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In Confidence: Not to be quoted without reference  
to the Laboratory.

## CRUISE REPORT

F.R.S. "EXPLORER"

13th April-18th May, 1967.

Narrative

"Explorer" sailed from Aberdeen at 02.00 hours on Thursday 13th April and proceeded to a position west of the Butt of Lewis. A line of plankton stations was worked on an echo-survey grid down the 100 fathom line to the west of the Hebrides and several deep-water stations were completed. The ship called into Campbeltown on Monday 17th April to land the Kelvin Hughes representative and after taking on water set out for Porcupine Bank a few hours later. Trawling commenced at a position East of the Bank at 15.00 hours on Tuesday the 18th and gear testing of the bottom trawl continued, with only short interruptions due to the weather, until Sunday 23rd. The mid-water trawl was worked from Sunday until Wednesday 26th when, after one last bottom haul which came fast, the ship set sail for Greenock. Plankton stations were worked intermittently during the trawling operations and hauls were completed every 30 miles on the steam to Greenock. Very good time was made and "Explorer" docked, mid-trip, at 19.30 hours on Thursday 27th April.

After victualling and changing the scientific personnel, fuel was taken on board and "Explorer" sailed for Rockall Bank at 16.30 hours on Tuesday 2nd June. The line of plankton stations out to the bank was twice interrupted by gale force winds and trawling did not start on the bank until Saturday 6th. On Sunday 7th a 24 hour station was worked about 100 miles S.E. of Rockall and a trawl haul, with the camera, and multiple plankton sampling, were carried out every 4 hours. Large numbers of blue whiting larvae were being caught and it seemed clear that the ship was in an area of very high larval abundance. An echo plankton grid of the area was started on Monday 8th and continued in excellent weather until Sunday 14th. Eight transects were worked across the Bank and one from North to South (see attached chart). "Explorer" steamed close to Rockall on the evening of the 14th and the Decca and Loran readings were both checked. A course was then set for the "Anton Dohrn" Bank between St. Kilda and Rockall and the ship worked an intensive grid of the area. It had been intended to trawl on the bank but it was discovered to be only a very sharp seamount with a minimum depth of about 288 fm. A line of plankton stations was worked North to Rosemary Bank where three transects were worked without any appreciable quantities of larvae being caught. Here again it was not found possible to trawl as the bottom topography was very uneven and no mid-water traces were seen. On Tuesday 16th a final line of stations was completed ENE to the Wyville Thomson Ridge and "Explorer" docked in Aberdeen at 21.00 hours on Thursday 18th June.

Trawling(a) Gear Testing

The gear testing work on the first part of the trip resulted in both the bottom and mid-water trawls being verified as operating satisfactorily. Preliminary depth-warp ratios were worked out for both gears and it was demonstrated that "Explorer" could fish satisfactorily to depths of up to 250 fm with the 600 fm of warp available on the main winch. The fitting of wider angle brackets on the curved doors resulted in a significant increase in the spread of the bottom trawl.

The Furuno depth telemeter was worked in conjunction with the mid-water trawl and the effects of changing the ships speed and the amount of warp out were assessed for the best procedure to adopt for changing the depth the net was fishing. Initially, the net was rather higher in the water than the boards but the fitting of two drilled bobbins adequately compensated for this.

A considerable amount of information on declination and divergence of the warps etc. was collected on both parts of the trip but the result of much of this will have to await more detailed analysis in the laboratory.

#### (b) Catches

During the first part of the trip catches of up to 25 baskets of blue whiting and up to 85 baskets of Argentina silus were taken in one hour with the bottom trawl to the S.E. of Porcupine Bank. No success was achieved with the mid-water trawl although this net was only shot in order to carry out the gear-testing work and no pelagic echo-traces were encountered on either part of the trip. The by-catch consisted mainly of Scorpaena dactylopterus, dogfish and hake. Two specimens of Oxydontus paradoxus were taken. The blue whiting in the catches were between 23 and 33 cm and were mainly in maturity stages  $\frac{1}{4}$ ,  $\frac{1}{2}$  and spent +. The A. silus on the other hand were all ripe running.

Fishing on Rockall yielded reasonable catches of blue whiting ranging from 16-56 baskets per 1 hour's trawl. The trawl catch composition varied considerably during the 24 hour trawling position consisting mainly of blue whiting during the hours of daylight and of Argentina sphyraena during the hours of darkness. The by-catch at Rockall was made up of haddock (average of 7 baskets per hour) and small quantities of ling and skate. At the most southerly position, 2 baskets of Chimaera were taken and one was preserved in formalin. Samples of Argentina silus and blue whiting were deep frozen for analysis in the laboratory and several of the less common dogfishes were also kept. The length composition of the blue whiting caught was from 23-30 cm and most were in maturity stages  $\frac{1}{4}$ - $\frac{1}{2}$ . The haddock were ripe but not ripe running.

#### Underwater Camera

On the only occasion when the camera was used on the trawl during the first part of the trip it came up flooded with the glass smashed. The flash unit of the second camera proved to be faulty. Further camera cases were made available for the second part of the cruise and the camera, fitted to the headline of the trawl, worked perfectly during the 6 hauls carried out at the 24 hour station. A preliminary examination of the photographs obtained, showed that most of the frames contained fish but any conclusions as to the orientation of blue whiting and argentines to the trawl will have to await a more detailed examination.

#### Plankton sampling

The principal object of the plankton work was to obtain accurate information on the depth distribution of blue whiting larvae. During the first part of the trip a number of "stepped", Gulf III hauls were taken but probably because of the patchiness of plankton distributions and the distance covered by the ship while doing a series of Gulf III's at 6 knots a cursory eye examination of these samples does not show up any striking differences between the samples taken at the different depths. Hauls were also taken during this part of the trip with the WP3 and surface nets.

An even greater emphasis was placed on the plankton work on the second half of the trip. A line of "stepped" Gulf III stations was worked out to Rockall Bank and during the 24 hour trawling station a series of stepped vertical WP3 plankton hauls were taken every 4 hours to 25, 50, 75, 100 and 150 m. Large numbers of larvae were caught.

A plankton/echo survey of the whole of Rockall Bank was carried out and an area of high abundance of blue whiting larvae was plotted. Plankton

hauls were taken every 10 miles and the net used for this survey was the WP3. Occasional comparative hauls were made with the Gulf III. The overall area of larval abundance was about 9,000 sq. miles, approximating to the area bounded by the 200 fm depth contour. This population of larvae was associated with a well defined echo-trace which extended, on average, from just below the surface, down to about 50 fm. The lower limit of depth varied, however, and the echo trace seemed to have a "cloud" effect. The edge of the larval concentration was clearly defined both in the plankton samples and on the echo trace. The area of dense echo trace and high blue whiting larval catches contained quantities of other plankton organisms more usually associated with "neritic" populations such as Calanus finmarchicus, decapod larvae and euphausiid furcilia. The "clear" water on the other hand was of "oceanic" origin and the plankton species included Sagitta maxima, Aglantha sp., Euclio sp., the diphyid Lensia conoidea and Physonectids.

During the survey at the southern edge of Rockall Bank, lantern fishes (myctophids) were common in the plankton catches at night and on one occasion "Explorer" steamed through shoals of these fishes, at the surface, for three hours at 9 knots. The 2 kw lamp lowered over the ship's side appeared to have a scaring effect.

Advantage was taken of the fair weather conditions to use the Furuno depth telemeter to calibrate depth-warp ratios for the WP3 net at different speeds from 1-3 $\frac{1}{2}$  knots and the Gulf III at 6 knots.

#### Echo-sounding

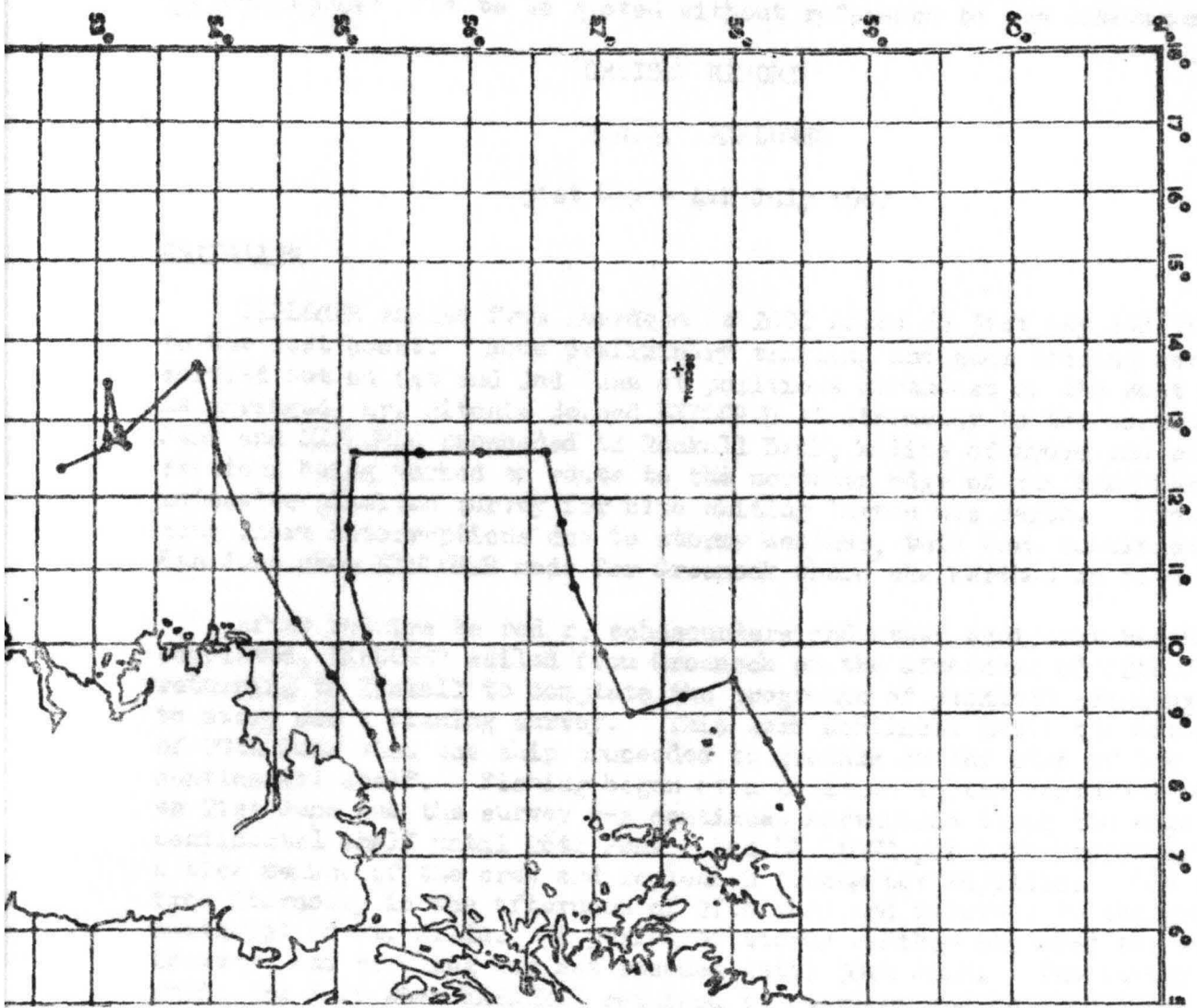
The Kelvin Hughes expert on the Humber echo-sounder was aboard for the first 5 days of the cruise and managed to get the equipment working satisfactorily. He also provided valuable instruction to the scientific staff on its operation. However, owing to the heavy swell running for most of the time, the subsequent echo-records obtained during the cruise were often of generally poor quality due to aeration at the oscillator. It was not possible to overcome this by using the towed oscillator. The Humber gear worked well on the second half of the trip and during the 24 hour trawl station some interesting changes in the echo-pattern of fish in the bottom 4 fathoms were observed.

The Marconi Fishgraph was run almost continuously during the whole trip and, in the Rockall Bank area particularly, a very good correlation was found between the presence of strong pelagic trace in the upper 50 fathoms and the occurrence of blue whiting larvae and crustacean zooplankton in the plankton samples. This has already been described above.

D.F.S. Raitt  
21st June, 1967.

EXPLORER'S COURSE AND PLANKTON SAMPLING POSITIONS.

A: 13.4.67-27.4.67



B: 2.5.67-18.5.67

