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In confidence: Not to be quoted without reference  
to the Laboratory.

## CRUISE REPORT

F.R.V. "MARA"

18th November-20th December 1968

PersonnelI. Fish behaviour studies

C. J. Chapman	18th-29th November 8th-14th December
A. D. Hawkins	18th November-7th December
A. Ranachan	23rd November-14th December
A. Corrigall	2nd-14th December
A. R. Stubbs (NIO)	18th-22nd November
S. Forbes	23rd-27th November
A. Naha	23rd-29th November

II. Loch Eil surveyObjectives

- I. 1. To determine the effects of intense pulsed low frequency sound and artificial light on fish.
  2. To carry out first sea trials of the sector scanning sonar system.
  3. To conduct pelagic trawling trials.
- II. To carry out routine pollution surveys in Loch Eil.

General

"Mara" left Buckie and arrived at Inverness on 18th November, where Messrs Chapman, Hawkins and Stubbs joined the ship. Passage was made through the Caledonian and Crinan Canals and "Mara" docked at Greenock on 22nd. During passage the compressed air sound source ("airgun") was tested and calibrated. On 23rd November, Messrs Forbes, Naha and Ranachan joined the ship and the sector scanning sonar was installed. "Mara" worked in Loch Goil from 25th to 28th November before moving to Loch Linne where fishing trials with the pelagic trawl were carried out from 5th-12th December. The Loch Eil survey took place during the period 16th-18th December and "Mara" then returned to Buckie.

A long weekend break for the crew was taken from 29th November to 2nd December.

Experiments with sound sources

The "airgun" sound source was used in Loch Striven, Loch Goil and Loch Linne. The echo traces in Loch Striven and Loch Linne were not identified, but no marked responses were observed to the pulses of sound. In Loch Goil, dense traces were recorded on the ship's echosounder and the sector scanner. Large numbers of saithe (29-58 cm) and some cod (44-100 cm) were caught when these traces were fished with handlines. Apart from a slight reaction at the onset of the sound, there was no marked tendency for these fish to avoid the vicinity of the ship when the source was turned on.

### Experiments with artificial lights

Underwater lights of 100-200 watts power were used at night in Loch Goil, and a dense echotrace formed beneath these lights. The depth of the trace depended on the depth of the light. When the light was lowered, the traces moved down abruptly, whereas ascent of the trace was more gradual on raising the light. As in daylight, large catches of saithe were made when the traces were fished with handlines. Juvenile herring were seen when the lights were brought up to the surface.

### Sector scanning sonar

This equipment was tested during the above acoustic and light experiments in Loch Goil. The transducer head was mounted on a dexion support fixed to the ship's side and fitted to look vertically beneath and obliquely out from the ship. Comparison was made between targets observed on the scanner and echo traces recorded on the ship's echosounder, but the overall performance of the sector scanner was disappointing. Major faults were excessive noise (reducing the effective working range) and a poor PPI display. A satisfactory picture was achieved using the display of the Tektronix storage oscilloscope.

### Pelagic trawling

The pelagic trawl had not previously been used on "Mara" so that most of the time was devoted to practice in handling and aiming the trawl. Most of the echotraces were close to the sea bed in daylight and on several occasions the gear touched bottom. This occurred because the otterboards had been weighted to facilitate shooting, resulting in their fishing about 5 fathoms below the net. Consequently the otterboards struck when the net was manoeuvred close to the bottom, the net was occasionally torn and on one occasion the headline oscillator cable snapped. Entry of water into the cable caused loss of signal and made it impossible to aim the trawl effectively. Small numbers of sprats and Euphausiids, Meganyctiphanes norvegica and Pasiphaea sp. were caught.

### Loch Eil Survey

The Loch Eil survey was carried out successfully.

C. J. CHAPMAN  
24th April 1969