



FINAL REPORT

Fishing Industry Grant (FIG) 95-FIG-080
Grant # NA66FK0087

Investigate Improved Net Design to Reduce Juvenile By-Catch In Whiting Fishery

Awarded to:

Fishermen's Dock Cooperative
John Cole, President
PO Box 1314
Point Pleasant Beach, NJ 08742

March 4, 1998

Report prepared by:

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ABSTRACT

The whiting, Merluccius bilinearis, fishery off the New Jersey coast has undergone a gradual, yet severe, change over the past fifteen years. Increased pressure from northern fleets as well as stock fluctuations have impacted the traditional fishery of the northern New Jersey coast by a change of the typical season and a shift in size classes toward the smaller sizes. In an effort to examine a method to reduce the by-catch of the smaller fish, a local net maker proposed an innovation in net design which he felt would allow for the escapement of smaller fish which would be allowed to grow for harvest at a larger size.

Initial delays were experienced because of problems with the net maker, which essentially cut a full year off the project. Continuing problems arose because of scheduling problems with student observers, a scarcity of fish inshore, better prices on other species when whiting were in the vicinity, and a general loss of interest by fishermen in the two ports of Belford and Point Pleasant. As a result there was only one trial of the net, and a large mixing of non-marketable fish in the trawls ended that trip, so as not to kill non-targeted species.

The nets will remain at the dock and at least one captain wants to try the net by itself to see how it would work in a cleaner fishery where small whiting are well mixed with marketable sizes. An amended final report would then be submitted.

EXECUTIVE SUMMARY

Because of the lack of data from the study, the abstract will also serve as the Executive Summary.

PURPOSE

A. Description of the problem or impediment of fishing industry that was addressed.

The whiting, Merluccius bilinearis, fishery off the New Jersey coast has undergone a gradual, yet severe, change over the past fifteen years. Once a mainstay of the ports of Belford and Point Pleasant where captains placed themselves on a 10,000 pound per day, the fishery has declined and the size of the individual fish has become smaller. No longer do the boats fish close to home in the Mud Hole (Christiansen Basin), but more frequently travel 80 miles offshore to Hudson Canyon to fish. It has only been an increase in price over the course of the year which has allowed the fishery to continue. There has been some market for small (under 12 inch) fish but the implications of targeting this size has not been popular among the local fishermen. Many captains feel the over harvest of small whiting on Cultivator Shoal in the last ten years led to a reduction of volume and size frequency in their fishery here.

In keeping with the general trend toward environmental awareness and responsibility, the local industry believed that some solution must be found to preserve the fishery for the future. They feel that the release of small whiting, and the by catch of other juvenile fish, would work toward that end. To take large amounts of whiting and cull a small amount of fish for market is counter productive to the health of the fishery.

From a fishermen's point of view, the attempt to use a mesh size of 3", inside the knot, for whiting, or 1 7/8" for squid, fails to take into consideration the problem with whiting gilling in the larger mesh, and the associated regulatory problems for the fishermen in order to comply with the fishery he is in. If the juvenile whiting could be forced out of the net before it was brought to the surface, the need for two different cod ends would be eliminated.

Since the vessels in these two ports have no conveyor systems for the culling of catch, the reduction of small fish in the net will make their operations much more efficient. The historic market cull for New Jersey whiting is at 12", thus this net design would reduce both operating time and resource waste. Management of stocks requires an effort on the part of the people affected. If the nets were passed through the fleets and fishermen were satisfied that the square mesh diverted juvenile fish without the loss of marketable product, the design would be adopted, and there would be no need for mesh size change and fish length regulations.

B. Objectives of the Project.

- 1) To alleviate the retention of juvenile whiting, nets would be constructed that would filter the small whiting from the net at the front of the net, rather than at the extension or in the cod end.
- 2) If juvenile whiting could be directed out of the trawl early, the need for the separation of the squid and whiting fisheries could be eliminated. This could reduce costs and operating time for the industry, and the enforcement officials.

APPROACH

A. Detailed description of the work that was performed.

1) The initial part of the project was the construction of 2 whiting nets by George Gallagher. The use of square mesh behind the over head on a trawl has been tested in Great Britain. Juvenile fish raise when they become tired of swimming in front of the net, and the water pressure forces them out through the square mesh. Two nets were built for vessels with 350 horsepower, a typical size vessel in the two port fleet. The nets incorporated square mesh into the top first belly of each net for 50 meshes. Both ports use the same size mesh (2 3/4"), which is larger than the size normally used in New England (6cm or 2 3/8").

The nets are professionally described as 56'x78'x2 3/4" 21 thread twisted poly "A" nets on 1/2" stainless steel combination wire with floats, sweep, and 2"x21 thread twisted poly extensions. A diagram is attached.

Most vessels in the two Co-ops use 2" B.K. 72 thread or 84 thread braided nylon cod ends. Because of the unique characteristics of the vessels (side rigs use 100 mesh deep cod ends, and stern trawlers use 150 mesh cod ends), the vessels were to use their own cod ends.

2) The boats were to take on a net and use it for one day prior to recording any catch data, so that the captains and crew can become familiar with the operation of the net, and fine tune any problems. Following that, each boat would use the net for three trips, while having technicians recording catches, and then pass it on to another boat in the fleet.

During the trials, the net would be used in a reciprocal tow method. The captain would pick a site for working. He would tow in one direction with one net (regardless of whether it is the traditional whiting net or the experimental), then change the net to the other one, and make a tow in the reverse direction, and back again. The net would be changed again, and towed back one final time. The boat would work in an area where other Co-op vessels typically work. Each tow would be for 1 to 1 ½ hours, weather permitting, at normal towing speeds.

Once the nets were hauled back, the catch would be dumped on the deck, and the crew would estimate the size of the total catch, cull the marketable fish, and estimate the number of boxes (100 lb. weight) of them as they sit in deck boxes, unless the haul was small enough to entirely weigh. The by-catch would be separated and saved for analysis while the next tow is in the water.

The marketable catch was subsampled and length frequency recorded. The by-catch was be separated into trash (discarded), non-target species, and juvenile whiting. The non-target species were separated into species, and weights estimated. The juvenile whiting, the actual target for the experiment, was weighed and subsampled for length frequency. The overall marketable catch from the experimental boat was to be compared with that of other similar vessels fishing the same area on that day. The catch on deck was recorded using a standard NMFS Trawl Log (form GPO 629-248),

B. Project management: Individuals and/or organizations actually performing the work and how it was done.

The nets were built by George Gallagher, who has since gone out of the net making business.

Local coordination at the Fishermen's Dock Cooperative was done by John Cole, President and Dock Manager of the Coop. Mr. Cole also arranged for the purchase of ancillary equipment which was ordered for the sea trials, such as the scales, baskets, and survival and foul weather gear.

Captain James Lovgren, owner of the Sea Dragon performed the sea trial.

Gef Flimlin, the Marine Extension Agent with NJ Sea Grant Marine Advisory Service

had written the original proposal at Mr Gallagher's request for a Saltonstall-Kennedy grant, and rewrote it when it was submitted for the Coops in the FIG program. He tried to reduce the time wasted in the hold up for the construction of the nets by Mr. Gallagher, served as a liaison between the dock and NMFS State, Federal and Constituent Programs, tried to enlist fishermen from the two docks to participate, sought out student help from three colleges in NJ, and wrote all the Progress Reports and most of the financial reports, with the assistance of Alice Johnson, the Coop's bookkeeper, although Mr. Cole's signature was placed on each. Mr. Flimlin was on the sea trial of the net, and is the author of the final report.

FINDINGS

A. Actual accomplishments and findings.

The nets which were designed by the net maker were built and transferred to the Fishermen's Dock Cooperative. One sea trial was done on the Sea Dragon with Captain Jim Lovgren. The sea trial was done on Memorial Day 1997 in an area about 20 off Point Pleasant. The day was partly sunny with 20 knot winds out of the North and a wave height of 5 feet. Data was recorded from two tows and photos of the net in the water and of the catch on deck were taken (these were taken as slides and if prints are needed, a special developing could be done).

The first tow was with the traditional diamond mesh, which is common to the whiting fleet in the area. After a 1.5 hour tow in the early morning, the net was hauled with about 500 lbs of market whiting, 200 lbs of small by-catch whiting, 150 lbs of marketable ling or red hake, and about 3500 lbs of smaller unmarketable ling. The market whiting ranged from 24 to 38 cm with the average about 30 to 32 cm. The small whiting ranged from 18 to 28 cm with an average size of 23 cm. The interesting factor here is that the unmarketable ling were of the same size as the marketable whiting which begs the question as to why that size ling can't be sold, instead of becoming a by-catch which would be returned dead to the sea. There also about 8 large fluke and a bit of trash in the haul.

When the experimental net with square mesh in the top was towed for two hours there was once again an obvious separation of the two size classes of whiting in the net. The marketable whiting ranged from 21 to 36 cm and the smaller by-catch whiting ranged from 14 to 27 cm. Although there is an overlap of size ranges, this is the way the captain and deck hand sorted the catch for market. The marketable whiting only amounted to about 75 lbs. and the by-catch whiting (total 262 fish) amounted to 40 lbs. The small whiting averaged about 21 or 22 cm whereas the marketable whiting averaged 26 to 29 cm. The trawl also produced about a dozen dogfish, about 85 lbs of skate and mixed trash. Copies of the data sheets are attached.

Information about the net's ability to reduce by-catch was inconclusive from the extremely limited use of the net, however Captain Lovgren liked the net, feels that it should accomplish the goal of reducing by-catch of juvenile fish, and will attempt to use it again. If Captain Lovgren has any further comments about the net, they will be provided as an amended final report.

B. Development of significant problems discussion.

The start of the grant was to be in February of 1996. Soon after that in March of 1996, a deposit for the construction of the two nets was given to the netmaker. From that time on for almost a year, we had trouble getting the netmaker, whose idea this project was in the first place, to complete the nets which were ordered. After 5 months of visits from the Marine Extension Agent, Susan Olsen, from the State, Federal and Constituent Programs office, spoke with him in mid-October and was told that the nets would be delivered during the week of October 21. On October 29, he told Marine Extension Agent, he would guarantee delivery by November 10. In fact they were not delivered then, and Mr. Gallagher went to Florida on vacation. They were not delivered until the second week of December. His lack of commitment to the project concept, personal agenda, and misconceptions about project direction and management, cost us a full year.

Aside from that, there were no significant quantities of whiting in the inshore waters where we intended this project to be done during that time period.

Gef Flimlin endeavored to enlist the assistance of students from Rutgers University, Stockton College, and Brookdale Community College to work on the net trials. Five of the students from Stockton had experience working on NJDEP Trawl Surveys and the others had a background in Marine Science.

At the beginning of 1997, we felt that it would be most prudent to wait for a few months to actually begin the net trials. There were several reasons for this. First, there was little supply of whiting in the inshore waters where trials could be conducted most efficiently, instead of offshore where vessels often have to go during the winter. Second, winter weather is very changeable and the captains can cancel a trip at a moments notice, so scheduling the field crew would be very hard, especially when several of the students lived about 75 miles away from the dock, and the vessels typically left at 3:30AM. Third, there is some reluctance to having extra people on board during the very cold winter months when weather can make vessel and gear operation dangerous.

The run of whiting in NJ was sporadic during the months of April and May 1997. A small amount of whiting were caught way off shore and it wasn't until the latter half of May that the whiting showed up inshore. As usual, spring weather was blustery and canceled several trips. A trip was made on Memorial Day on the Sea Dragon with Capt. Jim Lovgren of the Fishermen's Dock Cooperative in Point Pleasant Beach, NJ to an area about 20 miles from port. The standard net was towed first for an hour and a half and the catch was quite mixed. There were some whiting and other fish, but a predominance of small red hake or ling. Unfortunately there is no market for small ling and so most of the catch was returned to the ocean. Representative samples of "market sized" and "by-catch sized" whiting, as determined by the Captain were measured and rough weights were noted.

A second trawl was made with the experimental net with much the same result of a large by-catch of unmarketable small ling and a few boxes of small and marketable whiting. The whiting were measured again.

The captain then decided that it was not worth killing the large number of ling in that area to get a small return of whiting, so the day's trip was cut short.

Bad weather ended the field testing for the spring period.

During the summer of 1997, the infusion of small ling continued, and then the whiting became unavailable by moving too far offshore to be reached by the day boats. The trawling was suspended for the rest of the summer.

At this point, the PI had not been formally informed whether the grant had been given an extension through the end of 1997. It was not until August 30, 1997 that acknowledgment of the extension was received from NOAA Grants Management Division. Therefore even if the whiting had been in striking distance, spending the funds to field test the net was not approved and thus chancy. The Co-op was acting conservatively in relation to its fiduciary responsibility for grant accounting and suspended all testing until NOAA gave the permission.

Whiting stocks were not plentiful in the inshore areas during the fall of 1997. There were some whiting offshore, but the vessel capabilities, observer coverage, and experimental design did not provide for offshore work and so no sea trials occurred then. At this point conversation with personnel from the State, Federal and Constituent Programs office felt that another extension would not prove fruitful, and so it was decided to terminate the operations of the grant at the end of December 1997.

A particularly difficult part of the project was the coordination of the vessel schedule with the arrival of whiting into the inshore waters and the participation of the student labor. It seemed that whenever the students had the time and inclination, there were no whiting to be had. When the whiting were available, it was during the winter when the captains were reluctant to have passengers on board. And when the season was pleasant and the fish available, either the students had secured other jobs on land or another species with a higher return price was inshore, and so the boats fished that instead of the whiting.

Two issues eventually came to the surface as the time progressed which did nothing to help the situation. First, an export market developed in Europe for the very small whiting, especially in Spain. The price to the boat was between \$.50 and \$.75, which made the capture of the small whiting, which was one of the few species not under Federal or State management, an attractive target. Although there weren't vast amounts of small whiting, the nominal return for it at the dock would prove attractive when balanced against other lean parts of the year when fluke, a traditional species for the northern NJ fleets, was off limits.

The second issue focuses on the potential for the institution of mesh regulations in the whiting fishery, especially when the opportunity exists for a mixed trawl fishery with squid. Captains who use a mesh allowed for squid, might be prohibited from using that size mesh during times of the year when both the squid and whiting are in the same area and both can be harvested with small mesh. Thus, proving that a square mesh or a larger mesh would release small whiting, might sound the death knell for that mixed fishery through the imposition of mesh

regulations.

C. Need for additional work.

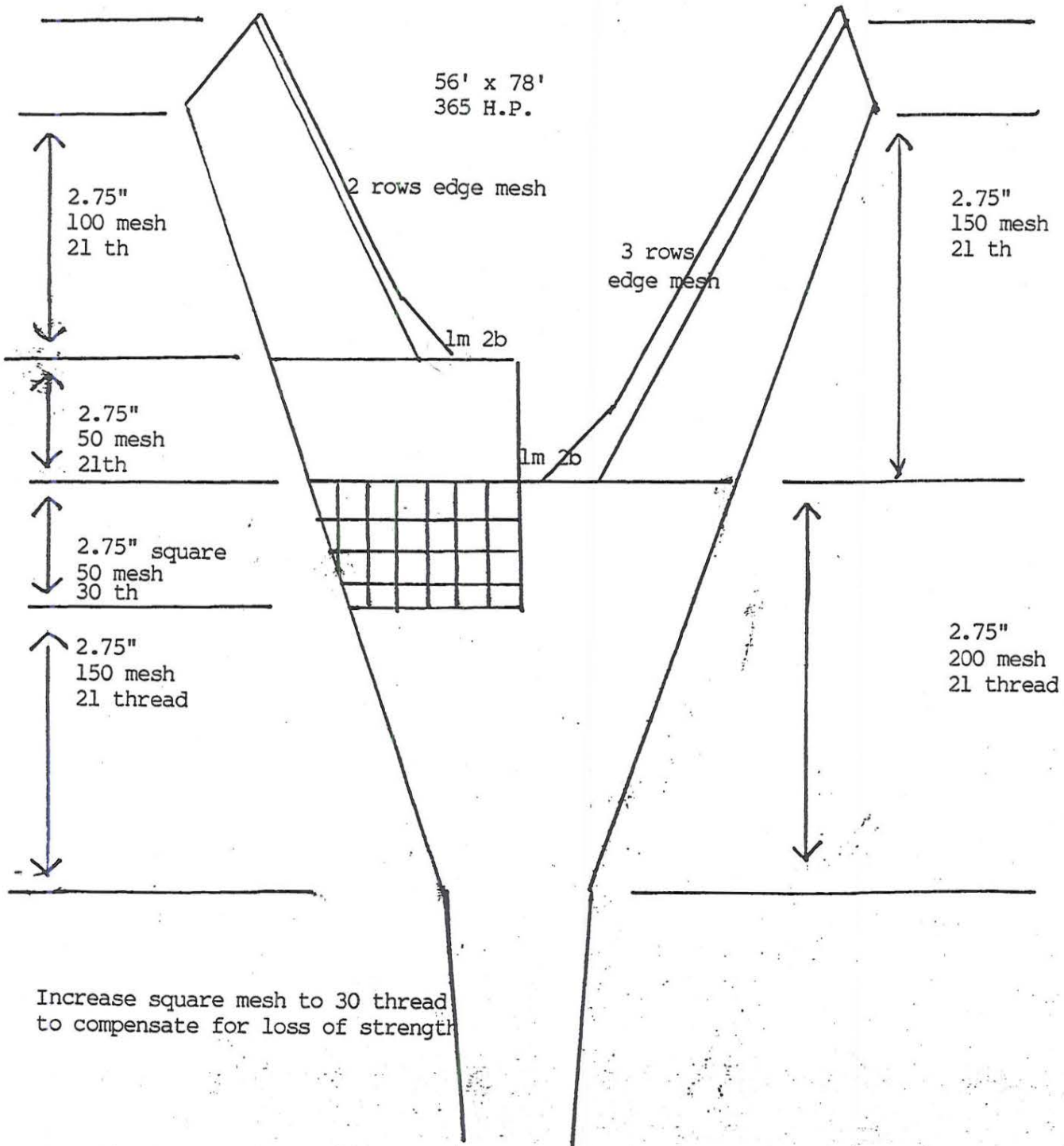
It is obvious that the net with the square mesh in the top was not given sufficient testing for a number of reasons. That infers that one of the nets might be transferred to another area, or to the NMFS research vessel, Gloria Michele, for an adequate trial.

EVALUATION

A. Description of the extent to which project goals were attained.

Unfortunately the goals of the original proposal were not met at all. The Dock Manager of the Coop and the Extension Agent are somewhat embarrassed that the project was not seen through to completion, and hope that neither would be eliminated *de facto* from other NMFS research projects in the future should the situation arise.

DESIGN OF NET WITH SQUARE MESH BEHIND OVERHEAD



SHIP OPERATIONS
FUSSEADragon

1 1/2 hrs. Tow

645 - 815

A lot of small ling
3500 small
ling

Few Hake (s)
Rock (s)

DOPPLER (.01)
(E)
(S)

OFFICER ON WATCH

GEAR PROBLEM:

LEAD FISHERMAN

Flinn

CHIEF SCIENTIST

Tim Hooper

WATCH CHIEF

RECORDER

CRU-CODE, STA

STRATUM - TOW

VALUES GEAR STAT
STA, HAUL COND AREA

VESEL - CRU

EST = (1) YR-MO-DA
EDT = (2)

GEAR TYPE Diamond

TIME MIN (1) OUT

DEPTH (S)TART (E)ND
(meters) ft

MIN MAX

LAT (S) LONG(S)

LAT (E) LONG(E)

L CHAIN (S)

OR US 9960 (E)

A OTHER

N STA W,X,Y,Z (S)

(C) OTHER (E)

CABLE(m) PITCH

HDG CRSE RPM

DOPPLER (.01) DSGN

BOTTOM, WATER SPD (1)

IDENT H ROPE

GEAR, DOORS HT (1m)

OTHER GEAR

AIR(°C) CLOUD INSOL

TEMP 0-8 CAL COUNT

BAR WIND

(MBS) DIR, SPD

WEA WAVE SWELL

HT (1m) DIR, HT (1m)

REF SURF SURF SAL

TEMP (1°C) BOX#, JAR#

TMS WING SURF, BOT

SPD TEMP (1°C)

XBT SURF - BOT

TEMP (1°C)

CODED TRASH (1)

SPECIES

%FULLNESS SEDIMENT

OF DREDGE TYPE

TRASH BY %

SHELL, SUBST, BIOL

TOW # 5/25-01

Market		Whiting		B/Catch					
				Whiting					
21		1		11		1		1	
2		2		2		2		2	
3		3		3		3		3	
4		4		4		4		4	
5		5		5		5		5	
6		6		6		6		6	
7		7		7		7		7	
8		8		8		8		8	
9		9		9		9		9	
30		0		20		0		0	
1		1		1		1		1	
2		2	1	2		2		2	
3		3		3		3		3	
4		4		4		4		4	
5		5		5		5		5	
6		6		6		6		6	
7		7		7		7		7	
8		8		8		8		8	
9		9		9		9		9	
40		0		30		0		0	
1		1		1		1		1	
2		2		2		2		2	
3		3		3		3		3	
4		4		4		4		4	
5		5		5		5		5	
6		6		6		6		6	
7		7		7		7		7	
8		8		8		8		8	
9		9		9		9		9	
50		0		40		0		0	
1		1		1		1		1	
2		2		2		2		2	
3		3		3		3		3	
4		4		4		4		4	
5		5		5		5		5	
6		6		6		6		6	
7		7		7		7		7	
8	350*	8		8	200*	8		8	
9	140	9		9		9		9	
0		0		0		0		0	
1		1		1		1		1	
2	500	2		2		2		2	
3		3		3		3		3	
4		4		4		4		4	
5		5		5		5		5	
6		6		6		6		6	
7		7		7		7		7	
8		8		8		8		8	
9		9		9		9		9	
0		0		0		0		0	
1		1		1		1		1	
2		2		2		2		2	
3		3		3		3		3	
4		4		4		4		4	
5		5		5		5		5	
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8		8		8		8		8	
9		9		9		9		9	
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1		1		1		1		1	
2		2		2		2		2	
3		3		3		3		3	
4		4		4		4		4	
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8		8		8		8		8	
9		9		9		9		9	
0		0		0		0		0	

150#
GOOD
LING

SHIP OPERATIONS

FV Sea Dragon

5/25/77

9¹⁰ - 11¹⁰10-12 Dogfish
A lot of Skate &
Junk

DOPPLER (.01)

(E)

(S)

OFFICER ON WATCH

GEAR PROBLEM:

LEAD FISHERMAN

F. H. Miller
CHIEF SCIENTIST

WATCH CHIEF

RECORDER

CRU-CODE, STA

STRATUM - TOW

VALUES GEAR STAT
STA, HAUL COND AREA

VESSEL - CRU

EST = (1) YR-MO-DA
EDT = (2)GEAR TYPE Square MeshTIME MIN (1)
OUTDEPTH (S)TART (E)ND
(meters)

MIN MAX

LAT (S) LONG(S)

LAT (E) LONG(E)

L CHAIN (S)

OR US 9960 (E)

A OTHER

N STA W,X,Y,Z (S)

© OTHER (E)

CABLE(m) PITCH
IN WATER

HDG CRSE RPM

DOPPLER (.01) DSGN
BOTTOM, WATER SPD (1)IDENT H ROPE
GEAR, DOORS HT (1m)

OTHER GEAR

AIR(°C) CLOUD INSOL

TEMP 0-8 CAL COUNT

BAR WIND

(MBS) DIR, SPD

WEA WAVE SWELL

HT(1m) DIR, HT(1m)

REF SURF SURF SAL

TEMP(1°C) BOX#, JAR#

TMS WING SURF, BOT

SPD TEMP(1°C)

XBT SURF - BOT

TEMP (1°C)

CODED TRASH (1)

SPECIES

%FULLNESS SEDIMENT
OF DREDGE TYPETRASH BY %
SHELL, SUBST, BIOL

5/25-02

3-4' swell

TOW # 5/25-02

Mabit Catching		B. Catel Catching							
1	21		11	1		1		1	
2	2 II	2	2	2		2		2	
3	3 II	2	3	3		3		3	
4	4 III	9	4 II	4		4	2	4	
5	5 III	16	5 III	5		5	5	5	
6	6 III	26	6 III	6		6	4	6	
7	7 III	26	7 II	7		7	2	7	
8	8 III	24	8 III	8		8	11	8	
9	9 III	27	9 III	9		9	18	9	
0	30 III	24	20 III	0		0	29	0	
1	1 III	8	1 III	1		1	42	1	
2	2 III	12	2 III	2		2	43	2	
3	3 III	8	3 III	3		3	35	3	
4	4 III	4	4 III	4		4	31	4	
5	5 I	1	5 III	5		5	20	5	
6	6		6 III	6		6	10	6	
7	7		7 I	7		7	1	7	
8	8		8	8		8		8	
9	9		9	9		9		9	
0	40		30	0		0		0	
1	1		1	1		1		1	
2	2		2	2		2		2	
3	3		3	3		3		3	
4	4		4	4		4		4	
5	5		5	5		5		5	
6	6		6	6		6		6	
7	7		7	7		7		7	
8	8		8	8		8		8	
9	9		9	9		9		9	
0	50		0	0		0		0	
1	1		1	1		1		1	
2	2		2	2		2		2	
3	3		3	3		3		3	
4	4		4	4		4		4	
5	5		5	5		5		5	
6	6		6	6		6		6	
7	7		7	7		7		7	
8	8		8	8		8		8	
9	9		9	9		9		9	
0	0		0	0		0		0	
1	1		1	1		1		1	
2	2		2	2		2		2	
3	3		3	3		3		3	
4	4		4	4		4		4	
5	5		5	5		5		5	
6	6		6	6		6		6	
7	7		7	7		7		7	
8	8		8	8		8		8	
9	9		9	9		9		9	
0	0		0	0		0		0	
1	1		1	1		1		1	
2	2		2	2		2		2	
3	3		3	3		3		3	
4	4		4	4		4		4	
5	5		5	5		5		5	
6	6		6	6		6		6	
7	7		7	7		7		7	
8	8		8	8		8		8	
9	9		9	9		9		9	
0	0		0	0		0		0	
1	1		1	1		1		1	
2	2		2	2		2		2	
3	3		3	3		3		3	
4	4		4	4		4		4	
5	5		5	5		5		5	
6	6		6	6		6		6	
7	7		7	7		7		7	
8	8		8	8		8		8	
9	9		9	9		9		9	
0	0		0	0		0		0	

Total Catch
= 75

40
Total Catch

262 fish