

MRH  
14-12-83

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IN CONFIDENCE: Not to be quoted without prior reference to the Laboratory

FRV 'Scotia'  
Cruise 12/83

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Report

9-29 November 1983

Objectives

1. To carry out a dual frequency (38KHz and 120KHz) echointegration and midwater trawling survey of herring and mackerel in the area to the north of Scotland and evaluate the use of the high frequency sounder for discriminating between herring and mackerel shoals.
2. To collect herring and mackerel pyloric caeca for parasitological investigations related to recruitment studies.
3. To collect data on individual weights of herring and certain other species for establishing length/weight relationships.
4. To collect herring ovaries for fecundity studies.
5. To collect water samples for radio-caesium monitoring.
6. Additional objectives were:
  - A. To collect live specimens of whiting and haddock for Laboratory studies.
  - B. To carry out tagging of any spurdog caught in trawls and of mackerel caught on handlines.

Narrative

'Scotia' sailed from Aberdeen at 1930 on 9 November and proceeded direct to anchor in Loch Eriboll to carry out a calibration of the sonar equipment, arriving at 1030 on 10 November.

Between leaving Loch Eriboll at 1630 on 10 November, and 2000 on 18 November a general echointegration and trawling survey was carried out within a sea area of approximately 9000 square miles. This employed a survey grid with parallel tracks approximately 20 miles apart running from close inshore to the edge of the continental shelf and extending from Noup Head to St Kilda. During 19 and 20 November a more intensive survey was carried out within the Minch and a second calibration was performed in Loch Erisort on the evening of 20 November. 'Scotia' docked in Stornoway for the half landing at 0800 on 21 November.

After sailing from Stornoway at 1000 on 22 November, four intensive surveys were completed covering areas where concentrations of fish had been detected during the general survey or where commercial fishing activity for herring or mackerel had recently been reported. The last of these surveys was completed at 2230 on 25 November off Thurso Bay, and an overnight course was then set for Foula. During 26 and 27 November a grid survey of the area to the west of Sumburgh Head, around Fair Isle and to the east of the Orkneys was completed and 'Scotia' anchored in Scapa Flow at 1830 on 27 November to carry out a final calibration of the echosounder equipment.

After sailing from Scapa Flow at 0400 on 28 November a grid survey was carried out in the area off Wick and Clythe Ness. At 1200 a course was set for Aberdeen where 'Scotia' docked at 1930.

## Results

During the general survey carried out over the first eight days of the cruise, echointegration watches were maintained continuously. The indications from this were that very few shoals remained compact and recognisable throughout the night, the majority becoming very diffuse, making identification and quantification impossible. Accordingly, the more intensive surveys performed during the latter part of the cruise were restricted to the period 0730 to approximately 2200.

All surveys were carried out at a speed of 10 knots and echointegration readings from both the 38KHz and 120KHz sounders recorded at half hour intervals.

During the course of the general survey a total of 15 midwater trawl hauls were carried out using the 'Scotia' pelagic sampling trawl (PT160) with 20mm codend, in order to identify echotraces. A further seven hauls were carried out during the subsequent more intensive surveys.

Representative samples of all species caught were measured and otoliths taken from herring, mackerel and sprats. In addition a total of 295 herring pyloric caeca were preserved in 70% alcohol and 15 stage III and IV ovaries preserved in Gilson's fluid. Approximately 100 mackerel intestines were frozen for subsequent parasitological examination. Individual weights were obtained for herring in the length range 24-31cm and horse mackerel in the range 16-40cm using a Mettler balance interfaced to a Commodore 3032 microcomputer. All herring and mackerel otoliths collected were examined for age determination, and these and all length distribution data logged on a floppydisk using a Commodore 8032 microcomputer and 8050 Disk-drive unit. A proportion of pyloric caeca collected from 1-group herring were examined for infection with the tag parasite Renicola in order to obtain a preliminary assessment of the extent of migration of this age group from the North Sea to the west coast of Scotland.

An attempt was made to transfer live whiting from a haul off Sumburgh Head to a sea water tank on deck for transport back to Aberdeen, but all of these fish died within a short period of time. There were no convenient opportunities to embark upon mackerel tagging.

Water samples for radio-caesium monitoring were collected off Cape Wrath and in the Pentland Firth. Seawater temperature and salinity at a depth of 4m were monitored continuously throughout the cruise.

## Pelagic Fish Distribution

### 1. Herring

Shoals of fish identifiable as herring were restricted to relatively small patches within the survey area. In particular, large marks were located to the south and west of St Kilda, to the north west of the Flannan Isles and in the Minch between Loch Inchard and Cape Wrath. Extensive echosounder marks 10-15 miles north of the Butt of Lewis proved extremely difficult to catch but the samples obtained suggest that these represented a mixture of herring and mackerel. Other smaller marks off Tolsta Head also yielded herring, but no other marks which could be positively identified as herring were found in the Minch.

Significant numbers of 1-group recruits were caught only off Tolsta Head and Handa, where they comprised approximately 20% of the catch, and off Copinsay to the east of the Orkneys. A preliminary examination of the

parasite fauna suggests that a proportion of this age group in the Minch may be immigrants from the Moray Firth area. Two-group recruits comprised 20-30% of the catch of herring in all areas except St Kilda where they represented only 2%.

Herring of maturity stages III and IV, presumed to be spring spawning fish, were very rare in all areas except at St Kilda where they represented an estimated 5% of the catch.

## 2. Mackerel

During the general survey, large echosounder marks identified by trawling as mackerel were encountered only in the vicinity of Nun Bank, Solan Bank and to the south of North Rona, and a fleet of 20-25 foreign purse seiners, presumed to be Norwegian or Farøese fishing for mackerel, was observed in this area on 10 and 11 November. Marks tentatively identified as being mixed herring and mackerel were encountered to the north of the Butt of Lewis. However, intensive surveys carried out on 24 and 25 November failed to locate any mackerel shoals in the Nun Bank, Solan Bank and Whiten Head Bank area, although large mackerel shoals were located around Sulasgeir on 17 November.

The majority of mackerel caught were of age groups 2 and 3 in the length range 31-35cm. Fish of 5-group and older were not common.

## 3. Sprats

Echosounder marks identified by trawling as sprats were encountered close to the Shiants and off Loch Erisort in the Minch. One small mark identified as mixed herring and sprats was identified off Copinsay.

## 4. Horse Mackerel

A large mark of horse mackerel in the length range 15-19cm was located close to the shelf edge, 25 miles north of the Flannan Isles, and larger horse mackerel were caught off the Butt of Lewis and in the Minch.

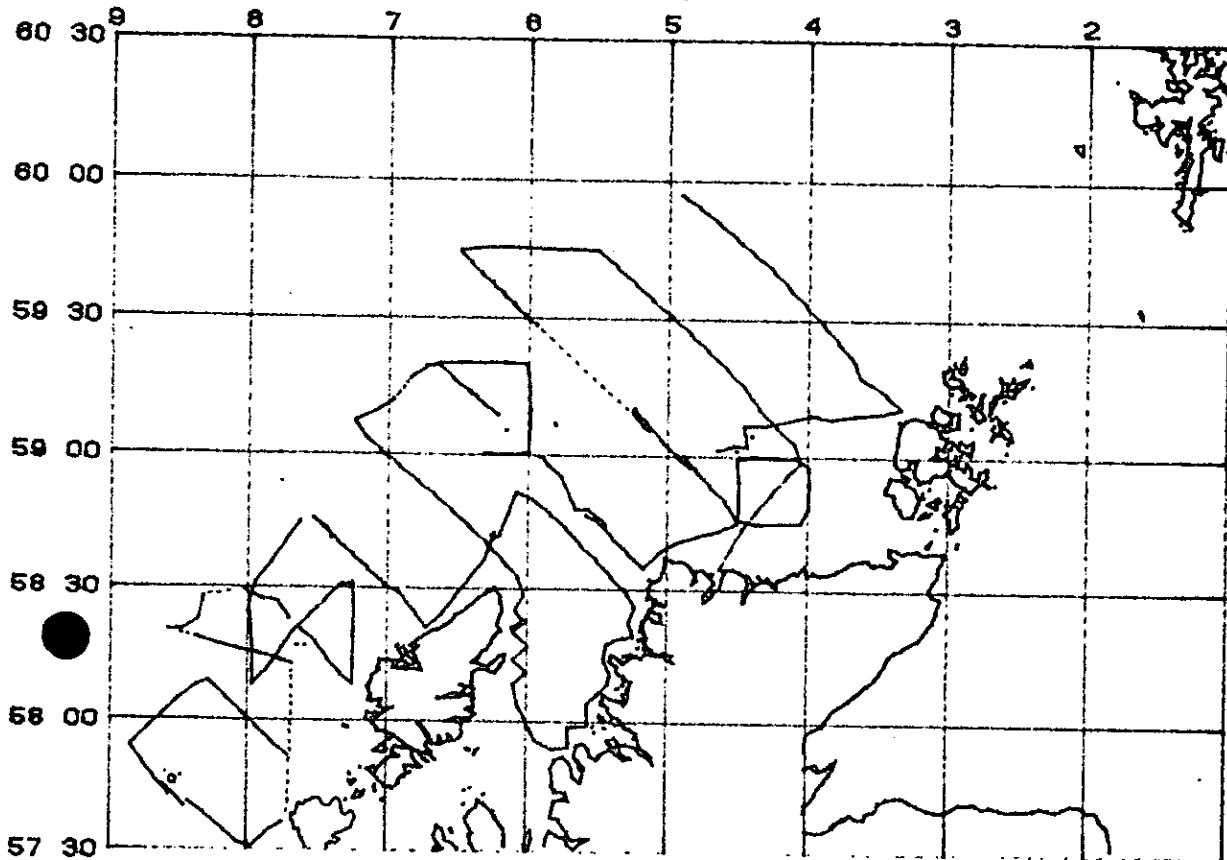
Echosounder marks representing fish shoals were extremely rare in the area surveyed to the east of approximately 04°30'W. Four days of intensive surveying in an area extending from Loch Eriboll to Sumburgh Head and south towards Wick located only two small marks worthy of identification by trawling.

Despite technical problems with a towed transducer and with some of the echointegration equipment (all of which were rectified), the high frequency (120KHz) sounder proved to be an extremely valuable tool for distinguishing between herring and mackerel shoals. Marks which were identified by trawling as mackerel were much more strongly represented on the 120KHz system than on the 38KHz sounder. By contrast, herring marks were represented to similar degrees on both sounders.

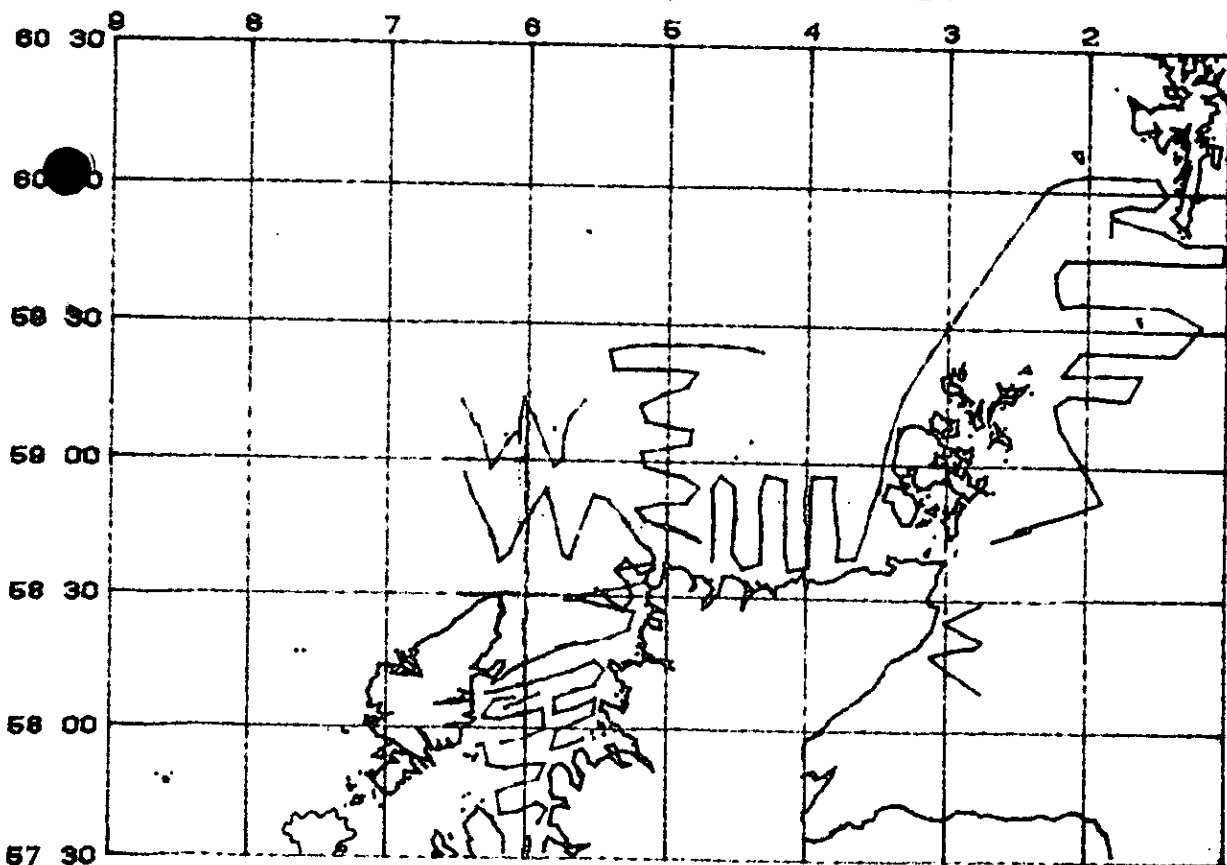
seen in draft  
W Findlay

M R Heath  
13 December 1983

GENERAL SURVEY TRACK 10-16, 18 NOVEMBER

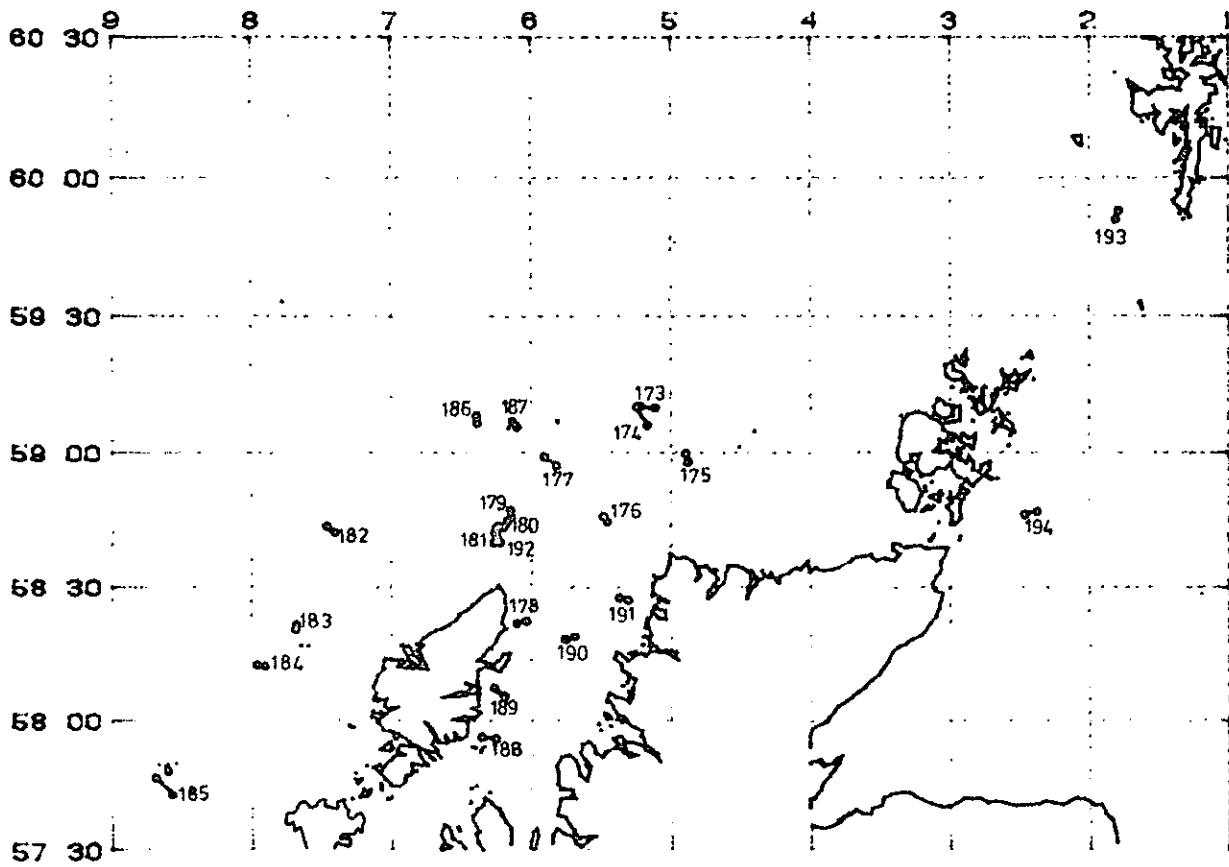


INTENSIVE SURVEY TRACKS 17, 19-28 NOVEMBER



SCOTIA 12/83

9 - 29 NOVEMBER 1983



PELAGIC TRAWL STATIONS