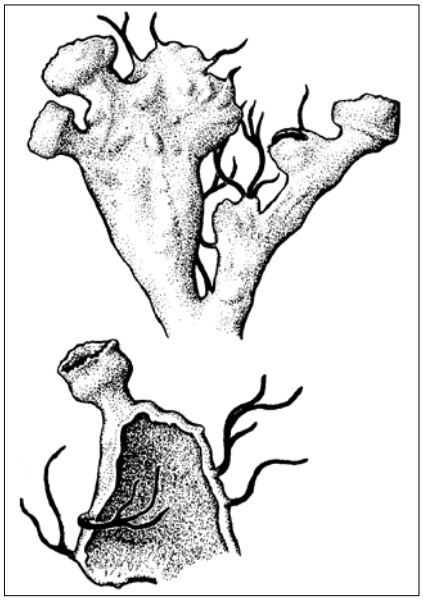
COSEWIC
Assessment and Update Status Report

on the

Seaside Centipede Lichen
Heterodermia sitchensis

in Canada



ENDANGERED
2006

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:

COSEWIC 2006. COSEWIC assessment and update status report on the seaside centipede Lichen *Heterodermia sitchensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 28 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Previous reports:

COSEWIC 2000. COSEWIC assessment and status report on the seaside centipede *Heterodermia sitchensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 28 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Goward, T. 1996. COSEWIC status report on the seaside centipede *Heterodermia sitchensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. 1-33 pp.

Production note:

COSEWIC would like to acknowledge Trevor Goward and Kenneth G. Wright for writing the update status report on the seaside centipede lichen, *Heterodermia sitchensis* in Canada. The report was contracted to Trevor Goward by Environment Canada and was overseen and edited by René Belland, Co-chair (Mosses and Lichens), COSEWIC Plants and Lichens Species Specialist Subcommittee.

Prior to 2006 the English name used for this species was seaside centipede *Heterodermia sitchensis*.

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Seaside centipede lichen —Habit (from Goward 1984), provided by the author.

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COSEWIC
Assessment Summary

Assessment Summary – April 2006

Common name
Seaside centipede lichen

Scientific name
Heterodermia sitchensis

Status
Endangered

Reason for designation
This is a foliose lichen restricted to shoreline Sitka spruce trees on the west coast of Vancouver Island. It has been documented from only ten locations in Canada, 11 worldwide. It requires high levels of nitrogen, so is restricted to sites subject to nitrogen enrichment, for example, sea lion haul-out sites and bird nest sites. The species may have poor dispersal abilities. It is highly vulnerable to tsunamis, and intensified winter storm activity associated with global warming.

Occurrence
British Columbia

Status history
Designated Endangered in April 1996. Status re-examined and confirmed in May 2000 and in April 2006. Last assessment based on an update status report.

COSEWIC
Executive Summary

Seaside centipede lichen
Heterodermia sitchensis

Species information

Heterodermia sitchensis Goward & Noble is a pale greyish, leafy, basally attached lichen belonging in the Physciaceae. It can be recognized by the presence of marginal cilia and tiny urn-like structures near the lobe tips. It was described from western Vancouver Island.

Distribution

In Canada, *H. sitchensis* occurs only in coastal British Columbia, where it ranges 210 km from northern Vancouver Island south to Pacific Rim National Park. Outside of Canada, it is known from a single outlying population in coastal Oregon. Within this region, it is known exclusively from the Very Wet Hypermaritime subzone of the Coastal Western Hemlock Zone (Meidinger & Pojar 1991).

Habitat

Throughout its range, *H. sitchensis* occurs exclusively at seaside on nitrogen-enriched twigs in the lower canopy of old Sitka spruce trees.

Biology

In keeping with its strong tendency to colonize small twigs, *H. sitchensis* is a short-lived species with a life cycle in the order of 10 to 15 years. By the end of that period, its substrate is usually overgrown to mosses, hepatics and other lichens, all of which tend to outcompete it. *Heterodermia sitchensis* reproduces exclusively via soredia, i.e., powdery asexual propagules made up of algal cells and fungal hyphae. Dispersal seems poor, with forest birds probably providing important vectors for this species.

Population sizes and trends

A total of 227 thalli of *H. sitchensis* have been recorded in Canada to date. These are divided among twelve spatially separate populations, two of which are now extirpated, and the three largest of which contain 148 thalli, or 65% of all thalli. Population size can vary markedly from year to year, depending on the intensity of winter storms. However, no long-term trends in population size have been documented to the present time.

Limiting factors and threats

As a pioneer lichen, *H. sitchensis* must colonize at frequent intervals. In order to become established, however, it must first successfully disperse its propagules to seaside Sitka spruce twigs subject to high concentrations of nitrogen. The infrequency of such habitats ensures that *H. sitchensis* is rare throughout its range, and hence especially vulnerable to disturbance.

Where not protected by legislation (as in parks), *H. sitchensis* is threatened primarily by logging activities, especially where large old Sitka spruce trees are targeted. Other threats include damage by winter storms, housing developments and, on a smaller scale, twig collection for campfires.

Special significance of the species

Heterodermia sitchensis is among the most northerly members of a predominantly tropical to warm temperate genus. It is also essentially endemic to Canada, where it occupies a very narrow latitudinal range along the west coast of Vancouver Island. The soredia-bearing "urns" located near the lobe tips in this species are seemingly unique among lichens.

Existing protection

H. sitchensis is known from ten localities in Canada, five of which are situated in Pacific Rim National Park Reserve. Here they are protected from human disturbance by the National Parks Act.

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 5th 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 (2006)

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 it 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.

Environment Canada | Environnement Canada
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Canada

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

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2006

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SPECIES INFORMATION

Name and classification

The Seaside Centipede Lichen, *Heterodermia sitchensis* Goward & Noble (Figure 1), was described in 1984 from the west coast of Vancouver Island, British Columbia (Goward 1984). The holotype specimen is on deposit at UBC, with an isotype each at the Canadian Museum of Nature (CANL), and the University of Helsinki (H), Finland. Though the taxonomic distinctness of this species has not been challenged since its description, *H. sitchensis* is an asexually reproducing lichen, and for this reason could represent the secondary counterpart of a fertile primary species such as *H. podocarpa* (Bél.) Awas. Lichenologists are not agreed on how best to treat secondary "species", i.e., whether as mere forms or subspecies of the primary species, or as distinct species in their own right. Given, however, that *H. sitchensis* is chemically, morphologically and geographically distinct from *H. podocarpa*, most lichenologists would unhesitantly accord it species status.

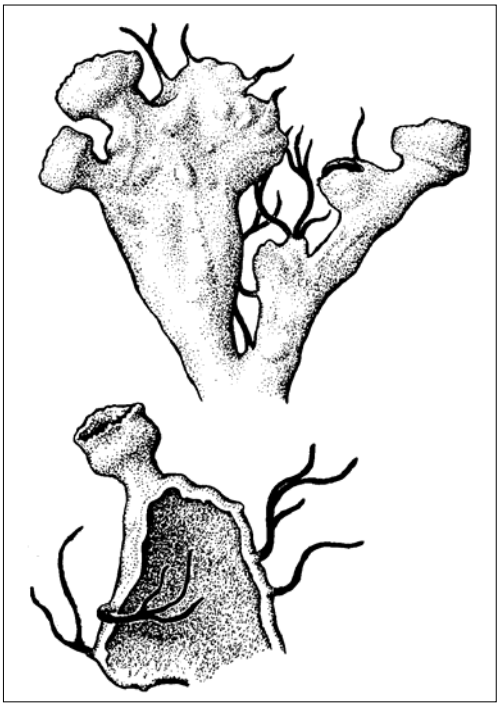

Figure 1. *Heterodermia sitchensis*: Habit (from Goward 1984).

Morphological description

Heterodermia sitchensis is a semi-erect, cushion-forming, foliose (leaf) lichen about 2 cm across (Figure 1). The lobes are thin, stiff, short to elongate, separate to loosely overlapping, 1-2 mm wide, and have long thin cilia (eyelashes) along the

margins. The upper surface is strongly convex, pale greenish white (but readily discolouring to bluish black), and often bears scattered whitish maculae (spots). The lower surface is white, appressed-cottony and unevenly thickened, with strut-like extensions of the lower cortex protruding into the medulla. Mature thalli bear apothecia (sexual fruiting structures) in urn-shaped outgrowths near the lobe tips. These have prominent flaring rims that in turn bear ring-shaped soredia (powdery asexual reproductive propagules) on their inner surface. Among the chemical substances present in *H. sitchensis* are atranorin, zeorin, and various fatty acids. Atranorin reacts K+ yellow both with the cortex and with the medulla. Goward (1984) reported a PD+ yellowish to pale orange medullary reaction; but this has not been confirmed in more recent material. A more detailed description is given in Goward (1984).

Generic description

Heterodermia is a genus of small to medium-sized lichens with narrow lobes almost always fringed with cilia ("eyelashes"). The upper cortex consists of elongate cells oriented lengthwise, giving the thallus a "stretched" appearance at close inspection, while the lower surface either bears a cortex or lacks a cortex, in the latter case with the white medullary hyphae exposed. The apothecia are dark brown with conspicuous pale margins coloured like the upper cortex. The spores are brown, 8 per ascus, 2-celled, and thick-walled. In the related genus *Physcia*, the cells of the upper cortex are unoriented, confering a more even appearance at close inspection.

Within *Heterodermia*, *H. sitchensis* belongs in the *H. podocarpa* group. This is an assemblage of about 27 foliose species (Trass 1992), all of which have erect or semi-erect lobes, terminal or subterminal apothecia, and a non-corticate lower surface (Kurokawa 1962). The *H. podocarpa* group has two obvious centres of distribution: one in southeast Asia (12 species), and the other in Central America, north to Mexico (15 species). In the United States and Canada, this group is represented by only five species: *H. echinata* (Taylor) Culb., *H. erinacea* (Ach.) W. Weber, *H. galactophylla* (Tuck.) Culb, *H. podocarpa* (Bél.) Awasthi, and *H. sitchensis*.

Similar species

With its loose habit, cottony lower surface, marginal cilia and sorediate urns, *H. sitchensis* is a distinctive species not readily confused with any other lichen. Most similar, perhaps, is *Physcia tenella*, another tree-dwelling species with pale greenish lobes lined with cilia. In that species, however, the soredia are located on the undersides of the lobe tips, and the lower surface is corticate (hard and skinlike), not cottony. *Cavernularia hultenii* can also sometimes be similar, though in that species the lower surface is black and pocked with tiny cavernulae ("pits"). See Goward *et al*. (1994) for keys to these and other similar lichens.

Genetic description

No information available.

DISTRIBUTION

Global range

Heterodermia sitchensis could be described as essentially endemic to western Canada (Figure 2). Outside of Canada, it is known only from Cape Lookout in coastal Oregon, based on collections made in 2001 (McHenry & Tønsberg 2002). An early report from Alaska (Geiser *et al*. 1994) is based on a misidentification, notwithstanding later reports to the contrary (McCune & Geiser 1997; Geiser *et al*. 1998).

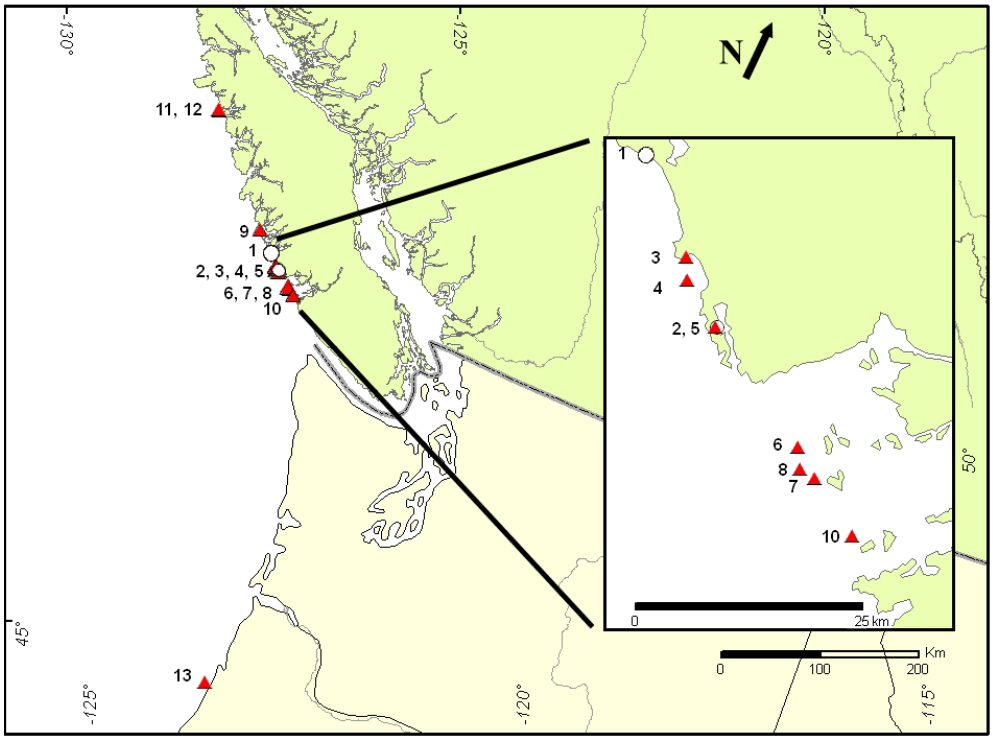

Figure 2. Global distribution of *Heterodermia sitchensis*. Site #1 shows the holotype locality visited in 1983; shaded (red) triangles are localities visited from 2000-2004; and the open circles (sites #1 and #5) are extirpated localities. Numbers correspond to site numbers from Table 1.

Canadian range

At the time of its description in 1984, *H. sitchensis* was known from only two localities ('localities' in this report refer to sites of occurrence separated by at least 1 km). Both of these localities are situated on the outer west coast of Vancouver Island, British Columbia. The first (holotype) locality is at Schooner Cove in Pacific Rim National Park Reserve, while the second is 22 km southeast, near Ucluelet on the Ucluth Peninsula. A recent visit to the type locality revealed a drastic decline from about 12 thalli in 1983 to only 1 moribund thallus in 2002, now also presumed to have disappeared. In addition, logging for a housing development at the Ucluelet locality led, in the early 1990s, to the disappearance of *H. sitchensis* here (Goward, personal observation).

Recent studies funded by Parks Canada from 2001 to 2004 have extended the known range of *H. sitchensis* south to Folger Island (48°49'N), and north to the vicinity of Kyuquot (49°59'N). Work to date has confirmed early impressions that *H. sitchensis* is a rare species with a sporadic distribution. In Canada, it has been recorded from a total of only 12 localities, ten of which occur in or near Pacific Rim National Park Reserve. The remaining two localities are situated near Kyuquot (Figure 2). Ten localities have been either found or confirmed since 2001, while the remaining two (Ucluelet and the holotype locality) apparently no longer support *H. sitchensis*.

HABITAT

Habitat requirements

Compared with most other tree-dwelling lichens, *H. sitchensis* has remarkably stringent habitat requirements. Its occurrence appears to be determined by the superposition of three essential ecological factors: 1) proximity to the ocean and seaward orientation of the site; 2) old Sitka spruce trees with defoliated twigs in the lower canopy; 3) slow growing branches; and 4) nitrogen and calcium enrichment. These and other field characteristics are briefly discussed below.

1) Seaside habitats

All finds of *H. sitchensis* to date have been restricted to the outer coast, within the spray zone of the Pacific Ocean. Interestingly, the same is true of virtually all western *Heterodermia* species, i.e., including *H. japonica*, *H. leucomela*, *H. namaquana*, and *H. obscurata*. Given the intense level of sampling for epiphytic macrolichens in coastal British Columbia, the strictly seaside occurrence of these lichens is certainly real, not a mere artifact of undercollecting; see Figure 3.

2) Sitka spruce

Heterodermia sitchensis is an epiphytic (tree-dwelling) lichen known only from Sitka spruce (*Picea sitchensis*). Because epiphytic macrolichens are seldom confined to a single tree species, a careful search of other potential host trees was made, including red alder (*Alnus rubra*), amabilis fir (*Abies amabilis*), western red-cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and western yew (*Taxus brevifolia*). These efforts yielded no additional host trees for this lichen.

The occurrence of Sitka spruce is controlled in part by a requirement for periodic disturbance. In the Broken Group Islands of Pacific Rim National Park, for instance, it occurs abundantly on exposed, outer islands. In more sheltered, inner islands, by contrast, it is virtually absent. This observation doubtless has profound implications for the occurrence of *H. sitchensis*.

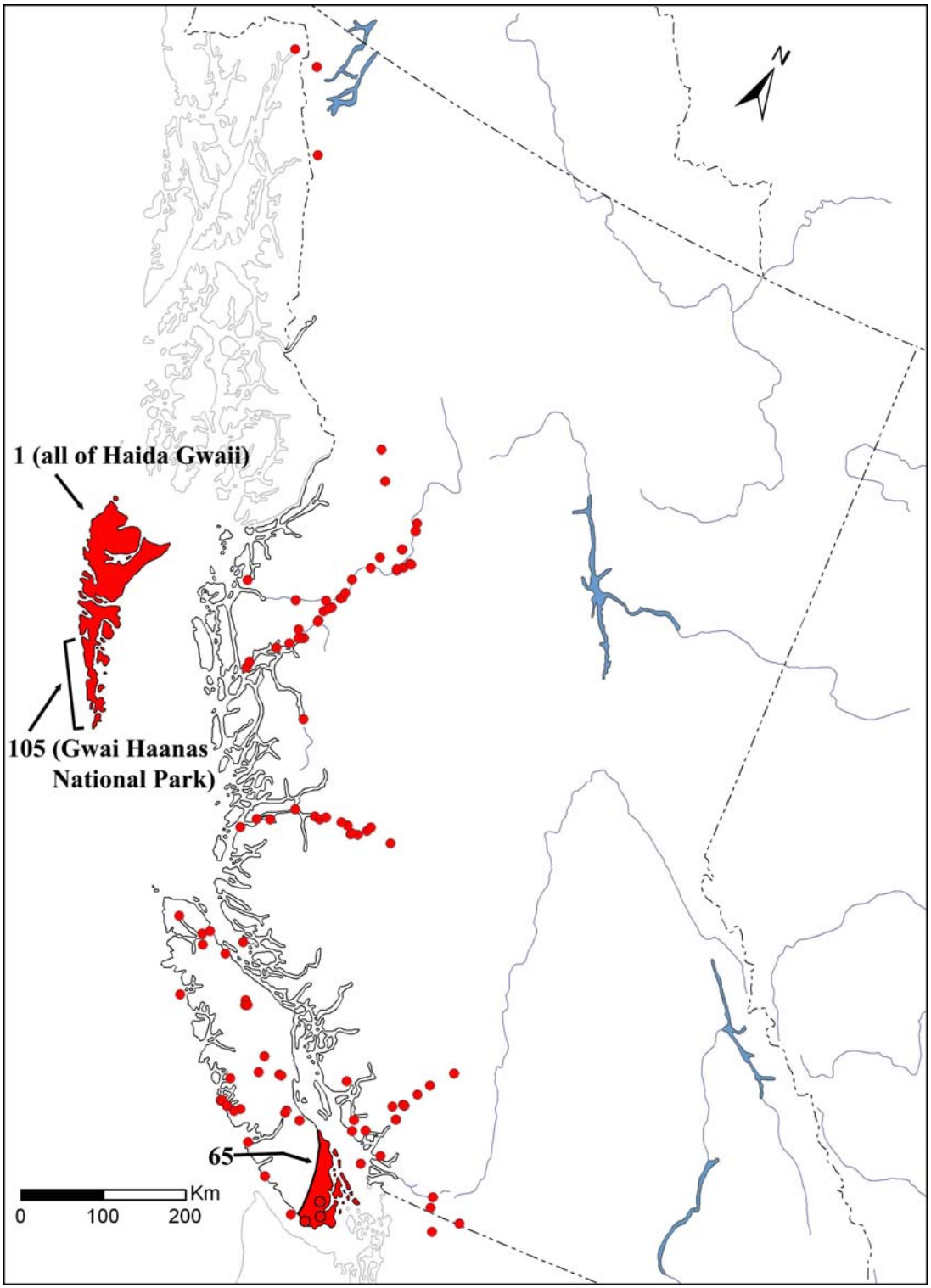

Figure 3. Search effort for macrolichens in coastal British Columbia and adjacent U.S.A. The numbers accompanying the three largest collecting areas accord with the map numbers given in Table 2.

3) Twigs

Heterodermia sitchensis is mostly restricted to twigs less than 8 mm in diameter, though a few twigs 12 mm in diameter were found to support this species. As a rule, only the defoliated portions of twigs are colonized, the adjacent foliated portions being perhaps too young or too ecologically unstable to support it. Twigs larger than about 10 to 12 mm in diameter characteristically bear mosses and hepatics, these presumably tending to outcompete *H. sitchensis*.

In common with other lichens of small twigs, *H. sitchensis* appears to be a short-lived species, completing its life cycle within about 10 to 15 years. It dies when its position on a given branch has been usurped by other more aggressive lichens and bryophytes. This observation is probably key to its status as a rare species; for though *H. sitchensis* has evolved a requirement for frequent recolonization, it appears to be conspicuously inefficient at dispersal and/or establishment (see below).

4) Branch elongation

Heterodermia sitchensis is mostly restricted to slow-growing twigs, with growth rates less than about 10 cm per year. This observation is consistent with its characteristic association with old trees, and could also explain its occasional presence on young trees growing on rocky outcrops. In both cases, branch growth would be expected to be slow.

Heterodermia sitchensis is probably most "abundant" following periods of stress to its host trees. Moderate insect defoliation, for example, appears to favour colonization on even rapidly growing branches. Population dynamics in this species are thus probably cyclic, with episodes of relative abundance at landscape scale alternating with periods of decline. Observations in 2002 suggest that *H. sitchensis* was then entering a period of "abundance" following a defoliation event in about 2000. Most favourable for colonization are twigs that survive defoliation, and hence continue to put on new growth in subsequent years. By contrast, branch death eventually leads to loss of bark and, with it, *H. sitchensis*.

5) Canopy position

Heterodermia sitchensis appears to be restricted to the lower forest canopy, typically growing within about 4 m of the forest floor. Goward (1994) interpreted this as reflecting sensitivity to desiccation, though recent observations of healthy thalli growing 13 m above the ground suggest this may not always be the case (Goward & Wright 2003). An alternative explanation, not necessarily precluding the first, is that *H. sitchensis* is absent from the middle and upper canopy owing to an unavailability of nitrogen and other nutrients needed in order to establish. According to this hypothesis, nitrogen is likely to be present in concentration only in the lower canopy, perhaps owing to leaching from higher in the tree.

6) Branch chemistry

Goward & Fredeen (2006, in prep.) provide indirect evidence that *H. sitchensis* has a strong physiological requirement for bark with an elevated pH. At first inspection, this would seem to be out of keeping with its occurrence on Sitka spruce which, in common with other conifers, tends to have acidic bark (Barkman 1958). Still, it is well known that conifer bark subject to nutrient enrichment of one kind or another can register a rather high pH (e.g., Goward & Arsenault 2000). A few instances of nutrient enrichment are briefly discussed below:

7) Bird perches

Droppings excreted by perching birds, especially Bald Eagles, create vertical columns of enrichment that extend downward to the forest floor. These nutrient columns appear to favour the establishment of *H. sitchensis*, even in trees otherwise with rather acidic bark. Once the supporting bird perch is abandoned (owing, for example, to breakage or crowding by younger branches), the nutrient column gradually dissolves. Such a phenomenon might explain, for example, the gradual loss of *H. sitchensis* from the holotype locality between 1983 and 2002 (see above).

8) Sea lion wintering grounds

One of the most productive sites for *H. sitchensis* is located on the north shore of Wouwer Island, well known as a winter haulout for California and Steller's sea lions, which gather here in the hundreds. The sea lions occupy rock shelves, beaches, and even penetrate a short distance into the forest. To judge from the results of recent elemental analyses of Sitka spruce twigs collected from this locality (Goward & Fredeen 2006, in prep.), the resulting aerosols impregnate nearby trees, considerably elevating bark pH. Not surprisingly, such localities provide prime habitat for *H. sitchensis*.

9) Base-rich bedrock

In common with Wouwer Island, Florencia Island has significant populations of *H. sitchensis*. This island is also notable for its largely calciferous bedrock. In our opinion, these observations are likely to be causally related. Calciferous bedrock has been hypothesized to benefit base-loving arboreal lichens through the uptake of nutrients via tree roots (Goward & Arsenault 2000). The translocated nutrients are later released into the forest canopy. Evidence for nutrient enrichment in at least some stands of Sitka spruce can be deduced from the presence, as on Florencia Island, of unusually rich assemblages of cyanolichens (i.e., species in which the photosynthesizing partner is a cyanobacterium).

10) Seabird colonies

In the case of Florencia Island, a supplementary source of enrichment could derive from intensive use by nesting seabirds. Glaucous-winged Gulls, Pelagic Cormorants, Black Oystercatchers, and Pigeon Guillemots all frequent this island throughout the

year, but are especially abundant during the breeding season. In addition to creating localized nutrient columns of the kind already described, the tendency of Glaucous-winged Gulls to defecate while ridge-soaring above the forest edge could contribute an additional, more generalized source of enrichment. Possibly, *H. sitchensis* benefits from such "fecal bombing."

11) Old village sites

Another possible source of enrichment are the shell middens that mark the presence of old Aboriginal villages. According to this hypothesis, the former habit of native peoples of concentrating seashells in their village sites could now provide a localized and highly concentrated source of nutrients. Once translocated into the forest canopy, these nutrients doubtless elevate bark pH and hence favour the establishment of nitrophilous lichens like *H. sitchensis*. Disturbance associated with these village sites more than a century ago now promotes a shoreline fringe of pioneering Sitka spruce and, by extension, future habitat for *H. sitchensis*.

12) Small islands

Small islands provide a measure of defence against predation, thereby encouraging regular and prolonged use by nesting seabirds, wintering sea lions, and other animals. The occurrence of a rich fauna doubtless promotes high levels of nutrient enrichment, which in turn could favour colonization by *H. sitchensis*. This observation, at any rate, could explain the relative frequency of *H. sitchensis* on small islands. Also apparently favourable to this species are capes, headlands, spits, peninsulas – all convenient resting places for migrating birds.

Habitat trends

In Canada, *H. sitchensis* is restricted to seaside oldgrowth forests along the west coast of Vancouver Island. Here it has probably been protected from resource extraction by the ruggedness of the topography, as well as by this region's relative inacessibility. Because, however, provincial regulations on forestry practice do not explicitly prohibit logging operations along the outer coast, it is highly likely that *H. sitchensis* has suffered at least some habitat loss, especially given the exceptional commercial value of its host tree, Sitka spruce. At a few southern localities on the Ucluth Peninsula, housing developments have already locally extirpated one population.

Habitat protection/ownership

Five of the ten extant Canadian localities for *H. sitchensis* are situated in Pacific Rim National Park Reserve, where they are strictly protected from logging and other forms of resource extraction. Four of the remaining localities are located on crown land on small, undeveloped islands. The last locality, also on crown land, is located near a tidal marsh on the Ucluth Peninsula 1 km from Ucluelet. See Table 1 for further details.

Table 1. Canadian localities of *Heterodermia sitchensis* and their historical and current status. Site numbers correspond to the numbered dots in Figure 2.

Area	Locality	Years reported	Original population size (no. of thalli)	Population size (2001-2004) (no. of thalli)	Population trends (Population threat)
Tofino, BC Site 1	Canada, British Columbia, Schooner Cove, Vancouver Island (Type locality)	1983, 2001, 2002	12	Extirpated	Decline (Pacific Rim Natl Park: loss of perching birds and hence loss of enrichment?)
Ucluelet, BC Site 2	Canada, British Columbia, Ucluth Peninsula, Vancouver Island	1983	4	Extirpated	Decline (Private land: logging for housing development)
Ucluelet, BC Site 3	Canada, British Columbia, Quisitis Point, Vancouver Island	2001	6		Unknown (Pacific Rim Natl Park: winter storms or collecting for kindling by recreationists)
Ucluelet, BC Site 4	Canada, British Columbia, Florencia Island, Vancouver Island	2001, 2002	56		Unknown (Pacific Rim Natl Park: winter storms or collecting for kindling by recreationists)
Ucluelet, BC Site 5	Canada, British Columbia, Ucluth Peninsula, Vancouver Island	2001	2		Unknown (Private land: logging for housing development)
Ucluelet, BC Site 6	Canada, British Columbia, Benson Island, Vancouver Island	2002	1		Unknown (Pacific Rim Natl Park: winter storms or collecting for kindling by recreationists)
Ucluelet, BC Site 7	Canada, British Columbia, Dicebox Island, Vancouver Island	2001	1		Unknown (Pacific Rim Natl Park: winter storms or collecting for kindling by recreationists)
Ucluelet, BC Site 8	Canada, British Columbia, Wouwer Island, Vancouver Island	2001, 2002	44		Unknown (Pacific Rim Natl Park: winter storms, loss of enrichment by sea lions, or collecting for kindling by recreationists)

Area	Locality	Years reported	Original population size (no. of thalli)	Population size (2001-2004) (no. of thalli)	Population trends (Population threat)
Tofino, BC Site 9	Canada, British Columbia, Lawrence Island, Clayoquot Sound, Vancouver Island	2001, 2002	21		Unknown (Crown Land: winter storms, loss of perching birds, or collecting for kindling by recreationists)
Bamfield, BC Site 10	Canada, British Columbia, Folger Island,Vancouver Island	2002	18		Unknown (Crown land: winter storms or loss of sea lions)
Kyuquot, BC Site 11	Canada, British Columbia, vicinity of Kyuquot, Vancouver Island	2004	14	14	Unknown (Crown Land: disturbance by logging or collecting for kindling by recreationists)
Kyuquot, BC Site 12	Canada, British Columbia, a second location in the vicinity of Kyuquot, Vancouver Island	2004	48	48	Unknown (Crown Land: winter storms or collecting for kindling by recreationists)
Tillamook, OR Site 13	United States of America, Cape Lookout, Tillamook Co., Oregon	2000, 2001	5-10 (T. Tønsberg, pers. comm.)	N/A	Unknown (Cape Lookout State Park: collecting for kindling by by recreationists)

BIOLOGY

Life cycle and reproduction

Mature lobes of *H. sitchensis* invariably bear apothecia (sexual fruiting structures) in urn-shaped outgrowths near the lobe tips. Notwithstanding their frequency, the apothecia are not directly involved with reproduction in *H. sitchensis*. Rather, their spores are apparently vestigial, failing to reach maturity. Instead, reproduction in this species takes place vegetatively, through the release of powdery soredia, borne on the inner walls of the urns. Because soredia contain both the fungal and algal partners of the lichen, they are effectively "instant lichens," establishing directly, with no need to acquire the opposing partner in order to reestablish the lichen symbiosis from its separate partners.

Herbivory/predation

No signs of herbivory on *H. sitchensis* have been noted.

Physiology

With the exception of its presumed requirement for nitrogen enrichment (Goward & Fredeen, in prep.), little is known about the physiological needs of *H. sitchensis*. Still, its narrow occurrence in hyperoceanic localities suggests a requirement for cool temperatures and high atmospheric humidity, a pattern supported by the absence in this species of a protective lower cortex. These and other observations led Goward (1994) to propose that *H. sitchensis* may have evolved as a species of equatorial cloud forests.

Dispersal/migration

Though soredia are produced in great abundance in *H. sitchensis*, they are nevertheless mostly confined to the inner surface of "urns" that invariably form near the lobe tips. If only for this reason, it seems unlikely that these propagules would be an efficient means of dispersal. One possibility (highly speculative) is that twig-feeding forest birds – especially Chestnut-backed Chickadees and Golden-crowned Kinglets – incidentally peck at the urns while foraging for invertebrates. Later, having flown to new trees, they disperse the soredia to new twigs.

Interspecific interactions

As mentioned above, *H. sitchensis* is a pioneer species, that is, it colonizes early in the development of its host twig. At this stage, the twig is usually devoid of competing epiphytes, allowing *H. sitchensis* to establish without direct interaction with other species. Within about a decade, however, other epiphytes – mosses, liverworts, and other lichens – begin to colonize the host twig, and *H. sitchensis* gradually goes into decline. Possibly the high nitrogen concentrations characteristic of twigs supporting *H. sitchensis* may actually promote the same heavy moss loadings that ultimately displace it.

Adaptability

Compared to other epiphytic lichens, *H. sitchensis* exhibits little adaptability in its choice of habitat. Indeed, careful searching has turned up populations only on nitrogen-enriched twigs on old Sitka spruce trees growing at seaside. Clearly, *H. sitchensis* is much more strict in its ecological requirements than any of the lichen species with which it occurs, including the related *H. leucomela*.

POPULATION SIZES AND TRENDS

Search effort

From 2001 to 2004, Parks Canada supported a considerable search effort for *H. sitchensis*. A total of 30 person days of search time has been dedicated to this species each summer, with a total of 60 days devoted to Pacific Rim National Park and 30 each to Gwaii Haanas (South Moresby Island) and northern Vancouver Island. To these more recent search efforts can be added several earlier field studies concentrated in coastal B.C., especially those of Dr. Irwin Brodo in the Queen Charlotte Islands in 2000 (I.M. Brodo, pers. comm.). See Appendix 1. Other search efforts within the known range of *H. sitchensis* are summarized in Table 2 and mapped in Figure 3.

Abundance

Two hundred and twenty-seven thalli of *H. sitchensis* in twelve localities have been recorded to date, including two localities that no longer support this species. Sixty-five percent of these thalli, however, were noted at only three of the existing localities (Table 3).

Fluctuations and trends

What little is known about population trends in *H. sitchensis* is based on observations made at two localities. The first of these is the holotype locality at Schooner Cove where in 1983 a single Sitka spruce branch bore at least a dozen thalli. When this same branch was re-examined twenty years later, in 2002, it was found to support only a single, rather moribund thallus of *H. sitchensis*. Also lacking on this branch was *Physcia tenella*, which had been reported two decades earlier (Goward 1984). The fact that both *H. sitchensis* and *P. tenella* are nitrophiles could suggest that their decline here is related to a gradual decline in nutrient status. In 1983 the host branch was apparently situated within the nutrient column of a bird perch no longer in use 20 years later. According to this scenario, potential host branches for *H. sitchensis* are likely to be available to this species for a short time only, depending on the spatial configuration of nutrient supply, suitable substrate (slow-growing Sitka spruce twigs), and diaspore availability.

Table 2. Significant macrolichen collections within the potential Canadian (and American) range of *Heterodermia sitchensis*. Map numbers 1, 65 and 105 are labelled in Figure 3.

Map #	Location	Year visited	Collector	# lichen specimens collected
1	**Haida Gwaii (Queen Charlotte Islands)**	1967-2000	E. Brodo	5500
2	**Alice Lake**	1969-1970	K. Ohlsson	66
3	**Squamish River**	1969-1970	K. Ohlsson	24
4	**Black Tusk**	1969-1970	K. Ohlsson	50
5	**Black Tusk**	1969-1970	K. Ohlsson	45
6	**Black Tusk**	1969-1970	K. Ohlsson	25
7	**Alta Lake**	1969-1970	K. Ohlsson	38
8	**Pemberton**	1969-1970	K. Ohlsson	27
9	**Alice Lake**	1969-1970	K. Ohlsson	40
10	**Sechelt**	1969-1970	K. Ohlsson	82
11	**Port Mellon**	1969-1970	K. Ohlsson	19
12	**Wilson Creek**	1969-1970	K. Ohlsson	22
13	**Walt Lake**	1969-1970	K. Ohlsson	88
14	**Frank Island and Cox Bay**	1969-1970	K. Ohlsson	110
15	**Kennedy Lake**	1969-1970	K. Ohlsson	30
16	**Kennedy Lake**	1969-1970	K. Ohlsson	16
17	**Cox Bay**	1969-1970	K. Ohlsson	17
18	**Goldstream Park**	1969-1970	K. Ohlsson	11
19	**Mt. Cain**	1969-1970	K. Ohlsson	141
20	**Schoen Lake**	1969-1970	K. Ohlsson	44
21	**Marble River**	1969-1970	K. Ohlsson	38
22	**Beaver Harbour**	1969-1970	K. Ohlsson	69
23	**Coal Harbour**	1969-1970	K. Ohlsson	35
24	**Holberg**	1969-1970	K. Ohlsson	30
25	**Port McNeil**	1969-1970	K. Ohlsson	83
26	**Buttle Lake**	1969-1970	K. Ohlsson	73
27	**Mt. Becher**	1969-1970	K. Ohlsson	84
28	**Forbidden Plateau**	1969-1970	K. Ohlsson	14
29	**Young Creek**	1969-1970	K. Ohlsson	45
30	**Mosher Creek**	1969-1970	K. Ohlsson	44
31	**Bella Coola**	1969-1970	K. Ohlsson	33
32	**Thorsen River**	1969-1970	K. Ohlsson	31
33	**Crayden Bay**	1969-1970	K. Ohlsson	50
34	**Kwatna Inlet**	1969-1970	K. Ohlsson	8
35	**Restoration Bay**	1969-1970	K. Ohlsson	9
36	**Namu**	1969-1970	K. Ohlsson	40
37	**Atnarko River**	1969-1970	K. Ohlsson	42
38	**Burnt River**	1969-1970	K. Ohlsson	49
39	**Mt. Walker**	1969-1970	K. Ohlsson	28
40	**Bella Coola River**	1969-1970	K. Ohlsson	28
41	**Four Mile Mountain**	1969-1970	K. Ohlsson	43
42	**Bella Coola Valley Summit**	1969-1970	K. Ohlsson	19
43	**Anahim Lake**	1969-1970	K. Ohlsson	35
44	**Furlong Bay**	1969-1970	K. Ohlsson	15
45	**Robinson Lake**	1969-1970	K. Ohlsson	25

Map #	Location	Year visited	Collector	# lichen specimens collected
46	**Hartley Inlet**	1969-1970	K. Ohlsson	22
47	**Kishkosh Inlet**	1969-1970	K. Ohlsson	23
48	**Port Ashton**	1969-1970	K. Ohlsson	23
49	**Emsley Pt**	1969-1970	K. Ohlsson	4
50	**Mt. Attree**	1969-1970	K. Ohlsson	49
51	**Furlong Bay**	1969-1970	K. Ohlsson	31
52	**Williams Creek**	1969-1970	K. Ohlsson	35
53	**Minette Bay**	1969-1970	K. Ohlsson	39
54	**Kitimat River**	1969-1970	K. Ohlsson	26
55	**Bornite Mountain**	1969-1970	K. Ohlsson	43
56	**Mt. Claque**	1969-1970	K. Ohlsson	35
57	**Bornite Mountain**	1969-1970	K. Ohlsson	42
58	**Mannix Creek**	1969-1970	K. Ohlsson	29
59	**Dorreen**	1969-1970	K. Ohlsson	26
60	**New Hazelton**	1969-1970	K. Ohlsson	18
61	**Buckley River**	1969-1970	K. Ohlsson	41
62	**Nine Mile Mt.**	1969-1970	K. Ohlsson	25
63	**Nine Mile Mt.**	1969-1970	K. Ohlsson	43
64	**Seeley Lake**	1969-1970	K. Ohlsson	28
65	**Gulf Islands & SE Vancouver Island**	1974-1981	W. Noble	5500
66	**Burns Bog**	1982	T. Goward	30
67	**Dyea, Alaska**	1982	T. Goward	50
68	**Taku River**	1982	T. Goward	165
69	**Pacific Rim National Park**	1982-1983	T. Goward	1500
70	**Port Alberni**	1983	T. Goward	15
71	**Sooke**	1984	T. Goward	85
72	**Gates Lake**	1984	T. Goward	120
73	**Vancouver**	1986	T. Goward	110
74	**Upper Campbell Lake, Vancouver Island**	1991	T. Goward	3
75	**China Beach and s. Vancouver Isl.**	1991	T. Goward	11
76	**Carmanah Valley and area**	1991	T. Goward	120
77	**Bamfield**	1991	T. Goward	46
78	**Port Alberni**	1991	T. Goward	64
79	**Sayward Area**	1991	T. Goward	125
80	**Kispiox Valley**	1991	T. Goward	128
81	**Terrace**	1991	T. Goward	240
82	**Skeena (w. of Terrace)**	1991	T. Goward	76
83	**Prince Rupert**	1991	T. Goward	100
84	**South Hazelton area**	1991	T. Goward	38
85	**Kitimat**	1991	T. Goward	48
86	**Kitlope**	1991	T. Goward	114
87	**Sooke**	1991	T. Goward	56
88	**Cathedral Grove - Port Alberni**	1991	T. Goward	130
89	**Tofino**	1991	T. Goward	75
90	**Cultus Lake - Chilliwack Lake**	1991	T. Goward	145
91	**Mt. Baker (WA, USA)**	1992	T. Goward	17
92	**Lower Fraser Valley**	1992	T. Goward	1
93	**Kispiox**	1992	T. Goward	150

Map #	Location	Year visited	Collector	# lichen specimens collected
94	**Haines Triangle - Tatshenshini R**	1992	T. Goward	700
95	**Chilliwack Lake**	1992	T. Goward	63
96	**Kispiox**	1994	T. Goward	10
97	**Kispiox**	1995	T. Goward	290
98	**Meziadin Lake**	1995	T. Goward	90
99	**Bell-Irving**	1995	T. Goward	60
100	**Hazelton**	1995	T. Goward	17
101	**Mount Cain**	1996	T. Goward	475
102	**Kispiox Valley**	1996	T. Goward	82
103	**Pacific Rim National Park, Vancouver Island**	2001	T. Goward	175
104	**Pacific Rim National Park, Vancouver Island**	2002	T. Goward	155
105	**South Morseby (Gwaii Haanas N. P.)**	2003	T. Goward/T. Tønsberg	720
106	**Queen Charlotte Strait**	2004	K. Wright	200
107	**Kyuquot Sound, Vancouver Island**	2004	K. Wright	200
	Total number of speciments collected:			**20446**

Table 3. Localities of *Heterodermia sitchensis*, their history of documentation and potential threats. Detailed locality information is given in Appendix 1.

Locality	First record abundance (No. of thalli)	Last record abundance (No. of thalli)	Ownership threats
Canada, British Columbia, Vancouver Island, Schooner Cove (Type locality)	30 March 1983 12 (min.)	16 June 2002 4 (1 thallus dying)	National Parkland (Pacific Rim National Park Reserve) Disturbance by recreationists
Canada, British Columbia, Vancouver Island, Ucluth Peninsula	3 April 1983 4 (min.)	3 April 1983 N/A	Private land; unprotected Colony **extirpated** by 1991 by logging for a housing development
Canada, British Columbia, Vancouver Island, Quisitis Point	17 July 2001 6	17 July 2001 N/A	National Parkland (Pacific Rim National Park Reserve) Disturbance by recreationists
Canada, British Columbia, Vancouver Island, Florencia Island	24 July 2001 56	11 June 2002 27	National Parkland (Pacific Rim National Park Reserve) Disturbance by recreationists

Locality	First record abundance (No. of thalli)	Last record abundance (No. of thalli)	Ownership threats
Canada, British Columbia, Vancouver Island, Ucluth Peninsula	18 July 2001 2	18 July 2001 N/A	Private land Logging
Canada, British Columbia, Vancouver Island, Benson Island	20 June 2002 1	20 June 2002 N/A	National Parkland (Pacific Rim National Park Reserve) Disturbance by recreationists
Canada, British Columbia, Vancouver Island, Dicebox Island	21 July 2001 1	21 July 2001 N/A	National Parkland (Pacific Rim National Park Reserve) Disturbance by recreationists
Canada, British Columbia, Vancouver Island, Wouwer Island	21 July 2001 44	18 June 2002 12 (not a complete count)	National Parkland (Pacific Rim National Park Reserve) Disturbance by recreationists
Canada, British Columbia, Clayoquot Sound, Vancouver Island, Lawrence Island	July 2001 1 (not a complete count)	12 June 2002 21	Crown Land Logging
Canada, British Columbia, Vancouver Island, Folger Island	19 June 2002 18	19 June 2002 N/A	Crown Land Logging
Canada, British Columbia, Vancouver Island, vicinity of Kyuquot	26 June 2004 14 (8 on fallen branch)	26 June 2004 N/A	Crown Land Logging & Disturbance by recreationists
Canada, British Columbia, Vancouver Island, a second location in the vicinity of Kyuquot	26 June 2004 48	26 June 2004 N/A	Crown Land Logging & Disturbance by recreationists
United States of America, Oregon, Tillamook Co., Cape Lookout	11 September 2000	10 June 2001 5-10 (T. Tønsberg, pers. comm.)	State Park Disturbance by recreationists (heavy use) & changes in environmental conditions

One of the most productive sites for *H. sitchensis* is a stretch of shoreline on Wouwer Island in the Broken Group Islands. Here, in 2001, a dozen thalli were noted among the lower branches of a stunted Sitka spruce tree exposed to northwest winds. When the same tree was visited in 2002, only eight thalli were found, one of which was apparently healthy, the others dead. A careful survey of the upper canopy revealed an additional twelve thalli, of which only four were alive. The high incidence of dead thalli points to a die-back event during the winter of 2001/2002. In fact, such a die-back had been predicted by Barry Campbell (pers. comm.), on the basis of exceptionally strong northwest winds in April of 2002. The branches of the host tree appear to have been repeatedly drenched with salt water, as suggested by the greenish algal layer covering the basal portions of the lichens. Epiphytic mosses, too, had been partly smothered by algae. Damage in the upper canopy was less extensive than in the lower canopy. Discoloured lichen thalli were noted in many other localities in 2002, especially in sites exposed to northwest winds.

Rescue effect

At the present time, *H. sitchensis* is an almost exclusively Canadian species, with only a single, presumably relictual population known from the United States. Because of this, diaspores originating from points south of the border are extremely unlikely to remedy future population losses in Canada.

LIMITING FACTORS AND THREATS

Even after an intensive search effort over four years, the known Canadian population of *H. sitchensis* amounts to only 227 thalli. Sixty-five percent of these are restricted to three localities on Florencia, Wouwer, and the vicinity of Kyuquot. The first two localities are in Pacific Rim National Park Reserve, while the last is located on crown land 130 km distant. All of these localities appear to have been subject to recent or ongoing nitrogen enrichment in connection with sea lion haul-outs or seabird nesting sites. Elsewhere, *H. sitchensis* averages only about eight thalli per locality, apparently very locally supported by nutrients from perching birds. The small number of thalli present at each site raises the possibility of sudden disappearance from the greater portion of its range, whether as a result, for example, of severe winter storms, decline in perching bird populations, prolonged summer drought, or logging operations. The occurrence of a few of the known populations near trails raises the possibility that branches bearing *H. sitchensis* could be collected, e.g., for kindling by rain-soaked hikers.

In this report, we present evidence that *H. sitchensis* is sensitive to prolonged wetting by salt spray as a result of strong winter windstorms. In other parts of the north coast, such storms have been observed to actually destroy entire epiphytic lichen communities over large areas. With the gradual trend to more intense storm events, it seems likely that *H. sitchensis* could be at risk at least in some parts of its range.

The frequently exclusive association of *H. sitchensis* with nutrient columns below the roosts of perching birds is especially disquieting: it suggests that this species is not stable at most sites, as for example at the holotype locality, where a population of 12 thalli in 1983 had dwindled to only one when last visited. Though the perch trees themselves may be long-lived, the roosts are likely to be relatively ephemeral.

Apparently the continued existence of *H. sitchensis* over large portions of its total range depends on an ability to recolonize at rather frequent intervals. Assuming the trend toward global warming (and coastal drying) continues, *H. sitchensis* could eventually lose this ability at many of the sites currently supporting it. In the long run, therefore, this species can be expected to go into gradual decline. In the short term, however, a recent defoliating event in the Pacific Rim area, apparently caused by insect outbreak, promises to provide abundant new habitat for this species, at least locally.

SPECIAL SIGNIFICANCE OF THE SPECIES

Heterodermia sitchensis is a Pacific Northwest endemic of unusually restricted distribution (see Figure 2) and ecology (see above). It is the most northerly member of a group of *Heterodermia* species more characteristic of tropical to warm temperate latitudes. Of special interest are the apothecia which, presumably once the primary reproductive organ in this species, no longer produce viable spores. Instead, the apothecial rim has evolved into highly specialized urn-shaped structures dedicated to the production of soredia, that is, powdery offshoots effective in asexual reproduction.

With the exception of a single locality in Oregon, *H. sitchensis* appears to be restricted to Canada. Its long-term welfare should therefore be thought of as a predominantly Canadian responsibility.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Ten extant populations of *H. sitchensis* are known from Canada at the present time. Of these, five are located in Pacific Rim National Park Reserve, and hence receive protection under the National Parks Act (John McIntosh, pers. comm.). The remaining five populations are situated on crown land, and for this reason are at least theoretically at risk of disturbance by logging and shoreline development.

NatureServe has accorded *H. sitchensis* a G2G3 rank, indicating that this species may be somewhat secure on a global scale. Actually the NatureServe rank is based on a rather optimistic S2S3 ranking by the British Columbia Conservation Data Centre. Here it can be noted that the BC CDC has subsequently withdrawn its lichen rankings, pending further study (Jennifer Penny, pers. comm.). By contrast, Goward *et al*. (1998) accorded *H. sitchensis* an S1 rank for British Columbia, while the Oregon Natural Heritage Program also lists it as S1.

TECHNICAL SUMMARY

Heterodermia sitchensis
seaside centipede lichen — hétérodermie maritime
Range: British Columbia

Extent and Area information	
• *extent of occurrence (EO)(km^2)*	< 5000 km^2
• *specify trend (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in EO (> 1 order of magnitude)?*	No
• *area of occupancy (AO)(km^2)*	875 m^2 *
• *specify trend (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in AO (> 1 order of magnitude)?*	No
• *number of extant locations*	10 in Canada (1 USA)
• *specify trend in # of locations (decline, stable, increasing, unknown)*	Original 2 popns lost; 10 new popns; fugitive life history strategy
• *are there extreme fluctuations in # locations (> 1 order of magnitude)?*	No
• *habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat*	Unknown, but probably stable
Population information	
• *generation time (average age of parents in the population) (indicate years, months, days, etc.)*	10-15 years
• *number of mature individuals (capable of reproduction) in the Canadian populations (or, specify a range of plausible values)*	211 thalli
• *total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals*	possibly declining based on Table 3
• *if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)*	Original 2 popns lost, but 10 new pops. found
• *are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?*	No
• *is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., ≤ successful migrant / year)?*	Probably
• *list each population and the number of mature individuals in each*	See Table 1
• *specify trend in number of populations (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in number of populations (>1 order of magnitude)?*	Unknown
Threats (actual or imminent threats to populations or habitats)	
- logging, winter storms, collection of kindling by recreationists, recreation pressure and development	

Rescue Effect (immigration from an outside source)	
• *does species exist elsewhere (in Canada or outside)?*	Yes
• *status of the outside populations(s)?*	Extant
• *is immgration known or possible?*	Unlikely
• *would immigrants be adapted to survive here?*	Probably
• *is there sufficient habitat for immigrants here?*	Yes
Quantitative Analysis	Not available

*****Area of occupancy is calculated according to the standard COSEWIC convention, based on a host tree areal coverage of 25 m^2. This areal measurement, of course, bears no relation to the actual per tree areal coverage of *Heterodermia sitchensis,* which averages about 1.5 cm^2. On average, *Heterodermia sitchensis* colonizes three trees per locality.

Status and Reasons for Designation

Status: Endangered	**Alpha-numeric code**: D1

Reasons for Designation:
This is a foliose lichen restricted to shoreline Sitka spruce trees on the west coast of Vancouver Island. It has been documented from only ten locations in Canada, 11 worldwide. It requires high levels of nitrogen, so is restricted to sites subject to nitrogen enrichment, for example, sea lion haul-out sites and bird nest sites. The species may have poor dispersal abilities. It is highly vulnerable to tsunamis, and intensified winter storm activity associated with global warming.

Applicability of Criteria

Criterion A: (Declining Total Population): Does not apply.

Criterion B: (Small Distribution, and Decline or Fluctuation): The criterion is not met. Sub-criteria B1 and 2 both apply for Endangered. Sub-criterion “a” is met for Endangered as the species is probably severely fragmented. However, for sub-criterion “b” a continuing decline could not be demonstrated in part because the species has a fugitive life history strategy.

Criterion C: (Small Total Population Size and Decline): The criterion is not met. Though there are only 227 thalli known, continuing declines cannot be demonstrated.

Criterion D: (Very Small Population or Restricted Distribution): The criterion is met for Endangered as there are 227 thalli known.

Criterion E: (Quantitative Analysis): Not available.

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Irwin, M. Brodo, lichenolgist, authority on the lichens of the Queen Charlotte Islands, Canadian Museum of Nature, Ottawa.

Katherine A. Glew, lichenologist, author of Rare Lichens of Washington. Cryptogamic Herbarium, University of Washington.

Bruce McCune, lichenologist, expert on lichens of the American northwest. Oregon State University.

Gayle McHenry, lichenologist, first to find *H. sitchensis* outside of Canada.

Jennifer Penny, contact at the British Columbia Conservation Data Centre office, Victoria.

Brian Reader, participant on *H. sitchensis* field trips during 2001, 2002, 2003, and 2004. Parks Canada, Victoria.

Tor Tønsberg, second to find *H. sitchensis* outside of Canada, participant on field trip to Queen Charlotte Islands. University of Bergen, Norway.

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Since earning a degree in French and Latin from Mount Allison University, New Brunswick in 1978, Trevor Goward (tgoward@interchange,ubc,ca) has dedicated his attention to lichen taxonomy and distributional ecology. Beginning in 1983 he has published dozens of professional papers and written or co-authored three books on the lichens of British Columbia. Currently he consults from the Edgewood Institute, Clearwater, British Columbia, with a special interest in rare lichens as well as in the lichens of oldgrowth rainforests. In 1989, he was appointed curator of lichens at UBC, where most of his 26,000 lichen specimens are on deposit. Since 1995, he has also served as a member of the lichen subcommittee of COSEWIC.

Kenneth Wright (kengwright@telus.net) participated in *H. sitchensis* field excursions during 2002, 2003, and 2004. In 2004 he located the northernmost colony of *H. sitchensis* near Kyuquot Village on northern Vancouver Island. When not searching for rare lichens, Ken works as a freelance ornithological consultant and leads educational nature tours in Antarctica. When not travelling abroad, he is based in the interior of British Columbia.

COLLECTIONS EXAMINED

All known Canadian collections of *H. sitchensis* have been examined in connection with this study. Specimens are listed in Appendix 1.

Appendix 1. Known collections of the North American endemic macrolichen *Heterodermia sitchensis*.

Specimen Location	Abundance (no. of thalli/ locality)	Locality Habitat Substrate	Collector Collecting # Date	Determined / Examined by
UBC	12 (min.)	Canada, British Columbia, Vancouver Island, Schooner Cove Seaside fringe forest at edge of broad sheltered beach on exposed outer coast On twigs of *Picea sitchensis*	T. Goward 83-326 March 30, 1983	T. Goward
UBC	4 (min.)	Canada, British Columbia, Vancouver Island, Ucluth Peninsula Seaside fringe forest in sheltered, well-lit bay on exposed outer coast On twigs of *Picea sitchensis*	T. Goward 83-341 April 3, 1983	T. Goward
UBC	42	Canada, British Columbia, Vancouver Island, Broken Group, Wouwer Island Seaside fringe forest in sheltered, well-lit bay on exposed outer coast On twigs of *Picea sitchensis*	T. Goward 01-344 & 01-346 July 20, 2001	T. Goward
UBC	56	Canada, British Columbia, Vancouver Island, Florencia Island Seaside fringe forest in sheltered bay on exposed outer coast On twigs of *Picea sitchensis*	T. Goward 01-401 July 24, 2001	T. Goward
UBC	21	Canada, British Columbia, Vancouver Island, Lawrence Island Seaside fringe forest of small unindented island on exposed outer coast On twigs of *Picea sitchensis*	T. Goward 02-067 June 12, 2002	T. Goward

Specimen Location	Abundance (no. of thalli/ locality)	Locality Habitat Substrate	Collector Collecting # Date	Determined / Examined by
UBC	42 (2001 count)	Canada, British Columbia, Vancouver Island, Wouwer Island Seaside fringe forest in sheltered, well-lit bay on exposed outer coast On twigs of *Picea sitchensis*	T. Goward 02-129 June 18, 2002	T. Goward
UBC	18	Canada, British Columbia, Vancouver Island, Folger Island Seaside fringe forest in sheltered, poorly lit steep bay on exposed outer coast Found on dead (fallen) twig of *Picea sitchensis*	T. Goward 02-151 June 19, 2002	T. Goward
UBC	14 (8 dead on fallen branch)	Canada, British Columbia, Vancouver Island, Kyuquot Sound, Spring Island Seaside fringe forest in sheltered, well-lit bay on exposed outer coast Collected from fallen twig of *Picea sitchensis*	K. Wright KGW2004-28 June 26, 2004	T. Goward
UBC	48	Canada, British Columbia, Vancouver Island, Kyuquot Sound, large unnamed island immediately south of Spring Island Seaside fringe forest in sheltered, well-lit bay on exposed outer coast Collected from twig of *Picea sitchensis*	K. Wright KGW2004-25 June 26, 2004	T. Goward
WTU	5-10	United States of America, Tillamook Co., Oregon, Cape Lookout Seaside fringe forest on exposed 2 km peninsula on outer coast Collected from fallen mossy twigs of *Picea sitchensis*	G. McHenry *McHenry 091100.10* (WTU) September 11, 2000	T. Tønsberg

Specimen Location	Abundance (no. of thalli/ locality)	Locality Habitat Substrate	Collector Collecting # Date	Determined / Examined by
BG	5-10	United States of America, Tillamook Co., Oregon, Cape Lookout Seaside fringe forest on exposed 2-km peninsula on outer coast Collected from fallen mossy twigs of *Picea sitchensis*	T. Tønsberg Tønsberg 30434 (BG) June 10, 2001	T. Tønsberg
BG	see above	United States of America, Tillamook Co., Oregon, Cape Lookout Seaside fringe forest on exposed 2-km peninsula on outer coast Collected from fallen mossy twigs of *Picea sitchensis*	T. Tønsberg Tønsberg 30437 (BG) June 10, 2001	T. Tønsberg