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Cruise Report

F.R.S. "EXPLORER

19th - 30th August, 1967

Narrative

"EXPLORER" sailed from Aberdeen at 1230 hrs on 19th August, and proceeded to the area between Rockall and St. Kilda. Instrumented gear testing was commenced on the 21st August, using the mid-water trawl on the port side. The weather was excellent, with very little wind, and a number of operations on that day were filmed. However, the succeeding days were overcast, with some mist and drizzle, which made colour filming impracticable. After three days, work with the mid-water trawl was concluded because of damage to the net, and the ship steamed to shallower ground off St. Kilda.

On the 24th August, having surveyed the ground by echosounder and found it to be good, the bottom trawl was used on the starboard side. Tests were carried out at depths ranging from 80 to 140 fathoms, using various lengths of warp. Filming of the activities on the ship was recommenced as the weather was dry and the light had improved. Catching rates were high, and it was clear that the gear was fishing well. Where the water was not too deep, the prototype telemeter unit was attached to the net, and its signals were successfully received by a receiver towed behind the ship. By the 27th, the tests using the longer bridle length (39 fm) were complete and the ship steamed into deeper water in order to test the handling of the spare mid-water trawl. This was successfully concluded by the end of that day, and the ship returned to St. Kilda.

Having fitted the shorter bridles (30 fm) to the bottom trawl, the gear was tested in the same conditions as previously. Where possible the telemeter or the Furuno depth transmitter was attached to the gear. The weather remained fine and a considerable amount of film was taken. Work was continued until the 29th August, when "Explorer" made for Greenock, where she berthed on the evening of 30th August. Equipment for the second part of the trip had been sent to Greenock by lorry, and this was transferred to the ship on the morning of the 31st. Instruments and other equipment were then loaded on to the lorry for the return journey, and the scientific staff then returned to Aberdeen by train.

Gear testing

A total of eighteen hauls was made, of which all but three were fully instrumented. These tests were a continuation of those carried out on "Explorer" last April.

(1) Mid-water trawl

In the past some difficulty has been experienced in handling the "Explorer's" mid-water trawl on account of its size. To counter this, a 'lazy decky' was attached to the net, and this proved to be very successful.

For the first three hauls the gear performed well and satisfactory readings were obtained from both the underwater and shipboard instruments. During the fourth haul, however, it became apparent that something was wrong as the fore deck tension cell showed a load of 10 tons against 2 tons on the after one. Having eliminated the possibility of instrument error the gear was hauled up. It was found that in addition to the boards being entangled, the two headline eyes and one footrope had parted. As a result of this the fore Mk IA transducer was lost, but all the other instruments were recovered complete with recordings. There are two possible reasons for this occurrence. When additional warp was payed out, one of the boards may have become

unstable, resulting in high stresses on the net. On the other hand, there may have been a weak link at some point on the net which gave under the strain of towing at maximum speed, thus causing higher than usual tensions to be applied to the remaining attachment points. In the latter case board instability may have been a contributing factor. Once the instrument records have been analysed, and the returned samples of damaged rope have been examined, it should be possible to give a more informed statement as to the cause of this event.

Repairs were effected on the net, but in subsequent tests further breaking of the headline and groundrope occurred.

Because of the high headline height and wide opening of the mid-water trawl, it is not possible to measure headline height with a single manometer unless the instrument is located on the top half and bottom half of the net on successive hauls. As two manometers were available, it was possible to carry out both these measurements simultaneously, the headline height being given by the sum of the two readings at a given time. Overall heights of about 33 ft were recorded, but the traces showed considerable oscillation about this figure.

Considerable data on the operating depth against warp length and speed for both mid-water trawls was recorded, but no significant difference in performance between the two could be detected. The acoustic link to the depth telemeter performed satisfactorily throughout these tests and sufficient reliable data were obtained to enable a study to be made of the sinking and rising rates of the gear, for various step changes in ship's speed.

(2) Bottom trawl

The ground which was worked was very good, mainly sand and shells, and this contributed to the excellent results which were obtained. The oscillations on the records were quite small, and thus step changes in parameters such as headline height could be seen which would otherwise have been masked. A fractured harness on the after MK II unit led to this instrument being removed from the gear for one haul, but the damage was quickly repaired. The MK II records were quite good, except that some traces were almost obscured by interference. This could have been caused by sonar equipment on nearby ships.

A large amount of data was obtained from these tests. Detailed conclusions on the performance of the gear must await the analysis of these data which is currently being carried out in the laboratory.

Telemeter equipment

A prototype net telemeter transmitter was used with the bottom trawl. The purpose of this experiment was to test the efficiency of the transmitter and receiver circuitry for high data transmission rates. On all trials, bar one, signals well in excess of the noise level were received at the ship. It was discovered after the unsuccessful trial that the transmitter was obscurred by a float and a quantity of webbing, which was clearly the cause of the trouble. One disturbing result was that the signal decay time following a pulse was rather long, about 100 milliseconds; this was due to multipath effects, which caused signals to be received via extraneous reflecting objects after the direct path signal has disappeared. It should be mentioned that the observed effect is probably the worst that could be obtained in practice, in view of the calm seas and the high biological content of the water. The transmitter system is now being changed to give a narrower vertical beam width, and this should lead to an improvement. Further experimental work at sea will be necessary in the near future before the design can be finalised.

Some trouble was experienced with the Furuno depth telemeter transmitter, which was traced to a faulty switch. A spare for this was not carried, but a temporary repair was effected which proved satisfactory throughout the trip. It was found that the normal arrangement of the receiver, mounted on a depressor towed behind the ship, was unsatisfactory due to instability of the depressor, particularly at high speeds. The Furuno receiver was therefore replaced by the net telemeter receiver and this produced excellent results. The only occasions on which this link failed were when the transmitter alignment was upset by abnormal net geometry.

Underwater camera

Wherever possible the underwater camera was used with both the midwater trawl and the bottom trawl. In the former case the photographs showed no fish, but with the bottom trawl some good shots of haddock, blue whiting and other fish were taken.

Motion filming

When the weather permitted, colour film was taken of the activities, both with the mid-water and bottom trawls. Thanks to the co-operation of the ship's officers and crew, it was possible to obtain a comprehensive record of the shooting of these gears, fully instrumented. In addition to this, shots of instrument preparation before the haul, and data collection afterwards, were taken, together with some film of shipboard instrument operation.

D. N. MacLENNAN,
5th October, 1967.