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Develop and Test Fish Pot Cull Rings

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Introduction

Fish potting is a growing fishery in Virginia's rivers and catfish is the primary targeted species. Demand for catfish is strong, and prices are good, but there is a lot of sorting and fish handling because the demand is for 2-8 pound fish. Traditionally, cull rings are used successfully in various traps/pots to let smaller fish/crabs escape and to reduce the labor and expense to manually sort and discard smaller animals. The use of cull rings in catfish pots, or hoop-nets, has not been studied in the Virginia catfish fishery. If cull rings could be successfully designed and placed within catfish pots to reduce the amount of small, less <1-2 lb fish, fishers could reduce fish handling (effort), reduce the potential for injury to both fish and fishermen (puncture wounds from fish barbs), and reduce young fish mortality while being able to catch more salable (larger) fish per pot. Initial testing of various cull ring diameters is needed to determine blue catfish size selectivity for a given cull ring diameter.

Methods

A reinforced hoop-net design with double mesh-net funnels was used to test multiple cull ring diameters for blue catfish size selectivity. The study required testing a control pot (no cull ring) against a treatment pot with cull rings, comparing catch data of pots with and without the cull rings. Cylindrical catfish pots (hoop-net type) were purchased from a supplier in Alabama for this study (Figure 1). The pots were 2 feet in diameter and 5 feet long with re-bar frames covered with 2-inch mesh net with additional rebar framing supports added lengthwise to provide additional structural support to the pots (Figure 2). A winch was used to handle large catches due to the overall weight of fish and trap (men working the heavy pots full of fish did not have to lift them). The pots could be lifted by a winch without the weight of the fish damaging the pot . The pots had two net funnels, one serving as entry funnel and another within the body of pot to move fish to opposite side of net which is closed by a mesh purse end (cod-end) from which bait is added and fish are removed from pot. Four cull ring diameters were tested over the course of the study, with adjustable stainless steel hose clamps sewn into the pot outer webbing serving as cull rings which could be adjusted to various testing diameters (Figure 3). The size of the pots, and the potential for large number of fish caught per pot, warranted the placement of two cull rings per pot, both within side netting in the baited section (pocket section) of pot. Over the course of the study, cull ring diameters of 2.25", 2.5", 2.75", and 3"were tested against controls (no cull rings) to evaluate blue catfish size selectivity. The study consisted of two testing periods; the first period tested fish size selectivity for 2' and 2.75" cull rings against controls, and the second period testing 2.5" and 3" cull rings.

Study design

Due to variability in catfish size and density within river habitats and across the duration of the proposed study (spatial and temporal differences), two different cull ring sizes were tested

against control pots per fishing site along river tributaries of the Rappahannock River (Figure 4). For testing fish size selectivity using two different cull ring sizes, 12 identically designed and constructed circular fish pots/traps were constructed, with one “control” pot/trap fished with 2 “treatment” pot/traps per site, with each “treatment” pot per site representing a different cull ring diameter. All three pots at each site were set in a random order of deployment under normal catfish fishing practices (using the same rigging, amount/type of bait, and deployment orientation). Each site was considered to represent a habitat type large enough to accommodate all three pots. Collaboration with current commercial catfish fishermen working on the Rappahannock River was obtained to provide information on catfish habitat use in which to target fishing activity for this project. Gear was fished Monday, Wednesday, and Friday (2-3 day soak periods). All blue catfish from each pot were measured to 1” bin sizes (fork length) and recorded onto trip data sheet along with water temperature and depth from each fishing site. When fish densities dropped off to negligible numbers at any given site, fishing was progressively moved to alternate sites along the river. After 5 weeks of sampling (~ 60-sample replication), the study progressed to evaluate fish size selectivity using 2.5 and 3” cull ring diameters, Fish harvested within the study were largely released live after measuring.

Initially, three groups of fish pots, a control with no escape rings; a test pot with two, 2.25-inch cull rings; and a second test pot with two, 2.75-inch cull rings was tested. Pots were set in groups of three per fishing location, with a total of 12 pots used during the testing period. After a successful five weeks, the cull rings were adjusted to 2.5-inch and 3-inch diameters and other creeks/rivers were fished. Changing out set diameter cull rings traditionally secured within the body of the pot to target fish size given changing resource and market situations can be burdensome. Therefore, cull rings evaluated in this study were adjustable. Use of an adjustable hose clamp as the cull ring provides flexibility to fishers in targeting a given size fish relative to fish habitat preference in different areas and changing market value (demands) of different size fish. Pots were fished on a 2-3 day soak schedule, fished on Monday Wednesday and Friday. Fish caught were transferred from pot onto a culling/measuring tray table made of wire mesh with measuring rulers attached to tray bottom and abutted to tray vertical sides so loaded fish could be measured more efficiently (Figure 5). Lengths of all catfish fish were recorded to the nearest 1”, with bycatch specie and number caught recorded. A subset of blue catfish 12-18” TL were weighed to get fish size-to-weight relationship to correlate small fish size with market categories, with the following observed; 12-13" fish =1lb fish; 14"-15" fish = 1.5lb fish; 15-16" fish = 2 lb fish; 16=17" fish = 2.5 lb fish; 18-20" fish = 3 lb fish.

Figure 1. Reinforced hoop-net design pot with double mesh-net funnels used in this study.

Figure 3. Adjustable stainless steel hose clamps sewn into the pot outer webbing served as cull rings which could be adjusted to various testing diameters.

Figure 2. Catfish pots were reinforced with rebar to provide structural support to handle large volumes of fish either by hand or use of winch.

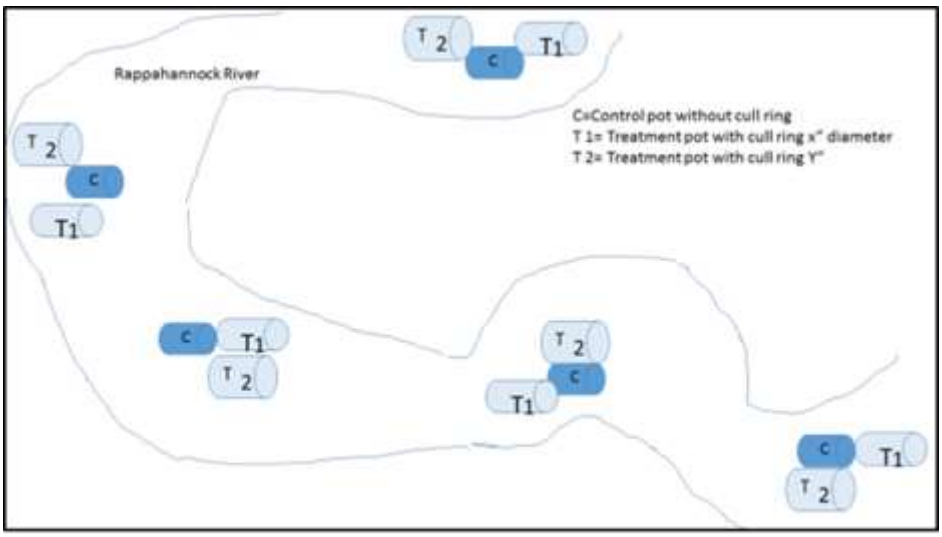

Figure 4. Study design testing 2 different cull ring sizes against a control trap was performed per fishing site along tributaries of the Rappahannock River.

Figure 5. Culling/measuring tray table made of wire mesh with measuring rulers attached to tray bottom and abutted to tray vertical sides so loaded fish could be measured more efficiently.

Results

A total of 316 pots were fished May through mid-July 2018 covering two testing periods. In the first test period (5/7-6/8/2018) 4205 fish were caught testing 2.25 and 2.3/4-inch diameter cull rings fishing 256 pots in Hoskins Creek. In the second testing period (6/11-7/13/2018), 596 fish were caught testing 2.5 and 3-inch diameter cull rings fishing 60 pots in the Totusky, Yeocomico, Coan, Great Wicomico, and Totuskey Rivers. The pots collectively caught over 4,800 catfish. Bycatch was minimal and consisted of 17 white perch, 31 blue crabs, and 6 snapping turtles, with all bycatch, with the exception of 1 white perch, caught during the second period of study in the Yeocomico and Coan Rivers. The reduced number of fish caught during the second fishing period was observed to be partly due to 4-6 inch holes repeatedly experienced in pot webbing and attributed to turtle interactions, which allowed for fish escapement.

In the first period of testing, fish size selectivity was similar for both the 2.25" and 2.75" diameter cull rings (Figure 6), culling out fish between 13-14" TL, which correlates to ~1lb fish. In the second period of testing, fish size selectivity differed between 2.5" and 3" diameter cull rings (Figure 7), with 2.75 cull rigs selecting out fish similar to that observed for 2.25 and 2.5" cull rings (~14" fish) and the 3" cull ring selecting out larger fish (~15" fish). Though there was reduced sampling effort and number of fish encountered during the second testing period which may have produced a finer scale of selectivity, the range of cull ring diameters tested in this study seemed to bracket the fish size/weight targeted. Blue catfish anatomy, especially considering lateral and dorsal spines may prevent identifying a singular fine scale cull diameter

for any specific size fish, however, 2.25-2.75” cull ring diameters successfully culled out fish <14” TL.

The control pots caught 800 small fish (under 1.5 lbs), 90% more than caught in pots with cull rings. In addition, and surprisingly, the test pots caught more of the larger fish than the control pots.

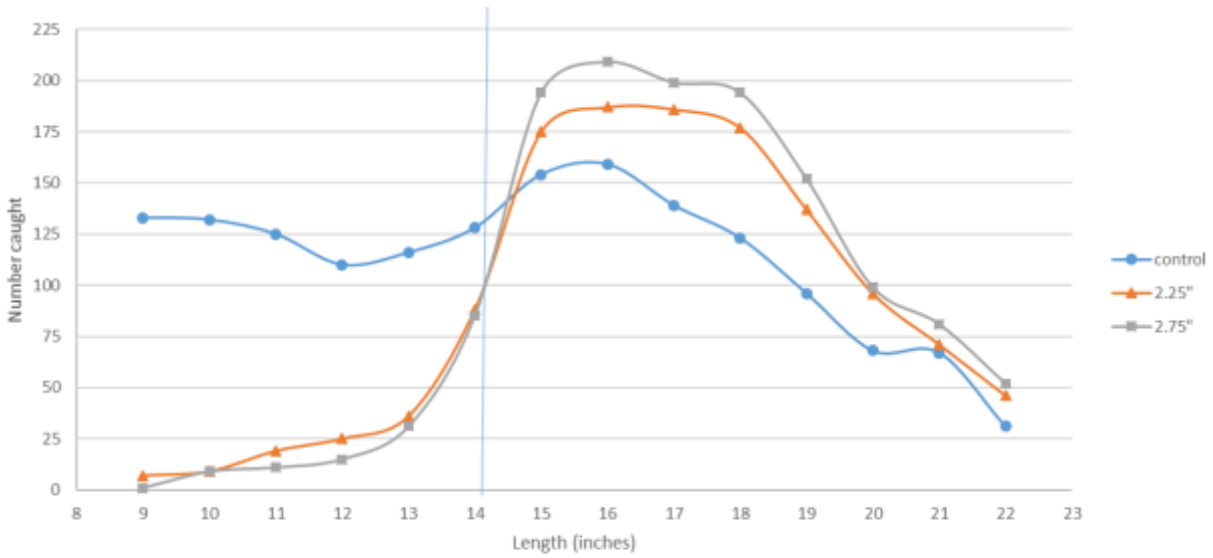

Figure 6. Blue catfish caught in fish pots with no cull ring (control) and pots with either 2.25" or 2.75" diameter circular cull ring. Both cull rings select fish size similarly at ~14”.

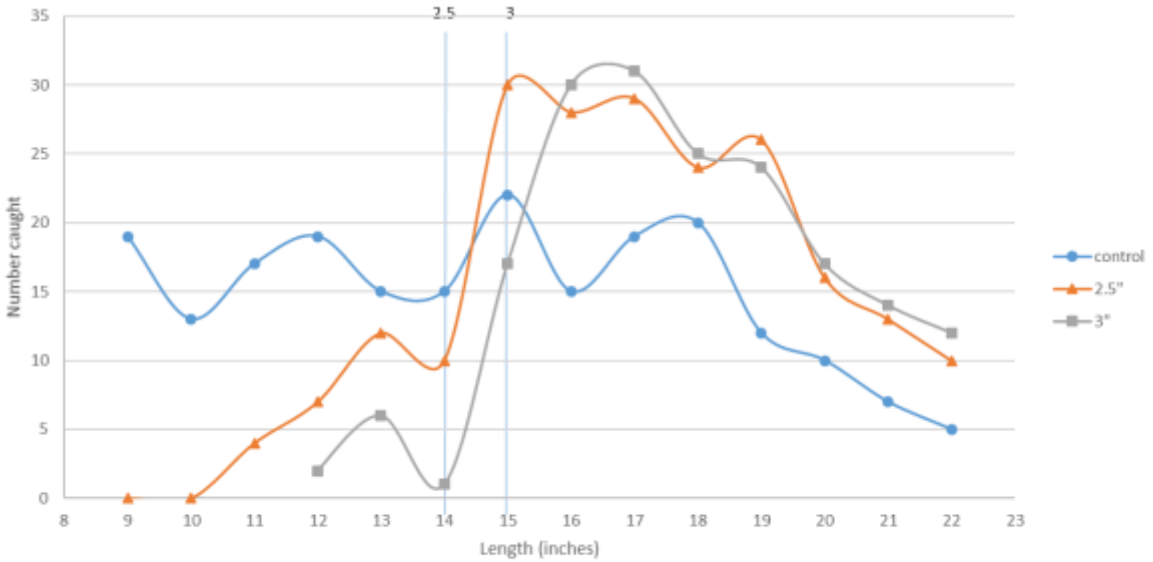

Figure 7. Blue catfish caught in fish pots with no cull ring (control) and with either 2.5" or 3" diameter circular cull ring, with 2.5” ring selectivity of 14” fish and 3” rings of 15” fish.

Conclusions and Recommendations

Cull rings reduced the smaller fish catch by 90%
Cull rings allowed a 32% increase in marketable fish 3 pound+ size
Stainless steel hose clamp cull rings are easily installed, inexpensive, adjustable, and durable.
Cull ring settings of 2.25-2.75 inch will let the majority of fish under 14" TL, or 1- 1.5 lb fish escape, and a cull ring setting of 3 inch will let the majority of fish under 15' TL, or 1.5-2 lb fish escape.

The only flaws in our study were the high loss of fish pots and that the Rappahannock River and its tributaries have more catfish than the tributaries off the Potomac River. The implications are that commercial blue catfish fishermen should put 2 adjustable (2-3 inch diameter hose clamps) cull rings in the pocket end of their pots immediately to eliminate excess culling of small fish caught and increase the catch of larger (more marketable) catfish. This will add to their bottom line by money saved in labor costs for sorting and increase revenue by a >30% increase of marketable fish. This was a very satisfying study and exceeded our expectations – let's get the word out. A follow-up study (possibly next year's FRG) could be evaluating funnel size/shape to prevent large (>15lbs), less-marketable blue catfish (due to health warnings from bio-accumulating toxins) from entering pots/traps. This would also increase bait longevity (enabling bait to fish long) by keeping larger fish from entering pot and consuming bait.

Acknowledgment
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