IN CONFIDENCE: Not to be quoted without reference to the Laboratory.

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CRUISE REPORT

FRV 'MARA'

16 AUGUST-24 SEPTEMBER 1971

PERSONNEL

Full-time C C Hemmings, J Main, A Corrigall, Miss M V Moodie, G I Sangster, G Booth, W S Duncan.

Part-time C Wardle, J R G Hislop, I Murray, J Gauld, L Kealey-Featherstone, M Groves, D J McMullen.

OBJECTIVES

Behaviour

1. Observation, recording and photography by divers of the behaviour of flatfish during the process of demersal seining will be carried out.

2. The light weight trawl camera will be used attached to the headline to take a regular sequence of pictures of the area in front of the groundline.

3. Flatfish will be tagged to determine behaviour in relation to tide, and for the estimation of the catching efficiency of the gear.

4. If haddock are seen at any stage during the operation, the opportunity will be taken to make observations upon them. The underwater tagging team will tag as many haddock as possible after the detachment of the codend prior to hauling the gear to the surface.

Gear

1. Wing end and deck tensions will be recorded by instruments. The deck tension meter may not be made available until part way through the cruise, and arrangements will be made at the time for fitting the apparatus.

2. Photographs will be taken from a fixed position on the boat deck to record the rope divergence and declination.

3. One diver will make periodic estimates of headline height and curvature. Photographs will be taken with a fish-eye lens in an attempt to get an accurate estimate of headline curvature.

4. A direct reading current meter will be used before and after each haul. 'Mara' will be required to maintain a fixed position at anchor whilst these readings are being taken.

5. Flowmeters will be used on the net and from 'Mara' to obtain ship and net speeds.

PHOTOMETRY

1. Surface illuminance will be continuously recorded during hauls, and intermittent readings taken of underwater illuminance to determine attenuation.

2. A sighting range will be set up on the bottom off Portnaguran; this will be used for underwater visibility experiments as fishing operations permit. 'Mara' will be required to lay a temporary mooring nearby using a spare anchor, in order that light meters can be used from the ship.

NEPHROPS STUDIES

C J Chapman will cross from Torridon for a weekend in order to sample and study local Nephrops populations in a sea loch south of Stornoway.

NARRATIVE

This cruise was originally scheduled to begin on the 19th of July, but was delayed due to the loss and subsequent replacement of FRV 'Mara's' rudder. It was amalgamated with the west coast underwater tagging cruise originally scheduled for 4 to 16 October.

'Mara' sailed through the Caledonian Canal and was in Stornoway for work in Broad Bay on 19 August. Throughout the cruise 'Mara' left Stornoway between 0730 and 0800 each day and scientific staff joined the ship on her arrival at Portnaguran, at the mouth of Broad Bay. This system worked very well. During the early part of the cruise a number of 'exploratory' hauls were made along the east and southeast sides of the bay, in order to have at least 6 separate clear hauls. Fishing was then concentrated in these areas. Only 6 working days were lost due to weather conditions, and this time was useful for typing up commentaries and routine maintenance of equipment. At the end of the trip 'Mara' remained in Stornoway for the start of the next cruise.

Mr Corrigall spent sometime aboard the Stornoway fishing boat 'Olive Branch' making measurements of the performance of Hong Kong divertors. One day was spent in a joint exercise with the Highlands and Islands Development Board making underwater observations of these boards in action.

RESULTS

Behaviour

The original objective of concentrating upon flatfish fortunately could be abandoned thanks to the availability of considerable quantities of haddock. Tape-recorded commentaries and photographs were thus made mostly of haddock. In a total of 41 hauls in the trip, diving observations were made on 38 of them; of these haddock were caught on 24 hauls.

Particular attention was given to the behaviour and orientation of haddock at the wings, where considerable numbers were seen to escape over the top of the headline. Only a part of this escape could be attributed to the squeezing effect which has been previously described. One possible cause is that individual fish visually 'lock onto' strips of slack netting which slope backwards and upwards at certain stages of hauling. This seems to lift fish up to headline height. This observation serves to emphasise the

importance of the wings in the orientation process of fish leading to their capture. In one haul using a Stewart 520 with 12" mesh wings, considerable numbers of haddock were seen, and there was no escape through the wings observed. Haddock actually seemed to keep further away from the large-mesh white wings than from those with a normal sized mesh. More work on this subject is planned for the near future.

Attempts to observe the herding of fish by the ropes were not successful although useful information about the degree of bottom contact and the speed of closure was obtained. The light-weight trawl camera was used during the first part of the trip but suffered from a number of synchronisation problems which must be remedied.

Tagging

The availability of haddock in shallow water (8-10 fathoms) resulted in successful joint observation tagging hauls, with the result that 710 haddock were tagged underwater and 472 at the surface; 84 plaice were tagged with Petersen buttons. In addition Mr Hislop took the opportunity of going out a number of times with a local small-line boat and he tagged 69 whiting.

Gear

Load cell measurements of wing end tension were made on nearly all hauls, but the deck tension meter was only available for the second half of the cruise when it gave successful continuous recordings. The programme of rope declination and divergence photography proceeded smoothly and photographs were taken on every valid haul.

Flow meters on ship and net were used on most hauls, but both suffered on occasions from failures of various kinds. The negligible tidal streams in the innermost part of Broad Bay meant that direct current meter readings were not necessary.

Photometry

Surface light measurements were made on some hauls. Black body readings and headline float visibilities for estimation of water clarity were taken on most hauls. Due to the success of other more important parts of the programme, studies on the underwater visibility range at Portnaguran received a low priority, but two sets of experiments were conducted on Saturday mornings. One of these produced a 'perfect' experiment when every target sighting can be related to four parameters of the surrounding light field.

Nephrops studies

Owing to a failure in the delivery of essential materials, Mr Chapman's planned programme of Nephrops studies had to be cancelled.

Hong Kong divertors

A separate report on the experiments using Hong Kong divertors will be written.

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C C HEMMINGS
12 October 1971