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A REVIEW OF THE OYSTER INDUSTRY OF THE STATE OF WASHINGTON

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OYSTERS AS A WORLD RESOURCE

Oysters, as a food, have been esteemed from time immemorial, enjoying a popularity and demand accorded no other fish or shellfish known to mankind. They are easily the most valuable cultivated water product of the world, and with the exception of a certain few pelagic species of fish, the most valuable of all aquatic animals. Of the food products known to modern dietary science the oyster is unexcelled, standing at the top of the list in nutritive and medicinal values and constituting in itself an almost "perfect food". Known to gourmets and gluttons alike as a delicacy, the demand for oysters has for centuries exceeded the supply.

Oysters, known to science as lamellibranchiate mollusks of the genus Ostrea, occur in greater or lesser abundance along the shores of all the temperate and tropical oceans and seas, and in at least 35 countries of the world provide the basis for an appreciable commercial fishery. Over 100 species, varying greatly in range, size, shape, flavor, and food value are known, but of this number only about a dozen species are utilized commercially. Generally speaking, oysters are grown in the rich intertidal zones along the bays and estuaries of the world, on bottomlands composed of mud or sandy silt, intermixed with varying quantities of sand, gravel, rock, debris, and broken shell.

Some species of oysters will grow in pure sea water, but in most instances the brackish waters of bays, inlets, and river mouths are a pre-requisite for successful oyster culture. Oyster reproductive processes are controlled by water temperatures, and no successful spawning and setting of oysters can take place in waters which do not attain a temperature of at least 65° F. for a minimum of 30 days annually. Oysters are subject in all phases of their life

cycle to a host of marine predators, and the profitable cultivation of oysters is a complex and hazardous undertaking in comparison with most agricultural crops.

While the origin of the artificial cultivation of oysters is lost in antiquity, we do know that the Chinese were successfully growing oysters centuries before the birth of Christ, and that as early as the year 100 B.C. the Italians were farming oysters for the lush banquet tables of Imperial Rome. Historians report that the great Caesar himself was a connoisseur of oysters and employed his slaves in gathering oysters in the British Isles for consumption in Rome. Our own Pilgrim Fathers would have found it hard going indeed during the long and hungry winters of early Colonial America had not the friendly Indians taught them to harvest and open the rich native oysters present in great abundance along the rugged New England coast.

Oysters are presently being cultivated commercially along the coasts of Italy, Spain, Portugal, England, France, Belgium, Holland, Germany, Denmark, and Norway on the European Coast; along the coasts of India, China, and Japan in the Orient; in the tidewaters of South Africa, Australia, and New Zealand in the Southern Hemisphere; along both the Atlantic and Pacific coasts of Canada; and along the coast of every tidewater state in the United States. In many other countries of the world, such as the seacoast states of South America, the Phillipine Islands, the West Indies, Hawaii, Mexico, Alaska, and various Pacific islands biological conditions are favorable for oyster culture and it is only a matter of time until many of these areas will be contributing to the world's production of oysters.

The annual production of oysters in the United States amounts to some 90 million pounds, contributed from the following areas: Chesapeake Bay, 35.9 million pounds; South Atlantic and Gulf States, 22.8 million pounds; Middle Atlantic States, 13.9 million pounds; Pacific Coast, 9.7 million pounds; and the New England States, 7.5 million pounds. Of this yield 48% was produced on privately cultivated oyster bottoms and 52% was supplied by

public oyster bottoms. Considered by areas it is significant that in the Pacific Coast and New England States more than 96% of the production comes from private grounds; in the Middle Atlantic States 91%; in the Chesapeake Bay area 35%; and in the Gulf and South Atlantic States only 28%; the balance in all instances being the yield of public grounds. In terms of productivity, or yield in pounds of oyster meat per acre, the average privately cultivated oyster bottoms outproduce the public grounds by a ratio of 6 to 1. In terms of quality or value, the average price per pound for oyster meats ranges from a high of 41.0¢ per pound in the Pacific Coast and New England States to a low of 3.7¢ per pound in the poorest areas of the Gulf and South Atlantic States.

On the Pacific Coast, some 75% or more of the 9.7 million pounds annual yield of oyster meats is produced in the State of Washington, from privately owned and cultivated oyster bottoms. A small portion of this production, probably less than 5%, consists of the famed native or Olympia oyster, Ostrea lurida, which is only cultivated in certain restricted areas in southern Puget Sound in the vicinity of the city of Olympia. The remaining 95% or so of the annual production in Washington consists of the larger Pacific oysters, Ostrea gigas, which is grown on a large scale in Samish Bay, Padilla Bay, Hoods Canal, Puget Sound, Grays Harbor, and famous Willapa Harbor. The production of Willapa Harbor surpasses that of the other areas of the State combined, and it may be safely said that more than half of the oyster production of the Pacific Coast is concentrated in this one bay.

The cultivation of Pacific oysters in Willapa Harbor represents one of the most intense and advanced forms of aquiculture to be found anywhere in the world today, and the methods and techniques employed by the commercial oystermen in this area are among the most modern and efficient known to the oyster industry. The production of Pacific oysters has, in Willapa Harbor, been reduced to an exact farming science and the Willapa oyster growers are widely known for their skill in this field. At a time when all other major oyster

producing areas of the United States are experiencing annually diminishing returns from their oyster industry the Pacific oyster producers of Willapa Harbor maintain a high level of production, and the fresh, frozen, and canned Pacific oysters produced there are becoming known and appreciated in market places all over the United States.

The most remarkable feature of the Pacific oyster industry in the State of Washington is its comparative youth as contrasted with the oyster industries of the United States and the rest of the world. Despite its amazing record of achievement the Pacific oyster business is but a scant twenty years old, and there is every reason to believe that it will continue to grow and expand for some time to come. Oysters have, however, been grown and marketed from Washington for some 97 years past, and the history of the oyster industry in the State if a long and fascinating one, full of ups and downs and replete with the vagaries of man and Nature. If the factors contributing to the success of the Pacific oyster industry are to be fully understood, a review of the past oystering activities in the State of Washington is essential. Briefly summarized, this history has been as follows:

THE NATIVE OYSTER INDUSTRY

Long before the first white man set foot in what we now know as the State of Washington the Indians of the Northwest were making extensive use of the abundant beds of native oysters (Ostrea lurida) then present in Willapa Bay and the numerous small bays and inlets of southern Puget Sound. The tribes of the interior made annual mass migrations down the Columbia River to Shoalwater Bay (as Willapa Bay was known to them) to harvest these native oysters, and at least one tribal war was fought over the privilege of gathering oysters from these natural beds. The Indians consumed large quantities of native oysters in the fresh state, and preserved others for winter use by drying and smoking. At many of the old Indian campsites along the Columbia River piles of native oyster shells from Willapa Bay

may be observed yet today.

The early white settlers of this region were likewise quick to take advantage of this wonderful natural resource, and many a pioneer feast was built around these succulent bivalves. The first commerical transaction of which we have record occurred in 1851, when one Charles Russell shipped a small cargo of native oysters to San Francisco by steamer, where they were received with great acclaim by the wealthy gold rush population of that city. From this beginning a booming oyster industry rapidly developed in the exportation of native oysters to San Francisco, and a fleet of small sailing schooners became engaged in transporting Willapa Bay oysters to the California market. By 1854 the shipments amounted to some 50,000 baskets per year and a large number of the settlers were engaged in the oyster business. Through the 1860's and into the early 1870's this business continued to boom, and at the peak of the trade shortly after 1870 the annual production of native oysters averaged more than 200,000 baskets per year.

The natural oyster beds, bountiful though they were, could not long withstand this onslaught, and in the late 1870's the harvest declined very rapidly. For a period of 10 or 15 years the industry languished, and at the lowest ebb in the 1880's the annual production amounted to less than 2000 sacks per year. Many excuses, such as storms, severe frosts, disease, and spat failure were advanced by the oystermen to explain this decline, but in fact the severe and reckless overfishing of the natural oyster beds was by far the major factor responsible for this failure.

When the white men first began to exploit the native oyster beds of Willapa Bay it was believed that the supply was inexhaustible. For many miles the mud flats and sand bars were covered with acres and acres of wild oysters, often to a foot in depth, and the oystering practice consisted simply of picking, tonging, or raking up canoe or boat loads of oysters on low tides, transporting them to the beach at high tide, and there culling out the marketable oysters into baskets or sacks. No

thought was given to returning the immature or seed oysters to the beds to provide for future crops, and each oysterman concerned himself solely with taking as many marketable oysters as he could in the shortest possible time. Inevitably, the consequence of this heedless action was felt, and the natural beds were depleted at an alarming rate.

When the results of this exploitation became apparent the conduct of the industry took a new turn, and the first real oyster farming efforts were made. The oystermen no longer contented themselves with just harvesting the marketable adult oysters, but each man pre-empted a plot of ground to his liking, and there transplanted quantities of immature and seed oysters for growth and fattening to a marketable size. As the advantages of this system were realized larger numbers of oystermen became interested in the future of the industry, and soon the Bay became dotted with planted oyster beds occupied under a rude law of squatter's rights. Increasing numbers of oystermen became oyster growers, rather then just harvesters, and systematically planted and harvested crops replaced the random harvests of the earlier years. Within a few years the commerce in native oysters was restored, and although the peak production figures of the early 1870's were never again attained, this oyster business flourished for another twenty-five years.

As soon as oyster farming became a generally accepted practice the oystermen began to feel some concern for their property rights, as no man wished to expend the effort developing an oyster bed unless he could be sure that the returns would accrue to himself. Accordingly, when Washington Territory was granted statehood one of the first acts of the legislature of 1890 was to pass a general tideland act, one of the provisions of which allowed the occupant of any plot of oyster land to buy up to 80 acres of that ground from the State for his personal use, provided that it was not a part of an original native oyster bed. This law proved to be cumbersome and indefinite in application, and so in 1895 the Washington legislature passed

the Bush Act which provided that any resident and citizen of the State might buy not to exceed 100 acres of oyster ground for his personal use, and prescribed the method of establishing claim, effecting payment, and gaining title to and use of the ground. This act, whether as a result of vision or accident, proved to be the most important single factor in the development of the oyster business from that time forward, as it clearly established private ownership of tidelands for the purpose of oyster cultivation in this State.

At about this same time various other acts to protect and encourage the native oyster business were passed by the legislature. In 1891 this body set aside some 14,000 acres of natural oyster beds in Willapa Harbor and Puget Sound as State Oyster Reserves, for the purpose of serving as a perpetual source of seed for the oyster growers. This act was strengthened and amended in 1897, and many safeguards were imposed, one of which was that this land should never be leased or sold, but reserved forever as a seed reservoir for the industry. During the next twenty years many supplemental acts pertaining to the conduct of the oyster industry were enacted, the general intents of which were to safeguard these reserves from thievery and depletion and insure adequate seed supplies and protection to legitimate oyster farmers. Within the wide range of latitude usually accorded restrictive laws in a pioneer society these measures were more or less effective in the purpose for which they were intended, usually less.

Concurrent with the development of the native oyster industry of Willapa Harbor, the native oyster beds of lower Puget Sound were exploited. Although these areas were nowhere as near as large or productive as those of Willapa Harbor, many acres of natural oyster beds were found to exist in Oyster Bay, Mud Bay, North Bay, Oakland Bay, and adjacent districts in the proximity of the city of Olympia. Prior to the development of rapid transportation facilities the output of these beds was marketed in the rapidly developing adjacent cities of Olympia, Tacoma, and Seattle, and

the annals of early travelers in these regions are replete with many references to the delightful oyster feasts enjoyed in that vicinity. In later years the production of native oysters in the Willapa Harbor area was supplanted by that of other species, the Olympia district became the sole source of any appreciable supply of this oyster in the entire world, and the choice quality native oysters cultivated there became nationally and even internationally known as the incomparably fine "Olympia Oyster".

While the production of native or Olympia oysters has fluctuated and waned under the press of population increases, industrial pollutions, seed failures, and various man-made vicissitudes, a substantial industry has persisted there for the last fifty years. With the expansion of transportation and marketing facilities and the increasing fame of the Olympia Oyster in the more exclusive dining rooms of the nation the demand for this fine product has long since eclipsed the supply and the commercial oystermen of that area will always be assured of a rich market for their harvest.

Due to the fact that the bays and inlets of southern Puget Sound are smaller, deeper, and contain proportionately only a fraction of the tide-flat area suitable for oyster culture as is found in Willapa Bay, the oystermen in this vicinity developed more than 50 years ago a system of growing Olympia oysters in diked plots of from 1/16 of an acre to 5 or 10 acres in area, created especially for that purpose. These dikes, arranged in terraces down the bay shores, are constructed of concrete or creosoted timbers, and often cost more than $2,000.00 per acre by the time the ground has been leveled and firmed by the addition of gravel or shell. Their function is to maintain a six inch blanket of insulating sea water over the oyster beds, thus protecting them from exposure to heat and cold alike, and under these most favorable conditions the yield per acre of merchantable Olympia oysters surpasses by many times that of the natural beds.

The Olympia oyster industry has developed through the years many other unique features peculiar to this area, and without going any further into detail it will suffice to say that here has evolved one of the most intricate and precise systems of oyster culture of which we have record. Oystermen and scientists from all over the world visit the Olympia area to study and observe the practices of the commercial oyster growers there, and their efforts may indeed be regarded as one of if not the highest for of aquiculture known to man.

During the period from 1890 to 1910 while the development of the Olympia oyster industry was progressing, the oyster growers of Willapa Harbor continued to grow and market the native oysters of that region, but the science of oyster farming in the Willapa area was more crude than that of southern Puget Sound. Accustomed from the boom days of the 1870's to dealing in volume, rather than a limited sustained production, the oyster-growers of Willapa Harbor were casting about for a solution to their problem of diminishing yields. Many dissatisfactions and business fluctuations resulted from the political maneuvering of first one faction and then another in their attempts to gain control of or strip the State Oyster Reserves of the slim remaining seed source available to the oystermen, the practice of oyster piracy annually took a heavy toll from the Reserves, and the industry never completely succeeded in readjusting itself from its early status of an open fishery to that of a sound oyster farming operation.

It was at this critical stage of the industry that the Eastern or Atlantic oyster, Ostrea virginica, was first introduced to Willapa Bay.

THE EASTERN OYSTER INDUSTRY

Sometime in the 1860's Eastern oysters were planted in San Francisco Bay, and within a short time a thriving industry developed there in the growing of this species of oyster for that market. Large quantities of seed oysters were imported annually from the Atlantic Coast and bedded out in San Francisco Bay where they made a rapid growth and attained

market size within three to four years. This business was extremely profitable, and before long a number of the wealthier Willapa Bay oystermen abandoned their native oyster interests and moved to San Francisco to engage in this more profitable activity. Conditions were favorable and these men prospered exceedingly well in their new undertaking. By the time the production of native oysters started to decline as a result of the overfishing of the 1870's the Eastern oyster growers of San Francisco Bay were prepared to step in and take over the oyster market from the Willapa Harbor shippers, and the Eastern oyster in a large measure supplanted the Willapa Bay native in favor in that market.

The situation which then developed has been very well summed up for us in the writings of an early historian and oysterman of Bay Center, on Willapa Bay, Mr. L. L. Bush, who, writing in 1906, made the following comments:

> "Eastern oysters were not grown in this (Willapa) bay till nearly thirty years after they were in San Francisco Bay. It was not that there was ever any reasonable doubt that the oysters would do well here. The difficulty was that it took a good sized chunk of hard money to import the seed. The oysterman who had not the money could not get into the game. Those who had the money were mostly interested in the California enterprises, even though some of them were residents here. Their goose was laying golden eggs. They were careful neither to kill her nor to start a rival poultry yard. The beginnings of the plantings of Easterns here as an industry was in 1896 when M. Wachsmuth, of Oysterville, imported a car of small or seed oysters from the East and planted them on his beds. The next year the Toke Point Oyster Co. was organized by Astoria and Portland parties, with Wallace Stuart as the local manager. Their first importation was three cars, mostly of very small seed which were planted on their beds at Tokeland. They grew famously and more were brought the next year. The success of the enterprise was immediate, and the company made large profits on their venture, these profits being mostly converted into expansion of the business. The company's only problem, in fact, seemed to be to meet the demand that sprang up."

Faced with the alternative of continuing in the waning native oyster business or engaging in the new and lucrative Eastern oyster growing, the oystermen of Willapa Harbor almost unanimously chose the latter, and from 1895 to 1906 some 131 carloads of Eastern oyster seed were transplanted to Willapa Bay. In the beginning seed oysters were imported and planted on local beds, but since these required five or six years to develop to

marketable size very few oystermen could afford to buy seed every year. Consequently they turned to the practice of importing partially grown Eastern oysters, two or three years of age, instead of seed as these could be grown to a marketable size in half the time required by the seed. Profits were correspondingly less, but since the shortage of operating capital was the limiting factor in the business those engaged in growing Eastern oysters were anxious to effect the fastest possible turnover.

The business of growing Eastern oysters in Willapa Bay developed rapidly and in a few short years the Willapa oystermen regained their California market. The farming of native oysters continued along the same lines as during former years, but in terms of relative production became secondary in importance to the cultivation of Eastern oyster. Commercial oystermen continued to wrangle over the acquisition of native seed oysters from the State Oyster Reserves and the legislature from time to time passed various acts designed to curtail piracy and depletion, but in spite of these efforts the native oyster industry continued to wane and languish. Commercial oystermen concentrated on the cultivation of the transplanted Eastern oyster and increasingly large shipments of seed were imported annually from the Atlantic Coast.

The most critical fault in the development of the Eastern oyster business in the Willapa Bay industry hinged around the high cost of the seed. The seed or young oysters purchased on the East Coast were expensive to begin with, and it cost as much for freight to bring them to the Pacific Coast as it did to buy the seed. The growers found a ready market for their product in the California cities, but a tremendous amount of investment was required to maintain a sustained annual yield of marketable Eastern oysters from the local beds. Practically every individual and company had their entire resources tied up in developing crops, and as fast at the profits of one sale were realized the proceeds

were reinvested in seed or young oysters to provide successive crops.

Despite this handicap, the industry prospered for more than twenty years, until 1919 when disaster overwhelmed the oystermen of Willapa Bay. Without warning some strange malady began to kill off the Eastern oysters in the Bay, and before that year passed practically the entire oyster population was destroyed. The oystermen were helpless to discover the cause of the kill, let alone apply any remedy, and within a few months almost every individual and company engaged in the growing of Eastern oysters suffered losses of such severity that they were unable to continue in the business. In later years scientists have been inclined to believe that this unusual and excessive mortality was possibly caused by something in the nature of the so-called "Red Tide" (which is in reality a tremendous concentration of minute toxic dinoflagellate organisms in the sea water) but no one will ever be able to say for certain what really happened.

The Eastern oyster business in Willapa Bay never recovered from this blow, and in effect passed out of existence that year. Some few beds which were not completely wiped out were harvested during the next few years, but other than this and some small native oyster business all of the major oystering activity ceased. The oystermen were mostly without funds to buy new seed supplies from the East Coast, and if they had desired to do so they would not have been able to as the Eastern seed growers had suffered a series of spat-failures and there was practically no seed available for shipment to the West Coast at that particular time. Even if there had been it is doubtful that any of the oystermen would have had the courage to resume the cultivation of the Eastern oyster in Willapa Bay in the face of the possibility of recurrence of the deadly malady which had wiped out their holdings. The flourishing and profitable Eastern oyster business disappeared in one calamitous season, and was no more.

Aside from some limited cultivation of the native oysters which amounted to practically nothing, no oystering activity was carried on in

Willapa Bay for the next nine years. Oysterlands formerly held at high valuations were allowed to revert to the county for taxes, and the discouraged and defeated oystermen turned in a large part to other businesses and occupations for their livelihood.

This was the prevailing state of affairs when the Pacific oyster, Ostrea gigas, was introduced into the waters of Willapa Harbor.

THE PACIFIC OYSTER INDUSTRY

The giant Japanese oyster, Ostrea gigas, and various other species have been cultivated commercially in Japanese waters for more than 300 years, but it is not definitely known who first conceived the idea of transplanting these oysters to the Pacific Coast of the United States. It is known, however, that Dr. Robert E. C. Stearns, of the U. S. National Museum as early as 1886 made recommendation to interested San Francisco oystermen that they attempt to introduce some varieties of the Japanese oysters to the West Coast, but apparently no action resulted from his suggestions. The earliest authenticated planting of seed oysters from Japan in the State of Washington was made in 1902, when a group of Japanese oystermen imported four carloads of Japanese oyster seed and planted them in Samish Bay, south of Bellingham. In the following year, 1903, they brought another twelve carloads of seed into Samish Bay, and by 1906, experimental plantings had been made in many locations along the Washington coast, including Willapa Bay. This exotic species thrived in Washington waters and oystermen were amazed at the rapid growth rate which they exhibited; however, the Eastern oyster business was still flourishing and the possibility of propagating Japanese oysters in Willapa Bay aroused little interest. By comparison with the tiny native oysters and the relatively small Eastern oysters, the Japanese oysters appeared to be gross and unattractive and it was felt that the buying public would not readily accept them.

A group of Japanese oystermen continued to cultivate these oysters on

a small scale in Samish Bay, but it was not until the Eastern oyster industry was obliterated in 1919 that the Japanese oysters were accorded much attention. About that time an enterprising Japanese oysterman, Mr. J. Emy Tsukimoto, after consultation with Dr. Trevor Kincaid of the University of Washington and Dr. Seno of Sendai University in Japan, was experimenting with a number of varieties of Japanese oysters in Samish Bay for the purpose of ascertaining which of the several species common in Japan would be best adapted for cultivation in Washington waters. As a result of his work it was concluded that the giant Japanese oyster, Ostrea gigas, was the best of the lot for commercial development here, and a small commercial operation based on this species was initiated.

During the earlier years of this development great difficulty was encountered in introducing this new oyster to the Western market, as consumers accustomed to the smaller and more attractive native and Eastern oysters were reluctant to accept this new variety, and the industry remained more or less static for a considerable period of time. However, in 1922 the Japanese oystermen of Samish Bay were obliged to sell out their interest to citizen oystermen in order to comply with certain of the provisions of the alien property law, and under the new local management the business was gradually increased to the point where some 1500 to 4000 cases of seed were being imported annually. In 1928 an experimental planting was made in Willapa Harbor, and when the oystermen there observed the phenomenal growth rate of this new species great interest was aroused. Many new companies were formed, a brisk promotion in the acquisition of tax-delinquent oysterlands developed, and there was a general boom engendered by individuals anxious to get into the business of growing Japanese oysters.

In 1929 some 3769 cases of Japanese seed oysters were planted in Washington waters, about two thirds of which were planted in Willapa Bay and the balance in Puget Sound bays. By 1933 seed imports had

jumped to 38,809 cases, and the first plantings had been made in Grays Harbor. In 1934 an amazing total of 47,740 cases of Japanese seed oysters were planted in Puget Sound bays alone, due mainly to a large scale development in Padilla Bay, and the total imports for that year amounted to more than 64,485 cases. The high point of the development of the Japanese seed business was attained in 1935, when some 68,044 cases of seed were planted in Washington waters, and the growing of Pacific oysters, as they were now called, was a firmly established industry.

This new species of oyster from Japan thrived in local waters, and biological conditions being favorable, soon began to reproduce in certain localities. Every year since 1930 some spawning and setting of Pacific oysters has occurred in Willapa Harbor, and from 1934 on similar spawnings were observed in Dabop and Quilcene Bays on Hood Canal. Within a few years thousands of acres of "wild" or unused tidelands on Willapa Bay, including the denuded State Reserves, were dotted with small beds of unplanted Pacific oysters, and the rocky beaches of Hood Canal were covered for dozens of miles in both directions from any commercially planted oyster beds. The oystermen were quick to take advantage of this natural spatfall, and each year placed thousands of bushels of clean oyster shells in the heaviest spawning locations to provide a medium for attachment of the millions of microscopic size free-swimming oyster larvae present in the waters of southern Hood Canal and Willapa Bay.

The State Department of Fisheries provided biological assistance to aid commercial oystermen to annually determine the period of maximum spatfall in order that they might obtain locally sufficient oyster seed for their own uses, and the Washington oyster growers became less and less dependent upon the Japanese seed growers for their annual plantings. Some years the spawning, which is governed by weather conditions, was scanty and insufficient seed catches were obtained to provide all the growers with the amount of seed they desired, and the natural seed catch had to be supplemented

with seed imports from Japan; but other years, such as the seasons of 1936 and 1942, the natural seeding was so successful that the almost incalculable numbers of wild oysters that settled and attached themselves to every solid object in the waters of Willapa Bay and certain portions of Hood Canal actually became a menace to the regularly cultivated commercial oyster beds.

Some oystermen, either by preference or reason of geographical location remote from the seed catching area, continued to purchase seed from Japan each year until 1941. At that time the advent of World War II shut off the annual seed imports from Japan and the Pacific oyster industry became solely dependent on locally caught seed. Although many inconveniences were experienced by individual oystermen in obtaining sufficient locally set seed for their businesses due to fluctuations in the annual spatfalls, the Pacific oyster industry was able to maintain itself satisfactorily and between 1941 and 1946 the production of Pacific oysters was sustained at a very high level. Due to the heavy demands of these war years the commercial oysterbeds were somewhat depleted, and upon the cessation of hostilities arrangements were made to resume seed imports from Japan. The growers of Washington purchased some 36,122 cases of seed in 1947, and in 1948 imported an additional 23,359 cases of Japanese seed oysters to replenish their beds. However, the natural spatfall of the 1947 season was very successful in Willapa Bay, and the industry could have continued to function without these imports if such had been a necessity. Generally speaking, the Pacific oyster industry of the State of Washington has at this time developed to the point where it is relatively independent of the Japanese seed supply and can, with proper precautions during seasons of abundant spatfall, maintain itself without outside assistance.

Naturally, as this terrific expansion of the Pacific oyster industry occurred, the development of the marketing segment of the new business was forced to keep pace. Prior to 1931 all the Pacific oysters grown in the State were marketed fresh as were the earlier native and Eastern oysters,

but in that year the canning of Pacific oysters was initiated and some 7930 cases of canned Pacific oysters were packed and sold. Consumer acceptance of this new species of oyster was slow to develop, but after a few years of intensive advertising and promotion on the part of the business leaders of the industry the public was educated to an appreciation of the merits of this fine product and sales kept up with the rapidly expanding production.

As long as these oysters were marketed in the fresh state only the market was confined to the West Coast, principally the urban centers of California, but with the inception of steam canning it became possible to ship processed Pacific oysters anywhere in the world and the market potential became almost unlimited. Inland markets were opened up, and within a few short years many thousands of cases of canned Pacific oysters were being sold annually throughout the entire marketing area west of the Mississippi River. The market for canned Pacific oysters is, in 1948, still expanding and their distribution in the market places of the United States is limited only by the competition afforded by the Southern canned oysters of the South Atlantic and Gulf States. If the production of Southern oysters continues to decline at its present rate there is every reason to expect that the market for canned Pacific oysters will be in the future only limited by the production facilities of the industry. Pacific oysters are now being offered to the consuming public not only in the canned state, but a substantial fresh distribution has been developed, and a brisk trade in smoked oysters and other oyster specialty products has been initiated. Given a reasonable chance to compete for market, there is every reason to believe that the Pacific oyster industry will continue to obtain a sale for all it can produce, now and in the future.

In terms of actual production figures the output of fresh Pacific oysters has increased from some 6514 gallons in 1929 to 598,493 gallons in 1947, and the pack of canned Pacific oysters has climbed from the 7930

cases marketed in 1931 to some 88,170 cases in 1947. The fresh production of Pacific oysters has grown steadily for the past twenty years and sales have increased from year to year with great regularity. While this is also generally true of the canned Pacific oyster production the canning industry was interrupted by World War II, due to tin conservation measures and other factors, and the oysters which would normally have been canned during the years 1942 to 1946 were diverted to the fresh markets temporarily and many thousands of gallons were frozen for overseas use by the Army and Navy. The production of canned Pacific oysters in 1941 amounted to 169,551 cases, which is the largest pack in the history of the industry to date, and while the packs of 1946, 1947, and 1948 have not exceeded 100,000 cases annually there is every reason to believe that the canning branch of the industry will soon again attain the level that it reached in 1941, and may perhaps even exceed this output in the future.

The mushroom growth of the Pacific oyster industry in the past twenty years has, of a necessity, revolutionized the techniques and physical tools of the trade. Crude methods and equipment inherited from the native and Eastern oyster industries early proved inadequate to handle the ever-increasing volume of production, and new systems for harvesting, transporting, and processing oysters in quantity have been evolved. Where oysters were formerly harvested by picking or tonging by hand labor, huge power scows or dredges, capable of doing the work of many hand laborers, have been substituted. Power conveyors have replaced hand labor at all points where oysters are required to be moved from one place to another in the opening houses or canneries, and for the removal of empty shells from the plants. The rude opening houses of earlier days have been replaced by sanitary modern plants comparable in efficiency with those of other food industries, and every mechanical aid is employed in the handling of the product from the harvesting of the shell oysters to the shipping of the processed food. The most modern merchandising techniques are utilized in the distribution

of fresh, frozen, and canned Pacific oysters to the consuming public, and competition within the industry has developed to a high pitch. In both a physical and psychological sense the Pacific oyster industry has grown up in recent years, passing from the status of a haphazardly conducted oyster farming effort to that of a sound and stable business enterprise.

THE ROLE OF THE STATE IN THE OYSTER BUSINESS

From the time Washington Territory was granted statehood in 1889 until the present day, the State of Washington, through the Legislature and the Department of Fisheries, has promulgated and executed numerous laws and regulations calculated to aid and protect the oyster industry of the State. While the effectiveness of the enforcement of these controls has been varied according to the efficiency of successive administrations, it has always been the intention of the State to support the oyster industry in every way possible and the value of this resource to the State has never gone unappreciated. The only criticism that may justly be leveled at the State and its representatives is that the oyster laws and regulations have, at times, failed to keep pace with changing conditions within the industry. The oyster laws designed to govern the native oyster industry were well calculated to serve that purpose, but when the native industry gave way to the Eastern oyster industry, and that industry in time gave way to the Pacific oyster industry, the laws were not revamped and modernized to accomodate the particular circumstances of these successive new industries. As a consequence the State of Washington is today forced to struggle along in its regulation of the highly developed and specialized Pacific oyster industry with an outmoded set of laws designed for the native oyster industry of 1890.

In one circumstance, however, the State of Washington and its oyster industry have been fortunate above practically any other State in the United States, and this is that the early legislators had the foresight, understanding, and perhaps even luck, to pass the Bush Act which permitted

private ownership of tidelands in the State of Washington for the purpose of propagating oysters. This single, simple law, above all other factors, provided the stimulus for the commercial oystermen of this State to withstand the adversities attendant upon the exhaustion of the native oyster industry and the sudden demise of the Eastern oyster industry, and go forward in the last twenty years to create the lucrative $4,000,000.00 Pacific oyster industry which exists in Washington today. The constantly declining production of the oyster industry of the Atlantic and Gulf States, both by way of total annual yield and average yield per acre of oysterlands, offers today clear proof that oystermen will not expend their full effort or capital in developing a sound oyster business unless they have clear title to and control of the oyster lands which they cultivate.

The principal role of the State in the oyster industry of Washington has been in connection with the administration of the State Oyster Reserves created by the legislature of 1891. From 1891 to 1915 practically every law which was placed on the statutes was designed to either increase the efficiency of these Reserves in their function as a seed reservoir for the native oyster growers, or to prevent and provide penalties for the depletion of the Reserves by individuals desiring to profit illegally therefrom. Most of these regulations were of sound principle, but enforcement was lax and cooperation from the industry itself was exceedingly poor and the native oyster industry failed in spite of them. Had these same measures been provided twenty-five of thirty years earlier when the native oyster industry was at its peak, and if the enforcement of the various conservation measures had been vigorously pursued with the full cooperation of the industry no doubt the native oyster industry would still be alive and flourishing yet today.

Lack of understanding with regard to their responsibilities toward the State Oyster Reserves by certain administrations of the State Department of Fisheries can be blamed in a large part for the failure of these

laws to function. In 1915 the Legislature, at the instigation of the Fisheries Department, passed a law providing for the annual improvement of a section of the State Oyster Reserves and establishing a state oyster reserve fund to be derived from seed licenses and sales for use in this endeavor. For a number of years the Fisheries Department functioned very efficiently by this authority, and under the direction of an astute conservation official, Mr. L. E. Mayhall, developed and diked large areas of the State Oyster Reserves in the Olympia district of Puget Sound. These Reserves, being located in natural seeding areas, provided a considerable annual yield of native seed oysters for the commercial oystermen of that area as long as they were properly farmed. The profits which accrued from seed sales were annually expended in the improvement of further portions of the State Oyster Reserves, and for a few years the Department of Fisheries performed a valuable function to the industry of that district by supplying the major portion of the native seed oysters for commercial growers.

Successive administrations of the State Fisheries Department failed, however, to continue the efficient development of this program and it was eventually abandoned entirely. The Legislature of 1935, for various political and economic reasons, abolished the state oyster reserve fund employed for this effort and directed that all funds derived from oyster seed sales from the Reserves be credited to the State Fisheries fund, and all expenditures for the maintenance, operation, and improvement of the State Oyster Reserves be in the future allocated from regular Fisheries funds. As a consequence, the operations of the State Oyster Reserves was swallowed up in the general activities of the Fisheries Department, and losing their identity as a valuable self-supporting aid to the industry, were neglected by subsequent administrations.

The State Oyster Reserves of Willapa Harbor served as an intermittent source of seed for the native oyster industry for many years, but their

location remote from populated centers made them difficult to police and the State neither derived any appreciable income from them nor made any comprehensive effort to develop them as an asset to the industry. Such native oysters as naturally accumulated there were pirated by unscrupulous oystermen and the lands were allowed to lie more or less dormant for many years, including the period of cultivation of Eastern oysters on Willapa Harbor. When the newly introduced Pacific oysters began to propagate themselves naturally in Willapa Bay, these Reserves, consisting of large areas of natural shell beds, provided a natural setting place for the drifting larvae of this species which settled in prodigious numbers over the thousands of acres of idle state-owned oysterland. The huge area of wild Pacific oyster beds which subsequently developed there in time came to constitute a definite menace to the commercial oyster beds of the private growers as the ever increasing millions of adult oysters growing there consumed a large portion of the food available in the water and some commercial oyster beds in the proximity of the Reserves lost their value as fattening grounds. In addition, the practice of oyster piracy was revived, and in some instances the oysters stolen from the State Reserves found their way into commercial channels in competition with privately grown Pacific oysters.

Being cultivated, these beds were generally regarded as being relatively worthless until the advent of World War II when the heavy demands of the market and the lack of good seed oysters created a general shortage of Pacific oysters. At this time the Department of Fisheries offered the oysters of the Reserves for sale, and thousands of bushels were sold to the industry for transplanting to private beds for fattening or for use in opening houses and canneries. Within a period of four years the Fisheries Department disposed of some $300,000.00 worth of wild oysters to the industry where they performed the valuable function of sustaining the production of Pacific oysters during the critical war years. Sales are still

going forward today, and the Reserves have been largely denuded of the tremendous quantities of Wild Pacific oysters growing there which were becoming a hazard for the private growers before the War.

Each successful spawning season in Willapa Harbor sees thousands of bushels of new seed deposited there, and sooner or later the Reserves will again be covered with wild Pacific oysters. The Fisheries Department is faced with a trying problem in enacting a sound program to cope with this situation in the future, and it remains to be seen whether or not they will be able to work out a solution of mutual benefit to the State and private industry. A considerable segment of the commercial industry feels that the State, entering the oyster business by accident, has no business competing with private growers and the Reserves should be disposed of to private individuals. Others are of the opinion that the Reserves can be made to function as an asset to the industry if properly administrated. While it remains to be seen what the eventual role of the State Oyster Reserves will be in the industry, all parties concerned are agreed that the million-dollar private Pacific oyster industry should at all cost be protected from harm which could be occasioned by the poor management of the Reserves in the future.

In recent years the Department of Fisheries has provided many valuable aids to the oyster industry by annually providing trained biologists in both Puget Sound and Willapa Harbor to predict the magnitude and time of maximum spatting of Olympia and Pacific oysters, in conducting pollution studies designed to protect private oyster industry from industrial pollution, and in establishing mandatory inspection of seed oysters from foreign areas to guard against the introduction of alien pests and predators which would wreck havoc with the cultivated beds of the industry. The increasing efforts of the Department of Fisheries to aid and protect the oyster industry of the State of Washington in every way possible bodes well for the future.

TRENDS FOR THE FUTURE

The rapid growth and development of the Pacific oyster industry in the State of Washington during the first twenty years of its existence can certainly be considered nothing short of phenomenal. This imported species of Japanese oyster appears to be biologically well-suited to the coastal waters of this State and has even in this short period of time exhibited some signs of further adapting itself to local environments in the various localities where it is presently being cultivated. One of the advantages of the Pacific oyster, as compared with other species, is that it will apparently grow and thrive under a wider range of temperature and salinity conditions than any other oyster which has yet been planted in these waters, and this trait has been recognized and capitalized upon by the commercial oystermen of this area. Neither can the value of the ability of the Pacific oyster to reproduce itself in local waters be underestimated, as the lack of adequate seed oysters for commercial plantings will always be a limiting factor in the development of any oyster business. The oyster industry of this State has been most fortunate in choosing this fine species of oyster upon which to found a lasting business enterprise.

The future of the industry seems assured. Even a biological catastrophe of the magnitude of the one that wiped out the Eastern oyster industry in Willapa Bay could not eliminate the Pacific oyster business by reason of the fact that Pacific oysters now enjoy such a wide distribution in Washington waters that any local kill would be disastrous to only one particular area and the industry would go ahead elsewhere in the State. Experienced Fisheries biologist are keeping the industry under close and constant surveillance to forestall the introduction or spread of harmful predators or parasites, and lending every assistance to the industry in making successful seed catches annually. Temporary shortages of local seed oysters may always be alleviated by importations from Japan, and the industry has now attained such magnitude that other local problems which

may develop in one locality or another in the years to come are sure to receive the attention and assistance of State and Government authorities.

Much of the tidelands of the State suitable for oyster culture have been planted to Pacific oysters, but many thousands of acres of presently idle tidelands may yet be employed in the industry as the cultivation of this species of oysters is reduced to a more exacting science. Eventually the many thousands of acres of the State Oyster Reserves may be employed in the cultivation of this oyster on a commercial basis, and improvements in equipment and oyster cultural practices may make possible the development of a form of deep water oyster culture which would bring into production many thousands of acres of bottomland lying below the mean low tide make as is now so common on the Atlantic Coast. The selective breeding of Pacific oysters to produce better yielding strains remains to be explored, as well at the artificial production of seed oysters under controlled conditions in aquaria or ponds designed for that purpose. Studies of the food and feeding habits of Pacific oysters may open up new vistas to the industry, and new methods for the improvement of natural oyster bottoms for increased yields may be evolved. In many ways the Pacific oyster industry may be said to be yet in its infancy, and no man can predict what possibilities may be revealed by the next year or the next decade.

Meanwhile the virile young Pacific oyster industry continues to go forward, annually setting new records for production and the quality of its product, and the State of Washington may well be proud of its latest contribution to the oyster harvest of the oyster-hungry world.

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