Derelict crab traps in South Carolina: Problem Characterization and Prevention

Mike Arendt, Ellen Waldrop, John Heinsohn, Sean Miller, Jeff Schwenter, and Peter Kingsley-Smith

Marine Resources Research Institute, Marine Resources Division, South Carolina Department of Natural Resources

217 Fort Johnson Road, Charleston, SC 29412

BACKGROUND

Derelict fishing gear poses significant environmental threats:

- Hazardous to a diversity of marine life
- Degradation of habitat and potential navigational hazards
- Economic burden to fishermen and removal groups

Diamondback terrapin (*Malaclemys terrapin*) range and habitat overlap with the blue crab (*Callinectes sapidus*), an important commercial and recreational fishery species. Both species are attracted by bait used in crab traps, but only air breathing terrapins subsequently drown after capture.

In addition to this detrimental effect associated with actively fished traps, the impact of derelict traps is also problematic. For example, Grosse et al. (2009) reported 94 dead terrapins in a single derelict crab trap in a Georgia tidal creek. Much effort has been expended to remove derelict fishing gear; however, generation of new derelict fishing gear must also be prevented.

Photo : Andrew Grosse

Abandoned crab traps on a mudflat in Bulls Bay (Cape Romain NWR), SC

Photo: Mike Yianopoulos

OBJECTIVES

In 2014, the South Carolina Department of Natural Resources received a one-year grant from the National Fish and Wildlife Federation ("Fishing for Energy" Fund) to achieve the following:

Job 1: Survey licensed SC crabbers to characterize temporal-spatial patterns in derelict trap generation and related attributes.

Job 2: Collect detailed trap deployment and retrieval data for one crabber (traps fished with two float lines) to quantify vessel strike frequency as well as complete loss of traps.

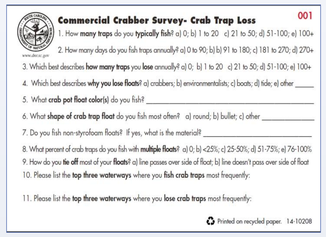
Job 3: Engineer and evaluate the efficacy of modified surface float and line configurations to withstand repeated vessel strikes.

Job 4: Opportunistically remove and repurpose suitable traps for use as substrate in oyster reef restoration efforts: http://www.dnr.sc.gov/marine/pub/srfac5yrreport.pdf

The findings of this study thus far have tremendous implications for reducing annual mortality of terrapins in derelict crab traps.

This study was conducted throughout the Stono River (yellow fill, right) for Job 2, but was restricted to a heavily trafficked section of this river near Elliot Cut for field data collection in Job 3.

METHODS & MATERIALS



Commercial Crabber Survey- Crab Trap Loss 001

1. How **many traps** do you **typically fish**? a) 0; b) 1 to 20 c) 21 to 50; d) 51-100; e) 100+
2. How many days do you fish traps annually? a) 0 to 90; b) 91 to 180; c) 181 to 270; d) 270+
3. Which best describes **how many traps** you **lose** annually? a) 0; b) 1 to 20 c) 21 to 50; d) 51-100; e) 100+
4. Which best describes **why you lose floats**? a) crabbers; b) environmentalists; c) boats; d) tide; e) other _____
5. What **crab pot float color(s)** do you fish? _____
6. What **shape of crab trap float** do you fish most often? a) round; b) bullet; c) other _____
7. Do you fish non-styrofoam floats? If yes, what is the material? _____
8. What percent of crab traps do you fish with **multiple floats**? a) 0; b) <25%; c) 25-50%; d) 51-75%; e) 76-100%
9. How do you **tie off** most of your **floats**? a) line passes over side of float; b) line doesn't pass over side of float
10. Please list the **top three waterways** where you **fish crab traps** most frequently:

11. Please list the **top three waterways** where you **lose crab traps** most frequently:

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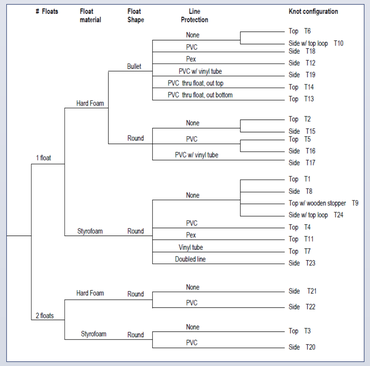
Job 1: In October 2014, a postage pre-paid survey was sent to 761 crabbers licensed in South Carolina in the past five years.

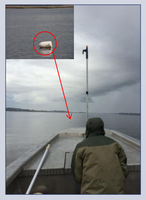
Job 2: Mr. Fred Dockery (on left), the crabber representative to the SC Marine Advisory Committee, recorded (~daily) traps deployed, run-over (i.e., one float missing), or lost at numerous locations throughout the Stono River between May and October 2014.

Job 3: Modified surface float designs were constructed using a variety of materials to evaluate three principal themes (more floats, more durable floats, surface line protection) for reducing trap loss.

For all float replicates, No. 10 (5/16 in.) nylon braided crab trap line (40') was attached to a 10 lb weight (the equivalent of a crab trap re-bar base). Floats consisted of round Styrofoam, spongex bullet-shaped floats, and round spongex designs. Sub-surface float line protectors (two feet in length) consisted of 0.5" Schedule 40 PVC, PEX tubing, and braided vinyl tubing. Line and float protectors located above the float included additional knots, PVC tubes, and plywood discs (3 in-sq). Among 264 possible combinations of protection designs, 24 (below) were field tested for strike durability.



An aluminum v-hulled research vessel (RV *Stratosfear*, 21' length) with a 150 HP Evinrude 4-stroke engine was used to run over floats at high speed (3300 to 3500 RPM) in an attempt to sever the float from the weight, thus creating a mock ghost trap. After each pass, damage to the float rigging was documented and floating marine debris was removed (see photos below). Passes were made moving up-river to standardize the effects of environmental conditions such as current direction, water level, and wind speed/direction.

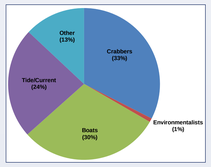


Photos: Sarah Latshaw

RESULTS

Job 1

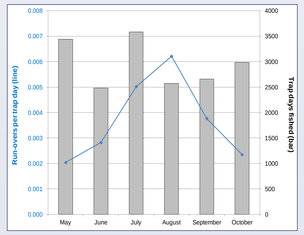
- 96 of 761 surveys (12.6% response rate) were returned, of which eight respondents simply indicated that they were no longer crabbing.
- 92% of licensed crabbers resided in nine counties near the coast; a significant correlation ($P<0.001$, $r=0.98$) was noted between the percent of surveys sent to and received from these nine counties.
- 892,375 trap-days fished estimated from Questions 1 and 2
- 1,925 traps estimated lost annually from Question 3 (<1% of total traps)



- 86% exclusively crab with single float lines
- 63% exclusively crab with bullet floats
- 20% indicated use of non-Styrofoam floats
- 61% of floats secured with line over side
- 82% of floats contain orange, white, red or green (of 11 colors); 29% are multi-colored

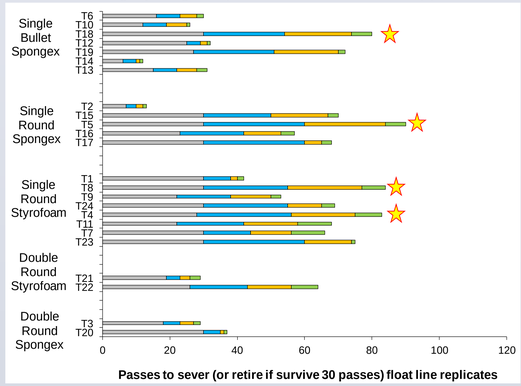
Job 2

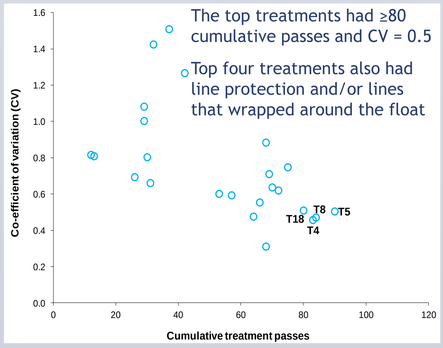
A total of 17,720 trap days (42 to 142 traps x 184 days) were fished in the Stono River by Mr. Fred Dockery. Sixty-five run-over events (0.4% of trap days) were recorded which peaked in July and August). Thirty-one trap losses were also noted.



Job 3

Ninety-six float line replicates received 1,280 run-over passes during 18 field days between September 2014 and February 2015. When a replicate was destroyed or survived 30 passes it was replaced with next replicate (four total) in the treatment group. Replicate survival (best to worst = gray to green) for all 24 treatments appears below.

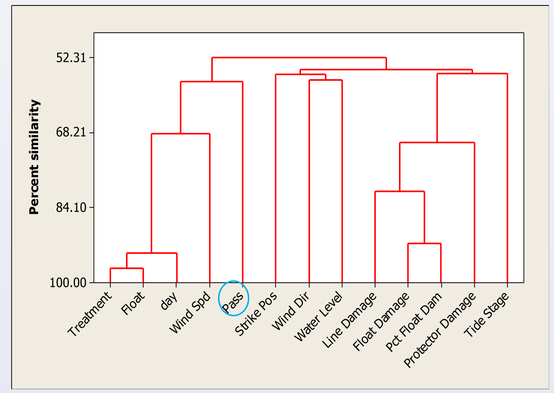


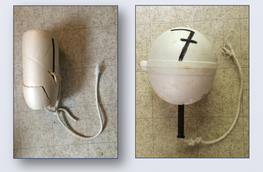


RESULTS (continued)

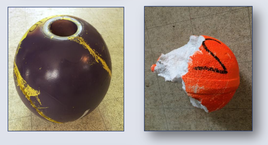
Job 3 (continued)

Single linkage Euclidean-distance cluster analysis revealed a weak association (57% similarity) between maximum pass (range = 0 to 30) and wind speed (range = 0 to 13 knots) in the 4th (of 24) analysis step.





Line was only recovered for 45% (43 of 96) of passes. Mean (± SD) severance occurred 19.5" ± 6.4" below the terminal float knot. Line was pulled partially or fully through the float in 45 passes.



79% percent (n = 76) of terminal passes were associated with <50% damage to floats. Greatest float destruction was associated with Styrofoam floats, which were often obliterated.

40 replicates without any form of line protection each lasted 11.7 passes on average, while 56 line-protected replicates each lasted 14.5 passes on average (a 24% increase).

SUMMARY AND RECOMMENDATIONS

- Trap loss occurs infrequently relative to fishing effort, but thousands of new derelict traps likely generated annually
- Vessel strikes thought to cause one-third of derelict traps
- Gear loss from vessel strikes can be reduced at little cost
  (a) Ensure that lines wrap around the side of floats to reduce the ability of line to pull through the float
  (b) Protect at least the upper 24" of line with a sacrificial and easily replaceable but rigid material such as PVC
  (c) Replace round Styrofoam with round Spongex floats

LITERATURE CITED

Grosse, A. M., J. D. van Dijk, K. L. Holcomb, and J.C. Maerz. 2009. Diamondback terrapin mortality in crab pots in a Georgia tidal marsh. Chelonian Conservation and Biology. 8(1): 98–100.

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