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MV *Aora*

Charter Cruise 0799H

REPORT

9-25 August 1999

Loading: 9 August, Port Ellen
Unloading: 24 August, Port Ellen

Personnel

G I Sangster (In charge)
T R W Howell
M Breen
R J Kynoch

Fishing Gear

76 cm wide (2.5 feet) standard scallop dredges with nine teeth bars per dredge
Teeth bars with 11 teeth per bar
Modified (partially closed) ring mesh bellies

Objectives

1. To observe, by the use of divers and underwater video, the action of the scallop dredges.
2. To measure the efficiency of the dredges.
3. To attempt to identify the mechanisms governing the scallop dredge selection process.
4. To collect data on numbers of damaged scallops missed by the dredges.
5. To assess, by underwater television techniques, the recessing rates of scallops that had been disturbed by the gear.
6. To collect scallop samples for toxin analysis.

Out-turn costs to project: 16 days; MFO6s

Narrative

Staff arrived in Port Ellen (Islay) on the afternoon of 9 August and immediately set up the diving shore-base in the hired storage facility provided by Caledonian MacBrayne. MV *Aora* arrived in Port Ellen on the evening of 9 August from Millport. The dredge gear, scientific equipment and diver's underwater vehicle (TUV) were prepared and set up on board *Aora* during the next morning. TUV familiarisation and handling trials alongside the dredges (at normal towing speed) were conducted that same afternoon. Work then continued on a daily basis, operating between the shore base and various diveable fishing sites around the south and east coasts of Islay, until lunchtime on 24 August when the vessel returned to Port Ellen. All equipment was immediately offloaded and *Aora* sailed for Millport via the Mull of Kintyre. Staff loaded the lorry that same afternoon and began their return to Aberdeen by ferry the following morning.

corrected - wrong dates in d/base

Results

A total of 38 dredge hauls were conducted during the cruise. Many of these hauls were purely for the purpose of checking for grounds with suitable scallop densities in safe diving areas clear of strong tides.

Objective 1. Observations and/or video films were made on six hauls using the underwater vehicle alongside the gear. The films showed the dredges in action both on flat sand and hard ground, including close-up sequences of the spring-loaded teeth bars when the netting covers were removed. Observations revealed that a) the build up of rocks and debris in front of the teeth bars and b) the undulating movements of the dredges on rocky or uneven grounds, affects the selectivity and efficiency of the gear. Furthermore, the rapid forward recoiling action of the spring-loaded teeth bars after release from the substrate, was seen to propel animals ahead of the dredge mouth. Rocks, trash and scallops were regularly pushed out to the sides of the gear and avoided capture. No scallops were seen passing between the teeth spacings of either the nine or 11 teeth bar types. On soft heavy shelly sand, the teeth dug well into the substrate before springing clear, but on the other sea bed types observed (hard sand, shingle and stones), only the tips of the teeth dug into the sediment. It was impossible to observe the chain bellies because of the clouds of disturbed sediments created by the dredges and beam wheels on the sea bed.

Objective 2. On another six hauls, whole dredge tracks were marked from the start to the end of towing. This was achieved using white marble stones (20-40 mm dia) dropped by a diver along the portside edge of the gear from within the TUV. This subsequently allowed a team of divers to swim along the distinctly marked track and accurately survey and measure the track length. Track lengths ranged from 510 m to 1,070 m. They also collected recessed and non-recessed scallops that had been missed by the dredges. Data from both the dredge catches and the diver's surveys allowed percentage catch efficiency values to be calculated thus:

$$\frac{\text{Number caught by dredge}}{\text{Number caught by dredge} + \text{Number collected on track}} \text{X100}$$

The values obtained from the six surveys were 45.1%, 29.2%, 32.9%, 49.3%, 14.7% and 26.3%. This gives a mean of 32.9 %.

Objective 3. As previously stated in results section 1 above, direct observations revealed that bottom contour and seabed type can affect dredge selection. The presence of rocks and debris blocking either the spaces between the teeth and/or the dredge entrance will affect selection by the tooth bars, allowing all sizes of scallops to enter the dredge or conversely, escape either a) over the top or, b) be pushed out to the side of the track. Insufficient data comparing open and closed ring mesh bellies prevented conclusions being drawn as to their influence in the selection process. This aspect of the dredge selection requires further investigation.

Objective 4. Data from the post dredging diver's surveys, showed that 40.9 % (non-recessed) and 44.7 % (recessed) of the scallops missed ('escapes') by the gear were <100 mm. Damage data was recorded on all scallop 'escapes' from the six diver's surveys using the following classification:

0 = no visible damage
1 = <5 % damage to either valve; and/or damage to either ear; with no disruption to soft tissue

2 = 5 - 15 % damage to either valve; and/or damage to either ear; with no disruption to soft tissue
3 = >15% damage to either valve; and/or disruption to soft tissue
4 = Broken hinge;< 15% damage to either valve; no disruption to soft tissue
5 = Left or right valve cracked or smashed, with disruption to soft tissue; and/or broken hinge

After consultation with an appropriate mollusc authority, it was agreed that any individual scoring two and above would not survive. Results concluded that all the recessed scallops collected by the divers from the six surveys would have survived. The escape mortality for the non-recessed scallops from the six surveys was 8.2 % (pooled) and 6.9 % (mean). Further analysis of the data showed that the severity of scallop damage increased with length.

A comprehensive spreadsheet data-base was set up and contains records of the injuries to all categories of scallops (marketable, non marketable and deck discard) using the above 0 to five damage scale. Similarly, digital-format video films recorded visual evidence of most of these injuries.

Objective 5. A remote mini TV apparatus was used to study the behaviour of 24 of the non-recessed scallops of various sizes which had been missed by the dredges. Eight separate experiments (of up to three hours duration) were set up with three scallops in the field of view of the TV camera. Analysis of the films showed that none of the scallops had recessed into the substrate. Scallops swim by forcing out jets of water ('jetting') between the two halves (valves) of the shell on either side of the hinge, so propelling the animal forwards. One deliberately upturned specimen flipped over to a correct attitude after 17 minutes. Scallop behaviour within the film durations varied from, no movement (n = 4), slight movement following 'jetting' (n = 4), multiple 'jetting' actions (n = 6) and large 'jetting' movements (n = 10) when approached by predators (*viz* Whelks, crabs and starfish and flatfish). In the latter behavioural category, the common whelk, *Buccinum undatum*, in particular, appeared to trigger an almost immediate reaction inducing swimming by touch or odour.

Objective 6. Scallop samples were collected and returned to Aberdeen for toxin analysis.

G I Sangster
6 December 1999