Briefing for the Sustainable Fisheries GIT Executive Committee (July 23,2018)

Donna Marie Bilkovic, Research Assoc. Professor, Virginia Institute of Marine Science

H. Ward Slacum, Director of Operations, Oyster Recovery Partnership

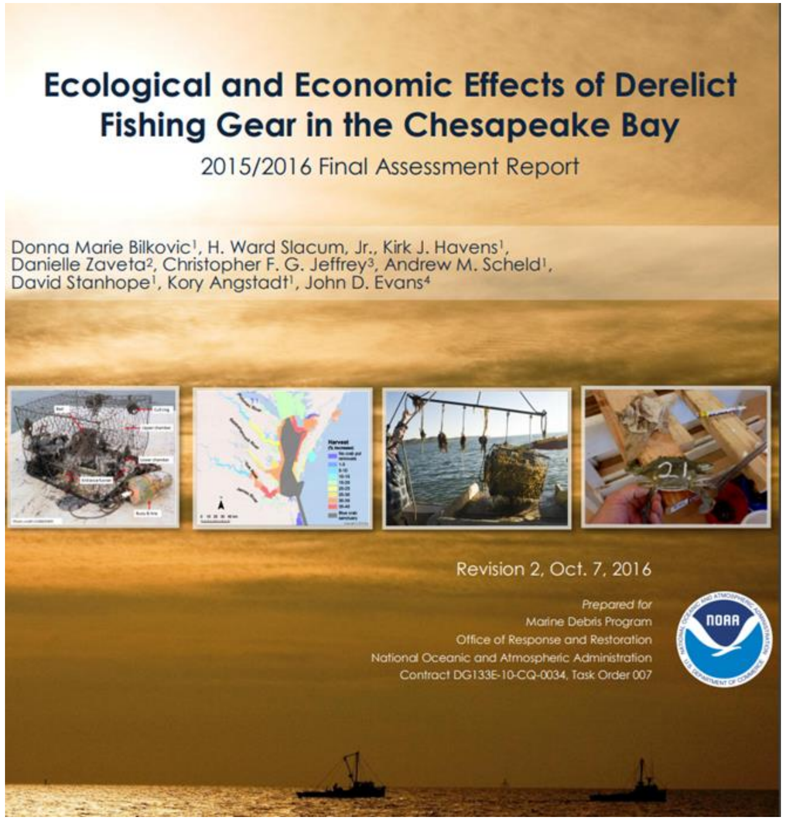
Kirk Havens, Asst. Director, Center for Coastal Resources Management, VIMS

Danielle Zaveta, Environmental Analyst, VERSAR

Christopher F.G. Jeffrey, Senior Marine Spatial Ecologist, NOAA

Andrew M. Scheld, Asst. Professor, Virginia Institute of Marine Science

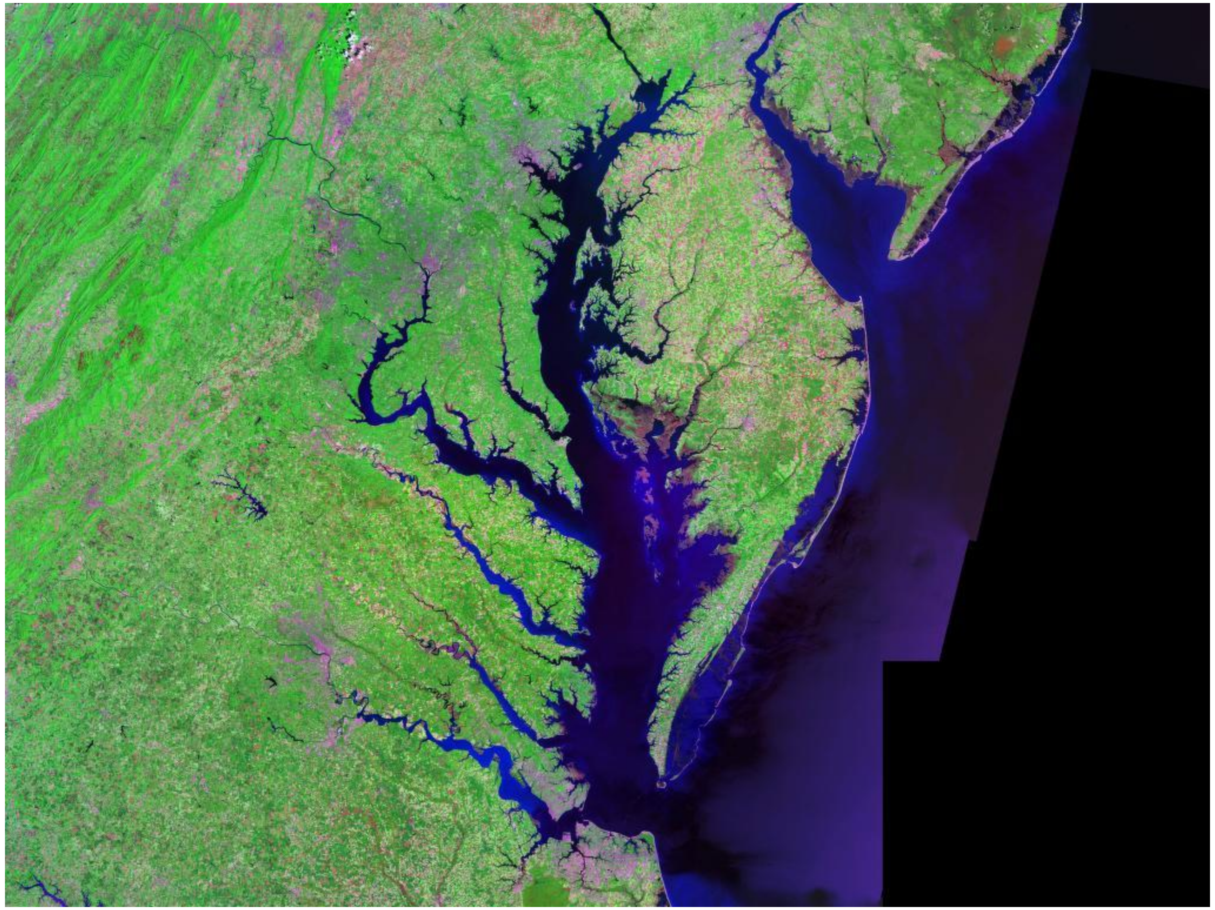
John Evans, Global Science & Technology, Inc



- NOAA Marine Debris Program has worked to reduce the amount and impact of derelict fishing gear.

- Wanted to do a comprehensive study and selected the Chesapeake Bay because of the decade of derelict gear research that had been conducted in MD & VA

- Interested in transferring knowledge and results to other regions and other trap fisheries



Monthly meetings with outside review group with members from NOAA MDP and NOAA CBPO regarding study

Multiple presentations including to the SF GIT and MB

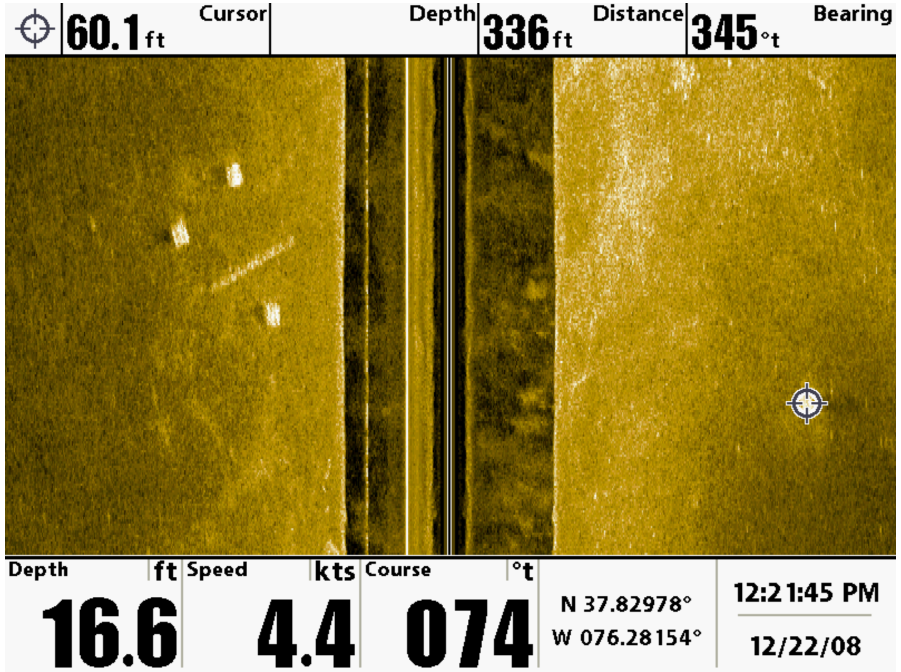
Marine Debris Location and Removal Project – Virginia 2008-2014

<u>A collaborative project between:</u>

Virginia Watermen — VIRGINIA WATERMAN'S ASSOCIATION

Virginia Marine Resources Commission

Virginia Institute of Marine Science — VIMS | WILLIAM & MARY — VIRGINIA INSTITUTE OF MARINE SCIENCE



Use one sheet for each item you pick up

DATE ____________

WAYPOINT # on screen ____________ (NO lat./ long.)

PHOTO # ____________

NAME ____________

TIME ____________

TYPE OF MARINE DEBRIS
CHOOSE ONLY ONE

- CRAB POT ☐
- PEELER POT ☐
- EEL POT ☐
- FRAME ONLY ☐
- PIECE OF CRABPOT WIRE ☐

- BUOYED ☐
- UNBUOYED ☐
- BUOY IN POT ☐

Pot Condition

- GOOD ☐ Still able to fish
- BAD ☐ Unable to fish
- VINYL POT ☐
- METAL POT ☐
- LINE ATTACHED ☐

CULL RINGS

- 2 Rings ☐
- 4 Rings ☐
- No Cull Ring ☐

NET ☐

TYPE OF NET
- GILL ☐
- SEINE ☐

Length
- 0 -100 Feet ☐
- 100+ Feet ☐

OTHER ☐
(appliance, tire, oyster cage)

TYPE ____________

BYCATCH

BLUE CRABS

Number of Males	How many male crabs are dead?	Number of Females	How many female crabs are dead?

FISH

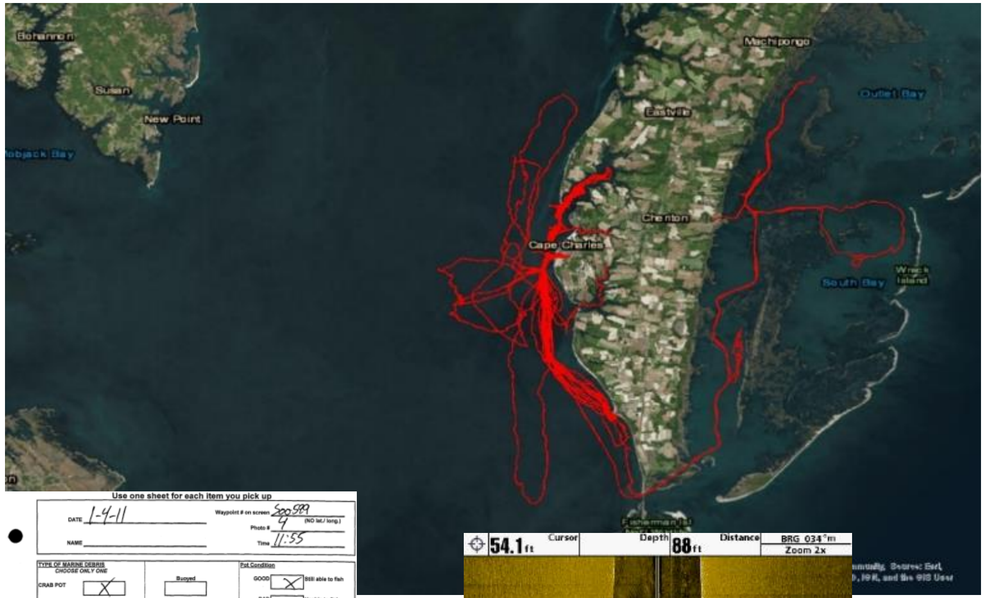
Species	# of fish	# of fish dead	Comments	Photo #

OYSTERS # of market size ____________ OYSTERS # of small ____________ Photo # ____________

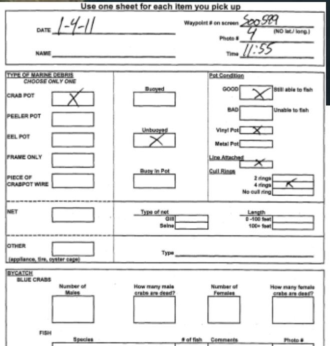
TURTLES ____________ # of Dead Turtles ____________ Photo # ____________

OTHER ANIMALS (muskrat, duck) Type ____________

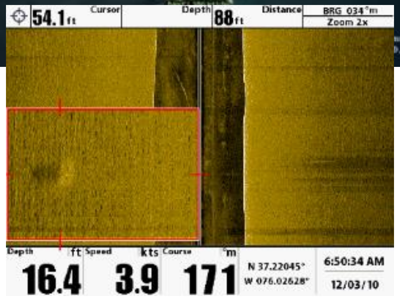
Bohannon
Susan
New Point
Mobjack Bay
Machipongo
Eastville
Outlet Bay
Cheriton
Cape Charles
South Bay
Wreck Island
Back River
Fisherman Isl Nat'l Wildlife Refuge



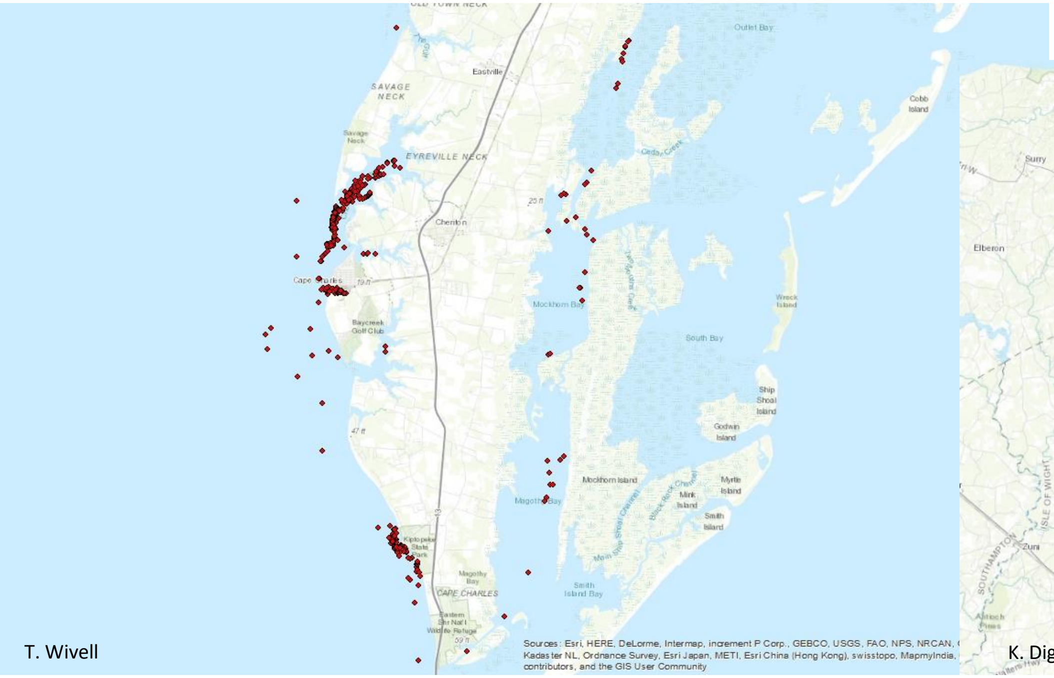
Bohannon
Susan
New Point
Mobjack Bay
Machipongo
Eastville
Outlet Bay
Cheriton
Cape Charles
South Bay
Wreck Island



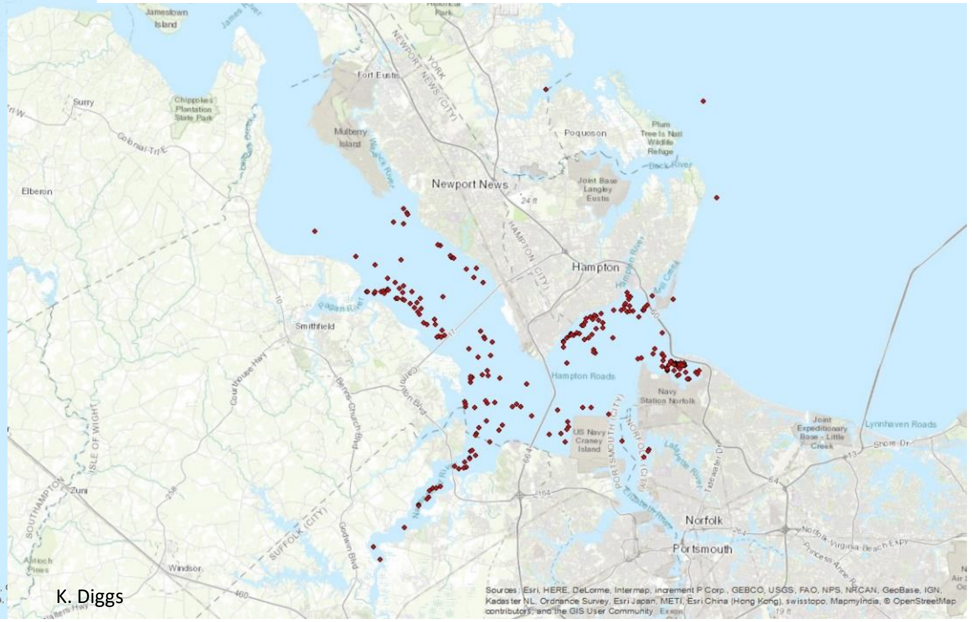
Use one sheet for each item you pick up
DATE 1-4-11
Waypoint # on screen
(NO lat./long.)
Photo # 4
NAME
Time 11:55
TYPE OF MARINE DEBRIS
CHOOSE ONLY ONE
CRAB POT X
PEELER POT
EEL POT
FRAME ONLY
PIECE OF CRABPOT WIRE
Buoyed
Unbuoyed X
Buoy in Pot
Pot Condition
GOOD X Still able to fish
BAD Unable to fish
Vinyl Pot X
Metal Pot
Line Attached
Cull Rings
2 rings
4 rings
No cull ring
NET
Type of net
Gill
Seine
Length
0-100 feet
100+ feet
OTHER
(appliance, tire, oyster cage)
Type
BYCATCH
BLUE CRABS
Number of Males
How many male crabs are dead?
Number of Females
How many female crabs are dead?
FISH
Species
# of fish
Comments
Photo #



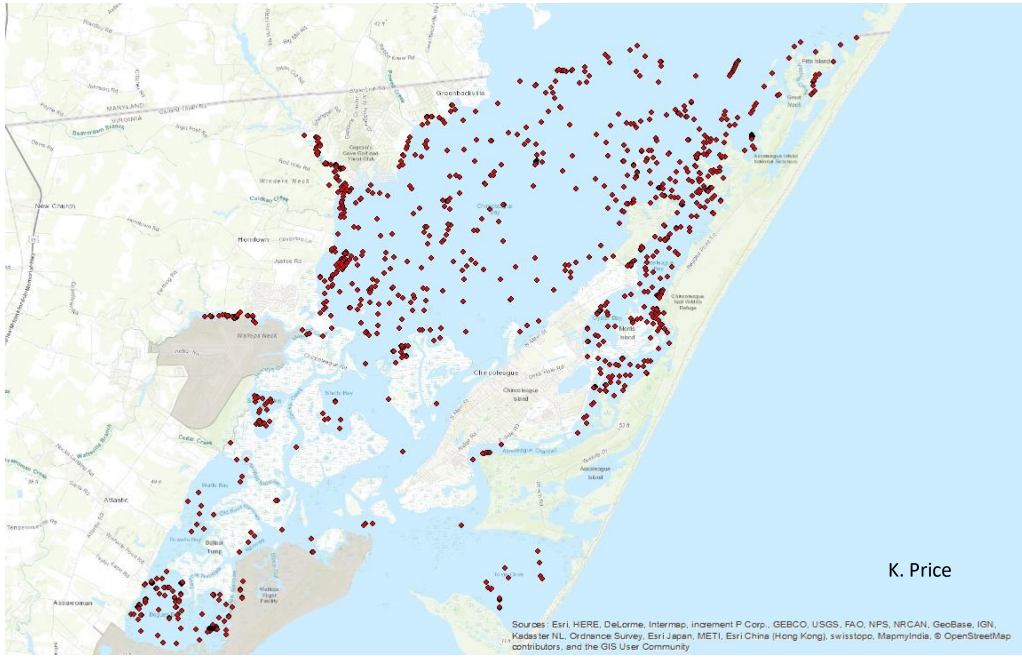
54.1 ft
Cursor
Depth
88 ft
Distance
BRG 034°m
Zoom 2x
Depth
16.4 ft
Speed
3.9 kts
Course
171 °m
N 37.22045°
W 076.02628°
6:50:34 AM
12/03/10



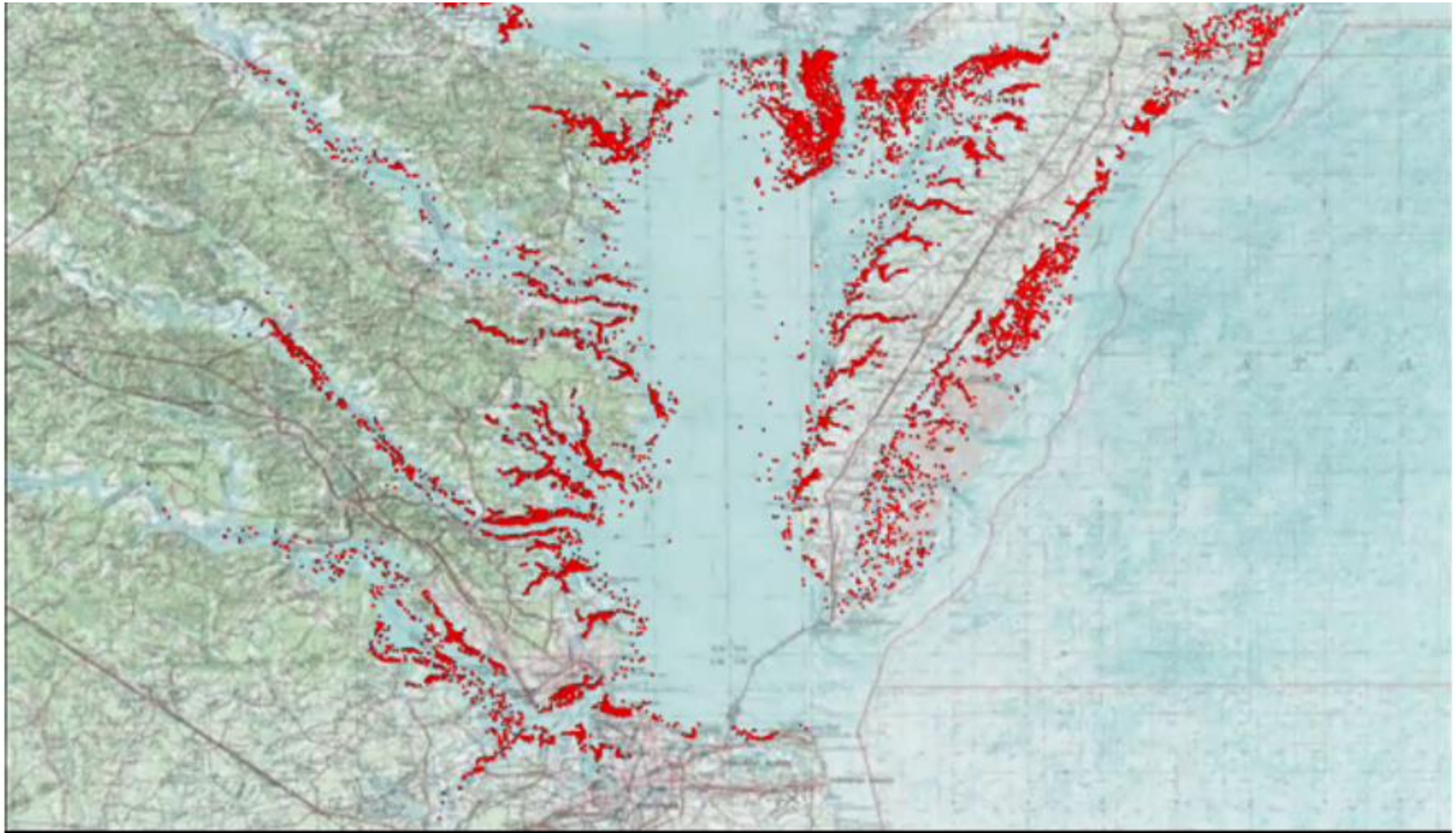
Eastville
SAVAGE NECK
EYREVILLE NECK
Cheriton
Cape Charles
Mockhorn Bay
South Bay
Cobb Island
Wreck Island
Ship Shoal Island
Godwin Island
Mockhorn Island
Myrtle Island
Mink Island
Smith Island
Magothy Bay
Smith Island Bay
CAPE CHARLES
T. Wivell
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Jamestown Island
Surry
Chippokes Plantation State Park
Fort Eustis
Mulberry Island
Poquoson
Plum Tree Island National Wildlife Refuge
Newport News
Joint Base Langley Eustis
Elberon
Hampton
Smithfield
Hampton Roads
Navy Station Norfolk
US Navy Craney Island
Joint Expeditionary Base - Little Creek
Lynnhaven Roads
Norfolk
Portsmouth
Windsor
K. Diggs
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



MARYLAND
VIRGINIA
Greenbackville
New Church
Horntown
Wallops Neck
Chincoteague
Chincoteague Island
Assateague Island
Atlantic
Assawoman
K. Price
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



FISH - Bycatch	ABUNDANCE	% of TOTAL	Cumulative %
OYSTER TOADFISH	3348	66.8	66.8
BLACK SEABASS	415	8.3	75.1
ATLANTIC CROAKER	313	6.2	81.3
AMERICAN EEL	184	3.7	85.0
WHITE PERCH	174	3.5	88.5
CATFISH SPP	171	3.4	91.9
SPOT	93	1.9	93.7
FLOUNDER	52	1.0	94.8
TAUTOG	52	1.0	95.8
MINNOW	47	0.9	96.7
UNKNOWN FISH	43	0.9	97.6
SHEEPSHEAD	29	0.6	98.2
STRIPED BASS	24	0.5	98.7
PIGFISH	19	0.4	99.0
ATLANTIC SPADEFISH	6	0.1	99.2
REDDRUM	6	0.1	99.3
STARGAZER	5	0.1	99.4
MULLET	4	0.1	99.5
PUFFERFISH	4	0.1	99.5
BUTTERFISH	3	0.1	99.6
ATLANTIC MENHADEN	2	0.0	99.6
HOGCHOKER	2	0.0	99.7
BLACK DRUM	2	0.0	99.7
SOLE	2	0.0	99.8
STRIPED BURRFISH	2	0.0	99.8
BOWFIN	1	0.0	99.8
CUNNER	1	0.0	99.8
PORGY SPP	1	0.0	99.9
SCUP	1	0.0	99.9
BLUEFISH	1	0.0	99.9
FEATHER BLENNY	1	0.0	99.9
PINFISH	1	0.0	99.9
SHAD	1	0.0	100.0
SPADEFISH	1	0.0	100.0
STRIPED KILLIFISH	1	0.0	100.0

5,012 fish bycatch

9 species groups made up >95% of catch

Oyster toadfish
Black Sea Bass
Atlantic croaker
America eel
White perch
Catfish
Spot
Flounder
Tautog



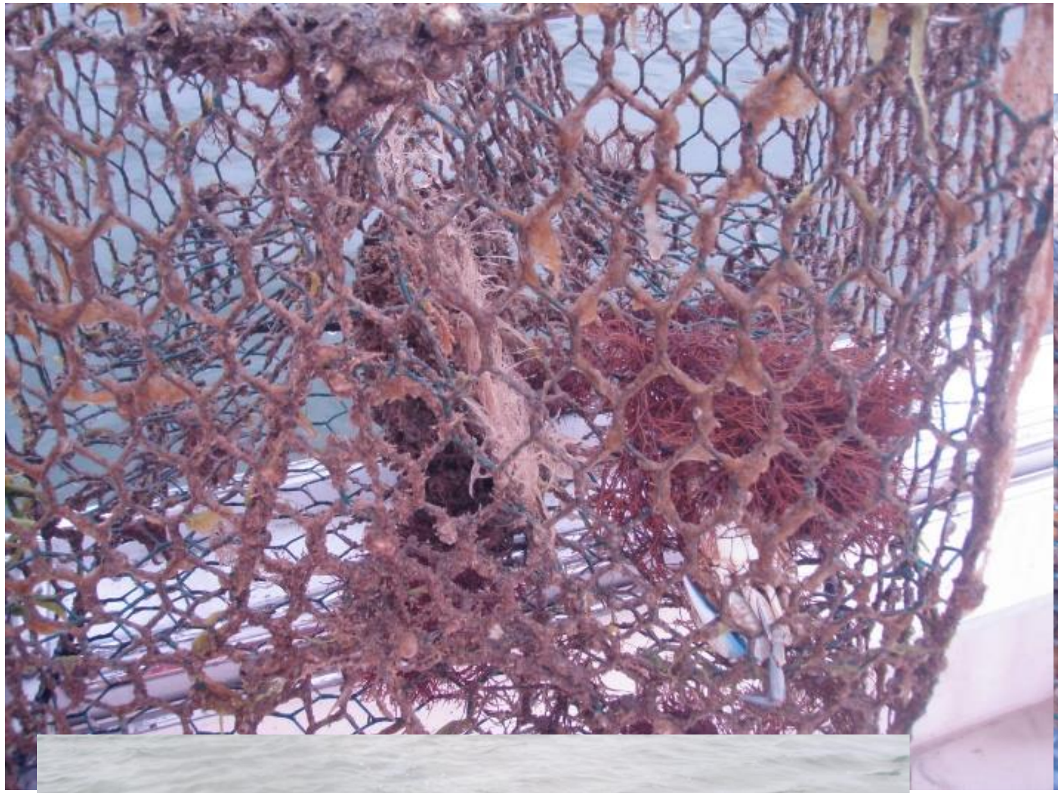











First	Last	YEARS IN PROGRAM	TOTAL CRAB POTS REMOVED	TOTAL PAYMENT	TOTAL BLUE CRABS FOUND IN POTS	TOTAL FISH FOUND IN POTS	TYPE OF FISH FOUND IN POTS
KENNETH L.	BOGGESS	4	182	$56,897	73	45	eel, oyster toadfish, tautog, menhaden, catfish
BILLY LEE	BONNIVILLE	3	1,055	$44,550	464	238	black seabass, oyster toadfish, flounder, eel, croaker, butterfish, catfish, white perch
JOHN T.	BONNIVILLE	4	1,233	$60,123	128	289	black seabass, oyster toadfish, flounder, eel, croaker, butterfish, catfish, Atlantic spadefish, tautog, spot
DAVID M	BRADSHAW	2	81	$26,240	69	18	black seabass, oyster toadfish, eel, tautog,
EDWARD V	CHARNOCK	4	898	$58,058	1089	162	black seabass, croaker, oyster toadfish, pigfish, perch,
JAMES D	CLOSE	4	651	$61,663	261	195	oyster toadfish, croaker, perch, catfish, spot, flounder,
JAMES E	CROCKETT	4	683	$58,693	711	41	Black seabass, oyster toadfish, croaker, eel, spot, puffer fish, stargazer, menhaden
CHARLES R	CROCKETT	4	591	$60,562	864	33	Black seabass, flounder, croaker, oyster toadfish, stargazer, spot, Atlantic spadefish
ANTHONY S	CZARNIAK	4	615	$57,775	278	6	blackseabass, oyster toadfish
DENNIS P	DALHEIM	4	551	$57,078	151	55	black seabass, oyster toadfish, eel, tautog, catfish, white perch
JAMES L	DAMERON	4	254	$57,363	54	40	oyster toadfish, spot, white perch, croaker, puffer
JEFFERY	DAMERON	4	188	$67,077	35	0	no fish
JASON L	DAMERON	4	82	$58,595	59	15	Atlantic croaker,, oyster toadfish, spot
CECIL E	DAMERON	4	42	$54,572	25	4	Atlantic croaker, spot, puffer
RONALD L	DENSTON SR	4	442	$58,000	64	2	no fish
MICHAEL D	DIGGS	4	267	$57,475	126	0	no fish
KENNETH N	DIGGS	4	257	$58,371	251	71	eel, oyster toadfish, tautog
DEAN N	DISE	4	361	$59,541	561	29	Black sea bass, croaker, eel, oyster toadfish, catfish
JOHN	DRYDEN	3	462	$42,571	488	83	Puffer, oyster toadfish, eel, flounder, pigfish, spot, sheepshead, strip killifish, tautog
JAMES W	ESKRIDGE	4	462	$59,536	748	57	Black sea bass, croaker, oyster toadfish, catfish, strip bass
TY D	FARRINGTON	4	934	$58,247	983	668	eel, oyster toadfish, catfish, mullet, perch, croaker, spot, white perch, bunker
GREG E	FINNEY	4	308	$56,681	210	57	Black sea bass, croaker, oyster toadfish, flounder, blue fish, eel
WILLIAM H	FORREST	4	321	$56,934	140	46	eel, oyster toadfish, tautog, flounder, spot
JOHN W	FREEMAN	4	346	$56,707	168	55	croaker, spot, catfish, oyster toadfish



First	Last	YEARS IN PROGRAM	TOTAL CRAB POTS REMOVED	TOTAL PAYMENT	TOTAL BLUE CRABS FOUND IN POTS	TOTAL FISH FOUND IN POTS	TYPE OF FISH FOUND IN POTS
RICHARD	GREEN	4	798	$59,430	356	142	black seabass, oyster toadfish, flounder, eel, croaker, catfish, Atlantic spadefish, tautog, spot, perch, sheepshead, sole
JOHN S	GREEN	2	124	$29,294	9	36	croaker, spot, white perch, eel, oyster toadfish
MARK A.	HAYNIE	4	441	$57,081	341	28	croaker, spot, black sea bass, oyster toadfish
VERNON G.	HAYWOOD	4	330	$50,666	173	102	croaker, flounder, sheepshead, oyster toadfish
WILLIAM N	HAYWOOD	4	160	$56,515	71	23	croaker, flounder, bowfin, hogchocker, oyster toadfish, eel, perch
JEREMY S	HEADLEY	4	697	$61,195	758	61	Black sea bass, croaker, oyster toadfish, flounder, perch, tautog, red drum, spot, eel
ROY C	HEADLY	4	206	$64,805	82	4	Black sea bass, croaker, perch
EDWARD	HOGGE, JR	3	697	$42,382	370	390	Black sea bass, croaker, oyster toadfish, flounder, perch, tautog, spot, eel, sole, shad, sheepshead, stripped burred fish, white perch
JAMES	HUNLEY	3	275	$44,170	126	32	Black sea bass, croaker, oyster toadfish, flounder, perch, tautog, puffer, white perch, eel
ARTHUR J	HURST, JR	3	211	$41,978	291	24	croaker, tautog, eel, oyster toadfish
RONALD L	JETT	4	320	$65,233	230	64	black seabass, oyster toadfish, flounder, eel, croaker, puffer, perch, stripped sea bass, spot
WAYNE C	JUSTIS	4	648	$60,070	454	55	croaker, spot, black drum oyster toadfish, eel, sheepshead, cunner,
EARL L	KELLUM	2	726	$25,254	229	118	oyster toadfish, croaker, perch, spot, flounder, porgy, pin fish, tautog, striped burrfish
EDWARD F	LANDON JR	4	527	$58,555	382	199	Black sea bass, croaker, oyster toadfish, flounder, white perch, shadefish, catfish
EDWARD F	LANDON, SR	4	417	$60,279	666	39	Black sea bass, croaker, oyster toadfish, spot
HARRY S	MARSHALL, JR	4	201	$61,870	95	0	no fish
JOHN	MASIAK	4	355	$57,840	171	73	croaker, sheepshead, black sea bass, oyster toadfish, eel, white perch
MAURY R	MCELLIGOTT, JR	4	241	$59,046	59	128	oyster toadfish, croaker, perch, eel
DON M.	MILES	4	507	$56,372	69	7	oyster toadfish
DON M.	MILES II	4	321	$56,035	60	4	oyster toadfish
TRACY A	MOORE	4	406	$61,564	975	94	black seabass, oyster toadfish, flounder, eel, croaker, white perch, catfish
JOHN	MORRIS, JR	4	1,428	$61,503	680	63	black seabass, oyster toadfish, flounder, red drum, croaker, spot, striped bass, catfish
BARRY M.	PARKS	4	624	$58,171	262	6	black seabass, croaker, catfish
KIM A	PARKS, JR	4	313	$58,226	201	6	oyster toadfish, croaker
BRUCE A	PARKS, SR	3	452	$42,113	708	30	black seabass, oyster toadfish, spot, croaker , catfish, puffer



First	Last	YEARS IN PROGRAM	TOTAL CRAB POTS REMOVED	TOTAL PAYMENT	TOTAL BLUE CRABS FOUND IN POTS	TOTAL FISH FOUND IN POTS	TYPE OF FISH FOUND IN POTS
GERHARD E	PEEMOELLER	4	164	$62,057	77	45	oyster toadfish, croaker, tautog, eel, sheepshead
KELLY	PRICE	4	1,120	$56,649	1331	64	oyster toadfish, tautog, strip bass, mullet,
RICHARD D.	PRUITT	4	557	$54,469	6	0	no fish
EUGENE L	PRUITT	4	563	$60,992	746	61	black seabass, oyster toadfish, croaker
ANTHONY K	PRUITT	4	524	$60,240	1378	50	black seabass, oyster toadfish, croaker
ALFRED A	PRUITT	4	476	$57,587	19	0	no fish
TIMOTHY J	PRUITT	4	285	$58,623	204	0	no fish
ALTON C.	PRUITT, JR	4	591	$61,625	1308	15	black seabass, oyster toadfish, croaker, striped bass
FREDDIE K.	PRUITT, JR	4	374	$59,972	1020	4	black seabass, oyster toadfish, striped bass
MARK S	PRUITT, SR	4	748	$57,667	575	27	black seabass, oyster toadfish, flounder, white perch, striped bass, eel
DONALD L	SMITH	2	89	$24,386	27	11	oyster toadfish, croaker, striped bass
LESLIE L	TURNER, III	3	328	$41,460	374	3	oyster toadfish, croaker
EDWARD R	VRABLITZ	4	498	$63,705	219	142	oyster toadfish, croaker, flounder, spot, eel, tautog, white perch
LLOYD C.	WALLACE	4	489	$56,112	354	34	oyster toadfish, black drum
MICHAEL W	WATKINS	4	317	$59,221	167	10	oyster toadfish, tautog, white perch
DANIEL B	WEST	4	663	$59,887	472	242	black seabass, oyster toadfish, flounder, eel, croaker, spot, sheepshead
MARK	WEST	4	352	$60,345	120	202	striped bass, oyster toadfish, flounder, sheepshead, tautog
JONATHON P	WHEATLEY	4	557	$58,481	144	7	black seabass, oyster toadfish
FREDDIE L.	WHEATLEY, JR	4	451	$61,602	878	46	oyster toadfish, spot , catfish, white perch
WILLIAM K	WILMER	4	196	$59,266	56	99	black seabass, oyster toadfish, spot, eel , catfish, white perch
TIMOTHY A	WIVELL	2	680	$25,821	0	1	Porgy
TOTALS			32,713	$3,853,127	25,293	5,000	



For years 2012-2014							
First	Last	YEARS IN PROGRAM	TOTAL CRAB POTS REMOVED	TOTAL PAYMENT	TOTAL BLUE CRABS FOUND IN POTS	TOTAL FISH FOUND IN POTS	TYPE OF FISH FOUND IN POTS
Ed	Charnock	2013-2014	119	$10,560	246	4	oyster toad fish, striped burred fish
Richard	Green	2013-2014	148	$10,560	88	47	oyster toad fish, eel, perch, catfish, speckled trout
EC	Hogge	2013-2014	169	$10,560	57	205	oyster toad fish, eel, perch, catfish, black seabass, porgy, croaker, flounder, red drum, sheepshead, tautog
Wayne	Justis	2013-2014	174	$10,560	191	11	oyster toad fish, flounder, sheepshead, tautog
Earl	Kellum	2013-2014	186	$10,560	101	36	oyster toad fish, flounder, sheepshead, Eel, Black seabass
Kelly	Price	2013-2014	201	$10,560	205	4	oyster toad fish, Tautog
Tim	Wivell	2013-2014	264	$10,560	0	0	
Ed	Charnock	2012-2013	180	$9,900	0	5	oyster toadfish, spade fish, stripped bass
Richard	Green	2012-2013	218	$9,900	2	48	oyster toad fish, eel, perch, catfish, stripped seabass, croaker, flounder, sheepshead
EC	Hogge	2012-2013	131	$9,900	0	126	oyster toad fish, butterfly, red drum, sheepshead, tautog
Kelly	Price	2012-2013	197	$9,900	0	6	Spade fish, tautog, oyster toadfish
TOTALS			1,987	$113,520	890	492	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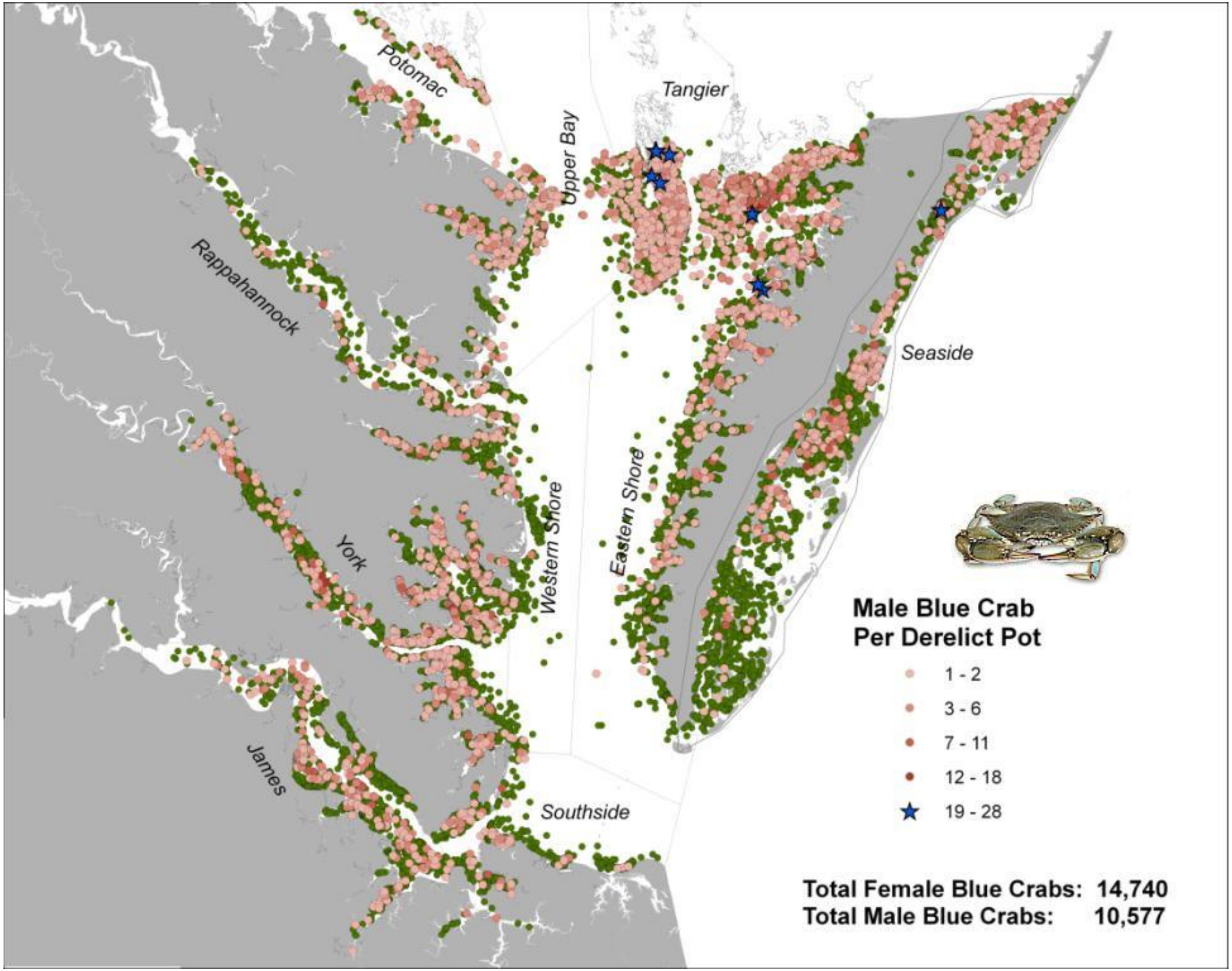
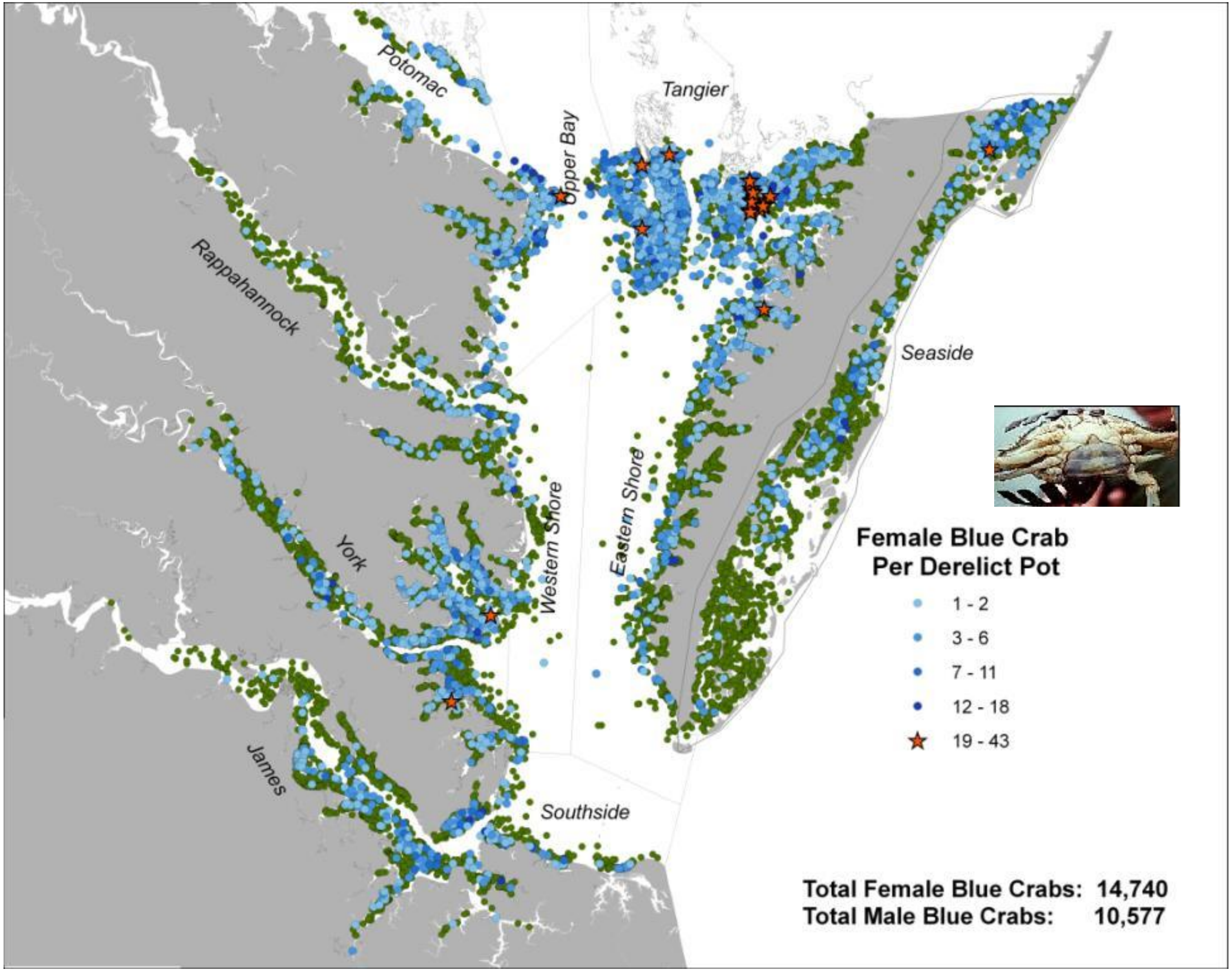
288
DO NOT PARK
WASTE MANAGEMENT
485-5700


Potomac
Tangier
Upper Bay
Rappahannock
Seaside
Eastern Shore
Western Shore
York
James
Southside
Male Blue Crab
Per Derelict Pot
1 - 2
3 - 6
7 - 11
12 - 18
19 - 28
Total Female Blue Crabs: 14,740
Total Male Blue Crabs: 10,577


Potomac
Tangier
Upper Bay
Rappahannock
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York
Western Shore
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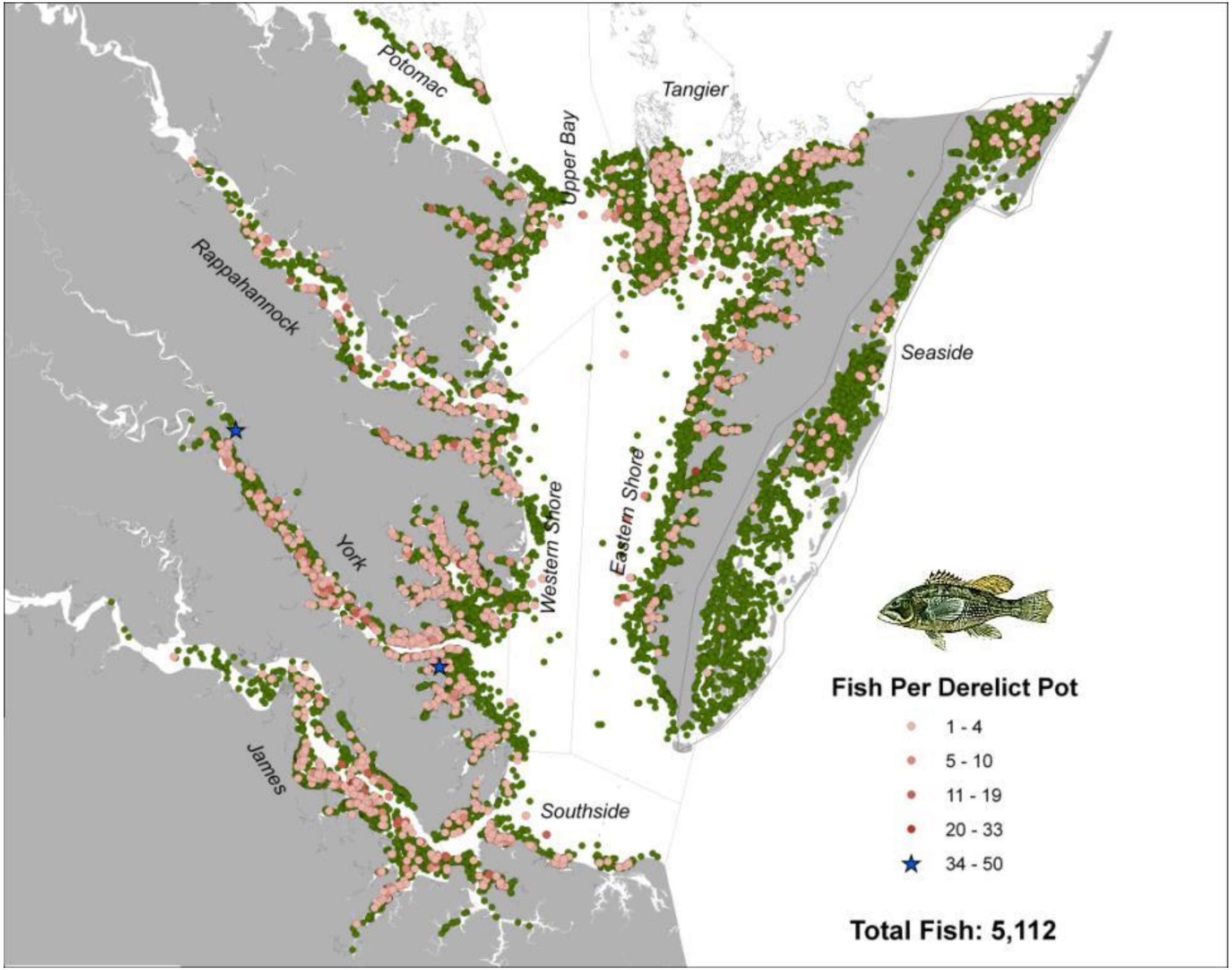
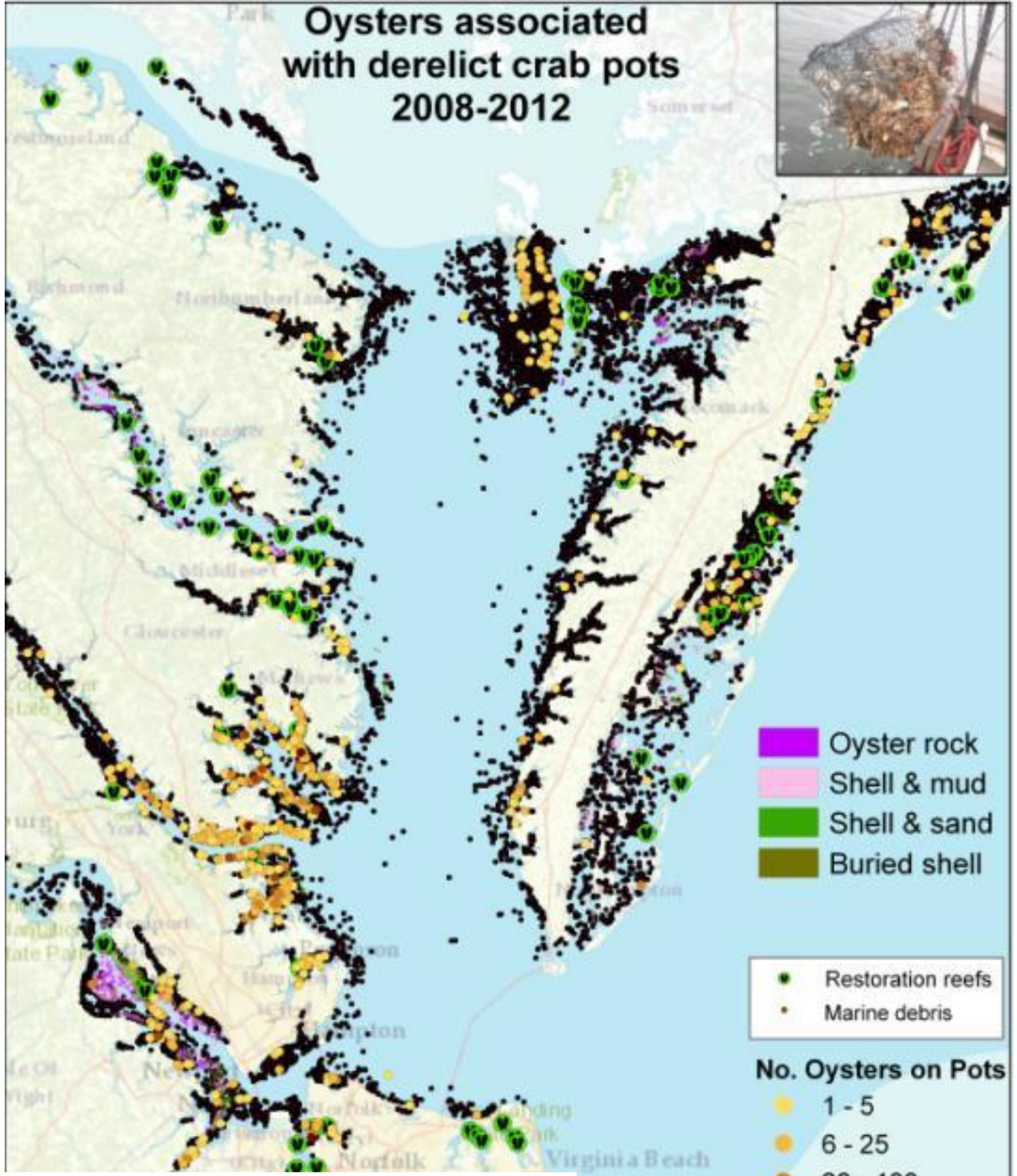
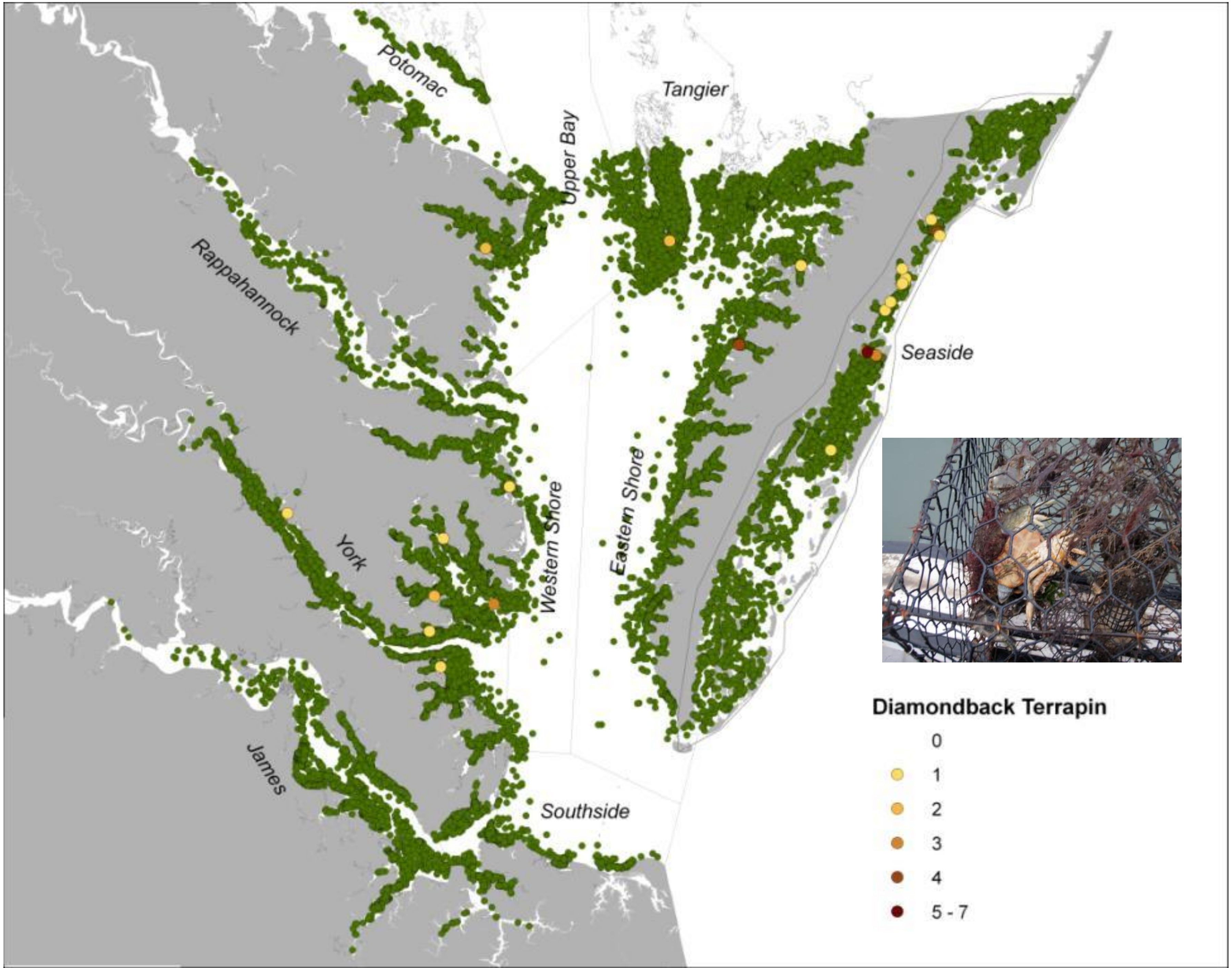
Southside
Female Blue Crab
Per Derelict Pot
1 - 2
3 - 6
7 - 11
12 - 18
19 - 43
Total Female Blue Crabs: 14,740
Total Male Blue Crabs: 10,577


Potomac
Tangier
Upper Bay
Rappahannock
Seaside
York
Western Shore
Eastern Shore
James
Southside
Fish Per Derelict Pot
1 - 4
5 - 10
11 - 19
20 - 33
34 - 50
Total Fish: 5,112



872 pots with oyster growth

Approx 18,900 oysters


Potomac
Tangier
Upper Bay
Rappahannock
Seaside
Eastern Shore
Western Shore
York
James
Southside
Diamondback Terrapin
0
1
2
3
4
5 - 7

Location	Average of crab catch in pot/day (SD)	Average annual crab catch pot/day
James River [1]	0.27[1] ± (0.24)	0.13
N. Eastern Shore [2]	0.66[2] ± (0.37)	0.39
S. Eastern Shore [1]	0.37[1] ± (0.29)	0.19
York River[2]	0.28[2] ± (0.09)	0.16
Total[3]	0.41[3] ± (0.31)	0.22 ± (0.06)
Guthrie Creek (York River) [4,6]	0.26[4,6] ± (0.22)	0.15
Cedar Creek (York River) [4,6]	0.27[4,6] ± (0..22)	0.16
Sarah Creek (York River) [4,6]	0.20[4,6] ± (0.15)	0.12
York River [4,6]	0.21[4,6] ± (0.24)	0.12
Total [4,6]	0.24[4,6] ± (0.20)	0.14 ± (0.01)
Grand Total [5]	0.32[5] ± (0.15)	0.178 ± (0.03)

Number of days: [1] 183, [2] 214, [3] 199, [4] 211, [5] 205 in season. [6] Havens *et al.* 2008.

65 crabs captured annually, 46% retention, 83% mortality.

Mortality of 25 legal size crabs/pot/yr.

- Numbers reflect legal crabs only.
- Sampled over one week every three weeks for 8 months (April – Nov, York River).
- Additive only up to month and takes into account season and pot condition.
- Not baited initially.
- Individuals removed, including fish, to avoid self-baiting
- When extrapolating to an annual catch, catch rate for Dec – March was considered zero (likely resulting in an underestimate of catch).

Figure 2-11. Picture of a waterman retrieving a derelict trap from the mouth of the Patapsco River.

Figure 2-9. Picture of intact derelict crab traps on the deck of a waterman's vessel.

Figure 2-12. Picture of dead fish and blue crabs found in some derelict traps.

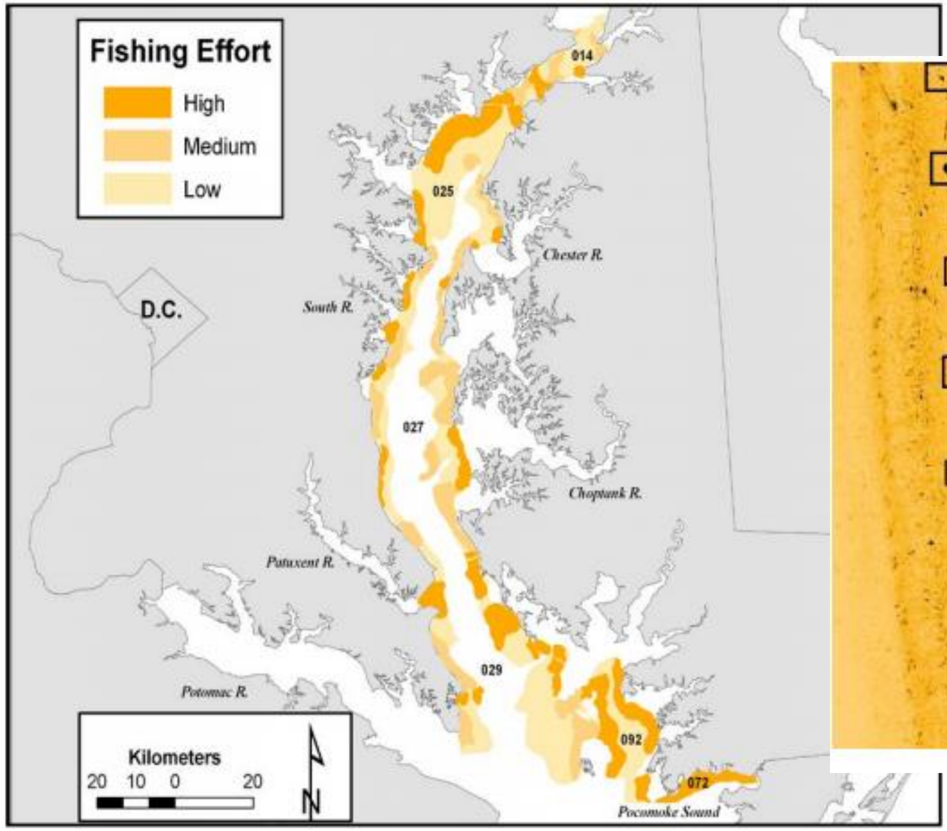
Oyster Recovery Partnership Program
Stephan Abel
Kelly Barnes
Steve Allen

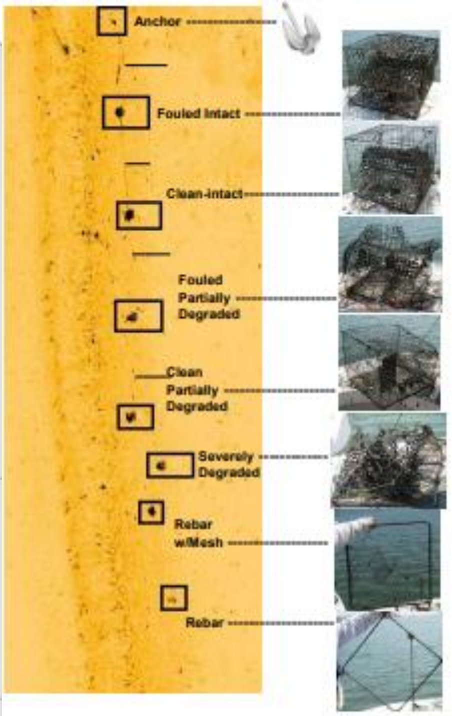
Applied Ecosystem Assessment Group
H. Ward Slacum Jr.
Lisa Methratta
Dave Wong
Ryan Corbin
Joe Williams
Jodi Dew-Baxter

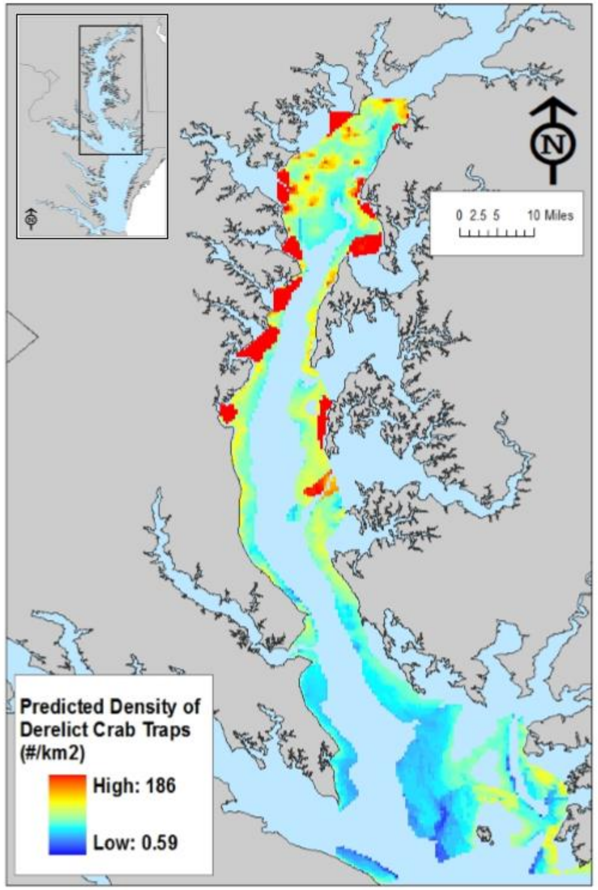
Maryland Department of Natural Resources
Lynn Fegley (Fisheries)
Brenda Davis (Fisheries)
Bob Conckright (MD Geological Survey)
Jeff Halka (MD Geological Survey)
Stephen VanRyswick (MD Geological Survey)
Richard Ortt (MD Geological Survey)
Rick Younger (Captain *R/V Kerhin*)
David White (Captain *R/V Miss Kay*)

NOAA Chesapeake Bay Office Habitat Team
Steve Giordano
Jay Lazar (NCBO/Versar, Inc.)
David Bruce (NCBO/Versar, Inc.)

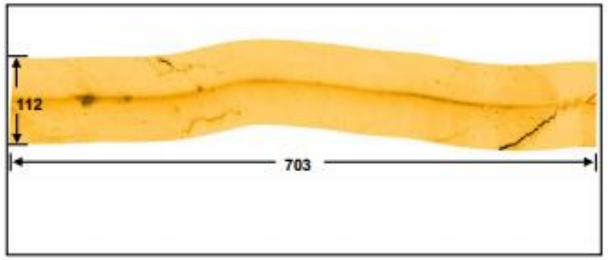
Maryland Waterman's Association and Individual Chesapeake Bay Waterman
359 Maryland Waterman and participants
Russel Dize
William "Buddy" Evans
Bob Gibson
JR Gross
Mark Kitching
Dwight Marshall
Tommy Zinn
Rick Morlock
Ben Parks
Mark Phillips
Henry Pratt
Greg Price
Larry Simns
Wayne Wilson
John Van Alstine







MDDNR annual effort survey used as guide to determine side-scan sonar transects (N=300)



2. An example of a typical side-scan sonar transect acquired during a six-minute vessel tow at 56 m range scale.

Table 3-2. The estimated number of derelict traps for each NOAA code. RSE=Relative standard error, SE=standard error, N=number of transects. †The estimate for NOAA code 014 is shown was based on data collected in a portion of a neighboring region (low fishing pressure areas of code 025; Section 3.2.4.1 for details). Therefore, the 28 transects used to make this estimate are a subset of the 47 transects conducted in code 025.

NOAA Code	# Traps	SE	RSE	N
014	8,857	2,389	0.27	28
025	29,426	5,146	0.17	47
027	21,635	3,172	0.15	68
029	12,386	1,620	0.13	56
072	3,093	641	0.21	24
092	9,170	982	0.11	90
Total	84,567	6,801	0.08	285

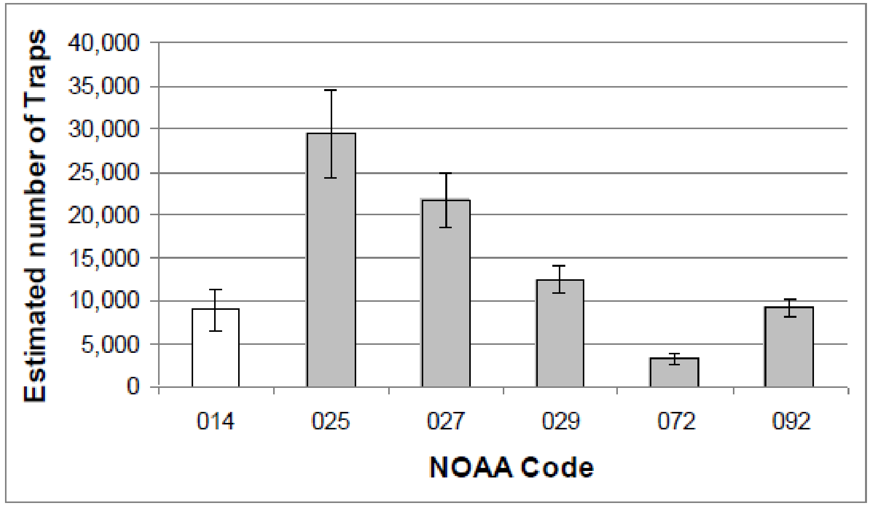
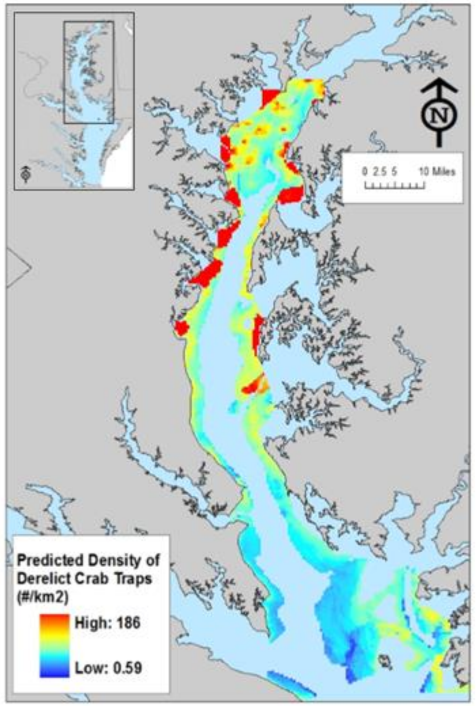
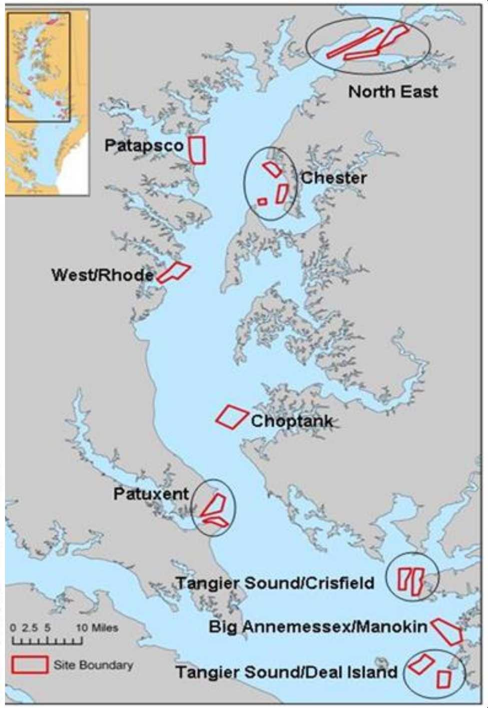
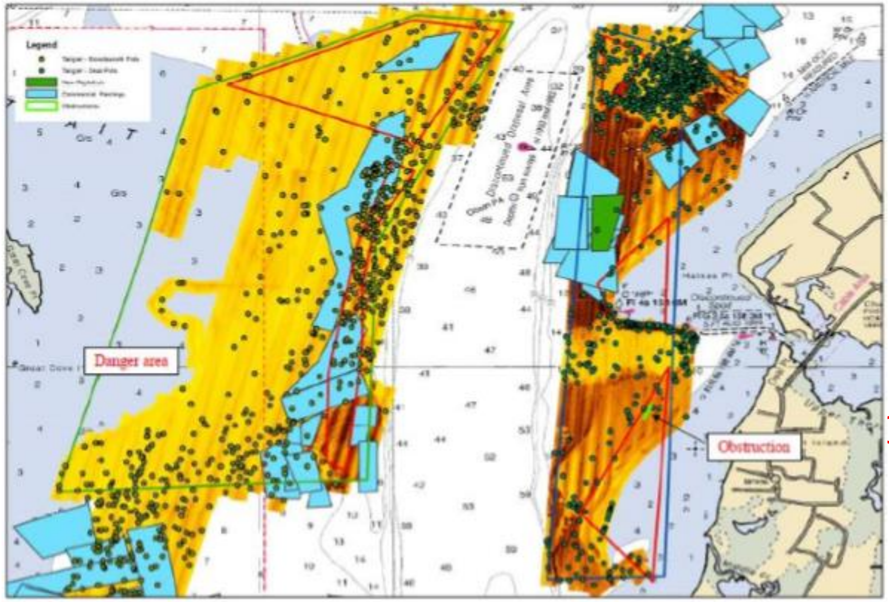


Figure 3-4. Estimated total number of derelict traps per NOAA code. Error bars represent ± 1 se of the total. NOAA code 014 is shown with a white bar to denote that the estimate for this region was based on data collected in a portion of a neighboring region (low fishing pressure areas of code 025; Section 3.2.4.1 for details).







Fish	Total # of Fish
Black Drum	1
Black Sea Bass	1
Blowfish	2
Blue Fish	1
Blue Gill	5
Catfish	17
Croaker	15
Eel	31
Goby	3
Hog Choker	4
Horseshoe Crab	6
Menhadden	7
Gizzard Shad	10
Naked Goby	4
Oyster Toadfish	707
Pickerel	1
Pumpkinseed	10
Striped bass	2
Shad	1
Skilletfish	1
Spot	11
Sunfish	30
Taug Taug	1
unknown fish remains	19
White Perch	264
Yellow Perch	56
Total Fish	**1210**
Crabs**	1369
# of Debris with Shellfish	1431

Type of Debris	Total # Debris
Anchor	40
Cable	38
Crab Trap	5064
Crab Trap Line	67
Eel Trap	103
Fish Trap	4
Fishing Line/Rod/Tackle	25
Frame Only	3460
Net	39
Other	156
Peeler Trap	580
Piece of Crab Trap Wire	1983
Piece of Peeler Trap	1
Rope	197
Tire	13
Trot Line	8
Wire	23
Total	**11,801**

River	# of Dead Crabs
Big Annemessex/Manokin	81
Chester	62
Choptank	43
North East	6
Patapsco	177
Patuxent	34
Tangier Sound (Crisfield)	118
Tangier Sound (Deal Island)	92
West/ Rhode	447
Total	**1060**

NCBO & Versar Inc. **Derelict Trap Simulation Study**

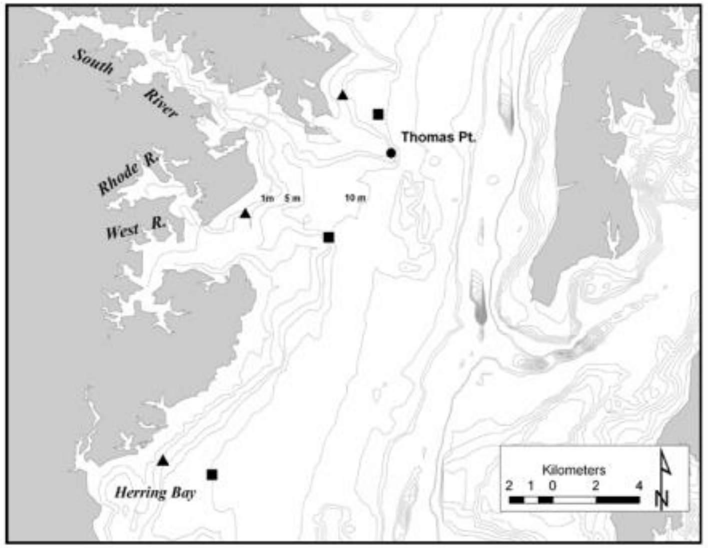
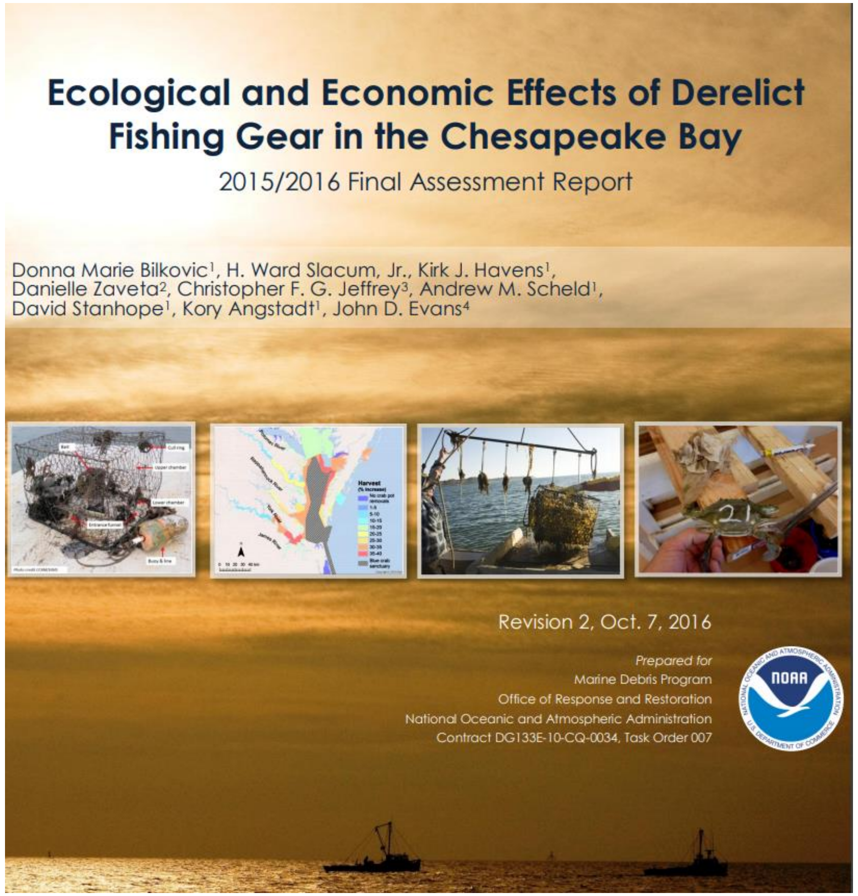


Figure 4-1. Map of three primary sampling locations in the Maryland Chesapeake Bay where experimental crab traps were deployed and sampled in two depth strata from October 2006 March 2008. Triangles represent sites in 1-3 m depths and squares represent sites in 5-10 m.

NCBO & Versar Inc. **Derelict Trap Simulation Study**

Figure 4-5. Picture of a tagged male blue crab with smaller newly recruited male crab in the top chamber of a trap at the Herring Bay deep strata in August 2007. The carcass of a spot is in the lower chamber under the crabs.

- Total of 80 traps sampled weekly over 14 month period (across seasons and trap condition) in three general locations at two depths.
- Traps pre-baited.
- Crabs measured and tagged and left in traps in same location.
- 1,096 individuals captured, 10 different species (705 blue crabs).
- Annual mortality of 20 crabs per trap, 79% legal size crabs, mortality of 16 legal crabs.



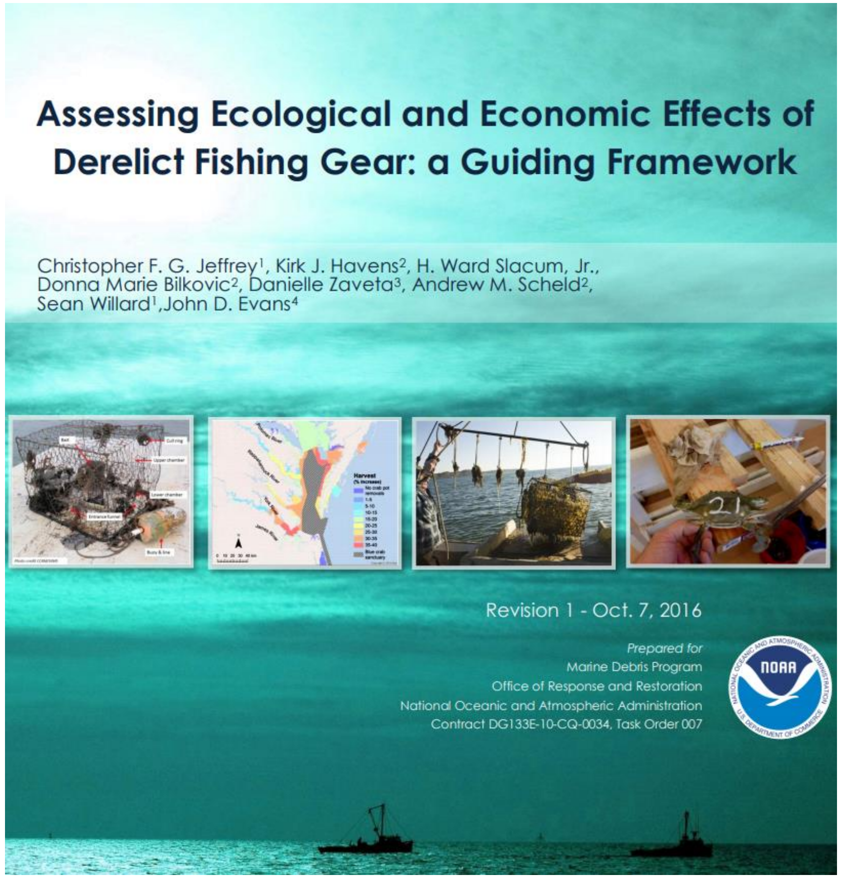
Ecological and Economic Effects of Derelict Fishing Gear in the Chesapeake Bay

2015/2016 Final Assessment Report

Donna Marie Bilkovic[1], H. Ward Slacum, Jr., Kirk J. Havens[1], Danielle Zaveta[2], Christopher F. G. Jeffrey[3], Andrew M. Scheld[1], David Stanhope[1], Kory Angstadt[1], John D. Evans[4]

Revision 2, Oct. 7, 2016

Prepared for
Marine Debris Program
Office of Response and Restoration
National Oceanic and Atmospheric Administration
Contract DG133E-10-CQ-0034, Task Order 007



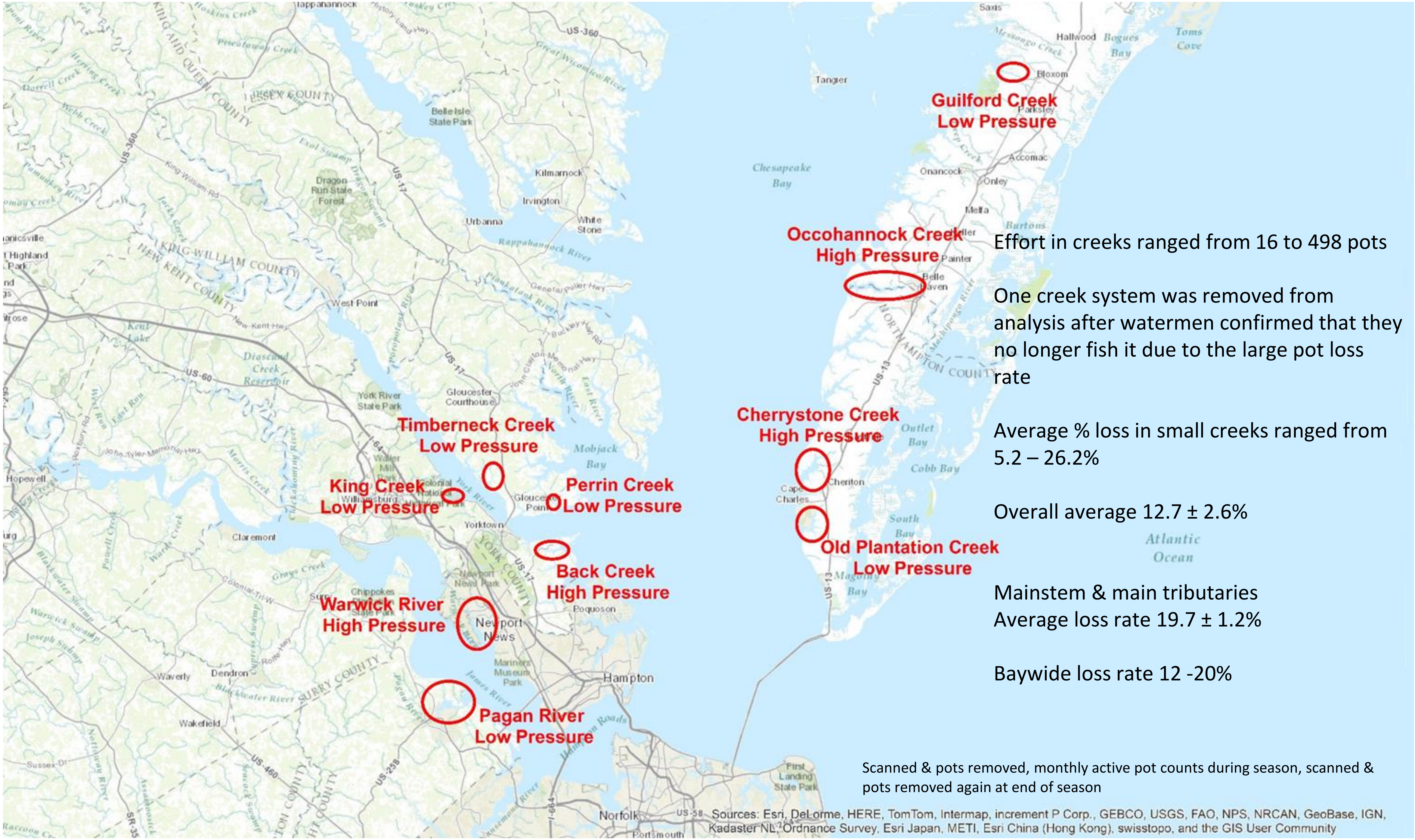
Assessing Ecological and Economic Effects of Derelict Fishing Gear: a Guiding Framework

Christopher F. G. Jeffrey[1], Kirk J. Havens[2], H. Ward Slacum, Jr., Donna Marie Bilkovic[2], Danielle Zaveta[3], Andrew M. Scheld[2], Sean Willard[1], John D. Evans[4]

Revision 1 - Oct. 7, 2016

Prepared for
Marine Debris Program
Office of Response and Restoration
National Oceanic and Atmospheric Administration
Contract DG133E-10-CQ-0034, Task Order 007

Reported pot loss of 20% in mainstem but little data on tributaries in VA



Effort in creeks ranged from 16 to 498 pots

One creek system was removed from analysis after watermen confirmed that they no longer fish it due to the large pot loss rate

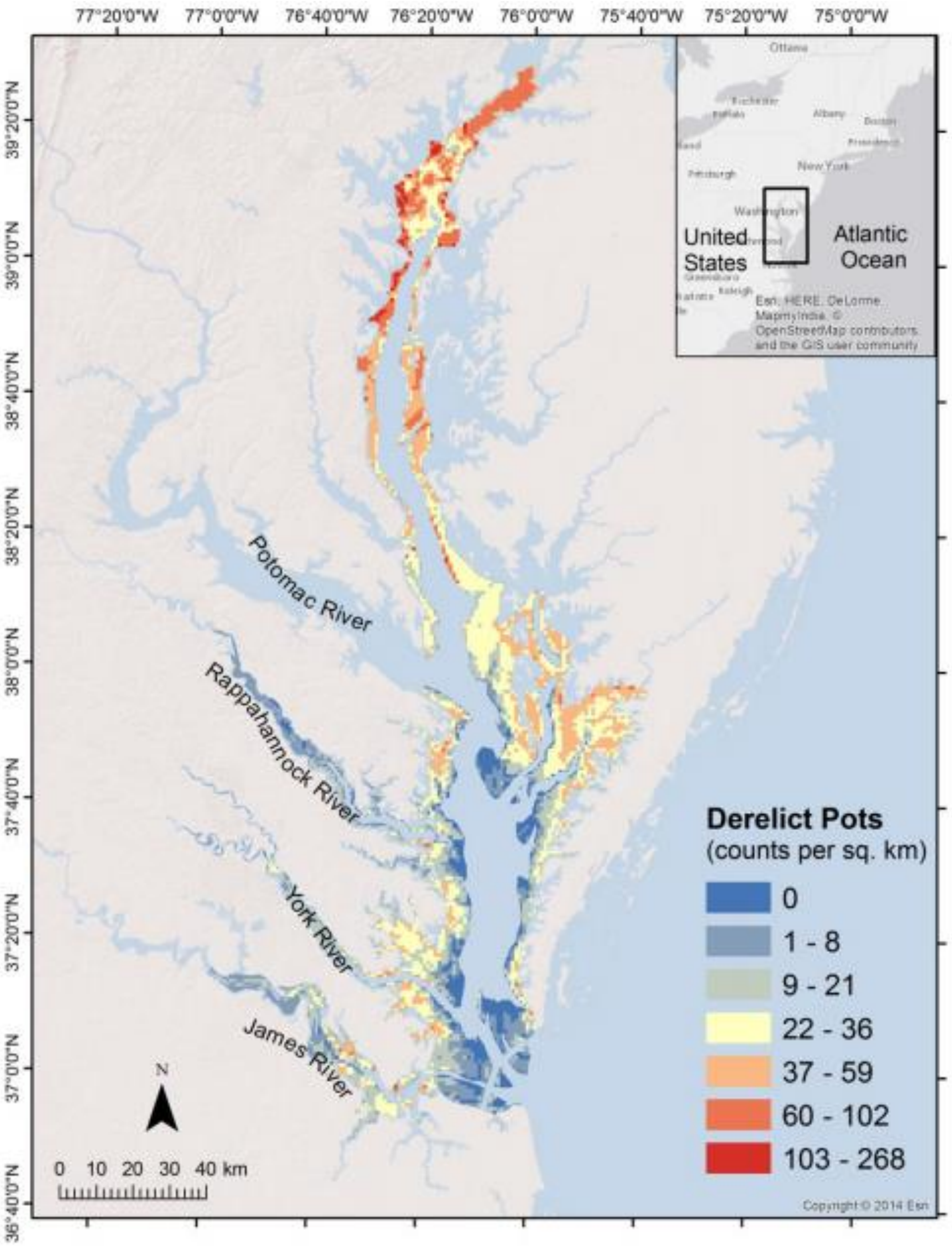
Average % loss in small creeks ranged from 5.2 – 26.2%

Overall average 12.7 ± 2.6%

Mainstem & main tributaries
Average loss rate 19.7 ± 1.2%

Baywide loss rate 12 -20%

Scanned & pots removed, monthly active pot counts during season, scanned & pots removed again at end of season

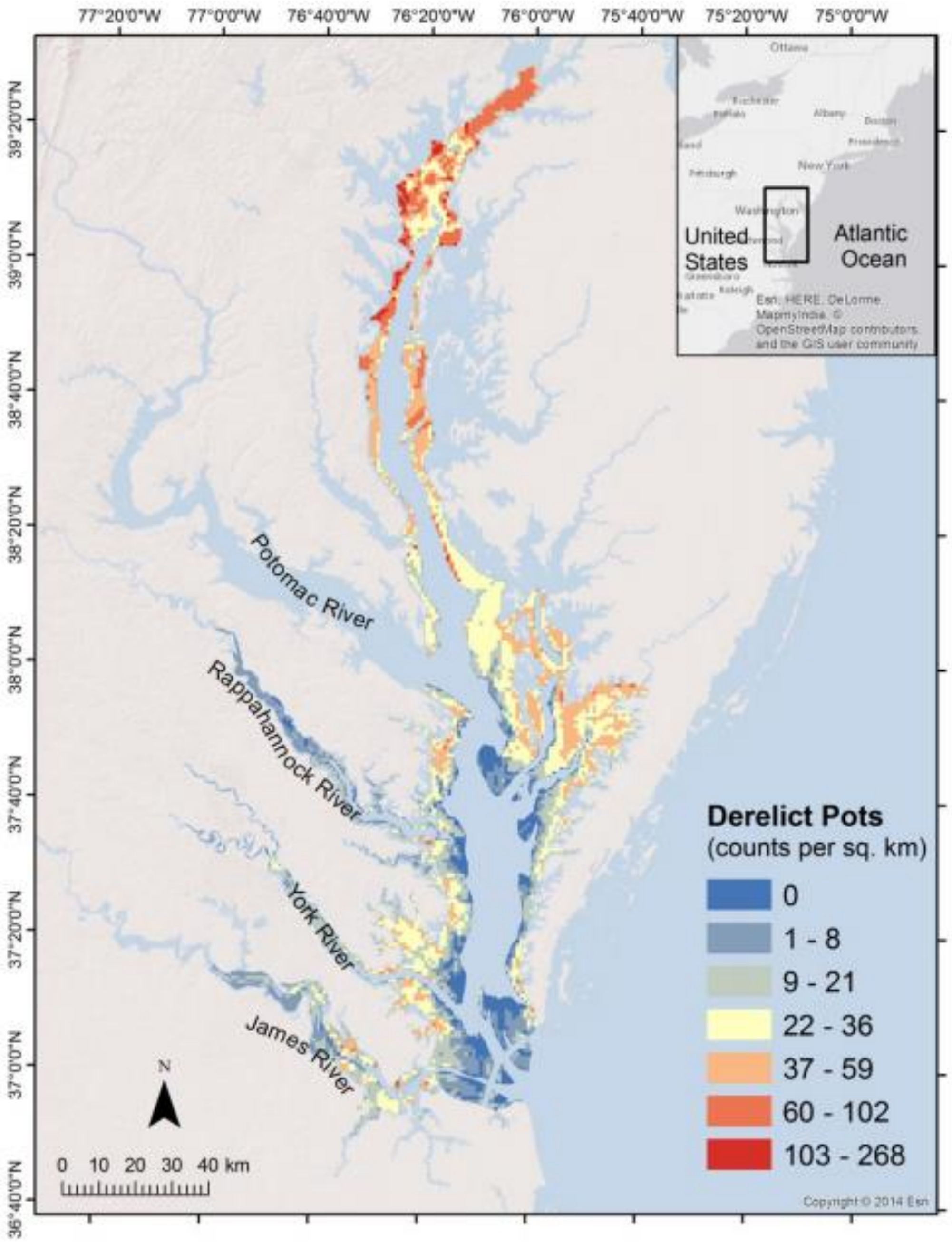


The GWR model developed for the 2016 report was based on a previous calibrated GWR model (Appendix A, Versar, Inc., 2009; Slacum et al. 2011b, 2013) that was ground-validated with experimental data (i.e. derelict trap retrievals) from areas identified to be hotspots in MD portion of the Chesapeake Bay.

This model was used by MD DNR to coordinate MD's derelict pot removal program and represents an experimentally calibrated model for estimating derelict trap abundance in sampled areas and predicting the same in unsampled locations of the Chesapeake Bay..

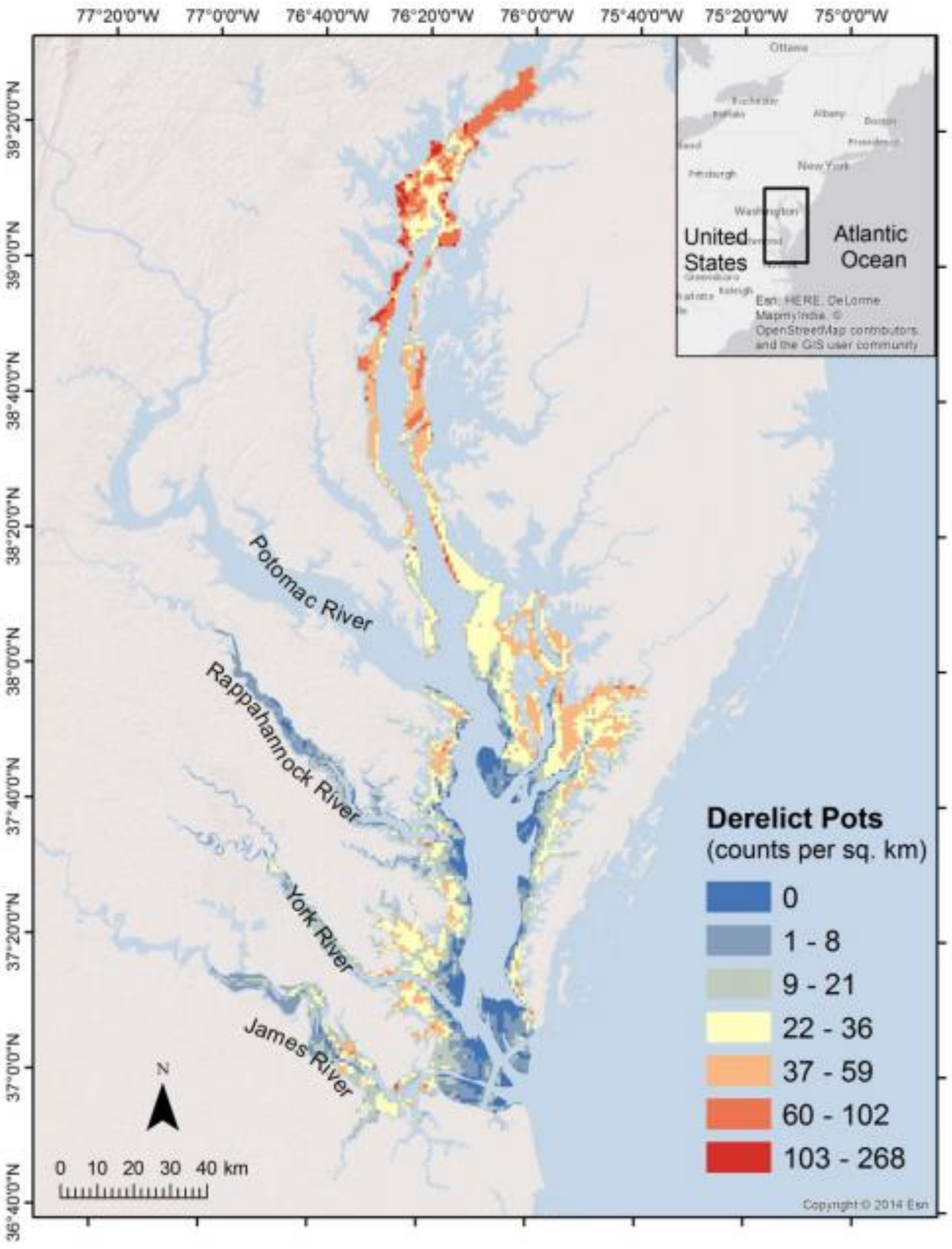
The Geographically Weighted Regression used 856 functional derelict pot locations to predict presence, absence, mean densities, and standard errors for 7,216 one kilometer grid cells within the Chesapeake Bay.

The bias associated with the estimate (i.e., +- standard error of the mean for each grid cell) amounted to a relative standard error of 26% suggesting that the total number of functional derelict pots range between 107,319 and 183,295 in the Chesapeake Bay with a mean of 145,233.



The derelict crab pot location data used to inform the GWR model consisted only of **functional** derelict pots (i.e., pots that were intact and capable of capturing bycatch and rated by watermen as pots they would put back in their line). The condition of the derelict pots were recorded upon retrieval as was the occurrence of bycatch. This was done in order to conservatively estimate the number of derelict pots at any given time in the Bay that were capable of capturing animals.

GWR allowed the evaluation of several factors expected to contribute to pot loss and determine the amount of influence that each of them contributed to the overall variance in derelict pot counts. This approach allowed identification through statistical inference a set of rational, meaningful, and relevant environmental and management correlates that influenced derelict pot distribution and abundance during the period of study.



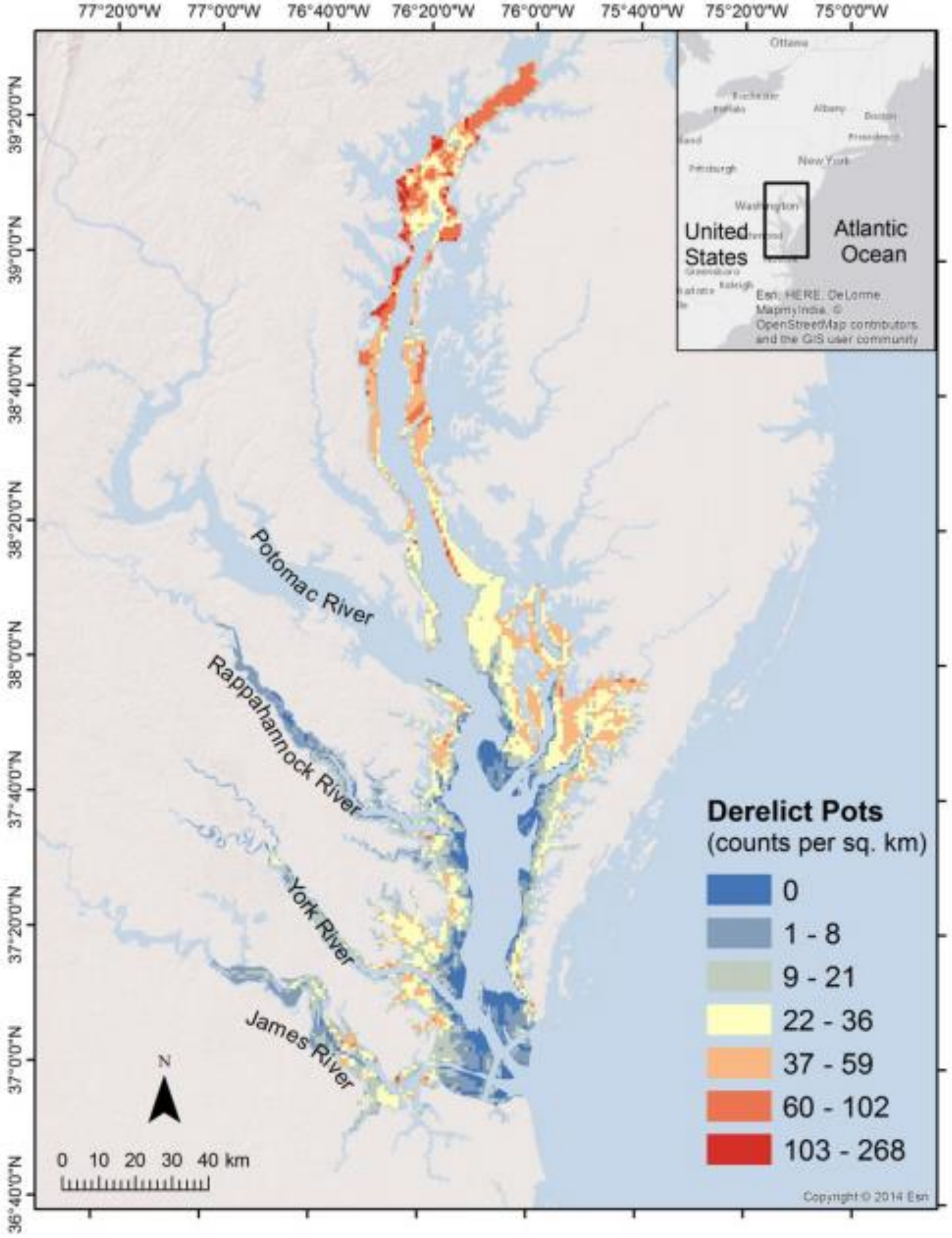
<u>Kriging models vs GWR-based models</u>

GWR is a well established approach for dealing with data plagued by spatial non-stationarity, spatial dependence and spatial autocorrelation [Brunsdon et al. (1996, 1998); Charlton and Fotheringham (2009); Lu et al. (2014)].

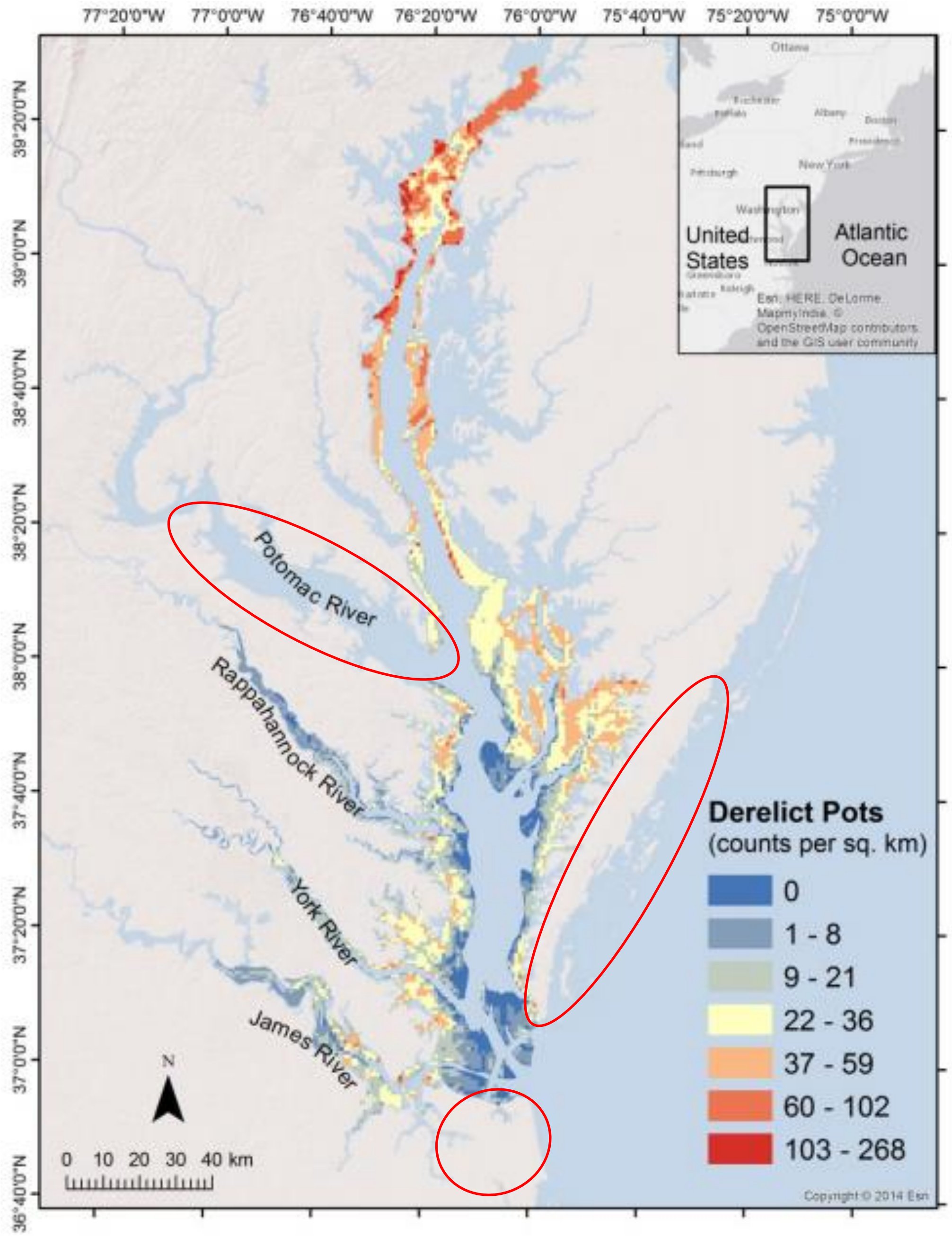
Although kriging provides the least biased estimates of statistical parameters, it assumes stationarity of the data; i.e. there is spatial homogeneity and that the mean and variance of response variables are the same at all locations within the area of interest. In contrast, GWR does not require the assumption of stationarity; but rather it allows for spatial variation in variables and correlations among interacting variables.

Because of the previous work done by NCBO & Versar Inc., we hypothesized that the distribution and average counts of derelict traps would vary locally within the Chesapeake Bay, and that GWR would better capture that inherent variation of the data.

Harris et al 2010 concluded that, “Universal Kriging, and GWR models were shown to out-perform the naive Multiple Linear Regression and Ordinary Kriging models' ... and "accounted for spatial autocorrelation".



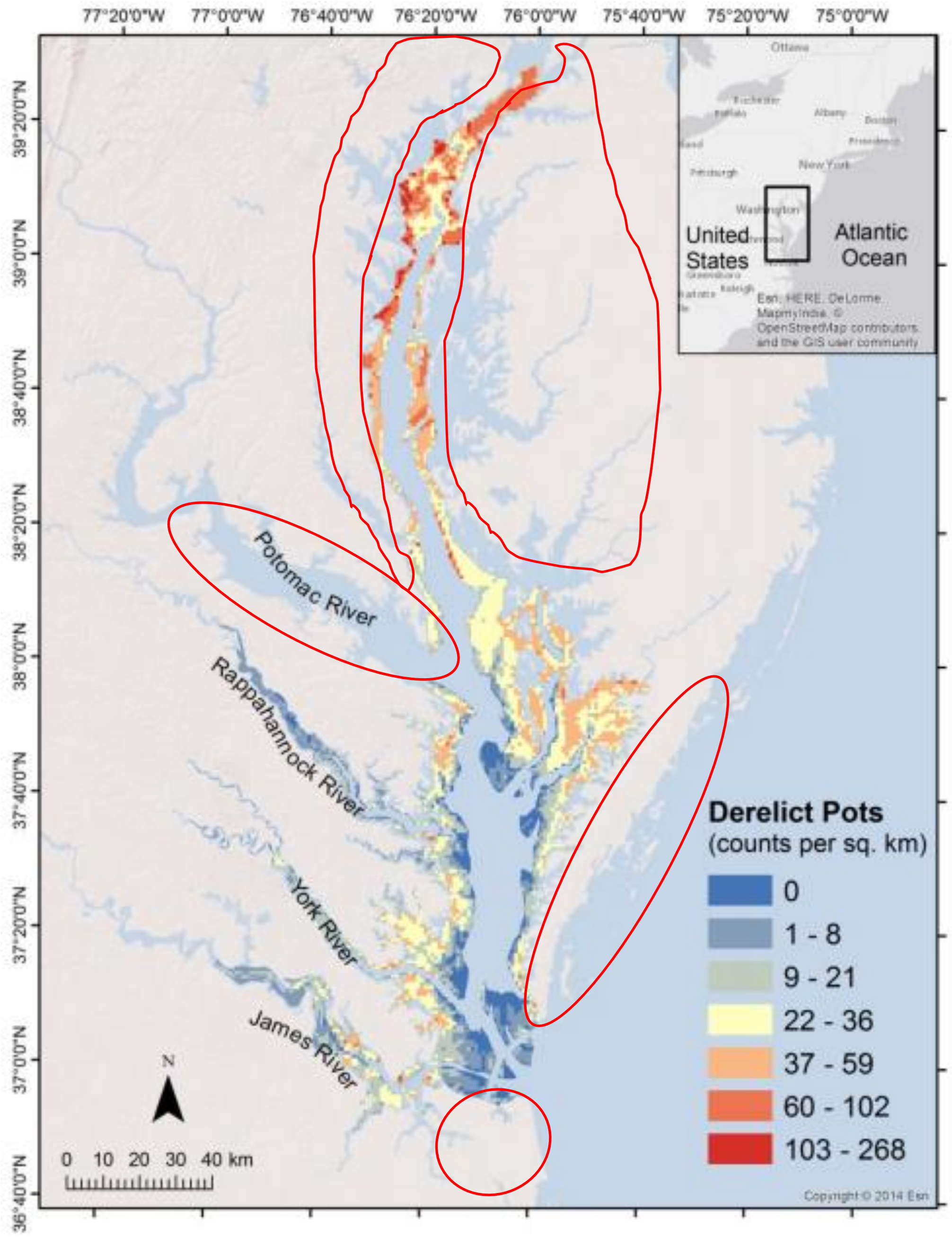
The GWR approach used in the DFG project represents a pragmatic, calibrated, and validated model for making statistical inferences and estimating the number of derelict traps.



≈ 145,000 (± 38,000) functional derelict pots in Chesapeake Bay

(107,000 – 183,000)

This number does not include pots lost in the Potomac River, the seaside eastern shore, or the Lynnhaven River or Backbay



≈ 145,000 (± 38,000) functional derelict pots in Chesapeake Bay

(107,000 – 183,000)

Or any recreational pot loss, particularly in the MD tributaries

145,000 with standard error of 26%
107,000 to 183,000 functional derelict pots
Average annual mortality (20.5 crabs/pot) of 2.2 million to 3.8 million legal size crabs (mean 3 million)

or

MD 58,185 (15.8 legal crabs) = 919,323
VA 87,048 (25 legal crabs) = <u>2,176,200</u>
3.1 million

<u>Other harvestable/legal size crab derelict pot annual mortality numbers</u>
North Carolina Division of Marine Fisheries (19 crabs)
Louisiana Department of Wildlife and Fisheries (25.8 crabs)

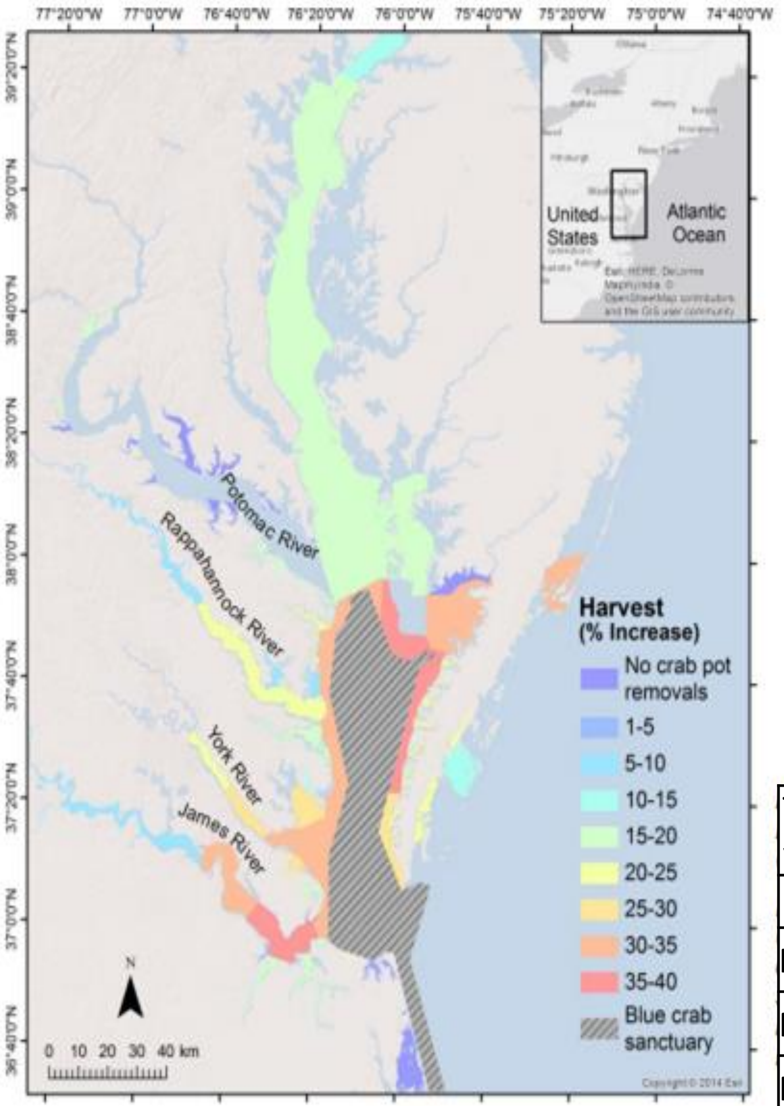
3 million crabs is approx 4% of the 2014 blue crab harvest of ≈ 73.5 million crabs (35 million lbs)

This mortality due to derelict pots is similar to what has been reported in other crustacean trap fisheries i.e Dungeness crab in Washington State & Alaska at 4.5% of harvest,
Maryland blue crab at 4% of harvest (NOAA CBO 2009).

From VMRC:

The conversion used in our database for numbers = 0.475 to convert numbers to lbs.

Harvest Impact – derelict pots reduce <u>gear efficiency</u>



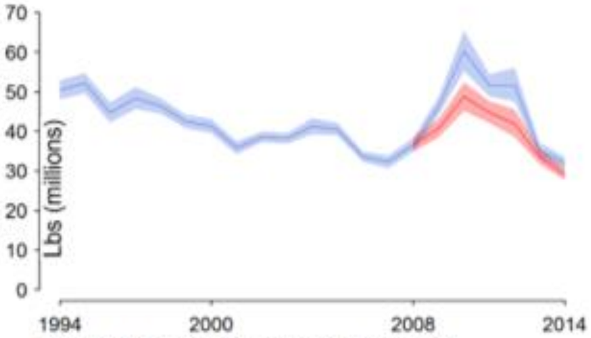


Figure 3-6. 95% Confidence Region of Chesapeake Bay Blue Crab Harvests with (Blue) and without (Red) Derelict Gear Removals.

Harvest & effort data obtained from 54 VMRC management zones in VA and 9 in MD where some areas had derelict pots removed and others did not.

Flexible Schaefer harvest function– spatially-explicit, allowed for area specific catchabilities, included effort, harvest, stock abundance, and derelict pot removals. Compared model predictions with and without removals.

Baywide: 38.17 million lbs increase in harvest with removals compared to that which might have resulted had no removals occurred

Table 3.7. Average harvest/pot before and after the first year of removals in areas with and without removals.

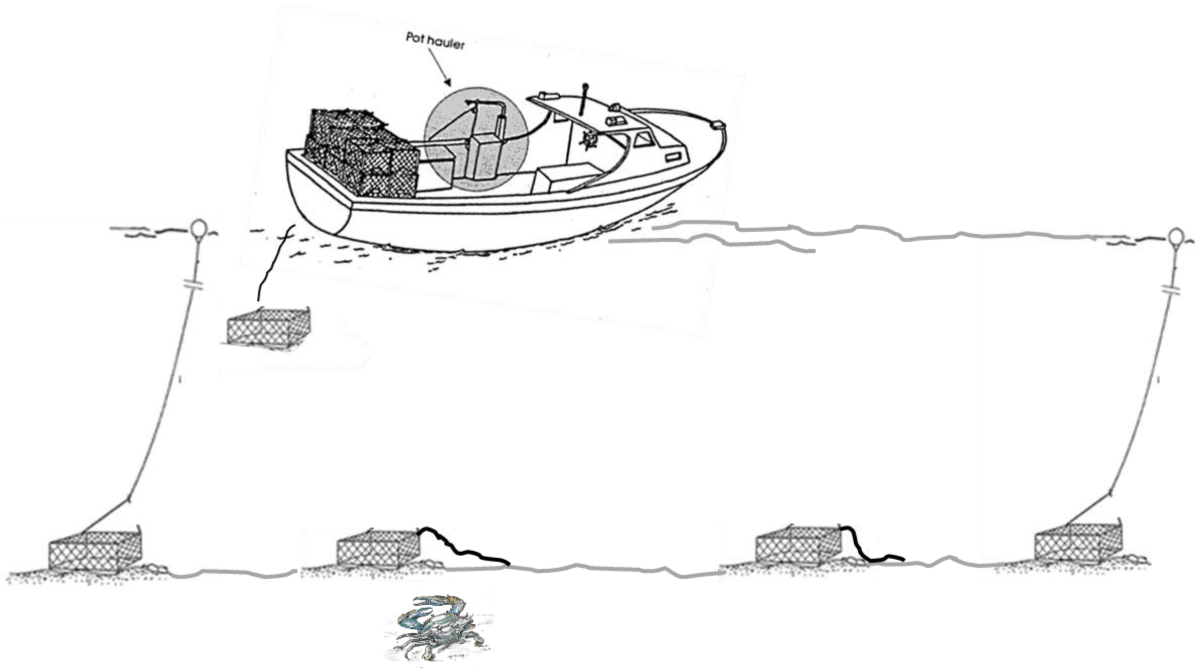
	Before (2008)	After (VA – 2009; MD – 2010)
Removals (VA, n=38)	1.84 (0.48)	2.06 (0.68)
No Removals (VA, n=12)	*1.56 (0.70)*	*1.50 (0.52)*
Removals (MD, n=5)	1.95 (0.66)	2.58 (0.51)
No Removals (MD, n=3)	*2.15 (0.47)*	*2.22 (0.46)*

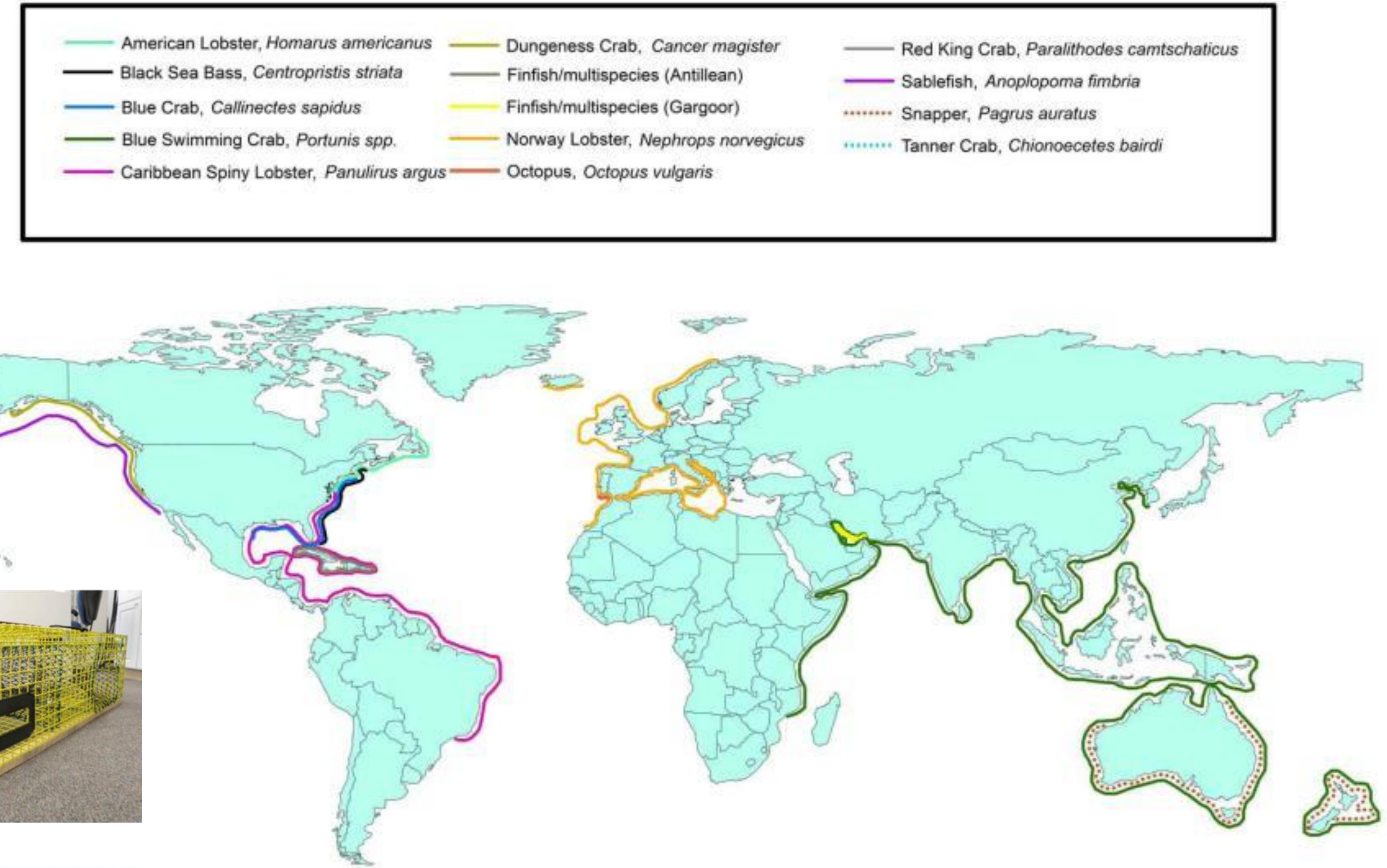
The Economics

43,968
Number of derelict crab pots removed from Chesapeake Bay between 2008-14

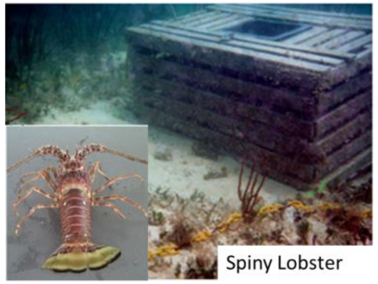
38,170,000
Estimated extra pounds of crabs caught in Chesapeake Bay between 2008-14 due to pot removals

$ 33,500,000
Estimated dollar value of increased harvest due to pot removals





Dungeness Crab



World Wide Pot Fisheries

NOAA
National Marine
Fisheries Service

Fishery Bulletin
established 1881

Factors driving the density of derelict crab pots and their associated bycatch in North Carolina waters

Christine M. Voss[1]
Joan A. Browder[2]
Andrew Wood[3]
Adriane Michaelis[3]

More than 1 million commercial crab pots are used annually in North Carolina, and an annual loss rate of 17% has been estimated by the North Carolina Division of Marine Fisheries (NCDMF[1]).

Future management considerations

Various management actions have been used to reduce the bycatch in DCPs: 1) reduction of the numbers of DCPs (e.g., as per NCDMF[9]); 2) promotion of the use of pots with panels that allow bycatch species and legally undersize blue crab to escape; and 3) promotion of the use of pots with replaceable biodegradable materials that will not remain intact for long after a pot becomes derelict.

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Kodiak Laboratory: Shellfish Assessment Program

Ghostly Killers: Effects of Lost Fishing Gear on Red King Crab in Womens Bay, Kodiak, Alaska

The mortality rates calculated from the data indicate that between 16% and 37% of the red king crabs with carapace length > 60 mm in Womens Bay were killed each year by ghost fishing gear.

Given that 60-mm crabs are vulnerable to ghost fishing and females of this size are at least 3 years from reproducing for the first time, we estimate that up to 75% of the female crabs in Womens Bay may have been killed in ghost fishing gear before successfully reproducing for the first time.

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ICES CIEM
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Effects of ghost fishing lobster traps in the Florida Keys FREE

Casey B. Butler, Thomas R. Matthews Author Notes

Commercial fishers reported an average annual loss of 18% of lobster traps, equivalent to 90,000–100,000 traps when 500,000–530,000 traps were used in the fishery. During years with hurricanes, trap losses have reached 65%.

The combined effects of greater lobster mortality and greater abundance of lost traps in inshore areas account for the majority of the estimated 637,622 lobsters that die in ghost traps annually.

The future of the lobster population and fishery in the Florida Keys depends on the success of these rules, but new avenues for management include identifying and encouraging the use of materials that degrade even more quickly, reducing buoy cut-offs that result in so many lost traps, and re-evaluating of the number of traps permitted.

Summary

- 107,000 to 183,000 (mean of 145,000) functional derelict pots in the Bay
- 2.2 million to 3.8 million legal sized crabs (mean 3 million) killed annually
- Significant economic impact due to cryptic gear competition resulting in active gear catch inefficiencies
- Derelict pot removal data shows a mobile blue crab population during winter suggesting potential issues with winter dredge survey assumptions of a buried and stationary sample population.
  Suggest the Sustainable Fisheries GIT collaborate with the Climate Change GIT to approach the Scientific and Technical Advisory Committee (STAC) to conduct an independent workshop on alternative sampling methods.
- Authors would be willing to assist SF GIT regarding derelict pot issues and SF GIT workplan.