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ICNAF Joint Larval Herring Survey in Georges Bank-Gulf of Maine areas in 1972 - Preliminary summary

by

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Preface

At the ICNAF Mid-Term Meeting in January 1973 preliminary reports were available for the cruises carried out in this joint survey program. It was suggested that a comprehensive paper based on the pooled data should be prepared for the ICNAF 1973 Annual Meeting. Most of the calculations have been done, however, not all of the final data were available in time prior to the meeting. A preliminary summary of results is given in this paper, but a more thorough look at the complete data is necessary and it is suggested that a comprehensive paper will be prepared for the next Mid-Term Meeting.

Methods

The standard methods to be used in the Joint Survey program were recommended in the Report of a Working Group (Res.Doc. 72/123), with a summary of the results from the 1971 survey. The recommended station grid and cruise track for the 1972 survey is given in Fig. 2; it has been changed slightly from that used in 1971. Generally, the research vessels have adhered to the standard station grid. The charts and Table 1 indicate where single stations have been left out or added.

Some alterations of the original recommendations (Res.Doc. 72/123) were made before the fall cruises. The maximum depth of tows was reduced from 200 to 100 m, and the rate at which the gear was to be hauled back was suggested to be 10 m per minute. Details of methods during individual cruises are outlined in the respective Res.Doc. mentioned in Table 1. Differences between countries occurred particularly in methods used to take length measurements and in the availability of hydrographical data. Recommendations for future surveys concerning sampling operation, processing of samples and reporting have been discussed in a small group (M.D. Grosslein (USA), W.T. Stobo (Canada), and D. Schnack (FRG)) during this Annual Meeting and are given as an Appendix (these will be distributed to all participants in the Joint Larval Herring Survey program).

Results

Distribution of larvae

Charts with numbers of larvae per m^2 of sea surface are given for the offshore cruises for three size groups (<10, 10-15, > 15 mm) and the total size range separately. The distribution of larvae in the Bay of Fundy and in the inner Gulf of Maine, derived from along shore cruises, are given in Res.Doc. 73/93 and 73/12, respectively. In general, the same areas were indicated as distinct spawning grounds as in the previous year: Nantucket Shoals, Georges Bank, off southwest Nova Scotia, and along the shore of the Gulf of Maine.

During the 1971 cruises in the area of Nantucket Shoals, 10-15 mm larvae were not caught in significant numbers before early November. Thus, it was decided to delete this area from the September 1972 cruises. However, in 1972 large numbers of 10-15 mm larvae were caught in early October in the Nantucket Shoals area, indicating the necessity of September cruises in that area.

In the Nova Scotia area only one large larva was caught in September, obviously due to the fact that stations near the shore were omitted during the first cruise. From length frequencies it would appear that hatching started earlier in that area than in the others, where hatching must have begun some time in August.

The distribution of larvae of the different size groups during the sampling period in 1972 was similar to that found in 1971. The general impression is, that although large larvae are more widely dispersed, drift between areas seems to be relatively small except from off southwest Nova Scotia into the Bay of Fundy (Res.Doc. 73/93). Any exchange of larvae between the Bay of Fundy and the area south of Grand Manan Island is still uncertain.

Quantitative estimates

The numbers of larvae per m^2 were estimated by multiplying the numbers per m^3 by the maximum depth of tow for the along shore cruises (Res.Doc.73/12). For the offshore cruises the depth of station was used since the maximum depth of tow was not always available. However, calculations using both methods for one example did not lead to important differences in view of the sampling error. The total abundance of larvae in the particular areas were then estimated by multiplying the average number per m^2 times the area sampled.

Abundance estimates for larvae less than 10 mm and for the total size range separately are given in Table 2. To compare the relative importance of the spawning areas in both years, the total abundance of larvae less than 10 mm is plotted against time in Fig. 1. The results indicate that larval production was in the same order of magnitude in both years in the inner Gulf of Maine. Estimates for Georges Bank for 1971 given in Res.Doc. 72/123 include the data for the Nantucket Shoals area. Separate estimates of abundance have now been made for Georges Bank and Nantucket Shoals for 1971 and 1972. While the combined estimates are in the same order of magnitude in both years, the larval abundance differed significantly for each area between 1971 and 1972. Larval production, measured by the area under the curves in Fig. 1, is indicated to be about one order of magnitude greater in 1972 than in 1971 in the Nantucket Shoals area, whereas, on Georges Bank the 1972 production appears to be about one third of that in 1971.

Sampling off Nova Scotia was too incomplete in both years, thus comparisons with

other areas are difficult.

Hydrography

For comparison purposes, the distributions of temperature and salinity are given in charts for three depth strata where available. It is not attempted to give a detailed description and comparison to larval distribution at this state. A more detailed analysis is planned.

A cursory analysis of the hydrographic data indicates at least three distinct areas: the rather isolated area of the Georges Bank, the area west and south of Nova Scotia under the influence of Labrador and Atlantic waters, and a large mixed-water zone in the Gulf of Maine. A fourth zone south of Cape Cod (between 40°30'N to 41°30'N and 69°30'W to 71°30'W) may exist with salinities under 32.00‰ and relative low temperatures. These separations seem to coincide generally with the distinct areas of larval distribution.

Table 1 : Data Basis from 1972 Survey

Vessel	Country	Period	Area	Available Data and Reports	
R.V."Argos"	USSR	22.Sep - 30.Sep	Georges Bank + Nova Scotia: Stat. 47-124 (8 Stat.left out)	BDS*), (no depth of tow) Res. Doc.: 73/97	standard length (nearest mm)
R.V."Argos"	USSR	12.Oct - 28.Oct	total offshore 17 Stat. left out	BDS, (no depth of tow) Res. Doc: 73/97	standard length (nearest mm)
R.V."Wieczno"	Poland	2.Oct - 28.Oct	total offshore: Stat. 2-124 (7 Stat. additional)	BDS, Res.Doc.:	total length (nearest mm) 73/16 and 73/21
R.V."A. Dohrn"	FR Germany	31.Oct - 12.Nov	total offshore: Stat. 3-124 (5 Stat. left out)	BDS Res.Doc.:	total length (mm below) 73/19
R.V."Albatross IV"	USA	2.Nov - 15.Dec	total offshore: Stat. 1-124 (3 additional Stat.)	BDS Res.Doc.:	73/11
R.V."Lucille B"	USA	2.Sep - 6.Sep	alongshore Gulf of Maine (eastern sector)	Res. Doc. 73/12	total length (nearest mm)
R.V."Albatross IV"	USA	21.Sep - 24.Sep	alongshore Gulf of Maine (total)	"	"
R.V."Duchness II"	USA	18.Oct - 22.Oct	"	"	"
R.V."Duchness II"	USA	6.Nov - 12.Nov	"	"	"
	Canada	16.Nov - 25.Nov	Bay of Fundy, Nova Scotia Stat. 112-124	Stationgrid No larvae /m^2 Res. Doc. : 73/93	

*) BDS = Basic Data Summary

A 5

Table 2 : Estimates of Larval Abundance

Area	Period	Number of larvae x 10^{-9} <10 mm	total
Nantucket Schoal (Stat. 1-35)	2.Oct - 7.Oct	244	450
	12.Oct - 17.Oct	810	1490
	31.Oct - 3.Nov	230	442
	28.Nov - 4.Dec	3.2	166
Georges Bank (Stat. 47-99)	22.Sep - 30.Sep	131	176
	10.Oct - 22.Oct	158	489
	18.Oct - 24.Oct	34	261
	5.Nov - 9.Nov	50	154
	6.Dec - 13.Dec	0.2	52
Nova Scotia (Stat. 100-109, 112-124)	28.Sep - 30.Sep	(0)*)	(0.1)*)
	23.Oct - 25.Oct	92	138
	26.Oct - 28.Oct	(0)*)	(6,5)*)
	10.Nov - 12.Nov	6.5	71
	.Nov - .Nov	?	68 (75)**)
	13.Dec - 15.Dec	0	35
Gulf of Maine (offshore stations: 34,36-38, 41,42,44-46)		along shore / off shore	along shore / off shore
	2.Sep - 6.Sep	22	29
	21.Sep - 24.Sep	55	116
	8.Oct - 10.Oct	0	5.8
	17.Oct - 18.Oct	0	9.1
	18.Oct - 22.Oct	81	199
	3.Nov - 5.Nov	0	6.1
	6.Nov - 12.Nov	0.5	97
Bay of Fundy	16.Nov - 25.Nov	?	87

*) largly underestimated as near shore stations not sampled

**) estimate from narrow station grid sampled by Canada

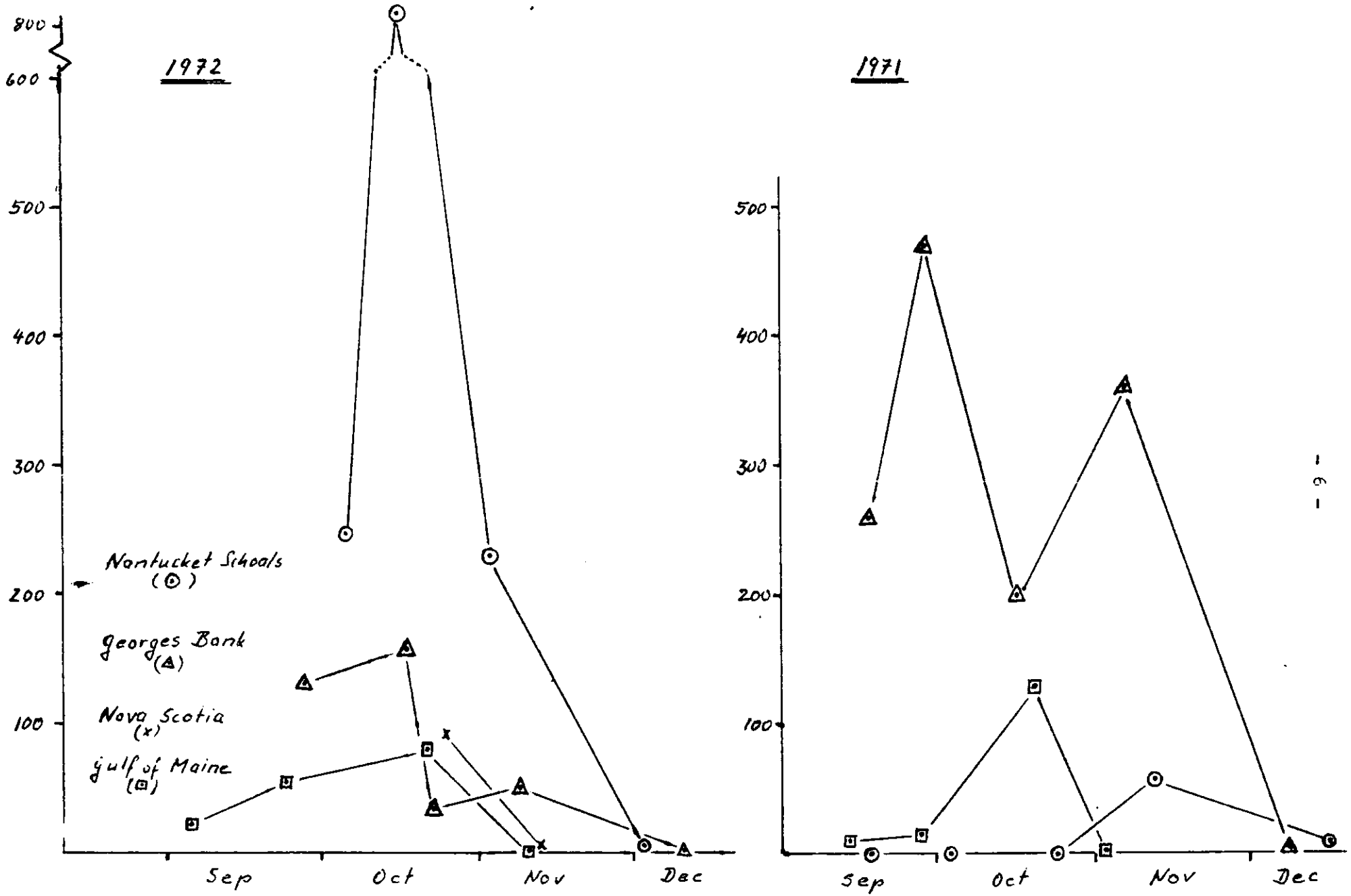


Fig. 1. Changes in total abundance of larvae < 10 mm (numbers x 10 ⁻) during the sampling periods in 1972 and 1971 for different spawning areas.

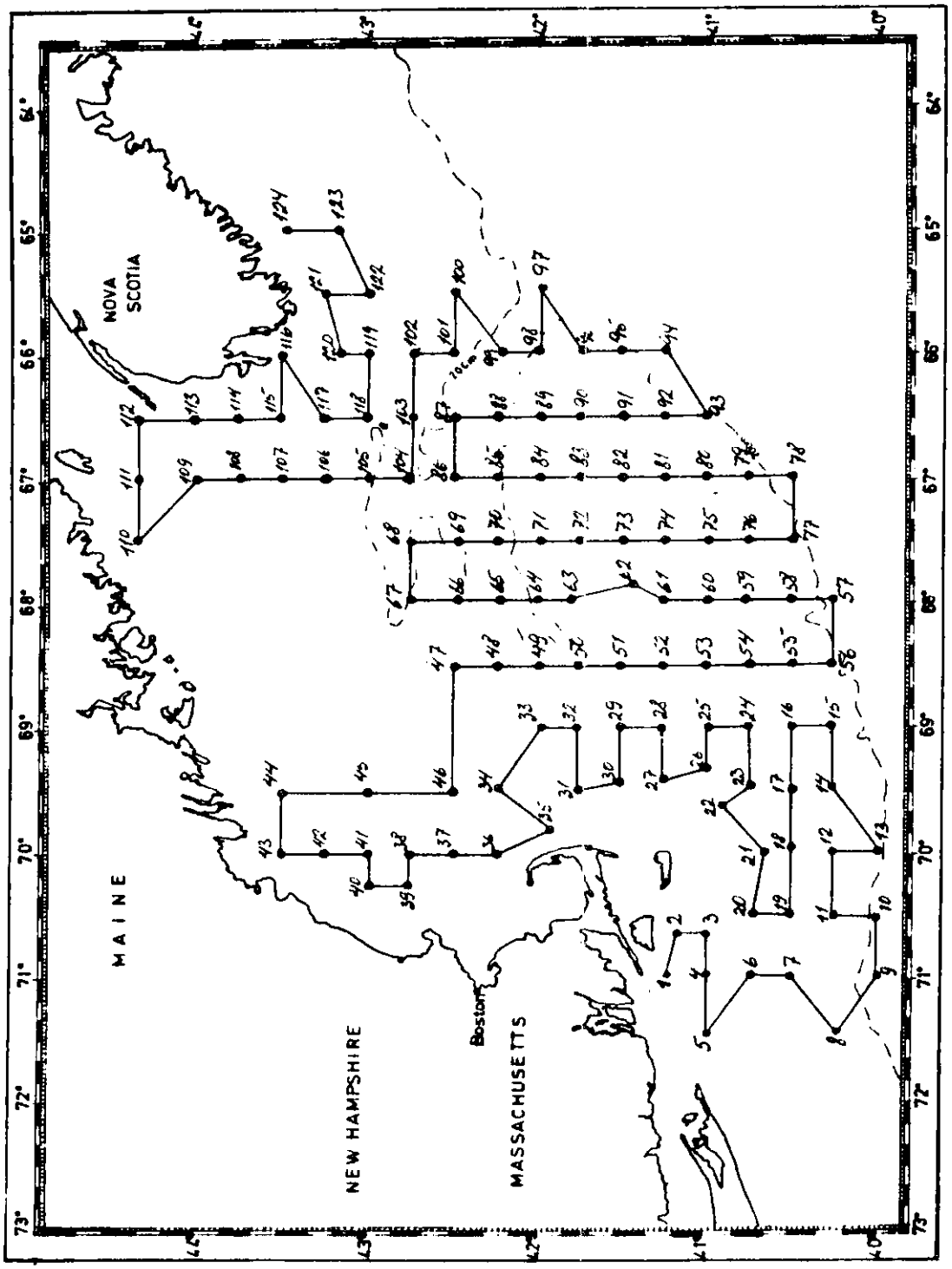


Fig. 2 : ICNAF Standart Cruise Track 1972

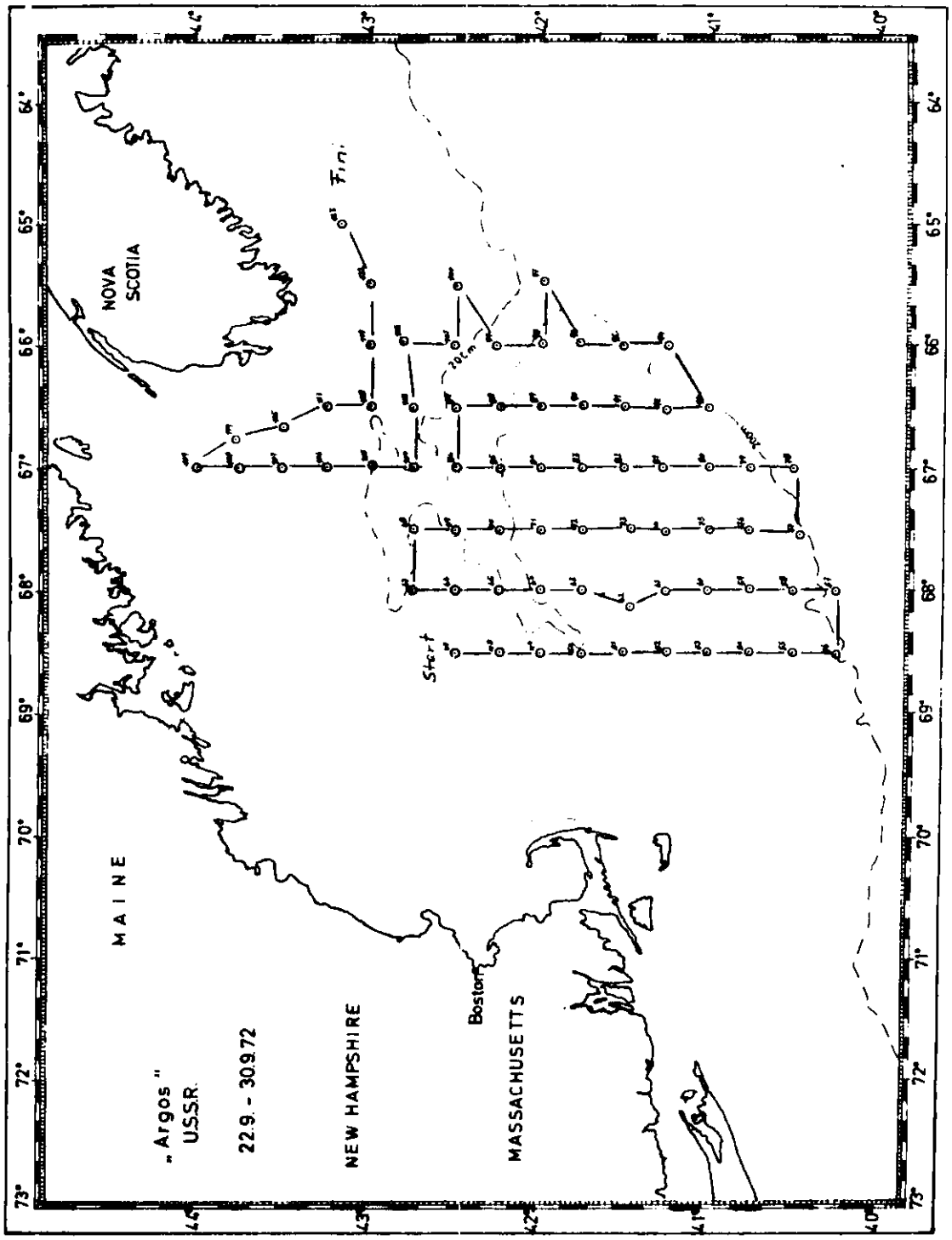


Fig. 3 : Cruise track R.V. "Argos" 22 sep - 30 sep 1972

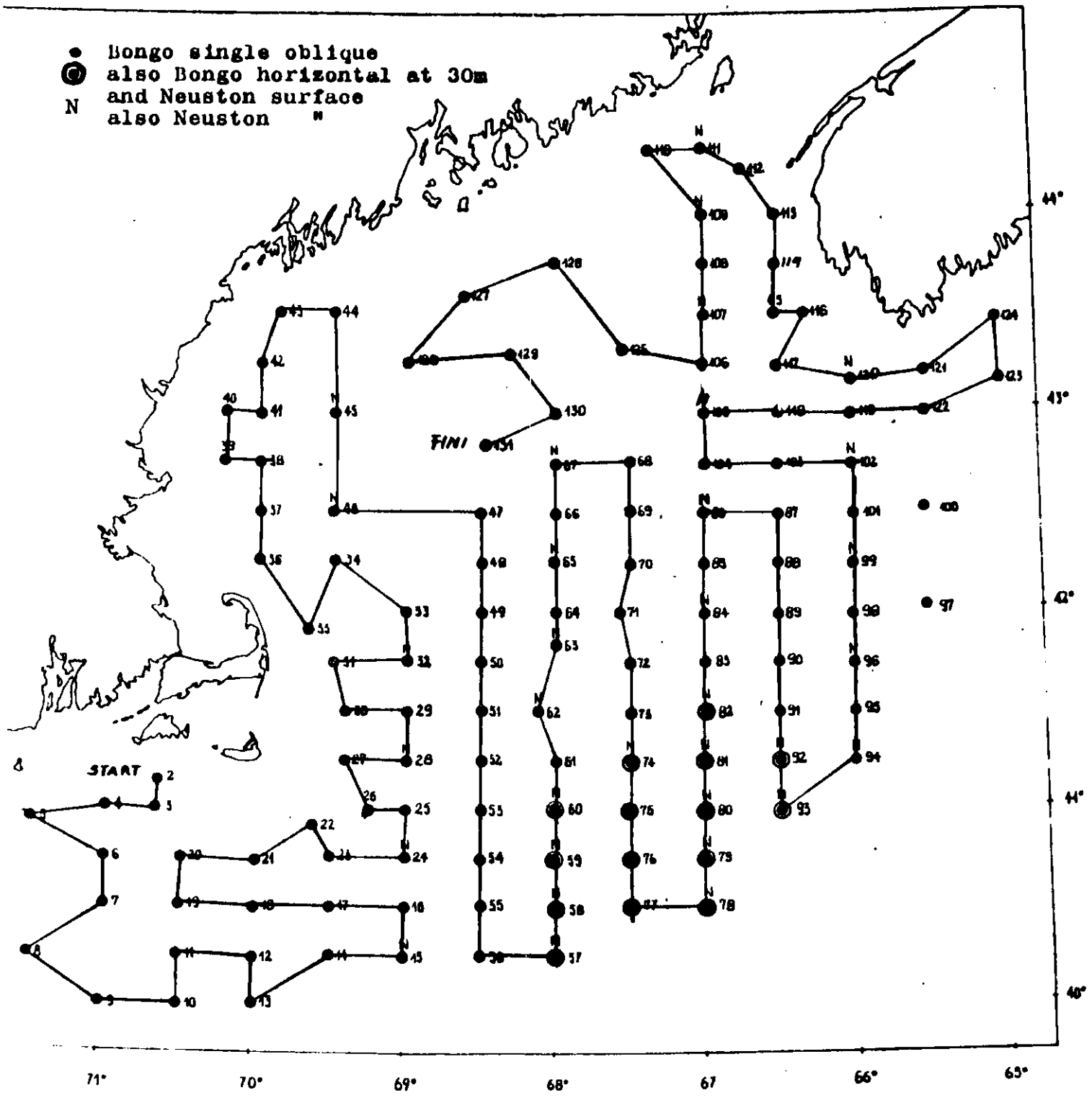


Fig. 4 Cruise tract and ichtioplankton station ICNAF Cooperative larval herring survey, 2-28 October 1972
R.V. "Wieczno"

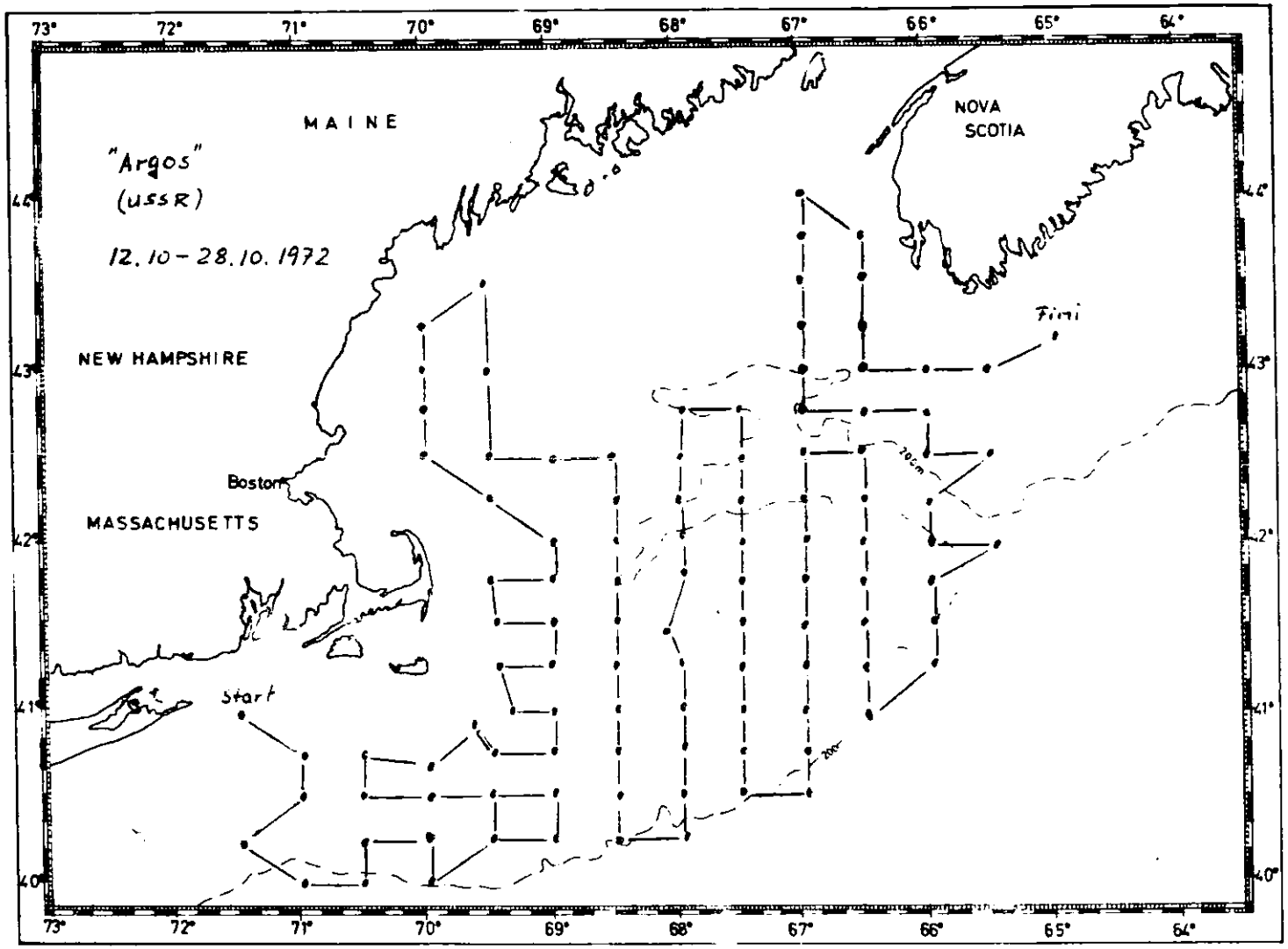


Fig. 5 : Cruise track R.V. "Argos" 12. Oct - 28. Oct. 1972

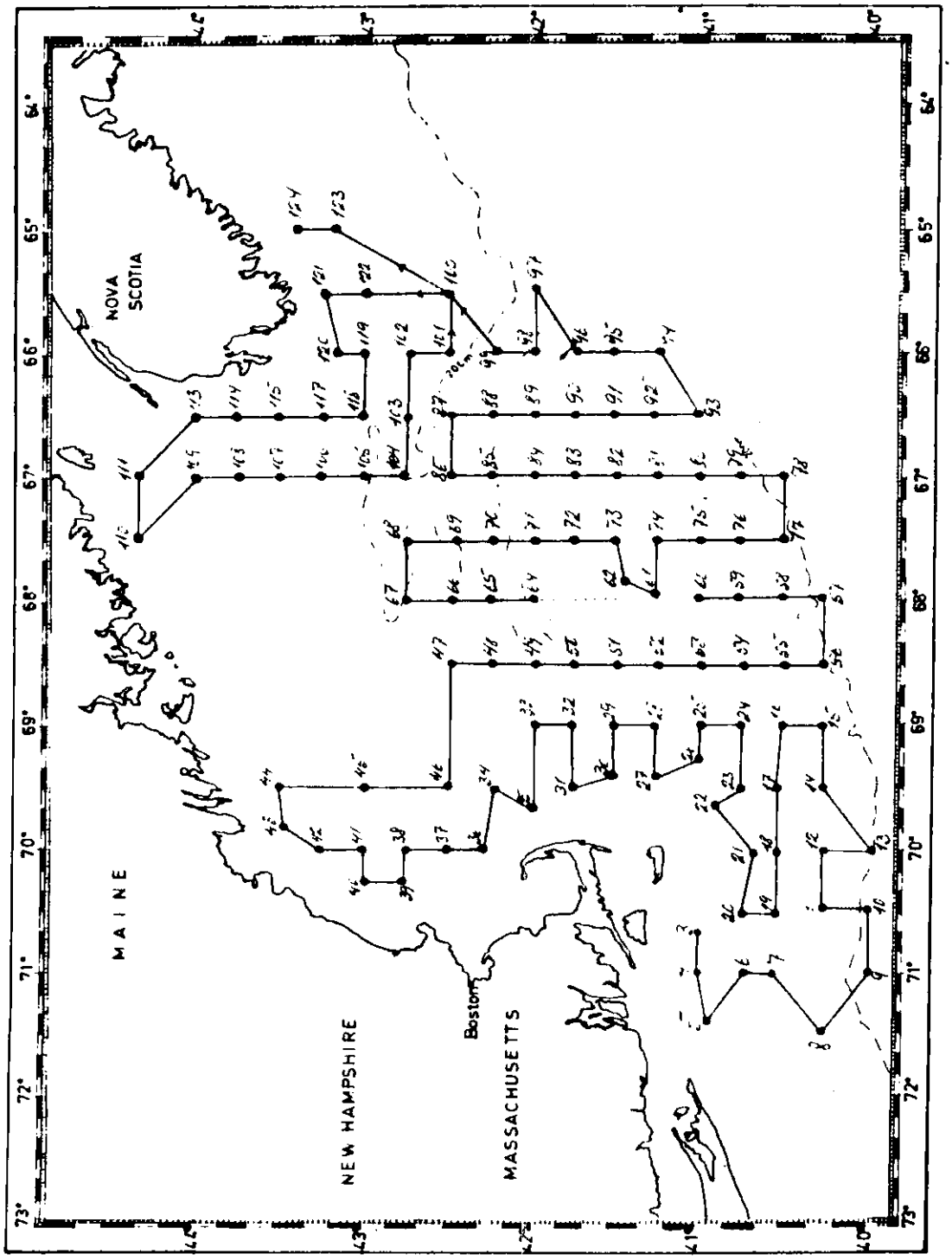


Fig. 6 : Cruise Track R.V."Anton Dohrn" 31. Okt.- 12. Nov. 1972

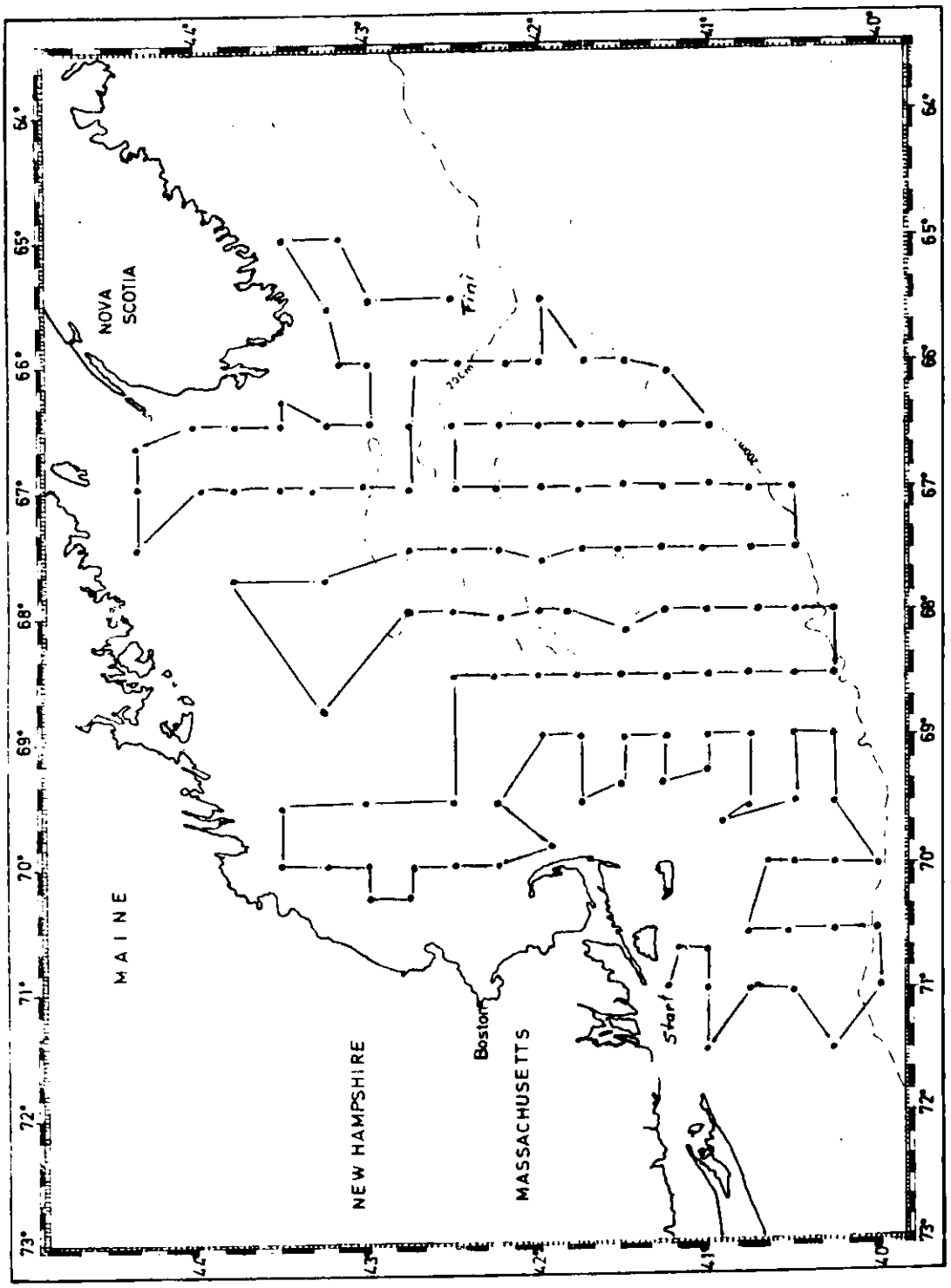


Fig. 7 : Cruise track R.V. "Albatross IV" 28 Nov - 15 Dec 1972

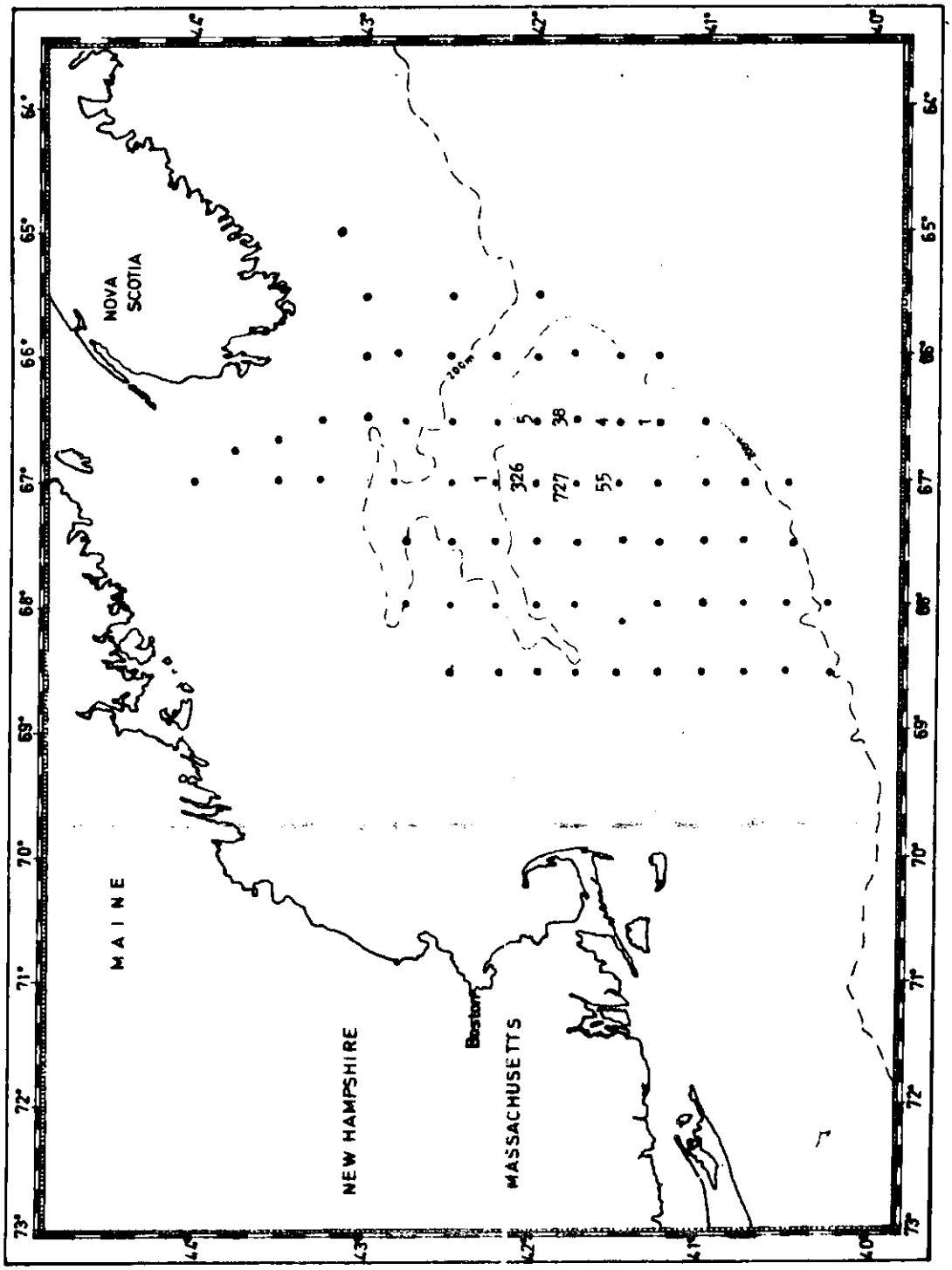


Fig. 8 : R.V. Argos 22.Sept.-30.Sept.1972
Larval Herring (< 10 mm - No/ 10 m^2)

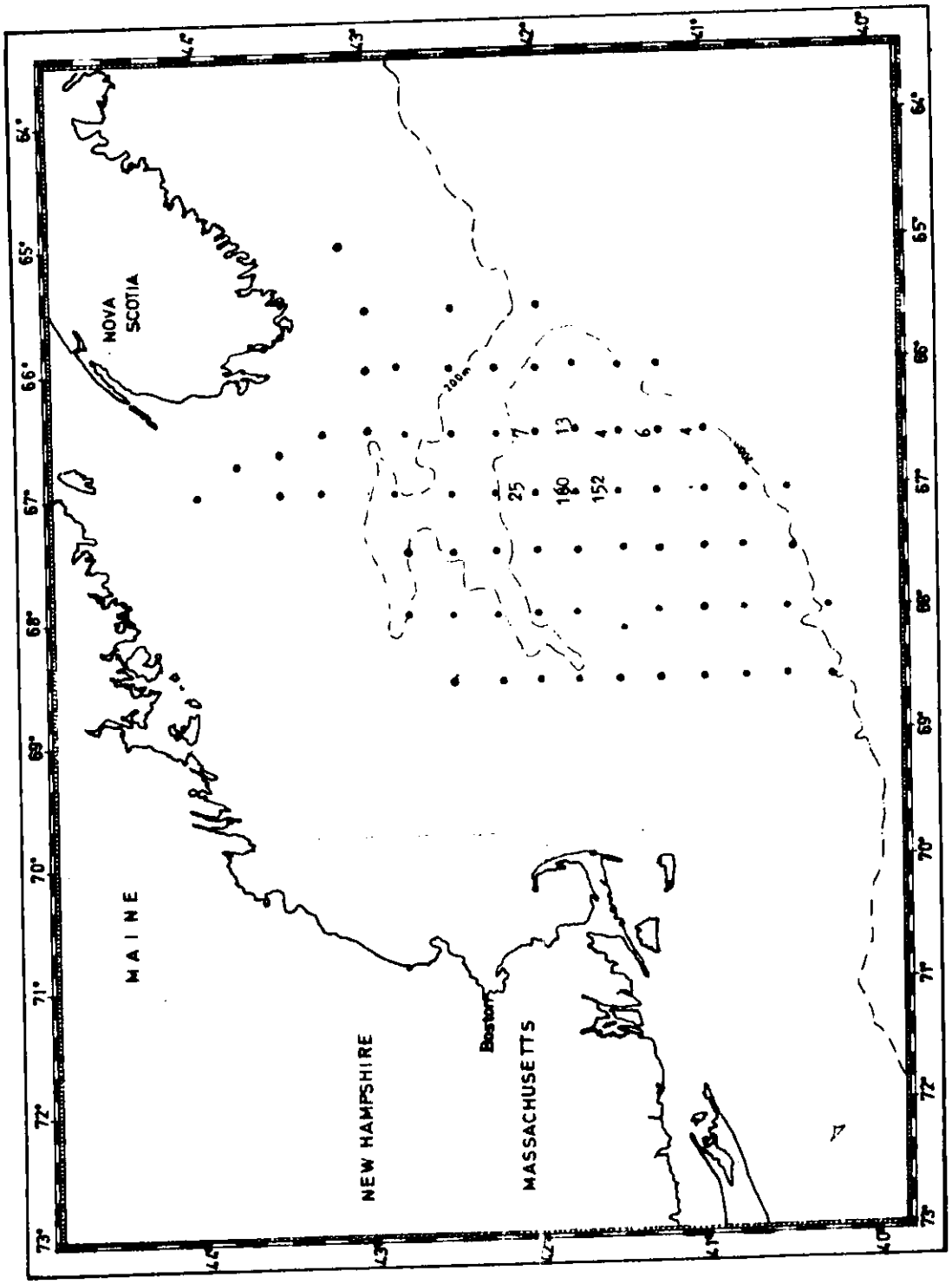


Fig. 9 : R.V. Argos 22.Sept.-30.Sept.1972
Larval Herring (10-15 mm - No/10 m^2)

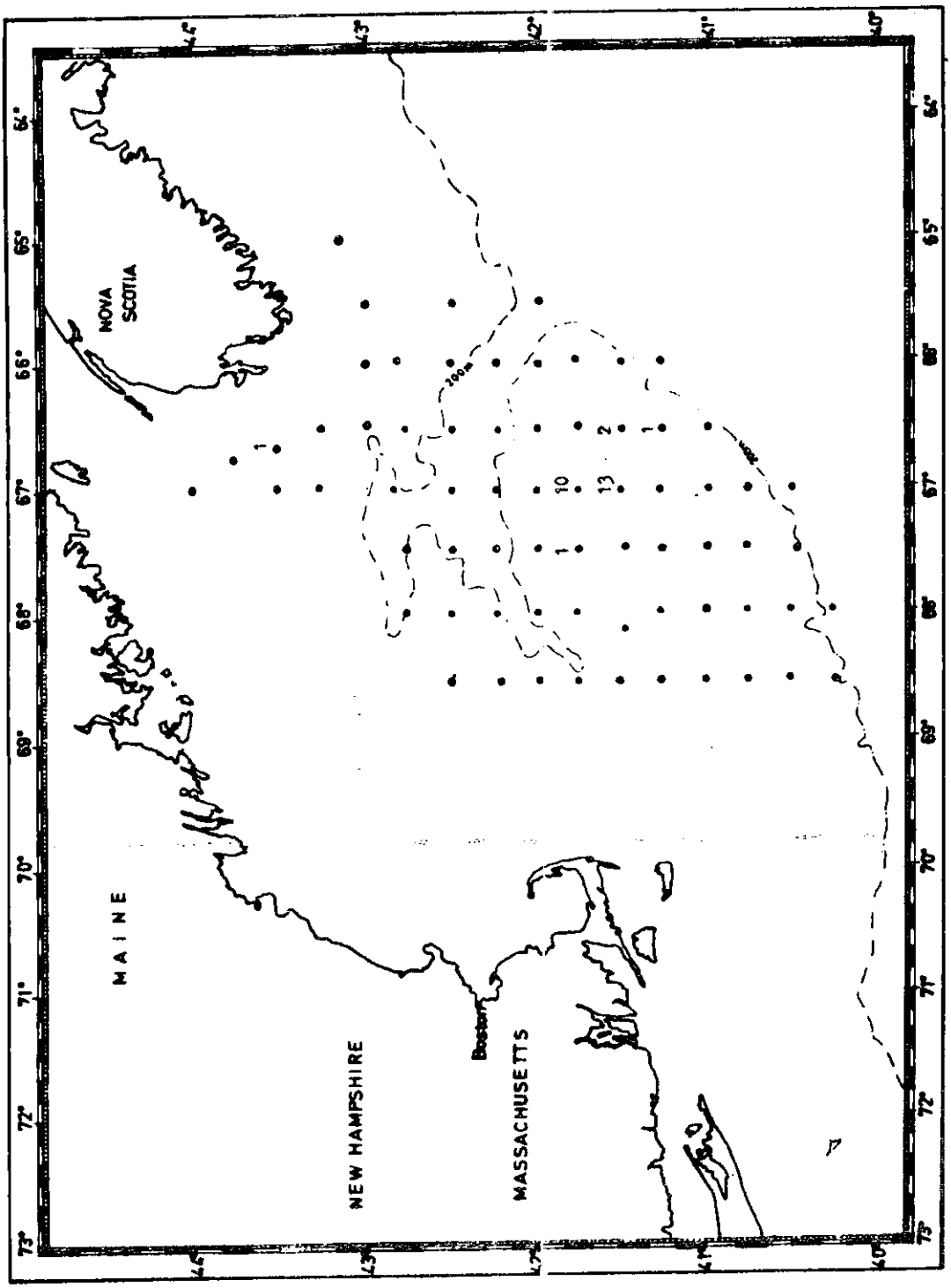


Fig. 10 : R.V. Argos 22.Sept.-30.Sept.1972
Larval Herring (> 15 mm - No/ 10 m^2)

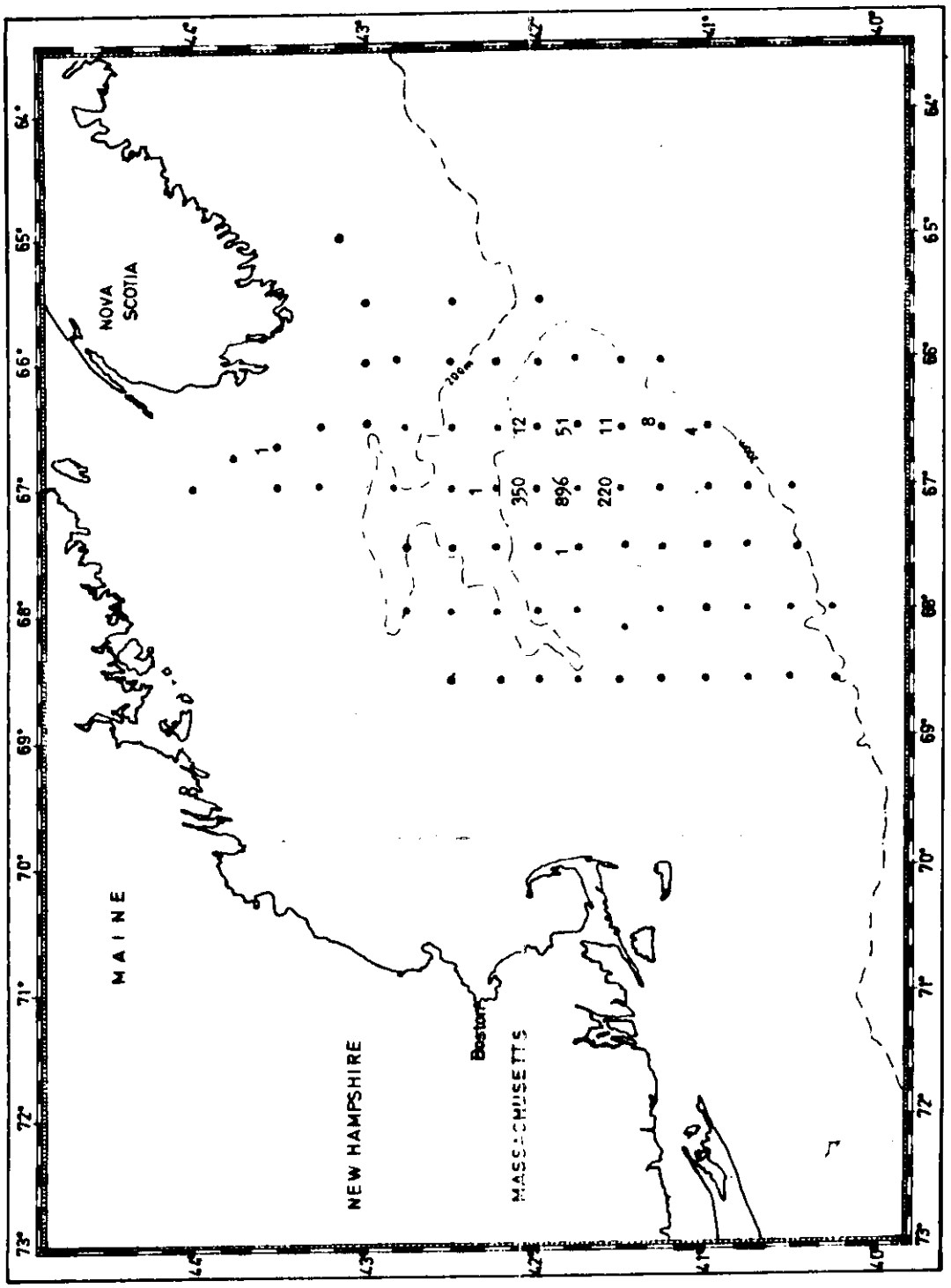


Fig. 11 : R.V. Argos 22.Sept.-30.Sept.1972
Larval Herring (Total - No/ 10 m^2)

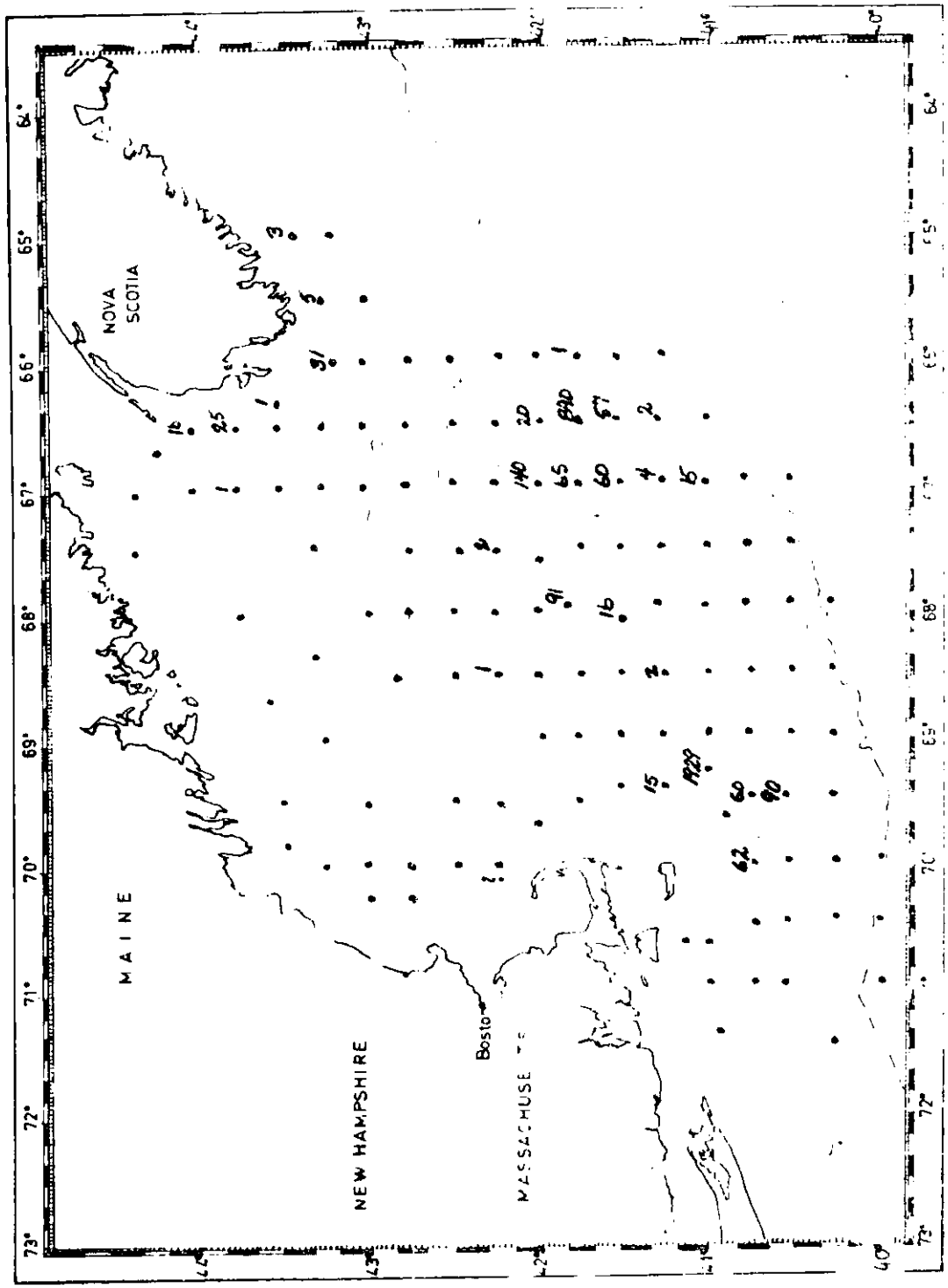


Fig. 12 : R.V. "Wieczno" 20 Oct - 28 Oct 1972
Larva. Herring (< 10 mm - No/10 m²)

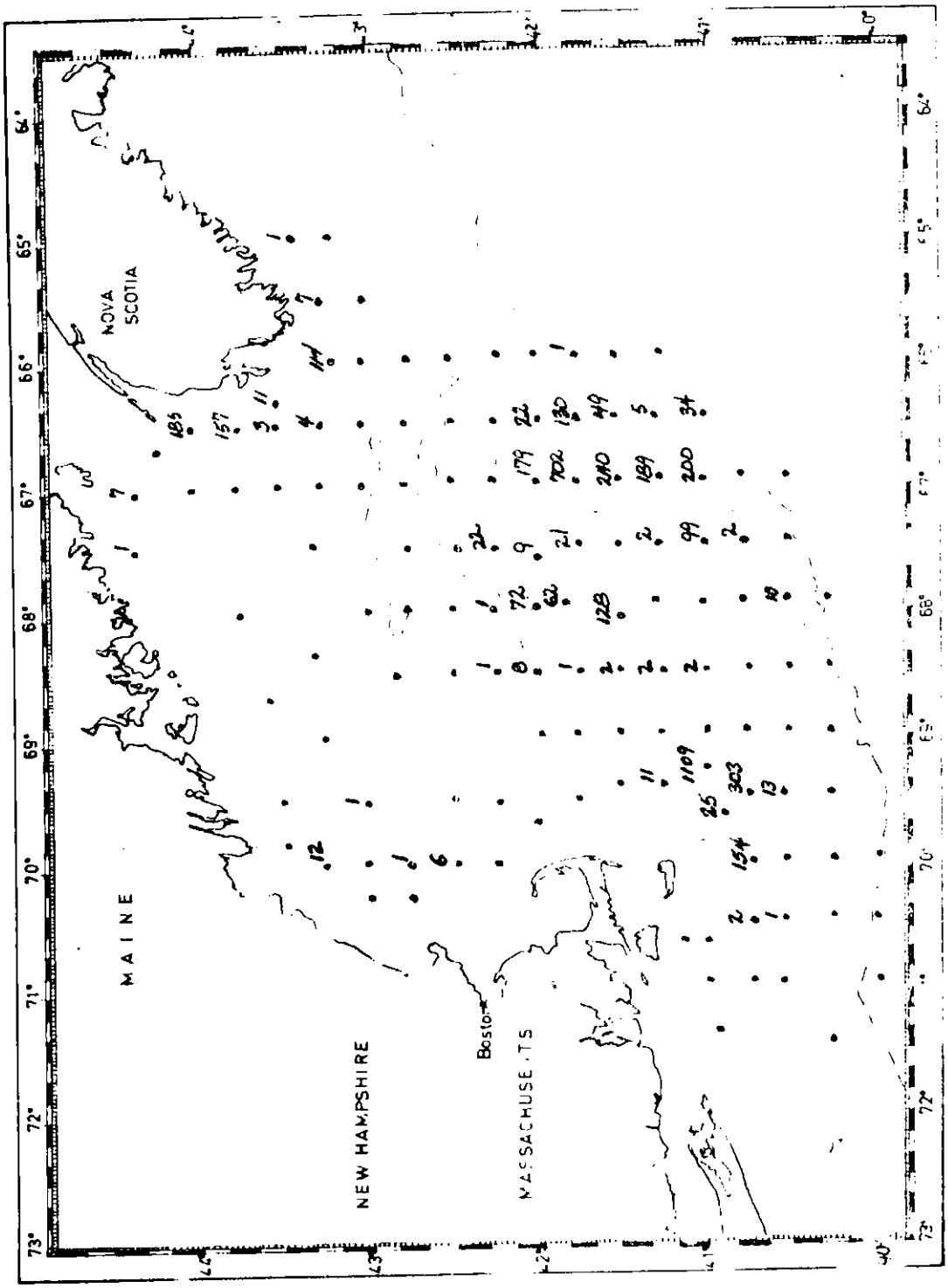


Fig. 13 : R.V "Wieczno" 2 Oct - 28 Oct 1972
Larval Herring (10-15 mm - No/10 m²)

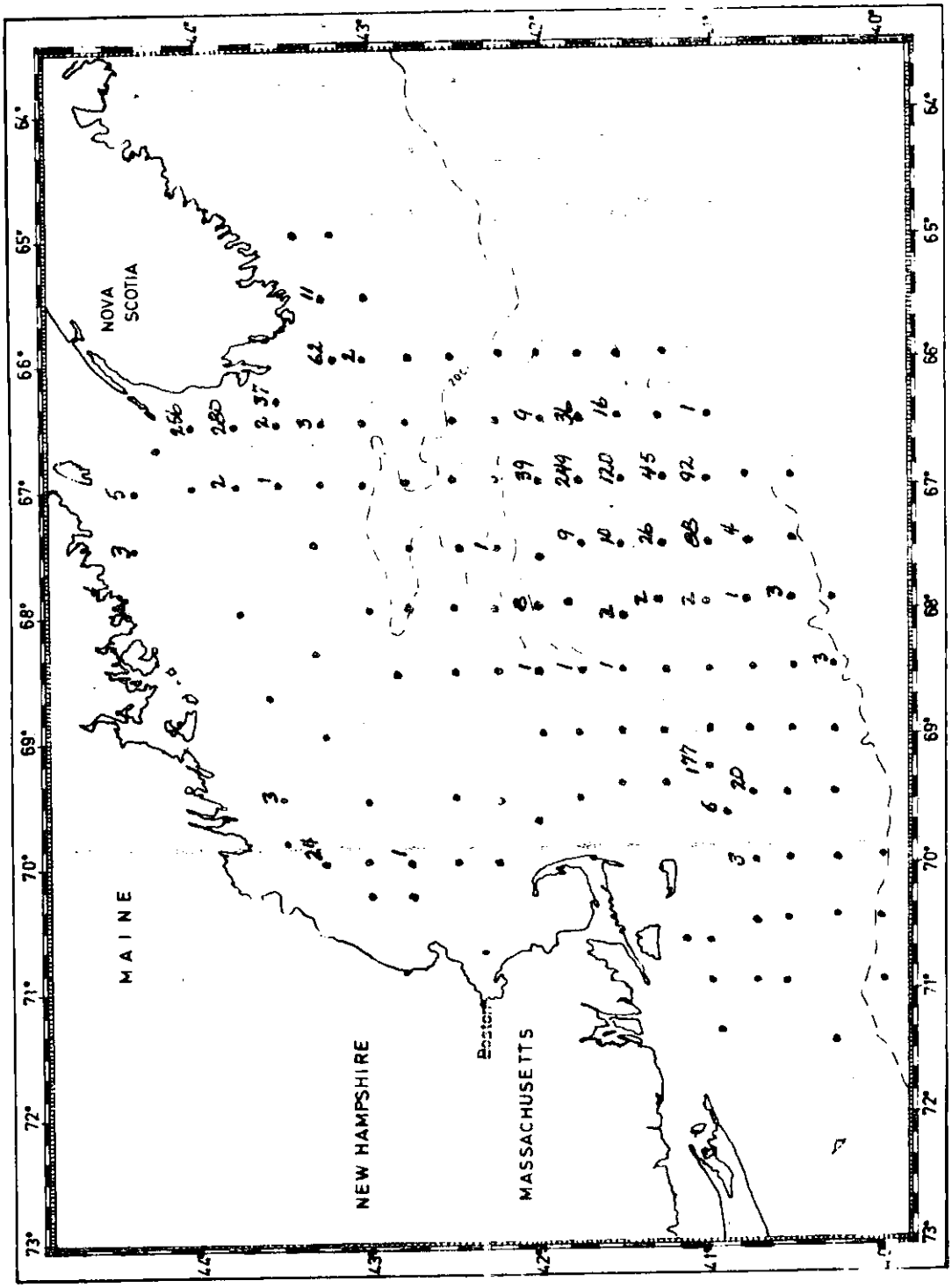


Fig. 14 : R.V. "Wieczno" 2 Oct – 28 Oct 1972
Larval Herring (>15mm - No/10 m²)

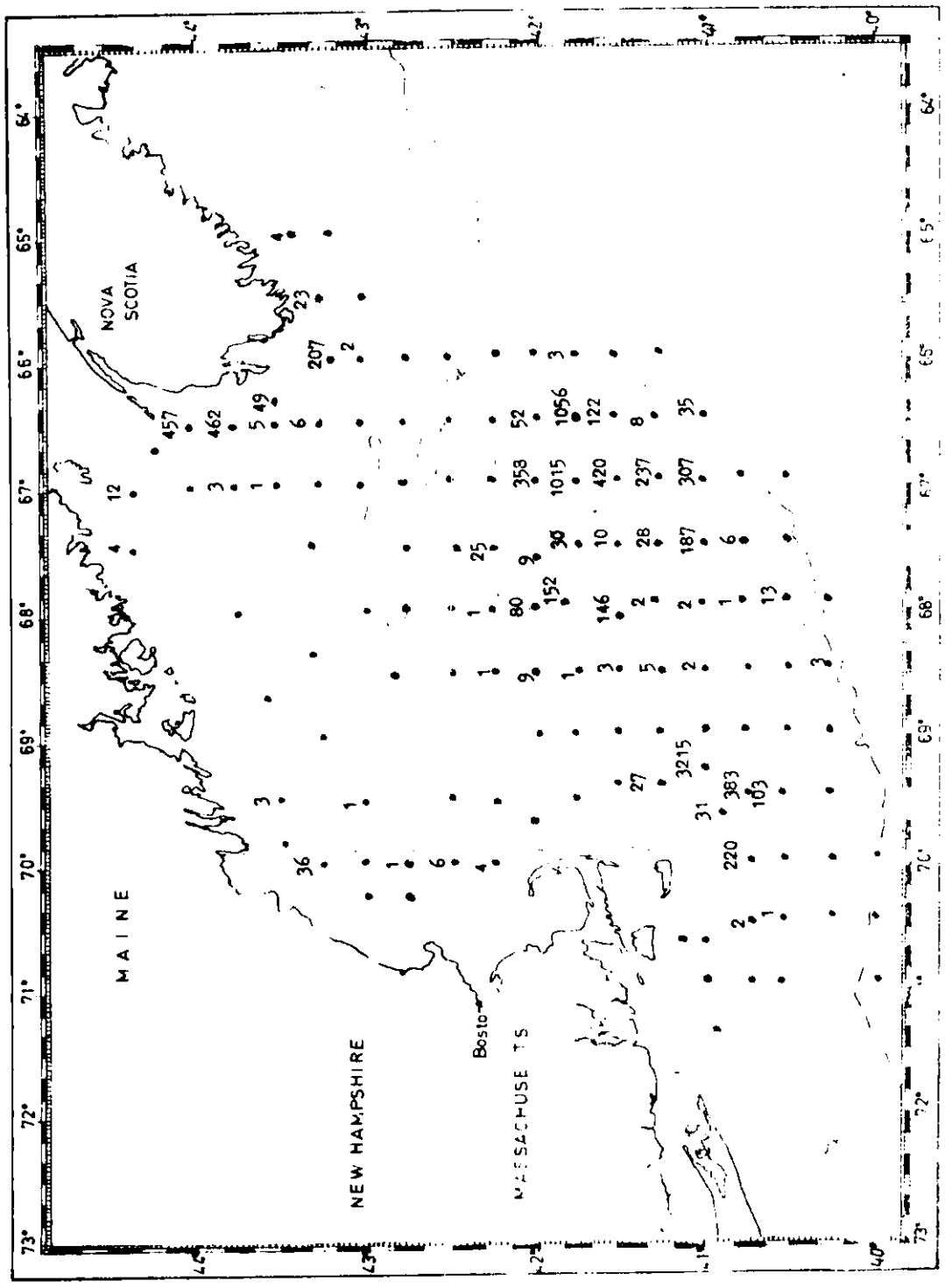


Fig. 15 : R.V. "Wieczno" 2.Oct.-28.Oct.1972
Larval Herring (Total - No/ 10 m^2)

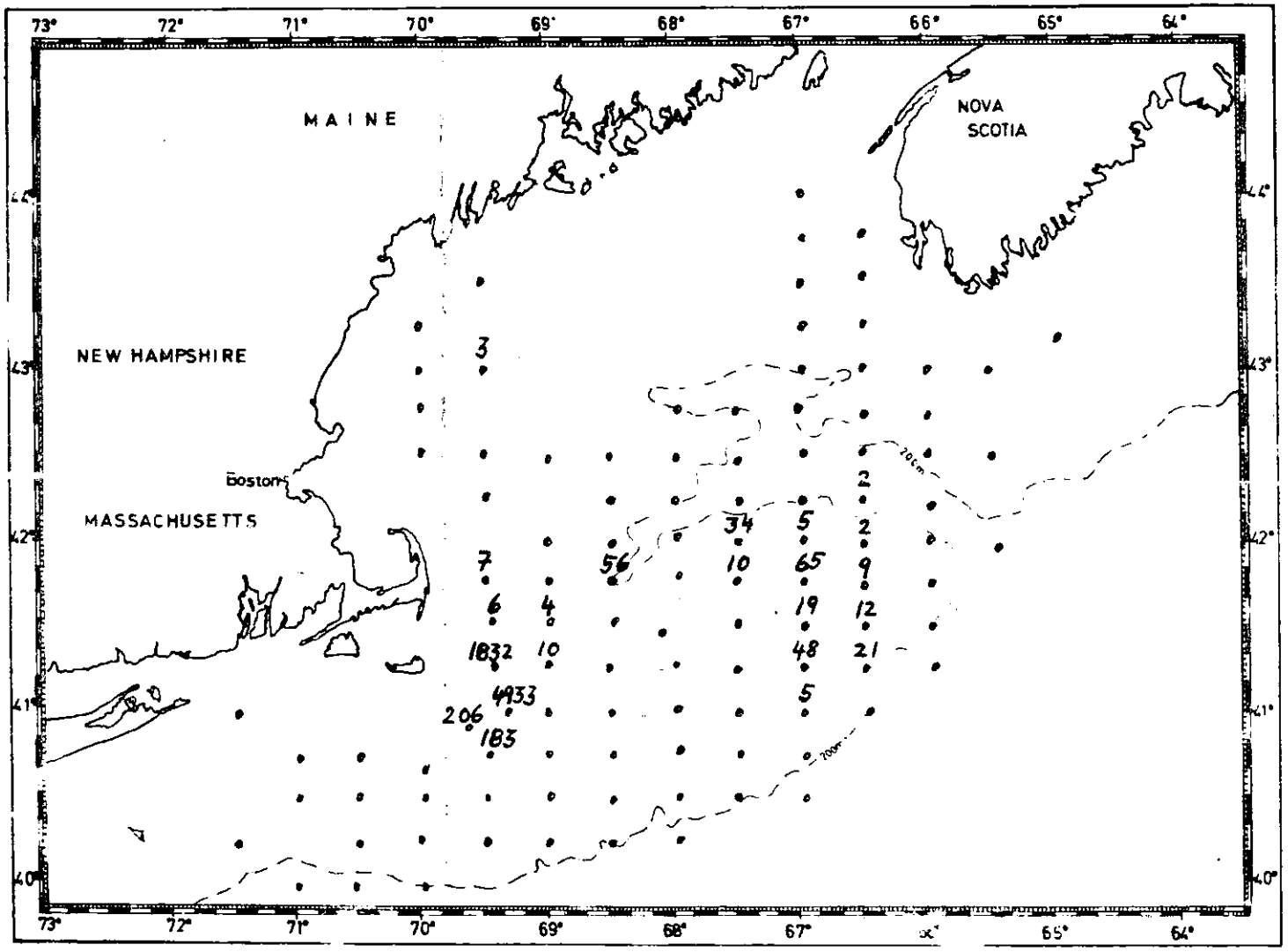


Fig. 16: R.V. Argos 12 Oct - 28 Oct 1972

Larval Herring (< 10 mm - No/10m²)

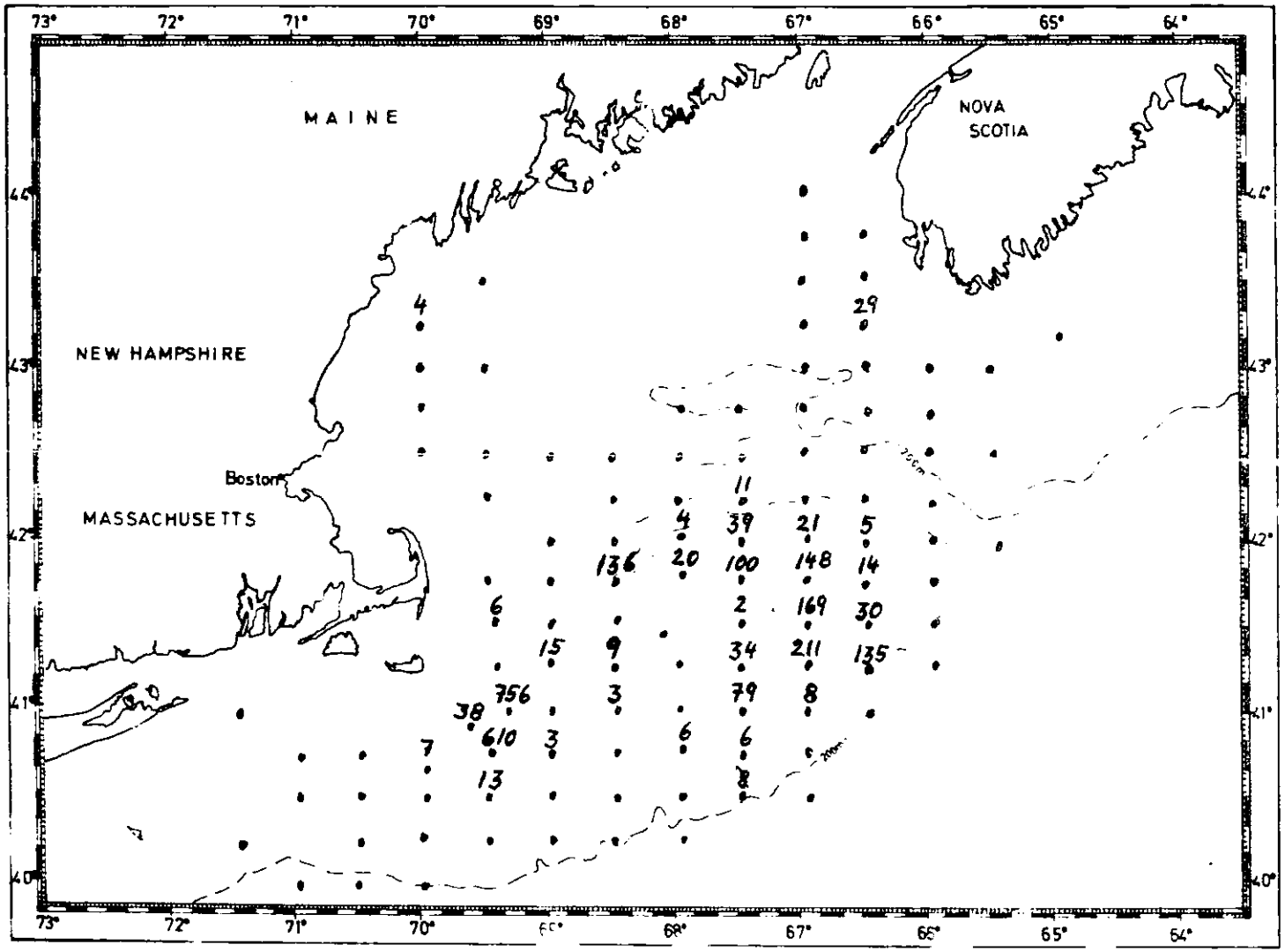


Fig. 17: R.V. Argos 12 Oct – 28 Oct 1972

Larval Herring (10 - 5 mm. No/10m²)

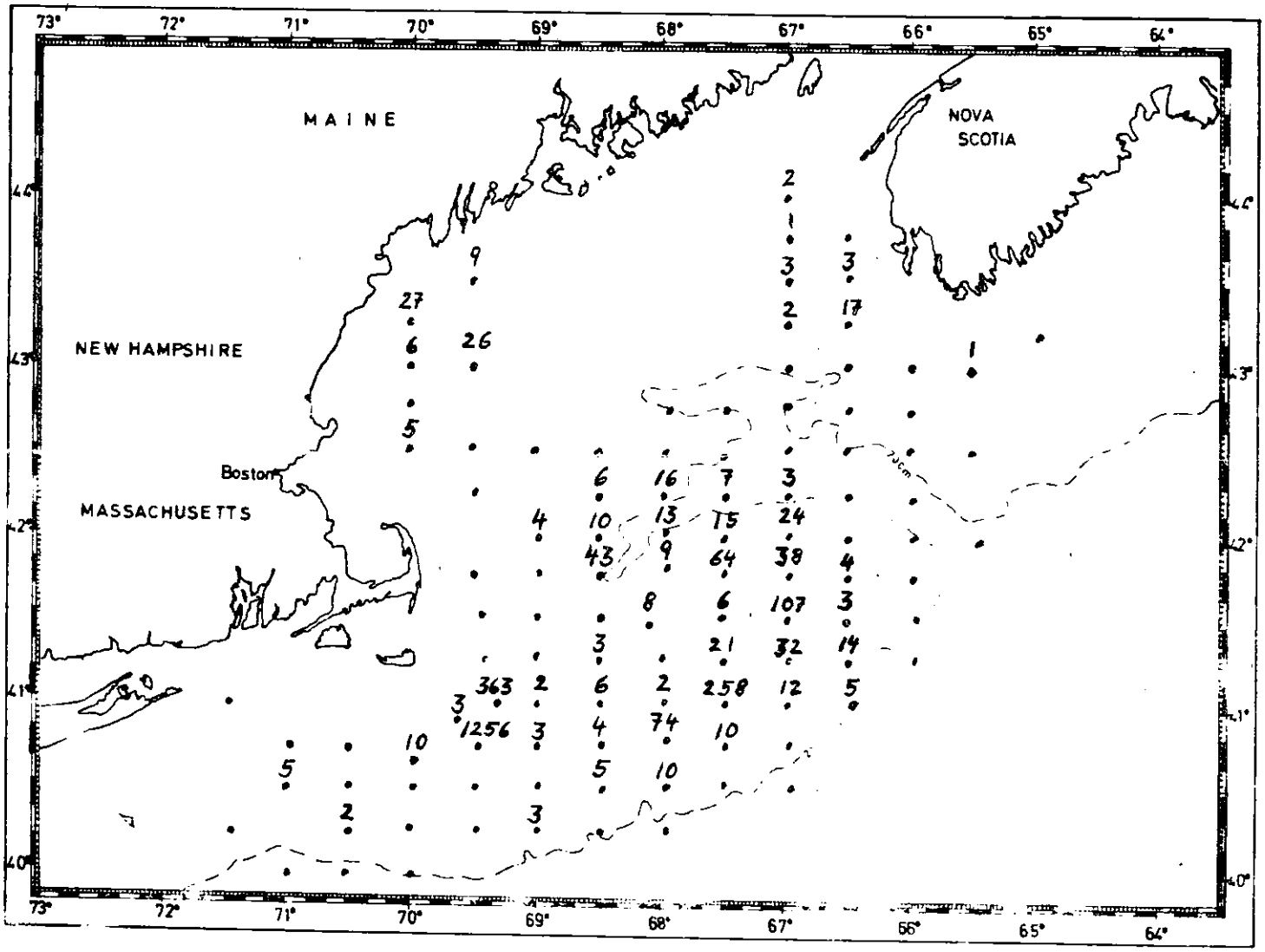


Fig. 18 · R.V Argos 12 Oct - 28 Oct 1972

Larval Herring (> 5 mm - No/10 m²)

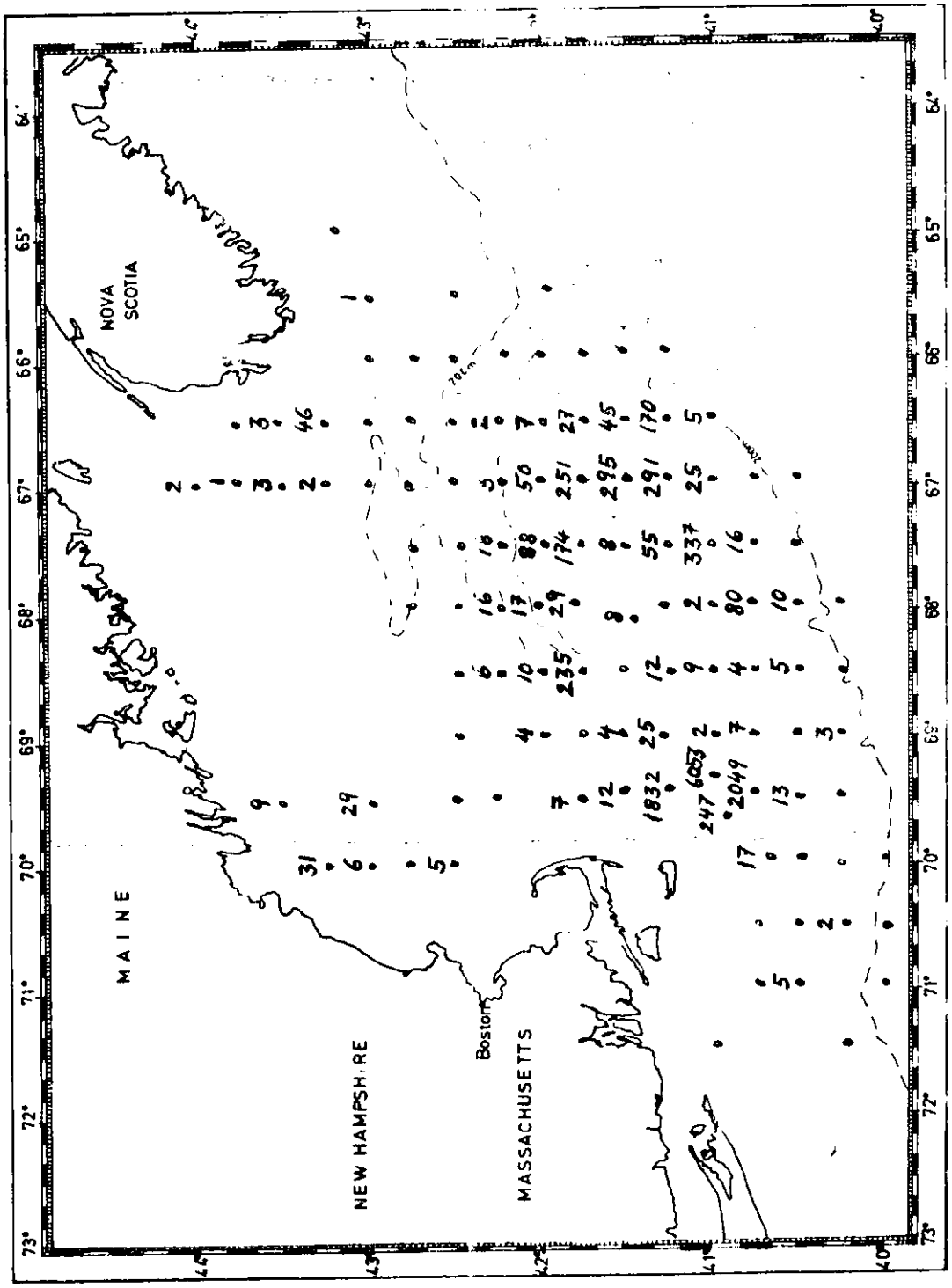


Fig. 19 : R.V Argos 12 Oct. – 28 Oct 1972

Larval Herring (Total – No/10 m²)

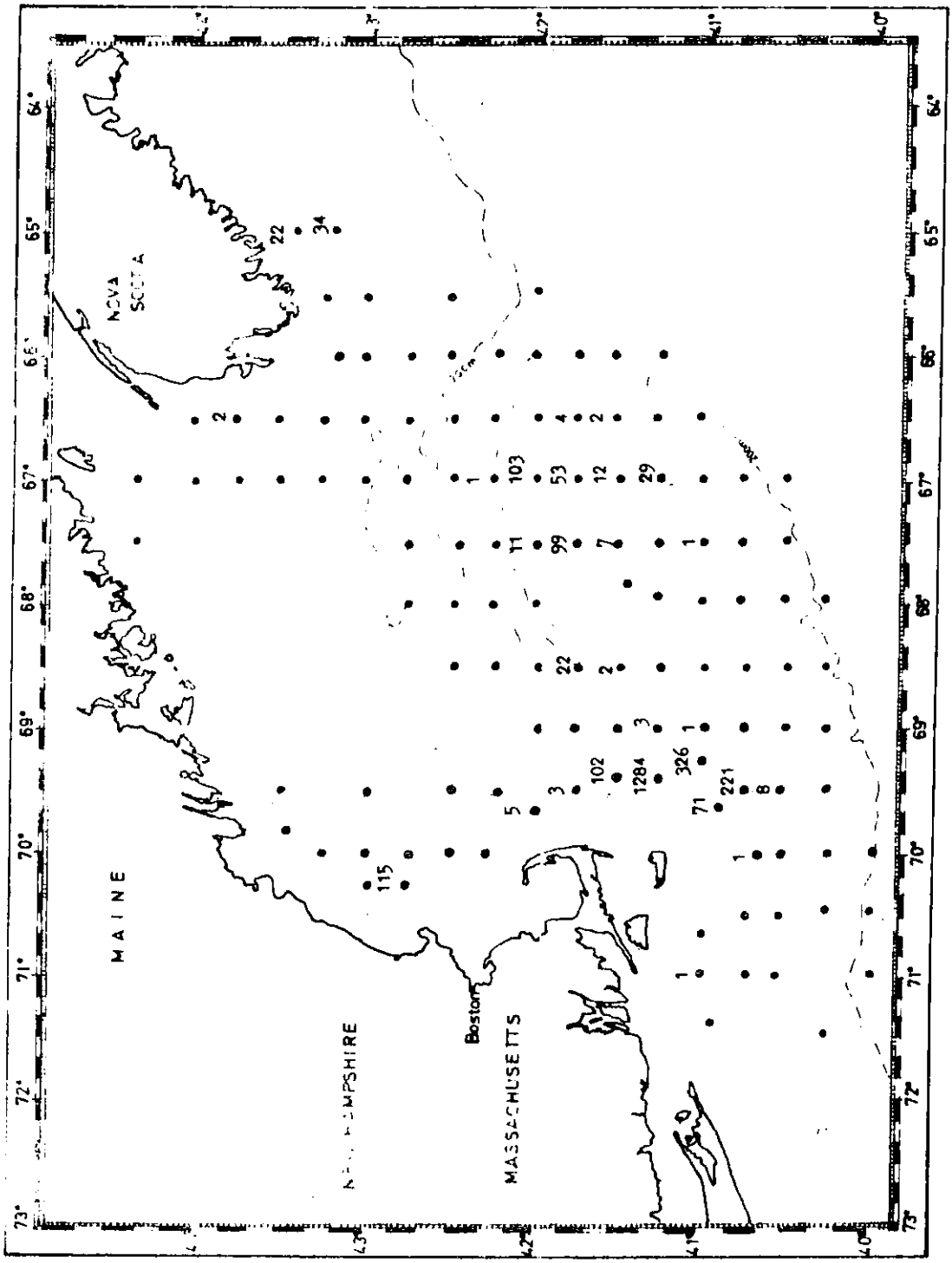


Fig. 20 : R.V. Anton Dohrn 31.Oct.-12.Nov.1972
Larval Herring (< 10 mm - No/ 10 m^2)

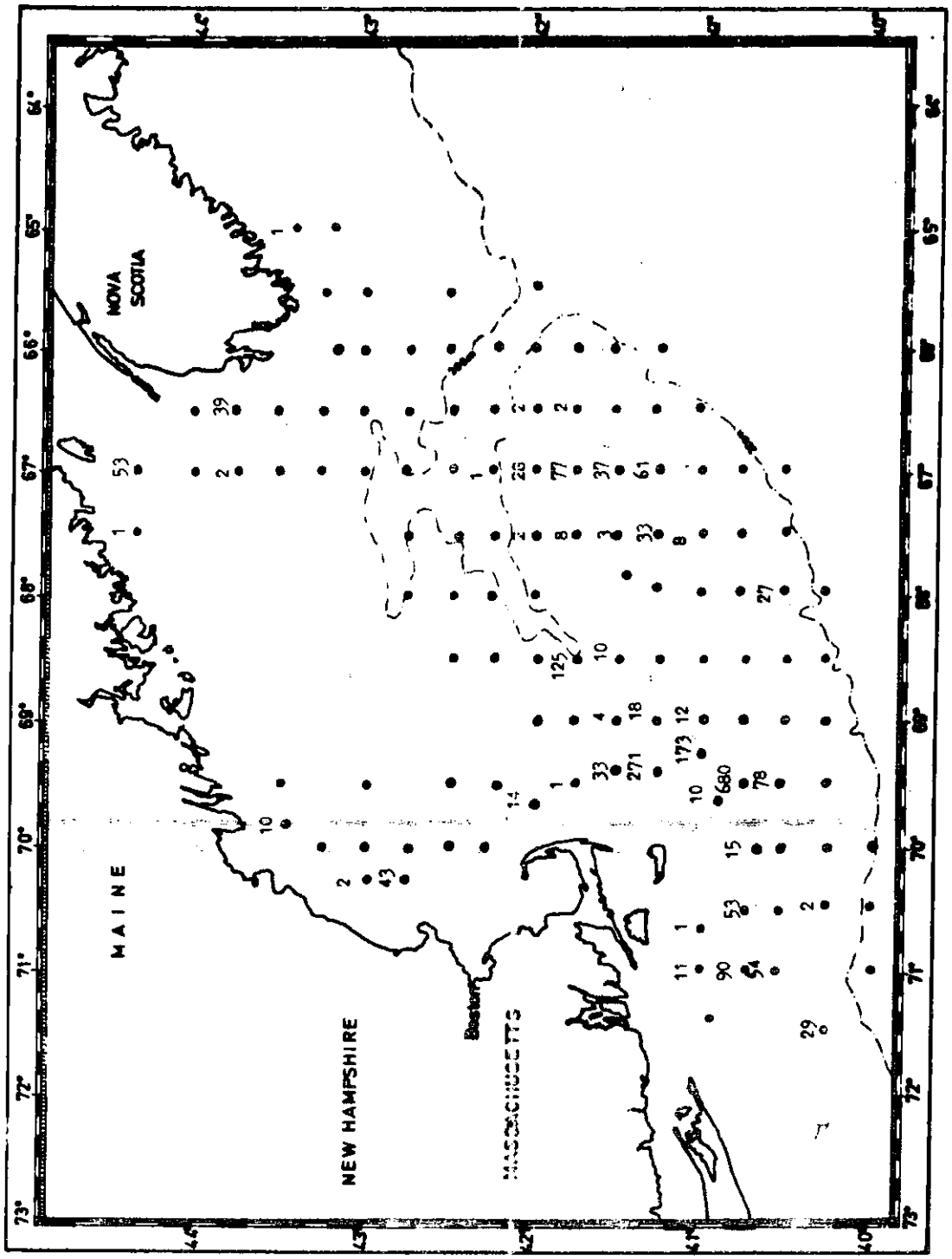


Fig. 2/ : R.V. Anton Dohrn 31.Oct.-12.Nov.1972
Larval Herring (10-15 mm - No/ 1o m^2)

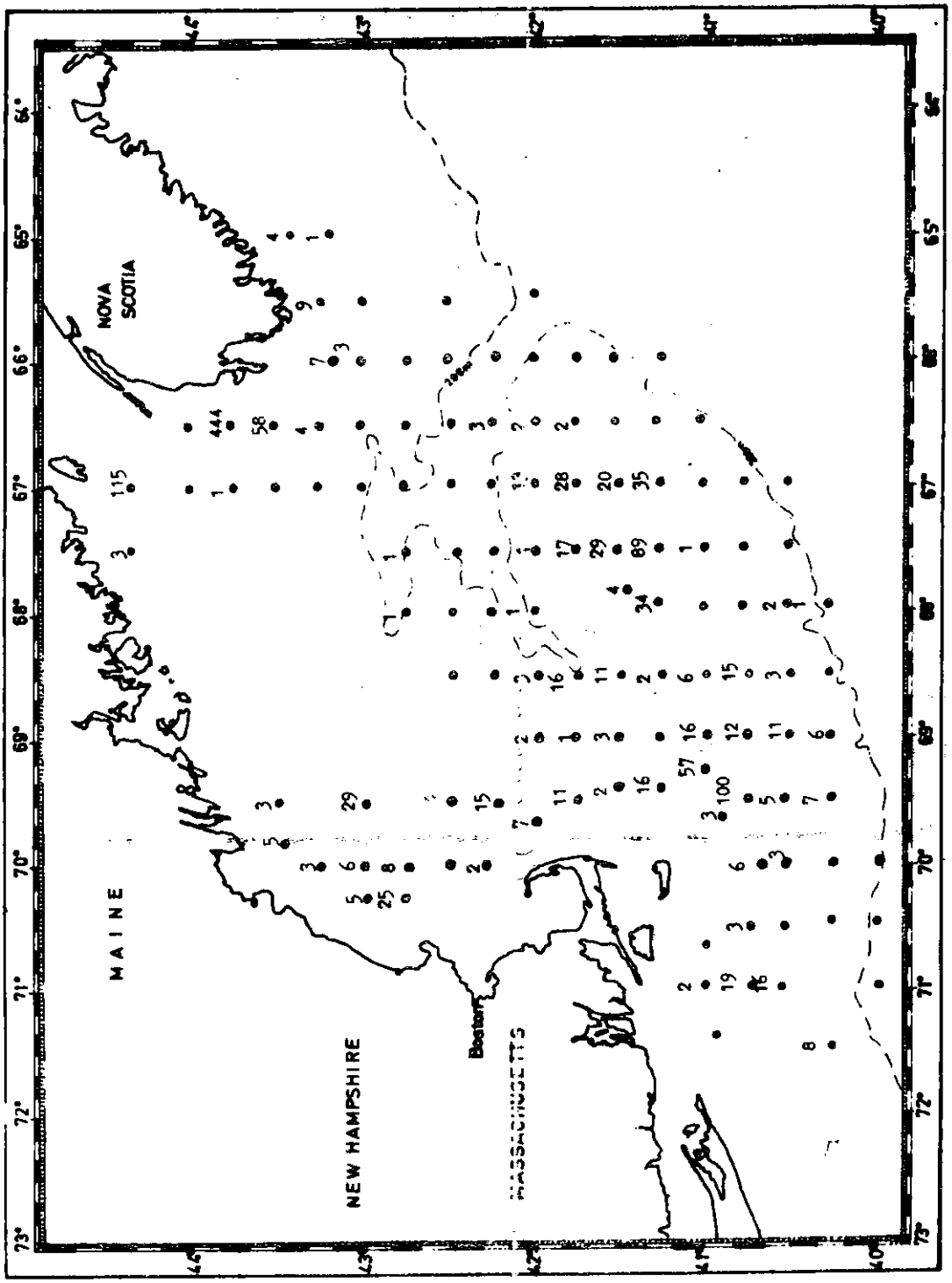


Fig. 22 : R.V. Anton Dohrn 31.Oct.-12.Nov.1972
Larval Herring (> 15 mm - No/ 10 m^2)

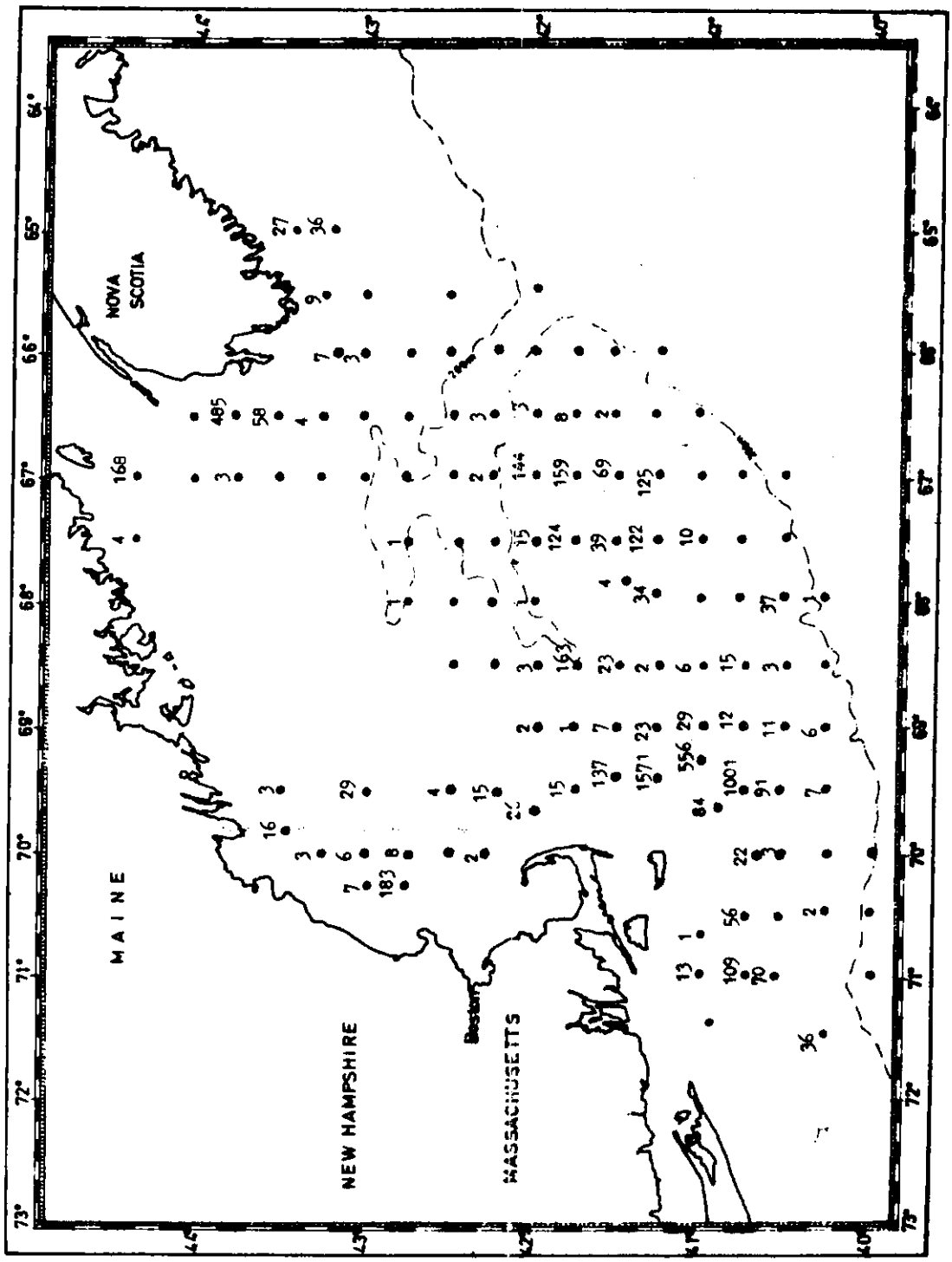


Fig.23:R.V. Anton Dohrn 31.Oct.-12.Nov.1972
Larval Herring (Total - No/ 1o m^2)

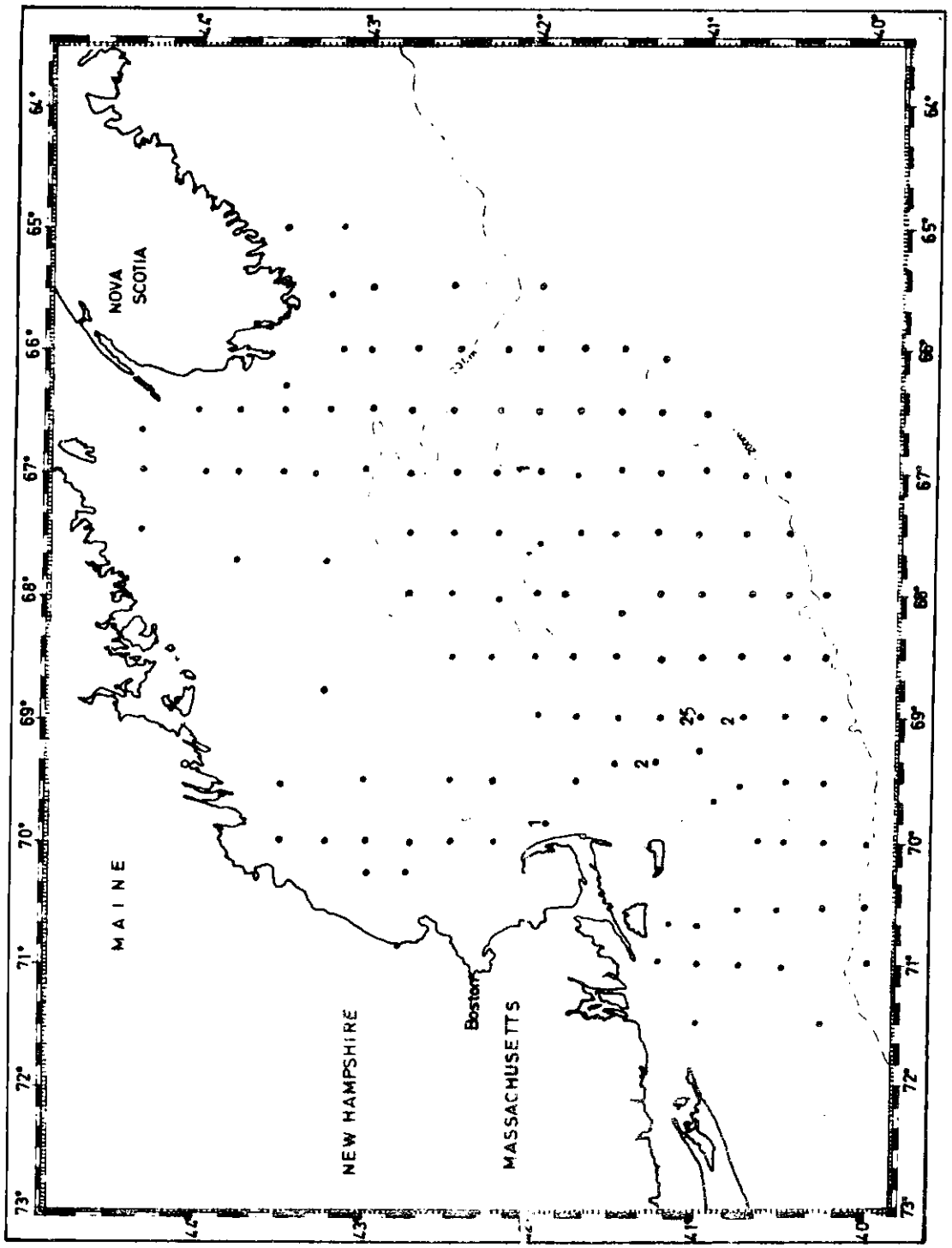


Fig. 24 : R.V.Albatross IV 28.Nov.-15.Dec.1972
Larval Herring (< 10 mm - No/1om^2)

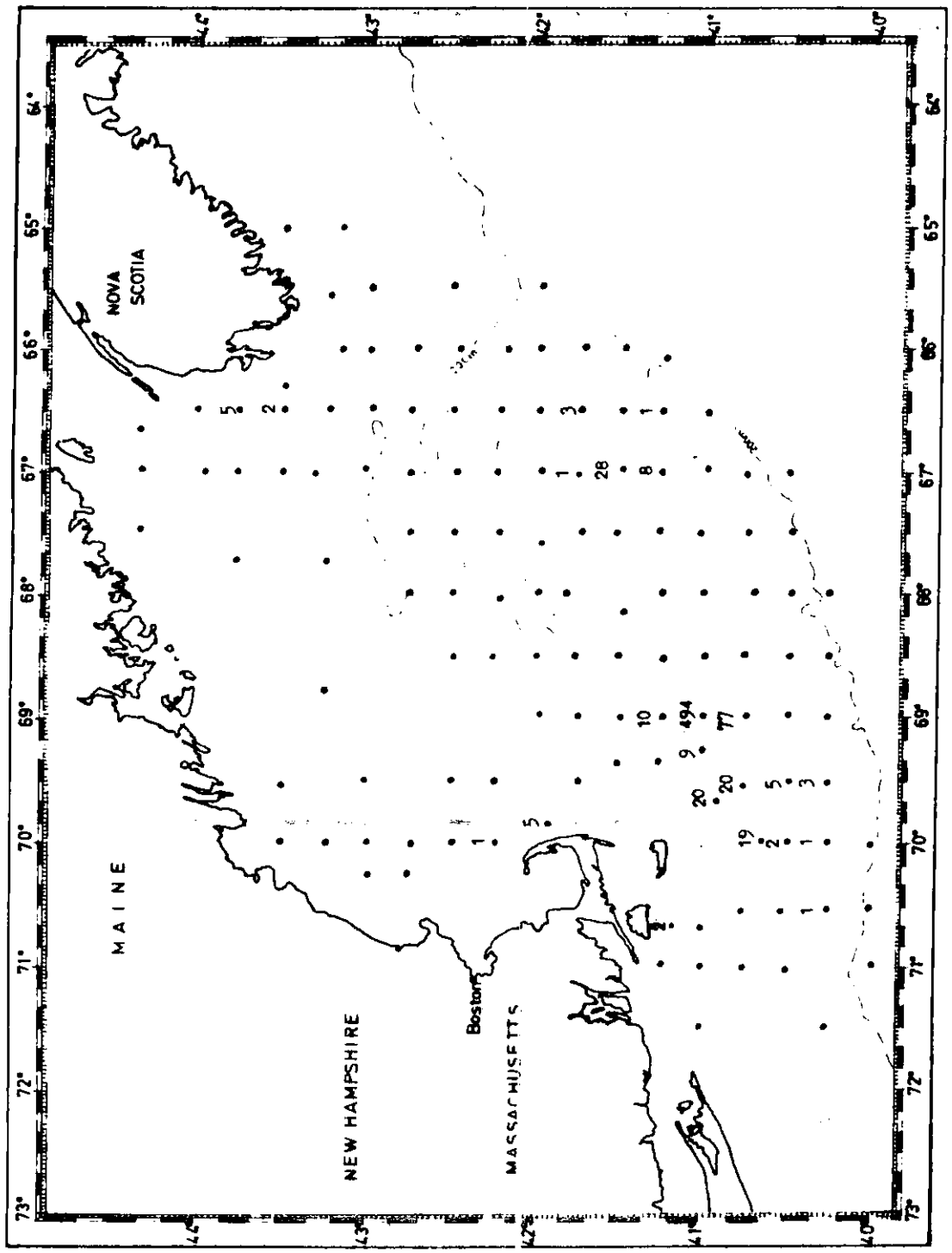


Fig.25 : R.V. Albatross IV 28.Nov.-15.Dec.1972
Larval Herring (10-15 mm - No/ 10 m^2)

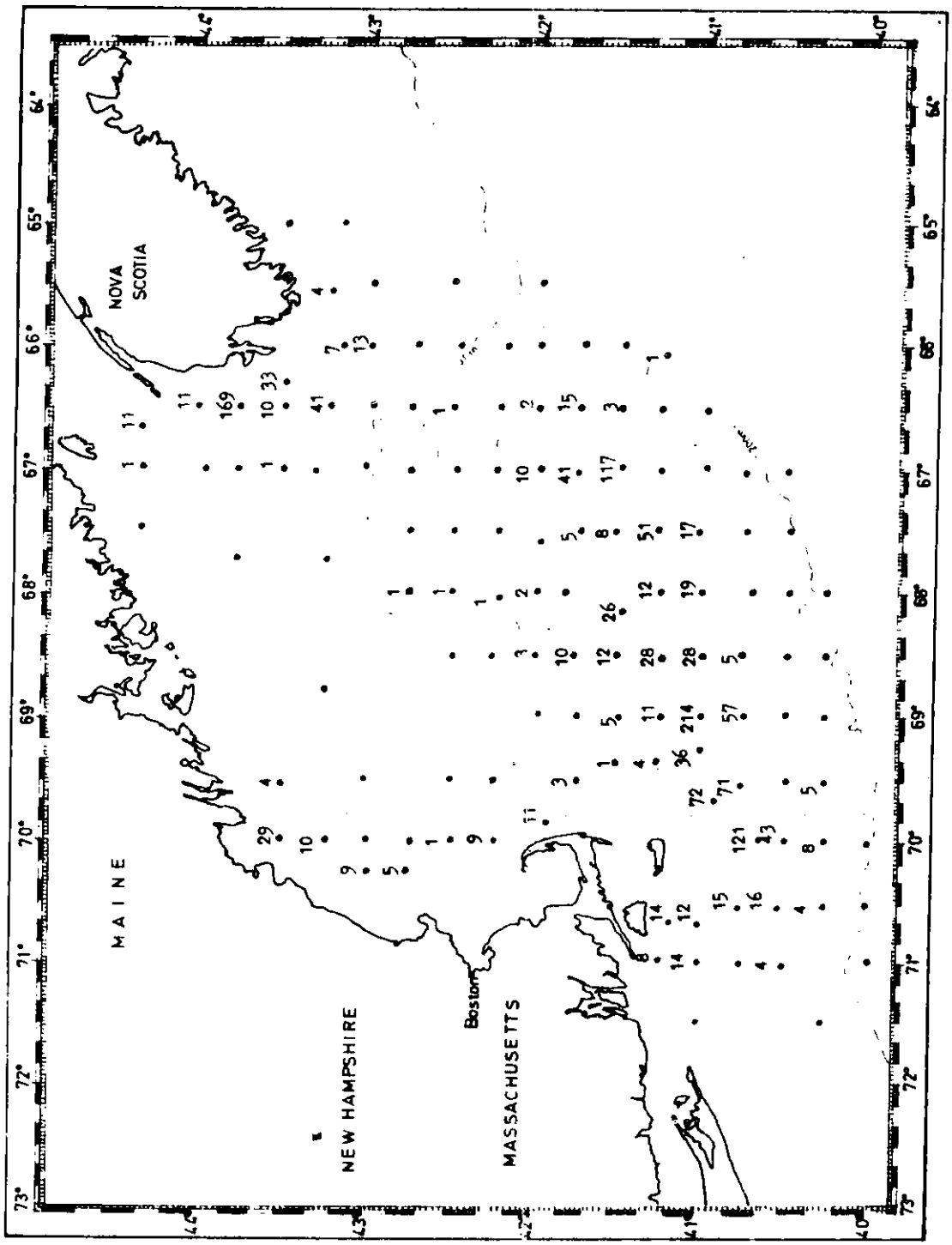


Fig. 26 : R.V. Albatross IV 28.Nov.-15.Dec.1972
Larval Herring (> 15 mm - No/ 10 m^2)

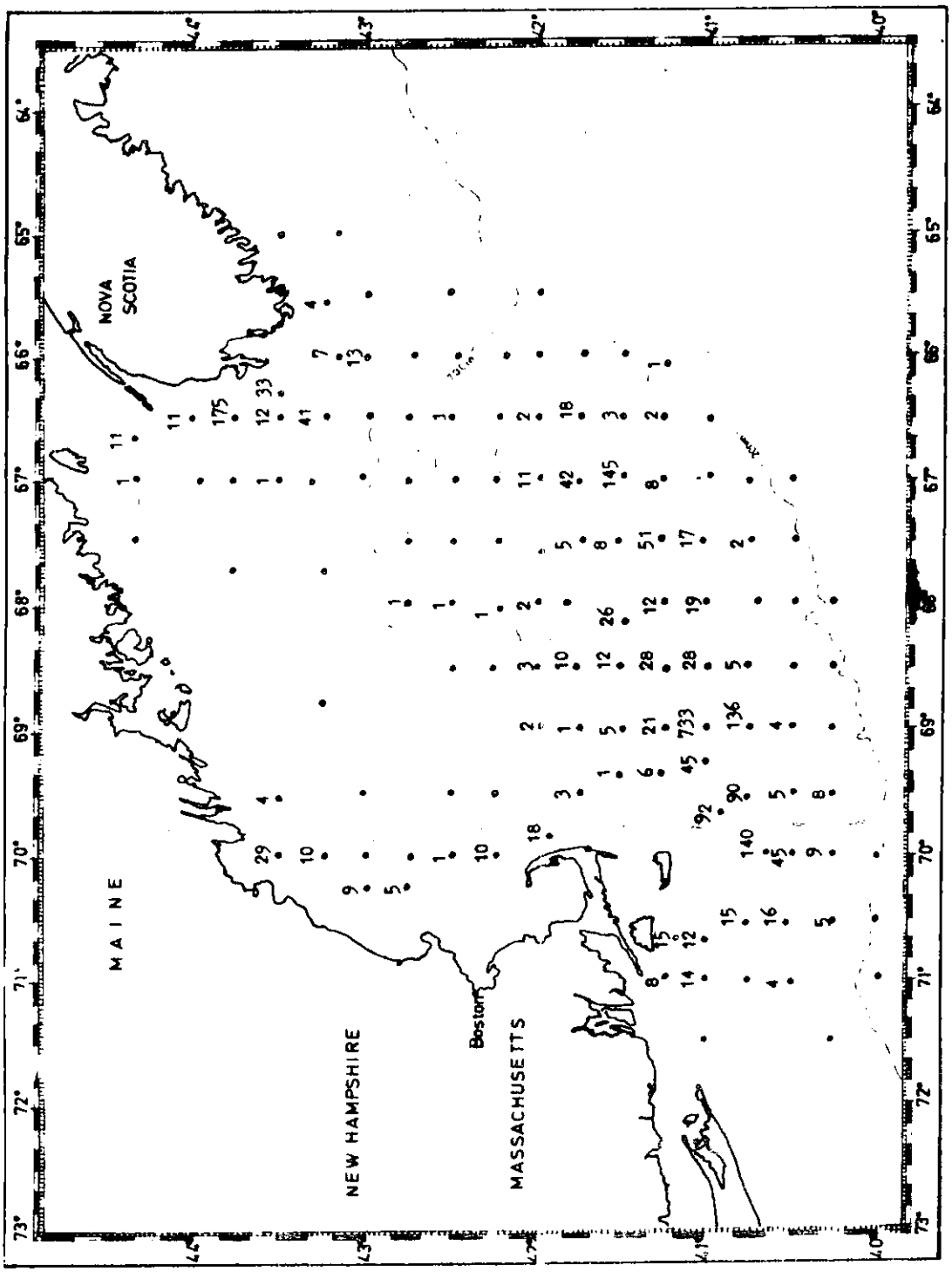


Fig. 27 : R.V. Albatross IV 28.Nov.-15.Dec. 1972
Larval Herring (Total - No/ 10 m^2)

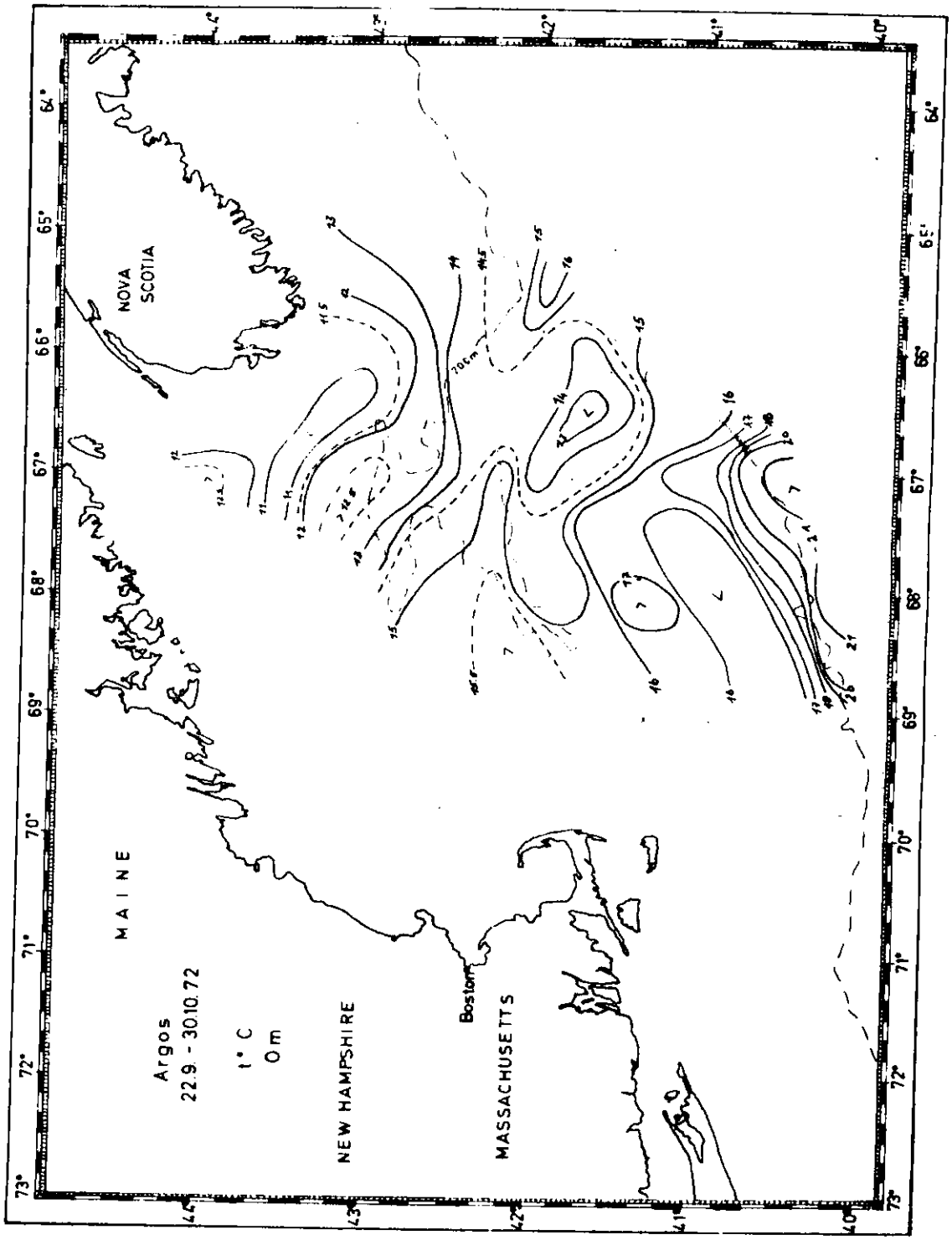

NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
Argos
22.9 - 30.10.72
1° C
0 m
700m

Fig. 28

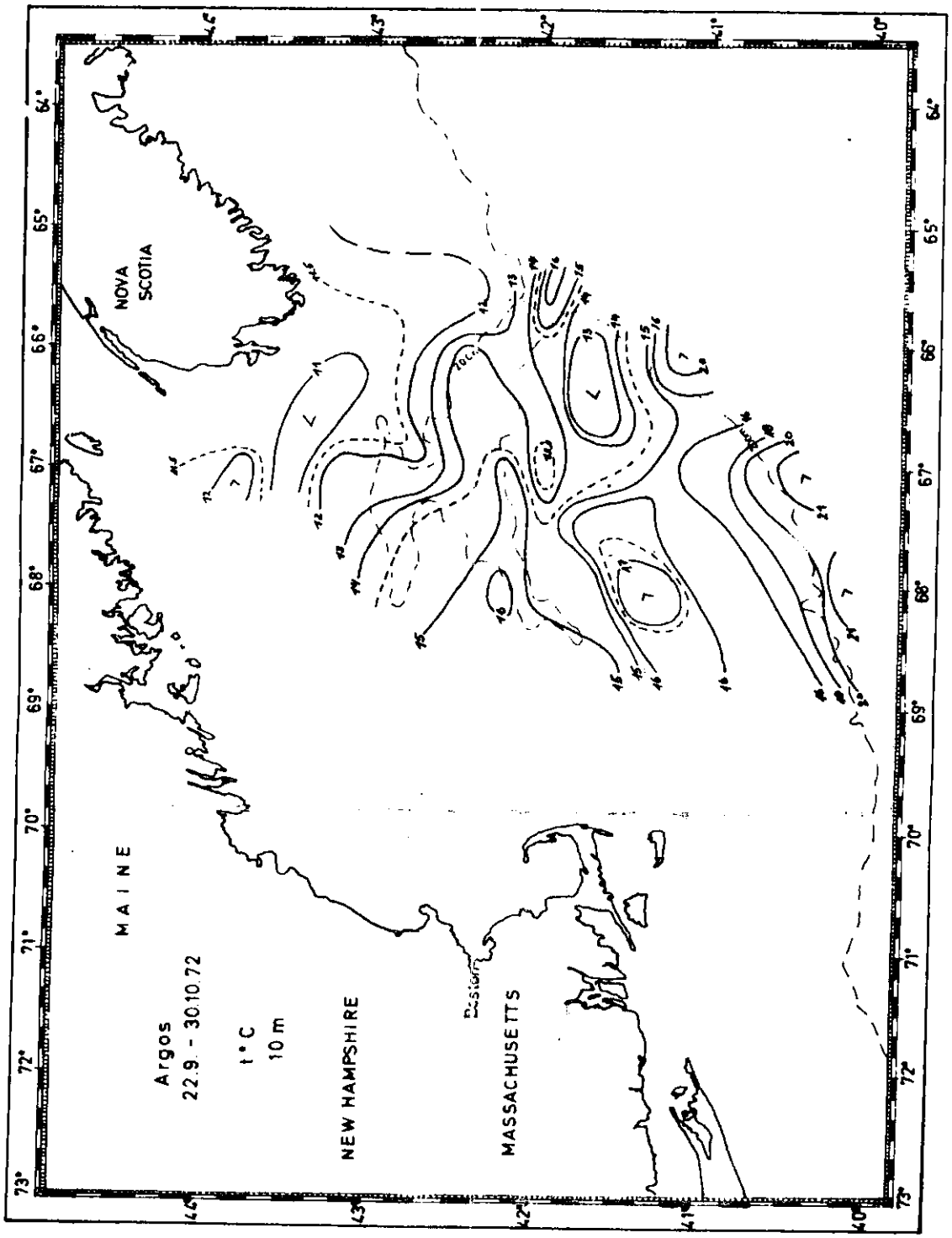

NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
Argos
22.9. - 30.10.72
1° C
10 m

Fig. 29

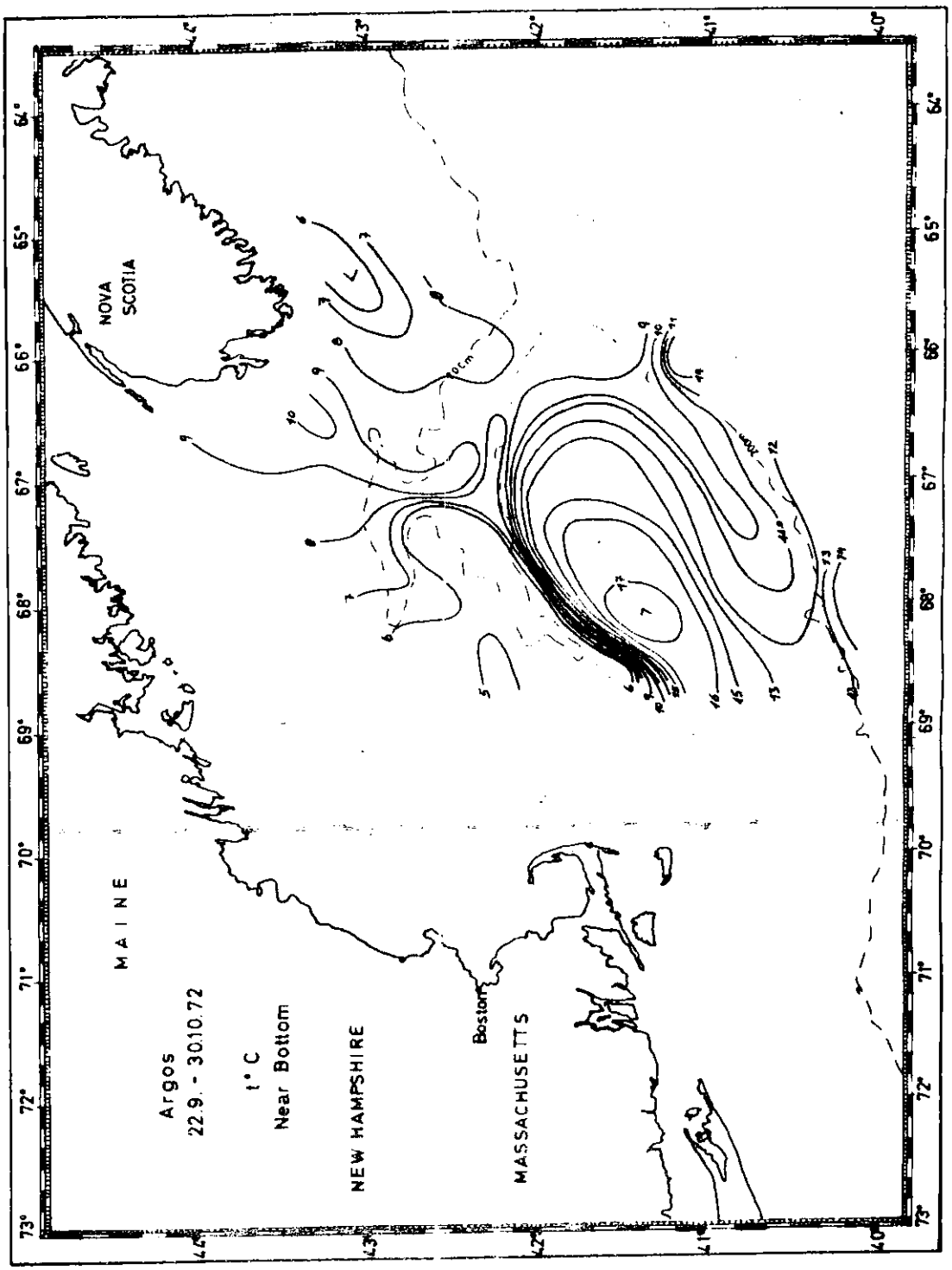
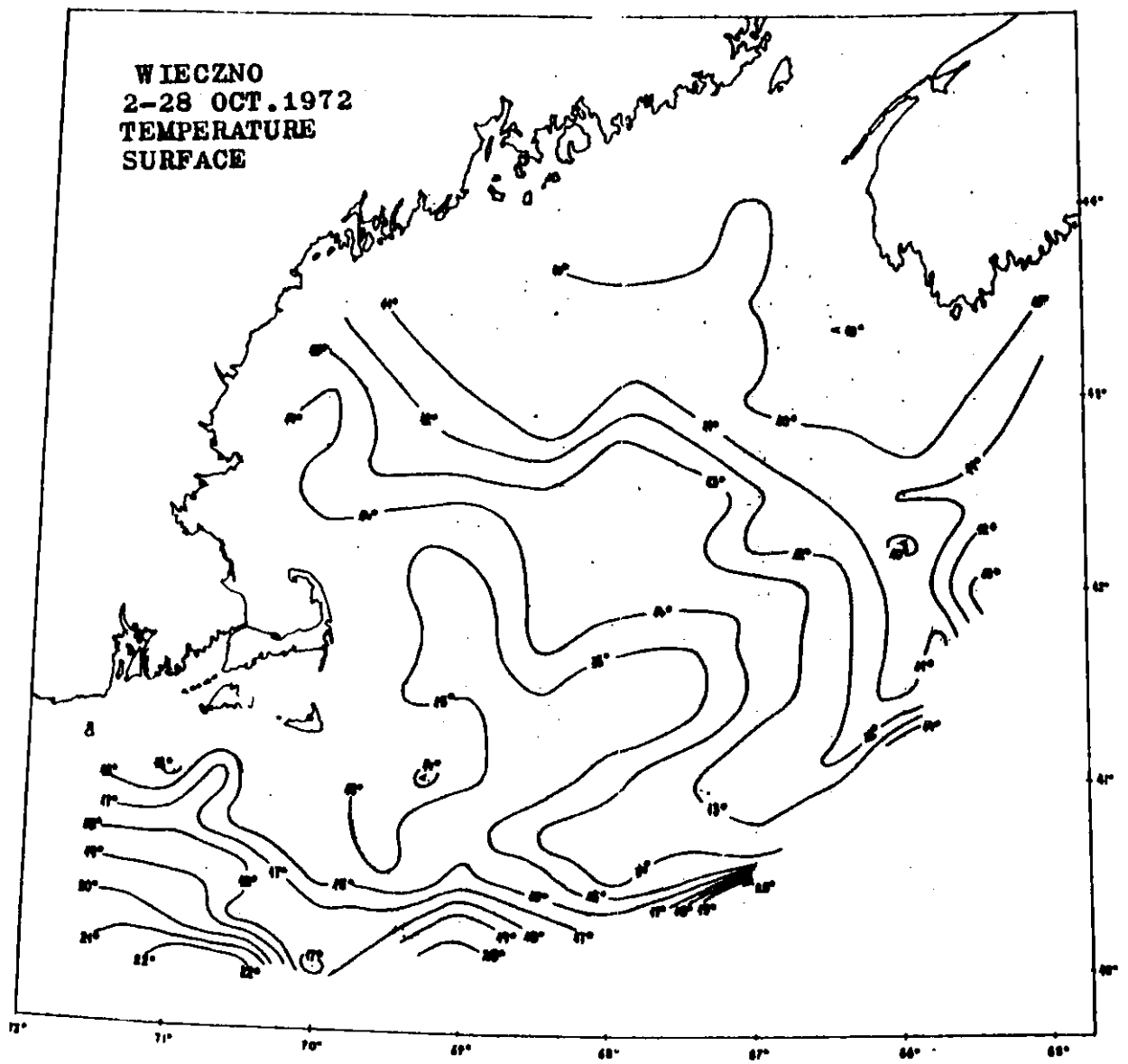

NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
Argos
22.9. - 30.10.72
t° C
Near Bottom
100m
200m
400
64°
65°
66°
67°
68°
69°
70°
71°
72°
73°
42°
43°
41°
40°

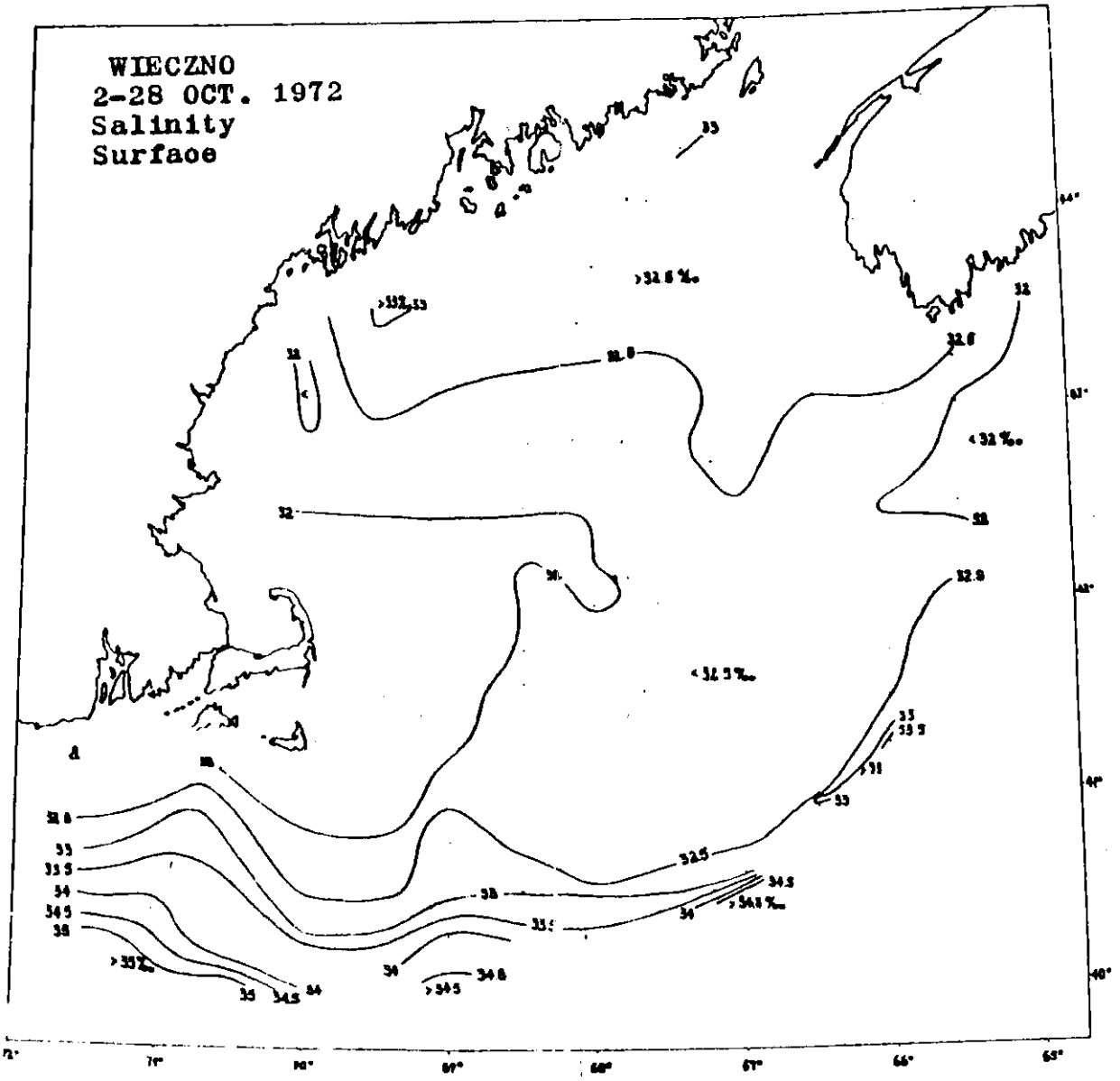
Fig. 30



RYS.

Fig. 31

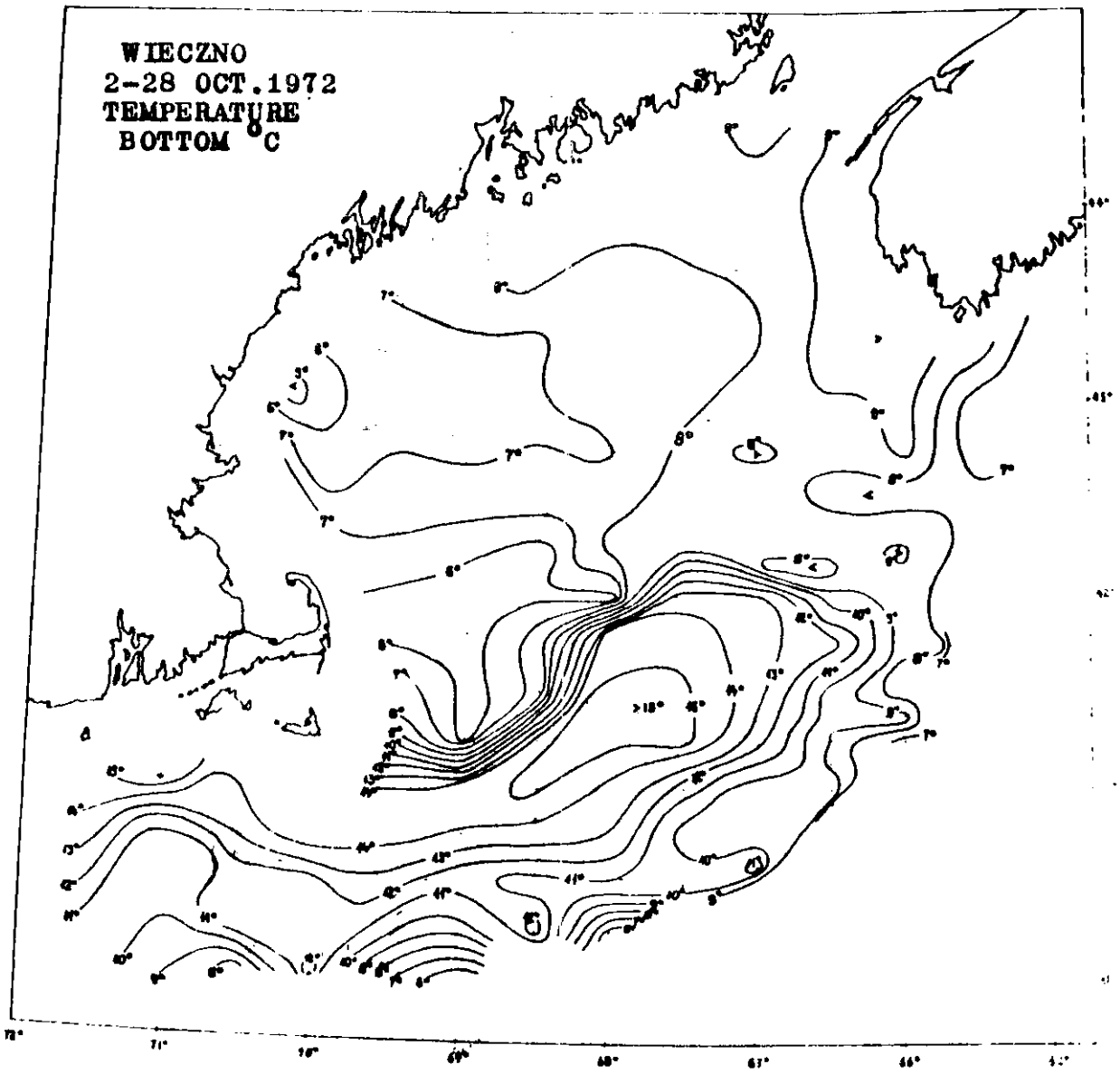
ROZMIESZCZENIE IZOTERM POWIERZCHNIOWYCH
LANICA GEORGE'A, ZATOKA MAINE I ZACH. SZELF
NOWEJ SZKOCJI 2-28.X.1972r.



RYS

Fig. 32

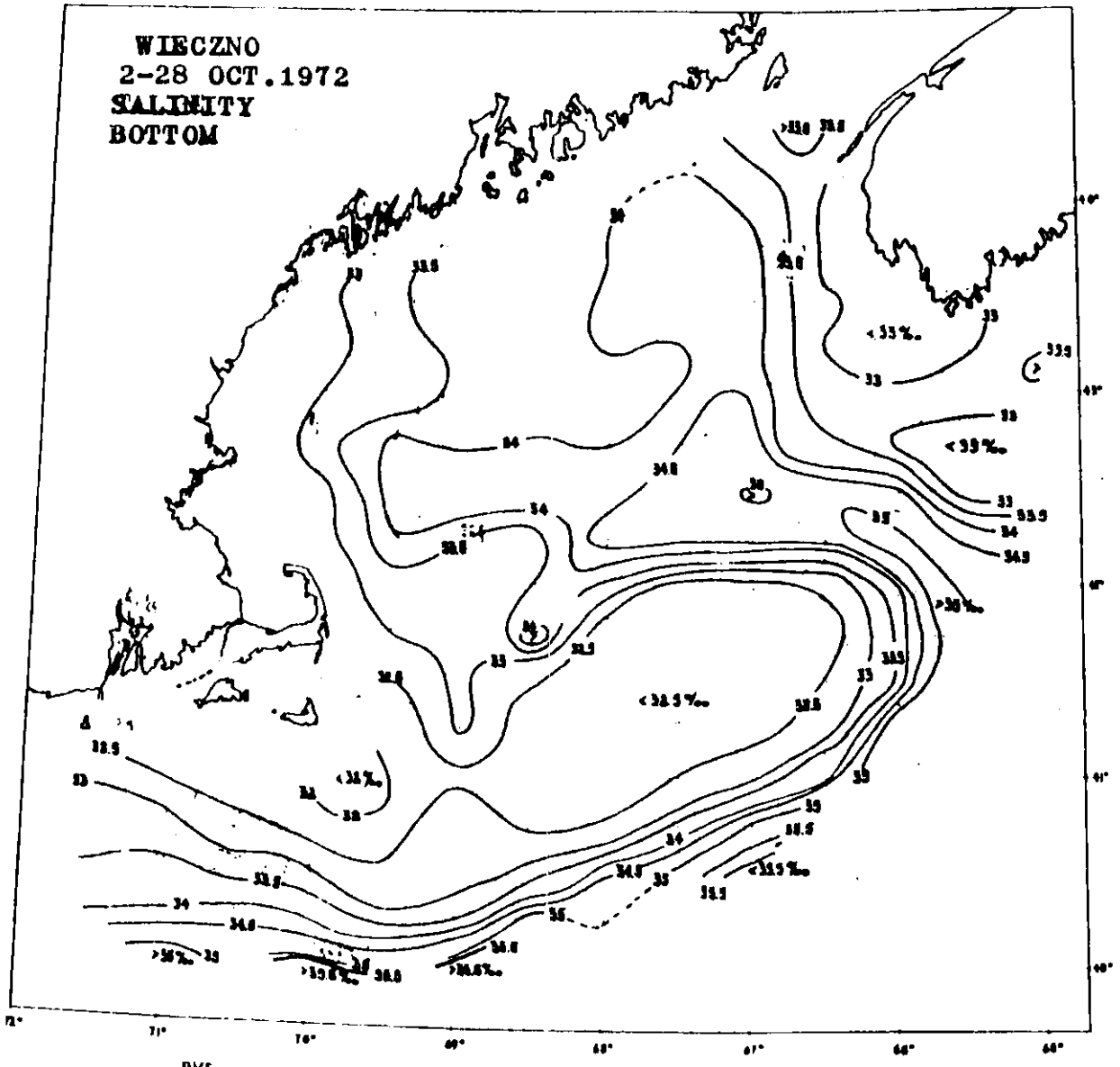
ROZMIESZCZENIE IZOHALIN POWIERZCHNIOWYCH
ŁAWICA GEORGE'A, ZATOKA MAINE, NANTUCKET SHOAL
I ZACH. SHELF NOWEJ SZKOCJI 2-28.10.1972r.



RYS

Fig. 33

ROZMIESZCZENIE IZOTERM PRZYDENNYCH
ŁAWICA GEORGE'A, ZATOKA MAINE I ZACH SZELF
WONEJ SZKOCJI 2-28 X 1972 r.



RYS.

Fig. 34

ROZMIESZCZENIE IZOHALIN PRZYDENNYCH
ŁAWICA GEORGE'A, ZATOKA MAINE, NANTUCKET SHOAL
I ŁACH SZELF NOWEJ SZKOCJI 2-28.10.1972 r.

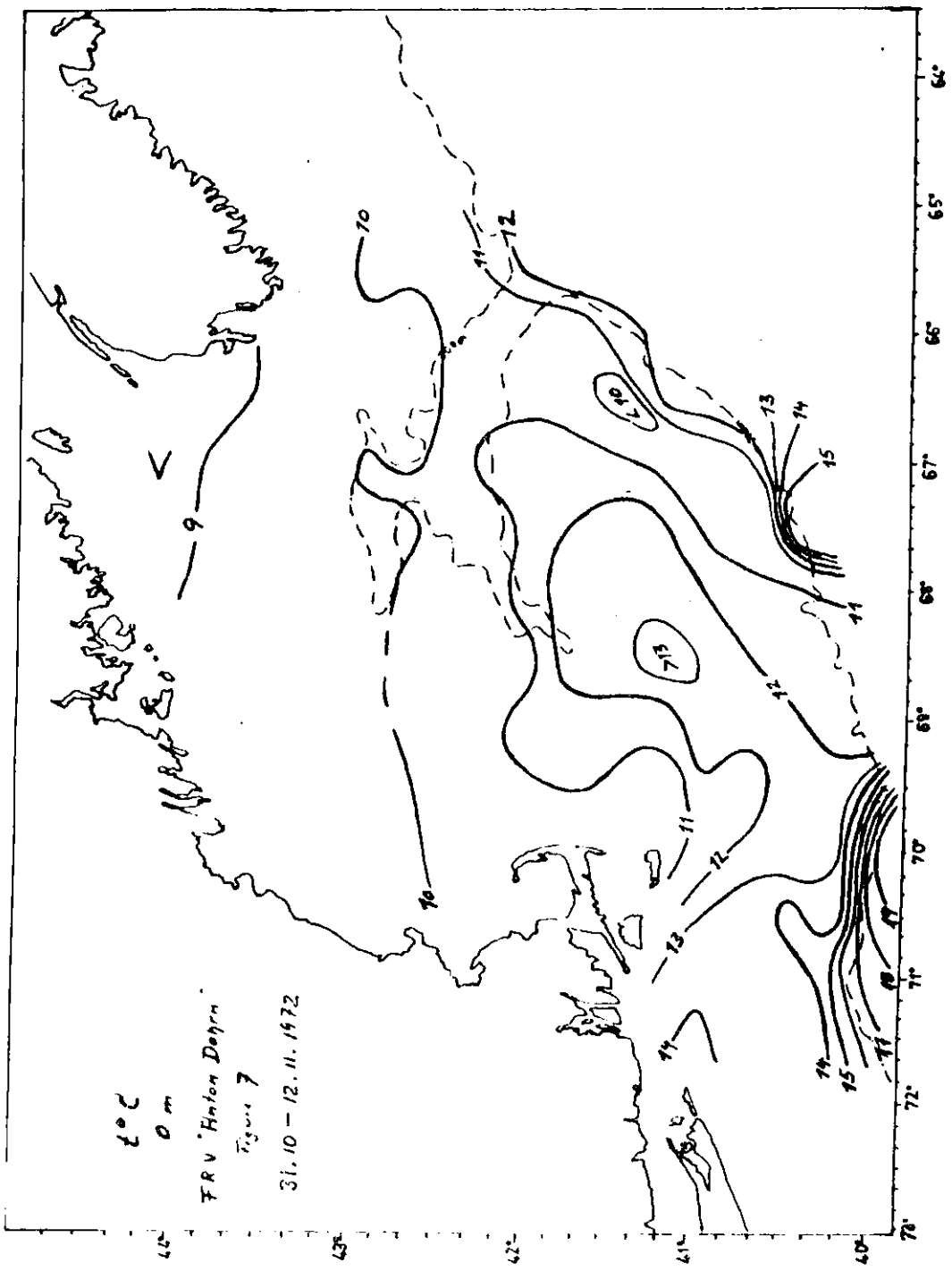

°C
0 m
FRV 'Anton Dohrn'
Figure 7
31.10 – 12.11.1972
9
10
11
12
13
14
15
64°
65°
66°
67°
68°
69°
70°
71°
72°
73°
42°
43°
41°
40°

Fig. 35

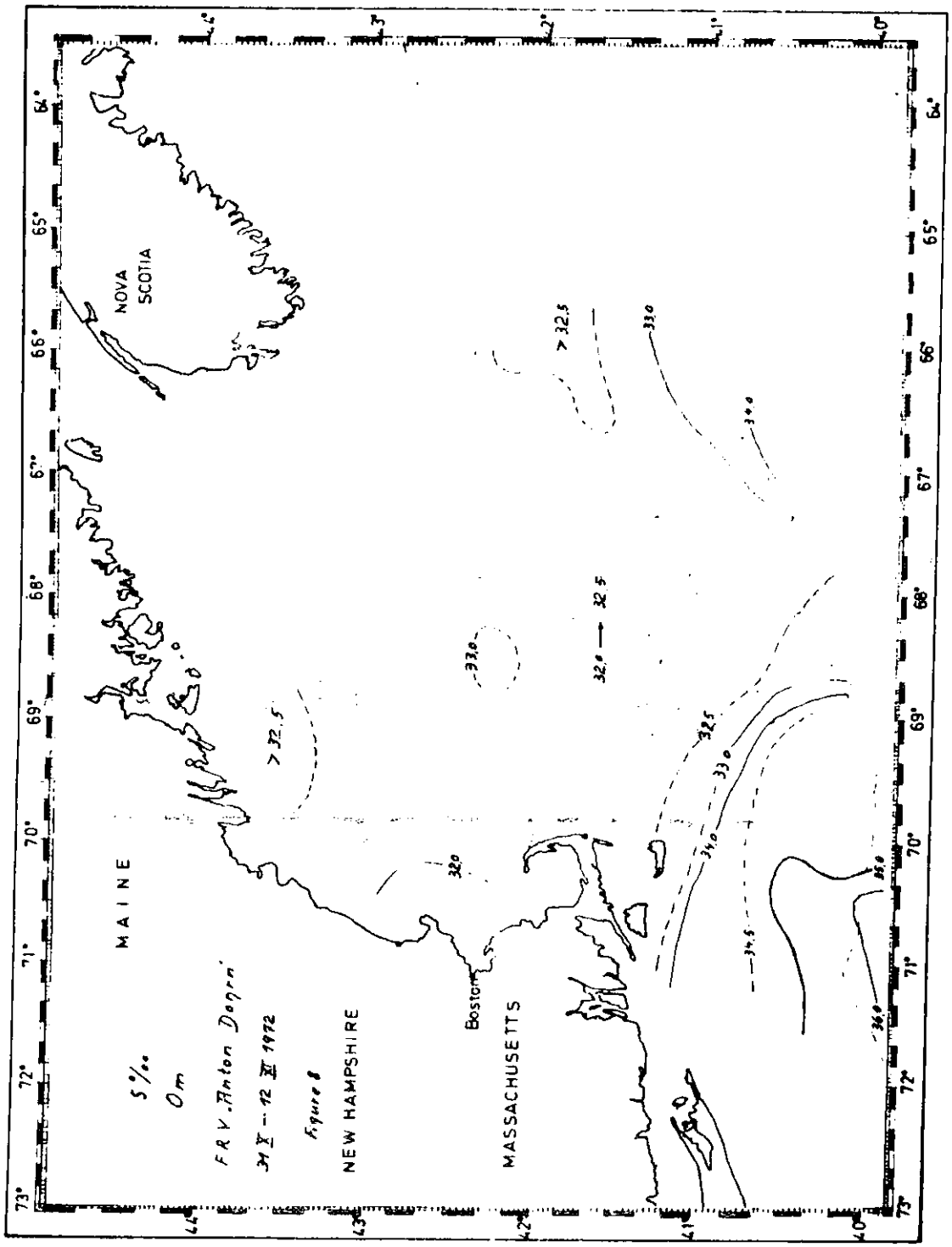

NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
> 32.5
32.5
33.0
34.0
34.5
35.0
S‰
0m
F.R.V. Anton Dohrn
IV X – 12 XI 1972
figure 8

Fig. 36

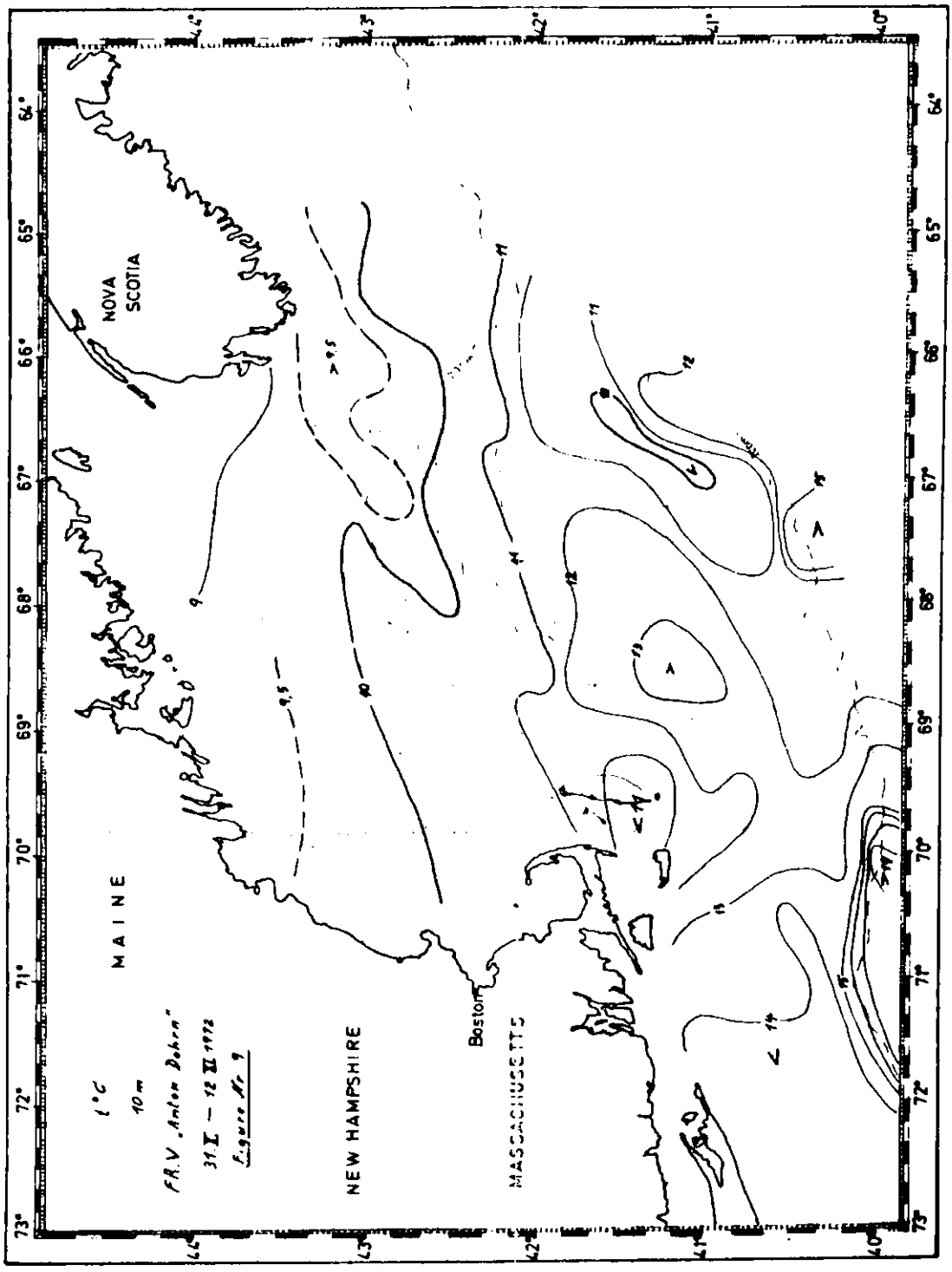

NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
1°C
10 m
F.R.V. "Anton Dohrn"
31 X – 12 XI 1972
Figure Nr 9

Fig. 37

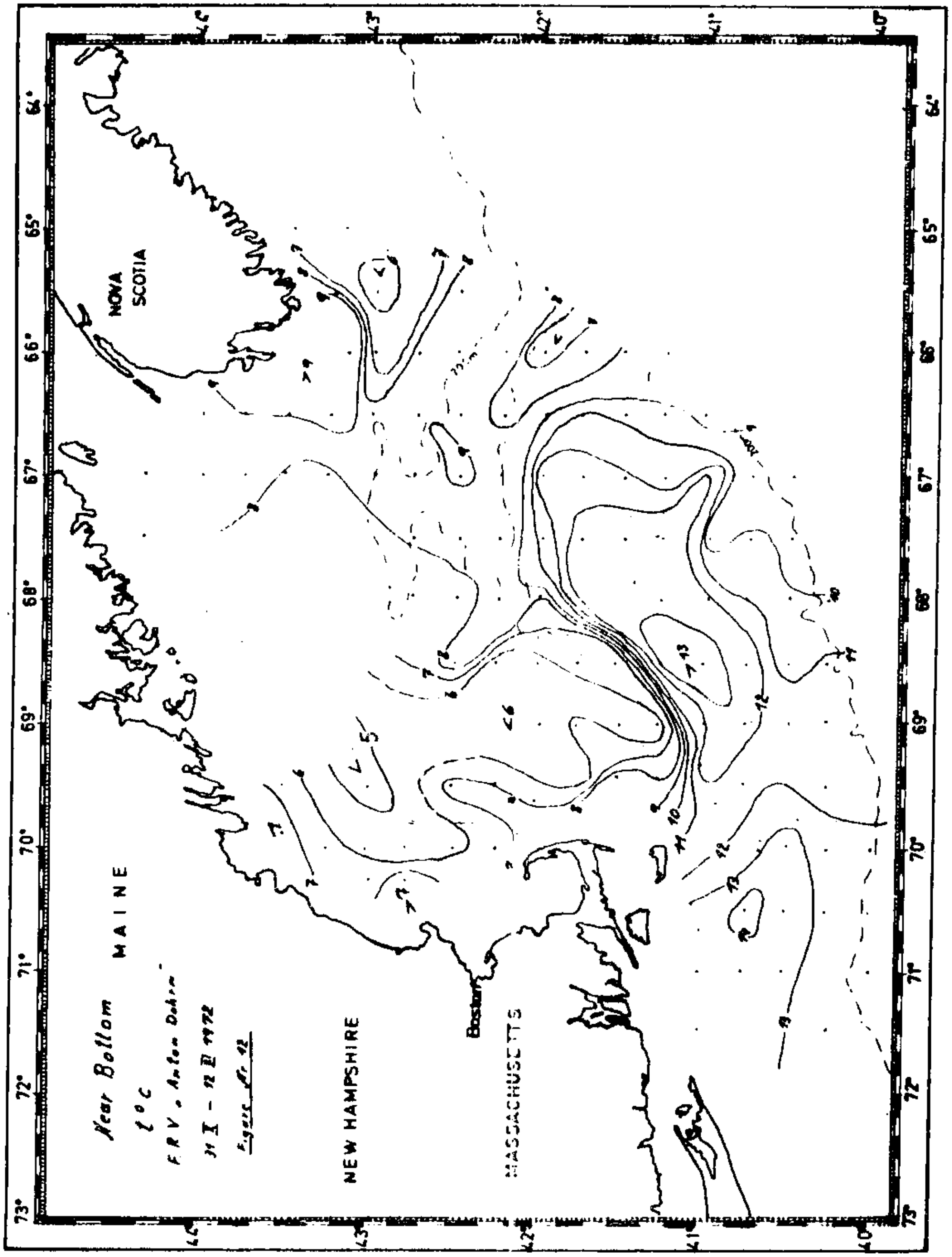

Near Bottom
t °C
F.R.V. Anton Dohrn
NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston

Fig. 38

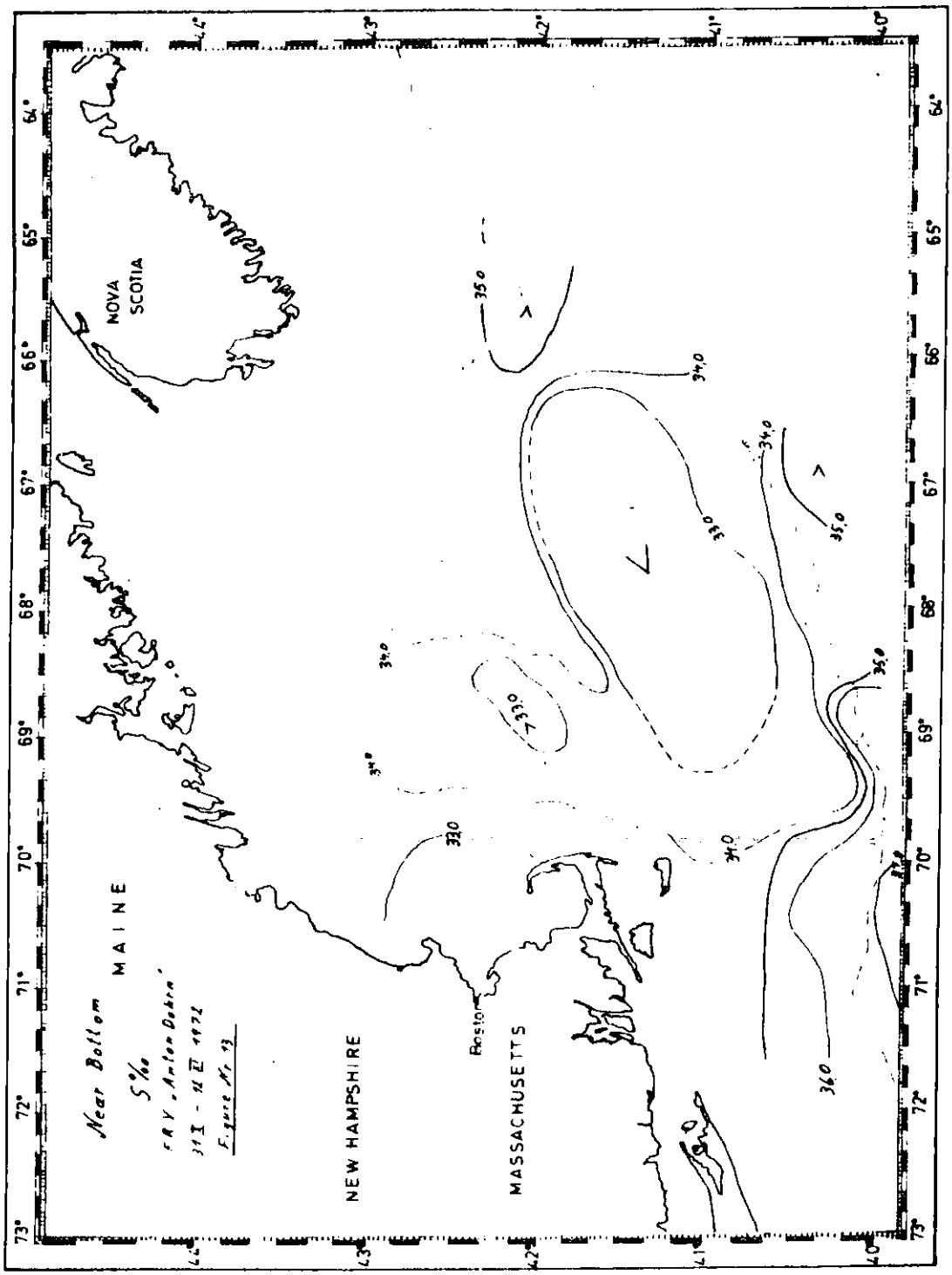

Near Bottom
S‰
R/V Anton Bruun
III - 11 E 1972
Figure No. 13
NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
32.0
33.0
34.0
35.0
36.0

Fig. 39

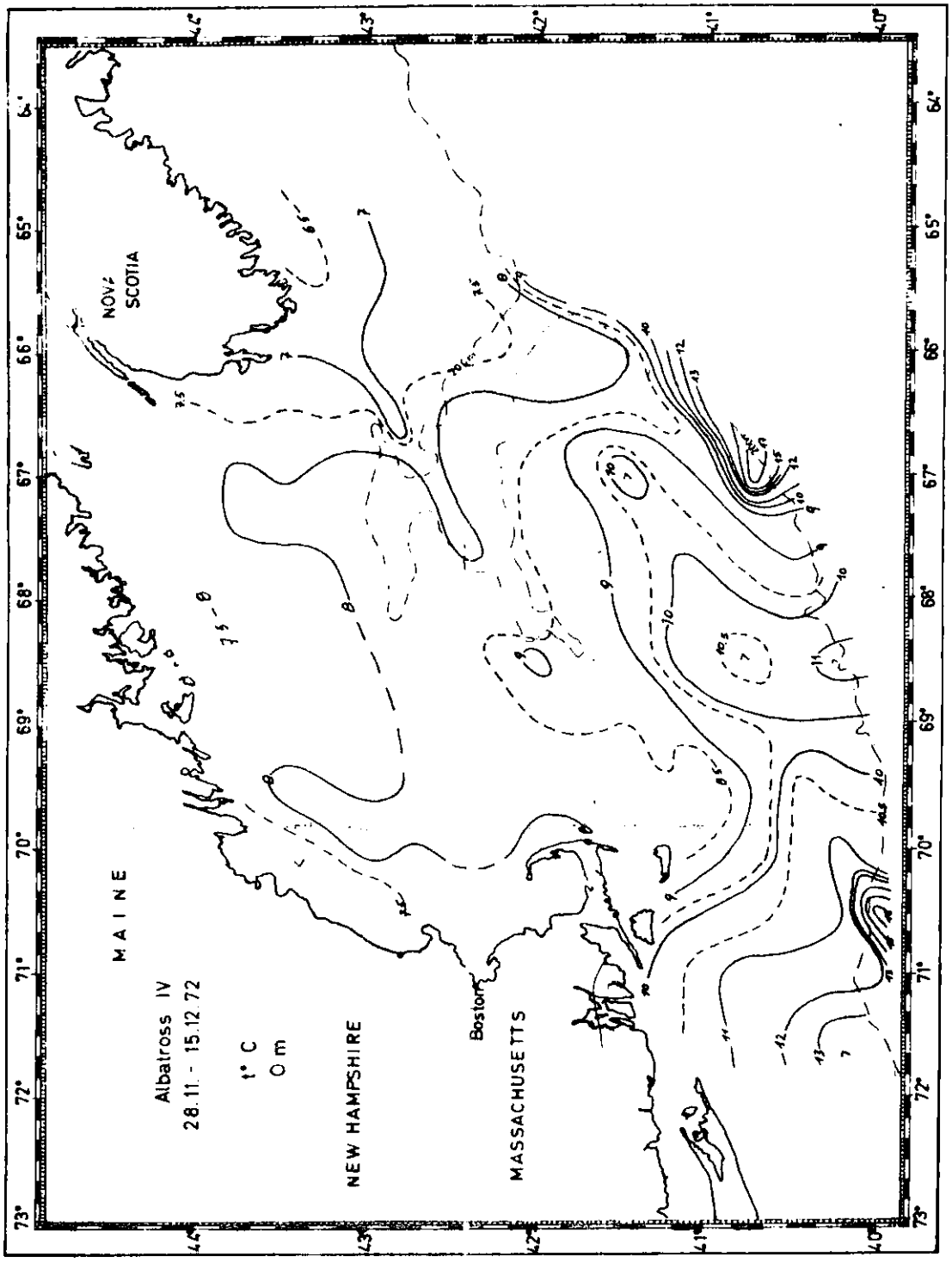
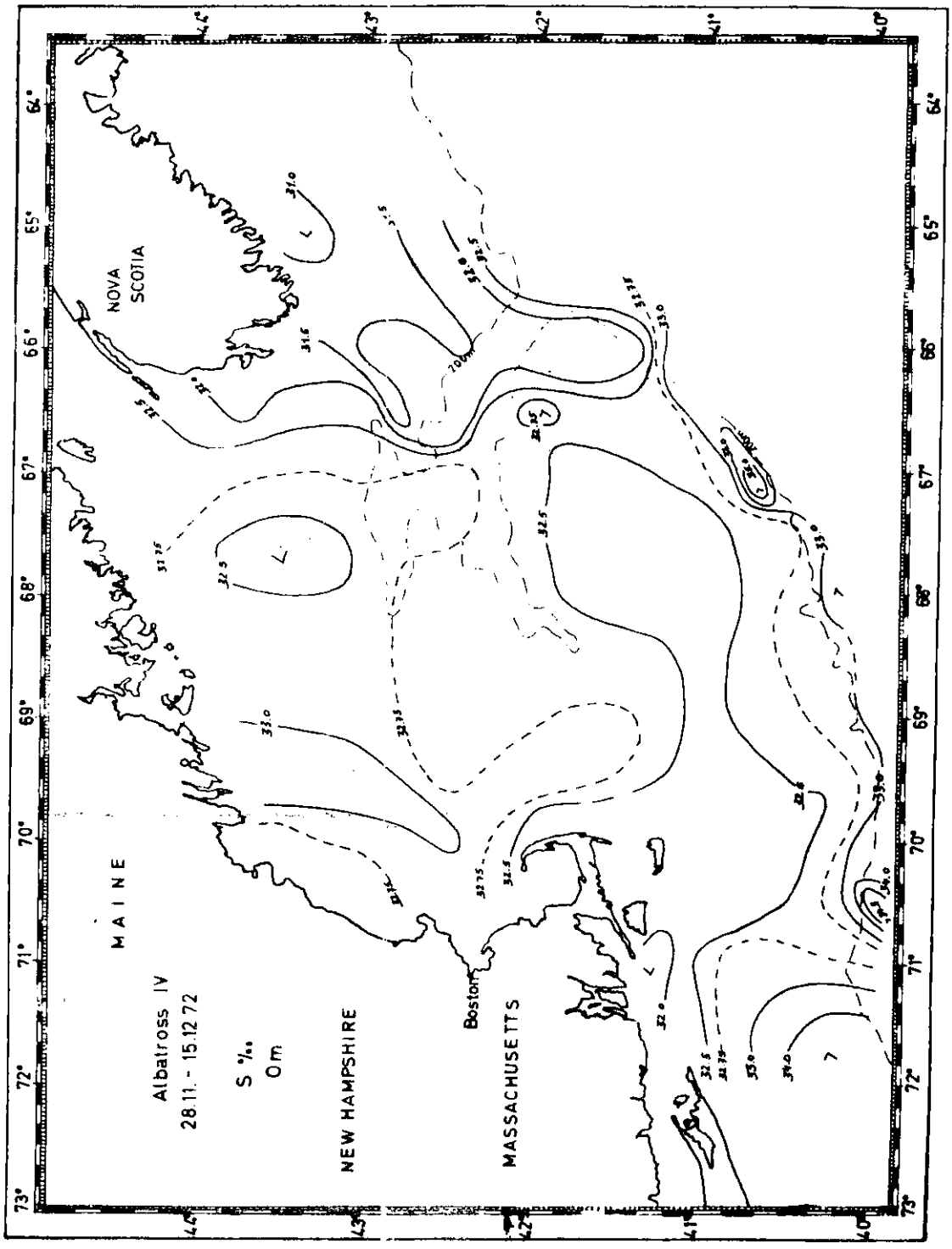

NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
Albatross IV
28.11. - 15.12.72
t° C
0 m

Fig. 40


MAINE
NOVA SCOTIA
NEW HAMPSHIRE
MASSACHUSETTS
Boston
Albatross IV
28.11. - 15.12.72
S ‰
Om

D 5

Fig 41

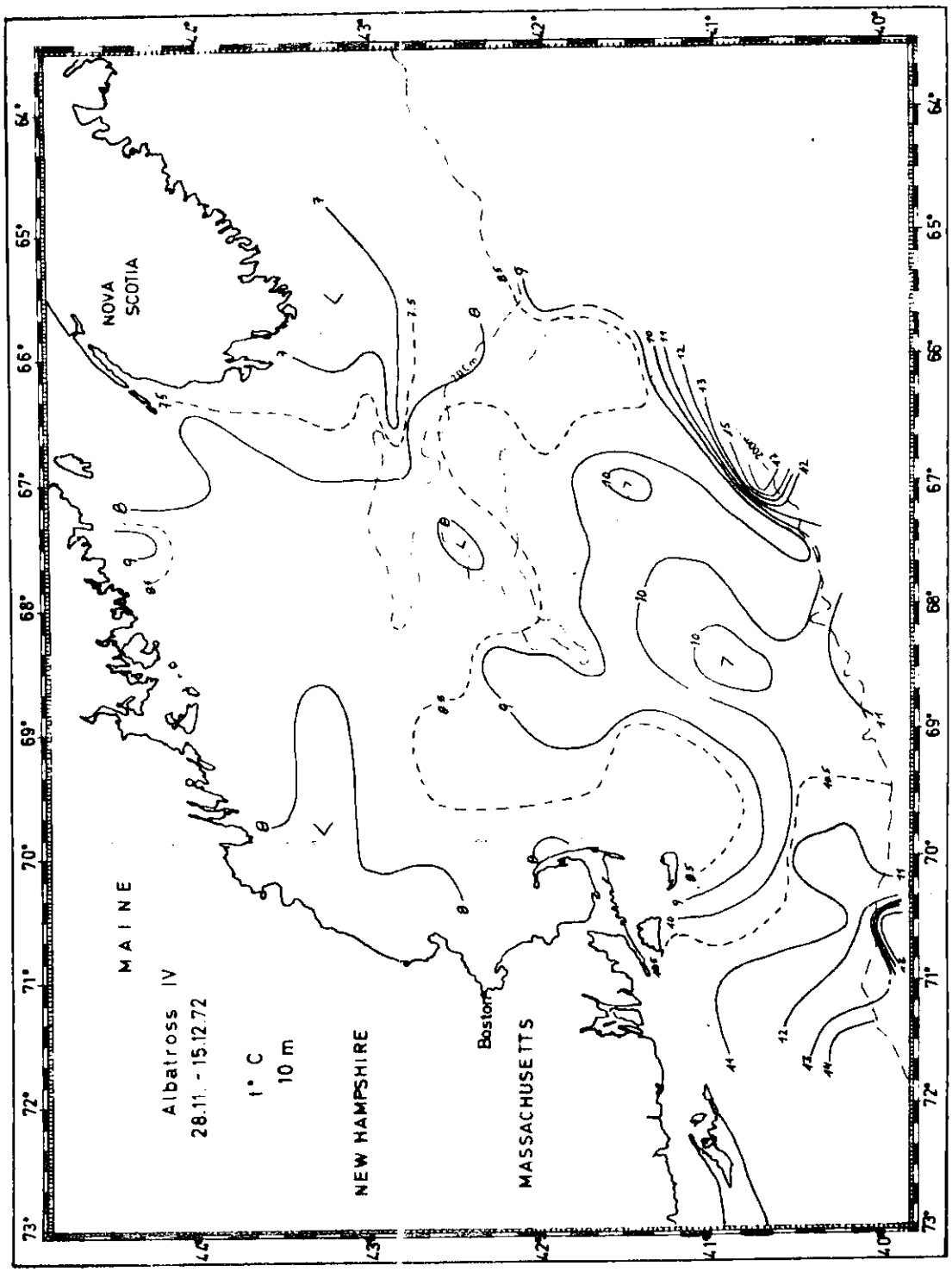

NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
Albatross IV
28.11. - 15.12.72
1° C
10 m

Fig. 42

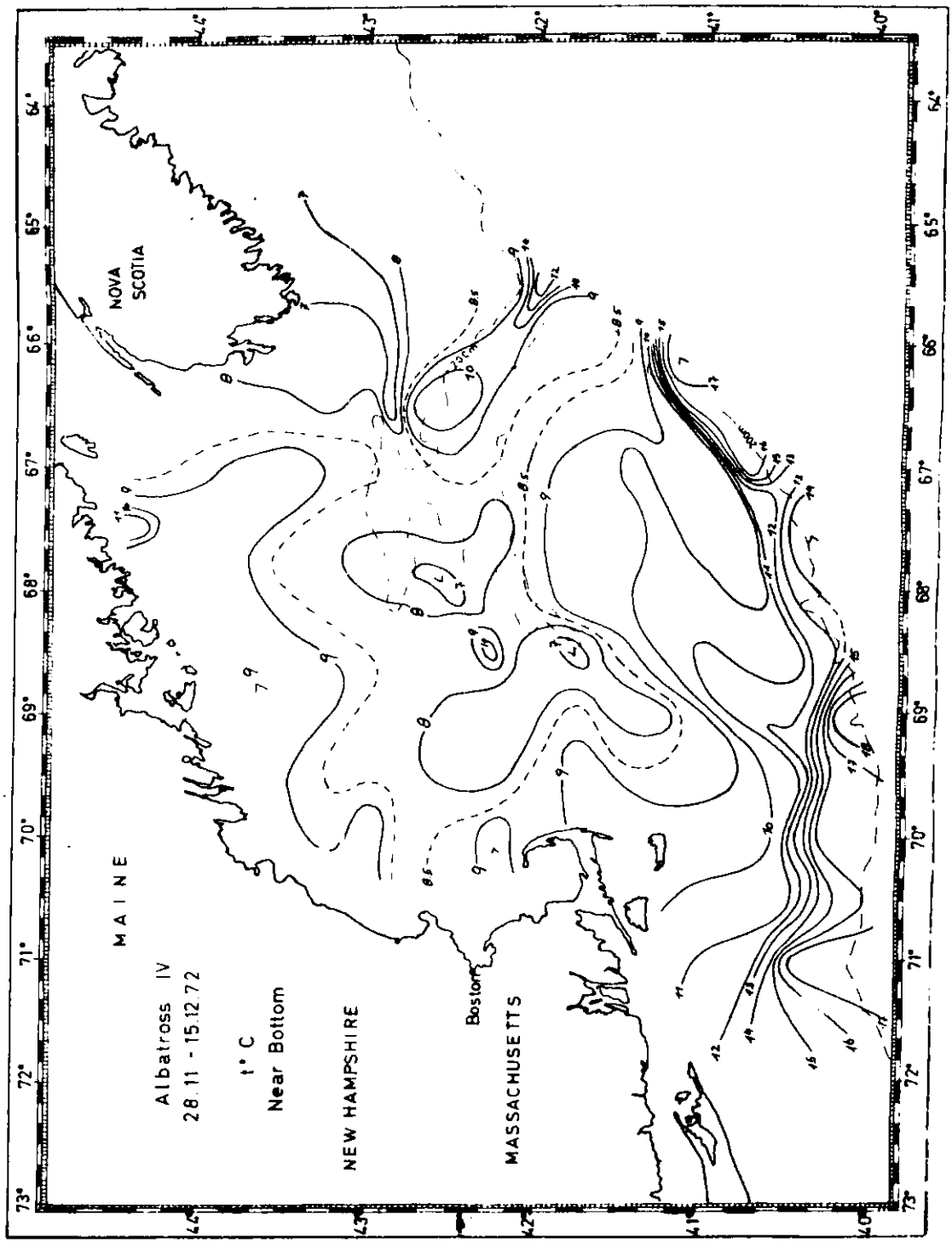

NOVA SCOTIA
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
Boston
Albatross IV
28.11 - 15.12.72
t° C
Near Bottom
73°
72°
71°
70°
69°
68°
67°
66°
65°
64°
43°
42°
41°
40°

Fig. 43

D 7

APPENDIX

Recommendations to Participants in the ICNAF Joint Larval Herring Survey

I. Sampling operation

1) Gear: a) Paired 61-cm Bongos should be used, fitted with cylinder-cone nets of 505 and 333 micron mesh size, a four-foot V-fin depressor calibrated flow meters inside each net (if possible with deck recorder), and a time depth recorder (if possible with deck recorder).

b) The USA can provide identical gear to participating countries which do not already have the specified sampling equipment. If such a loan is necessary, Dr. D.W.K. Au, National Marine Fisherie Service, Woods Hole, Massachusetts, USA, should be contacted well in advance of the cruise to make arrangements.

c) Flow meters should be calibrated before and after the cruise. For this purpose, tow flow meters ½ mile at 3.5 knots, determine revolutions, repeat ½ mile calibration tow in opposite direction in order to account for differences in currents. Repeat the calibration sequence at least three times.

2) Tow design:

a) Speed of ship: 3.5 knots

b) Tow profile: single oblique

c) Net setting: release wire at 50 m/min.
Net retrieval: haul back at 10 m/min.

d) Maximum depth of tow: 100 m or as close to the bottom as practical in shallower waters

e) Duration of tow: 10-25 minutes. In order to ensure a minimum towing time of 10 minutes at all stations, in shallow waters two sequential tows may be necessary. Also, if clogging is a problem, short sequential hauls should be made.

3) Sampling area

a) The standard cruise track (see chart and list of station positions) should be followed as far as possible. If changes are necessary, both time periods for surveying single spawning areas and the elapsed time between spawning area should be kept at a minimum.

b) If standard station grids cannot be completed due to lack of time, stations of lesser priority are those in the western Gulf of Maine (37-45).

c) If time permits, more intensive sampling across larval density gradients, then additional stations west of Nantucket Shoals and in central Gulf of Maine are recommended in that order of priority.

4) Additional information

a) Hydrography: Both temperature and salinity measurements at different depths are highly desirable. The origin of water masses and their movements can be established only if such data are available. Measurements of "surface" temperature should be taken at depths of 3-5 m since measurements taken directly at the surface appear highly variable.

b) Studies on vertical distribution of larvae are recommended near larval concentrations and hydrographic gradients. This will improve comparability of larval dispersal and hydrographic conditions.

II. Processing of samples

1) At sea — The plankton from each net should be placed in bottles, labelled and preserved in 5% buffered formalin separately.

2) Sorting

a) The total number of herring larvae taken in the 505 micron mesh net should be counted.

b) Counts of herring larvae retained by the 333 micron mesh size should be made if specimens less than 10 mm occur. (It is hoped that the sorting of all 333 nets may be done at a sorting centre in Gdynia in the future.)

c) Subsamples may be sorted in cases of high larval abundance. These subsamples should contain at least 4000 larvae.

3) Length measurements

Standard lengths of all larvae or a subsample of at least 100 specimens should be measured to the mm below.

4) Storage

All plankton samples should be retained for future integrated time series plankton studies. Although a common storage facility may be available in the future, for the present, the participating countries are requested to store their collections of samples which are not fully analyzed.

III. Reporting

1) A chart with the actual cruise track is desirable if it differs from the standard track.

2) Results should be reported in the standard format (a revised "Basic Data Summary" sheet will be distributed). To calculate the number of larvae/m^2, divide the total number per catch by the amount of water (m^3) filtered, as derived from flowmeter readings, and multiply this value by the maximum depth of to-

3) The distribution of larvae as numbers per m^2 should be presented on charts for three size groups (< 10, 10-15, > 15 mm) and total size range separately.

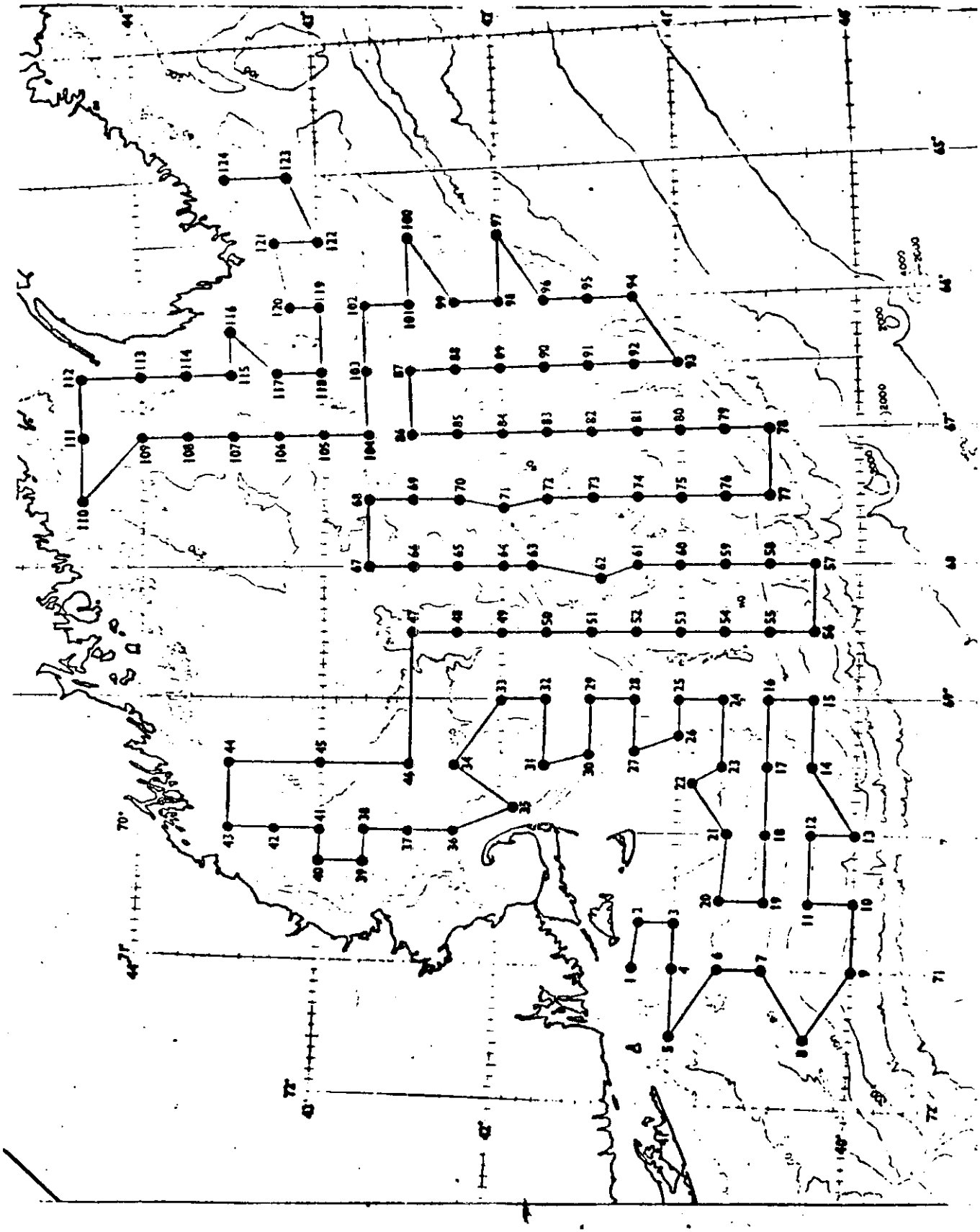
APPENDIX

Standard stations for ICNAF Joint Survey of Larval Herring in Georges Bank - Gulf of Maine areas.

ICNAF Stat.No.	Position	ICNAF Stat.No.	Position
1	41°12' N, 71°00' W	36	42°18' N , 70°00' W
2	41°10' N, 70°40' W	37	42°30' N , 70°00' W
3	41°00' N , 70°40' W	38	42°45' N , 70°00' W
4	41°00' N, 71°00' W	39	42°45' N , 70°15' W
5	41°00' N , 71°25' W	40	43°00' N , 70°15' W
6	40°45' N , 71°00' W	41	43°00' N , 70°00' W
7	40°35' N , 71°00' W	42	43°15' N , 70°00' W
8	40°15' N , 71°30' W	43	43°30' N , 70°00' W
9	40°00' N , 71°00' W	44	43°30' N , 69°30' W
10	40°00' N , 70°30' W	45	43°00' N , 69°30' W
11	40°15' N , 70°30' W	46	42°30' N , 69°30' W
12	40°15' N , 70°00' W	47	42°30' N , 68°30' W
13	40°00' N , 70°00' W	48	42°15' N , 68°30' W
14	40°15' N , 69°30' W	49	42°00' N , 68°30' W
15	40°15' N , 69°00' W	50	41°45' N , 68°30' W
16	40°30' N , 69°00' W	51	41°30' N , 68°30' W
17	40°32' N , 69°30' W	52	41°15' N , 68°30' W
18	40°32' N , 70°00' W	53	41°00' N , 68°30' W
19	40°32' N , 70°30' W	54	40°45' N , 68°30' W
20	40°45' N , 70°30' W	55	40°30' N , 68°30' W
21	40°40' N , 70°00' W	56	40°15' N, 68°30' W
22	40°55' N , 69°38'W	57	40°15' N , 68°00' W
23	40°45' N , 69°30' W	58	40°30' N , 68°00' W
24	40°45' N , 69°00' W	59	40°45' N , 68°00' W
25	41°00' N , 69°00' W	60	41°00' N , 68°00' W
26	41°00' N , 69°16' W	61	41°16' N , 67°54' W
27	41°15' N , 69°25' W	62	41°26' N , 68°06' W
28	41°15' N , 69°00' W	63	41°50' N , 68°00' W
29	41°30' N , 69°00' W	64	42°00' N , 68°00' W
30	41°30' N , 69°25' W	65	42°15' N , 68°00' W
31	41°45' N , 69°30' W	66	42°30' N , 68°00' W
32	41°45' N , 69°00' W	67	42°45' N , 68°00' W
33	42°00' N , 69°00' W	68	42°45' N , 67°30' W
34	42°15' N , 69°30' W	69	42°30' N , 67°30' W
35	41°55' N , 69°50' W	70	42°15' N , 67°30' W

ICNAF Stat.No.	Position	ICNAF Stat.No.	Position
71	42°00' N , 67°33' W	98	42°00' N , 66°00' W
72	41°45' N , 67°30' W	99	42°15' N , 66°00' W
73	41°30' N , 67°30' W	100	42°30' N, 65°30' W
74	41°15' N , 67°30' W	101	42°30' N , 66°00' W
75	41°00' N , 67°30' W	102	42°45' N , 66°00' W
76	40°45' N , 67°30' W	103	42°45' N , 66°30' W
77	40°30' N , 67°30' W	104	42°45' N , 67°00' W
78	40°30' N , 67°00' W	105	43°00' N , 67°00' W
79	40°45' N , 67°00' W	106	43°15' N , 67°00' W
80	41°00' N , 67°00' W	107	43°30' N , 67°00' W
81	41°15' N , 67°00' W	108	43°45' N , 67°00' W
82	41°30' N , 67°00' W	109	44°00' N , 67°00' W
83	41°45' N , 67°00' W	110	44°20' N , 67°30' W
84	42°00' N , 67°00' W	111	44°20' N , 67°00' W
85	42°15' N , 67°00' W	112	44°30' N , 66°30' W
86	42°30' N , 67°00' W	113	44°00' N , 66°33' W
87	42°30' N , 66°30' W	114	43°45' N , 66°30' W
88	42°15' N , 66°30' W	115	43°30' N , 66°30' W
89	42°00' N , 66°30' W	116	43°30' N , 66°00' W
90	41°45' N , 66°30' W	117	43°15' N , 66°30' W
91	41°30' N , 66°30' W	118	43°00' N , 66°30' W
92	41°15' N , 66°30' W	119	43°00' N , 66°00' W
93	41°00' N , 66°30' W	120	43°10' N , 66°00' W
94	41°15' N , 66°00' W	121	43°10' N , 65°42' W
95	41°30' N , 66°00' W	122	43°00' N , 65°30' W
96	41°45' N , 66°00' W	123	43°10' N , 65°00' W
97	42°00' N , 65°30' W	124	43°30' N , 65°00' W

APPENDIX



The following vessel schedule is proposed for the 1973 ICNAF Larval Herring Survey.

Country	Dates	Area of survey
USA	September-November monthly cruises	along shore Gulf of Maine
Canada	October-March monthly cruises	Bay of Fundy
USA	1-15 September	offshore, standard cruise track
France	15-30 September	" " " "
Poland	1-15 October	" " " "
USSR	15-30 October	" " " "
Fed.Rep. Germany	1-15 November	" " " "
USA	15-30 November	" " " "

The vessel schedules for the various countries fit the above proposal approximately. Each country is urged to attempt to cover the areas as closely as possible in the above time schedule. In the event that a major change (1-2 weeks) is required, Member Countries are requested to inform one of the cruise coordinators (Dr. M.D. Grosslein, USA; Dr D. Schnack, Fed.Rep. Germany).