Reducing Snow Crab By-catch in Turbot Gillnets
INTRODUCTION

Turbot fishing in Atlantic Canada has increased in importance in recent years, mainly because of price increases but also because of downturns in more traditional species. In the year 2000, approximately 10,000 tonnes of turbot were landed by the under-65' gillnet fleet. Gillnets are the predominant gear type used by this fleet. While the fishery is directed only at turbot, bycatches of witch flounder, thorny skate, spotted wolfish, redfish, cod, American plaice and snow crab are common.

The snow crab by-catch is of especially serious concern because the species is extremely valuable, both to individual fishermen and to the overall provincial economy. In addition, the crab by-catch lowers the overall quality of the turbot catch, and having to remove the crab individually from their nets significantly increases the fishermens' worktime and effort. Crab mortality in the case of gillnet by-catch is effectively 100 per cent, since they must be crushed in order to remove them from the nets.

Crab and turbot inhabit the same water depths throughout much of their range. The seven to eight-inch mesh generally used in turbot gillnets is particularly conducive to the entanglement of snow crabs. (However, the nets used in this project had 6" mesh, the size commonly used in the area of the project.) The fact that nets are usually left soaking for several days before hauling likely increases the bait aspect of the nets, as more and more fish become meshed, and further increases crab catches.

A proposal to carry out experiments to reduce this problem was submitted to the Department of Fisheries and Oceans by a fisherman who fishes both turbot and snow crab. The proposal involved the testing of a modified gillnet to assess its effectiveness in reducing the by-catch of crab.

PROJECT OBJECTIVE

To assess the effectiveness of a modified gillnet in reducing the by-catch of snow crab in the gillnet turbot fishery, by means of a test fishery using both standard and modified gillnets.

MATERIALS AND METHODS

The project used standard and modified standard deepwater gillnets measuring 50 fathoms long by 25 meshes deep.

To create the experimental nets, the standard net was altered by detaching the footrope (leadline) from the netting and replacing it with a regular rope. The leadline was then re-attached to this new footrope with 12" connecting lines, spaced at one-fathom intervals along the net.

A standard gillnet is set with one edge of its netting resting on the seabed, held in place by the heavy leadline. The net is kept upright in the water by a series of buoys attached to the headline along the opposite edge. The experimental nets in this project were set in the same manner. However, with the lead separated from the netting by its 12" attaching lines, the netting floated clear of the bottom, separated from the seabed by a foot-wide clear space running the full length of the net. The expectation was that crabs, which were thought to spend most of their time on the bottom, would be less likely to become entangled in the net; while the turbot, which were thought generally to spend most of their time some distance off the bottom, would still encounter the net and be caught.

All of the project nets were constructed of monofilament netting with a mesh size of 156 mm (6"). Their hanging ratio was 0.5 and their hung depth was 0.87. All nets were set in fleets of 20. Fleets were set in pairs comprising a fleet of
standard nets and a fleet of modified nets fishing in close proximity to each other.

The turbot catches and the crab by-catches from the standard and modified fleets were kept separate and sampled for weight and size measurement. Length frequency distributions were obtained for the turbot, and the crab were measured for carapace (backshell) length. (Amounts of other species caught were also recorded.)

The vessel used in the experiment was a 38' Newfoundland-type longliner with a deck-mounted deepwater net hauler, a forward wheelhouse and an after-deck working area.

**RESULTS**

Five fishing trips were conducted during September 9 - 21, 2001, in NAFO Division 3K, approximately 55 km east of Cape Freels. Water depths fished ranged from 342 metres (187 fathoms) to 369 metres (202 fathoms). Soak times (length of time the nets were in the water) ranged from 72 hours to 140 hours. The longer soak times were due to bad weather.

A total of 3,717 kg of turbot was taken in the standard nets, and 1,903 kg in the experimental nets. The catch in the experimental nets was almost 49 per cent less than the catch in the standard nets.

The total crab by-catch was 692 individuals in the standard nets and 246 in the experimental nets. The by-catch in the experimental nets was 64.5 per cent less than the by-catch in the standard nets.

It appeared that at least some of the crab by-catch in the experimental nets resulted from the nets being pulled closer to the bottom by the weight of dead fish enmeshed in them. In some cases, crab were found congregated around decaying cod that had been meshed in the net.

**CONCLUSIONS**

Because they achieved dramatically lower turbot catches in this experimental fishery, the use of standard gillnets to float one foot off the seabed does not appear to be a viable method of reducing crab by-catch in the turbot gillnet fishery. While use of the modified nets dramatically reduced the crab by-catch, they also reduced the turbot catch by almost one-half.

The reduction of the turbot catch was even more pronounced when the nets were allowed to fish beyond their normal soak times and dead fish accumulated in them. The caused the nets to sink to the bottom, severely reducing their effectiveness in catching turbot, and possibly increasing their capacity for catching crab.
Table 1: Amounts of turbot (kg) and crab (individual) caught in regular and modified gillnets in an experimental fishery conducted September 9-21 in NAFO Division 3L.

<table>
<thead>
<tr>
<th>Soak time (hrs)</th>
<th>Trip 1</th>
<th>Trip 2</th>
<th>Trip 3</th>
<th>Trip 4</th>
<th>Trip 5</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turbot caught in standard nets (kg)</td>
<td>1,450</td>
<td>601</td>
<td>813</td>
<td>318</td>
<td>530</td>
<td>3,717</td>
</tr>
<tr>
<td>2. Turbot caught in modified nets (kg)</td>
<td>556</td>
<td>180</td>
<td>636</td>
<td>177</td>
<td>354</td>
<td>1,903</td>
</tr>
<tr>
<td>(amount 2 is less than 1)</td>
<td>(894)</td>
<td>(421)</td>
<td>(177)</td>
<td>(141)</td>
<td>(176)</td>
<td>(1814)</td>
</tr>
<tr>
<td>% less turbot caught in modified nets</td>
<td>61.7%</td>
<td>70.0%</td>
<td>21.8%</td>
<td>44.3%</td>
<td>33.2%</td>
<td>48.8%</td>
</tr>
<tr>
<td>A. number crab caught in standard nets</td>
<td>472</td>
<td>65</td>
<td>44</td>
<td>82</td>
<td>29</td>
<td>692</td>
</tr>
<tr>
<td>B. number crab caught in modified nets</td>
<td>111</td>
<td>33</td>
<td>22</td>
<td>60</td>
<td>20</td>
<td>246</td>
</tr>
<tr>
<td>(amount B is less than A)</td>
<td>(361)</td>
<td>(32)</td>
<td>(22)</td>
<td>(22)</td>
<td>(9)</td>
<td>(446)</td>
</tr>
<tr>
<td>% fewer crab caught in modified nets</td>
<td>76.5%</td>
<td>49.2%</td>
<td>50%</td>
<td>26.8%</td>
<td>31.0%</td>
<td>64.5%</td>
</tr>
</tbody>
</table>

Partners/Contributors:
- Program Planning & Coordination - Fisheries Management Sector
  Fisheries and Oceans Canada
  Newfoundland Region
- Carson Melendy, Fisherman, Lumsden

For further information on this project:
- Gerry Brothers
  Coordinator - Conservation Technology
  Program Planning and Coordination
  Fisheries Management Sector
  Fisheries & Oceans Canada
  P O Box 5667
  St. John’s NF A1C 5X1

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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