Acc#650

A Study of Brown Shrimp in Texas Coastal Bays
(Spring 1971)

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Abstract

In spring 1971, juvenile brown shrimp (Penaeus aztecus) were abundant in samples from upper coastal bays. With temperature and salinity relatively high, their growth was rapid (estimated growth rates ranged from 1.2 mm/day, Lower Laguna Madre, to 2.2 mm/day, Galveston Bay).

The 1971 Texas shrimp catch was 53.7 million pounds. The dock-side value was $64.2 million.

Introduction

Each spring, state biologists study growth rates, movements, sizes, and abundance of juvenile brown shrimp, Penaeus aztecus, in Sabine Lake, Galveston Bay, Matagorda Bay, Aransas Bay and the Lower Laguna Madre. This progress report presents an analysis of shrimp data collected during the 1971 spring and a review of the 1971 commercial shrimp harvest. Earlier reports were prepared by Leary and Compton (1960), Compton (1962), Pullen (1963) and Moffett (1964, 1965, 1966, 1967, 1968, 1969, 1970).

Materials and Methods

Shrimp in nursery areas were sampled with 1.8 meter (six feet) bar seines (1.27 cm; 1/4-inch mesh webbing).* Stations in secondary and primary bays were sampled with 3.05 m (10 feet) trawls (3.17 cm; 1 1/4 inch mesh webbing) lined with 1.27 cm (1/2-inch) mesh webbing. A standard sample from a nursery area was the catch in one 152.4 m (500 feet) tow. Sampling duration at trawling stations was 15 minutes. Incomplete samples (short tows) were equated to the standard.

Between April 1 and June 1, stations were occupied weekly in Galveston and Matagorda Bays and semi-monthly in Sabine Lake, Aransas Bay and the Lower Laguna Madre (Figure 1).

Shrimp in samples were identified, measured to the nearest millimeter (tip of rostrum to end of telson), and counted.

Galveston Bay: Young brown shrimp (modal length; 18 mm) were present at some sampled nursery areas on 1 April. Largest shrimp in samples were 21 mm long on 1 April and 88 mm long on 1 May. On the average these shrimp grew an estimated 2.2 mm per day. Samples collected after 1 May indicated that the rather high rate of growth slowed before emigration began.

Emigration apparently began in late May. On 26 May, over 200 shrimp (modal length, 80 mm) were taken at our trawling station near Bolivar Roads.

Matagorda Bay: Postlarval brown shrimp (modal length 18 mm) were detected in samples on 5 April. The young were unusually abundant in shallow salt marsh areas. The calculated growth increment between 5 April and 23 May was 73 mm or 1.6 mm per day.

Lower Coastal Bays: Data from Aransas Bay and the Lower Laguna Madre were not indicative of high brown shrimp abundance. In early April the young were 13 to 28 mm long in Aransas Bay and 23 to 53 mm. long in the Lower Laguna Madre. Shrimp in Aransas Bay grew about 1.2 mm per day. Extreme lengths were 33 mm in early April and 88 mm in mid May. I could not estimate a rate of growth for shrimp in the Lower Laguna Madre.

Commercial Production

The dockside value for the 1971 Texas shrimp catch, 53.7 million pounds, was $64.2 million. The total catch was 2.1 million pounds less than the 1970 catch. The value, however, was $15.6 million greater.

Since 1961, annual brown shrimp catches (South Atlantic and Gulf States) ranged from a low of 48.6 million pounds in 1962 to 105.9 million pounds in 1967. Ex-vessel values ranged from $26.2 million in 1964 to $63.9 million in 1967 (Table 3). Landings and values have increased in recent years. This trend was accompanied by the steady introduction of new and more efficient trawlers to the fleet. In 1971 93.8 million pounds, worth $88.4 million, were reported.

In 1971, the Texas brown shrimp harvest increased 2.2 million pounds over that of 1970. The value increased $15.3 million (Tables 3 and 4). The Texas harvest was about 47 percent of the total 1971 catch (Gulf and South Atlantic states).

Between 1960 and 1972, white shrimp (*P. setiferus*) landings at Gulf and South Atlantic ports ranged from 31.0 million pounds (worth $20.3 million) in 1962 and 55.7 million pounds (worth $46.5 million) in 1970 (Table 3)

In 1971, 9.2 million pounds of white shrimp, worth $11.1 million,

were landed at Texas ports (Tables 3 and 5). This catch was 3.2 million pounds less than the 1970 harvest. About 17 percent of the total South Atlantic and Gulf states catch was landed at Texas ports.

The peak production month was October when 2.6 million pounds, worth $3.1 million, were landed. In December 1971, shrimpers received a record average price for shrimp ($1.58 per pound).

Relatively few pink shrimp are landed in Texas (Table 3). Most are caught during winter and spring (Table 6).

Galveston Bay Bait Production

The 1971 estimated brown (574.3 thousand pounds) and white (605.8 thousand pounds) shrimp bait catch was greater than estimates of the 1970 catches (Table 7). White shrimp catches were relatively poor during summer but increased sharply in fall. The peak white shrimp bait catch occurred in October (197.6 thousand pounds), whereas the peak brown shrimp catch occurred in June (249.4 thousand pounds).

Discussion

The statements concerning abundance, size, movement and growth of brown shrimp refer only to the late stage postlarvae and juveniles of the "commercial brood" or the large wave of shrimp that use coastal bays in late winter and spring. I have no data on late broods that are usually small and apparently contribute little to commercial production.

Each winter and spring, biologists of the National Marine Fisheries Service, Galveston, Texas sample shrimp postlarvae as they move into Galveston Bay. Their 1971 postlarval data indicated that postlarvae were more abundant than average (based on a 10-year average value), especially in April.

In 1971, bay shrimp samples and bay conditions differed from the previous year. Young brown shrimp in 1971 appeared to be in greater abundance in upper coastal bays (at least in early spring) and they grew faster. Water temperature and salinity levels were relatively low in the 1970 spring. In contrast early spring water temperatures and salinities were relatively high during the 1971 spring.

These factors (abundance of postlarvae, condition of bays and the abundance of juveniles in upper coastal bays) were indicators of successful upcoming brown shrimp harvest.

Occasionally large annual brown shrimp catches are followed by poor annual white shrimp catches. This is usually evident during drought years (e.g. 1967). Though 1971 was a dry year the white shrimp yield was not poor, however, there was a decrease from the previous year's catch. Perhaps the 1971 catch would have been less if fishing effort had not increased.

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Table 1: Values of brown shrimp catch per unit-of-effort based on biological samples (1968-1971)

Date		Tertiary Bays 1968	1969	1970	1971	Secondary Bays 1968	1969	1970	1971	Primary Bays 1968	1969	1970	1971
						Sabine Lake							
May	1	-	-	-	-	36	-	33	510	56	-	1	21
	15	-	-	-	-	108	-	123	1,200	660	0	40	62
						Galveston Bay							
Apr.	1	5	0	4	14	0	0	0	2	0	0	0	0
	8	18	18	33	16	0	0	0	3	0	0	0	0
	15	15	76	132	71	0	1	0	2	0	0	0	1
	23	69	49	165	169	3	0	18	19	0	1	42	0
May	1	65	117	327	509	3	2	51	120	4	1	3	1
	8	71	303	310	295	13	29	84	43	147	7	40	19
	15	402	114	151	379	27	11	68	182	109	8	30	14
	23	70	145	426	258	32	43	309	147	23	9	71	105
						Matagorda Bay							
Apr.	1	3	0	0	64	-	0	0	0	0	0	0	0
	8	11	18	0	200	0	0	0	1	0	0	0	0
	15	63	11	4	102	6	16	0	3	0	3	0	4
	23	70	49	22	59	16	10	33	8	4	2	124	4
May	1	107	10	130	442	22	148	101	34	34	49	34	-
	8	175	90	81	212	-	132	-	17	-	23	-	6
	15	40	63	78	212	222	11	63	-	133	23	71	-
	23	14	-	7	66	69	19	55	77	121	47	19	59

Table 1: Contd.

Date		Tertiary Bays 1968	1969	1970	1971	Secondary Bays 1968	1969	1970	1971	Primary Bays 1968	1969	1970	1971
						Aransas Bay							
Apr.	1	6	4	27	118	6	2	1	1	0	2	31	2
	8	0	77	-	-	0	2	-	-	0	4	-	-
	15	-	233	153	53	-	8	140	2	-	6	20	4
	23	19	1,007	-	-	10	4	-	-	0	16	-	-
May	1	16	316	263	362	16	13	146	3	10	38	379	65
	8	-	284	-	-	-	72	-	-	-	473	-	-
	15	69	392	518	192	69	199	474	49	190	792	1,687	150
	23	156	-	-	-	156	-	-	-	300	-	-	-
						Lower Laguna Madre							
Apr.	1	137	124	27	80	112	19	10	162				
	15	259	823	113	31	63	128	190	154				
May	1	43	195	63	31	527	8	693	134				
	15	71	271	86	8	617	247	984	91				

Table 2: April and May water temperature and salinity ranges recorded at shrimp sampling station (1970 and 1971)

	Temperature (°C) April		Salinity (ppt) April	
Estuary	1970	1971	1970	1971
Galveston Bay	16.0-24.5	17.0-27.0	1.1-20.0	8.9-27.8
Matagorda Bay	18.5-27.0	14.5-23.0	0.5-21.0	4.4-28.3
Aransas Bay	18.9-28.0	16.0-27.5	11.1-24.0	23.3-31.6
Lower Laguna Madre	21.6-23.9	20.0-25.0	14.9-38.3	12.2-38.9
	May		May	
Sabine Lake	21.5-25.0	21.0-25.0	0.5-7.2	5.6-12.2
Galveston Bay	18.5-27.5	21.0-30.5	1.1-23.3	11.1-27.8
Matagorda Bay	18.0-34.5	24.0-27.0	0.5-19.9	1.1-27.8
Aransas Bay	24.0-28.0	20.0-25.0	15.5-29.0	25.0-33.3
Lower Laguna Madre	24.0-28.0	23.0-25.0	15.5-34.9	15.5-38.3

Table 3: Brown shrimp landings (mill. of pounds) and value (mill. of dollars)

Year	TEXAS LANDINGS Lbs.	TEXAS LANDINGS Value	GULF LANDINGS Lbs.	GULF LANDINGS Value	SOUTH ATLANTIC Lbs.	SOUTH ATLANTIC Value	TOTAL LANDINGS Lbs.	TOTAL LANDINGS Value
1962	24.5	19.7	41.4	30.0	7.2	4.8	48.6	33.7
1963	31.3	19.3	56.0	29.1	4.7	2.4	60.7	31.6
1964	25.9	16.7	42.2	23.6	4.4	2.6	46.6	26.2
1965	34.3	22.2	62.4	35.5	5.0	2.9	67.5	38.5
1966	33.9	30.3	64.0	48.2	7.2	5.9	71.2	54.1
1967	55.5	39.3	100.9	60.6	4.9	3.0	105.9	63.9
1968	37.0	33.1	78.9	56.8	3.7	3.3	82.6	60.1
1969	29.8	29.5	65.8	51.1	6.0	5.6	71.0	56.4
1970	41.6	36.9	80.9	59.4	4.4	3.9	85.4	63.3
1971	43.8	52.0	87.6	81.7	-	-	93.8	88.4
	White shrimp landings (mill. of pounds) and value (mill. of dollars)							
1962	7.0	4.9	23.1	14.7	7.9	5.6	31.0	20.3
1963	8.9	4.8	47.1	19.9	4.7	2.6	51.8	22.5
1964	12.0	7.1	44.0	24.2	5.3	3.4	49.2	27.6
1965	9.2	5.7	33.6	19.1	10.6	6.7	44.2	25.8
1966	7.8	6.3	29.9	21.5	5.9	4.7	35.9	26.2
1967	6.4	5.0	24.9	18.4	7.1	5.3	32.0	23.7
1968	12.5	10.1	30.9	24.9	11.0	10.0	41.9	34.9
1969	12.0	10.8	43.6	36.3	11.0	10.2	55.7	46.5
1970	12.4	10.2	46.0	35.3	8.1	7.0	54.1	42.3
1971	9.2	11.1	41.9	41.6	-	-	54.2	55.0
	Pink shrimp (mill. of pounds) and value (mill. of dollars)							
1962	3.0	2.4	22.1	16.4	1.4	0.8	23.5	17.2
1963	3.4	2.5	24.1	14.4	0.3	0.2	24.5	14.6
1964	3.5	2.2	26.8	14.7	1.2	0.6	28.0	15.4
1965	4.6	3.3	26.2	16.1	1.0	0.5	27.2	16.6
1966	1.9	1.7	18.3	13.0	0.3	0.2	18.7	13.2
1967	2.2	2.0	15.3	11.5	1.0	0.5	16.3	12.1
1968	2.7	2.5	17.6	14.0	0.8	0.6	18.5	14.5
1969	2.3	2.8	15.2	13.2	1.1	0.8	16.2	14.0
1970	1.4	1.5	16.3	13.2	0.5	0.4	16.8	13.5
1971	0.7	1.1	12.6	11.9	-	-	13.9	13.1

Table 4: Brown shrimp landings (mill. of pounds) and value (mill. of dollars)*

Month	TEXAS LANDINGS Pounds 1970	TEXAS LANDINGS Pounds 1971	TEXAS LANDINGS Value 1970	TEXAS LANDINGS Value 1971	GULF LANDINGS Pounds 1970	GULF LANDINGS Pounds 1971	GULF LANDINGS Value 1970	GULF LANDINGS Value 1971	TOTAL LANDINGS** Pounds 1970	TOTAL LANDINGS** Pounds 1971	TOTAL LANDINGS** Value 1970	TOTAL LANDINGS** Value 1971
Jan.	1.2	1.5	1.3	1.8	1.8	2.2	1.9	2.5	1.8	2.2	1.9	2.5
Feb.	1.3	1.4	1.4	1.7	2.3	1.9	2.5	2.4	2.3	1.9	2.5	2.4
March	1.3	1.2	1.4	1.6	1.9	1.7	2.2	2.3	1.9	1.7	2.2	2.3
April	1.3	0.9	1.5	1.4	1.9	1.4	2.2	2.0	1.9	1.4	2.2	2.0
May	1.3	1.0	1.4	1.3	7.1	7.1	3.1	3.2	7.1	7.1	3.1	3.2
June	3.0	2.6	2.1	2.2	18.4	16.7	8.4	7.4	18.8	16.9	8.7	7.8
July	6.8	7.5	4.6	6.7	14.2	17.3	8.9	13.1	15.8	19.6	10.1	15.2
Aug.	7.9	9.4	6.6	10.1	12.1	16.6	10.1	17.3	13.3	18.9	11.2	19.6
Sept.	6.7	6.8	5.7	8.2	8.1	8.9	7.1	10.9	8.8	9.8	7.9	12.2
Oct.	4.0	5.2	3.9	7.2	4.6	6.1	4.4	8.5	4.9	6.4	4.7	8.8
Nov.	3.3	3.4	3.4	5.3	4.0	4.2	4.1	6.4	4.1	4.2	4.2	6.5
Dec.	3.3	2.9	2.4	4.5	4.5	3.5	4.7	5.7	4.5	3.7	4.7	5.7

* Totals are given in Table 3
** Includes South Atlantic landings

Table 5: White shrimp landings (mill. of pounds) and value (mill. of dollars)*

	TEXAS LANDINGS				GULF LANDINGS				TOTAL LANDINGS**			
	Pounds		Value		Pounds		Value		Pounds		Value	
Month	1970	1971	1970	1971	1970	1971	1970	1971	1970	1971	1970	1971
Jan.	0.2	0.1	0.1	0.1	1.5	1.7	1.1	0.9	1.7	2.0	1.3	1.1
Feb.	0.1	0.4	0.5	0.3	0.6	1.4	0.5	0.9	0.7	1.5	0.6	0.9
March	0.4	0.3	0.3	0.3	0.8	0.9	0.6	0.8	0.8	0.9	0.7	0.8
April	0.4	0.3	0.3	0.4	0.8	0.9	0.7	1.0	0.9	0.9	0.7	1.0
May	1.3	0.7	1.4	1.1	3.0	3.4	3.3	4.2	3.2	3.6	3.4	4.5
June	1.0	0.7	1.1	1.0	2.5	3.0	2.9	4.2	2.6	3.3	3.0	4.7
July	0.7	0.4	0.7	0.6	1.3	1.1	1.5	1.8	1.4	1.4	1.6	2.2
Aug.	1.4	0.8	4.2	1.8	2.6	1.6	4.9	2.8	4.8	2.4	2.9	2.4
Sept.	2.2	1.0	1.6	1.2	7.3	4.5	5.3	4.3	9.0	7.0	6.6	6.5
Oct.	3.0	2.6	2.5	3.1	12.2	11.1	9.7	11.5	14.1	14.3	11.5	15.3
Nov.	1.3	1.8	0.9	1.9	6.7	8.8	4.1	7.4	8.7	11.4	6.1	10.5
Dec.	0.3	0.5	0.3	0.6	3.3	3.3	2.1	3.0	4.6	5.1	3.1	4.9

* Totals are given in Table 3
** Includes South Atlantic landings

Table 6: Pink shrimp landings (mill. of pounds) and value (mill. of dollars)*

	TEXAS LANDINGS				GULF LANDINGS				TOTAL LANDINGS**			
	Pounds		Value		Pounds		Value		Pounds		Value	
Month	1970	1971	1970	1971	1970	1971	1970	1971	1970	1971	1970	1971
Jan.	0.06	0.03	0.07	0.03	1.8	1.2	1.7	0.9	1.8	1.2	1.7	0.9
Feb.	0.44	0.02	0.47	0.03	2.2	1.6	2.0	1.4	2.2	1.6	2.0	1.4
March	0.41	0.2	0.41	0.2	2.0	1.7	1.8	1.5	2.0	1.7	1.8	1.5
April	0.29	0.2	0.3	0.2	2.4	1.6	1.9	1.5	2.4	1.6	1.9	1.6
May	0.10	0.3	0.12	0.4	1.9	1.6	1.5	1.7	2.0	1.8	1.5	1.9
June	0.06	0.1	0.07	0.2	1.1	0.9	0.8	0.9	1.2	1.4	0.9	1.3
July	0.02	0.01	0.01	0.01	0.6	0.4	0.4	0.3	0.7	0.6	0.5	0.5
Aug.	-	-	-	-	0.5	0.2	0.4	0.2	0.5	0.2	0.4	0.2
Sept.	-	-	-	-	0.3	0.3	0.2	0.3	0.6	0.4	0.3	0.4
Oct.	-	-	-	-	0.9	1.0	0.5	0.8	1.0	1.0	0.6	0.8
Nov.	-	-	-	-	1.1	0.8	0.8	0.8	1.2	1.0	0.9	1.0
Dec.	0.03	0.006	0.03	0.009	1.1	1.3	0.8	1.6	1.1	1.4	0.9	1.6

* Totals are given in Table 3
** Includes South Atlantic landings

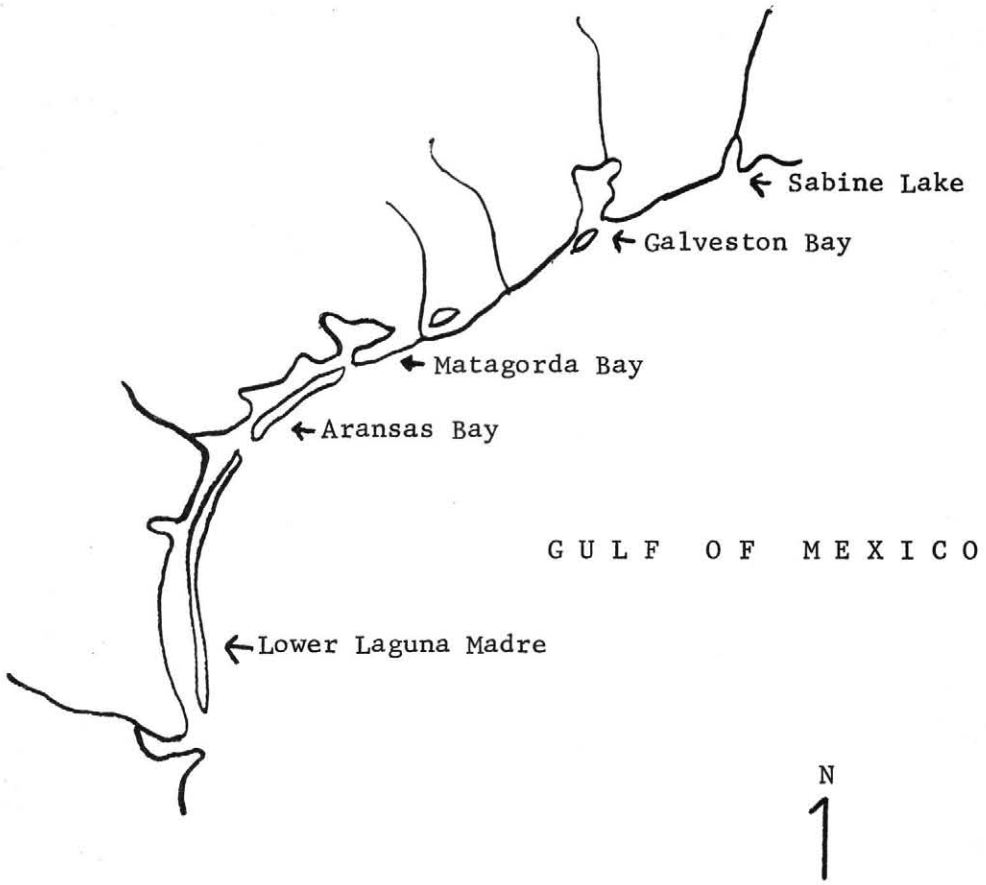
Table 7: Estimated white and brown shrimp bait catches (pounds x 1,000) and effort expanded (Galveston Bay, 1970-71)*

Month	1970	Total Effort (hours)*	1971	Total Effort (hours)*
		WHITE SHRIMP		
Jan.	2.0	70 ± 10	28.2	540 ± 70
Feb.	12.4	90 ± 5	12.4	530 ± 80
March	21.0	240 ± 30	8.3	1,000 ± 90
April	51.3	1,970 ± 230	8.7	1,160 ± 75
May	40.8	1,190 ± 155	10.6	1,390 ± 215
June	0.6	1,330 ± 120	-	2,770 ± 310
July	27.5	2,900 ± 320	11.5	3,140 ± 355
Aug.	92.3	2,180 ± 210	57.7	4,490 ± 380
Sept.	104.8	2,820 ± 365	104.0	3,870 ± 440
Oct.	123.0	1,750 ± 190	197.6	2,210 ± 265
Nov.	51.3	700 ± 55	128.1	1,390 ± 155
Dec.	17.6	670 ± 120	38.7	410 ± 70
		BROWN SHRIMP		
Jan.	-	70 ± 10	0.2	540 ± 70
Feb.	Trace	90 ± 5	-	530 ± 80
March	-	240 ± 30	0.1	1,000 ± 90
April	0.2	1,970 ± 230	0.9	1,160 ± 75
May	50.3	1,190 ± 155	100.2	1,290 ± 215
June	177.9	1,330 ± 120	249.4	2,700 ± 310
July	171.1	2,900 ± 320	122.5	3,140 ± 355
Aug.	34.1	2,180 ± 210	50.5	4,490 ± 380
Sept.	16.7	2,820 ± 365	17.7	3,870 ± 440
Oct.	4.9	1,750 ± 190	24.0	2,210 ± 265
Nov.	1.2	700 ± 55	8.7	1,390 ± 155
Dec.	Trace	670 ± 120	0.1	410 ± 70

* Source: National Marine Fisheries Service, Biological Laboratory, Galveston Bay, Texas

** 0.80 - Confidence limits

Figure 1: Texas Coast



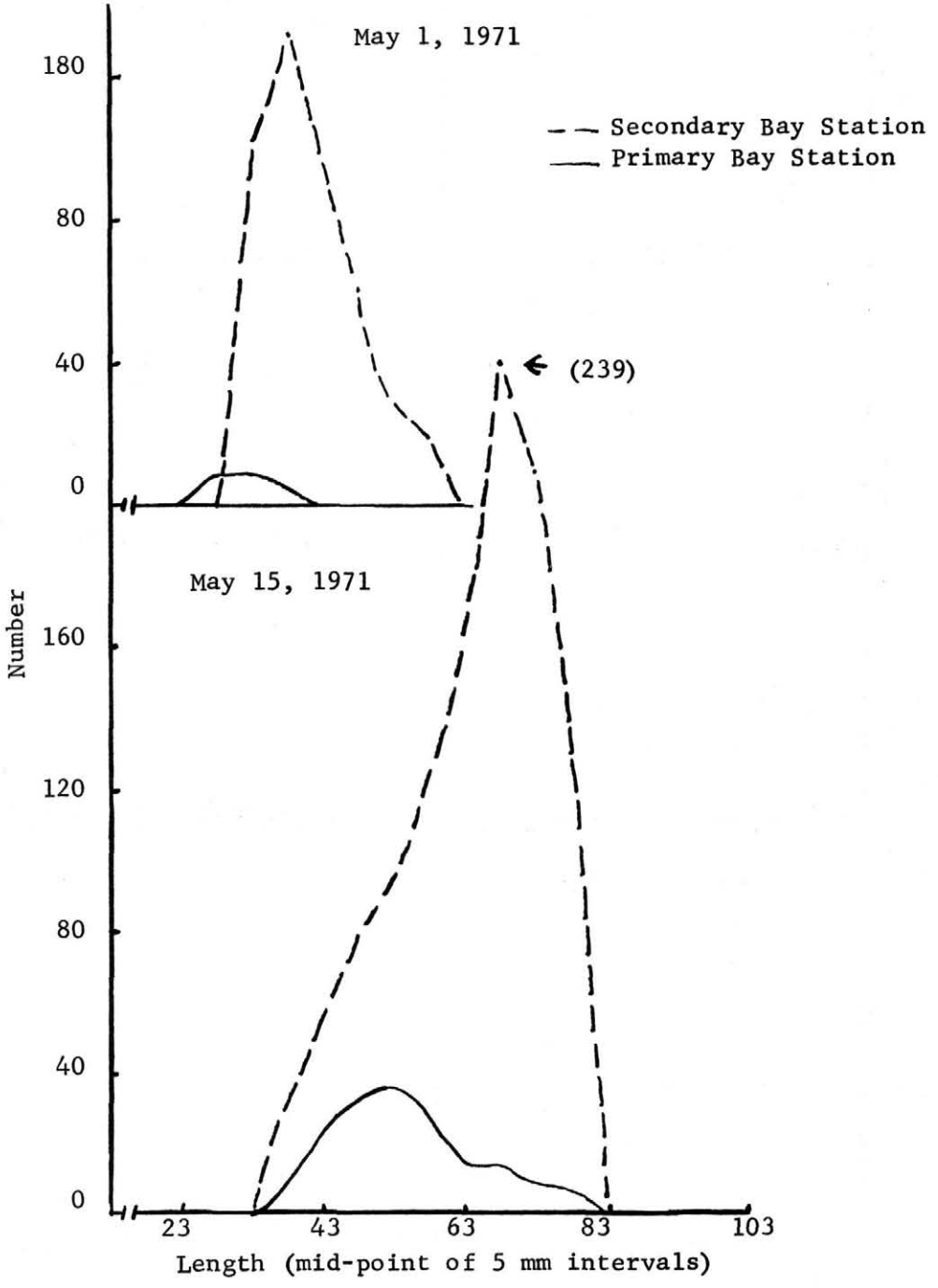


Figure 2: Length frequency distribution of brown shrimp, Sabine Lake 1971

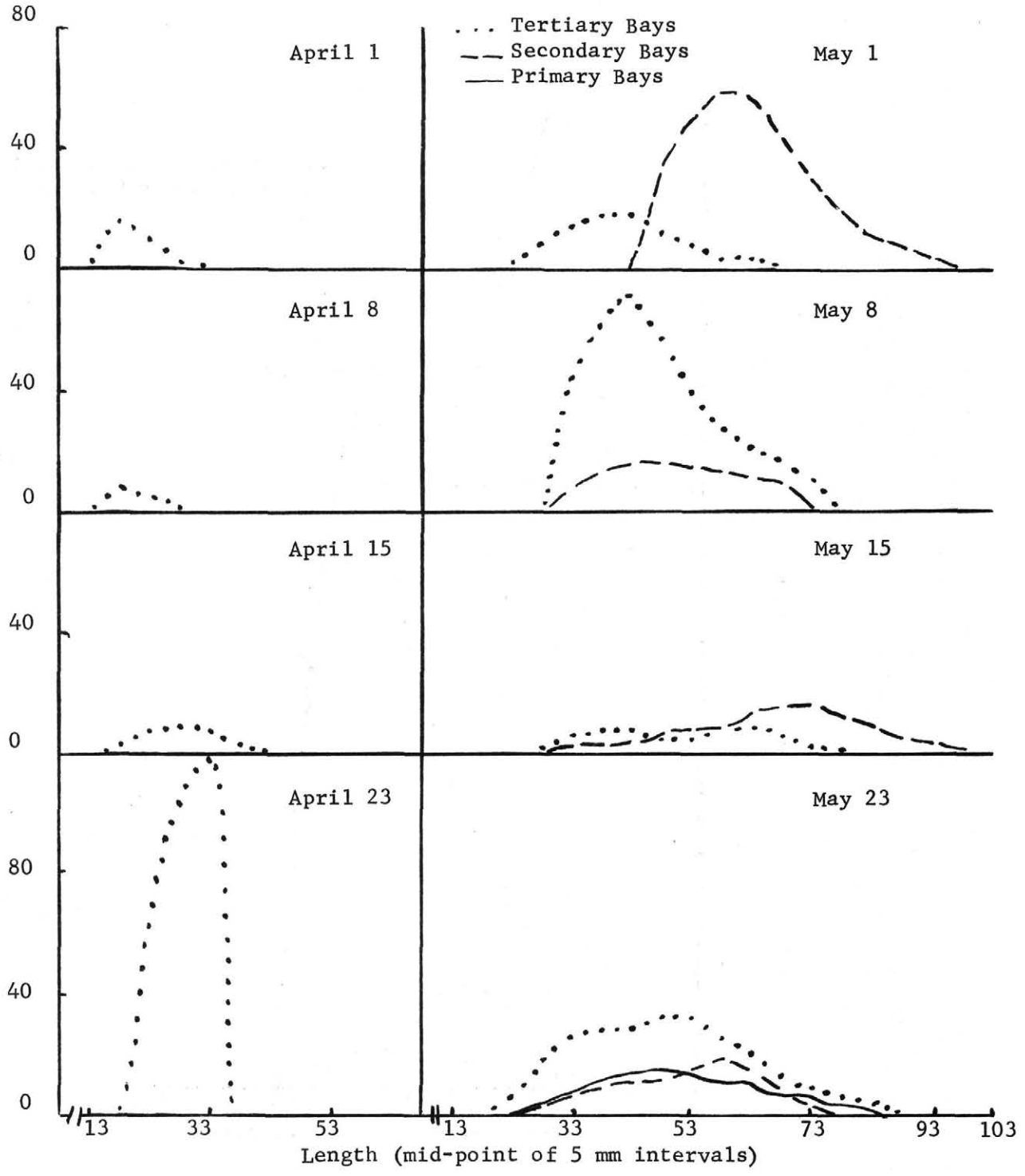


Figure 3: Weekly length-frequency distribution of brown shrimp, Galveston Bay, 1971 spring

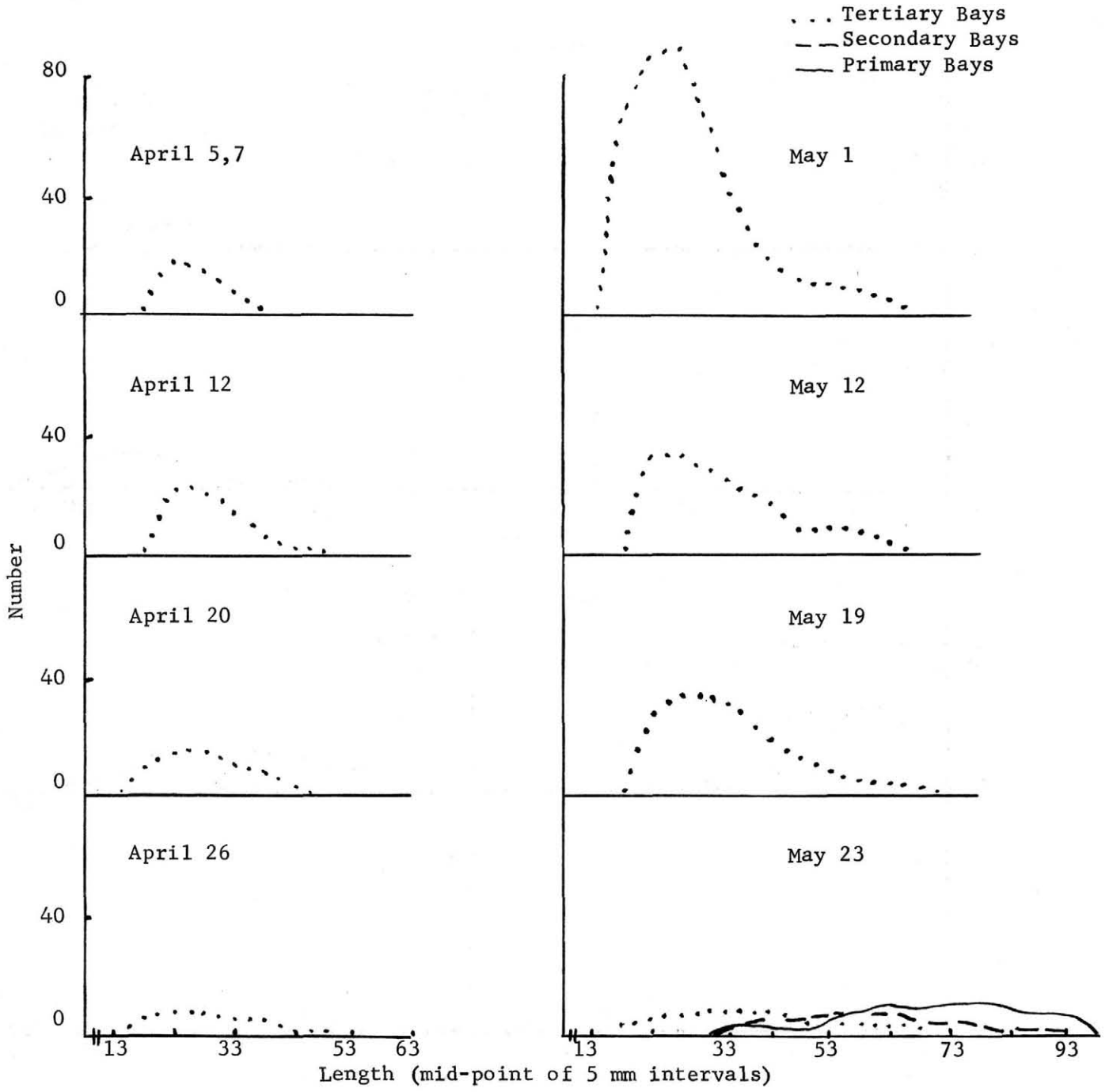


Figure 4: Weekly length frequency distribution of brown shrimp, Matagorda Bay, 1971 spring

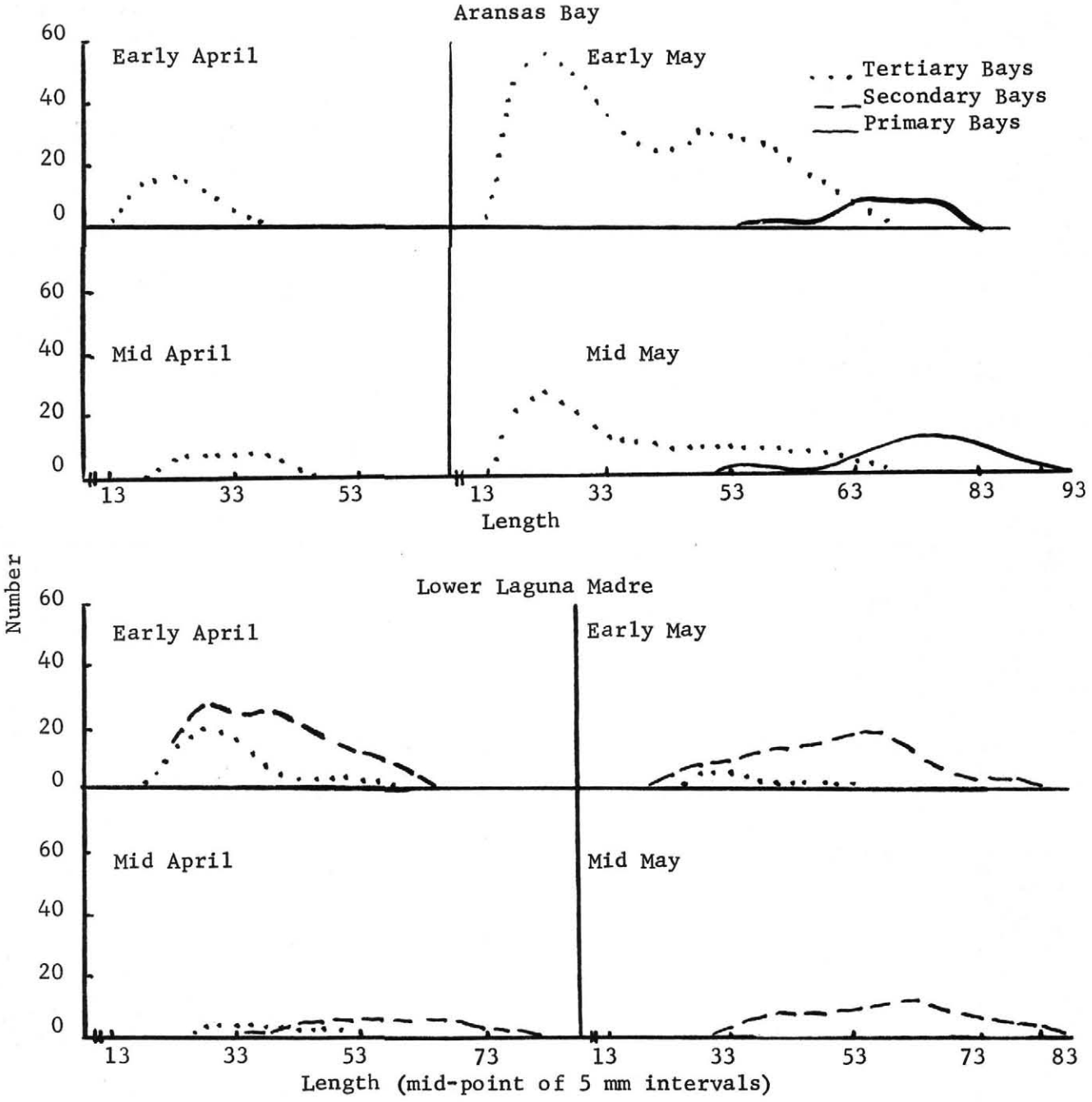


Figure 5: Semi-monthly length frequency distribution of brown shrimp, 1971 spring