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International Council for  
the Exploration of the Sea

C.M.1980/1: 18  
Pelagic Fish Committee

Assessment of blue whiting stocks and prospects  
of their fishery in the Norwegian Sea

by

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Abstract

The value of blue whiting biomass is given according to the results of investigations carried out on the FRV "Artemida" in the Faeroe Islands area in June 1979. At that time commercial concentrations were distributed in the area from 63°00'N to 64°30'N between 01°30'W to 04°15'W. Blue whiting migrated actively north-eastward to feed in the Norwegian Sea off-shore waters; thus, the biomass value obtained (3.4 mill.t.) proved to be underestimated. To judge by the estimate of stocks obtained a feasible yearly catch of blue whiting in the Faeroe Islands area may account for no less than 500 thou.t.

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### Résumé

Les résultats des recherches effectuées à bord du BRS "Artémida" en juin 1979 ont permis d'évaluer la masse biologique du poutassou dans la région des Iles Faerøer. Lors de cette période les concentrations de pêche se trouvaient entre 63°00' - 64°30' latitude nord et 01°30' - 04°15' longitude ouest. Le poutassou se déplaçait activement vers les lieux d'engraissement dans la direction nord-est en haute partie de la mer de Norvège ; ainsi la valeur obtenue de la masse biologique (3,4 millions de tonnes) s'est trouvée considérablement baissée. En fonction de l'évaluation des ressources effectuée, la pêche annuelle du poutassou dans la région des Iles Faerøer peut ne pas être inférieure à 500 mille tonnes.

### Introduction

A sharp increase in the intensity of blue whiting fishery in the North-East Atlantic is observed recently. So, if in 1977 the total catch of the fish by all countries was 214.4 thou.t., in 1978 it increased to 446.4 thou.t. and in 1979 it exceeded in all probability 1 mill.t. Under those conditions the necessity for more thorough study of biological aspects of blue whiting life cycle and working out methods of rational utilization of their stocks becomes apparent.

### Materials and methods

From June 7 to 20 1979 the assessment of blue whiting abundance and biomass was carried out on the FRV "Artemida" with the aid of an echo sounder HAG-451 and echo integrator IS-1. Operating conditions of echo sounder: range - 0-400 m, frequency - 50 kHz, power - 2 kw, impulse duration - 1 ms, gain in position 7, without TVG. Operating conditions of echo integrator: time constant - 0.5 s, gain coefficient - 1:3, echo signal threshold in position 3, integration interval - 195 m, TVG regime - multiple target, mode of operation - for time T.

Storage of echo integrator in conventional units during a 5-mile running corresponding to 1 line of paper tape of the recorder (1 conv.u. = 4 mm) was taken as a relative index of density. Distribution of echo intensities in the Faeroe zone according to the results of the survey is given in Fig.1.

Echo integrator was calibrated on a scattered fish concentration at night when single specimens were recorded. During calibration echo sounder was working in the range of 0-100 m and echo integrator in the following regime: range - 40-60 m, TVG - "on", gain coefficient 1:1, time constant - 0.1 s.

According to the data obtained an equation of calibration was developed by the least squares method:

$$\rho_A = 125000 I - 2000$$

Values of specific abundance (number of spec. per sq.mile) were calculated from readings of echo integrator according to equation of the acoustic calibration and were plotted on a chart of the survey (Fig.1). Boundary lines of concentrations and isolines of specific abundance of 1 and 3 mill.spec. per sq.mile were drawn on the chart. Areas were computed and average specific abundances in

each zone were calculated, fish abundance in zones and total abundance being determined thereupon. Results of calculations are given in Table 1.

Data on length/age and weight composition of blue whiting concentrations were collected from catches of control trawlings with a pelagic trawl. Age of fishes was determined by otoliths.

#### Discussion

During the survey blue whiting abundance in the Faeroe zone was  $26 \cdot 10^9$  spec. or 3.4 mill.t. (with mean weight of 1 spec. being 130 g). Considering that just then fishes migrated actively to feeding grounds situated beyond the limits of economic zones and a major part of blue whiting concentrations was distributed beyond the area of the survey, the biomass of commercial stock proved to be underestimated. The analysis of length/age composition (Tables 2, 3) shows that blue whiting are similar to the Atlanto-Scandian herring in lifetime. Mature specimens 28 to 32 cm long at an age of 6 to 11 years with the maximum age of 23 years prevailed in catches. Therefore, when calculating an optimum regime of the stock exploitation the value of natural and fishing mortality equal to 19% was taken as a first approximation (Benko, 1973). With this provision, the value of the feasible yearly catch of blue whiting in the Faeroe zone will be 510 thou.t.

It should be noted that the most reliable data on the size of blue whiting stock may be obtained in late February - early April when most of the stock is concentrated on the spawning grounds westward of Great Britain. But the Soviet research vessels have no permission to conduct investigations in that area.

As the results of the Norwegian and Scottish investigations showed, the blue whiting stock accounted for 6-8 mill.t. (Nakken, 1979) which permitted to take 0.9-1.2 mill.t.

Thus, under conditions of the intensive development of blue whiting fishery in the North-East Atlantic one of the urgent problems is to refine the value of their feasible catch. Solving of that problem is possible with the coordination of investigations and fisheries carried out by participating countries.

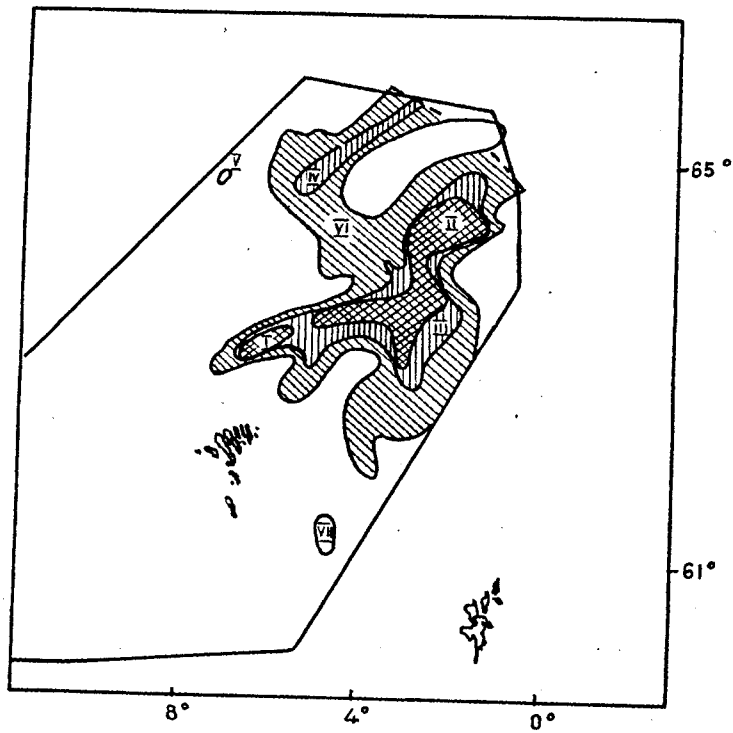
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Headings for Figures

to the paper by M.L.Zaferman et al. "Assessment of blue whiting stocks and prospects of their fishery in the Norwegian Sea"

Fig.1 Chart of the acoustic survey of blue whiting in the Norwegian Sea.



## Abundance of blue whiting in the Faeroe economic zone

| No. of zone | Area, sq.mile | Specific abundance, $10^5$ spec/sq.mile | Abundance, $10^5$ spec. |
|-------------|---------------|---|-------------------------|
| I           | 351           | 10,70                                   | 3756                    |
| II          | 2780          | 4,13                                    | 11481                   |
| III         | 2792          | 1,83                                    | 5109                    |
| IV          | 678           | 1,62                                    | 1098                    |
| V           | 42            | 1,40                                    | 59                      |
| VI          | 10288         | 0,41                                    | 4218                    |
| VII         | 314           | 0,29                                    | 91                      |
| Total       | 17245         |   | 25812                   |

Table 2

Length composition of blue whiting in June 1979

| Length<br>cm | 18  | 19  | 20  | 21  | 22  | 23  | 24  | 25  | 26  | 27  | 28   | 29   | 30   | 31   | 32  | 33  | 34  | 35  | 36  | Number of<br>spec. |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|--------------------|
| %            | 0,1 | 0,2 | 0,5 | 0,6 | 0,4 | 0,2 | 0,3 | 1,6 | 3,8 | 8,0 | 14,5 | 20,0 | 21,8 | 15,4 | 7,3 | 3,5 | 1,1 | 0,6 | 0,1 | 11546              |

Table 3

Age composition of blue whiting in June 1979

| Age | 3+  | 4+  | 5+  | 6+  | 7+   | 8+   | 9+   | 10+  | 11+ | 12+ | 13+ | 14+ | Number of spec. |
|-----|-----|-----|-----|-----|------|------|------|------|-----|-----|-----|-----|-----------------|
| %   | 1,0 | 2,5 | 4,0 | 9,0 | 15,0 | 16,0 | 20,0 | 12,0 | 9,0 | 6,5 | 4,5 | 0,5 | 200             |