

FISH COMMISSION OF OREGON
TRAWL INVESTIGATION

Report of Cruise 67-11, Shrimp

Vessel: MV Sunrise, chartered trawler

Dates: October 26-November 17, 1967

- Objectives:
1. To determine the vertical distribution of pink shrimp (Pandalus jordani).
 2. To collect associated oceanographic data.
 3. To compare size, sex, and age compositions of shrimp caught at various depths.
 4. To determine if ground fish is an effective attractant.
 5. To develop and refine techniques for handling shrimp pots.
 6. To obtain gravid female shrimp for egg counts.

Methods: From 34 to 37 shrimp pots were baited and fished for pink shrimp. The pots were attached at 5- or 10-fathom intervals to a main line. Two or four strings of pots were fished. Pot strings were pulled at 3- to 4-hour intervals for 24 hours. Frozen ground mink food, composed mostly of whole turbot (Atheresthes stomias), was used to bait each pot.

Pots were rebaited once during 24 hours of fishing. Shrimp and incidental fish caught were put in plastic bags and iced. All shrimp were sexed, measured, and weighed at the laboratory. The stomachs of incidentally caught fish were examined.

The exact depth at which the pots were fishing is unknown, however, an approximate depth can be obtained. The main lines were 85 to 90 fathoms long. An anchor with 20 feet of chain was used to anchor the strings. Pots were attached at 5- or 10-fathom intervals with the first pot just above the anchor chain. A final pot was attached within 5 fathoms of the surface. Tables 1-4 show the surface pot as No. 1 and end with the bottom pot.

During the cruise 3 tows were made with a 30-foot square midwater trawl. Fish caught were counted and weighed. A 1/2- to 1-pound shrimp sample was weighed, measured, and sexed. A time-depth recorder was used to obtain net depth.

Results: During the first trip (October 26-27) four strings were set just before dark with shrimp pots at 10-fathom intervals on each line. The strings were set approximately 200 yards apart. After 2 hours high winds resulted in termination of the trip. Three pots were lost while pulling string 4. Shrimp were caught in all but the uppermost pots of each string. A summary of the catch by pot is shown in Table 1. Five sablefish (Anoplopoma fimbria) were also caught in the pots.

Two strings of pots per set were fished at night during the second trip (November 1-2), with pots at 5-fathom intervals on each line. Again the shrimp catches were good, but we decided to terminate the trip after two sets to determine the unexplained loss of four pots during the first set. We found that the pots, which are attached to the main line by trolling clips, were looping around the clips and releasing themselves. Slight modifications of the clips corrected the problem. The shrimp catch by pot is shown in Table 2. Eight sablefish were also caught in the pots.

During trips three and four (November 3-5 and November 16-18) the pots were pulled at 3- to 4-hour intervals for 24 hours. The strings were set approximately 300 to 500 yards apart, with pots at 5-fathom intervals on each line. The results are shown in Tables 3 and 4. No shrimp were caught during the day (strings 7 and 8). Twenty sablefish were caught in the pots.

The midwater trawl was fished three times during the cruise and the tows are summarized in Table 5. Tow 2 was made to determine the approximate measurement of the vertical opening of the net. The time-depth recorder was alternately attached to the headrope and footrope of the net and towed for 15 minutes at the same warp length and rpm. The opening was estimated to be 7.2 meters or 23.7 feet.

A cursory examination of 33 sablefish stomachs revealed the following: 3 empty, 12 with unidentifiable contents, 6 with ground fish (bait) only, 1 with ground fish and a small rockfish, and 11 with shrimp. The sablefish ranged from 223 to 294 mm total length. Twenty-two whole shrimp were recovered and measured. Sixty-three gravid female shrimp were preserved for egg counts.

Four subsurface temperature profiles were taken with a bathythermograph and three bottom and three surface salinity samples.

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Table 1. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, October 26-27, 1967

Pot no.	String 1									String 2								
	Down 1745					Loran 2H4 3290				Down 1800					Loran 2H4 3290			
	Up 2200					Depth 65 fms.				Up 2130					Depth 65 fms.			
	Elapsed 4:15									Elapsed 3:30								
Numbers					Percent				Numbers					Percent				
M T F Total Shrimp/lb					M T F Gravid ^{1/}				M T F Total Shrimp/lb					M T F Gravid ^{1/}				
1	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	0	0	1	1	151	0.0	0.0	100.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
3	0	1	8	9	125	0.0	11.1	88.9	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
4	14	3	12	29	153	48.3	10.3	41.4	3.5	0	1	0	1	143	0.0	100.0	0.0	0.0
5	5	1	1	7	143	71.4	14.3	14.3	0.0	1	2	14	17	120	5.9	11.8	82.3	0.0
6	8	0	2	10	147	80.0	0.0	20.0	50.0	12	2	28	42	117	28.6	4.8	66.7	3.6
7	33	1	6	40	157	82.5	2.5	15.0	0.0	8	4	27	39	115	20.5	10.3	69.2	0.0
8	3	1	4	8	108	37.5	12.5	50.0	0.0	34	1	8	43	157	79.1	2.3	18.6	0.0
9	28	7	39	74	117	37.8	9.5	52.7	5.1	9	0	2	11	159	81.8	0.0	18.2	0.0
10			--				--					--				--		
Total	91	14	73	178						64	10	79	153					

^{1/} Percent gravid is number of gravid females expressed as a percent of total females.

M = males
T = transitionals
F = females

Table 1. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, October 26-27, 1967

Pot no.	String 3									String 4								
	Down 1815					Loran 2H4 3290				Down 1830					Loran 2H4 3290			
	Up 2100					Depth 65 fms.				Up 2030					Depth 65 fms.			
	Elapsed 2:45									Elapsed 2:00								
	Numbers					Percent				Numbers					Percent			
	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}
1	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
3	0	2	9	11	116	0.0	18.2	81.8	0.0	0	2	19	21	123	0.0	9.5	90.5	5.3
4	0	1	0	1	143	0.0	100.0	0.0	0.0	2	12	73	87	118	2.3	13.8	83.9	2.7
5	2	3	28	33	126	6.1	9.1	84.8	0.0	6	16	109	131	126	4.6	12.2	83.2	0.9
6	20	6	58	84	120	23.8	7.1	69.1	5.2	4	3	33	40	114	10.0	7.5	82.5	3.0
7	1	4	8	13	109	7.7	30.8	61.5	0.0	23	6	83	112	116	20.5	5.4	74.1	2.4
8	46	0	8	54	149	85.2	0.0	14.8	37.5	Pot lost				Pot lost				
9	7	2	9	18	111	38.9	11.1	50.0	22.2	"	"	"	"	"	"	"	"	"
10			--				--			"	"	"	"	"	"	"	"	"
Total	76	18	120	214						35	39	317	391					

^{1/} Percent gravid is number of gravid females expressed as a percent of total females.

M = males

T = transitionals

F = females

Table 2. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 1-2, 1967

Pot no.	String 1									String 2								
	Down 1520			Total Shrimp/lb	Loran 2H4 3285	Down 1530			Total Shrimp/lb	Loran 2H4 3280								
	Up 1930					Up 1845												
	Elapsed 4:10					Elapsed 3:15												
M	T	F	Percent	M	T	F	Percent	M	T	F	Percent							
1	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0	
2	0	0	0	0	0.0	0.0	0.0	0.0	0	0	1	1	101	0.0	0.0	100.0	100.0	
3	0	0	0	0	0.0	0.0	0.0	0.0	Pot lost				--					
4	0	0	0	0	0.0	0.0	0.0	0.0	" "				--					
5	0	0	0	0	0.0	0.0	0.0	0.0	1	0	2	3	97	33.3	0.0	66.7	50.0	
6	3	2	17	22	88	13.6	9.1	77.3	77.0	0	0	4	4	91	0.0	0.0	100.0	25.0
7	2	1	10	13	93	15.4	7.7	76.9	30.0	0	0	4	4	63	0.0	0.0	100.0	50.0
8	0	0	6	6	86	0.0	0.0	100.0	50.0	8	2	40	50	94	16.0	4.0	80.0	60.0
9	30	1	28	59	105	50.8	1.7	47.5	43.0	21	8	116	145	93	14.5	5.5	80.0	66.0
10	58	1	13	72	133	80.6	1.4	18.0	54.0	91	3	11	105	152	86.7	2.9	10.5	72.0
11	38	1	11	50	143	76.0	2.0	22.0	27.9	13	0	3	16	114	81.3	0.0	18.8	100.0
12	48	0	21	69	117	69.6	0.0	30.4	52.0	55	2	16	73	126	75.3	2.7	21.9	69.0
13	46	0	8	54	141	85.2	0.0	14.8	50.0	4	0	2	6	150	66.7	0.0	33.3	50.0
14	47	1	4	52	144	90.4	1.9	7.7	75.0	13	0	5	18	120	72.2	0.0	27.8	60.0
15	1	0	0	1	167	100.0	0.0	0.0	0.0	42	0	3	45	145	93.3	0.0	6.7	67.0
16	23	0	7	30	130	76.7	0.0	23.3	29.0	21	0	4	25	147	84.0	0.0	16.0	50.0
17	12	2	22	36	86	33.3	5.6	61.1	59.0	53	0	8	61	142	86.9	0.0	13.1	38.0
18	Pot lost					--				Pot lost				--				
Total	308	9	147	464						322	15	219	556					

1/ Percent of total females.

M = males
T = transitionals
F = females

Table 2. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 1-2, 1967

Pot no.	String 3									String 4									
	Down		2000		Loran	2H4		3272		Down		1915		Loran	2H4		3262		
	Up		2240			Depth		68 fms.		Up		2330			Depth		68 fms.		
	Elapsed		2:40		Numbers		Percent		Gravid ^{1/}		Elapsed		4:15		Numbers		Percent		Gravid ^{1/}
M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}		
1	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0	
2	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0	
3	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0	
4	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0	
5	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	1	1	114	0.0	0.0	100.0	0.0	
6	0	0	1	1	71	0.0	0.0	100.0	100.0	1	0	1	2	153	50.0	0.0	50.0	0.0	
7	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0	
8	0	0	0	0	0	0.0	0.0	0.0	0.0	0	1	0	1	114	0.0	100.0	0.0	0.0	
9	11	0	0	11	167	100.0	0.0	0.0	0.0	5	0	6	11	113	45.5	0.0	54.5	33.0	
10	85	0	0	85	164	100.0	0.0	0.0	0.0	48	4	11	63	135	76.2	6.3	17.5	73.0	
11	120	0	1	121	152	99.2	0.0	0.8	100.0	59	1	2	62	155	95.2	1.6	3.2	100.0	
12	96	1	7	104	151	92.3	1.0	6.7	43.0	63	0	1	64	161	98.4	0.0	1.6	0.0	
13	106	5	25	136	128	77.9	3.7	18.4	52.0	53	1	5	59	141	89.8	1.7	8.5	40.0	
14	183	3	47	233	128	78.5	1.3	20.2	64.0	81	3	13	97	139	83.5	3.1	13.4	31.0	
15	71	2	32	105	103	67.6	1.9	30.5	66.0	43	3	38	84	106	51.2	3.6	45.2	37.0	
16	41	3	42	86	137	47.7	3.5	48.8	45.0	36	3	18	57	119	63.2	5.3	31.6	28.0	
17	37	0	14	51	111	72.5	0.0	27.5	57.0	10	2	23	35	91	28.6	5.7	65.7	39.0	
Total	750	14	169	933						399	18	119	536						

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 3. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 3-5, 1967

Pot no.	String 1								String 2										
	Down 1630				Loran 2H4 3290				Down 1645				Loran 2H4 3290						
	Up 1930				Depth 68½ fms.				Up 2000				Depth 68½ fms.						
Elapsed 3:00								Elapsed 3:15											
Numbers					Percent					Numbers					Percent				
M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}		
1	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0		
2	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0		
3	0	0	1	1	114	0.0	0.0	100.0	0.0	0	0	2	2	77	0.0	0.0	100.0	50.0	
4	0	0	1	1	76	0.0	0.0	100.0	0.0	1	3	12	16	84	6.3	18.7	75.0	50.0	
5	0	0	10	10	89	0.0	0.0	100.0	10.0	1	0	28	29	85	3.4	0.0	96.6	50.0	
6	9	0	77	86	97	10.5	0.0	89.5	23.4	1	0	6	7	91	14.3	0.0	85.7	33.3	
7	0	4	40	44	82	0.0	9.1	90.9	40.0	4	1	63	68	87	5.9	1.5	92.6	31.7	
8	113	0	47	160	131	70.6	0.0	29.4	21.3	153	0	154	307	123	49.8	0.0	50.2	26.6	
9	44	0	16	60	130	73.3	0.0	26.7	31.3	87	0	17	104	142	83.7	0.0	16.3	11.8	
10	11	0	1	12	143	91.7	0.0	8.3	0.0	87	0	3	90	161	96.7	0.0	3.3	0.0	
11	1	0	0	1	151	100.0	0.0	0.0	0.0	91	0	11	102	146	89.2	0.0	10.8	27.3	
12	154	0	9	163	158	94.5	0.0	5.5	11.1	62	0	7	69	150	89.9	0.0	10.1	42.9	
13	88	0	4	92	157	95.7	0.0	4.3	50.0	131	0	4	135	155	97.0	0.0	3.0	0.0	
14	110	0	3	113	159	97.3	0.0	2.7	33.3	143	0	5	148	151	96.6	0.0	3.4	20.0	
15	105	0	6	111	153	94.6	0.0	5.4	50.0	80	0	4	84	160	95.2	0.0	4.8	50.0	
16	88	0	10	98	148	89.8	0.0	10.2	40.0	94	0	15	109	133	86.2	0.0	13.8	80.0	
17	3	0	7	10	83	30.0	0.0	70.0	42.9	29	3	48	80	91	36.3	0.0	60.0	58.3	
Total	726	4	232	962						964	7	379	1,350						

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 3. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 3-5, 1967

Pot no.	String 3								String 4									
	Down 1950				Loran 2H4 3288 Depth 68 fms.	Down 2014				Loran 2H4 3288 Depth 68 fms.								
	Up 2320 Elapsed 3:30					Up 2355 Elapsed 3:40												
	Numbers				Percent				Numbers				Percent					
M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	
1	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
3	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
4	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
5	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
6	0	0	0	0	0	0.0	0.0	0.0	0.0	3	0	0	3	114	100.0	0.0	0.0	0.0
7	1	0	4	5	143	20.0	0.0	80.0	25.0	0	0	0	0	0	0.0	0.0	0.0	0.0
8	40	0	126	166	103	24.1	0.0	75.9	37.3	10	0	21	31	98	32.3	0.0	67.7	42.9
9	89	0	52	141	128	63.1	0.0	36.9	25.0	14	0	28	42	92	33.3	0.0	66.7	46.4
10	98	0	32	130	141	75.4	0.0	24.6	43.8	180	0	26	206	157	87.4	0.0	12.6	46.2
11	175	0	20	195	152	90.0	0.0	10.0	50.0	267	2	20	289	150	92.4	0.7	6.9	60.0
12	125	0	8	133	153	94.0	0.0	6.0	37.5	231	0	7	238	167	97.1	0.0	2.9	57.1
13	263	0	7	270	151	97.4	0.0	2.6	71.4	200	0	4	204	160	98.0	0.0	2.0	25.0
14	127	0	2	129	158	98.4	0.0	1.6	50.0	103	0	0	103	161	100.0	0.0	0.0	0.0
15	207	0	5	212	157	97.6	0.0	2.4	20.0	137	0	6	143	152	95.8	0.0	4.2	50.0
16	81	0	43	124	119	65.3	0.0	34.7	51.2	88	0	0	88	159	100.0	0.0	0.0	0.0
17	18	0	43	61	85	29.5	0.0	70.5	55.8	60	0	91	151	90	39.7	0.0	60.3	55.9
Total	1,224	0	342	1,566						1,293	2	203	1,498					

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 3. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 3-5, 1967

Pot no.	String 5								String 6									
	Down 2345				Loran 2H4 3288				Down 0010				Loran 2H4 3288					
	Up 0340				Depth 68 fms.				Up 0410				Depth 68 fms.					
	Elapsed 3:55								Elapsed 4:00									
	Numbers				Percent				Numbers				Percent					
	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}
1	0	0	0	0	0	0.0	0.0	0.0	0.0	7	1	0	8	107	87.5	12.5	0.0	0.0
2	15	0	1	16	148	93.8	0.0	6.3	100.0	0	0	0	0	0	0.0	0.0	0.0	0.0
3	9	0	2	11	143	81.8	0.0	18.2	0.0	17	0	3	20	154	85.0	0.0	15.0	33.3
4	23	0	6	29	133	79.3	0.0	20.7	16.7	44	0	11	55	134	80.0	0.0	20.0	54.5
5	15	0	7	22	126	68.2	0.0	31.8	28.6	58	0	29	87	126	66.7	0.0	33.3	69.0
6	84	0	37	121	124	69.4	0.0	30.6	37.8	130	0	79	209	116	62.2	0.0	37.8	51.9
7	56	1	102	159	110	33.1	0.0	60.4	48.0	22	0	55	77	95	28.6	0.0	71.4	41.8
8	68	0	56	124	107	54.8	0.0	45.2	41.1	10	0	48	58	91	17.2	0.0	82.8	39.6
9	78	0	54	132	110	59.1	0.0	40.9	51.9	18	0	48	66	97	27.3	0.0	72.7	37.5
10	100	0	29	129	132	77.5	0.0	22.5	31.0	43	0	48	91	102	47.3	0.0	52.7	47.9
11	84	0	12	96	143	87.5	0.0	12.5	8.3	132	0	37	169	140	78.1	0.0	21.9	32.4
12	302	0	7	309	154	97.7	0.0	2.3	14.3	164	0	24	188	153	87.2	0.0	12.8	33.3
13	123	0	5	128	148	96.1	0.0	3.9	40.0	138	0	0	138	173	100.0	0.0	0.0	0.0
14	160	1	6	167	158	95.8	0.6	3.6	50.0	134	0	1	135	167	99.3	0.0	0.7	0.0
15	160	0	29	189	144	84.7	0.0	15.3	65.5	189	0	12	201	155	94.0	0.0	6.0	16.7
16	50	0	12	62	111	80.6	0.0	19.4	58.3	165	0	36	201	126	82.1	0.0	17.9	50.0
17	23	0	76	99	74	23.2	0.0	76.8	64.5	90	0	42	132	106	68.2	0.0	31.8	71.4
Total	1,350	2	441	1,793						1,361	1	473	1,835					

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 3. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 3-5, 1967

Pot no.	String 7								String 8									
	Down 0400				Loran 2H4 3290				Down 0430				Loran 2H4 3290					
	Up 0815				Depth 72 fms.				Up 0830				Depth 72 fms.					
	Elapsed 4:15				Percent				Elapsed 4:00				Percent					
	Numbers				Percent				Numbers				Percent					
	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}
1	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	10	0	0	10	156	100.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
3	0	0	0	0	0	0.0	0.0	0.0	0.0	1	0	0	1	227	100.0	0.0	0.0	0.0
4	0	0	0	0	0	0.0	0.0	0.0	0.0	12	0	0	12	164	100.0	0.0	0.0	0.0
5	41	0	27	68	116	60.3	0.0	39.7	37.0	0	0	0	0	0	0.0	0.0	0.0	0.0
6	60	0	41	101	112	59.4	0.0	40.6	65.9	16	0	2	18	129	88.9	0.0	11.1	50.0
7	6	0	20	26	96	23.1	0.0	76.9	25.0	10	0	1	11	143	90.9	0.0	9.1	0.0
8	12	0	21	33	100	36.4	0.0	63.6	33.3	11	1	3	15	125	73.3	6.7	20.0	66.7
9	4	0	19	23	77	17.4	0.0	82.6	36.8	8	0	1	9	141	88.9	0.0	11.1	0.0
10	18	0	47	65	94	27.7	0.0	72.3	31.9	12	0	29	41	85	29.3	0.0	70.7	44.8
11	9	2	28	39	93	23.1	5.1	71.8	35.7	33	0	22	55	95	60.0	0.0	40.0	54.5
12	13	0	9	22	110	59.1	0.0	40.9	33.3	15	0	8	23	110	65.2	0.0	34.8	62.5
13	15	0	16	31	86	48.4	0.0	51.6	37.5	9	0	4	13	108	69.2	0.0	30.8	50.0
14	15	0	12	27	104	55.6	0.0	44.4	41.7	18	0	9	27	113	66.7	0.0	33.3	44.4
15	9	0	7	16	107	56.3	0.0	43.7	71.4	13	0	11	24	96	54.2	0.0	45.8	18.2
16	18	0	32	50	91	36.0	0.0	64.0	43.8	19	0	10	29	100	65.5	0.0	34.5	60.0
17	36	0	37	73	99	49.3	0.0	50.7	43.2	15	0	17	32	94	46.9	0.0	53.1	47.1
Total	266	2	316	584						192	1	117	310					

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 4. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 16-18, 1967

Pot no.	String 1								String 2									
	Down 1920				Loran 2H4 3287				Down 1940				Loran 2H4 3287					
	Up 2250				Depth 68 fms.				Up 2320				Depth 68 fms.					
Elapsed 3:30								Elapsed 3:40										
Numbers				Percent				Numbers				Percent						
M T F Total Shrimp/lb				M T F Gravid ^{1/}				M T F Total Shrimp/lb				M T F Gravid ^{1/}						
1	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
3	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
4	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
5	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
6	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
7	0	0	0	0	0	0.0	0.0	0.0	0.0	10	0	0	10	189	100.0	0.0	0.0	0.0
8	1	0	0	1	168	100.0	0.0	0.0	0.0	19	0	0	19	201	100.0	0.0	0.0	0.0
9	34	0	0	34	168	100.0	0.0	0.0	0.0	51	0	0	51	174	100.0	0.0	0.0	0.0
10	13	0	0	13	162	100.0	0.0	0.0	0.0	41	0	0	41	181	100.0	0.0	0.0	0.0
11	109	0	0	109	168	100.0	0.0	0.0	0.0	28	0	0	28	160	100.0	0.0	0.0	0.0
12	30	0	0	30	203	100.0	0.0	0.0	0.0	24	0	0	24	165	100.0	0.0	0.0	0.0
13	11	0	0	11	170	100.0	0.0	0.0	0.0	4	0	0	4	191	100.0	0.0	0.0	0.0
14	4	0	0	4	154	100.0	0.0	0.0	0.0	5	0	0	5	171	100.0	0.0	0.0	0.0
15	8	0	0	8	165	100.0	0.0	0.0	0.0	4	0	0	4	165	100.0	0.0	0.0	0.0
16	3	0	0	3	151	100.0	0.0	0.0	0.0	39	0	0	39	162	100.0	0.0	0.0	0.0
17	72	0	0	72	160	100.0	0.0	0.0	0.0	94	0	0	94	179	100.0	0.0	0.0	0.0
18	95	0	0	95	160	100.0	0.0	0.0	0.0	128	0	0	128	156	100.0	0.0	0.0	0.0
Total	380	0	0	380						447	0	0	447					

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 4. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 16-18, 1967

Pot no.	String 3								String 4									
	Down 2310				Loran 2H4 3287				Down 2345				Loran 2H4 3287					
	Up 0315				Depth 68½ fms				Up 0350				Depth 68½ fms					
	Elapsed 4:05				Percent				Elapsed 4:05				Percent					
	Numbers			Shrimp/lb	Percent				Numbers			Shrimp/lb	Percent					
	M	T	F		M	T	F	Gravid ^{1/}	M	T	F		M	T	F	Gravid ^{1/}		
1	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0		
2	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0		
3	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0		
4	0	0	0	0	0.0	0.0	0.0	0.0	2	0	0	2	159	100.0	0.0	0.0	0.0	
5	0	0	0	0	0.0	0.0	0.0	0.0	1	0	0	1	162	100.0	0.0	0.0	0.0	
6	0	0	0	0	0.0	0.0	0.0	0.0	50	0	0	50	175	100.0	0.0	0.0	0.0	
7	0	0	0	0	0.0	0.0	0.0	0.0	247	0	0	247	169	100.0	0.0	0.0	0.0	
8	3	0	0	3	170	100.0	0.0	0.0	0.0	158	0	0	158	169	100.0	0.0	0.0	0.0
9	123	0	0	123	184	100.0	0.0	0.0	0.0	331	0	2	333	163	99.4	0.0	0.6	50.0
10	138	0	0	138	182	100.0	0.0	0.0	0.0	253	0	1	254	180	99.6	0.0	0.4	100.0
11	9	0	0	9	163	100.0	0.0	0.0	0.0	161	0	0	161	166	100.0	0.0	0.0	0.0
12	168	0	0	168	179	100.0	0.0	0.0	0.0	171	0	0	171	179	100.0	0.0	0.0	0.0
13	10	0	0	10	157	100.0	0.0	0.0	0.0	50	0	0	50	160	100.0	0.0	0.0	0.0
14	12	0	0	12	151	100.0	0.0	0.0	0.0	57	0	0	57	175	100.0	0.0	0.0	0.0
15	24	0	0	24	185	100.0	0.0	0.0	0.0	127	0	0	127	164	100.0	0.0	0.0	0.0
16	92	0	0	92	170	100.0	0.0	0.0	0.0	201	0	0	201	176	100.0	0.0	0.0	0.0
17		Pot lost				Pot lost				102	0	0	102	170	100.0	0.0	0.0	0.0
18	108	0	0	108	170	100.0	0.0	0.0	0.0	61	0	0	61	164	100.0	0.0	0.0	0.0
Total	687	0	0	687						1,972	0	3	1,975					

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 4. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 16-18, 1967

Pot no.	String 5								String 6									
	Down 0340				Loran 2H4 3285				Down 0410				Loran 2H4 3285					
	Up 0715				Depth 68 fms				Up 0745				Depth 68 fms					
	Elapsed 3:35								Elapsed 2:55									
	Numbers				Percent				Numbers				Percent					
	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}
1	1	0	0	1	146	100.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	0	0	0	0	0	0.0	0.0	0.0	0.0	2	0	0	2	171	100.0	0.0	0.0	0.0
3	11	0	0	11	158	100.0	0.0	0.0	0.0	7	0	0	7	154	100.0	0.0	0.0	0.0
4	52	0	0	52	162	100.0	0.0	0.0	0.0	24	0	1	25	162	96.0	0.0	4.0	100.0
5	62	0	0	62	165	100.0	0.0	0.0	0.0	165	0	0	165	169	100.0	0.0	0.0	0.0
6	17	0	0	17	164	100.0	0.0	0.0	0.0	259	0	4	263	176	98.5	0.0	1.5	100.0
7	118	0	1	119	158	99.2	0.0	0.8	100.0	213	0	7	220	176	96.8	0.0	3.2	100.0
8	472	0	4	476	172	99.2	0.0	0.9	100.0	122	0	1	123	178	99.2	0.0	0.8	100.0
9	249	0	0	249	170	100.0	0.0	0.0	0.0	133	0	0	133	165	100.0	0.0	0.0	0.0
10	178	0	4	182	164	97.8	0.0	2.2	75.0	105	0	0	105	171	100.0	0.0	0.0	0.0
11	235	0	2	237	169	99.2	0.0	0.8	50.0	143	0	0	143	169	100.0	0.0	0.0	0.0
12	252	0	0	252	156	100.0	0.0	0.0	0.0	45	0	1	46	156	97.8	0.0	2.2	100.0
13	31	0	0	31	160	100.0	0.0	0.0	0.0	40	0	0	40	175	100.0	0.0	0.0	0.0
14	92	0	1	93	171	98.9	0.0	1.1	100.0	79	0	2	81	165	97.5	0.0	2.5	100.0
15	85	0	1	86	159	98.8	0.0	1.2	100.0	66	0	0	66	170	100.0	0.0	0.0	0.0
16	79	0	4	83	159	95.2	0.0	4.8	100.0	81	0	12	93	147	87.1	0.0	12.9	100.0
17	39	0	15	54	124	72.2	0.0	27.8	80.0	56	0	33	89	112	62.9	0.0	37.1	90.9
Total	1,973	0	32	2,005						1,540	0	61	1,601					

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 4. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 15-E, 1967

Pot no.	String 9									String 10								
	Down			1400	Loran			2H4	3285	Down			1425	Loran			2H4	3285
	Up			1700	Depth			68 fms	Up			1720	Depth			68 fms		
	Elapsed			3:00	Numbers			Percent	Elapsed			2:55	Numbers			Percent		
	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}	M	T	F	Total	Shrimp/lb	M	T	F	Gravid ^{1/}
1	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
3	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
4	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
5	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
6	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
7	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
8	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
9	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
10	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
11	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
12	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
13	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
14	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
15	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
16	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
17	0	0	0	0	0	0.0	0.0	0.0	0.0	11	0	0	11	151	100.0	0.0	0.0	0.0
Total	0	0	0	0						11	0	0	11					

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 4. Pink shrimp sex, numbers, and percent by pot and string, cruise 67-11, November 16-18, 1967

Pot no.	String 11									String 12								
	Down 1715				Shrimp/lb	Loran 2H4 3285				Down 1740				Shrimp/lb	Loran 2H4 3285			
	Up 1945					Depth 68 fms				Up 2015					Depth 68 fms			
Elapsed 2:30				Percent				Elapsed 2:35				Percent						
Numbers				Shrimp/lb	Percent				Numbers				Shrimp/lb	Percent				
M	T	F	Total		M	T	F	Gravid ^{1/}	M	T	F	Total		M	T	F	Gravid ^{1/}	
1	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	0	0	0	0	0	0.0	0.0	0.0	0.0	1	0	0	1	130	100.0	0.0	0.0	0.0
3	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
4	1	0	0	1	162	100.0	0.0	0.0	0.0	0	0	0	0	0	0.0	0.0	0.0	0.0
5	0	0	0	0	0	0.0	0.0	0.0	0.0	3	0	0	3	172	100.0	0.0	0.0	0.0
6	51	0	0	51	181	100.0	0.0	0.0	0.0	29	0	0	29	173	100.0	0.0	0.0	0.0
7	57	0	2	59	166	96.6	0.0	3.4	100.0	74	0	0	74	175	100.0	0.0	0.0	0.0
8	191	0	1	192	166	99.5	0.0	0.5	100.0	217	0	0	217	174	100.0	0.0	0.0	0.0
9	23	0	0	23	161	100.0	0.0	0.0	0.0	271	0	0	271	177	100.0	0.0	0.0	0.0
10	39	0	0	39	167	100.0	0.0	0.0	0.0	142	0	1	143	171	99.3	0.0	0.7	100.0
11	195	0	3	198	166	98.5	0.0	1.5	33.3	99	0	1	100	172	99.0	0.0	1.0	0.0
12	81	0	0	81	163	100.0	0.0	0.0	0.0	74	0	0	74	165	100.0	0.0	0.0	0.0
13	158	0	0	158	167	100.0	0.0	0.0	0.0	100	0	0	100	175	100.0	0.0	0.0	0.0
14	263	0	1	264	195	99.6	0.0	0.4	100.0	136	0	0	136	182	100.0	0.0	0.0	0.0
15	260	0	0	260	204	100.0	0.0	0.0	0.0	190	0	1	191	171	99.5	0.0	0.5	0.0
16	132	0	0	132	158	100.0	0.0	0.0	0.0	172	0	0	172	163	100.0	0.0	0.0	0.0
17	161	0	59	220	125	73.2	0.0	26.8	91.5	84	0	44	128	151	65.6	0.0	34.4	93.2
Total	1,612	0	66	1,678						1,592	0	47	1,639					

^{1/} Percent of total females.

M = males
T = transitionals
F = females

Table 5. Summary of midwater tow data, cruise 67-11

Tow no.	Date	Loran (2H4)		Bottom depth (fms)	Time down (PST)	Tow time (min)	Warp length (fms)	Recorder depth (fms)	Shrimp catch (lbs)	Shrimp per pound
		Down	Up							
1	11-4	3288	3253	67-70	1810	58	175	49	10	145
2	11-5	3400	3420	42-45	0752	42	25	9	0	-
3	11-17	3282	3265	69-72	2047	47	200	59½	2	153