

Whelk (*Buccinum undatum*)

Common Names: Rough or wave whelk, northern whelk, buckie, Conchs, Coo Coos.

Description, Distribution and Biology

Whelk is biologically classified as a gastropod mollusc of the family Buccinidae. This large predatory marine snail is characterized by a thick, spirally, coiled, shell and a large muscular foot. The under surface of the foot is lubricated with a slime substance, allowing the organism to travel over the ocean bottom. The shell has 6 to 8 whorls with spiral ridges and is typically chalky grey to grey-yellow in colour with irregular light and dark segments (Fig.1). The entrance to the shell is oval in shape and can be sealed by a hard plate called the operculum, which is attached to the top of the foot. The soft body of the whelk is normally white or cream colour with black streaks or spots. Similar to a terrestrial snail, it has a head with two stubby tentacles with light sensitive eyes located at the base of each. The mouth is a long extended tube located between the tentacles and its tongue, (radula) is toothed and able to bore in the shells of its prey. Although this species can grow to a shell height of 15 cm, the average shell height obtained is 7 cm with an average whole weight of 50-100g.



Figure 1. Whelk. Source: Department of Fisheries and Oceans, Ottawa, Canada

The geographic range of the whelk in the North Atlantic Ocean extends from the Mediterranean Sea to Scandinavia on the eastern side and from Labrador to New Jersey on the western side, with reported pockets of high density in the Gulf of St. Lawrence and the Bay of Fundy. Whelk is considered a cold water species that inhabits a wide range of bottom types, however it prefers muddy or sandy substrates and can be found anywhere from tidal level to depths of 200 m or more. In Newfoundland and Labrador, whelk is located in numerous areas along the coast, particularly around southern Labrador and the northern coastlines of the island.

In the northwest Atlantic, whelk is known to migrate shoreward and to spawn anytime between late spring/summer on the north shore of the Gulf of St. Lawrence and late autumn in the Scotia-Fundy region. Fertilization occurs internally and the females will usually lay their eggs 2 to 3 weeks after copulation in a cluster of yellow egg cases that may contain between 80,000 to 340,000 developing embryos. Whelk often prefer to lay their eggs on irregular surfaces and kelp beds to reduce predation

by sea urchins and to protect against detachment as a result of current and/or storm activity. Since this species has no planktonic (free-floating) larval stage, the newly laid eggs remain congregate on the substrate until hatching. Juveniles will hatch from their capsules after 5 to 8 months of embryonic development, usually during late autumn and winter, and typically feed on the unfertilized egg sacs. Growth is fairly rapid during the first 2 to 3 years then it tends to slow down after the onset of maturation. Males usually reach maturity at 6 years (7 cm) while females mature at approximately 7 years (7.5 cm).

Whelk is both a predacious (feed on live prey) and a necrophagous carnivore (scavengers of dead animals), feeding predominantly on mollusc and other invertebrates. It is able to detect a scent trail such as fish bait and follow it to a particular source, which often explains their capture in lobster, crab or cod traps. Whelk is known to locate food resources on several different bottom habitats but typically prefers sandy substrates where it feeds on urchin, sea worm, bivalves (such as mussels), and crustaceans. Feeding activity typically decreases with the onset of spawning. When not feeding or mating, juvenile and adult whelk will spend most of the time either half buried in the sediment or laying on the surface of the substrate. Natural enemies of whelk include lobster, cod, crab, starfish, dogfish, wolffish, rays and seagulls. The empty shell of the whelk is often inhabited by other organisms, particularly by large hermit crabs.

Harvesting and Management

Whelk is harvested in many regions of the world using an assortment of trap technology and various bait types. In Newfoundland and Labrador, whelk has been traditionally harvested by small, twine, conical pots known as 'Korean pots' and homemade traps manufactured from plastic tubs and/or buckets. Whelk traps are typically weighted at the bottom with cement or by other means and a rope or other mechanism is positioned in the centre of the trap to secure the bait. Since whelk is a known scavenger of dead animal tissue, several bait types, including cod, herring and mackerel frames, can be used to attract the organism to the submerged traps. There is some indication that salted bait is more effective in catching whelk than fresh bait.

In recent years two additional pot designs were introduced by the Department of Fisheries and Aquaculture (DFA) and have produced more efficient catch rates than previous methods. The English plastic pot, also known as the portzic pot, was introduced in 1996 at a cost of approximately \$60 per unit. In 1999, a new gear type, conical in shape with plastic sides, was introduced at a cost of approximately \$20 per unit. Traditional traps made from converted tubs or buckets and twine pots typically cost \$20 to \$25 per unit. In 2000, a project was undertaken by the DFA with the assistance of an industry partner and local gear manufacturer to test a newly designed conical and stackable whelk pot. Results from this experiment demonstrated that the stability of the new conical pot allowed fishers to extend the fishing area to deeper and more unstable waters and the stackability of the pots increased the carrying capacity of the vessel.

The harvesting season for whelk is year round on the south coast of the island and extends from May to November in northern inshore waters. Reports by local fishers indicate that whelk is in relatively poor condition during the summer and early winter months. In 1999, there were 1,246 core and 18 non-core enterprises licensed to harvest whelk in this province, however less than 20% were active in the fishery during the year. New licenses are available to any core fisher, and license holders are able to hold a bait licence. Landings ranged from 247,340 lbs in 1999, to 350,000 in 2001. Although there is no current management plan for whelk in this province, vessels (35 - 55 feet) have generally been

restricted to inshore areas. Furthermore, the minimal acceptable size for whelk is approximately 5 cm in length and licenses only entitle fishers to 500 pots for a specific fishing area throughout the year.

The biology and physical distribution of whelk plays a vital role in conservation and management issues. The sedentary lifestyle of whelk makes it vulnerable to over harvesting and the absence of a planktonic larval stage limits dispersal, thereby reducing its ability to recolonize overexploited areas. Future resource management guidelines must protect the population's ability to reproduce. Conservation of whelk resources in this province should be based on management plans that have been applied in other whelk fisheries, including Nova Scotia, Quebec, Great Britain and the Gulf of Maine.

Processing and Marketing

Whelk can be processed into a number of different marketable products including whole fresh (live), whole cooked, frozen, pickled, smoked, and canned meats. Whelk is processed in Newfoundland and Labrador by two basic methods. The first requires a cooker and freezer. The whole whelk is placed in boiling water for 8 to 10 minutes, removed and the meat extracted manually with a fork. The final product is often frozen or bottled for local consumption. The second method involves an expensive mechanized processing machine, which can cost up to \$50,000 (excluding steam). The whole whelk is either cooked in steam at 140 °C or boiling water at 212 °C for 12 to 15 minutes. Subsequent to cooking or steaming, the whelk is placed directly in cold water prior to meat extraction. The meat is removed from the shell either manually or by a mechanical meat/shell separator and then meticulously washed to remove foreign debris and remnants of shell, stomach, or cap. Further sterilization involves inserting the meat into hypochloride solution (200 ppm) for 10 minutes and then it is removed to dry at room temperature for 3 to 4 minutes. Size grading of the meat is usually performed prior to packaging. The United Kingdom typically grades whelk into large (15-40 g per piece), medium (11-15 g per piece) and small (5 to 10 g per piece). The average yield obtained from whelk production is 18 to 20%. After grading the whelk, meat is packaged according to consumer specification.

There are presently 10 licensed whelk processing facilities operating in Newfoundland and Labrador. The most common whelk products produced in these facilities are fresh (in or out of the shell), raw or cooked frozen (whole or shucked), and pickled, which involves dipping whelk meat in a salt-enzyme mixture for 15 minutes prior to packaging in a brine-vinegar solution. Like all Canadian seafood commodities, whelk products produced in the province are processed under strict quality control procedure enforced by the federal Department of Fisheries and Oceans (DFO), which maintains a rigorous testing and inspection service.

While a small market exists in the United States (meat for chowder, soups or salads), the main market for Newfoundland and Labrador whelk products are in Europe and Asia, particularly Japan and Hong Kong. The Japanese prefer larger fresh whelk products for a high-end sashimi markets however, the whelk harvested in Newfoundland and Labrador is typically smaller and is therefore processed for low priced sushi bars. The price for whelk meat is extremely uncertain and often the cost of production (manual) has been near or exceeded market price. Current prices paid to Newfoundland and Labrador whelk producers range anywhere from \$4.00/kg to \$6.20/kg, with an average of \$5.00/kg. If a consistent market could be established for the province's whelk products the price paid to producers would likely rise.

Interest in whelk fishing in this province began in the early 1980s with the creation of the north shore Quebec fishery. Scientific studies conducted by the Provincial Department of Fisheries (presently DFA) in 1972 and 1983, concluded that whelk resources were accessible for a new fishery, however no fishing activity for whelk was reported during this period. In 1985, crab fishers considered harvesting whelk as by-catch and by 1986, processors and inshore fishers expressed interest in the development of a commercial whelk fishery. The first real attempt at a whelk fishery in Newfoundland and Labrador was in 1987, however the fishery did not proceed as intended as a result of a number of unforeseen circumstances, including problems with harvesting and processing technology, marketability, and availability of the resource.

Commercial Status

Interest in the whelk fishery became more attractive to fishers in the mid 1990s, due to a rise in international market demand and because of the moratorium on the traditional northern cod fishery. In 1996, a number of pilot projects were initiated by local fish harvesters and processors in collaboration with the Co-operation Agreement for Fishing Industry Development (CAFID) to determine the economic potential of a whelk fishery in this province. The results of these studies suggest that a whelk fishery can be economically viable for vessels less than 35 feet in length and with the introduction of more efficient processing technology. A survey conducted by DFA in 2002, indicated that near shore areas of Bonavista Bay (3L) and areas of the northwest corner of the St. Pierre Bank could support an economically viable commercial whelk fishery. However, the extent of whelk resource throughout the province has yet to be identified and further research is required for small boat fishers to make future investment decisions.

The attempts to establish a whelk fishery in the province have been largely unsuccessful for a variety of reasons. First, many fishers in the province holding valid whelk licences have opted to participate in more established and lucrative fisheries. Second, a lack of harvesters and a steady supply of whelk meat have inhibited the processing sector from optimizing production costs and finally, markets and therefore prices of whelk meat often fluctuate rapidly throughout the year, making the industry less attractive to both harvesters and processors.

Even though there have been many negative issues surrounding the development of a whelk fishery in Newfoundland and Labrador, there is a potential for an economically viable industry. Whelk is a common species in the inshore areas of the province but there is a need for future offshore resource identification. Establishing a whelk fishery in the province may require development in conjunction with other fisheries, such as the offshore snow crab industry. In addition, more research and investment is needed in both the harvesting and processing sectors, particularly in the development of value-added products and the identification and capture of new market niches.

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