

Fishery Resource Grant Program Final Report 2008

Project title: Characterization of Bycatch and Regulatory Discards in Virginia's White Perch and Spring Striped Bass Gill Net Fisheries and Assessing Gill Net Alterations for Effect on Bycatch and Target Species

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Give a brief summary of the project.

The striped bass fishery is of great economic importance to Virginia's commercial finfishermen and anchored gill nets are the predominant gear used in both coastal and estuarine waters. Unfortunately, these nets have the highest rate of Atlantic Sturgeon bycatch (85%) compared to other Virginia gear types (NMFS) and the second largest bycatch recorded by NMFS Northeast Observer Network coastally. High Atlantic sturgeon interaction rates could result in seriously restrictive regulations being imposed on the fishery or even complete closure, once Atlantic sturgeon are listed under the Endangered Species Act as has been proposed. Recognizing this important threat to the fishery, Virginia commercial fishermen have proposed continued proactive collection of sturgeon bycatch and research into means of reducing these gear interactions. This work is also integral to collection of biological data necessary to laying the foundation for restoration and improved protection of the species. Our breadth of knowledge on gillnet bycatch has led us to the point where we are actually testing and engineering solutions based on gear alterations.

Previous FRG sturgeon bycatch research established a fisher reward program for reported sturgeon catches. This provided data that suggested that the striped bass fishery was not the only Virginia fishery with a potentially problematic Atlantic sturgeon bycatch. The white perch fishery also interacts with juvenile sturgeon and also has a potentially significant bycatch of sub-harvestable striped bass, an issue that has recently become important to ASMFC Striped Bass Technical Committee. Since no data has been collected to quantify or qualify these bycatches this was one of the intents of this project. Due to the start date of notification of grant acceptance and the mid to late winter timing of the fishery, data on this portion of the project has not yet been collected. Collections will occur in Jan-March 2009 though the project was funded under the 2008 years cycle. Striped bass research has been completed and will be the work covered as fully as possible in the rest of this report. Sturgeon results are much more expansive since they are a combination of multi-year efforts. They are covered in the 2008 proposal to NMFS, which summarizes 2008 FRG results, and the final report to NMFS in 2007, which covers previous knowledge attained through the 2005-2007 FRG and collaborative efforts (Attachment 1 and 2).

What work did you intend to do, and how did you plan to accomplish it?

We intended to conduct a survey in the James River in Burwell Bay in April – early June using control gear that duplicates efforts conducted by the FRG given to Mr. Place in 2005 and 2006 and myself in 2007 and run experimental gear that varied from this control gear in hanging ratio and twine sizes. Meshes sizes that typify the striped bass fishery (5", 6", 7", 8") were to be run to test gear alteration effects on striped bass and survey mesh sizes of 10", 12", and 14" were also to be included. A total of 40 trips were proposed each to be conducted with 600 feet of 5, 6, 7, 8, 10, 12 and 14" stretched webbing. We also intended to examine how sturgeon were captured in the gear and where. We were also to record initial status (live/dead) of both sturgeon and striped bass and whether bass were kept for sale.

What was accomplished?

To accomplish our desired objectives as described in the 2008 proposal, we:

- 1) Observed and recorded catch in 22 fisheries dependent sets fished for striped bass in the spring, ~120 experimental net sets and 90 survey based sets using the 10, 12 and 14" gear. In addition, we deployed a 600' net consisting of 3 equal 100 foot sections of barium webbing and mono webbing. These sections contained an equal mesh size of 6" and contained meshes of equal twine size and hanging ratios. Eight trial days were conducted as a pilot test for Sea Grant. Barium webbing has a greater density than mono, one that allows cetaceans to pick it up with their sonar abilities more quickly and thus may reduce their entanglement rates. Trial numbers and catch rates are too low at this point to warrant statistical test, however, the two different net types total catches only varied by 2 fish (N= ~25) which suggest that there is not difference between webbings performance.
- 2) Net composition was recorded and species identified, counted, and total length measured. For striped bass and sturgeon status was recorded (live/dead) and for striped bass disposition fate (kept or discarded) was recorded. Sturgeon location in the gear top, middle, or bottom was also recorded. Time of day, gear location, relevant gear parameters, and physical conditions (water temp., clarity, PH) were also recorded so that gear performance could be compared.
- 3) All 128 sturgeon captured were measured and weighed and PIT tags and USFWS T bar Floy © applied if not present. All dead fish were given to VIMS for morphological research.
- 4) Twenty sturgeon of appropriate size were turned over to VASRP in order to continue cooperative tracking studies investigating habitat use and location of the spawning grounds.

5) DNA was collected from 128 fish and will be delivered to geneticists in order to continue to refine stock structure.

6) Thus far, the only way we can quantify temporal populations is through the CPUE that we have collected since 2005. This suggests that the population is stable and may be growing but since DNA has not been examined due to cost it remains unclear how many of these fish are actually of James River origin. Tag returns have thus far been too few to make a mark-recapture population assessment methodology applicable, given the highly migratory nature of the fish. However, data collected through our efforts has started to produce great promise of assistance from other funding sources such as NMFS and Army Corp of Engineers. Funding is expected from the Army Corp of Engineers in the coming year or so to improve our knowledge of sturgeon response to dredging and ability to quantify our local population's extent.

7. In collaboration with Maryland Sea Grant and DNR, sperm from 4 ripe running males was collected and sent to Maryland to assist with captive breeding program. The funding source requesting blood samples fell through so this objective was not applicable.

Thirty-seven days of fishing were accomplished. The three non-fished days will be added to the white perch study. Samples were collected from 3/7/07- 5/29/08 in the Burwell Bay area. Samples comparing gear did not start until 4/8/08 and continued until the end of the study. An offset in gear research start time occurred because we did not hear about study's acceptance until early March and subsequently had to locate, order and hang appropriate gear. In order to allow 2008's survey data to be compared with previous years the area sampled and time sampled had to be identical. Fish were also needed for the early spring ecological tracking studies that investigate sturgeon habitat use during the primary spring striped bass season (Feb-March).

All data was entered into preexisting access program in format used for 05-07 dataset and this was subsequently turned over to Chris Hager at VaSG for further analysis and incorporation into information formats to be delivered to management councils and committees. Segments of a 2008 NMFS proposals, which briefly summarizes our 2008 achievements with regard to sturgeon, and a summary to NMFS 2005-2007 efforts are attached (Attachments 1 and 2). These demonstrate the broad array of our results and provide evidence as to how our cooperative efforts have fed other studies to provide the best available science on sturgeon that has ever been collected in the Chesapeake. This will be essential information that by law must be taken into account in future management decisions.

Of the 128 sturgeon collected, 20 suffered gear related mortality with a 15% mortality rate resulting. It is important to note that this rate is not a representative mortality for the fishery for three very important reasons. First, gear was fished during warm water periods when the majority of the fishery would not be fishing thus increasing sturgeon death rates which are directly correlated with rising water temperatures (look to NMFS final report for more). Interestingly, if you look at work accomplished during the March-April period when most commercial striped bass fishing takes place, bycatch mortality is 9%. This

finding is inline with the 8% rate determined by previous FRG fisheries dependent analysis based on observer work. Second, this mortality rate includes survey gear. Gear being fished so as to provide a uniform continuation of a survey that was started in an area of the James River where interaction rates are historically higher than the norm witnessed in the commercial fishery. This location was chosen in order to assure the survey had adequate catches for relative population analysis through a viable CPUE and to increase the chances of attaining sturgeon for tracking studies. These studies being conducted in collaboration with VCU, Va. Sea Grant, USFWS, James River Association and the Army Corp of Engineers (later referred to as the Virginia Sturgeon Restoration Partnership, VASRP) are being done to gain a better understanding of the temporal and spatial aspects of sturgeon habitat use. Habitat use data is extremely important to the fisheries because such data will provide the best available science upon which future regulations will be based if regulations involving time- area closures become necessary to reduce interaction rates. Third, in some cases gear not normally used in the striped bass fishery is being used (10-14") to provide mature fish for spawning ground identification work and these large fish which show up in the warmer water periods have a higher death rate due to the fact that they are predominately gilled in a manner that prevents respiration and leads to quick death. This large fish collection effort is essential to our fisheries' preservation because it not only defines where these large fish are most likely to be through tracking research but it also directly ties our industry to restoration efforts.

Sample coverage of this study did not typify that of the striped bass fishery, since our sampling efforts extend beyond the normal striped bass season and some gear are atypical. However, by limiting analyzed samples to those with typical gear types and within a comparable temperature range and by simultaneously sampling fishery dependent gear reasonable estimates of gear performance in the fishery can be attained. Extension of sampling across a broad temperatures range is actually better when examining the effect of temperature on striped bass mortality (Figure 1). Though this data has only provide scientific evidence of what fishermen have known, that striped bass die much more rapidly in warm waters, this analysis must now be taken into account as best available science by management. If regulations are to prohibit the retention of large fish then gear regulations they should be tailored to maximizing the retention of fish of acceptable sizes.

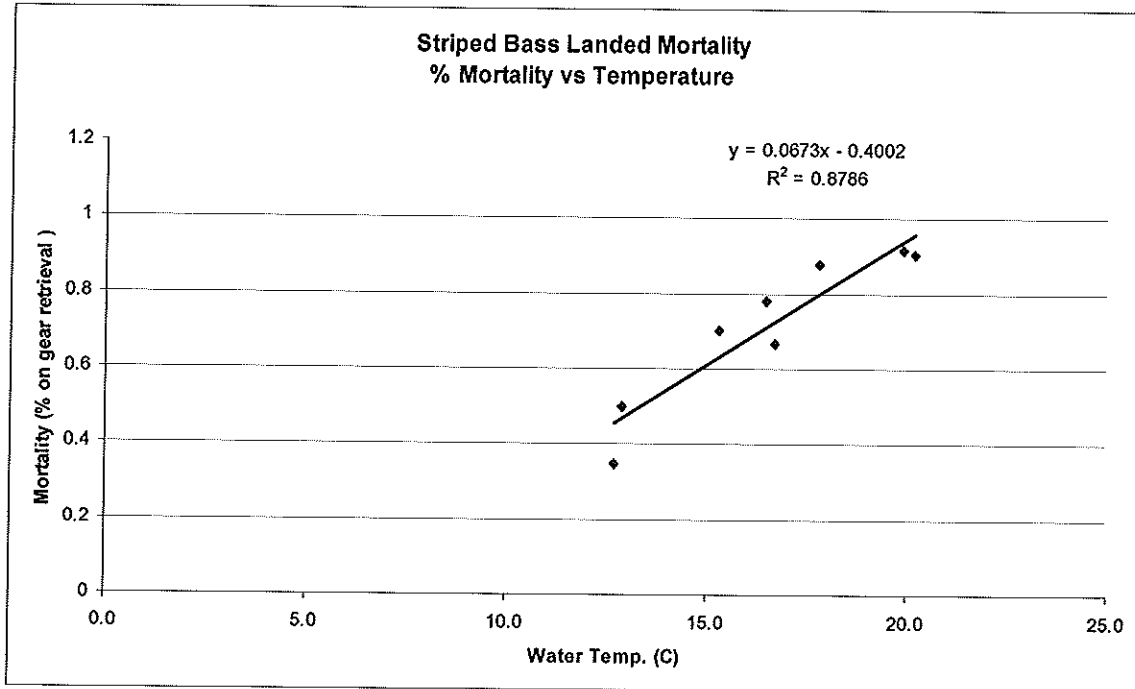


Figure 1. A clear relationship exists between striped bass survival in gill nets and water temperature as R^2 of .88 suggest. All nets sets were run for standard 24 hour sets and run from April 8th to May 8th 2008. .

Figure 2 demonstrates the selectivity of 5-8 inch nets based on 2005 through 2007 data> Nets were uniform in composition and length. Data suggest that after March 24 when bass of greater than 28 inches total length (711mm TL) cannot be kept a mesh size of 5 would be most appropriate. Six inch mesh can be used as is mandated currently but the mean size fish captured is 710mm. this finding implies that half of the fish captured would be larger than legally permissible given an equal distribution of fish across all size classes. If these fish suffer excessive mortality due to gear or warm water temperatures it could be suggested that this regulation is contributing to wanton waste of the resource.

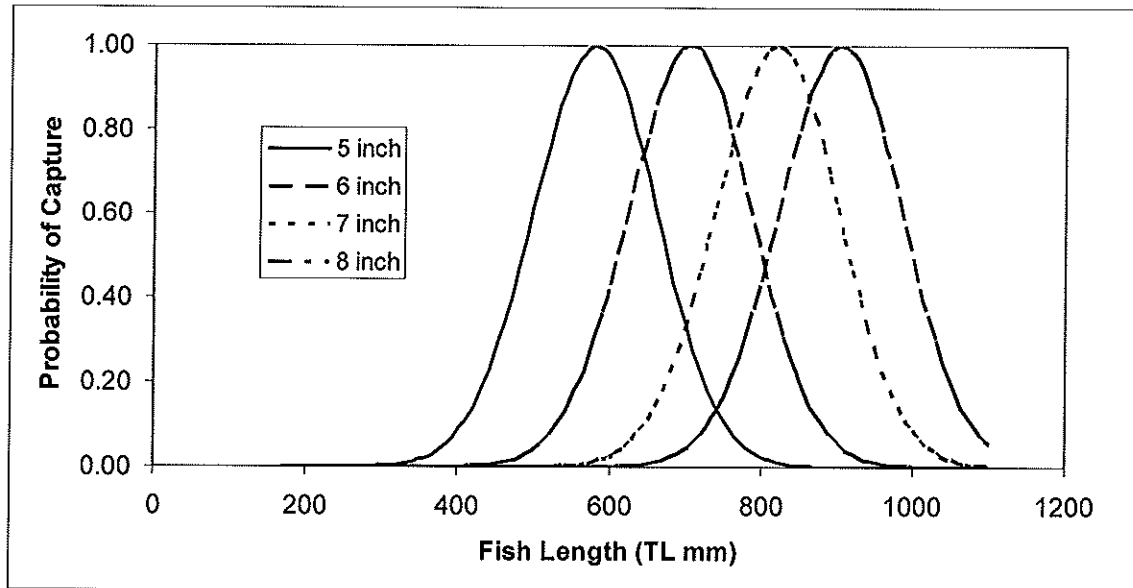


Figure 2: This figure defines selectivity for 5, 6, 7 and 8 inch stretched mesh based on data collected in 2005-2007 through the FRG programs sturgeon survey work.

In 2008 from April 8th to May 8th, 215 fish less than 711mm were taken in 6" gear and 43 fish of over 711mm were taken. No fish of over 711 were taken in 4.88 inch gear since 5 was not run due to lack of availability. The unequal distribution fish around a predicted mean of 710mm in 6" gear, is likely due to the lack of availability of larger fish. This supposition is supported by poor catches in both 7 (N=25) and 8" webbing (N=19), which should according to selectivity curves retain the same size range of fish in their lower size classes as 6" gear retains in its upper range.

Fish under 711mm (TL) experienced a 73% death rate and those over a 70% rate based on 6" webbing. This finding suggests that mortality rate on retrieval is not size dependent. All fish less than 711 were retained for sale except for two, which were rotten. These two were taken in the warmest water sampled, therefore, this waste would likely not occur in the fishery unless fishing in this warmer water. If 50% of the fish being retained in 6" webbing are greater than 711mm and 70% of these summer mortality than there could be a significant number of large fish being wasted in the fishery due to regulatory bycatch.

In 2008, we also attempted to collect enough data to examine differences in striped bass catch rates and survival due to gear alterations in hanging ratio and twine size. In order to do this all sections of each gear must be fished during periods of duplicate length and in the same area. Throwing out test that violated this parameter due to nets dragging or gear being cut, we collected 133 striped bass in 6", 39 in 7" and 26 in 8" gear. These lower than expected catch numbers prohibited acceptable confidence in statistical analysis of gear alterations. Low catch numbers were the result of not being able to order and complete the gear fast enough once notified of grant's acceptance to deploy it during cold water temperatures when bass are most plentiful. This late start also prohibited our ability

to determine striped bass mortality rates in these water temperatures that typify the fishery (figure 1), a factor that needs to be addressed to establish a typical gill net related mortality rate for the fishery under normal temperatures. In addition, more days when a net was cut or dragged occurred than we expected would occur. Each time this happens comparison for a mesh size across variables is prohibited, as are comparison between webbing sizes due to unequal soak times and as assumption of equal fish availability i.e. area fished. Standardizing each varied gear's potential to interact with fish through equal soak times and area fished/fish availability is essential so that assumptions implicit to statistical comparisons are not violated.

Despite low numbers preliminary analysis using Chi square, which does not require large sample sizes, were conducted. Findings based on catches in all three mesh sizes suggest that the variable hanging ratio did not make a significant difference in striped bass catch rates but that twine size may. Weaknesses exist, however, in the analysis due to sample size, availability of fish with a normal size distribution and gear attributes that must be made clear.

Twine size was correlated with increases in mesh size due to gear availability, a factor that given large enough sample sizes can be accounted for. As previously mentioned large fish were scarce and thus size distribution of available fish was skewed. The Chi square analysis can be used with low sample sizes, given some assumptions. However it interprets catch results based on an assumed equal distribution of fish across all sizes, therefore, it assumes reduced catches in larger meshes with larger twine sizes were due to twine size augmentation alone. Catches in 7 and 8" mesh suggest that large fish were not available and thus the assumption is flawed.

In short, experimental gear needs to be run more and earlier in the season when striped bass availability is high to get numbers that can lead to conclusive results. Running gear during this cold water period will also allow us to further examine the effects of temperature on striped bass mortality in anchored gill nets. Catches of sturgeon were too small and close in magnitude across variables in the experimental gear to warrant statistical examination. We did, however, attained 128 sturgeon, 20 of which were used to augment tracking studies that are researching spatial and temporal distribution patterns of sturgeon (see Attachment 1).

In order to improve catch numbers so that reliable analysis can be made, we are proposing to repeat the study in 2009 with an earlier start date. Since gear is already in possession this will not only be possible but the study will cost much less since gear is not to be purchased. Another year of data will allow for more robust analysis, a necessary element if this data should be used by VMRC to tailor better regulations.

Additional details on sturgeon research based on fish and/or data collected through the FRG will be covered to in Dr. Hager's attachments.

Signature: George E Trice Date: 1/16/09
George Trice