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Further Investigations on the Clyde Whiting Stock

by

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Introduction

In a paper presented to the 1960 meeting of ICES (Gamble, 1960) a preliminary estimate of 2.51 was given for the apparent total mortality coefficient (Z) for whiting in the Clyde. This value was derived from rather limited data, and using figures obtained from market sampling during 1959-61 a more reliable estimate has been made. This is based on the year-classes fully recruited to the fishery, and gives a value of Z = 2.56, with no significant differences between year-classes. This is a very high figure, representing an annual reduction in the whiting stock of about 92.3%.

Such a high apparent mortality rate could be due to two main causes. It might result from very heavy fishing mortality; or alternatively it could be due to emigration of part of the stock out of the area. To investigate these points more thoroughly, further studies have been carried out on the Clyde whiting stock.

Length Composition Studies

The main method of capture used for demersal fish species in the Clyde is the Danish seine-net. This was introduced into Scotland in the 1920s, but fishing by this method was on a comparatively small scale in the Clyde area at first (Ritchie, 1960). Activities increased in later years, until now the winter fishery is a very intensive one.

If fishing mortality is responsible for a large part of the apparent total mortality of whiting in the area, changes in the length composition of the exploited stock would be expected between the present time, with its high fishing effort, and the 1920s, with its much lower effort. Research vessel data is available for 1927-29, and the length compositions from hauls using small meshed covers are shown in Figure 1. They can be compared with length compositions obtained by more recent sampling, shown in Figure 2. Although the sampling was not carried out at exactly the same time each year, it is clear that there has been no major reduction in the relative numbers of big fish in the Clyde since the 1920s, and the data indicate very similar length compositions in all the years represented.

Tagging Experiments

Two tagging programmes have been carried out, in November 1960 and 1961, to detect any movements of the adult whiting stock.

The returns from the experiment in 1960 are illustrated in Figures 3 and 4. Up to the beginning of March 1961, roughly 100 days after release, all the recaptures came from the Clyde area, where the usual winter fishery was being conducted. After this time, when the fishery declined, a number of recaptures were made outside the Clyde - two from the Irish Sea, two from Donegal Bay on the west coast of Ireland, and one from the Tiree area of the South Minch. There were also some further returns from the Clyde itself, including one whiting recaptured more than a year after tagging. The overall impression from the tag returns is of a more widespread distribution after March, with whiting moving out of the Clyde and to its outer reaches.

The 1961 experiment was carried out much further up to the Firth (in Loch Long) than in the previous year. The returns from this experiment are shown in Figure 5. The initial recaptures came from the immediate area of tagging. The later ones tended to be from points progressively further down the Firth, and two were from the Irish Sea and one from the Tiree area. Recaptures after 100 days, roughly from March onwards, again showed a widespread distribution in the open reaches of the Clyde and outside.

Larval Distributions

The tagging results suggest that there might be a movement of the whiting stock into the lower reaches of the Clyde, and also beyond, in the spring-spawning period. Plankton samples, taken primarily to study the herring larval distribution in the spring, were therefore examined for whiting larvae. This investigation is continuing, but the preliminary results are given in Figures 6 and 7, which show the distribution of whiting larvae in May 1960 and 1961. The main features in both years are the relative concentration of whiting larvae along the coast of Northern Ireland, and the small numbers of larvae found in the greater part of the Clyde itself.

Seasonal Stock Density Variations

An interesting feature of the commercial landings from the Clyde, when associated with the tagging returns from the November 1961 experiment, is the secondary peak in the landings which occurs in March-April nearly every year (Figure 8). The tagging experiment carried out in Loch Long, in the upper part of the Clyde where the intensity of fishing is low, gave returns from the main fishing grounds in the lower reaches during the following spring. The whiting population in Loch Long in November 1961 comprised a great many large fish of the 1960 year-class, which were just maturing, and hardly any 0-group (1961 year-class) whiting. This is illustrated in Figure 9, which can be compared with the length composition of the stock in the open Firth at the same time (Figure 2, November 1961). The increased abundance of whiting on the main fishing grounds in spring, associated with the movement of mature fish from the upper reaches of the Clyde to the probable spawning grounds outside, and the virtual absence of larvae from the upper reaches in May, suggest a large-scale spawning migration from the higher reaches of the Firth.

Summary and Conclusions

From the length frequency studies, the tagging returns, stock density variations and the distribution of whiting larvae, the whiting population of the Clyde appears to show the following features. Whiting are present in the Clyde at least from the age of 6 months, when they appear in small mesh trawl catches. These fish remain in the area until they are sexually mature, at the age of two years. They then migrate to the North Channel to spawn, and afterwards disperse. Some whiting find their way into the Irish Sea, the west coast of Ireland or the South Minch, while a small proportion (less than 10%) return to the Clyde. The spawning products must drift into the Clyde to regenerate the stock there, the numbers which do so varying from year to year.

References

Gamble, R.	1960	"The Clyde whiting - a comparison with other whiting stocks". ICES Meeting 1960, Near Northern Seas Committee, Doc.No.8.
Ritchie, A.	1960	"The Scottish seine-net fishery 1921-1957". Mar. Res. Scot., 1960, No.3.

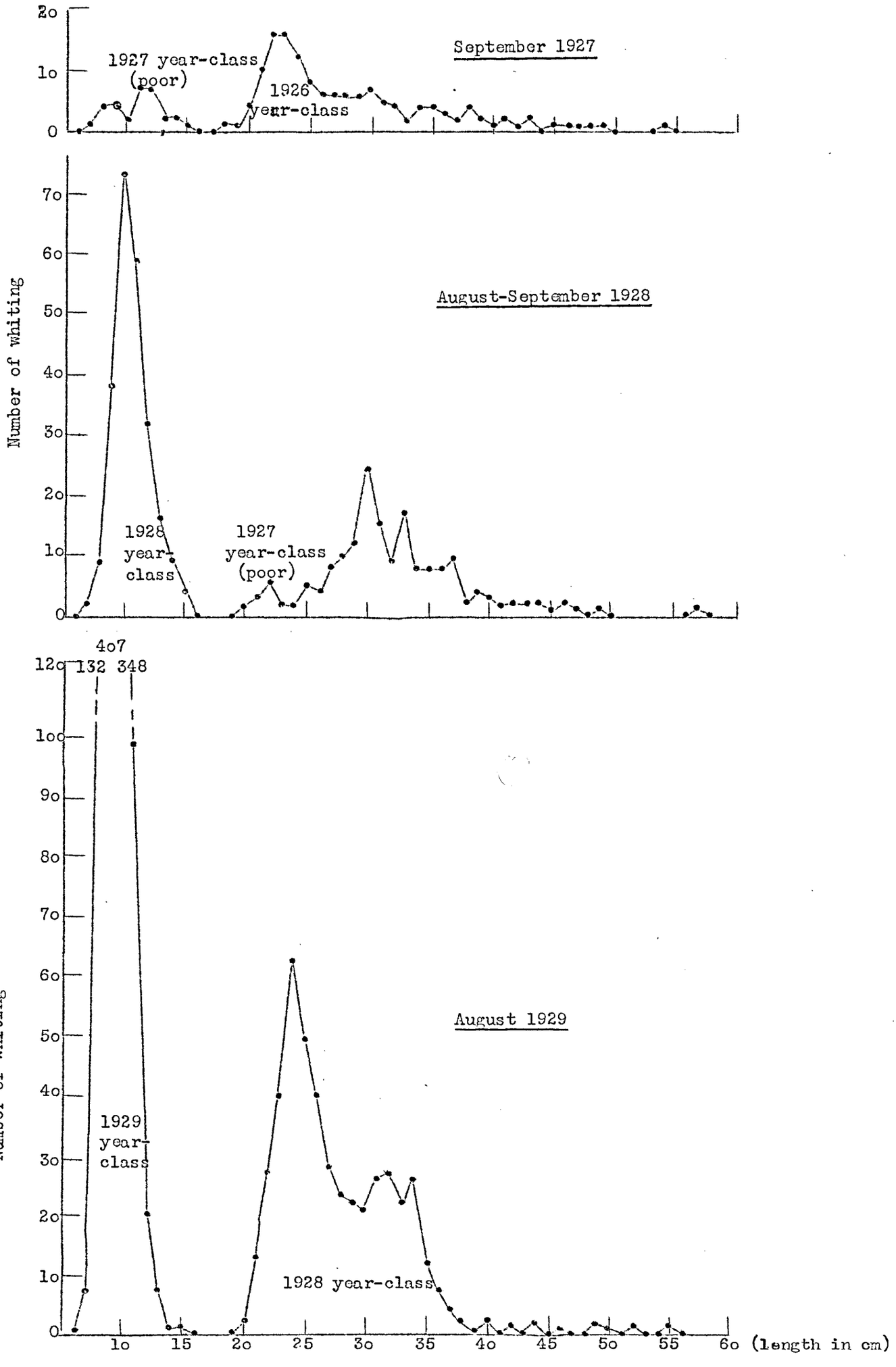


Figure 1. Length compositions of Clyde whiting (No. per 10 hrs.' trawling by old "Explorer".)

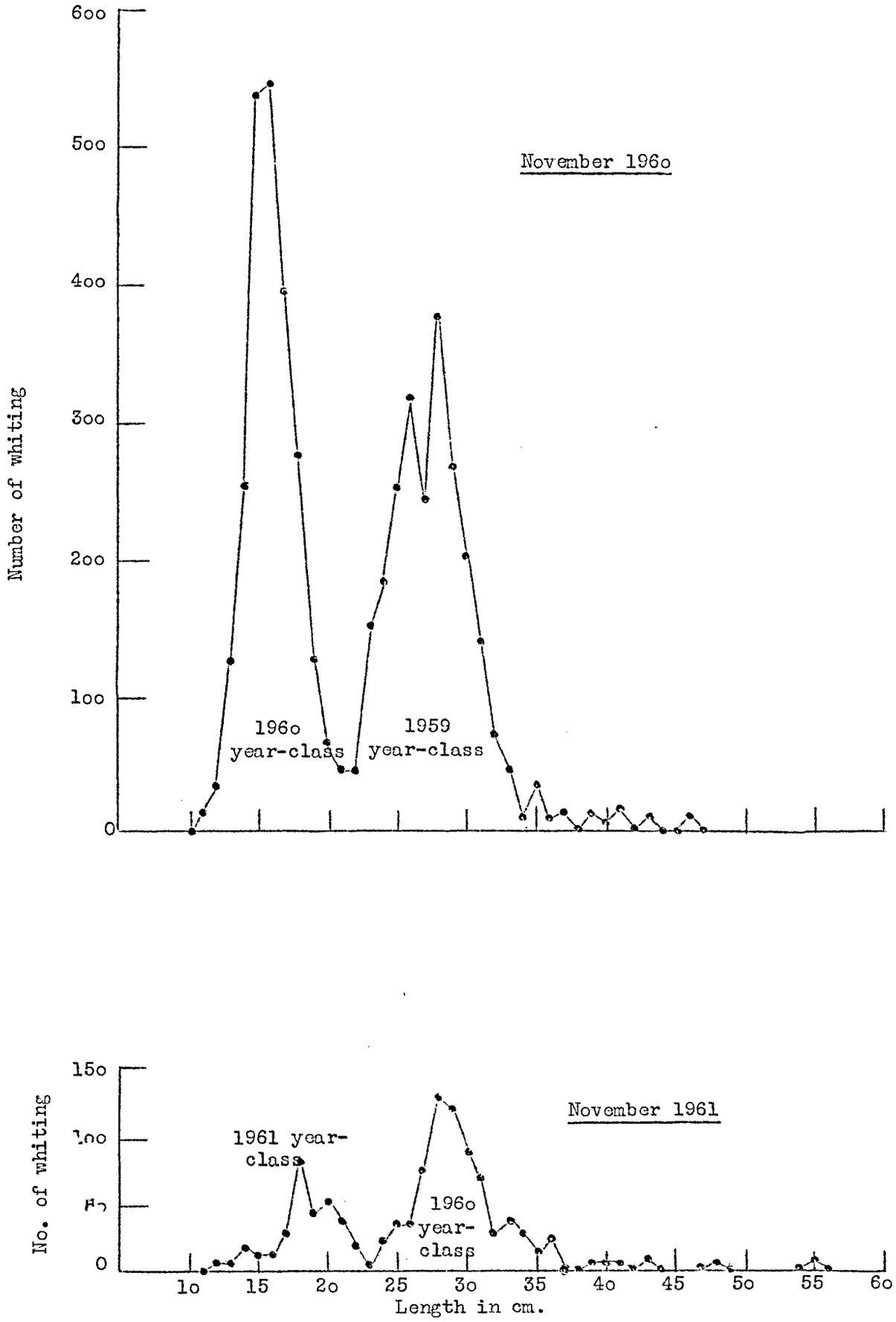
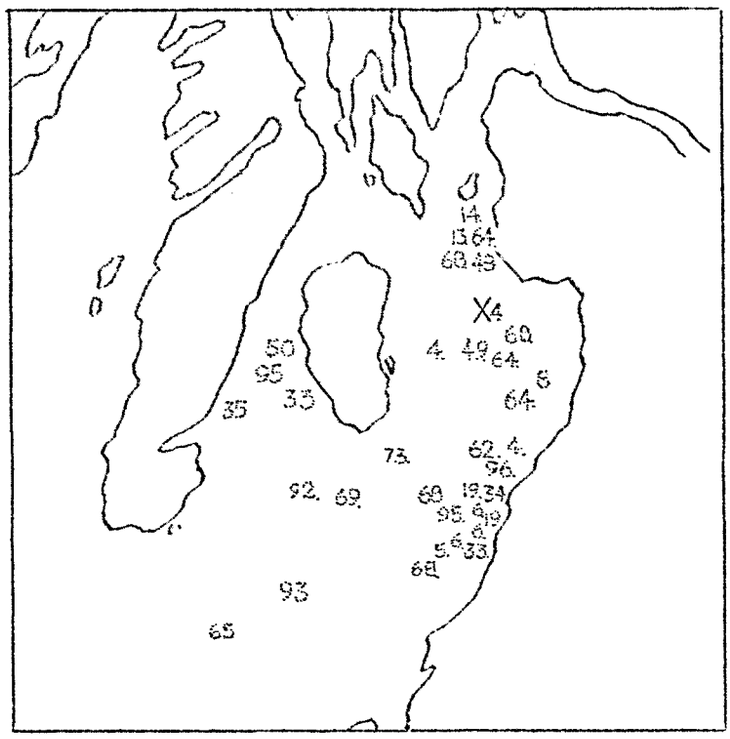


Figure 2. Length compositions of Clyde whiting. (No. per 10 hrs.' trawling by 'Mara').

Figure 3. Recaptures up to loo days after tagging



Tag returns from November 196o experiment (plotted as number of days free).

(X = liberation area)

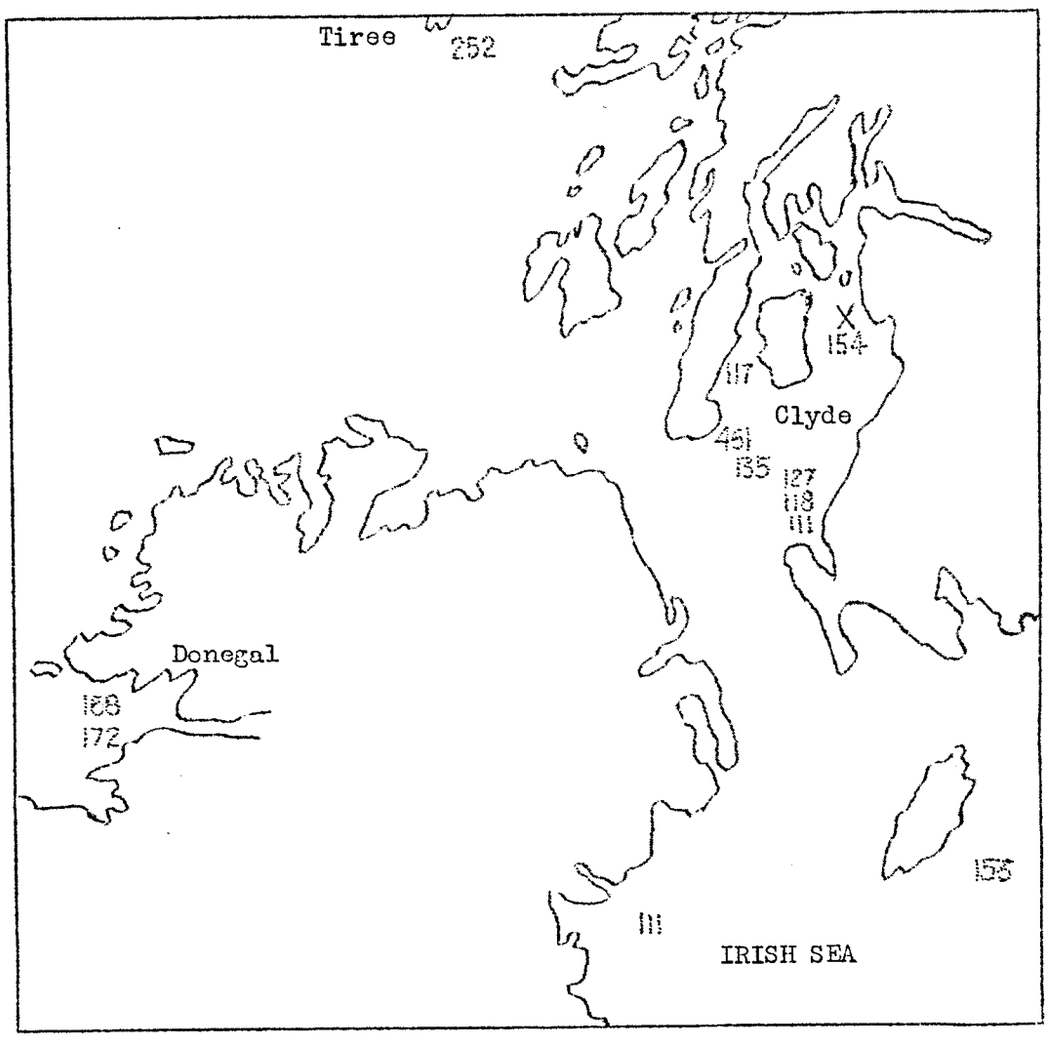


Figure 4. Recaptures made more than loo days after tagging.

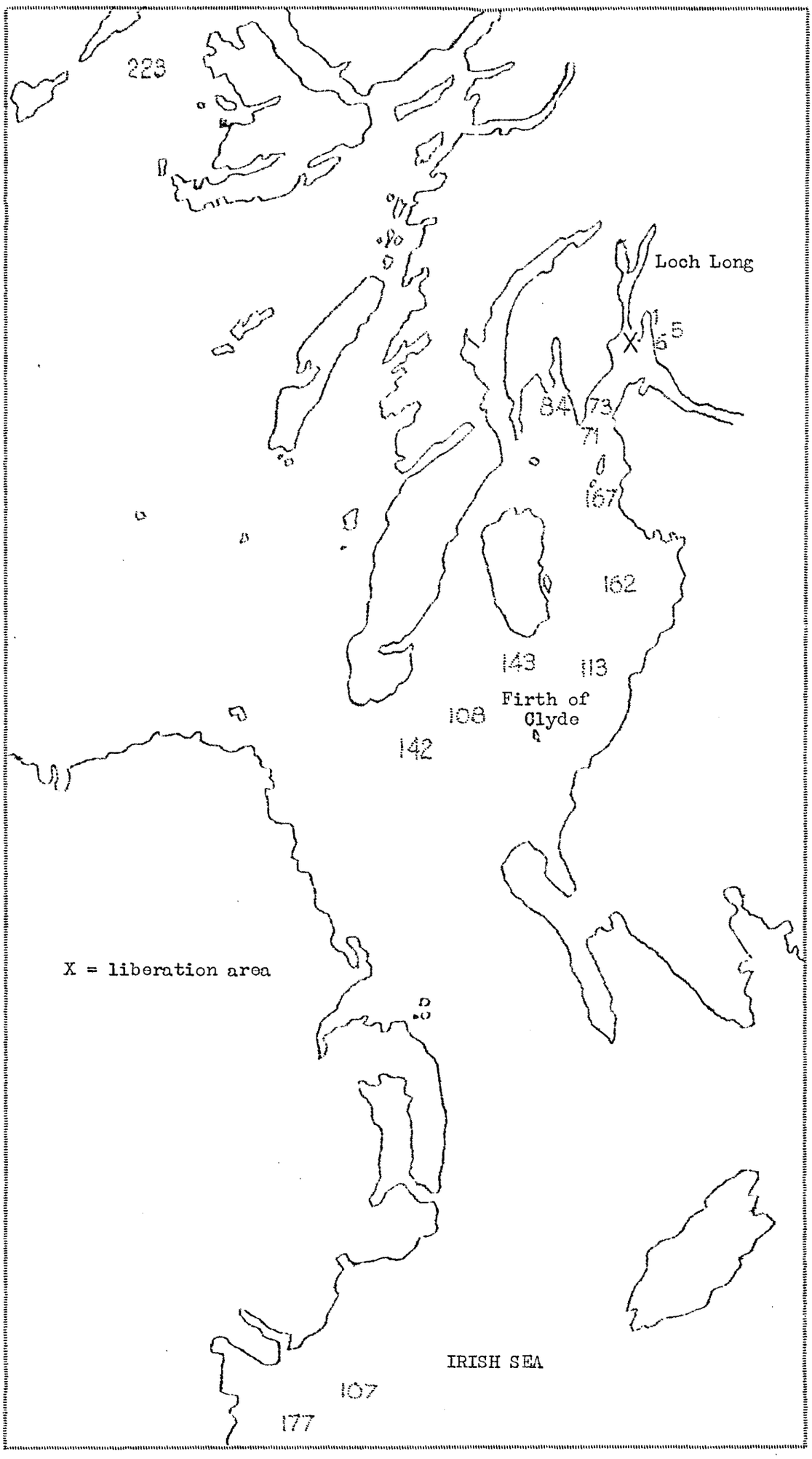
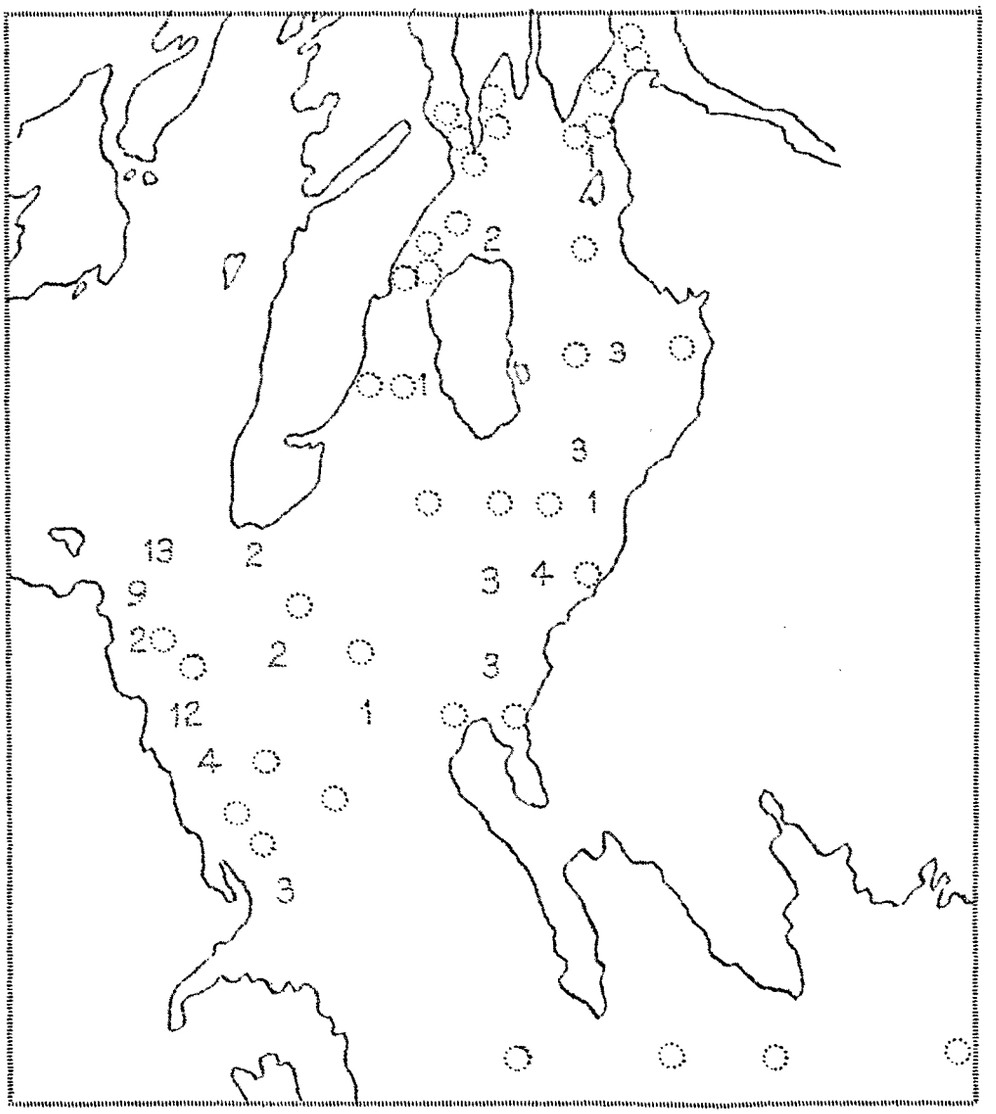


Figure 5. Tag returns from November 1961 experiment.
(plotted as number of days free).

Figure 6. Number of whiting larvae taken in 15 min. oblique plankton hauls. - May 1960.



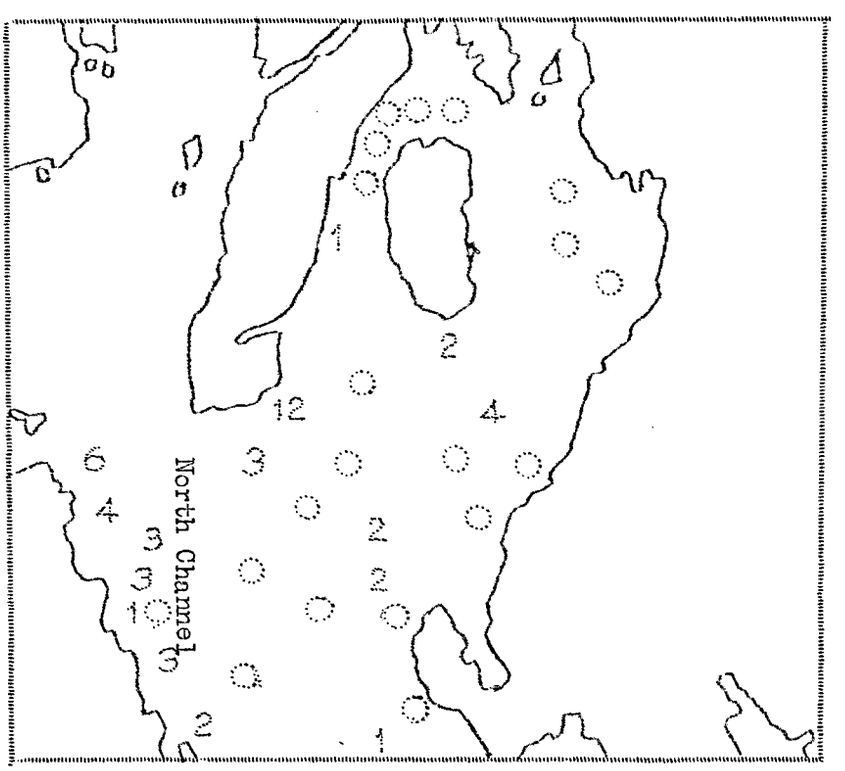


Figure 8. Average monthly landings of whiting per 1 day's absence by seiners fishing in the Clyde 1957-61.