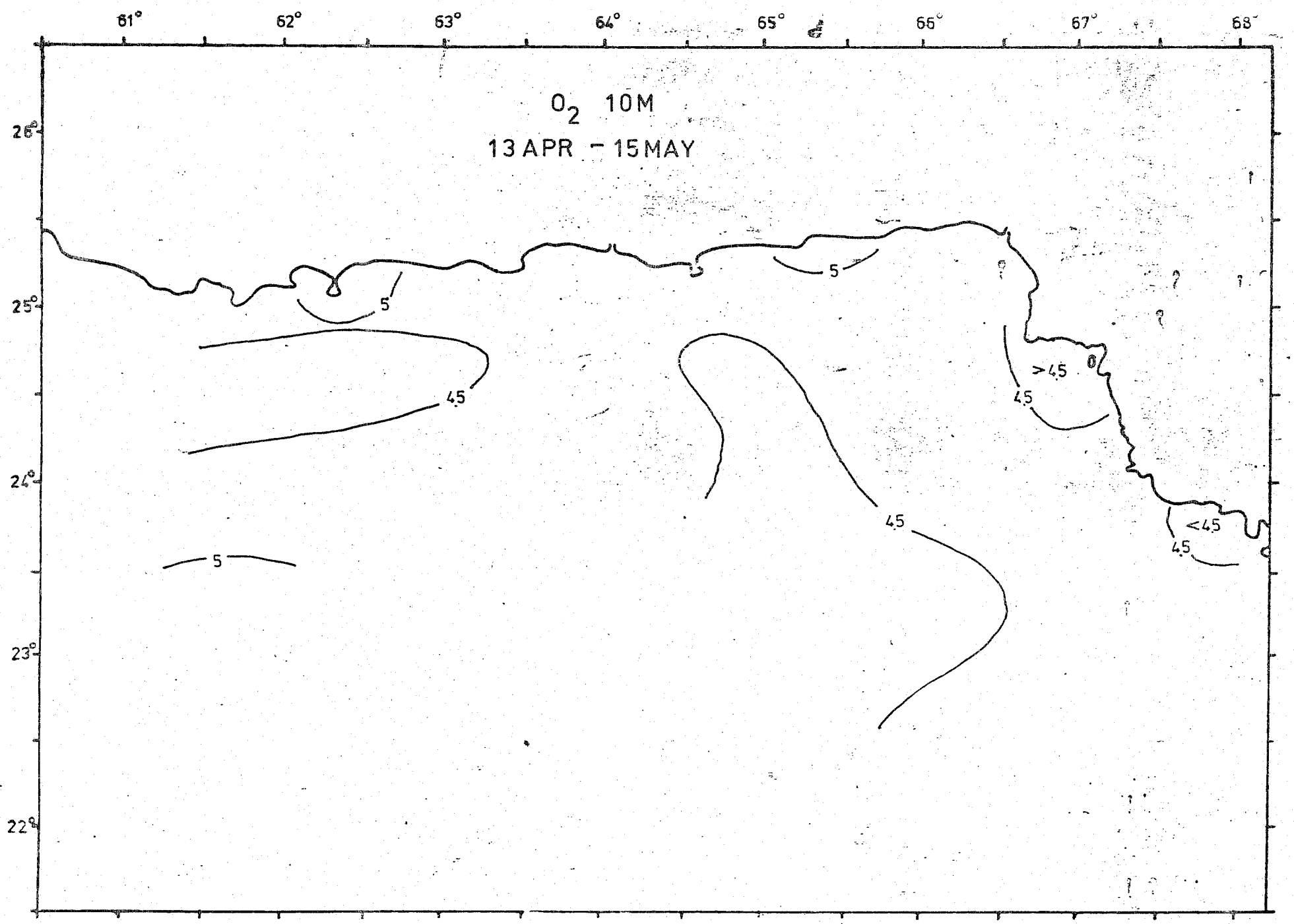
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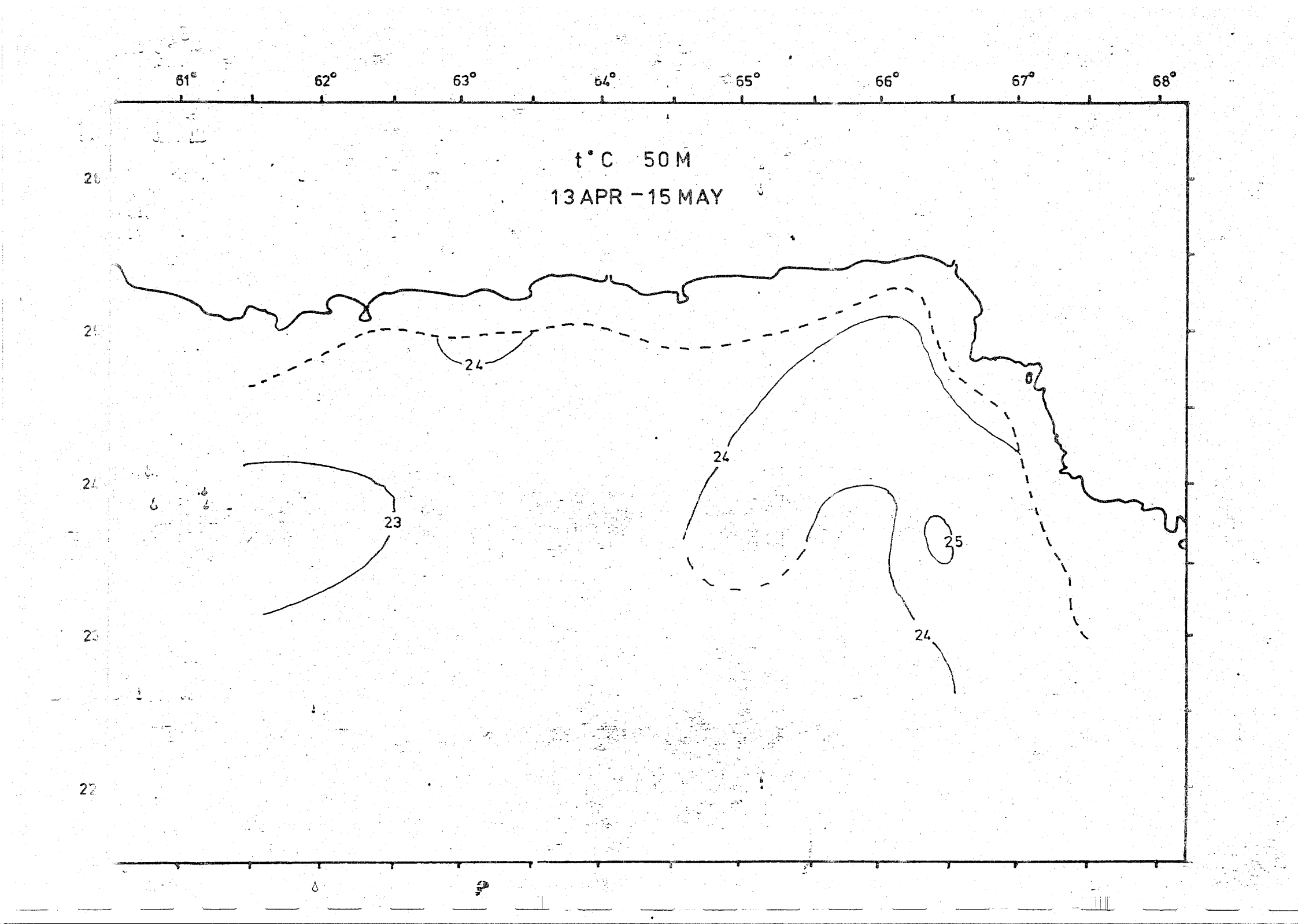
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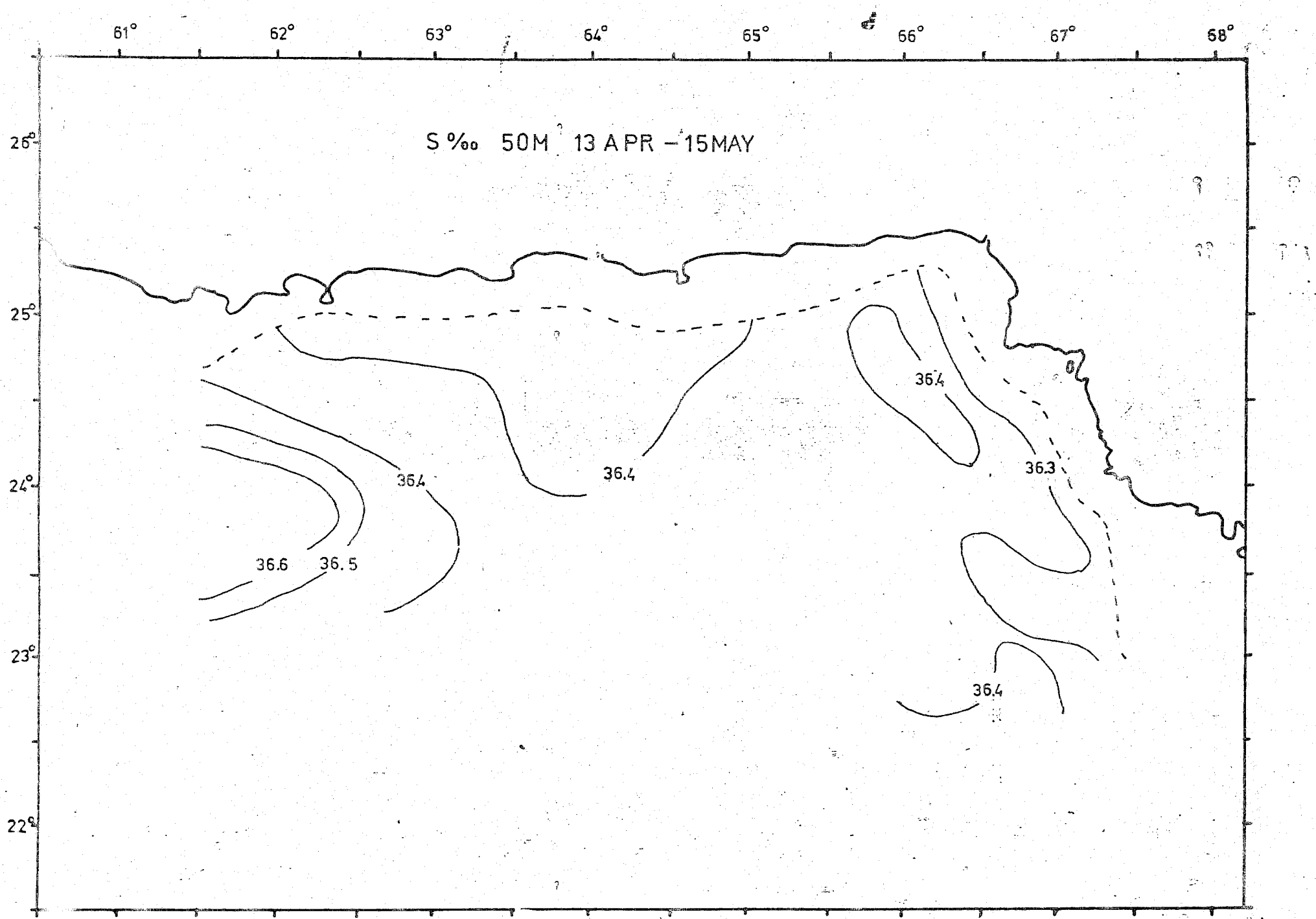
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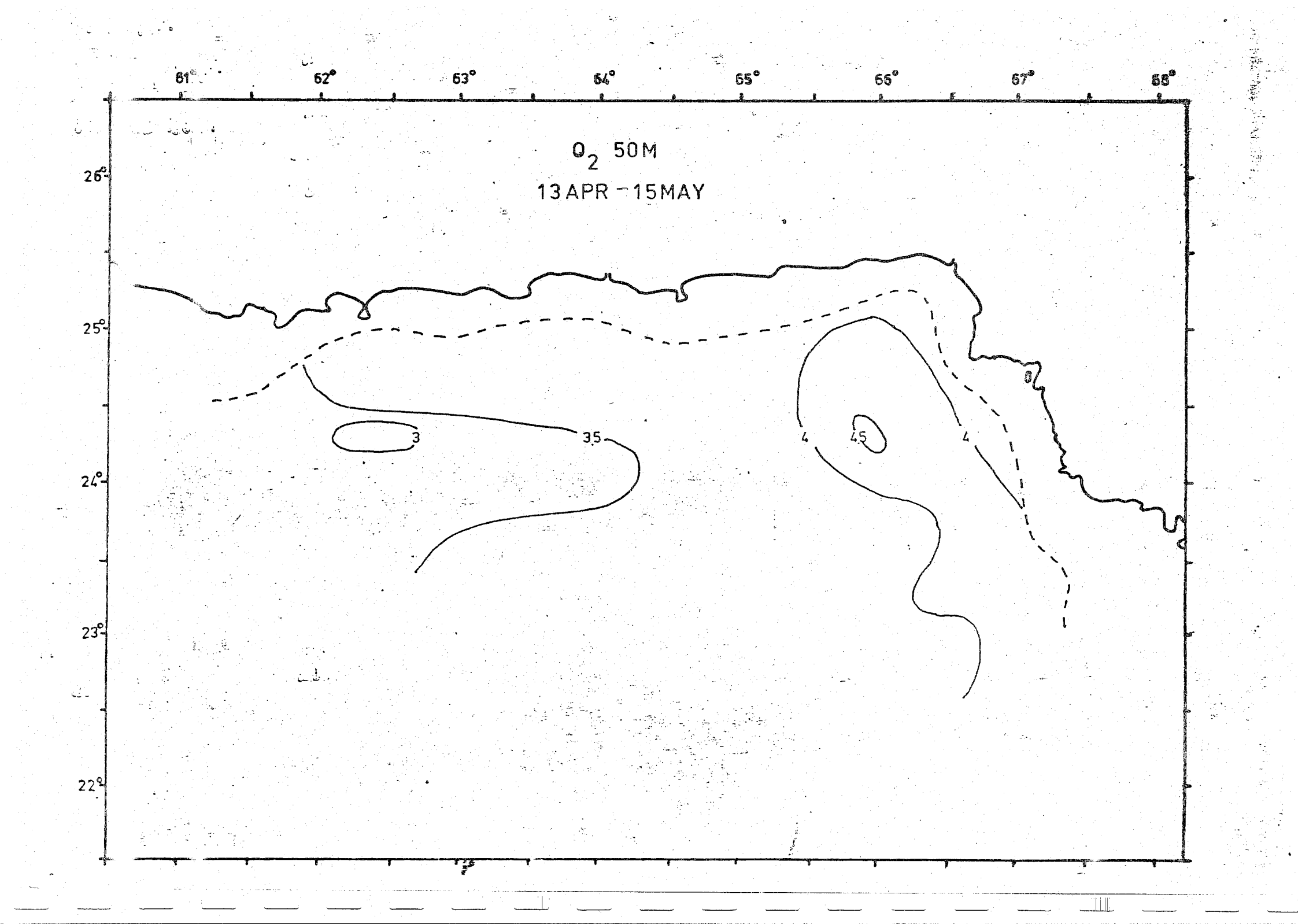
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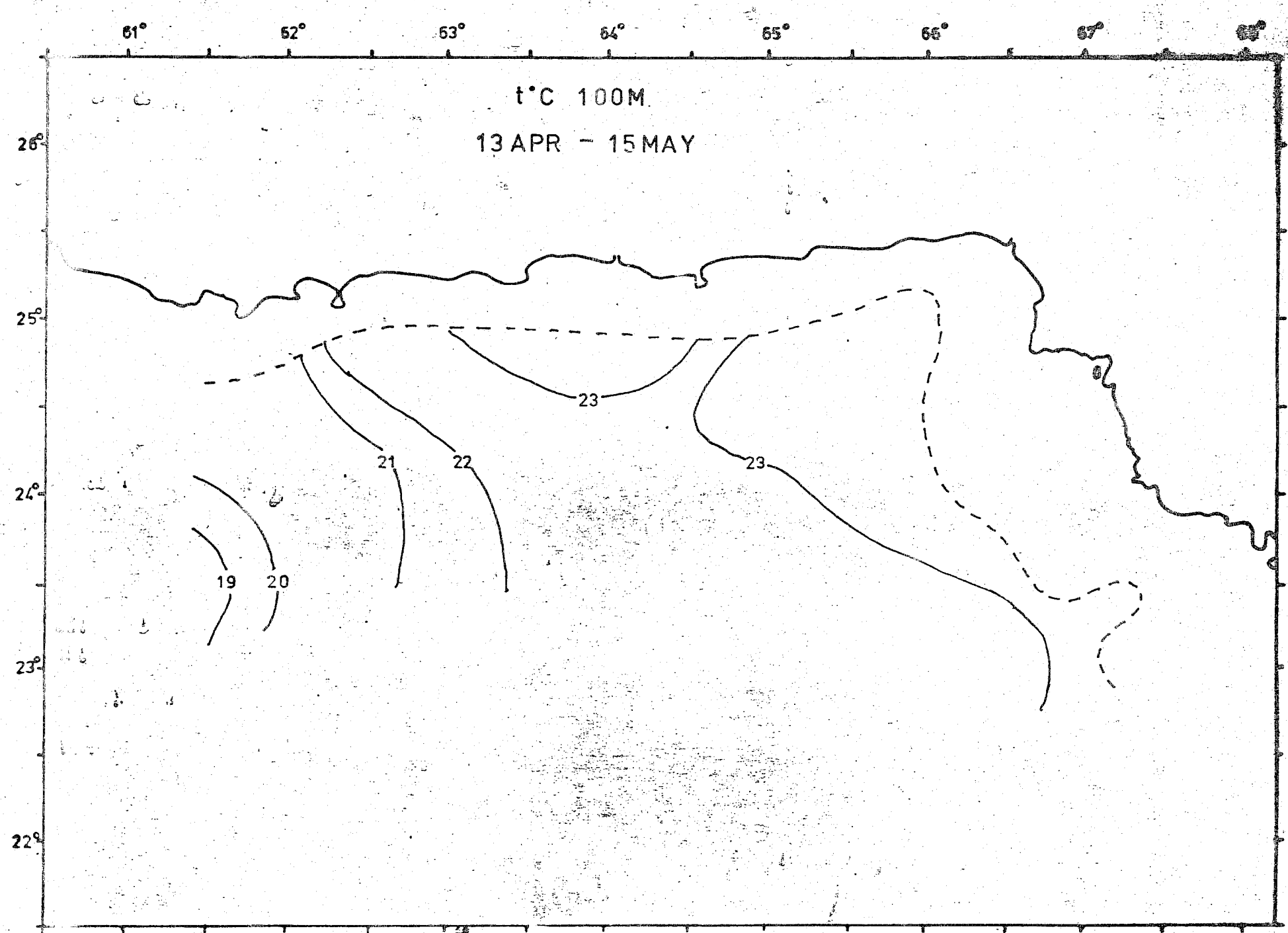
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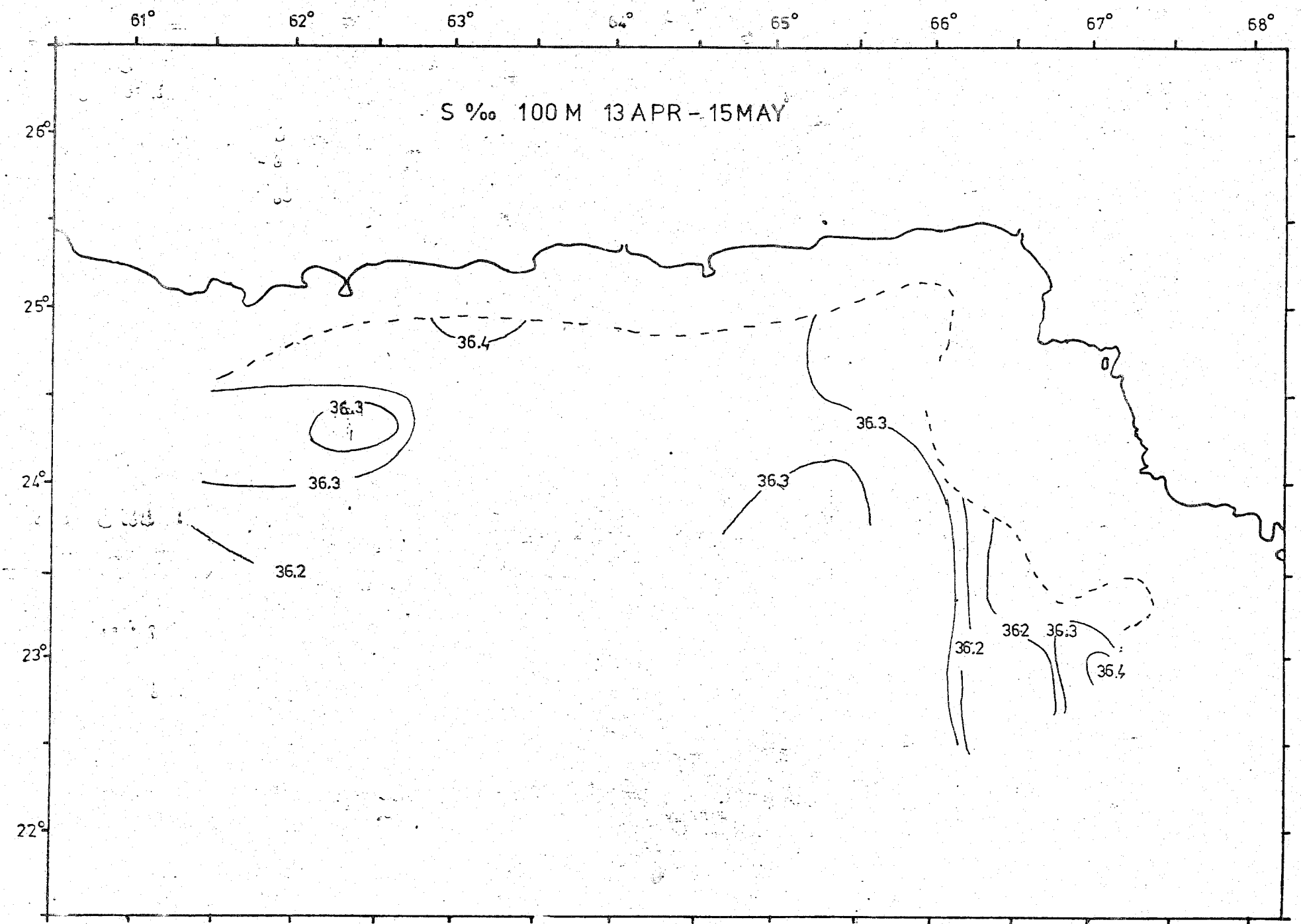
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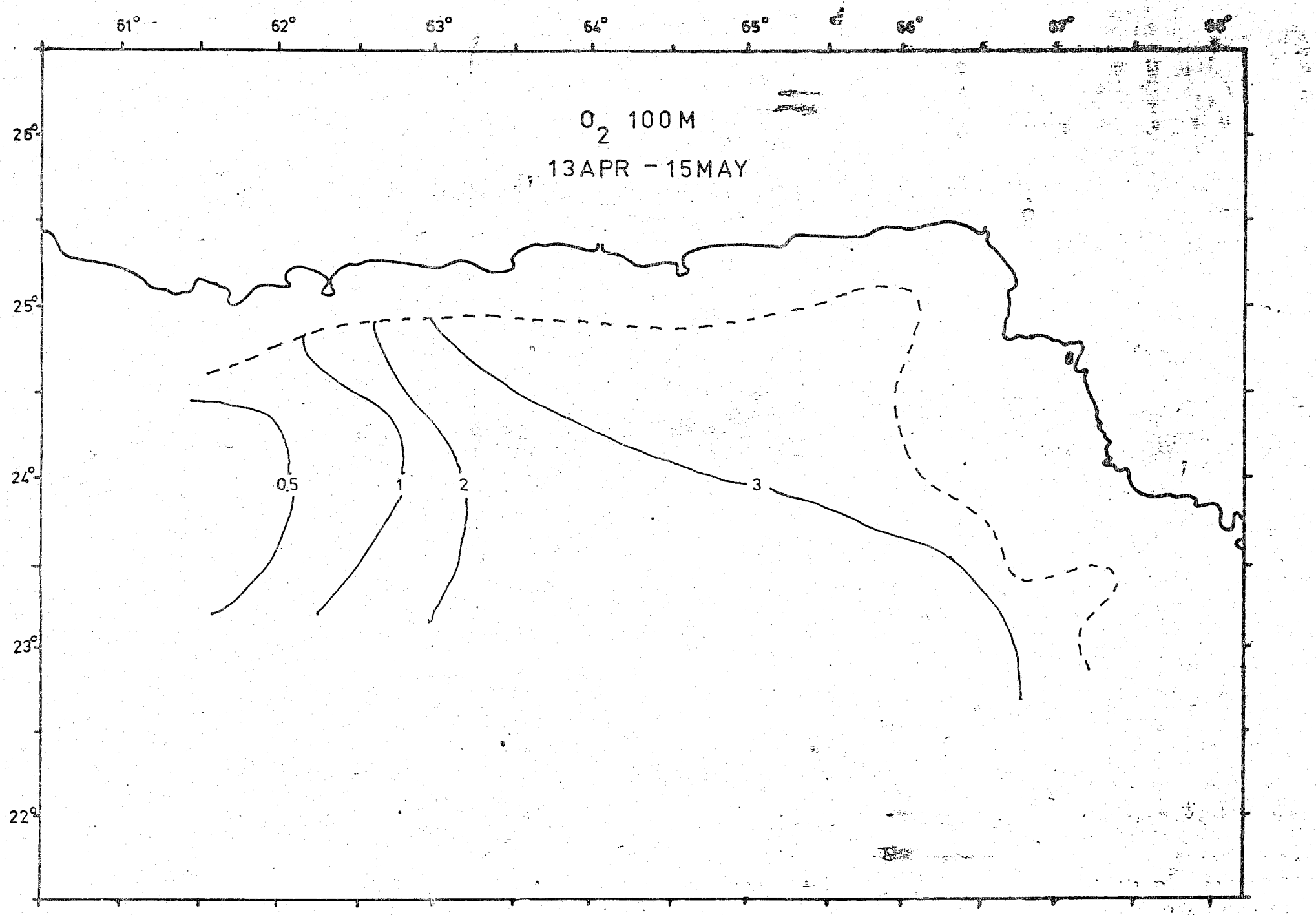
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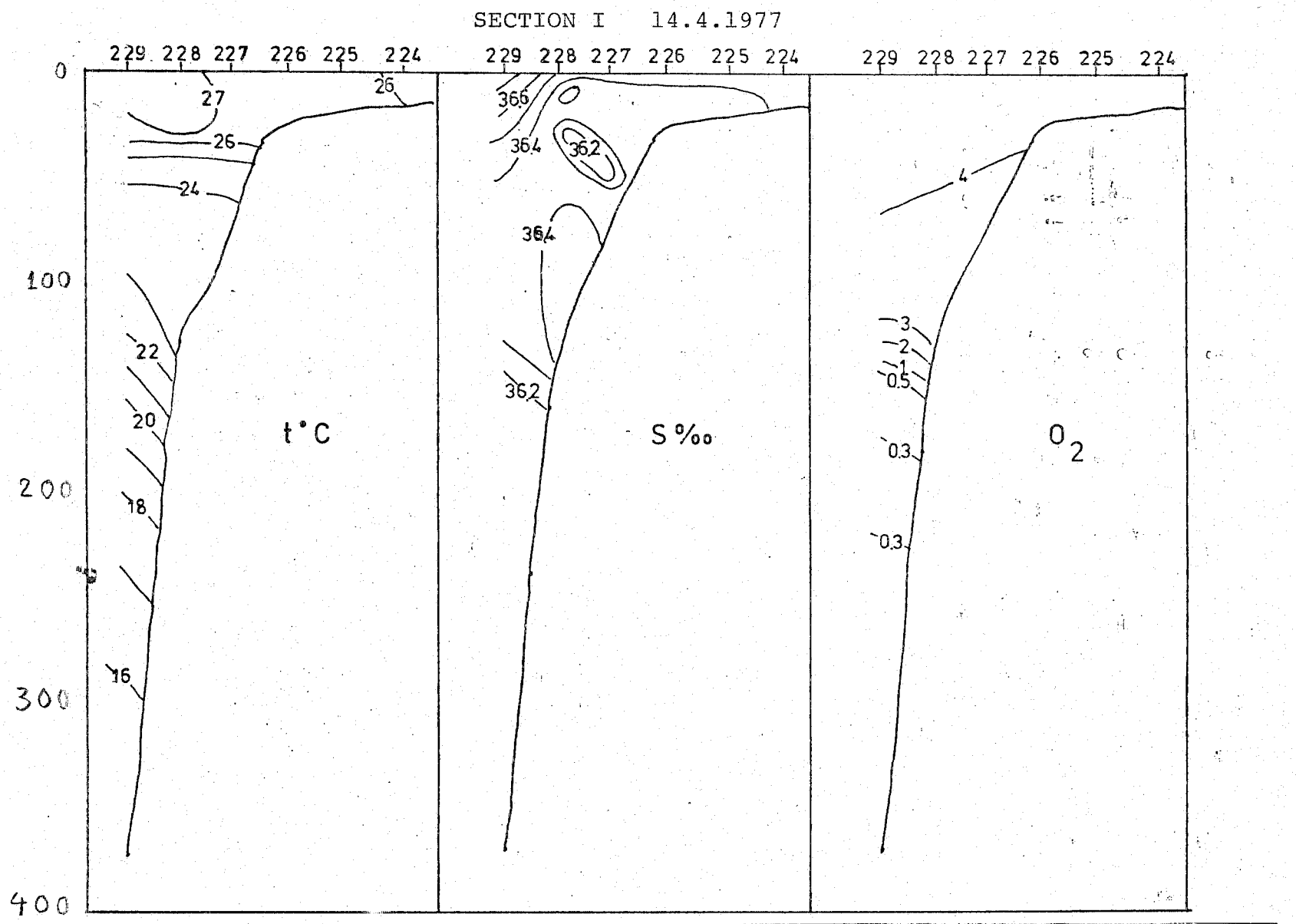
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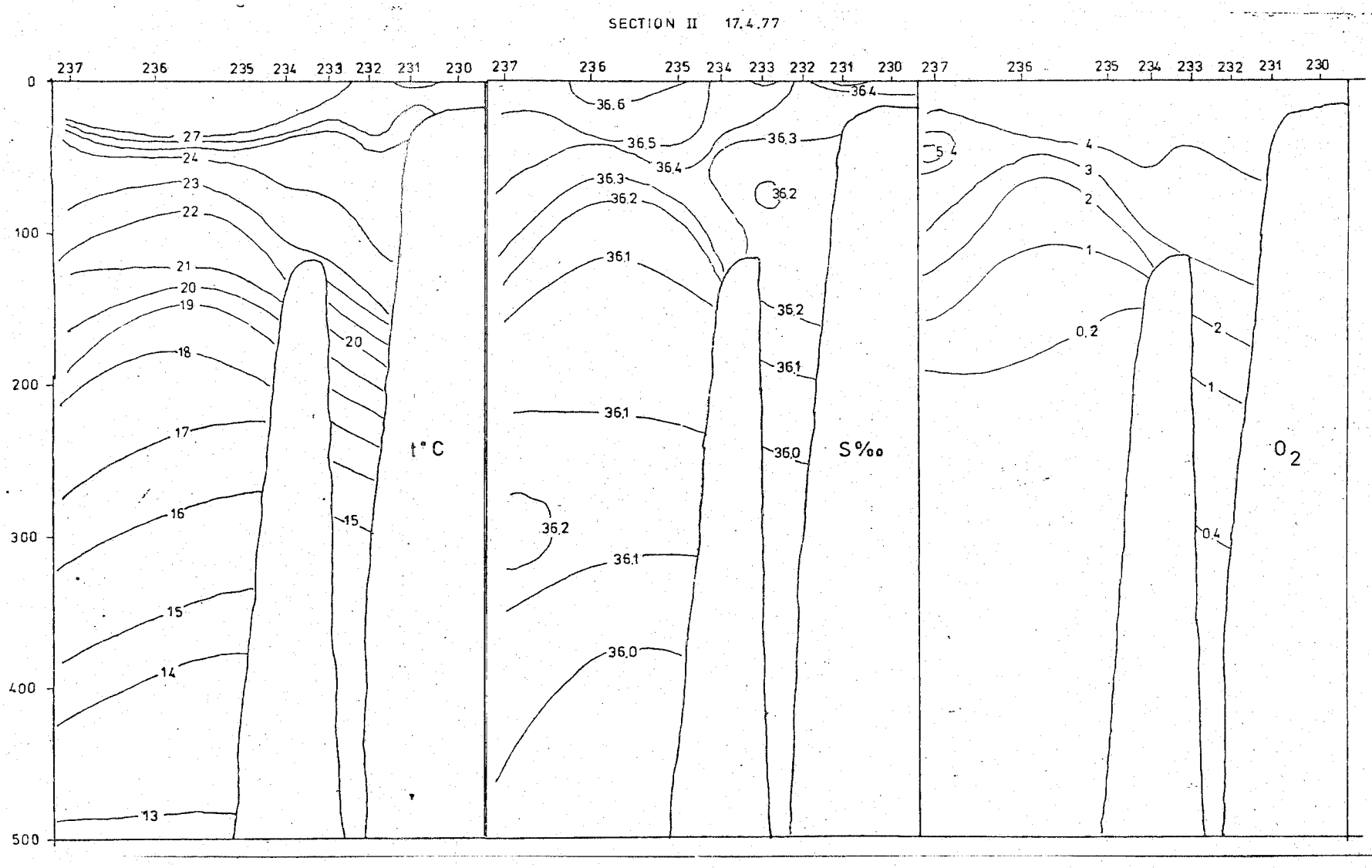
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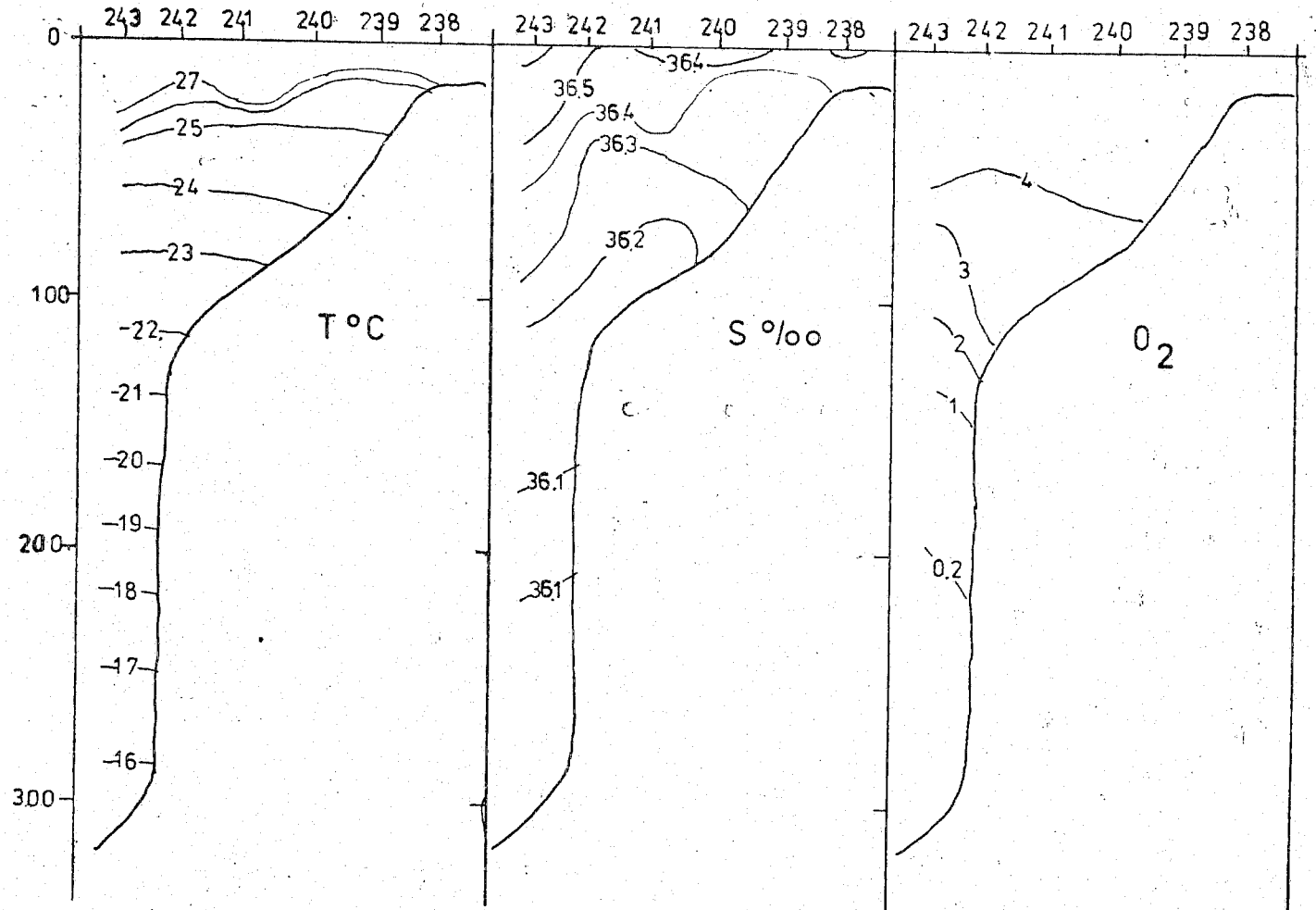

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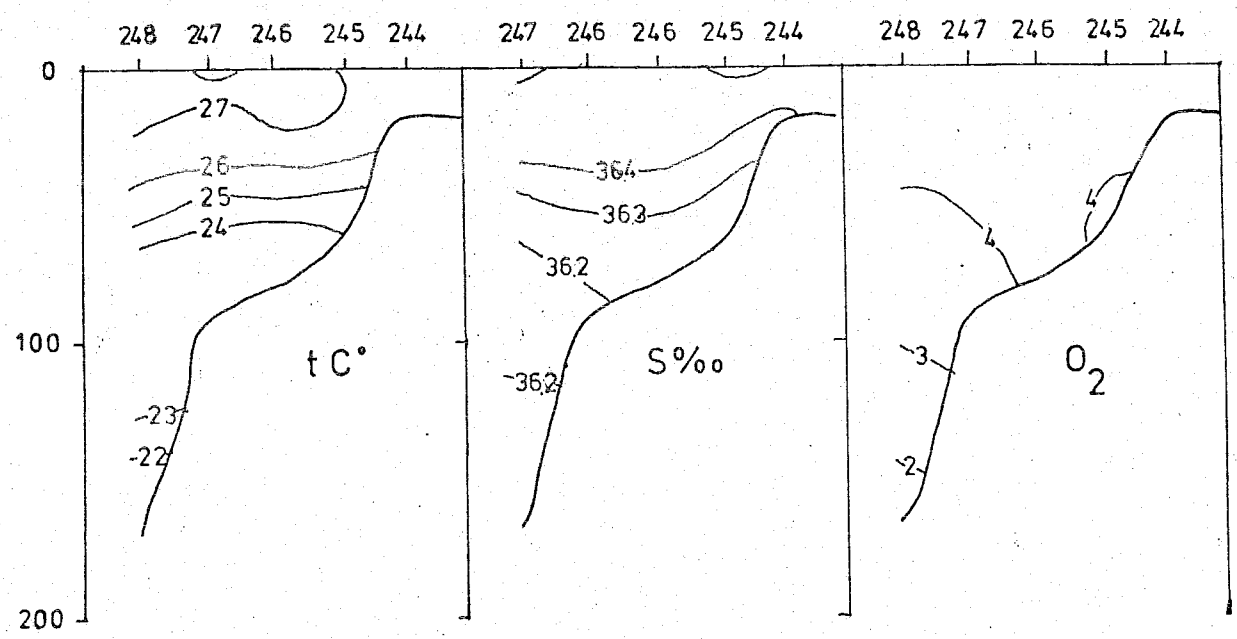

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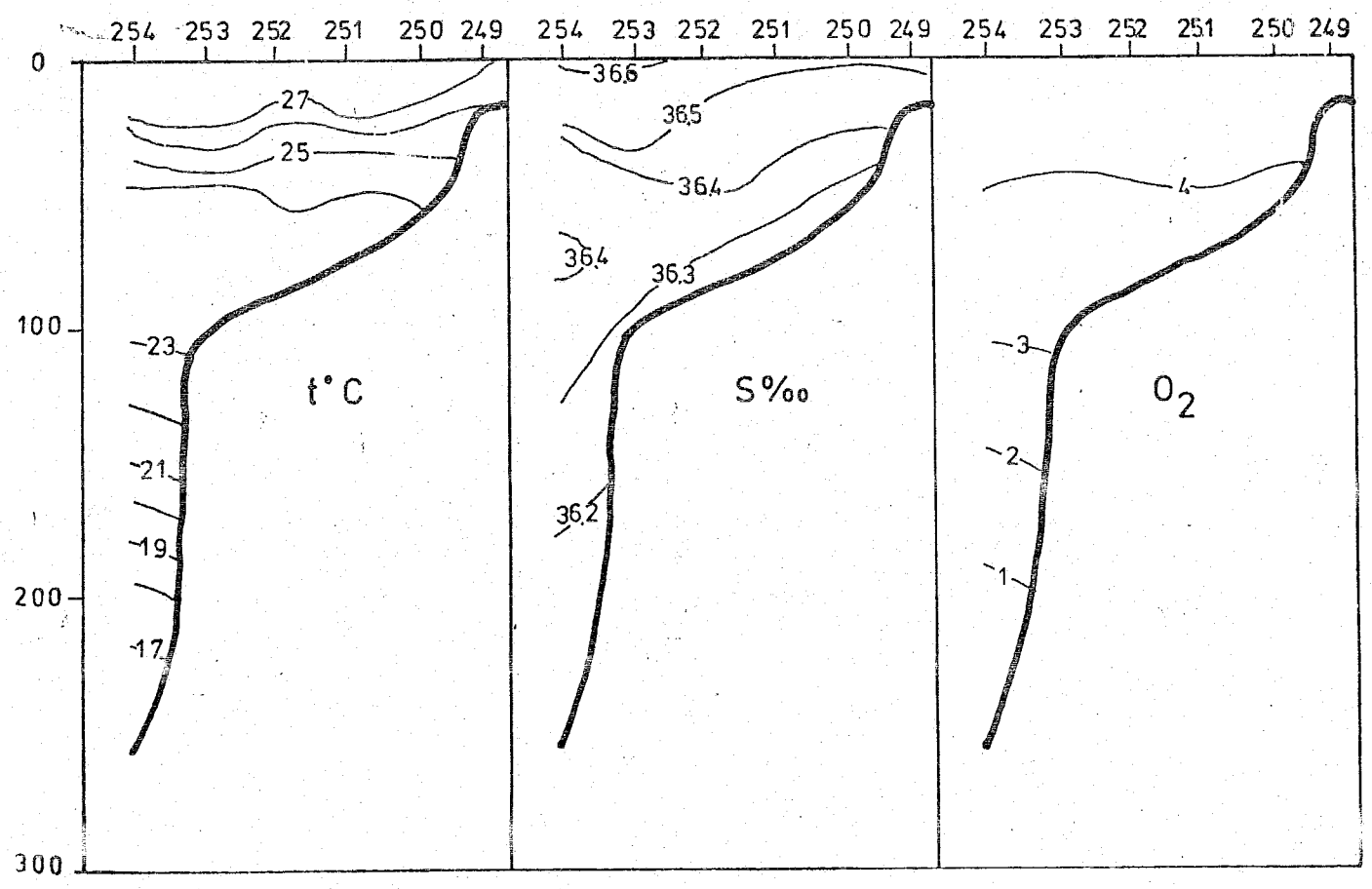

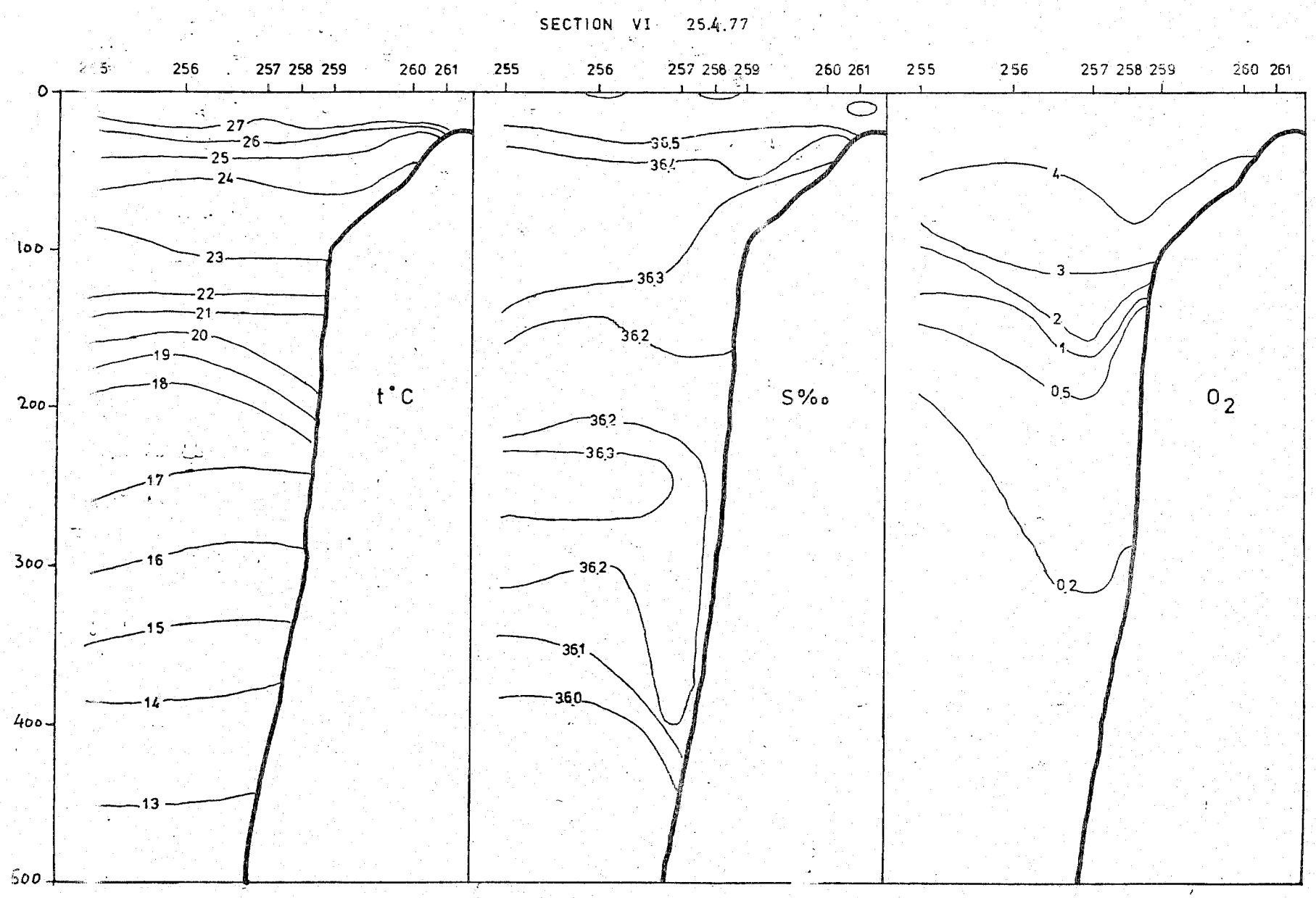
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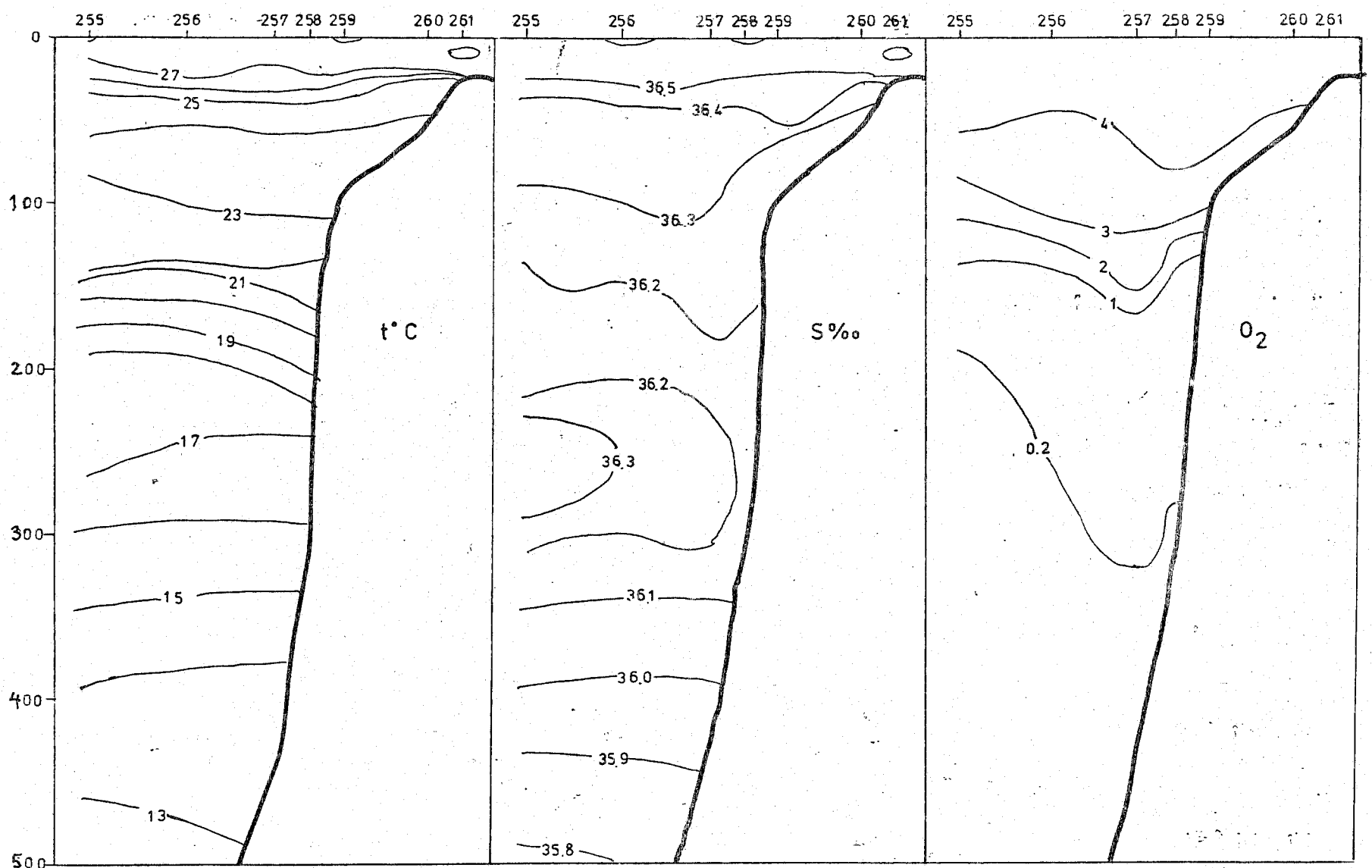
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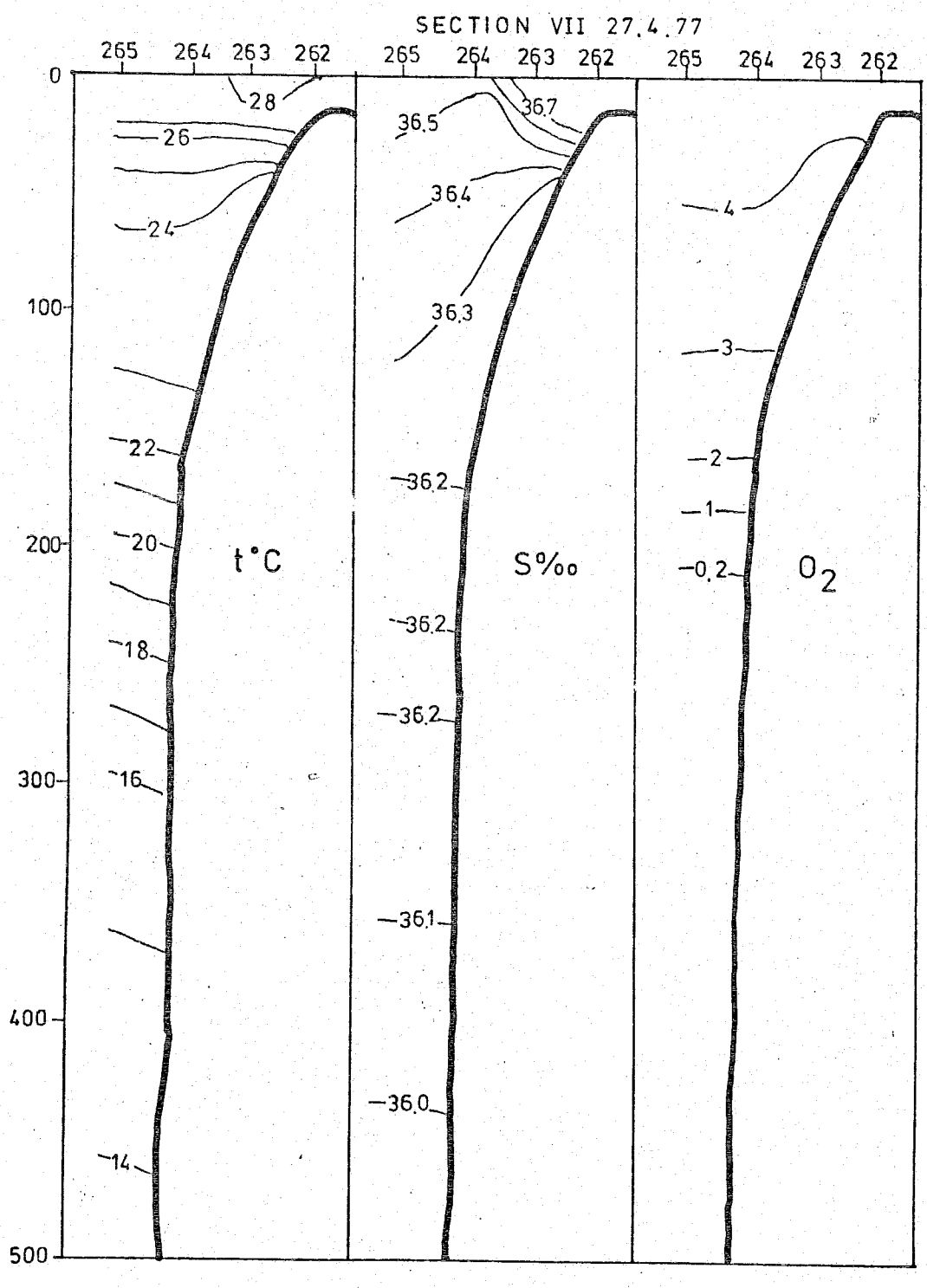
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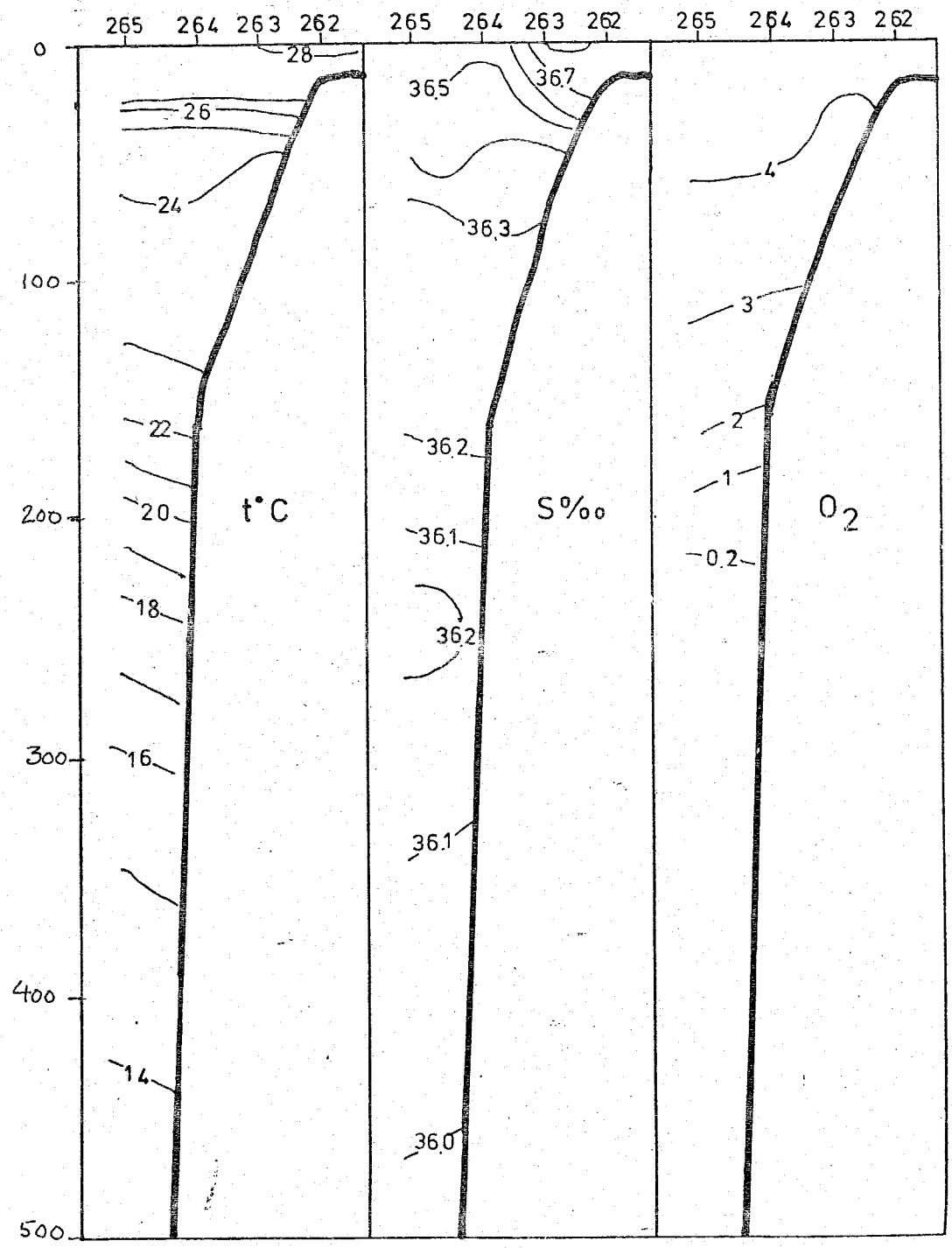

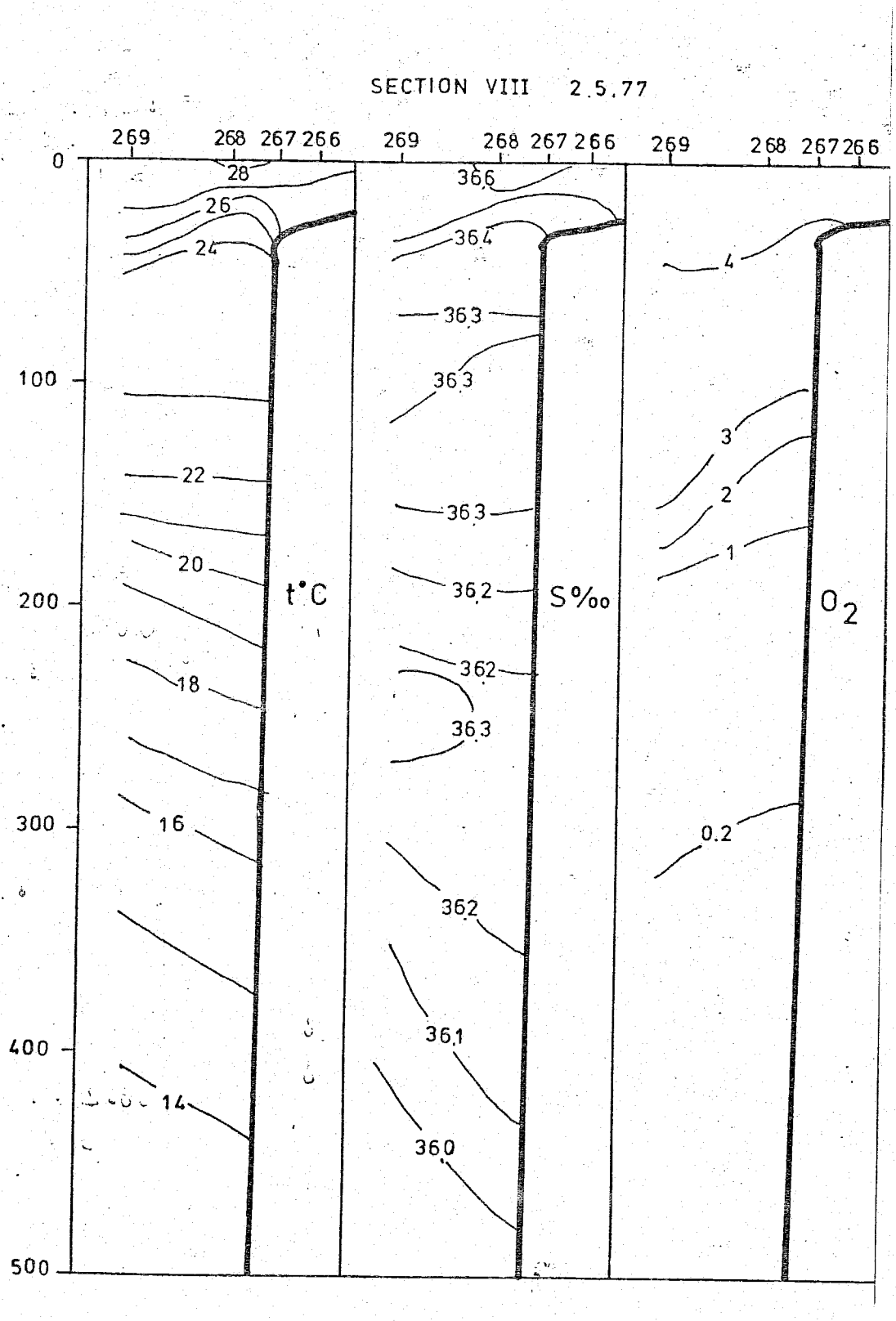
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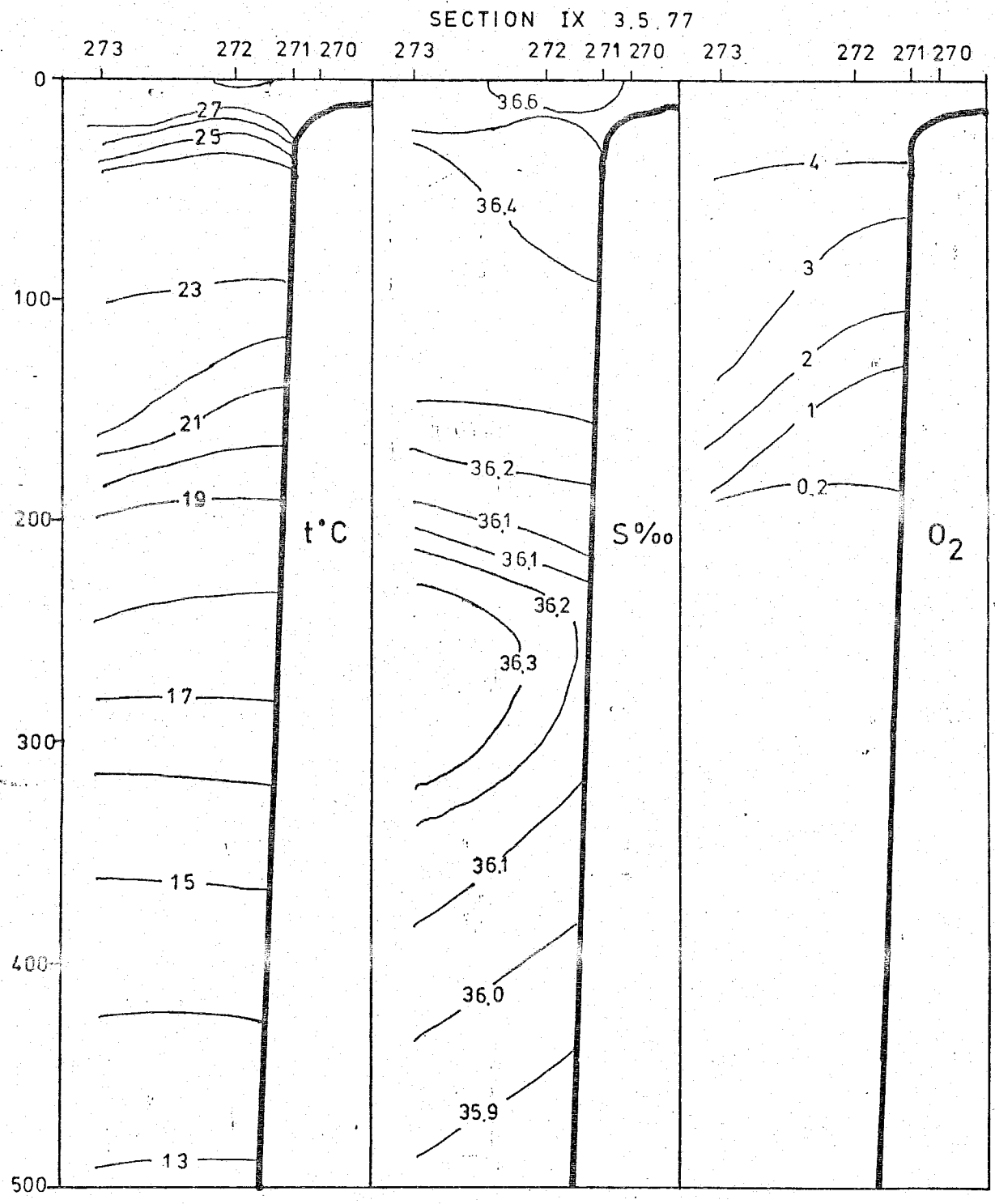
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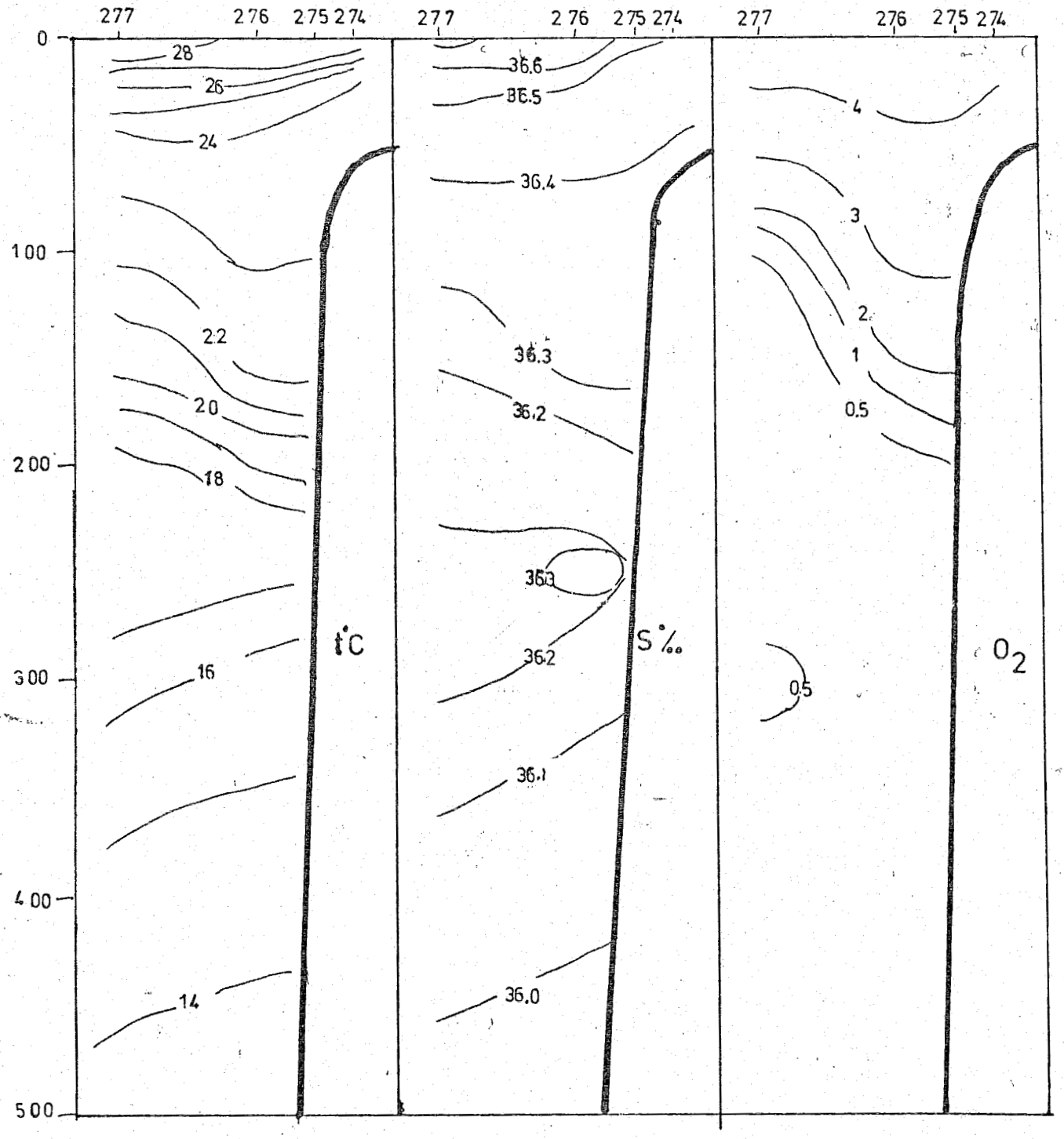

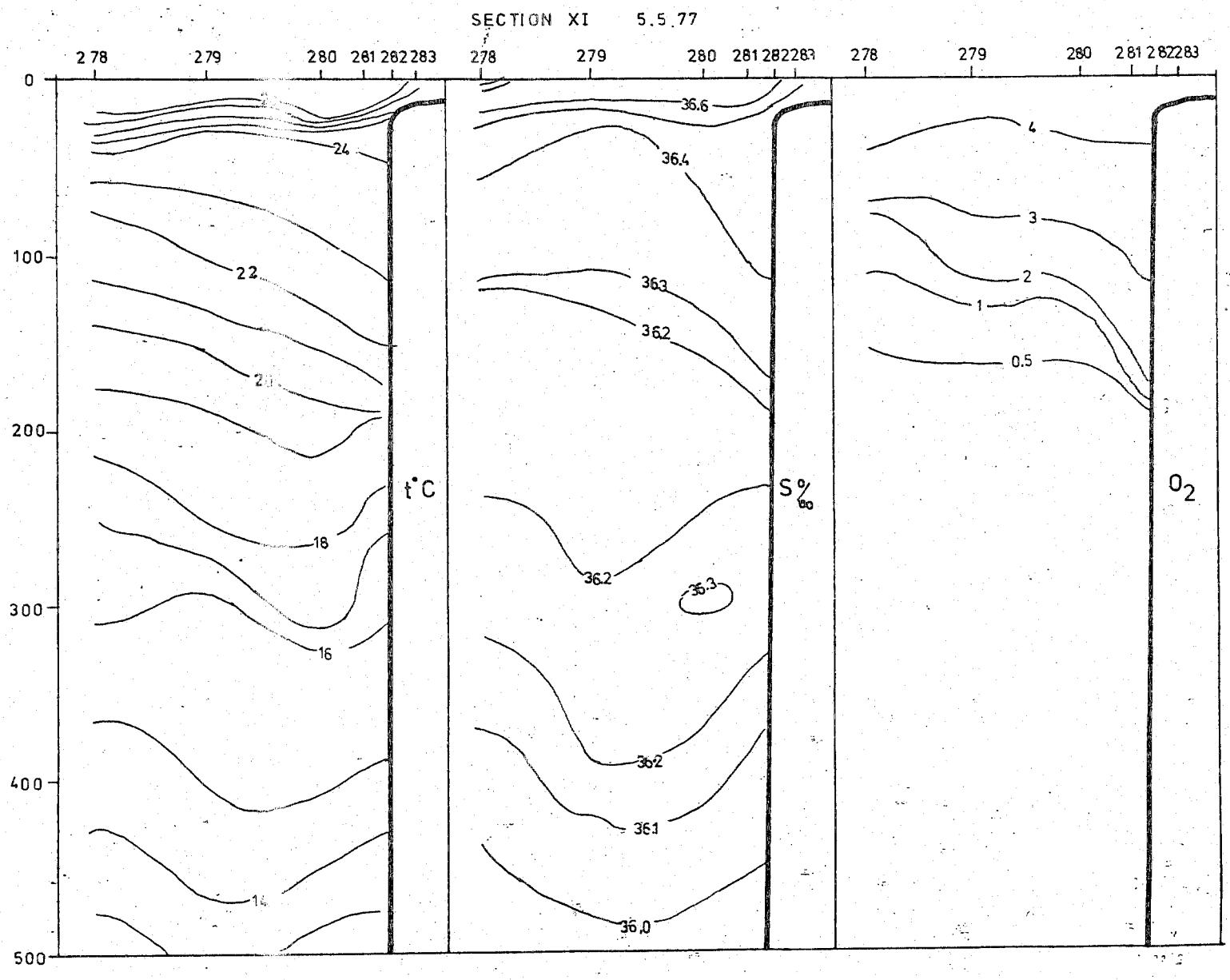
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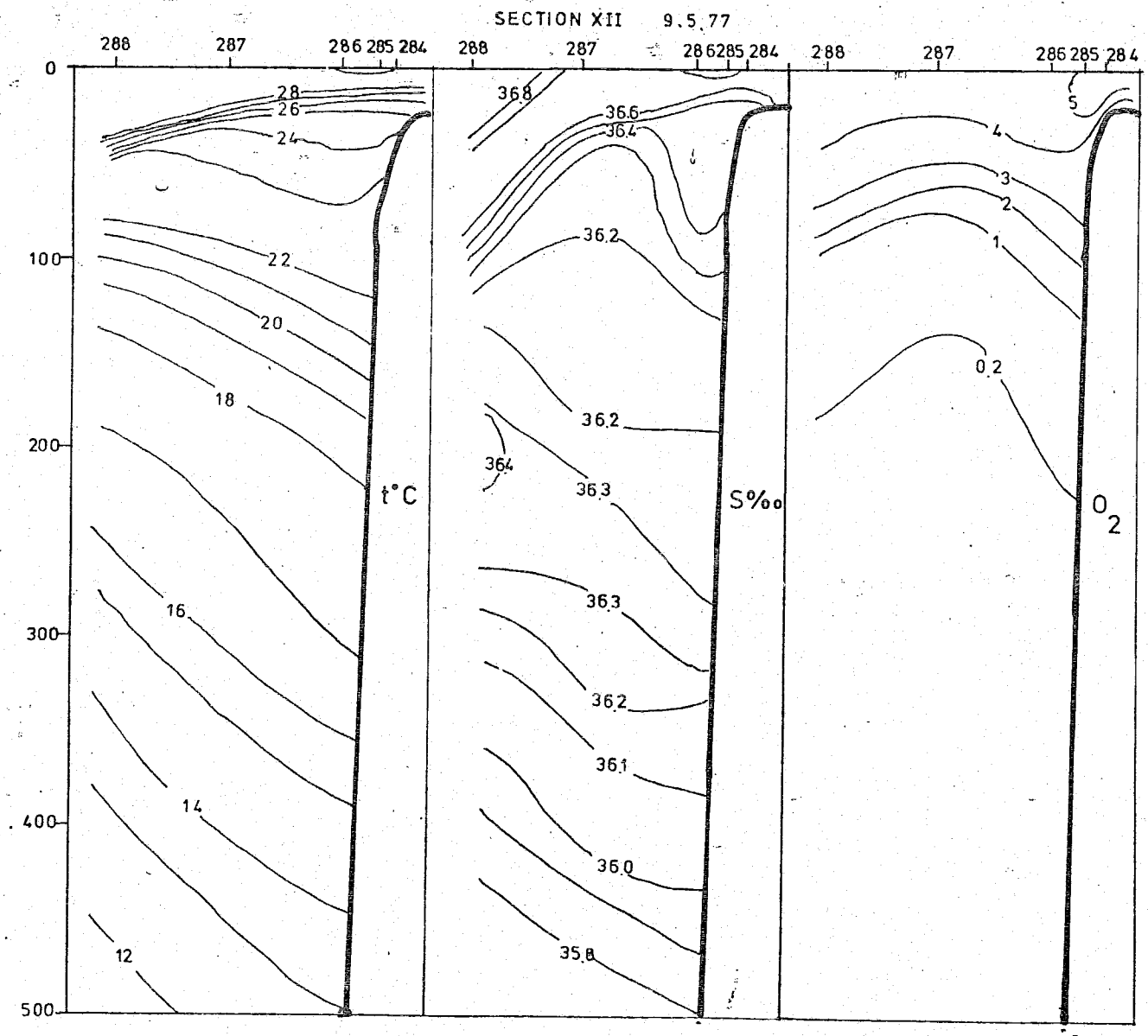
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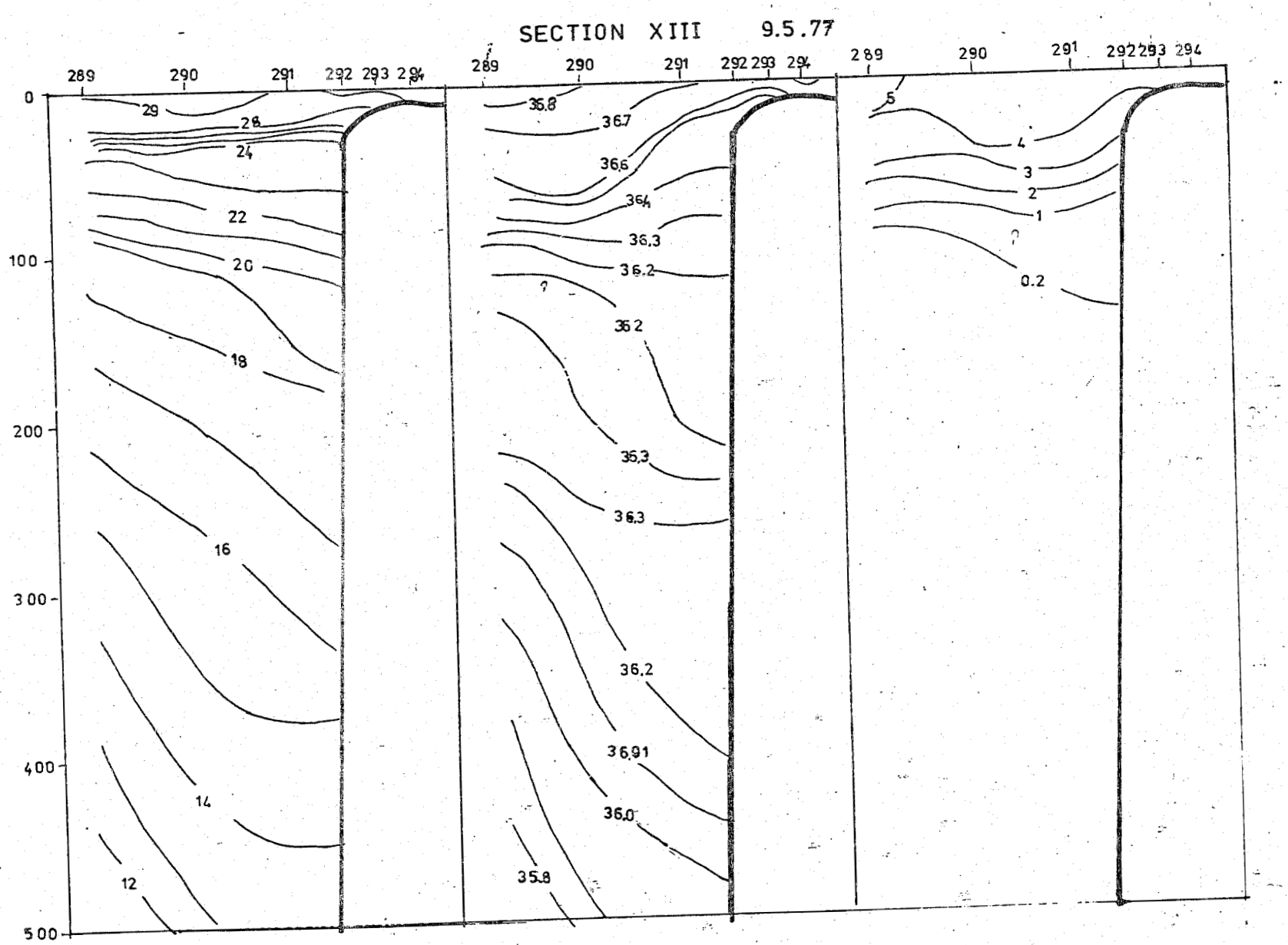
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36.2
36.91
36.0
35.8
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1
0.2

Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D
0224	1977	413	010 20	23310	67550	10
0225	1977	413	010 22	23230	67410	20
0226	1977	414	010 01	23160	67290	20
0227	1977	414	010 04	23080	67140	50
0228	1977	414	010 06	23010	67030	125
0229	1977	414	010 12	22500	66520	300
0230	1977	416	010 19	23400	67430	10
0231	1977	416	010 23	23310	67280	20
0232	1977	417	010 01	23240	67170	300
0233	1977	417	010 06	23170	67050	100
0234	1977	417	010 09	23100	66520	125
0235	1977	417	010 12	23020	66400	400
0236	1977	417	010 19	22490	66180	600
0237	1977	418	010 00	22330	65510	500
0238	1977	418	010 20	23510	67250	10
0239	1977	418	010 22	23450	67140	30
0240	1977	418	010 24	23380	67020	75
0241	1977	419	010 02	23300	66490	75
0242	1977	419	010 04	23240	66380	100
0243	1977	419	010 10	23180	66280	300
0244	1977	420	010 02	24060	67100	10
0245	1977	420	010 03	24010	67010	50
0246	1977	420	010	23540	66490	75
0247	1977	420	010 11	23470	66370	75
0248	1977	420	010 13	23410	66260	150
0249	1977	423	01 21	24300	67020	10
0250	1977	423	010 22	24240	66500	50
0251	1977	424	010 01	24170	66380	50
0252	1977	424	010 04	24100	66250	75
0253	1977	424	010 06	24030	66130	75
0254	1977	424	010 12	23550	66000	240
0255	1977	425	010 18	23480	64520	500
0256	1977	426	010 00	24040	65190	500
0257	1977	426	010 05	24170	65420	400
0258	1977	426	010 09	24230	65530	300
0259	1977	426	010 14	24290	66030	75
0260	1977	426	010 16	24420	66260	50
0261	1977	426	010 18	24470	66350	20
0262	1977	427	010 10	25200	66180	10

0263	1977	427	010	12	25100	66100	50
0264	1977	427	010	17	25000	66010	125
0265	1977	427	010	20	24470	65570	500
0266	1977	502	010	06	25150	65200	10
0267	1977	502	010	06	25070	65200	30
0268	1977	502	010	07	24560	65200	500
0269	1977	502	010	11	24350	65200	500
0270	1977	503	010	05	25050	64350	10
0271	1977	503	010	06	25000	64350	20
0272	1977	503	010	08	24470	64350	500
0273	1977	503	010	13	24170	64350	500
0274	1977	504	010	10	25000	63500	50
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0276	1977	504	010	20	24380	63500	500
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0286	1977	508	010	10	24500	62200	500
0287	1977	508	010	17	24200	62200	500
0288	1977	509	010	01	23500	62200	500
0289	1977	509	010	02	23300	61350	500
0290	1977	509	010	13	24000	61350	490
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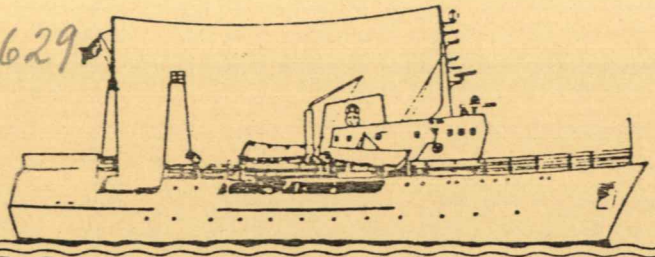


Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY CRUISE REPORT ON CRUISE NOS. 1 AND 2 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

19 January - 11 February 1977

Odd Nakken

Karachi, 11 February 1977

Institute of Marine Research, Bergen

PRELIMINARY CRUISE REPORT ON CRUISE NOS 1 AND 2 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

INTRODUCTION

This report covers the first complete coverage of the Pakistan waters during this project.

Daparture:	Karachi, 19 January 1977.
Arrival:	Karachi, 27 January 1977.
Scientific staff:	S. Qureshi, M. Khaliluddin, S. Amjad (Department of Fisheries)
	S. Saifullah, S. Huda, S. Sardar Alam (Institute of Marine Biology)
	O. Nakken, S. Lygren, O. Knutsen, Ø. Trogersen (Institute of Marine Research)
Departure:	Karachi, 29 January 1977.
Arrival:	Karachi, 11 February 1977.
Scientific staff:	S. Qureshi, Irshad Begum, Farkunda Jabeen (Department of Fisheries)
	S. Barkati, M. Mozzam Khan, S.H. Niaz Rizvi (Institute of Marine Biology)
	O. Nakken, S. Lygren, O. Knutsen, Ø. Trogersen (Institute of Marine Research)

Survey grid and stations are shown in Fig. 1. The most offshore station in section IX (Ras Ormara) was not occupied due to lack of time.

WORKING SCHEME

The standard hydrographic/plankton stations were worked as follows:

1. 2 and 4 litre samples with Nansen bottles from 0, 10 and 30 m for filtration.

2. Nansen bottles at standard depths to bottom or 500 m. These samples (observations) were taken: temperature and salinity at all standard depths: 0-10-20-30-50-75-100-125-150-200-250-300-400-500 m. Oxygen at: 10-20-30-50-75-100-150-200-300 m. Nutrients at: (depths as for oxygen) selected sections. Phytoplankton: 0-10-20 m.

3. Bathythermograph 0-250 m.

4. Phytoplankton net - 40 µ mesh size - vertical 0-50 m, horizontal tow at the surface for 5 minutes.

5. Bongo net (with flowmeter) - 180 µ mesh size - oblique 0-35 m (50 m wire), horizontal at the surface for 5 minutes or less, dependent on clogging.

6. Petersen grab when shallower than 150 m.

The salinity and oxygen samples were analysed onboard and sections and maps demonstrating the horizontal and vertical distribution of temperature, salinity and oxygen were drawn at the end of the second cruise.

The nutrient samples and the filter papers were frozen immediately and will be analuzed at the Institute of Marine Biology. The phytoplankton samples were preserved in formalin and will be analyzed at the Institute of Marine Biology. The Bongo net samples were preserved in formalin and will be analyzed both at the Institute of Marine Biology and the Department of Fisheries.

Continuous watch was kept on the acoustic equipment. Two echo sounders were run continuously as follows:

38 kHz, 0-250 m + 250 m, 120 kHz, 0-100 m. The echo integrators were connected to the 38 kHz sounder and adjusted to depth slices: 6-50 m, 50-100 m, 100-250 m, 250-500 m. The sonar was mainly used in the 1250 m range mode, but in shallow waters the 500 m range mode was operated.

Fishing stations were carried out whenever "fishable recordings" occurred on the echo recorder, or when the recording changed its

character. The fish was sorted according to species and measurements of length, volume/weight and maturity stage were carried out for the most abundant species in the catches.

Samples for further studies ashore were frozen or preserved in formalin.

All data log sheets were copied and Mr. Qureshi and Mr. Barkati received the copies for the two participating Pakistani institutions.

RESULTS

Distribution and abundance of pelagic fish

The distribution of pelagic fish species is shown in Fig. 2. The number within each square is the average integrator reading within that square and thus a measure of abundance (density/unit area). The observed abundance were generally low; higher values were found in an area south of Karachi and in Sonmiani Bay. South of Karachi species of anchovy (ENGRAULIDAE: Engraulis sp. and Thryssa sp.) dominated in the recordings, while westward along the Mekran coast, sardines (CLUPEIDAE: Sardinella sp. and Dussumieria acuta) were more common. The catch rates of pelagic fish were low (Table 1).

Distribution and abundance of demersal fish

The distribution of demersal fish is shown in Fig. 3. The highest abundances were found in Sonmiani Bay. Catfish (Arius sp.) dominated the catches and catch rates up to 6 tonnes/hour were obtained. Croakers (SCIAENIDAE), grunts (POMADASYIDAE) and pomfrets (Pampus sp.) were present in the catches in waters shallower than 50 m. In deeper waters, the threadfin bream (Nemipterus japonicus) was frequently caught.

Comments

The number of fishing stations is too small to indicate with any

certainty the species composition and the obtainable catch rates within the survey area. In the next cruises, the fishing time will be considerably increased in order to have more and better data on species composition, distribution and abundance.

Mesopelagic fish

The distribution of the mesopelagic fish layer (DSL) is shown in Fig. 4. The layer consisted mainly of lantern fish (MYCTOPHIDAE) and was most dense just off the continental shelf of the western Mekran coast. It stayed at depths between 150 and 300 m during the day and ascended, as usually, to the surface at sunset.

Plankton

The echo recordings originating from planktonic scatterers including Euphausiids, small squids, jellyfish and fish larvae, is shown in Fig. 5.

Hydrography

The distribution of temperature, salinity and oxygen are shown in Figs 6-21. Two features are clearly noticed from these figures:

1. The sinking of "Winter water" downward along the shelf, which brings high oxygen water masses down to depths between 150 and 200 m. This water is formed by cooling (heat loss to the cold air masses) in the near-shore, shallow water areas.

2. The pronounced intermediate salinity minimum which occurs in most sections between 100 and 200 m depth.

REMARKS

Except for minor faults which were repaired during the cruise, the equipment worked satisfactorily. The working capacity and qualifications of the staff members were excellent.

"Dr. Fridtjof Nansen" will depart from Karachi on 13 February, at 1600 hrs.

Karachi, 11 February 1977.

Odd Nakken

Copies to: The Director,
Institute of Marine Biology,
University of Karachi.

The Director,
Department of Fisheries,
Karachi.

The Director,
Institute of Marine Research,
Bergen.

Table 1.
R/V "Dr. Fridtjof Nansen". Record of fishing operations. BTR: bottom trawl, SPT: small pelagic trawl.
Fish names: FAO Species Identification Sheets for Fishery Purposes and Munro.

Date	Time start GMT	Stn No	Gear type	Bottom depth m	Gear depth m	Position north	Position east	Total catch kg	Catch per hour kg	Dominant species
22.1	1345	01	KTR	2025	60-75	23°37'	67°24'	29.5.	59.0	Leiognathus sp.
23.1	1118	02	BTR	57	57	23°53'	67°07'	45.0	56.3	Pomadasys maculatus Pomadasys hasta Sphyraena jello Decapterus macrosoma
25.1	1210	03	BTR	95	95	24°01'	66°32'	318.3	238.7	Nemipterus japonicus Ilisha megaloptera E. chlorostigma Carangoides malabaricus Cuttlefish
26.1	0205	04	BTR	67	67	24°12'	66°48'	503.5	503.5	Trichiurus lepturus Scoliodon sp. Rays Pomadasys maculatus Pomadasys hasta P. argenteus L. argentimaculatus
26.1	0455	05	BTR	55	55	24°14'	66°52'	159.4	159.4	P. argenteus L. argentimaculatus P. maculatus
26.1	1140	06	BTR	20	20	24°28'	66°56'	41.3	99.1	Thryssa hamiltonii Pomadasys hasta
31.1	1655	07	SPT	2450	12	23°45'	44°46'	25.0	50.0	Diaphus splendidus
1.2	0625	08	BTR	89	89	24°49'	66°16'	19.9	38.1	Chirocentrus dorab Pomadasys hasta

Date	Time start GMT	Stn No	Gear type	Bottom depth m	Gear depth m	Position north	Position east	Total catch kg	Catch per hour kg	Dominant species
1.2	1135	09	BTR	25	25	25°09'	66°30'	1039.7	3119.1	Sardinella spp. Carangoides maculatus Lactarius lactarius Squids Skates Nemipterus japonicus
1.2	1340	10	BTR	44	44-54	25°10'	66°27'	2017.7	3026.6	Arius spp. Johnius coibor Nemipterus japonicus Otolithes ruber Lactarius lactarius
2.2	0530	11	SPT	750	200	24°53'	65°52'	24.5	49.0	Lepturacanthus savala
2.2	1230	12	BTR	15	15	25°16'	65°45'	96.6	193.2	Arius spp. Lepturacanthus savala
2.2	1520	13	BTR	24	24	25°04'	65°42'	2000.0	4000.0	Arius spp. Pomadasys hasta Johnius coibor (MUNRO) Scomberoides commersonianus
3.2	0330	14	BTR	38	38-54	28°05'	65°23'	204.0	816.2	Pomadasys hasta Drepane punctata Lactarius lactarius
3.2	1620	15	SPT	420	15	25°07'	64°57'	110.0	220.0	Euphausiids
3.2	2045	16	BTR	15	15	25°08'	64°44'	3080.2	6160.4	Arius spp. Rays Trichiurus lepturus
4.2	0625	17	SPT	450	45	24°58'	64°24'	160.7	482.2	Megalaspis cordyla
4.2	1400	18	SPT	157	0-15	25°06'	64°02'	289.1	867.3	Tenualosa sinensis (MUNRO)

Date	Time start GMT	Stn No	Gear type	Bottom depth m	Gear depth m	Position north	Position east	Total catch kg	Catch per hour kg	Dominant species
4.2	1800	19	SPT	2200	15	24°35'	63°57'	6.3	12.6	Diaphus splendidus
6.2	1310	20	BTR	12	12	24°08'	63°11'	119.1	198.6	Lethrinus mohsenoides (MUNRO) Plectorhynchus crassispina Thrissocles dussumeiri (MUNRO)
7.2	1350	21	SPT	3600	15	23°48'	62°28'	9.0	18.0	Diaphus splendidus
8.2	1055	22	BTR	22	22	25°03'	62°51'	386.6	773.3	Arius spp. Pomadasys hasta P. argenteus Pseudopristipoma niger (MUNRO)
8.2	1635	23	SPT	15	84	24°57'	62°12'	122.0	244.0	Dussumieria acuta

OBS: Bottom & Gear depths at Stn No 23 (?)

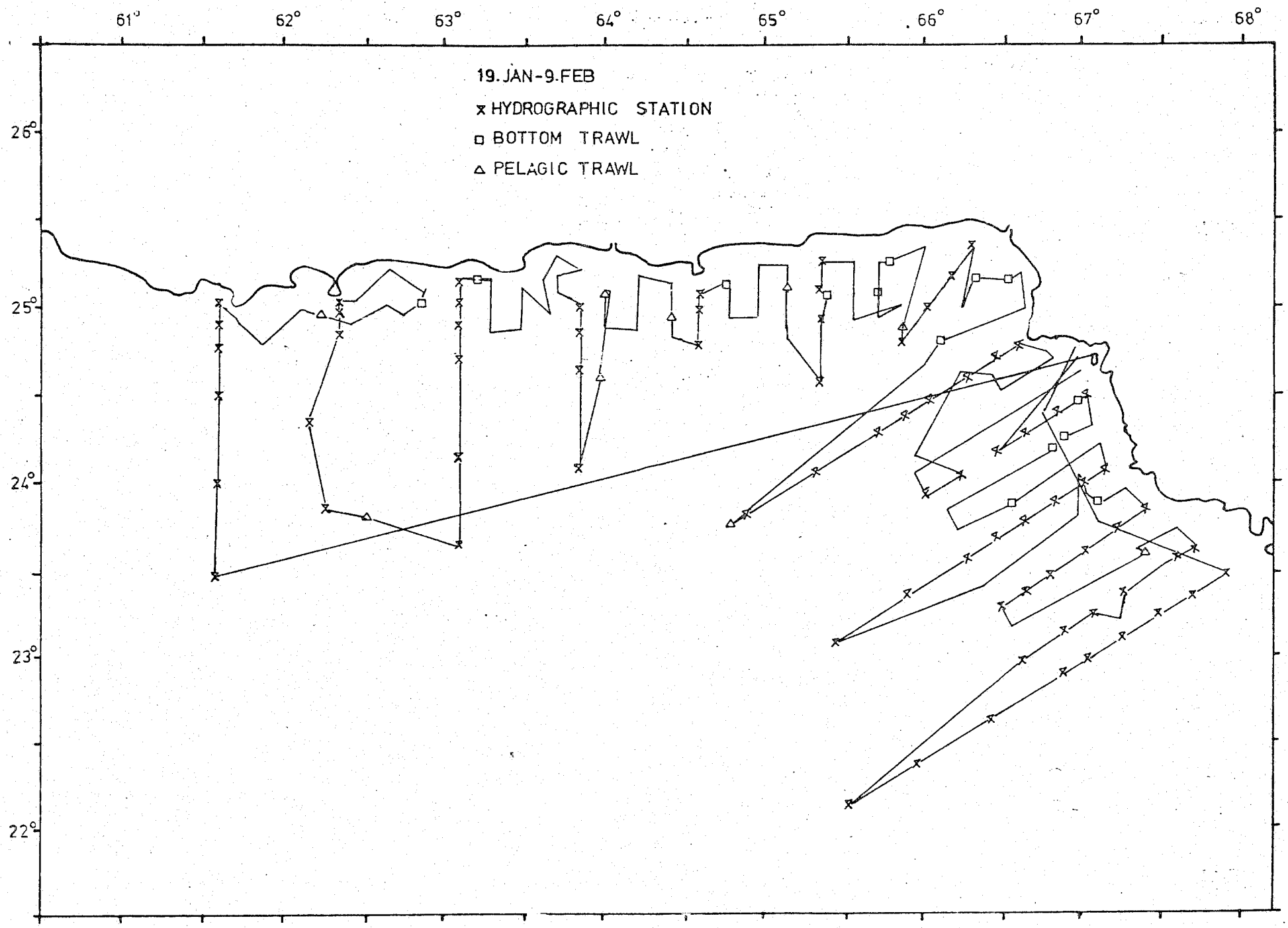
Table 3. Length- and maturity frequency distributions

SMALL FISH CR. 1+2

SPECIES	St.nos	Length in cm (below)																N	Maturity stage						
		≤5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>20		1	2	3	4	5	6	7
Dussumiera acuta	23								40	50	10							30		37	30	23	10		
Sardinella sindensis (day)	20							8	16	20	44	8	4					25	8	32	4	56			
Sardinella sp.	09-18						2	30	59	4	6							55	53	27	20				
Thryssa mystax	10-12-23						3	5	21	7	25	18	16	3	2	2		73		4	8	29	42	17	
Thryssa malabarica	12							8	12	24	28	8	0	16	4			25		16	12	24	24	24	
Thryssa dussumieri	12-20					37	47	16										56			18	33	39	10	
Thryssa hamiltonii	05										21	12	32	24		12		34		20	0	0	80		
Decapterus russellii	06			12	40	32	8	8										25		15	39	46			
Stolephorus sp.	06			4	0	40	24	12	8	8	0	0	4					25	30	30	20	10	10		
Lactarius lactarius	05-06-14				5	25	28	3	7	16	7	6						75	10	35	33	20	3		
Nemipterus japonicus	03								2	9	13	9	9	17	19	15	9	47		51	40	9			
Therapon jarbua	13										23	31	15	15	0	8	8	13					31	62	8

Table 3. Length and maturity frequency distributions. Cruise Nos 1 + 2. LARGE FISH.

Species	Stn Nos	Length in cm (below)									Maturity stage						
		10	15	20	25	30	35	40	45	N	1	2	3	4	5	6	7
Pomadasys hasta	04-13-14-20-22					8	36	16	40	54		16	12	8	40	24	
Pomadasys maculatus	04	14	49	34	3					70	20	20	1	17	27	14	
Pampus argenteus	04-10-22		2	48	48	2				52	2	59	29	28	8		4
Megalaspis cordyla	17						39	61		26	4	50	46				
Johnius carutta	10	15	65	20						20	5	45	35				
Otolithes ruber	10		10	50	40					20	10	75	15				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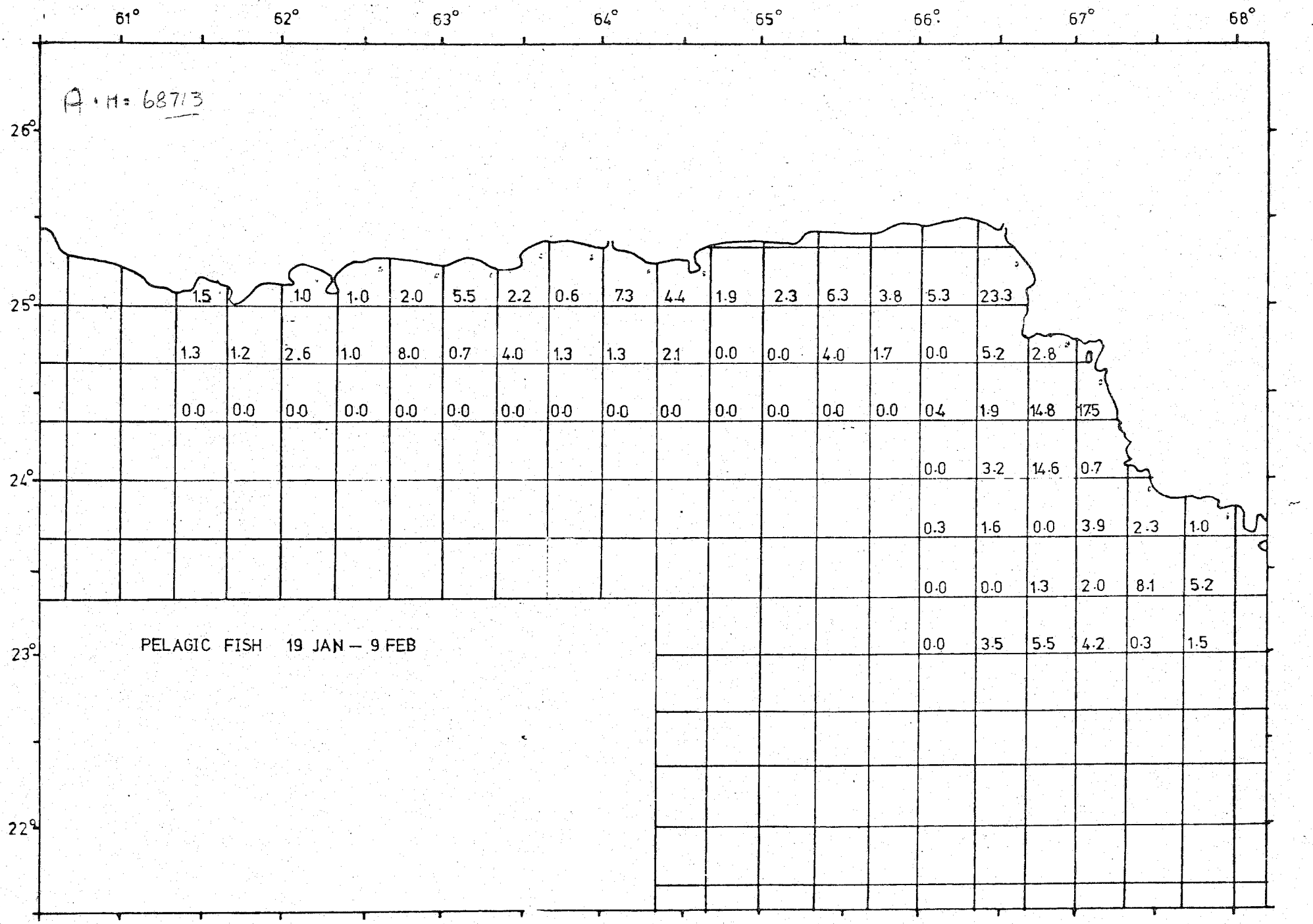
x HYDROGRAPHIC STATION
□ BOTTOM TRAWL
△ PELAGIC TRAWL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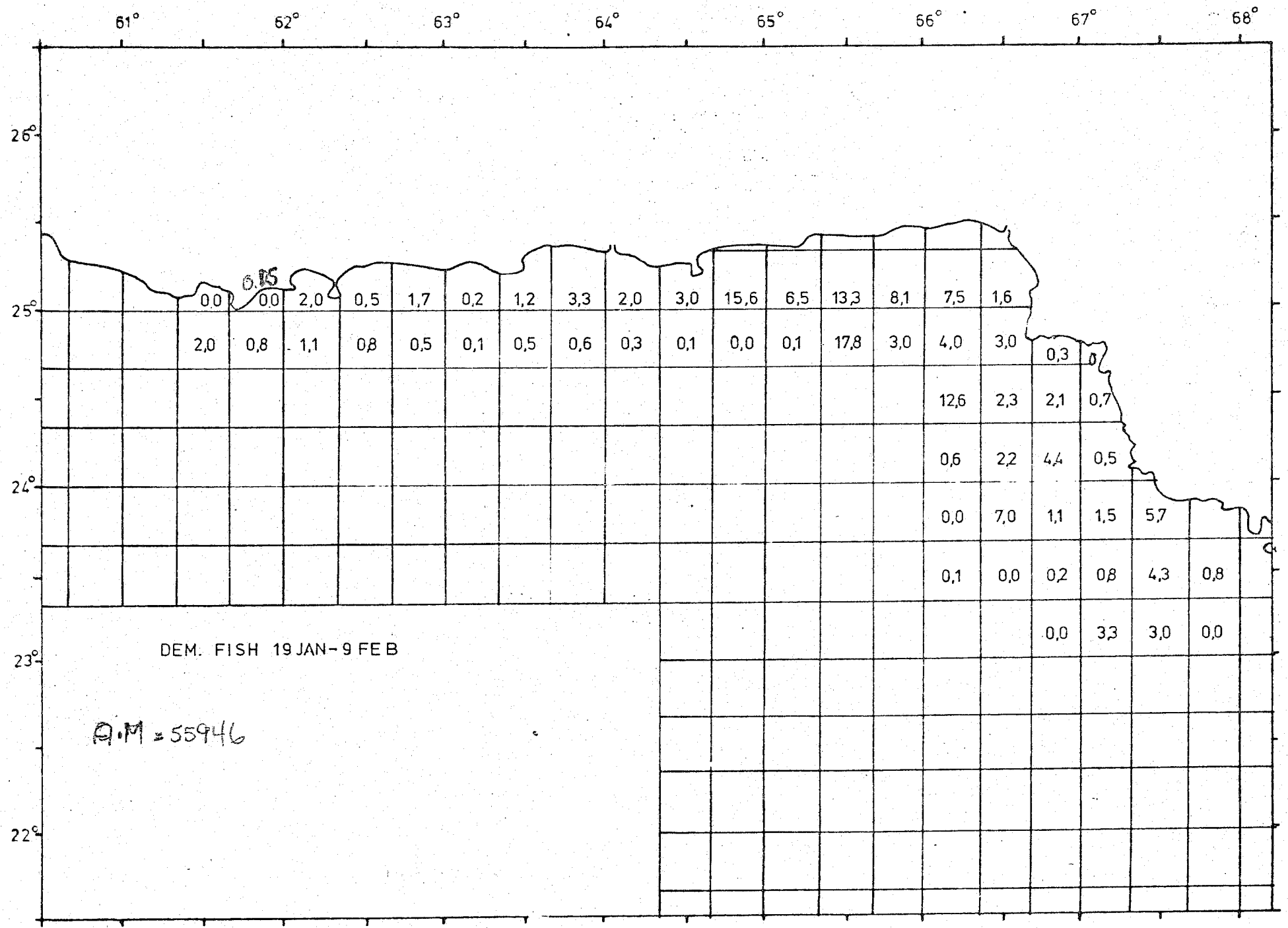
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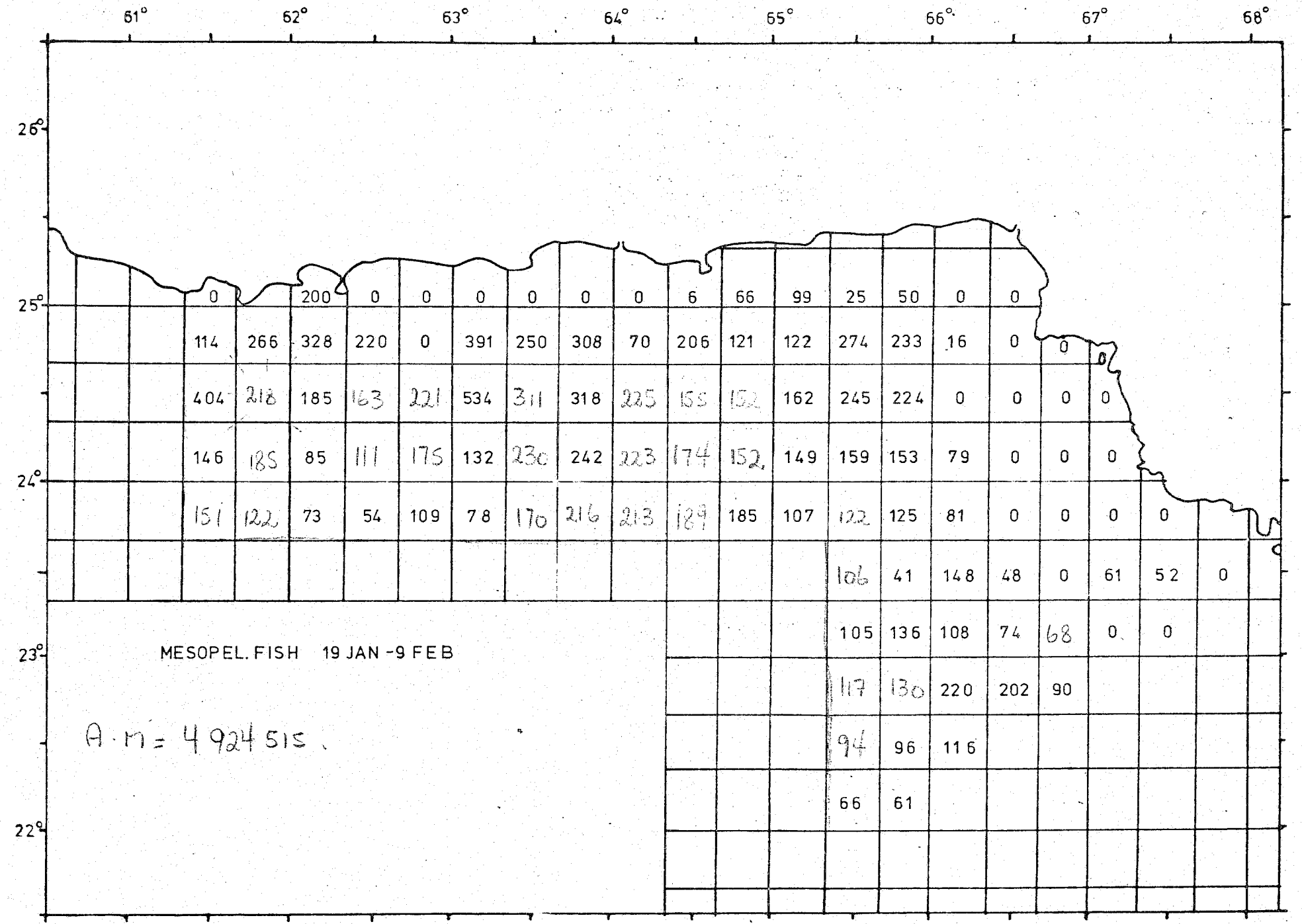
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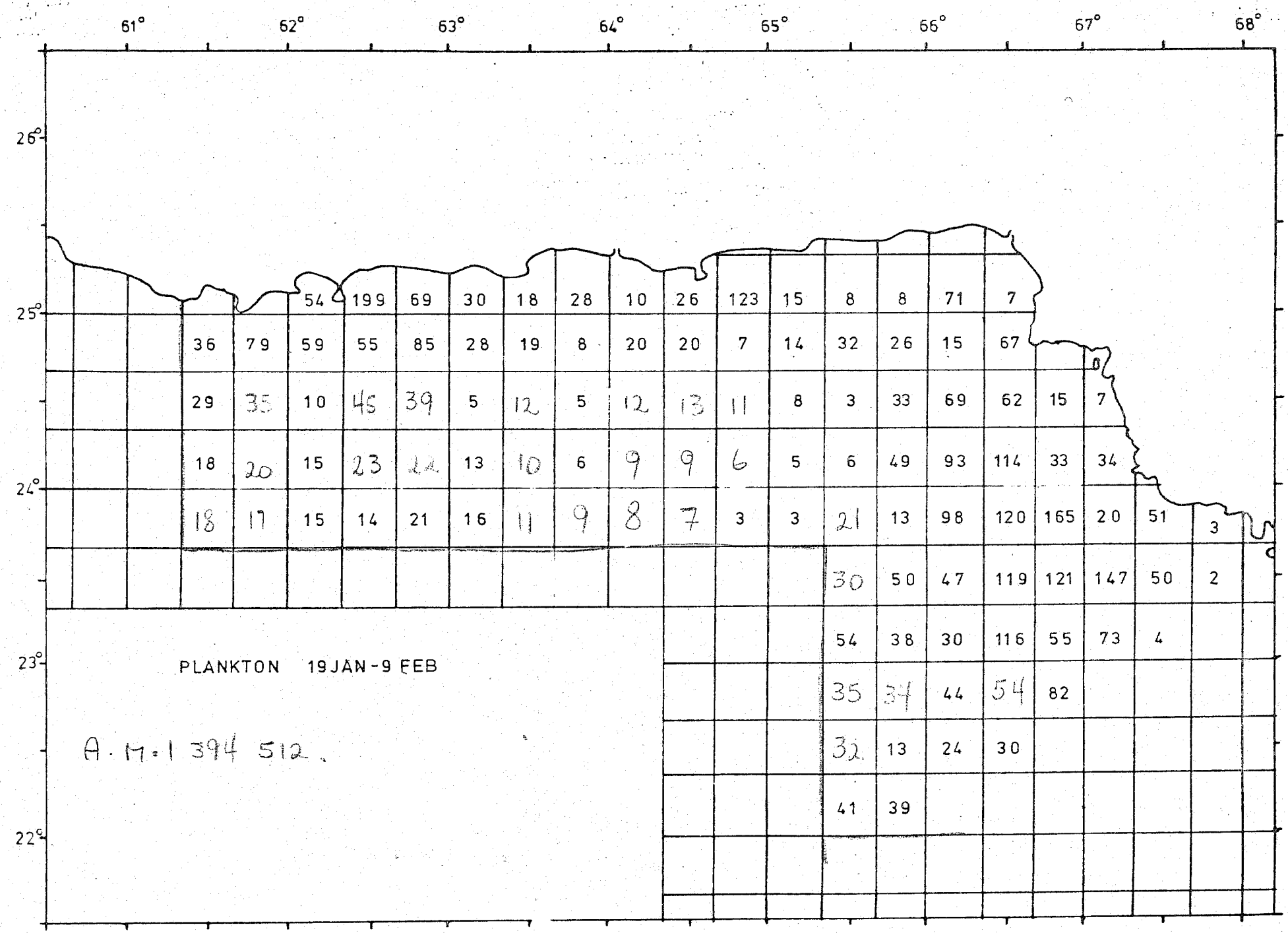
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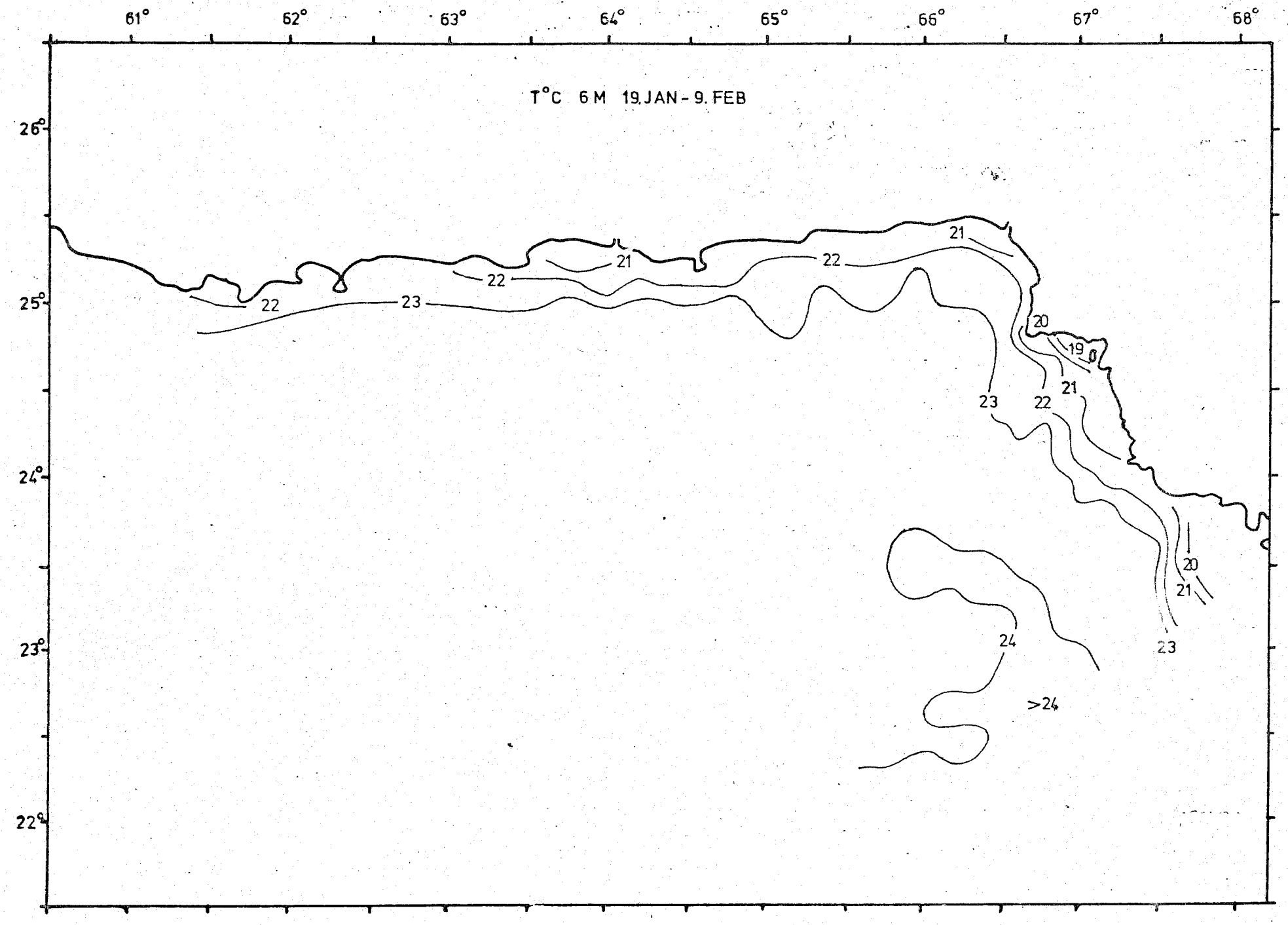
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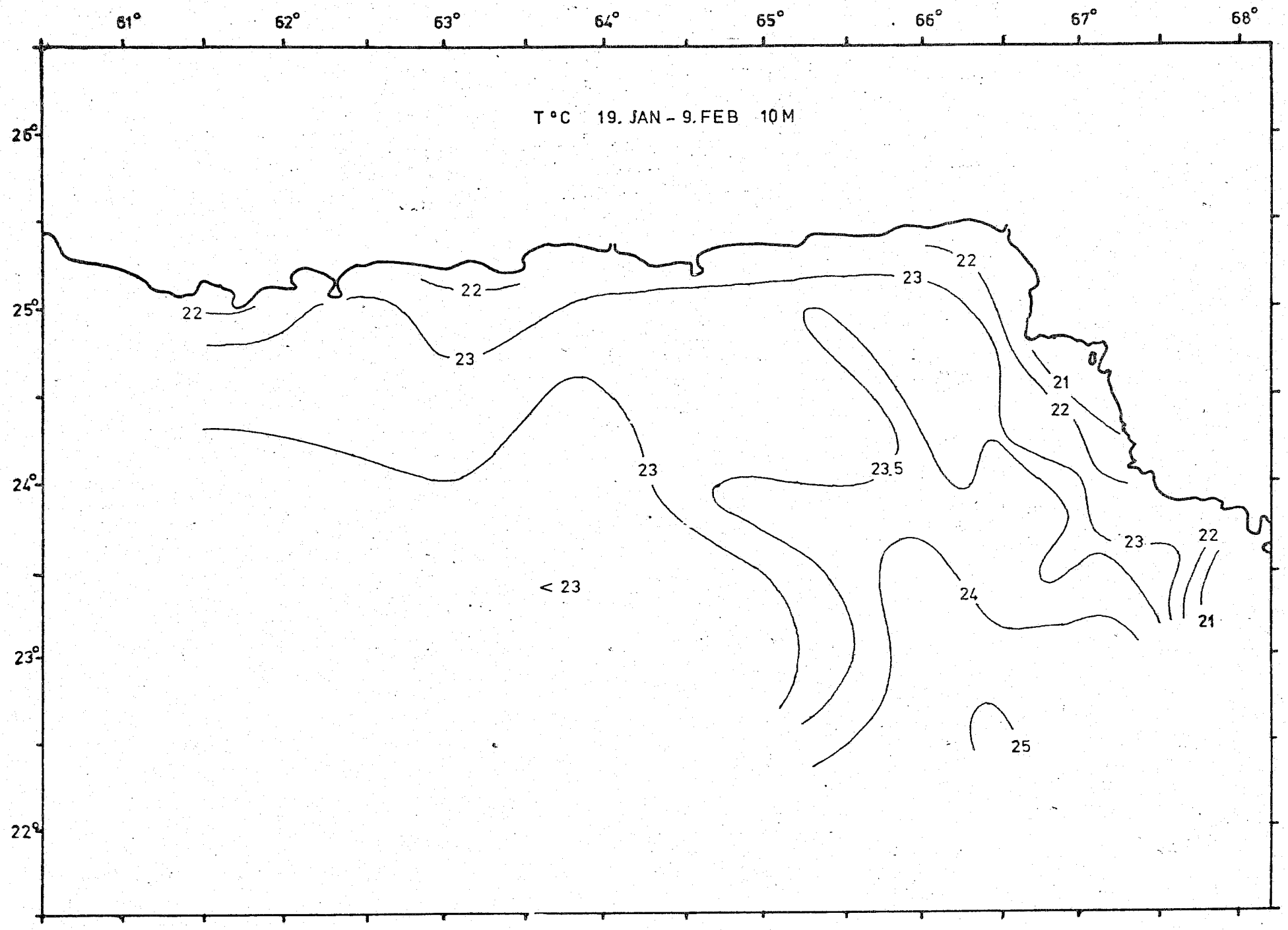
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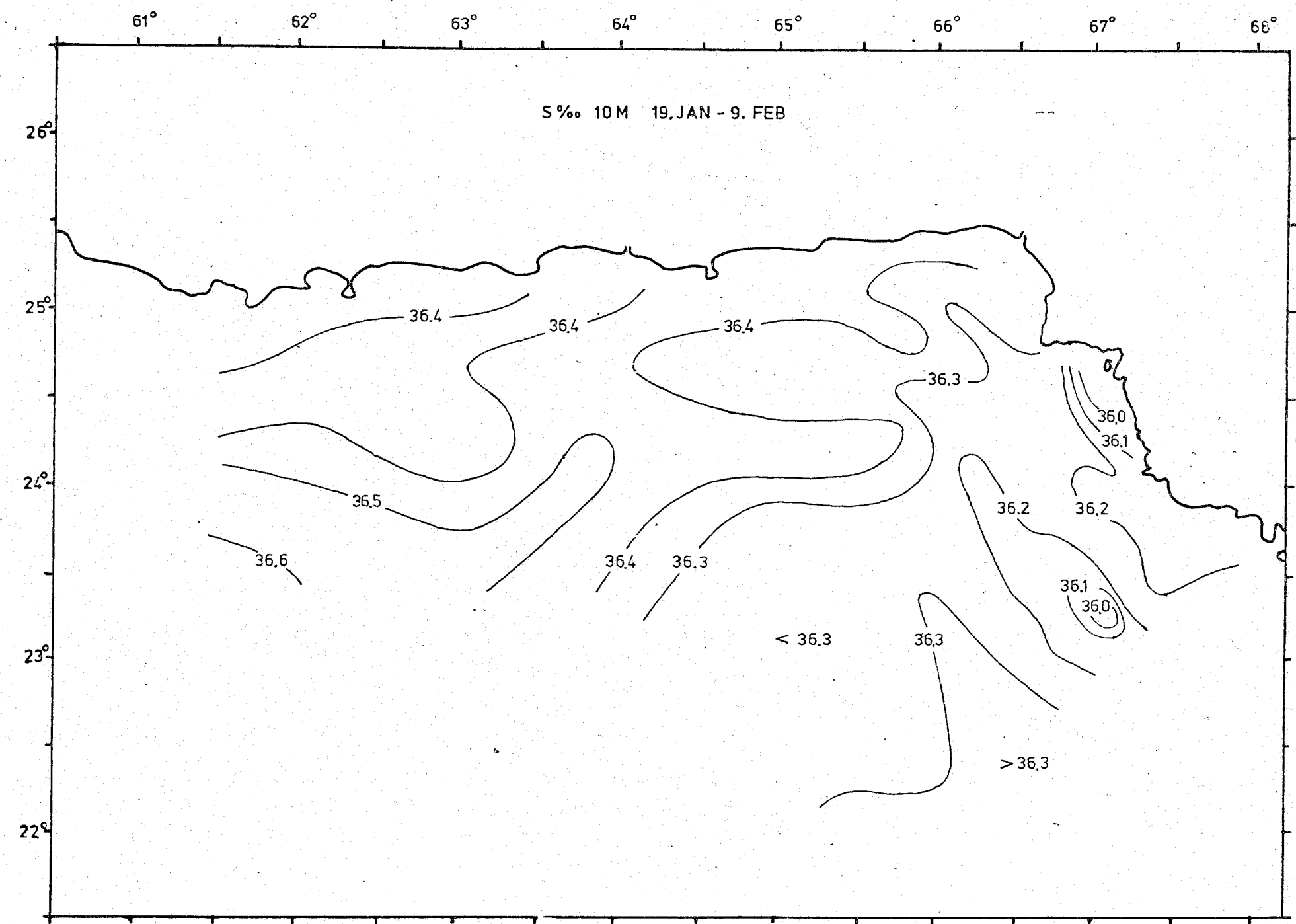
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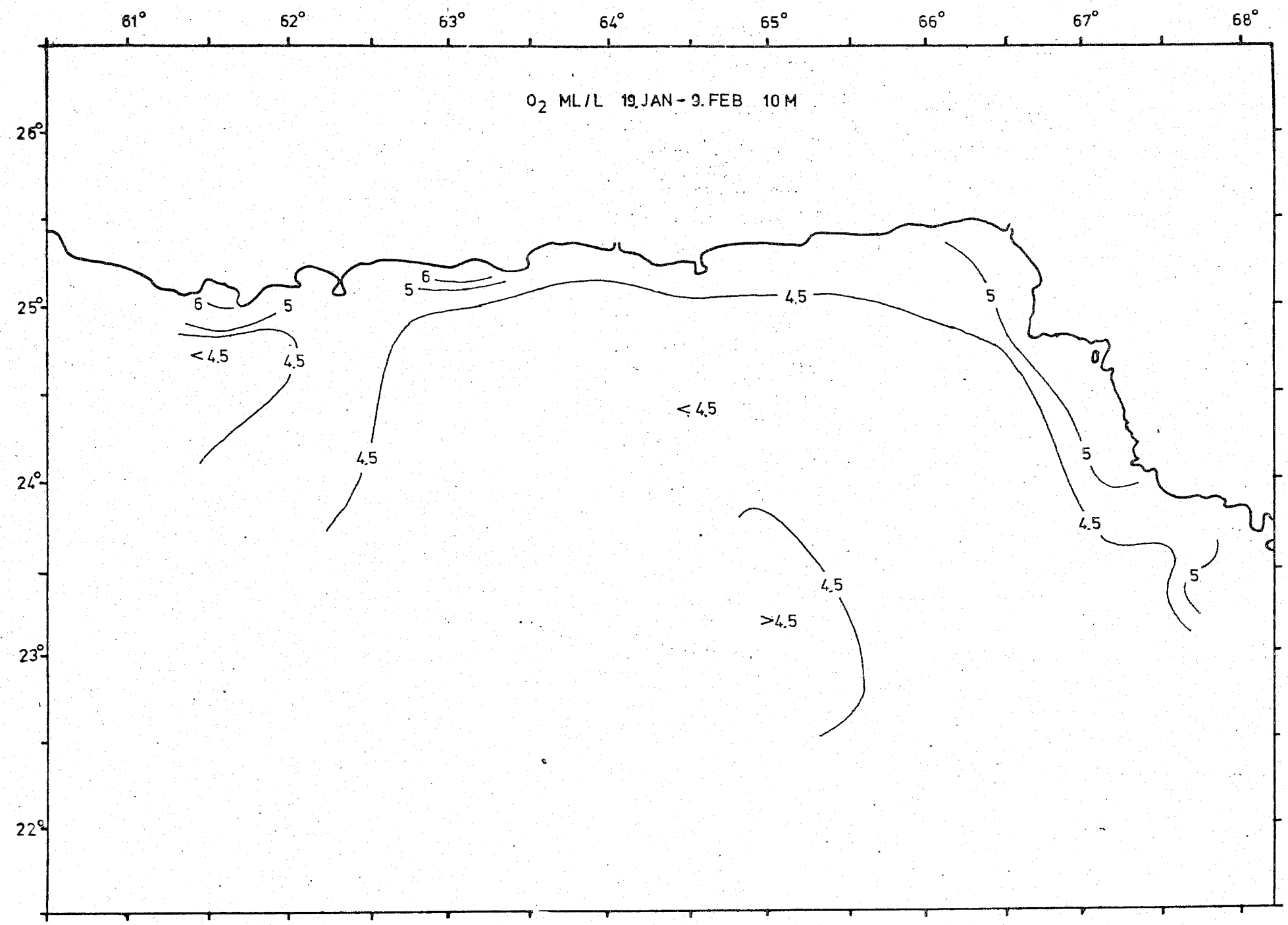
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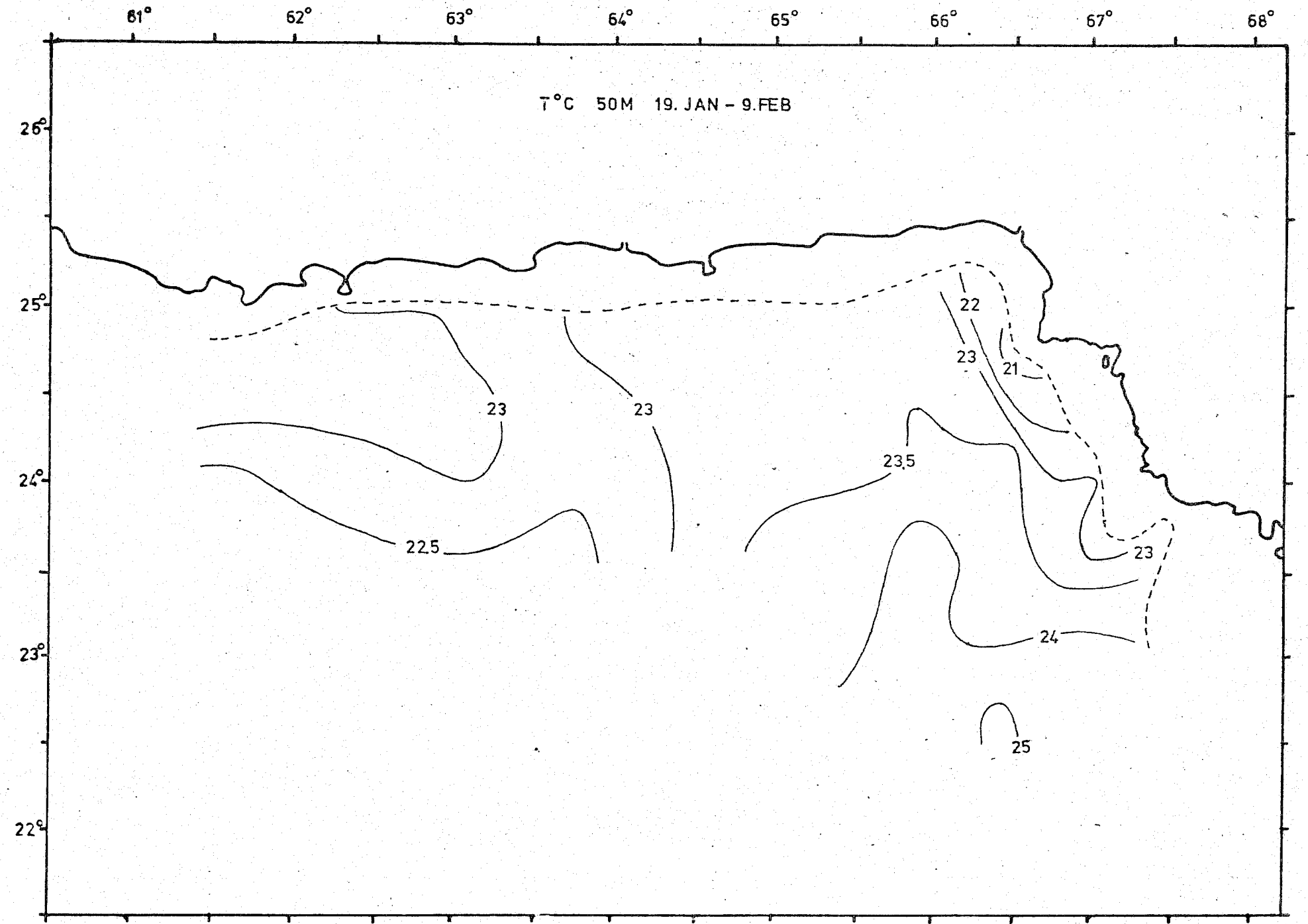
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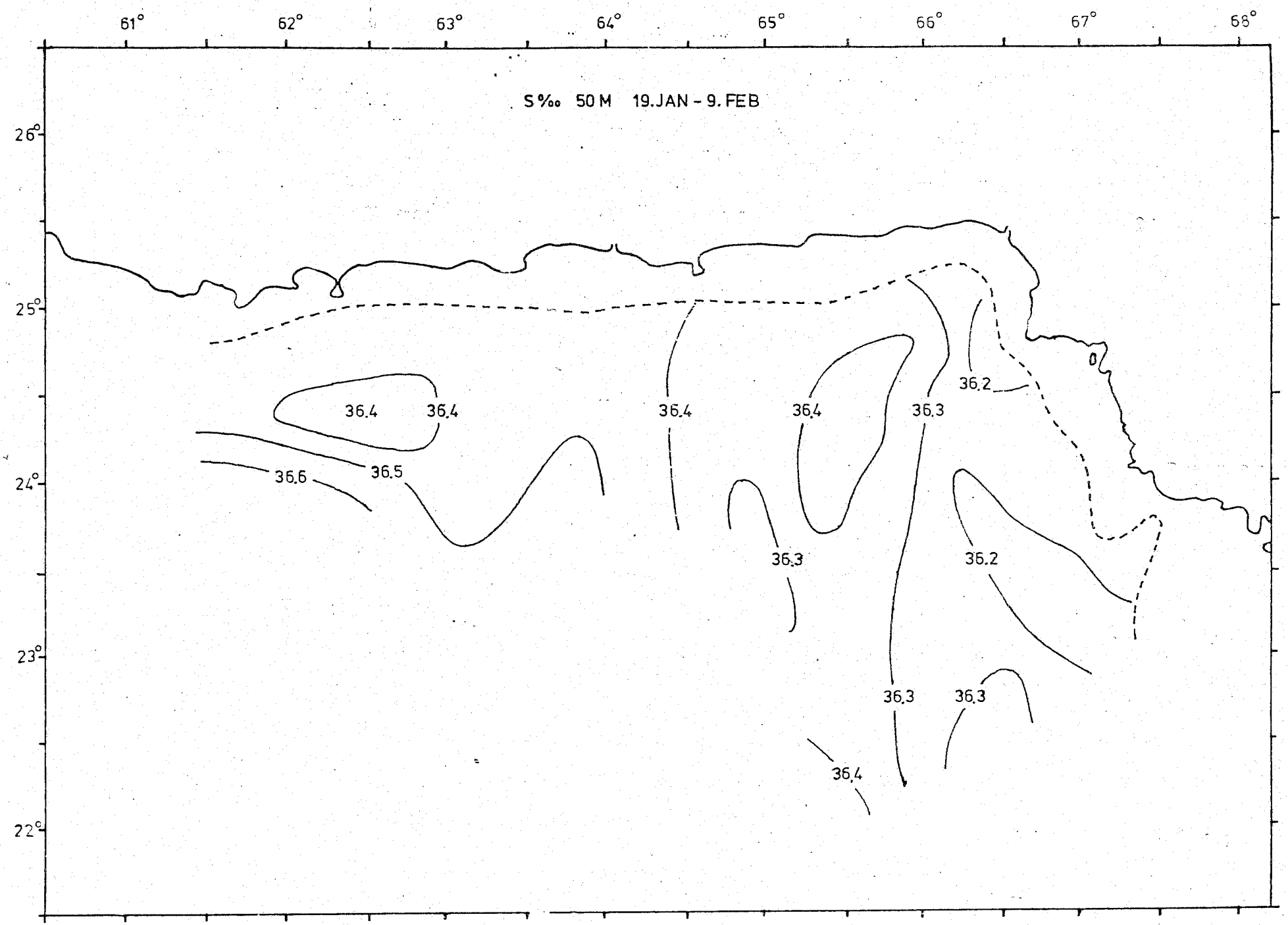
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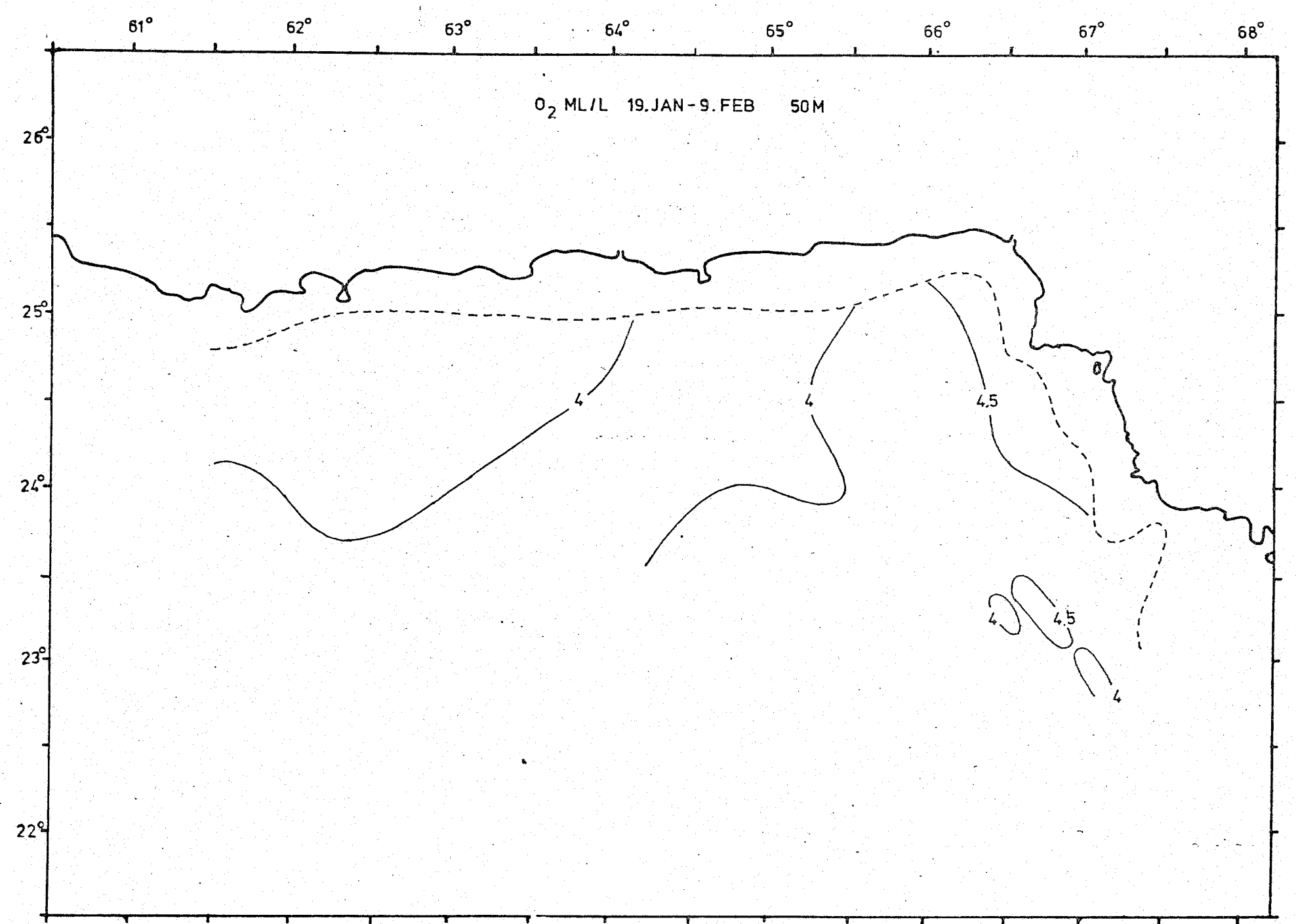
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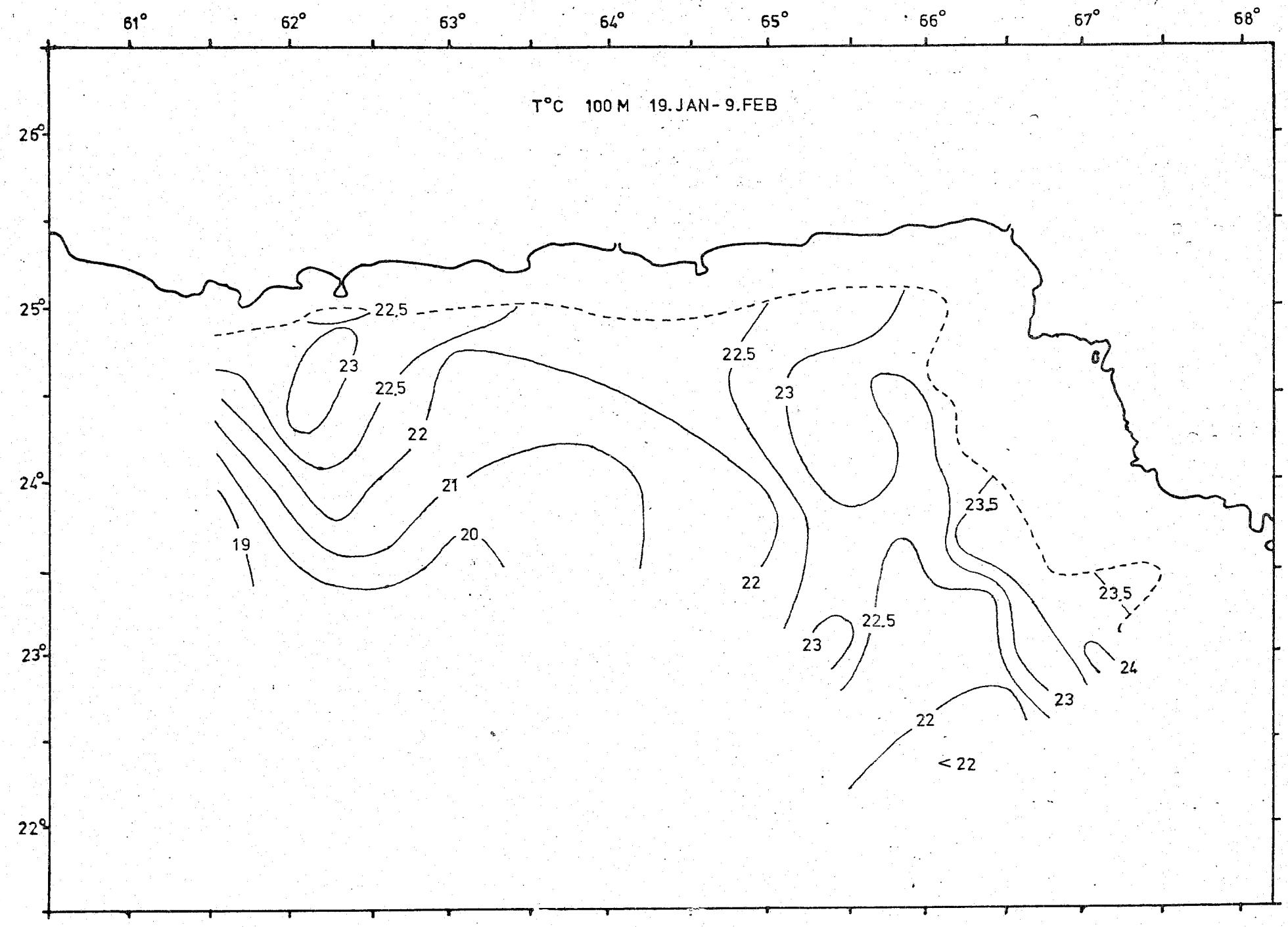
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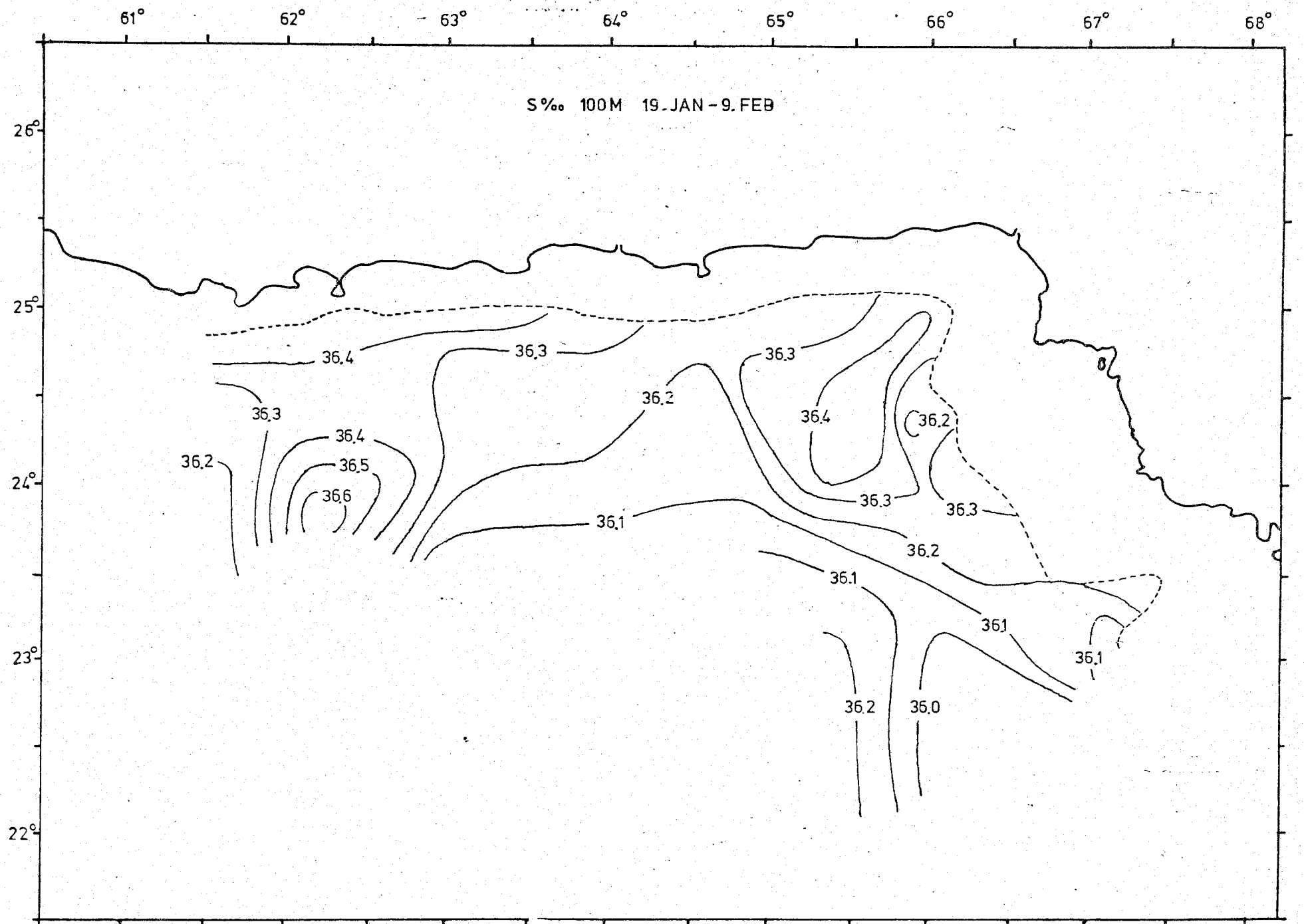
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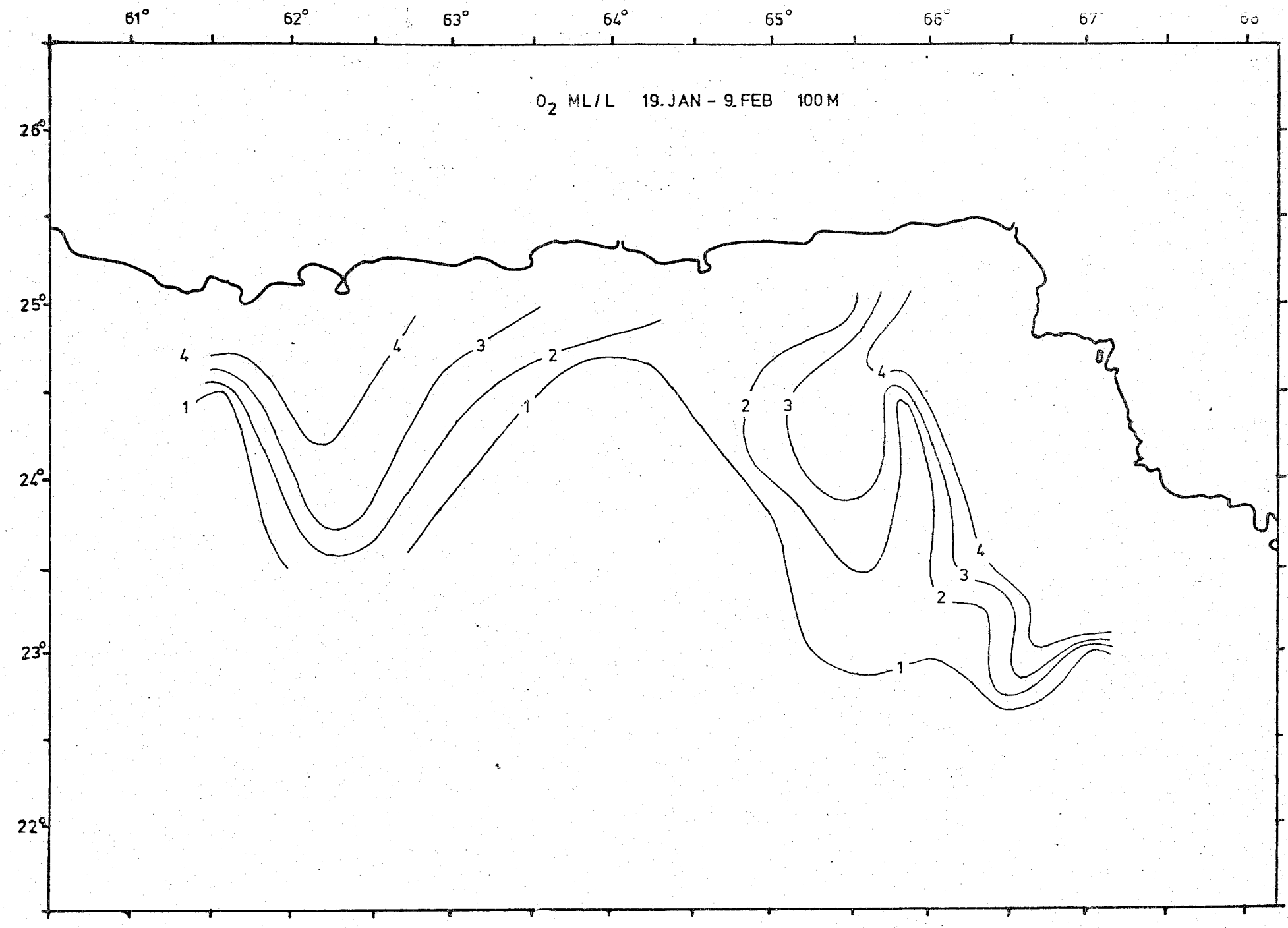
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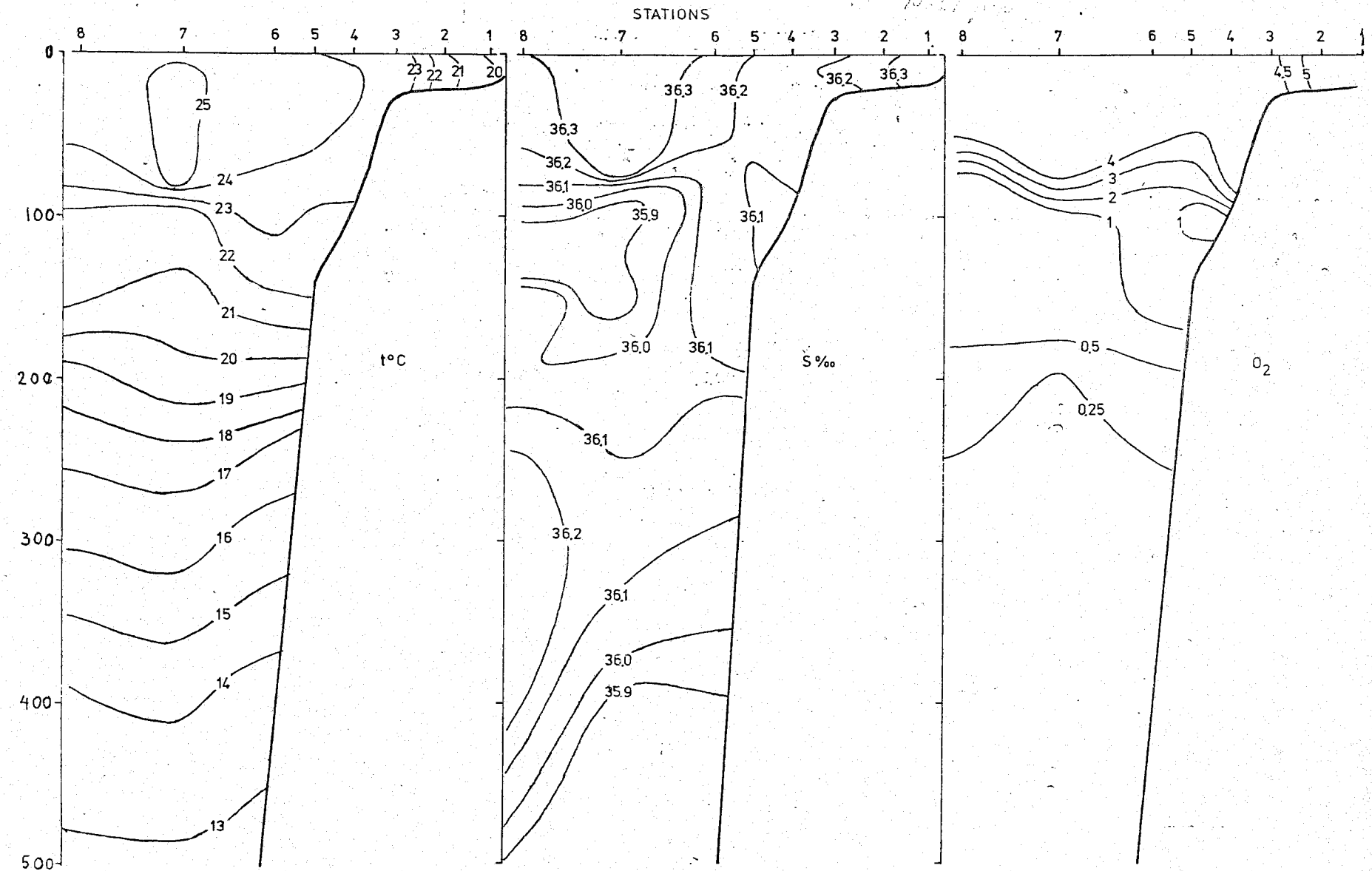
SECTION I 19-21 January 1977



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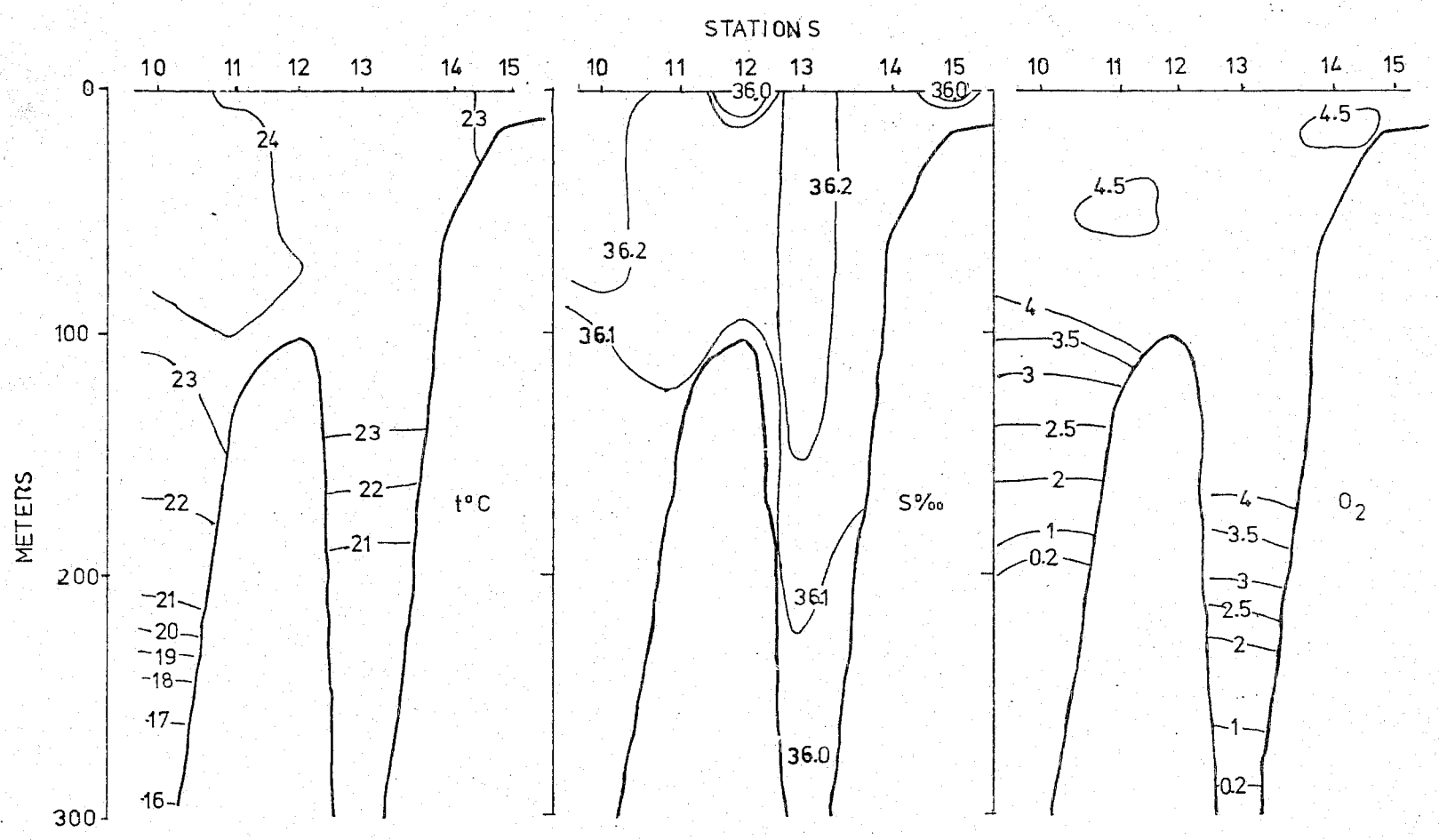

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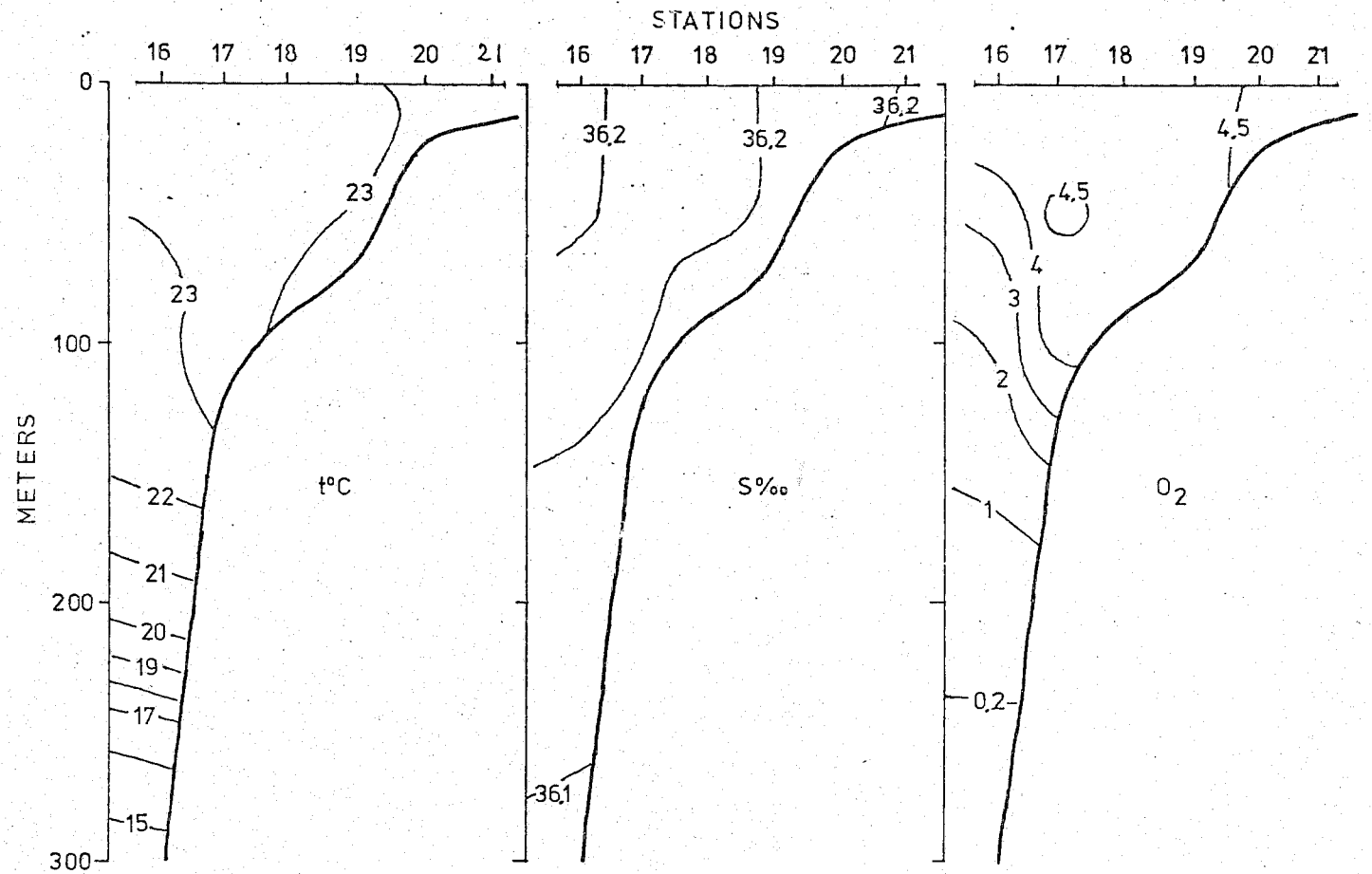

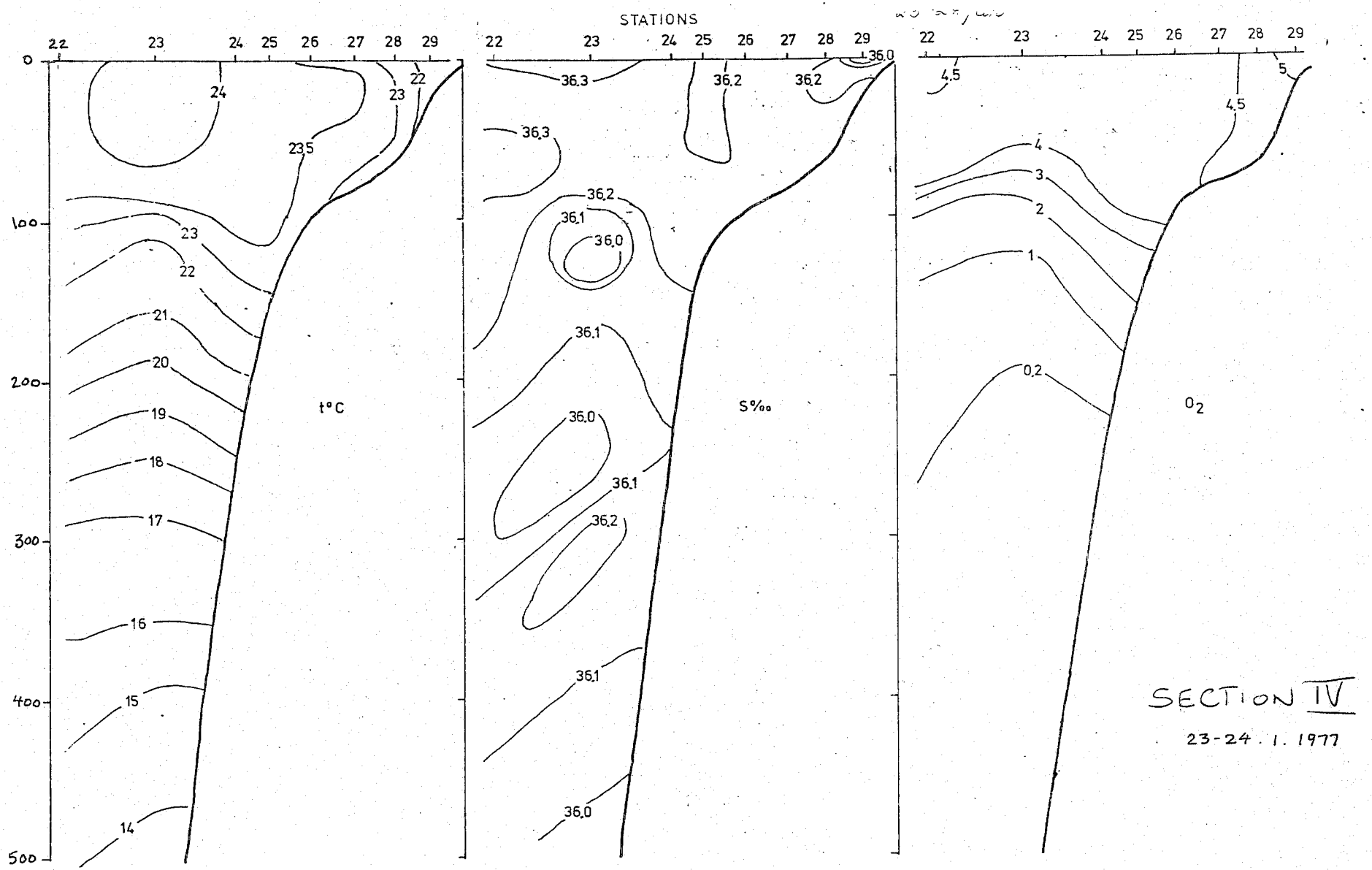
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SECTION IV
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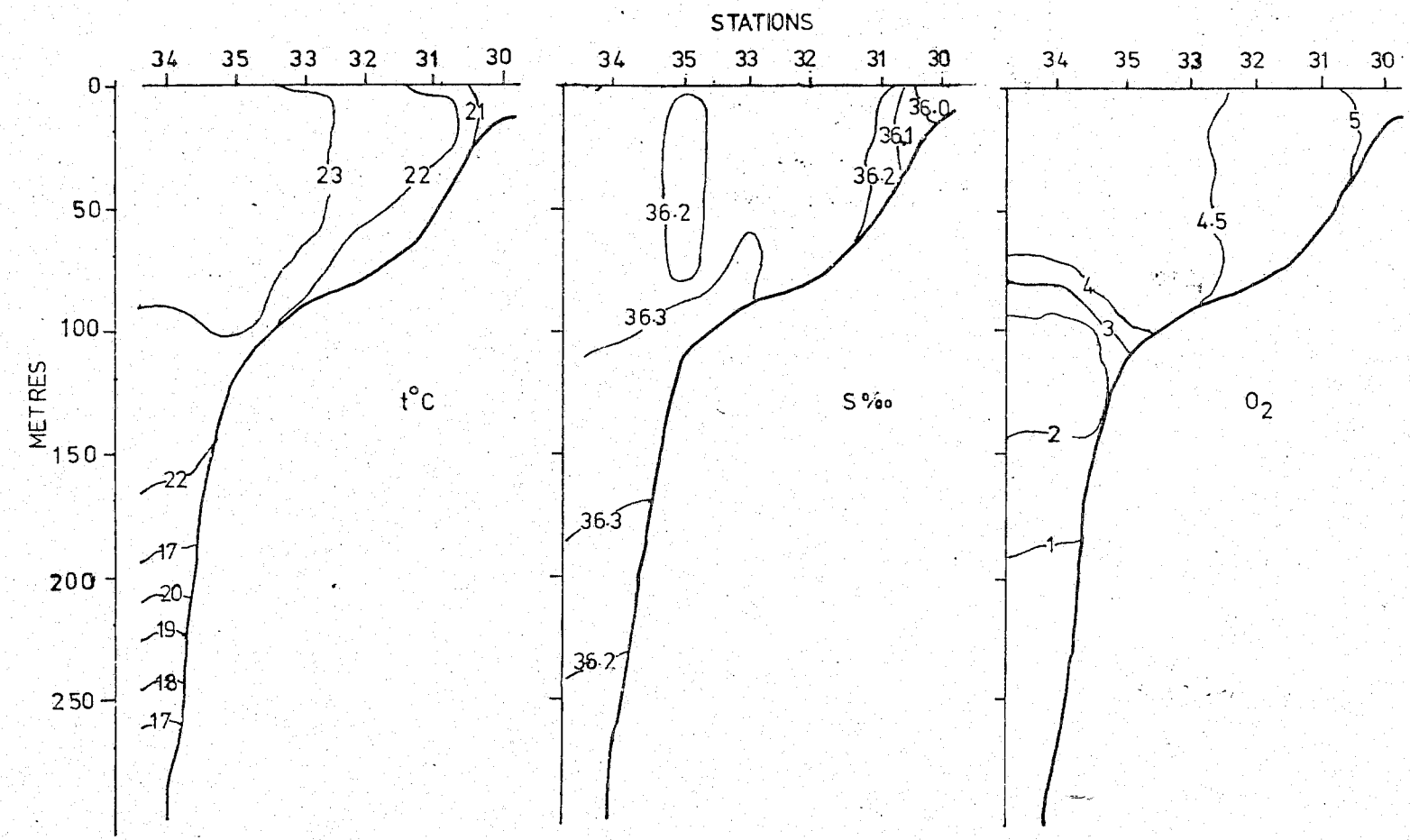
SECTION V 26-29 January 1977



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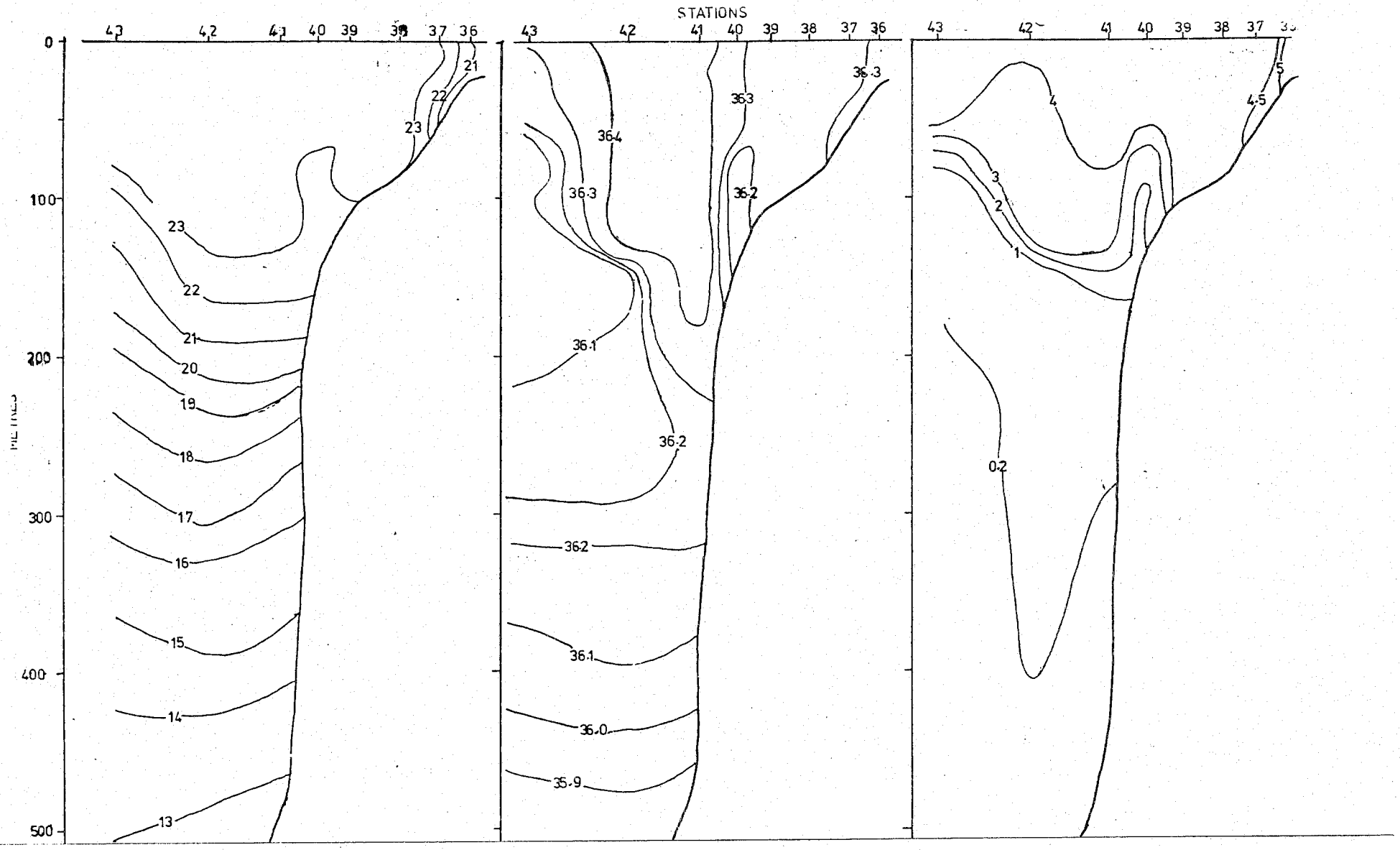

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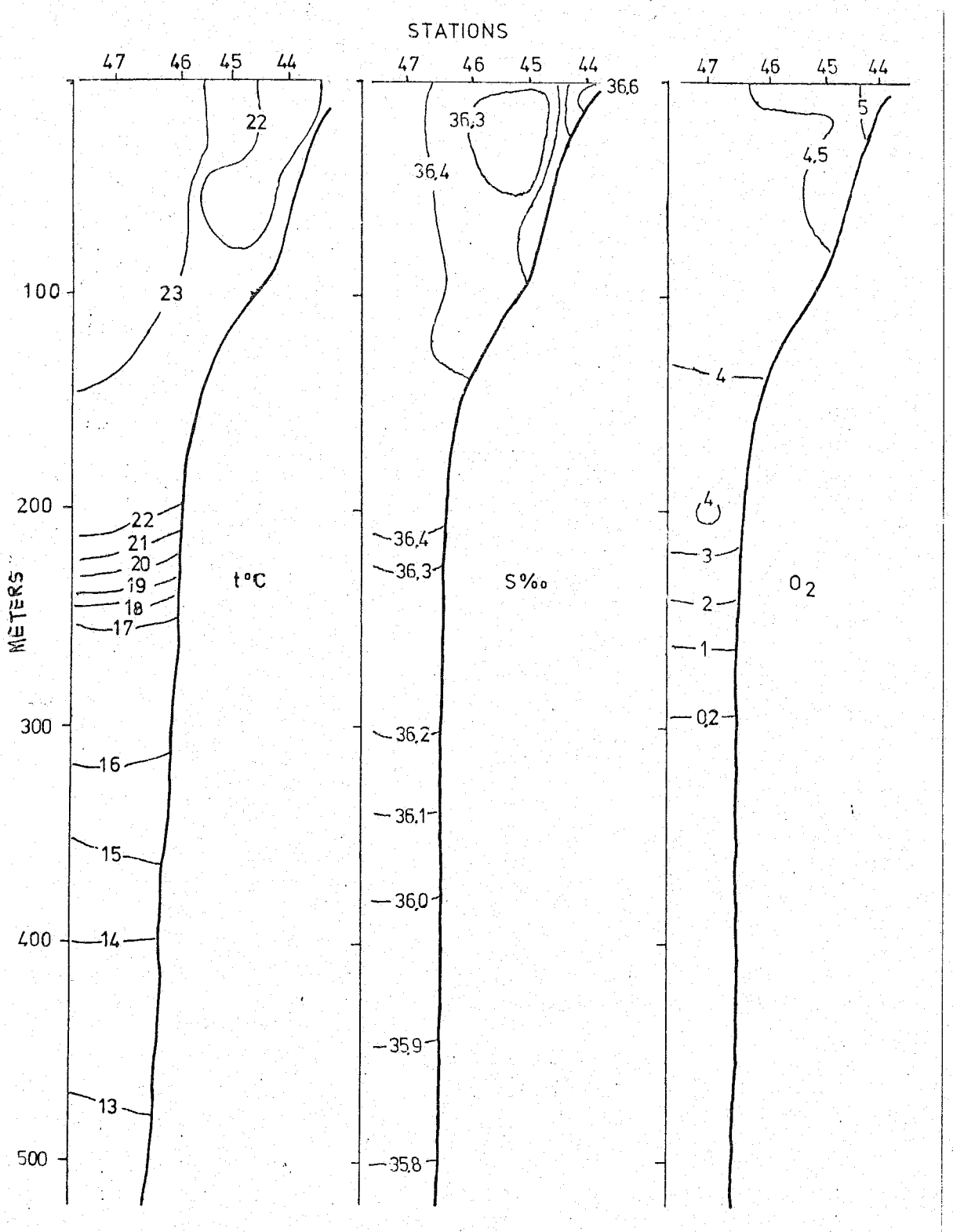

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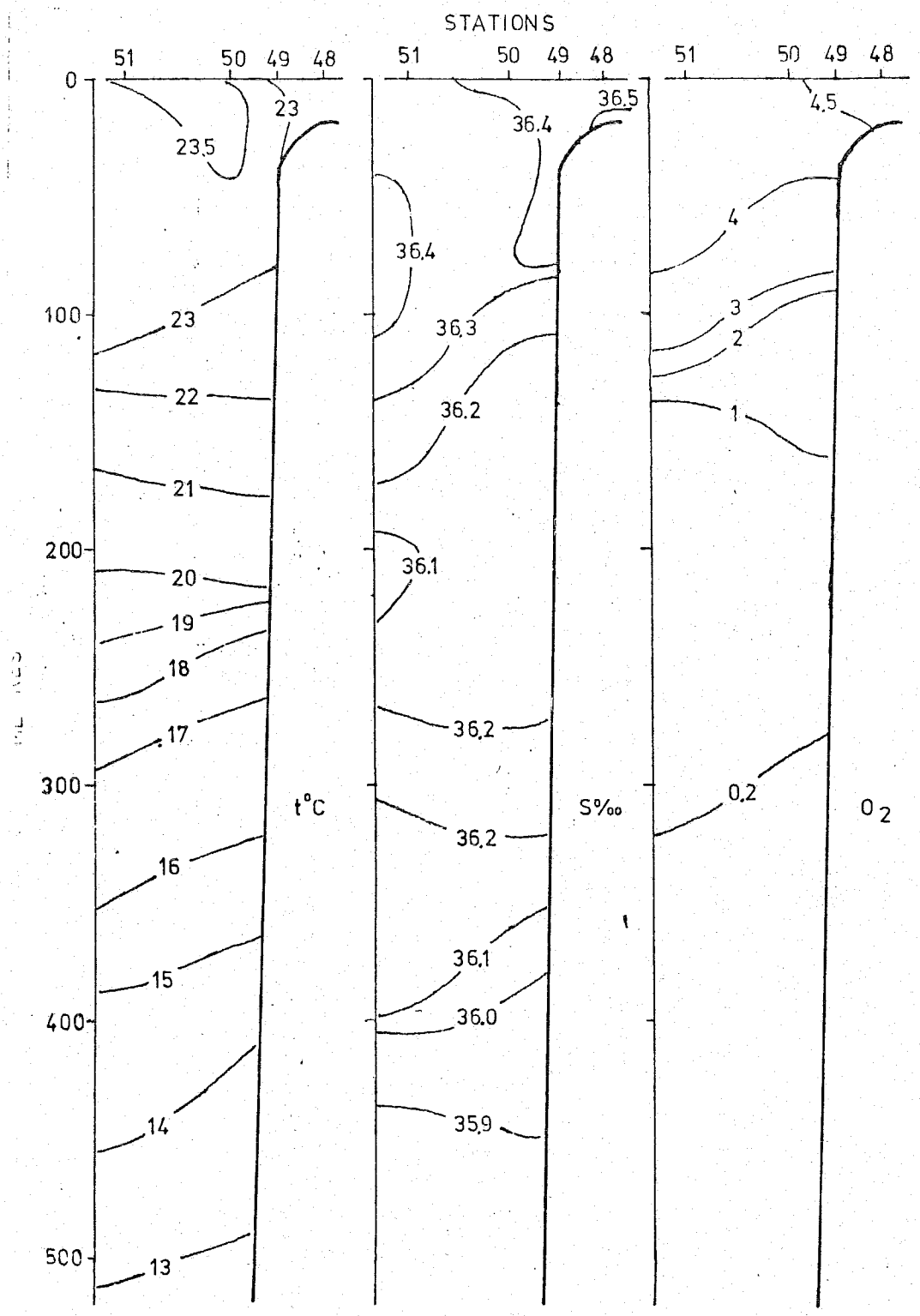

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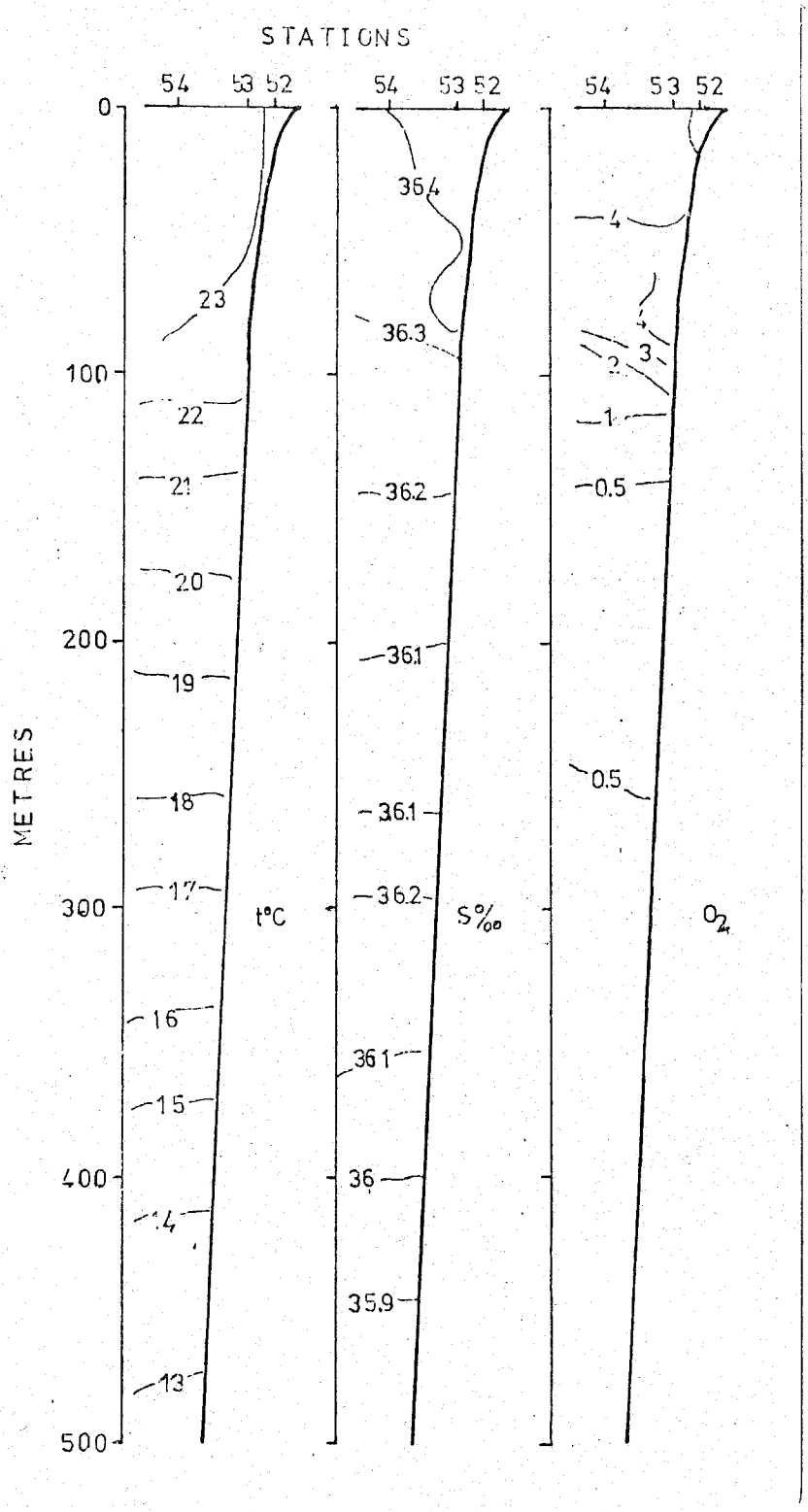

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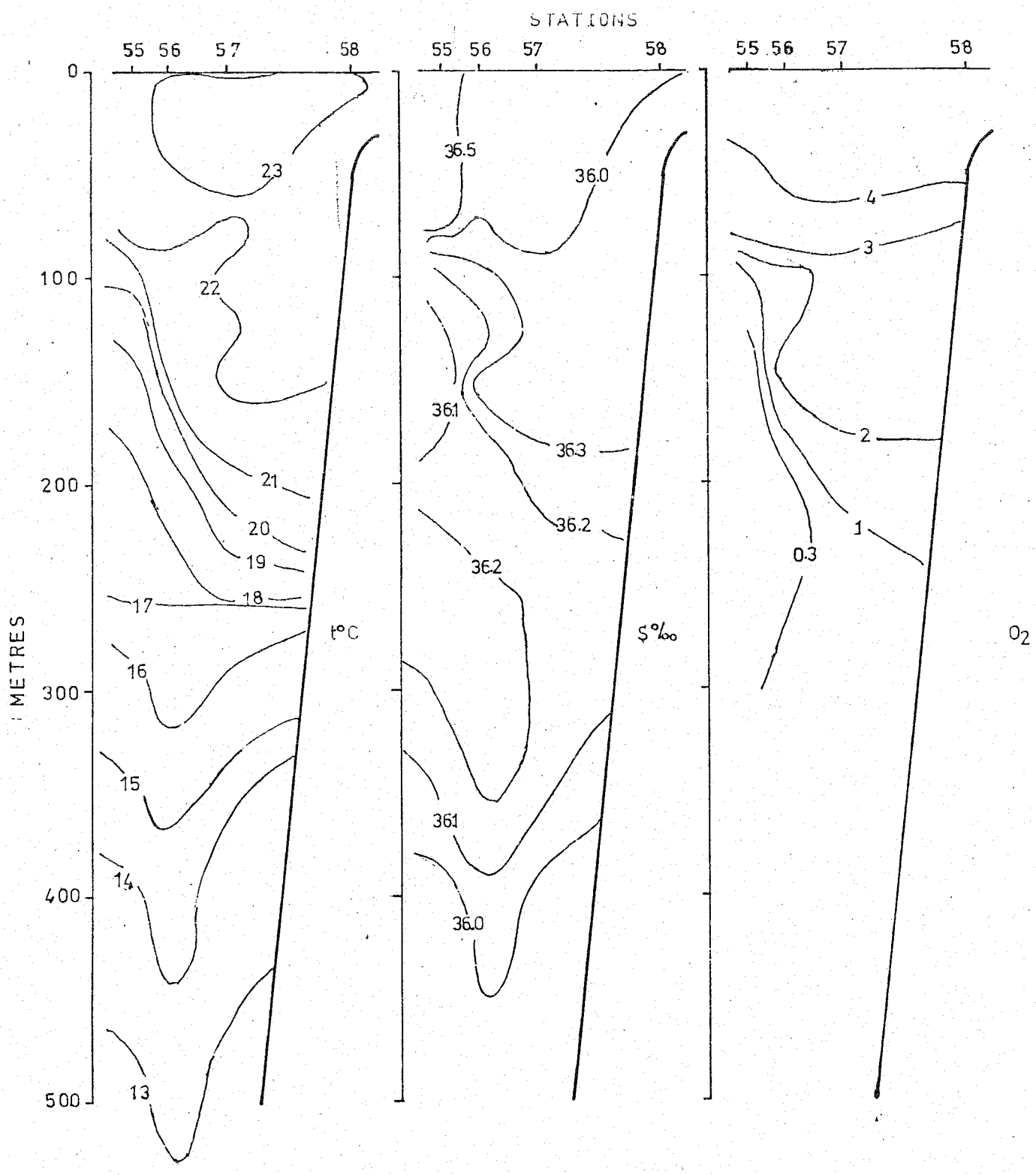
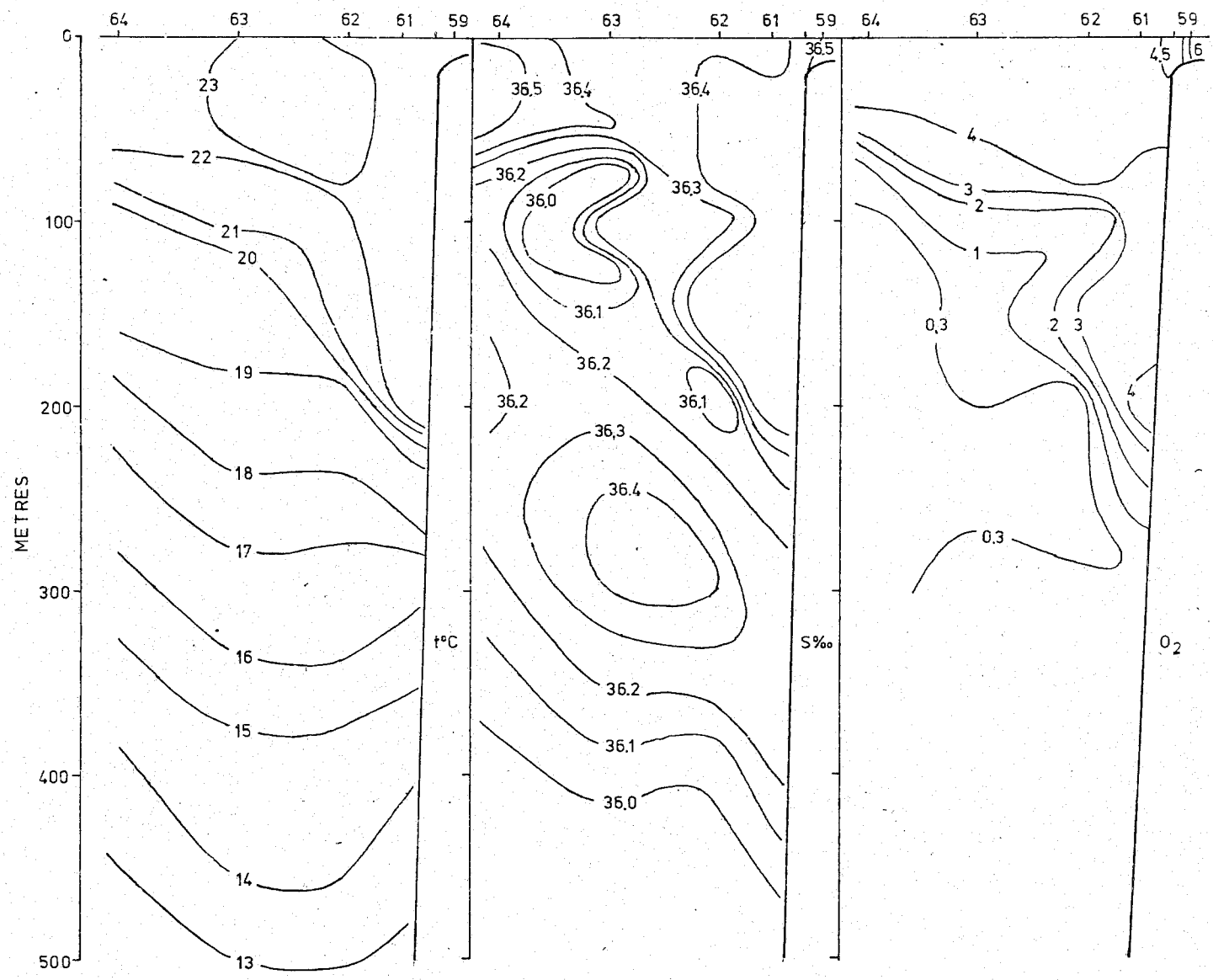
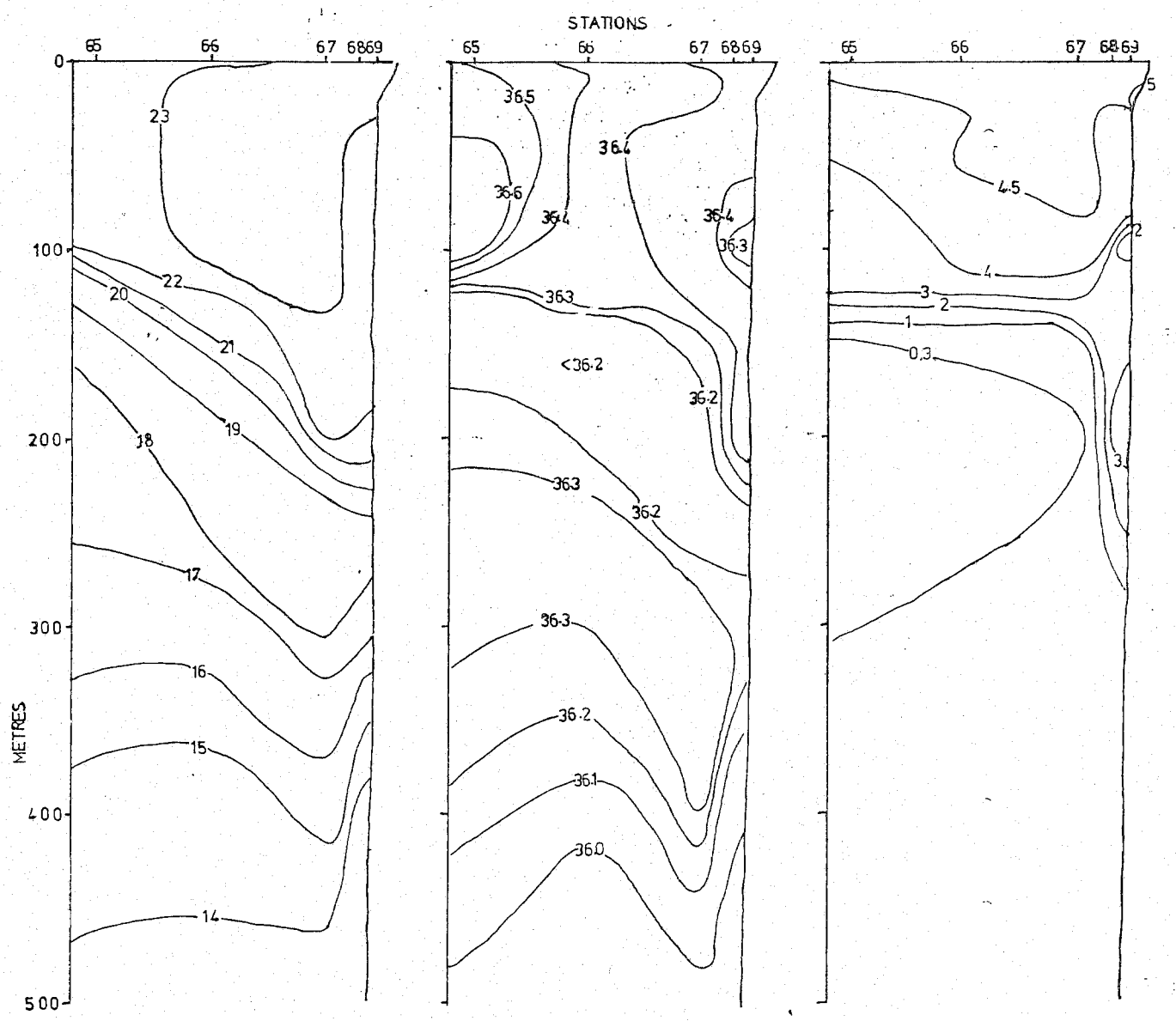


SECTION XI 6-7 February 1977



SECTION XII 7-8 February 1977



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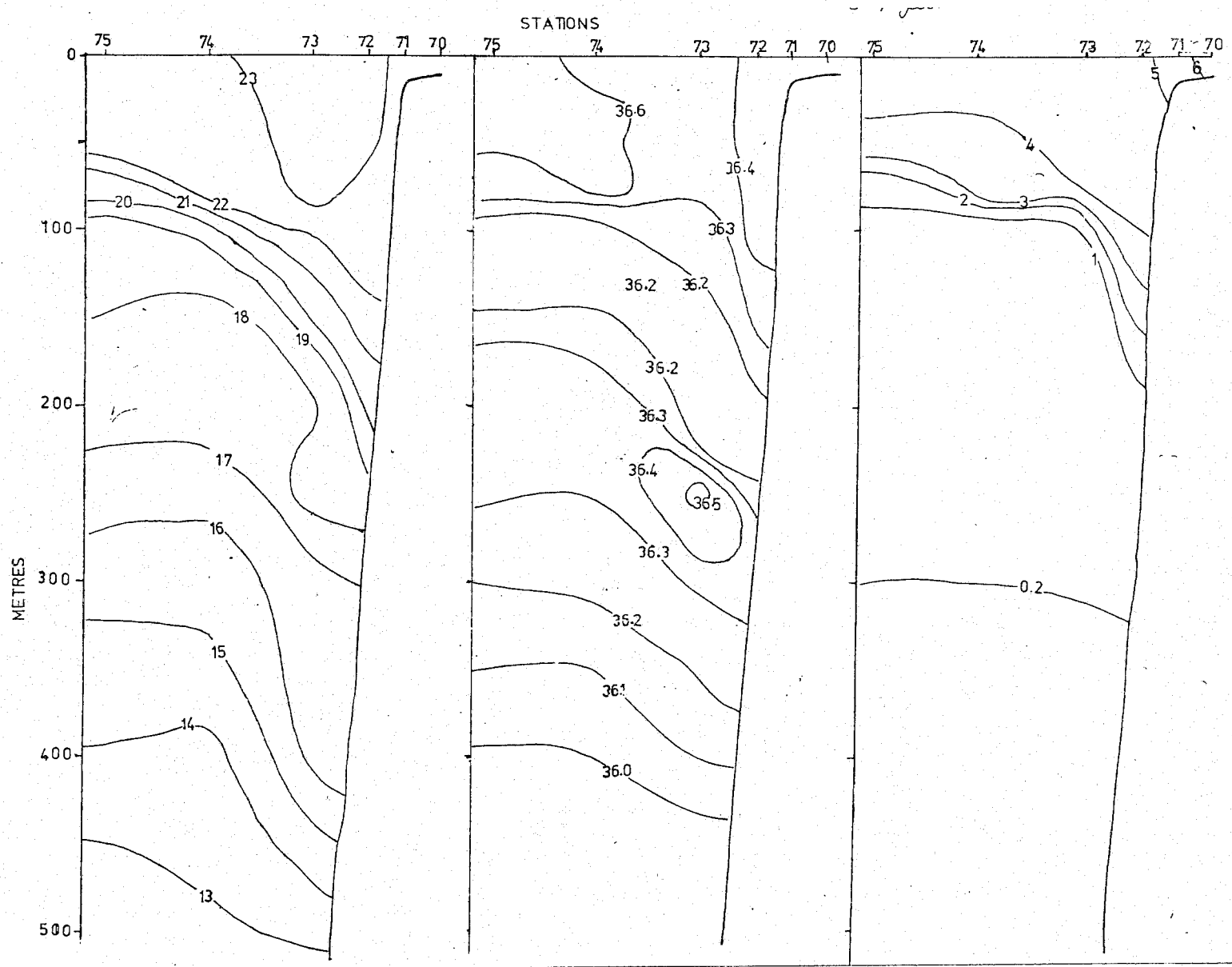

Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D.
0001	1977	119	010 23	23210	67550	15
0002	1977	120	010 08	23230	67410	18
0003	1977	120	010 11	23160	67280	20
0004	1977	120	010 13	23080	67140	75
0005	1977	120	010 17	23010	67030	125
0006	1977	120	010 19	22550	66520	400
0007	1977	121	010 00	22390	66240	500
0008	1977	121	010 05	22230	65580	500
0009	1977	121	010 09	22090	65310	500
0010	1977	121	010 18	23030	66400	500
0011	1977	121	010 22	23100	66520	125
0012	1977	122	010 00	23170	67050	95
0013	1977	122	010 05	23240	67170	500
0014	1977	122	010 07	23310	67280	30
0015	1977	122	010 09	23390	67430	10
0016	1977	122	010 21	23180	66280	300
0017	1977	122	010 23	23240	66380	115
0018	1977	123	010 02	23300	66490	75
0019	1977	123	010 04	23380	67020	60
0020	1977	123	010 06	23450	67140	20
0021	1977	123	010 08	23510	67250	10
0022	1977	124	010 04	23060	65250	500
0023	1977	124	010 09	23220	65530	500
0024	1977	124	010 13	23350	66160	230
0025	1977	124	010 15	23410	66260	110
0026	1977	124	010 17	23480	66370	75
0027	1977	124	010 19	23540	66490	75
0028	1977	124	010 21	24010	67010	60
0029	1977	124	010 23	24060	67100	15
0030	1977	126	010 09	24310	67010	10
0031	1977	126	010 13	24240	66500	40
0032	1977	126	010 17	24170	66380	75
0033	1977	126	010 19	24100	66250	75
0034	1977	129	010 19	23560	66000	250
0035	1977	129	010 22	24030	66150	95
0036	1977	130	010 16	24470	66350	20
0037	1977	130	010 18	24420	66260	50
0038	1977	130	010 21	24350	66150	80
0039	1977	130	010 23	24290	66050	95
0040	1977	131	010 02	24230	65530	125
0041	1977	131	010 05	24170	65420	400
0042	1977	131	010 10	24040	65190	500

0043	1977	131	010	18	23480	64520	500
0044	1977	201	010	18	25210	66180	10
0045	1977	201	010	21	25100	66100	65
0046	1977	201	010	24	25000	66010	115
0047	1977	202	010	02	24470	65510	500
0048	1977	202	010	24	25150	65200	15
0049	1977	203	010	02	25070	65200	30
0050	1977	203	010	05	24560	65200	500
0051	1977	203	010	09	24350	65200	500
0052	1977	203	010	23	25050	64350	10
0053	1977	204	010	00	25000	64350	75
0054	1977	204	010	02	24470	64350	500
0055	1977	204	010	22	24060	63500	500
0056	1977	205	010	03	24380	63500	500
0057	1977	205	010	06	24520	63500	500
0058	1977	205	010	08	25010	63500	45
0059	1977	206	010	17	25080	63050	10
0060	1977	206	010	19	25020	63050	20
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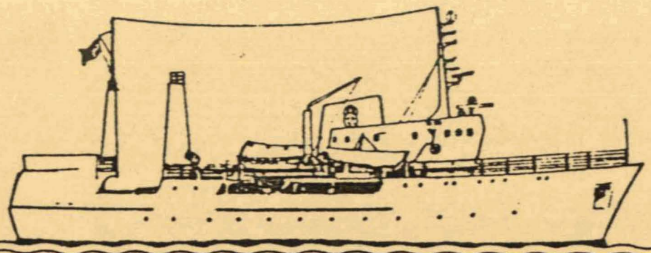


Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY CRUISE REPORT ON CRUISE NOS. 3 AND 4 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

13 February - 6 March 1977

Odd Nakken

Karachi, 24 March 1977

Institute of Marine Research, Bergen

PRELIMINARY CRUISE REPORT ON CRUISE NOS. 3 AND 4 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

INTRODUCTION

This report covers the second complete coverage of the Pakistan waters during this project.

Departure:	Karachi, 13 February 1977.
Arrival:	Karachi, 25 February 1977.
Scientific staff:	M. Arshad, I. Ahmad, S. Amjad (Department of Fisheries). J. Ali Khan (to 18 Feb), S.H. Niaz Rizvi (to 18 Feb), A.K. Showkat (Institute of Marine Biology). O. Nakken, S. Lygren, O. Knudsen, Ø. Torgersen (Institute of Marine Research).
Departure:	Karachi, 27 February 1977.
Arrival:	Karachi, 6 March 1977.
Scientific staff:	M. Arshad, M. Khaliluddin, M.A. Wahid (Department of Fisheries). S.M. Huda, S. Barkati, M. Moazzam Khan (Institute of Marine Biology). O. Nakken, S. Lygren, O. Knudsen, Ø. Torgersen (Institute of Marine Research).

Survey grid and stations are shown in Fig. 1. The most offshore stations in Sections I, XI and XIII were not occupied due to lack of time.

WORKING SCHEME

The standard hydrographic/plankton stations were worked as previously with two exceptions:

1) The amount of filtrated seawater from 0, 10 and 30 m was reduced to 2 litres.

2) After the completion of Section I the net in the Bongo 60 was changed from 180 µ to 500 µ mesh size. The flowmeter used in the Bongo was probably not functioning properly during the first coverage. The fault was repaired and the flowmeter readings obtained with the 500 µ mesh are correct. A calibration curve for the flowmeter in use is attached.

RESULTS

Table 1 shows the particulars of the fishing stations, while Tables 2 and 3 show the length and maturity distribution of the dominant species for the two first full coverages of the coast.

Distribution and abundance of pelagic fish (Fig. 2)

The main features of the distribution pattern are similar to those observed during Cruise Nos. 1 and 2, the highest abundances were found south of Karachi and in Sonmiani Bay. In the area south of Karachi, anchovies (species of Thryssa and Stolephorus) constituted the major portions of the catches, and trawl hauls yielding 15-20 tonnes/hour were obtained. Along the Makran coast, the pelagic fish recordings were dominated by various species of sardines and anchovies. Between Astola Island and the mainland, good recordings of oil sardine (Sardinella longiceps) were observed. The fish was schooling over bottom depths of 10-15 m and the conditions seemed ideal for purse seining. A purse seine set gave, however, no catch at all, as all the fish (10-15 tonnes) jumped over the corkline during hauling of the net. The reason for this strange behaviour was probably that the fish was scared by the sand and mud whirled up by the net which dragged along the bottom. The area where these schools were found was rather limited, ca 10 square nautical miles and the number of schools counted on the paper record of the sonar amounted to 200. Some few of them exceeded 15 tonnes, but the majority were between 5 and 10 tonnes, and the total amount of schooling oil sardine in this

small area therefore hardly exceeded 2000 tonnes.

Distribution and abundance of demersal fish (Fig. 3)

The abundance appears to be lower than during the first coverage, particularly in the area between Ras Ormara and Sonmiani Bay. This is due to the absence of catfish during the present cruise. The major constituents in the catches were grunters, croakers and threadfin bream, but also hairtails and ponyfishes made significant contributions.

Mesopelagic fish (Fig. 4)

As during the previous cruises the abundance of mesopelagic fish was highest off the shelf of the Makran coast. The observed densities were slightly higher than during Cruise No. 2. The diurnal behaviour pattern was as reported earlier.

Plankton (Fig. 5)

Off the coast of Sind, the echo recordings attributed to plankton were observed to be slightly lower than during the first two cruises, while a significant increase seemed to have taken place along the Makran coast east of 63°E.

Hydrography (Figs. 6-21)

A pronounced heating of the surface layers had taken place between the two coverages. The salinity minimum in intermediate depths (100-200 m) in most of the sections, was also observed during this coverage.

REMARKS

The equipment worked satisfactorily. The working capacity of the staff was excellent.

Karachi, 24 March 1977.

Odd Nakken

Table 1. Record of fishing operations. "Dr. Fridtjof Nansen" PAK/NOR/FAO Cruise Nos. 3 and 4, 13 - 25 February 1977 and 27 February - 6 March 1977.
BT: bottom trawl, SPT: small pelagic trawl, PS: purse seine.

Date	Time	Stn No	Gear	Depth in m		Position		Total catch kg	Catch per hour kg	Dominant species
				Bottom	Gear	North	East			
14.2	0500	24	BT	98	98	23°08'	67°12'	1500	3000	Lactarius lactarius (False trevally) Leiognathus equulus (Common ponyfish)
15.2	0630	25	BT	330	330	23°08'	66°43'	182	182	Otolithes sp. (Croaker)
15.2	0836	26	SPT	365	30-50	23°08'	66°43'	37	74	Arothron sp. (Blowfish) MUNRO
17.2	0425	27	BT	202	202	23°31'	66°25'	400	2400	Epinephelus fasciatus (Grouper)
18.2	0330	28	SPT	87	38	23°49'	66°40'	8	24	Various fish, larvae mainly. Myctophidae (Lanternfishes)
18.2	0425	29	BT	81	81	23°49'	66°40'	153	459	Nemipterus japonicus (Japanese threadfin bream)
18.2	1330	30	SPT	24	0-24	24°28'	66°54'	150	280	Jellyfish, squids.
19.2	0610	31	SPT	90	70	24°40'	66°31'	25	50	Various fish larvae, mainly Myctophidae.
20.2	0525	32	BT	26	26	24°58'	66°56'	5	10	Jellyfish, 0-group fish/Decapterus sp.
20.2	0625	33	BT	22	22	24°28'	66°56'	8000	16000	Stolephorus indicus (Indian anchovy)
20.2	0940	34	BT	52	52	24°21'	66°47'	2500	5000	Squids (small) Leiognathus sp. (Ponyfish)
21.2	0345	35	BT	13	13	24°37'	66°59'	400	800	Jellyfish Thryssa mystax (Moustached thryssa)

Date	Time	Stn No	Gear	Depth in m		Position		Total catch kg	Catch per hour kg	Dominant species
				Bottom	Gear	North	East			
21.2	0720	36	BT	25	25	24°23'	66°57'	15000	30000	Thryssa setirostris (Longjaw thryssa)
21.2	1420	37	SPT	60	20	24°34'	66°31'	45	90	Fish larvae
23.2	0455	38	BT	43	43	24°55'	66°28'	220	440	Leiognathus sp. (Ponyfish)
23.2	0845	39	BT	23	23	25°10'	66°33'	270	540	Trichiurus lepturus (Largehead hairtail) Carangoides malabaricus (Malabar cavalla)
23.2	1220	40	BT	80	80	25°07'	66°16'	400	1200	Squids (small), Trichiurus lepturus (Largehead hairtail)
24.2	0345	41	BT	13	13	25°20'	65°55'	500	1000	Scomberomorus guttatus (Spanish mackerel), Trichiurus lepturus (Largehead hairtail)
28.2	0335	42	BT	14	14	25°09'	63°13'	120	240	Pomadasys hasta (Lined silver grunt)
1.3	0210	43	BT	13	13	25°09'	63°58'	210	420	Argyrops spinifer (Longspine seabream)
1.3	0455	44	BT	10	10	25°14'	63°44'	2200	4400	Sardinella longiceps (Indian oil sardine)
1.3	0826	45	PS	14	14	25°14'	63°46'	500	-	Sardinella longiceps (Indian oil sardine)
1.3	1425	46	SPT	52	15	25°01'	63°50'	25	50	Jellyfish
2.3	1830	47	SPT	18	0-15	25°02'	63°05'	400	800	Jellyfish
3.3	0315	48	BT	22	22	25°04'	63°15'	1800	3600	Rays
3.3	0756	49	SPT	29	8-23	25°02'	62°53'	No catch		-

Date	Time	Stn No	Gear	Depth in m		Position		Total catch kg	Catch per hour kg	Dominant species
				Bottom	Gear	North	East			
3.3	1120	50	BT	35	35	25°02'	62°44'	140	250	Jellyfish Pomadasys hasta (Lined silver grunt)
3.3	1745	51	SPT	26	8-20	25°02'	62°20'	1000	2000	Dussumieria acuta (Rainbow sardine) Thryssa mystax (Moustached thryssa)

Table 2. Length and maturity frequency distributions. (When samples from several stations are averaged, each station has been given equal weight.)
"Dr. Fridtjof Nansen" PAK/NOR/FAO Cruise Nos. 3 and 4, 13 February - 6 March 1977.

A:. SMALL FISH

Species	Stn.Nos.	Length in cm 05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	N	Maturity stage 1	2	3	4	5	6	7
Dussumieria acuta	30-33-36-41-51	2	2	7	44	16	1	1	4	16	5							140	80			4	16		
Sardinella longiceps	44-45									20	20	52	8					40	13	25	47	15			
Sardinella sp.	33-39-41-44			1	17	1	14	12	14	17	18	6	1					92	3	58	31	8	1		
Thryssa mystax	35-47-51						1	9	18	19	26	18	5	3				99		14	22	34	12	17	
Thryssa setirostris	35-36-47	4	20	8	1		16	25	23	3								100	50		24	12	4	10	
Thryssa vitrirostris	35-41	25	22	3				15	15	13	5	2						38	50		15	27	8		
Stolephorus indicus	33-36-41	1	25	46	28													75		25	60	15			
Stolephorus sp.	30		8	81	12													26		19	69	12			
Nemipterus japonicus	24-27-29-34-39-40-41-44-48		1	6	9	13	14	7	10	5	4	7	4	3	3	4	11	331	22	38	22	12	5	1	
Decapterus sp. (russelli)	33-44				2	27	19	2	2	10	16	18	4					49	Not observed						
Lactarius lactarius	41					8	13	17	17	8	8	13	13	4				24		29	63	8			
Carangoides malabaricus	39									25	50	25						19		5	50	45			

(continued)

Table 2 (continued)

B: LARGE FISH

Species	Stn.Nos.	Length in cm 05	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	N	Maturity stage 1	2	3	4	5	6	7
Pomadasys hasta	34-38-42-43-48-50					1	7	13	39	27	12	1						127	6	11	11	13	21	38	
Pomadasys maculatus	29			96	4													27		15	11	41	33		
Argyrops spinifer	43-48					2	18	24	34	8	10	2						50	46	36	4	12	1	1	
Scomberomorus guttatus	41							30	50	15	5							20		5	65	15	15		
Scomberomorus commersoni	41					5	75	2	10		5	5						20	Not observed						
Johnius carutta	35		84	16														25		8	56	36			
Otolithes ruber	25-34-35		18	42	28	12												70	22	48	22	4	4		
Arius sp.	41					5	50	45										20	6		20	25			
Epinephelus fasciatus	24			48	48	4												25		96	4				
Hilsa ilisha	24				80	20												15				13	13	13	

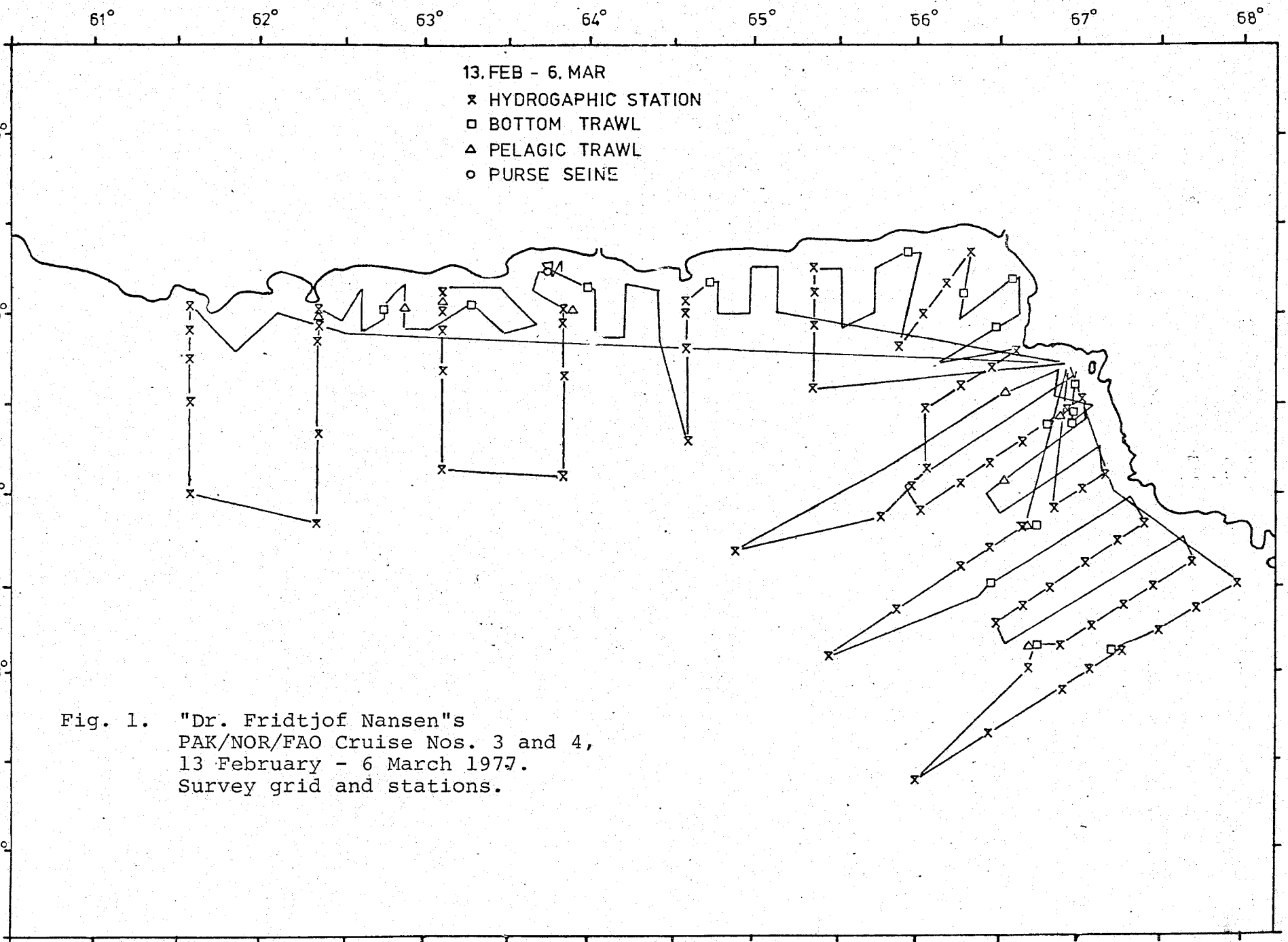
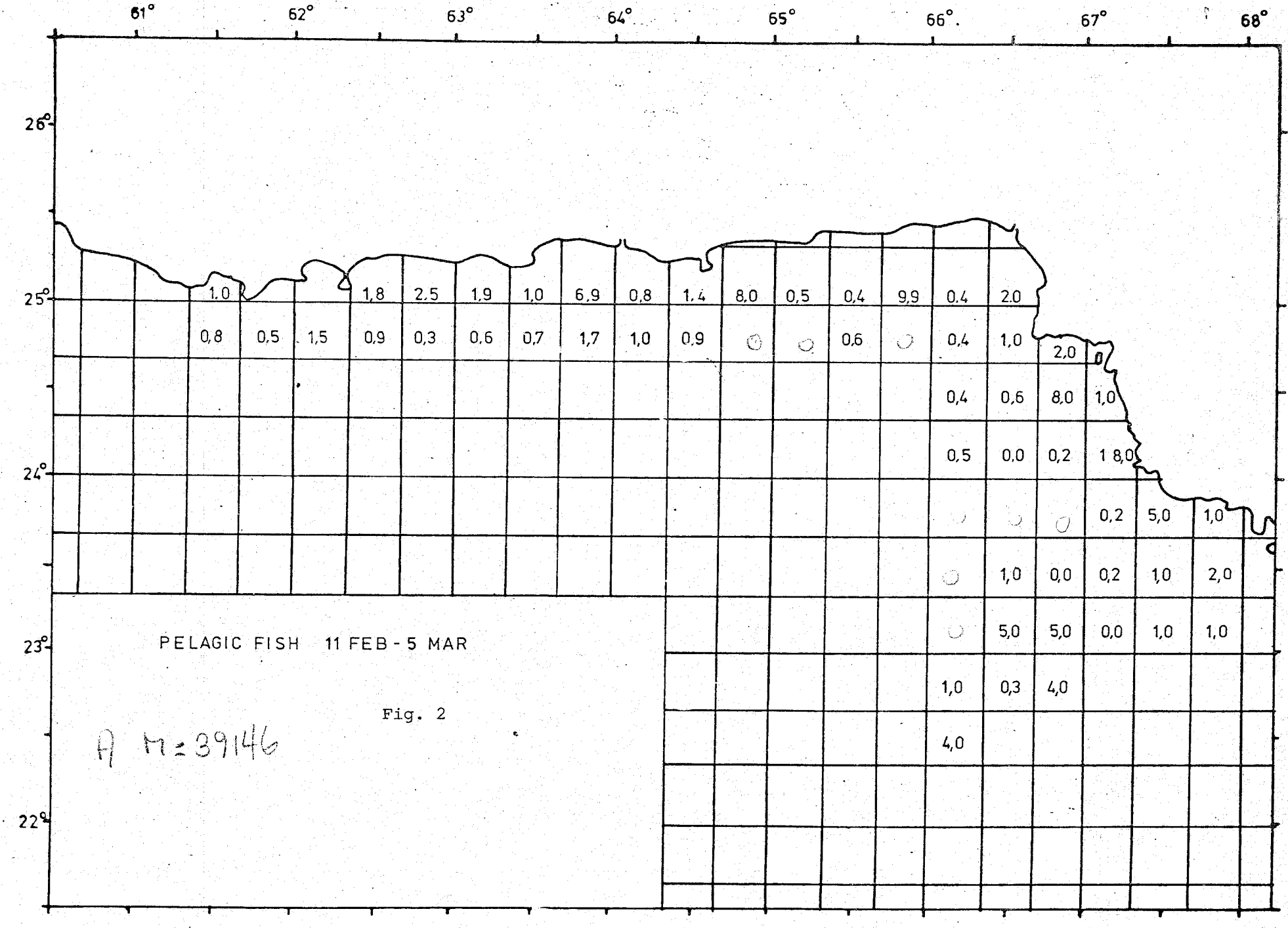


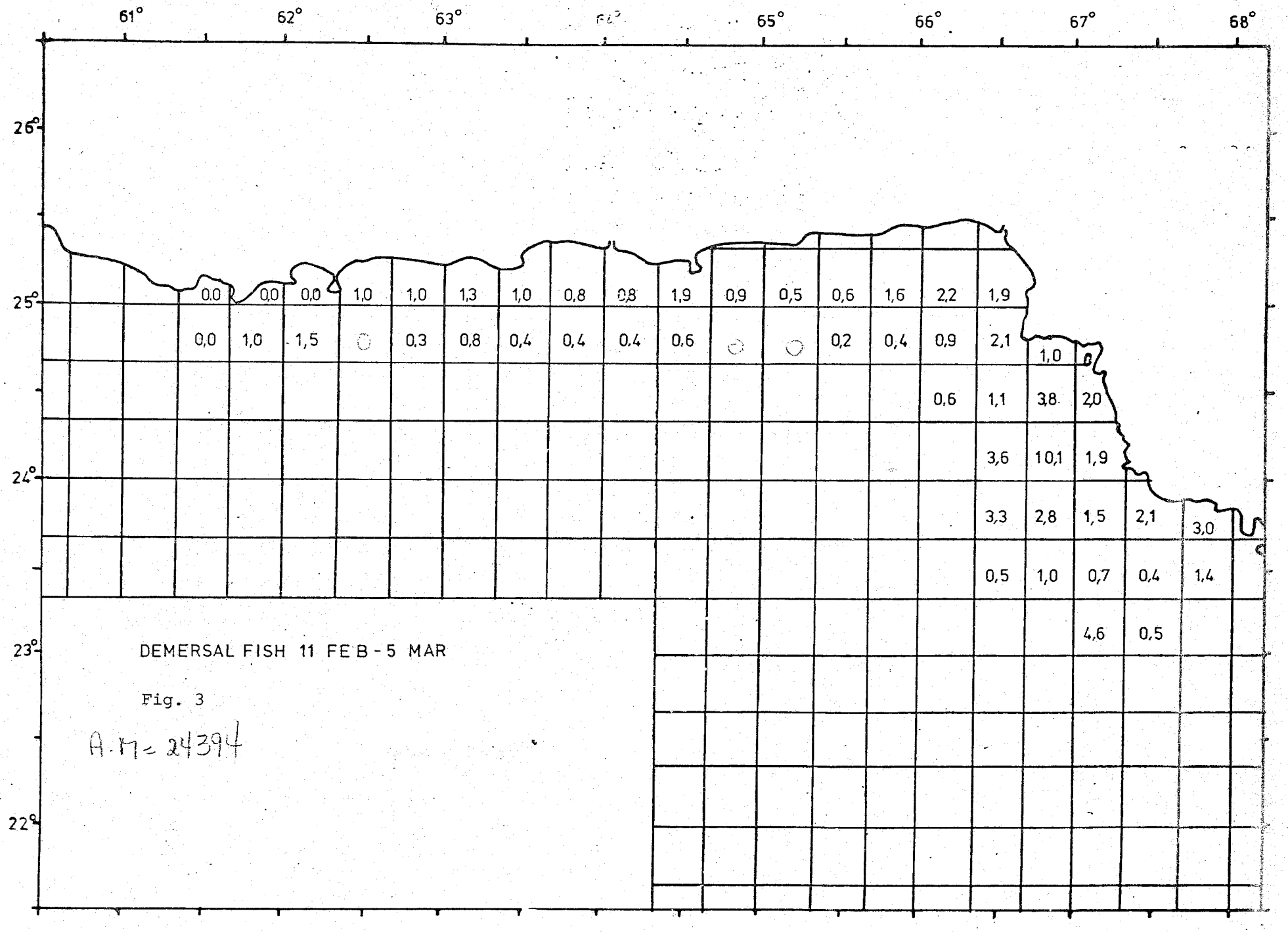
Fig. 1. "Dr. Fridtjof Nansen"s PAK/NOR/FAO Cruise Nos. 3 and 4, 13 February - 6 March 1977. Survey grid and stations.



PELAGIC FISH 11 FEB - 5 MAR

Fig. 2

A M = 39146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0,0 1,0 1,5 0,3 0,8 0,4 0,4 0,4 0,6 0,2 0,4 0,9 2,1 1,0
0,6 1,1 3,8 2,0
3,6 10,1 1,9
3,3 2,8 1,5 2,1 3,0
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4,6 0,5
DEMERSAL FISH 11 FEB - 5 MAR
Fig. 3
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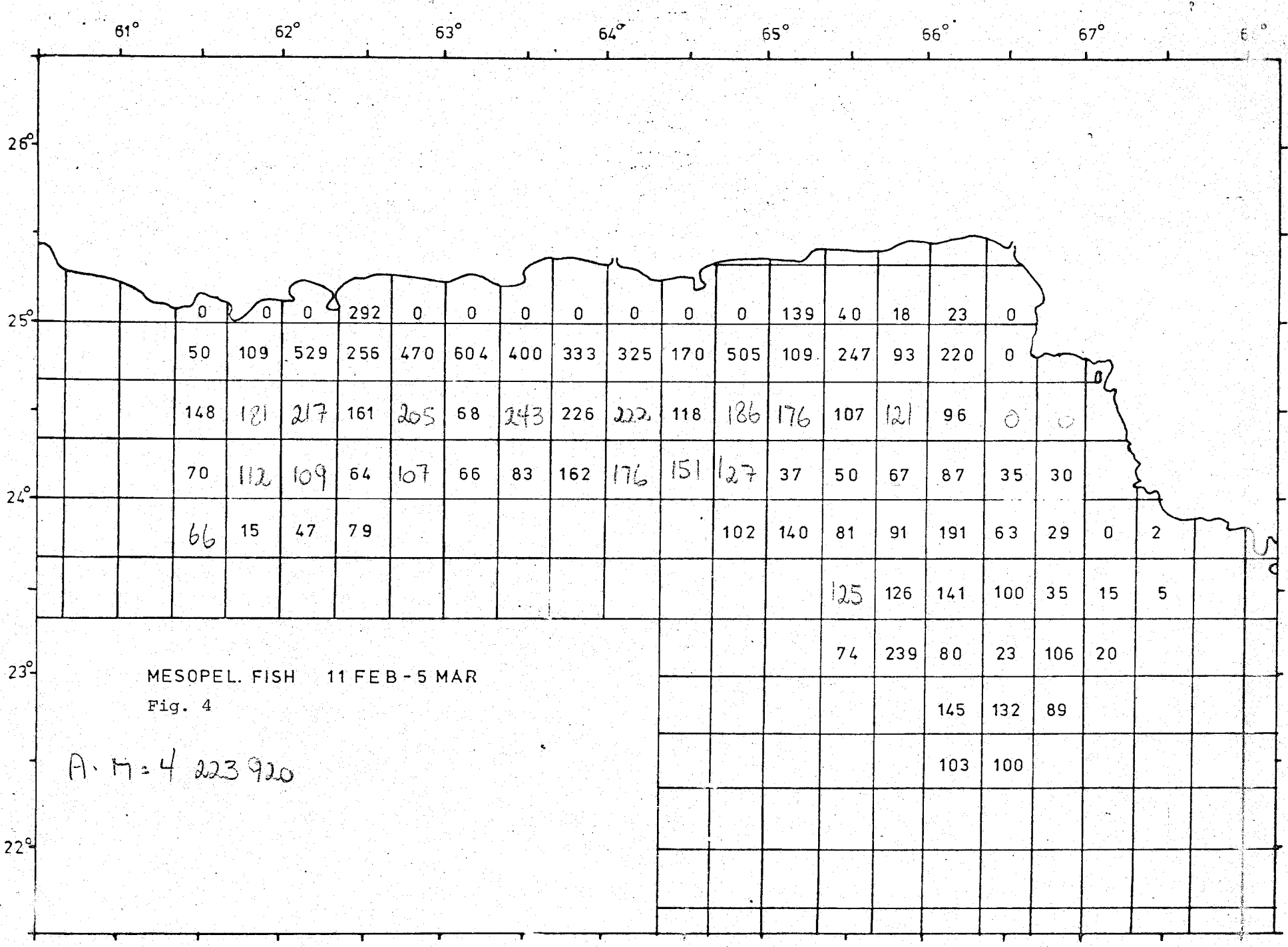
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50 109 529 256 470 604 400 333 325 170 505 109 247 93 220 0
148 181 217 161 205 68 243 226 222 118 186 176 107 121 96 0 0
70 112 109 64 107 66 83 162 176 151 127 37 50 67 87 35 30
66 15 47 79 102 140 81 91 191 63 29 0 2
125 126 141 100 35 15 5
74 239 80 23 106 20
145 132 89
103 100
MESOPEL. FISH 11 FEB - 5 MAR
Fig. 4
A. M = 4 223 920

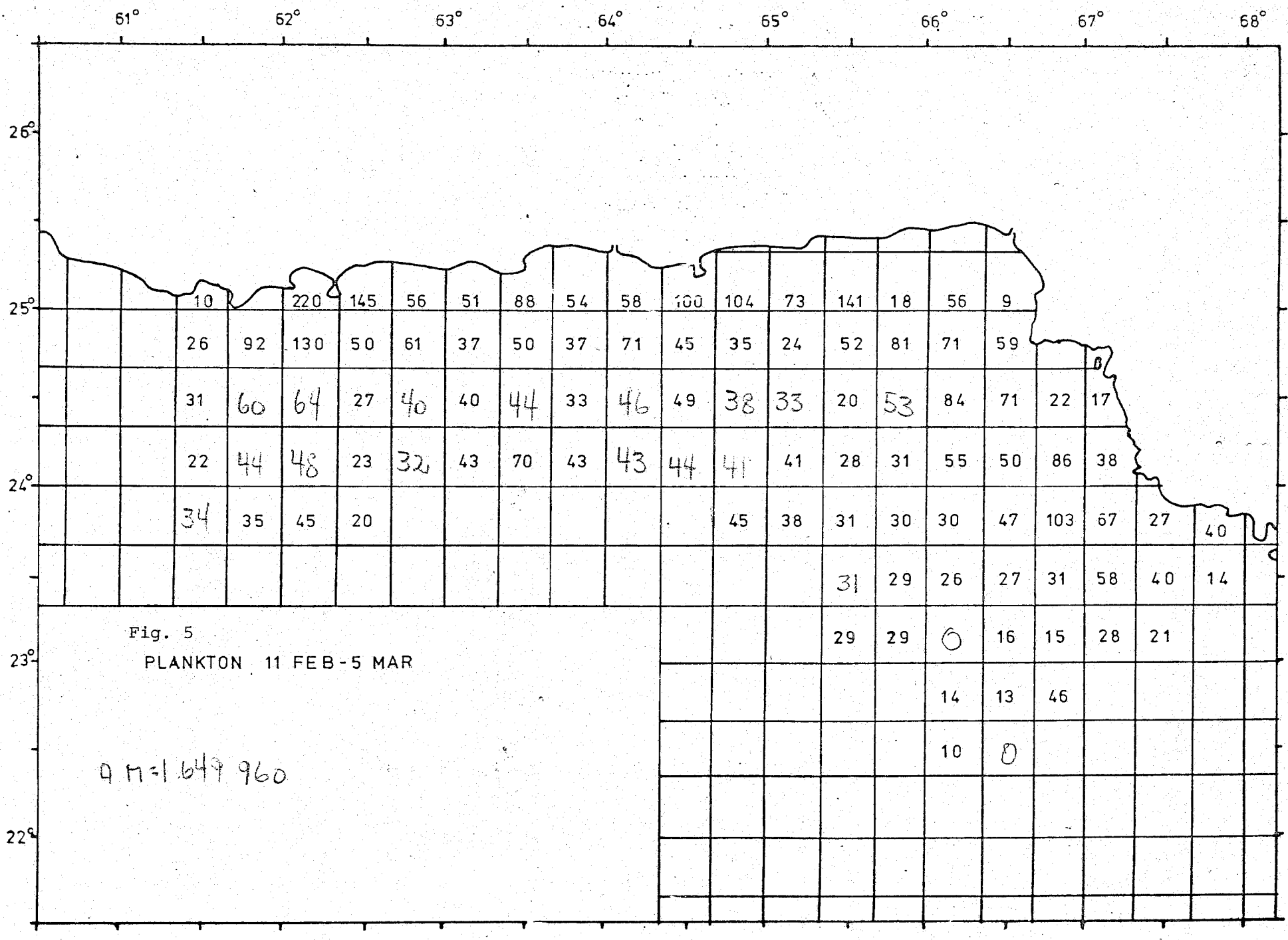
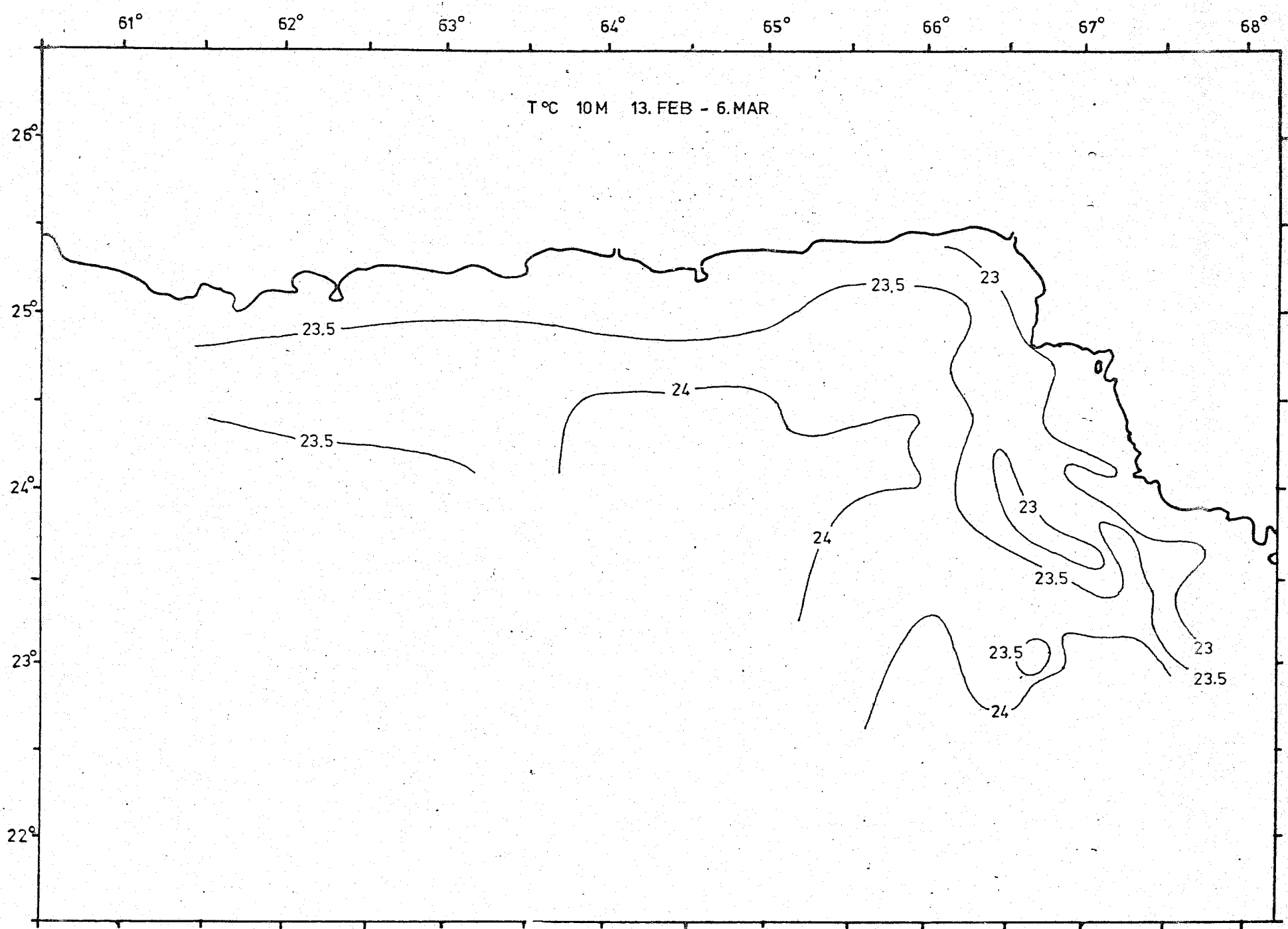


Fig. 5

PLANKTON 11 FEB-5 MAR

AM-1649 960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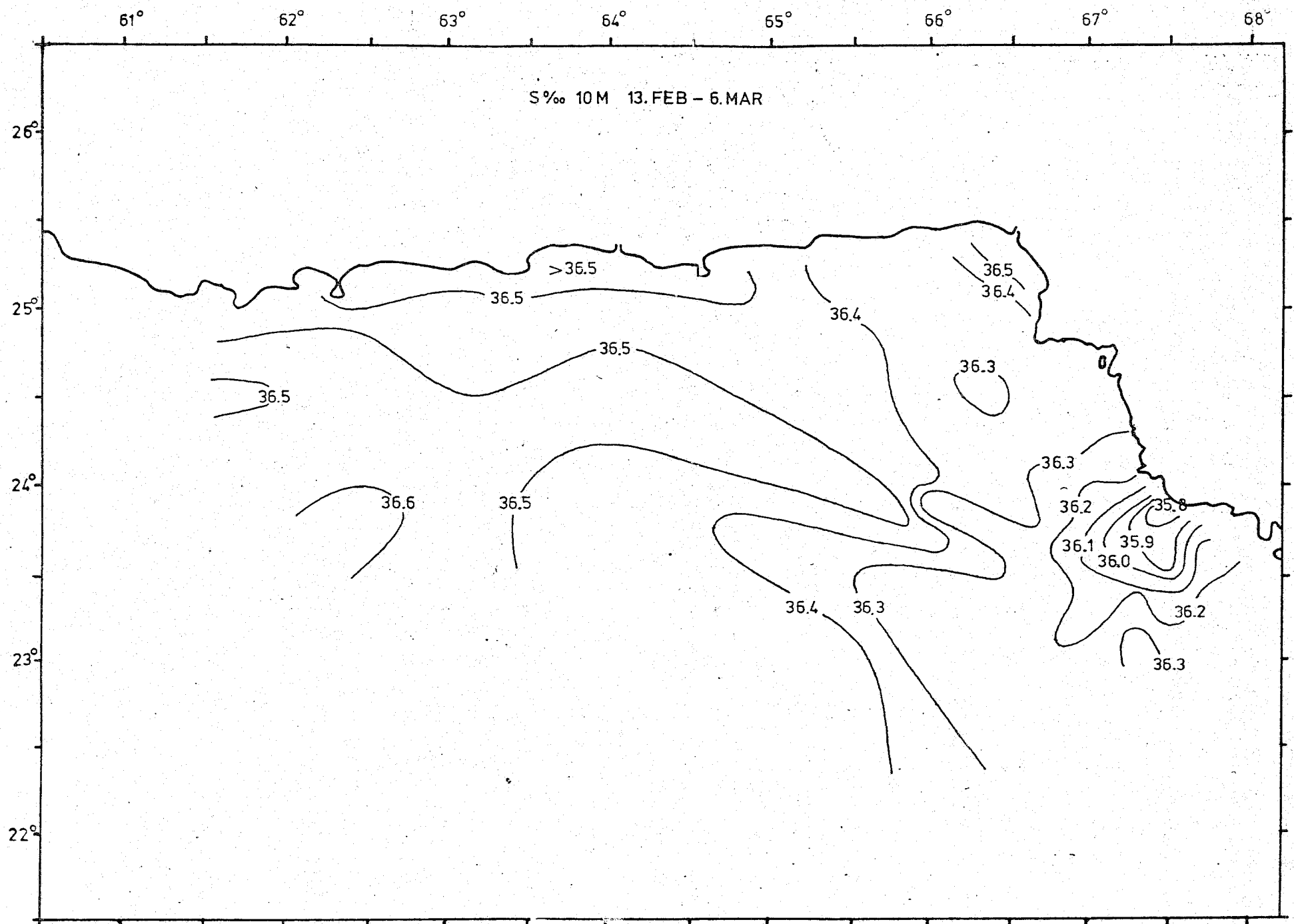
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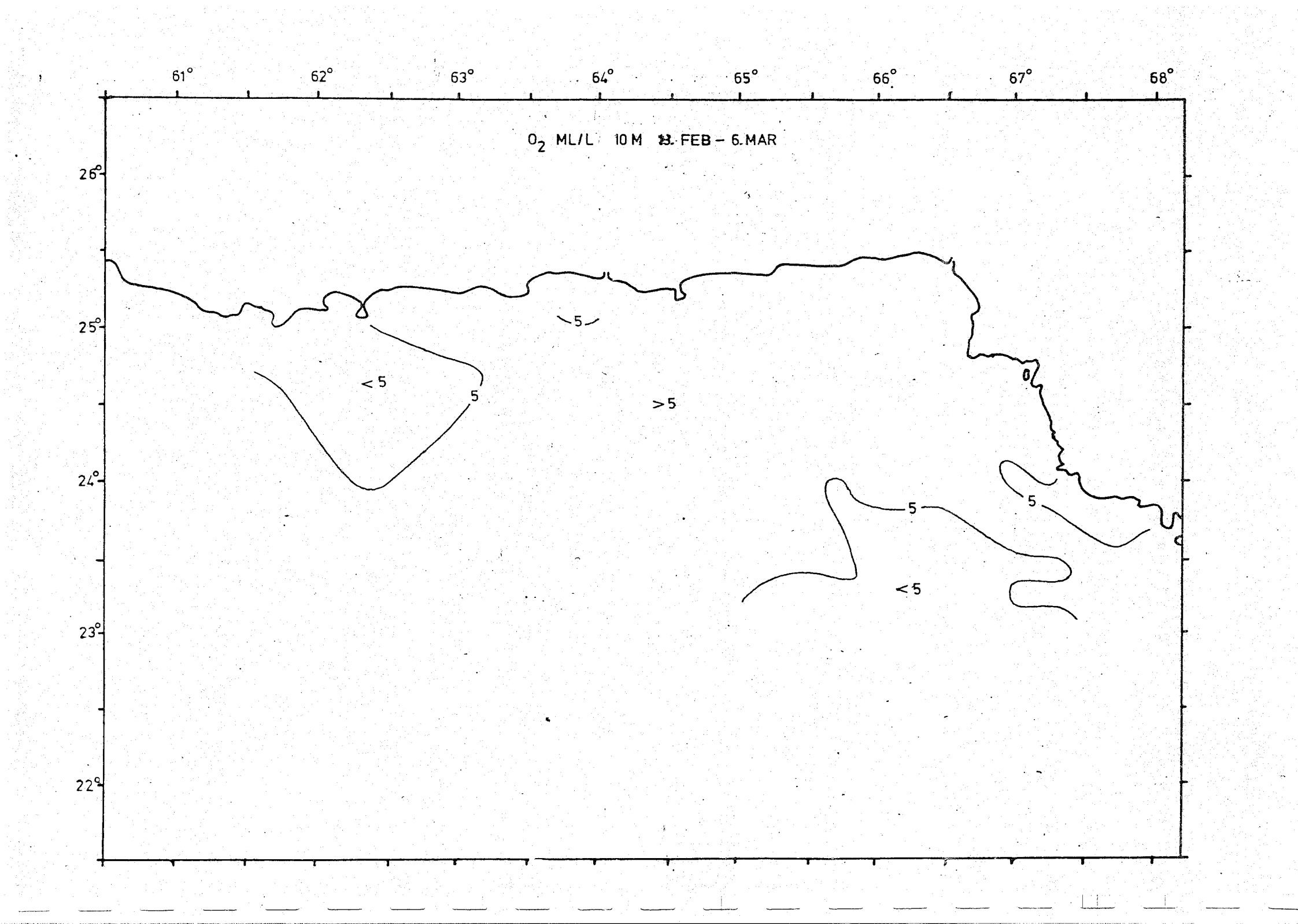
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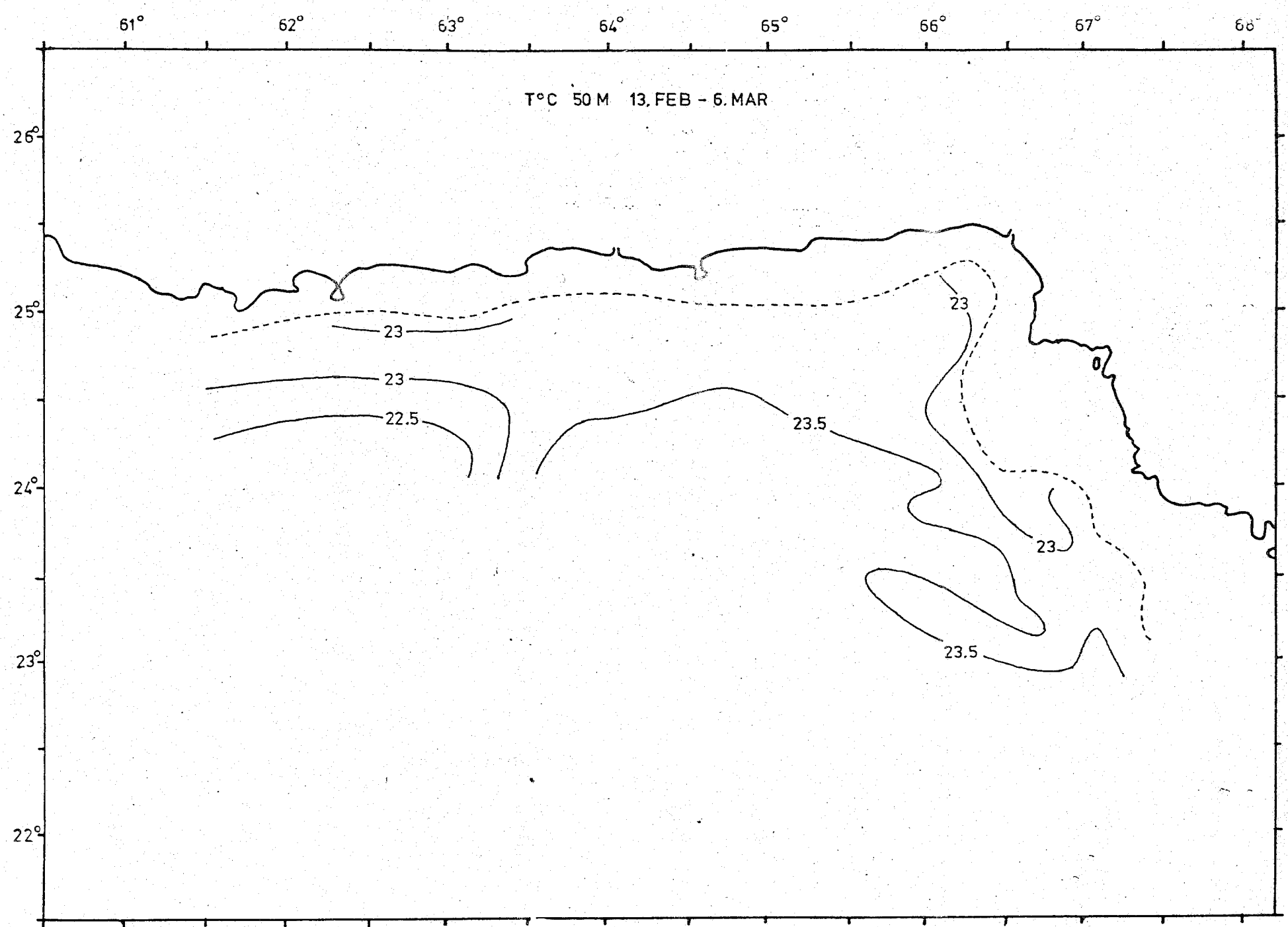
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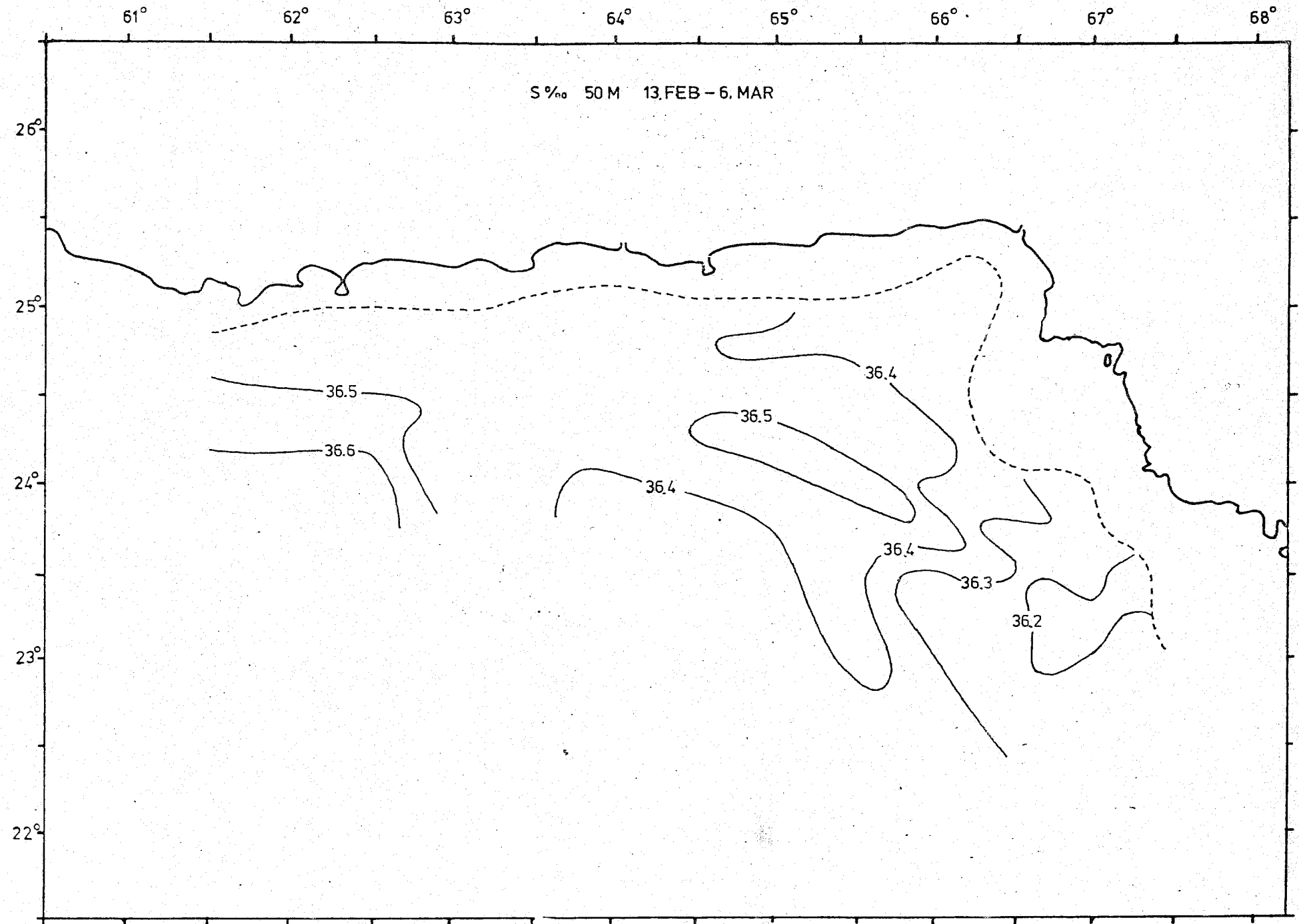
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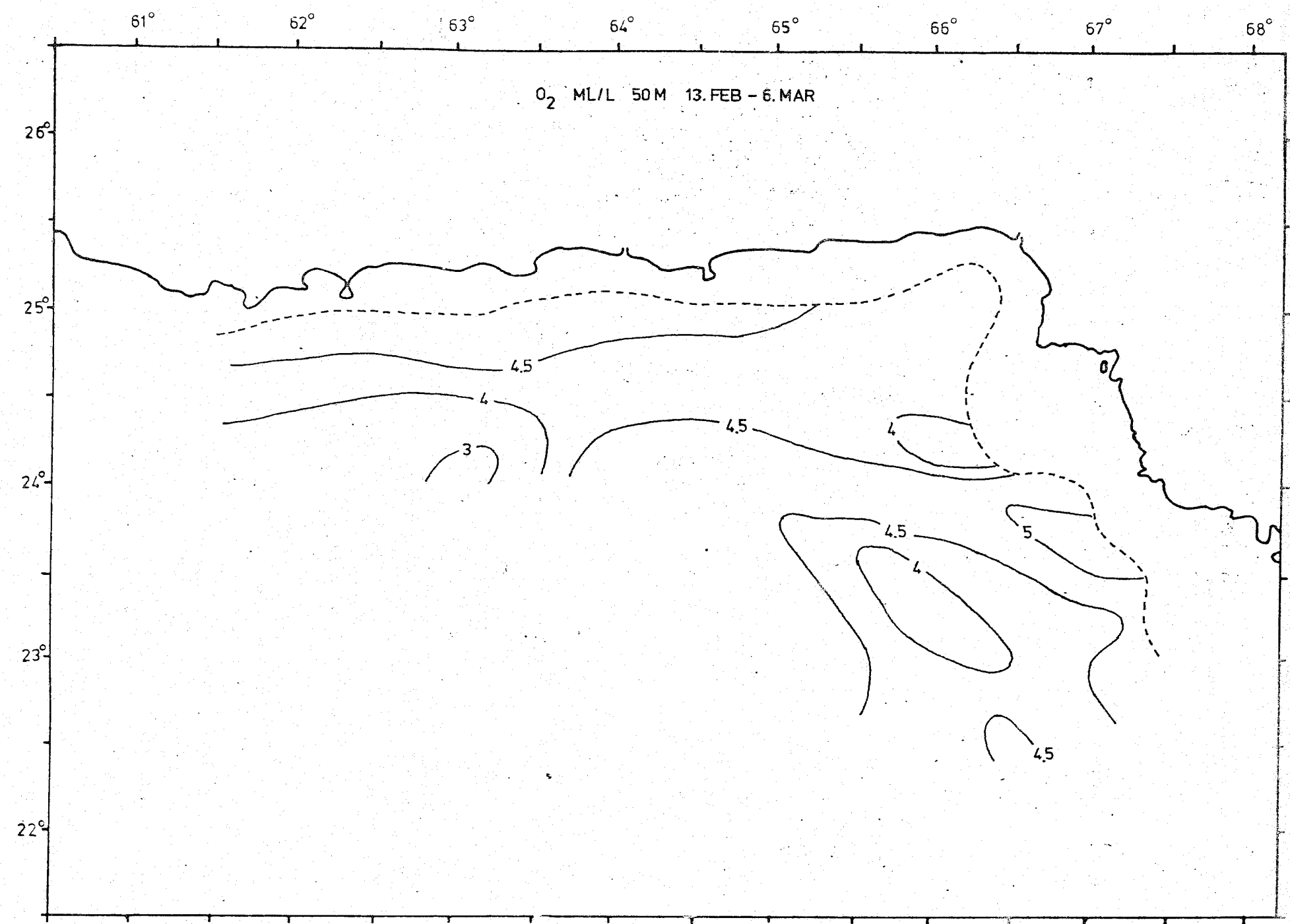
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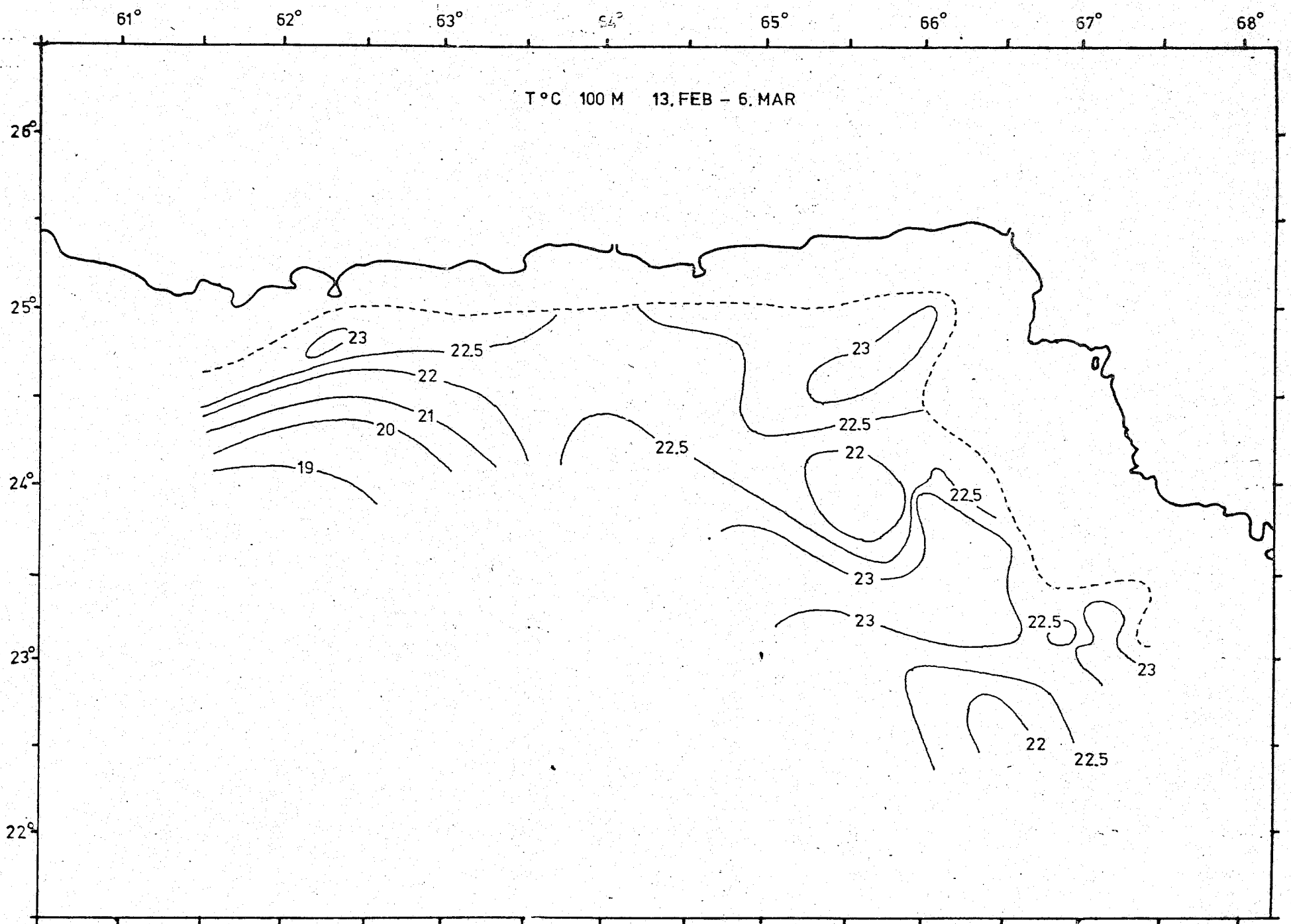
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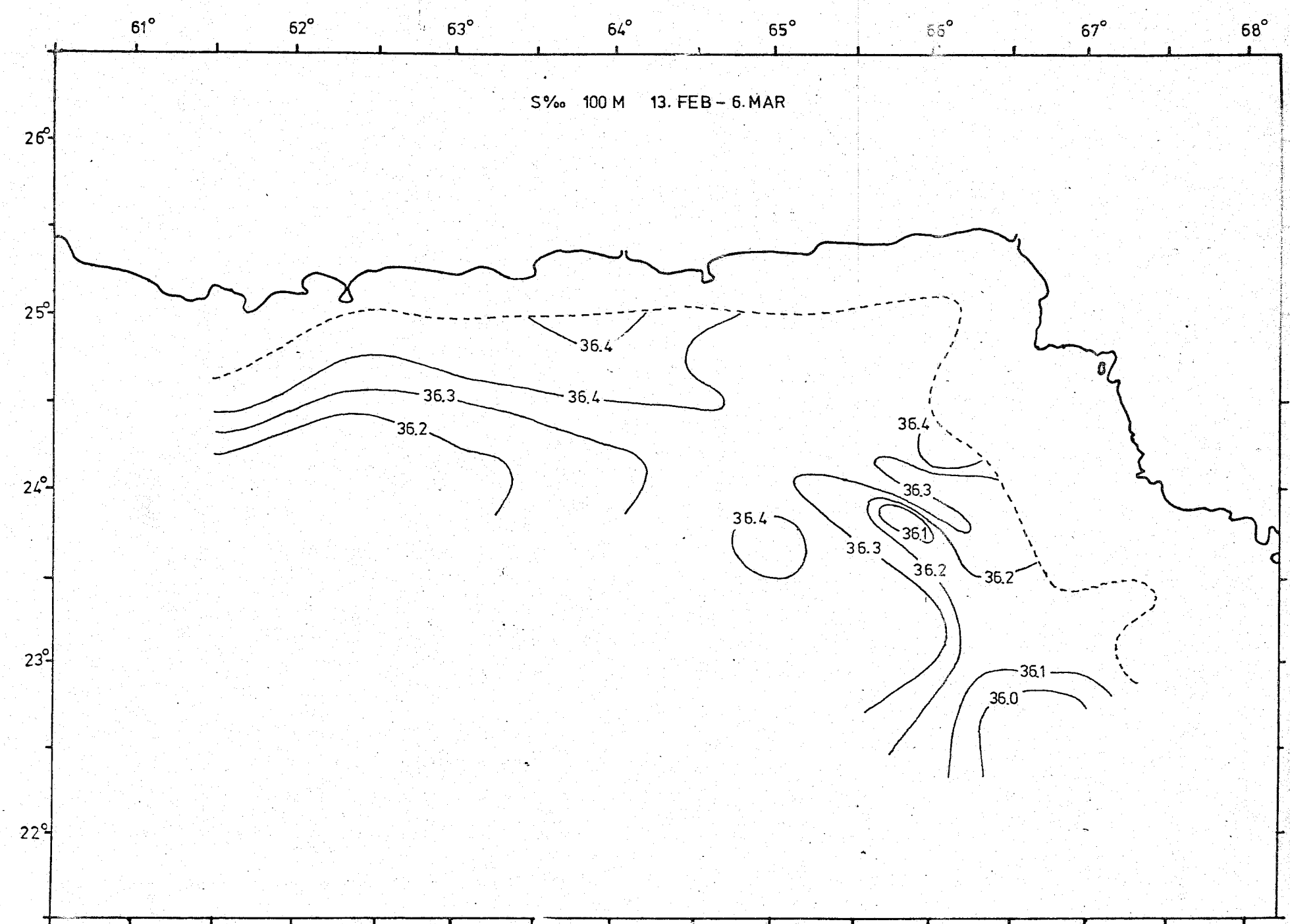
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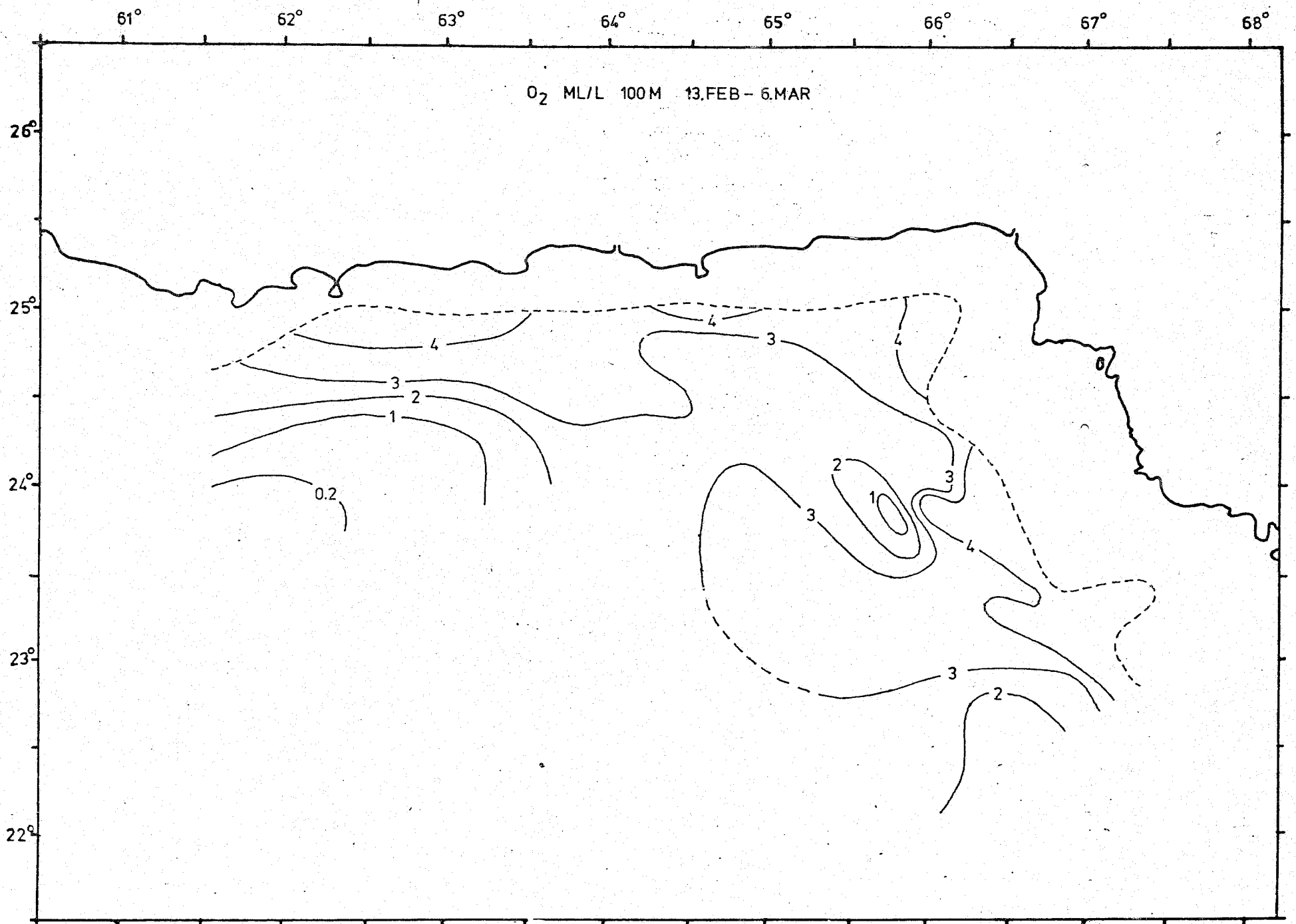
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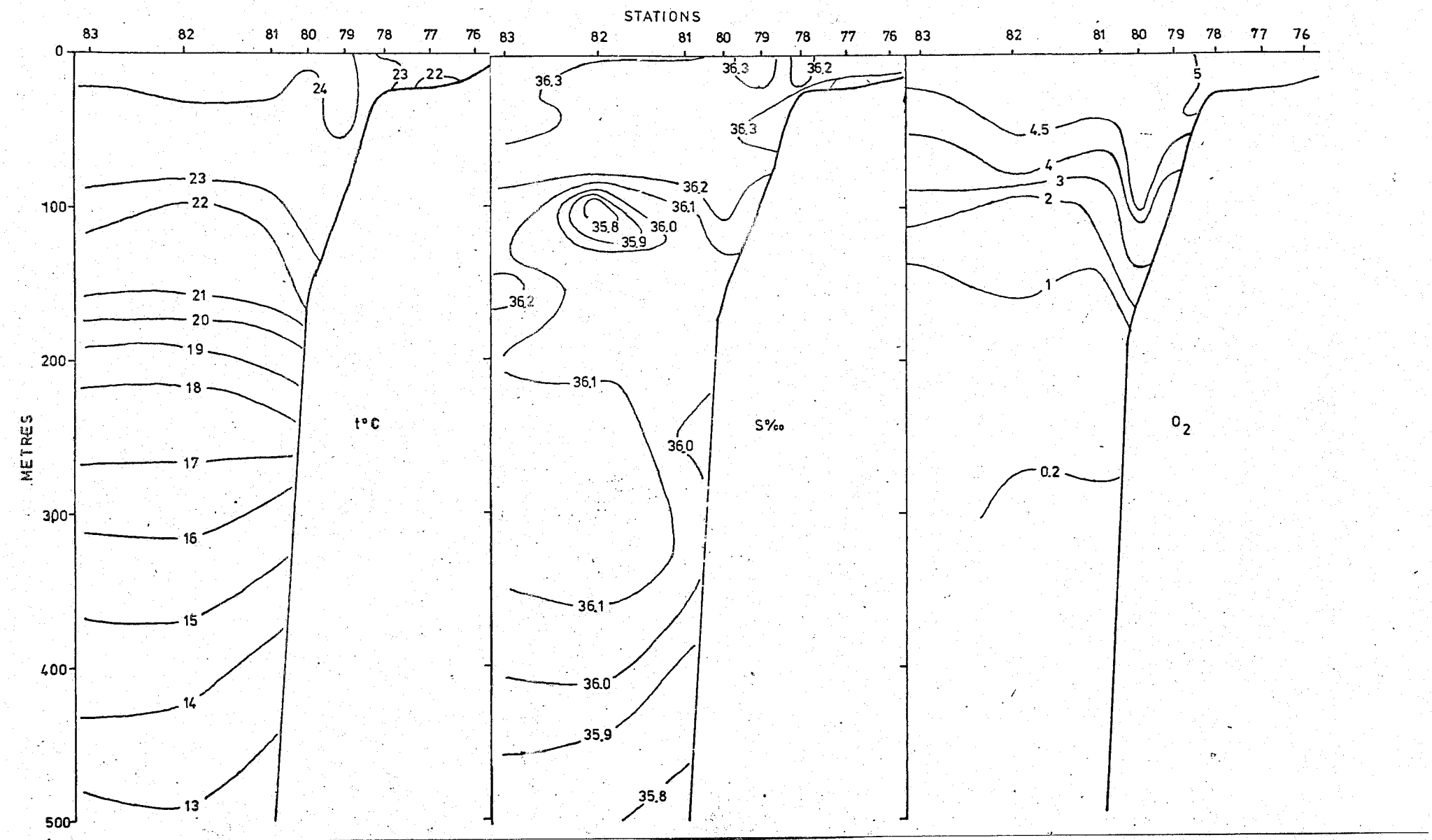
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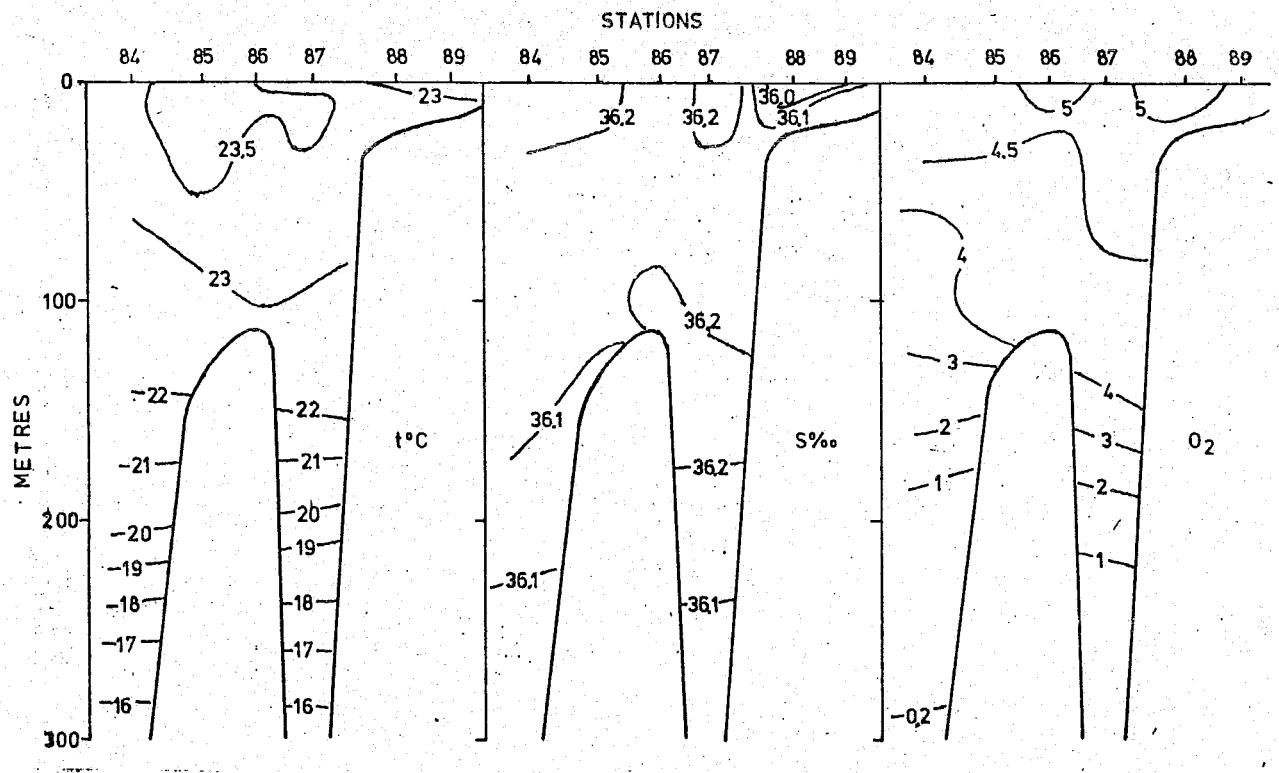
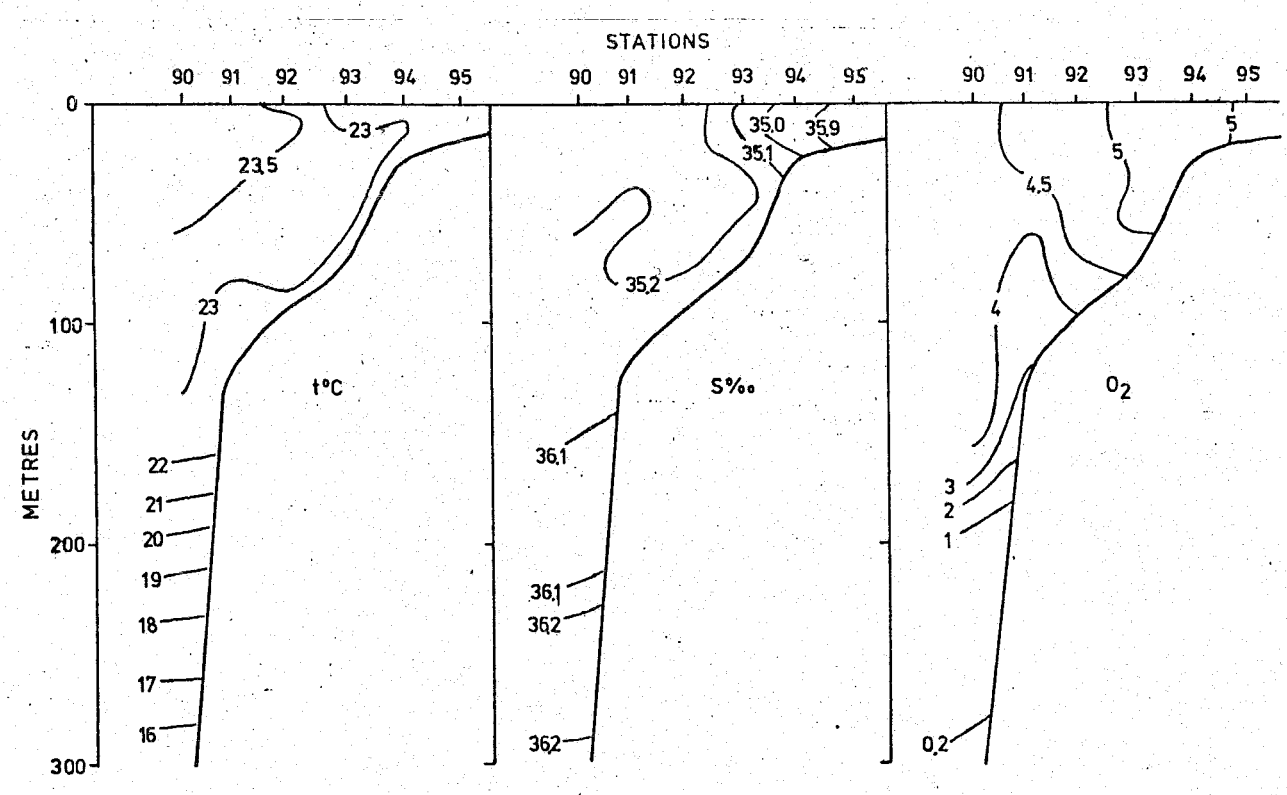
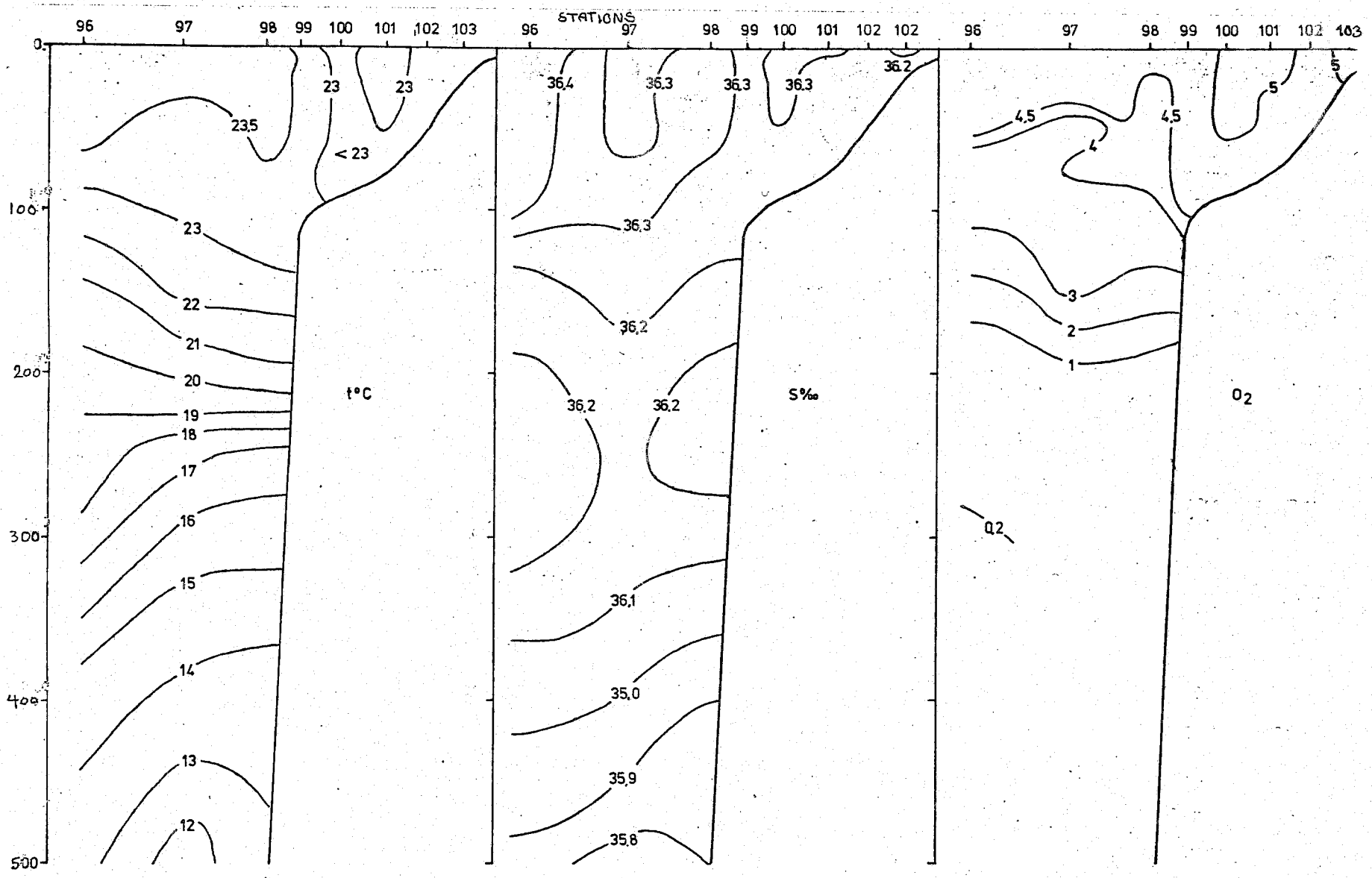
SECTION II 15-16/2-77





SECTION III 16/2-77

SECTION IV 17-18.2.77



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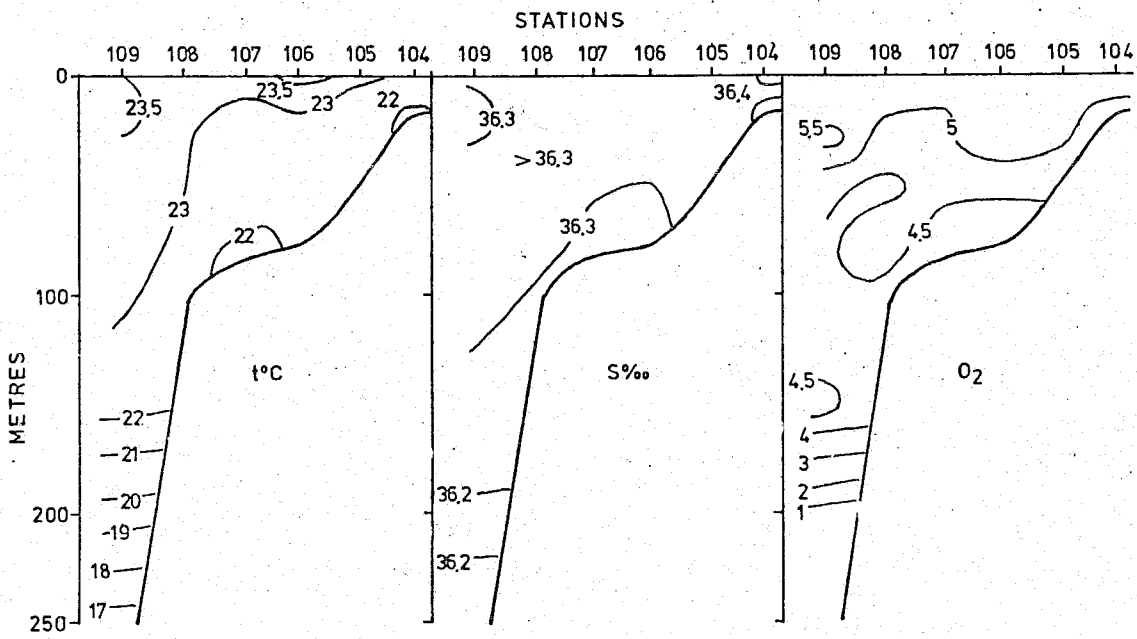

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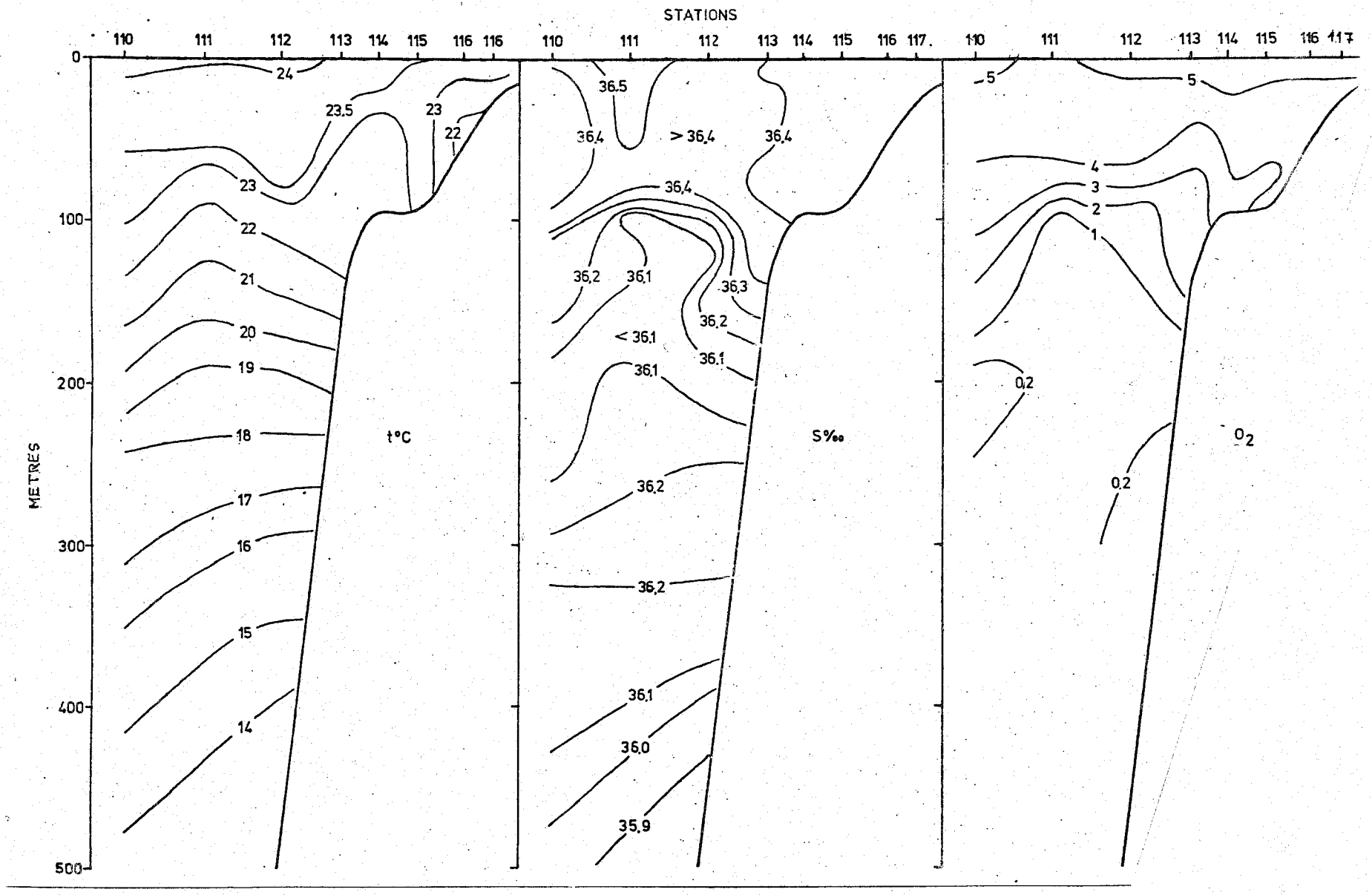

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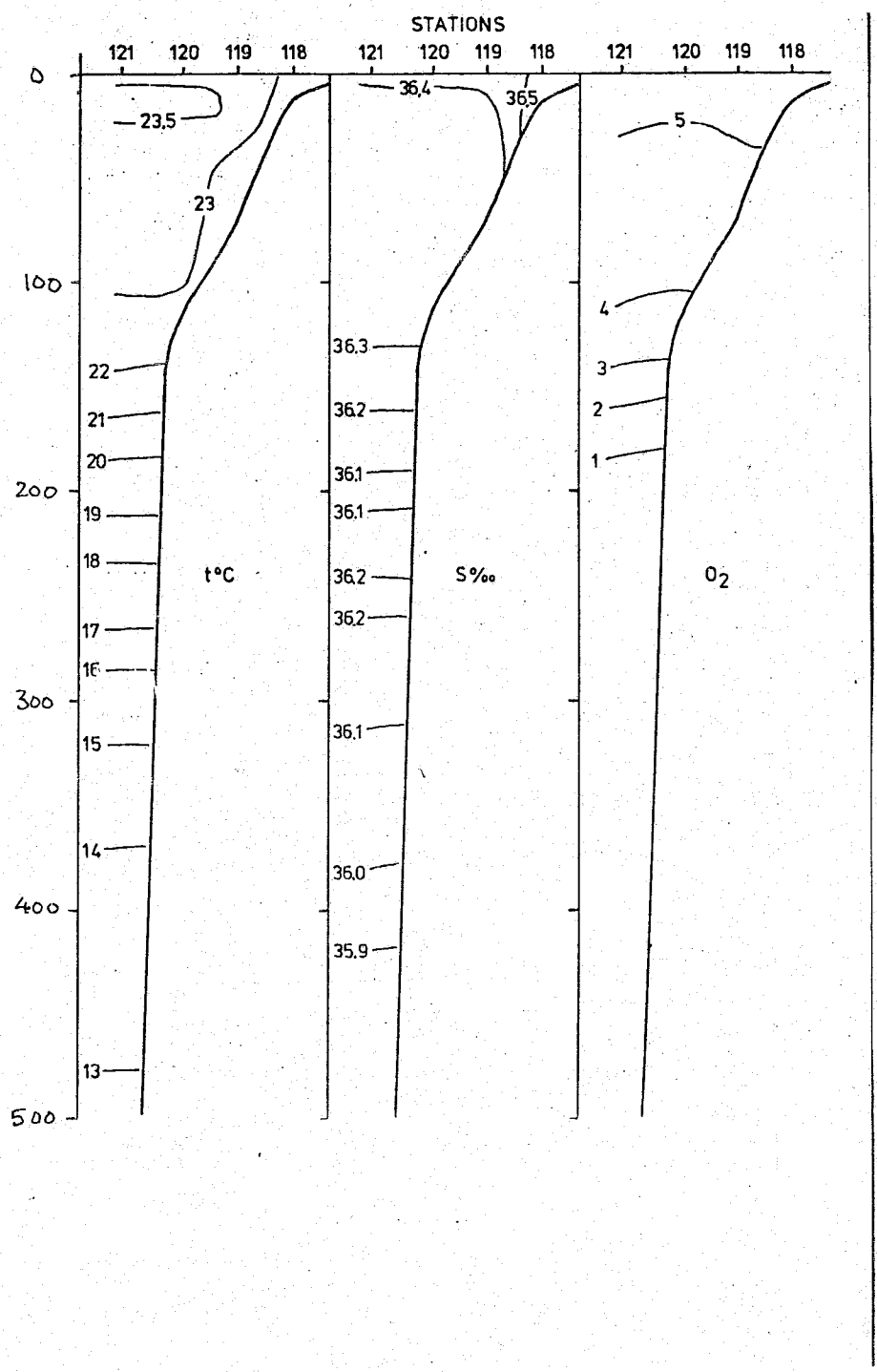

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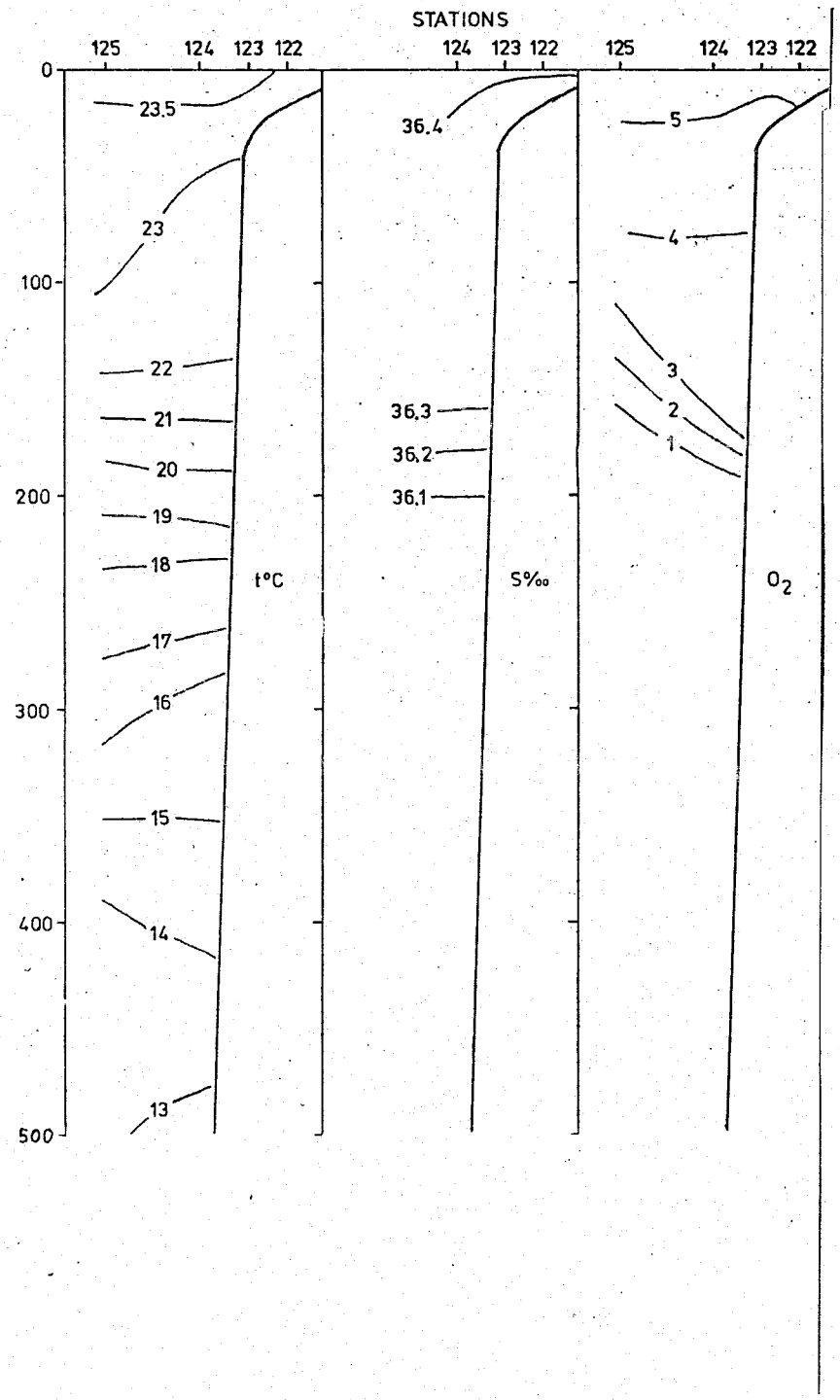
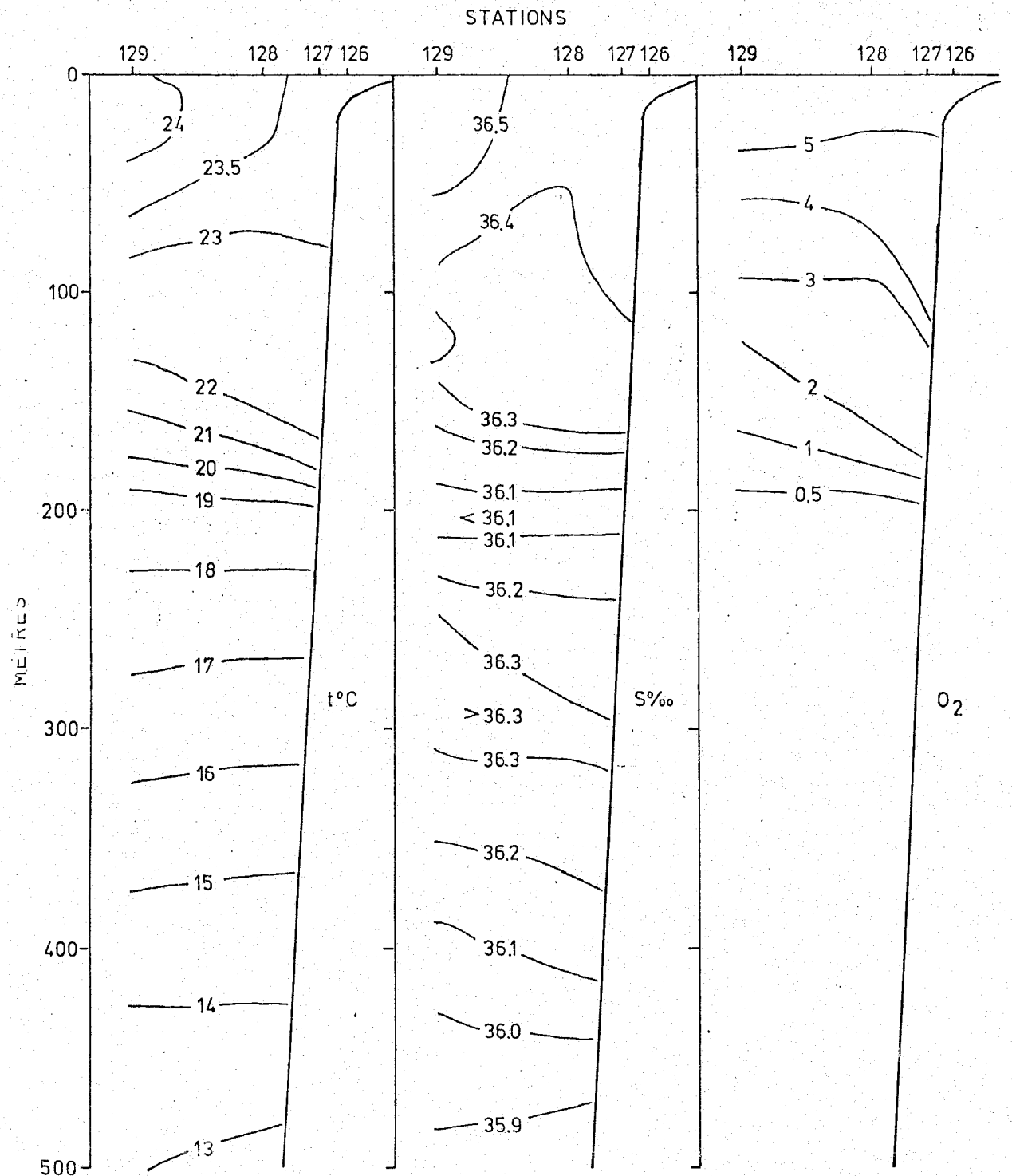
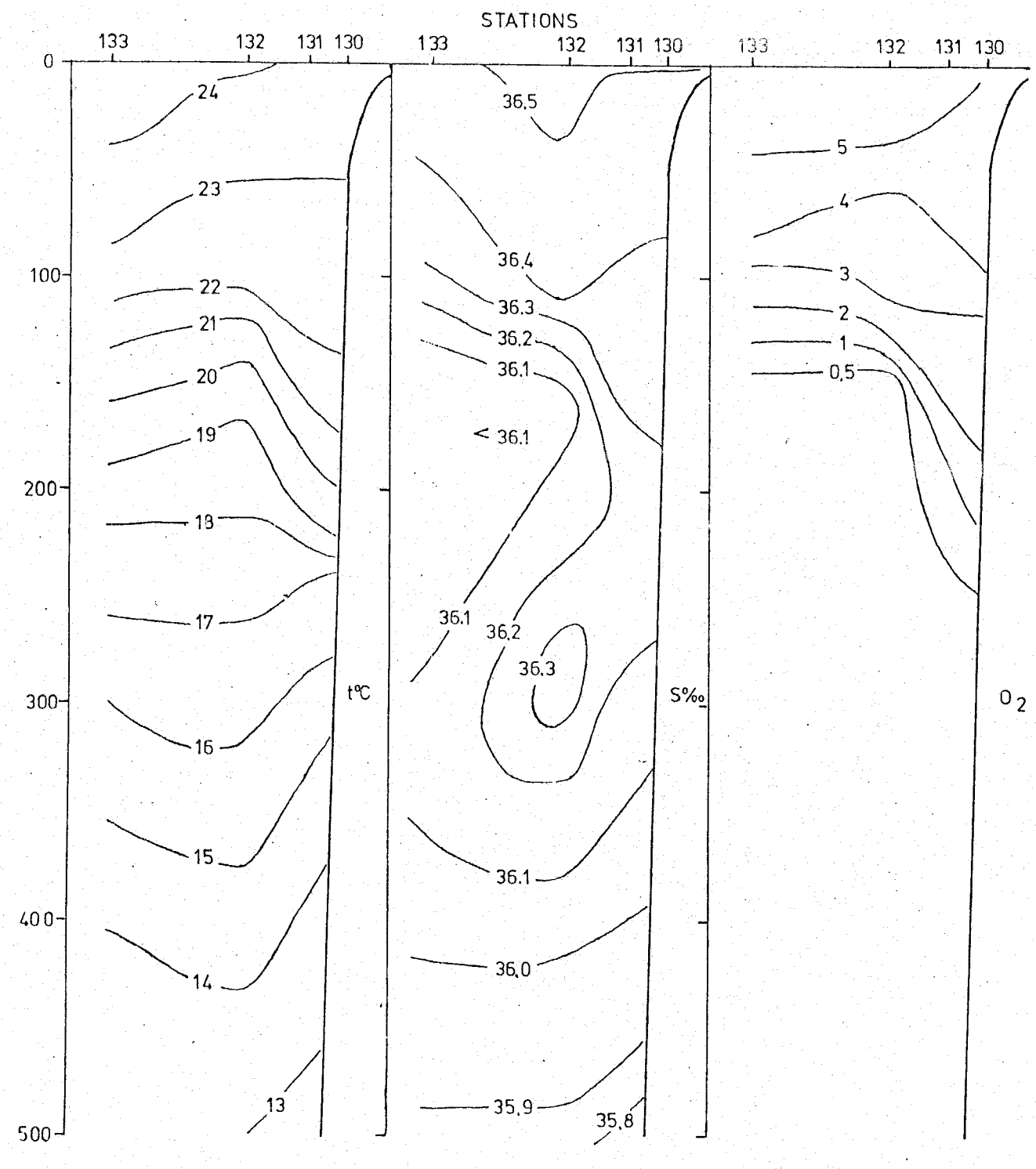


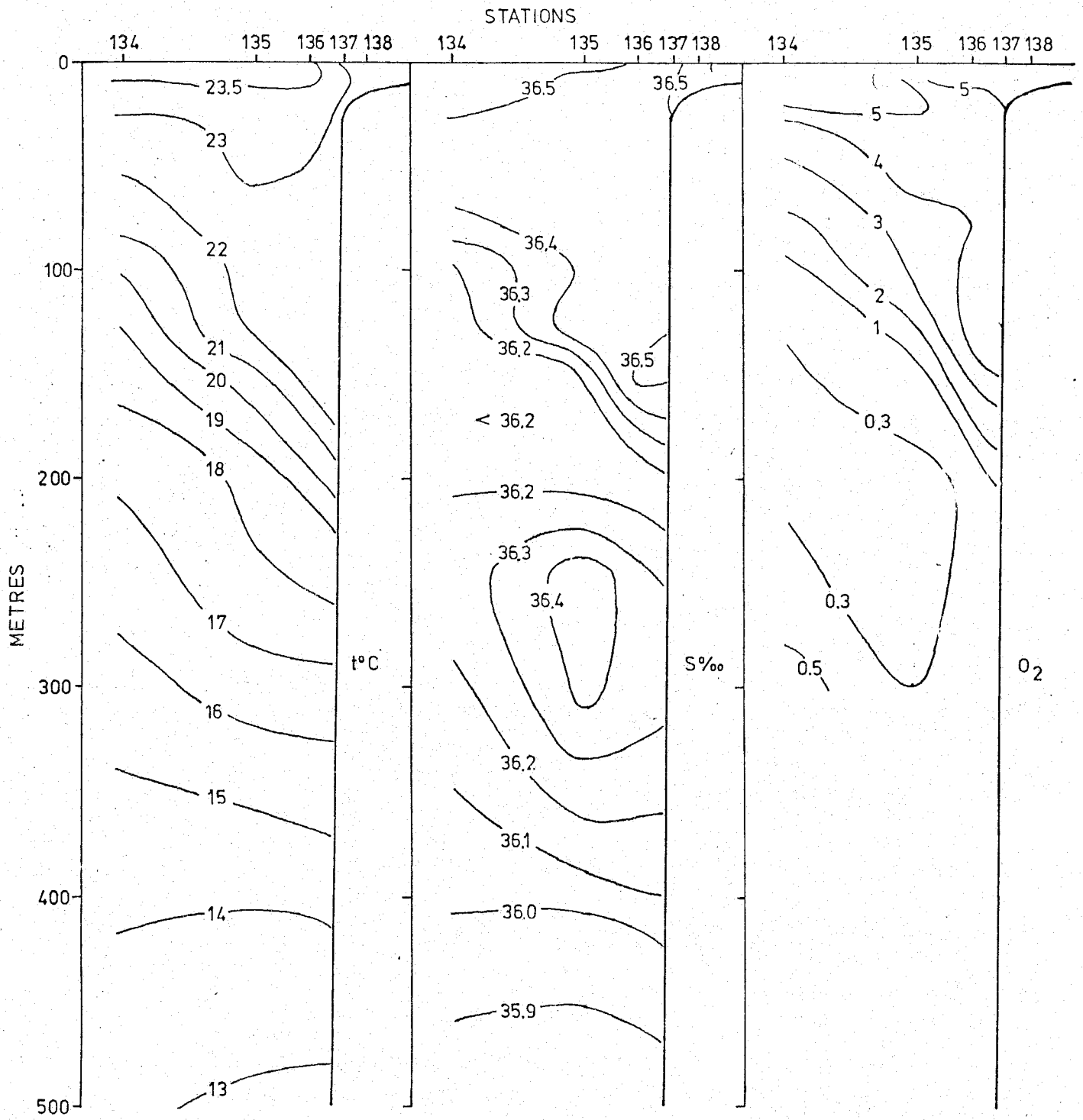
SECTION IX 28/2 - 77



SECTION X 1/3 - 77



SECTION XI 3/3 - 77



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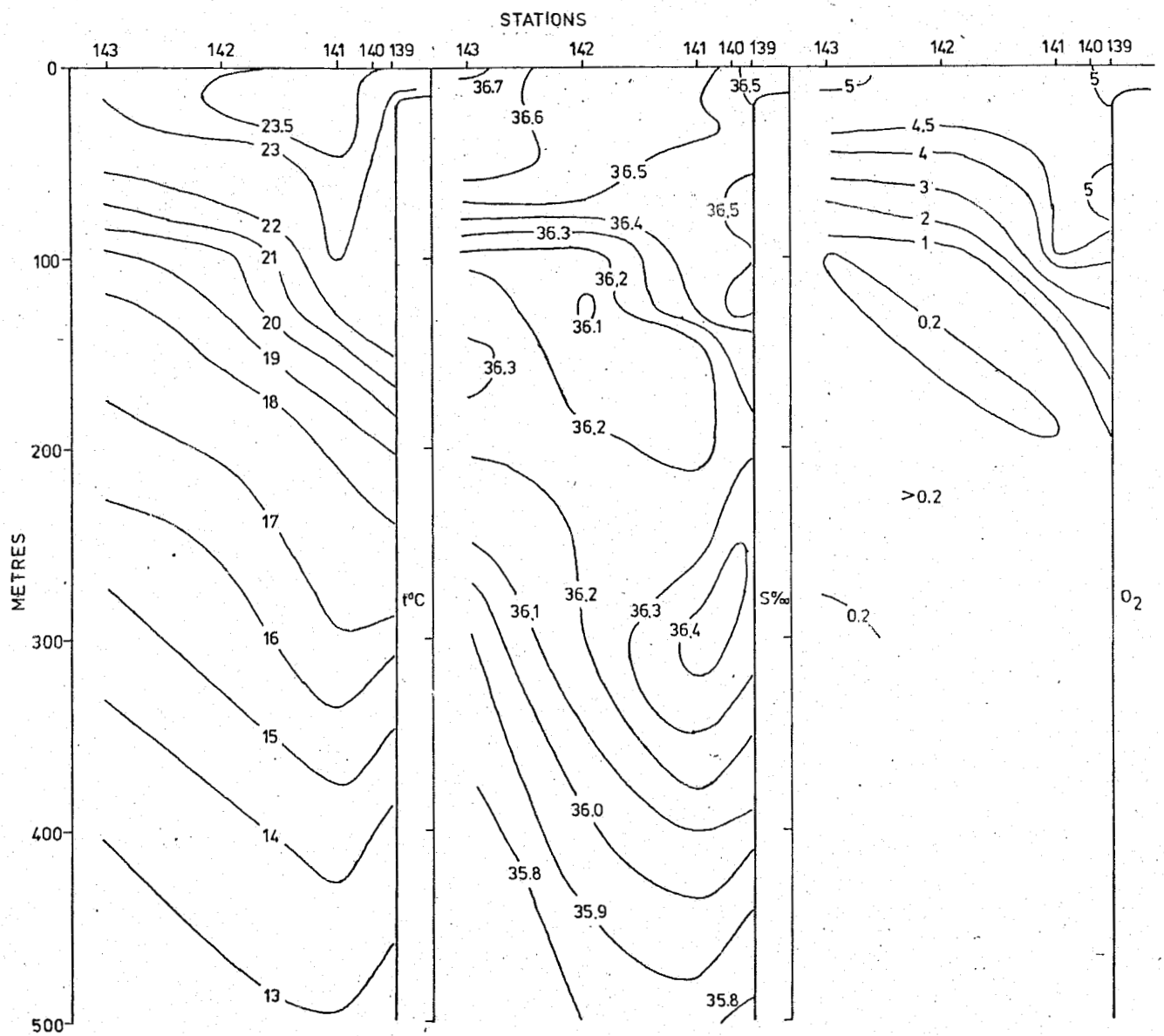
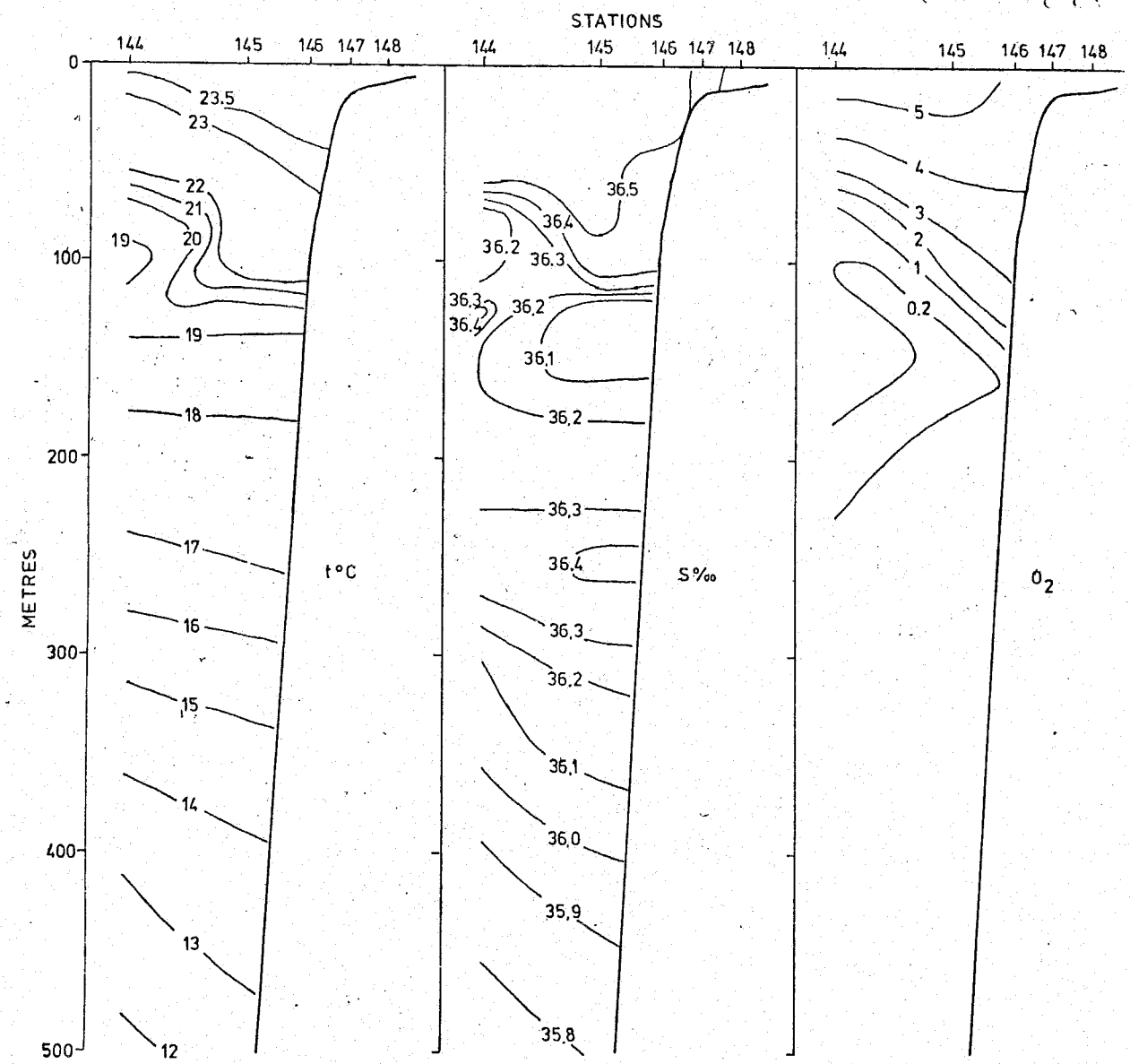


SECTION XIII 4/3 - 77



Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D.
0076	1977	213	010 21	23310	67550	15
0077	1977	213	010 24	23230	67410	20
0078	1977	214	010 02	23160	67280	20
0079	1977	214	010 06	23080	67140	85
0080	1977	214	010 09	23010	67030	150
0081	1977	214	010 11	22550	66520	500
0082	1977	214	010 15	22390	66240	500
0083	1977	214	010 20	22230	65580	500
0084	1977	215	010 03	23030	66400	500
0085	1977	215	010 11	23100	66520	125
0086	1977	215	010 13	23170	67050	100
0087	1977	215	010 16	23240	67170	500
0088	1977	215	010 18	23310	67280	20
0089	1977	215	010 21	23390	67430	15
0090	1977	216	010 06	23180	66280	500
0091	1977	216	010 10	23240	66380	115
0092	1977	216	010 12	23300	66490	85
0093	1977	216	010 15	23380	67020	60
0094	1977	216	010 19	23450	67140	20
0095	1977	216	010 21	23510	67250	15
0096	1977	217	010 11	23060	65250	500
0097	1977	217	010 18	23220	65530	500
0098	1977	217	010 20	23350	66160	500
0099	1977	217	010 24	23410	66260	100
0100	1977	218	010 02	23480	66370	85
0101	1977	218	010 18	23540	66490	75
0102	1977	218	010 20	24010	67010	40
0103	1977	218	010 22	24060	67100	15
0104	1977	220	010 04	24310	67010	15
0105	1977	220	010 08	24240	66500	40
0106	1977	220	010 11	24170	66380	70
0107	1977	220	010 14	24100	66250	75
0108	1977	220	010 16	24030	66130	100
0109	1977	220	010 19	23550	66000	250
0110	1977	222	010 02	23430	64520	500
0111	1977	222	010 07	23520	65460	500
0112	1977	222	010 11	24030	65570	450
0113	1977	222	010 15	24190	65540	125
0114	1977	222	010 17	24290	66030	85
0115	1977	222	010 19	24350	66150	85
0116	1977	222	010 21	24420	66260	45
0117	1977	222	010 23	24470	66350	20
0118	1977	223	010 14	25210	66180	10
0119	1977	223	010 18	25100	66100	65

0120	1977	223	010	21	25000	66010	100
0121	1977	223	010	23	24470	65510	500
0122	1977	224	010	11	25150	65200	15
0123	1977	224	010	12	25070	65200	25
0124	1977	224	010	13	24560	65200	500
0125	1977	224	010	17	24350	65200	500
0126	1977	228	010	05	25050	64350	10
0127	1977	228	010	07	25000	64350	100
0128	1977	228	010	09	24470	64350	500
0129	1977	228	010	13	24170	64350	500
0130	1977	301	010	13	25010	63500	50
0131	1977	301	010	16	24570	63500	500
0132	1977	301	010	19	24380	63500	500
0133	1977	301	010	24	24060	63500	500
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0142	1977	304	010	01	24200	62200	500
0143	1977	304	010	06	23500	62200	500
0144	1977	304	010	11	24000	61350	500
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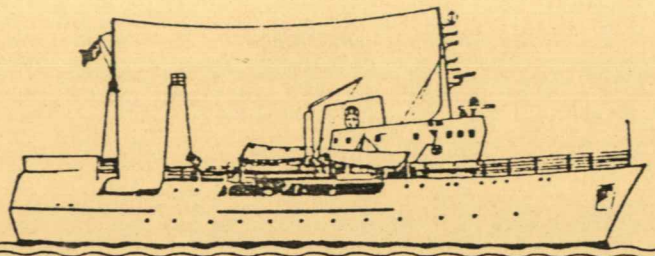


Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY CRUISE REPORT ON CRUISE NOS 5 AND 6 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

8 March - 8 April, 1977

Odd Nakken

Bergen, May 1977

Institute of Marine Research, Bergen

PRELIMINARY CRUISE REPORT ON CRUISE NOS 5 AND 6 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/ FAO FISHERIES RESEARCH PROJECT.

Introduction — This report covers the third complete coverage of the Pakistan waters during the project.

Departure — Karachi 8 March, 1977.

Arrival — Karachi 24 March, 1977.

Scientific staff — M. Hussain, Irshad Begum, Khushro Farooqui, L. Zakaria (Marine Fisheries Department)
S.A. Siddiqui, S.H. Niaz Rizvi, M. Masood (from 12 March, 1977),(Institute of Marine Biology, University of Karachi).
S. Lygren, O. Nakken, O. Knudsen, Ø. Torgersen (Institute of Marine Research).

Departure — Karachi 27 March,1977.

Arrival — Karachi 8. April, 1977.

Scientific staff — S. Qureshi, W. Malik (Marine Fisheries Department)
H. Hasan, M. Syed, M. Moazzam Khan (Institute of Marine Biology, University of Karachi).
S. Lygren, B. Myrseth, O. Nakken, O. Knudsen, Ø. Torgersen (Institute of Marine Reseach).

Survey grid and stations are shown in Fig. 1. The standard hydrographic/plankton stations were worked as described in detail in cruise report no. 1 with modifications in cruise report no. 2.

RESULTS

Table 1 shows the particulars of the fishing stations and table 2 shows the length and maturity distributions of the dominant species.

Distribution and abundance of pelagic fish (Fig. 2)

The distribution patterns are somewhat different to those observed during previous surveys with high abundances in the southern most Sind area and at the western part of the Makran coast. The tendency towards high values in Sonmiani Bay and of Karachi is however, in agreement with previous observations.

The concentrations at the southern Sind coast consisted mainly of sardinellas (Sardinella sindensis and Dussumieria acuta) but also small schools of large lysan (Scombroides commersonanus) were observed in this area. From south of Karachi to Sonmiani Bay a scattering layer of young anchovy (Stolephorus sp.) dominated the pelagic recordings. At times young scad (Decapterus sp.) 2-6 cm in length constituted a significant fraction of this layer.

Large amounts of big jellyfishes were found in shallow waters in the area south of Karachi and at times the quantity of jellyfish in the trawlcatches prevented proper sorting of the fish catch. At the Makran coast the most abundant pelagic fish species were the anchovies (Thryssa mystax, Thryssa dussumieri) and catches upto 8 tons/hour trawling were obtained. Table 2 shows the length and maturity distributions of the different fish species caught during the survey.

Distribution and abundance of demersal fish (Fig. 3)

The highest concentrations were found in 70-120 m depth in Sonmiani Bay were also the biggest catch were taken, 5 tons/hour trawling, the dominating species being croaker, pomfret and grunts. Further south threadfin bream and hairtails were frequently caught in members, while catfish and to some extent seabrams were more numerous along the western Makran coast.

Distribution and abundance of mesopelagic fish (Fig. 4)

High abundances of mesopelagic fish, mainly lantern fish (MYCTOPHIDAE) were observed off the continental shelf in the central

part of the survey area. At the end of the 6. cruise a few days were spent for fishing experiments and behaviour studies of mesopelagic fish in particular. The results of the fishing experiments are shown in table 1. The catches were generally low due to the wide spread in the vertical distribution pattern; at one station the catch amounted to 1.8 ton/hour trawling. The diurnal vertical migration pattern of the mesopelagic fish layer was a reported previously.

Plankton (Fig. 5)

The echo recordings attributed to plankton showed higher values over the shelf and the slope of the shelf than further seawards. The dominating species contributing to these recordings were - according to the trawlcatches: small squids, jellyfish, krill and different fish fry. A more comprehensive list of contributors should be made when the plankton samples are analyzed.

Hydrography (Fig. 6-21)

The heating of the surface waters, especially in the nearshore areas, had continued. The intermediate salinity minimum, in 100-200 m depth, was present in most of the vertical sections also during this coverage.

REMARKS

The equipment worked satisfactorly. The working capacity of the staff was excellent.

Bergen, May 1977

Odd Nakken

Table 1. Fishing stations carried out by R/V "Dr. Fridtjof Nansen" during her 5th and 6th cruise (8th March to 8th April 1977). BTR: bottom trawl, SPT: small pelagic trawl, KTR: krill trawl. Fish names: FAO Species Identification Sheets for Fishery Purposes.

Date	Time Start GMT	St no	Gear type	Bottom depth m	Gear depth m	Position South North	Position East	Total catch kg	Catch per hour kg	Dominant species (total catch, kg)
9.3	0140	52	SPT	18	10	23°30'	67°52'	500	750	Sardinella sindensis, Dussumieria acuta
10.3	0932	53	SPT	118	35	23°11'	66°54'	45	90	Canthigaster margaritatus (munro)
10.3	1030	54	BTR	111	11	23°14'	66°58'	400	800	Nempiterus japonicus, Sphyraena picuda
10.3	1810	55	SPT	31	19	23°32'	47°29'	45	135	Scombroides commersonianus
10.3	2142	56	BTR	13	-	23°41'	67°40'	180	360	Jellyfish, Pomadasys maculatus, Amblygaster clupeoins
11.3	0220	57	SPT	70	15	23°34'	64°10'	40	80	Jellyfish, Various fish larvae
11.3	0400	58	BTR	79	79	23°31'	47°12'	800	1200	Caranx malabaricus, Rays
11.3	1510	59	SPT	100	15	23°28'	66°44'	80	160	Jellyfish, Auxis thazard
12.3	0255	60	BTR	73	73	23°50'	67°00'	600	1020	Lepturacanthus savala, Pomadadys hasta
14.3	0315	61	SPT	70	40	24°00'	67°00'	120	240	Leiognathus spp., Squids, Jellyfish
14.3	0440	62	BTR	25	25	24°03'	67°06'	300	600	Pomadasys hasta, Trichurius spp., Scomberomorus guttatus
14.3	0715	63	BTR	17	17	24°06'	67°10'	300	600	Pomadasys hasta, Jellyfish
14.3	0923	64	BTR	22	22	24°12'	67°05'	250	500	Pseudosciaena diacanthus, Pomadasys hasta
15.3	0130	65	SPT	17	-	24°25'	67°05'	15000	30000	Jellyfish (
15.3	0455	66	BTR	23	23	24°30'	66°57'	100	200	Trichurius spp., Arius sp.
15.3	1150	67	BTR	86	86	25°10'	66°25'	204	408	Lepturacnthus savala, Pomadasys hasta, Sharks
16.3	0039	68	SPT	77	20	24°22'	66°31'	90	90	Jellyfish, Squids
16.3	0330	69	BTR	55	55	24°30'	66°47'	359	718	Trichrius spp., Lutjanus argentimaculatus

(Table 1. Continued)

Date	Time Start GMT	St no	Gear type	Bottom depth m	Gear depth m	Position South North	Position East	Total catch kg	Catch per hour kg	Dominant species (total catch, kg)
16.3	0535	70	SPT	28	12	24°32'	66°50'	200	400	Stolephorus sp.
16.3	1355	71	BTR	121	121	24°17'	65°59'	400	1600	Nemipterus japonicus, Platycephalus spp.
17.3	0950	72	BTR	460	460	24°17'	65°43'	50	50	Harpodon nerhereus
17.3	1445	73	BTR	355	355	24°19'	65°47'	40	50	Collithus lucidus
18.3	0125	74	SPT	33	20	24°46'	66°29'	40	80	Stolephorus spp., Decapus sp.
18.3	0440	75	BTR	104	104	24°45'	66°13'	5000	5000	Pseudosciana diacanthus, Pampus argenteus, Pomadasys hasta
18.3	1125	76	BTR	51	51	25°07'	66°26'	450	900	Trichurus spp., Lactarius lactarius
18.3	1335	77	SPT	72	35	25°02'	66°18'	100	200	Decapterus sp.
19.3	0355	78	BTR	98	98	25°00'	65°56'	650	1300	Rays, Pseusciana diacanthus, Pomadasys hasta
19.3	0650	79	BTR	36	36	25°10'	65°54'	225	450	Pomadasys maculatus, Pomadasys hasta
20.3	0435	80	SPT	16	12	25°15'	65°46'	100	200	Trichrius, Rays, Arius spp.
20.3	1104	81	HMB	17	-	25°13'	65°31'	24	55	Lutjanus argentimaculatus, Pomadasys hasta
20.3	1350	82	BTR	18	18	25°15'	65°21'	32	96	Pomadasys maculatus
21.3	0720	83	BTR	19	19	25°14'	65°06'	80	160	Argyrops spinifer, Rays, Drepane punctata
21.3	1315	84	BTR	16	16	25°08'	64°45'	200	270	Pomadasys hasta, Argyrops spinifer, Drepane punctata
21.3	1920	85	BTR	16	16	25°05'	64°24'	200	400	Arius sp.
22.3	0310	86	SPT	27	-	25°03'	64°02'	4	4	Rays
22.3	0625	87	BTR	11	11	25°12'	63°52'	280	300	Skates, Argyrops spinifer
28.3	1155	88	SPT	60	45	24°59'	63°50'	45	40	Megalaspis cordyla
29.3	2325	90	BTR	15	15	25°08'	63°05'	4000	8000	Thryssa mystax, Arius, Thryssa dussumieria
30.3	0215	91	BTR	15	15	25°08'	63°21'	600	1200	Arius spp., Pomadasys hasta, Pampus argenteus

(Table 1. Continued)

Date	Time Start GMT	St no	Gear type	Bottom depth m	Gear depth m	Position North	Position East	Total catch kg	Catch per hour kg	Dominant species (total catch, kg)
30.3	0918	92	BTR	24	24	25°01'	63°11'	200	400	Argyrops spinifer, Megalaspis cordyla, Pomadasys hasta
30.3	1800	93	SPT	32	08	25°03'	62°42'	300	900	Megalaspis cordyla, Decapterus russelli
31.3	0100	94	BTR	32	32	25°03'	62°20'	9	19	Argyrops spinifer, Shark
1.4	1500	95	BTR	10	10	25°03'	61°35'	207	310	Arius sp., Lepturacanthus savala, Nemipterus japonicus
1.4	1935	96	SPT	25	18	24°44'	61°50'	600	1200	Benthosema terutum
3.4	0700	97	SPT	780	200	24°50'	62°14'	73	146	Benthosema sp.
3.4	2125	98	SPT	640	70	24°54'	63°01'	-	-	-
3.4	2240	99	IKMT	780	80	24°54'	63°01'	-	1	Diaphus sp.
4.4	1240	100	SPT	-	138	24°47'	64°06'	182	365	Benthosema sp.
4.4	2123	101	APT	525	25	25°02'	64°46'	80	160	Squids, Fish larvae
5.4	0615	102	SPT	1700	168	24°51'	65°21'	1760	1760	Benthosema spp.
5.4	1635	103	SPT	750	-	24°52'	65°39'	25	51	Almus, Myctophids
5.4	1906	104	SPT	730	33	24°53'	65°43'	38	76	Benthosema
6.4	1850	105	SPT	1000	10	24°58'	65°19'	480	960	Benthosema sp.
6.4	2027	106	SPT	1050	37	24°56°	65°23'	50	100	Benthosema
7.4	0415	107	SPT	760	165	24°45'	66°00'	291	581	Benthosema sp.
7.4	0545	108	KTR	750	160	24°45'	66°00'	40	80	Benthosema

Table 2. Length frequency and maturity Cr. 5+6.

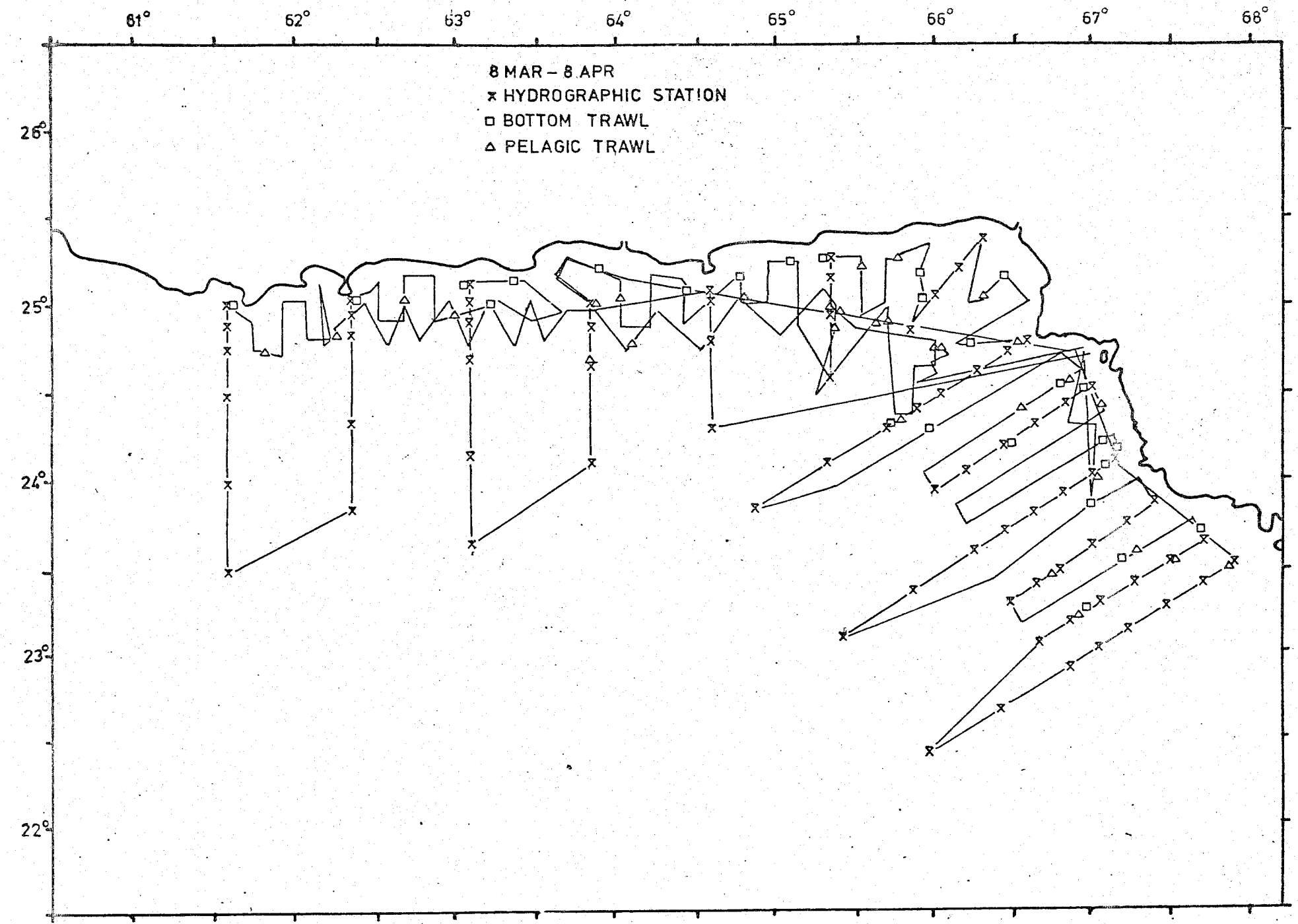
SMALL FISH

SPECIES	St.nos.	Length in cm (below) ≤2	3	4	5	6	7	8	9	10	11	12	≥13	N	Maturity stage 1	2	3	4	5	6	7
Benthosema plerotum	99-100-102	10	71	20																	
Diaphus sp.	99-98		50	0	25	29	7														
Decapterus russellii sp.	55-61-62-66-74-77-93	9	14	17	17	6	1	0	0	3	4	12	17	175		80	4	12 (only ≥10)			
Dussumieria acuta	52-91						34	13	39	9	0	2	4	43	100		(st. 52 i.e. less than 10 cm)				
Lactarius lactarius	76-78										4	8	88	50	2	4	6	34	42	12	
Nemipterus japonicus	75-95					1	0	1	3	9	11	15	61	60	12	60	16	12			
Nemipterus japonicus	54-58-60-66-62-67-71						1	7	12	8	4	7	60	150	7	23	15	4	2		
Opisthopterus tardore	91-										5	3	93	40	(st.91 only)			25	70	5	
Pomadasys maculatus	82-85												100	50	8		4	52	32	4	
Sardinella sindensis	52-56-66-85-91-95							1	2	6	11	14	66	132	21	28	13	30	9	0	
Squids	78-81-87-91-95	3	10	13	14	20	12	9	6	7	6	2	4	111							
Stolephorus indicus	55-56-74		3	21	9	0	13	51	3					75			35	65	(only st. 55 ≥7 cm)		
Thryssa dussimieri	77-85-90-91				1	1	6	2	8	29	12	14	27	113	3	8	29	29	30	1 (≥5)	
Thryssa mystax	77-85-90-91							4	27	21	2	13	34	82	25	9	4	22	41		

Table 2 . Length frequency and maturity. Cr. 5+6

LARGE FISH

SPECIES	St.nos.	Length in cm (below) ≤5	10	15	20	25	30	35	40	45	50	55	60 ≥65	N	Maturity stage 1	2	3	4	5	6	7
Arygrops spinifer	62-84-92	18	14	0	0	0	0	5	21	31	10			75	46	28	20	6			
Hilsa ilisha	78-91		24	26	40	10								50		6	12	42	30	12	
Megalaspis cordyla	88-92-93							31	55	15				73		40	50	11	(All in 2 rec.)		
Otolithes ruber	91		16	56	28									25	2	4	12	40	32	12	
Pampus argenteus	75-90-91			2	35	45	19							67		18	41	29	7		
Pomadasys hasta	90-92-95	33	0	0	13	0	0	18	24	10	2			37	6	0	7	9	29	4	(Not ≤10)
Pomadays hasta	75-78-79-82-84-85			1	19	8	7	19	23	19	24	0		160	4	26	2	18	17	(st.82-84)	


8 MAR – 8 APR
HYDROGRAPHIC STATION
BOTTOM TRAWL
PELAGIC TRAWL
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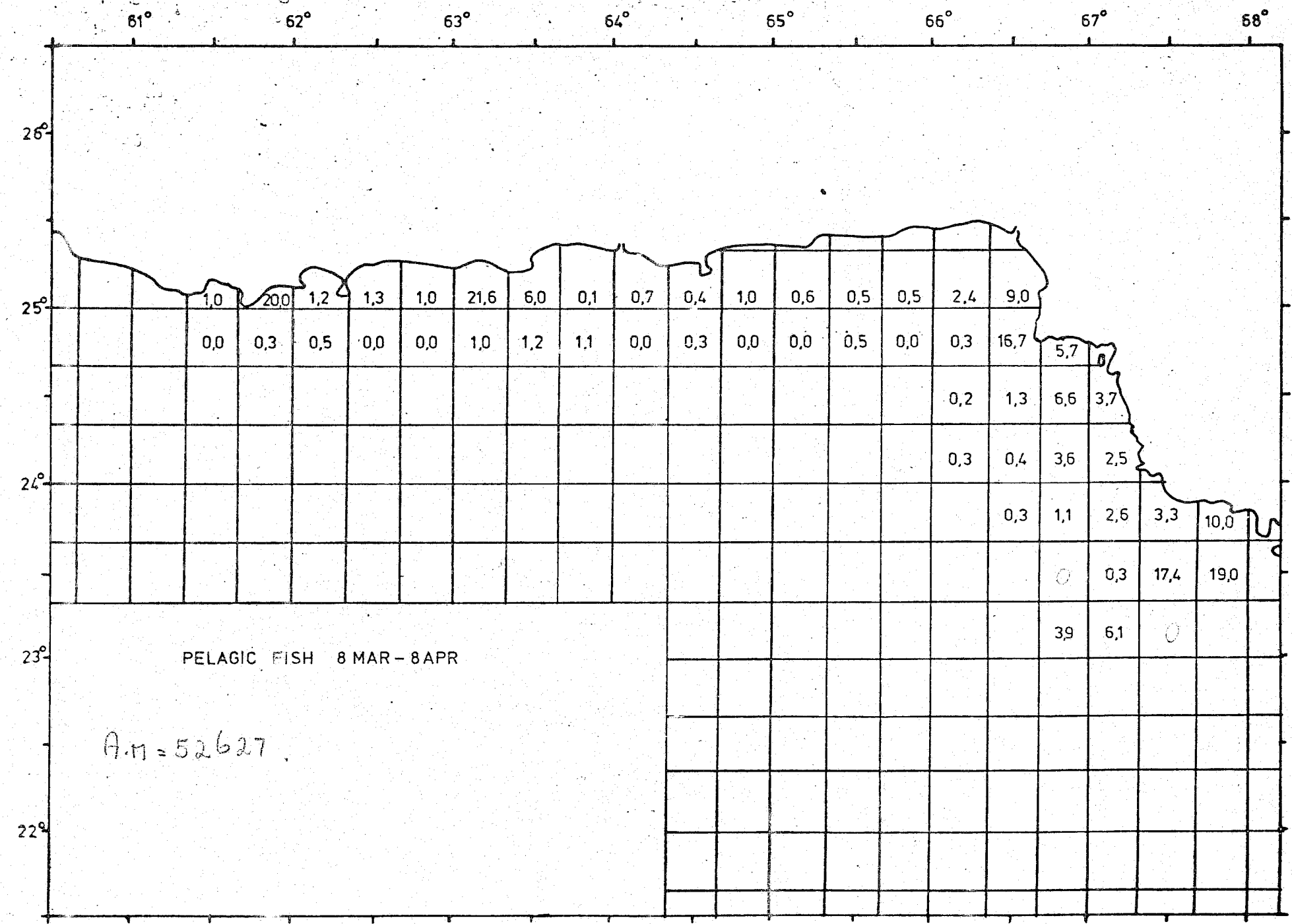
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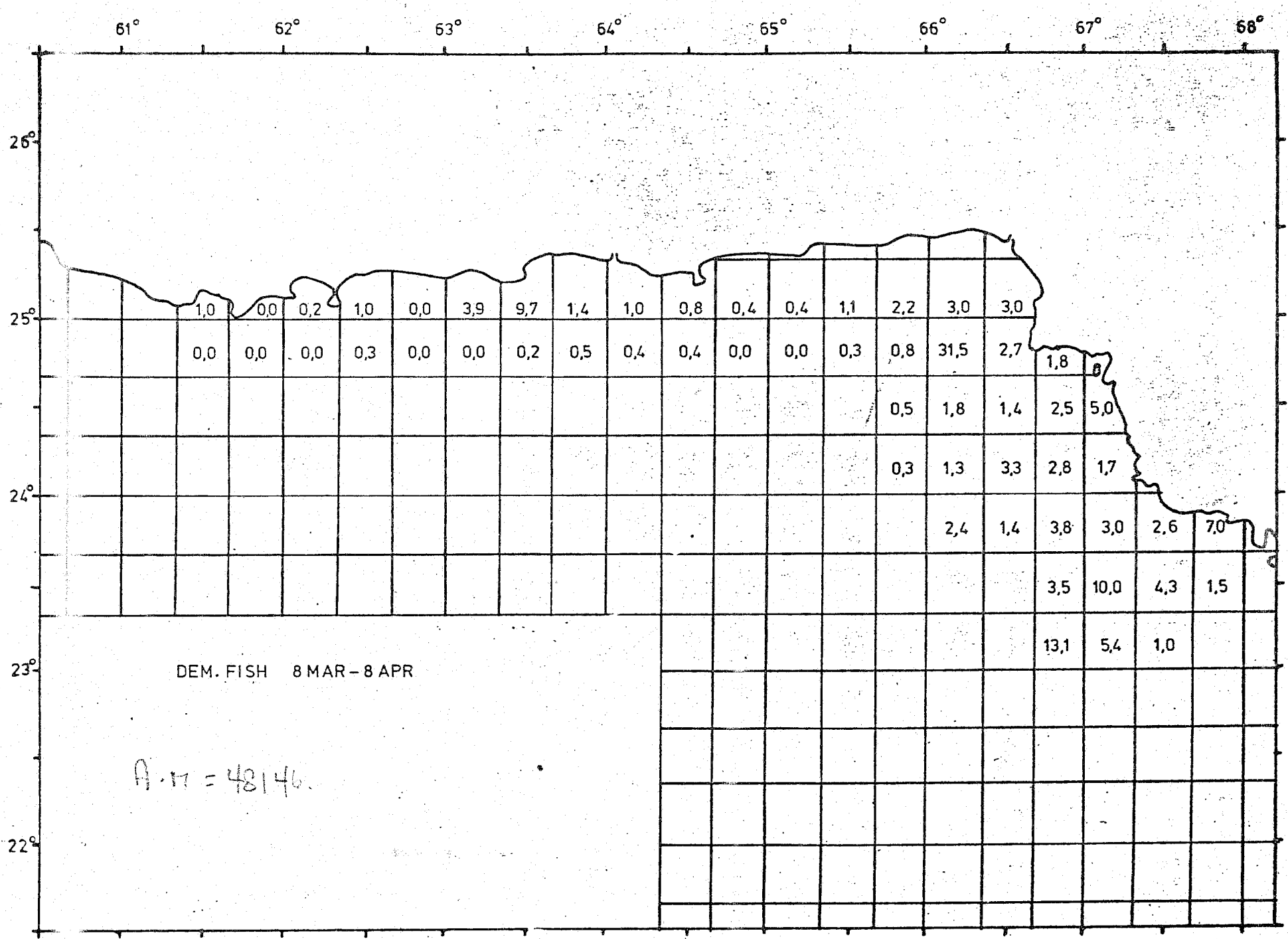
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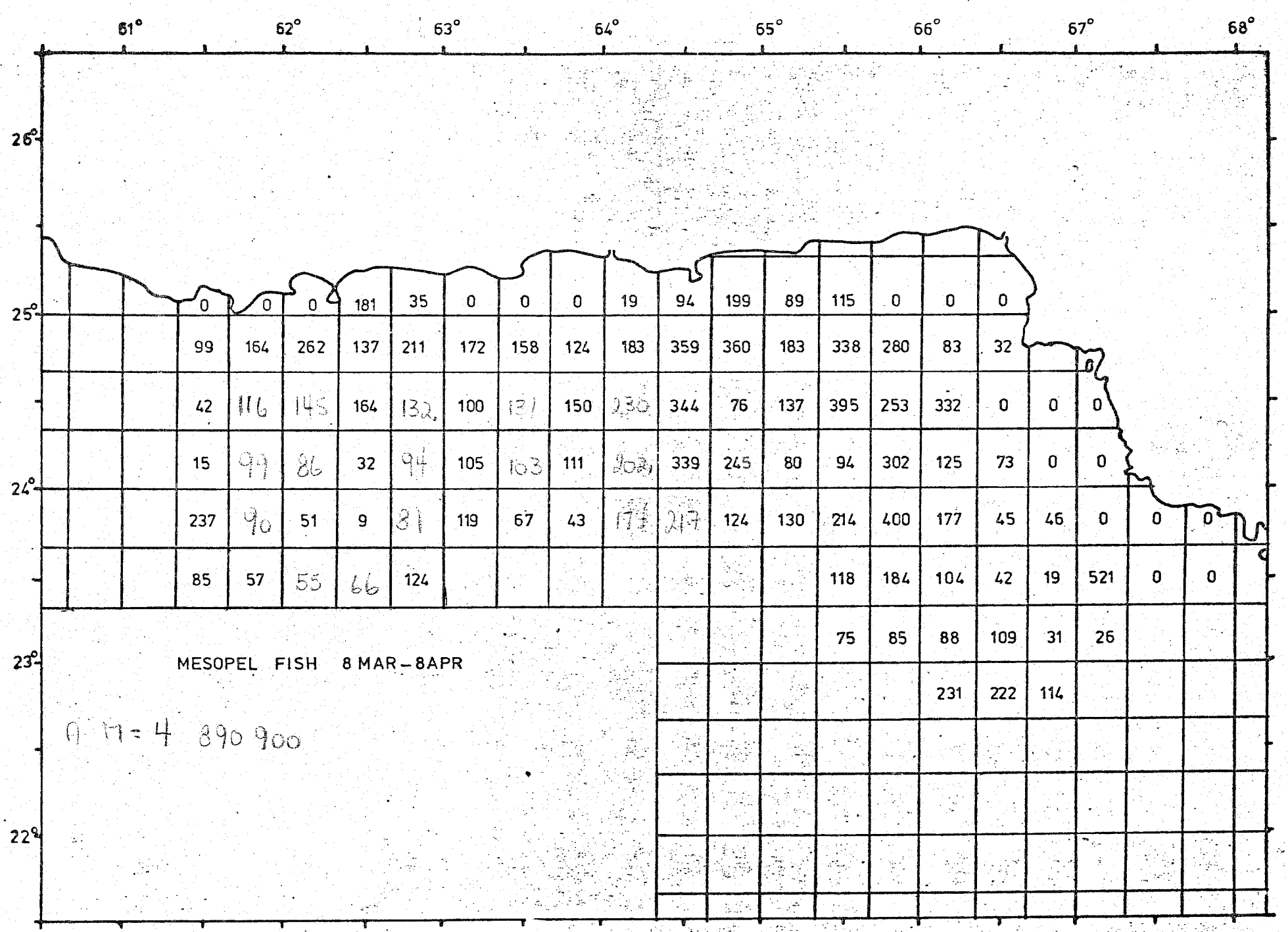
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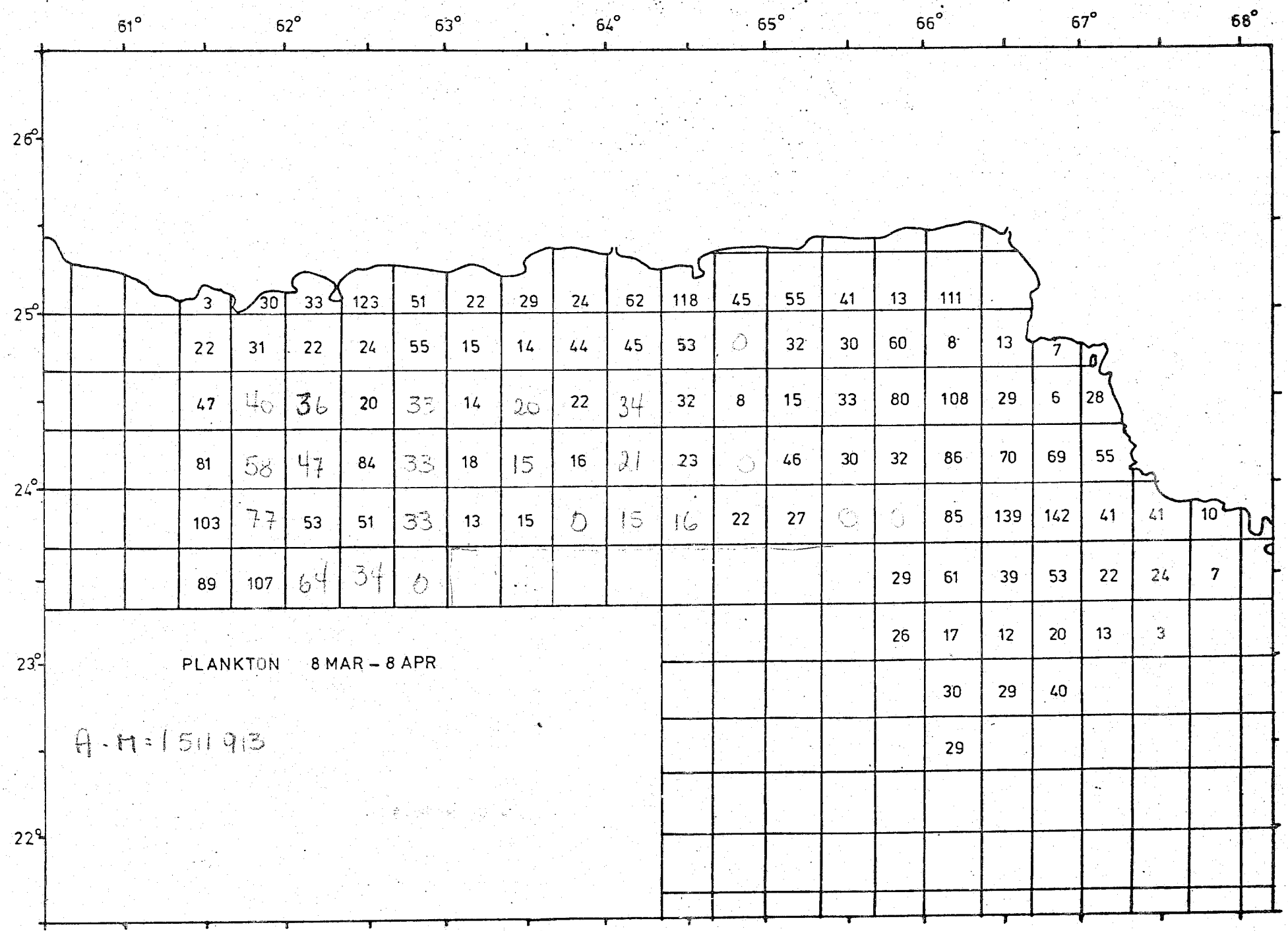
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81 58 47 84 33 18 15 16 21 23 0 46 30 32 86 70 69 55
103 77 53 51 33 13 15 0 15 16 22 27 0 0 85 139 142 41 41 10
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30 29 40
29
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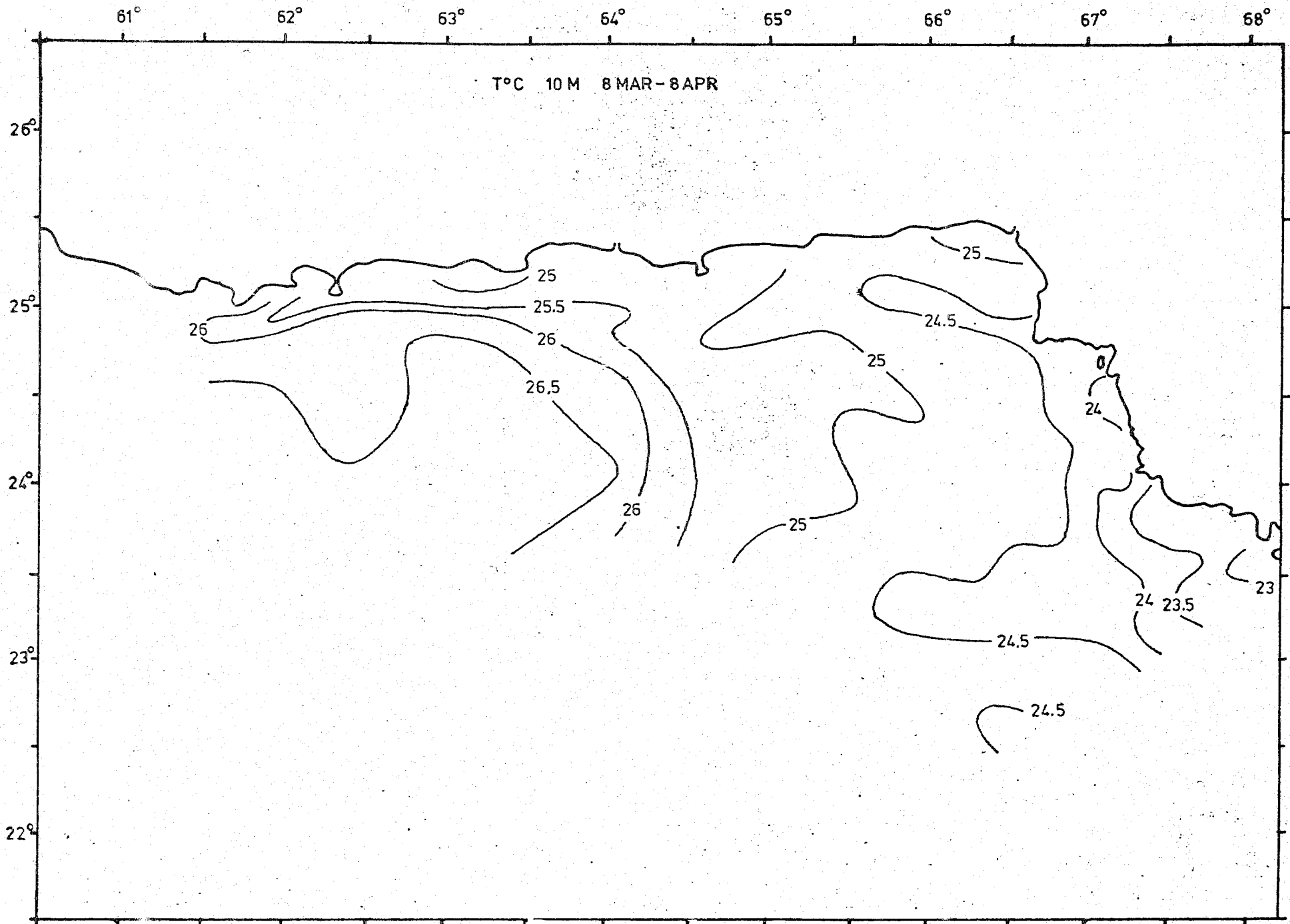
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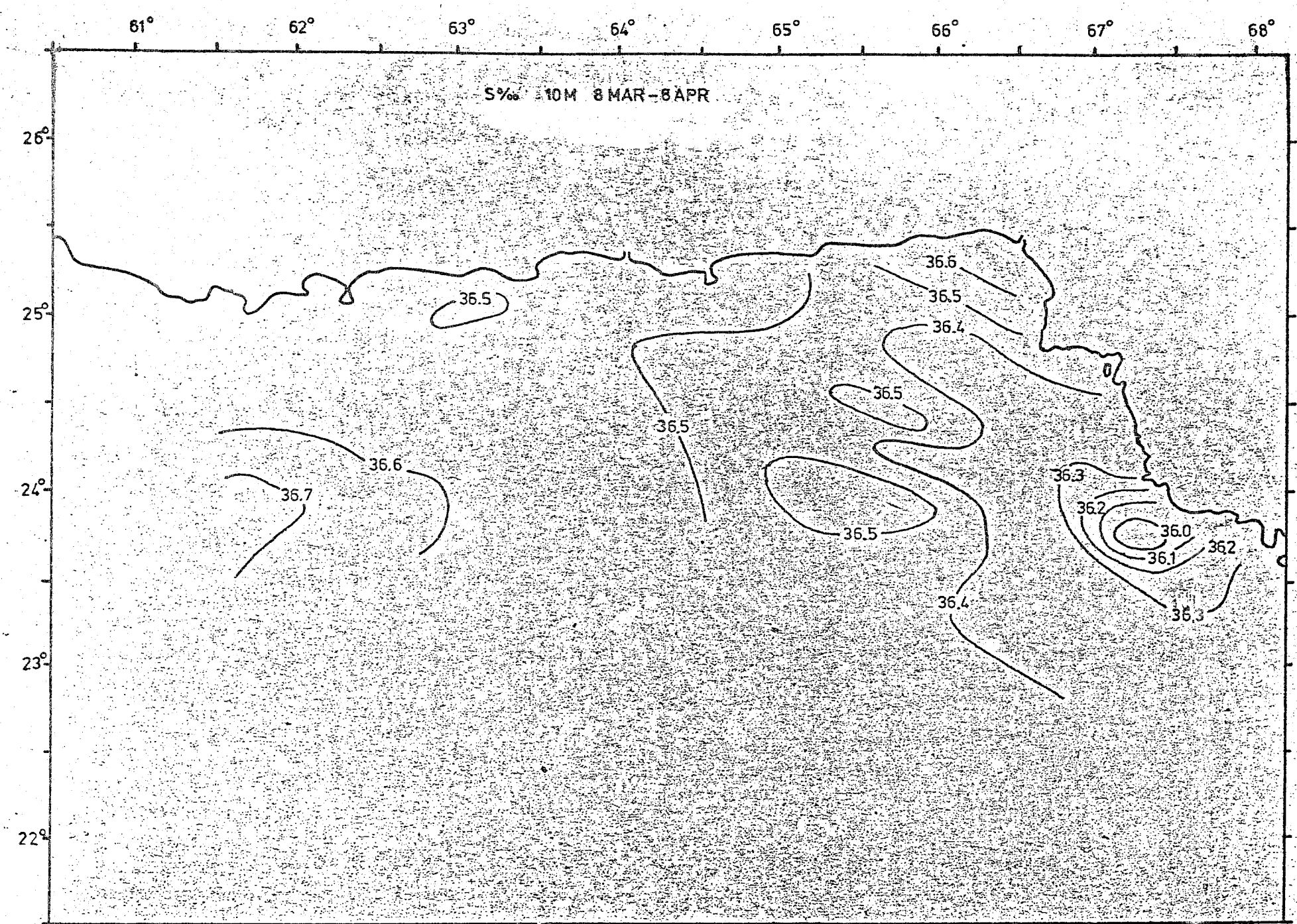
S‰ 10M 8 MAR–8 APR
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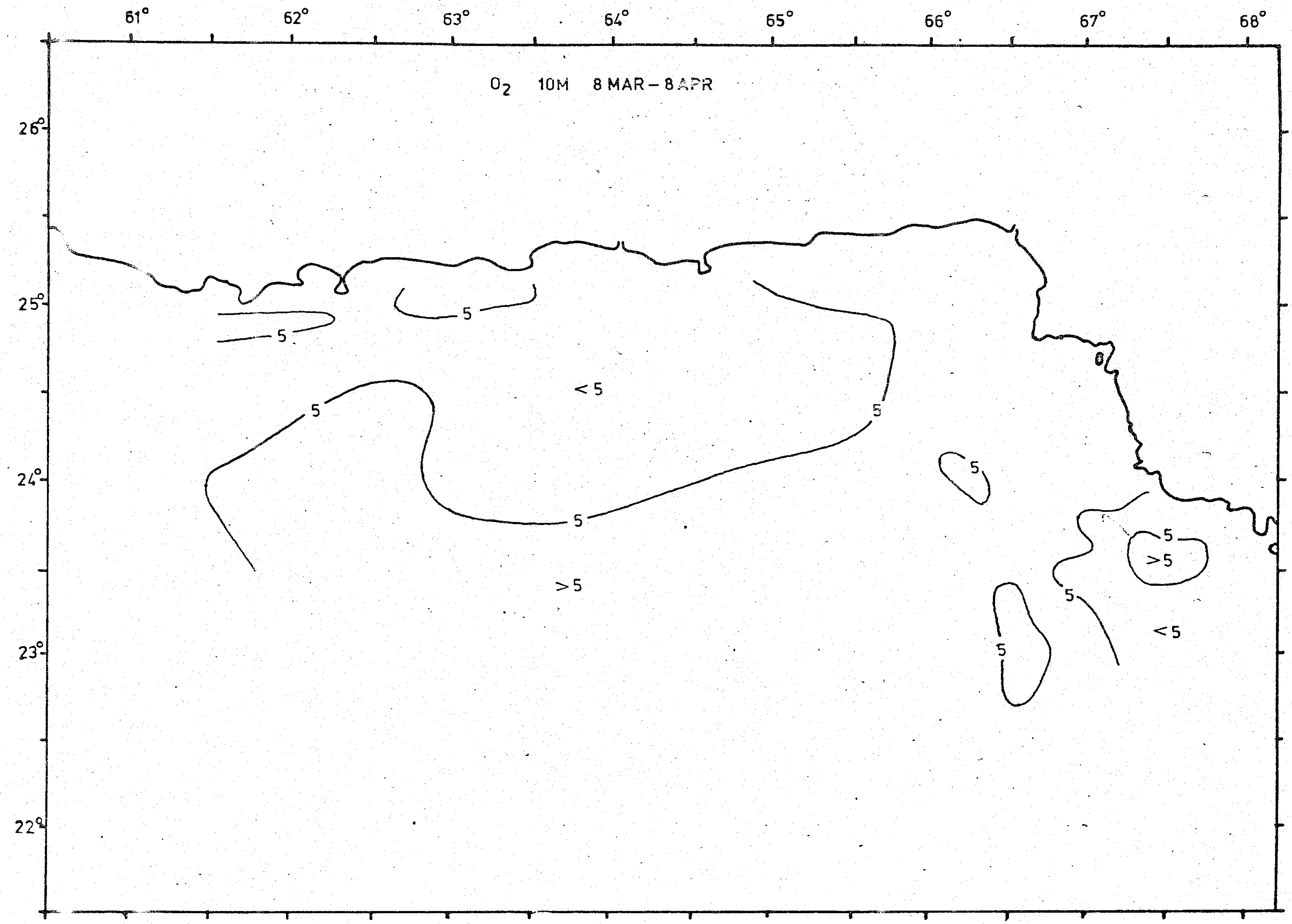
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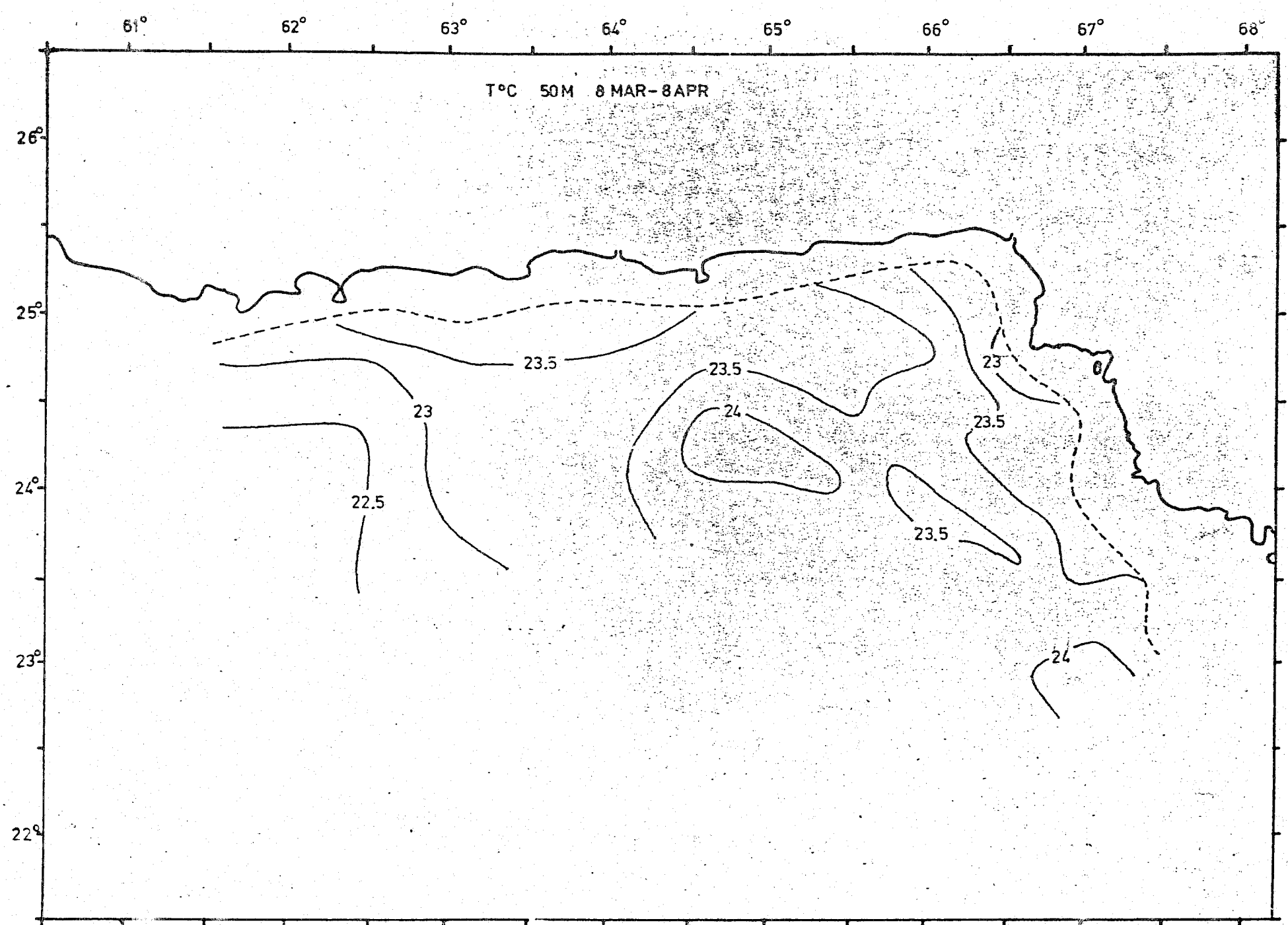
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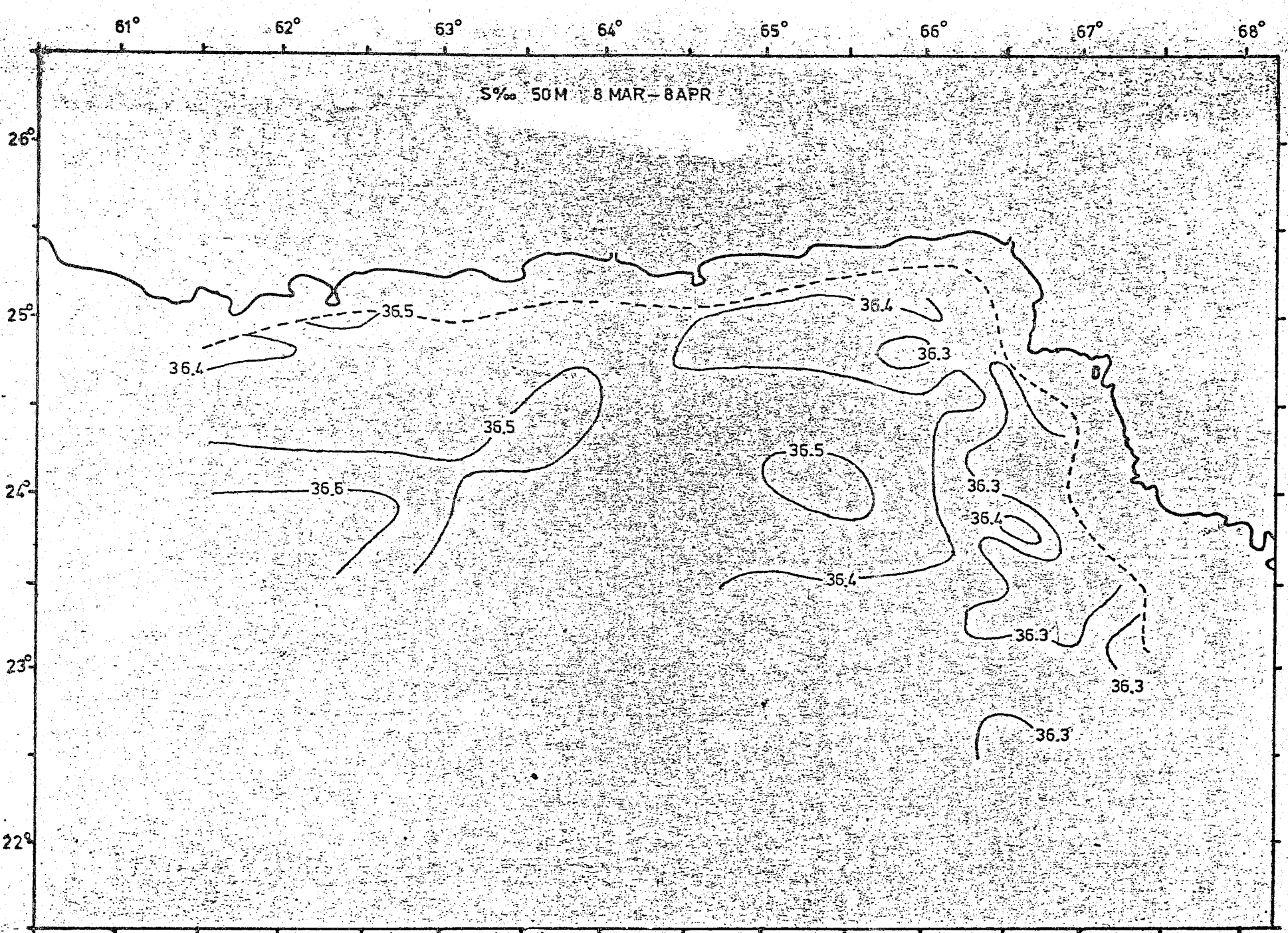
S‰ 50M 8 MAR–8APR
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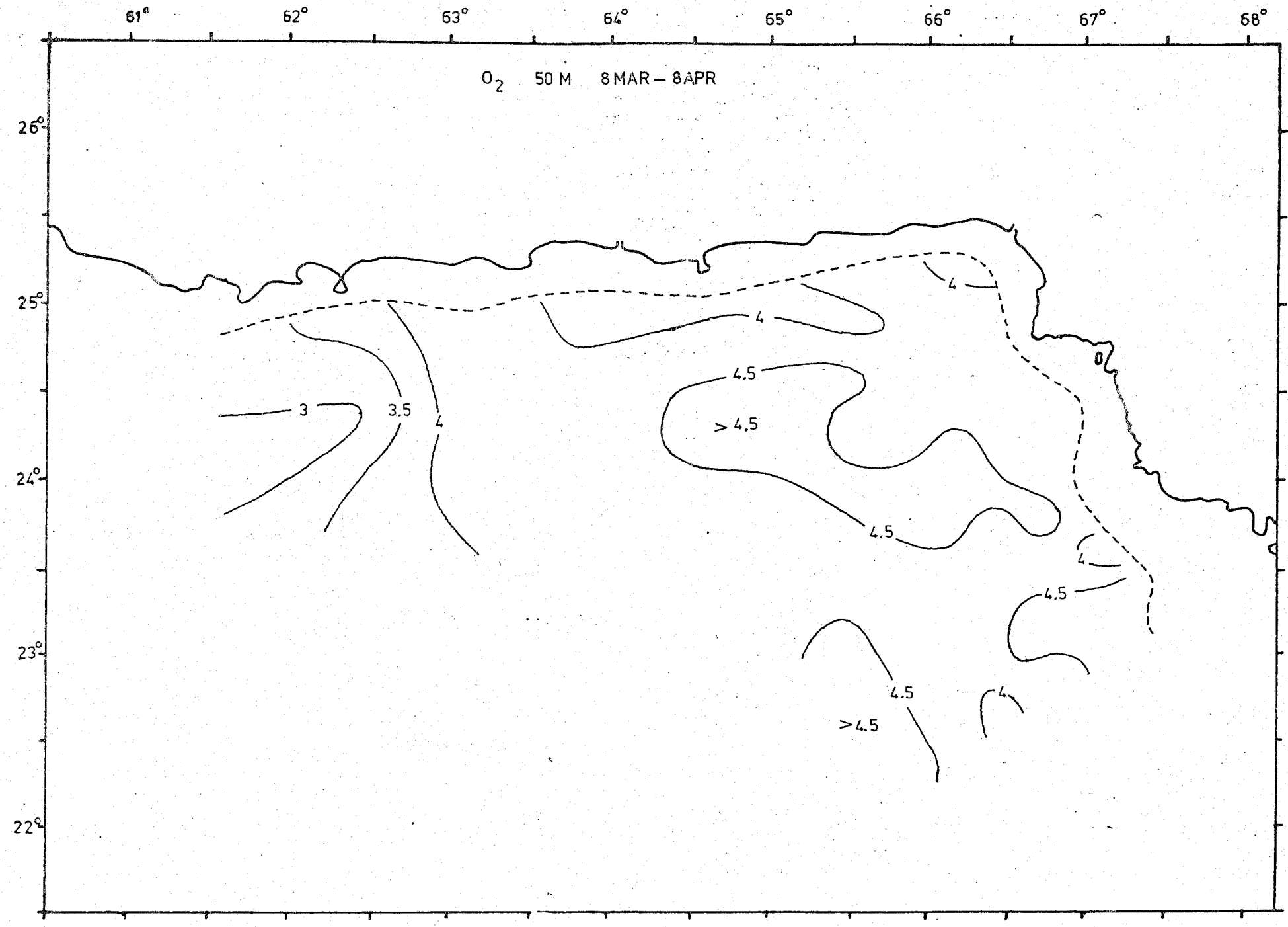
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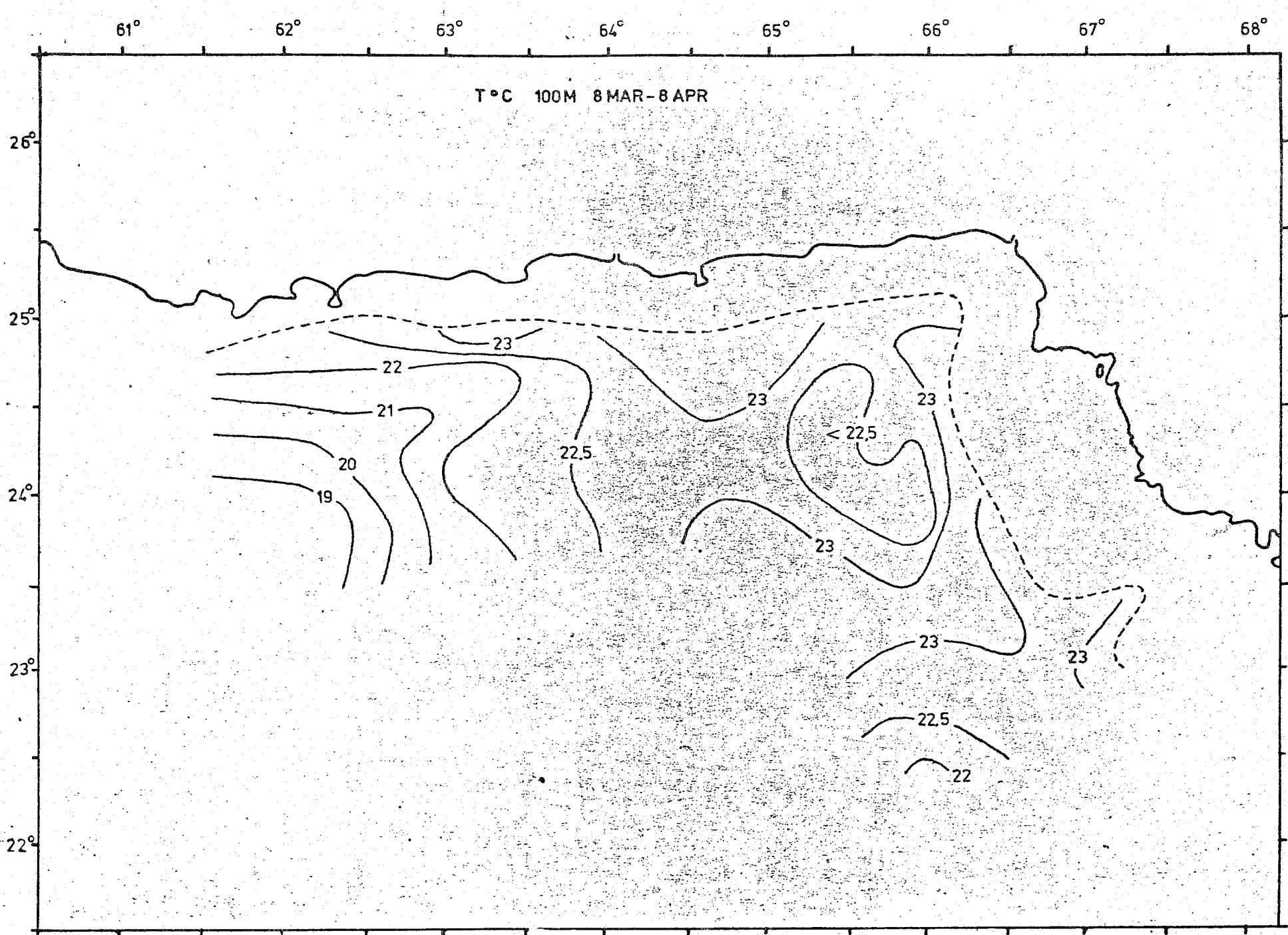
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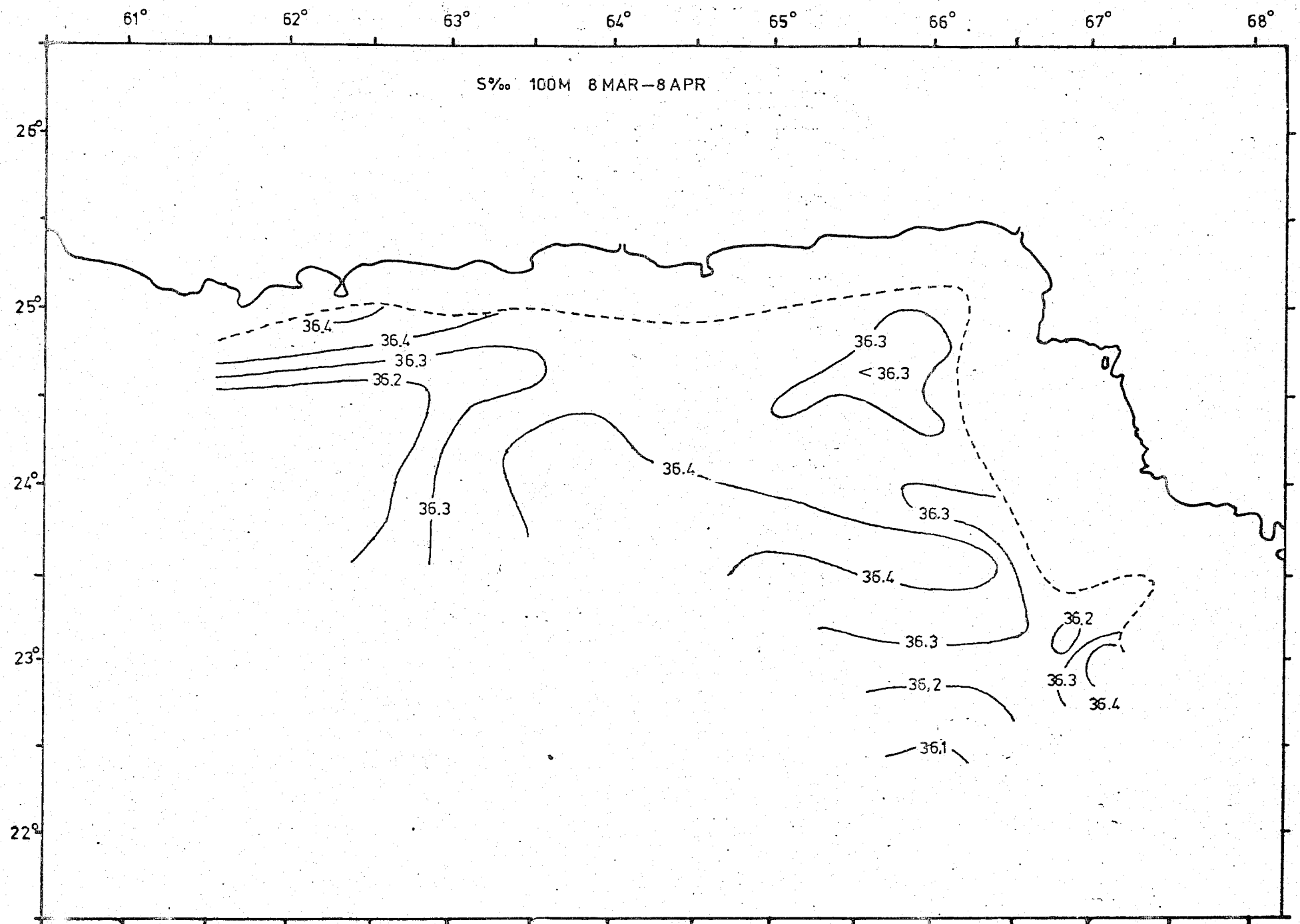
S‰ 100M 8 MAR—8 APR
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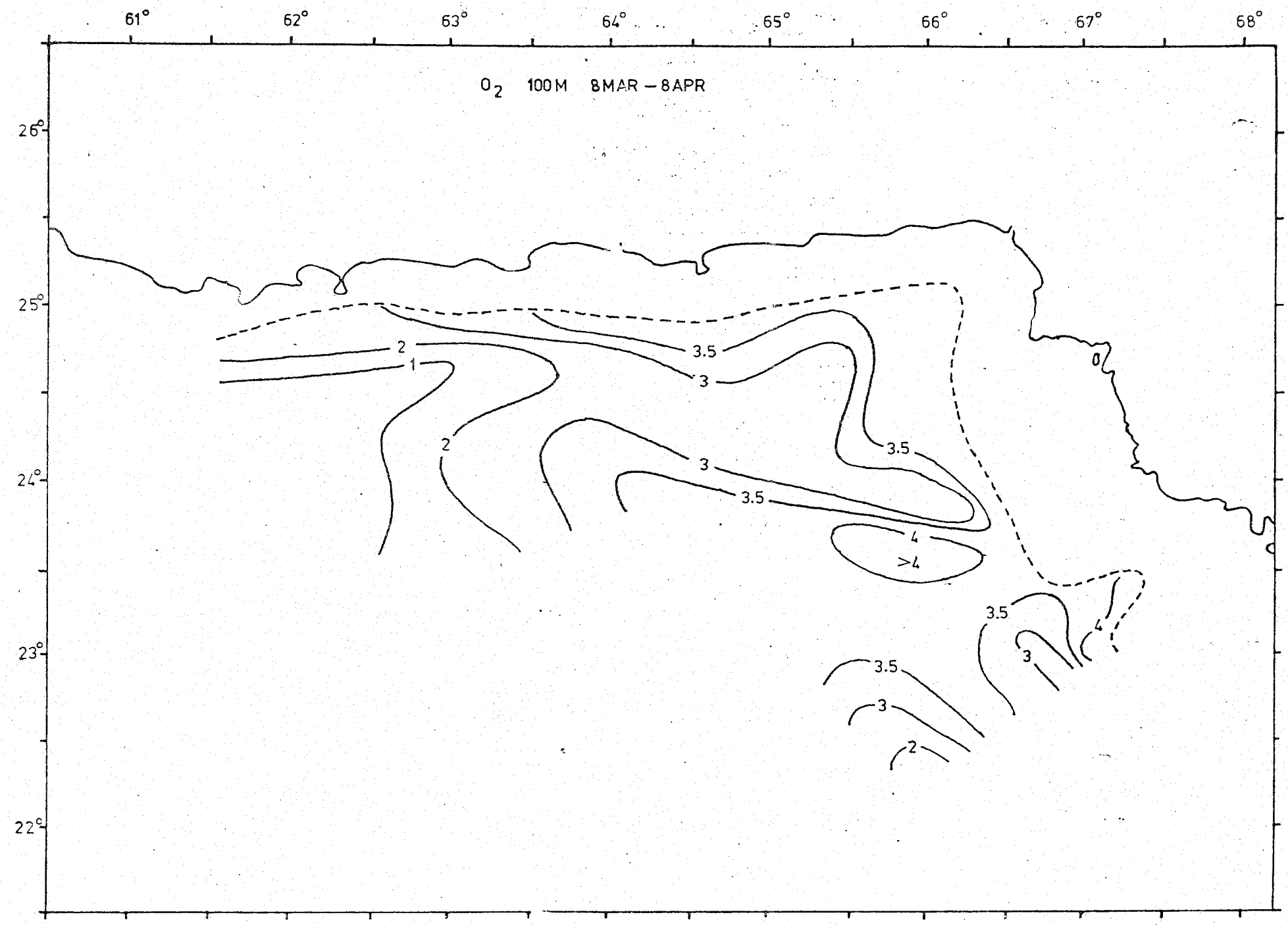
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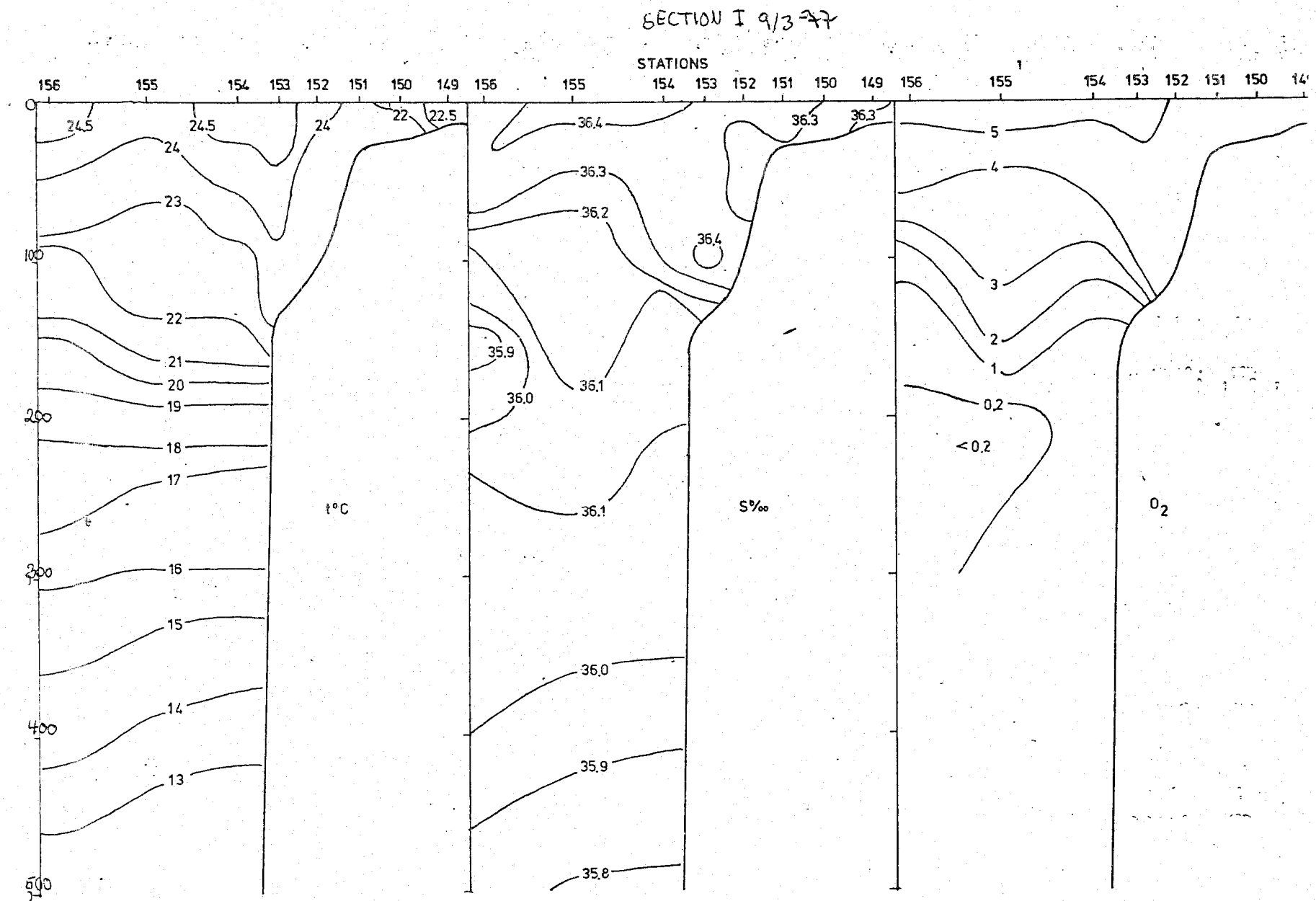
SECTION I 9/3 77
STATIONS
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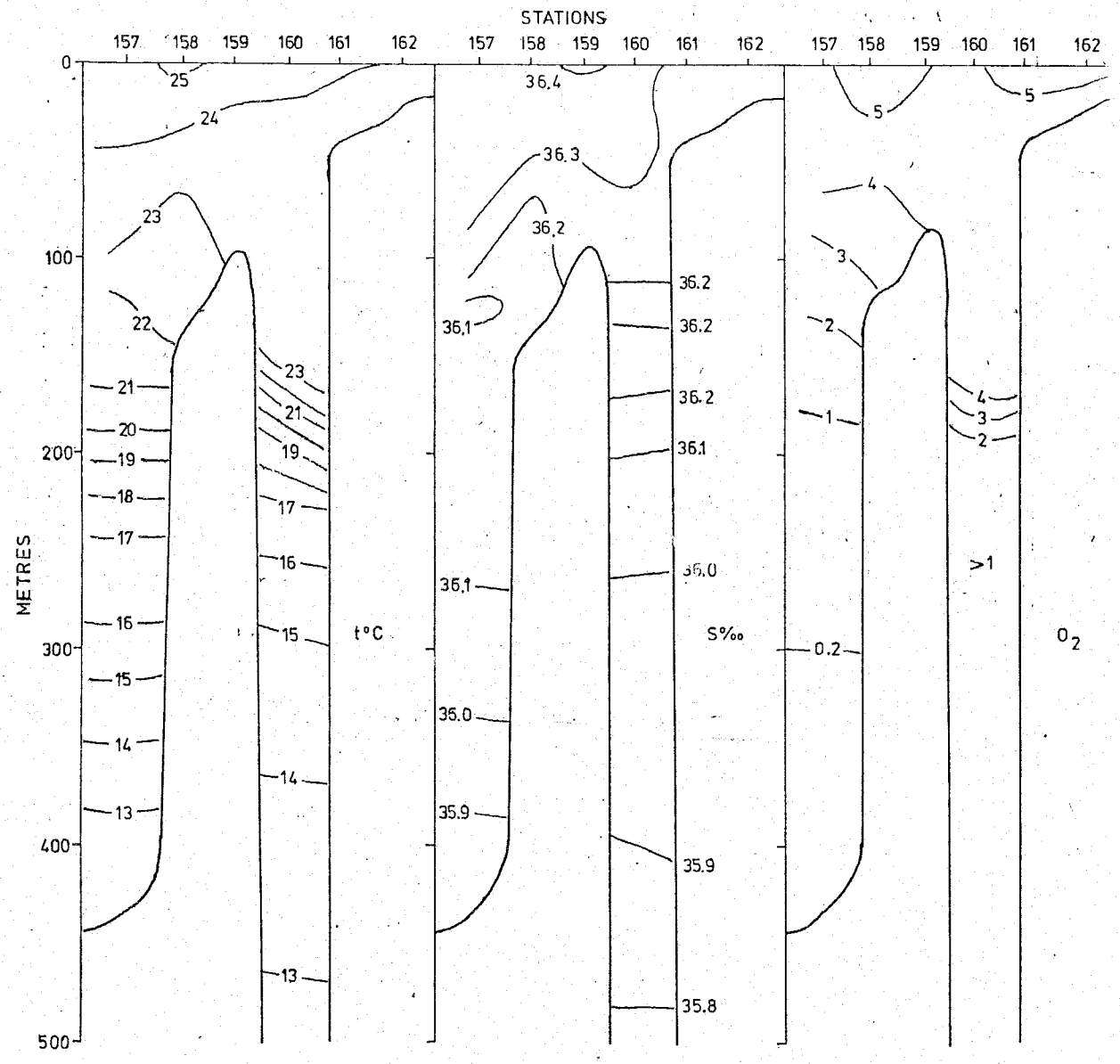
SECTION II 10/3 - 77



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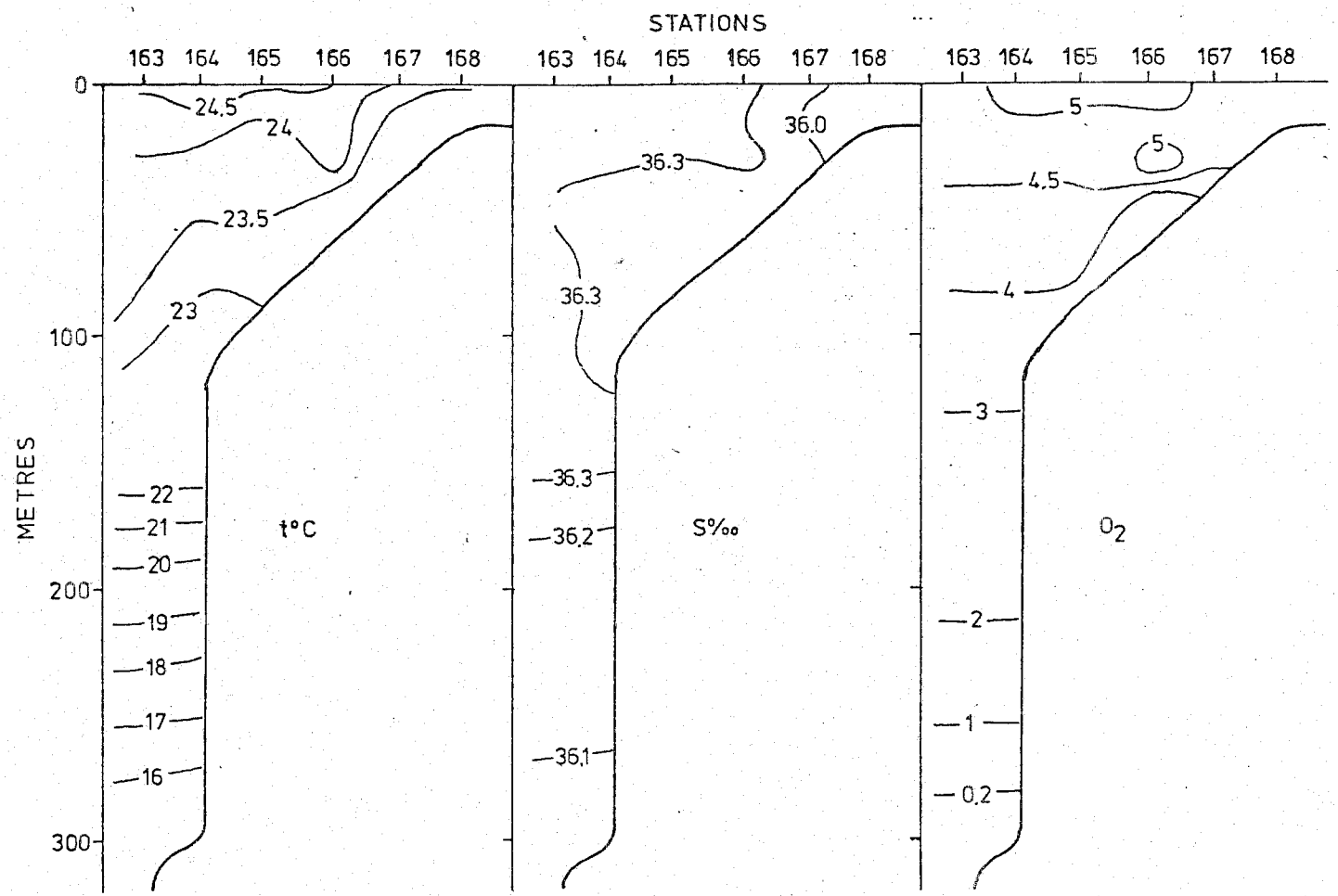

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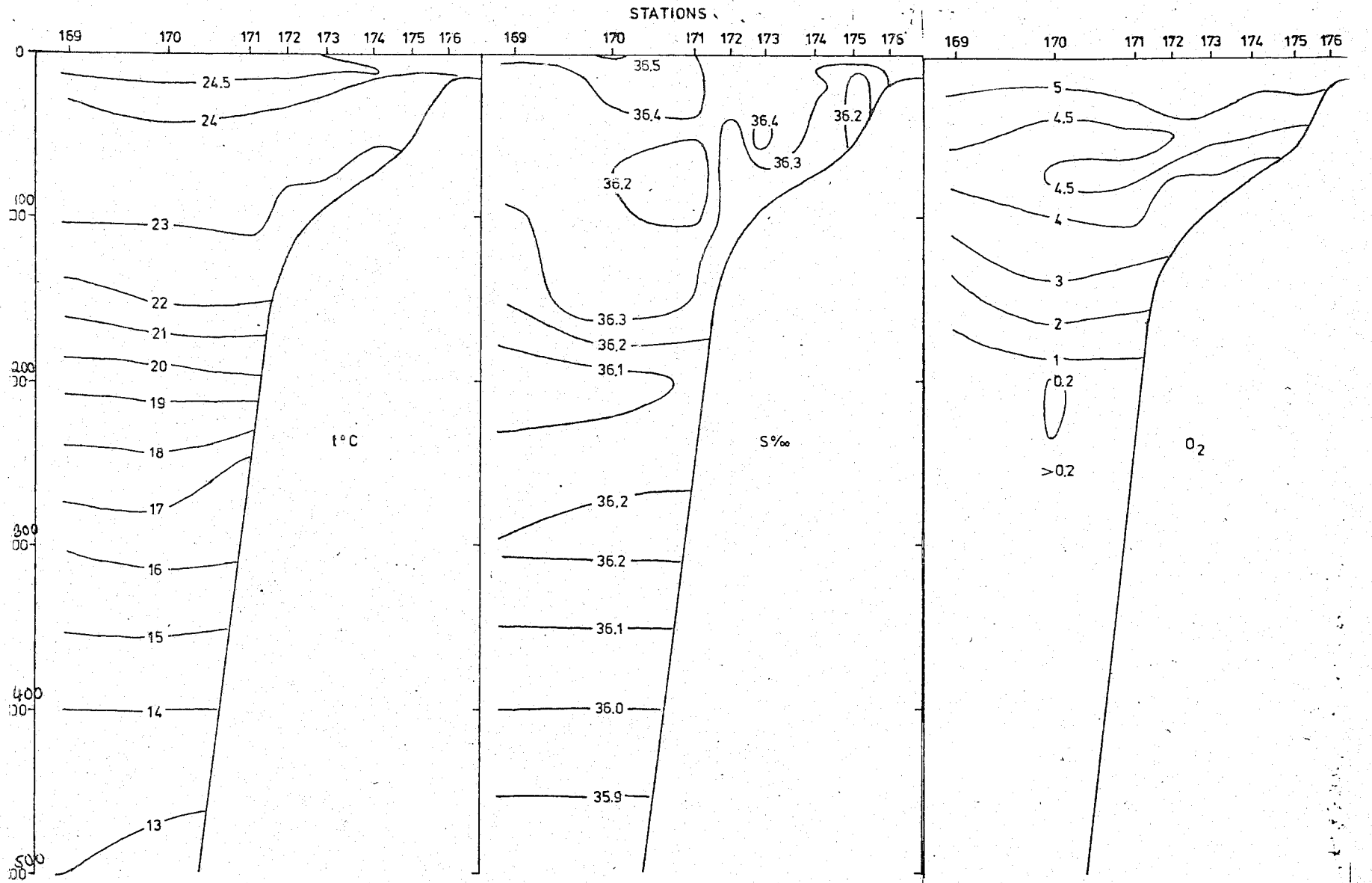

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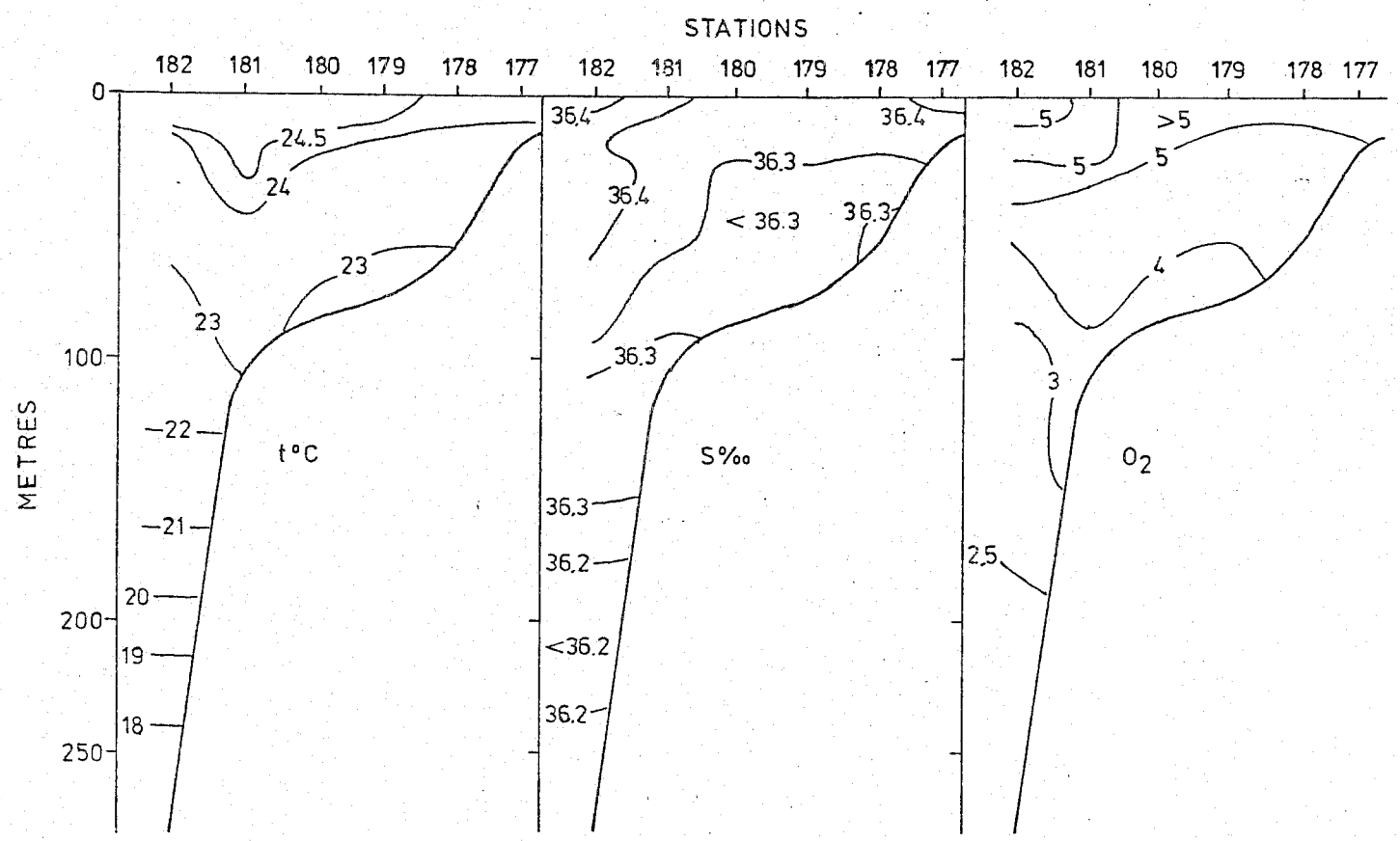

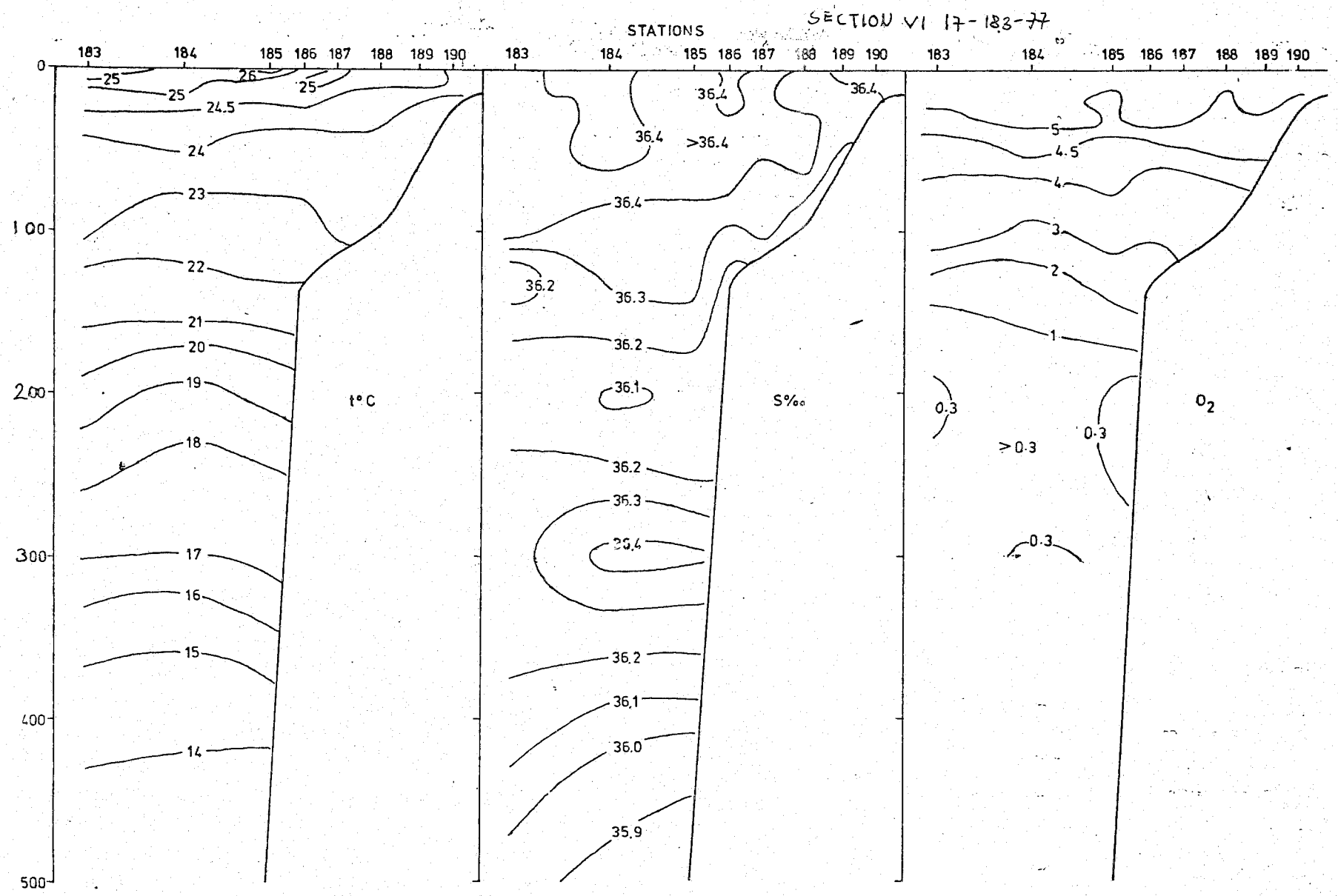
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STATIONS
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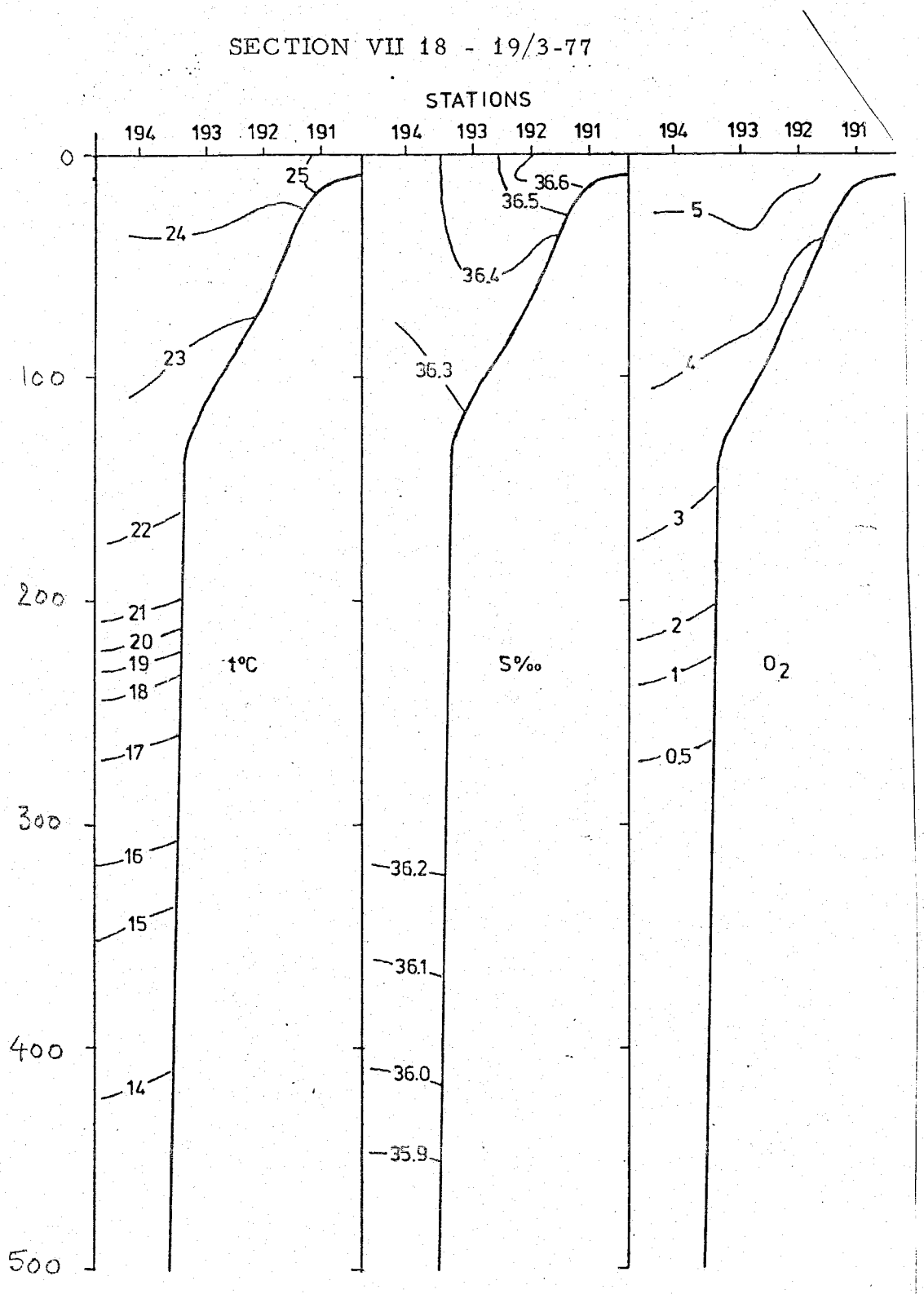
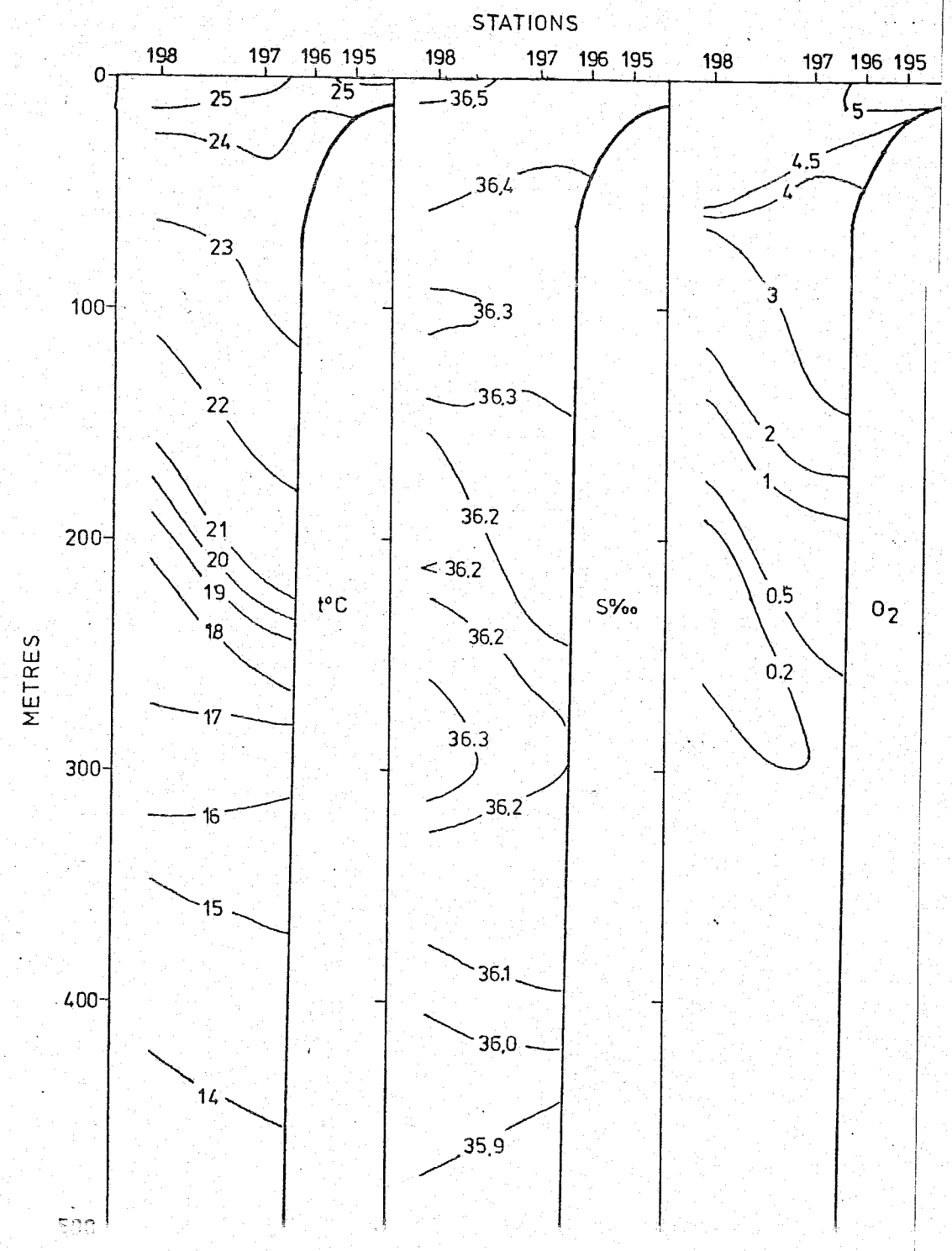
SECTION VII 18 - 19/3-77




STATIONS
198 197 196 195
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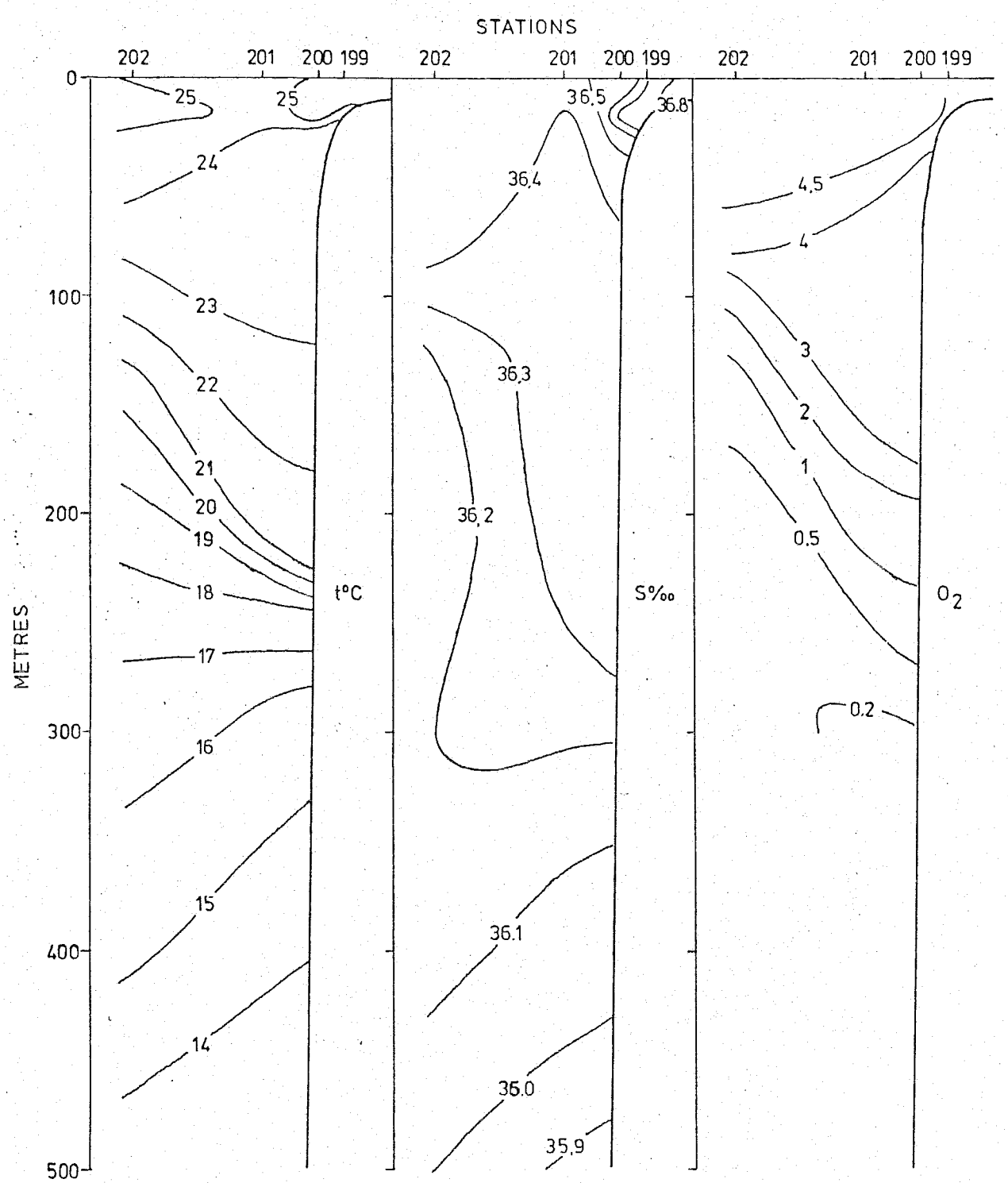
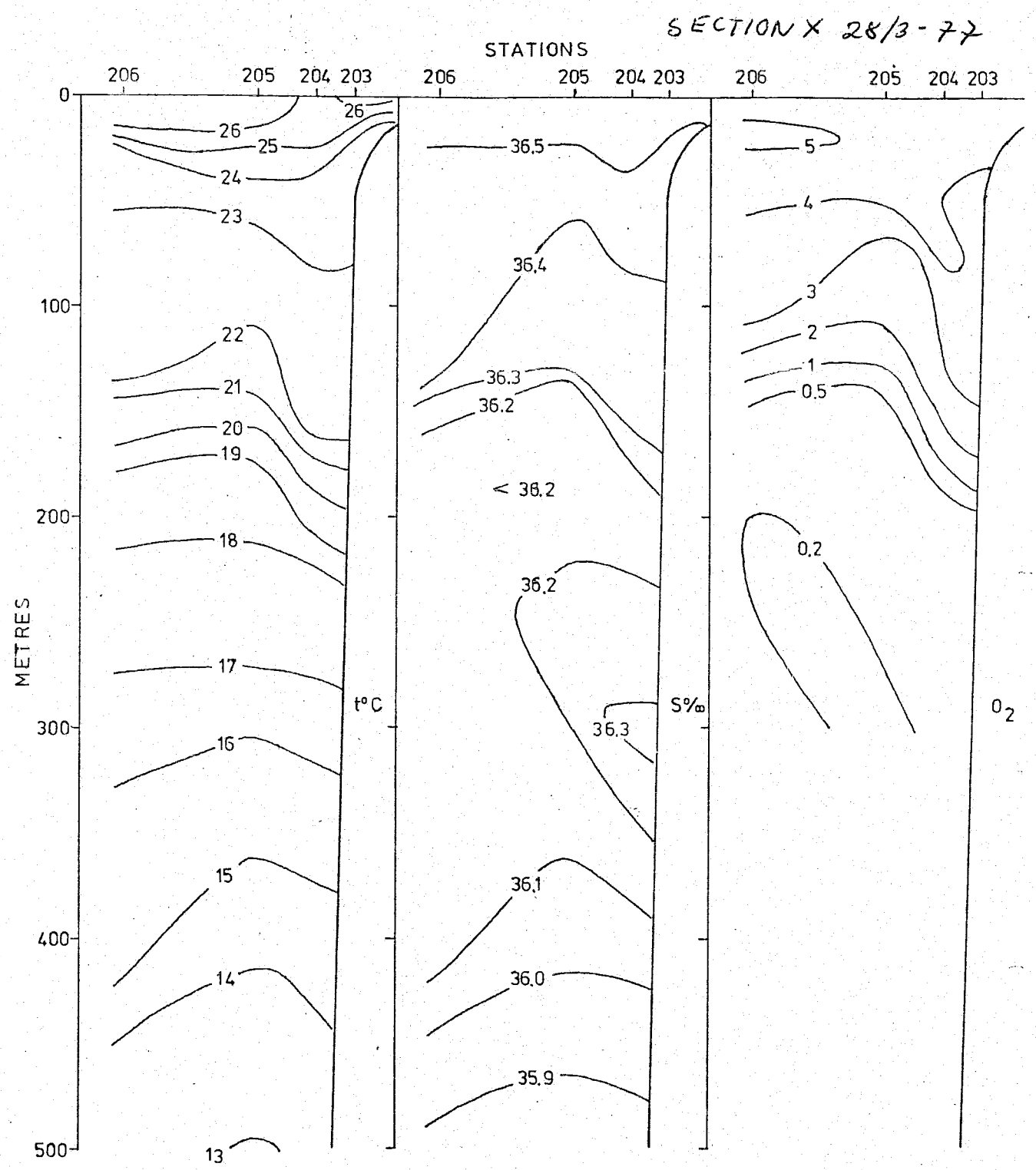
SECTION IX 22-23/3-77

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STATIONS
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METRES
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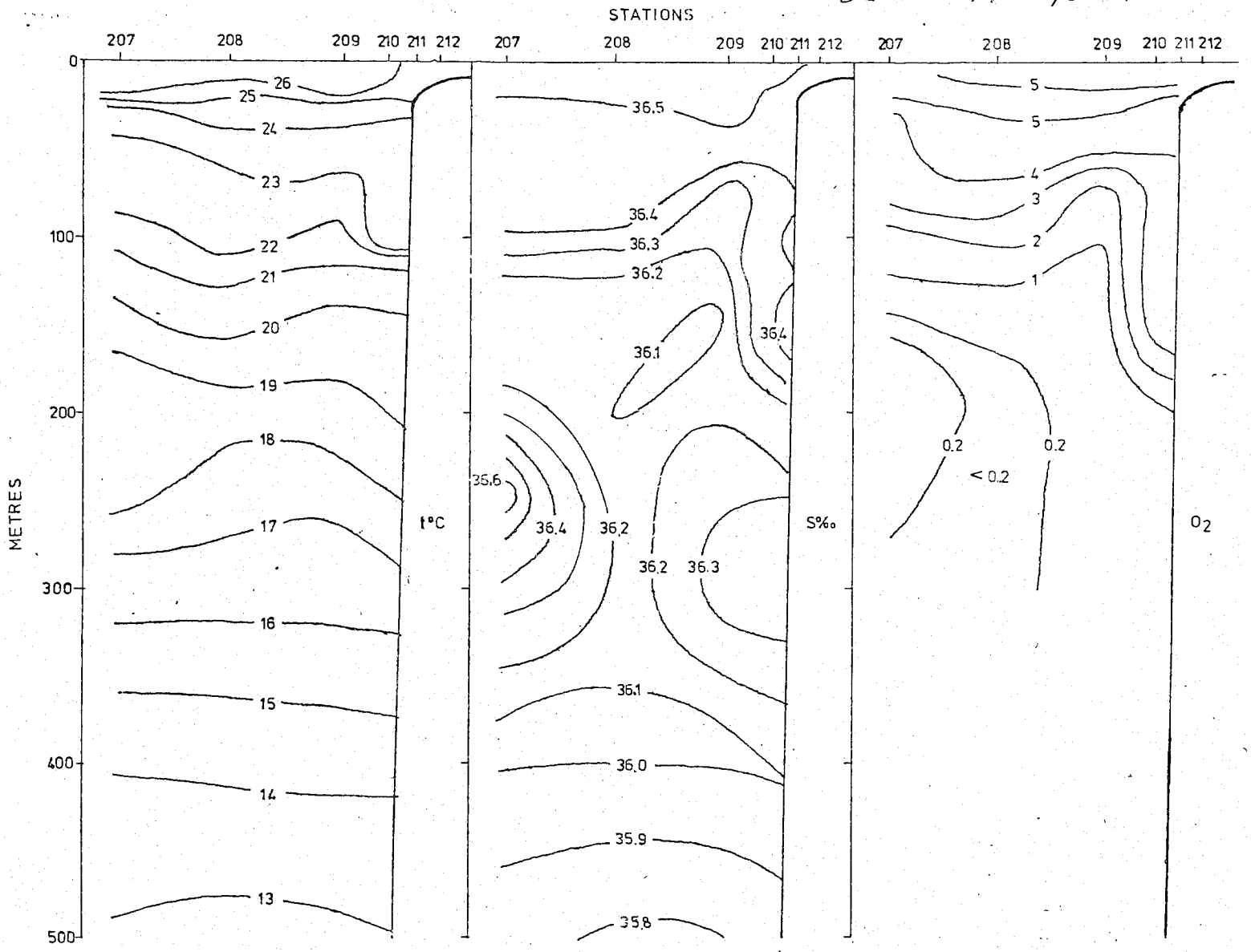
SECTION XI 29/3-77



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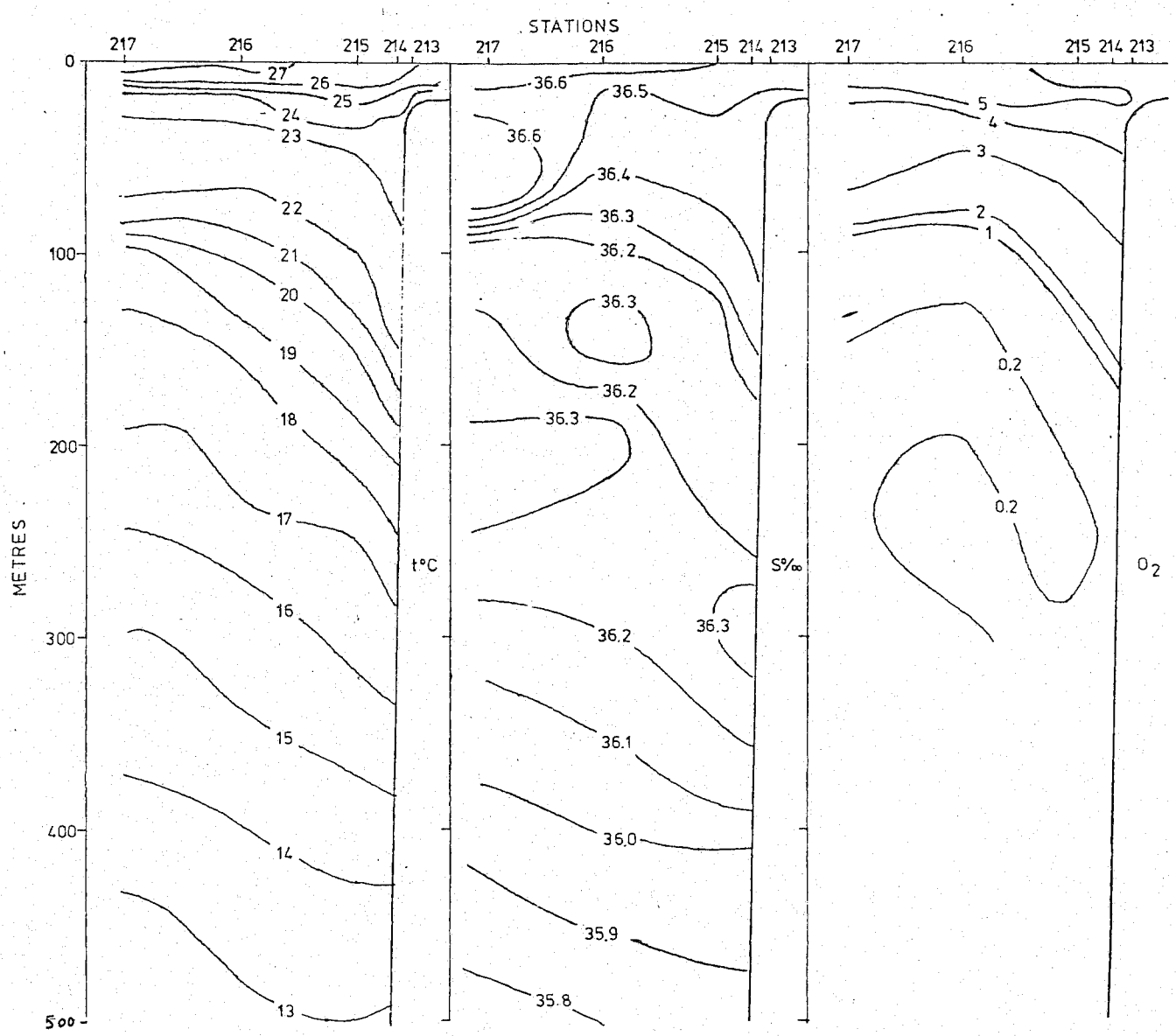

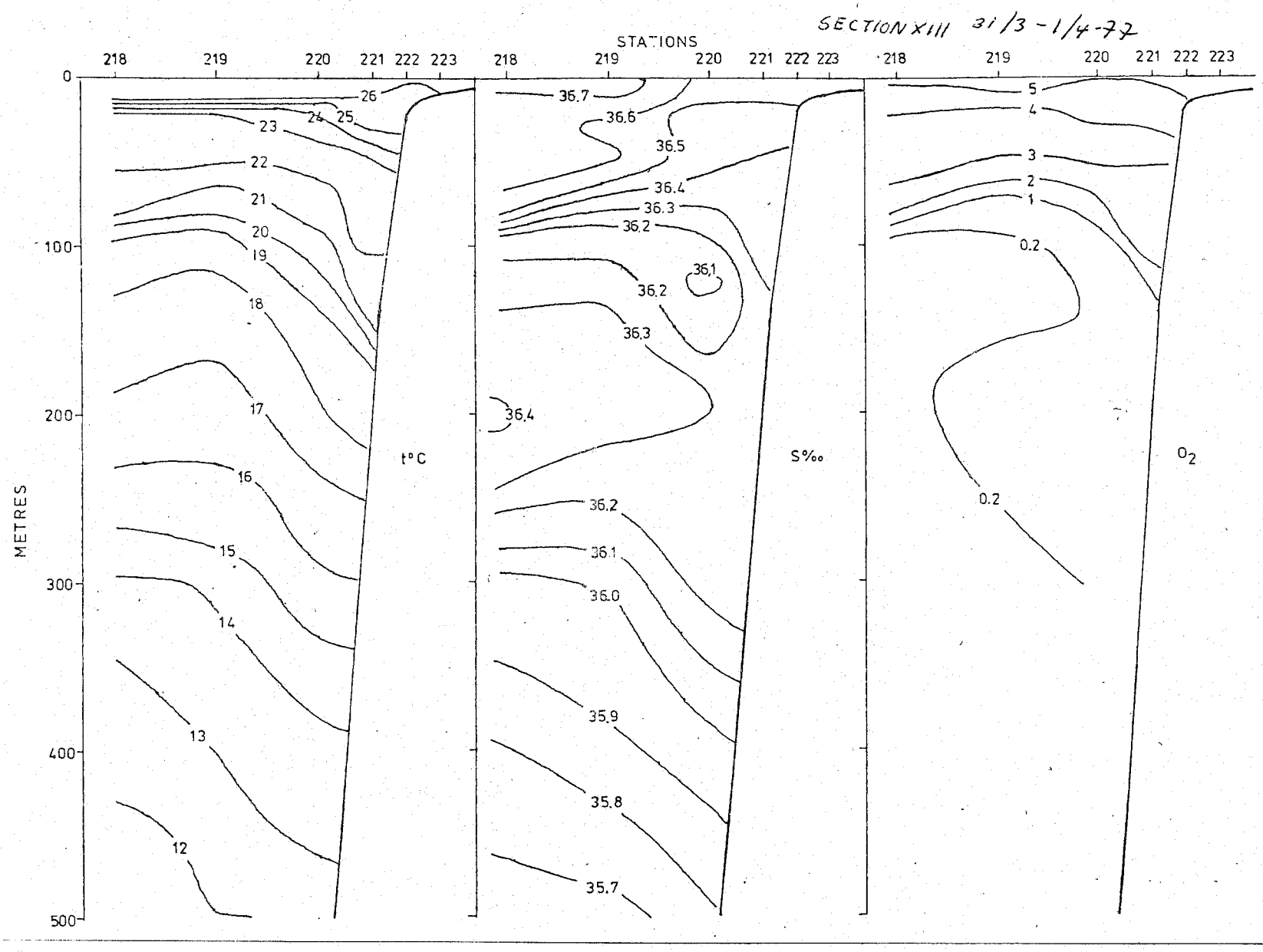
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STATIONS
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METRES
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Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D.
0149	1977	309	010 00	23310	67550	10
0150	1977	309	010 04	23230	67410	20
0151	1977	309	010 06	23160	67280	20
0152	1977	309	010 08	23080	67140	85
0153	1977	309	010 11	23010	67030	125
0154	1977	309	010 13	22550	66520	500
0155	1977	309	010 18	22390	66240	500
0156	1977	309	010 22	22230	65580	500
0157	1977	310	010 05	23030	66400	400
0158	1977	310	010 07	23100	66520	125
0159	1977	310	010 12	23170	67050	85
0160	1977	310	010 14	23240	67170	500
0161	1977	310	010 17	23310	67280	30
0162	1977	310	010 21	23390	67430	10
0163	1977	311	010 11	23180	66280	290
0164	1977	311	010 13	23240	66380	100
0165	1977	311	010 16	23300	66490	75
0166	1977	311	010 19	23380	67020	50
0167	1977	311	010 21	23450	67140	30
0168	1977	311	010 22	23510	67250	10
0169	1977	313	010 08	23060	65250	500
0170	1977	313	010 13	23220	65530	500
0171	1977	313	010 16	23350	66160	250
0172	1977	313	010 19	23410	66260	120
0173	1977	313	010 21	23480	66370	85
0174	1977	313	010 23	23540	66490	65

0175	1977	314	010	05	24010	67010	45
0176	1977	314	010	06	24060	67100	15
0177	1977	315	010	04	24310	67010	15
0178	1977	315	010	07	24240	66500	50
0179	1977	315	010	09	24170	66380	70
0180	1977	315	010	13	24100	66250	75
0181	1977	315	010	15	24030	66130	100
0182	1977	315	010	18	23550	66000	250
0183	1977	317	010	00	23480	64520	500
0184	1977	317	010	05	24040	65190	500
0185	1977	317	010	12	24170	65420	460
0186	1977	317	010	17	24230	65530	125
0187	1977	317	010	19	24290	66030	100
0188	1977	317	010	21	24350	66150	90
0189	1977	317	010	22	24420	66260	50
0190	1977	318	010	00	24470	66350	20
0191	1977	318	010	18	25210	66180	10
0192	1977	318	010	19	25100	66100	55
0193	1977	318	010	21	25000	66010	100
0194	1977	319	010	00	24470	65510	500
0195	1977	320	010	13	25150	65200	10
0196	1977	320	010	18	25070	65200	45
0197	1977	320	010	20	24560	65200	500
0198	1977	321	010	00	24350	65200	500
0199	1977	322	010	17	25050	64350	10
0200	1977	322	010	18	25000	64350	65
0201	1977	322	010	20	24470	64350	500
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0203	1977	328	010	10	25010	63500	40
0204	1977	328	010	14	24510	63500	500
0205	1977	328	010	17	24380	63500	500
0206	1977	328	010	23	24060	63500	500
0207	1977	329	010	07	23380	63050	500
0208	1977	329	010	11	24090	63050	500
0209	1977	329	010	17	24410	63050	500
0210	1977	329	010	19	24540	63050	500
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0217	1977	331	010	14	23500	62200	500
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0219	1977	401	010	01	24000	61350	500
0220	1977	401	010	06	24300	61350	500
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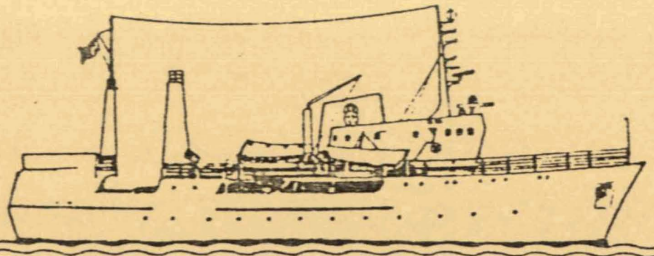


Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY REPORT ON CRUISES NOS 7 AND 8 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

13 April - 15 May 1977

Roald Sætre

Karachi, May 1977

Institute of Marine Research, Bergen

PRELIMINARY REPORT ON CRUISES NOS 7 AND 8 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT.

Introduction	This report covers the fourth complete coverage of the Pakistani waters during the project.
Departure	Karachi, 13 April 1977.
Arrival	Karachi, 29 April 1977.
Scientific staff	M. Arshad, M. Khaliluddin, S. Amjad (Marine Fisheries Department) H. Hassan, M. Hussain, S. Barkati (Institute of Marine Biology, University of Karachi) R. Sætre, B. Myrseth, S. Brattås, E. Olsen (Institute of Marine Research).
Departure	Karachi, 1 May 1977.
Arrival	Karachi, 15 May 1977.
Scientific staff	S. Qureshi, A.H. Qureshi, M.A.S. Sajid, (Marine Fisheries Department) H. Hassan, M. Hussain, J. Mustaqim (Institute of Marine Biology, University of Karachi) R. Sætre, B. Myrseth, S. Brattås, E. Olsen (Institute of Marine Research).

Survey grid and stations are shown in Fig. 1. The standard hydrographic/plankton stations were worked out as described in detail in report No. 1 with modifications in cruise report No. 2. Due to lack of filter paper on the last part of the cruise the chlorophyll samples were not taken for the stations along the Makran coast.

RESULTS

Table 1 shows the particulars of the fishing stations and Table 2 shows the length and maturity distribution of the dominant species.

Distribution and abundance of pelagic fish (Fig. 2)

A conspicious feature of this coverage is the significant reduction of the echo abundance along the whole Pakistani coast. This reduction seems to be most pronounced along the Makran coast and the southernmost Sind coast. In accordance with previous observations, the Sonmiani Bay area seems to contribute the highest values. The reduction in echo abundance is also reflected in the trawl catches. The catches of pelagic fish were much smaller than on the previous coverage. The dominant species along the whole coast were the anchovies (Thryssa mystax, Thryssa dussumeria). Other pelagic fish occasionally caught were sardine (Sardinella spp.), rainbow sardine (Dussumeria acuta) and scad (Decapterus spp.). All the pelagic fish were caught in small numbers and mainly by bottom trawling.

Distribution and abundance of demersal fish (Fig. 3)

As on the last coverage, the highest concentrations of demersal fish were found on the Great Kori Bank and in the Sonmiani Bay area. The largest catch, 24 tons/trawl hour, was taken at 150 m depth at the western edge of The Swatch. The dominant species in this catch were the tiger-toothed croaker (Otolithes ruber) and japanese threadfin bream (Nemipterus japonicus). Catches up to 8 tons/trawl hour were obtained in the Sonmiani Bay area consisting mainly of smallhead hairtail (Lepturacanthus savala) and japanese threadfin bream. These two species dominated the trawl catches along the Sind coast and in Sonmiani Bay. Other species of commercial interest frequently occurring in the catches were croakers, grunts (Pomadasys spp.) long-spined sea bream (Argyrops spinifer) and rock cod (Epinephelus spp.).

Distribution and abundance of mesopelagic fish (Fig. 4)

The total echo abundance of mesopelagic fish was less on this coverage than on the previous one. The highest integrator values were found off the Makran coast, and the largest catch, 2.8 tons/trawl hour, was taken off the central Makran coast.

The dominant species of the surveys were lantern fish (Benthosema pterotum). Some days of this coverage were also spent on a more detailed investigation on abundance and behaviour of the mesopelagic layer off Astola Island.

Plankton (Fig. 5)

The echo abundance attributed to plankton during this coverage is on average, slightly higher than on the previous one. Similar to the previous cruises, we observed higher values at the shelf and its slope than further seawards. Large aggregates of phytoplankton were observed floating at the surface off the Makran coast covering several square nautical miles.

Hydrography (Fig. 6 - 22)

Between coverages 3 and 4 the surface layers had warmed up by about 2 - 3°C. In this layer the highest values of both temperature and salinity were found along the western Makran coast and in Sonmiani Bay. At the 100 m level this picture had reversed and the highest temperatures were found along the Sind and Karachi coasts.

Along the whole Pakistani coast there was an intermediate maximum in salinity between 200 and 300 m.

The isoline of $1^{ml}/l\ 0_2$ was usually observed between 100 and 200 m. It reached higher up in the sea along the western Makran coast.

Karachi, May 1977

Roald Sætre

Roald Sætre

Table 1. Record of fishing operations. R/V "Dr. Fridtjof Nansen"s PAK/NOR/FAO Cruise Nos. 7 and 8, 13.4 - 15.5.1977. BT: Bottom trawl, PT: Pelagic trawl. Fish names: FAO Species Identification Sheets for Fishery Purposes.

Date	Time	Stn No	Gear type	Depth in m Bot-tom	Gear	Position North	East	Total catch kg	Catch/ hour kg	Dominant species
14.4	1005	109	BT	290	290	22°55'	66°55'	154	308	Japanese threadfin bream (Nemipterus japonicus) Croaker (Collichthys lucidus)
16.4	2030	110	BT	19	19	23°34'	67°41'	98	196	Lined silver grunt (Pomadasys hasta) False trevally (Lactarius lactarius) Ponyfish (Leiognathus spp.)
17.4	0405	111	PT	250	105	23°25'	67°15	0.01	0.03	Miscellaneous fish larvae
18.4	1340	112	BT	80	80	23°37'	67°19'	5000	7000	False trevally (Lactarius lactarius) Cardinal fish (Apogon spp.) Blackspot threadfin (Polynemus sextarius)
18.4	1750	113	BT	18	18	23°50'	67°27'	550	700	Spotted croaker (Protonibea diacanthus) Smallhead hairtail (Lepturacanthus savala) Tardoore (Opisthopterus tardoore)
19.4	0645	114	BT	150	150	23°22'	66°34'	12000	24000	Tigertoothed croaker (Otolithes ruber) Japanese threadfin bream (Nemipterus japonicus) Cardinal fish (Apogon spp.)
19.4	2100	115	PT	200	10	23°28'	66°25'	3	6	Lantern fish (Benthosema pterotum)
20.4	0030	116	BT	20	20	24°05'	67°08'	270	540	Ponyfish (Leiognathus spp.) False trevally (Lactarius lactarius) Smallhead hairtail (Lepturacanthus savala)
20.4	0530	117	PT	200	50	23°59'	66°56'	64	128	Hairtail (Lepturacanthus sp. Silver pomfret (Pampus argenteus)

Table 1 (continued).

Date	Time	Stn No	Gear type	Depth in m Bot.	Depth in m Gear	Position North	Position East	Total catch	Catch/ hour	Dominant species
20.4	0940	118	BT	90	90	23°50'	66°39'	384	768	Japanese threadfin bream (Nemipterus japonicus) Greater lizardfish (Saurida tumbil) Indian driftfish (Ariomma indica)
22.4	1350	119	BT	22	22	24°14'	67°05'	450	600	Longspined seabream (Argyrops spinifer) Rays Malabar reef cod (Epinephelus malabaricus)
22.4	2350	120	PT	330	10	23°42'	66°06'	25	50	Lantern fish (Benthosema pterotum)
23.4	0450	121	BT	96	96	23°56'	66°20'	1500	2225	Japanese threadfin bream (Nemipterus japonicus) One finlet scad (Selar mate) Squids
24.4	0925	122	BT	158	158	24°00'	66°07'	600	1200	Japanese threadfin bream (Nemipterus japonicus) Squids Barracudas (Sphyraena spp.)
24.4	1530	123	PT	105	40	24°07'	66°09'	8	16	Smallhead hairtail (Lepturacanthus savala) Shark Indian driftfish (Ariomma indica)
24.4	1710	124	BT	95	95	24°09'	66°11'	400	800	Japanese threadfin bream (Nemipterus japonicus) Russell's scad (Decapterus russelli) Sharks
25.4	0525	125	BT	95	95	24°23'	66°06'	440	880	Japanese threadfin bream (Nemipterus japonicus) Greater lizardfish (Saurida tumbil) Smallhead hairtail (Lepturacanthus savala)
25.4	0810	126	PT	800	150	24°16'	65°54'	5	10	Jellyfish
25.4	1540	127	PT	300	40	23°57'	65°00'	80	96	Lanternfish (Benthosema pterotum)
25.4	2320	128	IK	800	40	24°03'	65°17'	1	2	Jellyfishes / Salps

Table 1 (continued).

Date	Time	Stn No	Gear type	Depth in m Bot.	Depth in m Gear	Position North	Position East	Total catch	Catch/ hour	Dominant species
26.4	0830	129	BT	140	140	24°18'	65°52'	445	890	Squids Japanese threadfin bream (Nemipterus japonicus) Sharks
27.4	0120	130	BT	30	30	25°00'	66°35'	570	1140	Smallhead hairtail (Lepturacanthus savala) Threadfin trevally (Alectis indicus) Lined silver grunt (Pomadasys hasta)
27.4	0420	131	BT	60	60	25°04'	66°24'	4000	8000	Smallhead hairtail (Lepturacanthus savala) Japanese threadfin bream (Nemipterus japonicus) Squids
27.4	1020	132	BT	20	20	25°19'	66°17'	272	544	False trevally (Lactarius lactarius) Smallhead hairtail (Lepturacanthus savala) Japanese threadfin bream (Nemipterus japonicus)
27.4	2150	133	PT	790	50	24°50'	65°53'	90	180	Lanternfish (Benthosema pterotum) Sharks
28.4	0140	134	PT	50	40	25°10'	65°56'	18	36	Hairtail (Lepturacanthus spp.) Sharks Hardtail scad (Megalaspis cordyla)
28.4	0530	135	BT	15	15	25°18'	65°45'	164	328	Hairtail (Lepturacanthus sp.) Rays Catfish (Arius sp.)
2.5	0120	136	BT	18	18	25°14'	65°25'	136	272	Lined silver grunt (Pomadasys hasta) Longspined seabream (Argyrops spinifer) Mangrove red snapper (Lutjanus argentimaculatus)
2.5	1520	137	PT	2000	45	24°49'	65°08'	10	20	Lanternfish (Diaphus spp.) Lanternfish (Benthosema pterotum) Cubiceps sp.
2.5	2050	138	BT	15	15	25°15'	64°59'	512	1024	

Table 1 (continued).

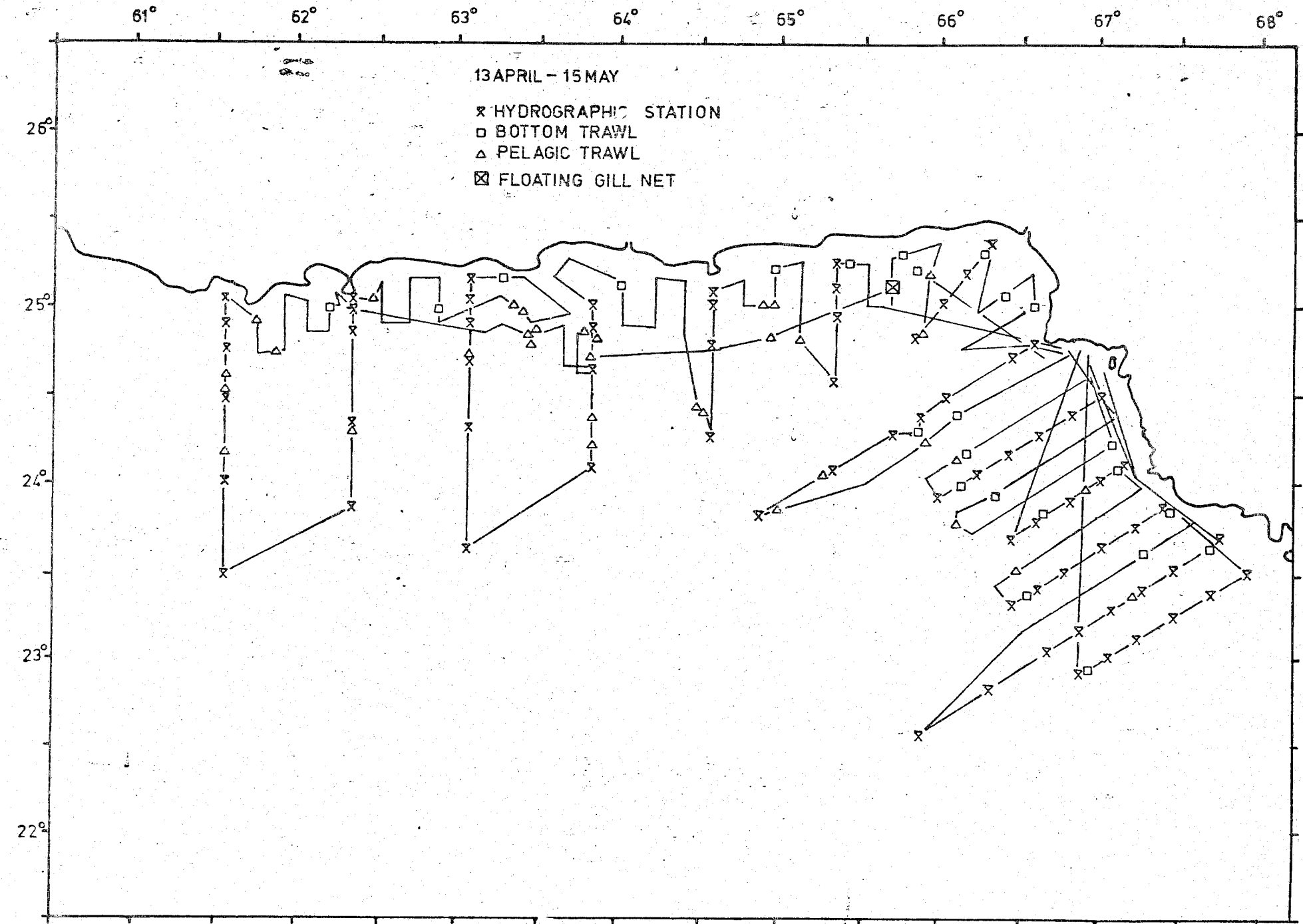
Date	Time	Stn No	Gear type	Depth in m Bot.	Depth in m Gear	Position North	Position East	Total catch	Catch/ hour	Dominant species
3.5	0000	139	PT	820	40	25°00'	64°56'	10	40	Lanternfish (Benthosema pterotum)
3.5	0125	140	PT	820	150	25°00'	64°56'	1	4	Cardinalfish (Apogon spp.) Lanternfish (Benthosema pterotum)
3.5	1623	141	PT	2900	15	24°23'	64°32'	160	320	Salps Lanternfish (Benthosema pterotum)
3.5	1821	142	PT	1450	55	24°34'	64°34'	44	59	Lanternfish (Benthosema pterotum) Smallhead hairtail (Lepturacanthus savala)
4.5	0505	143	BT	17	17	25°07'	64°02'	176	352	Longspined seabream (Argyrops spinifer) Small spotted grunt (Pomadasys opercularis) Spotted sicklefish (Drepane punctata)
4.5	1320	144	PT	500	145	24°49'	63°50'	440	880	Lanternfish (Benthosema pterotum)
5.5	0018	145	PT	3000	50	24°22'	63°50'	320	640	Lanternfish (Benthosema pterotum) Lanternfish (Benthosems fibulatum)
5.5	0410	146	PT	3200	375	24°12'	63°49'	35	35	Lanternfish (Benthosema pterotum) Lanternfish (Benthosema fibulatum)
6.5	0105	147	PT	2100	45	24°44'	63°05'	0	0	(NO CATCH)
6.5	0855	148	BT	17	17	25°02'	63°16'	489	838	Smallhead hairtail (Lepturacanthus savala) Catfish (Arius sp.) Rays
6.5	1520	149	PT	500	15	24°58'	63°22'	70	140	Lanternfish (Benthosema pterotum) Hardtail scad (Megalaspis cordyla)
6.5	1725	150	PT	23	0	25°00'	63°19'	189	378	Smallhead hairtail (Lepturacanthus savala) Moustached anchovy (Thryssa mystax) Starry trevally (Caranx stellatus)

Table 1 (continued).

Date	Time	Stn No	Gear type	Depth in m Bot.	Depth in m Gear	Position North	Position East	Total catch	Catch/ hour	Dominant species
6.5	2316	151	BT	37	37	24°59'	62°55'	298	596	Yellowstriped goatfish (Upeneus vittatus) Golden sixthread tassel (Polynemus sexfilus)
7.5	0755	152	PT	40	12	25°03'	62°28'	0	0	(NO CATCH)
8.5	1930	153	PT	2400	20	24°18'	62°20'	120	240	Lanternfish (Benthosema pterotum) Cubiceps spp.
9.5	1700	154	PT	3300	20	24°10'	61°35'	0.9	1.8	Cubiceps spp. Trachipterus spp.
10.5	0055	155	PT		50	24°32'	61°35'	0.15	0.3	Maurolicus muelleri
10.5	0405	156	PT	1100	260	24°36'	61°35'	42	54	Lanternfish (Benthosema pterotum) Lanternfish (Diaphus sp.) Lizard fish (Harpodon nehereus)
10.5	1300	157	PT	800	150	24°45'	61°46'	40	80	Lanternfish (Benthosema pterotum)
10.5	1540	158	PT	850	30	24°44'	61°53'	40	80	Lanternfish (Benthosema pterotum) Lanternfish (Benthosema fibulatum)
10.5	2315	159	BT	31	31	24°59'	62°12'	261	522	Small hairtail (Lepturacanthus sp.) Japanese threadfin bream (Nemipterus japonicus)
11.5	1715	160	PT	1150	15	24°50'	63°20'	62	74	Lanternfish (Benthosema pterotum)
11.5	1845	161	PT	1400	140	24°49'	63°28'	22	33	Jellyfishes Lanternfish (Diaphus sp.) Bregmaceros macclellandi
11.5	2100	162	PT		10	24°49'	63°30'	5	6	Lanternfish (Benthosema pterotum) Squids

Table 1 (continued).

Date	Time	Stn No	Gear type	Depth in m Bot.	Gear	Position North	East	Total catch	Catch/ hour	Dominant species
12.5	0515	163	PT	950	340	24°50'	63°50'	17	34	Lizardfish (Harpodon nehereus) Salps
13.5	0015	164	PT	1450	30	24°24'	63°50'	960	2880	Lanternfish (Benthosema pterotum) Lanternfish (Benthosema fibulatum) Bregmaceros macclellandi
13.5	1030	165	PT	1300	300	24°49'	64°57'	40	80	Lanternfish (Benthosema pterotum)
14.5	1615	166	GN	23	23	25°06'	65°42'	65	42	Sharks Bluefin tuna (Kishinoel tonggol)
14.5	0500	167	BT	18	18	25°12'	65°51'	60	62	Indopacific spanish mackerel (Scomberomorus guttatus) Lined silver grunt (Pomadasys hasta) Black pomfret (Pampus niger)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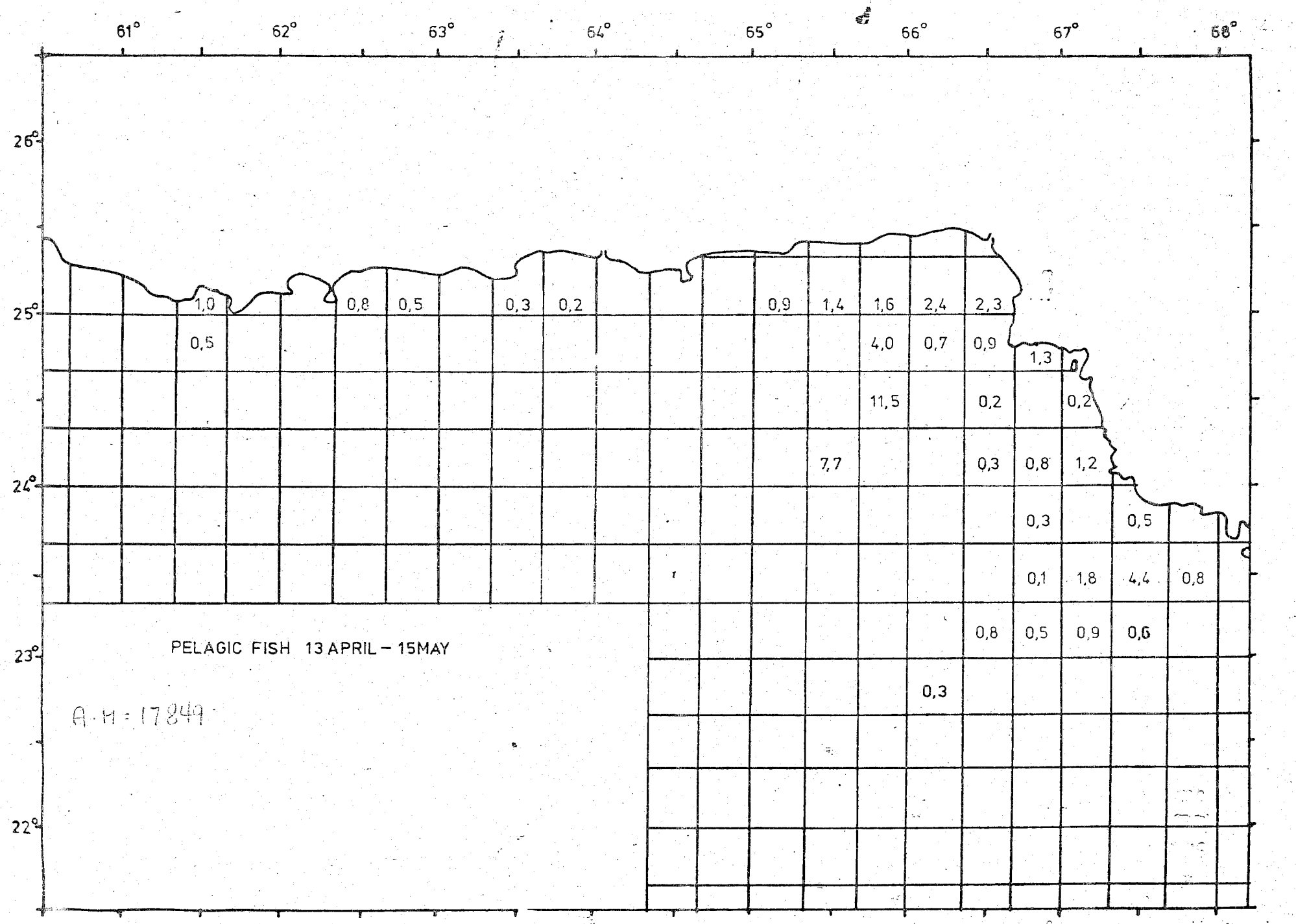
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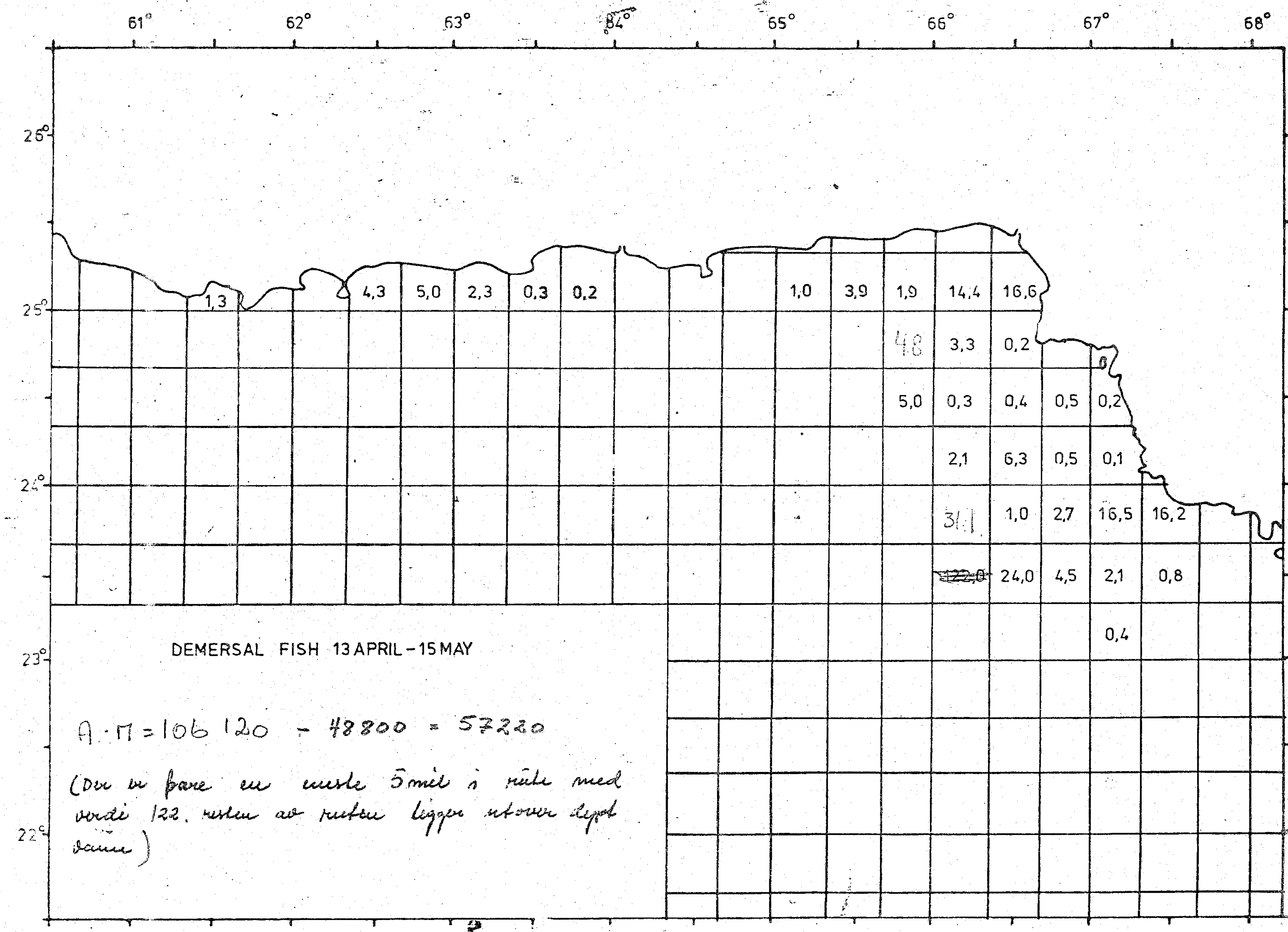

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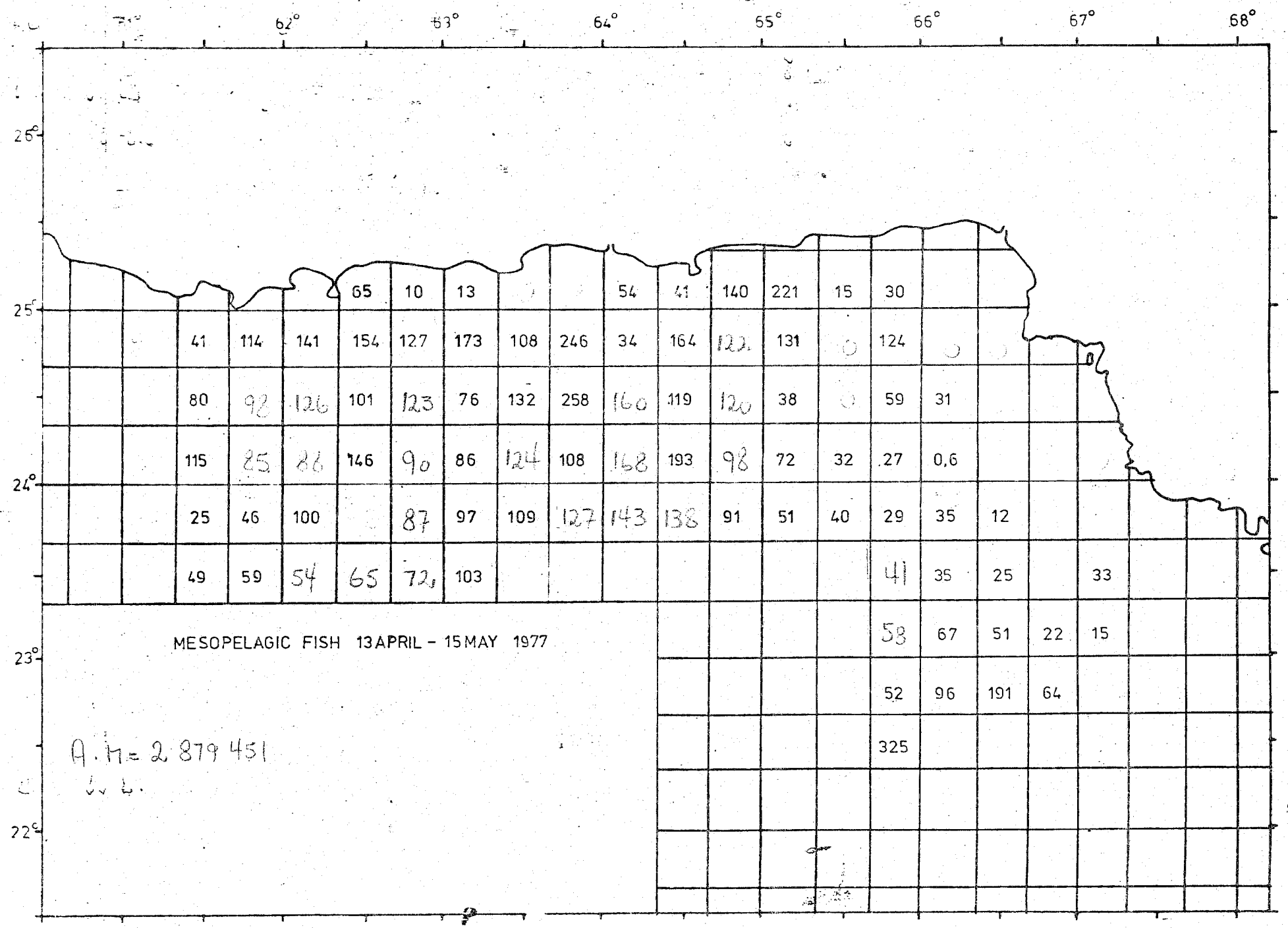
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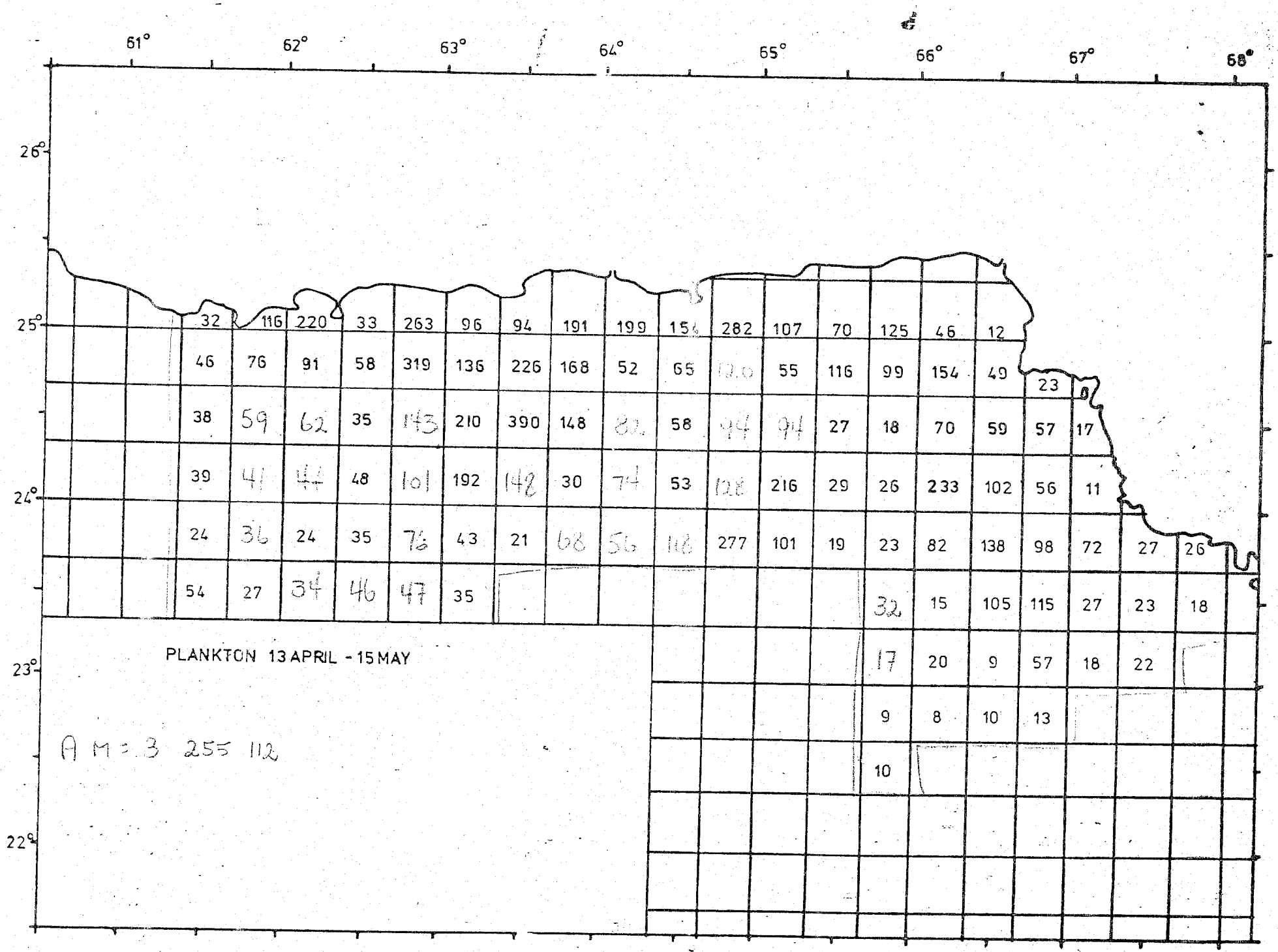
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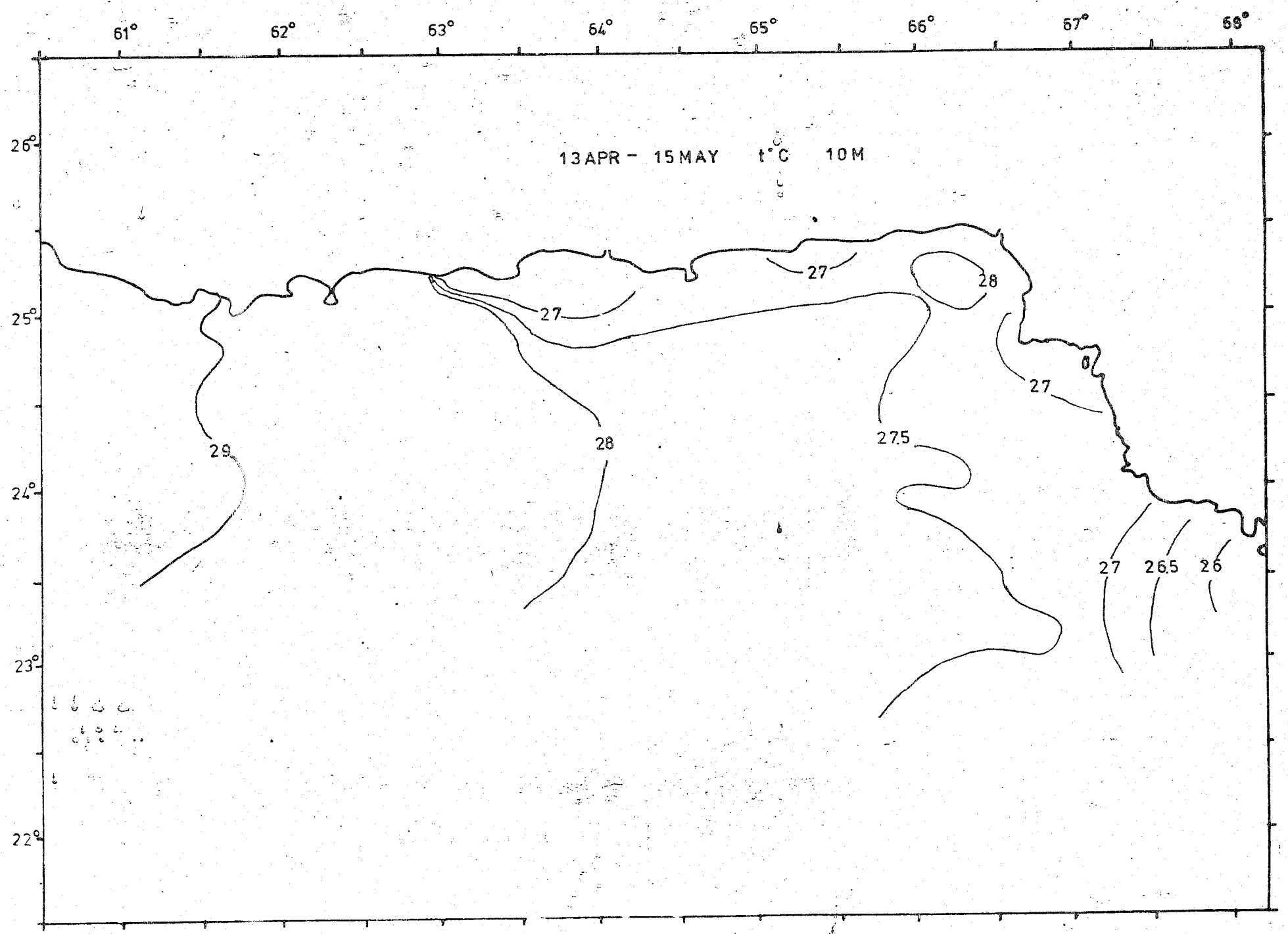
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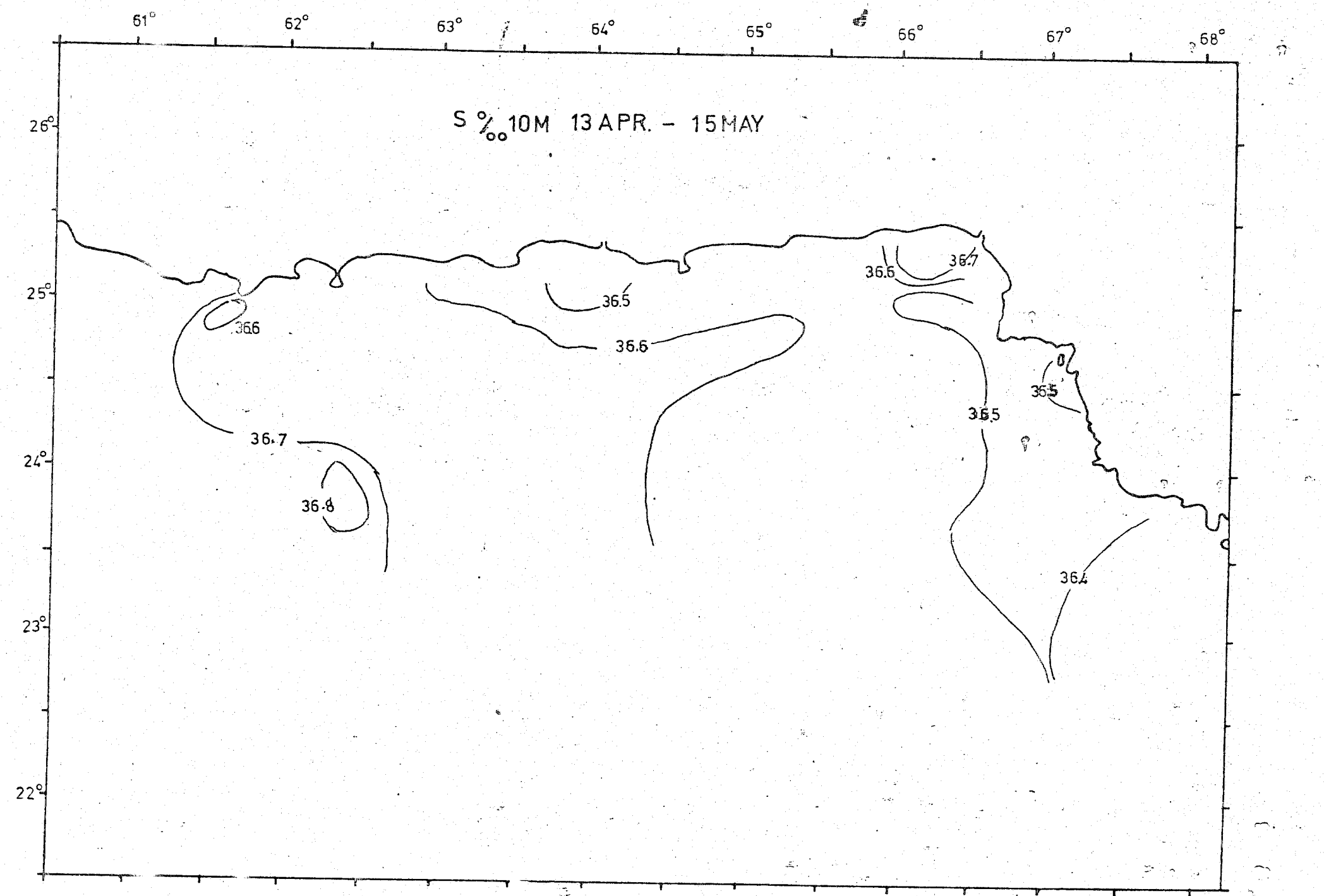
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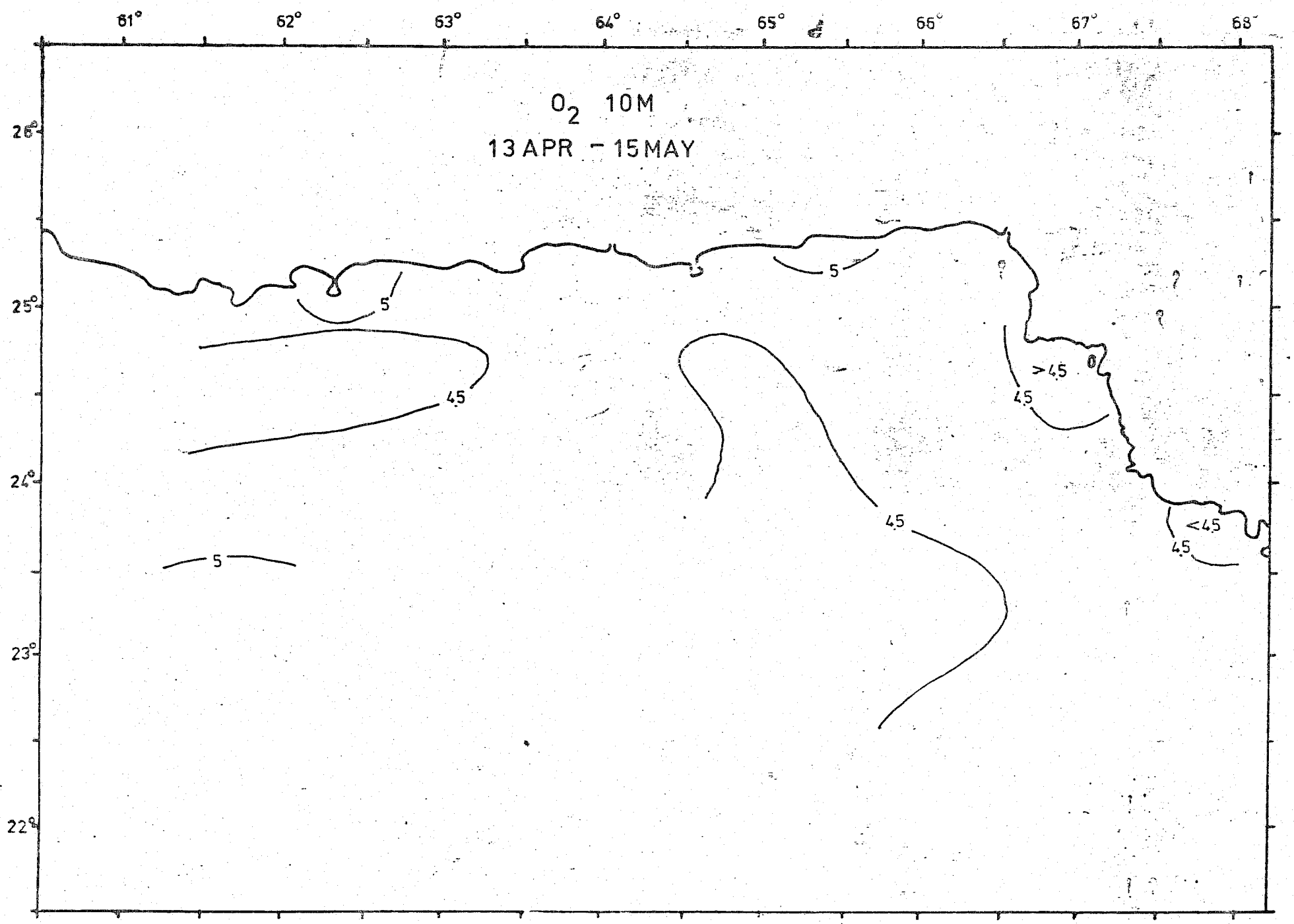
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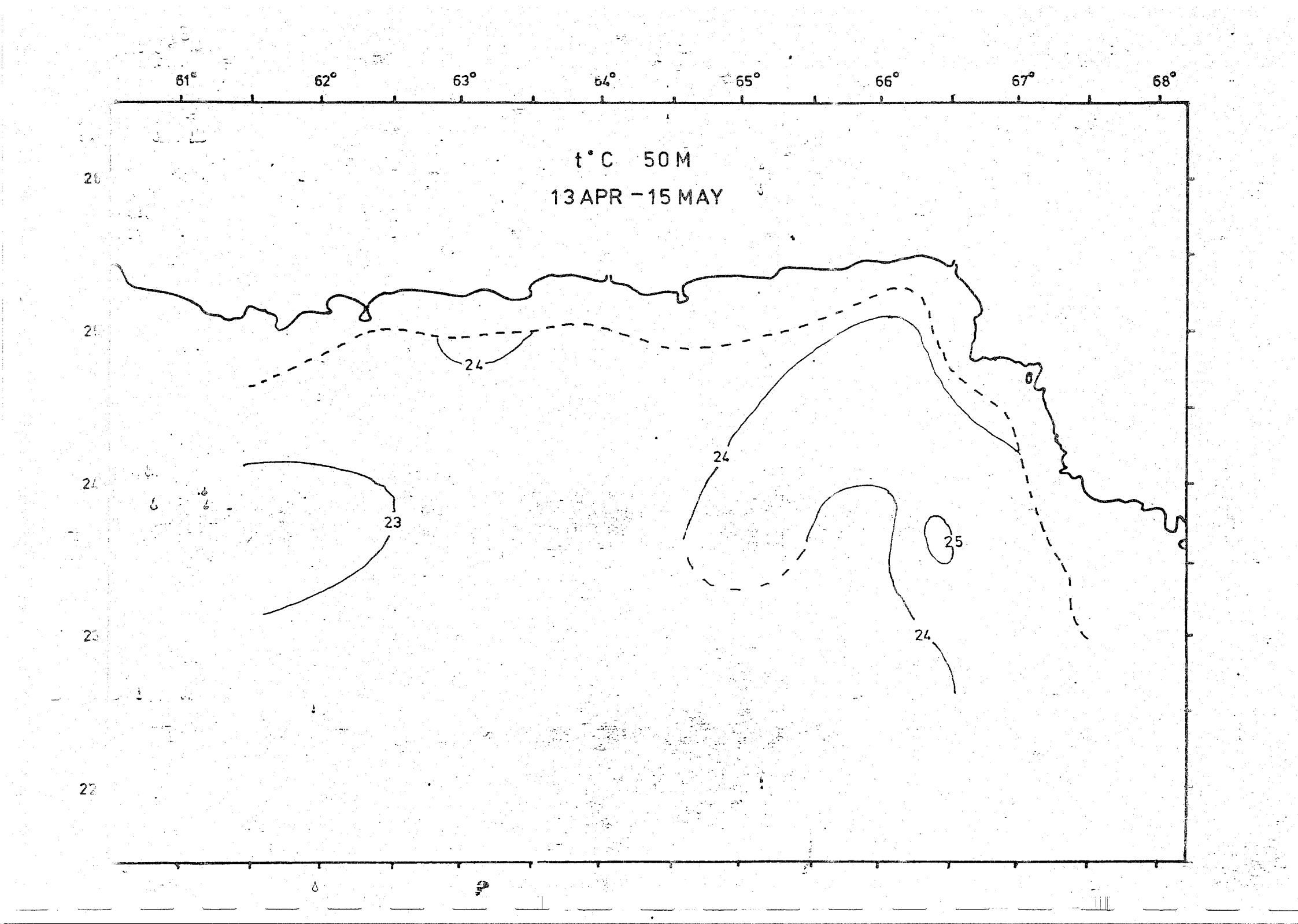
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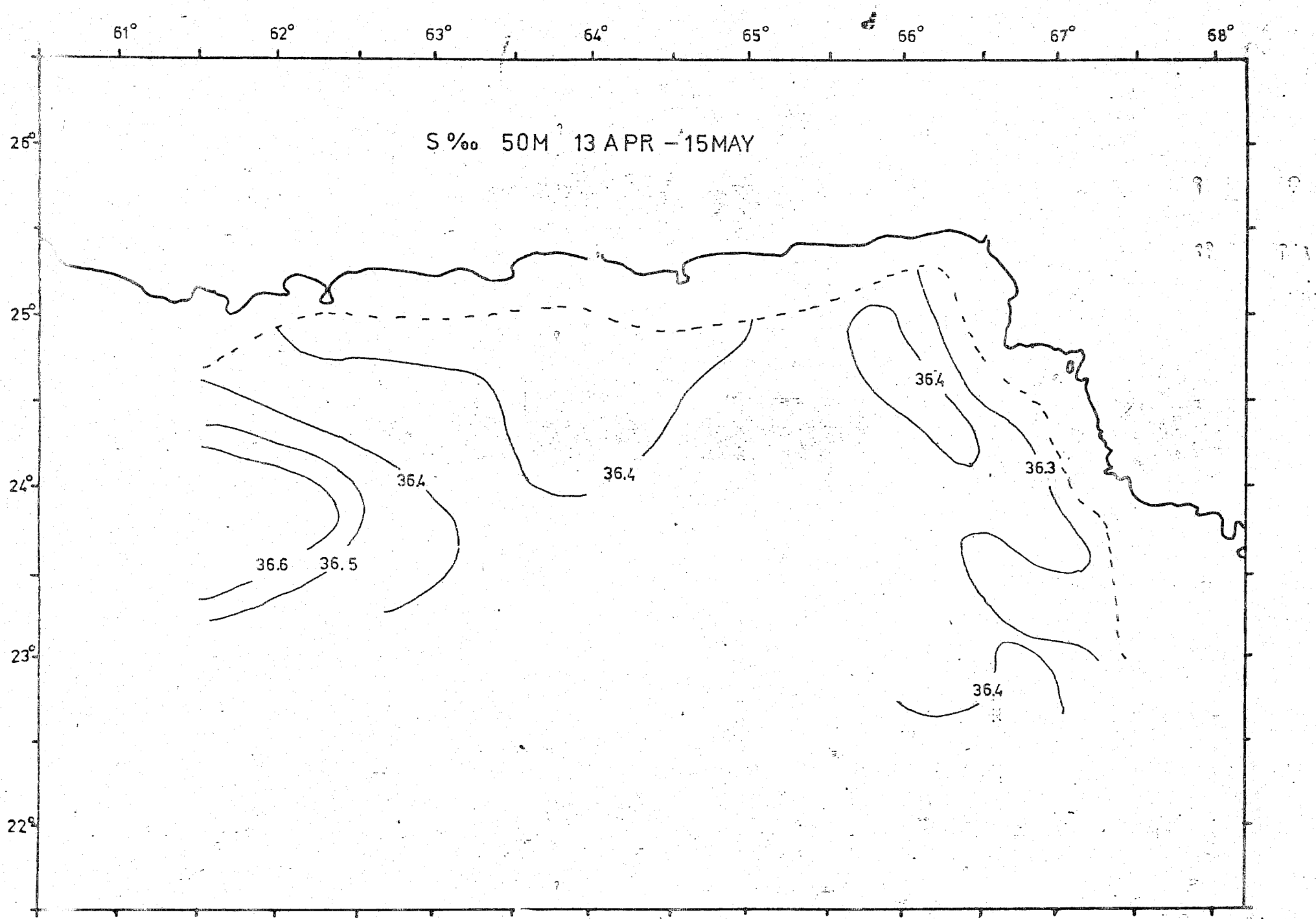
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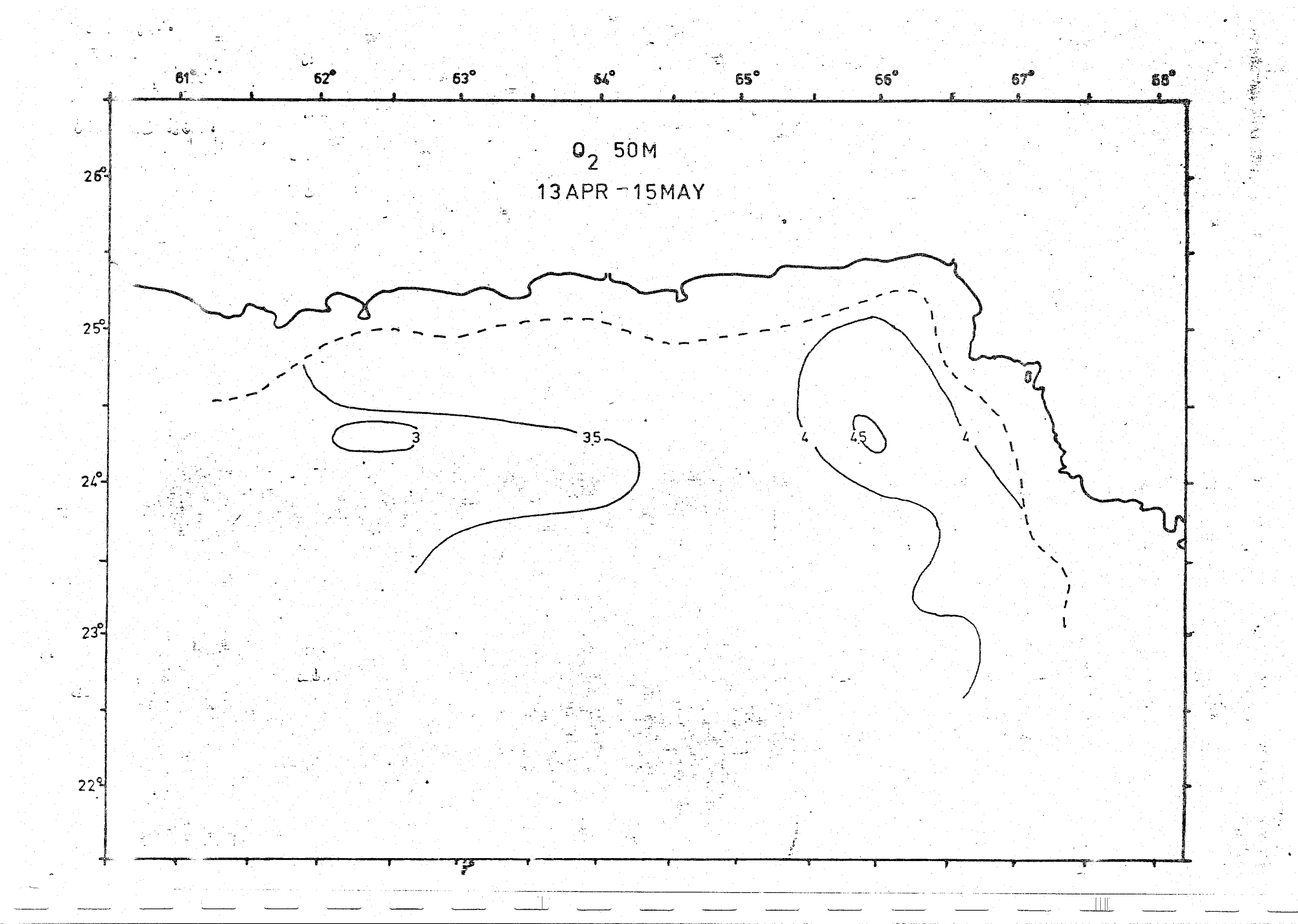
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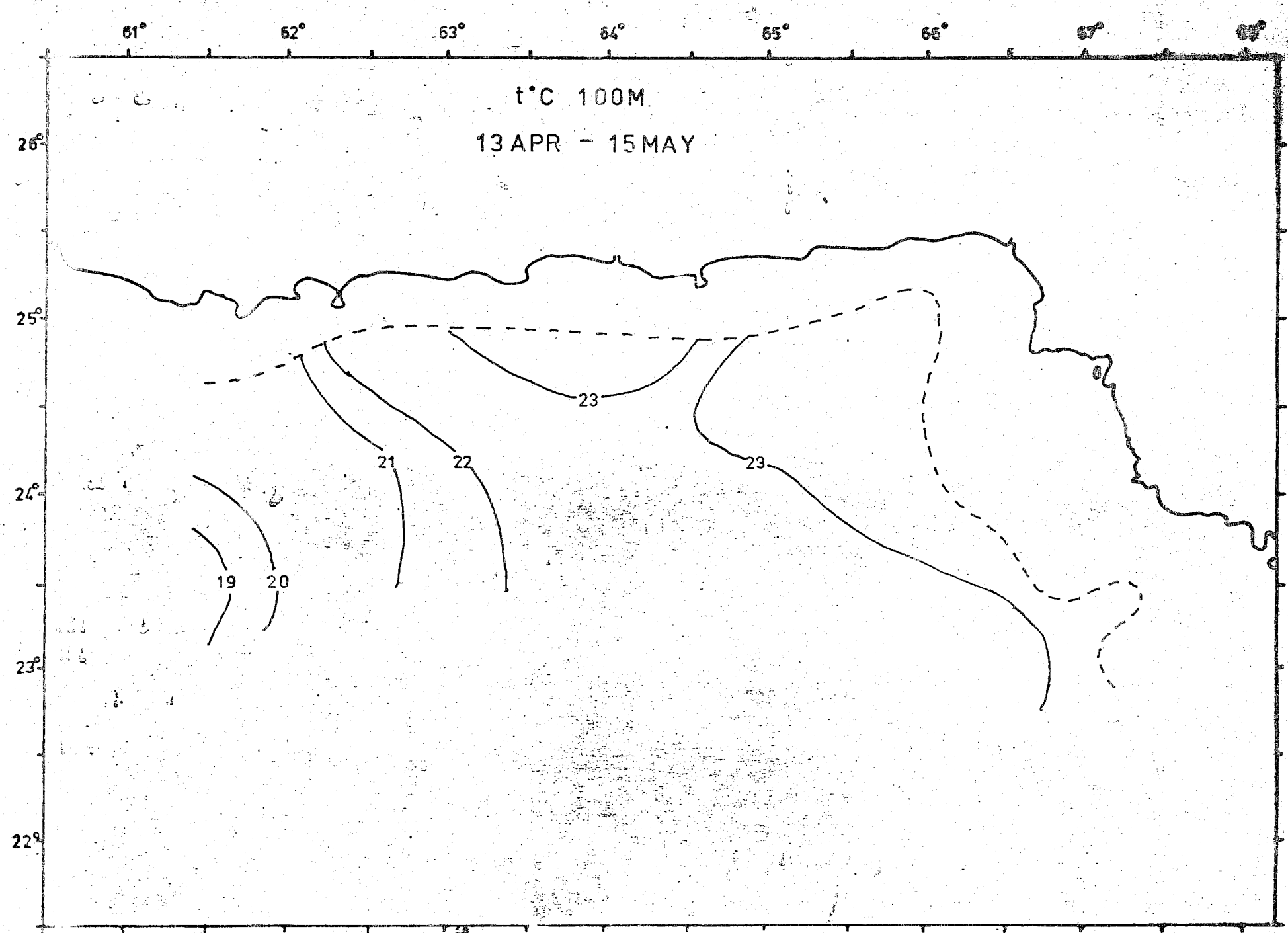
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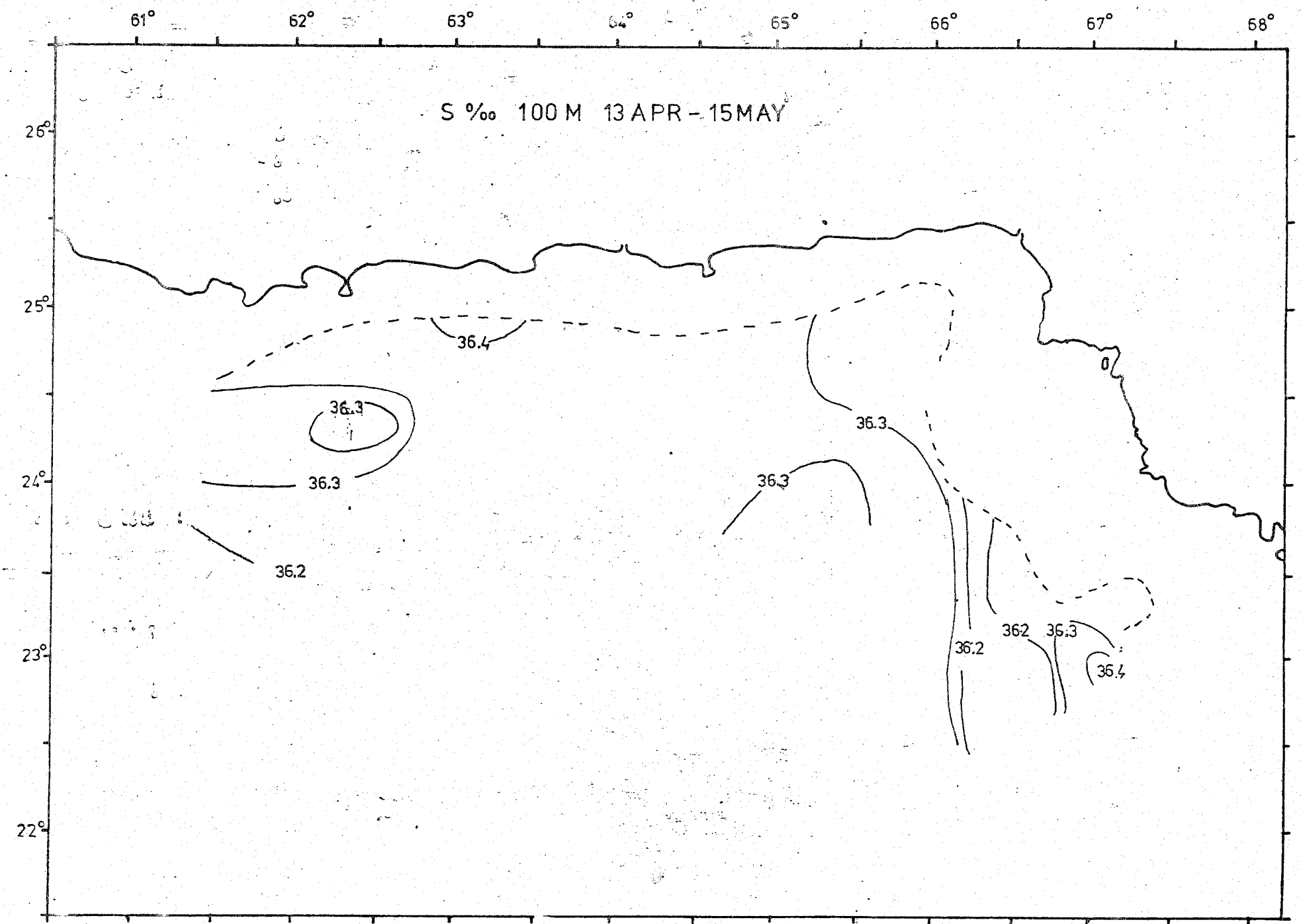
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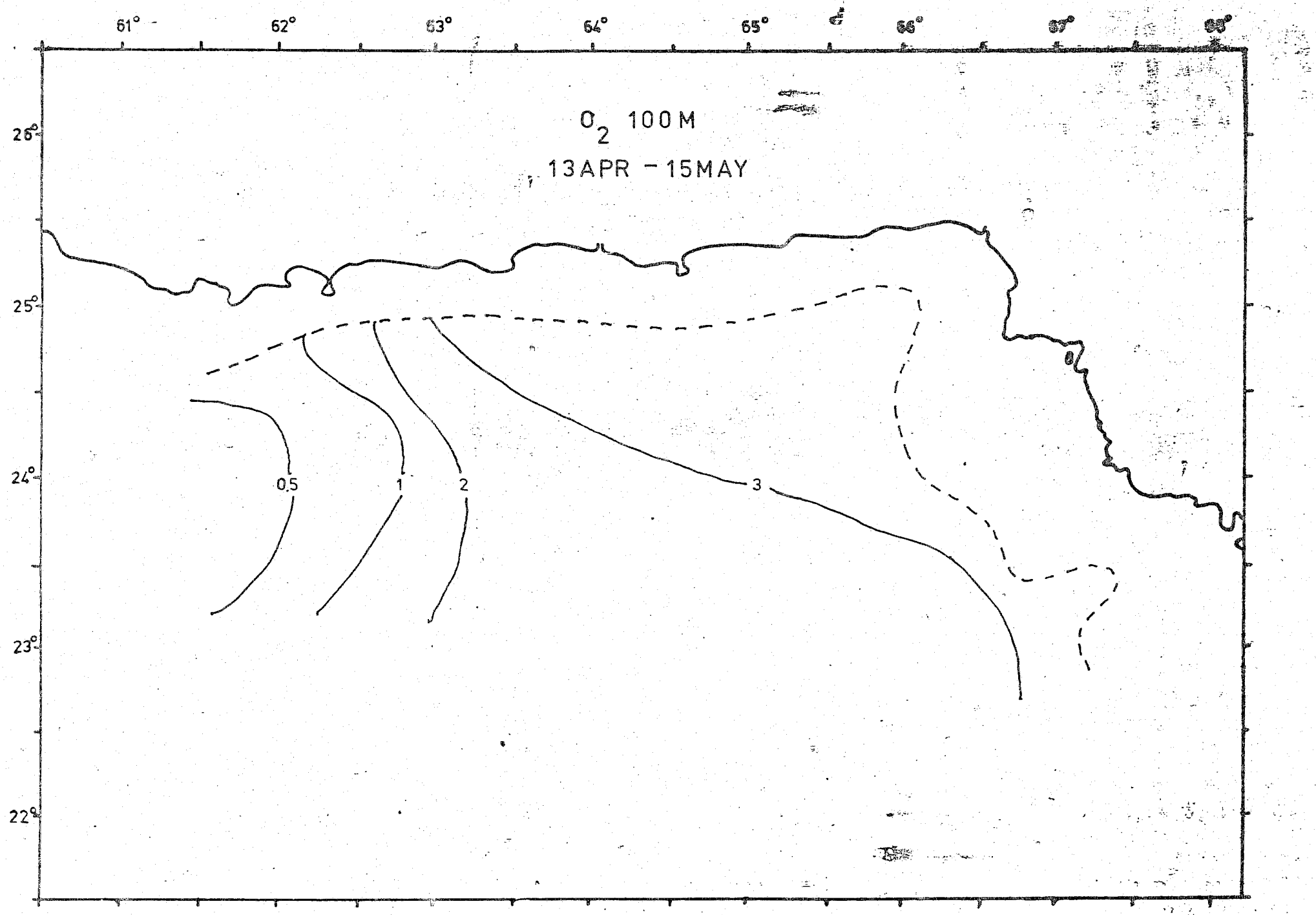
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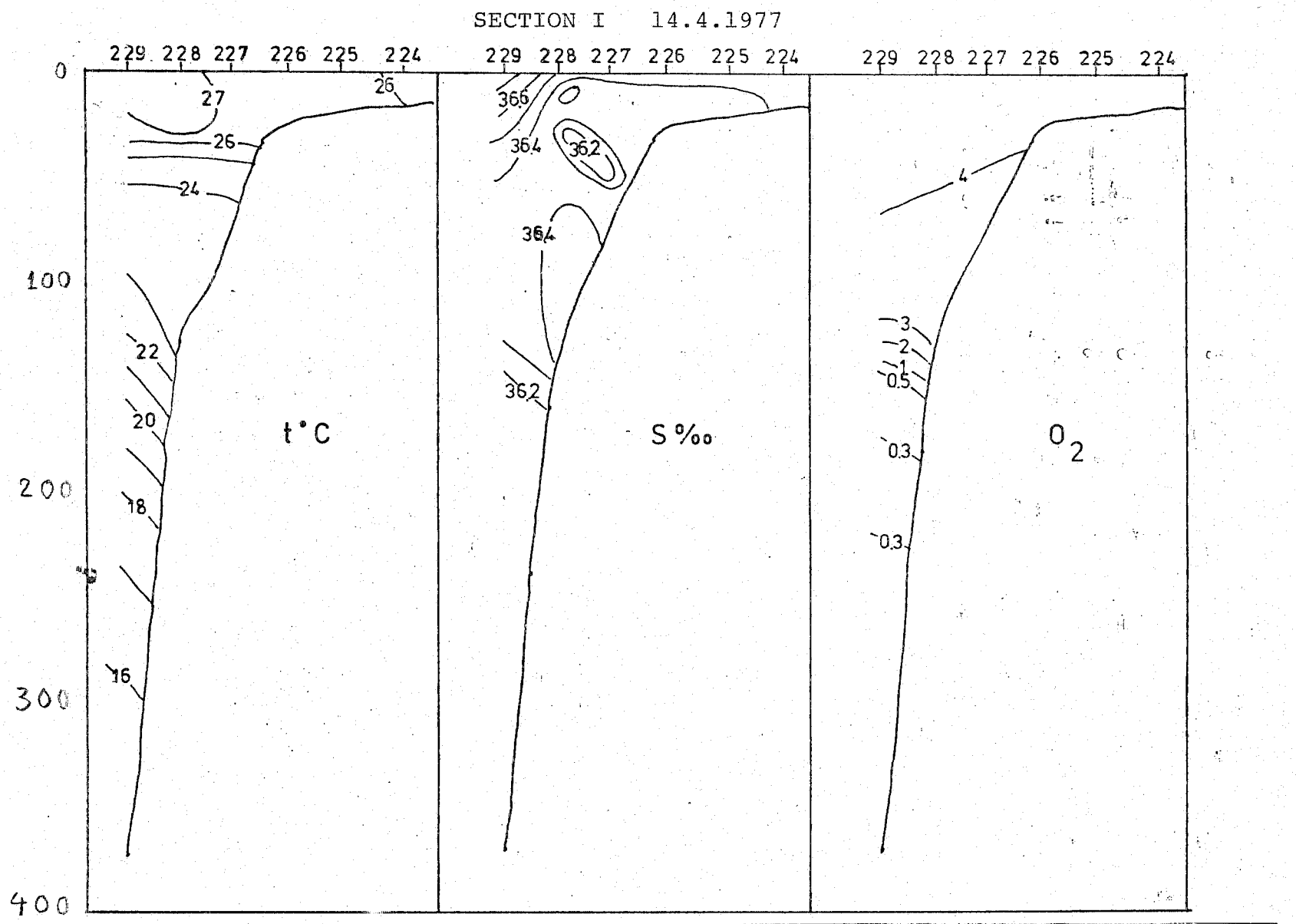
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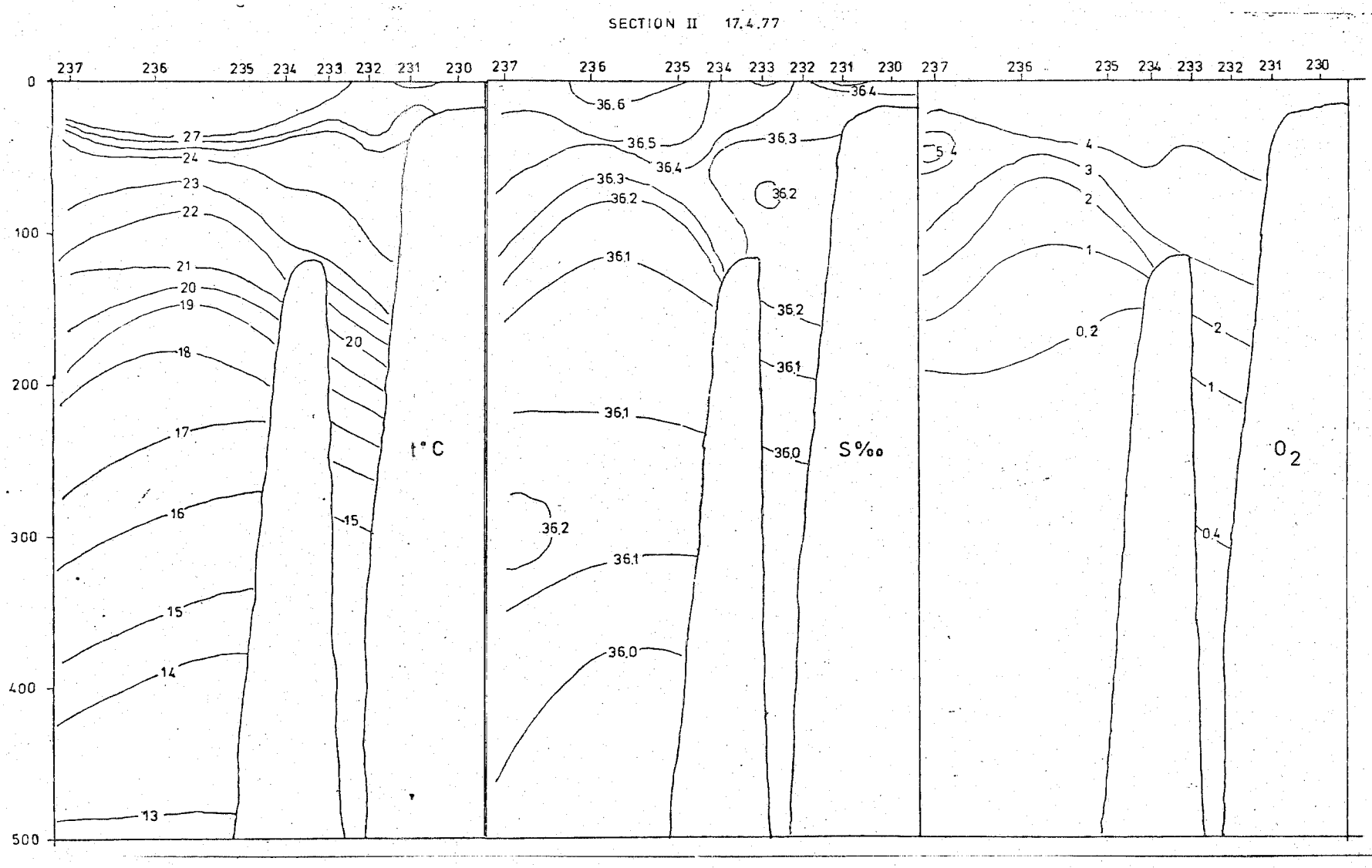
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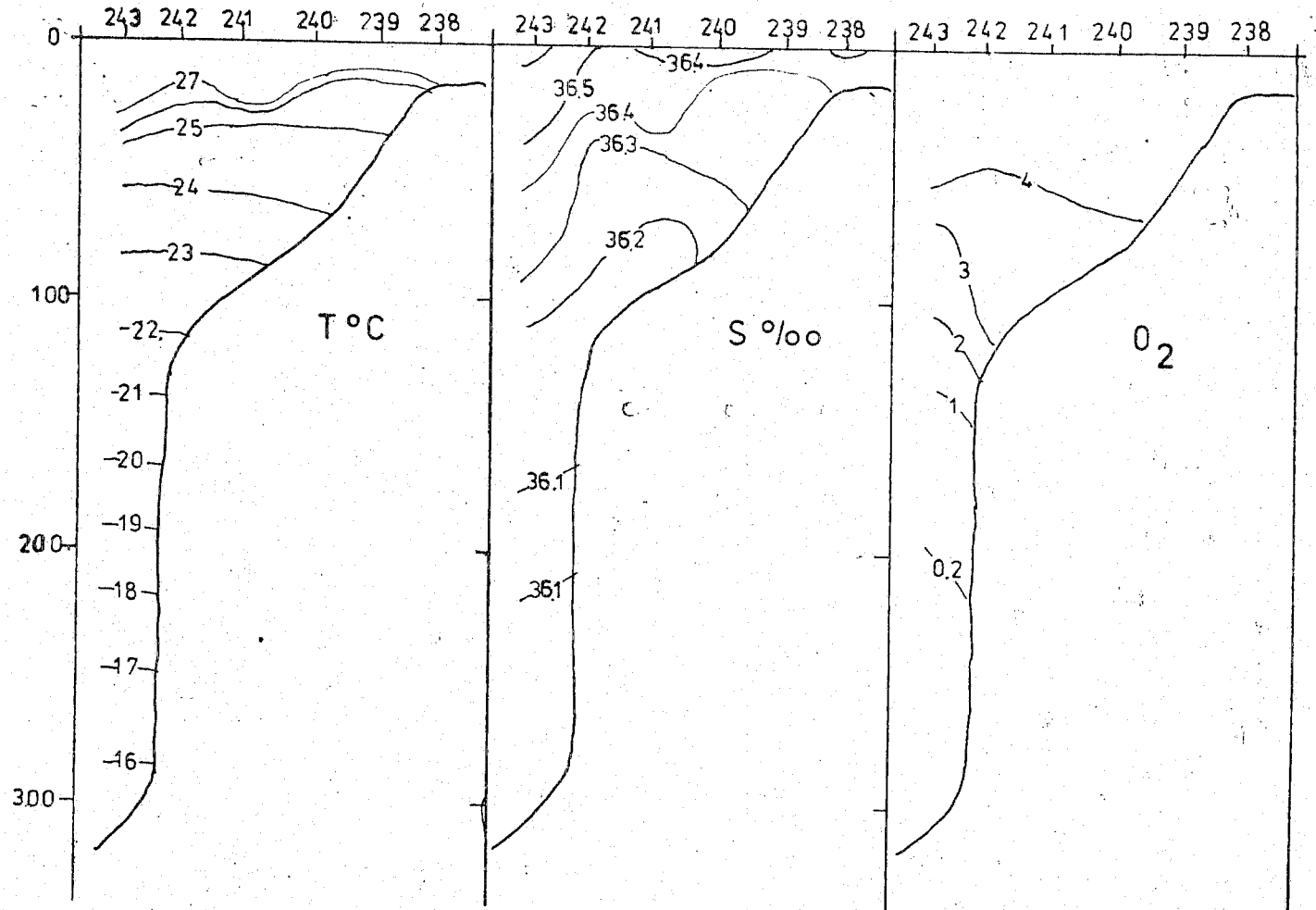

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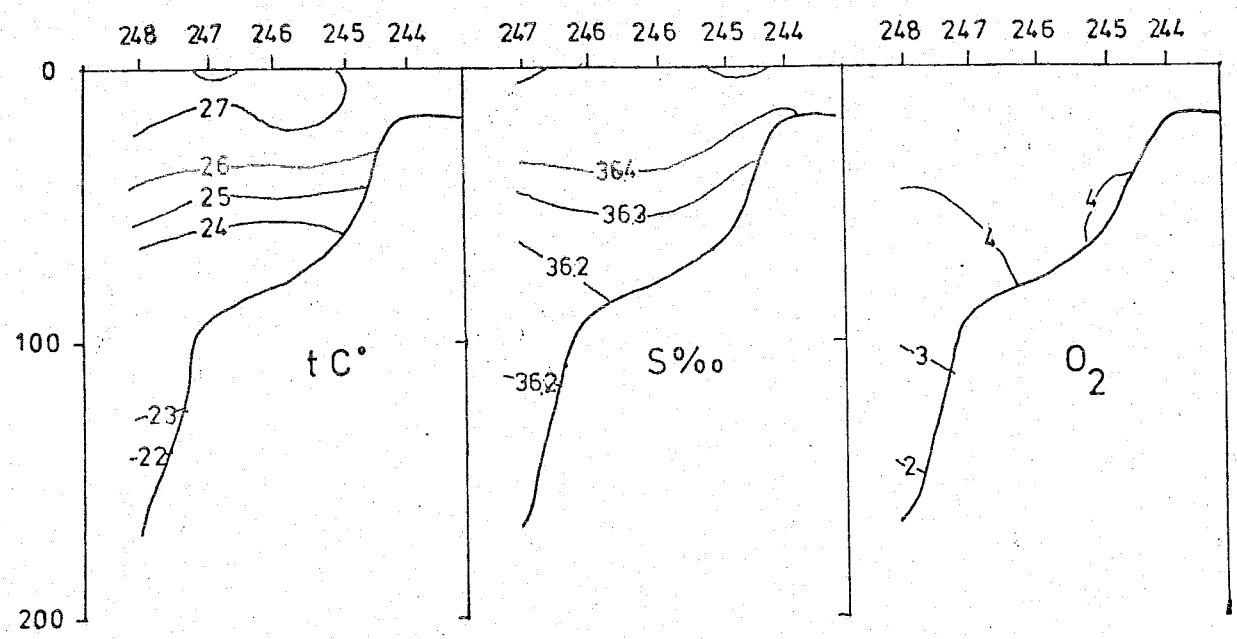

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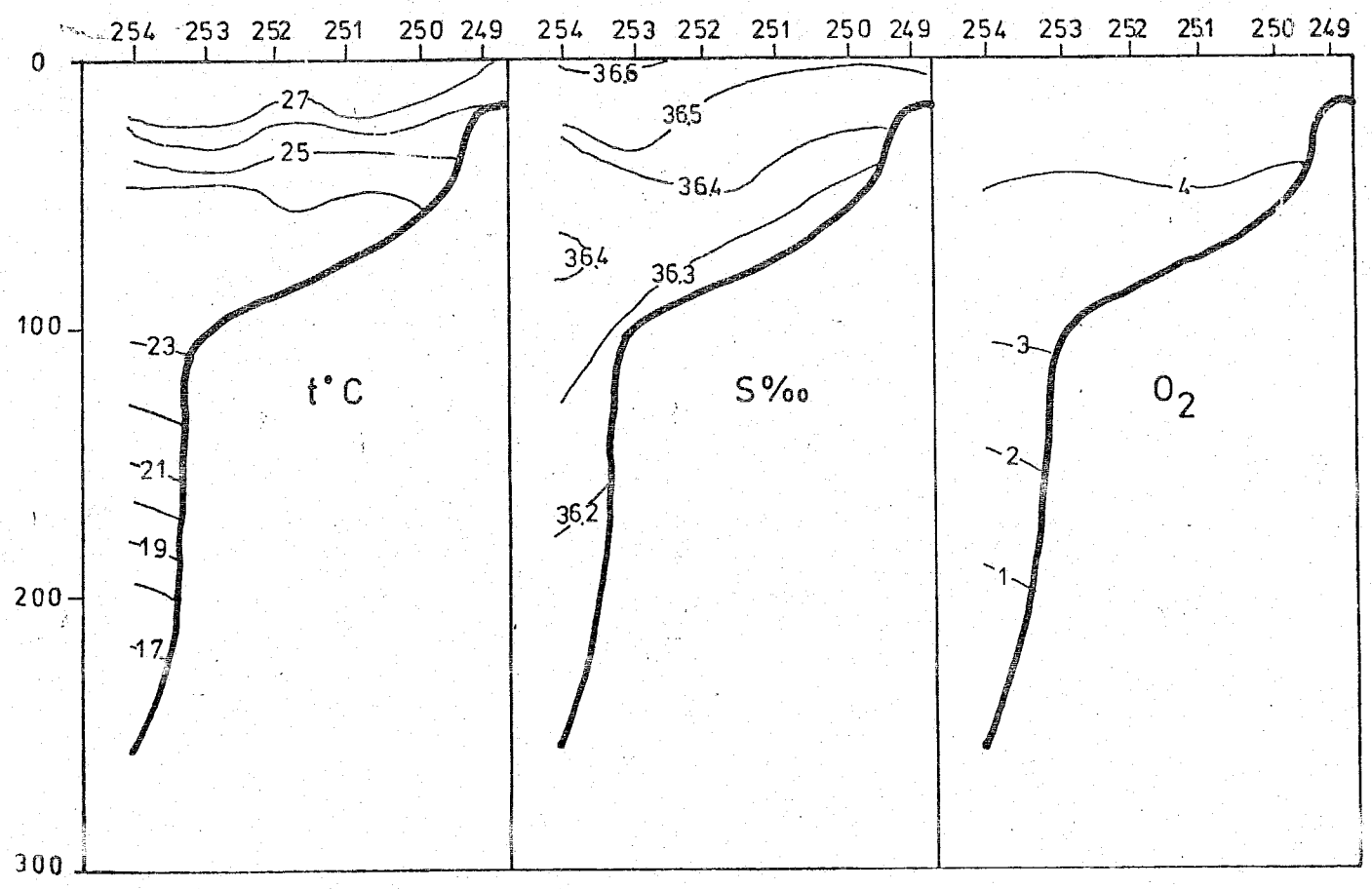

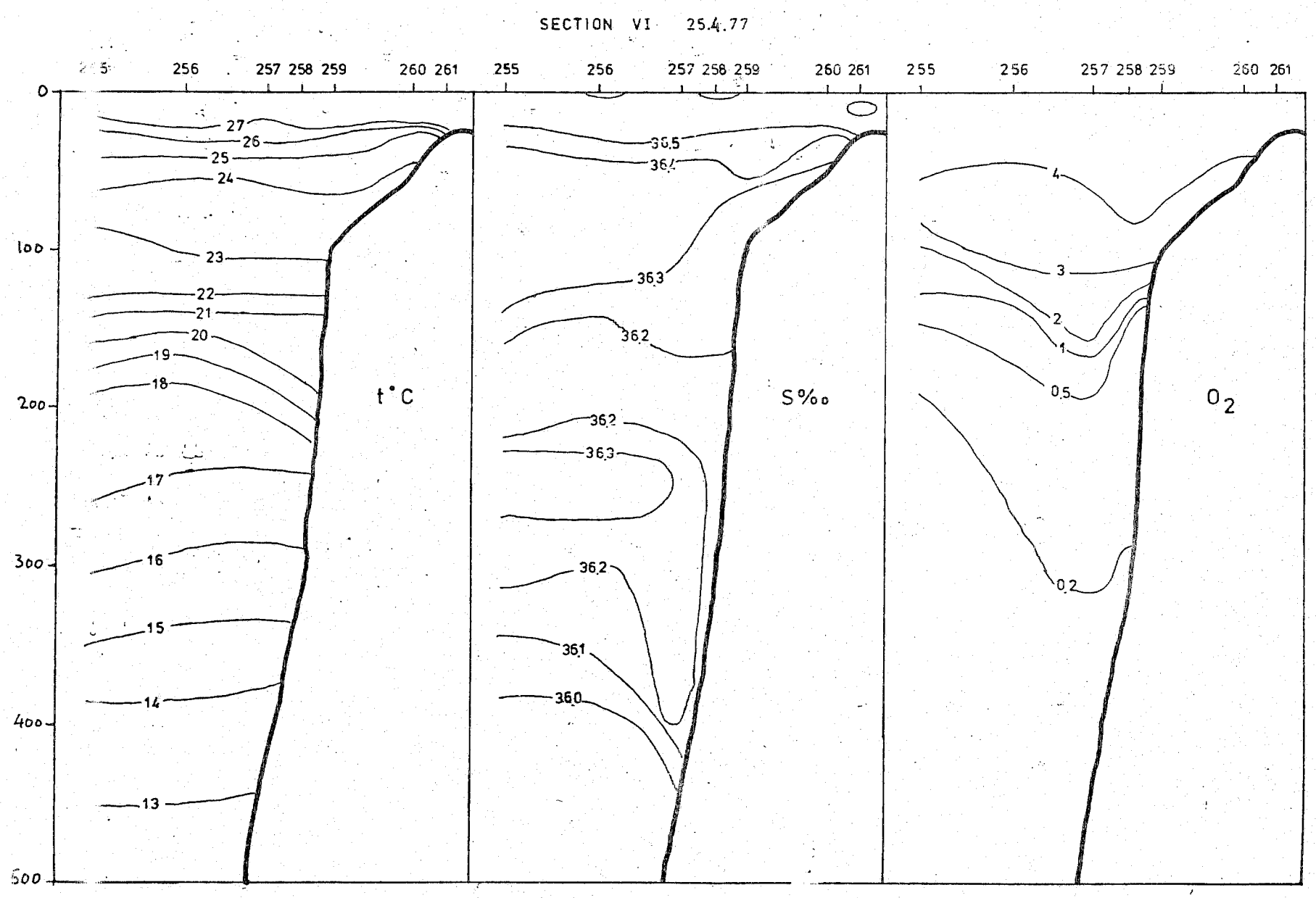
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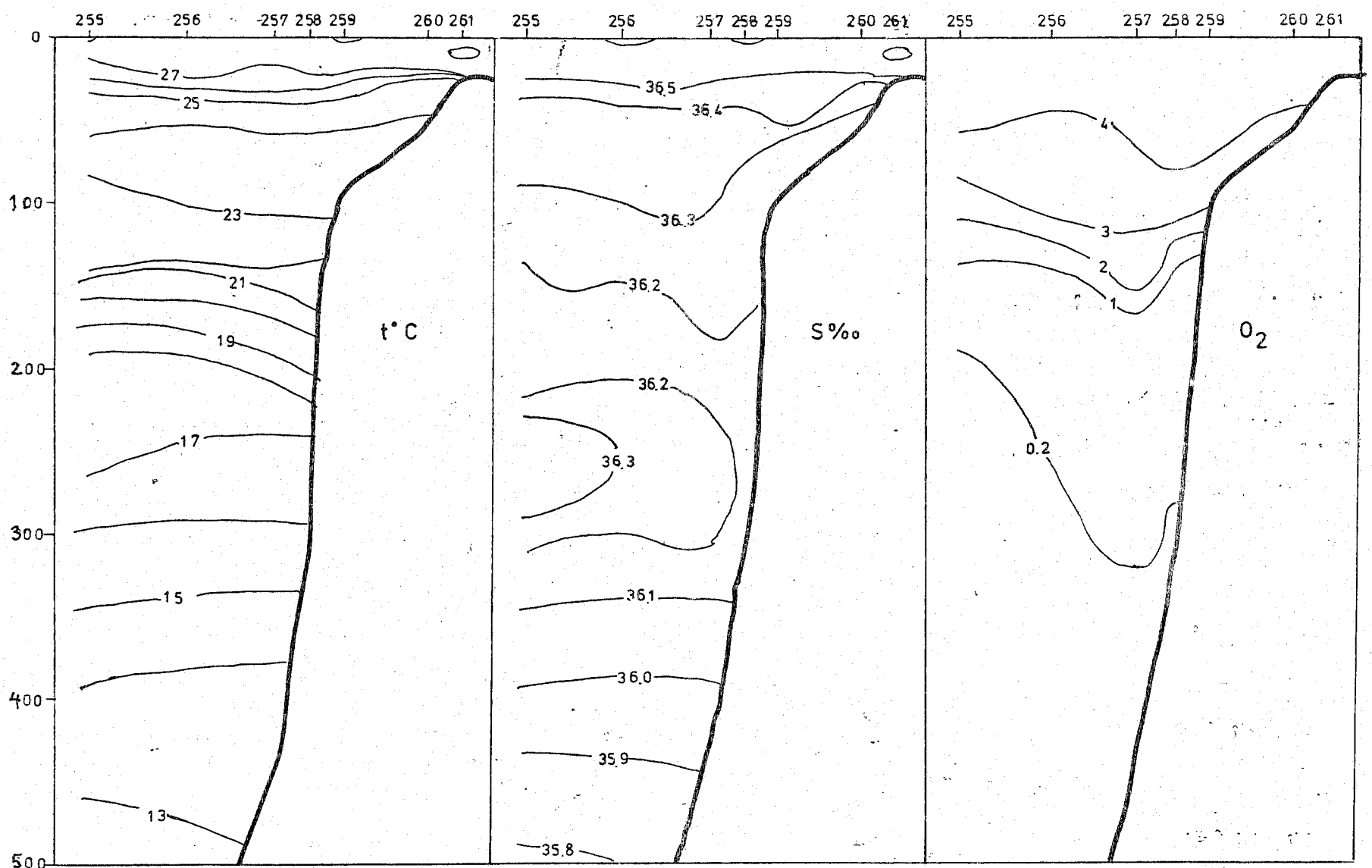
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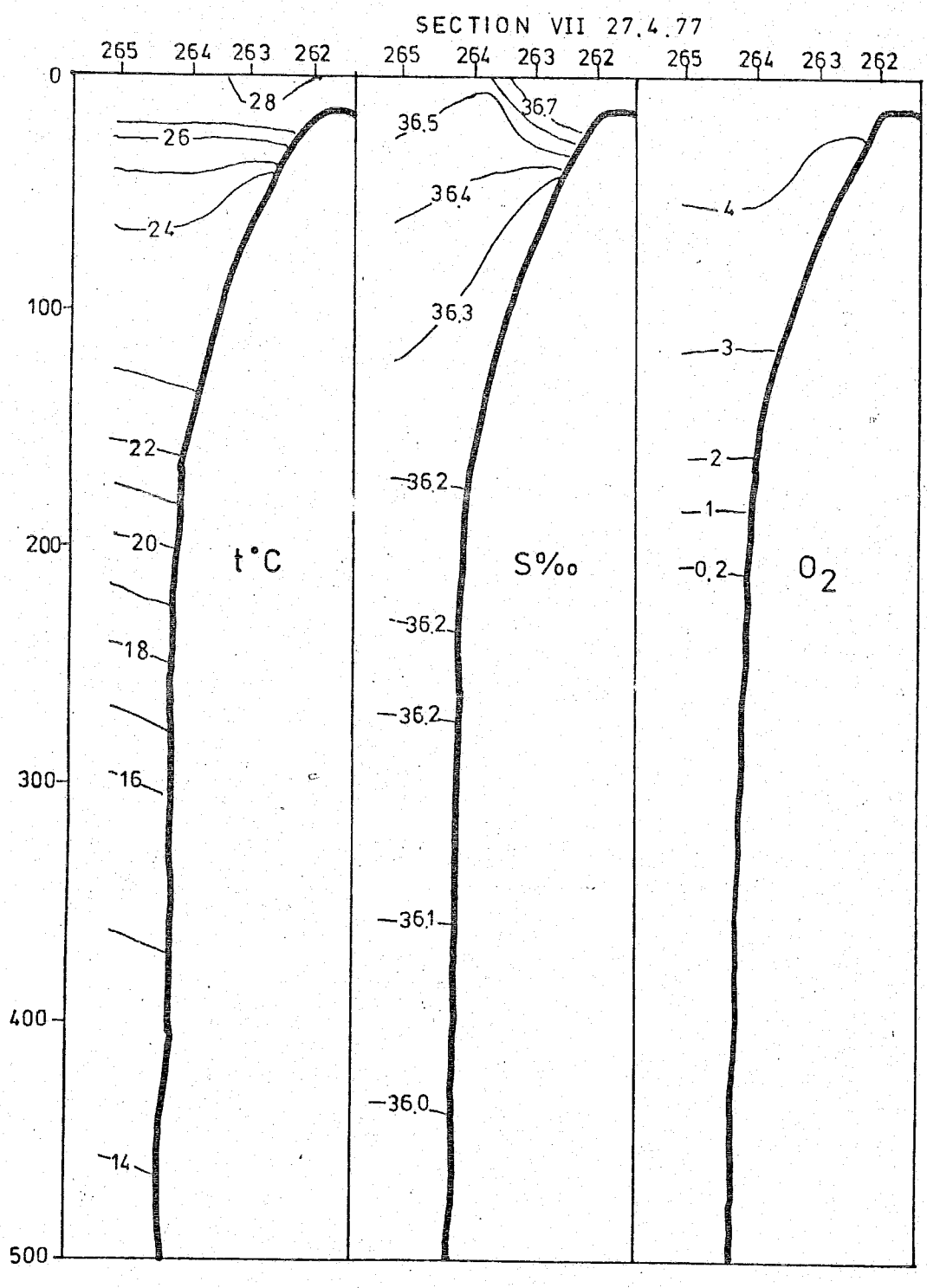
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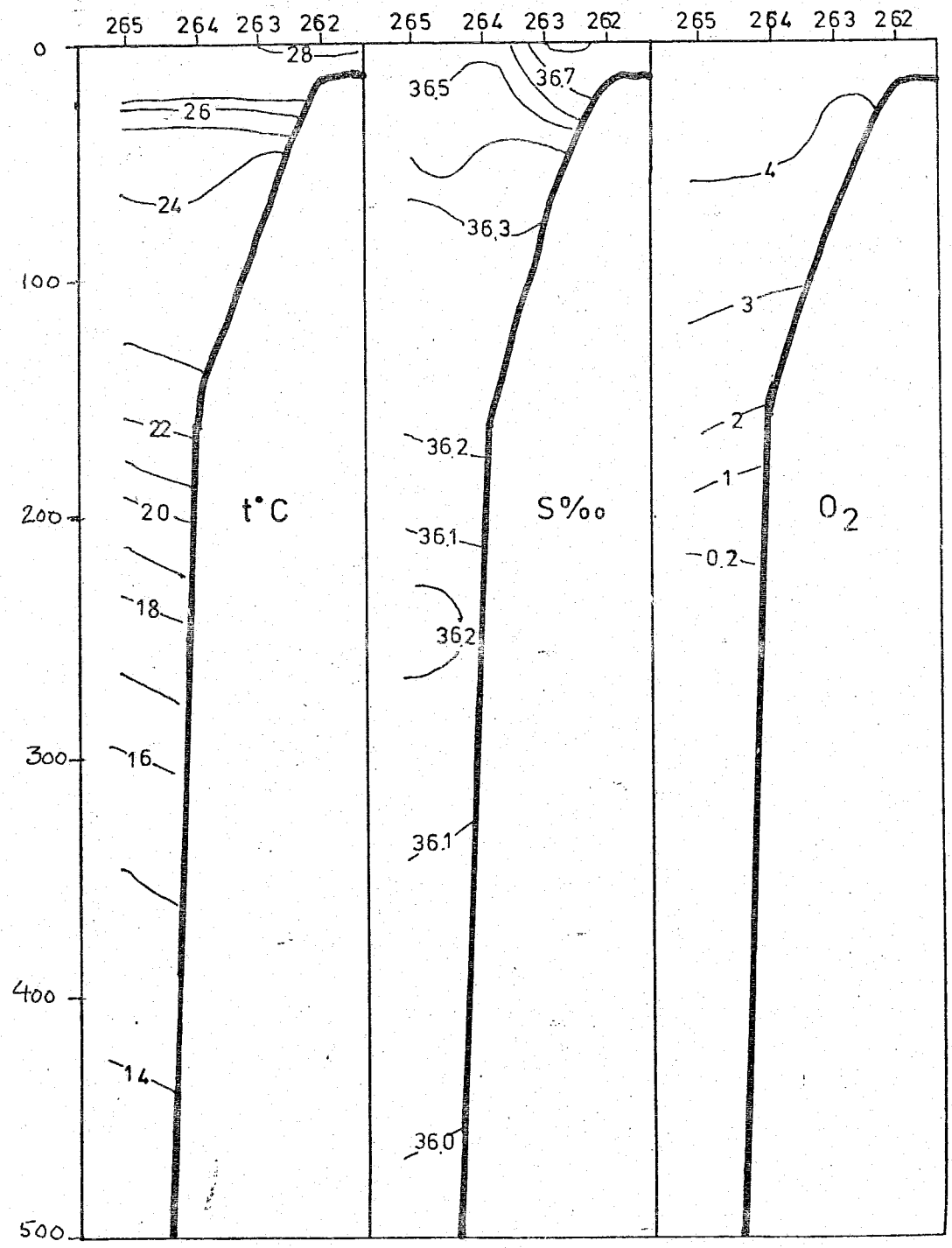

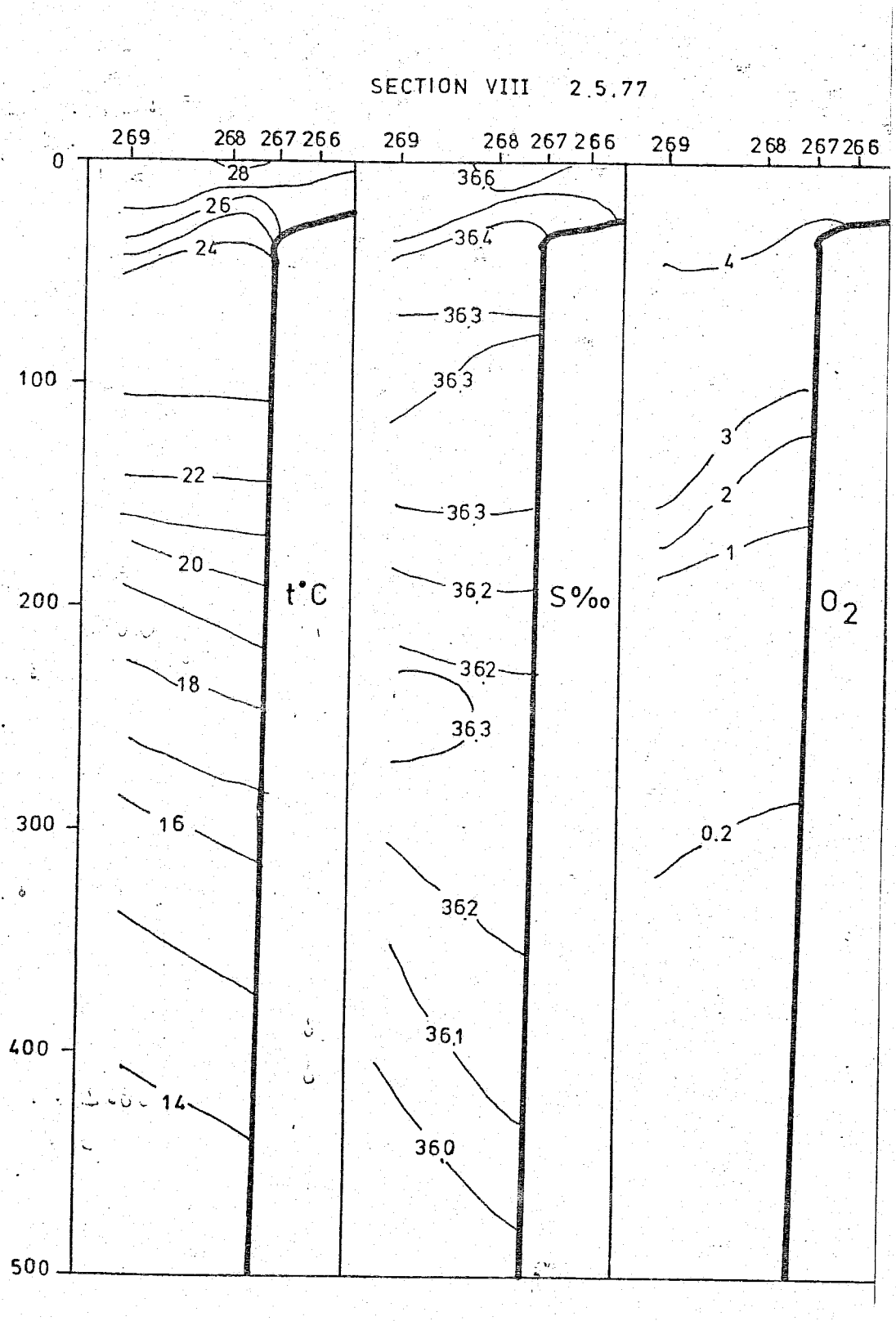
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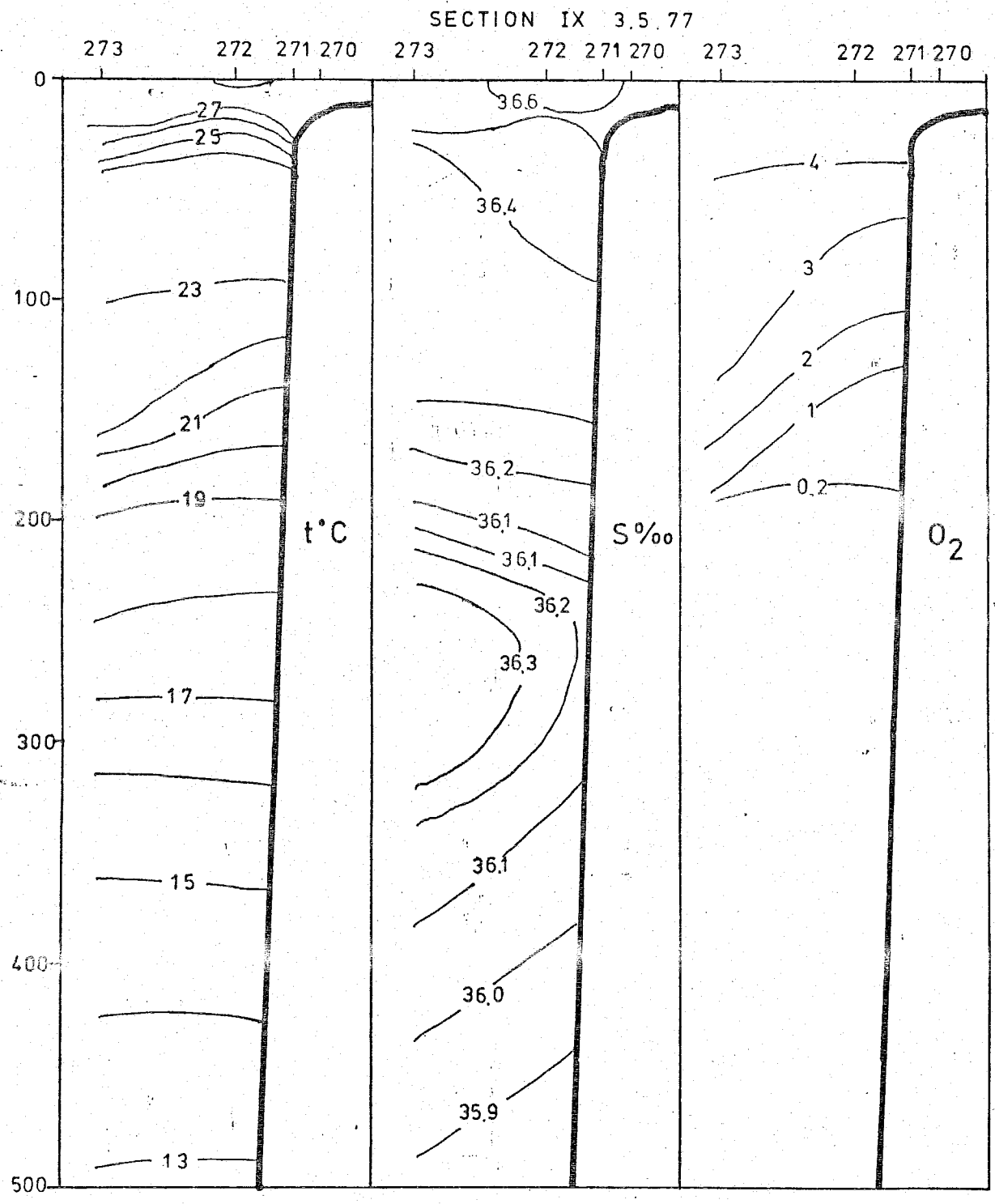
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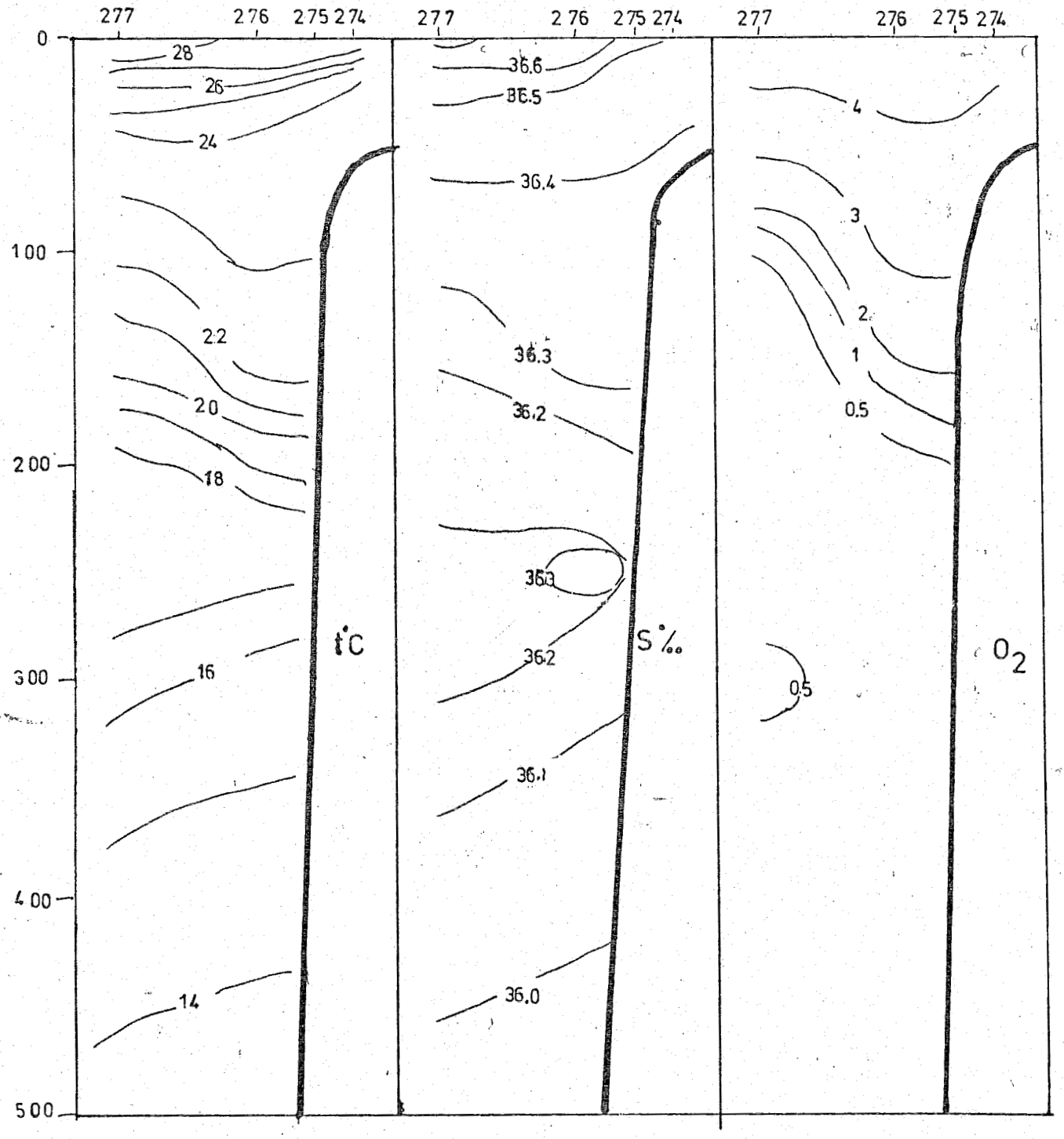

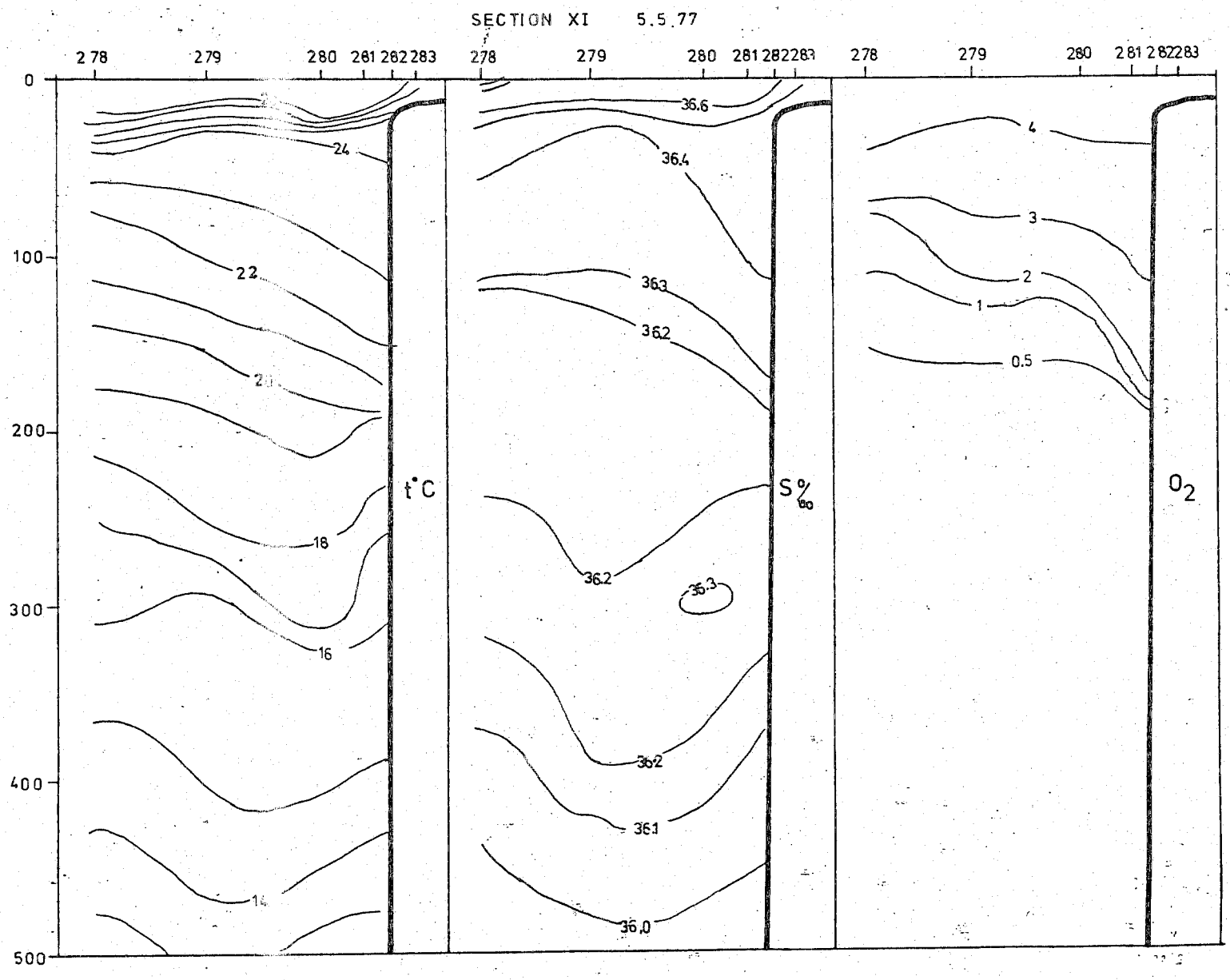
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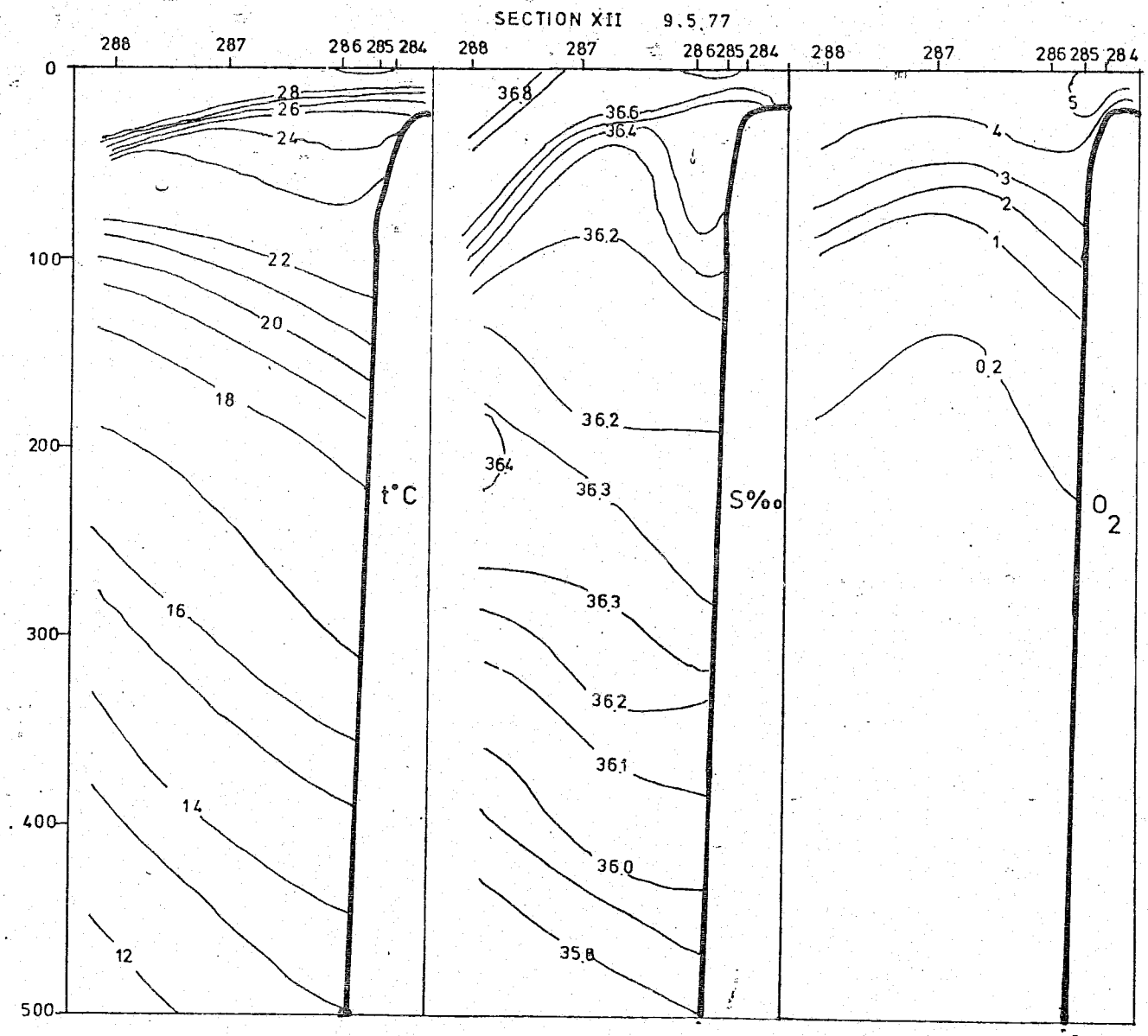
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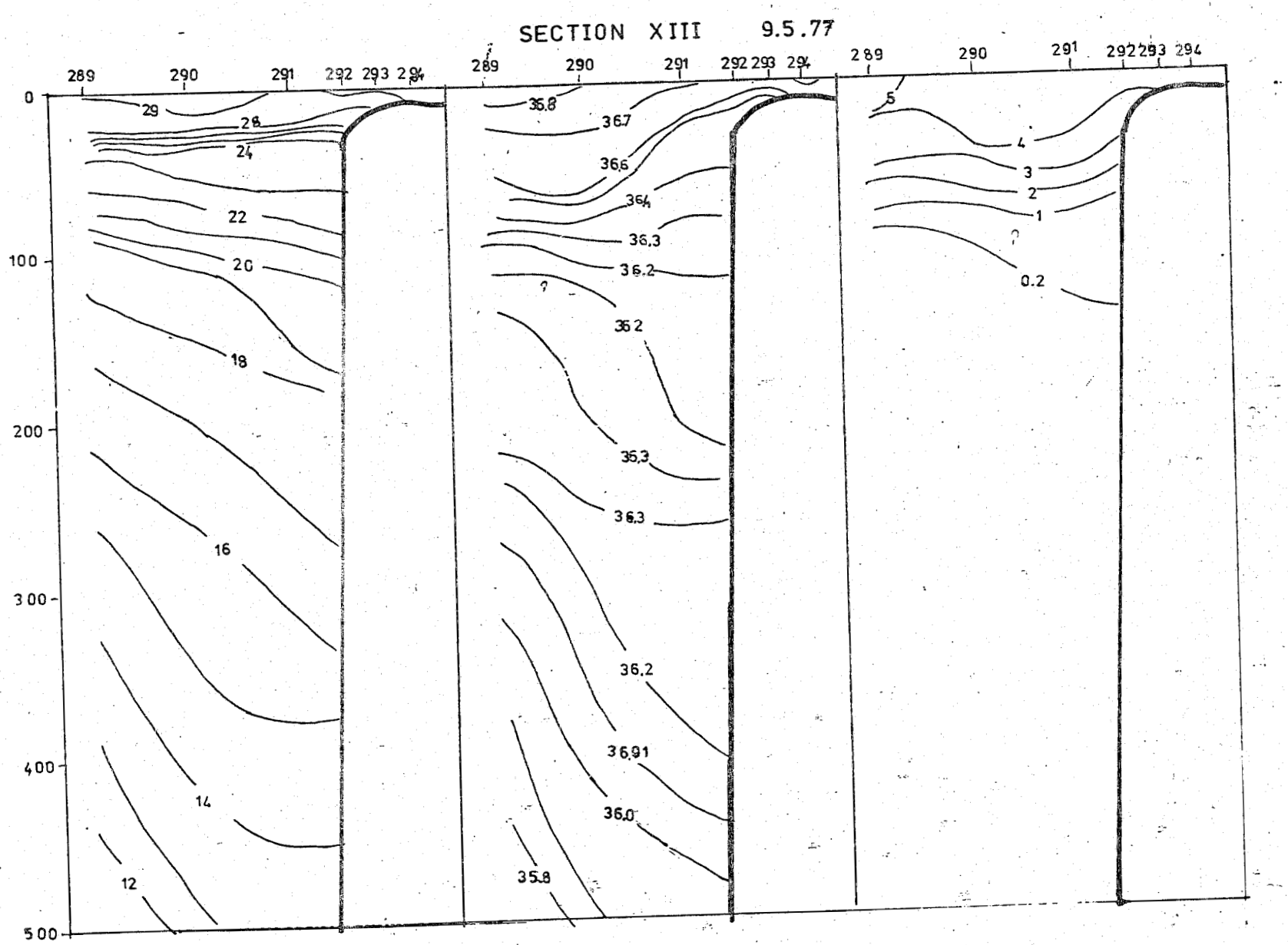
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36.3
36.2
36.91
36.0
35.8
5
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Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D
0224	1977	413	010 20	23310	67550	10
0225	1977	413	010 22	23230	67410	20
0226	1977	414	010 01	23160	67290	20
0227	1977	414	010 04	23080	67140	50
0228	1977	414	010 06	23010	67030	125
0229	1977	414	010 12	22500	66520	300
0230	1977	416	010 19	23400	67430	10
0231	1977	416	010 23	23310	67280	20
0232	1977	417	010 01	23240	67170	300
0233	1977	417	010 06	23170	67050	100
0234	1977	417	010 09	23100	66520	125
0235	1977	417	010 12	23020	66400	400
0236	1977	417	010 19	22490	66180	600
0237	1977	418	010 00	22330	65510	500
0238	1977	418	010 20	23510	67250	10
0239	1977	418	010 22	23450	67140	30
0240	1977	418	010 24	23380	67020	75
0241	1977	419	010 02	23300	66490	75
0242	1977	419	010 04	23240	66380	100
0243	1977	419	010 10	23180	66280	300
0244	1977	420	010 02	24060	67100	10
0245	1977	420	010 03	24010	67010	50
0246	1977	420	010	23540	66490	75
0247	1977	420	010 11	23470	66370	75
0248	1977	420	010 13	23410	66260	150
0249	1977	423	01 21	24300	67020	10
0250	1977	423	010 22	24240	66500	50
0251	1977	424	010 01	24170	66380	50
0252	1977	424	010 04	24100	66250	75
0253	1977	424	010 06	24030	66130	75
0254	1977	424	010 12	23550	66000	240
0255	1977	425	010 18	23480	64520	500
0256	1977	426	010 00	24040	65190	500
0257	1977	426	010 05	24170	65420	400
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0259	1977	426	010 14	24290	66030	75
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0261	1977	426	010 18	24470	66350	20
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0263	1977	427	010	12	25100	66100	50
0264	1977	427	010	17	25000	66010	125
0265	1977	427	010	20	24470	65570	500
0266	1977	502	010	06	25150	65200	10
0267	1977	502	010	06	25070	65200	30
0268	1977	502	010	07	24560	65200	500
0269	1977	502	010	11	24350	65200	500
0270	1977	503	010	05	25050	64350	10
0271	1977	503	010	06	25000	64350	20
0272	1977	503	010	08	24470	64350	500
0273	1977	503	010	13	24170	64350	500
0274	1977	504	010	10	25000	63500	50
0275	1977	504	010	19	24510	63500	125
0276	1977	504	010	20	24380	63500	500
0277	1977	505	010	07	24060	63500	500
0278	1977	505	010	14	23380	63050	500
0279	1977	505	010	19	24090	63050	500
0280	1977	505	010	23	24040	63050	500
0281	1977	506	010	03	24540	63050	500
0282	1977	506	010	05	25020	63050	20
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0284	1977	508	010	05	25030	62200	20
0285	1977	508	010	07	24580	62200	75
0286	1977	508	010	10	24500	62200	500
0287	1977	508	010	17	24200	62200	500
0288	1977	509	010	01	23500	62200	500
0289	1977	509	010	02	23300	61350	500
0290	1977	509	010	13	24000	61350	490
0291	1977	509	010	22	24300	61350	500
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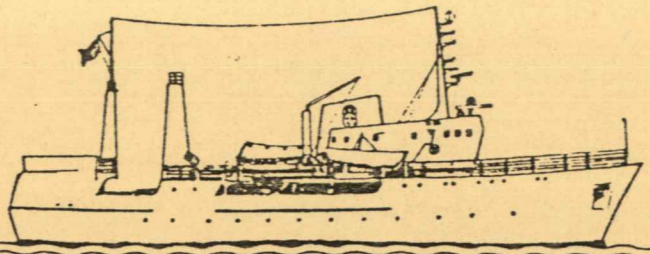


Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY CRUISE REPORT ON CRUISE NOS 9 AND 10 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

18 May - 20 June 1977

Roald Sætre

Bergen, June 1977

Institute of Marine Research, Bergen

PRELIMINARY REPORT ON CRUISE NOS 9 AND 10 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

Introduction	This report covers the fifth complete coverage of the Pakistani waters during the project.
Departure	Karachi, 18. May 1977.
Arrival	Karachi, 27. May 1977.
Scientific staff	Marine Fisheries Department: M. Arshad, M. Hussain, J. Bashir IMB - University of Karachi: S. Hoda, S.A. Siddiqui (to 20 May) M.M. Kahn (to 20 May), A. Kazmi (From 22 May), S.H. Kahn (From 22 May). Institute of Marine Research: R. Sætre, E. Olsen, S. Brattås.
Departure	Karachi, 29 May 1977.
Arrival	Karachi, 20 June 1977.
Ports of call	Dubai, 9 - 11 June 1977.
Scientific staff	Marine Fisheries Department: S. Qureshi, M. Khaliluddin, Irshad Begum Farkhundi Jabeen. IMB - University of Karachi: S.A. Siddiqui, S. Barkati, S.H. Niaz Rizvi. Institute of Marine Research: R. Sætre, E. Olsen, S. Brattås.

Survey grid and stations are shown in Fig. 1. The standard hydrographic/plankton stations were worked out as described in detail in report No. 1 with modification in cruise report No. 2. During most of the cruise the wind was south-west 5 - 6 Beaufort with heavy swell resulting in delaying the schedule. For this reason some of the standard hydrographic/plankton sections had to be shortened. During the first part of this coverage the last phytoplankton net aboard was destroyed. Therefore no samples of this kind

were obtained off the Karachi and the Makran coast. Due to a failure of the filtration instrument no chlorophyll samples were taken at section Nos X to XIII.

RESULTS

Table 1 shows the particulars of the fishing stations and Table 2 and 3 shows the length and maturity distribution of the dominant species.

Distribution and abundance of pelagic fish (Fig. 2).

The contribution to the total echo abundance from pelagic fish was small and approximately of the same size as on coverage No. 4. The Sonmiani Bay area and the southernmost Sind coast contributed the highest values. All pelagic fish were caught in small number by bottom trawl mainly no schools of pelagic fish were observed. The dominant pelagic species were the anchovies (Thryssa spp.). Other pelagic fish occasionally caught were sardine (Sardinella spp.), streaked spanish mackerel (Scomberomorus lineolatum) hard tail scad (Megalaspis cordyla), talang queen fish (Scombroidaes commersonianus) and Russel's scad (Decapterus russelli).

Distribution and abundance of demersal fish (Fig. 3).

Compared with coverage No. 4 there was a decrease in echo abundance attributed to demersal fish. This reduction was most pronounced at Great Kori Bank. The highest values were observed in the Sonmiani Bay area where also the largest catch, 10 tons/trawl hour, was obtained. This catch consisted mainly of catfish (Aries sp.) and lined silver grunt (Pomadasys hasta).

Distribution and abundance of mesopelagic fish (Fig. 4).

There seem to be a reduction in echo abundance of mesopelagic fish on this coverage compared to the previous one. The dominant specie in this layer was lantern fish (Benthosema pterotum).

Plankton (Fig. 5).

The echo abundance attributed to plankton during this coverage is on average slightly less than on the previous one. The highest values were observed along the continental edge. Along the whole Makran coast large patches of brownish-red phytoplankton were observed in the surface.

Hydrography (Fig. 6 - 22).

During this coverage an upwelling was observed along the Makran coast. This upwelling was most pronounced in the Sonmiani Bay area.

Bergen, June 1977

Roald Sætre

Roald Sætre

Table 1. Record of fishing operations. "Dr. Fridtjof Nansen" PAK/NOR/FAO Cruise Nos. 9 and 10, 18.5 - 20.6.1977.

Date	Time	Stn No.	Gear	Depth in m		Position		Total catch kg	Catch per hour kg	Dominant species
				Bot-tom	Gear	North	East			
19.5	1155	168	BT	100	100	23°10'	67°17'	120	144	Threadfin bream (Nemipterus japonicus) Russel's scad (Decapterus russelli) Malabar trevally (Carangoides malabaricus)
23.5	1120	169	BT	120	120	23°14'	67°01'	4.5	9	Smallhead hairtail (Lepturacanthus savala)
23.5	2335	170	BT	26	26	23°34'	67°34'	400	800	Moustached thryssa (Thryssa mystax) False trevally (Caranx sp.) Lined silver grunt (Pomadasys hasta)
25.5	2355	171	BT	25	25	23°47'	67°19'	240	480	Smallhead hairtail (Lepturacanthus savala) Catfish (Arius sp.) Rays
25.5	0630	172	BT	81	81	23°44'	66°57'	87	174	Smallhead hairtail (Lepturacanthus savala) Japanese threadfin bream (Nemipterus japonicus)
26.5	0355	173	BT	22	22	24°20'	67°02'	363	706	Beard croaker (Pseudosciaena sp.) Smallhead hairtail (Lepturacanthus savala) Rays
1.6	0455	174	SPT	105	80	25°00'	66°03'	20	20	Jellyfishes
1.6	0920	175	BT	75	75	25°13'	66°12'	2500	2700	Smallhead hairtail (Lepturacanthus savala) Skates Beard croaker (Johnius diacanthus)
1.6	1340	176	BT	30	30	25°16'	66°12'	5000	10000	Lined silver grunt (Pomadasys hasta) Talang queenfish (Scomberoides commersonianus) Catfish (Arius sp.)

Table 1 (continued).

Date	Time	Stn No.	Gear	Depth in m Bot-tom	Gear	Position North	East	Total catch kg	Catch/ hour kg	Dominant species
2.6	0615	177	BT	18	18	25°15'	65°42'	320	960	Catfish (Arius sp.) Smallhead hairtail (Lepturacanthus savala) Lined silver grunt (Pomadasys hasta)
2.6	1110	178	BT	17	17	25°15'	65°30'	182	364	Two-spined jewfish (Johnius diacanthus) Lined silver grunt (Pomadasys hasta)
3.6	0425	179	SPT	>500	120	25°08'	65°08'	5	10	Jellyfish
4.6	1212	180	SPT	>500	210	24°30'	64°37'	250	500	Myctophidae (Benthosema sp.)
5.6	0750	181	SPT	>500	210	24°44'	62°26'	25	50	Myctophidae (Benthosema sp.)
6.6	0919	182	SPT	1100	350	25°05'	58°12'	8	16	Myctophidae / Squids / Deep sea sharks
14.6	0430	183	SPT	1700	200	24°26'	61°51'	30	45	Myctophidae
15.6	0450	184	SPT	650	160	24°50'	62°03'	5	10	Myctophidae / Jellyfish
15.6	0730	185	BT	25	25	25°01'	62°20'	540	1080	Lined silver grunt (Pomadasys hasta) Catfishes (Arius sp.) Spotted sickle fish (Drepane punctata)
16.6	0807	186	BT	21	21	25°02'	63°05'	246	492	Smallhead hairtail (Lepturacanthus savala) Catfish (Arius sp.) Lined silver grunt (Pomadasys hasta)

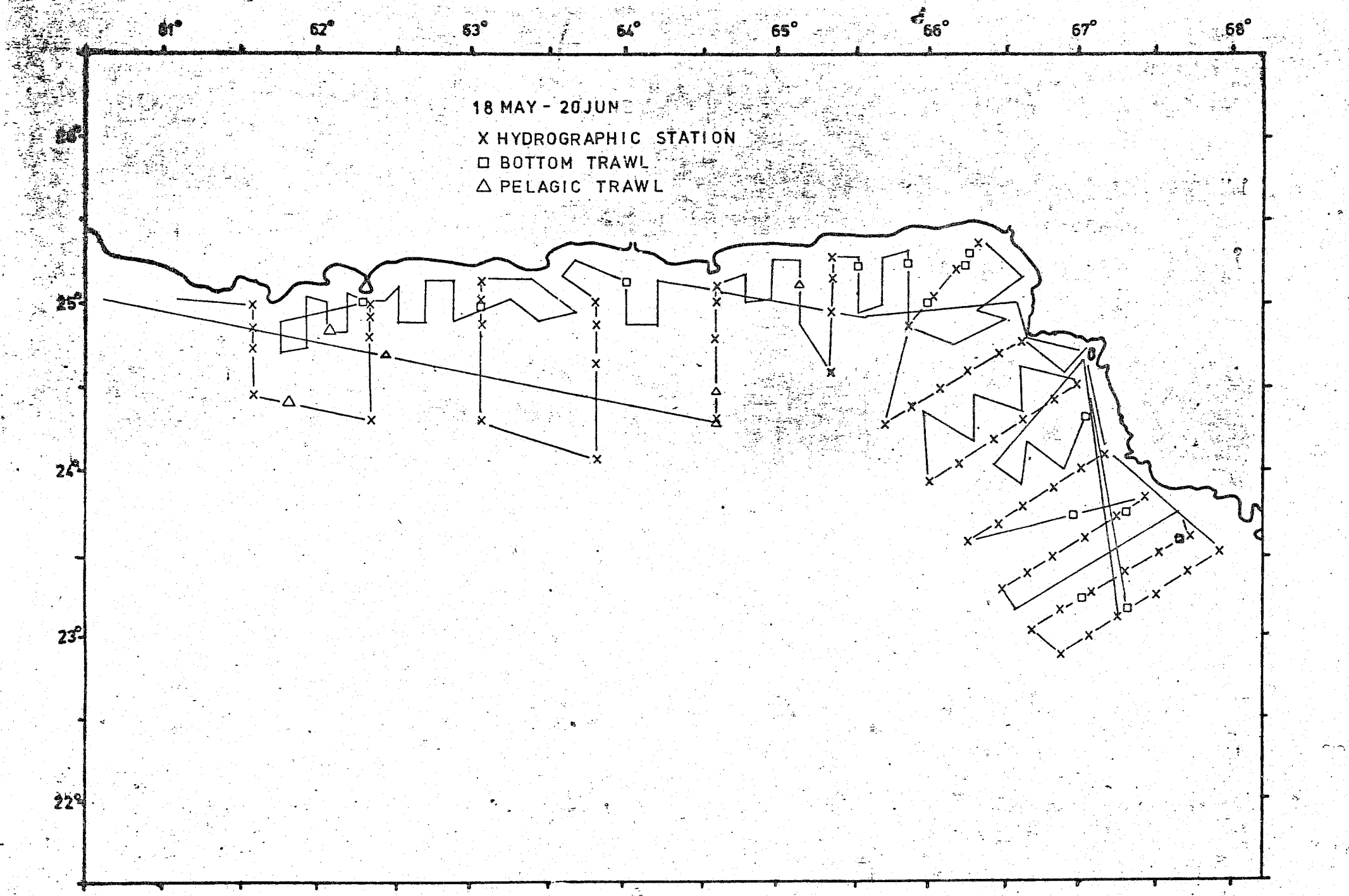
Table 2. Length frequency distribution of some species. Length in cm.

Species	N	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Thryssa mystax	25	2	13	7	3																	
Orthoterus tardorii	26		1	6	6	7	5	1														
Pampus argenteus	45									3	3	3	9	1	2	3	2	2	9	3		5

Species	N	25-29	20-34	35-39	40-44	45-49	50-54
Pomadasys hasta	79	3	4	12	24	20	16
Scomberomorus lineolatus	6				2	2	2
Mylio berda	15	1	10	4			

Table 3. Maturity distribution.

Species	0	1	2	3	4	5	6	7	8
Thryssa mystax				4	18	1	1	1	
Pampus argenteus	1	12	15	5	9	2	2		
Pomadasys hasta		1	2	1	7	8	11	14	39
Mylio berda		9	5						


61°
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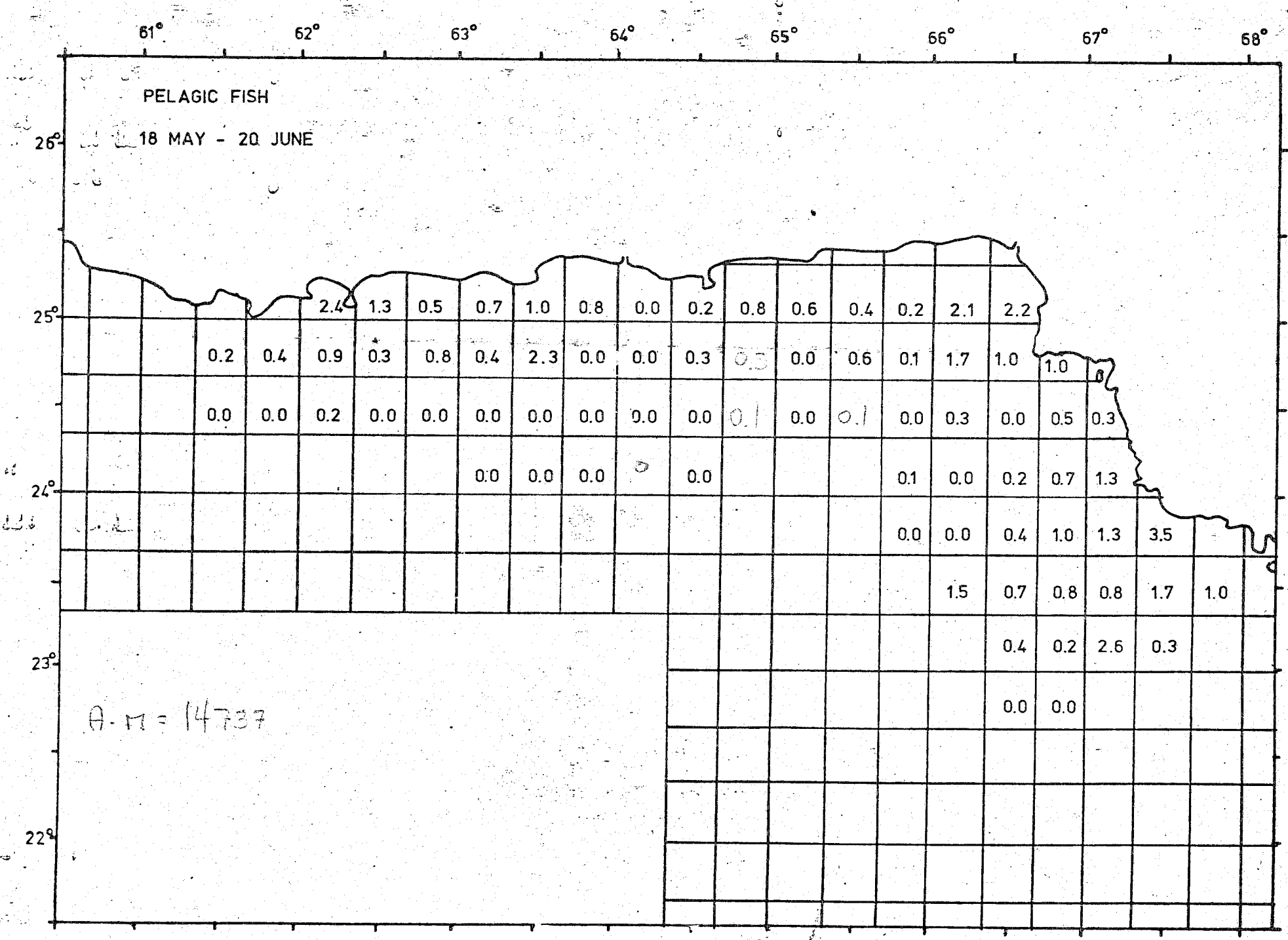
18 MAY - 20 JUN
X HYDROGRAPHIC STATION
□ BOTTOM TRAWL
△ PELAGIC TRAWL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PELAGIC FISH
18 MAY - 20 JUNE
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2.4 1.3 0.5 0.7 1.0 0.8 0.0 0.2 0.8 0.6 0.4 0.2 2.1 2.2
0.2 0.4 0.9 0.3 0.8 0.4 2.3 0.0 0.0 0.3 0.3 0.0 0.6 0.1 1.7 1.0 1.0
0.0 0.0 0.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.1 0.0 0.1 0.0 0.3 0.0 0.5 0.3
0.0 0.0 0.0 0.0 0.0 0.1 0.0 0.2 0.7 1.3
0.0 0.0 0.4 1.0 1.3 3.5
1.5 0.7 0.8 0.8 1.7 1.0
0.4 0.2 2.6 0.3
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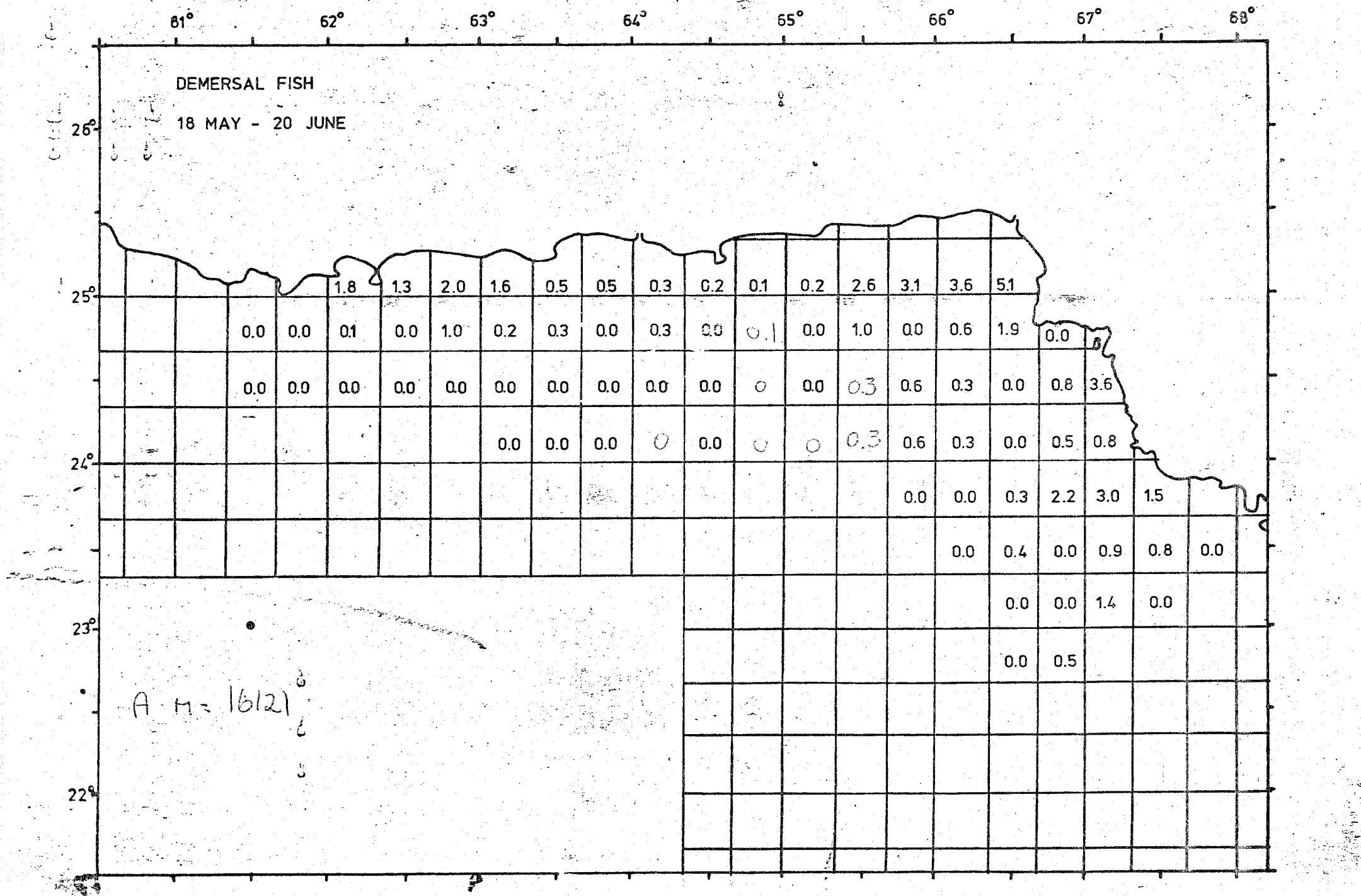
61°
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DEMERSAL FISH
18 MAY - 20 JUNE
26°
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1.8 1.3 2.0 1.6 0.5 0.5 0.3 0.2 0.1 0.2 2.6 3.1 3.6 5.1
0.0 0.0 0.1 0.0 1.0 0.2 0.3 0.0 0.3 0.0 0.1 0.0 1.0 0.0 0.6 1.9 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0.0 0.3 0.6 0.3 0.0 0.8 3.6
0.0 0.0 0.0 0 0.0 0 0 0.3 0.6 0.3 0.0 0.5 0.8
0.0 0.0 0.3 2.2 3.0 1.5
0.0 0.4 0.0 0.9 0.8 0.0
0.0 0.0 1.4 0.0
0.0 0.5
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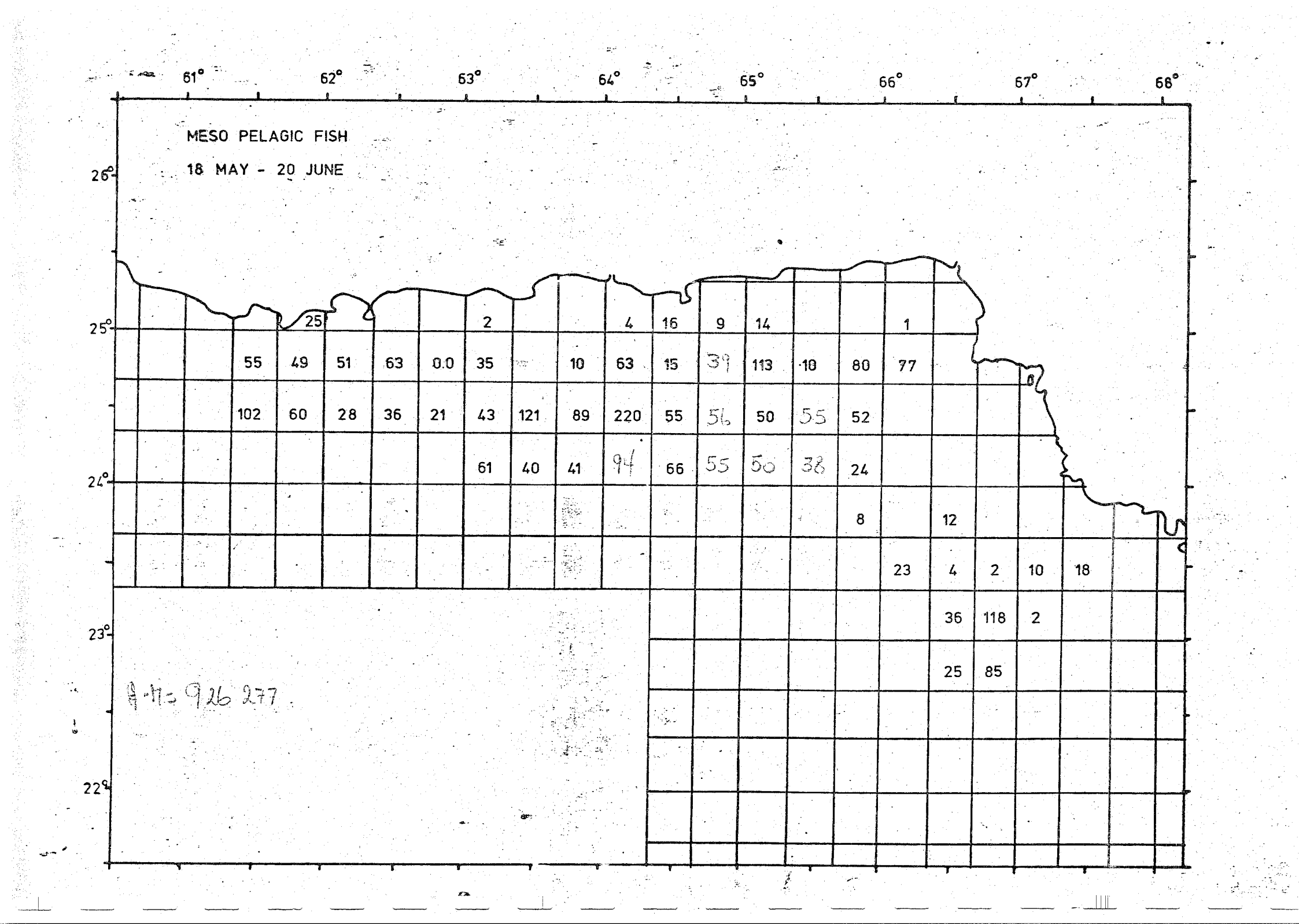
MESO PELAGIC FISH
18 MAY - 20 JUNE
61°
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77
102
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121
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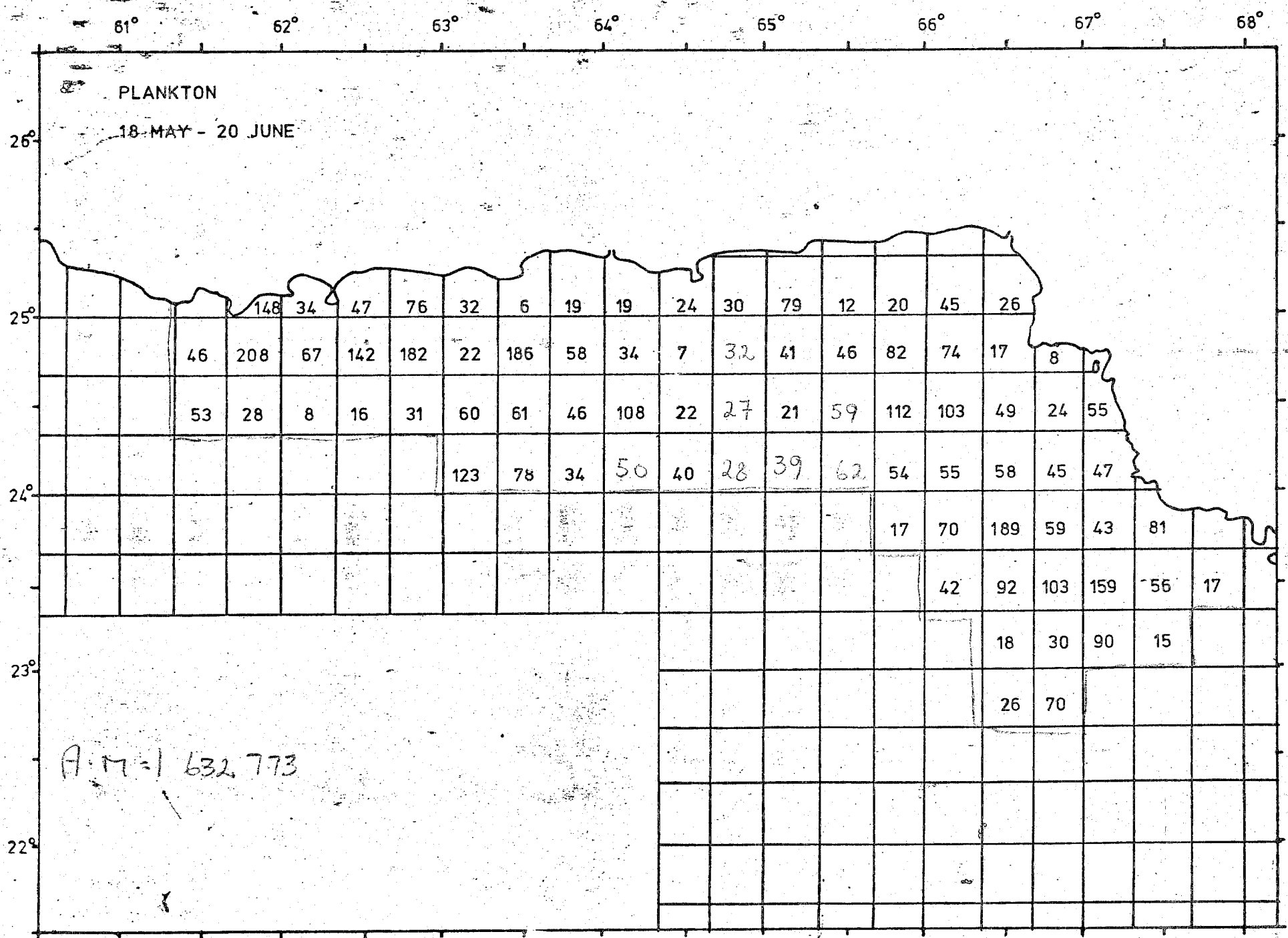
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PLANKTON
18 MAY - 20 JUNE
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148 34 47 76 32 6 19 19 24 30 79 12 20 45 26
46 208 67 142 182 22 186 58 34 7 32 41 46 82 74 17 8
53 28 8 16 31 60 61 46 108 22 27 21 59 112 103 49 24 55
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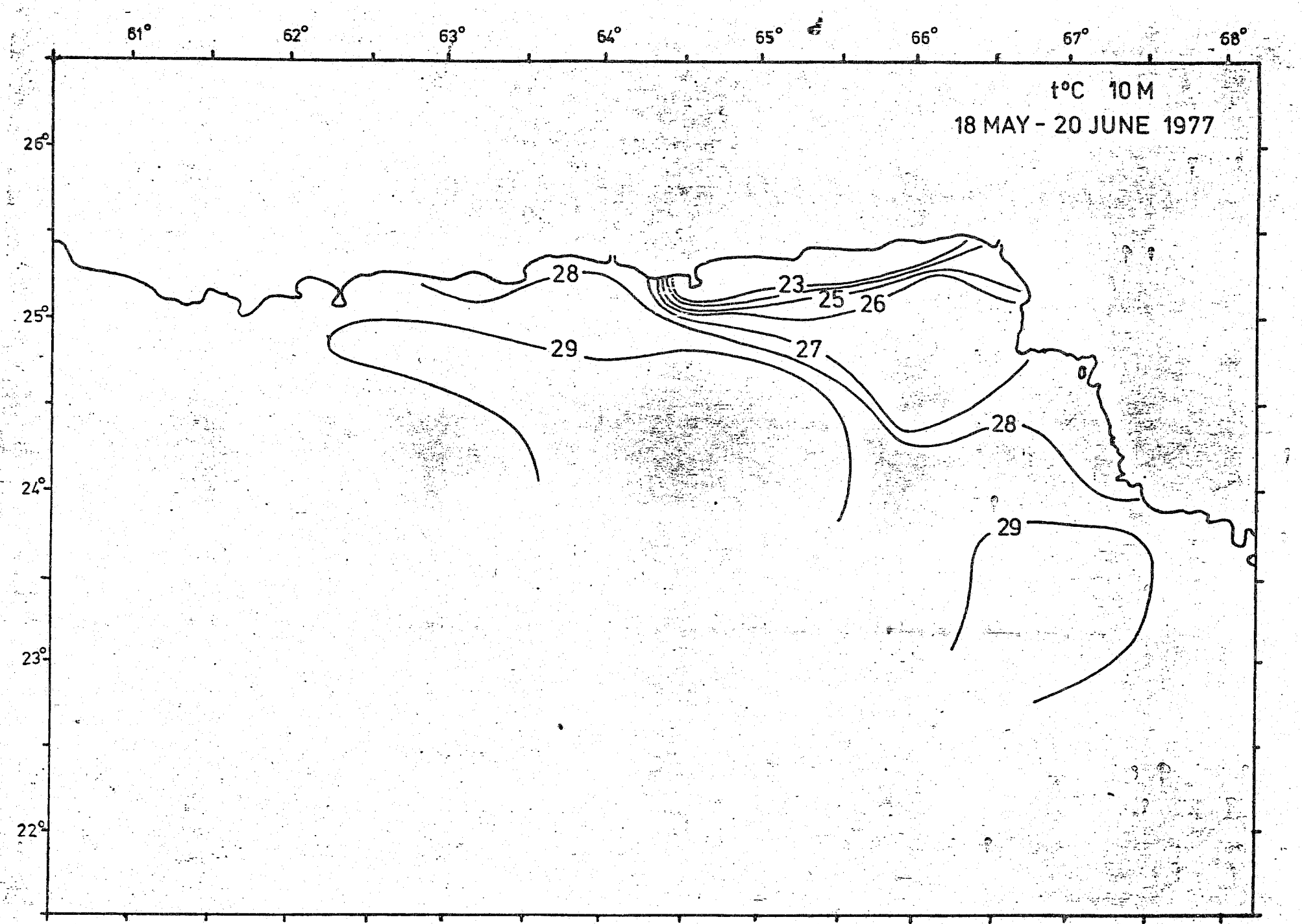
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18 MAY - 20 JUNE 1977
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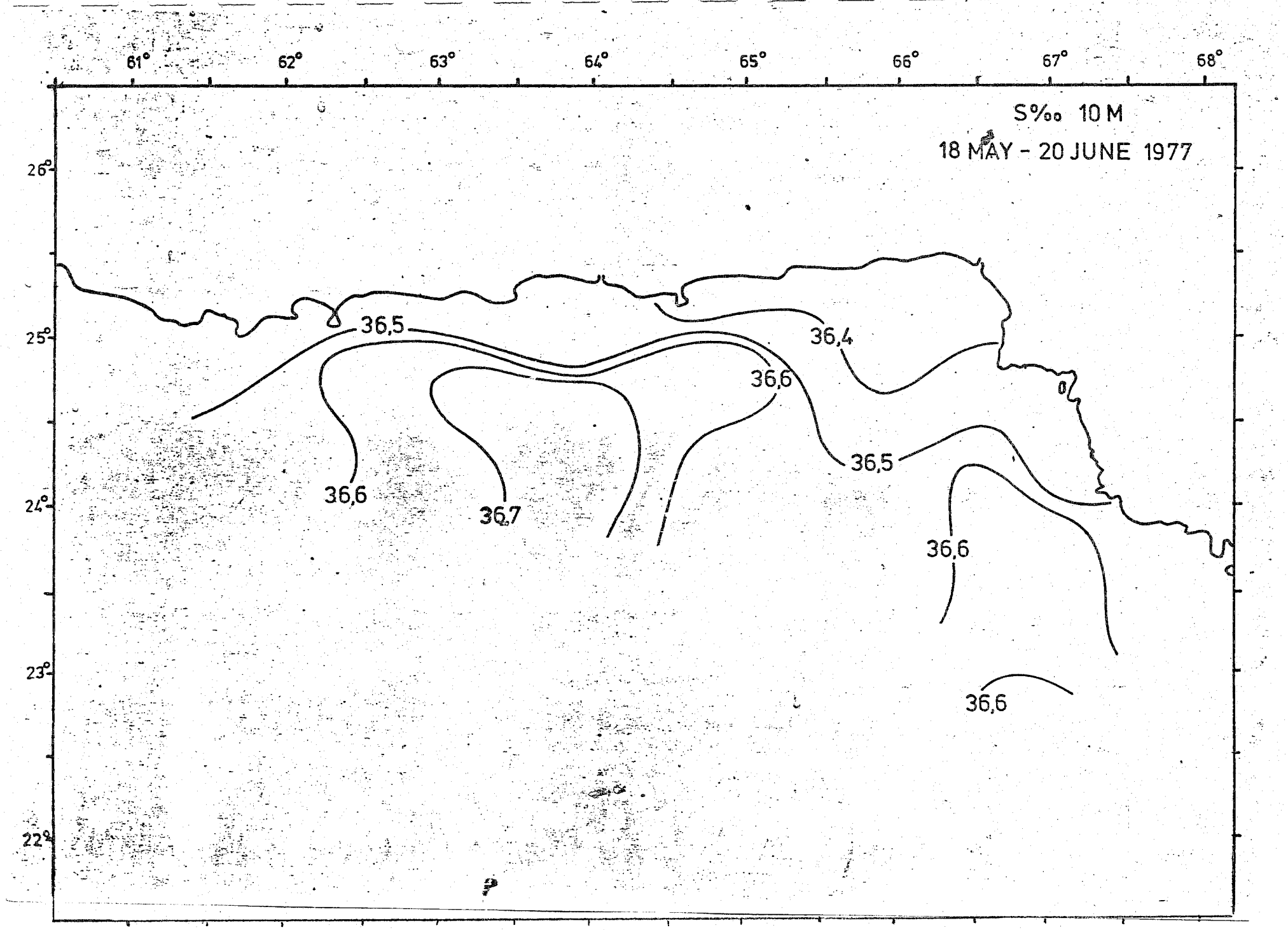
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S‰ 10 M
18 MAY - 20 JUNE 1977
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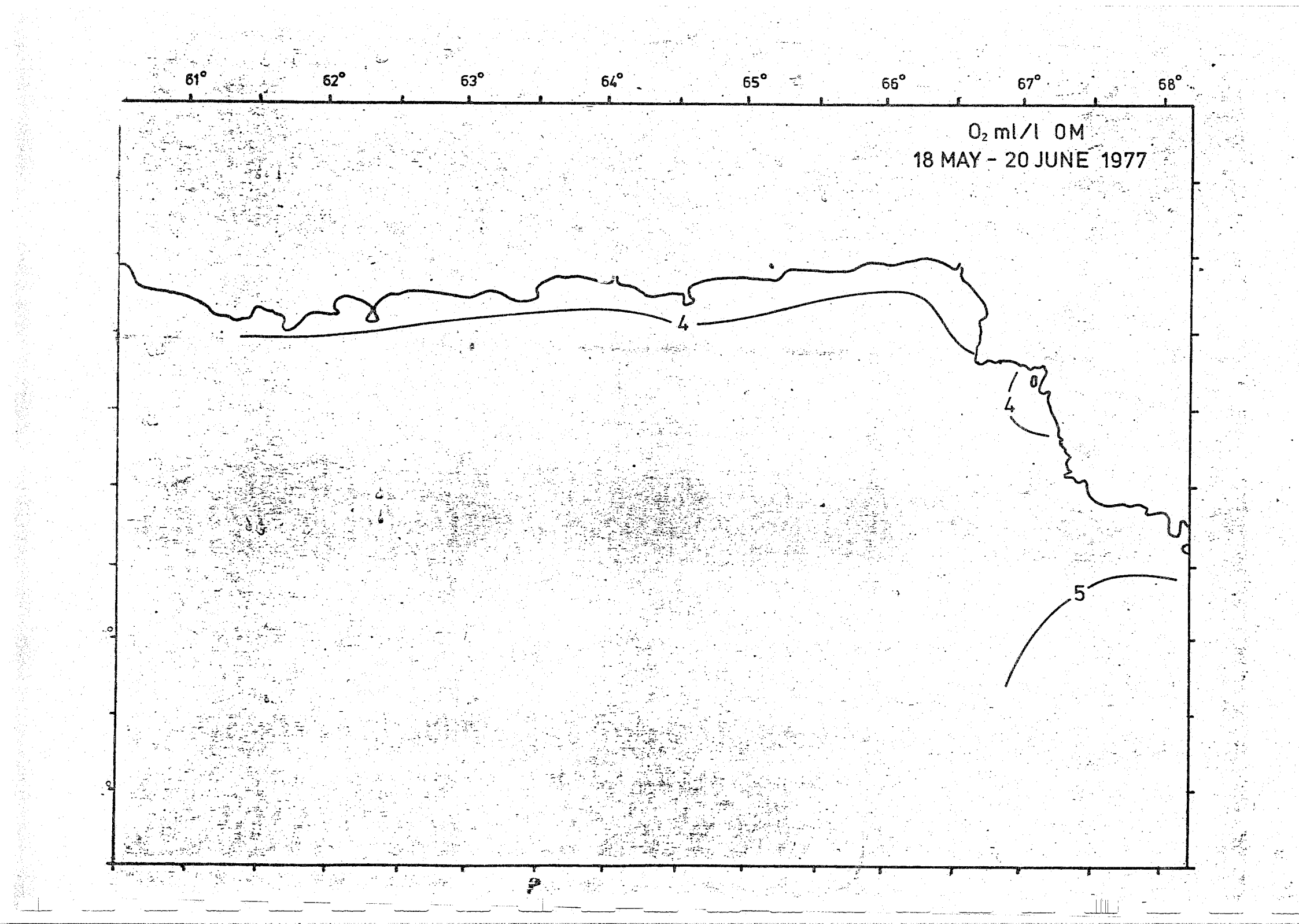
36,6
36,7
36,6
36,6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O2 ml/l OM
18 MAY - 20 JUNE 1977
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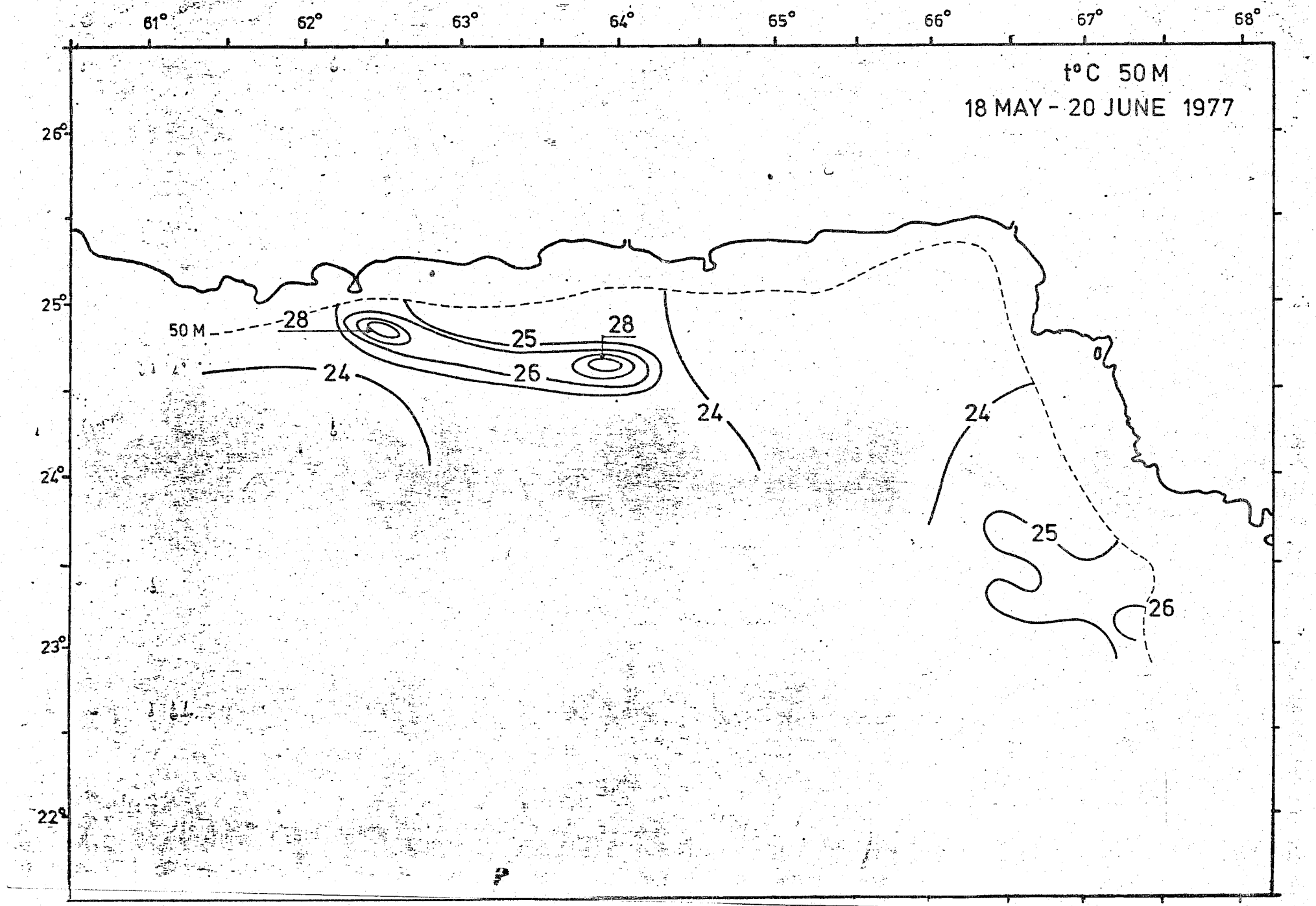
5


61°
62°
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68°
26°
25°
24°
23°
22°
t°C 50 M
18 MAY - 20 JUNE 1977
50 M
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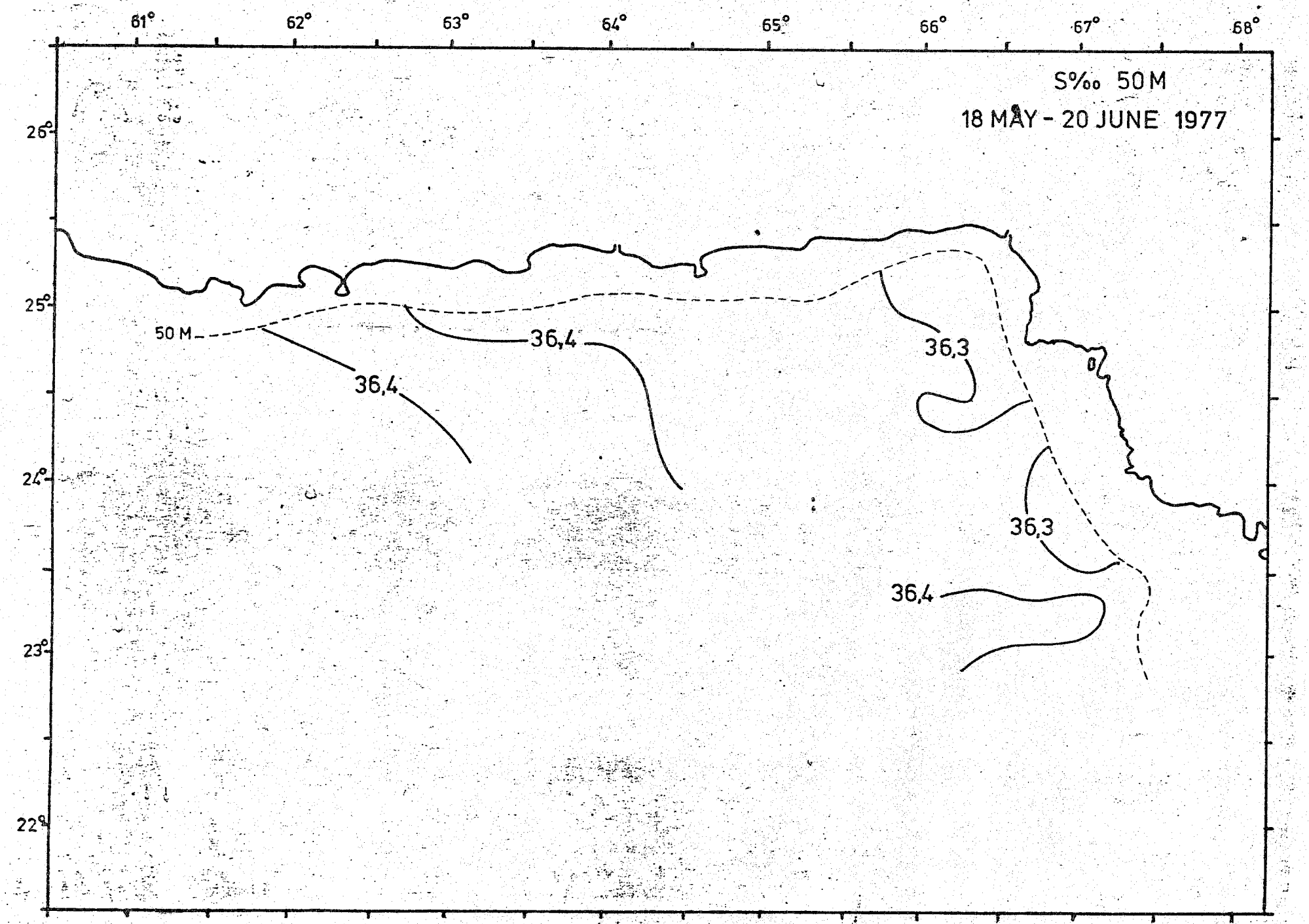
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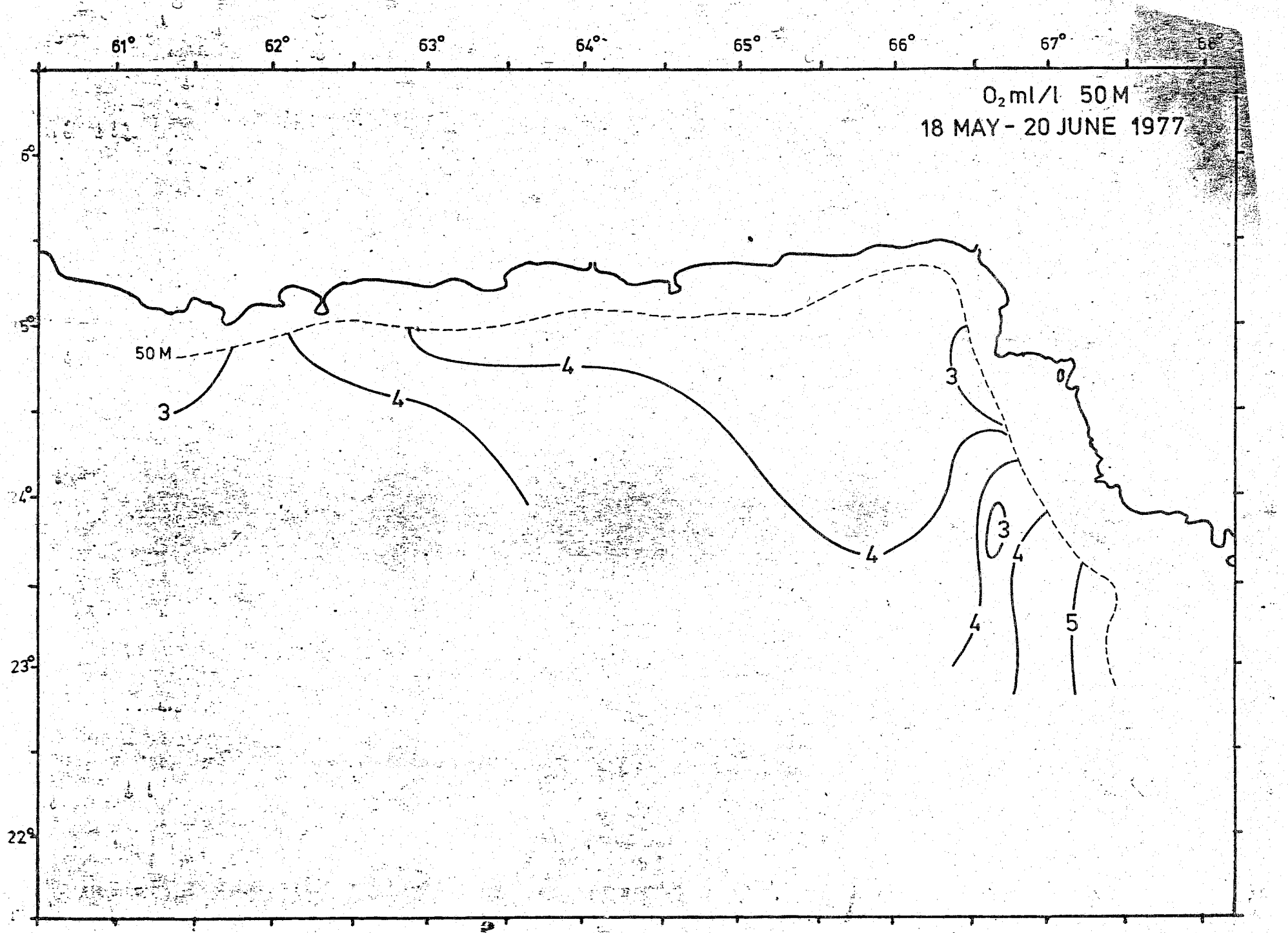
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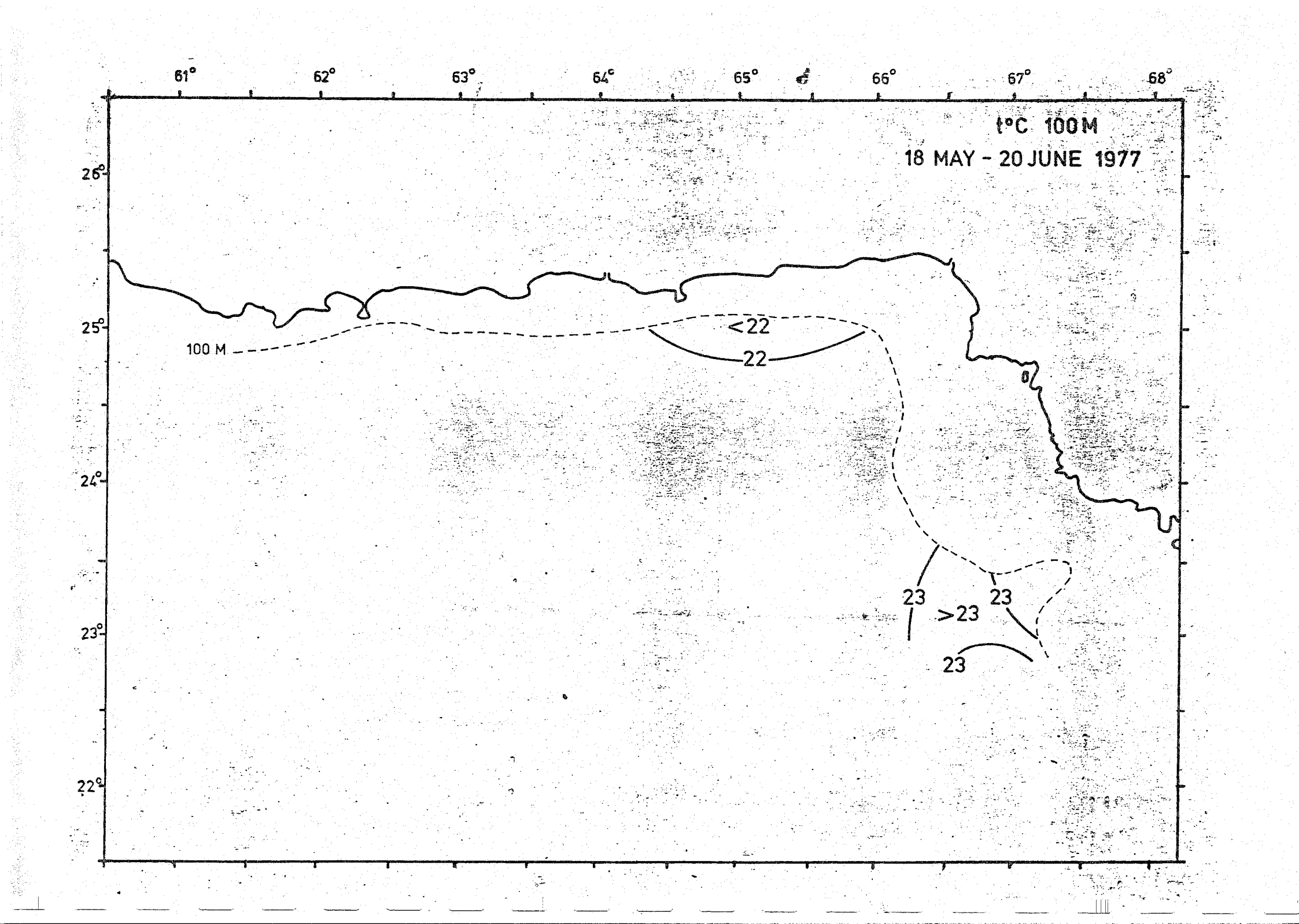
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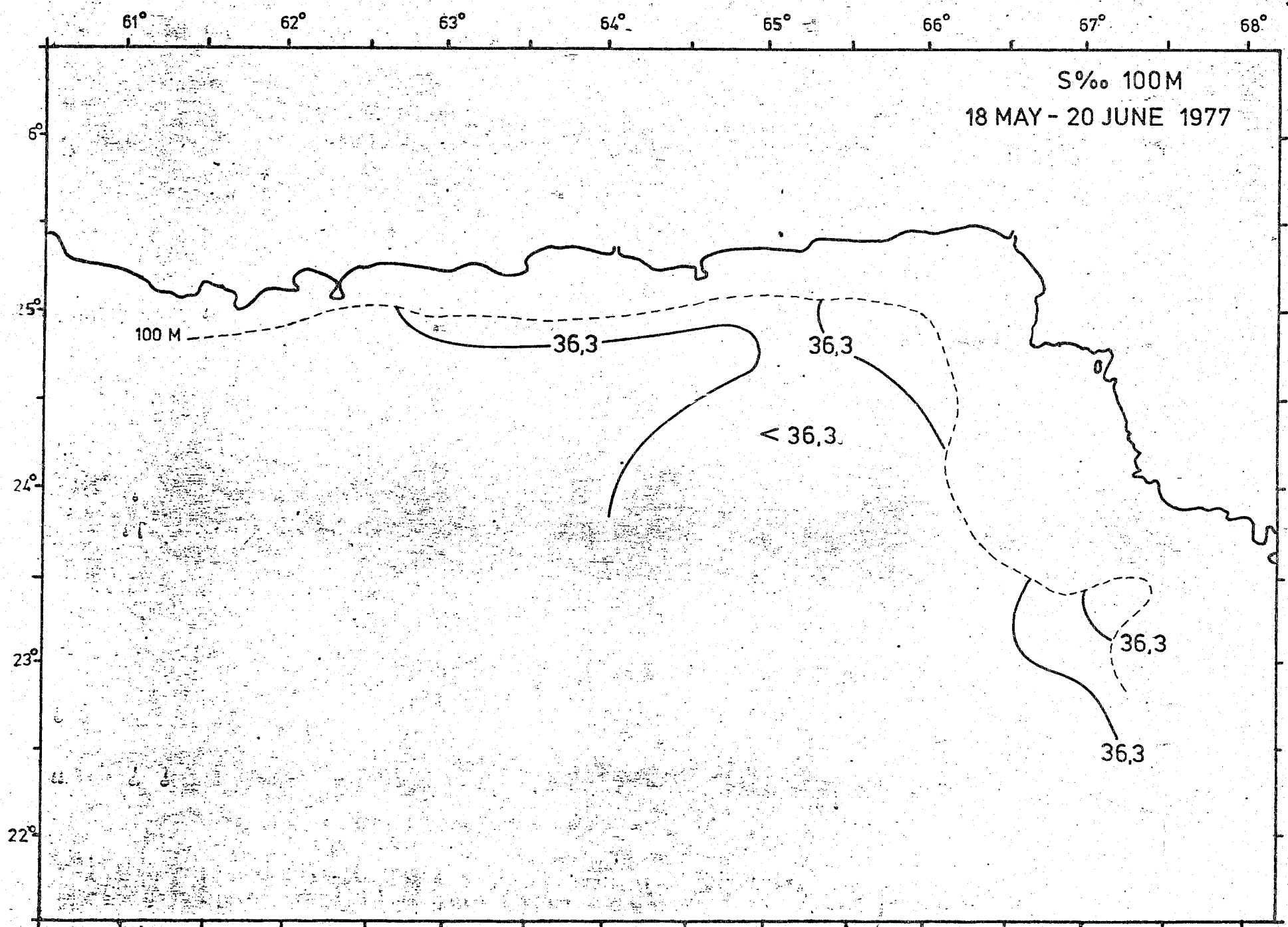
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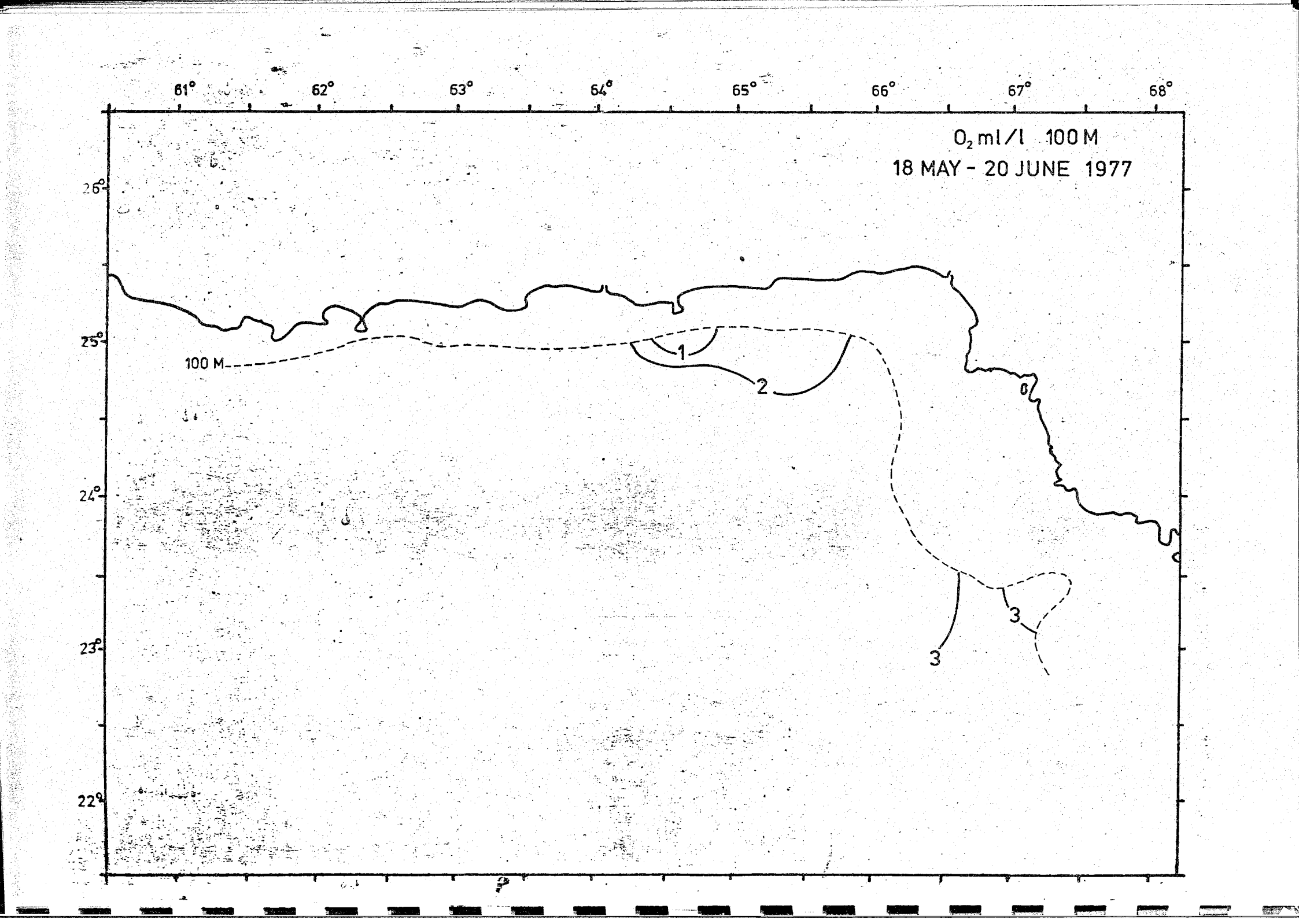
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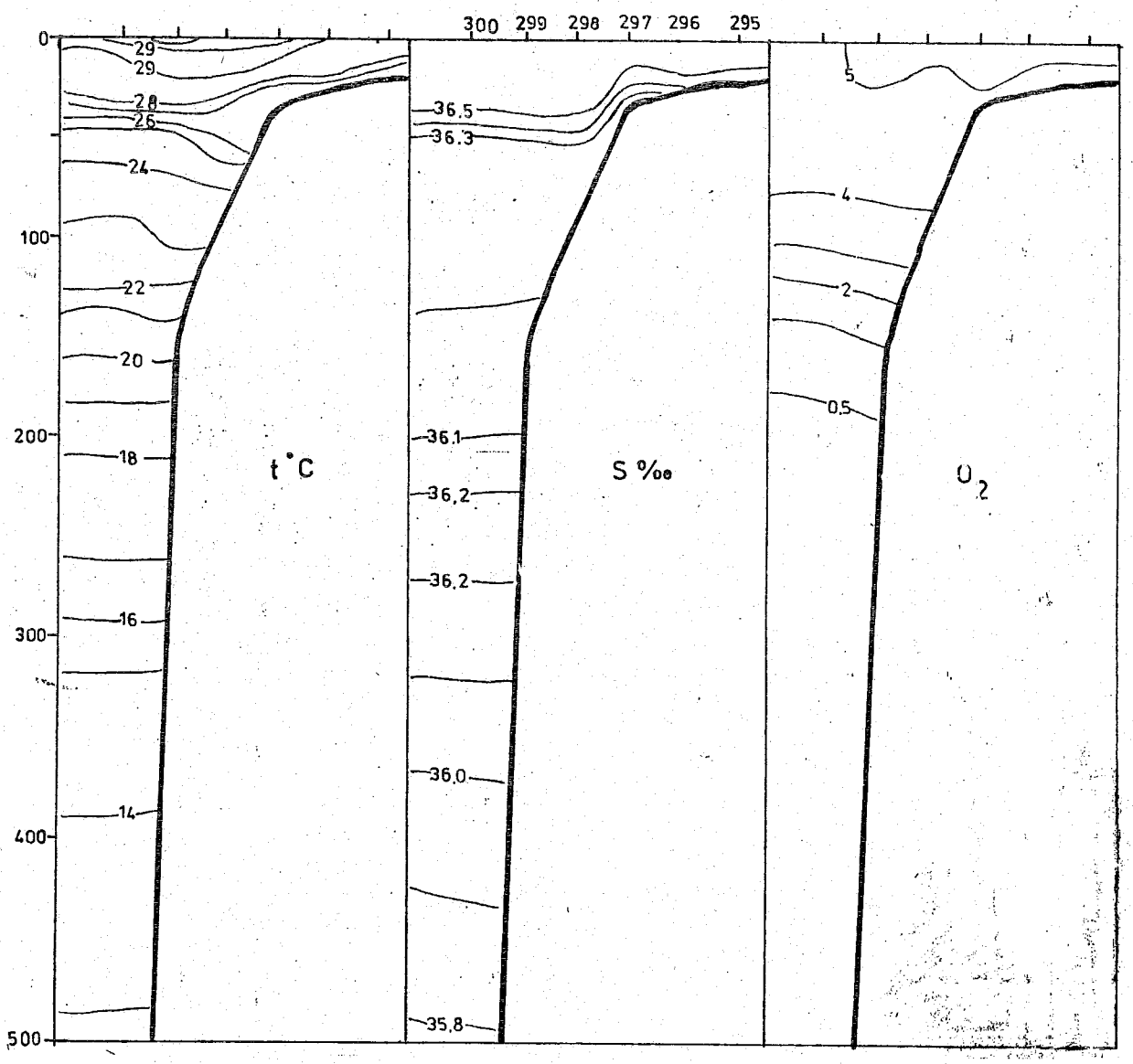

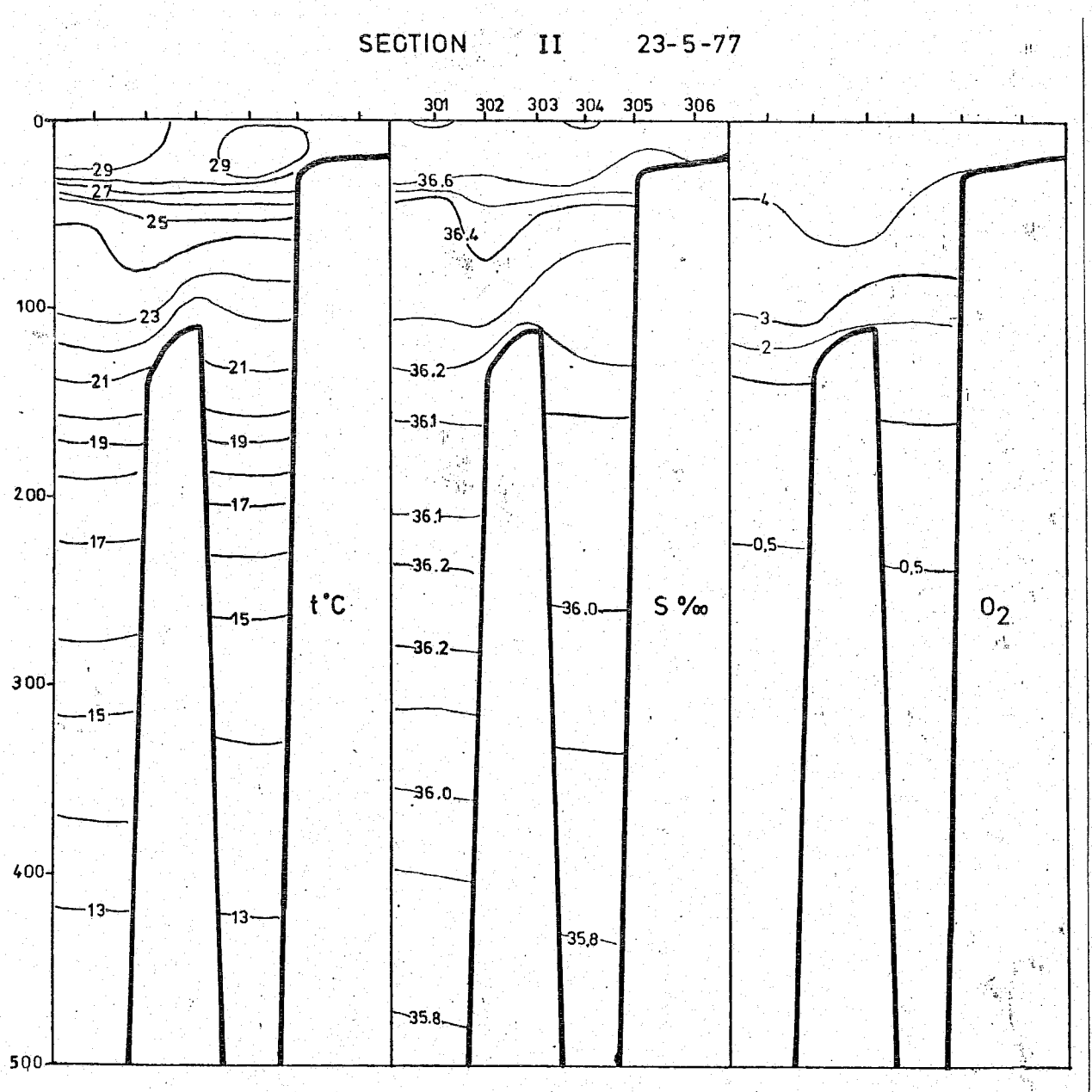
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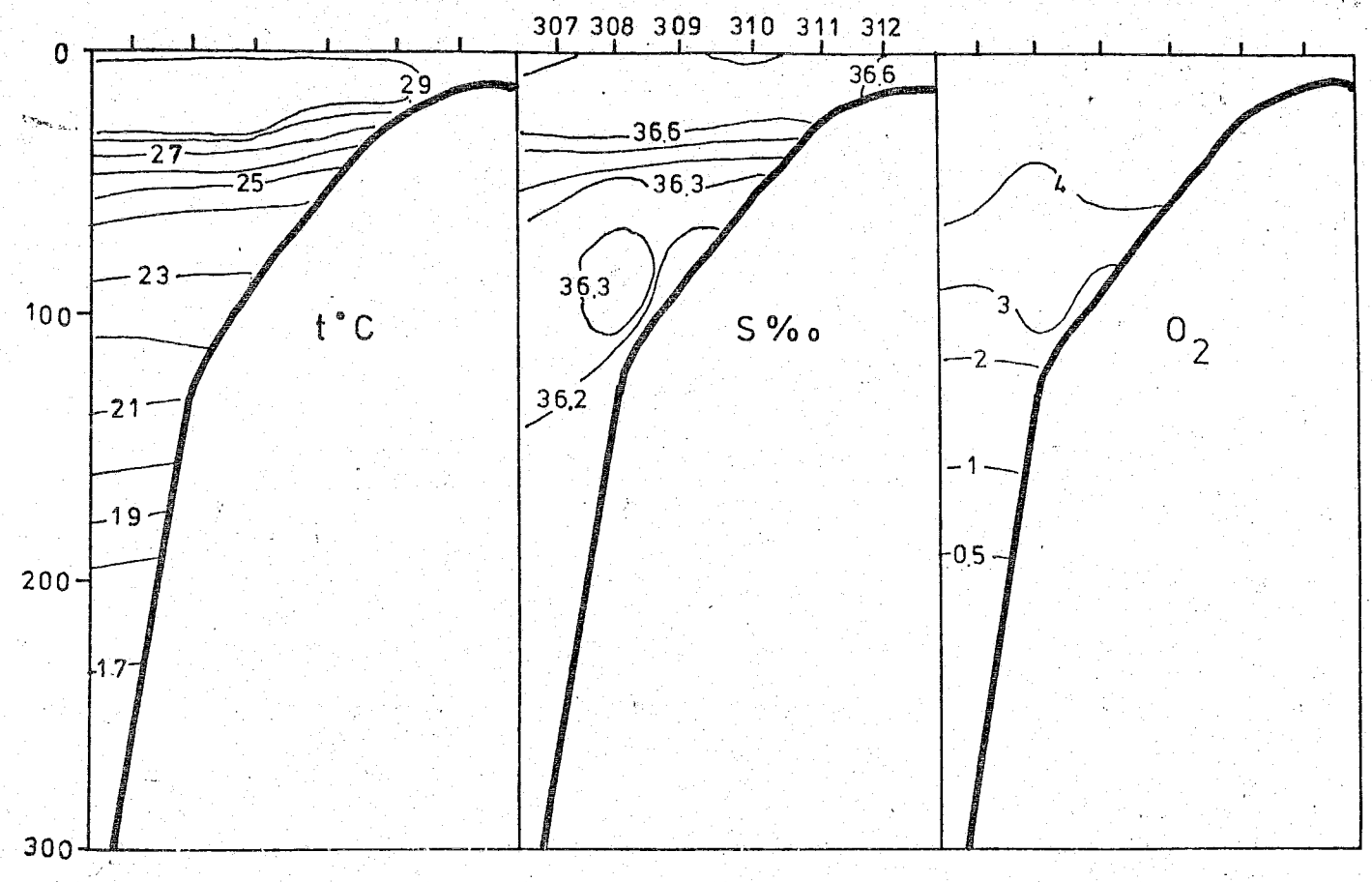

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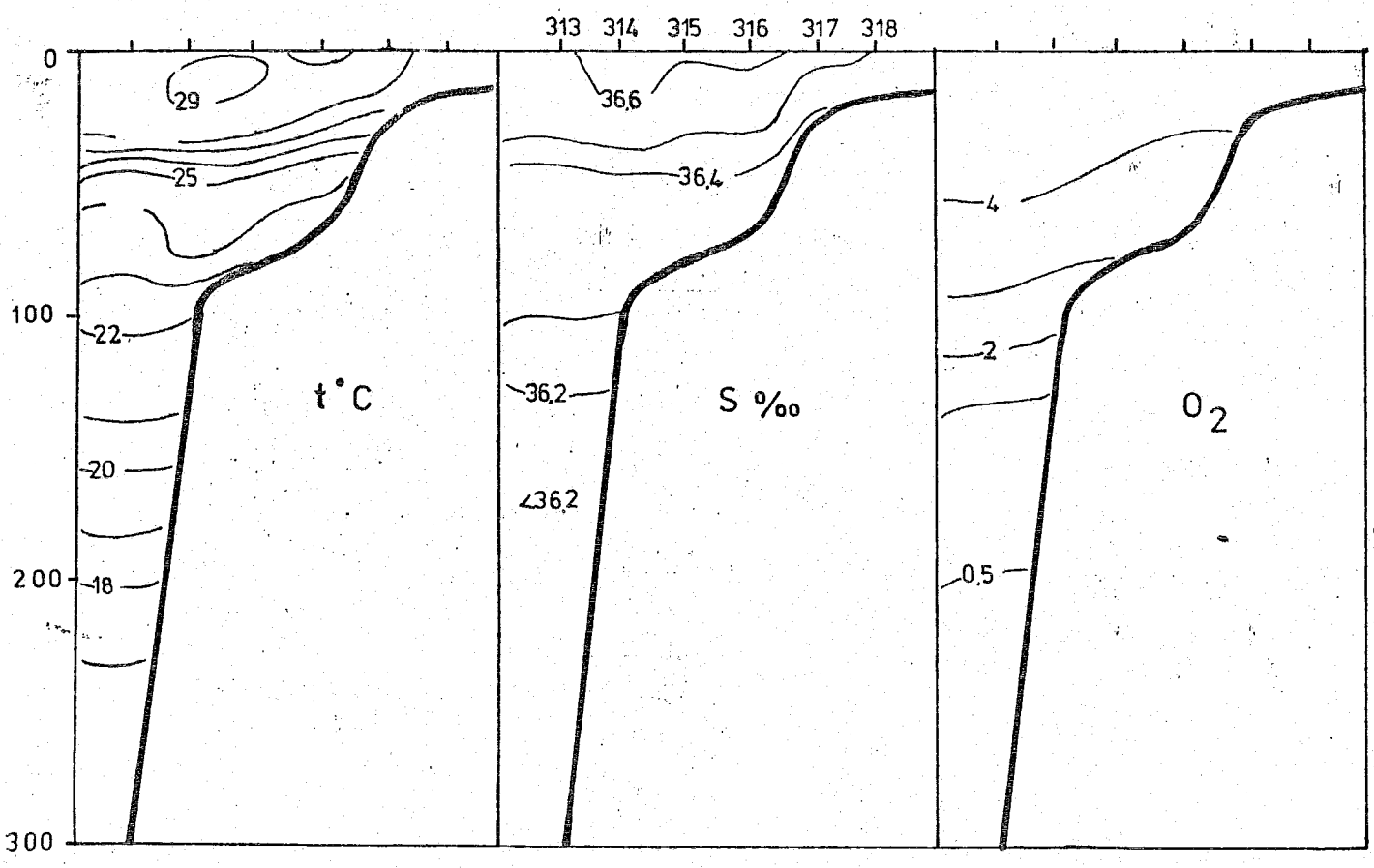

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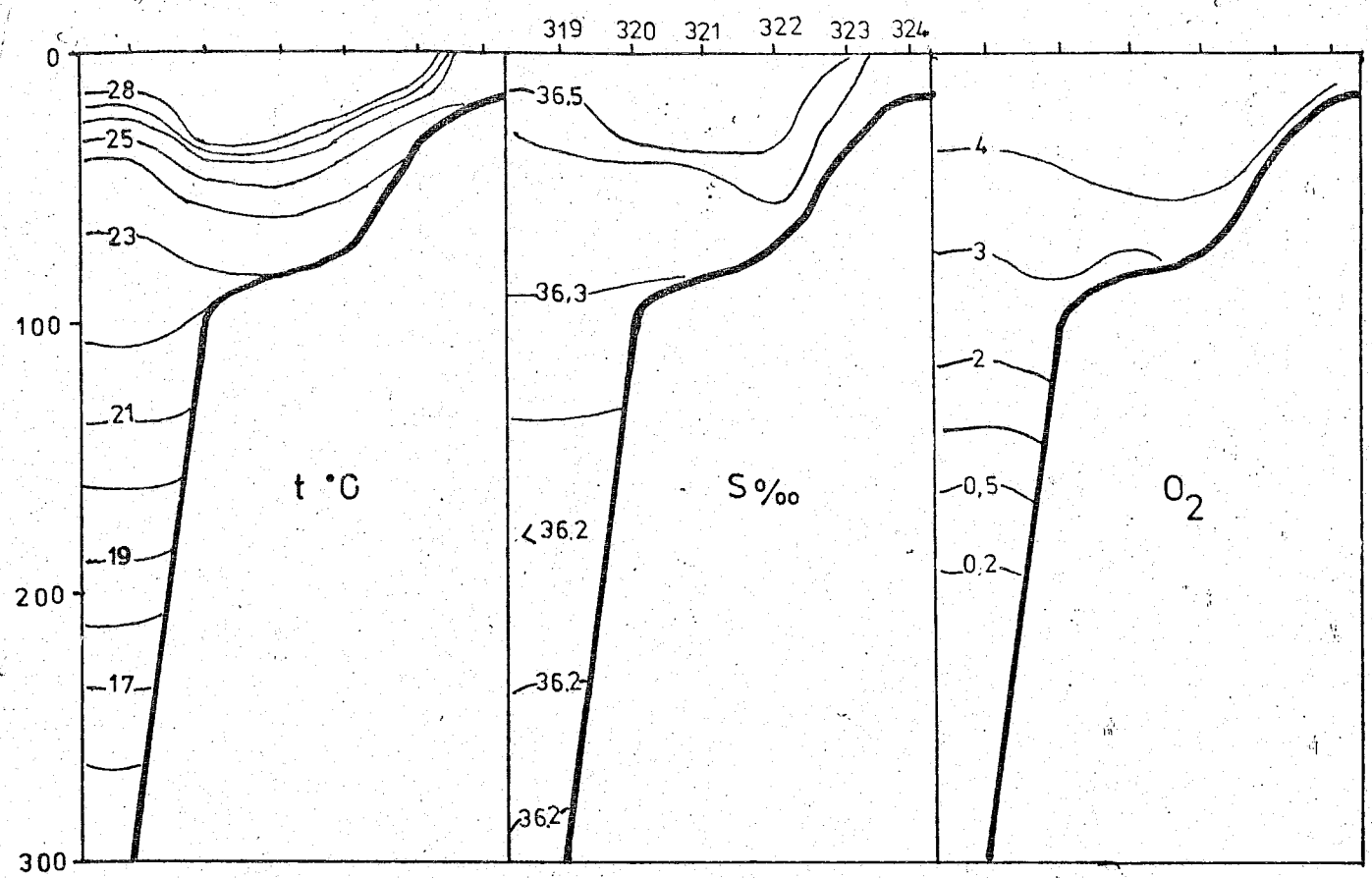

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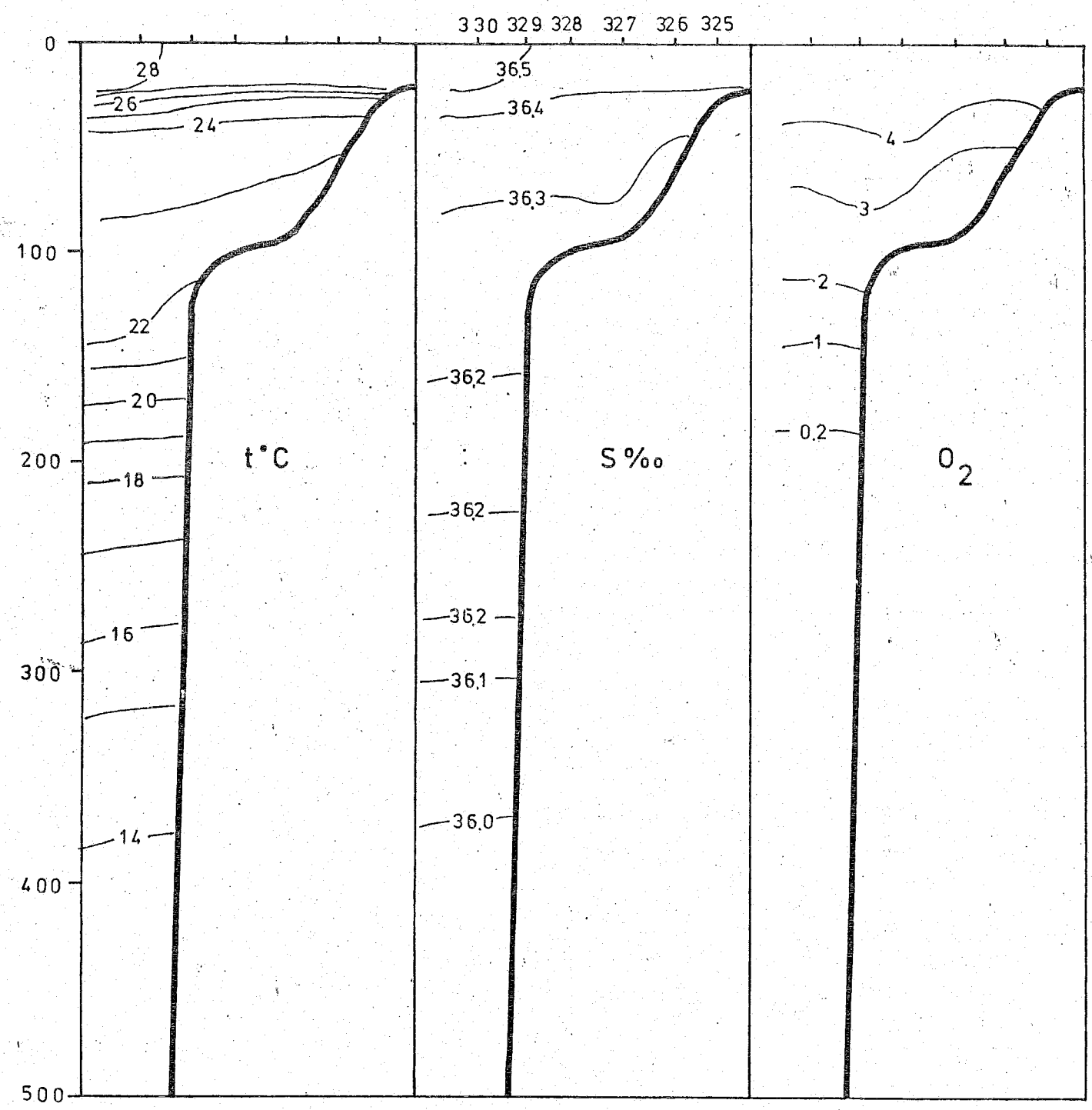

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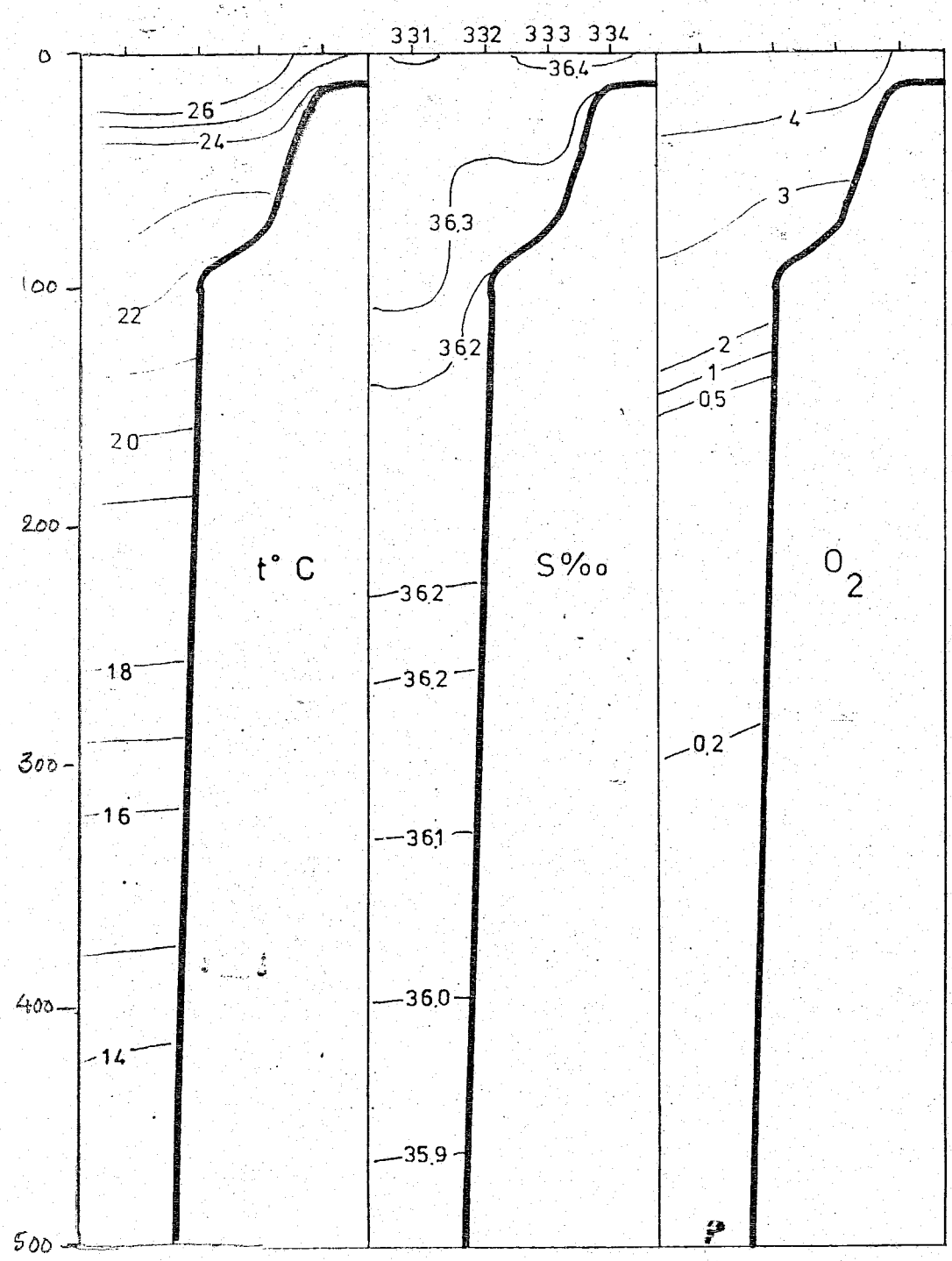

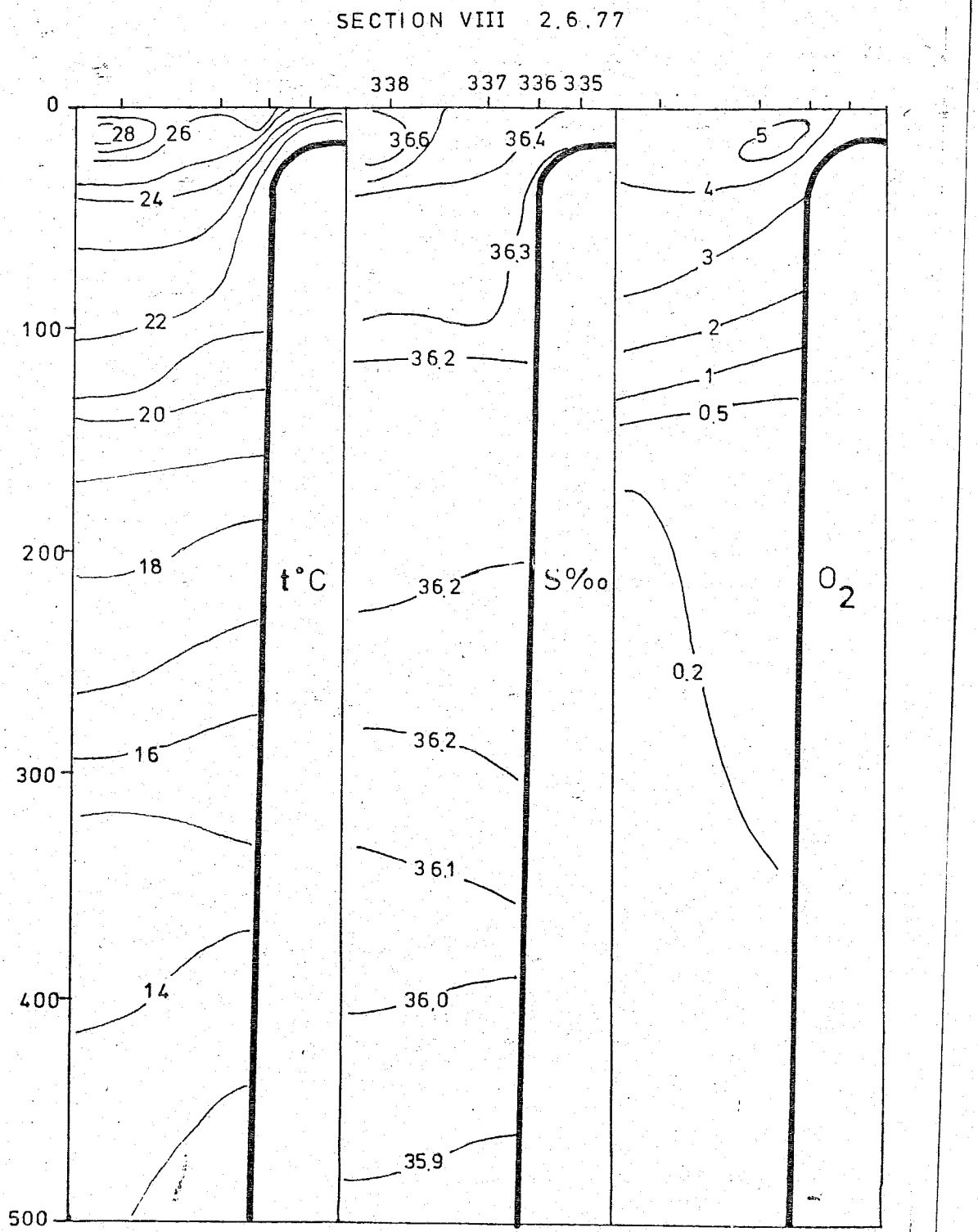
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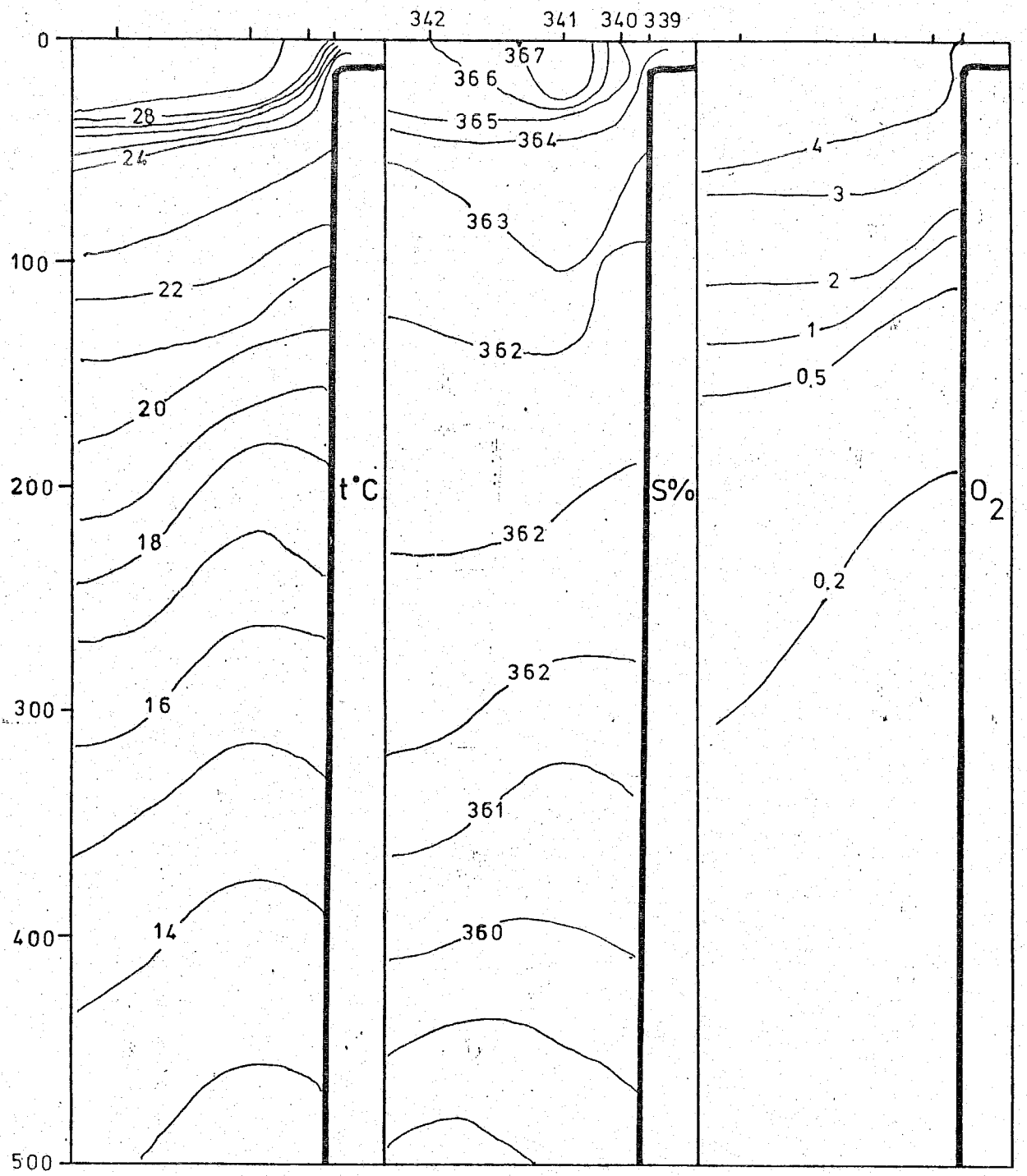

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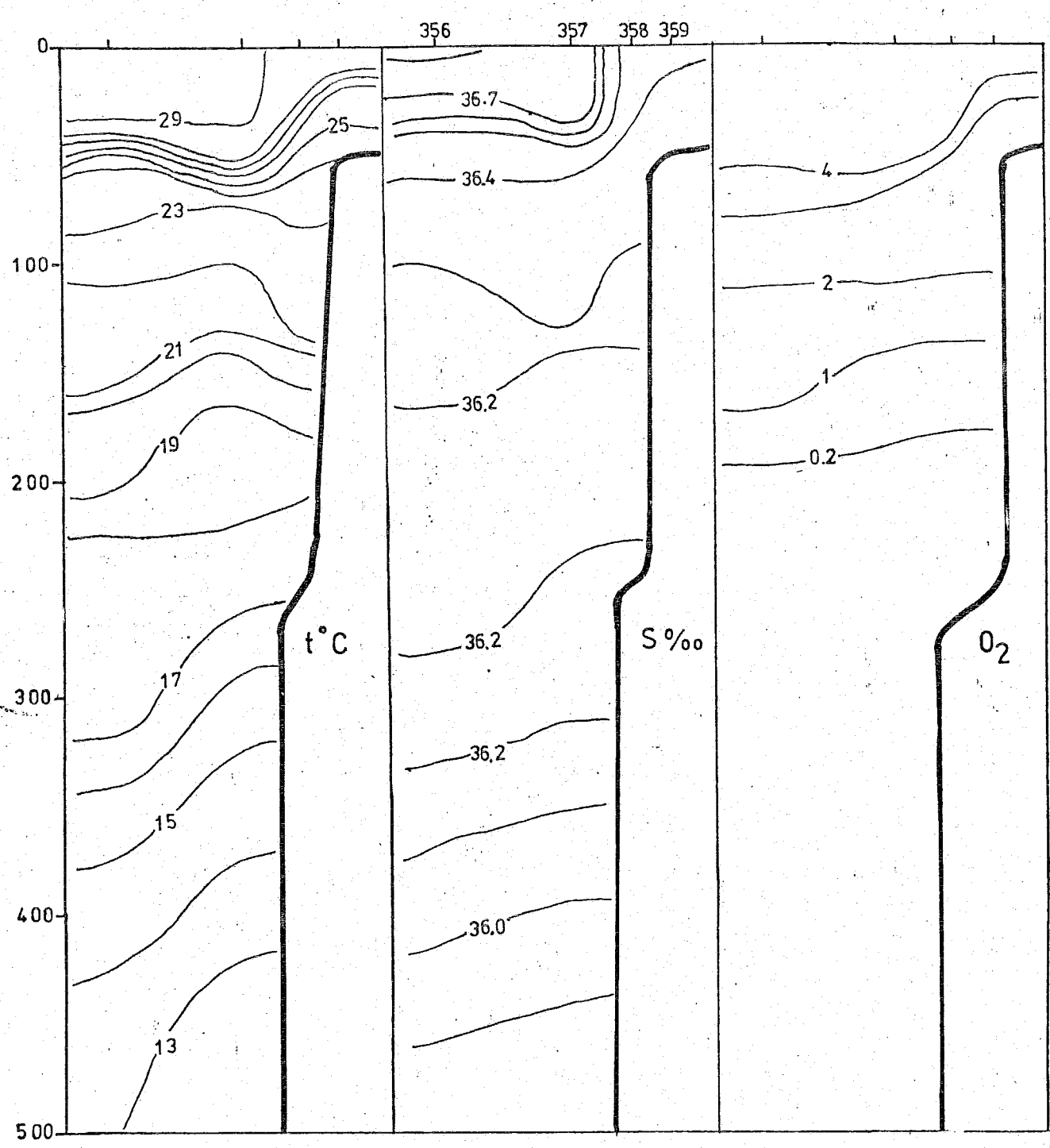

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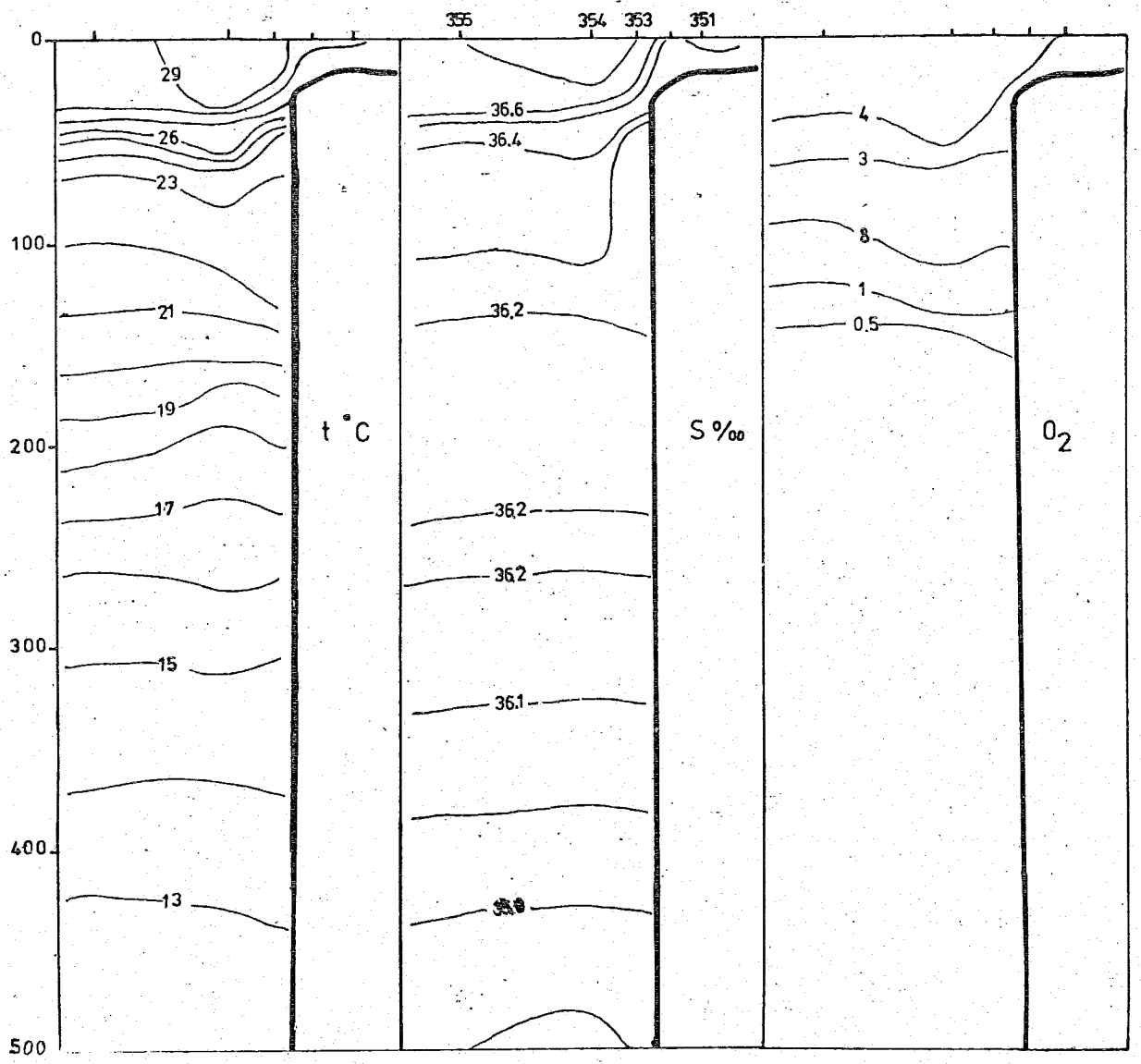

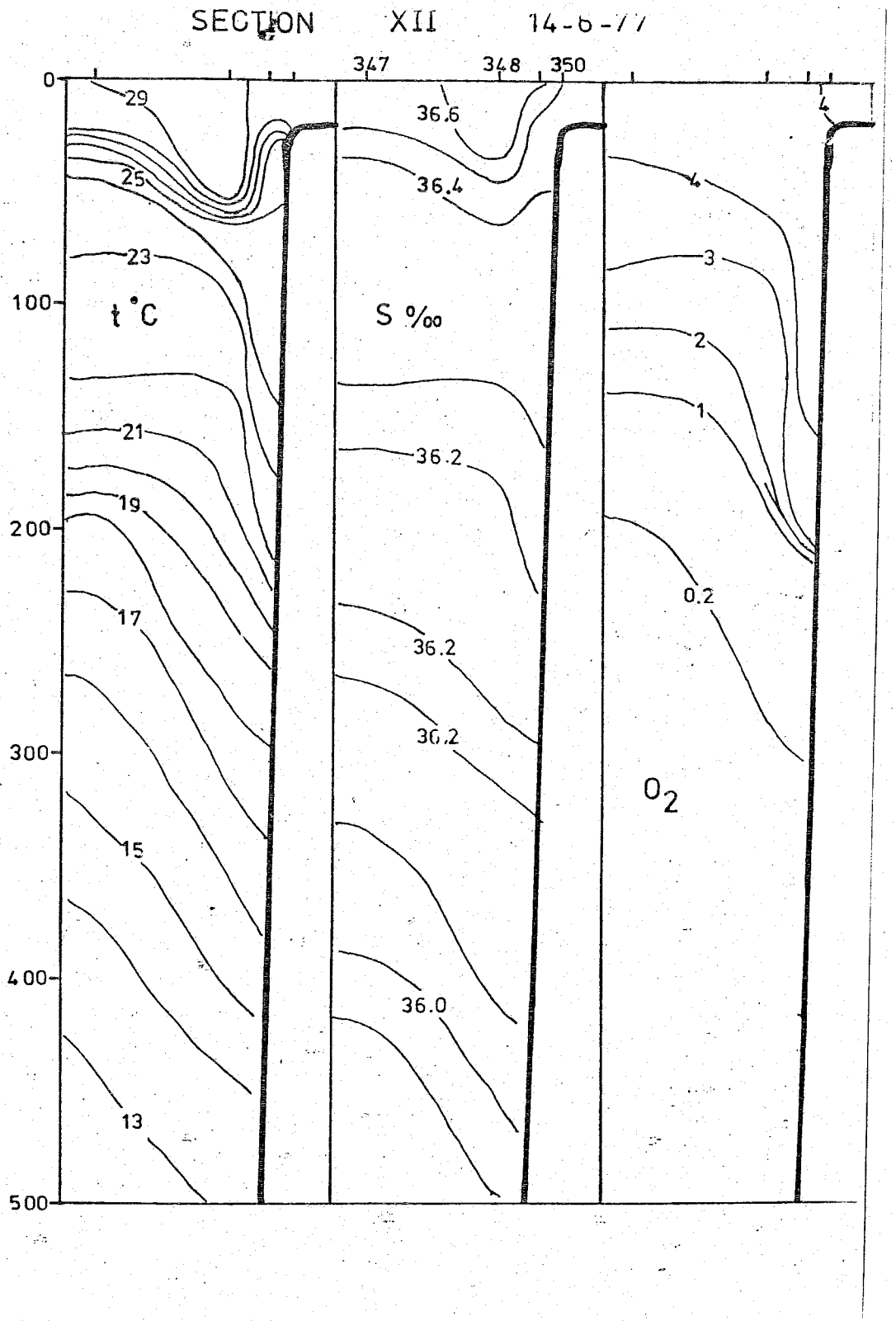
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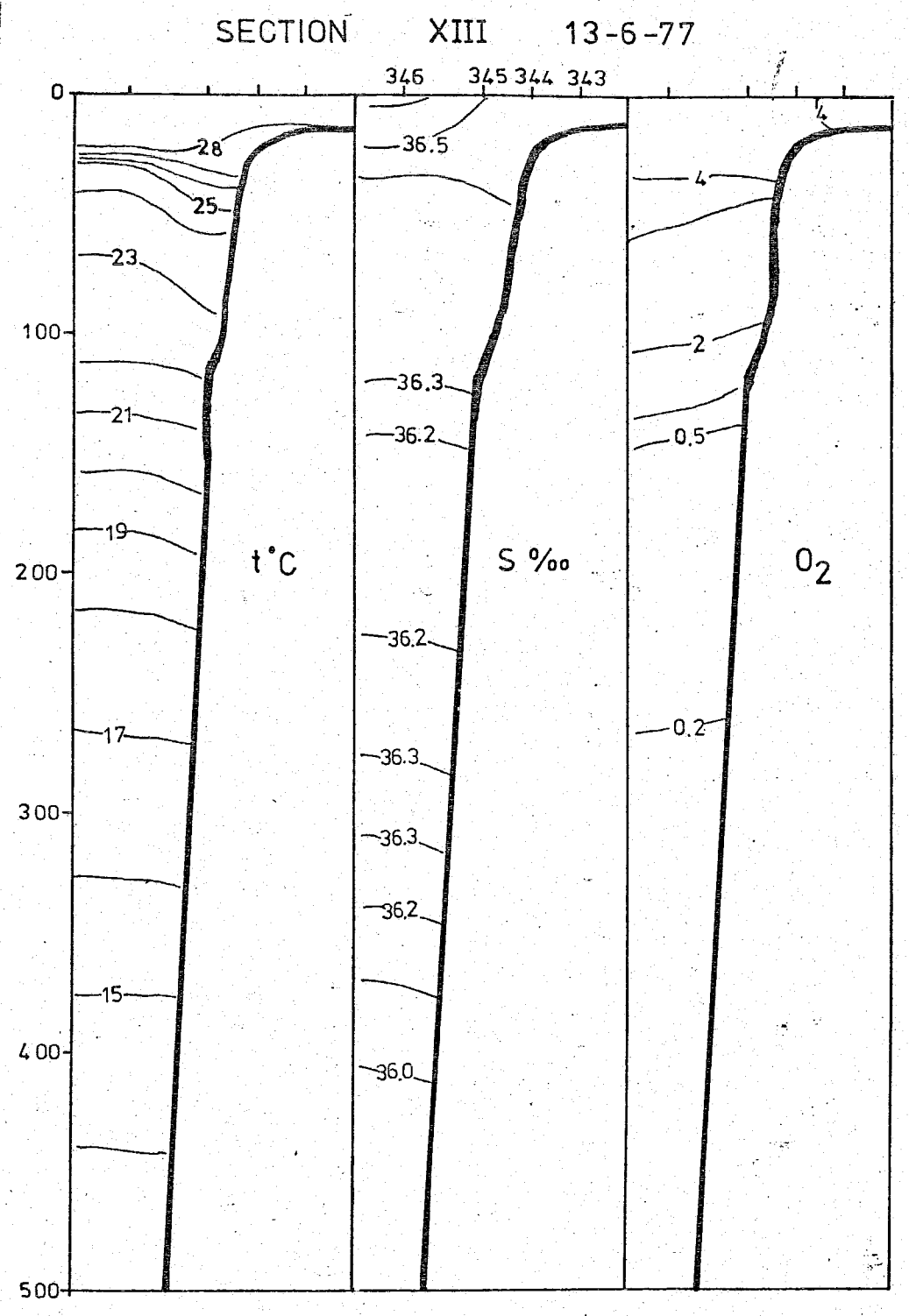
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Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D
0295	1977	518	010 22	23300	67540	20
0296	1977	519	010 06	23230	67410	20
0297	1977	519	010 09	23160	67280	30
0298	1977	522	010 19	23080	67150	75
0299	1977	522	010 21	23010	67010	150
0300	1977	523	010 00	22550	66520	500
0301	1977	523	010 04	23030	66400	500
0302	1977	523	010 09	23100	66520	125
0303	1977	523	010 13	23170	67050	100
0304	1977	523	010 18	23240	67170	500
0305	1977	523	010 22	23310	67280	20
0306	1977	524	010 01	23390	67430	20
0307	1977	524	010 13	23180	66280	250
0308	1977	524	010 16	23240	66380	125
0309	1977	524	010 19	23200	66490	75
0310	1977	524	010 20	23380	67020	50
0311	1977	524	010 22	23450	67140	20
0312	1977	525	010 01	23510	67250	10
0313	1977	525	010 13	23350	66160	250
0314	1977	525	010 18	23400	66250	75
0315	1977	525	010 20	23470	66370	75
0316	1977	525	010 23	23550	66500	50
0317	1977	526	010 01	24000	67000	20
0318	1977	526	010 02	24060	67100	10
0319	1977	530	010 13	23550	66000	250
0320	1977	530	010 17	24030	66130	75
0321	1977	530	010 19	24100	66250	75
0322	1977	530	010 23	24170	66380	50
0323	1977	531	010 01	24240	66500	30
0324	1977	531	010 03	24300	67010	10
0325	1977	531	010 07	24470	66350	20
0326	1977	531	010 09	24420	66260	50
0327	1977	531	010 12	24350	66150	75
0328	1977	531	010 16	24290	66040	100
0329	1977	531	010 17	24230	65530	125
0330	1977	531	010 20	24170	65430	400

0331	1977	601	010 00	24500	65530	500
0332	1977	601	010 03	25000	66020	75
0333	1977	601	010 08	25100	66100	50
0334	1977	601	010 12	25200	66180	10
0335	1977	602	010 14	25150	65180	10
0336	1977	602	010 15	25070	65200	30
0337	1977	602	010 17	24560	65200	500
0338	1977	602	010 21	24350	65200	500
0339	1977	604	010 03	25050	64350	10
0340	1977	604	010 04	25000	64350	500
0341	1977	604	010 09	24470	64350	500
0342	1977	604	010 17	24170	64350	500
0343	1977	613	010 17	25040	61350	8
0344	1977	613	010 19	24540	61350	10
0345	1977	613	010 20	24450	61350	100
0346	1977	613	010 23	24300	61350	500
0347	1977	614	010 09	24200	62200	500
0348	1977	614	010 14	24500	62200	500
0349	1977	614	010 04	24580	62200	250
0350	1977	614	010 18	25000	62200	20
0351	1977	616	010 06	25080	63060	10
0352	1977	616	010 07	25020	63050	18
0353	1977	616	010 10	24540	63050	500
0354	1977	616	010 13	24410	63050	500
0355	1977	616	010 18	24090	63060	500
0356	1977	616	010 23	24060	63500	500
0357	1977	617	010 04	24380	63500	500
0358	1977	617	010 06	24510	63500	200
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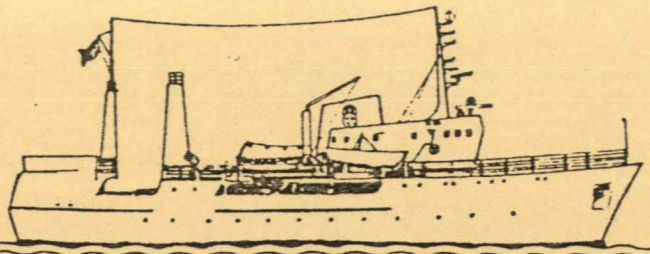


Reports on Surveys with the
R/V Dr Fridtjof Nansen

PRELIMINARY CRUISE REPORT ON CRUISE NOS 9 AND 10 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

18 May - 20 June 1977

Roald Sætre

Bergen, June 1977

Institute of Marine Research, Bergen

PRELIMINARY REPORT ON CRUISE NOS 9 AND 10 OF "DR. FRIDTJOF NANSEN" UNDER THE JOINT PAK/NOR/FAO FISHERIES RESEARCH PROJECT

Introduction	This report covers the fifth complete coverage of the Pakistani waters during the project.
Departure	Karachi, 18. May 1977.
Arrival	Karachi, 27. May 1977.
Scientific staff	Marine Fisheries Department: M. Arshad, M. Hussain, J. Bashir IMB - University of Karachi: S. Hoda, S.A. Siddiqui (to 20 May) M.M. Kahn (to 20 May), A. Kazmi (From 22 May), S.H. Kahn (From 22 May). Institute of Marine Research: R. Sætre, E. Olsen, S. Brattås.
Departure	Karachi, 29 May 1977.
Arrival	Karachi, 20 June 1977.
Ports of call	Dubai, 9 - 11 June 1977.
Scientific staff	Marine Fisheries Department: S. Qureshi, M. Khaliluddin, Irshad Begum Farkhundi Jabeen. IMB - University of Karachi: S.A. Siddiqui, S. Barkati, S.H. Niaz Rizvi. Institute of Marine Research: R. Sætre, E. Olsen, S. Brattås.

Survey grid and stations are shown in Fig. 1. The standard hydrographic/plankton stations were worked out as described in detail in report No. 1 with modification in cruise report No. 2. During most of the cruise the wind was south-west 5 - 6 Beaufort with heavy swell resulting in delaying the schedule. For this reason some of the standard hydrographic/plankton sections had to be shortened. During the first part of this coverage the last phytoplankton net aboard was destroyed. Therefore no samples of this kind

were obtained off the Karachi and the Makran coast. Due to a failure of the filtration instrument no chlorophyll samples were taken at section Nos X to XIII.

RESULTS

Table 1 shows the particulars of the fishing stations and Table 2 and 3 shows the length and maturity distribution of the dominant species.

Distribution and abundance of pelagic fish (Fig. 2).

The contribution to the total echo abundance from pelagic fish was small and approximately of the same size as on coverage No. 4. The Sonmiani Bay area and the southernmost Sind coast contributed the highest values. All pelagic fish were caught in small number by bottom trawl mainly no schools of pelagic fish were observed. The dominant pelagic species were the anchovies (Thryssa spp.). Other pelagic fish occasionally caught were sardine (Sardinella spp.), streaked spanish mackerel (Scomberomorus lineolatum) hard tail scad (Megalaspis cordyla), talang queen fish (Scombroidaes commersonianus) and Russel's scad (Decapterus russelli).

Distribution and abundance of demersal fish (Fig. 3).

Compared with coverage No. 4 there was a decrease in echo abundance attributed to demersal fish. This reduction was most pronounced at Great Kori Bank. The highest values were observed in the Sonmiani Bay area where also the largest catch, 10 tons/trawl hour, was obtained. This catch consisted mainly of catfish (Aries sp.) and lined silver grunt (Pomadasys hasta).

Distribution and abundance of mesopelagic fish (Fig. 4).

There seem to be a reduction in echo abundance of mesopelagic fish on this coverage compared to the previous one. The dominant specie in this layer was lantern fish (Benthosema pterotum).

Plankton (Fig. 5).

The echo abundance attributed to plankton during this coverage is on average slightly less than on the previous one. The highest values were observed along the continental edge. Along the whole Makran coast large patches of brownish-red phytoplankton were observed in the surface.

Hydrography (Fig. 6 - 22).

During this coverage an upwelling was observed along the Makran coast. This upwelling was most pronounced in the Sonmiani Bay area.

Bergen, June 1977

Roald Sætre

Roald Sætre

Table 1. Record of fishing operations. "Dr. Fridtjof Nansen" PAK/NOR/FAO Cruise Nos. 9 and 10, 18.5 - 20.6.1977.

Date	Time	Stn No.	Gear	Depth in m		Position		Total catch kg	Catch per hour kg	Dominant species
				Bot-tom	Gear	North	East			
19.5	1155	168	BT	100	100	23°10'	67°17'	120	144	Threadfin bream (Nemipterus japonicus) Russel's scad (Decapterus russelli) Malabar trevally (Carangoides malabaricus)
23.5	1120	169	BT	120	120	23°14'	67°01'	4.5	9	Smallhead hairtail (Lepturacanthus savala)
23.5	2335	170	BT	26	26	23°34'	67°34'	400	800	Moustached thryssa (Thryssa mystax) False trevally (Caranx sp.) Lined silver grunt (Pomadasys hasta)
25.5	2355	171	BT	25	25	23°47'	67°19'	240	480	Smallhead hairtail (Lepturacanthus savala) Catfish (Arius sp.) Rays
25.5	0630	172	BT	81	81	23°44'	66°57'	87	174	Smallhead hairtail (Lepturacanthus savala) Japanese threadfin bream (Nemipterus japonicus)
26.5	0355	173	BT	22	22	24°20'	67°02'	363	706	Beard croaker (Pseudosciaena sp.) Smallhead hairtail (Lepturacanthus savala) Rays
1.6	0455	174	SPT	105	80	25°00'	66°03'	20	20	Jellyfishes
1.6	0920	175	BT	75	75	25°13'	66°12'	2500	2700	Smallhead hairtail (Lepturacanthus savala) Skates Beard croaker (Johnius diacanthus)
1.6	1340	176	BT	30	30	25°16'	66°12'	5000	10000	Lined silver grunt (Pomadasys hasta) Talang queenfish (Scomberoides commersonianus) Catfish (Arius sp.)

Table 1 (continued).

Date	Time	Stn No.	Gear	Depth in m Bot-tom	Gear	Position North	East	Total catch kg	Catch/ hour kg	Dominant species
2.6	0615	177	BT	18	18	25°15'	65°42'	320	960	Catfish (Arius sp.) Smallhead hairtail (Lepturacanthus savala) Lined silver grunt (Pomadasys hasta)
2.6	1110	178	BT	17	17	25°15'	65°30'	182	364	Two-spined jewfish (Johnius diacanthus) Lined silver grunt (Pomadasys hasta)
3.6	0425	179	SPT	>500	120	25°08'	65°08'	5	10	Jellyfish
4.6	1212	180	SPT	>500	210	24°30'	64°37'	250	500	Myctophidae (Benthosema sp.)
5.6	0750	181	SPT	>500	210	24°44'	62°26'	25	50	Myctophidae (Benthosema sp.)
6.6	0919	182	SPT	1100	350	25°05'	58°12'	8	16	Myctophidae / Squids / Deep sea sharks
14.6	0430	183	SPT	1700	200	24°26'	61°51'	30	45	Myctophidae
15.6	0450	184	SPT	650	160	24°50'	62°03'	5	10	Myctophidae / Jellyfish
15.6	0730	185	BT	25	25	25°01'	62°20'	540	1080	Lined silver grunt (Pomadasys hasta) Catfishes (Arius sp.) Spotted sickle fish (Drepane punctata)
16.6	0807	186	BT	21	21	25°02'	63°05'	246	492	Smallhead hairtail (Lepturacanthus savala) Catfish (Arius sp.) Lined silver grunt (Pomadasys hasta)

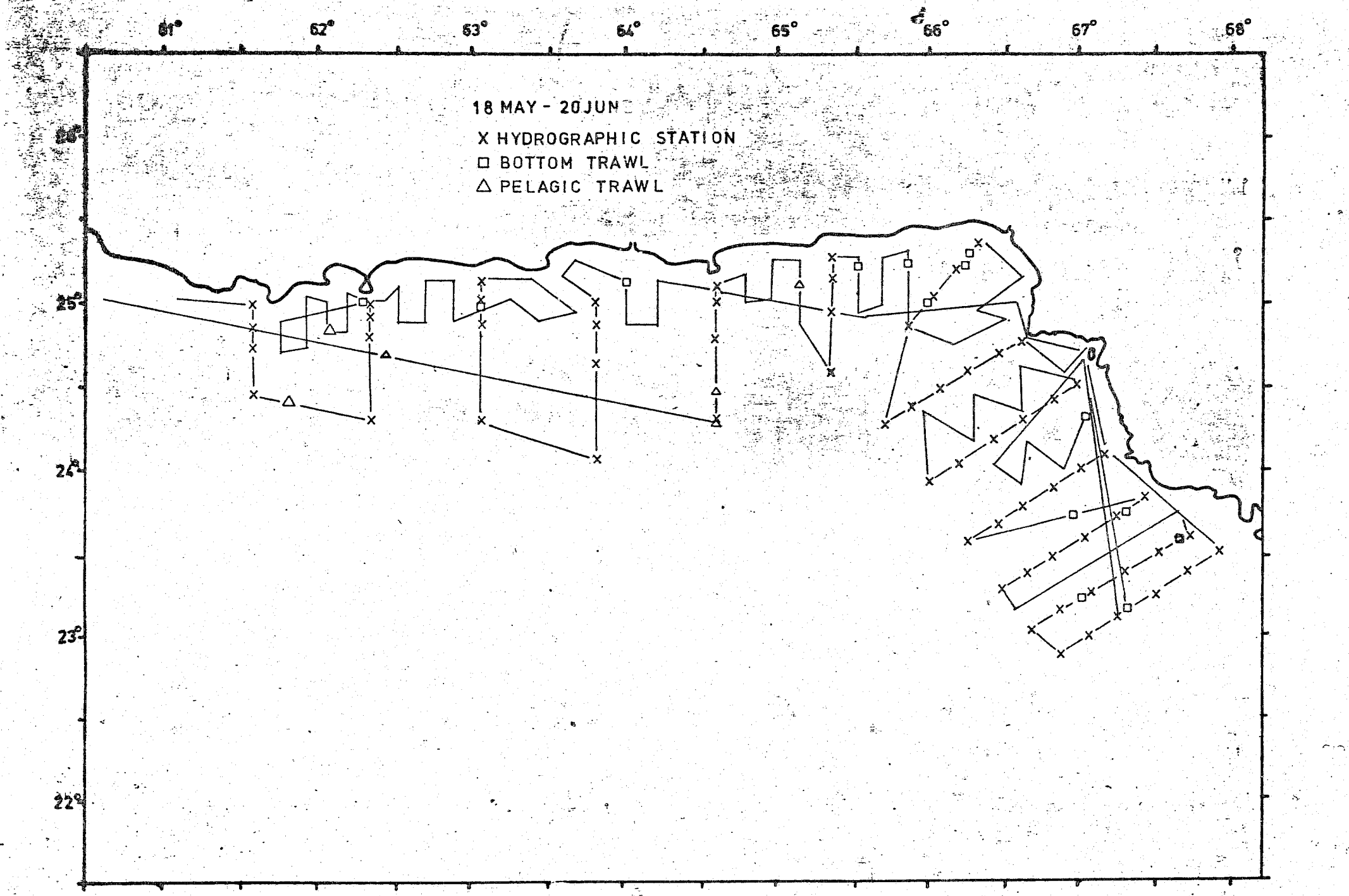
Table 2. Length frequency distribution of some species. Length in cm.

Species	N	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Thryssa mystax	25	2	13	7	3																	
Orthoterus tardorii	26		1	6	6	7	5	1														
Pampus argenteus	45									3	3	3	9	1	2	3	2	2	9	3		5

Species	N	25-29	20-34	35-39	40-44	45-49	50-54
Pomadasys hasta	79	3	4	12	24	20	16
Scomberomorus lineolatus	6				2	2	2
Mylio berda	15	1	10	4			

Table 3. Maturity distribution.

Species	0	1	2	3	4	5	6	7	8
Thryssa mystax				4	18	1	1	1	
Pampus argenteus	1	12	15	5	9	2	2		
Pomadasys hasta		1	2	1	7	8	11	14	39
Mylio berda		9	5						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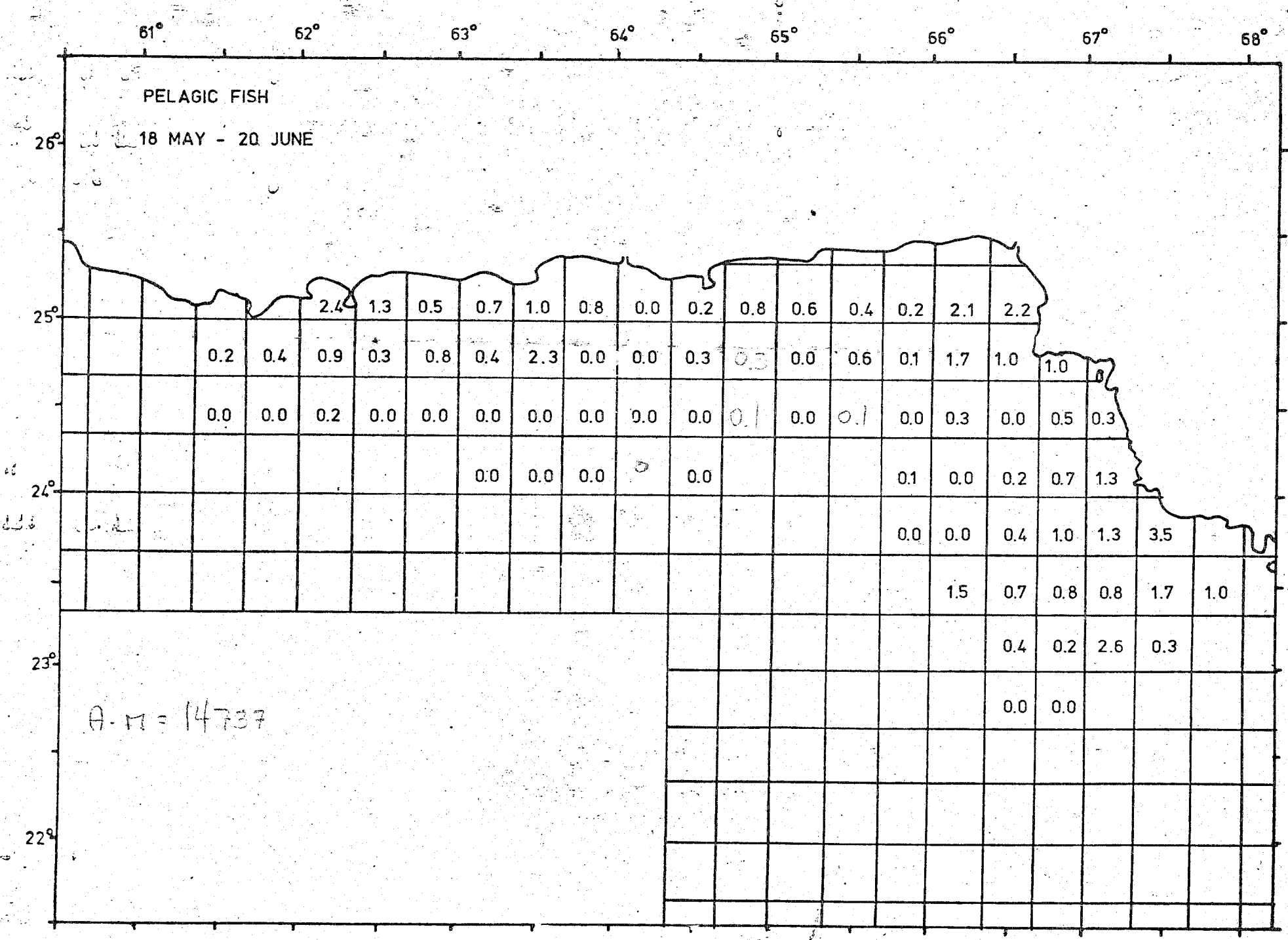
X HYDROGRAPHIC STATION
□ BOTTOM TRAWL
△ PELAGIC TRAWL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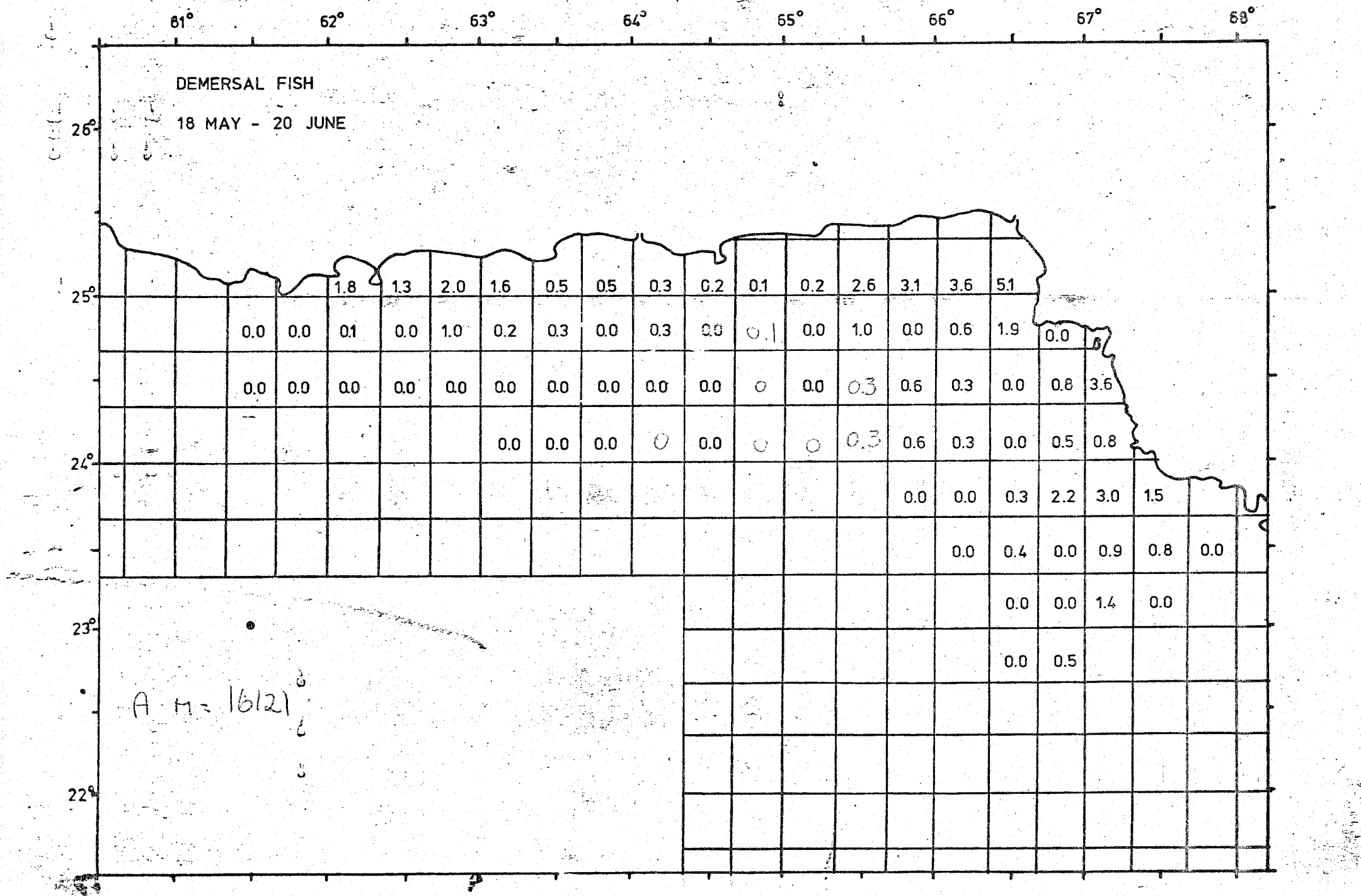
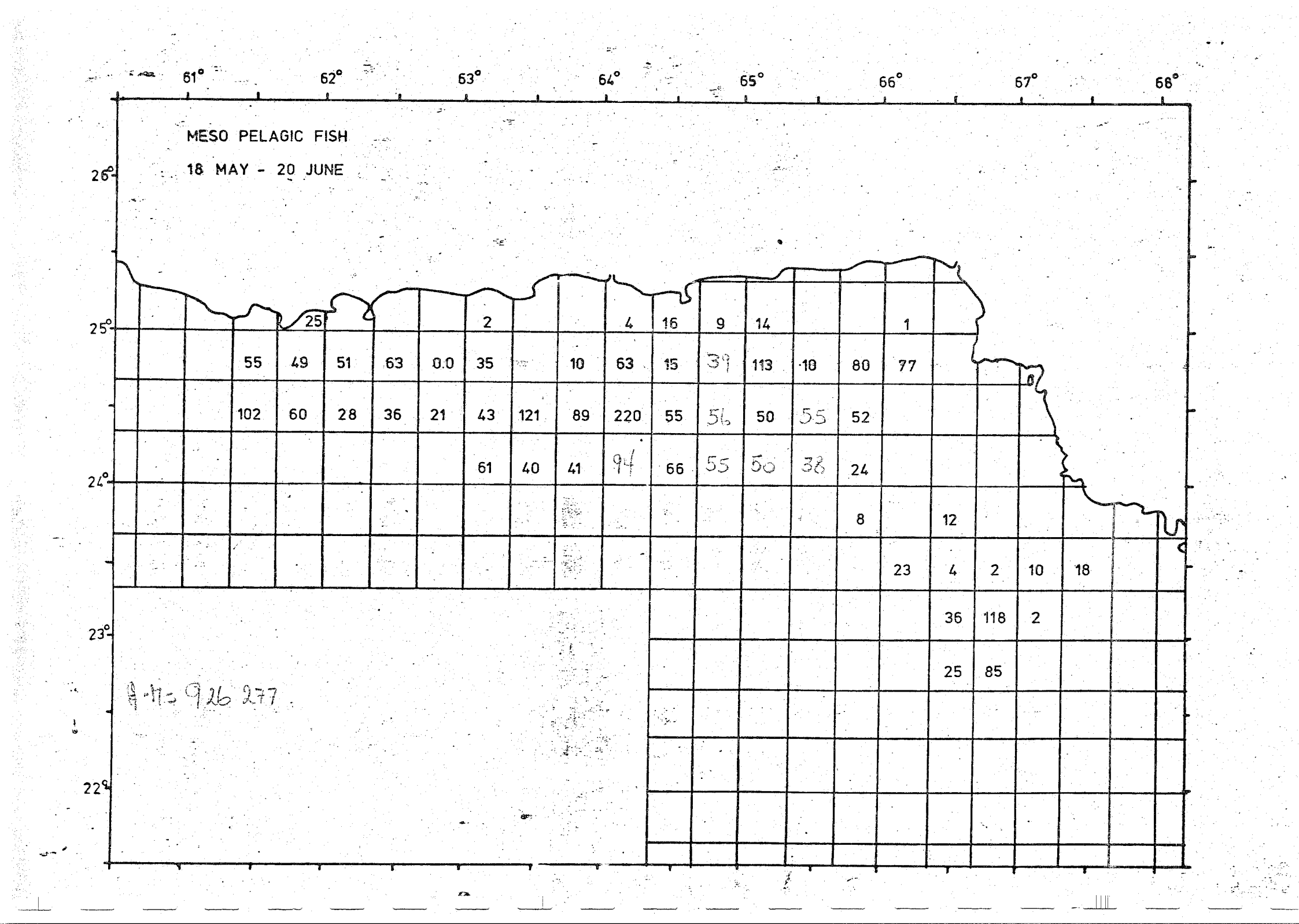
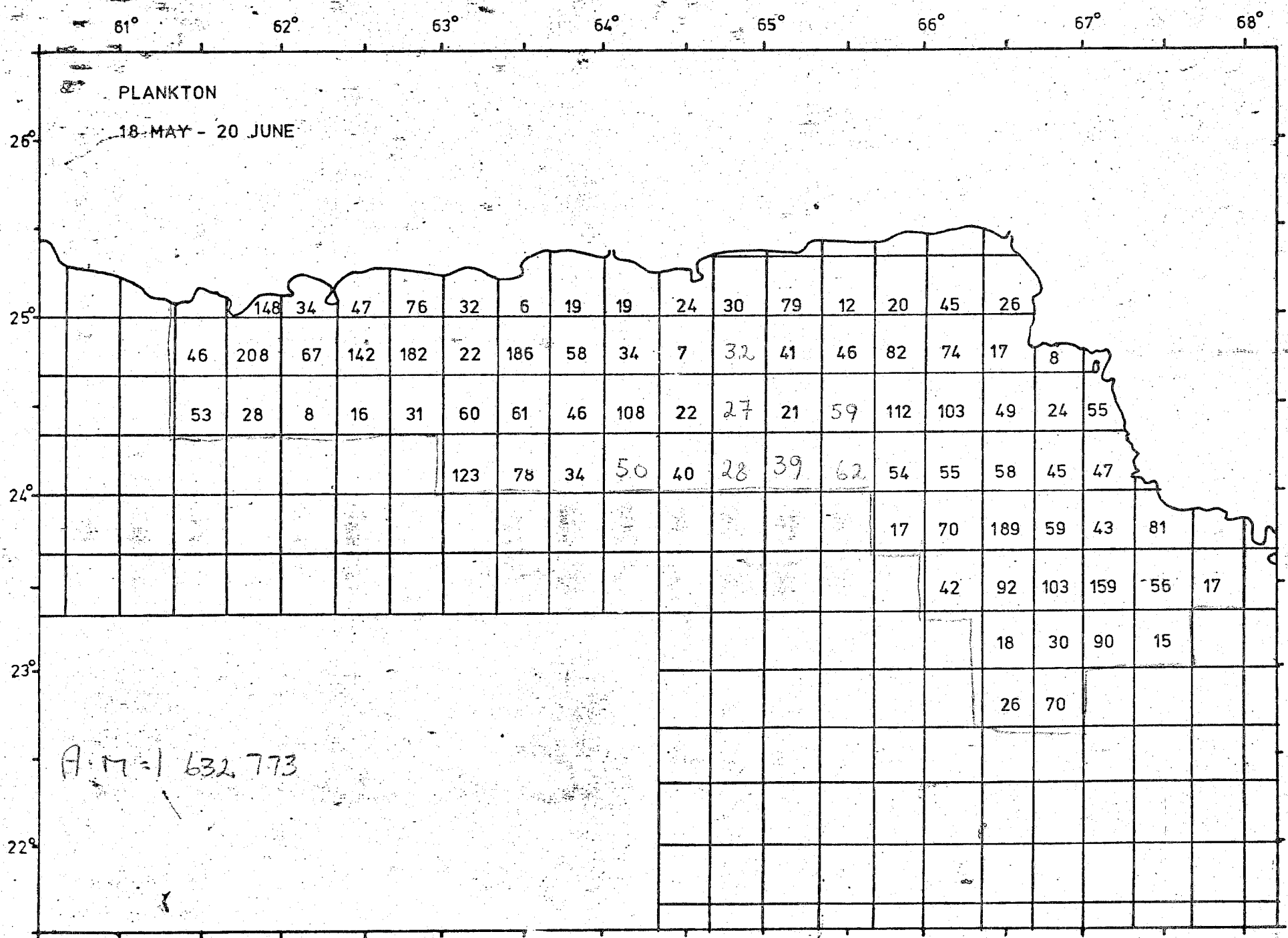
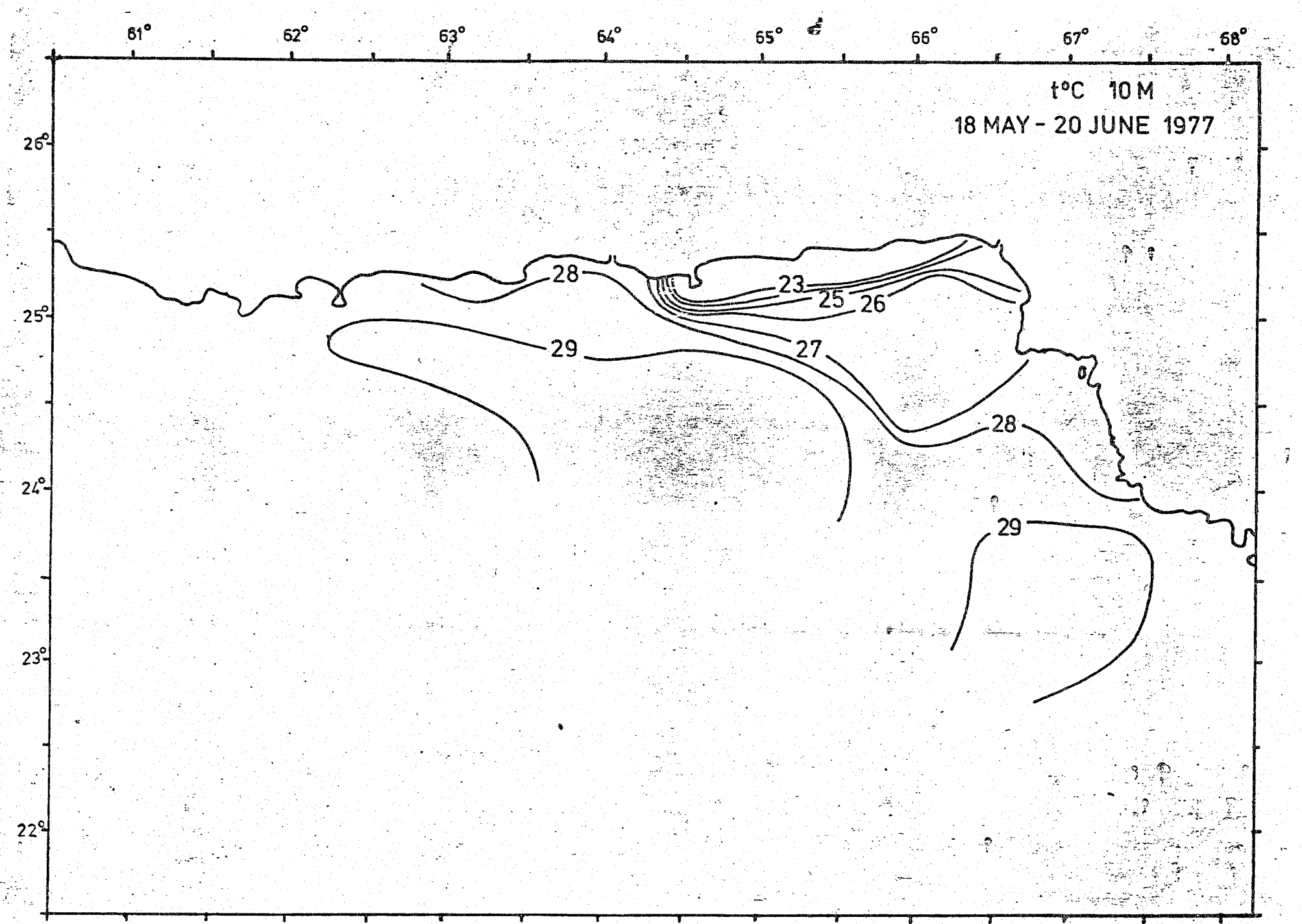
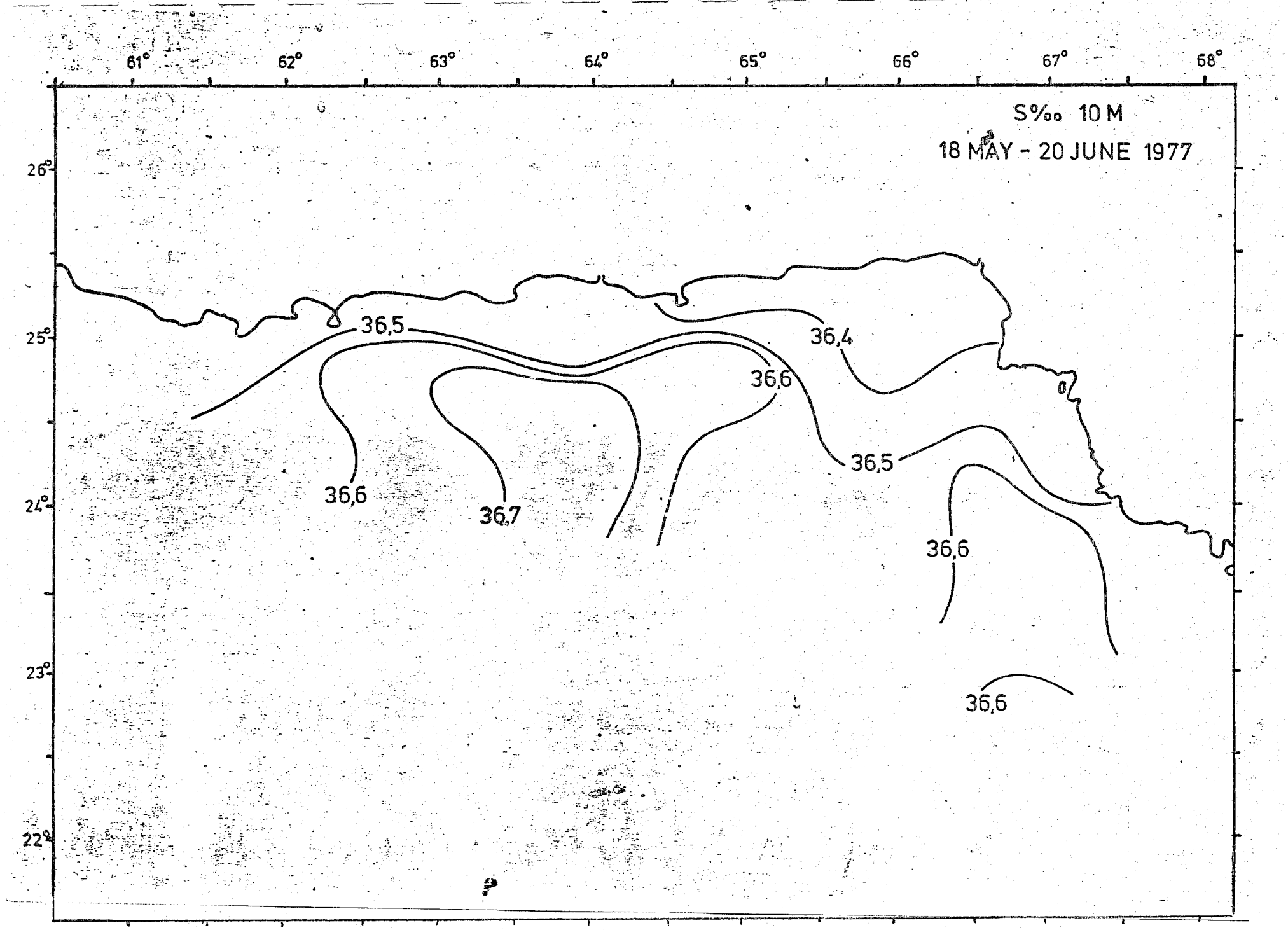
2.4 1.3 0.5 0.7 1.0 0.8 0.0 0.2 0.8 0.6 0.4 0.2 2.1 2.2
0.2 0.4 0.9 0.3 0.8 0.4 2.3 0.0 0.0 0.3 0.3 0.0 0.6 0.1 1.7 1.0 1.0
0.0 0.0 0.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.1 0.0 0.1 0.0 0.3 0.0 0.5 0.3
0.0 0.0 0.0 0.0 0.0 0.1 0.0 0.2 0.7 1.3
0.0 0.0 0.4 1.0 1.3 3.5
1.5 0.7 0.8 0.8 1.7 1.0
0.4 0.2 2.6 0.3
0.0 0.0
A-M = 14737

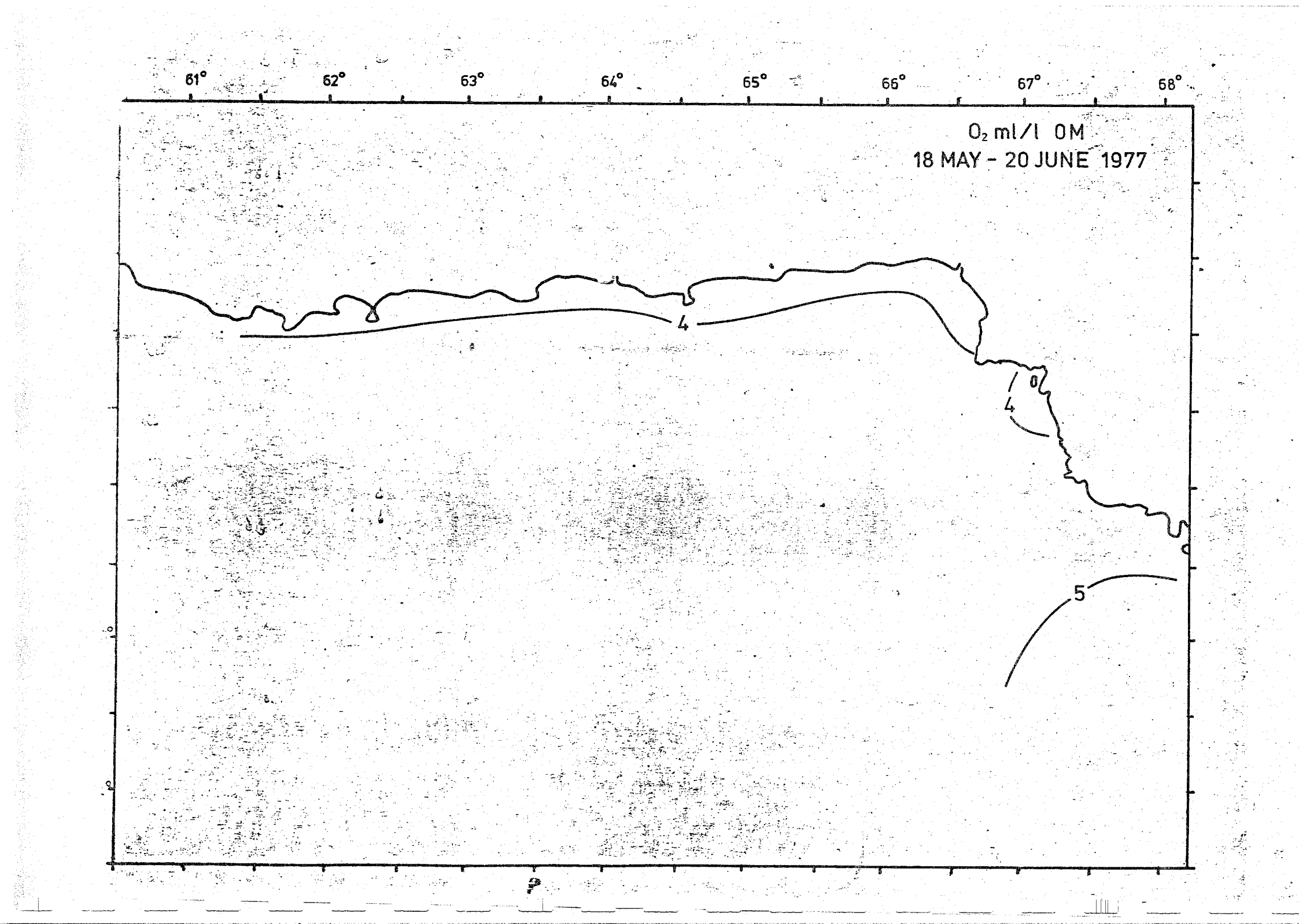

61°
62°
63°
64°
65°
66°
67°
68°
DEMERSAL FISH
18 MAY - 20 JUNE
26°
25°
24°
23°
22°
1.8 1.3 2.0 1.6 0.5 0.5 0.3 0.2 0.1 0.2 2.6 3.1 3.6 5.1
0.0 0.0 0.1 0.0 1.0 0.2 0.3 0.0 0.3 0.0 0.1 0.0 1.0 0.0 0.6 1.9 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0.0 0.3 0.6 0.3 0.0 0.8 3.6
0.0 0.0 0.0 0 0.0 0 0 0.3 0.6 0.3 0.0 0.5 0.8
0.0 0.0 0.3 2.2 3.0 1.5
0.0 0.4 0.0 0.9 0.8 0.0
0.0 0.0 1.4 0.0
0.0 0.5
A M = 16121

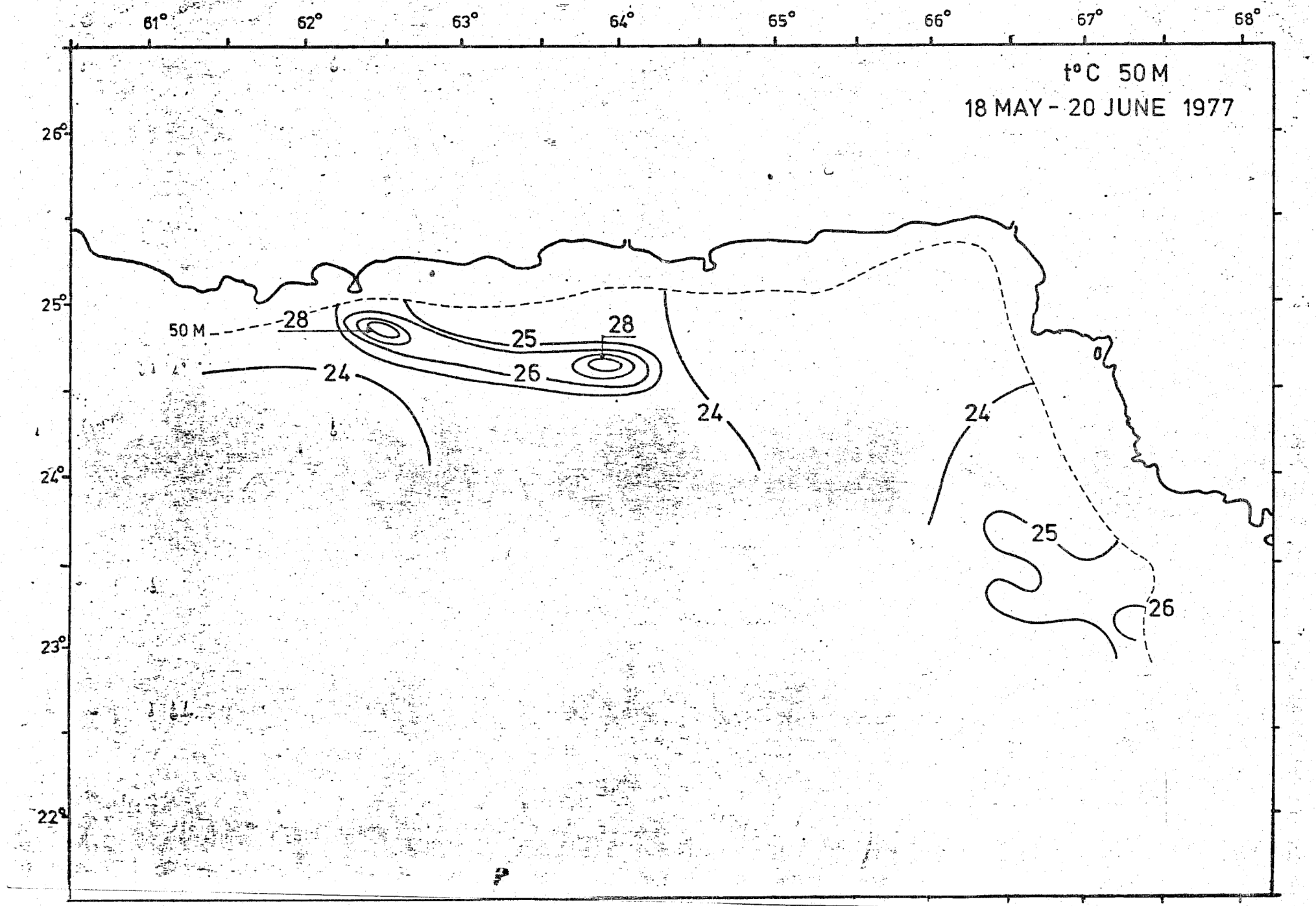

MESO PELAGIC FISH
18 MAY - 20 JUNE
61°
62°
63°
64°
65°
66°
67°
68°
26°
25°
24°
23°
22°
25
2
4
16
9
14
1
55
49
51
63
0.0
35
10
63
15
39
113
18
80
77
102
60
28
36
21
43
121
89
220
55
56
50
55
52
61
40
41
94
66
55
50
38
24
8
12
23
4
2
10
18
36
118
2
25
85
A-11= 926 277

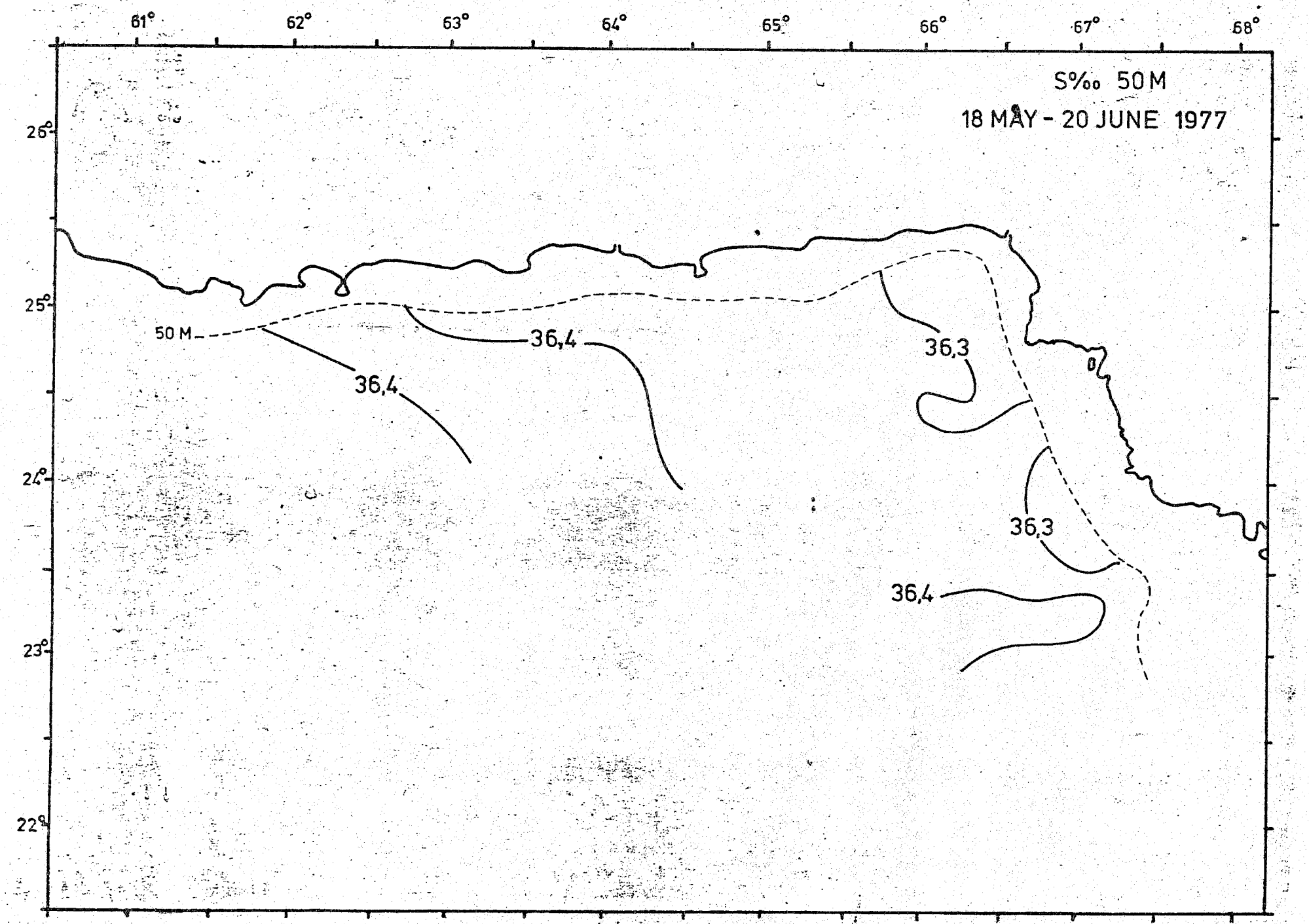

61°
62°
63°
64°
65°
66°
67°
68°
PLANKTON
18 MAY - 20 JUNE
26°
25°
24°
23°
22°
148 34 47 76 32 6 19 19 24 30 79 12 20 45 26
46 208 67 142 182 22 186 58 34 7 32 41 46 82 74 17 8
53 28 8 16 31 60 61 46 108 22 27 21 59 112 103 49 24 55
123 78 34 50 40 28 39 62 54 55 58 45 47
17 70 189 59 43 81
42 92 103 159 56 17
18 30 90 15
26 70
A·M=1 632 773

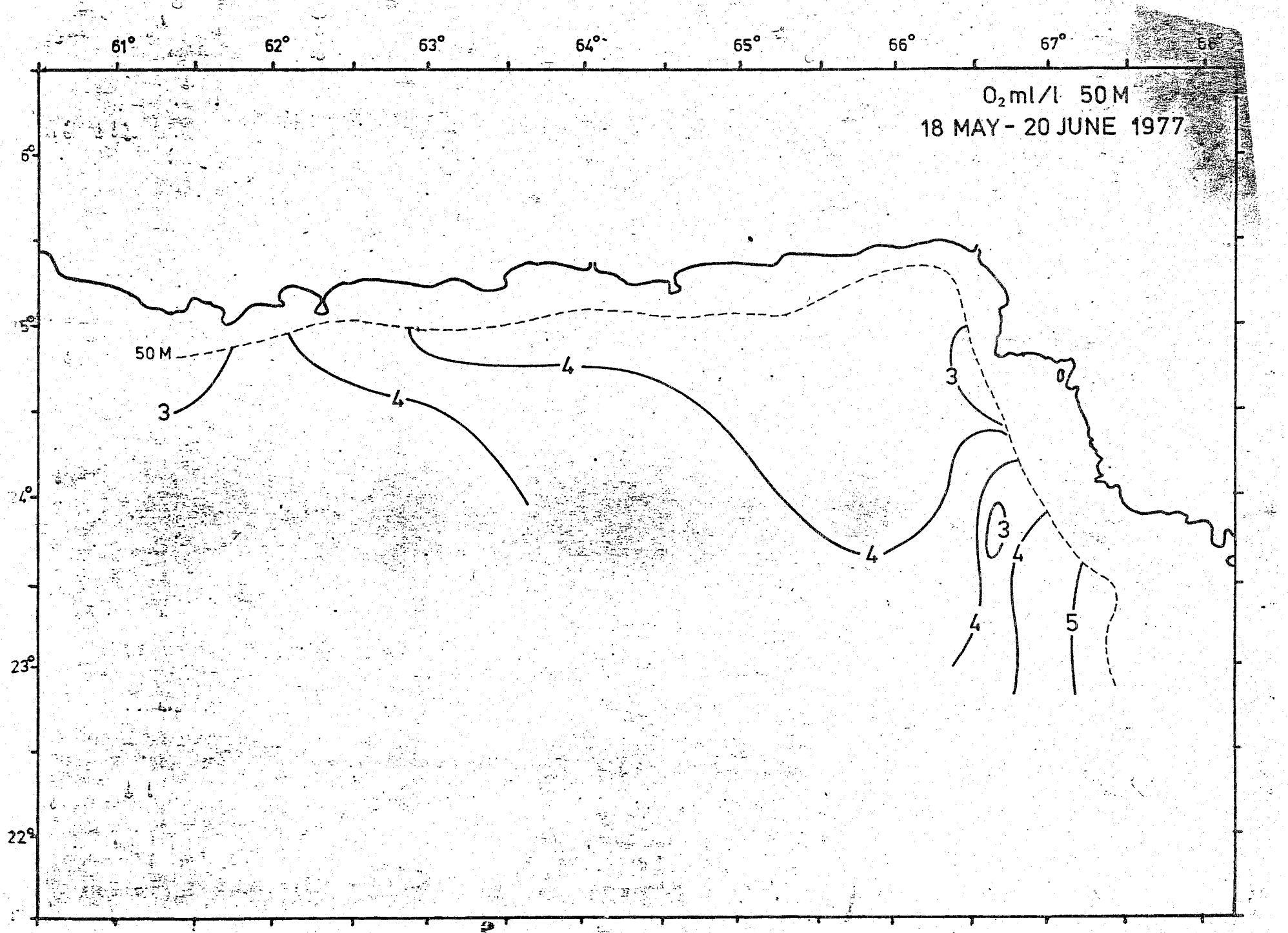

61°
62°
63°
64°
65°
66°
67°
68°
26°
25°
24°
23°
22°
t°C 10 M
18 MAY - 20 JUNE 1977
28
23
25
26
29
27
28
29

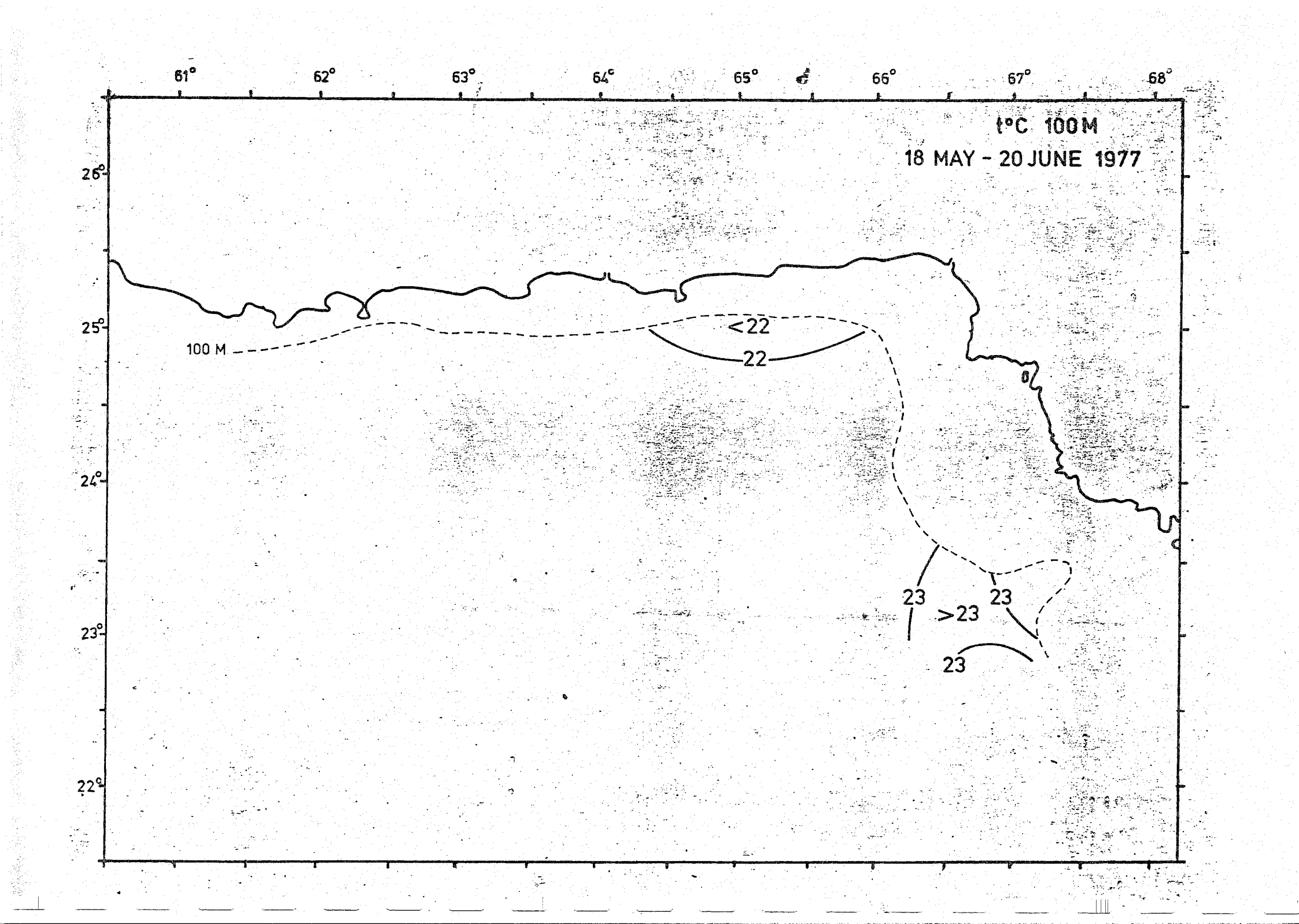

61°
62°
63°
64°
65°
66°
67°
68°
26°
25°
24°
23°
22°
S‰ 10 M
18 MAY - 20 JUNE 1977
36,5
36,4
36,6
36,5
36,6
36,7
36,6
36,6

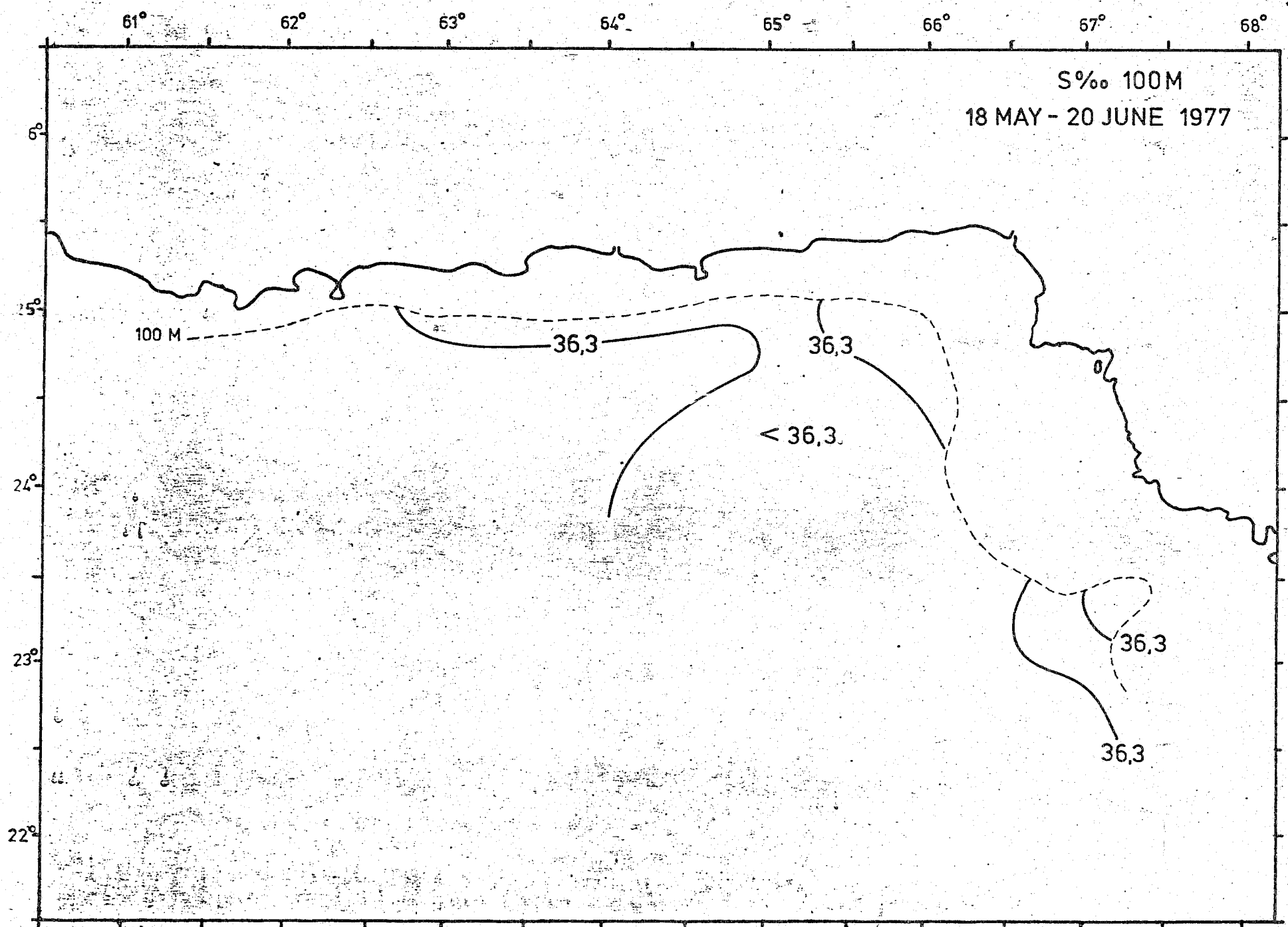

61°
62°
63°
64°
65°
66°
67°
68°
O2 ml/l OM
18 MAY - 20 JUNE 1977
4
4
5

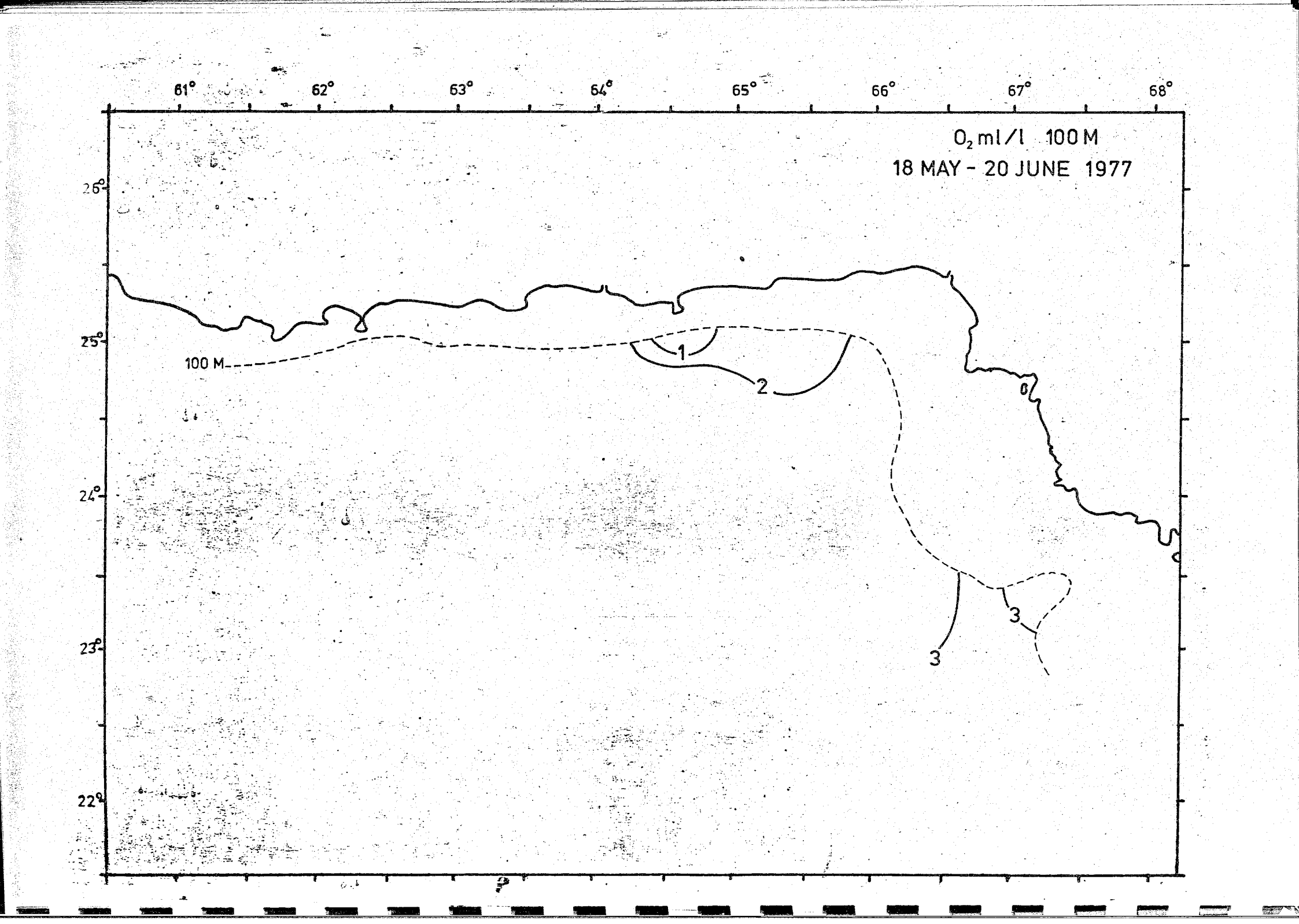

61°
62°
63°
64°
65°
66°
67°
68°
26°
25°
24°
23°
22°
t°C 50 M
18 MAY - 20 JUNE 1977
50 M
28
25
28
26
24
24
24
25
26


61°
62°
63°
64°
65°
66°
67°
68°
26°
25°
24°
23°
22°
S‰ 50 M
18 MAY - 20 JUNE 1977
50 M
36,4
36,4
36,4
36,3
36,3

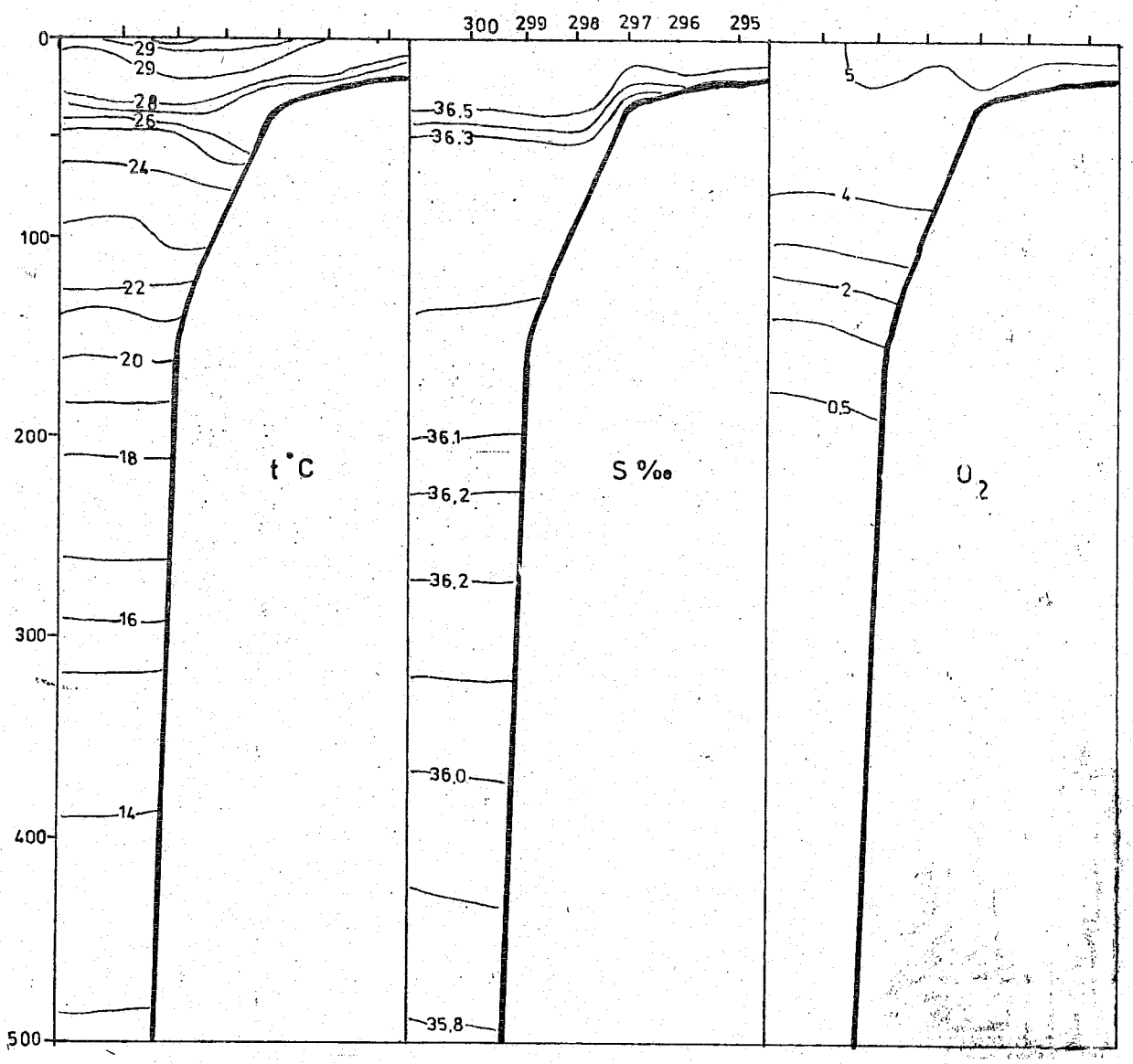

61°
62°
63°
64°
65°
66°
67°
68°
O₂ ml/l 50 M
18 MAY - 20 JUNE 1977
6°
5°
4°
23°
22°
50 M
3
4
4
4
3
3
4
4
5

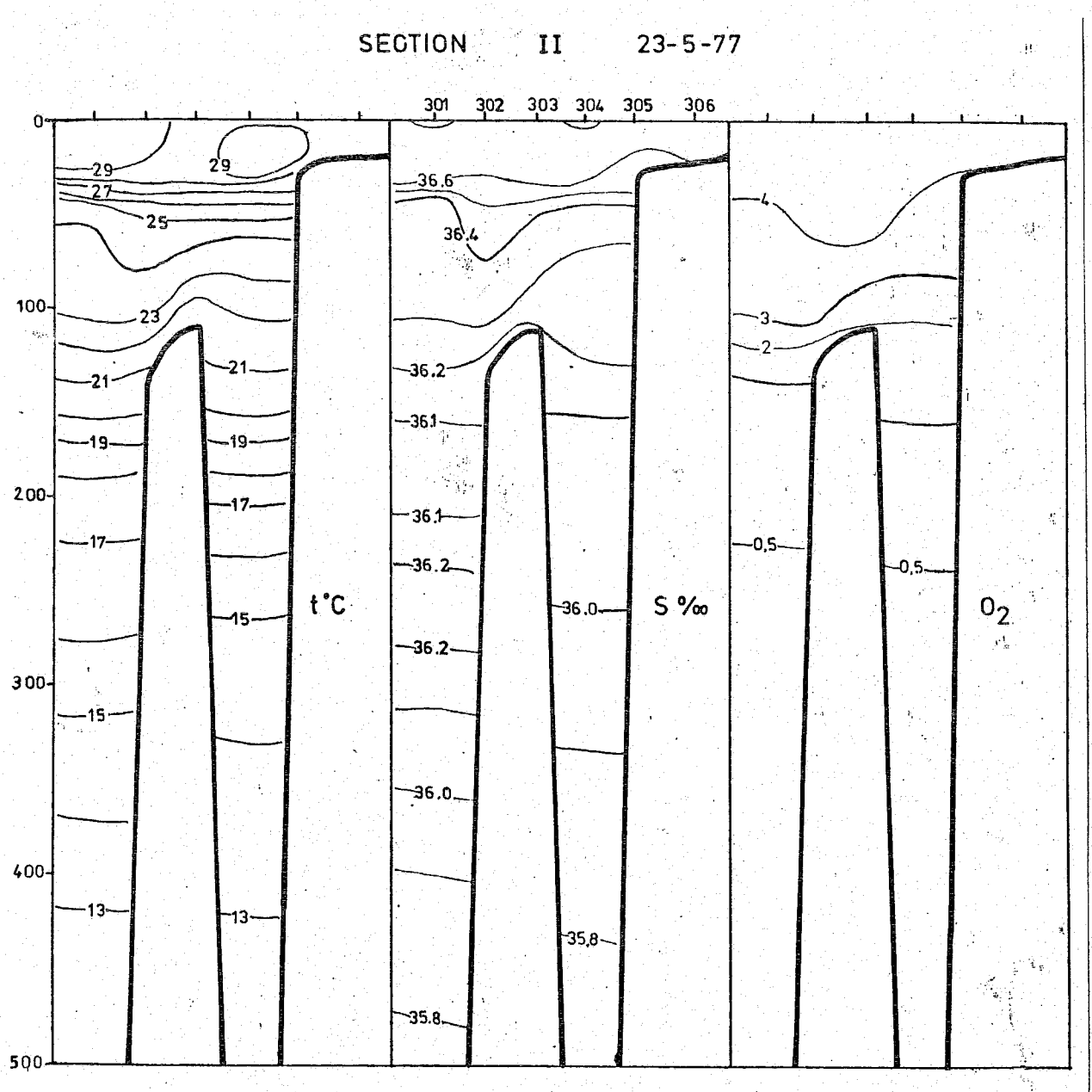

61°
62°
63°
64°
65°
66°
67°
68°
26°
25°
24°
23°
22°
t°C 100M
18 MAY - 20 JUNE 1977
100 M
<22
22
23
>23
23
23


61°
62°
63°
64°
65°
66°
67°
68°
6°
25°
24°
23°
22°
S‰ 100M
18 MAY - 20 JUNE 1977
100 M
36,3
36,3
< 36,3
36,3
36,3

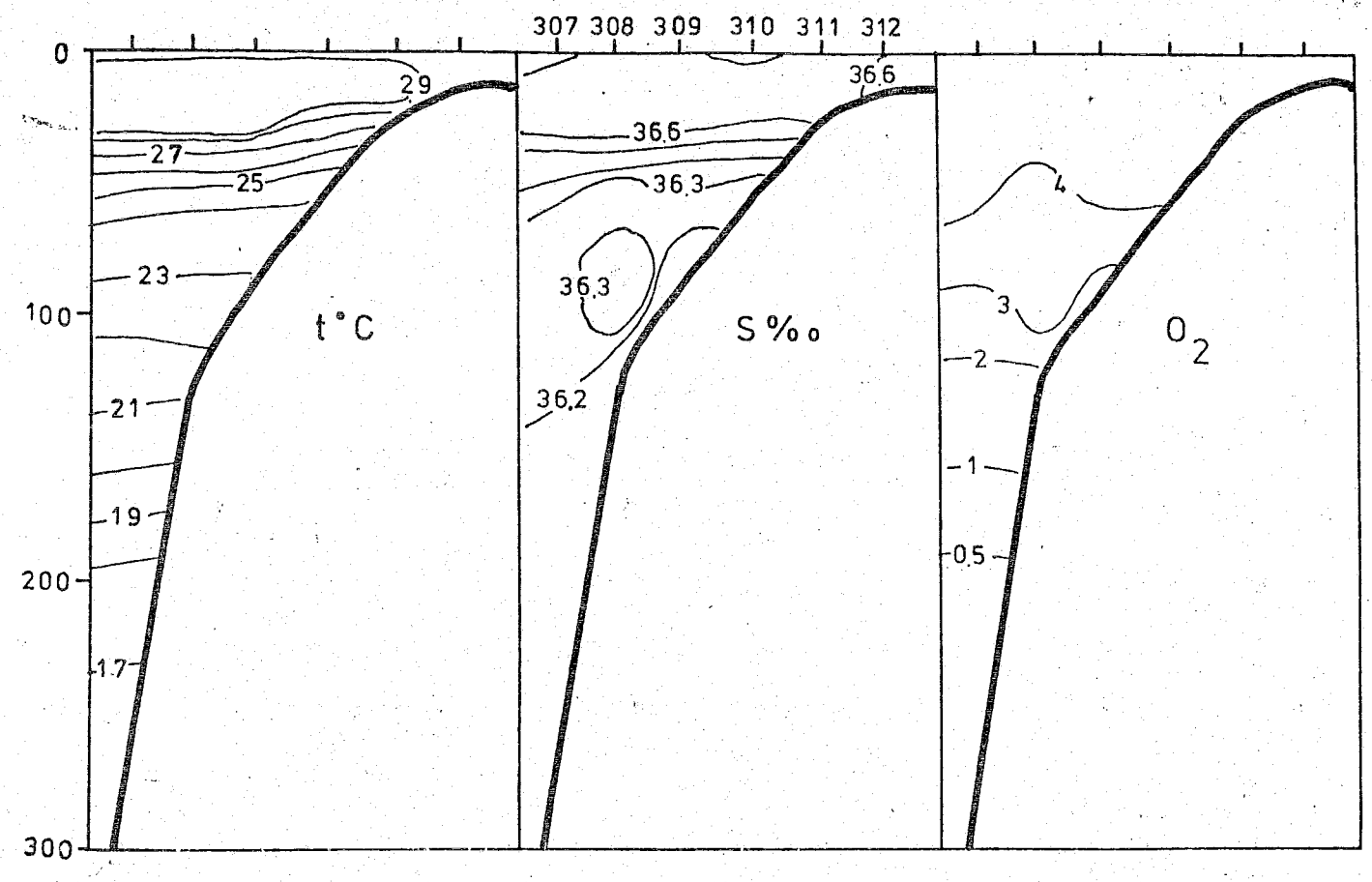

61°
62°
63°
64°
65°
66°
67°
68°
26°
25°
24°
23°
22°
O_2 ml/l 100 M
18 MAY - 20 JUNE 1977
100 M
1
2
3
3

SECTION I 23-5-77

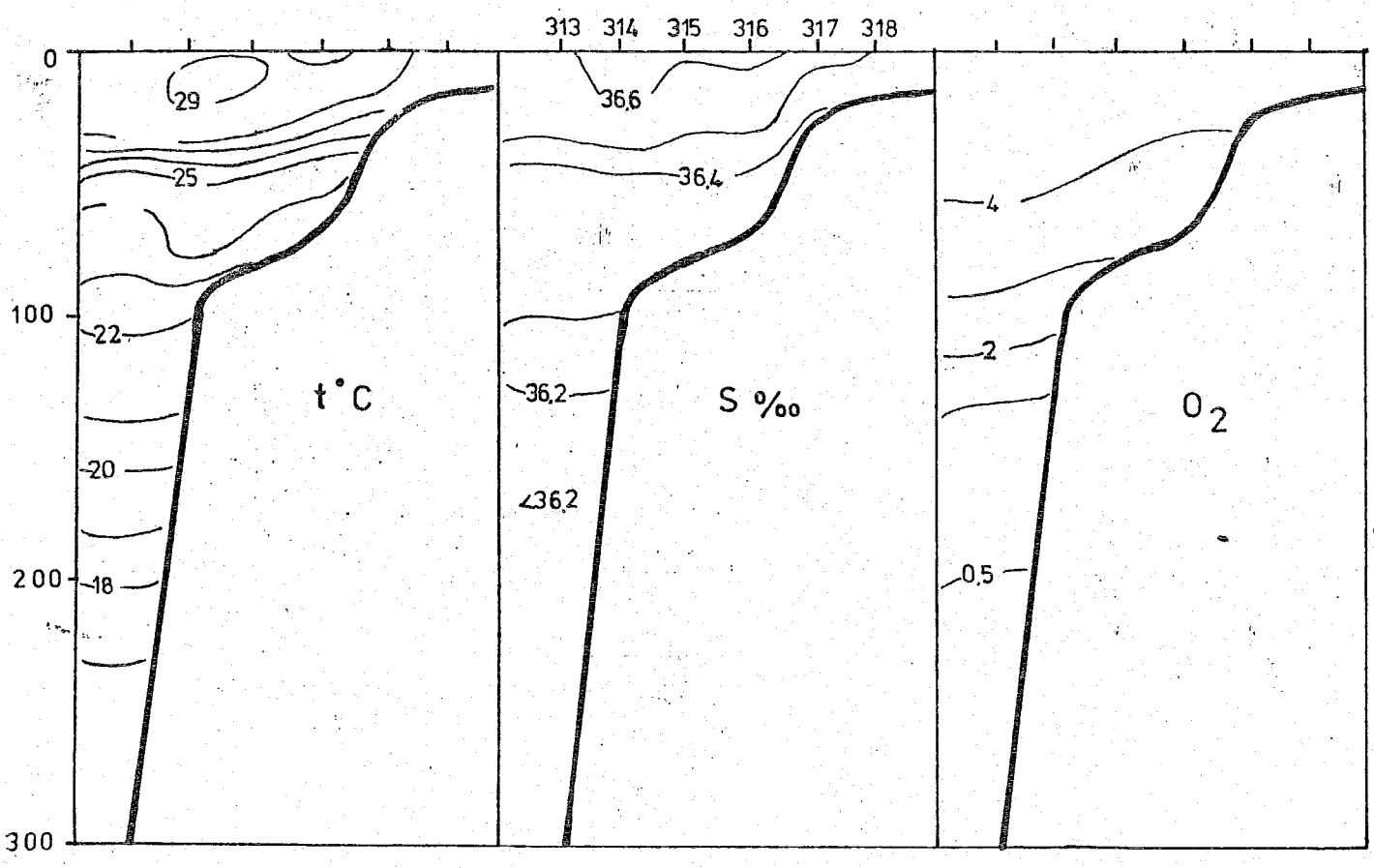



SECTION II 23-5-77
301 302 303 304 305 306
0
100
200
300
400
500
29
29
27
25
23
21
21
19
19
17
17
15
15
13
13
t°C
36.6
36.4
36.2
36.1
36.1
36.2
36.0
36.2
36.0
35.8
35.8
S ‰
4
3
2
0,5
0,5
O2

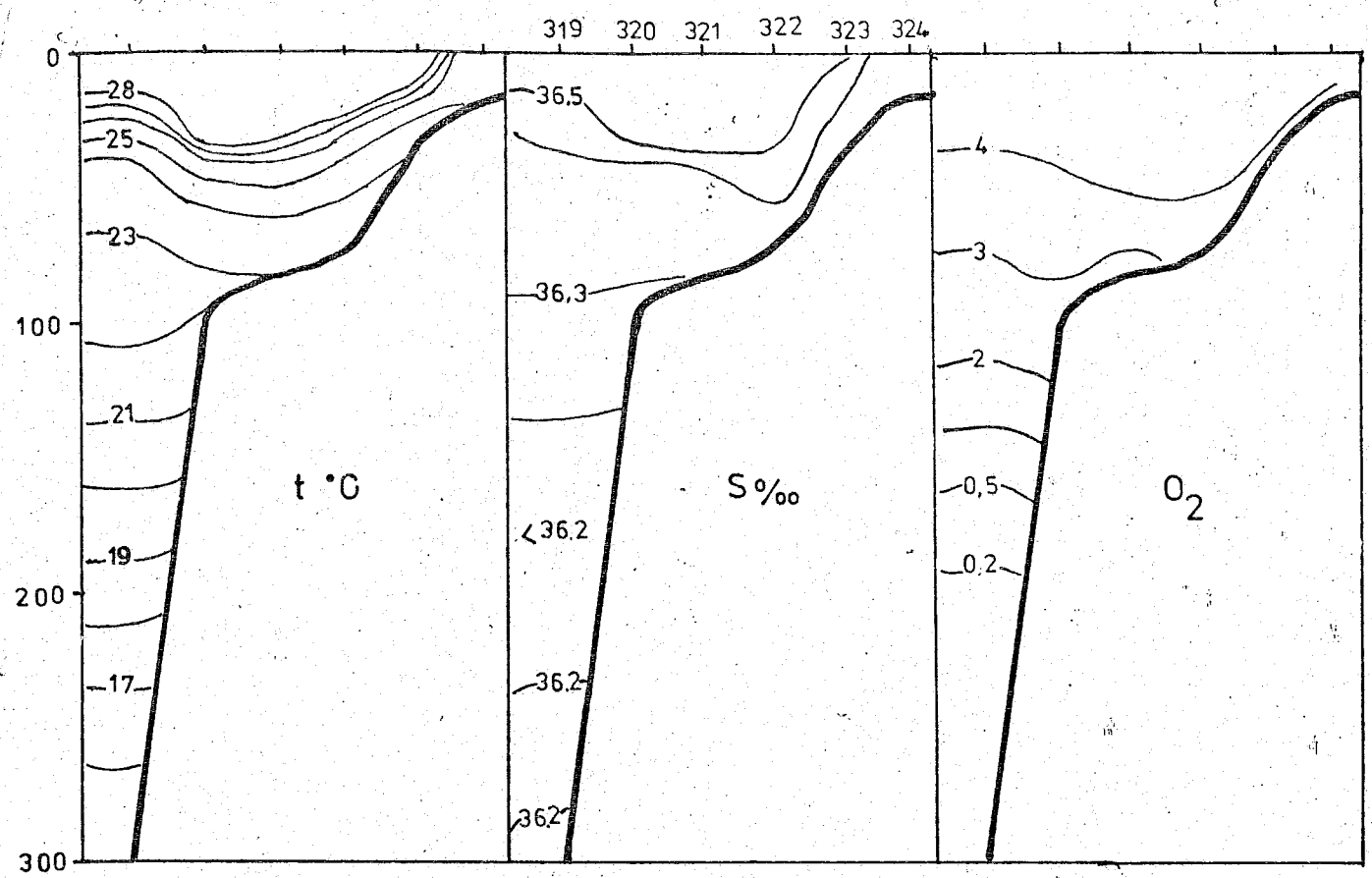
SECTION III 25-5-77



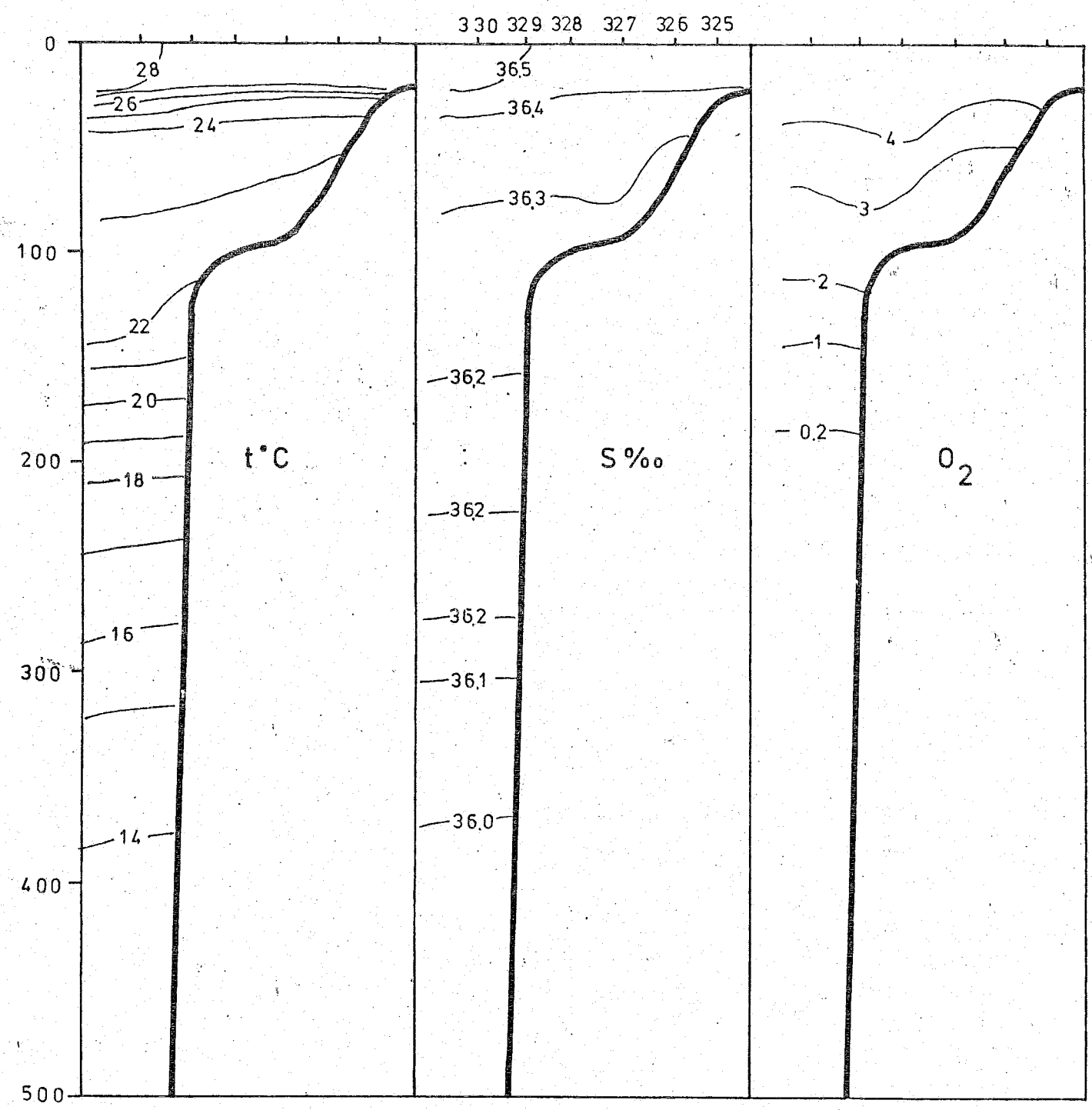
SECTION IV 26-5-77



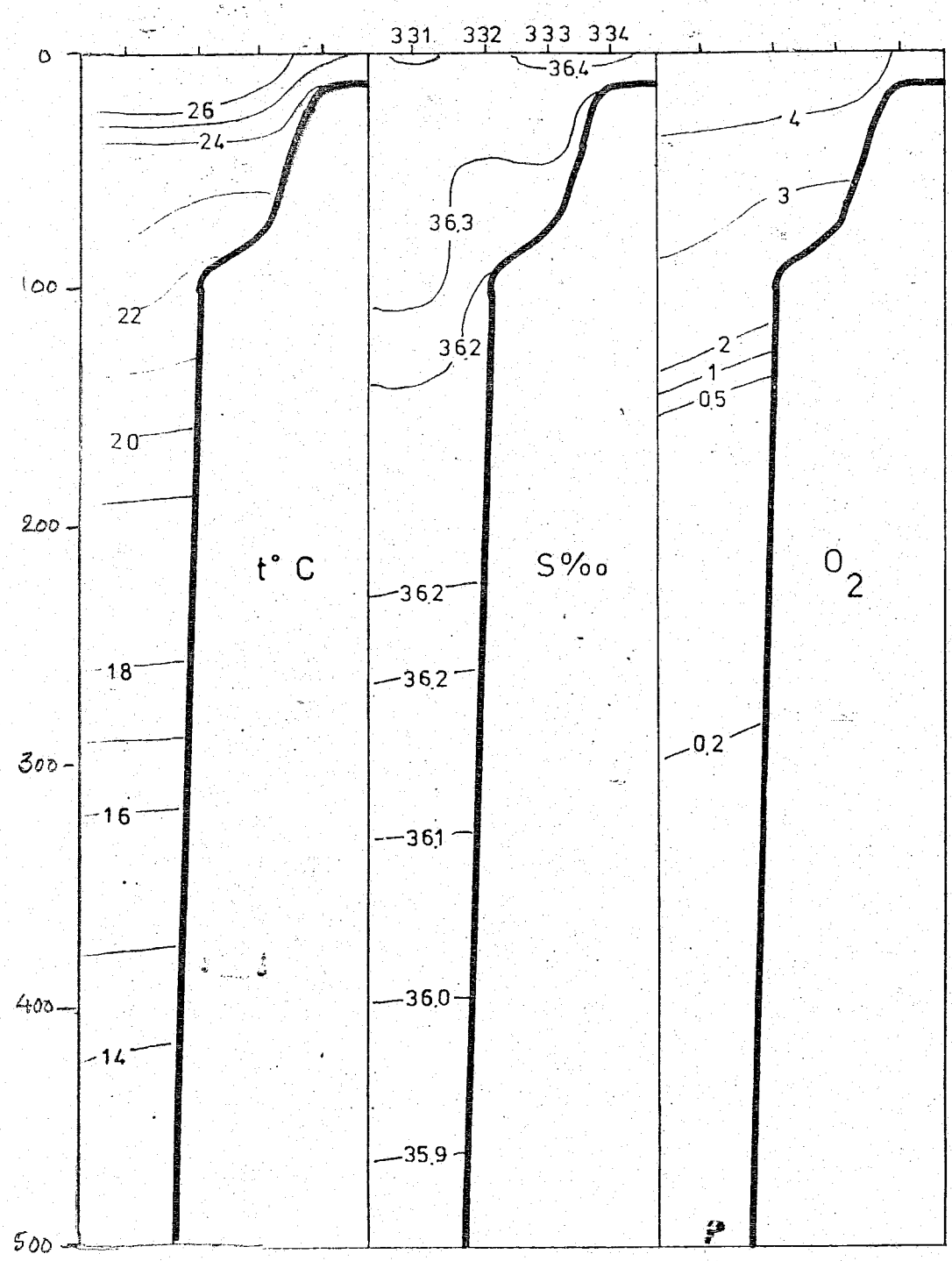
SECTION V 30-5-77

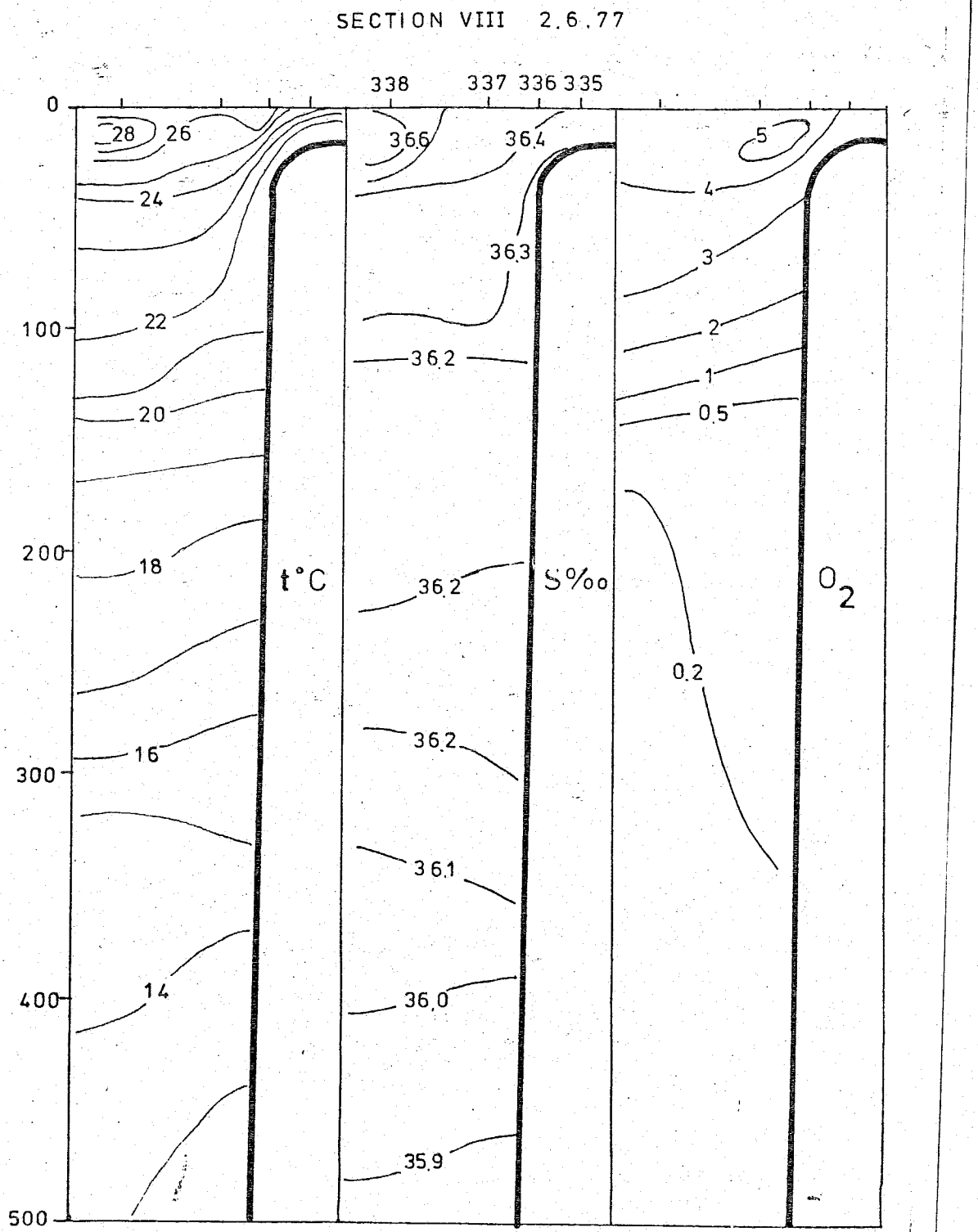


SECTION VI 31-5-77

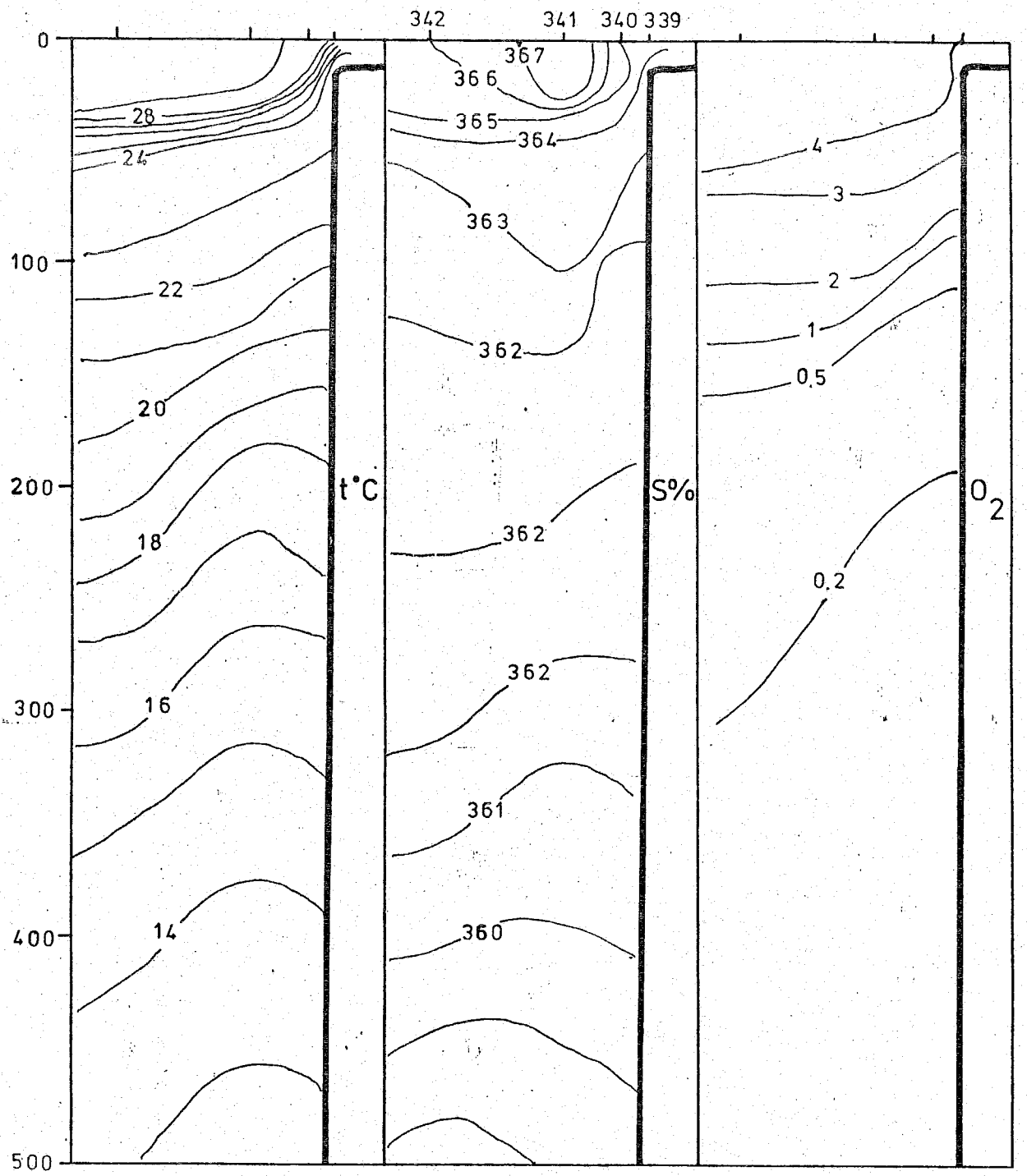


SECTION VII 1.6.77

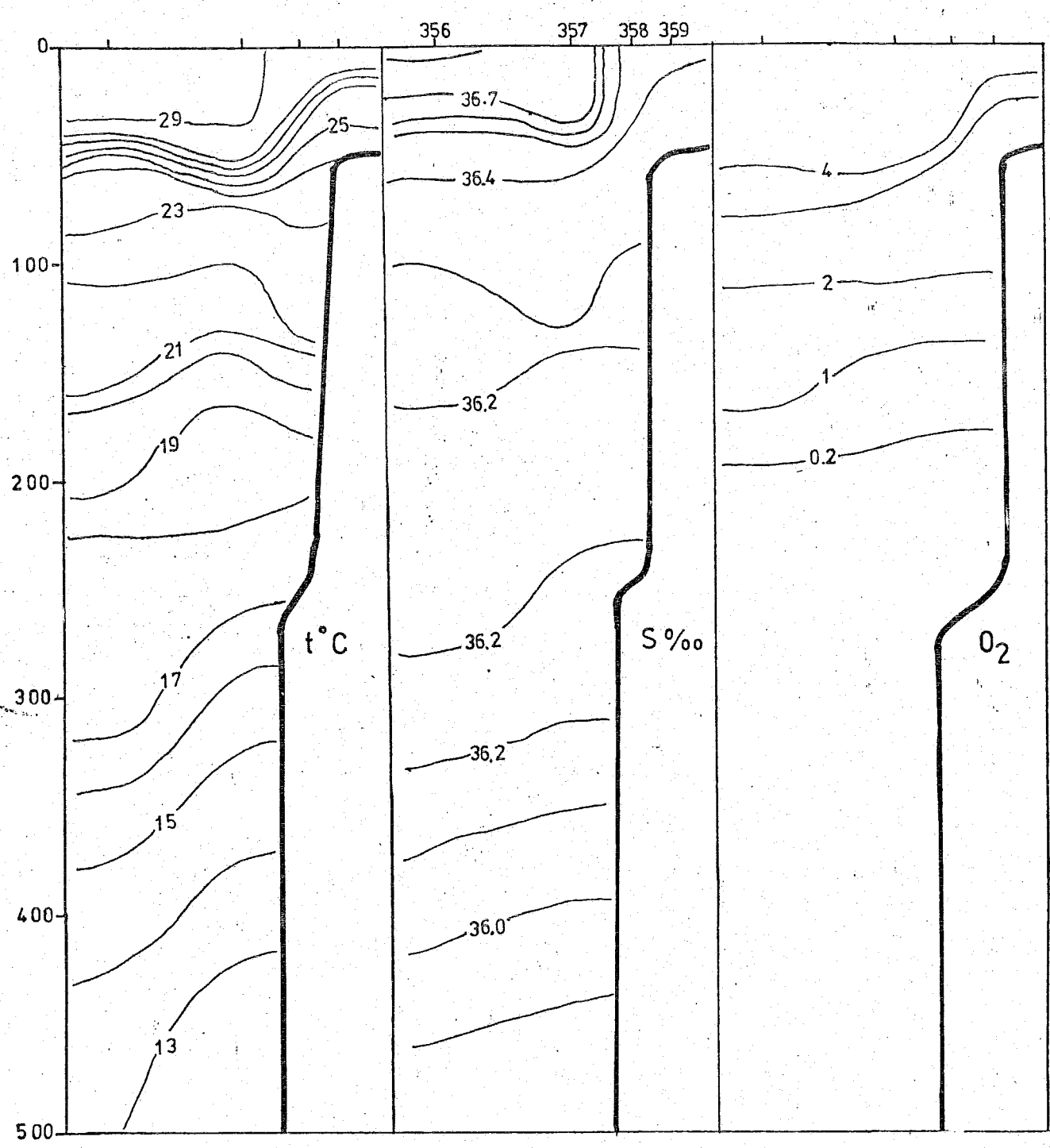



SECTION VIII 2.6.77
338
337
336
335
0
100
200
300
400
500
28
26
24
22
20
18
16
14
t°C
36.6
36.4
36.3
36.2
36.2
36.2
36.1
36.0
35.9
S‰
5
4
3
2
1
0.5
0.2
O2

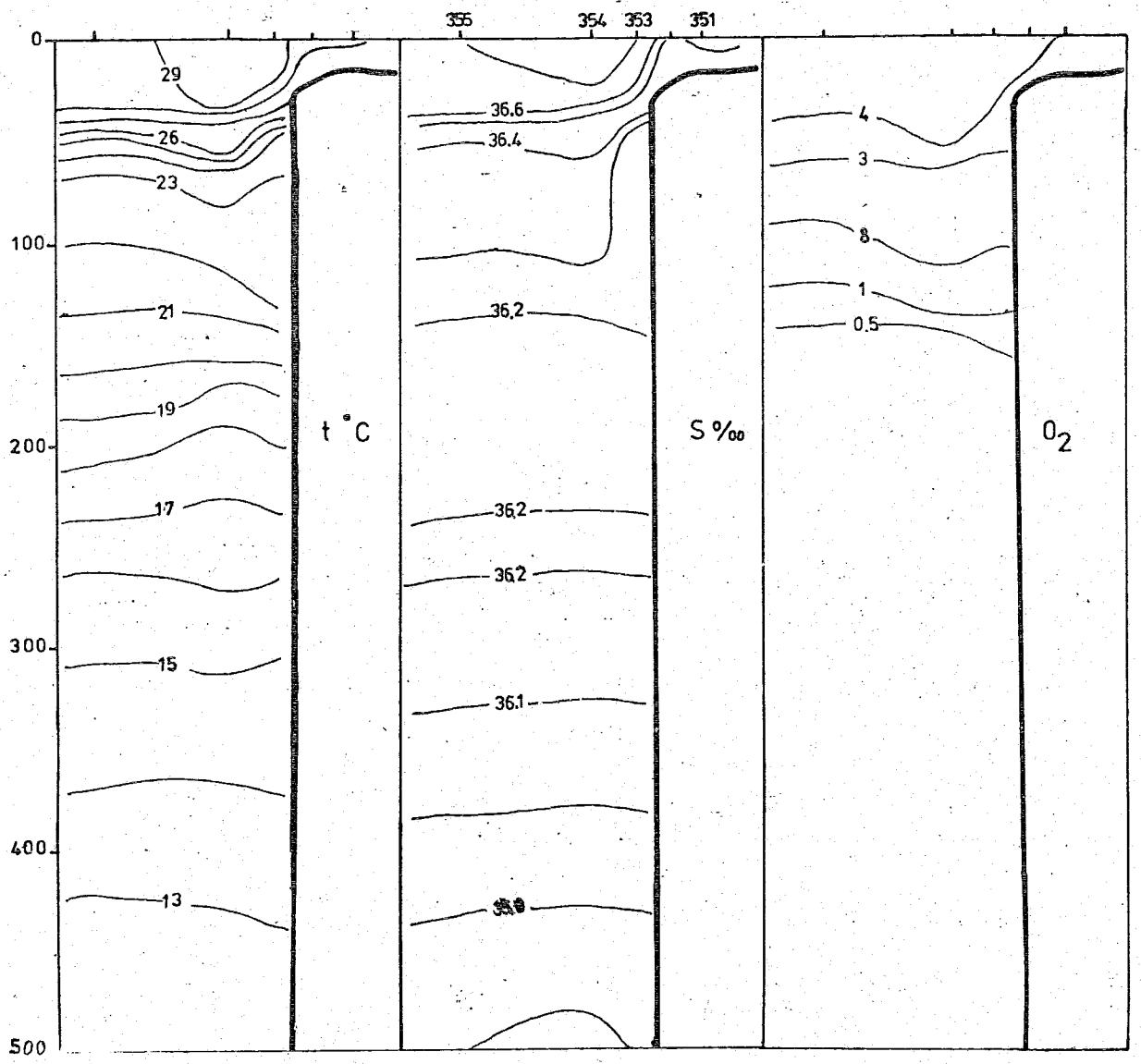
SECTION IX 4-6-77

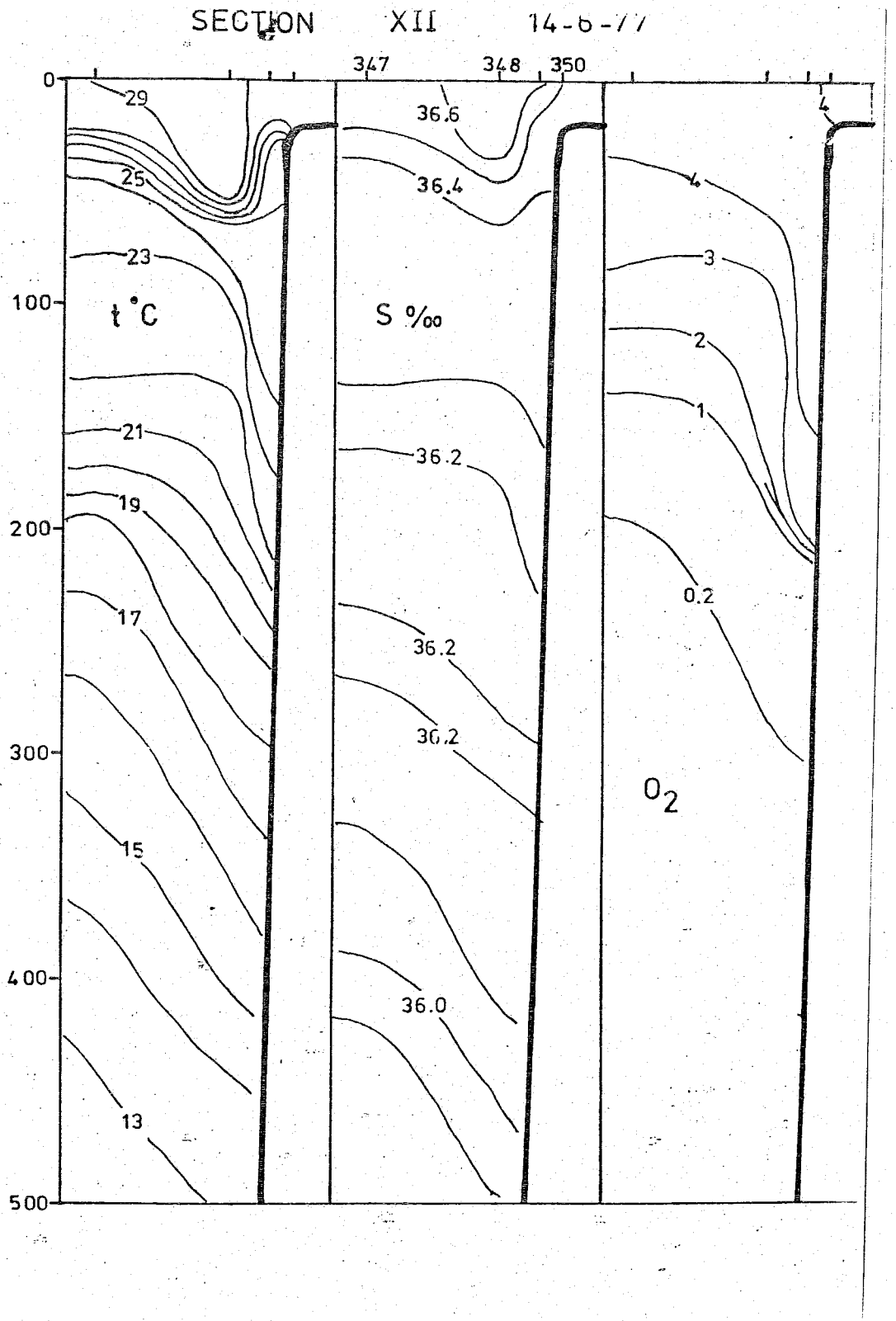


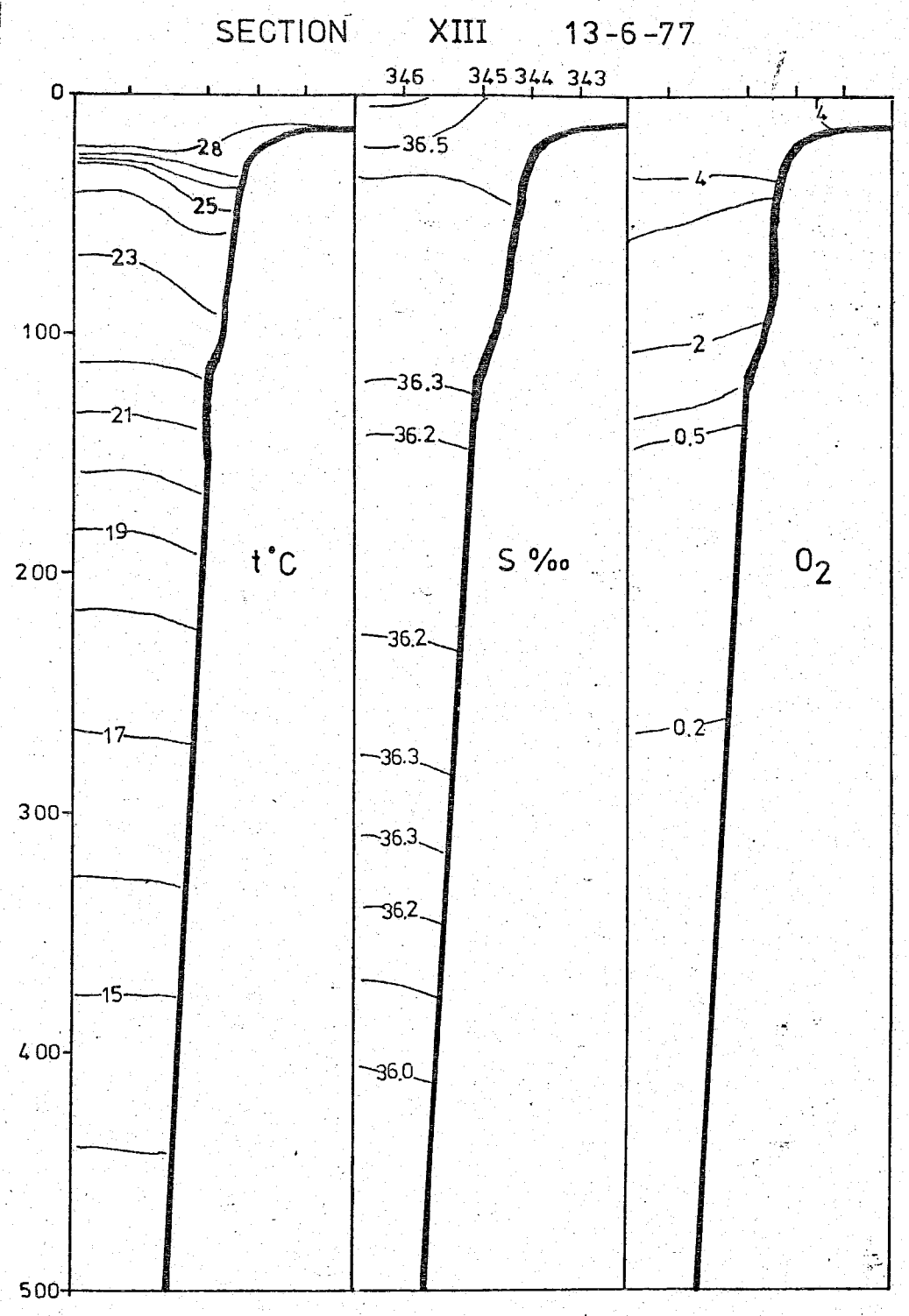
SECTION X 17-6-77



SECTION XI 16-6-77




SECTION XII 14-6-77
347
348
350
0
100
200
300
400
500
29
25
23
21
19
17
15
13
t °C
36.6
36.4
36.2
36.2
36.2
36.0
S ‰
4
4
3
2
1
0.2
O2


SECTION XIII 13-6-77
346
345
344
343
0
100
200
300
400
500
28
25
23
21
19
17
15
t°C
36.5
36.3
36.2
36.2
36.3
36.3
36.2
36.0
S ‰
4
4
2
0.5
0.2
O2

Hydrographic stations:

NO(S) = Station Number
Year Mo/Day = Year Month/Day
T/M/ST = Type/Measurements/Station time
T (01 = Nansen bottles, temperature & salinity)
M (0 = oxygen)
ST(hour)
LAT LONG = Latitude Longitude
(zero after latitude = North, after longitude = east)
OBS.D. = Deepest recording

NO(S)	YEAR	MO/DAY	T/M/ST	LAT	LONG	OBS.D
0295	1977	518	010 22	23300	67540	20
0296	1977	519	010 06	23230	67410	20
0297	1977	519	010 09	23160	67280	30
0298	1977	522	010 19	23080	67150	75
0299	1977	522	010 21	23010	67010	150
0300	1977	523	010 00	22550	66520	500
0301	1977	523	010 04	23030	66400	500
0302	1977	523	010 09	23100	66520	125
0303	1977	523	010 13	23170	67050	100
0304	1977	523	010 18	23240	67170	500
0305	1977	523	010 22	23310	67280	20
0306	1977	524	010 01	23390	67430	20
0307	1977	524	010 13	23180	66280	250
0308	1977	524	010 16	23240	66380	125
0309	1977	524	010 19	23200	66490	75
0310	1977	524	010 20	23380	67020	50
0311	1977	524	010 22	23450	67140	20
0312	1977	525	010 01	23510	67250	10
0313	1977	525	010 13	23350	66160	250
0314	1977	525	010 18	23400	66250	75
0315	1977	525	010 20	23470	66370	75
0316	1977	525	010 23	23550	66500	50
0317	1977	526	010 01	24000	67000	20
0318	1977	526	010 02	24060	67100	10
0319	1977	530	010 13	23550	66000	250
0320	1977	530	010 17	24030	66130	75
0321	1977	530	010 19	24100	66250	75
0322	1977	530	010 23	24170	66380	50
0323	1977	531	010 01	24240	66500	30
0324	1977	531	010 03	24300	67010	10
0325	1977	531	010 07	24470	66350	20
0326	1977	531	010 09	24420	66260	50
0327	1977	531	010 12	24350	66150	75
0328	1977	531	010 16	24290	66040	100
0329	1977	531	010 17	24230	65530	125
0330	1977	531	010 20	24170	65430	400

0331	1977	601	010 00	24500	65530	500
0332	1977	601	010 03	25000	66020	75
0333	1977	601	010 08	25100	66100	50
0334	1977	601	010 12	25200	66180	10
0335	1977	602	010 14	25150	65180	10
0336	1977	602	010 15	25070	65200	30
0337	1977	602	010 17	24560	65200	500
0338	1977	602	010 21	24350	65200	500
0339	1977	604	010 03	25050	64350	10
0340	1977	604	010 04	25000	64350	500
0341	1977	604	010 09	24470	64350	500
0342	1977	604	010 17	24170	64350	500
0343	1977	613	010 17	25040	61350	8
0344	1977	613	010 19	24540	61350	10
0345	1977	613	010 20	24450	61350	100
0346	1977	613	010 23	24300	61350	500
0347	1977	614	010 09	24200	62200	500
0348	1977	614	010 14	24500	62200	500
0349	1977	614	010 04	24580	62200	250
0350	1977	614	010 18	25000	62200	20
0351	1977	616	010 06	25080	63060	10
0352	1977	616	010 07	25020	63050	18
0353	1977	616	010 10	24540	63050	500
0354	1977	616	010 13	24410	63050	500
0355	1977	616	010 18	24090	63060	500
0356	1977	616	010 23	24060	63500	500
0357	1977	617	010 04	24380	63500	500
0358	1977	617	010 06	24510	63500	200
0359	1977	617	010 09	25010	63500	45