

**Species Composition of the
1994 Commercial Bay-Shrimp
Winter Open Season in Texas**

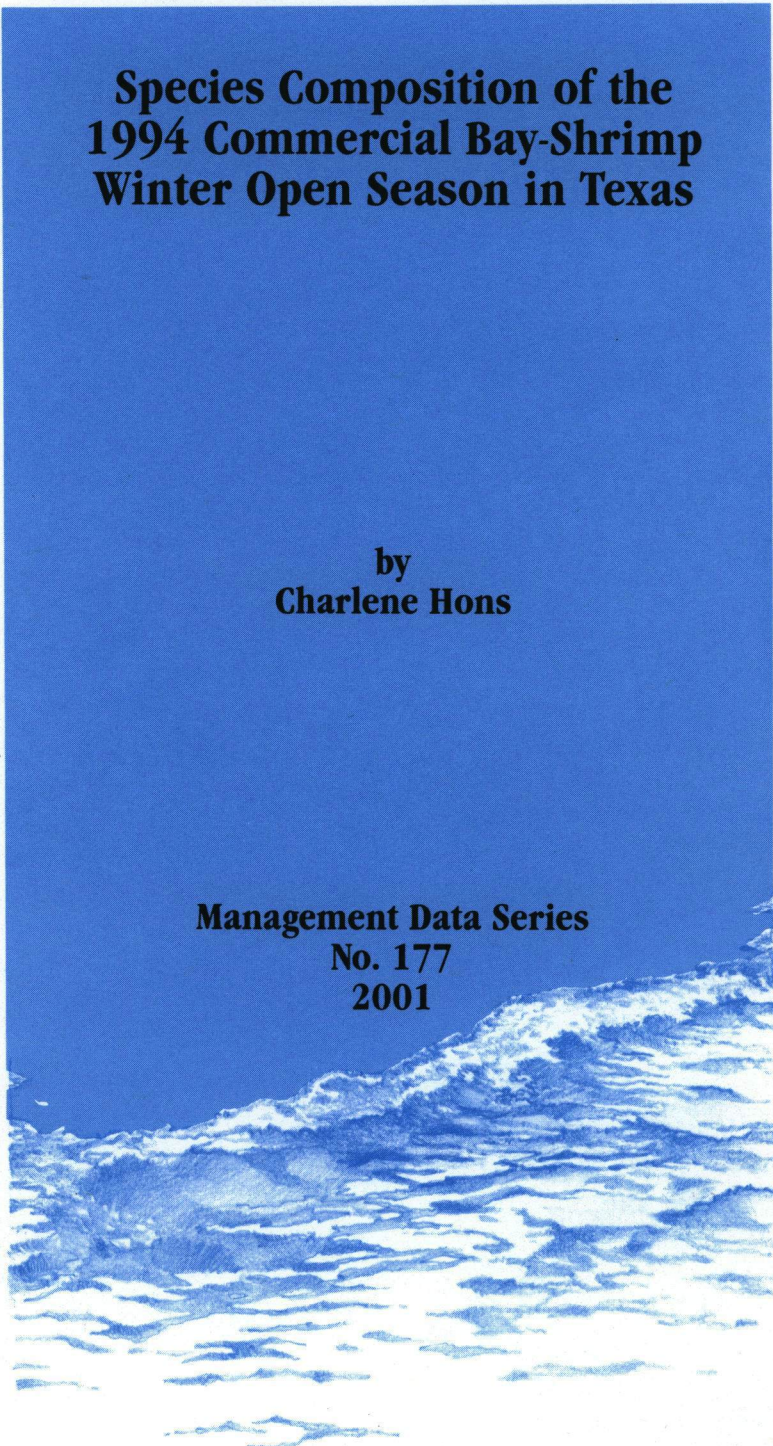
**by
Charlene Hons**

**Management Data Series
No. 177
2001**



COASTAL FISHERIES DIVISION

4200 Smith School Road
Austin, Texas 78744



SPECIES COMPOSITION OF THE 1994 COMMERCIAL
BAY-SHRIMP WINTER OPEN SEASON IN TEXAS

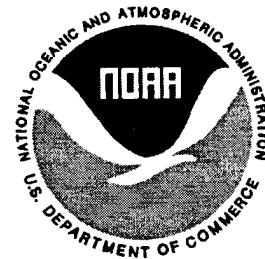
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ACKNOWLEDGEMENTS

I would like to thank the personnel from the Matagorda Bay, San Antonio Bay, Aransas Bay and Corpus Christi Bay ecosystems who collected data for this study. This special study was designed by biologists from the participating ecosystems with the help of Larry McEachron, Page Campbell and Billy Fuls. Thanks also to local area Game Wardens who participated in some roves, Paul Choucair for designing the rove and data sheets, Norman Boyd and Larry McEachron for their reviews.

ABSTRACT

In April 1990, the Texas Parks and Wildlife Commission approved a proposal to create a Winter Open Season to harvest pink shrimp (*Farfantepenaeus duorarum*) at night south of the Colorado River. Concerns about harvesting juvenile brown shrimp (*Farfantepenaeus aztecus*), during this night-time pink shrimp fishery (1 February-15 April 1994) prompted a study to determine the extent of brown shrimp in the landings. Pink shrimp comprised 80% of the shrimp landed by number with greatest landings occurring during 15 March through 15 April. Management objectives of providing harvest opportunity while minimizing impacts on brown shrimp are being met based on information collected during the present study.

INTRODUCTION

Prior to 14 May 1990, commercial harvest of shrimp at night in Texas inshore waters (bays) occurred only with a bait license from 16 December to 14 August of the following year, except in the Laguna Madre where shrimp were taken at night during any time of the year. In April 1990, the Texas Parks and Wildlife Commission approved a proposal to create a night-time commercial bay license Winter Open Season (hopper season). This season was designed to allow commercial bay license shrimpers to target pink shrimp (*Farfantepenaeus duorarum*) during 1 February through 15 April in all major bays, south of the Colorado River. Legal shrimping hours are 30 minutes after sunset to 30 minutes before sunrise. There are no bag and possession limits, but mesh size, trawl, and door restrictions are the same as the commercial bay license Spring Season regulations (State of Texas).

Pink shrimp and brown shrimp (*Farfantepenaeus aztecus*) are similar in appearance and are often mis-identified or not separated in landings totals. Pink shrimp range from lower Chesapeake Bay to south Florida, the Atlantic Ocean and into the Gulf of Mexico, south to Cabo Catoche at Isla Mujeres, Mexico. Brown shrimp range from Martha's Vinyard in the north Atlantic south to the Gulf of Mexico terminating at Campeche, Mexico. Both pink shrimp and brown shrimp have a lateral rostral groove on the carapace posterior to the last rostral spine (Figure 1). Pink shrimp usually have a lateral spot at the juncture of the third and fourth abdominal segments. These shrimp spawn in the Gulf of Mexico and the larvae are transported by wind driven currents into estuaries. While in the estuaries, shrimp grow to juvenile and subadult size. Shrimp move to the offshore Gulf waters to mature and complete their life cycle (Figure 2). Pink shrimp spawn in offshore depths ranging from 15 to 20 m. Spawning occurs year-around with peaks in late spring, summer, and early fall. Departure of pink shrimp from the bays is not clearly known. Some pink shrimp may stay in the estuaries for nine months, whereas, others may leave the bays when they reach 95 to 100 mm TL. Brown shrimp spawn offshore in depths greater than 14 m. At 27 m, spawning occurs from spring until early winter. Juvenile brown shrimp generally emigrate from Texas bays from April through August, with peaks from May to July, in conjunction with a full moon and strong tidal cycles (Bielsa et al. 1983, Cody et al. 1989).

Daytime fishery independent trawl data were collected by Texas Parks and Wildlife (TPW) personnel 10 years prior to the present study in Matagorda Bay, San Antonio Bay, Aransas Bay, and Corpus Christi Bay ecosystems (Fuls 1994). Mean trawl catch rates (no./h) of brown shrimp using a 6.1 m wide trawl (38 mm mesh) ranged from 0 to 199/h in April and 25 to 1,065/h in May. Mean lengths (TL) ranged from 41 to 107 mm in April and 80 to 103 mm in May. Mean bag seine lengths using a 18.3 m long, 1.8 m deep (19 mm mesh in wings and 13 mm mesh in bag) seine, reveal brown shrimp are smallest December through April and largest May through November (Cody et al. 1989; Dailey et al. 1991a, 1991b; Hammerschmidt and McEachron 1986; Hammerschmidt et al 1988; Mambretti et al. 1990; Meador et al. 1988; Texas Parks and Wildlife. Unpublished data. Coastal Fisheries Division. Austin, Texas).

The objectives of the present study were to: 1) characterize the night-time commercial bay license 1994 Winter Open Season fishery; and 2) determine species composition of the landings.

MATERIAL AND METHODS

This study consisted of two components conducted simultaneously. The first component consisted of roves to count shrimp boats trawling at night. The second component consisted of dock-side interviews with boat captains at the completion of a trip and documentation of shrimp landings. Data were collected during each of the 11 weeks of the 1994 Winter Open Season.

To determine when landings occur, TPW staff from Matagorda Bay, San Antonio Bay, Aransas Bay, and Corpus Christi Bay ecosystems conducted night roves to determine if shrimping was occurring in their respective bay system (Figure 3). Roving counts were conducted either on the water or were shorebased, between twilight and sunrise. A minimum of one roving count per week was conducted in each ecosystem. Information obtained during roves included: 1) major bay system; 2) date; 3) start and completion time; 4) type-biologist with game warden, biologist alone, game warden alone, or shorebased; 5) specific area and number of shrimp boats counted; 6) site where shrimp would be landed (if shrimpers were encountered); and 7) other pertinent comments (Figure 4).

Fact finding trips to seafood dealers were made when there was a high probability landings would be intercepted. This was accomplished by phoning and visiting seafood dealers to determine if landings were occurring. Information recorded during data collection included: 1) location of seafood dealer (major bay system); 2) date of interview; and 3) preassigned seafood dealer identification number. At the start of each interview, the time was recorded. Information obtained from the captain or crew of the boats landing shrimp included: 1) trip time - total number of hours elapsed between boat departure from dock until its return; 2) minor bay where shrimper trawled; 3) total number of drags for this fishing trip; 4) fishing time-number of drags multiplied by duration of each drag; 5) net size-width from leading tip of door to leading tip of door; and 6) mesh size-stretched mesh length from knot to knot, in the cod end of the net. The following questions were asked of the captain: 1) "Would you be shrimping during the day if there were no 'hopper season'?", and 2) "Did you shrimp the 'hopper season' last year?" Each captain was asked these questions only once during the study and answers were recorded in the comments section. Information obtained from the seafood dealer included: 1) total weight of shrimp landed (totals were listed by count size, if available); and 2) count size - number of shrimp/kg, if available (Figure 5). After the shrimp were weighed by the seafood dealer, a subsample of 50 shrimp were identified to species, and the number of pink, brown, white (*Litopenaeus setiferus*), and "other" shrimp were recorded.

RESULTS

Shrimp landings occurred during each of the 11 weeks of the Winter Open Season; most interviews (76%) and landings (91%) were intercepted during 20 March through 15 April (Tables 1, 2 and 4). Most shrimp identified from 71 interviews (Table 1) were pink shrimp, (80%), with brown shrimp comprising 12% of the landings (Table 2). White shrimp and "other" shrimp (*Trachypenaeus sp*, *Sicyonia dorsalis* and unidentifiable shrimp species) each comprised 4% of the landings. Total landings by major ecosystem, for the 11 weeks, ranged from 84 kg in Matagorda Bay to 1,680 kg in San Antonio Bay (Table 2). The heads-on count size of shrimp landed ranged from 42-46/kg to 178-220/kg (19-21/lb to 81-100/lb), with 2,346 kg (65%) landed as count size 112-132/kg (51-60/lb) (Table 3). Most shrimp boats were equipped with 9.75 m (32 ft) nets with a mesh size of 3.81 cm (1.5 in) (Table 5). Total fishing time within a night ranged from 4.4-7.5 h (Table 5). Of the 71 interviews conducted, only one captain was asked "Would you be shrimping during the day if there were no 'hopper season'", he answered-"yes". Only 13 of 71 captains were asked "Did you shrimp the hopper season last year?"; 12 answered "yes" and one answered "no".

DISCUSSION

Prior to the present study no data could be found concerning species composition of landings during the Winter Open Season. Information from this study indicates landings during the 1994 Winter Open Season were mainly pink shrimp (80%). Brown shrimp made up a small percentage (by number) of the landings. Samples of shrimp seen during the surveys were not measured by TPW staff, therefore no size information is available for any of the shrimp species.

Routine TPW bay trawl data and landings data collected from seafood dealers indicate there was an abundance of small shrimp in the bays during the Spring Open Season (15 May-15 July) of 1994. In March and April 1994, TPW routine sampling (Fuls 1994) using a 6.1 m wide trawl (38 mm mesh) in Matagorda Bay, San Antonio Bay, Aransas Bay and Corpus Christi Bay ecosystems for brown shrimp revealed a mean daytime catch rate of 10/hr in March and 46/hr in April. Mean total length was 84 mm in March and 94 mm in April (Texas Parks and Wildlife. Unpublished data. Coastal Fisheries Division. Austin, Texas). Data collected from seafood dealers since 1972 from Matagorda Bay, San Antonio Bay, Aransas Bay and Corpus Christi Bay ecosystems show that 1994 yearly landings for brown and pink shrimp were the second highest reported landings (Robinson et al. 1995). Based on TPW routine sampling, brown shrimp would be available to be caught by night shrimpers, especially during the latter portion of March and April.

Based on results of the present study and TPW monitoring data, it appears that the current Winter Open Season is meeting management objectives of providing harvest opportunity while minimizing impacts on brown shrimp. Changes in regulations for this shrimp season should be evaluated fully before any changes are recommended.

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Table 1. Number of roves (R) and commercial shrimp-boat interviews (I) conducted by week and ecosystem during 1 February-15 April 1994.

Week	Matagorda Bay		San Antonio Bay		Aransas Bay		Corpus Christi Bay		Total	
	R	I	R	I	R	I	R	I	R	I
Feb 1-5	1	0	1	0	1	0	1	2	4	2
6-12	1	0	1	0	1	0	1	1	4	1
13-19	1	0	1	0	1	1	1	1	4	2
20-26	1	0	1	0	2	1	1	2	5	3
27-Mar 5	2	0	1	0	2	2	1	1	6	3
Mar 6-12	1	0	1	0	1	0	1	1	4	1
13-19	1	0	1	0	1	3	1	2	4	5
20-26	1	0	1	0	1	3	1	6	4	9
27-Apr 2	1	0	1	0	1	4	1	6	4	10
Apr 3-9	1	0	1	8	1	1	1	3	4	12
10-15	1	3	1	11	1	8	1	1	4	23
Total	12	3	11	19	13	23	11	26	47	71

Table 2. Species composition (% by number) and total landings (kg) of shrimp encountered during commercial shrimp-boat interviews, by ecosystem and week during 1 February-15 April 1994. Other shrimp-*Trachypena* sp (118), *Sicyonia dorsalis* (11), not noted (unidentifiable)(7).

Ecosystem Week	Brown shrimp (%)	Pink shrimp (%)	White shrimp (%)	Other shrimp (%)	All shrimp (kg)
Matagorda Bay					
Apr 10-15	0	93	7	0	84
Total	0	93	7	0	84
San Antonio Bay					
Apr 3-9	9	90	0	1	551
10-15	18	82	0	0	1,129
Total	14	86	0	0	1,680
Aransas Bay					
Feb 13-19	8	90	0	2	14
20-26	8	92	0	0	38
27-Mar 5	8	91	1	0	61
Mar 13-19	1	89	9	1	28
20-26	6	94	0	0	60
27-Apr 2	18	80	0	2	163
Apr 3-9	12	86	2	0	3
10-15	15	84	0	1	538
Total	12	86	1	1	905
Corpus Christi Bay					
Feb 1-5	14	29	18	39	27
6-12	10	48	0	42	20
13-19	4	83	7	6	14
20-26	16	63	20	1	7
27-Mar 5	18	40	2	40	27
Mar 6-12	18	72	6	4	46
13-19	9	62	19	10	37
20-26	6	93	1	0	415
27-Apr 2	20	70	7	3	225
Apr 3-9	9	73	18	0	77
10-15	8	86	0	6	68
Total	12	70	9	9	963
All Ecosystems					
Feb 1-5	14	29	18	39	27
6-12	10	48	0	42	20
13-19	6	86	4	4	28
20-26	13	73	13	1	45
27-Mar 5	12	74	1	13	88
Mar 6-12	18	72	6	4	46
13-19	5	76	14	5	65
20-26	6	93	1	0	475
27-Apr 2	19	74	4	3	388
Apr 3-9	10	85	5	0	631
10-15	14	84	1	1	1,819
Total	12	80	4	4	3,632

Table 3. Number of kg landed/count size (number of heads-on shrimp/kg) by ecosystem during 1 February-15 April 1994.

Count size	Matagorda Bay	San Antonio Bay	Aransas Bay	Corpus Christi Bay	All ecosystems
42-46				2	2
68-88				49	49
90-110	84			100	184
112-132		1,210	670	466	2,346
134-154		470	106	194	770
156-176			113	31	144
178-220				33	33
unknown			16	88	104

Table 4. Number kg landed/count size (number of heads-on shrimp/kg) by week during 1 February-14 April 1994.

Week	Count size							Unknown	Total
	42-46	68-88	90-110	112-132	134-154	156-176	178-220		
Feb 1-5			9		18				27
6-12								20	20
13-19			13			14			27
20-26						45			45
27-Mar 5					27	61			88
Mar 6-12					46				46
13-19		13		21	31				65
20-26				357	102			16	475
27-Apr 2		36	36	220	73	24			389
Apr 3-9	2		42	204	350		33		631
10-15			84	1,544	123			68	1,819
Total	2	49	184	2,346	770	144	33	104	3,632

Table 5. Mean net size (m \pm 1SE), modal net size (m), mean mesh size (cm \pm 1SE), modal mesh size (cm), mean number of drags per trip (no. \pm 1SE), modal number of drags, mean fishing time (h \pm 1SE), mean weight per trip (kg \pm 1SE), mean catch rate (kg/h), by ecosystem.

	San Antonio Bay		Corpus Christi Bay		All ecosystems
	Matagorda Bay	San Antonio Bay	Aransas Bay	Corpus Christi Bay	
Mean net size (m)	9.75 ^a	9.45 ^b \pm 0.61	9.75 \pm 0.30	10.06 ^c \pm 0.30	9.75 \pm 0.30
Modal net size (m)	9.75	9.75	9.75	10.06	9.75
Mean mesh size (cm)	3.81 ^d	3.81 \pm 0.03	3.81 \pm 0.03	3.81 \pm 0.03	3.81 \pm 0.03
Modal mesh size (cm)	3.81	3.81	3.81	3.81	3.81
Mean number of drags per trip	2.0 \pm 2.0	4.4 \pm 1.7	4.9 \pm 3.0	4.9 \pm 2.6	4.5 \pm 2.5
Modal number of drags	1	4	2	3	4
Mean fishing time (h)	4.4 \pm 3.1	7.5 \pm 2.6	4.8 \pm 2.2	4.7 \pm 1.3	5.5 \pm 2.5
Mean weight (kg) per trip	28.01 \pm 19.11	88.53 \pm 32.19	39.36 \pm 31.14	38.54 \pm 31.42	51.94 \pm 38.00
Mean catch rate (kg/h)	6.37	11.80	8.20	8.20	9.44

^a 9.75m = 32ft, ^b 9.45m = 31ft, ^c 10.06m = 33ft, ^d 3.81cm = 1.5in

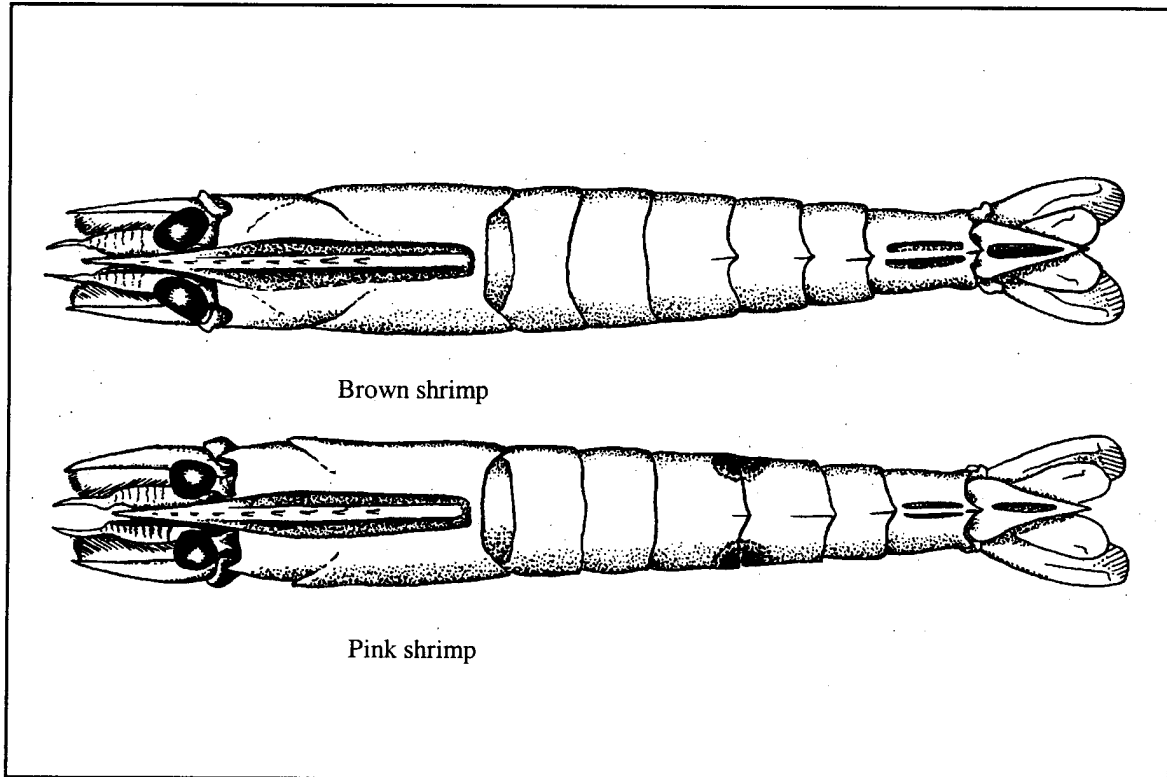


Figure 1. Brown shrimp (*Farfantepenaeus aztecus*) and pink shrimp (*Farfantepenaeus duorarum*).

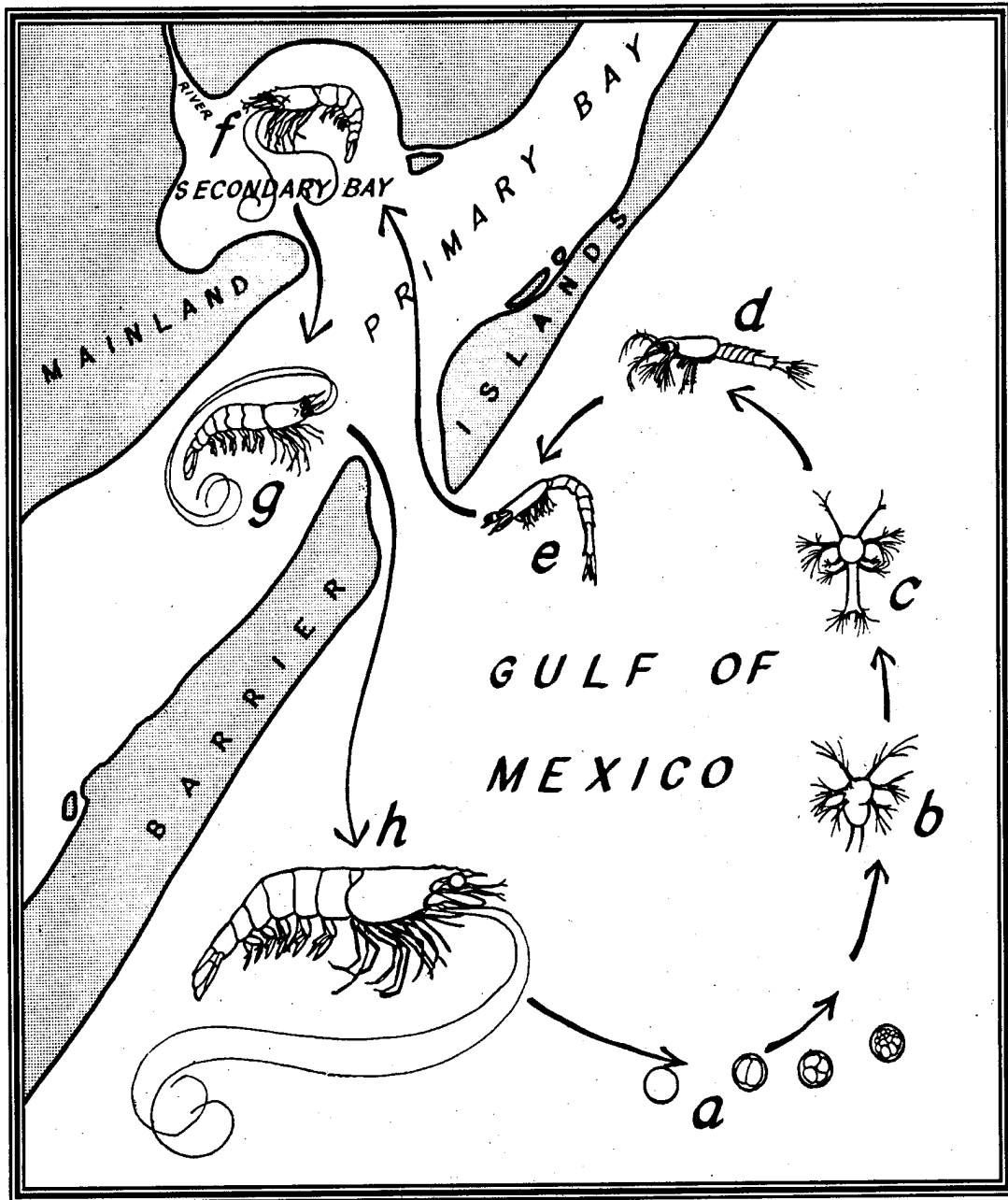


Figure 2. Life history of shrimp in Texas. a) shrimp eggs; b) nauplius larva; c) protozoa; d) mysis; e) postmysis; f) juvenile shrimp; g) adolescent shrimp; h) mature adult shrimp.

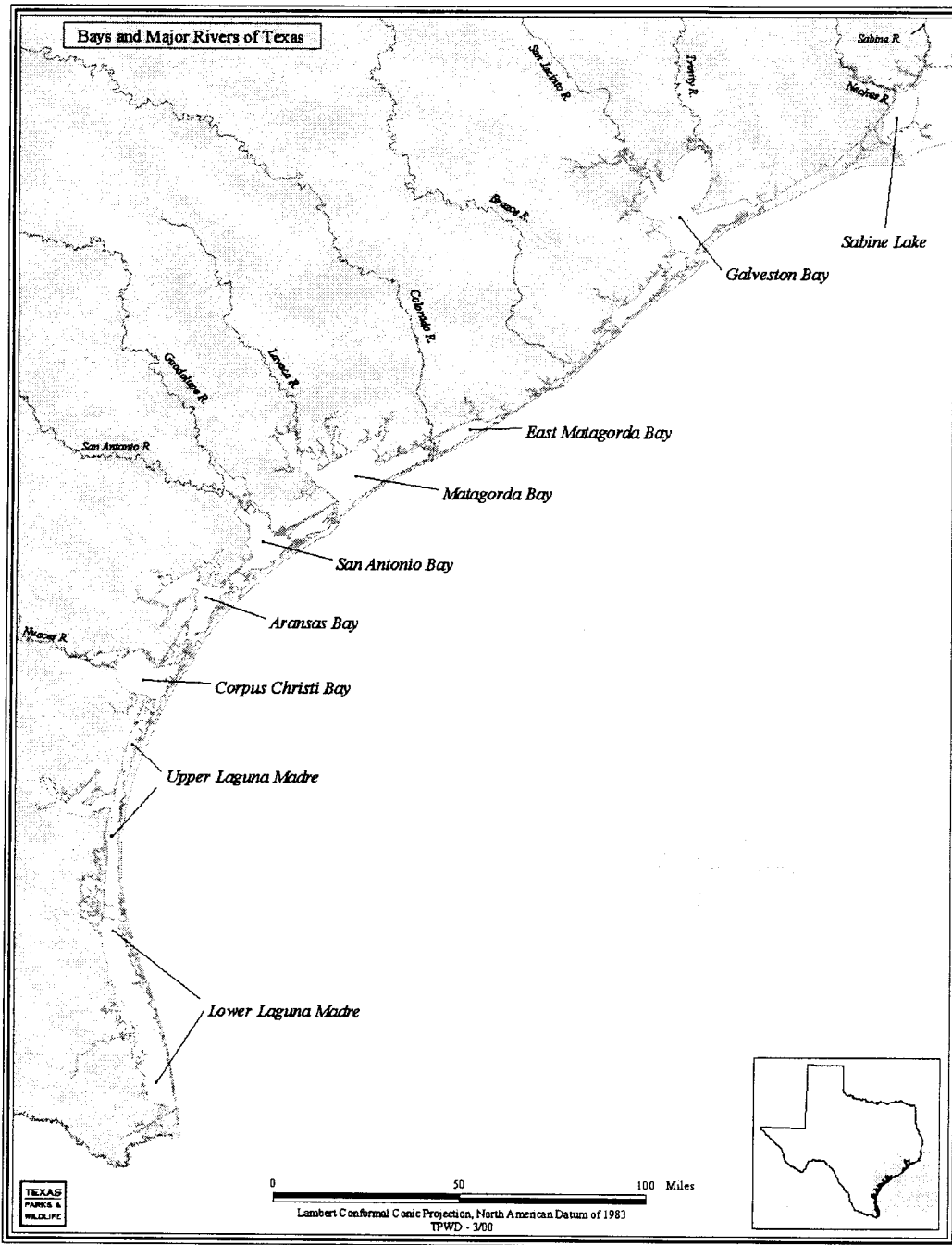


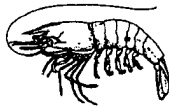
Figure 3. Ecosystems and major rivers of Texas.

TEXAS PARKS AND WILDLIFE SPECIAL STUDY #88

PINK SHRIMP SPECIAL STUDY
ROVE COUNT

MAJOR

DATE



Start Time **Completion Time**

Type of Rove

	1- Biologist with Game Warden	2- Biologist Alone
	3- Game Warden Alone	4- Shoreline

Area Roved

Number of Boats

TOTAL NUMBER

Where is shrimp going to be landed?

Comments

Figure 4. Roving count data sheet used in the pink shrimp special study conducted during the Winter Open Season.

PWD RP V3400-708 (5/01)

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