

**Georgia Department of Natural Resources  
Coastal Resources Division  
Management Plan: Blue Crab  
Updated June 2008**

**General Objective**

Manage Georgia's blue crab fishery to ensure the maximum aggregate social, economic, and ecological benefits to the citizens of Georgia.

**Life History and Reproductive Biology:**

The blue crab is a euryhaline decapod crustacean found throughout the year in estuarine waters along the Georgia coast. Mating occurs primarily in the meso- and oligo-haline zones (0.5 to 15 ppt) as waters begin to warm after winter – as early as February, with peaks in March and April, but continues until September.

There is an elaborate courtship ritual that occurs when the male encounters a juvenile female (shecrab or virgin) about to undergo a terminal molt to sexually maturity. Just prior to this molt, juveniles are called peelers and possess unique color characteristics. The male (jimmie) will clasp and carry the female with his walking legs (“doubler” or “buck and rider”). The male will then carry the female for two to seven days until ecdysis (molting). Once the female molts (soft shell) the male transfers a spermatophore to the female, which will be used to fertilize up to seven broods (sponges) each with 500,000 to 8,000,000 eggs (Prager et al., 1990). Egg masses are produced two to nine months after fertilization depending on the time of the year. Adult females (sooks) migrate to the lower sounds and produce an external egg mass carried on the abdominal pleopods (sponge crab). The egg mass is initially yellow to orange (egg yolk), and through a two week develop becomes brown and then black (eye stalks of fully developed larvae). Sponge crabs are most abundant in April. The female must release her eggs in the salty, sediment free waters of the ocean for maximum survival (salinities: 23-33 ppt and temperatures: 19-29° C) (Millikin and Williams, 1984). Wind driven and tidal currents transport the eggs as they develop through seven zoea larval stages and one megalop larval stage. These same currents and tides eventually transport larvae back to the estuaries and a metamorphosis to a true crab occurs. These young crabs migrate up and distribute throughout the estuaries where they molt up to 20 times before reaching sexually maturity at one to 1.5 years of age.

The blue crab has a role both as predator and as prey in the ecosystem. Postlarvae in the water column are a food source for plankton feeders. A variety of other species such as American eel, drum, spot, croaker, striped bass, seatrout, rays, sharks, and catfish prey on juveniles and adults. Cannibalism of young blue crabs by larger crabs is common and may affect abundance. Adult blue crabs feed on bivalves, crustaceans, fish, annelids, and plants. Although the blue crab is an opportunistic predator that feeds on commonly occurring bottom dwellers, recent research indicates that thin-shelled bivalves are preferred food (MDFMP, 1997).

## **Habitat Preferences:**

Submerged aquatic vegetation (SAV) and other shallow water habitats are utilized by blue crabs during postlarval settlement, juvenile development and overwintering, as well as for protection during molting and soft shell phases of all size classes. Several studies have documented that postlarval and juvenile blue crabs prefer SAV and similar structural habitat to unvegetated shallow-water habitats (MDFMP, 1997). Unlike Atlantic states to the north, SAV does not exist as critical habitat for blue crab in Georgia. Rather, water quality and upper marsh estuarine areas are the critical components of the blue crab habitat in Georgia. Dissolved oxygen content is a particularly important aspect of water for blue crabs. Blue crabs are tolerant of hypoxic (low oxygen) conditions, but oxygen content less than 0.5 mg/L at 77 degrees F (25 °C) is lethal within 4.3 hours (Millikin and Austin, 1984). Juvenile crabs may be less tolerant of hypoxia than adults. If larvae are spawned or remain in lower salinity and/or temperature conditions, development is retarded and survival unlikely (MDFMP, 1997).

Data on essential crab habitat in Georgia is unavailable, but it is generally true that the species has the same environmental requirements as those cited above throughout its range. Several studies focusing on essential crab habitat issues in Georgia are currently in the proposal process.

## **Description of the Fishery:**

### Recreational Fishery

Very little is known about the extent of the recreational fishery in Georgia, and this sector has been largely ignored in the management process. Under current regulations, an individual with a recreational fishing license may use up to six crab pots with a mandatory fluorescent (dayglow) green marker from a boat or dock and retain a maximum of one bushel per day. Anecdotal information suggests crabbing is a popular pastime with effort expanding and contracting in relation to overall abundance. A 1987 University of Georgia study of Chatham and Glynn Counties estimated 12% of residents crabbed recreationally, comprising 253,597 crabbing trips. However, no information on catch was collected (Absher, 1988). Of these trips, more than a third used bait tied to a line ("chicken necking") with less than 4% using the traditional commercial style trap. Public docks and private boats comprised 60.7% of the effort (Table 1). A 1991 study by the National Marine Fisheries Service estimated 20,466 Georgia households engaged in recreational crabbing during that year (Pritchard, 1991).

Table 1: 1987 Crabbing trips by gear and fishing mode from Chatham and Glynn Counties (Absher, 1988).

Fishing Gear		Fishing Mode	
Gear Type	%	Mode	%
Commercial Trap	3.6	Private Dock	14.3
Folding Trap	29.6	Public Dock	26.8
Lift Ring	23.6	Bridge	16.1
Line tied to bait	34.5	Beach or Bank	8.9
Seine	3.6	Boat	33.9
Cast Net	3.6		
Other	1.8		

### Commercial Fishery

**Hard crabs:** This component of the fishery typically ranks first in state landings and second only to shrimp in ex-vessel value. The 20-year average (1987-2006) is 5.74 million pounds with a value of \$2.66 million (Figure 1, Table 2). Declining catches in the late 90's and early 00's has lowered the 10-year average (1997 to 2006) to 3.80 million pounds valued at \$2.52 million. This decline is the result of changing market and harvesting practices (closing of all picking houses in favor of a live bushel market), and four consecutive record low years of harvest - the direct result of a prolonged drought. The major fishing gear is the crab trap, with other gears comprising less than 3% of the annual harvest. Harvest is typically lowest in the winter (January to March) and peaks between August and October (Table 2).

**Peeler and softshell crabs:** Peelers are harvested and processed to produce softshell crabs. Crabbers use specially designed crab traps baited with adult male crabs to attract females in search of a mate. The peelers are then collected and held in aquaculture facilities until they molt. Peelers make up less than 1% of the total blue crab harvest and 3% of the value, but the resulting softshell crabs constitute 7% of the overall harvest value (Figure 1, Tables 3 - 5). Although these sectors of the fishery are small with limited participation (< 20) they are highly lucrative from March to May. The average annual harvest of peelers (1989-2006) is 43,237 lbs, with a value of \$79,430. Annual soft-shell production for the same period produces 29,035 lbs valued at \$209,035 (Table 5).

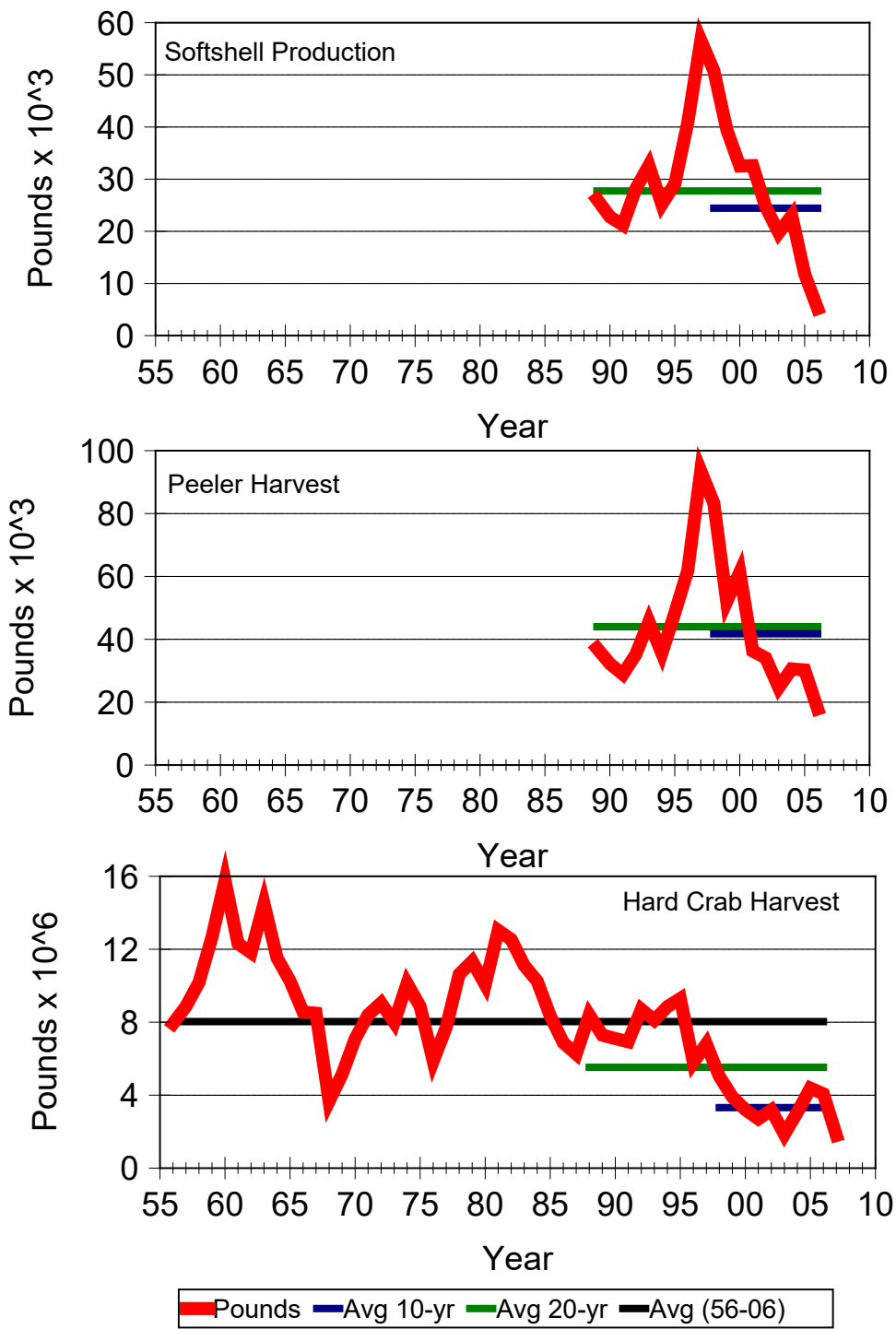


Figure 1. Commercial harvest of hard and peeler crabs and production of softshell crabs in Georgia. 2007 data is only through August.

Table 2. Georgia commercial hard crab harvest (in pounds) by year and month. (updated 12/19/07)

YEAR	Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1955													
1956	7,928,400	35,200	493,100	568,600	900,100	1,062,200	1,020,400	900,900	733,100	827,400	632,600	496,600	258,200
1957	8,867,700	412,700	477,000	448,400	774,500	969,000	1,041,500	999,300	964,300	1,028,900	798,400	646,300	307,400
1958	10,185,000	188,600	76,800	879,100	860,500	1,574,600	1,252,400	1,213,000	1,218,100	1,034,100	930,900	681,900	275,000
1959	12,682,500	296,100	397,700	812,300	1,377,900	1,163,200	1,353,800	1,434,500	1,437,900	1,321,500	1,407,700	1,089,400	590,500
1960	15,765,900	724,300	962,100	782,200	1,564,200	1,743,000	1,610,500	1,433,700	1,774,900	1,491,200	1,574,900	1,471,600	633,300
1961	12,312,400	903,000	989,000	964,600	1,212,500	1,211,800	1,206,500	1,166,700	1,263,300	1,014,600	1,010,700	759,800	609,900
1962	11,815,800	404,700	956,700	877,900	960,300	1,041,500	1,054,100	1,176,900	1,357,500	1,210,600	1,226,600	914,800	634,200
1963	14,500,000	840,000	734,100	1,492,900	1,571,300	1,363,300	1,338,200	1,496,000	1,221,400	977,400	1,401,200	1,465,700	598,500
1964	11,531,600	483,600	788,100	906,500	906,000	1,249,000	894,000	1,106,400	1,347,000	954,200	1,057,500	936,100	903,200
1965	10,258,200	490,000	245,000	542,700	732,900	815,200	1,203,800	1,311,400	1,304,900	1,195,200	933,800	952,000	531,300
1966	8,556,000	317,600	297,500	749,200	623,200	765,700	1,061,000	859,500	1,227,700	1,001,500	1,041,700	445,200	166,200
1967	8,496,500	653,100	427,300	1,007,500	640,000	808,300	551,800	814,200	1,120,700	915,400	858,000	488,200	212,000
1968	3,668,900	212,600	160,200	354,100	512,300	207,600	47,000	261,400	365,400	597,200	570,600	262,300	118,200
1969	5,146,700	61,900	131,800	177,300	333,100	435,700	757,200	932,800	626,300	618,500	539,000	413,800	119,300
1970	7,092,300	19,900	271,900	343,400	545,800	589,400	827,800	960,700	1,088,100	724,400	923,600	616,200	181,100
1971	8,408,500	430,800	710,700	936,600	784,400	499,000	948,900	1,022,900	897,600	903,600	669,500	349,300	255,200
1972	9,058,700	529,000	330,200	948,500	706,600	566,100	902,000	1,045,900	1,076,500	1,140,700	943,100	585,300	284,800
1973	7,994,100	400,500	233,400	516,800	627,900	805,900	1,016,500	1,039,100	905,000	948,200	760,100	513,900	226,800
1974	10,130,900	622,500	400,700	701,300	947,900	908,700	743,200	1,029,000	1,171,300	1,033,600	1,309,000	927,400	336,300
1975	8,865,300	737,500	466,300	400,900	580,600	852,000	1,016,600	1,011,200	990,900	974,500	993,900	665,800	175,100
1976	5,872,500	45,700	275,800	308,000	539,800	693,600	935,400	913,200	654,600	744,300	384,400	306,000	71,700
1977	7,721,700	16,500	44,700	162,200	502,200	887,300	954,000	981,800	1,136,200	1,009,600	906,900	888,200	232,100
1978	10,628,400	17,800	10,600	396,600	665,600	875,700	1,362,800	1,448,000	1,530,900	1,377,200	1,400,600	1,032,700	509,900
1979	11,337,700	58,600	104,700	851,900	1,112,900	1,199,500	1,207,200	1,403,300	1,537,000	1,410,900	1,576,700	719,500	155,500
1980	10,059,900	189,100	89,500	194,300	571,800	974,700	1,464,000	1,415,300	1,420,200	1,480,400	1,193,500	767,400	299,700
1981	13,038,200	84,700	294,400	741,300	1,115,600	1,239,200	1,429,200	1,550,900	1,580,300	1,684,700	1,828,800	1,054,000	435,100
1982	12,536,900	250,200	898,100	652,100	857,100	1,059,300	1,470,800	1,525,500	1,360,800	1,413,700	1,598,900	1,023,600	426,800
1983	11,104,000	222,200	156,300	173,900	467,800	830,300	1,315,600	1,488,200	1,607,100	1,597,200	1,701,100	1,055,300	489,000
1984	10,255,400	27,700	263,500	353,300	730,000	1,123,000	1,361,600	1,161,300	1,263,800	1,111,600	1,446,400	978,900	434,300
1985	8,341,600	177,200	257,300	324,800	625,400	798,400	1,029,800	1,218,700	1,141,900	871,500	1,060,600	669,800	166,200
1986	6,879,900	54,200	190,000	295,200	639,200	771,200	1,043,800	977,800	805,800	869,400	723,900	357,700	151,700

Table 2. Georgia commercial hard crab harvest (in pounds) by year and month. (updated 12/19/07)

YEAR	Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1987	6,256,200	45,300	38,900	100,400	245,600	562,000	938,400	857,300	823,200	952,900	876,400	502,500	313,300
1988	8,400,400	115,000	184,100	289,200	433,600	551,100	1,185,100	1,150,600	1,082,500	1,300,200	952,500	831,100	325,400
1989	7,296,781	450,854	228,293	138,557	317,723	645,710	957,924	918,074	1,026,918	961,057	776,723	721,578	153,370
1990	7,105,524	117,927	215,659	256,175	426,200	713,661	1,005,361	896,068	870,297	822,015	1,106,718	441,875	233,568
1991	6,927,785	165,638	157,652	168,989	438,329	579,850	887,483	842,152	822,875	783,513	1,111,326	627,729	342,249
1992	8,707,692	240,943	253,758	174,562	371,747	631,741	985,811	1,001,469	1,131,847	1,113,097	1,520,311	990,976	291,430
1993	8,112,326	233,550	106,013	117,833	227,958	659,315	838,732	1,031,366	1,149,182	1,114,687	1,223,366	863,688	546,636
1994	8,853,564	152,784	466,821	263,704	649,800	514,721	953,599	971,061	935,103	1,301,318	1,487,982	905,122	251,549
1995	9,299,190	146,149	84,809	100,654	248,356	466,508	819,535	1,051,285	1,097,584	1,674,530	1,920,616	1,252,120	437,044
1996	5,791,288	80,846	114,482	119,317	283,061	608,187	667,211	621,357	647,511	866,817	824,163	660,340	297,996
1997	6,808,290	166,860	155,265	156,011	478,606	610,116	748,008	844,559	918,080	982,339	916,429	546,201	285,816
1998	5,037,747	222,540	141,388	108,373	333,508	371,107	450,000	597,804	660,280	760,885	840,784	405,063	146,015
1999	3,901,226	74,845	65,924	83,112	208,953	217,813	320,138	426,320	437,114	582,268	742,443	418,923	323,373
2000	3,202,634	185,080	128,907	117,328	254,221	272,885	334,657	302,870	320,183	411,328	419,717	337,055	118,403
2001	2,702,493	35,793	83,294	55,314	357,819	503,320	399,309	293,137	272,919	243,299	218,944	157,760	81,585
2002	3,188,992	43,172	43,984	54,853	139,259	179,557	233,713	264,548	1,273,493	421,389	259,788	172,733	102,503
2003	1,857,755	35,113	45,411	60,817	119,981	208,385	255,985	216,933	203,761	202,888	237,979	161,105	109,397
2004	3,066,851	71,105	44,501	19,924	84,655	251,987	268,190	361,923	456,331	450,057	472,585	385,636	199,957
2005	4,387,042	124,875	159,642	136,291	138,088	298,760	432,091	423,479	525,071	652,228	580,781	542,145	373,591
2006	4,076,881	318,658	378,179	317,526	248,458	314,317	357,717	401,969	387,273	385,310	323,432	329,984	314,058
2007	2,731,605	379,217	252,477	137,303	178,689	218,758	279,150	317,251	357,862	366,426	244,472		
Avg(56-07)	8,052,959	256,034	297,768	420,012	599,500	739,677	898,837	944,058	990,959	958,303	970,424	682,124	314,426
Avg(88-07)	5,572,803	168,047	165,528	143,792	296,951	440,890	618,986	646,711	728,809	769,783	809,053	565,849	259,681
Avg(98-07)	3,415,323	149,040	134,371	109,084	206,363	283,689	333,095	360,623	489,429	447,608	434,093	323,378	196,542
Min	1,857,755	16,500	10,600	19,924	84,655	179,557	47,000	216,933	203,761	202,888	218,944	157,760	71,700
Max	15,765,900	903,000	989,000	1,492,900	1,571,300	1,743,000	1,610,500	1,550,900	1,774,900	1,684,700	1,920,616	1,471,600	903,200

Table 3. Georgia commercial peeler crab harvest (in pounds) by year and month.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
1989	0	0	2,747	8,684	9,254	3,394	1,139	2,567	7,980	975	460	0	37,200
1990	0	0	3,069	6,644	12,000	2,536	836	1,374	5,363	389	56	0	32,267
1991	0	0	1,708	11,496	4,864	2,142	1,011	1,739	4,440	1,483	0	0	28,883
1992	0	0	2,080	15,758	7,091	4,142	1,969	855	3,339	0	0	0	35,234
1993	0	0	0	28,717	5,401	2,633	830	422	4,721	2,929	0	0	45,653
1994	0	0	3,653	17,991	5,117	1,862	544	696	4,834	883	0	0	35,580
1995	0	0	3,202	21,039	7,776	4,018	380	952	9,621	1,335	33	0	48,356
1996	0	0	80	30,980	19,052	2,761	390	807	6,712	1,157	0	0	61,939
1997	0	0	57,538	15,347	7,334	2,285	705	1,056	7,487	1,549	260	0	93,561
1998	0	0	1,452	59,807	8,162	2,764	1,120	406	8,901	728	0	0	83,340
1999	0	180	23,437	18,925	2,875	1,695	389	300	2,176	2,019	26	0	52,022
2000	0	0	46,008	5,164	5,673	934	0	687	2,486	328	56	0	61,336
2001	0	0	11,456	21,863	2,758	30	14	12	97	36	10	0	36,276
2002	0	0	5,973	25,432	688	1,492	461	9	21	12	0	0	34,088
2003	0	0	3,774	15,656	2,653	450	28	0	914	937	252	0	24,664
2004	0	0	526	25,236	4,244	66	0	0	370	150	0	0	30,592
2005	0	0	81	28,068	1,545	545	15	0	0	0	0	0	30,254
2006	0	0	1,706	15,840	325	0	0	0	0	0	0	0	17,871
2007	0	0	18,533	25,805	2,638	95	0	0	0	0	0	0	47,071
Avg 10-yr	0	18	11,295	24,180	3,156	807	203	141	1,497	421	34	0	41,751
Avg 20-yr	0	9	9,843	20,971	5,761	1,781	517	625	3,656	785	61	0	44,010
Avg (56-07)	0	9	9,843	20,971	5,761	1,781	517	625	3,656	785	61	0	44,010
Min	0	0	0	5,164	325	0	0	0	0	0	0	0	17,871
Max	0	180	57,538	59,807	19,052	4,142	1,969	2,567	9,621	2,929	460	0	93,561

Table 4. Georgia commercial softshell crab production (in pounds) by year and month.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
1989	0	0	3,326	5,731	6,900	2,848	931	1,699	3,798	657	279	0	26,169
1990	83	0	1,251	4,617	9,001	1,691	668	916	3,988	295	274	0	22,784
1991	0	0	1,076	7,984	4,145	1,622	736	1,285	3,249	1,086	27	0	21,210
1992	0	0	543	14,375	6,143	3,195	1,317	389	2,216	1	2	0	28,181
1993	0	0	0	20,286	4,999	1,731	522	245	2,999	1,848	0	0	32,630
1994	0	0	2,300	13,193	3,834	1,080	297	468	3,349	649	0	1	25,171
1995	0	0	1,288	12,210	5,248	2,712	297	589	6,017	758	24	0	29,143
1996	0	0	0	20,638	12,511	1,757	255	510	4,449	783	0	2	40,905
1997	0	0	30,912	9,823	6,844	1,440	675	448	5,295	1,010	155	0	56,602
1998	0	0	904	33,357	6,340	1,736	816	267	6,998	362	19	22	50,821
1999	0	54	13,936	18,960	2,065	1,157	267	192	1,458	1,380	12	0	39,481
2000	0	0	19,545	7,027	2,718	663	0	486	1,809	246	42	0	32,536
2001	0	0	4,103	21,842	3,078	762	60	72	2,244	402	45	0	32,608
2002	0	0	3,944	14,716	1,808	1,092	327	1,233	1,047	467	42	0	24,676
2003	0	0	1,249	16,412	1,459	0	0	0	335	249	0	0	19,704
2004	0	0	1	16,279	4,253	75	66	2,184	140	25	0	0	23,023
2005	0	0	0	4,863	6,657	0	0	0	324	0	0	0	11,844
2006	0	0	43	5,143	0	0	0	0	0	0	0	0	5,186
2007	0	0	650	3,536	239	0	0	0	0	0	0	0	4,425
Avg 10-yr	0	5	4,438	14,214	2,862	549	154	443	1,436	313	16	2	24,430
Avg 20-yr	4	3	4,477	13,210	4,644	1,240	381	578	2,617	538	48	1	27,742
Avg (56-07)	4	3	4,477	13,210	4,644	1,240	381	578	2,617	538	48	1	27,742
Min	0	0	0	3,536	0	0	0	0	0	0	0	0	4,425
Max	83	54	30,912	33,357	12,511	3,195	1,317	2,184	6,998	1,848	279	22	56,602



Table 5. Annual summary of Georgia's commercial blue crab harvest and value by type (hard, peeler, or soft).

Year	Hard Crabs				Peelers				Soft-shell Crabs				Total	
	Harvest (lbs)	Pct of Harvest	Value (\$)	Pct of Value	Harvest (lbs)	Pct of Harvest	Value (\$)	Pct of Value	Harvest (lbs)	Pct of Harvest	Value (\$)	Pct of Value	Harvest (lbs)	Value (\$)
1989	7,296,781	99.14	2,337,267	92.77	37,200	0.51	52,592	2.09	26,169	0.36	129,492	5.14	7,333,981	2,519,351
1990	7,105,524	99.23	2,222,868	93.01	32,267	0.45	48,954	2.05	22,784	0.32	118,119	4.94	7,137,791	2,389,941
1991	6,927,785	99.28	1,976,309	93.43	28,883	0.41	42,070	1.99	21,210	0.30	97,014	4.59	6,956,668	2,115,393
1992	8,707,692	99.28	2,989,219	93.64	35,234	0.40	50,728	1.59	28,181	0.32	152,309	4.77	8,742,926	3,192,256
1993	8,112,326	99.04	3,010,039	93.02	45,653	0.56	69,128	2.14	32,630	0.40	156,911	4.85	8,157,979	3,236,078
1994	8,853,564	99.32	4,510,691	95.60	35,580	0.40	54,082	1.15	25,171	0.28	153,617	3.26	8,889,144	4,718,390
1995	9,299,190	99.17	5,020,701	95.19	48,356	0.52	72,653	1.38	29,143	0.31	180,840	3.43	9,347,546	5,274,194
1996	5,791,288	98.26	3,017,931	89.21	61,939	1.05	95,726	2.83	40,905	0.69	269,244	7.96	5,853,227	3,382,901
1997	6,808,290	97.84	3,835,798	87.91	93,561	1.34	152,054	3.48	56,602	0.81	375,608	8.61	6,901,851	4,363,460
1998	5,037,747	97.41	2,604,625	84.32	83,340	1.61	141,177	4.57	50,821	0.98	343,199	11.11	5,121,087	3,089,001
1999	3,901,226	97.71	2,045,493	82.67	52,022	1.30	92,202	3.73	39,481	0.99	336,500	13.60	3,953,248	2,474,195
2000	3,202,634	97.15	2,077,587	83.89	61,336	1.86	127,689	5.16	32,536	0.99	271,277	10.95	3,263,970	2,476,553
2001	2,702,493	97.51	2,500,657	86.16	36,276	1.31	84,308	2.90	32,608	1.18	317,444	10.94	2,738,769	2,902,409
2002	2,027,491	97.69	1,967,968	87.11	23,259	1.12	62,819	2.78	24,676	1.19	228,446	10.11	2,050,750	2,259,233
2003	1,855,396	97.67	1,901,797	87.32	24,647	1.30	66,980	3.08	19,704	1.04	209,119	9.60	1,880,043	2,177,896
2004	3,064,914	98.28	2,271,916	86.84	30,592	0.98	99,893	3.82	22,981	0.74	244,539	9.35	3,095,506	2,616,348
2005	4,385,787	99.05	3,018,789	94.23	30,254	0.68	66,765	2.08	11,844	0.27	118,248	3.69	4,416,041	3,203,802
2006	4,075,994	99.44	2,995,567	96.34	17,871	0.44	49,912	1.61	5,186	0.13	63,839	2.05	4,093,865	3,109,318
2007	1,798,494	97.22	1,633,178	92.23	47,071	2.54	94,977	5.36	4,425	0.24	42,658	2.41	1,845,565	1,770,813
Avg (89-06)	5,508,673	98.47	2,794,735	90.15	43,237	0.90	79,430	2.69	29,035	0.63	209,209	7.16	5,551,911	3,083,373

## Current Regulations

### Georgia Regulations:

O.C.G.A 27-4-130.1

Minimum-size:	Male: 5-inch CW, Peeler: 3-inch CW, Sook: no limit
Daily catch limit:	Recreational: 1 bushel per person per day, or two bushels per boat with more than one person. Commercial: none
Gear limit:	Two 2 3/8" escape rings. Floats to identify owner. Recreational: 6 pots with fluorescent green floats. Commercial: 200 pots sold in 50 pot permit increments.
Season:	Open all year
License:	Recreational: standard \$9 fishing license. Commercial: Commercial crab license (resident = \$12, non-resident = \$112), \$2 per trap fee, vessel registration fee. Limited entry: 159 total licenses.

### Federal Regulations:

Exclusive Economic Zone (3 - 200 miles offshore)

No regulations – blue crabs are managed on a state-by-state basis.

## Chronology of Blue Crab Fishery Development and Management Actions in Georgia

Pre-1939	Wood traps, trot lining and dipping.
1939-1955	Sponge crab harvest prohibited February-April.
1950-1970's	Wood traps and hand hauling dominated until 1973.
1955-1957	Sponge crabs prohibited year round.
1957-1979	Sponge crabs prohibited May-June.
1968	Crab die off – Gray Crab Disease.
1977	Sounds closed to power drawn nets.
1979 - 2002	Sponge crab harvest allowed.
1980s	Perfecting 2-barrel wire trap early 1980's. / Pot haulers became popular.
1981	Crab/whelk "conch" trawl fishery began.
1982-1984	Wire traps evolved to 4 barrel.
1989-1990	Live bushel trade developed.
1992-1993	Peeler industry established after ~5 years of development.
1995	"Ring Rule" implemented (2 3/8") for short crabs. Two-Year MORATORIUM on commercial licenses to investigate concept of controlled access Live bushel trade fully blossomed and dominated. Picking houses experience labor problems. Imports began replacing domestic picked crab meat
1996	Peeler pot exemption from ring rule. Limited entry workshops with Dr. Orbach.
1998	Limited Access System for crabbing and castnetting. Established a commercial crabbing license capping fishery at 159 licenses, one license per individual. Number of traps limited to 200 per license, with per trap fee (\$2). Required Boat / Trap ID. Lottery established for new entrants. Logbooks. Recreational traps allowed with recreational license. 6 commercial-style traps per person allowed with recreational license
2001	Crabbers began reporting as dealers.
2002	Sponge crab moratorium implemented until July 2005. DNR board granted authority to manage fishery during emergency conditions
2005-2008	Sponge crab prohibition continued until July 2008.
May 2003	Dept. of Commerce (NMFS) declares a fishery failure for GA blue crab in response to declining abundance associated with a five year drought.
2004	Harvest of adult females restricted for March 2004, and peelers until March 22, in response to decline female abundance associated with a five year drought.

## Prioritized Issues of Concern

1. The population of coastal Georgia continues to increase with concomitant urbanization of areas adjacent to the estuary.
2. Inland land and water use patterns are changing so that the quality and quantity of freshwater entering the estuaries may be altered to the point of comprising ecosystem function.
3. Much of the basic understanding of blue crab biology and population dynamics is derived from estuaries to the north (Carolinas and Chesapeake Bay) and the Gulf States. Very few studies have been undertaken in Georgia, which is unique in its tidal amplitude.
4. There are no timely estimates of the impact of the marine recreational fishery on the economy of Georgia. With these kinds of estimates, an accurate value could be assigned to the recreational blue crab fishery with human and fiscal resources in the form of research and population monitoring allocated accordingly for effective management.
5. The spatial aspects of blue crab mating/spawning in Georgia are poorly understood.
6. There are no estimates of reproductive output (eggs) of the spawning biomass or of the total spawning biomass (weight). Additionally, the relationship between fishing mortality, spawning biomass, and recruitment is unknown.
7. Very little information exists on the early life history of blue crabs in Georgia. Trawl surveys conducted in meso- and polyhaline areas in Georgia's estuarine waters have produced limited numbers of juvenile blue crabs (< 60 mm). Therefore, it appears they are selecting very specific microhabitats, probably in the oligohaline zone of the estuary. These areas are very vulnerable to degradation or destruction from coastal area urbanization, coastal plain silvicultural practices, and reduced fresh water inflow.
8. There are nine major estuarine systems along the coast of Georgia. Each has defining biotic and abiotic characteristics. Thus, it is reasonable to assume the suitability of each of these estuaries as habitat might vary greatly from year to year. Similarly, natural and fishing mortality in each of these estuaries can vary from year to year. Consequently, it can be expected that recruitment to the adult population, either on an estuarine-specific or coastwide basis, may vary greatly through time.
9. Create a management plan that allows flexibility during times of extreme climatic events (droughts): Threshold Management Approach.
10. Determine the optimum number of licenses and associated traps.

## Current Data Sources

### Fishery Dependent Data Sources

In addition to harvest information, the GADNR has required by law since 1998 that logbooks be maintained and reported to the agency on a monthly basis for dealers and fishers. To improve on these data all crabbers began reporting as dealers starting in 2001. In addition to total harvest, they are also required to report on grade, location caught, number of traps, and soak time.

In November 2003, a cooperative crab trap study was initiated in response to a NMFS blue crab fishery failure declaration (May 2003). This study put observers on crab vessels on a monthly basis to get information on distribution, size, sex composition, spawning condition, maturity, and water hydrographics. Participating crabbers collected similar information from a limited number of randomly designated traps on each of their trips as well.

Cooperative Statistics Program (CSP) is part of the joint State-Federal partnership between the National Marine Fisheries Service (NMFS) and the State of Georgia. Originally implemented in 1977, the primary objective is to eliminate duplication of effort and standardizing data collection. In 1995, the Atlantic Coastal Cooperative Statistics Program (ACCSP) was conceived with 23 Atlantic federal, regional, and state fisheries management agencies agreeing to cooperatively collect, manage and disseminate fishery statistical information. With funding from NMFS, Georgia cooperates fully with both programs. To achieve the goals set by CSP and ACCSP, Georgia implemented the trip ticket program in April 1999. All sales of seafood products landed in Georgia must be recorded on a trip ticket at the time of the sale. Both the seafood dealer and the seafood harvester are responsible for insuring the ticket is completed in full. The data collected via trip tickets are:

Trip start and unloading dates	Number of Crew
Vessel number	Harvester Identifier
Dealer Identifier	Area Fished
Actual Fishing Time	Number of Sets
Gear Type	Quantity of Gear
County Landed	Species
Pounds	Ex-vessel value
Market Size	Market Grade

The data collected by these trip tickets are used not only to manage Georgia's fisheries but also to demonstrate their cultural and economic importance to coastal Georgia.

Blue Crab Trap Cooperative was established in 2003 as a result of declining blue crab harvest, the industry's request to help, and to create pot-based estimates of relative abundance. The primary object is for a series of volunteer crabbers to collect basic data from a small portion of their traps each fishing day (n=5), and augment that with DNR observers who would accompany them on trips each month, collecting the same

information from all traps, with detailed information for the five primary traps. Funding was not secured for this project until April 2006, and will continue until June 2009. Initial response to the survey was favorable with over 85 crabbers signing up as interested during a November 2003, public meeting. A workshop was held in March 2004 and was attended by 28 individuals. A total of nine individuals returned information that year, only three reported information for more than one month, and by December 2004 participation had dropped to zero. Fortunately, observer trips continued, with intensity and regularity increasing with secured funding. A third component of the cooperative was to sample five traps off the DNR dock on Plantation Creek on a regular basis to simulate the shore-based recreational fishery (Figure 2). Initial data from this project suggests a strong correlation between commercial trap CPUE's and those from the cooperative components (Page et al, 2007).

### Fishery Independent Data Sources

Several fisheries independent datasets are available for use, each with their strengths and shortcomings (Table 6). Consistent funding for these surveys will provide better information for management in the years to come.

Table 6. GA DNR fishery independent data sources with blue crab information.

Survey	TimeFrame	Gear	Periodicity	Comments
Juvenile Finfish Survey	1978-1986, 2006 – present	78-86: 10 ft trawl with 1/8 mesh. 2006-: 20 ft trawl, 1.875 mesh, 0.25" liner	Monthly	Used in the smaller creeks
National Coastal Assessment	2000–2006	20 ft trawl, 1.875 mesh	July-Sep	50 sites conducted annually to assess community structure, toxins, water quality, etc
Beach Seine	2004 – present	100x6ft seine 1" mesh	Monthly	4 sites in SS and SA
Marine Sportfish Population Health Study	2003 - present	300x9ft gill net 600x7ft trammel	Jun-Aug Mar-May Sep-Nov	Wassaw and Altamaha Sounds Fixed and random sites with at least 25 in each sound.
Ecological Monitoring Trawl Survey	1976- present	40ft flat trawl with 1.875" mesh	Monthly	Presently six sound systems with 43 fixed stations stratified by creek, sound, and offshore – WA, OS, SP, SS, SA,CU

Ecological Monitoring Trawl Survey GADNR's Coastal Resources Division has conducted a trawl survey to monitoring shrimp and blue crab abundance since 1976. The monthly survey is a fixed site design stratified on creek, sound, and offshore locations in the various sound systems of Georgia. Data on blue crabs includes total number and weight, sex, maturity, egg and ecdysis stage, and health (disease). The survey indicated a very similar decline in abundance as compared to commercial harvest during the 1998-2002 drought period (Figure 3).

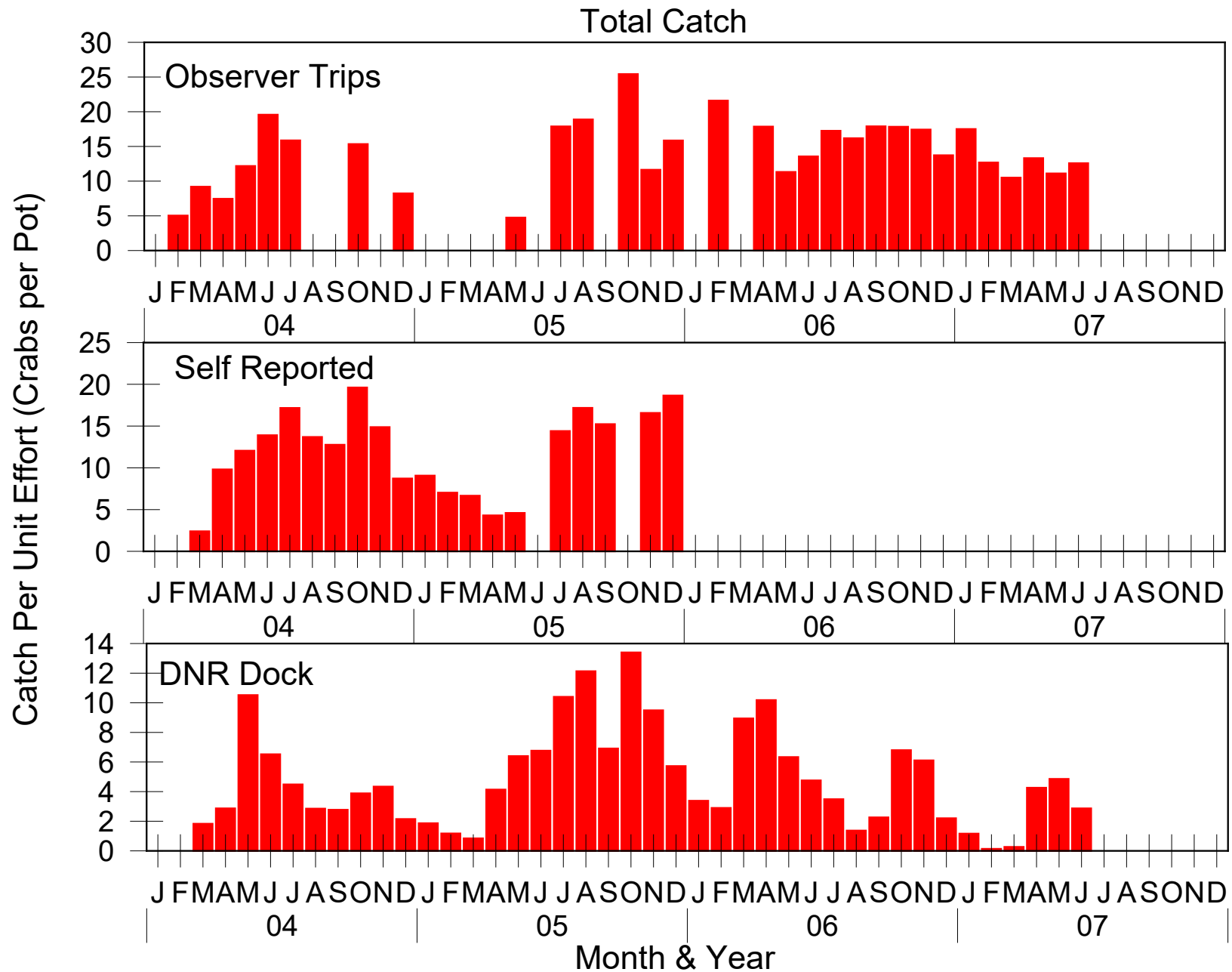
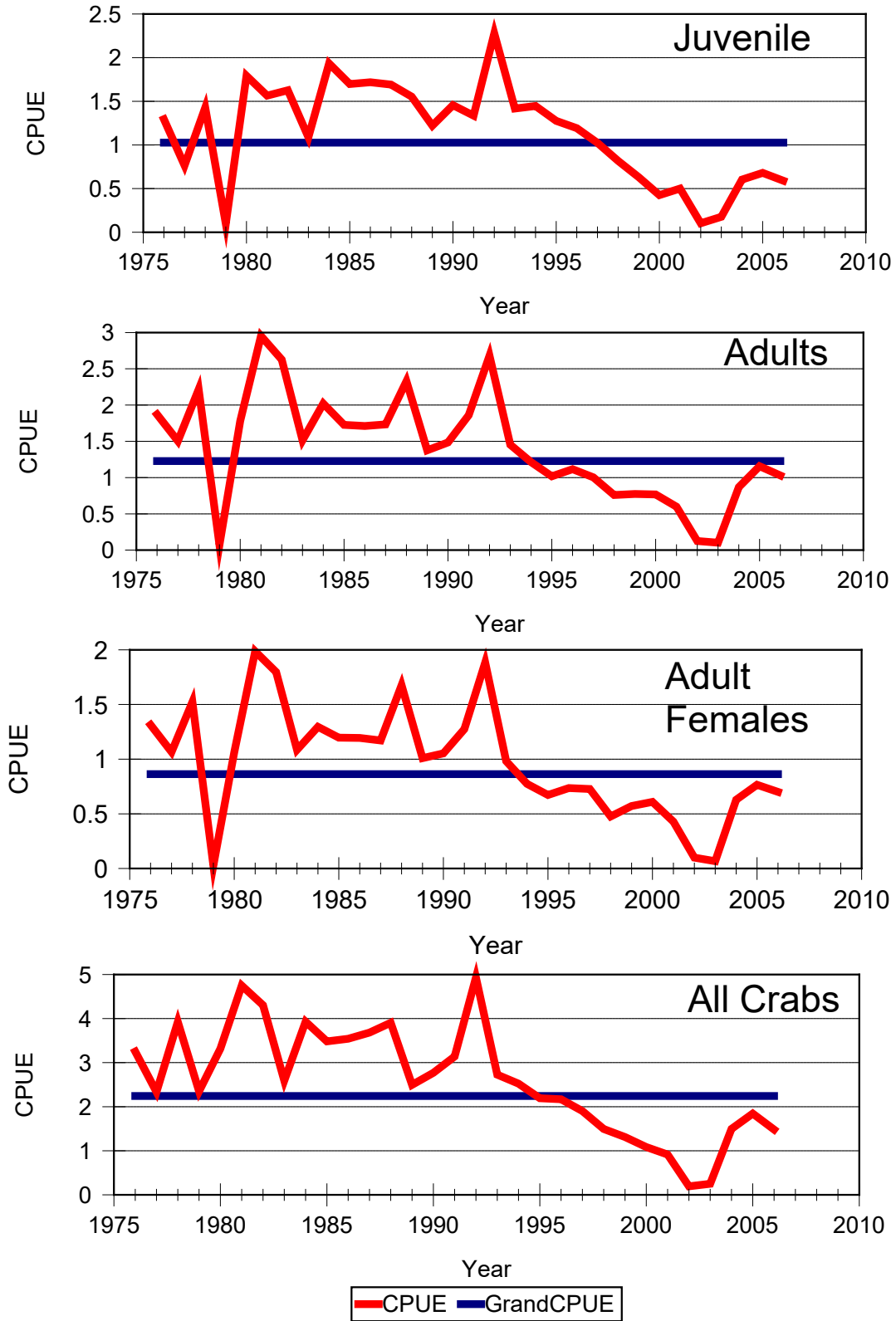


Figure 2. Monthly catch per unit effort (crabs per pot) from the Blue Crab Trap Cooperative Project (2004 to present).



Cpue is a geometric mean per 15 minute trawl

Figure 3. Catch per unit effort from the Ecological Monitoring Trawl Survey.



Marine Sportfish Population Health Survey has been conducted since 2003 to monitor populations of recreational important fishes (in particular, red drum and spotted sea trout). The Wassaw, Altamaha River Delta, and Cumberland systems have been identified as the primary estuaries but the latter is presently not sampled due to funding constraints. The survey is tasked to: (1) collect biological data from all estuarine fishes of importance; (2) characterize the essential habitats needed by the various life history stages of these fishes; (3) analyze these data to determine the health of marine sportfish populations; and (4) summarize this information in stock assessments and other status reports. Sampling is conducted with 600x7 ft trammel nets (2.75" to 14" stretch mesh): in March-May, and September to November, and with 300x9 ft gill nets (2.5" stretch) June to August. No lengths are taken on blue crabs, but total numbers are identified as either male, adult female, or juvenile female. Data from this survey indicated relative good success at catching crabs (Figure 4).

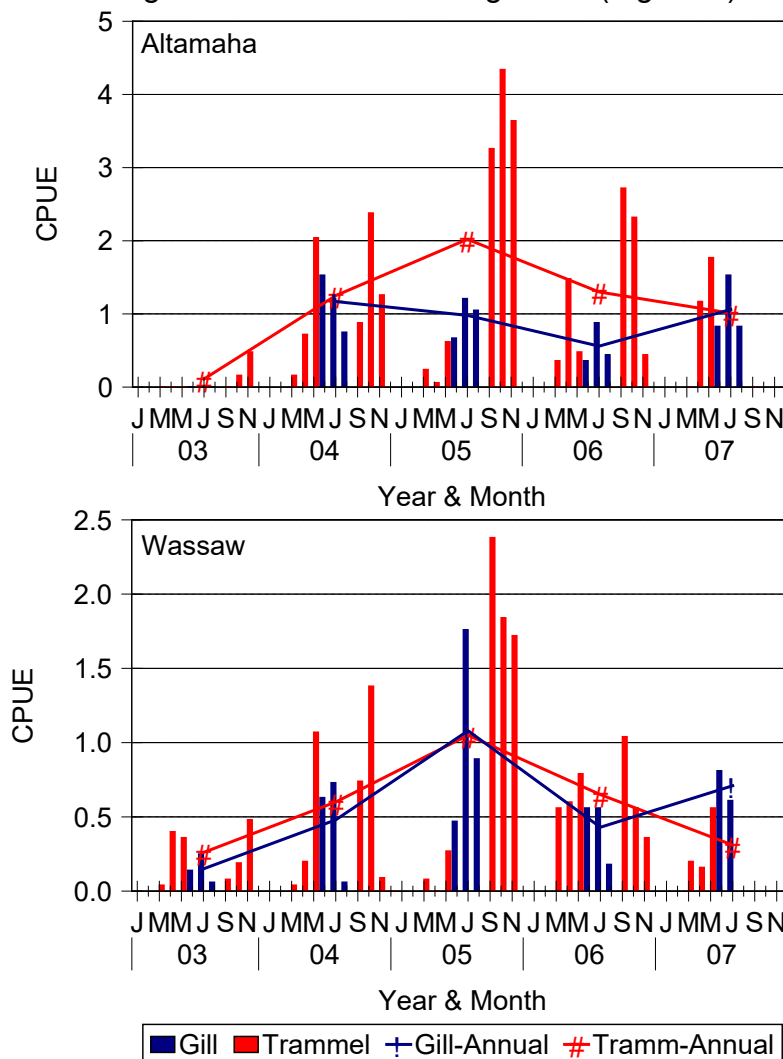
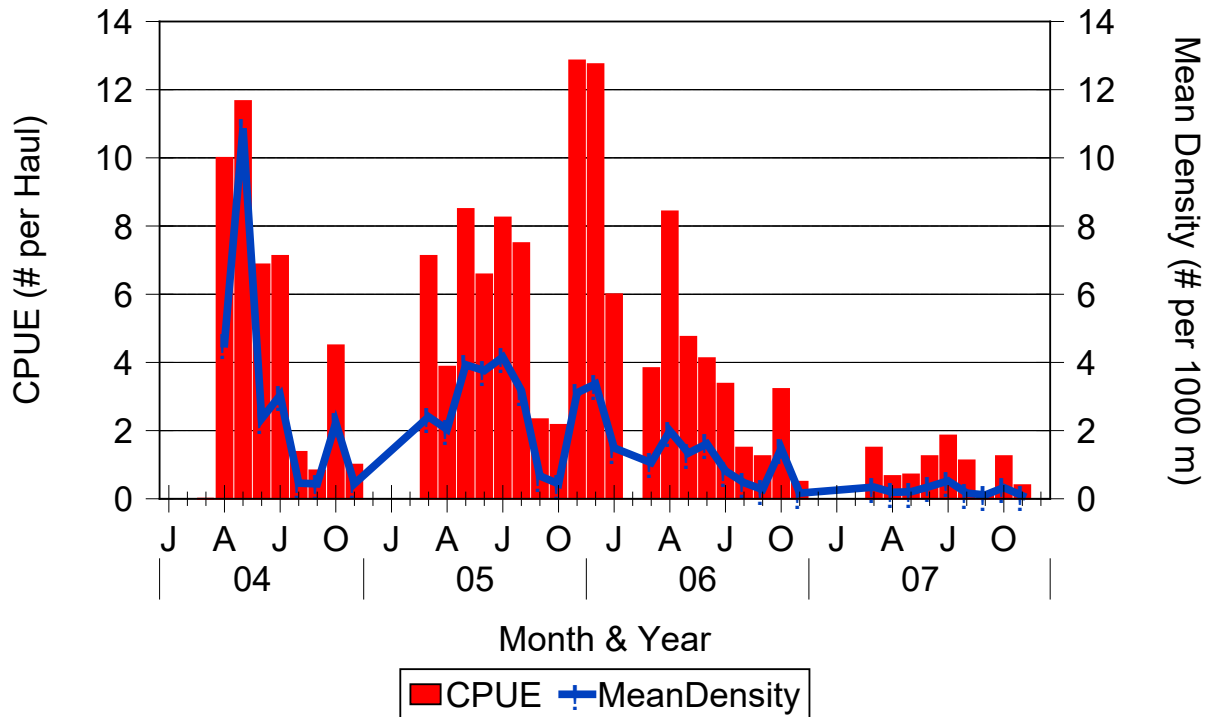


Figure 4. Monthly and annual CPUE by sound system and gear from the Marine Sportfish Population Health Survey. CPUE is crabs per net set.

Beach Seine Survey was initiated in 2004 in response to declining crab abundance associated with a prolonged drought. The primary objective was to intercept seaward migrating sponged females at and near various sound mouths. Sampling has been conducted at four sites in the entrance of St. Simons and St. Andrews sound using a 100 x 6 ft monofilament seine with 1" stretch mesh. All species are enumerated and subsamples measured. Information collected on blue crabs is similar to that of the EMTS.

## Blue Crabs from the Seine Survey



Source: GADNR EMS Seine Survey

CPUE is crabs per haul, Mean Density in crabs per 1000 m<sup>2</sup>

Figure 5. Monthly catch per unit effort and density from the GA DNR Beach Seine Survey, 2004-2007.

## Goals and Objectives for Management

1. Determine the maximum amount of commercial fishing pressure (in actively fishing traps) for sustainability and adjust the number of licenses accordingly.
2. Develop methods to address latent fishing effort.
3. Develop methods to assess the recreational component of the fishery.
4. Protect the spawning population as needed to avoid wide fluctuations in stock size.
5. Identify and protect Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC).
6. Develop a threshold management approach that will allow for clear and concise actions when pre-described levels of relative abundance (CPUE) are met.

### Threshold Management for blue crabs

Management of the blue crab resource in Georgia to date has been accomplished through limited commercial entry (159 maximum licenses) and fishing effort limitations (pot permits). There is no commercial catch limit or season for crabbing. These regulations appear to be relatively effective during normal conditions. However, a 52-month drought (June 1998 to Sept 2002) clearly indicated how climatic conditions can dramatically alter the ecosystem and the blue crab population.

This drought resulted in a 20% increase in coastal salinities, pushing the salt wedge 30 miles upriver in some places. The impacts on crabs were not immediate, but the long duration of the drought resulted in four consecutive years of record low commercial harvest and catch per unit effort. Independent research surveys supported these declines.

The impacts of the drought on coastal Georgia included:

- Marsh die off – resulting in loss of habitat for estuarine dependent species.
- Displacement of crab populations further upriver to areas of lower quality and quantity habitat.
- Increase in bitter crab disease. The organism that causes this disease, *Hematodinium sp.*, thrives in salinity above 11ppt. Its range and impact on blue crabs increased during the drought.
- Higher salinity also meant a wider distribution of coastal predators into the estuary, potentially increasing predation on blue crabs.
- The drought reduced river flow potentially concentrating pollutants.
- Recruitment failure: Blue crab eggs and larvae require high saline, low turbidity water for survival. These waters are typically found offshore. With females encountering oceanic salinity further upriver, it is likely eggs and larvae never survived. This became evident when numbers of juveniles declined dramatically in June 2001. A recovery of juveniles was not observed until the Fall of 2003.

It became evident during these type of environmental extremes that a more proactive management approach was necessary which could be enacted quickly with pre-established actions. The threshold approach to blue crab fishery management involves establishing values, or “triggers” that when reached, enact a specific management action. Data from various fishery-independent and -dependent sources should be utilized to insure agreement (Table 7).

Table 7: Available datasets for managing Georgia’s blue crab fishery.

Fishery Dependent Data Sources			
Data Source	Period	Pros	Cons
Commercial Harvest	1955-present	Long-term Gear specific	Market driven No effort Inconsistent Reporting
Commercial Effort			
Pounds per trip	1989-present	Long-term Effort driven	Number of pots and soaktime missing during earlier years Dealers often lump trips together
Pounds per pot/hr Pounds per pot	2001-present	Best available commercial data Easy to understand	Short-term Reporting discrepancies
DNR Trap Coop	2003-present	Science based Good coverage	Poor participation
Fishery Independent Data Sources - DNR			
EM Trawl Survey	1976-present	Long-term Consistent Tracks harvest well	Gear specific Site Specific
EM Juvenile Survey	1979-86, 2006	Samples creeks upriver Targets juveniles	Not continuous Funding
EM Seine Survey	2003-present	Captures spawners	Limited coverage
MSPHS	2003 – present	Crabs routinely encountered, good temporal and spatial coverage	Only samples in two sound systems

At present, the GA DNR Ecological Monitoring Trawl Survey and commercial blue crab catch and effort data (pounds-per-trip) will be the primary datasets. Other datasets are of valuable use (commercial effort in pounds-per-pot-hr, DNR’s Trap Cooperative, Seine, and Juvenile Trawl), but they are of limited duration and can only be incorporated with more years of data.

For a short-lived species such as blue crab, evaluating data on an annual basis has some shortcomings because reaction to concerns would be too slow and management actions may be unnecessarily prolonged. As a result, the decision was made to examine catch rates on a monthly basis and establish 6-month running averages to

exclude an affect of a single month. This method would insure changes to the stock were indeed real and not some environmental or sampling anomaly. Potential actions will not be implemented unless the threshold (or trigger) is exceeded for six consecutive months. Once this occurs, the recommended action will remain in effect until the threshold is NOT met for a minimum of three months. This method appears to be able to respond more quickly to changes in the blue crab population size. In addition, the actions will not automatically go into effect, but must be considered along with other potential factors to insure proper management. DNR will notify industry leaders prior to the threshold being met (4-5 consecutive months beyond average), so the Blue Crab Advisory Panel (BCAP) can have time to convene and discuss the actions to take place.

The proposed thresholds for management action will be:

Threshold Value 1:  $> 81\%$  C.I. Upper Bound (upper red line on Figs. 6 and 7)

Threshold Value 2:  $\leq 81\%$  C.I. Lower Bound (lower orange line on Figs. 6 and 7)

Threshold Value 3:  $\leq 95\%$  C.I. Lower Bound (lower red line on Figs. 6 and 7)

Both datasets (commercial catch and effort and the GA DNR Trawl Survey) should agree for an action to be taken. For the Trawl Survey, 41 of 228 months between 1989 and 2007 would require an action (18%) (Table 8), while 57 months from the commercial cpue data (25%) would have supported an action (Table 9). Of the months with a positive action (Threshold Value #1), 10 occurred from the Trawl Survey (4.4%) and 18 (7.9%) from commercial cpue. When total agreement is examined between the two data sources, only 35 out of 228 months (15.4%) would have had a management action initiated (Table 10). Six months had very favorable conditions (1992-1994, abundance above the 81% C.I.) with 29 months below at least the 81% confidence intervals, primarily 2002 - 2004.

#### Management Actions:

Threshold Value 1:  $> 81\%$  Upper Bound (upper red line on Figures 6 and 7)

Management action: Relax regulations on sponge crab harvest. At this point abundance is very high. It's likely price per pound will be very low. Increased harvest could allow crabbers to offset economic losses due to market conditions.

Threshold Value 2:  $\leq 81\%$  Lower Bound (lower orange line on Figures 6 and 7)

Management Action: Seasonal restrictions on adult female harvest. Below the 81 percentile and the fishery is clearly under stress. A ban or a reduction in harvest on adult females during key times of the year will allow for increased mating success and egg production.

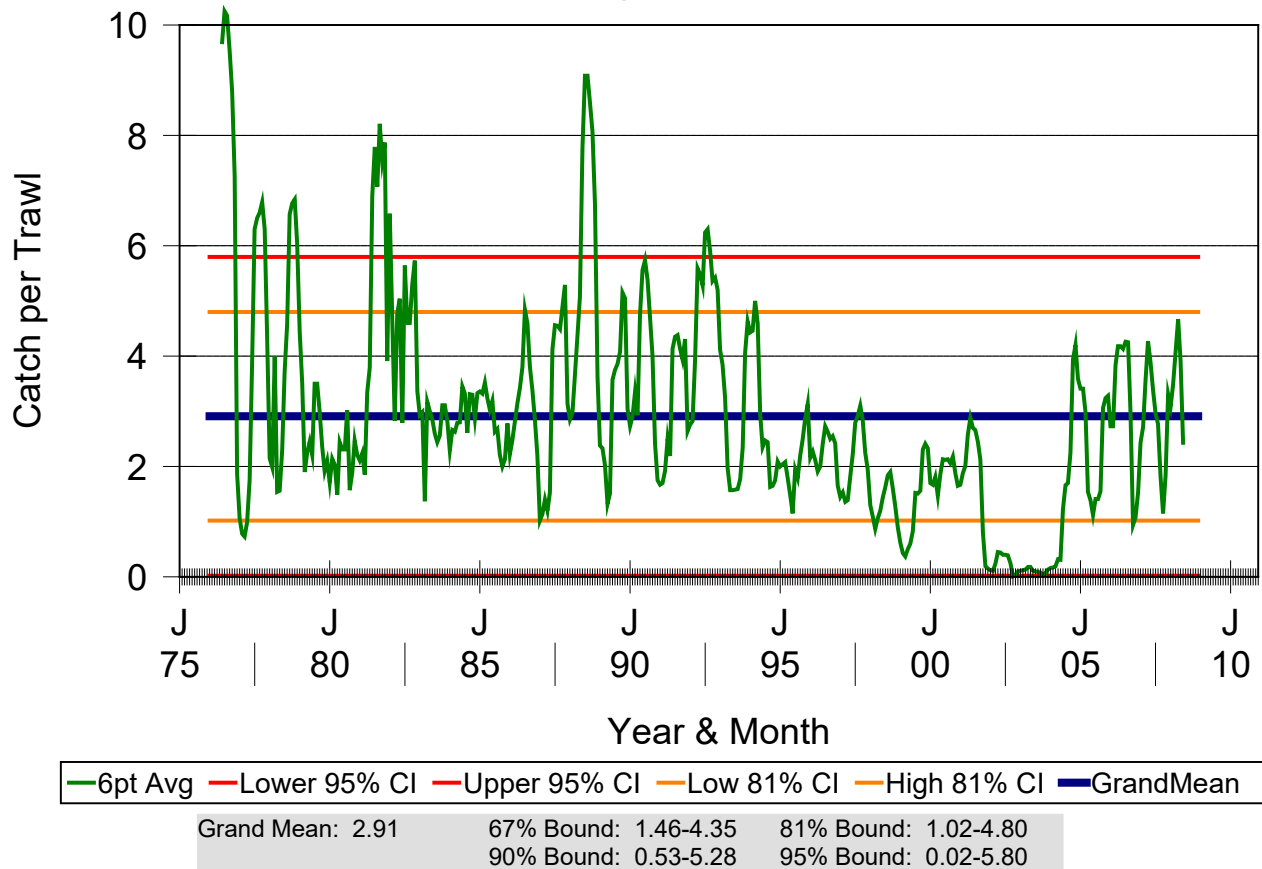
Threshold Value 3:  $\leq 95\%$  Lower Bound (lower red line on Figures 6 and 7)

Management Action: A ban on all females or complete closure. If catch rates fall in this range the population is in serious threat of crashing. Overfishing is a distinct possibility because the population is already depressed and continued harvest may prolong its recovery. This is the scenario faced during the 1998-2003 drought. The population was extremely low, and initially crabbers placed more effort in an attempt to remain solvent. Eventually the expense outweighed the return and many left the fishery.

It is recommended that no action be allowed to remain in effect longer than ninety (90) days without further review from DNR biologists and industry leaders. This may be difficult due to the lag associated with actual commercial harvest and the time these trips are reported to DNR. At any given time, as many as 15% of all commercial crabbers are in arrears for at least three months. This makes using the commercial cpue data on any real-time basis notably bias. Other datasets with less of a time series mentioned here may need to be incorporated to insure proper management.

One concern with using commercial CPUE in the form of pounds per trip is it ignores crabbers fishing limited numbers of pots. Those with a 50 pot permit cannot expect to catch those with the highest permitted amount of 200. In addition, often times market conditions result in crabbers harvesting only what they have orders for, regardless of the quantity of traps they have set in the water. Since 2001, mandatory trip tickets required number of traps fished for each daily record. This can provide a CPUE in pounds per pot which takes into account the various trap permits available within the fishery (Figure 8 and Table 11). During 2006 and 2007, 35 and 37 crabbers respectively, had annual harvest rates below the calculated lower 81% threshold value of 241 lbs per trip for the period of 2001 through 2007. This raises concern over using the pounds per trip estimates dating back to 1989 to trigger an action. The lower 81% value of 289 lbs/trip exceeds that harvested by many fishers with 50 trap permits harvest. Although these data are short duration (seven years) they may need to be incorporated into this FMP sooner than originally expected.

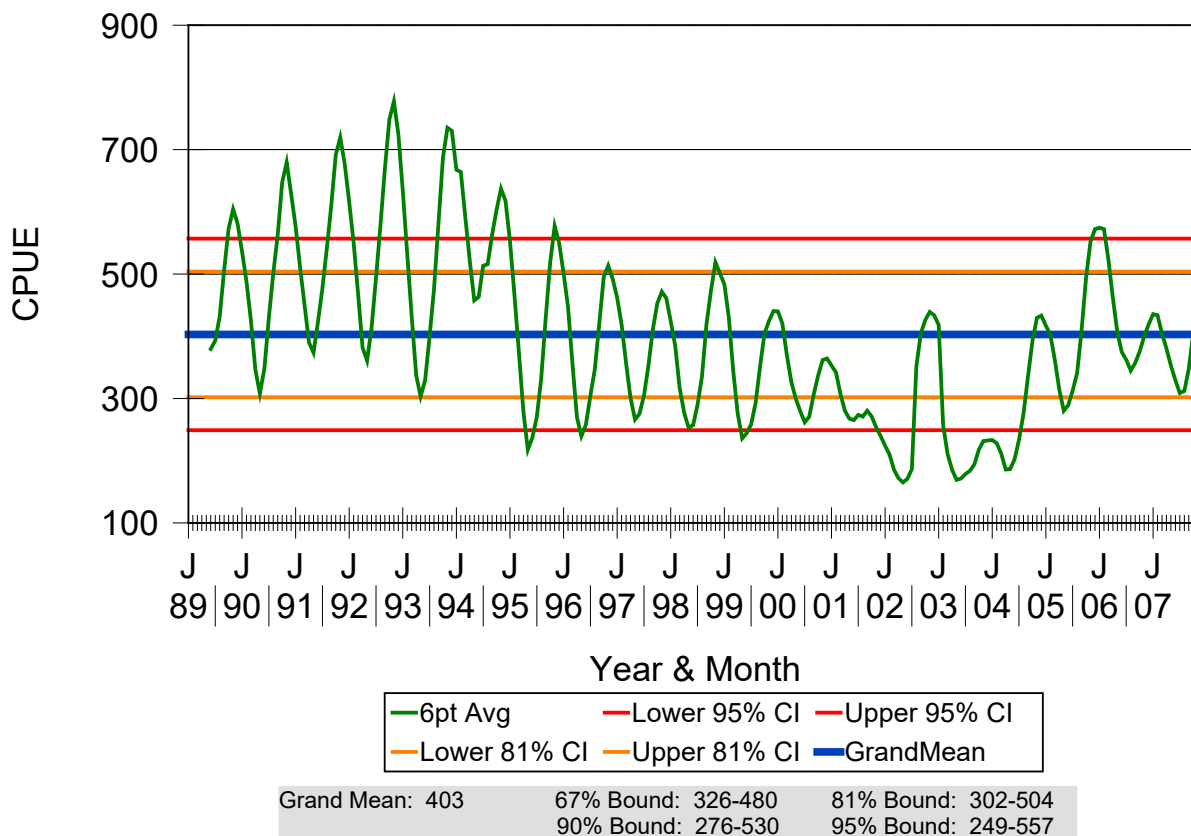
## Spawning Stock CPUE



Source: GA DNR Ecological Monitoring Trawl Survey  
CPUE in Crabs per standard 15 minute trawl

Figure 6. Blue crab monthly spawning stock estimates from the GA DNR Ecological Monitoring Trawl Survey (1976 to present). The green line is a 6-point average of monthly values, (ie, the average of January to June is the June value, February to July, the July value, etc). The purpose is to smooth the trend to take out the effects of a single month. The deep blue horizontal line is the long-term mean, in this case 2.91 crabs per standard 15-minute trawl. The other horizontal lines represent different levels of confidence. The red lines indicate to upper and lower 95% confidence interval (95% C.I. for short – 2 standard deviations). The orange lines are the corresponding 81% confidence intervals (1.5 standard deviations). The upper 81% C.I. will trigger Recommendation #1. Populations are healthy with ample spawning stock. The lower 81 percentile suggests the stock is in stress and will trigger Recommendation #2. The lower red horizontal line is the lower 95% confidence interval and suggests the stock is at extremely low levels. The period from April 2002 through August 2004 has been the only prolonged period stocks remained below this level. Extreme caution is necessary at these stock levels and Recommendation #3 is enacted for these circumstances.

## Commercial Hard Crab Harvest CPUE



Source: GA Commercial Statistics Program  
 CPUE in pounds per complete trip

Figure 7. Monthly commercial catch and effort data for hard blue crabs 1989 – 2007. These data show a similar decline and the estimates from the fishery independent estimates of spawning stock starting late 2001 and continuing until the fall of 2004.



Table 8. When would triggers fire? Months when a management action would have been in place based on the upper 95 percentile and 81<sup>st</sup> percentiles (both upper and lower) based on spawning stock estimates from the GADNR Trawl Survey.

Threshold Management in Effect												
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976												
1977												
1978												
1979												
1980												
1981												
1982												
1983												
1984												
1985												
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2003												
2004												
2005												
2006												
2007												
2008												

6 consecutive months above Upper 81% CI plus 3 months below  
 6 consecutive months below Lower 95% CI plus 3 consecutive months above  
 6 consecutive months below (at least) Lower 81% CI plus 3 consecutive months above

There are several months from 1979 - 1983 when sampling did not occur

Table 9. Circumstances when a management action would have been enacted under the present plan based on commercial catch per unit effort data (pounds per trip).

Threshold Management in Effect												
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1989												
1990												
1991												
1992												
1993												
1994												
1995												
1996												
1997												
1998												
1999												
2000												
2001												
2002												
2003												
2004												
2005												
2006												
2007												

	6 consecutive months above Upper 81% CI plus 3 month below
	6 consecutive months below Lower 95% CI plus 3 months above
	6 consecutive months below (at least) Lower 81% CI plus 3 months above

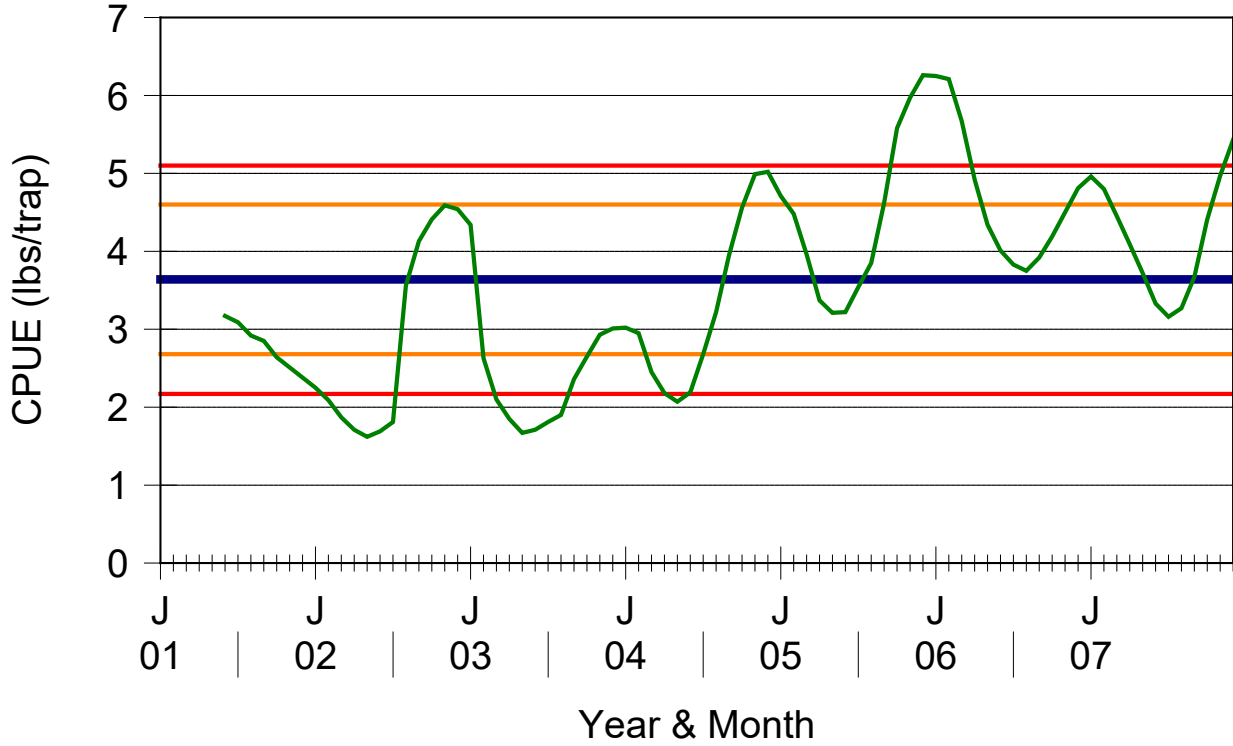
Table 10. Months between 1989 and present when both the GA DNR Trawl Survey and commercial pot CPUE exceeded threshold values and were in full agreement.

Threshold Management in Effect												
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1989												
1990												
1991												
1992												
1993												
1994												
1995												
1996												
1997												
1998												
1999												
2000												
2001												
2002												
2003												
2004												
2005												
2006												
2007												

	6 consecutive months above Upper 81% CI plus 3 month below
	6 consecutive months below Lower 95% CI plus 3 months above
	6 consecutive months below (at least) Lower 81% CI plus 3 months above

# Commercial Hard Crab Harvest CPUE



— 6pt Avg	— Lower 95% CI	— Upper 95% CI	— Lower 81% CI	— Upper 81% CI	— Grand Mean
Grand Mean: 3.55		67% Bound: 2.85-4.25		90% Bound: 2.40-4.70	
81% Bound: 2.63-4.46		95% Bound: 2.15-4.94			

Source: GA Cooperative Statistics Program  
 CPUE in pounds per traps fished

Figure 8. Reported commercial catch per unit effort (CPUE) measured as pounds per pot. Data were not available prior to 2001.

**Table 11. Months between 2001 and present when commercial pot CPUE (measured as pounds per pot) exceeded threshold values.**

Threshold Management in Effect													
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1989	Data on quantity of traps fished was not routinely reported until the 2001 fishing season												
1990													
1991													
1992													
1993													
1994													
1995													
1996													
1997													
1998													
1999													
2000													
2001													
2002	Orange	Orange	Orange	Orange	Orange	Red	Red	Red	Orange	Orange			
2003						Red	Red	Red	Red	Red	Red		
2004													
2005													
2006	Blue	Blue	Blue	Blue	Blue								
2007		Blue	Blue	Blue									
	Blue	6 consecutive months above Upper 81% CI plus 3 consecutive month below											
	Red	6 consecutive months below Lower 95% CI plus 3 consecutive months above											
	Orange	6 consecutive months below (at least) Lower 81% CI plus 3 consecutive months above											

## Prioritized Research and Monitoring Needs

### 1. Develop methods to assess recreational blue crab catch and effort.

Methods: Presently there are no methods to assess the recreational effort of blue crabs in Georgia. Absher's 1988 study of Chatham and Glynn Counties is one of the few available to estimate effort, and only in the two most populous coastal counties (Glynn and Chatham). His estimate of 12% participation of the general population, making 253,597 crabbing trips could produce 10.14 million pounds if each trip produced the limit of 1 bushel per person per day. An invertebrate recreation stamp (to include shrimp, whelk, etc) would identify the universe of potential users and a phone survey targeting these individuals would allow for annual estimates of these species from recreational harvest.

### 2. Develop abundance index for age-0 blue crabs.

Methods: Utilizing existing and ongoing trawl surveys (EMTS and juvenile survey) estimates can be created for age-0 blue crabs based on length frequencies and specific temporal and spatial components of those surveys.

Analytical Methods: Length frequencies from the various fishery independent surveys will be used to create a generalized monthly cutoff for age-0 blue crabs. Data will be examined to define the spatial and temporal components with maximum recruit to the various gears to produce a weighted geometric mean catch per trawl which minimizes the coefficient of variance. Over time, this index will provide a meaningful reference point to compare annual recruitment success.

### 3. Develop abundance indices for adult blue crabs.

Methods: Utilizing existing and ongoing trawl surveys (EMTS and juvenile survey) and the Blue Crab Trap Cooperative Project, estimates can be created for adults (based on legal size limit) and specific temporal and spatial components of those surveys.

Analytical Methods: Data will be examined to define the spatial and temporal components with maximum recruit to the various gears to produce a weighted geometric mean catch per trawl which minimizes the coefficient of variance. Over time, this index will provide a meaningful reference point to compare annual recruitment success. Adult, male, female indices should be created.

### 4. Develop assays to detect diseases in blue crabs.

Methods: Assays need to be created to assess the range and prevalence of diseases such as the parasitic dinoflagellate, *Hematodinium sp.*, in situ to better understand its impact on blue crab populations.

### 5. Evaluate the influence of environmental factors, including, rain, streamflow, habitat, etc.

Methods: Examine relationships between relative abundance of blue crabs using available catch per unit effort data and various environmental datasets available

via NOAA and state climatological offices. Examine the potential relationships of rainfall and instream flow with crab abundance and juvenile recruitment.

Analytical Methods: Multivariate statistical methods will be used to explore these data to determine what relationships exist with crab abundance.

## **6. Conduct tagging studies.**

Methods: Tag adult females and pre-peelers above demarcation line to determine fishing pressure on the fishing grounds and timing of the seaward migration of spawning females.

## **7. Pot efficiency studies**

Methods: Establish efficiencies of hard and peeler pots and the effectiveness of various baits on a seasonal basis. Factors to explore include: inverted bait wells, terrapin excluder devices, seasonal attractiveness of individual traps, and seasonal effectiveness of various natural and synthetic baits.

## **8. Larval Recruitment Studies**

Methods: Collect information on recruiting megalopa to determine periodicity and recruitment success. Simple PVC air filter collectors can be placed near the mouths of various sounds and creeks.

## **9. Identify habitats used by juvenile, adult males, and spawning female blue crabs.**

Methods: Adult male blue crabs typically inhabit different portions of the estuary than adult females – primarily along different salinity gradients. Understanding these distributions and habitat preferences of the various life stages will allow for better management of the stock and protection of vitally important habitats. By using existing surveys, many of these areas may be identified.

Analytical Methods: These systematic surveys should be able to identify aggregates by life stage. Physicochemical data (salinity, temperature, depth, turbidity, stream flow) typically collected from such samples can be compared to abundance to identify habitat preferences.

## **9. Examine interactions between crab traps and various marine and estuarine species.**

Methods: There are numerous species that interact with crab traps, either by attraction to the bait or the crabs held within. Bottlenose dolphins are often observed flipping traps to get to the fish in the bait well – prompting some crabbers fishing in areas prone to this behavior to invest in inverted bait wells. Marine sea turtles are known to forage at the traps, increasing crab mortality due to claw and leg loss. Diamondback terrapins are commonly found inside crab traps and can be deterred by various excluder devices. Finfish bycatch in crab traps appears to be minimal, however, invertebrates such as channel whelk are often found in commercial quantities (Page 2007).

Analytical Methods: Studies need to be conducted to determine ways of deterring or modifying behavior to limit these potential interactions.

## Activities for FY2008 – FY2012

### **Collection of fishery-independent catch/harvest/effort and life history data.**

Purpose: To describe the size distribution and relative abundance of various life stages of blue crabs in coastal waters.

Method: Continue collecting blue crab information from the following surveys:

1. Ecological Monitoring Trawl Survey
2. Marine Sportfish Population Health Survey
3. Juvenile Trawl Survey
4. Beach Seine Survey

### **Collection of fishery-dependent catch/harvest/effort data.**

Purpose: To evaluate the social, economic, and ecological impacts of the blue crab harvest on Coastal Georgia.

Method: Continue to collect mandated catch and effort data from the commercial harvesters and establish methods to improve non-reporting and reporting bias. Continue cooperative surveys such as the trap cooperative as a proxy to commercial fishing success and use these data to establish such bias estimates. Long-term funding for such cooperative surveys will need to be identified.



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