R.1/7 In confidence: Not to be quoted without reference to the Laboratory. 5MR67

CRUISE REPORT

F.R.S. "MARA" (and "MAID")

21st May-23rd June, 1967

Part I Loch Eil hydrobiological survey

Mr. R. Burns	S.E.O.
Dr. T.G. Pearson	(Millport)

Part II Loch Torridon acoustic experiments

Mr. C.J. Chapman	S.O.
Mr. A. Ranachan	S.S.A.
Dr. B.S. McCartney	(N.I.O.)
Mr. A.R. Stubbs	(N.I.O.)
Mr. J.R. Dunn	(University of Birmingham) (part time)

"Mara" left Buckie on Sunday, 21st May and proceeded through the Caledonian Canal to Loch Eil. The hydrobiological survey was completed by the afternoon of 24th May. Dr. McCartney, Mr. Stubbs and Mr. Ranachan then joined the ship and the acoustic equipment was loaded at Fort William. "Mara" then proceeded to Kyle to collect bottles of compressed air before going on to Loch Torridon to check the Admiralty moorings. These had been laid the previous week around a 50 fathom hole which had been found on the first cruise to be suitable for the acoustic work. The position of this hole is 57°32.82'N; 5°35.22'W. "Mara" was able to keep station in this position for most of the cruise, returning to Kyle harbour only at weekends to replenish water and food supplies. The cruise ended on June 23rd and "Mara" returned to Buckie.

A telephone link to the laboratory ashore was laid on 27th May and this proved invaluable. Several of the laboratory divers were used on this cruise and these were accommodated ashore. The "Maid" was operated by "Mara's" crew who were responsible for catching the live fish used in the experiments.

RESULTS

1. Acoustic experiments

Echo measurements were made on Saithe (1), Haddock (1), Whiting (1) and Pollack (3) using 65 Kc/s 'Gloria' array, 3 Kc/s array and a new wide band system (freq. range 15-50 Kc/s) designed and built at Birmingham University and operated by J.R. Dunn. An air-gun, which produced a low frequency pulse in the band 100-500 c/s was used to investigate the problem of swim bladder resonance. Recordings using this technique were made on live fish at 30 m and then at 20 m and 10 m as the fish was brought towards the surface. The three Pollack used were of different sizes. It is hoped that the results when analysed will correlate with work on fish sounds and hearing capacities carried out at the shore laboratory in Loch Torridon.

2. Fish handling

An important requisite of the acoustic experiments was the supply of live fish with intact swim bladders adapted to the water pressure at 31 m depth. This was achieved in the case of Whiting, Saithe and Pollack but not in the case of Haddock. The latter fish could only be obtained from Loch Ewe in depths below 30 m and when hauled to the surface their swim bladders rupture. The other species were obtained in shallow depths and this problem did not arise. Once the fish had been caught, they were placed in successive bottom cages at 15 m and 30 m until they had equilibrated to working depth. Finally, they were transferred to a mid water cage at 30 m about 100 m from "Mara" from whence they could be

towed across to the ship when required. All handling of fish was carried out by divers without change of depth to prevent swim bladder damage. The handling procedures used resulted in almost complete survival of fish during the course of the experiments.

3. Temperature and salinity readings were taken using the N.I.O. T/S bridge.

4. A few samples were obtained of the plankton organisms which were thought to be causing volume reverberation and interfering with the acoustic experiments.

C.J. CHAPMAN
20th October, 1967