The Bay Clams of Oregon

Their Economic Importance, Relative Abundance, and General Distribution

Lowell D. Marriage

FISH COMMISSION OF OREGON
Portland, Oregon
Contribution No. 20
May, 1954

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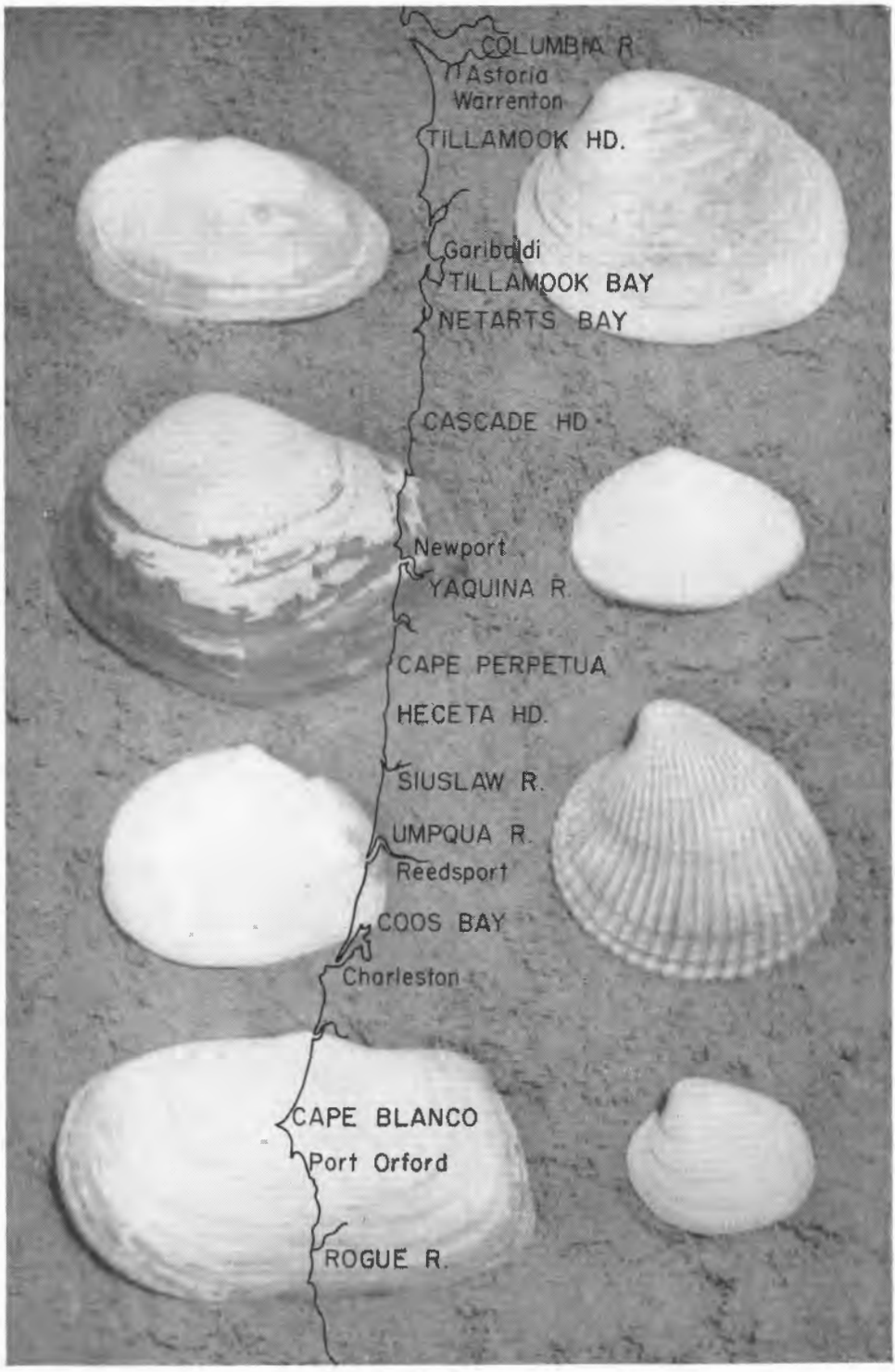

Frontispiece: The Oregon coastline showing location of principal bays.

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INTRODUCTION

Oregon's coastline has a number of bay or estuarine areas where several species of bay clams are taken both commercially and by sport diggers. The U. S. Bureau of Fisheries authorized a survey of these resources during World War I (Edmondson, 1920 and 1923). Oregon has long been cognizant of their importance but funds were not made available for detailed surveys by the state until the spring of 1947, at which time a permanent laboratory for the study of shellfish was established in Newport, Oregon.

From 1928 to 1950, inclusive, the total commercial clam production in Oregon varied from a low of 57,000 pounds in 1929 to a peak of 659,000 pounds in 1940, with an average production of 327,000 pounds. For the years 1941 to 1950, inclusive, an average of 58 per cent of all clams taken commercially were bay clams with razor clams comprising the remaining 42 per cent (Table 1 and Figure 1). In addition, preliminary surveys indicate a large amount of recreational production. The daily bag limit of bay clams (all species) for noncommercial diggers is the first 36 taken, regardless of size, of which not more than 18 may be gaper clams (horseclams). Gaper clams may not be taken between January 1 and June 30, both dates inclusive.[1]

Table 1. Total Oregon commercial clam production in pounds, including the shell, 1928-50

(for fiscal years beginning April 1)

Year	Production All Clams	Bay Clams[2] Only	Year	Production All Clams	Bay Clams Only
1928	110,471	.....	1940	658,564	.....
1929	56,600	.....	1941	338,371	214,085
1930	163,370	.....	1942	134,550	120,656
1931	143,159	.....	1943	196,505	177,697
1932	131,530	.....	1944	268,121	203,673
1933	127,635	.....	1945	384,134	306,146
1934	224,270	.....	1946	416,858	265,381
1935	469,445	.....	1947	343,555	177,502
1936	447,509	.....	1948	331,667	122,340
1937	471,615	.....	1949	349,696	135,408
1938	664,297	.....	1950	486,569	149,299
1939	607,985	.....			

[1] Regulations are subject to change at any time.
[2] No breakdown into bay and razor clams prior to 1941.

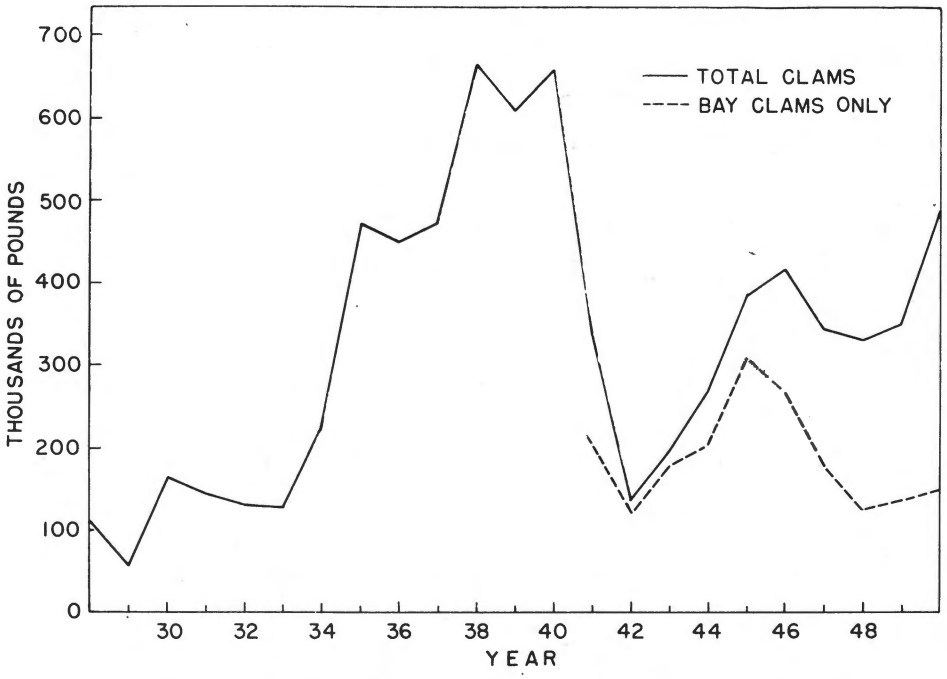


Figure 1. Total Oregon clam production, 1928-50.

Species of clams found within the mouth of a river or bay are commonly referred to as "bay clams", although in some instances they inhabit the outer open beach. For example, the common bay habitat of the cockle, *Cardium corbis* Martyn, is on sand-mud flats; they can, however, be found in small numbers on the open Oregon coast where they are frequently taken from crab pots by crab fishermen.① Also the razor clam, *Siliqua patula* Dixon, usually found on the open beach, is present inside several of the bays of Oregon.②

The purpose of this paper is to present data on distribution, approximate abundance, and habitat of the common bay clams of Oregon with general observations on their life histories.

DESCRIPTION OF SPECIES

Tidelands of Oregon's rivers and bays provide habitats for a variety of species of bay clams and other invertebrates. For the purpose of uniformity one common name has been assigned each bivalve mentioned in this report. The common name is followed by its scientific name and the name of the person who first described it. The scientific name of the cockle clam, *Cardium corbis,* is quoted from Oldroyd (1924) and the Japanese oyster, *Ostrea gigas,* from numerous sources. The rest of the scientific names are those used by Fitch (1953).

① Commonly found by the Port Orford crab fishermen off the southern coast of Oregon.
② Tillamook, Netarts, and occasionally Yaquina.

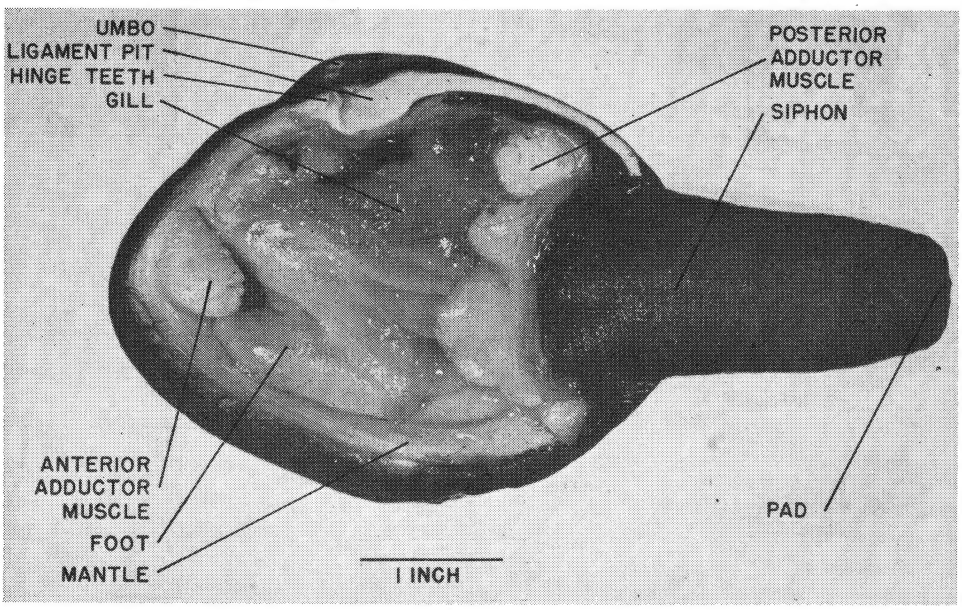


Figure 2. Internal anatomy of the gaper clam.

Figure 2 shows the internal anatomy of the gaper clam and pictures common anatomical parts used in describing the species of bay clams.

Glossary

Anterior—terminal portion of the clam opposite the siphon(s).

Beak or umbo—the rounded peak located near the hinge region of the shell.

Foot—the organ used for locomotion.

Height—the straight-line distance between the umbo and the ventral margin of the shell at approximately right angles to the length measurement.

Hinge—the point of articulation of the two valves of the clam.

Hinge tooth—any of the prominent internal processes originating on the valves in the hinge region.

Length—the straight line distance between the anterior and posterior extremes of the shell.

Ligament—a cartilaginous band of tissue which holds the valves together.

Ligament pit—the cavity in the hinge region which anchors the ligament (the gaper clam has a large ligament pit).

Mantle—the fleshy lobe inside the valves which bears the shell-secreting glands. Bivalves have a pair of mantles, one for each valve.

Pad—the leather-like pads adherent to the tip of the gaper clam siphon.

Periostracum—the skin-like covering of the outside of the shell.

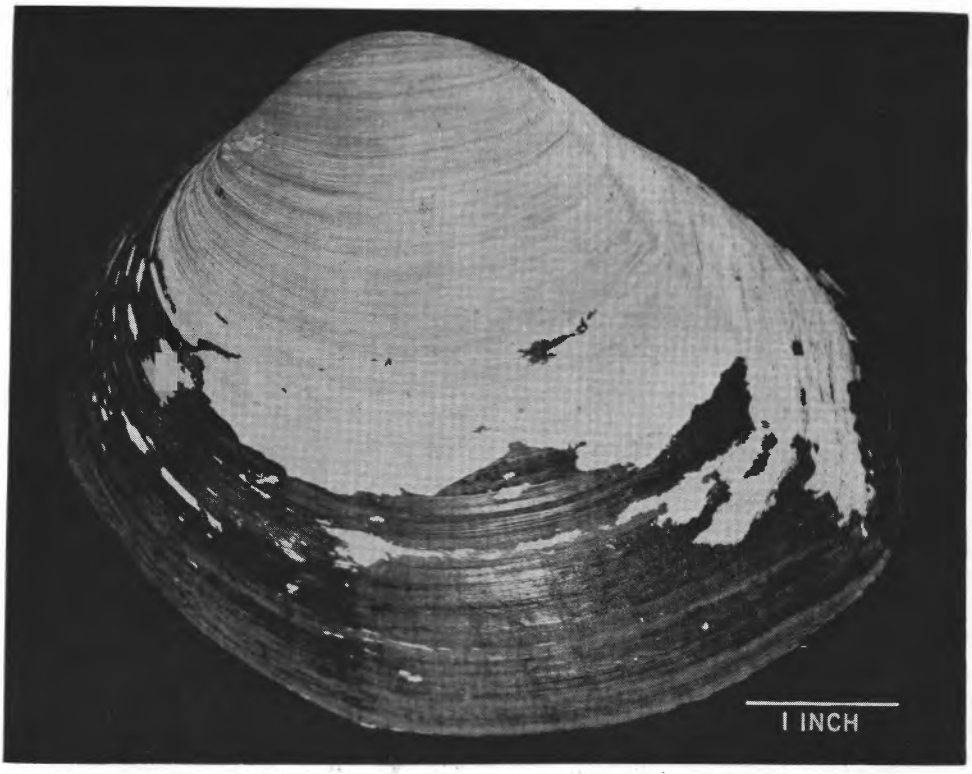
Posterior—the terminal portion of the clam containing the siphon.

Rib length—a straight line measurement of the longest radiating rib of the cockle or littleneck clam shell beginning at the umbo and terminating at the ventral margin.

Siphon—a tubular protuberance of the mantle margin through which water is conveyed to and from the gills. The excurrent and incurrent siphons may be separate or joined; when joined they are oftentimes referred to as the neck.

Valve(s)—the two shells of a clam are called valves; hence, the commonly used term bivalve.

Figure 3. The gaper clam.



The Gaper Clam, *Schizothaerus nuttalli* (Conrad) (Figure 3)

A few of the common names associated with this clam are Empire clam in the Coos Bay area, blue-neck and blue in the Tillamook-Netarts area, and horseneck or horseclam in many places.

The shell of this clam may be recognized by its large size, by the gape at the posterior end, and by the large ligament pit. The newer growth of the shell is covered with a brown periostracum in life. A large neck with dark, wrinkled skin and two leather-like flaps on the tip protrudes from the gaping posterior end. In Yaquina Bay algae of the genus *Polysiphonia* and barnacles of the genus *Balanus* have been found clinging to these flaps and camouflaging the presence of the clam.

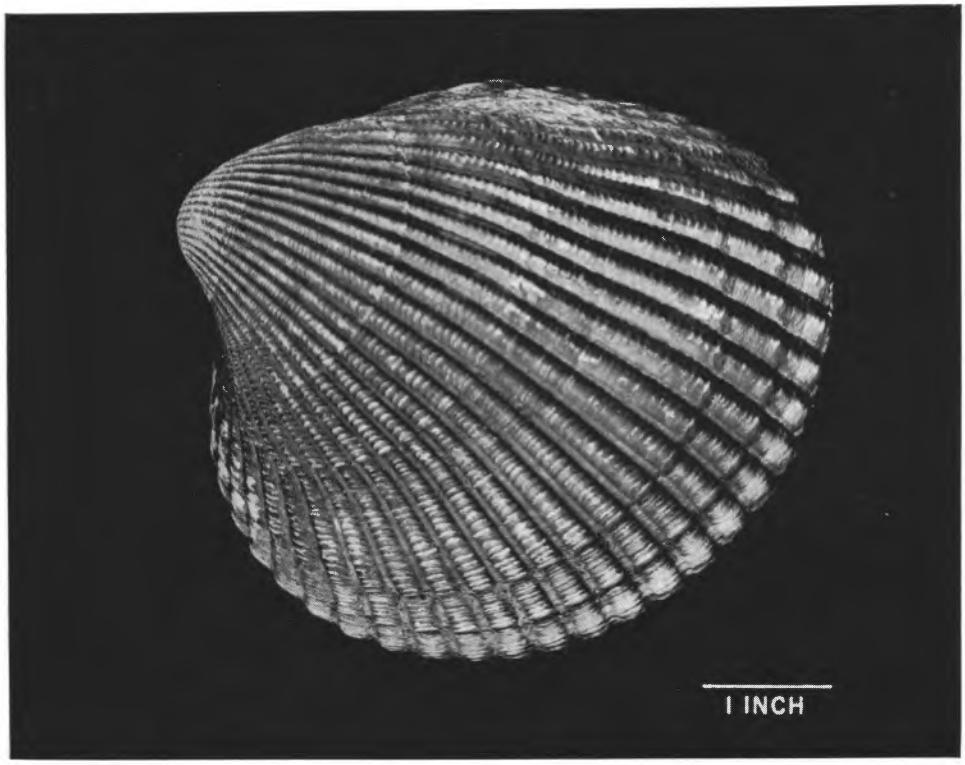
The clam inhabits the tidal flats of the larger bays and reaches its peak of abundance in a mud-sand mixture. It is usually found 14 to 16 inches beneath the surface of the tide flat but this depth varies considerably. The tip of the siphon (neck) showing at the surface or the depression resulting from retraction of the siphon, reveals the presence of this bivalve. Contrary to popular belief the gaper does not dig after being disturbed but remains sedentary most of its life. Digging is confined to gradual adjustment of the clam to its size, substrate, and other related factors. A garden spade or shovel makes a very effective tool for gathering gapers.

Gaper clams in the commercial landings average 5½ inches in length, (see glossary for definitions of shell measurments) 4¼ inches in height,

and 1¼ pounds in weight. Individual specimens have been recorded up to 7 inches in length and reports of larger specimens are common.

Immediately after spawning, about 15 per cent of the total weight of the gaper clam, including shell, is edible. This percentage gradually increases until just before spawning about 35 per cent of the total weight is edible.

Figure 4. The cockle.



The Cockle, *Cardium corbis* Martyn (Figure 4)

The cockle is easily identified by the many prominent, evenly spaced ridges (ribs) on the exterior of the shell. These originate at the umbo and radiate in a fan-like pattern terminating at a scalloped edge. Another name in general use for this clam is the cockerel.

As in most of the bivalves the color of the shell is affected by the habitat. Cockles found in sandy bottom-soil have a light-brown color while those in a more muddy bottom-soil have a dirty-grey hue.

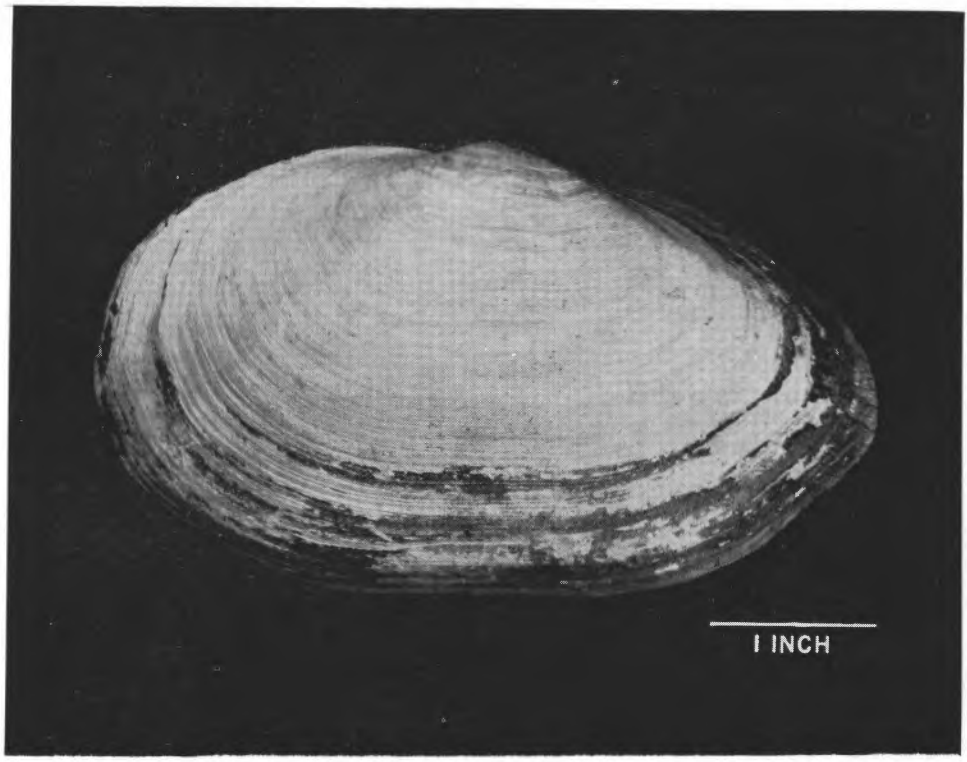
The very large, muscular foot enables this clam to travel short distances and to dig under the surface of the tide flat from 1 to 3 inches. Because of its short siphon the cockle is not adapted to depths common for the gaper clam and the softshell clam. When disturbed, this clam retracts all body parts and the valves close tightly. The cockle frequently attains 4 inches in longest rib length (straight line measurement) but the average size harvested is about 3 inches. The largest specimen ever encountered in Oregon

by the author measured slightly over 4¾ inches and weighed 1 pound 10 ounces live weight. This clam, taken in Tillamook Bay July 8, 1952, was about 10 years old, according to the rings on the shell.

Harvesting is usually accomplished by dragging a rake through the upper 1 to 3 inches of soil.

From 10 to 15 per cent of the total weight, including shell, of the live clam is edible.

Figure 5. The softshell clam.



The Softshell Clam, *Mya arenaria* Linnaeus (Figure 5)

The softshell clam is commonly called the eastern or mud clam. Its shell is of medium size, ovate, thin, brittle, and chalky. The interior hinge region of the left valve has a large hinge tooth projecting at right angles to the plane of the shell which readily distinguishes it from the other common species of clams in Oregon.

Like the gaper clam the softshell has an elongated siphon which allows it to live from 8 to 14 inches beneath the surface of the clam flats. A shovel is used for harvesting.

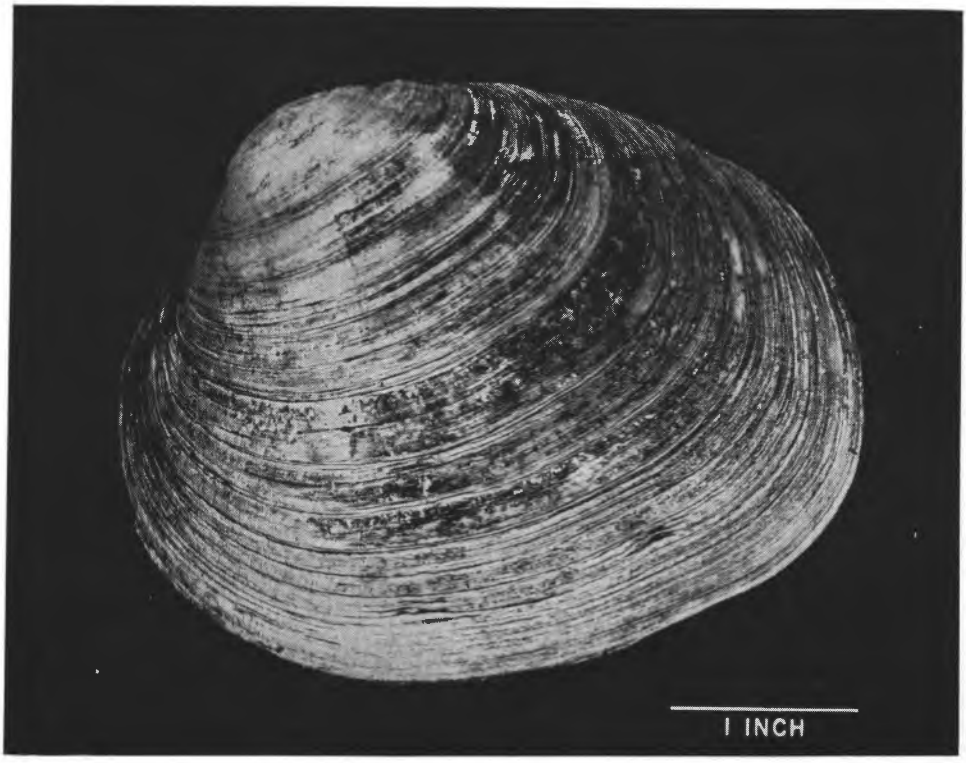
The softshell varies considerably in size among the bays and even within individual bays. Specimens from the Umpqua River, where conditions for growth appear to be near optimum, often measure 6 inches in length.

The most common habitat for this clam in the bays of Oregon is the firmer mud flats, although occasionally it can be found in gravel and sand flats. It

appears at the mouths of many of the smaller rivers where other species of clams are not to be found, and is also found in the larger bays farther upbay than the other species.

About 20 per cent of the total live weight of the clam, including the shell, is edible.

Figure 6. The butter clam.



The Butter Clam, *Saxidomus giganteus* (Deshayes) (Figure 6)

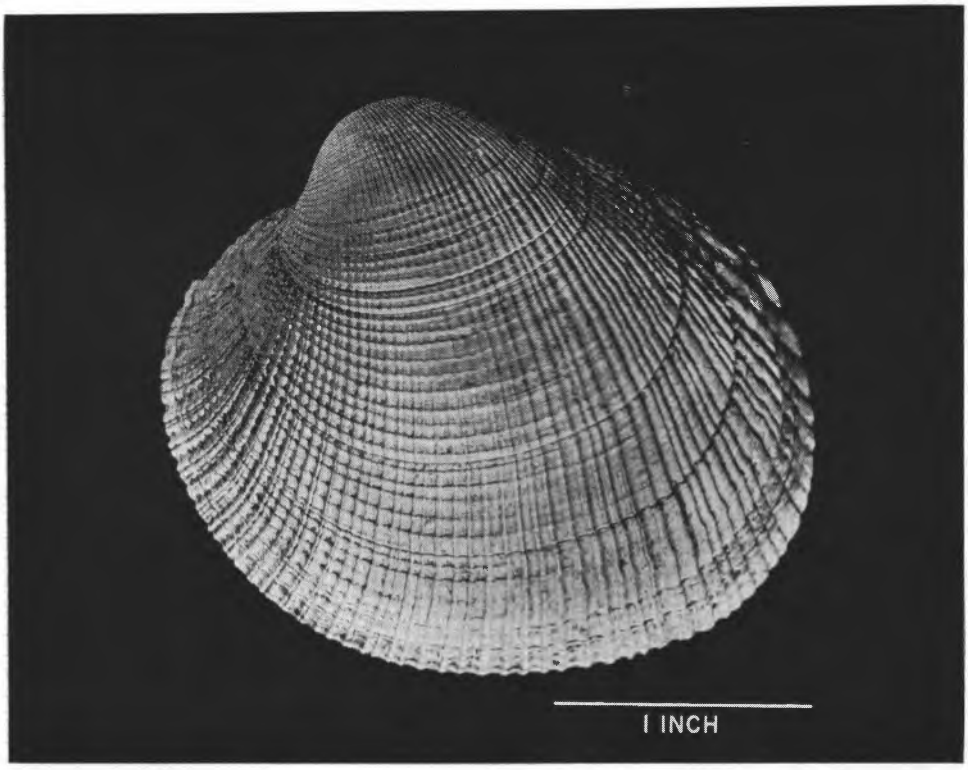
The butter clam is also known as the Washington clam, quahog, Coney Island, beef-steak clam (because of the color of the meat), and the great Oregon clam. It is identified by the large, external ligament; the heavy, ovate shell; the fine, concentric lines of growth on the exterior of the shell; and the relatively short, black-tipped siphon.

Oregon, unlike its neighboring state Washington, has relatively few beds of butter clams. This may be due to the lack of suitable habitat, or other inhibiting factors. Butter clams are commonly found in a gravel-mud-like soil, and where this type of soil exists in Oregon there are scattered beds of butter clams. They are generally found from 6 to 12 inches beneath the surface of the beds.

The average length of Oregon butter clams in samples of noncommercial landings is 3½ inches.

A shovel or potato fork is commonly used for harvesting this bivalve.

Figure 7. The littleneck clam.

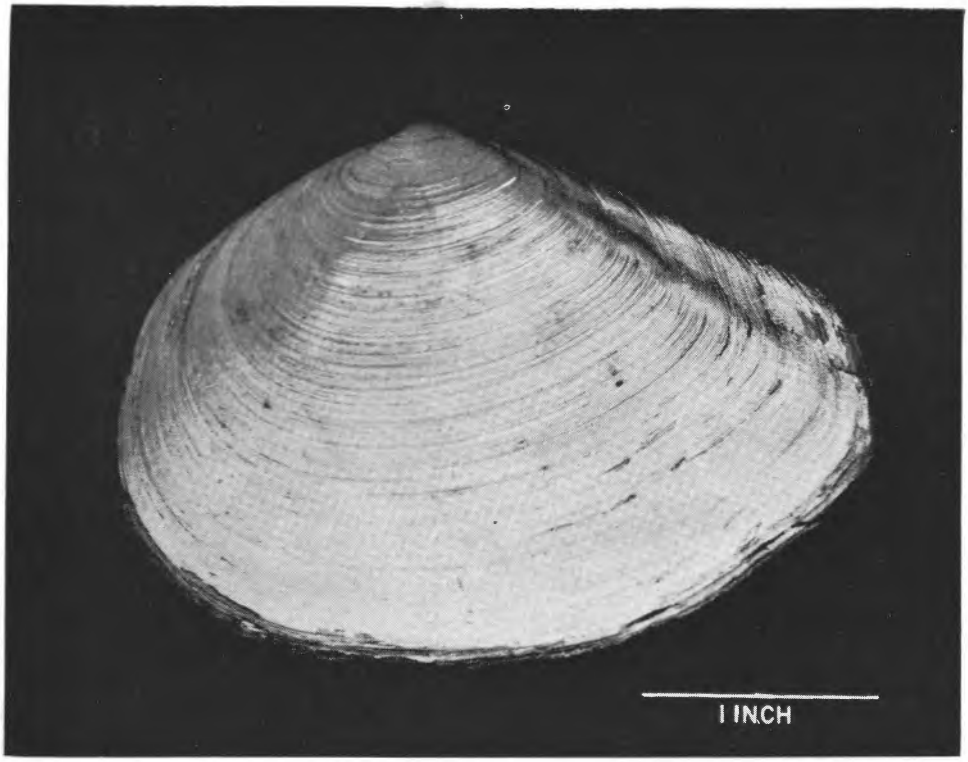


The Littleneck Clam, *Protothaca staminea* (Conrad) (Figure 7)

The littleneck clam, also called rock clam and butter clam, is similar to the cockle in that the radiating ribs are present, but it lacks the deeply-scalloped edge. In addition, concentric growth lines at right angles to the radiating ribs give a cross-hatched appearance. The color is variable but in the main a cream or grey. It is often indistinctly mottled with brown markings.

The littleneck clam requires a habitat similar to that of the butter clam. It is also scarce in Oregon's estuary areas and consequently is of little importance to the commercial fishery. In areas of greater abundance this clam is harvested by turning over the soil with a fork or shovel. More commonly it is taken only incidentally while raking for cockles. Oftentimes this clam may be found lying exposed on the surface of the beds. Littleneck clams taken by sport diggers commonly average 2½ inches in rib length.

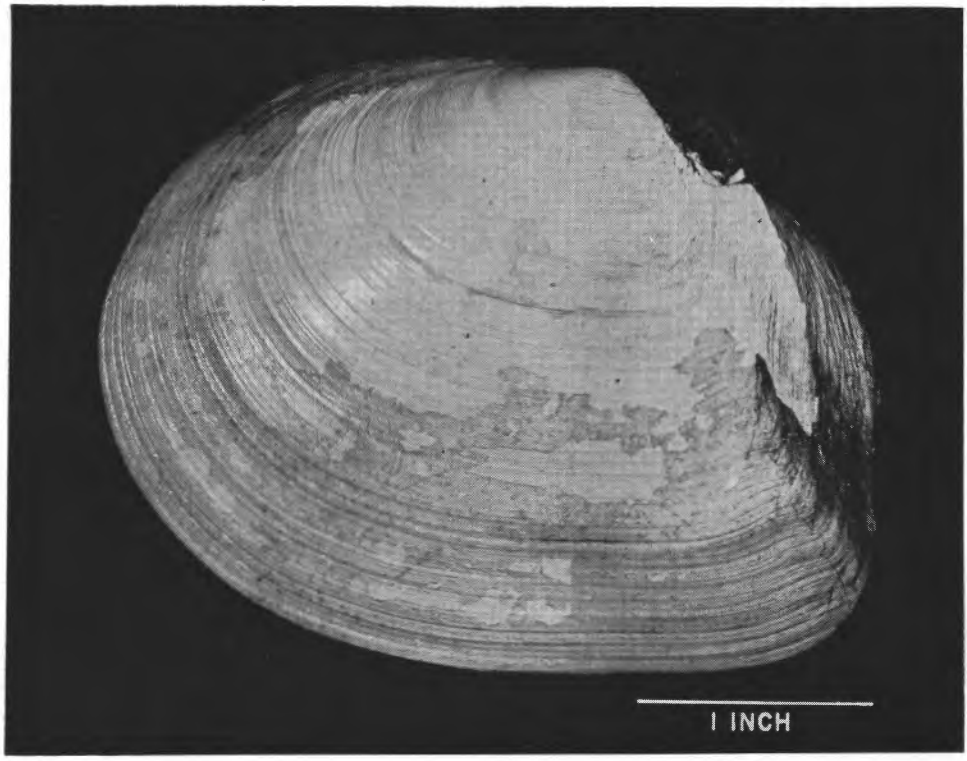
Figure 8. The bent-nose clam.



The Bent-Nose Clam, *Macoma nasuta* (Conrad) (Figure 8)

This small clam rarely exceeds 2 inches in length. It has a divided siphon which gives the impression of two necks. The common name, bent-nose, is derived from the curvature of each valve at the posterior end. Its habitat is similar to that of the gaper and cockle but lies from 6 to 8 inches beneath the surface of the flats. It is considered a delicacy by those few people who are aware of its edibility but is little used because of its small size. It is found in all of the larger bays of Oregon.

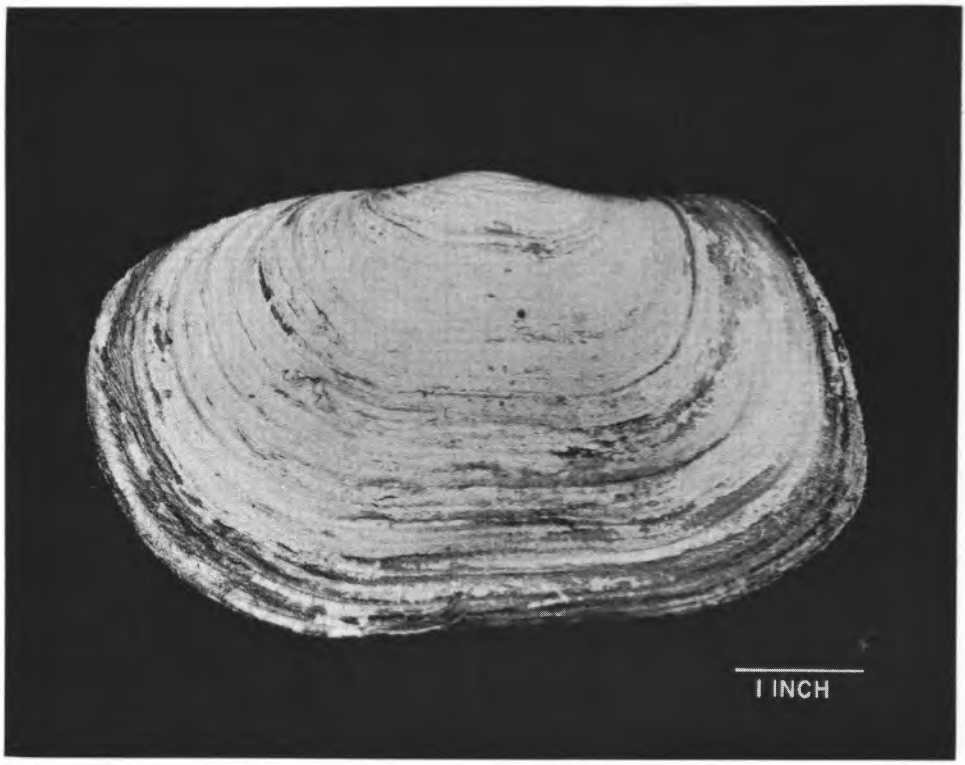
Figure 9. The sand clam.



The Sand Clam, *Macoma secta* (Conrad) (Figure 9)

The bleached, white shells of dead sand clams often lie completely open and give the appearance of wings; hence the common name, butterfly clam, in some areas. It is found in the more sandy clam flats in relatively small numbers as compared with the cockle. The valves have a very shallow cup. Like its close relative *M. nasuta* this clam has a split siphon. The clam is edible but rarely used. Specimens from Netarts Bay reach 4¼ inches in length. It is also known to occur in Yaquina Bay and is probably present elsewhere.

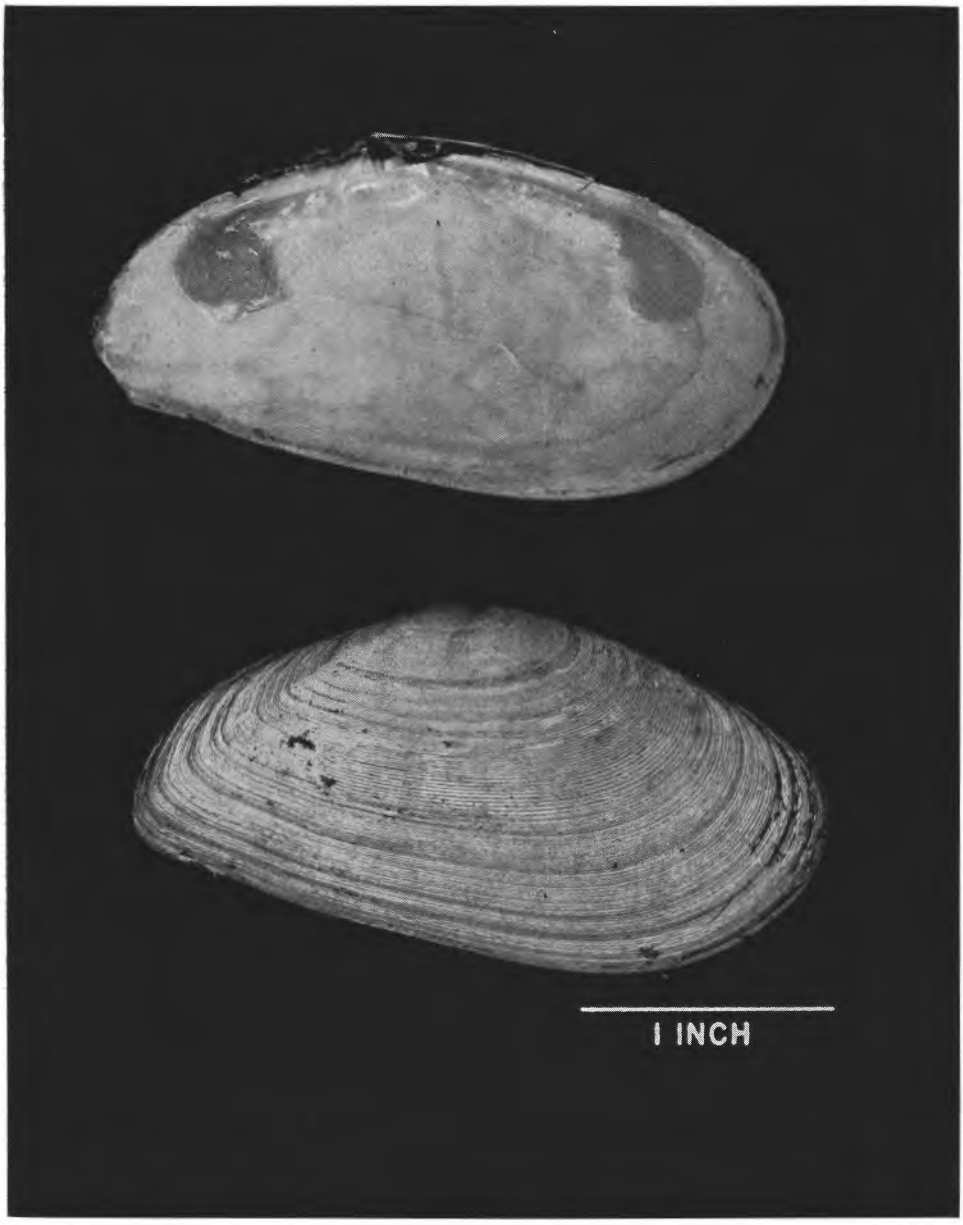
Figure 10. The geoduck.



The Geoduck, *Panope generosa* (Gould) (Figure 10)

The author has verified records of this clam in Oregon from Netarts Bay only, where it is occasionally dug. It is the largest of the Oregon bay clams. The body parts are too large for the shell and the animal is unable to withdraw completely. The shell gapes at both ends but especially at the posterior. The geoduck is distinguished from the gaper by the absence of leather-like flaps on the tip of the siphon and the absence of the deep ligament pit in the hinge region. Shells of the geoduck are large and nearly rectangular. One specimen dug May 27, 1949, in Netarts Bay measured 6¾ inches in shell length and weighed 6½ pounds.

Figure 11. The bodega tellen.



The Bodega Tellen, *Tellina bodegensis* Hinds (Figure 11)

The bodega tellen is a sand-inhabiting clam found scattered along the entire Oregon coast. It has been present in some years in quantities large enough for harvesting in Coos Bay, Yaquina Bay, and Tillamook Bay. Samples average 2½ inches in length and 1⅛ inches in height. The relatively heavy white shell is rounded anteriorly and pointed posteriorly and has distinct concentric lines.

Miscellaneous Species

There are numerous other species of clams found in Oregon's bays that do not warrant mention in this report because they are only rarely, if ever, utilized.

There are also two species of oysters present in the larger bays of Oregon. These are the native oyster, *Ostrea lurida* Carpenter, and the exotic Pacific or Japanese oyster, *Ostrea gigas* (Thunberg).

The native oyster is an inhabitant of Yaquina and Netarts Bays, and was formerly found in Coos Bay. It is very much depleted in numbers. The Pacific oyster is being cultivated quite extensively in Tillamook, Netarts, Yaquina, and Coos Bays and has been planted experimentally, at one time or another, in Nehalem, Siletz, Alsea, and Umpqua Bays.

DISTRIBUTION

Table 2 is offered as a guide to the general abundance and distribution of the major species of bay clams.

In the larger bays, where all the common species of bay clams are present, the softshell beds of importance are generally found in the upbay regions where the water is less saline, or in inlets where fresh water is being discharged. The cockle, gaper, butter, and littleneck clams are generally found in the lower regions of the bay where the salinity is influenced to a greater extent by the proximity of the ocean.

The softshell clam is the only bay clam adaptable to the conditions found in the smaller "fresh water" bays such as Nehalem, Nestucca, Salmon, Siletz, and Coquille.

Table 2. Major species of bay clams and relative abundance

River or Bay	*Gaper*	*Cockle*	*Softshell*	*Butter Clam*	*Littleneck*
Nehalem	0	0	2	0	0
Tillamook	3	3	2	1	1
Netarts	3	3	1	2	1
Nestucca	0	0	1	0	0
Salmon	0	0	1	0	0
Siletz	0	0	1	0	0
Yaquina	3	3	2	1	1
Alsea	1	1	2	0	0
Siuslaw	1	0	3	0	0
Umpqua	1	0	3	0	0
Coos Bay	3	2	1	1	1
Coquille	0	0	1	0	0

0—not known to be present
1—present but scarce
2—fairly abundant
3—present in considerable abundance

14,732

DESCRIPTION OF BAYS

As an aid in the description of the various bays the total acres enclosed by the boundaries of the respective bays and the acres of tideland in the various bays are presented in Table 3. Only those areas affected by tidal action were included in the acreage measurements. Coos, Tillamook, Yaquina, Umpqua, Siuslaw, and Nehalem Bays produce more than 95 per cent of the state's total commercial bay clams. It is, therefore, these bays that are of most interest for comparison.

Table 3. Summary of bay acreages①

Bay or River	Total Area Acres	Tideland② Area-Acres	Relative Position Based on: Total Area	Tideland Area	Commercial Production
Coos Bay	9,543	4,569	1	2	1
Tillamook	8,839	5,147	2	1	2
Umpqua	5,712	1,548	3	4	4
Nehalem	3,766	1,180	4	5	6
Yaquina	2,853	1,741	5	3	3
Netarts③	2,406	.....	6	..	9
Alsea	2,227	.....	7	..	7
Siuslaw	1,589	597	8	6	5
Siletz④	1,203	.....	9	..	..
Nestucca⑤	1,149	.....	10	..	10
Coquille	703	.....	11	..	8
Salmon⑥	438	.....	12	..	..

① Areas calculated from USCGS bay charts; when bay charts were not available coastal charts were used, thus reducing the accuracy of measurement because of reduction in scale. Areas are subject to revision.

② No charts available for measuring tideland acreage of some of the bays.

③ No commercial harvesting in Netarts before 1948 because of local agreement prohibiting taking of clams for commercial use.

④ Although Siletz had no commercial landings from 1943 to 1949 it remained legally open for commercial harvesting until August 12, 1948.

⑤ Nestucca was closed to commercial harvesting of clams August 12, 1948.

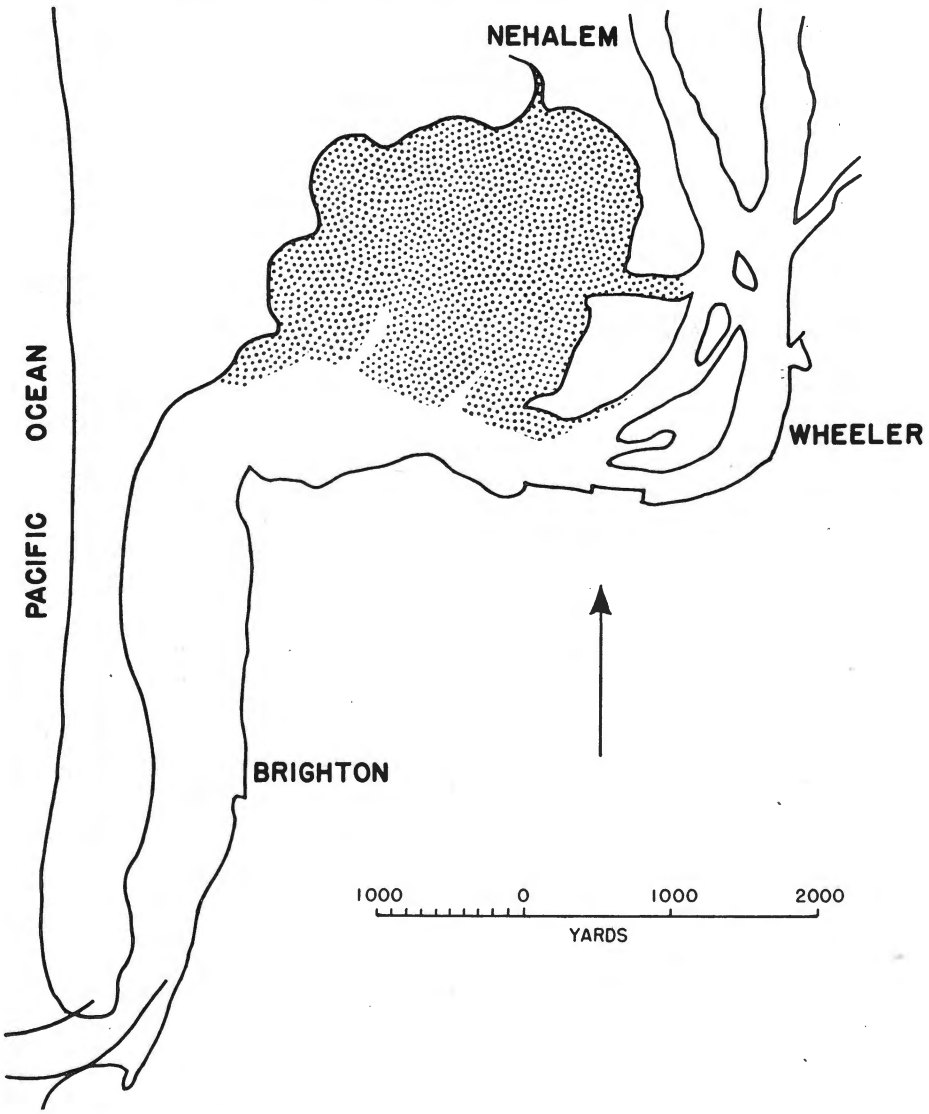
⑥ Salmon River has had little or no commercial production but was legally open until August 12, 1948.

Coos Bay is the largest of the Oregon bays although only a little larger than Tillamook Bay, but Tillamook Bay has more tideland acreage. These two bays contain 45 per cent of the total tideland acreage of the state.

Next in order on the basis of total size are Umpqua and Nehalem Bays. It can be seen, however, that the clam-producing area (tideland) in both bays is smaller than that of Yaquina Bay. Netarts, Alsea, Siuslaw, Siletz, Nestucca, Coquille, and Salmon Bays follow in order of decreasing total size.

While clams may be plentiful, the amateur may very well come back empty-handed because he does not know where to go. With this thought in mind, a brief description of the main clam beds for each bay is given. For ease of location, the bays are given in order of their appearance on Oregon's coastline from north to south (Frontispiece). All tideland heights referred to are deviations from mean lower low water.

Figure 12. Chart of Nehalem Bay showing location of clam beds.



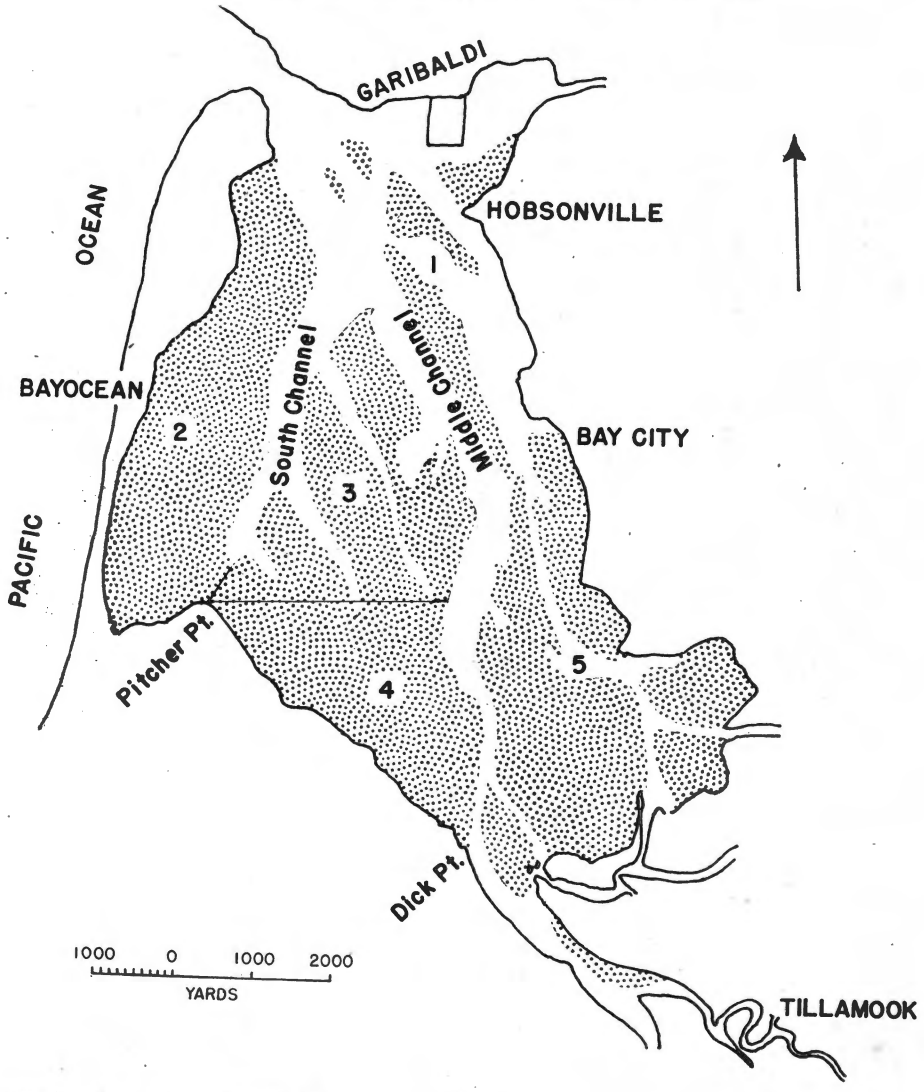
Nehalem Bay (Figure 12)

Nehalem Bay is comparatively long and narrow in outline. It supports a sizeable population of the softshell clam. The main beds are located 3 miles upriver from the mouth, to the north of the main river channel in a cove formed by a bend in the river bed. An estimated 375 acres of clam flats of variable productivity lie in this area with small beds found scattered at other places within the bay along both sides of the channel. Patches of marsh grass dot the main clam beds and here the softshell is literally dug in the grass. Despite fairly heavy digging pressure the beds appear to be maintaining themselves at a good level of abundance. Selected areas sampled

September 6, 1949, at a plus 1.7 feet tide, averaged more than 10 clams per square foot while random sampling yielded more than one clam per square foot. The clams averaged 3¼ inches in length.

The main beds may be reached by walking but a boat is recommended.

Figure 13. Chart of Tillamook Bay showing location of clam beds.



Tillamook Bay (Figure 13)

Tillamook Bay, the second largest bay on Oregon's coastline, is 70 miles south of Astoria. This bay has many miles of beaches from which bay clams may be gathered.

There is a ready market for the cockle clam in Tillamook Bay as bait for both the local crab fishery and the recreational bay and ocean fishery. This clam is also used in the restaurant and fresh market trade. It is popular with

tourists and other recreational clam diggers for use in their favorite clam recipe. The cockle clam supports 76 per cent of the Tillamook Bay commercial clam production.

Gaper clams are equally important for recreational digging. Twenty-seven diggers interviewed May 22, 1948, off the Bayocean area took a total of 315 pounds of clams of which 47 per cent were gapers and 53 per cent were cockles. Gaper clams measured from Tillamook Bay during the year 1949 averaged 4.6 inches in shell length and cockles during the same period averaged 3.0 inches in rib length.

Tillamook Bay is divided into five areas in Figure 13 for ease of location of the clam flats. Area 1 is the group of islands and tide flats lying at the forepart of the bay off Bay City, Hobsonville, and Garibaldi. Diggers have been observed here at tides of a plus 0.4 foot and lower. Area 2 includes tidelands lying off the town of Bayocean from the bay entrance to Pitcher Point and extending bayward to the edge of the South Channel. Clam diggers have been observed digging in this area when the tides ranged from a plus 2.7 to a minus 1.7 feet. Area 3 is the triangular portion of tidelands lying in the center of the bay between South Channel and Middle Channel. Although no extensive observations regarding the height of this area have been made, one observation showed clam diggers here at a plus 0.6 foot tide. Area 4 is designated as that triangular area upbay from, but adjoining, area 3 and separated from area 5 by the Middle Channel. Area 5 is that portion of tidelands lying upbay from a line drawn from Bay City to Dick Point following the Middle Channel.

Although there is no sharp dividing line in regards to species of clams inhabiting the various areas it can generally be said that gaper clams, cockle clams, butter clams, and littleneck clams may be found in areas 1, 2, and 3 while softshell clams may be found farther upbay in areas 4 and 5. Small numbers of razor clams may be found in areas 1 and 2.

The Pacific or Japanese oyster has been found to grow well in Tillamook Bay and oyster growers have taken advantage of this fact. Approximately 3,000 acres of tidelands in areas 2, 3, and 4 are held as oyster claims and are being used for the cultivation of oysters.

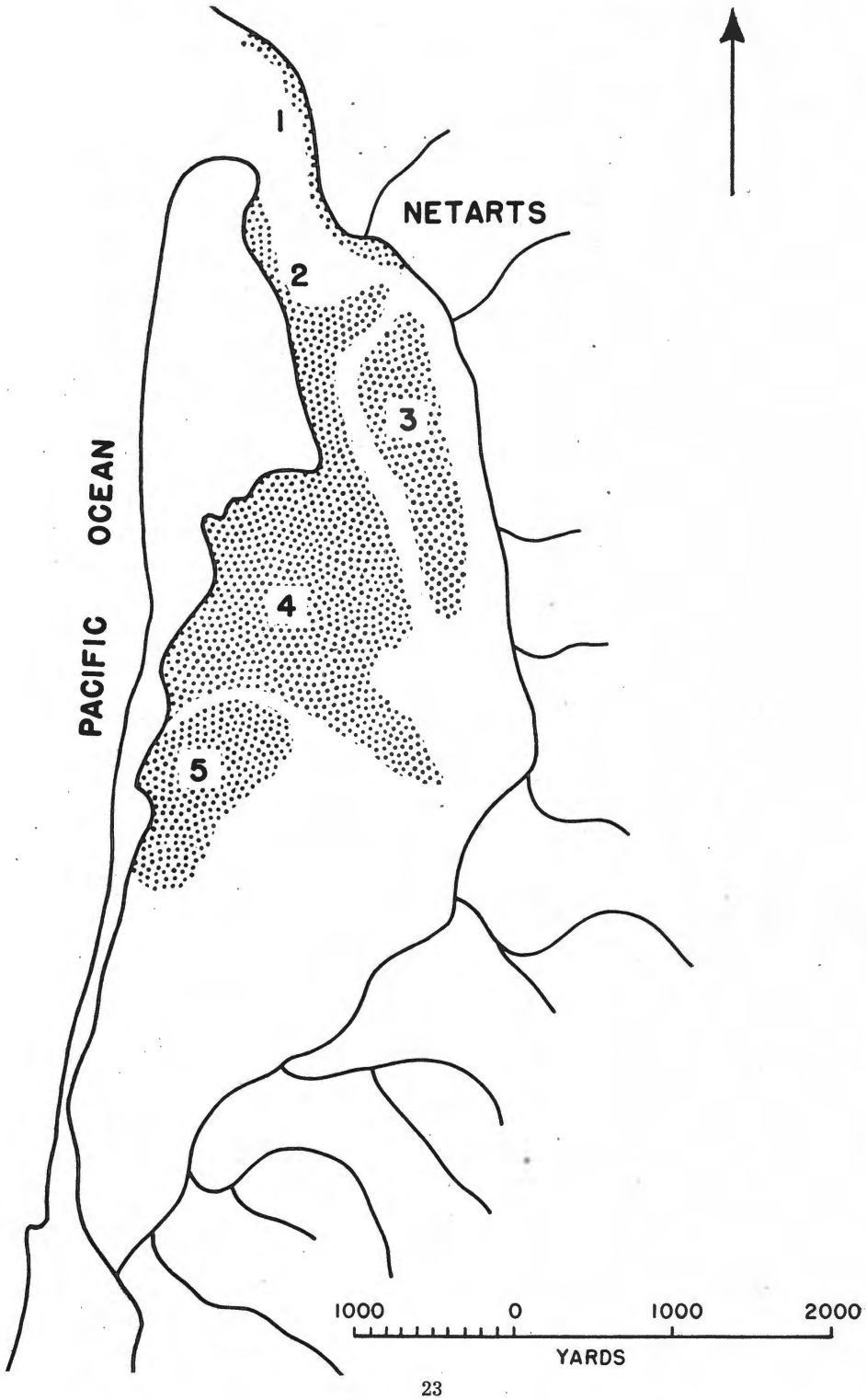
The conditions reported for Tillamook Bay were those existent prior to November, 1952. A major erosion of the Bayocean spit since this date has greatly altered clam and oyster beds in area 2. The ocean presently flows in and out of Tillamook Bay on both sides of the isolated town of Bayocean, which is now an island.

Netarts Bay (Figure 14)

Netarts Bay is less than 5 miles south of Tillamook Bay. It is essentially a salt water bay with only minor creeks discharging fresh water into it. The resort town of Netarts depends to a great extent upon the shellfish resources of the bay as a tourist attraction. During the summer season moorage owners make daily excursions to the clam beds upbay and diggers have no trouble obtaining their legal limit of clams. Commercial harvesting of the bay clams is limited to supplying cockle clams for bait for both a small local crab fishery and for recreational fishing.

Gaper clams may be found in areas 1, 3, 4, and 5; cockles in areas 1, 2, 3, 4, and 5; butter clams in areas 1, 3, 4, and 5; littleneck clams in areas 3, 4, and

Figure 14. Chart of Netarts Bay showing location of clam beds.



5; some softshell clams are present upbay from area 5; and razor clams are present in small numbers in areas 2 and 3. All areas are well exposed on tides of minus 1 foot or lower; however, except for area 1 all areas must be reached by boat.

Approximately 300 acres of tideland in Netarts Bay are used for cultivation of the Pacific oyster. The native oyster is present in very small numbers upbay from area 5.

Figure 15. Chart of Nestucca Bay showing location of clam beds.

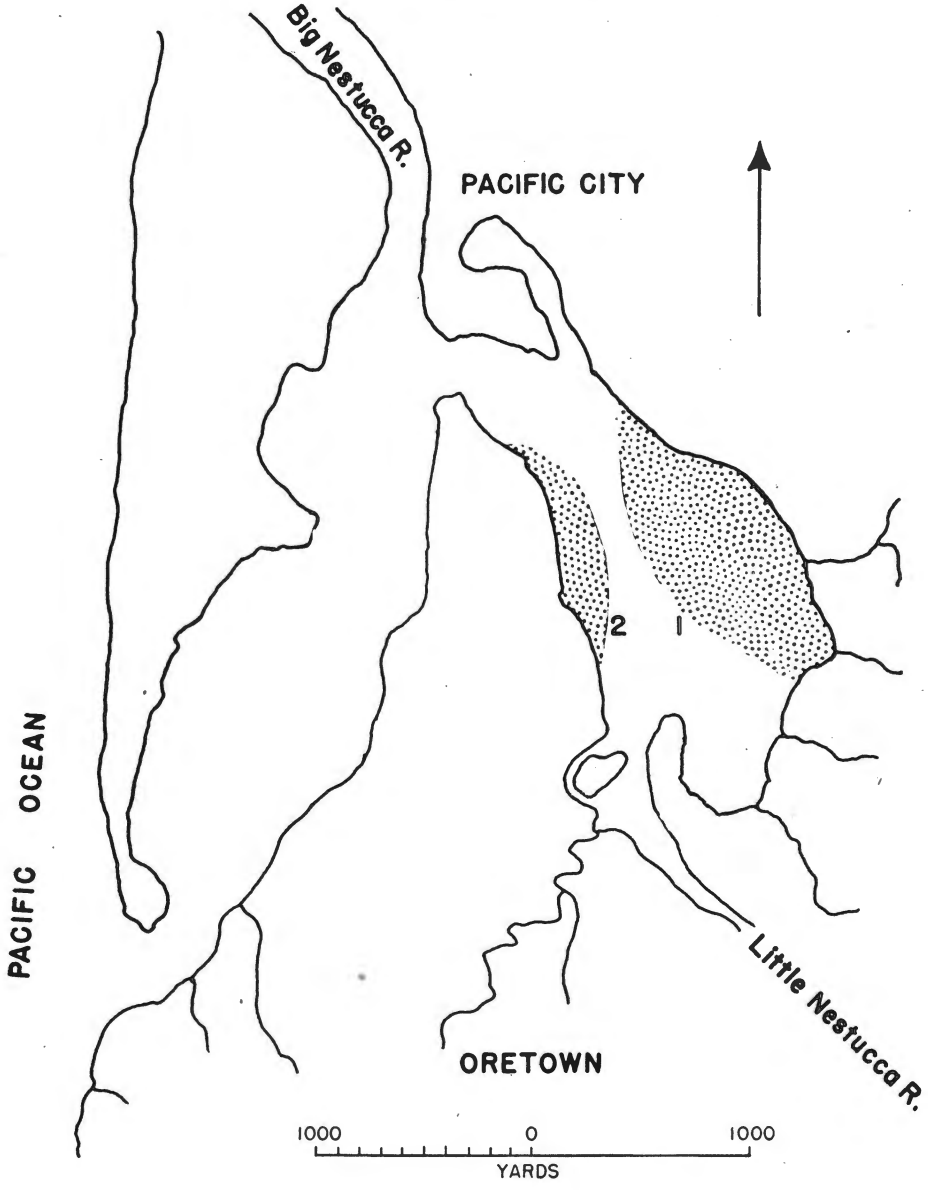
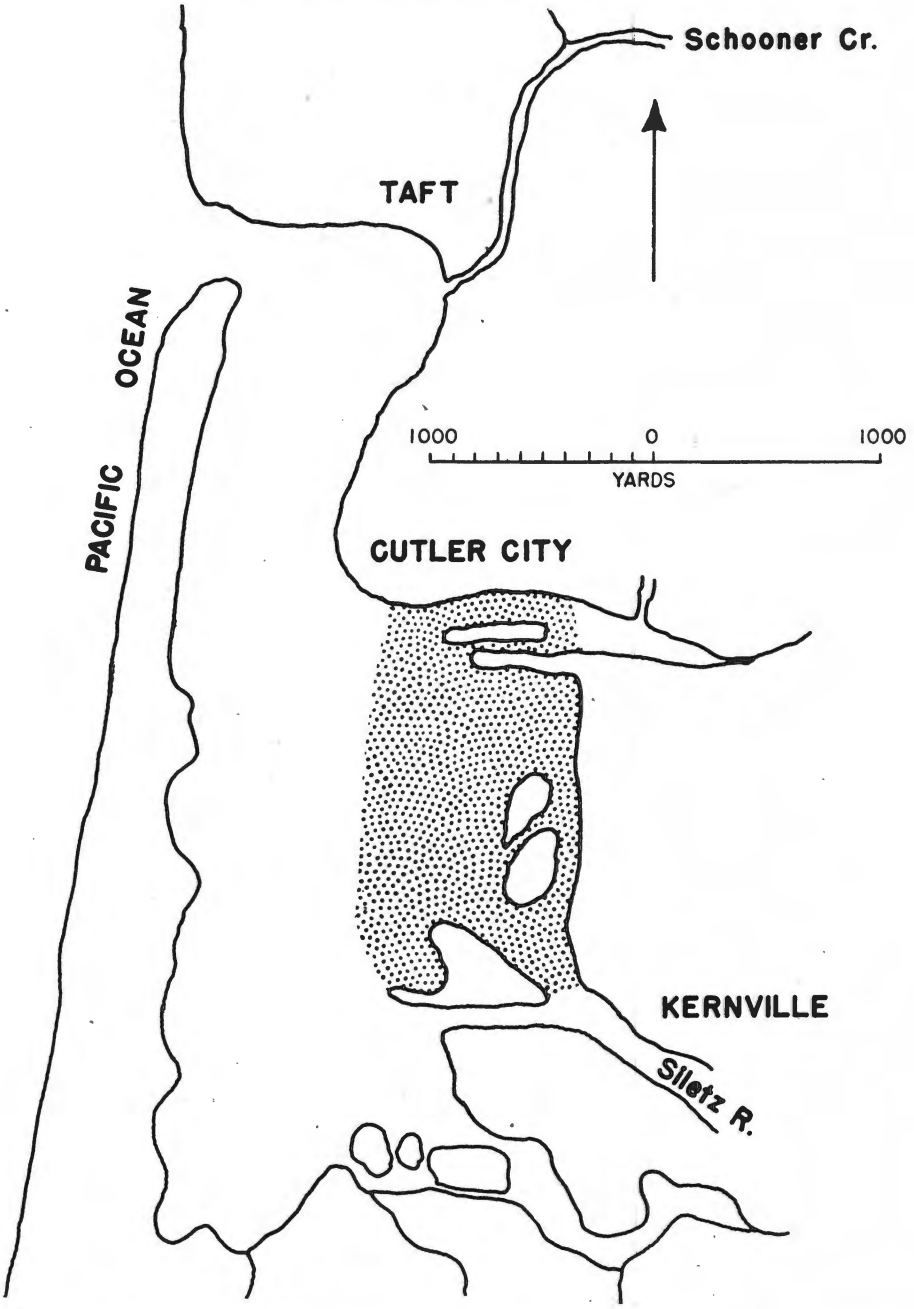


Figure 16. Chart of Siletz Bay showing location of clam beds.



Nestucca Bay (Figure 15)

With reference to the location of the clam flats one should call this bay Little Nestucca Bay for it is within the boundary of the Little Nestucca River that the softshell clam is found. Although not an extensive bed, it

furnishes softshell clams for tourists and local residents. The main clam area, area 1, is approximately 2 miles southeast of the town of Pacific City and is accessible by road. Across the bay is a smaller clam bed, area 2. The flats are well exposed at a minus 0.7 foot tide.

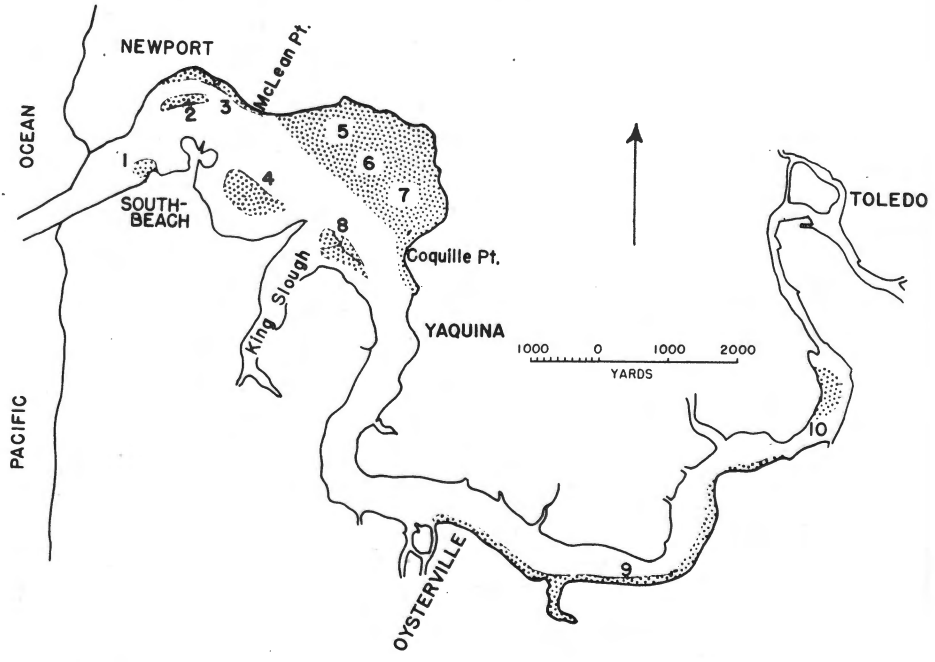
Salmon River

The adaptability of the softshell clam to its surroundings is evident in this small stream where the majority of clams are found in gravel. It is the only bed of its kind known in Oregon. The bed is of local interest only and is not of sufficient size to support an intensive fishery. It is located about 2 miles upriver from the mouth and is best reached by boat on tides of a plus 0.9 foot or lower.

Siletz Bay (Figure 16)

The softshell clam is found sparingly in this bay in the area between Cutler City and Kernville. Many old logs and snags have settled on the mud flats and among these the softshell is dug. The clams are generally harvested by local residents only. Tides of a minus 0.6 foot bare the flats sufficiently for digging.

Figure 17. Chart of Yaquina Bay showing location of clam beds.



Yaquina Bay (Figure 17)

Yaquina Bay, which ranks third in commercial bay clam production, produces an average of 40,000 pounds annually which is approximately 20 per cent of the state's total.[1] It is centrally located on the Oregon coast and receives fresh water from the Yaquina River. Tidewater extends upbay

[1] Average production 1943-49.

over an inverted "S" course for 12½ miles. Approximately 1,700 acres of tideland are within this area, which places Yaquina Bay third in size in regard to tideland acreage.

The cockle clam constitutes 66 per cent of the Yaquina Bay commercial production, and gaper clams and softshell clams constitute 28 and 6 per cent, respectively. Other species of clams found in Yaquina Bay are the butter clam, littleneck clam, bent-nose clam, and sand clam. Occasionally razor clams are dug in small numbers on the sandy bars within the bay.

Cockles are used in the restaurant trade, in the fresh sea food markets, and as bait for both recreational and commercial fishermen. The cockle clam has tight fitting valves and can be held in water-submerged cages (live-boxes) in anticipation of demand.

Gaper clams do not lend themselves to live-boxing for any length of time and therefore must be utilized soon after their removal from the clam flats. They support a limited restaurant trade, and a more substantial amount is sold to retail markets.

Like the gaper clam, the softshell clam is generally not held in the shell prior to marketing as it is not long-lived out of water. The softshell clam is used in a limited quantity in restaurants and also for home consumption.

Yaquina Bay has been divided into 10 areas in Figure 17. Area 1 supplies gapers and a few cockles mostly to the residents and tourists from Southbeach, a small settlement immediately adjacent to the area. No boat is needed to reach this readily available clam flat which is used most by recreational clam diggers. The flats are easily accessible on any minus tide.

Area 2, an area of approximately 12 acres of tidelands, varies in height from 8 feet at the upbay end to 1 foot at the downbay end. The extreme height upbay is due to dredging waste deposited in 1948. The upper end is sandy-gravel interspersed with dead clam shells while the lower end is shifting sand. Although gapers exist in the entire area, they are not often dug because of the relative inaccessibility of the area.

Area 3, a small strip of tideland lying on the northerly side of Yaquina Bay and extending from the trollers' docks to McClean's Point, is a readily available source of small gapers and cockles. It lies immediately adjacent to a public road. This area also supports a sizeable ghost shrimp fishery *(Callianassa* sp.). The shrimp are used as bait for nearby bay and ocean fishing. This tide flat is bared at a plus 1.0 foot tide.

A road near one edge of area 4 admits clam diggers to this beach. Considerable quantities of cockles and gapers are harvested by both commercial and recreational diggers. Littleneck clams may be found incidentally during digging operations. A plus 1.5 feet tide or lower is needed to expose the clam flats in this area.

Areas 5, 6, and 7, more commonly known collectively as Sally's Bend, contain approximately 500 acres and form the largest single clam flat in the bay. Here conditions for the growth of bivalves appear to be near optimum. The three areas are separated by two main drainage channels. A plus 2.0 feet tide bares part of area 6, the highest tideland of the three. Considering the three areas as a unit it is possible to obtain clams from the flats on tides as high as plus 1.5 feet. It is advisable to use a boat to reach these

tidelands rather than to depend on wading across shallow channels from shore.

Area 8 is on the same side of the channel but upbay from area 4. This is the farthest upbay area with sizeable quantities of gapers and cockles, although the softshell clam is found still farther upbay. Area 8 is exposed on a 0.0 foot tide.

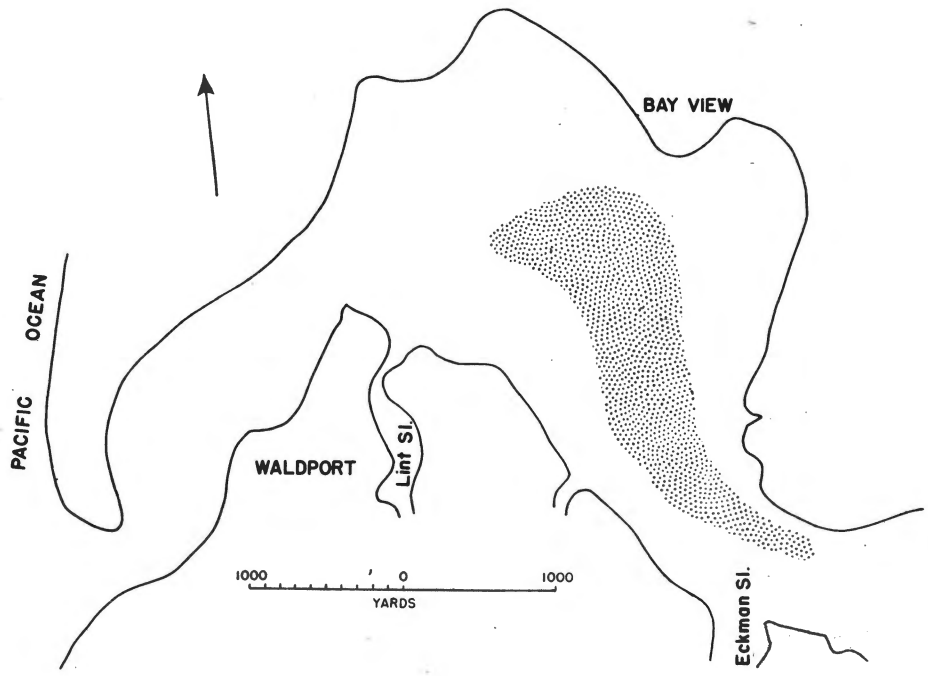
Areas 9 and 10 contain the main beds of the softshell clam. As there is no road along the southern bank of Yaquina Bay, a boat is needed to gather clams in area 9. Area 10 is an 18 acre tideland island ranging in height from plus 4.0 feet to minus 2.0 feet and represents, more or less, the upper limit for clams in the bay.

Scattered beds of softshell clams may also be found along the northern side of Yaquina River and in many of the small sloughs leading off the main bay.

In summary, gapers and cockles are found in areas 1 through 8; butter clams in areas 5, 6, and 7; littleneck clams in areas 4, 5, 6, and 7; and softshell clams in areas 9 and 10. The commercial harvesting of cockles and gapers comes mainly from areas 4, 5, 6, and 7, and the commercial harvest of softshell clams comes from areas 9 and 10.

Also, approximately 300 acres in Yaquina Bay are now being used to grow Pacific oysters. One hundred fifty acres are reserved for cultivation of the native oyster, although there are no native oyster farms in operation at present.

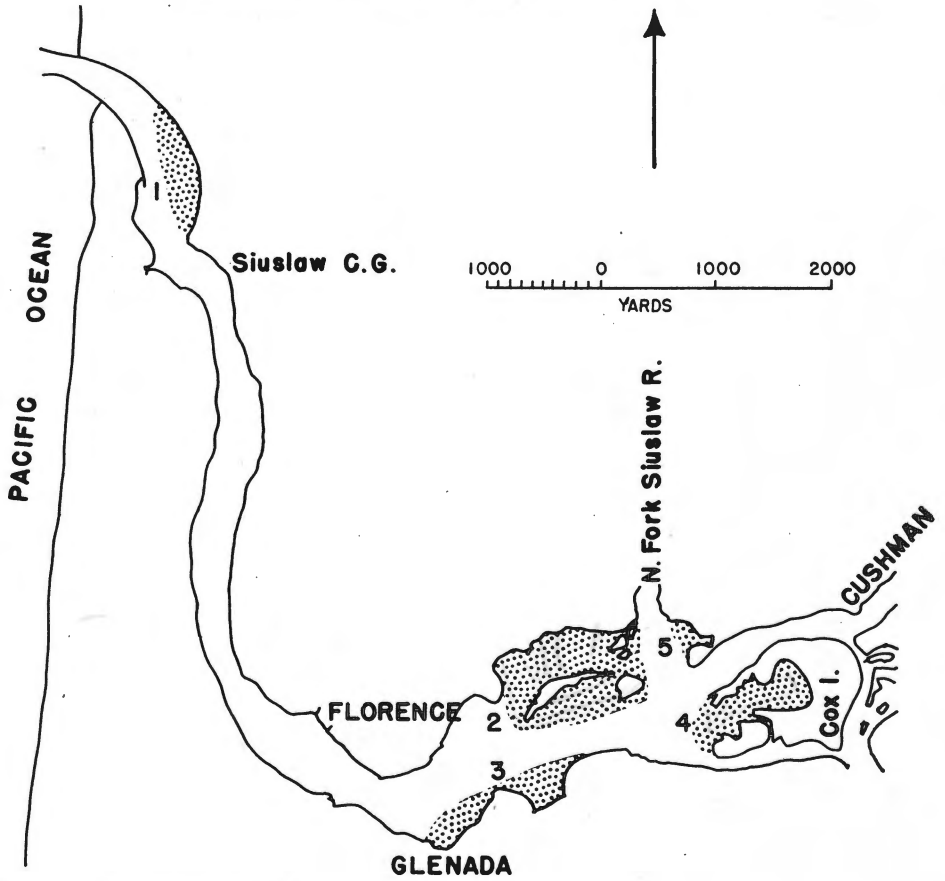
Figure 18. Chart of Alsea Bay showing location of clam beds.



Alsea Bay (Figure 18)

The softshell clam supports most of the fishery in Alsea Bay, although the cockle clam and the gaper clam are present in small numbers. A boat is needed to gain access to the main beds which are located about 2 miles upbay from the town of Waldport between the old railroad trestle and the mouth of Drift Creek on the north side of the river. The softshell clams are used in small quantities commercially but are utilized more often by local residents and tourists for personal use.

Figure 19. Chart of Siuslaw Bay showing location of clam beds.



Siuslaw Bay (Figure 19)

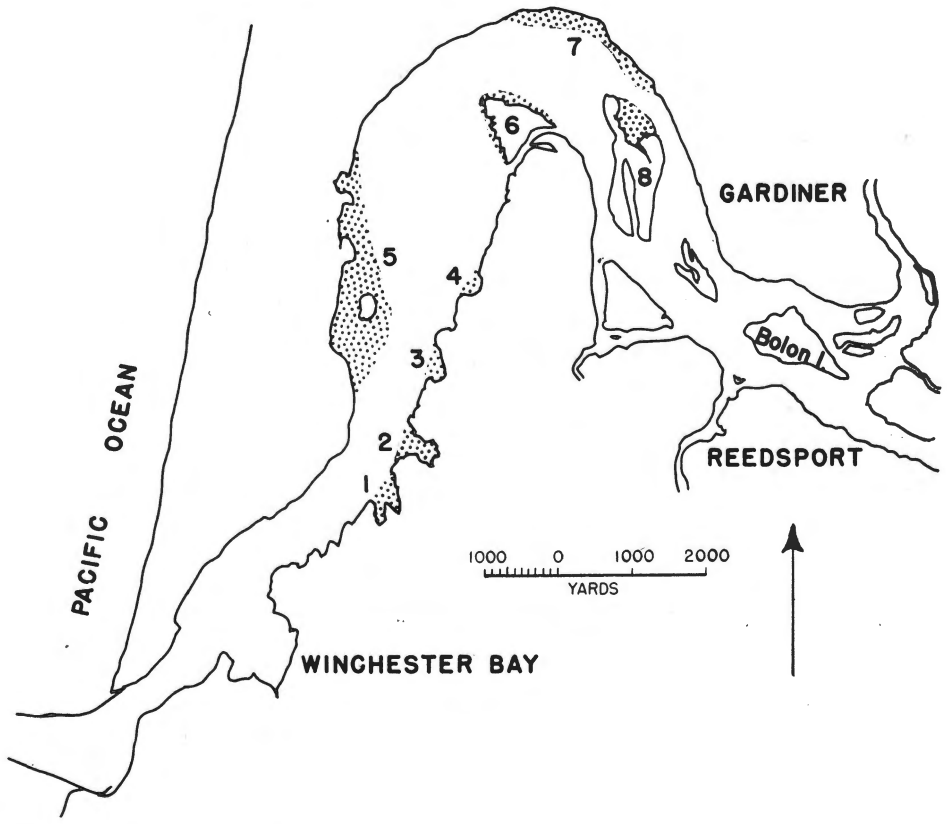
At the mouth of the Siuslaw River there is a small bed of gaper clams charted as area 1. Above the town of Florence the river area widens and here are found tide flats and islands inhabited by the softshell clam. Area 2, the largest single clam flat in the Siuslaw River, contains approximately 300 acres, and is immediately adjacent to a public road and accessible on foot. Softshell clams of large size and excellent quality were formerly dug here by both commercial and recreational diggers.[1] In recent years the clams have declined in numbers. Two smaller beds are combined into

[1] Clams sampled from area 2, July 10, 1949, averaged 4.2 inches in length.

area 3 near the town of Glenada and along the south bank of the river. The region off Cox Island, area 4, includes approximately 80 acres of clam producing ground. Area 5 contains 20 acres and is located on the east side of the bridge which crosses the north fork of the Siuslaw River.

The upstream limits for the survival of the softshell clam are the town of Cushman on the main river and Bull Island about 1¼ miles up the north fork of the Siuslaw River; the downstream limit for all practical purposes is the town of Florence.

Figure 20. Chart of Umpqua Bay showing location of clam beds.



Umpqua Bay (Figure 20)

The Umpqua River is similar to the Siuslaw River in having a comparatively long and narrow course, in being a "freshwater bay", and in having the same species of clams present. However, it is approximately 3½ times as large in total area and 2½ times as large in tide flat area. This directly affects the commercial production.①

Although there are a few trails leading to some of the clam beaches, it is to the digger's advantage to use water transportation to reach most of the clam beds. On the easterly bank of the bay are a series of coves, areas 1 through 4, known as Jorden Cove, Macey Cove, Double Cove, and Henderson

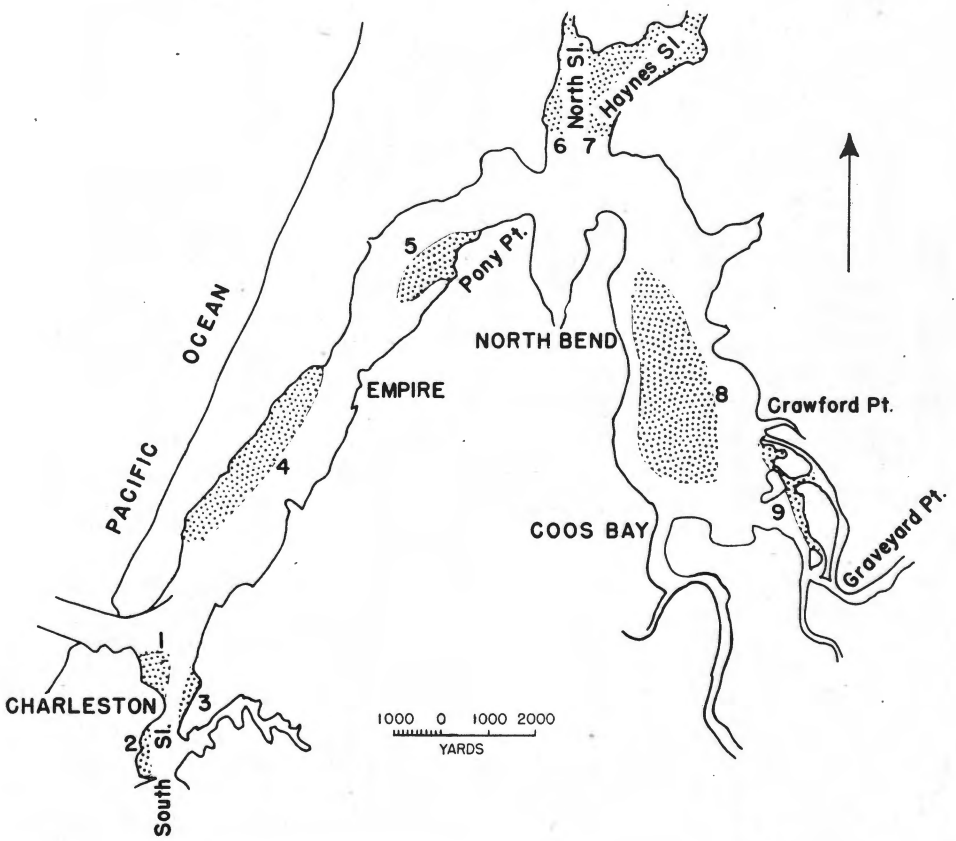
① Average production, 1943-49, Siuslaw 4,000 pounds, Umpqua 9,000 pounds.

Cove, respectively. Softshell clams may be found in all of these areas. The largest clam flat in the bay, area 5, more commonly called Middleground, is located on the westerly bank. Clams sampled from Middleground on September 7, 1949, averaged 4 inches in length. The Point, area 6, on the northern tip of the bay also has clams in abundance. Softshell clams of large size and numbers are found in area 7, across the bay from area 6, and in area 8, across the main river channel from the town of Gardiner.[1]

The upbay limit for the softshell clam may be considered the highway bridge across Bolon Island. The extreme downbay limit is Winchester Bay, where only scattered beds of softshell clams may be found. Winchester Bay also has a very small population of gaper clams.

In general, a plus 2.0 feet tide will expose the Umpqua tidelands sufficiently for clam digging.

Figure 21. Chart of Coos Bay showing location of clam beds.



Coos Bay (Figure 21)

Coos Bay residents prefer the gaper clam, which supports virtually 100 per cent of the fresh clam market in this area. An average of 80,000 pounds

[1] Measurements of 348 specimens from this area dug by a commercial clam digger during the 1950 season ranged in length from 3¼ to 5¾ inches, and averaged 4½ inches.

of this species is landed each year, which is 40 per cent of the state's total bay clam landings.

Recreational clam diggers find easy access to clam beds in the Charleston area, where it is not difficult to obtain the legal limit of clams. Area 1 is on the west shore of South Slough just north of Charleston in the old Government Dock area. Area 2 is on the same shore of South Slough but south of Charleston. Area 3, a clam bed on the east shore of South Slough, receives a great deal of digging effort and yields a large number of clams. Tidelands of these areas are exposed on tides of 0.0 feet or lower. Areas 1, 2, and 3 contain the gaper clam, cockle clam, butter clam, and littleneck clam. Gapers and cockles are most numerous.

Downbay and across the channel from the town of Empire are more clam flats, area 4, accessible only by boat. Here much of the commercial catch for the bay is taken. Gaper clams and cockle clams are available on tides of 0.0 feet or lower.

Farther upbay, adjacent to the North Bend municipal airport, is another clam bed, area 5. This represents the upper limit in Coos Bay for the gaper clam, cockle clam, butter clam, and littleneck clam. Area 5 is exposed on a tide of 0.0 feet or lower. The softshell clam increases in abundance upbay from this area.

The abundance of softshell clams in Coos Bay is evidently much reduced compared with former years. Edmondson (1920) reported softshell populations of "considerable" size on the east side of Coos Bay opposite North Bend. According to early residents, the softshell clam was formerly very numerous in the upper bay area. Scattered beds may now be found in North Slough, area 6, and Haynes Slough, area 7. There are also beds between the towns of North Bend and Coos Bay on a series of low islands and tide flats designated as area 8, and between Crawford Point and Graveyard point, area 9.

In summary, gaper clams and cockle clams are found in areas 1 through 5; butter clams and littleneck clams in areas 1, 2, and 3; and softshell clams in areas 6 through 9.

There are approximately 750 acres of oyster ground now actively farmed in Coos Bay. Much of the product is canned because human sewage pollution has caused a portion of the bay to be condemned for fresh oyster consumption. New sewage disposal plants planned or now under construction in the towns of North Bend and Coos Bay may soon relieve this condition.

Coquille Bay (Figure 22)

About three-quarters of a mile upbay from its mouth the Coquille River, southernmost Oregon bay in which bay clams are found, widens and offers the conditions necessary for the growth of the softshell clam. Although the beds are not extensive, they furnish clams for some of the restaurants and residents in the Bandon area.

The main beds, area 1, may be reached without the use of a boat on tides of plus 3.0 feet or less. Area 2 is across the channel and a boat is needed to reach this bed.

The upbay limit for the softshell clam is about 3 miles above the bay's entrance.

Figure 22. Chart of Coquille Bay showing location of clam beds.

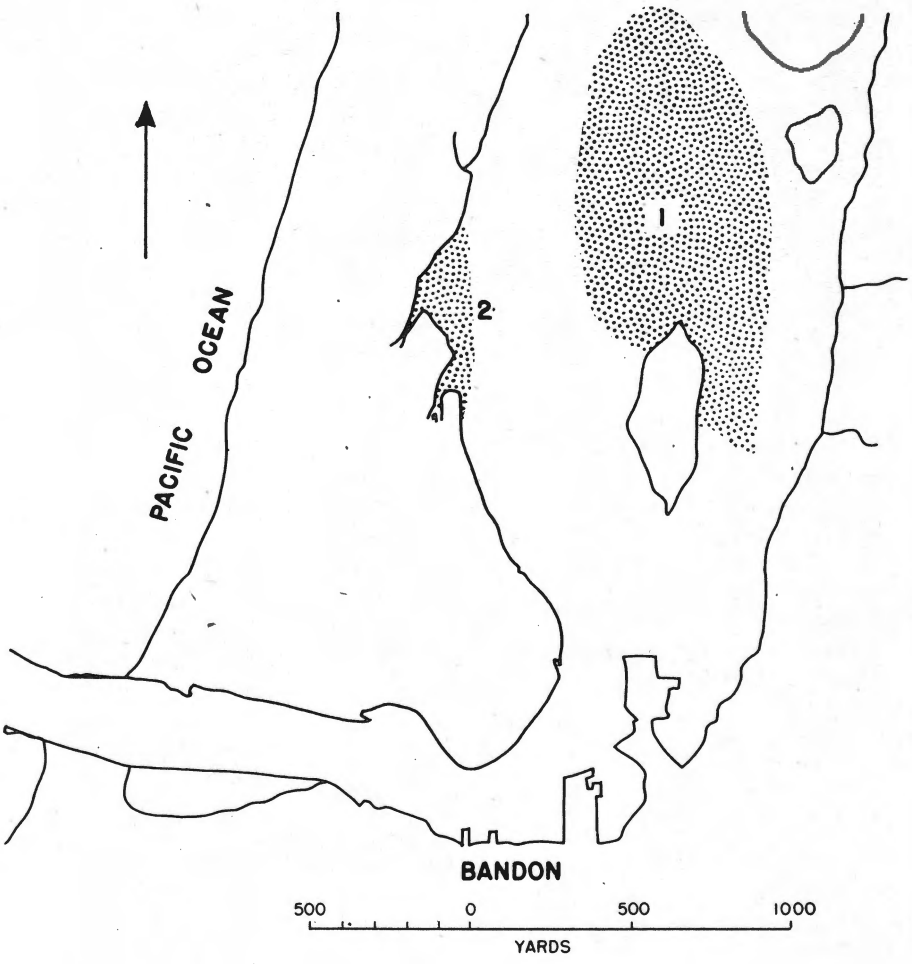


Table 4. Bay clam production of all species combined, by area, 1943-50[1]

Bay	YEAR[2] 1943	1944	1945	1946	1947	1948	1949	1950	Total	Per Cent
Coos	52,967	90,236	173,757	154,939	61,825	24,903	11,758	18,321	588,706	38.29
Tillamook	86,328	48,953	55,446	37,719	42,858	35,120	39,990	47,073	393,487	25.59
Yaquina	33,669	36,659	48,978	44,426	39,835	32,696	30,515	24,007	290,785	18.91
Umpqua	1,119	15,520	16,411	14,855	14,562	14,212	17,555	18,540	112,774	7.34
Siuslaw	2,587	11,300	4,722	7,580	3,138	4,461	9,682	13,196	56,666	3.69
Nehalem	.....	.....	.....	5,862	5,313	5,333	11,850	17,061	45,419	2.95
Alsea	531	1,005	5,411	.....	2,568	1,102	2,906	3,977	17,500	1.14
Coquille	496	.....	.....	.....	4,523	4,113	4,801	2,327	16,260	1.06
Netarts	.....	.....	.....	.....	.....	400	6,351	4,797	11,548	0.75
Nestucca	.....	.....	1,421	.....	2,880	.....	.....	.....	4,301	0.28
Total	177,697	203,673	306,146	265,381	177,502	122,340	135,408	149,299	1,537,446	100.00

[1] Includes less than 0.5 per cent razor clams.
[2] Dealer reports by fiscal year beginning April 1.

HARVESTING OF THE RESOURCE

Commercial Production

The bay clam statistics in this report were obtained from the statistical division of the Oregon Fish Commission and are of several origins. Total production figures were derived from dealer reports and are reliable and comparable from year to year. Beginning in April, 1943, in addition to dealer reports, commercial licensees have been required to keep a record of each landing in a recording book called a "pass book" which is provided by the state. No concentrated effort was made to require the clam licensees to report their landings by species until 1950. The breakdown by species for the period 1943 through 1949 was obtained only after interviewing the diggers still available who held licenses during this period. When no information regarding a licensee was found, his landings were apportioned in the ratio found to exist among the interviewed licensees. In general, this was necessary in only a few instances. The accuracy of these landings by species for the years 1943 through 1949 are subject to some error and should be regarded only as estimates. This also should be taken into consideration when analyzing the catch-per-pass-book-entry figures.

The figures on commercial clam production for the years 1928 through 1942 are those reported by the Oregon Fish Commission (1951). However, revision of catch records since that date has provided more accurate figures and this accounts for the differences between the 1951 figures and those in this report.

There is a ready market for bay clams in fresh fish markets, in the fish-bait markets, for restaurant use, and for recreational use. Coos, Tillamook, and Yaquina Bays supplied 60 to 97 per cent of Oregon's commercial bay clam landings from 1943 through 1950. Umpqua, Siuslaw, Nehalem, Alsea, Coquille, and Netarts Bays produced the remainder. Nestucca, Siletz, and Salmon Bays were closed to commercial harvesting in 1948 because of decreased abundance of clams and have not been reopened (Table 4).

Table 5. Bay clam production by species, 1943-49

Year①	SPECIES Gapers	Cockles	Softshells	Total
1943	79,709	80,120	17,868	177,697
1944	113,351	42,422	47,900	203,673
1945	183,853	71,480	50,813	306,146
1946	164,380	53,391	47,610	265,381
1947	58,479	76,579	42,444	177,502
1948	20,076	71,392	30,872	122,340
1949	18,397	64,885	52,126	135,408
Total	638,245	460,269	289,633	1,388,147
Per Cent	45.98	33.16	20.86	100.00
Average	91,178	65,753	41,376	198,307

① Reported by fiscal year beginning April 1.

The commercial species of clams are the gaper, which constituted 14 to 62 per cent of the state's landings for the years 1943-49, the cockle, 20 to 58 per cent, and the softshell, 10 to 39 per cent (Table 5). For the same time period the average yearly commercial landings of bay clams was approximately 200,000 pounds worth a calculated value of $14,000 to the commercial digger, or a retail value of approximately $40,000.

The minimum production for the years 1941 through 1950 was slightly less than 121,000 pounds in 1942, and the maximum 306,000 pounds in 1945 (Figure 23 and Table 6). The 1942 low was the result of partial to complete wartime closure of beaches and tidelands. Gradual easing of restrictions after 1942 was coincident with a steady increase in production through 1945. Production since 1945 shows a general downward trend, although both 1949 and 1950 show a slight increase over 1948. This is probably a result of a greater number of licenses (about one-third more than 1948). Seventy-five per cent of the annual bay clam production takes place during the months of March through August, the time of good daylight low tides (Table 7).

Table 6. Annual bay clam production, number of licensees, catch per licensee, and catch-per-pass-book entry

(All species combined)

Year①	Annual Production in Pounds②	Number of Licensees	Catch Per Licensee	Catch-Per-Pass-Book Entry
1941	214,085	97	2,207	Not available
1942	120,656	55	2,194	Not available
1943	177,697	55	3,231	98
1944	203,673	74	2,752	80
1945	306,146	102	3,001	85
1946	265,381	108	2,457	73
1947	177,502	73	2,432	62
1948	122,340	79	1,549	64
1949	135,408	128	1,058	66
1950	149,299	140	1,066	Not available
Total	1,872,187	911	.....	....
Average	170,199	83	2,055	76

① Fiscal year beginning April 1.
② Dealers reports.

Catch per licensee and catch-per-pass-book entry were the two types of catch-per-unit-of-effort figures available. The number of commercial licenses dropped from 97 in 1941 to 55 in 1942 and 1943, again probably because of the war years. The number of licenses then began a general increase reaching a peak of 140 in 1950, an indication of increasing fishing intensity after World War II (Table 8 and Figure 23). The number of pounds landed per licensee decreased from 3,231 in 1943 to 1,066 in 1950, a 66 per cent drop.

Table 7. Bay clam production by month, 1943-50

Year①	MONTH April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Misc.	Total
1943	13,987	21,675	19,814	13,897	24,030	7,869	2,317	4,478	2,600	2,085	11,960	52,985②	.....	177,697
1944	9,665	11,003	20,710	20,816	20,645	16,688	6,530	2,798	3,943	7,773	20,256	48,584	14,262③	203,673
1945	22,624	21,204	41,596	50,569	28,402	15,741	10,682	6,536	6,632	9,551	27,793	51,693	13,123③	306,146
1946	37,361	15,189	37,626	16,826	22,001	10,601	8,240	7,498	11,175	18,584	26,602	41,245	12,433③	265,381
1947	21,981	21,096	23,999	24,585	21,074	13,736	3,460	6,919	6,796	11,801	8,357	13,598	100	177,502
1948	12,346	13,983	17,276	20,917	12,599	11,270	5,212	5,557	3,448	4,923	3,623	10,458	728	122,340
1949	16,954	16,433	13,552	21,941	16,550	12,137	7,891	5,110	4,357	3,062	6,579	10,085	757	135,408
1950	14,852	20,128	23,863	25,315	24,618	8,614	4,502	3,110	3,448	2,831	5,483	10,827	1,708	149,299
Total	149,770	140,711	198,433	194,866	169,919	96,656	48,834	42,006	42,399	60,610	110,653	239,475	43,111	1,537,446
Per Cent④	10.02	9.42	13.28	13.04	11.37	6.47	3.27	2.81	2.84	4.06	7.40	16.03		100.01④

① Fiscal year beginning April 1.
② Contains unknown quantity of miscellaneous landings.
③ Contains a small unknown quantity of razor clams.
④ Subtracted miscellaneous and used 1,494,335 for calculating per cent.

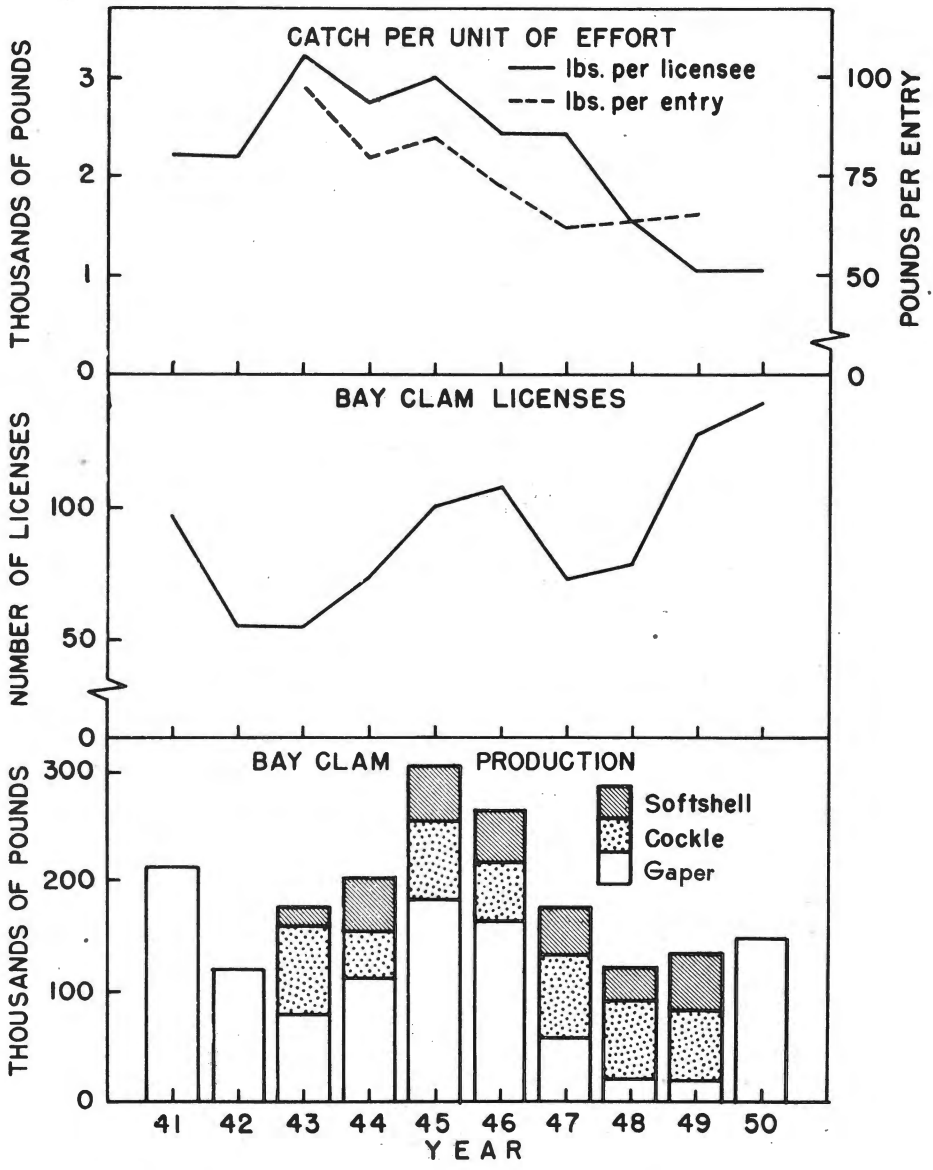


Figure 23. Annual bay clam production (no breakdown by species for 1941, 1942, or 1950), number of licensees, catch per licensee and catch-per-pass-book entry (all species combined).

As previously stated, since April, 1943, commercial clam licensees have been required to keep record of their landings in a pass book provided by the state. These records have not been analyzed for the years subsequent to 1949. The average landing-per-pass-book entry was calculated from yearly totals (Figure 23 and Tables 6 and 9). These figures also show an overall downward trend since 1943, although the years 1948 and 1949

Table 8. Bay clam licenses by area[1]

Bay	YEAR[2] 1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	Total
Coos	12	10	14	14	27	28	15	10	22	15	167
Tillamook	23	22	17	20	25	20	19	22	43	56	267
Yaquina	17	10	14	26	26	29	17	19	20	27	205
Umpqua	11	2	2	4	12	11	7	6	7	10	72
Siuslaw	7	2	4	5	5	8	7	13	13	11	75
Others	27	9	4	5	7	12	8	9	23	21	125
Total	97	55	55	74	102	108	73	79	128	140	911

[1] State of Oregon, Fish Commission, Biennial Reports 1943-53.
[2] Fiscal year beginning April 1.

show a slight increase over the low year of 1947. Pounds-per-pass-book entry dropped about one-third from 1943 to 1949.

Some of the decrease can be attributed to increasing numbers of individuals who hold commercial licenses in order to take over the legal personal limit of clams. Exact figures regarding this increase have not been determined. These individuals are not true commercial licensees because they neither sell nor harvest large quantities of clams. This practice decreases the pounds per licensee per year as well as the catch-per-pass-book entry.

Another factor affecting bay clam production has been the expansion of the oyster industry in the various bays. This has reduced the tideland available to clam diggers by about 5,000 acres of which at least one-half is good clam producing ground. This practice has concentrated the clam digging effort on a smaller area and undoubtedly has decreased clam production.

The figures relating to the gaper clam in Table 9 and Figure 24 do not reveal any apparent catch-per-pass-book-entry trend, although production noticeably decreased after 1946 (Figure 23). For the 7-year period 1943 to 1949 Coos Bay produced 89 per cent of Oregon's gapers and Yaquina and Tillamook Bays produced the remainder.

Because Coos Bay's commercial production is 100 per cent gapers, the number of licensees for Coos Bay may be used as a measure of digging pressure for this species (Table 8). The high production in 1945 and 1946 was coincident with a relatively high digging pressure and the following 3 years' production coincident with a relatively low digging pressure. Abundance samples taken on the important beds in Coos Bay in May, 1948, averaged 3 to 5 clams per 1,000 square feet as compared to 25 clams for the important beds of Yaquina Bay, a measure of the scarcity of gapers in Coos Bay at that time. Low digging pressure from 1941 to 1944, as a result of World War II, probably allowed some recruitment of clams that contributed to the large harvest in 1945 and 1946. However, it should be kept in mind that the gaper is a slow growing clam which takes about 5 years to reach a length of 5 inches.[1] Two or three years low digging pressure would allow only a moderate increase in abundance of the stocks unless a dominant year class(es) of younger clams was (were) already present

[1] From growth experiments in Yaquina Bay.

on the beds. Beginning in 1948 digging gaper clams has been prohibited from January 1 to June 30, both dates inclusive, because of the small numbers of clams on most of Oregon's gaper beds. As a result the digging pressure was greatly curtailed and production reduced.

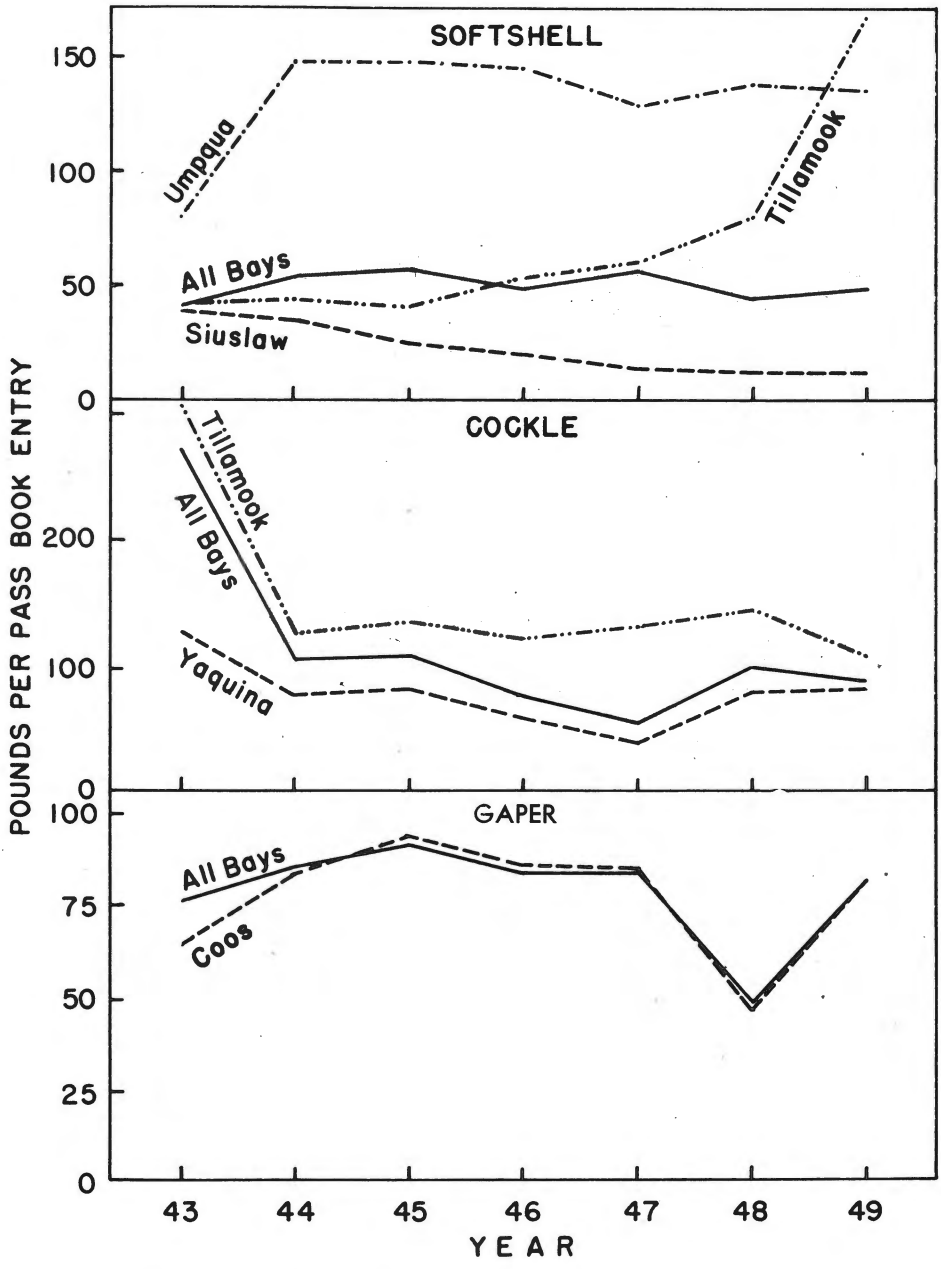


Figure 24. Catch per unit of effort expressed in pounds-per-pass-book entry, by species, 1943-49.

Table 9. Catch per unit of effort expressed in pounds-per-pass-book entry by species, 1943-49[1]

Area	Species	1943			1944			1945		
		Pass Book Entries	Pounds Landed	Pounds Per Entry	Pass Book Entries	Pounds Landed	Pounds Per Entry	Pass Book Entries	Pounds Landed	Pounds Per Entry
Tillamook		5	405	81.0	.....	.....	.....	.....	.....	.....
Yaquina	Gaper	168	20,969	124.8	122	12,030	98.6	132	7,759	58.8
Coos		692	44,835	64.8	717	59,667	83.2	1,455	136,935	94.1
Total		865	66,209	76.5	839	71,697	85.5	1,587	144,694	91.2
Tillamook		186	57,332	308.2	109	13,835	126.9	217	29,307	135.1
Yaquina	Cockle	46	5,792	125.9	88	6,659	75.7	258	21,472	83.2
Netarts		.....	.....	.....	.....	.....	.....	.....	.....	.....
Alsea		.....	.....	.....	.....	.....	.....	.....	.....	.....
Total		232	63,124	272.1	197	20,494	104.0	475	50,779	106.9
Umpqua		12	947	78.9	70	10,262	146.6	88	12,933	147.0
Tillamook		244	10,340	42.4	201	8,870	44.1	198	8,040	40.6
Siuslaw		56	2,190	39.1	216	7,472	34.6	151	3,721	24.6
Nehalem	Softshell	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yaquina		.....	.....	.....	.....	.....	.....	130	8,768	67.4
Coquille		14	420	30.0	.....	.....	.....	.....	.....	.....
Alsea		19	426	22.4	19	665	35.0	98	4,125	42.1
Nestucca		.....	.....	.....	.....	.....	.....	21	1,120	53.3
Total		345	14,323	41.5	506	27,269	53.9	686	38,707	56.4
Yaquina	Unknown	34	1,093	32.1	70	5,351	76.4	17	600	35.3
Tillamook		57	4,997	87.7	60	9,664	161.1	59	6,349	107.6
Total		91	6,090	66.9	130	15,015	115.5	76	6,979	91.4
GRAND TOTALS		1,533	149,746	97.7	1,672	134,475	80.4	2,824	241,129	85.4

[1] Fiscal year beginning April 1.

Table 9. (Continued)

Catch per unit of effort expressed in pounds-per-pass-book entry by species, 1943-49①

Area	Species	1946			1947			1948		
		Pass Book Entries	Pounds Landed	Pounds Per Entry	Pass Book Entries	Pounds Landed	Pounds Per Entry	Pass Book Entries	Pounds Landed	Pounds Per Entry
Tillamook		.....	.....	.....	.....	.....	.....	7	968	138.3
Yaquina	Gaper	79	4,420	55.9	19	1,111	58.5	.....	.....	.....
Coos		1,011	87,224	86.3	424	36,191	85.4	311	14,466	46.5
Total		1,090	91,644	84.1	443	37,302	84.2	318	15,434	48.5
Tillamook		104	12,650	121.6	151	19,688	130.4	151	21,710	143.8
Yaquina	Cockle	281	16,540	58.9	692	26,597	38.4	368	29,081	79.0
Netarts		.....	.....	.....	.....	.....	.....	.....	.....	.....
Alsea		.....	.....	.....	.....	.....	.....	.....	.....	.....
Total		385	29,190	75.8	843	46,285	54.9	519	50,791	97.9
Umpqua		58	8,363	144.2	107	13,720	128.2	57	7,797	136.8
Tillamook		136	7,320	53.8	105	6,370	60.7	42	3,325	79.2
Siuslaw		219	4,263	19.5	216	2,925	13.5	237	2,870	12.1
Nehalem	Softshell	48	3,300	68.8	43	3,675	85.5	95	5,937	62.5
Yaquina		71	2,601	36.6	9	112	12.4	11	240	21.8
Coquille		.....	.....	.....	.....	.....	.....	96	3,515	36.6
Alsea		.....	.....	.....	.....	.....	.....	.....	.....	.....
Nestucca		.....	.....	.....	.....	.....	.....	.....	.....	.....
Total		532	25,847	48.6	480	26,802	55.8	538	23,684	44.0
Yaquina	Unknown	.....	.....	.....	37	1,880	50.8	82	3,923	47.8
Tillamook		11	1,264	114.9	34	1,470	43.2	6	290	48.3
Total		11	1,264	114.9	71	3,350	47.2	88	4,213	47.9
GRAND TOTAL		2,018	147,945	73.3	1,837	113,739	61.9	1,463	94,122	64.3

① Fiscal year beginning April 1.

Table 9. (Continued)

Catch per unit of effort expressed in pounds-per-pass-book entry by species, 1943-49①

Area	Species	1949			TOTAL		
		Pass Book Entries	Pounds Landed	Pounds Per Entry	Pass Book Entries	Pounds Landed	Pounds Per Entry
Tillamook		.....	.....	.....	12	1,373	114.4
Yaquina	Gaper	.....	.....	.....	520	46,289	89.0
Coos		150	12,228	81.5	4,760	391,546	82.3
Total		150	12,228	81.5	5,292	439,208	83.0
Tillamook		169	18,403	108.9	1,087	172,925	159.1
Yaquina	Cockle	240	19,467	81.1	1,973	125,608	63.7
Netarts		72	4,016	55.8	72	4,016	55.8
Alsea		22	1,242	56.5	22	1,242	56.5
Total		503	43,128	85.7	3,154	303,791	96.3
Umpqua		52	6,952	133.7	444	60,974	137.3
Tillamook		53	8,740	164.9	979	63,005	54.1
Siuslaw		352	4,191	11.9	1,447	27,632	19.1
Nehalem	Softshell	101	10,070	99.7	387	22,982	80.1
Yaquina		.....	.....	.....	221	11,721	53.0
Coquille		68	3,382	49.7	178	7,317	41.1
Alsea		86	1,309	15.2	222	6,525	29.4
Nestucca		.....	.....	.....	21	1,120	53.3
Total		712	34,644	48.7	3,799	191,276	50.3
Yaquina	Unknown	.....	.....	.....	240	12,847	53.5
Tillamook		.....	.....	.....	227	24,034	105.9
Total		.....	.....	.....	467	36,881	79.0
GRAND TOTALS		1,365	90,000	65.9	12,712	971,156	76.4

① Fiscal year beginning April 1.

It is evident from the pass book data that 1943 was extremely productive for the few licensees who were harvesting. The number of licensees for both Yaquina and Tillamook Bays was relatively low for the years 1942 and 1943 as were the number of pass book entries (Tables 8 and 9). This probably resulted in each digger getting more clams, especially in 1943. Catch per unit of effort from 1944 through 1949 shows a slight downward trend. A decrease in available clam flats because of a growing number of oyster ground leases, especially in Yaquina Bay, with the resulting greater intensity on the remaining beds could very well be a major factor affecting this decrease. Tillamook and Yaquina Bays produced an average of 57 and 41 per cent, respectively, of Oregon's cockle production for the 7-year period from 1943-49.

Umpqua, Tillamook, and Siuslaw Bays have produced an average of 79 per cent of Oregon's softshell clams. Catch-per-unit-of-effort figures for all bays combined fail to demonstrate conclusively any overall major trend in abundance. Treating the bays individually, however, shows the catch per unit of effort of Umpqua Bay to be far greater than any of the other bays. No apparent trend in abundance is noticeable for Umpqua Bay, where the catch averages 137 pounds per entry. Tillamook Bay shows a rather sharp increase in the catch per unit of effort while Siuslaw shows a general decrease. Annual softshell production for all bays since 1943 has fluctuated considerably as have the number of licenses for the same time period.

Recreational Use

Estimates of the pounds of clams taken for recreational use are given in Tables 10, 11, and 12. During 1950 observations were made over a period of three tide series on the clam beds in front of Bayocean on Tillamook Bay. During this time period an accurate count of the number of clam diggers was kept. Occasional checks to obtain the ratio of commercial to recreational diggers, and also to obtain the catch of each, showed the recreational clam diggers to outnumber the commercial diggers 18:1 and the poundage taken to be in the ratio of 20:1. Commercial diggers use the Bayocean area only occasionally to dig small amounts of crab bait. They more often frequent the clam flats in the middle of the bay. The ratio is, therefore, not necessarily representative of Tillamook Bay as a whole. A total of 1,472 noncommercial diggers took a calculated 24,862 pounds. The commercial landings for the whole of Tillamook Bay for the same time period amounted to 9,479 pounds or less than 40 per cent of the noncommercial take of one area of Tillamook Bay.

Table 10. Calculated take of clams off Bayocean in Tillamook Bay July 15 to August 20, 1950

	Total No. Diggers	*Total Take in Pounds*		*Grand Total in Pounds*
		Gapers	*Cockles*	
Commercial	82	0	1,230	1,230
Recreational	1,472	6,403	18,459	24,862
Total	1,554	6,403	19,689	26,092

Similar observations were made at Netarts Bay, June 11-12, 1949. No commercial diggers were observed during the period and therefore the figures presented in Table 11 are entirely from recreational diggers.

A total of 189 diggers took a calculated 3,577 pounds of bay clams during the 2 days, which was an average of 13.6 pounds per digger. Although large populations of gapers occur in Netarts Bay, no landings were made because of the closed season on this species during the time of the survey. Area 1 of Table 11 is a narrow piece of tideland in front of the community of Netarts, area 2 a sand-spit across from Netarts bordering both bay and open ocean, and areas 3 and 4 the tidelands upbay from Netarts which constitute the greater portion of the bay (Figure 14).

Table 11. Take of clams, Netarts Bay, June 11-12, 1949

Area	Diggers	Numbers of Clams				Total
		Butter Clams	Littlenecks	Cockles	Razors	
1	96	1,856	0	108	0	1,964
2	10	0	0	40	25	65
3 & 4	83	1,200	218	400	0	1,818
Total	189	3,056	218	548	25	3,847
Total in pounds		3,323	46	203	5	3,577

No intensive survey of the recreational take of clams in Yaquina Bay has been made since July, 1947 (Tollefson, 1948) when a total of 21,900 pounds was taken by 990 noncommercial diggers for the time period July 17-23, 1947. This survey indicated 3.3 pounds of clams taken for recreational use for every 1 pound taken commercially during this selected time period.

However, since that time a total of 30 observations of the number of diggers and their catch has been made on the main flats of Yaquina Bay (Sally's Bend). Segregation of commercial and recreational diggers and their catch was made whenever possible and when not possible the diggers and catch were divided in the ratio of commercial to recreational found to be existing when this information was available. The results, therefore, are not exact. Ninety per cent of these observations were made from April through August, the time of heavy sports digging. The number of commercial diggers is therefore lower than it would be on a 12-month

Table 12. Take of bay clams in Yaquina Bay, (Sally's Bend) 30 observations for the years 1948 to 1950, inclusive

	A Total Diggers	B Ratio of Commercial to Recreational Diggers	C Average Catch of Interviewed Diggers in Pounds	A × C Total Calculated Production	D Ratio of Commercial to Recreational Production
Commercial	285	1	61.38	17,493	4.32
Recreational	370	1.30	10.95	4,052	1
Total	655			21,545	

basis. When data from the 4-year period 1947-50 were combined, the average number of diggers per tide was 22, and the ratio of commercial to noncommercial diggers was 1:1.30. Although the recreational diggers outnumbered the commercial diggers, the total poundages landed followed the reverse order of 4.32:1, indicating the effectiveness of an experienced digger. Table 12 gives the results of the surveys.

It is apparent, therefore, that during periods of observation there was a considerable take of bay clams for private use. In Tillamook Bay the recreational take of clams was greatly in excess of the commercial take. In Netarts Bay the recreational take of clams was 3,577 pounds and there was no commercial take. Yaquina Bay observations showed the commercial diggers to be taking more clams than the recreational diggers.

All observations were made during the summer months when the greatest number of recreational diggers, vacationists, tourists, and local residents, would normally be present and should not be accepted as a 12-month average. However, while the number of commercial diggers remains more or less constant during a season, their activities increase during the spring and summer period of good weather and daylight tides, and it is during this time that the greatest poundages of clams are taken (Oregon Fish Commission, 1951).

SUMMARY

An average of approximately 200,000 pounds of bay clams were harvested annually in Oregon for the years 1943-49, inclusive.

The commercial harvest of bay clams is composed of the gaper, cockle, and softshell clams.

The recreational, or noncommercial, harvest of bay clams is composed mainly of the gaper, cockle, softshell, butter, and littleneck clams, and occasionally the bent-nose, sand, geoduck, and bodega tellen clams.

Recreational production is estimated for selected time periods for Yaquina, Netarts, and Tillamook Bays.

A description of the common bay clams of Oregon with general information on common names, habitats, relative abundance, and method and place of harvesting is presented.

A description of the bay clam producing areas in the Nehalem, Tillamook, Netarts, Nestucca, Salmon, Siletz, Yaquina, Alsea, Siuslaw, Umpqua, Coos, and Coquille Bays is presented.

A discussion on the condition of the stocks of the gaper, cockle, and softshell clams is presented.

ACKNOWLEDGMENTS

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Mr. Donald L. McKernan, former director of research of the Oregon Fish Commission, under whose supervision the investigation of bay clams was started, deserves special mention. This publication contains a large amount of data collected by Mr. Roger D. Tollefson, formerly in charge of shellfish investigations for the Oregon Fish Commission. Other members or former members of the shellfish staff who participated in gathering data are Messrs. Kenneth D. Waldron, Stanley N. Wilkes, Dan R. Dion, Alvin Kray, and Harland Buhler.

LITERATURE CITED

Edmondson, Charles Howard

1920 Edible mollusca of the Oregon coast. Bernice Pauahi Bishop Museum of Polynesian Ethnology and Natural History Occasional Papers, vol. VII, no. 9:1-25, 6 figs., Bishop Museum Press, Honolulu, Hawaii.

1923 Shellfish resources of the northwest coast of the United States. Appendix III to the report of the U. S. Commissioner of Fisheries for 1922, Bur. Fish. Doc. No. 920: 21 p., 25 figs., Washington, D. C.

Fish Commission of Oregon

1943 Biennal Report:1-55, 4 tables, Salem.

1949 Biennial Report:1-36, Salem.

1953 Biennial Report:1-30, Salem.

Fitch, John E.

1953 Common marine bivalves of California. Calif. Dept. Fish and Game, Fish Bull. no. 90:1-102, 63 figs., San Francisco.

Oldroyd, Ida Shephard

1924 The marine shells of the west coast of North America. Stanford Univ. Publ., Geol. Sci., vol. 1, no. 1:1-247, 57 plates, Stanford Univ. Press.

Oregon Fish Commission

1951 Fisheries Statistics of Oregon. Contribution No. 16, Sept. 1951:1-176, 40 figs., 108 tables.

Tollefson, Roger D.

1948 Present state of the bay clams of Oregon. Fish Commission of Oregon Fish Commission Research Briefs, vol. 1, no. 2:3-9, 3 tables, 2 plates, Portland.