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Investigations on the lobster (Homarus gammarus) in
Northern Ireland - a progress report 1972-73

by

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INTRODUCTION

A preliminary survey was completed in 1971 of the stocks of the lobster Homarus gammarus off the coasts of Northern Ireland (Watson 1972). The results indicated that the inshore stocks were being heavily fished and in 1972 and 1973 more detailed sampling of lobster catches was undertaken. A small scale tagging and marking experiment was completed at one locality over 1972-1973 to obtain information on lobster movements and growth at moulting.

This paper summarises the results obtained up to the end of 1973 fishing season with the exception of the growth data, which is in preparation. The studies are being continued.

METHODS

Landed catches of lobsters were examined at five localities as shown in Fig. 1. A number of trips were made on board commercial lobster boats to obtain detailed information on fishing practices and the total lobster catches.

In 1972 the total length of all lobsters was measured to the millimetre below, i.e. from the tip of the rostrum to the edge of the telson with the lobster laid flat on its dorsal surface on a measuring board. The carapace length of 156 male and 164 female lobsters was also measured, i.e. from the rear edge of the eye socket to the mid point on the posterior edge of the carapace and ranged from 61 mm to 133 mm. The relationship between total length (T, t.l.) and carapace (C, c.l.) was calculated and in 1973 all lobsters were measured using the latter method. In this paper, all the 1972 total length measurements have been corrected to carapace length using the calculated formulae:

$$(a) \text{ Males} = 2.516 C + 22.69$$

$$(b) \text{ Females} = 2.703 C + 11.52$$

$$(c) \text{ Males and Females} = 2.596 C + 18.26$$

The minimum legal size limit of 9 inches t.l. has been equated to 80 mm c.l. in this paper.

RESULTS

The results are given separately for each area sampled. In 1972, 801 lobsters were measured representing 2.4% of the annual recorded catch of 33,274, whereas in 1973, 7.5% (2,466) of the recorded annual catch of 32,727 was measured. Samples of the total catch were measured at sea at two localities totalling 279 and 201 lobsters in 1972 and 1973 respectively. To date, insufficient data has been collected to present detailed seasonal analysis of the catch samples.

I. North Antrim:

In 1972, deep water (37-183 metres, 20-100 fathoms) fishing was commenced by one vessel at Rathlin Island, Co. Antrim (Fig. 1), setting a number of traps in the deeps while continuing to fish with the remainder within the normal depths (2-37 m, 1-20 fathoms). The deep water lies close to the north and west shores of the island and therefore the fishery cannot be described as "offshore" in the normal context. Fishing was continued in the same area in 1973. Due to the practice of fishing in both shallow and deep water, it was not possible to separate landed catches from each of these depths. From observations made during fishing trips it was clear however that the differences in the catch composition compared to other sampling areas was due to the catching of larger lobsters from this previously unexploited deep water stock.

When comparing lobster catches from one area with another the retainable catch (≥ 80 mm c.l.) provides a more valid comparison than the landed catch which may include variable proportions of undersized lobsters (i.e. < 80 mm c.l.) depending upon the attitude of individual fishermen.

The catch composition of lobsters from this area differed considerably from those of the traditional, shallower water fisheries (Tables 1-4 and Fig. 2). In the retainable catch, more medium to large sized lobsters were present, 37.7% and 28.9% being ≥ 100 mm c.l. in the 1972 and 1973 samples respectively (Table 4). Significantly fewer undersized lobsters were caught compared with a nearby shallower water fishery at Carnlough ($P < 0.001$, Fig. 2 and Table 3). The landings of undersized lobsters were also relatively low, 6.3% in 1972 and 7.8% in 1973, (Tables 1 and 2). In 1972 and 1973, about 1,360 and 1,130 lobsters were landed, of which approximately 86 and 88 lobsters may have been undersized respectively.

In 1973, fishing on the same grounds as in 1972 with a similar number of traps (average of 60) for a season of eight months (February

to September inclusive), 700 kg. of lobsters were caught compared to 925 kg. in 1972 during six months fishing (May to October inclusive). This means that the season's yield was on average 11.7 kg/trap in 1973 with two months longer fishing than in 1972 when the yield was an average of 15.4 kg/trap.

The mean c.l. of retainable lobsters decreased significantly ($P < 0.05$) from 96.7 mm in 1972 to 94.8 mm in 1973, although in each year the lobsters were significantly ($P < 0.001$) larger than those sampled from other areas (Table 4). About 4% of the traps fished each year were wide entrance (203-209 mm, 8-9 in. diameter) barrel pots, fished mostly in the deep specifically for larger lobsters. The remainder of the traps were Scottish creels with "eyes" of 127 mm., 5 in. diameter. Female lobsters were significantly ($P < 0.05$) larger than males in the 1972 samples but not in those of 1973. The proportion of females decreased from 51.2% in 1972 to 47.5% in 1973. Therefore the smaller mean length and proportion of females in the 1973 samples would account for the decrease in mean c.l. of lobsters over the period of study (Table 4).

The remainder of the Rathlin Island fishery, which is mainly within 2-37 m. (1-20 fathom) depth was also monitored in 1972-1973. In this fishery the majority of the traps used were Scottish creels with a very small number of barrel pots already described.

Retainable catches sampled in 1972 and 1973 consisted of 15.8% and 15.4% lobsters ≥ 100 mm. c.l. respectively. The mean c.l. of retainable lobsters did not differ significantly over the same period, being 90.2 mm and 90.3 mm respectively (Table 4).

A cause for concern was the high number of undersized lobsters landed, being 25.5% and 23.2% in 1972 and 1973 respectively (Tables 1 and 2). In 1973 approximately 3,600 lobsters were landed and as many as 830 may have been undersized.

The proportion of females in the retainable catch samples decreased from means of 60.8% in 1972 to 50.8% in 1973. Females were larger than males (Table 4) but the difference was not significant in either year.

Sampling was carried out on the Co. Antrim mainland only in June 1973 on the assumption that the Rathlin shallow water fishery was representative of the north Antrim coast. Lobsters caught in Scottish creels fished within 2-37 m. (1-20 fa.) from Dunseverick to Torr Head (Fig. 1) were measured.

12.3% of the retainable catch sampled was composed of lobsters ≥ 100 mm. c.l. while the mean c.l. of retainable lobsters was 90.5 mm. which did not differ significantly from those of the Rathlin shallow water fishery (Table 4). 26.6% lobsters landed were undersized and 58.8% of the

retainable catch consisted of females. The mean c.l. of the latter did not differ significantly from that of males (Table 4).

II. East Antrim

Sampling was carried out at Carnlough (Fig. 1) where the lobsters were caught by similar methods and within the same depth range as the above two localities. In 1972 and 1973, 14.2% and 7.4% respectively of the retainable lobsters in the samples were ≥ 100 mm. c.l. The reduction in the proportion of these medium-large sized lobsters from 1972 to 1973 was reflected in a significant ($P < 0.001$) decrease in the mean c.l. of retainable lobsters from 88.9 mm to 86.1 mm. In each year these were significantly ($P < 0.001$) smaller than lobsters from all other localities sampled, except the Rathlin deeps in 1972 (Table 4). Again, a high proportion of undersized lobsters occurred in the landed catch samples, 32.9% in 1972 and 44.3% in 1973 (Tables 1 and 2). No information was available on the total number of lobsters landed in this area.

The proportion of females in the retainable catch samples increased slightly from 53.7% in 1972 to 56.3% in 1973. In both years samples, females were slightly smaller than males, but the differences in the mean c.l. within each year were not significant (Table 4).

III. South Down

Lobsters were sampled on this coast at Greencastle (Fig. 1) in 1973 only. Fishing methods were similar to east and north Antrim shallow water fisheries.

The retainable catch sampled contained 20.2% ≥ 100 mm c.l. and the mean c.l. of retainable lobsters was 91.3 mm, which did not differ significantly from those sampled at Rathlin and Dunseverick-Torr Head fisheries in similar depths (Table 4). A total of 45.6% landed lobsters was undersized.

51.7% of the retainable catch sample consisted of females, which were not significantly larger than males (Table 4).

Berried Lobsters

Table 5 gives the length distributions of berried lobsters from each locality in the combined samples 1972 and 1973. 8.3% and 18.6% were in the c.l. group 75-79 mm (minimum c.l. 77 mm) at Dunseverick-Torr Head and Carnlough respectively, the remainder being in the retainable catch category (i.e. ≥ 80 mm c.l.). Total catch samples did not yield any smaller berried lobsters.

Seasonal data on the proportion of berried lobsters is incomplete but the indication is that they are most abundant in the catches from

September to April, decreasing through May and June to their lowest level in July and August.

Samples of external eggs were taken throughout 1973 from berried lobsters in the catches at all localities sampled. The majority of these were examined microscopically and graded into seven stages of development from spawning to hatching (after Herrick 1896), as shown in Table 6. Hatching appears to occur mainly in July and spawning in August but further details are required to separate seasonal differences that may occur in these stages for lobsters of different sizes. The low frequency of occurrence of recently spawned and hatching females suggests that catchability is reduced at these stages.

Catch-per-unit-effort in relation to fishing practices

To understand more fully catch-per-unit-effort (c.p.u.e.) from statistical returns, an intimate knowledge of fishing practice is required. The types of trap used and their efficiency under different conditions of fishing are two important factors. In 1973, details of the catch from individual traps hauled were noted during total catch sampling at sea, and these preliminary results are given in Table 7. As the Scottish creel is almost without exception the main trap used by professional lobster fishermen in Northern Ireland, details of the efficiency and selectivity of this trap are important, particularly as considerable local variations in design occur.

At Rathlin (2-183 m., 1-100 fa.), c.p.u.e. for both retainable and undersized lobsters was greatest in approximately 100-179 m. (about 55-100 fa.) for both Scottish creels and barrel pots, although the latter caught very few undersized lobsters. This does not agree with results obtained at Carnlough where, although fishing did not take place deeper than 37 m. (20 fathoms), the c.p.u.e. for both retainable and undersized lobsters was greatest within 20 m. (approximately 10 fa.).

Variations in the construction of Scottish creels fished at Carnlough indicated that a large creel with a single top entrance fished better in deeper (20-39 m., approximately 11-20 fa.) water than a normal sized creel with two side entrances, while closer inshore in shallower water the latter was a more efficient creel.

These preliminary results are based on small samples and, therefore, may not be typical. The higher c.p.u.e. for undersized lobsters in deep water compared to the shallowest area at Rathlin is contrary to the generally accepted theory that small lobsters are commonest in inshore, shallow water catches, as evident at Carnlough. An expansion of the above research on creel selectivity and efficiency is being carried out in 1974.

Tagging

Tagging of lobsters (and marking for growth studies) was completed over a short period in September 1972 at Rathlin Island, Co Antrim (Fig. 1), a small, discrete fishery in 2-183 m. (1-100 fathoms) depth as described above. The season for tagging was selected on the assumption that most lobsters would have completed moulting by September. Lobsters were claw tagged and tail punched according to the method reviewed by Simpson (1963) and used by several workers on H. gammarus and H. americanus. Retainable recaptures were purchased from fishermen and for both these and undersized recaptures a reward was offered. All recaptures caught within a year from tagging were returned alive to the sea.

Table 8 gives the numbers of lobsters in each 5 mm c.l. group tagged and released at 20 September 1972 and recaptured up to 30 April 1973. As the first moulted recaptures were obtained early in May 1973, the time from tagging to 30 April 1973 was identified as the "inter-moult" period. Only one undersized lobster was returned out of 145 released (0.7%), while 31 retainable lobsters were returned out of 194 released (16.0%), over the above period, the difference being significant ($P < 0.001$). Lobsters in the size group 70-79 mm c.l. were susceptible to capture by the traps in use, as shown by observations made at sea of the total catches (Table 3), and at times such lobsters appeared to be abundant. At least seventeen lobsters, which had been marked when undersized, were recaptured in the period from May to September 1973 inclusively, having recruited by moult into the retainable catch size category.

The reported recapture of 31 out of 905 (3.4%) retainable lobsters landed over the inter-moult period, combined with the number (3,129) landed after this period, to 19 September 1973, one year from tagging, gave an estimate of annual fishing mortality of 71%. This estimate is subject to limitations, notably the difficulty of distributing tagged lobsters over the fishing grounds in proportion to the natural density of lobsters. The position of the main fishing effort in any one year is usually closely related to this density.

There was very little evidence of extensive lobster movement (Tables 9 and 10). Out of 29 recaptures of retainable lobsters, 13 showed a movement into deeper water, 3 into shallower water and the remaining 13 no depth change (Table 9). The one undersized lobster recaptured was caught close to its release point. Those moving from one depth to another did not travel a great distance due to the proximity to the island of deep water, as described above. Two tagged lobsters were recaptured off the Co. Antrim mainland, having travelled 6.4 km. (4 miles) and 11.2 km.

(7 miles) S and WSW of their respective points of release.

Discussion

Almost all the lobsters landed in Northern Ireland in 1972 and 1973 were caught within 37 m. (20 fa.) depth. Fishing was particularly intense in the 2-18 m. (1-10 fa.) zone, close to the shore.

The carapace length distributions of the landed catch samples measured in 1972 and 1973 show that the lobster stocks being exploited by the present fishery are severely depleted. Out of 2,363 lobsters measured from landed catches, (excluding the Rathlin 2-183 m. landings) in these two years, 2,151 (91.0%) were less than 100 mm c.l. while 771 (32.6%) were undersized. These were random samples of the landed catches from typical localities covering a considerable area of the Northern Ireland coast.

Tagging at one site off the north Antrim coast gave evidence of little lobster movement and suggested a high fishing intensity.

Monitoring of catches from a newly developed but small deep water fishery (to 183 m., 100 fa.) showed that unexploited stocks of lobsters exist, which contain an accumulation of large lobsters, but it would appear that a relatively low level of fishing effort and rotational fishing may be required in this area to sustain present catch rates. An offshore survey of the Co. Londonderry and north Co. Antrim coasts in September 1973 (Watson 1973) showed that small patches of rough ground existed, also containing limited stocks of what may be previously unexploited lobsters. The limitations of fishing offshore and deep water lobsters, due to their uneven and apparently limited distribution plus the large capital outlay in fishing equipment required, suggests that such stocks will not provide a sustainable, alternative fishery to that inshore. There appears to be a need for further conservation measures within the present fishery, other than the 9 inch minimum size limit which is being disregarded by many fishermen, both professional and part-time.

References

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SUMMARY

The results of monitoring total and landed catches of lobsters at selected sites on the Northern Ireland coast in 1972-73 are presented. Some details of lobster movements and an estimate of annual fishing mortality, obtained from a small tagging experiment at one locality, are also given.

The length frequency distributions of lobsters landed in 1972-73 (sample N=2,363) show that 91.0% of these lobsters were less than 100 mm carapace length and 32.6% were undersized i.e. less than 80mm c.l., which is equivalent to the present minimum size limit of 9 inches (230mm) total length. Tagging at one site suggested that annual fishing mortality may be as high as 71% and there was very little evidence of lobster movements.

At present, most fishing takes place within 37 metres (20 fathoms) depth, while the greatest intensity of fishing is within 18m (10 fathoms). The lobster stocks in these zones are severely depleted and there appears to be a need for further conservation measures.

Table 1. Size distribution, by sex, of landed catches (i.e. including undersized lobsters, <80 mm. c.l.) from localities sampled in 1972, together with mean carapace length, standard deviation and percentage undersized.

Locality & Depth	Rathlin 2-183 m.				Rathlin 2-37 m.				Carnlough 2-37 m.			
C.L. (5 mm.) (group)	Males		Females		Males		Females		Males		Females	
	No.	% of total	No.	% of total	No.	% of total	No.	% of total	No.	% of total	No.	% of total
55-59												
60-64												
65-69												
70-74									18	10.1	15	7.9
75-79	8	7.3	6	5.4	30	32.6	24	20.0	47	26.3	42	22.2
80-84	13	11.9	8	7.1	19	20.7	24	20.0	38	21.1	53	28.0
85-89	24	22.0	28	25.0	29	31.5	33	27.5	39	21.8	51	27.0
90-94	14	12.8	12	10.7	2	2.2	12	10.0	10	5.6	10	5.3
95-99	18	16.5	12	10.7	4	4.4	10	8.3	5	2.8	5	2.7
100-104	18	16.5	17	15.2	3	3.3	9	7.5	9	5.0	5	2.7
105-109	5	4.6	5	4.5	1	1.1	3	2.5	7	3.9	5	2.7
110-114	6	5.5	8	7.1	1	1.1	2	1.7	2	1.1		
115-119	2	1.8	13	11.6	3	3.3	1	0.8	2	1.1		
120-124	1	0.9	1	0.9			2	1.7	2	1.1	2	1.1
125-129											1	0.5
130-134			1	0.9								
135-139												
140-144			1	0.9								
Total	109		112		92		120		179		189	
% U-S		7.3		5.4		32.6		20.0		36.4		30.1
Mean c.l. (mm)	93.6 (95.6)		97.4		85.4 (87.1)		88.4		85.2 (84.9)		84.6	
S.D.	10.2 (11.9)		13.1		9.3 (9.7)		9.8		10.3 (9.6)		8.8	

Table 2. Size distribution, by sex, of landed catches from localities sampled in 1973, together with mean carapace length, standard deviation and percentage undersized.

Locality & Depth	Rathlin 2-183 m.				Rathlin 2-37 m.				Dunseverick to Torr Head 2-37 m.			
	Males		Females		Males		Females		Males		Females	
c.l. (5 mm) (groups)	No.	% of total	No.	% of total	No.	% of total	No.	% of total	No.	% of total	No.	% of total
55-59												
60-64												
65-69					2	0.5	3	0.7				
70-74	1	0.3	2	0.6	32	7.6	22	5.4			1	1.3
75-79	30	8.3	20	6.2	72	17.1	62	15.1	18	30.0	18	22.8
80-84	52	14.4	60	18.7	115	27.4	111	27.0	16	26.7	21	26.6
85-89	74	20.4	51	15.9	81	19.3	73	17.8	13	21.7	9	11.4
90-94	65	18.0	51	15.9	50	11.9	58	14.1	7	11.7	10	12.7
95-99	51	14.1	44	13.7	30	7.1	22	5.4	3	5.0	6	7.6
100-104	34	9.4	36	11.2	12	2.9	19	4.6			7	8.9
105-109	25	7.0	25	7.8	10	2.4	15	3.6	1	1.7	2	2.5
110-114	8	2.2	18	5.6	7	1.7	11	2.7			1	1.3
115-119	12	3.3	6	1.9	5	1.2	10	2.4	1	1.7	4	5.1
120-124	5	1.4	4	1.2	3	0.7	5	1.2				
125-129	2	0.6										
130-134	1	0.3	3	0.9								
135-139	2	0.6			1	0.2						
140-144			1	0.3								
Total	362		321		420		411		60		79	
% U-S		8.6		6.8		25.2		21.2		30.0		24.1
Mean c.l. (mm)	93.2 (93.5)		93.9		85.5 (86.8)		87.7		84.9 (86.8)		88.3	
S.D.	11.4 (11.5)		11.6		10.0 (10.6)		11.1		10.2 (11.0)		11.3	

Table 2 continued

Locality and Depth c.l. (5 mm) (groups)	Carnlough 2-37 m.				Greencastle 2-37 m.			
	Males		Females		Males		Females	
	No.	% of total	No.	% of total	No.	% of total	No.	% of total
55-59					3	1.7	1	0.5
60-64					5	2.8	6	3.1
65-69			1	0.4	15	8.5	24	12.2
70-74	18	9.9	38	14.7	26	14.7	23	11.7
75-79	57	31.3	81	31.4	30	16.9	37	18.9
80-84	58	31.9	80	31.0	32	18.1	35	17.9
85-89	31	17.0	36	14.0	26	14.7	22	11.2
90-94	6	3.3	9	3.5	12	6.8	18	9.2
95-99	4	2.2	3	1.2	9	5.1	8	4.1
100-104	3	1.6	4	1.6	8	4.5	7	3.6
105-109	1	0.5	3	1.2	4	2.3	5	2.6
110-114	2	1.1	1	0.4	3	1.7	8	4.1
115-119	1	0.5	1	0.4	1	0.6		
120-124	1	0.5			1	0.6	1	0.5
125-129							1	0.5
130-139					1	0.6		
140-144					1	0.6		
Total	182		258		177		196	
% U-S		41.2		46.5		44.6		46.4
Mean c.l. (mm)	81.9 (81.5) 81.2				82.6 (82.6) 82.5			
S.D.	8.2 (8.1) 8.1				13.1 (13.0) 12.9			

Table 3. Size distribution, by sex, of total catch (i.e. includes all lobsters caught) sampled at sea from various localities in 1972 and 1973, together with percentage <80 mm.c.l.

Year	1972				1973			
Locality and Depth	Rathlin 2-183 m.		Carnlough 2-37 m.		Rathlin 2-183 m.		Carnlough 2-37 m.	
c.l. (5 mm) (groups)	Males Females No. % of No. % of Total Total		Males Females No. % of No. % of Total Total		Males Females No. % of No. % of Total Total		Males Females No. % of No. % of Total Total	
55-59							1 1.9	
60-64			1 2.1 1 1.5			2 4.4	3 5.4	
65-69	4 4.8 3 3.1		8 16.7 8 11.6		2 4.8 2 4.1		5 9.3 2 3.6	
70-74	15 17.9 15 15.6		24 50.0 13 18.8		2 4.8 3 6.1		11 20.4 12 21.4	
75-79	4 4.8 3 3.1		9 18.8 14 20.3		8 19.0 7 14.3		14 25.9 12 21.4	
80-84	5 6.0 4 4.2		2 4.2 14 20.3		8 19.0 6 12.2		12 22.2 11 19.6	
85-89	8 9.5 16 16.7		2 4.2 10 14.5		7 16.7 7 14.3		4 7.4 8 14.3	
90-94	8 9.5 12 12.5		3 4.3		6 14.3 4 8.2		4 7.4 2 3.6	
95-99	6 7.1 10 10.4				4 9.5 9 18.4		1 1.9 2 3.6	
100-104	11 13.1 16 16.7		1 2.1 1 1.4		3 7.1 6 12.2		1 1.9 1 1.8	
105-109	5 6.0 5 5.2		1 2.1 1 1.4		1 2.4		1 1.8	
110-114	7 8.3		1 1.4		1 2.0		1 1.8	
115-119	5 6.0 9 9.2		1 1.4		1 2.4 1 2.0		1 1.8	
120-124	2 2.4 2 2.1		1 1.4				1 1.9	
125-129	2 2.4 1 1.0							
130-134	1 1.2							
135-139	1 1.2							
140-144								
Total	84 96		48 69		42 49		54 56	
% <80 mm c.l.	27.5 21.8		87.6 52.2		28.6 28.9		57.5 51.8	

Table 4. Mean carapace length and standard deviation (in brackets) for retainable lobsters, ie all those ≥ 80 mm c.l., in landed catch samples, 1972 and 1973. The percentage ≥ 100 mm. c.l. is also given, with total number of retainable lobsters sampled (in brackets).

Locality and Depth	Mean carapace length (S.D.)				% ≥ 100 mm. c.l.(N)			
	1972		1973		1972		1973	
	Males	Females	Males	Females	Males	Females	Males	Females
Rathlin 2-183 m.	94.9(9.6)	98.5(12.6)	94.6(10.8)	95.1(11.1)	31.7(101)	43.4(106)	26.9(331)	31.1(299)
		96.7(11.4)		94.8(10.9)		37.7(207)		28.9(630)
Rathlin 2-37 m.	89.0(9.4)	91.0(9.3)	89.6(9.3)	90.9(10.2)	12.9(62)	17.7(96)	12.1(314)	18.5(324)
		90.2(9.2)		90.3(9.9)		15.8(158)		15.4(638)
Dunseverick Torr Head 2-37 m.	-	-	88.4(10.3)	91.9(10.6)	-	-	7.1(42)	23.3(60)
	-	-		90.5(10.6)	-	-		16.7(102)
Carnlough 2-37 m.	90.0(10.0)	87.9(8.6)	86.2(8.1)	86.0(8.1)	19.3(114)	19.9(132)	7.5(107)	7.3(138)
		88.9(9.4)		86.1(8.1)		14.2(246)		7.4(245)
Greencastle 2-37 m.	-	-	91.1(11.2)	91.5(10.7)	-	-	24.1(79)	21.0(105)
	-	-		91.3(10.9)	-	-		20.2(203)

Table 5. Size distribution of berried lobsters in combined samples of landed catches from each locality in 1972 and 1973.

Locality and Depth	Rathlin 2-183 m.		Rathlin 2-37 m.		Dunseverick to Torr Head* 2-37 m.		Carnlough 2-37m		Greencastle* 2-37 m.	
c.l. (5 mm groups)	No.	% of total	No.	% of total	No.	% of total	No.	% of total	No.	% of total
75-79					2	8.3	11	18.6		
80-84	2	2.2	11	14.7	7	29.2	18	30.5	4	16.7
85-89	8	8.6	10	13.3	3	12.5	12	20.3	6	25.0
90-94	17	18.3	15	20.0	3	12.5	5	8.5	6	25.0
95-99	19	20.4	12	16.0	3	12.5	2	3.4	1	4.2
100-104	21	22.6	7	9.3	4	16.7	4	6.8	2	8.3
105-109	10	10.8	7	9.3			5	8.5	2	8.3
110-114	10	10.8	4	5.3					3	12.5
115-119	4	4.3	7	9.3	2	8.3				
120-124			2	2.7			2	3.4		
125-129										
130-134	2	2.2								
135-139										
140-144										
Total	93		75		24		59		24	

*Sampled in 1973 only.

Table 6. Stages of development of external eggs (after Herrick 1896), from berried lobsters sampled through 1973 at all localities. Development determined by microscopic examination except in February-May when egg colour only was observed.

Egg development stages. Season	Spawning						Hatching	Total No.
	1	2	3	4	5	6	7	
February-May	No	11		10	4			(25)
	%	44.0		40.0	16.0			
June	No	1	6	12	23	4		46
	%	2.2	13.0	26.1	50.0	8.7		
July	No	2	1	1	3	11	5	25
	%	8.0	4.0	4.0	12.0	44.0	20.0	
August	No	3	9		1		1	14
	%	21.4	64.3		7.1		7.1	
September	No	2	19	9	1			31
	%	6.5	61.3	29.0	3.2			
October	No	14	3					17
	%	82.4	17.6					
Overall	No	7	44	19	15	36	9	133(158)
% (June - October)		5.3	33.1	14.3	11.3	27.1	6.8	2.3

Table 7. Variation in catch-per-unit-effort, expressed as number of retainable (\geq 80 mm. c.l.) and undersized ($<$ 80 mm. c.l.) lobsters respectively, according to (a) trap type (b) depth fished. Data from preliminary observations made at sea in 1973 only.

Locality	Approx. depth of fishing (m)	Total No. traps lifted		Total catch lobsters				c.p.u.e.			
		Scottish Creel	Barrel pot	Scottish creel		Barrel pot		Scottish creel		Barrel pot	
				R	U	R	U	R	U	R	U
Rathlin	<20	101	9	19	11	0	0	0.188	0.109	0	0
	20-39	32	-	5	2	-	-	0.156	0.063	-	-
	40-99	32	13	5	3	2	0	0.156	0.094	0.154	0
	100-179	29	9	20	5	9	1	0.690	0.172	1.000	0.111
	Overall	194	31	49	21	11	1	0.253	0.108	0.355	0.032
Carnlough	<20	181	-	62	94	-	-	0.343	0.519	-	-
	20-39	24	-	3	3	-	-	0.125	0.125	-	-
	Overall	205	-	65	97	-	-	0.317	0.473	-	-

Table 8. The numbers of lobsters by sex and in 10 mm. carapace length groups, tagged and released from 14-19 September-1972 at Rathlin Island, together with the number of identifiable recaptures up to 30th April 1973.

	C.L. (10 mm)	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	Total and mean % recaptured
Released	Males	10	67	32	17	17	12	7	2	1	165
	Females	7	61	35	46	14	8	2	1		174
Recaptured	Males		1	4	2	5	3	1			16
	Females			6	5	3	1				15
% Recaptured	Males	0	1.5	12.5	11.8	29.4	25.0	14.3	0	0	9.7
	Females	0	0	17.1	10.9	21.4	12.5	0	0	-	8.6
	Total	0	0	14.9	11.1	25.8	20.0	11.1	0	0	9.1

N.B. A male lobster of 89 mm. c.l. recaptured during this period at the mainland is not included in this table.

Table 9. The number and percentage of identifiable lobsters recaptured from various depths over the period of the experiment (September 1972 to September 1973), related to depth of release and average number of days at liberty, for retainable (≥ 80 mm.c.l.) lobsters only*.

No. released	63	67	49	0	15	194
Depth released (m)	20	20-39	40-59	60-79	80-99	
Depth recaptured (m)						
<20	4	1	1			6
20-39		6				6
40-59		9	2		1	12
60-79						
80-99		1	2		1	4
100-119						
120-139						
140-159						
160-179		1				1
Total No. recaptured	4	18	5	-	2	29
Total as % of number released	6.3	26.9	10.2	-	13.3	14.9
Average days at liberty	127	95	138	-	99	107

*One undersized lobster was recaptured (See Table 8 and text).

Table 10. The number of recaptures within stated radii of points of release over the total period of the experiment (i.e. September 1972 - September 1973).

Distance travelled in kilometres	<1	1-4	5-9	10-14	Overall
Number recaptured	21*	4	4	1	30
Average number days at liberty	107	184	13	276	108

*Includes one undersized

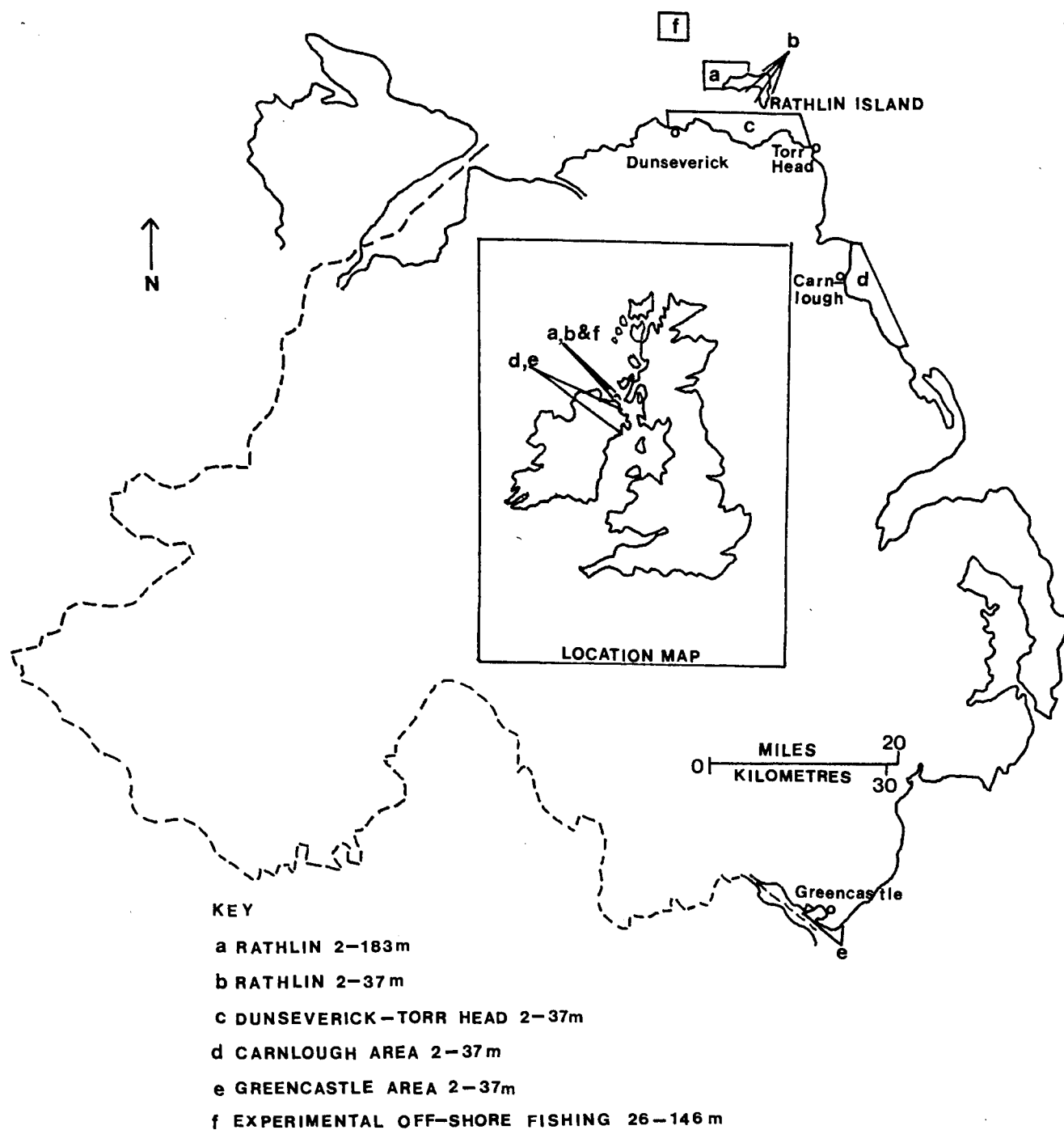


Figure 1: Details of the Northern Ireland coast, showing lobster sampling areas in 1972 - 1973.

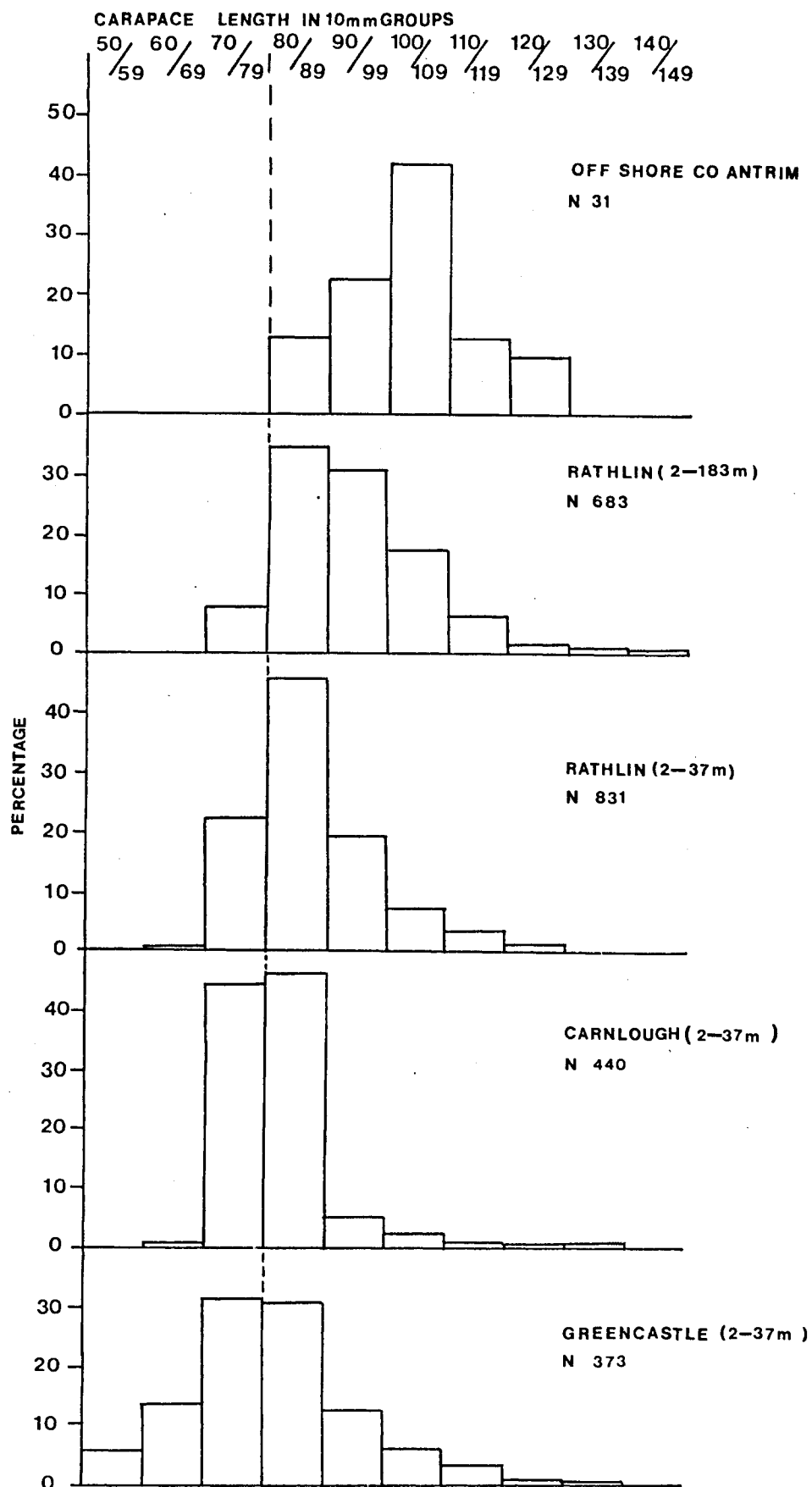


Figure 2: Percentage length frequency distributions (in 10 mm carapace length groups) of landed catch samples of lobsters, measured in 1973. The majority of these lobsters were sampled from June to September inclusively.