Technical Review Committee Meeting
1993 Small Turtle TED Test

National Marine Fisheries Service
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July 20-22, 1993

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INTRODUCTION

Federal regulations protecting sea turtles provide for the testing and certification of new types of turtle excluder devices (TEDs) for use in shrimp trawls. At the present time there are two test procedures identified in the federal regulations for determining the efficiency of a new TED design for releasing sea turtles. The first procedure is to tow a trawl equipped with the candidate TED in the Cape Canaveral ship channel where large sea turtles are found on a seasonal basis. Due to insufficient numbers of sea turtles in the channel in 1989, a second testing procedure was developed in which headstarted juvenile sea turtles are introduced into a trawl equipped with a candidate TED. Using a team of scuba divers to conduct the test, the small turtle test compares the exclusion efficiency of a candidate TED with that of a qualified TED (control) under similar test conditions.

Upon completion of the small turtle TED test, a review of the test results is conducted by a committee comprised of shrimping industry representatives and members of the sea turtle scientific community. The role of the committee is to conduct a multi-disciplined review of the test results leading to a committee recommendation on certification of candidate TEDs to the NMFS Southeast Regional Director.

The small turtle test was conducted in May-June 1993 to evaluate the small turtle exclusion efficiency of 6 candidate TED designs. This report summarizes the findings of the 1993 Technical Review Committee which convened July 20-22, 1993 to review the test results.

COMMITTEE MEMBERS
1993 TED TEST TECHNICAL REVIEW

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Advisory assistance was provided to panel members by the following individuals:

NMFS/Mississippi Laboratories
Wil Seidel - Chief, Harvesting Systems and Surveys Division
John Watson - Chief , Harvesting Systems Branch
John Mitchell - Fishery Biologist, TED Testing Coordinator
Dominy Hataway - Fishery Biologist
Charles Taylor - Fisheries Methods and Equipment Specialist
Dale Stevens - Fisheries Methods and Equipment Specialist

NMFS/Southeast Regional Office
Chuck Oravetz - Chief, Protected Species Management Branch

NMFS/Washington D.C. Headquarters
Phil Williams - NMFS National Sea Turtle Coordinator

Industry Representatives
Carl Hagenkotter III - Shrimp Fisherman, Key West, Florida

PRESENTATIONS / OVERVIEWS

*** Review of Committee Responsibilities / *John Watson***

Committee responsibilities were outlined as follows:

1.) Review the video record from each of 6 candidate TEDs tested using the small turtle test protocol. The video record consisted of a sample of 4 turtles which escaped through the candidate TED within the 5 minute exposure period, and all "captured" turtles (those which did not escape within the 5 minute exposure period).

2.) Provide an evaluation of each "captured" turtle by scoring as "definite capture" (would not have escaped given more time) or "might have escaped" (may have escaped given more time).

3.) After reviewing the video record from the testing of a candidate TED, each committee member provide written comments and certification recommendations.

4.) Provide recommendations on improving small turtle test procedure and committee review.

In addition to individual written recommendations, the committee chose to conduct an open discussion and take a committee vote regarding recommendation of a candidate TED. The results from committee voting are included in this report.

*** Review of 1992 Committee Recommendations / *John Watson***

Changes in the test procedure as recommended by the 1992 Technical Review committee were presented. The recommendations included: 1.) Do not use Kemp's Ridley (***Lepidochelys kempi***) turtles in the small turtle certification test. 2.) Limit the size of turtles used to no smaller than 25 cm straight line carapace length. 3.) Restrict test to spring or fall seasons when water temperature is moderate. 4) Insure expeditious transport of turtles from rearing facility to Panama City, Florida. 5) Use only turtles in good physical condition. 6) Investigate improvements to release technique to improve turtle orientation in trawl. 7.) Investigate extending exposure time.

All of the above recommendations were incorporated into the 1993 small turtle test except for the investigation of extended exposure time. Extended exposure time was not investigated for the following reasons: 1.) Analysis of data from 3 previous small turtle tests showed that 90% of turtles which have escaped from candidate TEDs have done so in 2.5 minutes or less. 2.) Extending exposure time would result in increased project costs 3.)

Committee review and scoring of "captured" turtles may make extended exposure time unnecessary and thus not worth placing turtles at additional risk.

*** Blood Chemistry of 1993 Test Turtles / *Dr. Peter Lutz***

Preliminary results from blood analyses of turtles used in the test were presented. Blood samples were drawn from turtles pre and post submergence in the test to assess metabolic stress. Lactic acid buildup and associated PH change were measured. Test turtles exhibited a significant buildup of lactic acid in their blood during the 5 minute exposure interval, indicating a large expenditure of energy. Blood samples taken from the same turtles 4 hours and 20 hours after a test submergence showed lactate levels at near normal and at normal levels respectively. Dr. Lutz commented that the recorded recovery rates were the most rapid he had ever seen. Dr. Lutz felt that the observed rapid recovery rates were an indicator of well conditioned turtles.

*** Conditioning of Turtles**
& Overview of Test Procedure / *John Mitchell*

Information was presented which summarized the NMFS Galveston program for preconditioning turtles used for TED testing. Videos were shown which displayed the TED testing procedure as well as a comparison of the fitness of turtles which have been used over the history of the small turtle TED tests.

*** Measurements of 1993 Test Turtles**

Mean carapace measurements of the 1993 test turtles were presented (Table 1). Straight line carapace lengths of turtles used in each small turtle TED test to date were presented (Table 2). Stranding data from 1988-92 for Kemp's Ridley, Green *(**Chelonia mydas**)* and Loggerhead **(*Caretta caretta*)** sea turtles from the Gulf of Mexico and the Southeast Atlantic were presented to indicate how 1993 test turtles are represented in the stranding data. The stranding data showed that Kemp's Ridley turtles between 25 to 35 cm straight line carapace length comprised 22% of the offshore strandings in the Gulf of Mexico and 35% of the offshore strandings in the Southeast Atlantic. Stranding data for Green turtles showed that 25 cm to 35 cm turtles comprised 14% of offshore strandings in the Gulf of Mexico and 33% of the inshore strandings in the South Atlantic. Loggerhead stranding data showed that less than 3% of turtles which stranded in the Gulf of Mexico and 3% of those which stranded in the Southeast Atlantic were in the 25-35 cm size range.

Table 1. Mean Carapace Measurements for Loggerhead Sea Turtles (*Caretta caretta*) Used in 1993 NMFS Small Turtle Test

STRAIGHT LINE CARAPACE MEASUREMENT	CM	n
Length	31.6	136
Width	25.6	130
Depth	12.1	130

Table 2. Species, year class, sample size and mean straight line carapace length by year for juvenile sea turtles used in NMFS small turtle TED test

YEAR	SPECIES	AGE (yr.)		SL LENGTH (cm)
1988	GREEN	2	150	**34.9**
1989	KEMPS RIDLEY	2	45	**32.8**
"	"	3	45	**46.8**
1991	LOGGERHEAD	1.5	85	**26.9**
1993	LOGGERHEAD	2	136	**31.6**
		TOTAL = 461		

*** Statistical Protocol - 1993 Small Turtle TED Test**

An outline of the statistical procedure used in conducting the small turtle TED test was presented as follows:

1.) A control (NMFS TED) was tested using a sample of 10 turtles. Data from testing of the NMFS TED in 1989 and 1991 were pooled with results from the 1993 test for comparison with the candidate TEDs (Table 3). Pooling of historical NMFS performance data resulted in a capture rate of 6 out of 60 trials or 10%.

Table 3. NMFS TED (control) performance in small turtle TED test for 1988, 1989, 1991, and 1993.

YEAR	n	CAPTURES	ESCAPES
1989	25	4	21
1991	25	2	23
1993	10	0	10

2.) Null Hypothesis (Ho) = exclusion rate of the candidate TED is equal to or greater than that of the control TED. Alternate hypothesis (Ha) = exclusion rate of the candidate

TED is less than the that of the control TED.

3.) To derive the number of turtle captures required to reject a candidate TED using a sample of 25 turtles, the probabilities of committing Type I and Type II error must be considered. These errors are defined as:

Type I Error ( ): Rejection of a candidate TED which is as good or better than the NMFS TED.

Type II Error ( ): Acceptance of a candidate TED which is inferior to the NMFS TED.

An inverse relationship exists between Type I error and Type II error probabilities with a fixed sample size (Appendix 1, Tables 1 - 3).

4.) A rejection rate of 5 captures was chosen for the test based on the associated Type I and Type II error probabilities. Testing of a candidate TED could be terminated if the TED captured 5 turtles.

COMMITTEE REVIEW
1993 SMALL TURTLE TED TEST

The findings of the committee with regard to each candidate TED are presented in the following order:

1.) **Committee Scoring:** Videos of each turtle which did not escape within the 5 minute exposure period during a test were reviewed. Each committee member scored the turtle as, a.) Definite Capture (would not have escaped given more time or, b.) may have escaped given more time. The majority vote of the committee is indicated in the committee score.

2.) **Committee Recommendations:** Comments and recommendations from each committee member regarding the candidate TED.

3.) **Committee Vote:** A summary of the committee vote regarding certification and or modification recommendations for each candidate TED.

NMFS TED

TED DESCRIPTION: Top opening, non-collapsible model with accelerator funnel and finfish excluder side openings.

FIELD RESULTS: 0 captures / 10 escapes = 10 trials

The committee viewed 4 of the 10 turtles which escaped from the NMFS TED. No scoring was conducted by the committee because all turtles escaped from the NMFS TED during testing.

NMFS FLOUNDER TED

TED DESCRIPTION: The NMFS Flounder TED (Figure 1) is a top opening hard TED designed for use in the Atlantic coast flounder fishery and specifically for areas where conch are encountered. During testing of prototype flounder TED designs, NMFS gear specialists observed that conch collecting ahead of the TED frame created excess weight and caused the TED to chafe on the sea floor during operation. Because larger trawls and catch weights associated with the flounder fishery place significant loads on a TED frame it was determined that heavier gauge materials and horizontal bars need to be incorporated into the TED frame in order to prevent structural failure of the device. The design features 5 vertical bars spaced 4-inches apart in the center of the frame, two (2) 10-inch X 14-1/2-inch spaces at the bottom of the frame to allow conch and flounder to pass through the grid and into the codend of the net. The design also features a 4-inch horizontal space at the top of the frame to allow flounder to pass through the grid.

The NMFS Flounder TED was tested without floatation and without an accelerator funnel.

FIELD RESULTS: 4 captures / 21 escapes = 25 trials

COMMITTEE SCORING: 2 captures / 23 escapes

COMMITTEE RECOMMENDATIONS / NMFS FLOUNDER TED

Committee Member: MURRAY

"The one horizontal bar at the top (of the TED frame) may have posed a small additional obstacle for escaping turtles. If, as video shows, the bar is not important to the success of flounder capture then I would go along with it's removal (if the rest of the committee feels strongly about it.)"

"I recommend that the NMFS Flounder TED be certified because it passed the statistical test and there did not appear to be obvious or repetitive problems with the four captured turtles."

Committee Member: PRITCHARD

"This is a marginal case for certification. Four captures out of 25 is not bad, although higher than 10%, and in two of these cases the turtle (in my judgement) was on the brink of escaping after 5 minutes, and in only one case was it seemingly hung up on the bars.

"It is noteworthy too that the test is a demanding one in that

(the NMFS Flounder TED) almost certainly would discharge large turtles more easily than the test subjects, and also 5 minutes is not very long - others might have escaped after ten minutes."

"Modifications might include: 1.) Making the lateral and vertical bars the same height (e.g. 4-inches). 2.) removing the top horizontal opening altogether, in that it can hang up turtles and apparently is not important for flounder retention."

"Follow-up and monitoring essential, especially for marginal cases like this"

Committee Member: GRAHAM

"This excluder has met the criteria for acceptance. It should be certified."

Committee Member: OGREN

"Certification with minor changes to grid and webbing is recommended. Problem with bar configuration caused turtles to get "wedged" or caught sufficiently by water pressure to inhibit any additional struggle to free itself/themselves and escape. Also, turtles appeared to be frustrated by skirt - clear visual cue was obscured by excessive length of flap overlap for an active escape to be successful."

"Remove top horizontal bar and extend vertical members to top of frame (this should improve chances for a passive release to occur, i.e., washing out turtle or other fish/trash caught up in trawl). Also, a reduction in spacing dimensions throughout design would greatly enhance design to shoot smaller Ridley turtles (< 25 cm carapace length), found in this area."

Committee Member: BAHEN

" 1.) No design problems, 2.) Structurally sound, industry would use TED, 3.) The one captured turtle was wedged between bar at bottom of TED. 4.) Design would give industry another option of a TED. 5.) Three out of the 4 captures were possible escapes. 6.) Saw no problem with the 10-inch slot at the bottom - would be beneficial to industry."

"Conclusion: Would recommend this design for certification consideration as a top opening TED with no accelerator (funnel)."

" Design has already been tested during the 1993 North Carolina winter flounder season with no problem."

" Do not remove top horizontal bar. It is critical for structural integrity of the device in the flounder fishery."

Committee Member: LUTZ

" Recommend certification of TED with caveat: May capture smaller size turtles, especially Ridley's. If possible certification, should discourage use in Ridley inhabited waters."

Committee Member: HARRINGTON

"I vote to certify. The bottom "conch" opening was given a fair test. Some of the turtles visited that area (10-inch openings at bottom of grid) but did not go through. I recommend to decrease the (top) horizontal bar spacing or eliminate it as it definitely seemed to have caused problems. I don't feel that a slight reduction in bar spacing would influence flounder loss much."

" I would suggest an oval design be allowed. The flap can be loosened."

Committee Member: LOHOEFENER

"Top horizontal bar should be eliminated or at least more narrow."

"TED should be certified for use in the flounder fishery. If possible, TED should be certified for use only when conch in the flounder fishery are a problem."

"Use of this TED should be accompanied by an observer program."

COMMITTEE DISCUSSION / NMFS FLOUNDER TED

At the request of the committee, NMFS gear specialists informed the committee that the top horizontal space of the TED was not necessary for flounder retention based on their assessment of flounder passing through the TED as observed in underwater video. The committee agreed that the top horizontal slot should be removed and the vertical grid bars extended to the top of the frame.

COMMENT: To allow the NMFS Flounder TED to be used in any fishery may present a problem, small sized Ridleys may be encountered by the shrimp fishery and even other Atlantic coast fisheries which may pull TEDs. These small turtles may go through bottom spaces of grid.

COMMITTEE VOTE / NMFS FLOUNDER TED

A poll of the committee resulted in a unanimous decision to certify the NMFS Flounder TED with the following conditions:

1.) Top excluding only

2.) Remove the top horizontal bar

3.) No accelerator funnel allowed

4.) Restrict use to the Atlantic flounder fishery.

CAROLINA FLOUNDER TED

TED DESCRIPTION: The Carolina Flounder TED (Figure 2) was developed for the Atlantic coast flounder fishery because standard aluminum and steel grids were bending as the large catches were hauled aboard. The horizontal bars of the TED give the TED frame the structural integrity necessary to withstand the increased loads.

The Carolina Flounder TED was tested as a bottom excluding device with an accelerator funnel and one (1) 7-inch X 9-inch spongex float attached to the top center of the grid.

FIELD RESULTS: 8 Captures / 16 escapes = 24 trials

COMMITTEE SCORE: 4 Captures / 17 escapes / 3 tie score

COMMITTEE RECOMMENDATIONS / CAROLINA FLOUNDER TED

Committee Member: MURRAY

Based on the certification (test) results I do not recommend that we certify the Carolina Flounder TED. Eight captures were too many and there appeared to be repetitive problems with turtle escape once they get to the area near the escape hole/flap. The accelerator funnel may have created relatively dead water near the flap thus allowing the turtle to remain there without being blown out. Second, the chafing rope caused an additional obstacle or friction point in this area. Third, the flap was sewn in (ahead of) the hole causing it to press the turtle against the frame before the escape hole. Fourth, because (the TED) was bottom shooting, the turtles were inclined to go to the top."

"My recommendation troubles me in that the purpose of the certification was to address the effect of the horizontal bars. (The horizontal bars) did not have much effect. The problems seemed to be caused by components already certified, which leads you to question either the test or the presently certified bottom shooting TEDs."

Committee Member: PRITCHARD

"It is not appropriate to recommend certification of a TED that captured 8 out of 24 turtles. Nevertheless, the great similarity of this TED to an already-approved model differing only in the number of horizontal bars is curious, in that the observed captured turtles did not seem to become involved with these bars,

but rather experienced difficulty getting around the chafing cord lining the lower edge of the device, or simply appeared to choose not to come out."

"Modifications for the future might involve: a.) converting to a top shooter; b.) altering the chafing cord to offer less of an obstacle; c.) altering the angle of attack, or possibly bending the vertical bars backwards further at their lower edge to facilitate discharge, and d.) strengthening the frame so that fewer horizontal bars are necessary."

"Also the flap seemed to be a significant obstacle to turtle discharge. It could perhaps be attached differently, with less lateral stitching to make it easier to push aside."

Committee Member: GRAHAM

"I do not recommend this device for certification. An angular bottom grid similar to the Super Shooter might solve many of the exclusion problems. Traditional flap seemed to cause problems which concern me regarding other TEDs."

Committee Member: OGREN

"Certification not recommended. Major problem with bottom opening configuration. Hard grid may perform better if installed in a larger trawl. Distance between bottom of frame and exit hole appeared to appeared greater than other hard TEDS and appeared to trap turtle and prevent successful escape and/or passive flushing out of turtle by water pressure."

"Strong behavioral response of turtle to swim to the surface played an important role in it's failure to release animal successful. Repeated "near escapes" were frustrated as turtle reversed position seeking a way out at top of trawl. Water pressure held turtle strongly against bars during period of inactivity. Webbing flap was held closely against turtle by pressure. Flap extended too far aft obscuring any visual cue that might assist turtle to escape."

Committee Member: BAHEN

"1.) This design is already approved with 3 horizontal slots. 2.) Nowhere in the test did the fourth horizontal bar impede the turtle. Conclusion: The TED test results indicate the Carolina Flounder TED captured eight (8) out of 24 turtles, therefore I would recommend this design for certification consideration."

"The 1990 TED regulations allow for three (3) horizontal slots at the top of the TED, therefore the Carolina TED could be modified

to only three slots at the top as it would qualify as an approved TED."

Committee Member: LUTZ

Certification recommendation: "Fails". (The test turtles exhibited a) strong bias to swim up. Probably much more effective if reversed to a top exit."

Committee Member: HARRINGTON

"Many of the captures seemed impeded by chafing rope. Also, after reviewing the NMFS Flounder TED, it seems, rather I feel, had this been a top excluder, more escapes would have occurred. Based on the exclusion rate I cannot recommend this for certification. What was disturbing regarding this review was that the bottom vertical bar section, where many of captures were impacted, is certified."

"A not so restrictive flap probably would have allowed more escapes. This device modified to eliminate one of the horizontal bar spacings and installed as a top excluder should work in areas void of conch."

Committee Member: LOHOEFENER

"(The Carolina Flounder TED) should not be certified. The combination of a large TED, bottom shooting, perhaps the placement of (chafing) ropes, has resulted in a TED that will not efficiently release sea turtles that are in the 25 cm (carapace length) range."

"I think that all bottom shooting TEDs should be reevaluated for efficiency, especially in the light of the Louisiana episode of 1993."

COMMITTEE VOTE / CAROLINA FLOUNDER TED

A poll of the committee resulted in a unanimous recommendation to not certify the Carolina Flounder TED.

JONES TED

TED DESCRIPTION: The Jones TED (Figure 3) is a bottom excluding device featuring irregularly spaced deflector bars which are attached to the outer frame on one end only. The TED was designed to be used in shrimping conditions where seaweed and grass cause clogging problems with standard grid-style TEDs. Testing of the Jones TED in 1991 resulted in turtles passing through the grid in spaces which exceeded 4-inches. The Jones TED was modified for the 1993 test by narrowing the problem spaces in the lower half of the grid. NMFS gear specialists feel that the Jones TED design may be beneficial for inshore shrimping conditions where grass and seaweed are prevalent.

The Jones TED was tested with an accelerator funnel and one (1) 7-inch X 9-inch spongex float attached to the top of the device.

FIELD RESULTS: 2 captures / 21 escapes = 23 trials

COMMITTEE SCORING: 2 captures / 21 escapes

NOTE: Both turtles which were captured in the test passed through the TED grid and went into the codend of the net. Carapace measurements of the captured turtles are listed in Table 4.

Table 4. Straight Line Carapace Measurements (cm) of Juvenile Loggerhead Sea Turtles *(Caretta caretta)* Captured in Jones TED during 1993 Small Turtle Test.

	Straight Line Carapace Measurements (cm)		
	Length	Width	Depth
Captured Turtle #1	**26.4**	**21.6**	**11.0**
Captured Turtle #2	**30.1**	**24.5**	**11.0**

COMMITTEE RECOMMENDATIONS / JONES TED

Committee Member: MURRAY

"Approve with the following conditions: 1) Tighten so that dimensions between the bars are shortened - in 1/2-inch increments."

"Based on the statistical test, this TED should be passed without restrictions, however, the two turtles which were caught passed through the TED into the tailbag because if the turtle

encounters the bars at precisely the right angle he can go through. The conditions (recommendations) above should correct the problem without unduly affecting the weedless function of the TED."

Committee Member: PRITCHARD

"Fast release and passed test requirement of exclusion frequency. Also probably effective in avoiding clogging with grass. Disadvantage is that turtles did go right through in two cases, and thus had no further possibility of escape."

"Thus, recommend certification but with a requirement that bar spacing be modified to exclude the size of small Ridley that stranded recently in Louisiana".

Committee Member: GRAHAM

"Recommend for certification after spaces between grids are narrowed."

Committee Member: OGREN

"Escapes and captures were dramatic - time lapsed for both very short. This suggests that the grid, in the case of the captures of 26 cm and 31 cm (CL) turtles, would need to be redesigned to eliminate smaller turtles in the shallow bay coastal-zone where this gear will be used."

"Modifications required: Reduce dimensions overall to prevent capture of < 25 cm (CL) Ridleys and Greens. Obtain size (length, width, depth) of juvenile Ridley turtles collected from 1993 stranding at Grand Isle, Louisiana. Use this recent data to modify spacing of grid."

Committee Member: BAHEN

" 1.) Design as a "weedless" TED. 2.) The 2 captures went through the bars into the tailbag. These captures happened very quickly."

"Conclusion: Recommend the TED be certified with the exception that the bar spacing be reduced from 4-inches to a measurement that considers the length and depth of the recent small Ridley turtles (1993 Louisiana strandings).

Committee Member: LUTZ

Certification Recommendation: "Pass. Problem for smaller turtles - suggest tighten up (bar spacing)."

Committee Member: HARRINGTON

"Recommend certification - also recommend narrowing of bar spacing and possible lengthening of bars to decrease the area of all voids"

Committee Member: LOHOEFENER

"This TED poses an interesting question. Does a TED that lets "average expected" sea turtle reach the bag automatically flunk the test. It should. By definition, a turtle excluder device should exclude a sea turtle, of the type to be expected present on the shrimp grounds, from the bag. Failure to exclude from the bag is a fatal design flaw whereas failure to exclude the net or flap or trap door could be a flaw subject to the momentary conditions of the test, and might easily corrected by the NMFS observers."

I suggest that any sea turtle that passes through the (candidate) TED to reach the (bag) be weighted by a factor of at least 2.5. Thus, a (through the TED) capture of 2 turtles would equal 5 turtles captured. Only the statistical protocol should be used to make the pass/flunk decision."

COMMITTEE DISCUSSION / JONES TED

COMMENT: The Jones TED, if certified, is likely to be used in the inshore shrimp fishery because of it's weedless features. Several panel members strongly urged that the bars spacing be reduced to a size which would prevent small ridleys (i.e. 1993 LA. strandings) from passing through the TED and into the tailbag.

A suggested method for deriving the bar spacing needed to protect small Ridleys was provided by Lohoefener: Analyze carapace depth stranding data from the 1993 Louisiana episode, find the lower limit at 95% confidence level and model a turtle to physically test bar spacing.

COMMENT: Approve the design which was tested for offshore use, investigate another with smaller bar spacing for inshore use.

COMMENT: If we impose new bar spacing standards on the Jones TED, should we reevaluate all other hard TEDs with 4-inch spacing?

COMMITTEE VOTE/ JONES TED

The committee voted unanimously to: " Recommend certification of the Jones TED with appropriate modifications to insure that or

greatly reduce the possibility of capturing the 2 small turtles that went through the bars." The committee defined the modification as a reduction of the spacing between the grid bars to achieve the recommended result and asked that NMFS determine what the exact measurement for the bar spacing should be.

ANDREWS 7-INCH, 3-PANEL SOFT TED

TED DESCRIPTION: The Andrews 7-inch, 3 panel soft TED, (Figure 4) is a bottom opening design with a deflector panel constructed of 7-inch stretched mesh length webbing (center of knot to center of knot). The design features a single body panel and 2 wing panels which taper to an exit hole at the bottom of the trawl just ahead of the trawl extension. The exit hole of the TED consists of a lateral slit with a flap covering the exit hole.

The Andrews 7-inch, 3 panel soft TED was tested in a 30-ft. headrope length trawl and was spread using 8'X 40" trawl doors. Initial inspection of the TED indicated that the trawl was overspread with the large doors resulting 1.) pocketing occurring in the TED panel just ahead of the escape opening and in the trawl wings and 2.) the footrope fishing 12 to 14-inches of the bottom. Both problems were corrected by modifying the panel sewing sequence and adding loop chain to the footrope in order to lower the footrope.

FIELD RESULTS: 6 Captures / 11 escapes = 17 trials

COMMITTEE SCORE: 6 Captures / 11 escapes

The committee chose to review the video record from a second test of the 7-inch Andrews soft TED before making final recommendations on the design. The modifications consisted of a change in the wing taper of the TED from a all bar taper to a 2:1 taper. This modification created a more gradual taper of the wings toward the escape opening. The modified design was spread using 5-ft. X 35-in. doors.

FIELD RESULTS (modified Andrews 7-inch): 3 Captures / 4 Escapes

COMMITTEE SCORE: No Scoring Conducted

COMMITTEE RECOMMENDATIONS / ANDREWS 7-INCH SOFT TED

Committee Member: MURRAY

"Because of the large number and repetitive nature of the captures, I recommend that this TED not be certified. There is a definite problem with turtle entanglement in the wings.

Committee Member: PRITCHARD

No comment provided

Committee Member: GRAHAM

"Reject under the circumstances reviewed. Are we affecting the test by releasing turtles in close proximity of the TED? (Turtles didn't seem to be orienting quickly enough When turtles were caught in webbing, often they seemed lethargic."

Committee Member: Ogren

"Soft TEDs continue to gill and entangle turtles, frequently ahead of escape hole and in the wings. Only solution would be to reduce the mesh size (5-inch to less than 5-inch). Not recommended for certification."

Committee Member: BAHEN

"Based on the number of captures on both the original and modified version, I would recommend not to certify the Andrews 7-inch 3 panel soft TED and the modification."

Committee Member: LUTZ

No comment provided

Committee Member: HARRINGTON

"Under the circumstances cannot recommend (for certification). The turtles that were captured exhibited the lateral and positive buoyancy. The question remains in my mind whether small wild turtles encountered by a large trawl would behave in this fashion or like those that did escape, i.e. they maintained a good altitude and physical attitude and gradually worked backward and out."

Committee Member: LOHOEFENER

"As the NMFS gear person speculated, unless the "TED" is tuned professionally, it will probably perform more poorly than it did during the Panama City tests."

"This TED clearly demonstrated the inadequacy of large mesh soft TEDs in excluding sea turtles, especially small sea turtles. NMFS has the data to demonstrate that greater than 5-inch mesh does not exclude turtles. If soft TEDs are going to continue to be part of the shrimpers arsenal, then no soft TEDs with mesh sizes greater than 5-inch should be certified. If any soft TEDs with mesh greater than 5-inch are currently legal and <u>have</u> <u>not</u> <u>been</u> subjected

to the small turtle test protocol, they should be so tested and decertified if they flunk the statistical test."

COMMITTEE VOTE / ANDREWS 7-INCH SOFT TED

The committee voted unanimously not to recommend certification of the Andrews 7-inch, 3 panel soft TED.

ANDREWS 6-INCH, 3-PANEL SOFT TED

TED DESCRIPTION: The Andrews 6-inch, 3 panel soft TED (Figure 5) is constructed of 6-inch stretched mesh polyethylene webbing (center of knot to center of knot). The panel was installed in the same manner as the 7-inch, 3-panel (see above). The TED was spread using 5-ft. X 30-inch doors.

FIELD RESULTS: 5 captures / 20 escapes = 25 trials

COMMITTEE SCORING: 5 captures / 20 escapes

COMMITTEE RECOMMENDATIONS / ANDREWS 6-INCH SOFT TED

Committee Member: MURRAY

"Even though I voted to certify this TED, I did so with reservations. I would have felt much more comfortable voting on a compromise recommendation of 5-inch mesh in the side panels and 6-inch or 7-inch in the top. Given the closeness of the test and the fact that 5 committee members voted against it, I would recommend that NMFS go along with the majority and not certify it.

" We had one committee member who indicated that economics and politics should not enter into the decision. In my view when the test is at the margin (5 vs. 4 captures), we should look at economics, and I was convinced there was a lot of interest in the Gulf region."

Committee Member: PRITCHARD

No comments provided

Committee Member: GRAHAM

" I recommend that this design be certified. The small turtle protocol is introducing a bias to the TED. Small turtles which are being released near the proximity of the device often do not seem to have time to become oriented. Turtles are noted on their sides being forced into the webbing by water pressure. Because results were so close, I feel confident that one turtle capture could be eliminated."

"Other information which exists wholeheartedly supports the certification of this device. Wild turtle tests at the Cape, i.e. large turtles with 7-7/8-inch webbing. Industry experience, supported by some observer data. I feel that accepting this device

is in the interest of turtle conservation for a number of reasons."

Committee Member: OGREN

" Soft TEDs of this mesh size entangle turtles. This problem has existed before, as in the last evaluation of TEDs. They should not be used at all, anywhere."

" Mesh sizes (6-inch, 7-inch, 8-inch, 10-inch) might be suitable for top panel and could be tested if industry desires."

"Not recommended for certification unless mesh size reduced. Possible solution is to vary mesh size of the 3 panels (5-inch wings, 6-inch, 7-inch, 8-inch top), and resubmit to NMFS for testing."

Committee Member: BAHEN

" 1.) The borderline capture of (5) five made recommending this TED for certification a "judgement call". 2.) If I had observed the soft TED video before viewing the hard TED footage, my decision would be somewhat different i.e., what was a definite capture vs. might have escaped. 3.) The Andrews 5-inch is already a certified TED. 4.) I have problems with the soft TED large mesh from the beginning. Conclusion: Voted not to recommend this 6-inch Andrews for consideration for certification."

"1.) All turtles were entangled in wing. 2.) Suggested different mesh sizes in wing might remedy the problem."

Committee Member: LUTZ

"Fail. Suggest testing 5-inch side panels (wings) and 7-inch or greater in the top."

Committee Member: HARRINGTON

"Based on this device missing the escape criteria by one and the need by segments of the industry for a bottom shooting soft TED and the fact these devices are known for effective turtle exclusion in the industry, I vote for or recommend certification."

"Furthermore, the behavior of the turtles which did not escape resembled that of past experiments where positive buoyancy responses were common. Although these turtles in this series of tests resembled wild behavior, a few did not."

Committee Member: LOHOEFENER

"1.) 3/4 of escapes shown could have been rated as "captured". 2.) This 6-inch mesh will probably be even more hazardous for

turtles smaller than 25 cm carapace length."

"There is no reason to believe that this test was anything but the best possible performance of this TED. Certification of a TED that has a field performance of 80% is unacceptable for all sea turtles and especially Kemp's Ridleys."

"I believe NMFS should revisit the whole concept of soft TEDs. Enforcement of soft TEDs is probably doubtful at best. No more soft TEDs should be certified until the enforcement difficulties can be worked out and an observer program demonstrates that soft TEDs actually exclude small turtles at a rate greater than 90%."

"A bottom shooting TED with 5-inch wings and larger mesh (top) might be certifiable".

COMMITTEE DISCUSSION / ANDREWS 6-INCH SOFT TED

COMMENT: Because the test score was marginal, consideration should be given to certification of the Andrews 6-inch due to the industry's need for a larger mesh size in a bottom opening soft TED which would improve shrimp retention. Bottom shooting soft TEDs with larger mesh sizes have passed certification tests in Cape Canaveral.

COMMENT: It is not the task of the committee to take economic factors into account in making recommendations, but rather to judge the performance of the TED in excluding sea turtles.

COMMENT: Consideration should be given to the fact that sea turtles which are smaller in size than the test turtles would probably not be excluded from the TED.

COMMENT: The TED did not perform as well as the NMFS TED and thus should not be certified.

COMMITTEE VOTE / ANDREWS 6-INCH SOFT TED

The following vote was recorded:

5 members opposed certification
3 members for certification

The committee recommended that industry should consider resubmitting a bottom shooting 3 panel soft TED with 5-inch mesh in the wings and 7-inch in the top panel for the next small turtle

test. Some committee members indicated that such a design may not be supported by soft TED manufacturers due to the difficulty in repairing damage to a soft TED constructed of differing mesh sizes.

COMMITTEE REVIEW
HAGENKOTTER BEAM TRAWL

TED DESCRIPTION: The beam trawl concept replaces the need for conventional trawl doors as a spreading mechanism by attaching the trawl directly to a steel beam fitted with a series of skids allowing the gear to be towed across the sea floor. The trawl is attached to the beam by eliminating the trawl leg lines and attaching headrope and wing ends directly to the beam frame. The concept results in the trawl maintaining a fixed horizontal spread and vertical height during operation.

The Hagenkotter Beam Trawl (Figure 6) is designed to exclude sea turtles from the trawl by fitting a panel of 8-inch stretched mesh polyethylene webbing (center of knot to center of knot) across the front of the beam and under the trawl footrope creating a barrier across the trawl mouth. Various modifications were made to excluder panel during the 2-day evaluation process. The 8-inch deflector panel was modified from a downward orientation to that of a V-shaped barrier providing the capability of deflecting turtles either downward and under the trawl footrope or upward and over the trawl headrope.

A complete test was not conducted on the Hagenkotter Beam Trawl due to the need for extensive modifications to the gear in order to improve turtle excluding efficiency. Limited evaluations of the deflector barrier were made by releasing turtles in front of the trawl.

FIELD TEST RESULTS (limited test):

HAGEN BEAM #1	4 captures / 1 escape	= 5 trials
V-PANEL #1	0 captures / 3 escape	= 3 trials
V-PANEL #2	0 captures / 6 escape	= 6 trials

COMMITTEE RECOMMENDATIONS / HAGEN TRAWL

Committee Member: MURRAY

"Could not vote to certify because not enough samples were done. Looked O.K. from a turtle escapement standpoint. Recommend that the gear be pursued, but needs more trials and more work to perfect the gear to retain shrimp. (The designer) needs to have the trawl better perfected to save valuable ship time before scheduling another re-certification cruise."

Committee Member: PRITCHARD

"It would be unfortunate to reject a device that excluded 9 out of 9 turtles, even though it cannot yet be approved. The device represents a rather radical innovation, with the potential of solving the problem of turtle exclusion by shrimp trawlers."

"In the ideal world, every minor modification could be tested immediately, resulting theoretically in rapid evolution of the "perfect" TED. On the other hand, testing is laborious, requires much public money, a supply of turtles, etc., and in practice can only be done once a year."

"The 30-ft. Hagen trawl may or may not be a good replicate for the 60-ft. version. The latter certainly needs independent testing. It may be necessary to wait until 1994 to test the 30-ft. model with 25 turtles; perhaps if the 60-ft. model is available by then it could be tested in 1994. This protocol would require that the applicant be granted a research permit in order for him to get his 60-ft. model ready."

Committee Member: GRAHAM

No comment sheet provided

Committee Member: OGREN

"Recommend that the concept be pursued as an experimental gear type that has potential for deflecting turtles. Whether or not it has any chance of being an efficient shrimp catching device and will be adopted by the fleet is in my opinion, doubtful, (e.g. The "bulk" of the equipment and it's configuration may not be acceptable to industry (the NMFS TED was objected to by shrimpers on the grounds as stated above.)"

Committee Member: BAHEN

"The overall beam trawl concept is not practical for the industry. It is bulky, and dangerous to handle at sea."

"The problem in obtaining consistent turtle exclusion with this design will be to insure that the deflector panel is installed tightly, and still allow the trawl to be efficient at catching shrimp. This is a problem that NMFS tried to address in the early days of TED development with barrier trawls, and found that distortion of the trawl opening was inherent with placing large mesh webbing across the mouth of the net."

Committee Member: LUTZ

"Without comment on the practicability and efficiency of the TED for catching shrimp - as a turtle excluder device the V-panel modification shows high promise and should be pursued and tested in

similar operating conditions."

Committee Member: HARRINGTON

"Very good at excluding turtles but feel industry would never adopt the beam trawl."

Committee Member: LOHOEFENER

" The (committee) review should not be given the opportunity to certify a TED that has not passed - or at worst marginally flunked - the statistical protocol."

"Strictly from the standpoint of sea turtle conservation, certification should only be after a standard test with a full size model."

COMMITTEE DISCUSSION / HAGEN TRAWL

Mr. Hagenkotter informed the panel that the 30-ft. version of his beam trawl was not the design which he was seeking to certify, but rather he was pursuing certification of a 60-ft. version with a deflector panel which would be modified from that which was evaluated during the 1993 test. The committee told Mr. Hagenkotter that they could not provide a recommendation on the 60-ft. version because it had not been tested.

COMMENT: As observed in the video, the trawl was not operating efficiently to catch shrimp (footrope was too far off bottom- and would probably not be operated in this manner on the shrimping grounds. Recommend that if the design is submitted for testing again in the future, it should be rigged in the configuration in which it will most likely be used to catch shrimp.

COMMITTEE VOTE / HAGEN TRAWL

The committee unanimously acknowledged that the Hagenkotter Beam Trawl has good potential as a turtle excluder. The panel suggested that the designer should consider pursuing certification of a final version of the design for the next small turtle certification test.

COMMITTEE RECOMMENDATIONS
TEST PROTOCOL AND COMMITTEE REVIEW PROCESS

** TEST PROCEDURE*

1.) Conduct limited testing of extended exposure time.

COMMENT: Conduct a limited test with a sample of turtles (enough to be statistically valid) of a 15, 20 or 30 minute exposure interval using a hard TED (not necessary on soft TED as captures are more definite). Purpose of test would be to determine how representative the 5 minute exposure interval is to a longer exposure period in terms of turtle stress, and to assess how much variability there is with escapes which take place within 5 minutes and those which take place longer than 5 minutes. Research Hypothesis I - Escape rate of turtles exposed to a 30 minute test is significantly greater than those exposed to a 5 minute test. Research Hypothesis II - Stress recovery rate (blood lactate and blood catecholamines) for turtles exposed to 30 minute tests is significantly greater than turtles exposed to a 5 minute test.

VOTE: The panel was unanimous in voting to recommend a limited test of extended exposure time.

2.) Investigate potential bias with regard to turtle behavior.

COMMENT: Determine through blood sampling and assessment of behavior in the test if turtles become stressed during holding period on a given test day, (i.e. turtles which are held on the vessel and not used until afternoon may be less active in a test.)

VOTE: No vote taken

3.) Use smaller sized turtles in the test.

COMMENT: The test needs to become more specific for excluding juvenile Kemp's Ridleys. Use 20 to 25 cm turtles. Small sized sea turtles (less than 25 cm CL) are not well represented in stranding data, however they do exist. As more small Ridley's are produced at Rancho Nuevo, more are recruited into the population. Unlike other species which have relatively substantial numbers of breeding adults (considered to be more valuable for population), Ridleys do not.

VOTE:. The recommendation to adopt a 20 to 25 cm straight line carapace length as the size range for turtles used in the

small turtle test yielded a vote of **5 agreed/ 3 opposed**.

* *STATISTICAL PROTOCOL*

1.) Is current statistical protocol allowing less efficient candidate TEDs to become certified?

COMMENT: Recommend changing rejection of a candidate TED from 5 turtles to 4 turtles. The current statistical protocol allows TEDs which are only 84% effective in excluding test turtles to be certified (pass rate is 4 captures out of 25). Type 1 error (probability of rejecting a good TED) should be increased from current level (10.5% at rejection of a candidate TED at 5 turtle captures) to provide for reduced Type II error (probability of accepting a poor TED).

VOTE: The recommendation to change the rejection of a candidate TED from 5 turtle captures to 4 turtle captures yielded the following vote:

3 agreed / 4 opposed / 1 abstention

COMMENT: Increase sample size for testing a candidate TED in order to reduce Type II error. Investigate what sample size should be used to achieve TYPE 1 error of 22%. Increasing sample size may require that NMFS Galveston raise more turtles.

VOTE: The committee was unanimous in voting to recommend an increase in the sample size used to test candidate TEDs.

** COMMITTEE REVIEW PROCESS*

1.) Scoring of captured turtles

COMMENT: The statistical test is the only valid aspect of the entire protocol. Panel scoring of captures only weakens the test. Eliminate scoring of captured turtles and rely on statistical protocol.

COMMENT: If panel is asked to score turtles, define scoring requirements better. Include gradients to score selection, i.e. definite capture, might have escaped, did escape, never encountered TED, encountered TED but did not exit, might have been captured.

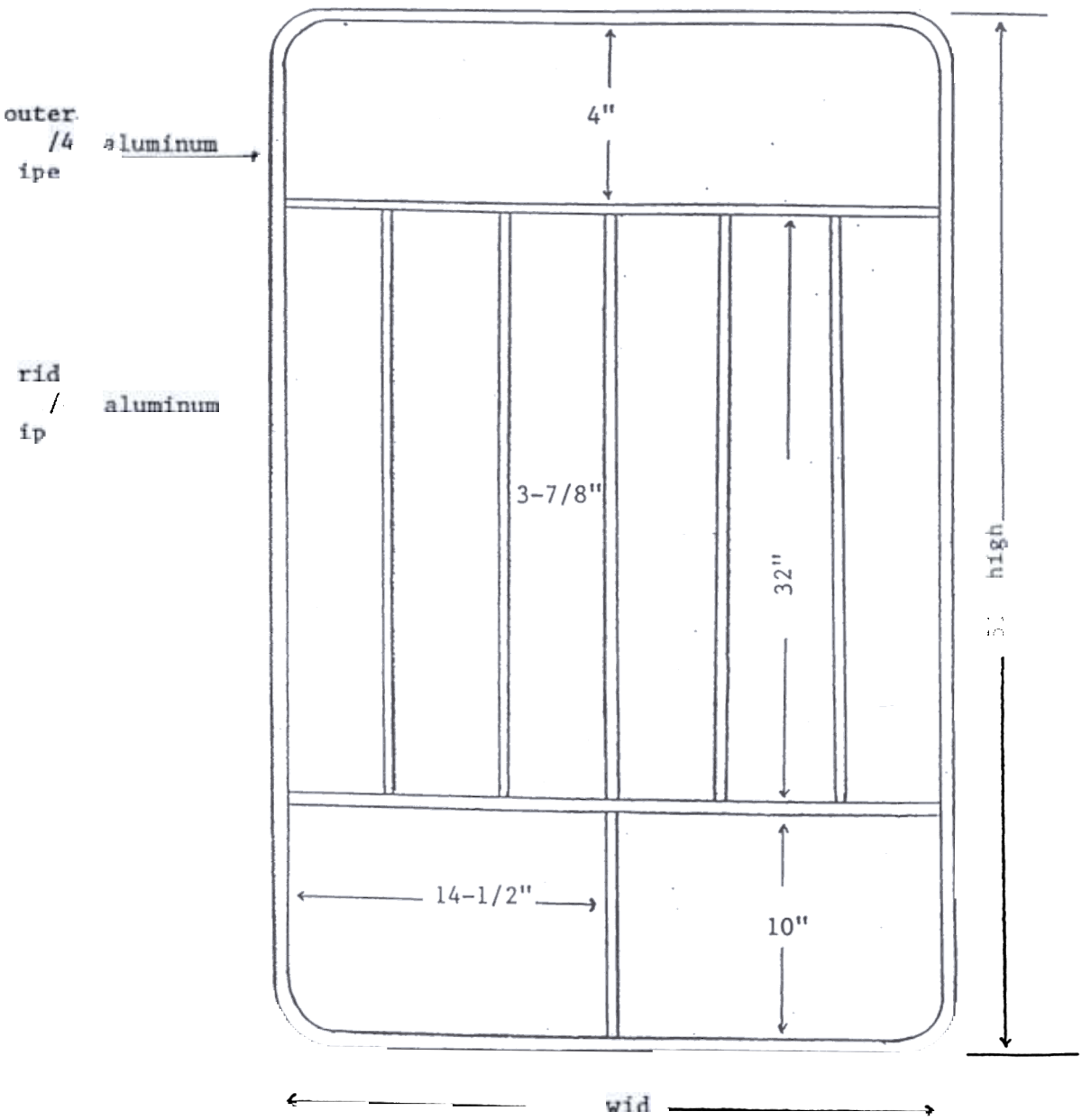
VOTE: The panel voted unanimously to recommend that NMFS reevaluate the scoring process.

2.) Provide more information on sea turtle distribution.

COMMENT: Include a presentation on the spatial and temporal distribution of sea turtles in the GOM and S.E. Atlantic, (especially as it relates to juvenile Kemp's Ridley). This information will be useful in future committee decisions as TED use will likely be expanded to other fisheries.

Figure

NMFS FLOUNDER TED



F re

CAROLINA FLOUNDER TED

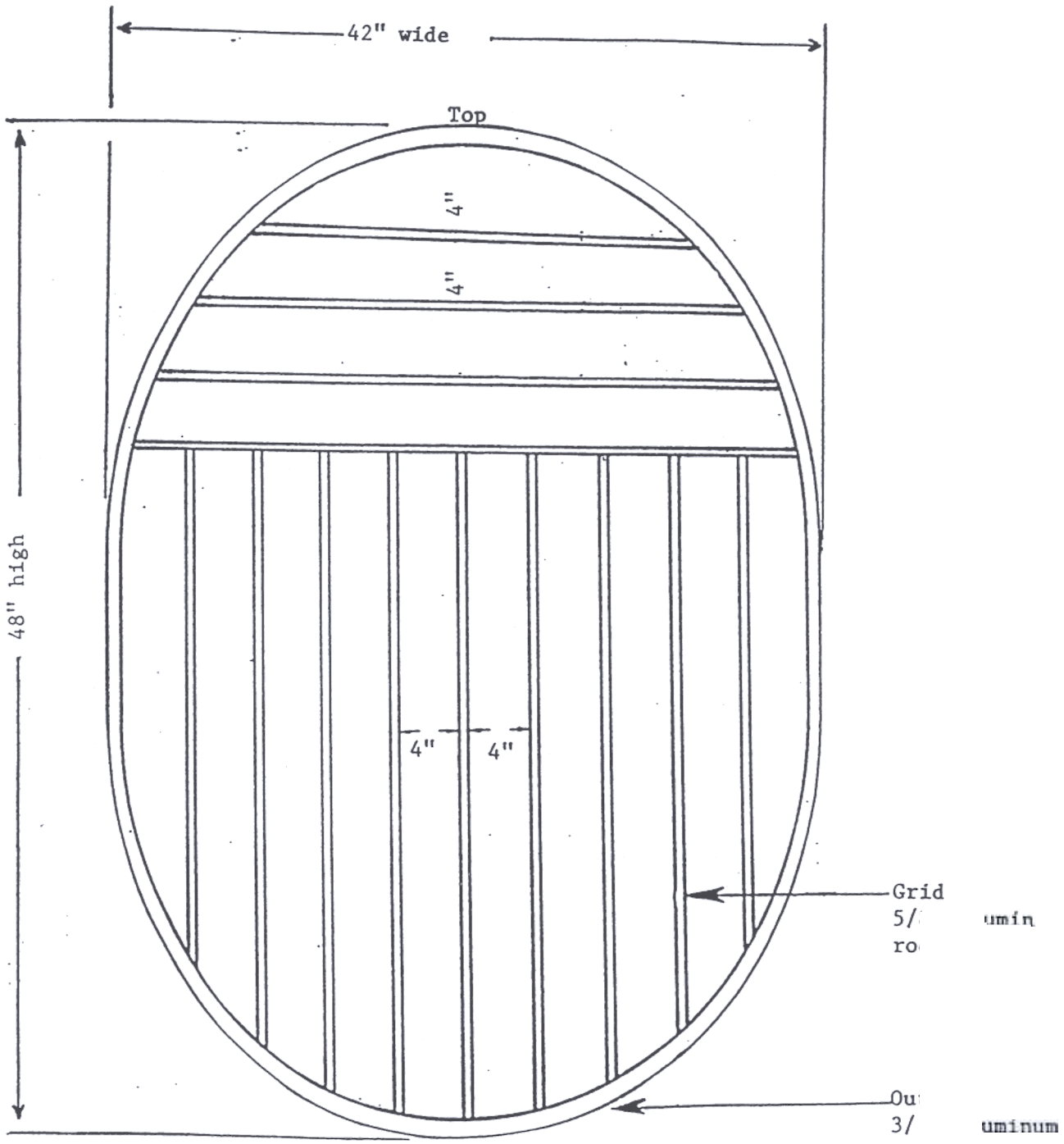
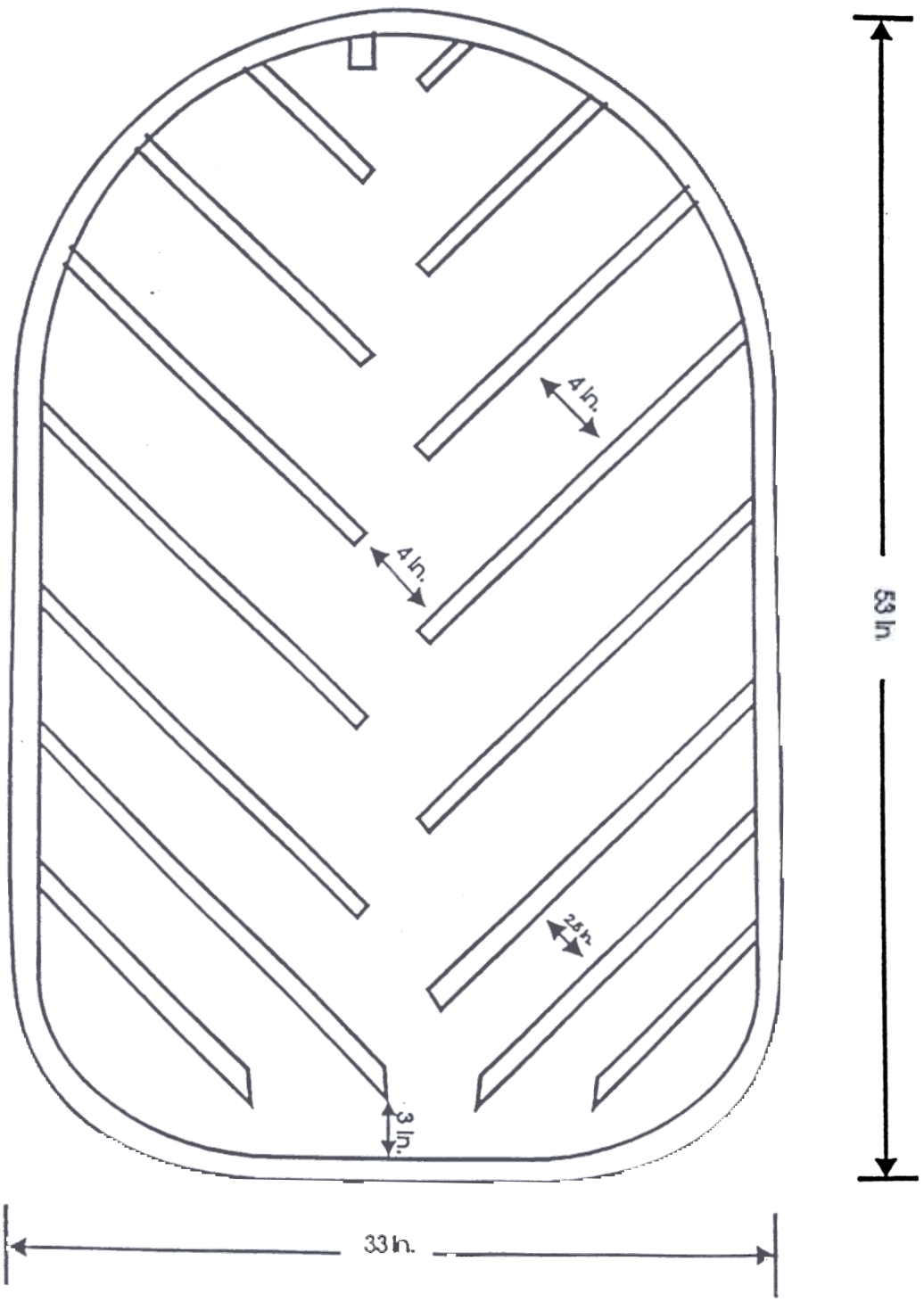
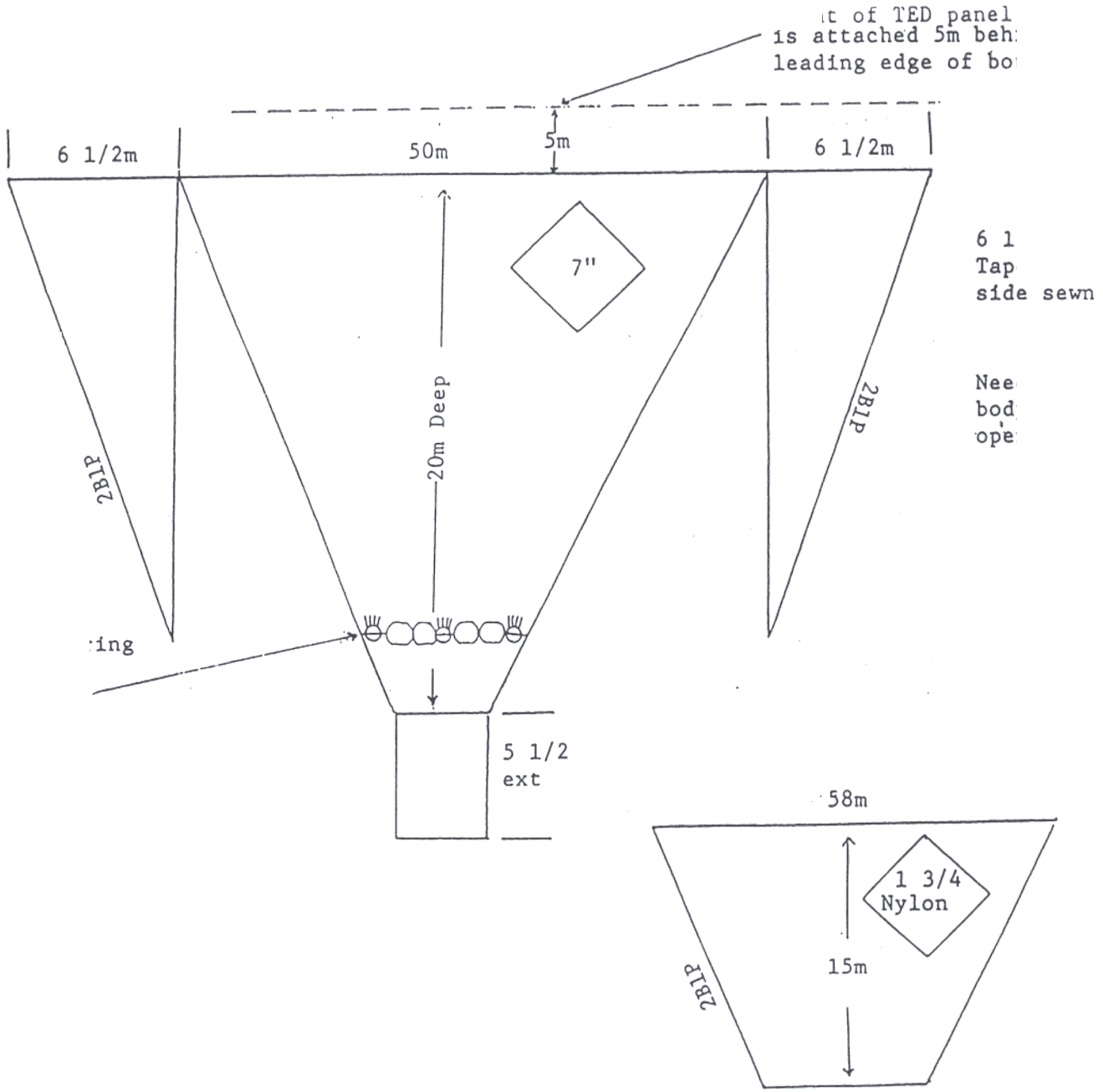
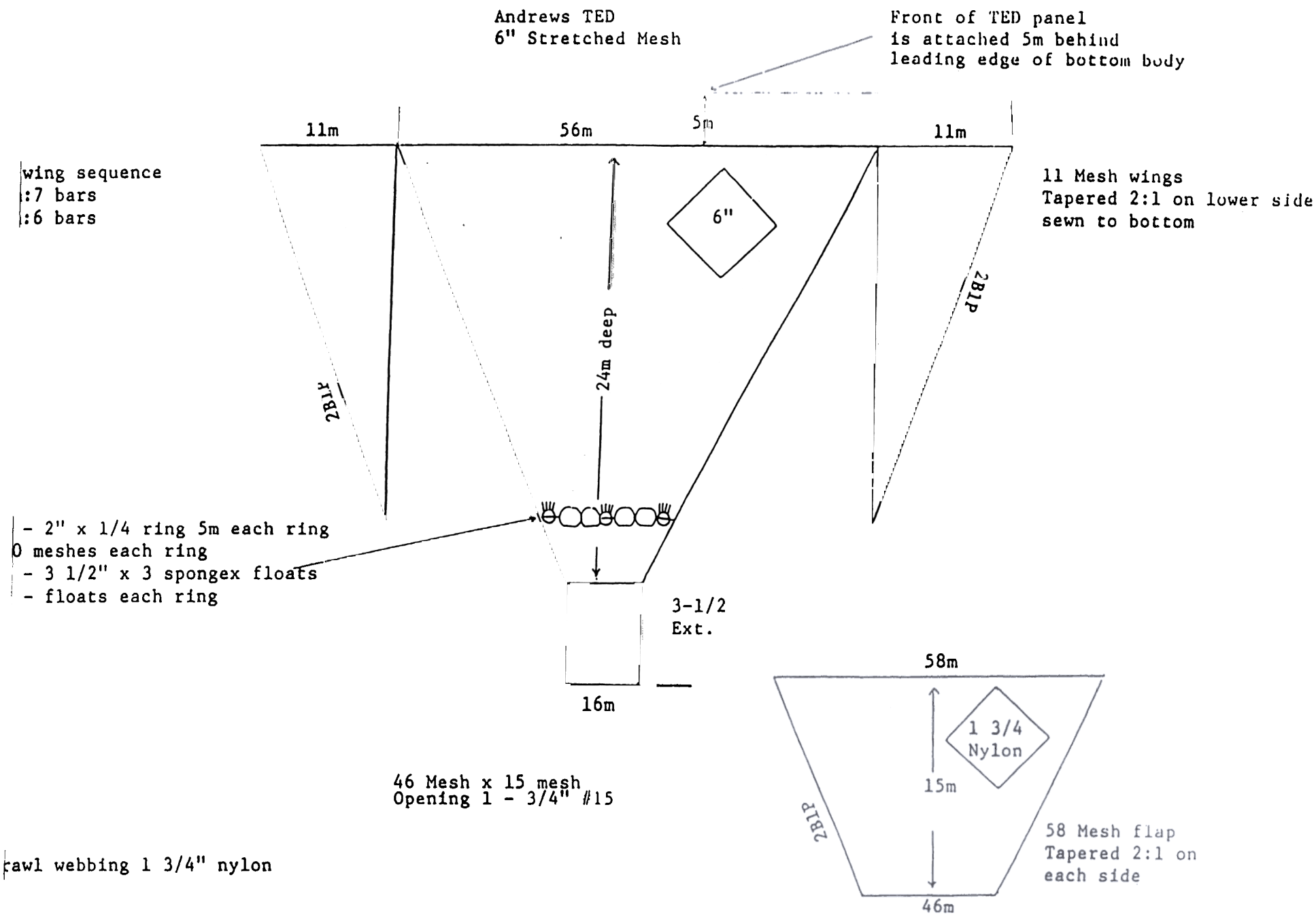


Fig re 3

JONES TED

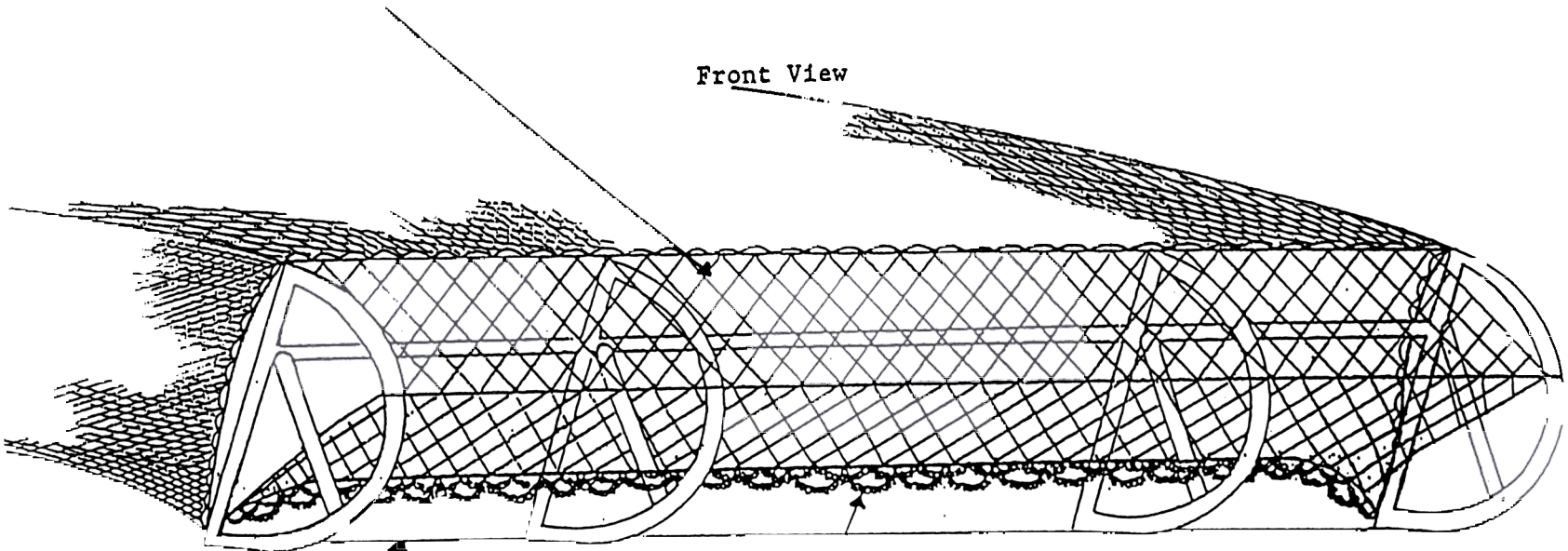



t of TED panel
is attached 5m beh
leading edge of bo
6 1/2m
50m
5m
6 1/2m
7"
20m Deep
2BlP
2BlP
6 1
Tap
side sewn
Nee
bod
ope
ing
5 1/2
ext
58m
1 3/4
Nylon
15m
2BlP


Andrews TED
6" Stretched Mesh
Front of TED panel
is attached 5m behind
leading edge of bottom body
11m
56m
5m
11m
wing sequence
:7 bars
:6 bars
6"
24m deep
2Blr
2Blp
11 Mesh wings
Tapered 2:1 on lower side
sewn to bottom
- 2" x 1/4 ring 5m each ring
0 meshes each ring
- 3 1/2" x 3 spongex floats
- floats each ring
3-1/2
Ext.
16m
58m
1 3/4
Nylon
15m
2Blp
58 Mesh flap
Tapered 2:1 on
each side
46m
46 Mesh x 15 mesh
Opening 1 - 3/4" #15
rawl webbing 1 3/4" nylon

DEFLECTOR BARRIER:
8-inch stretched mesh
poly webbing

Front View



1/4" galv. tickler chain
approx. 35 feet long
attached to the frame
24" ahead of bottom
rear edge of frame.

5/16" galv. chain
woven to the 8" webbing
across the bottom of the
frame to hold the extender
panel tight.

APPENDIX 1

TABLE 1. Type I and Type II error for rejection of a candidate TED at 4 turtle captures. n= 25

TYPE I ERROR = 22%

TYPE II ERROR

TRUE BUT UNKNOWN ESCAPE RATE	% CHANCE OF ACCEPTING TED
90%	76%
80%	23%
75%	10%
70%	3.32%
60%	0.24%
50%	0.01%

TABLE 2. Type I and Type II error for rejection of a candidate TED at 5 turtle captures. n= 25

TYPE I ERROR = 10.5%

TYPE II ERROR

TRUE BUT UNKNOWN ESCAPE RATE	% CHANCE OF ACCEPTING TED
90%	90%
80%	42%
75%	21%
70%	9%
60%	1%
50%	0.05%

TABLE 3. Type 1 and Type 2 error for rejection of a candidate TED at 6 turtle captures. n= 25

TYPE I ERROR = 4.5%

TYPE II ERROR

TRUE BUT UNKNOWN ESCAPE RATE	% CHANCE OF ACCEPTING TED
90%	97%
80%	62%
75%	38%
70%	19%
60%	3%
50%	0.2%