Mr. W. Wood.

Confidential.



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# CRUISE REPORT.

## F.R.S. "SCOTIA."

## April - May, 1951.

### AIMS.

The object of this cruise was to carry out a detailed biological and hydrographic survey of the Faroe plateau and to carry out extensive haddock marking experiments there.

### GENERAL.

"SCOTIA" left Aberdeen at 14.00 hours on the 23rd of April and proceeded towards Faroe Bank via Butt of Lewis, where a trawl and station were carried out. A heavy south westerly swell was running through the Faroe-Butt of Lewis Channel, such that trawling on Faroe Bank would have been dangerous, and accordingly the course was altered for the east side of Sydero, where the first stations were carried out.

"SCOTIA" completed several stations to the east of Faroe but then, by the 26th of April, there was a fresh wind blowing from the north-east, making the off-shore and northerly stations unworkable. Accordingly the next 48 hours were devoted to a series of trawl hauls in area XX22b, just off Nolso, with the object of tagging haddock and investigating the "day and night" phenomenon, which occurs during the first part of the year.

The following two days were passed in Klakksvig by which time the wind had decreased so that it was possible to continue with the programme until, by the 6th of May, all but four stations had been completed. "SCOTIA" finally returned to Aberdeen at 02.00 hours on 7th of May.

### HYDROGRAPHY.

Temperatures and salinity samples were carried out at 39 stations at positions all round the islands. Surface temperatures were highest to the north-west of Faroe, averaging 7.93°C by day and 7.34°C by night, whilst the lowest values were observed to the east where these temperatures were 5.97°C and 6.14°C respectively. Bottom temperatures were similarly distributed and were, on the average, only 0.32°C lower than the surface temperatures.

### PLANKTON.

Sampling with the Hensen 1 metre vertical and standard nets was carried out as indicated on the programme, a flow meter being used with the two former nets.

Both phyto- and zooplankton were taken in moderate concentrations at all stations, the former being represented almost entirely by a species of Coscinodiscus. Copepods, principally Calanus and Oikopleura, were well represented in all areas with species of Sagitta occurring less regularly. Gadoid eggs and larvae were only sparsely represented in the collections, the greatest number of eggs being taken at stations to the north and east of the islands.

### TRAWLING. /

TRAWLING.

The "day and night" phenomenon.

The magnitude and significance of this phenomenon which is said to occur each year from January to May is clearly demonstrated by the experiments carried out at station 30 of Nolso. Five hauls by daylight and six during darkness were carried out over a period including two days and two nights in depths from 40 to 50 fathoms. One daylight haul in 30 fathoms which had clearly been on a different type of bottom and one "dark haul", in which the net was torn, have been excluded from the table below which shows the relevant data for the principal species caught.

TABLE 1.

Catch/1 hrs. fishing of Haddock, Cod & L.Sole - Station 30.

| Date. | Time hrs. | Haddock. 1 yr. | 2 yrs. | 2 yrs. & older. | Total. | Cod | Lemon Sole. | |
|---|---|---|---|---|---|---|---|---|
| April. | | | | | | | | |
| 26 | 09.45 | 133 | 19 | 2 | 154 | 4 | - | |
| 27 | 14.30 | 40 | 26 | 2 | 68 | 3 | 2 | |
| 27 | 16.15 | 22 | 27 | 2 | 51 | 1 | - | |
| 28 | 06.40 | 10 | 11 | 3 | 24 | - | - | |
| | | 205 | 83 | 9 | 297 | 8 | 2 | Total |
| | | 51.2 | 20.8 | 2.2 | 74.2 | 2.0 | 0.5 | Average. |
| 26 | 23.00 | 236 | 279 | 35 | 550 | 8 | 14 | |
| 27 | 22.00 | 58 | 76 | 6 | 140 | 7 | 6 | |
| 28 | 00.15 | 10 | 119 | 53 | 182 | 9 | 12 | |
| 28 | 03.30 | 42 | 198 | 46 | 286 | 8 | 18 | |
| 28 | 04.45 | 80 | 144 | 16 | 240 | 4 | - | |
| | | 426 | 816 | 156 | 1398 | 36 | 50 | Total |
| | | 108.5 | 204.0 | 39.0 | 349.5 | 9.0 | 12.5 | Average. |

It is quite clear, without any detailed analysis, or allowance for a possible bias due to a steady depletion in the number of fish on the ground, that the catches of lemon sole, cod and two-year and older haddock were far greater during the hours of darkness than by day. This phenomenon is less clearly shown by the numbers of one-year haddock, and it would be unwise to draw any conclusion regarding these fish on so little data.

The fact that "night fishing" is not confined to area XX22b became quite clear as the cruise progressed and below are given the average numbers per hour's fishing of the principal species taken by daylight and by darkness in other areas.

TABLE 2 /

TABLE 2.

| | Haddock | | Cod | L. Sole |
|---|---|---|---|---|
| | 1 yr. | 2 yrs. & older. | | |
| Day | 7.6 | 9.3 | 0.9 | 0.9 |
| Night | 2.0 | 37.6 | 4.7 | 4.7 |

As an explanation for the dimunition in the catches of round fish during the day, it is suggested that these fish had erely moved vertically upwards off the bottom during these hours, although this cannot be expected to apply to lemon sole. An alternative explanation that has often been advanced, namely, that the fish move off into deeper water during the day, is I think, less probable either for round fish or for lemon sole, since a very considerable horizontal movement would be necessary to take the fish into a depth out of reach of the commercial trawler. It is quite possible however that there is a tendency to frequent rougher grounds during the daytime where it would not be possible to catch them.

In an attempt to catch fish off the bottom several pelagic hauls were made during daytime, using both "SCOTIA'S" trawl and also Mr. Craig's otter trawl.

This latter, which was of 2" mesh throughout (except for the cod-end which was of 1¾" mesh), and otherwise similar in design to that of an ordinary otter trawl, was towed pelagically at engine speeds ranging from 65 to 100 r.p.m. Judging by the angle between the warps on entering the water, the net was fishing well, with the mouth wide open as was also true of "SCOTIA'S" trawl when fished pelagically.

No fish at all were taken in any of these pelagic hauls which were carried out with the nets fishing some 10-30 feet off the bottom, but this is not necessarily indicative of an absence of fish since the shape of an otter-trawl, with its foot rope well behind the head rope, is admirably suited for permitting fish to escape by darting beneath it.

TAGGING.

A total of 195 haddock were successfully tagged and liberated, principally during hours of darkness so that the mortality due to gulls eating them at the surface should have been very low. The tag used was a numbered strip of red plastic passed loosely round the body just behind the joint of the pectoral fins and anchored by a piece of nickel wire just in front of the first dorsal fin. It is expected that these tags will prove more distinctive to fishermen than the green flag used in last year's experiments.

GENERAL.

Young haddocks of one or two years of age were all immature, whilst only 3% of the older ones were ripe. The remainder were all spent, and it was clear that the spawning season for haddock was practically at a close, as was also shown by the scarcity of gadoid eggs and larvae in plankton collections.

ESTIMATIONS /

ESTIMATIONS OF THE DEPTH BELOW THE SURFACE OF "SCOTIA'S" TRAWL FISHING PELAGICALLY.

The depth at which the net was fishing was estimated from the length of warp paid out and by measuring the angle between the warps and the vertical with a clinometer (constructed by Mr. Forbes), on the assumption that the warps descended to the boards in approximately a straight line.

The validity of this assumption was roughly tested as follows :

(a). By fishing in a constant 84-86 fathoms of water at 75 r.p.m., with 253 fathoms of warp (from block), the angle between the warp and vertical was found to be 71 - 72°, giving an estimated depth of 80 fathoms for the boards.

It is clear that if the path of the warps from towing block to boards was convex the true depth of the boards would be greater than that calculated in this manner, and thus the boards would have been running along on the bottom. That this was not the case was clearly shown from an examination of the metal runners on the boards on hauling, and it was concluded that the path of the warp was not appreciably convex.

(b). By fishing in a constant 80 fathoms of water at 75 r.p.m. with 250 fathoms of warp, the angle between warp and vertical was found to be 71 - 72° giving an estimated depth of 79 fathoms for the boards.

If the path of the warps had been concave, the depths of the boards below the surface would have been less than that calculated and hence they would have been off the bottom or at most only pressing lightly on it. On examining the runners however, it was clear that the boards had been biting deeply into the bottom, and so it was concluded that the path of the warp was not appreciably concave.

The conclusion that the path of the warp from block to board was therefore approximately that of a straight line is admittedly not completely justified on so little evidence, and corroboration by using a depth recorder is, of course, essential but at least this evidence is not contrary to that supposition.

This conclusion is also supported by the results obtained by Parrish* (1950) where it is shown that over a range of depths up to 30 fathoms, there was a linear relationship between warp length and depth of net for an engine speed of 90 r.p.m.

Provided the angle between the warp and the vertical remains approximately constant when varying lengths of warp were paid out (for any given engine speed), this result is consistent with the idea of the warp passing in a straight line from block to boards, and that this is so was confirmed for lengths of warp equal to 175 fathoms, 200 fathoms, 225 fathoms and 250 fathoms, at an engine speed of 75 r.p.m.

ECHO-SOUNDING.

Throughout the cruise the laboratory echo-sounder (Hughes MS 24) was run continuously during each trawl haul. This was invaluable in showing the regularity of the ground being trawled during experiments at station 30 and also for keeping a close watch on the depths when trawling pelagically near the bottom.

No /

No traces of fish either on or off the bottom were obtained at any time during the 24 hours.

R. JONES.

11th May, 1951.

* Parrish. 1950. "Report on trials made with pelagic trawl "F.R.S. "SCOTIA" 18-19th October, 1950.

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