

IN CONFIDENCE: NOT TO BE QUOTED WITHOUT REFERENCE TO THE LABORATORY

CRUISE REPORT

FRV "MARA"

10 September - 6 October 1973

OBJECTIVES:

1. Weeks 1-3: Observation and photography by divers of the behaviour of flatfish during the process of demersal seining.
2. Weeks 1-3: Sampling of fish at various stages during fishing of flatfish in the mouth of the net.
3. Weeks 2 or 3: A vinge trawl fitted with divertors to assess the effect of them on the rate of net closure.
4. At any time when the weather is suitable: A complete photographic record in black and white and colour, in 16 mm, 35 mm and 2 1/4 square to be made of the methods and techniques used in the seine net programme.
5. Week 4: The sector scanner on board FRV 'Clione' to be used to assess the change in rope shape and the effect of ropes on herding. If possible acoustic tagged fish to be released at critical positions for subsequent tracking.

NARRATIVE:

The cruise was programmed to take place entirely in St Andrew's Bay based in Dundee. However, underwater visibility was so poor that the location of the cruise was switched to the Moray Firth at the end of the first week. During the final week, the joint programme with 'Clione' was conducted in St. Andrew's Bay.

A number of staffing changes were made after the drafting of the programme. G. Booth was in charge of instruments for the whole cruise. The French visitor was prevented from attending. Mr D Godden of the Psychology Department, University of Stirling took part in weeks 2 and 3 of the cruise.

RESULTS:

1. Weeks 1-3, Gear/Behaviour studies

This period was beset by a number of setbacks: weather, underwater visibility and minor but troublesome faults in communications equipment, cameras and instruments. The number of fit divers was reduced by the transfer of a cold which at times affected all but two of the group.

A sequence of hauls was carried out that alternated between the study of fish behaviour plus gear parameters using a complete net with instruments and divers, and physiological hauls using a 'bagless' or 'wings only' net, (see section 2). Despite the problems mentioned above, a fair number of tape-recordings and photograph sequences were made of individual small flatfish. These will be analysed in the normal way to determine the orientation of the fish and their swimming activity. The instrument for

the measurement of divergence and declination angles and the rope hauling speed had been modified since the previous seine net cruise (14 May - 8 June 1973) to measure small angles more efficiently. This instrument worked more efficiently for the majority of the time, but gave a certain amount of trouble due to an imprecisely fitted grub screw on the divergence spindle. All other parameters on the data-logger were collected satisfactorily but few records of net speed were obtained. The photographic record (objective 4) was obtained during the only two days when the weather was suitable, and consisted of 35 mm reversal slide material only. These slides give an adequate description of the methods employed in the seine net project, but it is essential that an additional film record of the surface activities be obtained as well.

A research objective not included in the original programme forms part of a study at the Psychology Dept of Stirling University of memory mechanisms and loss of memory during and after diving. Slight modifications to the system of transcribing tape-recordings and an additional debriefing tape-recording have provided raw data for analysis at Stirling. The long-term aim of this work is to gain a better understanding of memory mechanisms and to suggest improved means of recovering information and data obtained by divers.

Due to the hydraulic arm not being fitted for the safe handling of the divertors, their use was restricted to a few hauls when sea conditions were perfect. They performed satisfactorily in keeping the net open, although further work with the sector scanner (see section 3 below) is required in this context.

2. Weeks 1-3, Fish physiology

The technique of capturing fish by hand in the mouth of a 'bagless' net was again used to provide tissue samples, which were removed immediately on return to 'Mara'. Fish were also taken from the codend after normal capture for comparison with those taken by hand during the fishing process. Some of these codend fish were kept in tanks on deck and sampled at varying time intervals in order to study the process of recovery from physiological stress.

All the samples were stored in liquid nitrogen for analysis in Aberdeen. Muscle tissue is being analysed for glycogen and lactate content, as part of the study of swimming energetics in relation to fish capture. Kidney and liver samples are being analysed to assess the role of these organs in the recovery of lactic acid to glucose.

3. Week 4. Sector scanner studies

Three working days of cooperation with FRV 'Clione' proceeded very smoothly and resulted in 14 hauls during which the ARL sector scanner was used to study the change in shape of ropes and net.

Previous work by Lowestoft on samples of seine net rope provided by Aberdeen with bubble-filled polythene cores, had failed to show improved acoustic reflectivity. Therefore conventional lead-cored polypropylene ropes were used. These were typically visible to a range of 130 m when off the bottom, but invisible when in contact with it. The bottom was a muddy sand with patches of high shell content. It was found that two Lowestoft transponding tags could be used simultaneously without the problems of multiple firing being too great. After the first hour or so, as the battery output declined to a plateau-value, tags could be distinguished to within approximately 3-4 m apart.

The technique finally evolved was to attach a transponding tag one coil (120 fm) up each rope from the wing end, bringing it to approximately the position of maximum curvature. With the 'Clione' situated about 50 m behind and slightly to one side of the net, the operator of the sector scanner could then obtain range and bearing of a sequence of: 'Port tag, net, starboard tag, net, port tag, net etc' as the gear closed. Periodic values of range and bearing of 'Mara' were taken by radar from the bridge of 'Clione'. Fixing these critical points will allow a fairly accurate plot to be made of the change in shape of ropes, and what is perhaps most important from the point of view of fish herding, the rate of change of shape. No attempt was made to release transponder tagged fish in the path of the gear.

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22 October 1973