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FRV *Clupea* 3CR89

Cruise 3/89

Report

13-28 March 1989

Personnel

J Morrison	SSO (in charge)
P Rankine	HSO
C Shand	HSO
J Gamble	PSO 21-28 March
J Main	SSO 21-28 March
D Seaton	SSO 15-17 March
G Sangster	HSO 21-28 March
N Ramsay	Visitor 15-17 March

Objectives

1. To collect samples of herring in spawning condition at Ballantrae Bank in order to establish the meristic and age structure of the spawning stock and to obtain eggs for measurement purposes.

2. To obtain samples of ripe herring for egg fertilisation to provide material for oil pollution and other experiments.

3. To use the ROV "Sea-pup" to search Ballantrae Bank and other areas for presence of herring spawn.

4. To lay a current meter on the site of the herring egg patch discovered in 1988.

5. To enable the diving team to undertake a pre-spawning investigation of the gravel beds, and to set up some experiments on the gravel beds prior to spawning.

6. To undertake limited hydrographic work on Ballantrae Bank to establish temperature and salinity profiles during the period of the cruise.

7. To set up a time-lapse camera or a frame with a pan and tilt camera if herring shoals are observed on the echo sounder in an attempt to obtain film of spawning herring.

8. To use a "Day" grab to sample any areas of spawn that are observed during the cruise.

Narrative

Clupea was loaded on the morning of 13 March but was forced to remain in Buckie until the following day by adverse weather conditions. On 14 March *Clupea* was able to leave Buckie and proceeded through the Pentland Firth and through the Minches, reaching Ardnamurchan by 0800 on 15 March and Campbeltown by 1700 the same day.

Messrs Seaton and Ramsay joined *Clupea* at Campbeltown and the following day *Clupea* proceeded to Ballantrae Bank. A trawl haul was carried out along the edge of the bank and 7 baskets of herring in maturity stages 5 and 6 were caught. *Clupea* immediately made for Campbeltown where egg fertilisation work was carried out. Messrs Seaton and Ramsay departed to Oban with the fertilised eggs the following morning and *Clupea* returned to Ballantrae.

The area of Ballantrae Bank in which the egg patch had been observed the previous year was examined with the ROV "Sea-pup". Five dives had been successfully completed when work had to be terminated because the cable of the "Sea-pup" became entangled with the propeller. Divers had to be called to remedy the situation, but no damage was done to the cable. *Clupea* made for Stranraer for the night and the following day returned to Ballantrae where a trawl haul was completed in deteriorating weather. About half a basket of herring in maturity stages 5 and 6 was taken in this haul. Further work at Ballantrae was precluded by gale force westerly winds and consequently *Clupea* made for Campbeltown. On 20 March the severe weather continued and *Clupea* made for the east side of Arran to investigate alleged herring spawning grounds in that area. Ten dives were carried out with the "Sea-pup" between Corrie and the south end of Holy Isle in depths of between 20 and 35 m but no substrates were obtained which were consistent with those observed at other herring spawning sites. Subsequent to this work *Clupea* made for Troon for the half landing.

At the half landing Messrs Gamble, Main and Sangster joined the vessel. On 22 March strong westerly winds made work at Ballantrae impossible and accordingly *Clupea* proceeded to the west side of Holy Island where the boat anchored. Diving equipment was tested while the boat was at anchor, and trials were carried out to attempt to locate the "Sea-pup" with the ship's sonar using a transponder mounted on the ROV. These trials were successful, but the ROV was not easily located on "hard" bottom. Subsequent to the completion of this work, *Clupea* made for Campbeltown in atrocious weather, arriving there in mid-afternoon. The very severe weather continued on 23 and 24 March and *Clupea* was stormbound in Campbeltown during this period.

On 25 March *Clupea* left Campbeltown and made for Ballantrae as the weather had now improved. Grab samples taken in the vicinity of the 1988 spawn patch, in the north east corner of the bank, established that spawning had taken place during the period of stormy weather between 19 and 24 March. The development stage of the eggs taken in the grabs however pinpointed 22 March as the probable spawning date.

A frame-mounted current meter was deployed within the patch of spawn that had been discovered and this acted as a reference point for the diving team to begin their investigations. While diving operations were proceeding, *Clupea* trawled along the edge of the bank. However, only a couple of spent herring were taken in this haul. Subsequently, a comprehensive grab survey of the north end of the bank was started and it became clear that the area of spawn deposition was considerably more extensive, and extended further westwards than had been the case in the last 2 years. *Clupea* finally made for Stranraer for the night.

On 26 March *Clupea* made straight for Ballantrae. The weather was too bad to allow diving operations but grabbing was continued until lunchtime when *Clupea* had to break off work and make for Troon because of gale force winds. The following day the weather improved and *Clupea* once again proceeded to Ballantrae. Marker dhans for the divers were placed in the north west part of the spawning area and in another location to the south of the current meter. Diving work was resumed and while this was being carried out the ROV "Sea-pup" was deployed twice in the north west area of egg deposition and twice in an area of gravel

ridges which had been a spawning location in the period between 1958 and 1972. Further grabbing work over the area of egg deposition was carried out until 1430 the same day, when *Clupea* made for Troon at the end of the trip.

Results

1. Trawling

Good samples of pre-spawning herring were caught at Ballantrae on 16 and 19 March. These fish were largely in maturity stage 6, ranged in length from 22 to 32.5 cm and had a modal length of 24.5 cm. On the basis of these samples it would appear that the bulk of the herring that spawned during this cruise were recruiting 3 ringers.

In addition to sampling to establish the age structure of the population, samples of herring were retained for meristic analysis and fatty acid analysis (Bergen University) and unfertilised eggs were collected for measurement.

Fertilised eggs were retained for the Ecotoxicology and Biology Sections, for Stirling University, and for the Danish Fisheries Institute, Copenhagen.

2. ROV "Sea-pup"

Nineteen dives were carried out with the "Sea-pup" during this cruise and despite rather poor visibility useful film was obtained of the severely disrupted state of the egg mat (the result of the storms that took place during or immediately after spawning). Film of alleged spawning locations on the east of Arran, coupled with grab samples from the same locations, suggested that these were not likely to be spawning areas.

3. Other camera work

The frame cameras were not deployed on this cruise because of bad weather and poor visibility.

4. Hydrography

Apart from laying the current meter and measuring water temperature at the time the current meter was laid, no hydrography was undertaken due to lack of time.

5. Grab surveys

One hundred and seventy two grab samples were taken with a "Day" grab during this cruise. A complete survey of the spawning patch and surrounding areas was carried out and core samples of the egg mat were taken wherever possible for subsequent analysis. The area of the egg patch was probably at least 3 times as big as the egg patch observed in 1988 (85,000 sq m) and, although centred on areas of gravel, also covered areas where pebbles lay on a muddy bottom. This suggested that the stress of extreme weather during the spawning period might have seriously affected the ability of the fish to select suitable bottom substrate.

6. Diving operations

Only 2 days diving were possible on Ballantrae Bank. Despite this limitation a sampling programme involving coring, photography and video recording was initiated. Only a single spawning seemed to have taken place but the most striking feature was the extensive damage

caused to the egg layer by the storms which took place in the period 19-24 March. Areas of gravel were completely denuded of eggs and the detached layers of eggs were either buried, dumped in the troughs between the gravel ridges or removed from the vicinity of the site. Bad weather prevented diving on the bank before spawning occurred so pre-spawning experiments were not possible.

J A Morrison

16 June 1989

Seen in draft: W Smith

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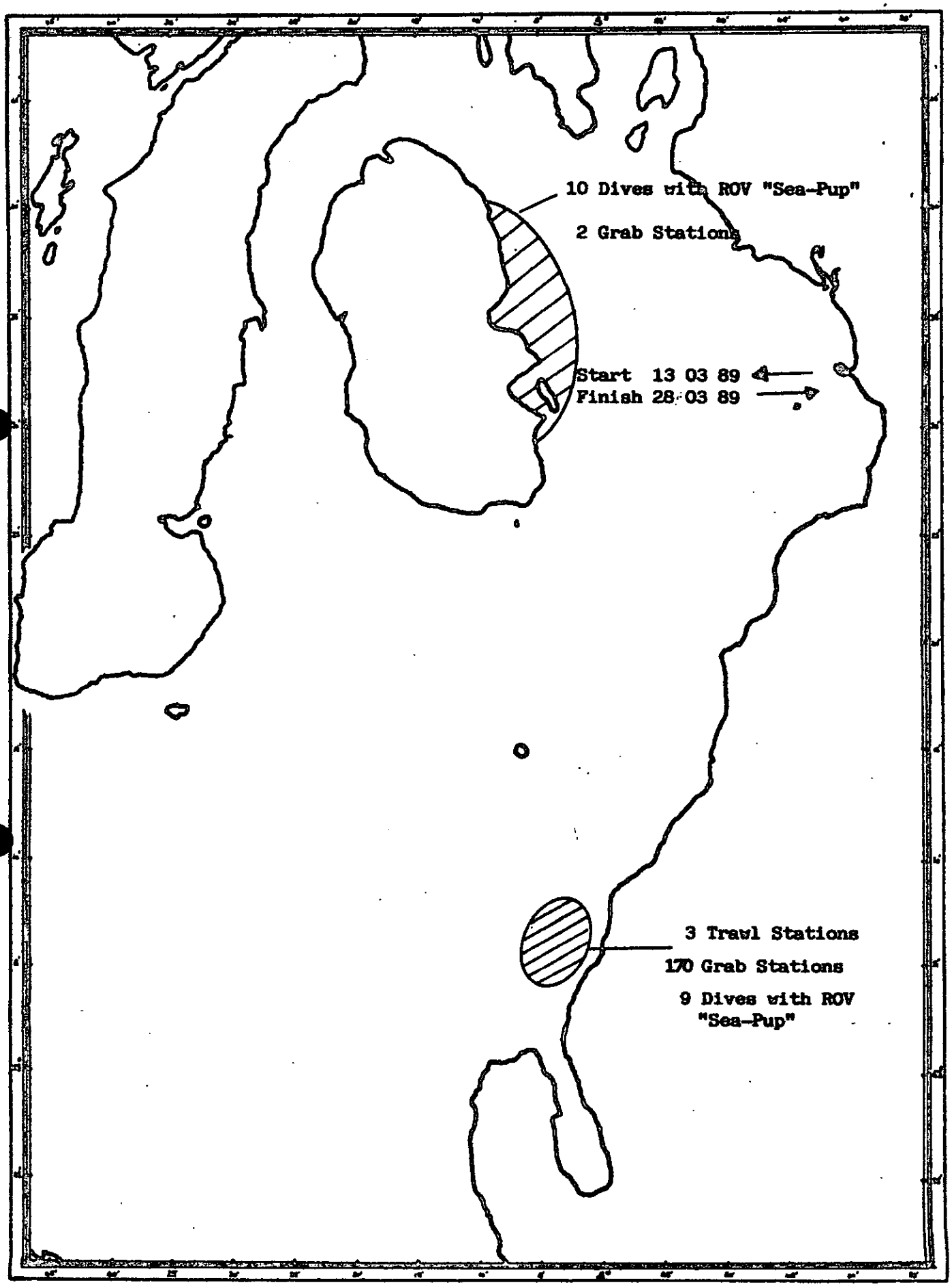

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