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## REPORT

CHARTER VESSEL "RADIANT STAR" BF 77

15-20 August,  
22-27 August,  
29 August-6 September 1988

Personnel

J Morrison SSO (in charge)  
D Beveridge ASO  
C Hall HSO (15 August-27 August)  
S Lemvig Visitor - Bergen University (27 August-6 September)

Objectives

1. To carry out a programme of tagging prespawning herring in the Aberdeen and Turbot Bank areas and off the Northumbrian and Yorkshire coasts using Floy T external anchor tags.
2. To carry out a tagging mortality experiment with Floy T-tags with herring held in the ship's RSW tanks.
3. To use the ROV "Sea-pup" to search for areas of gravel on known spawning grounds such as Aberdeen Bank, Turbot Bank and perhaps areas further south to obtain information on the extent and type of gravel beds in these areas.
4. To obtain herring samples for meristic and parasitological analysis.

Narrative

"Radiant Star" was loaded at Aberdeen on the morning of 15 August and made for Longstone in mid-afternoon as the weather was unsuitable for working in the Aberdeen or Turbot Bank areas. Longstone was searched unsuccessfully the following morning and subsequently "Radiant Star" continued south to the Yorkshire Coast. Considerable herring concentrations were found in this area and purse seine hauls were made in the Hartlepool, Whitby and Scarborough areas on 16 and 17 August. Herring were tagged from each of these hauls and in addition "Sea-pup" was deployed twice in likely spawning areas to enable examination of the sea bed. No spawn was observed and the dives were short due to the inability of "Sea-pup" to operate effectively in the strength of tide experienced.

As the weather to the north was now more settled, "Radiant Star" steamed north overnight on 17 August and spent the remainder of the week working on Turbot Bank. Three purse seine hauls were made in this area, with a catch being taken in the last one and a successful tagging operation was undertaken. In addition, two "Sea-pup" dives were carried out in the same area and good film of bottom substrates was obtained. "Radiant Star" returned to Aberdeen for the weekend in the early afternoon of 20 August.

"Radiant Star" left Aberdeen again on the afternoon of 22 August and made for Aberdeen Bank where the net was shot successfully and a tagging operation was carried out. The following morning the ship tried to anchor over a very large herring shoal on Aberdeen Bank but, although good film of the bottom was obtained when the "Sea-pup" was deployed, no herring were observed. Two further dives with the "Sea-pup" and one unsuccessful shot with the purse seine were then carried out the same day - all on Aberdeen Bank. Because of a poor forecast, "Radiant Star" then steamed inshore overnight and commenced searching in the Rattray Head area. There a successful haul was made in the early hours of 24 August and a further tagging operation was carried out.

Later on 24 August, "Radiant Star" proceeded to an area off Buckie where gravel deposits were indicated on the chart. A further three dives with the "Sea-pup" were carried out and good film of the bottom substrates in this area was obtained. The ship then headed north to search the grounds at Clyth Ness near Wick, arriving there on the morning of 25 August. A thorough search of the grounds was carried out, but only two small marks were observed and a decision was taken to return to the Rattray-Head area. Here, two dives with the "Sea-pup" were carried out in areas that were suggested by fishermen as being herring spawning grounds, but no spawn was observed. "Radiant Star" then steamed east again and carried out two further dives on part of Turbot Bank the same day. Once again however no spawn was observed.

On the morning of 26 August "Radiant Star" anchored over an extremely large herring shoal on Aberdeen Bank and deployed the "Sea-pup" down through the shoal. Very high quality film was obtained of the shoaling fish and of the bottom substrates, but there was no evidence of spawn on the bottom. Two further dives were carried out on Turbot Bank later the same day, but no spawn was located. Finally, a grid of 12 grab stations was completed to examine substrates in another likely spawning area south of Peterhead, before "Radiant Star" made for Aberdeen for the weekend - arriving there in the early hours of Saturday morning.

"Radiant Star" left Aberdeen on the final part of the cruise on the afternoon of 29 August and immediately made for Longstone. No fish traces were detected in this area and "Radiant Star" continued to the area off the Yorkshire Coast. Here three purse seine hauls were made in the Whitby/Scarborough areas in the period 30-31 August and two tagging operations were carried out. Gale force winds on the night of 31 August made further work impossible, and "Radiant Star" made for North Shields where she remained until the morning of 2 September. On that day the weather was still unsuitable for working in the area and "Radiant Star" steamed north for Buchan.

"Radiant Star" arrived at Rattray Head at mid-day on 3 September and began a grid of grabbing stations at a position where very large herring shoals had been reported. During this operation spawn was taken up in grabs over quite a wide areas, but a complete survey was not possible because of worsening weather. The vessel then made for the more sheltered waters of the Moray Firth, where two purse seine hauls were made off Troup Head. A good catch of herring was taken in the second of these two hauls and a further tagging operation was carried out. "Radiant Star" steamed to Turbot Bank overnight as the weather had by now ameliorated, and the whole day of 5 September was spent carrying out a grab survey in a variety of likely herring spawning locations on Turbot and Aberdeen Banks. No areas of spawn were discovered however, and "Radiant Star" steamed for Aberdeen, arriving there at the end of the cruise at 0730 on 6 September.

## Results

### 1. Tagging:

Over 36,000 herring were tagged, over 10,000 of these off the Yorkshire coast and the remainder in the Turbot Bank, Aberdeen Bank, Rattray Head and Troup Head areas.

### 2. Tagging Mortality Experiment:

One hundred herring caught in a purse seine haul off the Yorkshire coast on 30 August were tagged with Floy T-tags and released into the vessel's aft centre RSW tank. These fish were kept at ambient sea temperature (11-12°C) and the water was refreshed by pumping in fresh sea water for an hour or so every day. The tank was pumped dry and the fish removed on the night of 5 September and at that time 99 out of the 100 tagged fish were alive and in good condition.

### 3. Survey Work with "Sea-pup":

Seventeen dives were carried out with the "Sea-pup" during this cruise. The camera system worked well and excellent film was obtained of a very large shoal of herring and a variety of bottom substrates. However "Sea-pup" could only be used on spot dives, as it was totally uncontrollable at the working depth of 30-40 fathoms, due to tidal drag on the cable. The "Sea-pup" motors were not powerful enough to combat the drag on the cable and it was thus impossible to keep on a steady course.

### 4. Grabbing Surveys:

One hundred and twelve grab stations were completed with a "Day" grab at a variety of locations during this cruise. A herring spawning ground at Rattray Head extending to over 500,000 square metres was discovered, mapped out and samples of both spawn and substrate were taken.

### 5. Biological Sampling:

Samples of herring were taken from every catch to establish the age and maturity composition of the fish that were tagged. In all areas the catches were dominated by recruiting two ring fish in the length range 24-26 cm. Maturities of tagged fish ranged from stages 4-6 with the majority being in stages 5 and 6.

### 6. Sampling for Bergen University:

Herring samples were taken for workers at Bergen University for morphometric, mitochondrial DNA and fatty acid analyses.

### 7. Parasitological Sampling:

During this cruise a very heavy infestation of "sea lice" - Caligus elongatus was noticed on herring taken throughout the cruise. These parasites have previously only been noted on herring at low levels of infestation. Individual infestation rates were very high with frequent occurrences of between 10 and 20 adult parasites per fish, and with one fish being host to 41 adult parasites. Microscopic examination has subsequently revealed that individual herring were also infected with even higher numbers of immature stages of the same parasite. Preliminary counts suggest that up to several hundred immature Caligus may be present per fish.

Position of tagging and diving locations

