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CRUISE REPORT

FRS "Clupea"

19 April - 7 May, 1971

OBJECTIVES

1. To study the activity of Nephrops during day and night in relation to variations in depth and light intensity.

2. To make observations on the abundance of Nephrops burrows in different areas in relation to depth, substrate etc. To determine the size and sex composition of the Nephrops populations in these areas.

3. To test the effect of electric fields on Nephrops.

GENERAL

"Clupea" sailed from Campbeltown at 0640 on 19 April and proceeded to the Sound of Jura where a brief T.V. survey was carried out in the area examined with Vicker's submersible "Pisces" in 1970. A break in the electrical conductors through the instrumentation wire prevented use of the stereo cameras so "Clupea" left Jura Sound at 1200 hours and arrived in Loch Torridon at 1330 hours on 20 April. The remainder of the first week was spent in Loch Torridon. During the second week, Nephrops grounds in the North Minch and in Loch Brollum, Loch Broom and Loch Shieldaig were examined. During the period April 30 - May 3, the ship docked at Stornoway to enable the crew to have weekend leave. Dr Stewart and Mr Cameron joined the ship in Stornoway. The remainder of the cruise was spent in Loch Torridon, Loch Brollum and at the entrance to Loch Carron. "Clupea" finally docked in Stornoway at 1730 hours on 7 May.

RESULTS

1. Diurnal activity

With the ship at anchor counts were made, using the television camera, of the numbers of Nephrops seen away from their burrows at different times of the day and night. Observations were made at different depths as follows: 20 fathoms in Loch Brollum; 25-40 fathoms in Loch Torridon and 45-52 fathoms at the mouth of Loch Carron. The observations indicated that Nephrops emerged from their burrows for short periods of activity around sunrise and sunset but the precise timing of their emergence varied with depth. In 20 fathoms, Nephrops were active about 1 hour before sunrise and after sunset. At greater depths activity occurred progressively later in the morning and earlier at night. At 40 fathoms for example, Nephrops were seen away from their burrows $2\frac{1}{2}$ to $\frac{1}{2}$ hour after sunrise and before sunset respectively. These observations suggest that foraging activity only occurs when the light intensity on the sea bed reaches an optimum level. Measurements of light intensity made at the time indicate that the optimum range of light intensity in which Nephrops are active lies between 10^{-2} to 10^{-4} lux. For most of the day and night when the light intensity was above or below this range, Nephrops remained within their burrows.

2. Density of burrows

In each area examined photographs of the sea bed were taken at random with the IGS sea bed camera. The density of Nephrops burrows and of other burrowing

animals will be estimated once the photographs have been processed and analysed. Nephrops were found in all the areas examined apart from upper Loch Broom. The burrowing Thalassinid, Calocaris macardreae was very common on most of the Nephrops grounds. Specimens of Calocaris, captured by grab were maintained on mud in a tank on board "Clupea". The animals excavated burrows and their structure was found by casting with polyester resins.

Formost of the cruise only one of the seabed cameras was working satisfactorily so that very few stereo pairs of photographs were obtained. A new replacement camera was obtained for the final week of the cruise and this operated satisfactorily.

3. Response of Nephrops to electric fields

Experiments to test the effect of electric fields on the emergence of Nephrops from their burrows were conducted in Lochs Torridon and Brollum. A frame made of insulating material (Tufnol), fitted with metal electrodes at the base, was used to support the television camera lighting and the electrical circuits used to energise the electrodes. With the ship swinging at anchor, the frame was lowered to within a few inches of the sea bed and when the burrows of Nephrops appeared on the T.V. screen, the electrodes were energised from the ship. In Loch Brollum where the density of burrows was higher than in Loch Torridon, the frame rested on the sea bed. No Nephrops emerged from their burrows whilst the electric current was switched on. At dusk when Nephrops emerged naturally, their response to the current was striking. Animals which were lying in the entrance to their burrows rapidly retreated into them; Nephrops outside their burrows usually gave a strong flexure of the tail taking them backwards off the bottom and out of the electric field. These observations indicate that sufficient power was available to stimulate Nephrops but not to generate an emergence response. The stimuli used were 50 Hz A.C. and rectangular pulses and it is possible that current pulses of a different shape might be more effective.

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26 May 1971