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R1/6 10CR84

In Confidence: Not to be quoted without prior reference to the Laboratory

FRV 'Clupea' LD

Cruise 10/84

Report
21 August-5 September

Objectives

1. To locate herring spawning grounds to the west of South Uist and investigate the population characteristics of the fish found there.

2. To investigate the hydrographic conditions which may affect the rate of dispersal of herring larvae produced to the west of South Uist.

3. To investigate the growth, survival and predator/prey relationships of herring larvae.

4. To obtain live, fertilized herring eggs for experiments to be carried out at the Loch Ewe field station.

Narrative

'Clupea' sailed from Buckie of 1830 on 21 August arriving off Cape Wrath on the following morning, where 2 tows with the pelagic trawl were undertaken. The vessel tied up for the night at Breasclete pier (western Lewis) and the following day (23) a course was set for the area west of Benbecula where a hydrographic and plankton survey was commenced at 1800. This survey was completed at 1800 the following day and Clupea proceeded to moor at the pier in Castlebay (Barra), arriving at 2030. On leaving Castlebay on 25 August the vessel again headed for the western side of Uist via the Sound of Pabbay and commenced plankton survey work which was completed at 1930. At the end of this survey a parachute drogue and dhan buoy was deployed and Clupea then anchored for the night off West Strand (north western Bara).

On 26 August Clupea headed for an area 15 miles north west of Barra where herring marks had been observed on the echosounder earlier in the cruise and fishing operations undertaken with the pelagic trawl. The parachute drogue deployed the previous day was then located and the position recorded after which Clupea again anchored for the night off West Strand.

The drogue was again located at 0930 on 27 August and a plankton survey undertaken close-by, but with the forecast of deteriorating weather conditions, Clupea broke off the survey at 1300 and headed for Castlebay, anchoring off at 2100.

On the morning of 28 August, the arrival of the Oban ferry and a cargo vessel prevented Clupea from going alongside for the mid-cruise landing so a course was set for Loch Boisdalewhere the vessel was able to moor at 1100, although she had to anchor off again at 2230 to make way for the ferry.

By 29 August strong south westery winds prevented Clupea from heading for the western side of the Hebrides, so after fishing on herring marks of Curachan, the vessel made for more sheltered waters in Loch Dunvegan where plankton survey work was undertaken. After spending the night at anchor in Loch Snisort and with persisting adverse weather

conditions Clupea sailed around the north of Skye to undertake further plankton survey work in the Sound of Raasay, mooring at Portree pier on the evening of 30 August. Improved weather conditions the following morning allowed Clupea to head for Barra via the Sound of Sleat and the vessel anchored off West Strand at 1900.

On the morning of 1 September Clupea proceeded north towards the Monach Isles to search for the parachute drogue but without success and at 1400 a hydrographic and plankton survey was commenced, this being completed by 1915, the vessel then anchored off the Monach Isles. Further hydrographic and plankton work was undertaken the following day (2 September) this being broken off at 1515 in order to make a passage to Breasclete where Clupea moored at 2000.

The following day, strong northerly winds prevented fishing operations to the west of Lewis so Clupea made for Pentland Firth, calling briefly at Scrabster, and after undertaking a depth calibration of the plankton net in the Moray Firth, the vessel docked at Buckie at 0830 on 4 September.

Results

Fishing Operations

Five hauls were carried out during the cruise using the pelagic trawl (PT163) but significant numbers of herring were caught in only 2 of these. Considerable difficulty was encountered in operating the netsounder system although the fault was eventually rectified.

Large marks of herring were seen on numerous occasions within 10-15 miles of the western coast of Uist but the nature of the seabed in this area precluded any attempts at fishing. Herring were however caught over flat ground further offshore. The majority of these fish were in the length range 24-32 cm with modes at 26 and 30 cm, whilst maturity stages 4 and 5 predominated. Only one stage 6 fish was caught.

Dense shoals of herring were observed off Curachan on the east side of Barra and the catch in this area had a length range of 21-28 cm with a mode at 24 cm. These fish were of a less advanced maturity state than those caught to the west, with stages 3 and 4 predominating.

Otoliths and pyloric caeca were collected from all herring catches on a length stratified basis.

Hydrographic and Plankton work

Hydrographic data was collected using Knudsen bottles and reversing thermometers. Water samples were collected from each bottle for salinity and chloroplyll determination.

Three types of plankton sampler were used during the cruise:

1. A 1 m conical net fitted with a live bucket double oblique tows at 2 knots being performed at each station.

2. A 1 m diatmeter LVL 13 vertical haul net was used to collect gelatinous zooplankton.

3. A high speed Gulf III Sampler was used in certain areas, a double oblique tow at 5 knots being performed at each station.

All these samples were fitted with 250 μ mesh nets.

Extreme difficulties were encountered in operating the depth monitoring system for the high speed sampler and this contributed to the loss of a sampler through collision with

the seabed to the northwest of the Monach Isles. In practice the towed 1 m net proved to be a more versatile sampling tool on account of the very variable soundings in the area where the main survey was conducted. The survey work in Loch Dunvegan and Raasay Sound was designed to determine the Sampling efficiency of the 1 m net using the high speed Gulf III equipped with a calibrated flowmeter as the standard.

The survey carried out to the west of Uist on 23/24 August revealed the general distribution of herring larvae in relation to hydrographic features, whilst on 25 August a patch of herring larvae covering approximately 10 square miles with a peak density of about 2000/m^2 was successfully delineated and the parachute drogue deployed close to the centre. During this survey an estimate of the number of larvae caught was obtained immediately upon recovering the net and this information used to determine the position of the next station, these being positioned 1-1.5 miles apart.

Over the following 2 days, this patch of larvae moved approximately 5 miles to the NNE and increased in area whilst the peak density decreased to about 400/m^2. Over this period the parachute drogue appeared to be moving slightly faster than the centre of the patch but still remained within the area of high density.

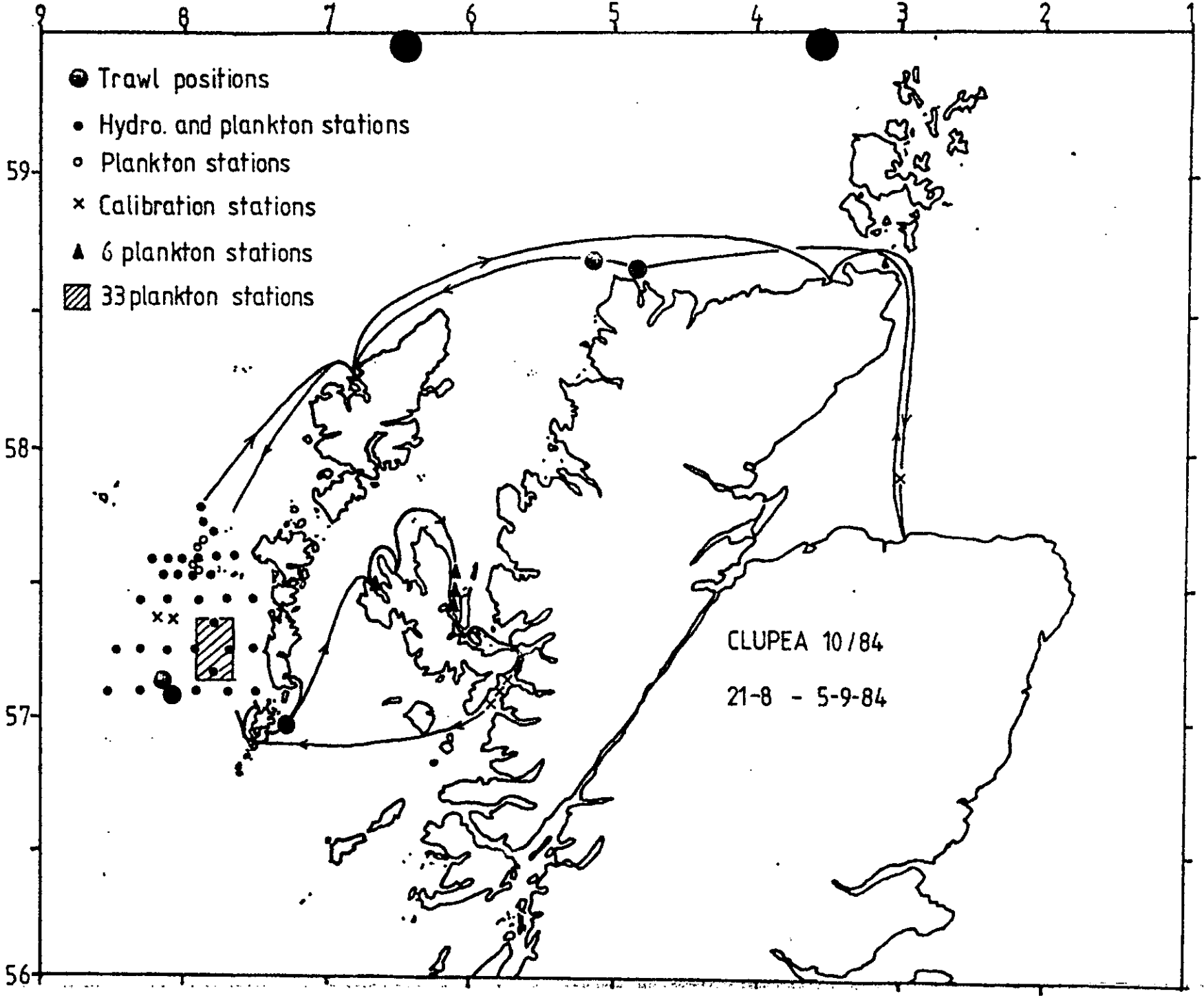
When first encountered, the larvae in the patch had large yolksacs and were estimated to be less than 2 days post hatching. No length measurements were carried out at sea but all individuals were clearly less than 10 mm long.

The spell of bad weather following the mid-cruise landing prevented further surveys to the west of Uist until 1 September. The parachute drogue unfortunately could not be found despite an extensive search of the area where drift projections based upon earlier sightings suggested that it should be located. However a patch of larvae was encountered in this area and this was again successfully delineated. The majority of larvae in this patch appeared to be longer than 10 mm and none were observed to have yolk sacs. The patch, which was very closely associated with a hydrographic front separating iso thermal coastal water from Stratified oceanic water, covered an area of approximately 60 square miles with a peak density of 70/m^2.

During these surveys, all plankton samples were preserved in 4% formalin for subsequent examination. All herring larvae were picked out during the cruise and some were preserved in liquid nitrogen for lipid content and genetic analysis. Material was also preserved in alcohol for otolith studies.

M R Heath
12 September 1984

Seen in draft
W Smith
4 September 1984


Trawl positions
Hydro. and plankton stations
Plankton stations
Calibration stations
6 plankton stations
33 plankton stations
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