2017

Determine Methods to reduce Bycatch of juvenile Atlantic croaker (Micropogonias undulatus) in Haul Seines (Continued)

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Final Report of Fishery Resource Grant Project 2017

Project Title: Determine Methods to reduce Bycatch of juvenile Atlantic croaker (*Micropogonias undulatus*) in Haul Seines (Continued)

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Introduction

The juvenile Atlantic croaker (*Micropogonias undulatus)* population is being severely cut down in the summer months by haul seines in Chesapeake Bay. It is common for commercial haul seines to land thousands of pounds of fish. When these fish are processed a large percentage of the smallest fish are sold on the bait market for a low price of .04 cents per pound. The high amount of small baitfish harvested annually by haul seines is only hurting future harvest of larger, more valuable fish. The bait caught is mostly Croaker but also includes Spot (*Leiostomus xanthurus*), Spotted Seatrout (*Cynoscion nebulosus*), and Weakfish (*Cynoscion regalis*), all important recreational and commercial fish species in Chesapeake Bay.

A previous study to reduce landing of small fish in haul seines used larger mesh within the seine (FRG 2016-05). This gear modification resulted in modest reductions of baitfish in some trials, but overall demonstrated no significant differences to a traditional haul seine (may be due to lack of small size). The main objective of this project is to demonstrate a way that will reduce the catch of small baitfish in the commercial haul seine fishery through the use of a culling table placed on-board the fishing vessel and which separates the small baitfish from the rest of the catch and returns them back into the water alive.

Methods

A wooden culling table measuring 4'x4' using 18 one-inch diameter galvanized pipe (Figure 1), was used to separate fish by size during the brailing stage (transferring fish from seine pocket to boat deck using a 200 lb. capacity brailing net (Figure 2). The purpose of this culling table was to reduce the amount of small "baitfish harvested. The initial Intention of the study was to start with the table in a position that released the small fish that fell through the pipes (grate) of the table into a chute that would move fish over-board (Figure 3,4). However, in order to obtain information on the size of fish being culled, and what necessary adjustments to the table may be needed to maximize its effectiveness, the chute was not used and all fish brailed onboard were kept. The boat deck, were fish are landed on-board, was partitioned in half using 2x12 lumber with fish culled out from table (small fish) channeled to one side and the fish not culled (larger fish) channeled to the other side. In this study, fish that did not fall through the grating (pipes) are termed "Un-Culled fish". Fish that fell through the grating are

termed “Culled fish”. All fish during the trials (where a large number of fish landed) were off-loaded at a commercial dock for grading and weighing within respective categories (Culled/Un-called). Bait-size fish were weighed separate from larger, more marketable fish.

During the study, changes were made to the culling table to increase its effectiveness. Changes that were made to the culling table included changing pipe spacing, slope (gradient) of the pipes which make up the grate, height of the culling table walls (fish piling up on table were spilling over the table), and bracing of the pipes to minimize pipe bending when a load of fish were placed on table. Initially, the grate part of the cull table consisted of pipe spacing of 1.5” (pipe-to-pipe) with a slope of 2.5/12 (0.21). The initial slope of the chute that moved fish overboard was 2/12 (0.17).

The study was conducted in the lower portion of Chesapeake Bay in waters surrounding Poquoson, Virginia (Figure 5). These bodies of water include Back River, Poquoson Flats, and Poquoson River.

Figure 1. Cull table used showing initial spacing of metal pipes (grating) designed to allow small fish to pass through.

Figure 2. Fish brailed from seine pocket onto culling table on boat deck.

Figure 3. Fish culling table actively separating fish by size. The spacing and slope of pipes were adjusted to improve culling.

Figure 4. Fish culling table separating small fish from catch and channeled back into the water alive.

Figure 5. Study area around Poquoson, VA

Results

A total of 14 fishing trips were made in this study, several of which did not provide information due to lack of sufficient catch. Multiple changes to the culling devise were made over the trips including the spacing of the pipe, slope of the layers of the cull table, and how the table was braced and built. Details of individual fishing trials are in Appendix A.

During the first fishing trial (Day 1) it was obvious that the pipe spacing was too far apart with fish considerably larger than baitfish size culled in large numbers (Figure 6). Of the total catch, the majority of fish landed (84.9%) were culled through the table, with over half of the Culled fish larger than the bait-size fish targeted by culling table. As a result, the spacing of the pipes from each other was reduced from 1.5" to 1.25" and tested in fishing trial Day 2.

In fishing trial Day 2, reducing the pipe spacing reduced the amount of larger fish culled out. During fishing, the decreasing of pipe spacing to 1.25" appeared to retain more of the smaller targeted fish while continuing to cull out the smallest baitfish. However, upon grading catch at the dock, a larger portion of Culled fish (60.32%) were fish larger than bait (Figure 7). The amount of UN-culled baitfish remained similar to that in trial Day 1. The walls for the culling table were found to be too short (10'), resulting in fish of all sizes spilling off the top of the table when fish were loaded onto the table. These fish spilled over onto the boat deck resulting in culled and un-culled fish mixing. This mixing resulted in inaccurate grading of culled and UN-culled groups. This situation resulted in the walls of the culling table raised in height to 16" to minimize fish spillage from the table during culling.

Results of fishing trial Day 3 showed that pipe spacing at 1.25" continued to cull out target bait-size croakers as well as the next size up fish, but not as many larger fish (34.4%) from previous trials (Figure 8). It was observed that resident time of fish on the grated table (pipes) was not long enough to allow for maximum culling of small fish before moving off table into Un-culled pile. The fish appeared to be moving too fast over the table, suggesting that the grate (pipes) had too much of a slope (2.5/12), not allowing fish time to fall through the pipes. The slope of the grate was reduced to 1/8 (0.13) for the next trial.

During fishing trial Day 4, the net spun out and no fish were caught. In the next fishing trial, Day 5, the slope of the grate was reduced to 1/8 (0.13) for this trial. Very few fish were caught (~20 lbs.) and were not brought to dock for grading and weighing. The small amount of caught fish were placed onto the culling table to see how the change in slope effected there movement down the table. The fish did not slide down the pipe grate at all. The grate slope was not steep enough to allow this small amount of fish to slide down over the grate. Even if a full load of fish were brailed onto culling table, it was thought that the reduced slope would still not allow fish to move over the grates good enough to result in effective culling. The slope of the grate was increased 2/12 (0.17) for the next trial.

In fishing trial Day 6, only 63 pounds of fish were pocketed and the fish were not sold to the fish house (no grading done), but it was noticed that multiple fish larger than bait (small and medium croaker) easily fell through the pipes. To note, as in trial Day 5, the amount of fish placed on cull table at one time has an effect on how many and for how long fish are in contact with the grate, which will affect culling. When large amounts of fish are piled on table, some

fish do not interact with grate during the period of time fish move down the sloped grate, while many of those that do only interacting with grate perpendicular to pipes instead of parallel to pipes. The slope of the pipes (grate) at 2/12 seemed to allow fish to move down grate and be subjected to culling, but the pipe spacing at 1.25" was still allowing larger fish to fall through. The spacing of the pipes was reduced to 1" for the next trial.

Trial Day 7 was the first time the majority of fish landed were culled fish (51.40%), with less baitfish present in the Un-culled fish (Figure 9) compared to the last trial in which a good number of fish were landed (Figure 7). Reducing the pipe spacing to 1" seemed more effective in culling out the smaller fish while retaining larger fish. However, there remains a significant amount of baitfish (30.85%) within the Un-culled fish. The pipe spacing was further reduced to 0.875" for the next trial.

The largest amount of fish landed for this project was in trial Day 8 with 8,107 lbs. of fish weighed and graded (Figure 10). With the grate slope held at 2/12 and the pipe spacing reduced to 0.875", there was a significant reduction of fish culled as bait over trial Day 7. In Un-culled fish, the fewest amount of baitfish was observed over all trials, suggesting successful culling of baitfish, however, a large proportion of these larger fish were small (2,729 lbs.) croakers border lining baitfish size. In Culled larger fish, a large proportion of these were small, but not bait size croakers (40.8%), suggesting that finer culling can possibly be obtained. The pipe spacing was further reduced to 0.815" for testing in the next trial.

In trial Day 9 about a third of the catch was Culled to baitfish (Figure 11), more than that observed in previous trial with wider pipe spacing. Reducing the pipe spacing from 0.875 to 0.8125 seemed to reduce the amount of larger fish in Culled fish, but increased the amount of baitfish in Un-culled fish. A slight flexing of the pipes towards the center of the grate was observed when a load of fish were brailed onto the table. This flexing likely results in larger and inconsistent spacing between pipes during culling. For further trials, a metal bar was placed under the pipes in the middle of the grate table to support the pipes and reduce flexing.

The remaining fishing trials (Day 10-14) resulted in either no fish caught due to seine net failure (spun-out) or all large fish caught. A summary of these trials are in Appendix A. The table was set with pipe spacing at 0.8125' with grate slope of 2/12. Fish caught during these trials were large Speckled Trout and Red Drum, all of which were too big to go through the grate.

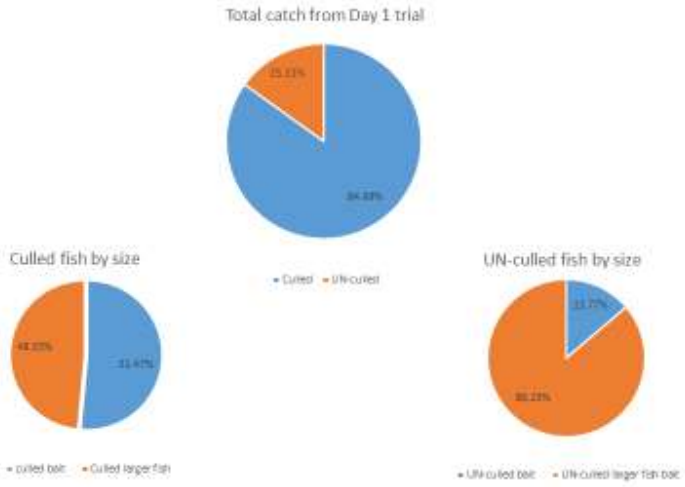

Figure 6. Day 1 fishing trial results (N=2403). Cull table pipe spacing of 1.5".

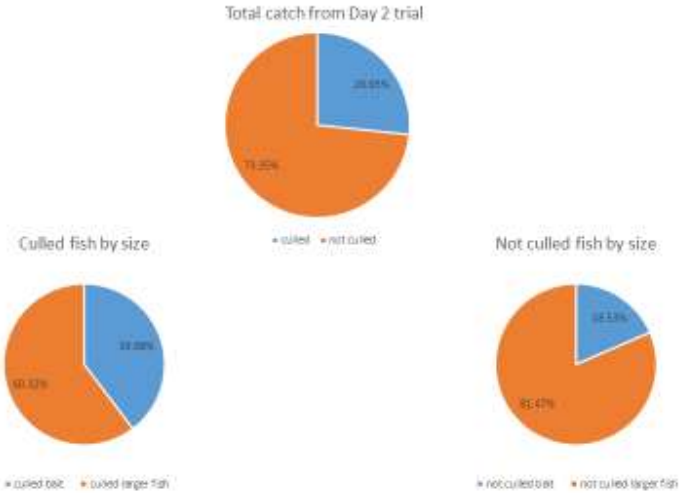

Figure 7. Day 2 fishing trial results. Culling table pipe spacing was decreased from 1.5" to 1.25".

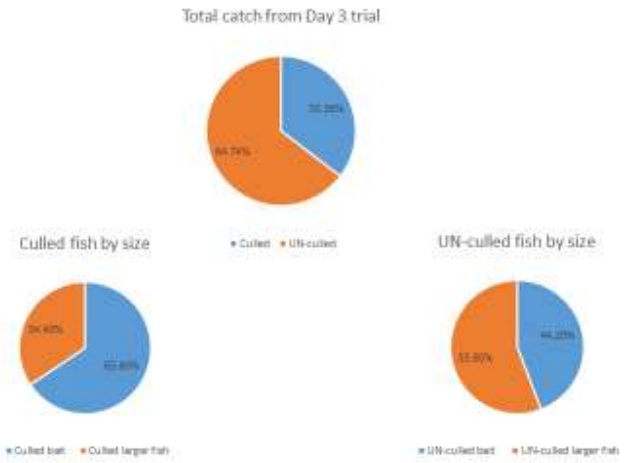

Figure 8. Day 3 fishing trial results (4538 lbs. landed). Fewer larger fish culled by table than in previous trials.

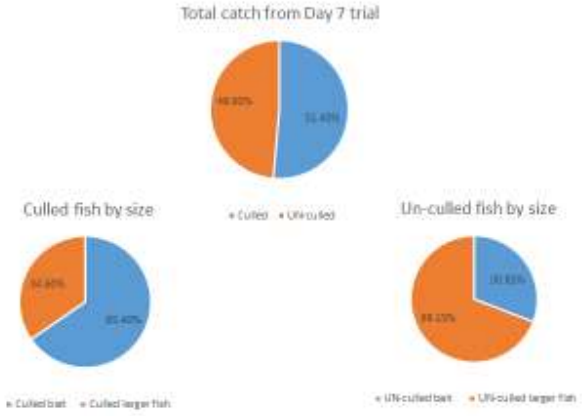

Figure 9. Day 7 fishing trial (1934 lbs. landed).

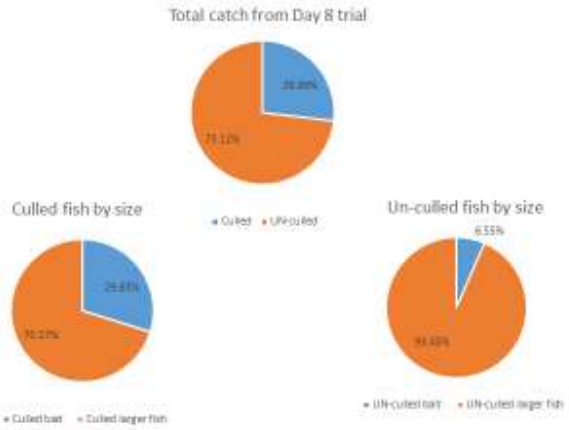

Figure 10. Day 8 fishing trial (8107 lbs. landed).

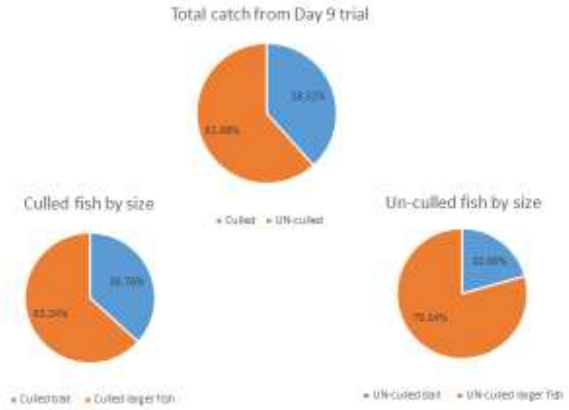

Figure 11. Day 9 fishing trial (1177 lbs. landed).

Project Result Summary

The hope of this study was to "cull-out" as much small bait-size fish as possible caught by haul seine while still keeping the more valued "good fish", or fish that are big enough to not be classified as bait. During the project, we were not able to catch Croaker into September as usual which affected the study by limiting the amount of fish we were able to use for testing. The main focus was to work out the structural details of the culling process. We were unable to include design work on the chute that would move culled fish over-board. In addition, the culling table was found to be quite heavy and hard to move around the deck, and took up valuable deck on the boat when packing-out fish upon arriving at the fish house. The size of the table would be hard to make any smaller given the size of brailing net and amount of fish brought on-board with each brailing. However, the table frame could be made from aluminum, which would greatly reduce its weight, making it more maneuverable on the boat.

We found that a cull table could be used to reduce the amount of baitfish landed in the haul seine fishery. The culling table could not be perfected to the point that all of the bait would be released, but we were able to demonstrate that a good amount of small baitfish can be conserved with alternative fishing practices. From fishing trials in this study, we found that pipe spacing of 0.8125" at a slope of 2/12 provided good results in culling small fish as croaker. In culling fish using sloping parallel bars, spacing of bars is highly dependent on the amount of fish placed onto the table (grate). If too many fish are "dumped" onto the table at one time, less actual culling will occur as a result of too many fish not interacting with the parallel bars in the length (head-to-tail) orientation (fish oriented parallel to bars instead of perpendicular to bars) before they slide down and off the table. Devising a mechanism and/or protocol that would feed fish onto the table in a more controlled, even-flowing rate, would increase fish-bar interaction and result in more efficient culling.

More work needs to be done on culling devices to limit the amount of small croaker harvested in haul seines. Once a culling device can be perfected and used to release bait-size fish, it can then be added with the larger meshed net used in 2016 study (FRG 2016-05) that was also found to reduce the amount of bait caught in haul seine fishing.

Acknolwedgment

This work was performed with help from commercial fishers George Trice IV and V. Project field management and report preparation was performed by George Trice V and Bob Fisher (VIMS Marine Advisory Services).

Appendix A

Day 1

Date: 7/22/2017

Water Fished: Poquoson Flats

Pipe Spacing: 1.5”

Slope of Grate: 2.5/12

Slope of Chute: 2/12

Modifications from Previous Day: N/A

Problems Presented with Cull Table: The pipes were spaced out too far apart and most everything fell through the pipes.

How these Problems Will be Fixed: The spacing of the pipes will be reduced.

Fish that Did Not Fall Through Pipe: Speckled Trout: 7lb Red Drum: 54lb Roundhead:2lb Spot:15lb Small Croaker:235lb Bait:50lb

Fish that Did Fall Through Pipe: Small Croaker:865lb Bait:1050lb Spot:107lb Roundhead:18lb

Day 2

Date: 7/31/17

Water Fished: Poquoson Flats

Pipe Spacing: 1.25”

Slope of Grate: 2.5/12

Slope of Chute: 2/12

Modifications from Previous Day: Spacing on the pies was reduced from 1.5” to 1.25”.

Problems Presented with Cull Table: The walls for the culling table were not high enough causing the fish to roll off the top of the table and mix.

How these Problems Will be Fixed: New walls will be put on the culling table higher than the current walls.

Fish that Did Not Fall Through Pipe: Medium Croaker:323lb Small Croaker:1550lb Bait:450lb Spot:105lb

Fish that Did Fall Through Pipe: Medium Croaker:75lb Small Croaker:420lb Bait:350lb Spot:35lb Roundhead:2lb

Day 3

Date: 8/2/2017

Water Fished: Poquoson Flats

Pipe Spacing: 1.25”

Slope of Grate: 2.5/12

Slope of Chute: 2/12

Modifications from Previous Day: The walls on the table were changed from 10’ tall to 16” tall.

Problems Presented with Cull Table: The grate is on too much of a slope not allowing fish time to fall through the pipe.

How these Problems Will be Fixed: The slope of the grate will be reduced.

Fish that Did Not Fall Through Pipe: Bait:1300lb Small Croaker:1095lb Medium Croaker:216lb Spot:321lb Roundhead:6lb

Fish that Did Fall Through Pipe: Bait:1050lb Small Croaker:317lb Medium Croaker:53lb Spot:179 lb Roundhead:1lb

Day 4

Date: 8/9/2017

Water Fished: Poquoson Flats.

Pipe Spacing: Nets Spun up resulting in no fish being caught.

Slope of Grate: Nets Spun up resulting in no fish being caught.

Slope of Chute: Nets Spun up resulting in no fish being caught.

Modifications from Previous Day: Nets Spun up resulting in no fish being caught.

Problems Presented with Cull Table: Nets Spun up resulting in no fish being caught.

How these Problems Will be Fixed: Nets Spun up resulting in no fish being caught.

Fish that Did Not Fall Through Pipe: Nets Spun up resulting in no fish being caught.

Fish that Did Fall Through Pipe: Nets Spun up resulting in no fish being caught.

Day 5

Date: 8/14/2017

Water Fished: Poquoson Flats

Pipe Spacing: 1.25”

Slope of Grate: 1/8

Slope of Chute: 2/12

Modifications from Previous Day: The slope of the grate was lowered from 2.5/12 to 1/8

Problems Presented with Cull Table: The slope of the grate had been lowered too much.

How these Problems Will be Fixed: the slope of the grate will be raised.

Fish that Did Not Fall Through Pipe: Very few fish were caught and were not weighed. When the fish were put onto the culling table they did not slide down the pipe grate at all.

Fish that Did Fall Through Pipe: Very few fish were caught and were not weighed. When the fish were put onto the culling table they did not slide down the pipe grate at all.

Day 6

Date: 8/16/17

Water Fished: Back River

Pipe Spacing: 1.25”

Slope of Grate: 2/12

Slope of Chute: 2/12

Modifications from Previous Day: The slope of the pipe was raised from 1/8 to 2/12

Problems Presented with Cull Table: The Spacing of the pipe was still too big.

How these Problems Will be Fixed: The spacing of the pipes will be reduced.

Fish that Did Not Fall Through Pipe: Only 63 pounds of fish were pocketed and the fish were not sold to a fish house where they were graded but we noticed multiple small and medium croaker that fell through the pipes.

Fish that Did Fall Through Pipe: Only 63 pounds of fish were pocketed and the fish were not sold to a fish house where they were graded but we noticed multiple small and medium croaker that fell through the pipes.

Day 7

Date:8/21/2017

Water Fished: Poquoson Flats

Pipe Spacing: 1”

Slope of Grate:2/12

Slope of Chute:2/12

Modifications from Previous Day: Pipe spacing was changed from 1.25” to 1”

Problems Presented with Cull Table: Pipes are still spaced too far apart.

How these Problems Will be Fixed: The spacing on the pipes will be reduced.

Fish that Did Not Fall Through Pipe: Bait:290lb Small Croaker:450lb Medium Croaker:175lb Spot:25lb

Fish that Did Fall Through Pipe: Bait:650lb Small Croaker:250lb Medium Croaker:74lb Spot:20lb

Day 8

Date: 8/22/2017

Water Fished: Poquoson Flats

Pipe Spacing: 0.875”

Slope of Grate: 2/12

Slope of Chute: 2/12

Modifications from Previous Day: The spacing on the pipes was reduced.

Problems Presented with Cull Table: Pipes are still slightly spaced too far apart.

How these Problems Will be Fixed: Spacing on the pipes will red reduced

Fish that Did Not Fall Through Pipe: Bait:375lb Small Croaker:2729lb Medium Croaker:2170lb Large Croaker:319lb Spot:135lb

Fish that Did Fall Through Pipe: Bait:650lb Small Croaker:890lb Medium Croaker:530lb Spot:109lb

Day 9

Date: 8/23/2017

Water Fished: Poquoson Flats

Pipe Spacing: .8125”

Slope of Grate: 2/12

Slope of Chute: 2/12

Modifications from Previous Day: The pipes were brought closer.

Problems Presented with Cull Table: The pipes were flexing and changing the spacing on the pipes.

How these Problems Will be Fixed: A brace will be put under the pipes in the middle of the culling table to reduce the flexing.

Fish that Did Not Fall Through Pipe: Bait:150lb Small Croaker:165lb Medium Croaker:149lb Large Croaker:30lb Spot:232lb

Fish that Did Fall Through Pipe: Bait:200lb Small Croaker:135lb Medium Croaker:43lb Spot:73lb

Day 10

Date: 8/25/2017

Water Fished: Back River

Pipe Spacing: Nets Spun up resulting in no fish being caught.

Slope of Grate: Nets Spun up resulting in no fish being caught.

Slope of Chute: Nets Spun up resulting in no fish being caught.

Modifications from Previous Day: Nets Spun up resulting in no fish being caught.

Problems Presented with Cull Table: Nets Spun up resulting in no fish being caught.

How these Problems Will be Fixed: Nets Spun up resulting in no fish being caught.

Fish that Did Not Fall Through Pipe: Nets Spun up resulting in no fish being caught.

Fish that Did Fall Through Pipe: Nets Spun up resulting in no fish being caught.

Day 11

Date: 8/29/2017

Water Fished: Back River

Pipe Spacing:.8125”

Slope of Grate:2/12

Slope of Chute:2/12

Modifications from Previous Day: A brace was added to the pipes to keep them from flexing.

Problems Presented with Cull Table: No issues were found with the table.

How these Problems Will be Fixed: No issues were found with the table

Fish that Did Not Fall Through Pipe: Not enough fish were caught to be taken to a fish house and graded but little to no fish fell through the pipe that would have been graded larger than bait.

Fish that Did Fall Through Pipe: Not enough fish were caught to be taken to a fish house and graded but little to no fish fell through the pipe that would have been graded larger than bait.

Day 12

Date: 10/10/2017

Water Fished: Poquoson River

Pipe Spacing: .8125”

Slope of Grate: 2/12

Slope of Chute: 2/12

Modifications from Previous Day: No modifications to the cull table were made from the previous day.

Problems Presented with Cull Table: The only problem that was found is that all the fish that were caught were too big to go through the grate. Because of that there was no comparison to be made.

How these Problems Will be Fixed: More Hauling would be done to get more comparisons.

Fish that Did Not Fall Through Pipe: Speckled Trout: 812lb Red Drum:54lb

Fish that Did Fall Through Pipe:

Day 13

Date: 10/12/2017

Water Fished: Poquoson River

Pipe Spacing: .8125”

Slope of Grate: 2/12

Slope of Chute: 2/12

Modifications from Previous Day: No modifications to the cull table were made from the previous day.

Problems Presented with Cull Table: The only problem that was found is that all the fish that were caught were too big to go through the grate. Because of that there was no comparison to be made.

How these Problems Will be Fixed: More hauling will be done to get more comparisons.

Fish that Did Not Fall Through Pipe: Speckled Trout:32lb

Fish that Did Fall Through Pipe:

Day 14

Date: 10/14/2017

Water Fished: Poquoson River

Pipe Spacing: .8125”

Slope of Grate:2/12

Slope of Chute:2/12

Modifications from Previous Day: No modifications to the cull table were made from the previous day.

Problems Presented with Cull Table: The only problem that was found is that all the fish that were caught were too big to go through the grate. Because of that there was no comparison to be made.

How these Problems Will be Fixed:

Fish that Did Not Fall Through Pipe: Speckled Trout: 758lb

Fish that Did Fall Through Pipe: