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In confidence: Not to be quoted without reference to the Laboratory.2
5CR70CRUISE REPORTFRV "CLUPEA"20 April-14 May, 1970Objectives

The main aim of the cruise was to carry out a survey of Nephrops grounds in the Clyde, Sound of Jura and in Loch Torridon using underwater television and still camera equipment kindly loaned by the Institute of Geological Sciences, Edinburgh. The surveys in the Clyde and Sound of Jura were carried out in preparation for a programme of dives in Vickers' submersible PISCES which took place at the end of May in collaboration with the Ministry of Technology. Particular attention was paid to the conditions in these areas likely to affect the PISCES programme, such as bottom visibility and currents.

Specific aspects of the programme were:-

1. Photographic and television surveys of the above areas to determine the density of Nephrops burrows. Studies of the diurnal activity of Nephrops.
2. Studies of the distribution and abundance of larvae and juvenile Nephrops by plankton and grab sampling.
3. Tests of gravity corers, grabs, UMEL camera and "shark" transducer housing.

General

"Clupea" sailed from Buckie at 10.00 hours on 20 April and arrived in Loch Torridon early on the 21st. Towing tests of the "shark" transducer housing were carried out during the passage and Mr Lawrie disembarked at Torridon. On 23 April, Messrs Eden and Ardu (I.G.S.) joined "Clupea" to carry out tests on gravity corers, "Shipek" grab and the UMEL camera. "Clupea" left Torridon on 24 April and made passage to Campbeltown.

During the period 27 April to 6 May, "Clupea" carried out T.V. and photographic surveys in the Sound of Jura, Kilbrannan Sound and in the area south of Arran. Mr Timbs (Atomic Energy Authority) joined "Clupea" from 27-29 April for the survey in the Sound of Jura.

The ship made passage to Loch Torridon on 7-8 May, anchoring overnight at Oban. The Director of the S.M.B.A. Laboratory, Mr R Currie, together with several colleagues, visited "Clupea" before departure on the 8th. "Clupea" worked in Loch Torridon until 13 May and then left for Buckie, arriving at 06.00 hours on 14 May.

Results1. Television and Photographic surveys

The Spirotechnique television camera and stereo cameras performed extremely well during the cruise and gave much information on the distribution and density of Nephrops and of their behaviour. Both instruments were used together, mounted on a rigid framework suspended beneath the drifting or

anchored ship. The combination of the two instruments gave excellent results since the flash cameras could be triggered from the ship whenever suitable subjects were observed on the television screen. The effect on Nephrops of the additional lighting required to operate the television, was reduced by covering the light with a red perspex filter. The television picture was recorded on video tape (Ampex). Analysis of these tapes together with the photographs (about 1,000 were taken during the cruise) will give information on the density of Nephrops (and other animals) and on the size and sex composition of the population in the different areas.

The greatest density of burrows was found in the Sound of Jura where the population consisted mainly of juvenile animals below marketable size (see section 4 below). Burrows which appeared to resemble those of Calocaris macandreae were also observed in about equal proportion to those of Nephrops.

A very high density of burrows was also found in Kilbrennan Sound, although here, the proportion of Nephrops was probably small and the majority of the burrows appeared to be of Calocaris. Some specimens of Calocaris were obtained by grab and were maintained in a tank containing mud from the same ground. These animals constructed "U" shaped burrows very similar to those observed in the Sound of Jura and Kilbrannan Sound.

2. Diurnal activity of Nephrops

Observations were made, either from the anchored ship or by drifting over the same area, of the number of Nephrops seen at the entrance to and outside their burrows at different times of the day and night. Most of the work was carried out in deep water (greater than 60 m) and it appears that at these depths, Nephrops are most active during the day. This was true in Loch Torridon and Jura Sound, in contrast to observations made in shallower water in Kilbrennan Sound (40 m) where Nephrops were seldom observed during the day but emerged from their burrows at dusk.

3. Plankton and grab sampling

Plankton samples were collected on two separate occasions in Loch Torridon and on one occasion in the Sound of Jura. On each occasion a series of stations were sampled using a special rig of four 1 m² nets fixed in a rigid framework which was hauled vertically. The samples from the four nets were preserved separately, so that a measure of the variability of the catches was obtained for each station, to enable differences in the catch from different stations to be interpreted with some confidence. A preliminary analysis of some of the samples, carried out on board, suggested that the density of Nephrops larvae was higher in Upper Loch Torridon than in Jura Sound. In Upper Loch Torridon, the largest catches were recorded inside the narrow entrance from Outer Loch Torridon. This could be due to movement of larvae into the Upper Loch from outside under the influence of the strong tidal current which flows in the narrows.

Very little grab sampling was carried out because of shortage of time. A series of hauls were taken in Kilbrennan Sound and the main burrowing animal caught was Calocaris macandreae. Once the sea-bed photographs have been analysed, it should be possible to obtain some estimate of the efficiency of the grab in sampling this species.

4. Fishing

The catches obtained by commercial fishing boats in Loch Torridon and in the Sound of Jura were sampled. In Torridon, the Nephrops were caught by creel and in Jura Sound by trawl. The analysis of these catches showed that there was a preponderance of small Nephrops captured by trawl in Jura Sound compared with the much larger size categories of Nephrops taken by creel in Loch Torridon. In Jura Sound 36% of the males and 80% of the females were below 30 mm (carapace length).

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