FINAL REPORT

TO:

The Gulf and South Atlantic
Fisheries Development Foundation, Inc.

FROM:

The University of Georgia Marine Extension Service

SUBJECT:

Cooperative Vessel Experimentation
Relative to :

SHRIMP FISHERY FINFISH BY-CATCH REDUCTION

BY:

Mr. Billy Burbank, III
Cooperative Agreement No. NA17FD-0103-01
Contract # 49-01-5250, 1992

and

Mr. David Cook
Contract # 49-03-4575, 1992

Prepared by:
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Marine Resource Specialists
University of Georgia
Marine Extension Service

INTRODUCTION

This report presents the methods and results of two industry ideas to reduce finfish capture in shrimp trawls. Proposals for funding to conduct these tests were submitted to Gulf and South Atlantic Fisheries Development Foundation, Inc. (GSAFDF, Inc., here on known as the Foundation), Tampa, Florida, in response to a request for proposals issued by the Foundation dated 22 May, 1992.

Mr. Billy Burbank III, Burbank Trawls, Fernandina, Florida, submitted a proposal to the Foundation (Appendix I) in June, 1992. The basic concept was to reduce the unwanted by-catch of finfish and other organisms in shrimp trawls equipped with a Morrison Turtle Excluder Devices (TED's). The innovative idea was to try the use of a fish-eye installed in the net, with a webbing panel to help deflect finfish out of the fish-eye. The proposal was funded, (Cooperative Agreement # NA17FD-0103-01, Contract # 49-01-5250) and the methods and results are presented in this report under the heading: PART I - Finfish Reduction Experiments by Burbank.

Mr. David Cook, P.O. Box 30, Fernandina Beach, Florida also submitted a proposal to the Foundation for funding (Appendix II) in June, 1992. Mr. Cook wanted to test a Morrison TED with the webbing of the apex section of the TED panel reduced in size. This project was also funded, (Contract # 49-03-4575) however the testing was never done. The reasons for this are explained in this report under the heading: PART II - Finfish Reduction Experiments by Cook.

PART I - Finfish Reduction Experiments by Burbank

METHODS:

Burbank's aversion to by-catch of finfish and other organisms in shrimp trawls inspired the development of the Burbank By-catch Reduction Device (BRD). Mr. Burbank combined the use of the Morrison TED and fish-eyes, with an additional 4 inch mesh, 3mm twine webbed panel to help deflect finfish through the fish-eye and out of the net.

Mr. Burbank placed an order for the construction of three nets (funded by the Foundation) to test his concept. Two 50' mongoose nets were tested aboard the *F/V Daddy's Girl*, with Capt. Ferrell White, and the third was a 68' mongoose net tested aboard *Miss Candice*, with Capt. H.W. Morrison III.

On board the twin trawl rigged (4 nets) shrimp trawler *Daddy's Girl*, Captain White had the two 50' mongoose nets (**nets X and Y**), along with two **Control** nets. Both experimental nets were towed on the inside, closer to the vessel; with **Net X** placed inside port and **Net Y** placed inside starboard. The two **Control** nets, placed on the outer trawls, contained only the Morrison TED. **Net X** contained a Morrison TED followed by a four inch mesh panel, of 3mm poly webbing placed 50 meshes aft of the TED exit hole in a downward shooting position. Along with two stainless steel fish-eyes placed on the sides near the base of the panel (Figures 1 and 3). **Net Y** contained a Morrison TED followed by a four inch mesh panel, of 3mm poly webbing placed 50 meshes aft of the TED exit hole in a upward shooting position. Along with two stainless steel fish-eyes placed on the sides near the base of the panel (Figures 2 and 3). All tows were conducted during daylight hours and ranged from 1 1/2 to 3 hours in length.

Tow time was dictated by the amount of shrimp and trash (grass) collected in the experimental nets. Comparison tows were conducted and the catch of the control nets were averaged together. Each treatment (**Net X and Y**) was compared to the averaged **Control** nets catch.

On board the double rigged (2 nets) shrimp trawler *Miss Candice*, Captain H.W. Morrison tested the 68' mongoose net, with BRD installed, against the control net that contained only the Morrison TED. The experimental net contained a Morrison TED followed by a 4 inch (3mm) poly webbed panel placed in an upward directing position with two stainless steel fish-eyes in front of the BRD panel (Figure 4). Captain Morrison initiated testing with the Burbank BRD design but experimentation came to a halt when Capt. Morrison noted the majority of the shrimp had migrated offshore and made dragging very inefficient in the area he generally worked. Capt. Morrison stated that " it was simply impractical to continue wasting time and fuel when there was in actuality no shrimp in the area to catch." However, he was pleased with the gear and is anxious to resume testing in mid-April to mid-June, 1993 when the roe shrimp season begins.

Budget:

The two 50' mongoose Model C nets along with the 68' mongoose model C net which were paid for by the Foundation made up the total expense of the study; as shown below:

2	50' Mongoose Model C net	$ 2315.70
1	68' Mongoose Model C net	$ 1544.85
	Total:	$ 3860.55

Results:

From the 24th of November, 1992 through the 2nd of January, 1993 the Burbank BRD's underwent tests that were conducted in the waters off of Cape Canaveral, Florida. The two 50' nets, Net X and Net Y which contained the Burbank BRD showed a significant loss of biomass (finfish, grass, jellyfish and crabs) when the mesh panel was in place (Table 1). The bottom shooting Burbank BRD Net X had a remarkable 82% reduction in biomass with panel in place but had an unacceptable 75% loss of shrimp over the control net (Figures 1 and 5). The panel was then removed after three tows by Captain Farrell White and he continued to tow Net X with only the Morrison TED and the two fish-eyes. After twenty tows without the panel, Net X showed only a 6% reduction of biomass with a 4% gain in shrimp (Figures 1 and 5).

The top shooting Burbank BRD Net Y in twenty-four tows, had an 18% reduction in biomass with a 9% gain in shrimp over the control, with panel in place (Figures 2 and 5). After the twenty-fourth tow was completed the top shooting panel had to be removed due to large quantities of grass that became entangled in the smaller webbing of the panel. Captain Ferrell White conducted four tows with Net Y which contained only the Morrison TED and the two fish-eyes. After removal of the top shooting panel Net Y showed a 6% reduction of biomass and a 17% gain in shrimp (Figures 2 and 5).

Discussion and Conclusion:

The position of the bottom shooting panel with the two fish-eyes, in Net X attributed to the great loss of shrimp on tows 1 - 3 (Figure 5). The angle of the panel and the placement of the fish-eyes created a quick exit for the majority of the catch. After removal of the panel, Captain

Ferrell White resumed testing and completed twenty-five more tows. The low reduction in biomass and slight gain in shrimp over the control demonstrated the great impact the added panel had on the experimental net.

The constant gain of shrimp in Net Y over the control net, could be attributed to the way the net was fished or how the BRD affected the net's hydrodynamics. The Burbank top shooting BRD exhibited a noticeable reduction in biomass with the panel in place without the loss of shrimp (Figure 5). When trawling in an area with dense grass the BRD panel quickly became clogged and prevented the catch from entering the bag. The majority of the catch, upon reaching the obstructed panel, was forced out of the net through the BRD exit hole causing an 80% shrimp loss as noted by Burbank.

In conclusion, the testing of Burbank by-catch reduction devices proved to be a success in the removal of unwanted by-catch. The problems of shrimp loss and grass entanglement due to the panel provides valuable information and guide lines on which future studies and gear modifications can follow. The results of these comparisons of by-catch reduction devices provide evidence that a solution to the by-catch problem is in sight, but finding one that will satisfy the industry and the environmentalists will be the ultimate goal.

Part II - Finfish Reduction Experiments by David Cook

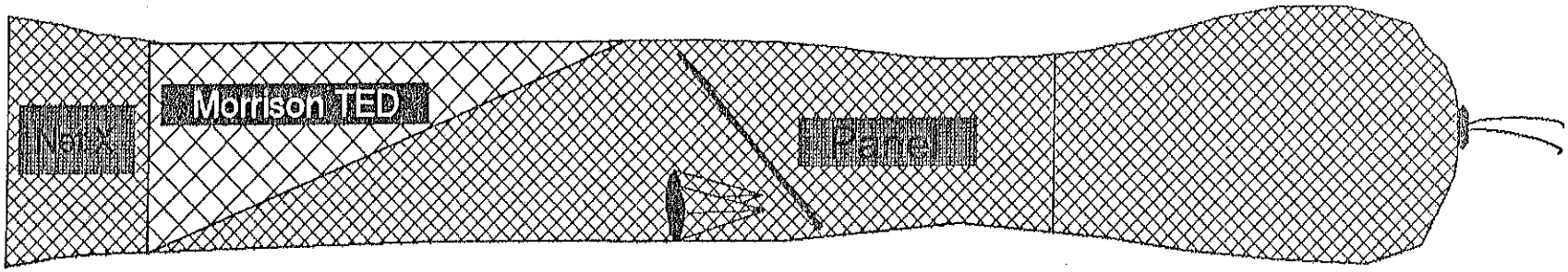
Mr. David Cook submitted a proposal to the Foundation for funding to test a by-catch reduction device (BRD) which entailed modification of the Morrison TED. This modification would require the installation of small mesh webbing at the apex of the Morrison panel and extend it some distance down the panel. This distance, or length of small mesh, will need to be determined by experimentation but testing will commence at 30% of the length of the panel and will be analyzed as a bottom shooter as well as a conventional top shooter (Figure 6).

Mr. Cook calculated a certain time frame in order to test the by-catch reduction design. He did not anticipate delays in permitting and was unable to proceed with testing of the experimental BRD design.

Budget:

The calculated cost that Mr. Cook wrote in his proposal never came about due to the fact that testing never started.

THE BURBANK BRD
Bottom Shooting



3 Tows with Panel.....Shrimp: 75% Reduction
Biomass: 82% Reduction

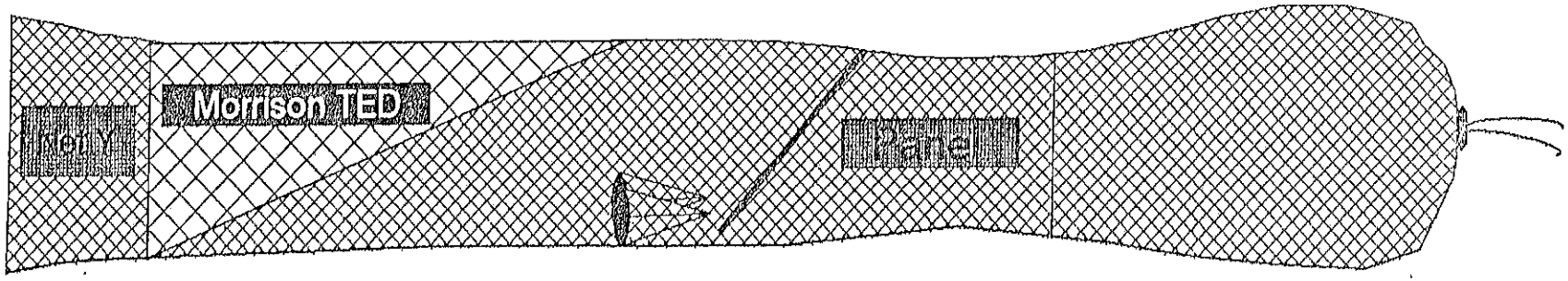
25 Tows Without Panel.....Shrimp: 4% Gain
Biomass: 6% Reduction

Funded by the Foundation

(Control net averaged 24 lbs of shrimp per tow.)

THE BURBANK BRD

Top Shooting



24 Tows with Panel.....Shrimp: 9% Gain
Biomass: 18% Reduction

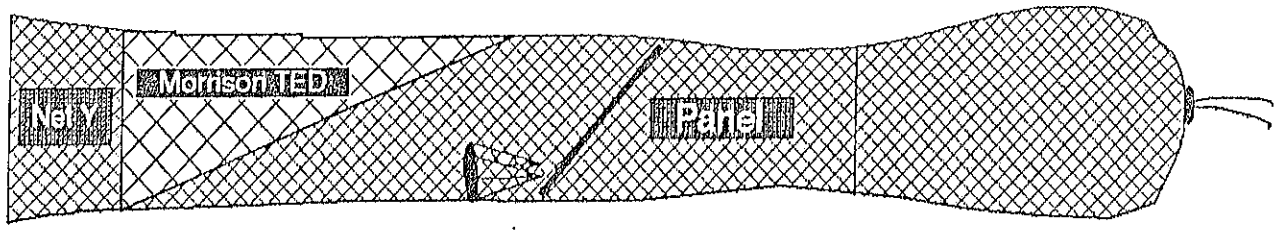
4 Tows Without Panel.....Shrimp: 17% Gain
Biomass: 6% Reduction

Funded by the Foundation

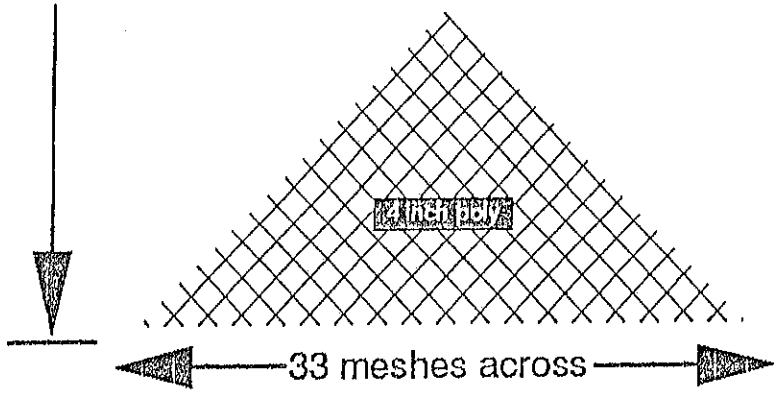
(Control net averaged 24 lbs of shrimp per tow.)

THE BURBANK BRD

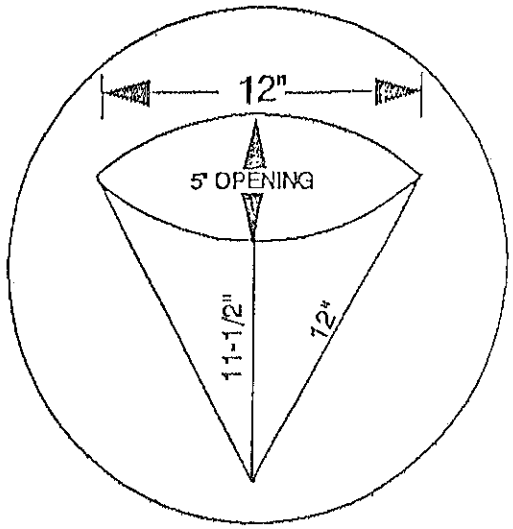
Panel Schematic



16 1/2 meshes deep



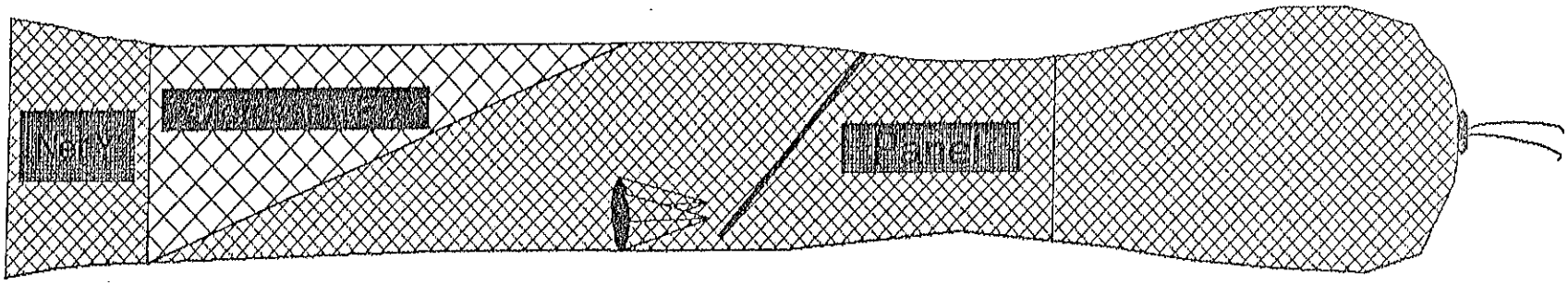
3 mm diameter twine



Fish-eye Diminsions

THE BURBANK BRD

Aboard the Miss Candice

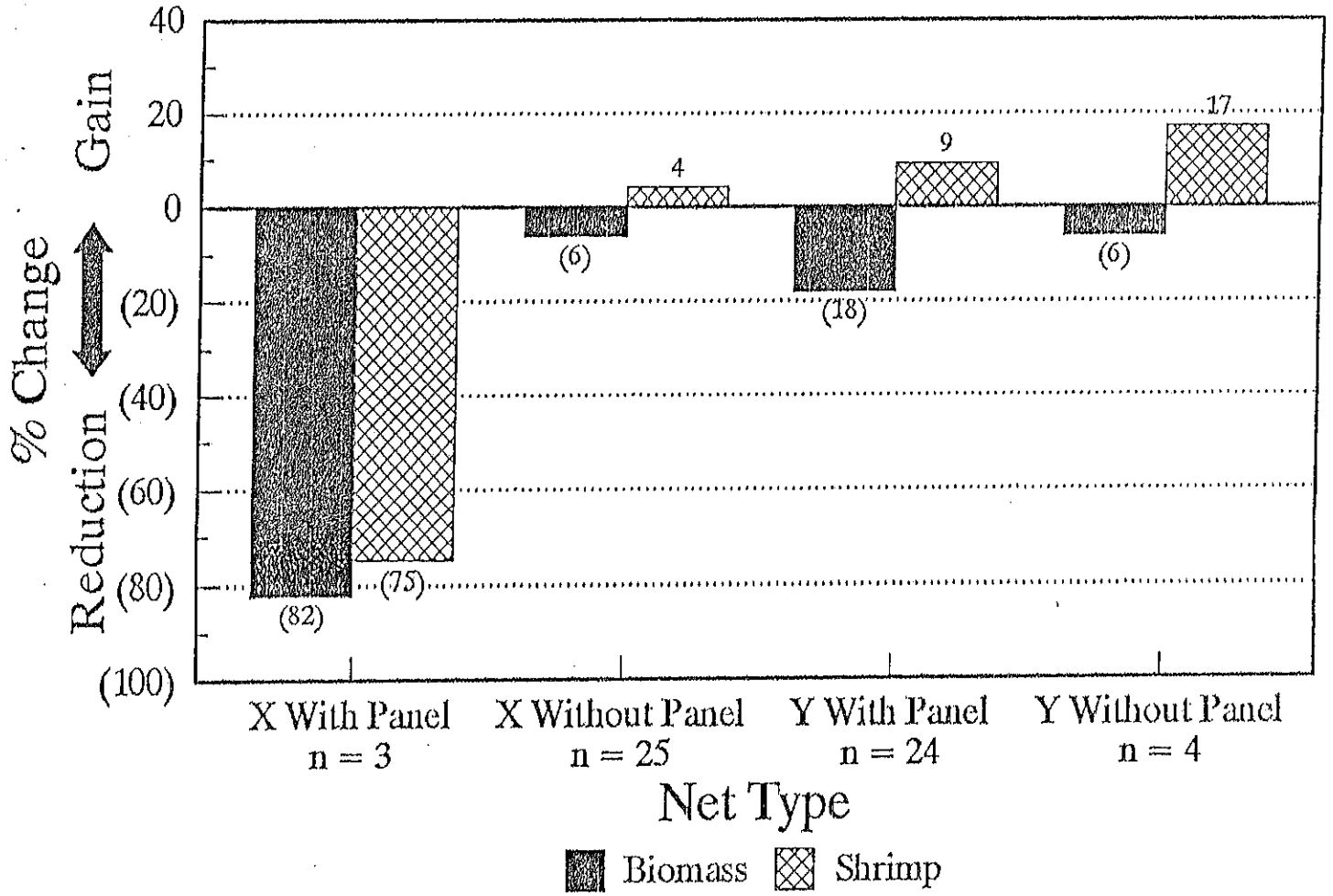


68' Mongoose Net with two Fish-eyes
and a upward shooting 4" mesh panel

Funded by the Foundation

% CHANGE FOR BIOMASS AND SHRIMP FROM AVERAGE CONTROL NET CATCHES

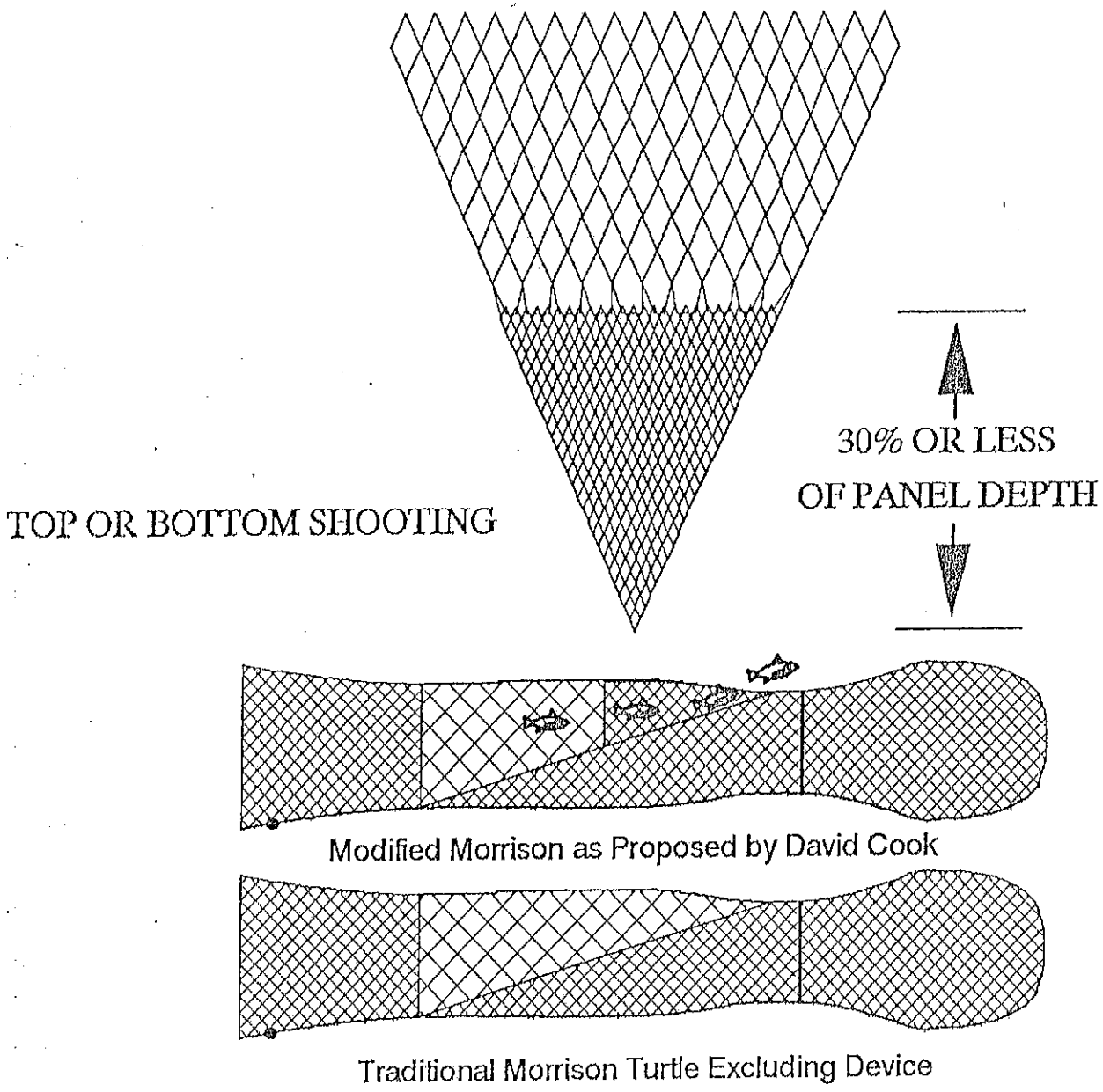
BURBANK BRD RESULTS



X Net - Two Fish Eyes, Bottom Shooting Panel

Y Net - Two Fish Eyes, Top Shooting Panel

COOK'S BRD


TOP OR BOTTOM SHOOTING
30% OR LESS
OF PANEL DEPTH
Modified Morrison as Proposed by David Cook
Traditional Morrison Turtle Excluding Device

No.	Tow Time	C 1(inside)		Net type X		Y		C 2 (outside)	
		pounds shrimp	% biomass reduction	pounds shrimp	% biomass reduction	pounds shrimp	% biomass reduction	pounds shrimp	% biomass reduction
	2½ hours	28	0%	30	5%	30	5%	25	0%
	2½ hours	25	0%	25	10%	28	10%	25	0%
	2½ hours	25	0%	30	5%	30	5%	25	0%
	2½ hours	20	0%	20	5%	25	5%	20	0%
	TOTALS =	98		105		113		95	
	AVERAGE=		0%		6.25%		6.25%		0%

Tows 1 through 3 were conducted with panel and two fish-eyes in both X and Y nets.
Tows 4 through 24 were conducted with two fish-eyes in both nets. Net X was losing a considerable amount of shrimp due to the downwar
shooting position of the panel; it was then removed. Net Y still contained the top panel since no great loss of shrimp was detecte
* Tows 25 through 28 were conducted with the two fish-eyes only; all panels were removed. Net Y's panel became clogged with grass a
became impratical and was then removed.

Tows 1 through 3:
Net (X) four-inch mesh panel placed in a downward shooting position with two fish-eyes had a 75% reduction of shrimp and an 81.5%
reduction in biomass.
Net (Y) four-inch mesh panel placed in a upward shooting position with two fish-eyes had a 4.2% gain of shrimp and an 18.3% reducti
of biomass.

Tows 4 through 24:
Net (X) four-inch mesh panel placed in a downward shooting position with two fish eyes had a 2.6% gain in shrimp and a 6% reducti
in biomass.
Net (Y) four-inch mesh panel placed in a upward shooting position with two fish eyes had 10% gain in shrimp and a 17.5% reduction
biomass.

* Tows 25 through 28:
Net (X) had a 8.2% gain in shrimp and a 6.3% reduction in biomass.
Net (Y) had a 16.4% gain in shrimp and a 6.3% reduction in biomass.

mments by Billy Burbank suggest that fish eyes need to be positioned lower and that the panel excluded all large fish. He also not
at the panel on top in net Y showed no shrimp loss except when the net encountered massive amounts of grass. Then he noticed 70 - 8
ss in shrimp.

omass consisted of various finfish(Atl.Croaker, Spanish Mackerel,Southern Kingfish) grass, jellies and crabs.

Table 1.

Preliminary data regarding the Burbank Bycatch Reduction Devices. Testing was conducted during daylight hours on the shrimp trawler *Daddy's Girl* with Captain Farrell White. A total of four nets were towed; Net (X) four-inch mesh panel placed in a downward shooting position with two fish-eyes behind the Morrison TED towed on the portside, inside trawl; Net (Y) four-inch mesh panel placed in a upward shooting position with two fish-eyes behind the Morrison TED and was towed on the starboard side, inside trawl. Both control nets (C 1) and (C 2) were towed on the outside trawls; one port and the other starboard.

Tow No. *	Tow Time	C 1 (outside)		Net type X		Net type Y		C 2 (outside)	
		pounds shrimp	% biomass / reduction	pounds shrimp	% biomass / reduction	pounds shrimp	% biomass / reduction	pounds shrimp	% biomass / reduction
1	2 hours	22	0%	5	80%	25	20%	24	0%
2	2 hours	28	0%	8	85%	30	20%	30	0%
3	2 hours	20	0%	5	80%	20	15%	20	0%
	TOTALS =	70		18		75		74	
**	AVERAGES=		0%		81.6%		18.3%		0%
4	2 hours	15	0%	15	10%	15	10%	15	0%
5	2 hours	10	0%	10	10%	10	10%	10	0%
6	2 hours	20	0%	20	10%	22	25%	20	0%
7	2 hours	15	0%	15	10%	20	15%	15	0%
8	2 hours	25	0%	25	5%	30	15%	28	0%
9	2 hours	25	0%	30	5%	35	10%	25	0%
10	90 minutes	30	0%	30	10%	35	20%	25	0%
11	90 minutes	25	0%	25	10%	30	30%	25	0%
12	90 minutes	20	0%	20	5%	22	25%	20	0%
13	90 minutes	20	0%	20	5%	22	30%	20	0%
14	90 minutes	15	0%	15	5%	18	30%	15	0%
15	90 minutes	20	0%	20	10%	22	30%	20	0%
16	3 hours	20	0%	20	0%	22	5%	20	0%
17	3 hours	60	0%	60	0%	65	5%	60	0%
18	3 hours	30	0%	30	0%	30	5%	25	0%
19	3 hours	30	0%	30	0%	35	10%	25	0%
20	2½ hours	20	0%	20	5%	22	15%	18	0%
21	2½ hours	30	0%	30	5%	30	15%	27	0%
22	2½ hours	25	0%	25	10%	25	20%	25	0%
23	2½ hours	20	0%	20	5%	22	25%	20	0%
24	2½ hours	25	0%	25	5%	10	---	25	0%
	TOTALS =	500		505		542		483	
	AVERAGE=		0%		6%		17.5%		0%

Appendix I

SHRIMP FISHERY FINFISH BY-CATCH REDUCTION

A Proposal by Billy Burbank III

Project Title

Gear modifications to address the issue of reducing the inadvertent retention of unwanted fin fish species in South Atlantic shrimp trawls.

Principle Investigator

Billy Burbank III, Burbank Trawls, Fernandina, Florida

Specific problem

Unwanted fin fish retention in trawls is perceived by many as a major problem facing the South Atlantic shrimp fishing industry. Following the implementation of rules mandating the installation of Turtle Excluder Devices in shrimp trawls and with the continued expansion of those rules, the industry will be hard pressed to accept yet another device in their trawls. Any modification to existing gear must be within the confines of the established designs for shrimp trawls and the reluctantly accepted TEDs. The changes must keep shrimp retention rates within permissible boundaries and be economically and socially acceptable to the industry.

Trawl gear description

Phase 1 (Prove the principal)

To satisfy the seasonal use of two major rig configurations used in South Atlantic waters, the listed trawls will be modified as described in the proposal:

One 60' tongue trawl with a"Morrison TED" installed (twin rigged)

Two 50' tongue trawls with "Morrison TEDs" installed (double rigged).

Each of the experimental trawls will be modified as follows:

A funnel made from #30, 1.5 inch stretched mesh, polyethylene webbing mounted behind the Morrison TED panel.

A deflector panel of 3mm., 6 inch stretched mesh, polyethylene webbing, mounted at an angle of approximately 30 degrees, installed at a discrete distance behind the exit of the funnel.(* see note)

A diamond cut exit hole, cut into the bag webbing of the trawl, at the top most point of the deflector panel. (See Diagram 1)

* Note If the fin fish reduction rate appears to be small, the 6 inch deflector panels will be removed and 4 inch stretched mesh panels will be substituted.

It is an established fact that the TEDs, either rigid frame or "soft" designs, are capable of ejecting large species of fish and crustacea, ie sharks, rays and horse shoe crabs. Some early work, by the NMFS Pascagoula Labs., seems to indicate that fish will congregate in slack water areas associated with webbing funnels in trawl nets. With the experimental rigs it is felt that the TED will eliminate the large fish and crustacea and that the smaller fish and shrimp will then pass through the funnel into the area of the deflector panel. The shrimp will continue through the panel meshes and into the bag while the small fish will be encouraged to swim upwards and into the area of slack water provided by the external periphery of the funnel. At this point the diamond cut exit hole, or holes, will become evident and the fish may be encouraged to leave the net.

Data collection will be limited to shrimp poundage from the control and experimental trawls and a basket count of biomass from the trawls. The availability of an observer, either from the NMFS or from the GASAFDFI program, would be welcome to provide a more detailed account of the shrimp harvesting and by-catch reduction rates.

Phase 2 (Test fleet acceptance)

On completion of Phase 1, and the selection of the best mesh size for the deflector panel, the BRD (to be known as the "Burbank" By-Catch Reduction Device) will be installed on 10 co-operating shrimp fishing vessels working in South Atlantic waters. The vessels will be chosen to allow a 50% split of double and twin rigged vessels. Again the data collection will be limited to a shrimp poundage from the control and experimental rigs and a basket count of by-catch, unless an observer is available for more detailed data gathering.

Budget Detail

Phase 1

As a shrimp trawler operator is being requested to test something that conceivably could lead to a lowering of his shrimp harvest, it is felt that supplying the cooperating two vessels in phase 1 with a complete net(s) is some compensation for the risk. These nets will be constructed and modified with a soft TED, and the funnel and deflector panel previously described, at a cost of;

1	60′ tongue net	$1350.00
2	50′ tongue nets	$2400.00

Phase 2

Supply and installation of Burbank BRDs to 10 co-operating vessels	$1500.00
Total project cost	$5250.00

Activity	July	August	September	October
Trawl constr.	_____			
Phase 1 test		_____		
Phase 1 mod. if reqd.			_____	
Phase 2 installations			____	
Phase 2 test				_____
Report prep.				_____

Statement of qualifications.

Billy Burbank III. of Burbank Trawls has been associated with the shrimp fishing industry as a trawl net designer and producer for 25 years. His own extensive experience of the trawl making and designing art is further boosted by the availability of Billy Burbank Jr. at all times in the net loft. The realization that any modification to a trawl net must affect its performance as a shrimp harvesting device is extremely clear, particularly in the light of past experience with the TEDs. He has been associated with TEDs from their inceptiom and worked with the NMFS in their development.

Any changes that will further reduce the shrimp harvest will be met with stiff opposition from the commercial sector and the Burbank net shop wishes to see an acceptable solution to the problem associated with by-catch.

Appendix II

SHRIMP FISHERY FINFISH BY-CATCH REDUCTION

A Proposal by David Cook

Project Title

Gear modifications to address the issue of reducing the inadvertent retention of unwanted fin fish species in South Atlantic shrimp trawls.

Principle Investigator

David Cook, Shrimp Fisherman, Fernandina Beach Florida.

Specific problem

Unwanted fin fish retention in trawls is perceived by many as a major problem facing the South Atlantic shrimp fishing industry. Following the implementation of rules mandating the installation of Turtle Excluder Devices in shrimp trawls and with the continued expansion of those rules, the industry will be hard pressed to accept yet another device in their trawls. Any modification to existing gear must be within the confines of the established designs for shrimp trawls and the reluctantly accepted TEDs. The changes must keep shrimp retention rates within permissible boundaries and be economically and socially acceptable to the industry.

Modified gear description

The "Morrison" TED is now established as one of the more acceptable devices in shrimp trawls to eject turtles and meet the requirements of the Endangered Species Act. As such it also proves to be an ideal candidate for modification to address the issue of unwanted species capture.

During many hours of shrimp trawling it has been noticed that on haul back many fish are seen gilled in the top part or apex of the Morrison panel. These fish may have been swimming in that region during the time the trawl was on the sea bed but did not react in an escape manner until the trawl began to collapse around them as the haul back commenced.

The idea behind this project is to install small mesh webbing at the apex of the Morrison panel and extend it some distance down the panel. This distance, or length of small mesh, will need to be determined by experimentation but it will begin at 30% of the length of the panel, (see Figure 1).

As shrimp behavior in trawls is not really understood or documented there will be a need to experiment with this modified TED panel as a bottom shooter as well as the conventional top shooter.

If the GASAFDF Inc. funds this project, assistance will be required

Statement of qualifications.

David Cook has had extensive experience of shrimp fishing, TED evaluation and has worked with research organizations in the past to determine turtle densities in the St Marys river system.