International Council for the
Exploration of the Sea

C.M. 1963

Symposium on the Measurement
of Abundance of Fish Stocks

No. 19

# A Change in the Normal Diurnal Pattern of Capture of Soles during the Severe Winter of 1963

by

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During the severe winter of 1963 exceptionally heavy landings of soles were made by all countries trawling in the southern North Sea. In part the high catches were certainly due to changes in the normal winter distribution and density of soles, the fish being concentrated into the western part of the North Sea by areas of cold water extending outwards from the Danish and Dutch coasts. (These changes will be discussed in detail elsewhere). Very similar changes in the distribution of soles, associated with high catches, also occurred in the cold winters of 1929 and 1947 (Lumby & Atkinson,1929; Simpson, 1953). The lower temperatures during the winter of 1963 also caused some changes in the normal diurnal pattern of capture of soles by trawlers. These will be discussed here because the observations suggest that even if adequate allowance were made for the abnormally high densities on the trawling grounds, it would be misleading to include this winter's sole catches in estimates of the normal abundance of this species.

It is well known that the largest trawl catches of soles are made at night (Woodhead, 1963a) and this is almost certainly due to a change in their behaviour to fishing gear. From aquarium observations it seems likely that soles partly bury themselves into the sea-bed during daylight and may well bury more deeply when a trawl approaches; at night they may roam more freely over the bottom, and in this case it might be expected that they would more easily be disturbed by the trawl footrope, and caught. During the recent winter large numbers of dead soles were reported in areas to the south of the Dogger Bank where high catches were made (Woodhead, 1963b), and it was probable that most of the live fish caught were in a semi-torpid condition; in such circumstances it seemed that the soles would be unlikely to bury to avoid the trawl, and that the very large catches were partly due to this change in vulnerability to the fishing gear.

This hypothesis implied that there would be little or no evidence of diurnal changes in the size of sole catches during the cold periods. Fortunately during this period Skipper I. S. Down of the Lowestoft trawler 'Highland Lady' made a report for each of his trawl hauls on a cruise in late March 1963. Skipper Down was trawling for soles and plaice in the area of the Cleaver Rough (position approximately 54°oo'N, 2°55'E to 3°1o'E) and on a ground in the Silver Pits (position approximately 54°oo'N, 1°55'E to 2°15'E), where heavy catches were being made, and four or five dead soles were also taken in each trawl haul. Analysis of his report for twenty-three night-time hauls and thirty day-time hauls, yielding 3,oookg of soles, showed no increase in catch at night, Table 1.

Table 1. Sole catches, "Highland Lady"

| | No. of hauls | Total catch x) | Catch/ haul | Variance $^2$ | Day:Night Catch | Difference (P) |
|---|---|---|---|---|---|---|
| Day | 33 | 2,o51 | 62.2 | 4o | 1:1.oo | Not significant $p > o.9$ |
| Night | 23 | 1,429 | 62.1 | 22 | | |

x) Catch in kgs, all hauls raised to same duration.

For the purposes of comparison with the catches of the "Highland Lady", three cruises made by the "R. V. Platessa" during March and early April in the normal winters of 1959 and 196o gave mean night catches which were 177, 174 and 191 per cent greater than those during the day, Table 2.

Table 2. Sole catches, "R. V. Platessa" 1959 and 196o

| | No. of hauls | Total catch[x)] | Catch/ haul | Variance $^2$ | Day:Night catch | Difference(P) |
|---|---|---|---|---|---|---|
| Day | 29 | 29o | lo.o | 23 | 1:1.77 | Significant p = o.ool |
| Night | 21 | 371 | 17.7 | 79 | | |
| Day | 21 | 349 | 16.6 | 189 | 1:1.74 | Significant p <o.ol >o.ool |
| Night | 37 | 1,o71 | 28.9 | 288 | | |
| Day | 18 | 186 | lo.3 | 41 | 1:1.91 | Significant p = <o.ool |
| Night | 52 | 1,o23 | 19.7 | 96 | | |

x) Catch in number of soles, all hauls raised to same duration.

The cruise of the "Highland Lady" was made after the period of highest mortalities of soles and reports of dead fish were rapidly decreasing as water temperatures rose. During the coldest period water temperatures in the Silver Pits probably fell to 2°C, but at the time of Skipper Down's report they were between 3.o and 3.5°C (observations made by "R. V. Platessa"). On the "Platessa" cruise in 1959 water temperatures were between 4.5°C and 7.o°C, and in 196o between 4.5°C and 5.o°C.

The results presented in this paper support the suggestion that the behaviour of the soles, at the low temperatures obtaining in the winter of 1963, was atypical, leading to an exceptional increase in vulnerability to the trawl, and that this contributed in part to the very large catches of North Sea soles.

References


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