In Confidence: Not to be quoted without reference to the Laboratory. 2/3ER68

CRUISE REPORT

F.R.S. EXPLORER

11th March - 24th April 1968

Narrative

"Explorer" left Aberdeen about 2300 hours on Monday, March 11. The following day, however, an involuntary stop had to be made at Scrabster to land one of the catering staff for emergency medical treatment. The ship then proceeded towards Rockall but, after passing the Butt of Lewis, winds of storm force resulted in flood damage in the fore hold where it affected electrical equipment and other items. As a result, "Explorer" had to return to Stornoway to have the electrical apparatus removed for drying and repairs.

At about 0700 hours on Saturday, March 16, "Explorer" left Stornoway for Rockall, again in gale and storm force winds, so as to be able to start work on Rockall Bank as soon as the weather moderated. Work eventually proved possible on the morning of Tuesday, March 19, and for the next four days a general survey of the area was carried out. "Explorer" then proceeded to the area on the Bank where the best catches of blue whiting had been obtained to make further observations on diurnal catching rates and on the vertical distribution of blue whiting eggs. Further severe weather hampered this operation and only one 24-hour period was workable before the ship left Rockall Bank on Monday, March 25, for the Clyde, where she arrived for oil on the afternoon of Tuesday 26th, and later that night docked in Greenock.

Messrs Groves, Booth and Barron returned to Aberdeen by train on the morning of Wednesday, March 27, while Dr Fraser and Messrs Seaton and Ballance awaited the arrival of Messrs Adams and Conway, later that day, for a discussion of the results of the previous two weeks. Adams and Conway stood by "Explorer" at Greenock to take care of various arrangements until the remainder of the scientific staff joined the ship about 1800 hours on Friday, March 29.

"Explorer" left Greenock about midnight on Friday, March 29, and proceeded to the first station west of the Outer Hebrides. This station was occupied at 2325 hours on the 30th and work proceeded as planned until 1315 hours on Monday, April 1, when a sudden deterioration in the weather forced the first station on Rockall Bank to be abandoned. Up to this time, daily contact had been maintained with "Ernest Holt" with a view to the two ships carrying out comparative sampling for blue whiting eggs and larvae. The weather conditions that developed at this time however made this cooperation impossible.

The weather deteriorated further, and it was late on the night of April 3 before conditions began to improve. Because of the time that had been lost, it was decided to proceed overnight to the south end of the Bank where work recommenced early on Thursday, April 4. On commencing hydrographic observations at the same position, it was found that water had been forced into the electrical compartment of the forward hydrographic winch during the period of heavy seas. As a result, only one hydrographic winch was available for the remainder of that part of the cruise.

By about 1300 hours, on the 8th, all but three of the Bank stations had been completed. During the remaining 22 hours, before "Explorer" left for Stornoway, two trawl hauls were carried out at the position successfully fished during the first part of the cruise, and the other stations completed. "Explorer" docked at Stornoway early in the afternoon of Wednesday, April 10, and Mr. Ballance left the ship as planned.

"Explorer" again left Stornoway about 0930 hours on Friday, April 12. The excellent weather conditions which had characterised the last few days of the second part of the cruise still prevailed when she worked the first station of the third and last part of the cruise at 1230 hours on the same day. "Explorer" then proceeded towards Rockall, repeating a series of Gulf III and surface hydrography stations which had been sampled while on passage to Stornoway. On completion of this work, she proceeded to the west of the Bank for further studies of diurnal variation in catching rates. Work was concentrated in this area from 1840 hours on the 13th to 2030 hours on the 14th, and a further seven trawl hauls were completed. From then until 2400 hours on Saturday, April 20, a trawling, plankton and hydrographic survey was carried out; trawling was confined to daylight hours, the hours of darkness being used for plankton and hydrographic observations only. Weather conditions during this period were at times poor and the ship had to dodge for a few hours on the 17th, after which weather conditions improved.

Having left the Rockall area at midnight on the 20th, "Explorer" made excellent progress during the 21st, but during the 22nd thick fog was encountered and the ship had to proceed slowly towards Aberdeen, where she docked at 2130 hours that day. Most of the gear and samples were unloaded during the 23rd, but some items were left on board for a visit from the Chairman and other members of the WFA on Wednesday, April 24.

Trawling Results

Apart from two hauls during Part II of the cruise, trawling was confined to Parts I and III. Apart from two occasions when fishing was conducted in one locality in both daylight and darkness, to provide further information on the diurnal variations in catching rates, the results of which showed much higher catches in daylight than in darkness, the trawling survey was carried out in daylight.

Blue whiting and other "industrial" species

The main catches of blue whiting were obtained in water deeper than 300 m. Thus, as with the distribution of the larvae (see below), the main concentration was on the edge of the Bank, not on the Bank, which contrasted with the results obtained during the 1967 surveys when the main catches were taken in depths of 174-284 m. However, the earlier timing of the present cruise must be borne in mind.

The highest catch of blue whiting, 36,322 per hour haul (143 baskets) was obtained on the northern slope of the Bank. Other catches taken at similar depths ranged from 648 to 35,639 per haul, while in depths less than 300 m the catches ranged from 0 to 85 per haul.

During Part I the blue whiting were predominantly female, mainly at an advanced stage of maturity with a small percentage of ripe and running fish and extremely few spents. The catches contained more males than females during Part III and of the latter about 50% were ripe and running. Ripe fish and spents were present in equal numbers.

The second most important "industrial" species was Gadiculus, particularly towards the western slope of the Bank where up to 40,000 per haul, with a modal length of 13 cm were obtained. Silver smelts were present in most hauls but usually only in small numbers.

Other fish

Of the commercial species, large ling (up to 33 per haul in Part I and 246 per haul in Part III) were perhaps the most marked and characteristic feature. Haddock was present in most hauls (2-135 per haul during Part I, 2-245 per haul in Part III) but only one cod was obtained during the whole cruise. Saithe were present in some hauls.

Other fish included Chimaera, Scorpaena, Sebastes, Spinax, Pristiurus, Lophius, megrim, witch, lemon sole, dabs and various species of skate. One large halibut (female, spent) was taken and two variegated soles.

Gear investigations

Gear and ship monitoring equipment was on board to keep a check on the SARO bottom trawl. Divergence and declination of the warp at the towing block were measured whenever possible (the length of warp used on many of the hauls was too great to allow the appropriate meter to be used) and indicated that the net was behaving properly, although with a board spread of 150 ft it did not have as large a spread as normal. With a major fault in the ship's Chernikeef log and, at a later time, damage to the towed speed log, it was not always possible to obtain accurate speed readings but the speed was of the order of 4 knots. Propeller thrust was about 10 tons.

Although net damage due to coral was extensive during Part I, during Part III very little damage of this nature was experienced although in two very large catches considerable difficulty was found in landing the catch on deck.

Fish eggs and larval blue whiting

Having satisfactorily fertilised the eggs stripped from ripe and running blue whiting during the first part of the cruise, it was possible to show that the egg of blue whiting has no oil globule and is about 1.1 mm in diameter. Although the egg of blue whiting may thus be indistinguishable from that of saithe, and although detailed analysis of the samples has not yet been possible, it is believed that the concentrations of eggs found during the cruise were in fact mainly of blue whiting. (Further laboratory examination of the pigmentation of the embryos will, it is hoped, clear up this problem.)

A series of oblique hauls with a 1 m 60 net suggested that the main concentration of eggs was at a depth of 100 to 50 metres.

During the first part of the cruise there was an area of fish eggs, reaching numbers of 2,740 per 1 m 60 net haul, along the western edge of the Bank as marked by the 200 fm contour. During that part of the cruise sampling was not carried out far enough to the east to locate the eastern concentrations of eggs found during the second part of the cruise, when up to 1,671 eggs per Gulf III haul were obtained. The western concentration was again encountered during the second part but the centre of abundance appeared to be further north. There, an estimated number of 3,000 per Gulf III haul was encountered.

Yolk sac and later larvae were already present before 24th March when 75 per 1 m 60 net haul were obtained. Although these numbers were obtained at the most southern position sampled - 55°22'N 15°58'W - there was already a clear indication of the pattern that was to be found when larvae were at their maximum (up to 1,501 per Gulf III haul) during the third part, i.e. a distribution with the main concentration on or beyond the 200 fm contour, and not within the 200 fm contour as was found during the May cruise in 1967.

Hydrography and chemical observations

During Parts I and III only surface observations were obtained, with a few exceptions, while during Part II a detailed investigation at all depths was carried out. A large number of the temperature observations have yet to be corrected and the temperature distribution will not be discussed here.

Almost 600 salinity samples were analysed on board. The detailed sampling during the second part of the cruise showed salinities of 35.40‰ and greater to be present between the Bank and the continental slope west of the Outer Hebrides. Near the Anton Dohrn sea mount this high salinity water extended down to about 1,100 m but only to about 50 m just off the eastern edge of the Rockall Bank. Water of greater than 35.40‰ was also encountered

to depths of about 500 m at the south end of the Bank although to the west of the Bank only small areas of water greater than 35.40‰ were encountered. The waters over the Bank were characterised by salinities of less than 35.40‰, mostly about 35.37-35.39‰, but at the north end of the Bank an area of water of less than 35.35‰ salinity was found, to an average depth of about 150 m. This latter area of lower salinities was also indicated by the surface sampling during the first part of the cruise, and the lowest salinity recorded during the third part was also 35.35‰, again over the northern part of the Bank.

The results of phosphate, nitrate and oxygen sampling are not yet available.

Productivity

One hundred and forty chlorophyll a samples were obtained but have not yet been analysed.

Zooplankton - with special reference to indicator species

During Part I of the cruise all plankton sampling was carried out with 1 m 60 mesh nets; during Part II the Gulf III and W.P.3 nets were used while during Part III only the Gulf III was used.

A marked feature of many samples, in particular over the Bank, were large numbers of Pelagia. The siphonophores, Dimophyes arctica, Sulculeolaria biloba, Lensia conoidea, Agalma, Chelophyes appendiculata, Physophora, Vogtia and Rosacea were all recorded but the latter two, both Lusitanian, were found only over the deeper water as were also Stylocheiron longicorne, S. maximum, Euphausia krohnii and Nematoscelis megalops.

The zooplankton standing crop, although generally low, did appear to have increased by the end of the cruise.

J. A. ADAMS
J. H. FRASER
8th July, 1968