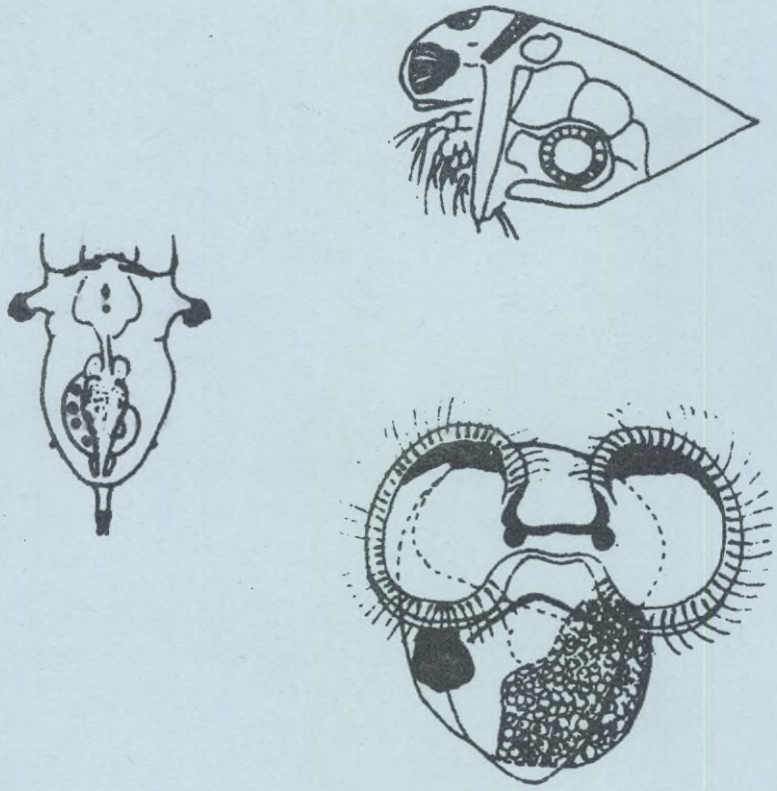

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Ecological zooplankton studies in the Baltic proper in connection with oceanographic studies in 1969 during the Baltic Year

by

Hans Ackefors & Lars Hernroth

August, 1970

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CONTENTS

INTRODUCTION

In January, 1969, "The BALTIC YEAR 1969-70" started. The Baltic Oceanographers had agreed to start intensive oceanographic investigations in the Baltic (ANON. 1970 c). The investigations should be carried out by the countries situated along the Baltic coast. Each country and its research vessel should be responsible for a 3 week period with different programs each week. In connection with the oceanographic program a lot of biological investigations were proposed by the different countries.

Among other things zooplankton investigations were proposed. At seven stations, 2A, 5A, 8A, 15A, 27A, 31A and 38A, zooplankton samples should be taken at the intervals 25-0, 50-25, 100-50, 150-100, 200-150, 300-200, 400-300 and 460-400 m. Nansen or Hensen nets were proposed with a diameter of 50 cm and a mesh size of 0.09-0.16 mm. It was also said that Sweden was interested in analysing the samples.

Unfortunately rather few samples were taken during the Swedish sea cruises in January, April and November partly because of bad weather conditions. No other country has yet sent any samples from the year 1969 for analysis to Sweden.

We have now analysed the available samples from the year 1969 and they may be regarded as a complement to the many samples taken in 1968, when samples were taken in February, April, June, September and November (ACKEFORS & HERNROTH 1970).

The purpose of this paper is simply to describe the conditions in 1969 and reproduce charts and diagrams as preliminary data. The investigations will later be discussed in connection with other plankton investigations in the Baltic proper.

These investigations are continued during 1970. This year the investigations are planned to take place in January, June, August and October with the Swedish research vessel. The aim is to investigate the ecology of the zooplankton fauna off the coast in different seasons and in various hydrographical conditions and to see the horisontal and vertical distribution in relation to hydrographical conditions. In a later paper the results will be compared with earlier studies, carried out off the coast (ACKEFORS 1966, 1969 a) as well as earlier studies near the coast (ACKEFORS1965, 1969 a, b).

The authors are greatly indebted to Dr. Stig Fonselius and Mr. Sven Engström who have been responsible for the work on board of the R/V "Skagerak" when the samples were taken. We also want to express our thanks to Mrs Britt-Maj Karlsson for technical assistance and Miss Gun Bergman and Miss Birgitta Bengtsson for help with the illustrations.

MATERIAL AND METHODS

The seven plankton stations were chosen to cover the subareas in the Baltic proper according to WATTENBERG (1949). A further divison of these areas were then proposed for zooplankton investigations by ACKEFORS (1969 a). The subareas and plankton stations are the Arkona Sea (S12-2A), the Bornholm Sea (S24-5A), the southern Gotland Sea (8A), the middle western Gotland Sea (S41-38A), the middle eastern Gotland Sea (F81-15A), the north western Gotland Sea (F78-31A) and the north eastern Gotland Sea (F72-27A). The latter station is differently situated from the station visited in 1968. The position in 1968 was 59°18'N, 21°28'E. 1969 it was moved to the east to the position 59°18'N, 21°34'E. In the new position the depth is 176 m.

The hydrographical data have been analysed by the Hydrographical Department, Institute of Marine Research (ANON, 1970 a, b). The methods used are evident in the manual for "THE BALTIC YEAR 1969-70" (ANON, 1970 c).

In 1969 the plankton samples have not been taken according to the decided program in the following cases: In January at station F78 net hauls were taken only down to 100 m depth. In November at station 8A only one net haul (100-0m) was taken and the sample 25-0m from station F81 has been destroyed. In April the sample from 150-100m was without any organisms, indicating that a mistake must have been made in this case.

The plankton samples were subsampled with the modified whirling apparatus constructed by KOTT (1953:87). The samples were coloured before the analyses, according to the method described by ACKEFORS & HERNROTH (1970).

In the diagrams, showing the vertical distribution of the zooplankton, no finds of specimens are indicated by hatched lines and slid lined occaisonal occurrence. In other cases the occurrence is reproduced according to the scale in each diagram.

RESULTS

Z O O P L A N K T O N

Cnidaria

Sarsia tubulosa (M. SARS)

Two specimens (1.2 mm size) were found in April in a net haul 45-25 m at station S12. The salinity was 21.63‰ near the bottom at 45 m, 12.98‰ at 30 m and 8.11‰ at 20 m depth.

Aurelia aurita (L.)

The ephyra larvae were caught in April. One specimen at station S12 in a net haul 45-25 m and one specimen at station S24 in a net haul 85-50 m. The size was about 3 mm. In November a medusa of the size 80 mm was caught in a net haul between 200-150 m in the Gotland Deep (F81).

Cyanea capillata (L.)

In the Gotland Deep C. capillata was found in January and in April. In January two specimens (10 mm and 7 mm) were found in a net haul 100-50 m. The salinity fluctuated between 10.63 and 7.34‰ in those levels. In April a specimen of the size 21 mm was caught at the same level. The salinity conditions were similar.

Ctenophora

Pleurobrachia pileus (O.F. MÜLLER)

Cydippid larvae were found in January and April. At station S41, 5 specimens were caught in a net haul 25-0 m and at station F72, 1 specimen in a net haul 50-25 m in January. In April 5 specimens were caught at station S24 in a net haul 85-50 m.

Rotatoria

Synchaeta spp.

We have not distinguished between the six different species in the Baltic proper: S. baltica, S. curvata, S. fennica, S. gyrina, S. monopus and S. triophthalma (BERZINS, 1960).

Only occaisonal occurrence was reported from the investigations in January and April (figs. 2 and 3). In November species occurred evenly on the three visited plankton stations but in a low abundance (fig. 4).

Polychaeta

Pygospio elegans CLAPARÈDE

In the southern Baltic proper at stations S12 and S24 larvae were found in April (fig. 6).

Harmothoe sarsi KINBERG

Larvae occurred in most plankton stationsin January, April and November (figs. 5-7).

Cladocera

Bosmina coregoni maritima (P.E. MÜLLER)

Single specimens of Bosmina appeared already in April, although the temperature was only around1°C (fig. 9). In November (fig. 10) when the temperature was 6-8°C in the surface water it occurred in a low abundance at all the three visited plankton stations.

Podon intermedius LILLJEBORG

The species appeared very sparsely in November (fig.13).

Podon polyphemoides LEUCKART

The species appeared in a low abundance in November (fig. 16).

Podon leuckarti G.O. SARS

Single specimens occurred in April and November in the southern Baltic proper (figs. 18 and 19).

Evadne nordmanni LOVEN

Single specimens occurred in April (fig. 21). In November the species occurred in a low abundance (fig. 22).

Copepoda

Limnocalanus grimaldii (DE GUERNE)

Limnocalanus grimaldii and L. macrurus are not treated as separate species by some authors (see e.g. PEJLER, 1965).

The species was found as far to the south as stations S41 and F81, west and east of Gotland. In January single specimens of C.IV-V were found at station S41 (50-25 m), at station F81 (150-100 m) and at station F72 (50-25 m). In April one female and one specimen of C.I-II were found at station S41 (25-0m) and one male at station F78 (25-0m).

Acartia bifilosa GIESBRECHT and A. longiremis LILLJEBORG

The nauplii and the copepodite stages except stage VI (adult) were put together for the species A. bifilosa and A. longiremis. The horisontal distribution of the two species above and below 50 m level is evident from figs. 23-25. The vertical distribution of the copepods in comparison with other copepods in the Gotland Deep is reproduced in figs. 50-52. The vertical distribution of the different stages in figs. 53-55.

Unfortunately one sample from the Gotland Deep (25-0m) has been destroyed (fig. 55). From the figs. 53-55 it is evident, that nauplii and C.I-III occurred abundantly in April. In November all stages except nauplii were frequent.

A lot of the Acartia spp. as well as other copepods had a long parasite fixed on the thorax. The parasite has been noticed by ACKEFORS in his study near the Askö Laboratory during 1963-1965. Owerwintering Acartia spp. were infected with this parasite and it was very common during the whole spring (ACKEFORS unpubl.).

Eurytemora sp.

The horisontal distribution above and below 50 m level is evident from figs. 26-28 and the vertical distribution in the Gotland Deep in figs. 50-52. The species occurred sparsely.

Centropages hamatus (LILLJEBORG)

The horisontal distribution of C. hamatus above and below 50 m level is evident from figs. 29-31 and the vertical distribution in figs. 50-52. C. hamatus was a little more frequent in the beginning of the year (January) and in the end of the year (November) in comparison with the results from April. It was more frequent below 50 m than above this level at the stations in the northern Baltic proper. The differences are usually too small to be indicated by the circles in figs. 29-31. In January and April the dominating stage was C.IV-V. In November C.I-III was as common as C. IV-V or at some stations more common than C.IV-V.

Pseudocalanus minutus elongatus (BOECK)

The horisontal distribution of P.m. elongatus is evident in figs. 32-34. The vertical distribution in figs. 50-52 and 56-58. Pseudocalanus was the most common species on the three occaisons when investigations were carried out. It was always more common below 50 m level than above. In the investigations in January and in November, 1969, in the Gotland Deep it was also frequent in a net haul between 150-100 m, although the oxygen conditions were bad (figs. 50, 52, 56 and 58). In January and November the copepodite stages C.IV-V were most common. In April these stages were just as common as adult females in the Gotland Deep.

Temora longicornis P. MÜLLER

The horisontal distribution of this species above and below 50 m level is evident in figs. 35-37 and the vertical distribution in figs. 50-52 and 59-61.

Temora was most frequent in November. In January the copepodite stages C.IV-V were most common and had a rather similar distribution in the Gotland Deep on all levels down to 150 m depth. Only single specimens occured between 200 and 150 m depth. Adult individuals occurred also in all levels down to 200 m depth, although less frequent than C.IV-V. In April adult

specimens was as common as or slightly less frequent than stages C.IV-V at the investigated plankton stations. In November the stages IV-V were most common at all stations, but also stages C.I-III were frequent. In the Gotland Deep the sample taken between 25-0m was destroyed. But from results at the other stations it is evident that even between 25-0m C.IV-V were the most frequent stages.

Oithona similis CLAUS

The horisontal distribution above and below 50 m level is evident in figs. 38-40. Oithona prefers normally a higher salinity than the surface salinity in the Baltic. The species occurred at stations S12, S24 and F81. At the most northern station, F81, occaisonal finds were made between 150-100 m in January and April. The salinity fluctuated between 12 and 10‰ on those levels. In November about 350 specimens were found between 100 and 150 m level (11.13‰-12.32‰ S) and 50 specimens between 150 and 200 m level (12.32‰-12.61‰ S)(fig. 40).

At station S24, 50 specimens were taken in as low salinity as 7.5‰ in a net haul between 50-25 m in November (cf. table 4).

Ostracoda

One not identified ostracod species was caught at station S12 in April.

Cirripedia

Balanus improvisus DARWIN

In April about 50 Balanus nauplii were caught in a net haul 45-25 m at station S12 and one in the net haul from 25 m to the surface. One Cypris larvae was taken in the net haul 45-25 m at the same station.

Acari

In January a hundred not identified mites were found in a net haul 100-50 m and 5 specimens in the net haul 50-25 m at station F81.

Lamellibranchiata

Mytilus edulis (L.)

The horisontal distribution of larvae above and below 50 m level is evident from figs. 41-43. In January Mytilus larvae occurred in a low abundance at station S12 and single specimens at station S41. In November the larvae occurred at all investigated stations.

Macoma baltica (L.) Cardium lamarcki REEVE Mya arenaria (L.)

The three species were put together when the samples were analysed. They occurred in as low abundance in January and November as the Mytilus larvae (figs. 44-46).

Chaetognatha

Sagitta elegans baltica RITTER-ZAHONY

In January 7 specimens were caught in a net haul 45-25 m in the Arkona Sea at station S12. In November 40 specimens were caught in the net haul 85-50 m in the Bornholm Sea at station S24.

Sagitta setosa MÜLLER

Two specimens were caught at station S12 in January in the net haul between 45-25 m.

Copelata

Fritillaria borealis acuta LOHM

The highest abundance of this species was found in the middle Baltic proper (areas MWG and MEG) and in the northern Baltic proper in (areas NWG and NEG) in January (fig. 47). In April the highest abundance was found at station S24 in the southern Baltic proper in the Bornholm Sea (fig. 48). In November the highest abundance was found at station F81 in area MEG (fig. 49).

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Legends

Fig.1. Chart of the Baltic proper.

Figs.2-49. In 1969 three cruises were made. Due to extremely bad weather conditions during one of these cruises only three of the seven plankton stations could be visited. In April we were able to visit all the seven stations. The most common species and their seasonal distribution are evident in figs.2-49. Winter (Dec.-Febr.) is reproduced as white charts, spring (March-May) as yellow charts and autumn (Sept.-Nov.) as blue charts. The abundance appears from the size of the circles. Open circles indicate the two hauls 25-0 m and 50-25 m together and black circles all the deep net hauls together. The divided circle on the November charts indicates a haul from 100-0 m.

	Jan.	April	Nov.
Synchaeta spp	2	3	4
Harmothoe sarsi Pygospio elegans	5	6	7
Bosmina coregoni maritima	8	9	10
Podon intermedius	11	12	13
Podon polyphemoides	14	15	16
Podon leuckarti	17	18	19
Evadne nordmanni	20	21	22
Acartia bifilosa Acartia longiremis	23	24	25
Eurytemora sp.	26	27	28
Centropages hamatus	29	30	31
Pseudocalanus minutus elongatus	32	33	34
Temora longicornis	35	36	37
Oithona similis	38	39	40
Mytilus edulis	41	42	43
Macoma baltica Cardium lamarcki Mya arenaria	44	45	46
Fritillaria borealis acuta	47	48	49

Figs.50-52. Vertical distribution of different copepods.

Fig.50. Station 15A in January
" 51. " " " April
" 52. " " " November

Figs.53-55. Vertical distribution of different stages of Acartia bifilosa and A. longiremis.

Fig.53. Station 15A in January
" 54. " " " April
" 55. " " " November

Figs.56-58. Vertical distribution of different stages of Pseudocalanus m. elongatus.

Fig.56. Station 15A in January
" 57. " " " April
" 58. " " " November

Figs.59-61. Vertical distribution of different stages of Temora longicornis.

Fig.59. Station 15A in January
" 60. " " " April
" 61. " " " November

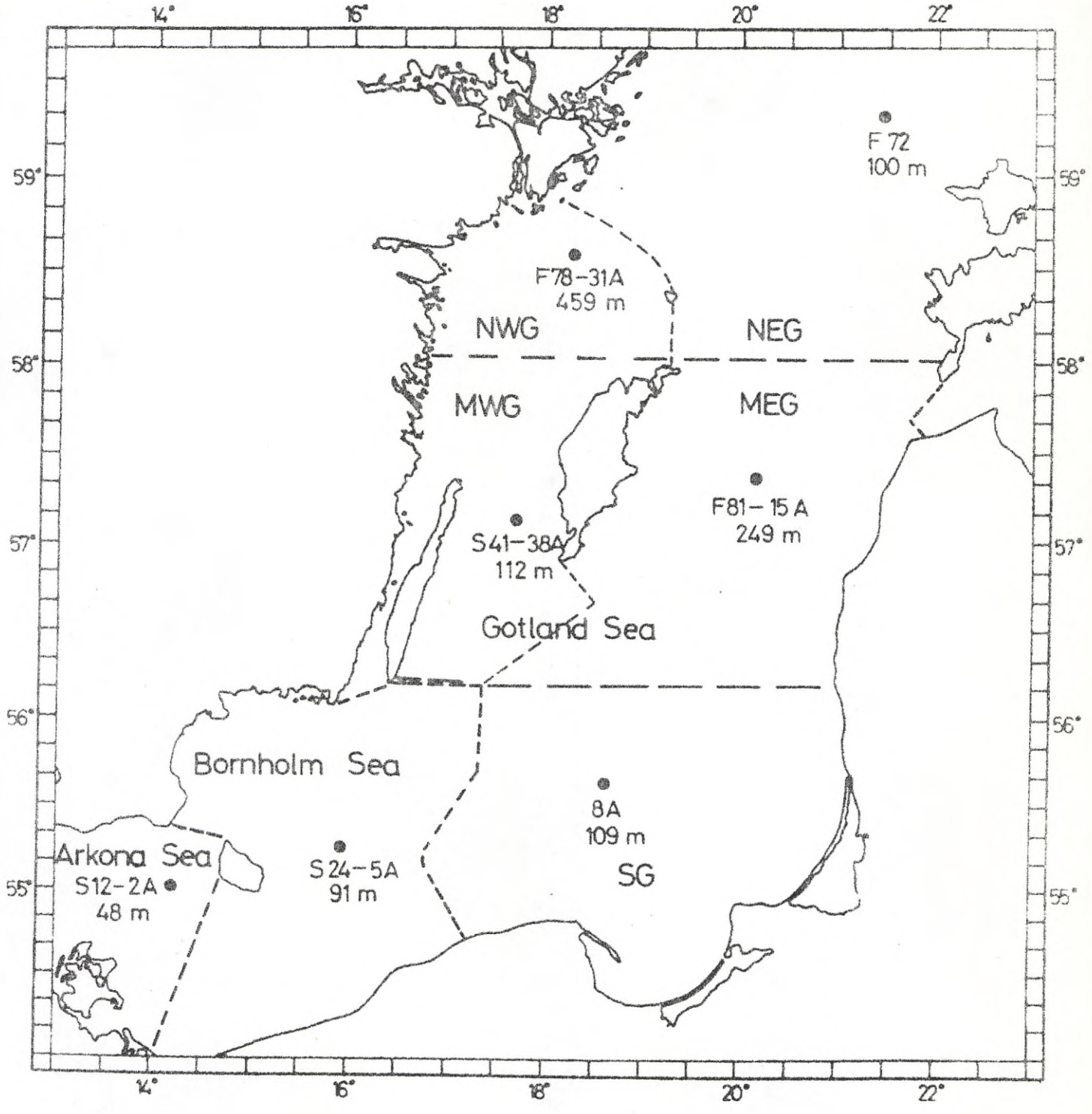
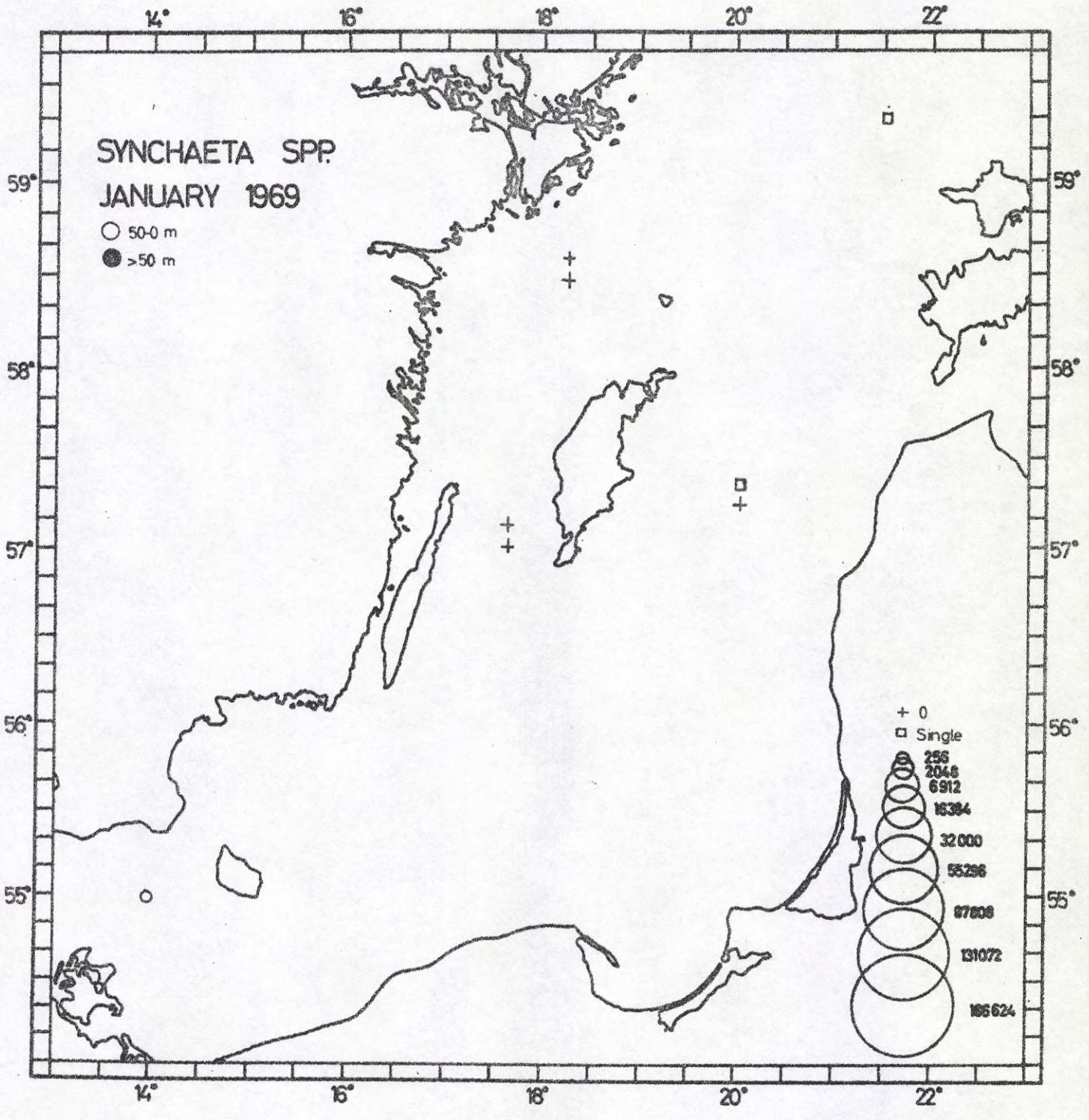


Fig 1. Chart of the Baltic proper and the three subareas, the Arkona Sea, the Bornholm Sea and the Gotland Sea according to WATTENBERG(1949). The Gotland Sea is divided into an eastern and western part by WATTENBERG. According to ACKEFORS(1969a) the Gotland Sea may be divided into five subareas; the southern(SG), the middle eastern and western(MEG and MWG) and the north-eastern and north-western(NEG and NWG). The seven plankton stations are evident from the chart, in some cases with both old and new symbols as well as the depths.

Fig 2.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50-0 m
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16°
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22°
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Fig 3.

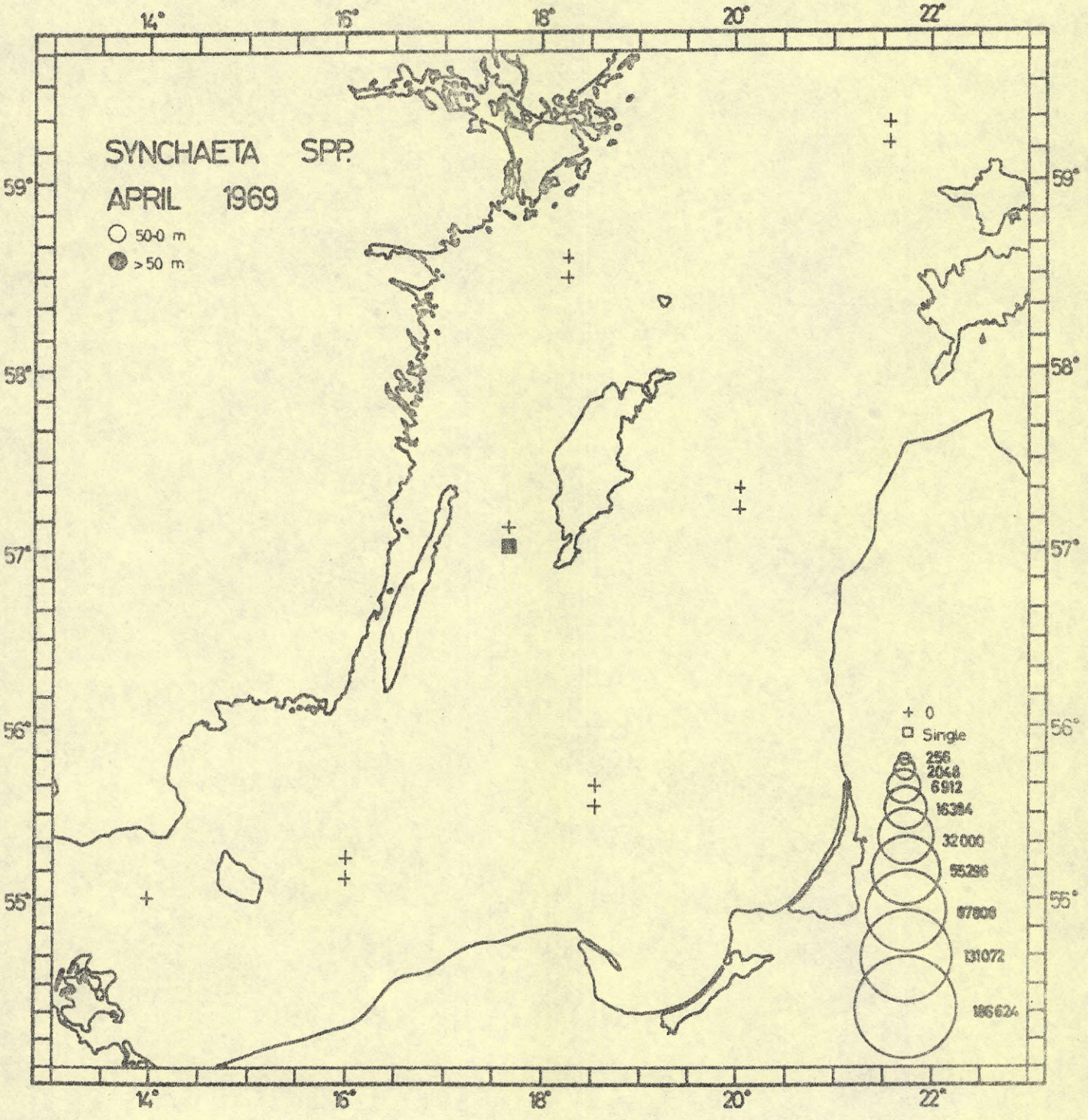
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Fig 4.

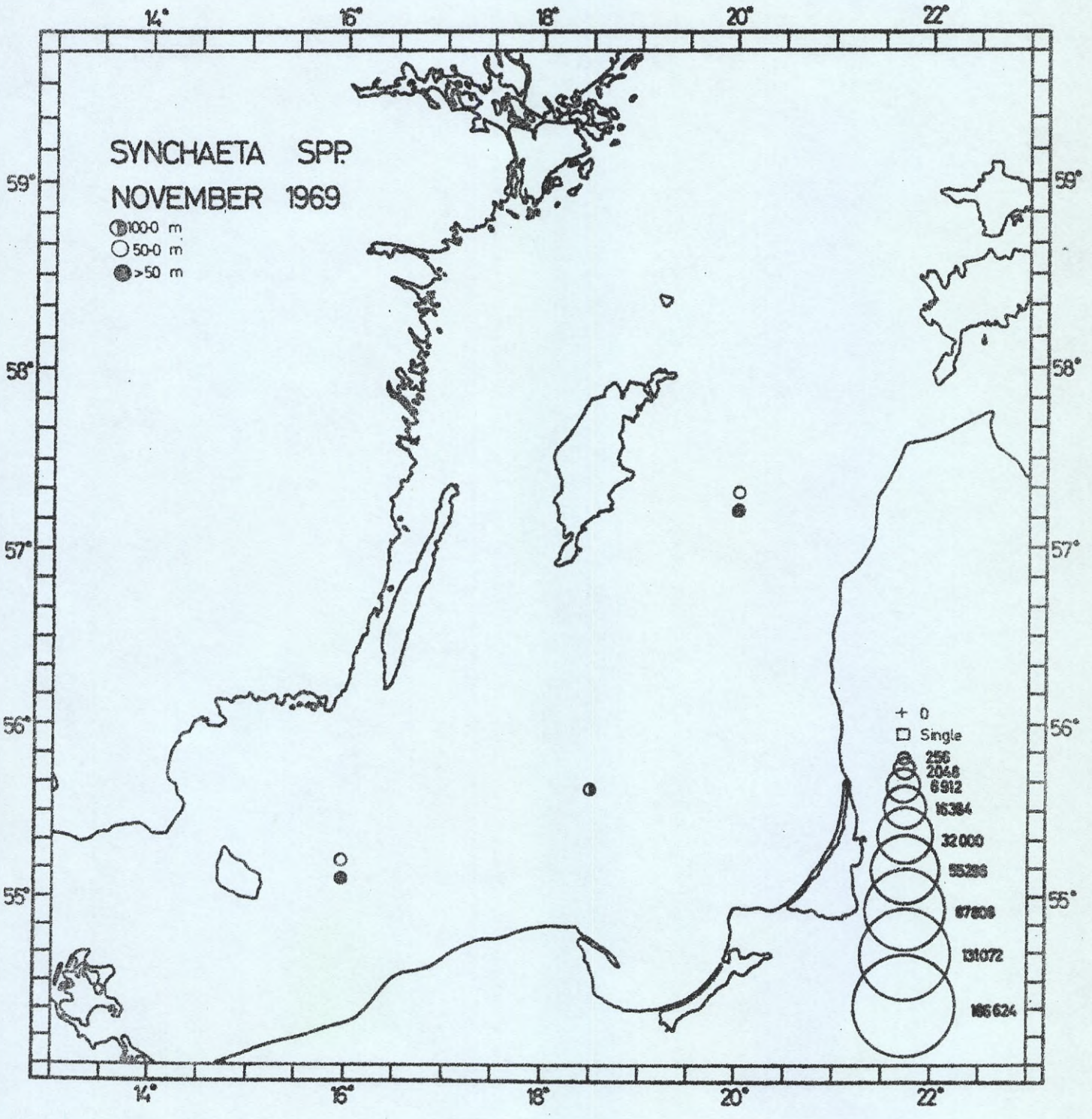
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Fig 5.

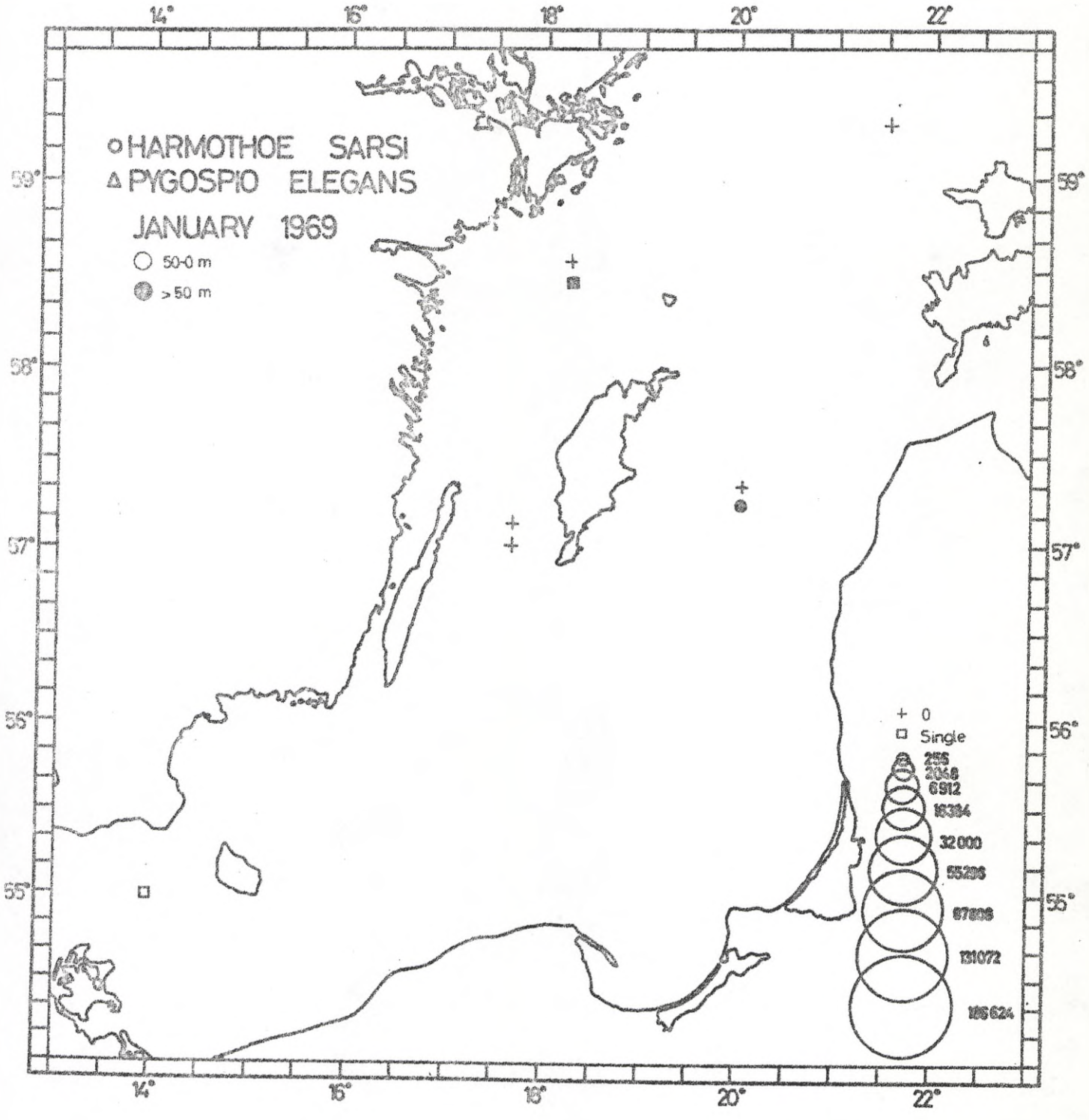
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Fig 6.

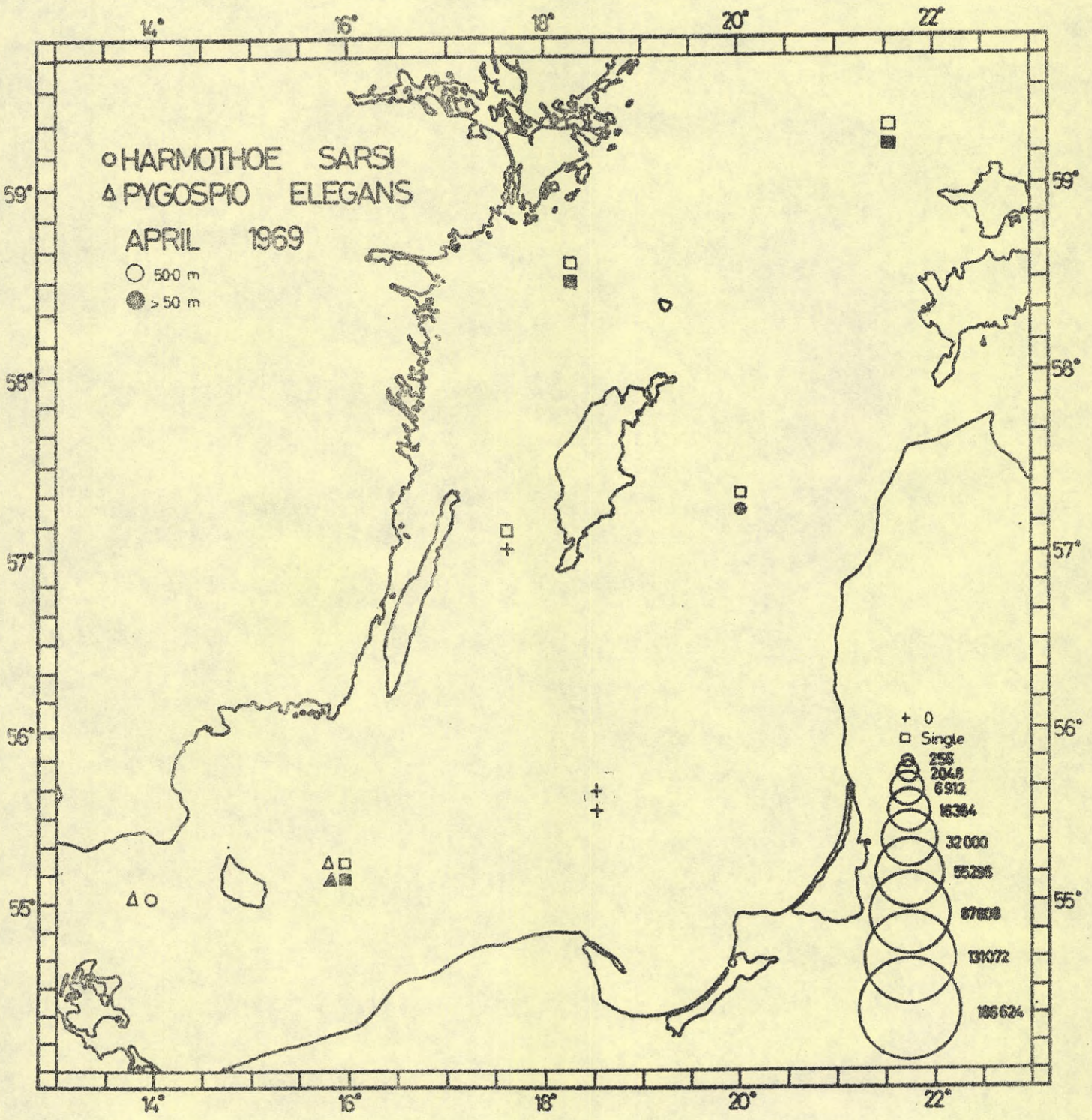
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Fig 7.

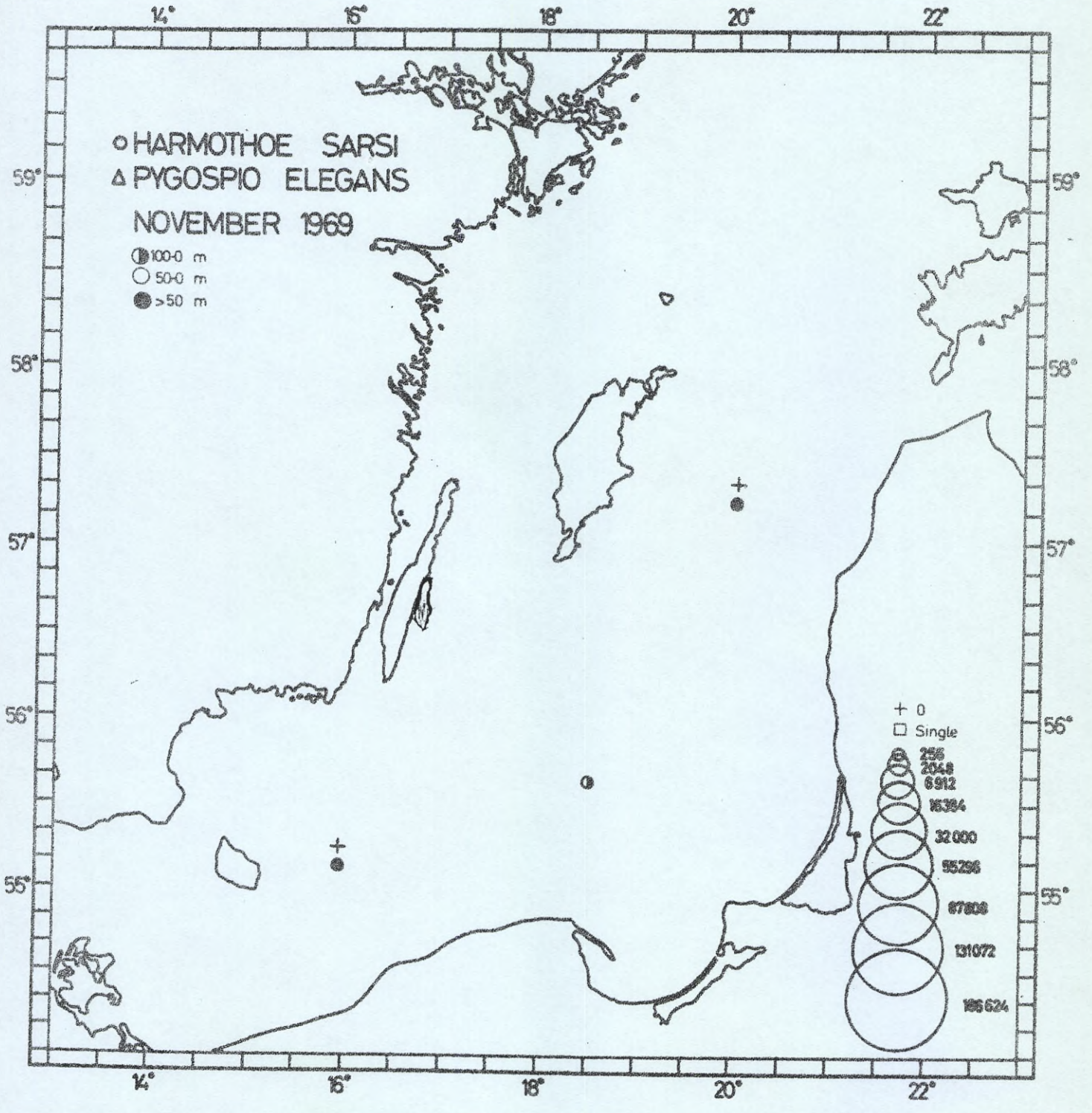
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Fig 8.

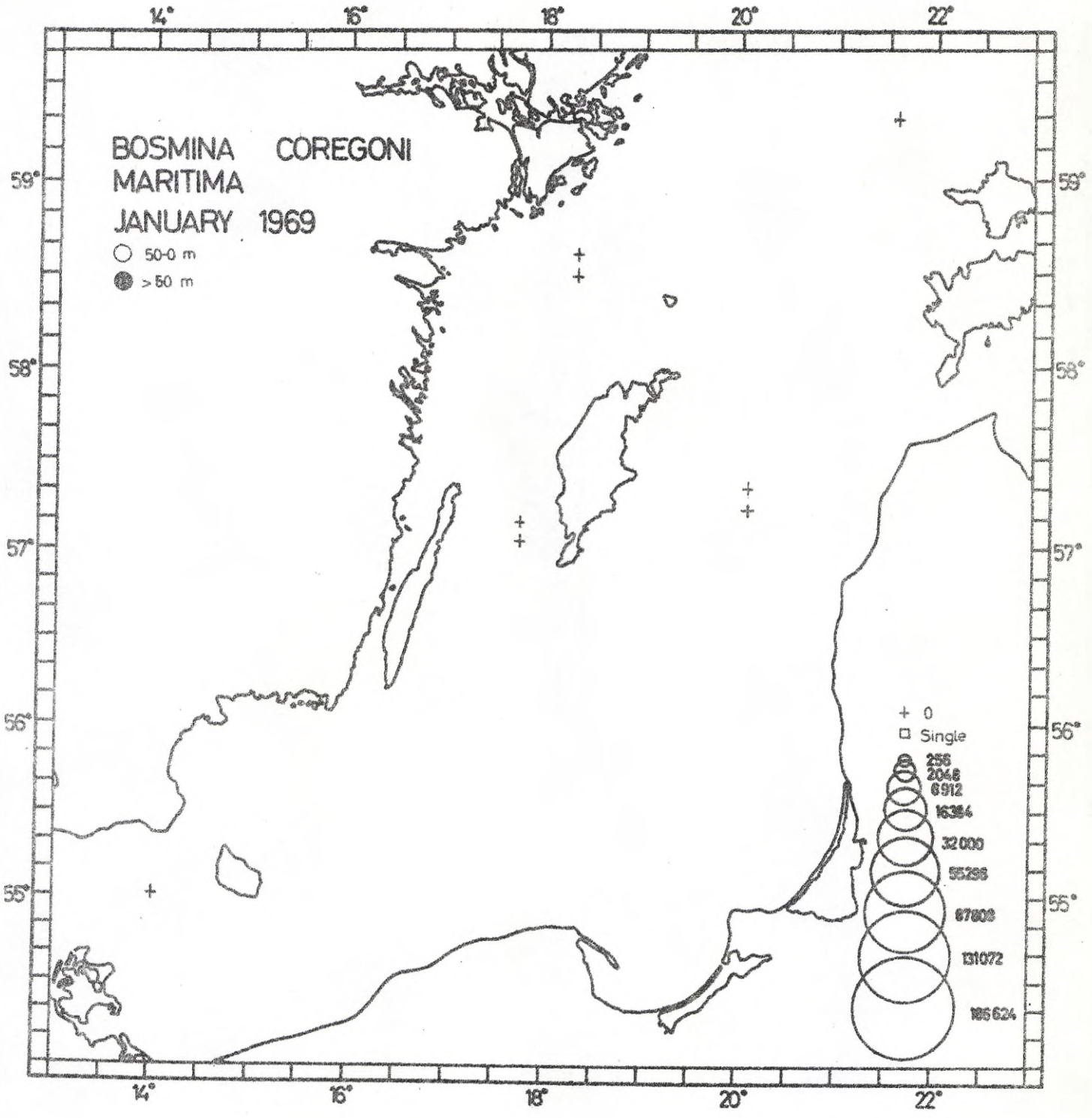
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Fig 9.

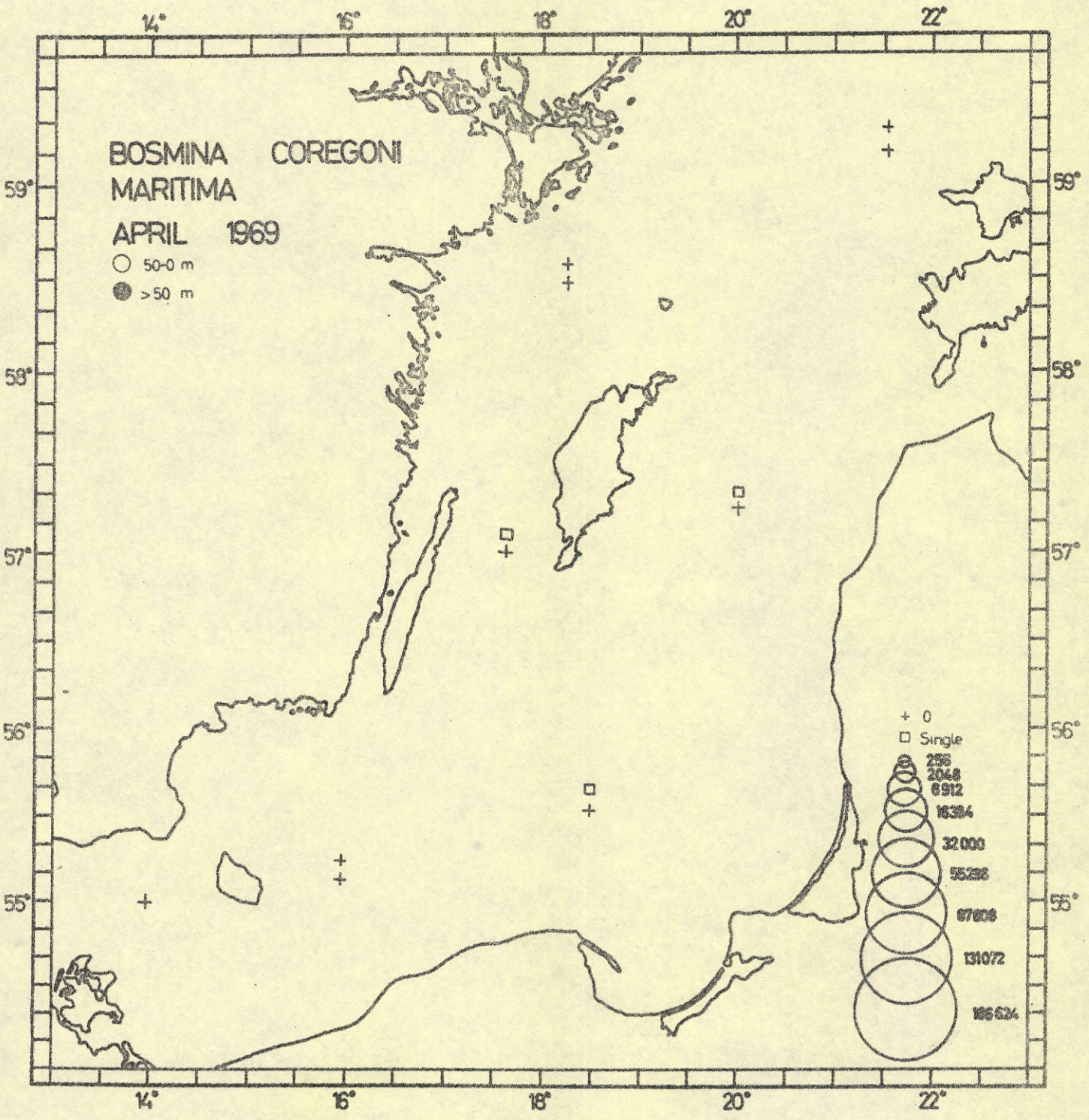
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Fig 10.

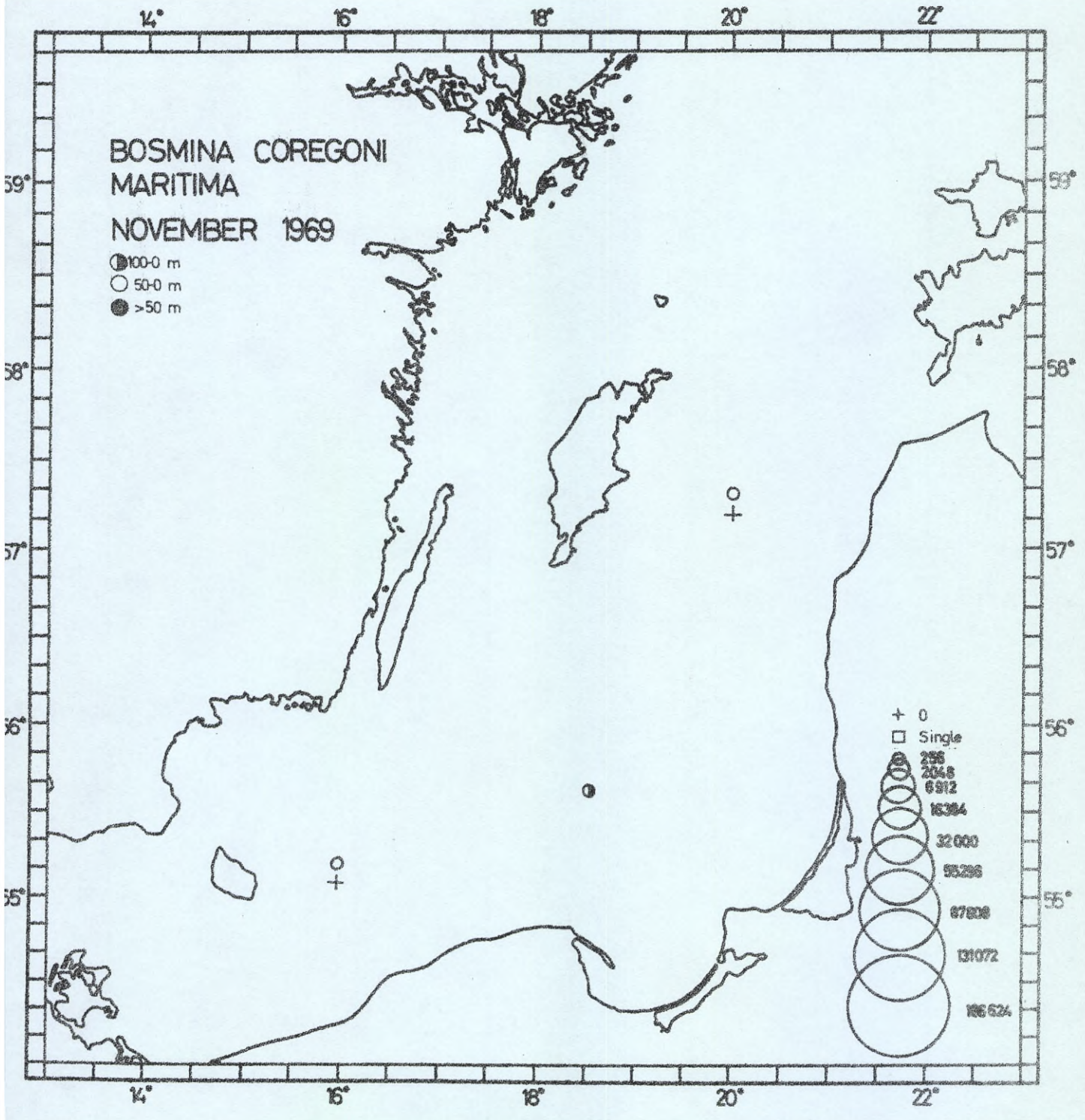
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Fig 11.

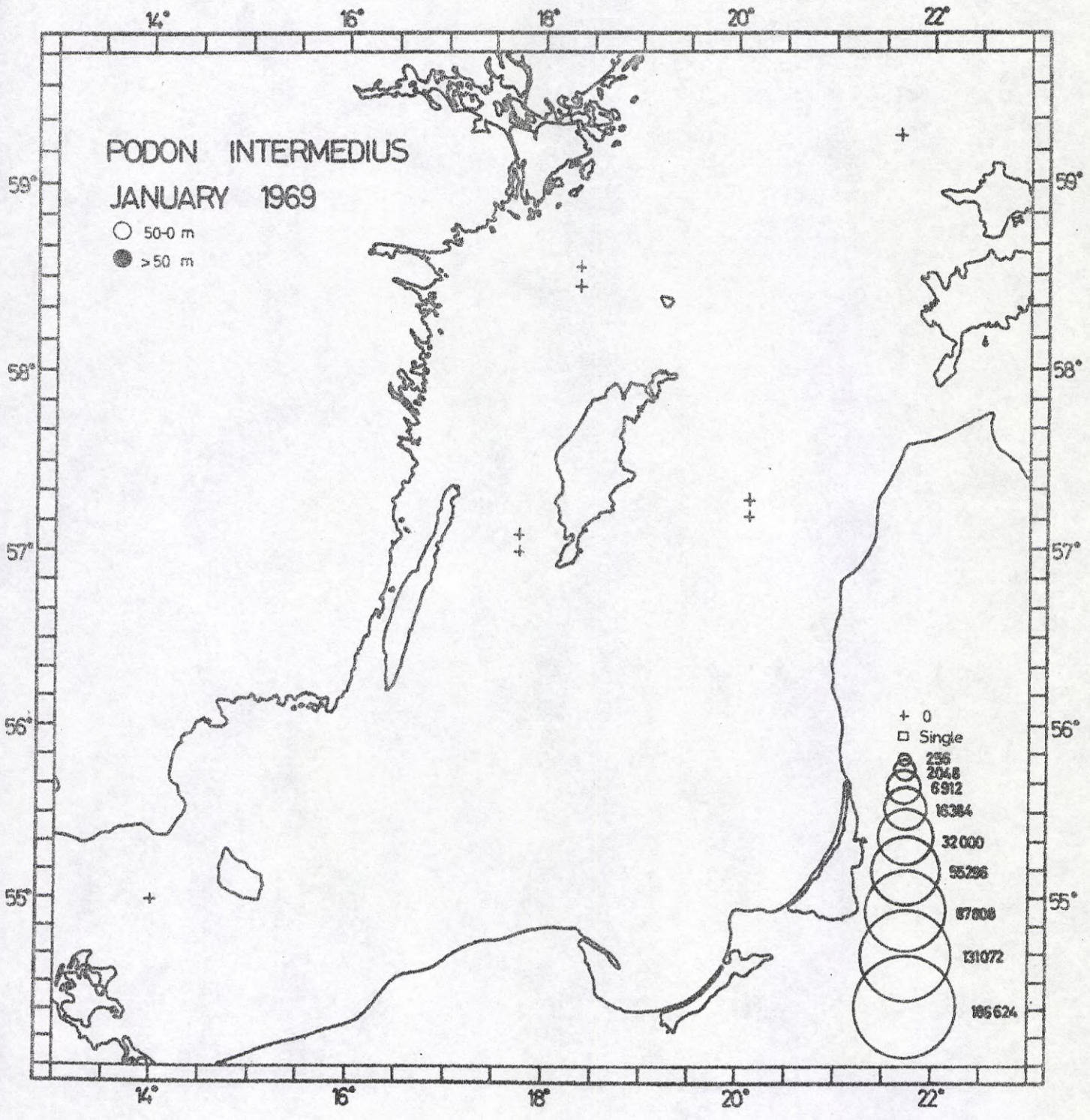
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Fig 12.

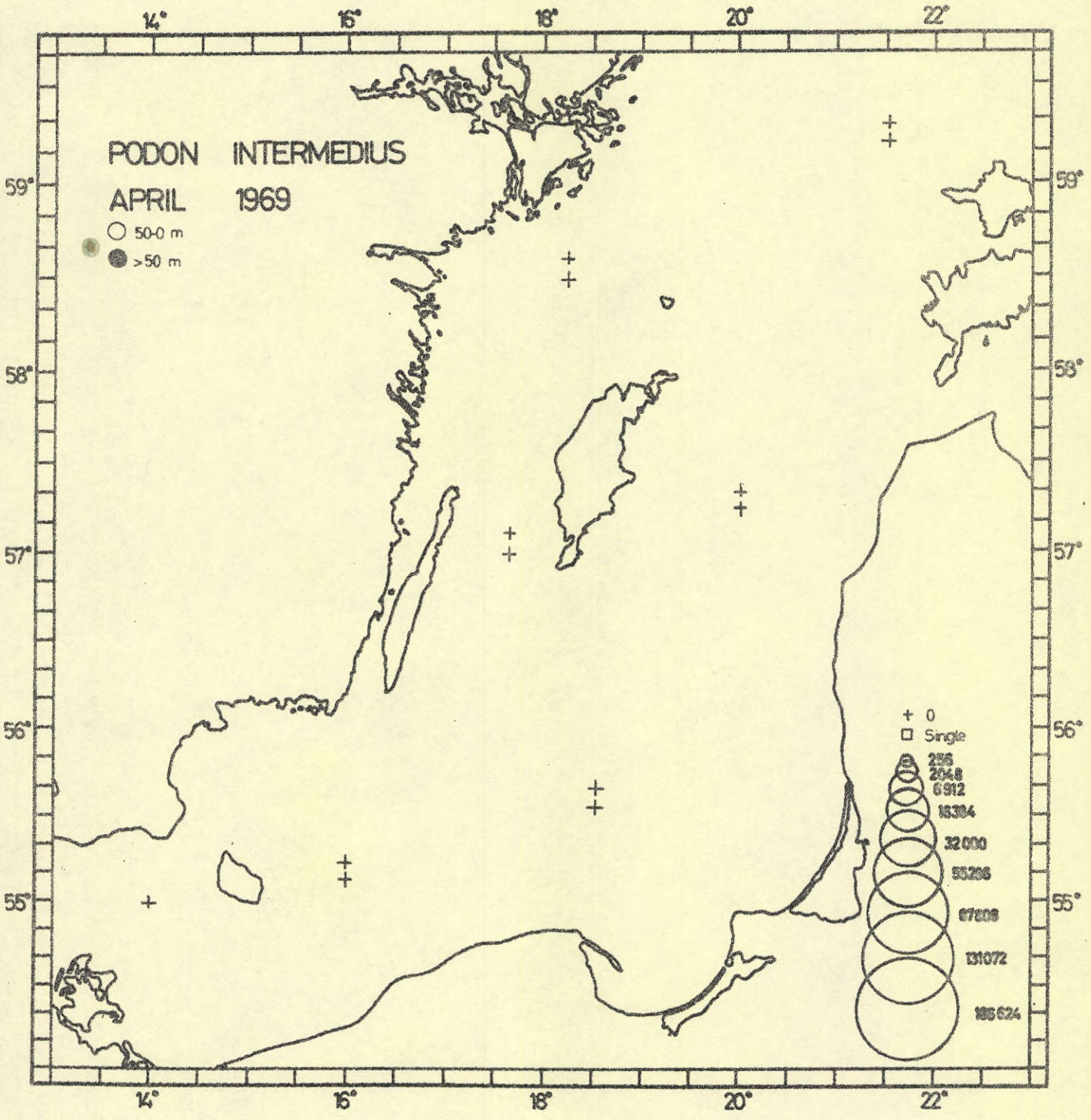
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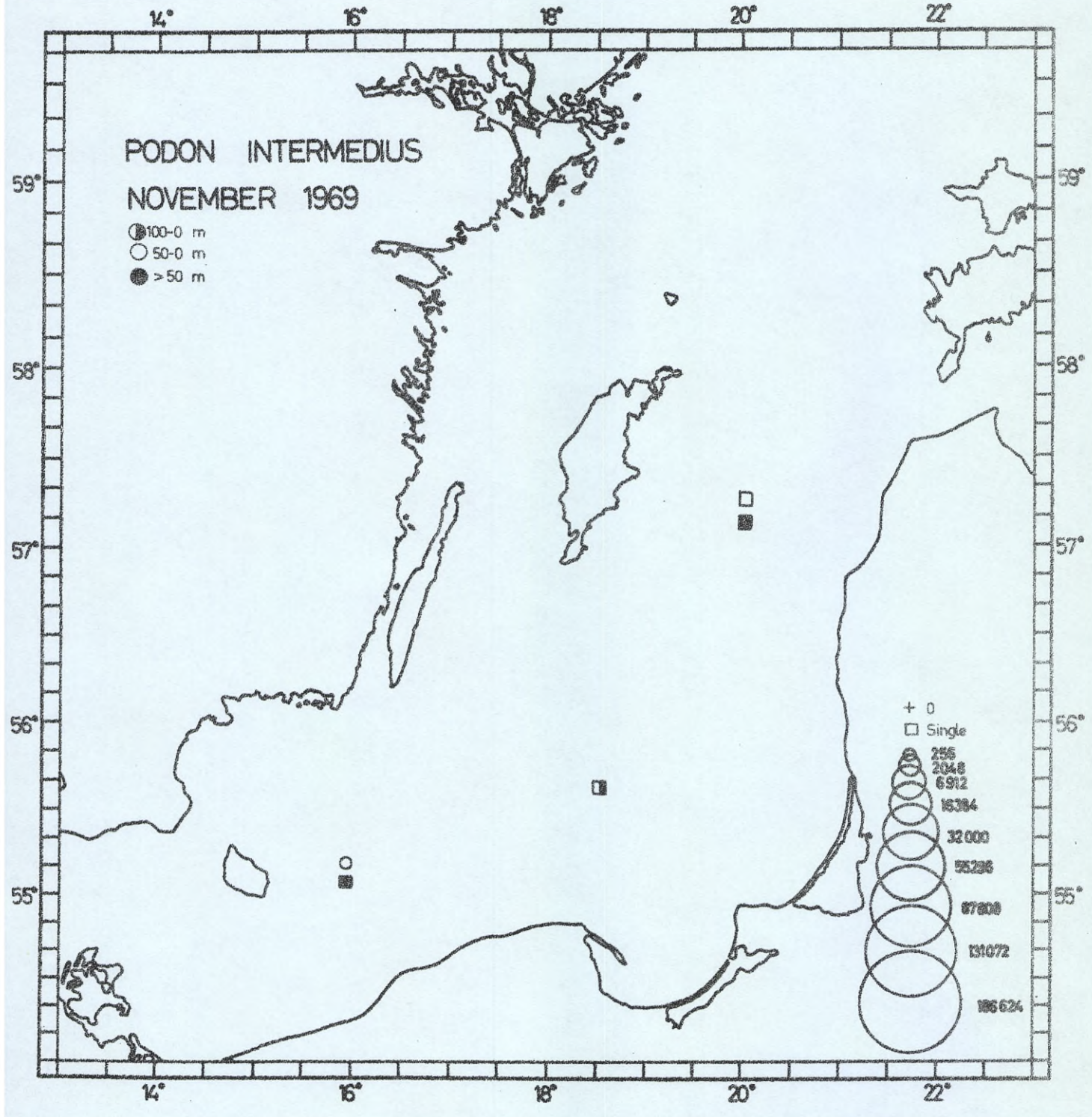
Fig 13.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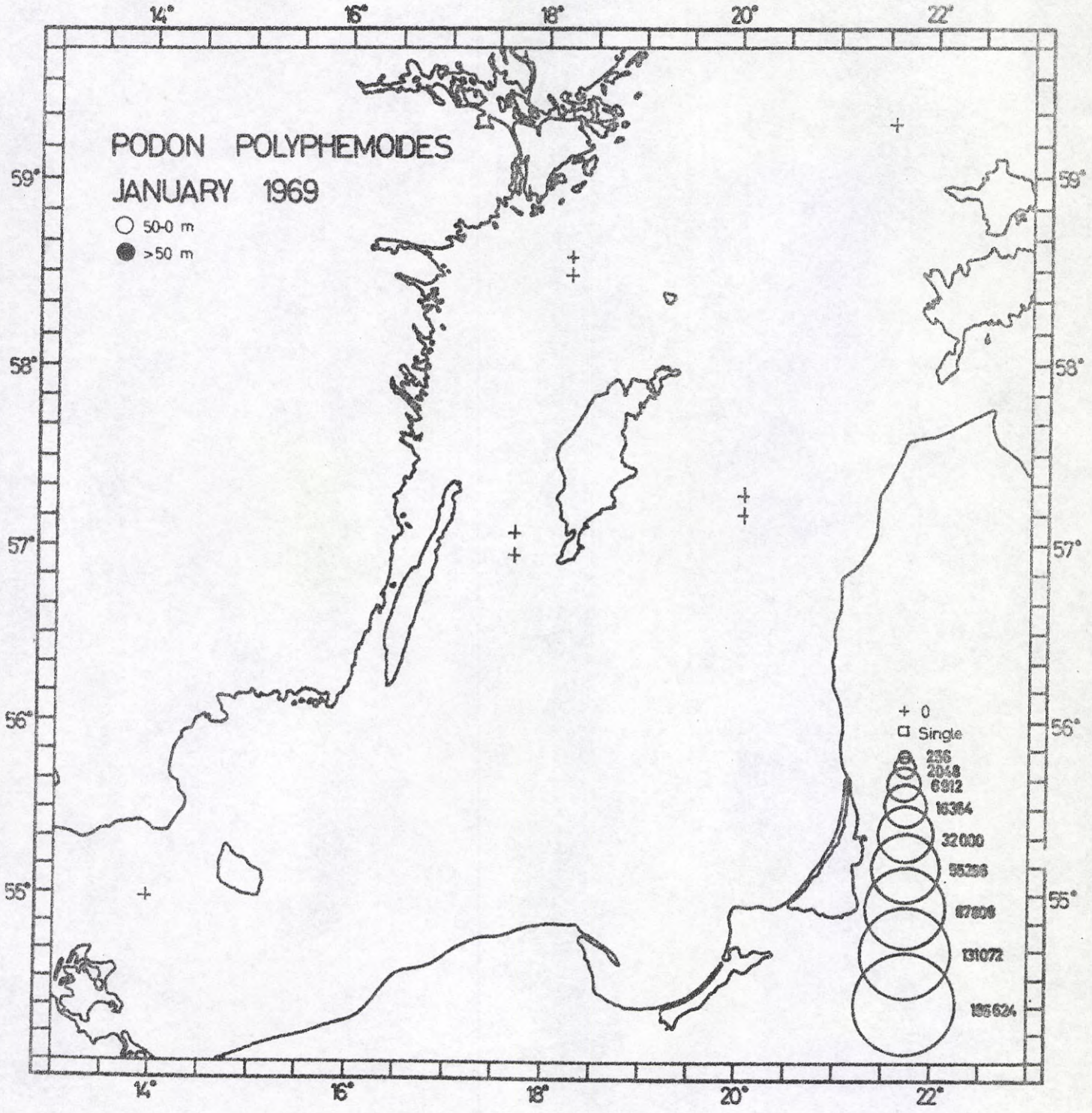
186624

Fig 14.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JANUARY 1969
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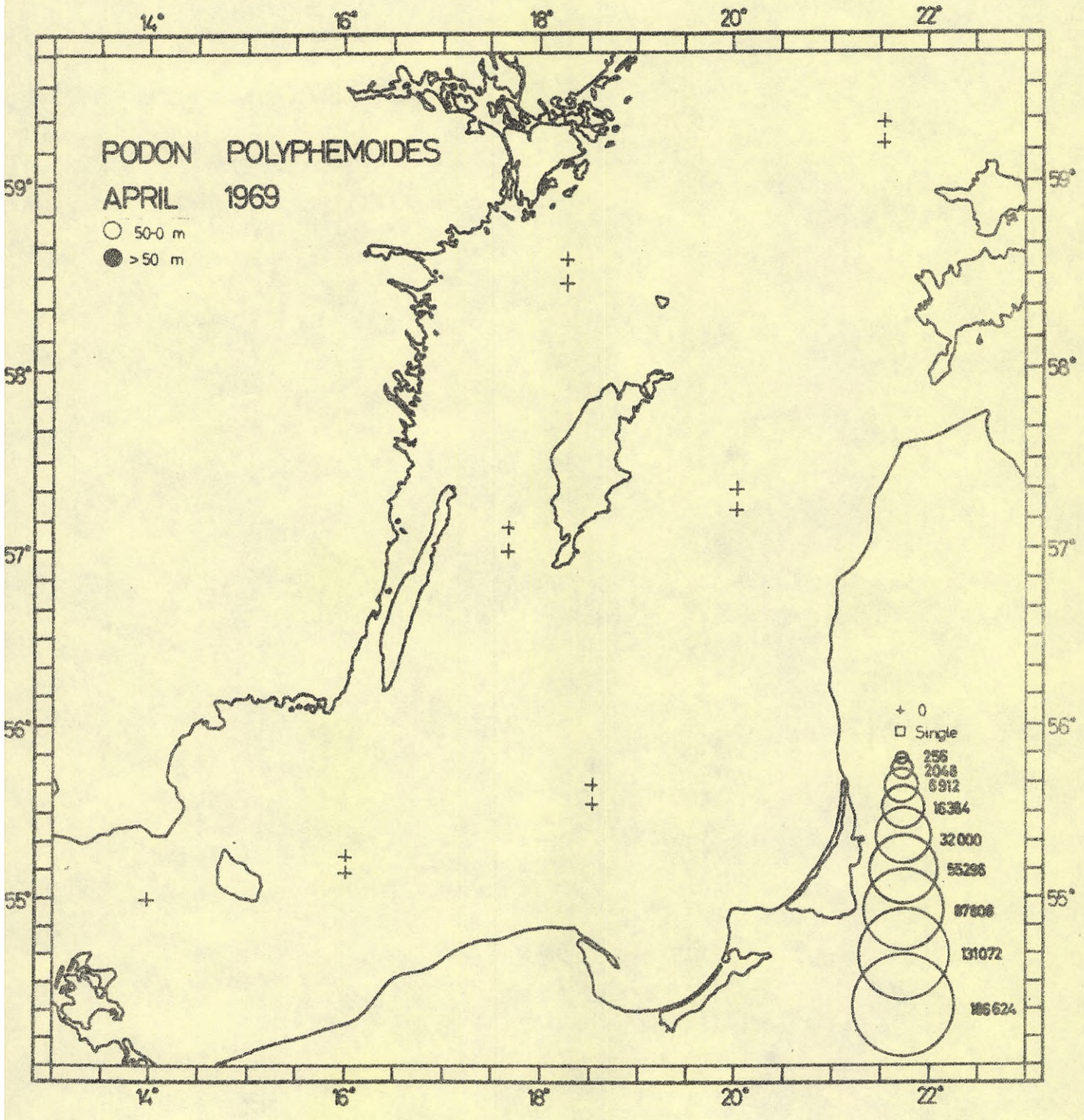
Fig 15.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PODON POLYPHEMOIDES
APRIL 1969
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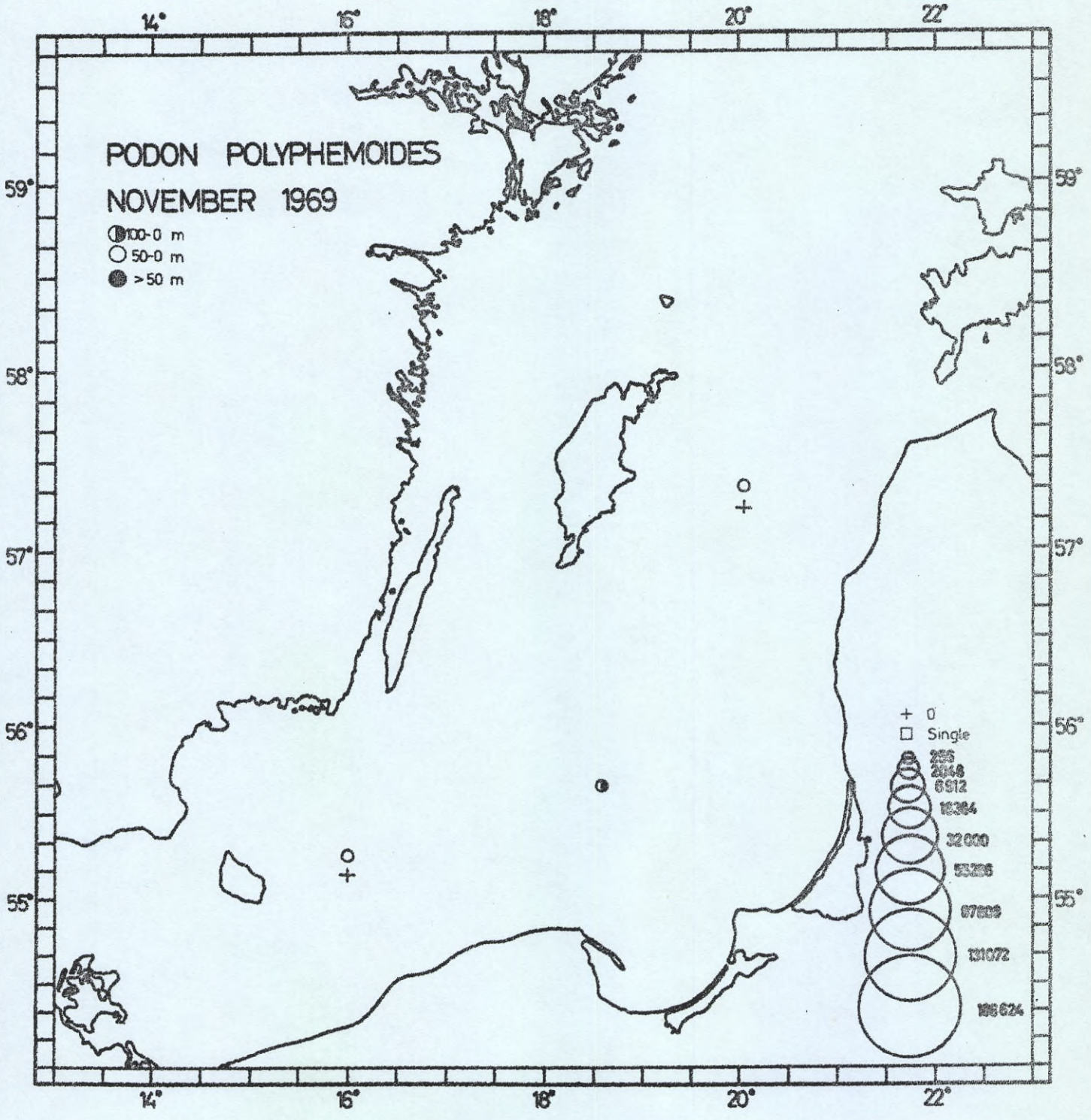
Fig 16.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NOVEMBER 1969
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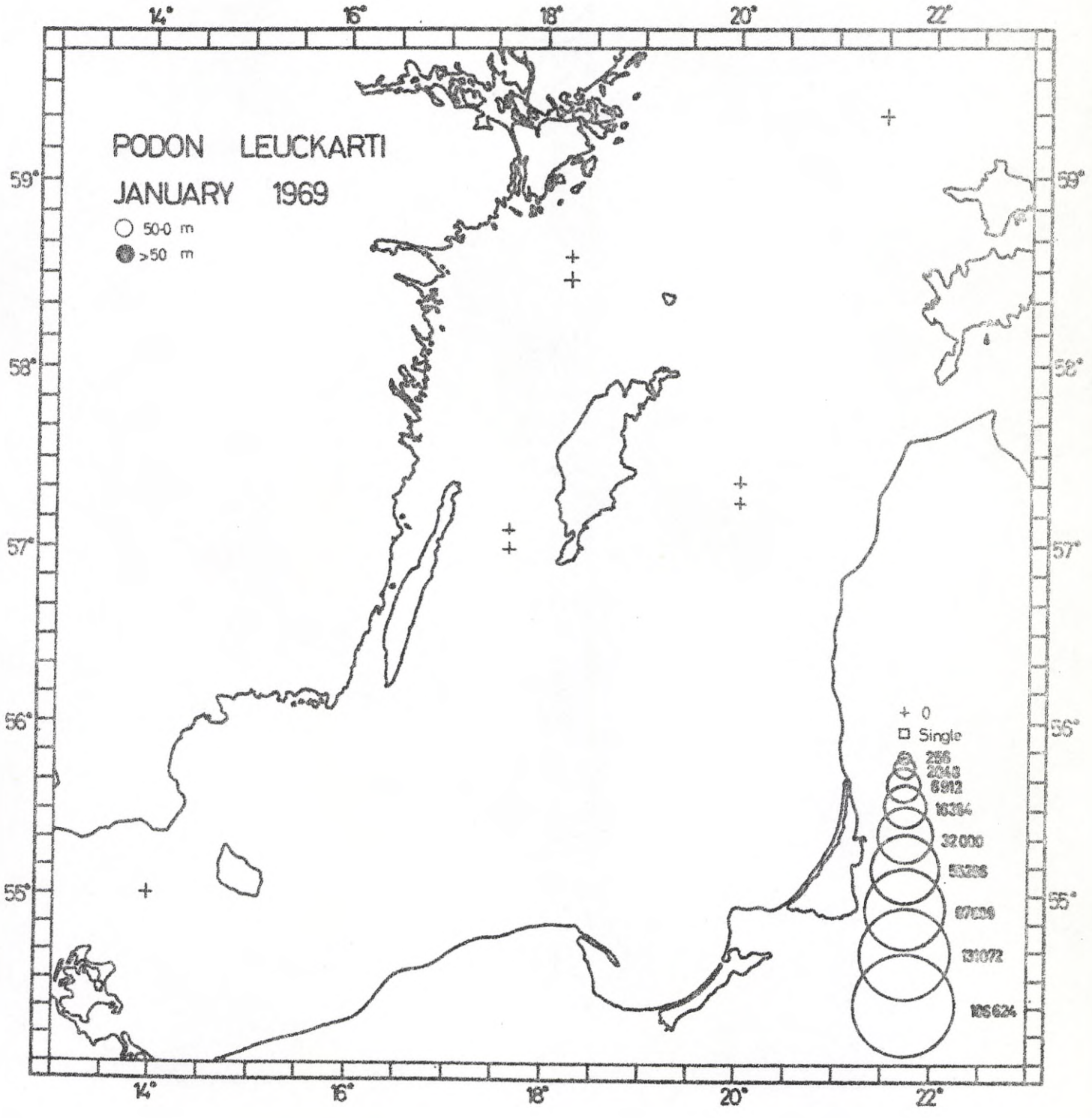
131072
196624

Fig 17.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JANUARY 1969
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Fig 18.

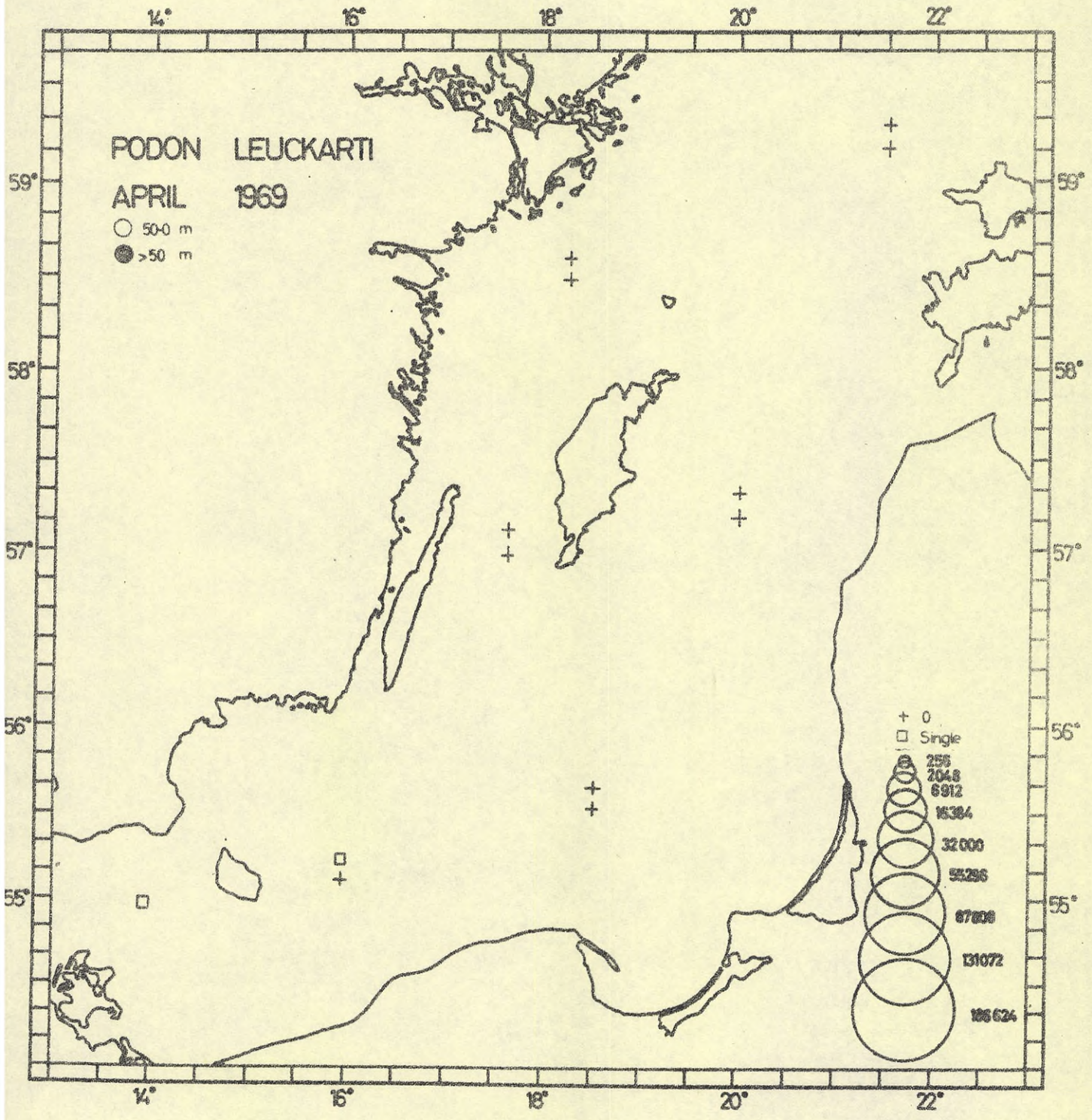
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Fig 19.

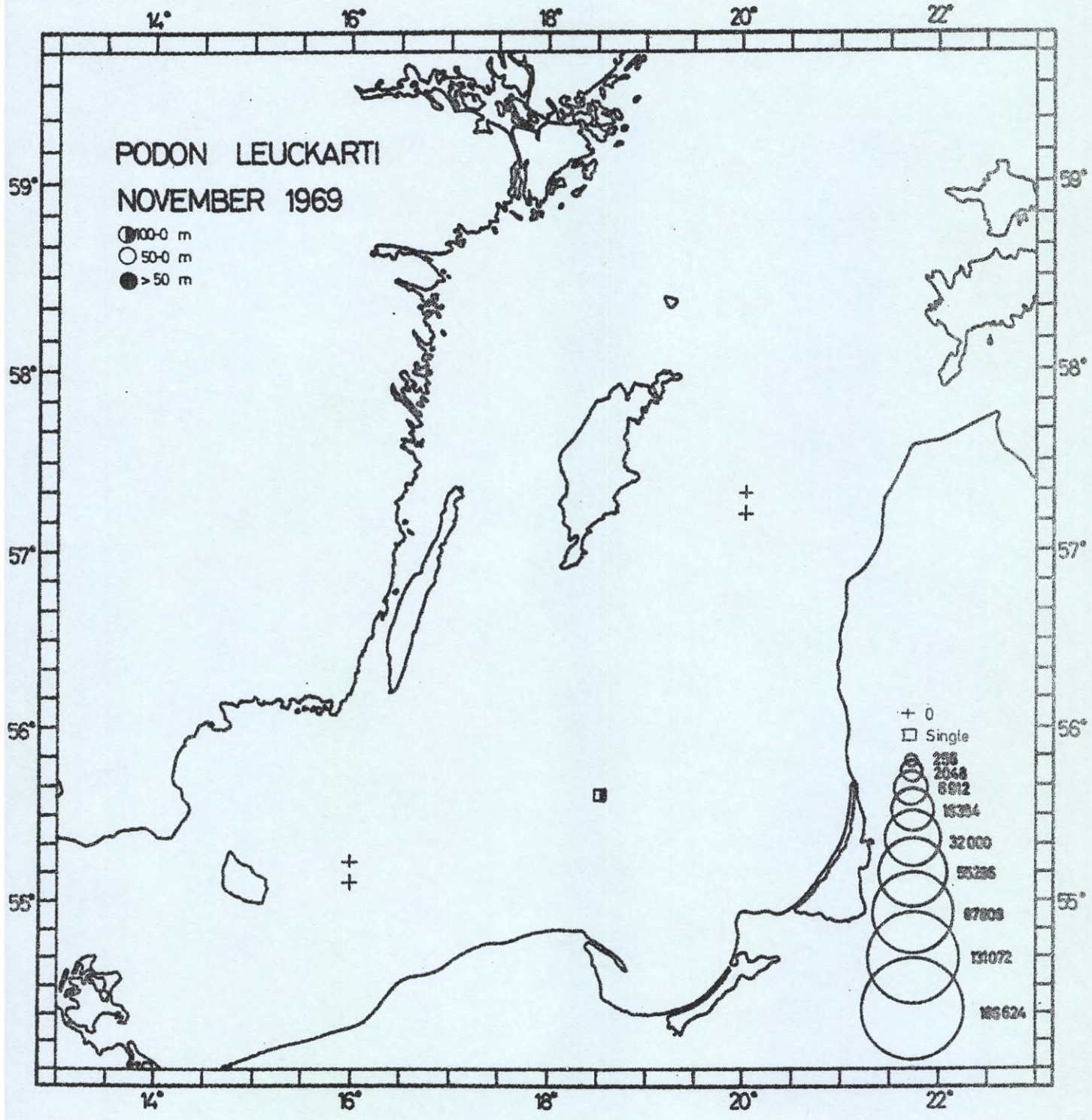
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Fig 20.

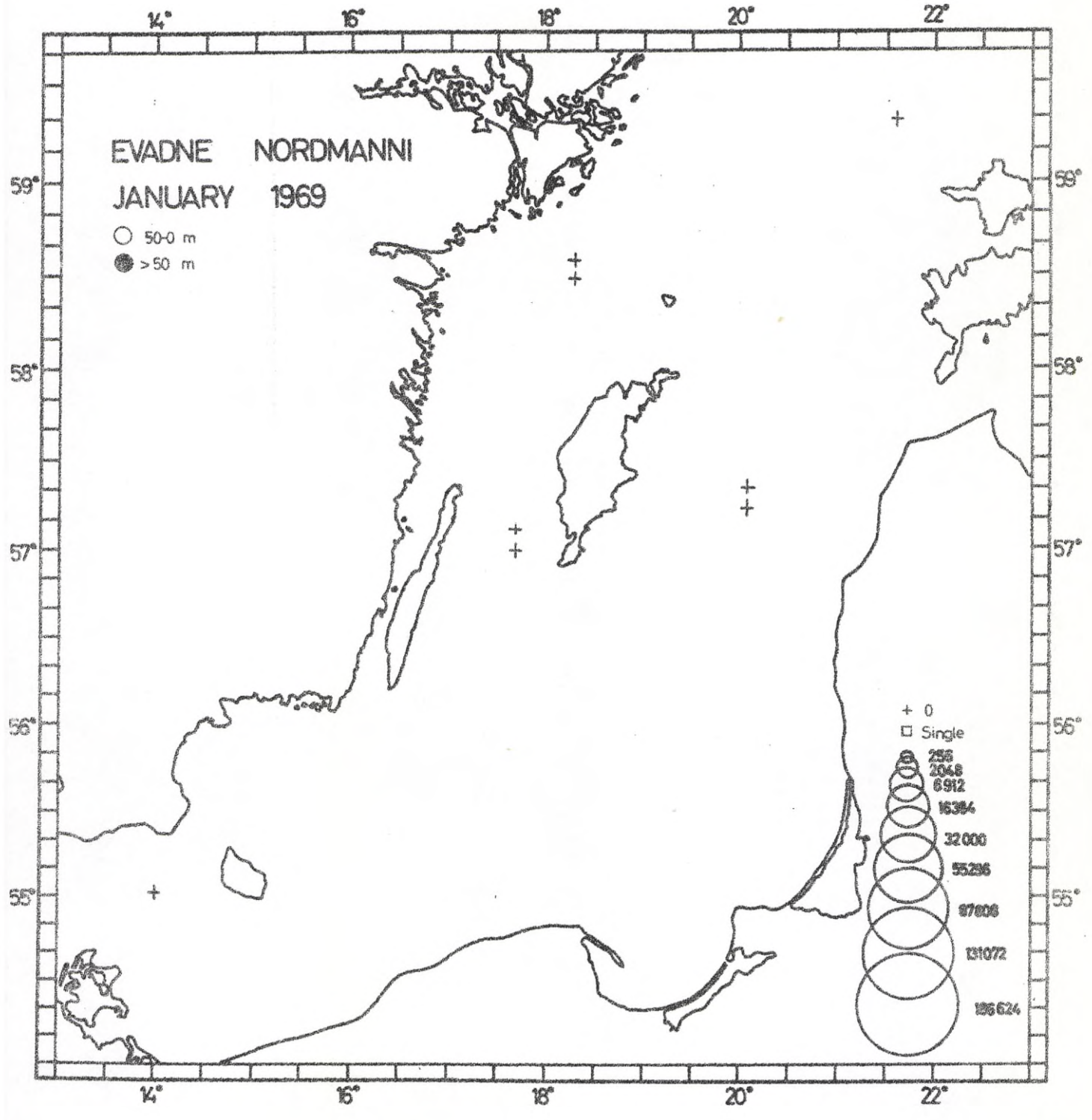
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Fig 21.

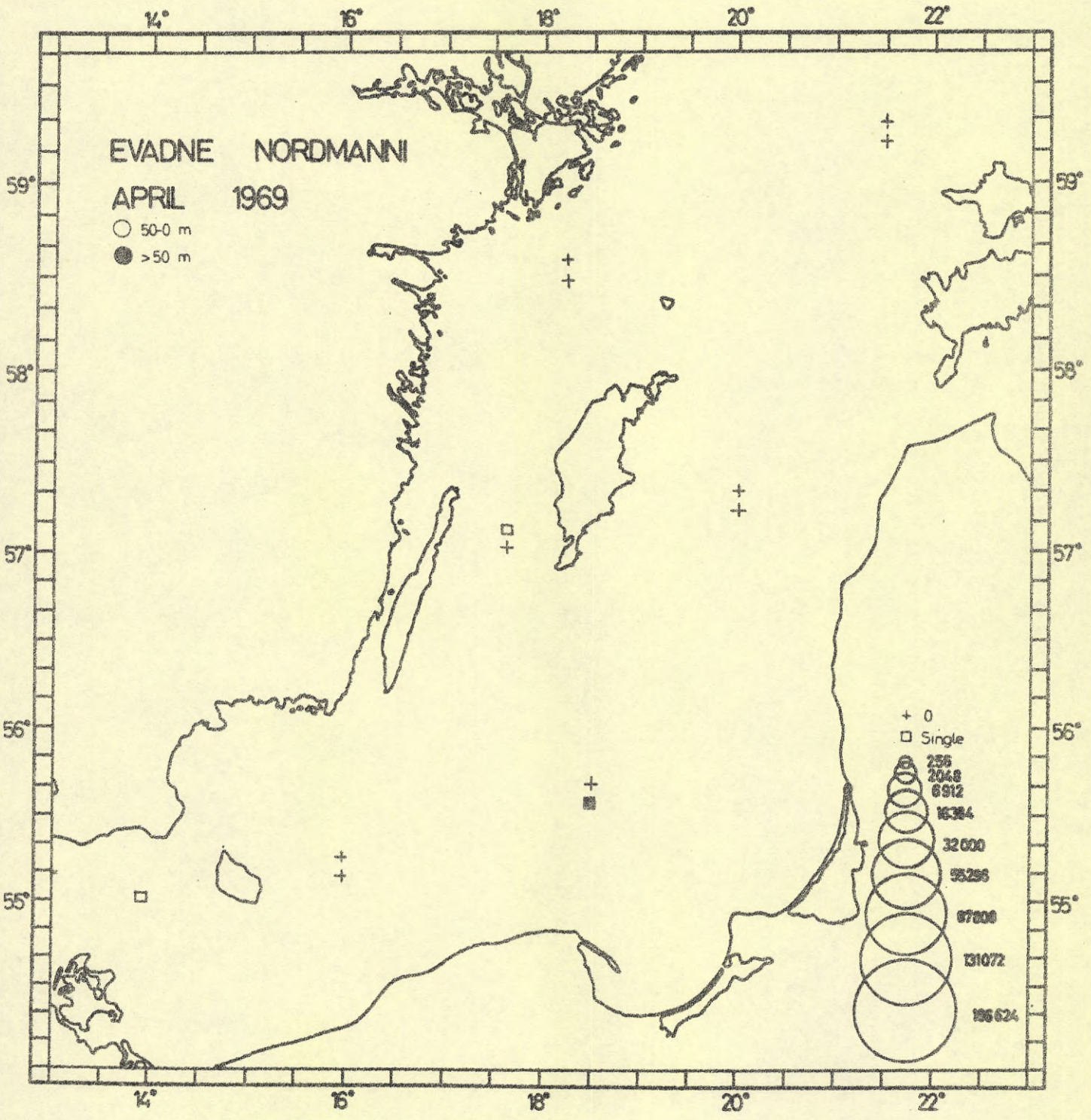
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Fig 22.

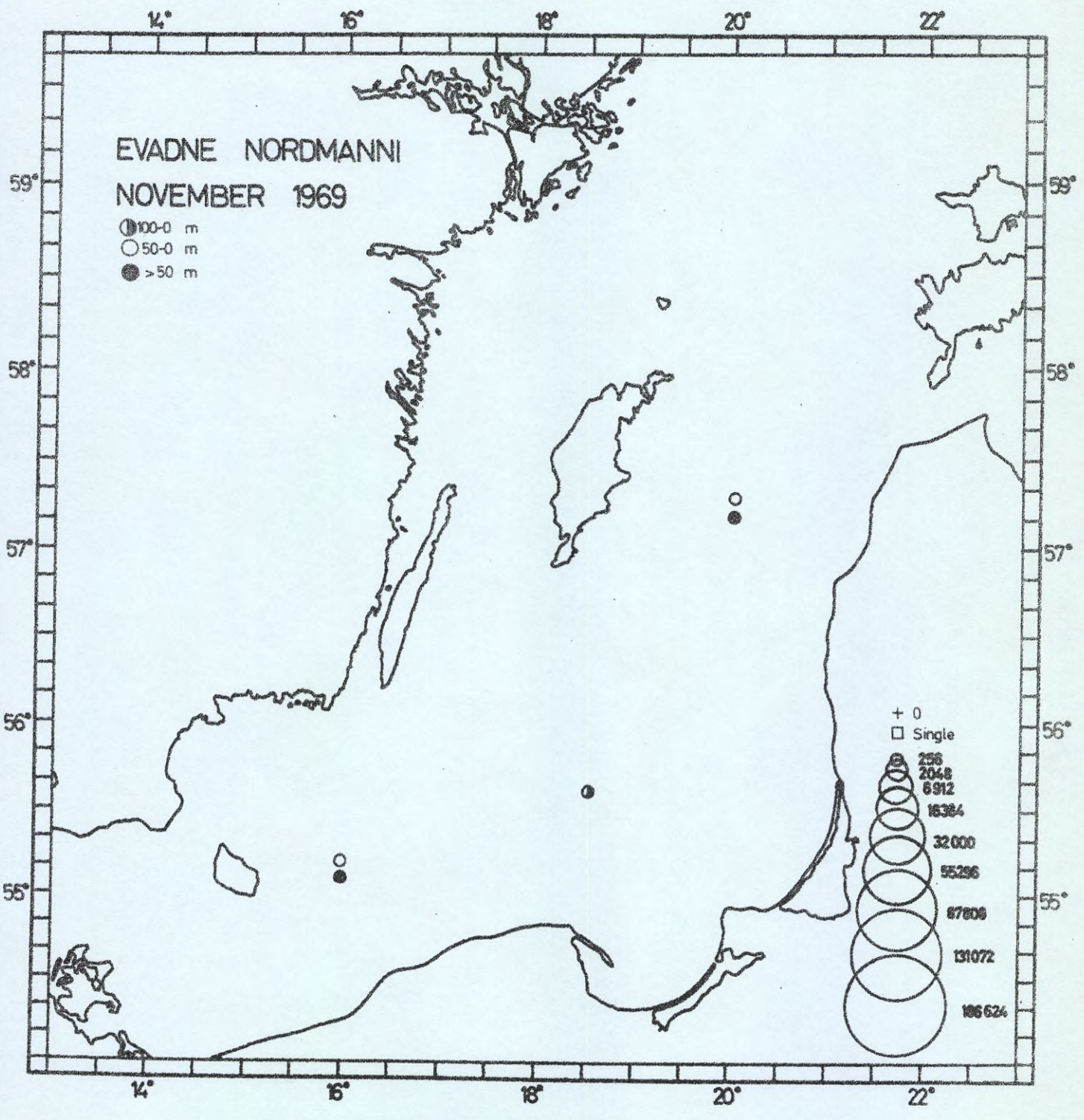
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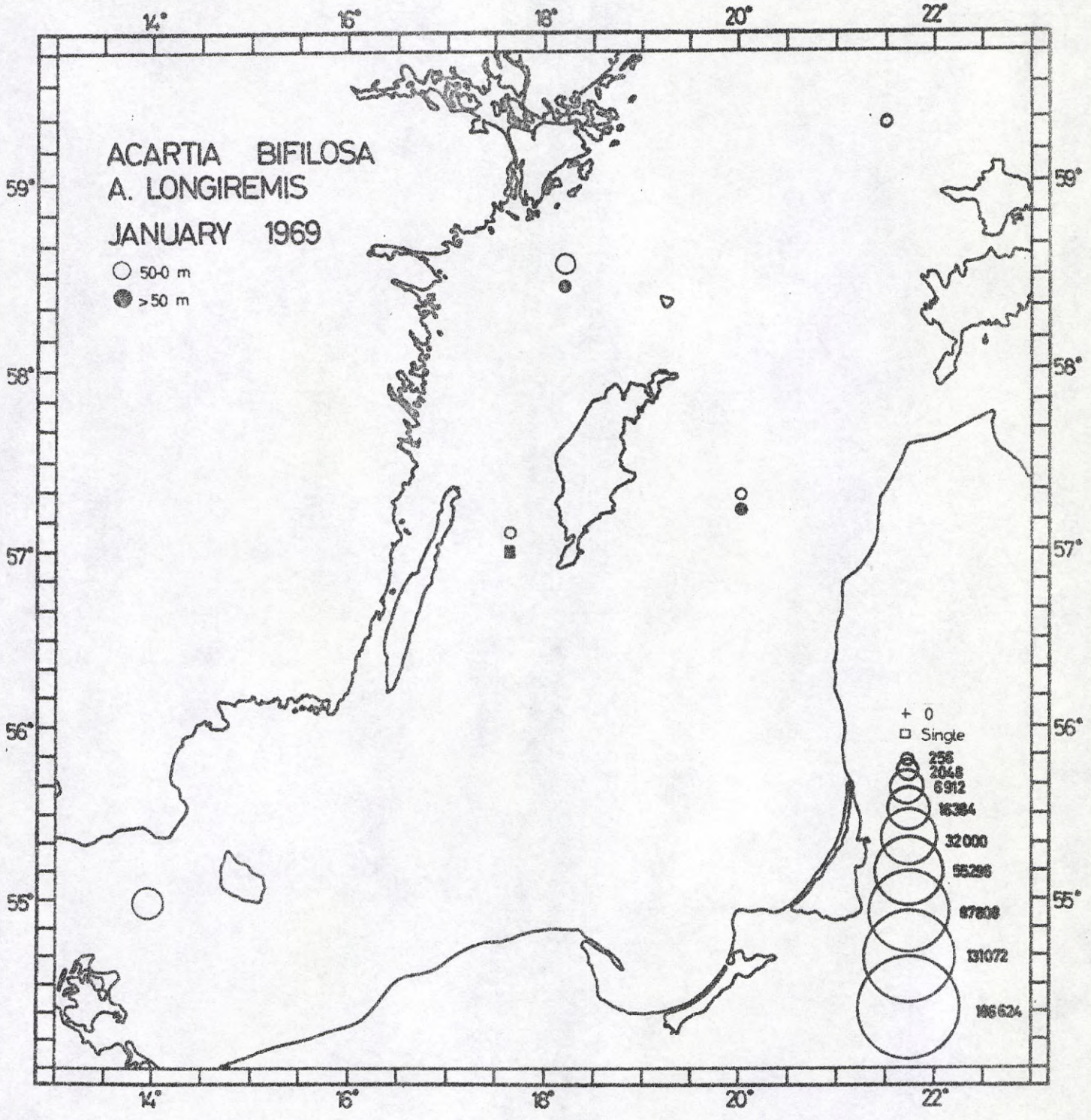
Fig 23.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A. LONGIREMIS
JANUARY 1969
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>50 m
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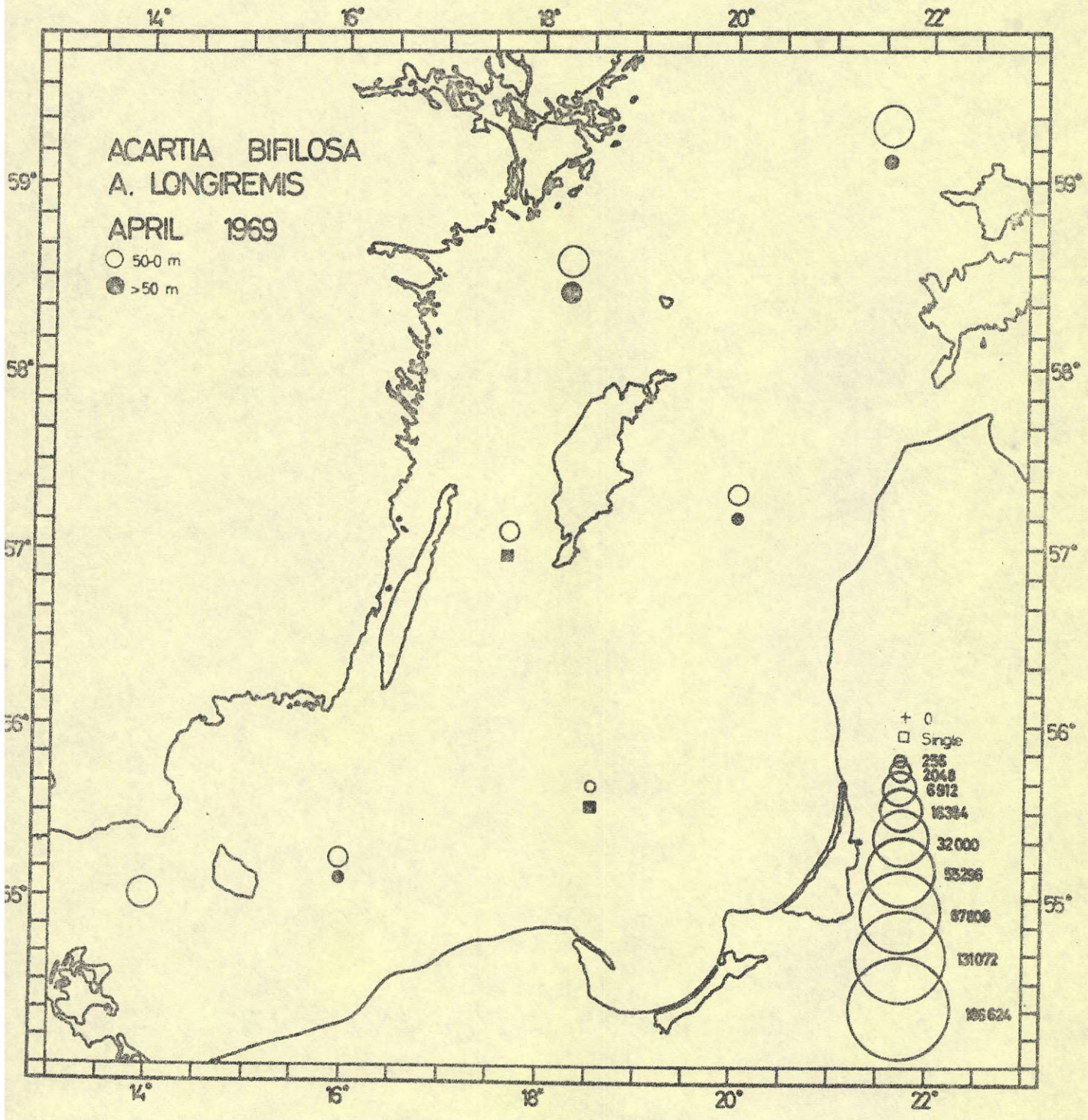
Fig 24.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A. LONGIREMIS
APRIL 1969
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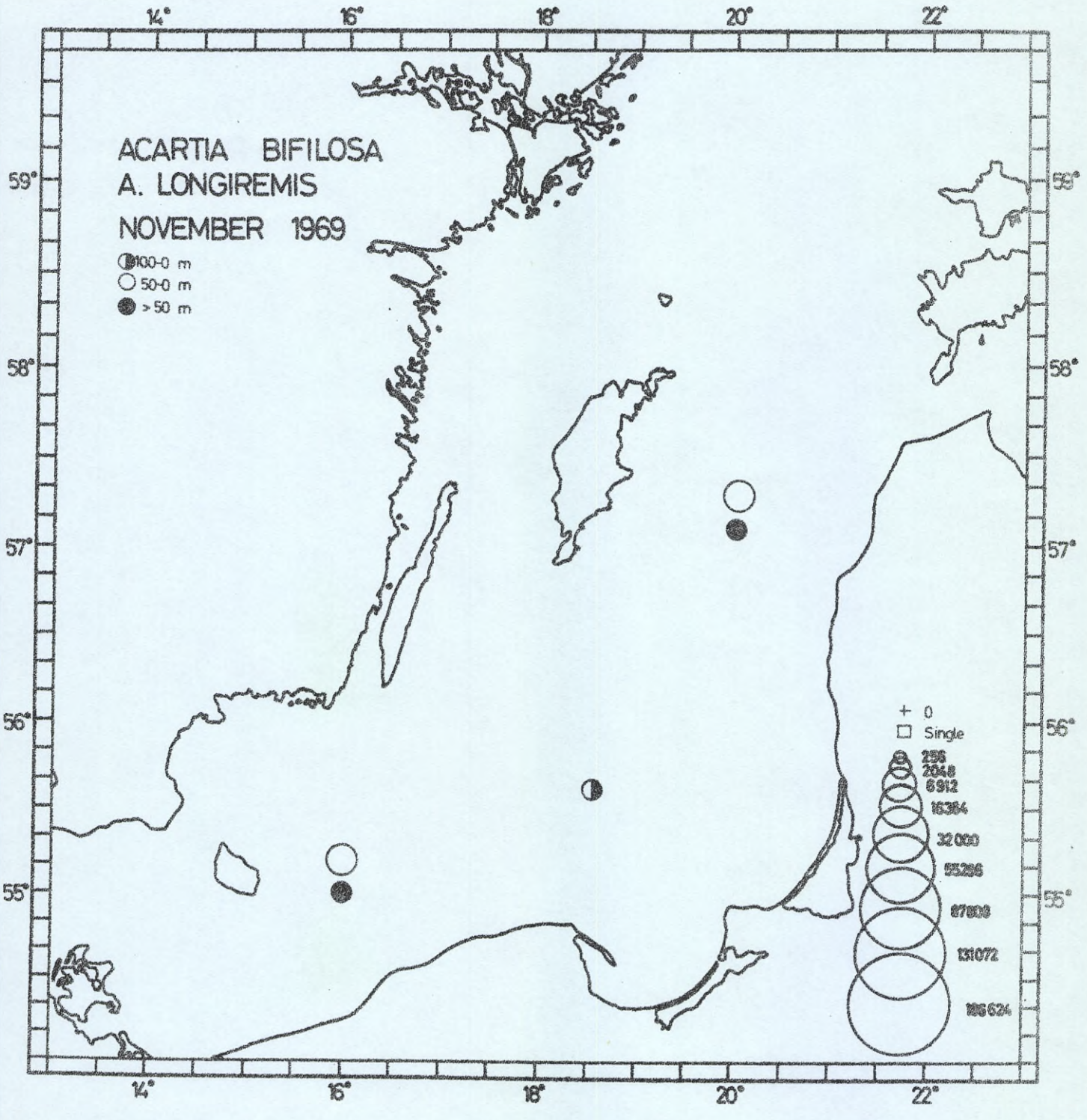
Fig 25.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A. LONGIREMIS
NOVEMBER 1969
100-0 m
50-0 m
>50 m
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Fig 26.

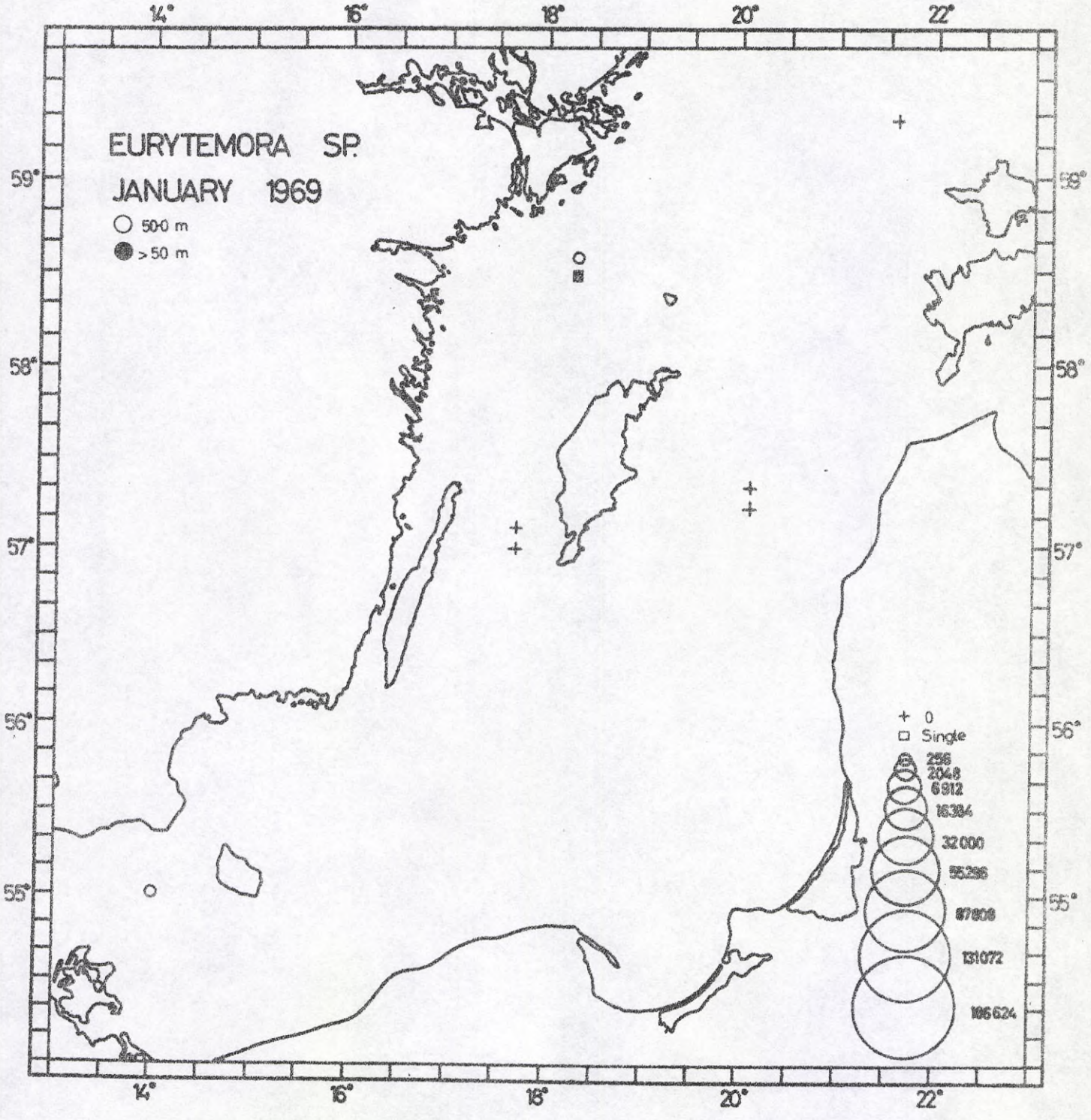
EURYTEMORA SP.
JANUARY 1969
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Fig 27.

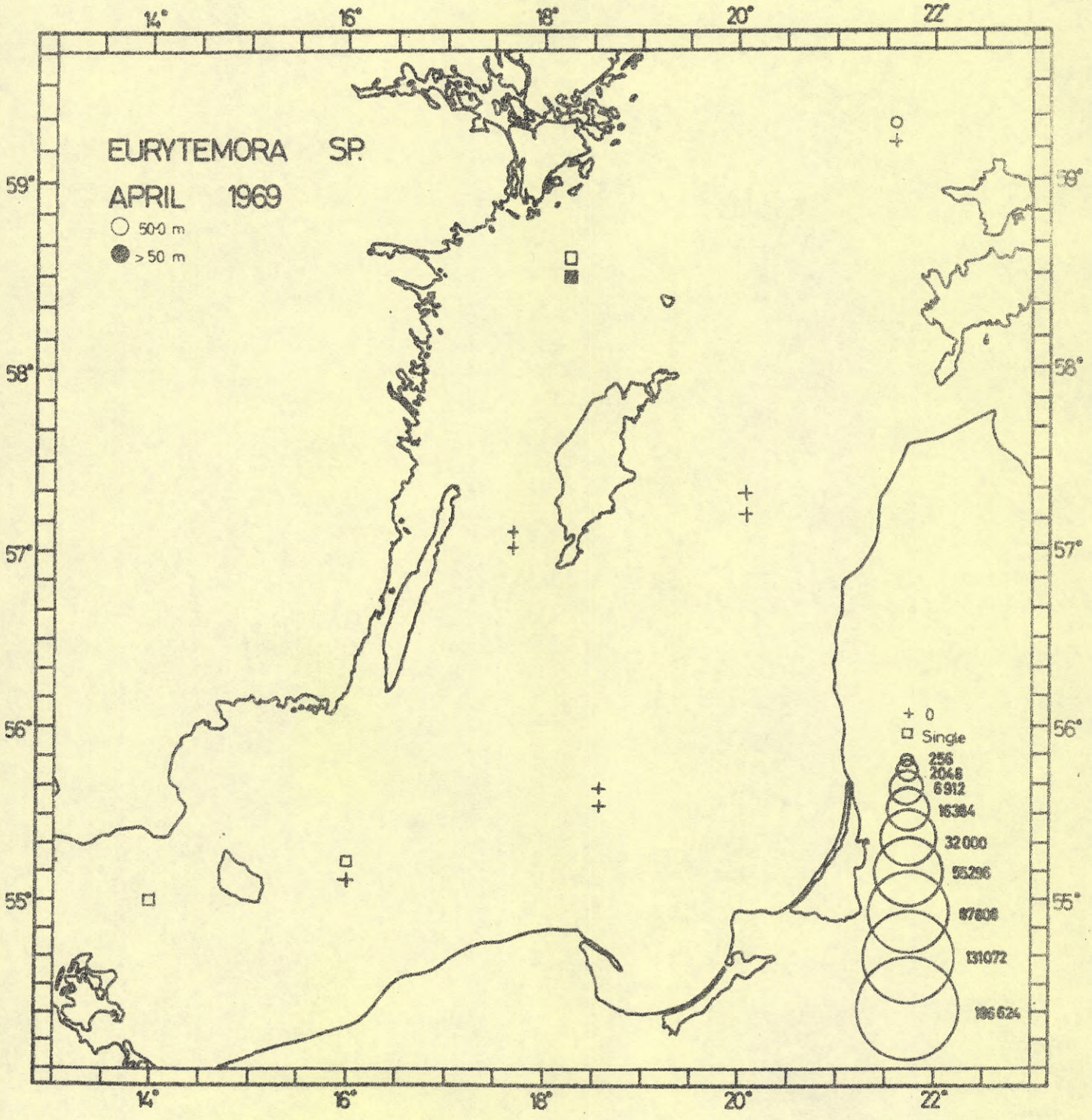
EURYTEMORA SP.
APRIL 1969
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Fig 28.

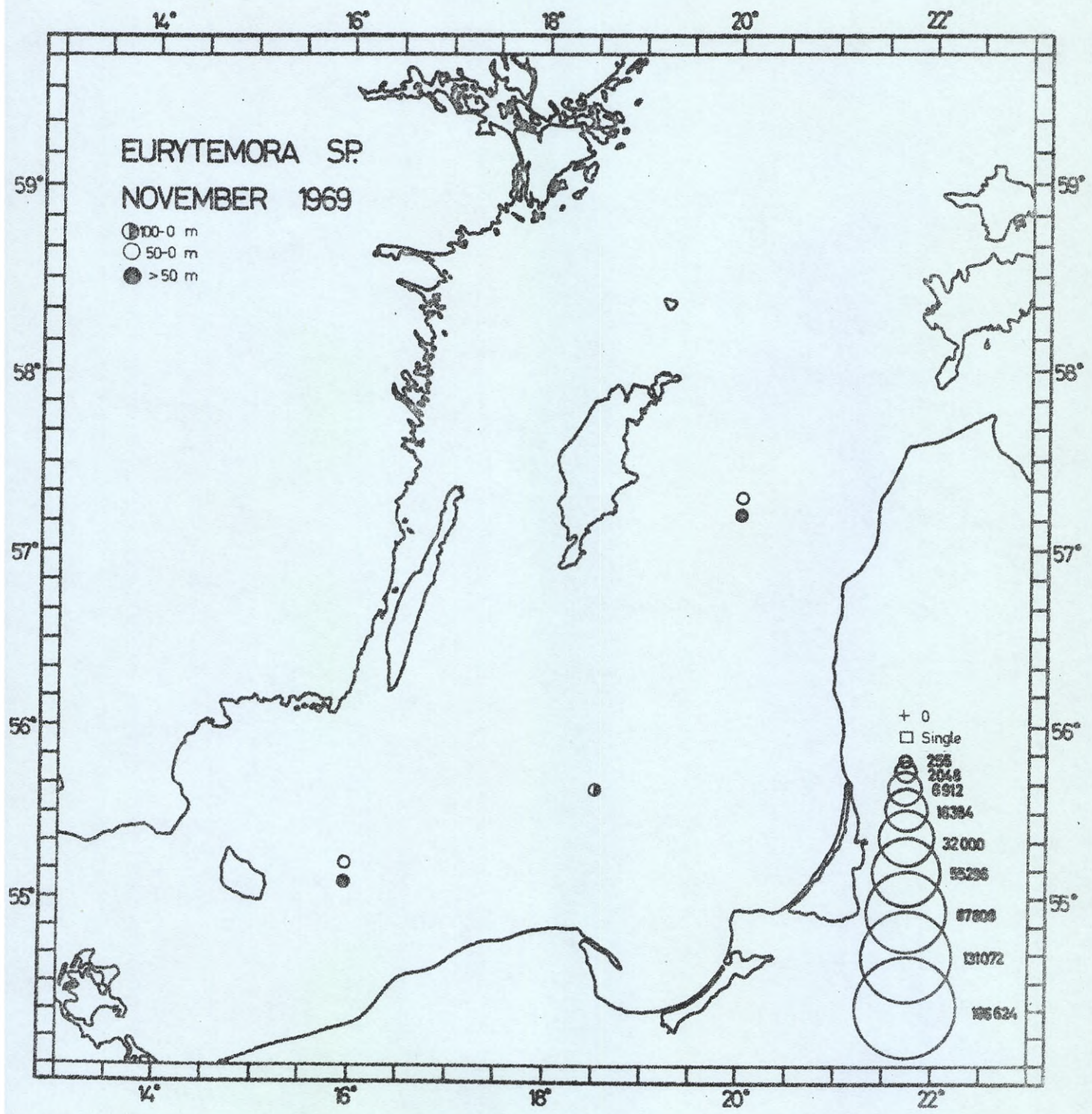
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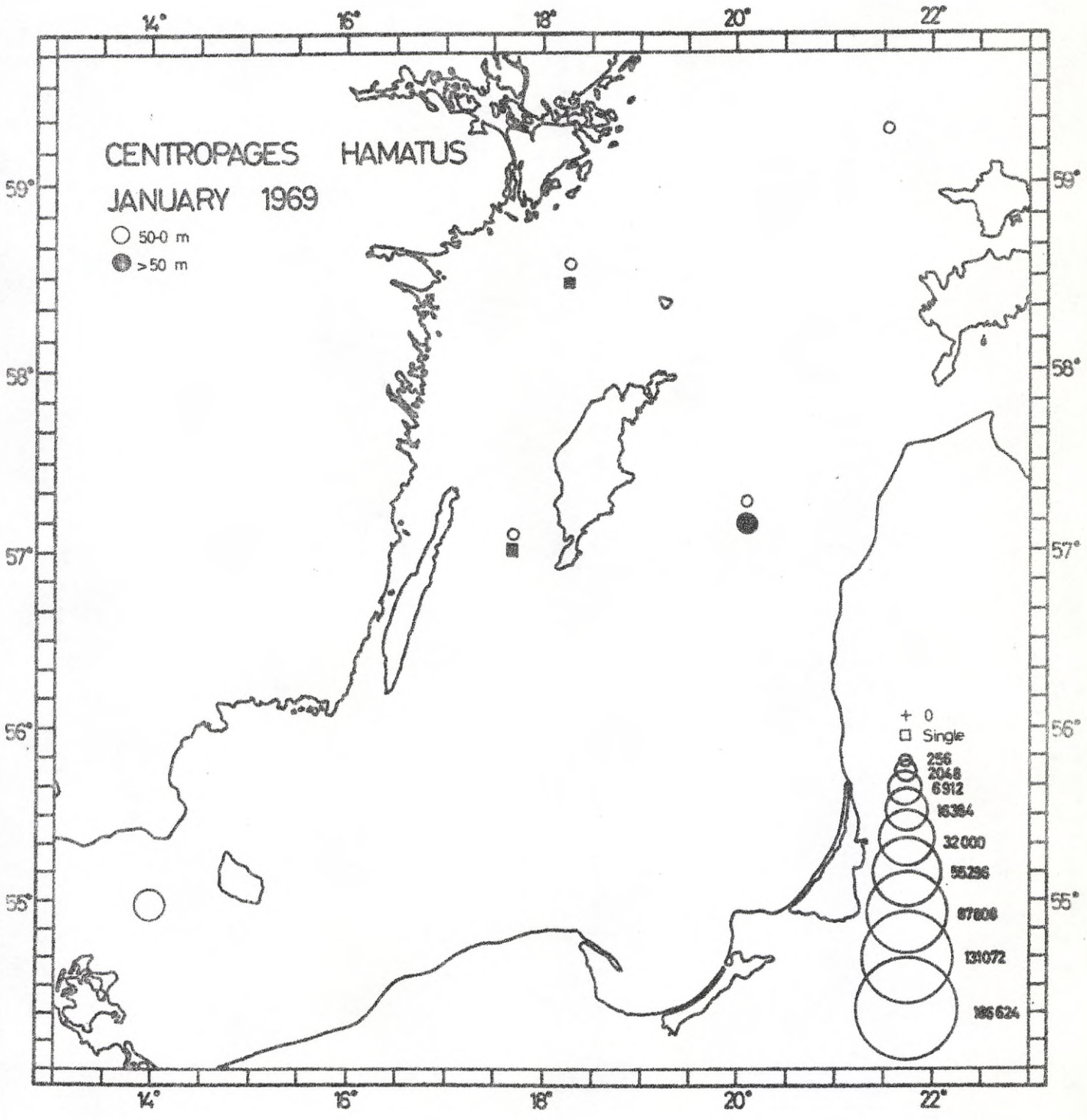
Fig 29.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JANUARY 1969
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Fig 30.

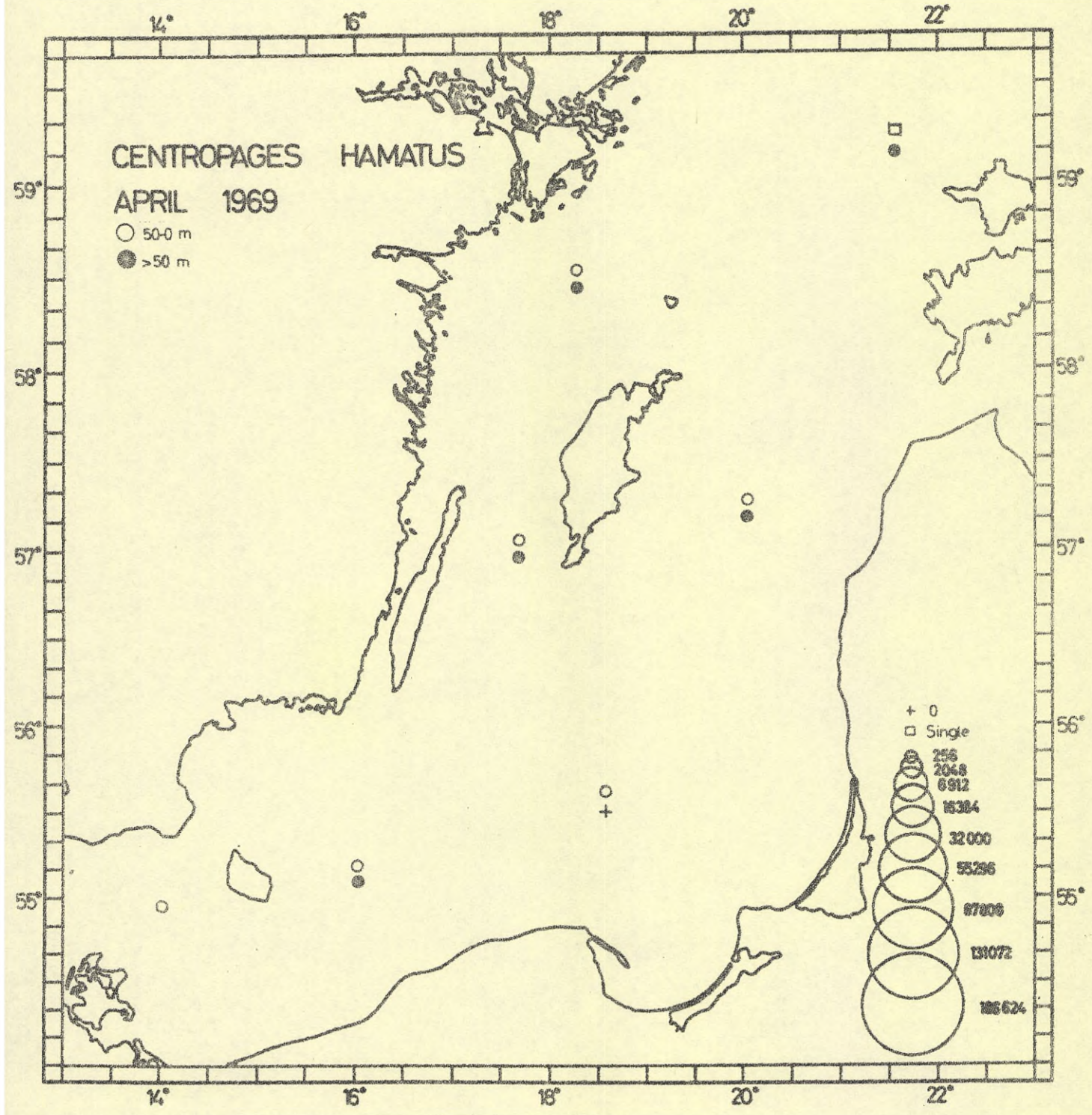
CENTROPAGES HAMATUS
APRIL 1969
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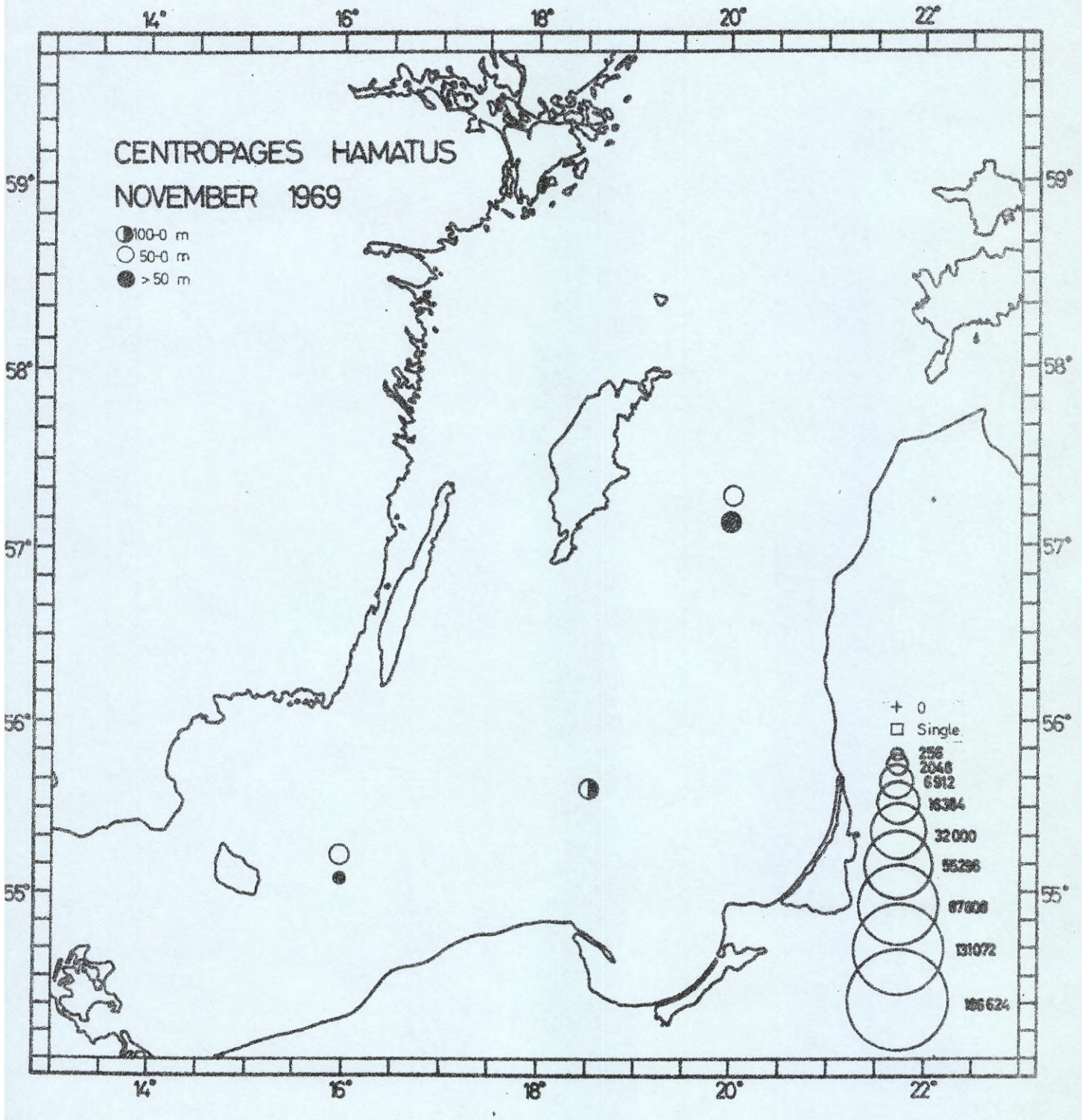
Fig 31.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NOVEMBER 1969
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> 50 m
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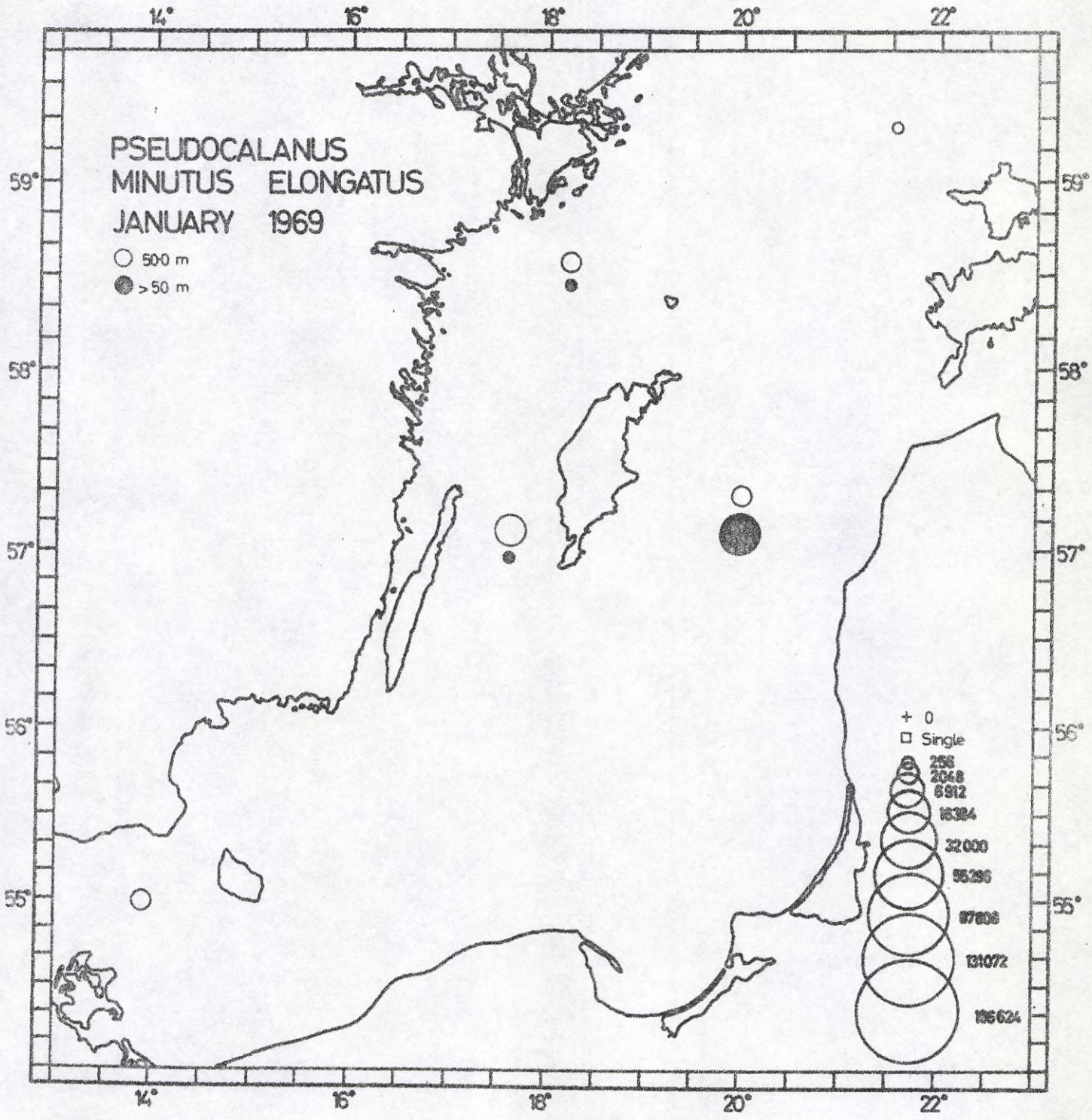
Fig 32.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MINUTUS ELONGATUS
JANUARY 1969
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>50 m
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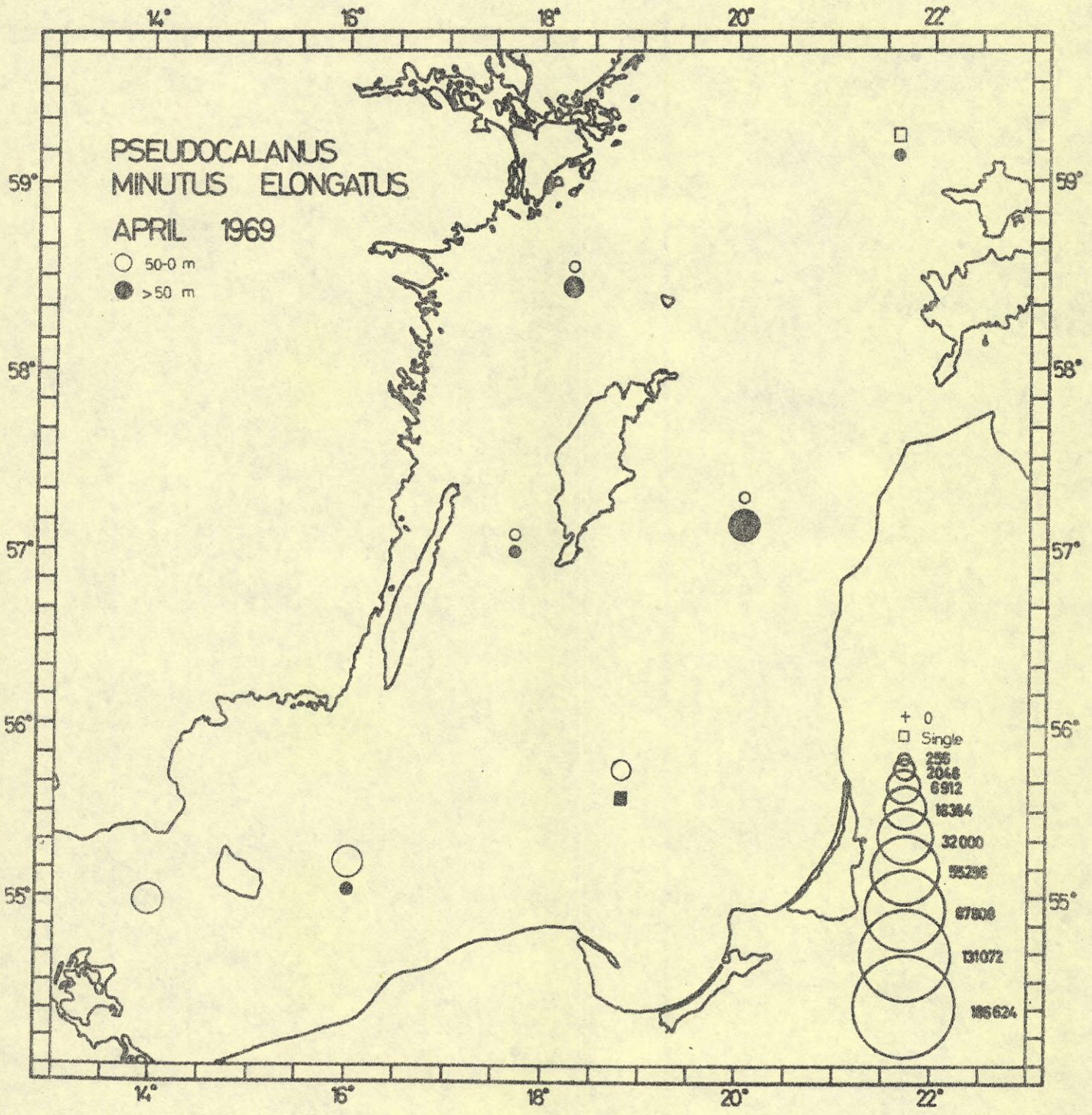
Fig 33.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MINUTUS ELONGATUS
APRIL 1969
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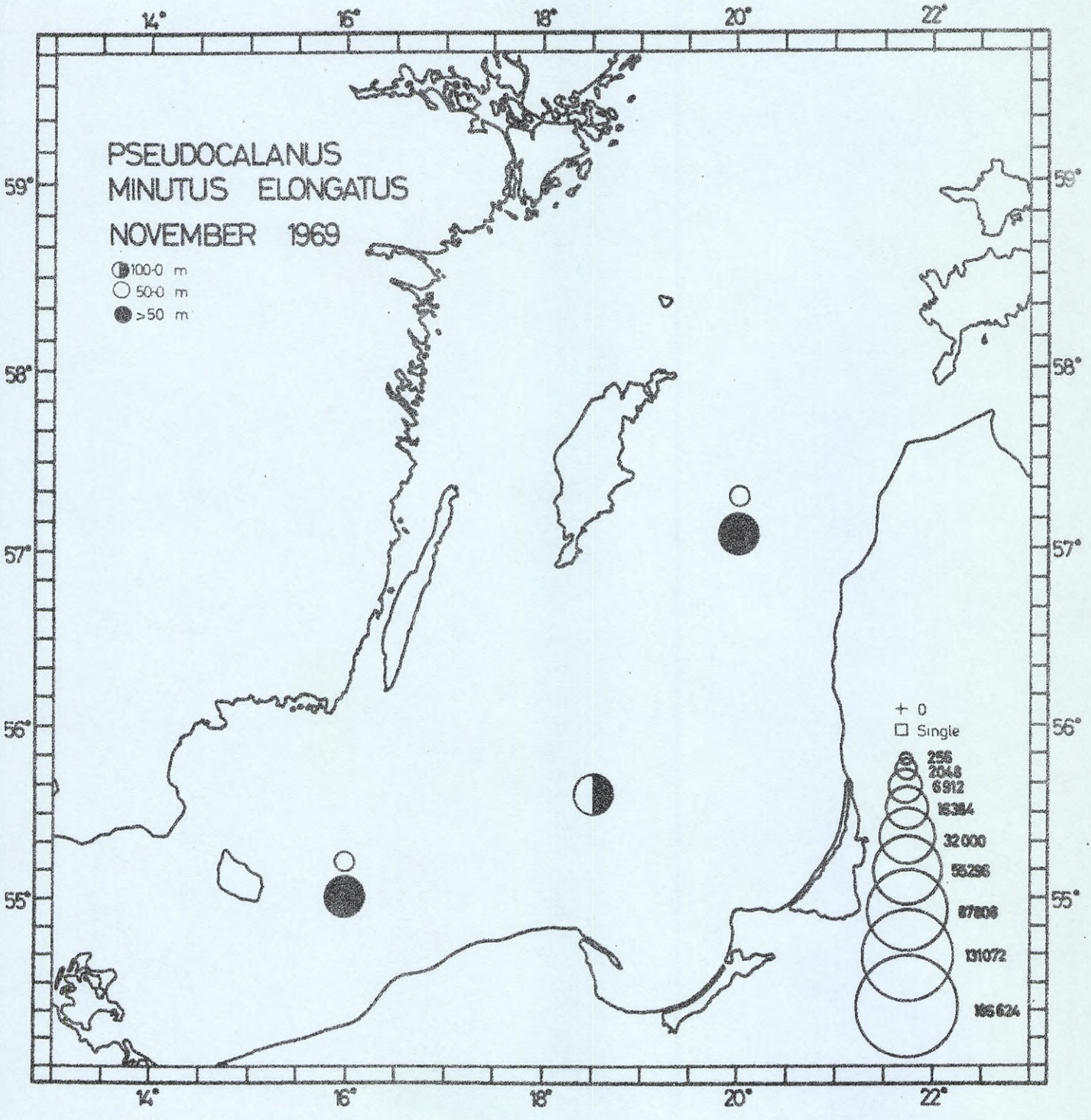
Fig 34.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MINUTUS ELONGATUS
NOVEMBER 1969
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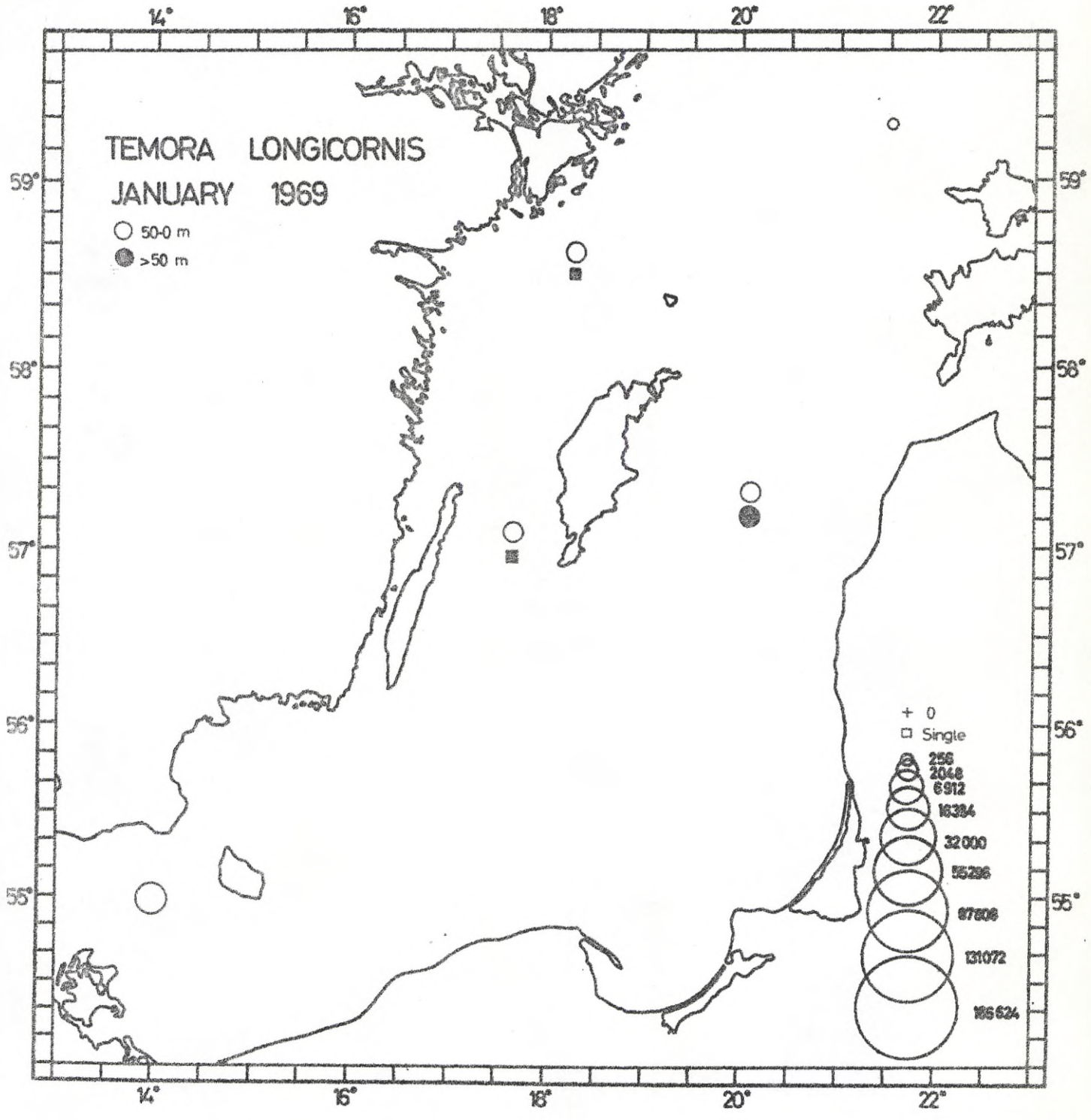
Fig 35.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JANUARY 1969
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Fig 36.

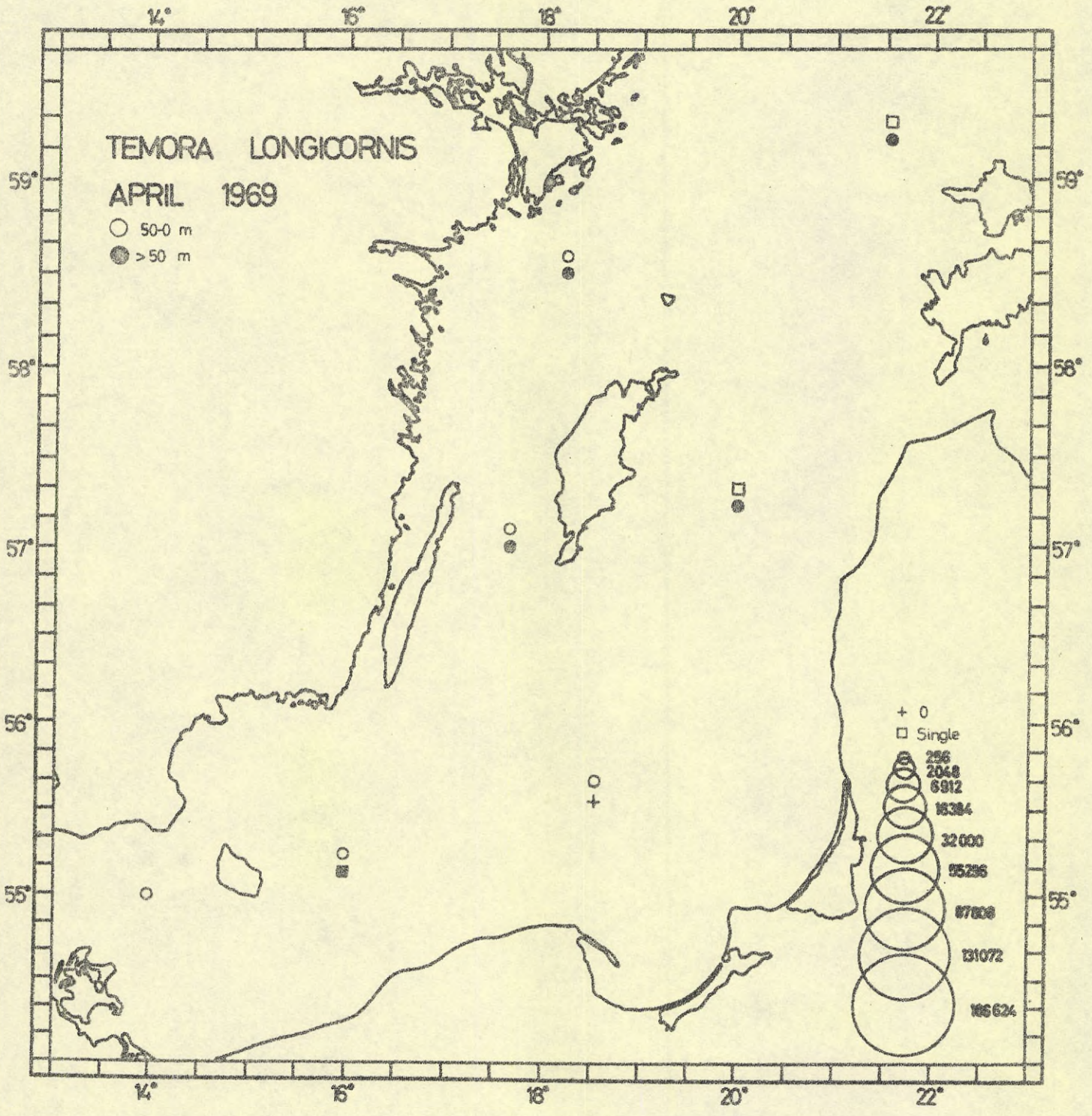
TEMORA LONGICORNIS
APRIL 1969
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Fig 37.

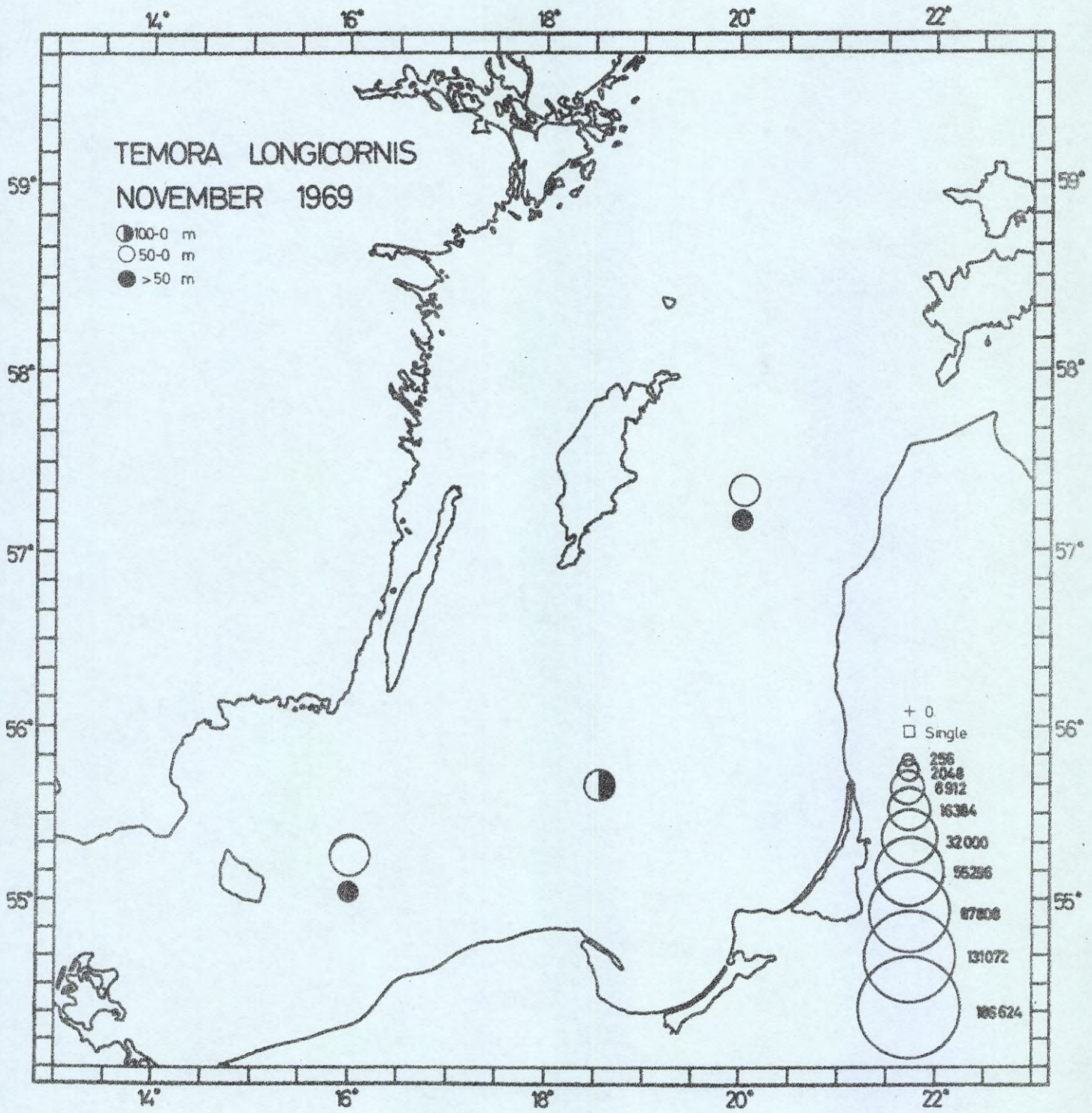
TEMORA LONGICORNIS
NOVEMBER 1969
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Fig 38.

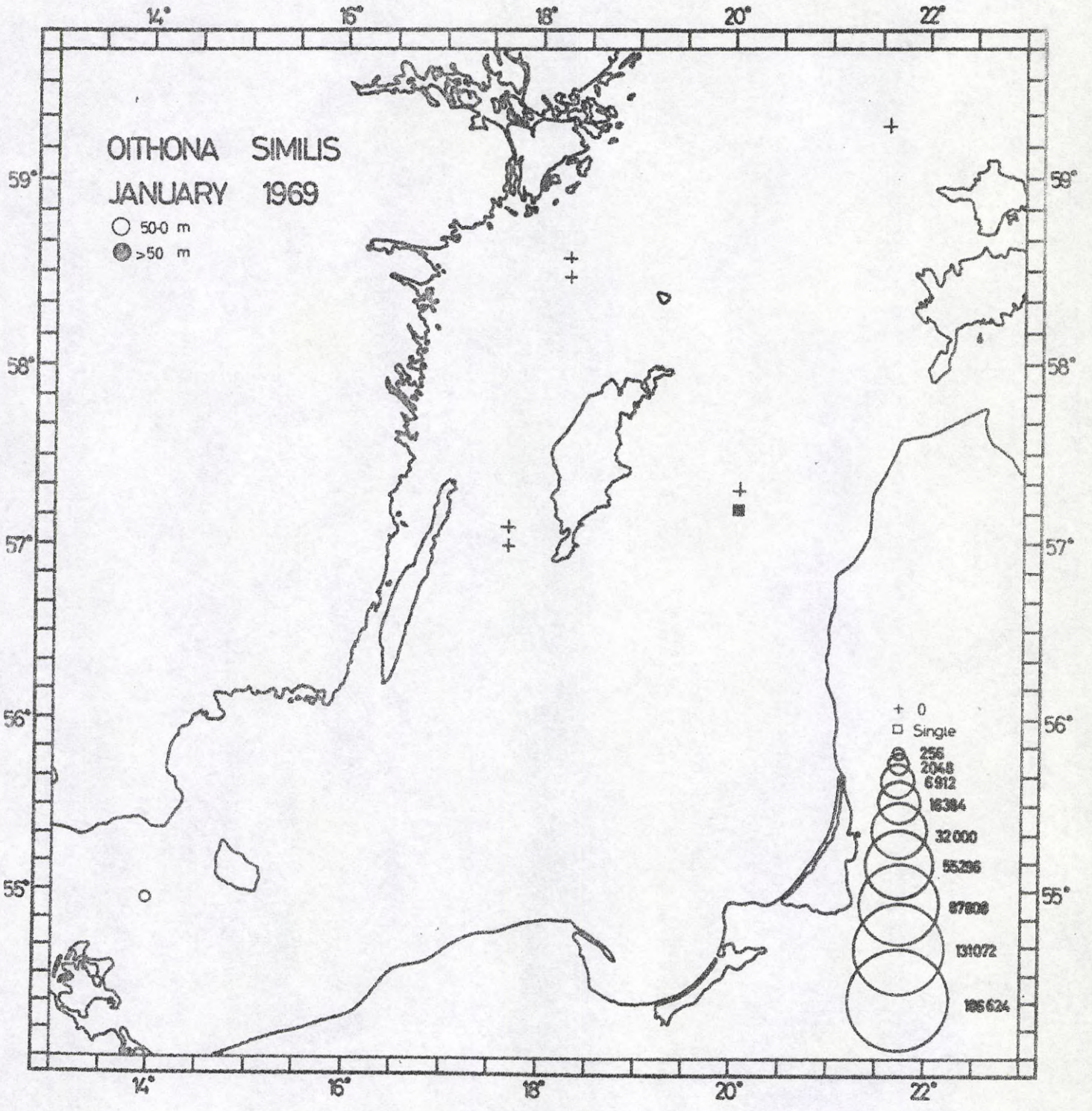
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Fig 39.

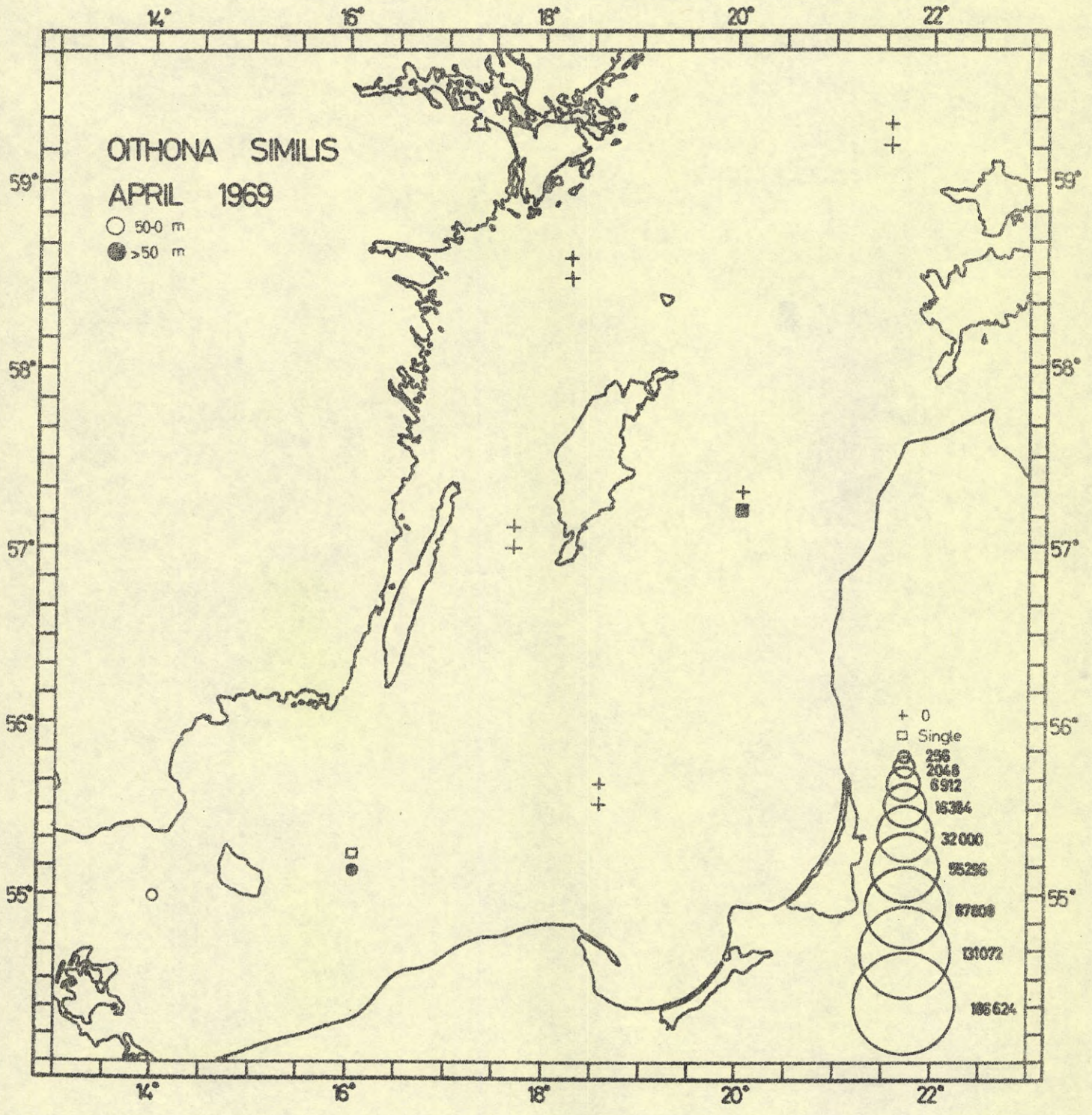
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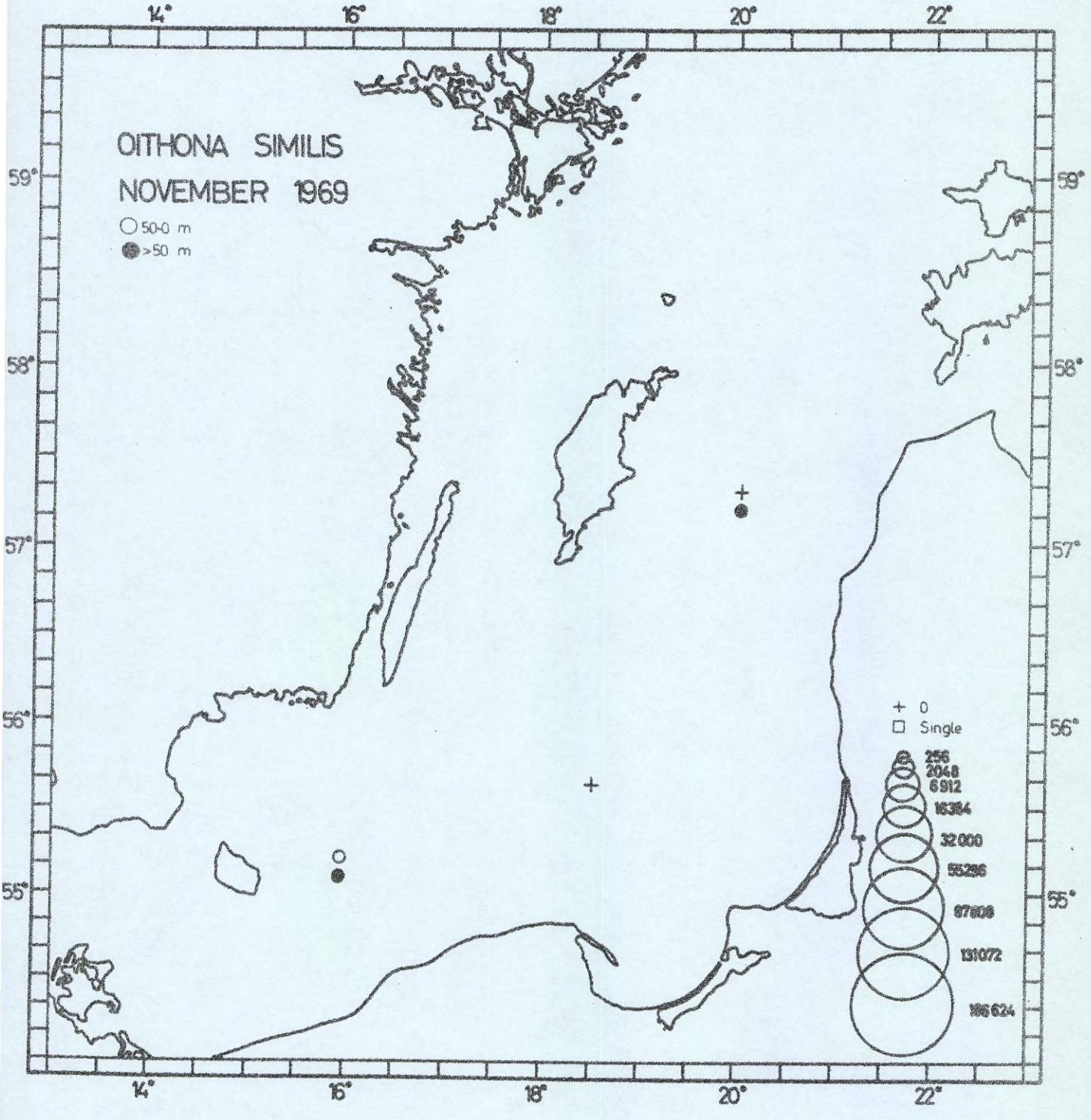
Fig 40.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NOVEMBER 1969
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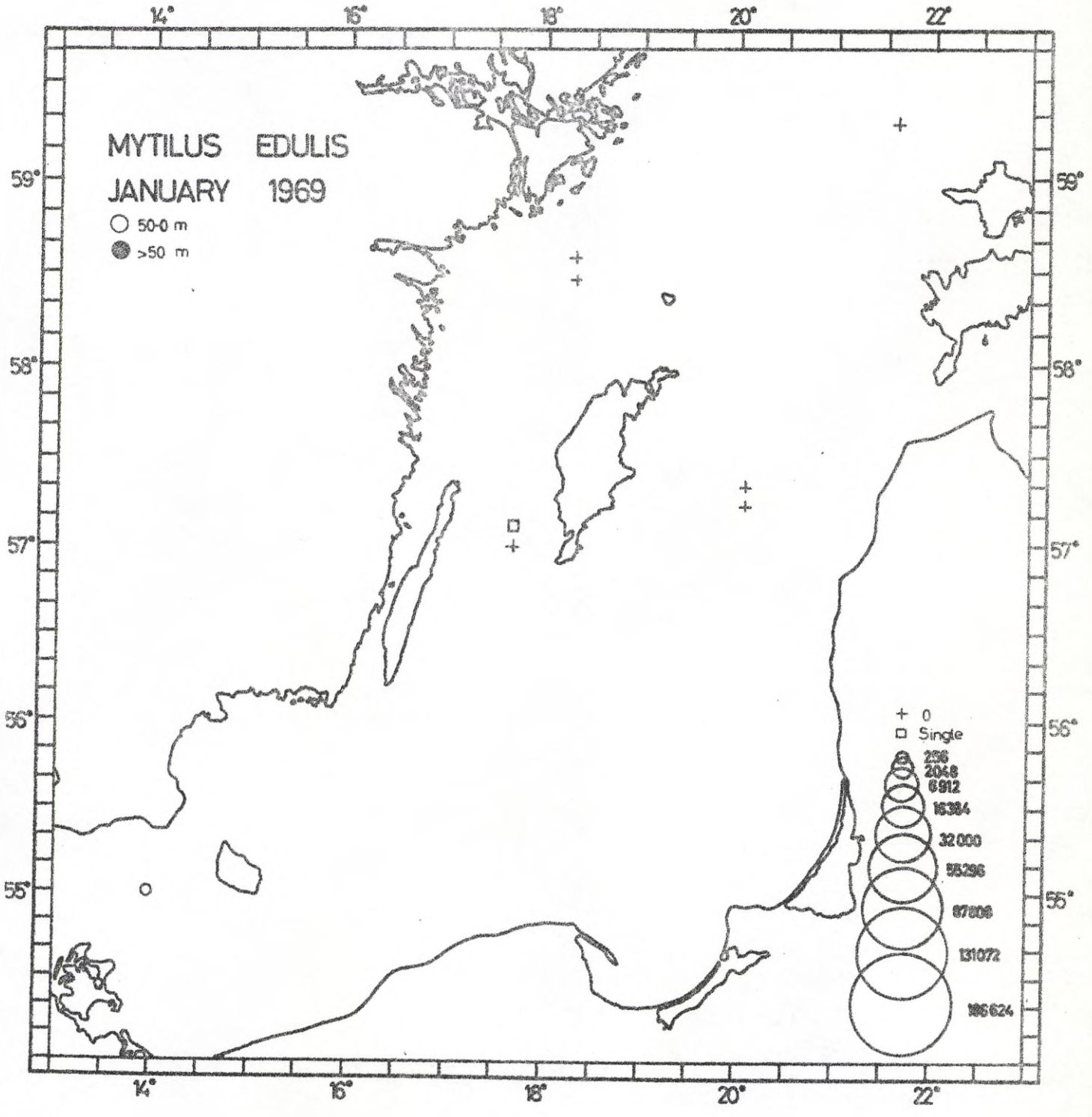
Fig 41.


MYTILUS EDULIS
JANUARY 1969
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>50 m
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Fig 42.

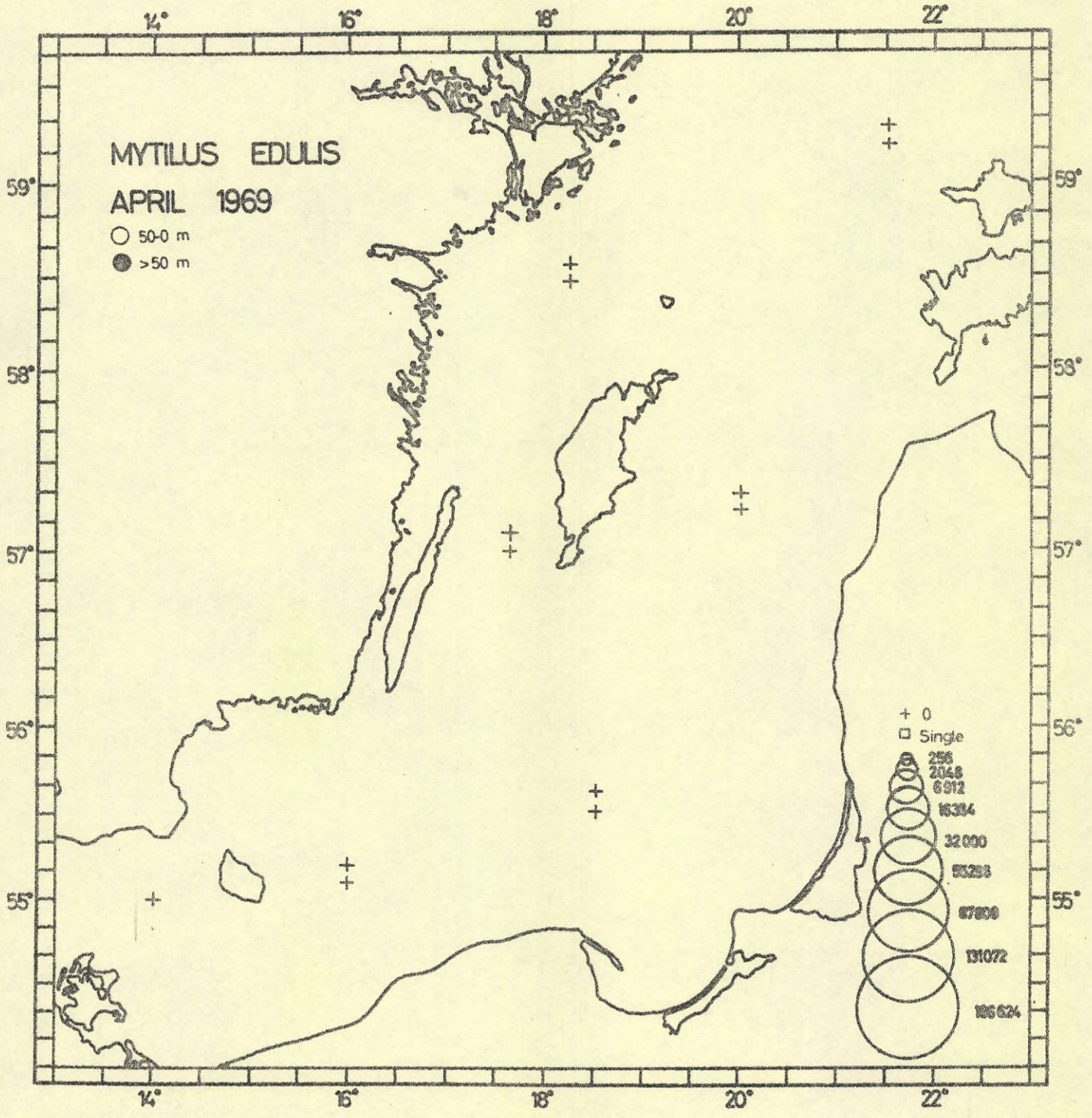
MYTILUS EDULIS
APRIL 1969
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Fig 43.

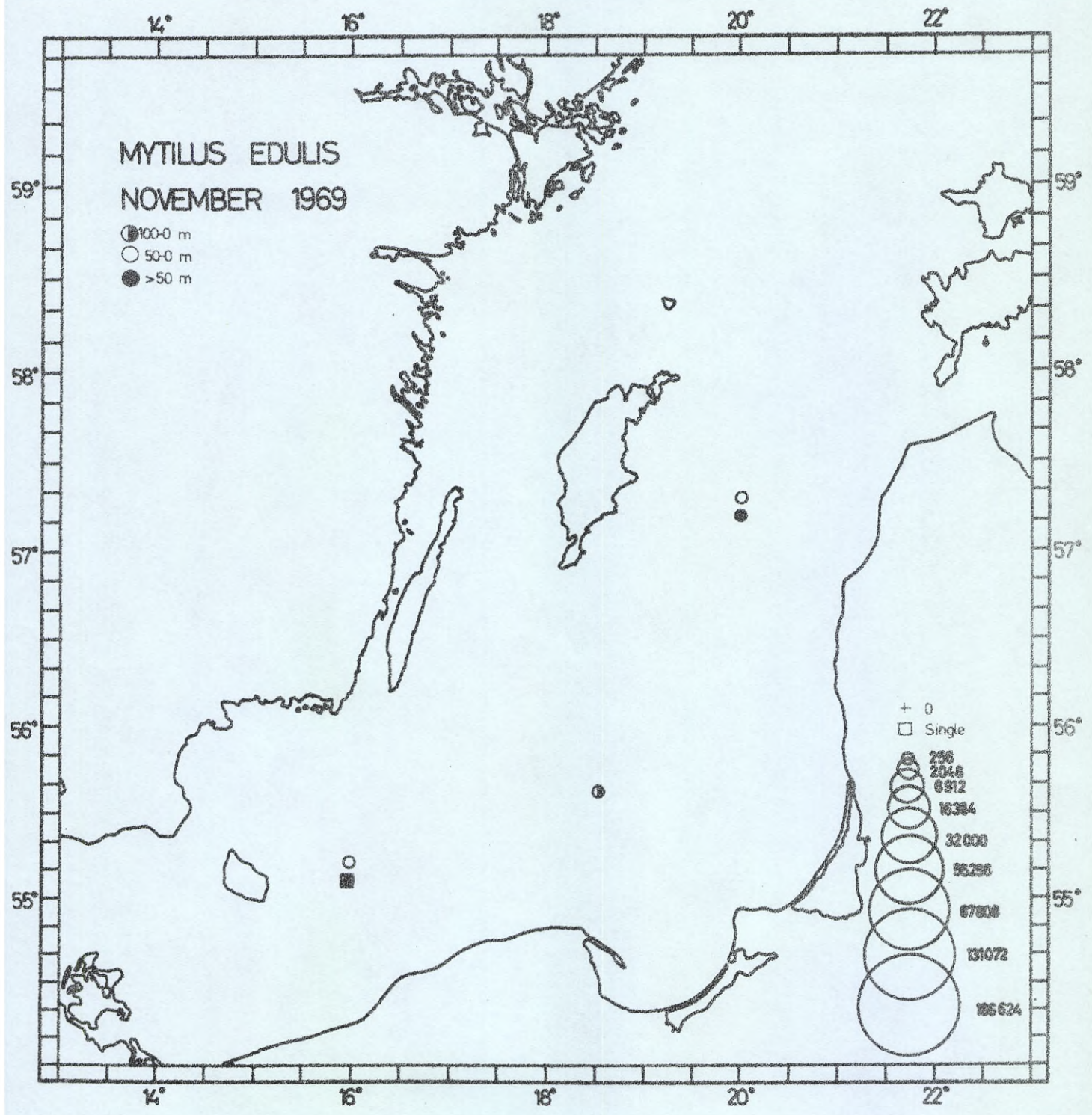
MYTILUS EDULIS
NOVEMBER 1969
100-0 m
50-0 m
>50 m
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Fig 44.

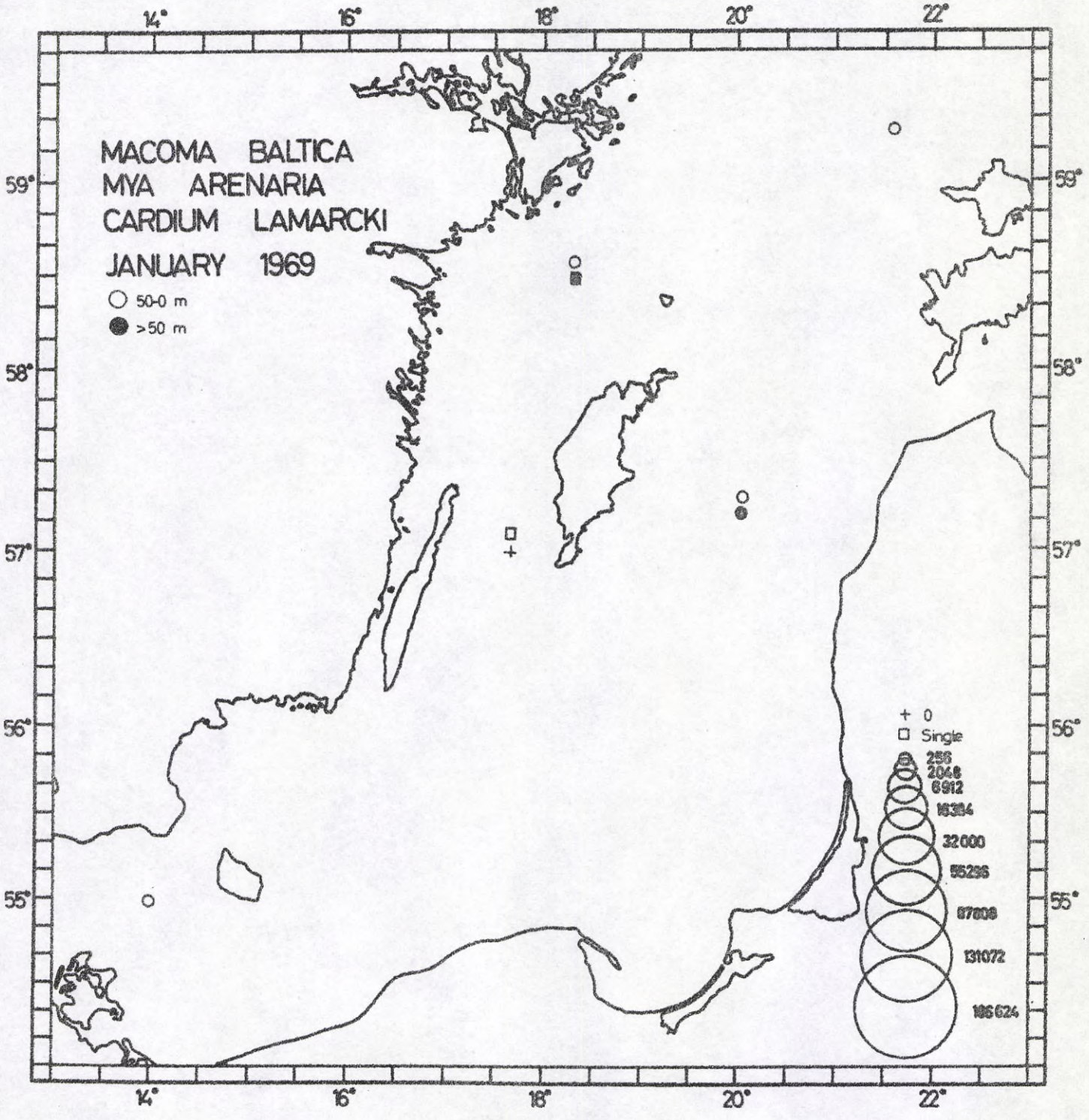
MACOMA BALTICA
MYA ARENARIA
CARDIUM LAMARCKI
JANUARY 1969
50-0 m
>50 m
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Fig 45.

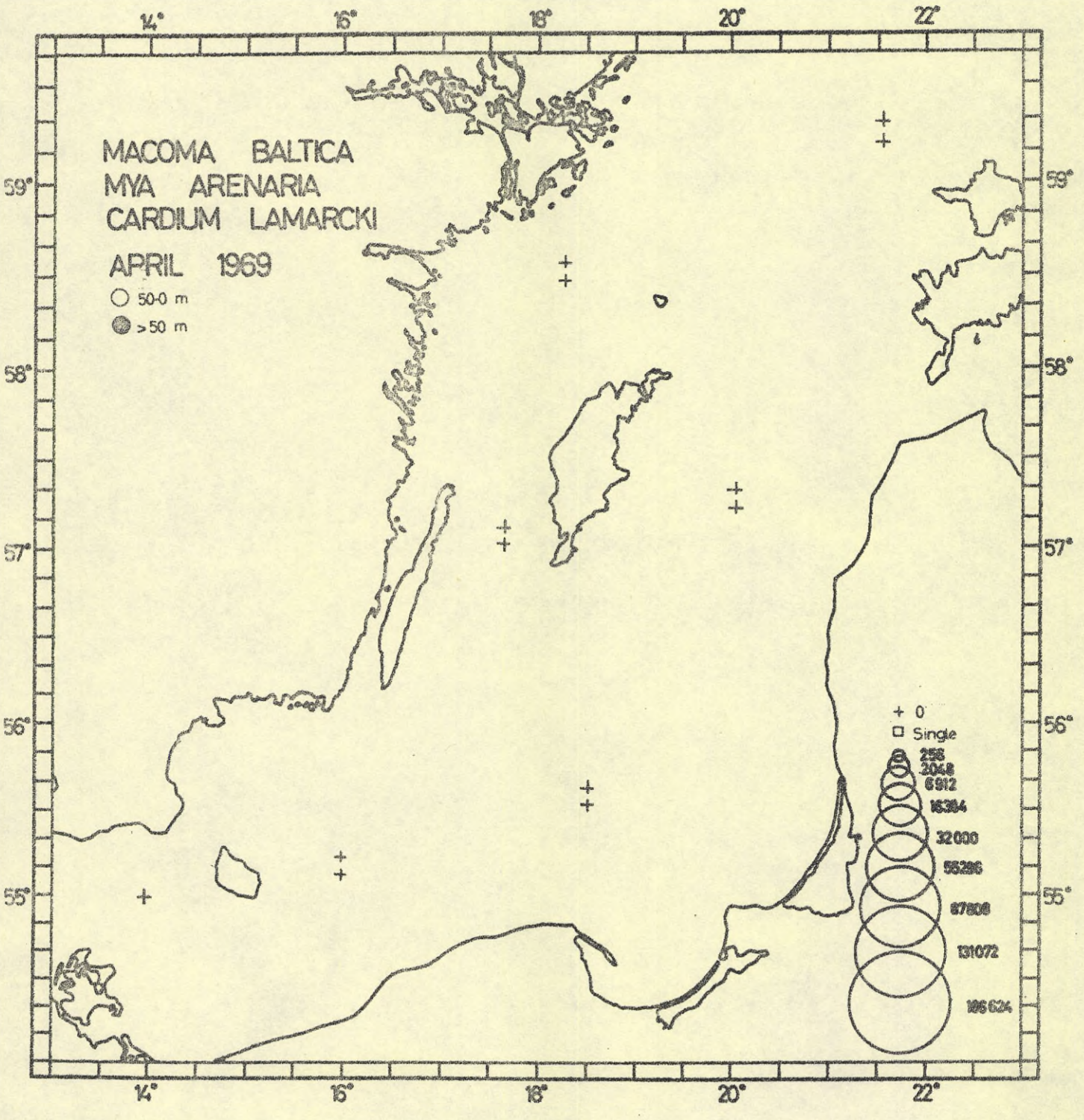
MACOMA BALTICA
MYA ARENARIA
CARDIUM LAMARCKI
APRIL 1969
50-0 m
>50 m
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Fig 46.

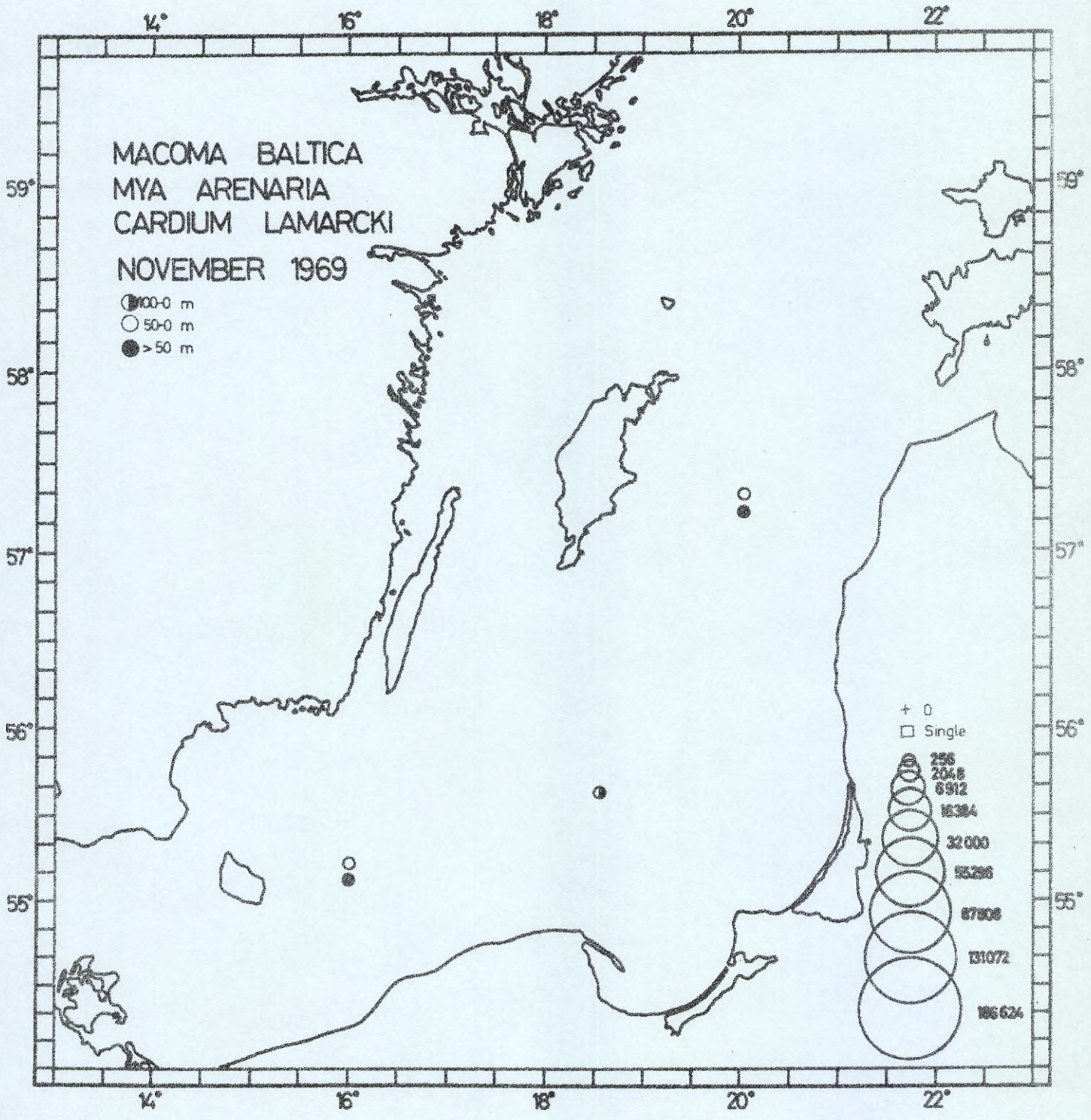

MACOMA BALTICA
MYA ARENARIA
CARDIUM LAMARCKI
NOVEMBER 1969
100-0 m
50-0 m
> 50 m
+ 0
Single
256
2048
6912
16384
32000
55296
87808
131072
186624
14°
16°
18°
20°
22°
59°
58°
57°
56°
55°

Fig 47.

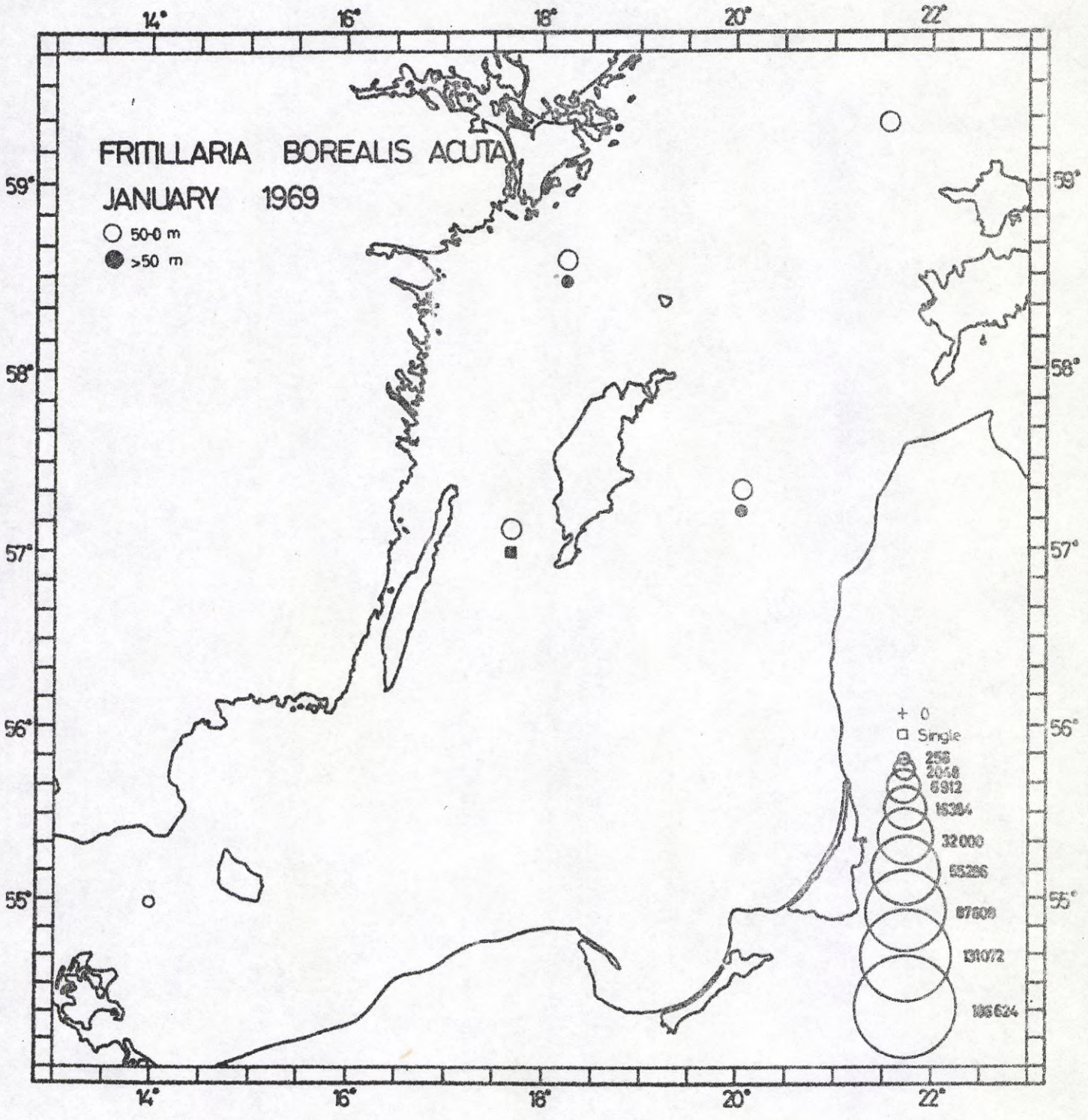

FRITILLARIA BOREALIS ACUTA
JANUARY 1969
50-0 m
>50 m
14°
16°
18°
20°
22°
59°
58°
57°
56°
55°
+ 0
Single
256
2048
6912
16384
32000
55296
87808
131072
186624

Fig 48.

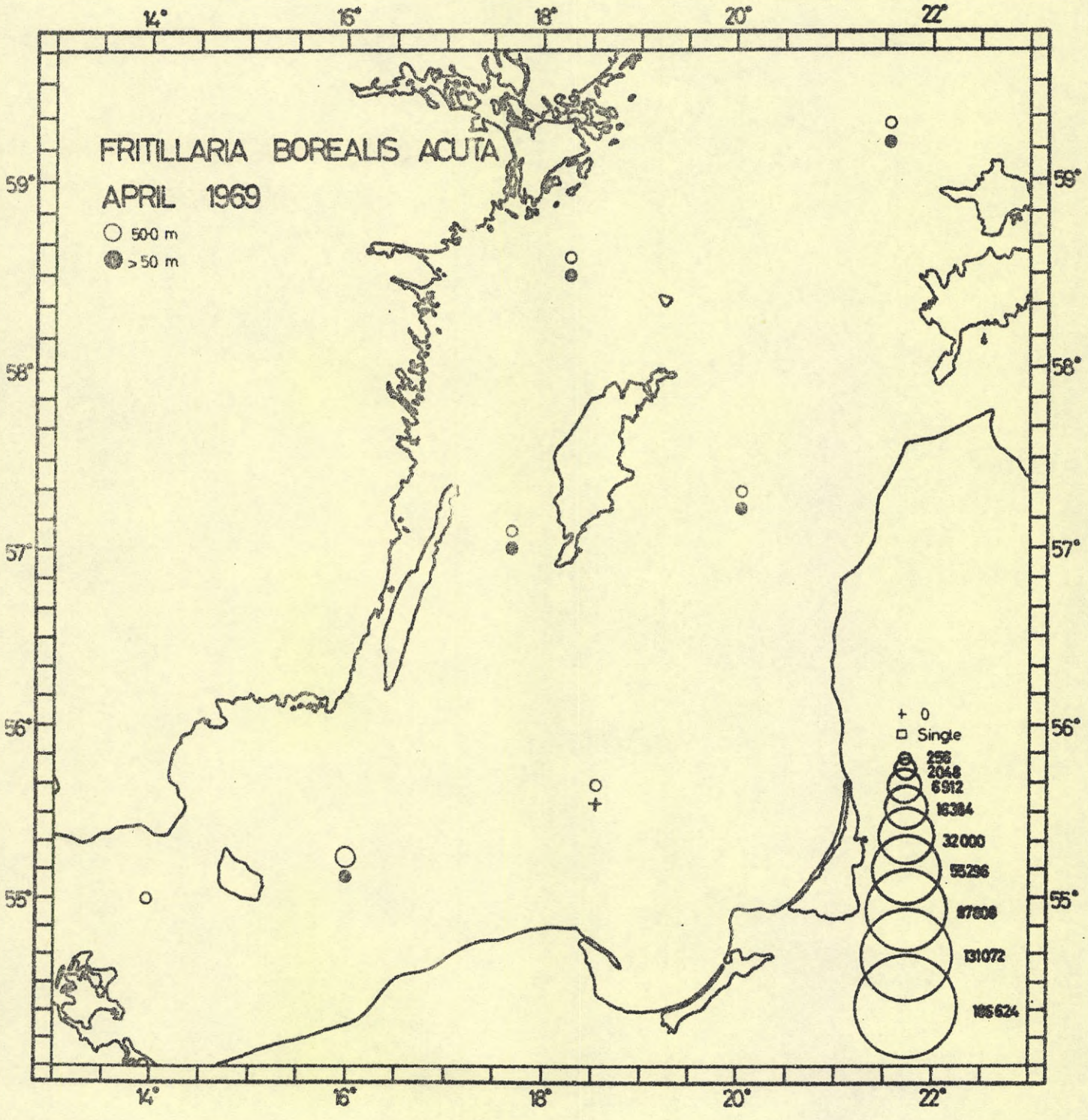
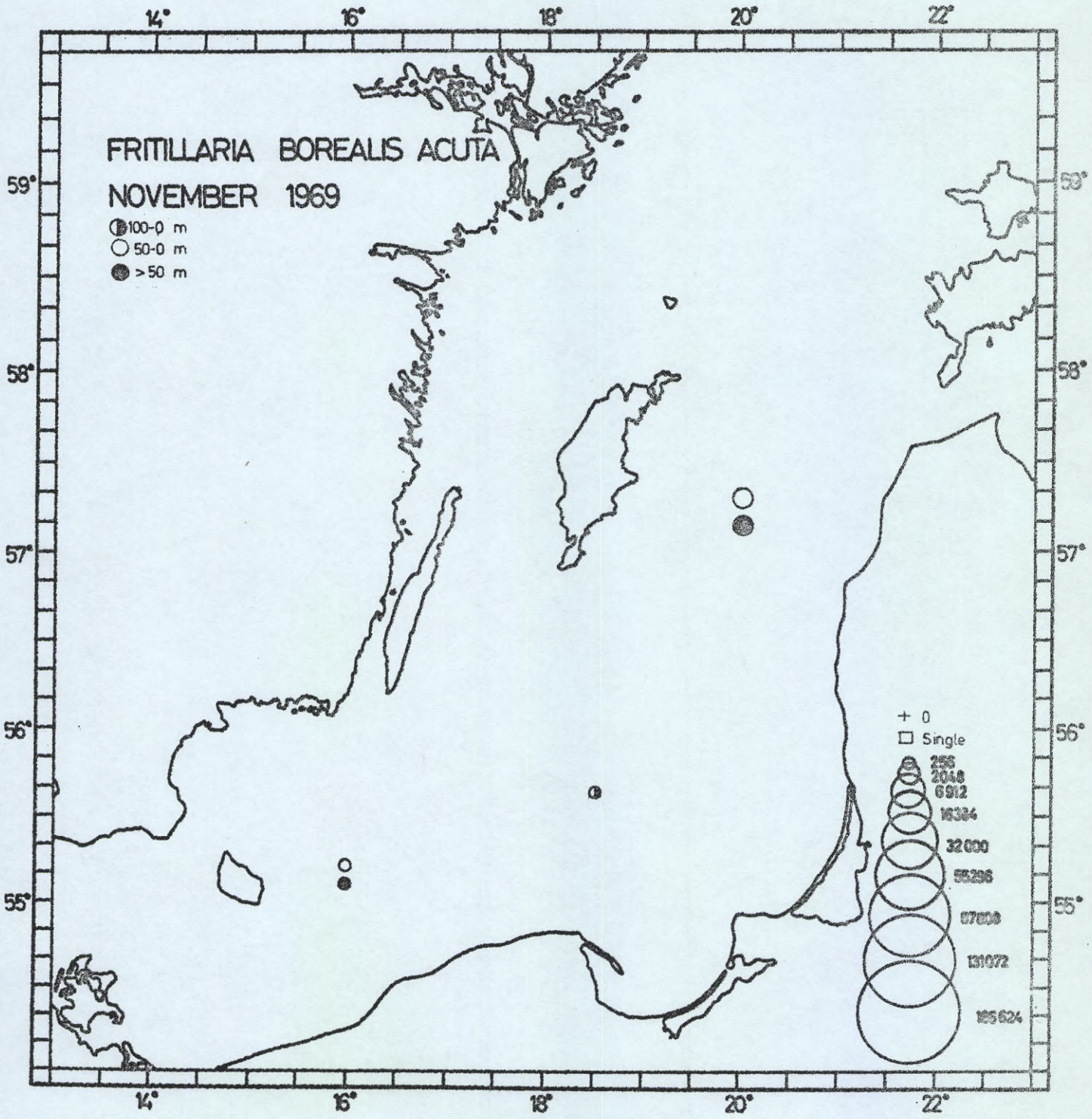

FRITILLARIA BOREALIS ACUTA
APRIL 1969
○ 500 m
● > 50 m
14°
16°
18°
20°
22°
59°
58°
57°
56°
55°
+ 0
□ Single
256
2048
6912
16384
32000
55296
87808
131072
186624

Fig 49.


FRITILLARIA BOREALIS ACUTA
NOVEMBER 1969
100-0 m
50-0 m
>50 m
14°
16°
18°
20°
22°
59°
58°
57°
56°
55°
+ 0
Single
256
2048
8192
16384
32000
65536
131072
262624

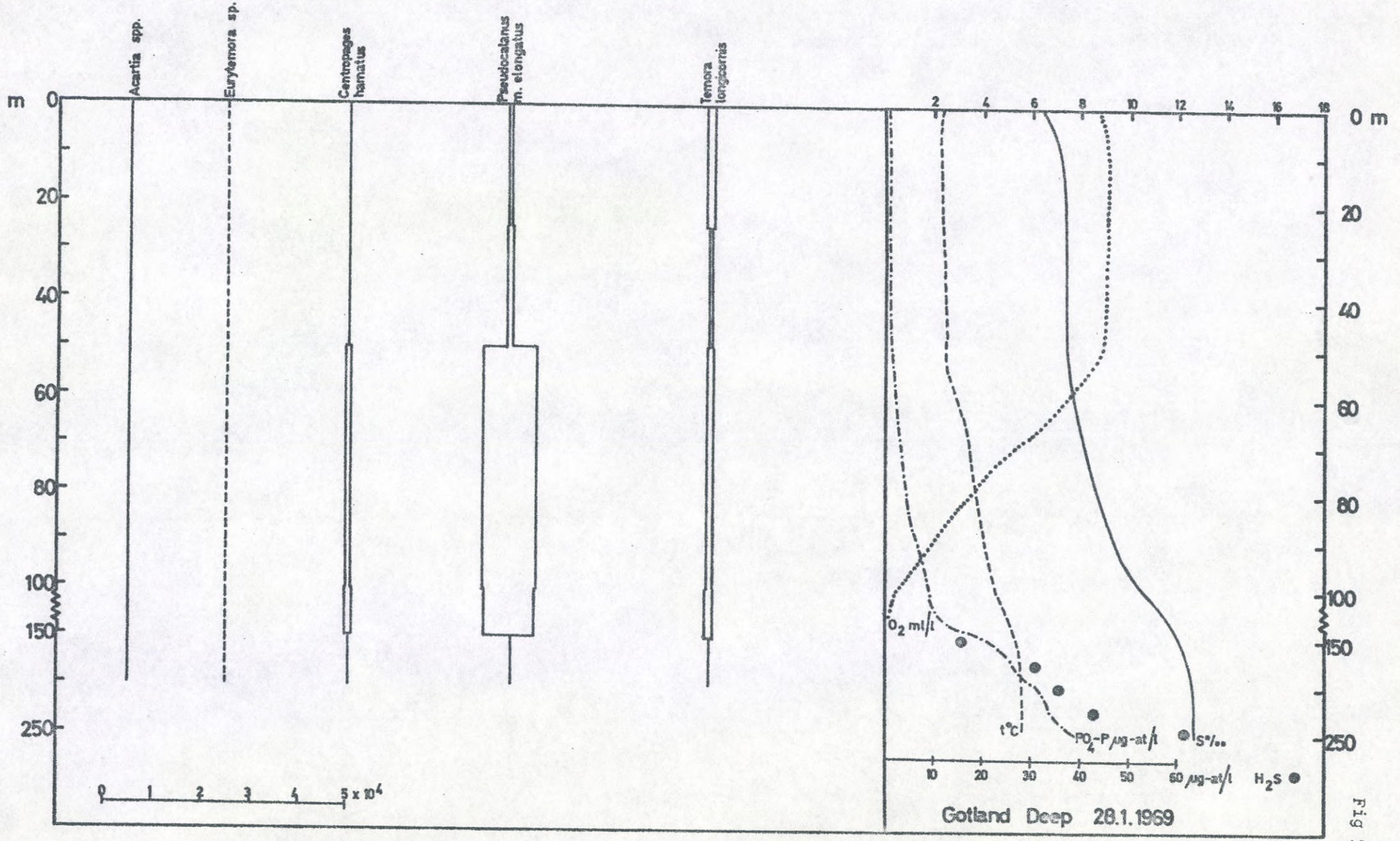

Acartia spp.
Eurytemora sp.
Centropages hamatus
Pseudocalanus m. elongatus
Temora longicornis
m
0
20
40
60
80
100
150
250
0 1 2 3 4 5 x 10⁴
2 4 6 8 10 12 14 16 18
O₂ ml/l
t°C
PO₄-P µg-at/l
S‰
10 20 30 40 50 60 µg-at/l
H₂S
Gotland Deep 28.1.1969

Fig 50.

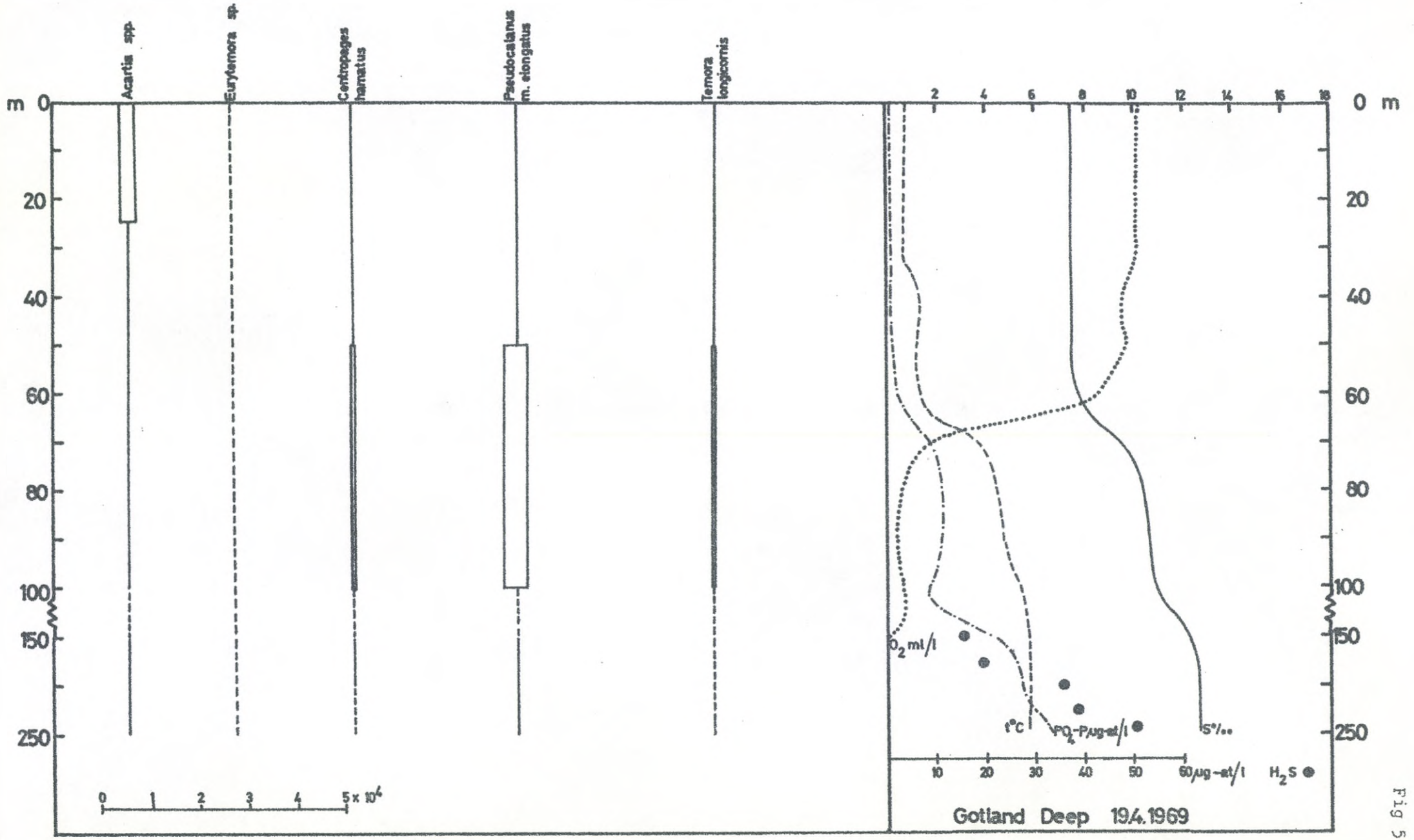

Acartia spp.
Eurytemora sp.
Centropages hamatus
Pseudocalanus m. elongatus
Temora longicornis
m
0
20
40
60
80
100
150
250
0 1 2 3 4 5 x 10⁴
2 4 6 8 10 12 14 16 18
O_2 ml/l
t°C
PO_4-P µg-at/l
S°/₀₀
10 20 30 40 50 60 µg-at/l
H_2S
Gotland Deep 19.4.1969

Fig 51.

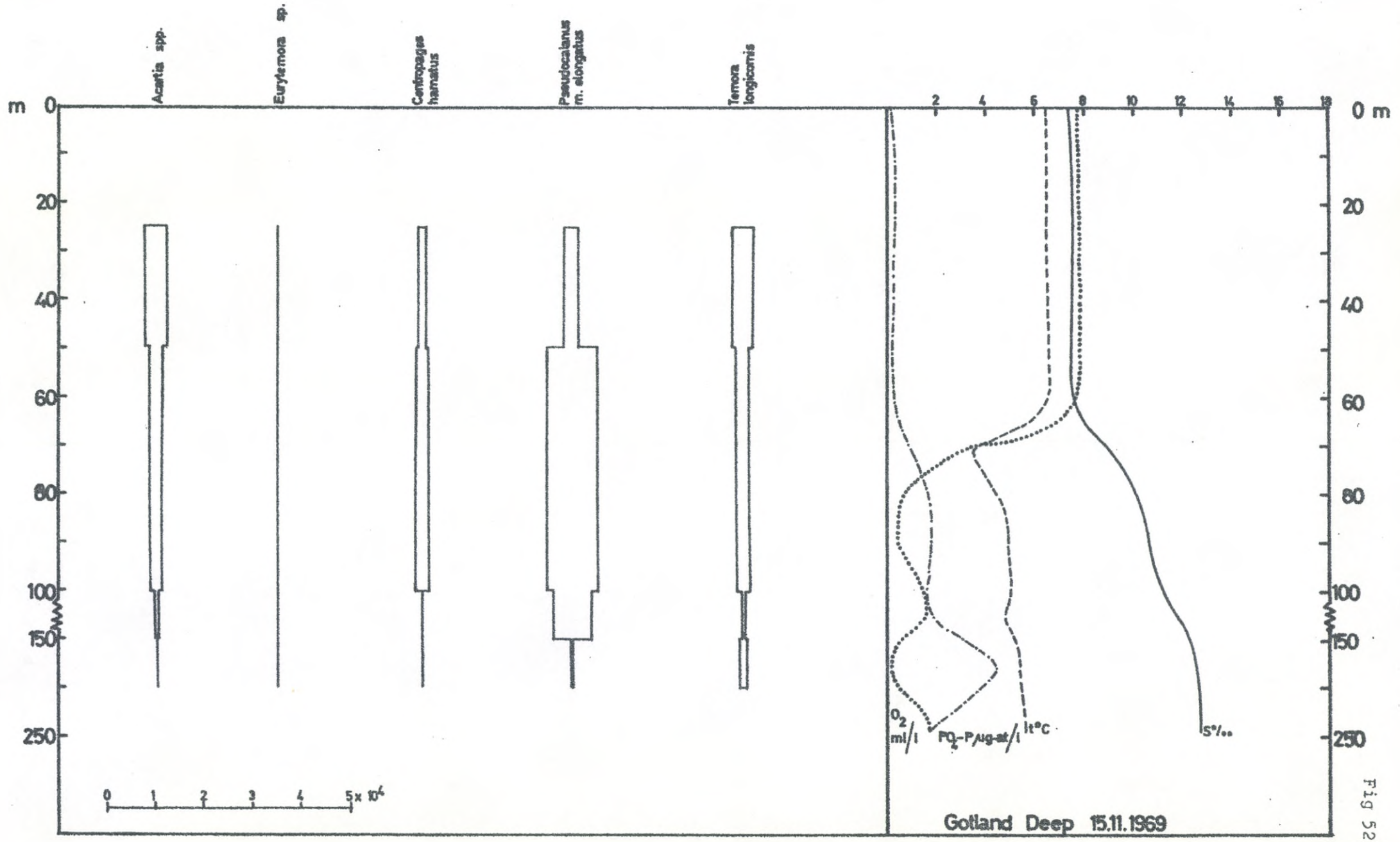

Acartia spp.
Eurytemora sp.
Centropages hamatus
Pseudocalanus m. elongatus
Temora longicornis
m
0
20
40
60
80
100
150
250
0 1 2 3 4 5 x 10⁴
2 4 6 8 10 12 14 16 18
0 m
O_2 ml/l
PO_4-P µg-at/l
t°C
S°/..
Gotland Deep 15.11.1969

Fig 52.

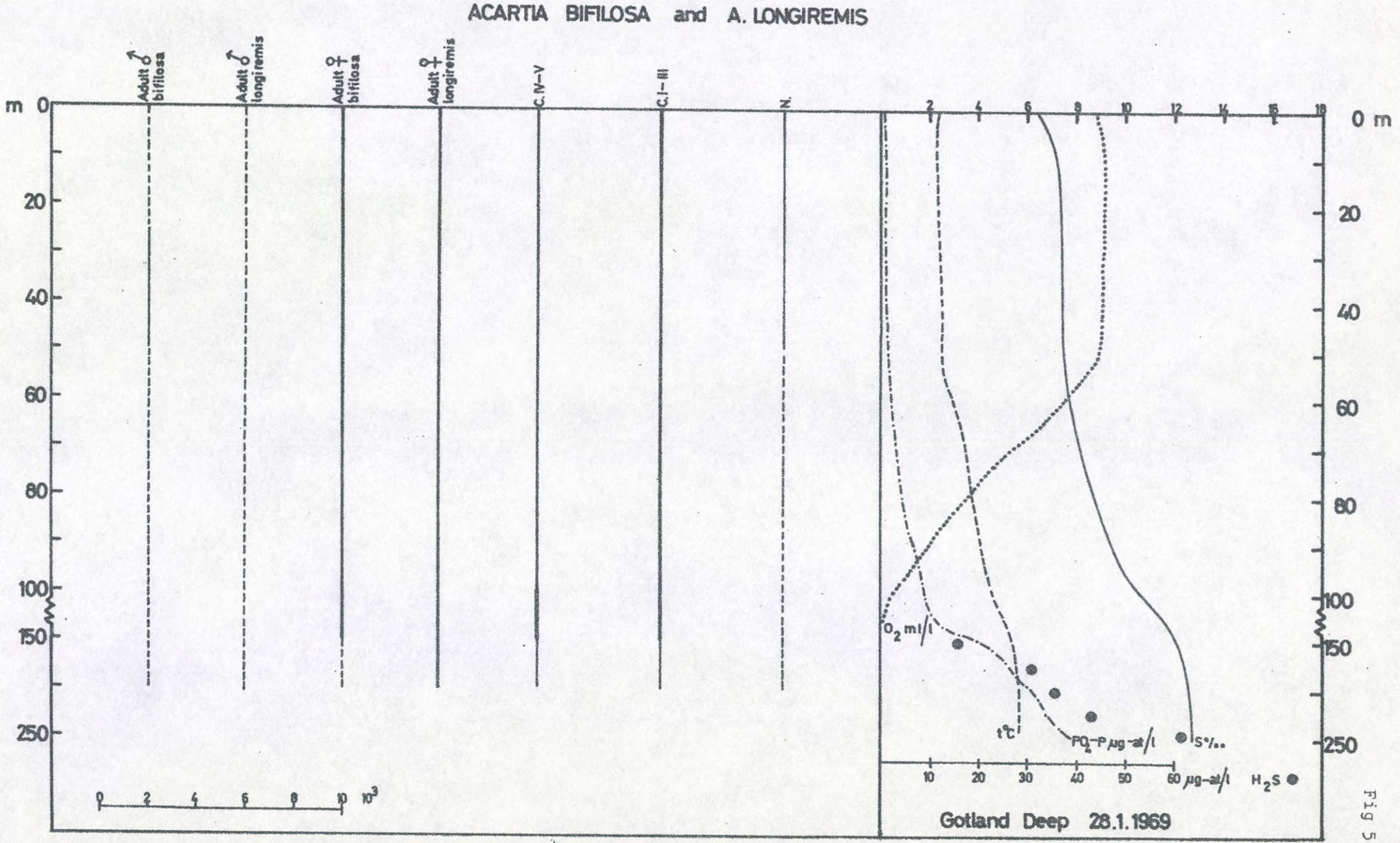

ACARTIA BIFILOSA and A. LONGIREMIS
Adult ♂ bifilosa
Adult ♂ longiremis
Adult ♀ bifilosa
Adult ♀ longiremis
C. IV–V
C. I–III
N.
m
0
20
40
60
80
100
150
250
0 2 4 6 8 10 10³
0 m
20
40
60
80
100
150
250
2 4 6 8 10 12 14 16 18
O₂ ml/l
t°C
PO₄-P µg-at/l
S‰
10 20 30 40 50 60 µg-at/l
H₂S
Gotland Deep 28.1.1969

Fig 53.

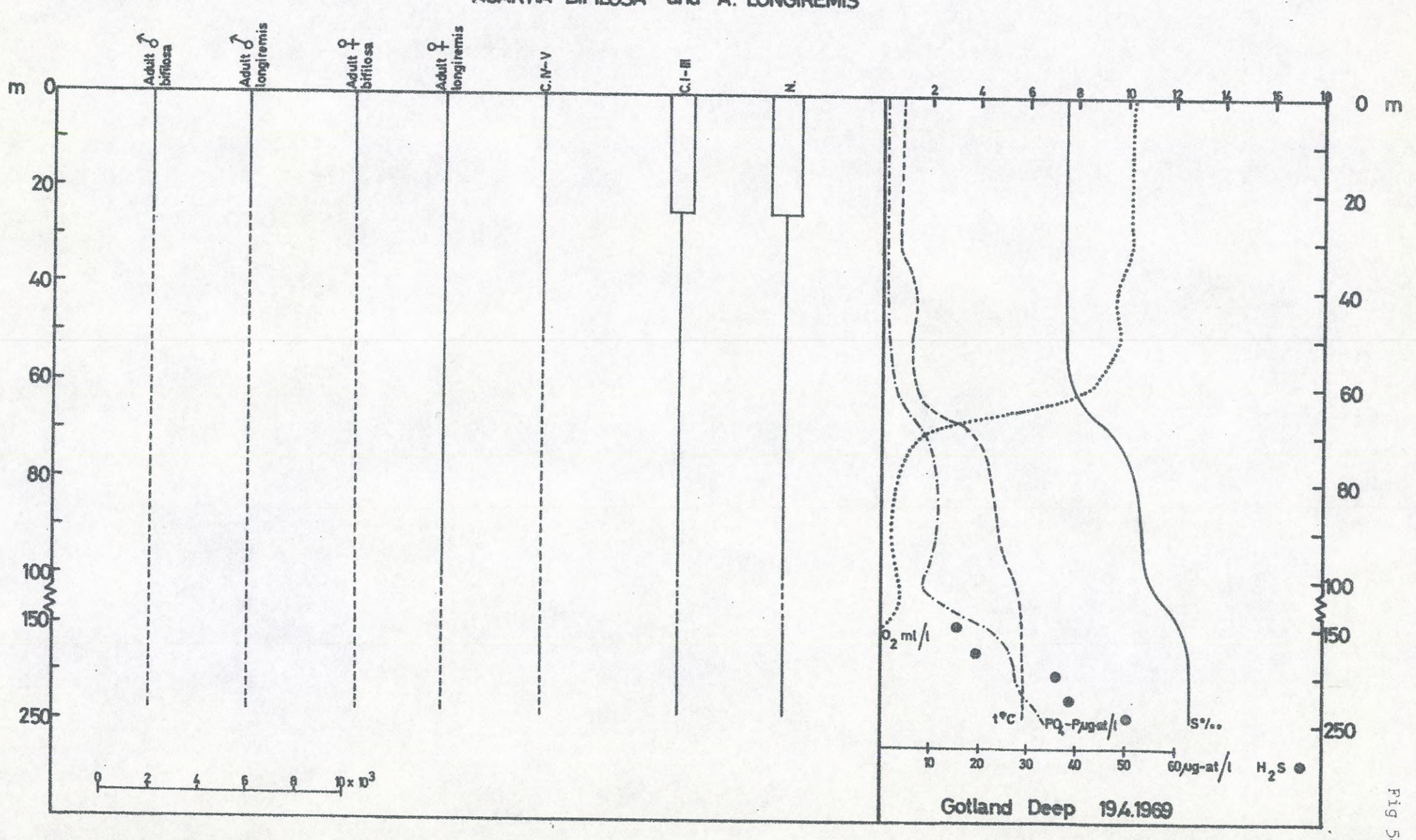

ACARTIA BIFILOSA and A. LONGIREMIS
Adult ♂ bifilosa
Adult ♂ longiremis
Adult ♀ bifilosa
Adult ♀ longiremis
C.IV–V
C.I–III
N.
m
0
20
40
60
80
100
150
250
0 2 4 6 8 10 x 10³
2 4 6 8 10 12 14 16 18
O₂ ml/l
t°C
PO₄-P µg-at/l
S°/₀₀
10 20 30 40 50 60 µg-at/l
H₂S
Gotland Deep 19.4.1969

Fig 54.

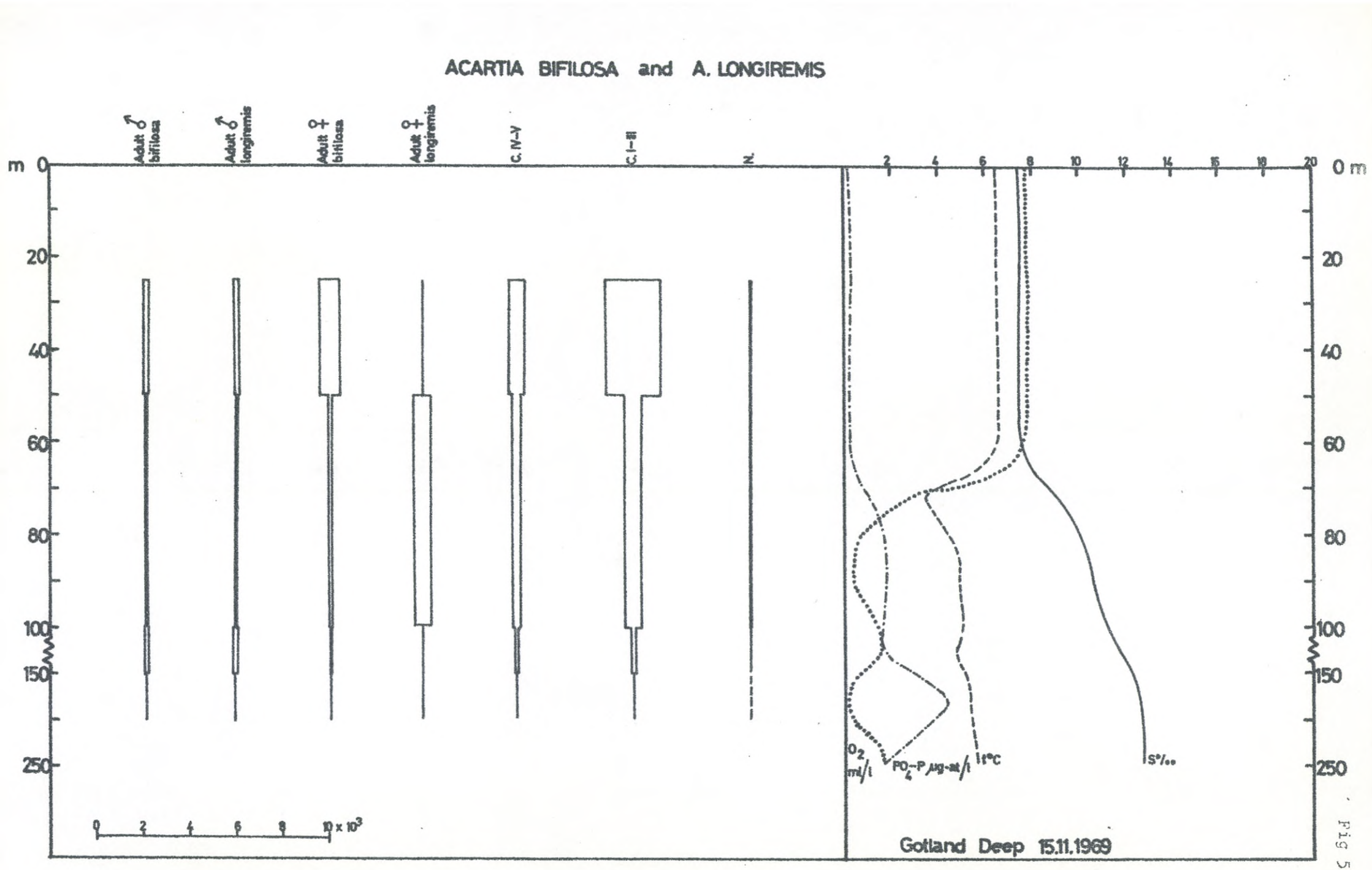

ACARTIA BIFILOSA and A. LONGIREMIS
Adult ♂ bifilosa
Adult ♂ longiremis
Adult ♀ bifilosa
Adult ♀ longiremis
C. IV–V
C. I–III
N.
m
0
20
40
60
80
100
150
250
0 2 4 6 8 10 x 10³
2 4 6 8 10 12 14 16 18 20
O₂ ml/l
PO₄–P µg-at/l
t°C
S°/₀₀
Gotland Deep 15.11.1969

Fig 55.

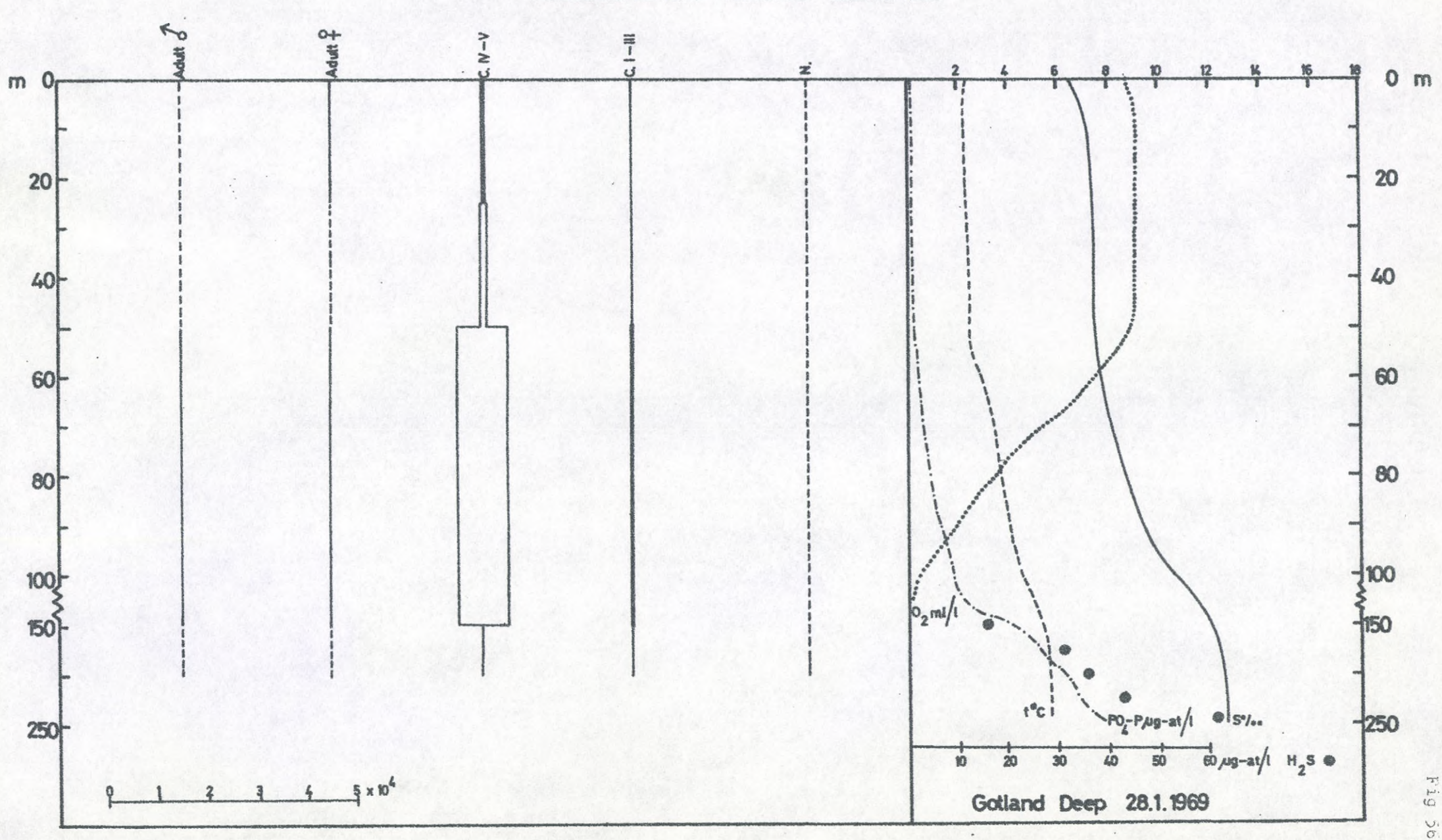

PSEUDOCALANUS MINUTUS ELONGATUS
Adult ♂
Adult ♀
C. IV–V
C. I–III
N.
m
0
20
40
60
80
100
150
250
0 1 2 3 4 5 x 10⁴
2 4 6 8 10 12 14 16 18
O₂ ml/l
t°C
PO₄-P µg-at/l
S°/₀₀
10 20 30 40 50 60 µg-at/l H₂S
Gotland Deep 28.1.1969

Fig 56.

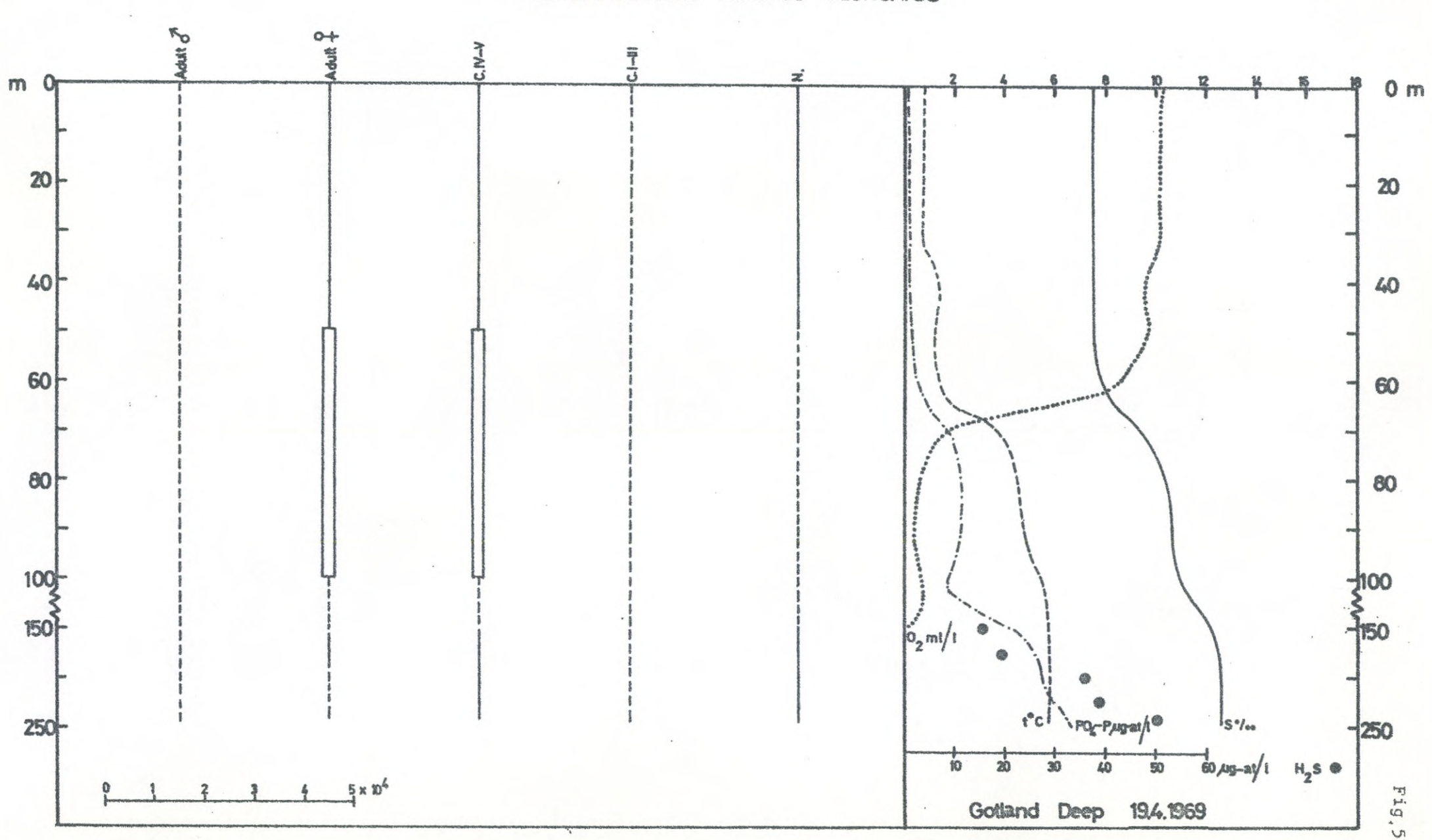

PSEUDOCALANUS MINUTUS ELONGATUS
Adult ♂
Adult ♀
C.IV–V
C.I–III
N.
m
0
20
40
60
80
100
150
250
0 1 2 3 4 5 x 10⁴
2 4 6 8 10 12 14 16 18
O₂ ml/l
t°C
PO₄-P µg-at/l
S °/₀₀
10 20 30 40 50 60 µg-at/l
H₂S
Gotland Deep 19.4.1969

Fig. 57.

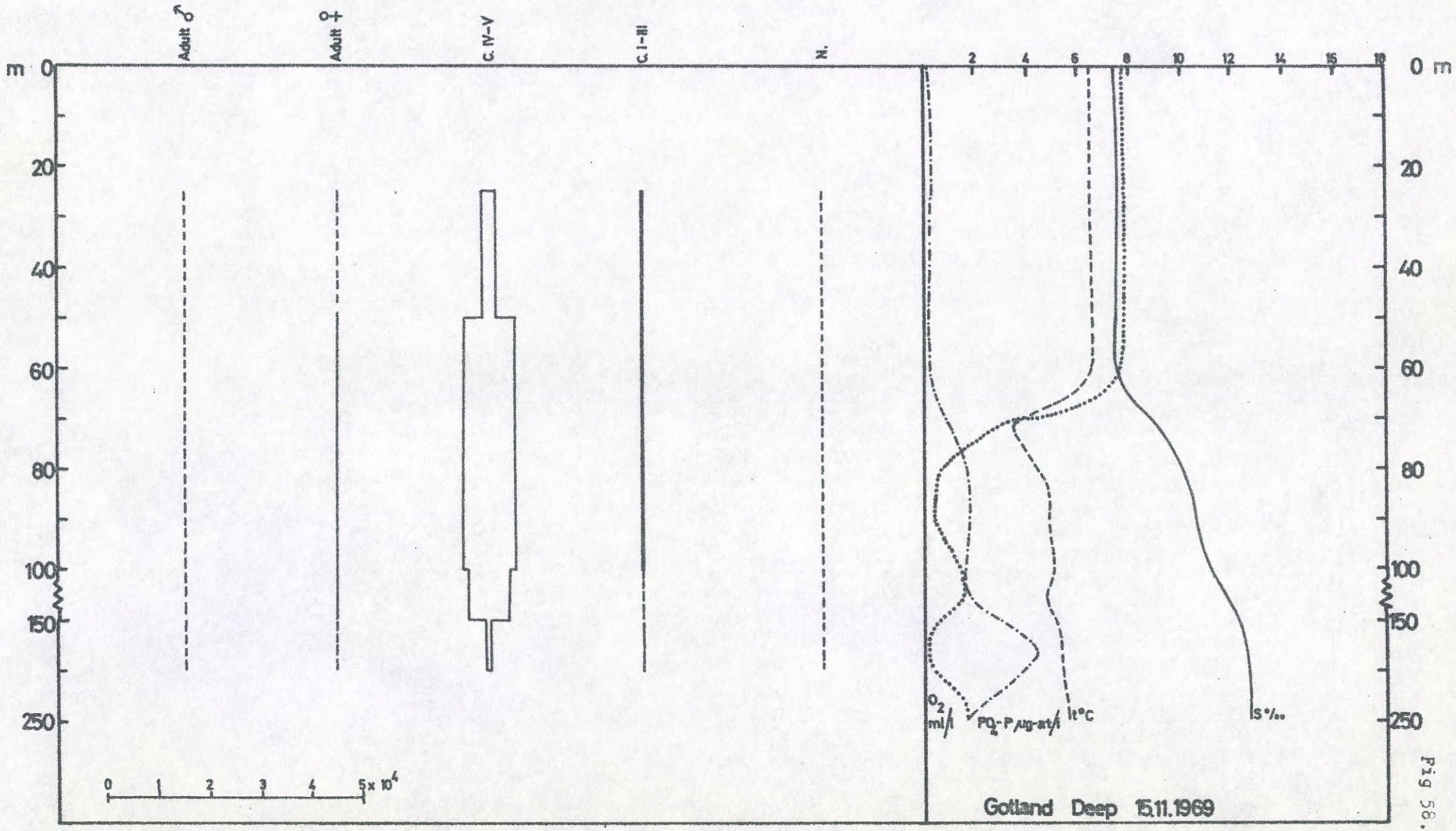

PSEUDOCALANUS MINUTUS ELONGATUS
Adult ♂
Adult ♀
C. IV–V
C. I–III
N.
m
0
20
40
60
80
100
150
250
0 1 2 3 4 5 x 10⁴
2 4 6 8 10 12 14 16 18
0 m
O_2 ml/l
PO_4-P µg-at/l
t°C
S °/₀₀
Gotland Deep 15.11.1969

Fig 58.

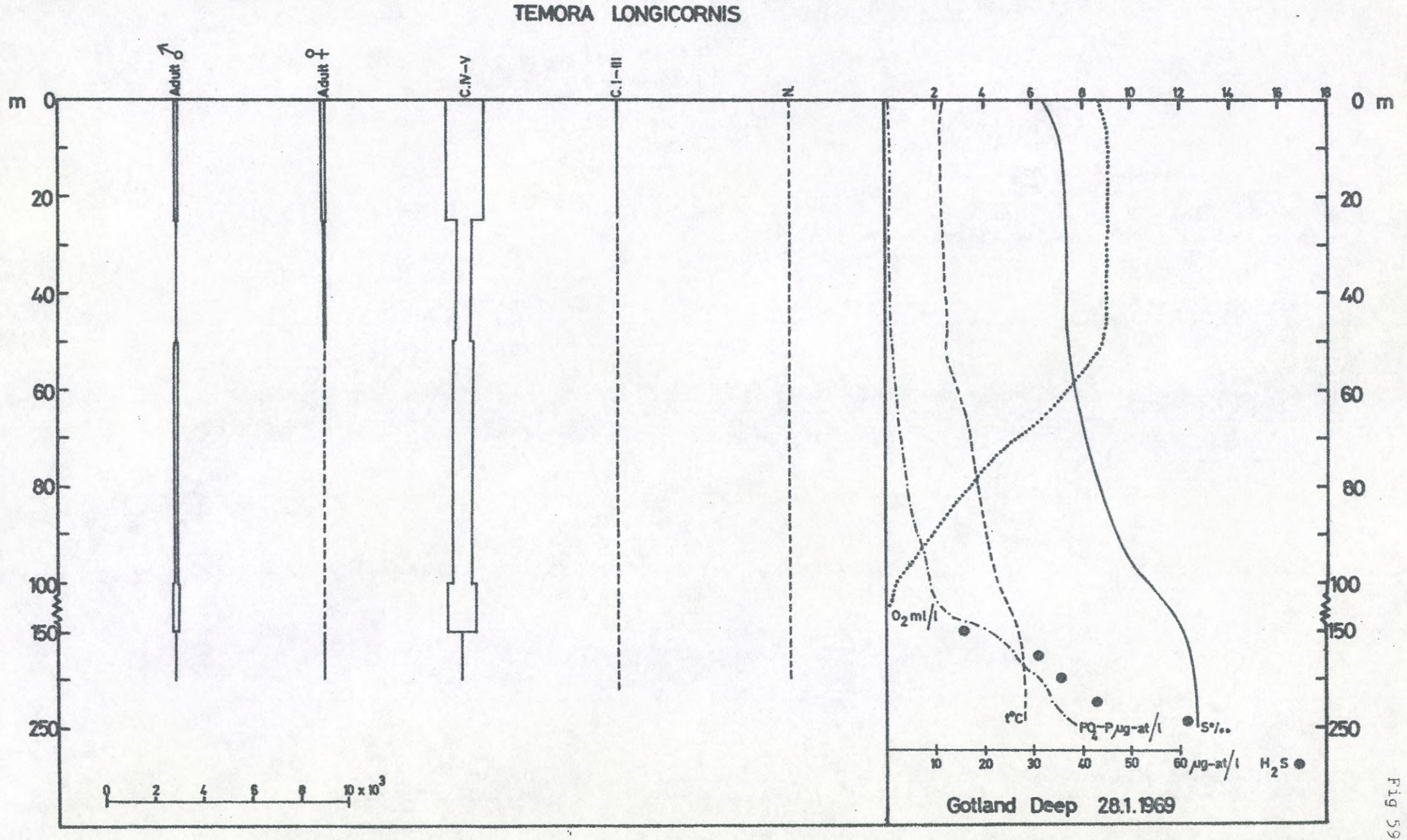

TEMORA LONGICORNIS
Adult ♂
Adult ♀
C.IV–V
C.I–III
N
m
0
20
40
60
80
100
150
250
0 2 4 6 8 10 x 10³
2 4 6 8 10 12 14 16 18
O₂ ml/l
t°C
PO₄–P µg-at/l
S‰
10 20 30 40 50 60 µg-at/l
H₂S
Gotland Deep 28.1.1969

Fig 59.

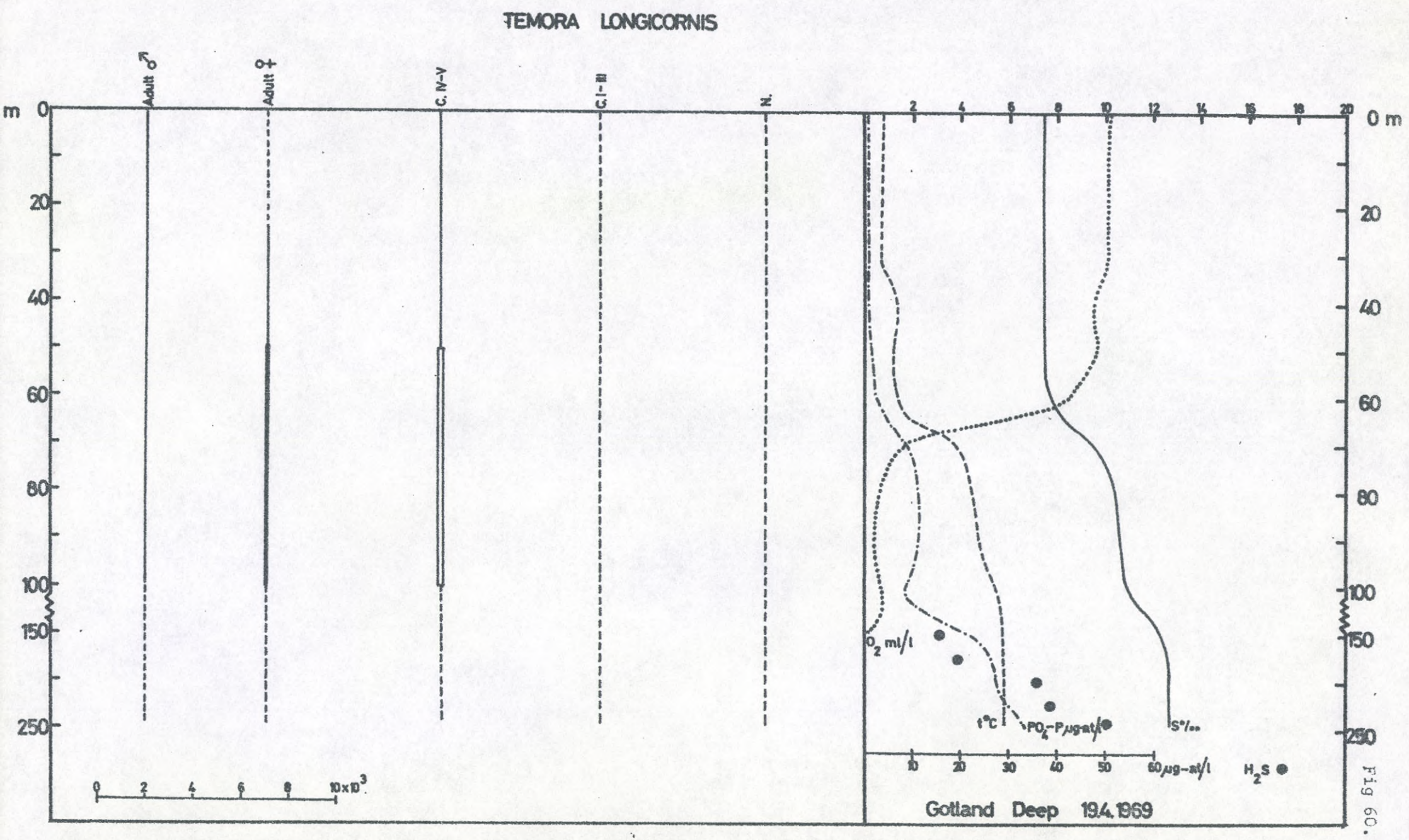

TEMORA LONGICORNIS
Adult ♂
Adult ♀
C. IV-V
C. I-III
N.
m
0
20
40
60
80
100
150
250
0 2 4 6 8 10x10³
2 4 6 8 10 12 14 16 18 20
0 m
O₂ ml/l
t°C
PO₄-P µg-at/l
S°/..
10 20 30 40 50 60 µg-at/l
H₂S
Gotland Deep 19.4.1969

Fig 60.

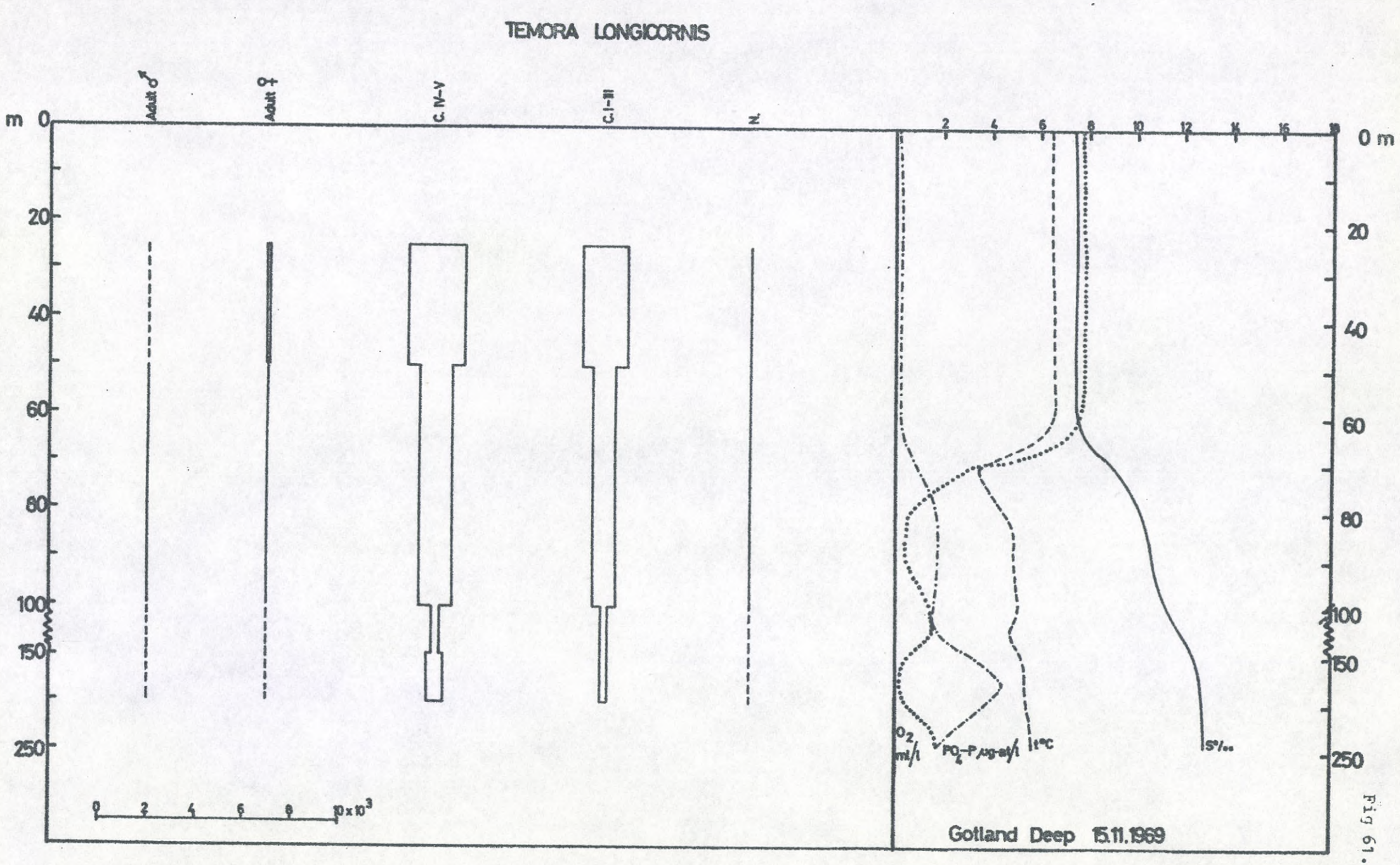

TEMORA LONGICORNIS
Adult ♂
Adult ♀
C. IV–V
C. I–III
N.
m 0
20
40
60
80
100
150
250
0 2 4 6 8 10 x 10³
0 m
20
40
60
80
100
150
250
O₂ ml/l
PO₄–P µg-at/l
t°C
S°/₀₀
Gotland Deep 15.11.1969

Fig 61.

Table 1. Plankton stations visited in 1969.

S 12 (2A)	Arkona	55°00'N 14°05'E
S 24 (5A)	Bornholm Deep	55°15'N 15°59'E
	8A "Rysshålan"	55°38'N 18°36'E
F 81 (15A)	Gotland Deep	57°20'N 20°03'E
F 72		59°18'N 21°34'E
F 78 (31A)	Landsort Deep	58°35'N 18°14'E
S 41 (38A)		57°07'N 17°40'E

Table 2. Temperature, salinity, oxygen and hydrogen sulphide values at stations S 12, S41, F72, F 81, and F 78, January 1969 (ANON., 1970a).

Station S 12; 21 January, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	1.68	7.87	9.10
5	1.65	7.85	9.18
10	1.69	7.87	9.11
15	1.68	7.87	9.10
20	1.78	7.88	9.14
30	2.35	7.92	8.90
40	4.73	13.30	7.44
45	5.91	15.07	6.60

Station S 41; 22 January, 1969

Depth m	t°C	S°/oo	O_2 ml/l	H_2S µgat/l
0	2.90	6.96	8.82	
5	2.88	6.97	8.86	
10	2.88	6.97	8.87	
15	2.87	6.97	8.80	
20	2.92	6.97	8.89	
30	2.94	6.97	8.85	
40	2.94	6.97	8.83	
50	2.98	7.00	8.73	
60	4.05	8.11	4.95	
70	4.12	9.07	2.36	
80	4.27	9.94	0.42	
90	4.36	10.26	0.18	
100	4.40	10.32		3.70

Continued

Table 2. Continued)

Station F 72; 24 January, 1969

Depth m	t°C	S°/oo	O_2 ml/l	H_2S µgat/l
0	2.43	7.17	8.90	
5	2.37	7.17	8.83	
10	2.36	7.17	8.89	
15	2.41	7.17	8.88	
20	2.42	7.17	8.90	
30	2.45	7.17	8.93	
40	2.51	7.19	8.89	
50	2.56	7.20	8.96	
60	2.57	7.22	8.84	
70	2.56	7.23	8.92	
80	4.15	8.58	3.86	
90	4.51	10.24	0.35	
100	4.58	10.47	0.19	
125	4.65	10.59	0.11	
150	6.42	10.67		0.60

Station F 81; 28 January, 1969

Depth m	t°C	S°/oo	O_2 ml/l	H_2S µgat/l
0	2.29	6.54	8.93	
10	2.28	7.29	9.10	
30	2.36	7.33	9.02	
50	2.37	7.34	8.99	
70	3.37	8.16	5.26	
100	4.56	10.63	0.44	
125	5.13	11.44	0.09	
150	5.47	12.05		15.30
175	5.59	12.38		31.80
200	5.70	12.54		35.50
225	5.73	12.62		43.00
240	5.76	12.69		61.50

Continued

Table 2. Continued)

Station F 78; 23 January, 1969

Depth m	t°C	S°/oo	O_2 ml/l	H_2S µgat/l
0	1.96	6.86	9.18	
5	1.89	6.84	9.17	
10	1.91	6.85	9.16	
15	1.94	6.85	9.26	
20	1.95	6.85	9.15	
30	2.01	6.86	9.12	
40	2.24	6.94	9.00	
50	3.46	7.17	8.54	
60	4.20	7.44	7.39	
70	4.02	7.83	6.21	
80	3.79	8.39	4.68	
90	4.01	9.22	2.49	
100	5.47	10.03	0.82	
125	4.64	10.67	0.10	
150	4.70	10.74	0.10	
175	4.68	10.75	0.10	
200	4.70	10.77	0.10	
300		10.89		1.98
400	4.80	10.95		3.40
440	4.82	10.93		3.58

Table 3. Temperature, salinity, oxygen and hydrogen sulphide values at stations S 12, S 24, 8 A, S 41, F 78, F 72 and F 81, April 1969 (ANON., 1970a).

Station S 12; 15 April, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	2.69	7.96	9.65
5	2.60	7.96	9.70
10	2.63	7.96	9.64
15	2.33	8.11	9.78
20	2.35	8.11	9.74
30	2.77	12.98	9.97
40	2.52	15.83	9.50
45	2.27	21.63	7.61

Continued

Table 3. Continued)

Station S 24; 15 April, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	1.94	7.59	9.82
5	1.89	7.60	9.90
10	1.96	7.59	9.89
15	1.95	7.60	9.76
20	1.93	7.60	9.73
30	1.88	7.60	9.72
40	1.52	7.68	9.69
50	0.86	8.47	9.35
60	4.30	12.89	6.09
70	5.81	14.99	3.40
80	3.57	16.38	6.10
87	3.28	16.90	6.30

Station 8 A; 16 April, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	1.41	7.48	9.71
5	1.43	7.49	9.74
10	1.44	7.49	9.92
15	1.74	7.49	9.70
20	1.41	7.49	9.61
30	1.40	7.51	9.85
40	1.43	7.51	9.65
50	1.14	7.58	9.64
60	1.04	7.74	9.33
70	2.33	8.39	6.87
80	4.27	9.90	0.91
90	4.87	11.85	4.73

Station S 41; 16 April, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	1.45	7.12	9.79
5	1.48	7.09	9.70
10	1.43	7.09	9.74
15	1.45	7.09	9.74
20	1.47	7.09	9.69
30	1.47	7.09	9.82
40	1.43	7.13	9.76
50	1.29	7.09	9.82
60	3.11	7.86	6.04
70	4.06	9.23	2.14
80	4.34	9.98	0.65
90	4.36	10.15	0.30
100	4.40	10.20	0.20
105	4.40	10.21	0.23

Station F 72; 18 April, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	0.37	7.05	10.15
5	0.37	7.05	10.16
10	0.35	7.04	10.21
15	0.34	7.05	10.21
20	0.36	7.04	10.12
30	0.33	7.08	10.05
40	0.12	7.21	9.71
50	0.30	7.41	9.33
60	1.96	7.83	7.07
70	3.65	9.31	2.51
80	4.22	10.15	0.81
90	4.23	10.17	0.74
100	4.76	10.21	0.69
125	4.37	10.36	0.54
150	4.50	10.51	0.27
175	4.59	10.59	0.16

Continued

Table 3. Continued)

Station F 78; 17 April, 1969

Depth m	t°C	S°/oo	O_2 ml/l	H_2S ugat/l
0	1.21	6.88	10.26	
5	1.23	6.88	10.19	
10	1.19	6.88	10.20	
15	1.20	6.88	10.14	
20	1.16	6.88	10.22	
30	1.04	6.90	10.13	
40	1.32	7.06	9.56	
50	1.72	7.40	8.04	
60	3.85	9.01	3.04	
70	4.09	9.58	1.53	
80	4.28	9.87	0.94	
90	4.34	10.00	0.70	
100	4.40	10.17	0.49	
125	4.53	10.39	0.35	
150	4.68	10.65	0.20	
175	4.72	10.77		1.20
200	4.77	10.82		2.14
300	4.78	10.88		3.05
400	4.79	10.89		4.30
440	4.85	10.89		1.30

Station F 81; 19 April, 1969

Depth m	t°C	S°/oo	O_2 ml/l	H_2S ugat/l
0	0.86	7.30	10.10	
5	0.88	7.31	10.15	
10	0.88	7.30	10.10	
15	0.89	7.31	10.15	
20	0.85	7.31	10.06	
30	0.82	7.31	10.10	
40	1.32	7.51	9.57	
50	1.07	7.52	9.66	
60	1.36	7.82	8.41	
70	4.00	9.53	1.67	
80	4.50	10.17	0.79	
90	4.78	10.58	0.44	
100	5.38	10.81	0.77	
125	5.62	11.67	0.80	
150	5.60	12.24		15.2
175	5.71	12.47		19.7
200	5.71	12.54		35.5
225	5.86	12.62		37.5
240	5.75	12.64		50.0

Table 4. Temperature, salinity and oxygen values at staticns S 24, 8 A and F 81, November 1969 (ANON., 1970b).

Station S 24; 14 November, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	8.22	7.55	7.65
5	8.23	7.56	7.67
10	8.24	7.55	7.61
15	8.21	7.54	7.67
20	8.15	7.55	7.56
30	8.14	7.54	7.59
40	8.16	7.55	7.58
50	8.25	7.55	7.61
60	6.17	11.37	2.88
70	7.20	15.48	2.53
80	5.14	16.47	2.15
87	5.25	16.63	2.05

Station 8 A; 14 November, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	7.12	7.41	7.79
5	7.05	7.42	7.78
10	7.05	7.42	7.81
15	7.12	7.42	7.84
20	7.09	7.42	7.73
30	7.07	7.42	7.72
40	7.16	7.44	7.70
50	7.23	7.44	7.69
60	3.48	8.58	4.85
70	4.39	9.80	2.44
80	4.88	10.92	2.29
90	5.46	11.77	2.14
100	5.94	12.30	2.14

Table 4. Continued)

Station F 81; 15 November, 1969

Depth m	t°C	S°/oo	O_2 ml/l
0	6.44	7.39	7.96
5	6.53	7.38	7.92
10	6.56	7.38	7.95
15	6.55	7.38	7.88
20	6.56	7.38	7.88
30	6.52	7.39	7.89
40	6.59	7.39	7.88
50	6.61	7.40	7.82
60	6.72	7.43	7.68
70	3.42	9.01	3.10
80	4.47	10.12	0.56
90	4.99	10.74	0.59
100	5.10	11.13	1.37
125	4.88	11.88	1.52
150	5.29	12.32	0.33
175	5.29	12.51	0.20
200	5.38	12.61	0.48
225	5.56	12.83	1.53
240	5.71	12.93	1.81