

**COSEWIC**  
**Assessment and Update Status Report**

on the  
**Seaside Bone**  
*Hypogymnia heterophylla*

in Canada



**THREATENED**  
**2008**

**COSEWIC**  
Committee on the Status  
of Endangered Wildlife  
in Canada



**COSEPAC**  
Comité sur la situation  
des espèces en péril  
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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## COSEWIC Assessment Summary

### Assessment Summary – April 2008

**Common name**

Seaside bone

**Scientific name**

*Hypogymnia heterophylla*

**Status**

Threatened

**Reason for designation**

This lichen is endemic to the Pacific Coast of North America, and southwest Vancouver Island represents the northern limit of its range. The species' survival depends on early to intermediate seral shore pine forests along the sea coast. The populations appear to be stable, but have a restricted occurrence and the species is known from only four locations. Severe winter storms, which are anticipated to increase, are the main threat to the species.

**Occurrence**

British Columbia

**Status history**

Designated Special Concern in April 1996. Status re-examined and designated Threatened in April 2008. Last assessment based on an update status report.



## COSEWIC Executive Summary

### Seaside Bone *Hypogymnia heterophylla*

#### Species information

*Hypogymnia heterophylla* L. Pike, seaside bone lichen, is a member of the lichen family Parmeliaceae. This foliose species has a medium sized thallus, 5-8 cm in diameter, with narrow lobes that support long, narrow lobules that are perpendicular to the lobe margins; these lobules are a distinctive feature of this lichen.

#### Distribution

The global distribution of the North American endemic species *Hypogymnia heterophylla* is along the Pacific coast from the southern tip of Vancouver Island in the north to Puget Sound in Washington and the outer Pacific coast south through Oregon and California to the Santa Barbara/Los Angeles/Channel Islands coastal regions. In Canada, *H. heterophylla* is known from four coastal locations at the southwest tip of Vancouver Island.

#### Habitat

*Hypogymnia heterophylla* is found in the driest sub-zone of the Coastal Western Hemlock biogeoclimatic zone. Locations where *H. heterophylla* occurs are typically coastal ledges at low elevation with high solar radiation, strong west-southwesterly winds, moderate precipitation and high humidity. Preferred habitat for *H. heterophylla* is coastal early to intermediate shore pine (*Pinus contorta* var. *contorta*) seaside stands. Marine aerosols from salt water spray may be a habitat requirements for this species.

#### Biology

Asexual reproduction in *Hypogymnia heterophylla* may occur by fragmentation of the lateral lobules that are perpendicular to the branch and by the production of conidiospores that act as asexual spores. Sexual reproduction in *H. heterophylla* must take place by the dispersal of sexually produced fungal ascospores that must capture compatible *Trebouxia* green algal cells before growth takes place.

## **Population sizes and trends**

Ten subpopulations of *Hypogymnia heterophylla* were found at four locations on the southwest tip of Vancouver Island: East Sooke Regional Park, Bentinck Island and Sheringham Point. The total number of thalli estimated is likely greater than 1000. Lichen populations most likely remain stable in these locations.

Herbarium database searches at the University of British Columbia (UBC) and the British Columbia Conservation Data Centre (CDC) indicate no collection of *H. heterophylla* has been accessioned after 1996, indicating that recent non-targeted collections have not contained *H. heterophylla* or collections may not have been accessioned.

## **Limiting factors and threats**

The primary factors limiting the dispersal and spread of *Hypogymnia heterophylla* are the necessity of early seral shore pine habitats located on rocky windswept ledges with southwest to western aspects. Damage caused by winter storms appears to be the major threat.

## **Special significance of the species**

*Hypogymnia heterophylla* is an endemic species in North America and its restricted occurrence in Canada is at the northern limit of its range. This epiphytic species is restricted to the Pacific Northwest coastal areas of North America.

## **Existing protection or other status designations**

*Hypogymnia heterophylla* was designated a species of Special Concern by COSEWIC in 1996. Parks and federally owned land protect the existing locations on the southwest tip of Vancouver Island where *H. heterophylla* is found. British Columbia ranks *H. heterophylla* as S1 indicating that occurrences are tracked. Washington (S3) tracks *H. heterophylla* while Oregon (SNR) and California (SNR) have not ranked this species.



### COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

### COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

### COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

### DEFINITIONS (2008)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

\* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

\*\* Formerly described as "Not In Any Category", or "No Designation Required."

\*\*\* Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

**Update  
COSEWIC Status Report**

on the

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## TABLE OF CONTENTS

SPECIES INFORMATION.....	3
Name and classification.....	3
Family classification.....	3
Morphological description.....	3
Genetic description.....	4
DISTRIBUTION.....	4
Global range.....	4
Canadian range.....	4
Designatable units.....	7
HABITAT.....	7
Habitat requirements.....	7
Habitat trends.....	8
Habitat protection/ownership.....	8
BIOLOGY.....	9
Life cycle and reproduction.....	9
Physiology.....	9
Dispersal/migration.....	9
Interspecific interactions.....	10
Adaptability.....	10
POPULATIONS SIZES AND TRENDS.....	10
Search effort.....	10
Abundance.....	11
Fluctuations and trends.....	12
Rescue effect.....	12
LIMITING FACTORS AND THREATS.....	12
SPECIAL SIGNIFICANCE OF THE SPECIES.....	13
EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS.....	13
TECHNICAL SUMMARY.....	14
ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED.....	16
Authorities contacted.....	16
INFORMATION SOURCES.....	17
BIOGRAPHICAL SUMMARY OF REPORT WRITER.....	18
COLLECTIONS EXAMINED.....	18

### List of figures

Figure 1. Photograph of the lichen <i>Hypogymnia heterophylla</i> .....	3
Figure 2. The global distribution of <i>Hypogymnia heterophylla</i> .....	5
Figure 3. The distribution of <i>Hypogymnia heterophylla</i> in Canada.....	6
Figure 4. Non-targeted search effort for lichens in British Columbia.....	11

### List of appendices

Appendix 1. Canadian populations and abundance of <i>Hypogymnia heterophylla</i> that were reported in the status report (Goward 1996) and surveyed during field work conducted in 2006.....	20
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## SPECIES INFORMATION

### Name and classification

Scientific name: *Hypogymnia heterophylla* L. Pike  
Mycotaxon XVI: 157-161 (1982), Figure 1

The common name is seaside bone lichen or seaside tube lichen (Brodo *et al.* 2001).



Figure 1. Photograph of the lichen *Hypogymnia heterophylla* (photo: Stephen Sharnoff).

### Family classification

The genus *Hypogymnia* has been included in the Parmeliaceae. However, Poelt (1974) suggested that it may be sufficiently distinct from other members of that family to warrant separate family status. Later he appears to have reversed this opinion in favour of assigning *Hypogymnia* a subfamily rank within the Parmeliaceae (Eriksson 1982). His original proposal was taken up (and validated) by Elix (1979). More recently, Tehler (1996), mainly based on the outline of ascomycete systematics of Eriksson and Hawksworth (1993), has placed the genus *Hypogymnia* in the family Parmeliaceae. The specific distinctness of *H. heterophylla* has not been challenged since its description (Goward 1996a).

### Morphological description

*Hypogymnia heterophylla* is a foliose (leaf) lichen averaging 5-8 cm across the thallus or lichen body. The inflated lobes or branches are hollow, pliable and variable in width from 1-6 mm, often on the same lobe; the lobes are typically fork-branched at the ends with long, narrow lobules that are perpendicular to the lobe margins and

constricted at the base. The greenish grey upper surface usually has the black dots of numerous pycnidia or sacks that contain conidiospores. The lower surface is black, shiny and wrinkled. The medullary cavity or inside of the hollow lobe is dark brown throughout. *Trebouxia* is the green alga or photobiont partner of this lichen. Soredia and isidia are absent.

Apothecia or fruiting bodies are common in this species, up to 8 mm across, and are raised on short broad stalks. The apothecial disc is brown with spores 8 per ascus, colourless, somewhat elongate, and about 4 µm x 7 µm. Pycnidia contain conidiospores which act as asexual spores and sometimes serve as male sexual cells (spermatia) (Brodo *et al.* 2001).

Technical descriptions and chemistry are described in Pike & Hale (1982), Goward *et al.* (1994), McCune & Geiser (1997) and Brodo *et al.* (2001).

Important diagnostic features of this lichen are:

- long, narrow lobules that are perpendicular to the lobe or branch and are constricted at the base
- medulla or inside of lobe is dark brown
- lichen medulla chemical spot test is PD+ red

### **Genetic description**

GenBank 2006, the comprehensive database for species' DNA sequences, has no records for *Hypogymnia heterophylla*.

## **DISTRIBUTION**

### **Global range**

*Hypogymnia heterophylla* is endemic to the Pacific coast of North America from California to the southern tip of Vancouver Island, British Columbia (Figure 2). Since the 1996 status report (Goward 1996a), its latitudinal range now includes the state of Washington, with six occurrences in the Puget Sound region (Glew pers. comm. 2007). Many occurrences are reported for coastal regions of Oregon and California as far south as Los Angeles/Santa Barbara (Glavich *et al.* 2005, OSU, SBBG herbaria databases).

### **Canadian range**

*Hypogymnia heterophylla*, first found in Canada in 1991, is at the northern edge of its range in Canada (Goward 1996b). It has a distinctly restricted distribution (Figure 3) and ecology. The four known locations where it occurs are at the southwest tip of Vancouver Island in East Sooke Regional Park, Bentinck Island and Sheringham Point. These sites lie northwest across the Strait of Georgia/Juan de Fuca Strait from the Puget Sound occurrences in Washington State.

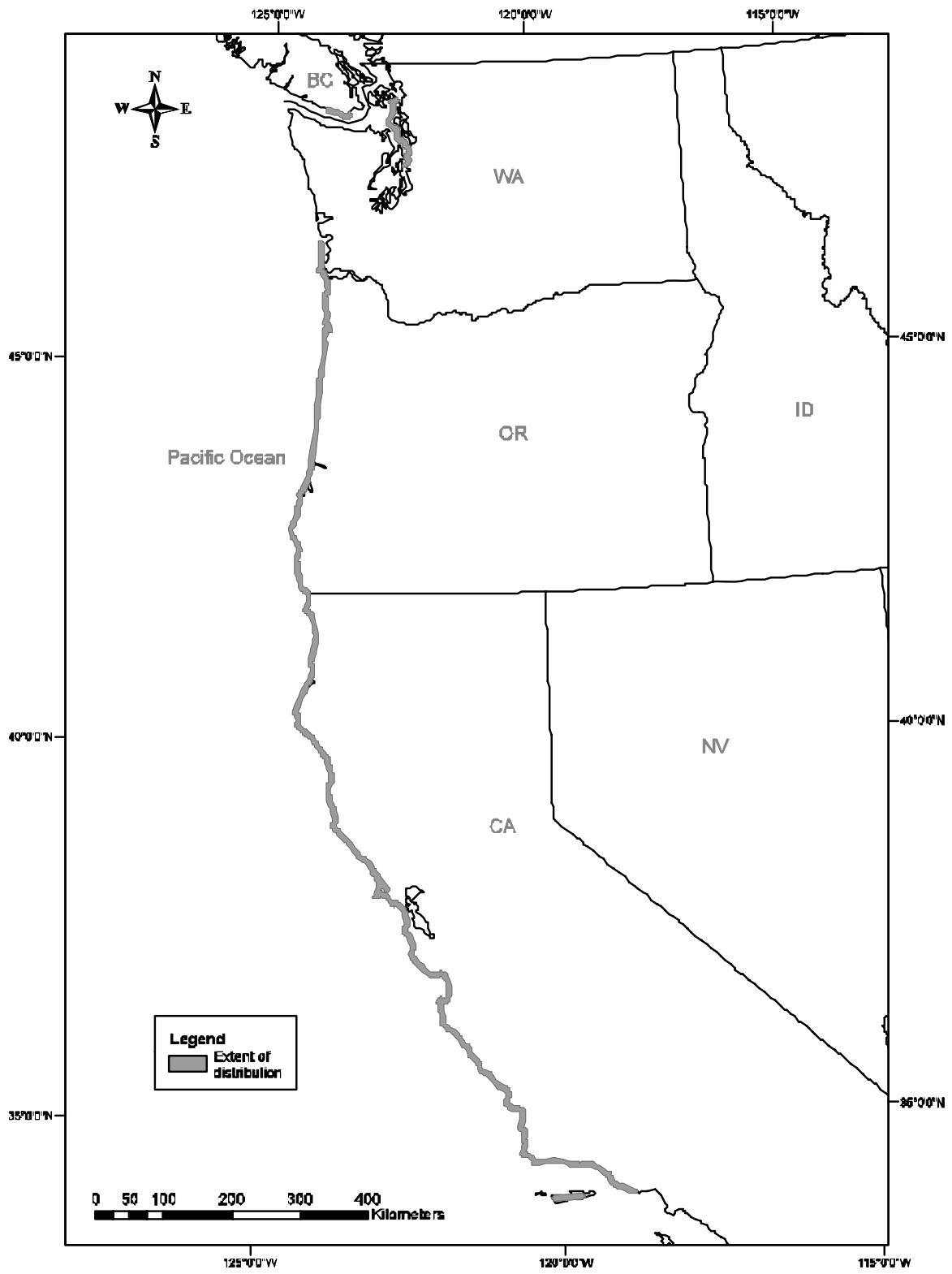


Figure 2. The global distribution of *Hypogymnia heterophylla*.

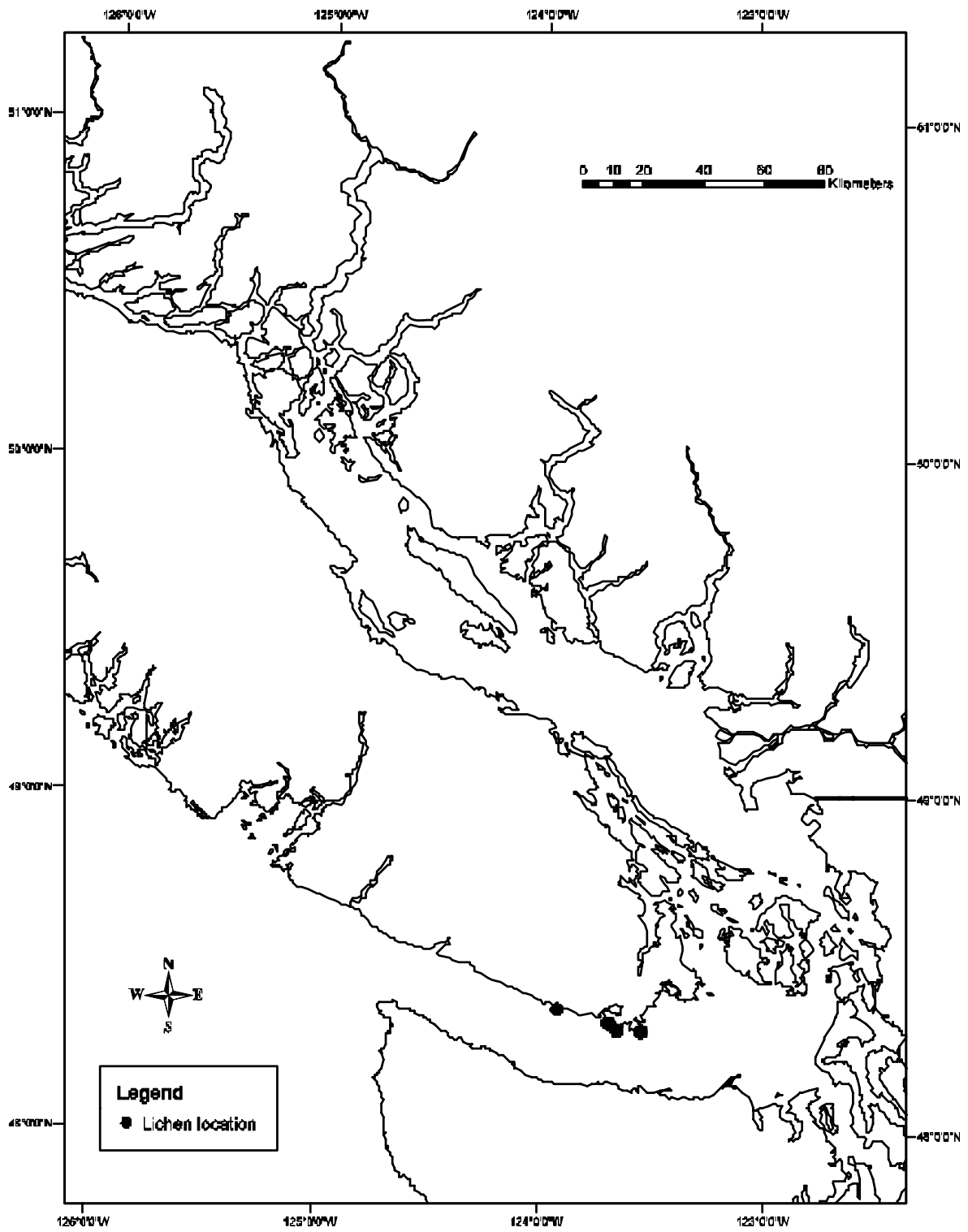


Figure 3. The distribution of *Hypogymnia heterophylla* in Canada.

All four locations of *Hypogymnia heterophylla* are within 100 m of the ocean coast in exposed, windswept, open shore pine forests.

### **Designatable units**

Only a single designatable unit is recognized since all of the populations occur within relatively restricted shoreline stretches within a single COSEWIC National Ecological Area.

## **HABITAT**

### **Habitat requirements**

*Hypogymnia heterophylla* is restricted to the branches and terminal twigs of conifers, especially shore pine (*Pinus contorta* var. *contorta*) in exposed seaside habitats along the northwest Pacific coast. *H. heterophylla* occupies the driest subzones of the Coastal Western Hemlock Zone of the British Columbia Biogeoclimatic Ecosystem Classification System (Meidinger & Pojar 1991), in a region of rainshadow-induced Mediterranean climate. In Canada, this species appears to be restricted to younger forest stands and may therefore be indirectly dependent on early seral forest attributes. Its distribution, for the most part, may further be controlled by a requirement for salts associated with sea spray (Goward 1996). Other lichens are similar, for instance, Glavich (2003) speculates that the epiphytic species *Bryoria pseudocapillaris* and *B. spiralis* may be dependent on oceanic salts because they are only found in locations in close proximity to the coastline in the Pacific Northwest.

The climate in the region of Vancouver Island in which the four locations containing *Hypogymnia heterophylla* were found can be characterized as oceanic. The Sheringham Point weather station, located approximately 8 km west of the Sooke area, reported a mean annual temperature of 10.4°C, mean December minimum temperature of 3.7°C, extreme minimum temperature of -3.5°C, mean maximum August temperature is 17.9°C and extreme maximum temperature is 29.8 ° C (1996–2004) (Environment Canada 2006).

Though actual data are lacking, the microsites colonized by *Hypogymnia heterophylla* are expected to have a distinct thermal profile due to their locations along the outer coast and are subject to a strong moderating influence from the adjacent ocean. In addition, Coxson *et al.* (1984) demonstrated that thallus temperatures in *Hypogymnia* (specifically *H. physodes* (L.) Nyl.) exposed to full sunlight are much higher than adjacent air temperatures, notwithstanding strong convective wind cooling. Because *H. heterophylla* occurs primarily in rather exposed, well-illuminated sites, elevated temperatures must constitute an important part of its operating environment (Goward 1996).

Precipitation occurs predominantly in the winter months between October and March with the mean annual precipitation of 96 cm at the Sheringham Point weather

station (Environment Canada 2006). Drought conditions often occur in the summer months with the extreme monthly minimum rainfall of 1.6 mm in August 2002. In nearby Washington state, *Hypogymnia heterophylla* is limited to the Puget Sound area in the rain shadow of the Olympic Mountains; here, as in British Columbia, humidity and summer fog likely help to offset low rainfall in the summer to allow limited growth in morning and evening. Under such conditions, *H. heterophylla* grows mainly in the winter months when temperatures and solar radiation are lower and precipitation occurs. Also, early spring is conducive to spore germination on the growing twigs of shore pine where there is no competition from other lichens for space. Shore pine can tolerate the summer drought and extreme conditions of the coastal habitat where other coastal tree species require year round precipitation. Fire does not appear to be a critical factor in the coastal shore pine communities in Canada where *H. heterophylla* is found.

Wind data are not available from Sheringham Point weather station; at Gonzales Heights in Victoria, prevailing winds are from the southwest and west-southwest throughout the year and secondarily from the north and northeast in winter (Environment Canada 1975). Conditions are calm only 3% of the time, so the desiccating effects of wind on *Hypogymnia heterophylla* may be a physiological advantage in maintaining the wetting and drying cycle required by this and other lichens (Goward 1996; Kershaw 1985; Nash 1996).

### **Habitat trends**

*Hypogymnia heterophylla* occurs on primarily rocky, windswept ledges, predominantly southwest to west facing in early to intermediate seral shore pine (*Pinus contorta*) forests. Shore pine trees in these locations are somewhat stunted and prone to branch destruction and damage from offshore winds and winter storms. The severe winter storms of 2006/2007 blew down several individual trees in East Sooke Regional Park (J. Miskelly, pers. comm. 2007). As part of storm clean-up, all downed vegetation will be left on site, so any *Hypogymnia heterophylla* on trees damaged in the storms, could be viable for a limited time.

*Hypogymnia heterophylla* occurs in Washington, Oregon and California as far south as the Los Angeles/Santa Barbara/Channel Islands area at favourable windswept sites in close proximity to the coast (Figure 2). This is one of few epiphytic macrolichens specifically tied to localities in close proximity to the outer coast. Its colonization of southern Vancouver Island from the islands of Puget Sound was probably effected via spores being transported northward either by wind or by migratory birds (Bailey & James 1979; M. Raymond, pers comm. 2006). Potential habitat for *H. heterophylla* would be restricted to the Gulf Islands in the Strait of Georgia and southern, coastal Vancouver Island.

### **Habitat protection/ownership**

East Sooke Regional Park is part of the Capital Region District's parks system. The 'Park' designation ensures the habitat will not be intentionally violated but inadvertent

damage could occur due to the passage of hikers, cyclists and dogs along trails through the shore pine stands. *Hypogymnia heterophylla* on Bentinck Island is potentially in danger of being damaged or eradicated due to Department of National Defence (DND) use of the island for demolitions; the DND liaison person with Environment Canada is aware of the locations of *H. heterophylla* (A. Robinson, pers comm. 2006).

At Sheringham Point the habitat is on a steep cliff and thus well protected from hikers, cyclists and dogs. The area is currently owned by Fisheries and Oceans Canada, which operates a navigation light at the point of land. There are no plans to alter the *Hypogymnia heterophylla* habitat on trees along the coast (N. Taylor, pers. comm. 2007).

## BIOLOGY

### Life cycle and reproduction

Lichens are dual organisms and reproduction in *Hypogymnia heterophylla* involves the necessity of pairing a fungal ascospore or fungal hypha with the compatible *Trebouxia* green alga. Asexual reproduction is effected by fragmentation of the long, narrow perpendicular lobules; the fungus and alga are “in place” in the lobule, which acts as a vegetative propagule. The abundant pycnidia on *H. heterophylla*'s upper lobe surface produce mitotic spores or conidiospores that when freed must find compatible *Trebouxia* alga in order to initiate growth of a lichen thallus. Apothecia are fairly common on *H. heterophylla* and sexual reproduction of a fungal ascospore resynthesizing with a *Trebouxia* alga most likely often occurs. Compatible *Trebouxia* alga partners appear to be readily available on the shore pine twigs through intact thalli of *H. heterophylla*, intact thalli of other lichens in the same habitat or as free-living algae from decaying lichens.

In this coastal habitat, nutrient enrichment associated with sea spray may favour *Hypogymnia heterophylla* by, for example, controlling the availability of suitable external algal partners. This suggestion seems consistent with this species' habitual occurrence on small terminal twigs, which are presumably highly exposed to sea spray, but only moderately exposed to acidification from rain-carried leachates from the middle and upper canopy (Barkman 1958; Goward 1996).

### Physiology

Specific physiological studies have not been conducted on *Hypogymnia heterophylla*. In Canada this species is a seaside epiphyte of exposed areas of the Pacific coast. In such exposed habitats, it is inferred that this lichen can withstand strong winds, high solar radiation, high humidity and salt spray.

### Dispersal/migration

Lichen diaspores, including conidiospores, may be dispersed in three different ways: by wind, by water, and by animals (Bailey 1976). It is likely that all three mechanisms

operate to different degrees in dispersing the spores of *Hypogymnia heterophylla*, though for long-distance dispersal, wind and especially birds (Bailey & James 1979; Jorgensen 1983) are expected to be the most important agents (Goward 1996).

### **Interspecific interactions**

*Hypogymnia heterophylla* is found on the twigs and branches of young to intermediate-aged shore pine. Other lichen species found on shore pine branches in the same habitat and often with *H. heterophylla* include *H. enteromorpha*, *H. inactiva*, *H. physodes*, *H. imshaugii*, *Melanelixia subaurifera*, *Parmelia sulcata*, *Platismatia herrei*, *Ramalina farinacea*, *R. menziesii*, *Tuckermannopsis orbata*, *Usnea cavernosa*, *U. ceratina* and *Usnea sp.*

### **Adaptability**

Given its extremely narrow habitat preferences, growing from the coast to approximately 1 km inland on early to intermediate seral shore pine, *Hypogymnia heterophylla* would not be considered as being adaptable. The presence of sea spray may be a critical factor in its establishment and survival.

## **POPULATIONS SIZES AND TRENDS**

### **Search effort**

In the field, two person-days of search effort were expended at each of the four locations previously surveyed in the 1996 status report (Goward 1996) on southern Vancouver Island (May 18 and 19 at East Sooke Regional Park and May 20, 2006 at Sheringham Point); *Hypogymnia heterophylla* was found at all four locations (Figure 3) (Appendix 1). In addition, the coastlines along French Beach Provincial Park and the Qualicum coast area were surveyed for *H. heterophylla* without success (May 20, 2006). Bentinck Island, DND property, was surveyed September 18, 2006. Other locations in the region that were recently surveyed for lichens (2004-2006), including *H. heterophylla*, are Saltspring Island, Tofino and the shore forest to the south, Ucluelet coast, Mt. Washington, Cathedral Grove, Cowichan Bay Canyon, Sechelt Peninsula, Campbell River/Elk Falls and other areas on the south centre and east coast (S. Harris, pers. comm. 2007). Other British Columbia lichen collectors known to have collected lichens on Vancouver Island and/or the mainland were contacted by email regarding element occurrences of *H. heterophylla* in Canada (C. Bjork, T. Goward, T. Spribille pers. comm. 2007). None reported any element occurrences of *H. heterophylla* after 1996. Total search effort for British Columbia lichens is shown in Figure 4. The intense search effort in southern Vancouver Island is evident by the number of sites indicated by the high density of black dots representing sites searched for lichens.



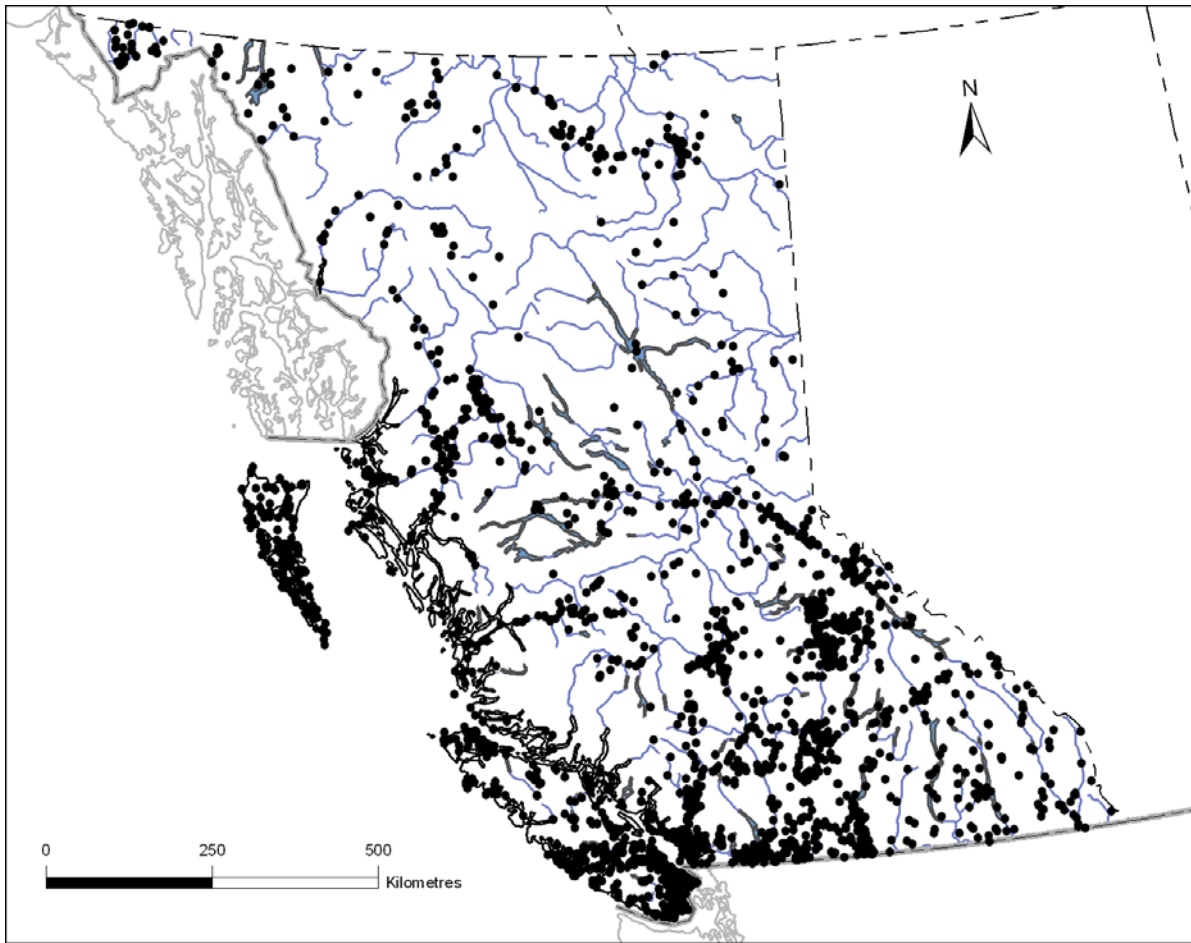


Figure 4. Non-targeted search effort for lichens in British Columbia.

Herbarium database search at the University of British Columbia (UBC) and the British Columbia Conservation Data Centre (CDC) indicate no collection of *Hypogymnia heterophylla* has been accessioned after 1996. The University of Washington Herbarium reports six accessions of *H. heterophylla* since 1996 in Washington State (K. Glew, pers. comm. 2007). Web searches of herbarium databases at the University of California at Riverside (UCR) and Santa Barbara Botanic Garden (SBBG) indicate that *H. heterophylla* occurs as far south as the Channel Islands and along the Pacific Ocean coast to the Los Angeles area (Figure 2). This range has been extended south due to extensive lichenological collections on the Channel Islands in the early 1990s. Search of the Mycological Herbarium database at Oregon State University (OSU) revealed several recent collections of *H. heterophylla* in Oregon and California.

### Abundance

Goward (1996) reported that *Hypogymnia heterophylla* was relatively abundant within its range on Vancouver Island. Populations are listed in Appendix 1, and indicate

that the most abundant sites had > 100 thalli while the least abundant sites had > 10 thalli. These estimates may be low as branches higher up in the trees could not be assessed.

*Hypogymnia heterophylla* is abundant on coastal conifers and hardwoods in northern California and Oregon, but less common in Washington and British Columbia.

### **Fluctuations and trends**

Search effort in May and September 2006 show that population sizes of *Hypogymnia heterophylla* appear to be stable (Appendix 1). The lichen was found again at the Sheringham location where it had been absent in the 1996 status report (Goward 1996). As indicated in Appendix 1, population sizes appear not to have changed since the 1996 survey, as it was observed that populations of this species were fairly abundant at most locations. However, the recent 2006/2007 severe winter storms may have reduced the populations of *H. heterophylla* in East Sooke Regional Park, as many individual shore pine trees along the coast were toppled or damaged (J. Miskelly pers. comm. 2007)

### **Rescue effect**

In the past ten years populations of *Hypogymnia heterophylla* have been found in nearby Puget Sound, Washington state, located south (across Georgia Strait) of the Canadian populations on the southwest coast of Vancouver Island. These populations may provide a source for *H. heterophylla* populations in Canada.

## **LIMITING FACTORS AND THREATS**

The primary factors limiting the dispersal and spread of *Hypogymnia heterophylla* are the necessity of early seral shore pine located on rocky windswept ledges with southwest to western aspects. Much of the coastline along the southwest coast of Vancouver Island is rocky undulating hills or sandy/gravelly beaches; rocky windswept ledges are less commonly found and thus could be a limiting factor.

Also, the frequency and severity of storms and high tides where the sea spray can be swept inland appear to be of importance as seen in destruction caused by the severe winter storms of 2006/2007 where many of the coastal trees were damaged. On the other hand, these storms, although damaging many trees, at the same time may be creating new shore pine habitat and thus increasing suitable substrate for *Hypogymnia heterophylla*.

Climate change will cause greater fluctuation in temperature and precipitation, higher storm intensities and more coastal flooding for the Pacific Northwest. Climate models predict an increase in temperature in this area of up to 3.2 °C by the 2040s (Mote *et al.* 2003). In a study of rare epiphytic lichen habitats of the Pacific Northwest,

*Hypogymnia heterophylla* was an associate lichen with the rare coastal lichens, *Bryoria pseudocapillaris*, *B. spiralifera* and *H. leucomela* in  $\geq 67\%$  of plots where they were found. Logistic regression indicated that for all three species, the environmental variable of mean minimum December (winter) temperature above freezing identified the most suitable habitat. Generally, small changes in climate and forest type strongly affected the probability of occurrence for many species in this study (Glavich *et al.* 2005).

Thus climate change may be a positive force for northward expansion of *Hypogymnia heterophylla* into Canada if sufficient early seral shore pine habitat is available in exposed coastal areas. In Oregon and California, it appears that *H. heterophylla* persists into late seral aged forests (Glavich *et al.* 2005).

Damage from winter storms appears to be the major threat for *Hypogymnia heterophylla* and lack of suitable habitat is the main limiting factor.

### **SPECIAL SIGNIFICANCE OF THE SPECIES**

The special significance of *Hypogymnia heterophylla* is that it is an endemic species in North America and its restricted occurrence in Canada is at the northern limit of its range. This epiphytic species is restricted to the Pacific Northwest coastal areas of North America where it is most often found in open windswept early to intermediate seral shore pine forests (Figure 2).

### **EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS**

In 1996, COSEWIC assessed the national status of *Hypogymnia heterophylla* as Special Concern (the terminology in use at the time was "Vulnerable"). In British Columbia occurrences of *H. heterophylla* (S1) are tracked.

The four localities of *Hypogymnia heterophylla* occur in regional parks, DND property or Fisheries and Oceans property, all of which are protected areas.

NatureServe (2006) ranks the global distribution of *Hypogymnia heterophylla* as follows:

Global Status	G3
Last Updated	October 6, 2006
Canada, COSEWIC	SC, Special Concern
British Columbia	S1
US, National	NNR
California	SNR
Oregon	SNR
Washington	S3

## TECHNICAL SUMMARY

### *Hypogymnia heterophylla*

Seaside bone

Hypogymnie maritime

Range of Occurrence in Canada: British Columbia

<b>Extent and Area Information</b>	
<ul style="list-style-type: none"> <li>• <i>Extent of occurrence (EO)(km<sup>2</sup>)</i> <b>Polygon of EO was drawn around Canadian point locations in GIS application.</b></li> </ul>	8.70 km <sup>2</sup>
<ul style="list-style-type: none"> <li>• <i>Specify trend in EO</i></li> </ul>	stable
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in EO?</i></li> </ul>	no
<ul style="list-style-type: none"> <li>• <i>Area of occupancy (AO) (m<sup>2</sup>)</i> Area of occupancy is calculated at 25 m<sup>2</sup>.per subpopulation; 10 Canadian subpopulations of <i>Hypogymnia heterophylla</i> = 250 m<sup>2</sup></li> </ul>	8 km <sup>2</sup> using a 2km x 2km grid. Actual occupation is 250 m <sup>2</sup>
<ul style="list-style-type: none"> <li>• <i>Specify trend in AO</i></li> </ul>	stable
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in AO?</i></li> </ul>	no
<ul style="list-style-type: none"> <li>• <i>Number of known or inferred current locations</i></li> </ul>	4 in Canada
<ul style="list-style-type: none"> <li>• <i>Specify trend in #</i></li> </ul>	stable
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of locations?</i></li> </ul>	no
<ul style="list-style-type: none"> <li>• <i>Specify trend in area, extent or quality of habitat</i></li> </ul>	stable
<b>Population Information</b>	
<ul style="list-style-type: none"> <li>• <i>Generation time (average age of parents in the population)</i></li> </ul>	10-15 years
<ul style="list-style-type: none"> <li>• <i>Number of mature individuals</i></li> </ul>	unknown but likely > 1000 thalli
<ul style="list-style-type: none"> <li>• <i>Total population trend:</i></li> </ul>	stable
<ul style="list-style-type: none"> <li>• <i>% decline over the last/next 10 years or 3 generations.</i></li> </ul>	unknown
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of mature individuals?</i></li> </ul>	no
<ul style="list-style-type: none"> <li>• <i>Is the total population severely fragmented?</i></li> </ul>	no
<ul style="list-style-type: none"> <li>• <i>Specify trend in number of populations</i></li> </ul>	stable
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of populations?</i></li> </ul>	no
<p>List subpopulations with number of mature individuals in each:</p> <ol style="list-style-type: none"> <li>1. Park Pike's Point and Iron Mine Bay areas:               <ul style="list-style-type: none"> <li>East Sooke 1 &gt;100</li> <li>East Sooke 2 &gt;100</li> <li>East Sooke 3 &gt;100</li> </ul> </li> <li>2. Aldridge Point area to Beechy Head               <ul style="list-style-type: none"> <li>East Sooke 4 &gt;100</li> <li>East Sooke 5 &gt;100</li> </ul> </li> <li>3. Bentinck Island               <ul style="list-style-type: none"> <li>Bentinck Is 6 &gt;10</li> <li>Bentinck Is. 7 &gt;10</li> <li>Bentinck Is. 8 &gt;100</li> <li>Bentinck Is. 9 &gt;100</li> </ul> </li> <li>4. Sheringham Point               <ul style="list-style-type: none"> <li>Sheringham Point 10 &gt;100</li> </ul> </li> </ol>	
<b>Threats (actual or imminent threats to populations or habitats)</b>	
<p>Severe winter storms of 2006/2007 damaged many individual coastal trees in East Sooke Regional Park; debris will be left in place on the ground.</p>	

<b>Rescue Effect (immigration from an outside source)</b>	
<ul style="list-style-type: none"> <li>• <i>Status of outside population(s)?</i>  <b>USA: 3 populations in Washington, south of Canadian populations; many populations in Oregon and California</b></li> </ul>	
<ul style="list-style-type: none"> <li>• <i>Is immigration known or possible?</i></li> </ul>	possible, from Puget Sound
<ul style="list-style-type: none"> <li>• <i>Would immigrants be adapted to survive in Canada?</i></li> </ul>	yes
<ul style="list-style-type: none"> <li>• <i>Is there sufficient habitat for immigrants in Canada?</i></li> </ul>	unknown
<ul style="list-style-type: none"> <li>• <i>Is rescue from outside populations likely?</i></li> </ul>	unknown
<b>Quantitative Analysis</b> [provide details on calculation, source(s) of data, models, etc]	Not applicable
<b>Current Status</b> COSEWIC: Special Concern (1996), Threatened (2008)	

### Status and Reason for Designation

<b>Status:</b> Threatened	<b>Final Criteria:</b> D2
<b>Status History:</b> Designated Special Concern in April 1996. Status re-examined and designated Threatened in April 2008.	
<b>Reason for Designation:</b> This lichen is endemic to the Pacific Coast of North America, and southwest Vancouver Island represents the northern limit of its range. The species' survival depends on early to intermediate seral shore pine forests along the sea coast. The populations appear to be stable, but have a restricted occurrence and the species is known from only four locations. Severe winter storms, which are anticipated to increase, are the main threat to the species.	
<b>Availability of Criteria</b>	
<b>Criterion A:</b> Not applicable. Does not meet criterion: no evidence of decline.	
<b>Criterion B:</b> Not applicable. Does not meet criterion: no evidence of decline or fluctuation.	
<b>Criterion C:</b> Not applicable. Does not meet criterion: no evidence of decline.	
<b>Criterion D:</b> Does not meet criteria for Threatened D1 (# of individuals likely > 1000), but meets criteria for Threatened D2, with number of locations < 5, and the habitat is prone to the effects of stochastic events (winter storms) within a very short time period in an uncertain future.	
<b>Criterion E:</b> Not applicable.	

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## **BIOGRAPHICAL SUMMARY OF REPORT WRITER**

Janet Marsh has been collecting lichens in Alberta since the late 1970s. She earned her BA in Biology and Psychology and a fourth year Honour's Thesis in Biology at Laurentian University, Sudbury, ON. She completed a MS in lichens as indicators of air pollution in 1975 and PhD in a study of the lichen family Ramalinaceae at Arizona State University, Tempe, AZ in 1996. She taught Plant Biology and Ecology at The University of Northern British Columbia and now works as an independent lichen consultant in Okotoks, near Calgary, Alberta. She is co-author of *Mosses, Lichens and Ferns of Northwest North America*.

## **COLLECTIONS EXAMINED**

All collections (8) of *Hypogymnia heterophylla* at the Canadian Museum of Nature herbarium (CANL) in Ottawa were studied prior to the field work. A voucher specimen was collected for each surveyed population.



Two collections of *Hypogymnia heterophylla* from Oregon were observed at the Provincial Museum of Alberta in Edmonton herbarium (PMAE). No collections of *Hypogymnia heterophylla* were found at the University of Alberta Cryptogamic Herbarium (ALTA) or at the University of Calgary herbarium (UC).

**Appendix 1. Canadian populations and abundance of *Hypogymnia heterophylla* that were reported in the status report (Goward 1996) and surveyed during field work conducted in 2006. An asterisk indicates locations where no *H. heterophylla* was found.**

<b>Location</b>	<b>Years collected</b>	<b>Size of population, 1996</b>	<b>Size of (sub) population, 2006</b>
East Sooke Park Pike's Point and Iron Mine Bay areas	1991-1992	abundant	≥ 100
	2006		≥ 100
East Sooke Park, Aldridge Point area to Beechy Head	1991-1992	abundant	≥ 100
	2006		≥ 100
Bentinck Island	1991-1992	abundant	≥ 10
			≥ 100
	2006		≥ 10
			≥ 100
Sheringham Point	1991-1992	not seen	≥ 100
	2006		
*French Beach Provincial Park	2006		
*Qualicum coast area	2006		