Status and Trends Report: 2012 Penaeid Shrimp Species Account

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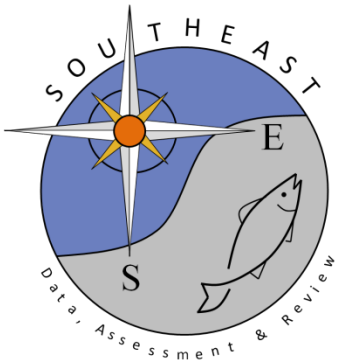
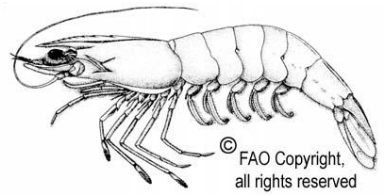


Status and Trends Report: 2012 Penaeid Shrimps Species Account

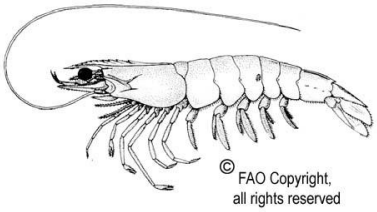
Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
100 Eighth Avenue Southeast
St. Petersburg, Florida 33701-5020

In-House Report IHR2012-057

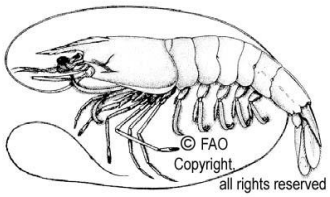
Penaeid shrimps



Brown shrimp,
Farfantepenaeus aztecus
(Ives, 1891)



Pink shrimp,
Farfantepenaeus duorarum
(Burkenroad, 1939)



White shrimp,
Litopenaeus setiferus
(Linnaeus, 1767)

Three commercially important species of penaeoid shrimp occur on both coasts of Florida. The distribution of white shrimp, *Litopenaeus setiferus*, and brown shrimp, *Farfantepenaeus aztecus*, is intermittent in Florida waters. White shrimp do not occur from about St. Lucie Inlet on the Atlantic coast around the southern tip of Florida north to about the mouth of the Ochlockonee River. Brown shrimp do not occur on the gulf coast between Sanibel Island and Apalachicola Bay. All three shrimp species occur in nearshore waters and estuaries and use the estuaries as nursery areas. At various juvenile stages, penaeoid shrimp usually inhabit seagrass beds and algal mats within estuaries. Stable isotope studies show young pink shrimp that recruited to the southeastern Gulf of Mexico offshore fisheries are mostly migrants from seagrass meadows (Fry *et al.* 1999). Adult pink shrimp, *F. duorarum*, are most abundant at depths between 35' and 120'. White shrimp are most abundant in waters shallower than 90', and brown shrimp are most abundant in waters less than 180'. White shrimp are typically distributed in areas of low salinity over organic-rich, mud bottoms. Brown shrimp are found on similar bottoms but in higher salinities. Pink shrimp occur on more coarse sediments and in a wide variety of salinities (Steele unpublished ms.). White shrimp grow rapidly until about 6.3 inches total length (TL). Peak growth rates are 0.8 inches/month during summer. Brown shrimp can grow at peak rates of 1.8 inches/month during spring; pink shrimp peak growth rates have been reported to exceed 2.0 inches/month.

All three species mature during their first year. Sizes at maturity are about 5.5 inches TL for white and brown shrimp and about 3.3 inches TL for pink shrimp. Spawning occurs in relatively deep water for brown shrimp (49'–360') and pink shrimp (13'–160'), and in nearshore waters (20'–80') for white shrimp. White shrimp spawn during April–October. Pink and brown shrimp can spawn year-round, especially in deeper or more southern waters. Peak spawning occurs during February and March for brown shrimp and during spring, summer, and fall for pink shrimp.

Reported commercial penaeid shrimp landings totaled 16,102,635 pounds in Florida during 2011. Around half of the landings (52%) were made on the Atlantic coast. The geographic distribution of landings for each species was different. The greatest landings of brown shrimp were reported in the Florida Panhandle region and in Lee and Citrus Counties on the gulf coast, and in Nassau, Duval, St. Johns, and Brevard Counties on the Atlantic coast (Fig. 1a). Pink shrimp were landed mostly in Lee, Hillsborough, Monroe, Dade, Pinellas, Pasco, Gulf, and Franklin Counties (Fig. 1b). White shrimp were landed mostly in Nassau, Duval, St. Johns, Volusia, Brevard, and Dade Counties on the Atlantic Coast, and Franklin, Gulf, and Wakulla

Counties in the panhandle region of the Gulf (Fig. 1c) in areas adjacent to extensive saltwater marshes and high freshwater run-off. The 2011 total landings of penaeid shrimp were 15% higher than the average landings in the previous five years (2006–2010) and were 16% lower than the 1986–2011 historical average landings (Fig. 2). Commercial landings of penaeid shrimp increased on the Atlantic coast from a low of about 2.5 million pounds in 1984 to a peak of about 8 million pounds in 2011 (Fig. 2). Gulf coast landings increased dramatically, from about 10.6 million pounds in 1992 to 24.6 million pounds in 1996, and then dropped to an average of 13.4 million pounds during the period 1999-2005, and declined to an average of around 8 million pounds from 2007-2011. Competition from foreign imports and increased fuel and operating costs contributed significantly to the declines in penaeid shrimp landings by commercial shrimpers over the last 13 years.

Standardized annual landings rates for all three species generally increased or held steady on both the Atlantic and gulf coasts from 1999-2006, but landings rates have declined on the gulf coast during 2007 for all three species and for pink shrimp on the Atlantic coast [Fig. 3(a)-(f)]. Brown shrimp landings rates have fluctuated with an increasing trend on both coasts from 1992-2011 [Fig. 3(a)-(b)]. Landings rates for pink shrimp fluctuated on both coasts, but peaked in the mid 1990s, declined then until 2000 and exhibited an increasing trend during 2003-2006, and have declined back to 2005 levels [Fig 3 (c)-(d)]. White shrimp landings rates on the Atlantic coast fluctuated without a trend until 2003, and have since increased [Fig. 3(e)]. On the gulf coast, white shrimp catch rates increased from 1992 to 1997, declined between 1999 and 2001 increased significantly during 2003-2006, and declined significantly in 2007 [Fig. 3(f)].

The index of relative abundance of young-of-the-year (YOY) pink shrimp fluctuated without trend on the Atlantic coast from 1997 through 2004 after which abundances declined through 2010 (Fig. 4a). Recruitment of gulf coast YOY pink shrimp shows a discrete declining trend since from 2000 to 2005, followed by a rebounding increasing trend through 2011 (Fig. 4b).

An assessment of the condition of U.S. gulf and South Atlantic penaeid shrimp stocks suggests that they are all harvested at or slightly in excess of the fishing mortality rates associated with maximum yield-per-recruit (Steele unpubl. data). Increasing the size-at-entry to the fishery could increase the yield and value of the landings for all three shrimp species. Available data do not suggest a strong link between parent stock abundance and subsequent abundance of their progeny. Regardless, estimated spawning potential ratios were estimated to be 4%–12% for brown shrimp and 13%–39% for white shrimp during 1970–1987 (Nance *et al.* 1989).

Nance (1999) found that the parent stock levels for brown shrimp in the Gulf of Mexico were up in 1998 at over 300 million age-7^{+}-month-old shrimp for November through February, well above the 125 million overfishing threshold and the highest level since 1994. For white shrimp, the parent stock number had been highly variable since the mid 1980s and the number dropped slightly in 1998 to around 800-million individuals age-7^{+} months for May through August. However, this level is still well above the 330 million individuals overfishing threshold. Pink shrimp parent stock numbers were up in 1999 following a slight decline in 1998 to nearly 250-million age-5^{+} -month-old individuals for July through June and were well above the 100 million overfishing threshold.

The recent stock assessments of brown, pink, and white shrimp in the Gulf of Mexico incorporated a stock synthesis model that provided outputs for new overfished and overfishing

definitions for the fisheries. The stocks have been showing increasing tends in spawning biomass and recruitment and decreasing trends in fishing mortality. Both fisheries have no indication of overfishing or being in overfished states (Hart 2012a, Hart 2012b, Hart 2012c). Both regional federal councils, the South Atlantic Fishery Management Council and the Gulf of Mexico Fishery Management Council, have established fishery management plans for shrimp (GMFMC 1981; SAFMC 1993). The main objectives of these plans were to delay harvest of shrimps through season and area closures, reduce bycatch, and minimize gear conflicts. The SAMFC's shrimp fishery management plan was instituted to protect the white shrimp stock from over-harvest after severe winter cold-kills. This plan allows for the closure of the Exclusive Economic Zone after severe winter kills and requires permits as a first step toward possible limited entry.

a. Commercial landings of brown shrimp (pounds)

b. Commercial landings of pink shrimp (pounds)

c. Commercial landings of white shrimp (pounds)

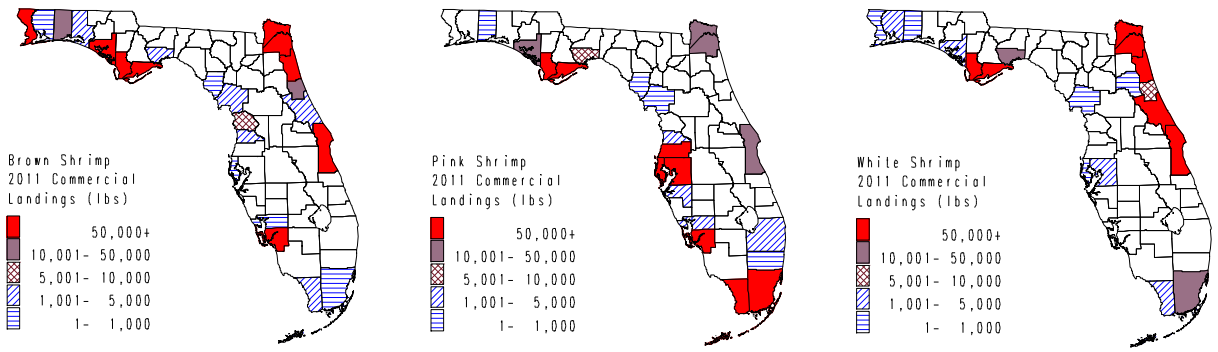


Figure 1 (a)-(c). Geographic distribution of penaeid shrimp landed commercially during 2011 by species and county.

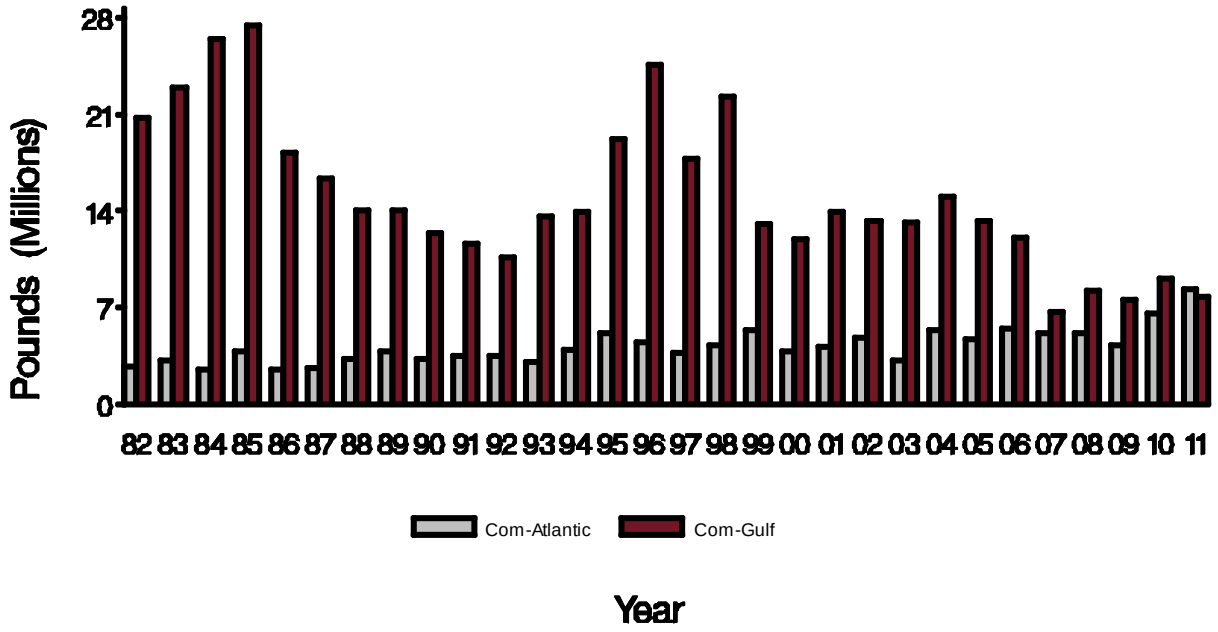
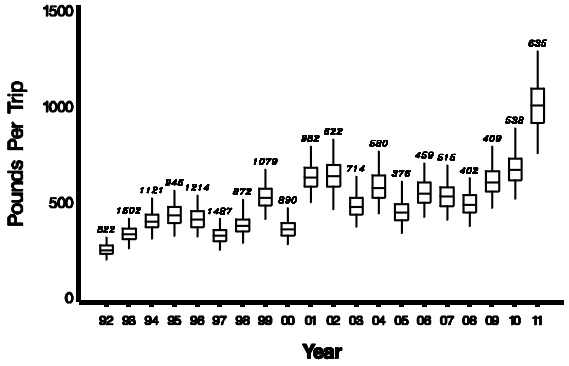
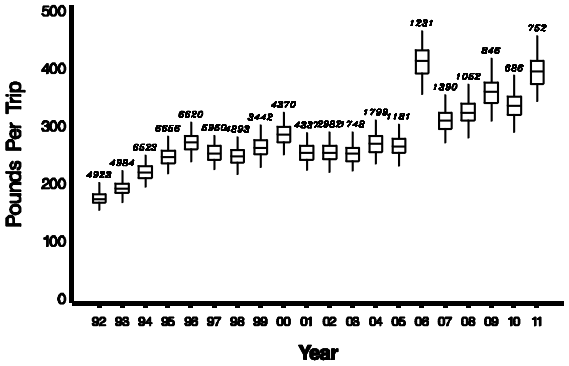


Figure 2. Total annual commercial landings (pounds) of penaeid shrimp on the Atlantic and gulf coasts of Florida, 1982–2011.

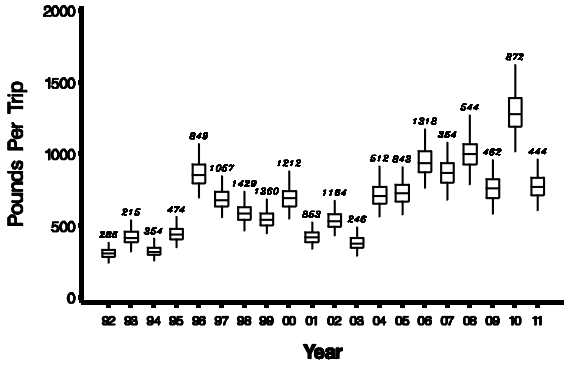
a. Atlantic Coast, commercial landings rates (pounds/trip) for brown shrimp



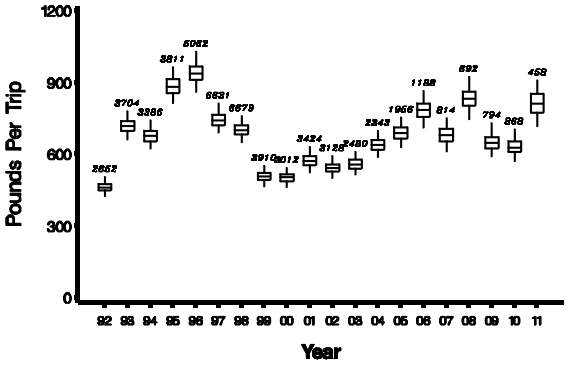
b. Gulf Coast, commercial landings rates (pounds/trip) for brown shrimp



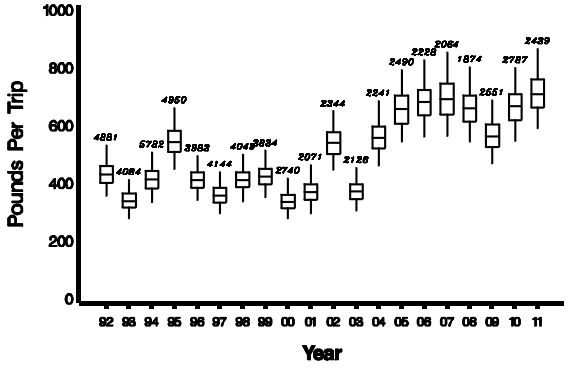
c. Atlantic Coast, commercial landings rates (pounds/trip) for pink shrimp



d. Gulf Coast, commercial landings rates (pounds/trip) for pink shrimp



e. Atlantic Coast, commercial landings rates (pounds/trip) for white shrimp



f. Gulf Coast, commercial landings rates (pounds/trip) for white shrimp

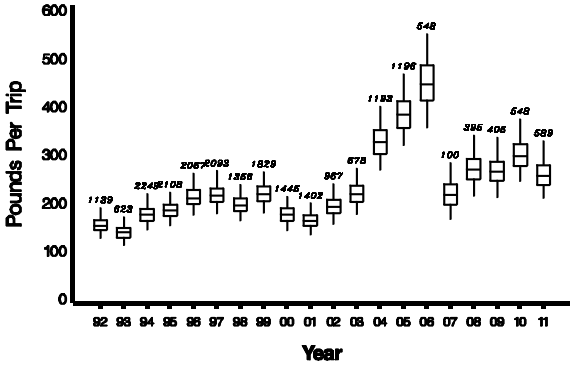
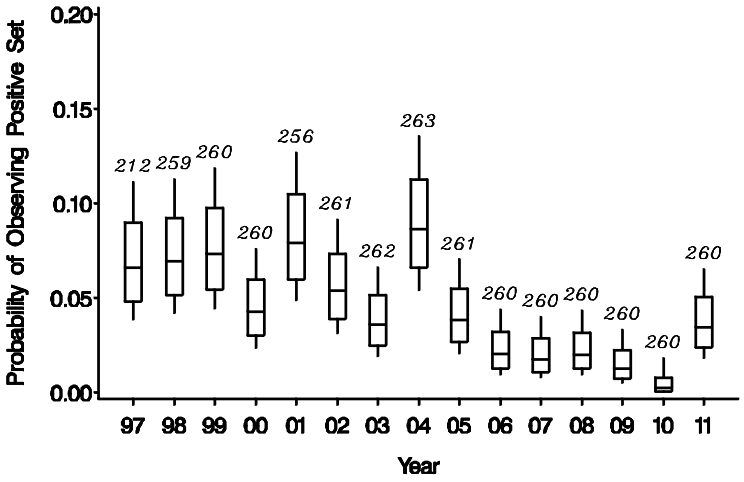


Figure 3 (a)-(f). Annual standardized catch rates for penaeid shrimp in Florida. Commercial landings rates (pounds/trip) 1992-2011: (a) Atlantic Coast brown shrimp; (b) Gulf Coast brown shrimp; (c) Atlantic Coast pink shrimp; (d) Gulf Coast pink shrimp; (e) Atlantic Coast white shrimp; (f) Gulf Coast white shrimp.

a. Atlantic coast YOY



b. Gulf coast YOY

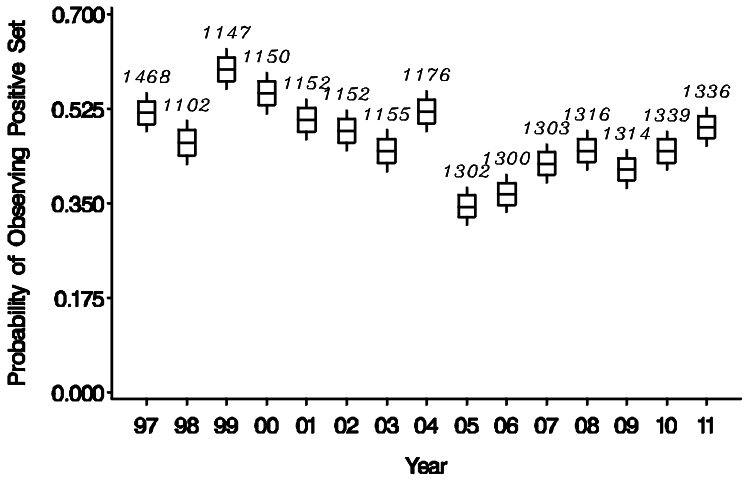


Figure 4(a)-(b). Proportion of fishery-independent-monitoring sets that captured pink shrimp from 1997-2011. Young-of-the-year (YOY): (a) Atlantic coast; (b) Gulf coast.