Summary table of brown shrimp (*Penaeus aztecus*) life history information for the Gulf of Mexico. Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Selection	Growth	Mortality	Production
Non-spawning adults (females > 140 mm TL)	Most abundant in summer and fall	Offshore-over shelf; concentrated off TX, LA, and MS	Survival is good between 10–37 C in ponds; natural variability in temperature is less	Survival is good between 2–35 ppt in ponds; natural variability in salinity is less	Less than 2 ppm causes stress	From about 14 m to 110 m	Omnivorous; feed at night	Few trawl-caught fish appear to eat brown shrimp, major predators may be larger fish	Select soft bottom sediments such as mud and sand; correlation between turbidity and shrimp abundance			Trophic models developed for bycatch management indicate that reducing discards from the fishery can affect shrimp productivity.
Citations:	1	1, 3, 13, 26, 104	2	2	2	1, 3, 12	1	4, 38, 39, 40	1, 13, 24, 101			39, 111, 112, 113
Spawning adults	Mainly fall and spring but throughout the year in water deeper than 64 m	Offshore-over shelf				Spawning occurs in water deeper than 18 m, generally between 46-91 m; in water 64-110 m, spawning appears continuous throughout the year	Omnivorous; feed at night	Few trawl-caught fish appear to eat brown shrimp, major predators may be larger fish				
Citations:	5, 12, 13	12				5, 12, 13, 24	1	4, 38, 39, 40				
Fertilized eggs (0.26 mm diameter)	Mainly fall and spring; assumed similar to spawning adults above	Offshore-over shelf	Eggs do not hatch below 24 C			Distribution assumed similar to spawning adults above; eggs are demersal and hatch within 24 hrs after spawning						
Citations:	5, 12, 13	12	1, 13			1, 5, 12, 13, 24						
Larvae and pre-settlement postlarvae; developmental stages include 5 nauplier, 3 protozoel, 3 mysis, and postlarval (< 14 mm) stage	Present offshore year-around; most abundant in fall through spring. Peak recruitment of postlarvae into estuaries occurs in spring; minor peak in fall.	Offshore-over shelf and in passes to estuaries	Optimal temperature for larval development between 28–30 C	Larvae tolerate 24-36 ppt; postlarvae have broader tolerance range		Collected from shore out to 82 m	Phytoplankton and zooplankton; feeding begins at first protozoel stage	Fish and perhaps some zooplankton	Postlarvae migrate through passes mainly from Feb-April with minor peak in fall; recruitment through passes appears to occur on flood tides at night			
Citations:	1, 13, 24, 25, 84, 109	1, 25, 93	13, 24, 63	13		25	5, 24, 63		13, 24, 84, 90, 91, 93, 109			

Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships: Food	Trophic relationships: Predators	Habitat Associations and Interactions: Selection	Habitat Associations and Interactions: Growth	Habitat Associations and Interactions: Mortality	Habitat Associations and Interactions: Production
Late postlarvae and juveniles (after settlement; 14-80 mm)	Present spring through fall; most abundant in spring and early summer	Found in estuaries; concentrated in TX, LA, and MS	Survival is good between 7–35 C, this temperature tolerance decreases at low salinities; growth increases up to about 30 C; postlarvae burrow at low temperatures; catastrophic kills have occurred after cold fronts in shallow water	Collected over wide range (0–70 ppt); good growth at 2-40 ppt	Juveniles avoid 1.5 and 2.0 ppm water; not lethal until below 1.0 ppm	Generally occur in shallow water habitats (< 1 m)	Benthic algae, polychaete worms, and peracarid crustaceans; detritus is common in guts, but detrital diets provide little growth	Fishes; especially southern flounder, spotted seatrout, red drum, and inshore lizardfish; secondary predators include Atlantic croaker, pinfish, and sea catfish	Densities highest in marsh edge habitat and submerged aquatic vegetation followed by tidal creeks, inner marsh, shallow open water, and oyster reef; on nonveg bottom, muddy substrates selected; on a larger scale, abundances are highest in turbid estuaries	Growth rates shown to be higher in salt marsh than on nonvegetated bottom; assimilation and growth higher on animal diet than plant diet; growth positively related to temperature up to about 30 C	Predation is major cause of mortality; habitat characteristics that reduce mortality include vegetative structure and an appropriate substrate for burrowing; turbidity also affects predation in a species-specific manner	Coastal wetland area, the amount of marsh edge, and elevation of the marsh surface appear related to production; mechanistic production models have identified the importance of temp, sal, tidal flooding, vegetation, and predators.
Citations:	18, 33, 42, 44, 45, 54, 56, 58, 110	3	2, 6, 10, 11, 13, 24, 34, 47, 86	1, 2, 6, 13, 24, 47, 82, 83	2, 34 ,85, 96-98	33, 44, 57, 64	9, 14, 15, 16, 21, 22, 27, 95	34, 37, 65-81	8, 9, 13, 18, 23, 24, 28, 29, 30, 33, 41-46, 50, 54-61, 64, 77, 110	2, 13, 21, 22, 33, 82, 83, 94	32-37, 106	7, 17, 19, 20, 31, 34, 48, 49, 51, 54, 92, 105, 108
Sub-adults	Present spring through fall; most abundant in late spring and early summer	Found in open water of bays and nearshore over shelf; concentrated in TX, LA, and MS	Cold fronts with air temperatures between 18-22 C have been documented to cause mass mortality	Abundant from 0.9 to 30.8 ppt; salinity has little effect on distribution	Large juveniles avoid 1.5 and 2.0 ppm water; not lethal until below 1.0 ppm in lab; persistent hypoxia (<2 ppm) in summer has caused mass mortality; oxygen requirement increases with temperature	Generally greater than 1 m and out to 18 m on the shelf	Polychaetes, amphipods, and other benthic infauna; some evidence for scavenging	Fishes are predators in estuaries; especially southern flounder, spotted seatrout, red drum, and inshore lizardfish; secondary predators include Atlantic croaker, pinfish, and sea catfish; predation appears lower after leaving estuary	Select sandy mud substrate over sand and shell; migration from estuaries occurs at night, on full and new moon, and ebb tide, may also be stimulated by freshwater flows; abundance offshore correlated positively with turbidity and negatively with hypoxia			Correlations between abundance of subadults and landings offshore suggest that annual production is fixed by this life stage. Impoundments of estuarine areas have been shown to reduce production.
Citations:	13, 52, 62, 107	3	10	107	2, 34, 87, 88, 89, 96-98, 102	24	27, 95	4, 34, 37-40, 65-81	1, 8, 9, 13, 41, 52, 98, 101, 103			26, 34, 53, 99, 100, 109

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