Final Contract Report

Evaluation of Bycatch Reduction Devices to Facilitate Summer Flounder (*Paralichthys dentatus*) Escapement from Sea Scallop Trawls

Award No. NA16FM1647

01- SCA-001

Research TAC Set-Aside
Mid-Atlantic Scallop Exemption Program
Closed Area Access

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Project Background/Summary

Trawl vessels targeting sea scallops account for 10% to 15% of annual landings. While these landings represent a small fraction of the total annual landings, sea scallop trawl vessels are few in number and are restricted to operate in the mid-Atlantic region where the substrate consists of gravel/sand and is free of large obstructions. Operating in this region, sea scallop trawl vessels encounter summer flounder (*Paralichthys dentatus)* as the flatfish overwinters along the edge of the continental shelf between the months of November to April. Bycatch rates can be high as sea scallops and summer flounder coexist both spatially and temporally.

The bycatch of summer flounder is of particular concern due to the fact that it is a regulated species and is managed by a strict quota. At some times of the year, summer flounder can be landed, however trip limits can be low or non-existent and many summer flounder must be discarded with varying degrees of survival. One solution to this problem is to modify the design of the existing gear to facilitate the escapement of non-target species. Two approaches to gear design can be pursued to accomplish this task. Drawing on the experiences of other trawl fisheries, modifications to the gear that promote the escapement of bycatch after it has entered the gear can be used. Turtle excluder devices (TED) and bycatch reduction devices (BRD) are two examples. Another approach consists of modifying the gear so that it minimizes bycatch species from entering the gear. Any gear modification, however, can be considered acceptable if it does not result in a concomitant loss of the target species.

For this award, the development and implementation of a gear modification to reduce summer flounder bycatch in the sea scallop trawl fishery hinged upon the behavioral characteristics of the bycatch species. Evidence suggests that summer flounder rise up from the bottom as they encounter trawl gear. The fish then come into contact with the top square of the trawl behind the headrope and are funneled into the net. Trawls designed to capture summer flounder will take advantage of this behavior and place the headrope forward of the footrope to minimize the number of fish that rise up off the bottom and pass over the headrope. In this study, our gear modification attempted to utilize this behavior to facilitate escape. Meshes from the top square of the experimental net were removed, in effect, bringing the position of the headrope behind the footrope. This modification attempted to allow summer flounder an opportunity to rise off the bottom and pass over the headrope.

The goal of this study was to field test the experimental trawl in relation to the standard trawl employed in the sea scallop fishery in an attempt to reduce the capture of summer flounder. Project objectives were: (1) to examine the efficacy of modified sea scallop gear to reduce the incidence of finfish bycatch in general and summer flounder bycatch in particular and (2) to assess whether gear modifications result in concomitant losses in the catch of sea scallops. The testing of the experimental trawl was facilitated by the operational characteristics of sea scallop trawl vessels. Usually, vessels simultaneously tow two nets with ground sweeps of 60' to 70'. This configuration allows the experimental net to be tested against the other net as a control. Side by side

comparisons or resulting catches can then be made as all conditions are equal except for the modification in the experimental net.

Materials and Methods

Under this award, an experimental trawl was designed and constructed by Dave Buetel, a gear design specialist from the Sea Grant Program at the University of Rhode Island (Figure 1). The experimental net was constructed by modifying a standard sea scallop trawl. As with the standard trawl, the experimental net had a footrope length of 65' (19.8m), was composed of 5.5" (139.7 mm) between the knot, diamond mesh with a twine diameter of 4.5mm. In the experimental trawl, eleven meshes were removed from the top square and the headrope was lengthened accordingly. There were no other modifications made to the experimental trawl.

A sampling cruise was taken in January of 2002 to test the efficacy of the experimental net to reduce the incidence of finfish bycatch in general and summer flounder bycatch in particular without concomitant reductions in sea scallop catch. The cruise was conducted aboard the F/V *Capt. Tuck*, a commercial sea scallop trawler hailing from Newport News, Virginia. The trip was conducted in the Hudson Canyon South Closed Area, where large concentrations of sea scallops and summer founder coexisted during that time of year (Figure 2). Nineteen experimental tows were conducted. Both the experimental and control nets were towed simultaneously and tow time was generally one hour.

While at sea, both a tow log and deck log were maintained. The tow log, compiled by the captain and/or first mate, contained information pertaining to the operation of the fishing boat and gear. The tow log included: (1) tow number, (2) date, (3) time at the beginning and end of each tow, (4) location (DGPS) at the beginning and end of each tow, (5) vessel speed, (6) depth, (7) sea scallop harvest (baskets) by each gear (port-starboard), and (8) comments on the tow.

The deck log was maintained by the chief scientist, and contained information pertaining to the biological parameters of the catch. Information recorded in the deck log included: (1) harvest volume (baskets), (2) shell-height frequency distribution in 5 mm intervals of both retained and discarded scallops, and (3) length measurements of finfish bycatch (4) volume estimates (baskets) of trash and miscellaneous invertebrates.

Deck operations were conducted under near normal commercial fishing conditions. For all tows, the sea scallop catch from each gear was dumped on the deck, culled, shucked, placed in chilling totes, bagged, and placed on ice or frozen until offloaded at the termination of the trip. Of the sampled tows, the crew culled the catch for scallops to be retained for shucking. A sub-sample of up to two baskets (1 basket equals approximately 1.5 bushels) of retained scallops were set aside for length frequency analysis. The scientific staff then sorted through the debris for discarded scallops. Depending on the volume of trash and numbers of juveniles present, a fraction of the

juveniles were retained for length frequency analysis. Shell height measurements were taken at 5 mm intervals from the umbo to the ventral margin of the shell for each sampled scallop using a National Marine Fisheries Service sea scallop measuring board. Total length measurements to the nearest millimeter were taken for all finfish bycatch.

Information from the tow and deck logs were entered into the VIMS sea scallop database for analysis. Length frequency distributions and catch per unit effort (CPUE) values were generated for sea scallops and each finfish species and from the raw catch data. Statistical differences in CPUE were tested for using a paired Student's t-test at an alpha level of 0.05.

Results

The results from the research conducted under this award are grouped according to the following project objectives.

Objective 1. To examine the efficacy of modified sea scallop gear to reduce the incidence of finfish bycatch in general and summer flounder bycatch in particular.

Length frequency distributions for summer flounder, monkfish, black sea bass and gray sole are shown in Figures 3 and 4. Condensed catch data and the results of the paired t-tests for finfish bycatch species are shown in Tables 1-4. Length frequency distributions for summer flounder show increased catches of smaller (<43mm) animals by the experimental gear. The greater numbers of these smaller animals resulted in the catch per tow of summer flounder by the experimental gear being greater than that of the control gear. This difference was statistically significant ($p=0.189$) at the $\alpha=0.05$ level. Catch per tow of monkfish, black sea bass, and gray sole was not significantly different ($p=0.825$, $p=0.398$, $p=0.667$, respectively) at the $\alpha=0.05$ level.

Objective 2. To assess whether gear modifications result in concomitant losses in the catch of sea scallops.

The length frequency distribution for sea scallops is shown in Figure 5. Condensed catch data and the results of the paired t-tests for sea scallops is shown in Table 5. There was no statistically significant difference ($p=0.978$) in baskets caught per tow between the experimental and control gear at the $\alpha=0.05$ level.

Conclusions

The objective of reducing the incidence of summer flounder bycatch using a modified sea scallop trawl was not achieved. The experimental trawl actually captured a greater number of summer flounder than the control net. For other species categorized as finfish bycatch there was no statistically significant differences in catch. Additionally, results from the experimental tows indicated that there were no significant losses of sea

scallops by the experimental net relative to the control net. While the objective of summer flounder bycatch reduction was not achieved by this design, other design options exist and with further research and testing hold promise for the resolution of the bycatch issue

List of Entities

David Buetel from the Sea Grant Program at the University of Rhode Island was contracted to design and construct the experimental sea scallop trawl.

All of the field work associated with this project was conducted on the F/V *Capt. Tuck*, and steel-hulled sea scallop trawler operating out of Newport News, Virginia. The F/V *Capt. Tuck* is owned and operated by Old Point Seafoods[1].

Fishing operations, gear storage and logistical support were provided by Old Point Seafoods, Newport News, Virginia.

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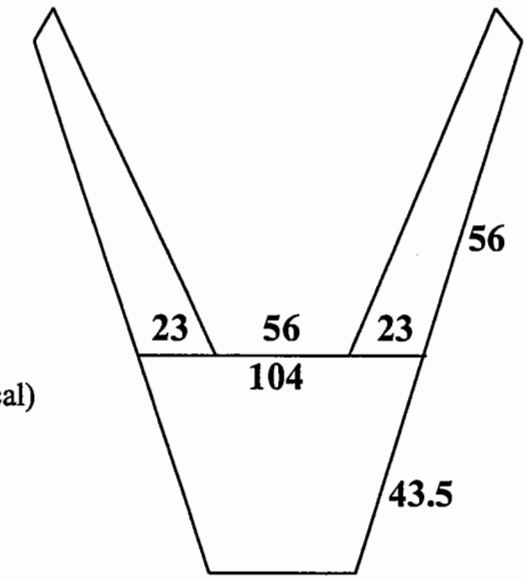
[1] F/V *Capt. Tuck*
Old Point Seafoods
817 Jefferson Ave.
Newport News, VA 23607-0817

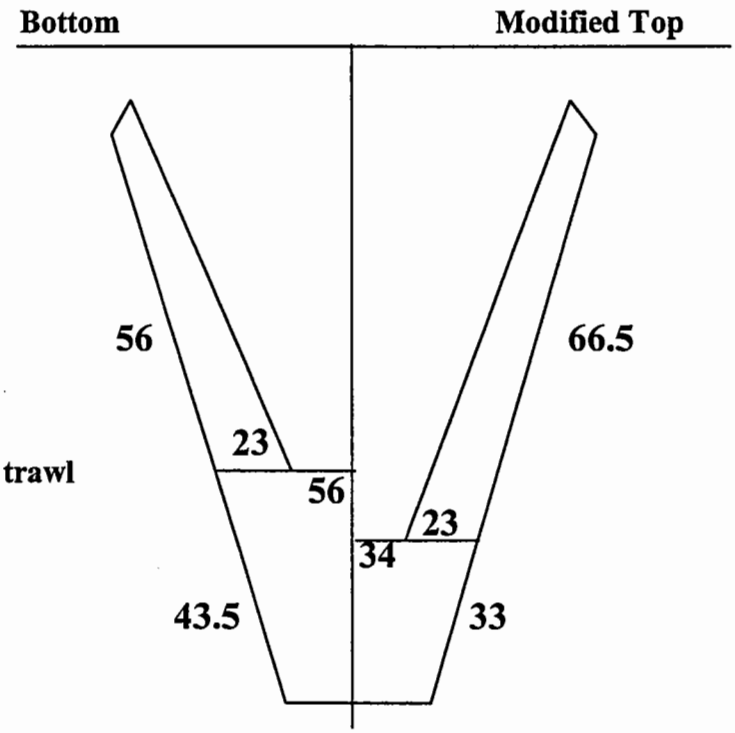
Permit # 3300780
Registration # 1037847

Figure 1

Figures A and B are the net plans for the two trawl configurations used in the comparative gear trials. The numbers in the figures represent the number of meshes in each corresponding portion of the trawls.



A. Control trawl
(top and bottom identical)



B. Experimental trawl

Figure 2

Map of the sea scallop closed areas.

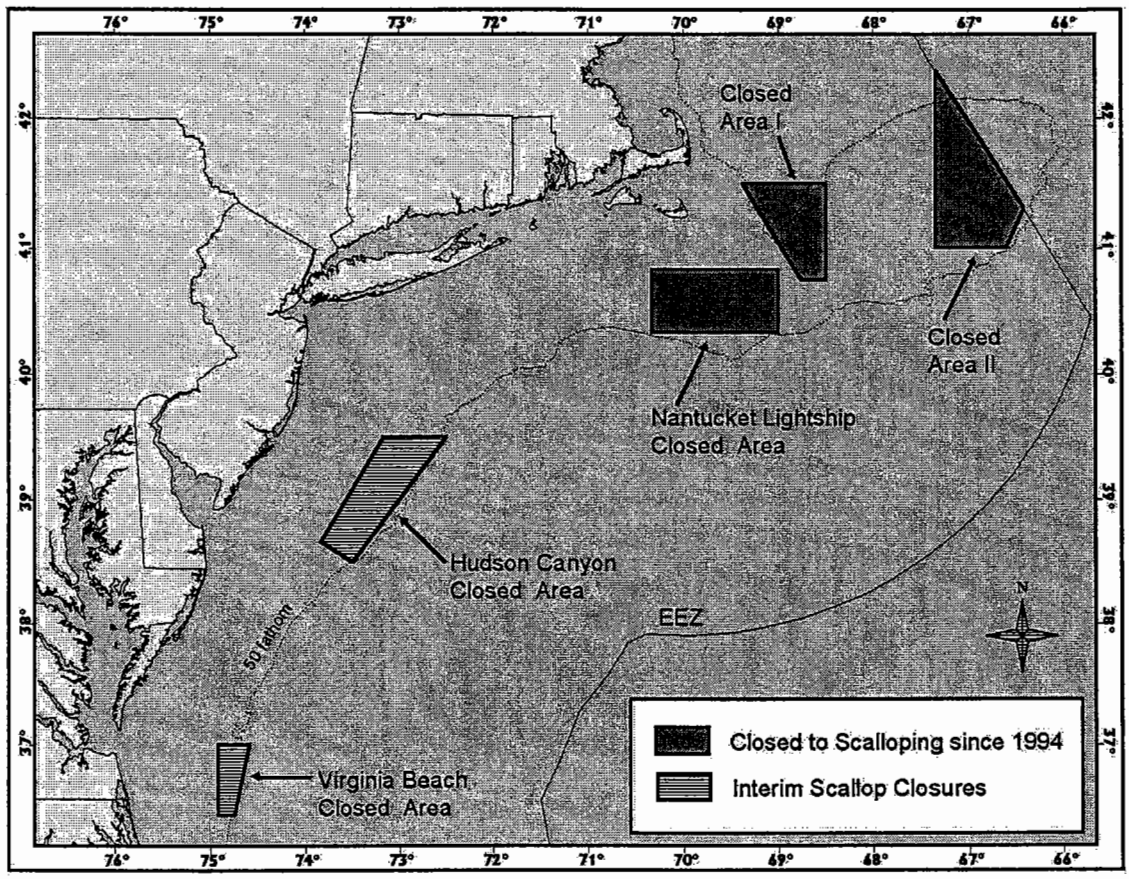
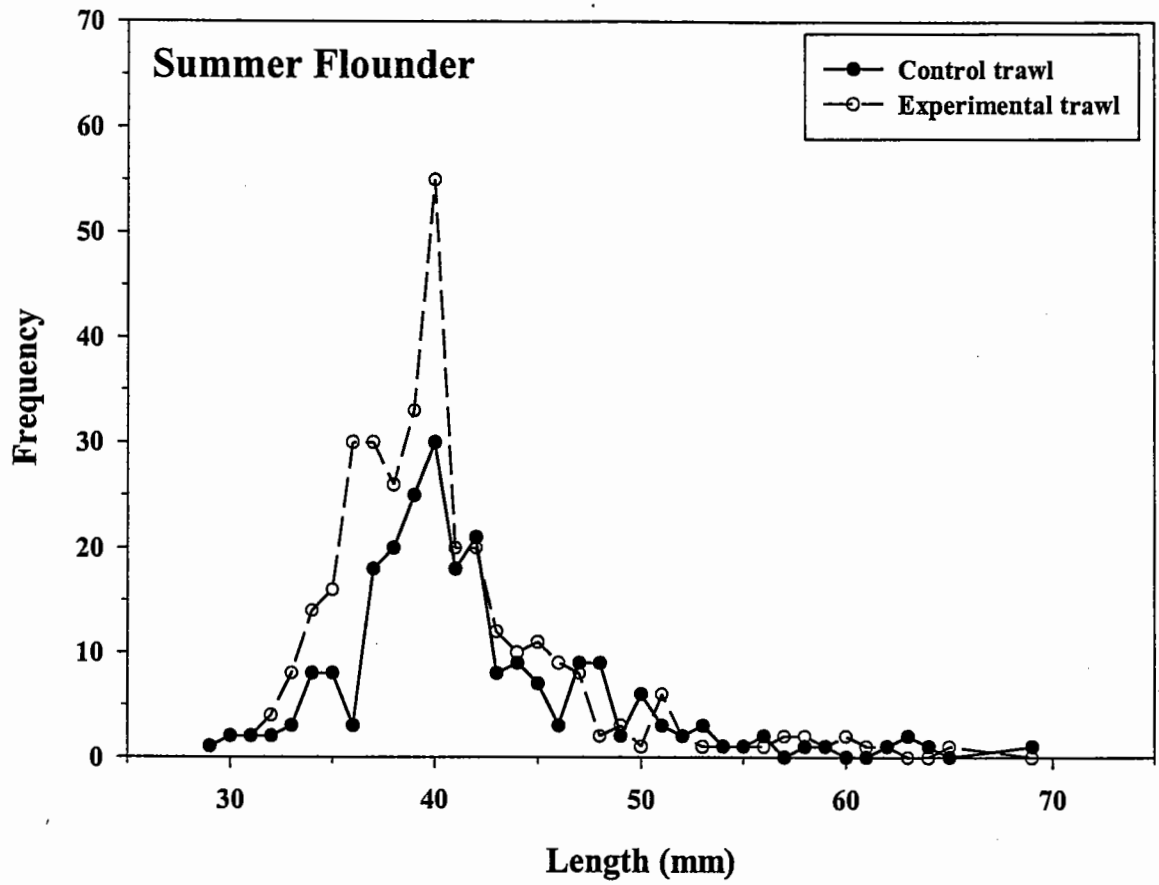

76°
75°
74°
73°
72°
71°
70°
69°
68°
67°
66°
42°
41°
40°
39°
38°
37°
Closed
Area I
Closed
Area II
Nantucket Lightship
Closed Area
Hudson Canyon
Closed Area
50 fathom
EEZ
N
Virginia Beach
Closed Area
Closed to Scalloping since 1994
Interim Scallop Closures

Figure 3

Length frequency distributions for summer flounder and monkfish.


Summer Flounder
Control trawl
Experimental trawl
Frequency
Length (mm)
0
10
20
30
40
50
60
70
30
40
50
60
70

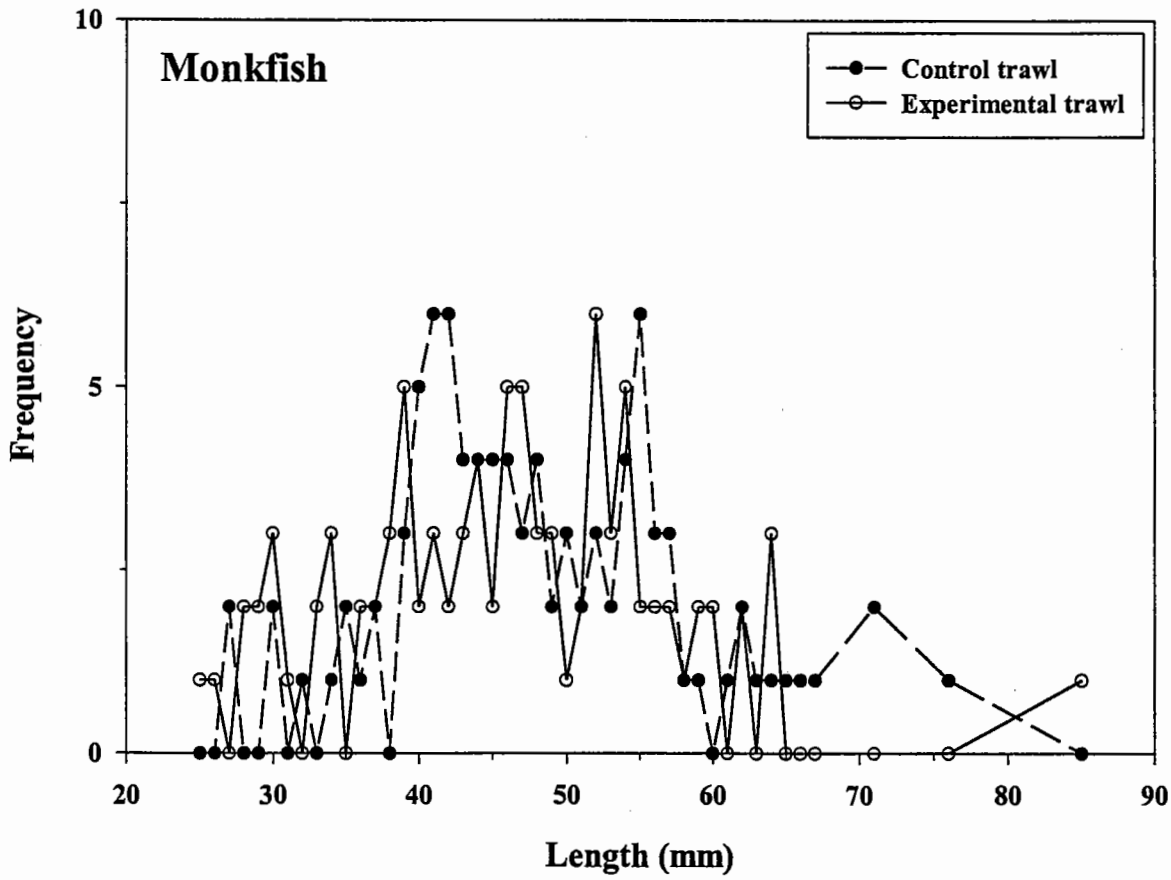
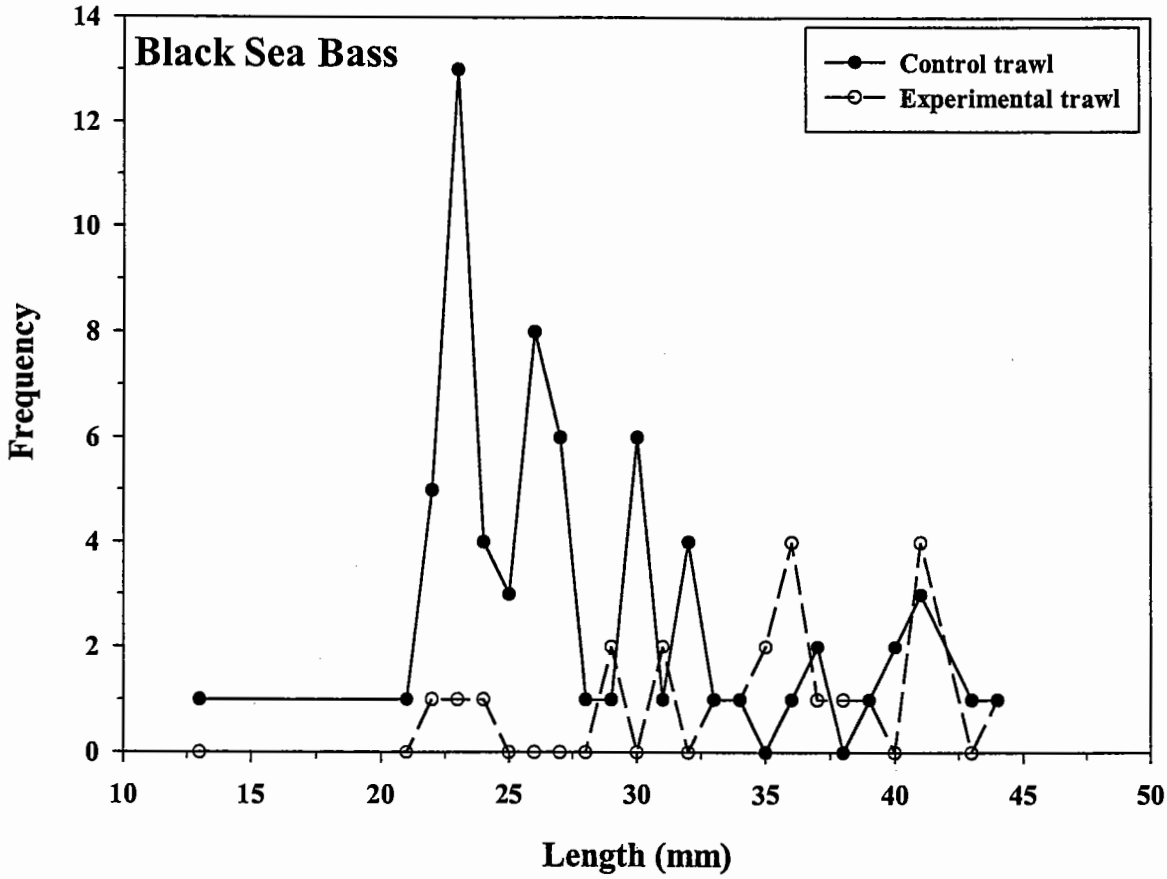

Monkfish
Control trawl
Experimental trawl
Frequency
Length (mm)
0
5
10
20
30
40
50
60
70
80
90

Figure 4

Length frequency distributions for black sea bass and gray sole.


Black Sea Bass
Control trawl
Experimental trawl
Frequency
Length (mm)
0
2
4
6
8
10
12
14
10
15
20
25
30
35
40
45
50

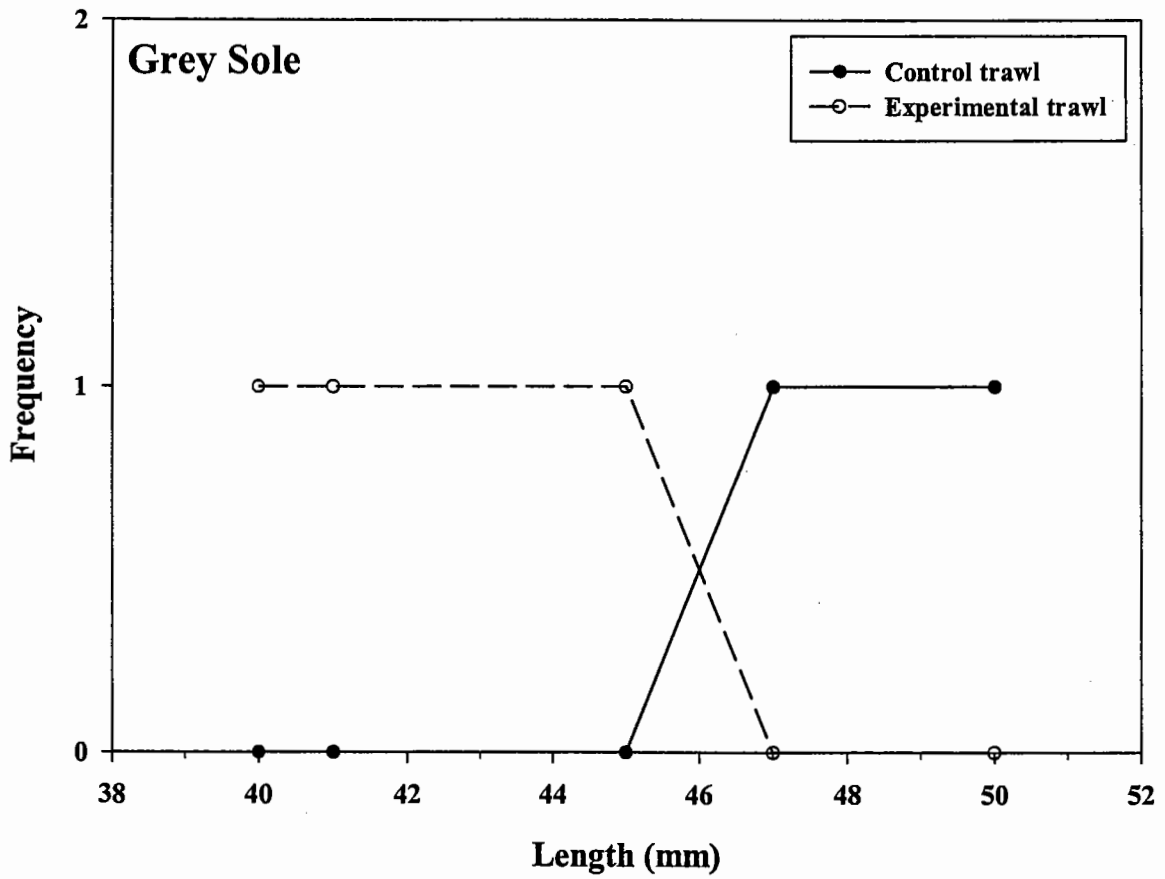

Grey Sole
Control trawl
Experimental trawl
Frequency
Length (mm)
0
1
2
38
40
42
44
46
48
50
52

Figure 5

Length frequency distributions for sea scallops

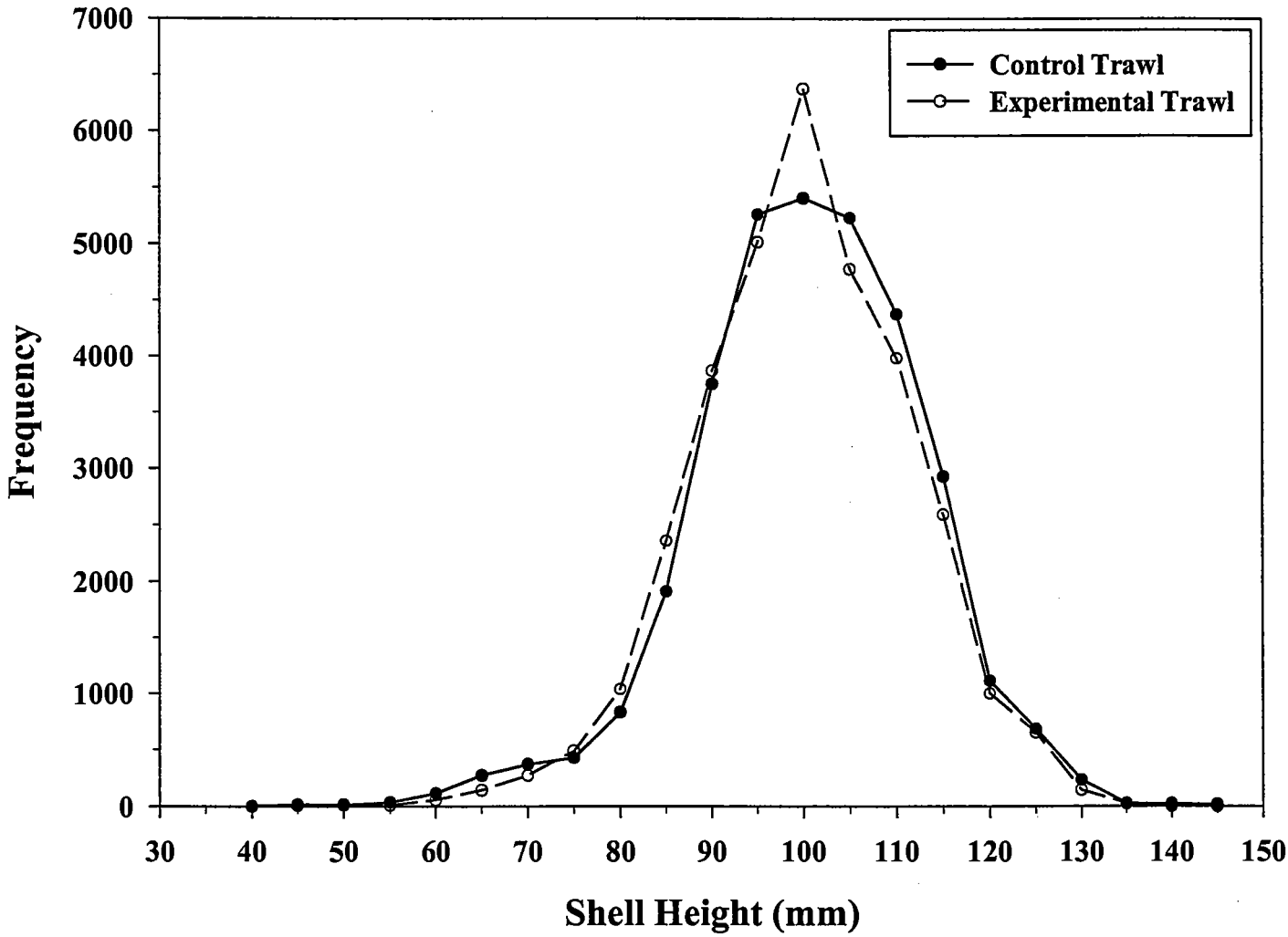

Control Trawl
Experimental Trawl
Frequency
7000
6000
5000
4000
3000
2000
1000
0
30
40
50
60
70
80
90
100
110
120
130
140
150
Shell Height (mm)

Table 1
Catch data and results of statistical test for summer flounder.

	N	Sum	Mean	Std. Dev.	Significant
Control trawl	19	233	12.26	8.55	significant
Experimental trawl	19	339	17.84	13.60	experimental>control

Table 2
Catch data and results of statistical test for monkfish.

	N	Sum	Mean	Std. Dev.	Significant
Control trawl	19	95	5.00	3.34	ns
Experimental trawl	19	93	4.89	3.51	

Table 3
Catch data and results of statistical test for black sea bass.

	N	Sum	Mean	Std. Dev.	Significant
Control Trawl	19	67	3.52	11.56	ns
Experimental trawl	19	23	1.21	1.47	

Table 4
Catch data and results of statistical test for gray sole.

	N	Sum	Mean	Std. Dev.	Significant
Control trawl	19	2	0.11	0.32	ns
Experimental trawl	19	3	0.16	0.37	

Table 5
Catch data and results of statistical test for sea scallops.

	N	Sum	Mean	Std. Dev.	Significant
Control trawl	19	161.75	8.51	6.92	ns
Experimental trawl	19	161.50	8.50	7.46	