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RESULTS OF THE 1976 SOUTHERN  
CALIFORNIA PISMO CLAM CENSUS

by

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ABSTRACT

A Pismo clam, *Tivela stultorum*, census was conducted in January 1976 on selected southern California beaches. Effort and catch information was collected through clammer interviews. Estimates for January 17 on beaches sampled were 3,296 clammer-hours, 2,170 clammers, and 10,739 legal clams (4.5 inches or larger) harvested.

Clams were collected for age and growth studies. Samples of clams from the Long Beach to Newport Beach pier area demonstrate the fastest growth rates of any Pismo clams reported in the literature. Clams begin to be recruited to the fishery at age 4<sup>0</sup> months.

The 1974 year class was the largest on beaches sampled. Recruitment to the fishery will be poor for the 1976-77 and 1977-78 seasons and clamming will be dependent on large older clams.

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## INTRODUCTION

The number of Pismo clam diggers in California is not known, but it is considerable. It was estimated that on one weekend; 150,000 people were seeking these clams on Pismo beach.

A statewide survey and census was initiated in 1975 to evaluate the effects of sea otter foraging and heavy sport clamming pressure on clam stocks. Information obtained from the 1975 census was reported by Miller, Hardwick, and Dahlstrom (1975).

A follow up survey was conducted in January 1976 on selected southern California beaches where sport clamming was known to occur. This report summarizes the past survey results and presents census, age composition, and growth estimates obtained in 1976.

## METHODS AND PROCEDURES

### Census Methods

Interviewers inquired after each clammer or group of clammers the number of clammers in party, digging implements used, hours clammed, legal clams harvested, and sublegal clams found which ranged in size from 88.9 to 114.3 mm (3.5 to 4.5 inches). Four interviewers were provided with measuring boards to obtain length frequencies of clams captured and retained by clammers. Two observers flew in a Department airplane and counted clammers along the southern California coastline.

Effort estimates were determined by the number of digging implements and not by number of persons. This avoids the group phenomenon and inaccurate effort estimates, i.e. four persons with only two digging implements. The effort calculations would be for the two

digging implements.

#### Growth and Aging Procedures

Clams were collected during minus tides at the same beaches where clambers were interviewed. Clams were taken by probing the sand with a six-tined "potato" fork. All clams encountered were measured and aged. Effort, during these collections, was recorded for a comparison with census estimates.

Calculations of length at age were done by the "annual ring" method (Weymouth 1923). Measurements were made to the nearest millimeter in the greatest antero-posterior dimension. Each measurement was made at a dark colored band or "growth ring".

#### Pismo Clam Areas of Occurrence and Season

Pismo clams probably occur on most flat sandy beaches in southern California. They have been taken in 24 m (80 ft) of water, and large clams off some of the southern California beaches are found only subtidally.

A Pismo clam season in southern California is defined as the period during a year when minus tides occur between 1000 and 2200 hours. This situation occurs from September to May each year. It should be pointed out that subtidal clams are available all year round to skin or scuba divers. Clamming also can occur during some minus tides which take place during early daylight hours in the spring and summer.

### RESULTS

#### Ventura County

Ormond Beach was sampled only in 1976 (Table 1). Effort was low

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and few conclusions can be drawn from this sample except that Pismo clams are present at Ormond Beach. Approximately 2 weeks later, on the next series of minus tides, effort remained low at Ormond Beach. Silver Strand, the beach north of Ormond Beach, was observed having some clamming effort (30-40 people).

#### Los Angeles County

##### Hermosa Beach

Conclusions based on the 1975 and 1976 figures would be very subjective at best. Again, the most that can be said is that clamming for Pismo clams occurs at this beach.

##### Long Beach

The catch per clammer day (C/D) and catch per hour (C/H) at Long Beach was much higher for legal clams in 1976 than 1975. However, this higher figure reflects a high catch rate on one portion of this beach which was sampled in 1976 but not in 1975. This portion of the beach had a C/D of 8.7 and C/H of 8.1 legal clams.

A comparison of the sections of beach sampled both in 1975 and 1976 shows a C/D of 2.94 and 3.22 for 1975 and 1976, respectively. The C/H for legal clams was 1.74 for both years, and C/H data for sublegal clams were comparable to each other in 1975 and 1976 (Table 1).

#### Orange County

##### Seal Beach

Catch rates at Seal Beach declined by about 50% from 1975 to 1976. The low C/H for sublegal clams indicates poor recruitment to the fishery for next year also (Table 1).

TABLE 1. Number of Clammers, Hours, Numbers of Legal and Sublegal Pismo Clams Sampled, Catch per Day (C/D), and Catch per Hour (C/H) at Ventura, Los Angeles, and Orange County Beaches During January 1975 and 1976 Low Tide Period.

	Year	No. of clammers*	Hours	Legal sized		Sublegal sized		January Dates	
				No.	C/D	C/H	No.		C/H
Ventura County									
Ormond Beach	1976	17	25	59	3.47	2.36	75	3.00	16, 18
Los Angeles County									
Hermosa Beach	1975	20	46	39	1.95	0.85	85	1.85	25
	1976	45	78.25	311	6.91	3.97	334	4.27	16, 17
Long Beach	1975	69	117	203	2.94	1.74	304	2.60	25
	1976	118	179.75	656	5.56	3.64	497	2.76	16, 17, 18
Orange County									
Seal Beach	1975	90	133	269	2.99	2.02	258	1.94	25, 26
	1976	53	84.50	87	1.64	1.03	152	1.80	16, 17, 18
Bolsa Chica-Huntington Pier	1975	585	707	826	1.41	1.17	148	0.21	25, 26
	1976	268	451.25	852	3.18	1.89	269	0.60	16, 17, 18
Huntington Pier-Santa Ana R.	1975	495	830	2,244	4.53	2.70	2,224	2.68	25, 26
	1976	680	990	3,783	5.56	3.82	2,064	2.08	16, 17, 18
Santa Ana R.-Newport Pier	1975	100	158	677	6.77	4.28	324	2.05	25, 26
	1976	99	119.75	437	4.41	3.65	585	4.89	16, 17, 18

\* This was a measure of the number of digging implements, i.e. forks, not number of clambers

#### Bolsa Chica to Huntington Beach Pier

While C/D went up in 1976, total effort dropped. Interviews revealed a very low C/H of sublegal clams which should mean continued poor clamming during the 1976-77 clam season. Catch per day and C/H for this area would be much lower if one section next to Huntington Beach pier did not have a high C/D of 5.76 and C/H of 5.40 legal clams.

#### Huntington Beach Pier to Santa Ana River

Clamming remained very good at this beach and compares very closely with 1975 figures (Table 1). Numbers of sublegal clams observed by clambers remained at a moderately low level. This beach accounted for 51% of the clamming effort and 61% of legal clams taken from beaches sampled (Table 2).

#### Santa Ana River to Newport Pier

The C/D and C/H dropped in 1976, but this beach still provided good clamming. There was, however, an increase in C/H of sublegal clams to 4.89. These sublegal clams should provide for a continued successful fishery during 1976-77 season.

#### San Diego County Beaches

There was almost a complete lack of Pismo clamming on San Diego county beaches as observed from the Department airplane and information provided by the unit manager in this area. Total number of clambers observed from the Department airplane was two at Silver Strand State beach.

#### Coastal Airplane Observations

Coastal observations of beaches were made from the United States-Mexico border to Point Dume. Counts of clambers on beaches which were

not sampled were as follows: 10 between Newport pier and Balboa pier, 3 at Doheny State Beach, 10 at Cabrillo Beach, 4 on Torrance and Redondo beaches, and 10 at Santa Monica Beach State Park.

Coastal observations could not be made above Point Dume due to fog and low clouds.

#### Census Catch and Effort Estimates

Total numbers of clammers, clammer hours, and legal clams were estimated for beaches where there were both interviews and counts from the airplane. Estimates were made using turnover curves for each beach area to estimate the portion of total clammer effort represented by counts made from the airplane.

Formulas for making various estimates were as follows:

$$E = n/2c$$

where: E = Total clammer hours

n = Count of clammers from airplane for a section of beach

c = Proportion of total clammer effort during 1/2-hr count  
when plane flew over section of beach

$$C = EN/T$$

where: C = Total clammers

T = Total clamming hours compiled by interviewers for  
section of beach

N = Total numbers of clammers interviewed for section of beach

$$TC = C(a)$$

where: TC = Total number of legal clams taken per section of beach

a = The average catch of legal clams per clammer day (C/D)



Estimates for Huntington Beach Pier-Santa Ana River section were 1,426 clammer hours, 977 clammers, and 5,430 clams taken by clammers (Table 2). Total estimates, for beaches where there were both interviews and counts from the airplane, were 3,296 clammer hours, 2,170 clammers, and 10,739 "legal" clams. Since only 39 clammers were seen from the airplane on beaches where there were no interviewers, out of a total of 1,444 observed from the plane, we feel that the estimates cover a majority of the clamming which occurred between United States-Mexico boundary and Point Dume on January 17, 1976.

#### Census Length Composition

Compliance to the 114.3-mm (4.5-inch) minimum size limit appears to be good. All clams measured by interviewers were legal or within 9.3-mm (0.37 inch) of being legal size (Table 3). Clam size range above 114.3 mm (4.5 inches) is large (Table 3) which may indicate a low catch to total resource; that is, clams are not being fully exploited as soon as they are recruited to the fishery.

#### Length at Age Calculations

Coe and Fitch (1950) state that principal spawning season for Pismo clams at La Jolla is June to December and spawning season at Sunset Beach, Orange County, is approximately the same.

Annual rings appear to be formed during late fall and early winter. Clams larger than 100 mm (3.9 inches) had annual rings on the edge of the shell during January, while those less than 100 mm (3.9 inches) had completed rings and were returning to a period of rapid growth.

Due to the stated spawning season, clams taken for age and growth samples in January were given monthly ages of 4, 16, 28, 40, 52, 64,

TABLE 2. Estimates of Total Clammer Hours, Clammers, and Number of Clams Harvested on Sampled Southern California Beaches.

Location	Clammer hours	Clammers	Number of legal clams
Hermosa Beach	269	154	1,067
Long Beach	519	340	1,894
Seal Beach	104	66	107
Bolsa Chica-Huntington Pier	756	450	1,431
Huntington Pier-Santa Ana R.	1,426	977	5,430
Santa Ana R.-Newport Pier	222	183	810
TOTALS	3,296	2,170	10,739

TABLE 3. Measurements of Pismo Clams Harvested From Orange County Beaches.

Area	Length interval (5 mm)										
	105-109.9	110-114.9	115-119.9	120-124.9	125-129.9	130-134.9	135-139.9	140-144.9	145-149.9	150-154.9	155-159.9
Bolsa Chica State Beach		6	26	59	74	68	34	9	8	2	1
Huntington Beach	7	64	113	134	121	74	47	22	11	2	
Newport Beach		11	30	27	39	39	25	14	8	5	2

76, and 88 months. This corresponds to yearly ages given by other authors (Fitch 1950; Weymouth 1923) of 0, I, II, III, IV, V, VI, and VII.

Pismo clams at three southern California beaches appear to have a very similar growth rate (Table 4). Clams begin to be recruited to the fishery at age 40 months (age-group III), while most clams have reached legal size around age 52 months (age-group IV).

A total of 249 clams were used to determine the age composition of Pismo clams on Los Angeles and Orange County beaches. The 1974 year class was the largest on beaches sampled (Table 5) with 38.5%. Age-group VI and older were combined and made up 31.3% of the population. The 1973 year class appeared weak while the 1970 year class appears to have been a strong year class. From a small sampling of clams used in an availability study, 75% of clams under 100 mm (3.9 inches) were vulnerable to six tined potato forks, while almost all clams above 100 mm were vulnerable to these digging implements. This means the 1973 and 1974 year classes are larger than indicated by the digs.

#### Mortality

A sample of 47 clams of the 1974 year class shows 10 would have suffered either mortality or damage from probing with a potato fork. Extent of mortality is not known at this time.

#### DISCUSSION

Huntington Beach pier to Newport Beach pier continues to provide good clamming, and due to large numbers of clams above 114.3 mm (4.5 inches) there should be a good fishery in this area during the 1976-77

TABLE 4. Growth by Age of Pismo Clams Taken at Three Southern California Beaches in January, 1976.

Yearly age	0	I	II	III	IV	V	VI	VII
Monthly age	4	16	28	40	52	64	76	88
Long Beach								
n	5	39	37	32	23	16	7	3
$\bar{X}$ in mm.	34	69	94	107	115	118	118	119
$\hat{\sigma}$ in mm.	8.4	7.4	7.0	6.7	6.9	6.2	3.1	1.5
Bolsa Chica State Beach								
n	7	30	28	28	26	20	14	6
$\bar{X}$ in mm.	37	70	94	108	116	122	129	132
$\hat{\sigma}$ in mm.	5.6	7.9	7.9	8.6	6.5	6.2	7.8	12.1
Huntington Beach								
n	9	90	86	85	68	56	35	12
$\bar{X}$ in mm.	38	69	93	107	114	118	120	120
$\hat{\sigma}$ in mm.	6.3	8.1	7.7	7.7	7.6	8.1	6.4	5.4

TABLE 5. Age Composition of Pismo Clams on Los Angeles and Orange County Beaches.

Age	0	I	II	III	IV	V	VI+
Year-class	1975	1974	1973	1972	1971	1970	
Number	0	96	6	21	20	28	78
Percent	0	38.5	2.4	8.4	8.0	11.2	31.3

season. Seal Beach to Huntington Beach pier area continues to provide poor clamming, in general, and prospects of a good fishery are poor due to very little recruitment and small numbers of legal clams. Long Beach should continue to have good clamming in certain areas during the 1976-77 season. Low population levels may be inferred by a lack of clamming in San Diego County.

The minus tide on January 17, 1976, was -1.2 ft as determined for outer harbor Los Angeles, California. During the 1975-76 season there was a total of 18 minus tides, -1.0 ft or lower. If the estimates of 3,296 clammer hours, 2,170 clammers, and 10,739 legal clams represent a typical clamming day, then effort and numbers of clams harvested during the season in southern California is considerable.

Compliance to the 114.3 mm minimum size limit was good. Large numbers of clams above 114.3 mm indicate continued existence of a large fishable resource, particularly in Huntington Beach pier to Newport Beach pier area.

Growth rates of Pismo clams collected from Long Beach to Newport Beach pier are the highest of any reported in the literature (Weymouth 1923; Coe and Fitch 1950). Clams on these southern California beaches are recruited to the fishery 2 years before clams on Pismo Beach.

The 1974 year class appears to be strong but these clams will not begin to be recruited to the fishery until the fall of 1977 and they will not be recruited fully until the fall of 1978. The 1972 and 1973 year classes which will provide recruitment for the next two seasons are weak and the fishery will be dependent on large older clams.

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