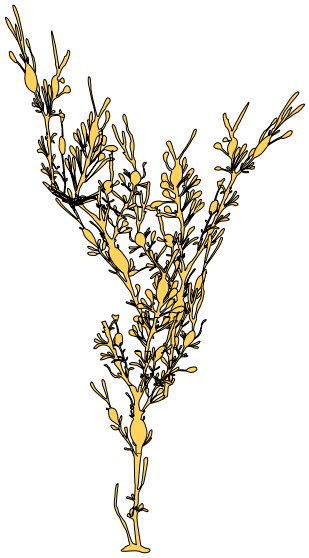
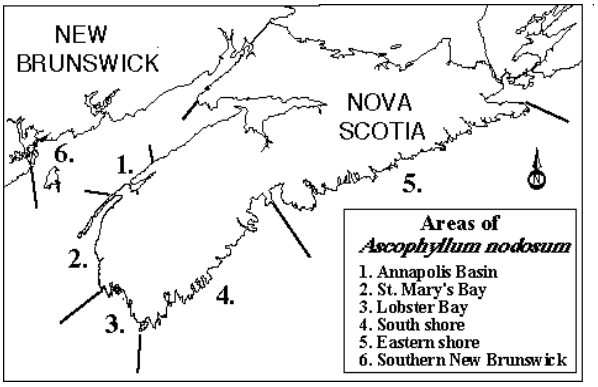




Rockweed in the Maritimes

Background

Rockweed (Ascophyllum nodosum) is the dominant brown seaweed in the intertidal zone along the Atlantic coastline of the Maritimes. Its range extends from the Arctic Circle to New Jersey. Rockweed occurs in a wide range of wave exposures but is replaced or mixed with other related species (Fucus spp.) in the most exposed or ice scoured areas.

This seaweed is attached to rocks or bedrock by a holdfast. It has complex branching structures with V branching and side branches. As the tide rises, the plant floats by means of gas bladders (vesicles) on the shoots. In the spring, specialized bladders (receptacles) form on the sides of shoots. These are reproductive structures containing either egg or sperm producing tissues. Reproductive products are released in the late spring to early summer and the receptacles fall off after release. Newly settled germlings are extremely vulnerable to grazers and wave action as a result, recruitment of new plants is episodic. However, the majority of new shoots arise from basal holdfast tissues. Holdfasts are long lived, exceeding 40 years old. Shoots are rarely over 10 years old and usually have some breakage after 3 years of age.

Growth occurs at the distal ends of the branches. Length increases on each main branch from 10 to 20 cm per year.

Rockweed forms a very stable cover in the intertidal zone but storms, ice action and pollution can reduce abundance or restrict its distribution. Any foreshore development that changes the type of bottom such as boulder removal or siltation will reduce abundance and distribution.

Summary

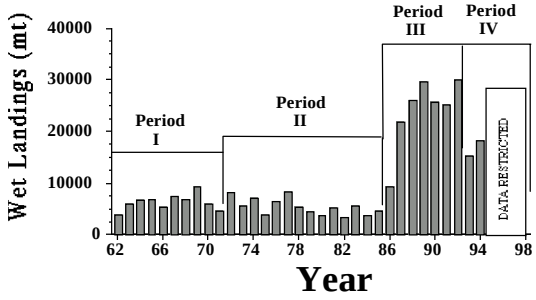
- The fishery is in a period of expansion into new areas.
- Traditional harvest areas are near or at their exploitation limit.
- Management of the resource has become more area-based and intensive than in the 1980's.
- A 1997 survey indicates there are 77,000t of potentially harvestable seaweed along the Fundy shore of N.B. (Area 6).
- A 1998 harvest of 10,000t in Area 6 will ensure that an exploitation rate of 17% will not be exceeded.

Overview

Rockweed was traditionally used for agricultural purposes along Maritime coastal areas. Commercial exploitation began in the late 1950's to use rockweed for a seaweed extract (sodium alginate) and "kelp" meal.

The recovery of **harvestable standing crop,** (the proportion of the resource available to harvest) by vegetative growth requires 3 to 5 years if exploitation exceeds 50%.

The **exploitation rate** is the amount of seaweed harvested from the estimated original standing crop. The optimum exploitation rate for large harvest areas is 17% annually.



The industry has had four distinctive phases beginning with (I) a development phase in the 1960's when the industry began, followed by (II) stabilization of landings with mechanization of the harvesting techniques and low landings, (III) a quick expansion in the mid 1980's (Sharp and Semple, 1997), and reversion, in the 1990's, to hand-harvesting methods, (cutter rake or sickle) and a reduction, then cessation (IV) in purchasing by one of the two major processors characterized 1993-1994. From 1995 to present, the industry has expanded to southern New Brunswick and an new buyer has been added in Nova Scotia.

Approximately 120 individuals participate in rockweed harvesting in the Maritimes each year. Weekly individual landings of hand harvesters in Lobster Bay averaged 18.0 and 14.6t per harvester per week in 1996 and 1997 respectively.

In Nova Scotia, both the federal and provincial governments implement marine plant regulations. In general, the province provides exclusive buying privileges to the resource by area and the federal government licenses individual harvesters. **Exclusive license areas** are areas which are only available to harvesters associated with the licensed holder. **Open areas** are those which can be harvested by anyone with a federal marine plants license. A joint federal-provincial memorandum of understanding in New Brunswick coordinates the management of the resource. A rockweed management committee reviews management plan and industry harvest reports on a quarterly basis. In Nova Scotia, the province manages exclusive licenses unilaterally and the federal government provides biological advice as requested.

Annapolis Basin

The Fishery

Harvesting in Annapolis Basin began in the early 1960's and the area remained open to all buyers and harvesters until 1992. Competition between harvesters led to severe over-harvesting on the northern shore and parts of the southern shore between 1988 and 1991. Harvesters on foot used and continue to use small sickles to cut and hand gather the rockweed. After several partial and a full closure of the basin in 1995, a quota was set at 500t for 1996. The entire basin was exclusively licensed to two companies in the following year.

Landings (wet t) from Annapolis Basin.

Year	1991	1992	1993	1994	1995	1996	1997
Landings	1626	2042	1175	380	0	239	579

New harvesting strategies were promoted in 1997 to obtain a higher mean cutting height (20 cm), compared to the regulated height of 13.5 cm, and a lower exploitation rate (50 to 60% versus 80 to 90% in previous years). The average cutting height at 10 sites sampled in the basin in 1997 was 18 cm. Holdfast content in the harvest was 1.4 % in two of the samples.

Resource Status and Outlook

The exclusive licensing of the basin has the potential to bring the basin up to a sustained harvest of 1000 to 1200t annually. Harvesting plans must avoid exploitation rates over 50 % and short-cutting below 13.5 cm and move toward the 20 cm cutting height.

St. Mary's Bay

The Fishery

The history of harvesting in St. Mary's Bay is similar to that in the Annapolis Basin. Although Digby Neck is licensed to one company, the mainland shore has been an open harvest area from Cape St. Mary's eastward. Hand sickle has been the most common harvest tool combined with shore harvesting on foot. Pulse harvesting and over-harvesting were particularly evident in the upper reaches of the bay. Qualitative surveys of 6 beds in 1996 determined the beds were recovering but the plants had not reached harvestable lengths. Landings were only 12t in 1996 although the area was open to harvest. In 1997, 565t were landed; far below the peak landings of 2277t in 1992.

Resource Status and Outlook

One third of St. Mary's Bay south side was exclusively licensed in 1998. The chosen company has begun an assessment of this area and will be able to base harvest strategies on up-to-date figures. The remainder of the south side of the bay is open and pulse harvesting will keep yield low and there will be a risk of competitive over harvesting.

Lobster Bay

The Fishery

Lobster Bay is the source of the majority of rockweed landings (67.8 to 88.0%) in the Maritime Region. A total of 1100 ha of rockweed beds grow on drumlin shorelines from extreme wave-sheltered areas along the Tusket River estuary to the wave-exposed Mud and Seal islands.

The area has had up to four companies operating in both exclusive and open areas. There has been a great degree of instability in the boundaries of open and licensed areas. The provincial government has reassigned areas between existing companies frequently in the last 10 years. Recently, the situation has stabilized as the entire bay was divided between two companies. This division eliminated areas open to unlimited harvesting and reduced the amount of common border areas. In the past, harvesters have crossed between leases and harvested illegally.

For the last four years, the resource has been harvested exclusively from boats. Harvesters have used cutter rakes mounted on 3 metre

poles. Previously there was a mix of mechanical and hand methods of harvest.

Landings decreased dramatically in 1993 (11,275t) and 1994 (16370t) from a peak of 21453t in 1989 but have stabilized and increased in the last two years. Changes in company and allocated operating areas were the major factors affecting landings.

Resource Status

Assessment is based on detailed landing data by 203 sub-sectors of the resource. The resource base in each sector was surveyed with remote sensing and estimated in 1988. There have been ground biomass surveys of portions of this resource since but no recent comprehensive survey is publicly available. A ground survey of 6 km of shore line in an area repeatedly harvested over 30 years was made in 1997. Maximum canopy height was 89.4 cm (SD±33). Density of biomass averaged 18.4 kg m^{-2} (SD±14.3) where there was plant cover.

The exploitation rates in the late 1980's and early 1990's routinely exceeded the target level of 17% in both the hand harvest and mechanically harvested sectors in Lobster Bay. Exploitation rates have increased on average 3.9% in Lobster Bay between 1995 and 1997. Based on exploitation rates in 1996 and 1997, the resource from Yarmouth to Comeau's Hill is being overexploited.

Exploitation rates (%) of the standing crop from the Lobster Bay area.

Year	Ym-CH	Tusk	CH-PP	PH	WH	Avg.
1995	22.4	3.6	11.3	12.6	5.0	11.0
1996	23.3	3.5	10.0	12.4	7.0	11.2
1997	28.3	12.8	12.2	12.5	8.7	14.9

Code: Ym=Yarmouth, CH=Comeau Hill, Tusk= Tusket Islands, PP=Pubnico Point, PH=Pubnico Harbour, WH=Woods Harbour

Holdfast removal in Lobster Bay has been an issue; as it has exceeded 20%, the highest in the Maritimes. Recent changes by the industry in cutter rake design and maintenance have decreased the rate of holdfast removal. Holdfast content in the harvest by weight as monitored by N.S. Department of Fisheries and Aquaculture was 9.4% (SD±13.7) for company 1 and 13.1% (SD±13.4) for company 2 in 1997. However variation is high and standardization of the techniques is needed to make annual comparisons.

Outlook

Unless some effort is redirected from the Yarmouth to Comeau's area, we can expect declining harvests in this area in 1998-1999. The Tusket islands offer the best opportunity for diffusion of effort as they were lightly exploited between 1992 and 1996. The bay is now divided into two parts with different harvest strategies. However, with the exception of Woods Harbour area, we are close to reaching the maximum sustainable quantities from most areas in the bay. An updated assessment will be available for this area in 1998.

South Shore Nova Scotia

The Fishery

This area has been partially under exclusive licensing. The license from Baccaro to Shelburne was held since the 1950's. However in general, the area has been open and only infrequently harvested by cutter rake techniques. The biomass density of the average site (5.0 to 8.7 kg m^{-2}) is less than in Lobster Bay (8.0 to 12.3 kg m^{-2}). Landings from this area did not change between 1996 and 1997.

Resource Status and Outlook

This area has not been assessed in 10 years, however large sections of the shoreline have had no harvesting activity in several years. If the area were fully exploited, an annual sustained harvest of 2000t is possible.

Eastern Shore

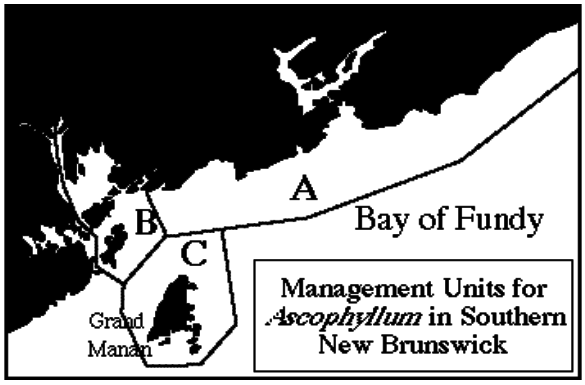
The Fishery

East of Halifax, the rockweed resource tends to be in sheltered bays. The plants are shorter than in southwestern Nova Scotia and the zone is only a few meters wide. Harvesters use cutter rakes from skiffs. Harvesting began in 1992 and landing sites were established in five bays by 1995. Landings have not exceeded 1000t. Holdfast content in the harvest is low being 2.7% (SD±4.6).

Resource Status and Outlook

There are no comprehensive surveys of bed area or biomass for the Eastern Shore. The most viable harvest areas are now being utilized. It is unlikely landings will exceed 1000 t. The potential for over-harvesting does exist since no exclusive license is in effect for the Eastern Shore.

Southern New Brunswick



The Fishery

Data bases existing prior to 1992 indicated an accessible rockweed resource of 153,000t in southern New Brunswick. Following a review of the available assessment data and a consideration of habitat issues, CAFSAC (1992) recommended a controlled harvest not exceeding 10,000t annually be permitted in New Brunswick for three years. The harvest technique was restricted to cutter rakes only.

Harvesting of rockweed began in July 1995 on the mainland shore of Charlotte County and was active on Grand Manan in 1996. Landings did not reach the quota or the company harvest plan for 1995, 1996 or 1997. Logistical problems, equipment and training issues were major reasons for short-falls. A total of 58 harvesters were active in 1997. The average landings per individual in all harvest areas was 8.6t (SD±6.0). per week in 1996. Individual landing records were not available by week for 1997. Based on landings by site and crew size for the

entire 16 weeks, the landings ranged from 2.5 to 10.6t per week per harvester in 1997.

Resource Status

A complete assessment of this resource was completed in 1997 by Acadian Seaplants Ltd. This survey revised estimates for harvestable crop based on the limitations of the harvesting equipment (a minimum canopy height of 50 cm height and areas accessible to harvest via small boats) from all three major harvest areas. Although the total biomass falls within the previous estimates that were used to base the pilot scale harvest, the amounts that are accessible to the harvester have been revised. The total biomass is estimated at 159,687t in 1997 versus 153,053t in 1992. However, the distribution of harvestable biomass (77,005t) is estimated to be 8,152t in area A, 44,116t in area B, and 24,737t in area C.

The exploitation rates (percentage of the harvestable standing crop of 80t ha^{-1} removed annually by sector) were limited in the pilot harvesting plan to a maximum of 50% spread over 3 years (17% annually).

Year	Exploitation Rate Range
1995	0.7-1.1
1996	1.5-2.5
1997	2.3-3.6

Samples were taken from the harvest for holdfast analysis from each of the landing sites. Clumps with holdfasts attached were sorted from those without holdfasts and the two units weighted to 10 g. About 4.4% (SD± 6.9) by weight of the harvest had holdfasts attached 1996 and 8.3% (SD±7.4) by weight in 1997.

Outlook

Landings in New Brunswick, as predicted, fell short of the 10,000t quota in 1997. The pilot scale harvest plan will need to be adjusted between areas A, B and C. The 10,000t quota is expected to be reached in 1998. An extension of one year was granted to the licensee, ending in 1999.

Management Considerations

The management of rockweed in the Maritimes is becoming more intensive. The enactment of new regulations in Nova Scotia and detailed conditions of license in New Brunswick have placed more performance criteria on both companies and their harvesters. There are now fewer parts of the coastline open to competitive harvesting. The entire region has the potential to sustain up to 40,000t annually.

For more Information:

Contact: Glyn Sharp
Invertebrate Fisheries Division
Depart. of Fisheries & Oceans
1 Challenger Drive, BIO
P.O. Box 1006
Dartmouth, N. S. B2Y 4A2

Tel: (902) 426-6042
Fax: (902) 426-1862
E-mail: SharpG@mar.dfo-mpo.gc.a.

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This report is available from the:

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

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