International Council for the Exploration of the Sea

CM 1968/K14

Shellfish and Benthos Committee

Survival of Nephrops returned to the sea

by

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Preliminary investigations on the survival of Nephrops after capture by a commercial trawler were made in September 1964 on board M.V. "Bonnie Les" from Kilkeel, Northern Ireland, working on the Irish Sea Nephrops grounds.

Materials and methods

During the period of observation, the "Bonnie Les" was fishing commercially for Nephrops with a Vinge trawl. The trawl was towed for 3 to 3½ hours, and on hauling the cod-end was emptied into the pounds, the trawl being shot away again before sorting began. The time to sort the catch varied considerably, depending on its size and composition, and took between 30 minutes and 1 hour 40 minutes during these investigations. Details of the trawl hauls from which Nephrops were taken for these survival experiments, and other relevant information, are given in Table 1.

Table 1 Details of hauls from which samples of rejected Nephrops were taken

	Sample number				
	1	2	3	4	5
Time (BST) when					
Trawl shot	0640		0953		1335
Trawl hauled	0935		1317		1705
Cod-end aboard	0945		1325		1715
Sorting started	1001		1340		1726
Sorting finished	1140		1425		1758
Sample taken	1002	1110	1350	1500	1730
Experiment ended	1120	1320	1455	After 1600	After 1830
Time (mins) during which					
Nephrops were out of water	17	85	25	95	15
Nephrops were in tub	78	130	65	Over 60	Over 60
No. of Nephrops in sample	97	99	101	99	89

Unselected samples of about 100 rejected Nephrops (23 to 31 mm carapace length) were kept in a tub of sea water for at least 1 hour. Periodically these were examined and those strongly alive or obviously dead were counted and removed from the tub; at the end of the experiment

those remaining were classified into one of three categories: "live", "dead" or "moribund". Five samples were taken and treated in this manner. After the second sample, it was noticed that there appeared to be considerable damage to claws, and note was taken of those Nephrops having 2, 1 or no claws remaining in each of the three categories. Two samples of rejected Nephrops not put in the tub were also examined for claw damage.

Results

The numbers and percentages of Nephrops in the three categories in each sample are given in Table 2. The percentage definitely surviving ranged from 47.5 to 69.7, with a mean of 58.8. As seen in Figure 1, survival appears to be correlated to the time the Nephrops were left in the pounds before being put into the tub.

Table 2 Numbers and percentages of Nephrops in each of the three categories "live", "dead" and "moribund" at the end of each experiment

Sample	Category						Total
	Live		Dead		Moribund		
	No.	%	No.	%	No.	%	
1	63	64.9	30	30.9	4	4.1	97
2	50	50.5	37	37.4	12	12.1	99
3	63	62.4	33	32.7	5	5.0	101
4	47	47.5	41	41.4	11	11.1	99
5	62	69.7	21	23.6	6	6.7	89
All samples	285	58.8	162	33.4	38	7.8	485

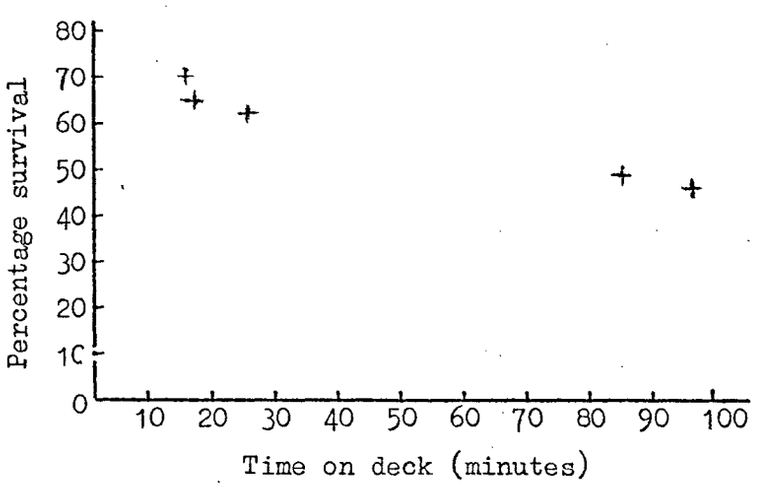

Figure 1 The relationship between Nephrops survival and time out of water.

Although the observations were few in number they indicate that a mortality of about 30 per cent had occurred (under the conditions of these experiments), either in the trawl or within the first 15 minutes of the

cod-end being brought on deck, and that thereafter further mortality was small. The samples were randomly selected from the rejected Nephrops in the catch, and it may be that much of the initial high mortality occurred during the long tow or on hauling the trawl, suggesting that the mortality rate of Nephrops while in the pounds, even up to 1½ hours after capture, was low.

Details of claw damage in the Nephrops samples are given in Table 3. It is clear that, of those Nephrops which definitely survived, more (61 per cent) had both claws intact, only 36 per cent of the "dead" and "moribund" Nephrops having both claws at the end of the experiment. It is not known whether those Nephrops in the "moribund" category would survive or eventually die, but the fact that the percentages of Nephrops having 2, 1 or no claws in this category were similar to those in the "dead" group suggests that the majority would die.

Table 3 Numbers of Nephrops in each of the three categories ("live", "dead" and "moribund") having 2, 1 or no claws present at the end of each experiment

Sample	Live			Dead		
	Number of claws			Number of claws		
	2	1	0	2	1	0
3	49	14	0	16	10	7
4	31	14	2	11	20	10
5	25	31	6	7	8	6
All samples	105	59	8	34	38	23
Percentage	61.0	34.3	4.6	35.8	40.0	24.2

Sample	Moribund			Total		
	Number of claws			Number of claws		
	2	1	0	2	1	0
3	2	2	1	67	26	8
4	5	4	2	47	38	14
5	1	3	2	33	42	14
All samples	8	9	5	147	106	36
Percentage	36.4	40.9	22.7	50.9	36.7	12.4

Notes were also made on the number of Nephrops having 2, 1 or no claws in two samples of rejects not put into the tub, and details are given in Table 4. Over half had two claws present and about a third had one claw. These proportions are very similar to those of claw damage found in the Nephrops at the end of the survival experiments (see end column in Table 3), suggesting that claw damage and loss of claws take place during the trawling operations and during sorting, and not after the return of the Nephrops to the water.

Table 4 Numbers and percentages of Nephrops having 2, 1 or no claws present in two samples of rejects not placed in tub of sea water

		Claws present			Total numbers
		2	1	0	
Haul 2	Number	118	65	29	212
	Percentage	55.7	30.7	13.7	
Haul 3	Number	59	44	9	112
	Percentage	52.7	39.3	8.0	
Total	Number	177	109	38	324
	Percentage	54.6	33.6	11.7	

The data in Table 3 have been rearranged in Table 5 to show the survival of Nephrops having 2, 1 or no claws present at the end of the experiment. An average of 71 per cent of Nephrops with 2 claws lived, as compared with only 56 per cent with 1 claw and 22 per cent with no claws. Thus there seems to be a definite correlation between the number of claws intact and the subsequent survival of rejected Nephrops.

Table 5 Survival of Nephrops having 2, 1 or no claws present at the end of each experiment (data from Table 3)

Sample	Number of claws								
	2			1			0		
	Live	Dead	Moribund	Live	Dead	Moribund	Live	Dead	Moribund
3	49	16	2	14	10	2	0	7	1
4	31	11	5	14	20	4	2	10	2
5	25	7	1	31	8	3	6	6	2
All samples	105	34	8	59	38	9	8	23	5
Percentage	71.4	23.1	5.4	55.7	35.8	8.5	22.2	63.9	13.9

Discussion

All the observations reported here were made on one day when there was a bright sun and no cloud, the air temperature was cool, and the wind was moderate (force 4). It is possible that with other conditions the survival of Nephrops returned to the sea might be very different. It might be expected that on a hot day, or during severe weather (when the boat would roll excessively during hauling), mortality of rejected Nephrops would be much increased. It is hoped to continue these experiments under various conditions. However, it is encouraging that in these experiments at least 47 per cent of the Nephrops survived after $1\frac{1}{2}$ hours out of the water, and that following the initial high mortality, probably caused mainly by the Nephrops being damaged during the hauling of the net, the mortality rate decreased significantly.

The fact that rejected Nephrops are alive when returned to the sea does not necessarily mean that they will all survive. Until they can reach the sea bottom and the safety of a new burrow, they will be more susceptible to predation. This is particularly true of the "moribund" individuals which, as pointed out above, would probably not survive in any case.