

**DEVELOPMENT OF A NET
TO REDUCE BYCATCH OF COD
IN THE FLOUNDER FISHERY**

A report to

The Northeast Consortium

by

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Summary

A commercial bottom trawl net was modified with the installation of a Nordmore-style grate with horizontal openings and an escape vent. The purpose was to develop a net that would allow flounder to pass through to the cod end but direct codfish upwards and out of the net. The original design, which had a 10-inch opening at the bottom of the grate and decreasing sized openings up to the top, was not successful. As a result, a series of grates were built with smaller openings. Both plastic and metal grates were built and tested. The final design was made of steel with horizontal bars spaced at 3 inches apart. A few successful tows were made with this grate, producing a 73 percent reduction in the number of cod caught on the grate or in the cod end and a 12 percent loss of flounder out the escape vent. There were, however, significant problems with the grate clogging with large monkfish and dogfish. Modifications, such as adding a lower escape vent for monkfish, might make the net more suitable for use at the times of the year when this species is common. Other possible changes include using a taller grate, a greater angle on the grate installation and self-cleaning rollers. The simple design has some promise for use at certain times of the year when flounder are common but cod and monkfish are not and could be installed or taken out of a net in a few hours.

The project was hindered by the seasonality in cod abundance and by the EFP (exempted fishing permit) process, which limited the time periods when trawling could occur. The study was conducted from a 43 ft vessel in nearshore waters and many tows were made when no cod were caught and therefore no comparative evaluations could be made. A by-product of the project was the development of video systems and approaches to document the performance of a trawl net in commercial use and the behavior of fish inside the net.

Background

The demersal fishery involves a large number of species – many of which are commercially exploited. The congregation of these species at or near the ocean floor where they feed and reproduce makes it difficult to target one species without significant bycatch of others. Among the commercially desirable species some are more heavily overfished than others. To date, the traditional bottom trawl, as used in the New England area, is rather indiscriminate and simply collects a wide range of the demersal species including some species, which should not be caught in this manner - such as lobsters. With differing reproductive rates, growth rates and ages at maturity, overfished species do not recover at the same rates. A particular concern at present is the status of the cod fishery. It is well known that many small cod are caught while fishing for flounder and other groundfish. With current limits on landings, unnecessarily large numbers of cod are discarded – most of which do not survive the trip to the surface and subsequent return.

This project was an attempt to exploit behavioral differences between species so that fishermen might be able to target flounder while catching few, if any, cod. Flounder scuttle along the sea floor when disturbed and are seldom found at any significant height above the sea floor. In contrast, cod swim just above the sea floor and will quickly rise above disturbances. They are also more likely to react to visual clues in searching for escape routes.

There has been a significant amount of research directed towards selectivity of gear and efforts in this regard have been accelerated with the collapse of various fisheries in different parts of the world over the last twenty years. Considerable research has been done on types of nets as well as sizes and shapes of mesh (Masden et al., 1999; Myers and Hoenig, 1997; Broadhurst et al., 1999). One device that has been used successfully is the Nordmore grate which is currently required in the northeast shrimp fishery and in the whiting fishery. Small cod used to be caught in the Labrador and northeast Newfoundland shrimp fishery. These juveniles represented an average of 92 percent of the discards (Kulka, 1997). Since the Nordmore grate system was introduced into the fishery in 1993 there has been a significant reduction in cod bycatch and discards. The Alaska Fisheries Development Foundation tested separator panels during commercial fishing operations (Stone and Bublitz, 1996). These panels were shown to significantly reduce the catch of halibut and arrowtooth flounder while cod fishing. Only a small percentage of cod escaped.

The objectives of the study were to:

Construct a simple grate system in a standard bottom trawl that would reduce or eliminate the bycatch of cod in the flounder fishery

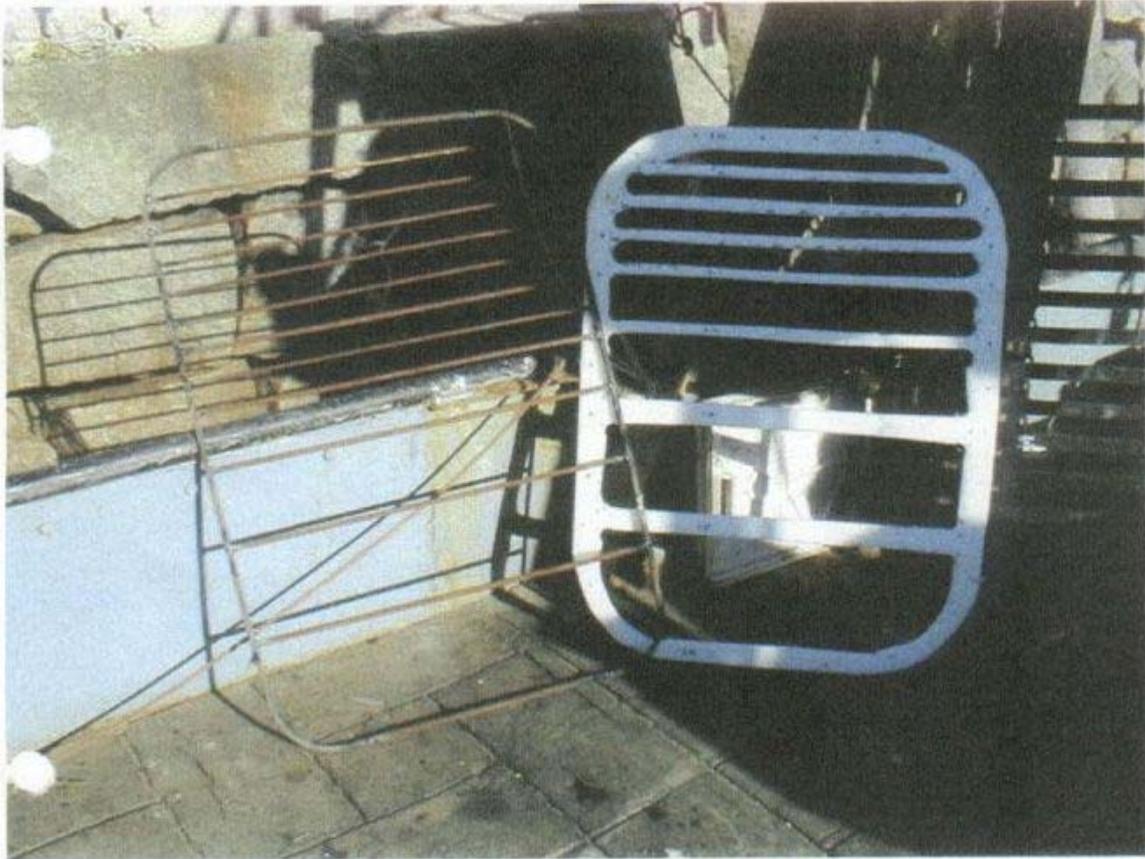
Complete field tests using paired trawling to provide statistically valid data on the effectiveness of the gear

Develop video methods for evaluating trawl performance and reaction of fish to gear.

Methods

Grate construction and testing

A grate was cut out of a 4ft x 3ft sheet of $\frac{3}{4}$ inch high-density polyurethane and fabricated so that the bottom opening was 10 inches. Subsequent spacings going up the grate were 8 inches, 6 inches, 4 inches, and then a series of 2-inch openings (Figure 1). The grate was fitted into a standard commercial trawl net and an escape vent cut into the net adjacent to the top of the grate. In the initial testing phase, a separate cod end was attached to the escape vent to capture fish moving up the grate and out. It was known that the attachment of a cod end at the escape vent might impact fish behavior and net performance but, in the early stages of testing, a direct count of species and species



STEEL GRATE NOV 2000 1/2 ROUND STOCK WELDED TO 1/2 SHELL



Figure 1: Original grate design in steel and plastic.

composition of fish exiting via the escape vent was desirable. A large number of tows would be required to demonstrate statistical differences (compared to control tows) with the escape area completely opened. After the developmental phase was completed and the design finalized, a series of paired trawls (experimental vs. control) was planned with no cod end on the escape vent in the experimental net to compare catch rates with an unmodified trawl (control). The grate was installed with the top edge back at an angle of 22 degrees (3 mesh units) as used in shrimp nets. In early tests, it was apparent that the plastic used was prone to bending and so a second grate was built out of ½ inch mild steel to the same specifications. An additional advantage of steel was that cutting and welding could quickly modify the grate, whereas changes in the design of the polyurethane grate would require a complete rebuild with a new sheet of plastic.

Tows were completed using the 43 ft, 325 h.p. steel trawler Ocean Reporter out of Rockport, Massachusetts. The rigging consisted of a 7/16 main wire (125 fathoms), 25 fathom ground cables with 603 lb Tiburon doors. The 6-inch mesh net had 12 floats with a 6.5-inch mesh cod end. Trawl speed was 2.2 – 2.4 knots and the depths at the two sites were 40 – 50 fathom (80 – 100 meters). A second vessel, used in comparative trawls, the Marie Rose, also of Rockport, was a 275 h.p. 40 ft fiberglass trawler. This vessel had 3/8th inch main wire and 375 lb Bison doors.

Initial tests revealed that the original design did not separate cod and flounder as hoped (Table 1). There were as many cod passing through the grate into the main cod end as were found in the escape cod end. A total of four additional grates were built, each with smaller, evenly spaced openings (6 inch, 5 inch, 4 inch). Even with 4-inch spacing, significant numbers of cod got through the grate into the main cod end (Table 2). The final design was a grate made of steel with evenly spaced 3-inch openings (Figure 2). The grate was, in later tows, painted white to make it more visible to fish in the net.

The performance of the net with the grate in place was evaluated by video. The net was towed in Ipswich Bay where the shallow depth and clean sands provided excellent visibility (Figure 3). After the net was set, a 19 ft skiff was tied to the stern of the trawler and a video camera lowered from the skiff to film the net performance. By lengthening or shortening the line tied to the trawler and using the motor and tiller on the skiff, it was possible to maneuver and view all aspects of the net including the grate (Figure 4). Adjustments were made (e.g. floats) so that the grate towed in the correct position with no visible impact on the shape of the net. The grate was first towed without any floats and then tested with from one to six floats. Video evaluation indicated that two floats, one on each side of the top of the grate, was the most desirable configuration for this particular design.

Table 1

Representative tows with the original grate

Date	3-Dec-00	Starting Coordinates	13756.5; 25832.6
Trawl Duration	1 hour	End Coordinates	
Grate Type	Original		

<u>Cod end Species</u>	<u>Length (Range)</u>	<u>Escape Chute Species</u>	<u>Length (Range)</u>
126 Cod	710	105 Cod	650
Flounder		6 Cod	920
1 Blackback	250	Flounder	
4 Blackback	350	1 Blackback	370
13 Yellowtail	340	1 Dogfish	850
18 Yellowtail	360	1 Monkfish	340
2 Yellowtail	400	1 Skate	970
2 Windowpane	285	1 Skate	500
18 Dogfish	850		
35 Monkfish	260		
1 Monkfish	700		
1 Sculpin	360		
30 Skate	360		

Date	4-Dec-00	Starting Coordinates	13752; 25763.9
Trawl Duration	1 hour	End Coordinates	13750; 25760
Grate Type	Original		

<u>Cod end Species</u>	<u>Length (Range)</u>	<u>Escape Chute Species</u>	<u>Length (Range)</u>
18 Cod	600-650	9 Cod	600
1 Cod	350		
Flounder			
1 Blackback	320		
2 Dabs	300		
1 Sunlight	240		
5 Yellowtail	300		
4 Dogfish	850		
19 Monkfish	290		
2 Sea Ravens	580		
18 Skates	540		
2 Whiting	150		
9 Crabs			
18 Lobsters			

**Table 1
(cont)**

Date	4-Dec-00	Starting Coordinates	13750; 28500
Trawl Duration	1 hour	End Coordinates	
Grate Type	Original		

<u>Cod end Species</u>	<u>Length (Range)</u>	<u>Escape Chute Species</u>	<u>Length (Range)</u>
3 Cod	580	4 Cod	690
3 Cod	560		
2 Cod	690		
1 Cod	890		
Flounder			
3 Blackback	380		
1 Dab	500		
8 Sunlight	300		
9 Yellowtail	350		
3 Dogfish	800		
1 Gray Sole	370		
15 Monkfish	380		
3 Monkfish	500		
2 Monkfish	700		
2 Sculpin			
1 Sea Raven	390		
3 Crabs			
16 Lobsters			
3 Squid			
2 Starfish			

Table 2

Representative tows with 6" grate

Date	8-Dec-00	Starting Coordinates	13758.1; 25842.1
Trawl Duration	21 minutes	End Coordinates	13761.5; 25852.1
Grate Type	6"		

<u>Cod end Species</u>	<u>Length (Range)</u>	<u>Escape Chute Species</u>	<u>Length (Range)</u>
2 Cod	600	Flounder	
1 Cod	620	1 Blackback	380
Flounder		1 Yellowtail	370
6 Yellowtail	360	1 Fluke	480
33 Monkfish	275	2 Monkfish	300
3 Sculpin	280	3 Skates	560
58 Skates	490		
3 Crabs			
4 Lobsters			
1 Starfish			

Date	8-Dec-00	Starting Coordinates	13757.8; 25846.9
Trawl Duration	8 minutes	End Coordinates	N/A
Grate Type	6"		

<u>Cod end Species</u>	<u>Length</u>	<u>Escape Chute Species</u>	<u>Length</u>
170 Cod	620-670	20 Cod	670-750
Flounder		11 Monkfish	
4 Blackback	400	29 Skate	
2 Yellowtail	300		
51 Monkfish	280		
2 Monkfish	430-480		
1 Monkfish	650		
1 Sea Robin	370		
4 Crabs			
1 Lobster			



ALL-WELDED STEEL GRATE
36 IN. WIDE 48 IN. HIGH
FRAME 5/8 COLD ROLL STEEL
BARS 1/2 COLD ROLL STEEL
SPACING 3 INCHES (76.2 MM)

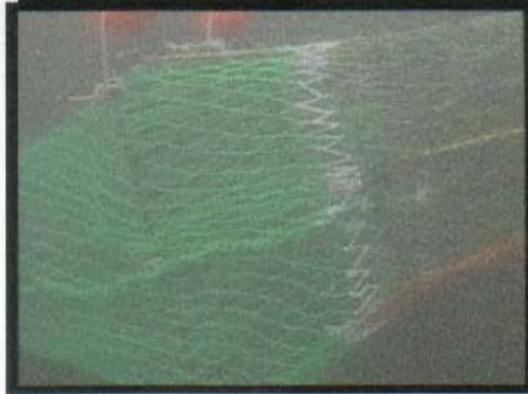
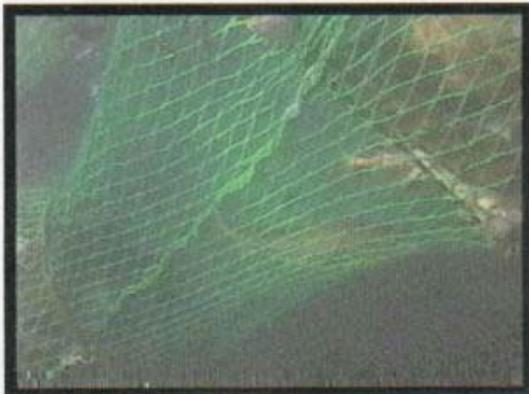


Figure 2: Final grate design with 3" spacing.

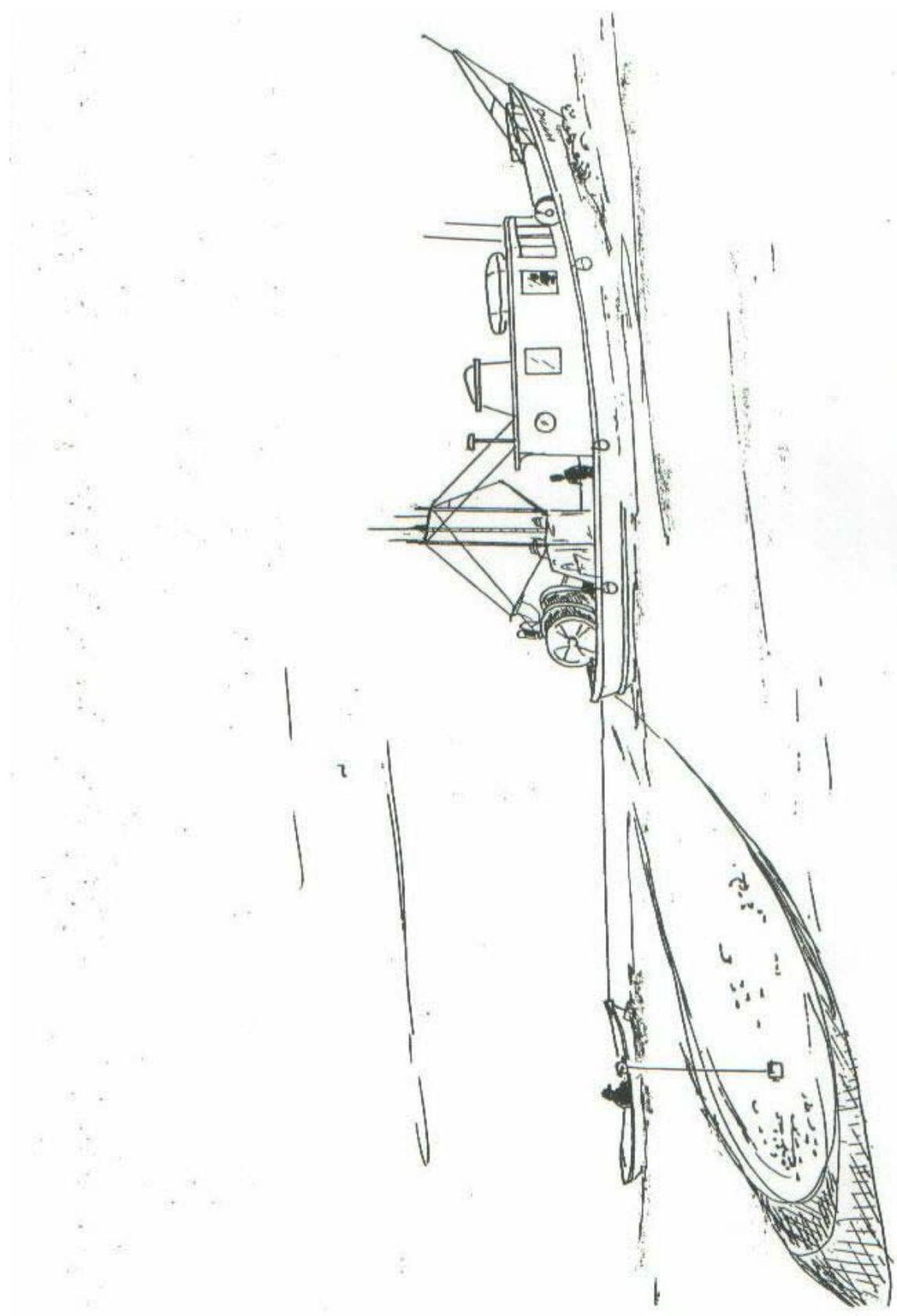


Figure 4: System used to videotape trawl performance.

Test trawls

All tows were made in one of two areas, just off the coast of Cape Ann (Figure 2), in water depths of 80 to 100 meters. Tow lengths were typically twenty minutes to one hour, but shorter and longer trawls were also used. Duration of tows was influenced by catch rates and information provided by other vessels fishing in the area.

After haul-back, the catch from the main cod end and the escape cod end were placed in separate bins, identified and counted. **Approximate** length measurements of most fish were taken during the net development and testing phase. If most of the fish of one species were of a similar size, one individual was measured. Outliers consisting of much larger or smaller fish were also measured. This was done to conserve time and maximize the number of trawls completed in a day. Since this study was to determine separation of cod and flounder rather than stock assessment, we wanted to get a general idea of possible differences in separation between large and small fish. All fish were to be measured accurately in the final paired-trawling evaluation. Photographs of field procedures are shown in Figures 5 and 6.

Problems Encountered

This study was based on a very modest level of funding. It was assumed that the design, as proposed, would work and that after a few days of testing, paired trawling experiments involving two vessels would begin which would generate data suitable for statistical analysis. It was quickly determined that the original design did not work and most of the funds (and time) for the project were used in development and testing of alternatives. At the end of project period and funding, there were still significant questions to be addressed. Some of these might be answered in another, more comprehensive, study of grate performance funded by Northeast Consortium, although it appears that project has encountered some of the same problems (grate clogging etc.,)

The permit process and other regulatory issues limited the time available for trawling. The original EFP (exempted fisheries permit) took 100 days to process, leaving little time available for the project based on the proposed allotted timeframe. It took another 60 days to get the permit extended for 100 days. During that period, in the fall of 2001, both cod and dogfish were abundant in the experimental areas to the point where they were clogging the gear but there were few flounder. Subsequently, 60 days of rolling closures occurred, after which, the federal government instigated a complete shutdown due to lawsuits. At the end of the project, allotted days at sea (for commercial fishing) were used in an attempt to finish the project. The lawsuit issue could not be avoided but perhaps regulatory agencies need to consider streamlining the EFP process and allowing research, which might be beneficial to overall fisheries, to be performed in closed areas (either rolling or permanent).



HAUL BACK DECEMBER 4 2000



Figure 5: Field tests with original grate.



INSTALLING GRATE



BOTTOM WITH CHAFFING GEAR



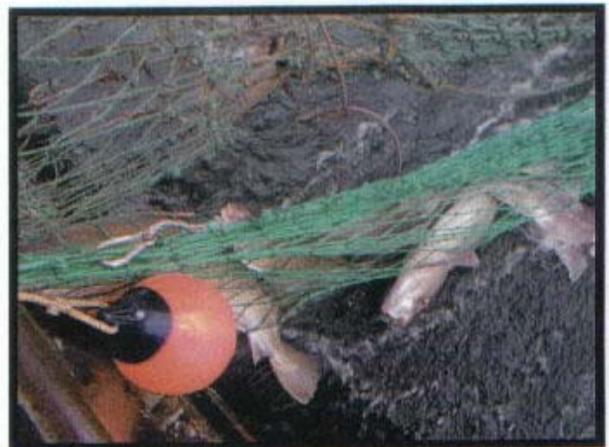
TOP COD ESCAPE



2.2 KNOTS



COD AND FLOUNDER IN FRONT OF GRATE



COD AND DOGFISH IN ESCAPE COD END

Figure 6: Installation and testing of grates.

Seasonality, abundance, and species composition were major factors. Cod and flounder are present together in the areas used for research in the late fall and spring. Many more days were spent trawling but not reported due to cod and flounder numbers that were too small for comparative evaluations. Only a few of these results are included in the report. In some cases, cod or dogfish were so abundant that the gear became clogged. One 8-minute tow in December 2001 produced 2,100 lbs of cod. A significant problem, as identified earlier, was clogging of the grate by monkfish, which are present at highest densities in the research area from October to early December

Results

The original grate design allowed for more cod to pass through to the cod end than exit through the escape chute (e.g. Table 1). Grate openings were immediately changed to progressively smaller sizes (6-inch, 5-inch, 4-inch) and a few tows were performed with each. Even with 4-inch spacing (Table 2), significant numbers of cod got through to the main cod end. In one case, a cod weighing 25 lb was stuck in the 4-inch grate suggesting that others of this species, just slightly smaller than that could get through. With the size reduced to 3-inches, separation of cod and flounder was observed with most of the latter being found in the escape cod end and most of the flatfish in the main cod end. An analysis of the data from 19 tows with the 3-inch grate is shown in Table 4. Additional data on 3-inch grates can be found in Appendix A.

Table 4. Separation of flounder

	<u>Main cod end</u>	<u>Escape cod end</u>	<u>Caught in grate</u>
	2	0	0
	4	1	0
	2	0	0
	4	2	0
	5	0	0
	7	2	0
	6	1	0
	3	2	0
	5	0	0
	74	42	0
	380	8	0
	14	1	0
	3	1	0
	17	4	0
	35	6	0
	15	8	8
	14	5	3
	35	8	0
	13	0	0
Total	638	91	21

Table 3

Representative tows with 4" grate

Date	10-Dec-00	Starting Coordinates	13753.8; 25825.7
Trawl Duration	20 minutes	End Coordinates	13752.5; 25844.0
Grate Type	4"		

<u>Cod end Species</u>	<u>Length (Range)</u>	<u>Escape Chute Species</u>	<u>Length (Range)</u>
20 Cod	650	11 Cod	610-650
10 Cod	450	Flounder	
Flounder		1 Blackback	370
2 Blackback	360-430	1 Monkfish	310
3 Yellowtail	380	8 Skates	500
19 Monkfish	250		
1 Sculpin	290		
1 Silver Hake	350		
36 Skates	430		
3 Crabs			
1 Lobster			

Date	12-Dec-00	Starting Coordinates	13753.2; 25847.5
Trawl Duration	20 minutes	End Coordinates	N/A
Grate Type	4"		

<u>Cod end Species</u>	<u>Length (Range)</u>	<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder		* Removed escape cod end	
1 Blackback	420		
3 Yellowtail	340		
1 Dogfish	720		
36 Monkfish	290		
3 Sculpin	300		
6 Skates	540		
1 Crab			
1 Lobster			

<u>Caught in Grate</u>	<u>Length (Range)</u>
Flounder	
1 Yellowtail	290
7 Monkfish	
2 Dogfish	
1 Lobster	

Of 750 flounder caught, 638 were found in the main cod end, 21 were caught in the grate (and thus retained) and 91 exited through the escape vent into the escape cod end. This represents a 12.1 percent loss of fish (that have entered the net) through the escape chute. Individuals stuck in the grate were considered caught. The proportion of flounder caught in the grate, and those exiting through the escape cod end, was dependent upon clogging of the grate by other species such as monkfish and dogfish – a problem that may or may not be resolved with design modifications. While the number of tows is low, the data suggests that the grate system does have potential for catching flounder with an acceptable loss rate.

A similar analysis on cod with much fewer numbers (125 individuals) found that 27.2 percent of the individuals were either caught in the grate or in the main cod end. The remaining 72.8 percent were found in the escape cod end. This analysis excluded a few tows where the excessive number of fish caught clogged the entire system (2,100 lbs of cod in 8 minutes) and most fish were found in front of the grate.

Conclusions and Recommendations

Net Performance

The proposed design is not suitable for use at all times of the year. In the presence of other species such as monkfish and dogfish, and even very heavy densities of cod, the grate becomes clogged and little or no separation of cod and flounder occurs. A possible solution to this problem is the use of a ventral escape vent for monkfish. This approach is being evaluated in a much larger-scale study also funded by Northeast Consortium. That study is also investigating a self-cleaning grate where rollers or plastic tubes are placed over the bars on the grate to facilitate the movement of fish up the grate. The net in that case is a more complicated double-grate system, which requires major modifications to the basic trawl. The purpose of this effort was to determine whether fairly simple modifications to the basic trawl would achieve separation of cod and flounder. Further evaluation and improvements of this simple system, such as a taller grate set at a more acute angle, a ventral escape chute, and self-cleaning rollers, would require significant funding. It seems appropriate to wait for the results of the other major study before determining whether further research is warranted. The simple grate system with minor modifications might be suitable for use in nearshore waters in the late spring – early summer when flounder are present and cod densities are low. This is the time of year when rolling closures occur and it is doubtful that fishermen will be allowed to fish in these waters in the near future.

Gear Development Studies in Nearshore Waters

The project has highlighted some of the problems encountered when conducting gear testing. In the case of species selectivity, a major issue is the large variation in

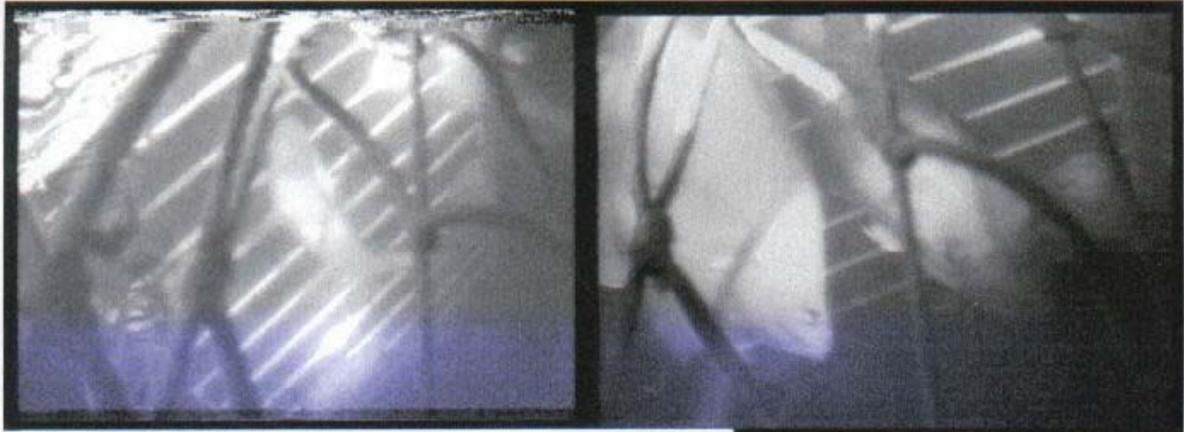
seasonal distribution of species. In most cases, the periods suitable for conducting research are limited to certain months. This is a major consideration in the design of projects, as is the permit process. We believe that a general scientific research permit would be preferable. One that would allow studies to be performed at times of closure since the purpose of the research is to benefit the fisheries.

Video Techniques

While there are some obvious advantages to flume tank testing, an alternative approach was demonstrated in this project. The overall performance of a full-size trawl can be evaluated using the system as shown in Figure 2. A skiff towed behind a trawler in the shallow, clear water of Ipswich Bay can be maneuvered to record all aspects of the trawl gear from the doors and head rope to the net and any modifications added such as a grate. A video of the gear used in this project and that of other vessels is available from Captain Bill Lee (title; "Trawls, Nets and Doors"). In addition to that, other camera systems were built which can be used to record fish behavior inside the net and at the grate (e.g. Figure 7). These systems should be included in any future studies on gear performance or selectivity.

Collaborations

A positive aspect of this project was the interest and cooperation of a number of fishing vessels that operate in the same area. Captains were curious about the performance of the grate system and were helpful in reporting their own catch rates and composition. The length of tows on a given day was often influenced by catch taken on other vessels the same morning. In developmental tests, the goal was to avoid hauling in very large numbers of fish since they were to be returned overboard. During the last few tows, while pair trawling, there were four other vessels of similar size fishing in regular commercial mode within a radius of 5 miles. At the end of the day the boat captains reported their tow times and catch numbers of flounder and cod. This allowed for a comparison of the catch rate and composition during experiments with normal commercial activity on other vessels. This cooperative approach has promise for bolstering data produced in future gear development studies.



STEEL GRATE 50 FATHOM (300
FEET) WATER
2.2 KNOTS WITH LIGHT
COD, FLOUNDER, WHITING AND
DOG FISH
NOVEMBER 2001

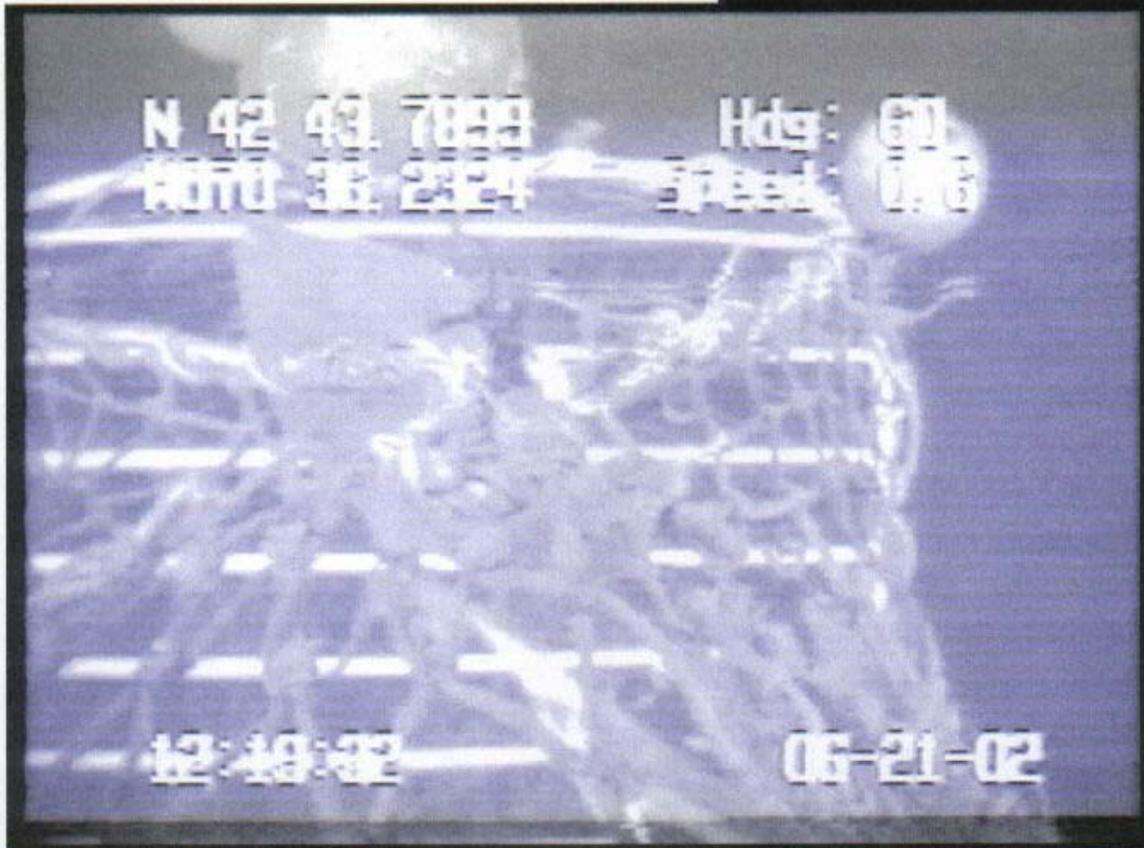
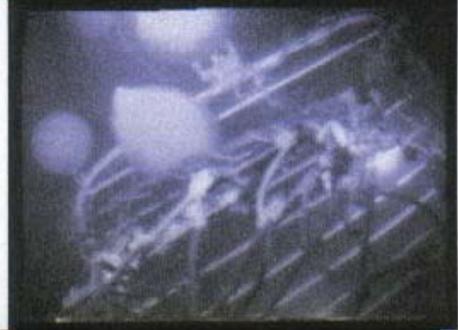


Figure 7: Fish interaction with grate in deep water.

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Appendix

Date 19-Dec-00
Trawl Duration 20 minutes
Grate Type 3"

Starting Coordinates 13756.4; 25840.3
End Coordinates 13759.5; 25846.7

<u>Cod end Species</u>	<u>Length (Range)</u>
1 Cod	740
11 Monkfish	280
10 Sculpin	280
37 Skates	410
1 Crab	
2 Lobsters	
2 Starfish	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
1 Cod	730
1 Monkfish	240
5 Skates	440

Date 19-Dec-00
Trawl Duration 20 minutes
Grate Type 3"

Starting Coordinates 13757.6; 25850.3
End Coordinates 13756.9; 25856.8

<u>Cod end Species</u>	<u>Length (Range)</u>
1 Cod	660
Flounder	
1 Blackback	260
1 Blackback	390
1 Monkfish	280
2 Sculpin	270
1 Silver Hake	350
21 Skate	380
1 Skate	610
2 Crabs	
2 Lobsters	
3 Starfish	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
1 Cod	610
1 Cod	500
1 Monkfish	370
3 Skates	470

Date 19-Dec-00
Trawl Duration 21 minutes
Grate Type 3"

Starting Coordinates 13755.5; 25857.1
End Coordinates 13751.6; 25849.3

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
1 Dab	430
3 Yellowtail	320-350
14 Monkfish	280
2 Sculpin	
2 Sea Raven	260
15 Skates	500
1 Crab	
3 Lobster	
1 Shrimp	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
1 Blackback	350
1 Skate	300

Date 19-Dec-00
Trawl Duration 23 minutes
Grate Type 3"

Starting Coordinates 13751.2; 25851.7
End Coordinates 13760.7; 25855.3

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
2 Yellowtails	300-360
25 Monkfish	310
8 Sculpin	
2 Silver Hake	200-260
25 Skates	435
3 Crabs	
7 Lobsters	
1 Sea cucumber	
1 Shrimp	
1 Starfish	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
1 Cod	685
2 Monkfish	220
4 Skates	450

<u>Caught in Grate</u>	<u>Length (Range)</u>
5 Skates	

Date 19-Dec-00
Trawl Duration 1 hour
Grate Type 3"

Starting Coordinates 13767.0; 25856.7
End Coordinates 13776.8; 25879.7

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
2 Yellowtail	270-340
2 Sunlight	300
11 Monkfish	200
6 Sculpin	290
3 Silver Hake	190
512 Skates	450
1 Skate	600
7 Crabs	
3 Lobsters	
10 Starfish	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
2 Sunlight	280
6 Monkfish	300
88 Skates	670

<u>Caught in Grate</u>	<u>Length (Range)</u>
Flounder	
1 Blackback	
3 Skates	

Date 21-Dec-00
Trawl Duration 24 minutes
Grate Type 3"

Starting Coordinates 13754; 25760
End Coordinates 13760; 25762

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
2 Blackbacks	390
1 Dab	410
2 Yellowtail	320
1 Dogfish	
10 Monk	260
6 Sculpin	
1 Sea Robin	400
16 Skate	50
4 Crabs	
10 Lobsters	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
1 Sea Robin	390

Date 21-Dec-00
Trawl Duration 20 minutes
Grate Type 3"

Starting Coordinates 13761; 25762
End Coordinates 13758; 25763

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
3 Blackback	450
4 Yellowtail	245
1 Monkfish	500
16 Monkfish	260
6 Sculpin	
9 Crabs	
28 Lobster	
3 Starfish	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
1 Dab	400
1 Yellowtail	350
2 Monkfish	410
2 Sea Robin	390
4 Skate	270

Date 21-Dec-00
Trawl Duration 20 minutes
Grate Type 3"

Starting Coordinates 13755; 25763
End Coordinates 13753; 25764

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
1 Dab	350
1 Dab	310
1 Sunlight	310
3 Yellowtail	290
3 Ocean Pout	700
25 Skate	470
9 Crab	
4 Lobster	
2 Starfish	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
1 Yellowtail	340
2 Monkfish	410
1 Sea Robin	390
6 Skate	290

Date 21-Dec-00
Trawl Duration 21 minutes
Grate Type 3"

Starting Coordinates 13750; 25765
End Coordinates 13751; 25763

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
2 Dab	310
1 Yellowtail	270
16 Monkfish	270
20 Sculpin	300
6 Crab	
6 Lobster	
4 Starfish	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
2 Yellowtail	340
4 Pollock	870
1 Sculpin	300
4 Skate	270

Date 21-Dec-00
Trawl Duration 1 hour
Grate Type 3"

Starting Coordinates 13740; 25755
End Coordinates 13730; 25740

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
4 Dab	320
1 Dab	450
1 Monkfish	510
1 Monkfish	450
4 Sculpin	310

<u>Escape Chute Species</u>	<u>Length (Range)</u>
14 Pollock	870
1 Skate	270

Date 28-Mar-01
Trawl Duration 1 hour
Grate Type 3"

Starting Coordinates 13850; 25850
End Coordinates

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
25 Blackback	250-400
20 Dabs	500-700
4 Sunlight	
25 Yellowtails	330-470
2 Ocean Pout	700
1 Monkfish	200
2 Sculpin	240
3 Skates	410
1 Whiting	200
4 Crabs	
4 Lobsters	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
6 Blackback	250-400
11 Dabs	500-700
25 Yellowtail	330-470
1 Ocean Pout	100
4 Sea robins	400

Date 28-Mar-01
Trawl Duration 4 hours
Grate Type 3"

Starting Coordinates 13850; 25850
End Coordinates 25870

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
55 Blackback	250-400
80 Dabs	500-700
20 Sunlight	400
225 Yellowtail	300-500
1 Monk	250
12 Sculpin	250
1 Sea Robin	400
50 Skates	350-650
8 Crabs	
12 Lobsters	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
4 Cod	550-700, 900, 1100
Flounder	
2 Blackback	250-300
6 Yellowtail	300-470
Monkfish	750
4 Skates	450

Date 3-Oct-01
Trawl Duration 15 min
Grate Type 3"

Starting Coordinates 13761.1; 25846.9
End Coordinates 13756.0; 25842.6

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
5 Yellowtail	330
3 Dab	390
1 Blackback	390
5 Grey Sole	390
2 Skates	440 - 610
1 Dogfish	730
7 Monkfish	270 - 500
6 Crabs	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
1 Dab	350
1 Skate	500
1 Monkfish	440 - 1000

<u>Caught in Grate</u>	<u>Length (Range)</u>
Flounder	
1 Grey Sole	380
7 Monkfish	360 - 600
4 Dogfish	800 - 1000

Date 3-Oct-01
Trawl Duration 15 min
Grate Type 3"

Starting Coordinates 13780.7; 25849.5
End Coordinates 13783.5; 25855.0

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
2 Blackback	370
1 Sunlight	265
37 Skates	490
7 Monkfish	310
9 Crabs	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
1 Yellowtail	36
1 Skate	

<u>Caught in Grate</u>	<u>Length (Range)</u>
Flounder	
8 Yellowtail	345
2 Lobster	
1 Skate	

Date 19-Oct-01
Trawl Duration 30 min
Grate Type 3"

Starting Coordinates 13745.0; 25823.4
End Coordinates 13748.2; 25828.2

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
3 Blackback	270 - 370
5 Dab	300
3 Dab	430
3 Grey Sole	430
1 Grey Sole	300
2 Yellowtail	340
30 Monkfish	200
1 Monkfish	400
1 Dogfish	800
1 Squid	280
9 Crabs	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
Flounder	
2 Dab	220 - 430
2 Blackback	390
2 Skate	440
4 Monkfish	400 - 660
1 Dogfish	720
1 Lumpfish	430

Caught in Grate **Length (Range)**

5 Monkfish

Date 19-Oct-01
Trawl Duration 56 min
Grate Type 3"

Starting Coordinates 13742.6; 25828.8
End Coordinates 13722.1; 25828.4

<u>Cod end Species</u>	<u>Length (Range)</u>
1 Cod	870
Flounder	
1 Yellowtail	350
25 Grey Sole	390
1 Grey Sole	300
7 Dab	340 - 430
1 Blackback	400
19 Monkfish	400
2 Monkfish	200
4 Skate	510
2 Squid	340
6 Scallops	
1 Lobster	
1 Crab	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
1 Cod	740
Flounder	
2 Grey Sole	410
2 Dab	430
2 Dab	310
12 Monkfish	420
3 Monkfish	500
4 Skate	400 - 900

Caught in Grate **Length (Range)**

1 Monkfish 430
1 Skate 400
5 Scallops

Date 13-Nov-01
Trawl Duration 1 hr
Grate Type 3"

Starting Coordinates 13756.7; 25829.3
End Coordinates 13734.9; 25822.8

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
7 Blackback	340
5 Yellowtail	350
2 Grey Sole	400
1 Dab	500
16 Skates	420 - 900
1 Dogfish	870
28 Monkfish	400 - 500
4 Scallops	
2 Lobster	
2 Crabs	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
6 Cod	680 - 1125
Flounder	
1 Blackback	300
3 Yellowtail	310 - 360
3 Dab	320 - 410
1 Sand Dab	290
11 Monkfish	430 - 500
12 Skates	510 - 820

<u>Caught in Grate</u>	<u>Length (Range)</u>
2 Cod	680 - 750
Flounder	
3 Blackback	430
3 Yellowtail	310 - 390
2 Dab	440
7 Monkfish	360 - 730
5 Skates	470 - 660
2 Dogfish	810
1 Lobster	
1 Scallop	
1 Crab	

Date 2-Dec-01
Trawl Duration 1 hr
Grate Type 3"

Starting Coordinates 13753.6; 25827.6
End Coordinates 13758.5; 25850.3

<u>Cod end Species</u>	<u>Length (Range)</u>
3 Cod	600 - 660
Flounder	
1 Blackback	320
10 Yellowtail	350
2 Sunlight	290
1 Dab	340
56 Skates	460
1 Dogfish	860
36 Monkfish	370
1 Sculpin	310
1 Scallops	
1 Lobster	
6 Crabs	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
17 Cod	650 - 900
Flounder	
1 Blackback	370
2 Yellowtail	260 - 360
1 Dab	350
1 Sunlight	270
10 Monkfish	330
9 Skates	530
2 Dogfish	820

<u>Caught in Grate</u>	<u>Length (Range)</u>
8 Cod	600 - 890
Flounder	
1 Dab	350
1 Yellowtail	370
1 Blackback	380
2 Skates	500
2 Dogfish	700
4 Monkfish	280
1 Squid	360
2 Crabs	
1 Starfish	
1 Lobster	

Date 3-Dec-01
Trawl Duration 2 hr 1 min
Grate Type 3"

Starting Coordinates 13755.1; 25829.0
End Coordinates 13758.8; 25871.9

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
4 Dab	300
5 Sunlight	280
26 Yellowtail	340
6 Dogfish	820
49 Monkfish	460
2 Sculpin	280
1 Sea Robin	430
73 Skate	860, 400
2 Whiting	390
1 Conga Eel	740
3 Crab	
5 Lobster	
4 Scallop	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
23 Cod	
Flounder	
1 Blackback	350
2 Dab	340, 470
5 Yellowtail	340
8 Skate	400
1 Sculpin	
12 Monkfish	
3 Crab	

Caught in Grate **Length (Range)**

6 Cod
9 Dogfish

Date 3-Dec-01
Trawl Duration 2 hrs
Grate Type 3"

Starting Coordinates 13754.0; 25871.5
End Coordinates 13578.0; 25832.8

<u>Cod end Species</u>	<u>Length (Range)</u>
2 Cod	630
Flounder	
2 Blackback	
2 Dab	
9 Yellowtail	
200 Monkfish	
200 Skate	
13 Crab	
3 Lobster	

<u>Escape Chute Species</u>	<u>Length (Range)</u>
30 Cod	
6 Dogfish	

Caught in Grate **Length (Range)**

4 Cod
10 Dogfish

Date 11-Oct-02
Trawl Duration 30 min
Grate Type 3"

Starting Coordinates 13751.6; 25830.5
End Coordinates 13751.8; 25845.8

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
1 Dab	320
3 Grey Sole	400
2 Yellowtail	375
8 Blackback	360
1 Whiting	250
2 Dogfish	710
3 Skate	430
19 Monkfish	250-380
2 Monkfish	530
2 Lobster	
2 Crab	

Escape Chute Species Length (Range)

* Removed escape cod end

Caught in Grate Length (Range)

Flounder	
2 Blackback	380
1 Sunlight	310
2 Dogfish	830
4 Monkfish	380
1 Monkfish	600
2 Squid	310
1 Scallop	

Date 11-Oct-02
Trawl Duration 33 min
Grate Type Control (no grate)

Starting Coordinates 13750.3; 25837.1
End Coordinates 13747.2; 25842.4

<u>Cod end Species</u>	<u>Length (Range)</u>
1 Cod	765
30 Flounder	200 - 390
3 Flounder	130
25 Monkfish	
5 Dogfish	
2 Skate	
2 Whiting	
2 Crab	

Escape Chute Species Length (Range)

* no grate

Caught in Grate Length (Range)

* no grate

Date 11-Oct-02
Trawl Duration 1 hr. 1 min
Grate Type 3"

Starting Coordinates 13753.6; 25848.7
End Coordinates 13747.2; 25867.6

<u>Cod end Species</u>	<u>Length (Range)</u>
1 Cod	630
Flounder	
1 Blackback	350
2 Sunlight	320
10 Dab	320 - 430
10 Grey Sole	360, 410
1 Fluke	440
33 Monkfish	340, 450, 540
7 Dogfish	830
1 Lobster	
2 Crab	
1 Scallop	
1 Squid	

Escape Chute Species Length (Range)

* Removed escape cod end

Caught in Grate Length (Range)

1 Cod	740
2 Monkfish	850, 310
2 Dogfish	680
2 Scallop	

Date 11-Oct-02
Trawl Duration 1 hr. 4 min
Grate Type Control (no grate)

Starting Coordinates 13746.2; 25850.0
End Coordinates 13747.7; 25877.9

<u>Cod end Species</u>	<u>Length (Range)</u>
2 Cod	660, 730
53 Flounder	115 - 425
17 Monkfish	
7 Dogfish	
1 Skate	
3 Starfish	
1 Crab	

Escape Chute Species Length (Range)

* no grate

Caught in Grate Length (Range)

* no grate

Date 11-Oct-02
Trawl Duration 1 hr.
Grate Type 3"

Starting Coordinates 13750.5; 25867.7
End Coordinates

<u>Cod end Species</u>	<u>Length (Range)</u>
Flounder	
1 Blackback	400
2 Sunlight	350
6 Dab	350
5 Grey Sole	400
1 Yellowtail	370
8 Dogfish	760
27 Monkfish	350
2 Skate	790, 510
1 Starfish	310
1 Lobster	
2 Crab	
1 Lg. Jellyfish	3 ft

Escape Chute Species Length (Range)

* Removed escape cod end

Caught in Grate Length (Range)

Flounder	
1 Sunlight	280
10 Monkfish	320
4 Dogfish	890

Date 11-Oct-02
Trawl Duration 1 hr. 2 min
Grate Type Control (no grate)

Starting Coordinates 13751.4; 25876.0
End Coordinates 13760.0; 25856.3

<u>Cod end Species</u>	<u>Length (Range)</u>
2 Cod	800, 760
29 Flounder	250 - 450
2 Flounder	130
32 Monkfish	
10 Dogfish	
1 Lobster	
1 Starfish	
1 Crab	
2 Squid	
3 Whiting	

Escape Chute Species Length (Range)

* no grate

Caught in Grate Length (Range)

* no grate

Date 21-Oct-02
Trawl Duration 1 hr. 28 min
Grate Type 3"

Starting Coordinates 13749.6; 25822.6
End Coordinates

<u>Cod end Species</u>	<u>Length (Range)</u>
1 Cod	680
Flounder	
3 Blackback	350, 360
3 Dab	290 - 380
3 Grey Sole	320 - 420
2 Yellowtail	350, 360
4 Dogfish	540 - 820
46 Monkfish	250 - 670
5 Skate	350 - 550
1 Starfish	
1 Lobster	
8 Crab	

Escape Chute Species Length (Range)

* Removed escape cod end

Caught in Grate Length (Range)

Flounder	
1 Dab	390
1 Blackback	330
11 Monkfish	270 - 810
1 Dogfish	760
1 Skate	690
2 Lobster	
1 Scallop	

Date 21-Oct-02
Trawl Duration 1 hr. 31 min
Grate Type Control (no grate)

Starting Coordinates 13749.3; 25825.1
End Coordinates 13744.5; 25857.2

<u>Cod end Species</u>	<u>Length (Range)</u>
6 Cod	590 - 780
59 Flounder	130 - 420
72 Monkfish	
5 Dogfish	
2 Lobster	
8 Skate	
2 Crab	
2 Squid	
2 Scallop	
1 Sea Robin	

Escape Chute Species Length (Range)

* no grate

Caught in Grate Length (Range)

* no grate

