Brown, White and Pink Shrimp Life History Summaries

Jen Leo

SEDAR87-RD-11

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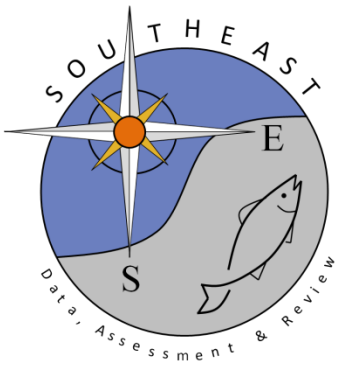
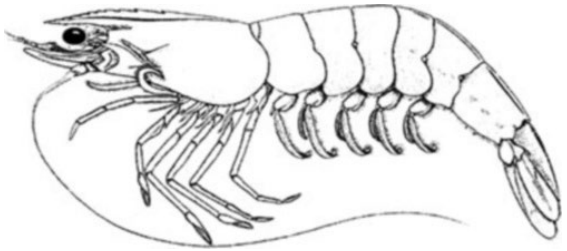


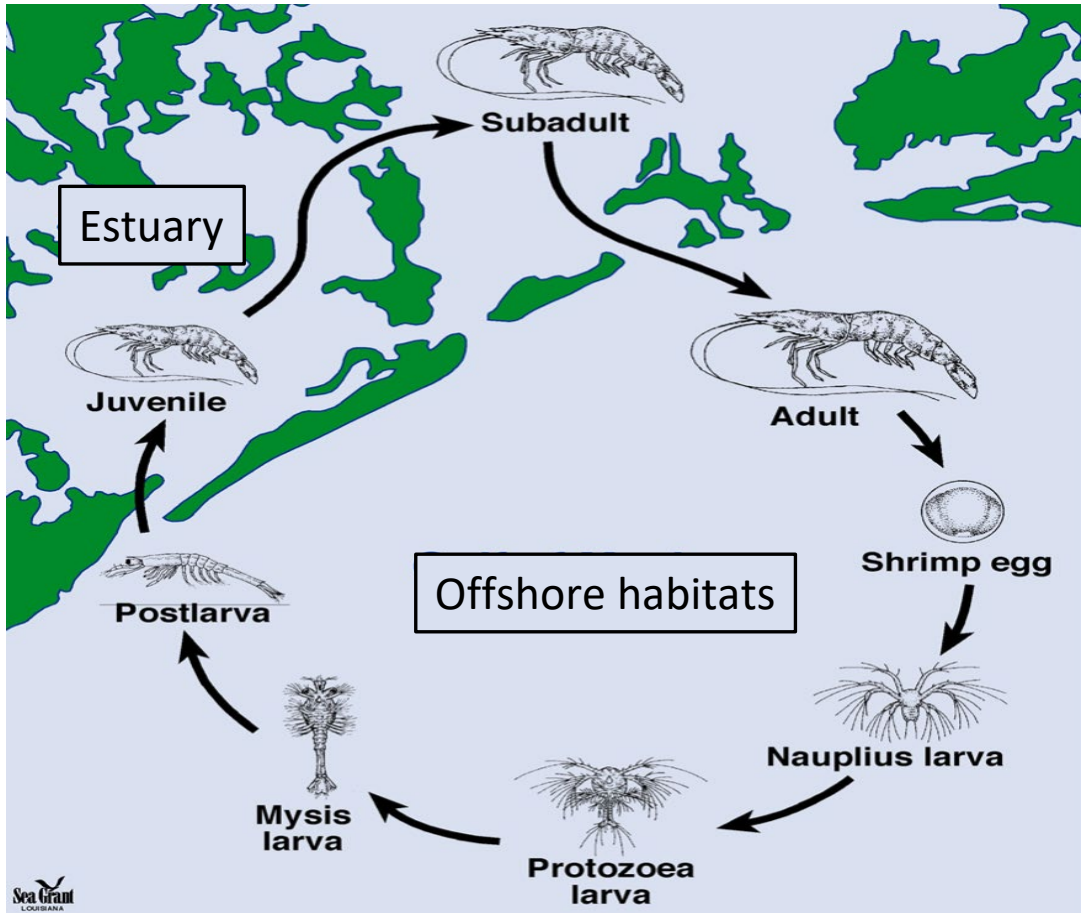
Brown, White and Pink Shrimp Life History Summaries

Jen Leo, SEFSC. 2020.

Brown shrimp
Farfantepenaeus aztecus



US Atlantic coast as far north as Massachusetts, throughout the Gulf and along the Atlantic coast of Mexico from Tamaulipas to Campeche. Depths of 4–160 m, with highest densities at 27–54 m, on muddy, peat, sandy or clay bottoms



Spawning

- Occurs offshore
- Occur at depths >18, peaks at depths of 27-46, spent adults as deep as 137m (Renfro and Brusher 1982)
- Likely year-round, peak Oct-Dec and Mar-May (Renfro and Brusher 1982: year round with peaks spring and fall) (Christmas and Etzold 1977: spring through fall)
- External fertilization, broadcast, semi-buoyant eggs

Eggs → Postlarvae

- Hatch within 14-24 hours
- Several larval stages
  - 5 naupliar (demersal)
  - 3 protozoeal (pelagic)
  - 3 mysis (pelagic)
  - Postlarva

≈ 10 – 25 days

≈ 40 days

Lassuy, 1983; Christmas and Etzold 1977; Klima et al. 1982; Temple and Fisher 1965

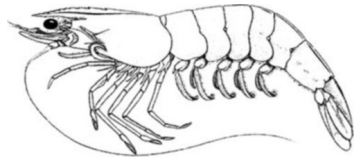
- PL's may occur all year and overwinter, burrowed offshore

Postlarva → Juvenile → Subadult

- At ≈ 10 mm TL, recruit to estuaries, settle in shallow vegetation (e.x. marsh grass, seagrass, mangrove)(Baxter and Renfro 1967; Cook and Lindner 1970)
- Two to three month residency, rapid growth (1-2 mm/day) (Rozas and Minello, 2009)
- At ≈ 70 mm TL move into open bays as subadults (Minello et al. 1989)
- At ≈ 90 – 110 mm TL begin offshore migration
- Freshwater may force them out at smaller TL
- Peak emigration May-Aug (Copeland 1965)
- Sexual maturity at ≈ 140 mm TL (Henley and Rauschuber 1981)
- Likely max age 2 years

Brown Shrimp Stock Assessment Configuration

Brown shrimp
Farfantepenaeus aztecus



Spawning

- 1 area model, so settlement is essentially in a “bath tub”
- Model starts January 1st
- Annual model (12 months) with six recruitment settlement events, occurring in months 2-8 (all months equally likely)
- Model assumes stock is split 50/50, males: females

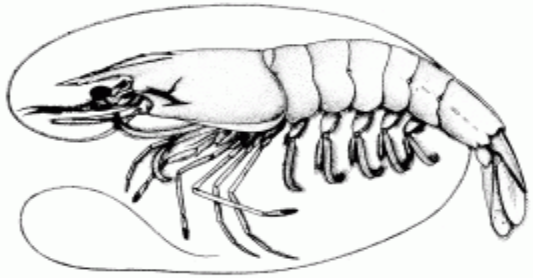
Eggs → Postlarvae (males and females)

- Min length = 30 mm (assumes 30 mm settlers by Feb)
- Max length set to Linf = 230 mm
- Inshore fishery peak selectivity = 70-80 mm (plateau)
- Offshore fishery peak selectivity = 110-160 mm (broad plateau)

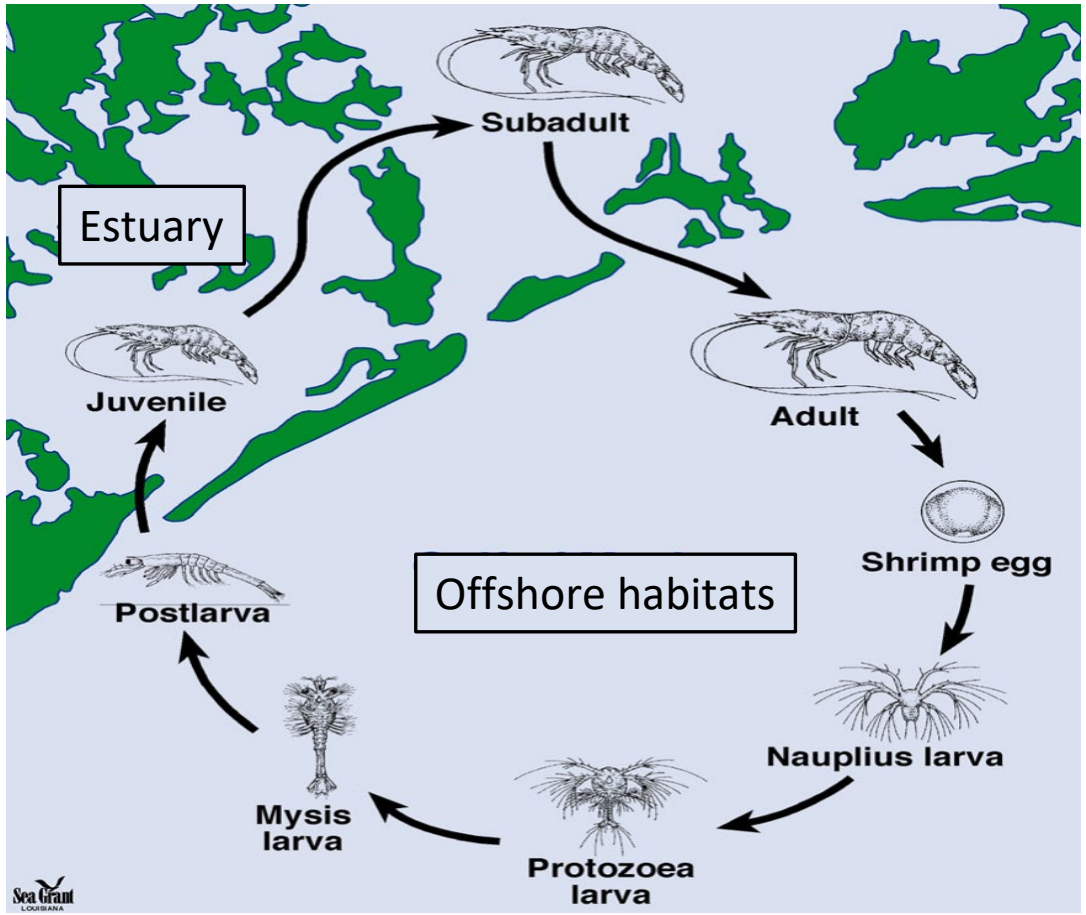
Postlarva → Juvenile → Subadult (males and females)

- Mature at age 0 years/months (may be better at ~ 0.25 years)
- Length at 50% sexually mature = 95 mm
- Length at 100% sexually mature = 110 mm (literature = 140 mm)
- By 12 months they’ve reached asymptotic spawning potential

White shrimp
Litopenaeus setiferus



US Atlantic coast as far north as New York, throughout the Gulf and along the Atlantic coast of Mexico from Tamaulipas to Campeche.
Depths of 8 – 55 m, with highest densities at 11 – 36 m, on mud, silt, sand bottoms



Spawning

- Occurs offshore Dall et al. 1990; Lindner and Cook 1970
- Between at least 8 – 55 m depth
- Mar – Oct, with a peak Jun – Jul Lindner and Anderson 1956; Weymouth et al. 1933; Temple and Fisher 1968
- External fertilization (spermatophore), broadcast, semi-buoyant eggs

Eggs → Postlarvae

- Hatch within 10 – 12 hours
- Several larval stages
  - 5 naupliar (demersal)
  - 3 protozoeal (pelagic)
  - 3 mysis (pelagic)

  ≈ 10 – 12 days (Dall et al. 1990; Lindner and Cook 1970)
  - Postlarva

  ≈ 18 days

Postlarva → Juvenile → Subadult

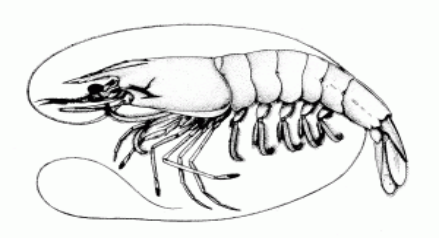
- At ≈ 10 mm TL, recruit to estuaries, settle in mud bottoms, shallow vegetation (less associated with veg, lower salinities) Zein-Eldin and Griffith 1969; Baker and Minello 2010
- Two to three month residency, rapid growth (1-2 mm/day) Rozas and Minello 2009, 2011
- At ≈ 100 – 120 mm TL begin offshore migration (Sep – Dec) Lindner and Cook 1970;
- Peak emigration from estuaries driven by cold water temps.

Adults

- Westward and deeper; April-May return to nearshore and inshore shelf waters
- Sexual maturity females ≈ 140 mm Lindner and Anderson 1956 TL, males ≈ 119 mm TL Burkenroad 1934
- Likely max age 2 year, 3 – 4 in lab

White Shrimp Stock Assessment Configuration

White shrimp
Litopenaeus setiferus



Spawning

- 1 area model, so settlement is essentially in a “bath tub”
- Model starts January 1st
- 1 recruitment settlement event per month (i.e., monthly model format); uses rec devs – putting most of the weight on the 3rd month (of a 12 month cycle)
- Model assumes stock is split 50/50, males: females

Eggs → Postlarvae

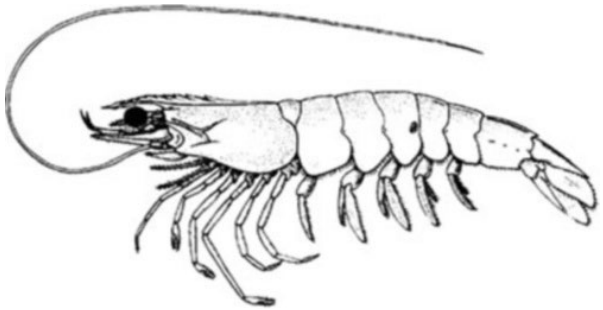
- Min length = 10 mm (settlement age)
- Max length set to Linf = 224 mm
- Combined fishery mean selectivity = 100 mm

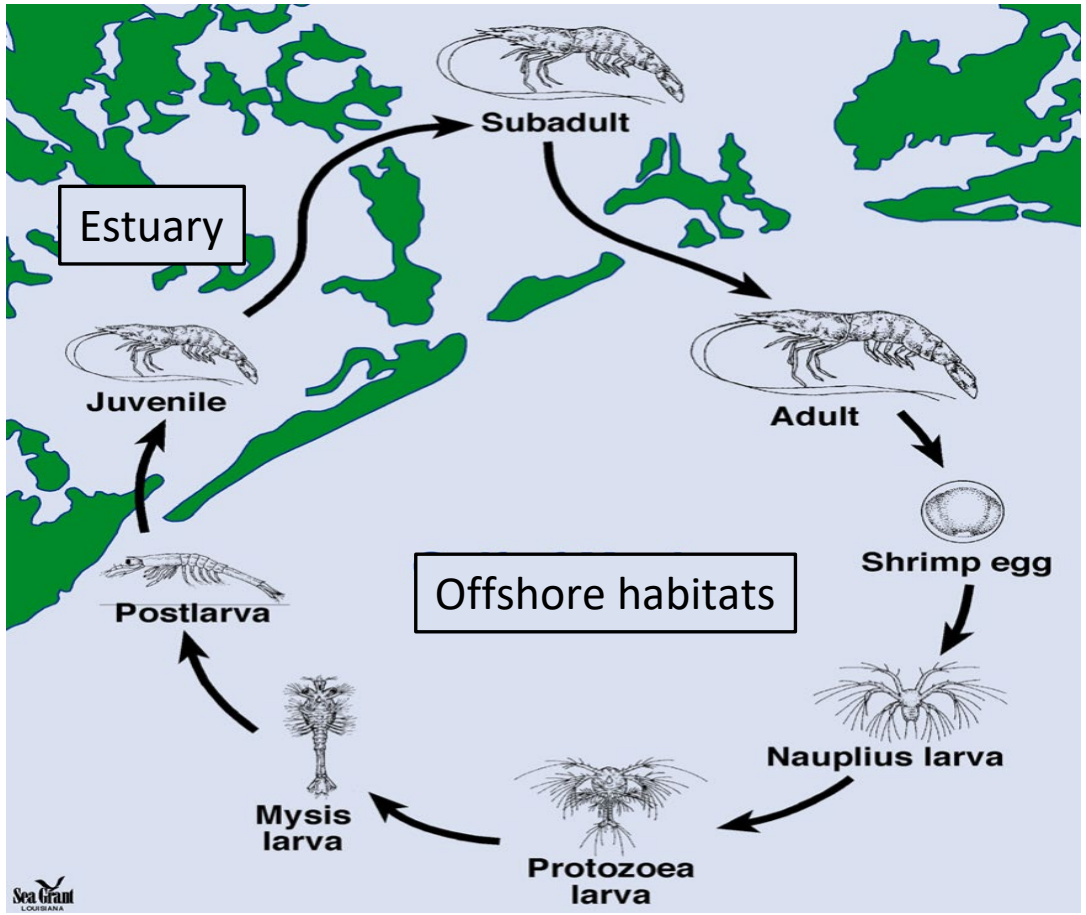
Postlarva → Juvenile → Subadult

- Mature at age 1 (because monthly format – so at 1 month)
- Length at 50% mature = 130 mm (recall brown was 95 mm)
- Length at 100% mature = 150 mm (literature = 140 mm; males 120 mm)
- By 20 months they’ve reached asymptotic spawning potential

Pink shrimp

Farfantepenaeus durorarum





Spawning

- Occurs offshore Costello et al 1986
- Occur at depths 3.7 – 47.5 m, spent adults as deep as 137m
- Temperature dependent (19.6 – 30.6 ^{o}C), year-round in Dry Tortugas, northern latitudes Apr – Sep,
- External fertilization, demersal eggs, likely spawn more than once

Eggs → Postlarvae

- Hatch within 12 – 16 hours Cook and Murphy 1969
- Several larval stages Ewald 1965
  - 5 naupliar (demersal)
  - 3 protozoeal (pelagic, diel vertical migration)) ≈ 14 days
  - 3 mysis (pelagic, diel vertical migration)
  - Postlarva ≈ 40 days

Postlarva → Juvenile → Subadult

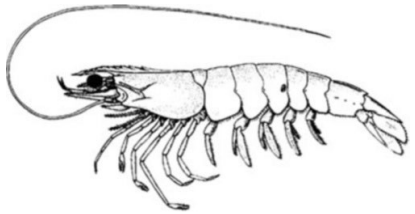
- At ≈ 6 – 12 mm TL, Jun – Oct recruit to estuaries, settle in seagrass Costello et al 1986
- Two to six months residency, growth 0.5 – 1 mm/day Costello and Allan 1970
- At ≈ 100 mm TL Joyce 1965;Hughes 1969 early recruits begin offshore migration in Fall, later recruits overwinter and move offshore in Spring

Adults

- Found on calcareous mud and sand, shell-sand mixture
- Highest densities at depths of 11 – 36 m
- Sexual maturity at ≈ 6 – 8 months females at 85mm, males at 74mm Eldred et al. 1961
- Likely max age 16 – 20 months

Stock Assessment Configuration

Pink shrimp
Farfantepenaeus durorarum



Spawning

- 1 area model, so settlement is essentially in a “bath tub”
- Model starts in “biological year” = July 1st
- 1 recruitment settlement event per month (i.e., monthly model format); uses rec devs – putting more of the weight on the 10th month (of a 12 month cycle)
- Model assumes stock is split 50/50, males: females

Eggs Postlarvae

- Min length = 10 mm (settlement age)
- Max length set to Linf = 182 mm
- Combined fishery mean selectivity = 100-110 mm (plateau)

Postlarva Juvenile Subadult

- Mature at age 1 (because monthly format – so at 1 month)
- Length at 50% mature = 95 mm (recall brown was 95 mm; but white is 130 mm)
- Length at 100% mature = 100 mm (or 4 months; recall literature says 6-8 mons)
- By 20 months they’ve reached asymptotic spawning potential