

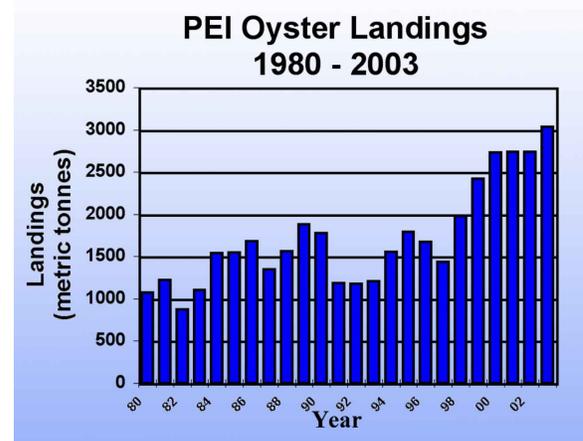
Oyster Production in Prince Edward Island

Background

The oyster which is native to the North American Atlantic coast is commonly known as the Atlantic oyster, American oyster or Eastern oyster (*Crassostrea virginica*). In Prince Edward Island, this species has become synonymous with Malpeque Bay, well known for its production of the world famous Malpeque oyster. PEI is near the most northerly tip of the oyster's range. PEI's warm, shallow, food rich bays and estuaries provide excellent growing conditions for oysters. Oysters of the same species can have very different qualities due to local variation and the influence of the environment in which they grow. This is why the Malpeque oyster can be acknowledged for its superior flavour.

The oyster is the second most valued shellfish species grown in Prince Edward Island after the blue mussel (*Mytilus edulis*). PEI is the leading oyster producer in Eastern Canada, accounting for more than 80 per cent of the total landings. In recent years, annual production figures have topped three thousand metric tonnes with a landed value \$7.4 million. Although oyster landings and values fluctuate from year to year, PEI's oyster landings have increased 115 per cent in volume and 245 per cent in value in the last decade. PEI has a well-established market in Canada, selling the bulk of its production in Quebec and Ontario. In the past seven years, however, increasingly more oysters are being exported, principally to the United States. Less than five percent of PEI's total export goes to the overseas market. Most of the sales are *Choice* grade, served primarily in the half-shell and eaten raw at up-scale restaurants and oyster bars. Lower grade *Standards* are popular in Quebec. *Commercials* make up a small proportion of overall landings and they are often used in chowders or stews. There is also a small market for raw shucked

oysters packed fresh in plastic tubs for use in chowders or stews for both the restaurant trade and domestic use.



A Lesson in History

The history of the Malpeque Oyster actually begins with its use by the Island's aboriginals as a food source. The fact that oysters have been found in Malpeque Bay for thousands of years is described in a speech in 1915 by Hon. A.E. Arsenault: "That oysters have existed in Malpeque and St. Peter's bays, and which in places are over 35 feet deep". In the late 1700s and early 1800s, Acadians who first settled the shore of Malpeque Bay had no market for oysters. Since the oysters were so plentiful, large quantities were spread over the land as fertilizer. The shells were also burned for the lime they produced, until 1832 when the province enacted a statute banning the practice. In 1868, another conservation measure banned the fishing of oysters from June 1 to September 1 during the spawning season. Before PEI joined Confederation in 1873, the Dominion of Canada granted licences or leases for the exclusive right of fishing oyster beds. The opening of the



Intercolonial Railway in 1876 opened new markets for Malpeque oysters in Montreal and other parts of Canada. This meant an increase in production which put added pressure on the natural stocks. Production reached its highest level in the 1880s and 1890s.

By the turn of the century, Bedeque Bay stocks were decimated and as a result Malpeque Bay oysters were exposed to increased pressure. As many as 500 boats were engaged in the oyster fishery in Malpeque Bay at that time. Soon the oyster stocks declined to an extent that oysters were brought in from New England to bolster the industry. Little was it known that these oysters were the likely source of what had become known as Malpeque Disease.

Malpeque Disease devastated the industry with a mortality rate over 90 per cent. By the 1920s, oysters which appeared resistant to the disease were used to re-seed once productive oyster beds.

The development of an oyster research facility at Eglarville on Bideford River led to a rebirth of the oyster industry. Culture methods were developed which forged the framework of PEI's present day success in Canadian oyster production.

General Description

The oyster is a bivalve mollusc consisting of a soft body enclosed between two calcareous shells or valves, joined together by a tough ligament along a narrow hinge line.

The shell varies in colour but is mainly a mixture of grey, brown, white or green shades. The two valves are asymmetrical, the lower one is cupped to accommodate the body while the upper valve is flat and acts as a lid. A large adductor muscle attached to both shells controls the opening and closing of the shells.

Oysters require oxygen much like a fish – using gills and mantle. The gills play a major role in feeding by maintaining a steady water flow and filtering the water to collect food particles (plankton).

Selected food items are passed into a pouch-shaped channel surrounded by a digestive gland. Waste passes through a long, coiled intestine to be discharged by the exhalent current.

Oysters can feed on plankton almost continuously when conditions are favourable. The warmer the water, the more active the feeding up to about 26°C. A 10 cm (4 inch) long oyster can pump or filter 9-13 L (2-3 gallons) of water an hour. Feeding ceases when water temperatures drop below 4°C.



Choice grade oyster from East River, PEI

Reproduction and Early Development

Oysters have separate sexes, but individuals can change sex during their life span. Spawning is triggered when water temperatures rise above 20°C (68°F) usually after mid-July.

Fertilization is external and within 24 hours the larva begins to form a shell, and develops a feeding and swimming organ. After feeding and drifting about in tidal currents for up to three weeks, the *veliger* larvae reaches about 300 microns and the probing foot seeks a site for attachment.

Larvae will set on many clean surfaces such as shell, stone, metal, brick, glass and plastic. Once it finds a suitable substrate, the foot secretes a cement-like adhesive. Material put out for oysters to attach to is called *cultch*, the process of becoming cemented to the cultch is termed *setting*, and once the larvae have set, the young oyster becomes known as *spat*. The young oyster now becomes immobile for the rest of its life, feeding only on what food the water brings, unable to escape overcrowding, or flee from predators.

Growth

Growth is optimal from May to November at temperatures between 10-23°C with a recess in July for spawning.

Oysters continue to grow throughout their life span, but growth slows with age. Some oysters have attained a length of 38 cm (15 inches) and can weigh in excess of 1.35 kg (three pounds). The rate of growth varies by estuary. In PEI for example, growth is fastest in Bedeque Bay at up to 37 mm/year, it is moderate in East River, and it is slowest in branches of Malpeque Bay at 10 mm/year.

The shape and outer appearance of an oyster's shell reflect the conditions under which it has grown. Crowding produces shell distortions. On muddy bottoms and on over-crowded beds the

shells grow long and narrow. On hard, sandy bottoms where there is no over-crowding, the shells grow round, and are deeply cupped, producing oysters of first-rate quality. In general, it takes an oyster between five to seven years to reach the minimum market-length of 76 mm (three inches), however with applied culture techniques four years is possible.

Mortality

Oysters have a number of predators which can devastate oyster beds and reduce production. A high proportion of the oyster larvae are consumed by other organisms feeding on the plankton community, including adult oysters.

The change from a free-swimming larval stage to a sessile life exposes juvenile oysters to new enemies. The most common predators of oysters are starfish, rock crabs, lobsters, mud crabs, oyster drills and moon snails. Adverse environmental conditions including prolonged exposure to freezing temperatures at low tide, heavy silt or marine plant growth (which can smother oysters), can result in heavy oyster mortality in some years. In addition to life forms that prey on oysters, there are those which compete with them for available food and space. Blue mussels, for example can be a major competitor in some areas. Three recent invaders to PEI waters, the oyster thief (1997), and clubbed tunicate (1998), threaten oyster production by fouling shells or gear, and green crab (1998) prey on oyster spat.

Disease

A large variety of diseases may affect the oyster, but the best known is the Malpeque Disease, which first appeared in Malpeque Bay in the early 1900s. This serious infection devastated oyster stocks in PEI and eventually spread to New Brunswick and Nova Scotia. The agent causing the disease is still present and virulent for weaker oysters although no outbreaks have been documented since the early 1960s. The cause of the disease is still being studied.

The PEI Fisheries and Aquaculture Division in cooperation with DFO monitors the health of oyster stocks in the province. A number of other disease organisms such as SSO (Seaside Organism) and MSX (Multinucleated Sphere Organism) both caused by a microscopic parasite have made an appearance in the Atlantic region in recent years. While SSO has been found at background levels in PEI, MSX has not been found outside its recent occurrence in Nova Scotia's, Cape Breton Island.

Oyster shells can be invaded by pests like the boring sponge (*Cliona spp.*) or bristle worm (*Polydora spp.*) making them unmarketable.

Water Quality

The Canadian Shellfish Sanitation Program (CSSP) which is jointly administered by DFO, the Canadian Food Inspection Agency (CFIA) and Environment Canada has the primary objective to protect the public from the consumption of contaminated shellfish by ensuring they are harvested from waters of acceptable sanitary and bacteriological quality. The classifications presently used to describe water quality conditions are **approved**, **conditionally approved** and **closed** areas.

Oyster Fishing and Culture

In PEI, the federal Department of Fisheries and Oceans (DFO) manages and regulates oyster harvesting.

A rather complicated set of regulations governs the oyster fishing seasons. Seasons differ for public and leased ground. For the public fishery, the spring season is May 1 to July 15 and the fall fishery is September 15 to November 30. The majority of oyster fishers hold both spring and fall licences.

There are also oyster spat collection licences issued for approved and closed areas as well as a few communal oyster licences that are issued to First Nations.

In 2002, DFO issued 1,841 commercial oyster licences, 189 spat collection licences and 88 aboriginal commercial licences. During the spring public fishery, commercial fishers can harvest oysters in contaminated public beds or closed areas. The oysters of at least 76 mm are sold to registered buyers who then relay them to approved beds on private leases in clean areas, or to a depuration facility for cleansing.

In PEI, the areas with the greatest concentration of oyster leases are Foxley River and Conway Narrows on the north shore; and Egmont Bay, East River and Orwell Bay on the south shore. The majority of oyster leases are bottom leases (84 per cent), the remaining 16 per cent being water column or off-bottom leases. In PEI, the 777 leases are held by 616 leaseholders (individuals or companies) of which approximately 350 are also registered commercial fishers. Overall, the oyster industry employs more than 1,000 Islanders.

Enhancement

The Fisheries and Aquaculture Division, the PEI Shellfish Association and leaseholders use a number of techniques to enhance oyster production. The division has conducted a shell-bed cultivation project on public oyster beds in the West and North rivers for the past 20 years. Specially designed cultivators towed behind a boat expose clean shell for oyster spat to settle on. Eighty to 100 acres of oyster ground is improved annually using this technique.

The PEI Shellfish Association also provides further improvements to the public oyster grounds through oyster seed replanting projects, shell mining and spreading, and shallow and deep-water oyster relays. Many leaseholders use similar techniques.

Harvesting

The principal method of harvesting oysters is the use of rakes or *tongs*. Hand-picking is not permitted. TONGING is the oldest method used to harvest oysters in waters up to about 4.3 metres (14 feet). Tongs have long handles and curved teeth and are operated in a scissor-like fashion by hand from a dory.



Tonging oysters in East River, Prince Edward Island

After harvesting, oysters are culled, cleaned and graded. Clusters are separated and undersized oysters, as well as old shells, are returned to the beds.

Fishers can also collect spat from their own leases or approved spat collection sites or purchased from commercially licenced producers.

A wide variety of spat collectors are used, including Chinese hats, vexar sheets, drainage tiles, veneer rings and mollusc shells. The collectors are coated with cement and put in the water just before spatfall, around three weeks after the water warms above 20°C, generally in mid to late July. The division's Oyster Monitoring Program advises producers on the best time to place collectors in the water to ensure a good set and reduce the incidence of other unwanted organisms (sea squirts, barnacles, mussels) that can also attach to the collectors. Most

aquaculturists will separate the seed from the collectors during fall for grow-out elsewhere.

The seed oysters are then spread directly on the bottom or placed in specially designed protective materials such as vexar bags. In the previous year or two prior to harvest, oysters can be placed directly onto the bottom to improve shell thickness and shape. The off-bottom technique consists of growing oysters in suspension utilizing floating vexar bags or floating bags attached to longlines either singly or in special racks that may contain several bags.

The oysters are grown close to the surface during the summer months, hibernate in suspension under the ice in winter, and placed at or re-suspended to the surface the next spring.

Processing

According to Canadian fish inspection regulations, oysters must be bought and sold according to specific grades, namely *Fancy*, *Choice*, *Standard*, and *Sub-standard* or *Commercial*.

There are 13 provincially licenced and federally registered processors of oysters in PEI. These processors also hold a plant registration from the federal Canadian Food Inspection Agency (CFIA) which permits the export of seafood products. In addition, a small number of provincially licenced processors provide oysters for the in-province or domestic market.

Conclusion

Regulations and programs to manage, conserve and enhance the oyster fishery, as well as to protect the industry and public at large, are continuously being improved.

Numerous collaborative aquaculture and bivalve shellfish research projects assist the industry so that PEI oyster production will continue to maintain its fair share in the marketplace.

No other experience rivals that of consuming a Malpeque oyster in the half-shell.

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