Shrimp Review Panel Report

South Atlantic Fishery Management Council

May 2008

South Atlantic Fishery Management Council

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NOAA, National Marine Fisheries Service

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Background

The Shrimp Review Panel (SRP) met via conference call on April 24, 2008 to address the condition of the pink shrimp stock in the South Atlantic region. Amendment 6 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region (SAFMC 2004) established a proxy for a minimum stock size threshold (MSST) as a parent stock size capable of producing maximum sustainable yield (MSY) the following year. Indications in 2008 are that the stock is again below the MSST. At their meeting in Jekyll Island, GA, in March 2008, the Council requested advice from the Shrimp Review Panel on whether management action is necessary to bring the pink shrimp stock back above the MSST level.

The Shrimp Review Panel also met in February 2007 to address the condition of the pink shrimp stock. At that time, the Shrimp Review Panel concluded that the pink shrimp stocks in some areas along the Southeast coast were depleted due to factors other than fishing such as environmental and climactic factors. The Shrimp Review Panel recommended no management action was necessary at that time **(Attachment 1).**

Results

Pink shrimp landings in North Carolina have shown a marked decline since 2005 **(Table 1)**. Pink shrimp harvest averaged 323,228 lbs. during 2000-2004 whereas the average harvest during 2005-2007 was 64,591 lbs. However, landings in 2006 showed a 50% increase over landings in 2005 whereas 2007 landings were above 2006 landings by 30% but still considerably less than in the 2000-2004 time period. Catch per unit effort (CPUE), as catch per trip, for the same time period increased by 53% in 2006 over the previous year **(Table 1)**. By contrast, CPUE decreased by about 12% in 2007 over that observed in 2006 (**Table 1**). Effort, as measured by the number of trips, decreased sharply from 2004 to 2005 and remained at a low level in 2006 increasing again slightly in 2007 **(Table 1)**. Still, effort in 2007 is still very low by historical standards (e.g. half of the 2004 level).

Landings in Florida have not shown a consistent trend for the period 2000-2007; however, landings in 2007 are the lowest in the series **(Table 1)**. In 2006, landings increased by 31% over 2005 and subsequently decreased by 64% in 2007. CPUE went up by 33% in 2006 compared to 2005 and showed

a 10% decrease the following year (**Table 1**). Effort trends, as indicated by the number of trips, showed a steep decline in 2003, recovering somewhat in 2004-2006 and declining again in 2007 (**Table 1**).

Table 1. Landings (lbs) and Catch-per-unit-effort (CPUE) for pink shrimp harvested in North Carolina and Florida in 2000-2007 (Source: NC Division of Marine Fisheries and Florida Fish and Wildlife Commission).

Year	NC landings	NC trips	NC CPUE (lbs/trip)	FL landings	FL trips	FL CPUE (lbs/trip)
2000	161,422	1,468	109.96	893,020	1,340	666.43
2001	211,858	2,068	102.45	558,013	1,031	541.23
2002	879,894	3,609	243.81	618,857	1,241	498.68
2003	219,010	1,631	134.28	212,381	276	769.50
2004	143,954	1,398	102.97	489,106	533	917.65
2005	43,489	427	101.85	436,455	856	509.88
2006	65,232	420	155.31	573,330	844	679.30
2007	85,053	625	136.08	207,976	342	608.11
Total	1,648,490	11,646		3,989,138	6,463	

While economics appear to be driving the effort level, the apparent decrease in abundance of pink shrimp (as illustrated by #/ha. from 2003-2007; **Table 2**) is likely due to other factors. Fishery-independent shrimp CPUE (density) for the South Atlantic SEAMAP Survey data has been below the MSST threshold value of 0.461 shrimp/ha. for the past five years. 2007 densities are below those observed in 2006 but not as low as those from 2005 **(Table 2)**.

Table 2. Brown, pink and white shrimp densities in numbers per hectare (#/ha) from the Southeast Area Monitoring and Assessment Program (SEAMAP) for 1990 through 2007 (Source: SEAMAP-SA). NOTE: #/ha = mean of number of individuals per tow divided by the mean area swept (ha) by sample trawls One hectare = 2.47 acres; CV= coefficient of variation [standard deviation/mean density].

Year	Brown Shrimp		Pink Shrimp		White Shrimp	
	# / ha	cv	# / ha	cv	# / ha	cv
1990	4.022	3.544	0.568	4.150	9.028	3.173
1991	2.469	6.929	0.873	4.473	12.880	3.197
1992	2.000	8.045	0.511	5.929	5.868	4.240
1993	5.899	4.547	0.673	4.850	5.665	3.533
1994	5.568	5.224	0.594	3.767	10.606	3.561
1995	3.104	4.785	1.728	5.359	17.535	3.420
1996	10.277	4.004	0.461	4.455	12.913	3.279
1997	2.275	4.007	0.948	4.987	7.447	3.624
1998	1.975	3.943	0.853	5.851	18.256	3.701
1999	2.972	5.788	0.450	5.750	34.799	2.623
2000	7.697	6.063	0.211	7.337	13.060	3.523
2001	8.637	3.676	0.502	4.329	10.454	6.239
2002	3.347	3.669	0.867	7.311	9.186	4.971
2003	9.640	4.927	**0.418**	**4.267**	7.372	2.987
2004	8.800	4.077	**0.40**	**5.427**	25.8	3.340
2005	17.100	4.430	**0.10**	**6.775**	31.3	9.470
2006	10.93	7.304	**0.217**	**6.482**	22.384	3.404
2007	7.852	4.885	**0.149**	**7.350**	21.044	3.894

Pink shrimp are one of three penaeid species commercially exploited in the South Atlantic region. Pink and white shrimp occur in South Atlantic waters at the same time and may be in direct competition with

one another (Rulifson 1981; Williams 1955). Brown shrimp, on the other hand, are temporally separated from the other two species (Williams, 1955). Hence, the Shrimp Review Panel consolidated current information on harvest and density of white shrimp and compared it to that of pink shrimp. Similar comparisons were made between brown and pink shrimp to examine possible relationships.

White shrimp density based on SEAMAP survey data from 1990 through 2007 shows a significant ($P < 0.05$) negative relationship between density of white shrimp and that of pink shrimp (**Figure 1**). However, only 26% of the variability in the density of pink shrimp can be attributed to that of white shrimp (as indicated by an $r^2 = 0.26$). Note that data for 1995 were excluded from the analysis below as very high densities of pink shrimp [1.728 shrimp/ha] were observed. Inclusion of data that are very distant numerically from the rest fo the data can introduce bias in statistical analyses and lead to misleading conclusions.

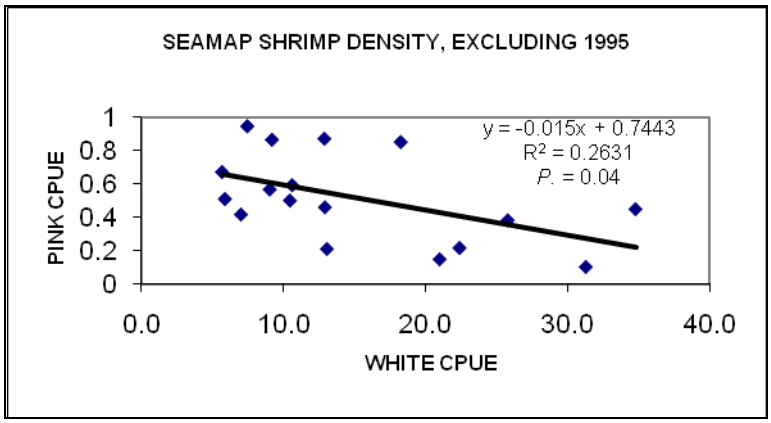

Figure 1. Linear regression of white vs. pink shrimp density for the period 1990-2007 based on SEAMAP data (Source: SEAMAP-SA)

Similarly, density data for pink and brown shrimp from SEAMAP surveys from 1990 thrugh 2007 show a strongly significant ($P < 0.05$) negative relationship (**Figure 2).** In this case, 58% of the variability in the density of pink shrimp is directly related to that of brown shrimp (as indicated by $r^2 = 0.58$). These trends could potentially suggest increased competitive dominance by brown and white shrimp over the less abundant pink shrimp.

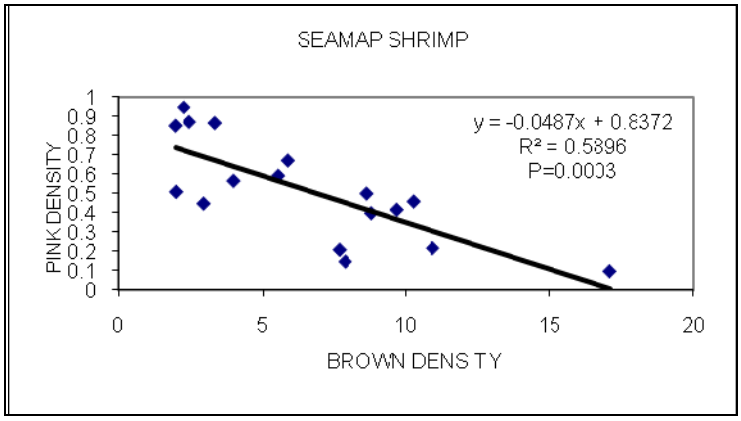

Figure 2. Linear regression of brown vs. pink shrimp density for the period 1990-2007 based on SEAMAP fishery-independent data (Source: SEAMAP-SA).

In North Carolina, landings of pink and white shrimp appear to show a negative relationship with lowest landings of pink shrimp occurring during years of high white shrimp landings (**Figure 3**).

Catch per unit effort from Pamlico Sound survey data since 1987, is shown for both pink and white shrimp in **Figure 4**. The North Carolina Division of Marine Fihseries' Pamlico Sound Trawl Survey began in 1987 and was initially designed to provide a long-term fishery-independent database for the waters of the Pamlico Sound, eastern Albemarle Sound and the lower Neuse and Pamlico rivers. However, in 1990 the Albemarle Sound sampling in March and December was eliminated, and sampling now occurs only in the Pamlico Sound and associated rivers and bays in June and September. CPUE demonstrates a similar trend to the NC landings above with higher CPUE of pink shrimp during years of low white shrimp CPUE. After 2004, however, white shrimp CPUE dominates **(Figure 4)**.

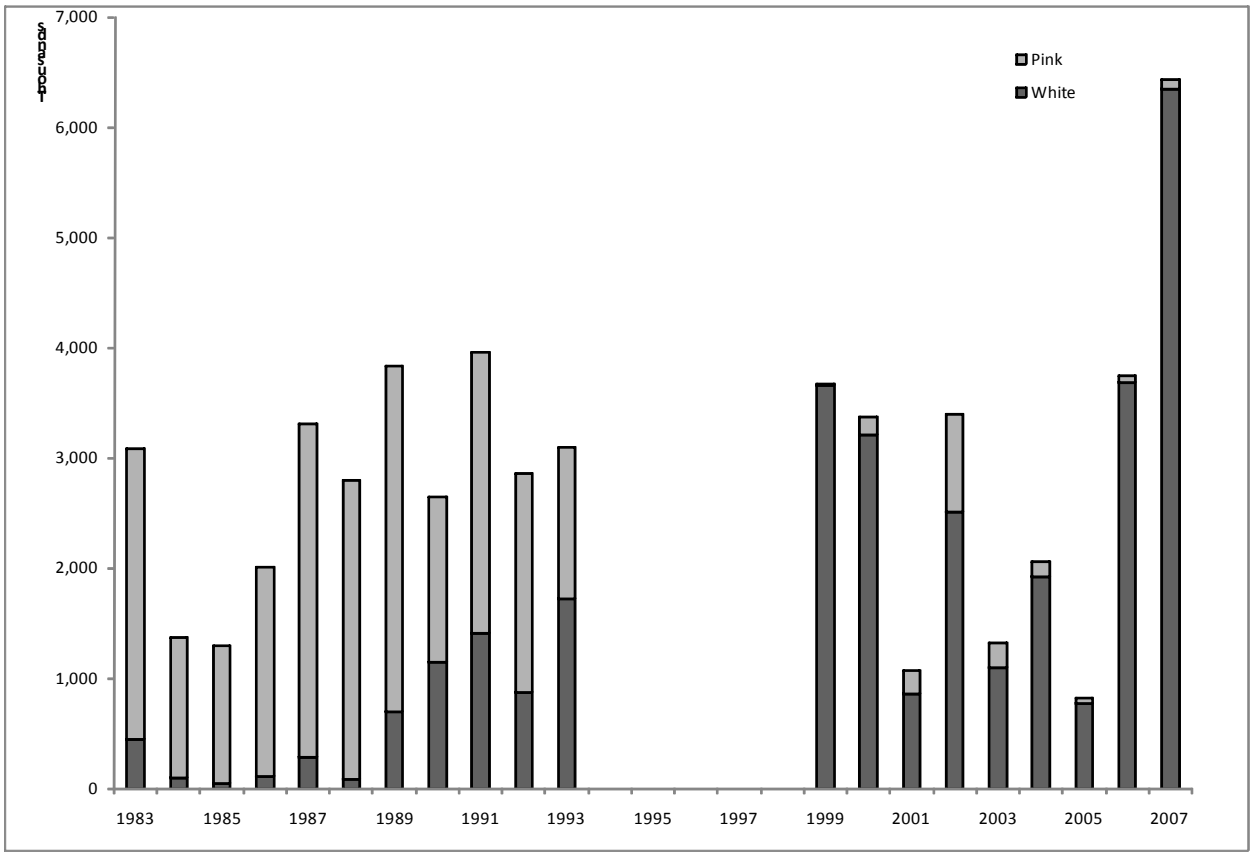

Figure 3. North Carolina white and pink shrimp annual landings (in thousands of pounds landed) for the period 1983-2007 (Source: NC Division of Marine Fisheries). NOTE: landings data are lacking for pink and white shrimp in 1996, 1997 and 1998 because shrimp species were not identified on trip tickets during those years and, and unfortunately, that is when the shift in dominance from pinks to whites seems to have occurred (R. Carpenter, NCDMF Personal Communication).

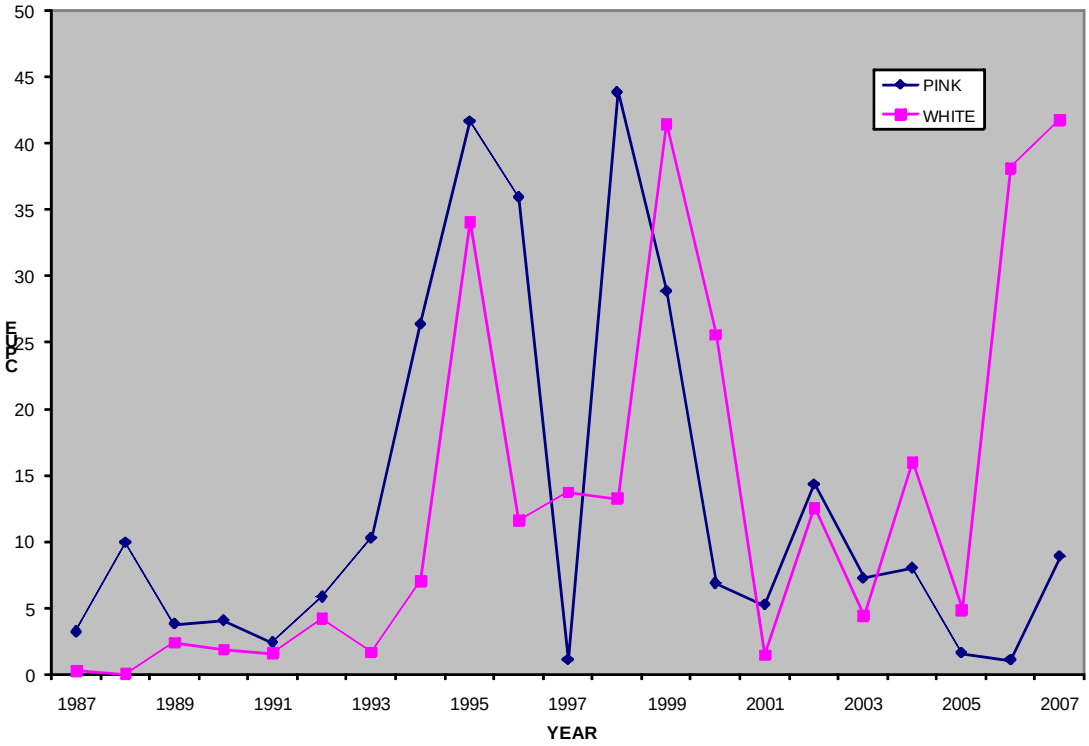

Figure 4. CPUE as indicated by the Pamlico Sound survey for pink and whites shrimp for the period 1987-2007. Catches from the September leg of the survey were used as that is when shrimp have recruited to the open water (Source: North Carolina Division of Marine Fisheries).

Landings of pink and white shrimp in areas of Florida do not show a similar trend to those from North Carolina. Landings for Florida counties north of Cape Canaveral since that constitutes the area where the two species overlap in distribution is shown in **Figure 5**. Where there is overlap in Florida white shrimp dominate the area and no switch in dominance has been observed from 1986 to the present. The lack of a relationship between the CPUE of the two species (note the r^2 close to zero) is shown in **Figure 6**.

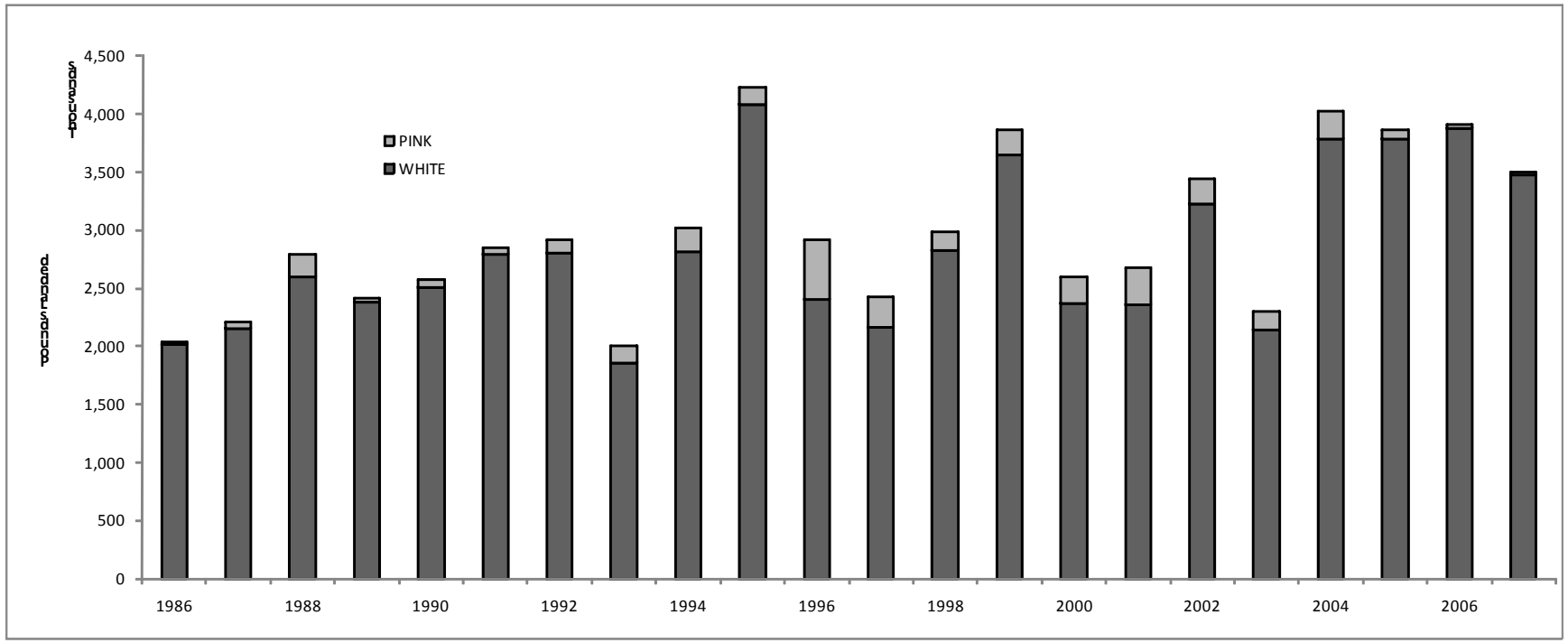

Figure 5. Pink and white Shrimp landed in Brevard, Duval, Flagler, Nassau, St. Johns, and Volusia Counties, FL (Source: FWC Division of Fisheries Management).

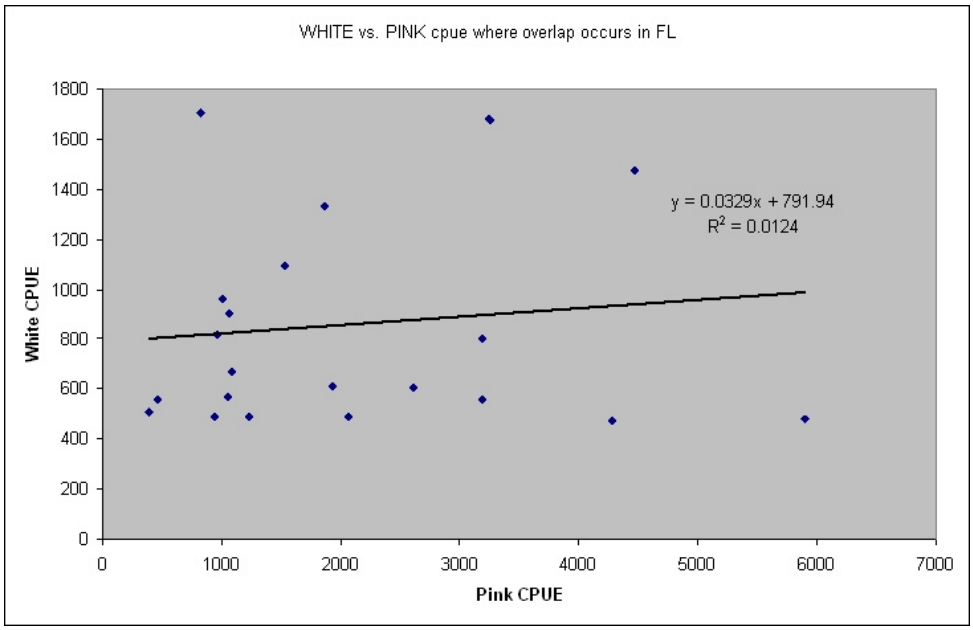

Figure 6. Relationship between white and pink shrimp CPUE in areas of Florida where their distribution overlaps (north of Cape Canaveral).

The NMFS Southeast Fisheries Science Center has been successful in predicting pink shrimp harvest in North Carolina based on overwintering temperatures for over two decades. However, the model used to make these predictions has returned significantly erroneous predictions over the past two years indicating that factors other than water temperature during the vulnerable overwintering period are determining spring pink shrimp harvests in North Carolina (D. Evans, Personal Communication). These factors could include decreased fishing effort resulting from low market prices and high fuel costs, poor recruitment following prior low temperature years, or increased competition with other shrimp species (NCCOS Weekly Report, 2007).

Recommendations

Based on the information presented above and current economic trends in South Atlantic fisheries, the Shrimp Review Panel again concluded that pink shrimp abundance in the region is not due to overfishing but rather to the cumulative effect of other factors. The Shrimp Review Panel, therefore, recommends that the Council take no management action at the present time.

References

NCCOS (National Centers for Coastal Ocean Science). 2007. Weekly Report, January 10. Available online at: http://www.safmc.net/Portals/6/Meetings/Council/BriefingBook/March%202007/NCCOS%20Weekly%20Report.pdf

SAFMC (South Atlantic Fishery Management Council). 2004. Amendment 6 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 256 p + appendices.

Rulifson, R. A. 1981. Substrate preferences of juvenile penaeid shrimps in estuarine habitats. Contributions in Marine Science 24: 35-52.

Williams, A. B. 1955. A contribution to the life histories of the commercial shrimps (Penaeidae) in North Carolina. Bulletin of Marine Science 5: 117-145