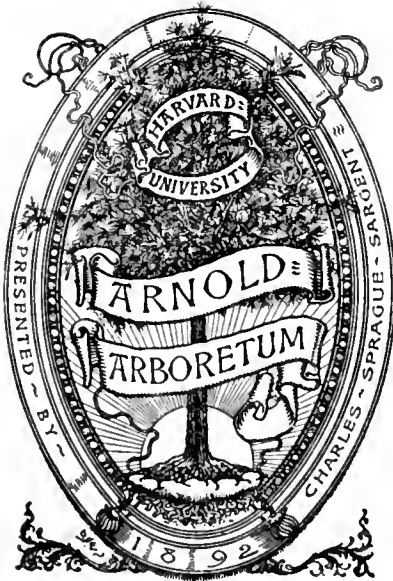
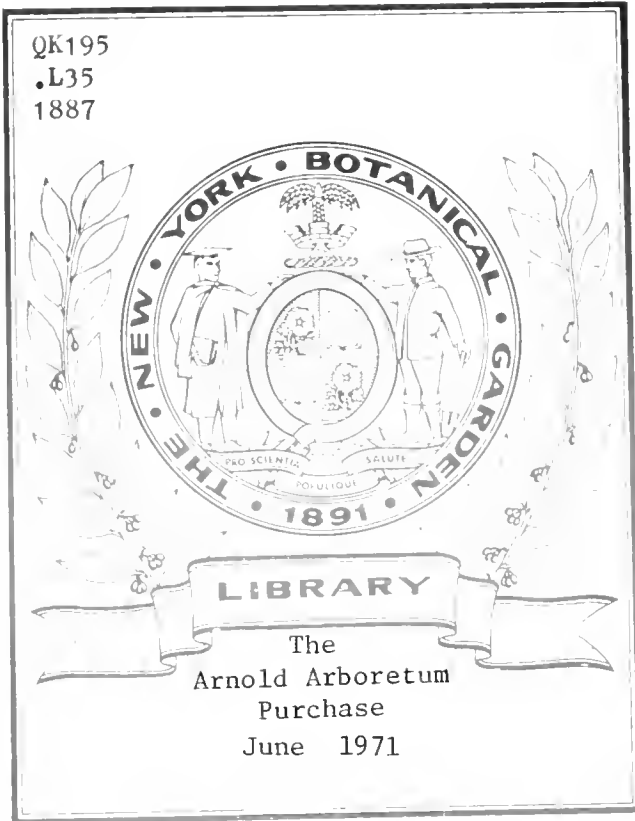
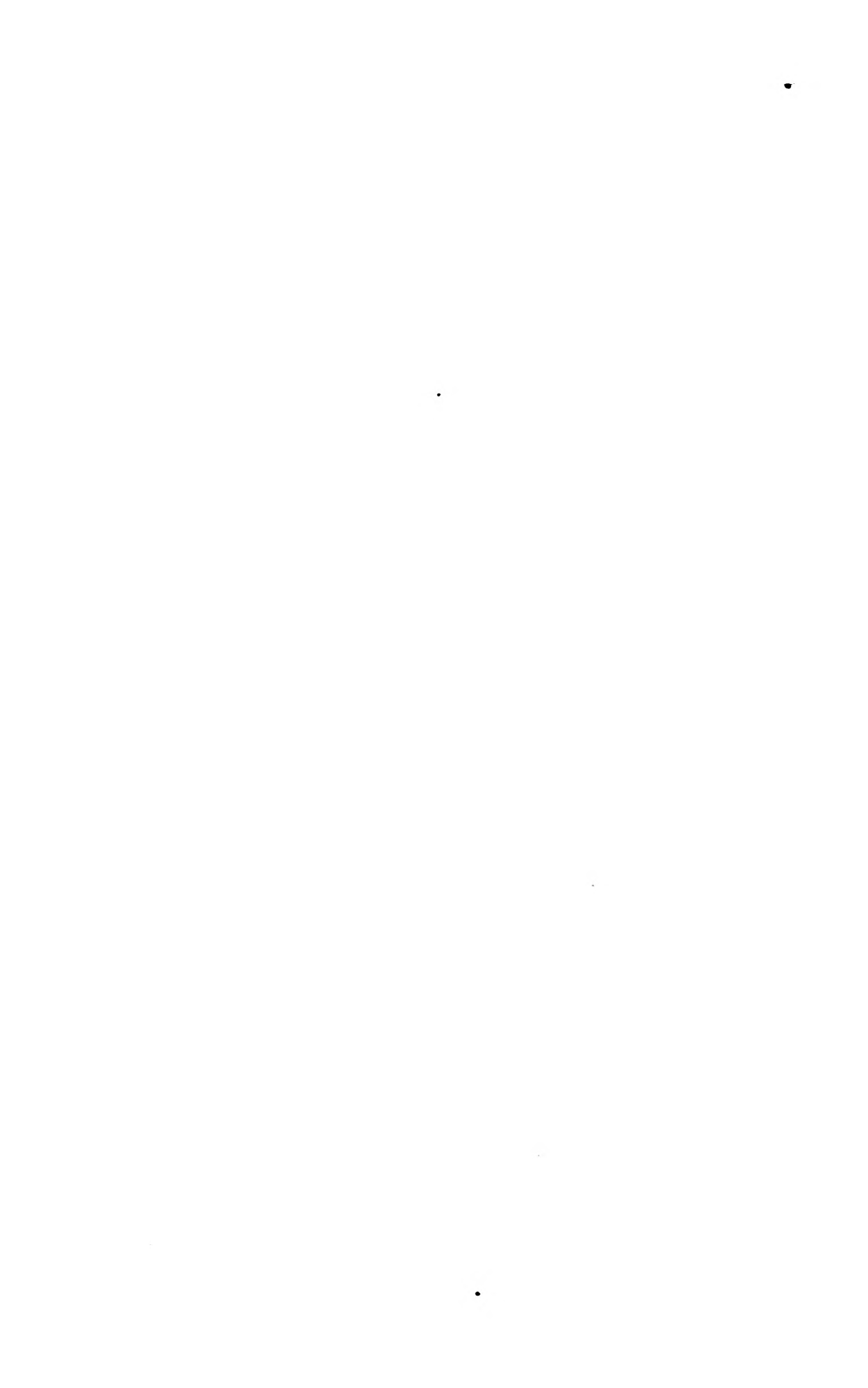


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XVII.—*Remarks on the Flora of the Northern Shores of America, with Tabulated Observations made by Mr. F. F. PAYNE on the seasonal development of Plants at Cape Prince of Wales, Hudson Strait, during 1886. By GEORGE LAWSON, Ph.D., LL.D.*

(Read May 25, 1887.)

The observations made by Mr. Payne on the progress of vegetation during the spring, summer and autumn of 1886, at Cape Prince of Wales, Hudson Strait, cannot fail to be of interest and use to those who are desirous of definite knowledge respecting the climate of the Hudson Strait shores during the period of active plant growth. But a knowledge of our northern vegetation is not only of interest in enabling us to form a judgment as to the general character of the climate, or ascertain how far a given district is capable of producing cultivated crops or plants that are in any way useful in the economical sense; there are other questions which, if more remote from immediate practical utility, are yet not of less interest from a scientific point of view, and every contribution of information, whether in form of observations or specimens, is of value. The floras of our northern shores gradually merge northwardly into the composite flora found within the Arctic circle, commonly called "the Arctic flora," the remarkable composition of which has given rise to speculation as to its origin. Sir Joseph Hooker accounts for it by assuming extensive changes of climate and of land and sea, leading to a spread of Scandinavian species over the whole polar zone, and the subsequent introduction of Asiatic and American species, with which the Scandinavian are so largely associated in all the Arctic districts except those of Europe and Greenland. Some of the difficulties of this view are overcome, if we admit, with Darwin and Hooker, the great antiquity of the Scandinavian flora, and the hypothesis originated by Edward Forbes and extended by Charles Darwin, that previous to the Glacial Epoch, that flora was more uniformly distributed over the whole polar zone than now; that during that period it was driven southward in every longitude, even across the tropics into the south temperate zone; and that, on the succeeding warmth of the present epoch, the surviving species again spread northward, accompanied by aborigines of the countries which they had invaded during their southern migration, and leaving behind on the northward march stragglers of the Scandinavian flora that found permanent refuge in the mountains of the warmer zones. The discussion of such an hypothesis necessarily opens up questions of variation, adaptation, and survival, under changing conditions of climate and over large areas of the earth's surface. It will be seen, at once, how important it is to have our Northern American species carefully collocated with those of Northern Europe and Asia, especially such of them as belong, or are allied, to species of the true Scandinavian flora. It is not the discovery of new species on our northern shores that is the object most to be desired in the interest of science, for we have already a confusing plethora of names, but rather the collection of material to enable us to ascertain more accurately the relations to each

other of the species that have been already described, so that duplicate names may be eliminated, and our nomenclature placed on such a basis that equivalent forms—whether species, so-called subspecies, or varieties, or even less pronounced forms—may be compared together from the several regions, as evidence of community of origin, or otherwise, or to indicate possible or probable sources of derivation.

At an early period in the century preceding the present one, long before questions of origin had arisen, and long before it was thought of any consequence to mankind to ascertain the possibilities of productive culture on our northern coasts, Linnaeus's "Tour in Lapland" and the "Flora Lapponica" had excited an interest in these little northern plants from the systematic botanist's point of view. And, while, subsequently, the Scandinavians themselves and the botanists of Russia, have been active in making known the vegetation of the northern verges of Europe and Asia, so the northern shores of America and the Greenland coast have been visited by whaling vessels, whose officers have, season after season, carried specimens to British botanists; but the principal botanical work on our shores has been accomplished by the numerous exploring expeditions sent out from time to time by England and the United States, whose collections have been elaborated in the most careful manner and the results systematised and published for general use.

More recently, substantial work has been done at the meteorological stations for observation on Hudson Strait, and especially by Dr. Robert Bell, scientist and medical officer of the expedition to Hudson Bay in 1884, a list of whose botanical collections, identified by Prof. Macoun, has been published.

Work still remains to be done by observers who have opportunity, and it may be thus summarised:—To collect and dry specimens in as many conditions or stages of growth as possible, carefully noting (1) dates of collection, (2) kinds of soil, whether sandy, loamy, clayey, peaty (these greatly affecting moisture and temperature), (3) distance from sea shore, elevation above sea-level, (4) surroundings of locality or particular spot where the plant is gathered, as regards protection from cold, or conditions of shelter favourable to prolonged humidity of atmosphere or to accumulation of warmth in time of sunshine. These particulars are specially mentioned, not only because they are intrinsically of special importance; but because we had scarcely any systematic observation of them, until the establishment of the stations of observation on Hudson Strait. It is to be hoped that what has been begun so well by the Hudson Strait observers, will be continued and developed by those who have opportunity, from time to time, to add to the information already acquired. These regions are so seldom visited in the ordinary course of travel, and the collection and preservation of specimens is attended with so many difficulties, that even the veriest scraps are welcome to the home botanist. How much more valuable are specimens, carefully selected so as to show modifications of form, and thus serve to determine questions of specific identity or distinction, or those collected at different times during the seasons of sprouting or budding, leaf-development, flowering, ripening of seeds, and autumn withering, or fall of leaf or browning of evergreens, with dates carefully recorded, so as to show the beginning, progress and ending of the annual growing period for vegetation.

In the following tabulation of Mr. Payne's observations, the several columns after that containing the name of the species give:—

A.—Date of spring-budding in case of shrubs, and sprouting or appearance of new shoots from the rhizomes of herbaceous plants.

B.—Date when plant was found in leaf, i.e., when leaves of the season were fairly developed.

C.—When first found in flower.

D.—When specimens were found with ripe seeds.

E.—Autumn withering of foliage, or defoliation.

F.—Particulars as to the nature of the habitat of each species, or spot where found growing—especially with respect to proximity to, or distance from, the sea-shore, elevation above sea-level, whether in exposed hilly situations, or sheltered, or protected amongst rocks or in water-courses, etc.: general character of soil, whether gravelly, sandy, compact, or peaty, and whether moist or dry, etc. Northern plants have a special tendency to assume luxuriant forms when grown in sheltered spots where the air is kept moist by waterfalls, rapid streams, or even rocky brooks.

Corresponding observations of these several phenomena in the same species of plants in any other locality or country will enable a comparison to be made of its climate, so far as it affects vegetation, with that of Cape Prince of Wales. The variations of seasons in different years in the same locality may also be determined from such observations.

The names of all the species were determined from a careful examination by myself of Mr. Payne's specimens. The condition of the plants, as to progress of seasonal growth at the several dates, as noted by Mr. Payne at the time, was also ratified in each case by examination of the specimens. The abundant ripening of seeds is one of the features of Mr. Payne's collection, showing a marked difference from some of the collections taken to England by exploring expeditions. In less hospitable regions, although plants grow even luxuriantly, they are not known to ripen seeds sufficiently for germination. This has led to the belief that within the Arctic circle the permanent continuance of vegetation is dependent upon fertile seeds ripened farther south and transported to the belt of the Arctic flora. However this may be, it is interesting to note that in all the specimens from Cape Prince of Wales that were sufficiently advanced, the seeds were plump and perfect.

Additional collections have been received, but too late to be included in this paper. The results of an examination of these, as well as the consideration of some general questions regarding the northern shore flora, must consequently be deferred.

LIST OF PLANTS COLLECTED AT CAPE PRINCE OF WALES, HUDSON STRAIT, DURING THE SUMMER OF 1886, WITH NOTES OF OBSERVATIONS MADE ON THEIR GROWTH, OR SUCCESSIVE DEVELOPMENT OF ORGANS, DURING THE SEASON, NATURE OF LOCALITIES WHERE FOUND, ETC., BY F. F. PAYNE. THE SPECIES DETERMINED FROM MR. PAYNE'S SPECIMENS BY PROF. LAWSON.

	A.	B.	C.	D.	E.	F.
1. <i>Ranunculus nivalis</i> , <i>Linn.</i> .....		June 30	July 5	Aug. 18	Aug. 29	Nature of locality or spot where found, as regards Elevation, Protection, Soil, Moisture, etc. All the plants were collected within 500 yards and most of them within 100 yards, of high tide mark. The letters M.S.L. in this column refer to mean sea level.
2. <i>R. hyperboreus</i> , <i>var. pygmaeus</i> , <i>Lawson</i> .....		July 25	.....	.....	.....	In very damp soil, alongside margins of streams, well protected, 500 yards from high tide mark. Height above M.S.L., 40 feet.
3. <i>Papaver alpinum</i> , <i>Linn.</i> ( <i>P. nudicaule</i> ).....	May 29	June 1	June 30	Aug. 6	Sept. 1	Similar situations as preceding species (No. 1), but not near streams, although in damp soil.
4. <i>Draba alpina</i> , <i>Linn.</i> var. ....		June 25	July 1	.....	.....	On dry gravel and sand, tolerably well protected, on level ground only fifty yards from shore. Elevation above M.S.L., twenty (20) feet.
5. <i>Cochlearia officinalis</i> , <i>Linn.</i> .....	June 15	June 22	June 22	Aug. 18	Aug. 26	Similar locality as preceding. No. 3, but in soil more moist, 200 yards from shore.
6. <i>Cerastium alpinum</i> , <i>Linn.</i> .....	June 15	June 22	June 30	Aug. 15	Sept. 8	Same as No. 4, twenty yards from shore.
7. <i>C. vulgatum</i> , <i>Linn.</i> .....		.....	.....	.....	.....	In dry soil in localities similar to No. 5, very plentiful, isolated from other plants, except grass.
8. <i>Stellaria longipes</i> , <i>var. s. Torr. &amp; Gr.</i> .....	June 15	June 22	July 8	Aug. 20	Sept. 12	In dry soil, in rocky crevices, in same locality as No. 6.
9. <i>Lycchnis apetala</i> , <i>Linn.</i> .....		June 30	July 5	Aug. 30	Aug. 20	Same as No. 3, grouped (in patches), but not isolated.
10. <i>L. apetala</i> , <i>var. affinis</i> .....	June 15	June 22	July 2	Aug. 14	Aug. 20	Same as No. 9.
11. <i>Silene acaulis</i> , <i>Linn.</i> .....	May 26	June 1	July 5	Aug. 22	Sept. 8	Same as No. 10, situation rather exposed, 50 feet above M.S.L.; some leaves still green on September 16.
12. <i>Honekeneya peboides</i> , <i> Ehr.</i> .....	June 10	June 20	July 10	Aug. 6	Sept. 1	In dry sand, twenty feet above M.S.L., and twenty yards from high water mark; not plentiful.
13. <i>Astragalus alpinus</i> , <i>Linn.</i> .....	June 20	June 25	June 30	Aug. 19	Aug. 25	Sand and gravel, thirty feet above M.S.L., thirty yards from shore; on level ground only, pretty well exposed.
14. <i>Oxytropis arctica</i> , <i>R. Br.</i> .....	June 20	June 26	July 7	Aug. 20	Sept. 5	Same situations as No. 13.
15. <i>Dryas integrifolia</i> , <i>Vahl.</i> .....	June 9	June 18	July 1	Aug. 29	Sept. 1	Gravelly soil on level ground, but well exposed, 100 yards from shore; elevated 50 feet above M.S.L. Grouped and isolated.
16. <i>Potentilla nivea</i> , <i>Linn.</i> .....		.....	.....	.....	.....	On sand, isolated, rather exposed; 20 yards from shore; 20 feet from M.S.L.
17. <i>P. maculata</i> , <i>Lam.</i> .....	May 25	June 3	June 22	Aug. 6	Aug. 20	Dry sand, level ground; 100 yards from shore; 50 feet from M.S.L. Some leaves still green, September 5.
18. <i>Rubus Chamamorus</i> , <i>Linn.</i> .....	June 20	July 5	July 7	Aug. 5	Sept. 1	Well protected, growing amongst moss and grass, 200 yards from shore; 60 feet above M.S.L.; tolerably dry.
19. <i>Epilobium latifolium</i> , <i>Linn.</i> .....	June 25	July 1	July 15	Sept. 5	Sept. 9	Much exposed, hard level beds of gravel, very dry; 80 yards from shore and 40 feet above M.S.L.
20. <i>Hippuris vulgaris</i> , <i>f. maritima</i> (tetraphylla).....		.....	.....	.....	.....	In a small pond, well protected, 500 yards from shore and 100 feet above M.S.L.
21. <i>Saxifraga cernua</i> , <i>Linn.</i> .....	June 20	.....	July 10	Aug. 27	Sept. 3	Amongst rocks, well protected, 80 yards from shore and 40 feet above M.S.L. Soil, sand and gravel.



22. <i>S. trienspidata</i> , <i>Retz.</i> .....	May 25	June 10	July 4	Aug. 20	Sept. 12	Dry gravel, level, exposed; 100 yards from shore, 40 feet above M.S.L. Some leaves remain green throughout the winter. Eskimo eat quantities of the flowers.
23. <i>S. oppositifolia</i> , <i>Lin.</i> .....	May 20	June 1	June 18	Aug. 15	Aug. 25	Very plentiful, dry gravel, etc., as No. 22
24. <i>S. rivularis</i> , <i>Lin.</i> .....	.....	July 1	July 10	Sept. 3	Sept. 8	Damp, light soil, isolated, well protected at bottoms of hills; 200 yards from shore, 30 feet above M.S.L.
25. <i>S. nivalis</i> , <i>Lin.</i> .....	June 23	June 30	July 7	Aug. 26	Sept. 6	Situation fairly protected, 100 yards from shore, 50 feet above M.S.L. Soil rather damp; plants scattered.
26. <i>S. nivalis</i> , <i>var. β.</i> .....	.....	.....	.....	.....	.....	On dry gravel, rather exposed; 100 yards from shore, 50 feet above M.S.L.
27. <i>S. cespitosa</i> , <i>Lin.</i> .....	May 20	June 1	June 28	Aug. 25	Aug. 31	Sand, dry, same as No. 25. Showed signs of sprouting again, Sept. 10.
28. <i>Parnassia palustris</i> , <i>Lin.</i> .....	.....	.....	.....	.....	.....	Amongst boulders in old river bed, sheltered; 400 yards from shore, 80 feet above M.S.L.
29. <i>Erigeron uniflorus</i> , <i>Lin.</i> .....	.....	June 28	July 10	Aug. 27	Sept. 3	Gravel, dry, exposed on level; 90 yards from shore, 50 feet above M.S.L. Plant scattered.
30. <i>Arnica alpina</i> , <i>Oliv.</i> .....	June 27	July 5	July 12	Aug. 27	Sept. 3	Sand, only 20 yards from shore, rather exposed; 30 feet from M.S.L. Plant rather scarce.
31. <i>Antennaria alpina</i> , <i>Lin.</i> .....	May 26	June 10	June 22	Aug. 12	Aug. 12	Hard gravel, dry, well exposed; 60 yards from shore, 50 feet above M.S.L.
32. <i>Taraxacum officinale</i> , <i>var. palustre</i> , <i>D.C.</i> , ( <i>alpinum</i> et <i>lividum</i> , <i>Koch.</i> , <i>A. Gr.</i> , &c.; <i>β. sativum</i> , <i>L.</i> , <i>Moq.</i> , <i>Fl. Labradorica</i> .).....	June 3	June 30	July 4	Aug. 1	Sept. 5	Sand protected; 20 yards from high tide mark, 20 feet above M.S.L. Not plentiful.
33. <i>Marricaria inodora</i> , <i>var. nana</i> <i>Torr.</i> , <i>A. Gr.</i> .....	.....	.....	July 28	.....	.....	Well protected, small island, 30 feet from M.S.L., 80 yards from shore.
34. <i>Campanula uniflora</i> , <i>Lin.</i> .....	June 25	July 1	July 5	Aug. 16	Aug. 25	Gravel, exposed on level, 80 yards from shore, 20 feet above M.S.L. Plentiful, scattered.
35. <i>Vaccinium nigrescens</i> , <i>Lin.</i> .....	June 15	June 25	July 7	Aug. 25	Sept. 10	Gravel, well exposed on level, 300 yards from shore, 60 feet above M.S.L. Berry black when ripe.
36. <i>V. vitis-idaea</i> , <i>Lin.</i> .....	May 20	June 1	July 1	Aug. 31	Sept. 10	Dry gravel, well exposed, high up on hill sides, and level ground; 500 yards from shore. Some leaves remain green throughout the winter. In many instances its berries did not drop until spring.
37. <i>Cassiope tetragona</i> , <i>Lin.</i> .....	June 1	June 15	June 25	Aug. 25	Sept. 5	Exposed on highest hills, 500 feet above M.S.L., growing between rocks. In sheltered places this plant remains green throughout the winter.
38. <i>Arctostaphylos alpina</i> , <i>Spreng.</i> .....	June 1	June 22	June 22	Aug. 31	Sept. 14	Well exposed, generally on level; 200 yards from shore, 100 feet above M.S.L. Eskimo eat quantities of the berries of this plant.
39. <i>Ledum palustre</i> , <i>Lin.</i> ( <i>var. decumbens</i> , <i>E. Vepér</i> )......	May 25	June 1	July 1	Aug. 25	Sept. 8	Well exposed, but generally on south sides of hills only, 100 feet above M.S.L. Where well protected, some leaves remain green throughout the winter.
40. <i>Diapenzia Lapponica</i> , <i>Lin.</i> .....	May 20	June 1	July 1	Aug. 31	Sept. 5	Well exposed, but generally on level ground; dry gravel and sand, 100 feet above M.S.L., 300 yards from shore. Some leaves remain green throughout the winter.
41. <i>Pyrola minor</i> , <i>Lin.</i> .....	.....	May 25	July 10	Aug. 30	Sept. 6	Protected between boulders on level, 400 yards from shore, 100 feet above M.S.L. Some leaves green throughout the winter.
42. <i>Rhododendron Lapponeicum</i> , <i>Wahl.</i> .....	May 15	May 25	June 25	Sept. 5	Sept. 10	Exposed on level, 500 yards from shore, dry gravel, 150 feet above M.S.L.
43. <i>Mertensia maritima</i> , <i>Don.</i> .....	June 15	June 22	July 5	Aug. 25	Aug. 28	Sand, fairly protected, isolated, 20 feet above M.S.L., 20 yards from high tide mark.
44. <i>Pedicularis flammica</i> , <i>Lin.</i> .....	.....	July 5	July 12	Aug. 20	Aug. 25	Dry bed of stream, fairly protected, 30 feet above M.S.L., 50 yards from shore. Much frequented by bees, flies and butterflies.
45. <i>P. Langsdorffii</i> , <i>var. lanata</i> , <i>A. Gr.</i> .....	June 1	June 10	June 20	Aug. 12	Aug. 18	Same as preceding, No. 45, rather dry, with sand and gravel.
46. <i>P. hirsuta</i> , <i>Lin.</i> .....	June 1	June 15	June 20	Aug. 10	Aug. 20	Same as preceding, Nos. 44 and 45, rather moist; earth, sand and gravel.

LIST OF PLANTS COLLECTED AT CAPE PRINCE OF WALES, HUDSON STRAIT, DURING THE SUMMER OF 1886.—Continued.

A.		B.	C.	D.	E.	F.
Date of spring bud-bud or sprouting.	Plant in leaf, new leaves of the season developed.	In flower.	Fruit or seeds ripe.	Autumn withering.		Name of locality or spot where found, as regards Elevation, Protraction, Soil, Moisture, etc. All the plants were collected within 500 yards, and most of them within 100 yards, of high tide mark.
July 3	July 12	July 17	Aug. 26	Aug. 31		Same as preceding, No. 46, rather moist; earth, sand and gravel.
June 15	June 22	June 30	Aug. 31	Aug. 31		Dry sand and gravel, level, exposed; 40 feet above M. S. L., 100 yards from shore, scattered.
June 10	June 15	June 22	July 28	Sept. 11		Generally on moist earth along margins of streams; 30 feet above M. S. L., 100 yards from shore. Plentiful.
June 12	June 22	July 1	July 25	Sept. 1		Grows wherever moss grows, on damp soil. The sweet, knotty root of this plant is much sought after by Eskimo and caton.
June 28	July 6	.....	.....	Sept. 10		Remains green much later in sheltered places. Grows on hillsides, well exposed. Very plentiful; used by Eskimo to make fires whenever any cooking is done.
June 10	June 15	June 22	Aug. 30	Sept. 10		Amongst moss, well exposed, but on level ground, generally in moist places.
June 20	July 1	July 10	Aug. 10	Aug. 28		Dry sand and gravel, tolerably well protected between rocks, or in old river beds 40 feet above M. S. L.
.....	.....	.....	.....	.....		Well exposed on hill and level; dry light earth.
.....	.....	.....	.....	.....		Moist earth, rather exposed, in wide, open valley, 500 yards from shore, 200 feet above M. S. L.
.....	July 10	July 15	July 25	Sept. 5		Well protected, moist old river beds, 80 feet above M. S. L., 200 yards from shore. Plentiful.
May 25	June 12	July 10	Aug. 21	Sept. 8		Sand, well protected, 20 feet above M. S. L., 15 yards from high water mark. Not plentiful.
May 25	June 1	July 15	Aug. 28	Sept. 1		Sand, only found close to high water mark, 15 feet above M. S. L. (Sept. 10, still green in warm, sheltered places.)
June 10	June 20	July 15	.....	Sept. 10		Amongst stones, protected, same as preceding, No. 50. Not plentiful.
June 1	June 22	July 10	Aug. 25	Sept. 1		Sand, same as preceding, No. 64, but more plentiful.
June 20	July 1	July 15	Sept. 3	Sept. 8		Well exposed on level and south side of hill; dry, light soil, amongst rocks, 80 feet above M. S. L.
June 1	June 25	July 15	Aug. 31	Aug. 31		Well protected amongst stones, close to high tide mark; scarce (Sept. 20, some blades still green.)
.....	June 1	June 1	.....	.....		Well protected, amongst rocks, near shore, 20 feet above M. S. L.; grouped, scarce. (Sept. 10, 1 fronds quite green and fresh looking.)
.....	June 30	June 30	.....	.....		Well protected amongst boulders and rocks, 200 yards from shore, 60 feet above M. S. L.; grouped, scarce. (Sept. 10, 1 fronds quite green and fresh looking.)
.....	.....	.....	.....	.....		Amongst moss, 300 yards from shore, rather exposed; 60 feet above M. S. L.





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