

Van Heyning

C-3(3)

INFORMATION REPORT

Utilization and Regulation
of Clatsop Beach Razor Clam Stocks

Oregon Fish Commission
Research Division

Shellfish Investigations

November 1966

TABLE OF CONTENTS

	<u>Page No.</u>
INTRODUCTION.....	1
REVIEW OF REGULATIONS.....	1
STATUS OF THE FISHERY.....	2
<u>Harvest and fishing effort</u>	2
<u>Age composition</u>	4
UTILIZATION OF CLAM STOCKS.....	4
<u>Harvest of young clams</u>	9
<u>Wastage</u>	9
DISCUSSION.....	13
SUMMARY.....	20
RECOMMENDATIONS.....	22

LIST OF FIGURES

<u>Figure No.</u>		<u>Page No.</u>
1.	Personal-use harvest of razor clams and numbers of diggers on Clatsop Beaches, 1955-66.....	3
2.	Commercial harvest of razor clams and numbers of landings from Clatsop Beaches, 1946-66.....	5
3.	Commercial and personal-use razor clam harvest from Clatsop Beaches, 1946-66.....	6
4.	Per cent age composition of recreationally harvested razor clams, 1955-66.....	7
5.	Per cent age composition of commercially harvested razor clams, 1952-66.....	8
6.	Average number of recreationally dug razor clams per pound, April-September 1961.....	10
7.	Two-year averages of recreational harvest of first-year razor clams in per cent by tide series, Clatsop Beaches, April-September 1958-65.....	11
8.	Recreational harvest of first-year razor clams from Clatsop Beaches, 1957-66.....	12
9.	Wastage of razor clams by the recreational fishery, April-September 1958-60, 1962, 1964-66.....	14
10.	Annual wastage of razor clams by the recreational fishery, Clatsop Beaches, 1957-66.....	15
11.	Theoretical reduction in recreational wastage of razor clams effected by July 15-August 31 beach closure, 1957-66.....	17
12.	Theoretical reduction in recreational harvest of first-year razor clams effected by July 15-August 31 beach closure, 1957-66.....	18
13.	Recreational harvest of first-year razor clams in numbers and per cent and numbers of diggers, by tide series, Clatsop Beaches, 9-year mean, April to September 1958-66.....	21

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
1.	Numbers of razor clams harvested from each year class by age group (includes recreational, commercial, and wastage).	2
2.	Theoretical carry over of razor clams effected by July 15-August 31 beach closure, 1957-66, in thousands of clams....	16
3.	Estimated effect of natural mortality on razor clams saved during July 15 to August 31, 1957-66 in thousands of clams.	19
4.	Numbers of recreational diggers on Clatsop Beaches, July 15-August 31, 1958-63.....	19

UTILIZATION AND REGULATION OF CLATSOP BEACH RAZOR CLAM STOCKS

INTRODUCTION

In 1949 the Oregon Fish Commission began investigating the razor clam fishery. About 90% of the fishery was located on the 18-mile beach between Tillamook Head and the Columbia River; in this area the 2-mile Seaside Beach supported nearly one-half the fishery. Both recreational and commercial fisheries were active. Early in the investigation certain problems became evident. This report discusses these problems under the following sections: a review of regulations, status of the fishery, utilization of the clam stocks, and recommendations for management.

REVIEW OF REGULATIONS

Prior to 1954 the personal-use limit on razor clams was 36 clams per digger per day. In 1954 the limit was reduced to the first 24 clams dug regardless of size. These restrictions are in effect at the present time.

Commercial diggers prior to 1954 were restricted to clams that measured at least 3-1/2 inches in length, and were prohibited from digging in the Cove area at Seaside (OFC General Order No. V). Hirschhorn ^{1/} presented data in July 1954 to show that a large number of first-year clams were being taken by commercial diggers. These data suggested that postponing harvest of the young clams until spring of the following year would cause a significant gain in weight and a greater yield from the resource. In September 1954 the regulation was changed from 3-1/2 to 4-1/4 inches minimum length; the Cove restriction was retained. The regulation change to 4-1/4 inches eliminated most of the first-year clams from the commercial fishery.

^{1/} Hirschhorn, 1962. Growth and mortality rates of the razor clam (Siliqua patula) on Clatsop Beaches, Oregon. Fish Commission of Oregon Contribution No. 27.

STATUS OF THE FISHERY

Harvest and fishing effort

The recreational harvest fluctuates markedly and reflects both the number of diggers and the relative abundance of clams. The recreational harvest of razor clams and number of diggers for 1955-66 are shown in Figure 1. The sharp decline in the harvest in 1959 was probably due to a weak year class that began to enter the fishery in 1957. Table 1 shows that the strength of the year classes in the harvest was reduced from 2,797,000 clams for the 1956 year class to 809,000 for the 1957 year class, a reduction of 71%. The level has improved since 1960, but is still considerably lower than for the 1954-56 level.

Table 1. Numbers of razor clams harvested from each year class by age group (includes recreational, commercial, and wastage).

Year of set	Age at harvest						Total
	0	1	2	3	4	5	
	Thousands of clams						
1954	705	745	332	115	12	1	1,910
1955	706	1,023	330	93	14	1	2,167
1956	850	1,469	364	89	24	1	2,797
1957	348	286	109	61	5	1	809
1958	194	479	86	18	4	1	782
1959	103	312	74	16	7	1	512
1960	250	591	112	43	5		1,001
1961	409	442	118	58			1,033 1/
1962	316	418	126				900 1/
1963	898	878					2,166 1/
1964	494						
1965	870						

1/ Estimates.

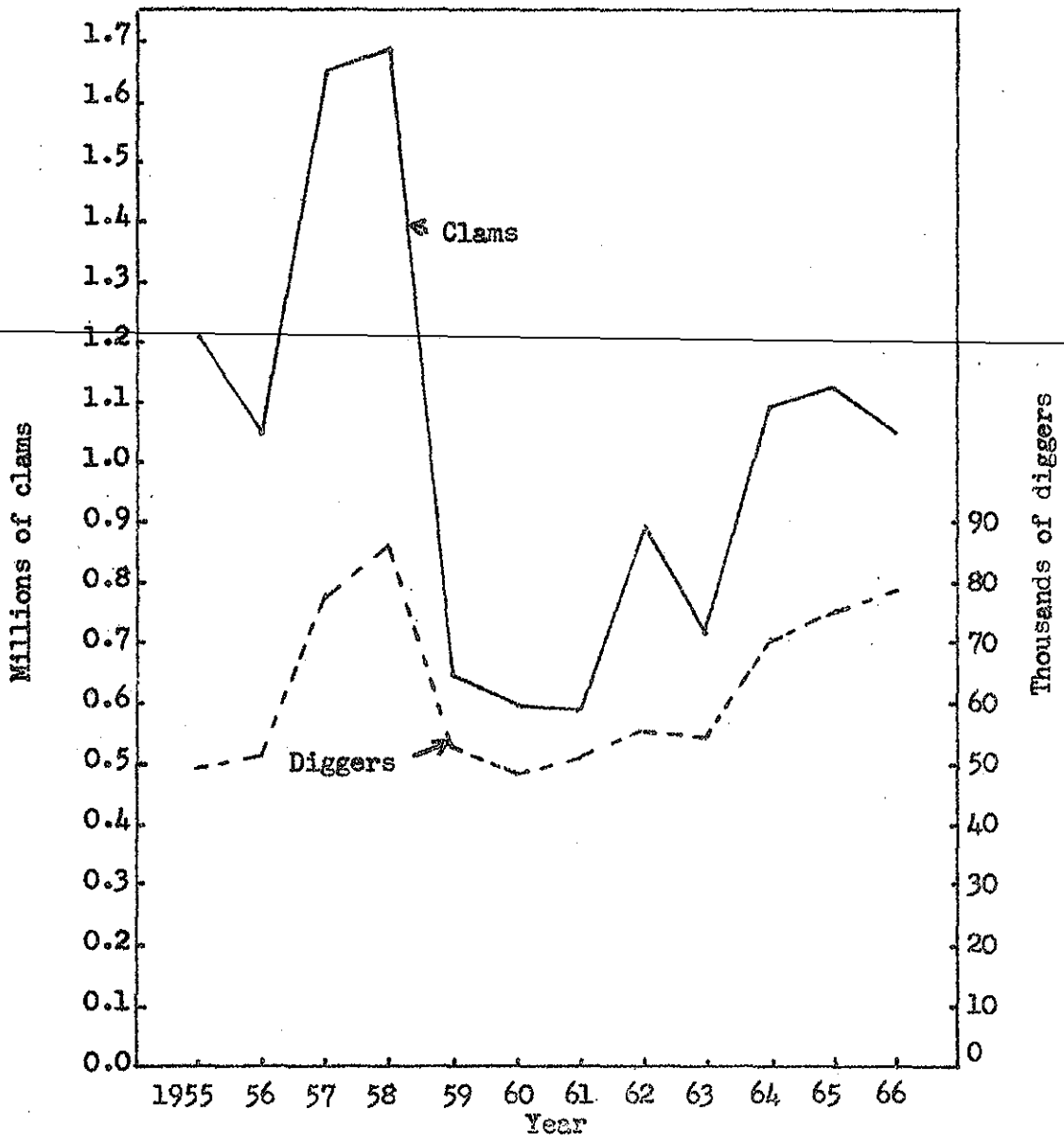


Figure 1. Personal-use harvest of razor clams and numbers of diggers on Clatsop Beaches, 1955-66.

The commercial harvest of razor clams for 1946-66 and the number of landings are shown in Figure 2. The decline from 1952 to 1955 appears to be due to fewer diggers. In 1955 the 4-1/4-inch minimum size limit discouraged more diggers; by 1957 the recreational fishery began to dominate the scene and commercial digging was no longer an easy and profitable venture. A sustained decline in the clam harvest was not evidenced until 1959 with the entrance of the very weak 1957 year class into the fishery. The magnitude of the recreational and commercial harvests are compared in Figure 3.

Age composition

The per cent age composition of recreationally dug clams for 1955-56 is shown in Figure 4. These data show that the bulk of the clams are harvested before their third year of life and that clams three years old and older contribute little to the fishery. A substantial part of the recreational harvest is composed of first-year clams in both good and poor years of production. In 1964, 58% of the catch was first-year clams.

Figure 5 shows the per cent age composition for commercially dug clams for 1952-66. The effect of the regulation change in 1954 from 3-1/2 to 4-1/4 inches is evident by the near elimination of the first-year clams from the catch. The commercial fishery then is obtaining better utilization of the resource, but over the past five years has comprised only 8 to 20% of the total harvest.

UTILIZATION OF CLAM STOCKS

Under the present personal-use regulation specifying that the first 24 clams dug be retained regardless of size, it is highly unlikely that better utilization will result without additional restriction. From a practical standpoint, this regulation is almost impossible to enforce and does little to curtail wastage.

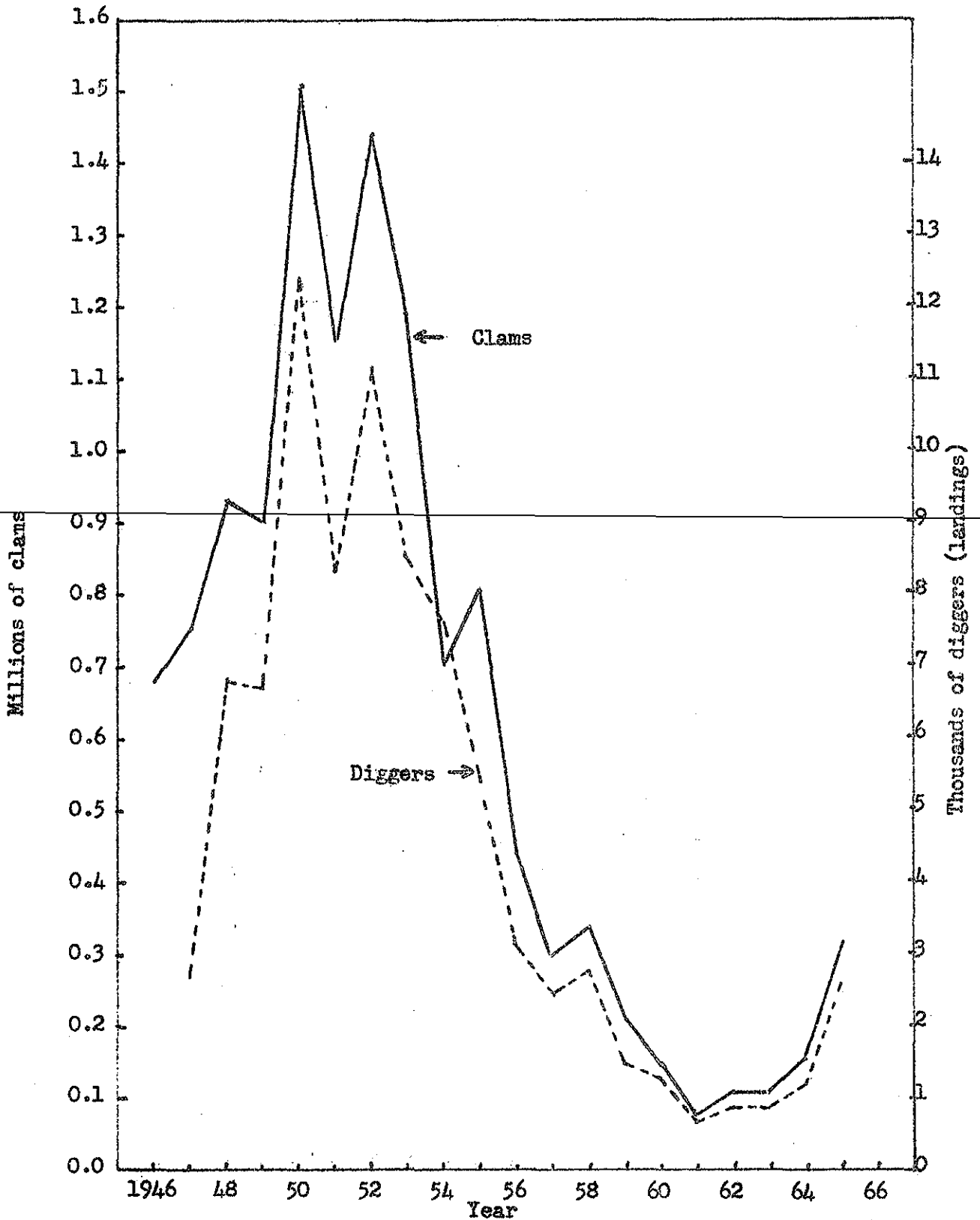


Figure 2. Commercial harvest of razor clams and numbers of landings from Clatsop Beaches, 1946-66.

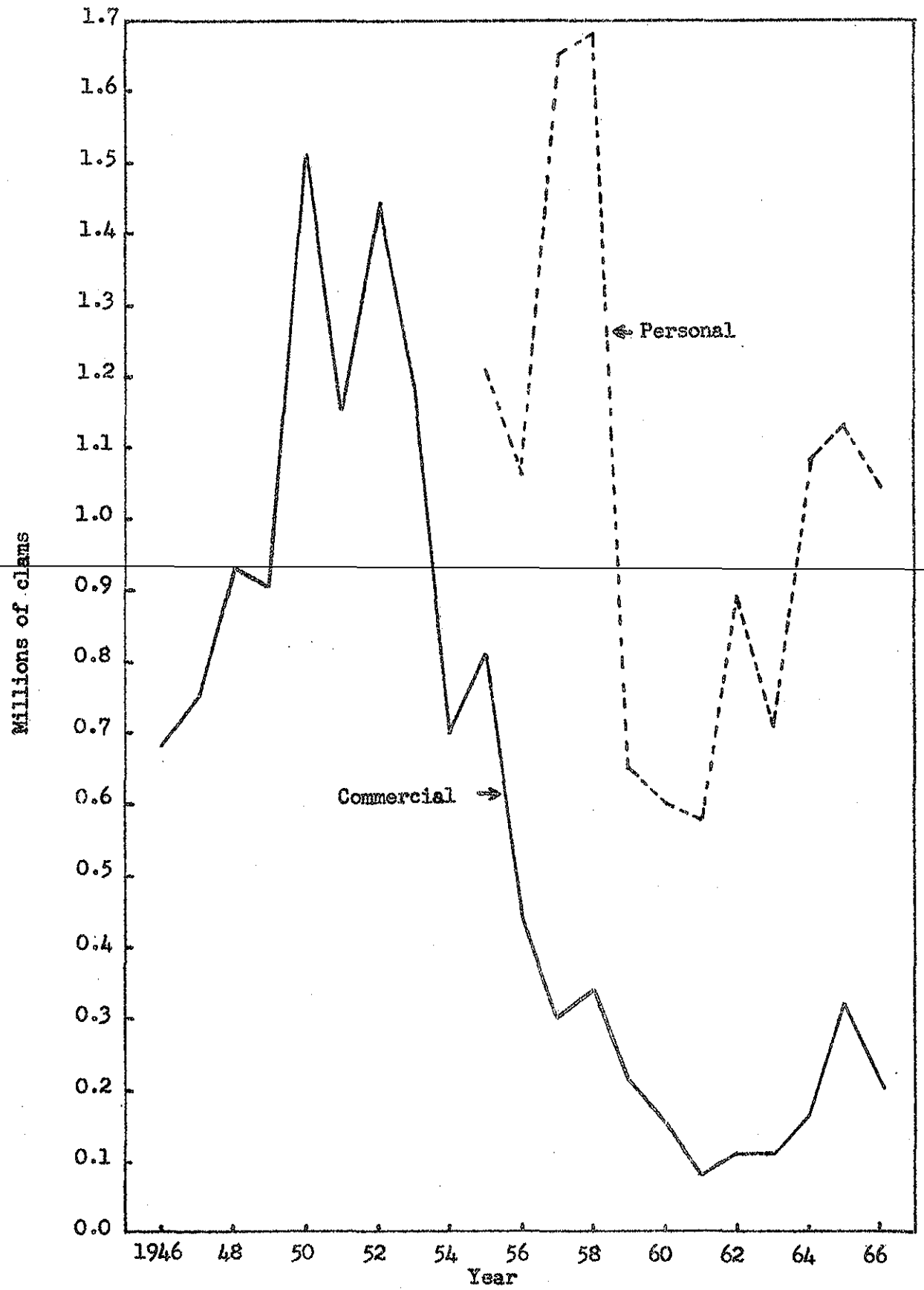


Figure 3. Commercial and personal-use razor clam harvest from Clatsop Beaches, 1946-66.

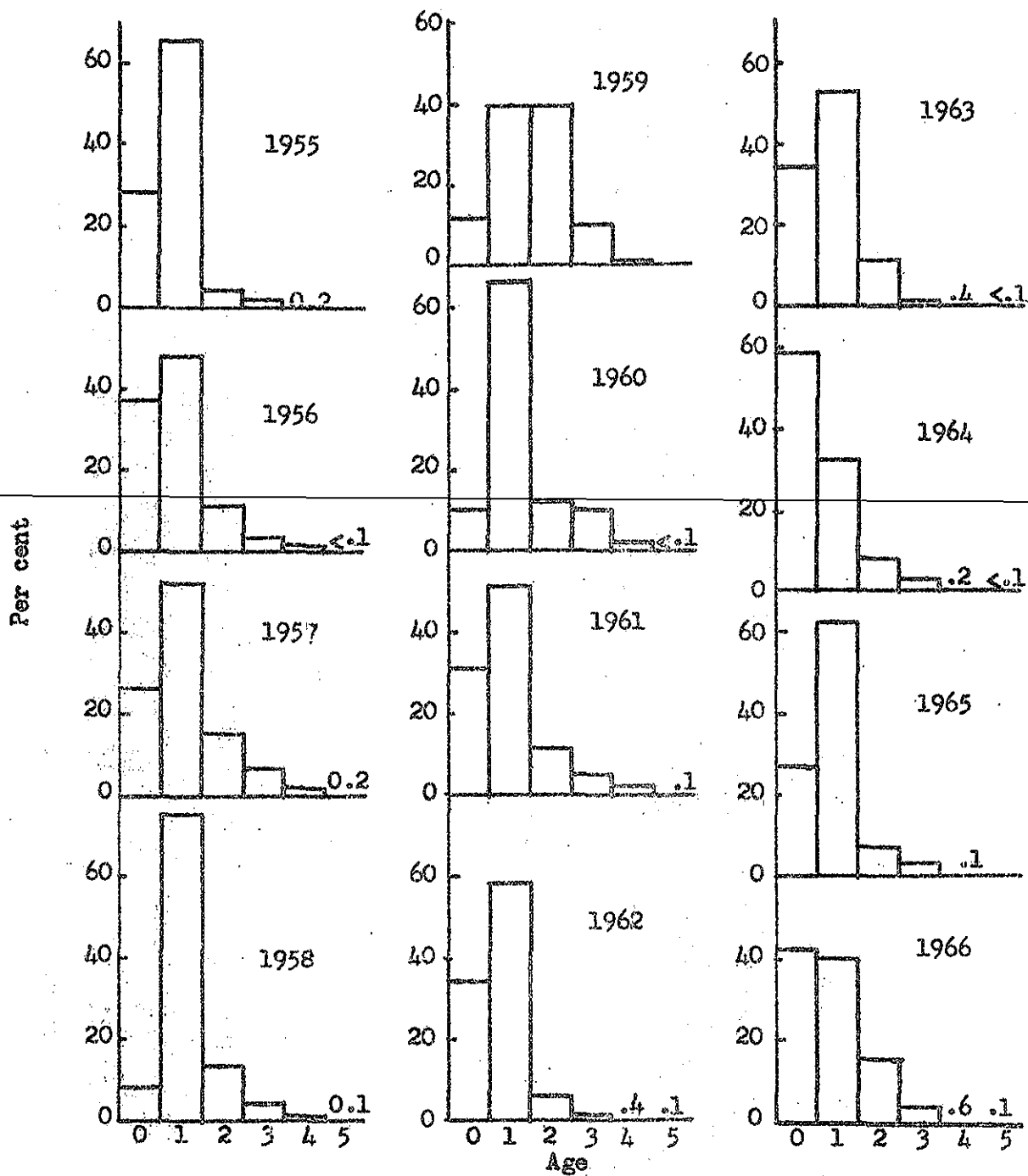


Figure 4. Per cent age composition of recreationally harvested razor clams, 1955-66.

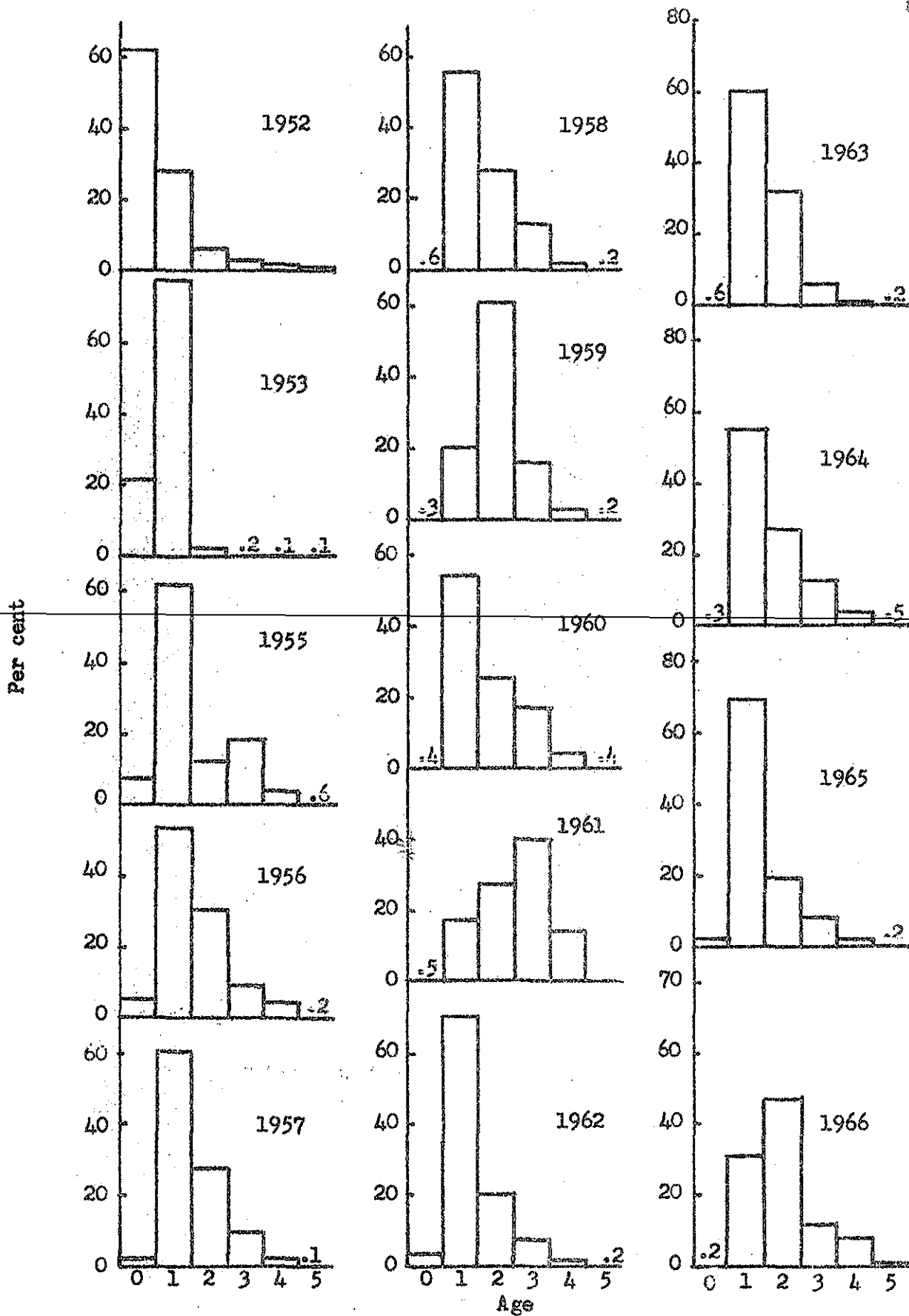


Figure 5. Per cent age composition of commercially harvested razor clams, 1952-66.

Harvest of young clams

Clams in their first year of life usually range from 1 to 4-1/8 inches in length or 9 to 44 per pound (average 15 per pound) in the recreational catch. Figure 6 shows the average size of recreationally dug clams in number of clams per pound for the 1961 season. Toward the latter part of the season the average size is quite small especially at Seaside where more than 15 clams are required to make one pound. Commercially dug clams ranged from 3.7 to 4.8 clams per pound for the same period.

Generally, the harvest of first-year clams remains relatively low until the latter part of the season (Figure 7). The low percentage of first-year clams through July prior to 1961 indicates that a carry over of larger clams was still affecting the fishery. From 1962 to 1964 the take of first-year clams began to increase from the start of the season and indicates that the larger clams were drastically reduced annually with little carry over, which in turn increases the proportion of smaller clams. Figure 7 shows that an increase in the harvest of young clams has been occurring progressively earlier in the season since 1958. Any regulation intended to reduce the harvest of small clams must become effective by July 15.

Figure 8 shows the take of first-year clams as number and per cent of the total recreational harvest for the years 1957-66. Of special note is the strong increase from less than 10% in 1960 to 58% in 1964.

Wastage

A wastage estimate is made by feeling in shovel holes where an attempt was made to dig a clam. A sample of 50-100 holes is taken in each subarea of beach during each tide series. The total number of clams wasted is calculated by applying the percentage of clams found in these samples to the calculated recreational harvest for the appropriate time period and area.

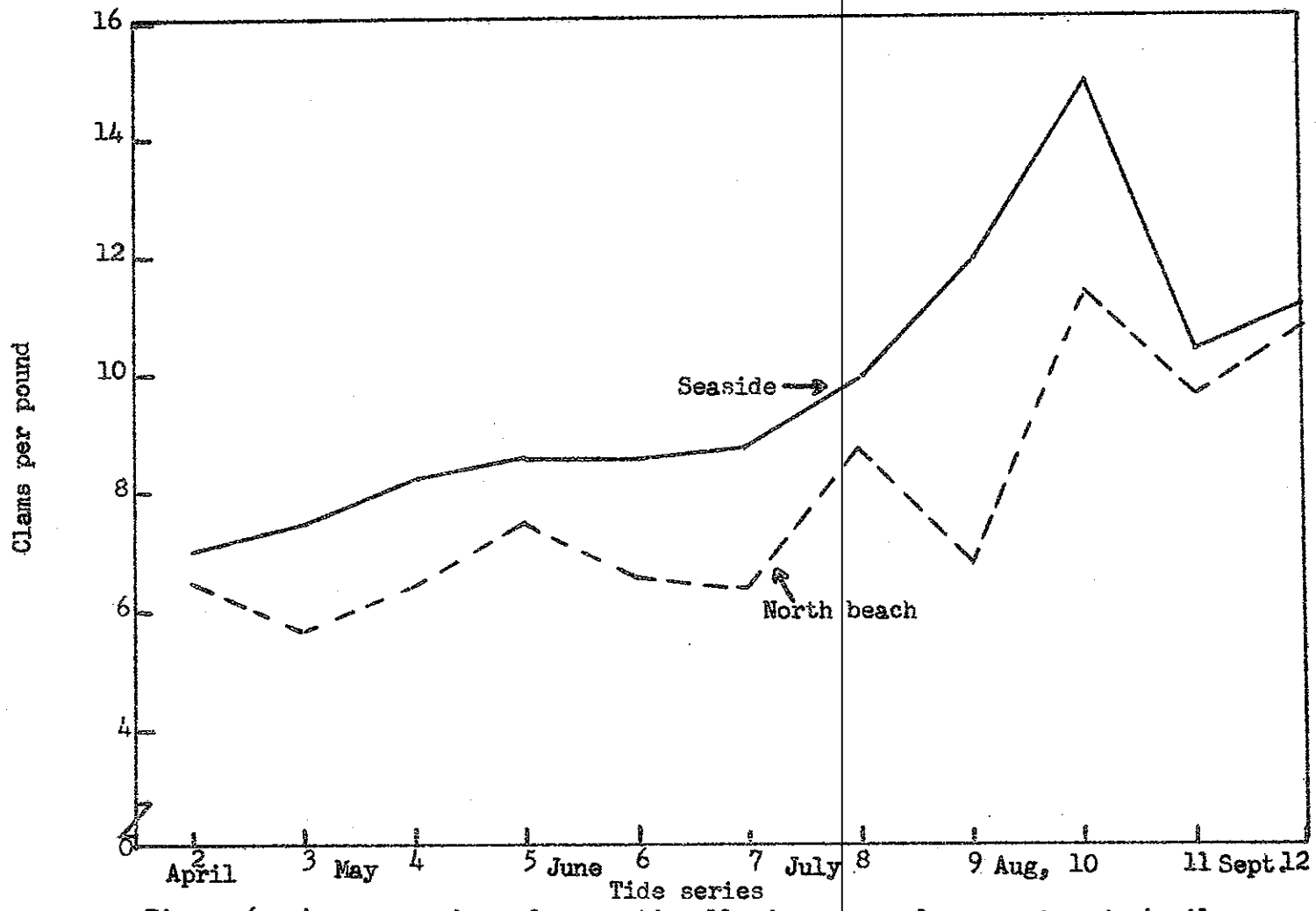


Figure 6. Average number of recreationally dug razor clams per pound, April-September 1961.

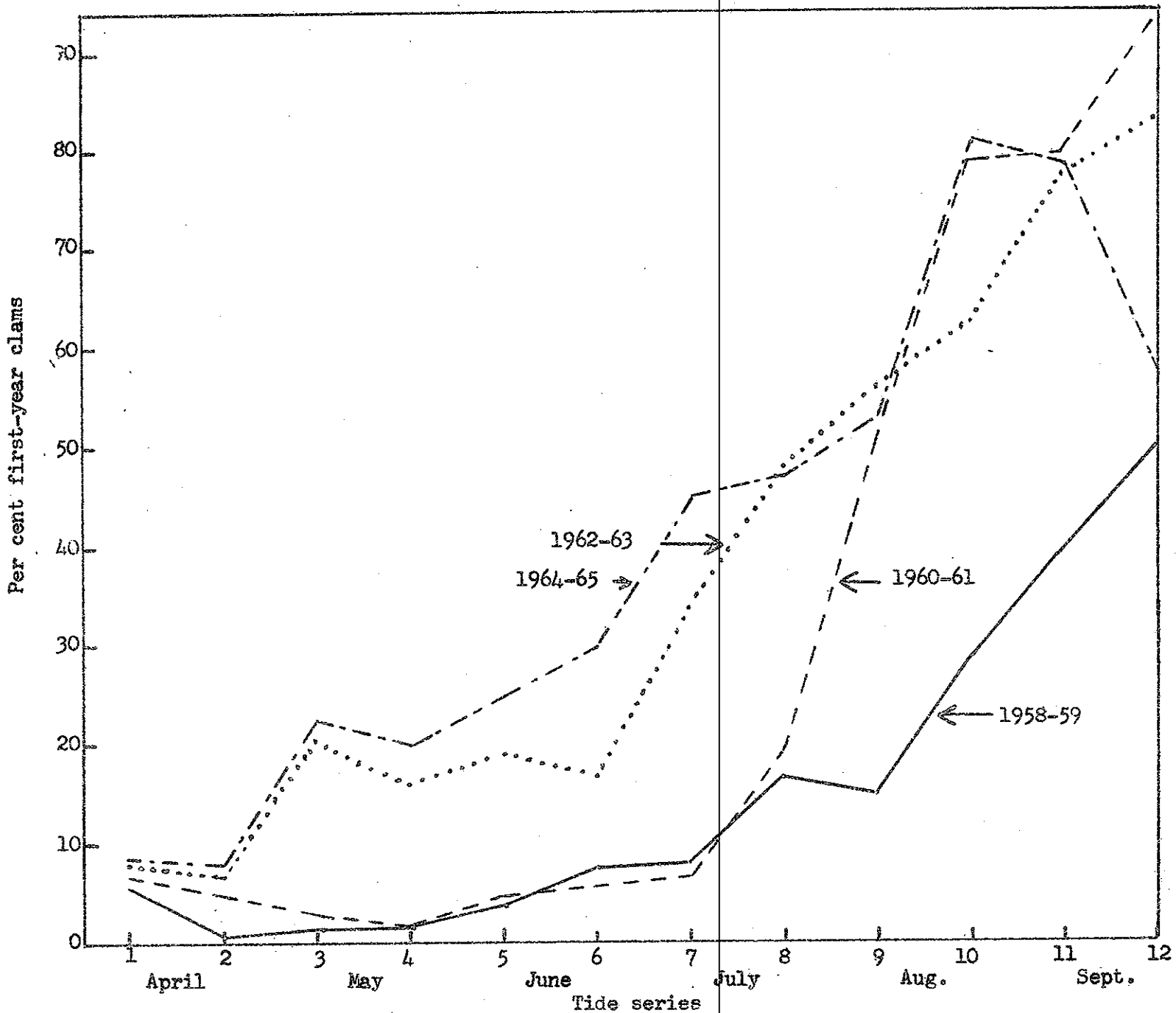


Figure 7. Two-year averages of recreational harvest of first-year razor clams in per cent by tide series, Clatsop Beaches, April-September 1958-65.

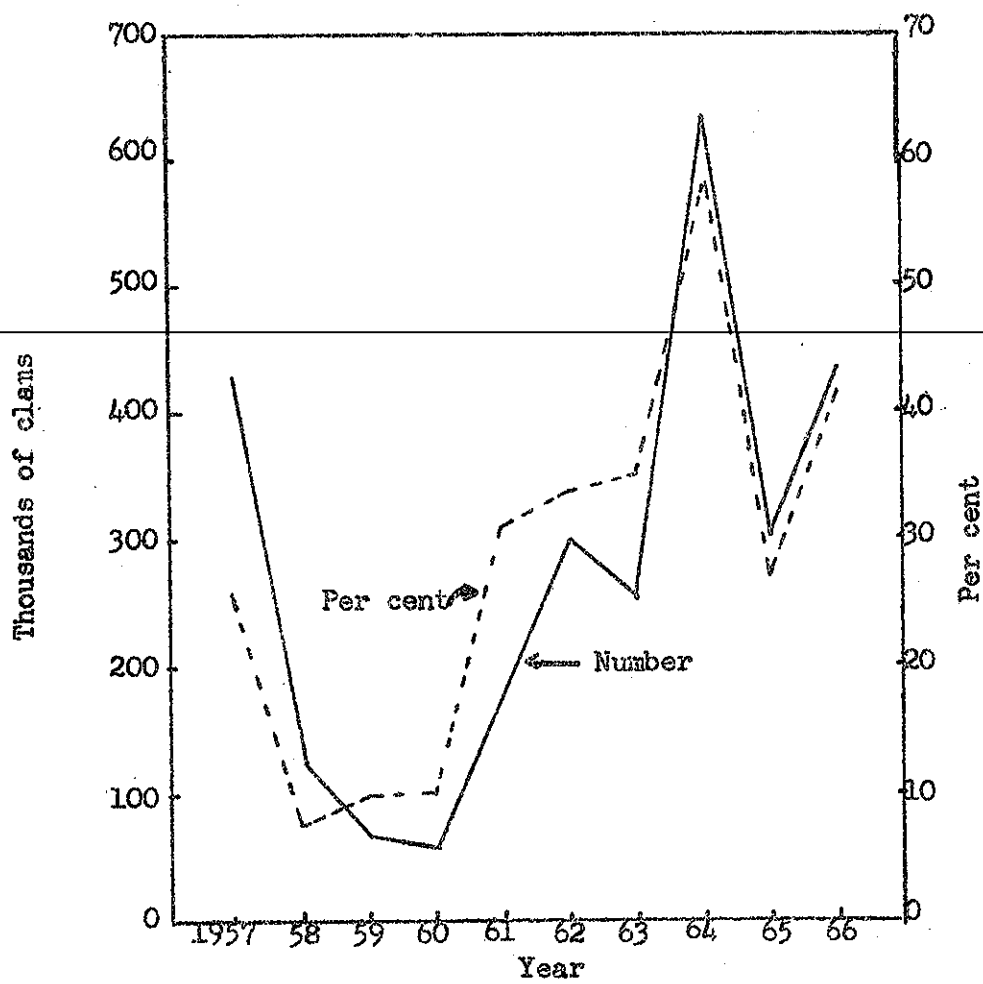


Figure 8. Recreational harvest of first-year razor clams from Clatsop Beaches, 1957-66.

This method gives only a minimum estimate of wastage for the following reasons: (1) some of the holes sampled do not contain clams in the first place, (2) some discarded clams are missed by the biologist, (3) many discarded clams are picked up by sea gulls, and (4) wastage by those digging in the surf is not sampled. On the other hand, some clams survive the digging and handling ordeal as evidenced by the presence of injured clams in the catch.

Wastage by recreational diggers is inherent in the fishery. Some fluctuation is seen in wastage, but in general an increase is evident toward the latter part of the season, when the number of older and larger clams has been reduced and when the first-year clams are somewhat larger. Figure 9 shows the per cent wastage by tide series for 1958 to 1966 with the years 1959 and 1966 being atypical. It appears that the diggers were expecting a big year in 1959, and they became selective early in the season in search of large clams. In 1966, few large clams appeared available and a strong year class was entering the fishery.

Figure 10 shows wastage in per cent and number for the years 1957-66. Wastage in 1957 was $1/3$ greater than the commercial harvest and twice the commercial catch in 1964. The high percentage in 1957 may have been the result of an increased number of diggers. The poor production years following 1958 would have been aided by a carry over of larger clams had not a good portion of them been wasted. Wastage in 1960 was low, but 1966 set a new high at 434,000 clams wasted, still a minimum figure.

DISCUSSION

The only practical method to reduce wastage and the harvest of small clams is to keep the diggers off the beach during the period July 15 to August 31 when small clams dominate the catch. This type of regulation will affect both recreational and commercial diggers, but the greatest effect will be on the recreational fishery because 90% of the razor clam harvest is dug by recreational diggers.

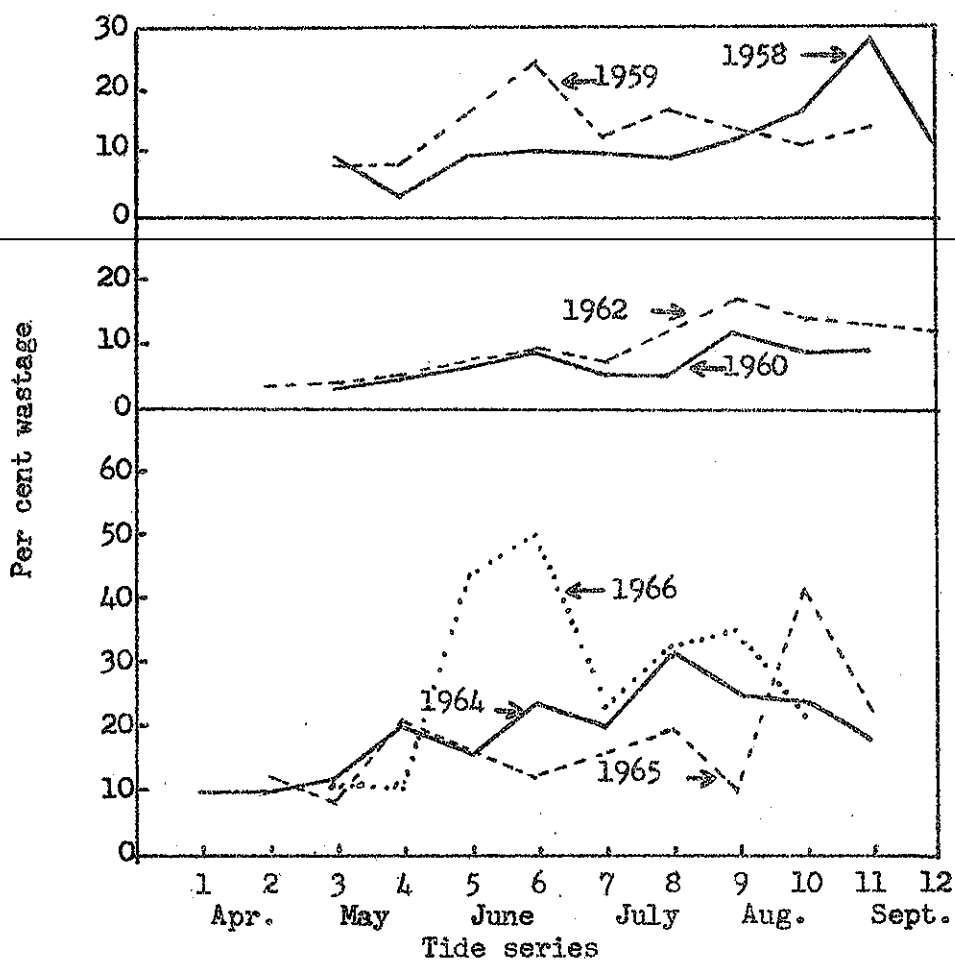


Figure 9. Wastage of razor clams by the recreational fishery, April-September 1958-60, 1962, 1964-66.

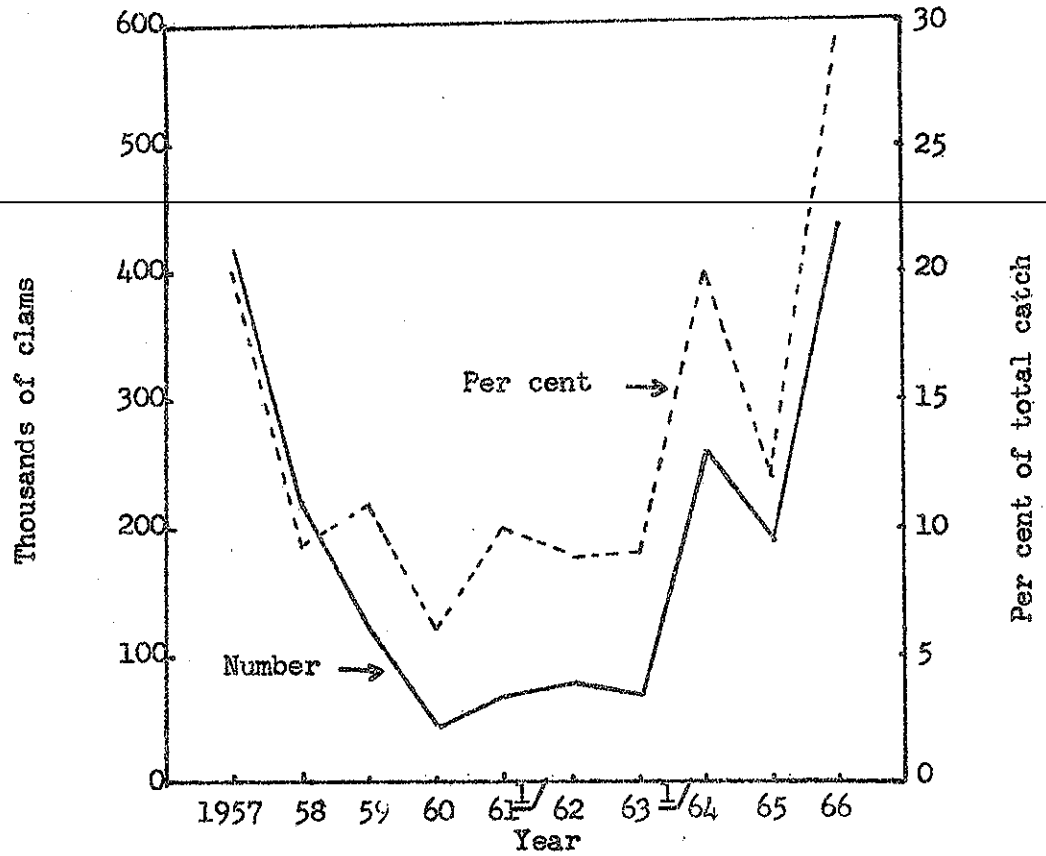


Figure 10. Annual wastage of razor clams by the recreational fishery, Clatsop Beaches, 1957-66.

1/ Estimated.

A substantial reduction in wastage and harvest of small clams would be realized by closing the beach to digging from July 15 to August 31 (Figures 11 and 12). Prior to 1961 the closure would have had less effect on wastage, but a sustained reduction of 35 to 53% over the past six years shows that the closure at present would be quite effective. The reduction in the harvest of small clams is more impressive and for all but one year (1965) a minimum saving of 54% should be realized (Figure 12).

Table 2 lists the theoretical carry over of clams affected by the closure. Prior to 1961 more older clams were involved during this period, but for the past six years small clams, including wastage, made up the bulk of the carry over. Even when considering that natural mortality will reduce the carry over to a degree, the carry over is still very significant with at least 170,000 to 369,000 clams being involved (Table 3).

Table 2. Theoretical carry over of razor clams effected by July 15-August 31 beach closure, 1957-66, in thousands of clams.

Year	First-year clams		Other ages	Total
	Catch	Wastage	Catch	
1957	238	89	423	750
1958	69	69	421	551
1959	38	27	94	159
1960	33	14	93	140
1961	155	29	76	260
1962	172	56	168	396
1963	134	29	109	272
1964	219	92	64	375
1965	175	74	177	426
1966	261	181	125	567

Hirschhorn (1962) constructed yield isopleths for various levels of natural and fishing mortality for razor clams and in all cases tested, increased yields appeared attainable by deferring harvest until spring of the clam's second year.

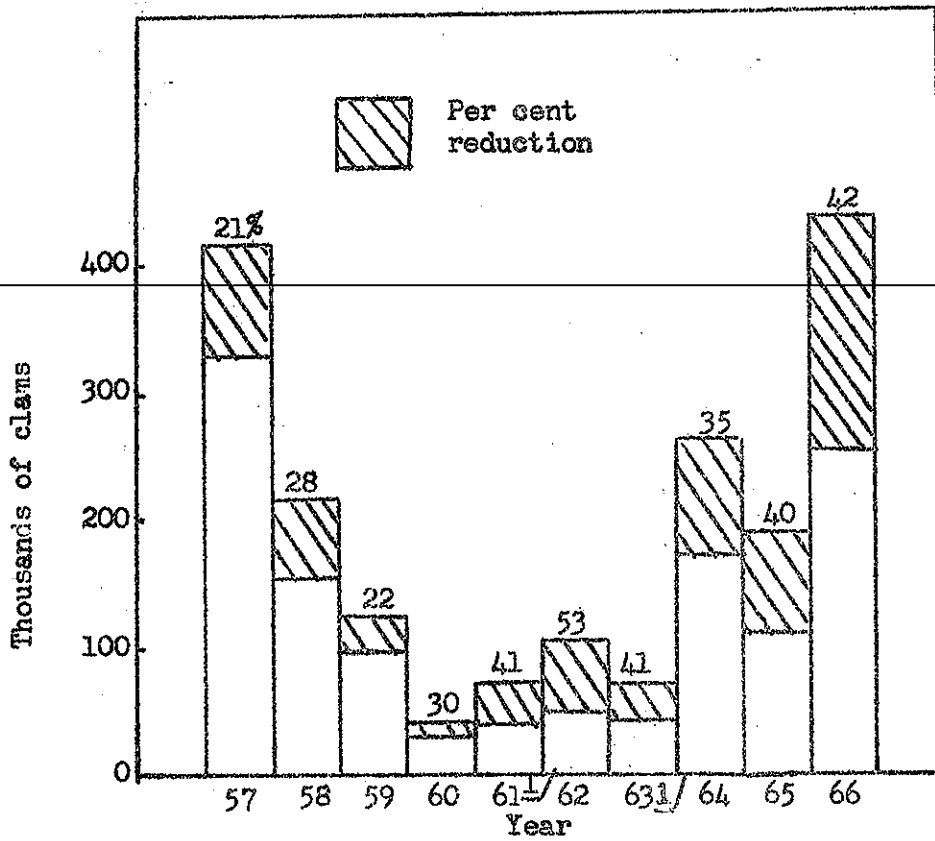


Figure 11. Theoretical reduction in recreational wastage of razor clams effected by July 15-August 31 beach closure, 1957-66.

1/ Estimated.

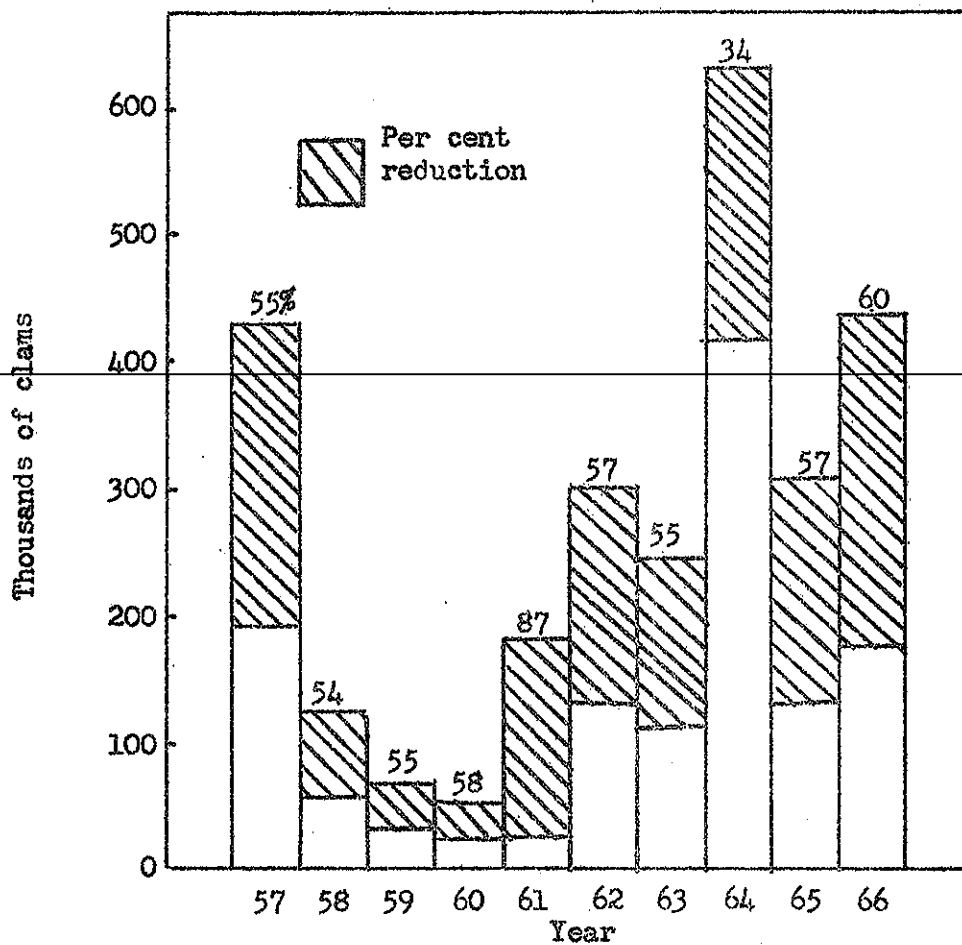


Figure 12. Theoretical reduction in recreational harvest of first-year razor clams effected by July 15-August 31 beach closure, 1957-66.

Table 3. Estimated effect of natural mortality on razor clams saved during July 15 to August 31, 1957-66 in thousands of clams. (Rates from Hirschhorn, 1962)

Year	Total savings	Natural mortality rate		
		15%	25%	35%
1957	750	637	562	487
1958	551	468	413	358
1959	159	135	119	103
1960	140	119	105	91
1961	260	221	195	169
1962	396	337	297	257
1963	272	232	204	177
1964	375	319	281	244
1965	426	362	319	277
1966	567	482	425	369

The importance of the carry over other than providing more larger clams for the diggers, is that it will increase the proportion of large clams on the beach and should help stop wastage and small clam harvest.

It is estimated that only about 15% of the commercial harvest is dug between July 15 and August 31. The closure should have little effect on this fishery.

Table 4 shows estimated numbers of recreational diggers that frequent Clatsop beaches during the July 15-August 31 period. It is assumed that some of the diggers would dig earlier in the year, but a major shift is not expected. If one should occur, most of the first-year clams would be too small to be found in the spring and early summer.

Table 4. Numbers of recreational diggers on Clatsop Beaches, July 15-August 31, 1958-63.

Year	Seaside	North Beach	Total
1958	8,767	16,402	25,169
1959	6,168	7,844	14,012
1960	4,941	5,946	10,887
1961	12,702	8,462	21,164
1962	9,035	10,932	19,967
1963	12,260	6,036	18,296
1964	7,641	10,199	17,840
1965	13,723	9,918	23,641
1966	12,174	13,567	25,741

A closed period from July 15 to August 31 is sufficient to protect the small clams. Their numbers are generally large throughout August, then both the numbers of clams and diggers decline. Even though 80-95% of the catch are small clams in September, the number dug is low (Figure 13).

Finally, our problems were presented to the diggers themselves via a questionnaire that explained the problems and their possible solution. In all, about 2,000 questionnaires were circulated and 634 or 32% were returned. Included are 87 that went to motel operators in the Seaside area of which 30 (34%) were returned. Of the 634 returned, 95% favored the proposed closure, 3% opposed it, and 2% advocated other closures.

Of the 30 questionnaires returned by the motel operators, 76% favored and 24% opposed the closure.

Additional details are presented in the supplemental questionnaire report.

SUMMARY

1. Prior to 1954 the recreational bag limit was 36 razor clams and the commercial minimum size was 3-1/2 inches. In September 1954, this was changed to 24 clams and 4-1/4 inches, respectively.
2. The recreational harvest declined from 1955 to 1961, but has shown improvement since 1962.
3. The commercial fishery has declined since 1952, apparently because of fewer diggers.
4. Age composition of the recreational harvest shows that more than 70% of the clams taken are in their first and second years of life. The commercial harvest is primarily second- and third-year clams.
5. Up to 58% of the clams in the recreational harvest are first-year clams (average 9 to 44 per pound) and another 10-29% are wasted. The problem is most serious between July 15 and August 31 and more serious at Seaside than on the north beach.

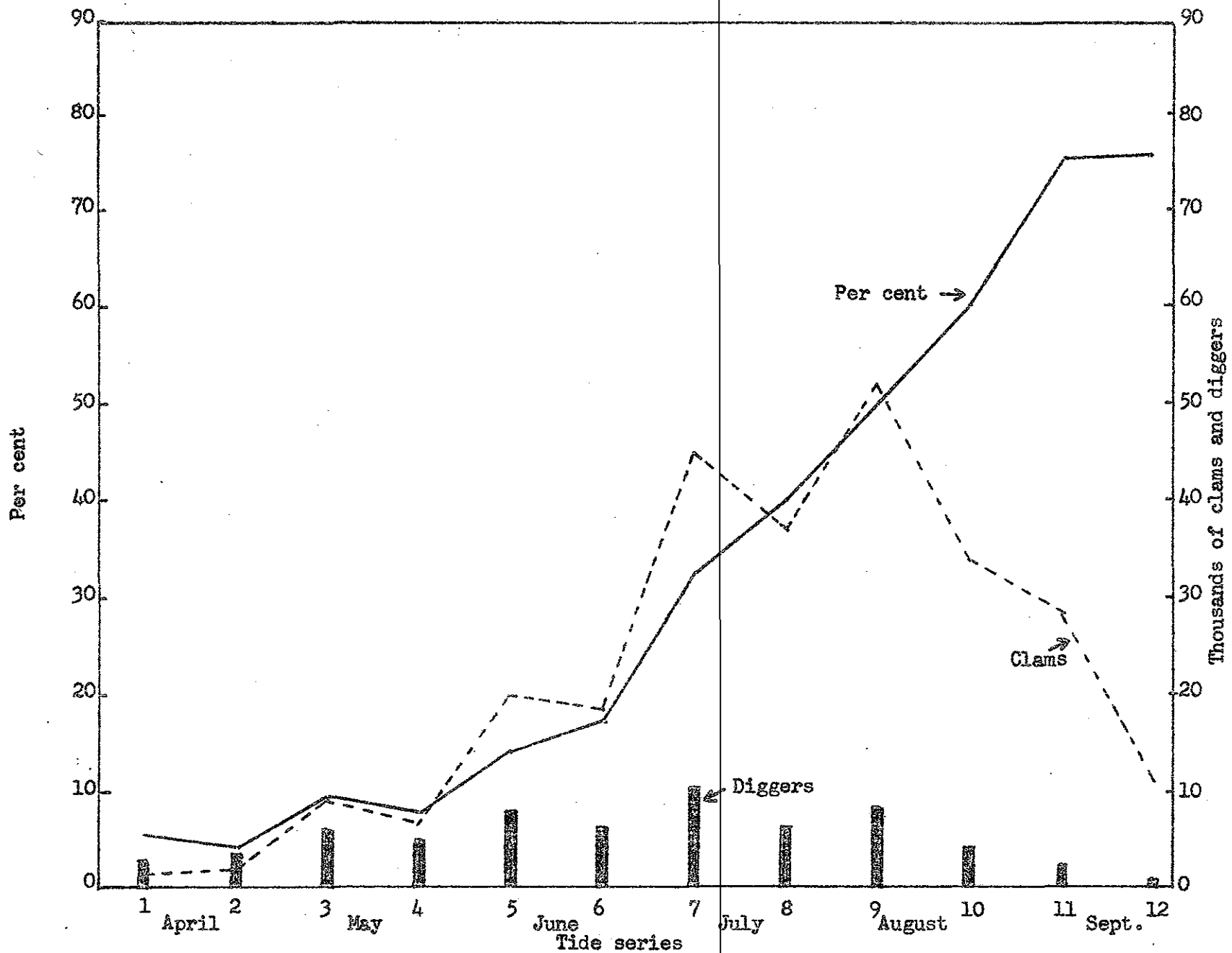


Figure 13. Recreational harvest of first-year razor clams in numbers and per cent, and numbers of diggers, by tide series, Clatsop Beaches, 9-year mean, April to September 1958-66.

6. A closure from July 15 to August 31 should eliminate 35-87% of the small clam harvest and reduce wastage by 21-53%. Digging pressure will probably be reduced and a carry over of larger clams would be expected.
7. Questionnaire returns from diggers show that 95% are in favor of a closure from July 15 to August 31.

RECOMMENDATIONS

The staff recommends that Clatsop beaches from the Columbia River to Tillamook Head be closed to all razor clam digging from July 15 to August 31, inclusive, for a period of at least three years. During this period an intensive sampling program will be conducted to assess the effect on the fishery. At the end of the three years the situation should be re-evaluated.

Darrell Demory
Shellfish Investigation
Oregon Fish Commission

November 4, 1966

INFORMATION REPORT
OPERATION QUESTIONNAIRE

INTRODUCTION

At a Fish Commission public hearing in June 1964, it was shown that much of the razor clam resource was either wasted or taken at a small size. A beach closure was recommended which should have reduced wastage by at least one-third and the harvest of small clams by over 50%. Only the opposition was represented at the hearing and the proposal was tabled.

To sample the opinions of the diggers themselves, a questionnaire (attached) was formulated which explained the problems and their possible solution. The questionnaires were distributed to diggers on the beach and many opinions were requested in person or by correspondence. This report presents the results of Operation Questionnaire.

RESULTS

In all, about 2,000 questionnaires were circulated and 634 or 32% were returned. Included are 87 that went to motel operators in the Seaside area of which 30 (34%) were returned. Of the 634 returned, 95% were in favor of the proposal to close Clatsop beach from July 15 to August 31, 3% were opposed, and 2% advocated other closures.

Of the 30 questionnaires returned by the motel operators, 76% favored the closure and 24% opposed.

The geographical representation of the questionnaire returns is listed in Table 1. The representation coincides with the results of a digger origin study which indicated that 2/3 to 3/4 of the diggers were from Clatsop County, and that most of the visitor diggers were from the Portland area.

DISCUSSION

It is clearly indicated by the questionnaires returned that the vast majority of the diggers are in favor of the proposed closure. It is also significant that 74% of the questionnaires from the motel operators in the Seaside area are in favor of the closure.

We can only speculate about the other 68% of the questionnaires that were not returned. It appears that those people have only a cursory interest in the resource. The motel people perhaps are willing to wait and see what will happen.

Table 2 is included to show the various opinions that diggers have regarding regulations. Most of the opinions fall into five types which are discussed in the attached report.

Darrell Demory
Shellfish Investigations
Oregon Fish Commission

November 4, 1966

Table 1. Geographic representation of questionnaire returns.

Area	No.	Area	No.
Clatsop County 60 %		Rainier - St. Helens 5 %	
Astoria	201	Rainier	12
Seaside	78	Clatskanie	11
Warrenton	56	Vernonia	2
Cannon Beach	5	Scappoose	2
Gearhart	8	St. Helens	<u>5</u>
Hammond	17		32
Arch Cape	9		
Brownsmead	1	Coastal 4 %	
Westport	2	Nehalem	3
Jewell	<u>4</u>	Tillamook	2
	381	Cloverdale	5
		Florence	6
Portland and vicinity 24 %		Reedsport	10
Portland	110	Winchester Bay	<u>1</u>
Lake Oswego	5		27
Sandy	2		
Boring	2	Central 1 %	
Hillsboro	4	Roseburg	2
Cresham	4	Bend	1
Tigard	1	Grants Pass	<u>1</u>
Milwaukie	6		4
Clackamas	3		
West Linn	3	Eastern 1 %	
Oregon City	2	The Dalles	5
Troutdale	2	Long Creek	2
Beaverton	2	Pilot Rock	1
Cornelius	2	Milton-Freewater	<u>1</u>
Forest Grove	2		9
Gaston	<u>2</u>		
	152		
Salem - Eugene 5 %			
McMinnville	1		
Willamina	1		
Woodburn	1		
Hubbard	1		
Silverton	5		
Salem	8		
Albany	2		
Alsea	1		
Corvallis	1		
Lebanon	2		
Sweet Home	3		
Eugene	<u>3</u>		
	29		

Table 2. Razor clam digger comments and number of persons favoring.

Comments	Number
Alternate beach closure	18
Restrict commercial diggers	17
1- or 2-year closure	15
Reduce bag limit (6-18)	12
Close July 1 - August 31	12
Prohibit driving on clam beds	10
Do as Washington	6
More enforcement	5
Close all of coast	5
More digging schools	3
Close June 1 - August 31	3
Close alternate years	3
Prohibit use of razor clams for crab bait	3
Close weekends and holidays	2
Winter closure	2
Require police in uniform	2
Open March 1 to June 30 only	2
Commercial quota and area	1
Close later in year	1
Close part of each month	1
Close August 1 to December 31	1
Commercial wastage	1
Close July 15 to April 1	1
Close June 15 to August 31	1
Close to Nehalem Bay	1
50-cent car toll	1

ATTENTION - CLAM DIGGERS

The razor clams on Clatsop Beaches are subjected to an intensive harvest annually. As a result of this intensive digging, the fishery is forced to utilize small clams as soon as they become available in midsummer. This creates a condition resulting in wastage of large numbers of clams which are dug but not kept and a harvest of a large number of small clams. For example, over 262,000 clams were wasted in 1964 and over 186,000 in 1965. Also, over 635,000 small clams (1 to 3 1/2 inches) were dug in 1964 and over 300,000 in 1965. The problem is most serious between July 15 and August 31.

The Oregon Fish Commission is dedicated to the maximum production from this resource consistent with a sustained-yield principle. We must consider closing the Clatsop Beaches from July 15 to August 31. We estimate that this closure would reduce wastage by 21 to 53%, would reduce the harvest of small clams by 34 to 86% and would provide an increased population of large clams for harvesting the following year. The purpose of this questionnaire is to solicit public comment on the need to close Clatsop Beaches to razor clam digging from July 15 to August 31.

I (DO) (DO NOT) favor a regulation closing Clatsop Beach (Columbia River to
(circle one)

Tillamook Head) from July 15 to August 31 to reduce wastage and to conserve small clams.

Comments: _____

Name: _____

Return to:

Address: _____

Fish Commission Research Lab.
859 Olney Avenue
Astoria, Oregon 97103

8/2/66

INTERVIEWS RELATIVE TO RAZOR CLAM REGULATIONS

Preparatory to a proposed hearing on razor clam regulations, dealers, motel owners, and chambers of commerce in the Astoria-Seaside area were interviewed to obtain their thinking on razor clam regulations and seasons. Diggers were not interviewed in the same way, but over the past 3 years comments by diggers regarding regulations were noted and are presented here. The person being interviewed was told that a late summer beach closure on razor clams was being considered and was then asked for any comments or suggestions. In some cases the actual time period proposed (July 15 - August 31) was indicated, but as the interviews progressed this direct approach appeared to have no effect on the answers received. Although there are few motel people included it is felt that a representative sample of opinions was obtained. The following are the essence of the interviews.

Sands Motel, Gearhart: Estimates that 1% of his guests dig clams and actually tries to discourage them. There would be no problem with a late summer closure.

Tides Motel, Seaside (on the beach in the Cove): Hits the peak of the tourist season, but feels that few of his guests come for clams only; those that do don't stay anyway. Claims that commercial diggers waste many clams. Whatever the Commission decides is OK if it helps the clams.

Lansai Motel, Seaside (in the Cove): New owners from Astoria and haven't experienced a summer season as yet, but didn't think that a closure would affect them.

Roxy's Motel, Seaside: A closure would have some effect, but hard to say how much.

Ambassador Motel, Seaside: Would have some effect on business, but doesn't know how much. Sort of a wait and see attitude. Realizes that clams need some help.

Miller's Motel, Seaside: Any closure is OK, but feels sorry for some of the other motel people.

Clam Digger Cottages, Seaside: Caters to clam diggers and has no objection to a late summer closure. Claims that most of their guests come down in the spring for clams.

12th Avenue Court, Seaside: Deals a lot with clambers and closure would have quite an effect on their business. Owner is the sister of a commercial digger and is aware of the needs of the clams.

White Caps Motel, Seaside: Would have little effect. Most business is early in summer.

4-Winds Motel, Seaside: Some regulation needed to save small clams and closure wouldn't hurt business much. An active digger.

Beachcomber Motel, Seaside: Closure OK. Clams small anyway. Wouldn't hurt business.

5th Avenue Motel, Seaside: Should close beach to save small clams. Won't hurt business.

Emerald Court, Seaside: Shouldn't hurt business and clams need protection. July 15 - August 31 would be proper time. (Interested in resource so a full explanation given.)

Shoreacres Motel, Seaside: No objection to closure. Not many diggers stay here.

City Center Motel, Seaside: Hard to say what effect of a closure would be, but no big attraction here for clambers.

Cedar-Lea Court, Seaside: Hard to say, but do have a few diggers stay here.

Monty's Lodge, Seaside: Has many diggers stay here as family groups. Hopes that beach will not be closed. (This one would probably oppose a closure.)

Scott Oceantel, Seaside: Doubts if closure would have much effect on his business.

Clarence Sigurdson - Bellbuoy Crab Co., Seaside: Bellbuoy is now the only dealer in Clatsop County for razor clams. Feels that the commercial fishery is of minor importance, but would like to see some protection afforded to the small clams. Agrees that a July 15 - August 31 closure would have little to do with the tourist trade, but thought the motel owners might think differently.

Mervin Smith - Commercial Digger: A July 15 - August 31 closure would help the clams and any effect on the commercial fishery would be nil.

Lawrence Smith - Seaside Aquarium - Commercial Digger: Says that the commercial fishery is gone, thanks to $4\frac{1}{2}$ -inch regulation. (The regulation discouraged most of the diggers.) Agrees that a July 15 - August 31 closure would help all concerned, but didn't think the motel people would see it that way. Would stand up at a hearing in favor of a closure.

Bob and Ina Gassner - Commercial Diggers: Both agree that a closure would help the clams and not adversely affect the tourist trade. Would stand up at a hearing in favor of a closure.

Seaside Chamber of Commerce: No comments from any merchants concerning razor clams, but would inquire around. Agrees that motel people would have much to say about a closure of any type.

Astoria Chamber of Commerce: No comments, but agrees that motel people would probably object to any closure.

The following section is a summary of comments made by various diggers over the past 3 years. Their comments are grouped into the 5 main lines of thought.

Total beach closures for 1 or 2 years: It is true that such a closure would provide some larger clams, but unless large year classes are moving into the fishery the large clams would be dug out in a short time because of the increased effort that usually follows a complete closure. Also, natural mortality would increase during the closure and more clams could be lost than gained. A complete beach closure should be of at least 3 years' duration to determine if strong year classes are actually building up the stocks or if the increase is simply a temporary accumulation of a few large clams from weak year classes. In any case the risk is great.

Eliminate commercial digging: This is a frequent remark with sport diggers who fail to dig a limit. In recent years the commercial harvest has amounted to only 10-15% of the total razor clam harvest. Moreover, the term "commercial digger" must be defined to honestly appraise the situation.

To most people a commercial digger is one who sells his catch for income. For commercial razor clam license holders this is not entirely true. To illustrate, in 1962 there were 100 licensed commercial razor clam diggers. Forty of these sold clams at least once, 32 dug for personal use, and 28 claimed no landings, although it is known that most of the 28 dug for their own use. Of the 40 diggers who sold clams, only 15 made more than 10 landings and 6 diggers accounted for 73% of the 1962 commercial harvest. So we see that over 50% of the commercial diggers are actually sport diggers with a license. Their motivation is personal use and they feel that a sport limit is not worth their time and want to take all they can when the opportunity arises, or if a large number of clams are dug, enough will be sold to pay for the license and the rest will be for their own use.

During 1962 there were about 10 commercial diggers who sold clams consistently. They dug for supplementary income and in some cases for an occupa-

tion, but also provided a service to those people who do not or cannot dig their own clams.

Limit commercial landings to 30 pounds per day: At least 1 person has made this remark or one similar. Since 1955 the commercial landings have averaged 26.6 to 32.9 pounds per landing. Only 3 years averaged over 30 pounds. In 1961, 81% of the landings were under 30 pounds and in 1962, 75%.

"Do as Washington does": This remark was one of the most frequently heard. The reference is to an 18-clam bag limit, digging on weekends and holidays only from September 16 to February 28, and alternate beach closures.

A reduced bag limit in Oregon would have little effect on the fishery or the clam stocks. If the annual average catch per digger does not reach the daily bag limit, little is to be gained from reducing it further unless the reduction is large. Since 1959 the average catch has ranged from 11.3 to 16.2 clams per digger. An analysis of the 1963 data shows that a change from 24 to 18 clams per digger would have reduced the sport catch by less than 10%. Also, a reduced bag limit would make the diggers more selective and wastage would increase.

Digging on weekends and holidays only during the winter may have occasional merit in Washington due to the location of several large population centers near the coast. In Oregon the occurrence of the minus tides at night, rough surf, and adverse weather limit the winter fishery greatly. To illustrate, there were 81 minus tides during the 1962-63 winter season. On only 16 of these tides were more than a dozen diggers present, and some 35,000 clams (10% of the total sport harvest) were dug. In the 1963-64 winter season (October-January) 59 minus tides ranging to 1.8 feet have occurred and digging has taken place on only two of these tides except for sporadic commercial digging. It would be difficult to justify a winter closure of any type.

Alternate beach closures have been attempted in Washington, admittedly with little success, but with 60 some miles of beach to utilize, the experiment could be afforded. Oregon, on the other hand, has only 18 miles of prime razor clam beds and cannot afford the gamble. In essence, alternate beach closures concentrate the diggers in a smaller area, possibly with adverse results. In recent years over half of the digging has taken place on the 2-mile Seaside Beach and the effects of this are fully explained in an informational report. ^{1/} As it is, 76-88% of the harvested portion of a year class consists of clams less than two years old.

Size limit: A few diggers are of the opinion that a sport size limit will alleviate the wastage and small clam harvest. It can be stated factually that wastage will increase with a size limit. When Oregon initiated a 3 $\frac{1}{4}$ -inch minimum size in 1949 for commercially dug clams, many diggers thought that the regulation was also for sport-dug clams. The resulting wastage was very high. It is the wastage problem that makes this alternative unfavorable because a size limit could be adjusted to eliminate small clams from the sport catch.

DISCUSSION

The variety of comments expressed in the foregoing interviews instigated two avenues of thought; (1) the motivation of the recreational digger, and (2) digger origin.

The motivation of the personal-use digger is recreation, food, or both. But even among diggers their desires differ depending upon the frame of reference; for example, digging a few large clams on the north beach or many small clams from Seaside. Most local diggers prefer large clams, but some will take the smaller clams and reason better quality. The novice diggers, however, who comprise the bulk of the visitors are happy with almost any clams regardless of size.

^{1/} Utilization and Regulation of Clatsop Beach Razor Clam Stocks.