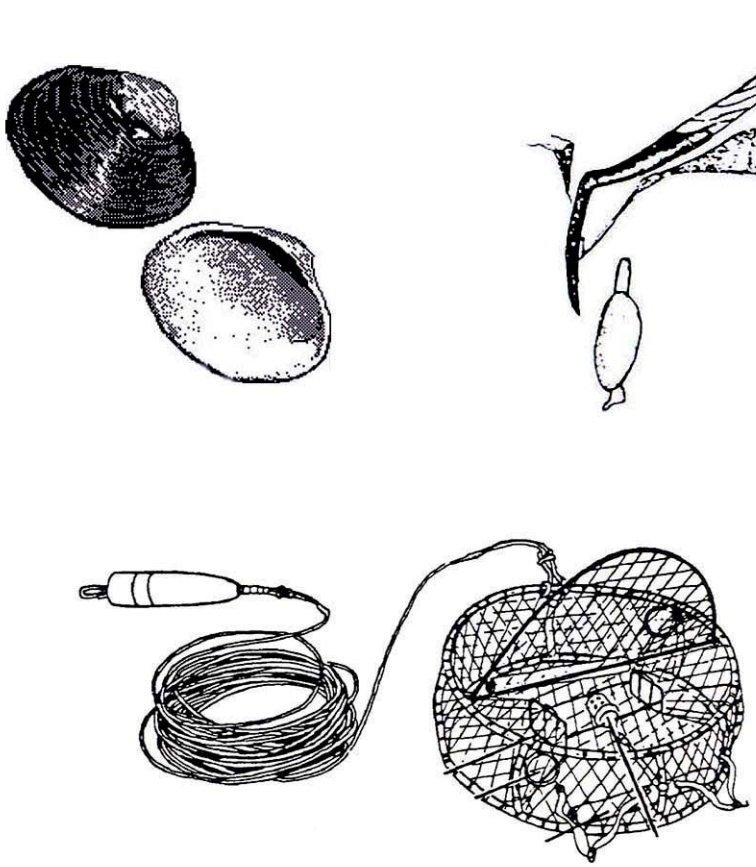
Shellfish / Estuarine Habitat Projects
DATA REPORT

2006 Clatsop Beach Razor Clam Fishery



Marine Resources Program
Oregon Department of Fish and Wildlife

2006 Clatsop Beach Razor Clam Fishery
Status Report

By

Matthew Hunter

Oregon Department of Fish and Wildlife
Marine Resources Program
2001 Marine Drive
Astoria, Oregon 97103

September 2008

Table of Contents

List of Tables

List of Figures

Oregon south coast limit of razor clams

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.

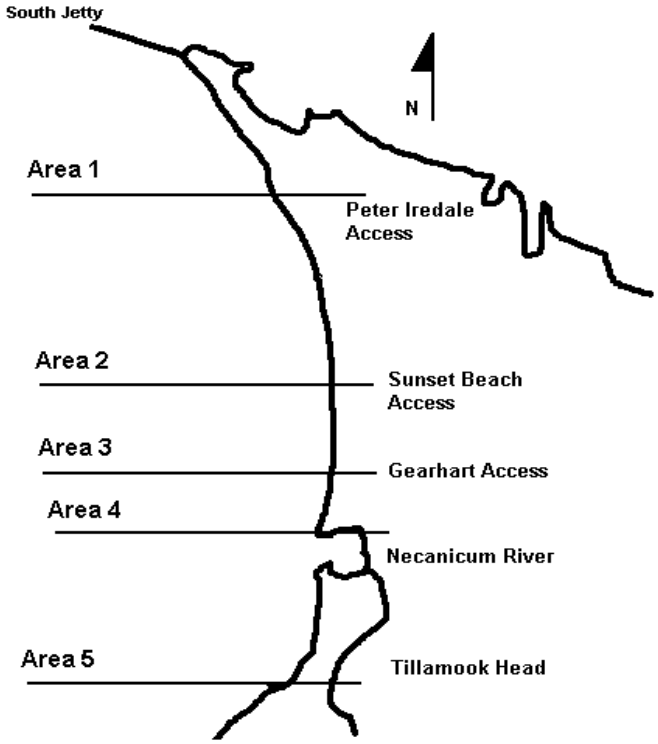
Area 2 (6.2 mi.) is from the Peter Iredale access to the Sunset beach vehicle access point.

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 length frequencies were conducted during sampling interviews. Data collected were used to determine length frequency composition per area during the year and each area total was combined to give overall length 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.

Stock Assessment

The razor clam stock assessment is conducted during the summer conservation closure from July 15th – September 30th. Transect locations are chosen randomly and optimally conducted at a rate of one for each mile of beach that razor clam populations exist. Due to limited low-tide sampling days and available staffing, 12 transects are sampled instead of 18 (one per beach mile). 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 1). 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.

Phytoplankton Sampling

Since 2005, when ODFW was awarded an emergency grant from NOAA, we have collected water samples from the surf at least twice a month from five sites along the Oregon coast. The sampling is done by state field staff who are already involved in shellfish sample collection and surveys.

Samplers collect a five-gallon bucket of water from the surf where they take a 125 milliliter (ml) "whole" water sample straight from the bucket. A "filtered" sample is also collected after the bucket has been poured through a 25 micron mesh phytoplankton net with a 125 milliliter collector at the cod end. Date, time, and area of sample are recorded for all sites and temperature and salinity are recorded from the Clatsop beach site.

These sites (from north to south) are (Figure 3):

1. Clatsop Beach, near Astoria, site of recreational and commercial razor clamming
2. Agate Beach (just N of Newport), site of recreational razor clamming
3. Heceta Head, onshore site closest to Heceta Bank (near Florence)
4. Bailey Beach, just south of Coos Bay
5. Gold Beach, south of Cape Blanco

All samples are shipped to the Astoria ODFW office for analysis where observed species complexes are enumerated and categorized. Harmful species that produce biotoxins (*Alexandrium sp*; PSP and *Pseudo-nitschzia sp.*; DA) are the priority.

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 2006, DA toxin rates on the Clatsop beach rose above the alert level on July 13th, one day before the season was to close for the summer conservation period. Nonetheless, the beaches were closed north of Cape Falcon to all harvest until levels receded below the alert level and reopened on October15th. The mid-coast beaches, Cape Falcon to the Oregon/California border, were open the entire year. 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 2006 were favorable for clam harvest throughout the early 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 128,000 digging trips on the Clatsop beaches during 2006 (Table 1). This was below the all-time record in 2004 of 155,000 digger trips, yet still larger than the 10 year average (1997-2006) of 65,000 diggers. The resulting total recreational catch of razor clams was estimated at 1,803,000. This total catch was also below the all-time record in 2004 of 2,254,000 clams, yet it was significantly larger than the 10 year average of 840,000 clams. The 2006 recreational harvest total includes 271,000 clams wasted in the harvest process. The average catch per digger trip, not including clams wasted, was 12.0 clams (Table 2).

A harvest of 385,000 clams for the last low-tide series in April was the highest series harvest for 2006. This low-tide series accounted for over 25% of the total recreational

harvest. Typically, the low-tide series in the late spring and summer months have the highest harvest. Due to optimal weather and that clams "showed" very easily during this time of year, effort and harvest was very large. It should also be noted that 2006 was the first year we observed the mature population (>4 inches) spawn in mass during a two-week period. Typically, mature clams spawn throughout the late spring and summer and not in such a short period as we observed in 2006. In most instances, after a mature clam spawns, it will exhibit a post-spawn dormancy behavior for a period of time, weeks to months, as the clam recoups from the energy expending process. Because of this mass spawning event, mature clams were not accessible for harvest. Subsequently, catch and effort decreased for the last half of May until the conservation closure.

For the first time in four seasons, harvest was not the largest in Area 3, but instead in Area 2 where over 585,000 clams (38%) were harvested recreationally. Area 3 accounted for 429,000 clams or 28% of the total harvest. Area 1 accounted for 270,000 clams or 17% of the total harvest. Area 5 accounted for 191,000 clams or 12% of the total harvest. Area 4 accounted for 5% (57,000 clams) of the total harvest (Table 2).

Catch and effort on the Clatsop beaches has been at or near all-time highs since 2002. This is in part due to the very large and successful recruitment of "set" clams to harvestable size but also due to the fact that Clatsop beach has been the only stretch of beach in Oregon that hasn't been closed for long periods of time due to bio-toxins. Middle and southern beaches on the Oregon coast have populations of razor clams but harvesters have not been able to consistently access them due to the bio-toxin closures.

Wastage

Wastage sampling occurred from April into July, until the summer conservation closure. We re-dug 744 harvester holes and found 126 clams (16.9%) (Table 4). This wastage rate was considerably lower than what was observed in 2004 (29.8%). The wastage rates varied by area sampled and by the time of year sampling occurred. The early spring sampling revealed wastage rates as high as 30% in Area 1 which prompted staff to distribute a news release reminding harvesters to abide by the rules and retain the first 15 clams dug regardless of size or condition. As the season progressed through the late spring and early summer, the wastage rates declined drastically. This decrease in wastage rates was probably more a result of the mass spawning event and lack of juvenile clams than from harvester behavior changes. Wastage sampling was not conducted during the fall and winter months.

Stock Assessment

Stock assessments began in mid-July after the start of the conservation closure. In 2006, staff completed 12 transects. The stock assessment for the 2006 razor clam

population was estimated at 5.37 million clams. Out of the total population, an estimated 3.18 million clams were pre-recruits (<75 mm) and 2.19 million clams were recruits (>75 mm). The average density for all clams on Clatsop beach was 0.77 clams/m^2. The average density for pre-recruits was 0.46 clams/m^2 and for recruits was 0.31 clams/m^2. Total razor clam abundance for 2006 was lower than what was observed in both 2004 (5.90 million) and 2005 (6.56 million). Distribution of clam abundance on the beaches was highest in the southern portion (Area 5) and in the northern portion (Area 1) (Figure 2). 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 2006 accounting for over 66% of the total recreational catch. These two areas showed relatively low abundances of recruit-sized clams in comparison to areas with much lower harvest. These two areas showed signs of minimal set clams (pre-recruits) in abundance compared to the rest of the sampled areas. We expect that the northern and southern areas will produce large harvest of razor clams in the next year.

Phytoplankton Sampling

In 2006, we collected 135 water samples from the five sites along the Oregon Coast. There were 47 samples from Clatsop beach, 20 samples from Agate beach in Newport, 21 samples from Bob's creek at Heceta Head, 23 samples from Bastendorf beach in Coos Bay and 24 samples from Gold Beach. Analysis of the samples showed only one large bloom of *Psuedo-nitzschia sp*. that occurred during the same time frame that the Clatsop beach razor clam population showed high levels of Domoic acid (Figure 4).

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. 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 vast majority of the commercial harvest occurs on the Clatsop beaches. During years of wide spread set abundance, commercial harvest can occur on other beaches south of Clatsop beach. In most years, this amounts to zero harvest but, in some years, it can account for as much as 10% of the total commercial harvest. It should be noted that south of Clatsop beach commercial harvesters are prohibited from harvesting from state parks.

The 2006 Clatsop beach commercial harvest was 236,000 clams (44,000 pounds), well above the ten year average of 131,000 clams per year (Table 3). The 2006 commercial harvest accounted for 12% of the total annual razor clam harvest. We issued a total of 114 Shellfish Harvest Permits to commercially harvest razor clams in 2006: 47 were certified to sell for human consumption (an ODA certification permit) and 67 were strictly bait harvesters. Out of the 114 commercial razor clam harvesters, only 51 (45%) made commercial landings of which 35 (74% of those certified) landed for human consumption and 16 (31% of those permitted) landed for bait.

Historically, the clams sold for human consumption are the main component of the total catch. During 2001-2005, an average of 83% of the clams was sold for human consumption and 17% were sold for bait. In 2006, the component of razor clams sold as bait (30%) was nearly two times the five-year average. Poor human consumptive markets for razor clams, the limited number of human consumptive processors, the bio-toxin closure during the optimal spring and summer tourist season and the demand for crab-bait after several large commercial Dungeness crab seasons most likely contributed to the increase.

In 2006, the average delivery was 35 pounds, equal to the 10 year average. Prices for human consumption clams ranged from $2.00 to $2.50 per pound while bait prices ranged from $1.00 to $2.25 per pound. This was the third year that bait prices were near or met human consumption prices for razor clams.

The majority of the commercially harvested clams came from Area 5 (57.5%). Followed by Area 2 (18.5%). Areas 1, 3 and 4 comprised of the rest of the harvest with significantly less harvest amounts (10.5, 2.5 and 11%, respectfully). A small portion of the commercially harvested razor clams came from Cannon Beach in late 2006. Approximately 5% (12,000 clams) were harvested from this area. All clams harvested from Cannon Beach were sold as bait since the only beaches in Oregon certified by ODA for harvest of razor clams to be sold as human consumption are the Clatsop beaches.

It should be noted that the areas of highest recreational and commercial harvest are not always 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.

RESEARCH PROJECTS

Newport Area Catch and Effort Estimates

In 2006, through shellfish recreational funding, we were able to begin a pilot project to sample the recreational razor clam fishery on the Newport beaches. There had been anecdotal reports of significant harvester effort and catch on several areas of beach from Yaquina Head south to Waldport. Three beaches were identified as sampling areas due to their close proximity to each other and they also had consistent harvester numbers for sampling purposes. The three beaches sampled, from north to south, were Agate beach, North Jetty beach, and South beach. We conducted sampling from May through the first tide series of September of 2006. A minimum of two sampling days per low-tide series was the sampling goal. Sampling did not occur during August due to staff unavailability.

Catch sampling protocols were very similar to protocols for sampling on the Clatsop beaches. The main difference is that the Newport area beaches are exclusively walk-on access beaches so sampling occurred in the parking lots where the harvester vehicles were located. Interview data collected from harvesters included; area sampled, time spent harvesting that day, number of harvesters in party, harvest method used (tube or shovel) and number of clams retained. We also took length measurements from a subsample of the total daily number of clams sampled. No wastage sampling was conducted during the pilot project.

Effort counts were conducted two hours before low water from vantage points that allowed the greatest view of the area harvested. Effort counts were made every day catch sampling took place. Since this was a pilot project, we did not have standardized effort indices for the Newport area beaches. We used the effort expansion from the Clatsop beaches (1.3) for this pilot project until expansion indices are determined for the Newport area beaches.

The estimated total harvest of razor clams from the Newport area beaches for the period sampled was 37,500. Estimated effort for that time period was 4,800 digging trips. Average catch per unit effort was 7.8 clams per t rip (Table 5). We measured 285 clams with an average length of 112.5 millimeters (4 7/8 inches). Agate beach was the most harvested beach accounting for over 74% of the effort and 73% of the total catch. The North jetty beach was distant second in both effort and catch.

One interesting and surprising finding from this study was that the clam shovel was used by harvesters 3 times more often than the clam tube. This is completely opposite of what is observed on the Clatsop beaches. Due to this finding, we plan on conducting wastage sampling during the 2007 sampling season to determine if the harvest implement used factors into the wastage rate.

Table 1. Annual catch and effort data for the Clatsop Beach razor clam fishery, 1971-2006.

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		
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
2005	66,000	12	773,000	136,000	909,000	174,000	1,083,000
2006	128,000	12	1,532,000	271,000	1,803,000	236,000	2,039,000
Ten-Year Average	**64,830**	**9**	**718,300**	**121,800**	**840,100**	**131,240**	**971,340**

Table 2. Recreational harvest (number of clams) by area, by tide series, 2006.

Month		Area 1	Area 2	Area 3	Area 4	Area 5	Total	Total Effort
Jan	**Series 1**	830	1,596	1,727	179	2,220	**6,552**	**790**
Jan	**Series 2**	121	399	372	35	70	**997**	**151**
Jan	**Series 3**	2,593	5,358	4,623	1,110	1,080	**14,764**	**2,147**
Feb	**Series 4**	2,931	9,120	18,891	1,466	3,094	**35,503**	**2,803**
Feb	**Series 5**	11,726	38,353	67,114	4,397	6,270	**127,860**	**9,270**
Mar	**Series 6**	44,949	158,731	125,074	14,042	35,394	**378,190**	**29,857**
Apr	**Series 7**	1,078	9,643	12,051	1,954	5,537	**33,263**	**2,466**
Apr	**Series 8**	59,143	154,374	107,460	11,776	52,006	**384,758**	**27,920**
May	**Series 9**	25,894	46,124	27,142	8,143	20,909	**128,212**	**10,795**
May	**Series 10**	33,887	35,352	13,998	3,034	19,318	**105,588**	**9,766**
Jun	**Series 11**	19,197	33,793	15,815	1,500	9,231	**79,527**	**8,809**
Jun	**Series 12**	14,156	5,831	990	2,232	10,137	**33,347**	**4,820**
Jul	**Series 13**	24,127	32,977	19,304	2,543	15,627	**94,578**	**8,356**
Jul	**Series 14**							
Aug	**Series 15**							
Aug	**Series 16**			***ODFW Season Closure***				
Sep	**Series 17**							
Sep	**Series 18**							
Oct	**Series 19**			***Bio-toxin Closure***				
Oct	**Series 20**	3,474	7,383	1,701	145	2,171	**14,874**	**1,369**
Nov	**Series 21**	266	266	65	89	89	**774**	**69**
Nov	**Series 22**	271	271	66	90	90	**790**	**70**
Dec	**Series 23**	15,851	36,480	7,068	3,836	5,573	**68,809**	**6,242**
Dec	**Series 24**	3,664	3,176	478	326	570	**8,214**	**703**
Dec	**Series 25**	2,541	5,928	4,728	494	1,858	**15,549**	**1,228**
	Sport Total	**269,690**	**585,157**		**57,391**	**191,245**	**1,532,149**	**127,631**

Sport total w/ 15% wastage	**1,802,529**	**CPUE**	**12.0**

Table 3. Annual commercial razor clam catch and effort, 1971-2006.

Year	Pounds Landed	Number of Landings	Number of Clams	Lbs. / Landing	Clams / Pound	Number of Diggers	Landings / Digger
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
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
2005	27,310	1,057	174,000	25.8	6.37	101	10.5
2006	44,007	1,252	236,000	35.1	5.36	114	11.0
10-Year Average	**25,042**	**709**	**131,240**	**35.3**	**5.24**	**84**	**8.5**

Table 4. Clatsop beach recreational wastage sampling results, by area, 2006.

	Area 1			Area 2			Area 3			Area 4			Area 5			Total for Day		
Date	Holes	Clams	%	Holes	Clams	%	Holes	Clams	%	Holes	Clams	%	Holes	Clams	%	Holes	Clams	%
4/28	100	27	27.0	105	12	11.4										205	39	19.0
5/16	80	24	30.0				53	2	3.8	50	5	10.0				183	31	16.9
5/17													74	13	17.6	74	13	17.6
5/30				80	11	13.8										80	11	13.8
6/13	80	9	11.3													80	9	11.3
6/28	40	13	32.5													40	13	32.5
7/10													32	4	12.5	32	4	12.5
7/11	50	6	12.0													50	6	12.0
Total	350	79	22.6	185	23	12.4	53	2	3.8	50	5	10.0	106	17	16.0			
															Grand Total	744	126	16.9

Table 5. Newport beaches recreational razor clam catch and effort estimates, 2006.

		Sample Totals						Estimates		
		Effort Counts	Corrected (0.75)	Days Counted	Series Length (d)	No. of Diggers	Clams / Digger	Effort (Diggers)	Clams	
May	Series 9	50	65	2	10	23	4.9	325	1,597	
May	Series 10	360	468	5	10	26	8.4	936	7,812	
June	Series 11	222	289	4	10	101	5.6	722	4,025	
June	Series 12	233	303	3	10	113	9.5	1,009	9,626	
July	Series 13	273	355	3	10	121	9.1	1,182	10,765	
July	Series 14	104	135	3	10	43	5.3	450	2,397	
Sept.	Series 17	40	52	3	9	15	8.3	156	1,300	
										CPUE
							Totals	4,780	37,521	7.8

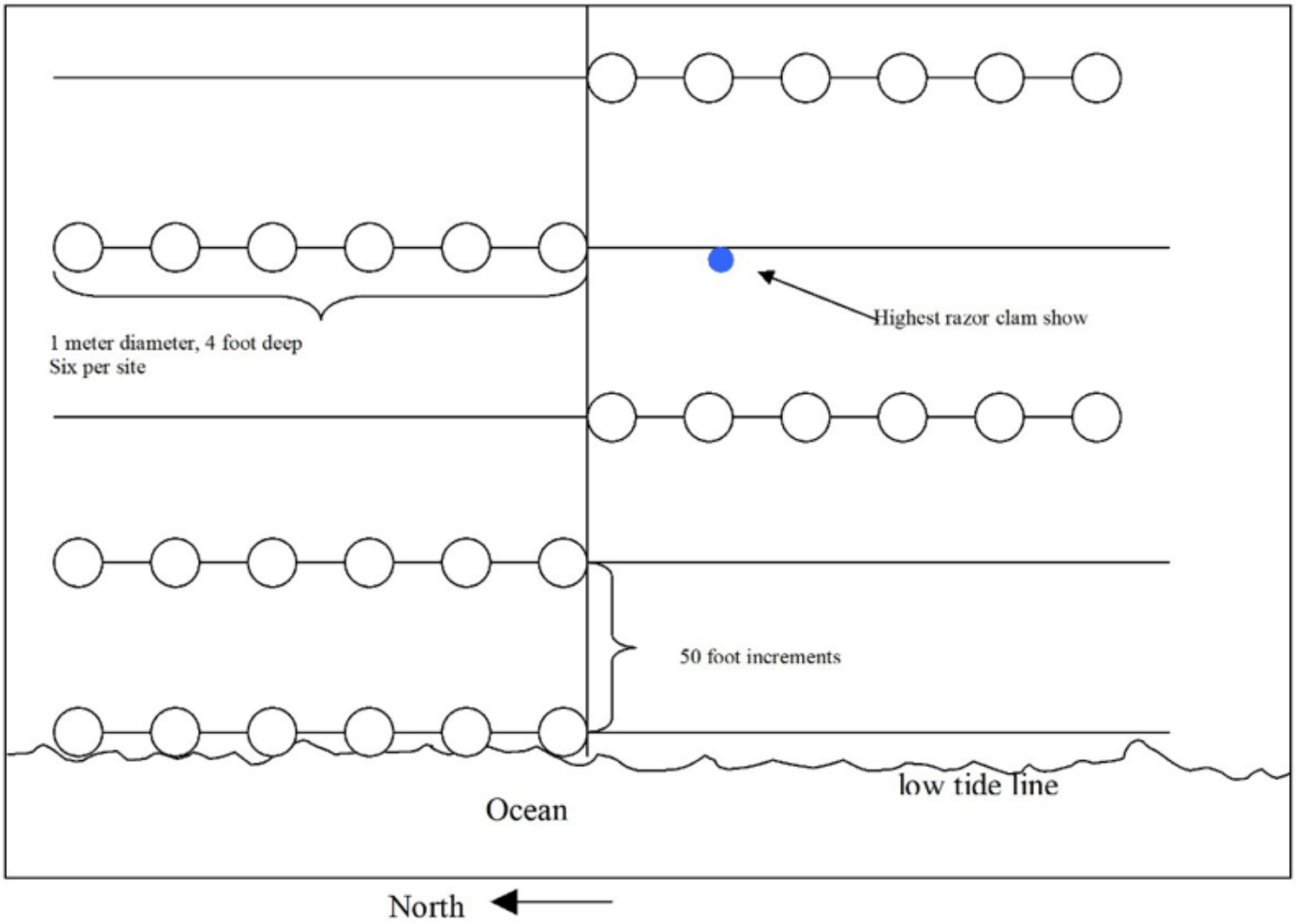


Figure 1. Sample layout of razor clam stock assessment transect.

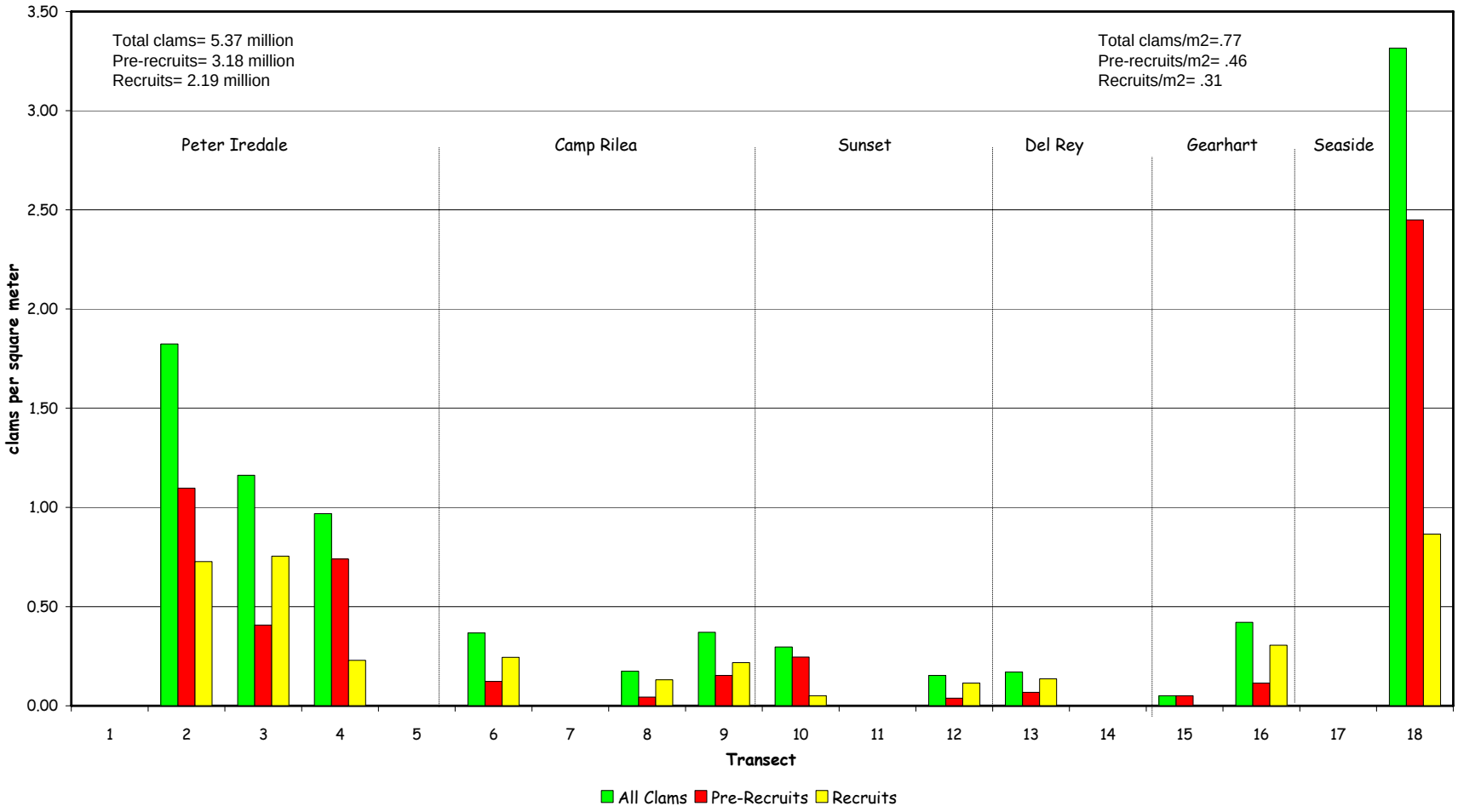


Figure 2: Clatsop Beach razor clam densities (clams/m2), by size (pre-recruits <3 in., recruits >3 in.), by area, 2006

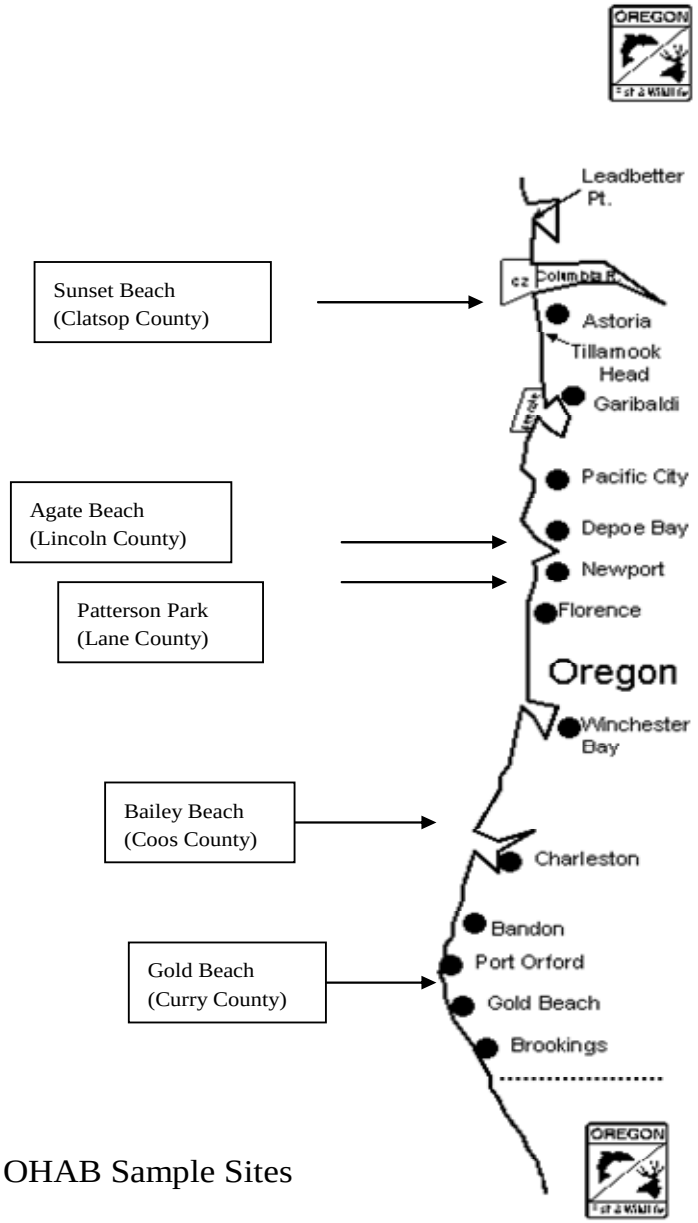


Figure 3: OHAB Sample Sites

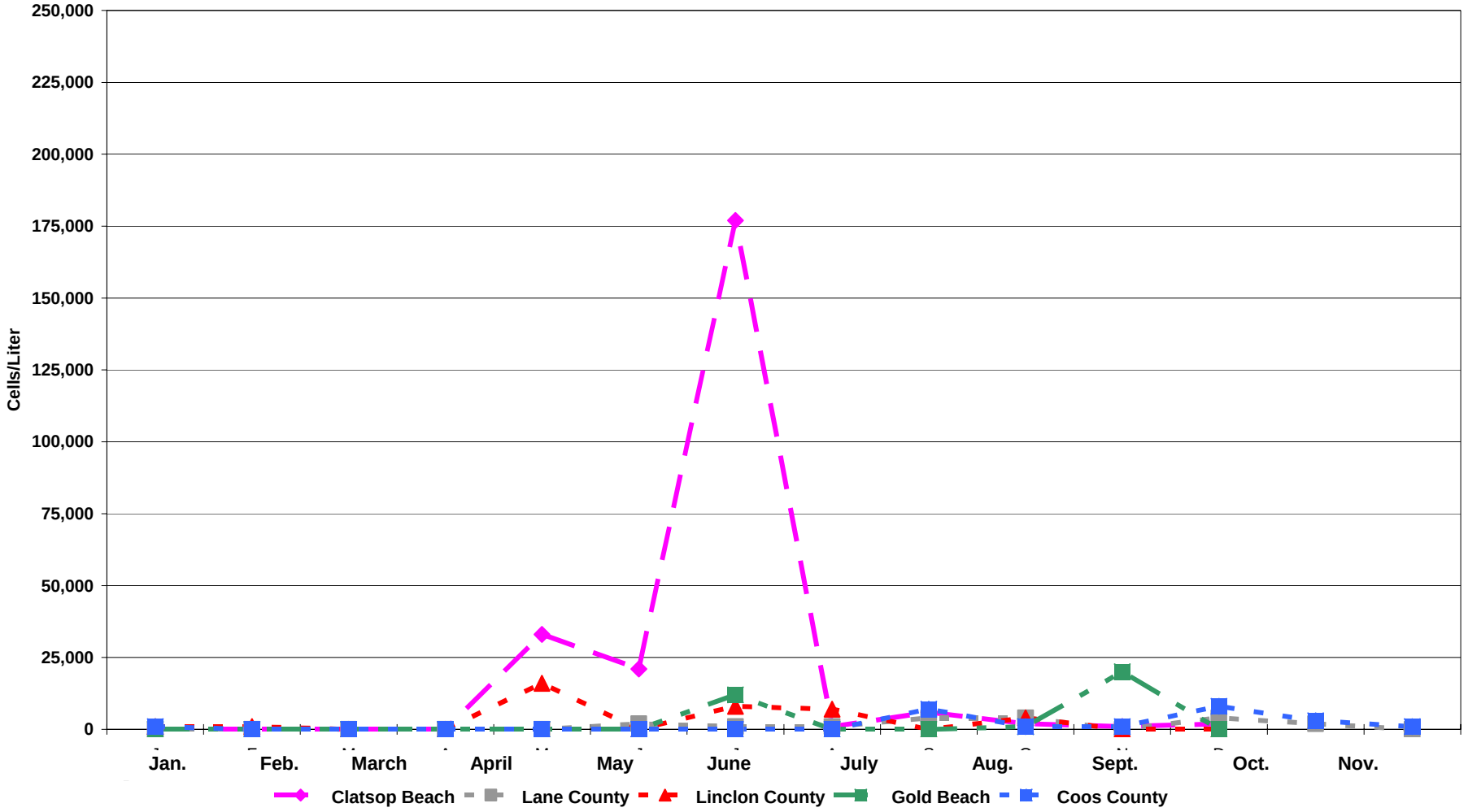


Figure 4: 2006 Oregon Coast Pseudo-Nitzschia Abundance