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FRV *Clupea*

Cruise 0691C

REPORT

8-26 April 1991

Personnel

J Morrison	SSO (in charge)
J Gamble	PSO (9-11; 15-17; 22-26 April)
J Main	SSO (9-12 April)
G Sangster	HSO (22-26 April)
C Shand	HSO
S Greenstreet	HSO (15-17 April)
I Gibb	SO (8-25 April)
J Hunter	PTO (11-12 April)
I Napier	PhD student

Objectives

1. To carry out herring egg surveys at Ballantrae and at South Arran using a "Day" grab, ROV "Sea-sprint" and divers to map the extent of egg deposition and to obtain quantitative samples to provide estimates of egg density and mortality.

2. To use the trawl to sample herring present at Ballantrae and South Arran to obtain data on the age structure of the stock.

3. To service a current meter laid at South Arran, to use a towed CTD to establish temperature and salinity profiles in the area and carry out a variety of hydrographic and other sampling operations at Ballantrae and Arran.

Narrative

Scientific staff and crew joined *Clupea* at Kyle on the afternoon of 8 April and after loading the vessel proceeded to the Clyde, arriving there at mid-day on 9 April. A short survey of the South Arran area was then carried out en route for Ardrossan, where the diving team joined ship the same night. On 10 April *Clupea* made for Ballantrae where bad weather precluded diving, but a grab survey was carried out. During this survey one week post-fertilisation herring eggs were discovered. *Clupea* made for Campbeltown for the night and was detained in port for most of the next day because of gales. On 12 April a survey was carried out at South Arran with the towed CTD, a hydro station was completed near the current meter at the site of the 1990 egg patch and measurements of water-column

fluorescence were made. Diving and grab surveys established that some spawning had taken place at this site within the last few days and the ROV "Sprint" was used to investigate a dense shoal of herring that had assembled to the west of the spawning ground.

Between 13 and 17 April two days were spent at South Arran and three at Ballantrae. In these two areas, time was almost equally split between grab and ROV survey work with diving surveys and hydro work also being carried out. On 17 April, work at South Arran was abandoned in the early afternoon to take J Gamble to the doctor. The diving team returned to Aberdeen the same evening.

On 18 April, the mid-cruise break was spent at Ardrossan with work being resumed at South Arran the following day. There, newly fertilised eggs found in association with a dense bottom echosounder trace suggested that spawning was taking place at the time. ROV surveys within the area in which the fish traces were observed proved impossible due to water turbidity and the remainder of the day was spent in carrying out grab surveys in various known maerl patches around the spawning site. 20 April was spent working at Ballantrae, where a comprehensive grab and camera transect was carried out to check mortality and degree of egg cover on the bottom substrate. It became very clear during this survey that a high proportion of the herring eggs laid at this site were dead.

21 and 22 April were spent working at South Arran with the ROV where grab samples had established that some spawning was still taking place. The diving team rejoined the ship on the evening of 22 April and the following two days were spent at Ballantrae and South Arran respectively, where diving and grabbing operations were carried out. Work had to be terminated at 1300 on 24 April due to bad weather and *Clupea* made for Ardrossan. There the ship's bows were damaged on berthing and a subsequent inspection delayed departure until 1130 the following day. *Clupea* returned to South Arran where work was resumed and, after spending the night in Campbeltown, continued until 1430 on 26 April. Passage was then made for Ardrossan at the end of the cruise.

Results

1. Herring egg survey

Spawning was estimated to have started at Ballantrae on 3 April and was noted approximately a week later at South Arran where it continued until 22 April.

Areas of egg deposition were detected and comprehensively mapped at both Ballantrae and South Arran using the ROV and "Day" grab. 25 dives were made with ROV "Sprint" and 853 grab stations were completed. The areas of spawn deposition at both of the above sites showed a considerable decrease in area compared with April 1990. The spring spawning population in the Clyde is estimated to have decreased each year since 1989 when the 1986 year-class first recruited to the population and there seems to have been little subsequent recruitment to this stock.

2. Trawling

No trawling was carried out on this survey as the prespawning shoals had been adequately sampled on a preceding cruise.

3. Diving and hydrographic work

Dives were carried out on both spawning sites whenever weather conditions permitted. In total three days were spent diving at each site. Core samples of spawn, *in situ* dissolved oxygen and sulphide measurements, particulate carbon samples and underwater photographs were taken at both sites.

Extensive deposits of eggs were seen at both Ballantrae and South Arran, although the former were laid 1-2 weeks earlier. In contrast to the previous two years, there was no evidence of extensive storm damage at Ballantrae. It appeared, however, that a large proportion of the fertilised eggs at both sites had died during development, seemingly due to inadequate ventilation and to the additional fallout of phytoplanktonic materials at South Arran. *In situ* oxygen measurements above, within and below the egg mat indicated a progressive reduction in the dissolved oxygen concentration of the sea water around the developing eggs.

Hydrographic and water column samples (three at Ballantrae, three at South Arran, one towed CTD at South Arran) indicated a slight development of stratification towards the end of the cruise together with increasing higher chlorophyll levels. Large quantities of sedimented material were collected in the traps

J Morrison
8 October 1991

CRUISE TRACK FRV "CLUPEA" CRUISE 0691C 8-26 APRIL 1991