Youth as environmental leaders: science and education towards conservation of a rare lichen in Newfoundland

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Abstract
In 1996 the government of Newfoundland halted logging operations in Lockyers Waters, in the central Avalon peninsula, pending an environmental review of the status of the rare lichen, *Erioderma pedicellatum*. During the moratorium period that followed local conservation groups initiated a government sponsored project to study this species. A distinctive feature of this project was its reliance on unemployed young people with little or no work experience in lichenology. This paper outlines the advantages and disadvantages of recruiting young people for conservation based projects of this kind, and recommends a seven-step approach for doing so.

Keywords: lichen conservation, logging, *Erioderma pedicellatum,* community youth initiative programs, Newfoundland

1 Introduction

Erioderma pedicellatum (Fig. 1) is a rare and conspicuous foliose cyanolichen that in Newfoundland, Canada is found primarily on the trunks and branches of *Abies balsamea* and to a lesser extent *Picea mariana*. To date more than 5000 thalli have been documented in this province. By contrast, only a few thalli are known to exist outside of Newfoundland, all of which occur in Nova Scotia and coastal Norway (MAASS 1980; HOLIEN *et al.* 1995).

It is widely held that clear cutting constitutes a significant threat to *Erioderma pedicellatum* in most portions of its range (MAASS 1980; RINGIUS 1997). In Norway, for example, logging has been shown to affect this species both directly, by removing suitable substrate and indirectly, by affecting microclimatic conditions in adjacent sites (http://www.toyen.uio.no/botanisk/bot-mus/lav/factshts/eriopedi.htm). In Sweden too, several hundreds of thalli were found to disappear in standing forests adjacent to clear cuts. (AHINER 1954; JØRGENSON 1990). Likewise both commercial and domestic cutting have been implicated in the loss of *Erioderma* from New Brunswick (MAASS 1980).

In Newfoundland, increasing demands for wood products and the impact on pristine forest areas has long been a concern for local citizens. This is especially true on the Avalon peninsula. In 1996 a forest ecosystem management consultation process began to address these concerns and work toward sustainable forest management. At the same time it was revealed that the Department of Forest Resources intended to build a logging access road into the central Avalon region known as Lockyers Waters. Simultaneous with this announcement local conservationists became aware of the presence of a globally rare lichen, *Erioderma pedicellatum* in the area. The Newfoundland government responded by halting logging in Lockyers Waters until such time as a detailed status report on the species could be completed. This lead to the development of two successful proposals in 1997 and 1999 to study the population dynamics of this species. Both were funded by Youth Services Canada, a division of Human Resources Development of Canada.

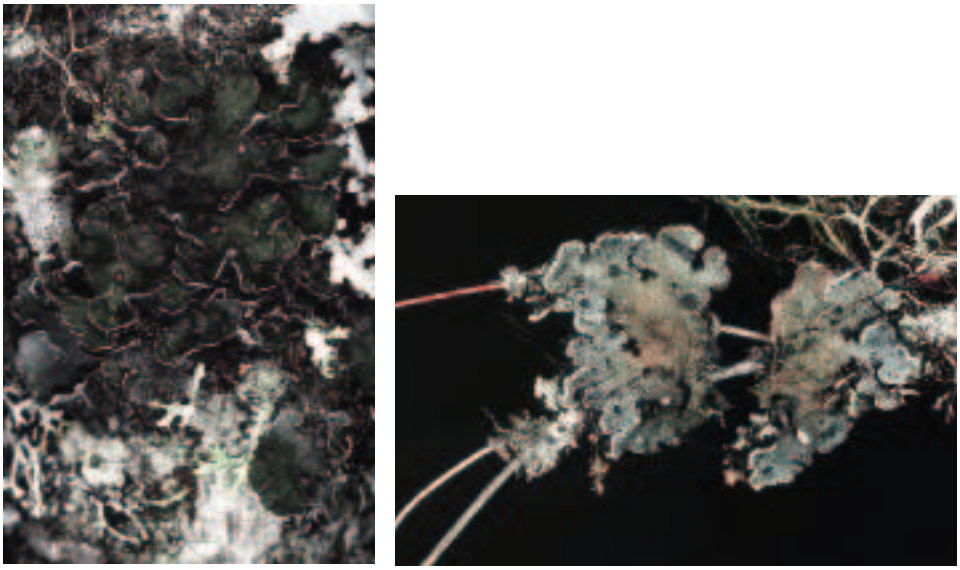

Fig. 1. *Erioderma pedicellatum* from Newfoundland on a trunk (left) and branch (right) illustrating the eye catching appearance of the species.

Fig. 2. A participant from the Youth Services Canada project of 1999 inspecting an *Erioderma* (between red falf tape) individual for the presence of necrosis and slug damage.

This paper has three objectives. The first objective is to describe a lichen conservation project conducted in 1999. A second objective is to present a seven-step approach using community youth programs for the furtherment of lichen conservation. And the third objective is to discuss the advantages and disadvantages of using local youth in conservation studies.

2 The *Erioderma* research project: investment in longterm research

Brief history

In the spring of 1999 the Newfoundland Lichen Education Group submitted a proposal to Youth Services Canada to study *Erioderma* at Lockyers Waters. The youth employment criterion stipulated that post secondary students could not be selected. Project participants were to include high school dropouts and young people struggling to find employment. The possibility of training such a group in ecological field research offered an interesting challenge. Upon approval of the proposal, 14 young people aged 19–27 were hired from surrounding communities (Fig. 2). A biologist from the Memorial University of Newfoundland (the author) was hired as research coordinator and supervisor of the young field crew.

Project components

A Instruction in lichenology

Initially, for a two week period, formal lectures on lichen terminology and concepts were presented to participants. These lectures were combined with short field trips to enhance understanding of lichen biology. Discussion of certain topics was generated when presented in a general way, such as the impacts of logging on diversity. At the end of the lichen biology lectures, a short oral exam was administered to assess the level of understanding reached.

B Field training

A four week period was used to instruct youth participants on the methodology used in the study. This included one week of lectures designed to enhance understanding of ecological methodology, which partly involved explaining the scientific method and its purpose. Three weeks were then set aside to demonstrate these principles in the field, allowing abundant practice time to accommodate for lack of previous experience.

C Data collection

A two-month period of data accumulation ensued, following the methods briefly outlined below. Participants measured and recorded data on their own and the research supervisor did random daily checks to ensure accuracy in recorded data and to provide encouragement and support. If data were substandard, the supervisor would demonstrate the techniques and the procedure would be redone.

Population and forest dynamics

Several methods were developed in accordance with a previous study (McHUGH 1998), including measuring the length and width (in mm) of the thalli. Secondly, the percentage of necrosis and outer cortex damage from invertebrate browsing was included. This factor has been important in monitoring for changes in thallus health since the initial discovery in 1996. An attempt was also made to determine the percentage of loose thalli, as well as the number of thalli that had disappeared since 1996. Finally the frequency of trees within different age classes was recorded.

In order to investigate forest stand dynamics, several measurements relating to tree density were conducted. These included the number of trees in a two meter radius around any tree supporting *Erioderma* thalli. Other variables included tree height, diameter at breast height, the nearest tree neighbour, chronological age, developmental class (young, mature, overmature, dead), and percent canopy cover. The nearest distance to a forest gap was also measured.

Transplant experiments

Participants also conducted two trial *Erioderma* transplants in Lockyers Waters each involving a single thallus segment. The transplant methodology used was modified from SCHEIDEGGER (1995a, 1995b, 1998a) and HALLINGBÄCK (1990). Transplanting involved placing the segment of thallus securely onto a piece of surgical gauze 8 mm in diameter, and stapling it to a tree.

3 A seven-step approach to lichen conservation

Lichen conservation can extend beyond the level of pure science by including local community resources in the conservation of a rare species. Here a seven-step approach is presented that focuses on lichen conservation biology using community-based, youth initiative programs. This model can be adapted to other disciplines for the local, regional, or national development of conservation programs.

1. **Identifying a conservation priority**
   Identifying a conservation priority can transpire from a resource management plan, from a previous scientific study, or identification by an expert in the particular field. The conservation priority may be on a landscape scale (forest habitat- old growth forest), or localized such as an uncommon species with endangered or rare status.
2. **Create a context for support**
   Inspiration from a determined individual is necessary; otherwise the rare species is an unrecognized component of an ecosystem. For educational reasons this may involve the formation of a group or committee to accelerate regional awareness of the species and proposal response from agencies. The Newfoundland Lichen Education Group was partly formed for this reason.
3. **Create partners for long-term conservation**
   Maximizing set goals requires the cooperation of several partners. Cooperation between partners provides added weight to applications/proposals. Six partners are involved in the study and conservation of *Erioderma pedicellatum* in Lockyers Waters. They are the Memorial University of Newfoundland, the Newfoundland Lichen Education Group, Parks and Natural Areas, the government of Newfoundland, the Department of Forest Resources and Agrifoods, Newfoundland Wildlife and Inland Fish Division, and Human Resources Development of Canada.
4. **Target appropriate (and "inappropriate") funding agencies**
   Innovation during selection of funding agencies can lead to positive results, namely financial support. Diversify the selection process by including not only the appropriate funding agencies, but also municipal councils, volunteer based cooperative groups, community youth initiative programs and even local schools. Many research proposals can be modified to incorporate the specific requirements of these funding agencies.

5. **Incorporate benefits to participants**
   The protection and promotion of the rare species is a definitive priority. However, the interests of the young people are equally important. A proposal must reflect the needs of the young people in giving them the skills associated with studying a rare species, and the motivation to be confident about their own abilities. The knowledge they then gain from their conservation experience will protect the species indirectly when they educate others about its existence and status.
6. **Establish media coverage**
   During youth initiative programs several opportunities arise for media coverage. Youth program magazines and newsletters are distributed nationally and summarize both successful and unique programs. The increased media available from the particular funding agencies chosen, such as monthly newsletters, magazines, and television coverage can enhance the awareness of a rare species. *Erioderma pedicellatum* only exists in Lockyers Waters today owing to the widespread media attention in the mid 90's.
7. **Undertake public education**
   Youth programs can incorporate educational presentations describing the content of their research, their experiences in conservation, and the life history of the rare species. These presentations can be geared to a wide audience ranging from elementary, junior, and senior highschools, to the general public and to university faculty members. If interest is generated, then biomonitoring programs can be developed to monitor the continuity of the forest ecosystem or rare species over time.

4 Discussion

Community youth initiative programs are transdisciplinary and offer a dual benefit to community and youth participants (BARTON *et al.* 1997; FINN and CHECKOWAY 1998). By their nature, these programs train youth work-oriented skills and offer short- or long-term tangible benefits for communities. With growing concern for and changing attitudes towards the environment (GLINSKI 1994; LYON and BREAKWELL 1994; SZAGUN and PAVLOV 1995), communities can harness the vibrant energies of youth in conservation projects. Young people can play key roles in long-term research projects that centre around local environments.

There are several advantages that arise from community youth projects. First, with proper supervision from a scientist, young people can be trained to accurately measure and record large amounts of ecological data. The work ethic and enthusiasm of young participants may also allow for more than one hypothesis to be tested in a project. Learning about the scientific method and its purpose may increase youth awareness of the environment (LYON and BREAKWELL 1994). Young people can effectively learn about the natural world around them through environmental and scientific work and work related tasks (KLEINBARD 1983). At the end of the *Erioderma* project the participating young people could identify, using Latin nomenclature, seven epiphytic lichen species!

The second advantage is that, youth initiative programs can be an important component in establishing base-line data of a particular rare or endangered species. For lichens base-line data is one of the initial steps in the long-term conservation of the species (DIETRICH and SCHEIDEGGER 1997; GOWARD *et al.* 1998). In Newfoundland there is little known about lichens and there has been minimal study of lichen flora in general (AHTI 1983). During the summer of 1999, the Youth Services Canada project team collected crustose lichens representative of the central Avalon region and produced a mini herbarium, now deposited at the

Newfoundland Museum. An extensive sampling regime was made possible because of the large number of participants involved. Further projects such as the 1999 project could yield large amounts of information on lichen flora and perhaps begin the process of developing the first thorough lichen flora manual of Newfoundland, and eventually a Red List of species.

Third, young people can educate others about their research experience. Youth educational programs have a team philosophy exposing participants to social interaction, working partnerships, and co-leadership. The professionalism and confidence that young people gain from developing formal presentations for specific audiences is remarkable. Prior to the *Erioderma* project, none of the participants had taken part in a formal presentation, yet by the time the project came to an end some were contemplating teaching careers!

Fourth, youth projects that involve educational components can encourage further spin-off projects run by volunteer organizations or schools. After educational presentations during the *Erioderma* project, one local school developed an *Erioderma pedicellatum* web site (http://www.stellar.nf.ca/1997-1998/district9/rchs3.html) intended not only to inform but also to update the general public on changes in science and local politics concerning the species. Other junior school students have taken part in major science projects involving anthropogenic disturbance and its effects on *Erioderma* populations. Public monitoring programs would be beneficial to sensitive cyanolichen species (HALLINGBÄCK 1991) that are dwindling in the face of increasing SO_2 pollution in Newfoundland (MAASS 1999; WADLEY and BLAKE 1999) and globally (WOLSELEY 1995; KASIWADAD and KUROKAWA 1995).

There are however, also several notable disadvantages with these youth programs. To begin with projects with many participants introduce the possibility that habitats may be damaged by trampling. The continuous pressure of walking in an old growth forest habitat, for example, can damage forest floor bryophytes that aid moisture retention in these forest ecosystems. It is therefore important to balance the number of project workers against the capacity of an ecosystem to withstand disturbance.

A second disadvantage for the scientist is the added workload involved in such projects. Considerable time is needed to teach young people the fundamental skills of lichenological research and its associated theory. This adds to the already heavy schedules of most scientists. In the *Erioderma* project of 1999, the entire instructional phase required two weeks. An additional month was needed to train the participants in data collecting techniques and ecological measurement in the field. Project proposals and research methodology should reflect a realistic balance between how much time scientists can give and how much time funding agencies allot for the completion of project objectives.

5 Conclusion

Community youth initiative programs, such as those provided by Youth Services Canada, have a potential to benefit lichen conservation. Accurate and large amounts of data can be collected if structured around a simple, coherent and beneficial scientific study. Such programs can enhance the conservation of a species and lichenology in general. Second, the presentation component of youth projects can contribute to the conservation of the species by raising awareness through education. Volunteer programs and secondary projects may be initiated if educational programs are presented to a wide audience, ranging from junior high school, government and non-government organizations to university groups. Notwithstanding several disadvantages arising from youth programs, careful planning at the proposal phase can eliminate most. The benefits of community youth programs such as developing the skills,

confidence, and leadership qualities of participants and contributing to the conservation of the species strongly outweigh the negative components of the extra workload for researchers and possible impact on habitat.

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