

SUMMARY OF 1995 TED TESTING PROCEDURES AND GEAR DESCRIPTION

**1995 TED Certification Test
R/V Caretta
Panama City, Florida
May 27 - June 6, 1995**

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National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
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INTRODUCTION

The Harvesting Systems Branch of the National Marine Fisheries Service conducted certification testing of candidate TED designs using the juvenile sea turtle protocol during the period of May 27 through June 6, 1995 in Panama City, Florida. Two year-class loggerhead turtles (*Caretta caretta*) were released into candidate TED equipped trawls in order to determine TED exclusion efficiency. Candidate TED designers were invited to participate in testing their respective TEDs.

As recommended by the 1994 TED Testing Review Committee, testing was also conducted on top and bottom opening Super Shooter TEDs. The committee will review the results of these tests and make recommendations as to a replacement of the NMFS TED as a control.

The juvenile turtle TED test was developed in 1989 due to the inability to adequately test candidate TED designs using the Cape Canaveral protocol. The juvenile turtle test protocol has been used to evaluate new TED designs in 1989, 1991, 1993 and 1994.

Results from the juvenile turtle TED tests are presented to the TED Testing Review Committee comprised of shrimping industry representatives and sea turtle conservationists. Based on their review, the committee formulates recommendations to the NMFS Southeast Regional Director on candidate TED certification, and modifications to the test procedure.

METHODS

Area of Operation

Testing was conducted in the Gulf of Mexico, 1/4 mile off Shell Island, Panama City, Florida. A 4 mile east/west towing lane was established in 5 to 7 meters of water.

Preliminary Inspection of Candidate TEDs

Preliminary diver inspection and underwater video recordings were made of each candidate TED before initiating the test for that TED. TED designers were given the opportunity to review the inspection video of their respective TED, consult with NMFS gear specialists, and make modifications to their device prior to testing. Continued inspection dives and modifications were allowed as time permitted.

Test Turtles

A total of 166, 2-yr. class loggerhead turtles were used in the tests/evaluations. The turtles had a mean straight line carapace length of 34.9 cm with a range of 27.4 cm - 37.7 cm. (Appendix 1, Table 1). Care and handling of the test turtles was conducted by NMFS Galveston personnel. A detailed description of their procedures may be found in "*Conditioning, Transporting and Maintaining of Sea Turtles for TED Certification Trials in Spring 1995*" prepared by NMFS Galveston.

During the testing period, turtles were maintained and handled on and off the vessel by NMFS Galveston personnel.

Each day during the test, approximately 16 turtles were removed from the pen and placed aboard the *R/V Caretta* for transport to the test area. While aboard the vessel, the turtles were held in individual plastic tubs filled with sea water. Sea water in the tubs was monitored for temperature and changed as necessary. The turtles were shaded from sun exposure using a canopy suspended from the vessel rigging. On several occasions, turtles were transported to the vessel via small boat at midday.

Turtle Behavior

The turtles used for this test exhibited a great deal of vigor during their underwater exposure period. The turtles exhibited an ability to adjust their buoyancy rapidly for the enforced submergence. This was indicated as many of the turtles dove to the bottom of the trawl after being released.

Post Test Release of Turtles

Turtles, which were not released during the course of the TED tests, were released at the conclusion of the test in the Gulf of Mexico approximately 6 miles west of the Panama City Ship Channel in 30 meters of water. The turtles were transported to the release site by the Panama City Marine Institute aboard the *R/V Guardian Angel*. A complete list of the released turtles is available in a summary report prepared by the NMFS Galveston field party chief.

Recaptured Turtles

Some turtles were recaptured for blood sampling after being used in a test. Recapture was facilitated by attaching a 6-inch x 8-inch football float to the posterior marginal scutes of the turtle before it was released from the trawl. The turtle was captured with a dip net at the surface by a support Zodiac and returned to the vessel. Recaptured turtles were allowed a minimum 48 hour recovery period before being reused for TED testing.

Test design

In order to establish control data, a complete test of 25 turtle exposures was conducted using the NMFS TED. The NMFS TED has a record of proven effectiveness and scored a 95%, 84%, 92% and 88% turtle exclusion rate during testing in 1988, 1989, 1991 and 1994 respectively. In 1993, NMFS TED test data (n=10) were pooled with historical data sets to arrive at a 90% turtle exclusion rate.

Each candidate TED was scheduled to be tested for small turtle exclusion a total of 25 times. Based on the performance of the NMFS TED, testing of a candidate TED could be terminated before 25 turtles were released if the candidate TED displayed a significantly lower escape rate. This method was employed to insure that a sufficient number of turtles would be available to complete the proposed test schedule.

Turtles were transferred from the surface to divers on the trawl via a 1/8-inch stainless steel wire which was spliced into the trawl bridle split and attached to the center of the trawl head rope. Turtles were placed inside a weighted 25-inch x 25-inch mesh bag at the surface, attached to the messenger wire with

a snap clip and sent underwater to divers on the trawl. Transit time for the turtle from the surface to the trawl was approximately 1 minute.

Three scuba divers were used to monitor each test. Diver #1 released the turtle into the trawl, then took position at the TED to recapture the turtle, diver #2 monitored the turtles passage through the net, recorded escape time and noted turtle activity level and, diver #3 recorded each test using an underwater video camera. After release into the trawl, each turtle was allowed 5-minutes to escape through a candidate TED. If at the end of 5 minutes the turtle was still within the trawl, it was removed by a diver and released. If a turtle was determined to be overly stressed during the five-minute exposure period , it was removed from the trawl, returned to the vessel immediately, and not counted in the sample.

Statistical Methods

An outline of the statistical procedure used in conducting the small turtle TED test is provided below:

1. A control (NMFS TED) was tested using a sample of 25 turtles.
2. Null Hypothesis (H_0) = exclusion rate of the candidate TED is equal to or greater than that of the control TED. Alternate hypothesis (H_a) = exclusion rate of the candidate TED is less than 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 (Appendix 1, Table 5). These errors are defined as:

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

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

NOTE: An inverse relationship exists between Type I error and Type II error probabilities with a fixed sample size .

4. Based on the performance of the NMFS TED (1995 test = 1 capture in 25 releases), and the associated Type I and Type II error probabilities, it was determined that testing of a candidate TED could be terminated after it had failed to release four turtles. This capture rate corresponded to an 8% risk of rejecting a candidate TED which was as good as or better than the NMFS TED.

GEAR DESCRIPTION

Project operations were conducted aboard the *R/V Caretta*, a 60-ft steel hull shrimp trawler operated by the NMFS Southeast fisheries Science Center, Mississippi Laboratories, Pascagoula Facility. Tests and evaluations were conducted towing a single TED equipped trawl at 2.5 knots directly astern of the vessel.

NMFS TED (control)

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

Trawl Type/Size: 50-ft flat net
Door Size: 8-ft x 40-in

Top and Bottom Opening Super Shooter TED (Figures 1-3)

A mid-sized aluminum frame Super Shooter TED was used in the testing of a new test control. The TED was tested in a top opening and bottom opening configuration. In a bottom opening mode, a single K-50 spongy float was attached to the top of the TED frame providing approximately 10 lbs. of positive floatation.

No floats were attached to the top opening TED. Both top and bottom opening forms were fitted with an accelerator funnel. For details on material specifications and installation of the TED frame and associated components refer to "Super Shooter TED Construction (mid-size) a NMFS Harvesting Systems Branch brochure.

Trawl Type/Size: 50-ft flat net
Door Size: 8-ft x 40-in

Moore Ramp (Figure 4)

The purpose of the ramp is to direct shrimp away from the TED exit hole in much the same way as an accelerator funnel. The ramp was sponsored by Mr. Richard Moore of Galveston, TX.

Initial testing of the Moore ramp was conducted with the modification installed in a weedless-type TED design. Due to an inability of turtles to escape from the TED due to a design flaw in the TED frame, the Moore ramp was reinstalled in a mid-sized Super Shooter (See Results and Discussion sections).

A certification test was conducted on a bottom opening Super Shooter TED with a ramp modification. The ramp was constructed of 1-1/2-inch stretched mesh, #24 nylon webbing. The leading edge of the ramp (30M) was sewn to 48M of the leading edge of the TED flap. The 25M sides of the ramp were sewn along bars of the TED extension. The trailing edge of the ramp was measured at 4 mesh step up from the flap seam.

When in a fishing configuration, the space between the trailing edge of the ramp and the TED deflector bars was measured as follows: 8-inch clearance at center, 5-inch clearance at the sides. The angle of the TED frame was measured a 45° under tow. The ramp was installed in a bottom opening mid-size super shooter with flap dimensions identical to that shown in Figure 2.

Trawl Type/Size: 50-ft flat net
Door Size: 8-ft x 40-in

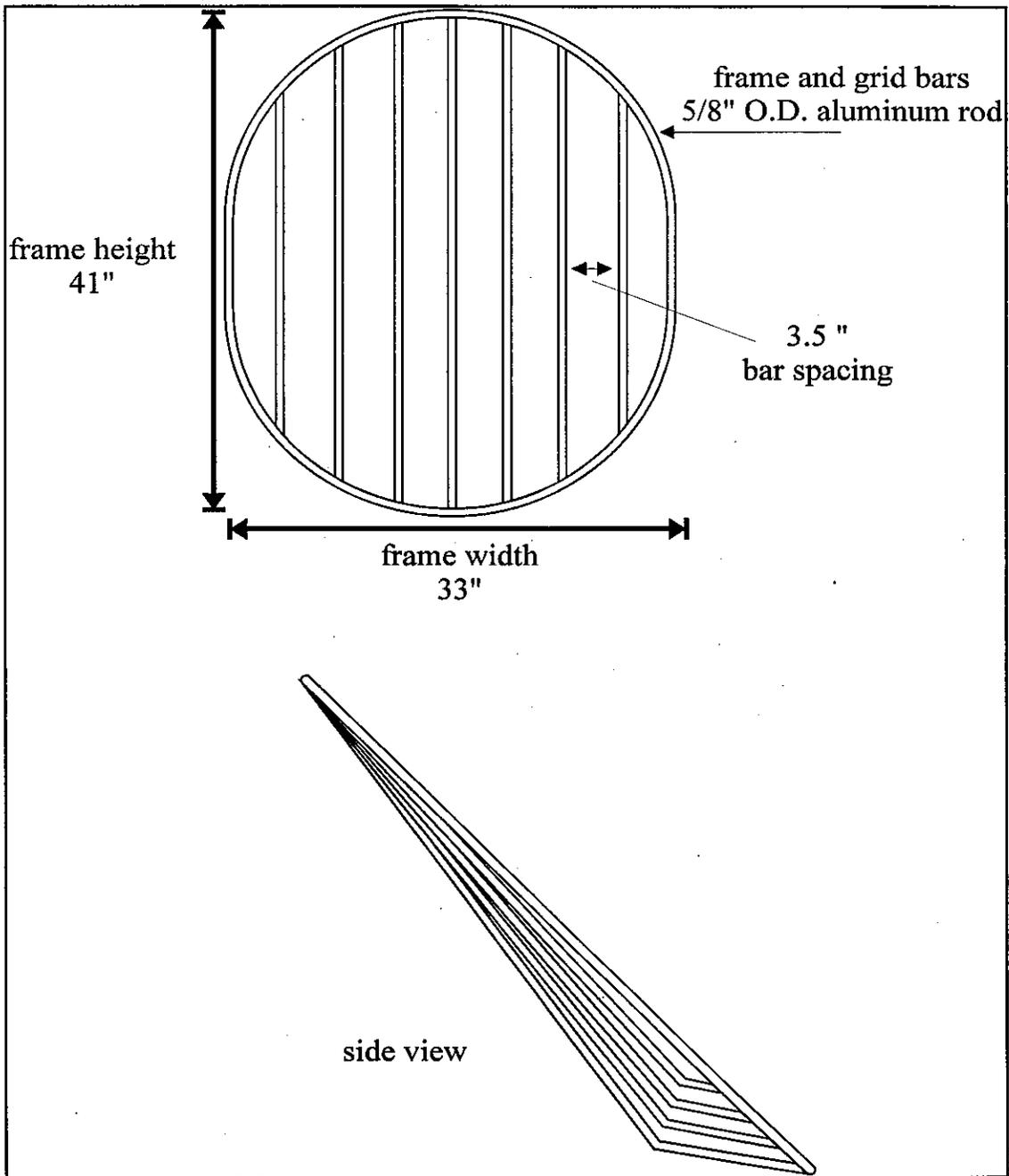


Figure 1 Dimensions of mid-size Super Shooter frame used in 1995 TED Tests

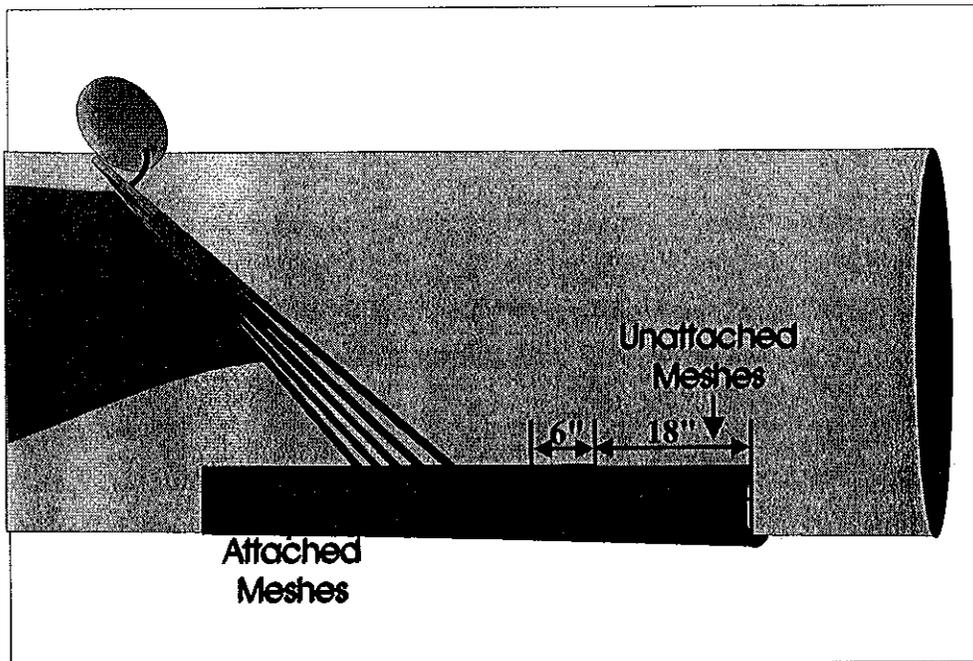


Figure 2 Detail of extended flap used on top and bottom opening mid-size Super Shooter in 1995 TED Tests.

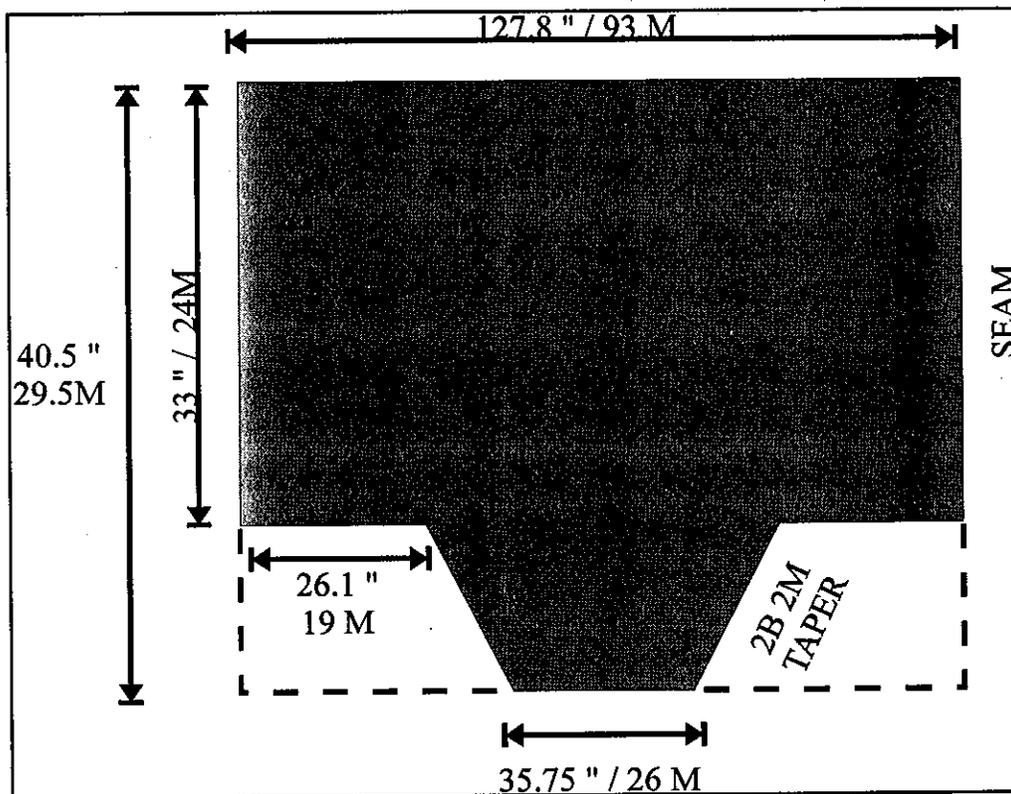


Figure 3 Accelerator funnel dimensions for mid size Super Shooter in 1995 TED Tests

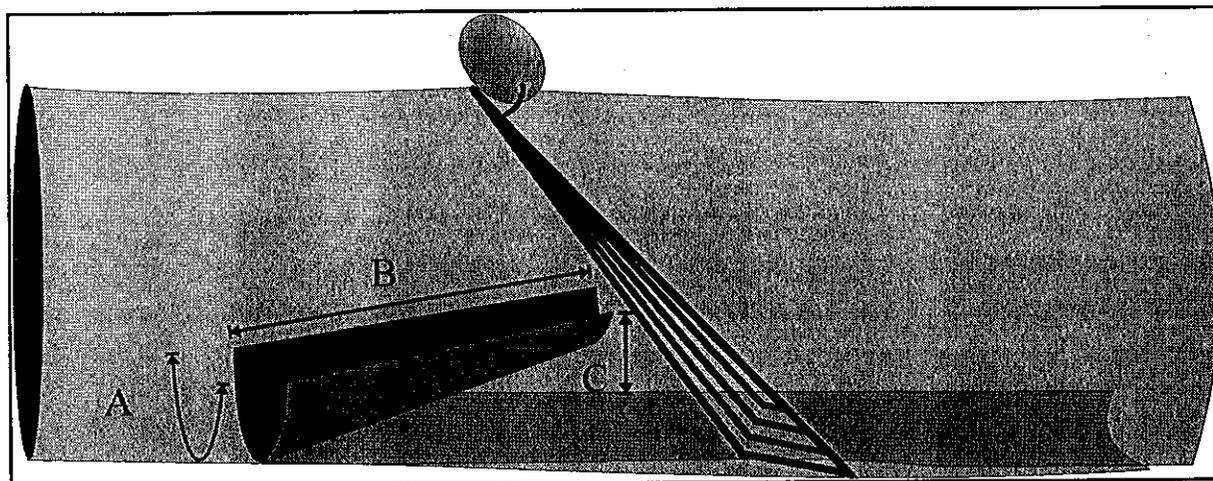


Figure 4 Moore Ramp installed in a mid-size Super Shooter TED. 1995 TED Test. A = Leading edge of ramp panel: 30M of ramp panel attached to 48M of flap. B = 25M edge of ramp panel attached to 20 bars of TED extension, 5 meshes left unattached. C = Trailing edge of ramp stepped up 4 meshes from flap seam.