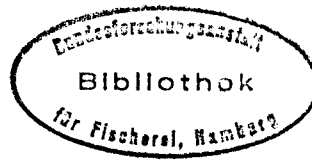


This paper not to be cited without prior reference to the author

International Council  
for the Exploration of the Sea.



C.M. 1971/F:13  
Demersal Fish (Northern) Committee

SCOTTISH PLAICE TAGGING EXPERIMENTS IN THE NORTH SEA 1910-1961

by

D. W. Armstrong

Marine Laboratory,  
Aberdeen, Scotland.

# SCOTTISH PLAICE TAGGING EXPERIMENTS IN THE NORTH SEA 1910-1961

by

D. W. Armstrong

## Summary

A preliminary analysis has been made of Scottish plaice tagging experiments from 1910 to 1961. Plaice liberated off the Scottish east coast tended to move north in the first quarter of the year. Plaice released in the Moray Firth, on the north coast of Scotland and near Fair Isle were recovered from regions which overlapped to a great extent and only a very small proportion of the fish released in these areas were recovered off the Scottish east coast or in Shetland waters. Plaice released in Shetland waters tended to remain there but a few moved to the Fair Isle region.

## Introduction

Tagging experiments have been carried out on plaice in Scottish waters since 1888 (Fulton, 1892). However, it was not until 1910 that techniques resulting in relatively little damage to the fish were evolved. Since then two reports dealing with Scottish plaice tagging experiments have been published. Fulton (1919) reported on experiments carried out between 1910 and 1913 while Bowman's (1933) paper dealt with a series of liberations in Shetland waters between 1923 and 1931.

In addition to those referred to above, a large number of other experiments were carried out between 1920 and 1939 and between 1947 and 1960. These experiments were undertaken in the same general areas as those of Bowman and Fulton, and can be used to supplement and extend the conclusions reached by these workers.

Data from all experiments from 1910 onwards from which more than twenty fish were returned have been subjected to a preliminary analysis, which has disclosed some features of interest which are discussed in this paper.

## Material and Methods

Records are available of the position of recapture of each plaice recovered from every liberation carried out since 1910. To simplify the analysis, each of the standard ICES rectangles in the North Sea and adjacent waters was subdivided into four equal squares. Each liberation was referred to one of these sub-squares. The total number of liberations in any given sub-square was subdivided into four groups, each group being liberated in a different quarter of the year. For each of these subgroups the recoveries in the three months of liberation and in each subsequent three month period were then plotted out as shown in Figs 1 to 6. In this way it was possible to follow the movements of plaice tagged in each of the areas shown in Fig. 7. A total of 219 experiments has been dealt with in this way.

## Results

With such a large number of liberations over such a wide area it is not practicable to show the complete results of the analysis. A number of liberations in specified areas have therefore been used to typify the results obtained in the various regions.

### a) Liberations near the east coast of Scotland (south of the Moray Firth)

The results of seven experiments in square B11c have been used to illustrate movements of tagged plaice in this region. Four of these were carried out by

Fulton in the period 1910-1913, using plaice transplanted from the Firth of Forth. The remaining three experiments, in which plaice caught in the vicinity of the area of liberation were used, were carried out between the two world wars. Almost all of the plaice recovered from Fulton's experiments had lengths in excess of 30 cm while those recovered from the later experiments were mostly less than 35 cm in length.

It can be seen from Figs 1a and 1b that the recaptures show a northerly trend towards the Moray Firth and the north coast of Scotland during the first three months of the year. During the second quarter, a considerable proportion of the fish were caught at relatively large distances north of the point of liberation while in the third and fourth quarters the recoveries tended to be closer to the area of liberation. Plaice released in the first quarter of the year did not move very far from the liberation area until the first quarter of the year after liberation.

Regardless of the time of release, very few of the fish moved to positions south of the Firth of Forth and very few were recovered outwith the 50 fm depth contour.

It should be added that, although the results obtained from Fulton's experiments were very similar to those obtained from the later ones, it was noticeable that in the later series a larger proportion of the plaice was recaptured close to the area of liberation in the first and second quarters of the year.

For liberations made off the east coast of Scotland further north than square B11 there was also a well marked northerly movement in the first quarter of the year, although the distances moved were not as great.

Some results diverging widely from those discussed above were obtained from a large number of releases made over a number of years in square B11a. All of these were from liberations made on the nursery grounds of St Andrew's Bay and Carnoustie Bay. The fish recovered were small (mainly less than 25 cm) and were almost certainly all immature. Virtually no recaptures were made outside the square in which these plaice were released.

#### b) Liberations in the Moray Firth

Eleven experiments conducted between April and June in square A14 have been chosen to demonstrate the movements of plaice in the Moray Firth, (6 in square A14a, 1 in square A14b, 2 in square A14c and 2 in square A14d). These include one release made by Fulton in 1911, the remainder being made at later dates. All the fish released were caught locally, those recaptured from Fulton's experiment generally having lengths greater than 30 cm while those recaptured from the later experiments were almost all less than 35 cm.

Figures 2a and 2b show that most of the recaptures from these experiments were made inside the Moray Firth. Most of the recaptures outside it were made off the north and west coasts of Scotland, very few being taken to the south, in the Scottish east coast region.

#### c) Liberations on the north coast of Scotland

Six experiments, all using locally caught fish, have been carried out in this region, one in 1928, one in 1935, and the remainder in 1953 and 1954. No fish were released in the fourth quarter of the year. The plaice recovered were almost all less than 35 cm long.

The results of these experiments show that those fish which moved away from the tagging locality in this area mostly did so in a westerly direction. However, two recoveries were made near Fair Isle and one in Shetland waters.

Vary few of the recoveries were made to the south of the liberation area. Figs 3a and 3b show the results from two releases made in the period July-September in 1925 and 1938 in square A16d.

#### d) Liberations near Fair Isle

Six experiments, using plaice transplanted from Aberdeen Bay and the Moray Firth, were carried out by Fulton between 1910 and 1912 in squares A17b and B18c. The plaice used in these experiments mostly exceeded 35 cm in length. Figs 4a and 4d show the results of two releases made in the fourth quarter of the year, one in square C17b and one in square D18c. There was a general movement away from the tagging locality, predominantly towards the north and west coasts of Scotland and the Moray Firth. Relatively few plaice were recovered either to the south of the Moray Firth or in the vicinity of Shetland and comparatively few were recovered from depths greater than 50 fm. The movement of the fish away from the area of liberation did not appear to be seasonal, in contrast to the northerly movements seen with plaice liberated near the east coast of Scotland.

#### e) Liberations in the vicinity of Shetland

Recaptures from two experiments in the last quarter of the year, both in square D20c, are available to show the movements of tagged plaice released in northern Shetland waters. One of these was carried out by Bowman in 1926, using fish transplanted from St Andrew's Bay, while the other, using locally caught fish, took place in 1960. There is little difference between the results obtained from releases using transplanted and local fish. In both experiments the plaice released were almost all greater than 30 cm in length.

Figure 5 shows that, of those fish which moved out of the release area, most were recovered to the west or north-west close to the land. No recaptures were made in the open North Sea or Scottish coastal waters to the south but a number of recoveries were made close to Fair Isle from liberations not illustrated in Figure 5.

There are also data from a single experiment conducted on locally caught fish in the third quarter of 1960 in southern Shetland waters (square C19d). Most of the recoveries came from waters off southern Shetland. As with releases in northern Shetland, small numbers of the fish were recovered near Fair Isle (Fig. 6).

#### Discussion

On the basis of these data the plaice fished by Scottish vessels in the North Sea can be divided into three groups within which the results of various experiments were broadly similar. The areas occupied by each of these groups is shown in Fig. 7. The lines enclosing each one delimit the region from which the majority of the recoveries of fish released in the positions indicated were obtained.

The most southerly group is found in the area off the east coast of Scotland, approximately between Rattray Head and the Firth of Forth.

The second group comprises plaice released in the Moray Firth, off the north coast of Scotland and in the region of Fair Isle where recoveries came from areas which overlap to a great extent. A third group of plaice can be conveniently recognised around the Shetland Islands.

There is some evidence of a minor interchange of fish between the Shetland and the Fair Isle/Moray Firth areas. There is little evidence of movement from the Fair Isle/Moray Firth region to the east coast but considerable numbers of plaice released off the east coast have been recovered from the Moray Firth and adjacent areas. Since plaice are known to spawn in the Moray Firth at this time (Bowman 1921), this northward movement probably is associated with spawning.

Further work is planned to investigate the inter-relationship between the plaice in the three regions in detail.

#### References

- |               |      |   |
|---------------|------|---|
| Bowman, A.    | 1921 | The distribution of plaice eggs in the northern North Sea - II Scient. Invest. Fishery Bd Scotl. 1921, I.                                 |
| Bowman, A.    | 1933 | Plaice marking experiments in Shetland waters. J. Cons. int. Explor. Mer., VII(2), 223-229.   |
| Fulton, T. W. | 1893 | An experimental investigation on the migration and rate of growth of the food fishes. Rep. Fish. Bd Scotl. (1892), 11(3), 176-196.        |
| Fulton, T. W. | 1919 | Report on the marking experiments on plaice, made by S.S. "Goldseeker" in the years 1910-1913. Scient. Invest. Fishery Bd Scotl. 1919, I. |

TEXT FIGURES 1-6      EXPLANATORY NOTES


- \*      Recapture period during the same calendar year as that in which the fish were liberated.
- +      Recapture period during the first calendar year after liberation.
- Recapture period during the second calendar year after liberation.
-       Stippled regions indicate liberation rectangles.















FIG. 4a.  
 RECOVERIES OF TAGGED PLAICE RELEASED BETWEEN OCTOBER AND  
 DECEMBER NEAR FAIR ISLE.

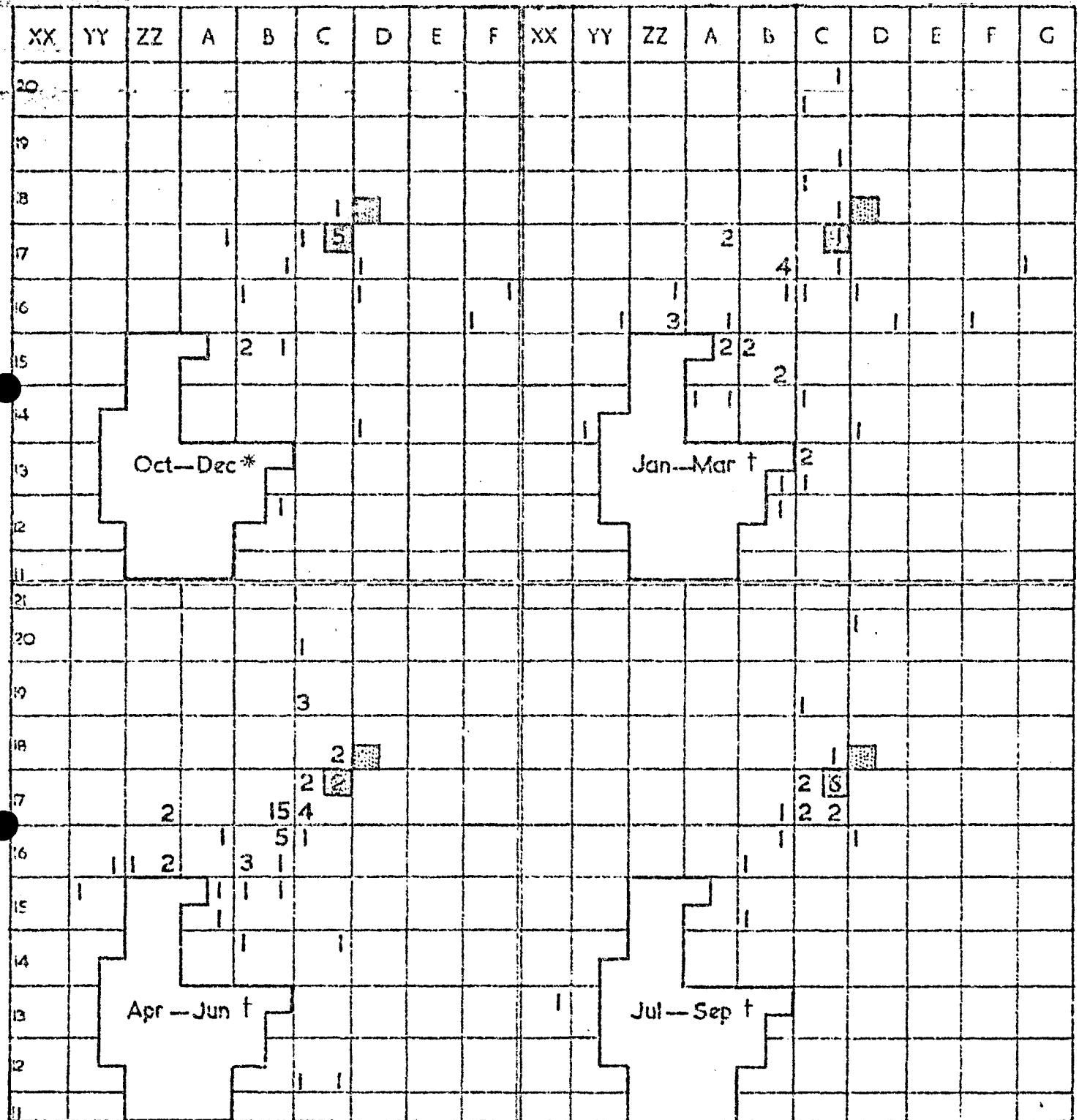




FIG. 5  
 RECOVERIES OF TAGGED PLAICE RELEASED BETWEEN JANUARY AND  
 MARCH IN NORTH SHETLAND WATERS.  
 (dotted line indicates approximate extent of Shetland Islands)

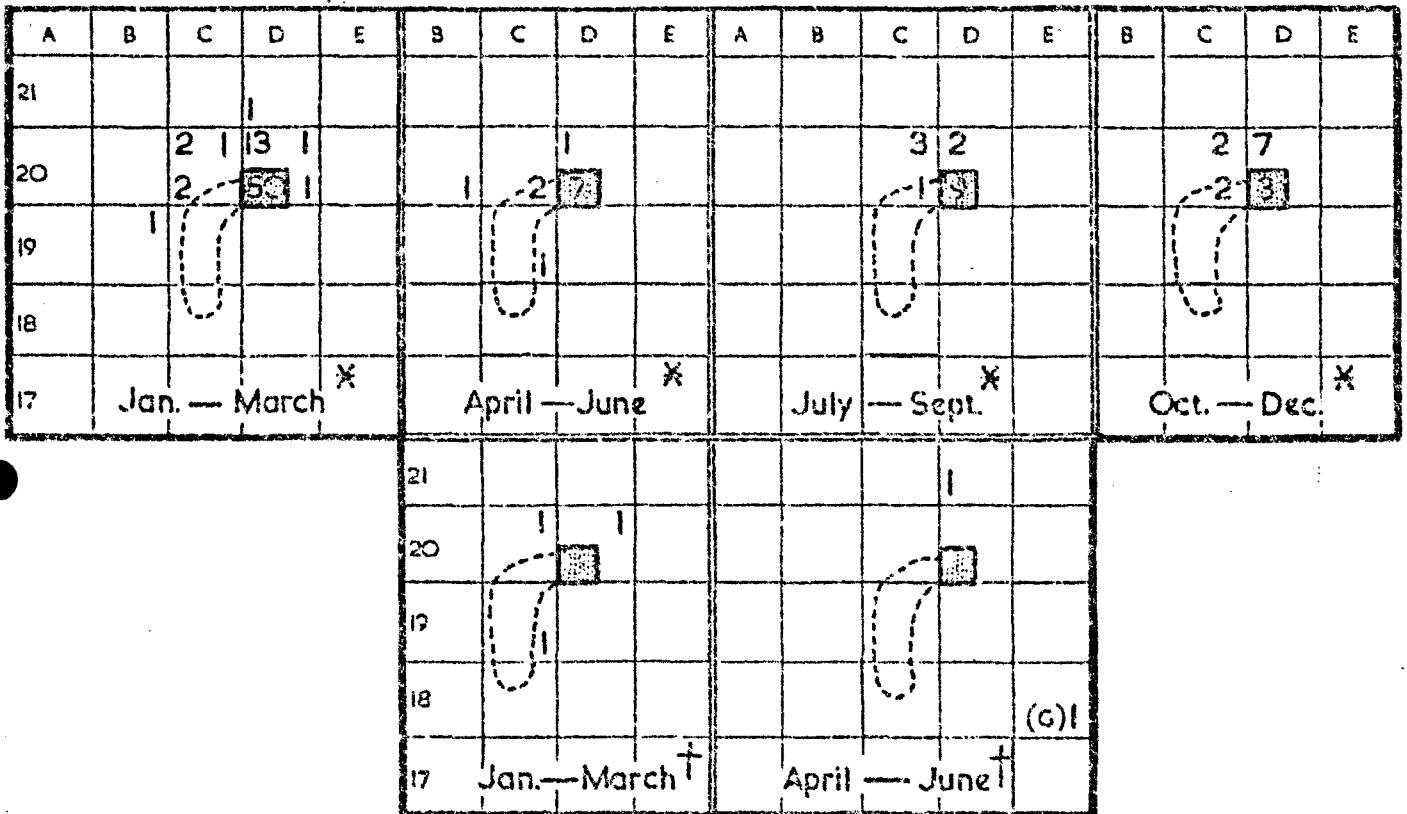


FIG. 6.  
 RECOVERIES OF TAGGED PLAICE RELEASED BETWEEN APRIL AND JUNE IN SOUTH  
 SHETLAND WATERS  
 (dotted line indicates approximate extent of Shetland Islands)

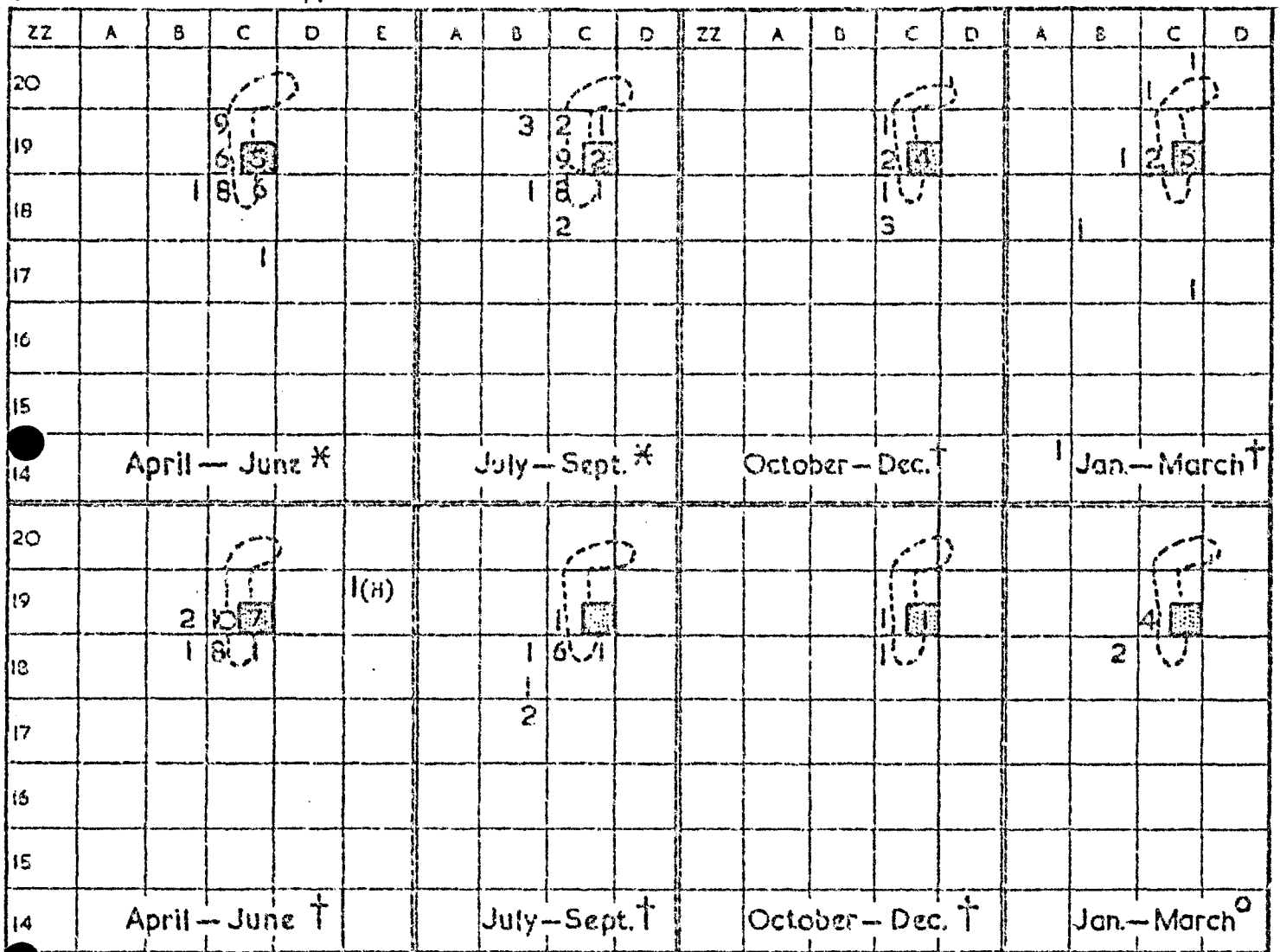
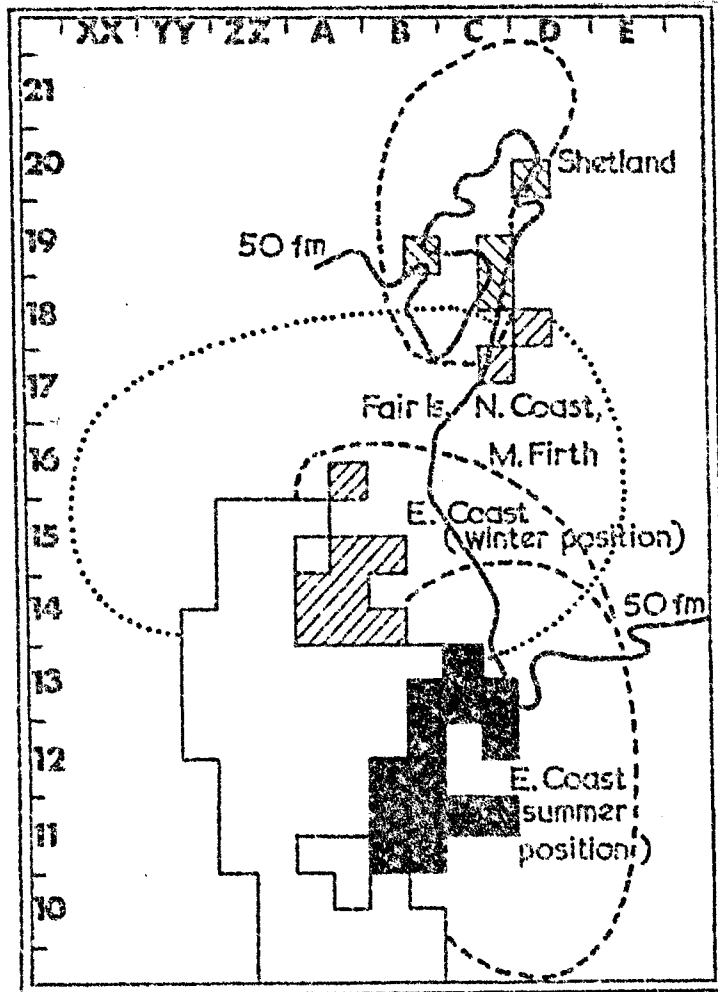





FIG. 7. DOTTED LINES SHOW THE AREAS WITHIN WHICH THE MAJORITY OF THE FISH RELEASED IN THE POSITIONS INDICATED WERE RECOVERED.



-  Areas of release of Shetland tagged plaice.
-  Areas of release of Moray Firth/Fair Isle tagged plaice.
-  Areas of release of East Coast tagged plaice