

The Oyster
Industry in Oregon

by

Roberta Ann Stream

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THE OYSTER INDUSTRY IN OREGON

ABSTRACT. Aquaculture of oysters has never obtained the economic importance in Oregon as it has in other coastal states. There are at present seven commercial culturists in Oregon. The two oysters cultured are the Crassostrea gigas and the Ostrea lurida.

Since oysters do not naturally spawn in Oregon waters the spat, seed, must be produced elsewhere to be planted in the tidewaters.

Many problems in the culture of oysters result after the larvae has attached itself to a permanent growing site. It is then easy prey for other sea life, starfish and oyster drills. In todays environment a greater danger is water pollution. The pollution changes the chemical balance of the water as well as the temperature, both of which the oyster is sensitive to.

INTRODUCTION

Aquaculture in various forms is becoming an industry of increasing interest to various groups. Yet, as was pointed out in a conference on estuaries held on the Oregon State University Campus in March of 1973, in Oregon there is little information available on the industry in general or on any special aspect of it.

The objective of this paper is to determine the status of aquaculture in Oregon. The focus will be on the commercial oyster industry, the only current commercial aquaculture. There will be a comparison of the problems Oregon producers face compared to universal oyster culture problems. Reference to the Oregon state law will show that oyster production is a

private industry with little support from government in law or subsidy. It will try to determine where the production is and who are the commercial producers.

BACKGROUND

History of Oyster Culture

The early beginning of oyster culture is thought to have been at Lake Fusaro in Italy during the Roman Empire. The culture of oysters as it is done today was started in 1673-80 by Goroemon Koneshiya at Kustsu Hiroshima Prefecture in the Empo era of Japanese history. About 290 years ago, Shozaemon Utsumi is said to have collected oysters at Nonoshima, Matsushima Bay (Miyagi Prefecture), and then to have gathered the larvae, which he released at suitable places.¹

Of the twenty different types of edible oyster in Japan the Oregon culturist is interested in the Crassostrea gigas, which has been renamed the Pacific oyster in the United States. The name Pacific oyster was deliberately chosen by Mr. E. N. Steele so people on the west coast could not associate the oyster with the Japanese at a time when anything Japanese was taboo on the west coast.

The other oyster raised in Oregon has various names: the native oyster, Olympia oyster, cocktail oyster (so called because of its size which is rarely over 5.5 centimeters in length and 4.5 centimeters in width and is served raw or in the half-shell with cocktails), it was scientifically named

Ostrea lurida by P. P. Carpenter in 1864. This oyster is hermaphroditic. Whereas both male and female germ cells exist in the same oyster they (eggs and sperm) are not ripened in abundance at the same time and so an oyster may be described as male at one time and female at another.²

Oyster Development

The seven following conditions must be fulfilled for successful oyster growth:

- (a) The farming area must be protected by nature against wind and wave action.
- (b) The adult oysters which produce the spawn must be present in nearby waters in sufficient numbers to insure adequate reproduction.
- (c) Tidal and/or current flow must be sufficient to change the water of the area completely and frequently.
- (d) The salinity should be very close to 27 parts per thousand and the water should have a specific gravity of approximately 1,020 within a total range from 1.014 to 1.025.
- (e) The water must contain adequate nourishment for plankton production and should be abundant in phytoplankton suitable as food for the oysters and their larvae.
- (f) Except where hanging methods are to be used, the

bottom must be relatively flat and sandy-mud in quality, free of excessive growth of aquatic vegetation.

- (g) Because the optimum temperature for oyster culture is about 24°C or 25°C, the water temperature must be within the tolerance range of the species, which is 15°C and 30°C.³

The C. gigas will lay eggs in the amount of 55.8 million in 15-130 minutes when the water temperature is 23-24°C. In the two to three weeks after fertilization the larva is free floating. It goes from a 50 micron sized egg to a 0.22 mm. shell length in these first few weeks. When the foot has developed and the shell is 0.33 mm. it changes to an attached existence.

The larva attaches itself to a collector⁴ by extruding the byssus (cement from the byssal gland at the base of the foot and also secreting lime from the shell glands in the mantle).⁵ The water depth at which the larvae will best set is 0-1 m. When the time for attachment arrives the cultch⁶ must be available for the larvae. Once attached the oyster is permanent and if conditions are right will grow to market size (usually considered to be 120 centimeters) in two or three years.

The majority of oyster growers culture their oysters on the bottom, most frequently in intertidal areas. (Unlike the native oyster, the Pacific oyster is extremely hardy and can withstand prolonged

exposure out of water.) The oysters may be harvested by hand, fork, or, when the tide is high, by dredge. A good average yield is 1,000 bushels of oysters per acre every three years. Although one bushel of C. gigas normally will produce one gallon of meats, valued at anywhere from \$6.00 to \$8.00 depending upon season, the value of the unshucked oyster is considerably less. Harvested but unshucked, a bushel of Pacific oysters has an approximate value of \$3.50 to \$4.00. The native oyster average 1200-1500 per gallon and sell for \$35 to \$40 per gallon.⁷

Oyster Seed

In Oregon today there are three sources of seed: Japan; Washington; and some on an experimental basis from the Oregon Marine Science Center, Newport, Oregon. There is, as yet, no yearly production of seed naturally of either the Pacific or native oyster in Oregon, probably due to the local water temperature.

In the report for the Department of Interior in 1950, A. R. Cahn described the development of oyster seed production. In the early 1900's adult oysters were shipped from Japan to Washington for transplanting, usually with a high rate of mortality. In 1920 a shipment of dead oysters was dumped in the shallow bay only to be rediscovered a few years later as a thriving bed of C. gigas. The live spat⁸ on the dead oyster shells had survived. So after that shipments were of special

spat, instead of adult oysters, from Japan.

The spat is exposed to the air at ebb tides to develop a strong, thick shell having an almost gasketlike seal which enables it to retain sea water between closed valves during the ocean shipment.

The Pacific Coast Oyster Growers Assn. has specified that there be a minimum of 10 spat, 6 to 15 millimeters in diameter, per collector shell. At the time of packing in wooden crates, the collector shell is also examined for oyster drills.

This seed, delivered by the case, cost \$3.50 per case in the early 1930's, slightly over \$9.00 per case in 1961, and, at the present time, \$18.00 per case, F.O.B. Washington ports. In some instances the survival of the seed on the beds is extremely low, as a result of poor handling in transit, siltation, and predation.⁹

GENERAL PROBLEMS

Due to the fact that oysters are stationery after their first few weeks of existence they are highly susceptible to the environment.

A severe temperature change in the water above or below the tolerance range of the oyster will cause damage or death. When wind damage occurs, the oysters sowed on a sandy bottom are scattered by the wind at low tide. Often there is considerable damage to the frames and rafts used in tray culture and hanging cultures. Floods in the estuaries of mud

and silt destroy the growth of oysters. If the oysters are not actually buried under the deposit of mud and silt they often die because their cilia is clogged with the debris and they smother to death. A layer of 8 centimeters is enough to cause death.

Of the various predators the starfish works by pouring a poison from its extruded stomach in the water near the oyster. The oyster inhales the poison with the current of water and while this causes it to close its shell at once it is too late because the poison is already working to relax the adductor muscle. The nerves are affected and the muscle finally can no longer hold the shell closed. The starfish can then pull the valves open with its hydro-vascular feet, protrude its stomach between the open valves, and digest the oyster. The time this takes from the first injection of the poison to the complete digestion is about two hours.

Oyster drills from Japan have accidentally been introduced with some small seed shipments to the west coast. The one specie in particular is the Tritonalia japonica. The native drills seem to prefer mussels and barnacles to the exclusion of oysters. The drill works by using a broad band of minute chitinous teeth on the radual. It takes it about 70 hours to drill through the shell of an adult. The Japanese have found that one drill can drill 22,4 oysters in one year. This drill cannot survive in water where the salinity is less than 12 parts per thousand or over 18 parts per thousand.

Red tide is actually various dinoflagellates which look

like reddish fish-egglike granules. The red tide usually occurs in the spring and autumn where the ocean current is sluggish. Death is apparently due primarily to suffocation caused by the great consumption of available oxygen by the dinoflagellates or by the clogging of the gills of the organisms. There are still experiments being done to see if there is a toxin as a secretion or the result of the dead dinoflagellates. The Oregon State Health Division seems to believe it is a toxin from the dying plankton and gave that reason for banning the harvest of oysters in the Tillamook Bay area on the 24th of June, 1973.

Various parasites infect the oyster. The usual treatment to destroy the parasites is to use copper sulfate and remove the oysters to areas of low salinity which is not favorable to the parasites.

Fouling animals that do any great amount of damage to the oyster are the various barnacles and mussel. The damage is through competition for food after the animals have attached themselves to the oyster shell. The oyster dies from undernourishment.

OYSTER INDUSTRY IN OREGON

History

The first published report on the oyster industry in Oregon was by Paul S. Galtsoff for the U.S. Bureau of Fisheries in 1928. According to this report there were three major

localities for the production of the native oyster; Tillamook, Yaquina River, and Coos Bay, which are located in Figure 1. The reason given for only three sites along a three hundred mile coastline was the coastline was too straight to have the protected bays and estuaries needed for the development of oyster beds.

The only figure quoted was for 1925 when 1,453 bushels were produced and sold for \$4,300.

According to the Galtsoff report the center of the industry in 1928 was the Yaquina River. He made reference to an unpublished report by Holmes for the Oregon State Fish and Game Commission that 135 acres of land was in oyster beds from Yaquina to Boon's Point, a distance of 4 or 5 miles. The land at that time (1928) was either owned or leased by the Oregon Oyster Company.

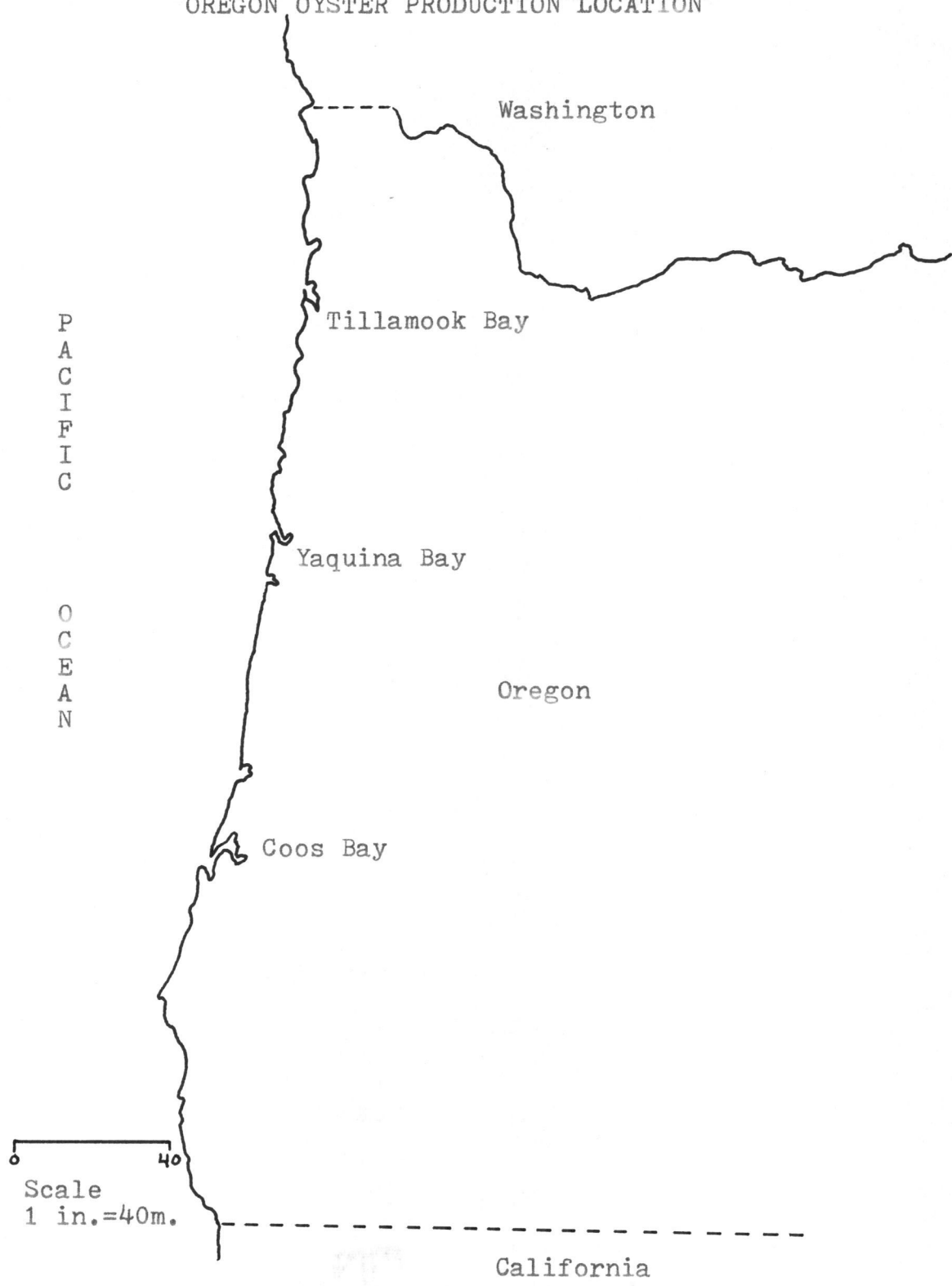
Then the culture of Pacific oysters in Oregon was described in a book by E. N. Steele. After the Pacific oyster had been introduced into Washington in the 1930's various people began to try to produce it in the tidelands of Oregon. Two of the Early Oregon oystermen were Louis Washmuth of Portland and Jesse Hayes of Bay City.

The oysters, both native and Pacific, raised by Mr. Washmuth were used by his oyster bar in Portland. After his death in 1957 his sons continued the business for a few years until they sold out.

Jesse Hayes started the Hayes Oyster Company which grew Pacific oysters. After his death in 1957 his sons continued

Figure 1

OREGON OYSTER PRODUCTION LOCATION



Washington

Tillamook Bay

P
A
C
I
F
I
C

Yaquina Bay

O
C
E
A
N

Oregon

Coos Bay

0 40
Scale
1 in. = 40m.

California

the business. They purchase seed directly from Japan and have extensive holdings in Tillamook Bay.

Present Development

Oregon does not have a well-developed division of shellfisheries in its Fish Commission. The only person in the commission who had information on oyster culture was Darrell Snow in Newport. Every other state in the United States that has a sea coast has an active division of shellfisheries in their fisheries department and publishes various types of information on the oyster and the industry, such as, yearly economic reports.

In 1969 the Oregon State Legislature revised the laws dealing with the oyster beds but at the same time some rather important requirements for oyster culture were left out, probably from ignorance rather than deliberately. For example, in the state of Washington any oyster taken out of the water by non-commercial growers must be returned to the water as available cultch for the oysters. In Oregon not only is there not any requirement like this but the fish commission will not allow the commercial firms to put the old shells back in the estuaries to try to create a bed for any native spat that might occur.

In chapter 675 of the Oregon laws, which deals with the shellfishes there is a section, 509.505, which seems to be designed to help the oyster industry in its fight with silt, which can kill the oyster. This section states

"Placing in water matter injurious to shellfish.

It is unlawful for any person, municipal corporation, political subdivision or governmental agency to deposit or allow to escape into, or cause or permit to be deposited or escape into any public waters of this state, any substance of any kind which will or shall in any manner injuriously affect the life, growth or flavor of shellfish in or under such waters."¹⁰

However, there is no penalty for an act committed and trying to prove it is left to the oyster producer.

Since the passage of the revised laws in 1969 there is now a state report on the production of oyster. Section 509.436 requires an annual report by March each year on the amount of oyster produced the preceding year. Darrell Snow of the Fish Commission in Newport, Oregon, provided figures for the three years he had by area and then named the companies which were growing oysters in the areas. He could not, by law, report on the amount each company produced annually. The following table is the amount produced and in the appendix are the six companies.

Table 2

OREGON OYSTER PRODUCTION

Year	1000 Pounds	1000 Dollars
1960	494	99
1961	329	72
1962	512	128
1963	387	109
1964	335	106
1965	185	53
1966	250	106
1967	411	169
1968	628	246
	1000 Bushels	
1969	59	177
1970	34	Not available
1971	33	Not available

Source: Fishery Statistics of the U.S., U.S. Department of Interior, Fish and Wildlife Service, 1960-68. Darrell Snow, Fish Commission, Newport, Oregon, 1969-1971.

To try to discover why the oyster industry was producing more a visit was made to the largest of three growers in the Yaquina Bay area, the Fowler's. George and Betty Fowler have owned and operated the business for the last five years. At the present time the business is up for sale as are the other two companies in the Yaquina Bay area. The problem is pollution, not a lack of demand, in fact, often they cannot fill the demand. As of the writing of this paper they are buying oysters in Washington, hauling them to their beds in Yaquina Bay where they replant them using one of two methods--sowing them on the bed of the estuary or placing them in trays that are made out of green plastic shaped like large chicken wire (which is made only by the Japanese), then harvesting them later in the year for local sale. This year in January their entire seed crop was killed by silt.

From the information at the beginning of this report Oregon has only one major problem with its oyster industry and that is water pollution. This includes not only the silt which has been added to the estuaries in a short time (along Fowler's bed in three years there has been an addition of almost a foot of silt) but also a change in the temperature of the water from the chemicals and the other waste products emptied into the water upstream. The temperature change is causing different types of plankton and algae to grow in the water. Since at this time research is still not sure which of the algae and plankton the oyster requires for growth and raid each other's bed and try to kill off the crop by

various methods instead of working together to increase the potential market.

On the plus side for the oyster industry is that predators either because of the salinity of the water or often just the depth of the oyster strings do not cause any appreciable amount of damage in Oregon.

The Marine Science Center at Newport has been able to produce seed on an artificial basis and feels it will just take time until it can so do on a regular basis.

While Oregon lacks the many protected bays that are to be found in both Washington and California it could increase production. Mrs. Fowler stated that while their family handles the production from the 114 acres they lease from the state at \$2 an acre they could support 300 workers if the silt problem could be controlled.

CONCLUSION

It is the personal feeling of this writer that the oyster industry in Oregon will never amount to an important economic factor in the state economy unless there is outside development. After checking the producers of oysters on the grocery store shelves it would not be too surprising if the Japanese food concerns would attempt to start canneries and production beds in this country to sell to both the American and Japanese markets. This is because the major canners of oysters are in Japan and they are having a decline in the

oyster business because of the industrial growth in Japan which makes the oyster beds unprofitable.

FOOTNOTES

- 1 Tadashi Tamura, Marine Aquaculture (Washington, D. C.: Department of Commerce, 1970) p. 18.1-1.
- 2 Paul S. Galtsoff, Oyster Industry of the Pacific Coast of the United States, Bureau of Fisheries Document No. 1066 (Washington, D. C.: Department of Commerce, Bureau of Fisheries, 1929), p. 369.
- 3 A. R. Cahn, Oyster Culture in Japan, Fishery Leaflet 383 (Washington, D. C.: Department of Interior, Fish and Wildlife Service, 1950) p. 34.
- 4 collector--any material, such as shells, bamboo, roof tile coated with lime laid down on oyster grounds to provide attachment for the spat; cultch.
- 5 Tamura, op. cit., footnote 1, p. 18.1-5.
- 6 cultch--collectors for oyster spat.
- 7 George C. Matthiessen, A Review of Oyster Culture and the Oyster Industry in North America, (Woods Hole, Massachusetts, Woods Hole Oceanographic Institution, 1971), p. 33.
- 8 Cahn, op. cit., footnote 3, p. 34.
- 9 spat--larvae of the oyster which have attached permanently to an object.
- 10 Oregon Laws 1969, Chapter 675, p. 1762.

Appendix

OREGON OYSTER COMPANIES

Tillamook Bay

1. Hayes Oyster Company
C Street
Bay City, Oregon 97107
2. Olson Oyster Company
Box 435
Bay City, Oregon 97107
3. Tillamook Oyster Company
1985 Bayocean Rd. N.W.
Tillamook, Oregon 97141

Yaquina Bay

1. Fowler's Yaquina Pacific Oysters
Rt. East, Box 139
Toledo, Oregon
2. Oregon Oyster Company
South Yaquina Bay Road
South Beach, Oregon
3. Joe G. Lewis
Newport, Oregon

Coos Bay

1. Qualim
Coos Bay, Oregon

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Personal Communication

Mr. and Mrs. George Fowler-Growers-Newport, Oregon

Dr. Michael Mix-O.S.U. Professor-Corvallis, Oregon

Mr. Darrell Snow-Fish Commission-Newport, Oregon