

THE USE OF PARASITES IN TRACING HERRING RECRUITMENT MIGRATIONS

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Summary

It is possible to distinguish clearly between juvenile autumn-spawned herring populations from Bløden and Scottish coastal waters on the basis of differences in the occurrence of three parasites: two forms of Renicola metacercariae and the plerocercoid of the cestode Lacistorhynchus. This paper suggests that it should be possible to trace the recruitment migrations of juvenile herring to the adult populations by using these parasites and presents some preliminary results to support this view.

Introduction

Saville (1971) presented considerable evidence of a close link between the Moray Firth juvenile herring population and the Minch autumn-spawning stock. The initial aim of the project, the results of which are described in this paper, was to search for parasites typical of the Moray Firth juveniles which might be used as indicators to yield further evidence for or against this link. The preliminary results, together with Saville and Morrison's (1973) statement that over 40 herring tagged as juveniles in the Bløden area had been recovered in the Minch, suggested that it might be rewarding to widen the scope of the project. The data presented in this paper are therefore the first results of an investigation designed to trace the recruitment migrations of juvenile herring populations from various Scottish coastal areas and from Bløden.

Materials and Methods

In this paper, 2+ herring taken up to the end of March were considered to be juveniles, and the same age group taken after the beginning of August to be adults. Samples of juvenile autumn-spawned herring from the Moray Firth, Firth of Forth, the Minches, and Bløden were obtained from commercial catches or by research vessels and examined fresh for parasites. A preliminary investigation in the winter of 1972-73 suggested three parasites of potential value as biological indicators and subsequent examinations were for these alone. They were found almost entirely on the outside surfaces of the pyloric caeca, so that the method of examination involved removing the caeca by cutting the intestine on either side and then teasing them carefully apart under a dissecting microscope. Samples of adult herring were similarly treated. Sampling positions are shown in Figure 1.

Results

The parasites selected are illustrated in Figure 2 and their occurrence in herring samples shown in Table 1.

1. Small metacercariae of the digenean genus Renicola, with ovoid thick-walled cysts, mean dimensions 0.43 x 0.26 mm, occurred commonly in juvenile herring from Scottish waters but rarely in Bløden juveniles. In adult herring they were common in the North Minch, but rare at Shetland and Longstone.

2. Larger metacercariae of the same genus with sub-spherical thin-walled cysts, mean dimensions 0.52 x 0.45 mm, were found in juvenile herring from Scottish waters only. They were most common in the Firth of Forth, but several fish from the South Minch sample also harboured them.

3. Plerocercoids of the trypanorhynch cestode Lacistorhynchus were fairly common in Bløden juveniles, but in Scottish waters they occurred in only two juvenile fish from the Minches. In adult herring they occurred at Shetland and Longstone, but not in the North Minch.

Discussion

The results in Table 1 show clear differences in parasite infections between the populations of juvenile herring from the Bløden area and those from Scottish coastal waters (Moray Firth, Firth of Forth, North and South Minches). As far as relationships between juvenile and adult populations are concerned, the main conclusion to be drawn from these preliminary results is that juvenile populations in Scottish coastal waters contribute few, if any, recruits to the Shetland and Longstone adult populations. Parrish and Sharman (1959) and Saville (1971) came to the same conclusion on the basis of evidence from studies of otolith types and growth characters.

These preliminary data provide no evidence of substantial recruitment of adult herring in the Minch from the Bløden area. It is worth mentioning, however, that a recent sample of adult herring from the South Minch, for which age data are not available and therefore not shown in Table 1, included several Lacistorhynchus-infected individuals. Further sampling of adult populations to the north and west of Scotland is in progress.

Over the next two years it is intended that special attention be paid to the 1972 herring year-class, as this was the one best represented in the juvenile samples. Fish of this year-class will be sampled again as juveniles in the winter of 1974-75 and as adults thereafter. Following a single year-class in this way eliminates error due to variations in incidence of infection between year-classes, and may also yield evidence of any changes in infection with host age.

References

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- Saville, A. 1971 The biology of young herring in the Moray Firth and their recruitment to the adult stocks. Rapp. P.-v. Réun. Cons. perm. int. Explor. Mer, 160, 184-193.
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Table 1

Incidence of Renicola and Lacistorhynchus infection in
A, juvenile and B, adult autumn-spawning herring

Sampling position	Date	Year-class	Number examined	Incidence of infection (%)		
				<u>Renicola</u> small form	<u>Renicola</u> large form	<u>Lacistorhynchus</u>
A.						
Bløden	Mar 1974	1971	93	0	0	6
		1972	207	1	0	15
Moray Firth	Nov 1973- Jan 1974	1972	123	64	2	0
Firth of Forth	Nov 1973- Feb 1974	1972	110	75	18	0
South Minch	Sep 1973	1971	98	30*		1
North Minch	Feb 1974	1971	43	37	2	2
B.						
North Shetland	Sep 1973	1969	40	2	0	7
		1970	58	0	0	3
South Shetland	Jun 1974	1970	31	3	0	15
West Shetland	Jul 1974	1969	32	0	0	9
		1970	33	3	0	6
Longstone	Aug 1973	1970	133	2	0	9
North Minch	Aug 1973	1970	171	33	0	0

*This figure includes both forms of Renicola

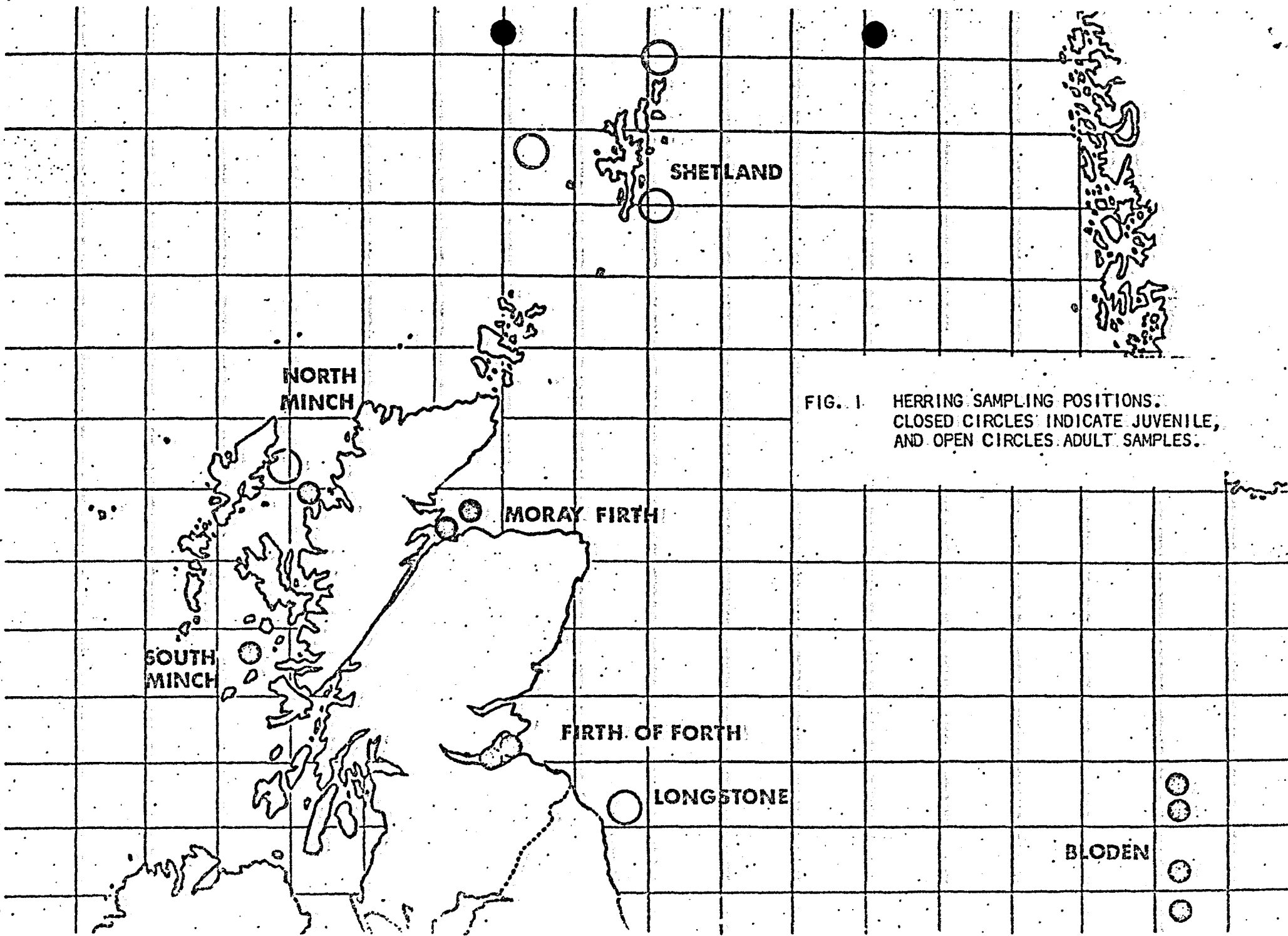


FIG. 1. HERRING SAMPLING POSITIONS. CLOSED CIRCLES INDICATE JUVENILE, AND OPEN CIRCLES ADULT SAMPLES.

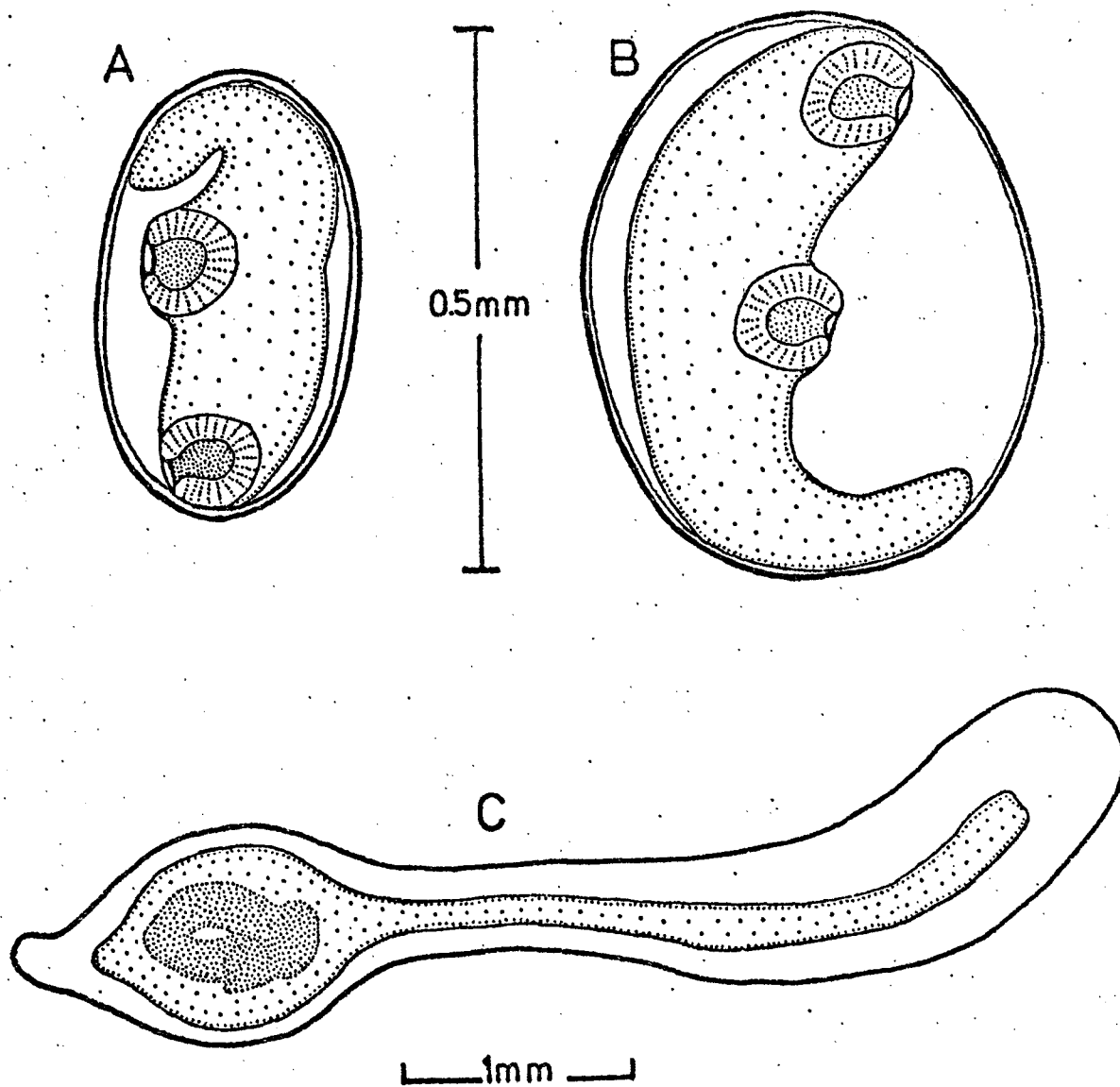


Fig. 2 A, small form Renicola metacercariae.
B, large form Renicola metacercariae.
C, Lacistorhynchus plerocercoid.