Blue Crab,
*Callinectes sapidus*
Rathbun, 1896

In the western Atlantic, Blue Crabs are distributed from Nova Scotia south to northern Argentina, including Bermuda and the Antilles. Blue Crabs are an important link in the food chain, feeding on fish, aquatic vegetation, mollusks, crustaceans, and annelids while they serve as prey to mammals, birds, and fishes. The high level of genetic patchiness and gene flow found among Blue Crabs inhabiting Gulf and Atlantic estuaries suggests that little population substructuring occurs; although, latitudinal clines in allele frequencies may be maintained by selective forces operating over broad geographic scales (McMillen-Jackson *et al.* 1994, McMillen-Jackson & Bert 2004).

Blue Crabs grow to adult size, 3.9 – 9.4" carapace width, after 18 to 20 molts (Van Engel 1958). In the St. Johns River, where some Blue Crabs survive to four years of age, adult size is reached after one year (Tagatz 1968). Blue Crab growth rates in the Gulf of Mexico can be modeled using the von Bertalanffy growth equation (Table 1). This continuous growth function does not literally describe the incremental growth of Blue Crabs, but since members of a cohort molt at different times, the average growth of a cohort becomes a smooth curve (Sparre *et al.* 1989). Smith (1997) and Rothschild and Ault (1992) modified the von Bertalanffy model to consider incremental growth, although Rugolo *et al.* (1997) concluded that the von Bertalanffy model adequately described Blue Crab widths at ages.

Female Blue Crabs mate once in their lifetimes during the period March–December following their terminal molt. Size at maturity varies between about 2.0" and 7.0" carapace width (Steele 1979). After mating in the upper reaches of estuaries, females move to the mouth of the estuary or nearshore coastal waters to spawn. On the Gulf coast of Florida, females leave the estuary and move northward toward the Florida Panhandle region before spawning (Steele 1991).

Table 1. von Bertalanffy growth parameters and length-weight relations for Florida Blue Crab

<table>
<thead>
<tr>
<th>Source</th>
<th>( CW_1 = CW_\infty (1 - e^{-Kt_0}) )</th>
<th>( K )</th>
<th>( CW_\infty ) (mm)</th>
<th>( t_0 ) (years)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gulf Coast, Florida</td>
<td>2.1582</td>
<td>166.05</td>
<td>0.1740</td>
<td>Cooper et al. (2013)</td>
<td></td>
</tr>
</tbody>
</table>

Weight in g = \( a \cdot (CW)^b \)

<table>
<thead>
<tr>
<th>Source</th>
<th>( a )</th>
<th>( b )</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both Sexes, Gulf Coast, Florida</td>
<td>0.00856</td>
<td>1.994</td>
<td>Cooper et al. (2013)</td>
</tr>
<tr>
<td>Male, Gulf Coast, Florida</td>
<td>0.00214</td>
<td>2.289</td>
<td>Cooper et al. (2013)</td>
</tr>
<tr>
<td>Female, Gulf Coast, Florida</td>
<td>0.00786</td>
<td>1.981</td>
<td>Cooper et al. (2013)</td>
</tr>
</tbody>
</table>

Reported commercial landings of Blue Crab were 5,581,870 pounds during the calendar year 2016. Landings were greater on the Gulf coast with about 66% of the statewide landings made. More than 1,000 pounds of Blue Crab were landed in every coastal county of Florida during 2016 (Fig. 1). The 2015 total landings were 28% lower than the average landings in the previous five years (2011–2015) and were 53% lower than the 1982–2015 historical average landings (Fig. 2). There are no precise estimates of the size of the recreational fishery, but it may be substantial (Steele unpublished ms).

On the Atlantic coast, landings have been primarily cyclic with small fluctuations ranging from approximately 150-250 pounds per trip. Notable highs were in 1992, 1996, 1999, 2000, 2004, and 2011 with lowest rates in 1995, 2003, 2009, and 2014 (Fig. 3a). Landings rate ranging...

from approximately 150-300 pounds per trip on the Gulf coast have been historically cyclic, with lows in 1994, 1997, 2001, and 2008 and highs in 1996, 1998, 2006, and 2011 (Fig. 3b).

Indices of abundance for young-of-the-year (YOY) Blue Crab followed a cyclical pattern on both coasts, with peaks in 1998, 2005, 2011, 2012, and 2016 on the Atlantic coast and in 1998, 2004, 2007, and 2011 on the Gulf coast (Figs. 4a and 4b). However, both coasts show long term decreasing trends. Abundance of post-YOY Blue Crab on the Atlantic coast varied followed similar patterns as observed in the YOY index with highs in 1998, 2000, and 2005 (Fig. 4c). The post-YOY abundance index on the Gulf coast followed similar patterns as the YOY index with highs in 1998, 2006, and 2010 (Fig. 4d). Post-YOY abundance on both coasts are at or near historic lows in recent years. On the Atlantic coast, the incidence of Blue Crabs captured during monitoring trips with gross external abnormalities was extremely low, with the exception of 2011 (Fig. 5a). On the Gulf coast, the incidence of individuals with gross external abnormalities was high in 2001, and showed an increasing trend from 2004-2008 before dropping precipitously through 2012 (Fig. 5b). Only a small number of Blue Crab on the Gulf coast in 2016 were found dead prior to collecting by independent monitoring activities (Fig. 5d).

The Gulf States Marine Fisheries Commission developed a fishery management plan for Blue Crab (Steele and Perry 1990) and updated it in 1999 (Guillory et al. 2001). In the most recent plan recommended management actions included: minimum outside wall mesh sizes of 1.5” (corner to corner) hexagonal or 1.75” square mesh for hard crab traps, a 5” minimum size limit (except peeler crabs held for shedding), prohibition of the sale of egg-bearing females, a trap identification system, and the use of 2.375” escape rings. Guillory et al. (2001) concluded that there was no evidence of a decline in Blue Crab abundance in Florida; it was believed that the average historical landings might be a better estimate of maximum sustainable yield than that estimated by a simple surplus-production model. None of the “stock stress” indicators were detected using Florida data where, excluding 1998 data, no increase in total mortality and no decrease in relative abundance, mean carapace width or landings were observed. Population models provide evidence that Blue Crab in Chesapeake Bay were growth overfished (Tang 1983, Rugolo et al. 1997). While Blue Crab abundance was at average long-term levels in the Chesapeake, the expended effort needed to make the current landings there is too high, resulting in a less economically viable fishery (Rugolo et al. 1997).

Murphy et al. (2007) developed a stock assessment for Blue Crabs in Florida during 2002-2005. A catch survey analysis and a stochastic stock reduction analysis showed that the stocks on both coasts were most likely not being overfished during 2002-2005. However, a biomass dynamic model indicated that the fishery had been overfishing the stock on both coasts since the mid 1960’s or early 1970’s with respect to F_MSY. Cooper et al. (2013) developed a stock assessment for Blue Crabs in Florida through 2011. All three assessment models that were developed indicated that fishing mortality rates have trended downwards on both coasts since the mid- to late 1990’s, which follows the general trend in the number of traps fished over this time period. The general conclusions from the three analyses suggest that neither Florida coast is currently overfished nor undergoing overfishing. The primary assessment model estimated an MSY of 31.9 and 12.0 million crabs for the Gulf and Atlantic coasts, respectively. Although there were troubling gaps in Blue Crab life history and fishery information, a common feature of all the assessments was the finding that Blue Crabs in Florida appeared to be very resilient to high fishing rates and freshwater inflow can have a strong influence on their population dynamics, leading to large fluctuations in year-to-year abundance.
Figure 1. Geographic distribution of Blue Crab commercial landings by county during 2016.

Figure 2. Total annual landings (pounds) of Blue Crab on the Atlantic and Gulf coasts of Florida, 1982–2016.
a. Atlantic coast, commercial landings rates (pounds/trip)

b. Gulf coast, commercial landings rates (pounds/trip)

Figure 3 (a)-(b). Annual standardized catch rates for Blue Crabs in Florida. Commercial landings rates (pounds/trip), 1992-2016: (a) Atlantic Coast; (b) Gulf Coast
Figure 4(a)-(d). Proportion of fishery-independent-monitoring sets that captured Blue Crab from 1997-2016. Young-of-the-year (YOY): (a) Atlantic coast; (b) Gulf coast. Post-YOY: (c) Atlantic Coast; (d) Gulf coast.
a. Atlantic coast proportion to total collected

b. Gulf coast proportion to total collected

c. Atlantic coast percentage of abnormality types

d. Gulf coast percentage of abnormality types

No data available

Figure 5(a)-(d). Gross external abnormalities of Blue Crab ≥ 75mm SL collected in fishery-independent-monitoring sets, 1999-2016. Breakdown of gross external abnormalities by coast: (a) Atlantic coast; (b) Gulf coast. Percentage of abnormalities in 2016 by type: (c) Atlantic Coast; (d) Gulf coast.