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FRV *Clupea*

Cruise 4/89

CRUISE REPORT

3-12 April 1989

Personnel

J Gamble	PSO	3-7 April and 10-12 April (in charge 3-4 April)
J Morrison	SSO	5-12 April (when in charge)
P Rankine	HSO	
C Shand	HSO	
K Coull	HSO	3-7 April
S Hall	SSO	5-7 April
J Main	SSO	10-12 April
G Sangster	HSO	10-12 April
R Mitchell	SSO	5 April
A Naha	HSO	5 April

Objectives

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

2. To use a "Day" grab to delimit the extent of the egg patches discovered during *Clupea* Cruise 3/89 and to obtain quantitative samples for stock estimation work.

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

4. To undertake limited hydrography work at Ballantrae to establish temperature and salinity profiles during the period of the cruise.

5. To support diving work on the egg patch to examine:

   a) mortality of eggs during development;
   b) localised egg distribution patterns;
   c) factors affecting the spawning behaviour of herring;
   d) egg mass porosity and oxygen demand; and
   e) identification of predators.

Narrative

Scientific staff joined *Clupea* at Troon on the afternoon of 3 April, and the ship proceeded to Cairnryan which became the working port until 7 April. Six dives were carried out with "Sea-pup" on 4 April in the vicinity of the egg patches discovered at Ballantrae during *Clupea* Cruise 3/89 and the diving team carried out survey work in the same general area. On 5 April grabbing work in the area of the egg patch was continued until mid-morning when a good herring mark was observed on the "northwest" patch and "Sea-pup" was deployed in attempts to observe the fish. Fish marks appeared on the echosounder at frequent intervals during the period that "Sea-pup" was in the water, but only a few herring were seen, and none came close to "Sea-pup" even when it was static on the sea bed. Subsequently, a trawl haul was carried out along the outer edge of Ballantrae Bank, but no herring were caught on this occasion.

On 6 April herring marks were again observed in the "northwest" patch during grabbing. In an attempt to monitor the behaviour of the herring, the pan and tilt camera was deployed with the ship at anchor. No herring were observed, but film was obtained of areas of apparently dead eggs overlying substrate that, when disturbed, appeared to be black and anaerobic. Grabs confirmed the presence of dead eggs and anaerobic substrate in parts of this area. On the morning of 7 April, grabbing work was continued whilst the divers continued with the programme started 2 days previously. The divers disembarked at Cairnryan at midday and *Clupea* returned to Ballantrae where 2 hydrographic stations were carried out over the "northeast" and "northwest" patches. The camera frame was again deployed in an area of fish traces but few fish were observed and *Clupea* then made for Campbeltown for the night.

On 8 April *Clupea* made for the "Iron rock ledges" to the southwest of Arran - an area in which herring were alleged to have spawned in the 1950s and 1960s. Sixteen dives were carried out with the "Sea-pup" and an extensive area of parallel ridges running ESE/WNW was located. These ridges were made up of coarse shell sand and fine gravel but there was no evidence of any herring spawn in this area. A limited amount of grabbing was also carried out in this area in order to confirm the exact nature of the bottom substrates.

On 9 April the weather made work at the south end of Arran impossible and the day was spent using "Sea-pup" to investigate the nature of the sea bed in the inshore area between Ayr and Troon. No bottom substrates suitable for herring spawn deposition were observed. This work was continued in the inshore area between Troon and Irvine the following day, but no suitable areas of gravel were discovered and work had to be discontinued midway through the afternoon because of a malfunction in "Sea-pup".

The diving team rejoined *Clupea* at Troon on the night of 10 April and the following day the ship made for Ballantrae where the day was spent on a programme of diving, grabbing and camera work. *Clupea* finally returned to Troon by 1800 the same day at the end of the cruise.

Results

1. ROV "Sea-pup"

Thirty-five dives were carried out with "Sea-pup" at Ballantrae, to the southwest of Arran and in inshore areas between Ayr and Irvine. In the area investigated off Arran an extensive area of ridges of apparently suitable coarse shell sand and fine gravel was encountered, but there was no evidence of herring spawn in this area. No likely spawning substrates were located in the area investigated between Irvine and Ayr. Useful video film was obtained at Ballantrae

which showed the extent of the storm damage to the egg mat and also areas of dead eggs within the egg mat, but the clarity of the water was poor which limited the usefulness of some of the video film.

2. Grab survey

A grab survey was carried out with a "Day" grab at Ballantrae, to the southwest of Arran and in the inshore waters between Ayr and Irvine, a total of 274 stations being occupied. A complete mapping of the Ballantrae Bank egg patch was carried out and samples of the egg mat and underlying gravel were retained for subsequent analysis. In addition, samples of gravel were collected from an extensive area on Ballantrae Bank to the south of the area in which egg deposition occurred in an attempt to assess whether differences in gravel characteristics could be detected between the 2 areas.

3. "Pan and tilt" camera work

The camera frame mounted with a pan and tilt camera was used on 6 occasions in attempts to observe fish shoals, but although fish were observed on several occasions they never came very close to the camera. Good film was obtained, however, of the spawn patches and of anaerobic areas underlying patches of dead eggs.

4. Hydrography

Hydrographic stations were carried out in the centre of egg deposition in both the "northeast" and "northwest" egg patches midway through this cruise to act as a check on the temperature data being collected by a bottom-mounted current meter which had been deployed in the "northeast" patch during *Clupea* Cruise 3/89.

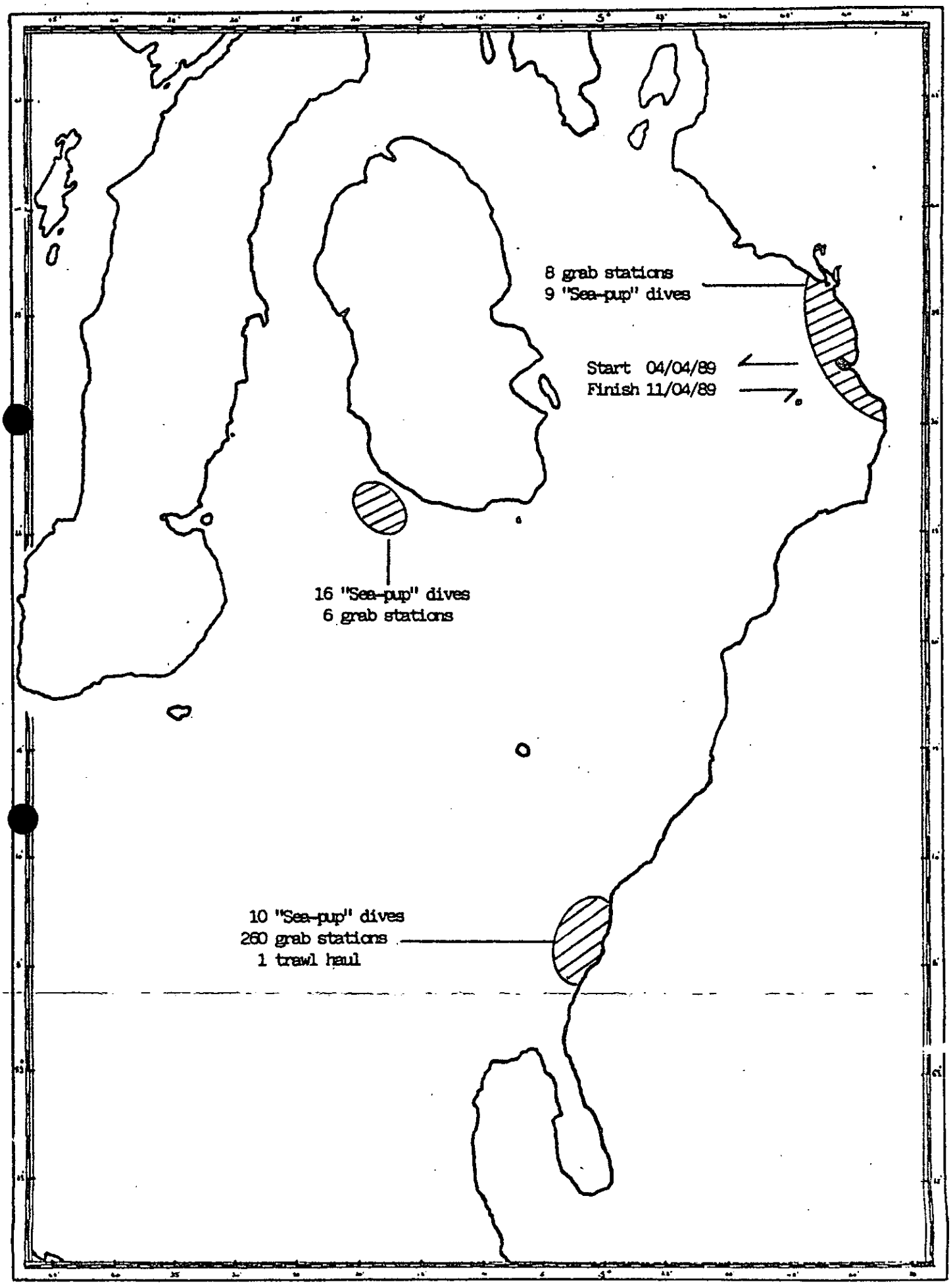
5. Diving

Diving operations were carried out on 5 days. The work was a continuation of the specific site surveys initiated during the previous cruise. Samples were taken over the period of hatching and observations suggested that considerable mortality had occurred during the developmental period.

J A Morrison
J C Gamble

16 June 1989

Seen in-draft: M Smith


8 grab stations
9 "Sea-pup" dives
Start 04/04/89
Finish 11/04/89
16 "Sea-pup" dives
6 grab stations
10 "Sea-pup" dives
260 grab stations
1 trawl haul