FLYNET CABLE TED CATCH RETENTION TESTING 2015-2017

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Background

Flynet TED testing and development has been ongoing since 1998. Many prototype TEDs have been examined with mixed results (Gearhart 2010). The most current design, the Cable TED, is constructed entirely of cable, which allows it to easily be stored on net reels without damage. Net reels are a common feature throughout this fleet for storing and deploying trawls. This storage system has posed a significant design problem with regard to storage of rigid or semi-rigid TEDs, which tend to incur damaged during retrieval of large catches in heavy seas. The Cable TED has performed well during usability trials and has been certified for use through the small turtle testing protocol.

Methods

Due to the configuration of the gear and installation location of the Cable TED in the trawl, standard paired comparisons utilizing twin-trawls or a trouser trawl were not possible. To complete testing, an alternate-haul testing design that consisted of alternating tows with and without the TED installed in the same net was required to evaluate the gear for target catch loss and bycatch reduction. Power analyses of previous catch data indicated that 42 matched pairs were needed with this protocol to detect a 10% difference with 80% (β) confidence at an α of 0.10.

Testing was conducted from 2015 through 2017 with 28 matched pair tows completed. Throughout the testing period marketable size Atlantic croaker (*Micropogonias undulatus*) were difficult to locate. Once marketable fish were found they tended to be in large dense schools that resulted in catches that were too large to bring onboard at one time and required multiple 5,000 lb splits to retrieve the catch, which took hours to complete. This issue combined with amount of time required to remove or install the TED between tows caused a significant delay in the subsequent matched tow. The captain attempted to modify his fishing protocol to target the edge of the school to catch fewer fish in a single tow to make catches more manageable and minimize delays. This technique seemed to work, but gear installation delays still caused subsequent tows to be conducted hours later. These sampling issues unique to this fishery resulted in high between tow catch variability, which made many tows unusable.

Results

In an attempt to salvage reliable results from the testing, tows with extreme differences were removed from the dataset prior to analysis. For comparative purposes, all tows and three separate subsets of the data were analyzed (Table 1).

When all tows were compared, croaker catches in the control net averaged over 10,000 kg/hr more than the TED equipped trawl with a 77.47% mean reduction observed, which was not significant. After removal of nine highly variable tows the mean reduction of croaker was reduced to 54.03%, which was significant. The removal of two separate groups of three additional tows for subset 2 and 3 resulted in mean catch reductions of 19.05% and 23.27% respectively, which were not significant. Large 95% confidence intervals were associated with each catch comparison.

Table 1. Atlantic croaker (*Micropogonias undulates*) catch comparisons for all tows and three subsets of data collected during flynet TED testing conducted off the coast of North Carolina from 2015-2017 using an alternate haul experimental design.

Catch		Mean (kg/hr)		% Change			
Comparison	n	Control	TED	L 95%CI	Mean	U 95%CI	p-value
All tows	28	13,764.12	3,100.97	-208.38	- 77.47	53.44	0.1127
Subset 1	19	4,165.04	1,910.34	-115.49	- 54.13	7.22	0.0338
Subset 2	16	2,031.77	1,644.76	- 64.16	- 19.05	26.07	0.2077
Subset 3	16	2,447.89	1,878.20	- 72.42	- 23.27	25.87	0.1639

Discussion

The development of TEDs for the flynet fishery along the East Coast of the U.S. has been ongoing for over 20 years. Initial resistance by industry to TED development efforts hampered progress. Once development gained traction, TED evaluations were initially limited to usability testing. Usability testing is an important component of research and development to insure that devices developed can be easily used, function properly, and hold up to the rigors of daily use. This testing needs to be coupled with comparative testing to determine how effective devices are at excluding bycatch and retaining target catch. The operational characteristics of the flynet fishery and lifestyle of the target species do not lend to this type of testing and make things difficult at best.

Vessels in the fishery tow a single trawl, which reduces options for comparative testing to trouser trawl, two vessel paired testing, and alternate haul testing. Of these three, trouser trawl is most rigorous experimentally if the trawl is configured properly, followed by two vessel paired testing, which is difficult to coordinate. Alternate haul is the least desired method for gear researchers because of the potential for between tow variability that may bias results. This variability differs by fishery as it relates to the density and distribution of the target species.

Species that are more evenly distributed and residing on the sea floor such as shrimp and flounder species may have lower between tow variability than those species that have a patchy distribution and are found in constantly moving dense three-dimensional schools up in the water column. For alternate haul testing, each tow should have the same opportunity to encounter the same number of fish. This varies between tows and between pairs of tows. For the flynet fishery, catches of up to 20,000 lbs can occur in a 15 minute tow and with the method of fish storage used it may take up to 10 hours to put those fish onboard and be ready for the next tow. Often, the next tow can yield a very small catch or the next tow may be hours later as the captain searches for remnants of the school of fish he just broke up with the first tow.

Developing gear for the flynet fishery has been a long and difficult undertaking. When considering everything that has been examined, the cable TED is the best option and exactly what the industry asked for initially when we broached the subject of TEDs in flynets. Usability testing indicates it is a viable option for the fishery with regard to durability and ease of use. Concerning catch loss, catches of over 20,000 lbs have been landed with the cable TED installed during usability testing. During those tows, the net was almost completely full with fish packed in the trawl far ahead of the TED. Does catch loss occur during tows like this? Yes, it is likely, but hard to quantify. Can the gear be required without sufficient catch retention testing to estimate the economic impact of requiring the gear in the fishery? This is a question for fisheries managers. While effort in the fishery ebbs and flows in response to croaker population fluctuations, the flynet fishery has continued to catch sea turtles.

Literature Cited

Gearhart, J.L. 2010. Evaluation of a turtle excluder device (TED) designed for use in the U.S. mid-Atlantic Atlantic croaker fishery. NOAA Technical Memorandum NMFS-SEFSC-606, 30 p.