

**Periwinkle**  
(*Littorina littorea*)

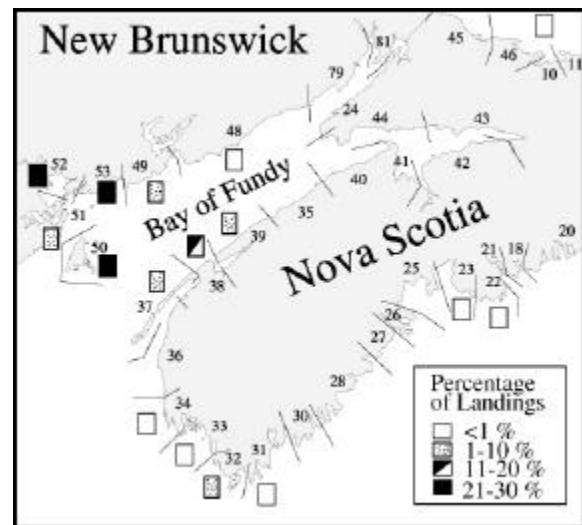
#### Background

The common periwinkle (*Littorina littorea*) is widely distributed in the North Atlantic. The range of the periwinkle (commonly called wrinkle-winkle) in North America extends from Labrador to New Jersey. This small snail can have a maximum shell height of 37 mm but is usually less than 25 mm. Shells have been found at pre-Columbian Mi'kmaq campsites. It was not abundant until after European settlement 150 years ago and the first live specimens were collected in 1840. It rapidly increased in abundance and distribution and displaced the indigenous *Littorina palliata*.

It lives from the high water mark to depths of 40 m on diverse substrata ranging from rock to sand. It can tolerate low salinities (13 ppt) that are found at the head of estuaries. Aggregations can be found on subtidal drift algae, in tide pools and along rock crevices. During the winter months, the periwinkle population migrates down the intertidal zone near or below the mean low tide mark.

The common periwinkle grazes on a wide range of micro and macroalgae as well as early settlement stages of sessile invertebrates. Its feeding activity can be a major factor in structuring communities on the benthic hard bottom.

Females are mature at 14 mm shell height, releasing eggs up into the plankton from April to July. Periwinkle larvae remain in the plankton for up to 4 weeks. Recruitment occurs in the Bay of Fundy either in July-August or August-September depending on water temperatures. After settlement, periwinkles are at risk of predation by man, fish, waterfowl, crabs and lobsters. They have two peak periods of growth during the year (early spring and early fall). Periwinkles usually live to 3 years and 20 mm shell height but can survive to a maximum of 4 to 5 years.

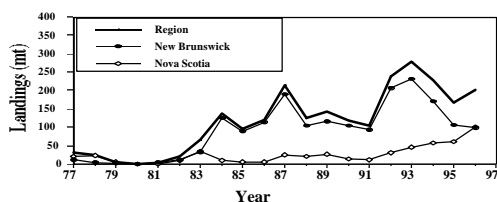


#### The Fishery

The hand gathering of periwinkles is an open fishery not requiring a license. There is no active management strategy but policy requires the licensing of mechanical harvesters. Access to the periwinkle resource is largely tide dependent. Although periwinkles can be found throughout the intertidal zone, they are more concentrated near the low tide mark or in areas of low algal cover. Hand gathering usually occurs during the lowest tides of the summer months but harvesting can occur year round. Lights are used to take advantage of extreme low water night tides. Boats and all-terrain vehicles (ATV) provide access to most of the shoreline. Exposed high-relief shores are generally inaccessible to shore harvesters. Scuba diving has been used to hand gather and recently exploratory licenses have been issued for diver-operated suction devices. Large aggregations are needed to make diving profitable.

The periwinkle market has two size categories: 1.) Jumbo size -greater than 19 mm and 2.) Small size -13 to 19 mm.

Current prices are \$ 1.76 and 1.00 per kg respectively. Since periwinkle harvesting is very much a supplemental or a casual fishery not requiring any capital investment; effort is very difficult to track. The effort is very sensitive to price and changes in other supplemental fisheries including the dulse harvest, clam digging, bait worm collection and rockweed harvest. Harvesters also come from a range of other professions near the coastal zone. Buyers report regular harvesters who target the species for a significant part of their income. Catch per unit effort (CPUE) has a very wide range due the mix of participants. Average adult harvesters gather 27-36 kg per tide and highliners exceed 50 kg. School children can harvest up to 20 kg on a tide. There are a minimum of 10 buyers, 150 regular harvesters and hundreds of occasional periwinkle harvesters in the region.



Periwinkles have been reported from up to 16 statistical districts over the past 20 years. Landings have been reported periodically from the southern Gulf of St. Lawrence but only exceeded one ton in 1994. Harvest from southern New Brunswick dominated the landings in the 1980's in the Maritime region, accounting for 85% to 90% of the total. Total Maritime landings increased sharply in the mid 1980's and exceeded 200 t in 1987. The Digby - St. Mary's Bay area represent over 90% of the Nova Scotia's landings. The harvest has declined in New Brunswick but the Nova Scotian landings increased steadily over the 1990's. Effort has increased five fold in the Digby area over the

past 5 years. Effort is steady in the Grand Manan-Charlotte County area.

Recent changes in reporting structure and loss of some local statistical coordinators have lead to poorer reporting in some cases. These landings represent those recorded for adults marketing through registered processing plants. School children and persons marketing directly to the consumer are not usually recorded in the statistics.

### Resource Status

There have been no recent, comprehensive or even local assessments of *L. littorea* stocks. There have been a number of studies that have provided detailed population information at selected sites.

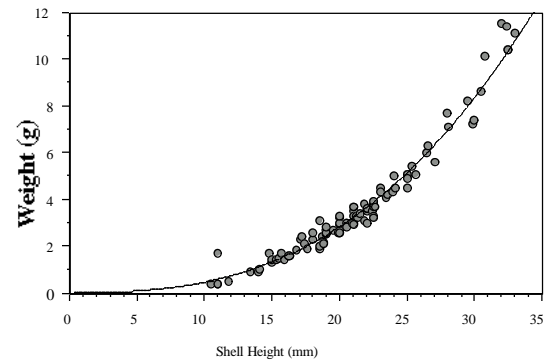
The distribution of periwinkles is extensive, from 3 to 4 m above mean low water down into the sub-tidal in the Bay of Fundy. As well as being widely distributed at medium densities 20-35 m<sup>-2</sup>, periwinkles frequently form aggregations over 900 m<sup>-2</sup> in crevices, on storm cast seaweed and in tide pools. This type of distribution increases the complexity of assessment. A survey on Grand Manan in the fall and winter of 1975, recorded densities of 14.6 m<sup>-2</sup> to 35 m<sup>-2</sup> in a 9 m band above the low tide mark. If this band exists on one half of the coastline of the Bay of Fundy (2745 km) there is a minimal biomass of 2594 tons of *L. littorea*. A biomass of animals in the rockweed canopy can be added if we assume an even distribution at 5 periwinkles kg<sup>-1</sup>. Total harvestable rockweed canopy was assessed as 140,000 t in southern New Brunswick. The total number in the rockweed canopy would be 700,000,000 individuals or 2100 t at 3 g per individual. Under the rockweed canopy near the mid-tide level, periwinkle densities range from 3-9 m<sup>-2</sup>. Extrapolation

of these densities to the total area of rockweed, in southern New Brunswick (2350 hectares) results in 211.5 to 634.5 t of periwinkles.

The total biomass of periwinkles is spread over the entire region, but the area of exploitation is small. The industry is very concentrated in a portion of the Bay of Fundy, Digby, Grand Manan and Charlotte county. It is a reasonable assumption that on most of the coast with stable substratum, periwinkles can be found. However, for an area to be commercially viable, it must be accessible to walking and have a critical density of animals. In a survey of 11 sites on Grand Manan, two stations were non-commercial (densities less than 15 m<sup>-2</sup>) versus densities greater than 30 m<sup>-2</sup> at commercial sites. The size selectivity of the harvesters limits the catch to animals 12.7 mm or greater representing 52 to 56 % of the population by number and 79 % by weight.

#### Size and Maturity of Catch

A premium price is paid for animals over 19 mm shell height, however, animals down to 12.7 mm shell height are purchased. Periwinkles reach 12.7 mm in their second year. Yield per recruit increases at least 3 fold if harvesting is directed at 19 mm plus animals in their fourth year. Egg production increases directly with shell height. Females in the 14 mm size class are releasing less than 1000 embryos compared to over 50,000 for 19 mm females.



#### Rockweed Harvesting and Periwinkle Gathering

Harvesting of rockweed (*Ascophyllum nodosum*) began in southwestern Nova Scotia in 1959. In 1995, a pilot harvest was initiated in southern New Brunswick, designed to reach 10,000 tons. Concern was expressed regarding the impact of this harvest on the periwinkle industry.

Periwinkle harvesting is concentrated mainly at the lower part of the intertidal, however the population is mobile and recovery of this part of the population is partially attributed to immigration from other parts of the zone. During fall and winter there is a movement of periwinkles to near or below the low tide mark.

Harvesting removes a portion of the algal canopy. The canopy of rockweed has up to 11 gastropod species of which the common periwinkle represents 1.1 % to 8.0% of the gastropod density. Densities of periwinkles in canopy samples from Grand Manan ranged from .06 to .46 individuals kg<sup>-1</sup> at three sites. Near St. Andrews, mean density was 3.3 to 8.2 kg<sup>-1</sup>. *Littorina littorea* have less ability to adhere to algal thallus than other gastropods thus some are shaken free when material is moved from the water to the boat. By-catch samples taken directly from the harvesters averaged 0.6 common

periwinkles  $\text{kg}^{-1}$ . If the pilot scale harvest of 10,000 t is reached, the by-catch of periwinkles would be 6,000,000 individuals. This by-catch will include all size classes and if it is representative of the entire population it will contain 11.7 t. This by-catch is spread over the entire harvest area and the impact is cycled in a 3 year harvest strategy.

The optimal habitat of the common periwinkle is the substratum under algal canopy or the immediate subtidal. Reduction in algal cover can lead to an increased growth of ephemeral algae and increased settlement of periwinkle spat. The levels of exploitation permitted under the management plan (17% of harvestable standing stock) has not lead to significant reduction in algal cover.

Harvesting is directed for rockweed not for periwinkles and cannot be considered as giving comparative mortalities to the directed periwinkle harvest. Mitigation of impact is possible if animals shed into the bottom of vessels are returned to the intertidal within 24 hours.

### Outlook

It is not possible to determine if we are locally overfishing this species from the existing data base. It is clear we are only harvesting in a minuscule part of its overall range and within a small section of its local habitat. This large breeding reserve can contribute to recruitment over a wide area over the four week planktonic phase. We do not have a reliable record of effort and the landings data are somewhat questionable. Immigration contributes significantly to recovery of stocks from the subtidal and middle of the intertidal. The present Jumbo market size is well above the minimum size of maturity. The harvesting of animals less than 19 mm shell height is not optimal for

reproduction or yield per recruit. Diver harvests from the subtidal populations can have an impact on the recovery of adjacent hand-harvested intertidal populations. Studies are needed to understand the dynamics of recruitment and immigration under harvesting pressure in commercial populations.

### For more Information

**Contact:** Glyn Sharp  
Invertebrate Fisheries Division  
Science Branch  
Dept. of Fisheries and Oceans  
Maritimes Region  
P.O.Box 550  
Halifax, NS B3J 2S7  
Tel: (902) 426-6042  
Fax: (902) 426-1862  
E-mail: SharpG@mar.dfo-  
mpo.gc.ca

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Maritimes Regional Advisory Process  
Department of Fisheries and Oceans  
P.O. Box 1006, Stn. B105  
Dartmouth, Nova Scotia  
Canada B2Y 4A2

Phone number: 902-426-7070

e-mail address: MyraV@mar.dfo-mpo.gc.ca

Internet address: <http://www.dfo-mpo.gc.ca/csas>

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