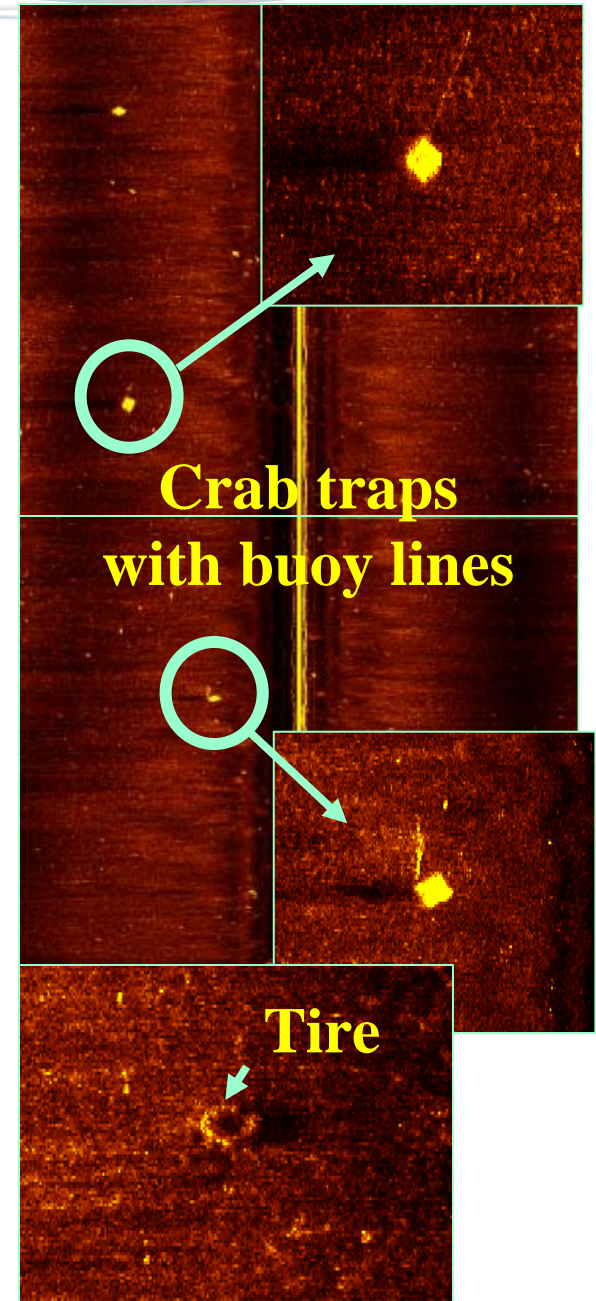


Derelict Blue Crab Traps in the Virginia Portion of the Chesapeake Bay



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



**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?

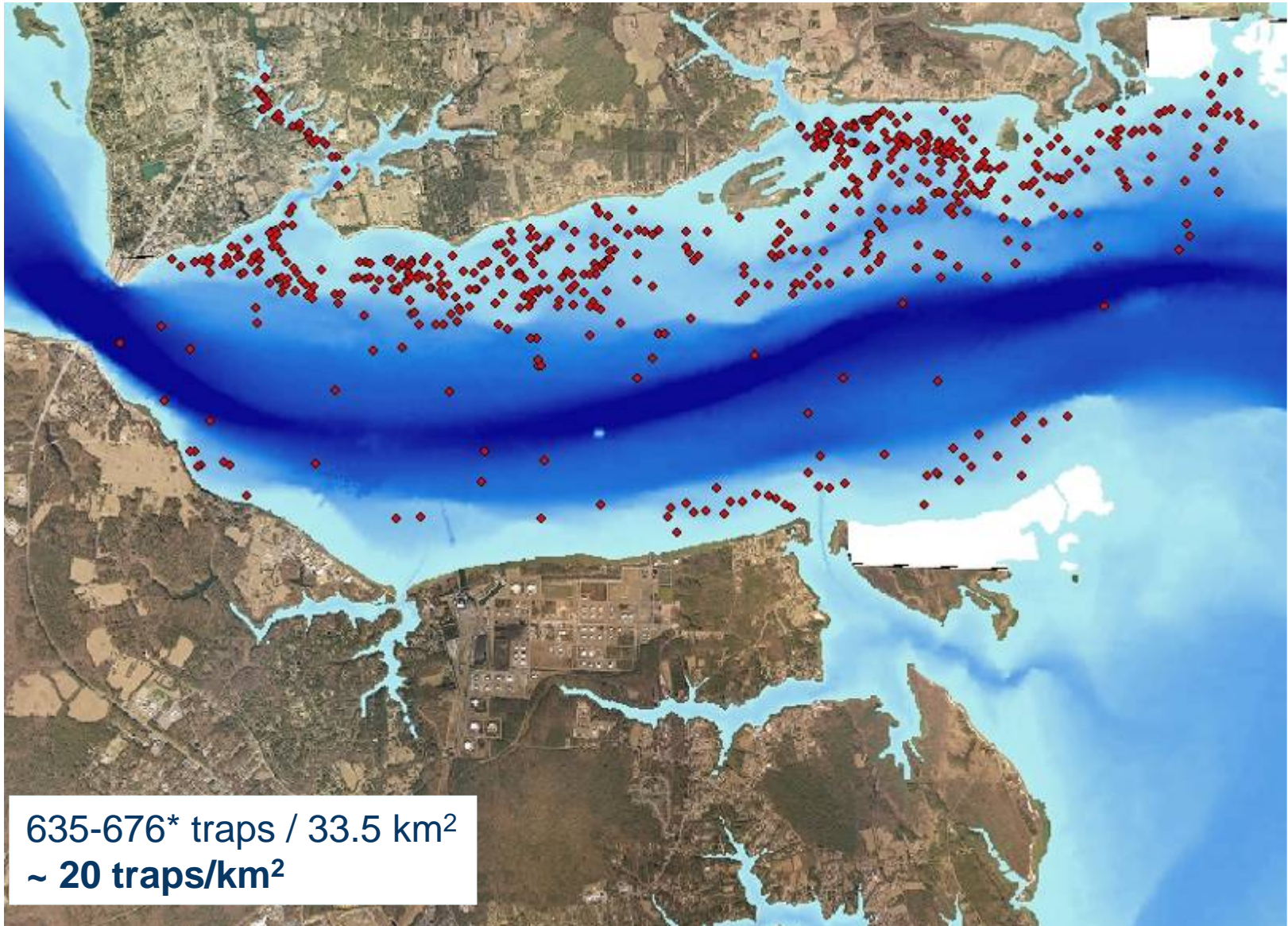
Pilot Survey Lower York River 2005-2006



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

33.5 km² surveyed





**Includes a 6% identification error estimated from a subset of SSS targets in Sarah Creek*

LOWER YORK RIVER TRAP CATCH

27 of 33 (82%)
derelict traps
removed from
York River and
Sarah Creek were
deemed still
functional

Good Condition



**Poor Condition –
no longer trapping**



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

<u>Species</u>		<u>Abundance</u>	<u>Percent of catch</u>
Blue crab	<i>Callinectes sapidus</i>	11	34%
Atlantic croaker	<i>Micropogonias undulatus</i>	7	22%
Oyster toadfish	<i>Opsanus tau</i>	6	19%
Black seabass	<i>Centropristis striata</i>	4	13%
Spot	<i>Leiostomus xanthurus</i>	2	6%
Flounder	<i>Paralichthys dentatus</i>	1	3%
Pigfish	<i>Orthopristis chrysoptera</i>	1	3%

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

ANNUAL LOSS RATE OF CRAB TRAPS



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 their annual loss of traps is ~ 20-30%



New Crab Traps

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



New Crab Traps with “Doors” open



New Crab Traps with “Doors” closed

Site	Salinity (ave)	Catch rate (crabs/trap/day)
G	5.9	0.26 (SE=0.08)
C	16.2	0.27 (SE=0.08)
S	19.8	0.20 (SE=0.06)
Y	20.0	0.21 (SE=0.09)

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 ($p=0.8$)

ChesMMAAP 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.



2 locations -
high and low
salinity



14 traps at each location
deployed in Aug & Sept
-7 traps at each site baited
with a single croaker
-7 traps at each site were
left unbaited



After 5 d, traps were
checked, the entrapped
organisms identified,
measured, & released



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*)

BLUE CRAB SEASONAL CATCH RATES IN DERELICT TRAPS

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?



New

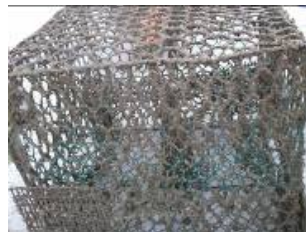


1 yr

- 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



Over 2 yrs (high salinity & energy)



Over 2 yrs (brackish salinity)



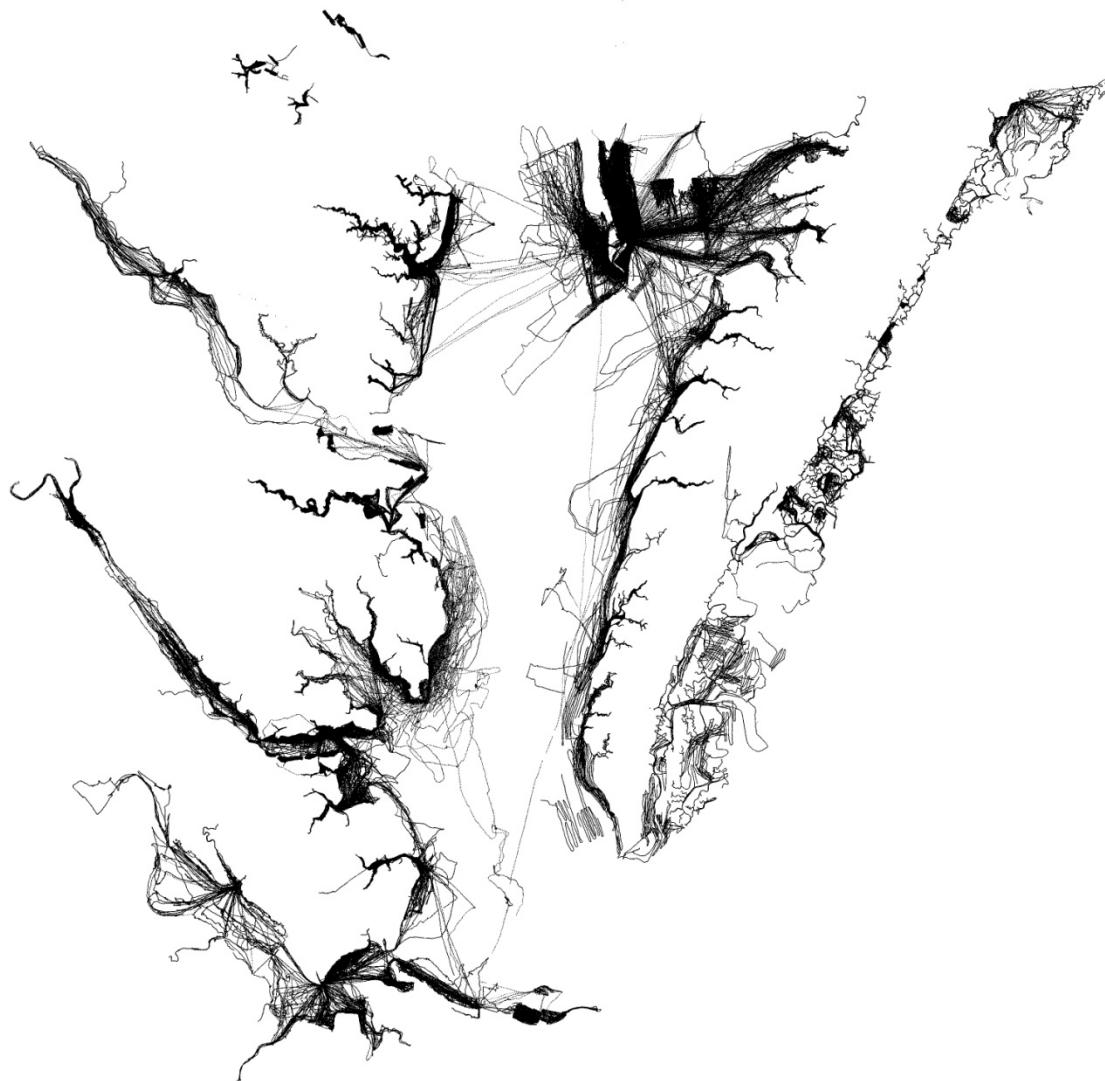
Over 3 yrs (high salinity & low energy)

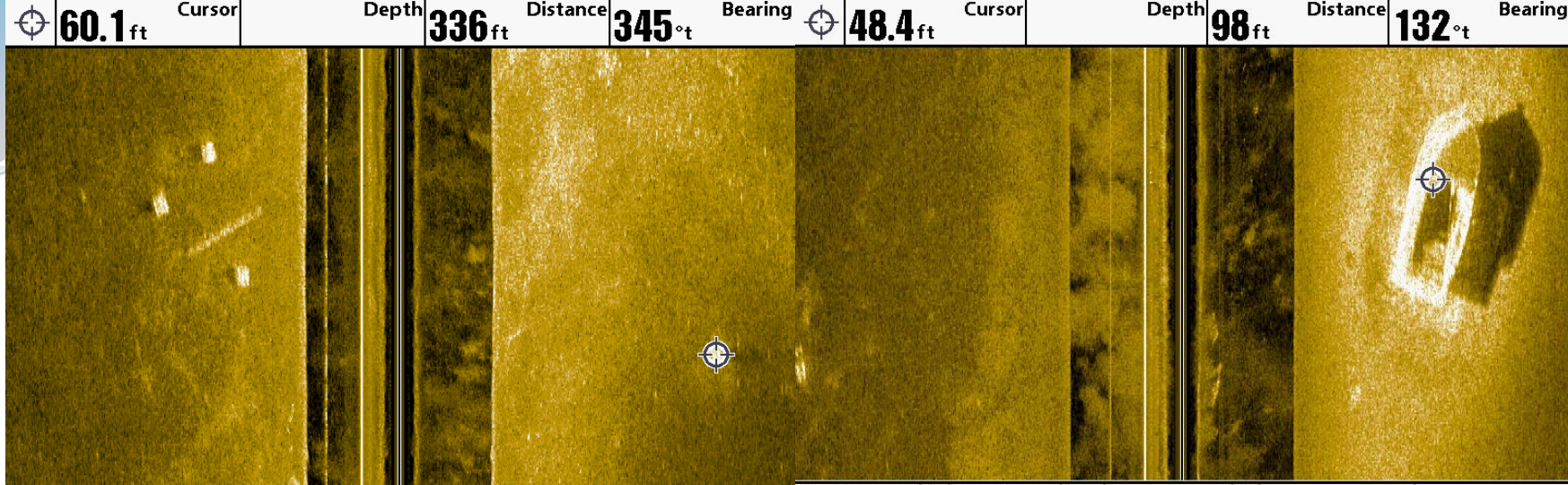
MARINE DEBRIS REMOVAL PROGRAM Dec 2008 – Mar 2009

Total Debris Removed – 8,990

Total Area Scanned- 1524 km² (376,000 acres)

Side imaging track lines of Program Participants



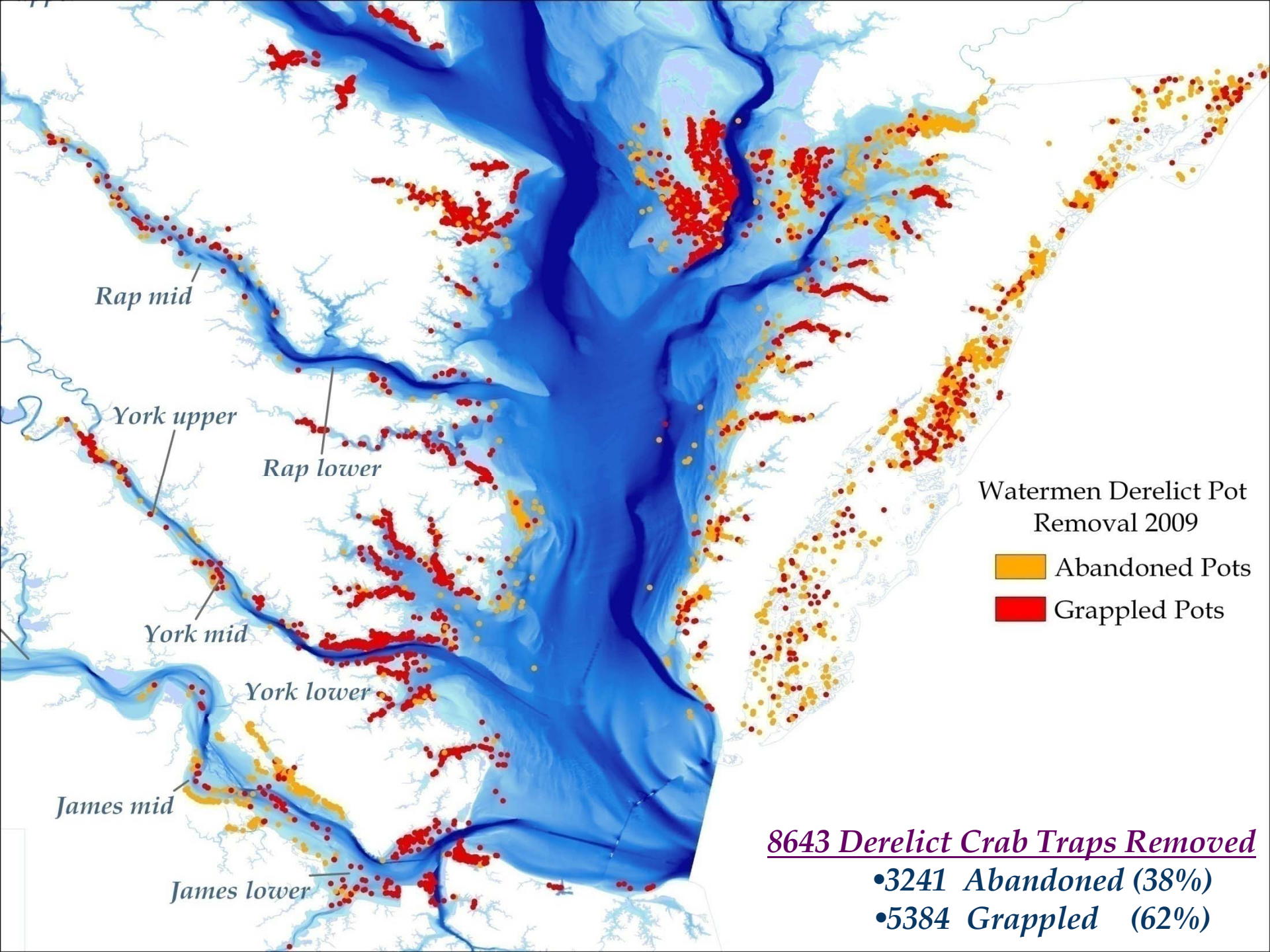


Depth	ft	Speed	kts	Course	°t	Depth	ft	Speed	kts	Course	°t	Depth	ft	Speed	kts	Course	°t
60.1						16.6		4.4		074		21.5		5.3		336	
						N 37.82978°						N 37.82029°					
						W 076.28154°						W 076.29806°					
						12:21:45 PM						7:51:56 AM					
						12/22/08						1/02/09					



Designed to ride above the bottom with only the tip of the hook dragging through the sediment.





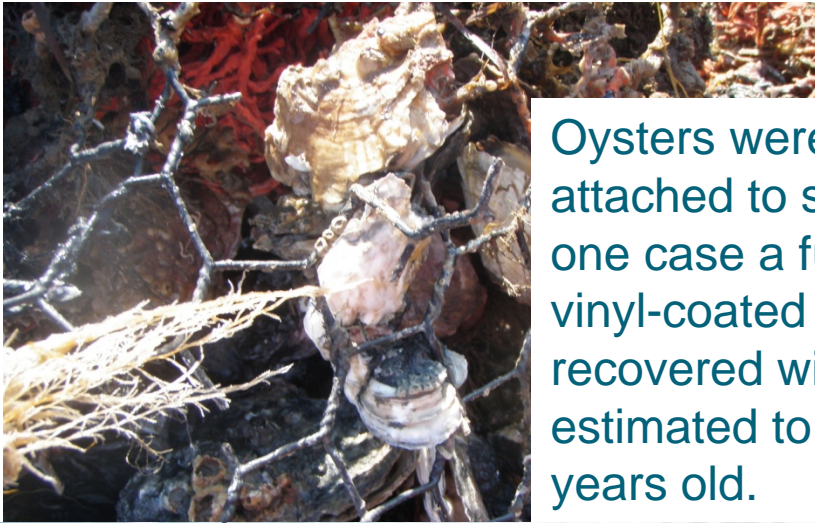
TOTAL BYCATCH- WATERMEN REMOVAL PROGR

Female Blue Crab	1875
Male Blue Crab	1414
Oyster Toadfish	856
Whelk	300
White Perch	65
Black Seabass	63
Catfish spp	27
Atlantic Croaker	27
American eel	22
Turtle spp	19
Striped Bass	18
Spot	15
Flounder spp	9
Sheepshead	7
Tautog	6
Red Drum	4
Horseshoe Crab	3
Rappa Whelk	3
Lobster	1
Atlantic Menhaden	1
Merganser (diving duck)	1
Muskrat	1

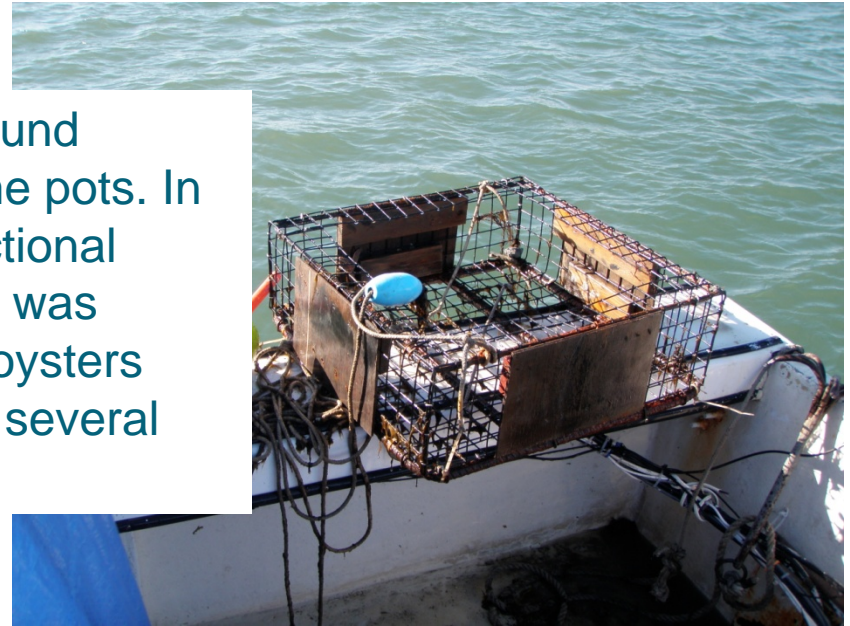
TOTAL
4737



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.

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

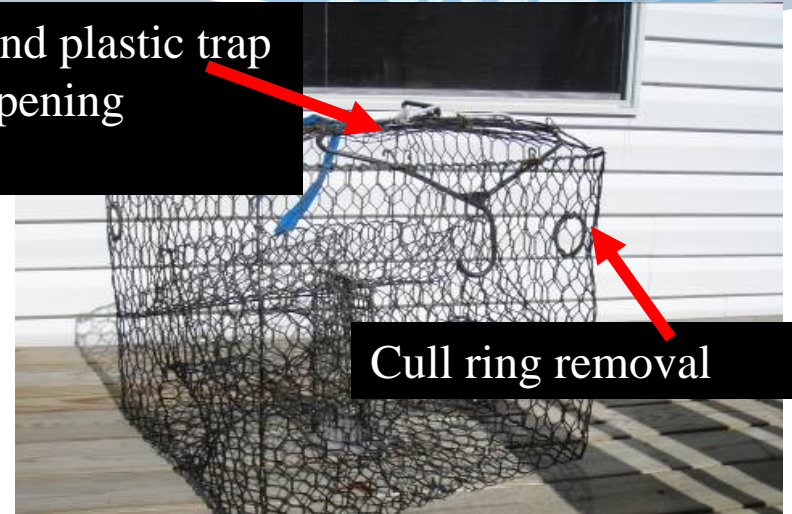
8643 Derelict crab traps were removed from Virginia waters in 2009

Before debris-removal program ends, trap modifications & other measures should be implemented to **reduce trap loss & fishing potential of lost traps**

Testing degradable components on pots



Rebound plastic trap opening



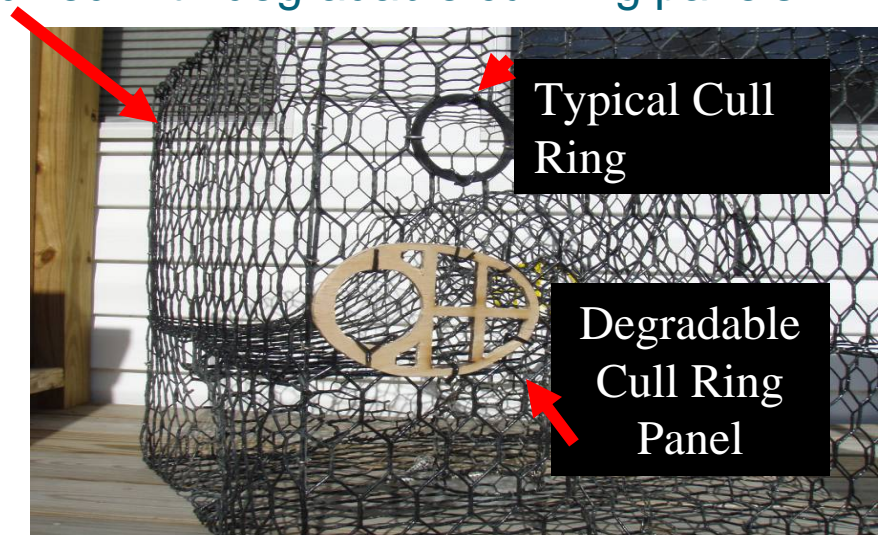
Cull ring removal

Latch cord breakage results in minimal opening



Latch rot cord

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



Typical Cull Ring

Degradable Cull Ring Panel



Stop the cycle of derelict trap loss

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

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)



Typical Cull Ring

Degradable
Cull Ring
Panel

Beyond Removal Program

1. Target areas that have abundant abandoned pots.
2. Incorporate degradable components in both recreational & commercial pots.