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FRV *CLUPEA*

9pt2CR89

CRUISE 9/89 PART 2

REPORT

1-11 August 1989

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Objectives

1. To obtain dual frequency echosounder data from a survey line extending from west of Colonsay, through the Firth of Lorne and Loch Linnhe, to Fort William (see attached chart).
2. To obtain samples of macrozooplankton using the Methot Isaacs Kidd net for comparison with the echosounder data.
3. To obtain plankton and hydrographic data using the Autosampling and Recording Instrumented Environmental Sampler (ARIES).

Narrative

Scientific personnel and equipment joined the vessel in Troon on 1 August, and *Clupea* sailed at 0600 the following day. After calling at Dunstaffnage to collect a visiting scientist, acoustic surveying was carried out over a 24 h period and completed on the evening of 3 August. Sampling with the Methot net then commenced on 4 August and continued for 36 h. After exchange of scientific personnel at Dunstaffnage on the evening of 5 August the vessel changed to operate on a 12 h working day, and a continuous sampling track from northwest of Colonsay to Fort William was carried out using ARIES, being completed by midday on 9 August. After additional sampling at a station in Loch Linnhe, *Clupea* commenced a passage to Buckie at 1645 on 9 August, arriving at 1915 the following day.

Results

1. Acoustic and Methot net sampling

Echosounding was carried out at 200 and 38 kHz using towed transducers. The entire survey line was sampled during both night and day at 200 kHz, but only during daylight at 38 kHz. Echointegration data were recorded at 15 min intervals, and in addition all the raw data were saved on tape. During acoustic surveying, near surface (3 m) temperature, conductivity, fluorescence and transparency measurements were collected at 1 min intervals from a towed sensor unit. The towing cable incorporated a hose for pumped water sampling, and material was collected at 15 min intervals for nutrient, pigment and particulate nitrogen analysis.

Oblique tows with the Methot net (5m² mouth opening, 1.5 mm mesh) were carried out to collect scyphomedusae, macrozooplankton and O-group fish samples for interpreting the acoustic data. During each tow, acoustic data were recorded at 200 kHz during the descent phase of the net and at 38 kHz during the recovery phase. All scyphomedusae caught were measured, and some specimens in good condition frozen for weight and nitrogen content analysis. Specimens of the major constituents of the macrozooplankton catch were measured and frozen for similar analysis, and all or a subsample of the remainder of the catch preserved in formaldehyde solution. A total of 27 Methot net tows were carried out during the survey.

Initial inspection of the data indicated that the region could be divided into two contrasting parts: a) the Firth of Lorne (stations 16-9) where few targets were detected at 200 kHz, and only diffuse signals detected at 38 kHz; b) Loch Linnhe (stations 8-1) where dense 200 kHz scattering layers were detected at depths greater than approximately 60 m, which could not be detected at 38 kHz. Sampling with the Methot net (and ARIES) showed that this layer was composed of euphausiids and decapods. In the upper basin of the Loch, the decapod *Pasiphaea* (length approximately 70 mm) predominated, whilst in the lower basin the euphausiid *Meganyctiphanes* (length 30-40 mm) was most abundant. The 38 kHz echosounder showed a diffuse scattering layer in the upper 20 m within the Loch, and a discontinuous layer of dense targets at approximately 70 m. The samples from the Methot net indicated that the surface layer was probably composed mainly of scyphomedusae (*Aurelia aurita* and *Cyanea capillata*) whilst the deeper layer was probably O-group whiting and shoals of O-group sprats which were caught in moderate numbers at night.

2. ARIES deployments

A continuous sampling track from northwest of Colonsay (station 16) to Fort William (station 1) was carried out with undulating deployments of ARIES. The sampler was towed at 4 kn, and undulated between the surface and 10 m above the sea bed, by repeatedly deploying and recovering the towing wire. The sampler was configured to collect depth, conductivity, temperature, fluorescence, transparency, light intensity, dissolved oxygen, bioluminescence and flowmeter data at 5 sec intervals, water samples at 120 sec intervals, and integrated plankton samples over consecutive 120 sec intervals throughout each tow. The 120 km survey track was completed with 13 deployments of the system. One tow had to be repeated due to equipment failure. The 12 successful deployments constituted approximately 13.5 h of sampling, during which 385 water and plankton samples and approximately 10,000 data values from each sensor were collected. 50 ml from each water sample were frozen for nutrient analysis and the remainder (approximately 200 ml) filtered for pigment and particulate nitrogen determination. Half of the plankton samples were preserved in formaldehyde solution, and the remainder frozen for nitrogen analysis.

The sensor data indicated similar hydrographic features to those observed during an earlier survey in June. Strong salinity stratification was present in Loch Linnhe, and weak thermal stratification at the offshore end of the survey line. Chlorophyll concentrations were lower than in June, and there was less bioluminescence, although large concentrations of dinoflagellates were observed within the Loch. *Meganycitophanes* was present in plankton samples from depths greater than 60 m in Loch Linnhe, corresponding to the conclusions of the acoustic and Methot net sampling.

M Heath
15 August 1989

Seen in Draft: G B Calder

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