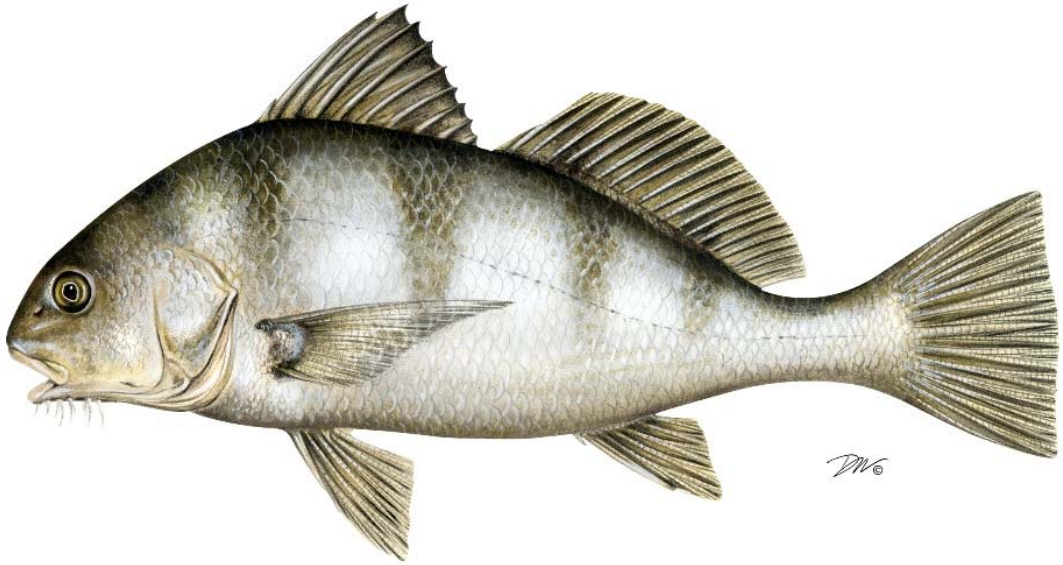
Black Drum Benchmark Stock Assessment



South Atlantic State/Federal Fisheries Management Board

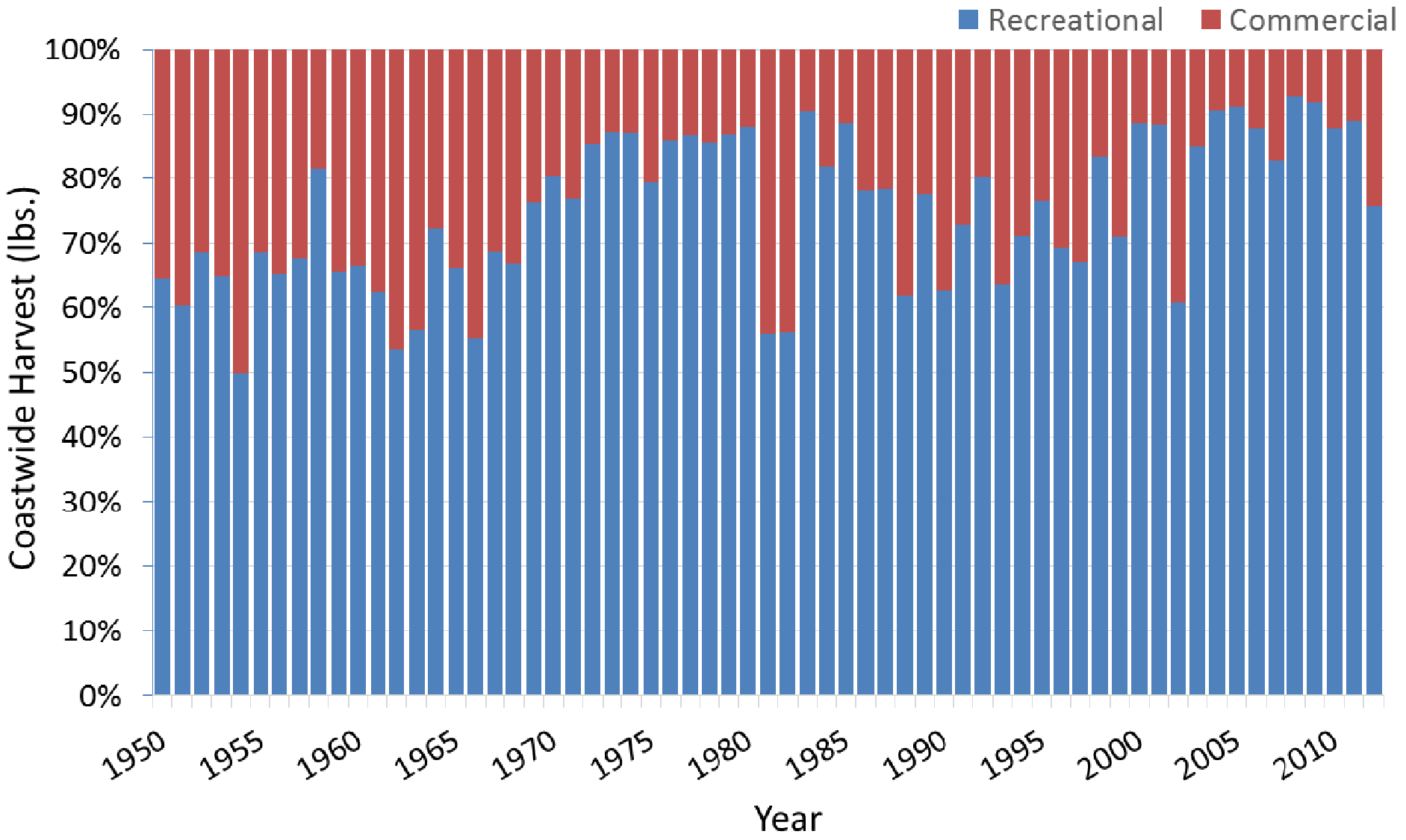
February 2015

Outline

- Data
- Assessment Methods
- Reference Points and Stock Status
- Research Recommendations

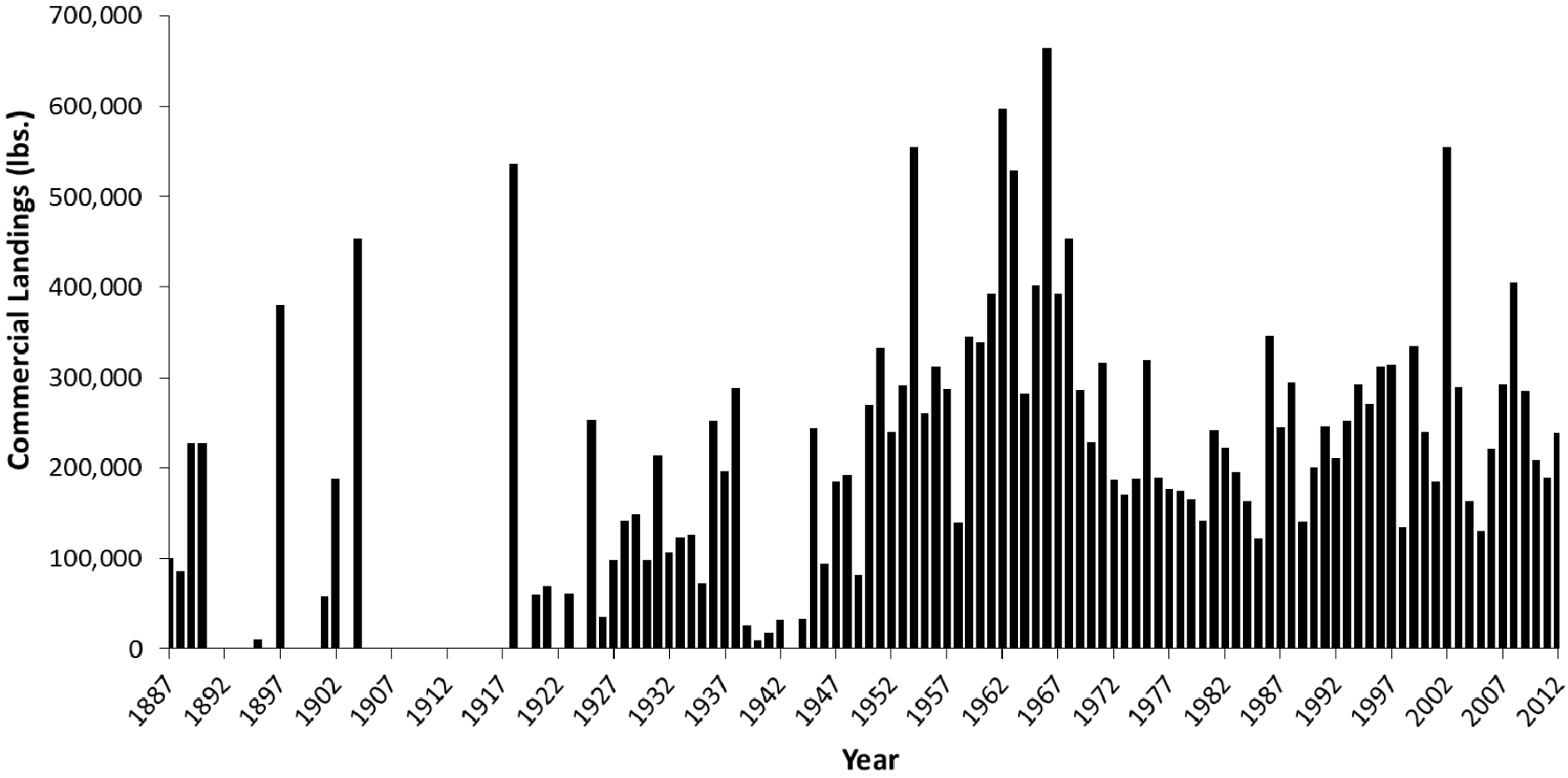
Data

Recreational and Commercial Harvest

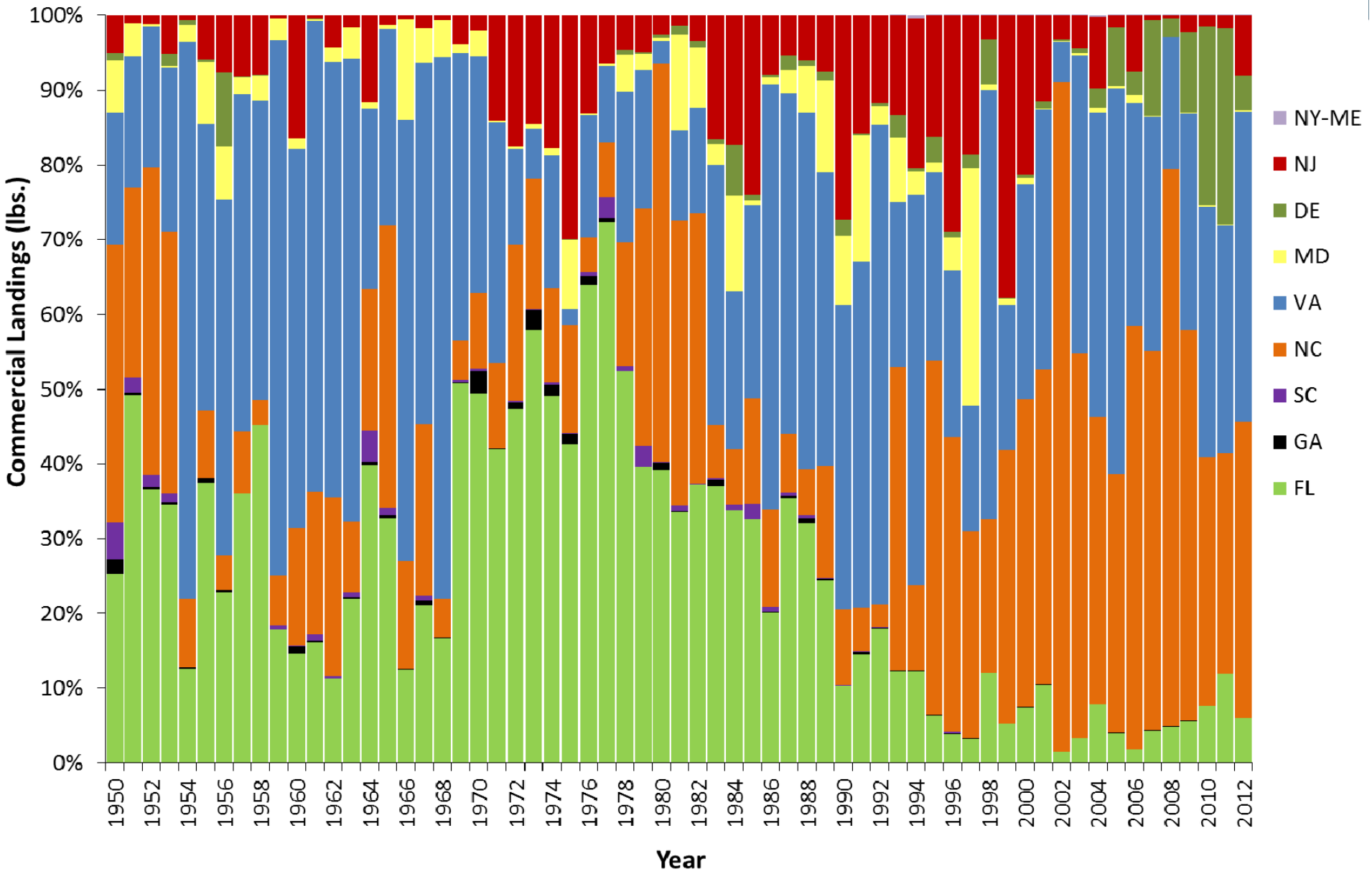


Commercial Landings

- U.S. Fish Commission (1887-1944)
- NMFS (1945-1949)
- ACCSP (1950-2012)



Commercial Landings by State



Commercial Landings Size Data

- DE DFW Commercial Sampling
- VMRC Biological Sampling Program
- NC DMF Program 400s Fish House Sampling
- SEFSC Trip Interview Program (TIP)

- Only the NC DMF sampling program averaged more than 65 samples/year over all gears and months

- Available length samples indicate primarily harvest of immature fish in the South Atlantic and primarily mature fish in the Mid-Atlantic

Coastwide Age Samples by Year and 25 mm Length Bin

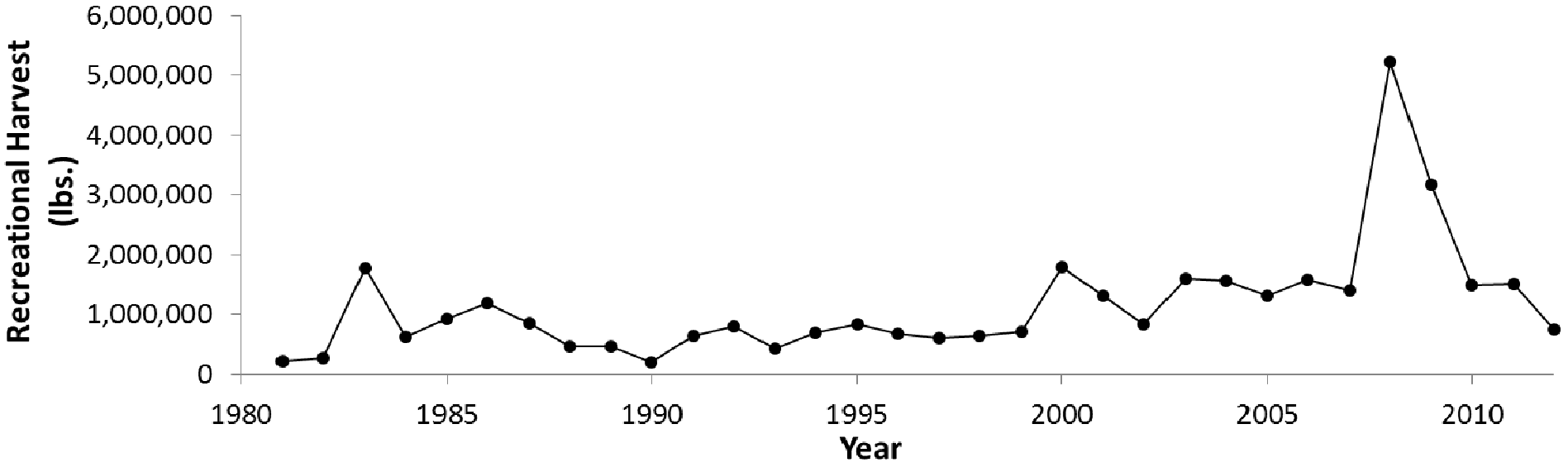
TL (mm)	Year Collected																											
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
75-99	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100-124	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
125-149	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
150-174	0	0	0	0	0	0	2	0	1	0	0	0	0	0	1	0	0	0	1	0	3	0	2	5	16	0	0	2
175-199	4	1	3	0	0	0	1	1	15	0	0	0	0	5	1	0	0	3	5	0	3	1	11	12	20	2	0	2
200-224	0	3	5	0	0	0	2	5	18	0	0	0	0	4	1	0	3	3	9	1	10	2	16	36	25	8	10	11
225-249	0	16	14	0	0	0	1	7	16	1	0	0	0	6	0	0	3	2	6	0	6	3	22	55	12	2	24	10
250-274	0	9	14	0	0	0	0	5	8	4	0	0	2	2	0	0	1	6	2	1	1	1	4	41	3	7	15	7
275-299	0	4	4	0	0	0	0	2	0	0	0	0	3	2	0	6	1	9	1	2	0	5	5	9	10	0	16	2
300-324	0	2	3	0	0	0	0	1	0	0	0	2	11	0	3	11	0	12	0	0	1	2	4	0	6	0	13	2
325-349	0	1	3	0	0	0	0	1	1	0	1	1	4	1	5	15	2	21	3	0	0	3	1	0	1	7	2	0
350-374	0	1	4	0	0	0	4	3	5	0	0	3	0	1	5	13	2	21	5	0	1	4	2	0	2	2	0	2
375-399	0	3	6	0	0	0	2	0	3	1	2	7	4	0	5	7	5	18	6	2	1	7	2	1	2	5	0	1
400-424	0	3	1	0	0	0	0	4	3	1	2	11	5	8	4	16	0	17	8	1	1	2	2	3	5	8	6	1
425-449	0	3	0	0	0	0	5	4	7	7	1	7	9	5	9	10	8	14	19	1	2	2	5	1	5	0	13	3
450-474	0	0	6	0	0	0	1	1	1	2	0	3	10	4	5	17	7	7	17	1	5	1	4	0	4	0	12	3
475-499	0	0	4	0	0	0	1	0	2	2	0	4	6	3	3	9	7	7	15	4	2	0	0	4	4	0	4	2
500-524	0	0	1	0	0	0	0	0	0	1	0	2	8	0	0	5	5	3	9	6	4	0	1	3	3	0	1	0
525-549	0	1	2	0	0	0	0	1	1	1	0	2	6	3	1	4	5	6	4	2	2	3	2	0	8	3	3	1
550-574	0	0	5	0	0	0	0	0	0	0	3	2	1	2	5	4	6	8	3	6	2	2	1	1	2	1	1	0
575-599	0	0	2	0	0	0	0	0	0	0	0	0	2	1	1	4	5	5	2	8	1	0	1	1	2	5	2	0
600-624	0	0	0	0	0	0	0	1	0	1	1	1	0	2	2	2	1	5	2	5	2	1	0	1	2	4	1	0
625-649	0	0	1	0	0	0	0	1	1	2	0	1	0	1	0	3	5	3	1	2	4	1	0	1	0	2	6	0
650-674	0	1	0	0	0	0	0	0	2	0	1	1	0	1	2	3	2	5	2	1	1	1	1	3	5	1	8	0
675-699	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	2	0	8	1	2	1	1	1	0	4	3	6	0
700-724	0	0	0	0	0	0	1	2	0	3	0	2	0	1	0	0	1	7	1	4	0	0	0	0	0	7	8	0
725-749	0	0	0	0	0	0	2	0	0	0	1	2	0	0	0	2	1	1	0	0	0	1	0	1	3	8	8	0
750-774	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	2	1	1	2	1	0	0	1	1	10	6	9	0
775-799	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	1	1	1	0	0	2	0	0	4	7	6	10	2
800-824	0	1	0	0	0	0	1	0	1	1	2	1	0	0	0	0	3	1	0	0	1	0	1	8	22	24	10	6
825-849	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	1	0	1	0	0	0	1	9	24	22	13	2
850-874	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	1	0	1	0	4	15	32	14	0
875-899	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3	2	0	0	0	0	2	0	4	13	21	14	3
900-924	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	1	1	1	0	0	9	15	20	8	0
925-949	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	4	0	3	0	0	0	0	1	7	13	15	5	0
950-974	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	1	2	4	0	0	0	0	0	9	11	9	5	1
975-999	0	0	1	0	0	0	1	0	0	0	0	0	0	0	4	2	1	3	0	0	0	0	0	7	5	7	6	0
1000-1024	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	3	4	0	0	0	0	1	12	6	5	2	0
1025-1049	0	0	0	0	0	0	0	1	0	1	0	0	0	1	8	2	8	2	0	0	0	1	0	7	7	5	2	0
1050-1074	0	0	0	0	0	0	2	0	0	1	0	0	0	0	13	12	3	5	0	1	0	0	0	11	5	4	4	2
1075-1099	0	1	0	0	0	0	0	0	0	0	0	0	0	0	24	5	8	4	0	0	0	1	1	19	3	7	2	1
1100-1124	0	0	0	0	0	0	0	0	0	0	0	1	0	1	22	12	9	6	0	0	1	1	0	23	9	10	6	1
1125-1149	0	0	0	0	0	0	0	0	1	2	0	0	0	0	22	12	8	6	1	0	0	0	1	16	5	7	6	1
1150-1174	0	0	0	0	0	0	0	0	0	0	0	0	1	0	22	12	12	9	0	0	1	0	7	32	16	4	7	3
1175-1199	0	0	0	0	0	0	1	0	0	0	0	0	0	0	20	9	9	3	0	0	0	1	4	17	8	6	6	1
1200-1224	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	5	18	2	1	0	0	1	8	22	5	6	1	1
1225-1249	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	8	9	4	1	1	0	0	7	23	6	2	1	0
1250-1274	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	6	2	0	0	0	0	5	8	4	3	0	0
1275-1299	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	1	1	0	0	0	2	5	3	2	1	0
1300-1324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	2	3	0	0	0	0
1325-1349	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	1	1	0	0	0
1350-1374	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0

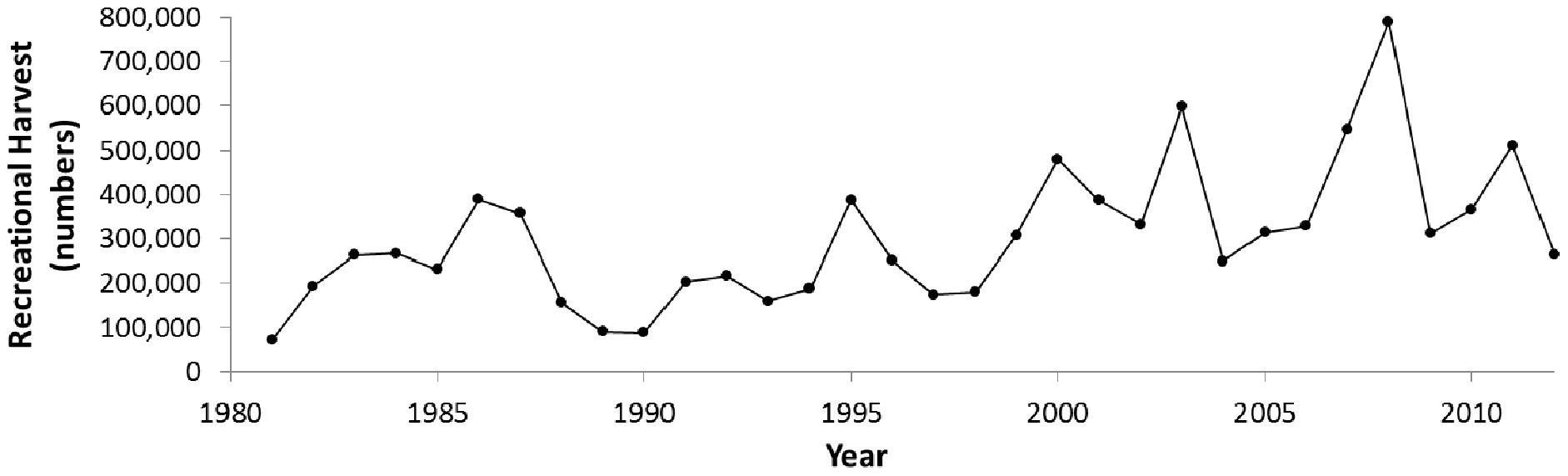
- < 5 samples = red
- 5-9 samples = yellow
- > 9 samples = green

Commercial Landings: caveats, biases, and uncertainty

- Historical landings are highly uncertain
- NMFS landings that precede required trip-ticket reporting are likely under reported
- Limited gear information in early years
- No reliable commercial discard data
- Issues with species identification and reporting
  - Fish landed as ‘drum’ were not included
  - in FL black drum possibly landed as ‘miscellaneous’ or ‘industrial fish’, not included

MRFSS & MRIP Recreational Harvest



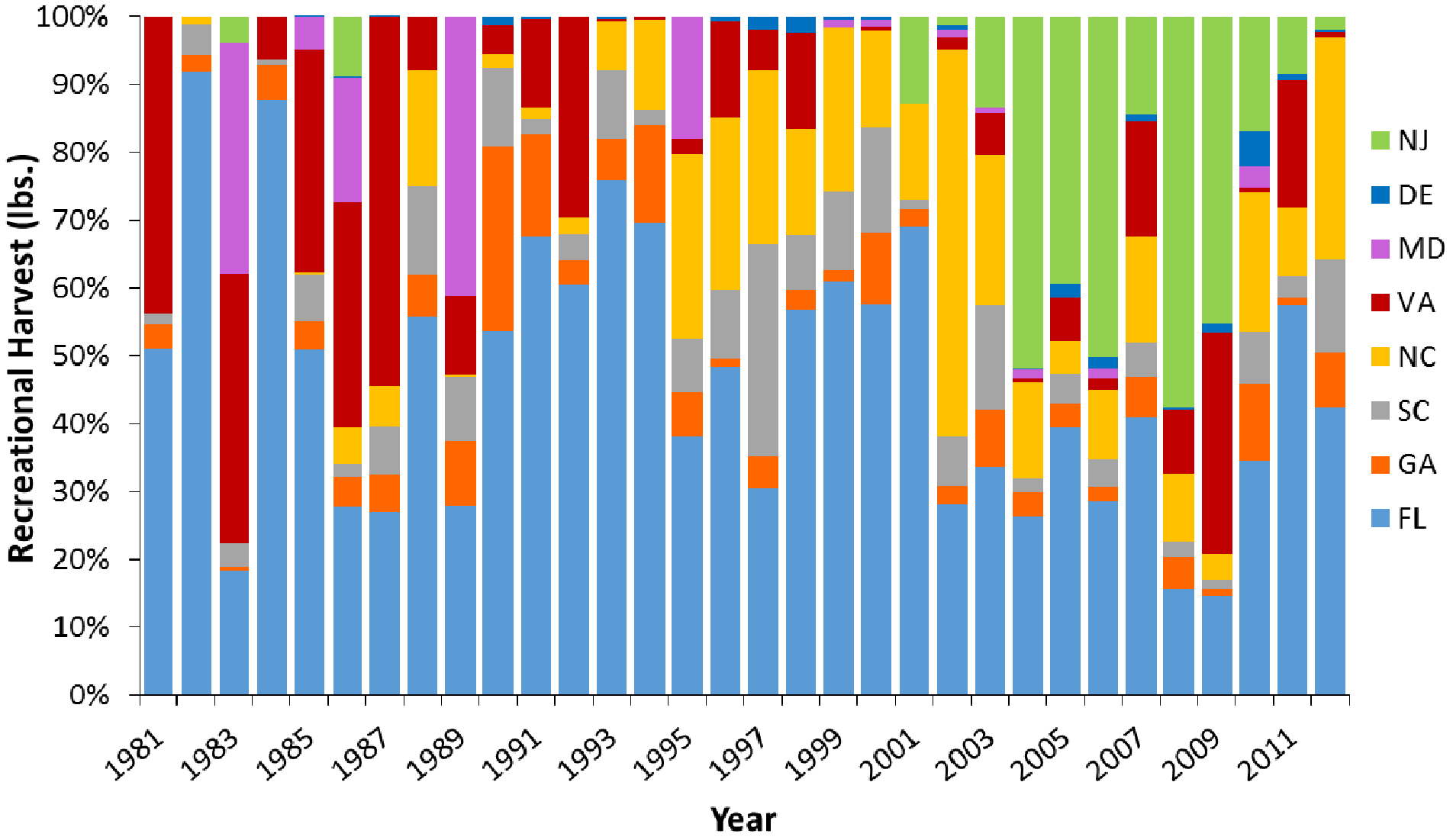


Year	FL	GA	SC	NC	VA	MD	DE	NJ	COASTWIDE
1981	23	61	67						12
1982	28	44	35	114					26
1983	24	46	64		33	29		77	17
1984	25	39	53						22
1985	24	50	64	52	41	39			19
1986	27	24	36	65	34		89	51	15
1987	26	21	36	30	32		59		19
1988	23	27	45	66					18
1989	60	23	56	82	14	37			24
1990	40	91	73	66	100		65		34
1991	21	69	54	30			48		18
1992	18	21	30	33	39				16
1993	16	27	33	25	71		47		13
1994	17	39	35	19	74				13
1995	30	33	47	17	97	72			19
1996	29	44	31	16	71		90		18
1997	21	54	32	20					13
1998	15	47	40	26	92		100		17
1999	12	43	33	18					9
2000	14	51	41	19	60		85		12
2001	13	33	43	21	100		62	39	11
2002	15	36	41	19	51	71	80	28	12
2003	15	26	36	19	37	68		80	14
2004	29	32	44	23	70	85	87	65	35
2005	24	32	42	33	67		101	42	20
2006	23	37	29	22	80	105	82	55	29
2007	19	27	26	19	58		69	63	16
2008	16	28	38	27	52		52	23	15
2009	22	29	28	20	49		47	36	23
2010	14	35	41	35	66	100	95	52	15
2011	30	41	38	18	21		67	68	19
2012	21	37	39	18	102		57	93	12

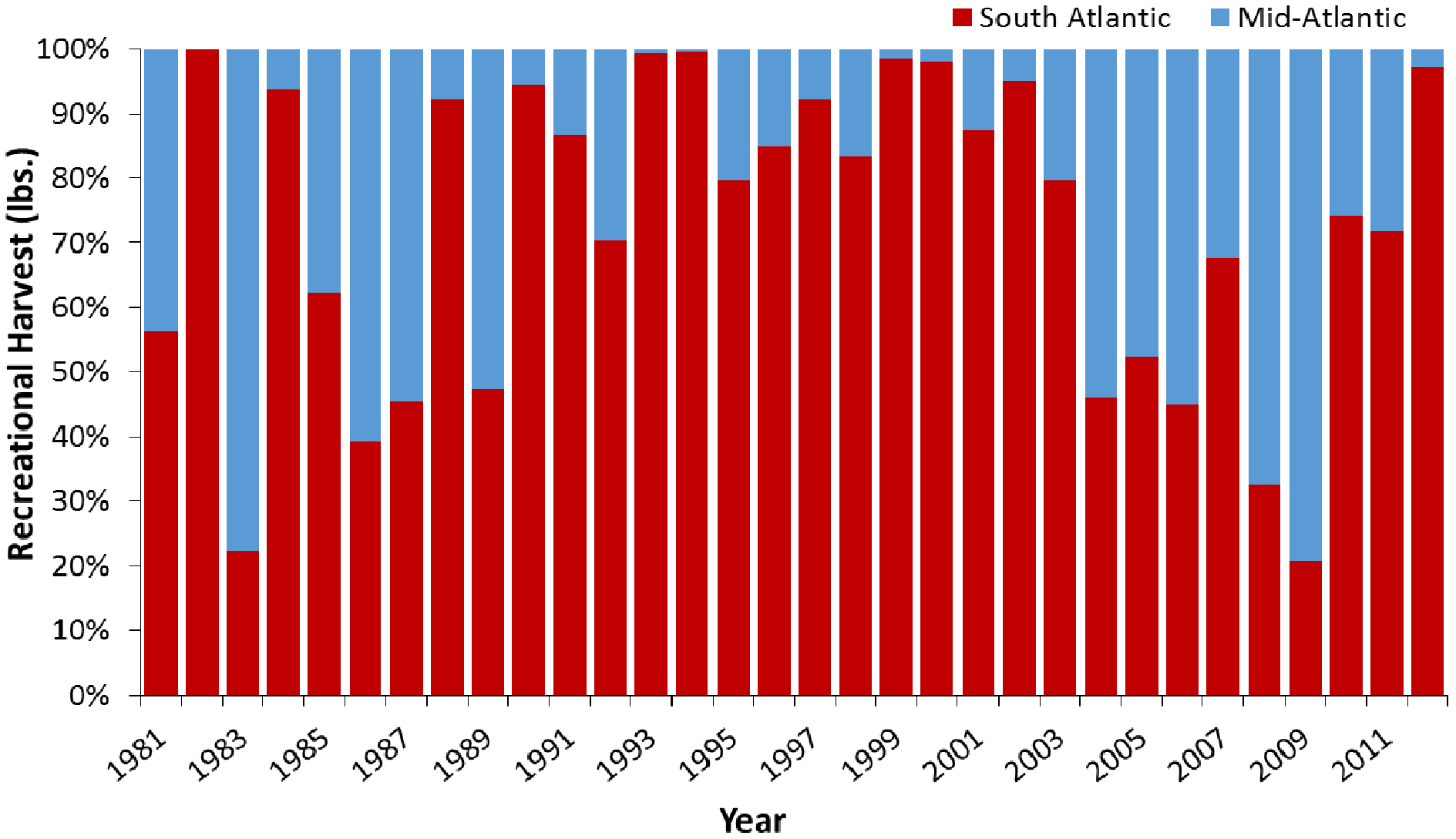
MRFSS & MRIP Harvest PSEs

- Proportional Standard Error (PSE) as a measure of precision
- > 50 indicates very imprecise
- Precision is generally lower in Mid-Atlantic than South Atlantic

MRFSS & MRIP Recreational Harvest by State



MRFSS & MRIP Recreational Harvest by Region



FL

YR	Wave 1	2	3	4	5	6
1981	NA	1	NA	3	9	6
1982	4	1	39	4	8	2
1983	5	7	6	5	17	24
1984	10	11	13	4	26	48
1985	3	4	9	13	18	14
1986	3	4	15	25	5	13
1987	9	20	12	3	18	7
1988	3	5	10	2	14	16
1989	1	NA	NA	2	1	7
1990	1	1	2	1	0	4
1991	5	NA	9	5	1	30
1992	7	5	5	7	8	7
1993	5	7	15	6	7	17
1994	29	8	2	5	10	32
1995	8	5	2	9	3	4
1996	3	12	4	6	9	15
1997	0	9	1	4	5	21
1998	13	25	1	11	4	39
1999	25	34	17	16	36	49
2000	17	45	17	10	20	29
2001	28	16	23	22	67	20
2002	9	6	8	14	26	14
2003	14	11	10	11	12	37
2004	3	8	9	8	46	16
2005	16	19	8	3	4	23
2006	15	9	10	8	20	13
2007	14	24	15	9	16	37
2008	42	23	10	17	43	50
2009	44	40	20	14	14	20
2010	36	31	14	12	18	27
2011	10	5	14	12	18	23
2012	9	10	2	10	15	14

GA

YR	Wave 1	2	3	4	5	6
1981	NA	NA	2	6	NA	NA
1982	NA	NA	3	NA	7	3
1983	NA	NA	3	3	4	7
1984	NA	1	0	7	5	5
1985	NA	1	3	6	5	56
1986	10	11	19	32	40	22
1987	14	29	17	48	47	16
1988	5	2	9	16	5	7
1989	14	7	30	11	21	13
1990	NA	1	NA	2	NA	1
1991	NA	0	0	0	3	2
1992	NA	3	7	3	3	17
1993	NA	1	3	6	4	2
1994	NA	4	2	9	2	6
1995	NA	1	3	6	3	6
1996	NA	NA	1	1	0	NA
1997	NA	2	2	0	1	1
1998	NA	0	NA	3	3	NA
1999	NA	0	0	1	0	6
2000	NA	3	9	1	23	8
2001	NA	1	2	11	2	2
2002	NA	2	9	1	30	1
2003	NA	7	19	35	16	1
2004	NA	2	16	0	5	11
2005	NA	2	5	7	4	0
2006	NA	8	5	2	10	7
2007	NA	3	13	14	36	13
2008	NA	16	8	26	50	12
2009	NA	3	8	5	17	4
2010	NA	3	45	9	7	12
2011	NA	NA	0	5	4	8
2012	NA	4	2	4	9	6

SC

YR	Wave 1	2	3	4	5	6
1981	NA	0	NA	0	3	NA
1982	NA	1	2	1	6	NA
1983	NA	0	NA	1	2	NA
1984	NA	NA	NA	1	NA	12
1985	NA	NA	NA	2	0	2
1986	NA	0	1	2	7	1
1987	NA	NA	4	6	3	4
1988	NA	7	5	2	0	1
1989	NA	3	8	7	1	2
1990	NA	0	0	3	NA	2
1991	NA	NA	1	1	NA	1
1992	NA	4	NA	0	10	6
1993	NA	NA	1	4	9	2
1994	NA	2	2	0	NA	1
1995	NA	1	3	0	5	5
1996	NA	10	5	3	20	2
1997	NA	4	6	8	9	39
1998	NA	1	4	6	6	4
1999	NA	NA	0	12	5	27
2000	NA	NA	4	17	17	2
2001	NA	2	1	0	NA	3
2002	NA	0	6	2	2	5
2003	NA	2	5	5	0	9
2004	NA	NA	3	1	2	9
2005	NA	0	5	1	1	10
2006	NA	NA	1	2	7	165
2007	NA	4	63	33	4	9
2008	NA	10	7	7	17	9
2009	NA	11	6	4	6	2
2010	NA	4	24	2	3	5
2011	NA	1	4	3	3	2
2012	NA	0	3	3	7	4

NC

YR	Wave 1	2	3	4	5	6
1981	NA	NA	NA	NA	NA	NA
1982	NA	NA	NA	1	NA	NA
1983	NA	NA	NA	NA	NA	NA
1984	NA	NA	NA	NA	NA	NA
1985	NA	NA	NA	NA	0	2
1986	NA	NA	NA	NA	3	2
1987	NA	NA	2	12	31	0
1988	NA	NA	NA	15	1	NA
1989	NA	NA	NA	1	NA	NA
1990	NA	NA	0	4	1	1
1991	NA	NA	NA	3	1	18
1992	NA	NA	3	1	3	0
1993	NA	NA	1	2	19	39
1994	NA	NA	54	38	14	15
1995	NA	1	4	16	145	224
1996	NA	5	38	60	110	126
1997	NA	12	35	72	20	5
1998	NA	NA	3	52	82	30
1999	NA	4	33	72	95	44
2000	NA	3	50	68	31	26
2001	NA	0	11	30	82	50
2002	NA	17	24	51	80	47
2003	NA	10	56	26	72	34
2004	NA	3	39	14	36	42
2005	0	0	5	4	18	62
2006	NA	1	22	25	34	24
2007	NA	3	13	10	30	135
2008	NA	3	42	32	126	162
2009	0	6	8	17	92	68
2010	1	7	62	31	71	87
2011	NA	2	14	1	260	290
2012	1	17	40	47	50	82

VA

YR	Wave 1	2	3	4	5	6
1981	NA	NA	NA	NA	1	NA
1982	NA	NA	NA	NA	NA	NA
1983	NA	NA	10	NA	NA	NA
1984	NA	NA	1	NA	NA	NA
1985	NA	NA	28	1	NA	NA
1986	NA	NA	38	NA	2	NA
1987	NA	NA	29	NA	NA	NA
1988	NA	NA	NA	1	NA	NA
1989	NA	NA	1	1	1	NA
1990	NA	NA	NA	1	NA	NA
1991	NA	NA	1	NA	NA	NA
1992	NA	NA	14	NA	NA	1
1993	NA	NA	NA	NA	1	1
1994	NA	NA	NA	0	3	NA
1995	NA	0	1	NA	4	NA
1996	NA	NA	3	1	1	NA
1997	NA	NA	NA	NA	1	NA
1998	NA	NA	2	NA	1	0
1999	NA	NA	NA	NA	0	NA
2000	NA	NA	1	NA	1	NA
2001	NA	NA	NA	NA	2	NA
2002	NA	NA	NA	2	3	NA
2003	NA	1	5	1	5	NA
2004	NA	NA	NA	NA	2	NA
2005	NA	NA	5	NA	1	NA
2006	NA	NA	1	NA	NA	NA
2007	NA	NA	4	NA	4	4
2008	NA	NA	1	NA	NA	NA
2009	NA	NA	12	1	2	NA
2010	NA	NA	1	0	2	NA
2011	NA	NA	0	2	1	3
2012	NA	NA	1	NA	1	NA

MD

YR	Wave 1	2	3	4	5	6
1981	NA	NA	NA	NA	NA	NA
1982	NA	NA	NA	NA	NA	NA
1983	NA	NA	5	15	NA	NA
1984	NA	NA	3	NA	NA	NA
1985	NA	NA	4	8	NA	NA
1986	NA	NA	NA	1	NA	NA
1987	NA	NA	NA	0	NA	NA
1988	NA	NA	NA	NA	NA	NA
1989	NA	NA	13	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA
1991	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA
1995	NA	NA	0	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA
1998	NA	NA	NA	NA	0	NA
1999	NA	NA	1	NA	NA	NA
2000	NA	NA	NA	1	NA	NA
2001	NA	NA	NA	NA	NA	NA
2002	NA	NA	NA	1	0	NA
2003	NA	NA	NA	0	2	NA
2004	NA	NA	1	1	NA	NA
2005	NA	NA	NA	NA	NA	NA
2006	NA	NA	2	NA	NA	NA
2007	NA	NA	NA	NA	NA	NA
2008	NA	NA	NA	NA	NA	NA
2009	NA	NA	NA	NA	NA	NA
2010	NA	NA	NA	0	NA	NA
2011	NA	NA	NA	NA	NA	NA
2012	NA	NA	NA	NA	NA	NA

DE

YR	Wave 1	2	3	4	5	6
1981	NA	NA	NA	NA	0	NA
1982	NA	NA	NA	NA	NA	NA
1983	NA	NA	NA	NA	NA	NA
1984	NA	NA	NA	NA	NA	NA
1985	NA	NA	NA	NA	1	NA
1986	NA	NA	NA	NA	13	NA
1987	NA	NA	NA	NA	3	NA
1988	NA	NA	NA	NA	NA	NA
1989	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	1	6	NA
1991	NA	NA	NA	NA	8	NA
1992	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	21	NA
1994	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA
1996	NA	NA	1	NA	1	NA
1997	NA	NA	1	1	NA	NA
1998	NA	NA	1	NA	NA	NA
1999	NA	NA	NA	NA	0	NA
2000	NA	NA	NA	NA	1	NA
2001	NA	NA	NA	NA	1	NA
2002	NA	NA	3	8	NA	NA
2003	NA	NA	NA	NA	NA	NA
2004	NA	NA	1	NA	NA	NA
2005	NA	NA	1	1	1	NA
2006	NA	NA	NA	8	1	NA
2007	NA	NA	1	NA	4	1
2008	NA	NA	4	11	NA	NA
2009	NA	NA	29	NA	NA	NA
2010	NA	NA	4	2	NA	NA
2011	NA	NA	6	NA	1	NA
2012	NA	NA	12	NA	1	NA

NJ

YR	Wave 1	2	3	4	5	6
1981	NA	NA	NA	NA	NA	NA
1982	NA	NA	NA	NA	NA	NA
1983	NA	NA	1	NA	NA	NA
1984	NA	NA	NA	NA	NA	NA
1985	NA	NA	NA	NA	NA	NA
1986	NA	NA	1	NA	NA	NA
1987	NA	NA	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA	NA
1989	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA
1991	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA
1998	NA	NA	NA	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA
2000	NA	NA	NA	NA	NA	NA
2001	NA	0	4	3	NA	NA
2002	NA	NA	0	2	NA	NA
2003	NA	NA	2	1	NA	NA
2004	NA	NA	14	NA	NA	NA
2005	NA	2	8	0	NA	NA
2006	NA	32	8	1	NA	NA
2007	NA	NA	4	NA	1	NA
2008	NA	NA	65	2	0	NA
2009	NA	2	40	NA	NA	NA
2010	NA	NA	10	NA	NA	NA
2011	NA	NA	8	1	2	NA
2012	NA	5	1	NA	NA	NA

MRFSS & MRIP Length Data

- No harvest estimate = grey
- <10 samples = red
- ≥10 samples = green

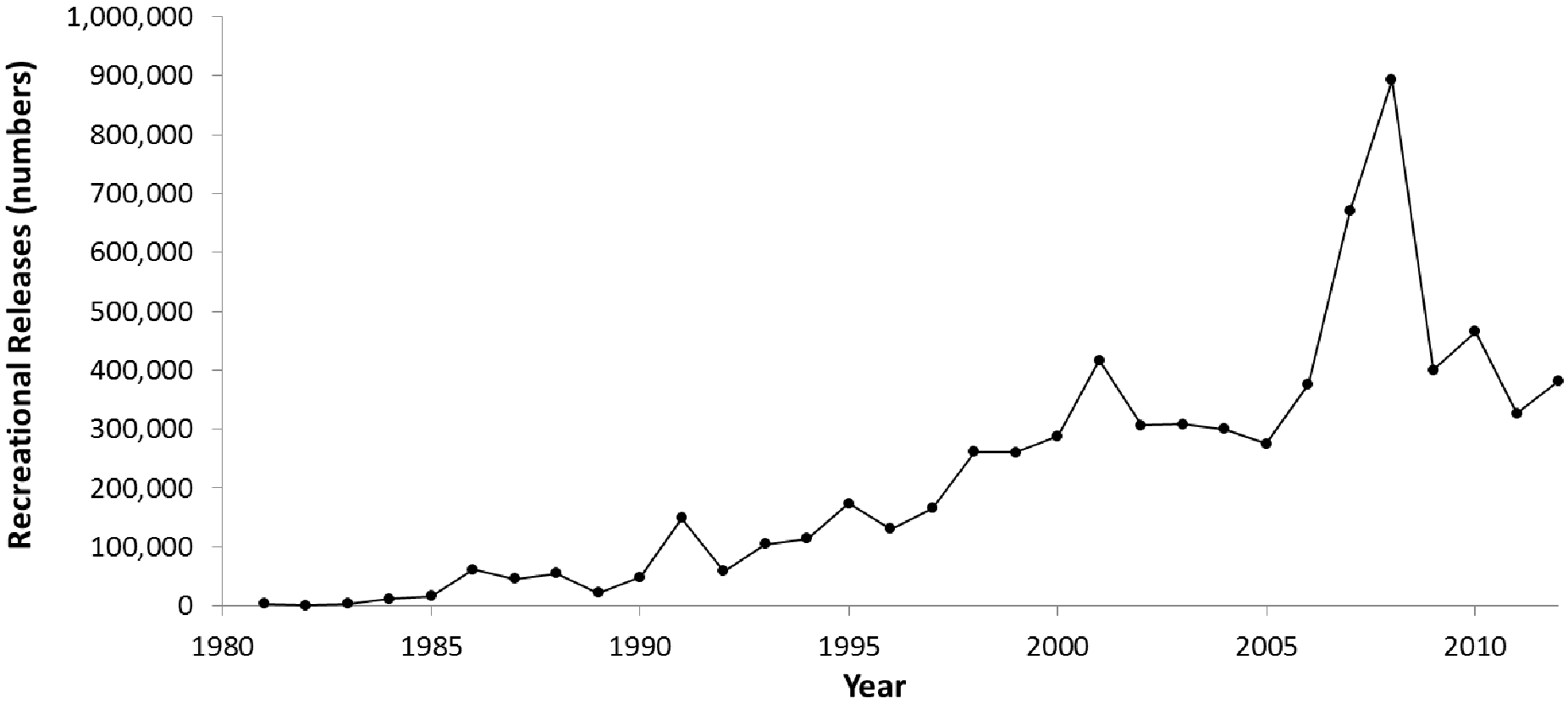
Supplemental Recreational Programs

- DE DFW Recreational Sampling
- VMRC Biological Sampling Program
- NC DMF Program 930 for Age and Growth
- SC DNR Freezer Fish Program
- SC DNR State Finfish Survey (SFS)
- GA DNR Marine Sportfish Carcass Recovery Project

- No sampling program averaged more than 73 samples/year over all waves and modes

- Available length samples indicate primarily harvest of immature fish in the South Atlantic and primarily mature fish in the Mid-Atlantic

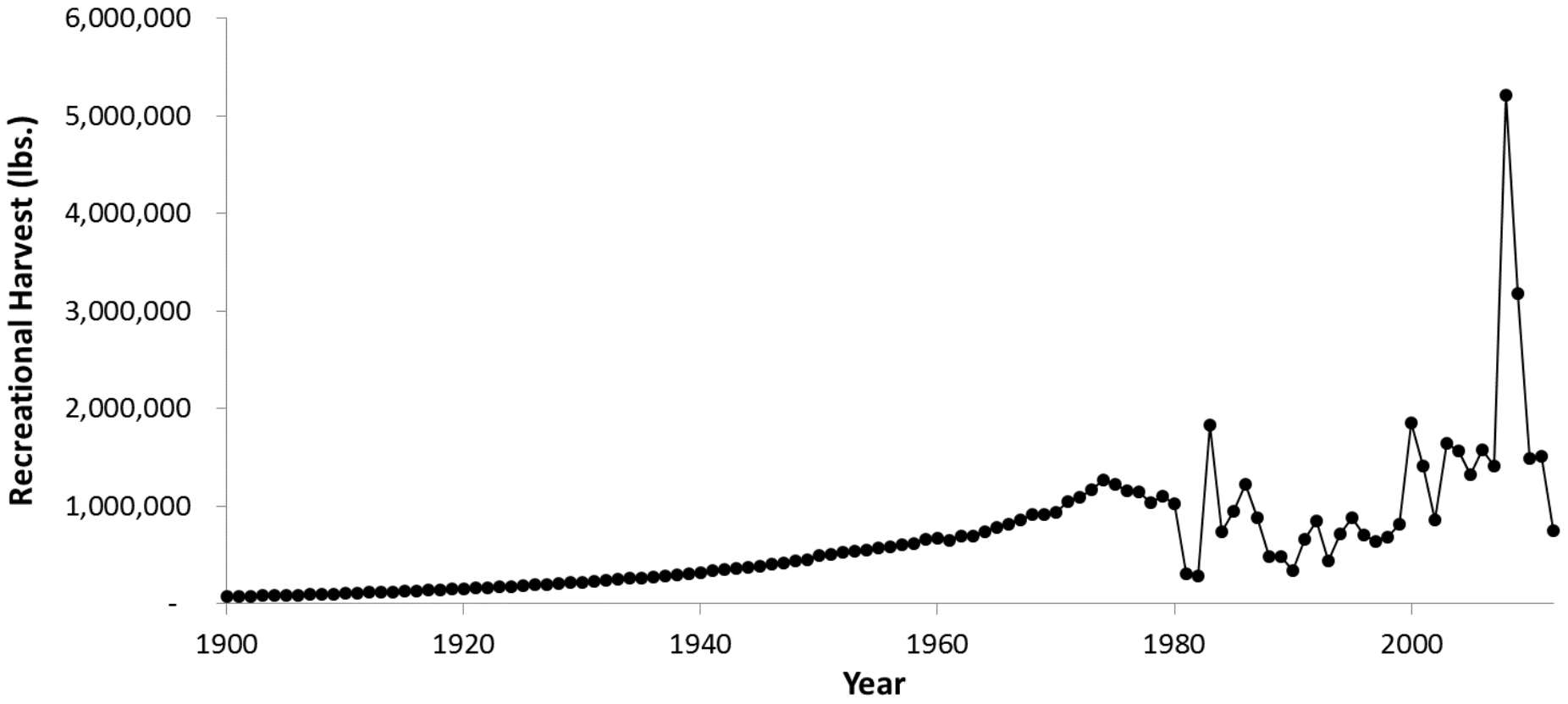
MRFSS & MRIP Recreational Releases



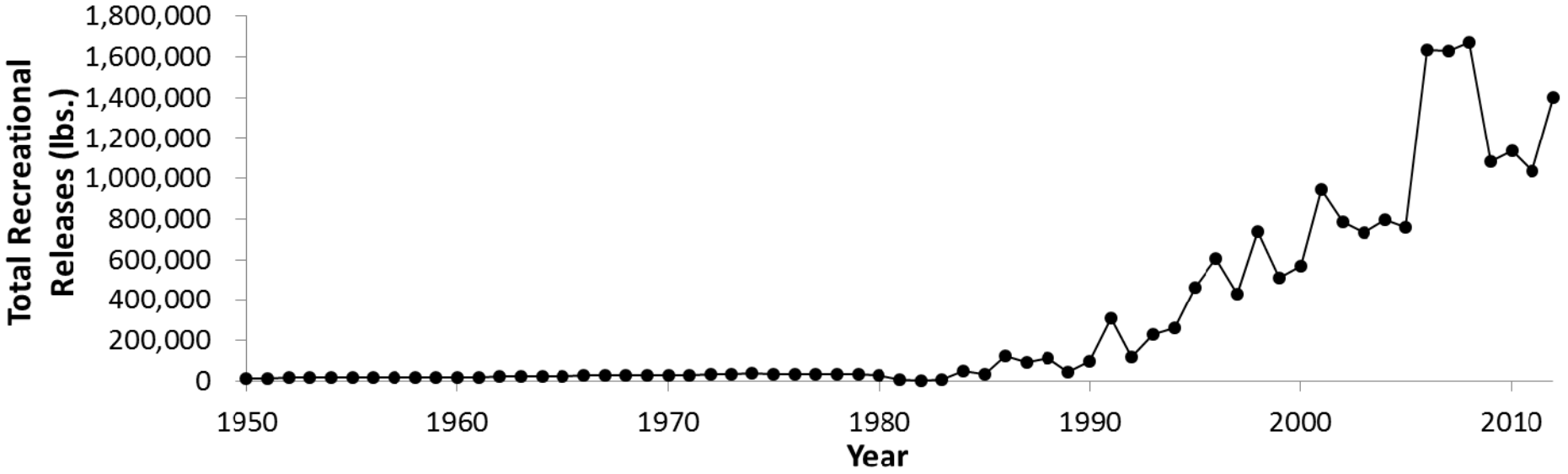
Historical Recreational Estimates

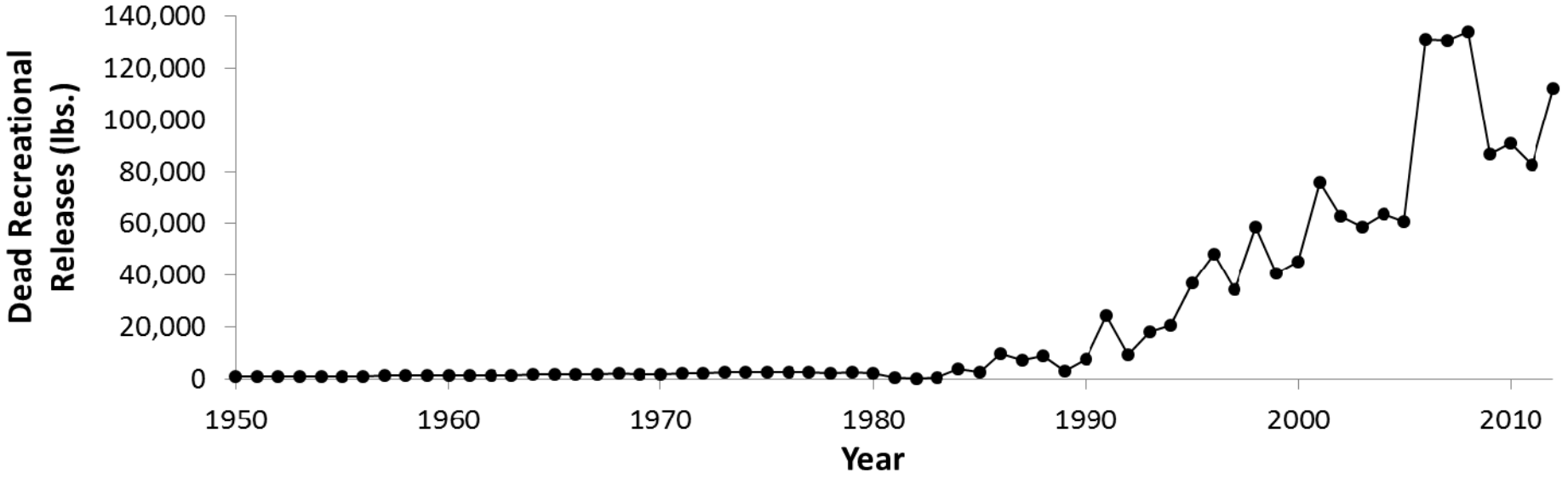
- Estimated historical recreational harvest and releases to address requirements for a complete catch history
  - 1950-1980
    - USFWS fishing license data and mean MRFSS CPUE 1981-1985
  - 1900-1949
    - Extrapolated harvest based on exponential regression and assumed negligible releases

Final Recreational Harvest



Final Recreational Releases





MRFSS/MRIP bias and caveats

- Pulse fisheries have less precise estimates
- State programs have recorded harvest in strata where MFRSS/MRIP estimated none
- Night fishing
  - Phone survey should capture effort
  - Preliminary data inconclusive about differences in catch rate between night and day

Fisheries Independent Data

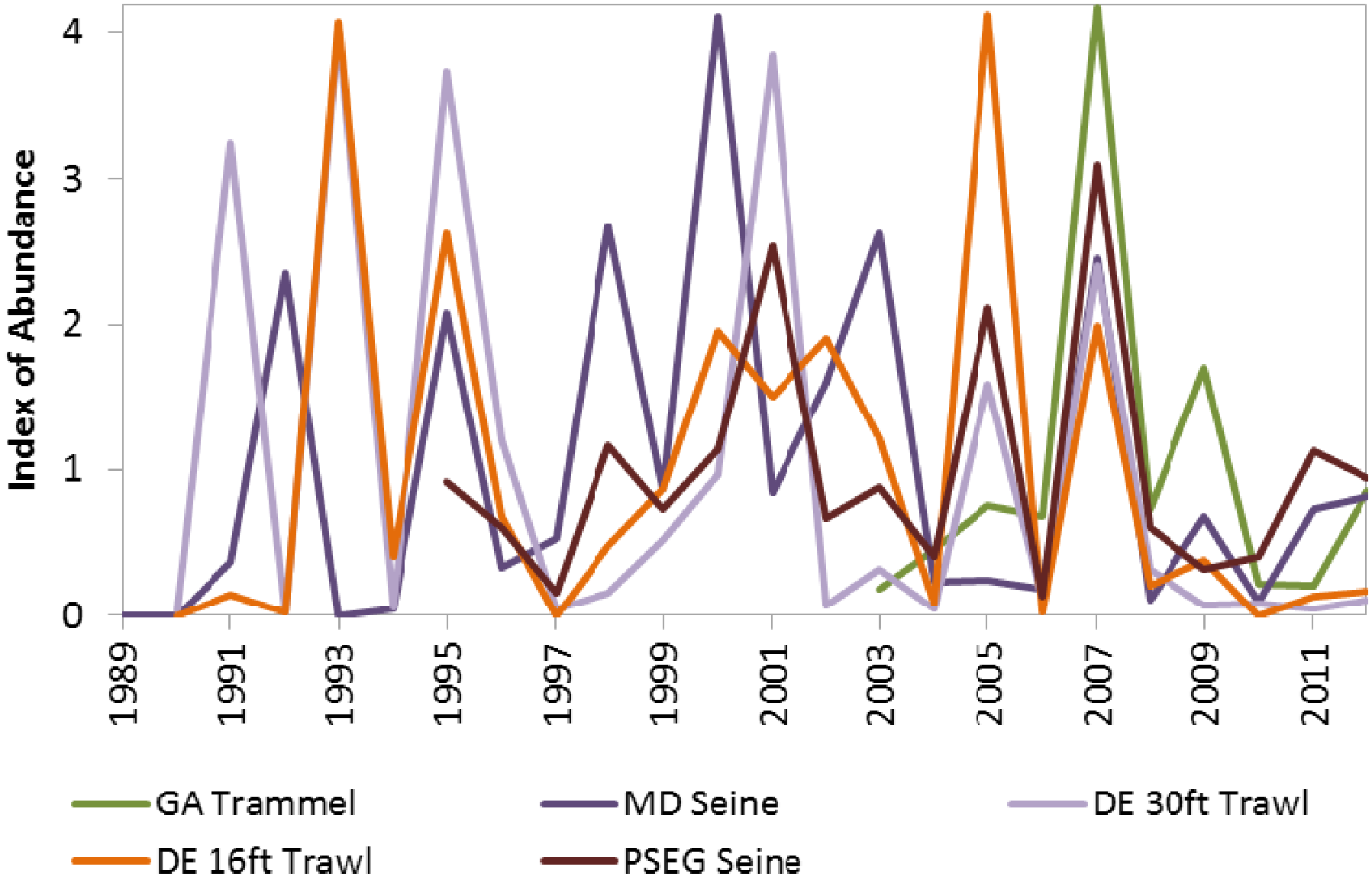
- Evaluated 28 fishery-independent data sources
  - Few regularly encountered black drum, especially adults
  - Most excluded because of low number of positive observations
- Only 8 were considered for tracking abundance
- All data sets with biological data used for life history analyses

Data Sources for Indices of Abundance

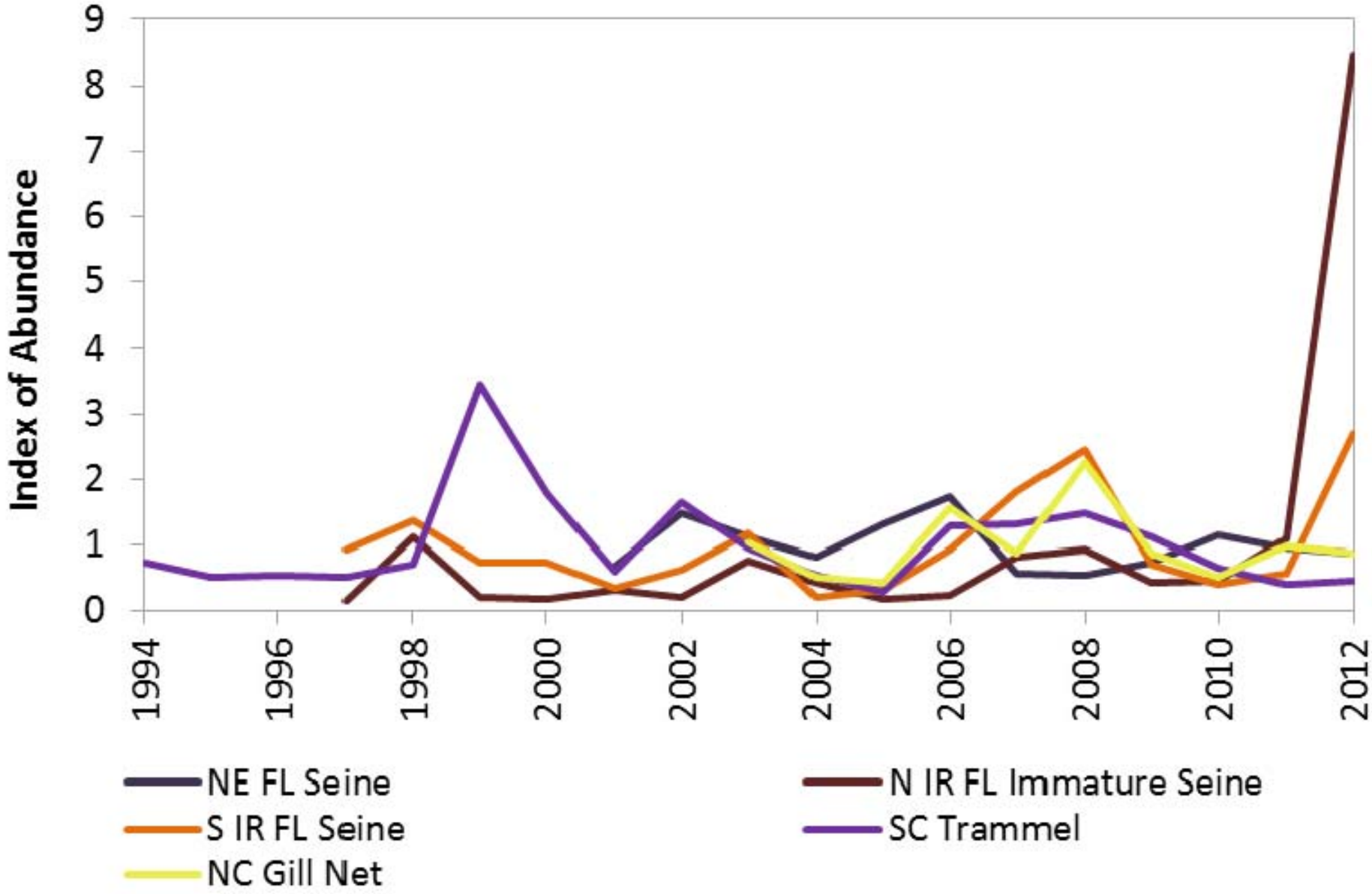
- Decision tree to standardize indices
- One fishery-dependent data source (MRFSS & MRIP access-point angler intercepts)
- Five indices tracking YOY, five indices tracking immature fish (≈600 mm TL), one index tracking entire exploitable stock
  - Three indices developed from FL FWC seine survey data

Data Source	Years	Type
PSEG Beach Seine Survey	1995-2012	YOY
DE DFW 16ft Trawl Survey	1990-2012	YOY
DE DFW 30ft Trawl Survey	1990-2012	YOY
MD DNR Coastal Bays Seine Survey	1989-2012	YOY
NC DMF Program 915 Gill Net Survey	2003-2012	Immature
SC DNR Trammel Net Survey	1994-2012	Immature
GA DNR Marine Sportfish Population Health Trammel Net Survey	2003-2012	YOY
FL FWC Fisheries Independent Mointoring Program Seine Survey	1997-2012	Immature
MRFSS & MRIP Dockside Intercepts	1982-2012	Aggregate

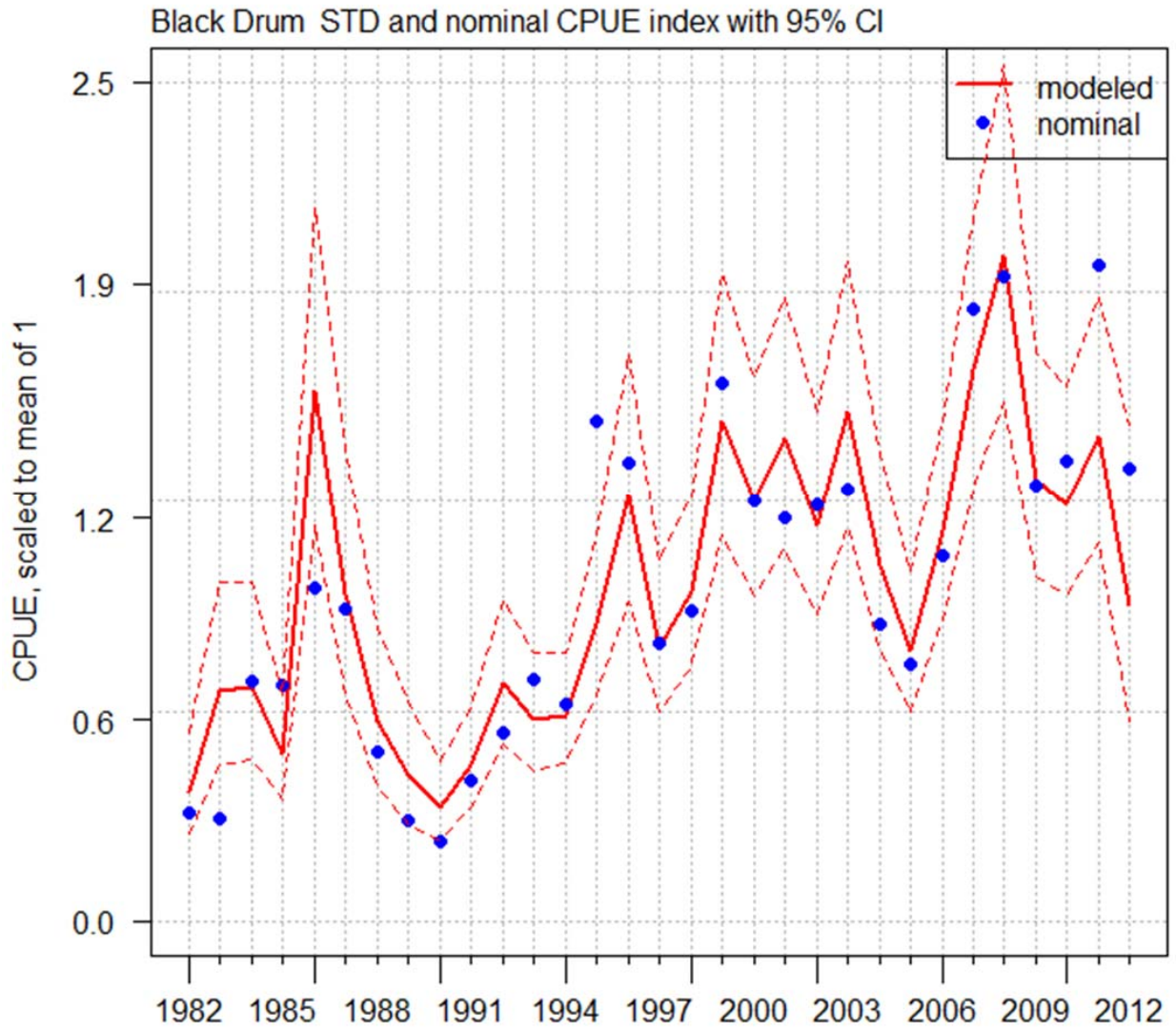
YOY Indices


Index of Abundance
0
1
2
3
4
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
GA Trammel
MD Seine
DE 30ft Trawl
DE 16ft Trawl
PSEG Seine

Immature Indices



MRFSS/MRIP Index



Life History Analyses

- Develop life history parameter estimates for assessment methods

Data Source	Data Type	Analysis		
		Growth	Maturity	Mortality
DE DFW Commercial & Recreational Sampling	FD	X		
NEAMAP	FI	X		
ChesMMAP	FI	X	X	
VMRC Biological Sampling Program	FD	X	X	
NC DMF Program 930	FI & FD	X		
SC DNR Various	FI & FD	X	X	X

Assessment Methods

- Trend Analysis
- Per Recruit Analysis
- Catch-Based
  - Depletion-Corrected Average Catch
  - Catch-MSY
  - Depletion-Based Stock Reduction Analysis

Trend Analyses

- Spearman's Association
  - Evaluate association between indices

- Mann-Kendall Analysis
  - Test for increasing or decreasing trends

Trend Analyses Results

- Significant, positive associations between indices from different surveys
  - Most notably YOY indices in the Mid-Atlantic
- Only trend (increasing) detected in MRFSS & MRIP index
  - Contradicted other indices and fishery

Equilibrium Per-Recruit Analysis

- Per capita age-structured model that uses survivorship along with age schedules of size, weight, mortality, fecundity, maturity, and harvest vulnerability
- Equilibrium Yield Per Recruit (YPR) and spawning potential ratio (SPR) calculated over a range of exploitation rates and minimum size limits
- Not endorsed by SASC due to lack of information on selectivity and fishing mortality

Catch-Based Methods

- Removal history available
- Do not require an index of abundance
- Meta-analyses and data available to inform required input parameters
- Good practice to compare different methods
- Evaluated three methods developed to estimate catch reference points
  - Depletion-Corrected Average Catch (DCAC, McCall 2009)
  - Catch-MSY (Martell and Froese 2012)
  - Depletion-Based Stock Reduction (DB-SRA, Dick and McCall 2011)

Catch-Based Methods - Advantages

- Performance of the methods relative to data-rich methods has been evaluated and is fairly robust given assumptions are correct

- Provide a good alternative to estimate reference points for data-poor stocks that lack information on size composition and abundance, but do have information on life history and removals

Catch-Based Methods - Limitations

- Were developed to estimate catch reference points not to make stock status determination
  - Conditional on subjective depletion assumptions
  - Methods do not fit estimates to any abundance data

Catch-Based Methods - Uncertainty

- Specify distributions for input parameters
- Run a number of model iterations with parameters drawn from distributions
- Calculate reference points from accepted iterations to develop probability distributions
- Sensitivity Analysis

Catch-Based Method Selection

- Chose DB-SRA as preferred method
  - DCAC does not incorporate a population dynamics model – it is a slightly modified average catch
  - Catch-MSY not robust for lightly exploited stocks
  - The life history and productivity parameters required for DB-SRA are better defined in meta-analyses.
  - DB-SRA more robust in sensitivity analysis and projections

DB-SRA Background

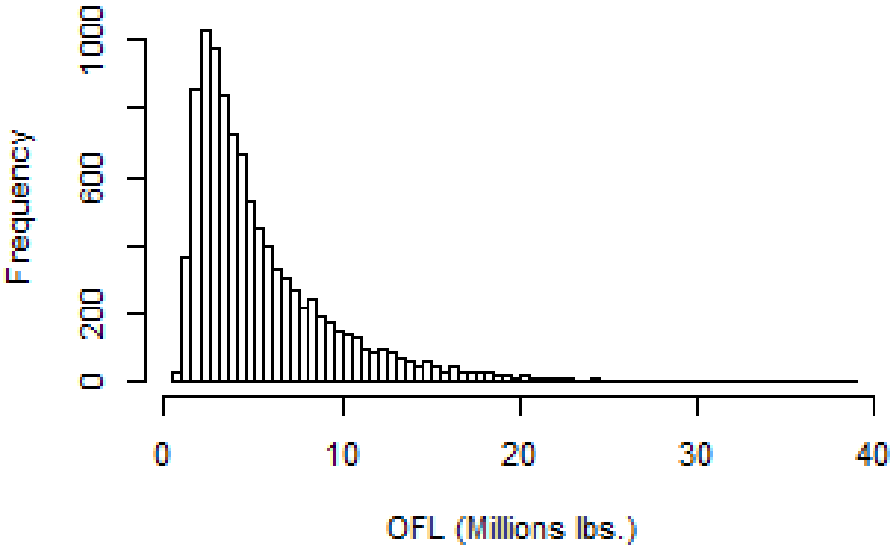
- Estimates what carrying capacity (K) must be if a stock is at a recent biomass level, given a time series of removals
- The observed time series of removals is assumed to start at unfished stock conditions, so B_{1900} is equal to K
- Select life history and stock condition parameters from distributions and project biomass forward with a production model and removal history

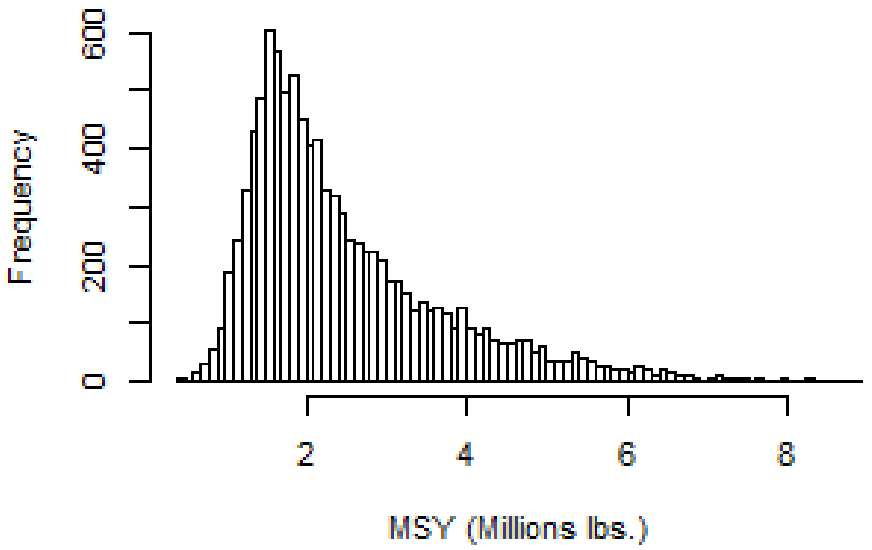
$$B_t = B_{t-1} + P(B_{t-a}) - R_{t-1}$$

- Iteratively solve for K based on assumed Bcur/K.

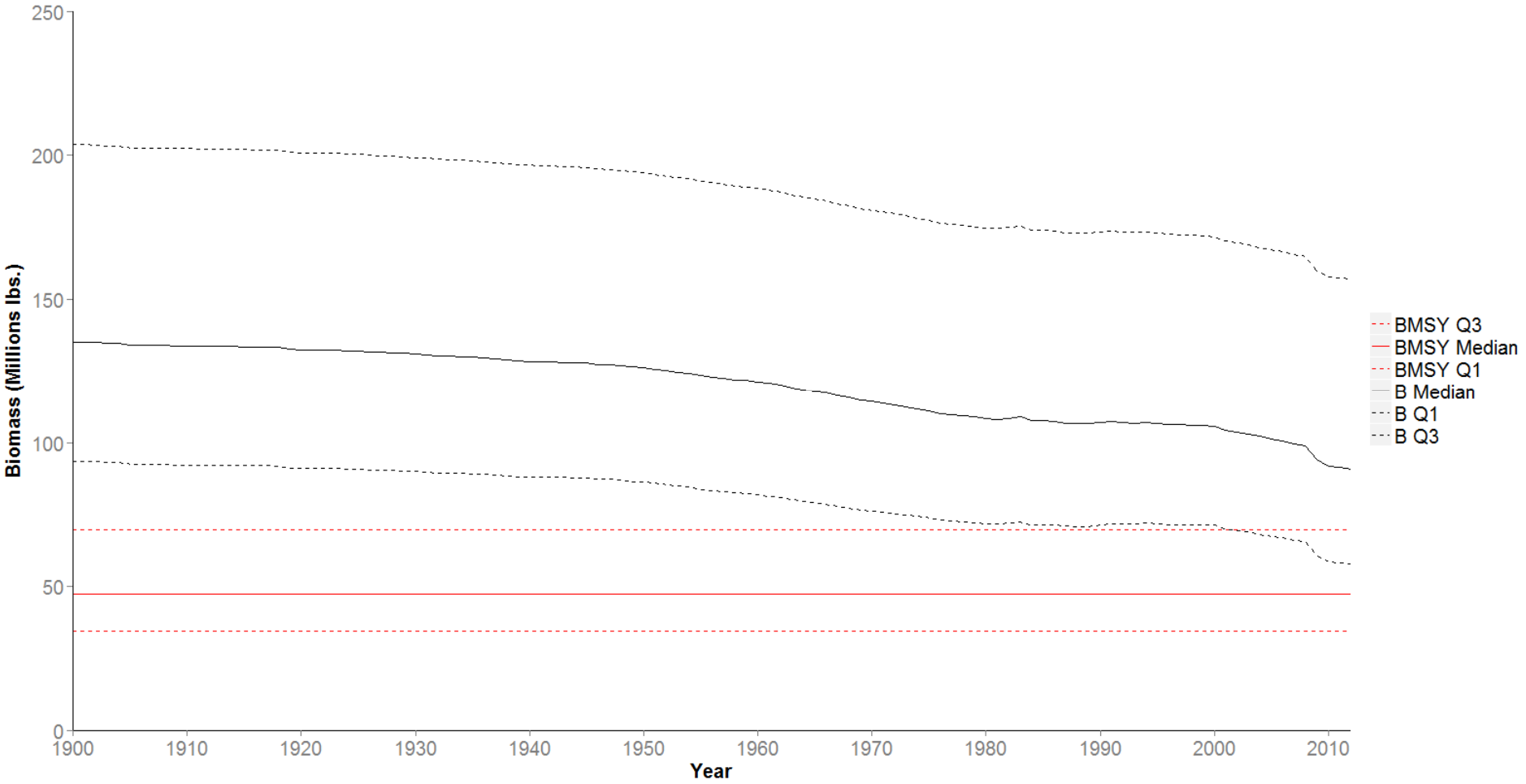
DB-SRA Results

- OFL (million lbs.)
  - Q1 = 2.60
  - Median = 4.12
  - Q3 = 6.98
- MSY (million lbs.)
  - Q1 = 1.60
  - Median = 2.12
  - Q3 = 3.05

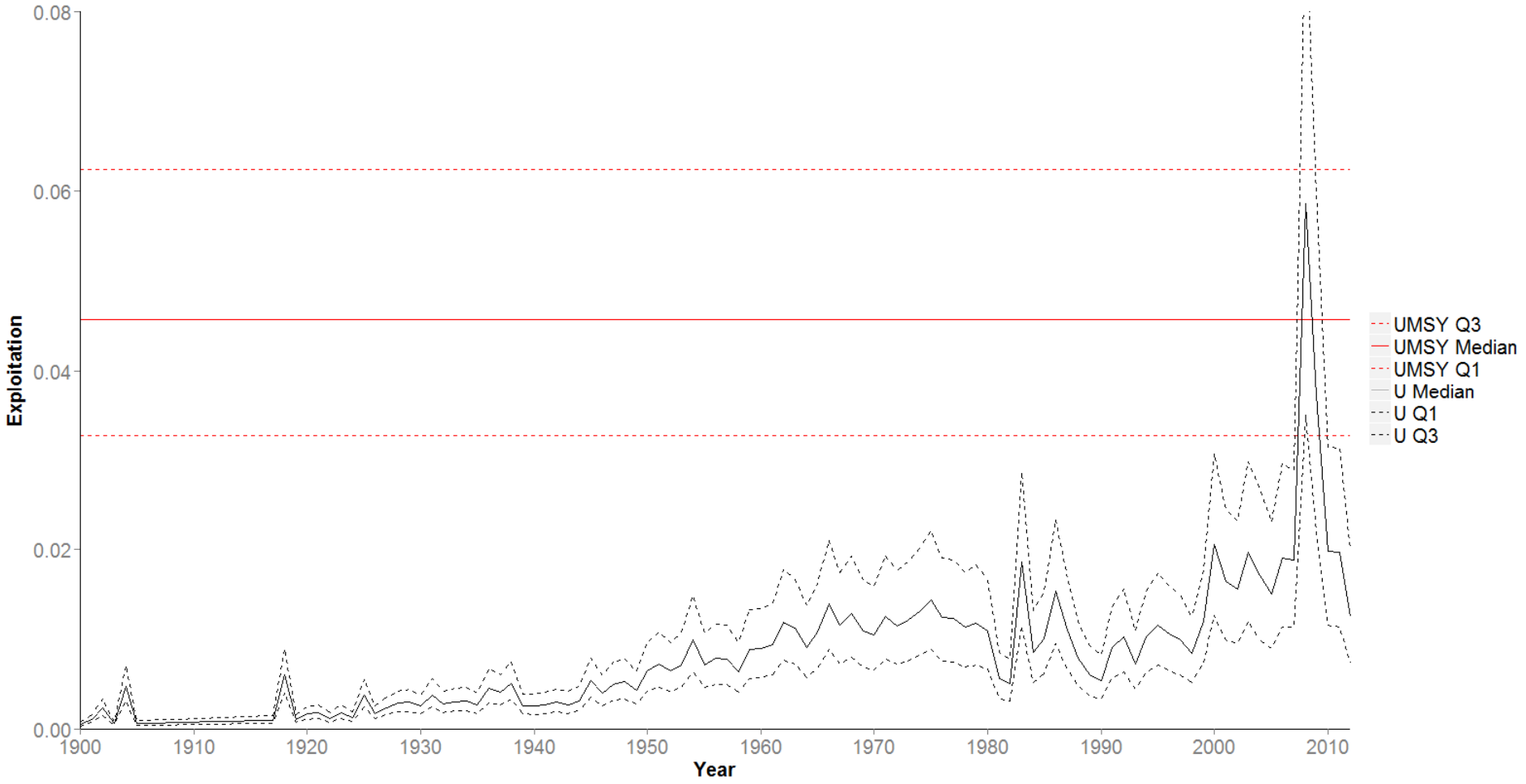




DB-SRA Biomass and BMSY

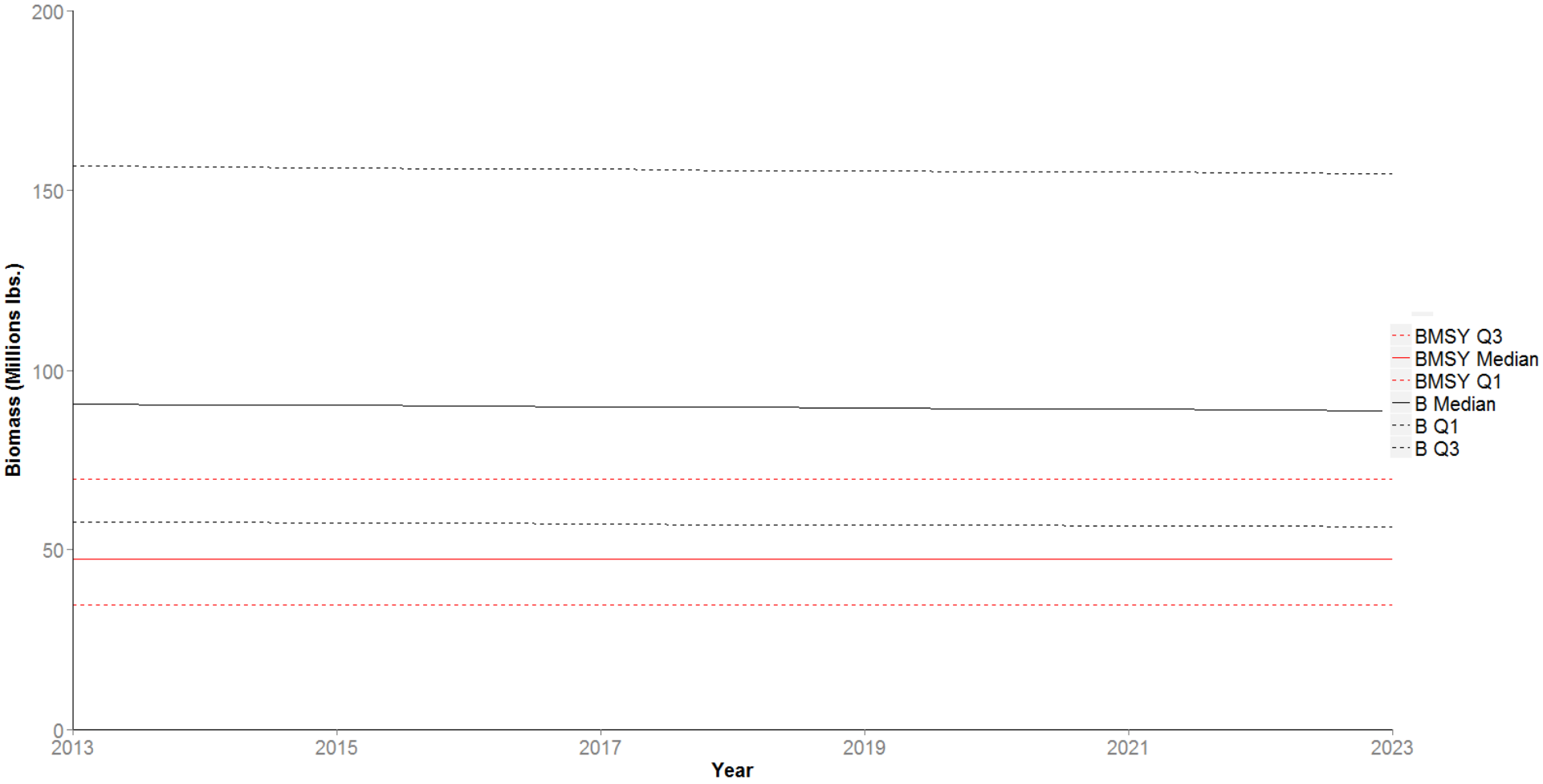


DB-SRA Exploitation and UMSY



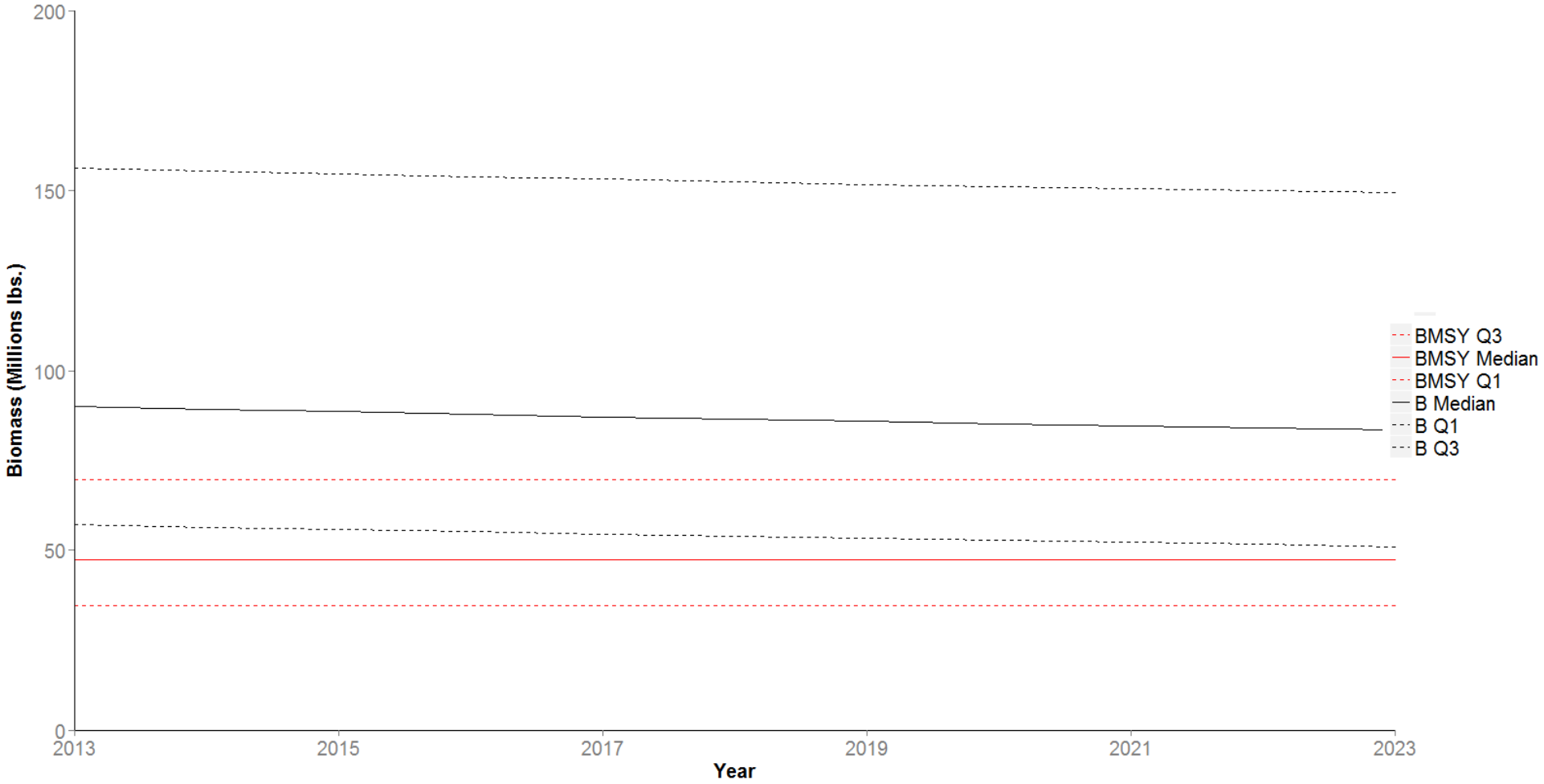
DB-SRA Projections

- Removals equal to average removals from 2010-2012 (1.56 million lbs.)



DB-SRA Projections

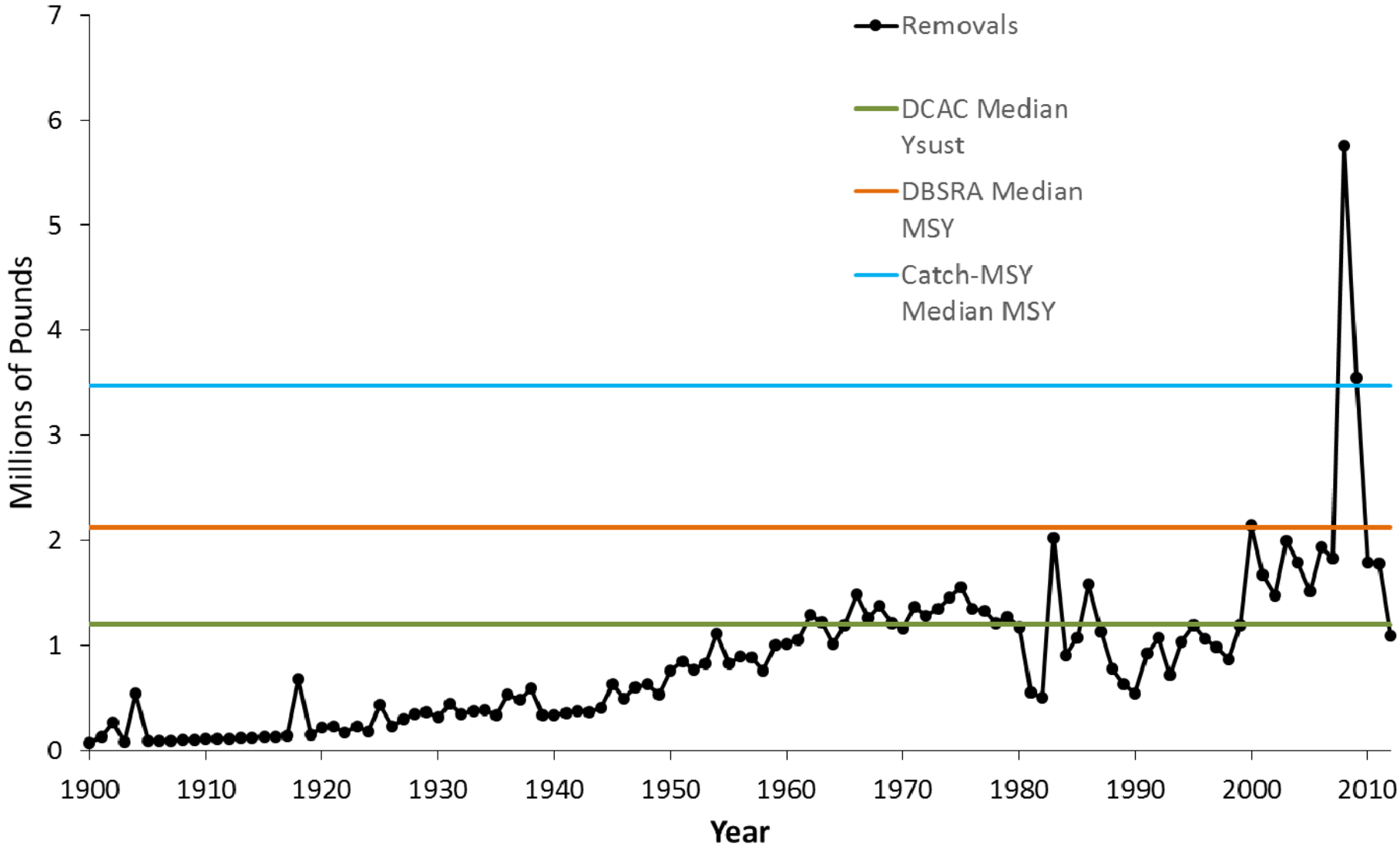
- Removals equal to DB-SRA median MSY estimate (2.12 million lbs.)



DB-SRA Sensitivity Analysis

- Depletion
  - Sensitive to depletion assumptions
  - Broad, uniform distribution
- Input Parameters
- Removals Time Series

Comparison of Catch-Based Methods



Reference Points

- Catch target – median DB-SRA MSY estimate
  - 2.12 million lbs.

- Catch threshold – median DR-SRA OFL estimate
  - 4.12 million lbs.
  - Product of current biomass and maximum sustainable exploitation (U_{MSY}) and indicates threshold for overfishing

Stock Status

- Black drum stock not overfished and overfishing is not occurring

- Based on results of catch-based methods, life history, and indices of abundance

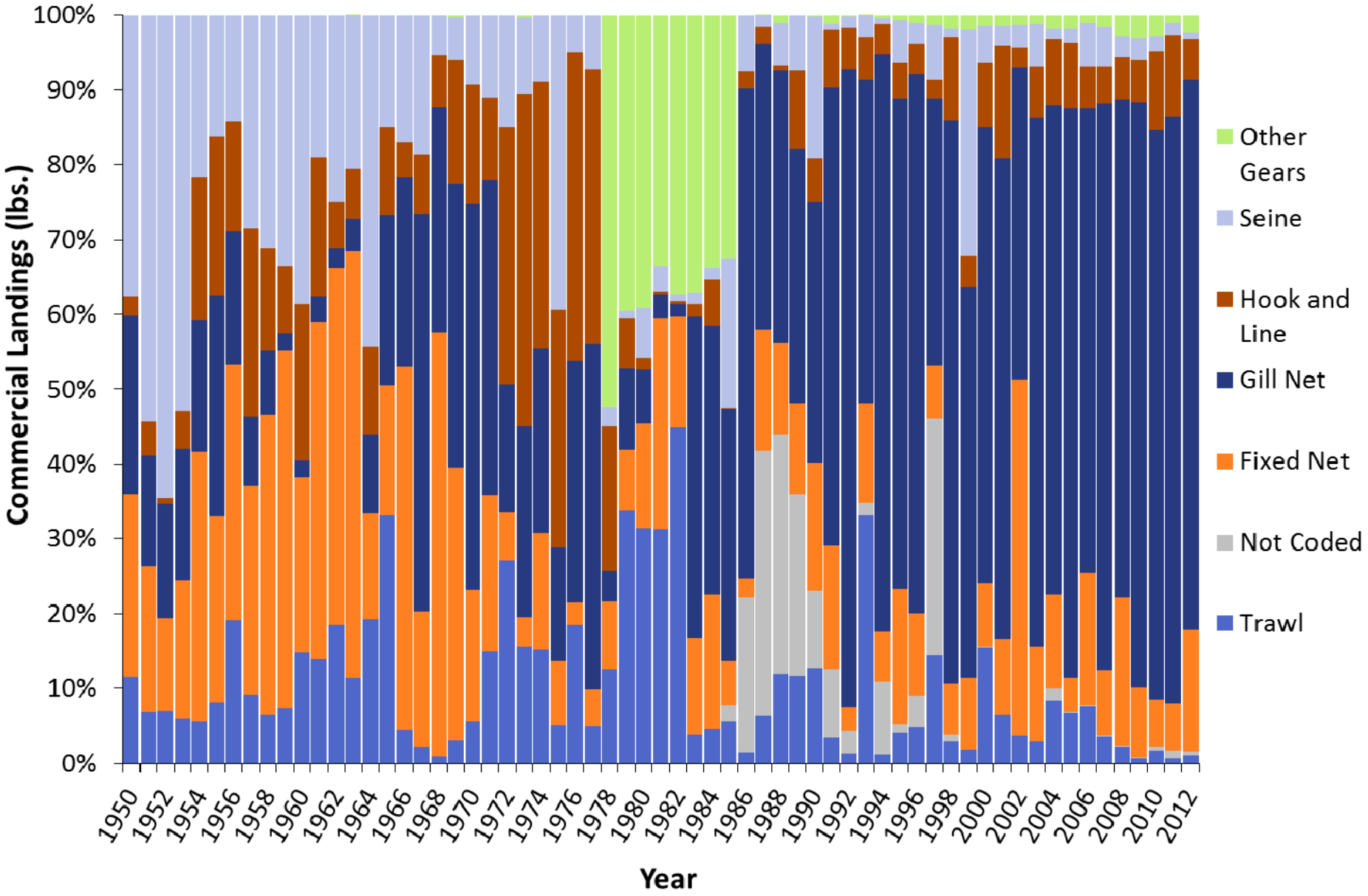
Research Recommendations: High Priority

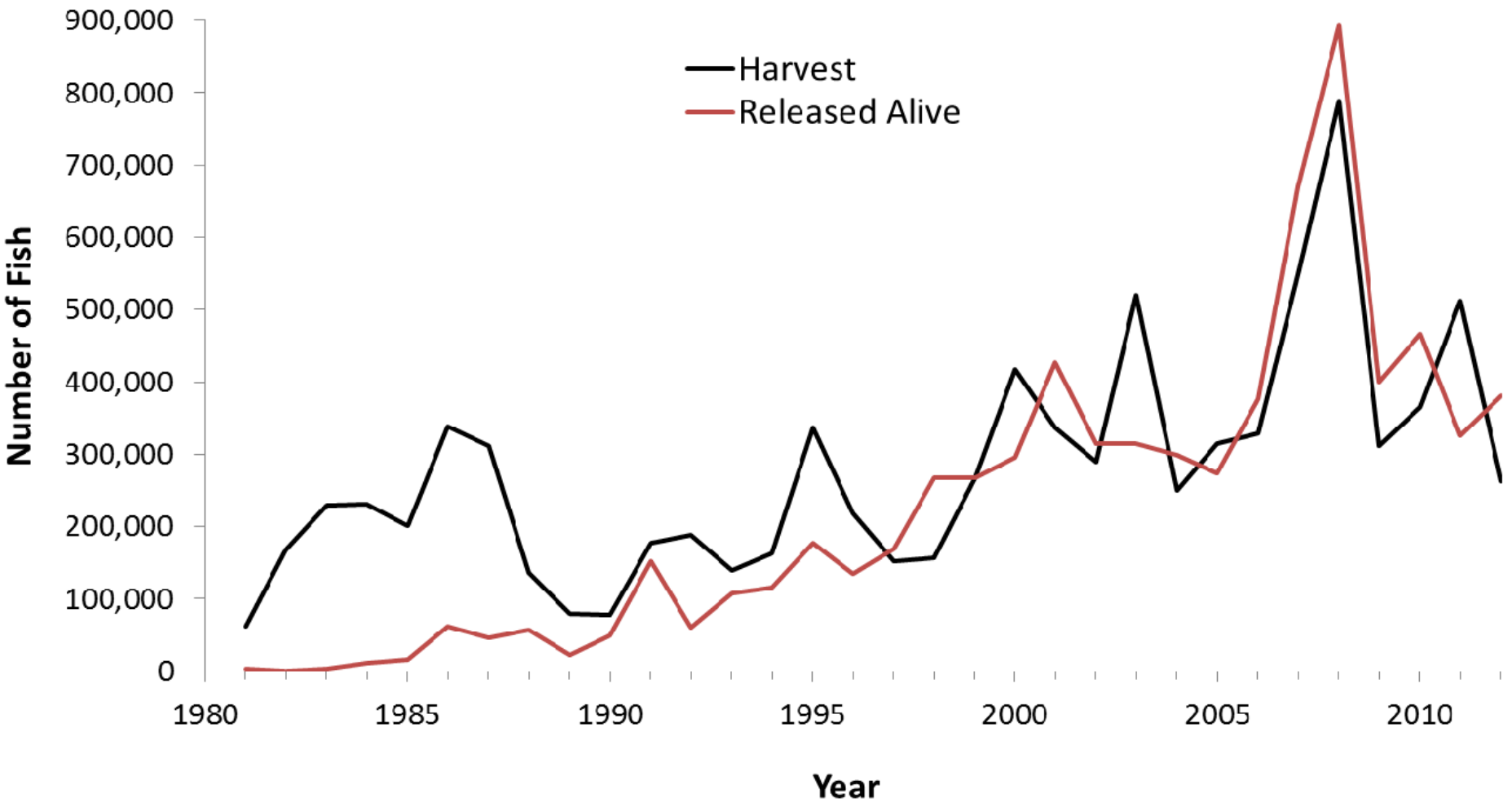
- Age otoliths that have been collected and archived.
- Collect information to characterize the size composition of fish discarded in recreational fisheries.
- Collect information on the magnitude and sizes of commercial discards. Obtain better estimates of bycatch of black drum in other fisheries, especially juvenile fish in south Atlantic states.
- Increase biological sampling in commercial fisheries to better characterize the size and age composition of commercial fisheries by state and gear.
- Increase biological sampling in recreational fisheries to better characterize the size and age composition by state and wave.
- Obtain estimates of selectivity-at-age for commercial fisheries by gear, recreational harvest, and recreational discards.
- Continue all current fishery-independent surveys and collect biological samples for black drum on all surveys.
- Develop fishery-independent adult surveys. Consider long line and purse seine surveys. Collect age samples, especially in states where maximum size regulations preclude the collection of adequate adult ages.

Research Recommendations: Moderate Priority

- Conduct reproductive studies, including: age and size-specific fecundity, spawning frequency, spawning behaviors by region, and movement and site fidelity of spawning adults.
- Conduct a high reward tagging program to obtain improved return rate estimates. Continue and expand current tagging programs to obtain mortality and growth information and movement at size data.
- Improve sampling of night time fisheries.
- Conduct studies to estimate catch and release mortality rates in recreational fisheries.
- Collect genetic material (i.e., create “genetic tags”) over a long time span to obtain information on movement and population structure, and potentially estimate population size.
- Obtain better estimates of harvest from the black drum recreational fishery (especially in states with short seasons).

Questions?


Commercial Landings (lbs.)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
Other Gears
Seine
Hook and Line
Gill Net
Fixed Net
Not Coded
Trawl


900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Number of Fish
Harvest
Released Alive
1980
1985
1990
1995
2000
2005
2010
Year

Catch-MSY Assumption and Limitations

- Reference points highly dependent on upper limit of K and lower limit of r
  - Lower values of r are more likely to be accepted due to less dramatic increases in biomass
  - The higher the upper bound on K, the lower the central r value will be due to the negative correlation between the parameters
  - The higher K is relative to removals the more difficult for the model to narrow in on the accurate r parameter. Removal history is not informative of maximum productivity and the method may perform poorly for lightly exploited stocks
- The lower limit of the MSY distribution is dependent on the lower limit of the assumed depletion and the upper limit of the MSY distribution is dependent on the upper limit of the assumed depletion and the range of K values
- Catch-MSY tended to overestimate K relative to the K estimate from independent data-rich assessments and underestimate r relative to $2*F_{MSY}$
  - Higher biomass thresholds and lower fishing mortality thresholds

Supplemental Recreational Programs

- DE DFW Recreational Sampling
  - Length samples from 2009-2012, average 55/year
- VMRC Biological Sampling Program
  - Mean length sample size from 1999-2012 is 36/year
- NC DMF Program 930 for Age and Growth
- SC DNR Freezer Fish Program
  - Mean length sample size from 1995-2012 is 29/year
- SC DNR State Finfish Survey (SFS)
  - Mean length sample size from 1989-2012 is 73/year
- GA DNR Marine Sportfish Carcass Recovery Project
  - Mean length sample size from 1998-2012 is 48/year
  - Otolith collected but not aged

Commercial Landings Size Data

- DE DFW Commercial Sampling
  - Length samples from 2009-2012, average 56/year
- VMRC Biological Sampling Program
  - Mean length sample size over all gears from 1989-2012 is 65/year
  - Less than 10 length samples in 4 of 7 years from 2006-2012
- NC DMF Program 400s Fish House Sampling
  - Mean length sample size over all gears from 2002-2012 is 1121/year
- SEFSC Trip Interview Program (TIP)
  - Mean length sample size over all gears from 1992-2012 is 32/year

DCAC Background

- If observed exploitation ***has not*** resulted in declining biomass, average removals are sustainable
- If observed exploitation ***has*** resulted in declining biomass, a portion of the removals, termed the windfall harvest (W), is not sustainable and caused the decline in biomass
- Windfall harvest relative to potential yield (W/Y_{pot}) is equivalent to the number of years of potential yield already removed by the windfall harvest
- Correct the observed average removals based on W (depletion) in terms of Y_{pot} to estimate a sustainable level of removals (Y_{sust}) at current stock conditions

DCAC Sustainable Yield

$$\bar{Y} = \frac{\Sigma R}{n}$$

$$Y_{sust} = \frac{\Sigma R}{n + \left(\frac{W}{Y_{pot}}\right)} = \frac{\Sigma R}{n + \frac{\Delta}{\left(\frac{B_{MSY}}{K}\right) cM}}$$

- If there has been no change in abundance, Y_{sust} is equal to average removals
- If there has been a decline in abundance, Y_{sust} decreases
- If there has been an increase in abundance, Y_{sust} increases

Catch-MSY Assumption and Limitations

- Constant productivity parameters
- Lumped biomass responds immediately to changes in biomass (i.e., no lags in recruitment to exploitable biomass)
- There may be a portion of the mature stock that is not fully vulnerable to the fisheries, depending on the proportion that migrate to the Mid-Atlantic, and this portion will not be captured in exploitable biomass estimates.
- No process error incorporated and the stock is assumed not to deviate from the deterministic production dynamics

Comparison of Exploitation Reference Points

- Per Recruit Exploitation Reference Points
  - U_{MSY} = 0.089
  - $U_{SPR0.4}$ = 0.047

- Catch-Based Methods Median U_{MSY}
  - DB-SRA = 0.046
  - Catch-MSY = 0.113

DCAC Background

- If observed exploitation ***has not*** resulted in declining biomass, average removals are sustainable
- If observed exploitation ***has*** resulted in declining biomass, a portion of the removals, termed the windfall harvest (W), is not sustainable and caused the decline in biomass
- Correct the observed average removals based on W to estimate a sustainable level of removals (Y_{sust}) at current stock conditions

DCAC Sustainable Yield

$$\bar{Y} = \frac{\Sigma R}{n}$$

$$Y_{sust} = \frac{\Sigma R}{n + \frac{\Delta}{\left(\frac{B_{MSY}}{K}\right) cM}}$$

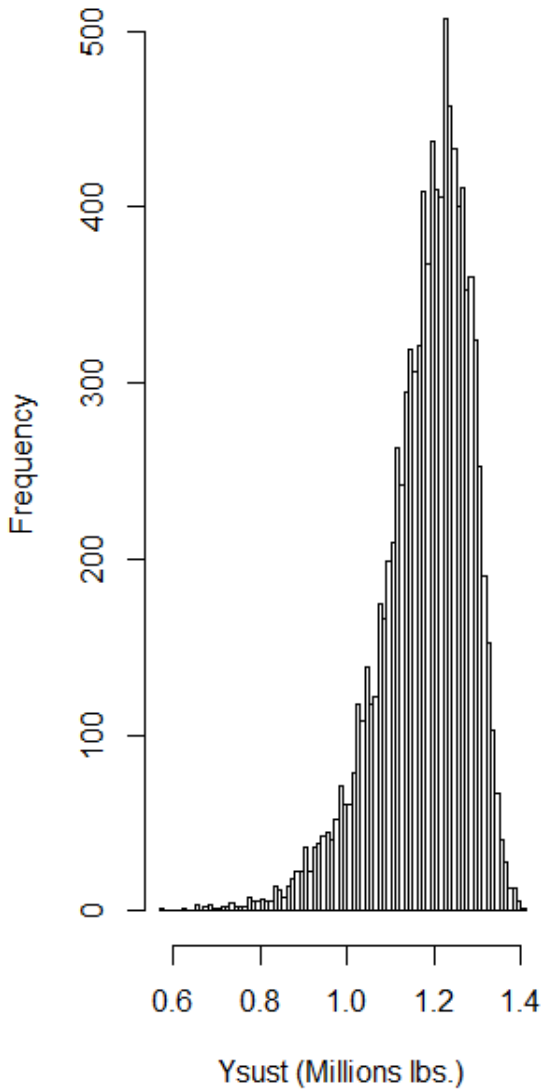
- If there has been no change in abundance, Y_{sust} is equal to average removals
- If there has been a decline in abundance, Y_{sust} decreases
- If there has been an increase in abundance, Y_{sust} increases

DCAC Assumptions and Limitations

- Sustainable yield estimate is not equal to MSY, but rather a more precautionary yield unlikely to exceed MSY
- Wetzel and Punt (2011) found that DCAC can be sensitive to an overly optimistic depletion parameter (Δ) and to the M and F_{MSY}/M parameters for some life-history types
- Sustainable yield may be underestimated if the removal history is not informative of maximum productivity
- Consistent bias in removals (e.g., underreporting) will be carried through equation to estimates

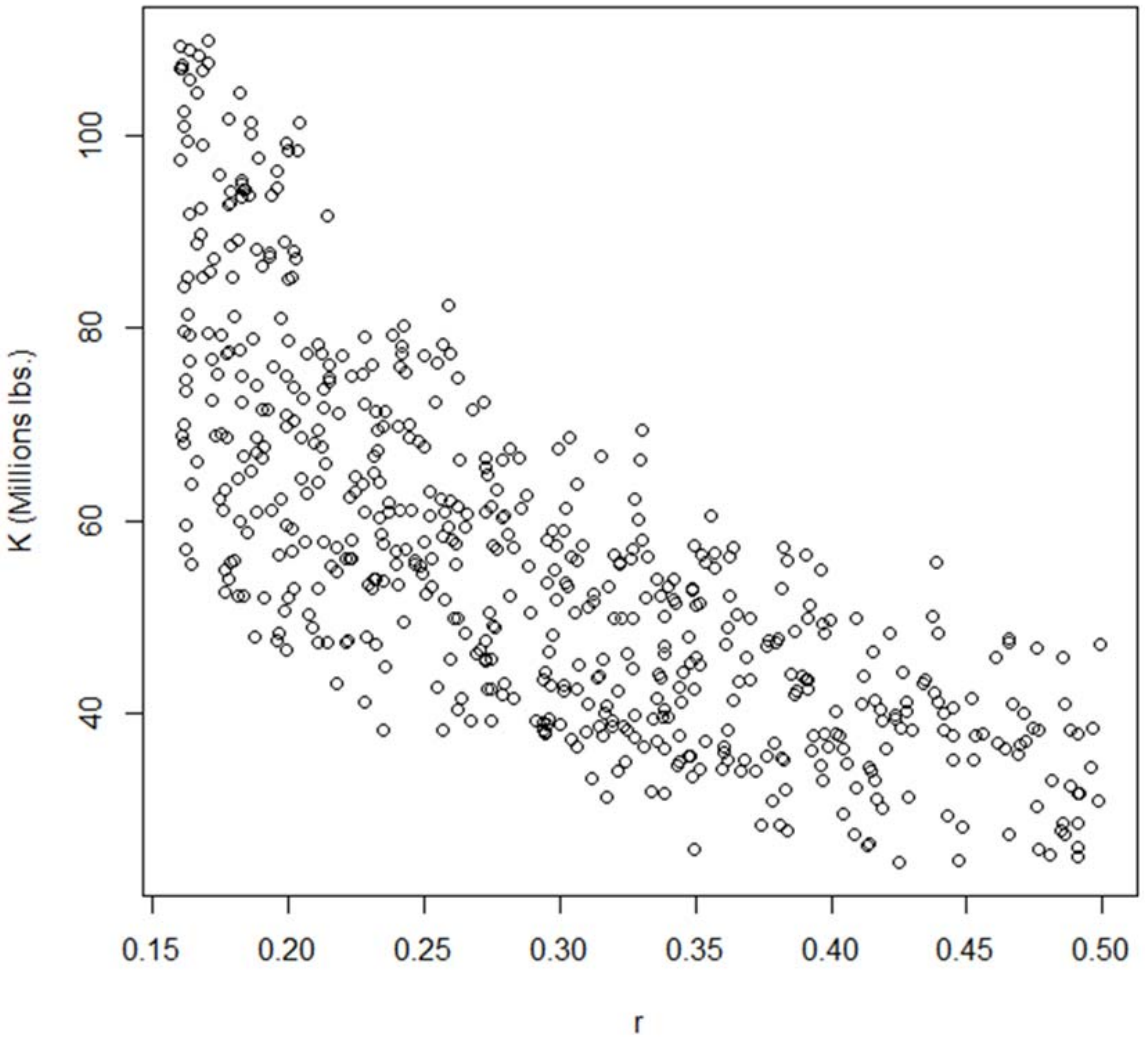
DCAC Results

- Average Removals = 1.31 million lbs.
- Y_{sust} (million lbs.)
  - Q1 = 1.12
  - Median = 1.20
  - Q3 = 1.25



Catch-MSY Background

- A strong negative correlation between two productivity parameters, maximum population increase rate (r) and carrying capacity (K), limits the possible combinations of these parameters that produce positive biomass estimates that do not exceed K, given a time series of removals



Catch-MSY Background

- Draw r and K parameters from distributions and project biomass forward with a production model

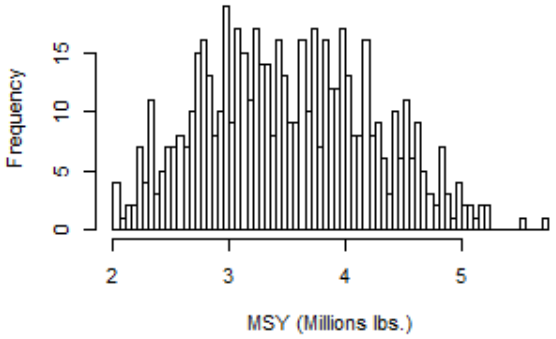
- If no biomass estimates fall below zero or exceed K and estimated relative biomass in a recent year is close to assumed relative biomass (depletion), the parameter combination is retained for reference point probability distributions

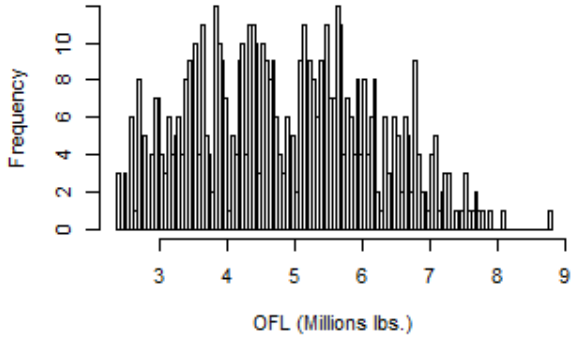
Catch-MSY Assumption and Limitations

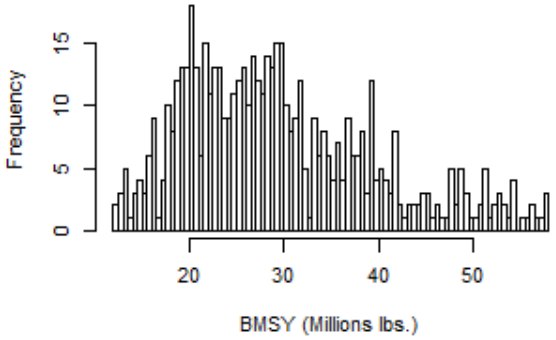
- Constant productivity parameters
- Lumped biomass responds immediately to changes in biomass (i.e., no lags in recruitment to exploitable biomass)
- No process error incorporated and the stock is assumed not to deviate from the deterministic production dynamics

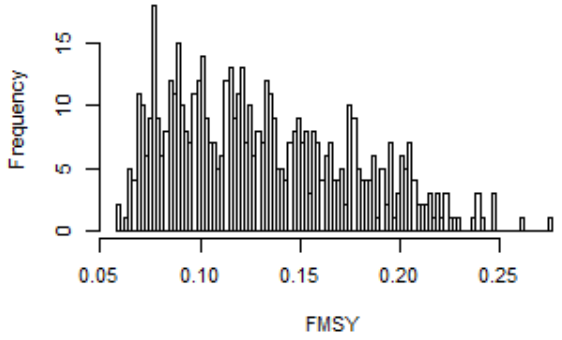
Catch-MSY Results

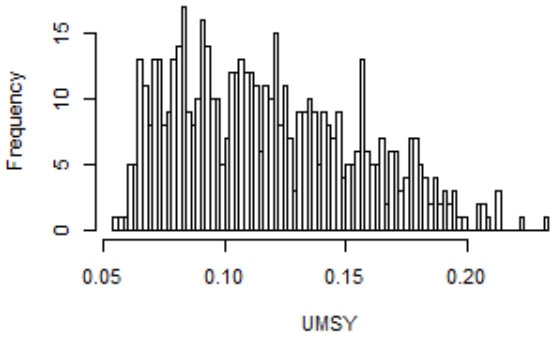
- MSY (million lbs.)
  - Q1 = 2.96
  - Median = 3.46
  - Q3 = 4.03
- OFL (million lbs.)
  - Q1 = 3.83
  - Median = 4.74
  - Q3 = 5.76





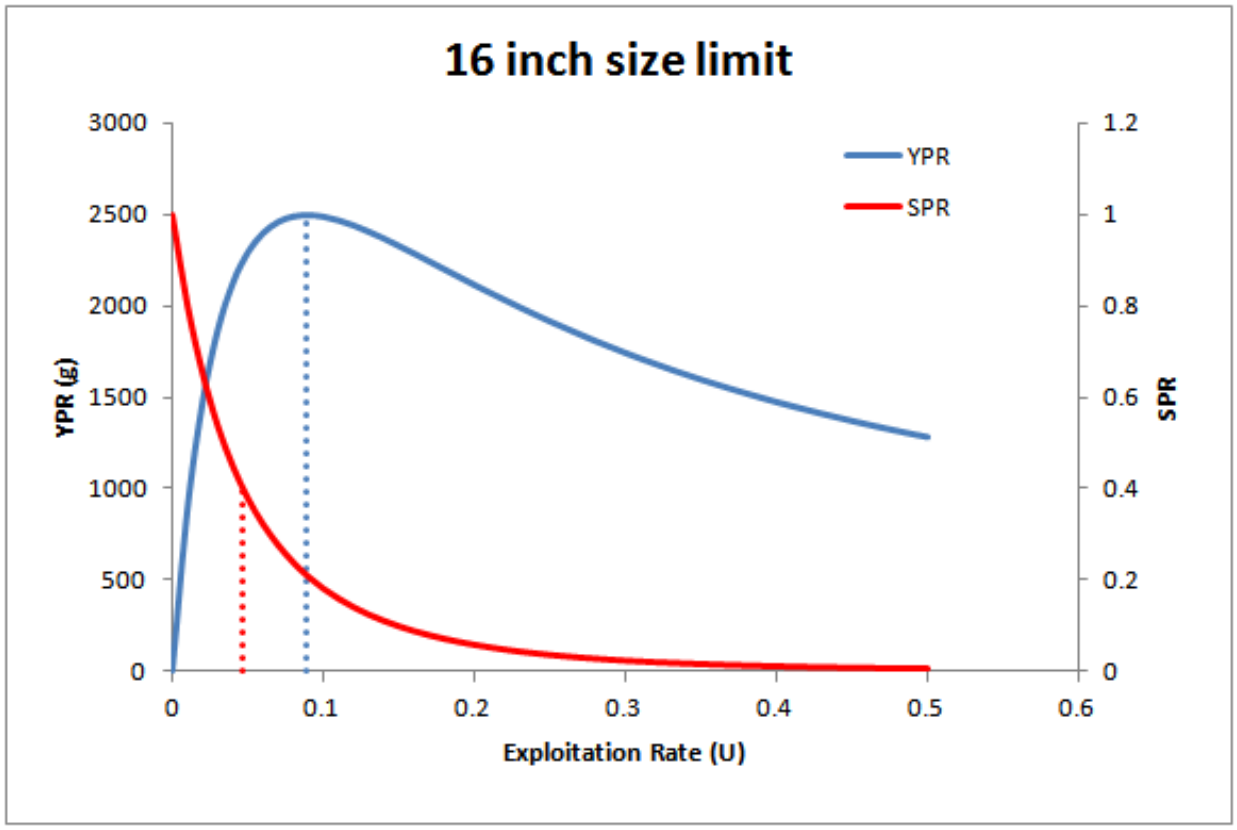






Equilibrium Per-Recruit Analysis

- Under a 16 inch minimum size limit:
  - U_{MSY} = 0.089
  - $U_{SPR0.4}$ = 0.047
- Lack of information on selectivity



Model Configuration	Changes from Base Configuration	MSY				OFL			
		Min	Median	Change from Base Configuration Median	Max	Min	Median	Change from Base Configuration Median	Max
Base	NA	0.48	2.60	NA	28.98	0.24	5.50	NA	76.30
B2012/K = 0.90	B2012/K = 0.90	0.38	2.91	12%	43.47	0.05	6.29	14%	118.68
B2012/K = 0.80	B2012/K = 0.80	0.48	2.95	14%	38.75	0.19	6.48	18%	111.58
B2012/K = 0.70	B2012/K = 0.70	0.42	2.17	-17%	20.76	0.28	4.25	-23%	62.23
B2012/K = 0.60	B2012/K = 0.60	0.36	1.65	-37%	10.07	0.27	2.72	-51%	44.83
B2012/K = 0.50	B2012/K = 0.50	0.31	1.36	-48%	5.08	0.23	1.84	-67%	20.87
B2012/K Uniform Distribution	B2012/K Distribution = Uniform; B2012/K Bounds = 0.656-0.856	0.59	2.53	-3%	6.47	0.99	5.35	-3%	25.55
Hewitt and Hoenig (2005) M	M = 0.045	0.35	2.20	-15%	20.93	0.20	4.64	-16%	70.43
Jones and Wells (1998) M	M = 0.08	0.58	2.87	11%	35.44	0.27	6.10	11%	88.26
Zhou et al. (2012) Perciformes Fmsy/M	Fmsy/M mean = 0.92; Fmsy/M cv = 0.1	0.50	2.66	3%	32.58	0.24	5.64	3%	84.40
Delay Difference Model	Age-at-Maturity = 4	0.48	2.71	4%	28.25	0.24	5.75	5%	84.15
Thorson et al. (2012) Bmsy/K for Pooled Orders	Bmsy/K = 0.4	0.49	2.57	-1%	32.90	0.22	4.85	-12%	74.12
Adjusted 2008-2009 MRIP Estimates	2008-2009 MRIP Harvest and Released Alive Estimates = Mean of 2006,2007,2010 and 2011 estimates	0.45	2.29	-12%	28.98	0.22	4.86	-12%	76.45
Assume No Recreational Harvest from 1900-1949	Recreational Harvest from 1900-1949 = 0	0.43	2.55	-2%	28.98	0.23	5.43	-1%	77.08
Increased Commercial Landings Error from 1900-1993	Upper Bound of Commercial Landings Uniform Distribution from 1900-1993 = 2*reported landings	0.50	2.64	2%	28.98	0.25	5.58	1%	76.65
Upper Bound on K from Catch-MSY	Upper Bound of K = 100 million lbs.	0.58	1.80	-31%	6.18	0.24	2.53	-54%	17.79

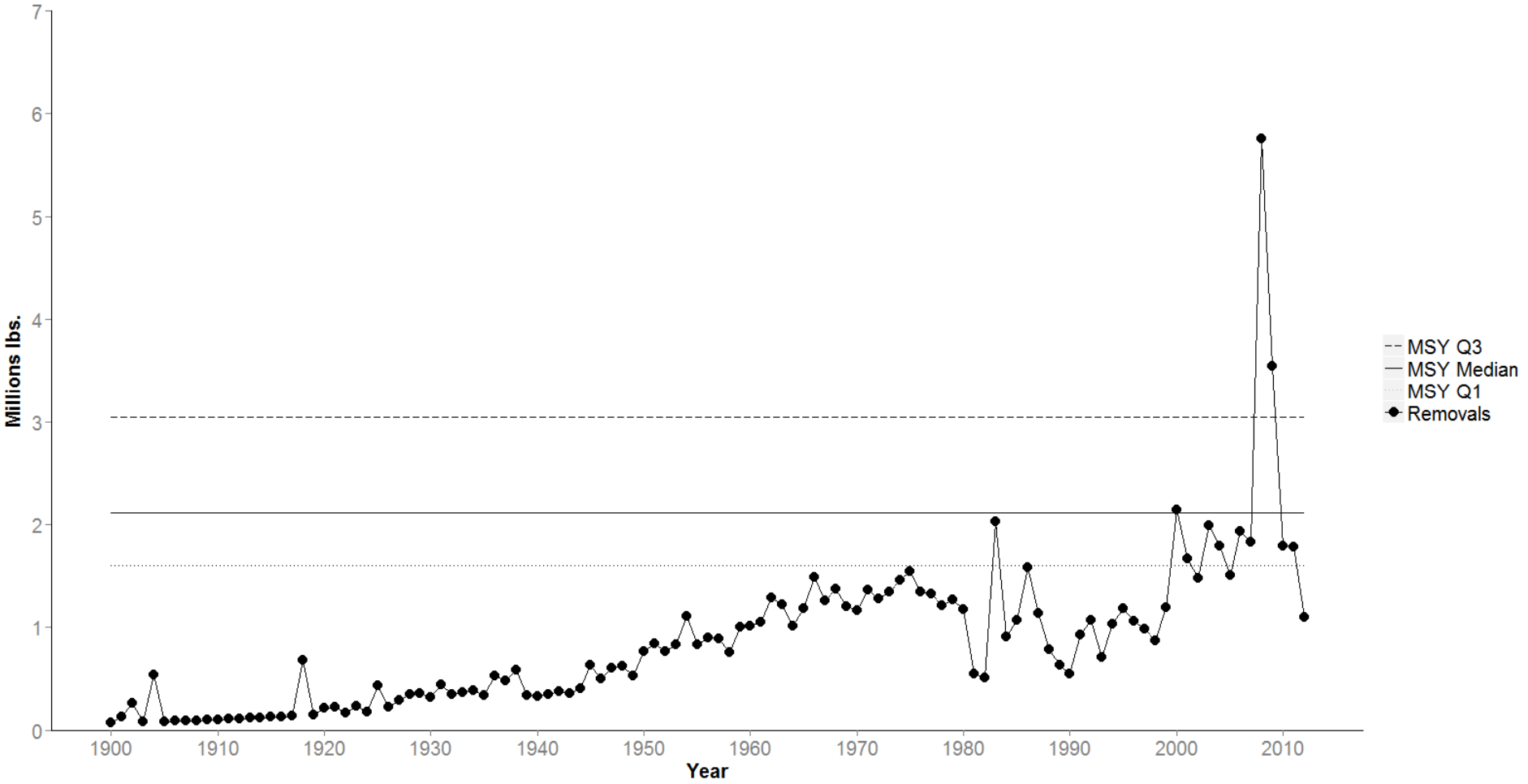
DB-SRA Assumptions and Limitations

- Constant productivity parameters
- Lumped biomass responds immediately to changes in biomass (i.e., no lags in recruitment to exploitable biomass)
- No process error incorporated and the stock is assumed not to deviate from the deterministic production dynamics
- Unfished conditions in 1900
- Wetzel and Punt (2011) found that DB-SRA can be sensitive to an overly optimistic depletion parameter (B2012/K) and to the M and Fmsy/M parameters for some life-history types

Recreational Data Adjustments

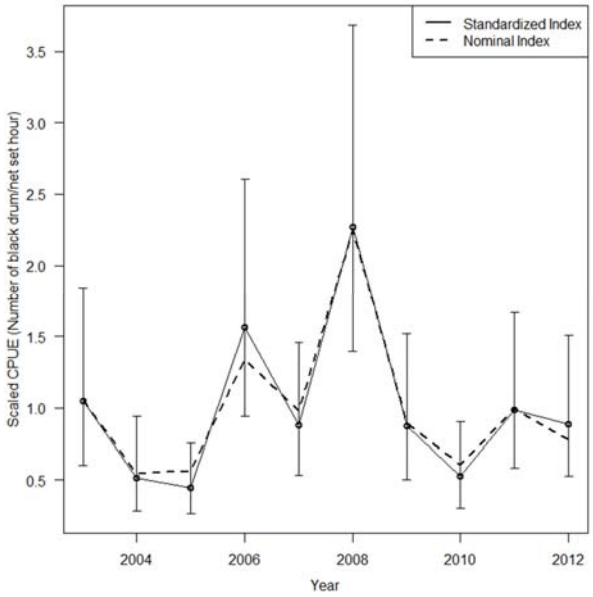
- Evaluated 2008 and 2009 peaks in harvest
- Pooling scheme to develop missing weight estimates
- Calibrated MRFSS estimates to MRIP estimates
- Estimated recreational releases in weight
- Estimated historical recreational harvest and releases
  - USFWS fishing license data and mean MRFSS CPUE (1950-1980)
  - Extrapolated harvest based on exponential regression and assumed negligible releases (1900-1949)

Removals and DB-SRA MSY

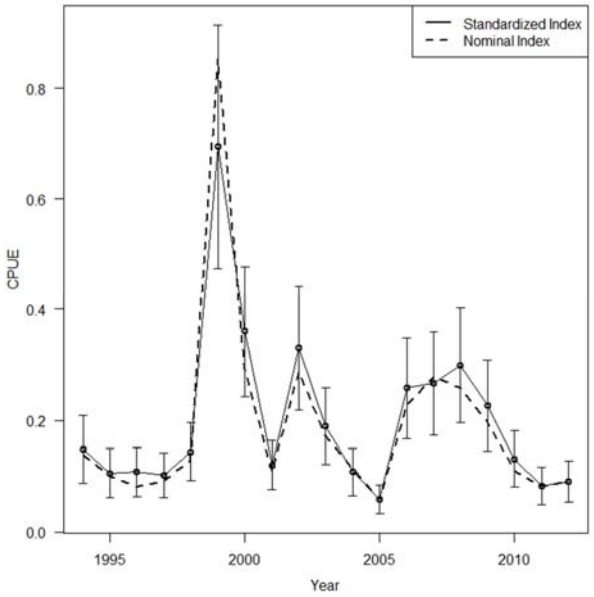


Immature Indices

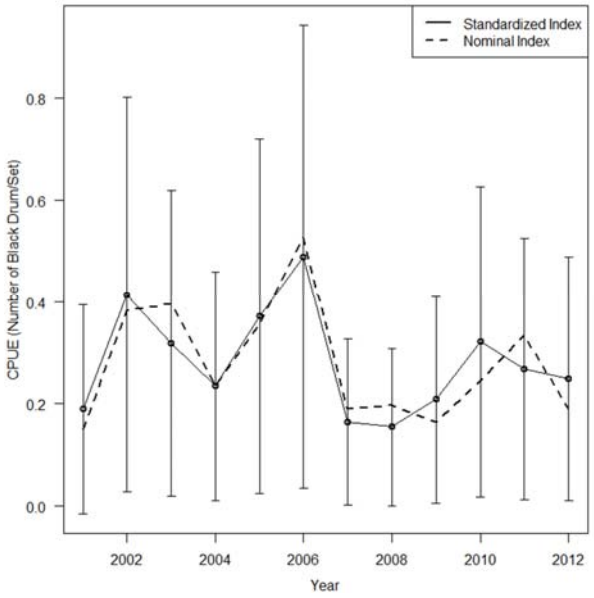
NC DMF Gill Net



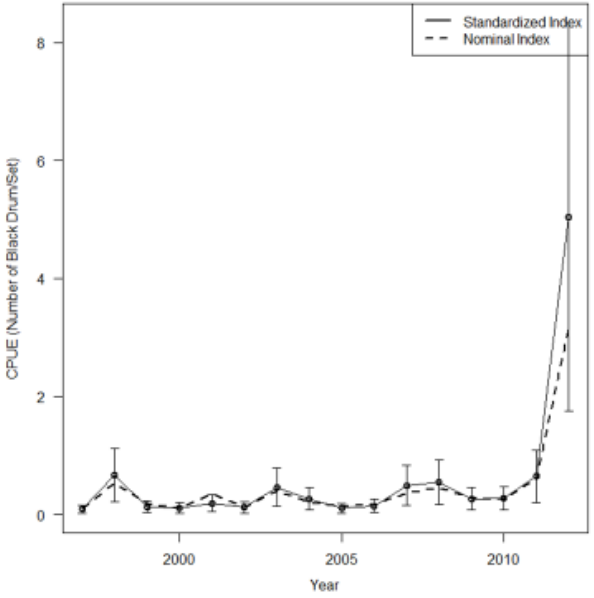
SC DNR Trammel



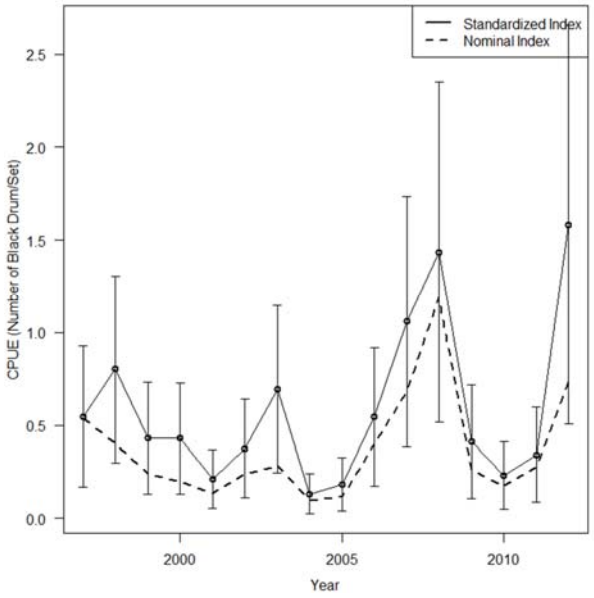
FL FWC Seine – NE FL



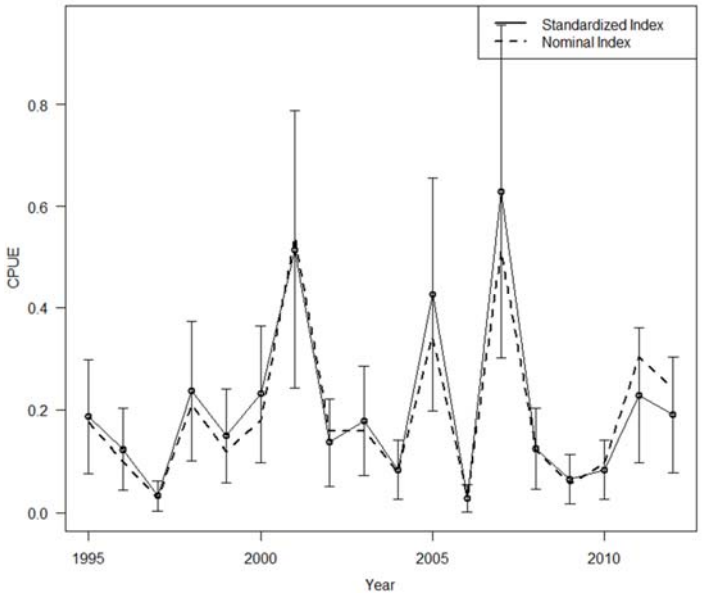
FL FWC Seine – N IR



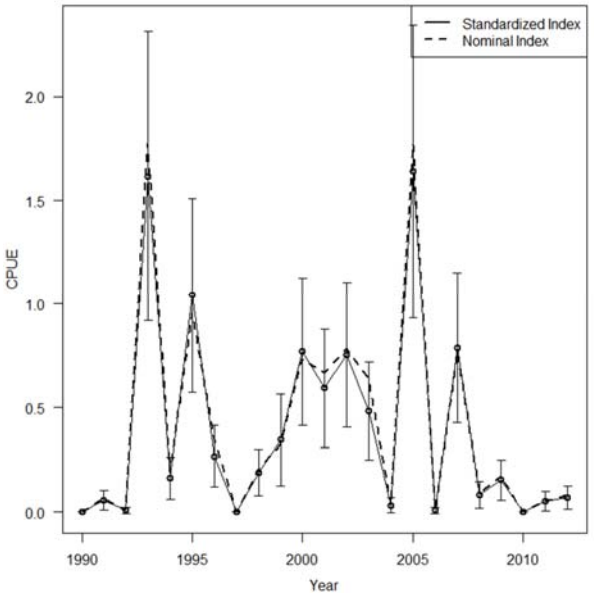
FL FWC Seine – S IR



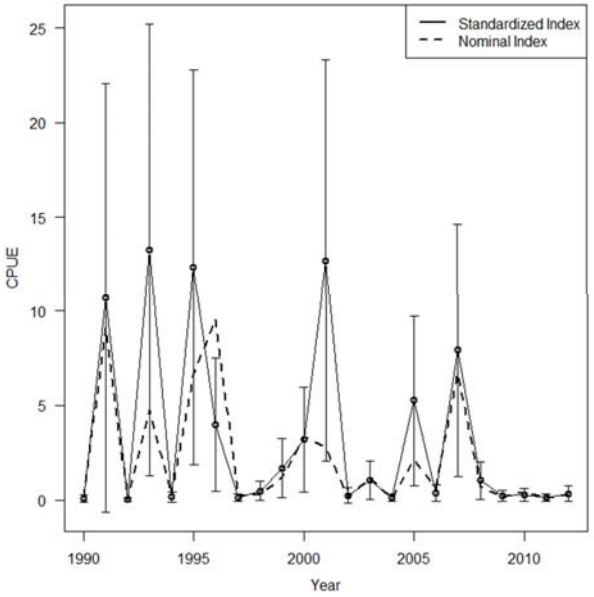
PSEG Seine



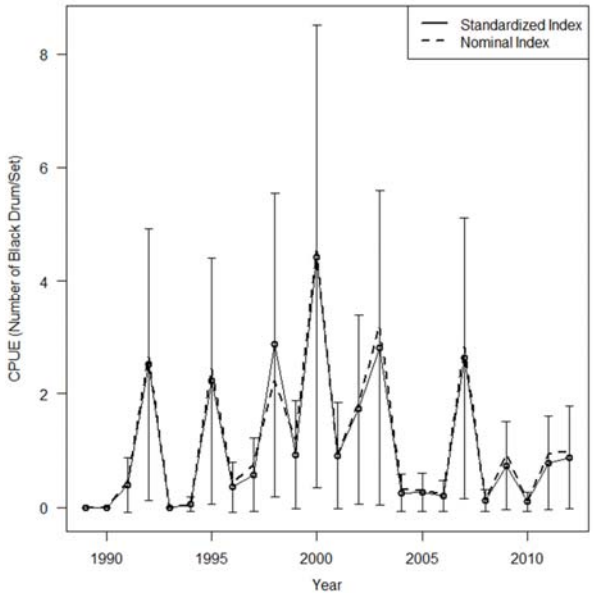
DE DFW 16ft Trawl



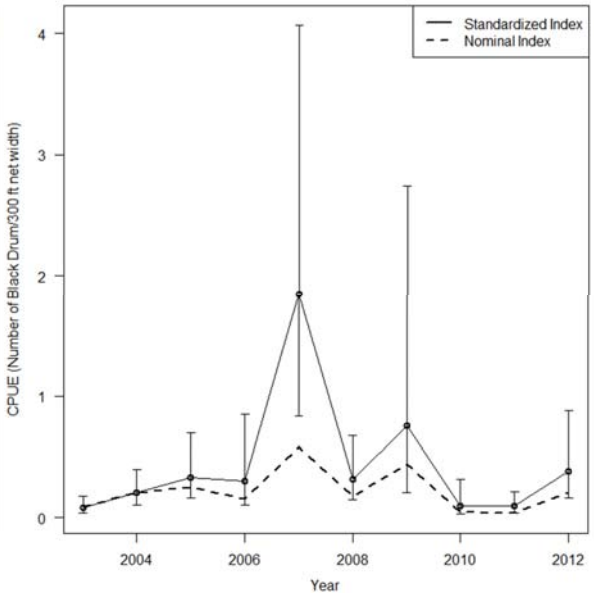
DE DFW 30ft Trawl



MD DNR Seine



GA DNR Trammel



YOY Indices

Black Drum
Assessment Peer Review Report

Presented to ASMFC Black Drum Management Board

February 4, 2015

Black Drum Assessment Peer Review

1. Black Drum Assessment Subcommittee and Technical Committee developed assessment

2. External Peer Review Panel: Chair + 3 Independent Experts

    - Emphasis on reviewing only the science/assessment

3. Panel Product: Summary Report

    http://

ASMFC Black Drum Stock Assessment Review Panel
November 11-14, 2014
Virginia Beach, Virginia

Dr. Cynthia Jones, Panel Chair, Old Dominion University

Dr. Gary Nelson, Massachusetts Division of Marine Fisheries

Dr. Yan Jiao, Virginia Polytechnic University

Dr. Jason Cope, NMFS Northwest Fisheries Science Center

Review Panel Overall Findings

- Stock assessment was accepted; stock is not overfished and overfishing is not occurring in 2014

- Panel finds stock assessment acceptable for management use

Assessment Terms of Reference

ToR 1: Evaluate the thoroughness of data collection and the presentation and treatment of fishery-dependent and fishery-independent data in the assessment, including the following but not limited to:

- Presentation of data source variance (e.g., standard errors).
- Justification for inclusion or elimination of available data sources.
- Consideration of data strengths and weaknesses (e.g., temporal and spatial scale, gear selectivities, ageing accuracy, sample size).
- Calculation and/or standardization of abundance indices.

Panel Findings:

- Age can be accurately read from otolith annuli and size-at-age is reliable
- Recreational data were obtained from MRFSS/MRIP; CPUE estimates were not consistent over time because of the infrequency of intercepts. This is exacerbated by short season fisheries and sporatic availability due to migratory behavior in the northern part of the range.
- Coverage of the commercial landings came from disparate sources over the catch history, with inconsistencies in coverage and gears and are a minor component of the fishery.
- There are no fishery-independent surveys to monitor black drum
- Eight indices were used in the assessment and standardized with either the Delta method and lognormal distribution or with a binomial GLM.
- The Panel considers this a credible analysis of the available data

ToR 2: Evaluate the methods and models used to estimate population parameters (e.g., F, biomass, abundance) and biological reference points, including but not limited to:

- Evaluate the choice and justification of the preferred model(s). Was the most appropriate model (or model averaging approach) chosen given available data and life history of the species?
- If multiple models were considered, evaluate the analysts' explanation of any differences in results.
- Evaluate model parameterization and specification.

Panel Recommendations:

- Four models were candidates for stock assessment & relied only on catch and life history
  - Per-recruit analysis;
  - Catch-MSY;
  - Depletion-corrected-average-catch DCAC;
  - Depletion-based stock reduction analysis DB-SRA

Panel Recommendations:

Per-recruit analysis;

- Is an equilibrium approach
- Drawback was lack of knowledge of selectivity pattern
- Reference points were within 95% CI of DB-SRA

Catch-MSY;

- Used Pella-Thomlinson surplus production model
- Projections showed that the model was unstable

Panel Recommendations:

Depletion-corrected-average-catch DCAC;

- Doesn't use a model of population dynamics
- Adjusts average catch based on assumptions about depletion
- Gives static yield calculation

Panel Recommendations:

Depletion-based stock reduction analysis DB-SRA;

- Used a flexible production model with MC resampling of inputs
- Included uncertainty in catch history
- Most transparent model
- Used full time series of catches
- Had high sensitivity to relative biomass assumptions
- Chosen as the preferred model

ToR 3: Evaluate the diagnostic analyses performed, including but not limited to:

- Sensitivity analyses to determine model stability and potential consequences of major model assumptions.
  - No sensitivity for YPR and SPR
  - Catch-MSY
    - Robust across wide range of r & K values
    - Very sensitive to relative depletion in terminal year
    - Sample retention was very low
  - DCAC &DB-SRA
    - Included additional assumptions on K, B_{2012}/K, M
    - DB-SRA had sample retention of 90%

ToR 4:Evaluate the methods used to characterize uncertainty in estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.

Panel Findings:

- No estimates of uncertainty for YPR & SPR
- Catch-MSY uncertainty for MSY and management quantities from MC sampling of priors
- DB-SRA used MC in input parameters perpetuated into model-derived estimates

- **ToR5:** Recommend best estimates of stock biomass, abundance, and exploitation from the assessment for use in management, if possible, or specify alternative methods/measures.

Panel Findings:

- The Panel concurs that the best model is DB-SRA with the least informative priors
- The population biomass is declining slowly with steady increase in harvest
- The population is not experiencing overfishing in 2014

ToR 6: Evaluate the choice of reference points and the methods used to estimate them. Recommend stock status determination from the assessment, or, if appropriate, specify alternative methods/measures.

<u>Panel Findings:</u>

- Reference points determined by YPR, DCAC, DB-SRA and Catch-MSY
- DB-SRA reference point was MSY 2.11 million lbs

ToR 7: Review the research, data collection, and assessment methodology recommendations provided by the TC and make any additional recommendations warranted. Clearly prioritize the activities needed to inform and maintain the current assessment, and provide recommendations to improve the reliability of future assessments.

Panel Recommendations:

- Develop a protocol to alert the SASC to any major changes in harvest and F that could trigger a reassessment of the reference points similar to the 'rumble strips' approach developed by the MAFMC for data-poor stocks.

- Increase age sampling along the coast. Juvenescence of the population is a good indicator of overfishing, and the availability of age data is crucial to being alerted to such changes in age structure.

- Indices, such as the South Carolina trammel net survey, could be used directly in an extended version of DB-SRA. The implementation of xDB-SRA could instead specify stock status at an earlier time period, thus allowing the most recent catches to inform population dynamics and thus stock status.

ToR 8: Recommend timing of the next benchmark assessment and updates, if necessary, relative to the life history and current management of the species.

<u>Panel Recommendations:</u>

Because black drum is not overfished and overfishing is not occurring, the Panel recommended the next benchmark assessment be done in 5 years, or sooner if 'rumble strips' indicate significant changes

Review Panel Overall Findings

- Because Black Drim are an infrequent catch in the recreational & commercial fisheries, their rarity and migration history leads to variable catch history
- Of the four data-poor models used, the DB-SRA proved the most reliable, providing stable estimates of biomass and MSY
- Black Drum is not overfished and overfishing is not occurring
- Median MSY was 2.11 million lbs and a median OFL harvest at F_{MSY} was 4.13 million lbs
- Nonetheless, because of life history characteristics precaution should be used in setting management goals

Update on Southern Flounder Management

South Atlantic State/Federal Fisheries Management Board

Feb. 4, 2015

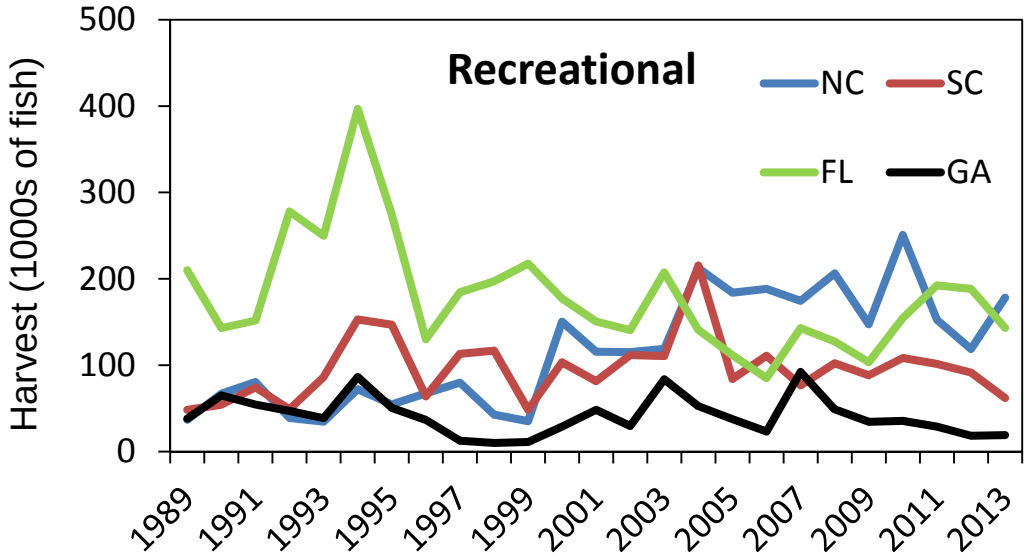
Dr. Louis B. Daniel

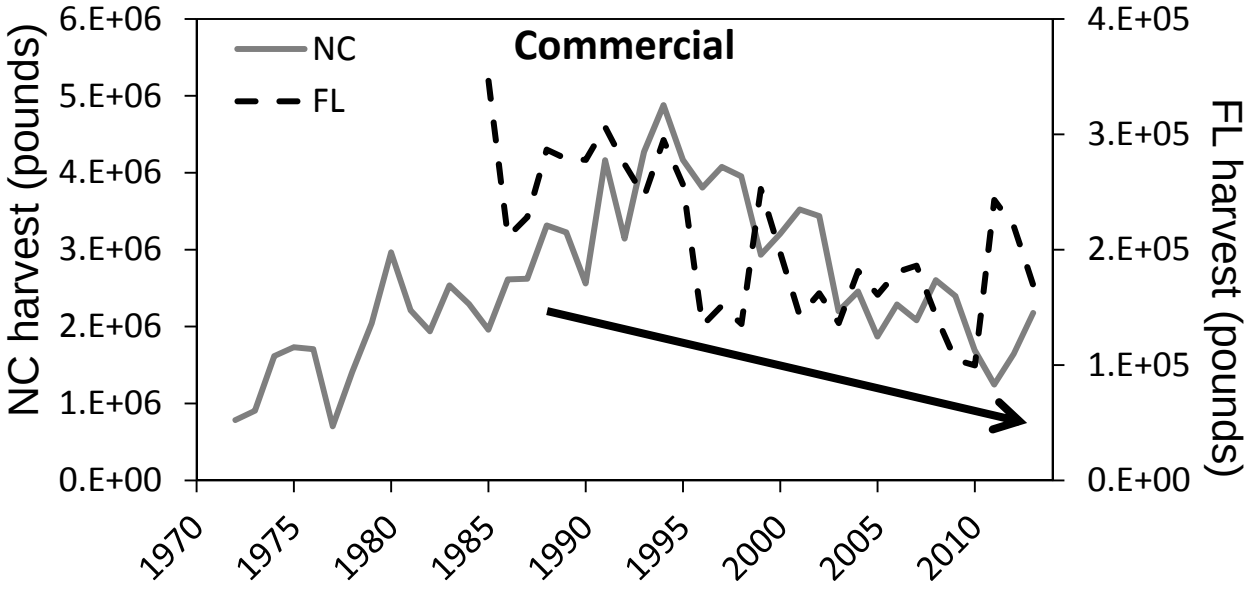
Southern flounder background

- Distributed from NC to northern Mexico
- Offshore spawning, larval ingress to estuaries
- Juveniles remain inshore 1–2 years
- Maturation by 2nd or 3rd year, offshore spawning migration
- Currently managed separately by each state
- However, entire South Atlantic is one unit stock

South Atlantic Harvest

- Recreational harvest in all South Atlantic states
  -hook and line, gig, spear
- Substantial commercial fisheries in North Carolina and Florida
  -gillnet, pound net, gig, trawl

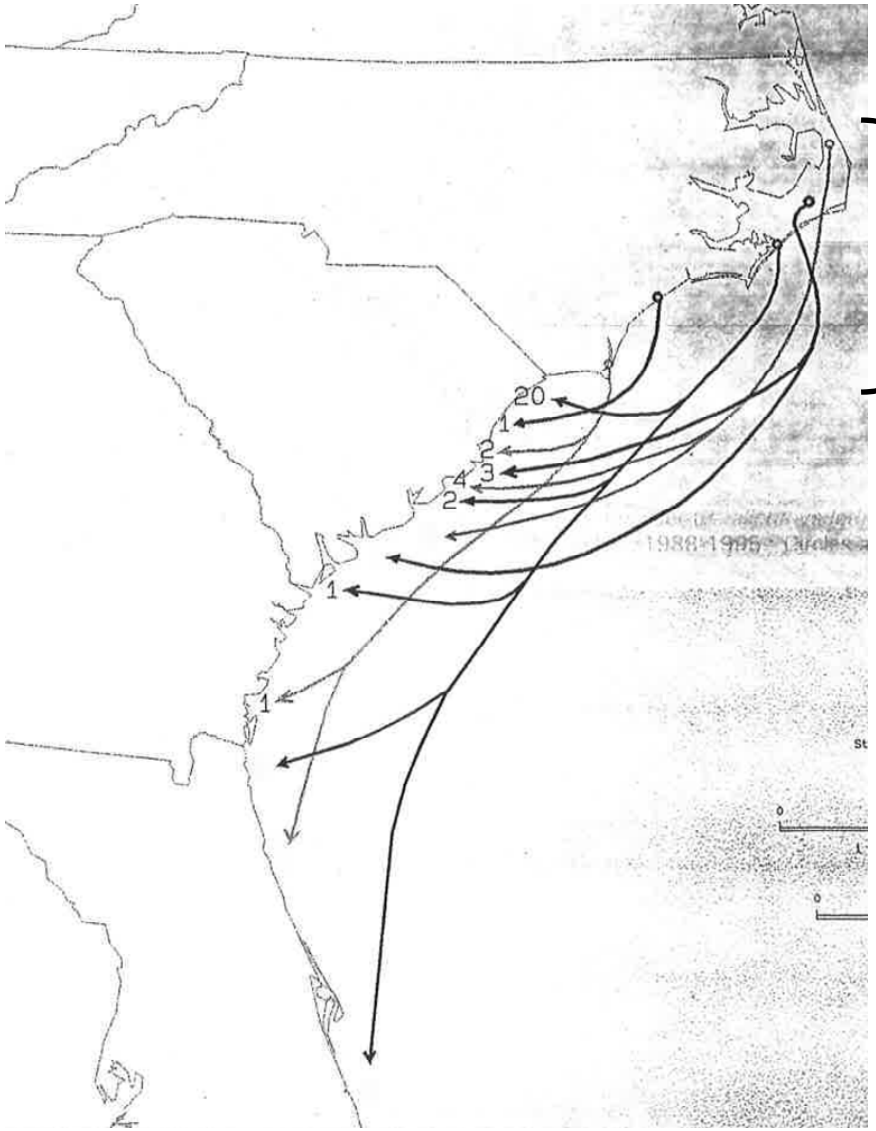




Evidence for significant stock mixing in South Atlantic

- Genetic
  -Anderson and Karel (2012); Anderson et al. (2012); Wang et al. (*In review*)
- Otolith morphometric
  -Midway et al. (2014)
- All genetic and otolith studies show a difference between Gulf and Atlantic basins, but little difference within basins
- Tag-return studies in North Carolina

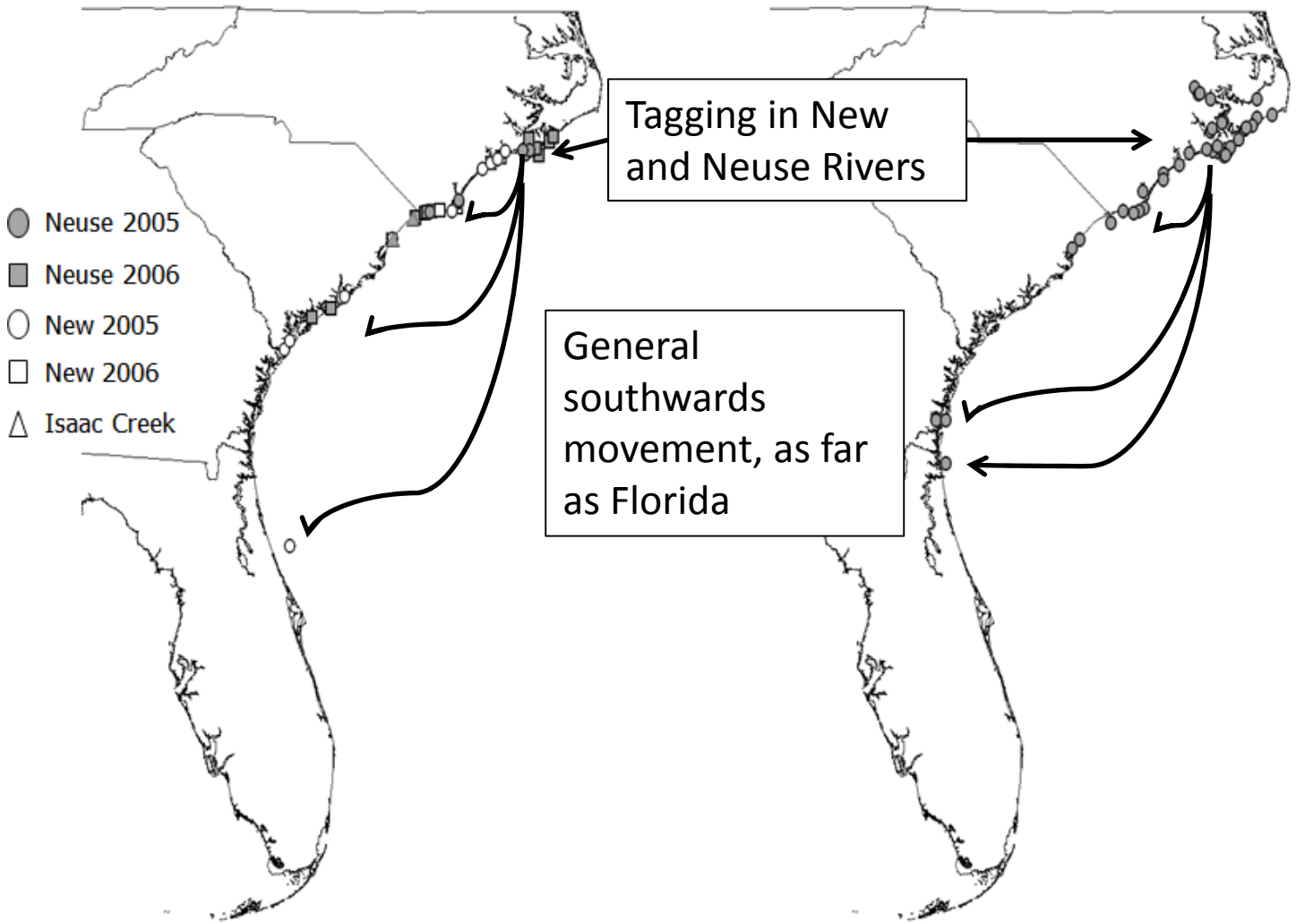
Tagging: NCDMF studies (1980-90s)



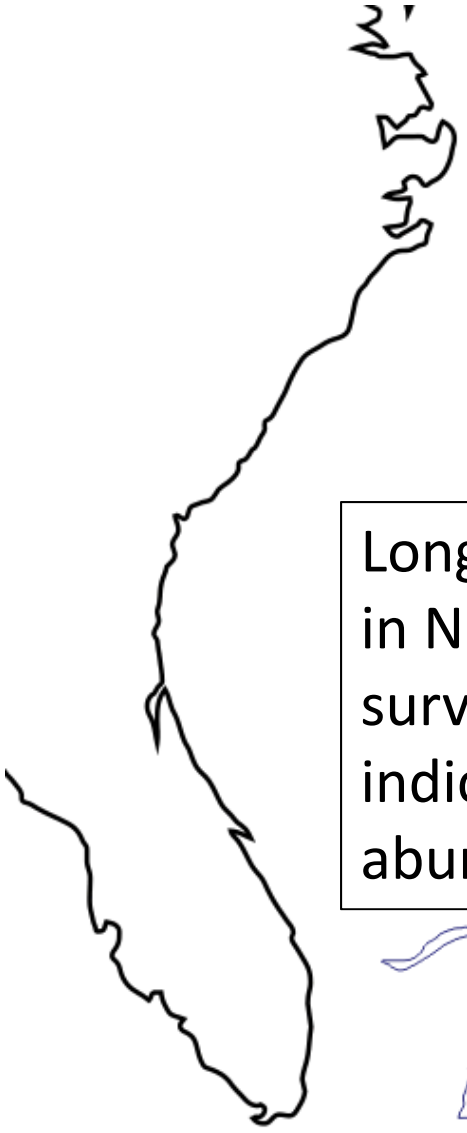
Tagging throughout North Carolina

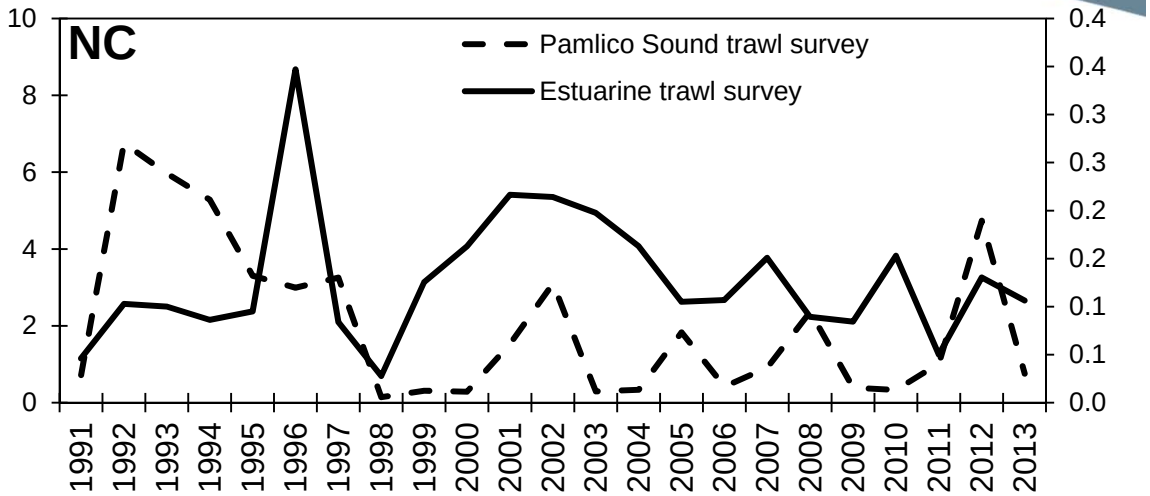
General southwards movement, as far as Florida

Tagging: Sea Grant studies (2000s)

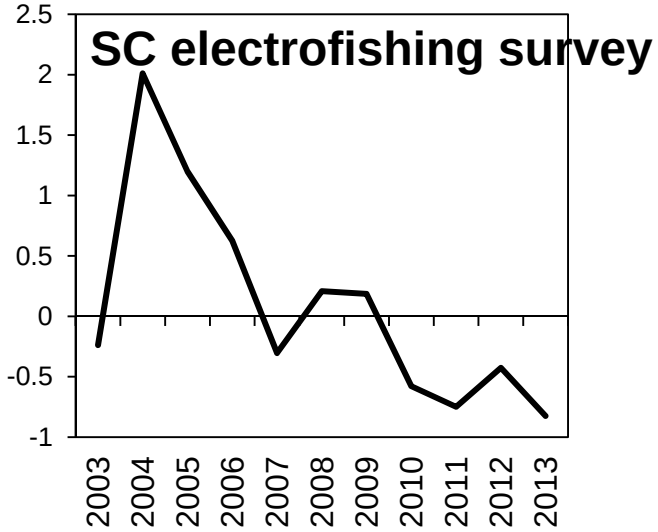


Juvenile abundance

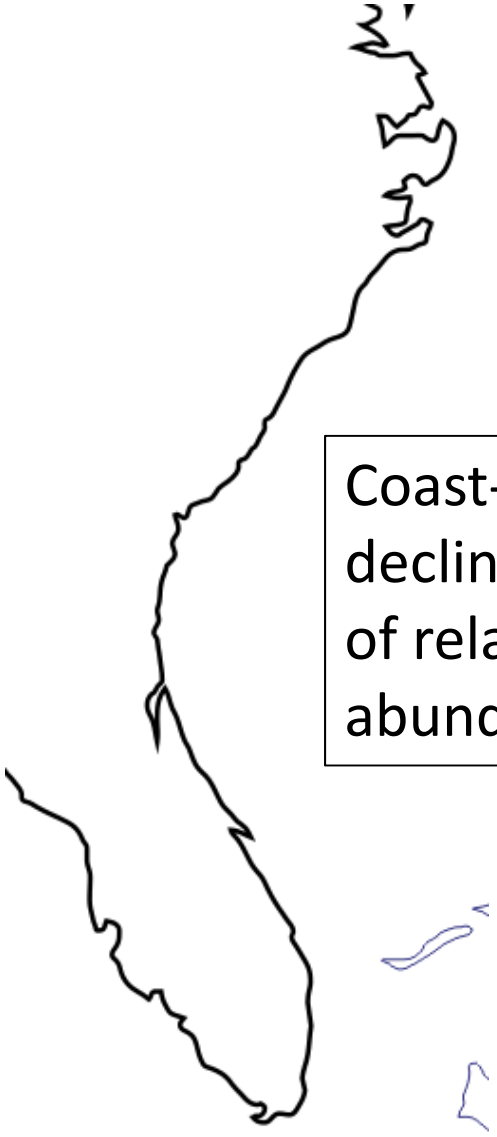




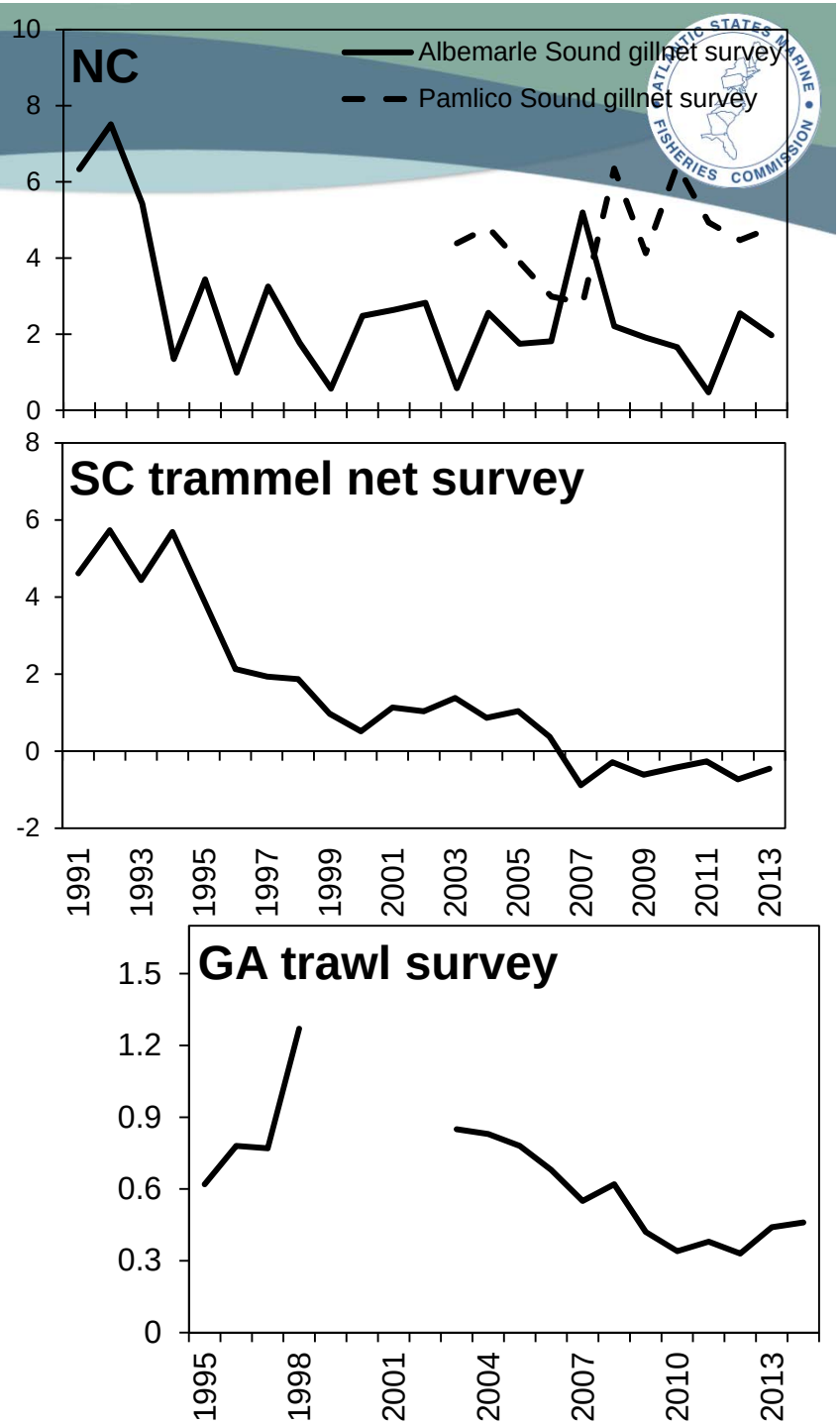
Long-term declines in NC (Pam S. survey) and SC indices of relative abundance



General abundance



Coast-wide declines in indices of relative abundance



Conclusion

- Southern flounder form a single population from NC to FL
- Recreational harvest in all South Atlantic states, two states have significant commercial fisheries
- Evidence for decadal decline in abundance
- Difficult/impossible to assess or manage without information and cooperation from all states

Amendment 20B: Changes to Spanish Mackerel Coastwide Quota

South Atlantic State/Federal Management Board

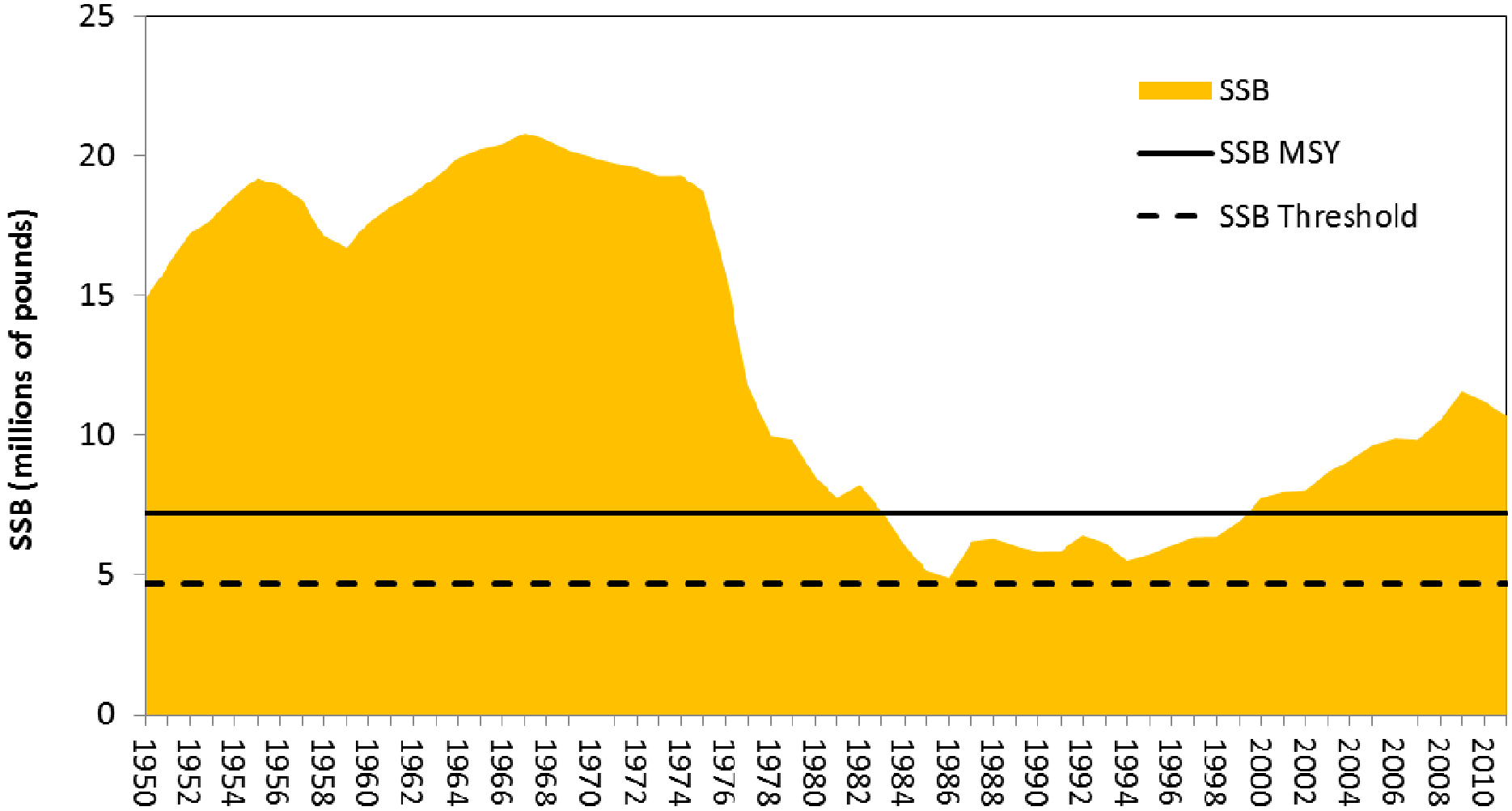
February 4, 2015

Background

- Omnibus Amendment (2011)
  - Set Management Measures, Quota, and Accountability Measures
- Amendment 20A (2014)
  - Implements rules for sale of bag limit fish from tournaments

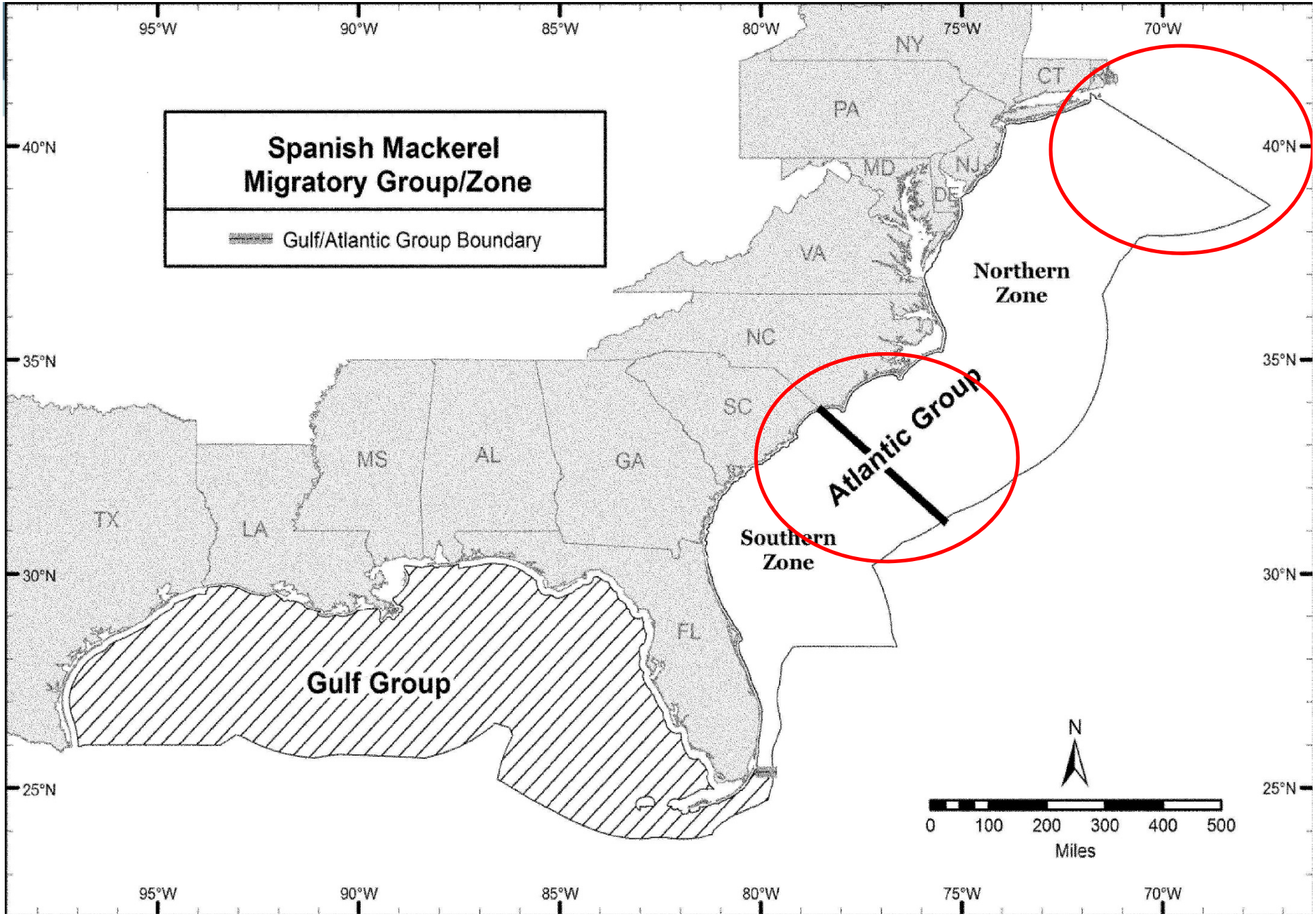
Spanish Mackerel Spawning Stock Biomass (SSB)

Source: SouthEast Data, Assessment and Review, 2012



Amendment 20B

- Concern had been raised over how distribution of quota catch
- Creates new quota zones
  - Northern: NY/CT/RI through North Carolina
  - 19.9% of the coastwide ACL/Quota (662,670 lbs)
  - Southern: NC/SC through Monroe/Miami-Dade County
  - 80.1% of the coastwide ACL/Quota (2.67 million lbs)
- Quota can be moved between zones


Spanish Mackerel
Migratory Group/Zone
Gulf/Atlantic Group Boundary
Gulf Group
Atlantic Group
Northern
Zone
Southern
Zone
NY
CT
PA
MD
NJ
DE
VA
NC
SC
GA
FL
AL
MS
LA
TX
95°W
90°W
85°W
80°W
75°W
70°W
40°N
35°N
30°N
25°N
N
0
100
200
300
400
500
Miles

Questions