Shellfish / Estuarine Habitat Projects
DATA REPORT

2004 Clatsop Beach Razor Clam Fishery

Marine Resources Program
Oregon Department of Fish and Wildlife

2004 Clatsop Beach Razor Clam Fishery
Status Report

By

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FISHERY SUMMARY

Introduction

The 18-mile stretch of shoreline, known as the Clatsop beaches, extends from the South Jetty of the Columbia River, south, to Tillamook Head. Over 90% of Oregon's razor clam catch and effort occurs in this area. The Clatsop beach razor clam commercial fishery has been monitored by the Oregon Department of Fish and Wildlife (ODFW) since 1935. The recreational fishery has been monitored since 1955. Historically, the fishery has been sampled on low-tide series, with sampling per tide series ranging from 2-8 days during the spring and summer months and as time and weather permitted the rest of the year. Recreational and commercial harvesters were interviewed to obtain data on effort, catch, age composition and harvest area. ODFW staff collects random age and length data, performs wastage analysis, conducts stock assessments on the Clatsop beach and assists in collecting samples for the Oregon Department of Agriculture (ODA) to test for biological toxins.

Methods

Sampling Area Description

For sampling purposes, Clatsop beach is divided into five areas. Each area represents a distinct segment of the sampling area and estimates of total catch and effort are made separately for each area. This sampling procedure accounts for variability in effort and catch rates.

Area 1 (3.6 mi.) is from the South Jetty of the Columbia River to the Peter Iredale vehicle access point.

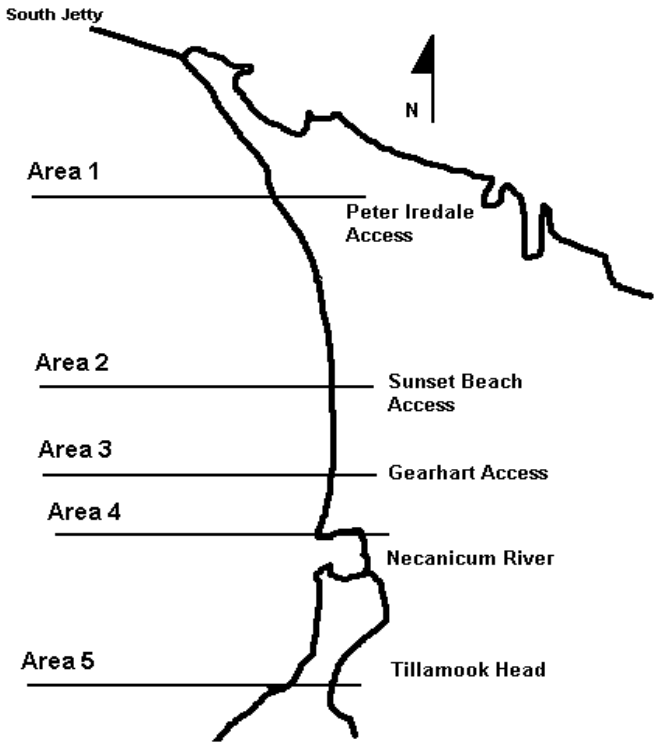
Area 2 (6.2 mi.) is from the Peter Iredale access to the Sunset beach vehicle access point.

Area 3 (5.0 mi.) is from the Sunset beach access to the Gearhart vehicle access point.

Area 4 (1.2 mi.) is from the Gearhart access to the Necanicum River.

Area 5 (2.0 mi.) is from the Necanicum River to Tillamook Head.

Areas 4 and 5 are restricted to walk-on access only.



Catch and Effort Estimates

Staff conducted random digger interviews at the vehicle access points on the beaches in Areas 1-3 and interviewed diggers as they left the harvest area in Areas 4 and 5. Digger catch rates as well as catch per unit hour were determined. In March through July, digger interviews were conducted four days per low-tide series (eight to nine days each) to account for variability in catch rates.

Since 1955, a minimum of four effort counts during each low-tide series have been made of all vehicles and diggers in each area of the Clatsop beaches prior to maximum low-tide. Low-tide series are tides that are at or below the mean low tide of zero. Counts were made on both weekdays and weekends to take into account effort differences. Expansion factors for vehicle and digger counts were developed in the 1970s and 1980s. At that time, vehicle and digger counts were made at ½ hour and

one hour intervals in each area as well as the use of car counters at access points to develop effort profiles during low-tide series. From this, total vehicle and digger effort were determined using the Area-Under-the-Curve calculation.

Effort totals were combined for each area during the low-tide series to determine total effort for each beach area. Average length of digger trips, average number of diggers per vehicle, and the proportion of vehicles from each state were determined from the sampling data. Total catch and effort estimates were made for each low-tide series by combining total effort estimates with observed catch rates in each area.

Biological Sampling

Random sampling of digger harvest for age composition and length frequencies were conducted during sampling interviews. Data collected were used to determine age composition per area during the year and each area total was combined to give overall age composition for the total harvest.

Wastage Sampling

Wastage is defined as the loss of clams during the process of harvesting by deliberate discarding or reburying razor clams contrary to harvest regulations. Wastage studies are conducted by re-digging a harvester's hole after they have left the harvest area. Waiting until the harvester leaves the harvest area insures that his or her behavior is not affected by the sampling presence. The presence or absence of razor clams in the hole was documented, as well as harvest gear used, clam condition, and sediment composition. Any clam that was found in the hole was considered a wasted clam based on previous mortality studies that indicate 80 percent of clams with minor shell or siphon damage died. Wastage studies are conducted between one and three times per low-tide series in each harvest area during the spring and summer months and as time and weather permit during the fall and winter months.

Results and Discussion

Biological Toxins

Periodically, algal blooms of certain species of phytoplankton that produce biological toxins are ingested by razor clams and stored in the muscles, gonads, gills, and digestive systems. Two biological toxins that can contaminate razor clams are Paralytic Shellfish Poisoning (PSP) which is caused by a dinoflagellate and Domoic Acid (DA) which is caused by a diatom. Contaminated clams, if consumed by warm-blooded animals, can be harmful, affecting the neurological and gastrointestinal systems. The biological toxins cannot be cooked or soaked out, the clam needs to depurate (cleanse)

the toxins out of its system. Depuration rates vary, with low levels getting flushed out in weeks while high levels may very well last the life of the clam (several years).

The ODA is the agency responsible for the monitoring of the toxin levels in shellfish. In cooperation with ODFW staff, samples from up to four separate areas on Clatsop beaches are collected every low-tide series for biological toxin analysis.

In 2004, DA and PSP toxin rates on the Clatsop beach stayed below the alert level for the entire year. The mid-coast beaches from Tillamook Head to Cape Perpetua were closed for the entire year due to prolonged high levels of DA. The south coast beaches from Cape Perpetua to the Oregon/California border closed in the fall due to high levels of DA. Information on beach closures due to high toxin levels can be obtained from the ODA Shellfish Hotline: 800-448-2474.

Weather and Surf Conditions

Weather and the subsequent surf conditions are the most important factor in determining digger success for razor clams. Windy wet weather with associated high surf will substantially reduce digger success by making the clam "show" difficult if not impossible to see. High surf conditions alone can decrease digger success, since the constant pounding of the waves makes the clams less likely to show when diggers stomp or pound.

Conditions in 2004 were very favorable for clam harvest throughout the spring and winter months. Surf conditions for the months of October through December were moderate with few large winter storms hitting the coast.

Recreational Catch and Effort

Clam diggers made an estimated 155,000 digging trips on the Clatsop beaches during 2004 (Table 1). This set the all-time record in effort surpassing the previous high set in 2002 of 147,000 digger trips. The resulting total recreational catch of razor clams was estimated at 2,254,000. This total catch also set a new all-time record surpassing the previous record high recreational catch of 2,179,000 clams in 2002. The 2004 recreational harvest total includes 338,000 clams wasted in the harvest process. The average catch per digger trip, not including clams wasted, was 12.3 clams (Table 2).

A harvest of 378,000 clams for the first low-tide series in June was the highest series harvest for 2004 (Table 2). This tide series (series 11) had the two single largest low-tide days (-2.0 and -2.1 feet) and even though it occurred before the end of school year, it attracted substantial digging effort. This low-tide series accounted for over 20% of the total recreational harvest.

Harvest was the largest in Area 3, where over 682,000 clams (36%) were harvested recreationally. Area 2 accounted for 558,000 clams or 29% of the total harvest. Area 5 accounted for 251,000 clams or 13% of the total harvest. Area 1 accounted for 236,000 clams or 12% of the total harvest. Area 4 accounted for 10% (189,000 clams) of the total harvest.

Age composition for the 2004 recreational fishery indicated that the previous year's clams had survived well, though there was a lack of younger clams with 2% being 0-year clams (Table 3). The majority of the harvest, 37%, was of the 1-year age class, while the 2-year age class made up 32% of the harvest, and the 3-year age class made up 20% of the harvest. Surprisingly, recreational harvesters were able to find a fair number of 4-year and older age class clams contributing 8% of the total harvest.

Unfortunately, a good harvest of available clams was accompanied by an increase in violations of catch regulations. The Oregon State Police (OSP) were kept busy every low-tide series with numerous fish and game violations ranging from exceeding the daily bag limit to digging another person's limit. Compliance continues to be below OSP respectful standards (>95% compliance) and at one time, enforcement personnel determined that, on average, 1 out of every 5 people were in violation of some razor clam regulation.

Wastage

Private citizens have submitted two petitions (2002 and 2004) to the Oregon Fish and Wildlife Commission (OFWC) for an emergency closure of razor clam harvesting on the Clatsop beaches because of concerns of a late 'set' and the risk of a large increase in wastage. In May 2004, a large wastage program collected samples to determine if there was an increase in wastage. In a four-day period, over 1000 harvester holes were re-dug and 289 clams were discovered. Instead of considering the 2004 petition for an early closure of the Clatsop beaches, the OFWC directed staff to conduct further wastage studies and initiate an intensive on-site education campaign for the months of June and July. The OFWC also recommended that the Oregon State Police (OSP) increase enforcement during the same timeframe.

In the 2004 summer wastage studies, monthly wastage rates (wasted clams found in holes vs. all clam holes sampled) ranged from 27.4 to 39.0% (Figure 1). Higher than normal wastage rates during the late fall and winter also indicated that small clams were still present in large numbers. Results from the 2004 wastage study indicated that the clam tube/gun was responsible for over 90% of the wasted clams observed (Figure 2) and was responsible for the most damage to razor clams. Results also indicated that the intensive on-site education and enforcement campaign did little to reduce wastage as the rates continued to climb as the season progressed to the July 15th closure. Since the educational effort was not effective, we expect that with the renewed interest in razor clam harvesting, another late 'set' in future seasons will trigger the same wastage scenario and subsequent petition to the OFWC.

Commercial Fishery

The commercial fishery has been monitored since 1935, with the number of licensed diggers and catch recorded since 1947. Commercial catches are sampled at processors for age and length frequencies as well as average clams per pound. Documented landings in pounds (i.e. fish tickets) are then used with the sampled average clams per pound to determine estimated total commercial harvest in number of clams. Required harvest logbooks are used to determine catch per area and yield per hour.

The annual harvest and the number of permitted diggers tend to fluctuate with the number of clams available for harvest. A record high harvest of 1,900,000 clams occurred in 1952 and in 1983 the record low occurred of 1,000 clams (Table 4). The highest effort occurred in 1950 when 790 diggers participated in the fishery. The commercial fishery accounts for less than 20% of the total harvest on average. In years of high clam abundance, the percentage is higher and in years of low clam abundance the percentage is smaller.

The 2004 Clatsop beach commercial harvest was 286,000 clams (60,800 pounds), well above the ten year average of 120,000 clams per year (Table 4). The 2004 commercial harvest accounted for 12% of the total annual razor clam harvest. A total of 156 commercial harvesters were issued ODFW Shellfish Harvest Permits to commercially harvest razor clams in 2004: 62 were certified to sell for human consumption (an ODA certification permit) and 94 were strictly bait harvesters. Out of the 156 commercial razor clam harvesters, only 85 (54%) made commercial landings of which 55 (89% of those certified) landed for human consumption and 30 (32% of those permitted) landed for bait.

Historically, the clams sold for human consumption are the main component of the total catch. During 2000-2004, an average of 91% of the clams was sold for human consumption and 9% were sold for bait. In 2004, the component of razor clams sold as bait (17%) was nearly twice the five-year average. Poor human consumptive markets for razor clams, the limited number of human consumptive processors, and the demand for crab-bait after two record commercial Dungeness crab seasons most likely contributed to the increase.

In 2004, the average delivery was 33 pounds, the third highest since 1965. Prices for human consumption clams ranged from $1.75 to $2.40 per pound while bait prices ranged from $1.00 to $2.00 per pound. This marked one of the first years that bait prices were near or met human consumption prices for razor clams.

The majority of the commercially harvested clams came from Area 4 (38.6%). Followed by Area 5 (32%). Areas 1-3 comprised of the rest of the harvest with nearly identical harvest amounts (10.6, 10.5 and 8.3%, respectfully). The age composition of the commercial harvest fluctuates annually, but the trend has changed little over time due to the minimum size requirement of 3.75 in. established in 1972 (Table 5). The age

composition was 54% 1-year age class clams, 26% 2-year age class clams, 15% 3-year age class clams, and less than 1% 4-year or older age class clams.

It should be noted that the areas of highest recreational and commercial harvest are not the same. The reasons for this difference are presumed to be that commercial harvesters do not like digging amongst crowds due to the increased disturbance from added pressure, easy access to Areas 2 and 3 for novice recreational harvesters and that commercial harvesters have a minimum size restriction so they need to harvest where larger clams are present even if abundances are lower.

REGULATIONS AND RESEARCH PROJECTS

Recreational Shellfish License

Citizens initiated and backed the passage of the new license bill in the 2003 Legislative Session due to concerns regarding lack of enforcement, minimal toxicity testing, beach closures, shellfish wastage, lack of public education, lack of information on shellfish population status and abundance, and lack of current data to address impacts due to shellfish habitat loss/alteration. The recreational shellfish license is now required for harvesting shellfish including, but not limited to, clams, crab, mussels, abalone, oysters, piddocks, shrimp or scallops. Oregon was the last coastal state to enact the requirement of a license to recreationally harvest shellfish.

The recreational shellfish license requirement took effective for the 2004 harvesting season. ODFW shellfish license sales in 2004 were over 172,000 licenses (resident annual, non-resident annual and 3-day non-resident). This figure was nearly double from what was anticipated with the limited data available.

Razor Clam Stock Assessment

Developed in the early 1990s by a University of Alaska graduate student, the clam pump stock assessment technique has become the standard in determining razor clam population abundances. It is used by the Washington Department of Fish and Wildlife (WDFW), the Alaska Department of Fish and Game (ADFG) and tribal nations in Washington and British Columbia, Canada. The effectiveness of the clam pump stock assessment techniques is equaled by its simplicity. A water pump takes water from the surf and forces it down a hose and out a PVC wand, which, when pushed into the sand, liquefies it, causing any razor clam in the defined ½ meter square plot to float to the surface.

In 2004, ODFW conducted the first razor clam stock assessment in Oregon on the Clatsop beaches. Assessments were conducted during the annual conservation closure from July 15-September 30. Conducting stock assessments after the bulk of

the harvest (May-July) would present a better estimate of what clams survived the harvest season and what new recruits would be available for the next harvest season. Transect locations were chosen randomly and optimally conducted at a rate of one for each mile of beach that razor clam populations exist. We intended on sampling 12 transects instead of 18 (one per beach mile) due to limited low-tide sampling days and available staffing. However, due to inclement weather conditions only 11 transects were sampled in 2004.

One east-to-west transect is sampled per sampling day. At each transect, plot lines are set up at 50-foot intervals, called elevations. These elevations are established beginning 50 feet above (eastward) the highest clam "show" located visually. A random number generator determines if the plot line will be on the north or south side of the elevation marker (Figure 3). Location data (north or south and plot number) are taken for each plot and plot line elevation for each transect. All clams pumped are enumerated, measured, classified as either pre-recruits (<3 in) or recruits (>3 in) and returned to the plot unharmed.

The number of clams and sample pots at each elevation of transect are used to determine the density of clams per square meter per elevation. The number of elevations and mean density per elevation group are then used to estimate the total abundance of clams per elevation, per transect, and over the entire length of Clatsop beach (18 miles). Abundance estimates are calculated for pre-recruits, recruits, and all clams. All summaries for abundance include confidence intervals.

The stock assessment for the 2004 razor clam population was estimated at 5.9 million clams. Out of the total population, an estimated 3.2 million clams were pre-recruits (<75 mm) and 2.7 million clams were recruits (>75 mm). The average density for all clams on Clatsop beach was 1.12 clams/m^2. The average density for pre-recruits was 0.61 clams/m^2 and for recruits was 0.51 clam/m^2. Distribution of clam abundance on the beaches was highest in the middle portion (Area 2) and in the southern portion (Area 5) (Figure 4). The other beaches showed relatively equal distribution of the estimated razor clam population. It should be noted that Area 2 and Area 3 had the two highest numbers of recreationally harvested clams in 2004 accounting for over 65% of the total recreational catch. Yet these two areas still showed relatively high abundances of clams in comparison to areas with much lower harvest. We expect that these two areas will continue to produce large harvest of razor clams in the next year.

Table 1. Annual catch and effort data for the Clatsop Beach razor clam fishery, 1955-2004.

Year	Recreational Fishery					Commercial Number of Clams	Total Harvest
	Digger Trips	Catch per Unit Effort	Number of Clams	Number of Clams Wasted	Total Rec. Harvest		
1955	56,000	22	1,212,222	295,000	1,507,000	904,000	2,411,000
1956	60,000	18	1,061,000	295,000	1,056,000	490,000	1,846,000
1957	77,000	21	1,646,000	416,000	2,062,000	336,000	2,398,000
1958	89,000	19	1,679,000	218,000	1,897,000	386,000	2,283,000
1958	54,000	12	646,000	124,000	770,000	179,000	949,000
1960	48,000	12	596,000	46,000	642,000	154,000	796,000
1961	51,000	11	583,000	70,000	653,000	80,000	733,000
1962	56,000	16	892,000	105,000	997,000	102,000	1,099,000
1963	55,000	13	713,000	70,000	783,000	107,000	890,000
1964	71,000	16	1,098,000	264,000	1,632,000	125,000	1,487,000
1965	76,000	15	1,134,000	186,000	1,320,000	399,000	1,719,000
1966	78,000	14	1,052,000	434,000	1,486,000	282,000	1,768,000
1967	74,000	20	1,472,000	195,000	1,667,000	494,000	2,161,000
1968	64,000	13	831,000	162,000	993,000	361,000	1,354,000
1969	59,000	14	851,000	155,000	1,006,000	111,000	1,117,000
1970	56,000	13	715,000	125,000	840,000	61,000	901,000
1971	77,000	13	968,000	213,000	1,181,000	123,000	1,304,000
1972	69,000	9	636,000	139,000	775,000	49,000	824,000
1973	76,000	10	725,000	159,000	884,000	89,000	973,000
1974	44,000	8	347,000	5,000	352,000	32,000	384,000
1975	75,000	10	785,000	157,000	942,000	171,000	1,113,000
1976	119,000	12	1,431,000	63,000	1,494,000	717,000	2,211,000
1977	51,000	10	499,000	33,000	532,000	143,000	675,000
1978	72,000	12	849,000	137,000	986,000	205,000	1,191,000
1979	90,000	11	958,000	63,000	1,021,000	180,000	1,201,000
1980	70,000	11	747,000	143,000	890,000	116,000	1,006,000
1981	30,000	6	187,000	49,000	236,000	128,000	364,000
1982	84,000	9	758,000	123,000	881,000	165,000	1,046,000
1983	32,000	3	105,000	12,000	117,000	1,000	118,000
1984	23,000	15	341,000	15,000	356,000	37,000	393,000
1985	94,000	10	894,000	147,000	1,131,000	303,000	1,434,000
1986	46,000	5	260,000	33,000	,293000	18,000	,311000
1987	68,000	15	1,010,000	83,000	1,093,000	236,000	1,329,000
1988	84,000	11	1,016,000	168,000	1,184,000	161,000	1,345,000
1989	97,000	11	1,082,000	136,000	1,218,000	195,000	1,413,000
1990	55,000	11	579,000	61,000	640,000	75,000	715,000
1991	57,000	11	643,000	80,000	723,000	130,000	853,000
1992							
1993				***Seasons Closed Due to Biotoxins***			
1994	59,000	15	885,000	0	885,000	78,000	963,000
1995	91,000	10	912,000	67,000	979,000	276,000	1,255,000
1996	21,000	9	192,000	11,000	203,000	17,000	220,000
1997	27,000	7	186,000	47,000	233,000	8,000	241,000
1998	21,000	7	149,000	12,000	161,000	11,000	172,000
1999	32,000	5	167,000	10,000	177,000	2,000	179,000
2000	17,000	5	78,000	0	78,000	4,000	82,000
2001	7,300	10	70,000	8,000	78,000	5,000	83,000
2002	147,000	13	1,852,000	327,000	2,179,000	481,000	2,660,000
2003	48,000	10	460,000	81,000	841,000	105,000	646,000
2004	155,000	12	1,916,000	326,000	2,254,000	286,000	2,540,000

Table 2. Recreational harvest (number of clams) by area, by tide series, 2004.

Month		Area 1	Area 2	Area 3	Area 4	Area 5	Total	Total Effort
Jan	**Series 1**	1,714	5,229	6,857	2,194	1,080	**17,074**	**3,327**
Jan	**Series 2**	7,131	17,966	23,897	5,631	3,471	**58,097**	**7,555**
Feb	**Series 3**	2,769	4,526	10,183	2,117	3,429	**23,023**	**2,872**
Feb	**Series 4**	10,800	30,140	44,775	3,740	15,067	**104,522**	**9,660**
Mar	**Series 5**	2,857	12,143	14,286	786	1,286	**31,357**	**3,282**
Mar	**Series 6**	8,907	17,203	29,180	5,214	11,734	**72,238**	**6,888**
Apr	**Series 7**	12,595	43,210	85,964	24,557	22,512	**188,837**	**14,026**
Apr	**Series 8**	4,474	10,080	14,629	3,750	1,641	**34,574**	**3,958**
May	**Series 9**	40,311	109,314	125,214	26,252	23,056	**324,147**	**231,153**
May	**Series 10**	20,643	58,333	27,386	13,179	16,473	**136,013**	**10,170**
Jun	**Series 11**	45,463	110,949	129,384	40,469	51,377	**377,641**	**27,733**
Jun	**Series 12**	22,452	41,150	21,195	7,264	25,997	**118,058**	**9,209**
Jul	**Series 13**	36,654	58,804	80,332	35,070	55,514	**264,375**	**20,300**
Jul	**Series 14**							
Jul	**Series 15**							
Aug	**Series 16**			***ODFW Season Closure***				
Aug	**Series 17**							
Sep	**Series 18**							
Oct	**Series 19**	1,153	1,297	2,469	63	951	**5,933**	**478**
Oct	**Series 20**	5,764	7,013	8,640	1,099	444	**22,961**	**1,888**
Oct	**Series 21**	384	1,921	4,114	888	1,332	**8,640**	**685**
Nov	**Series 22**	4,323	9,133	17,856	7,442	3,467	**42,222**	**3,346**
Nov	**Series 23**	2,352	4,032	6,480	420	560	**13,844**	**1,142**
Dec	**Series 24**	3,072	9,600	17,088	5,120	4,800	**39,680**	**3,489**
Dec	**Series 25**	1,728	7,968	12,576	3,680	7,040	**13,992**	**2,622**
	Sport Total	**235,547**	**558,009**	**682,504**	**188,936**	**251,232**	**1,916,228**	**155,482**

Sport total w/ 15% wastage	**2,254,386**	**CPUE**	**12.3**

Table 3. Annual age composition (percent) for the Clatsop Beach recreational fishery, 1955-2004.

Harvest Year	Percent Age composition						Rec. Harvest (clams)
	0	1	2	3	4	5+	
1955	29.2	64.6	4.3	1.7	0.2	0.0	1,507,000
1956	36.9	48.4	11.2	2.8	0.7	0.0	1,056,000
1957	26.1	51.7	15.4	5.7	0.9	0.2	2,062,000
1958	7.6	74.8	13.0	3.8	0.7	0.1	1,897,000
1958	10.7	38.9	39.3	10.0	1.1	0.0	770,000
1960	9.6	66.4	11.8	10.7	1.5	0.0	642,000
1961	30.7	51.2	10.9	4.9	2.2	0.1	653,000
1962	33.8	58.4	6.0	1.3	0.4	0.1	997,000
1963	34.4	52.9	10.9	1.4	0.4	0.0	783,000
1964	57.9	31.8	7.6	2.5	0.2	0.0	1,632,000
1965	27.1	62.4	7.0	3.4	0.1	0.0	1,320,000
1966	41.5	40.1	15.2	2.6	0.6	0.1	1,486,000
1967	23.5	70.0	5.5	0.1	0.1	0.1	1,667,000
1968	10.9	56.6	27.7	3.7	1.0	0.1	993,000
1969	19.1	55.8	18.4	5.9	0.7	0.1	1,006,000
1970	25.1	64.7	8.0	1.7	0.4	0.1	840,000
1971	33.0	54.2	8.6	3.3	0.7	0.2	1,181,000
1972	24.2	53.8	18.2	3.4	0.3	0.1	775,000
1973	32.4	49.9	8.1	8.5	1.0	0.1	884,000
1974	10.0	55.3	24.3	6.9	3.3	0.2	352,000
1975	24.0	46.0	17.6	9.8	2.3	0.3	942,000
1976	14.6	78.9	2.8	2.0	1.3	0.1	1,494,000
1977	37.5	15.7	33.5	6.6	3.8	2.9	532,000
1978	28.7	61.8	4.0	3.5	1.3	0.7	986,000
1979	12.3	75.3	11.1	0.1	0.3	0.1	1,021,000
1980	44.6	32.0	16.7	6.1	0.5	0.1	890,000
1981	44.1	51.4	3.1	1.3	0.1	0.0	236,000
1982	18.1	80.7	0.1	0.1	0.1	0.0	881,000
1983	29.5	55.7	13.7	1.1	0.0	0.0	117,000
1984	46.8	46.7	6.2	0.0	0.0	0.0	356,000
1985	13.0	83.7	3.2	0.0	0.0	0.0	1,131,000
1986	52.3	29.0	18.5	0.0	0.0	0.0	,293000
1987	14.2	82.2	3.6	0.0	0.0	0.0	1,093,000
1988	5.5	63.5	31.1	1.6	0.0	0.0	1,184,000
1989	28.2	55.3	12.1	3.4	1.0	0.0	1,218,000
1990	14.3	52.1	25.5	5.9	2.1	0.1	640,000
1991	16.0	26.5	47.0	8.5	1.6	0.4	723,000
1992							
1993			***Seasons Closed Due to Biotoxins***				
1994	3.1	44.6	47.6	4.5	0.2	0.0	885,000
1995	1.9	27.9	39.2	23.9	5.5	1.6	979,000
1996	10.5	40.3	27.4	15.2	5.6	1.0	203,000
1997	40.2	29.9	19.8	7.8	1.5	0.8	233,000
1998	15.5	44.5	27.9	9.7	2.0	0.4	161,000
1999	8.8	34.9	38.2	14.4	3.5	0.2	177,000
2000	8.0	16.3	28.5	27.0	16.2	4.0	78,000
2001	66.0	28.0	4.0	1.0	1.0	0.0	78,000
2002	10.7	61.5	27.0	0.6	0.2	0.0	2,179,000
2003	1.3	43.8	33.8	27.4	2.7	1.6	541,000
2004	2.2	36.8	32.3	20.4	7.4	0.7	2,254,000
10 Yr. Ave, 1995-2004	**16.5**	**36.4**	**27.8**	**14.7**	**4.6**	**1.0**	

Table 4. Annual commercial razor clam catch and effort, 1935-2004.

Year	Pounds Landed	Number of Landings	Number of Clams	Lbs. / Landing	Clams / Pound	Number of Diggers	Landings / Digger
1935						93	
1936						161	
1937						135	
1938						107	
1939						202	
1940						243	
1941	123,934					238	
1942	13,353					192	
1943	15,698					57	
1944	57,787					197	
1945	81,794					242	
1946	151,477		606,000			719	
1947	166,355	2,662	666,000	62.5	4.00	558	4.8
1948	206,835	6,849	827,000	30.2	4.00	505	13.6
1949	200,486	6,683	802,000	30.0	4.00	381	9.8
1950	335,091	12,416	1,340,000	27.0	4.00	790	15.7
1951	255,631	8,283	1,534,000	30.9	6.00	574	14.4
1952	319,165	11,095	1,915,000	28.8	6.00	613	18.1
1953	264,278	8,527	1,320,000	31.0	4.99	592	14.4
1954	156,215	7,628	781,000	20.5	5.00	430	17.7
1955	180,818	5,496	904,000	32.9	5.00	295	18.6
1956	97,899	3,231	490,000	30.3	5.01	253	12.8
1957	67,157	2,469	336,000	27.2	5.00	193	12.8
1958	82,140	2,832	386,000	29.0	4.70	221	12.8
1958	48,401	1,518	179,000	31.9	3.70	118	12.9
1960	34,126	1,258	154,000	27.1	4.51	93	13.5
1961	17,845	671	80,000	26.6	4.48	58	11.6
1962	24,221	910	102,000	26.6	4.21	79	11.5
1963	23,822	889	107,000	26.8	4.49	77	11.5
1964	35,300	1,245	125,000	28.4	3.54	125	10.0
1965	79,767	2,192	399,000	36.4	5.00	213	10.3
1966	82,852	2,208	282,000	37.5	3.40	217	10.2
1967	120,452	4,130	494,000	29.2	4.10	297	13.9
1968	92,462	3,119	361,000	29.6	3.90	340	9.2
1969	25,124	975	111,000	25.8	4.42	185	5.3
1970	14,806	635	61,000	23.3	4.12	79	8.0
1971	30,135	1,450	123,000	20.8	4.08	134	10.8
1972	12,550	688	49,000	18.2	3.90	76	9.1
1973	16,030	721	89,000	22.2	5.55	111	6.5
1974	8,553	461	32,000	18.6	3.74	58	7.9
1975	41,412	1,785	171,000	23.2	4.13	146	12.2
1976	118,019	5,160	717,000	22.9	6.08	391	13.2
1977	41,055	1,338	143,000	30.7	3.48	269	5.0
1978	40,000	1,810	205,000	22.1	5.13	253	7.2
1979	36,140	1,637	180,000	22.1	4.98	236	6.9
1980	20,291	919	116,000	22.1	5.72	145	6.3
1981	22,414	1,011	128,000	22.2	5.71	91	11.1
1982	26,524	1,806	165,000	14.7	6.22	209	8.6
1983	100	13	1,000	7.7	10.00	9	1.4
1984	5,803	323	37,000	18.0	6.38	34	9.5
1985	58,219	3,842	303,000	15.2	5.20	340	11.3
1986	2,935	302	18,000	9.7	6.13	51	5.9
1987	29,167	2,344	236,000	12.5	8.08	173	13.5
1988	33,910	2,695	161,000	12.6	4.72	178	15.1
1989	32,101	2,592	195,000	12.4	6.07	228	11.4
1990	13,474	1,337	75,000	10.1	5.57	151	8.9

Table 4. (continued)

Year	Pounds Landed	Number of Landings	Number of Clams	Lbs. / Landing	Clams / Pound	Number of Diggers	Landings / Digger
1991	28,471	1,691	130,000	16.8	4.57	129	13.1
1992	7	1	35	7.0	5.00	81	0.0
1993	0	0	0	0.0	0.00	56	0.0
1994	19,116	651	78,000	29.4	4.08	107	6.1
1995	58,830	2,7050	276,000	21.7	4.69	159	17.0
1996	2,901	214	17,000	13.6	5.86	33	6.5
1997	2,011	217	8,000	9.3	3.98	13	16.7
1998	2,526	224	11,000	11.3	4.30	18	12.4
1999	483	45	2,000	10.7	4.96	12	3.8
2000	978	64	4,000	15.3	4.09	30	2.1
2001	987	62	5,000	15.9	5.07	24	2.6
2002	89,250	1,805	481,000	49.4	5.39	255	7.1
2003	22,066	515	105,000	42.8	4.76	114	4.5
2004	60,797	1,850	286,000	32.9	4.70	156	11.9

Table 5. Annual age composition for the Clatsop Beach commercial razor clam fishery, 1955-2004.

Harvest Year	Percent Age composition						Com. Harvest (clams)
	0	1	2	3	4	5+	
1955	7.2	60.5	10.8	17.3	3.6	0.6	904,000
1956	4.5	52.6	29.9	8.9	3.9	0.2	490,000
1957	1.6	60.3	27.1	9.2	1.7	0.1	336,000
1958	0.6	55.2	27.9	13.2	2.9	0.2	386,000
1958	0.3	19.5	61.2	15.9	2.9	0.2	179,000
1960	0.4	53.9	25.0	16.6	3.7	0.4	154,000
1961	0.5	17.2	27.4	39.9	14.2	0.8	80,000
1962	3.1	69.4	19.8	6.5	1.0	0.2	102,000
1963	0.5	65.0	28.5	4.8	1.0	0.2	107,000
1964	0.3	55.0	27.2	13.0	4.0	0.5	125,000
1965	2.4	69.2	18.8	7.9	1.5	0.2	399,000
1966	0.2	31.3	47.4	12.3	8.0	0.8	282,000
1967	1.6	63.2	14.8	17.2	2.2	1.0	494,000
1968	0.1	39.0	39.3	12.6	7.5	1.5	361,000
1969							111,000
1970	1.0	30.3	28.5	27.0	12.2	1.0	61,000
1971	2.1	68.8	15.9	5.7	4.1	0.4	123,000
1972	0.0	9.9	78.0	11.4	0.7	0.0	49,000
1973	2.0	67.0	13.3	15.8	1.3	0.2	89,000
1974	0.4	40.0	35.9	13.0	10.2	0.2	32,000
1975	0.1	50.8	14.7	20.6	11.9	1.6	171,000
1976	8.7	87.4	2.6	0.9	0.4	0.0	717,000
1977	1.6	8.7	6.0	12.0	10.6	7.1	143,000
1978	0.8	70.8	10.7	12.6	3.4	1.7	205,000
1979	0.0	61.9	26.1	7.1	4.0	0.9	180,000
1980	0.7	90.9	7.5	0.7	.0.	0.2	116,000
1981	1.4	89.8	8.8	0.0	.0.	0.0	128,000
1982	0.4	98.7	0.7	0.2	.0.	0.0	165,000
1983	2.5	65.5	24.0	8.0	.0.	0.0	1,000
1984	93.7	5.1	1.2	0.0	.0.	0.0	37,000
1985	11.2	85.8	2.7	0.2	0.1	0.0	303,000
1986	10.0	30.0	58.0	2.0	0.0	0.0	18,000
1987	0.0	98.4	1.6	0.0	0.0	0.0	236,000
1988	15.6	60.0	21.6	2.6	0.2	0.0	161,000
1989	6.5	87.1	2.2	3.7	0.3	0.2	195,000
1990	0.0	52.3	42.9	3.7	0.8	0.3	75,000
1991	1.5	18.5	60.4	13.8	2.2	0.6	130,000
1992							
1993			***Seasons Closed Due to Biotoxins***				
1994	1.5	38.5	46.4	12.0	1.5	0.1	78,000
1995	0.0	20.7	43.2	22.9	10.4	2.8	276,000
1996	0.3	49.1	23.4	16.0	11.2	0.0	17,000
1997	0.0	25.0	33.8	39.0	1.2	0.0	8,000
1998	1.8	40.7	36.3	16.4	4.3	0.5	11,000
1999	0.0	25.0	34.8	37.0	3.0	0.2	2,000
2000	3.0	18.5	43.6	15.7	16.2	3.0	4,000
2001	0.0	14.0	33.0	18.0	3.0	0.0	5,000
2002	7.6	67.1	23.2	1.7	0.4	0.0	481,000
2003	0.5	15.5	45.5	27.5	9.8	1.2	105,000
2004	0.0	54.2	26.1	15.3	0.3	0.1	286,000
10 Yr. Ave, 1995-2004	**1.3**	**33.1**	**37.6**	**21.0**	**6.0**	**0.8**	

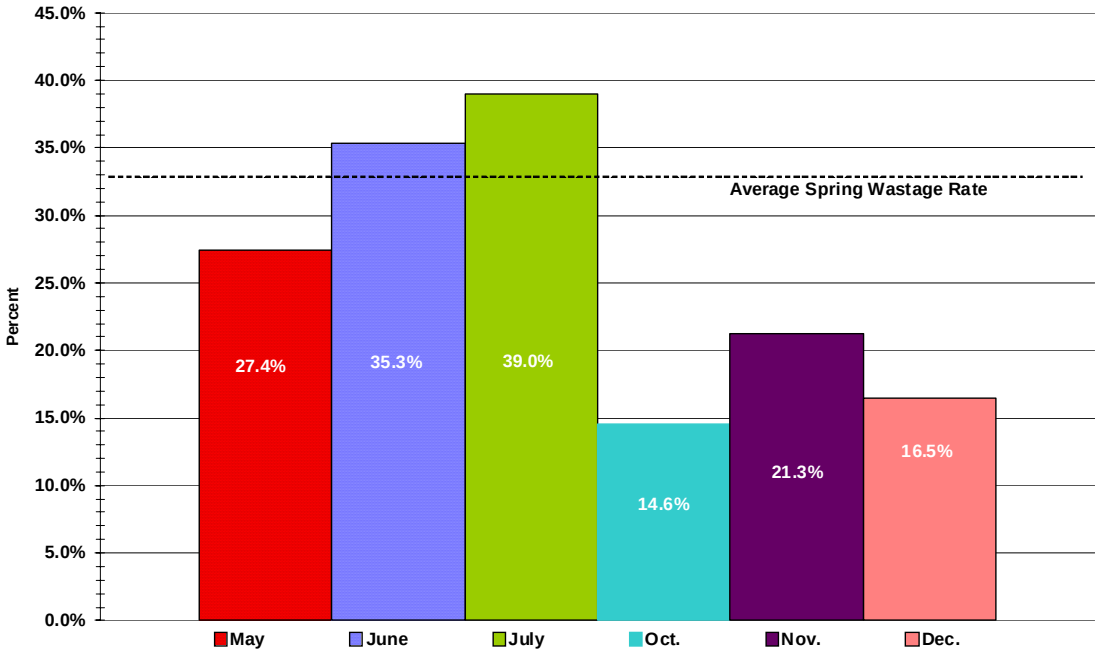


Figure 1. Percent wastage, by month, in the Clatsop Beach recreational razor clam fishery, 2004

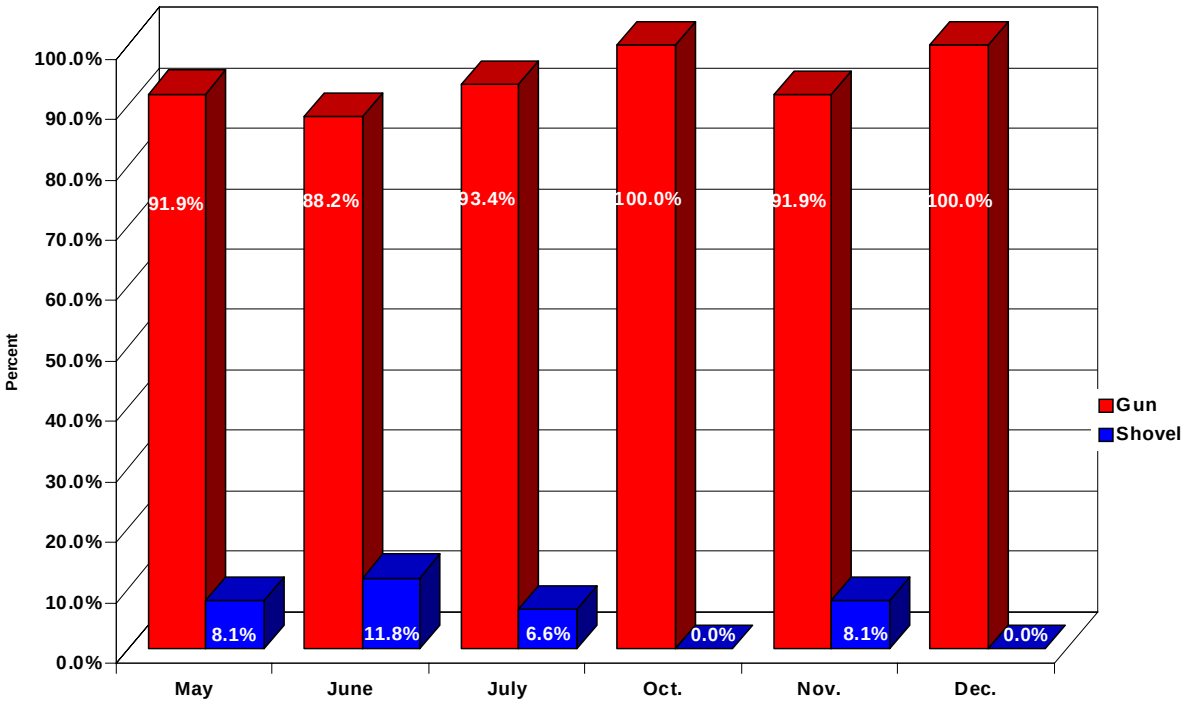


Figure 2. Percent wastage, by gear type, in the Clatsop Beach recreational razor clam fishery, 2004

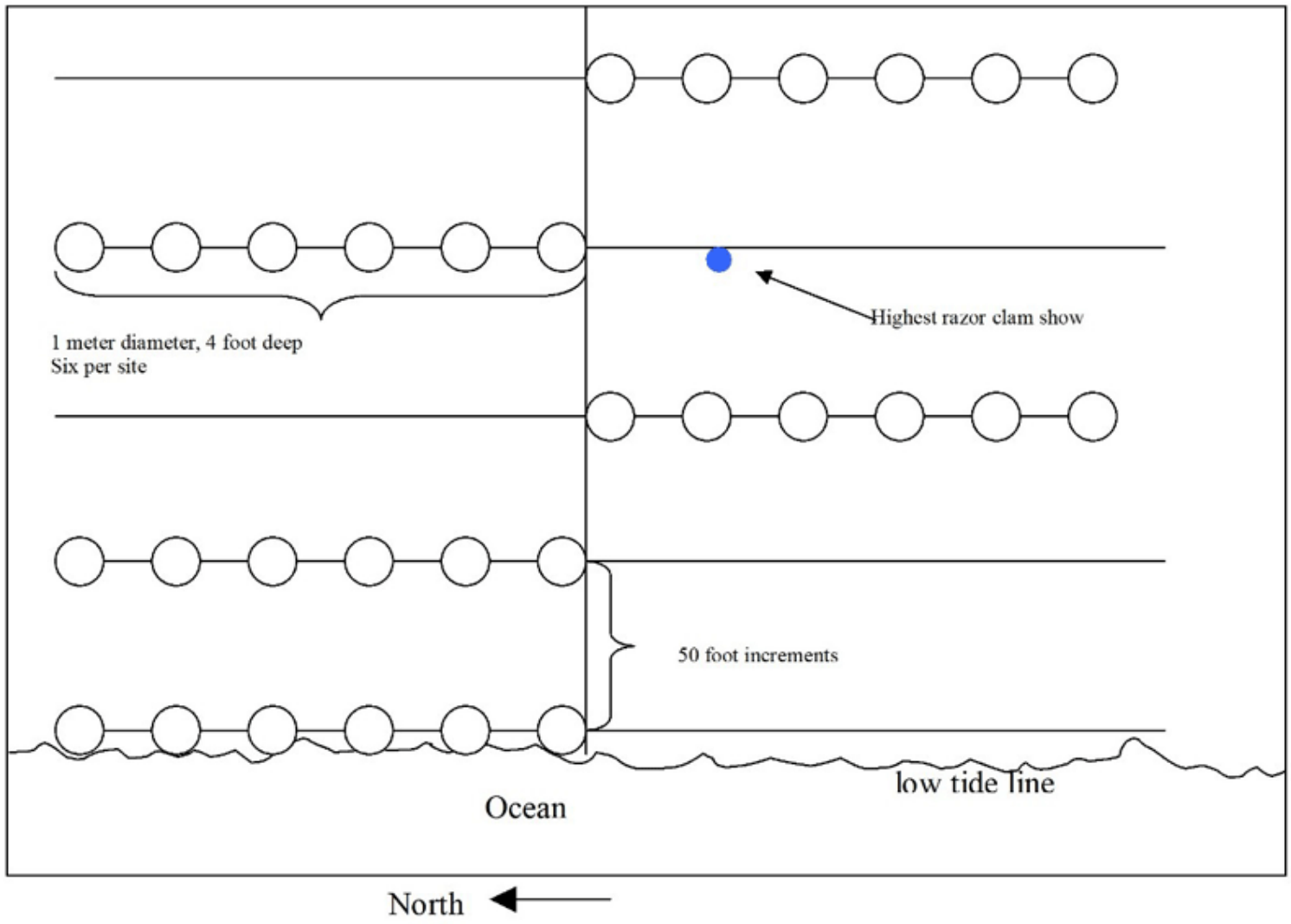


Figure 3: Sample layout of razor clam stock assessment transect

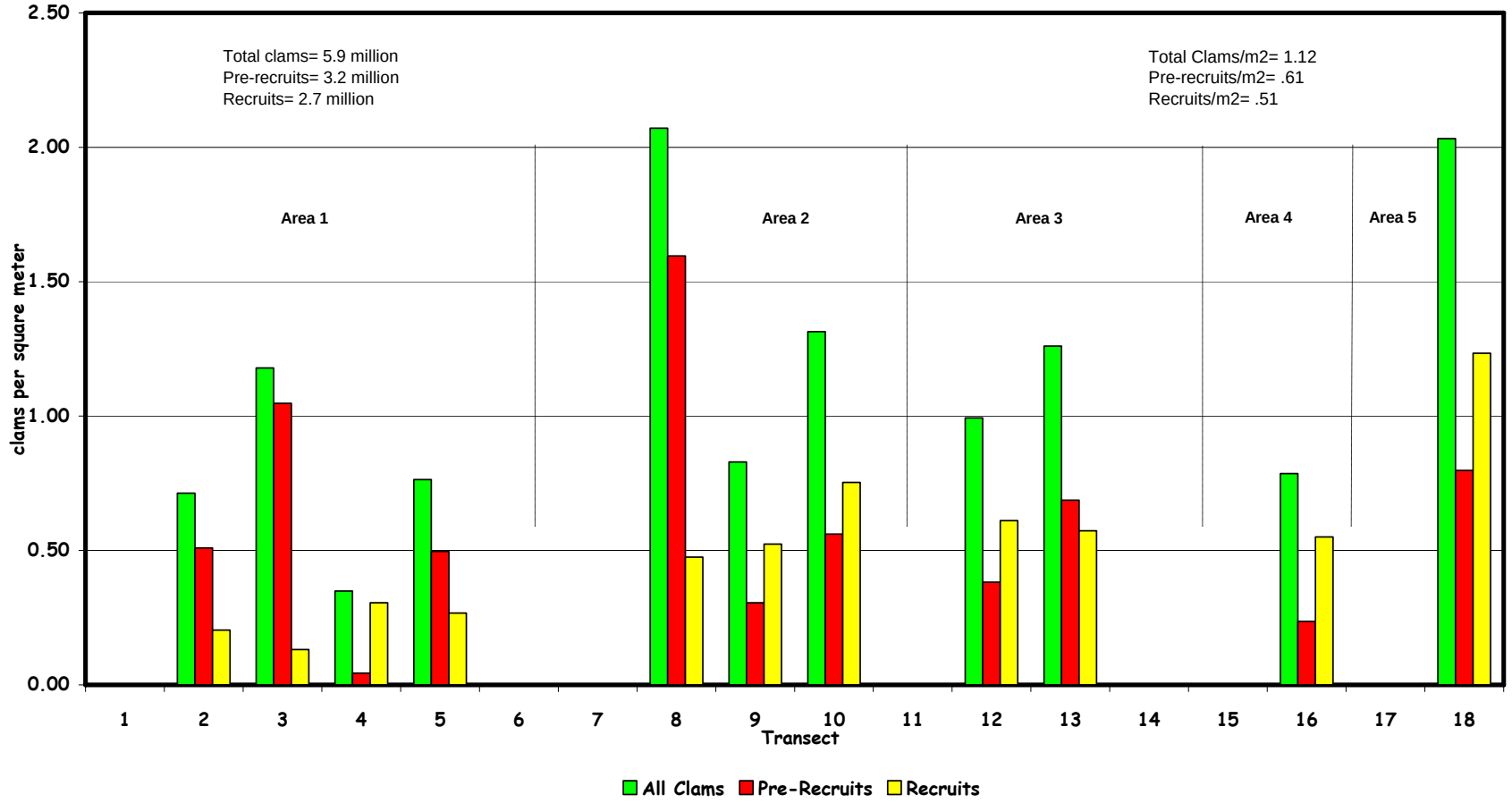


Figure 4. Clatsop Beach razor clam denities (clams/m2), by size (pre-recruits <3 in., recruits > 3in.), by area, 2004