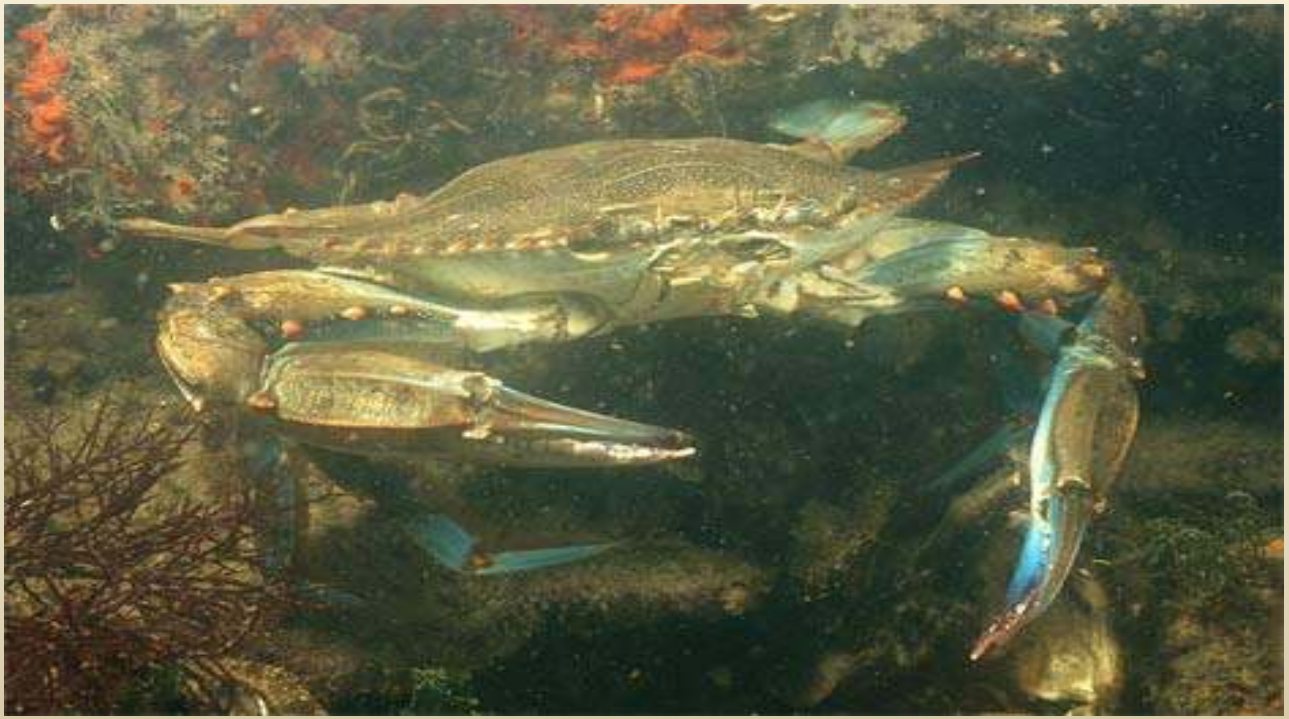
Natural, Environmental and Fishery Variability Challenge
Sustainability of the

Blue Crab Resource



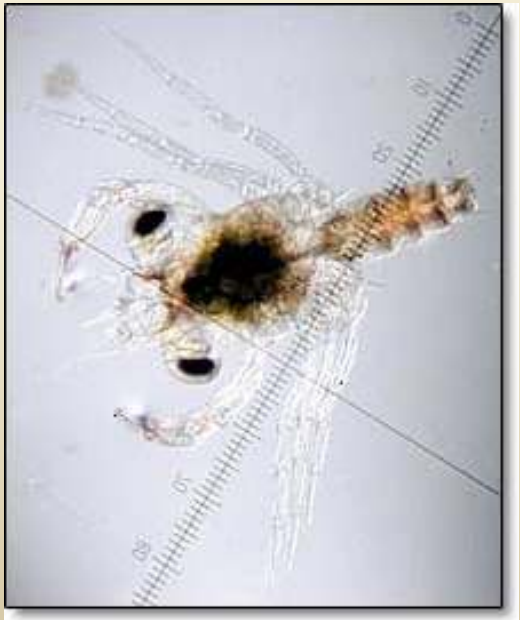
Recommendation:

A management policy which states that the living resources of the Chesapeake Bay are dependent on the management of the total ecosystem, the improvement of the Bay habitat, and the protection of today's living resources from overharvest, must be articulated (From a 1983 workshop sponsored by the Citizens Program for the Chesapeake).

Hatching

- Salinities of 23-33 ppt
- Temperatures of 66-84 F
- Once released, larvae drift from lower Bay out to continental shelf to develop

Zoea - First Larval Stage
Photo courtesy of Alicia Young-Williams
Smithsonian Environmental Research Center



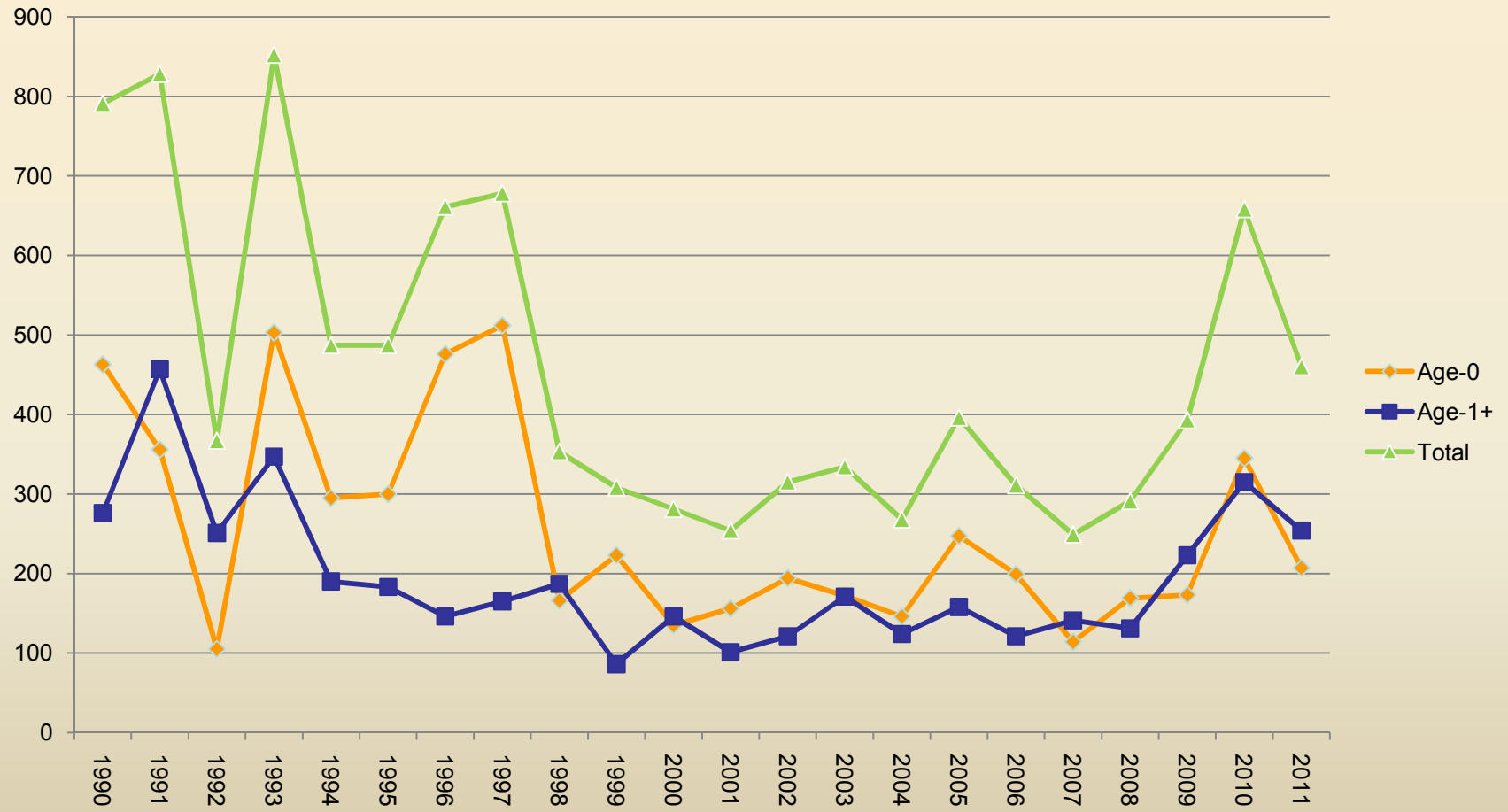
Megalopa - Post Larval Stage
Photo courtesy of Alicia Young-Williams
Smithsonian Environmental Research Center

"First Crab"
Photo courtesy of Alicia Young-Williams
Smithsonian Environmental Research Center

Mortality sources

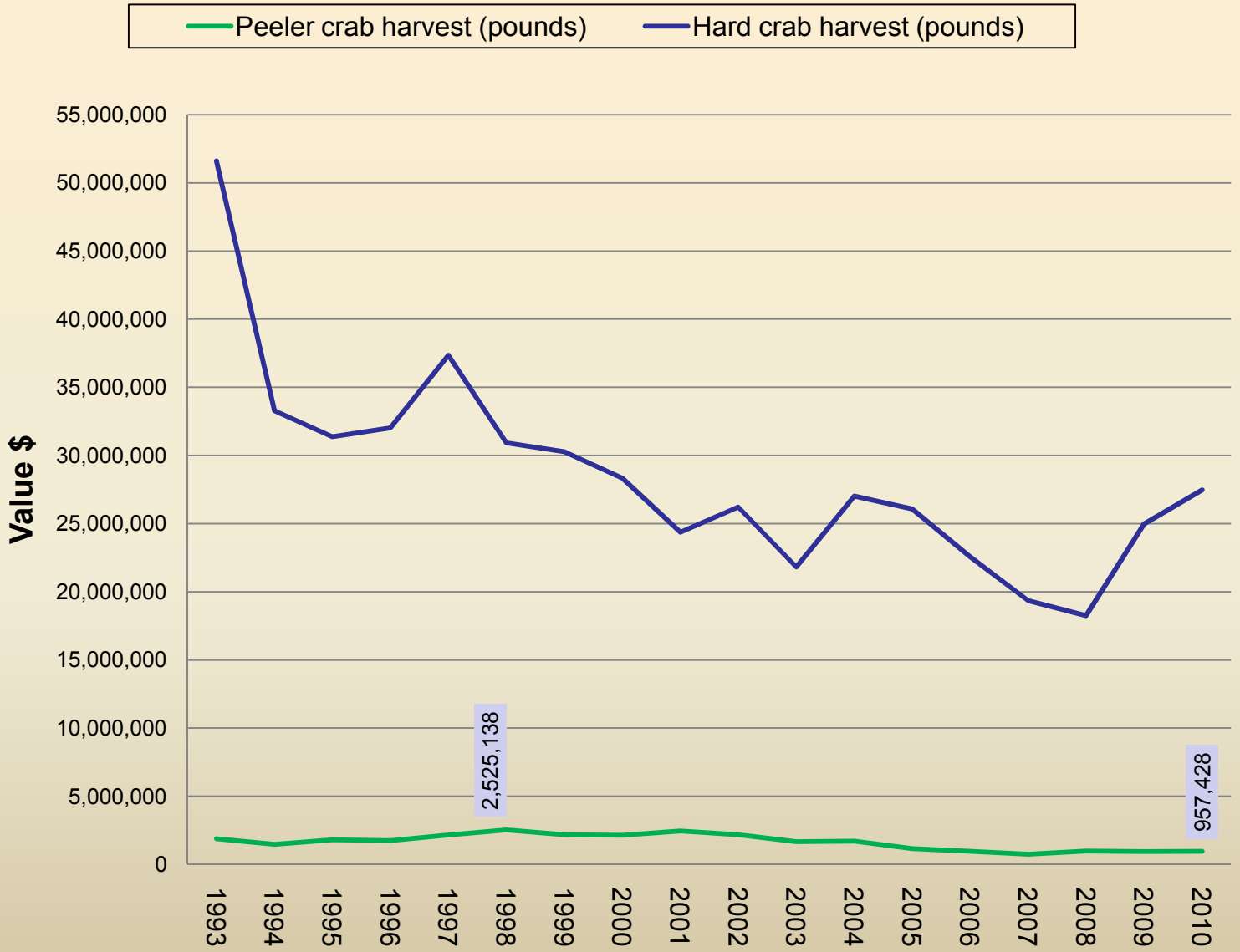
- Cold, severe winter temperatures
- Habitat loss
  - (seagrass beds)
  - Leads to increased predation
- Disease
- Over-exploitation by commercial and recreational fisheries
  - Peak harvests 1950's-1960's
  - Serious population decline in 1990's

Bay-wide Winter Dredge Survey estimates of age-0, age-1+ and total abundance of blue crabs

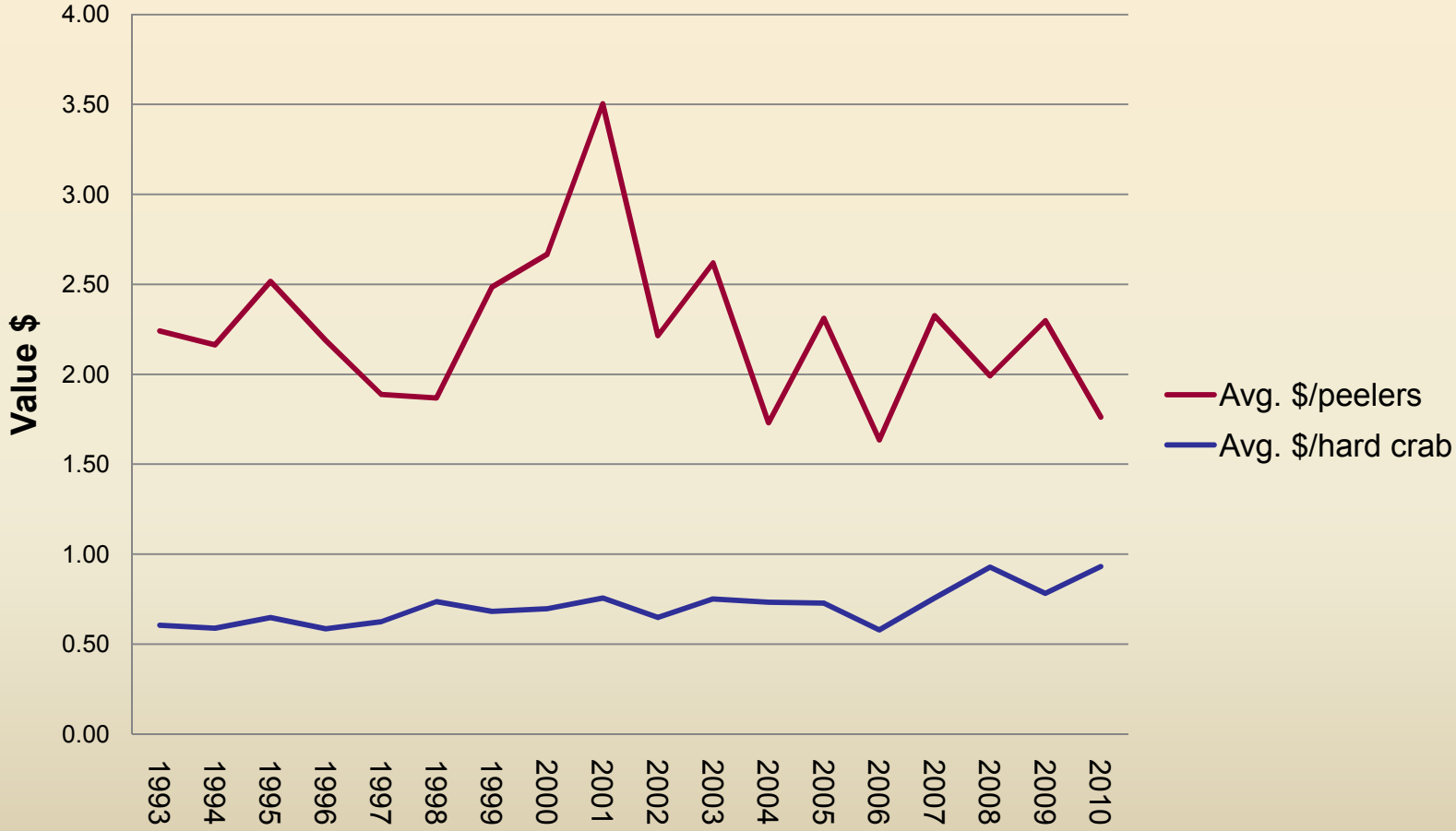


Winter of Survey	Survey Year (Year Survey Ended)	Total Number of Crabs in Millions (All Ages)	Number of Age-0 Crabs in Millions	Number of Spawning-Age Crabs in Millions	Bay-wide Commercial Harvest (Millions of Pounds)	Percentage of Crabs Removed
1989 - 1990	1990	791	463	276	96	42
1990 - 1991	1991	828	356	457	90	38
1991 - 1992	1992	367	105	251	53	54
1992 - 1993	1993	852	503	347	107	44
1993 - 1994	1994	487	295	190	77	57
1994 - 1995	1995	487	300	183	72	56
1995 - 1996	1996	661	476	146	69	41
1996 - 1997	1997	678	512	165	77	45
1997 - 1998	1998	353	166	187	56	64
1998 - 1999	1999	308	223	86	62	79
1999 - 2000	2000	281	135	146	49	69
2000 - 2001	2001	254	156	101	47	71
2001 - 2002	2002	315	194	121	50	59
2002 - 2003	2003	334	172	171	47	51
2003 - 2004	2004	268	146	124	47	72
2004 - 2005	2005	396	247	158	58	47
2005 - 2006	2006	311	199	121	54	54
2006 - 2007	2007	249	114	141	49	56
2007 - 2008	2008	291	169	131	43	48
2008 - 2009	2009	393	173	223	49	43
2009 - 2010	2010	658	345	315	89	43
2010 - 2011	2011	460	207	254		

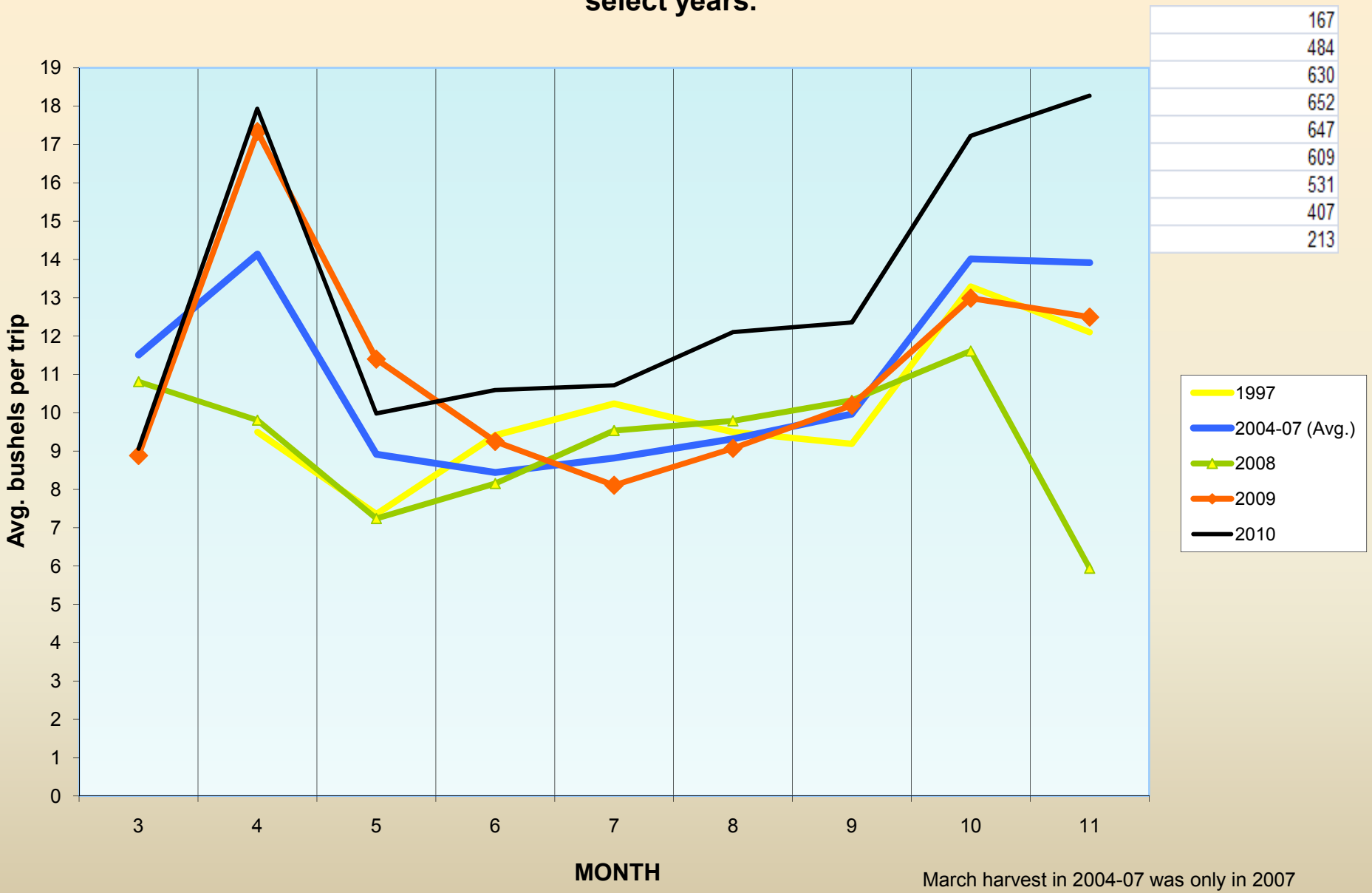
Comparison of Virginia harvests (pounds) of peeler and hard crabs, 1990 - 2010



Comparison of dockside value between Virginia peeler and hard crab harvests, 1990 - 2010

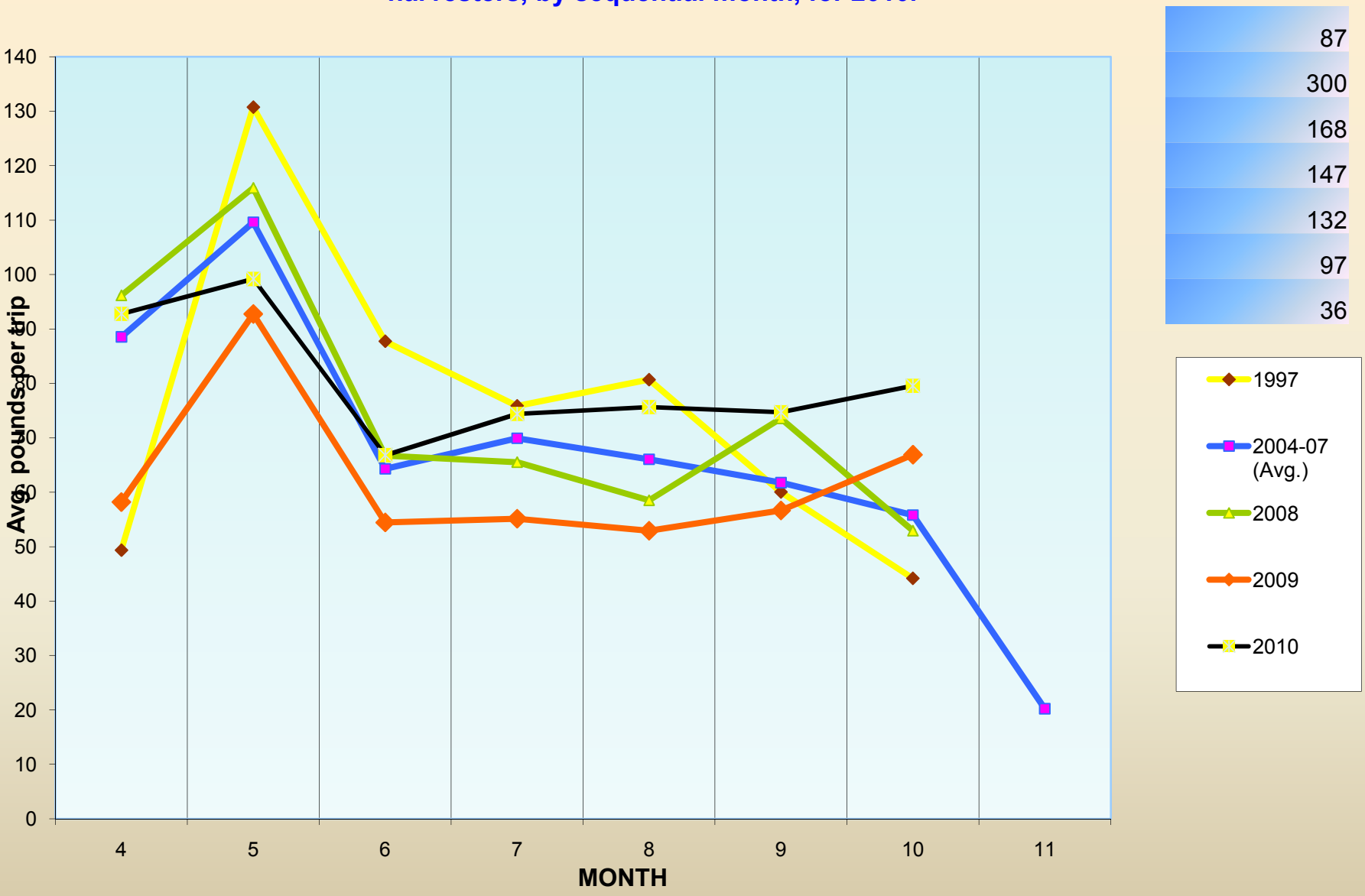


Comparison of average crab harvest (bushels) per crab pot trip, by month, for select years.

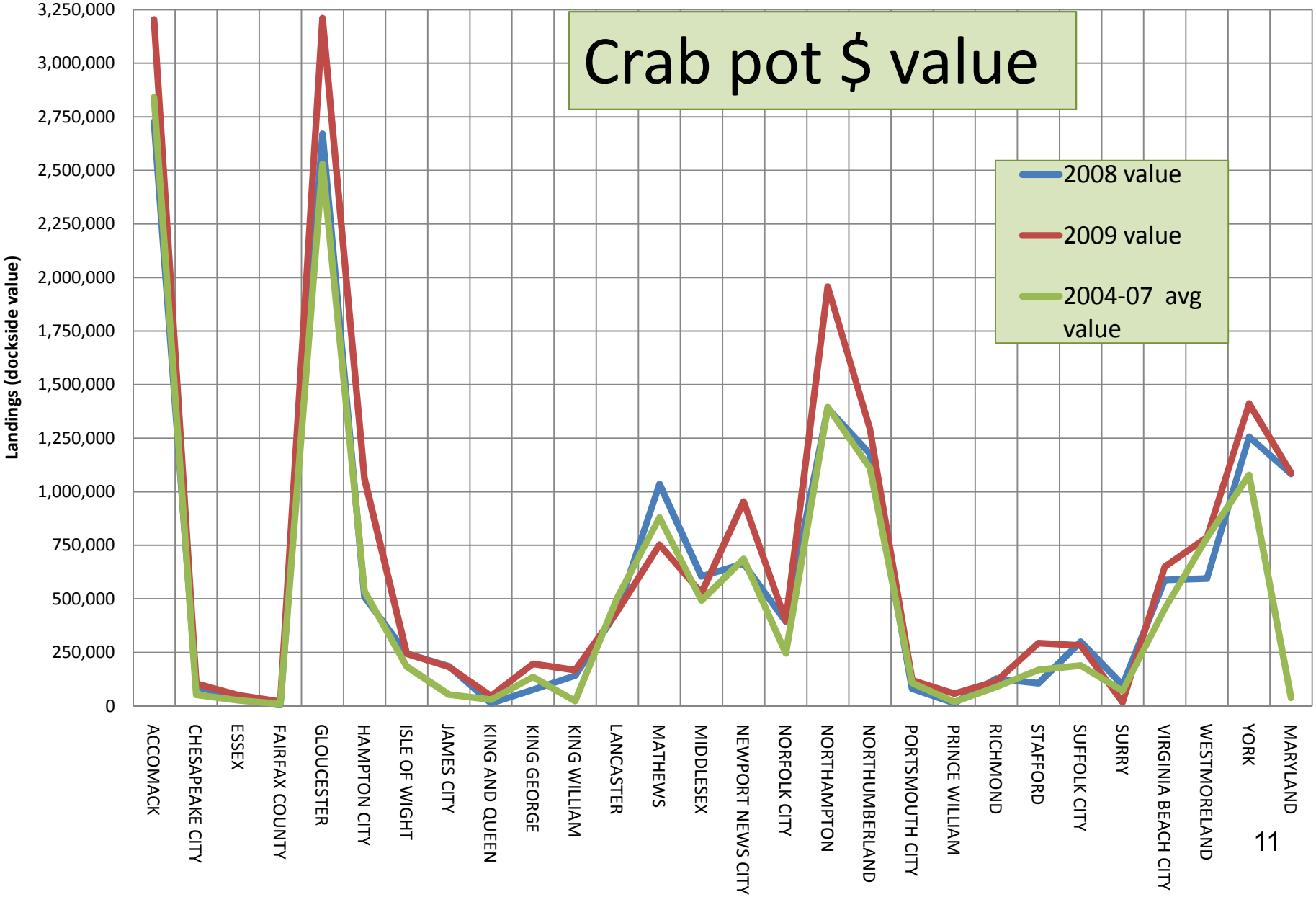


March harvest in 2004-07 was only in 2007

Comparison of average crab harvest (pounds) per peeler-pot trip, by month,
CPUE affected by 2008 conservation measures. Text box contains number of harvesters, by sequential month, for 2010.



Comparison among average 2004-07, 2008 and 2009 Virginia landings (dockside value) of blue crab from crab pot gear, by county/city



- “A significant factor for which there are no data available is the catch taken by recreational crabbers. There is no doubt that substantial numbers of peelers, soft and hard crabs are harvested on a recreational basis for which there are no reporting requirements. Clearly, there is a need for obtaining both commercial and recreational landings before trends in abundance can be fully discerned. This need will assume greater importance in the future as the burgeoning human population exerts its increasing influence on the Chesapeake Bay.” *(Status of Fisheries and Wildlife in the Chesapeake Bay, prepared for the Bi-State Conference on Chesapeake Bay, 28-29 April 1977)*

- Recreational harvests have been previously established from 11.5 – 41.2 million pounds (1983, 1988, and 1990 estimates). *(Rugolo et al. 1997)*

- Recent stock assessments (2005, 2011) estimated the recreational harvest as 8% of total harvest for MD and VA combined *(based on studies by Ashford and Jones, ODU 2001, 2002).*

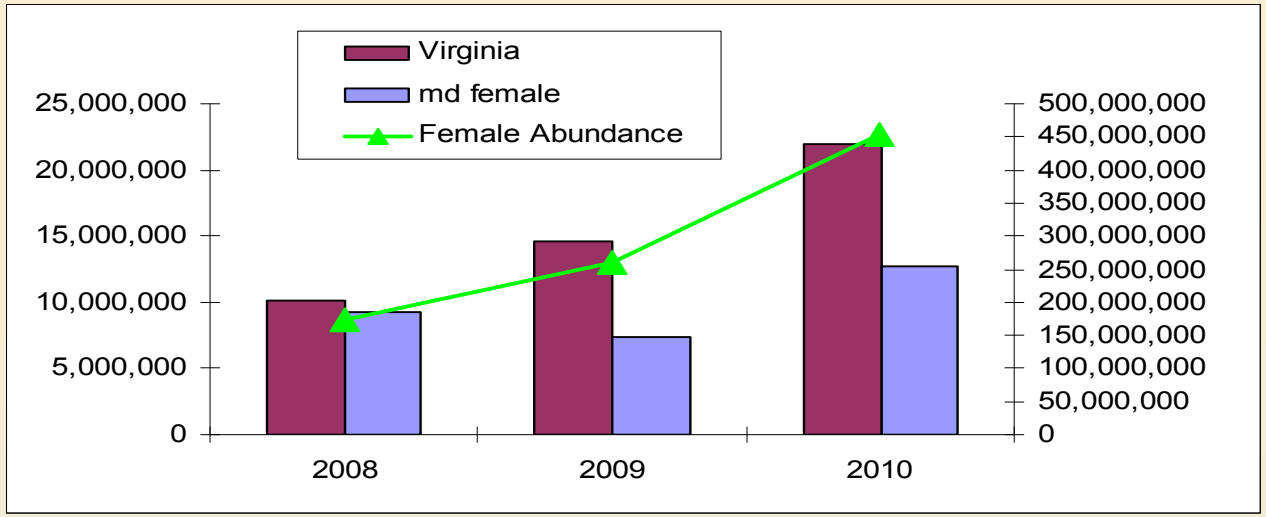
Fishery Issues Impacting Female Crab Abundance

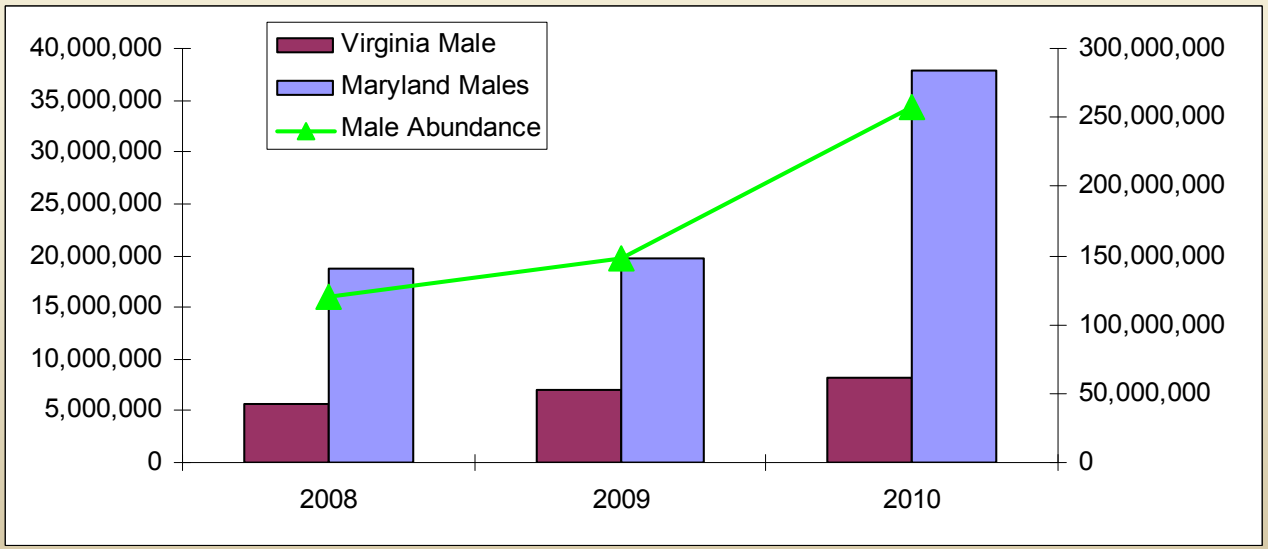
- Blue Crab Sanctuary closure / boundaries
- Winter dredge fishery
- Waiting list

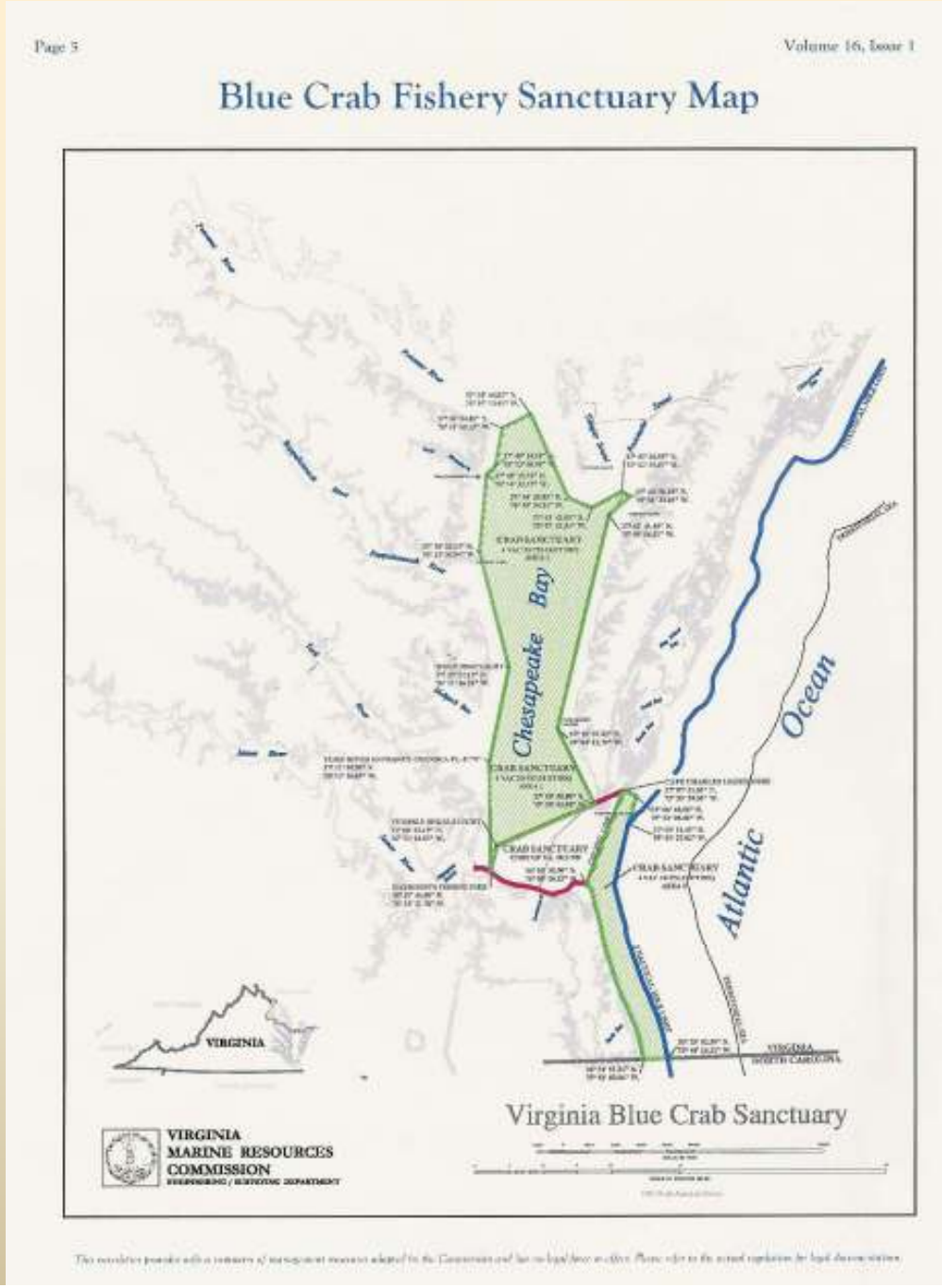
Female Blue Crab Conservation 2008-2011

- Conserve female crabs and reduce capacity
  - Winter dredge fishery capped at 53 individuals, then closed – since April 2008
  - Larger cull ring requirements in crab pots for escapement
  - Waiting list established
  - Earlier closure of spawning sanctuary (May 1)
  - Reduction in crab pot and peeler pot amounts
  - Continued the license moratorium indefinitely

Sex-Specific Harvest by Region, Relative to Sex-specific Abundance.
2010 Harvest Values are Preliminary (from L. Fegley).





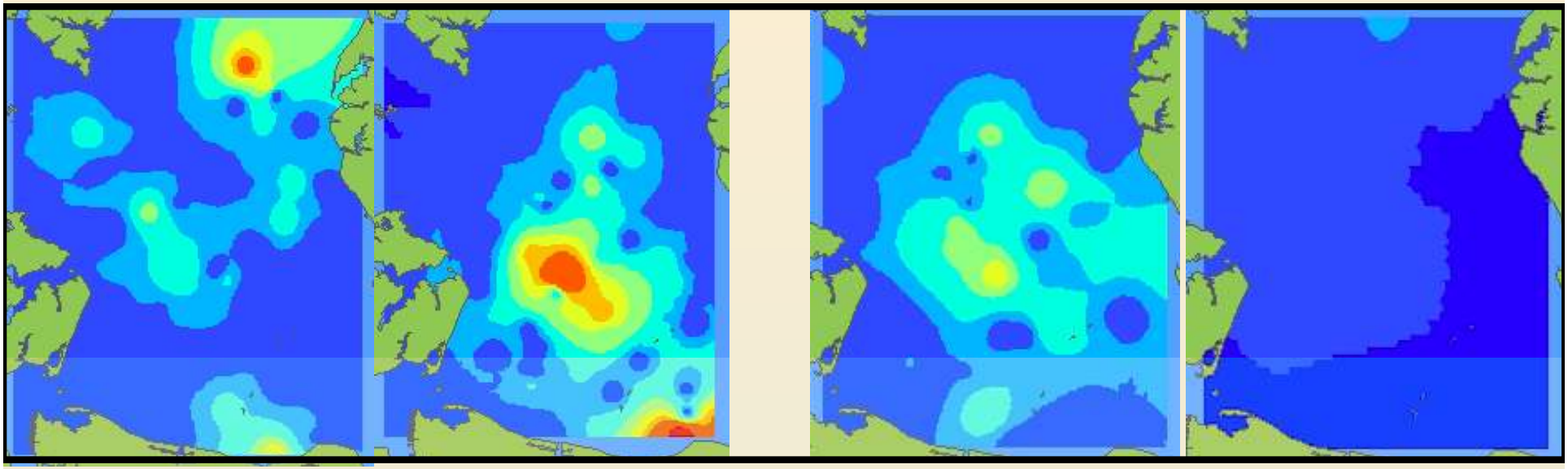


- Today: 1,012 mi^2
- ~70% of female spawning crabs protected
- May 1- Sep 15
- Sanctuary established in 1942 (146 mi^2)

Pre- and Early Winter Dredge Fishery ***Late and Post-Winter Dredge Fishery***

2005

November December January February



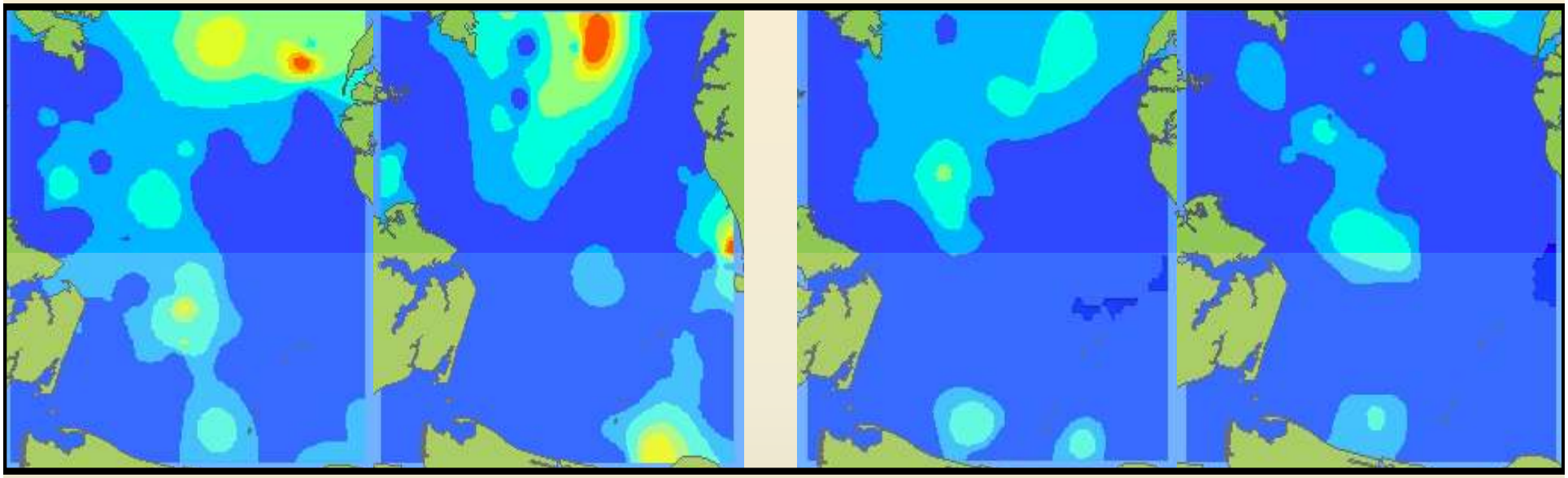
Note: Different random stations are sampled each month, such that the peaks of abundance will not necessarily be in the same locations each month.

These display the annual reductions in crab densities due to the winter dredge fishery from November-December through January-February. These years (2005 and 2008) are typical of years when crabs are moderately abundant, and show the potential of the winter dredge fishery to impede population recovery (From R. Lipcius, VIMS).

Pre- and Early Winter Dredge Fishery ***Late and Post-Winter Dredge Fishery***

2008

November December January February



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Pre- and Early Winter Dredge Fishery

Late and Post-Winter Dredge Fishery

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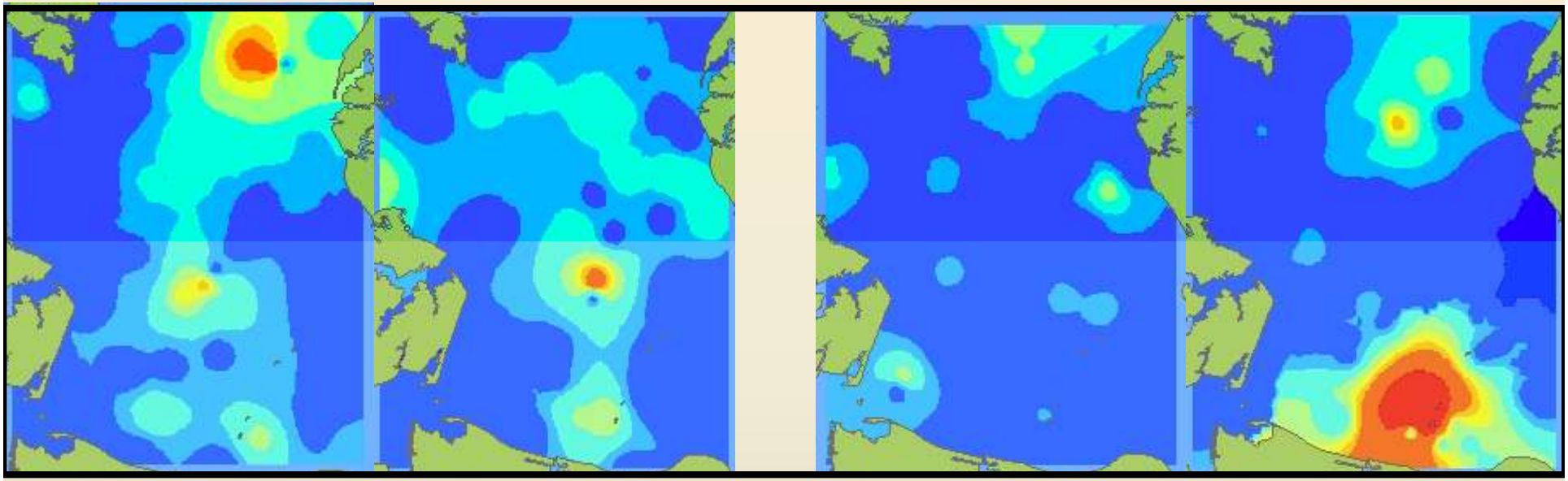

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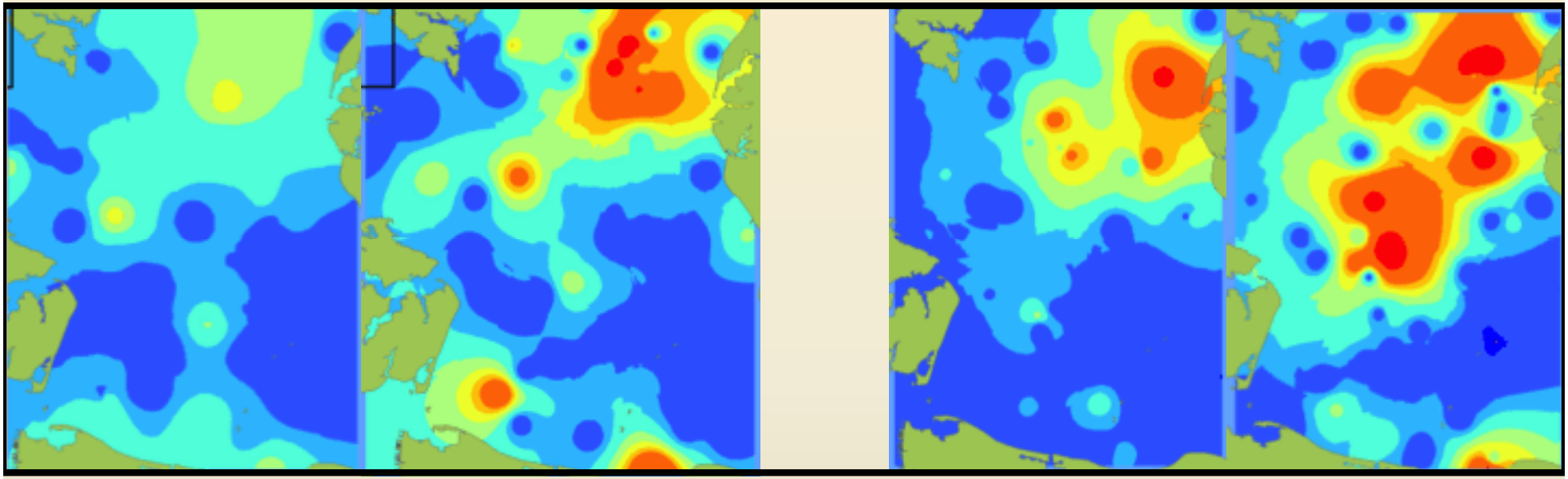
These show the maintenance of high crab densities in 2009 and 2010 through February, in a year when the winter dredge fishery was closed. They also show the substantial increase in female abundance in 2010 (From R. Lipcius, VIMS).

Pre- and Early Winter Dredge Fishery

Late and Post-Winter Dredge Fishery

2010

November December January February



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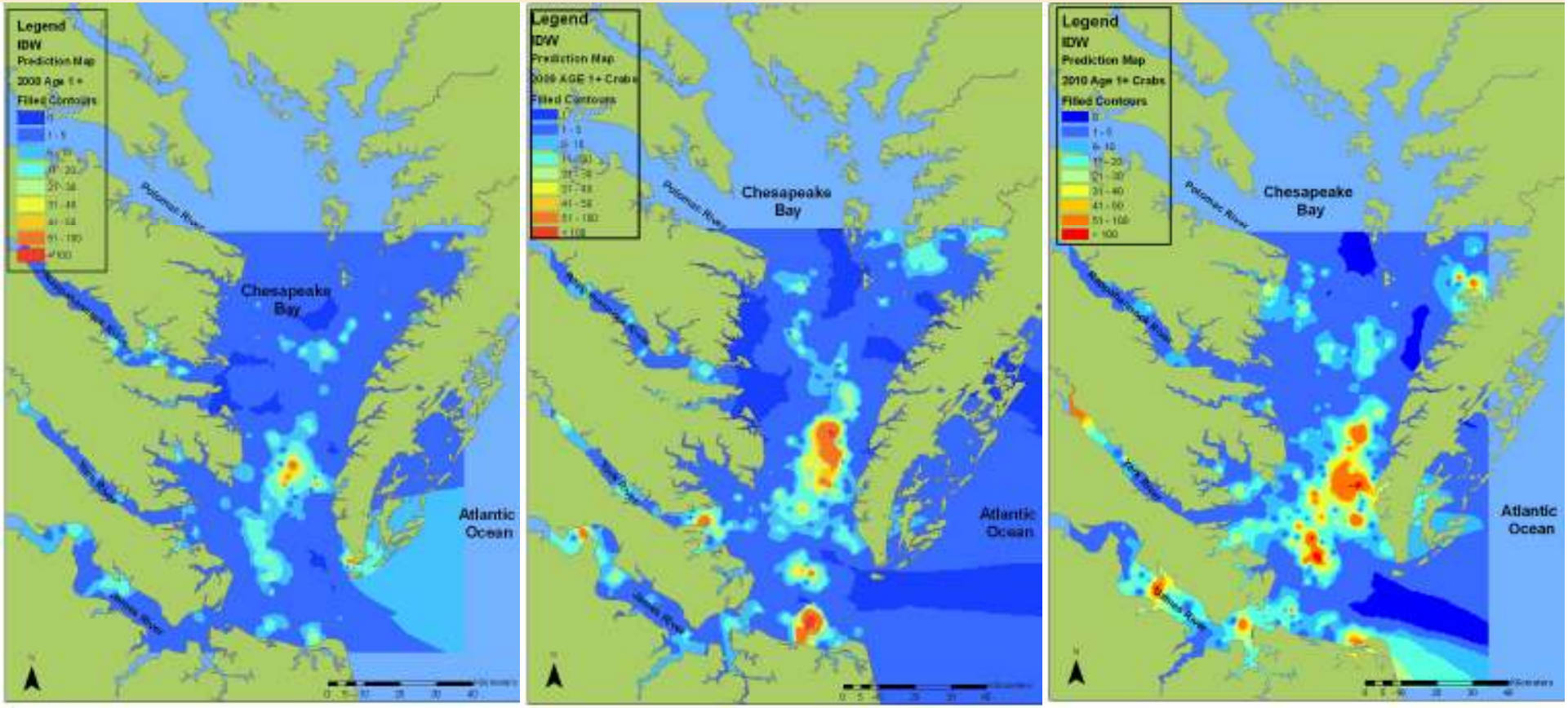
Substantial increases in Age 1+ and female crab densities in the lower bay from the 2007-2008 survey to the 2008-2009 and 2009-2010 surveys (from R. Lipcius, VIMS).

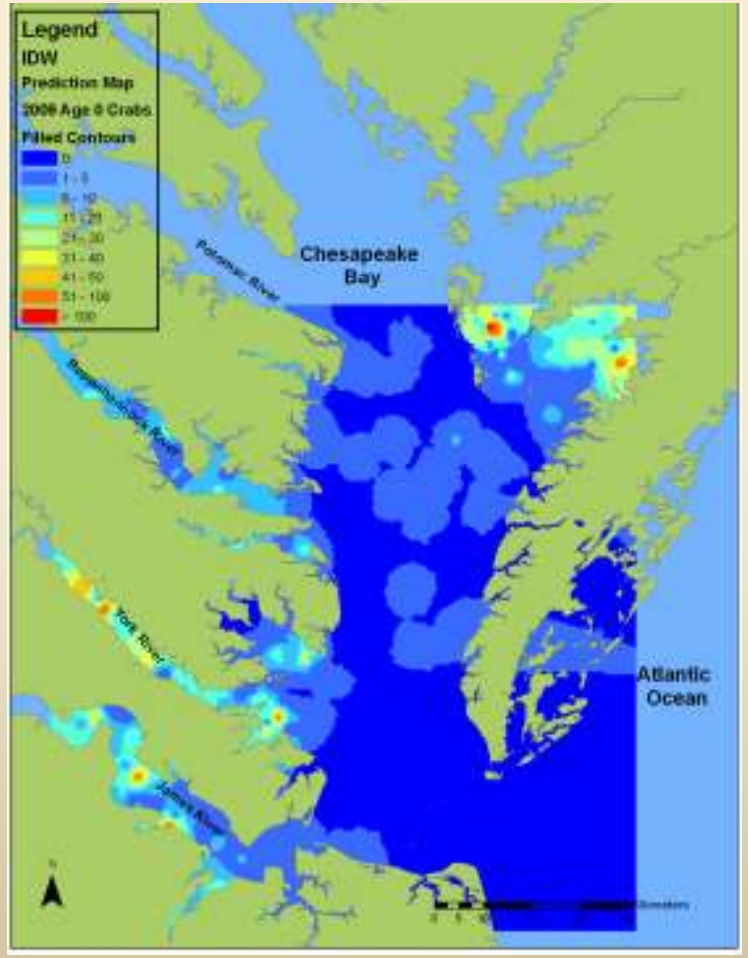
Age 1+

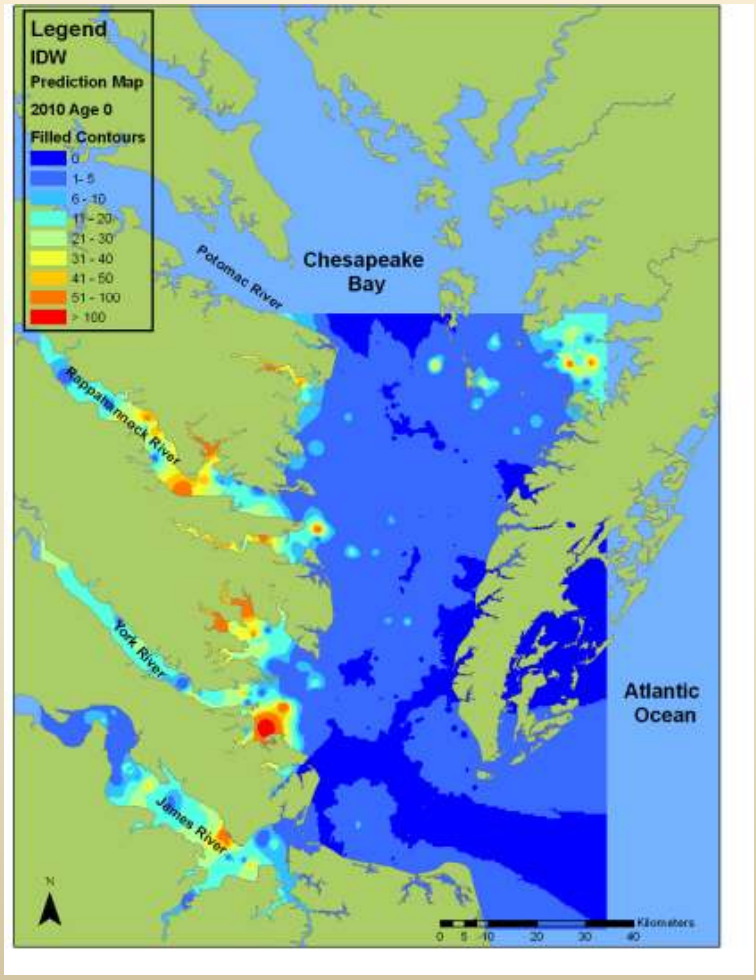
2008 2009 2010



Substantial increase in Age 0 crab densities in the lower bay's tributaries (nursery grounds) from the 2008-2009 survey to the 2009-2010 (From R. Lipcius, VIMS).

2009 Age 0 2010

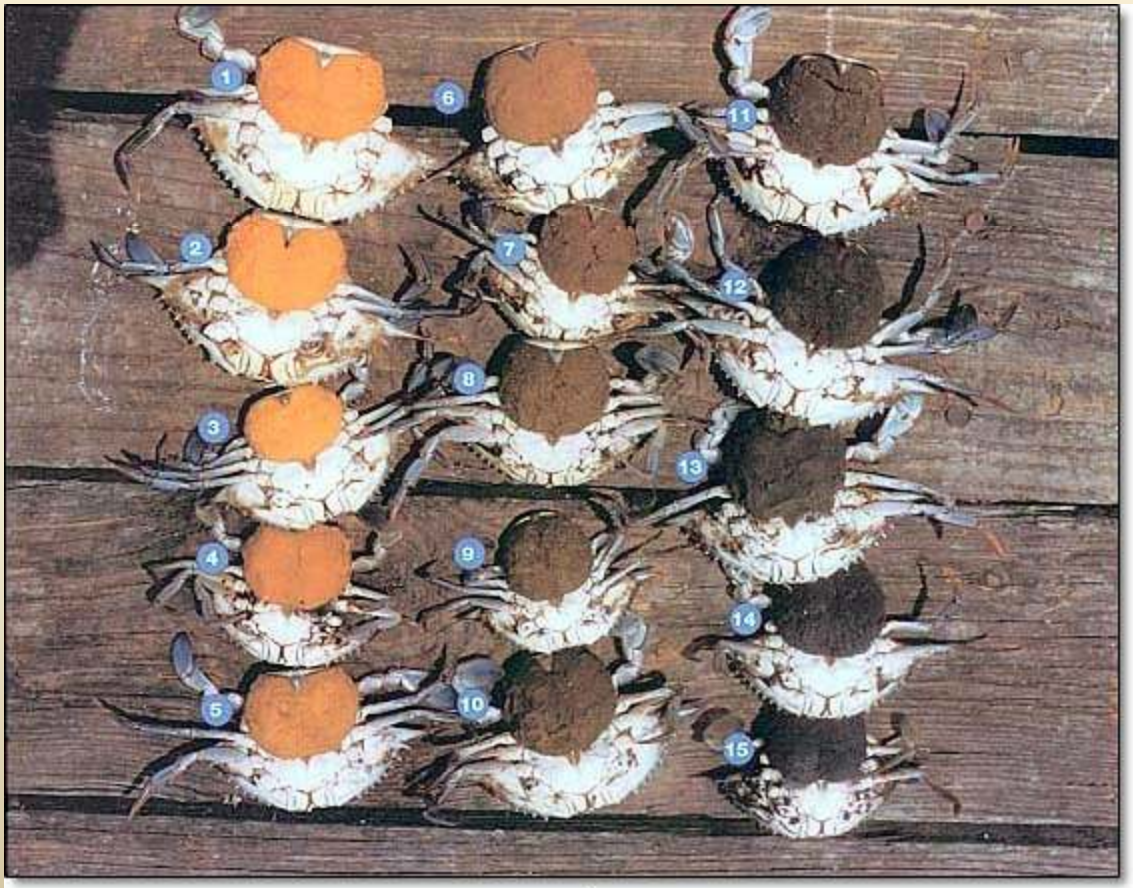




Sponge crabs

- Females produce “sponges” on abdomen
  - Average sponge:
    2 million eggs

- Coloration changes as eggs mature



Sponge Development
Photo courtesy of the Virginia Marine Resources Commission

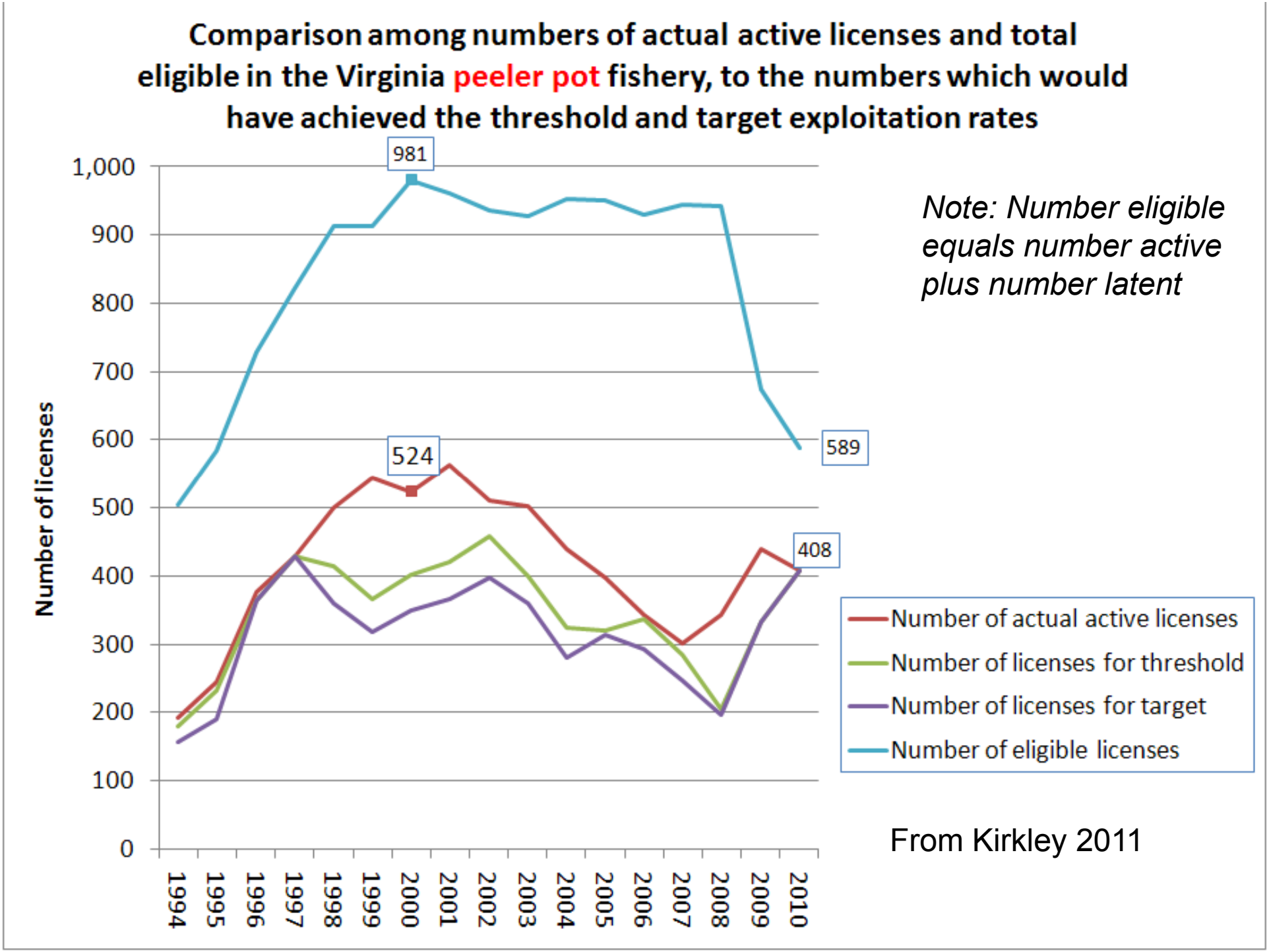
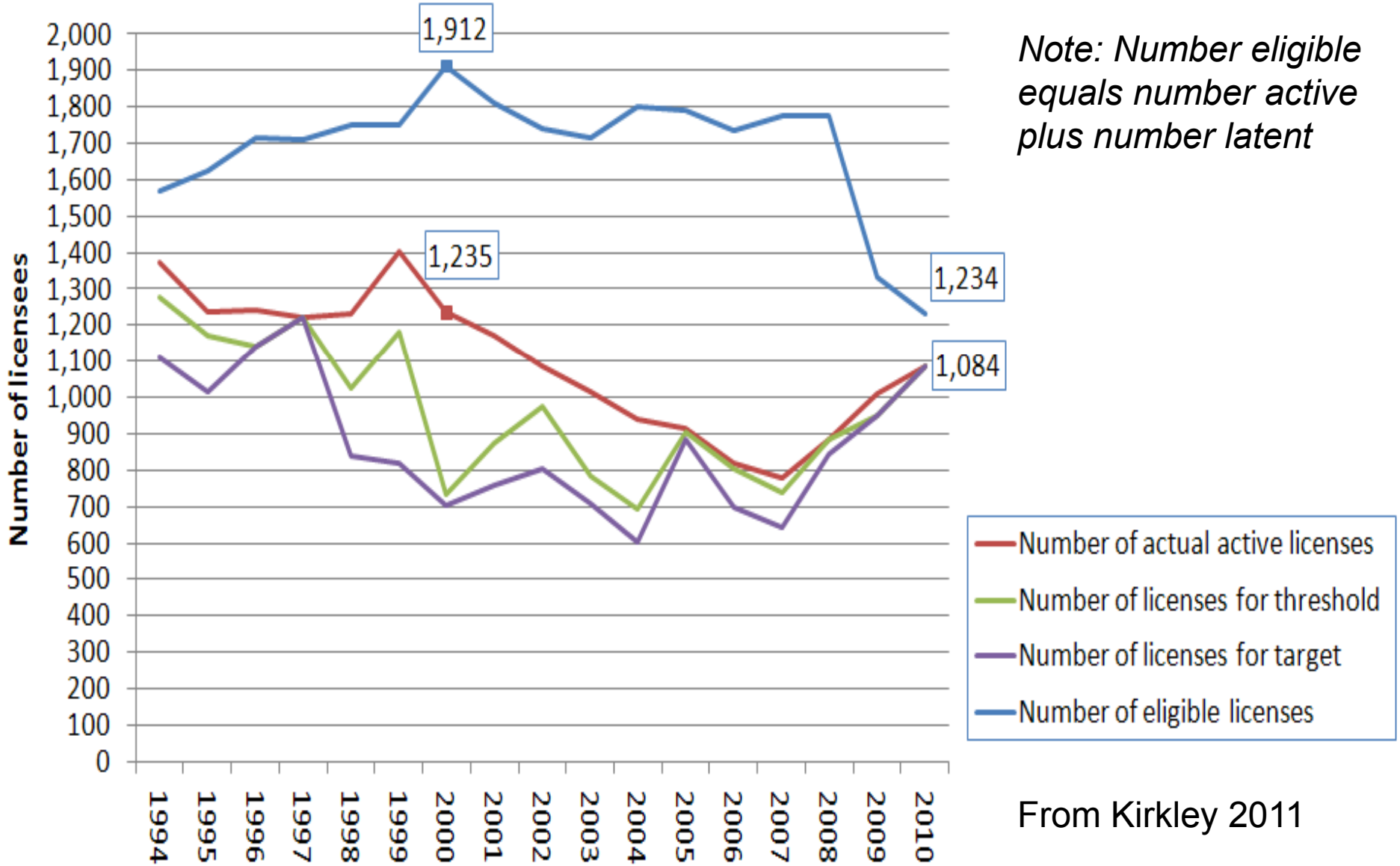

Comparison among numbers of actual active licenses and total eligible in the Virginia peeler pot fishery, to the numbers which would have achieved the threshold and target exploitation rates
Number of licenses
1,000
900
800
700
600
500
400
300
200
100
0
981
524
589
408
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Number of actual active licenses
Number of licenses for threshold
Number of licenses for target
Number of eligible licenses
Note: Number eligible equals number active plus number latent
From Kirkley 2011

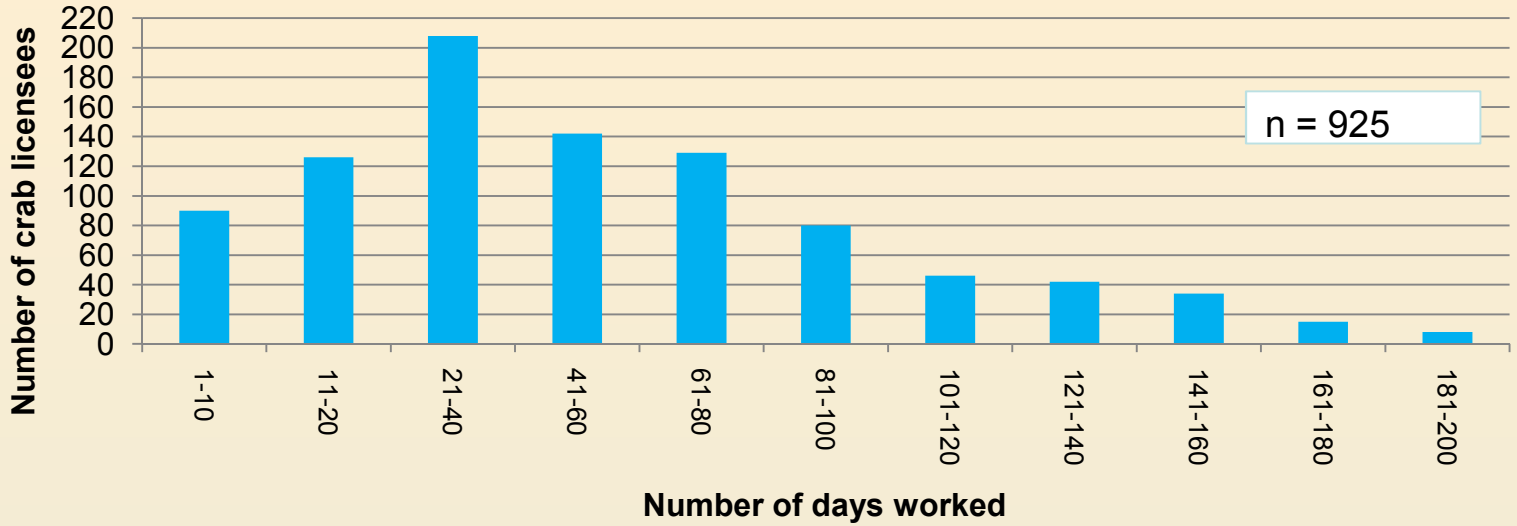
Figure 7. **Comparison among numbers of actual active licenses and total eligible in the Virginia crab pot fishery, to the numbers which would have achieved the threshold and target exploitation rates**



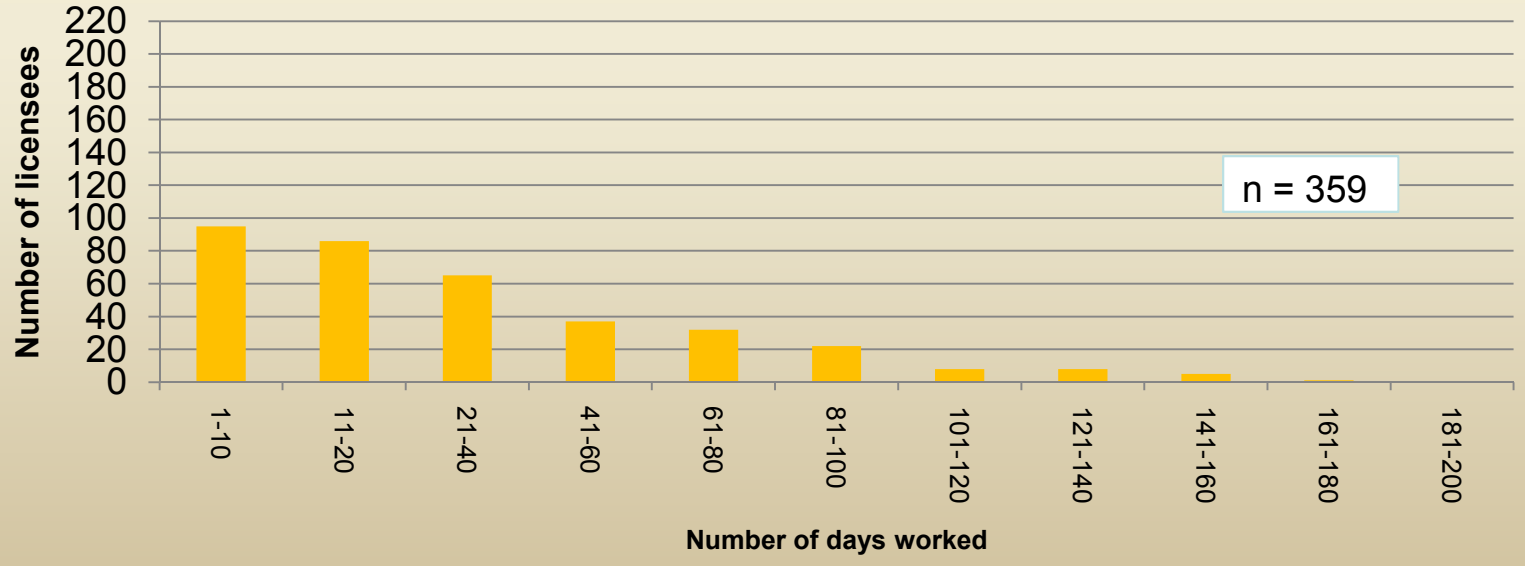
Note: Number eligible equals number active plus number latent

From Kirkley 2011

Number of days worked for active crab pot licensees in Virginia in 2010 (preliminary data)



Number of harvest days by active peeler pot licensees in Virginia in 2010 (preliminary)



	LATENT EFFORT OF CURRENT WAIT LIST		
	License type	Number of licenses	Potential active pots
CRAB POTS	85 pots	82	6,970
	127 pots	12	1,524
	170 pots	3	510
	255 pots	86	21,930
	425 pots	10	4,250
	Total latency:	193 crab potters	35,184 total hard crab pots
PEELER POTS	210 pots	133 peeler potters	27,930 peeler pots

Blue crab abundance and bay-wide harvest (millions) with annual removal rates and corresponding target and threshold removal rates (1990-2010)