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Monitoring the Recovery of Lichen Communities on Hagemeister Island, Alaska

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Monitoring the Recovery of Lichen Communities on Hagemeister Island, Alaska

Patrick Walsh, Andy Aderman, and Michael Winfree¹

ABSTRACT

We sampled lichen biomass in Dwarf Shrub Lichen communities on Hagemeister Island in 2003 in order to initiate a long-term effort to monitor the recovery of lichen communities that were damaged by reindeer (*Rangifer tarandus*) overgrazing. We found relatively low biomass (mean = 507 kg/ha), consistent with lichen communities in an early state of development. Visual cover estimates were significantly related to weight measurements but had limited value as a monitoring metric. Dwarf Shrub Lichen communities on Hagemeister Island were composed of various mixtures of at least 75 lichen taxa, and were dominated by *Cladina stygia*, followed by *Cetraria laevigata*, *Thamnolia vermicularis*, *Sphaerophorus globosus*, *Cladonia gracilis ssp. vulnerata*, *Cladonia uncialis*, *Flavocetraria cucullata*, *Cladonia subfurcata*, and *Pertusaria dactylina*.

INTRODUCTION

Hagemeister Island has been part of the National Wildlife Refuge System since 1980. Although part of Alaska Maritime National Wildlife Refuge, management of the island, including removal of introduced reindeer and evaluation of range recovery has been conducted by nearby Togiak National Wildlife Refuge. Refuges in Alaska have establishing purposes that include conservation of natural biodiversity. We initiated a monitoring program to evaluate recovery of vegetation following removal of reindeer and this report summarizes the results from our initial survey.

The predominant communities on Hagemeister Island are shrub and tundra types, including tall shrub, low shrub tundra, lichen tundra, and low shrub meadow (Swanson and LaPlant 1987). These communities developed in the absence of ungulate grazers until 1965, at which time reindeer were introduced under a Bureau of Land Management grazing permit. The reindeer population grew from an initial introduction of 71 animals to over 1,000. Overgrazing was evident by 1973. A 1987 survey found damage to lichen sites but little impact to vascular plant-dominated sites (Swanson and LaPlant 1987). A 1992 survey measuring lichen utilization at 23 sampling sites found the virtual depletion of lichens on the primary lichen-dominated sites (which total approximately 57% of the island) and significant ecological damage on the remaining vascular-plant dominated sites (Swanson and Barker 1993). A dieoff of approximately 300 animals occurred in 1992

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and the remaining animals were removed in 1992-1993 (Stimmelmayer 1994). Since the lichens were particularly damaged by the introduced reindeer we focused our monitoring program on this group of taxa.

There are over 14,000 lichen species described world-wide, 3,600 of which occur in North America (Thomson 1984, Brodo et al. 2001). In a four-day survey, Talbot et al. (1987) identified 63 lichen taxa on Hagemeister Island (Appendix A). Lichens are important in caribou and reindeer diets, particularly during winter (Andreev 1954, Klein 1959 and 1968, Pegau 1968, Skoog 1968). Lichen taxa that have been determined to be particularly important to reindeer and caribou include members of the principally ground-dwelling genera *Cladonia*, *Cladina*, *Cetraria* and *Stereocaulon* and the arboreal genera *Alectoria*, *Evernia*, and *Usnea* (Skoog 1968, Sveinbjornsson 1990.)

Lichens are characterized by extremely low rates of growth, relative to vascular plants in general (Pegau 1968, Sveinbjornsson 1990). Swanson (1992) estimated that it would take 75-100 years for the depleted lichen communities on Hagemeister Island to recover in the complete absence of reindeer grazing. Other investigators have estimated that lichen community recovery following fire in Canada requires over 100 years (Black and Bliss 1978, Maikawa and Kershaw 1976). As such, efforts to measure change in lichen communities at sampling intervals meaningful for vascular plants are unlikely to detect differences. Relatively long sampling intervals are necessary.

The Alaska Department of Fish and Game has monitored lichens in the Talkeetna Mountains of Alaska since 1955 (Lieb 1994). This study used a combination of grazing exclosures and associated grazed plots to monitor percent cover of lichen taxa, lichen height, and range condition using categorical condition classes. Over a 27-year period, Lieb reported that preferred lichen species (*Cladonia stellaris*, *C. arbuscula*, *C. rangiferina*) protected from grazing increased from 8-24% in cover. All lichens, including the preferred species, increased from 8-30% in cover during the same period.

Klein (1959, 1968 and 1987) studied lichen community recovery on St. Matthew Island, Alaska following destructive grazing by reindeer. Klein established a monitoring program for vegetation through a combination of point-intercept transects and meter-square quadrats. Lichens and other vegetation were measured in 1963 (at the time of the reindeer dieoff) and in 1985 after 22 years of virtually no grazing. He used 12 point-intercept transects 31 m long with measures made every .31 m. The quadrats consisted of three groups of four 1 m square plots. Two plots in each group were grazing exclosures. Ground cover was mapped by species for cover and height. Twenty-two years after the die-off mosses had invaded large portions of the ground area denuded of lichens, and lichens had recovered to only 10% of the standing crop of living lichen biomass occurring on adjacent Hall Island where there was no grazing.

At Hagemeister Island, we wanted to evaluate recovery of native lichens to determine if the management action of removing the reindeer would be sufficient to restore native biodiversity.

Objectives:

1. Establish and implement a program to monitor change in biomass of lichen taxa important to *Rangifer* species on Hagemeister Island.
2. Determine the relationship between weight and visual estimates of lichen cover on Hagemeister Island.
3. Describe the composition, including the dominant species, of Hagemeister Island lichen communities.

STUDY AREA

Hagemeister Island is located at approximately 160° 54' west longitude and 58° 29' north latitude (Fig. 1). The island is approximately 39 km in length, has a perimeter of

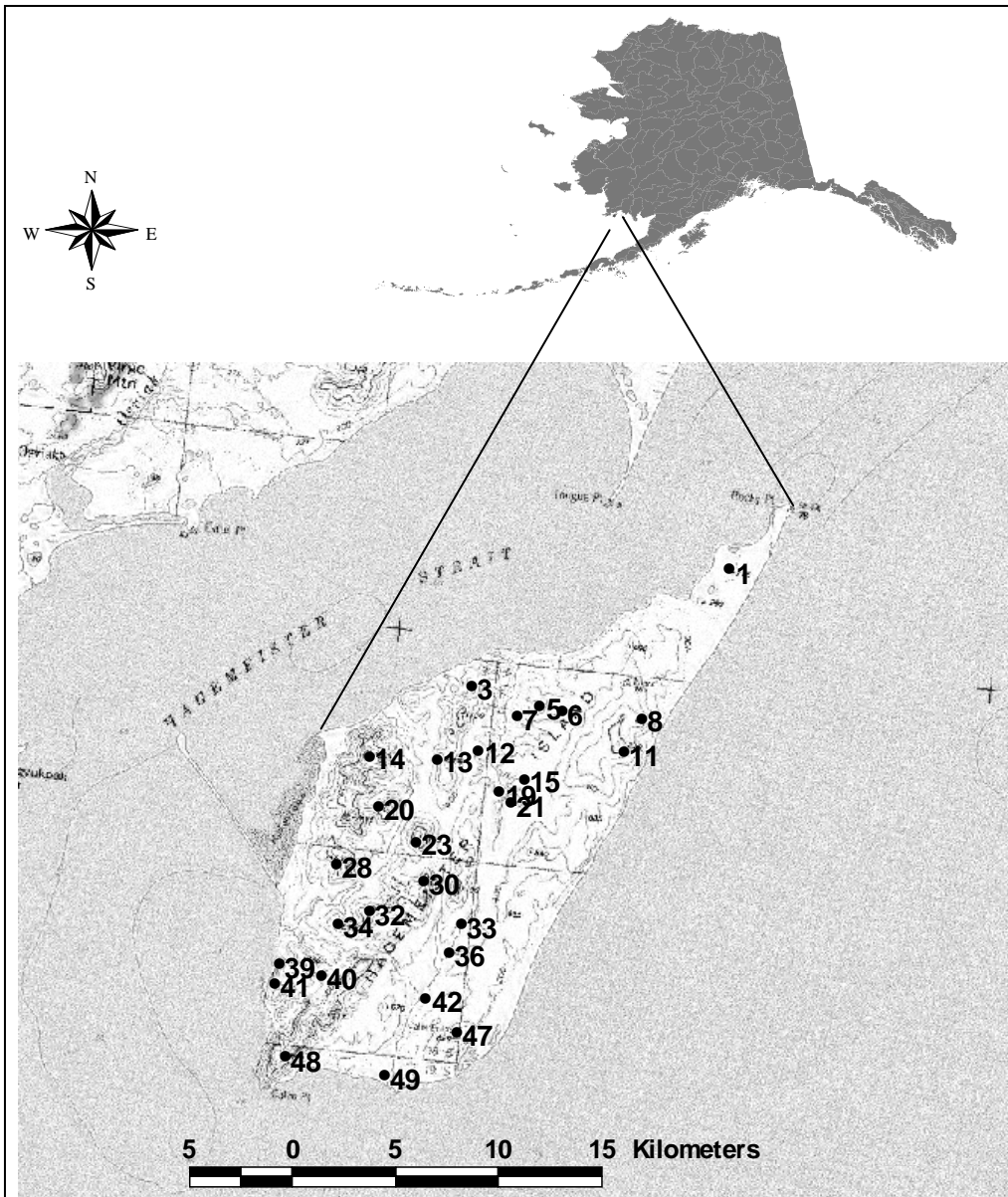


Figure 1. Location of study sites on Hagemeister Island, Alaska.

approximately 110 km, and is located approximately 31 km south of the village of Togiak in Bristol Bay (Bailey 1983). The size of the area is approximately 27,000 ha (Stimmelmayer 1994). The climate on Hagemeister Island is maritime. The weather station nearest to Hagemeister Island is located approximately 65 km to the west at the U.S. Air Force's Cape Newenham Long Range Radar Station. At that location, the average daily high and low temperatures for February (the coldest month) during the years 1973--1997 was -5 and -9° C, and those during the warmest month (August) was 12 and 9° C (Air Force Combat Climatology Center 1998). Mean annual rainfall was 93.2 cm, with approximately 64% falling July-November. Mean annual snowfall averages 195.3 cm, with snow occurring in all months except June--August. The island surficial geology ranges from relatively recent flood plain alluvium, colluvial deposits, and glacial drift of sand, gravel, and boulders to paleozoic siltstone, limestone, and argillaceous rocks (Hoare and Coonrad 1961). Intermediate in age are extensive carboniferous to cretaceous volcanic deposits. The island ranges from rolling hills up to 150 m elevation in the east to steep mountains up to 500 m in the west. Several permanent streams originate near the center of the island and flow both north and south to the sea.

Hagemeister Island is treeless, and the major vegetation types are dwarf shrub heath and deciduous scrub (Talbot et al. 1987). Low elevation sites beginning at the beaches are forb and graminoid-dominated, and graminoid-dominated communities also occur above coastal cliffs and on elevated benches. Extensive alder thickets occur on mountain slopes protected from the wind. Lichens occur on exposed upland dwarf shrub heath sites.

Hagemeister Island supports diverse faunal communities, including seabird colonies estimated at 26,000 (Bailey 1983) to 31,000 individuals (Arneson 1977, as reported in Bailey 1983). Bailey recorded 56 bird species, including 16 seabird, 1 raptor, 14 waterfowl, loons, and grebes, 13 shorebird, and 12 passerines and ptarmigan species. He recorded 3 marine mammal species and three terrestrial mammal species. Stimmelmayer (1994) also provided an animal list that included two bird and two mammal species not listed by Bailey. However, with the exception of reindeer, no lichen grazers were identified in either previous study.

METHODS

Study site selection

The land cover of Hagemeister Island was delineated into 12 cover types using the classification method of the Bureau of Land Management and Ducks Unlimited (1998). Although lichens occurred in several of the types, lichens were most prominent in the cover type Dwarf Shrub Lichen, which by definition included a cover component of greater than 20% lichen. We found more than 2,000 individual Dwarf Shrub Lichen sites on Hagemeister Island ranging in size from less than 0.04 ha to over 73 ha. To minimize the probability of sampling in the ecotone of other cover types, we selected sites greater than 4.05 ha as potential sampling locations. We then randomly selected our study sites from the approximately 150 total sites that fell into this size category.

Sampling method

We marked the approximate center of each sampling site with a steel post. At each site, we then collected four sub-samples within rectangular aluminum sampling frames measuring 0.125 m² (0.25 m by 0.5 m.) The sub-samples were taken at 3.05 m intervals along a transect following a random azimuth originating at the site marker post. Transect azimuths were determined by hand-held compass using uncorrected magnetic bearings.

We visually estimated percent ground cover of lichens within each sampling frame to the nearest percentage, then plucked all fruticose and foliose lichen material (both live and attached dead) from within each sampling frame and stored them in paper bags. We oven dried the lichen samples at 40° C, sorted them into like taxa and then weighed them to the nearest 0.001g using an AND GX 400[®] balance (weight range: 0.001g to 410g). T. Goward, Enlichened Consulting, Clearwater, B.C. Canada identified all specimens to species.

Analysis

We totaled lichen weights among the four sub-samples taken at each site, and considered the total weights by taxa for each site as replicates. These weights were used to represent the average lichen weight per unit area of Dwarf Shrub Lichen cover for the island and will serve as the units of comparison with future measurements. Future repeated sampling measures will be made at approximately 10-year intervals.

Estimated cover percentages of lichens were averaged among plots at each site and sites were considered replicates. Average cover values were related to total weight of all lichens per site using linear regression (NCSS 2001).

Pilot test

Prior to undertaking field operations for this project, we conducted pilot tests in order to understand the time requirements for sampling and to practice field methods. Pilot testing was conducted at an area on the outskirts of Dillingham, Alaska, located approximately 140 km to the east of Hagemeister Island. The pilot test site had likely been ungrazed for >70 years. Pilot tests consisted of practice sampling of cover estimation and lichen collection on plots of various sizes ranging from 0.125 to 1.0 m². Lichens were dried, weighed, and sorted.

Results and Discussion

We conducted pilot testing on 7 February and 29 April 2003. During the pilot tests, cover estimation took approximately 11 minutes/sample while collecting weight data took approximately 76 minutes/sample. Total lichen weights from two 0.25 m² plots sampled were 111.5 and 60.0 g.

We sampled 28 sites on Hagemeister Island (Fig. 1, Appendix A) during the period 16-21 June, 2003. A total of two crews of two persons each conducted the sampling. Sites were accessed via helicopter. A total of 1,420 specimens were collected, sorted and weighed (Appendix B). A total of 68 lichen species were found. Of these, five species included two or more subspecies, totaling 75 distinct taxa. Additionally, there were eight specimens that could not be identified.

Previous lichen investigations (Talbot et al. 1987, Swanson and Barker 1992) identified 66 species of lichens on Hagemeister Island (Appendix C). Twenty-four of those species were found in the current study, while 42 species were not encountered. Fifty of the species identified during the current study were not found during previous studies. Discrepancies in the number of taxa identified during different studies were likely the result of differences in search areas, rather than changes in lichen flora. Our study focused exclusively on areas identified as Dwarf Shrub Lichen sites, whereas previous studies had broader focus in both ecological sites and growth forms.

Total weights of lichens per site averaged 25.35 g (standard deviation 10.11, range 7.43 - 56.81, Appendix D). Extrapolating these weights to Dwarf Shrub Lichen communities in general on Hagemeister Island in 2003 results in an average estimate of 506.96 kg per ha (standard deviation 202.12, range 148.5 - 1,136.2). To put this into perspective, the ungrazed plots (n = 2) sampled during the pilot test resulted in an average lichen biomass estimate of 3,430 kg per ha. These results are similar to those of Klein (1987), who reported an average lichen biomass value (n = 3) of 350 kg/ha on St. Matthew Island after 22 years of grazing deferment that followed a reindeer overgrazing event that depleted lichen communities. Simultaneously, Klein reported that on adjacent Hall Island, which had no history of grazing, lichen communities averaged 5,500 kg/ha. Thus, results are consistent with the assumption that Hagemeister Island lichen communities are still in a relatively early stage of recovery.

Overall lichen cover estimates at study sites ranged from <2 to 50% and averaged 21.6% (Fig. 2, Appendix E). There was a moderately strong relationship (simple regression: $r^2 = 31.12$, $p = 0.002$; polynomial regression: $r^2 = 31.16$, $p = 0.009$) between visually estimated cover and measured weight.

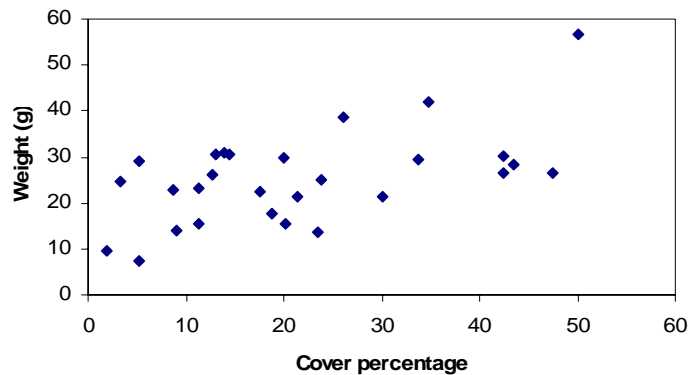


Figure 2. Relationship between visual cover estimates and measured weight of lichens at Hagemeister Island.

Visual estimates of percent cover are commonly used to monitor change in lichen communities over time (Lieb 1994, Webb 1998). We were able to perform cover estimates approximately seven times faster than collecting lichen samples in the field. Additionally, cover estimation does not require time for drying and weighing lichen samples. However, cover estimates only explained ~31% of the variability in true lichen quantity. Thus, the value obtained by being able to increase sample size did not offset the lower power in estimating true quantity in Hagemeister lichen communities, and so we do not consider percent cover estimation an acceptable surrogate for weight measurement on Hagemeister Island.

Frequency of occurrence of lichen taxa among sites ranged from a single site (n = 15 taxa) to 100% of sites (n = 3, Fig. 3). Taxa that occurred within the upper 95th percentile of sites included *Certraria laevigata*, *Sphaerophorus globosus*, *Thamnolia vermicularis*, *Cladina stygia*, *Cladonia subfurcata*, *Cladonia uncialia*, *Flavocetraria cucullata*. Weights of lichen taxa per site ranged from a trace quantity less than 0.001 g to 127.6 g (Fig. 4). Dominance, or the influence of an individual taxon within its community, can be reported as biomass, or weight per unit area. In this regard, *Cladina stygia*² was clearly the dominant lichen species in 2003 at Hagemeister Island, followed by *Cetraria laevigata*, *Thamnolia vermicularis*, *Sphaerophorus globosus*, *Cladonia gracilis ssp. vulnerata*, *Cladonia uncialis*, *Flavocetraria cucullata*, *Cladonia subfurcata*, and *Pertusaria dactylina*. Future sampling will demonstrate whether the community composition on Hagemeister Island remains constant or whether successional changes will occur.

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² *Cladina stygia* is part of the *C. rangiferina* group, and is similar to *C. rangiferina* in form, color, and chemistry, but is distinguished by its dark brown to black stereome expressed at the basal portion of the thallus (Brodo et al. 2001). Bases were broken or missing in many specimens collected in this study, so positive identification was not possible. However, as the majority of the specimens that could be identified with certainty were *C. stygia*, it is assumed that the remainder was *C. stygia* as well.

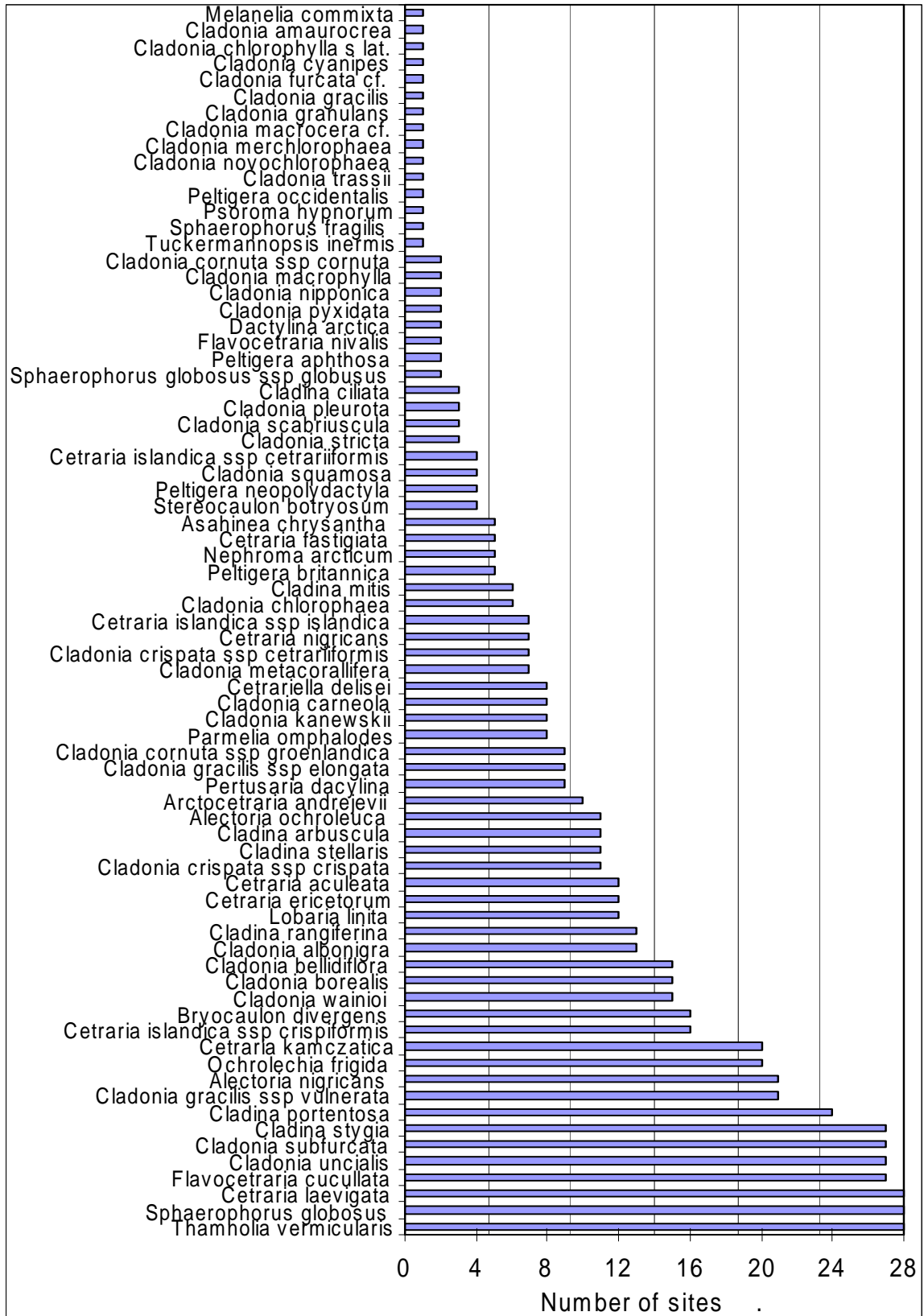


Figure 3. Frequency of occurrence of lichen taxa at Hagemeister Island sampling sites.

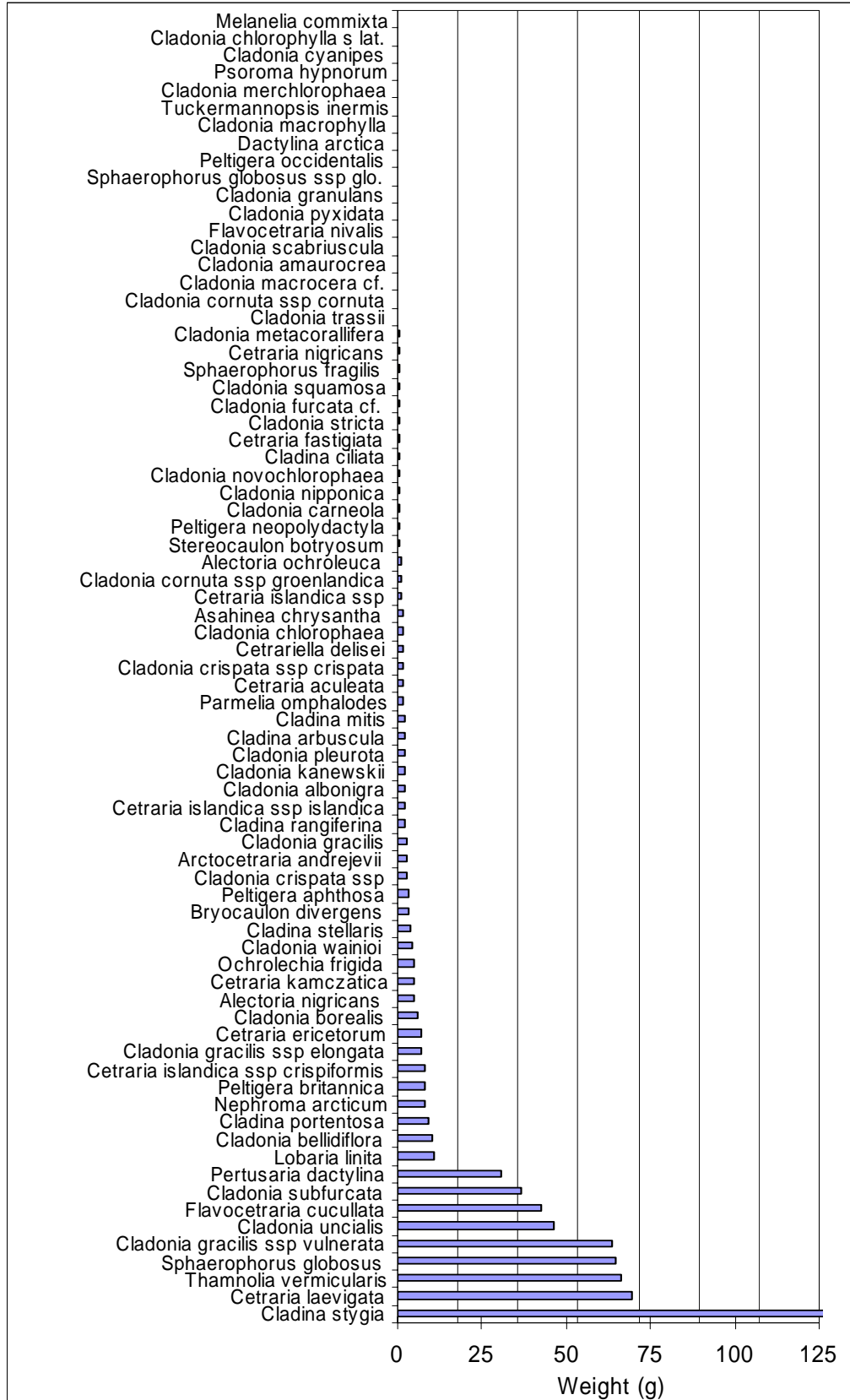


Figure 4. Total weight of lichen taxa at all Hagemeister Island sampling sites.

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Appendix A. Study site area and location.

Study Site	Ha	N Latitude (decimal degrees)	W Longitude (decimal degrees)
1	6.5	58.7882	160.7278
3	9.3	58.7273	160.9333
5	9.3	58.7219	160.8747
6	6.6	58.7204	160.8555
7	17.2	58.7164	160.8928
8	8.0	58.7208	160.7884
11	5.7	58.7056	160.8012
12	23.8	58.7003	160.9224
13	7.4	58.6945	160.9560
14	73.6	58.6922	161.0133
15	5.6	58.6900	160.8812
19	5.5	58.6831	160.9012
20	5.7	58.6713	161.0007
21	17.8	58.6791	160.8906
23	8.4	58.6585	160.9664
28	40.0	58.6450	161.0313
30	22.1	58.6416	160.9569
32	14.7	58.6266	160.9995
33	4.9	58.6249	160.9218
34	12.9	58.6198	161.0245
36	7.6	58.6125	160.9292
39	4.6	58.5998	161.0696
40	16.7	58.5968	161.0334
41	7.9	58.5913	161.0721
42	4.8	58.5920	160.9449
47	23.5	58.5791	160.9167
48	4.7	58.5604	161.0572
49	5.1	58.5571	160.9731

**Appendix B. Weight of lichen specimens collected at Hagemeister Island in 2003.
Weights less than 0.001 g indicated by T.**

Sample	Site	Plot	Weight (g)
Bryocaulon divergens	1	1	0.003
Cetraria laevigata	1	1	0.12
Cladina stygia	1	1	0.427
Cladonia crispata ssp cetrariiformis	1	1	0.099
Cladonia crispata ssp crispata	1	1	0.351
Cladonia gracilis ssp vulnerata	1	1	0.616
Cladonia uncialis	1	1	0.106
Flavocetraria cucullata	1	1	0.394
Sphaerophorus globosus	1	1	0.103
Thamnolia vermicularis	1	1	0.066
Alectoria nigricans	1	2	0.017
Bryocaulon divergens	1	2	0.02
Cetraria islandica ssp crispiformis	1	2	0.219
Cetraria kamczatica	1	2	2.241
Cetraria laevigata	1	2	2.578
Cladina arbuscula	1	2	0.026
Cladina stygia	1	2	0.84
Cladonia bellidiflora	1	2	0.482
Cladonia gracilis ssp vulnerata	1	2	0.78
Cladonia uncialis	1	2	0.404
Flavocetraria cucullata	1	2	1.573
Peltigera britannica	1	2	1.015
Sphaerophorus globosus	1	2	0.525
Thamnolia vermicularis	1	2	0.208
Cetraria islandica ssp crispiformis	1	3	1.015
Cetraria laevigata	1	3	1.189
Cladina stygia	1	3	0.318
Cladonia gracilis ssp vulnerata	1	3	0.781
Flavocetraria cucullata	1	3	1.036
Thamnolia vermicularis	1	3	0.162
Alectoria nigricans	1	4	0.041
Bryocaulon divergens	1	4	0.343
Cetraria kamczatica	1	4	0.017
Cetraria laevigata	1	4	0.767
Cladina portentosa	1	4	0.384
Cladina stygia	1	4	0.596
Cladonia bellidiflora	1	4	0.37
Cladonia borealis	1	4	0.825
Cladonia chlorophaea s lat.	1	4	0.403
Cladonia cornuta ssp groenlandica	1	4	0.025
Cladonia gracilis ssp elongata	1	4	0.118
Cladonia stricta	1	4	0.01
Cladonia subfurcata	1	4	0.44
Cladonia uncialis	1	4	1.357
Flavocetraria cucullata	1	4	1.193
Ochrolechia frigida	1	4	0.033
Parmelia omphalodes	1	4	0.01
Sphaerophorus globosus	1	4	1.085
Thamnolia vermicularis	1	4	0.497
Cetraria aculeata	3	1	0.038
Cetraria kamczatica	3	1	0.032
Cetraria laevigata	3	1	0.056
Cladonia borealis	3	1	0.028
Cladonia uncialis	3	1	0.389
Flavocetraria cucullata	3	1	0.341
Sphaerophorus globosus	3	1	1.09

Thamnolia vermicularis	3	1	0.403
Alectoria nigricans	3	2	0.111
Alectoria ochroleuca	3	2	0.009
Bryocaulon divergens	3	2	0.207
Cetraria fastigiata	3	2	0.099
Cetraria laevigata	3	2	0.084
Cladina stygia	3	2	0.057
Cladonia borealis	3	2	0.118
Cladonia uncialis	3	2	0.724
Flavocetraria cucullata	3	2	2.167
Sphaerophorus globosus	3	2	1.388
Thamnolia vermicularis	3	2	0.664
Alectoria nigricans	3	3	0.022
Bryocaulon divergens	3	3	0.097
Cetraria andrejevii	3	3	0.163
Cetraria fastigiata	3	3	0.12
Cetraria islandica ssp islandica	3	3	0.022
Cetraria kamczatica	3	3	0.275
Cetraria laevigata	3	3	0.959
Cladina stygia	3	3	0.888
Cladonia	3	3	0.033
Cladonia crispata ssp cetrariiformis	3	3	1.059
Cladonia gracilis ssp vulnerata	3	3	0.206
Cladonia kanewskii	3	3	0.053
Cladonia uncialis	3	3	1.267
Flavocetraria cucullata	3	3	0.516
Sphaerophorus globosus	3	3	0.446
Thamnolia vermicularis	3	3	1.252
Alectoria nigricans	3	4	0.023
Bryocaulon divergens	3	4	0.053
Cetraria islandica ssp cetrariiformis	3	4	0.07
Cetraria kamczatica	3	4	0.25
Cetraria laevigata	3	4	0.128
Cladina arbuscula	3	4	0.053
Cladina stellaris	3	4	0.193
Cladina stygia	3	4	0.921
Cladonia bellidiflora	3	4	0.273
Cladonia crispata ssp cetrariiformis	3	4	0.561
Cladonia subfurcata	3	4	1.045
Cladonia uncialis	3	4	2.133
Cladonia wainioi	3	4	0.026
Flavocetraria cucullata	3	4	1.939
Sphaerophorus globosus	3	4	1.323
Thamnolia vermicularis	3	4	0.528
Alectoria nigricans	5	1	0.008
Alectoria ochroleuca	5	1	0.011
Asahinea chrysantha	5	1	0.082
Bryocaulon divergens	5	1	0.027
Cetraria fastigiata	5	1	0.008
Cetraria islandica ssp islandica	5	1	0.066
Cetraria kamczatica	5	1	0.016
Cetraria laevigata	5	1	0.474
Cladina stygia	5	1	0.298
Cladonia kanewskii	5	1	0.484
Cladonia subfurcata	5	1	0.31
Flavocetraria cucullata	5	1	0.339
Flavocetraria nivalis	5	1	0.022
Sphaerophorus globosus	5	1	1.925
Thamnolia vermicularis	5	1	0.916
Alectoria nigricans	5	2	0.027
Alectoria ochroleuca	5	2	0.135
Bryocaulon divergens	5	2	0.045

<i>Cetraria aculeata</i>	5	2	0.124
<i>Cetraria ericetorum</i>	5	2	1.094
<i>Cetraria kamczatica</i>	5	2	0.153
<i>Cetraria laevigata</i>	5	2	0.036
<i>Cladina portentosa</i>	5	2	0.444
<i>Cladina rangiferina</i>	5	2	0.226
<i>Cladina stygia</i>	5	2	1.054
<i>Cladonia bellidiflora</i>	5	2	0.094
<i>Cladonia carneola</i>	5	2	0.009
<i>Cladonia cornuta ssp groenlandica</i>	5	2	0.153
<i>Cladonia squamosa</i>	5	2	0.033
<i>Cladonia subfurcata</i>	5	2	1.93
<i>Cladonia uncialis</i>	5	2	1.588
<i>Flavocetraria cucullata</i>	5	2	0.634
<i>Ochrolechia frigida</i>	5	2	0.018
<i>Pertusaria dactylina</i>	5	2	0.161
<i>Sphaerophorus globosus</i>	5	2	1.227
<i>Thamnolia vermicularis</i>	5	2	0.394
Undetermined	5	2	0.006
<i>Alectoria nigricans</i>	5	3	0.052
<i>Alectoria ochroleuca</i>	5	3	0.065
<i>Bryocaulon divergens</i>	5	3	0.394
<i>Cetraria ericetorum</i>	5	3	0.994
<i>Cladina stellaris</i>	5	3	0.049
<i>Cladina stygia</i>	5	3	0.297
<i>Cladonia albonigra</i>	5	3	0.087
<i>Cladonia borealis</i>	5	3	0.048
<i>Cladonia carneola</i>	5	3	0.009
<i>Cladonia gracilis ssp vulnerata</i>	5	3	0.45
<i>Cladonia kanewskii</i>	5	3	0.754
<i>Cladonia metacorallifera</i>	5	3	0.003
<i>Cladonia subfurcata</i>	5	3	0.347
<i>Cladonia uncialis</i>	5	3	0.832
<i>Cladonia wainioi</i>	5	3	0.19
<i>Flavocetraria cucullata</i>	5	3	0.424
<i>Flavocetraria nivalis</i>	5	3	0.009
<i>Ochrolechia frigida</i>	5	3	0.017
<i>Sphaerophorus globosus</i>	5	3	1.127
<i>Thamnolia vermicularis</i>	5	3	1.07
<i>Alectoria nigricans</i>	5	4	0.01
<i>Alectoria ochroleuca</i>	5	4	0.125
<i>Bryocaulon divergens</i>	5	4	0.302
<i>Cetraria fastigiata</i>	5	4	0.012
<i>Cetraria islandica ssp cetrariiformis</i>	5	4	0.065
<i>Cetraria kamczatica</i>	5	4	0.022
<i>Cetraria laevigata</i>	5	4	1.063
<i>Cladina stellaris</i>	5	4	0.03
<i>Cladina stygia</i>	5	4	0.303
<i>Cladonia bellidiflora</i>	5	4	0.006
<i>Cladonia crispata ssp crispata</i>	5	4	0.053
<i>Cladonia subfurcata</i>	5	4	0.962
<i>Cladonia uncialis</i>	5	4	1.205
<i>Cladonia wainioi</i>	5	4	0.114
<i>Flavocetraria cucullata</i>	5	4	0.546
<i>Ochrolechia frigida</i>	5	4	0.002
<i>Sphaerophorus globosus</i>	5	4	0.96
<i>Thamnolia vermicularis</i>	5	4	0.81
<i>Alectoria nigricans</i>	6	1	0.021
<i>Bryocaulon divergens</i>	6	1	0.018
<i>Cetraria laevigata</i>	6	1	0.135
<i>Cladina stellaris</i>	6	1	0.11
<i>Cladina stygia</i>	6	1	0.023

Cladonia chlorophaea s lat.	6	1	0.005
Cladonia subfurcata	6	1	0.127
Cladonia uncialis	6	1	0.586
Cladonia wainioi	6	1	0.109
Flavocetraria cucullata	6	1	0.189
Ochrolechia frigida	6	1	0.006
Sphaerophorus globosus	6	1	0.2
Thamnolia vermicularis	6	1	0.687
Alectoria nigricans	6	2	0.039
Alectoria ochroleuca	6	2	0.079
Cetraria ericetorum	6	2	0.44
Cladina stellaris	6	2	0.074
Cladina stygia	6	2	2.164
Cladonia	6	2	0.015
Cladonia subfurcata	6	2	0.054
Cladonia uncialis s lat.	6	2	0.055
Flavocetraria cucullata	6	2	2.785
Ochrolechia frigida	6	2	T
Sphaerophorus globosus	6	2	0.216
Stereocaulon botryosum	6	2	0.368
Thamnolia vermicularis	6	2	0.973
Alectoria nigricans	6	3	0.018
Bryocaulon divergens	6	3	0.022
Cetraria sp.	6	3	0.499
Cladina mitis	6	3	0.082
Cladina portentosa	6	3	0.268
Cladina stellaris	6	3	0.245
Cladina stygia	6	3	3.768
Cladonia sp.	6	3	0.773
Cladonia bellidiflora	6	3	0.708
Cladonia cornuta ssp groenlandica	6	3	0.013
Cladonia metacorallifera	6	3	0.051
Cladonia pyxidata	6	3	0.033
Cladonia subfurcata	6	3	1.081
Cladonia uncialis	6	3	0.985
Flavocetraria cucullata	6	3	0.051
Ochrolechia frigida	6	3	0.316
Sphaerophorus globosus	6	3	0.442
Thamnolia vermicularis	6	3	0.941
Cetraria sp.	6	4	1.768
Cladina sp.	6	4	0.607
Cladina mitis	6	4	0.009
Cladina portentosa	6	4	0.094
Cladina stellaris	6	4	1.39
Cladina stygia	6	4	13
Cladonia gracilis	6	4	2.472
Cladonia uncialis	6	4	0.022
Cladonia wainioi	6	4	0.971
Flavocetraria cucullata	6	4	0.956
Sphaerophorus globosus	6	4	0.086
Thamnolia vermicularis	6	4	0.673
Undetermined	6	4	0.109
Cladonia albonigra	7	1	0.142
Cladonia uncialis	7	1	0.076
Thamnolia vermicularis	7	1	0.029
Alectoria nigricans	7	2	T
Alectoria ochroleuca	7	2	0.041
Asahinea chrysantha	7	2	0.129
Bryocaulon divergens	7	2	0.443
Cetraria ericetorum	7	2	0.431
Cetraria kamczatica	7	2	0.035
Cladonia subfurcata	7	2	0.126

Cladonia uncialis	7	2	0.304
Ochrolechia frigida	7	2	T
Sphaerophorus globosus	7	2	0.811
Thamnolia vermicularis	7	2	1.251
Alectoria nigricans	7	3	0.004
Alectoria ochroleuca	7	3	0.003
Bryocaulon divergens	7	3	0.019
Cetraria aculeata	7	3	0.034
Cetraria andrejevii	7	3	0.026
Cetraria delisei	7	3	0.011
Cetraria islandica ssp cetrariiformis	7	3	0.009
Cetraria laevigata	7	3	0.018
Cetraria nigricans	7	3	0.025
Cladonia subfurcata	7	3	0.149
Cladonia uncialis	7	3	0.191
Flavocetraria cucullata	7	3	0.118
Sphaerophorus globosus	7	3	0.53
Thamnolia vermicularis	7	3	0.792
Alectoria nigricans	7	4	0.315
Alectoria ochroleuca	7	4	0.004
Bryocaulon divergens	7	4	0.005
Cetraria aculeata	7	4	0.032
Cetraria ericetorum	7	4	0.49
Cetraria islandica ssp islandica	7	4	0.032
Cladonia nipponica	7	4	0.522
Cladonia subfurcata	7	4	0.075
Sphaerophorus globosus	7	4	0.346
Thamnolia vermicularis	7	4	2.169
Cetraria islandica ssp cetrariiformis	8	1	0.994
Cladina rangiferina	8	1	0.1
Cladina stygia	8	1	0.148
Cladonia gracilis ssp vulnerata	8	1	0.563
Thamnolia vermicularis	8	1	0.009
Cetraria laevigata	8	2	0.547
Cladina rangiferina	8	2	0.096
Cladina stygia	8	2	0.08
Cladonia gracilis ssp vulnerata	8	2	1.413
Cladonia subfurcata ?cfr. (poor specimen)	8	2	9.678
Lobaria linita	8	2	0.016
Thamnolia vermicularis	8	2	7.729
Cetraria laevigata	8	3	1.756
Cladina stygia	8	3	0.415
Cladonia gracilis ssp vulnerata	8	3	0.956
Cladonia scabriuscula	8	3	0.02
Thamnolia vermicularis	8	3	0.059
Cetraria laevigata	8	4	1.369
Cladina stygia	8	4	2.053
Cladonia albonigra	8	4	0.108
Cladonia gracilis ssp vulnerata	8	4	0.347
Cladonia uncialis	8	4	0.121
Lobaria linita	8	4	0.184
Sphaerophorus globosus	8	4	0.015
Stereocaulon botryosum	8	4	0.011
Thamnolia vermicularis	8	4	0.298
Cetraria laevigata	11	1	1.441
Cladina mitis	11	1	0.013
Cladina portentosa	11	1	0.005
Cladina rangiferina	11	1	0.161
Cladina stygia	11	1	0.271
Cladonia gracilis ssp vulnerata	11	1	1.297
Flavocetraria cucullata	11	1	0.081
Lobaria linita	11	1	0.373

Thamnolia vermicularis	11	1	0.181
Cetraria laevigata	11	2	1.056
Cladina stygia	11	2	0.386
Cladonia gracilis ssp vulnerata	11	2	1.007
Cladonia trassii	11	2	0.252
Cladonia uncialis	11	2	0.024
Cladonia wainioi	11	2	0.77
Flavocetraria cucullata	11	2	0.039
Lobaria linita	11	2	0.128
Sphaerophorus globosus	11	2	0.039
Thamnolia vermicularis	11	2	0.627
Cetraria laevigata	11	3	0.74
Cladina rangiferina	11	3	0.032
Cladina stygia	11	3	0.6
Cladonia crispata ssp cetrariiformis	11	3	0.117
Cladonia gracilis ssp vulnerata	11	3	0.789
Cladonia uncialis	11	3	0.127
Cladonia wainioi	11	3	0.06
Flavocetraria cucullata	11	3	0.178
Lobaria linita	11	3	0.123
Sphaerophorus globosus	11	3	0.112
Thamnolia vermicularis	11	3	0.914
Cetraria andrejevii	11	4	1.303
Cetraria laevigata	11	4	1.239
Cladina portentosa	11	4	0.271
Cladina stygia	11	4	5.925
Cladonia subfurcata	11	4	1.705
Cladonia uncialis	11	4	1.286
Flavocetraria cucullata	11	4	0.334
Sphaerophorus globosus	11	4	0.053
Thamnolia vermicularis	11	4	0.632
Undetermined	11	4	0.008
Cetraria laevigata	12	1	0.755
Cladina stellaris	12	1	0.012
Cladina stygia	12	1	2.046
Cladonia carneola	12	1	0.162
Cladonia cornuta ssp cornuta	12	1	0.188
Cladonia gracilis ssp vulnerata	12	1	2.604
Cladonia wainioi	12	1	0.181
Flavocetraria cucullata	12	1	0.303
Nephroma arcticum	12	1	0.965
Thamnolia vermicularis	12	1	0.089
Cetraria laevigata	12	2	2.199
Cladina stygia	12	2	3.131
Cladonia albonigra	12	2	0.22
Cladonia bellidiflora	12	2	4.96
Cladonia cornuta ssp groenlandica	12	2	0.094
Cladonia cyanipes	12	2	0.011
Cladonia gracilis ssp elongata	12	2	5.277
Cladonia pleurota	12	2	1.469
Cladonia wainioi	12	2	0.044
Cetraria laevigata	12	3	1.296
Cladina portentosa	12	3	0.999
Cladina stygia	12	3	10.696
Cladonia	12	3	0.009
Cladonia bellidiflora	12	3	0.307
Cladonia carneola	12	3	0.039
Cladonia gracilis ssp vulnerata	12	3	4.13
Cladonia subfurcata	12	3	0.366
Cladonia uncialis s lat.	12	3	0.856
Flavocetraria cucullata	12	3	0.32
Sphaerophorus globosus	12	3	0.978

Thamnolia vermicularis	12	3	0.133
Cetraria islandica ssp crispiformis	12	4	0.021
Cetraria laevigata	12	4	1.071
Cladina portentosa	12	4	0.022
Cladina stygia	12	4	7.882
Cladonia bellidiflora	12	4	0.009
Cladonia gracilis ssp vulnerata	12	4	2.357
Cladonia subfurcata	12	4	0.04
Flavocetraria cucullata	12	4	0.062
Sphaerophorus globosus ssp globosus	12	4	0.076
Thamnolia vermicularis	12	4	0.431
Cetraria laevigata	13	1	0.045
Cladina stygia	13	1	0.071
Cladonia carneola	13	1	0.009
Cladonia uncialis s lat.	13	1	0.004
Flavocetraria cucullata	13	1	0.182
Sphaerophorus globosus	13	1	0.04
Thamnolia vermicularis	13	1	0.072
Bryocaulon divergens	13	2	0.054
Cetraria kamczatica	13	2	T
Cetraria laevigata	13	2	0.231
Cladina stygia	13	2	0.152
Cladonia subfurcata	13	2	0.534
Cladonia uncialis	13	2	0.081
Flavocetraria cucullata	13	2	2.333
Ochrolechia frigida	13	2	0.017
Parmelia omphalodes	13	2	0.049
Pertusaria dactylina	13	2	0.208
Sphaerophorus globosus	13	2	2.794
Thamnolia vermicularis	13	2	0.424
Alectoria nigricans	13	3	0.03
Bryocaulon divergens	13	3	0.005
Cetraria aculeata	13	3	0.049
Cetraria laevigata	13	3	0.076
Cladina stygia	13	3	0.05
Cladonia borealis	13	3	0.139
Cladonia subfurcata	13	3	0.044
Cladonia uncialis	13	3	0.138
Flavocetraria cucullata	13	3	0.72
Ochrolechia frigida	13	3	0.013
Parmelia omphalodes	13	3	0.597
Sphaerophorus globosus	13	3	2.679
Thamnolia vermicularis	13	3	0.371
Alectoria nigricans	13	4	0.068
Asahinea chrysantha	13	4	0.306
Cetraria aculeata	13	4	0.01
Cetraria laevigata	13	4	0.285
Cladina portentosa	13	4	0.158
Cladina rangiferina cfr.	13	4	0.027
Cladina stygia	13	4	0.188
Cladonia bellidiflora	13	4	0.246
Cladonia gracilis ssp elongata	13	4	0.055
Cladonia uncialis	13	4	0.02
Flavocetraria cucullata	13	4	0.804
Sphaerophorus globosus	13	4	0.759
Thamnolia vermicularis	13	4	0.352
Cetraria andrejevii	14	1	0.025
Cetraria islandica ssp crispiformis	14	1	0.139
Cetraria islandica ssp islandica	14	1	0.042
Cetraria kamczatica	14	1	0.052
Cetraria laevigata	14	1	0.167
Cladina portentosa	14	1	0.814

Cladina rangiferina cfr.	14	1	0.056
Cladina stygia	14	1	0.301
Cladonia crispata ssp cetrariiformis	14	1	0.059
Cladonia gracilis ssp elongata	14	1	0.155
Cladonia gracilis ssp vulnerata	14	1	0.032
Cladonia stricta	14	1	0.064
Cladonia uncialis	14	1	0.23
Flavocetraria cucullata	14	1	0.066
Sphaerophorus globosus	14	1	0.156
Sphaerophorus globosus ssp globosus	14	1	0.002
Thamnolia vermicularis	14	1	1.087
Cetraria fastigiata	14	2	0.076
Cetraria islandica ssp crispiformis	14	2	0.102
Cetraria laevigata	14	2	0.154
Cladina stygia	14	2	0.278
Cladonia gracilis ssp vulnerata	14	2	0.011
Cladonia subfurcata cfr (poor specimen)	14	2	0.037
Cladonia uncialis s lat.	14	2	0.835
Flavocetraria cucullata	14	2	0.089
Sphaerophorus globosus	14	2	0.333
Thamnolia vermicularis	14	2	1.022
Cetraria islandica ssp crispiformis	14	3	0.027
Cetraria laevigata	14	3	1.322
Cladina portentosa	14	3	0.007
Cladina rangiferina cfr.	14	3	0.12
Cladina stygia	14	3	1.248
Cladonia albonigra	14	3	0.028
Cladonia bellidiflora	14	3	0.024
Cladonia gracilis ssp vulnerata	14	3	0.911
Cladonia merchlorophaea	14	3	0.019
Cladonia subfurcata cfr (poor specimen)	14	3	0.086
Cladonia uncialis	14	3	0.066
Lobaria linita	14	3	0.592
Thamnolia vermicularis	14	3	0.404
Cetraria islandica ssp crispiformis	14	4	0.071
Cetraria laevigata	14	4	0.245
Cladina stellaris	14	4	0.093
Cladina stygia	14	4	3.804
Cladonia crispata ssp cetrariiformis	14	4	0.108
Cladonia gracilis ssp vulnerata	14	4	1.073
Cladonia scabriuscula	14	4	0.094
Cladonia uncialis s lat.	14	4	0.436
Flavocetraria cucullata	14	4	0.033
Sphaerophorus globosus	14	4	0.097
Thamnolia vermicularis	14	4	0.34
Cetraria delisei	15	1	0.074
Cetraria laevigata	15	1	0.378
Cladina rangiferina cf.	15	1	0.081
Cladina stygia	15	1	0.305
Cladonia squamosa	15	1	0.017
Cladonia subfurcata	15	1	0.23
Thamnolia vermicularis	15	1	0.193
Alectoria nigricans	15	2	T
Cetraria islandica ssp crispiformis	15	2	0.48
Cetraria laevigata	15	2	1.139
Cladina stygia	15	2	0.393
Cladonia albonigra	15	2	0.052
Cladonia bellidiflora	15	2	0.178
Cladonia borealis	15	2	0.106
Cladonia carneola	15	2	0.005
Cladonia gracilis ssp vulnerata	15	2	0.218
Cladonia metacorallifera	15	2	0.063

Cladonia squamosa	15	2	0.268
Cladonia subfurcata cf.	15	2	0.063
Cladonia uncialis	15	2	1.728
Flavocetraria cucullata	15	2	0.392
Ochrolechia frigida	15	2	0.008
Sphaerophorus globosus	15	2	0.682
Thamnolia vermicularis	15	2	0.548
Cetraria islandica ssp crispiformis	15	3	0.3
Cetraria laevigata	15	3	1.051
Cladina stellaris	15	3	0.3
Cladina stygia	15	3	5.383
Cladonia albonigra	15	3	0.135
Cladonia bellidiflora	15	3	0.014
Cladonia borealis s lat.	15	3	0.133
Cladonia gracilis ssp vulnerata	15	3	1.975
Flavocetraria cucullata	15	3	0.006
Nephroma arcticum	15	3	0.202
Cetraria laevigata	15	4	2.513
Cladina portentosa	15	4	0.078
Cladina stellaris	15	4	0.126
Cladina stygia	15	4	1.046
Cladonia albonigra	15	4	0.036
Cladonia bellidiflora	15	4	0.229
Cladonia crispata ssp cetrariiformis	15	4	0.084
Cladonia gracilis ssp vulnerata	15	4	0.701
Cladonia novochlorophaea	15	4	0.578
Cladonia subfurcata	15	4	0.233
Cladonia uncialis	15	4	0.521
Flavocetraria cucullata	15	4	0.47
Nephroma arcticum	15	4	1.577
Peltigera neopolydactyla	15	4	0.407
Thamnolia vermicularis	15	4	0.846
Cetraria laevigata	19	1	0.452
Cladina portentosa	19	1	0.014
Cladina stygia	19	1	0.537
Cladonia gracilis ssp vulnerata	19	1	2.617
Peltigera britannica	19	1	1.773
Thamnolia vermicularis	19	1	0.013
Cladina rangiferina	19	2	0.085
Cladina stygia	19	2	3.212
Cladonia albonigra	19	2	0.444
Cladonia bellidiflora	19	2	0.416
Cladonia carneola	19	2	0.332
Cladonia cornuta ssp groenlandica	19	2	0.13
Cladonia crispata ssp crispata	19	2	0.094
Cladonia gracilis ssp vulnerata	19	2	10.933
Cladonia metacorallifera	19	2	0.076
Cladonia pleurota	19	2	0.3
Cladonia subfurcata	19	2	0.029
Flavocetraria cucullata	19	2	0.075
Sphaerophorus globosus	19	2	0.068
Cetraria laevigata	19	3	0.174
Cladina stygia	19	3	2.066
Cladonia albonigra	19	3	0.053
Cladonia bellidiflora	19	3	0.663
Cladonia carneola	19	3	0.051
Cladonia gracilis ssp vulnerata	19	3	4.16
Cladonia pleurota	19	3	0.135
Cladonia squamosa	19	3	0.061
Thamnolia vermicularis	19	3	0.02
Cladina portentosa	19	4	0.087
Cladina rangiferina cf.	19	4	0.051

Cladina stygia	19	4	0.255
Cladonia bellidiflora	19	4	0.452
Cladonia cornuta ssp groenlandica	19	4	0.117
Cladonia gracilis ssp vulnerata	19	4	1.04
Flavocetraria cucullata	19	4	0.05
Peltigera neopolydactyla	19	4	0.03
Cetraria andrejevii	20	1	0.146
Cetraria delisei	20	1	0.505
Cetraria ericetorum	20	1	0.262
Cetraria islandica ssp islandica	20	1	0.197
Cetraria laevigata	20	1	0.006
Cladina portentosa	20	1	0.1
Cladina stygia	20	1	0.28
Cladonia	20	1	0.099
Cladonia subfurcata	20	1	0.529
Cladonia uncialis	20	1	0.034
Nephroma arcticum	20	1	0.683
Sphaerophorus globosus	20	1	0.304
Thamnolia vermicularis	20	1	0.061
Cetraria kamczatica	20	2	0.075
Cetraria laevigata	20	2	1.029
Cladina stygia	20	2	2.236
Cladonia crispata ssp crispata	20	2	0.046
Cladonia gracilis ssp vulnerata	20	2	0.908
Cladonia uncialis	20	2	0.291
Cladonia wainioi	20	2	0.108
Flavocetraria cucullata	20	2	0.168
Thamnolia vermicularis	20	2	0.148
Alectoria nigricans	20	3	0.072
Cetraria andrejevii	20	3	0.035
Cetraria delisei	20	3	0.237
Cetraria islandica ssp islandica	20	3	0.222
Cetraria kamczatica	20	3	0.209
Cetraria laevigata	20	3	1.878
Cladina portentosa	20	3	0.214
Cladina stygia	20	3	1.262
Cladonia subfurcata	20	3	0.551
Cladonia uncialis	20	3	0.328
Flavocetraria cucullata	20	3	0.063
Lobaria linita	20	3	2.798
Sphaerophorus globosus	20	3	0.31
Thamnolia vermicularis	20	3	0.131
Cetraria delisei	20	4	0.049
Cetraria fastigiata	20	4	0.031
Cetraria islandica ssp islandica	20	4	1.322
Cetraria kamczatica	20	4	0.061
Cetraria laevigata	20	4	0.993
Cladina portentosa	20	4	0.388
Cladina stygia	20	4	1.914
Cladonia subfurcata	20	4	0.433
Cladonia uncialis	20	4	0.252
Flavocetraria cucullata	20	4	0.243
Lobaria linita	20	4	0.556
Sphaerophorus globosus	20	4	0.097
Thamnolia vermicularis	20	4	0.075
Cetraria laevigata	21	1	2.68
Cladina arbuscula	21	1	0.476
Cladina stellaris	21	1	0.135
Cladina stygia	21	1	4.546
Cladonia albonigra	21	1	0.095
Cladonia borealis	21	1	0.264
Cladonia cornuta ssp cornuta	21	1	0.03

Cladonia crispata ssp crispata	21	1	0.089
Cladonia gracilis ssp vulnerata	21	1	2.011
Cladonia subfurcata	21	1	3.355
Cladonia uncialis	21	1	0.407
Flavocetraria cucullata	21	1	0.257
Ochrolechia frigida	21	1	0.008
Sphaerophorus globosus	21	1	0.152
Thamnolia vermicularis	21	1	0.946
Alectoria nigricans	21	2	0.004
Bryocaulon divergens	21	2	0.056
Cetraria kamczatica	21	2	0.018
Cetraria laevigata	21	2	0.389
Cladina portentosa	21	2	0.115
Cladina rangiferina	21	2	0.043
Cladina stygia	21	2	0.584
Cladonia borealis	21	2	0.14
Cladonia gracilis ssp vulnerata	21	2	0.534
Cladonia nipponica	21	2	0.079
Cladonia subfurcata	21	2	0.568
Cladonia uncialis	21	2	0.173
Flavocetraria cucullata	21	2	0.181
Ochrolechia frigida	21	2	0.003
Sphaerophorus globosus	21	2	2.093
Thamnolia vermicularis	21	2	0.509
Cetraria laevigata	21	3	0.173
Cladina portentosa	21	3	0.002
Cladina stygia	21	3	0.415
Cladonia subfurcata	21	3	0.583
Cladonia uncialis s lat.	21	3	0.424
Cladonia wainioi	21	3	0.187
Alectoria nigricans	21	4	0.022
Cetraria islandica ssp crispiformis	21	4	0.299
Cetraria laevigata	21	4	0.77
Cladina portentosa	21	4	0.462
Cladina stygia	21	4	0.857
Cladonia chlorophaea s lat.	21	4	0.021
Cladonia gracilis ssp vulnerata	21	4	0.806
Cladonia metacorallifera	21	4	0.019
Cladonia subfurcata	21	4	0.193
Cladonia uncialis	21	4	1.385
Flavocetraria cucullata	21	4	0.317
Sphaerophorus globosus	21	4	1.071
Thamnolia vermicularis	21	4	1.115
Cetraria aculeata	23	1	0.266
Cetraria andrejevii	23	1	0.076
Cetraria ericetorum	23	1	0.043
Cetraria laevigata	23	1	0.181
Cladina stygia	23	1	0.299
Cladonia borealis	23	1	0.492
Cladonia crispata ssp cetrariiformis	23	1	0.13
Cladonia crispata ssp crispata	23	1	0.033
Cladonia gracilis ssp elongata	23	1	0.578
Cladonia gracilis ssp vulnerata	23	1	0.222
Cladonia kanewskii	23	1	0.141
Cladonia scabriuscula	23	1	0.02
Cladonia stricta	23	1	0.082
Cladonia subfurcata	23	1	1.071
Cladonia uncialis	23	1	1.623
Flavocetraria cucullata	23	1	2.053
Ochrolechia frigida	23	1	0.02
Parmelia omphalodes	23	1	0.124
Pertusaria dactylina	23	1	0.049

Sphaerophorus globosus	23	1	1.245
Thamnotia vermicularis	23	1	0.506
Alectoria nigricans	23	2	0.017
Alectoria ochroleuca	23	2	0.072
Cetraria andrejevii	23	2	0.534
Cetraria delisei	23	2	0.005
Cetraria kamczatica	23	2	0.016
Cetraria laevigata	23	2	0.007
Cetraria nigricans	23	2	0.03
Cladina arbuscula	23	2	0.08
Cladina portentosa	23	2	0.203
Cladina stellaris	23	2	0.165
Cladina stygia	23	2	0.39
Cladonia	23	2	0.027
Cladonia albonigra	23	2	0.083
Cladonia borealis	23	2	0.193
Cladonia crispata ssp crispata	23	2	0.309
Cladonia gracilis ssp vulnerata	23	2	0.116
Cladonia subfurcata	23	2	0.926
Cladonia uncialis	23	2	1.021
Flavocetraria cucullata	23	2	0.805
Lobaria linita	23	2	0.11
Melanelia commixta	23	2	T
Ochrolechia frigida	23	2	0.019
Parmelia omphalodes	23	2	0.043
Sphaerophorus globosus	23	2	0.93
Thamnotia vermicularis	23	2	1.743
Bryocaulon divergens	23	3	0.004
Cetraria aculeata	23	3	T
Cetraria andrejevii	23	3	0.213
Cetraria delisei	23	3	0.348
Cetraria ericetorum	23	3	0.014
Cetraria islandica ssp crispiformis	23	3	0.071
Cetraria laevigata	23	3	0.309
Cladina portentosa	23	3	0.254
Cladina stygia	23	3	1.058
Cladonia cornuta ssp groenlandica	23	3	0.092
Cladonia gracilis ssp vulnerata	23	3	0.379
Cladonia kanewskii	23	3	0.257
Cladonia stricta	23	3	0.356
Cladonia subfurcata	23	3	1.188
Cladonia uncialis	23	3	0.917
Cladonia wainioi	23	3	0.359
Flavocetraria cucullata	23	3	0.396
Lobaria linita	23	3	0.033
Ochrolechia frigida	23	3	0.033
Parmelia omphalodes	23	3	0.516
Sphaerophorus globosus	23	3	1.472
Thamnotia vermicularis	23	3	0.806
Alectoria nigricans	23	4	0.04
Bryocaulon divergens	23	4	0.058
Cetraria andrejevii	23	4	0.02
Cetraria delisei	23	4	0.04
Cetraria kamczatica	23	4	T
Cetraria laevigata	23	4	0.148
Cladina stygia	23	4	0.222
Cladonia albonigra cf.	23	4	0.045
Cladonia crispata ssp crispata	23	4	0.127
Cladonia gracilis ssp vulnerata	23	4	0.127
Cladonia subfurcata	23	4	0.211
Cladonia uncialis	23	4	0.159
Cladonia wainioi	23	4	0.015

Flavocetraria cucullata	23	4	0.405
Lobaria linita	23	4	0.01
Ochrolechia frigida	23	4	0.929
Parmelia omphalodes	23	4	0.032
Thamnolia vermicularis	23	4	0.817
Asahinea chrysantha	28	1	0.457
Bryocaulon divergens	28	1	0.004
Certraria kamczatica	28	1	0.059
Cetraria aculeata	28	1	0.037
Cetraria andrejevii	28	1	0.015
Cetraria delisei	28	1	0.1
Cetraria islandica ssp crispiformis	28	1	0.124
Cetraria laevigata	28	1	1.847
Cladina stygia	28	1	0.487
Cladonia subfurcata	28	1	0.439
Cladonia uncialis	28	1	0.93
Cladonia wainioi	28	1	0.256
Flavocetraria cucullata	28	1	0.15
Lobaria linita	28	1	0.015
Ochrolechia frigida	28	1	0.015
Parmelia omphalodes	28	1	0.15
Sphaerophorus globosus	28	1	0.39
Thamnolia vermicularis	28	1	1.024
Alectoria nigricans	28	2	0.013
Alectoria ochroleuca	28	2	0.023
Bryocaulon divergens	28	2	0.129
Cetraria aculeata	28	2	0.083
Cetraria delisei	28	2	0.028
Cetraria islandica ssp crispiformis?	28	2	0.208
Cetraria islandica ssp islandica	28	2	0.011
Cetraria kamczatica	28	2	0.017
Cetraria laevigata	28	2	0.023
Cetraria nigricans	28	2	0.043
Cladina arbuscula	28	2	T
Cladina portentosa	28	2	0.048
Cladina rangiferina	28	2	0.052
Cladonia uncialis	28	2	0.308
Flavocetraria cucullata	28	2	0.078
Lobaria linita	28	2	0.063
Parmelia omphalodes	28	2	0.116
Sphaerophorus globosus	28	2	0.75
Thamnolia vermicularis	28	2	0.234
Alectoria nigricans	28	3	0.434
Asahinea chrysantha	28	3	0.329
Bryocaulon divergens	28	3	0.036
Cetraria aculeata	28	3	0.184
Cetraria andrejevii	28	3	0.024
Cetraria delisei	28	3	0.055
Cetraria ericetorum	28	3	0.008
Cetraria kamczatica	28	3	0.005
Cetraria laevigata	28	3	0.107
Cetraria nigricans	28	3	0.016
Cladina portentosa	28	3	0.246
Cladonia borealis	28	3	0.041
Cladonia subfurcata	28	3	0.144
Cladonia uncialis	28	3	0.276
Flavocetraria cucullata	28	3	0.125
Ochrolechia frigida	28	3	0.002
Parmelia omphalodes	28	3	0.024
Sphaerophorus globosus	28	3	0.762
Thamnolia vermicularis	28	3	1.388
Undetermined	28	3	0.01

Alectoria nigricans	28	4	0.051
Bryocaulon divergens	28	4	0.046
Cetraria islandica ssp crispiformis	28	4	0.037
Cetraria kamczatica	28	4	0.047
Cetraria laevigata	28	4	0.034
Cetraria nigricans	28	4	0.015
Cladina mitis	28	4	0.018
Cladonia borealis	28	4	0.182
Cladonia subfurcata	28	4	0.112
Cladonia uncialis	28	4	0.931
Flavocetraria cucullata	28	4	0.06
Sphaerophorus globosus	28	4	0.232
Thamnolia vermicularis	28	4	0.732
Cetraria aculeata	30	1	0.04
Cetraria ericetorum	30	1	0.041
Cetraria nigricans	30	1	0.181
Cladina	30	1	0.004
Cladina portentosa	30	1	0.169
Cladina stygia	30	1	0.029
Cladonia borealis	30	1	0.488
Cladonia chlorophaea	30	1	0.015
Cladonia subfurcata	30	1	1.184
Cladonia uncialis	30	1	0.243
Flavocetraria cucullata	30	1	1.82
Lobaria linita	30	1	0.027
Ochrolechia frigida	30	1	0.025
Peltigera	30	1	0.236
Peltigera neopolydactyla	30	1	0.103
Sphaerophorus globosus	30	1	0.765
Thamnolia vermicularis	30	1	0.461
Cetraria aculeata	30	2	0.019
Cetraria delisei	30	2	0.046
Cetraria islandica ssp crispiformis	30	2	0.373
Cetraria laevigata	30	2	0.185
Cladina stygia	30	2	0.069
Cladonia cornuta ssp groenlandica	30	2	0.025
Cladonia subfurcata	30	2	0.17
Cladonia uncialis s lat.	30	2	0.131
Lobaria linita	30	2	0.016
Sphaerophorus globosus	30	2	0.249
Thamnolia vermicularis	30	2	0.212
Cetraria delisei	30	3	0.022
Cetraria laevigata	30	3	0.115
Cladina portentosa	30	3	0.008
Cladina stygia	30	3	0.039
Cladonia bellidiflora	30	3	0.07
Cladonia borealis	30	3	0.045
Cladonia subfurcata	30	3	0.367
Cladonia uncialis	30	3	0.076
Ochrolechia frigida	30	3	T
Pertusaria dactylina	30	3	1.2
Sphaerophorus globosus	30	3	0.797
Thamnolia vermicularis	30	3	0.197
Alectoria nigricans	30	4	0.008
Alectoria ochroleuca	30	4	0.046
Cetraria aculeata	30	4	0.18
Cetraria delisei	30	4	0.013
Cetraria kamczatica	30	4	0.018
Cetraria laevigata	30	4	0.085
Cetraria nigricans	30	4	0.005
Cladina portentosa	30	4	0.139
Cladina stygia	30	4	0.139

Cladonia subfurcata	30	4	0.839
Cladonia uncialis	30	4	0.163
Lobaria linita	30	4	0.051
Sphaerophorus globosus	30	4	1.421
Thamnolia vermicularis	30	4	0.142
Alectoria nigricans	32	1	0.092
Cetraria laevigata	32	1	1.031
Cladina stygia	32	1	1.304
Cladonia crispata ssp crispata	32	1	0.332
Cladonia gracilis ssp vulnerata	32	1	2.083
Cladonia subfurcata	32	1	0.008
Cladonia uncialis	32	1	0.726
Flavocetraria cucullata	32	1	0.711
Peltigera aphthosa s lat.	32	1	3.056
Sphaerophorus globosus	32	1	0.081
Thamnolia vermicularis	32	1	0.558
Cetraria islandica ssp crispiformis	32	2	0.107
Cetraria kamczatica	32	2	0.063
Cetraria laevigata	32	2	0.96
Cladina stygia	32	2	0.695
Cladonia bellidiflora	32	2	0.126
Cladonia borealis	32	2	0.131
Cladonia subfurcata	32	2	2.048
Cladonia uncialis	32	2	0.309
Flavocetraria cucullata	32	2	2.639
Lobaria linita	32	2	0.039
Ochrolechia frigida	32	2	0.007
Sphaerophorus globosus	32	2	0.081
Thamnolia vermicularis	32	2	3.083
Alectoria nigricans	32	3	0.006
Cetraria delisei	32	3	0.046
Cetraria laevigata	32	3	0.124
Cladina portentosa	32	3	0.011
Cladina stygia	32	3	0.412
Cladonia gracilis ssp elongata	32	3	0.01
Cladonia gracilis ssp vulnerata	32	3	0.032
Cladonia subfurcata	32	3	0.309
Cladonia uncialis	32	3	0.242
Flavocetraria cucullata	32	3	0.434
Ochrolechia frigida	32	3	0.006
Pertusaria dactylina	32	3	0.064
Sphaerophorus globosus	32	3	1.789
Thamnolia vermicularis	32	3	1.917
Undetermined	32	3	0.007
Cetraria laevigata	32	4	2.515
Cladina stygia	32	4	0.592
Cladonia subfurcata	32	4	0.216
Flavocetraria cucullata	32	4	0.003
Thamnolia vermicularis	32	4	0.719
Alectoria nigricans	33	1	0.225
Cetraria delisei	33	1	0.026
Cetraria islandica ssp crispiformis	33	1	0.324
Cetraria islandica ssp islandica	33	1	0.321
Cetraria kamczatica	33	1	T
Cetraria laevigata	33	1	1.612
Cladina stygia	33	1	0.116
Cladonia albonigra	33	1	0.081
Cladonia borealis	33	1	0.511
Cladonia chlorophylla s lat.	33	1	0.009
Cladonia crispata ssp crispata	33	1	0.008
Cladonia gracilis ssp vulnerata	33	1	0.361
Cladonia macrophylla	33	1	0.015

Cladonia uncialis	33	1	1.361
Flavocetraria cucullata	33	1	0.007
Sphaerophorus globosus	33	1	1.112
Cetraria islandica ssp islandica	33	2	0.047
Cetraria laevigata	33	2	0.93
Cladina arbuscula	33	2	0.026
Cladina stygia	33	2	0.357
Cladonia albonigra	33	2	0.056
Cladonia borealis	33	2	0.348
Cladonia subfurcata	33	2	0.821
Cladonia uncialis	33	2	0.559
Cladonia wainioi	33	2	0.048
Sphaerophorus globosus	33	2	0.479
Thamnolia vermicularis	33	2	0.942
Alectoria nigricans	33	3	0.044
Bryocaulon divergens	33	3	0.003
Cetraria islandica ssp crispiformis	33	3	0.186
Cetraria laevigata	33	3	1.633
Cetraria nigricans	33	3	0.011
Cladina stygia	33	3	0.339
Cladonia borealis	33	3	0.322
Cladonia gracilis ssp vulnerata	33	3	1.784
Cladonia uncialis	33	3	0.406
Cladonia wainioi	33	3	0.09
Flavocetraria cucullata	33	3	0.085
Ochrolechia frigida	33	3	0.009
Sphaerophorus globosus	33	3	0.471
Thamnolia vermicularis	33	3	1.452
Cetraria andrejevii	33	4	0.015
Cetraria islandica ssp crispiformis	33	4	2.329
Cladina portentosa	33	4	0.707
Cladina stygia	33	4	0.197
Cladonia albonigra	33	4	0.047
Cladonia gracilis ssp vulnerata	33	4	0.829
Cladonia uncialis	33	4	0.088
Nephroma arcticum	33	4	1.2
Sphaerophorus globosus	33	4	0.008
Stereocaulon botryosum	33	4	0.074
Thamnolia vermicularis	33	4	0.231
Alectoria nigricans	34	1	0.056
Alectoria ochroleuca	34	1	0.043
Bryocaulon divergens	34	1	0.065
Cetraria aculeata	34	1	0.236
Cetraria ericetorum	34	1	0.715
Cetraria kamczatica	34	1	0.029
Cladina stygia	34	1	0.084
Cladonia kanewskii	34	1	0.007
Cladonia subfurcata	34	1	0.094
Flavocetraria cucullata	34	1	0.092
Sphaerophorus globosus	34	1	2.113
Thamnolia vermicularis	34	1	0.553
Alectoria nigricans	34	2	0.92
Bryocaulon divergens	34	2	0.202
Cetraria andrejevii	34	2	0.048
Cetraria laevigata	34	2	0.027
Cladina stygia	34	2	0.026
Cladonia subfurcata	34	2	0.297
Cladonia uncialis	34	2	0.439
Cladonia wainioi	34	2	0.046
Flavocetraria cucullata	34	2	0.167
Ochrolechia frigida	34	2	0.009
Sphaerophorus globosus	34	2	2.877

Thamnotia vermicularis	34	2	0.478
Alectoria nigricans	34	3	0.73
Bryocaulon divergens	34	3	0.308
Cetraria laevigata	34	3	0.074
Cladina arbuscula	34	3	0.288
Cladina mitis	34	3	0.055
Cladina portentosa	34	3	0.008
Cladina rangiferina	34	3	0.173
Cladina stygia	34	3	1.073
Cladonia furcata cf.	34	3	0.51
Cladonia gracilis ssp vulnerata	34	3	0.122
Cladonia subfurcata	34	3	0.93
Cladonia uncialis	34	3	0.393
Cladonia uncialis s lat.	34	3	0.26
Cladonia wainioi	34	3	0.106
Flavocetraria cucullata	34	3	2.382
Sphaerophorus globosus	34	3	0.805
Thamnotia vermicularis	34	3	0.162
Alectoria nigricans	34	4	0.072
Bryocaulon divergens	34	4	0.043
Cetraria aculeata	34	4	0.01
Cetraria laevigata	34	4	0.09
Cladina portentosa	34	4	0.076
Cladina stygia	34	4	0.033
Cladonia borealis	34	4	0.232
Cladonia subfurcata	34	4	0.084
Cladonia uncialis	34	4	0.432
Flavocetraria cucullata	34	4	0.093
Lobaria linita	34	4	0.425
Ochrolechia frigida	34	4	0.052
Sphaerophorus globosus	34	4	1.337
Thamnotia vermicularis	34	4	0.194
Cetraria laevigata	36	1	1.639
Cladina stygia	36	1	1.46
Cladonia borealis	36	1	0.192
Cladonia crispata ssp crispata	36	1	0.118
Cladonia gracilis ssp vulnerata	36	1	0.66
Cladonia subfurcata	36	1	1.304
Cladonia uncialis	36	1	0.725
Cladonia wainioi	36	1	0.021
Flavocetraria cucullata	36	1	0.021
Ochrolechia frigida	36	1	T
Sphaerophorus globosus	36	1	0.26
Thamnotia vermicularis	36	1	0.397
Cetraria ericetorum	36	2	1.42
Cetraria kamczatica	36	2	0.255
Cetraria laevigata	36	2	0.014
Cladina portentosa	36	2	0.083
Cladina stygia	36	2	4.412
Cladonia albonigra	36	2	0.044
Cladonia borealis	36	2	0.106
Cladonia carneola	36	2	0.006
Cladonia gracilis ssp vulnerata	36	2	0.202
Cladonia subfurcata	36	2	2.284
Cladonia uncialis s lat.	36	2	0.797
Cladonia wainioi	36	2	0.058
Flavocetraria cucullata	36	2	0.11
Ochrolechia frigida	36	2	0.007
Sphaerophorus globosus	36	2	0.452
Thamnotia vermicularis	36	2	0.577
Cetraria fastigiata	36	3	0.191
Cetraria laevigata	36	3	2.414

Cladina stygia	36	3	0.464
Cladonia albonigra	36	3	0.029
Cladonia borealis	36	3	0.025
Cladonia gracilis ssp vulnerata	36	3	1.205
Cladonia subfurcata	36	3	0.095
Cladonia uncialis	36	3	0.518
Cladonia wainioi	36	3	0.05
Flavocetraria cucullata	36	3	0.458
Peltigera britannica	36	3	0.64
Psoroma hypnorum	36	3	0.012
Sphaerophorus globosus	36	3	0.631
Thamnolia vermicularis	36	3	0.296
Alectoria nigricans	36	4	0.002
Cetraria islandica ssp crispiformis	36	4	0.116
Cetraria kamczatica	36	4	0.747
Cetraria laevigata	36	4	1.266
Cladina arbuscula	36	4	0.051
Cladina stygia	36	4	0.619
Cladonia borealis	36	4	0.552
Cladonia gracilis ssp vulnerata	36	4	0.7
Cladonia subfurcata	36	4	0.049
Cladonia uncialis	36	4	0.235
Sphaerophorus globosus	36	4	0.969
Thamnolia vermicularis	36	4	0.646
Alectoria ochroleuca	39	1	0.016
Cladina mitis	39	1	0.015
Cladonia	39	1	0.076
Cladonia kanewskii	39	1	0.074
Cladonia macrocera cf.	39	1	0.208
Cladonia uncialis	39	1	0.605
Ochrolechia frigida	39	1	0.092
Sphaerophorus globosus	39	1	0.068
Thamnolia vermicularis	39	1	0.734
Bryocaulon divergens	39	2	0.048
Cetraria islandica ssp crispiformis	39	2	0.082
Cetraria laevigata	39	2	0.159
Cladina rangiferina	39	2	0.027
Cladina stygia	39	2	0.056
Cladonia borealis	39	2	0.054
Cladonia pyxidata	39	2	0.062
Cladonia subfurcata	39	2	0.033
Cladonia uncialis	39	2	0.529
Flavocetraria cucullata	39	2	0.094
Lobaria linita	39	2	0.039
Ochrolechia frigida	39	2	0.353
Parmelia omphalodes	39	2	T
Sphaerophorus globosus	39	2	0.24
Thamnolia vermicularis	39	2	0.084
Cetraria aculeata	39	3	0.024
Cetraria ericetorum	39	3	0.151
Cladonia uncialis	39	3	0.023
Ochrolechia frigida	39	3	0.353
Parmelia omphalodes	39	3	T
Sphaerophorus globosus	39	3	0.888
Thamnolia vermicularis	39	3	0.081
Cladina portentosa	39	4	0.033
Cladina stygia	39	4	0.012
Cladonia bellidiflora	39	4	0.006
Cladonia borealis	39	4	0.043
Cladonia chlorophaea s lat.	39	4	0.01
Cladonia cornuta ssp groenlandica	39	4	0.038
Cladonia uncialis	39	4	0.543

Flavocetraria cucullata	39	4	T
Lobaria linita	39	4	3.526
Parmelia	39	4	T
Pertusaria dactylina	39	4	20.395
Sphaerophorus globosus	39	4	0.761
Thamnotia vermicularis	39	4	0.005
Cetraria aculeata	40	1	0.014
Cetraria islandica ssp crispiformis	40	1	0.074
Cetraria laevigata	40	1	0.636
Cladina portentosa	40	1	0.106
Cladina stygia	40	1	0.475
Cladonia kanewskii	40	1	0.043
Cladonia subfurcata	40	1	0.218
Cladonia uncialis s lat.	40	1	1.238
Flavocetraria cucullata	40	1	0.155
Lobaria linita	40	1	0.296
Peltigera britannica	40	1	0.033
Sphaerophorus globosus	40	1	1.18
Thamnotia vermicularis	40	1	1.41
Tuckermannopsis inermis	40	1	0.04
Cetraria islandica ssp crispiformis	40	2	0.194
Cetraria laevigata	40	2	0.377
Cladina stygia	40	2	0.623
Cladonia amaurocrea	40	2	0.208
Cladonia crispata ssp crispata	40	2	0.008
Cladonia gracilis ssp vulnerata	40	2	0.368
Cladonia subfurcata	40	2	0.11
Flavocetraria cucullata	40	2	0.048
Lobaria linita	40	2	0.057
Peltigera neopolydactyla cf.	40	2	0.123
Sphaerophorus globosus	40	2	0.478
Thamnotia vermicularis	40	2	0.525
Alectoria nigricans	40	3	0.018
Cetraria aculeata	40	3	0.286
Cetraria islandica ssp crispiformis	40	3	0.067
Cetraria laevigata	40	3	0.055
Cetraria nigricans	40	3	0.009
Cladonia subfurcata	40	3	0.086
Lobaria linita	40	3	0.015
Ochrolechia frigida	40	3	1.243
Sphaerophorus globosus	40	3	0.274
Thamnotia vermicularis	40	3	0.657
Alectoria nigricans	40	4	0.163
Cetraria kamczatica	40	4	0.006
Cladina portentosa	40	4	0.103
Cladina stygia	40	4	0.28
Cladonia	40	4	T
Cladonia subfurcata	40	4	0.154
Cladonia uncialis	40	4	0.343
Flavocetraria cucullata	40	4	0.175
Ochrolechia frigida	40	4	0.024
Peltigera occidentalis	40	4	0.066
Sphaerophorus globosus	40	4	0.462
Thamnotia vermicularis	40	4	0.418
Alectoria nigricans	41	1	0.046
Bryocaulon divergens	41	1	0.375
Cetraria aculeata	41	1	0.027
Cetraria kamczatica	41	1	0.063
Cetraria laevigata	41	1	0.091
Cladina stygia	41	1	0.104
Cladonia crispata ssp cetrariiformis	41	1	0.626
Cladonia gracilis ssp elongata	41	1	0.116

Cladonia uncialis	41	1	0.215
Dactylina arctica	41	1	0.006
Flavocetraria cucullata	41	1	1.183
Ochrolechia frigida	41	1	0.007
Parmelia omphalodes	41	1	0.006
Sphaerophorus globosus	41	1	2.551
Thamnolia vermicularis	41	1	0.328
Undetermined	41	1	0.015
Asahinea chrysantha	41	2	0.1
Cetraria laevigata	41	2	0.093
Cladina stygia	41	2	0.074
Cladonia	41	2	0.02
Cladonia subfurcata	41	2	0.039
Cladonia uncialis s lat.	41	2	0.028
Flavocetraria cucullata	41	2	0.044
Parmelia omphalodes	41	2	0.025
Pertusaria dactylina	41	2	T
Sphaerophorus globosus	41	2	0.106
Bryocaulon divergens	41	3	T
Cetraria laevigata	41	3	0.025
Cladonia uncialis	41	3	0.009
Sphaerophorus globosus	41	3	0.206
Thamnolia vermicularis	41	3	0.06
Cetraria	41	4	0.001
Cetraria andrejevii	41	4	0.019
Cladonia uncialis	41	4	0.024
Flavocetraria cucullata	41	4	0.118
Ochrolechia frigida	41	4	0.006
Parmelia omphalodes	41	4	0.028
Sphaerophorus globosus	41	4	0.575
Thamnolia vermicularis	41	4	0.053
Undetermined	41	4	0.013
Cetraria laevigata	42	1	0.756
Cladina ciliata	42	1	0.41
Cladina portentosa	42	1	0.363
Cladina stellaris	42	1	0.144
Cladina stygia	42	1	4.779
Cladonia albonigra	42	1	0.295
Cladonia bellidiflora	42	1	0.194
Cladonia cornuta ssp groenlandica	42	1	0.215
Cladonia subfurcata	42	1	1.238
Cladonia uncialis	42	1	0.264
Cladonia wainioi	42	1	0.332
Nephroma arcticum	42	1	0.145
Ochrolechia frigida	42	1	0.081
Sphaerophorus globosus	42	1	0.228
Thamnolia vermicularis	42	1	0.053
Cetraria laevigata	42	2	0.317
Cladina arbuscula	42	2	0.536
Cladina stellaris	42	2	0.046
Cladina stygia	42	2	6.016
Cladonia uncialis	42	2	0.092
Cladonia albonigra	42	2	0.027
Cladonia bellidiflora	42	2	0.011
Cladonia carneola	42	2	T
Cladonia gracilis ssp vulnerata	42	2	1.85
Cladonia granulans	42	2	0.091
Cladonia metacorallifera	42	2	0.005
Cladonia subfurcata	42	2	0.323
Cladonia subfurcata	42	2	0.034
Nephroma arcticum	42	2	1.767
Thamnolia vermicularis	42	2	0.031

Cetraria laevigata	42	3	0.593
Cladina mitis	42	3	1.793
Cladina portentosa	42	3	0.196
Cladina stygia	42	3	2.491
Cladonia	42	3	0.032
Cladonia gracilis ssp vulerata	42	3	1.345
Cladonia subfurcata	42	3	0.604
Cladonia uncialis	42	3	0.281
Thamnolia vermicularis	42	3	0.286
Cetraria islandica ssp crispiformis	42	4	0.037
Cetraria laevigata	42	4	1.308
Cladina portentosa	42	4	0.077
Cladina stygia	42	4	0.805
Cladonia chlorophaea	42	4	1.045
Cladonia gracilis ssp vulnerata	42	4	0.894
Flavocetraria cucullata	42	4	0.033
Nephroma arcticum	42	4	1.67
Peltigera aphthosa	42	4	0.037
Peltigera britannica	42	4	4.439
Alectoria nigricans	47	1	0.152
Cetraria kamczatica	47	1	0.012
Cetraria laevigata	47	1	1.202
Cladina	47	1	0.01
Cladina ciliata	47	1	0.153
Cladina rangiferina	47	1	0.911
Cladina stellaris	47	1	0.185
Cladina stygia	47	1	1.468
Cladonia albonigra	47	1	0.054
Cladonia bellidiflora	47	1	0.015
Cladonia carneola	47	1	0.007
Cladonia gracilis ssp elongata	47	1	0.2
Cladonia macrophylla	47	1	0.027
Cladonia squamosa	47	1	0.029
Cladonia subfurcata	47	1	1.028
Cladonia uncialis	47	1	1.749
Cladonia wainioi	47	1	0.096
Flavocetraria cucullata	47	1	1.169
Ochrolechia frigida	47	1	0.142
Pertusaria dactylina	47	1	0.076
Sphaerophorus globosus	47	1	0.731
Thamnolia vermicularis	47	1	1.194
Alectoria nigricans	47	2	0.065
Bryocaulon divergens	47	2	0.016
Cetraria laevigata	47	2	0.092
Cladina stygia	47	2	0.504
Cladonia	47	2	0.034
Cladonia bellidiflora	47	2	0.107
Cladonia subfurcata	47	2	0.36
Cladonia wainioi	47	2	0.021
Flavocetraria cucullata	47	2	0.5
Sphaerophorus globosus	47	2	1.436
Thamnolia vermicularis	47	2	0.603
Alectoria nigricans	47	3	0.075
Cetraria laevigata	47	3	0.776
Cladina portentosa	47	3	1.132
Cladina stygia	47	3	0.229
Cladonia albonigra	47	3	0.016
Cladonia bellidiflora	47	3	0.014
Cladonia borealis	47	3	0.027
Cladonia crispata ssp crispata	47	3	0.131
Cladonia gracilis ssp elongata	47	3	0.034
Cladonia subfurcata	47	3	0.49

Cladonia uncialis	47	3	1.08
Flavocetraria cucullata	47	3	1.608
Flavocetraria nivalis	47	3	0.065
Ochrolechia frigida	47	3	0.156
Parmelia omphalodes	47	3	0.068
Sphaerophorus globosus	47	3	1.731
Thamnolia vermicularis	47	3	0.476
Alectoria ochroleuca	47	4	0.03
Cetraria ericetorum	47	4	0.015
Cetraria kamczatica	47	4	0.004
Cetraria laevigata	47	4	0.802
Cladina	47	4	0.471
Cladina stygia	47	4	0.014
Cladonia	47	4	0.052
Cladonia gracilis ssp vulnerata	47	4	0.292
Cladonia uncialis	47	4	0.482
Dactylina arctica	47	4	0.045
Flavocetraria cucullata	47	4	0.875
Parmelia omphalodes	47	4	0.008
Sphaerophorus globosus	47	4	0.646
Undetermined	47	4	0.347
Alectoria nigricans	48	1	0.458
Alectoria ochroleuca	48	1	0.092
Bryocaulon divergens	48	1	T
Cetraria kamczatica	48	1	0.058
Cetraria laevigata	48	1	0.273
Cladina ciliata	48	1	0.007
Cladina portentosa	48	1	0.094
Cladina rangiferina cf.	48	1	0.051
Cladina stellaris	48	1	0.515
Cladina stygia	48	1	0.811
Cladonia gracilis ssp elongata	48	1	0.042
Cladonia gracilis ssp vulnerata	48	1	0.176
Cladonia kanewskii	48	1	0.216
Cladonia uncialis s lat.	48	1	0.47
Cladonia wainioi	48	1	0.053
Flavocetraria cucullata	48	1	0.037
Ochrolechia frigida	48	1	0.016
Sphaerophorus globosus	48	1	0.659
Stereocaulon botryosum	48	1	0.332
Thamnolia vermicularis	48	1	0.957
Bryocaulon divergens	48	2	0.004
Cetraria laevigata	48	2	0.247
Cetraria nigricans	48	2	0.045
Cladina arbuscula	48	2	0.094
Cladina portentosa	48	2	0.056
Cladina stygia	48	2	0.801
Cladonia gracilis ssp elongata	48	2	0.385
Cladonia subfurcata	48	2	0.161
Cladonia uncialis	48	2	0.2
Ochrolechia frigida	48	2	0.592
Pertusaria dactylina	48	2	6.159
Sphaerophorus fragilis	48	2	0.399
Sphaerophorus globosus	48	2	0.049
Thamnolia vermicularis	48	2	0.349
Alectoria nigricans	48	3	0.046
Alectoria ochroleuca	48	3	0.105
Bryocaulon divergens	48	3	0.034
Cetraria laevigata	48	3	0.169
Cladina stellaris	48	3	0.171
Cladina stygia	48	3	0.182
Cladonia gracilis ssp elongata	48	3	0.019

Cladonia kanewskii	48	3	0.022
Cladonia subfurcata	48	3	0.184
Cladonia uncialis s lat.	48	3	0.241
Cladonia wainioi	48	3	0.116
Parmelia omphalodes	48	3	0.053
Pertusaria dactylina	48	3	2.313
Sphaerophorus globosus	48	3	0.713
Thamnolia vermicularis	48	3	0.406
Alectoria nigricans	48	4	0.109
Cetraria islandica ssp crispiformis	48	4	0.2
Cetraria laevigata	48	4	0.025
Cladina portentosa	48	4	0.055
Cladina stellaris	48	4	0.025
Cladina stygia	48	4	0.755
Cladonia gracilis ssp elongata	48	4	0.008
Cladonia gracilis ssp vulnerata	48	4	0.085
Cladonia metacorallifera	48	4	0.055
Cladonia subfurcata	48	4	0.04
Cladonia uncialis	48	4	0.465
Flavocetraria cucullata	48	4	T
Ochrolechia frigida	48	4	0.017
Sphaerophorus globosus	48	4	0.349
Thamnolia vermicularis	48	4	0.753
Alectoria nigricans	49	1	0.315
Bryocaulon divergens	49	1	0.002
Cetraria aculeata	49	1	0.002
Cetraria ericetorum	49	1	0.628
Cetraria kamczatica	49	1	0.072
Cladonia subfurcata	49	1	0.005
Cladonia uncialis	49	1	0.515
Flavocetraria cucullata	49	1	0.004
Sphaerophorus globosus	49	1	1.017
Thamnolia vermicularis	49	1	1.27
Alectoria nigricans	49	2	0.008
Cetraria aculeata	49	2	0.01
Cetraria laevigata	49	2	3.302
Cladina portentosa	49	2	0.185
Cladina stygia	49	2	0.417
Cladonia bellidiflora	49	2	0.106
Cladonia gracilis ssp vulnerata	49	2	1.005
Cladonia kanewskii	49	2	0.039
Cladonia uncialis	49	2	0.385
Flavocetraria cucullata	49	2	0.031
Lobaria linita	49	2	1.485
Sphaerophorus globosus	49	2	0.096
Thamnolia vermicularis	49	2	0.504
Cetraria laevigata	49	3	2.871
Cladina arbuscula	49	3	0.458
Cladina stygia	49	3	1.734
Cladonia gracilis ssp vulnerata	49	3	1.864
Cladonia pleurota	49	3	0.186
Cladonia uncialis	49	3	0.039
Flavocetraria cucullata	49	3	0.293
Sphaerophorus globosus	49	3	0.046
Thamnolia vermicularis	49	3	0.278
Cetraria islandica ssp crispiformis	49	4	0.632
Cetraria laevigata	49	4	0.745
Cladina stygia	49	4	0.086
Cladonia	49	4	0.042
Cladonia gracilis ssp vulnerata	49	4	0.492
Flavocetraria cucullata	49	4	T
Thamnolia vermicularis	49	4	0.059

Appendix C. Lichen taxa found on Hagemeister Island during the current and previous investigations.

Taxa	Present study	Talbot et al. 1987	Swanson and Barker 1992
Alectoria nigricans	x	x	
A. ochroleuca	x		
Arctocetraria andrejevii*	x	x	
Asahinea chrysantha	x	x	
Bryocaulon divergens	x	x	
Buellia erubescens		x	
Caloplaca holocarpa		x	
Cetraria aculeata	x		
C. commixta		x	
C. cucullata		x	x
C. ericetorum	x	x	
C. fastigiata	x		
C. hepatizon		x	
C. islandica			x
C. islandica ssp cetrariiformis	x		
C. islandica ssp crispiformis	x		
C. islandica ssp islandica	x		
C. kamczatica	x		
C. laevigata	x	x	
C. nigricans	x		
C. nivalis		x	x
Cetrariella delisei	x		
Cladina arbuscula	x		x
C. ciliata	x		
C. mitis	x	x	
C. portentosa	x		
C. rangiferina	x		x
C. stellaris	x	x	x
C. stygia	x	x	
Cladonia albonigra	x		
C. amaurocrea	x		
C. bellidiflora	x	x	
C. borealis	x		
C. carneola	x		
C. chlorophaea	x		
C. chlorophylla s lat.	x		
C. coccifera		x	
C. cornuta		x	
C. cornuta ssp cornuta	x		
C. cornuta ssp groenlandica	x		
C. crispata		x	
C. crispata ssp cetrariiformis	x		
C. crispata ssp crispata	x		
C. cyanipes	x		
C. fimbriata		x	

C. furcata cf.	x		
Cladonia gracilis ssp elongata	x		
C. gracilis ssp vulnerata	x		
C. granulans	x		
C. kanewskii	x		
C. macrocera cf.	x		
C. macrophylla	x		
C. maxima		x	
C. merchlorophaea	x		
C. metacorallifera	x		
C. nipponica	x		
C. novochlorophaea	x		
C. pleurota	x		
C. pyxidata	x		
C. scabriuscula	x		
C. squamosa	x		
C. stricta	x		
C. subfurcata	x	x	
C. sulphurina		x	
C. trassii	x		
C. uncialis	x		
C. wainioi	x		
Dactylina arctica	x		
Flavocetraria cucullata	x		
F. nivalis	x		
Icmadophila ericetorum		x	
Lecanora circumborealis		x	
L. intricata		x	
L. polytropha		x	
L. symmicta		x	
Lecidea atrobrunnea		x	
L. lithophila		x	
L. lapicida		x	
Lobaria linita	x	x	
Melanelia commixta	x		
M. septentrionalis		x	
M. stygia		x	
Nephroma arcticum	x	x	x
N. bellum		x	
Ochrolechia frigida	x	x	
Parmelia omphalodes	x	x	
P. sulcata		x	
Peltigera aphthosa	x		
P. britannica	x		
P. horizontalis		x	
P. leucophlebia		x	
P. neopolydactyla**	x	x	
P. occidentalis	x		
P. rufescens		x	
P. scabrosa		x	

Pertusaria dactylina	x	x
Pertusaria subplicans		x
Phylliscum demangeonii		x
Platismatia lacunosa		x
Porpidia flavicunda		x
P. speirea		x
Pseudephebe pubescens		x
Psoroma hypnorum	x	x
Rhizocarpon anseris		x
R. geographicum		x
Sphaerophorus fragilis	x	x
S. globosus	x	x
S. globosus ssp globosus	x	
Stereocaulon botryosum	x	x
S. glareosum		x
S. paschale		x
Thamnolia subuliformis		x
T. vermicularis	x	x
Tremolechia atrata		x
Tuckermannopsis inermis	x	
Umbilicaria hyperborea		x

*named *Cetraria andrejevii* in original study

**named *Peltigera polydactyla* in original study

**Appendix D. Lichen taxa weights by study site at Hagemeister Island in 2003.
(Weights less than 0.001 are indicated as T).**

Species	Study site									
	1	3	5	6	7	8	11	12	13	14
<i>Alectoria nigricans</i>	0.058	0.156	0.097	0.078	0.319				0.098	
<i>A. ochroleuca</i>		0.009	0.336	0.079	0.048					
<i>Arctocetraria andrejevii</i>		0.163			0.026		1.303			0.025
<i>Asahinea chrysantha</i>			0.082		0.129				0.306	
<i>Bryocaulon divergens</i>	0.366	0.357	0.768	0.04	0.467				0.059	
<i>Cetraria</i>				2.267						
<i>C. aculeata</i>		0.038	0.124		0.066				0.059	
<i>C. ericetorum</i>			2.088	0.44	0.921					
<i>C. fastigiata</i>		0.219	0.02							0.076
<i>C. islandica</i> ssp <i>cetrariiformis</i>		0.07	0.065		0.009	0.994				
<i>C. islandica</i> ssp <i>crispiformis</i>	1.234							0.021		0.339
<i>C. islandica</i> ssp <i>islandica</i>		0.022	0.066		0.032					0.042
<i>C. kamczatica</i>	2.258	0.557	0.191		0.035				T	0.052
<i>C. laevigata</i>	4.654	1.227	1.573	0.135	0.018	3.672	4.476	5.321	0.637	1.888
<i>C. nigricans</i>					0.025					
<i>Cetrariella delisei</i>					0.011					
<i>Cladonia</i>				0.607						
<i>C. arbuscula</i>	0.026	0.053								
<i>C. ciliata</i>										
<i>C. mitis</i>				0.091			0.013			
<i>C. portentosa</i>	0.384		0.444	0.362			0.276	1.021	0.158	0.821
<i>C. rangiferina</i>			0.226			0.196	0.193		0.027	0.176
<i>C. stellaris</i>		0.193	0.079	1.819				0.012		0.093
<i>C. stygia</i>	2.181	1.866	1.952	18.96		2.696	7.182	23.76	0.461	5.631
<i>Cladonia</i>		0.033		0.788		9.678		0.009		
<i>C. albonigra</i>			0.087		0.142	0.108		0.22		0.028
<i>C. amaurocrea</i>										
<i>C. bellidiflora</i>	0.852	0.273	0.1	0.708				5.276	0.246	0.024
<i>C. borealis</i>	0.825	0.146	0.048						0.139	
<i>C. carneola</i>			0.018					0.201	0.009	
<i>C. chlorophaea</i>	0.403			0.005						
<i>C. chlorophylla</i> s lat.										
<i>C. cornuta</i> ssp <i>cornuta</i>								0.188		
<i>C. cornuta</i> ssp <i>groenlandica</i>	0.025		0.153	0.013				0.094		
<i>C. crispata</i> ssp <i>cetrariiformis</i>	0.099	1.62					0.117			0.167
<i>C. crispata</i> ssp <i>crispata</i>	0.351		0.053							
<i>C. cyanipes</i>								0.011		
<i>C. furcata</i> cf.										
<i>C. gracilis</i>				2.472						
<i>C. gracilis</i> ssp <i>elongata</i>	0.118							5.277	0.055	0.155
<i>C. gracilis</i> ssp <i>vulnerata</i>	2.177	0.206	0.45			3.279	3.093	9.091		2.027
<i>C. granulans</i>										
<i>C. kanewskii</i>		0.053	1.238							
<i>C. macrocera</i> cf.										
<i>C. macrophylla</i>										
<i>C. merchlorophaea</i>										0.019
<i>C. metacorallifera</i>			0.003	0.051						
<i>C. nipponica</i>					0.522					
<i>C. novochlorophaea</i>										

Species	Study site									
	1	3	5	6	7	8	11	12	13	14
C. pleurota								1.469		
C. scabriuscula						0.02				0.094
C. squamosa			0.033							
C. stricta	0.01									0.064
C. subfurcata	0.44	1.045	3.549	1.262	0.35		1.705	0.406	0.578	0.123
C. trassii							0.252			
C. uncialis	1.867	4.513	3.625	1.648	0.571	0.121	1.437	0.856	0.243	1.567
C. wainioi		0.026	0.304	1.08			0.83	0.225		
Dactylina arctica										
Flavocetraria cucullata	4.196	4.963	1.943	3.981	0.118		0.632	0.685	4.039	0.188
F. nivalis			0.031							
Lobaria linita							0.2	0.624		0.592
Melanelia commixta										
Nephroma arcticum								0.965		
Ochrolechia frigida	0.033		0.037	0.322	T				0.03	
Parmelia										
P. omphalodes	0.01								0.646	
Peltigera										
P. aphthosa										
P. britannica	1.015									
P. neopolydactyla										
P. occidentalis										
Pertusaria dactylina			0.161						0.208	
Psoroma hypnorum										
Sphaerophorus fragilis										
S. globosus	1.713	4.247	5.239	0.944	1.687	0.015	0.204	0.978	6.272	0.586
S. globosus ssp globosus								0.076		0.002
Stereocaulon botryosum				0.368		0.011				
Thamnolia vermicularis	0.933	2.847	3.19	3.274	4.241	8.095	2.354	0.653	1.219	2.853
Tuckermannopsis inermis										
Unknown			0.006	0.109				0.008		
Total weight	26.23	24.9	28.38	41.93	9.737	29.09	24.7	56.81	15.49	17.63

Species	Study site									
	15	19	20	21	23	28	30	32	33	34
<i>Alectoria nigricans</i>	T		0.072	0.026	0.057	0.498	0.008	0.098	0.269	1.778
<i>A. ochroleuca</i>					0.072	0.023	0.046			0.043
<i>Arctocetraria andrejevii</i>			0.181		0.843	0.039			0.015	0.048
<i>Asahinea chrysantha</i>						0.786				
<i>Bryocaulon divergens</i>				0.056	0.062	0.215			0.003	0.618
<i>Cetraria</i>										
<i>C. aculeata</i>					0.266	0.304	0.239			0.246
<i>C. ericetorum</i>			0.262		0.057	0.008	0.041			0.715
<i>C. fastigiata</i>			0.031							
<i>C. islandica</i> ssp <i>cetrariiformis</i>										
<i>C. islandica</i> ssp <i>crispiformis</i>	0.78			0.299	0.071	0.369	0.373	0.107	2.839	
<i>C. islandica</i> ssp <i>islandica</i>			1.741			0.011			0.368	
<i>C. kamczatica</i>			0.345	0.018	0.016	0.128	0.018	0.063	T	0.029
<i>C. laevigata</i>	5.081	0.626	3.906	4.012	0.645	2.011	0.385	4.63	4.175	0.191
<i>C. nigricans</i>					0.03	0.074	0.186		0.011	
<i>Cetrariella delisei</i>	0.074		0.791		0.393	0.183	0.081	0.046	0.026	
<i>Cladina</i>							0.004			
<i>C. arbuscula</i>				0.476	0.08	T			0.026	0.288
<i>C. ciliata</i>										
<i>C. mitis</i>						0.018				0.055
<i>C. portentosa</i>	0.078	0.101	0.702	0.579	0.457	0.294	0.316	0.011	0.707	0.084
<i>C. rangiferina</i>	0.081	0.136		0.043		0.052				0.173
<i>C. stellaris</i>	0.426			0.135	0.165					
<i>C. stygia</i>	7.127	6.07	5.692	6.402	1.969	0.487	0.276	3.003	1.009	1.216
<i>Cladonia</i>			0.099		0.027					
<i>C. albonigra</i>	0.223	0.497		0.095	0.128				0.184	
<i>C. amaurocrea</i>										
<i>C. bellidiflora</i>	0.421	1.531					0.07	0.126		
<i>C. borealis</i>	0.239			0.404	0.685	0.223	0.533	0.131	1.181	0.232
<i>C. carneola</i>	0.005	0.383								
<i>C. chlorophaea</i>				0.021			0.015			
<i>C. chlorophylla</i> s lat.									0.009	
<i>C. cornuta</i> ssp <i>cornuta</i>				0.03						
<i>C. cornuta</i> ssp <i>groenlandica</i>		0.247			0.092		0.025			
<i>C. crispata</i> ssp <i>cetrariiformis</i>	0.084				0.13					
<i>C. crispata</i> ssp <i>crispata</i>		0.094	0.046	0.089	0.469			0.332	0.008	
<i>C. cyanipes</i>										
<i>C. furcata</i> cf.										0.51
<i>C. gracilis</i>										
<i>C. gracilis</i> ssp <i>elongata</i>					0.578			0.01		
<i>C. gracilis</i> ssp <i>vulnerata</i>	2.894	18.75	0.908	3.351	0.844			2.115	2.974	0.122
<i>C. granulans</i>										
<i>C. kanewskii</i>					0.398					0.007
<i>C. macrocera</i> cf.										
<i>C. macrophylla</i>									0.015	
<i>C. merchlorophaea</i>										
<i>C. metacorallifera</i>	0.063	0.076		0.019						
<i>C. nipponica</i>				0.079						
<i>C. novochlorophaea</i>	0.578									
<i>C. pleurota</i>		0.435								
<i>C. pyxidata</i>										

Species	Study site									
	15	19	20	21	23	28	30	32	33	34
C. scabriuscula					0.02					
C. squamosa	0.285	0.061								
C. stricta					0.438					
C. subfurcata	0.526	0.029	1.513	4.699	3.396	0.695	2.56	2.581	0.821	1.405
C. trassii										
C. uncialis	2.249		0.905	2.389	3.72	2.445	0.613	1.277	2.414	1.524
C. wainioi			0.108	0.187	0.374	0.256			0.138	0.152
Dactylina arctica										
Flavocetraria cucullata	0.868	0.125	0.474	0.755	3.659	0.413	1.82	3.787	0.092	2.734
F. nivalis										
Lobaria linita			3.354		0.153	0.078	0.094	0.039		0.425
Melanelia commixta					T					
Nephroma arcticum	1.779		0.683						1.2	
Ochrolechia frigida	0.008			0.011	1.001	0.017	0.025	0.013	0.009	0.061
Parmelia										
P. omphalodes					0.715	0.29				
Peltigera							0.236			
P. aphthosa								3.056		
P. britannica		1.773								
P. neopolydactyla	0.407	0.03					0.103			
P. occidentalis										
Pertusaria dactylina					0.049		1.2	0.064		
Psoroma hypnorum										
Sphaerophorus fragilis										
S. globosus	0.682	0.068	0.711	3.316	3.647	2.134	3.232	1.951	2.07	7.132
S. globosus ssp globosus										
Stereocaulon botryosum									0.074	
Thamnolia vermicularis	1.587	0.033	0.415	2.57	3.872	3.378	1.012	6.277	2.625	1.387
Tuckermannopsis inermis										
Unknown						0.01		0.007		
Total weight	26.55	31.07	22.94	30.06	29.58	15.44	13.51	29.72	23.26	21.18

Species	Study site								Total
	36	39	40	41	42	47	48	49	
<i>Alectoria nigricans</i>	0.002		0.181	0.046		0.292	0.613	0.323	5.069
<i>A. ochroleuca</i>		0.016				0.03	0.197		0.899
<i>Arctocetraria andrejevii</i>				0.019					2.662
<i>Asahinea chrysantha</i>				0.1					1.403
<i>Bryocaulon divergens</i>		0.048		0.375		0.016	0.038	0.002	3.49
<i>Cetraria</i>				0.001					2.268
<i>C. aculeata</i>		0.024	0.3	0.027				0.012	1.705
<i>C. ericetorum</i>	1.42	0.151				0.015		0.628	6.746
<i>C. fastigiata</i>	0.191								0.537
<i>C. islandica</i> ssp <i>cetrariiformis</i>									1.138
<i>C. islandica</i> ssp <i>crispiformis</i>	0.116	0.082	0.335		0.037		0.2	0.632	7.834
<i>C. islandica</i> ssp <i>islandica</i>									2.282
<i>C. kamczatica</i>	1.002		0.006	0.063		0.016	0.058	0.072	4.927
<i>C. laevigata</i>	5.333	0.159	1.068	0.209	2.974	2.872	0.714	6.918	69.51
<i>C. nigricans</i>			0.009				0.045		0.38
<i>Cetrariella delisei</i>									1.605
<i>Cladina</i>						0.481			1.092
<i>C. arbuscula</i>	0.051				0.536		0.094	0.458	2.088
<i>C. ciliata</i>					0.41	0.153	0.007		0.57
<i>C. mitis</i>		0.015			1.793				1.985
<i>C. portentosa</i>	0.083	0.033	0.209		0.636	1.132	0.205	0.185	9.278
<i>C. rangiferina</i>		0.027				0.911	0.051		2.292
<i>C. stellaris</i>					0.19	0.185	0.711		4.008
<i>C. stygia</i>	6.955	0.068	1.378	0.178	14.09	2.215	2.549	2.237	127.6
<i>Cladonia</i>		0.076	T	0.02	0.032	0.086		0.042	10.89
<i>C. albonigra</i>	0.073				0.322	0.07			2.177
<i>C. amaurocrea</i>			0.208						0.208
<i>C. bellidiflora</i>		0.006			0.205	0.136		0.106	10.08
<i>C. borealis</i>	0.875	0.097				0.027			5.785
<i>C. carneola</i>	0.006				T	0.007			0.629
<i>C. chlorophaea</i>		0.01			1.045				1.499
<i>C. chlorophylla</i> s lat.									0.009
<i>C. cornuta</i> ssp <i>cornuta</i>									0.218
<i>C. cornuta</i> ssp <i>groenlandica</i>		0.038			0.215				0.902
<i>C. crispata</i> ssp <i>cetrariiformis</i>				0.626					2.843
<i>C. crispata</i> ssp <i>crispata</i>	0.118		0.008			0.131			1.699
<i>C. cyanipes</i>									0.011
<i>C. furcata</i> cf.									0.51
<i>C. gracilis</i>									2.472
<i>C. gracilis</i> ssp <i>elongata</i>				0.116		0.234	0.454		6.997
<i>C. gracilis</i> ssp <i>vulnerata</i>	2.767		0.368		4.089	0.292	0.261	3.361	63.42
<i>C. granulans</i>					0.091				0.091
<i>C. kanewskii</i>		0.074	0.043				0.238	0.039	2.09
<i>C. macrocera</i> cf.		0.208							0.208
<i>C. macrophylla</i>						0.027			0.042
<i>C. merchlorophaea</i>									0.019
<i>C. metacorallifera</i>					0.005		0.055		0.272
<i>C. nipponica</i>									0.601
<i>C. novochlorophaea</i>									0.578
<i>C. pleurota</i>								0.186	2.09
<i>C. pyxidata</i>		0.062							0.095

Species	Study site								Total
	36	39	40	41	42	47	48	49	
<i>C. scabriuscula</i>									0.134
<i>C. squamosa</i>						0.029			0.408
<i>C. stricta</i>									0.512
<i>C. subfurcata</i>	3.732	0.033	0.568	0.039	2.199	1.878	0.385	0.005	36.52
<i>C. trassii</i>									0.252
<i>C. uncialis</i>	2.275	1.7	1.581	0.276	0.637	3.311	1.376	0.939	46.08
<i>C. wainioi</i>	0.129				0.332	0.117	0.169		4.427
<i>Dactylina arctica</i>				0.006		0.045			0.051
<i>Flavocetraria cucullata</i>	0.589	0.094	0.378	1.345	0.033	4.152	0.037	0.328	42.43
<i>F. nivalis</i>						0.065			0.096
<i>Lobaria linita</i>		3.565	0.368					1.485	10.98
<i>Melanelia commixta</i>									T
<i>Nephroma arcticum</i>					3.582				8.209
<i>Ochrolechia frigida</i>	0.007	0.798	1.267	0.013	0.081	0.298	0.625		4.656
<i>Parmelia</i>		T							T
<i>P. omphalodes</i>		T		0.059		0.076	0.053		1.849
<i>Peltigera</i>									0.236
<i>P. aphthosa</i>					0.037				3.093
<i>P. britannica</i>	0.64		0.033		4.439				7.9
<i>P. neopolydactyla</i>			0.123						0.663
<i>P. occidentalis</i>			0.066						0.066
<i>Pertusaria dactylina</i>		20.4		T		0.076	8.472		30.63
<i>Psoroma hypnorum</i>	0.012								0.012
<i>Sphaerophorus fragilis</i>							0.399		0.399
<i>S. globosus</i>	2.312	1.957	2.394	3.438	0.228	4.544	1.77	1.159	64.63
<i>S. globosus ssp globosus</i>									0.078
<i>Stereocaulon botryosum</i>							0.332		0.785
<i>Thamnolia vermicularis</i>	1.916	0.904	3.01	0.441	0.37	2.273	2.465	2.111	66.31
<i>Tuckermannopsis inermis</i>			0.04						0.04
Unknown				0.028		0.347			0.515
Total weight	30.6	30.64	13.94	7.425	38.609	26.54	22.57	21.228	709.75

Appendix E. Mean percent cover estimates and weight measurements of lichens at study sites on Hagemester Island in 2003.

Site	Mean lichen % cover estimate	Lichen weight (g)
1	12.625	26.228
3	23.75	24.902
5	43.5	28.379
6	34.75	20.442
7	1.875	9.737
8	5.25	29.085
11	3.25	24.699
12	50	56.81
13	20.125	15.489
14	18.75	17.632
15	47.5	26.545
19	13.875	31.065
20	8.75	22.939
21	42.5	30.061
23	33.75	29.578
28	11.25	15.439
30	23.5	13.511
32	20	29.724
33	11.25	23.262
34	30	21.175
36	14.5	30.604
39	13	30.64
40	9	13.941
41	5.25	7.425
42	26	38.609
47	42.5	26.539
48	17.5	22.573
49	21.375	21.228