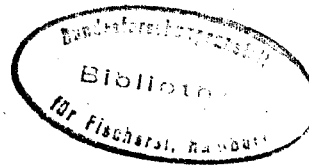


THIS PAPER NOT TO BE CITED WITHOUT PRIOR REFERENCE TO THE AUTHOR

International Council for the
Exploration of the SeaCM 1975/H:23
Pelagic (Northern)
Committee

ON CATCHES OF SMALL HERRING LARVAE

by

R. J. Wood

Ministry of Agriculture, Fisheries and Food, Fisheries Laboratory, Lowestoft

INTRODUCTION

Wood (1974) found considerable differences in the catches of herring larvae obtained by research vessels of England and the Netherlands when the same stations were sampled either on the same day or within one or 2 days by both countries. The English catches contained herring larvae 5 and 6 mm in length and yolk-sac stages, although none of these appeared in the Netherlands' catches. A similar discrepancy was also found between the catches of English and Scottish research vessels. No herring larvae 5 and 6 mm in length were recorded by Scotland, nor any yolk-sac stages, although these were all present in the English catches in some quantity.

In view of the importance placed by the ICES Working Group on North Sea Herring Larval Surveys on the abundance estimates of small herring larvae < 10 mm in length, and the fact that these are used to make deductions regarding changes in the size of the adult North Sea herring spawning stocks, it is of considerable importance to examine the reasons for the above discrepancies.

It was at first thought that differences in the sorting and identification techniques employed at the laboratories of the various countries might be an important factor, but it was later realized that:

- a. the speed of tow of the sampling gear was not the same for all countries, even though a speed of 5 knots had been specified for the internationally coordinated surveys;
- b. the depth to which sampling was carried out was variable.

These 2 factors have been investigated.

SPEED OF TOW

During autumn 1974 a series of hauls was made at a single station in the North Minch with the standard English 50.8 cm high-speed sampler (fitted with the normal nylon net of 23.6 meshes per cm) being towed at a number of different speeds in order to ascertain whether the smallest herring larvae might be extruded through the meshes of the net at speeds higher than 5 knots. Details of the resulting catches of herring

larvae are summarized in Table 1 and the percentage length distributions obtained at 3 different speeds are plotted in Figure 1. The work was conducted from RV SCOTIA and unfortunately at the time the ship's log was inoperative: the speed of tow in knots for each haul listed in Table 1 has therefore been calculated from a calibration of the sampler's external flowmeter revolutions against known speeds of tow. The calibration was obtained at a later date from RV CIROLANA.

It is clear from these data that the length distributions of the herring larvae which were caught in this experiment over a wide range of towing speeds were remarkably similar. More 5 mm larvae were caught at the lowest speeds and more 15 and 16 mm larvae at the higher speeds, but the differences are certainly not significant, and there is no indication at all of 6 mm larvae, which were caught in some numbers, having been extruded from the net at the high towing speeds.

DEPTH OF TOW

An examination was made of data for those hauls with the standard English sampler, in the central and northern North Sea during the past 4 years in which substantial numbers of 5 and 6 mm herring larvae had been caught. The relevant details have been summarized in Table 2. The most interesting point that emerges is that most of the sizeable catches of small herring larvae have been obtained during tows in which the sampler reached to within 5 metres of the sea bed at the deepest point in the tow. There is no evidence from the data in Table 2 to suggest that these very small herring larvae perform any active upward migration away from the seabed during daylight, as has been demonstrated for larger herring larvae (Wood 1971), since the hauls are evenly distributed between day and night. This suggests that newly hatched herring larvae in these areas of the North Sea remain close to the seabed, perhaps until a substantial part of the yolk-sac has been absorbed.

CONCLUSIONS

It seems unlikely that variations in towing speed could have led to the discrepancies in catches of small herring larvae described in the introduction to this paper. It appears more probable these might have resulted from different countries sampling to different depths because of variations in sampling technique. This is suggested by the fact that sizeable English catches of very small herring larvae have usually only been obtained when the sampler has been towed close to the seabed. The English sampling technique aims, when the nature of the seabed allows, to obtain an oblique tow from the surface to within 5 metres of the seabed in accordance with the recommendations of the ICES Working Group on North Sea Herring Larval Surveys (Anon. 1971). This is achieved by using a pressure transducer on the sampler in conjunction with a ship-board depth gauge, as described by Harding et al (1971). It has been demonstrated on

many occasions that reliance on a warp/sampler depth relationship alone can lead to considerable errors in the depth of water actually sampled.

It is therefore recommended that in order to ensure that sampling is carried out to a uniform depth above the seabed and hence that small herring larvae are correctly sampled countries participating in future internationally co-ordinated North Sea surveys should use an instrument similar to that described by Harding et al (1971).

REFERENCES

- ANON., 1971. Report of the Working Group on North Sea herring larval surveys. ICES CM 1971/H:10 (mimeo).
- HARDING, D., SHREEVE, E., TUNGATE, D. S. and MUMMERY, D., 1971. A net-changing mechanism for the Lowestoft multipurpose sampler. J. Cons. int. Explor. Mer, 33(3): 483-491.
- WOOD, R. J., 1971. Some observations on the vertical distribution of herring larvae. Rapp. P.-Réun. Cons. int. Explor. Mer, 160: 60-64.
- WOOD, R. J., 1974. Report on the International Surveys of Herring Larvae in the North Sea and adjacent waters in 1973/74. ICES CM 1974/H:13 (mimeo).

Table 1. Catches of herring larvae at different towing speeds

Haul Number	Speed in knots	Length of larvae in mm											Total Larvae	
		5	6	7	8	9	10	11	12	13	14	15		16
1	4.6		1	20	5	9	4	4	2					52
2	4.3		1	27	14	8	3	4	1	1				59
6	4.1		2	21	18	4	3	6	4		1			59
10	4.6	1	7	62	32	22	6	6	2	2	1			141
14	5.4	2	6	35	34	26	10	8	3	2	1			127
Mean speed	4.6	3	17	165	103	69	26	28	17	7	3			438
% Length distribution		0.7	3.9	37.7	23.5	15.8	5.9	6.4	3.9	1.6	0.7			
3	7.6		2	36	43	7	5	12	4	1	2	1		113
5	7.8		6	21	39	12	6	10	8	4	3	1		110
7	7.8		1	32	39	13	8	11	3	4				111
9	7.6		2	37	52	29	15	9	7	4	1	2	1	159
11	7.6	1	8	129	88	29	18	16	5	3	1			298
13	7.8		18	102	78	36	30	16	3	1				284
Mean speed	7.6	1	37	357	339	126	82	74	30	17	7	4	1	1075
% Length distribution		0.1	3.4	33.2	31.5	11.7	7.6	6.9	2.8	1.6	0.7	0.4	0.1	
4	10.3		8	67	28	15	17	17	9	2	1			164
8	9.7		13	60	54	25	10	18	4	2	1	1	2	190
12	10.6		35	175	85	60	70	30	12	4	1			472
Mean speed	10.3		56	302	167	100	97	65	25	8	3	1	2	826
% Length distribution			6.8	36.6	20.2	12.1	11.7	7.9	3.0	1.0	0.4	0.1	0.2	

Table 2. Summarized data for hauls containing substantial numbers of small herring larvae

Date	Time (GMT)	Seabed Depth (m)	Sampled Depth (m)	Minimum sampler height above seabed (m)	Numbers of herring larvae per length group					
					<5mm Yolk sac	<5mm No Yolk sac	5mm Yolk sac	5mm No yolk sac	6mm Yolk sac	6mm No yolk sac
<u>CENTRAL NORTH SEA</u>										
5.10.71	1757	47	38	9			223	25	167	29
2.10.72	1357	55	53	2			61	45	150	214
18. 9.73	0628	51	45	6			5	3	30	25
"	0723	40	36	4			1	10	14	26
"	0822	46	45	1				24		168
"	0917	88	84	4				15		56
"	1102	78	76	2				12		27
"	1515	50	47	3			4	2	69	11
"	2029	59	55	4			1		18	10
"	2136	52	49	3			1	7	2	12
"	0238	44	44	0				1		14
"	0516	25	25	0	1	10	1	19		9
<u>NORTHERN NORTH SEA</u>										
7. 9.71	0129	75	71	4			11	27	28	268
"	2114	75	74	1			4		5	11
8. 9.71	0152	77	72	5			4		14	18
"	1027	89	89	0			62	21	137	58
8. 9.72	1547	66	62	4			8		147	37
11. 9.73	0852	76	76	0			5		27	29
"	1915	61	56	5	3		75	50	81	87
"	2103	70	56	14	2	3	5	68	10	59
12. 9.73	0710	92	90	2		1		2		18
15. 9.73	2256	94	73	21			6	25	162	130
16. 9.73	0018	60	56	4				75		63
"	0146	95	90	5				3	2	30
"	0246	99	94	5				48	7	78
"	1854	54	46	8				1	7	9

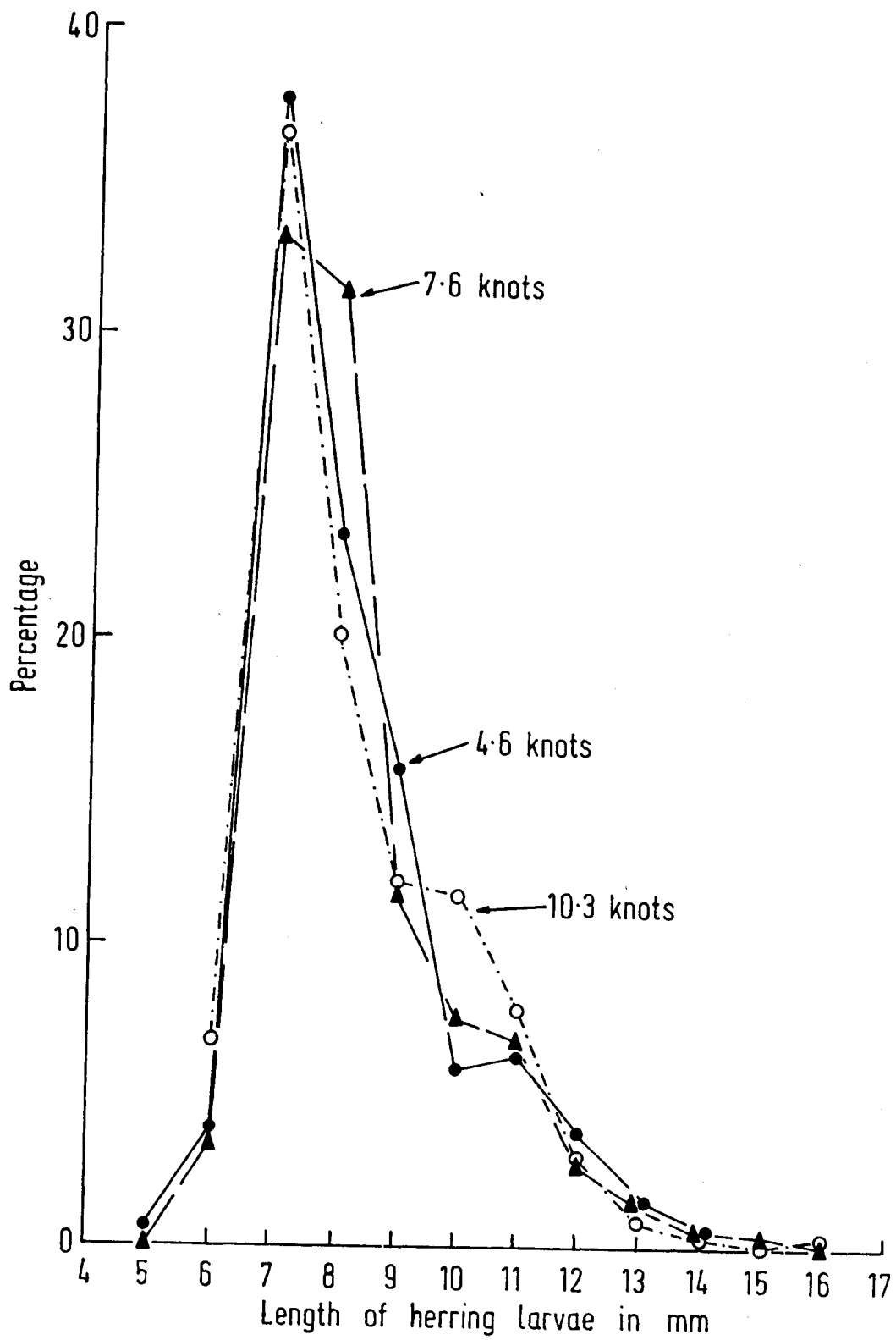


Figure 1. Percentage length distribution of herring larvae caught at three different speeds.