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OCEAN SHRIMP REPORT
1978 SEASON

by

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TWENTY-SECOND ANNUAL SHRIMP REPORT

MARINE RESOURCES

Administrative Report No. 79-13

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ABSTRACT

Statewide Pacific ocean shrimp, *Pandalus jordani*, landings totaled 13,163,243 lb, down about 2.5 million lb from the 1977 record catch of 15,639,584 lb. However, the 1978 landings were still the second highest on record. Area A (Eureka-Crescent City) landings were the second highest in history with landings of 11,101,895 lb. Landings of 2,061,348 lb in Area B-1 (Fort Bragg) broke all existing records for the bed. The previous record was 799,722 lb landed in 1961. No landings were reported for Areas B-2 (Bodega Bay) and C (Avila-Morro Bay). In Area A the average catch per hour for the season for single-rig vessels was 581 lb and 862 lb for double-rig vessels. Area B-1 average catch per hour was 819 lb and 1,069 lb per hour for single-rig and double-rig vessels, respectively. Two-year-old (1976 year class) shrimp dominated the catches during the first three months in Area A and throughout the season in Area B-1. One-year-old (1977 year class) shrimp dominated the catches in Area A from July to the end of the season. Catches during the first part of October in Area A fell below the established criteria for keeping the season open. This necessitated closing the season two weeks early.

1/ Marine Resources Administrative Report No. 79-13

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INTRODUCTION

California's 1978 Pacific ocean shrimp, *Pandalus jordani*, landings totaled 13,163,243 lb. Although not as high as last year's record catch of 15,639,584 lb, the landings are the second highest in history.

Eureka-Crescent City landings of 11,101,895 lb represented the second largest catch ever recorded in this area. Landings of 2,061,348 lb at Fort Bragg broke all existing records for the bed. The previous record was 799,722 lb landed in 1961. Two-year-old (1976 year class) shrimp dominated the catches during the first three months of the season in the Eureka-Crescent City area. One-year-old shrimp (1977 year class) dominated the catches from the middle to the last of the season. Two-year-old shrimp dominated the catches in the Fort Bragg area throughout the season.

Price to the fishermen began at 26¢ per lb in April, then increased to 28¢ on August 28, for the remainder of the season.

AREA A

Area A landings from the ports of Crescent City and Eureka totaled 11,101,895 lb for 1978. This was the second largest catch ever recorded for Area A, exceeded only by 1977's 13,061,191 lb. Shrimpers landed 1,371,000 lb in Crescent City, which had been caught in Oregon's Areas 19 and 20 (Cape Blanco to the California border).

Fishing commenced on April 16 with most of the effort concentrated off Point Saint George through mid-June, shifting to the Redding Rock-Klamath River area in 50 to 90 fm during July. The boats alternated between these two areas throughout the remainder of the season (Figure 1). By the end of the season a total of 66 vessels, 36 single-rigged and 30

double-rigged, had engaged in the fishery (Table 1), a record number for this area.

The average catch per hour in late August and September dropped drastically from the preceding month. Catches during the first part of October fell below the established criteria for keeping the season open. This necessitated closing the season two weeks early. The season's average catch rate was 713 lb per hour with the single-rigged vessels averaging 581 lb per hour and double-riggers averaging 862 lb per hour (Table 1).

Two-year-old, 1976 year class shrimp dominated the fishery in percent by number and percent by weight during April, May, and June. From July on, one-year-old shrimp dominated the fishery in percent by number and was only slightly less than that for two-year-old shrimp in percent by weight (Table 2). One-year-old male shrimp in the catch increased from 2.6% in April to a high of 57.1% in September (Table 3).

The average size of all age classes of shrimp caught during the 1978 season were larger than the corresponding age classes during the 1977 season (Table 4).

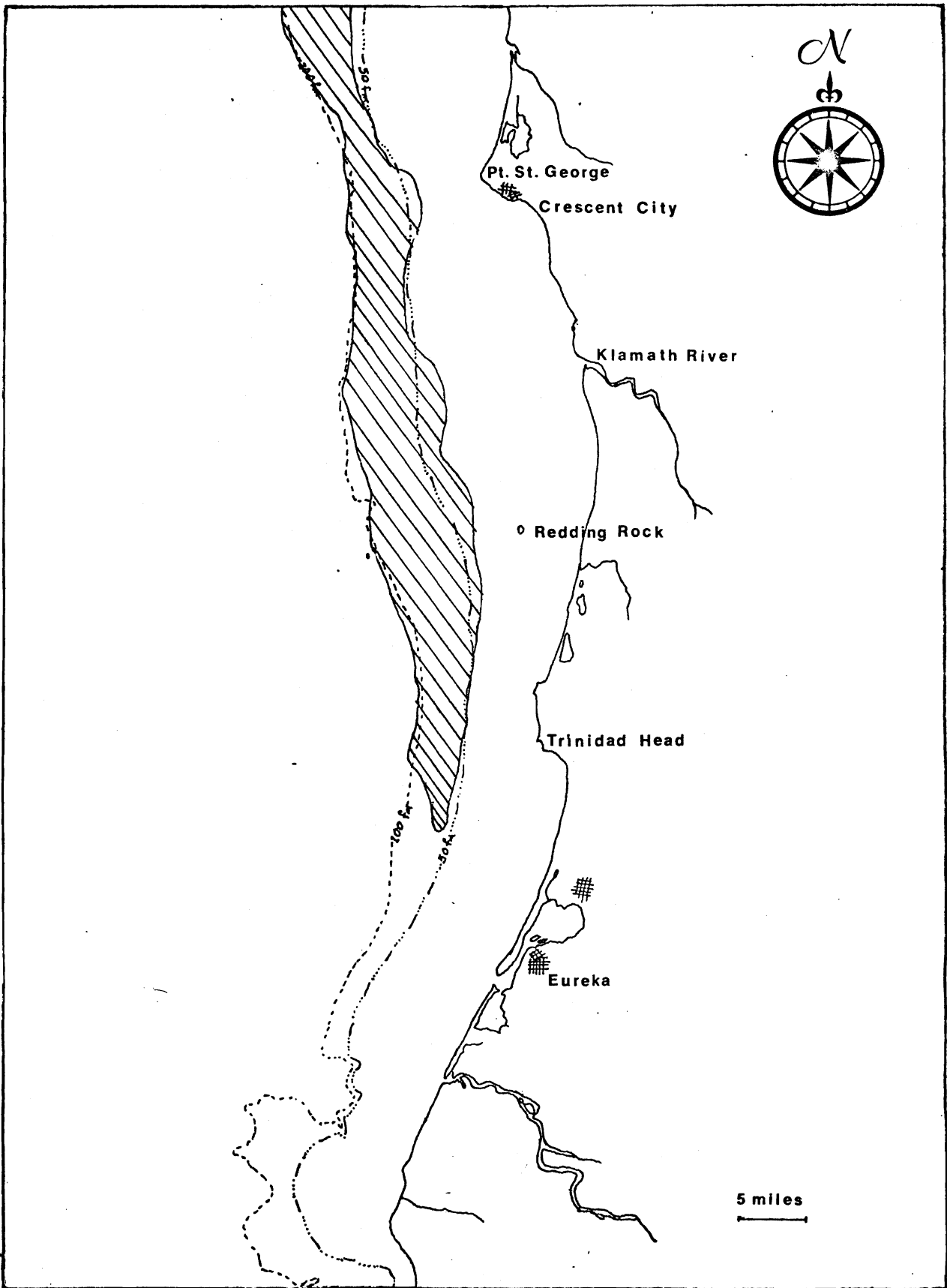


Figure 1. Area A Pacific ocean shrimp, *Pandalus jordani*, catch locations, 1978.

TABLE 1. Area A Monthly Catch and Effort Data, 1978 Season

Month	Pounds ^a landed	Effort ^b (hours)	Pounds ^b per hour	Vessels	Trips
<u>Single-rig Vessels</u>					
April	200,698	375.9	534	19	67
May	924,670	1,267.8	724	26	204
June	1,100,649	1,893.2	574	27	218
July	1,661,848	2,284.4	727	28	241
August	1,394,259	2,643.2	520	28	340
September	366,731	964.7	356	26	108
October	147,501	383.1	314	13	42
Totals	5,796,356	9,812.3	581 ^c	36 ^d	1,220
<u>Double-rig Vessels</u>					
April	142,492	61.7	2,310	2	7
May	464,192	234.5	1,956	9	25
June	531,720	503.9	976	10	33
July	989,284	812.5	1,214	15	56
August	1,677,910	1,927.7	845	23	122
September	971,801	1,379.5	581	23	83
October	528,140	844.3	541	24	56
Totals	5,305,539	5,764.0	862 ^c	30 ^d	382
<u>All Vessels</u>					
Season Totals	11,101,895	15,576.5	713 ^c	66 ^d	1,602

a Pounds landed are total pounds

b Effort and Pounds per hour based upon boat logs

c Mean

d Total vessels that made landings

TABLE 2. Area A Count Per Pound and Year Class Composition of Shrimp, 1978 Season

Month	Count per lb	Age class percent by number				Age class percent by weight			
		0	I	II	III	0	I	II	III
April	95	-	3.7	89.5	6.8	-	1.5	89.1	9.4
May	106	-	25.9	66.4	7.7	-	12.9	75.2	11.9
June	110	-	40.2	54.0	5.8	-	23.8	66.2	10.0
July	114	-	56.9	40.3	2.8	-	40.0	54.4	5.6
August	105	-	60.3	37.6	2.1	-	43.8	52.0	4.2
September	111	0.1	78.7	20.3	1.0	.01	65.7	32.0	2.3
October	87	0.8	52.4	44.8	2.0	.11	39.8	56.9	3.2

TABLE 3. Year Class and Sex Composition of Area A Shrimp by Month, 1978 Season (Percentages)

Month	0	Males			Transitionals			Females		
		I	II	III	I	II	III	I	II	III
April	-	2.6	3.4	-	0.9	30.8	-	0.1	55.3	6.8
May	-	21.4	0.6	-	4.4	24.6	-	0.1	41.2	7.7
June	-	33.2	1.9	-	6.3	19.4	-	.7	32.7	5.8
July	-	45.8	2.0	-	10.1	14.1	-	1.0	24.2	2.8
August	-	43.9	0.4	-	14.0	12.2	.06	2.3	25.0	2.1
September	.1	57.1	0.1	-	11.9	2.5	-	9.7	17.7	1.0
October	.8	33.1	-	-	6.0	1.5	-	13.3	43.3	2.0

TABLE 4. Average Carapace Length (mm) of Area A Shrimp, 1977 and 1978 Seasons

Season (Year Class)	I		II		III	
	1977 (1976)	1978 (1977)	1977 (1975)	1978 (1976)	1977 (1974)	1978 (1975)
April	13.4	15.1	17.7	20.1	22.0	22.9
May	13.8	15.5	18.0	20.4	21.9	22.8
June	14.2	16.0	18.1	20.7	21.9	23.5
July	15.2	16.6	18.8	20.9	22.6	23.6
August	15.7	17.2	19.1	21.3	22.8	23.9
September	16.3	17.6	19.5	21.9	22.8	24.5
October	16.8	18.4	20.3	22.3	23.4	24.2

OUTLOOK

At the end of the 1978 season the catch-per-unit-of-effort and the total catch were very low. Because of this, the outlook for 1979 does not look very bright - even though a high percentage of the catch was composed of one-year-old shrimp during the last part of the season.

AREA B-1

Area B-1 (Fort Bragg) landings of 2,061,348 lb broke all existing records for the bed. The previous record was 799,722 lb landed in 1961 under the quota system.

Fishing began on April 23 with the primary fishing effort focused off Usal in 75 to 80 fm. Four tows north of this productive area and 12 tows scattered south to Kibesillah produced no catch. In May, single-rig vessels concentrated effort between Cape Vizcaino and Abalone Point in 69 to 75 fm, while double-rig vessels continued to fish at a considerably higher catch rate off Usal to Cape Vizcaino in 64 to 75 fm. Tows in shallower and deeper water produced no catch. Total fishing effort in June was split into two areas: off Usal in 55 to 70 fm early in the month and off Cape Vizcaino in 70 to 90 fm later in the month. Again, tows were made south of the productive fishing areas with no success. The whole fishery shifted north to the East-West tows off Jackass Gulch to Usal in July through September, divided in depths between 48 to 65 fm and 70 to 85 fm. Tows were made in the previously productive areas off Cape Vizcaino with no success. Fishing in October was dominated by double-rig trawlers fishing from Mistake Point to Cape Vizcaino with best catches occurring in the area fished July through September. Eight tows, scattered south to Bruhel Point, were unproductive.

It appeared considerable movement of the shrimp population occurred and seemed to correlate well with upwelling and current patterns. Although the areas producing shrimp throughout the season collectively formed a bed 5.5 miles wide by 15.5 miles long (Figure 2), no more than 32% ($\bar{x} = 24\%$) of that area produced commercial quantities of shrimp in any one month.

quantities of shrimp in any one month.

Area B-2 (Bodega Bay) failed to produce any commercial quantities of shrimp, shifting that fleet's effort into Area B-1. Six local trawlers entered the fishery, primarily due to the strike for higher bottomfish prices. Two single-rig vessels and five double-rig vessels from the Eureka-Crescent City area fished Area B-1 and landed in Eureka.

In all, 13 single-rig trawlers made 253 trips, averaging 819 lb per hour. Five double-rig vessels made 39 trips (usually consisting of two or more fishing days) averaging 1,069.1b per hour (Table 5). The overall catch per hour of 887 lb was the fourth highest in the bed's history and was expected to be higher, but probably was affected by the considerable movement by the shrimp population.

Two-year-old shrimp dominated the catch in numbers (with the exception of August) and in weight throughout the season (Table 6). Count per lb remained unusually low throughout the season providing a very desirable processing product.

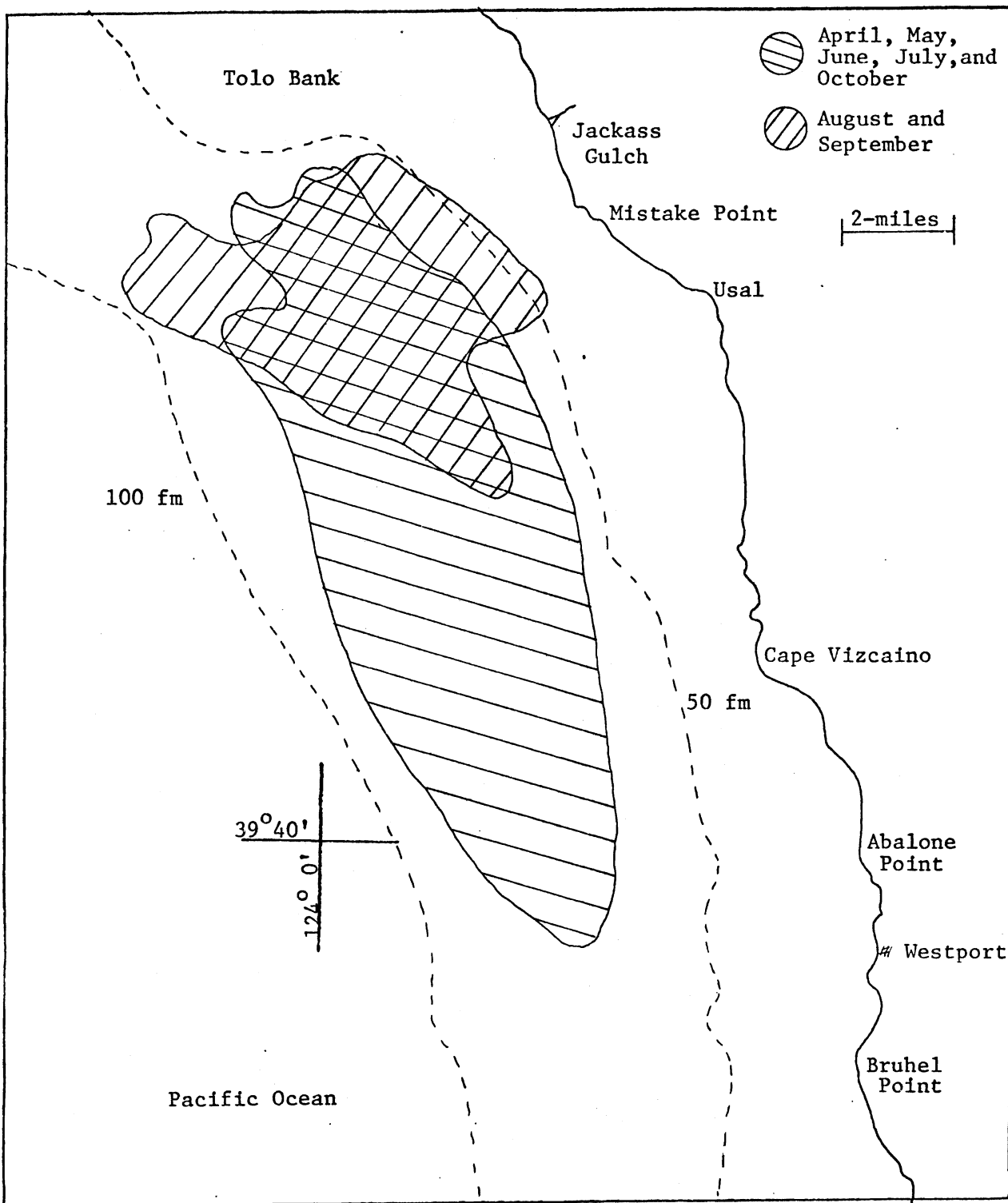


Figure 2. Pacific ocean shrimp, *Pandalus jordani*, catch locations, 1978.

TABLE 5. Area B-1 Monthly Catch and Effort Data, 1978

<u>Single-rig Vessels</u>					
Month	Pounds landed	Effort (hours)	Pounds per hour	Vessels	Trips
April	33,796	49.5	683	3	6
May	52,685	111.1	474	7	26
June	233,250	341.3	683	7	57
July	392,445	411.5	954	9	61
August	557,500	558.9	997	10	63
September	116,156	213.9	543	10	38
October	1,130	6.7	170	2	2
Totals	1,386,962	1692.9	* 819	+13	253
<u>Double-rig Vessels</u>					
Month	Pounds landed	Effort (hours)	Pounds per hour	Vessels	Trips
April	0	0	0	0	0
May	247,591	142.4	1,740	3	12
June	153,351	85.9	1,786	3	6
July	49,845	38.3	1,302	3	3
August	58,449	60.9	960	4	4
September	11,432	30.9	371	3	3
October	153,718	272.4	595	4	11
Totals	674,386	630.8	* 1,069	+5	39
All Vessels					
Season Totals	2,061,348	2,323.7	887	18	292

* Mean

+ Total vessels which made landings.

TABLE 6. Area B-1 Count Per Pound and Year Class Composition of Shrimp, 1978 Season.

Month	Count per lb	Age Class percent by number				Age Class percent by weight			
		0	I	II	III	0	I	II	III
April	90	-	8.6	82.3	9.1	-	4.4	83.9	11.7
May	111	-	22.2	74.4	3.4	-	12.4	82.1	5.5
June	108	-	26.4	72.5	1.1	-	16.0	82.1	1.9
July	96	-	28.3	69.3	2.4	-	18.7	77.6	3.7
August	106	-	52.8	45.8	1.4	-	39.4	58.0	2.6
September	98	-	43.6	54.0	2.4	-	31.6	64.5	3.9
October	88	-	41.3	55.8	3.1	-	30.2	65.3	4.5

Two-year-old females dominated the catch by percent April through July and October, while one-year-old males entering the fishery in August and September dominated the landings for those months (Table 7).

TABLE 7. Year Class and Sex Composition of Area B-1 Shrimp by Month, 1978 Season (Percentages).

Month	Males				Transitionals			Females		
	0	I	II	III	I	II	III	I	II	III
April	-	8.6	19.6	-	-	19.1	-	-	43.6	9.1
May	-	18.8	12.4	-	3.1	28.1	0.02	0.3	33.9	3.4
June	-	20.9	7.9	-	5.4	29.9	-	0.08	34.7	1.1
July	-	25.4	10.4	-	3.0	26.0	1.2	-	32.8	1.1
August	-	43.7	4.1	-	7.6	18.3	0.13	1.4	23.4	1.3
September	-	33.9	3.8	-	6.3	25.0	-	3.4	25.2	2.4
October	-	34.6	1.0	-	3.9	5.7	0.03	2.8	48.9	3.1

Although carapace lengths for all year classes landed in 1978 exceeded 1976 and 1977 carapace lengths, the difference was considerable in one-year-olds (Table 8). For those months fished during 1976-78, the average carapace length of the 1978 one-year-olds was 1.65 mm more than that for the 1976 one-year-olds and .93 mm more than that for the 1977 one-year-olds.

TABLE 8. Average Carapace Length (mm) of Area B-1 Shrimp, 1976-1978 Seasons.

Season	I			II			III		
	1976	1977	1978	1976	1977	1978	1976	1977	1978
April	13.6	-	15.3	18.9	-	19.6	21.5	-	22.2
May	13.6	-	15.6	19.2	-	19.8	21.5	-	22.7
June	13.8	14.7	15.9	19.2	18.7	19.9	21.8	22.4	22.6
July	14.6	15.4	16.1	19.4	19.3	20.0	21.8	22.3	22.3
August	15.3	-	16.5	20.0	-	20.2	21.9	-	22.6
September	15.7	16.1	17.0	20.0	20.0	20.4	22.0	22.6	22.9
October	-	16.8	17.3	-	20.5	20.7	22.6	-	22.6

Average weight per shrimp further amplifies the annual growth differences. For shrimp landed in June and July 1978, one-year-olds averaged 74% heavier than 1976 one-year-olds; two-year-old shrimp averaged 22% heavier, and 1978 three-year-olds averaged 23% heavier than those in 1976. Although average carapace lengths account for some of the difference, 1978 shrimp were heavier in all year classes, making a considerable contribution to the total biomass landed (Table 9).

TABLE 9. Average Weight (g) of Area B-1 Shrimp, 1979 Season.

Month	I			II			III		
	1976	1977	1978	1976	1977	1978	1976	1977	1978
April	1.40	-	2.57	4.20	-	5.18	6.14	-	6.4
May	1.44	-	2.27	4.10	-	4.51	5.40	-	6.54
June	1.45	2.05	2.54	3.96	3.69	4.76	5.41	5.82	7.00
July	1.84	2.16	3.14	4.26	4.08	5.32	5.97	6.03	7.30
August	1.96	-	3.19	4.63	-	5.41	5.69	-	7.58
September	-	2.87	3.34	-	5.14	5.52	-	6.9	7.73
October	-	2.90	3.77	-	5.23	6.07	-	8.3	7.39

Forty-five percent of the females sampled during week Number 2 were ovigerous, dropping to 19% by week Number 4 and to only one individual during week Number 6. Headroe was first noted September 1, present in 19% of the females and increasing to 30% by mid-October.

OUTLOOK

Catch per hour dropped considerably the last two months of the season. The 1977 year class (one-year-olds) in August through October accounted for 53, 44, and 41% of the landings, respectively, and are expected to contribute substantially to the 1979 fishery as two-year-olds. A good carry over of the 1978 two-year-olds is expected to make a fair contribution as three-year-olds in the early part of the 1979 season and hopefully, a good 1978 year class as one-year-olds will contribute the later part of the season. Excluding the unusual 1978 record landings and any unusual behavioral patterns in shrimp movement, the 1979 season is expected to be good compared to previous years.

AREA B-2

Area B-2 (Bodega Bay) fishermen were unable to find shrimp in commercial quantity and made no landings. A total of 44 exploratory tows, which encompassed 19 hours, were conducted from off Bodega Head to Stewart's Point in 40 to 104 fm. The fishermen tried during April, May, and August.

AREA C

No landings or effort was reported from this area.