THE SEAGRASS (*ZOSTERA MARINA* [ZOSTERACEAE]) INDUSTRY OF NOVA SCOTIA (1907–1960)[1]

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Wyllie-Echeverria, Sandy. (*School of Marine Affairs, University of Washington, Seattle, Washington 98105-6715 and Department of Botany and Range Science, Brigham Young University, Provo, Utah 84602*) *and* **Paul Alan Cox** (*National Tropical Botanical Garden, Lawai, Hawaii 96765*). THE SEAGRASS (*ZOSTERA MARINA*, ZOSTERACEAE) INDUSTRY OF NOVA SCOTIA (1907–1960). *Economic Botany 53(4):419–426, 1999. Wild gathering of the leaves of the submerged marine monocotyledon* Zostera marina *L. once formed the basis of a vigorous insulation industry in North America. Since European colonization, fishing communities used detached leaves, deposited on the beach by tide and wind, as green manure and domestic insulation, but beginning in the late 1800s, these leaves were utilized in a commercial insulating product. Two companies manufactured seagrass "quilts" that were installed in many buildings of the period including some of the first skyscrapers. We here describe the importance of seagrass gathering for the coastal community of Yarmouth County, Nova Scotia, Canada. Interviews with older residents and analysis of county and company archives facilitate the reconstruction of what was once a seasonally important activity. Our findings have direct application to global seagrass protection initiatives.*

L'INDUSTRIE DE L'AILLEUL (*ZOSTERA MARINA* ZOSTERACEAE) DE LA NOUVELLE-ÉCOSSE (1907–1960). *L'assemblage sauvage des feuilles submergés du monocotyledon marine,* Zostera marina *formait a un moment les bases d'une industrie d'isolation en Amérique du Nord. Depuis la colonisation Européenne, des communautés de pêcheurs utilisaient des feuilles détachées, déposées sur la plage par la marée et le vent comme engrais vert et isolation domestique; mais commençant à la fin des années 1800, ces feuilles séparées furent utilisées dans un produit commercial insultant. Deux compagnies manufacturaient des "édredons" de pailleule qui furent installées dans plusieurs bâtiments de l'époque y compris dans certains des grattes-ciel. Nous décrirons ici l'importance de l'assemblage de la pailleule pour la communauté côtière de Yarmouth County, Nova Scotia, Canada. Des entretiens avec des résidents d'un certain âge ainsi qu'une analyse du département et des archives de compagnies, facilitent la reconstruction de ce qui était à une époque, une activité saisonnière importante. Nos découvertes ont une application directes sur les initiatives de la protection globale de la pailleule.*

Key Words: Zosteraceae; *Zostera marina*; seagrass; wild plant gathering; insulation; Nova Scotia.

The seagrass *Zostera marina* L. [Zosteraceae] is a submerged marine monocotyledon growing in subarctic and temperate regions of the Northern Hemisphere (den Hartog 1970:44–49; Phillips and Menez 1989:30). One of eleven species in the genus *Zostera,* the plants are monoecious with both pollen and seed carried on sea currents (Ackerman 1986; Churchill, Nieves and Brenowitz 1985; Cox, Laushman and Ruckelshaus 1992). Plants spread through proliferation of plagitrophic rhizomes in the sediment and seed. Erect shoots which rise from the rhizomes are dimorphic—fertile shoots terminate in monoecious inflorescences while sterile shoots produce "strapped-shaped" foliage leaves (den Hartog 1970:44–49; Tomlinson 1982:424–429). The production of these foliage leaves increases in spring with maximum biomass achieved in mid summer. After the growing season, many leaves break away and, carried by wind and wave action, lie in windrows on the beach in late summer and early fall (Roman and Able 1988). The purposes of this paper are to describe commercial seagrass gathering and processing of *Z. marina* leaf litter in Yarmouth County, Nova Scotia, Canada, analyze the forces that ended the gathering of this wild plant and consider the re-

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TABLE 1. TIMELINE OF *ZOSTERA MARINA* GATHERING IN YARMOUTH COUNTY.

Date	Event
1907	First bales shipped to Boston, USA
1914	Land purchased by Samuel Cabot, Inc. at Morris Island, Argyle Township, Yarmouth County.
1917–1921	Reduction of export associated with WWI
1928–1929	Peak in exports to Boston via Ferry Steamships
1930 or 1931	Gathering for Seafelt begins; transport to Sable River, N.S.
1932–1939	Disease reduces or eliminates resources.
1940	Resource recovery; some gathering resumes
1941–1945	Export and transport within N.S. suspended during World War II
1942	Samuel Cabot, Inc stops production of "Cabot's Quilt"
early 1960's	Guildfords Limited stops production of "Seafelt".

lationship between seagrass ethnobotany and seagrass conservation.

The manufacture of commercial insulating products—"thermal insulating materials that have a high degree of heat resistance per unit of thickness" —began in the late 1800s (Close 1952:2) and was motivated by demands from building owners (residential and commercial), architects and building contractors. Five properties were necessary for the product to meet industry needs: (1) low heat conductivity; (2) acoustic dampening; (3) low weight per volume; (4) ease of installation and (5) low cost (Wilkes 1950:1–7; Close 1952:1–3).

The first "blanket-type" insulation was developed by Samuel Cabot, Inc. of Boston, Massachusetts in 1891 (Close 1952:6). The product known as "Cabot's Insulating and Deafening Quilt" or "Cabot's Quilt" was made from the dried leaves of *Z. marina*. Later in the 1930s, Guildfords Limited, Dartmouth, Nova Scotia also manufactured "Seafelt," another blanket-type insulating product from the same plant. Although such seagrass quilts are no longer manufactured, we sought to reconstruct from interviews and historical records, the nature of this industry.

METHODS

With assistance from Ms. L. Bradley, archivist, Yarmouth County Museum Yarmouth, N.S. and Mr. P. Crowell, historian, Municipal Office of Argyle, Yarmouth, N.S., we identified local residents who might have potential knowledge of *Z. marina* harvest to interview. Audio-taped interviews were conducted with Mr. Richard Crocker, Mr. Pat and Mrs. Elsie Crowell and Mr. Harold and Mr. Neil LeBlanc (father and son) on the site of gathering activities (Lofland and Lofland 1995:18–26; Strauss and Corbin 1990: 75–84). Ancillary interviews were taped with personnel from Samuel Cabot, Inc. (now in Newburyport, MA, USA) and Guildfords Limited, Dartmouth, N.S., Canada. Transcripts were prepared from the audiotapes and these data were entered into ETHNOGRAPH v4.0, a computer program that contributes to the analysis of qualitative data by allowing investigators to view and manipulate non-numerical data derived from interviews and field notes (Berg 1998:245–247). We also searched the archives of Yarmouth County Museum and the Argyle Township Court House. Copies of period photographs, newspaper accounts and tax records were obtained and added to the database. In addition, the business archives of two seagrass quilt manufacturers, were searched and relevant documents photocopied.

FINDINGS

We found that from 1907 until the early 1960s farmers, fishers and town dwellers in Yarmouth County sold the dried leaves of *Z. marina* to businesses in the United States and Canada. Although exports were reduced during World War I, commerce was suspended only twice; first by a disease that infected and killed plants and shortly thereafter by industrial shifts associated with World War II (Table 1).

Commercial gathering was modified from former non-commercial practices. Early settlers collected leaves from beach wrack and used them wet as green manure and dried for animal bedding and "banking up" around houses and out buildings (Ricker 1941). The custom of "banking up" also occurred in New England

TABLE 2. NUMBER OF *ZOSTERA MARINA* BALES SHIPPED VIA FERRY STEAMER FROM THE PORT OF YARMOUTH BETWEEN 1907 AND 1931. EACH BALE WEIGHED APPROXIMATELY 80 POUNDS (36 KG). ALL CARGO WAS DESTINED FOR BOSTON (SOURCES: YARMOUTH COUNTY HERALD AND YARMOUTH COUNTY TELEGRAM).

Year	Number of bales
1907	102
1908	592
1909	1744
1910	1175
1911	15
1912	1361
1913	3243
1914	2408
1915	2863
1916	452
1917	n.d.*
1918	n.d.*
1919	n.d.*
1920	n.d.*
1921	n.d.*
1922	842
1923	4810
1924	4593
1925	5758
1926	4183
1927	5244
1928	12 484
1929	12 854
1930	4599
1931	6780

* During this time frame primary shipment occurred on Cabot owned vessels (Cabot 1986; R. Crocker Pers. Comm.).

and is achieved by layering outside walls with loose, dry leaves of *Z. marina* (Wilkes 1950:2). This protection buffered humans and their livestock against winter cold and prevented cellars and icehouses from warming in summer (Cottam 1934:192).

Early commercial gathering in Yarmouth County was driven by manufacture of a seagrass quilt in Boston, Massachusetts, USA. Seagrass leaves from this effort were purchased exclusively by Samuel Cabot, Inc. (hereafter SCI). Export data extracted from local newspapers reveals a gradual increase in gathering over time with peak production occurring in 1928–1929 (Table 2). Later a second company, Guildfords Limited, Dartmouth, Nova Scotia also purchased dried seagrass from Yarmouth County.

We also learned that, although gathering was a seasonal activity, financial gain was substantial (The Busy East of Canada 1911). Ricker (1941) notes that the average price was $10.00 (Canadian) per ton (909 kg) and that in some years "more than $100,000 was shipped from the port of Yarmouth." This total represented the work of fisher and farmer family groups and individual workers from town and, based on our archival research, was most likely a reflection of production during the 1920s. During this period gathering and exports increased (Table 2).

Using information from period photographs, archival material and information from our informants, we estimate approximately ten percent of the male population in the town of Yarmouth between the ages of twenty and forty gathered *Z. marina* during the 1920s (Seventh Census of Canada, 1931, Dominion Bureau of Statistics, Canada, Vols. I and III). It is more difficult to calculate the number of rural people involved. However, two of our informants recalled that within a thirty-mile radius of Yarmouth, most families participated in gathering seagrass (E. Crowell and R. Crocker).

Z. MARINA LEAVES AS INSULATION

"Cabot's Quilt" was made by stitching various thicknesses of dry *Z. marina,* leaves between layers of heavy Kraft paper (Fig. 1; Cabot 1986). Fame of the "Quilt" spread: in 1895, Rudyard Kipling wrote, ". . . I make it that we shall need some two hundred square feet of the Quilt. Could you kindly let us have an estimate on this? I have found the Quilt invaluable as a deadener of noise and now wish to test it as a weather protection" (SCI archives).

Initially three varieties were made: (1) Single-ply—common lining for houses; 1/3″ (0.8 cm) thick; (2) Double-ply—sound deadening material; 1/2″(1.27 cm) thick and (3) Asbestos-single and double ply covered with asbestos rather than Kraft paper. Over time other grades were introduced bringing the total to eight varieties of "Cabot's Quilt" available to the construction trades. The product was used extensively in houses, office buildings, hotels, apartment buildings, warehouses, schools, hospitals, conservatories and lecture halls throughout Canada, the U.S. and Great Britain. By 1930, 350 apartment buildings in New York City and surrounding boroughs and 200 commercial buildings including hospitals, cinemas and apartment buildings

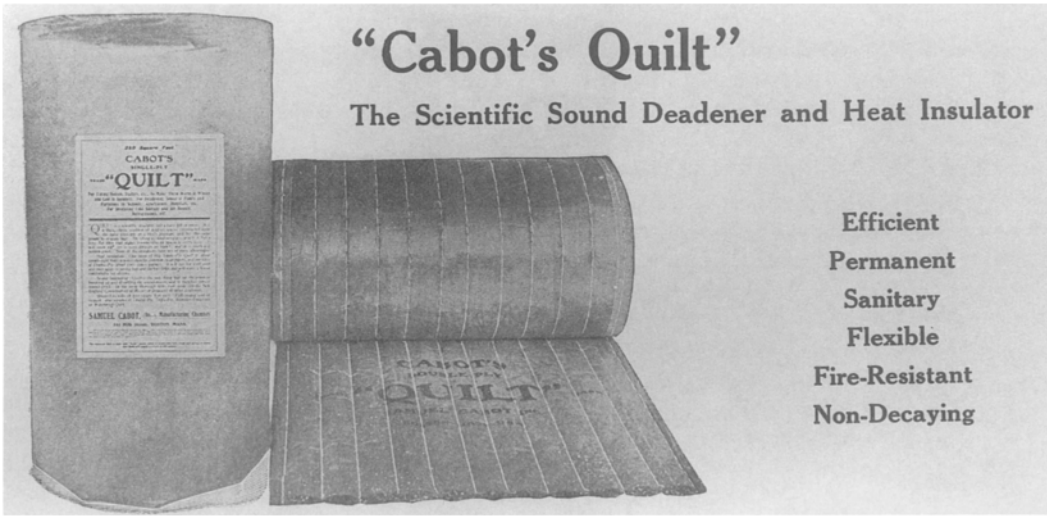

Fig. 1. Advertisement photograph from a 1925 brochure promoting the worth of Cabot's Quilt (SCI Archives).

in England and Scotland were insulated with "Cabot's Quilt." Independent studies found the "Quilt" to be an efficient thermal and acoustical barrier, particularly for sensitive environments such as lecture halls and music conservatories (Barss 1930 Bureau of Standards 1927; Huntley 1928; Illinois Master Plumbers Association 1928; Norton 1902:7–8).

Dried leaves for the "Quilt" came from New England sites in the early years but starting in 1907, the company began to import bales of *Z. marina* from Yarmouth County (Cabot 1986; Table 2). By 1914, SCI established collection and storage sheds in Yarmouth County and hired a seasonal labor force from the town of Yarmouth. By the mid 1920s, fourteen collection sheds were in operation—eight owned directly by SCI and another six leased from local farmers—all furnished with scales and stationary hay balers or wooden hand presses. *Zostera marina* gathering was a thriving industry and exports (except during WW I), via local steamship remained steady until 1932 (Table 2). Some leaves were gathered and processed during WW I but these bales were shipped on Cabot owned vessels (Cabot 1986; R. Crocker pers. comm.).

Two events occurred in the early 1930s that jeopardized SCI's exclusive control over *Z. marina* gathering in Nova Scotia. First, Guildfords Limited, began manufacturing insulation from Nova Scotian *Z. marina* and second, the "wasting disease" eliminated or reduced *Z. marina* populations throughout its range in Atlantic waters (Cottam 1934; Muehlstein 1989). The disease prevented gathering in Yarmouth County until 1939 (Ricker 1941). SCI did import bales from River Herbert in northern Nova Scotia and northern Germany (Cabot 1986; U.S. Department of Commerce 1932–1942; R. Crocker pers. comm.), however, the onset of World War II suspended German imports and the company decided to stop production in 1942 (Cabot 1986). Recovery from the "wasting disease" was evident by 1953 (Cottam and Munro 1954) but Guildfords Limited, rather than SCI, bought the leaves and processed them in Sable River, north of Yarmouth to become "Seafelt." Production of "Seafelt" was discontinued with the advancement of fiberglass insulation and other synthetic fiber products in the early 1960s (J. Guildford pers. comm.).

Gathering and Processing Techniques

Zostera marina leaf gathering did not demand intensive capital or material investment because many farmers, fishers and other folk could participate in the activity for a minimal start-up cost by using equipment they already owned (Ricker 1941). Also, the season of gathering did not conflict with farming and fishing (P. Crowell pers. comm.). Leaves were gathered after the hay was cut. Labor divided among men, women and children was a formula for maximum efficiency (R.

Fig. 2. Photograph (circa 1925) showing workers gathering dry *Zostera marina* leaves from the hay fields (Yarmouth County Museum Archives).

Crocker, E. Crowell, and N. LeBlanc pers. comm.).

On tidal flats adjacent to Little Thrum Cap, south of Yarmouth town, SCI contracted with residents to build a 75 m long rock wall to capture floating *Z. marina* leaves before they reached the beach. Leaves were forked from the rocks into ox drawn carts parked behind. Carts were pulled by a single ox, called a dagon ox. At other sites in Yarmouth County, leaf litter was gathered from the water and the rocky intertidal region. Wet leaves were then spread atop the recently mowed hay fields to dry. The work began in late July after the hay was cut from the fields and, in some years, continued until October. Leaves were turned until they were thoroughly dry, then loaded into horse drawn wagons (Fig. 2) and transported to one of the fourteen collection sheds (Fig. 3) which were strategically placed next to main arterial roadways and abundant *Z. marina* resources.

Each shed was equipped with gear for baling the dried leaves. There were two types of balers both owned by SCI. The first was a "stationary hay baler." It was made of iron and was used to bale meadow grass hay. Because the length and width of *Z. marina* leaves are not dissimilar to particular strains of true grasses used as hay

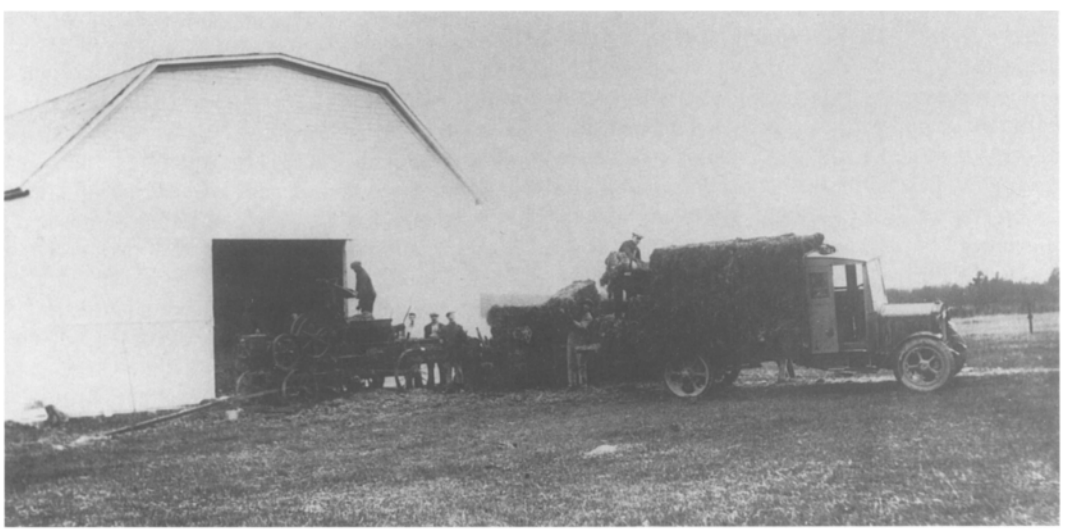

Fig. 3. Photograph (circa 1925) of a storage shed built by Samuel Cabot Inc.. Workers are loading recently baled *Zostera marina* leaves onto the transport truck (Yarmouth County Museum Archives).

(e.g.,.*Phleum pratense* L.), no modification of the equipment was necessary to produce seagrass bales. The second, a hand press is described by our informant (E. Crowell) as, "a wooden press with two ends to it and they would fill the lower part with eelgrass (*Z. marina*) and as you pressed you would jam it up to the top, till you made a bale out of it."

Bales, weighing approximately 80 pounds (36 kg) were stored until picked up by SCI employees with wagons in the early days and later with trucks (Fig. 3). The cargo was shipped to Boston usually from July to December. Late fall and early winter shipments originated from bales that were stored in SCI owned collection sheds. These bales remained in storage until requested by the company.

Collection and processing for Guildfords Ltd. varied little from techniques developed during previous years. Wet seagrass was gathered from shore and placed in hay fields to dry. In contrast with SCI loose rather than baled leaves were often delivered to the company agents and no oceanic export was involved. The Guildford facility, located in Sable River, paid an agent to accept and transfer Yarmouth County collections (P. Crowell and H. LeBlanc pers. comm.).

Discussion

Analysis of coded interviews confirmed that gathering and processing practices remained relatively constant over the 53 years of the commercial operation. Tools and equipment that were already used in farming and fishing became the tools of *Z. marina* gathering, a fact further supported by historical photographs obtained from company and museum archives. No new or modified tools were necessary thus reducing the cost to the gatherers. In addition, the processing of seagrass, once gathered, was not specialized but followed common techniques associated with the practice of haying. Both activities demand that leaves be dried before the manufacture of bales and drying is achieved by the periodic turning of the gathered or cut plant material. All guides reported that *Z. marina* leaves were dried on recently mowed hay fields with the same tools used to process the hay just prior to the *Z. marina* gathering season. This sequence was critical. The mowed hay fields provided a "platform" for drying and the timing of the two separate harvests allowed full participation in wild gathering by farmers and their families.

The harvest sequence also benefitted those who fished. Because fishing was vitally important to the people of Nova Scotia (Campbell 1876; Johnston 1989), economic activities that conflicted with fishing season rarely flourished. The peak season for lobster and mackerel fisheries occurred in May and June (McLeod 1903: 160–162; The Busy East of Canada 1917; Williams 1988) and the cod fishing season, although longer, was more prominent in northern Nova Scotia (Innis 1940:9). Because the seagrass gathering season occurred after these fishing seasons, those who fished could participate in *Zostera* gathering and their boats could be used.

When *Z. marina* leaves drifted ashore in great quantities on the beach, farming and fishing families were ready to gather them. The gathering season became a priority and did not interfere with fishing or farming. Moreover, the addition of this wild crop provided increased revenue and buffered families from financial hardship (Ricker 1941).

In conclusion, the Yarmouth history of seagrass gathering is more than a story about wild gathering, it is also a story about the relationship between plants and people. Women, men and children knew the yearly sloughing of leaves would yield important income once they were dried and baled. Also, Samuel Cabot Inc. and Guildfords Inc. realized the profit potential of "Cabot's Quilt" and "Seafelt" and distributed the product through wholesale and retail outlets. It was everywhere advertised as a product derived from eelgrass (an English common name for *Z. marina*), strengthening the connection between public perception of the product and the plant kingdom. Finally, apartment dwellers and owners, theater audiences and factory workers benefitted from the insulating and sound-deadening qualities of the leaves wrapped in Kraft paper. They were warmed in winter and cooled in summer and enjoyed rich sound transfer in environments buffered from external noise. The sloughed leaves of *Z. marina* linked rural and urban dwellers on two continents and improved the lives of them all.

The Yarmouth story is also not an isolated event. Previous studies (e.g., Felger and Moser 1986:376–382; Turner and Efrat 1983) discuss the material importance of *Z. marina* in regional settings and Partharsarathy et al. (1991) and

Bandeira (1995) briefly discuss local use of other seagrass species. Moreover, our on-going research is documenting use of a number of species by several different ethnic and, in some cases, aboriginal groups. We suggest that while the ecological value of seagrass systems has been well documented (e.g., Thayer, Kenworthy and Fonseca 1984; Larkum, McComb and Shepherd 1989), the significance of these plants, to local and regional people has been overlooked.

Threats to seagrass survival may demand more emphasis on the cultural and historical significance of these plants. While loss from disease has reoccurred at some North Atlantic sites (Short, Mathieson and Nelson 1986), the most significant threat to these plants is the reduction of water clarity, which is directly linked to human activity (Short and Wyllie-Echeverria 1996). Kurien (1998) argues that the success of initiatives designed to curb human destruction of the coastal zone may be related to the cultural fabric of the coastal community involved. We concur and suggest that an awareness of the cultural and historical significance of particular seagrass species may directly contribute to their protection.

The model proposed by Monson (1996) for relic mulberry trees (*Morus* spp.) in Utah is instructive. The leaves of this tree, being necessary as a food for the silk moth (*Bombyx mori*), were essential for the sericulture industry of the 1800s. Monson (1996) argues that extant trees should be preserved as "monuments" of Utah's cultural history. In the same way, *Z. marina* prairies in Yarmouth County are "monuments" to the once thriving insulation industry. Preservation of these prairies would benefit both the ecological integrity and cultural heritage of the region and may have application at other sites. In sum, ethnobotanical investigation detects cultural saliency in a way that ecological investigations can not. This added dimension adds power to global seagrass conservation efforts to reduce or eliminate human activities, which threaten this important biome.

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