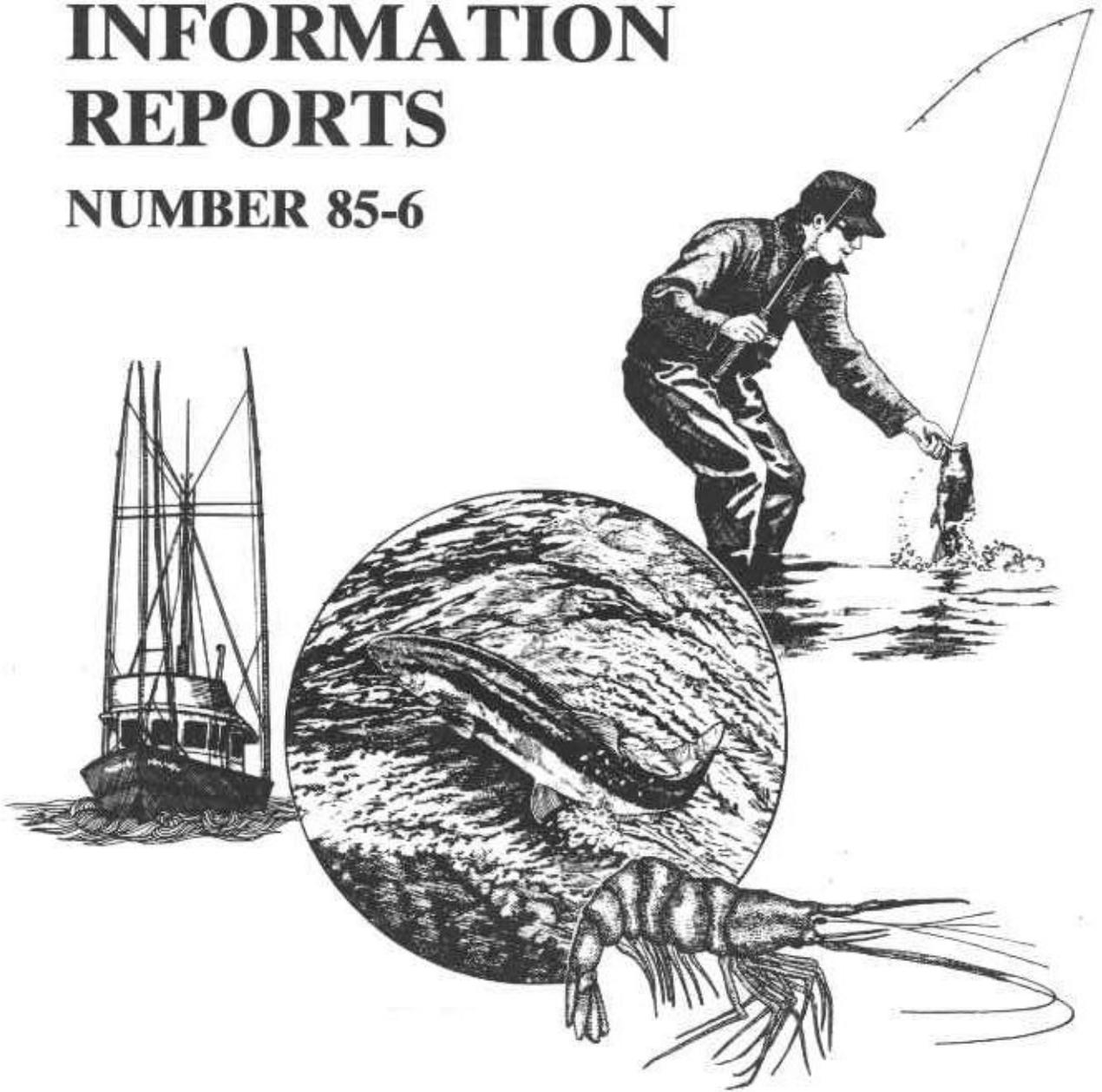


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Oregon Department of Fish and Wildlife

The 1984 Oregon Shrimp Fishery

THE 1984 OREGON SHRIMP FISHERY

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Malcolm H. Zirges

Shrimp Investigations
Report 85-6

Oregon Department of Fish and Wildlife
Marine Region
Newport, Oregon 97365

June 1985

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INTRODUCTION

Ocean pink shrimp (Pandalus jordani) fishery statistics were obtained by the Oregon Department of Fish and Wildlife (ODFW) from fishermen's logbooks, fish tickets, and market samples taken by Marine Region personnel. Monthly catch and effort statistics, age composition, count per pound (grade) and incidental groundfish landed catch were estimated from these sources.

Some catch and effort statistics for Alaska, British Columbia, Washington, and California are also presented in this report. These data were compiled from information gathered in written or oral form from the appropriate state or Canadian resource agency personnel.

Data provided in this report summarize the 1984 pink shrimp fishery primarily for Oregon. A brief discussion including some data for other Pacific coast shrimp fisheries is provided to put Oregon's fishery into perspective with the total coastwide fishery.

THE 1984 OREGON SHRIMP FISHERY

Catch and Effort

Oregon pink shrimp (Pandalus jordanii) landed catch in 1984 totaled 4,844 thousand pounds (2,197 mt), 26% less than the 6,547 thousand pounds (2,970 mt) landed in 1983 (Figure 1). This was the lowest season total since 1966 when 4,751 thousand pounds (2,155 mt) were landed. Astoria ranked highest with total landings of 1,625 thousand pounds (737 mt); but also the largest decline (48.5%) in production from 1983. Newport landings declined 14.9% to 1,276 thousand pounds (579 mt). Coos Bay landings increased 26% to 1,554 thousand pounds (705 mt) (Table 1).

Table 1. Annual shrimp landings at Oregon ports 1981-84 in thousands of pounds. 1/

Port	1981	1982	1983	1984	% Change 83-84
Astoria	8,061 2/	6,232	3,154	1,625	48.5
Garibaldi	1,312	928	462	281	39.2
Newport	7,000	4,433	1,499	1,276	14.9
Winchester Bay	348	331	85	3/	-
Coos Bay	8,126	5,543	1,233	1,554	126.0
Port Orford	4	-	-	-	-
Gold Beach	2	-	-	-	-
Brookings	1,065	995	114	108	5.3
Total	25,918	18,462	6,547	4,844	26.0

1/ Figures represent only the shrimp poundage landed at each port, not the poundage that was processed (Some was transhipped to other ports).

2/ Includes 207.9 thousand pounds caught of southeast Alaska.

3/ Less than 1,000 pounds landed.

A total of 59 vessels landed shrimp in Oregon in 1984, 71 fewer than in 1983 (Table 3, Figure 2). This was the fourth consecutive

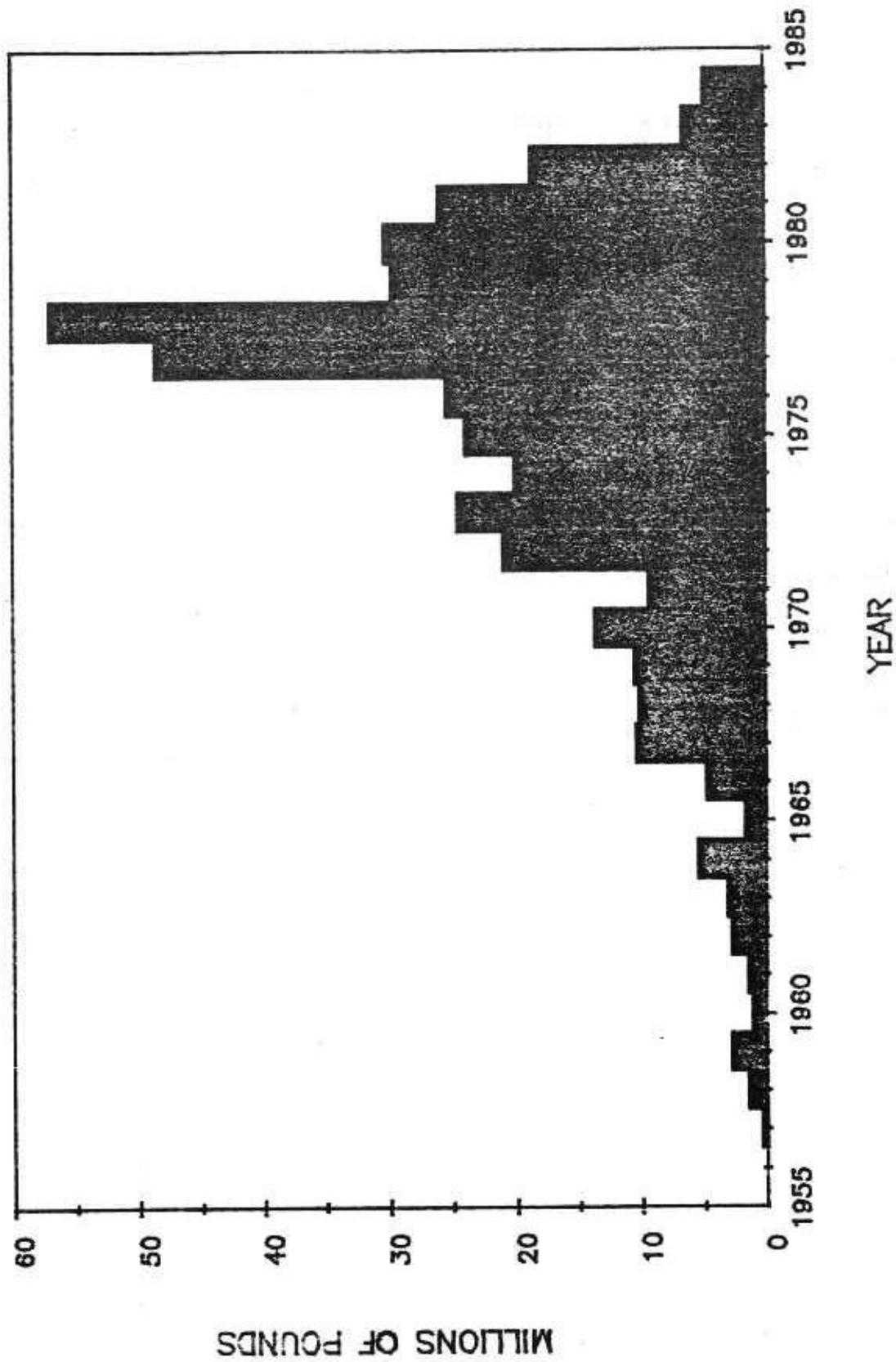


Figure 1. Annual Oregon Shrimp Landed Catch, 1957-1984.

Table 2. Number of Vessels Delivering Shrimp into Oregon by Port, 1983-84.

Port	Home Port		Transient 1/		Out-of-State		Total	
	1983	1984	1983	1984	1983	1984	1983	1984
Astoria	21	13	20	4	9	1	50	18
Garibaldi	7	1	10	3	-	-	17	4
Newport	33	11	19	2	1	2	53	15
Win. Bay	5	1	1	-	-	-	6	1
Coos Bay	39	20	13	8	13	11	65	39
Brookings	7	1	3	1	2	1	12	3
Total Oregon	112	47						
Out-of-State								
California	13	9						
Washington	5	3						
Total Vessels Delivering to Oregon ports	130	59	2/					

1/ Oregon vessels which delivered to ports other than their home port.

2/ Oregon double-rig count was 36 for 1984.

Figure 2. Annual Number of Shrimp Vessels by Gear in the Oregon Shrimp Fishery, 1957-1984.

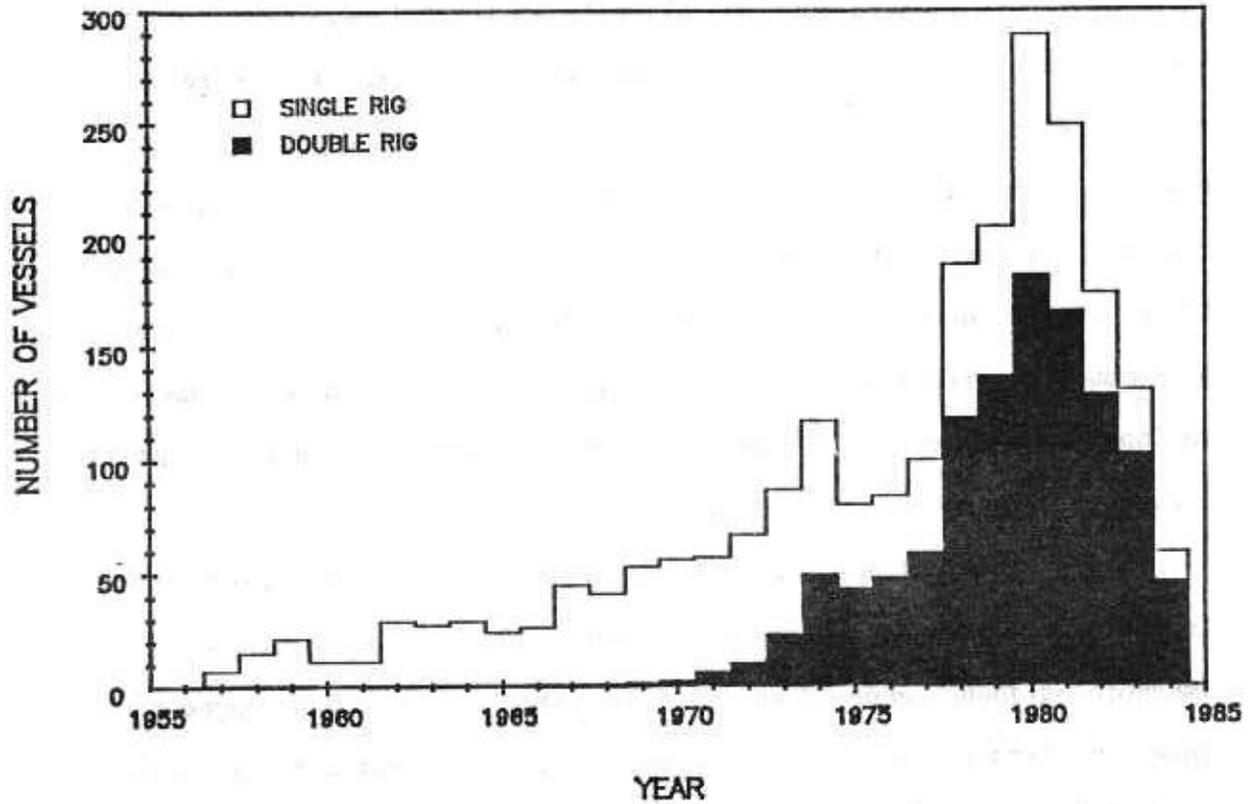


Table 3. Annual Number of Shrimp Vessels by Gear in the Oregon Shrimp Fishery, 1957-1984.

Year	Gear Rigging		Total
	Single	Double	
1957	7	-	7
1958	15	-	15
1959	21	-	21
1960	11	-	11
1961	11	-	11
1962	29	-	29
1963	27	-	27
1964	29	-	29
1965	24	-	24
1966	26	-	26
1967	45	-	45
1968	41	-	41
1969	52	1	53
1970	54	2	56
1971	51	6	57
1972	57	10	67
1973	64	23	87
1974	68	49	117
1975	37	43	80
1976	36	48	84
1977	41	59	100
1978	68	118	186
1979	67	136	203
1980	108	181	289
1981	84	165	249
1982	45	128	173
1983	28	102	130
1984	13	46	59

year in which the number of vessels operating declined. Vessel activity peaked in 1980, when 289 vessels made deliveries into Oregon. The number of out-of-state vessels declined slightly to 12 in 1984, down from 18 in 1983. Double-rigged vessels comprised 78% of the fleet (46 vessels).

Landed catch and effort were highest in May when 856,600 pounds (393 mt) (Table 4, Table 5) were caught during 5,753 hrs of single-rigged equivalent (SRE) trawl effort. The highest catch per unit effort (CPUE) occurred during October at 323 lbs/hr SRE. The greatest annual catch and amount of effort was expended in State statistical area 21 (Cape Blanco to Cape Arago) where 11,432 hrs SRE yielded 1,638,600 pounds (743 mt) (Table 6, Figure 3).

Other important areas were State statistical area 32 (Destruction Island), 26 (Cascade Head to Cape Falcon), 30 (Grays Harbor), and 22 (Mudhole) although area 32 was the only other area which produced more than a million pounds. The best annual CPUE's did not occur in areas of high production. Area 19 (Oregon border to Rogue River) had the highest CPUE at 440 lbs/hr SRE, but only produced 47,700 pounds (22 mt) of shrimp. CPUE during 1984 improved in all areas over 1983 except in areas 29 (Columbia River to Grays Harbor) and 20 (Rogue River to Cape Blanco) where minimal effort produced no catch.

Market Conditions

Fifteen processors operated in 1984, down 5 from 1983. The number of peeler machines used dropped from 56 in 1983 to 48 in 1984. At least 10 of these machines were used only part of the season. Large inventories of imported Norwegian shrimp and the strength of the U.S. dollar continued to impede domestic shrimp marketing. As a result the

Table 4. Oregon 1984 Monthly Shrimp Landed Catch, In Thousands of Pounds, and Catch-Per-Effort (Hours) by Statistical Area for Single-rigged and Double-rigged Vessels.

State Area	April	May	June	July	August	Septemb	October	Total
32 C	47.6	124.9	94.0	238.8	332.4	168.2	22.6	1028.5
C/E1	-	-	-	152.6	-	-	-	152.6
C/E2	507.2	353.1	254.6	232.6	209.5	233.8	221.6	243.2
30 C	16.6	161.0	77.0	161.8	133.2	57.0	0	606.6
C/E1	-	-	-	-	128.6	-	-	128.6
C/E2	295.8	332.6	122.4	207.8	488.4	309.0	0	214.2
29 C	-	-	-	-	-	-	0	0
C/E1	-	-	-	-	-	-	-	-
C/E2	-	-	-	-	-	-	0	0
28 C	0	0	8.7	29.7	-	0.2	0	38.6
C/E1	-	-	-	-	-	-	-	-
C/E2	0	0	93.1	159.3	-	122.5	0	131.4
26 C	0.1	6.3	51.6	34.2	97.2	66.8	399.1	655.3
C/E1	-	-	108.4	79.6	177.9	-	-	136.1
C/E2	10.1	141.9	123.0	135.6	161.2	196.6	649.0	294.1
24 C	0.2	9.2	15.9	0.5	-	7.3	123.1	156.2
C/E1	-	-	99.0	32.1	-	122.9	406.5	131.0
C/E2	14.5	210.3	98.5	65.6	-	0	680.9	364.5
22 C	2.5	7.3	145.5	152.4	0	237.7	50.0	595.4
C/E1	0	-	106.2	117.9	-	153.1	-	130.6
C/E2	32.5	54.6	190.2	198.8	259.1	312.7	209.9	175.1
21 C	752.7	556.9	159.8	68.5	88.1	9.9	2.7	1638.6
C/E1	140.5	116.9	124.5	-	-	-	-	132.8
C/E2	299.8	222.1	237.4	115.5	140.1	179.9	59.7	230.9
20 C	-	-	-	-	-	0	-	0
C/E1	-	-	-	-	-	-	-	-
C/E2	-	-	-	-	-	0	-	0
19 C	-	-	-	-	0	47.7	-	47.7
C/E1	-	-	-	-	-	-	-	-
C/E2	-	-	-	-	0	732.4	-	703.2
18 C	-	-	-	-	32.1	31.7	13.0	76.8
C/E1	-	-	-	-	-	-	-	-
C/E2	-	-	-	-	854.6	312.0	178.5	362.6
Total C	819.7	865.6	552.5	685.9	683.0	626.5	610.4	4843.6
C/E1	140.0	116.9	117.8	127.4	147.6	141.5	406.5	139.0
C/E2	296.3	242.9	176.2	190.6	191.9	258.4	516.1	239.6

C is total catch in thousands of pounds.

C/E1 Average catch in pounds per hour effort for single-rigged vessels.

C/E2 Average catch in pounds per hour effort for double-rigged vessels.

Table 5. Catch (In Thousands of Pounds), Hours of Effort Expended, and CPUE In the 1984 Shrimp Fishery by Month.

	Month							Total
	April	May	June	July	Aug.	Sept.	Oct.	
Single Rig								
Catch	86.1	25.4	27.8	21.6	27.4	21.8	1.5	211.6
Effort	615.0	217.1	236.2	169.2	186.6	153.8	3.7	1581.6
CPUE	140.0	116.9	117.8	127.4	147.0	141.5	406.5	133.8
Double Rig								
Catch	733.6	840.2	524.7	664.3	655.6	604.7	608.9	4632.0
Effort	2476.2	3459.7	2978.1	3485.0	3415.5	2340.0	1179.8	19334.3
CPUE	230.6	179.7	150.5	147.7	131.3	138.1	130.5	170.4
Total								
Catch	819.7	865.6	552.5	685.9	683.0	626.5	610.4	4843.6
Effort (SRE)	4576.9	5752.6	5001.2	5745.2	5651.4	3897.8	1891.4	32516.5
CPUE (SRE)	179.1	150.5	110.5	119.5	120.5	160.7	322.7	149.0

(SRE) = Single Rig Equivalent

Table 6. Catch (in Thousands of Pounds), Hours of Effort Expended, and CPUE in the 1984 Shrimp Fishery by State Statistical Area.

	State Areas North of Cape Perpetua						Total
	32	30	29	28	26	24	
Single Rig							
Catch	16.2	15.0	0	0	17.4	9.5	58.1
Effort	106.2	116.7	0	0	127.9	72.3	423.1
CPUE	152.6	128.6	-	-	136.1	131.0	137.3
Double Rig							
Catch	1012.3	591.5	0	38.6	637.9	146.8	3439.4
Effort	4161.8	2761.0	2.3	293.5	2168.9	402.8	9790.3
CPUE	243.2	214.2	-	131.4	294.1	364.5	351.3
Total							
Catch	1028.5	606.5	0	38.6	655.3	156.3	2485.2
Effort (SRE)	6765.1	4534.3	3.7	469.6	3598.1	716.8	16087.6
CPUE (SRE)	152.0	133.8	-	82.2	182.1	218.1	154.5

Table 6. (Continued)

	State Areas South of Cape Perpetua					Total
	22	21	20	19	18	
Single Rig						
Catch	23.2	130.2	0	0	0	153.4
Effort	178.0	980.5	0	0	0	1158.5
CPUE	130.6	132.8	-	-	-	132.4
Double Rig						
Catch	572.2	1508.4	0	47.7	76.8	2205.1
EFFORT	2726.7	6532.3	5.4	67.8	211.8	9544.0
CPUE	209.9	230.9	-	703.2	362.6	231.0
Total						
Catch	595.4	1638.6	0	47.7	76.8	2358.5
Effort (SRE)	4540.7	11432.2	8.6	108.5	338.9	16428.9
CPUE (SRE)	131.1	143.3	0	439.7	226.6	143.6

(SRE) = Single Rig Equivalent

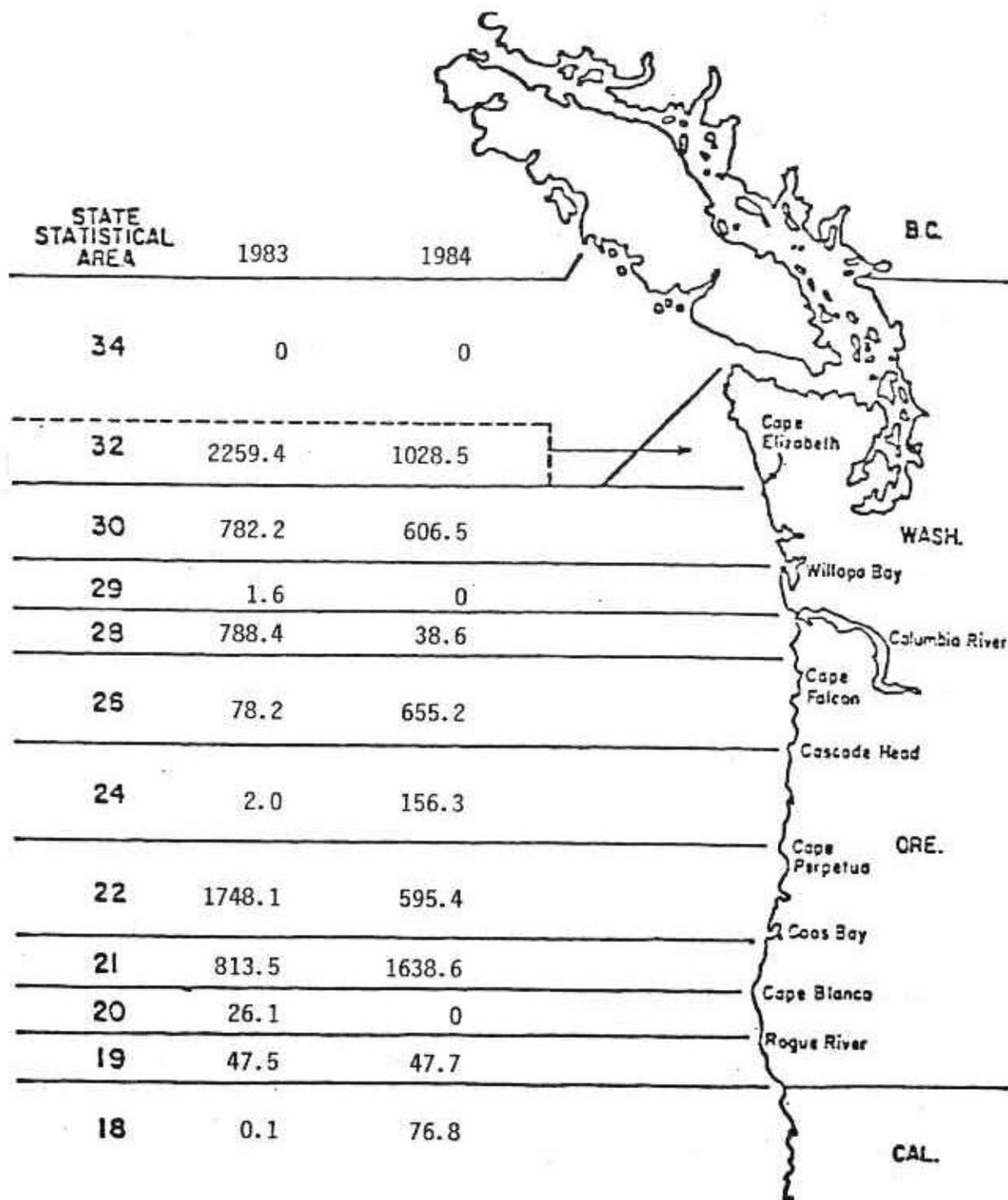


Figure 3. Oregon 1983 and 1984 Shrimp Landed Catch, in Thousands of Pounds, by Oregon Statistical Area.

season started slowly with price negotiations and stormy weather keeping the fleet tied up until mid-April. Fishermen received 45-52 cents per pound for their catch in April and in May larger grade shrimp received 60-65 cents per pound through September. Some deliveries of larger grade continued to receive 50 and 60 cents per pound, but 40-46 cents per pound was a more common price in September and October.

Market Samples

The largest shrimp were caught during September in State area 19 at 69.9 shrimp per pound (Table 7). The smallest recorded average shrimp in landings were caught in state area 32 (Destruction Island) during April at 212.5 shrimp per pound. Average age composition of landings in Oregon (by number of shrimp) was 0.2% zero-age shrimp, 49.6% age 1, 41.9% age 2, and 8.3% age 3+. Zero-age shrimp were found in abundance during October in southern coastal areas while off the central coast a high number of age 2 shrimp were available.

Incidental Groundfish Catch

Landed catch of incidentally caught groundfish totaled 471,494 pounds (214 mt) in 1984, down 63% from the 1,283,182 pounds (582 mt) landed 1983. Rockfish was the major component (76.4%) of the incidental catch at 360,241 pounds (163 mt). Lingcod (Ophiodon elongatus), Dover sole (Microstomus pacificus) and sablefish (Anoplopoma fimbria) landed catch totaled 63,772 pounds (29 mt); 19,191 pounds (9 mt); and 17,129 pounds (8 mt), respectively (Table 8). State areas 32 and 21 were the top producers of incidental catch at 181,486 pounds (82 mt) and 115,439 pounds (52 mt) respectively.

Table 7. Oregon 1984 Monthly Shrimp Age Composition (by number), Count per Pound, and Number Sampled by State Statistical Area. 1/

State Area	Age	April	May	June	July	Aug.	Sept.	Oct.
32	1	79.6	87.3	79.4	89.7	86.4	83.5	84.0 2/
	2	17.9	9.1	17.1	8.0	8.7	13.1	12.6
	3+	2.5	3.6	3.5	2.3	4.8	3.4	2.5
	C†	212.5	174.6	170.3	161.4	135.0	136.0	135.8
	N	240	110	228	524	1361	237	119
30	1	31.5	45.4	54.6	86.4	81.7	-	-
	2	48.4	48.6	34.3	6.3	16.1	-	-
	3+	20.1	6.1	11.1	7.2	2.3	-	-
	C†	117.5	122.0	126.2	124.1	118.4	-	-
	N	219	313	108	221	311	-	-
26/24 3/	1	-	23.8	34.4	-	94.7	51.7	50.8 4/
	2	-	56.1	48.9	-	3.8	45.0	39.8
	3+	-	20.1	16.7	-	1.5	3.3	9.1
	C†	-	87.2	86.5	-	114.6	103.1	99.4
	N	-	164	395	-	133	149	1220
22	1	-	89.2	92.9	97.8	-	91.3	-
	2	-	5.7	6.1	1.5	-	7.0	-
	3+	-	5.2	1.0	0.7	-	1.7	-
	C†	-	157.8	142.5	154.2	-	95.8	-
	N	-	406	296	404	-	345	-
21	1	77.7	91.0	90.0	97.6	91.3	94.2	51.2 5/
	2	17.2	5.4	7.3	1.8	4.2	5.0	37.5
	3+	5.1	3.6	2.7	0.5	4.5	0.8	6.5
	C†	148.2	155.2	149.2	151.7	112.2	105.7	80.9
	N	1720	610	511	453	404	379	400
19	1	-	-	-	-	-	38.1	-
	2	-	-	-	-	-	45.8	-
	3+	-	-	-	-	-	16.1	-
	C†	-	-	-	-	-	69.9	-
	N	-	-	-	-	-	91	-
18	1	-	-	-	-	90.0	-	43.6 6/
	2	-	-	-	-	6.5	-	35.1
	3+	-	-	-	-	3.5	-	0.7
	C†	-	-	-	-	96.7	-	120.4
	N	-	-	-	-	400	-	436

1/ Due to low effort, no market samples were collected in Areas 20, 28, or 29.

2/ Zero-age shrimp comprised 0.9 percent of the catch.

3/ Areas 24 and 26 were combined during 1984.

4/ Zero-age shrimp comprised 0.3 percent of the catch.

5/ Zero-age shrimp comprised 4.8 percent of the catch.

6/ Zero-age shrimp comprised 20.6 percent of the catch.

Table 8. Incidental Groundfish Catch (Pounds) by State Statistical Area Taken by the 1984 Oregon Shrimp Fishery

Species	State Area																TOTAL
	32	30	29	28	26	24	22	21	20	19	18						
English Sole	446	309	0	611	5	0	87	4	0	0	0	1463					
Petrale Sole	385	385	0	337	95	0	643	473	0	0	0	2317					
Dover Sole	30620	5007	2	8503	7515	0	9556	14105	75	153	0	75516					
Rex Sole	3027	1085	0	1351	46	0	1794	528	0	0	0	7832					
Arrowtooth Floun.	13187	1007	0	492	0	0	0	0	0	0	0	14686					
Flathead Sole	978	457	0	654	0	0	4	0	0	0	0	2093					
Sand Dab	0	0	0	65	6	0	1158	87	0	0	0	1316					
Sand Sole	0	0	0	6	1	0	527	0	0	0	0	535					
Pac. True Cod	15869	870	0	445	4	0	41	0	0	0	0	17229					
Lingscod	45799	20578	2	8854	1291	0	3403	1220	4	147	0	81297					
Sablefish	31721	5068	0	8440	3529	0	1913	4127	0	0	0	54798					
Pac. Ocean Perch	9128	355	0	3220	56	1	938	1416	0	0	0	15113					
Other Rockfish	389100	102586	236	208164	16167	297	134273	126718	8921	3796	0	990059					
Pacific Whiting	182	795	0	5405	0	0	4416	2743	910	6	0	14457					
Misc. Species	1009	1050	0	412	185	0	877	938	0	0	0	4471					
TOTAL LANDINGS	541451	139352	240	246959	28900	298	159610	152359	9910	4102	0	1283182					

PACIFIC COAST

Catch and Effort

Pacific coast 1984 landed catch of pink shrimp (including Alaska and British Columbia) reached only 20.5 million pounds (9,299 mt), a 7% decrease from the 22.0 million pounds (9,979 mt) landed in 1983 (Figure 4, Table 9). This was the lowest total Pacific coast landing since 1964 when 15.6 million pounds (7,076 mt) were delivered.

Landed catch of shrimp in Oregon represented 23.4% of the total Pacific coast landed catch in 1984. Of the 4.8 million pounds (2,197 mt), 3.1 million pounds (1,406 mt) were caught in waters off Oregon (Table 10). Shrimp caught off Oregon and landed at California ports totaled 224,550 pounds (102 mt). Shrimp landed at Washington ports totaled 216,436 pounds (98 mt). This brought the total landed catch taken off Oregon by Washington, Oregon and California to 3.6 million pounds (1,633 mt), or 17.6% of the total 1984 Pacific coast shrimp landed catch.

Washington shrimp landed catch totaled 3.4 million pounds (1,542 mt) in 1984, down 40% from the 5.7 million pounds (2,586 mt) landed in 1983. These landings included 36 thousand pounds caught off southeast Alaska. Vessels fishing off Washington landed 1.6 million pounds (726 mt) in Oregon, or 33% of Oregon's total landings. This 1.6 million pounds, combined with another 3.2 million pounds (1,452 mt) caught off Washington and landed at Washington ports totaled 4.8 million pounds (2,177 mt), 23.4% of the total Pacific coast landed catch.

California 1984 landed catch totaled only 1.5 million pounds (680 mt). Of this total, approximately 15% was caught off Oregon (224,550 pounds). Most of the California landings were caught in California statistical area A (Eureka Area) which totaled 1.1 million pounds (499 mt). California areas

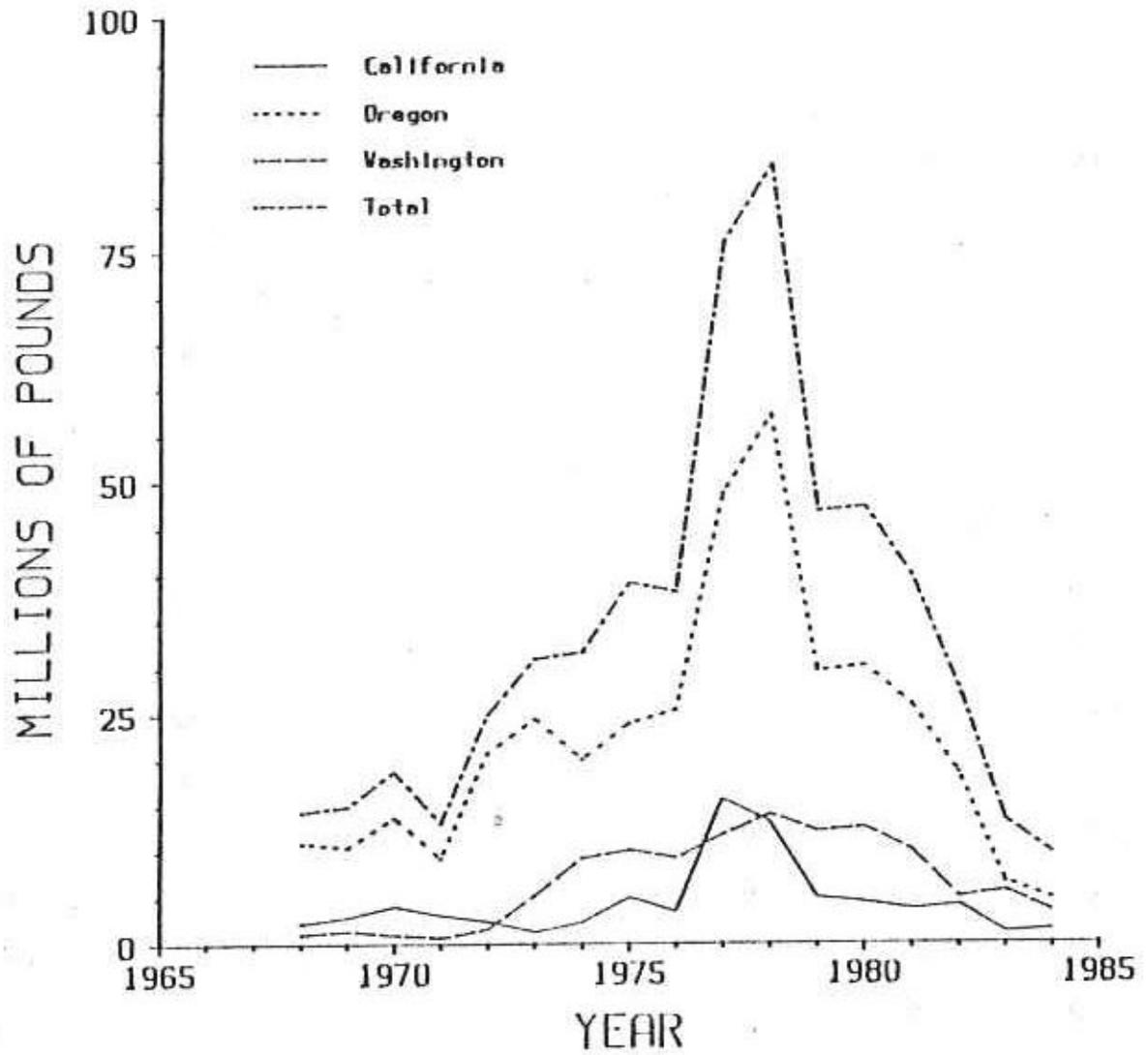


Figure 4. Annual Landed Catch of Shrimp by State, 1968-1984 (in millions of pounds). Source PMFC Crab and Shrimp Data Series and Personal Communication with State Authorities.

Table 9. Annual Landed Catch of Shrimp by State, Province, and Entire Pacific Coast, 1968-1984 (in thousands of pounds; primarily Pandalus sp.) source PMFC Crab & Shrimp Data Series and Personal Communication with State and Provincial Authorities

Year	Alaska	Br. Columbia	Washington	Oregon	California	Total
1968	42,023	1,566	1,164	10,976	2,270	57,999
1969	47,851	2,119	1,425	10,505	2,948	64,848
1970	74,256	1,538	926	13,735	4,048	94,503
1971	94,891	735	678	9,291	3,081	108,676
1972	83,830	794	1,582	20,861	2,434	109,501
1973	119,964	1,729	5,271	24,517	1,240	152,720
1974	108,275	2,644	9,325	19,968	2,338	142,550
1975	98,535	1,728	10,167	23,893	4,993	139,316
1976	129,011	7,723	9,261	25,392	3,400	174,787
1977	116,891	6,176	11,803	48,580	15,640	199,090
1978	73,397	2,969	13,987	56,997	13,167	160,517
1979	50,916	1,578	12,135	29,587	4,922	99,138
1980	52,865	1,175	12,600	30,152	4,400	101,192
1981	28,100	1,200	10,055	25,918	3,673	68,946
1982	16,987	1,160	4,999	18,462	4,207	45,815
1983	7,500	1,200	5,656 2/	6,547	1,132	22,035
1984	9,300	1,500	3,423 3/	4,844	1,482	20,549

1/ Primarily Pandalus sp. from PMFC Crab & Shrimp Data Series and conversation with state and provincial authorities.

2/ Includes 60,294 pounds caught off Southeast Alaska.

3/ Includes 35,890 pounds caught off Southeast Alaska.

Table 10. California, Oregon, and Washington 1984 Shrimp Catch (in Pounds), Effort (in Single-rigged Equivalent Hours), and Catch per Hour (in Pounds per Single-rigged Equivalent Hour) Combined.

	<u>Catch</u>	<u>Effort</u>	<u>CPUE</u>
<u>Washington Fishery</u>			
Washington waters	3,170,311	23,810.0	133.2
Oregon waters	216,436	640.4	338.0
Total	3,386,747	24,450.4	138.5
Alaska (Area 51)	35,890	27.2	1,319.5
<u>Oregon Fishery</u>			
Washington waters	1,634,974	11,303.1	144.6
Oregon Waters	3,131,803	20,874.5	150.0
California waters	76,795	338.9	235.5
Total	4,843,572	32,516.5	149.0
<u>California Fishery</u>			
Oregon waters	224,550	1,132.0	198.4
California waters	1,257,486	5,840.2	215.3
Total	1,482,036	6,972.2	212.6
<u>Combined Fisheries</u>			
Washington waters	4,805,285	35,113.1	136.9
Oregon waters	3,572,789	22,646.9	157.8
California waters	1,334,281	6,179.1	215.9
Total	9,712,355	63,939.1	151.9

B1 and B2 produced no shrimp in 1984 while Area C produced 150 thousand pounds. Including 77 thousand pounds caught off California and delivered into Oregon ports the total catch of shrimp in waters adjacent to California was 1.3 million pounds (590 mt), or 6% of the total Pacific coast landed catch.

Combined fishing effort in SRE for Washington, Oregon, and California continued to decline in 1984 to approximately 64 thousand hours (Figure 5, Table 11). In 1983 total effort was 123 thousand hours (SRE). The combined CPUE for the three states improved to 152 lbs/hr SRE, up from 108 lbs/hr SRE in 1983 (Figure 6, Table 12). Catch per unit effort was 138, 149, and 213 lbs/hr SRE in Washington, Oregon, and California respectively for trips made in areas adjacent to each state during 1984. In 1983 CPUE was 109, 98, and 155 lbs/hr SRE respectively.

Figure 5. Fishing Effort (in Single-Rigged Equivalent Hours) for California, Oregon, and Washington Pink Shrimp Fishery Combined, 1957-1984.

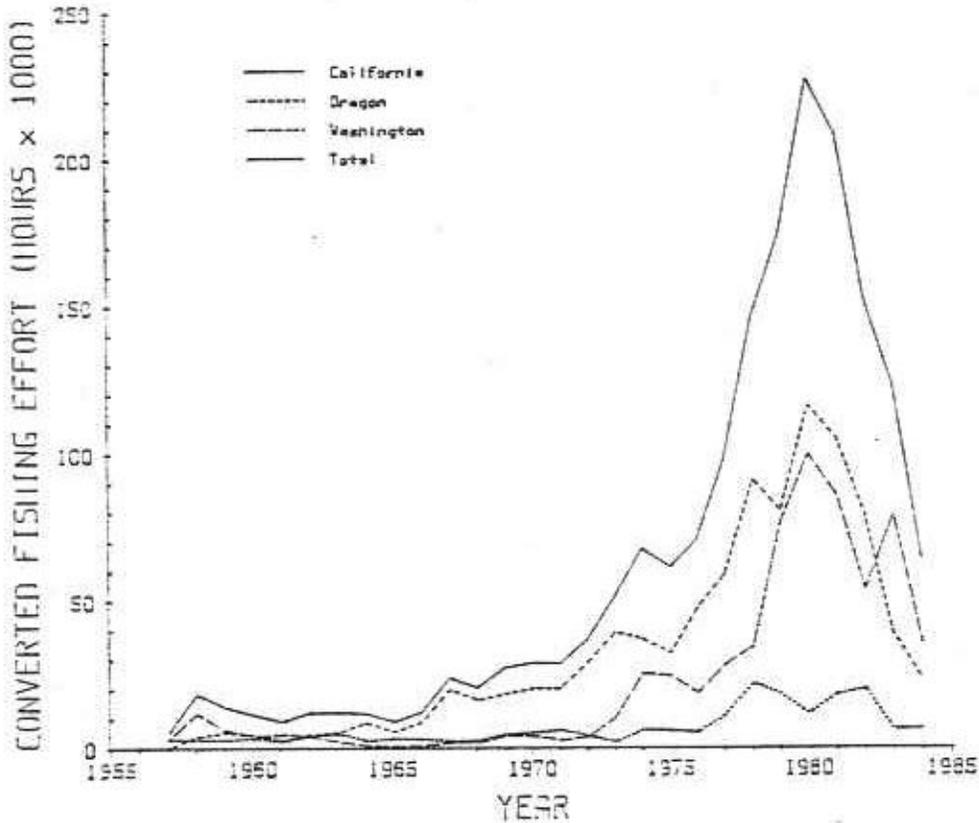


Table 11. Fishing Effort (In Single-Rigged Equivalent Hours) for the California, Oregon, and Washington Pink Shrimp Fisheries Combined, 1957-1984.

Year	Coastal California	Coastal Oregon	Coastal Washington	Total
1957	2,959	316	3,189	5,464
1958	2,764	3,682	11,627	18,073
1959	2,648	5,191	5,762	13,601
1960	3,195	4,141	3,505	10,841
1961	2,084	2,144	4,314	8,542
1962	4,024	4,289	3,478	11,791
1963	4,810	5,174	1,841	11,825
1964	2,462	8,462	358	11,282
1965	3,155	5,312	120	8,587
1966	2,869	8,785	270	11,924
1967	2,102	19,681	1,529	23,312
1968	2,248	16,115	1,554	19,917
1969	4,721	18,300	3,902	26,923
1970	5,257	20,001	3,358	28,616
1971	6,101	19,868	2,205	28,174
1972	3,926	29,006	3,553	36,485
1973	1,814	38,979	10,059	50,852
1974	6,117	36,412	24,838	67,367
1975	5,520	31,697	23,873	61,090
1976	5,101	46,946	18,268	70,315
1977	11,060	58,899	28,028	97,987
1978	21,737	90,691	34,043	146,471
1979	18,079	80,278	76,420	174,777
1980	11,436	116,196	99,635	227,267
1981	18,281	104,635	85,269	208,185
1982	20,000	78,486	53,514	152,000
1983	6,108	38,477	78,877	123,462
1984	6,179	22,647	35,113	63,939

Figure 6. Catch per Unit Effort (in Pounds per Single-Rigged Equivalent Hour) in the Pink Shrimp Fishery for California, Oregon, and Washington Combined, 1957-1984.



Table 12. Catch per Unit of Effort (in Pounds per Single-Rigged Equivalent Hour) in the Pink Shrimp Fishery for California, Oregon, and Washington Combined, 1957-1984.

Year	Average CPUE	Year	Average CPUE
1957	771	1971	461
1958	541	1972	686
1959	550	1973	610
1960	456	1974	450
1961	574	1975	634
1962	500	1976	493
1963	522	1977	779
1964	604	1978	563
1965	364	1979	265
1966	524	1980	202
1967	550	1981	190
1968	714	1982	183
1969	551	1983	108
1970	673	1984	152

REGULATIONS

During 1982 the Oregon Fish and Wildlife Commission (OFWC) adopted two administrative rules which affect the shrimp fishery. The first, OAR 635-05-186, required vessels landing shrimp in Oregon that were caught off Washington or California to use a mesh size which is legal in each respective state's waters. The second rule, OAR 635-05-200, specified a maximum average count per pound of 160 whole shrimp per pound applicable only to landings of 3,000 lbs or greater. In addition to the above rules an incidental groundfish catch limit of 1,500 lbs/day on a trip was adopted. These regulations were in effect during most of the 1983 shrimp season. Trip limits of 3,000 and 1,000 lb/trip on *Sebastes* complex and widow rockfish, *Sebastes entomelas* respectively were adopted by the OFWC as a temporary rule to be in compliance with Federal and State regulations governing groundfish during the period.

Mesh Restriction

635-05-186 (1) It is unlawful to land shrimp taken south of the Oregon-California border with nets having a mesh size of less than 1-3/8 inches between knots.

(2) It is unlawful to land shrimp taken north of the Oregon-Washington border with nets having a mesh size of less than 1-1/2 inches, including one knot.

Maximum Count Per Pound

635-05-200 (1) It is unlawful to possess or land shrimp from any one trip or landing which exceeds an average count of 160 whole shrimp per pound. This rule shall not apply to landings or possession of less than 3,000 pounds of shrimp.

(2) To determine average count per pound when a landing exceeds 3,000 pounds of shrimp, one sample must be taken from each one thousand pounds up to a maximum requirement of twenty samples. The sampling unit shall consist of at least one pound of whole unbroken shrimp.

Incidental Catch Limit

635-05-195 It is unlawful to have on board a commercial fishing boat taking shrimp for commercial purposes an aggregate incidental catch of more than 250 Dover, English, or petrale sole less than 11 inches in length. It is unlawful for a commercial fishing boat taking shrimp for commercial purposes to land an incidental catch of groundfish in excess of 1,500 pounds per day accumulated over the trip. Pacific whiting, shortbelly rockfish and arrowtooth flounder are excluded from the incidental landing restriction.

SHRIMP ASSESSMENT

Residual Effect of the 1983 El Nino

During 1984, the pink shrimp fishery again suffered from availability and abundance problems which in turn caused financial problems in the industry. A number of seafood processors and fishermen felt that the 1983 El Nino event was continuing to affect shrimp off Oregon in 1984, but the U.S. Small Business Administration (SBA) had previously limited El Nino disaster designation to 1983 only. Since a number of south coast processors wanted the option of applying for SBA disaster loan funds in 1984, they requested assistance from ODFW in establishing that 1984 should be included under the El Nino disaster relief program. The Shrimp Assessment Project provided data that helped obtain inclusion of 1984, and also information documenting how it specifically affected shrimp catches off southern Oregon.

Although shrimp catches off Oregon were not as severely depressed in 1984 as they were during 1983, of particular concern was that average shrimp size was less than in earlier years. Small size equates to lower price, and this was of particular importance during 1984 because the west coast shrimp industry was facing stiff price and product-size competition from overseas.

The impact of El Nino during 1983 was obvious. The shrimp fleet found atypical shrimp distribution patterns and very low apparent abundance. The warmer El Nino water apparently altered shrimp distribution through three modes-- (1) some shrimp were apparently driven into deeper (and presumably colder) water

where they were only marginally accessible to fishing trawls, (2) some shrimp were displaced northward by an El Nino accelerated Davidson Current, and (3) some shrimp were simply dispersed out of normal fishing areas. Each of these modes would result in lower availability of shrimp to fishing gear and may increase the impact and incidence of predation.

Movement of pink shrimp is still poorly understood, but could have partially accounted for reduced catches. One model of shrimp movement suggests that they are slowly displaced northward by the Davidson Current as they are growing older, while larvae are transported in the opposite direction by southward summer surface flows. Sea-bed drifters we released showed that El Nino accelerated the Davidson Current during 1983--possibly exaggerating the northward displacement hypothesized by the model. Figure 7 shows that distribution of shrimp (as indicated by catches) did shift slightly northward in 1983 compared to earlier years.

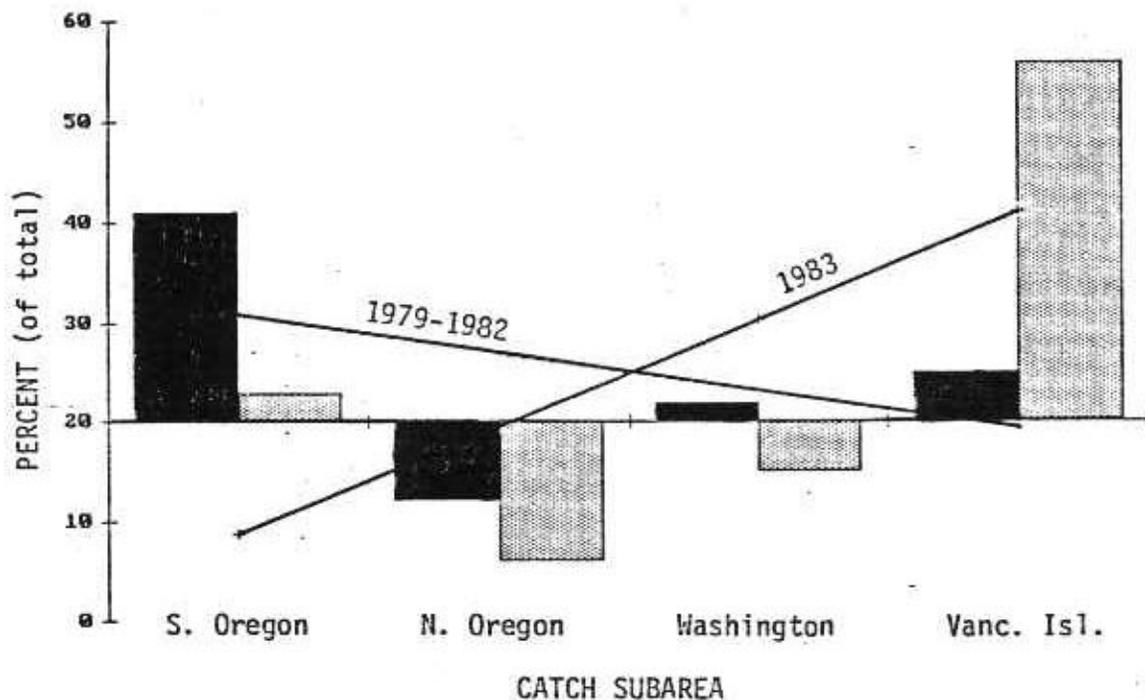


Figure 7. Comparison of 1979-1982 (dark bars) vs 1983 (light bars) Pink Shrimp Catch Distribution by Area--with Trend Lines.

We also examined age and growth characteristics of shrimp sampled in the 1984 Oregon shrimp catch. Reduced average shrimp size in the catch did not appear to be the result of reduced growth. In fact, the data illustrated in Figure 8 indicates that growth during 1982, 1983, and 1984 may have been slightly better than during the 1966-1981 period for both age-1 and age-2 shrimp. This result is very interesting since it suggests that a density-dependent growth relationship may be operating in the Oregon pink shrimp stock. If this is the case, a density-growth variable should be included in future yield models.

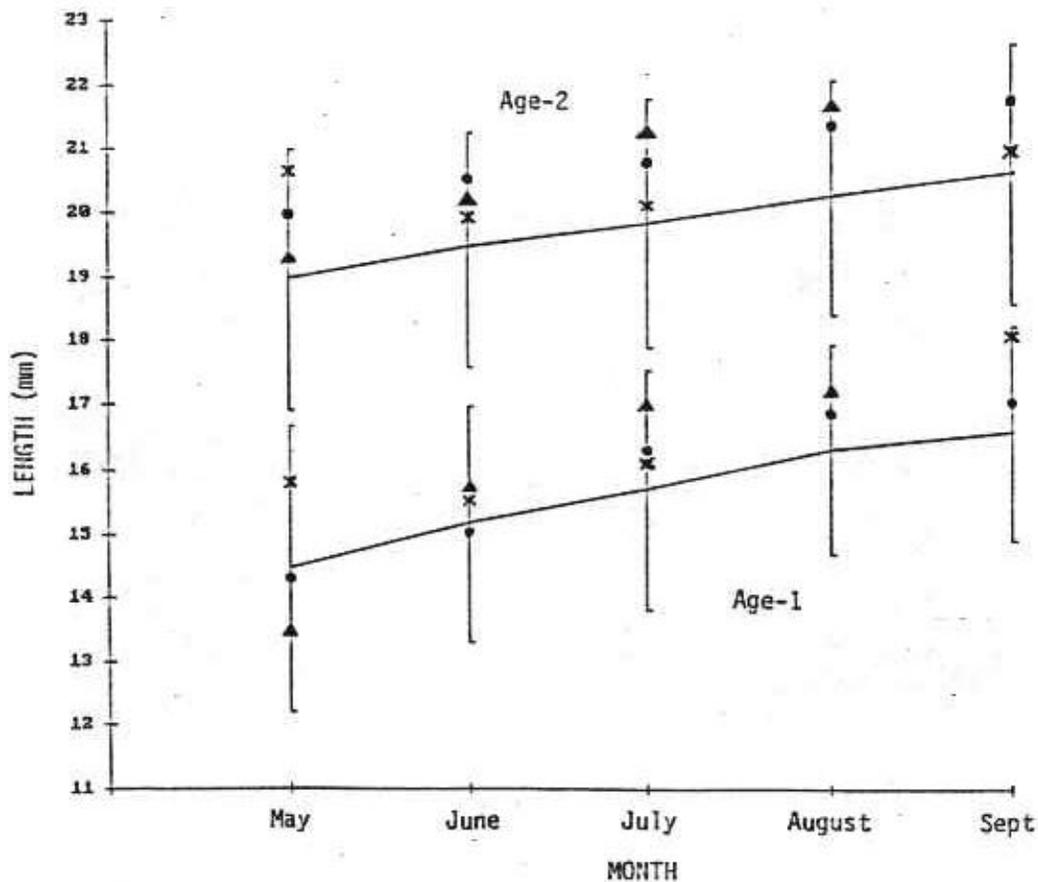


Figure 8. Comparison of Mean Carapace Length by Month of Age-1 and Age-2 Pink Shrimp Caught off Coos Bay During 1966-1981 (Trend Lines with Vertical 95% Confidence Intervals) vs 1982 (dots), 1983 (triangles), and 1984 (X's) Sample Observations.

Atypical age composition during 1984 appears to be the key to small overall average shrimp size in landings. Figure 9 compares age composition in catches from the Coos Bay area (State Areas 21 and 22) during the important months of June, July, and August of the 1966-81 period to those during 1984. Older shrimp were simply less available in 1984--and reduction of just a few percentage points of older, and larger, shrimp dramatically reduces the overall count-per-pound (average size) in a catch. Older pink shrimp must either have suffered disproportionately high mortality during 1983 or, in fact, were displaced out of the Oregon fishery area leaving only incoming age-1 shrimp to support the fishery in 1984.

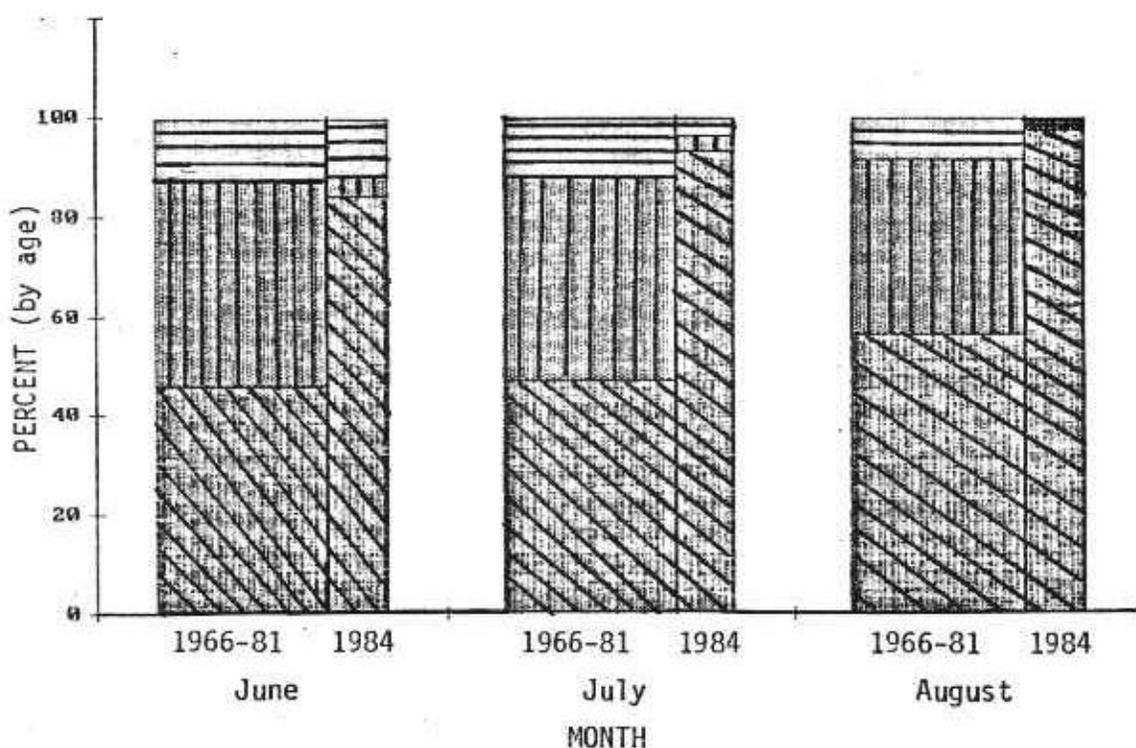


Figure 9. Comparison of Mean Percentage of Age-1 (diagonal bars), Age-2 (vertical bars), and Age-3+ (horizontal bars) Pink Shrimp Observed in the Catch by Month Off Coos Bay During 1966-1981 vs That Observed in 1984.

Net mesh selectivity studies remain a project priority. Mesh selectivity curves permit us to correct landed catch composition to reflect actual size and abundance composition encountered by trawls as they are fished. This information allows evaluation of growth and also assessment of relative abundance of incoming age-0 and age-1 shrimp.

We are particularly interested in testing a one-inch mesh codend to both extend and verify our net mesh selectivity curve, but tests with this mesh size were not conducted during 1984 because the high concentrations of small shrimp needed were unavailable at any time during the season.

Historical Yield by Year Class

The age composition analysis discussed above spurred an interest in the shift in dependence by the fishery onto younger age classes in recent years. The question arose as to whether the total yield, in pounds, from each year class has also changed over time as the age composition of the catch has changed. Figure 10 shows the estimated total yield to the fishery from 1966 through 1980 year classes of pink shrimp in the Oregon stock area. This graph has important implications for the shrimp processing industry if in fact smaller shrimp are less valuable and more difficult to market.

Outlook for 1985

Prospects for the 1985 shrimp fishery off Oregon remain mediocre. Our recruitment model suggests that survival was mediocre for both the 1983 and 1984 broods, which would be two-year-olds and one-year-olds respectively in 1985; the available 1983 brood shrimp were also harvested heavily, at least off the south coast, as one-year-olds during 1984. The 1982 brood, which would contribute as three-year-olds in 1985, should also be very scarce since they were apparently affected by the 1983 El Niño event—which is indicated by their poor showing in 1984 at age-2. Spawner abundance was low for all three broods as well.

There are two items of encouragement on the horizon for the future. The first is that there was a good showing of age-0 shrimp off northern California at the end of the 1984 season. This may indicate that survival of the 1984 brood was fairly good south of Oregon, but these small shrimp will only be pinheads during 1985. The other positive note is that there do not appear to be any new, strong hake (Merluccius productus) year classes coming behind the 1980 brood. This could mean reduced losses of shrimp to predation mortality.

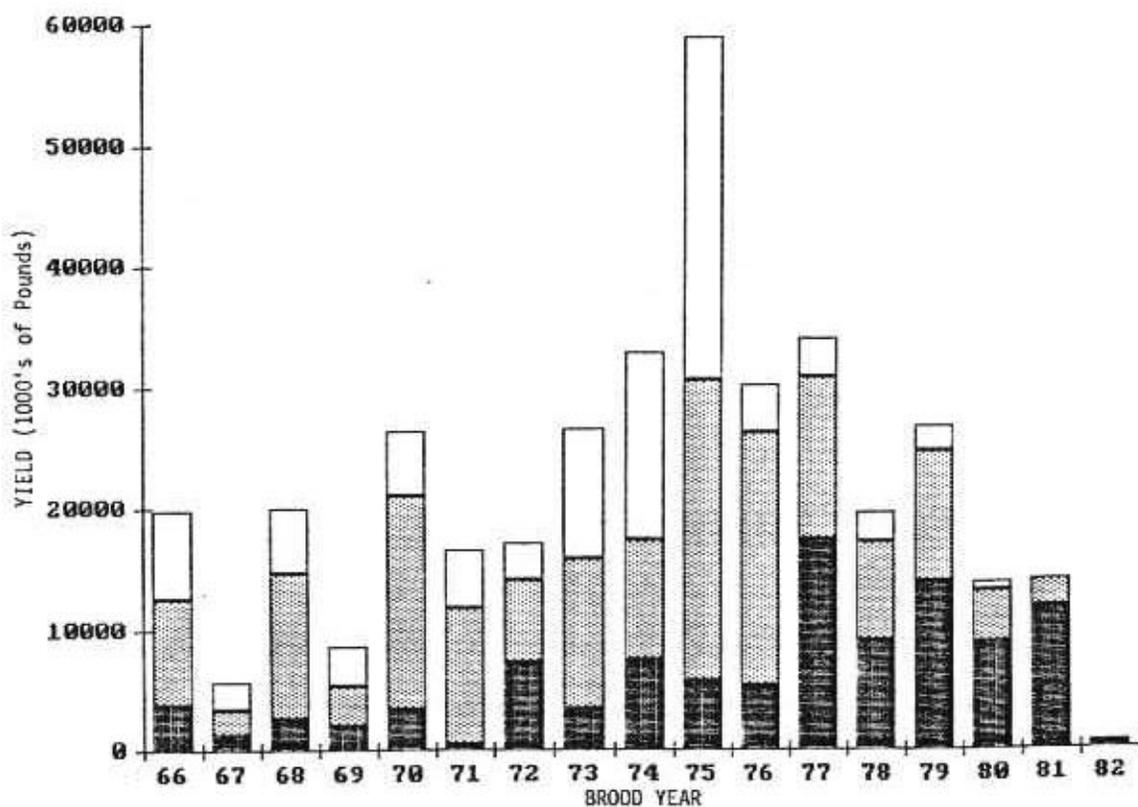


Figure 10. Catch in Pounds as Age-1 (dark bars), Age-2 (medium bars), and Age-3+ (light bars) from each Brood of Pink Shrimp Harvested in Oregon Areas 18-23 from 1966-1982. Note that the 1981 and 1982 Broods are Incomplete.

SUMMARY

Low shrimp abundance or availability continued during the 1984 shrimp season. The overall age composition was similar to that found in 1983; however, apparent abundance was lower possibly due to atypical shrimp distribution patterns resulting from the 1983 El Nino event. Marketing of shrimp was hampered by imported Norwegian product competing for the same market.

Following a mid-season slump in availability (reduced landings) and quality (size of shrimp) of shrimp in Oregon waters the picture brightened as larger volumes of good grade shrimp became available in September and October. During October high percentages of zero-age shrimp were found in southern coastal areas.

As a result we expect the 1985 season will open with large amounts of these zero-age shrimp (by season opening age-1 shrimp) available in southern coastal areas. If survival of age-1 and age-2 shrimp is good during the winter, larger than usual amounts of good grade shrimp may be available in central coast areas.

ACKNOWLEDGEMENTS

Thanks are due to the many fishermen and processors who supplied much of the information for this report. Thanks are also due to Jerry McCrary (Alaska Department of Fish and Game), Barb McIntosh (Washington Department of Fisheries), and Pat Collier (California Department of Fish and Game) who were very helpful in supplying data for their respective jurisdictions. Finally, appreciation is due to port biologists Dave Douglas (ODFW - Astoria), Mike Hosle (ODFW - Coos Bay), and their assistants who collect much of the raw data summarized in this report.

Table 13. Annual Oregon Shrimp Landings in Thousands of Pounds and Catch-Per-Effort (Hours) by Statistical Area for Single and Double-Rigged Vessels, 1968-1984.

Year	Area of Catch												
	34	32	30	29	28	26	24	22	21	20	19	18	
1968 C	0	0	25.2	1/	1,771.6	2,660.8	325.9	4,062.8	238.9	1,302.9	307.2	281.2	
C/E	-	-	494		792	635	556	580	636	1,087	554	895	
1969 C	0	166.4	1,067.4	1/	1,220.0	3,852.1	251.1	3,666.9	159.4	2.1	15.0	140.4	
C/E	-	692	690		662	567	430	431	398	58	157	551	
1970 C	0	475.2	787.1	1/	601.3	2,915.8	2,207.6	4,686.9	199.7	1,550.4	141.9	168.0	
C/E	-	775	539		497	560	675	565	494	1,228	443	740	
1971 C	0	9.8	461.5	1/	430.2	5,575.9	5/	1,534.4	6/	656.0	576.0	46.7	
C2	2/	0	1.9		337.0	1,762.1		0		0	0	0	
C/E1	3/	-	416		368	465		357		879	472	341	
C/E2	4/	-	552		926	720		-		-	-	-	
1972 C	0	0	1,553.6	1/	14.0	9,295.8	5/	7,011.3	6/	1,344.9	1,454.6	187.0	
C2	0	0	606.7		0	4,381.0		0		0	0	0	
C/E1	-	-	933		469	671		632		975	677	727	
C/E2	-	-	1,253		-	1,001		1,213		-	-	-	
1973 C	0	1,829.3	113.9	1/	105.9	8,665.9	5/	10,757.4	6/	2,240.7	802.3	0.9	
C2	0	84.4	35.8		40.3	5,947.8		3,228.6		38.8	89.1	0	
C/E1	-	722	702		489	617		627		1,098	549	132	
C/E2	-	356	702		1,061	795		778		2,589	810	-	
1974 C	893.2	2,526.3	2,936.0	642.5	626.0	5,366.6	5/	5,661.5	6/	1,038.2	251.8	25.6	
C2	838.6	1,983.1	2,271.4	359.6	479.4	3,607.4		2,888.2		392.3	41.6	18.8	
C/E1	872	746	592	624	639	362		355		565	213	171	
C/E2	1,248	1,182	726	677	846	550		563		1,261	633	692	
1975 C	1.9	259.9	2,630.4	1,350.1	734.0	4,936.9	2,780.4	9,502.4	927.0	754.1	14.8	0.6	
C2	1.9	218.8	2,224.9	1,42.0	617.3	3,891.7	2,076.6	6,048.1	463.0	246.5	14.8	0	
C/E1	-	556	627	551	590	608	603	731	903	654	-	158	
C/E2	97	753	951	717	808	757	813	1,180	1,352	1,500	388	-	
1976 C	1,466.2	108.8	1,728.4	955.1	986.7	7,236.8	3,311.7	6,752.1	1,674.0	704.9	105.5	361.6	
C2	1,120.3	92.2	1,558.0	665.1	727.3	6,459.1	2,899.1	4,491.3	538.5	254.8	81.7	227.1	
C/E1	1,462	551	702	544	628	433	374	595	724	690	383	526	
C/E2	1,394	594	745	542	730	658	582	800	875	963	829	993	

1/ Areas 30 and 29 Combined Through 1973.
 2/ C2 is Landed Catch by Double-Rig Vessels; Included in C.
 3/ C/E1 = Catch per hour by single-Rig Vessels.
 4/ C/E2 = Catch Per Hour by Double-Rig Vessels.
 5/ Area 24 Included with Area 26 Data.
 6/ Area 21 Included with Area 22 Data.

Table 13. Continued

Year	Area of Catch												
	34	32	30	29	28	26	24	22	21	20	19	18	
1977 C	5.1	1,396.6	5,822.4	827.0	3,686.2	5,461.1	2,836.0	17,208.7	8,435.1	1,755.1	811.9	155.0	
C2	5.1	1,196.5	5,239.9	587.3	2,870.3	4,649.2	2,639.1	12,601.1	4,844.4	571.0	307.0	126.1	
C/E1	-	1,045	922	465	695	582	457	786	1,120	1,424	1,585	4,012	
C/E2	565	1,170	1,052	751	886	751	790	1,232	1,526	1,920	1,424	1,838	
1978 C	0	2,353.8	2,325.8	76.4	782.5	2,478.4	350.2	21,026.4	20,321.0	353.0	5,875.0	1,032.6	
C2	0	2,154.0	2,090.0	70.5	748.2	2,027.8	325.7	18,024.8	16,021.0	306.8	5,213.0	889.4	
C/E1	-	562	569	173	408	360	256	515	782	507	684	447	
C/E2	-	691	565	248	490	461	420	927	1,085	769	1,112	853	
1979 C A/	0	3,356.0	4,134.7	254.0	150.3	2,852.1	795.1	6,132.2	8,513.7	839.5	1,011.6	1,315.6	
C2	0	3,223.3	4,050.6	225.8	150.3	2,756.1	719.1	4,994.0	6,937.9	650.7	608.0	1,045.0	
C/E1	-	434	225	181	6	182	189	260	280	292	285	305	
C/E2	-	413	325	212	300	311	257	419	490	565	477	635	
1980 C	0	3,976.9	4,134.7	157.1	834.4	300.8	205.1	5,684.5	7,807.8	150.6	1,290.7	780.8	
C2	0	3,844.6	4,060.3	149.4	817.3	276.8	185.5	4,425.8	5,643.6	114.9	795.1	537.2	
C/E1	-	215	154	95	112	148	138	180	271	159	195	243	
C/E2	-	344	288	246	305	221	225	258	414	292	318	616	
1981 C	0	4,849.5	2,245.7	70.8	480.4	4,350.9	1,215.0	6,536.0	5,336.8	4.2	590.4	236.8	
C2	0	4,773.4	2,224.9	70.8	459.7	4,304.9	1,193.2	5,563.6	5,974.7	4.2	441.0	178.7	
C/E1	-	196	240	-	122	130	96	162	229	-	224	219	
C/E2	-	380	272	175	230	254	246	282	338	82	400	415	
1982 C	0	3,177.4	1,349.8	0.6	2,819.2	1,043.4	277.4	6,174.6	2,616.4	175.5	550.1	277.6	
C2	0	3,158.3	1,349.8	0.6	2,805.4	1,031.2	266.9	5,734.2	2,283.2	146.4	467.7	205.8	
C/E1	-	225	-	-	199	96	117	180	167	192	160	252	
C/E2	-	326	209	17	236	164	214	379	284	437	398	176	
1983 C	0	2,265.1	783.9	1.6	788.3	78.2	2.0	1,741.9	812.4	26.1	47.5	0.1	
C2	0	2,229.7	781.7	1.6	760.6	77.4	0.8	1,706.3	688.9	26.1	34.1	0.1	
C/E1	-	115	33	-	61	118	49	77	127	-	91	-	
C/E2	-	195	184	72	121	92	10	175	178	194	116	4	
1984 C	0	16.2	15.0	-	-	17.4	9.5	23.2	130.2	-	-	-	
C2	0	1,012.3	591.5	0	38.6	637.9	146.8	972.2	1,508.4	0	47.7	76.8	
C/E1	-	153	129	-	-	136	131	131	133	-	-	-	
C/E2	-	243	214	0	131	294	364	210	231	0	703	363	

A/ Catch and Catch Per Unit Effort Based on Preliminary Landing Estimates of 29.4 Million Pounds.