Distributions of American Lobster (Homarus Americanus) in the Midshore and Offshore Regions of S.W. Nova Scotia During October 1980, July 1981, and October 1981 Trap Surveys

by

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Abstract

Data are presented from a series of late-summer and early-fall (1980-81) trapping surveys designed to investigate lobster distribution along the outer Scotian Shelf, Browns Bank and the region between Browns Bank, Truxton Swell, and the inshore region near Seal Island. Catch rates were consistently higher on the Banks than in deeper water regions with the highest catch rate on Browns Bank (<100 m). No lobsters were caught east of Browns Bank Catch distribution suggests no overlap of inshore and offshore lobster distributed in late summer and fall.

Résumé

Nous présentons ici les données d'une série de relevés menés à la fin de l'été et au début de l'automne (1980-81) à l'aide de casiers, relevés conçus dans le but de connaître la distribution du homard le long de la partie extérieure du plateau Scotian, sur le banc Browns, dans la région comprise entre ce banc et Truxton Swell, et dans la région côtière au voisinage de l'Île Seal. Sur les bancs, les taux de capture ont été uniformément plus élevés que sur les fonds plus profond. Les taux de capture les plus élevés ont été observés sur le banc Browns (< 100 m). Aucun homard n'a été capturé à l'est du banc Browns. La répartition des prises laisse supposer qu'il n'y a pas chevauchement dans la distribution des homards côtiers et hauturiers à la fin de l'été et en automne.

Introduction

Prior to the establishment of the offshore lobster (Homarus americanus) fishery in 1971, little was known about the distribution of lobster on the Scotian Shelf beyond the traditional inshore areas. Trawl surveys in 1965 and 1966 concentrated effort along the Shelf edge and slope regions (MacKenzie, 1966a; 1966b). Trap surveys were conducted in the midshore region (area between offshore and traditional inshore grounds) (Graham and Wilder, 1966; Wilson and Wilder, 1967), but the few sites sampled and the low catches added little to our knowledge of lobster distribution.

Since that time, the offshore lobster fishery has supplied information on the distribution of lobsters beyond the 50-mile boundary line through the fishing location information on the vessel logbooks (Fig. 1). Inshore vessels have extended their fishing areas out to German Bank, the northern edge of Browns Bank, Crowell Basin, and the area south of Seal Island, but they are not required to submit logbooks; and our information on vessel fishing location is very limited.

A series of trap surveys were conducted in 1980 and 1981 to determine the distribution and compare size frequency of lobsters from the offshore to the inshore regions off S.W. Nova Scotia. These were conducted in conjunction with a series of cruises designed to investigate the distribution and abundance of red (Geryon quiquedens) and Jonah (Cancer borealis) crab along the outer edge and slope of the Scotian Shelf. Partial results of the crab surveys have been previously reported by McElman and Elner (1982).

Methods

Three charter cruises were made on the M.V. Flying Duchess (C.W. McLeod Fisheries Limited) out of Port Mouton in 1980, and four were made in 1981. Cruises 1, 4, and 6 were primarily designed for red and Jonah crab. Cruise 2 (September 1980) (Fig. 2) was designed to survey the Browns Bank area; and Cruise 3 (October 1980) (Fig. 2) to survey along a transect from Browns Bank to Seal Island and Seal Island to Truxton Swell. Cruise 5 (July 1981) (Fig. 3) was designed to repeat the transects of October 1980 and to more extensively sample the deep water north of Browns Bank. Cruise 7 (October 1981) (Fig. 4) repeated the transect, but bad weather and vessel problems resulted in cancellation of stations between German and Browns Banks out to the deep Georges Basin area. The exact locations of sites are given in Tables 1 and 2.

At each site 25 (Cruises 1 and 2) or 12 (Cruise 3-7) traps were set 59 m to 62 m apart on a ground line anchored at each end and marked with a radar-reflecting high flyer.

In Cruises 1-2 a variety of trap types were used including snow crab, Japanese conicals, and inshore and offshore lobster traps (Table 3), the majority being offshore lobster traps. Cruises 3 to 7 used only lobster traps.

A variety of trap types were used in Cruises 1 and 2 to test the efficiency of each and to minimize the chance that red crabs were not missed due to improper trap design. The results were that the lobster trap (inshore and offshore) proved the most effective and were easiest to obtain and work with. In subsequent cruises the main trap type used was the large offshore lobster-style trap with a 17 cm entrance ring.

Smaller inshore-style traps with 14 cm entrance rings and experimental traps with 7.5 cm rings were added in small numbers to test for the presence of smaller lobsters which may not be trapped by the large traps.

A comparison of lobster catches between trap types is not possible due to insufficient number, but analysis of crab catch has been presented by McElman and Elner (1982). Data presented in this paper are the catch from the offshore and inshore lobster traps only.

Approximately 100 traps were set between noon and early evening and were hauled again the following morning with an average soak time of 16-18 hours. Frozen mackerel was used as bait in each trap and was replaced each time the trap was set. Lobsters caught were measured (carapace length), sexed, tagged, and released as close to the capture site as possible.

At selected sites (Fig. 8, 9, 10), bottom temperatures were taken with XBT's or a Ryan temperature recorder which was placed in one of the lobster traps.

Results and Discussion

The results are summarized in Tables 4 and 5 and Figures 5, 6, and 7.

The sites with the highest CPUE's were centered on the western portion of Browns Bank and to a lesser extent on German Bank. No lobsters were caught east of 65°W, which is similar to that observed in the 1965 and 1966 trawl surveys (McKenzie, 1966a; 1966b) where few lobsters were caught between Browns Bank and Sable Island Bank, though a small number of lobsters were

taken near Sable Island Bank. Lobsters were also absent in the July 1981 survey at the sites between Cape Sable Island and Browns Bank (Sites 43 to 51). Water temperatures in this area were significantly lower than in other areas sampled, and the average bottom temperatures east of Cape Sable Island are generally lower than those of the Gulf of Maine, Browns Bank, and slope area (Colton and Stoddard, 1973). This may explain the apparent absence of lobsters from much of the Scotian Shelf. Few lobsters were caught in the deep water north of Browns Bank and west of German Bank. The bottom temperatures in these areas are generally lower than in adjacent shallow areas, and the bottom type often differs. The area north of Browns Bank is mainly silty and clayey sand with more than 10% gravel compared to the mainly sand and gravel of German and Browns Banks (<50% gravel). The area west of German Bank is a mixture of areas with silty, clayey sand with >10% gravel, area of glacial till, and area of clay and silt bottom (Gordon et al., 1977).

The absence of lobster at those sites which correspond to the commercial offshore grounds (Fig. 1) may be due in part to the inability of the charter vessel to set traps in the areas containing commercial gear. Approximately 4,000 commercial traps in 40 strings were concentrated in a relatively small area of S.E. Browns Bank, which most probably corresponds to an area of higher lobster concentrations than the surrounding areas the survey was able to sample.

Lobsters were generally absent in the few sites sampled in the Fundian Channel. Unlike other deep-water areas, north and west of Browns Bank, the Fundian Channel receives an influx of warm slope water (Colton, 1968) and during the July 1981 survey period showed bottom temperatures of 9.0° and 10.2°C at 223 and 183 m respectively.

As a result of the low catches at most sites a comparison of size frequency and sex ratios between areas was not possible. The pooled size frequency of lobsters caught at the sample sites on western Browns and German Banks are given in Figure 11. In both October 1980 and October 1981, western Browns Bank catches consisted of a high proportion of berried females (61% of the total catch in 1980 and 64% 1981). The degree to which the high percentage of berried females in the catches is influenced by gear selectivity or by season is not known.

The surveys indicate a concentration of lobster on the Banks during the survey periods. However, without data from the winter and spring period it cannot be determined if these distributional patterns are seasonal in nature. Along the outer shelf of S.E. Browns Bank fishermen seasonally move the gear to deep water (250 m) in winter and to shallow water in late summer (100 m). Tagging work on Georges Bank by Uzmann et al. (1977)

also suggests seasonal lobster movement up and down the continental slope. Such seasonal movement could result in potential overlap and mixing of inshore and offshore populations in areas north of Browns Bank in winter and early spring if some lobsters from Browns Bank move to deep water north of the Bank in winter; however, if all movement is toward the warmer deep water of the slope and Fundian Channel, little or no winter mixing would occur.

Further work is needed to describe the seasonal and yearly patterns of lobster and the relationship of bottom temperature and type to lobster distribution and movements in the offshore areas.

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Table 1. Sample site locations of lobster/crab survey - September and October, 1980 (see also Fig. 2).

Site No.	Lat.	Long.
September 9-17:		
1	42°55'10"	62°20'59"
2	42 53 17	62 20 07
3	42 49 49	62 45 06
4	42 48 21	62 56 38
5	42 48 01	63 07 45
6	42 48 03	63 41 58
7	42 46 30	63 38 52
8	42 45 38	64 05 21
9	42 43 12	64 03 17
10	42 30 48	64 34 47
11	42 20 03	64 59 38
12	42 16 00	65 10 38
13	42 13 03	65 17 27
14	42 09 11	65 25 54
15	42 07 28	65 26 08
16	42 06 32	65 26 34
17	42 07 32	65 23 33
18	42 35 50	64 37 32
19	42 42 10	64 42 13
20	42 49 00	64 46 26
21	42 25 36	65 05 17
22	42 31 10	65 09 49
23	42 35 59	65 14 06
24	42 42 45	64 59 26
25	42 30 38	64 49 22
September 23 to October 2:		
26	42 17 51	65 18 52
27	42 21 31	65 20 14
28	42°27'52"	65°23'23"
29	42 34 45	65 27 26
30	42 11 51	65 28 07
31	42 17 54	65 31 54
32	42 23 37	65 38 05
33	42 27 50	65 38 33
34	42 33 00	65 38 49
35	42 38 32	65 40 07
36	42 20 57	65 49 56
37	42 25 23	65 50 27
38	42 26 39	65 50 39
39	42 29 20	66 12 24
40	42 33 18	66 13 37
41	42 33 51	66 10 08
42	42 36 45	66 12 30
43	42 36 51	66 12 30
44	42 40 00	66 11 24
45	42 46 53	66 13 32
46	42 54 22	66 11 54
47	42 33 51	66 24 44
48	42 35 55	66 22 08
49	42 40 36	66 24 52
50	42 47 00	66 22 00
51	42 36 50	66 43 14
52	42 44 53	66 43 48
53	42 51 11	66 43 38
October 16-20:		
54	42 46 38	66 11 25
55	42 49 16	66 10 50
56	42 52 05	66 12 38
57	42°55'50"	66°13'47"
58	42 58 47	66 13 28
59	43 01 26	66 12 28
60	43 03 04	66 11 04
61	43 05 17	66 11 04
62	43 08 33	66 11 29
63	43 11 16	66 10 42
64	43 13 39	66 10 31
65	43 18 41	66 09 24
66	43 23 51	66 09 12
67	43 23 06	66 16 06
68	43 21 04	66 24 18
69	43 21 07	66 26 00
70	43 19 40	66 29 39
71	43 20 02	66 32 54
72	43 19 45	66 37 33
73	43 18 42	66 40 57
74	43 18 11	66 45 45
75	43 17 09	66 48 20
76	43 16 33	66 51 37
77	43 13 09	66 56 09
78	43 10 59	67 02 58
79	43 08 28	67 09 10
80	43 05 30	67 15 38
81	43 04 57	67 20 02

Table 2. Sample sites for lobster/crab survey - July, September, and October, 1981 (see also Figs 3 and 4).

Site No.	Lat.	Long.
July 22-31:		
1	43°10'48"	66°56'20"
2	43 12 34	66 51 40
3	43 14 24	66 47 50
4	43 15 44	66 43 36
5	43 17 26	66 41 06
6	43 17 55	66 37 19
7	43 18 30	66 33 30
8	43 19 37	66 29 36
9	43 20 26	66 25 43
10	43 20 53	66 21 33
11	43 21 30	66 17 31
12	43 22 33	66 14 21
13	43 23 00	66 10 19
14	43 18 18	66 13 47
15	43 17 05	66 20 33
16	43 15 25	66 24 21
17	43 13 20	66 30 33
18	43 11 09	66 35 45
19	43 09 44	66 41 20
20	43 06 44	66 38 14
21	43 04 18	66 32 49
22	43 05 58	66 27 45
23	43 07 30	66 23 35
24	43 04 04	66 20 25
25	43 00 10	66 16 34
26	42 58 59	66 21 58
27	42 55 12	66 21 01
28	42 54 22	66 26 41
29	42 51 20	66 23 32
30	42 50 55	66 17 52
31	42 52 57	66 11 59
32	42 54 43	66 16 01
33	42 58 26	66 11 15
34	43 01 53	66 10 33
35	43 05 25	66 09 48
36	43 09 02	66 09 00
37	43 12 32	66 08 16
38	43 16 02	66 07 31
39	43 19 34	66 06 35
40	43 19 00	65 55 25
41	43 18 46	65 50 09
42	43 15 37	65 47 09
43	43 11 36	65 44 34
44	43 07 58	65 42 47
45	43 04 25	65 42 52
46	43 00 51	65 42 56
47	42 57 26	65 43 38
48	42 53 42	65 42 54
49	42°49'50"	65°43'05"
50	42 47 25	65 48 05
51	42 51 09	65 50 16
52	42 55 05	65 52 08
53	42 59 18	65 51 09
54	43 01 58	65 52 57
55	43 05 45	65 54 50
56	43 01 10	65 57 29
57	43 01 36	66 02 18
58	42 57 44	65 59 00
59	42 55 03	65 57 12
60	42 52 54	65 59 39
61	42 54 26	66 05 13
62	42 51 13	66 06 39
63	42 47 45	66 06 55
64	42 49 06	66 12 42
65	42 47 22	66 17 18
66	42 45 34	66 13 25
67	42 41 44	66 15 04
68	42 37 41	66 13 01
69	42 35 27	66 16 24
October 15-21:		
70	43 13 28	66 52 27
71	43 16 00	66 43 25
72	43 17 26	66 40 43
73	43 18 03	66 37 26
74	43 19 37	66 29 36
75	43 20 16	66 25 27
76	43 19 46	66 22 03
77	43 21 46	66 17 44
78	43 16 35	66 21 02
79	43 13 19	66 31 19
80	43 10 43	66 35 39
81	43 08 10	66 41 59
82	43 15 24	66 07 10
83	43 12 03	66 07 38
84	43 08 30	66 08 13
85	43 04 47	66 09 04
86	43 01 17	66 09 58
87	42 57 55	66 10 37
88	42 54 20	66 11 45
89	42 52 19	66 12 10
90	42 47 42	66 06 46
91	42 45 22	66 13 32
92	42 47 28	66 17 15
93	42 41 41	66 14 54
94	42 37 50	66 12 44
95	42 35 17	66 11 31
96	42°34'36"	66°11'54"
97	42 33 08	66 11 47
July 7-16:		
98	42 49 59	63 20 12
99	42 47 20	63 20 05
100	42 50 23	63 08 25
101	42 47 35	63 07 14
102	42 49 34	62 56 23
103	42 48 31	62 56 01
104	42 50 41	62 44 39
105	42 50 21	62 42 30
106	42 52 57	62 34 25
107	42 51 33	62 34 05
108	42 59 02	62 38 12
109	42 57 52	62 27 22
110	42 55 45	62 26 50
111	42 56 07	62 20 42
112	42 53 06	62 20 00
113	42 58 19	62 05 09
114	42 56 47	62 03 08
115	43 00 40	61 46 21
116	42 58 50	61 44 16
117	42 56 49	61 44 02
118	43 08 32	61 24 50
119	43 14 25	61 17 29
120	43 13 35	61 16 51
121	43 12 09	61 18 11
122	43 18 14	61 09 00
123	43 16 59	61 09 20
124	43 15 08	61 07 05
September 23 to October 1:		
125	42 46 44	63 13 17
126	42 46 29	63 12 54
127	42 47 23	63 06 23
128	42 47 15	63 05 13
129	42 47 05	63 05 51
130	42 46 55	63 07 05
131	42 47 03	63 03 46
132	43 16 15	61 07 01
133	43 17 01	61 06 01
134	43 18 21	60 52 37
135	43 16 50	60 50 19
136	43 34 01	60 00 12
137	43 32 29	59 59 36
138	43 37 51	59 41 00
139	43 38 50	59 18 50

Table 3. Trap sizes.

Trap type	Trap size	Entrance size
Snow crab	0.53 x 1.19 x 1.17 m	0.12 x 0.39 m (two end)
Small Japanese conical	Base - 1.20 m diameter Top - 0.72 m diameter Height - 0.64 m	0.45 m diameter (one top)
Large Japanese conical	Base - 1.60 m diameter Top - 0.72 m diameter Height - 0.70 m	0.45 m diameter (one top)
Inshore lobster trap	1.21 x 0.70 x 0.38 m	0.14 m diameter (two side, one end)
Offshore lobster trap	1.02 x 0.81 x 0.40 m	0.17 m diameter (two side)
Experimental lobster trap	0.71 x 0.55 x 0.36 m	0.075 m diameter (two side)

Table 4. Summary of lobster and Jonah crab catches at sampling sites of September to October, 1980, surveys (Cruises 1, 2, 3).

Site no.	Date sampled (day/month)	Depth (m)	No. of traps	No. of lobsters				Lobsters / trap haul	No. of Jonah crab	Jonah crab / trap haul
				M	F	Berried F	Total			
1	10/09	258	25	0	0	0	0	0.0	153	6.12
2	10/09	432	25	0	0	0	0	0.0	4	0.16
3	09/09	309	25	0	0	0	0	0.0	2	0.08
4	09/09	296	25	0	0	0	0	0.0	46	1.84
5	09/09	322	25	0	0	0	0	0.0	27	1.08
6	08/09	234	23	0	0	0	0	0.0	49	2.13
7	08/09	443	24	0	0	0	0	0.0	2	0.08
8	12/09	223	25	0	0	0	0	0.0	97	3.88
9	12/09	476	25	0	0	0	0	0.0	2	0.08
10	13/09	322	25	0	0	0	0	0.0	7	0.28
11	14/09	340	25	0	0	0	0	0.0	18	0.72
12	14/09	304	25	0	0	0	0	0.0	91	3.64
13	14/09	375	25	0	0	0	0	0.0	41	1.64
14	15/09	227	25	0	0	0	0	0.0	62	2.48
15	15/09	472	25	0	0	0	0	0.0	4	0.16
16	15/09	576	25	0	0	0	0	0.0	3	0.12
17	15/09	608	13	0	0	0	0	0.0	1	0.08
18	17/09	132	25	0	0	0	0	0.0	84	3.36
19	17/09	123	25	0	0	0	0	0.0	56	2.24
20	17/09	108	25	0	0	0	0	0.0	1	0.04
21	16/09	128	25	0	0	0	0	0.0	191	7.64
22	16/09	113	25	3	1	0	4	0.16	45	1.80
23	16/09	104	25	0	0	0	0	0.0	16	0.64
24	16/09	110	25	0	0	0	0	0.0	1	0.04
25	17/09	128	25	0	0	0	0	0.0	143	5.72
26	24/09	119	25	1	0	2	3	0.12	65	2.60
27	24/09	113	25	0	2	3	5	0.20	512	20.48
28	24/09	102	25	0	1	0	1	0.04	19	0.76
29	24/09	91	25	1	0	0	1	0.04	4	0.16
30	26/09	117	25	3	2	12	17	0.68	23	0.92

Table 4 contd...

Site no.	Date sampled (day/month)	Depth (m)	No. of traps	No. of lobsters				Lobsters / trap haul	No. of Jonah crab	Jonah crab / trap haul
				M	F	Berried F	Total			
31	26/09	104	25	5	1	8	14	0.56	124	4.96
32	25/09	93	25	0	0	0	0	0.0	1	0.04
33	25/09	88	25	0	0	0	0	0.0	22	0.88
34	25/09	88	25	2	1	5	8	0.32	2	0.08
35	25/09	88	25	1	0	0	1	0.04	10	0.40
36	27/09	205	25	0	0	0	0	0.0	3	0.12
37	27/09	137	25	2	0	0	2	0.08	32	1.28
38	27/09	123	25	4	1	0	5	0.20	23	0.92
39	01/10	238	25	0	0	0	0	0.0	32	1.28
40	01/10	198	25	0	2	0	2	0.08	233	9.32
41	28/09	163	25	2	0	1	3	0.12	76	3.04
42	28/09	110	25	5	2	31	38	1.52	0	0.0
43	28/09	62	25	11	3	18	32	1.28	1	0.04
44	28/09	58	25	5	7	11	23	0.92	0	0.0
45	02/10	46	25	3	10	35	48	1.92	1	0.04
46	02/10	152	25	1	3	0	4	0.16	11	0.44
47	30/09	165	25	0	0	1	1	0.04	8	0.32
48	30/09	165	25	3	0	0	3	0.12	98	3.92
49	30/09	119	25	1	0	0	1	0.04	2	0.08
50	02/10	91	25	6	0	0	6	0.24	254	10.16
51	29/09	187	25	0	0	0	0	0.0	29	1.16
52	29/09	172	25	0	0	2	2	0.08	260	10.40
53	29/09	227	25	0	0	0	0	0.0	206	8.24
54	17/10	53	12	0	0	3	3	0.25	7	0.58
55	17/10	46	12	6	4	0	10	0.83	5	0.42
56	17/10	148	12	4	1	0	5	0.42	19	1.58
57	17/10	148	12	1	0	0	1	0.08	6	0.50
58	17/10	123	12	2	1	0	3	0.25	10	0.83
59	17/10	124	12	1	0	0	1	0.08	34	2.83
60	17/10	119	12	1	1	0	2	0.17	45	3.75

Table 4 contd...

Site no.	Date sampled (day/month)	Depth (m)	No. of traps	No. of lobsters				Lobsters / trap haul	No. of Jonah crab	Jonah crab / trap haul
				M	F	Berried F	Total			
61	17/10	106	12	2	1	0	3	0.25	56	4.67
62	18/10	90	12	2	0	0	2	0.17	58	4.83
63	18/10	93	12	0	0	0	0	0.0	41	3.42
64	18/10	81	12	2	4	1	7	0.58	15	1.25
65	18/10	53	12	8	0	0	8	0.67	78	6.80
66	18/10	55	12	1	4	0	5	0.42	14	1.17
67	18/10	66	12	1	0	0	1	0.08	277	23.08
68	18/10	62	12	1	0	0	1	0.08	28	2.33
69	18/10	68	12	2	0	0	2	0.17	39	3.25
70	19/10	64	22	3	2	1	6	0.27	24	1.09
71	19/10	112	22	15	6	6	27	1.23	22	1.00
72	19/10	102	11	9	1	1	11	1.00	6	0.54
73	19/10	115	11	5	1	0	6	0.54	4	0.36
74	19/10	145	12	2	1	0	3	0.25	32	2.67
75	19/10	163	12	1	0	0	1	0.08	82	6.83
76	20/10	194	12	1	1	0	2	0.17	37	3.08
77	20/10	205	12	0	0	0	0	0.0	37	3.08
78	20/10	129	12	0	0	0	0	0.0	48	4.00
79	20/10	196	12	0	0	0	0	0.0	39	3.25
80	20/10	181	24	1	0	0	1	0.04	3	0.12
81	20/10	185	24	0	0	1	1	0.04	187	7.79

Table 5. Summary of lobster and Jonah crab catches at sampling sites of July and October, 1981, surveys (Cruises 5, 7).

Site no.	Date sampled (day/month)	Depth (m)	No. of traps	No. of lobsters				Lobsters / trap haul	No. of Jonah crab	Jonah crab / trap haul
				M	F	Berried F	Total			
July, 1981:										
1	23/07	170	12	1	0	0	1	0.08	38	3.17
2	23/07	172	12	0	0	0	0	0.0	34	2.83
3	23/07	150	12	0	1	0	1	0.08	11	0.92
4	23/07	108	12	0	0	0	0	0.0	25	2.08
5	23/07	97	12	1	0	0	1	0.08	10	0.83
6	23/07	92	12	0	0	0	0	0.0	10	0.83
7	23/07	97	12	0	0	0	0	0.0	15	1.25
8	23/07	62	11	5	3	0	8	0.73	30	2.73
9	24/07	60	12	7	5	1	13	1.08	95	7.92
10	24/07	60	12	1	2	0	3	0.25	44	3.67
11	24/07	68	12	2	3	0	5	0.42	6	0.50
12	24/07	80	12	3	0	1	4	0.33	19	1.58
13	24/07	58	12	1	2	1	4	0.33	6	0.50
14	24/07	73	12	5	5	1	11	0.92	40	3.33
15	24/07	70	12	3	1	2	6	0.50	16	1.33
16	24/07	73	12	11	15	0	26	2.17	31	2.58
17	25/07	99	12	6	5	0	11	0.92	21	1.75
18	25/07	102	12	0	3	0	3	0.25	52	4.33
19	25/07	110	12	0	0	0	0	0.0	3	0.25
20	25/07	130	12	4	1	0	5	0.42	45	3.75
21	25/07	115	12	0	2	0	2	0.17	110	9.17
22	25/07	106	12	1	2	0	3	0.25	34	2.83
23	25/07	101	12	0	1	0	1	0.08	17	1.42
24	25/07	113	12	0	0	0	0	0.0	31	2.58
25	26/07	117	12	1	2	0	3	0.25	41	3.42
26	26/07	130	12	6	1	0	7	0.58	64	5.33
27	26/07	137	12	0	0	0	0	0.0	11	0.92
28	26/07	137	12	0	0	0	0	0.0	10	0.83
29	26/07	146	12	2	1	0	3	0.25	267	22.25
30	26/07	124	12	4	3	0	7	0.58	115	9.58

Table 5 Continued...

Site no.	Date sampled (day/month)	Depth (m)	No. of traps	No. of lobsters				Lobsters / trap haul	No. of Jonah crab	Jonah crab / trap haul
				M	F	Berried F	Total			
31	26/07	168	12	0	0	0	0	0.0	10	0.83
32	26/07	135	12	0	0	0	0	0.0	23	1.92
33	27/07	113	12	0	1	0	1	0.08	34	2.83
34	27/07	108	12	0	0	0	0	0.0	19	1.58
35	27/07	92	12	0	1	0	1	0.08	9	0.75
36	27/07	102	12	1	0	0	1	0.08	9	0.75
37	27/07	82	12	0	0	0	0	0.0	60	5.00
38	27/07	53	11	2	3	0	5	0.45	64	5.82
39	27/07	49	12	0	1	0	1	0.08	0	0.00
40	28/07	26	12	0	0	0	0	0.0	3	0.25
41	28/07	37	12	0	0	0	0	0.0	1	0.08
42	28/07	40	12	3	2	0	5	0.42	2	0.17
43	28/07	58	12	3	0	0	3	0.25	10	0.83
44	28/07	73	12	0	0	0	0	0.0	5	0.42
45	28/07	97	12	0	0	0	0	0.0	4	0.33
46	28/07	139	12	0	0	0	0	0.0	15	1.25
47	28/07	150	4	0	0	0	0	0.0	5	1.25
48	29/07	134	12	0	0	0	0	0.0	5	0.42
49	29/07	128	12	0	0	0	0	0.0	0	0.00
50	29/07	113	12	0	0	0	0	0.0	1	0.08
51	29/07	102	12	0	1	0	1	0.08	4	0.33
52	29/07	168	12	0	0	0	0	0.0	11	0.92
53	29/07	144	12	0	0	0	0	0.0	10	0.83
54	29/07	112	12	0	0	0	0	0.0	90	7.50
55	29/07	92	12	0	0	0	0	0.0	63	5.25
56	30/07	110	12	1	0	0	1	0.08	35	2.92
57	30/07	117	12	0	2	0	2	0.17	39	3.25
58	30/07	143	12	0	0	0	0	0.0	22	1.83
59	30/07	165	12	1	1	0	2	0.17	0	0.00
60	30/07	150	12	0	1	0	1	0.08	9	0.75

Table 5 Continued...

Site no.	Date sampled (day/month)	Depth (m)	No. of traps	No. of lobsters				Lobsters / trap haul	No. of Jonah crab	Jonah crab / trap haul
				M	F	Berried F	Total			
61	30/07	146	12	1	1	0	2	0.17	6	0.50
62	30/07	102	12	1	0	0	1	0.08	10	0.83
63	31/07	62	12	1	2	0	3	0.25	2	0.17
64	31/07	53	12	3	6	3	12	1.09	3	0.25
65	31/07	51	12	11	11	0	22	1.83	0	0.00
66	31/07	59	12	9	13	1	23	1.92	1	0.08
67	31/07	66	12	17	17	6	40	3.33	0	0.00
68	31/07	64	12	20	12	6	38	3.17	0	0.00
69	31/07	154	12	15	8	0	23	1.92	10	0.83
October 15 to October 21, 1981:										
70	16/10	168	12	0	0	0	0	0.0	98	8.17
71	16/10	108	12	0	1	0	1	0.08	19	1.58
72	16/10	91	12	1	0	0	1	0.08	38	3.17
73	16/10	91	12	1	1	0	2	0.17	58	4.83
74	16/10	58	12	5	8	0	13	1.08	66	5.50
75	16/10	58	12	5	4	1	10	0.83	58	4.83
76	17/10	55	12	6	7	3	16	1.33	101	8.42
77	17/10	64	12	4	4	1	9	0.75	154	12.83
78	17/10	58	12	13	2	0	15	1.25	260	21.67
79	18/10	77	12	9	8	0	17	1.42	68	5.67
80	18/10	101	12	5	0	0	5	0.42	38	3.17
81	18/10	124	12	5	4	0	9	0.75	79	6.58
82	21/10	58	12	10	4	1	15	1.25	113	9.42
83	19/10	80	12	7	1	0	8	0.67	0	0.00
84	19/10	91	6	2	0	0	2	0.33	116	19.33
85	19/10	101	12	0	2	0	2	0.17	106	8.83
86	19/10	110	12	2	2	0	4	0.33	136	11.33
87	19/10	124	12	1	0	0	1	0.83	58	4.83

Table 5 Continued...

Site no.	Date sampled (day/month)	Depth (m)	No. of traps	No. of lobsters				Lobsters / trap haul	No. of Jonah crab	Jonah crab / trap haul
				M	F	Berried F	Total			
88	19/10	166	12	1	2	0	3	0.25	193	16.08
89	20/10	157	12	1	0	0	1	0.08	152	12.67
90	20/10	55	12	2	2	1	5	0.42	25	2.08
91	21/10	46	13	2	0	62	64	5.33	1	0.08
92	21/10	46	3	1	3	0	4	1.33	47	15.67
93	21/10	64	12	13	3	28	44	3.67	0	0.00
94	21/10	60	12	12	7	24	43	3.58	2	0.17
95	21/10	69	12	16	4	8	28	2.33	2	0.17
96	21/10	119	12	10	3	16	29	2.42	0	0.00
97	21/10	188	12	0	0	0	0	0.0	466	38.83

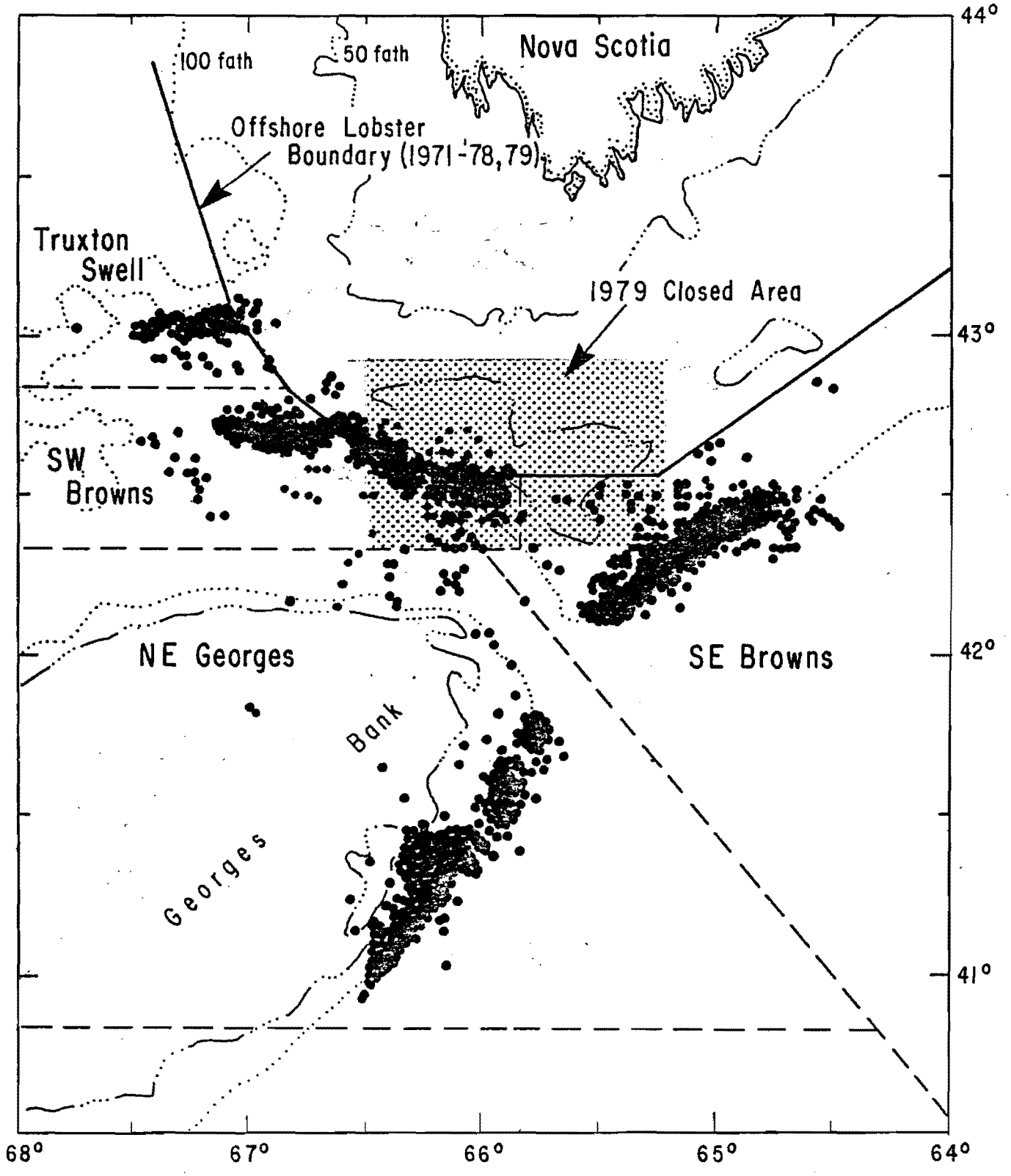

Figure 1. Canadian offshore lobster fishing areas. Dots indicate fishing location based on fishermen's logbooks, 1973 to 1979. Four subareas are identified for analyses: Truxton Swell, SW Browns Bank, SE Browns Bank, and NE Georges Bank.

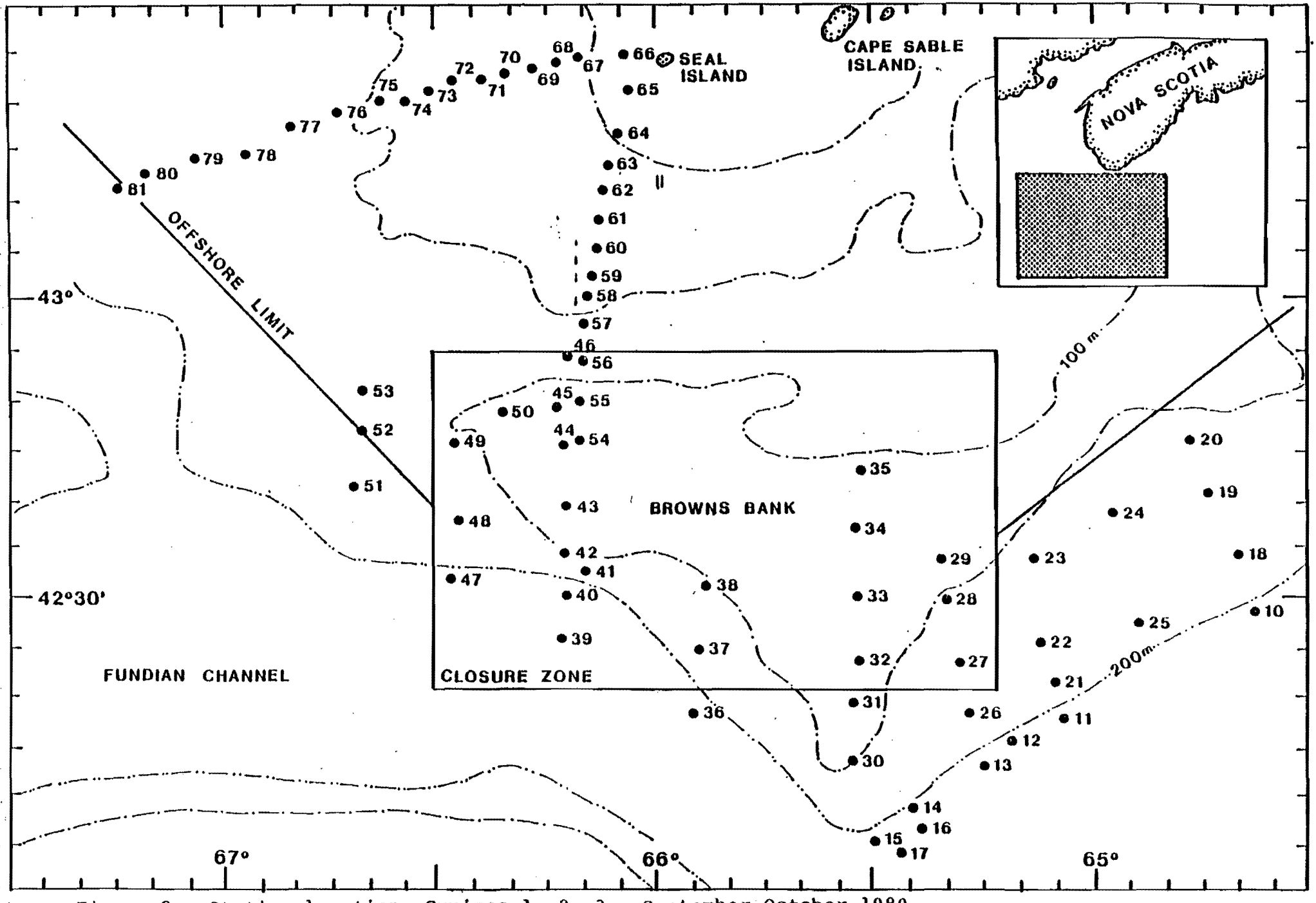

Figure 2. Station locations, Cruises 1, 2, 3 - September-October 1980.

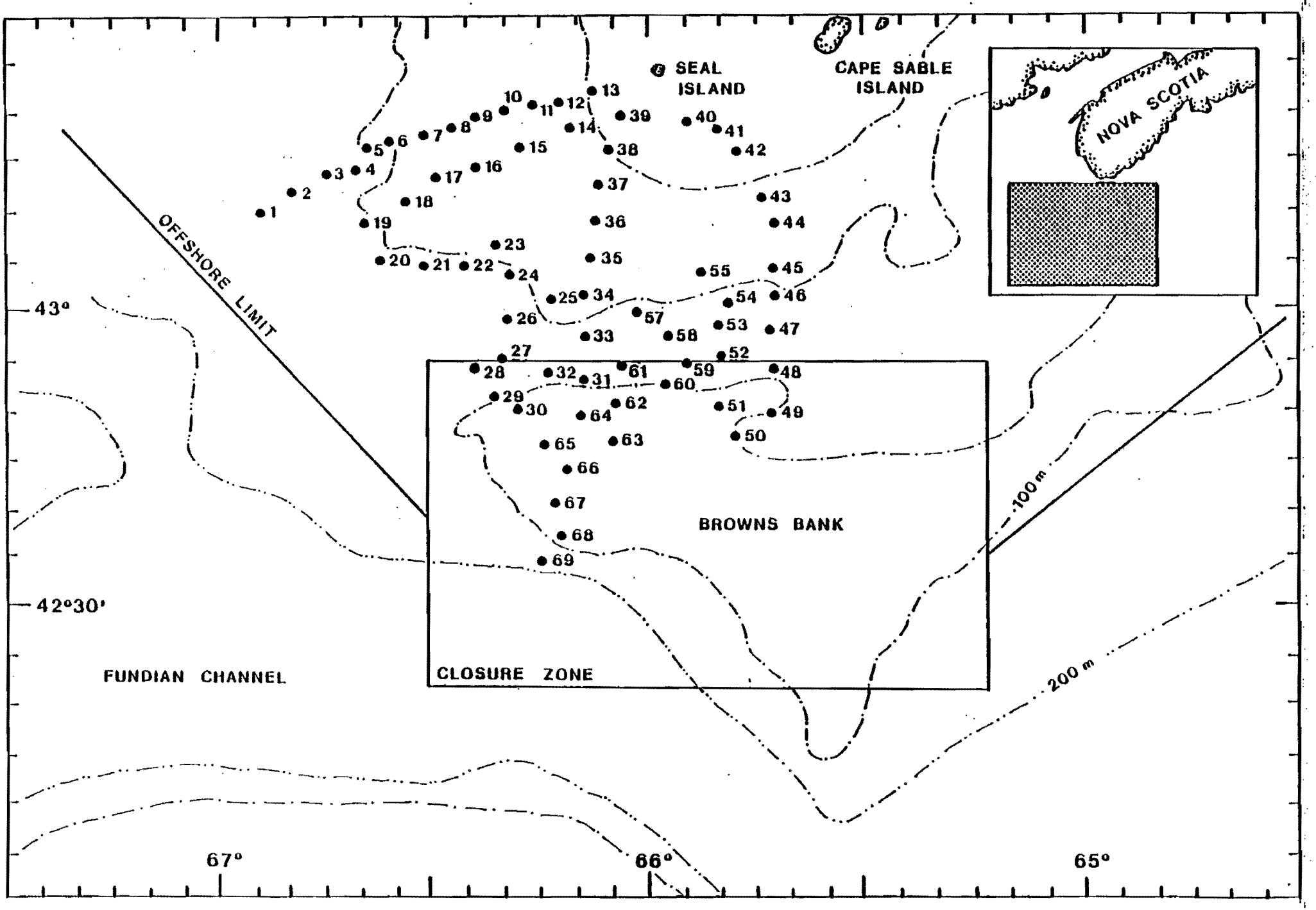

Figure 3. Station locations, Cruise 5 - July 1981.

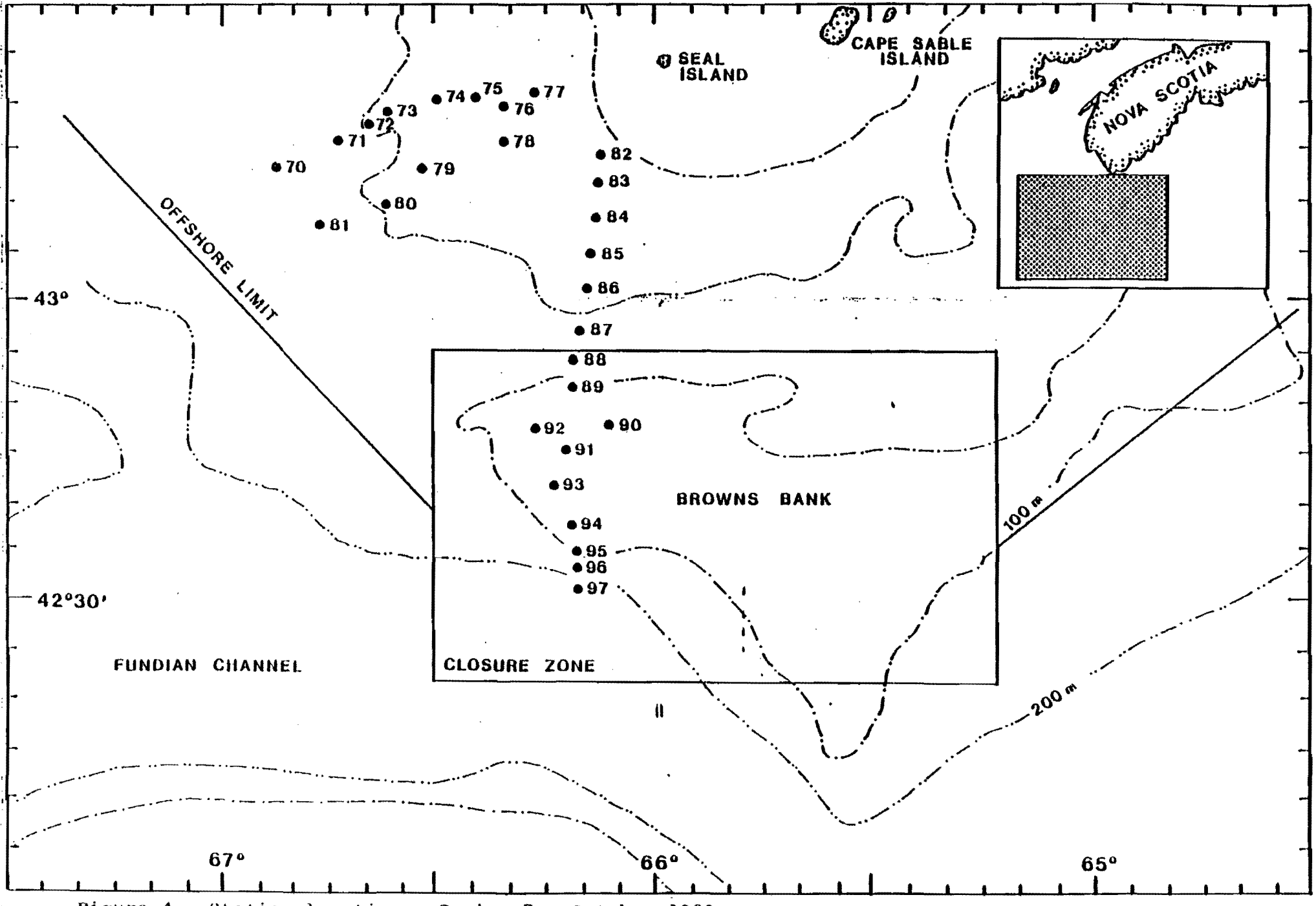

Figure 4. Station locations, Cruise 7 - October 1981.

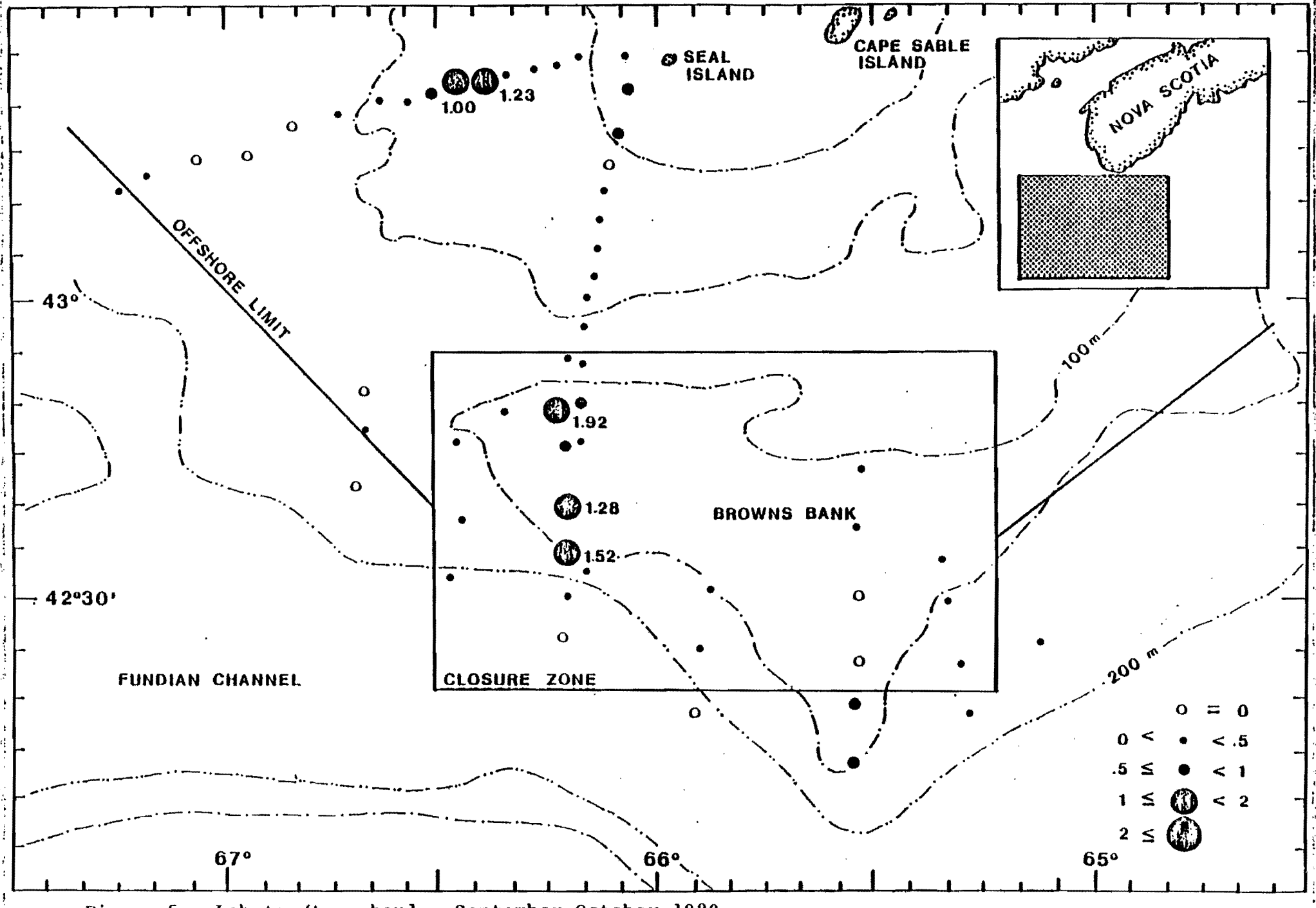

Figure 5. Lobster/trap haul - September-October 1980.

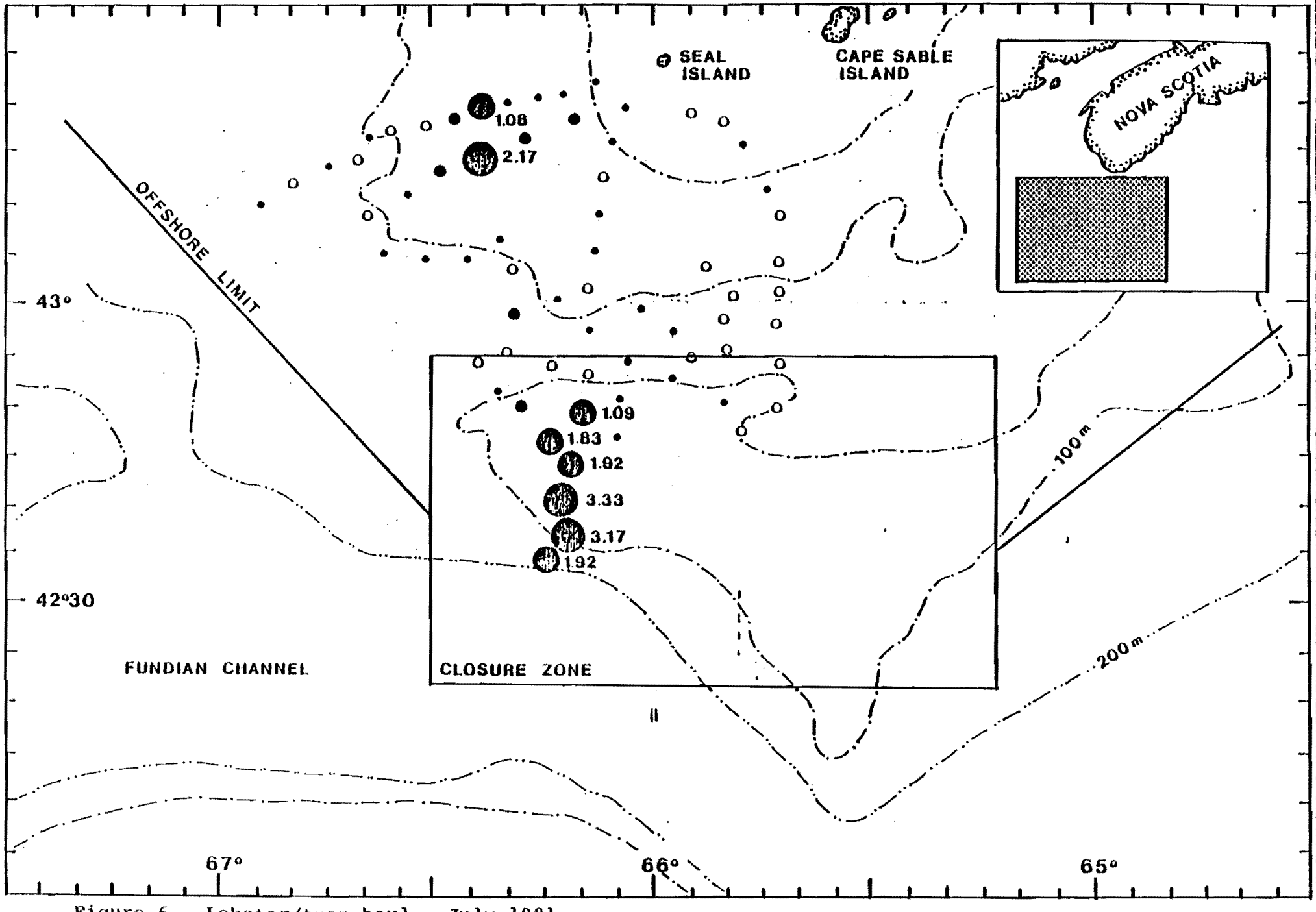

Figure 6. Lobster/trap haul - July 1981.

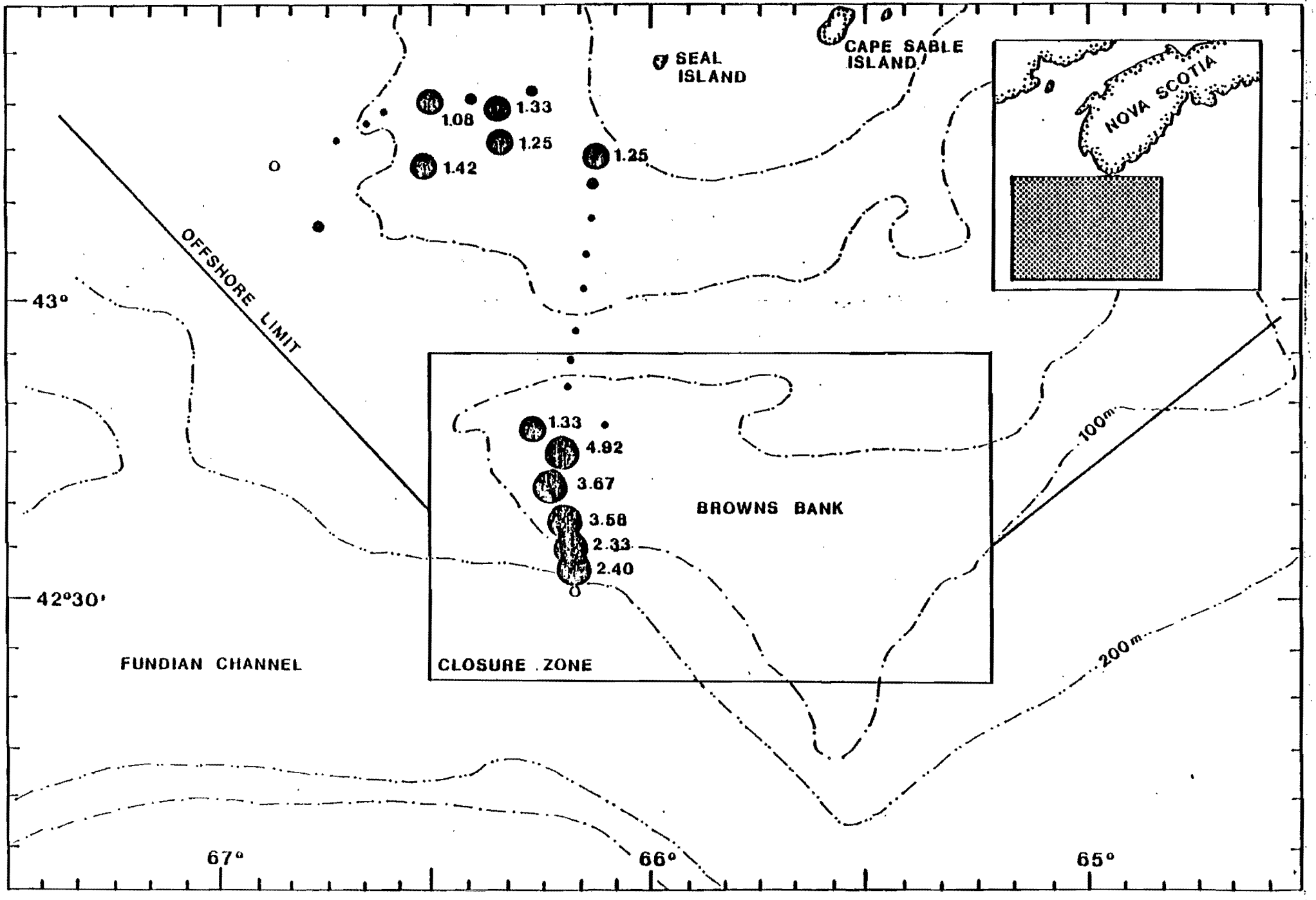

Figure 7. Lobster/trap haul - October 1981.

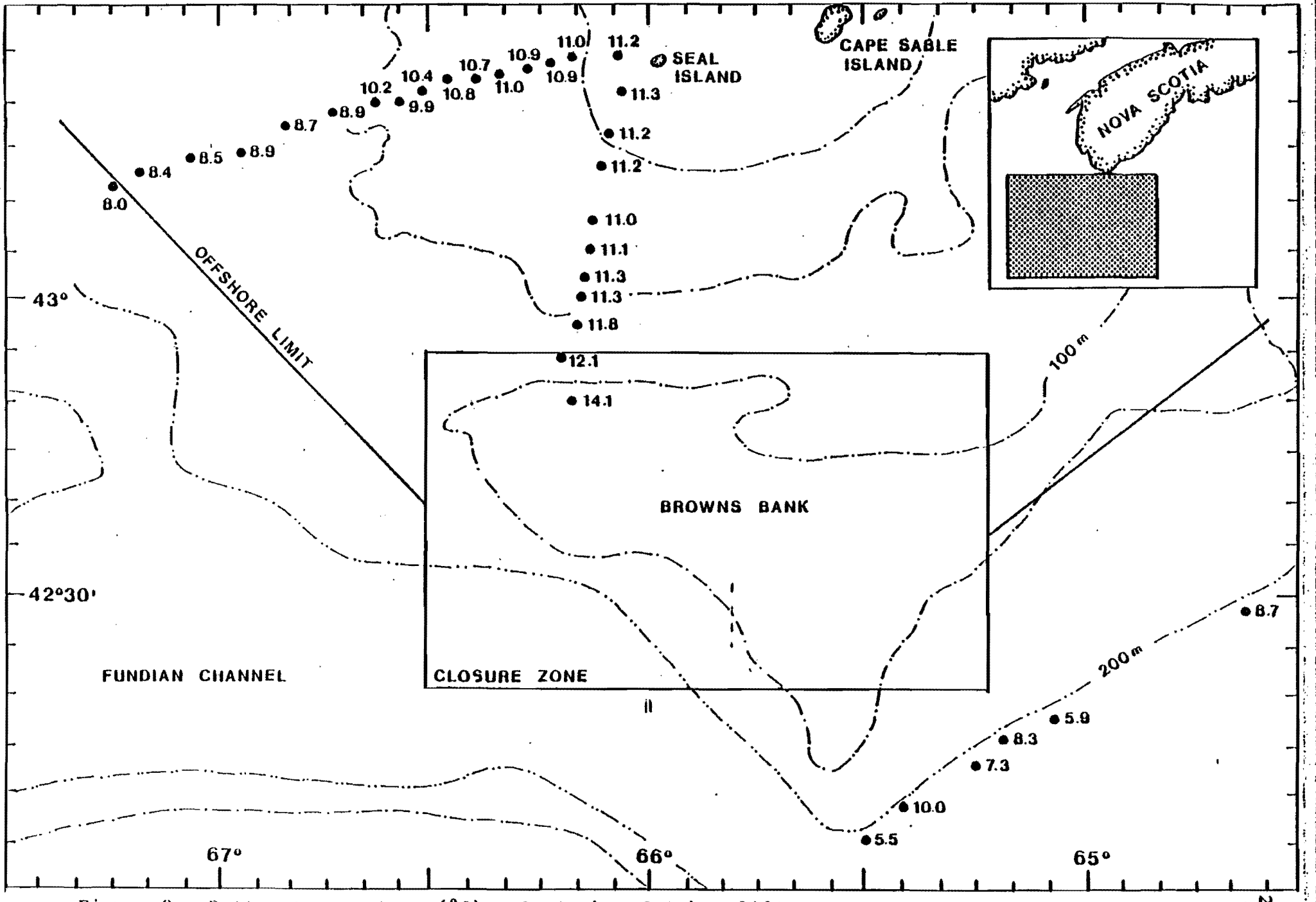

Figure 8. Bottom temperature (°C) - September-October 1980.

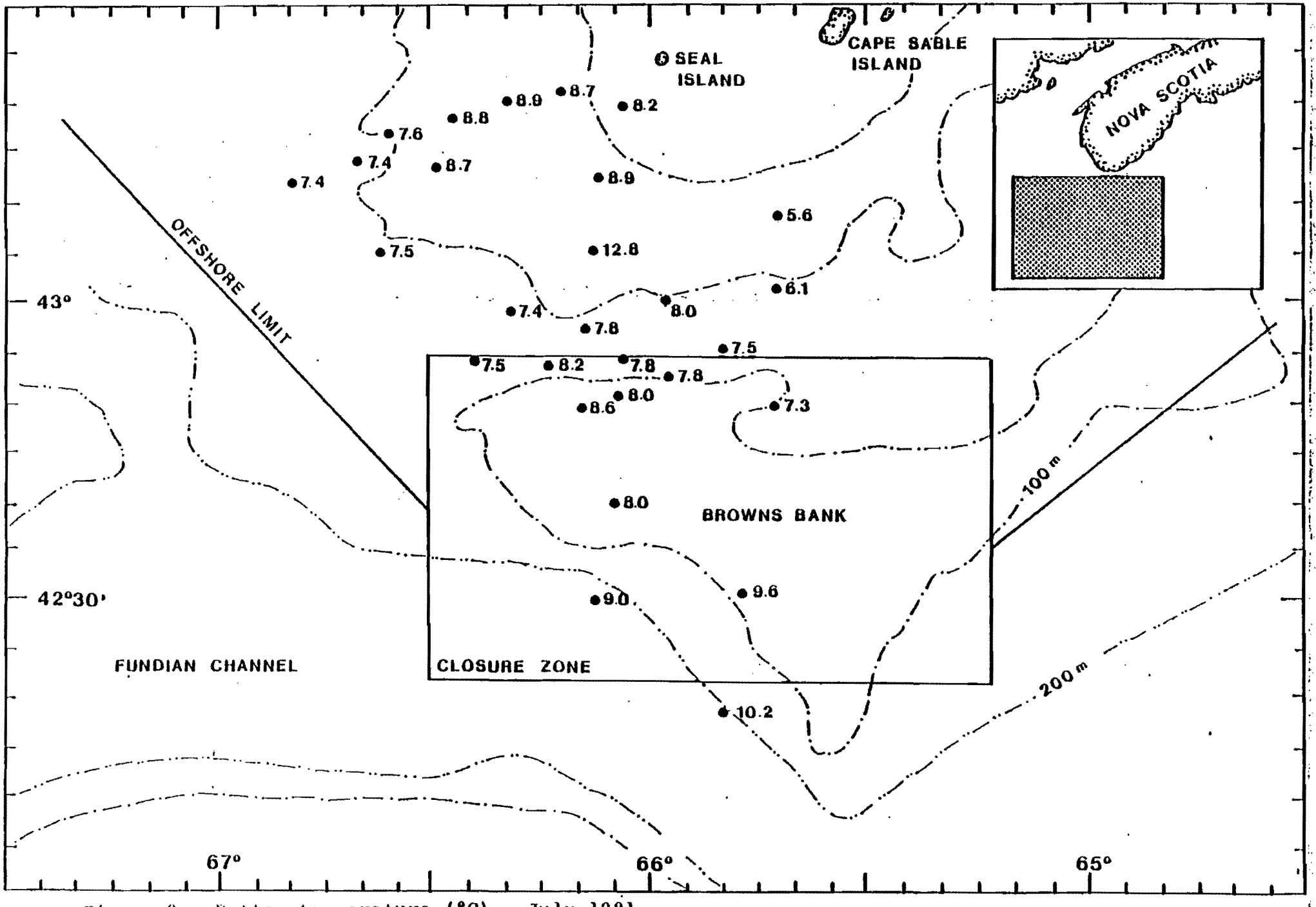

Figure 9. Bottom temperature (°C) - July 1981.

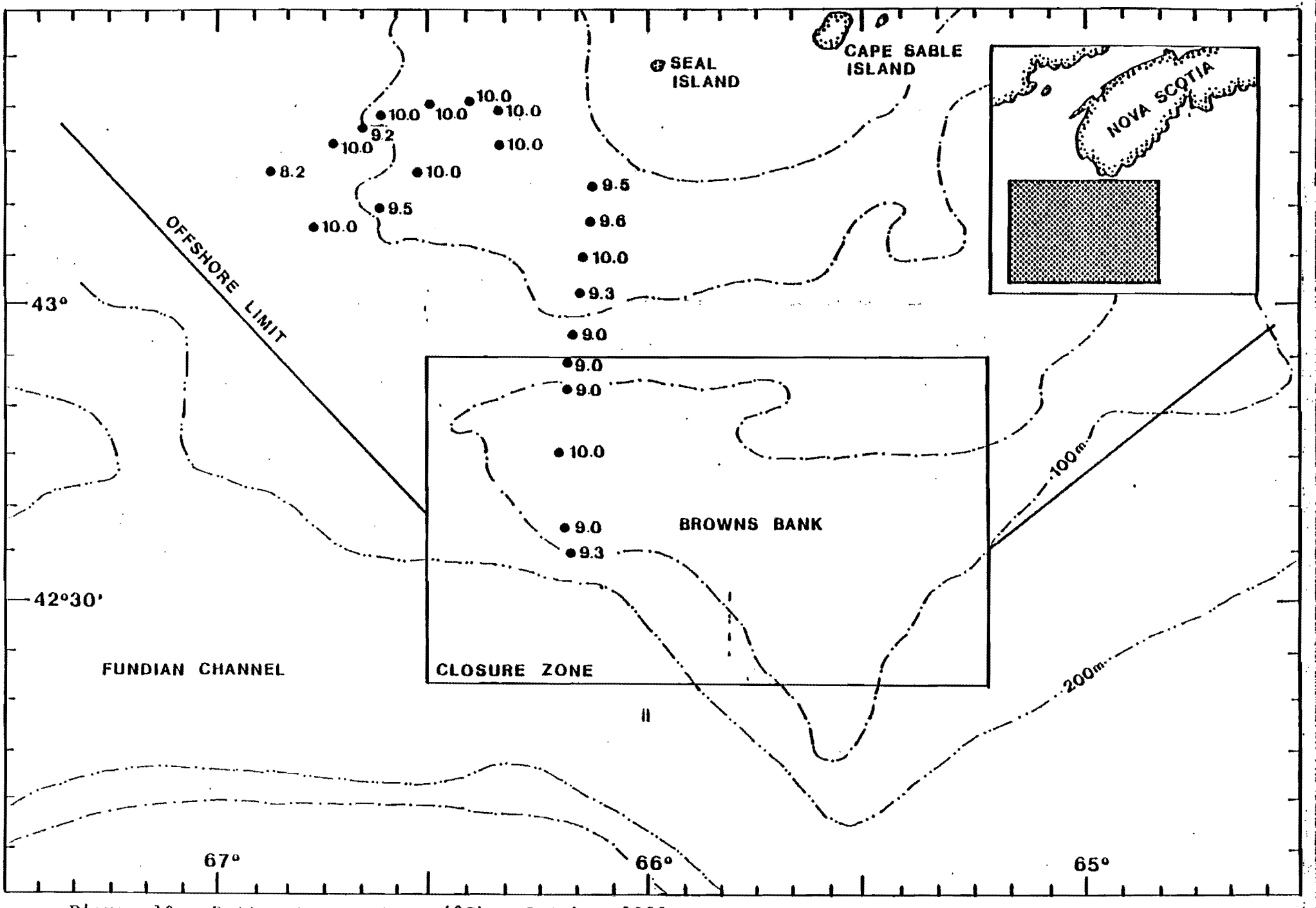

Figure 10. Bottom temperature (°C) - October 1981.

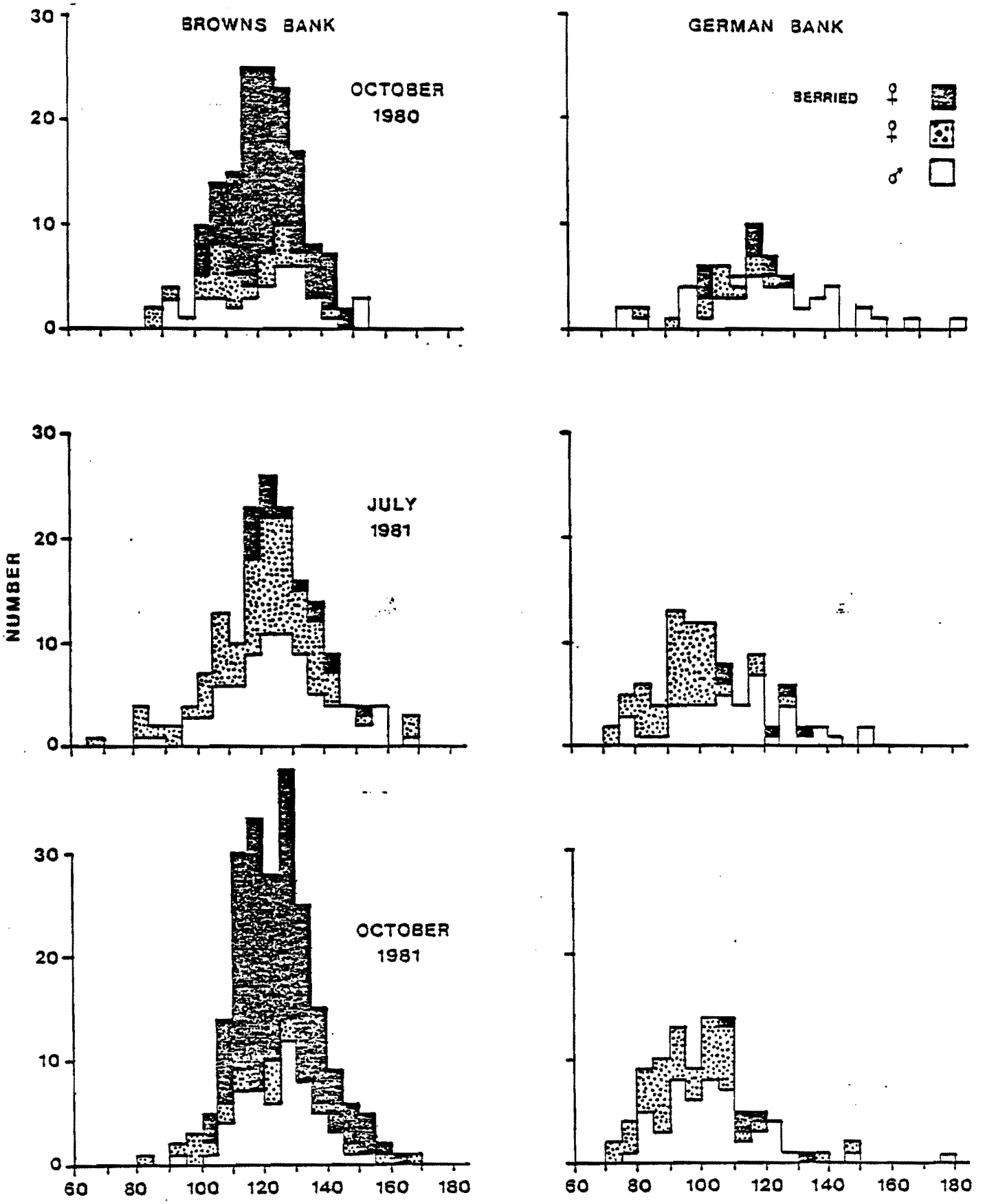

Figure 11. Size frequency distribution of catch: Browns Bank and German Bank.