

Project Summary: EACT- 5.2001.DFO (FDP 289)

## Reducing the Percentage of Small Redfish in Otter Trawl Catches



## INTRODUCTION

The relatively small, 90-mm mesh in redfish otter (bottom) trawls, and the bony surface of the fish itself, result in large amounts of small redfish being caught in this gear. Mortality, due to distended swim bladders, is 100 per cent when these fish are brought to the surface.

Efforts to reduce catches of small redfish (fish under 22 cm in length) using otter trawls with increased mesh sizes and shortened lastridge ropes have been partially successful. However, the latter method has not been adopted commercially because of the difficulty in finding a mechanism to permanently attach the lastridge ropes to the netting in a manner that will prevent slippage of the ropes.

Trawl fisheries for other species such as cod and shrimp have successfully incorporated methods for both size and species selectivity. The most successful of these is the Nordmore grate, used to reduce by-catch in the shrimp fishery. The most recent adaptation of the Nordmore grate is a system developed in Iceland called the Ex-It system (currently used in that country to size-sort cod).

Newfoundland fish harvesters caught only 3000 tonnes of their overall 8,500-tonne redfish quota in 1999. The main reason was the frequent overrunning of the small-fish limit of 15 per cent of landings, causing the fishery to be closed. (The small-fish protocol requires that when landings of redfish under 22 cm in length exceeds 15 per cent of total landings, the fishery will be closed for at least 10 days.) In addition, there was no market for small redfish.

In an attempt to find a remedy for this situation, Cape Mariner Enterprises submitted a proposal to the Fisheries Diversification Program for assistance to test the Icelandic Ex-It system. The project was approved, and sea trials were carried out during a 10-day trip by the M/V Cape Mariner in NAFO Division 3-0 in March, 2001.

## MATERIALS AND METHODS

The M/V "Cape Mariner" is a 20-metre (65') multi-purpose vessel used for pot fishing, gillnetting and otter trawling. For otter trawling, for both shrimp and groundfish the vessel operates as a stern trawler, outfitted with a net drum mounted on the aft main deck. The main split winches are on the main deck just aft of the wheelhouse. Groundfish catch is sorted in the deck area between the main winches and the net drum. This space is also used for net repair and modifications.

The trawl used for this experiment is the standard type of redfish trawl used by this type of vessel. An Icelandic EX-IT system was installed into a lengthening piece, and that replaced the standard lengthening piece. For the first few sets a retainer bag was attached over the fish escape opening to capture the fish escaping between the bars of the EX-IT system. The experiment tested two different bar spacings: 30 mm, and 35 mm. The vessel fished on March 4 (one set), 5 (four sets), 6 (three sets) and 9 (two sets). (The vessel fished on just four days of a 10-day trip because of adverse weather conditions.) A Fishery Observer was onboard to collect data.

The EX-IT system used was constructed in Iceland and inspected by DFO gear technologists prior to commencing the project. Periodically throughout the experiment, The Fishery Observer measured the mesh size in the trawl and the retainer bag.

A random sample of at least 250 Redfish were collected from both the codend and the retainer bag from each set. Each fish in the sample was measured for length. The total weight of each sample was recorded, as was the total weight of the catch from each set. Set and catch details were all recorded, including start and end times of each set; water depth; warp length; towing speed; direction of current, and; wind and sea conditions was all recorded. The performance of

the gear, and any damage, repairs and modifications, were also noted.

## RESULTS

Because of high winds, only 10 sets were completed during this experiment.

For the first three sets, a retainer bag was placed over the EX-IT system's fish outlet to collect fish that were escaping from the trawl through the system's grate bars. Sets 1 and 2 were made with 35-mm bar spacing in the grate. Set three was made with 30-mm bar spacing. The remaining seven sets were made with 30-mm bar spacing, without the use of the retainer bag.

It was determined that when the retainer bag began filling with fish, it affected the operation of the EX-IT system, and for the remaining seven sets the bag was removed. A second concern, noted by the Fishery Observer once fishing commenced, was that the retainer bag as it was installed did not completely cover the EX-IT system's fish outlet and that some of the fish escaping from the trawl via the system were not being captured by the bag. It was concluded, therefore, that the contents of the retainer bag would not give a true representation of the size distribution of fish that the EX-IT system was permitting to escape the trawl. The area not enclosed was the bottom grate of the EX-IT system.

During the experiment, a total of 12,158 kg of fish were caught. The species distribution of the catch was: 4,431 kg of redfish; 2,781 kg of cod; 1,766 kg of haddock, and; 3,180 kg of other species (including sizeable quantities of white hake, American plaice, witch flounder and thorny skate). Water depths fished ranged from 280 metres to 494 metres. The experiment was carried out in NAFO division 3-0. Fourteen per cent of the redfish retained by the trawl while using the 35-mm EX-IT system grate was small fish (under 22 cm in length). When the 30-mm grate was used, 14.49 per cent of the redfish catch was small. (It must be noted, however, that the great majority of small fish caught with the 30-mm grate in use - 40 per cent of the catch - came from one set, the fourth.

The 35-mm grate was used for the first two sets of the experiment. Analysis of the length distributions of the redfish retained in the codend of the trawl and of those being captured by the retainer bag (i.e. fish escaping the trawl) showed that the mean length of the fish escaping was less than the mean length of those being retained.

Some redfish longer than 22 cm were found in the retainer bag. The mean length of redfish caught with the retainer bag removed, after the third set, was greater than the combined means, (from the retainer bag and the codend), of redfish caught in sets 1 and 2.

A detailed statistical analysis of the data is not possible because of the small number of sets made while using the retainer bag, and also because of the technical problems with the bag while it was being used.

## DISCUSSION AND RECOMMENDATIONS

Indications are that the EX-IT system would have a positive effect on reducing the percentage of small (under 22 cm) fish in redfish catches.

- A more controlled experiment should be conducted during which at least 15 valid sets would be completed. (Probably the best way of achieving this is to use a twin trawl arrangement, with one section of the trawl outfitted with an EX-IT system and the other not. An alternative though less desirable approach would be to use the alternate haul method, with the EX-IT system being used in half the sets.)
- An attempt should be made to construct a retainer bag that does not affect the operation of the EX-IT system.

**Table 1: Experimental trawl – Icelandic redfish trawl: gear fittings**

Headrope length:	45 m
Footrope length:	46 m
Bridle length:	36 m
Groundwarp length:	18 m
Headline floats:	20-cm diameter (90)
Rockhopper gear:	36-cm rubber discs (30)
Main warp used:	777 m

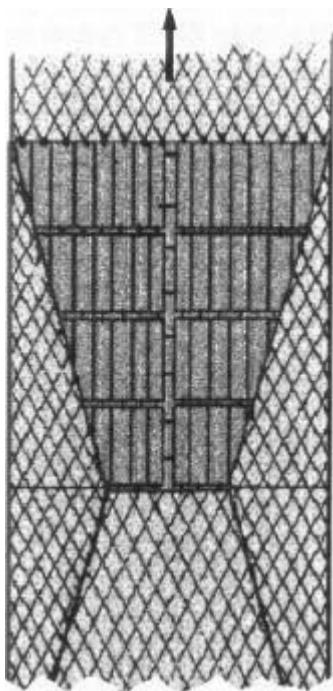
**Table 2: Sets: depth, duration, tow speed; catches of redfish, cod and haddock; per cent of redfish under 22cm in length.**<sup>(1)</sup>

Set	Depth	Duration	Tow speed	Total catch (kilograms) <sup>(2)</sup>			Redfish: % < 22 cm	
				Redfish	Cod	Haddock	Codend	Retainer
1.	336 m	1 hr 30 min	2.8 kn	77	18	61	9.3	19.8
2.	309 m	2 hr 00 min	2.8 kn	3,859	65	255	15.6	29.8
3.	300 m	2 hr 18 min	2.6 kn	3,600	45	520	37.5	42.2
4.	287 m	2 hr 36 min	2.7 kn	1,135	35	200	40.5	
5.	400 m	1 hr 42 min	2.5 kn	681	923	35	1.2	
6.	421 m	2 hr 30 min	2.7 kn	350	435	165	(data NA)	
7.	475 m	2 hr 24 min	2.7 kn	450	1150	155	1.9	
8.	280 m	2 hr 18 min	2.6 kn	125	15	215	(data NA)	
9.	362 m	3 hr 18 min	2.7 kn	681	60	75	3.9	
10.	494 m	2 hr 30 min	2.7 kn	1,200	35	85	1.1	

<sup>(1)</sup> The EX-IT bar spacing was 35 mm for the first two sets, 30 mm for the remaining eight.

<sup>(2)</sup> A retainer bag was used in the first three sets to capture fish escaping from the trawl through the EX-IT grid; for these three sets, the totals include fish retained in both the codend and the retainer bag.

**Fig. 1: The EX-IT size-sorting system is a steel grating made up of eight separate sections hinged together so that the whole system is flexible enough to be rolled onto a trawl-drum with the netting.**



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The \$10 million Fisheries Diversification Program is part of the \$81.5 million Canada-Newfoundland Agreement respecting the Economic Development Component of the Canadian Fisheries Adjustment and Restructuring Initiative, announced in August, 1999. The main thrust of the Fisheries Diversification Program is industry-wide research and development initiatives that reflect the economic development priorities of the Newfoundland and Labrador fishing industry.

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