Derelict Blue Crab Traps in the Virginia Portion of the Chesapeake Bay

Kirk J. Havens, Donna Marie Bilkovic, David Stanhope, Kory Angstadt
Center for Coastal Resources Management
Virginia Institute of Marine Science
www.ccrm.vims.edu
Initial Observations

Crab traps with buoy lines

Tire
Can side-scan sonar be used to locate derelict traps?

What is the annual accumulation rate of crab traps?

Are traps still actively fishing, and for how long?
Do derelict trap decay rates vary with salinity?

How many are out there?

Solutions?
CAN SONAR BE USED TO LOCATE DERELICT TRAPS?

Pilot Survey
Lower York River
2005-2006

York River Marine Debris Survey-
Jan/Feb 2006 (Off-season)
33.5 km² surveyed

DERELICT TRAP ABUNDANCE

635-676* traps / 33.5 km²
~ 20 traps/km²

*Includes a 6% identification error estimated from a subset of SSS targets in Sarah Creek
27 of 33 (82%) derelict traps removed from York River and Sarah Creek were deemed still functional.

### Species trapped in derelict traps recovered from the York River (Aug 2006) - 27 Pots

<table>
<thead>
<tr>
<th>Species</th>
<th>Abundance</th>
<th>Percent of catch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue crab</td>
<td>11</td>
<td>34%</td>
</tr>
<tr>
<td>Atlantic croaker</td>
<td>7</td>
<td>22%</td>
</tr>
<tr>
<td>Oyster toadfish</td>
<td>6</td>
<td>19%</td>
</tr>
<tr>
<td>Black seabass</td>
<td>4</td>
<td>13%</td>
</tr>
<tr>
<td>Spot</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Flounder</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Pigfish</td>
<td>1</td>
<td>3%</td>
</tr>
</tbody>
</table>

*Species: Callinectes sapidus, Micropogonias undulatus, Opsanus tau, Centropristis striata, Leiostomus xanthurus, Paralichthys dentatus, Orthopristis chrysoptera*
WHAT IS THE APPROXIMATE ANNUAL LOSS RATE OF CRAB TRAPS?

Annual Survey in Sarah Creek, VA
From 2005-2007

- Identify derelict traps with SSS
- Remove all derelict traps
- Enumerate buoyed traps in-season for fishing effort estimate
- Rescan the following year for derelict traps
- Estimate loss rate (derelict/buoyed+derelict)
- Repeat
Derelict traps identified & removed:
2005 16 derelict traps
2006 12 derelict traps
2007 11 derelict traps
Trap loss rate approx. 20 – 22% per yr

- In Gulf of Mexico, Guillory (2001) applied a 25% loss rate to approximate a 250,000 annual trap loss.
- Our study found an average annual trap loss rate of 21% for Sarah Creek.
- Anecdotally, watermen have indicated that there annual loss of traps is ~ 20-30%.
DERELICT CRAB TRAP EXPERIMENT

- 56 vinyl coated traps were fitted with “doors” that can be opened or closed
- One week per month the doors are opened so the traps can fish (unbaited)
- Traps fished every other day for 7d, catch identified, measured then released
- Trap Wet weight recorded each month
BLUE CRAB CATCH RATES IN DERELICT TRAPS

<table>
<thead>
<tr>
<th>Site</th>
<th>Salinity (ave)</th>
<th>Catch rate (crabs/trap/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>5.9</td>
<td>0.26 (SE=0.08)</td>
</tr>
<tr>
<td>C</td>
<td>16.2</td>
<td>0.27 (SE=0.08)</td>
</tr>
<tr>
<td>S</td>
<td>19.8</td>
<td>0.20 (SE=0.06)</td>
</tr>
<tr>
<td>Y</td>
<td>20.0</td>
<td>0.21 (SE=0.09)</td>
</tr>
</tbody>
</table>

Average = 0.24 crabs/trap/day or ~50 crabs/trap/season*

No significant difference between old traps (deployed in November) and new traps (deployed in April) ($p=0.5$) between sites ($p=0.2$), or as an interactive effect ($p=0.8$)

ChesMMAP derelict trap average catch rate for 2002,2003,2005 = 0.42

Watermen derelict trap average catch rate = 0.37

* Season based on April – October 2006

Poon (2005), in a review of published blue crab mortality rates for derelict traps, calculated an average of 53.8 blue crabs/trap/year.
Baited and un-baited traps had varying catch rates (One-way ANOVA, $p = 0.02$), with the traps simulating ‘self-baiting’ capturing slightly more than **DOUBLE** the unbaited traps (mean catch rate 0.79 and 0.39 crabs·trap day$^{-1}$, respectively)
Data suggest a conservative estimate of blue crabs trapped by derelict traps in the Lower York River at an average of 1 market-sized blue crab every 4 days per trap is 25,000 - 30,000 crabs/season OR ~500-600 bushels.

Loss of croaker in the lower York River is estimated at over 7,000 per year.
DO DERELICT TRAP DECAY RATES VARY WITH SALINITY?

• High salinity, main stem traps collapse after two seasons

• Brackish, tributary traps still effectively trapping after 3 seasons – 4th year to be tested this summer
MARINE DEBRIS REMOVAL PROGRAM Dec 2008 – Mar 2009
Total Debris Removed – 8,990     Total Area Scanned- 1524 km² (376,000 acres)

Side imaging track lines of Program Participants
Designed to ride above the bottom with only the tip of the hook dragging through the sediment.
8643 Derelict Crab Traps Removed
- 3241 Abandoned (38%)
- 5384 Grappled (62%)
<table>
<thead>
<tr>
<th>Species</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Blue Crab</td>
<td>1875</td>
</tr>
<tr>
<td>Male Blue Crab</td>
<td>1414</td>
</tr>
<tr>
<td>Oyster Toadfish</td>
<td>856</td>
</tr>
<tr>
<td>Whelk</td>
<td>300</td>
</tr>
<tr>
<td>White Perch</td>
<td>65</td>
</tr>
<tr>
<td>Black Seabass</td>
<td>63</td>
</tr>
<tr>
<td>Catfish spp</td>
<td>27</td>
</tr>
<tr>
<td>Atlantic Croaker</td>
<td>27</td>
</tr>
<tr>
<td>American eel</td>
<td>22</td>
</tr>
<tr>
<td>Turtle spp</td>
<td>19</td>
</tr>
<tr>
<td>Striped Bass</td>
<td>18</td>
</tr>
<tr>
<td>Spot</td>
<td>15</td>
</tr>
<tr>
<td>Flounder spp</td>
<td>9</td>
</tr>
<tr>
<td>Sheepshead</td>
<td>7</td>
</tr>
<tr>
<td>Tautog</td>
<td>6</td>
</tr>
<tr>
<td>Red Drum</td>
<td>4</td>
</tr>
<tr>
<td>Horseshoe Crab</td>
<td>3</td>
</tr>
<tr>
<td>Rappa Whelk</td>
<td>3</td>
</tr>
<tr>
<td>Lobster</td>
<td>1</td>
</tr>
<tr>
<td>Atlantic Menhaden</td>
<td>1</td>
</tr>
<tr>
<td>Merganser (diving duck)</td>
<td>1</td>
</tr>
<tr>
<td>Muskrat</td>
<td>1</td>
</tr>
</tbody>
</table>

**TOTAL**

**4737**
Some other debris recovered

Oysters were found attached to some pots. In one case a functional vinyl-coated pot was recovered with oysters estimated to be several years old.

Over time, pots become nonfunctional and can provide some habitat value.
# Results of Participant Survey (40/58)

- Would change nothing: 20
- Start date of December 1st: 11
- Add more days to program: 5
- Allow 6 day weeks: 4
- Provide $ for mates: 3
- Provide $ for winches to pull up debris: 3
- Allow 9 hr work days: 1
- Limit program to VA crabbers: 1
- Closer monitoring to prevent fraud: 1
- Would like to be able to keep sonar units: All
- Other – provide $ for oil & propane
Participant comments

- “I was able to provide a living for my family and help clean up the Bay.”
- “I am stunned by all the debris that was caught. It was good to clean up the Bay.”
- “I never knew there were so many lost and abandoned pots.”
- “This program helped pay our bills for the winter months and I was very grateful.”
- “Learned a lot with the sonar unit. Everyone was 100% to deal with.”
- “After having crab dredging closed by VMRC, I was happy to have had the opportunity to participate in the program.”
- “I really liked the work and the side-scanning and identifying the marine debris. I got really inspired about that kind of work.”
- “It was helpful to have the income since the dredging season was closed and jobs are not that plentiful.”
- “It gave me work to do through the winter and gave me a chance to clean up the waters of abandoned pots that were a hazard to all boaters. And Lord knows how many crabs they trapped and killed before they decayed enough to fall apart.”
Participant comments (continued)

- “I liked the fact that I helped clean-up the creeks that I work in. The money that we received was a fair compensation for losing crab dredging and I put in a day’s work cleaning up the bay.”

- “I really enjoyed the work, especially the fact that we cleaned up a lot of areas. The response I received from the public was so encouraging.”

- “Liked the fact we were allowed to help VMRC instead of being in their way.”

- “I thought it was a great idea to remove the old pots and other debris form the bay to help with the clean-up program.”
CCRM/VIMS modifications

- Information on oysters found on pots
- Vinyl vs. galvanized pots
- Pictures of all non blue crab bycatch
- Add shallow water vessels to effort
- Include Back Bay as part of program
- Target areas for re-scanning by watermen to look at pot accumulation rates.
**CONCLUSIONS**

- **Sonar is a highly effective tool** for locating & retrieving derelict traps.

- Derelict Traps can effectively trap in high saline/high energy systems for ~ 2 years, while in lower saline or lower energy systems traps capture for at least 3 years.

- Derelict trap accumulation is ~20-30% of traps fished annually.

- On average, **50.6 crabs/trap/season** are captured with derelict traps.

- **8643** Derelict crab traps were removed from Virginia waters in 2009.

- Before debris-removal program ends, trap modifications & other measures should be implemented to **reduce trap loss & fishing potential of lost traps**.
The odds of escape in the first 4 hours from a trap modified with a gapped opening or degradable latch cord are 5 times lower than the odds of escape from a trap modified with degradable cull ring panels.
Solutions?

Typical Cull Ring

Degradable Cull Ring Panel

- Require proper disposal of traps
- Education – recreational and commercial users

Stop the cycle of derelict trap loss

Modify trap design to reduce capture efficiency of lost traps within a year

- Experimental evidence that degradable cull ring panels placed flush with the floor wall of the upper chamber allow for greatest escape rates (compared detached rot cord latch, and gapped opening due to rebound plastic)

Havens et al in press. Transactions of the American Fisheries Society
**Beyond Removal Program**

1. Target areas that have abundant abandoned pots.

2. Incorporate degradable components in both recreational & commercial pots.