

Evaluating the Recreational Blue Crab Fishery in Maryland using Mark-Recapture Methods



Matthew B. Ogburn, Robert F. Semmler, Rob Aguilar, Anson H. Hines



Smithsonian Environmental
Research Center

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Recreational creel surveys

Year	Crabs (M)	Male hard crabs	All males	% Total
2001	5.0	16.0%	13.6%	7.0%
2002	3.2	9.9%	9.6%	4.8%
2005	5.6	13.2%	12.6%	6.5%
2011	5.1	7.1%	8.4%	5.1%

Ashford and Jones 2001, 2002, 2005, 2011

Estimating statewide recreational harvest

$$\begin{array}{ccccc} & & \text{Rec} & & \\ & & \text{X} & \text{=} & \\ \text{Commercial} & & & & \text{Recreational} \\ \text{Harvest} & & \text{Comm} & & \text{Harvest} \end{array}$$

The diagram illustrates the formula for estimating statewide recreational harvest. It consists of three main components: Commercial Harvest, a ratio of Recreational to Commercial harvest rates, and Recreational Harvest. The Commercial Harvest is represented by a photo of a commercial fisherman in orange overalls. The ratio is represented by a fraction where the numerator is a photo of recreational anglers (a man and a woman) and the denominator is a photo of a commercial fisherman. The Recreational Harvest is represented by a photo of recreational anglers. The formula is: Commercial Harvest \times $\frac{\text{Recreational Harvest Rate}}{\text{Commercial Harvest Rate}}$ = Recreational Harvest. The photos include a pink tag with the number 33001 and the text: 'Please record: DATE, LOCATION, DEPTH, SEX, AGE'.

Estimating statewide recreational harvest

$$\text{Commercial Harvest} \times \frac{\text{Rec}}{\text{Comm}} = \text{Recreational Harvest}$$

The diagram illustrates the formula for estimating recreational harvest. It features three images: a commercial fisherman in orange gear handling a crab trap on the left; a recreational fisherman in a blue shirt and jeans crouching on a dock with a crab on the right; and a close-up of a pink tag with the number 33001 in the center. The tag also contains fields for 'Please record', 'Date, Location', 'Depth, Sex, Size', and 'Release Date'. The tag is shown in two positions, once above and once below a horizontal line, representing the 'Rec' and 'Comm' components of the ratio.

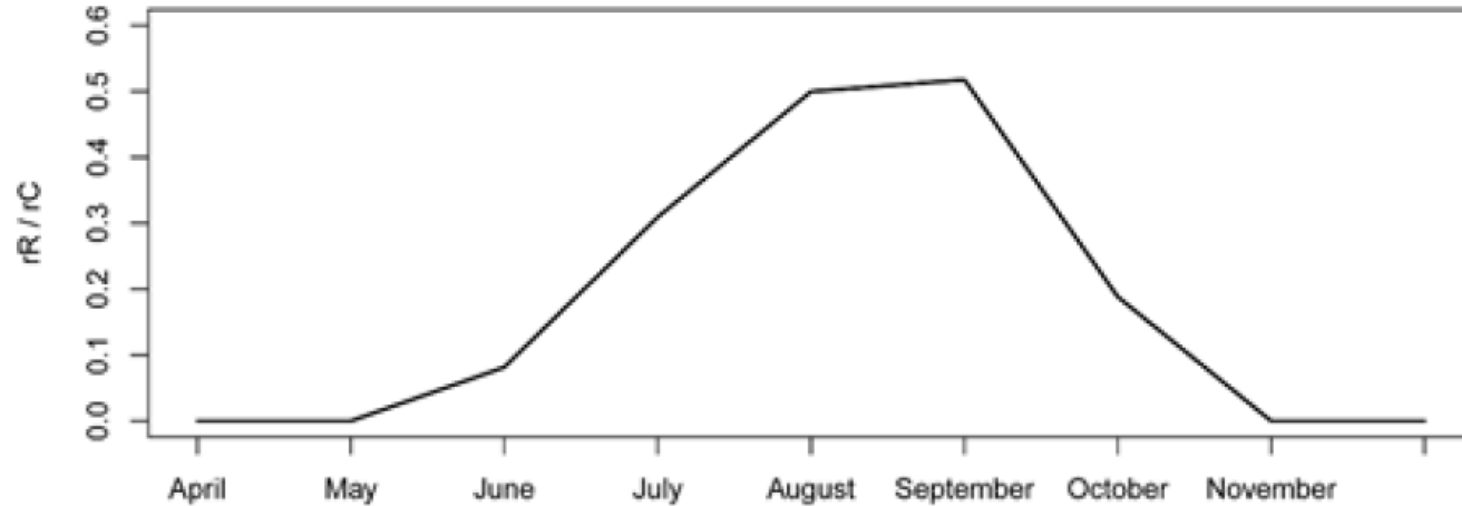
1. Estimate (Rec / Comm) for month of release at each site (commercial data are monthly)
2. Estimate (Rec / Comm) for sites without tagged crabs
3. Use seasonal relationship to determine (uR / uC) in other months

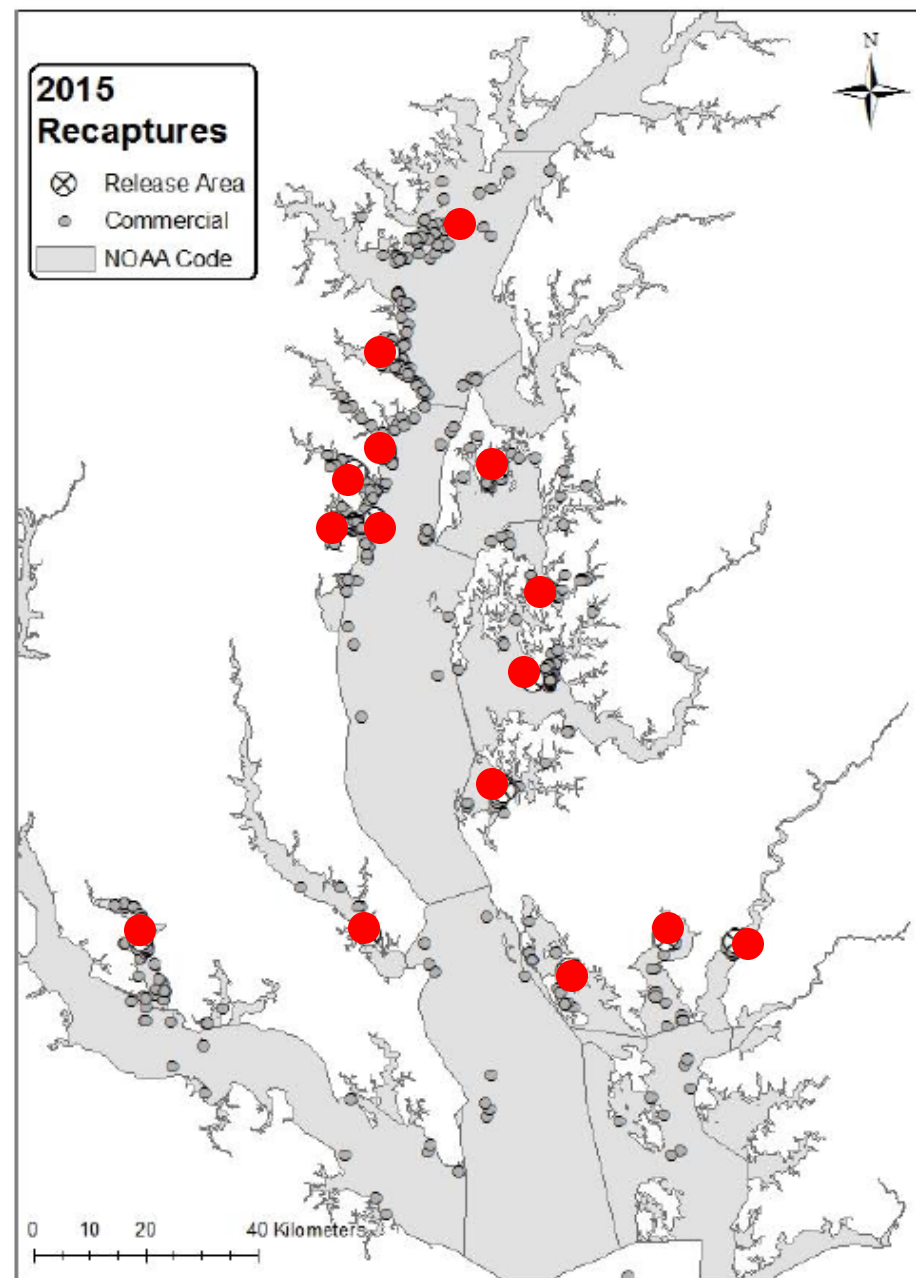
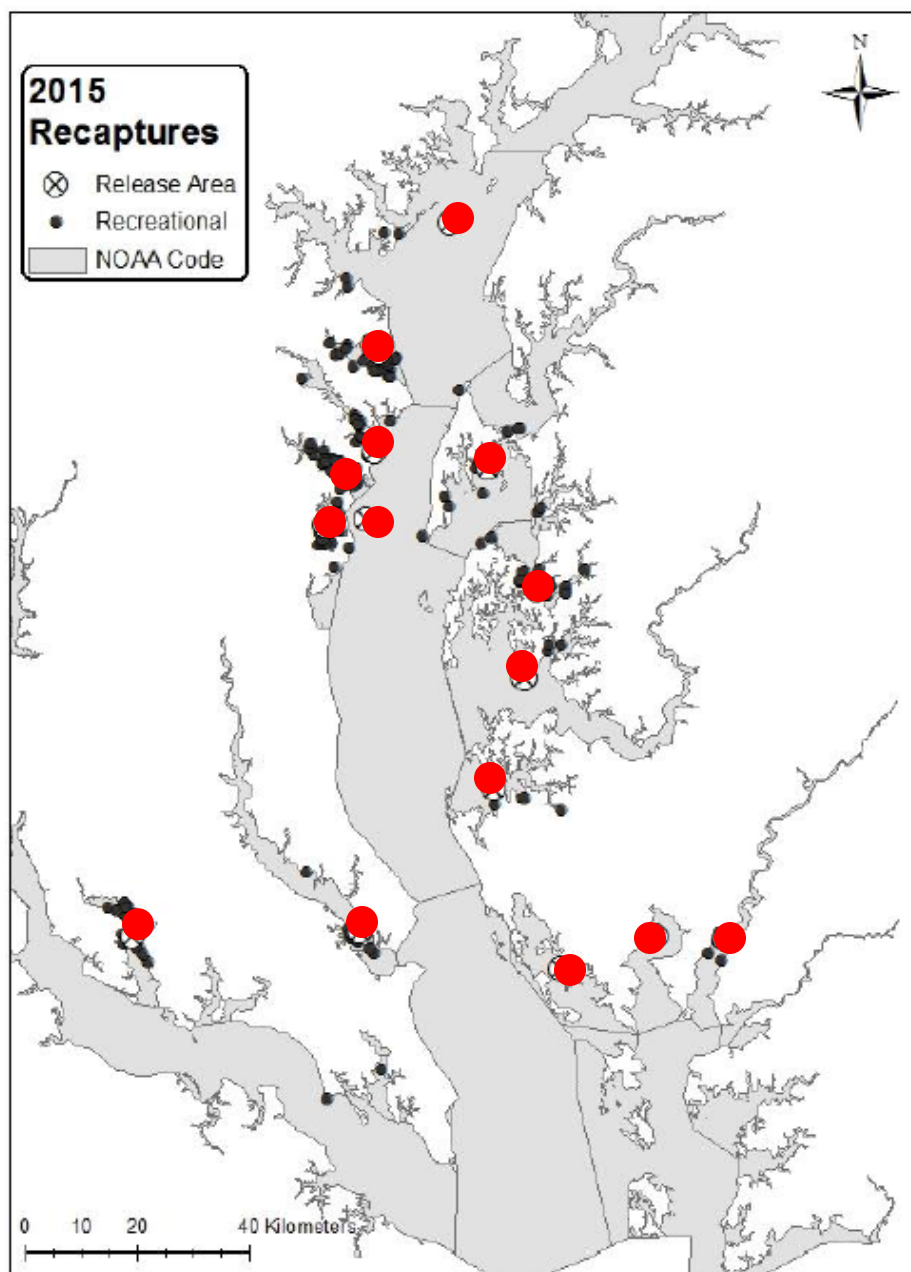
Crab tagging, recaptures and gear type

1. Of 8,741 crabs tagged at 15 sites, 35% of males and 11% of females were caught
2. 1,552 commercial (75% trotline, 25% pot)
3. 444 recreational (62% trotline, 18% pot, 12% trap)

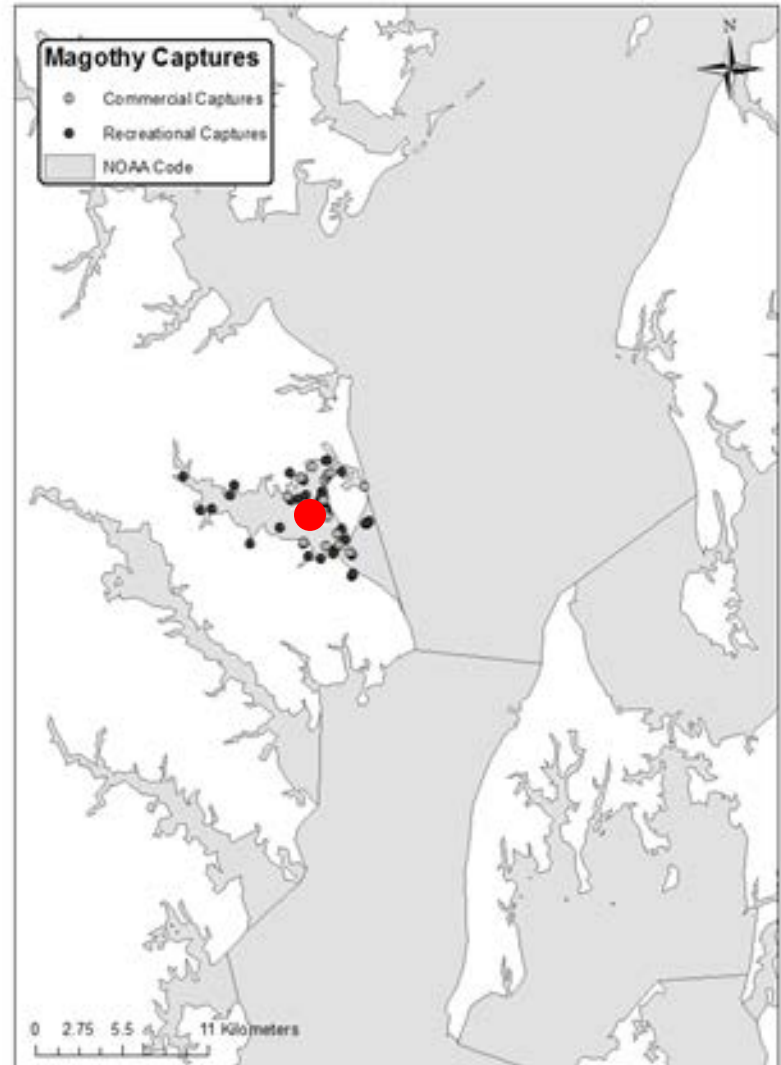
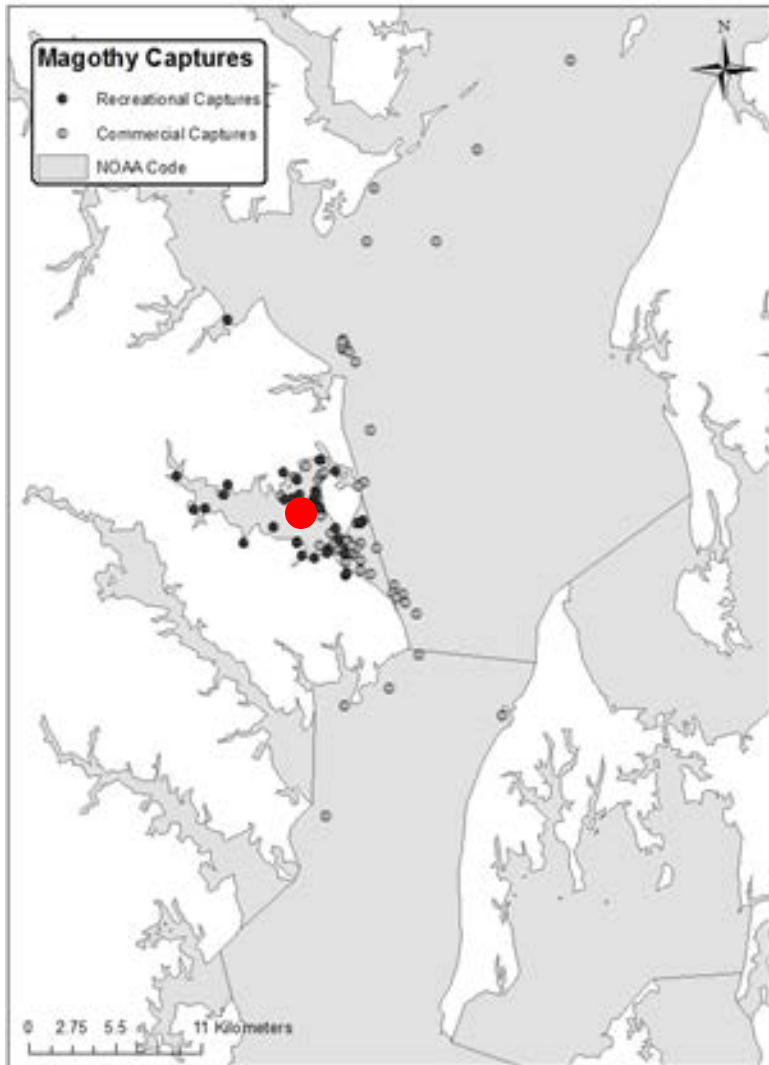


Seasonal variation (in 2014)

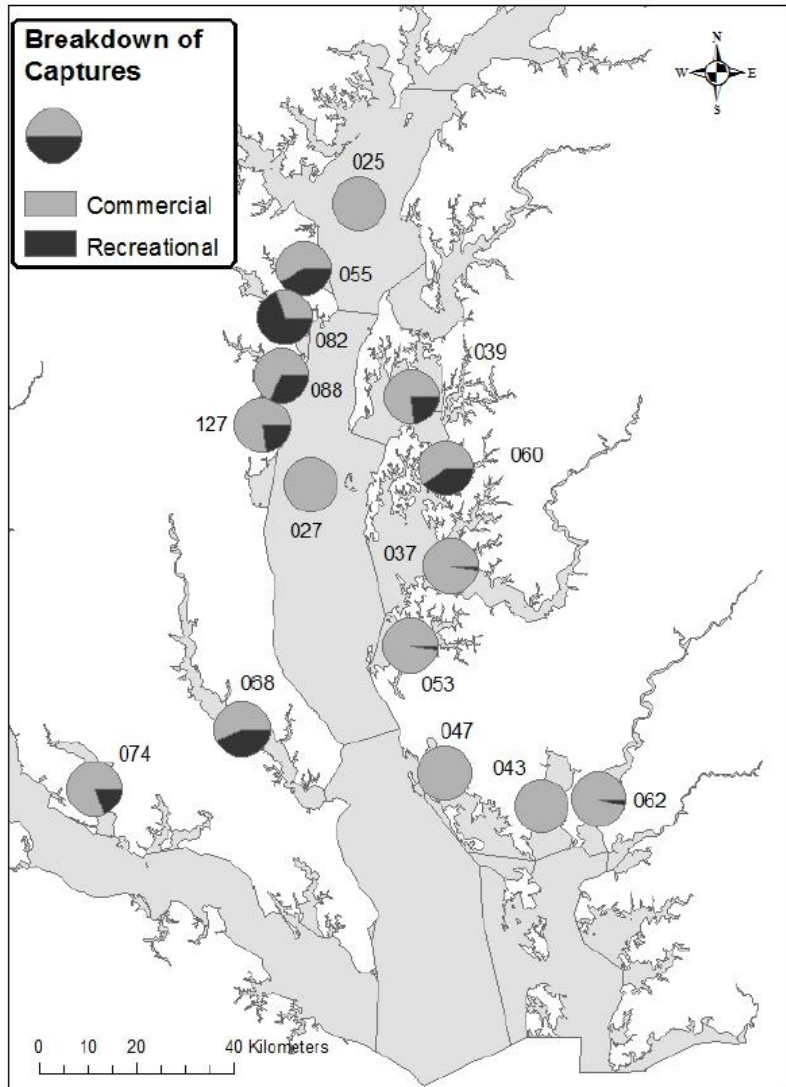




Calculating recaptures

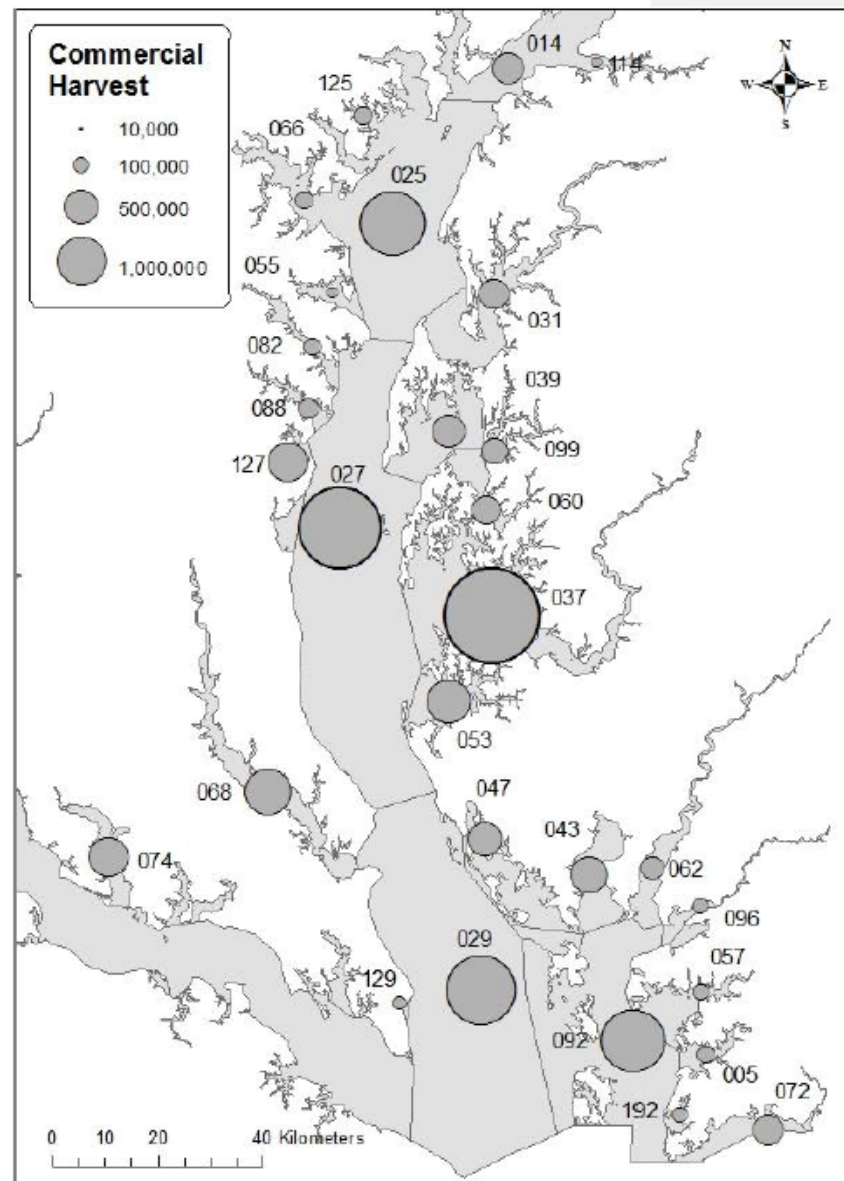


Spatial variation



Site Code	Original Site	Estimated As
(005)	Big Ammenesex	Nanticoke River
(014)	Mainstem NN	Mainstem N
(114)	Tribs NN	Magothy River
(025)	Mainstem N	----
(125)	Tribs N	Magothy River
(027)	Mainstem S	----
(127)	Tribs S	----
(029)	Mainstem SS	Mainstem S
(129)	Tribs SS	Patuxent River
(031)	Chester River	Eastern Bay
(037)	Choptank River	----
(039)	Eastern Bay	----
(043)	Fishing Bay	----
(047)	Honga River	----
(053)	Little Choptank River	----
(055)	Magothy River	----
(057)	Manokin River	Nanticoke River
(060)	Miles River	----
(062)	Nanticoke River	----
(066)	Patapsco River	Magothy River
(068)	Patuxent River	----
(072)	Pocomoke Sound	Nanticoke River
(074)	Potomac (MD Tribs)	----
(082)	Severn River	----
(088)	South River	----
(092)	Tangier Sound	Nanticoke River
(192)	Tangier Sound Tribs	Nanticoke River
(096)	Wicomico River	Nanticoke River
(099)	Wye River	Miles River

Reported commercial harvest

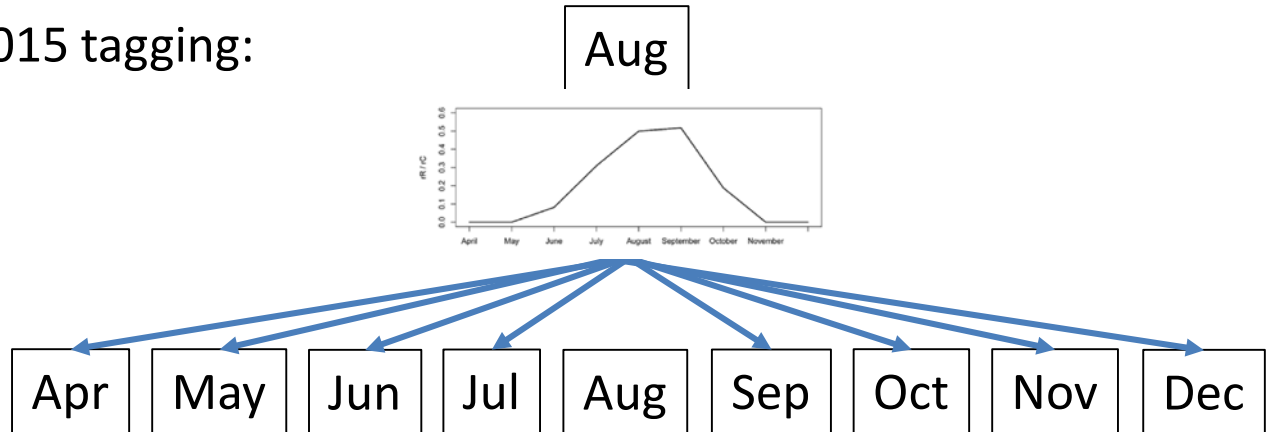


Calculating harvest for each area

Rec/Comm ratio from 2015 tagging:

Seasonal variation:

Monthly Rec/Comm:

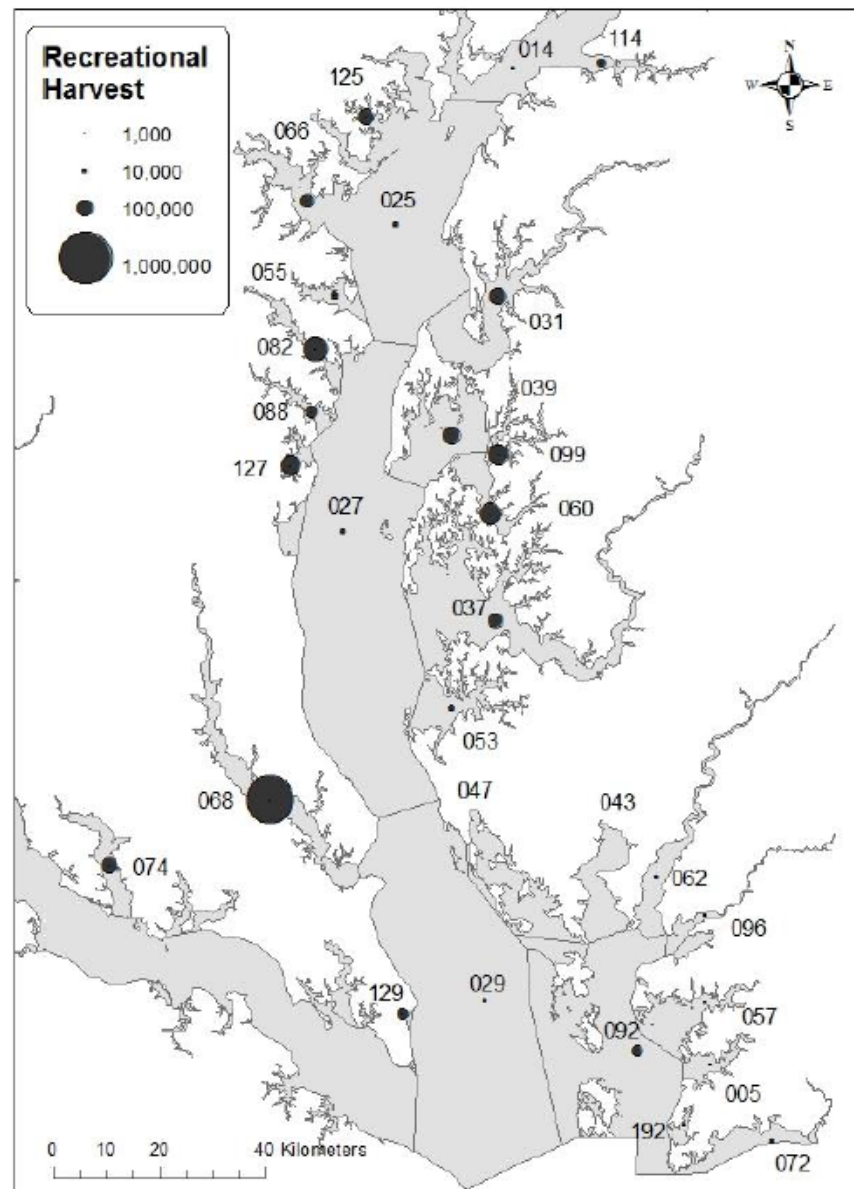
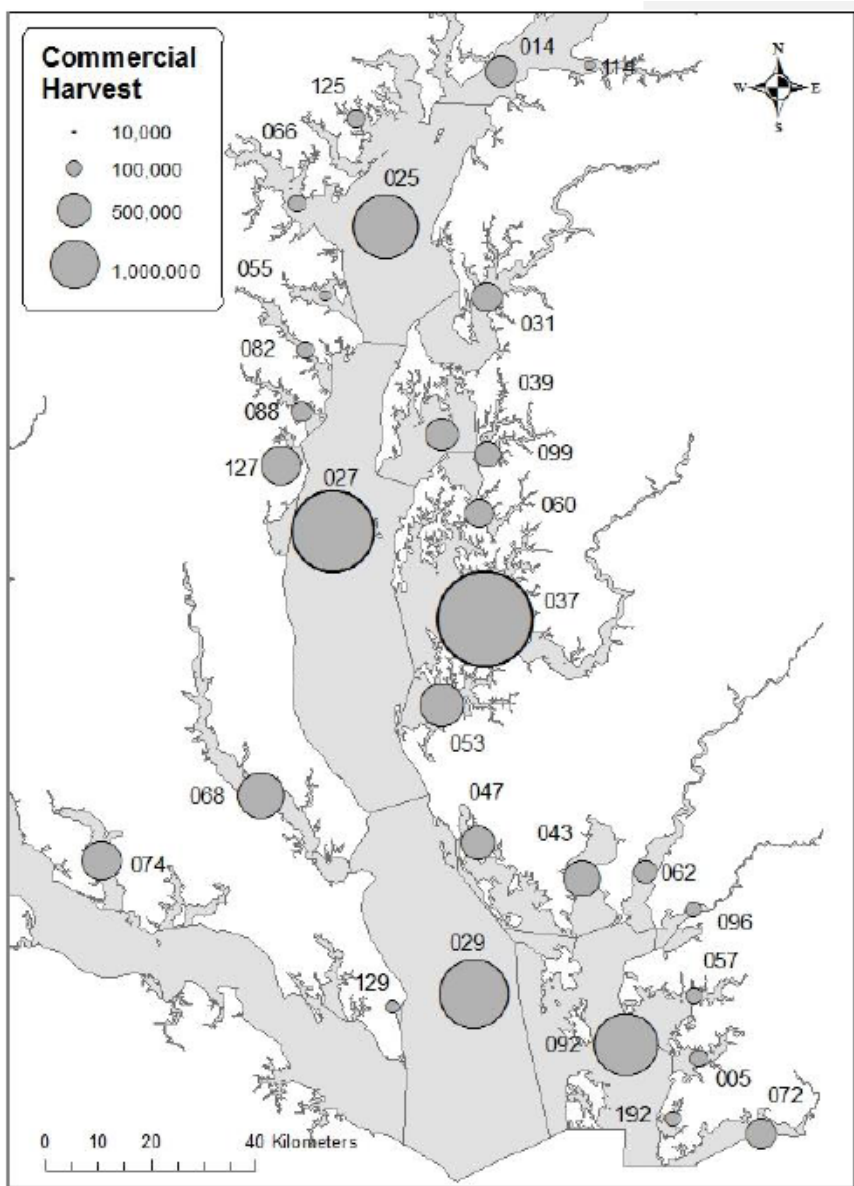


Commercial harvest:



Recreational harvest:





Recreational creel surveys

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2011	5.1	7.1%	8.4%	5.1%
2015	5.3	11.2%	10.4%	6.5%

Recommend a shift back to using 8% of total harvest, not 8% of males to estimate the recreational fishery

Questions?



Exploitation rates

$$U = \frac{ \left(\text{Crab in cage} \right) / \text{Reporting Rate} }{ \left(\text{Crab} - \left(\text{Crab} + \text{Skull and Crossbones} + \text{Smithsonian 39999} \right) \right) }$$

- The number of captures as a portion of tags left remaining
- We know the number released and recaptured crabs but the other terms must be estimated.
- Exploitation varied from 8% - 70% in 2 months