

Lichens of the Coastal Forest Chronosequences

Introduction

In 1992, the Canadian Forest Service established the Coastal Forest Chronosequence project in age sequences of coastal temperate rainforests on Southern Vancouver Island. They were established to investigate several key questions about the conversion of old-growth forests to younger seral stages. Old forests are habitat to a variety of species with small home ranges or poor dispersal capability, including lichens. Conversion of large areas may therefore result in the decline of some lichen species. A brief examination of lichens on branches from the chronosequences compares the diversity of lichens in each of the chronosequences sampled in 1995 and compares this sample to a more detailed sample series taken from a single chronosequence in 1996.

Objectives

The objectives of the study were to:

1. Determine lichen fragments on branch samples collected during an earlier nutritional study.
2. Determine the number of species present in each seral stage.
3. Determine the number of species obtained by directed sampling.

Methods

Two series of branch samples were examined for lichen species occurrence. The first collection consisted of recent-growth, mid-upper canopy branches from trees in each of the four seral stages from each of the eight sites (see Trofymow and Porter, this issue). Each of the branches was placed in a plastic bag and examined for presence of epiphytic lichens. Fragments of immigrants and juveniles were included. The species and genus names of all identifiable lichens, mosses, hepatics and obvious non-lichenized fungi were recorded with substrate species and notes. Sample identifications were verified by Irwin Brodo and Fred

Rhoades. The second collection series was a directed sample that took place in mid-October of 1996 at the Koksilah site. Lichens from canopy branches and the boles of trees were collected, with no limit to the collection site; the objective was to maximize the number of species collected from the site. Canopy sampling per se was not possible due to weather, access, and cost limitations. Samples were taken from branches that had fallen during a recent severe windstorm.

Results

In comparison to species lists for similar forest sites on Vancouver Island (Brodo and Hawksworth 1977), species diversity was low on all the branches regardless of seral stage. Young branches of early seral stages had less lichen species and individuals than similarly aged branches of older seral stages, with zero lichens on most branches. Older branches tended to have more fragments and more established lichens. This indicated that several species were missed by sampling only young portions of branches. Stone (1986) found a similar pattern of colonization by epiphyte species colonization on successively older branch whorls in Garry oak (*Quercus garryana*), with very few species on the youngest branch whorls and greater diversity on older portions of branches. Younger seral stages were similar in total number of individuals regardless of zonal (climate) differences (Figure 1), though some substrate affinity was weakly apparent in the dataset. Some species of epiphytes were more likely to occur in older seral stages than younger ones (data not shown). In all samples from the first collection sampled for nutritional analysis, the highest number of species on any one of the branches was 12.

Directed sampling for lichen diversity in the single Koksilah chronosequence indicated that lichen diversity from the larger series of branch samples taken in 1995 yielded a greater number of total species than the single directed sample of 1996, for the old-growth plot in particular (Figure 2). This

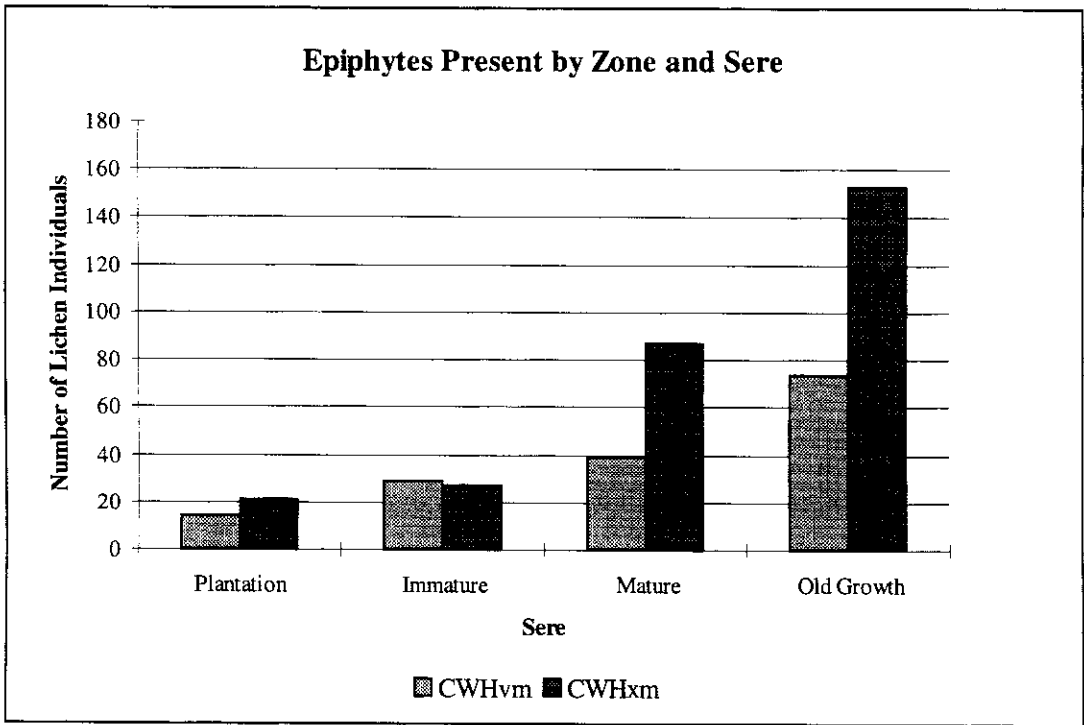


Figure 1. Number of individual epiphytes found on sample branches by biogeoclimatic zone and sere. Sampled in 1995.

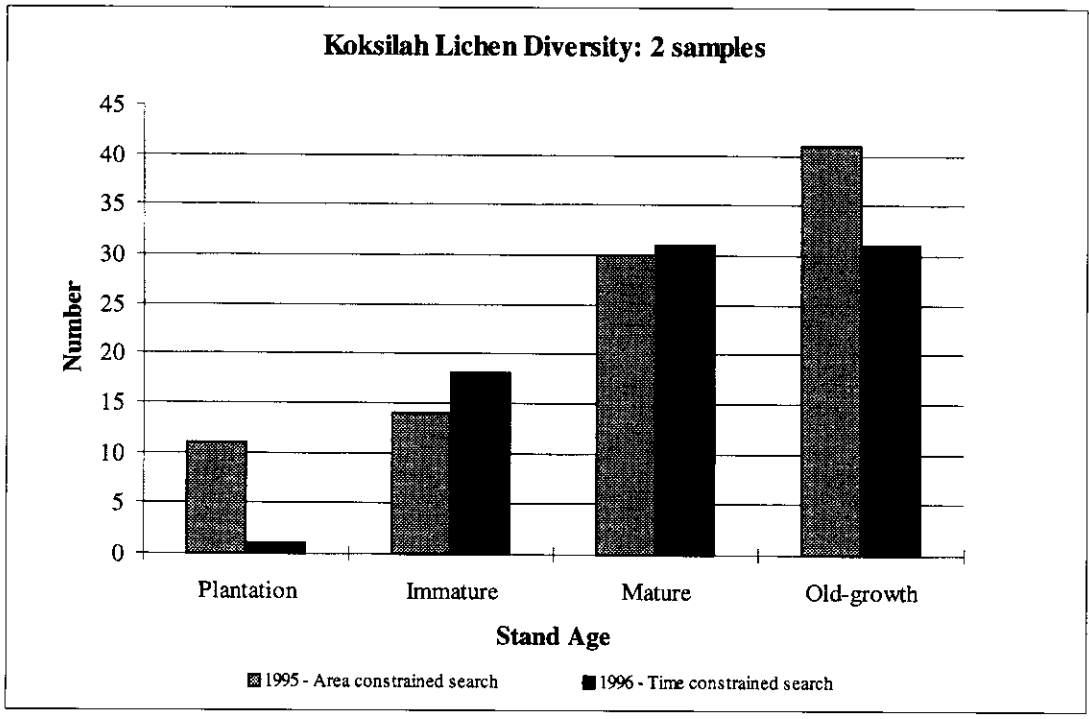


Figure 2. Lichen diversity in two sample episodes from Koksilah Chronosequence.

is a result of the sample effort as well as the maturity of the population; juveniles and immigrants accounted for several of the records in the old-growth samples taken in 1995. In the old growth at Koksilah, the branch lichens taken in 1996 from windstorm samples did not have many of the upper canopy juvenile colonies that were taken in 1995. In 1996, positive identifications were made for 32 species with identifiable mature structures, versus positive identifications for only 24 species in 1995, despite the much greater number of branches sampled in 1995.

In the immature forest at the Koksilah chronosequence, 18 windfallen upper canopy and lower-stem, foliose and crustose species of lichens were collected in 1996, whereas 12 mature species were collected from juvenile branches in 1995. Most of these mature species also occurred in the 1996 sample. The new species found in 1996 were mainly associated with lower boles of Douglas-fir (*Pseudotsuga menziesii*). For example, *Peltigera degenii* was found growing in moss in the lowest 10 cm of a large Douglas-fir trunk. *Alectoria vancouverensis*—a species given rare status (Goward 1994)—was also found in this stand. One species of branch lichen was collected in the single sample of 1996 in the ten-year-old Koksilah plantation, versus seven mature lichens species collected in 1995. This earlier sample included >50 branches in excess of the 1996 sample.

Discussion

These results indicate that there are still some species of upper canopy lichens as yet unsampled.

Literature Cited

- Brodo, I.W. and D.L. Hawksworth. 1977. *Alectoria* and allied genera in North America. *Opera Botanica* vol. 42.
- Goward, T. 1994. Rare and endangered lichens in British Columbia. In Lee E. Harding and E. McCullum (eds.) *Biodiversity in British Columbia: Our Changing environment*. Environment Canada, Canadian Wildlife Service, Ministry of Supplies and Services, Ottawa, Ontario.

Unsampled species of fairly stable upper canopy communities, consisting of crustose species growing with the macrolichens *Sticta fuliginosa* and *Sphaerophorus fragilis*, likely occur in both the mature and older forests. Lichens of the CWHvm differ in species composition from the CWHxm. Noble (1982) attributed these differences to climate, as do Brodo and Hawksworth (1988). The CWHvm is cooler and wetter than the CWHxm (Green and Klinka 1994). Stand histories and ecological matching were as close together as possible for each of the seral stages in the chronosequences, but the stand history of the plantation differs from the old seral stages in the size of the original disturbance. The plantation at Koksilah was >300 m from a source of lichen propagules, whereas sources of propagules were contiguous with each of the older seral stage edges. The question is, will the plantation eventually develop a community similar to old-growth?

Conclusions

Dispersal of immigrant species has occurred into the immature and mature forest stands, but the examination of tree epiphytes at Koksilah indicates there is a dramatic difference in species diversity and abundance between juvenile seres and older seres. Tentatively, forest harvesting that retains some Douglas-fir has a greater likelihood of continuing to support some components of the epiphytic community than conversion to western hemlock or single species, monotypic stands.

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