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International Council for  
the Exploration of the Sea

CM 1980/G: 14  
Demersal Fish Committee

THE MIGRATION PATTERN OF SOLE TAGGED IN THE  
THAMES ESTUARY IN THE SUMMER OF 1976 and 1977

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#### SUMMARY

This paper describes the results of two sole tagging experiments which were carried out in the early summers of 1976 and 1977 in the Thames Estuary. The results from the recaptures indicated that many of the soles which had been tagged one and two years previously moved back to the original tagging area to spawn. As the majority of the returned fish in the winter period came from well outside the 12-mile United Kingdom zone, it is possible that at the end of the year these fish make quite extensive migrations to the north and the north east.

#### INTRODUCTION

In the early summer of 1976 and 1977 two sole tagging experiments were carried out in the Thames Estuary. The 1976 experiment was carried out in the River Blackwater and the 1977 experiment was carried out in the area just north of Whitstable on the north Kent coast. The main reason for doing these experiments was the need for more information on the inshore fisheries of the United Kingdom, particularly about fish which spawn within our 12-mile coastal limit. Between April and June sole are ripe or spawning in various parts of the Thames Estuary and their presence forms the basis for a small fishery which takes place from May to July. In 1977 this fishery yielded 134 tonnes.

For stock management purposes we need to know the migration pattern of these fish and to obtain information on the numbers recaptured by UK and foreign vessels both within and outside our 12-mile limit. The method of tagging and preliminary results of recaptures of sole up to October 1977 have been published in MAFF Fisheries Notices, Numbers 48 (Wallace, 1977) and 55 (Wallace, 1978). This account reports all the recaptures which have taken place up to July 1979.

## TAGGING

In the first experiment, which was carried out in early May 1976, 1 072 sole were tagged and released in the River Blackwater. These were mainly fish between 20 and 35 cm in length. The second tagging experiment was carried out in early July 1977 when 500 sole of the same length range were released in the area between Whitstable Street and the Queen's Channel. The fish were tagged with plastic Petersen discs; the upper disc is yellow and carries a serial number and the lower disc is plain red. The two discs are joined through the body of the fish by a stainless steel pin. The fish were released as quickly as possible after capture, close to the position at which they were caught.

## RECAPTURES

The recapture positions have been grouped by quarterly periods in the appropriate ICES statistical rectangles from the beginning of each experiment up to July 1979 (see Figures 1 and 2). Different symbols have been used for each quarterly period and the numbers of recaptured soles have been placed next to the appropriate symbol.

### Fish tagged in the River Blackwater

In May-July the great majority of sole were recaptured within the 12-mile inshore zone and just to the east of the tagging area and the same general pattern was repeated during August-October. However, there were a few returns in each period from the eastern end of the English Channel. In November-April fish were returned from a wide area of the southern and central North Sea and the eastern Channel, but throughout February-April most of the tagged fish returns were again caught within the 12-mile zone.

### Fish tagged off Whitstable

Most of the fish recaptured in May-July were caught close to the original tagging area. During August-October some fish recaptures were still made in the tagging area while others were made to the east and the north-east and there were several recaptures in the eastern English Channel. During the winter period (November-January) only one tagged fish was caught inside the 12-mile zone and in February-April five tagged fish were returned from as far north-east as the Tea Kettle Hole and as far south-west as Rye Bay.

## A GENERAL PATTERN OF MOVEMENT

The simplest interpretation of these recaptures is that many of the soles which had been tagged one and two years previously moved back to the original tagging area to spawn. This movement was most marked among those sole which had been two years at liberty. Furthermore, fish which had been at liberty for two years and which were recovered in August-October 1978 were all caught within the 12-mile zone. During the period of the experiment the biggest catch of sole and the greatest fishing effort occurred between May and October, especially in the Thames Estuary and off the Essex and Suffolk coasts.

As the majority of the returned fish in November-January came from areas well outside the 12-mile zone, it is probable that at the end of the year most sole which spawn inshore in the River Blackwater in May make quite extensive migrations to the north and north-east (see Figure 3). Similarly, sole tagged off Whitstable in July are spread over the southern North Sea at the end of the year and only one sole was recaptured in the 12-mile zone in the period November 1977 to January 1978. English catch and effort was low in the southern North Sea in November-January, but during February-April the catch of soles increased by a factor of four even though the effort remained the same. The biggest catches were taken in the north Thames Estuary and off the Essex and Suffolk coast. In February-April some fish were still recaptured in the southern and central North Sea but may have been making their way back to the Thames area in time to spawn in April-June. The returns indicate a movement back towards the River Blackwater to spawn from April to May by soles which had originally been tagged in that river in May 1976. In short, these experiments indicate that there is a movement of most adult sole out of the Thames Estuary in winter and a general return the following spring to spawn. These movements are shown diagrammatically in Figure 3.

## REFERENCES

- WALLACE, P. D., 1977. Sole tagging in the River Blackwater in May 1976 - A progress report. Fish. Not., MAFF Direct. Fish. Res., Lowestoft (48) 5 pp.
- WALLACE, P. D., 1978. The migration pattern of soles, plaice and rays tagged in the River Blackwater in May 1976. Fish. Not., MAFF Direct. Fish. Res., Lowestoft (55) 6 pp.

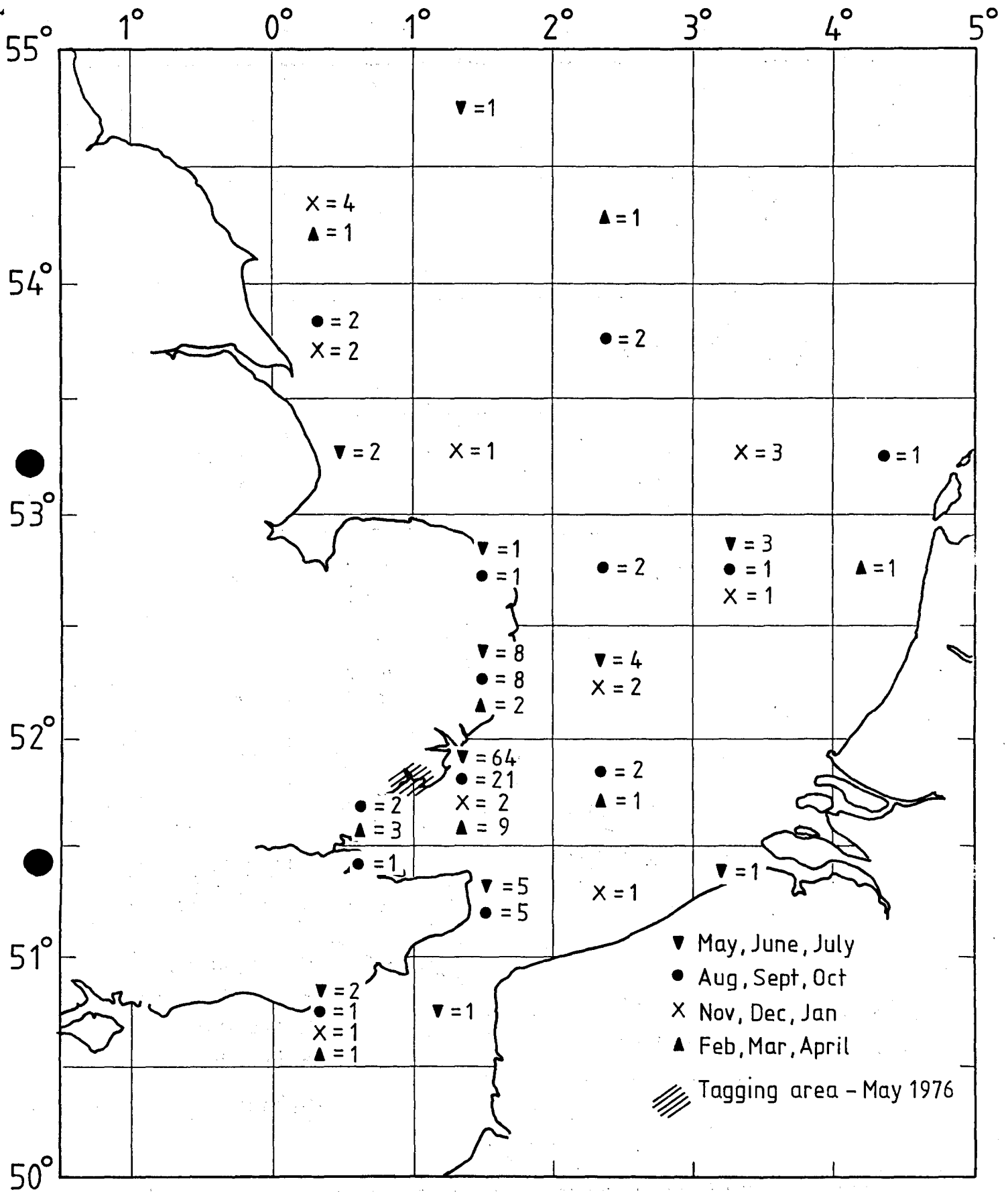


Figure 1 River Blackwater tagging, May 1976: recapture position by rectangles.

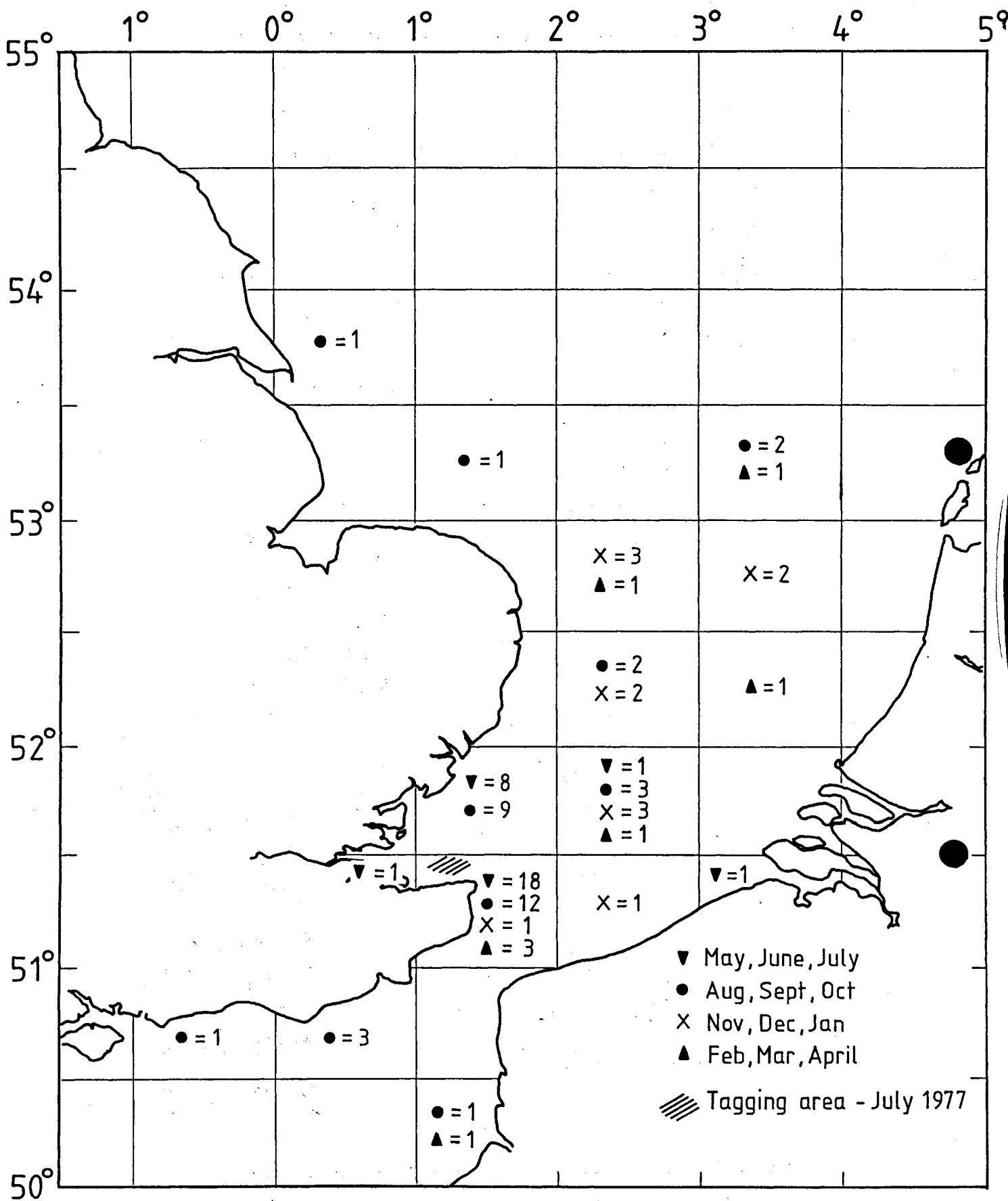


Figure 2 Whitstable tagging, July 1977: recapture positions by rectangles.

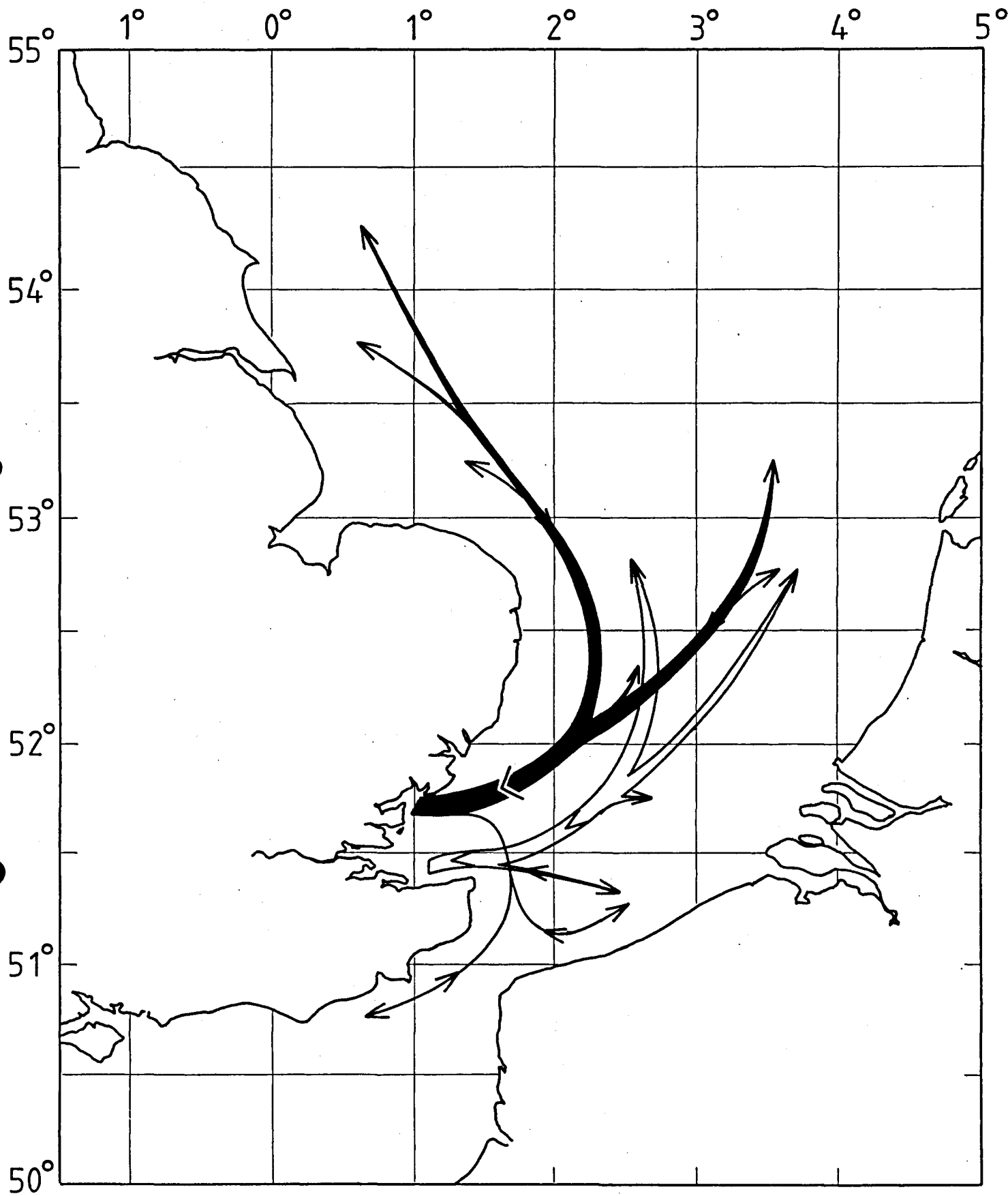


Figure 3 Thames sole: probable winter movement pattern.