THE CANADIAN BOTANICAL ASSOCIATION

BULLETIN

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Her Excellency the Right Honourable / Son excellence la très honorable
Adrienne Clarkson, C.C., C.M.M., C.D.
Governor General of Canada / Gouverneure générale du Canada

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2001 CBA ANNUAL MEETING KELOWNA, BC, 23-27 JUNE

CONGRÈS ANNUEL DE L'ABC 2001
KELOWNA, BC, 23-27 JUIN

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Texts and illustrations for the Bulletin must be sent to the Editor preferably via the electronic mail (attached file) or on a diskette. Texts should be saved under "Microsoft Word 6 for Macintosh" and illustrations under the "TIFF" format.
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CBA Bulletin / Bulletin de l'ABC

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Texts for the February issue must be received before January 31, 2001. Les textes pour le bulletin de février doivent arriver au plus tard le 31 janvier 2001.

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Poorly Known Economic Plants of Canada - 27. Cloudberry, *Rubus chamaemorus*.

E. Small and P.M. Catling, Eastern Cereal and Oilseed Research Centre, Research Branch, Agriculture and Agri-Food Canada, Saunders Bldg., Central Experimental Farm, Ottawa K1A 0C6

Latin Names

Rubus chamaemorus L. *Rubus*, from the Latin *rubus*, bramble, - from *ruber*, red, an allusion to red dye obtained from fruits of some of the species; *chamaemorus*, from the Greek *chamae*, on the ground, a reference to the low habit, and the Latin *morus*, the mulberry tree, a reference to the mulberrylike fruit.

English Names

Cloudberry, baked-apple, baked-apple berry, bake-apple, bakeapple, yellow-berry, malka (hyphens optional, i.e. words may be separated). "Cloudberry" is from the Old English *clād*, meaning rocky hill, + berry. The name "bake-apple" presumably is an allusion to the taste, which is reminiscent of baked apples. The species is sometimes called salmonberry, a name that is usually used for *R. spectabilis* Pursh of the Pacific Coast. Alaska natives called these species salmonberries because of the resemblance of the raspberrylike fruits to salmon eggs.

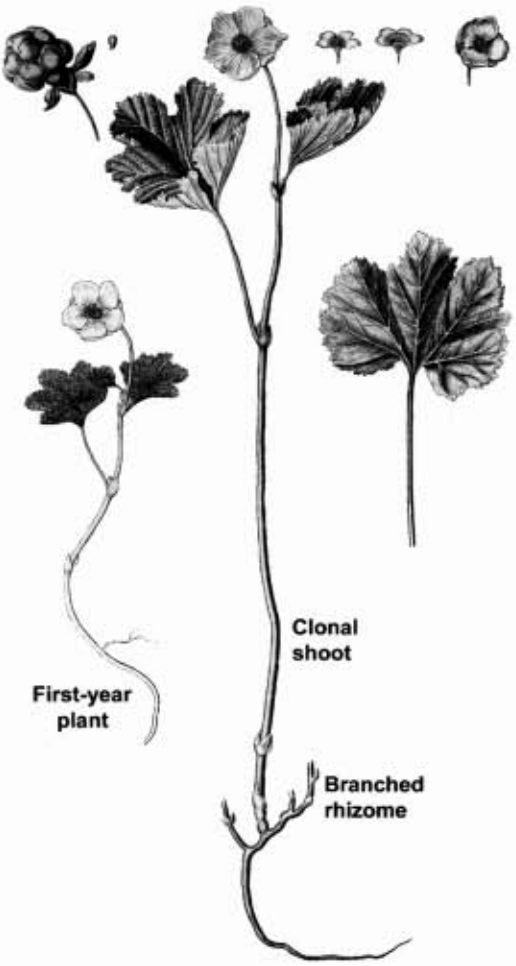
French Names

Chicouté, chicoutai (du *shekuteu* (Montagnais) qui signifie feu ou qui mûrit avec la chaleur, à cause de la couleur rouge du fruit avant maturité; une liqueur québecoise est connue sous son nom de "Chicoutai"), ronce mûrier, ronce petit-mûrier, mûre blanche, mûre des marais, plaquebière (une déformation du vieux français *plat de bièvre* (plat-de-bièvre, c'est-à-dire nourriture du castor), blackbière (apparemment une variante de plat-de-bièvre).

Morphology

Cloudberry has an extensive creeping and branching system of slender woody rhizomes covered with brownish papery bark. These can grow down to a depth of 30 cm. They have an average length of about a meter, but can be a great as eight or nine meters, and a single clone can cover an area of hundreds of square meters. Terminal buds on the rhizomes typically overwinter at a depth of 4-6 cm. These produce single, upright, often flexuous, unbranched stems 10-20 cm high, with 1-3 (possibly more often three in females) simple, alternate deciduous leaves at the upper nodes, and sheathlike stipules at the lower nodes. The rather leathery leaves have petioles 2-8 cm long, and blades 4-11 cm wide, serrate, round-cordate or reniform, with 5-7 rounded lobes and shallow sinuses. At the base of the upright shoots, in the axils of the sheathlike stipules, buds produce new rhizomes that grow under the surface.

The solitary, unisexual flowers, 2-3 cm in diameter, are borne at the top of the plant. The petals are white, four or five to the flower. Flowering occurs in early spring (from late May to July, depending on latitude and/or altitude), and the fruit ripens in mid- to late summer (July to early September), by which time the leaves are senescent. A fertilized flower may produce a fruit in 4 to 8 weeks, the process speeding up at higher temperatures.



The globular fruit is 1-2 cm in diameter, composed of 5-25 large-seeded drupelets. The fruit is tightly enclosed in the reflexed sepals, until the drupes enlarge and start to emerge above and between the sepals. The fruits are bright red when immature, quite hard and firm at this stage, becoming orange or amber, and later soft and pale translucent yellow. When the fruit is hard and red-tinged, it is firmly attached to the calyx, and as it ripens, becoming juicy and yellow, the calyx loosens its hold on the

fruit. The fruits quickly drop from the dry receptacle when ripe. Overripe fruits are a pale cream colour, and the translucence has been lost.

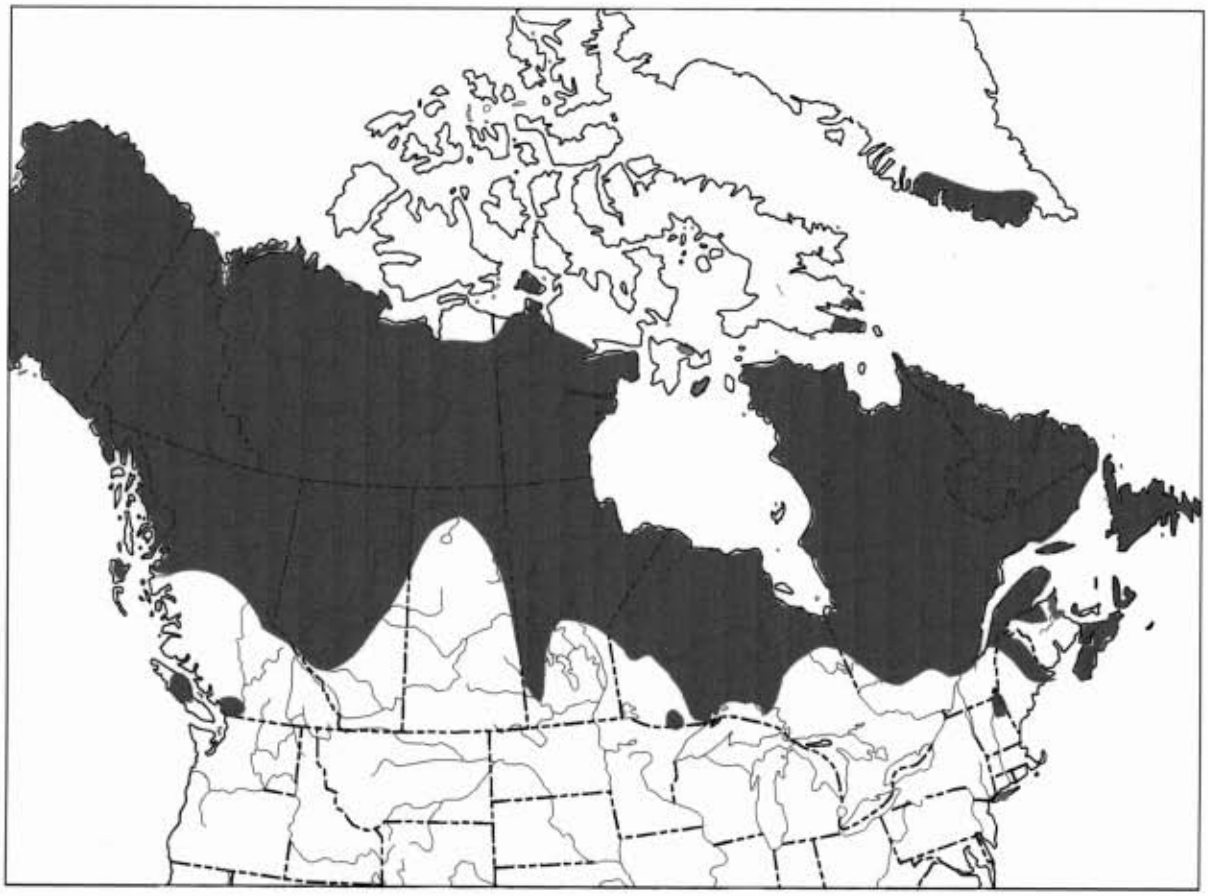
Cloudberry is intriguing because of the dominance of male plants, and its dioecious nature has been the subject of many evolutionary research studies. Individual plants bear either male or female flowers, but usually male flowers predominate, so that there may be little or no fruit. In most cloudberry bogs, less than 25% of the flowering shoots are female. This has been attributed partly to greater competitive ability of male plants, and partly to greater flower production by the males. The important fly and bee pollinators, show a strong preference for male flowers, which are larger, provide pollen, and much more nectar. This seemingly excessive favouring of the male sex may be related to the relatively low dependence of the species on sexual reproduction.

Classification and Geography

Rubus is a large genus, and is taxonomically difficult because of the tendency to proliferate microspecies through apomictic reproduction. Over 2000 species names have been created, but perhaps less than 300 species deserve recognition. There are many cultivated fruit species, including raspberries, blackberries, dewberries, loganberries and boysenberries, and the fruit of many of these are collected from the wild. The numerous carpels of the flower develop into an aggregate fruit, the pistils transforming into small, juicy coherent drupelets, which in north temperate species usually either detach easily from the receptacle (core) as in the raspberries, or do not detach from the fleshy core and fall off with it, as in the blackberries and dewberries.

Rubus chamaemorus is an octoploid species (with $2n$ = 56 chromosomes), and is the only species in the subgenus *Chamaemorus*, which is characterized by annual aerial stems, simple leaves and yellow fruit. *Rubus chamaemorus* has crossed spontaneously (and has been artificially crossed) with the common raspberry, *R. idaeus* L. ($2n$ = 14). It has also been crossed with the bramble *R. fruticosus* L. ($2n$ = 28), as well as several Asian species. All of the offspring of these crosses have been sterile.

Rubus chamaemorus is a circumpolar, low-arctic species. In North America, it occurs in cool and cold regions from Newfoundland to British Columbia and Alaska, south to the coast of eastern Maine, the mountains of western Maine and northern New Hampshire, and an isolated colony on Long Island, New York. Further west, its southern limit is near the 49th parallel in southern British Columbia and northern Minnesota. Cloudberry grows well in areas of Finland, Norway, Sweden, England, and Russia, where semi-commercial to large scale com-



mercial harvesting occurs. In North America, large areas of cloudberry that could be commercially harvested are found in the bogs of northern Quebec, and Newfoundland and Labrador.

Ecology

Cloudberry inhabits moist, peaty and turfy soils, including sphagnum bogs and hummocks with pH 2.5-4.5, muskegs, mossy tundra and black spruce bogs. The species occupies a broad spectrum of sites from dry to wet, but is most common on wetter sites, particularly raised bogs, meadows and freshwater marshes. However, in very wet sites, the rhizome is less strongly branched than in drier sites. The optimal depth to the ground water table has been estimated to be 30 cm. Although obviously adapted to very acidic peatlands, good growth has been observed with the pH as high as 6.1. Cloudberry sometimes occurs in periodically dry lichen carpets on acid rocks. It is shade tolerant, and is an important understory component of open or closed forest habitats, primarily in black spruce-sphagnum bogs. However, the plants grow best in full sun, although shaded sites provide some protection from the damaging effects of frosts, discussed below. Cloudberry is a frequent dominant or codominant of dwarf-shrub associations of bogs, muskegs and open tussock tundra. When such areas are damaged, for example by fire or road construction, cloudberry is among the first to re-establish. The species is considered to be a pioneer that rapidly colonises bare soil.

Cloudberry propagates predominantly by subterranean runners which grow about 10 cm below the substrate surface. Vegetative reproduction has been said to be the best strategy for reproduction in the unpredictable climate of high latitudes. Although obviously seeds are necessary to colonize sites, seedlings are rarely observed under natural circumstances. The fruits have a very hard endocarp, and germination is delayed until the tough boney endocarp is broken down, and cold stratification is completed. The fruit is very attractive to animals, including bears, grouse, sea birds and ravens, which disperse the seeds. The seeds have been shown to remain viable after passing through the digestive system of several bird species. Moose and caribou browse on the twigs. In northern areas heavy frost during flowering may result in very limited or no fruit production. Female flowers appear to be more susceptible to frost than the male flowers. Good snow cover has been observed to delay flowering until the danger of frost damage is reduced. As a result of periodic frost damage the harvest yield of cloudberries fluctuates drastically from year to year in many regions, especially in northern, interior areas. In milder southern areas, the destruction of fruits by heavy spring frosts is less common. Cloudberry is entomophilous, the pollinators including mostly syrphid flies and bumblebees, and the inadequacy of available pollinators is another factor responsible for very poor yields in some years. It has been suggested that wind pollination may contribute to fruit set in coastal windswept areas, but this seems unlikely.

Use as Food

In many northern communities, particularly of the Inuit, fruit imported from the south is rare and if available may be in poor condition and extremely expensive. Wild-growing cloudberries are, accordingly, highly valued, and indeed are the favourite wild fruit of the Inuit. Native peoples of northern areas often conserved the berries in a frozen state in the snow. "Eskimo ice cream," a beaten mixure of berries, seal oil and chewed caribou tallow, or just berries and fluffy fat, was frequently made with cloudberries. The leaves have occasionally been employed as a tea substitute.

Investigators have made the following observations regarding harvesting, preserving and preparing the berries. The best way to harvest is to pick a combination of the hard red fruit and the soft golden fruit. The hard red fruits seem to have a higher pectin content, and when cooked produce a delicious, apricot-like flavour. But using only the hard red berries produces too thick and dry a preserve. The soft golden fruit is fragile, deteriorates easily, and when cooked without some hard red fruits produces a slightly runny product with an inferior flavour. When used in baking, a smoother texture results when the berries are pureed in a blender before they are cooked. The fresh berries will keep for several weeks in a refrigerator.

Cloudberries are considered best when freshly picked, and may be served on pancakes or waffles, or with sugar, cream, whipped cream or ice cream. The taste and smell have been said to be unique and difficult to describe. The berries have a musky aroma and a strong, sour but delicious flavour. The Finnish liqueur Lakka, and the Quebec liqueur Chicoutai are both distilled from cloudberry. Cloudberries are employed in baking, in pies and puddings, in stews, and to decorate cakes and desserts. Commercially, cloudberries are used in yogurts and jams, and juice concentrate. Recipes are available on the web (e.g. wysiwyg://41/http://www.baccalieu.com/yaffles/bk-ap.htm).

Chemistry

Cloudberry has a high content (50 to over 150 mg per 100 g fruit) of ascorbic acid (vitamin C), which is retained well when the berries are frozen or otherwise preserved immediately after picking. The berries are also rich in benzoic acid (ca. 50 mg/100 g fruit), which promotes good storage. Aromatic compounds are prevalent in cloudberry, and produce a very pleasing and unique scent. More than 100 volatiles have been identified. The most important odour chemicals are ethyl hexanoate, 4-vinylphenol, 2-methoxy-5-vinylphenol, 2-methylbutanoic acid, hexanal, benzyl alcohol and 2-phenyl-ethanol. The volatile compounds may be used to identify cultivars.

Toxicity

The seeds have tested positive for amygdalin, a poisonous cyanogenetic compound, which may function as a germination inhibitor. There has been no suggestion that the concentrations are sufficient to raise concern, and cloudberries are considered non-toxic.

Non-Food Uses

Cloudberry juice has been used in folk medicine to treat hives. Because of the high content of vitamin C, cloudberries were an important remedy for scurvy among Arctic hunters. North American Indians used cloudberry for several medicinal purposes. The Woodland Cree employed a decoction of the root to aid women experiencing a difficult childbirth, and a decoction of the root and stem to help women become pregnant. The Micmac used the roots for cough and tuberculosis, and to treat fever.

Cloudberry is often grown in cool rock gardens as an ornamental. The plant is not easily propagated. If seeds are used, 6 to 8 months (some sources recommend shorter periods) of moist, cold stratification (4-5°C) should be given, and the seed coat should be nicked (even then germination rates are below 50%). Seeds have been observed to remain viable when stored air-dry at room temperature for at least 5 years. Cloudberry is more difficult to propagate vegetatively than other species of *Rubus*. Best results have been obtained when rhizome cuttings are taken in early spring or autumn, and with relatively long sections of rhizome (15 -20 cm).

The fruits have been used as a source of a purple to dull blue dye.

Agricultural and Commercial Aspects

Cultivation and management techniques have been extensively studied and developed in northern Europe, especially in Scandinavian countries. Burning of surface vegetation is sometimes practiced to increase plant density and fruit production. Control of competing plants, such as bulrush (*Scirpus cespitosus*), may substantially increase productivity of cloudberry. Although cloudberry is often found in nutrient-poor substrates, its productivity can be increased at least somewhat by appropriate fertilization, especially with phosphorus (but simply broadcasting fertilizer on a bog may benefit other bog species at the expense of the cloudberry). Frost damage to the flowers is sometimes controlled by flooding bogs, as is done with commercial cranberry bogs. Also, plowing furrows into a bog seems to increase the growth of cloudberries while lowering the freezing of flowers. Short fences have been used to increase snow cover. Of course, the above measures could upset the natural vegetation of bogs, and should not be undertaken without consideration of environmental effects. In nature, male plants predominate, but 10% males have been proposed as sufficient, and this can be achieved by planting male and female clones in a 1:10 ratio. However, as noted above female flowers offer little incentive for pollinator visitation, and disappointed pollinators might search for more rewarding species.

Most cloudberries on the market today come from wild plants from native sphagnum peat bogs. With favourable conditions (bogs with peat between 0.5 and 1 metre in depth, pH between 3.5 and 4.5, and ground water 40 to 50 cm below the surface) berry yield on native peatland is 20 to 50 kg/ha. In Scandinavia, average yields from unmanaged natural bogs are of the order of 20 kg/ha, which is considered low by the industry. Managed bogs are much more productive. In Newfoundland, a yield of 112 kg/ha has been considered good. Newfoundland prices are (1985: wholesale: $2.00/pound; retail: $3.00-$32.50/pound). Harvest statistics are difficult to find. Finland is said to produce about 25 million kg annually.

As with the harvest of some other wild fruit, picking cloudberries is not the easiest exercise. The bog environment requires slogging through wetlands, and there is the inevitable battle against black flies and mosquitoes. When the berries are picked in the red stage, they need to be "dehulled," i.e. the adherent sepals have to be removed, and this results in sore fingers and ruins fingernails. The picking rate in productive Newfoundland bogs has been estimated to be 4 litres/hour (4.5 kg/h).

Cultivars & Germplasm

Breeding has been in progress in several European countries, and several cultivars of *Rubus chamaemorus*, including all-male and all-female lines, are available. Hybrids with raspberry (*Rubus idaeus*) have been produced to combine the unique advantages of cloudberry and the high productivity of raspberry. Breeding aimed at production of hermaphroditic (monoecious) varieties is underway. The Holt Research Centre in Tromsø Norway protects some germplasm, and has an ongoing breeding program with selections based on larger and more abundant berries and rapid establishment. The Atlantic Cool Climate Research Centre of Agriculture and Agri-Food Canada in St. John's Newfoundland has a collection of cloudberry clones, and is developing a micro-propagation protocol to multiply the plants.

Prospects

Large amounts of cloudberries are harvested in Europe, but the industry is relatively minor in Canada. Cloudberry has a very attractive taste and interesting colour, and because it is considered a gourmet item it is quite competitive in the fruit market. Since it is perishable, cloudbery is especially suitable for processing as juices, preserves, liqueurs, and frozen products. Not only is the European and world market demand for this very special fruit largely unmet, even the demand by local Canadian markets, particularly in Newfoundland and Labrador, far outstrips the supply. In Norway, 200 to 300 t of cloudberry are imported in some years to satisfy domestic needs. The fact that there is already a large market demand is very important when considering development of minor or wild crops, since there are numerous wild attractive fruits in most countries, but almost no new fruit today will succeed in the highly competitive marketplace unless it displaces a fruit that is already well establised. Under these circumstances, there is universal reluctance to introduce new fruits. This does not apply to cloudberry since it already has a guaranteed market. Moreover, cloudberry is a suitable crop for northern areas that are rich in peatlands, but lack extensive agricultural lands of good quality. Bogs of eastern Canada, particu-

larly of Newfoundland, Labrador and parts of Quebec are rich in cloudberry, and the industry deserves to be developed. Recent studies have suggested that it could become a marketable crop in Cape Breton (Nova Scotia), Newfoundland and Labrador. European experience has shown that appropriate management dramatically increases yields, and the same should be achievable in Canada. In 1985 the estimated possible harvest for Newfoundland and Labrador alone was more than 1,000,000 kg, worth about $5,000,000.00, but these figures probably undervalue the potential.

Myths, Legends, Tales, Folklore, and Interesting Facts

* The cloudberry is the badge of the Scottish clan McFarlane.

* Many species of *Rubus* produce shoots that bend over, with the tips rooting in the soil. The loop thus formed was once believed to have restorative properties. In Europe, children with hernias were passed backwards and forwards through the arch of the bramble in order to alleviate the condition. This treatment was also used for boils. It was said to be good for curing sick cows as well, although one may doubt a bramble-loop large enough for this purpose could be located.

* In Poland, cloudberry is considered a threatened species, and is strictly protected.

* Imaginative if far-fetched explanations of the derivations of the names cloudberry and bake-apple can be found on the Web. One interpretation claims that "cloudberry" is so named because the cluster of drupelets that make up the fruit looks like cumulus clouds. And "bake-apple" is said to have arisen when Newfoundlanders overheard French speakers ask "Baie qu'appelle?" (What do you call this berry?).

* Scandinavians are so respectful of the cloudberry that the right to pick it is enshrined in some laws. In Norway, only landowners can pick cloudberries on their land, and in northern Finland only local inhabitants can pick them in quantity.

* A celebration of Labrador heritage and a tribute to cloudberry called the 'Bakeapple Folk Festival" is held every year in mid August in Labrador Straits.

* During a productive year, a cloudberry bog may suddenly change colour when the berries ripen, a consequence of fruit densities up to1200/m2.

* Species like the cloudberry, with some plants producing only male flowers and others producing only female flowers, are often said to be male or female but, strictly speaking, this is not correct. "Males" are defined as directly producing male reproductive cells (gametes), while "females" directly produce female gametes, but in flowering plants gametes are produced by gametophytes, microscopic plants that are generated by the flowers. Dioecious flowering plants like *R. chamaemorus* are correctly (if pedantically) referred to as staminate (bearing stamens, which produce pollen grains, which are tiny plants that generate sperm) or pistillate (bearing pistils, which produce embryo sacs - tiny plants in the ovaries, that produce the eggs). To test students' understanding of this complex phenomenon of "Alternation of generations" in higher plants, university botany exams often ask questions like "What is the sex of a vegetative tomato plant?" [Answer: it is asexual.]

Acknowledgments: J. Cayouette (review), B. Brookes (artwork).

Faculty Opening

Plant Ecology

University of Toronto at Scarborough

The Division of Life Sciences, University of Toronto at Scarborough, invites applications for a tenure-stream position in plant ecology. Applicants must have a Ph.D. (or equivalent), and preferably one or more years of postdoctoral experience. The successful candidate will complement current research and teaching strengths in the division and will be expected to take an active role in both undergraduate and graduate teaching, and to develop a strong research program.

Interested applicants should submit a complete c.v., a statement of research and teaching interests, three letters of recommendation (including comments on teaching ability and publications), and copies of recent reprints to:

Dr. Ron Dengler
Associate Chair, Biology
Division of Life Sciences
University of Toronto at Scarborough
1265 Military Trail
Scarborough, Ontario
MlC lA4.

Closing date for applications is January 5, 2001.

Jim Phipps (UWO) retired

The University of Western Ontario Herbarium

Dr. James B. Phipps, the recent curator, who has been active in vascular plant systematics, particularly Rosaceae and Poaceae, for 44 years, retired on June 30th, 2000. The new curator will be Dr. Gregg Thorne, a soil mycologist, to whom future communications should be addressed. The UWO herbarium is presently undergoing a significant increase in space and cabinetry.

A Commentary on Food Derived from Genetically Modified Organisms (GMOs)

I write as one concerned about the premature introduction of genetically modified organisms (GMOs) into our food supply. First let me say that research, which was exciting before we knew how to transfer DNA from one organism to another, is even more exciting now. A new understanding of cell structure and function that we could not have dreamed of as little as ten years ago is now at our finger tips. This research also has important implications for agriculture and the health sciences and if we are careful may also benefit mankind. The push for GMOs is the population explosion that will increase our population considerably by 2020. However, my reading of the situation is that we are likely to run out of water and perhaps even energy before we run out of food supplies. It is imperative that we reasses the utilization of these raw materials as well as the agricultural food supply. (see *Tough Choices* by Lester Brown and *Who Will Feed China* by Lester Brown).

My qualifications for joining the discussion are a lifelong professional interest in plant physiology, biochemistry and molecular biology. I conducted experiments in the area of nitrogen assimilation, with an emphasis in understanding the regulation of that assimilation. In addition to a standard course in plant physiology, I also taught a course in plant nutrition and the modification of plant metabolism so that agricultural plants would be more efficient suppliers of food for people and other animals. I included those aspects of genetic engineering which were important both in our understanding of plant metabolism and in the potential commercialization of that understanding. I thought then, and I still think to-day, that we are in the phase of understanding alterations of plant metabolism and that commercialization is premature.

There should be labelling of foods derived from GMOs. For example, scientists at Pioneer-hybrid transferred a gene from brazil nuts, which coded for a nutrient sufficient protein, into soybeans. They were successfull and the protein was expressed in the soybean cotyledon. As an after thought they decided to see if the allergen common to nuts had also been transferred. To there surprise it had been and to their credit the whole experiment was discarded. There are also less common allergens that individuals know about, but that the market place does not. People sensitive to these minor allergens have learned to avoid specific foods. To protect themselves from future self-experimentation they need to be forwarned of the source of genes incorporated into specific genetically engineered plants.

There also needs to be long term testing to detect allergens, toxicants that may be present in low levels and which are effective only over long periods of exposure. We could also be interfering with normal growth and development or with the immune response. These tests should be performed on several test animals and should be performed for a minimum of one generation.

We should also be including nucleotide sequences in the promoter that specify the tissue type where the new property will be encoded. For example, if the pest eats leaves, the pesticide need only be expressed in the leaves not in the whole plant. The problem with monarch butterflies and honey bees is really a red herring; a problem that need not have been had the promoter of the Bt protein been modified in such a way that the Bt protein was not made in the pollen. We know how to do this; we were just in too much of a hurry.

The companies involved in commercialization have chosen to introduce herbicide and pesticide resistant traits into select crop plants. For the past 50 years or so we have been applying herbicides and pesticides to crop plants, and there have been problems as well as benefits. Many of these problems remain unresolved: lack of specificity, toxic effects on people and the persistence of poisons in the soil. The same problems are apparent in crop plants that have been genetically modified. We should not have taken that route. We should still be working on problems of specificity and tolerance in standard field trials. In addition, it is really quite astonishing how quickly tolerance to herbicides and internal pesticide production has developed in genetically modified plants. This result suggests to me that the whole experiment with herbicides and pesticides is unwarranted.

Reports of increases in yields as a result of genetic modification are not consistent and, in fact, the results actually indicate reduced yields as often as they show increased yields. We will probably not see real increases in yield until we have improved the efficiency of photosynthesis or of nitrogen assimilation or until we have enhanced properties leading to drought resistance or salt tolerance. It is these latter processes that we should be incorporating into our transgenic plants. Assuming that we are successful in incorporating genes required, for example, to make photosynthesis more efficient, we still need health trials, health of people and the environment. For example, experiments have shown that the promoter for the cauliflower mosaic virus used in the construct to permit the foreign DNA to be recognized in the host plant may be promiscuous and could result in other viral constructs that are harmful to plants or even people. (see references in Mae-wan Ho,1997). Then there is the antibiotic resistance marker gene used to identify which cells have been transformed. We already have a problem with antibiotic resistance. I understand that other marker genes are on the horizon so this criticism will shorly be a non-criticism. However, this only emphasises my main concern and that is that there was an unnecessary haste to commercialization.

If we clone genes and use them there will be a loss of biodiversity, a loss exagerated over what we have already seen through application of North American agriculture (the green revolution) in various parts of the world. We need biodiversity to protect our food supply from epidemics such as the corn blight that devastated the corn crop in the American midwest in the 1980's.

I recommend the following references which give an important overview of the whole problem in the creation of foods from genetically modified organisms:

1) Lester R. Brown. *Tough Choices. Facing the challenges of food scarcity*. 160 pages. Worldwatch Instute. 1996

2) Lester R. Brown. *Who Will Feed China*. 163 pages. W.W Norton and Company. 1995

3) Gordon Conway. *The Doubly Green Revolution. Food for all in the twenty-first century*. 335 pages. Cornell University Press. 1997.

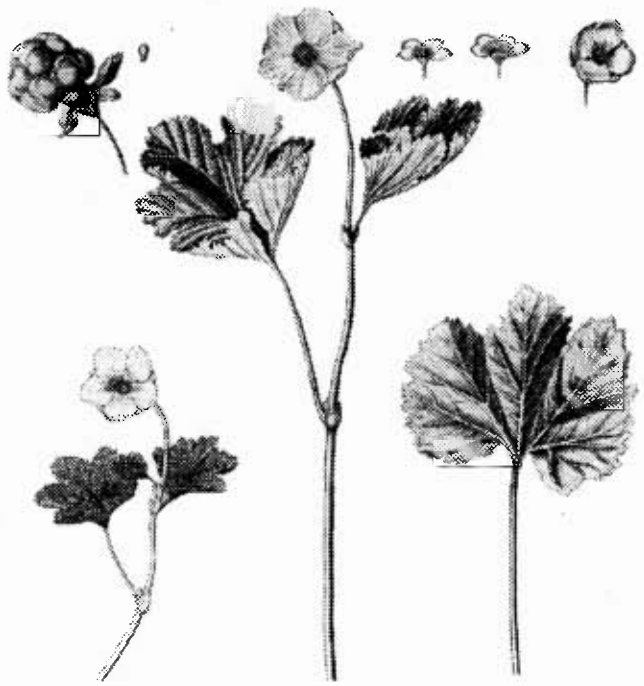
4) Mae-Wan Ho 1997, *The unholy alliance*. In The Ecologist, 27(4), 152-158.

5) Brewster Kneen. *Farmageddon. Food and the culture of biotechnology*. 229 pages New Society Publishers. 1999. (This could probably be listed as anti-GM propaganda)

6) Frances Moore Lappe et al. *World Hunger*. (Twelve myths). 254 pages. Food First, Grove Press. 1998.

7) Alan McHughen. *Pandora's Picnic Basket. The potential and hazards of genetically modified foods*. 277 pages. Oxford University Press. 2000. (I thought this was by and large pro-GM propaganda and not very sound science.)

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The StarLink Fiasco

The StarLink Corn (StarLink Corn: This) is a genetically modified corn that may improve food qualitiy in corn, however, it has a contaminant protein from the bacterial DNA-donor that is difficult to digest and as a result may induce allergic responses in humans. As a result it was approved by American authorities for animal consumption only. It has not been approved in countries outside the U.S., including Canada.

It turns out that products of the harvest designated for animal use only have not been adequately separated and have turned up in taco shells and other corn products used for human consumtion. This has lead to real problems in the U.S. where taco shells have been recalled from the distributors; where Aventis, the supplier of the GM-seed, is trying to recall all the harvest; where Kellogues, of Kellogues cornflakes, has closed two plants in Tennessee while they await results of assays designed to determine if their product has been contaminated; where grain elevators are claiming hundreds of thousands of dollars in financial losses as a result of the mix-up; where Tyson's Chickens have said they will not use StarLink products as feed for their chickens; where the Japanese have turned back at least on ship laiden with maize flour contaminated with the StarLink GM-contaminant, a shipment worth $55,000.

Although StarLink products are not legally sold as either feed or food in Canada, Canadian officials are waiting the voluntary recall by suppliers of tainted products. This is a serious breach of health regulations, which Aventis is trying to appeal. The mistake is causing finacial losses to the company, to grain elevators and to farmers which may never be recouped. It is a mistake which should not happen if we are to have both GM- and non-GM food products. It has happened before when it was discovered that non-GM canola shipped to Europe from Canada, and the U.S. was contaminated with GM-canola seed, a product that is not legally imported into countries belonging to the European union. That mistake, too, represented huge financial losses, mainly to the farmers, because the Europeans chose other suppliers who could gaurantee that their canola was GM-free.

Foods derived from GM-plants are not essential to our survival, will not solve food problems in the third world, and are not wanted by the general populace. Perhaps with this current fiasco in the U.S. with StarLink it will become apparent that GM-food products should at the very least be labelled, but preferably should not be foisted at all on an unwilling public.

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The following publications have not yet been spoken for. If you are willing to review one of these books please contact the Editor at the address indicated at the beginning of the bulletin (page 42). On request, the book you wish to review will be sent to you.

Les publications suivantes n'ont pas encore été réclamées. Si vous voulez faire la critique d'un de ces ouvrages, veuillez contacter le rédacteur du bulletin à l'adresse indiquée à la page 42.

Molecular Genetics of Plant Development
by S.H. Howell
Cambridge University Press, 1998

African Traditional Medecine - A Dictionary of Plant Use and Applications
by H. Neuwinger
Medpharn Scientific Publishers, 2000

Cultiver des plantes sauvages ... sans leur nuire

By Gisèle Lamoureux and Patrick Nantel
Fleurbec éditeur
Saint-Henri-de-Lévis (Québec) 1999
(Cdn $9.95, softcover)

(French review follows the English review)

Growing wildflowers and especially native herbaceous perennials is currently "hot" in North American gardens. Advocates of this horticultural trend claim that these species are easy to grow since they are well-suited to our climate; they also claim that growing our native beauties will increase our appreciation of them. Others see a darker side to this movement: the potential destruction of some of our rarest and most beautiful woodland flowers due to the ruthless habits of some plant collectors who dig up plants in the wild and the unscrupulous practices of some nurseries who encourage this practice. In fact, some conservationists see a parallel between this phenomenon and the quasi-disappearance of native ginseng in Quebec in the 1700's.

The authors of "Cultiver des plantes sauvages ... sans leur nuire" (translation: Growing wild plants ... without harming them) are definitely in the latter group. Their 80-page book outlines the environmental risks involved in encouraging wildflower gardening. Actually the book's title is a bit misleading: a more accurate one might be "Why we should not grow Quebec's native woodland flowers in our gardens".

The book starts with an overview of the recent horticultural interest in wildflowers, especially woodland species native to Northeastern North America such as *Trillium*, *Cypripedium* and ferns. Included is review of write-ups of wildflowers in Quebec's gardening media and a survey of species offered by nurseries in Quebec.

Chapters 2, 3 and 4 analyze the apparently widespread practice of digging up plants in the wild to supply the horticultural trade. These chapters characterize the harm this practice causes to many woodland herbaceous perennial plants. The authors consider several factors including the various species' natural rate of reproduction, the current status of wild populations, current demand by gardeners and the potential for commercial propagation by seed or vegetative means. After presenting several lists of plants, the authors settle on about 40 species which they consider the most vulnerable because of high demand by gardeners (and which are therefore more likely to be dug up in the wild), slow and low reproduction rate and the great difficulty in propagating them commercially. This list includes Trilliums, Lady's slipper, *Dicentra canadensis, Clintonia borealis*, several ferns and others.

Chapter 5 reviews the legislation - current, proposed and hoped for - as well as voluntary codes of conduct (proposed by various associations) that relate to wildflowers and their commercial uses. The authors present as an example Quebec's legislation regulating the harvest and sale of wild garlic or ramps (*Allium tricoccum*). Chapter 6 offers several recommendations concerning the collection, propagation, use and sale of native plants for and by the horticultural sector including nurseries, seed companies, garden centers, landscapers and home gardeners.

The book does a good job of shedding light on an issue largely ignored by the general public and the horticultural industry. The book is also interesting in that it clearly identifies species that stand to suffer the most from the practice of collecting plants from the wild. There are, however, a few downsides. First, the book is written in a mixture of styles which, to me, results in a lack of focus: it is part anecdotal journalism, part editorial, part literature review, part conservationist manifesto. This mix makes it difficult to identify the target audience: home gardeners? professional horticulturists? legislators? conservationists? botanists? No single group may understand or be interested in all the chapters. Indeed, chapter 4 presents mathematical models that predict population growth rates of several species; certainly over the heads of most non-scientific readers.

A second criticism has to do with the choice of format. I found having more than 30 sidebars or text boxes rather distracting. Two of them (on pages 16 and 21) are repeated almost word-for-word in the main body of the text. One quarter of the book consists of fifteen appendices which, to me, seems excessive. Appendix 5 is a list of three web sites: this could easily be

replaced by a footnote. Appendix 1 contains long lists of popular articles about, and advertisements for, wildflower gardening; this doesn't contribute much to the content of the book and could easily have been summarized in the text.

While the book points out many of the problems in propagating wildflowers, it barely discusses any existing, successful and environmentally-friendly techniques for doing so. This would be useful to ethically-minded gardeners and nursery owners who wish to cultivate native species.

The authors frequently refer to a survey of Quebec nurseries that sell native plants. Unfortunately the survey's sample size is very small (eleven responses). Also one has to wonder, when the nursery owners surveyed say they would favour legislation outlawing collection of plants from the wild, if they aren't simply giving answers the authors of the survey wanted to hear.

Despite these short comings, the book will be of definite interest to those concerned with the conservation of our native woodland plants. And at $9.95, the price is right.

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La culture des fleurs sauvages, en particulier celle des vivaces indigènes est actuellement très à la mode dans les jardins nord-américains. Les partisans de ce courant horticole prétendent que ces espèces sont bien adaptées à notre climat donc plus faciles d'entretien; ils suggèrent aussi qu'en les cultivant, le public appréciera davantage notre flore indigène. D'autres par contre, voient d'un mauvais oeil cette pratique; ils craignent plutôt une destruction de certaines de nos espèces les plus rares et les plus belles à cause des activités de certains collectionneurs de plantes sans merci et de certains pépiniéristes peu scrupuleux qui prélèvent des plantes indigènes dans nos forêts. En effet, certains écologistes y voient un parallèle avec la quasi-disparition du ginseng au Québec dans les années 1700 à cause d'une récolte intensive.

Les auteurs de "Cultiver des plantes sauvages ... sans leur nuire" se rangent derrière le deuxième groupe. Leur livre de 80 pages résume les risques écologiques encourus lorsqu'on encourage la culture commerciale des fleurs sauvages. En fait, ce livre aurait pu s'intituler "Pourquoi on ne devrait pas cultiver les plantes vivaces forestières indigènes du Québec dans nos jardins".

Le livre débute avec un résumé de l'engouement actuelle des horticulteurs pour les fleurs sauvages, en particulier les vivaces herbacées, indigènes aux milieux forestiers du nord-est du continent nord-américain. On discute en autres des *Trillium*, *Cypripedium* et fougères. On y examine l'intérêt des médias horticoles québécois et les espèces offertes par les pépinières du Québec.

Les chapitres 2, 3 et 4 analysent la pratique apparamment courante du prélèvement en milieu forestier de plantes indigènes. Ces chapitres étudient les dommages que cette pratique cause à plusieurs fleurs sauvages. Les auteurs considèrent plusieurs facteurs tels que le taux de reproduction naturel des espèces, l'état actuel des populations de ces plantes, la demande commerciale et les possibilités de multiplication par semis ou par voie végétative. Après avoir considéré plusieurs listes de plantes, les auteurs présentent une quarantaine d'espèces qu'ils considèrent les plus vulnérables à cause de la forte demande commerciale (donc susceptibles au prélèvement en nature), leur taux de reproduction faible et lente et la grande difficulté à les multiplier de façon rentable. Cette liste compte, en autres, les trilles, les sabots-de-vierge, *Dicentra canadensis*, *Clintonia borealis* et plusieurs fougères.

Le chapitre 5 passe en revue la législation (actuelle, future et espérée) ainsi que des codes d'éthique (proposées par divers associations) se rapportant aux plantes sauvages et à leur utilisation commerciale. Les auteurs apportent comme exemple la loi québécoise régissant la récolte et la vente de l'ail des bois (*Allium tricoccum*). Le chapitre 6 présente plusieurs recommandations concernant le prélèvement, la multiplication, l'utilisation et la vente de plantes indigènes pour et par le secteur horticole: pépinières, compagnies de semences, centres-jardin, paysagistes et jardiniers.

Un des points forts de ce livre est qu'il fait connaître un problème généralement ignoré par le grand public et l'industrie horticole. De plus, le livre est intéressant puisqu'il identifie clairement des espèces particulièrement vulnérables à cette pratique de prélèvements massifs de plantes en milieu forestier. Par contre, il y a quelques faiblesses à ce volume. Premièrement, le texte est rédigé dans un mélange de plusieurs styles: on y trouve reportage, polémique, revue de litérature scientifique, manifeste écologique. On ne sait plus quels sont les lecteurs visés: jardiniers? horticulteurs? politiciens? écologistes? botanistes? Il est probable qu'aucun de ceux-ci ne soit intéressé ou même capable de comprendre tous les chapitres. En effet, le chapitre 4 élabore des modèles mathématiques servant à prédire la croissance des populations de certaines espèces: sûrement pas à la portée des lecteurs non-scientifiques.

Une deuxième critique vise le format choisi. J'ai trouvé distrayant la trentaine de textes encadrés. Deux d'entre eux (pages 16 et 21) reprennent presque mot pour mot une partie du texte. Quinze annexes forment le dernier quart du livre: c'est un peu excessif à mon avis. L'annexe 5 est une liste d'exactement trois (!) sites internet: un post-scriptum aurait suffit. L'annexe 1 contient de longues listes d'articles de vulgarisation sur, et de publicités pour, les plantes sauvages: cela ne contribue pas grand

chose au contenu du livre et on aurait pu facilement résumer les points saillants ailleurs dans le texte.

Le livre repère plusieurs des problèmes avec la multiplication des fleurs indigènes. Par contre on parle à peine des méthodes existantes de multiplication rentables et respectueuses de l'environnement. Dommage, car sûrement des jardiniers et des pépiniéristes consciencieux voudraient bien les connaître.

Les auteurs citent à plusieurs reprises un sondage fait auprès de pépinières québécoises qui vendent des plantes indigènes. Malheureusement la taille de l'échantillon est très petit (onze répondants). Aussi quand des pépiniéristes se sont prononcés en faveur de lois interdisant le prélèvement de plantes indigènes en milieu naturel pour des fins commerciales, il faut se demander s'ils ne faisaient que donner la réponse que les sondeurs voulaient bien entendre.

Malgré ces lacunes, ce livre intéressera sûrement tous ceux préoccupés par la protection de nos plantes sauvages indigènes. Et avec un prix de seulement $9.95, on peut difficilement se tromper.

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British Plant Communities
Volume 5
Maritime Communities and Vegetation of Open Habitats

Edited by J.S. Rodwell
Cambridge University Press
Cambridge, 2000
(US $54.95)

This is the final volume of a series that documents Britain's National Vegetation Classification. This project began in 1975 and was to describe and phytosociologically classify "all natural, semi-natural and major artificial habitats" in Great Britain (excluding Northern Ireland). The volume begins with a detailed history of institutional and methodological contributions to this effort.

This massive quantitative survey involved field work at approximately 35 000 sites and the use of numerous previously published vegetation surveys. Vegetation was surveyed using standard quadrat sampling methods with some alterations to account for plant size and the shape of patches in challenging habitats such as cliffs and walls. While 'homogeneous patches' of vegetation were selected for the quadrat sampling, there is much treatment in the text of gradients: zonation and transitions between vegetation types and also acknowledgement that the homogeneity of any vegetation is always scale-dependent. All vascular plants, bryophytes and macrolichens were included in the quadrat sampling. Unfortunately, communities dominated by cryptogams were ommitted from the final classification.

The rest of the book is divided into four sections each identified by a major community type: salt-marsh; shingle, strand-line and sand dune; maritime cliff; open habitats. Each section has a detailed introduction that summarizes the history of research on the community type in Britain. The introductions give a flavour of the types of research questions that propelled early work, and the ways in which the emphasis has changed over the decades. The authors also discuss specific characteristics of the habitats and any challenges these traits presented to the surveyors.

The section introductions are followed by the actual community descriptions which make up the bulk of the text. The descriptions include synonymy, general physiognomy, distribution, the presence of sub-community types, a section on 'habitat' which includes physical or biotic factors thought to influence or maintain the community structure, and a section on zonation and succession (dynamics in space in time). The presence of rare plant species within each community is noted, but, unlike some North American classifications there is no framework for recognizing the rarity of community types, although there are distribution maps provided for the majority of communities described.

The sections on habitat and dynamics will likely be the most interesting to ecologists and field botanists. It is here that the authors recognize the continuity of vegetation types and the necessary fluidity of any such classification scheme. Philosophically there is a balance between typological thinking and the recognition that vegetation is dynamic. I found it refreshingly free of the dogma that characterizes some earlier phytosociological efforts and some current natural history writing. The treatment is relatively open-ended, using language that explicitly recognizes the uncertainty among ecologists about which factors actually maintain the communites in question, leaving room for future ecological work as well as improvements to the classification system. There is also ample discussion of the ways that these communities are shaped by the larger landscape context with particular emphasis on anthropogenic disturbances.

While this series would be primarily of interest to plant ecologists who work in Europe, there are several elements of this volume in particular that may appeal to a wider audience. First, there is an explicit inclusion of anthropogenic plant communities. North American ecologists have been reluctant to consider vegetation dominated by exotic species as communites in their own right, tending to regard them rather as degraded versions of native communities. The identification of consistent associations of species in habitats such as urban courtyards and walls in

Britain can help in our understanding of the maintenance of community structure in general.

North American workers will also find interesting the description of natural communities in Britain dominated by species considered to be weeds in Canada and the U.S. In many cases, the habitats to which these weedy species are native are different from the types of habitats they have colonized in their weedy range. Did you know that native *Sonchus arvensis* is a species of mobile dune habitats or *Daucus carota* a frequent dominant of sea cliffs? While invasion biologists find it difficult to predict the fate of invaders based on their habitats of origin, it is nonetheless valuable information and may be a basis for better research questions about invasion. There is also detailed treatment of British habitats dominated by species from elsewhere and the factors that might maintain this dominance.

Likewise, there are species that dominate similar habitats on both sides of the Atlantic. Many species of British scree (talus) and limestone pavement communities can also be found (at least around the Great Lakes) as natives in similar habitats in North America. It was also intriguing to read descriptions of marine cliff communities dominated by native varieties of species commonly cultivated as vegetables e.g *Brassica oleracea*, *Beta vulgaris*, and *Daucus carota*. Unfortunately, there is no mention of the economic significance of wild relatives of crops that grow in such extreme habitats.

While an exhaustive treatment of British vegetation may not be everyone's cup of tea, this volume should prove interesting to anyone involved with plant community classification and conservation or the study of biological invasions. This is a well-referenced, accessible collection of information about British plant communities and the ecological factors thought to explain their abundance, distribution and dynamics. The editor's committment to detailed discussion of ecological factors relevant to plant community maintenance makes this reference text into a valuable sourcebook for future work in ecology.

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Spatial Pattern Analysis in Plant Ecology

by Mark R.T. Dale
Cambridge Studies in Ecology
Cambridge University Press
Cambridge, 1999

The detection, quantification and interpretation of spatial patterns among plants and the scales at which these patterns occur is a subject area within plant ecology that has received much attention lately. This book, first published in 1999 in the Cambridge Studies in Ecology series and now reprinted, fills the need for a comprehensive, in-depth guide through the maze of techniques, both old and new, that are available for analyzing spatial patterns in plant communities. The book begins with a general chapter that introduces the concepts of pattern and scale and discusses the processes that cause them, illustrating them with an abundance of examples from the literature. Chapter 2 is an excellent presentation of sampling designs and techniques that are appropriate when sampling for pattern and scale. The text not only summarizes and clearly explains the various methods available, but places great emphasis on illustrating - again using abundant examples from the literature - that the most appropriate sampling method will always depend on the circumstances and on the specific hypothesis the researcher wishes to test.

The rest of the book (except the final chapter) covers analysis methods. It progresses in an organized fashion from the basic methods used to detect the pattern of one species in one dimension (Chapter 3) to the extension of these methods for analyzing patterns of two species (Chapter 4), many species (Chapter 5), or patterns in more than one dimension (Chapter 6). Chapter 7 then deals with point patterns, where the analysis is based on distances among individual plants, and Chapter 8 with patterns on environmental gradients. The methods presented in these chapters cover the whole spectrum from the older, original ones (such as blocked quadrat variance) that are mainly of historical interest, complete with the reasons why they have fallen into disuse; the ones most frequently used in current work; and cutting-edge techniques (such as those involving semivariograms, fractals, or spectral analysis) whose eventual merit remains to be proven. Each method is presented in great detail and often derived from first principles. Here, many readers of the book that are first-time users of such techniques will likely shrink from the abundance of mathematical formulas. However, despite the mathematical approach, the text remains readable, and by having well-organized subsections and frequent brief summaries within the text as well as at the end of each chapter, the author is able to retain the interest of those less mathematically inclined. Especially useful are the frequent comparisons among methods and the discussion of the relative merits and drawbacks of each. The situations where each method will perform best and, con-

versely, where certain methods will lead to erroneous results are illustrated throughout the text with a rich variety of examples, many of them from the author's own published work which has covered a wide range of plant groups, ecosystems, and approaches. At the end of each chapter, the points made in the chapter are condensed into one or several brief, numbered recommendations.

The final chapter, entitled 'Conclusions and future directions', begins with a summary of recommendations and goes on to examine the possible future directions of spatial pattern analysis, pointing out where present techniques are lacking and where future work is needed. At the back of the book, following the reference list, there is a glossary of abbreviations - an extremely useful and necessary feature, given the sometimes overwhelming number of acronyms used for the various techniques throughout the text. Also given is a list of the plant species mentioned in the text, which I found less necessary given the mainly methodolodical slant of the book.

One of the few shortcomings of the book is its surprising lack of very recent references, considering that the author himself states, in his preface, that the book 'describes material in a rapidly developing field of research'. The book was first published in 1999, but the most recent references cited are a single one dating from 1997, five from 1996, and only 15 from 1995.

While the book is intended for ecologists, conservation biologists, and vegetation scientists varying in experience level from graduate student to researcher, it is likely to be most useful for experienced users. It presents a useful overview and valuable reference work for those who have already performed some form of pattern analysis, are familiar with the mechanics of doing it, and wish to put their knowledge into context, learn more about the pros and cons of the various techniques, or find out what other techniques are available. However, inexperienced users simply picking up the book in the hope to get directions on how to get started will not get much help from this book; while intended as a methodological book, it is not a 'how-to' manual for the beginner. The equations are given in great detail but few novices are going to be able to apply these to their own data without further guidance. There is no mention of computer programs available that might be used to perform such calculations, much less sample input data, programs, or output that would guide the beginner through the steps. Nevertheless, the book achieves its objective (as stated by the author in the preface) of helping the reader 'understand the concepts and methods of spatial pattern analysis'. It is comprehensive, extremely well organized, well written, and well edited. The way in which the vast amounts of information available are clearly outlined, synthesized, summarized and finally condensed into a short paragraph of clear recommendations is one of the main reasons for the appeal of the book, which will be a useful addition to any library.

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Constance Ida MacFarlane 1904-2000

We have been informed of the death of Constance Ida MacFarlane by the co-executive of her Estate. We reproduce here the text given at the funeral and the obituary published in the National Post. Thanks to Sylvia J. Fulleton for the texts.

The following is the text given at the Memorial Service held at the King's College Chapel, Halifax NS, on June 1, 2000 (she died in Halifax on May 23, 2000).

Constance Ida MacFarlane was born in Charlottetown, P.E.I. in 1904, a daughter of the late Henry H. and Ida (Leslie) MacFarlane. She graduated from Prince of Wales College, Charlottetown (1924), Dalhousie University (B.A. 1929, M.Sc. 1931) and did post-graduate studies on marine algae at the University of Liverpool, England. She taught in schools in Prince Edward Island, Quebec and Ontario and at the Mount Allison School for Girls (1939-46), becoming its Principal. From 1946-48 she taught at the University of Alberta, where she was Dean of Women. In 1948-9, Miss MacFarlane taught at Victoria College (now the University of Victoria) in British Columbia. From 1950-70, she taught a course on Algae at Acadia University.

From 1949-70 Miss MacFarlane was Director of the Seaweeds Division of the Nova Scotia Research Foundation. She was internationally recognized for her research into the ecology and distribution of seaweeds, which was fundamental to the industrial development of seaweed in the Atlantic Provinces.

Throughout her career Miss MacFarlane considered herself primarily a teacher, whether her students were in school, fishermen, harvesters, gouvernment officials, lawyers or industrialists. She wrote "... as in the way with teaching, I also learned much from (my students)- particularly the fishermen who, of necessity, are ressourceful poeple".

She was a member of the British Phytological Society; the International Phycological Society; the Canadian Botanical Association; The Nova Scotian Institute of Science; The Canadian Nature Federation; the Ecology Action Center; the Canadian Club; the Royal Commonwealth Society; the Dalhousie Alumni Association (Honourary President and Life Member); the National Council of Women of Canada; the Heritage Canada Foundation; the Prince Edward Island Museum and Heritage Foundation (Life Member); Zonta International. Among other awards, she received the Centennial Medal and three honourary degrees - D.Sc. (Acadia); LL.D (U.P.E.I. and Dalhousie). She was predeceased by her friend, Evelyn Campbell. She is survived by her niece, Elisabeth Anderson, Montreal; her nephew, John MacFarlane-Anderson, Ottawa; many friends and students.

Constance Ida MacFarlane 1904-2000

The following is a reproduction of the obituary published in the National Post on Monday June 5, 2000
The reproduction was permitted
by the National Post.

Constance MacFarlane, Seaweed a lifelong passion for scientist

Constance MasFarlane, who has died aged 95, was a leading expert on seaweed; her research laid the foundation for a thriving industry in Nova-Scotia and other Atlantic prrovinces.

Seaweed has myriad uses, and Constance MacFarlane was one scientist who helped to classify different species in order to understand their various properties. Some seaweeds are used to bond chemical solutions that can range from salad oil to gazoline. Others can be spun into a thread that allows for the continuous machine knitting of connected socks. When the thousands of connected socks are washed at the mills, the seawwed threat disintegrates and the socks can be packaged in pairs.

And Canadians ingest seaweed everyday - as a key ingredient in toothpaste.

Constance Ida MacFarlane was born in Charlottetown on Dec. 5, 1904. The MacFarlanes were an old Island family, as were her mother's poeple, the Leslies. Her father, Henry, ran an upholstery business. He could see that his daughter was bright, and he sent her to Prince of Wales College, where she graduated with a teaching certificate.

Most women of the time went straight into teaching, but Connie, as she was always known to her familiy and friends, went on to Dalhousie University. At first she planned to study English, but she encountered Professor Hugh Bell, a scientist whose ideas convinced her she should take biology. She graduated in 1929 with Dalhousie's first honours degree in biology and was awarded the Governor General's medal as the top student in her year.

During her years at Dalhousie she made two visits to the marine biology laboratory at Wood's Hole, Mass., for research on her honours thesis on *Ascophyllum*, or rockwood, a common seaweed in Nova-Scotia.

Her work so impressed the scientist at Wood's Hole that she was awarded a Dupont Fellowship to study for a doctorate. Bur the stock market crash of 1929 reduced the amount of cash available for Dupont scholorships and she was forced to withdraw from school. She received her Master's in science in 1931, but the lack of a doctorate hindered her academic career.

For most of the 1930's, Connie MacFarlane taught science in high schools, first in Baie Comeau, Que., then at Branksome Hall, a private girl's school in Toronto. In 1939, she returned to Nova Scotia to teach at the Mount Allison School for girls.

All through this period she continued her research on seaweed, gaining recognition as a world authority. She kept up a correspondance with academics around the world, and later in her career she travelled to Scotland and Scandinavia to assist with international projects on seaweed. The Japanese, who have perhaps the greatest interest in seaweed, invited her to study for a month at the University of Kokkaido.

In 1946, she began teaching at the college level at the University of Alberta, where she was also dean of womem. Three years later, she returned to Nova-Scotia for good; there she taught a course at Acadia University and for the next 20 years and led one of the most important studies on seaweed in Canada.

In 1949, Constance MadFarlane was named director of the Seaweeds Division of the Nova Scotia Research Foundation. She retired in 1970, but continued working as a consultant to government, including the Department of Fisheries and Oceans. She was active in the National Council of women and for a time headed its environment committee.

Seaweed, for Miss MacFarlane, was more than an academic fascination. Her hobby was collecting seaweed from around the world. She bequeathed her huge collecton of dry plants specimens to the Nova Scotia Museum of Natural History in Halifax, her research and papers have gone to the Nova Scotia archives.

Constance MacFarlane was active until the last few months of her life; she died of a brain tumor. She was predeceased by her companion, Evelyn Campbell, the librarian at the Nova Scotia Research Foundation.



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