
Botany

Experiment 1.

The Fusion of Borax.

Purpose of Experiment — To determine the fusion temperature of Borax and to obtain data with which to plot the fusion curve for Borax.

Properties of Borax. $Na_2B_4O_7 \cdot 10H_2O$

Borax is the most important salt of pyroboric acid, a boric acid obtained by heating either metaboric or orthoboric acid to 140° for some time by $2H_2B_2O_4 \rightarrow H_2O + H_2B_4O_7$

or $4H_3BO_3 \rightarrow 5H_2O + H_2B_4O_7$

Borax occurs in nature as "tincal". It is manufactured from boric acid by double decomposition with sodium carbonate —

$4H_3BO_3 + Na_2CO_3 \rightarrow Na_2B_4O_7 + 6H_2O + CO_2$

Anhydrous sodium carbonate is added to a boiling solution of boric acid and the liquid is then allowed to crystallize, when it forms large transparent prisms belonging to the monoclinic system. The chief source of borax however is furnished by the natural deposits of borate of lime in Bolivia & California. The powdered mineral is boiled with water, and soda ash is added to the mixture, when calcium carbonate is precipitated and a mixture of sodium and sodium metaborate is formed —

$Ca_2B_6O_{10} + 2Na_2CO_3 \rightarrow 2CaCO_3 + Na_2B_4O_7 + Na_2B_2O_4$

On Xlization the borax deposits, and the more soluble metaborate remains in the mother-liquid. On concentrating these mother liquors and blowing carbon dioxide through the solution, the metaborate is converted into borax, which is precipitated as a fine meal; leaving Na_2CO_3 in solution —

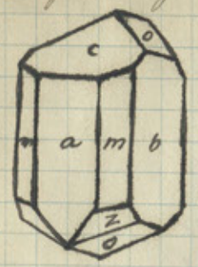
$2Na_2B_2O_4 + CO_2 \rightarrow Na_2CO_3 + Na_2B_4O_7$

When heated Borax loses its water of Xligation and swells up, forming a white porous mass, which finally melts to a clear glass.

100 parts of water at 10° dissolve 4.6 parts of Xliged borax and at 100°, 201.4 parts; the solution possesses a feeble alkaline reaction.

When deposited slowly from warm solutions (i.e. above about 50°C) borax Xliges in octahedrons having the composition $Na_2B_4O_7 \cdot 5H_2O$; but when Xliged without any special precautions it forms prismatic Xls containing 10 molecules of H_2O. This is the ordinary form of borax encountered.

Crystalligation



Monoclinic - Axes $\dot{a} : \dot{b} : \dot{c} = 1.0995 : 1 : 0.5632$
$\beta = 73°25'$

oa	$001 \wedge 100 = 72°26'$	oz	$001 \wedge \bar{2}21 = 69°8'$
mm'''	$110 \wedge 1\bar{1}0 = 93°0'$	oo'	$\bar{1}11 \wedge \bar{1}\bar{1}1 = 57°27'$
oo	$001 \wedge \bar{1}11 = 40°31'$	zz'	$\bar{2}21 \wedge 221 = 83°28'$

Crystals prismatic, sometimes large; resembling pyroxene in habit and angles. Cleavage: a perfect; m less so; b in traces. Fracture conchoidal. Rather brittle. H = 2 - 2.5. G = 1.69 - 1.72 Luster vitreous to resinous sometimes earthy. Color white; sometimes grayish, bluish, or greenish. Streak white. Translucent to opaque Taste sweetish-alkaline, feeble. Optically —. Ax pl ⊥ b. $Bx_a \perp b$. $Bx_{o.r} \wedge \dot{c} = -56°60'$. $\beta = 1.470$. $2E_r = 59.30$
Composition - $Na_2B_4O_7.10H_2O$ or $Na_2O.2B_2O_3.10H_2O$
= Boron trioxide 36.6, soda 16.2, water 47.2 = 100.

Obtained from salt lakes of Tibet. In California abundant in Lake Co., at Borax L. and Hachinhama two small alkaline lakes in the immediate vicinity of Clear Lake; present in solution in the lake waters, and obtained also in large quantities in fine crystals imbedded in the lake mud and surrounding marshy soil; also found in fine large xls at Borax L. San Bernardino Co.; at Death Valley Inyo Co. Also Rhodes Marsh, etc. Esmeralda Co. Nevada.

0	16	16	27	27	48	190	228	201	239
1	16	18	27	29	49	194	230	205	241
2	20	30	31	41	50	197	235	208	246
3	22	40	33	51	51	200	240	211	251
4	30	45	41	56	52	205	244	216	255
5	36	57	47	68	53	208	247	219	258
6	42	64	53	75	54	210	250	221	261
7	50	74	61	85	55	214	252	225	263
8	52	80	63	91	56	218	257	229	268
9	56	88	67	99	57	220	262	231	273
10	60	94	71	105	58	226	265	237	276
11	60	100	71	111	59	229	270	240	281
12	60	104	71	115	60	232	273	243	284
13	61	108	72	119	61	237	277	245	288
14	64	115	75	126	62	240	280	251	291
15	70	120	81	131	63	242	282	253	294
16	73	122	84	133	64	249	286	261	298
17	75	125	86	136	65	250	290	262	302
18	78	129	89	140	66	253	292	265	304
19	80	130	91	141	67	257	297	269	309
20	83	134	94	145	68	260	300	272	312
21	90	138	101	149	69	263	305	275	317
22	96	140	107	151	70	266	308	278	320
23	102	145	113	156	71	270	310	282	322
24	110	150	121	161	72	272	315	284	327
25	116	153	127	164	73	276	320	288	332
26	120	158	131	169	74	280	323	292	335
27	123	160	134	171	75	281	326	293	338
28	125	164	136	175	76	285	330	297	342
29	126	168	137	179	77	290	335	302	347
30	130	170	141	181	78	293	338	305	350
31	130	171	141	182	79	296	341	308	353
32	132	174	143	186	80	300	344	312	356
33	136	176	147	187	81	303	348	315	360
34	140	180	151	191	82	305	350	317	362
35	140	180	151	191	83	310	356	322	368
36	145	184	156	195	84	313	364	325	376
37	149	190	160	201	85	319	370	331	382
38	150	190	161	201	86	324	375	336	387
39	154	194	165	205	87	327	380	339	392
40	160	200	171	211	88	332	385	344	397
41	163	200	174	211	89	336	390	348	402
42	166	204	177	215	90	341	394	353	406
43	170	206	181	217	91	346	400	358	412
44	174	210	185	221	92	350	404	362	416
45	177	213	188	224	93	356	409	368	421
46	180	216	191	227	94	360	410	372	422
47	185	222	196	233	95	364	417	376	429

96	368	418	380	480
97	370	421	382	433
98	373	425	386	437
99	377	430	389	442
100	380	430	392	442
101	383	431	395	443
102	385	440	397	452
103	390	441	402	453
104	392	450	404	463
105	397	455	409	467
106	402	460	414	472
107	409	472	421	484
108	415	475	427	487
109	420	480	432	492
110	425	486	437	498
111	430	490	442	502
112	435	495	447	507
113	440	500	452	512
114	—			
115	447	510	459	522
116	—	510		522
117	454	514	466	526
118	458	520	470	532
119	464	530	476	542
120	470	536	482	548
121	480	540	492	552
122 } 123 }	484	548	496	560
124	490	550	502	562
125	491	550	503	562
126	494	554	506	566
127	497	560	509	572
128	500	566	513	579
129	505	570	518	583
130	510	575	523	588
131	515	580	528	593
132	520	585	533	598
133	525	590	538	603
134	530	594	543	607
135	533	600	546	613
136	535	600	548	613
137	536	602	549	615
138	540	605	553	618
139	542	610	555	623
140	545	612	558	625
141	550	615	563	628
142	551	620	564	633
143	555	620	568	638

144	557	623	570	636
145	560	627	573	640
146	564	636	577	649
147	570	640	583	653
148	575	650	588	663
149	580	652	593	665
150	584	654	597	667
151	585	655	598	668
152	590	660	603	673
153	594	670	607	683
154	602	675	615	688
155	608	686	621	699
156	611	682	624	695
157	616	690	629	703
158	622	696	635	709
159	630	710	643	
160	636	716	649	
161	640	720	653	
162	650	726	663	
163	650	734	663	
164	657	742	670	
165	664	750	677	
166	670	755	683	
167	676	760	689	
168	680	765	693	
169	685	765	698	
170	685	755	698	
171	690	758	693	
172	690	780	693	
173	705	800	718	
174	710	790	723	
175	715	800	728	
176	715	790	728	
177	716	784	729	
178	710	790	723	
179	715	805	728	
180	724	815	737	
181	726	822	739	
182	730	833	743	
183	745	840	758	
184	755	850	768	
185	764	860	777	
186	770	860	783	
187	775	865	788	
188	780	870	793	
189	785	880	798	
190	790	885	803	
191	805	890	818	

192	810	895	823
193	815	900	828
194	824	910	837
195	830	920	843
196	834	925	847
197	840	930	853
198	845	937	858
199	856	944	870
200	860	950	874
201	867	956	881
202	870	960	884
203	875	960	889
204	880	970	894
205	884		898

0	886	900
	886	900
	880	894
	874	888
1	864	878
	860	864
	840	854
	830	844
2	820	834
	810	824
	800	814
	793	807
3	783	797
	773	787
	765	779
	757	771
4	750	764
	740	754
	730	744
	725	739
5	720	724
	710	718
	704	713
	697	711
6	690	704
	685	699
	679	693
	674	688
7	666	680

Notes on Snow Diminution at Umanak.

The light covering of snow on the wind-swept portions of the Umanak plain began disappearing on May 17 on the slopes exposed to the southerly winds and to the warmest rays of the sun.

May 18. — Melted from many rocks.
" 19 — Cloudy and Cold
" 20 — Melted past in spots, and in bands on slopes. Warm
" 21 — " some more, but slightly.
" 22 — Cloudy but mild with southerly wind Melting
" 23 — Cloudy and cold
" 24 — Clear, Mild, warm. Melting fast
" 25 — Cloudy but mild
" 26 — Clear, Bright warm " "
" 27 — " " " "
" 28 — " " Colder. No melting
" 29 — " " warm Melting
" 30 — Clear " " "
" 31 " " " "

Notes on Botany at Umanak

May 8, 1914.

In a walk over the ridge south east of the house to the plain beyond, I found an inch patch of rhododendron on the hill slope. Peter Fruchen tells me the rhododendron is a rather rare plant here.

I found that some of the plants have begun to develop chlorophyll in their leaves, notably Cassiope tetragona, of which many showed emerald green along the rocks when the snow is melted.

The lichens, both on the rocks and the ground, are flourishing. I collected ~~on~~ a species I have not before noticed

May 9, 1914.

I found another smaller patch of rhododendron near yesterday's discovery.

May 17, 1914.

I spent a warm day geologizing in a sheltered cove on the north side of Wolstenholme Bay. In this warmest spot I have yet found, the vegetation had not yet begun to show any signs of life, though most of the snow was melted from the ground. It is a locality of varied physiographic forms and should afford considerable variety of plant forms later, though then, I fear, it will be inaccessible. The only plant I saw there, that I have not already found at Umanak is the Statice.

May 26 and 27.

The vegetation at the head of Grenville Bay is varied and luxuriant, though it shows no signs of life at present. Heath and bog and moor, grassy hillsides, sedgey hollows, dry rock ledges lichen-covered. I gathered a few grasses and sedges, Lycopodium, Rhododendron, Phyllodoce, Pyrola and Statice. Later in the season when the forms have begun to develop, it should be a splendid locality for botanical work.

June 2. A few days of warm sun have rapidly melted the snow, and the tips of Cassiope tetragona & Saxifraga oppositifolia, Cochlearia officinalis, and Cerastium alpinum are showing green. The rock lichens are fast maturing fruit. I collected some fungi, a marchantia apparently covered with an orange fungus, and a few lichens. The gray fungus I collected grows in damp spots, most profusely at the edge of a melting snowdrift. It apparently

becomes symbiotic at places, with an algae which seems to modify its character to a large degree. Because of my suspicion that this is the case I collected a large quantity of material some of it the fungus free, as I think of the algae, and in order of ascertaining the different stages. There are lichens which I believe are parasitic upon some of the mosses.

June 3.

I found a new locality which promises to yield some interesting results, both from an ecological and a taxonomic viewpoint. It lies on the northwest slope of the shore of the Fjord above the peninsula upon which Unalaska stands. I found in this locality a great deal of Rhododendron, Pyrola, Azalea, Empetrum nigrum, and Statice in addition to the more numerous plants. There is a profusion of Rhododendron, a plant which I had supposed was quite rare so far north.

An interesting specimen I collected is what I take to be the chasmogamous flower of Saxifraga cernua. It was growing in the moist soil beside a rock, quite buried under snow. I preserved the specimens in 70% H2O, 25% Alcohol, and 5% Formalin.

The Pyrola is as green and flourishing as if it had not experienced a cold greater than 30° below zero.

June 6

I find the first full open blossoms of Saxifraga oppositifolia with many partly opened buds. I also find the first catkins of Salix arctica producing pollen. These are on the southeast slope of a beach which has a general angle of 20° from the vertical

June 12.-

I find Oxyria digyna abloom on the small ridge just north of the missionary's house. Cochlearia officinalis is in bloom; I found also the first flowers of Potentilla pulchella and Draba hirta.

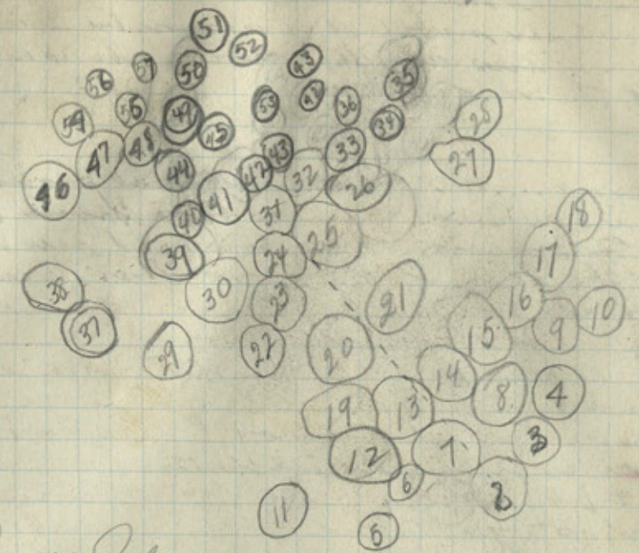
June 17. I find Cerastium alpinum abloom; also Stellaria humifusa, Draba alpina, and Potentilla pulchella. The Papaver and Taraxacum have large buds almost ready to burst into bloom.

3

Studies of Saxifraga oppositifolia.

Ecad No. 1.

This clump, a single plant of Saxifraga oppositifolia



June July.

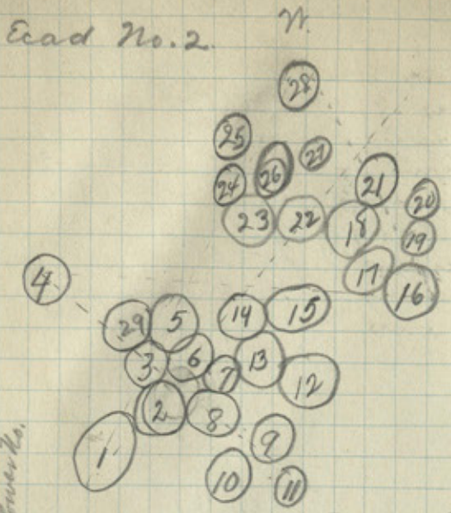
Flower No. 6 8 10 12 14 16 18 20 22 24 26 28 30 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

1		
2	③ ⓓ ⑨ ④	Cutworm cuts off
3	① ④ ⑦ ⑥	Cut " "
4	① ③ ⑥ ⑥ ⑦	
5	⑤ ⑦ ③ ③ ⑤	
6	② ② ⑨ ⑦	Cut worm destroys
7	① ③ ⑥ ⑤	" " "
8	① ④ ⑤ ⑨ ⑨	
9	③ ⑦ ② ⑥ ⑧	
10	③ ⑦ ② ⑤ ⑦	
11	⑨ ⑤ ○ ⑦ ⑧	
12	⑨ ⑤ ○ ⑧ ⑦	
13	○ ⑥ ⑤ ⑥ ⑥	
14	⑨ ⑥ ⑨ ⑤	Cut worm cuts off
15	⑨ ⑥ ○ ⑦	" " " "
16	⑨ ⑥ ○ ⑤	" " " "
17	② ⑦ ○ ⑧ ⑧	
18	② ⑥ ① ② ⑨	
19	○ ⑥ ⑥ ⑧	Cut worm " "
20	○ ② ⑤ ⑦ ⑨	
21	⑨ ⑤ ○ ⑧	Cut " " "
22	⑦ ⑨ ② ⑤ ⑧	
23	○ ③ ⑥ ⑦ ⑨	
24	⑥ ⑦ ○ ⑦	" " " "
25	⑨ ⑥ ⑨ ⑥	" " " "
26	⑨ ⑨ ② ⑥	" " " "
27	⑨ ⑨ ⑨ ○	" " " "
28	⑨ ○ ⑨ ⑤	" " " "

Destroyed by Cutworm. See page 18.

Continued on page 18

Ecad No. 2

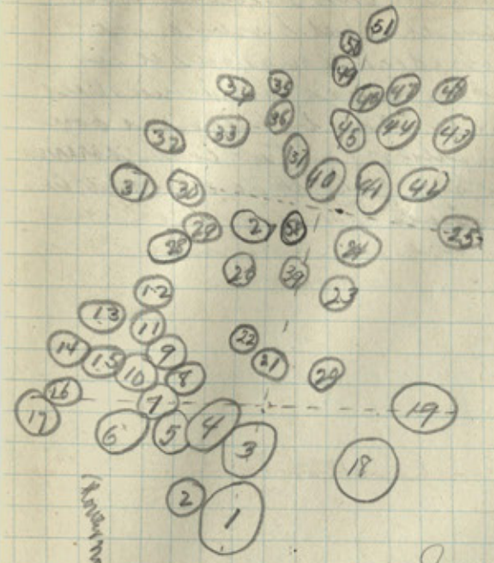


This study lay 15 feet south and a foot lower than 1a. Its environment was much the same, but it grew more elevated above the general surface of the ground as the soil caught and held between three basaltic pebbles upon which the stems lay. The southeastern half of the plant sloped southeast, the northwestern half toward the northwest. It emerged from the snow three days before 1a. or on May 22.

June – July.

Date	6	8	10	12	14	16	18	20	22	24	26	28	30	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
1	⑥	⓪	⑨	⑫	⑭	⑨	C	②	③	③																		
2	⑥	⑥	③	⑫	⑭	⑨	C	C	②		X		X															
3	⑤	⑥	⑫	⑫	⑭	⑨	C	C	②		③		X															
4	⑥	⑥	⓪	⑫	⑭	⑨	C	C	②		③		X															
5	⑥	⑥	⓪	⑫	⑭	⑨	C	C	②		③		X															
6	⑥	⑥	⓪	⑫	⑭	⑨	C	C	②		③		X															
7	⑥	⑥	⑥	⑫	⑲	✓	C	②		③		X																
8	⑥	⑥	⓪	⑫	⑭	✓	C	C	②		③		X	X														
9	⑥	⑥	⑥	⑫	⑭	✓	C	C	②		③		X	X														
10	⑥	⑥	⑫	⑫	⑭	✓	C	C	②		③		X	X														
11	⑥	⑥	⑥	⑥	⑭	✓	✓	C			③		X	X														
12	⑥	7	⓪	⓪	⑫	C	C	②			③		X															
13	⑤	⑥	⑫	⑫	✓	C	C	C			③		X	X														
14	⑥	⓪	⑫	⑫	✓	C	C	C			③		X	X														
15	⑥	⑥	⓪	⑫	✓	✓	✓	C			③		X															
16	⑥	⑥	⑫	⑫	✓	✓	✓	C			③		X															
17	⑥	⑥	⓪	⑫	✓	✓	✓	C			③		X															
18	⑥	⑥	⓪	⑫	✓	✓	✓	C			③		X															
19	⑥	⑥	⑥	⑫	✓	✓	✓	C			③		X															
20	⑥	⑥	⑥	⑫	⑦	⑨	✓	C	C		③		X															
21	⑥	⑥	⑥	⑥	⑫	✓	✓	✓			③		X															
22	⑥	⑥	⓪	⑫	⑫	✓	✓	✓			③		X															
23	⑥	⑥	⑫	⑫	⑫	✓	✓	✓			③		X															
24	⑥	⑥	⑥	⑥	⑦	⑨	✓	✓	✓		③		X															
25	⑥	⑥	⑥	⓪	⑫	⑨	✓	✓	✓		③		X															
26	⑥	⑥	⑥	⓪	⑥	⑨	✓	✓	✓		③		X															
27	⑤	⑥	⑥	⑥	⑥	⑨	✓	✓	✓		③		X															
28	⑤	⑥	⑥	⑥	⑥	⑧	⑨	✓	C		③		X															
29	⑥	⓪	⓪	⑫	⑦	⑫	C	C			③		X															
30																												

Ecad # 3



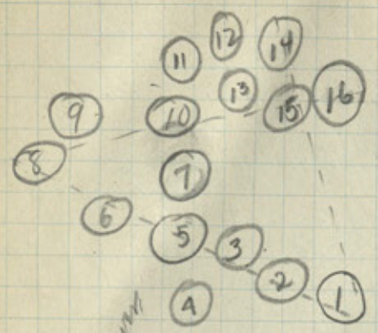
This study lay four inches to the north east of 2. It lay low on the ground and the entire plant with the exception of blossoms 1, 2, 5, 6, 18, and 19 which sloped toward the south east and blossoms 2, 5, 42, 43, 44, 47, 48, and 51 which sloped toward the northwest, sloped toward the southwest. It emerged from the snow the same day as No. 2. Its habitat was much the same.

June July

Date	6	8	10	12	14	16	18	20	22	24	26	28	30	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
1	⑥	⓪	⓪	⑥	⓪	⑨	✓	C	✓	✓	②		X															
2	⑥	⑥	⑥	⓪	Imperfect flowers. Eaten by worm																							
3	③	⑥	⑫	⑥	⓪	⑨	✓	C	✓	✓	②		X															
4	⑥	⓪	④	⑫	⓪	⑨	✓	✓	✓	✓	②		X															
5	⑫	⑥	⓪	⑫	⑦	⑨	✓	✓	✓	✓	②		X															
6	⑫	⑦	⑥	⑥	⓪	⑨	✓	✓	✓	✓	②		X															
7	③	⑥	⑦	⓪	⑨	⑨	✓	✓	✓	✓	②		X															
8	②	⑦	⑥	⑥	⑦	⑨	✓	✓	✓	✓	②		X															
9	⑦	⑥	⑥	⑦	⑫	⑨	✓	✓	✓	✓	②		X															
10	⑥	⑥	⑥	⑥	⓪	⑨	✓	✓	✓	✓	②		X															
11	⑦	⑥	⑥	⑥	⓪	⑨	✓	✓	✓	✓	②		X															
12	⑦	②	⑥	⑥	③	⑨	✓	✓	✓	✓	②		X															
13	⑦	⑦	⑥	⑥	④	⑨	✓	✓	✓	✓	②		X															
14	⑥	⑦	⓪	⑥	⑦	⑨	✓	✓	✓	✓	②		X															
15	⑦	⑥	⑥	⑧	②	⑨	✓	✓	✓	✓	②		X															
16	⑦	⑥	⑥	⑥	⓪	⑨	✓	✓	✓	✓	②		X															
17	②	③	⑦	⓪	⓪	⑨	✓	✓	✓	✓	C		X															
18	⑥	⑦	⑥	⑥	⑥	⑧	⑨	✓	✓	✓	C		X															
19	⑥	⑦	⑥	⑤	⑦	⑨	✓	C	C	✓	③		X															
20	⑦	③	⑦	⓪	⑥	⑨	✓	✓	C	✓	③		X															
21	⑦	③	⑦	⓪	⑤	⑨	✓	✓	C	✓	③		X															
22	⑥	③	⑦	⓪	④	⑨	✓	✓	✓	✓	③		X															
23	⑥	⑦	⑦	⓪	⑥	⑨	✓	✓	✓	✓	③		X															
24	②	③	⑦	⓪	⑤	⑨	✓	✓	C	C	②		X															
25	⑥	⑦	⑦	⑥	⑥	⑨	✓	C	C	C	③		X															
26	⑦	⑦	⑥	⑥	②	⑨	✓	✓	C	C	②		X															
27	⑦	⑦	⑦	⑤	⑨	⑨	✓	✓	✓	C	C		X															
28	②	⑦	⑥	⑥	⑦	⑨	✓	✓	✓	C	C		X															

Continued on page 19

Exp't 4

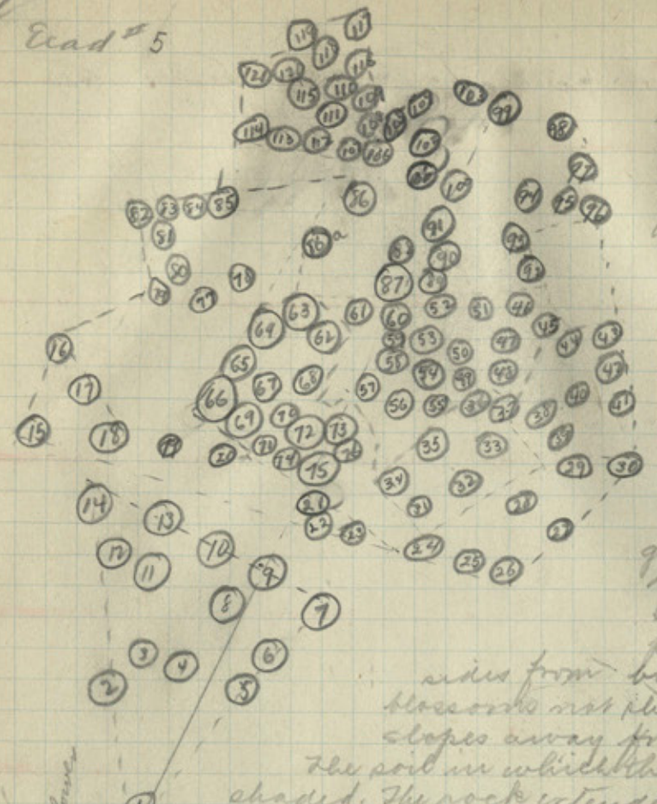


This study lay 3 feet south of No. 2. It grew high on soil between several small pebbles, at least an inch above the general surface of the soil. To the south-east lay a small boulder which retarded the melting of the snow so this study was exposed one day later than No. 2; but this boulder did not cut off any sunlight from the plant, though it may have shaded part of the soil to which the root penetrated.

Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
1	6	0	5	7	3	10	v	v	C	G	X																	
2	5	4	8	0	Eaten by worm																							
3	5	10	8	6	9	11	v	v	C	G	X																	
4	5	8	4	10	12	9	v	v	C	G	X																	
5	5	9	3	6	7	9	v	v	v	C	X																	
6	7	8	2	5	8	10	v	v	v	C	X																	
7	3	8	2	4	7	10	v	v	v	C	X																	
8	6	0	3	7	9	9	v	v	v	C	X																	
9	5	9	3	6	8	9	v	v	v	C	X																	
10	4	8	2	4	6	9	v	v	v	C	X																	
11	3	8	2	2	4	9	v	v	v	C	X																	
12	9	8	2	3	4	9	v	v	v	C	X																	
13	9	8	3	5	11	9	v	v	v	C	G	G	X															
14	5	9	2	6	7	9	v	v	v	C	G	G	X															
15	5	9	3	6	8	9	v	v	v	C	X																	
16	5	9	7	7	8	9	v	C	G	G	X																	

Exp't 5

Ecad # 5



This interesting study lay three feet south of No. 2. It grew flush with the general surface of the soil. It emerged from the snow on the same day as No. 2, May 22. The ~~last~~ interesting factor is the fact that it lay on an outcrop of a large flat basaltic boulder, the corners of which connected would just include the outer edge of the plant. The bended leaves of the plant, the blossoms 1 to 14 lying deep within the angle and shaded by it from the northeastern to northwestern sunlight inclusive. The plant sloped away on all sides from blossom No. 57, so that those blossoms not shaded by the rock, lay on slopes away from the warmest sunlight. The soil in which the root grew was likewise shaded. The rock extended above the soil four inches and projected from its base at least 3.

Fleur

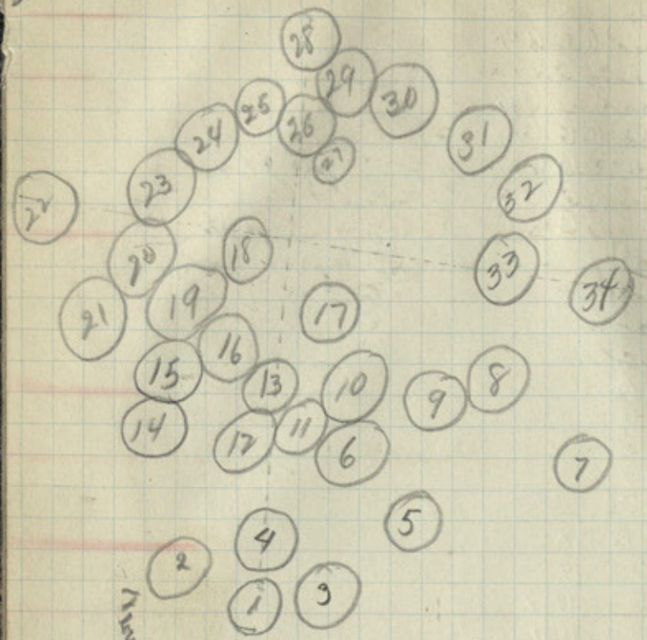
Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
1	U	U	U	3	U	O	6	9	✓	✓	✓	C	G	G	X													
2	U	U	U	3	U	O	6	9	✓	✓	✓	C	G	G	X													
3	U	U	U	3	O	O	6	9	✓	✓	✓	C	G	G	X													
4	U	U	U	3	U	O	6	9	✓	✓	✓	C	G	G	X													
5	U	U	U	3	U	O	6	9	✓	✓	✓	C	G	G	X													
6	U	U	U	3	U	3	5	9	✓	✓	✓	C	G	G	X													
7	U	U	U	3	U	O	5	9	✓	✓	✓	C	G	X														
8	U	U	U	3	U	O	6	9	✓	✓	✓	C	G	X														
9	U	U	U	3	U	4	6	9	✓	✓	✓	C	G	X														
10	U	U	U	3	U	6	7	✓	✓	✓	C	C	G	X														
11	U	U	U	3	U	O	6	9	✓	✓	✓	✓	C	G	X													
12	U	U	U	3	U	4	5	9	✓	✓	✓	✓	C	G	X													
13	U	2	U	3	O	3	7	9	✓	✓	✓	✓	C	G	X													
14	U	U	U	3	U	O	4	7	9	✓	✓	✓	C	C	X													
15	U	U	U	3	U	O	6	7	✓	✓	✓	✓	C	C	X													
16	U	U	3	3	U	O	6	9	✓	✓	✓	✓	C	G	X													
17	U	U	3	3	U	O	6	9	✓	✓	✓	✓	C	G	X													
18	U	U	3	3	U	O	6	9	✓	✓	V	✓	C	G	X													
19	U	U	1	3	U	O	6	9	✓	✓	✓	✓	C	G	X													
20	U	U	U	2	3	O	8	9	✓	✓	V	C	G	X	C	X												
21	U	5	U	O	6	9	✓	✓	✓	✓	G	X	X	C	X													
22	U	5	U	O	O	8	9	✓	✓	✓	G	X	X	C	X													
23	3	5	U	O	O	7	9	✓	✓	✓	G	X	X	G	X													

Ecad # 5 (continued)

Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
24	U	U	U	O	U	6	9	✓	✓	✓	✓	✓	C	G	G	X												
25	U	U	U	O	O	6	9	✓	✓	✓	✓	✓	C	G	G	X												
26	U	U	U	O	O	3	9	✓	✓	✓	✓	✓	C	G	G	X												
27	U	U	U	3	U	O	7	9	✓	✓	✓	✓	C	G	G	X												
28	U	U	U	3	U	2	6	9	✓	✓	✓	✓	✓	C	G	G	X											
29	U	U	U	3	U	3	6	9	✓	✓	✓	✓	✓	C	G	G	X											
30	U	U	U	3	U	3	6	9	✓	✓	✓	✓	✓	B	B	X												
31	U	U	U	3	U	5	2	9	✓	✓	✓	✓	G	X														
32	U	2	8	O	U	9	9	✓	✓	✓	✓	X	X															
33	U	U	3	U	U	6	9	✓	✓	✓	✓	G	X															
34	U	5	7	O	5	9	✓	✓	✓	✓	G	X																
35	U	5	8	U	6	9	✓	✓	✓	✓	C	X																
36	U	U	4	5	U	8	9	✓	✓	✓	✓	G	X															
37	U	U	3	5	U	8	9	✓	✓	✓	✓	G	X															
38	3	5	9	O	O	6	9	✓	✓	✓	✓	G	X															
39	3	4	8	O	U	9	9	✓	✓	✓	✓	G	X															
40	3	6	U	U	O	9	9	✓	✓	✓	✓	✓	G	X														
41	2	4	9	O	O	5	9	✓	✓	✓	✓	✓	G	X														
42	U	3	2	U	4	Eaten cut							Tip	C	G	X												
43	U	U	3	5	O	7	9	✓	✓	✓	✓	✓	G	G	X													
44	3	6	9	U	4	9	9	✓	✓	✓	✓	✓	G	X														
45	U	6	2	3	5	2	9	✓	✓	✓	✓	X																
46	U	2	2	U	O	3	9	✓	✓	✓	✓	X																
47	3	5	8	O	O	7	9	✓	✓	✓	✓	X																
48	3	5	8	O	U	8	9	✓	✓	✓	C	X																
49	3	5	8	O	9	8	9	✓	✓	✓	C	X																
50	3	6	8	O	9	8	9	✓	✓	✓	C	X																
51	U	2	3	6	Eaten by cut worm																							
52	U	2	U	6	6	7	9	✓	✓	G	8	X																
53	3	6	8	9	9	9	✓	✓	G	8	X																	
54	2	4	7	O	8	7	✓	✓	G	8	X																	
55	2	5	8	O	Eaten by worm																							
56	3	6	8	O	Eaten by worm on N.E. & S. sides																							
57	3	6	8	O	Eaten by worm on N. side																							
58	2	5	8	O	6	"	"	"	Entirely																			
59	3	5	8	O	Eaten by cut worm, Fading on N.W. side																							
60	3	6	9	2	9	9	✓																					
61	3	6	8	O	Eaten by cut worm at tip																							
62	3	9	O	9	6	6	9	✓	✓	C	G	X																
63	6	9	2	6	8	8	9	✓	✓	C	G	X																
64	6	9	2	6	9	9	✓	✓	✓	C	G	X																
65	U	O	3	9	Eaten by cut worm																							
66	U	O	4	8	"	"	"	"																				
67	U	O	4	9	Cut by cut worm																							
68	3	5	8	O	"	"	"	"																				
69	6	9	2	9	"	"	"	"																				
70	3	6	8	O	6	9	✓	✓	C	G	X																	
71	U	3	6	U	6	8	9	✓	✓	C	G	X																

Continued on page 21

Ecad #6



Date 6 8 10 12 14 16 18 20 22 24 26 28 30 June 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 July

1	⑫	0	⑧	⑦																												
2	⑫	0	⑧	⑦																												
3	⑫	⑨	⑥	⑨																												
4	⑫	0	⑦	⑨																												
5	⑫	①	⑥	⑦																												
6	⑫	②	⑥	⑨																												
7	⑧	③	⑥	⑨																												
8	⑧	③	⑥	⑨																												
9	⑧	③	⑦	⑨																												
10	6	0	⑧	⑦																												
11	⑧	③	⑦	⑨																												
12	⑧	③	⑦	⑨																												
13	⑧	③	⑦	⑨																												
14	⑧	③	⑥	⑨																												
15	⑨	③	⑦	⑨																												
16	⑨	④	⑦	⑨																												
17	⑨	④	⑦	⑨																												
18	⑧	②	⑥	⑨																												
19	⑧	③	⑥	⑨																												
20	⑨	③	⑦	⑨																												
21	⑨	⑤	⑦	⑨																												
22	⑧	④	⑥	⑨																												
23	7	①	⑥	⑨																												
24	⑨	②	⑦	⑨																												
25	⑧	①	⑤	⑨																												
26	6	0	⑤	⑦																												

Destroyed by Cutworms. Ecad 6a substituted June 1st page 11

~~Ecad #6 (continued)~~

Ecad 6a.

This study lay ten feet to the north of 10, and about 1 ft. higher. All its habitat factors were to all appearances the same, except that it emerged from the snow two days later. Its stem was bitten off by cut-worms at greatest height above the ground of blossoms 7, 8 and 13 was 1 inch. It was a dense compact bunch.



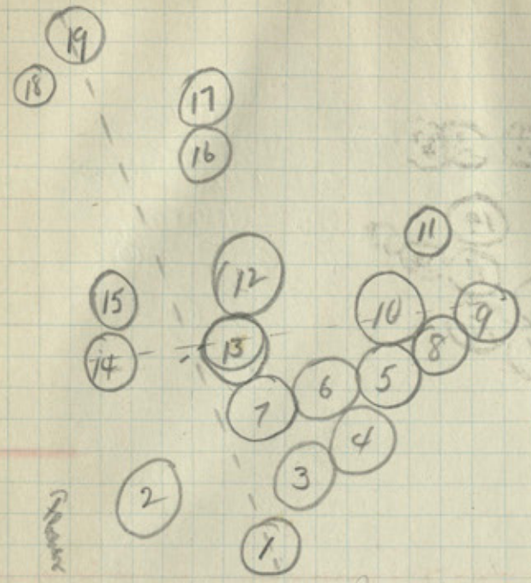
Ecad No 6a

Date 14 16 18 20 22 24 26 28 30 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 June July

1	0	⑧	⑨	✓	✓			C	G	X																						
2	0	⑧	⑨	✓	✓			C	G	X																						
3	0	⑧	⑨	✓	✓			C	G	X																						
4	⑫	⑥	⑨	✓	✓			C	G	X																						
5	⑫	⑦	⑨	✓	✓			C	G	X																						
6	0	⑥	⑨	✓	✓			C	G	X																						
7	0	⑦	⑨	✓	✓			C	G	X																						
8	①	⑧	⑨	✓	✓			C	G	X																						
9	0	⑧	⑨	✓	✓			C	G	X																						
10	⑫	⑨	✓	✓	✓			C	G	X																						
11	⑫	⑨	⑨	i	✓			C	G	X																						
12	0	⑧	⑨	✓	✓			C	G	X																						
13	⑫	⑦	⑨	✓	✓			C	G	X																						
14	⑫	6	⑨	✓	✓			C	G	X																						
15	0	Broken off																														
16	⑫	⑨	✓	✓	✓			C	G	X																						
17	0	⑨	✓	✓	✓			C	G	X																						
18	0	⑦	⑨	✓	✓			C	G	X																						
19	0	6	⑨	✓	✓			C	G	X																						
20	0	⑤	⑨	✓	✓			C	G	X																						
21	⑫	6	⑨	✓	✓			C	G	G	X																					
22	⑫	⑤	⑨	✓	✓			C	G	6	X																					
23	⑫	②	⑨	✓	✓			✓	C	G	X																					
24	⑨	②	⑨	✓	✓			✓	C	0	X																					
25	⑦	①	⑨	⑨	✓			✓	C	G	X																					
26	⑫	0	⑨	⑨	✓			✓	C	G	X																					
27	0	②	⑨	✓	✓			✓	C	G	X																					
28	⑫	0	⑨	⑨	✓			✓	C	G	X																					
29	0	⑨	⑨	✓	✓			✓	C	G	X																					
30	⑥	0	⑨	⑨	✓			✓	C	G	X																					
31	⑫	⑥	⑨	⑨	✓			✓	C	G	X																					
32	⑫	0	⑨	⑨	✓			✓	C	G	X																					
33	⑫	⑨	⑨	✓	✓			✓	C	G	X																					
34	0	⑨	⑨	✓	✓			✓	C	G	X																					
35	⑫	⑨	⑨	✓	✓			✓	C	G	G	X																				

36 >

Ecad #7

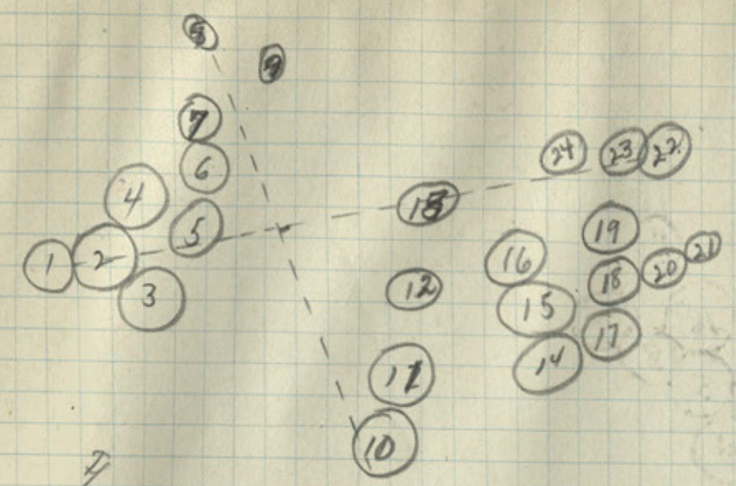


This study lay 30 feet to the south and two feet below No. 2 and emerged from the snow two days earlier. Nos 7, 8, and 9, and 10 were exposed to the same conditions and growing all within a foot of each other, has the same habitat except that No. 7 grew on an eminence an inch above the general surface, No. 9 and 10 a half inch above, and No. 8 flush with the soil.

Plane

Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	14	16	18	
1	W	5	7	7	9	✓	C	C	✓	G	X												
2	O	3	6	7	7	✓	C	C	✓	G	X												
3	W	7	9	7	9	✓	C	C	✓	G	X												
4	O	3	9	7	9	✓	✓	✓	C	G	X												
5	W	0	6	7	7	✓	✓	C	✓	G	X												
6	O	4	9	9	9	✓	C	C	G	G	X												
7	O	6	9	7	9	✓	C	C	G	G	X												
8	O	5	8	7	7	✓	✓	C	C	G	X												
9	O	2	6	7	9	✓	✓	C	C	G	G	X											
10	2	4	6	7	9	✓	C	C	C	G	X												
11	W	O	3	6	8	9	✓	✓	✓	G	G	X											
12	2	7	9	9	C	C	C	C	G	G	X												
13	2	9	9	9	7	✓	C	C	G	G	X												
14	2	5	7	9	9	✓	C	C	C	G	X												
15	O	4	6	7	7	✓	C	C	C	G	X												
16	3	4	6	7	9	✓	✓	✓	C	C	X												
17	3	4	6	8	7	✓	✓	✓	✓	G	X												
18	W	W	2	6	8	9	✓	✓	✓	G	G	X											
19	O	3	6	7	9	✓	✓	✓	✓	G	G	X											

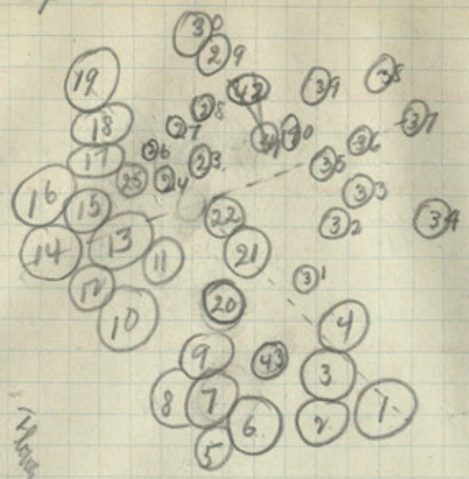
Ecad #8



Plane

Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	14	16	18	
1	O	3	6	7	9	✓	✓																Destroyed
2	2	4	4	7	9	✓	✓																
3	7	6	9	7	9	✓	✓																
4	3	2	9	9	9	✓	✓																
5	O	2	4	7	9	✓	✓																
6	W	6	9	7	8	9																	Destroyed
7	W	O	9	6	8	9																	
8	W	O	4	W	O	3																	
9	W	O	6	8	O	5																	
10	9	9	9	9	9	7																	
11	2	9	9	9	9	9																	
12	W	O	6	7	9	9																	
13	O	O	5	6	Broken off																		
14	6	9	7	9	9	✓	✓	C	C	G	X												
15	O	2	6	8	9	✓	✓	C	✓	G	X												
16	O	6	8	7	9	✓	✓	C	✓	G	X												
17	O	2	5	7	9	✓	✓	C	✓	G	X												
18	W	2	4	6	8	9	✓	✓	C	G	X												
19	O	6	5	7	9	✓	✓	✓	C	C	X												
20	W	O	6	4	7	9	✓	✓	✓	G	X												
21	5	W	O	3	6	9	✓	✓	✓	G	X												
22	6	W	O	5	7	9	✓	✓	✓	G	X												
23	6	8	1	4	7	9	✓	✓	✓	G	X												
24	W	6	O	3	6	9	✓	✓	✓	G	X												

Ecad #9



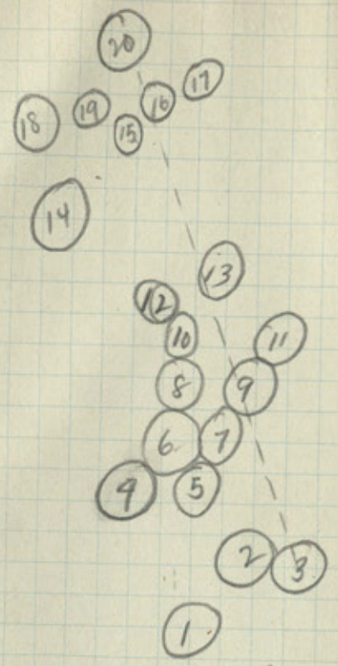
Water

Date	June 6	8	10	12	14	16	18	20	22	24	26	July 28	30	2	4	6	8	10
1	8	0	3	6	8	9	C	C	G	G	X							
2	8	0	4	7	7	9	C	C	G	G	X							
3	8	0	4	7	9	9	C	C	G	G	X							
4	8	0	4	6	8	9	C	C	G	G	X							
5	8	0	4	6	9	9	✓	C	G	G	X							
6	8	0	4	7	9	✓	✓	C	G	G	X							
7	9	2	6	8	9	✓	✓	C	G	✓	X							
8	9	0	4	7	9	✓	✓	C	G	✓	X							
9	9	0	4	7	9	✓	✓	C	G	✓	X							
10	9	2	6	8	9	✓	✓	C	G	✓	X							
11	9	0	4	6	9	✓	✓	C	G	G	X							
12	9	0	4	6	9	✓	✓	C	G	G	X							
13	9	0	4	7	9	✓	✓	C	G	✓	X							
14	8	0	5	7	9	✓	C	C	G	G	X							
15	7	0	4	7	9	✓	✓	C	G	G	X							
16	6	0	4	8	9	✓	C	C	G	✓	X							
17	7	0	4	7	9	✓	✓	C	G	✓	X							
18	6	4	8	7	9	✓	✓	C	G	✓	X							
19	8	0	4	8	9	✓	✓	C	G	✓	X							
20	7	0	3	6	8	9	✓	C	G	✓	X							
21	6	4	8	6	8	9	✓	✓	C	G	X							
22	5	4	3	5	8	9	✓	✓	C	G	X							
23	5	4	3	4	8	9	✓	✓	C	G	X							
24	4	4	4	4	4	9	9	✓	✓	C	X							
25	5	4	0	5	8	9	✓	✓	C	G	X							
26	4	4	4	4	4	9	9	✓	C	G	X							
27	4	4	4	4	4	3	9	✓	C	G	X							
28	4	4	4	4	Broken off													
29	4	4	4	3	5	8	9	✓	C	G	X							
30	4	4	0	5	7	9	✓	✓	C	G	X							
31	4	4	4	4	0	6	9	✓	C	G	X							
32	4	4	4	0	5	8	9	✓	C	G	X							

Ecad #9 (continued)

	June 6	8	10	12	14	16	18	20	22	24	26	July 28	30	2	4	6	8	10	12
33	4	6	4	0	3	6	9	✓	✓	G	X								
34	4	7	4	0	0	5	9	✓	✓	G	X								
35	4	7	4	4	4	5	9	✓	✓	G	X								
36	4	6	4	4	0	6	9	✓	✓	G	X								
37	4	7	6	4	0	4	9	✓	✓	G	X								
38	4	8	4	4	4	5	9	✓	✓	G	X								
39	3	6	4	0	0	5	9	✓	✓	G	X								
40	4	5	4	4	0	6	9	✓	✓	G	X								
41	4	8	6	4	5	9	✓	C	C	G	X								
42	4	3	4	4	Left Ft.														
43	3	6	4	0	5	8	C	C	C	G	X								

Card #10



Date	6	8	10	12	14	16	18	20	22	June 24	26	28	30	July 2	4	6	8	10	12	14	16	18	20
1	9	8	8	7	7	✓	C	2	2	X	X												
2	8	8	8	6	7	✓	C	2	2	X	X												
3	5	6	8	9	9	✓	C	2	3	X	X												
4	5	6	5	8	9	✓	✓	C	2	3	X												
5	3	4	5	6	9	✓	✓	C	2	3	X												
6	1	3	7	9	9	✓	✓	C	2	3	X												
7	3	4	6	7	9	✓	✓	C	2	3	X												
8	4	5	7	7	9	✓	✓	✓	2	3	X												
9	5	6	7	8	9	✓	✓	✓	2	3	X												
10	6	4	3	4	5	9	✓	✓	2	3	X												
11	6	10	9	6	7	9	✓	✓	C	2	X												
12	6	10	7	5	8	9	✓	✓	2	3	X												
13	6	6	10	4	6	9	✓	✓	2	3	X												
14	7	7	10	6	7	✓	✓	✓	C	3	X												
15	6	6	10	10	9	✓	✓	✓	3	X													
16	6	6	10	10	6	9	✓	✓	✓	2	X												
17	6	6	10	2	7	9	✓	✓	✓	2	X												
18	6	9	10	4	9	✓	✓	✓	✓	2	X												
19	6	8	10	2	7	✓	✓	✓	✓	2	X												
20	6	9	2	5	9	✓	✓	✓	✓	2	X												

Ecad No. 1 (continued from page 3)

Flower

Date	6	8	10	12	14	16	18	20	22	24	June 26	28	30	July 2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
29	G	G	G	G																								
30	W	W	O	G																								
31	G	G	O	G																								
32	G	G	O	G																								
33	U	G	W	G																								
34	U	G	G	O																								
35	U	G	G	W																								
36	U	G	G	O																								
37	G	O	G	G																								
38	G	G	G	G																								
39	G	G	O	G																								
40	G	G	G	G																								
41	G	G	O	G																								
42	W	G	G	G																								
43	G	G	O	G																								
44	U	G	G	O																								
45	G	G	G	O																								
46	G	G	G	G																								
47	G	G	G	G																								
48	G	G	O	G																								
49	U	G	G	O																								
50	G	G	O	G																								
51	G	G	G	G																								
52	G	G	G	G																								
53	G	G	G	O																								
54	G	G	O	G																								
55	G	G	G	G																								
56	U	G	G	O																								
57	G	G	G	G																								
58																												
59																												
60																												

Destroyed by Cut worm.

Ecad No. 1a substituted on June 14.

Ecad No 1a.



This study lay on a gravelly slope near the house of Knud Carstensen at Anaiak. It lay about 100 yards from the shore and about 25 feet above sea-level. Its immediate habitat was quite flat; the soil was a decomposition product of the ground-rock - the characteristic basalt of the peninsula. No rocks shaded it during any part of the day, and it received every bit of sunlight. Two small granite pebbles lying west of it may have reflected some of the morning sun.

Its greatest height above the ground was not quite ¾ inch.

Ecad No. 3 (continued from page 5)

Flower

Date	6	8	10	12	14	16	18	20	22	24	June 26	28	30	July 2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
29	U	U	G	G	G	G	✓	✓	✓		G		X															
30	W	G	G	G	G	G	✓	✓	✓		G		X															
31	G	G	G	G	G	G	✓	✓	✓		G		X															
32	U	G	G	G	G	G	✓	✓	✓		G		X															
33	U	G	G	G	O	G	✓	✓	✓	C	G		X															
34	U	G	G	G	O	G	✓	✓	✓	C	G		X															
35	W	G	G	G	G	G	✓	✓	C		G		X															
36	U	G	G	G	G	G	✓	✓	✓	C	G		X															
37	G	G	G	G	G	G	✓	✓	✓		G		X															
38	U	G	G	G	G	G	✓	✓	✓		G		X															
39	U	G	G	G	G	G	✓	✓	✓		G		X															
40	G	G	G	G	G	G	✓	✓	✓		G		X															
41	G	G	G	G	G	G	✓	✓	✓		G		X															
42	G	G	G	G	G	G	✓	C	C		G		X															
43	G	G	G	G	G	G	✓	✓	✓		G		X															
44	G	G	G	G	G	G	✓	✓	✓		G		X															
45	G	G	G	O	G	G	✓	✓	✓		G		X															
46	G	G	G	G	G	G	✓	✓	✓		G		X															
47	G	G	G	O	G	G	✓	✓	✓		G		X															
48	U	G	G	G	G	G	✓	✓	✓		G		X															
49	U	G	G	G	G	G	✓	✓	✓		G		X															
50	G	G	G	G	G	G	✓	✓	✓		G		X															
51	G	G	G	O	G	G	✓	✓	✓		G		X															

Ecad No. 1a. continued from page 3

	14	16	18	20	22	24	June 26	28	30	July 2	4	6	8	10	12	14	16	18
1	G	G	✓	✓	C	G	G		X									
2	G	G	✓	✓	C	G	G		X									
3	G	G	✓	✓	C	G	G		X									
4	G	G	✓	✓	C	G	G		X									
5	G	G	✓	✓	C	G	G		X									
6	G	G	✓	✓	C	G	G		X									
7	G	G	✓	✓	C	G	G		X									
8	G	G	✓	✓	C	G	G		X									
9	G	G	✓	✓	C	G	G		X									
10	G	G	✓	✓	C	G	G		X									
11	G	G	✓	✓	C	G	G		X									
12	G	G	✓	✓	✓	G	G		X									
13	G	G	✓	✓	✓	G	G		X									
14	G	G	✓	✓	✓	G	G		X									
15	G	G	✓	✓	✓	G	G		X									
16	G	G	✓	✓	✓	C	G		X									
17	G	G	✓	✓	✓	C	G		X									
18	G	G	✓	✓	✓	C	G		X									
19	G	G	✓	✓	✓	C	G		X									
20	G	G	✓	✓	✓	C	G		X									
21	G	G	✓	✓	✓	C	G		X									
22	G	G	✓	✓	✓	C	G		X									

Ecad No. 5 (continued from page 9)

June July

Date 6 8 10 12 14 16 18 20 22 24 26 28 30 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

72 Eaten by worm on side
73
74
75
76 Eaten by C worm on N & S sides
77
78
79
80
81
82
83
84
85
86 Fading from C worm
87 Eaten by cut-worm
88
89 Eaten by cut worm
90
91
92
93
94
95 Destroyed
96 "
97 Eaten by worm
98
99
100
1
2
3 Eaten by worm
4
5
6
7 Fading from worm cut
8
9
10
1
2
3
4
5
6
7
8
9
10

86a above

121 above

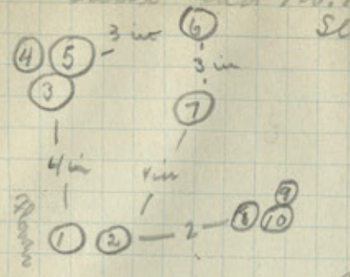
The actual reproducing period of Arctic plants is almost or quite, as long as that of the temperate zones, considering the whole day sunshine? Vegetative period longer in temperate produces larger plants but not more hardy or enduring? Plants that must have long flowering or vegetative period those that can not adapt themselves to Arctic conditions?

Regional limitation of plants determined by adaptability through temperature range. Some plants may be more adaptable and adjustable through temperatures increasing from optimum, others through temperatures decreasing from optimum. Thus plants of first class for example of Canadian life zone optimum would more readily, more swiftly migrate southward into Transition; those of second class into Hudsonian; etc. Plants of first class northern origin; those of second class of southern origin.

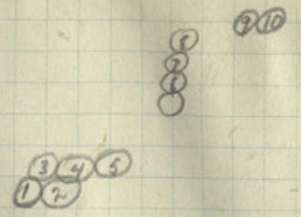
Also, some plants of a more adaptable character might migrate farther from the optimum conditions in both directions than another of more stable form. Those more adaptable might be more fruitful of new species by variation; those less adaptable might be accumulating a great tendency to produce new species which under proper conditions would "mutate;" these new species might be as adaptable as any or only to definite limits.

Vegetation is vernal in character. Perhaps it is only spring plants, spring species that occur here, or if there be any summer plants they are those that in the Southland usually grow in bogs? There is really no Arctic summer, it is but a spring that lapses into autumn so gradually that the growing season is over ere one notices. The sedges are generally the last of the plants to begin and end their season's growth.

Salix Ecad No. 1. ♂ Slope 10° S.



Salix Ecad No. 2. ♂ Slope 20° S.

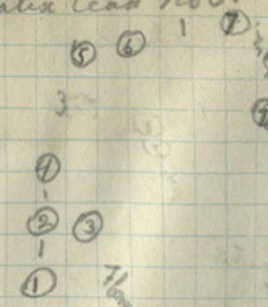


Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12
1	2	3	4	5	7	✓	✓	✓	✓	X	X								
2	2	3	4	5	7	✓	✓	✓	✓	X	X								
3	1	2	3	4	6	✓	✓	✓	✓	X	X								
4	2	3	4	5	7	✓	✓	✓	✓	X	X								
5	1	2	2	3	4	6	7	✓	✓	X	X								
6	1	2	3	4	5	6	7	✓	✓	X	X								
7	2	3	4	5	7	✓	✓	✓	✓	X	X								
8	1	2	3	4	5	6	7	✓	✓	X	X								
9	1	1	2	3	3	4	7	✓	✓	X	X								
10	1	2	3	4	5	6	7	✓	✓	X	X								

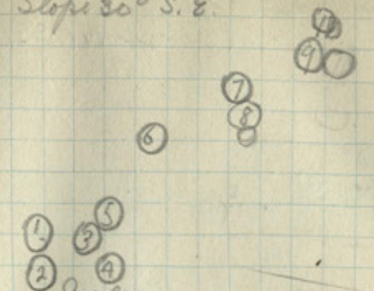
Salix Ecad No. 2.

Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12
1	1	2	2	3	4	6	7	✓	✓	✓	X								
2	2	3	4	5	6	7	✓	✓	✓	✓	X								
3	1	2	2	3	3	4	7	✓	✓	✓	X								
4	2	3	4	5	6	6	7	✓	✓	✓	X								
5	1	2	2	3	3	5	7	✓	✓	✓	X								
6	1	2	2	3	3	4	6	7	✓	✓	X								
7	1	2	2	3	3	4	6	7	✓	✓	X								
8	1	2	2	3	3	5	6	7	✓	✓	X								
9	1	2	2	3	3	6	7	✓	✓	✓	X								
10	1	2	2	3	3	6	7	✓	✓	✓	X								

Salix Ecad No. 3. ♂ Slope 0



Salix Ecad No. 4. ♀ Slope 20° S. E.

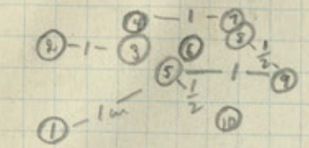


Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12
1	1	1	1	1	1	1	1	2	3	5	6	7	7	X					
2	1	1	1	2	2	3	4	5	6	6	6	7	X						
3	1	1	1	1	2	3	4	5	6	6	6	7	X						
4	1	1	1	2	3	4	6	6	7	✓	✓	X							
5	1	1	1	2	3	4	6	7	7	✓	✓	X							
6	1	1	1	2	3	5	6	7	7	✓	✓	X							
7	1	1	2	3	5	6	7	✓	7	✓	✓	X							
8	1	1	1	2	3	5	7	✓	7	✓	✓	X							
9	1	1	1	2	3	3	6	7	7	✓	✓	X							
10	1	1	1	1	2	2	4	5	6	7	✓	X							

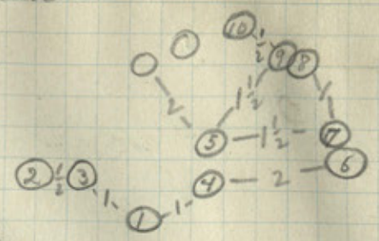
Salix Ecad No. 4.

Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12
1	2	3	4	5	5	✓	6	6	✓	X	X								
2	2	3	4	5	5	✓	6	6	✓	X	X								
3	3	4	5	5	5	✓	6	6	✓	X	X								
4	3	4	5	5	5	✓	6	6	✓	X	X								
5	3	4	5	5	5	✓	6	6	✓	X	X								
6	3	4	5	5	5	✓	6	6	✓	X	X								
7	2	3	4	5	5	✓	6	6	✓	X	X								
8	3	4	5	5	5	✓	6	6	✓	X	X								
9	3	4	5	5	5	✓	6	6	✓	X	X								
10	3	4	5	5	5	✓	6	6	✓	X	X								

Salix Ecad No. 5 ♂ Slope 10° S.



Salix Ecad # 6 ♀ Slope 10° S

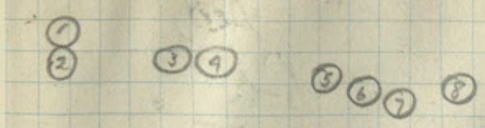


Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	
1	1	2	2	3	3	4	6	7	7	7	X									
2	1	1	2	2	2	2	5	6	7	7	X									
3	1	2	2	3	3	5	6	6	7	7	X									
4	1	2	3	3	3	4	6	6	7	7	X									
5	1	2	3	3	3	5	6	7	7	7	X									
6	1	1	1	2	2	4	6	6	7	7	X									
7	1	1	1	1	1	1	3	6	7	7	X									
8	1	2	3	3	3	5	6	6	7	7	X									
9	1	1	2	2	3	5	6	6	7	7	X									
10	1	1	1	1	1	3	5	6	7	7	X									

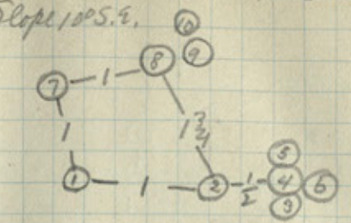
Salix Ecad # 6 ♀

Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	
1	1	1	1	1	2	5	5	6	6	✓	✓	✓	7							
2	1	1	1	1	1	4	5	6	6	✓	✓	✓	7							
3	1	1	1	1	1	4	5	6	6	✓	✓	✓	7							
4	1	1	1	1	1	4	5	6	6	✓	✓	✓	7							
5	1	1	1	1	1	4	5	6	6	✓	✓	✓	7							
6	2	2	3	3	4	5	5	6	6	✓	✓	✓	7							
7	1	1	2	2	3	5	✓	6	6	✓	✓	✓	7							
8	1	1	1	1	1	4	5	6	6	✓	✓	✓	7							
9	1	1	1	1	1	4	5	6	6	✓	✓	✓	7							
10	1	2	2	3	3	5	5	6	6	✓	✓	✓	7							

Salix Ecad # 7 ♂ Slope 0.



Salix Ecad # 8 ♀ Slope 10° S.E.

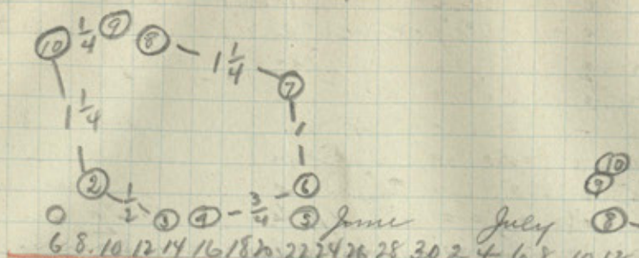


Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	
1	1	1	1	2	2	4	6	6	7	✓	X									
2	1	1	1	2	2	3	6	6	7	✓	✓	X								
3	1	1	1	2	2	4	6	6	7	✓	✓	X								
4	1	1	1	2	2	3	6	7	7	✓	✓	X								
5	1	1	2	2	3	5	6	7	7	✓	✓	X								
6	1	1	1	2	2	3	5	6	7	✓	✓	X								
7	1	1	1	1	1	1	1	1	2	4	6	7	7	X						
8	1	1	1	1	1	3	2	3	6	7	✓	X								
9	1	1	1	1	1	2	2	2	2	6	7	7	7	X						
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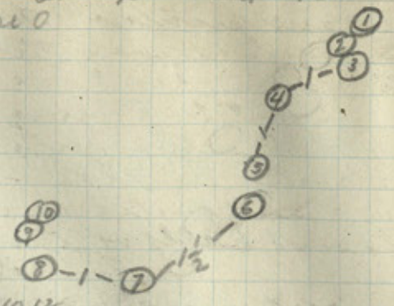
Salix Ecad # 8 ♀

Date	June 6	8	10	12	14	16	18	20	22	24	26	28	30	July 2	4	6	8	10	12	
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2	1	2	3	3	4	5	6	X	X	X	X									
3	1	1	1	1	2	5	6	6	6	X	X									
4	1	1	1	1	2	5	5	6	6	X	X									
5	1	2	2	2	2	5	5	6	6	X	X									
6	2	3	3	3	4	5	6	X	X	X	X									
7	1	1	2	2	3	5	6	X	X	X	X									
8	3	4	4	5	5	5	6	X	X	X	X									
9	1	1	1	2	2	5	6	X	X	X	X									
10	1	1	1	1	1	5	5	6	6	X	X									

Salix Eead #9 ♂ Slope 10° N.



Salix Eead #10 Slope 0



Date

	6	8	10	12	14	16	18	20	22	24	26	28	30	2	4	6	8	10	12
1	2	3	4	4	5	5	6	7	7	✓	✓	X	X						
2	1	2	2	2	3	3	3	5	5	6	7	7	X						
3	1	3	3	3	4	4	6	6	7		✓	X	X						
4	3	3	4	4	4	4	6	6	7		✓	X	X						
5	1	1	1	2	2	2	3	5	6	7	✓	✓	X						
6	1	1	1	2	2	2	5	6	7	7	✓	✓	X						
7	1	2	2	3	3	3	5	6	6	7	✓	✓	X						
8	1	2	2	3	3	3	5	6	6	7	✓	✓	X						
9	1	1	1	2	2	2	2	2	5	7	7	X							
10	2	3	3	4	4	4	5	6	6	✓	7	7	X						

Salix Eead #10 ♂

Date

	6	8	10	12	14	16	18	20	22	24	26	28	30	2	4	6	8	10	12
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2	2	3	3	4	4	6	7	7	✓	✓	X								
3	2	2	3	3	3	5	6	7	✓	✓	X								
4	2	2	3	3	3	5	6	7	✓	✓	X								
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6	3	3	4	4	5	7	7	7	✓	✓	X								
7	1	2	2	2	3	6	6	7	✓	✓	X								
8	2	2	3	3	4	7	7	7	✓	✓	X								
9	1	1	2	2	3	6	6	7	✓	✓	X								
10	1	1	2	2	3	5	6	7	✓	✓	X								

June 20. 1914. It has been interesting to note how the stamens and pistils of the catkins of Salix arctica have grown out. Always those catkins which were on the southeast slopes, however slight that slope, opened first, other conditions being the same. And always the stamens and pistils came out on that portion of the catkin most directly exposed to the warmest rays of the sun. On level ground and southerly slopes they came out first on the lower half of the upper third of the catkin and always on the southeast side. From this locus they came out in all directions most rapidly toward the bottom and toward the west, the antipodal locus of the catkin being last to burst into bloom. The development and fading of the essential organs progressed in a similar manner. This same progression prevails in the tufts of Saxifraga oppositifolia, Arabis alpina, Cochlearia officinalis, and Silene acaulis

Since the prevailing warm winds are those from the southerly, the colder winds from the northerly directions, the influence of the light may be augmented or retarded by the wind.

June 22 and 25

The plants of Saunders Island are still far behind those of the Umanak plain. The saxifraga and salix are just waxing toward the height of their bloom whereas on the Umanak plain they are far on the wane. The former grows in great profusion on the gravelly ridges relics of old beach lines, that lie on the delta toward the west end of the island when the igloos formerly were and when still the tupiks are pitched in summer. A few flowers of Dryas octopetala were in bloom, a few of Ranunculus nivalis, of Draba hirta, and of a plant of which I have not yet determined the species. This plant as yet unknown to me has a crown of small obate leaves, hard and thick and fringed with hairs. The crown, quite orbicular, is about half an inch in diameter, reddish in color. The flower of which I found a single one, is yellow, of eight petals, eight stamens, and a dome pistac. It propagates itself by runners, like miniature strawberry runners, which radiate out from the parent plant, five to ten in number. The runners of last years plants bear smaller crowns at the ends, as large as No. 2 shot. The plant may be Diapensia. I had little time for collecting at this place but found nothing new except this one plant, and a small tiny yellow flowered plant that looked like a small form of Draba alpina. Lam. - The plants are Saxifraga flagellaris and Saxifraga hirculus

June 23rd 24.

On this day I went to a small rocky islet which I shall designate as Eider Duck Islet for want of another name, which lies between Saunders Island and Mobstenholm Island. It was for the purpose of getting eider-duck eggs that I went but only 11 were found. I expected to obtain a collection of many species of plants because the island had been so well fertilized by the guano of the eider ducks, but in this I was disappointed.

The islet is about an acre in extent and rises not more than 40 metres above sea-level. It is merely a rocky ledge cut into distinct portions by fault- and joint-planes. These planes extend north-east and south-west. The rock is a foliated gneiss, derived I think, from metamorphosed sandstones and shales; it is intersected by several dykes of pegmatitic granite, in some of which feldspar predominates. It has emerged from the sea in relatively recent times. Even the topmost points are rounded and polished by wave and ice. The snow was still lying in the crevices and on some of the ledges.

The dominant vegetation is grass, with mosses dominant in the very-moist places, and almost as plentiful in the grass localities. Cerastium alpinum is one of the most common plants and Alsine is plentiful. I was quite surprised to find Salix, Dryas, Saxifraga and Papaver absolutely absent from the islet. Had there been any, I think I should have found them, for the ice kept us on the islet for forty-eight hours, and I had nothing to do but study the flora and the avifauna.

The list of plants collected is as follows:

Poa (sp.?)
Elymus arenarius
Alopecurus alpinus
Luzula
Potentilla pulchella
Ranunculus nivalis
Draba hirta
Arastium alpinum
Alsine
Cochlearia officinalis
Taraxacum
Saxifraga oppositifolia (a stiff plant)
Cassiope tetragona
Draba alpina (3 plants).

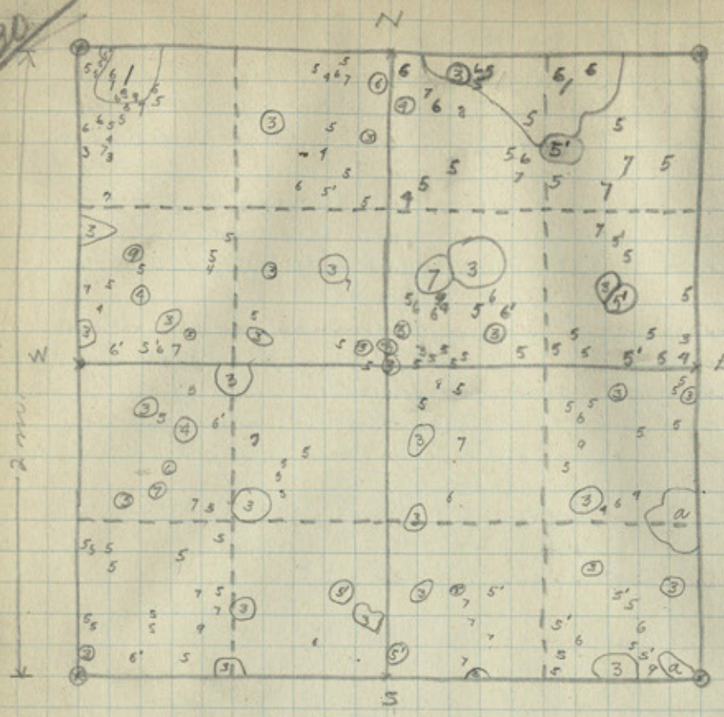
A visit to the islet later in the season would probably net a large list, particularly after the snow has entirely melted.

The Elymus, Alopecurus, Luzula and Alsine grew most abundantly on the damper terraces and hollows, where the ground was soggy and saturated with water. I found them in such places from the level of high tide to the tops of the knobs. Along the margins of the marshier places Ranunculus nivalis, Cerastium alpinum, and Cochlearia were abundant, the latter two most plentiful when the soil was apparently most enriched by the duck guano.

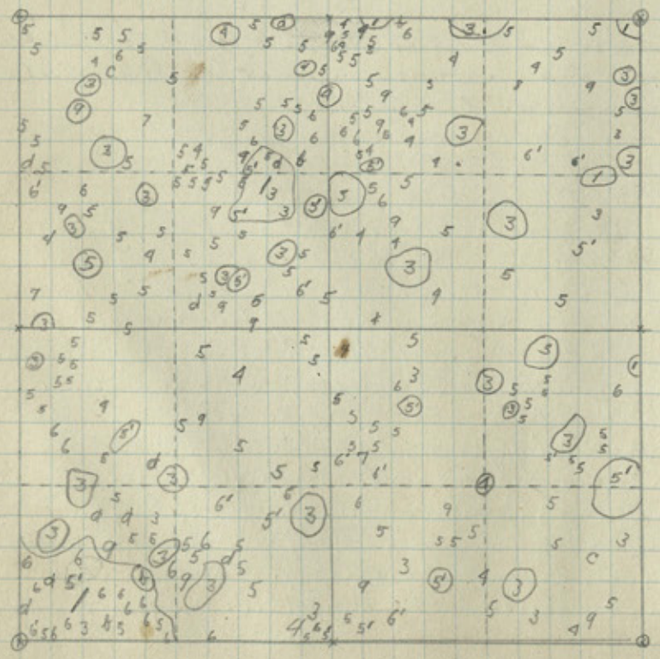
Potentilla pulchella I found on sandy dry slopes all over the island. Draba hirta, Taraxacum, Draba alpina, Saxifraga oppositifolia and Draba alpina I found only on a warm sunny-sloped shelf on the south side of the more westerly of the two highest knobs, nowhere else.

I collected several specimens of mosses from as many and varied situations as I considered worth while.

June 28. — I went for a long walk over the hills to note the progress of plant life and to collect. The Papaver is now coming well into bloom, the flowerstems are weak, and many of the flowers are open and remain so for two or three days before the stem straightens. The number of white blossoms-yellow only at the base of the petals is large. In the vicinity of the Station all the poppies are apparently of the white form except a single one just in front of the door a short distance, where all the blossoms are bright yellow. About the igloos across the peninsula the yellow is predominant, in large areas being the exclusive form. The Arastium both species is in bloom, Melandrium, Potentilla pulchella; Potentilla rubricaulis; Lesquerella; Draba hirta, alpina, flad[illegible]genesis, nivalis, and subcapitata, at least; Salix herbacea; Cassiope tetragona; Oxyria digyna; Pedicularis arctica; Luzula sp.; Elymus sp.; Pleuropogon?; several species of Saxifraga in addition to oppositifolia; Silene; Alsine 2 sp.; Ranunculus nivalis; Dryas integrifolia and Taraxacum all shows blossoms today. I found a great deal of Pyrola grandiflora, Lycopodium sp. Rhododendron lapponicum and Empetrum nigrum. The Vertillus uliginosum is also beginning to bloom. The grasses are beginning to fruit, and the grasses and sedges are becoming green.



1 Salix a
5' Silene acaulis
3 Saxifraga oppositifolia
4 Papaver
5 Alsine small grasslike
L Draba hirta
7 Luzula(?)
8 Melandrium sp.
6' Draba alpina
9 Cerastium alpinum
a: Dryas integrifolia(?)
b Poa glaucus
c Statice maritima
d ~~grass~~ (?) Luzula
f Aira sp?
h Cochlearia officinalis
n = spreading alsine
s = saxifraga like b apert
t = taraxacum sp
p = potentilla pulchella
x = Lesquerella arctica
z = Erigeron, compositus
y = Draba nivalis
v = Dryas integrifolia



Quadrat Study No. 1.— June 28. 1914

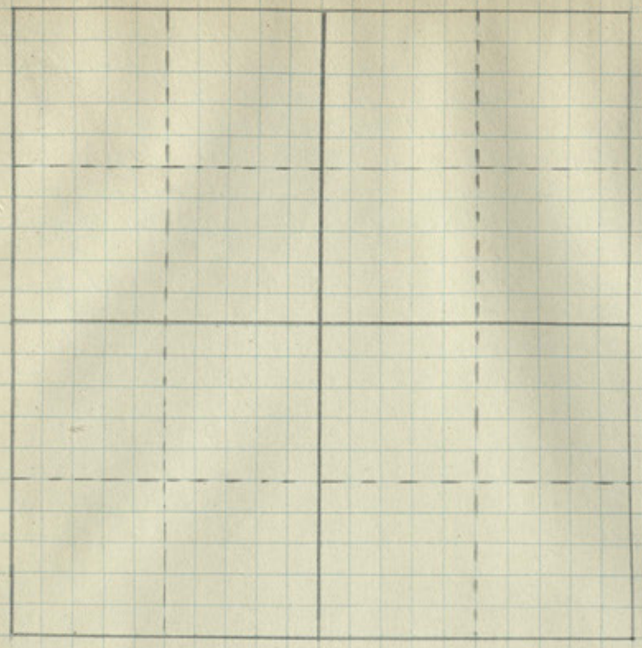
This major quadrat, two meters square, lay on the southward slope of the old gravel beach at Utkiavik. The slope is about 10° toward the sea, and this quadrat lies 125 meters from the edge of the ice. The ice was all gone from it on May 26 and snow has since covered it. The soil is a coarse gravel, with numerous slabby pebbles not more than 2 in. in dimension and 1 inch thick of the igneous sills which form the ground rock here, a rock of basaltic character.

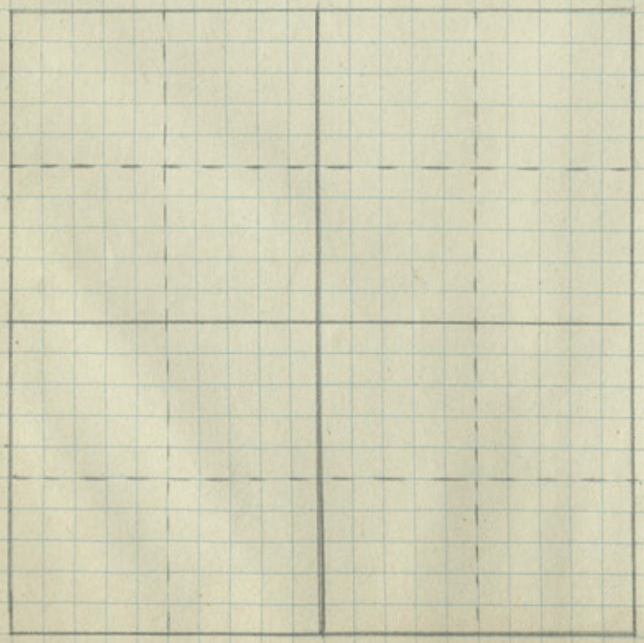
This quadrat was selected as a fair example of the old gravel beach association, to which at this season, Saxifraga oppositifolia gives the distinctive aspect. Though not the most numerous, it is by far the most conspicuous, and its presence indicates that this is one of the dryest portions of the old gravel beach association.

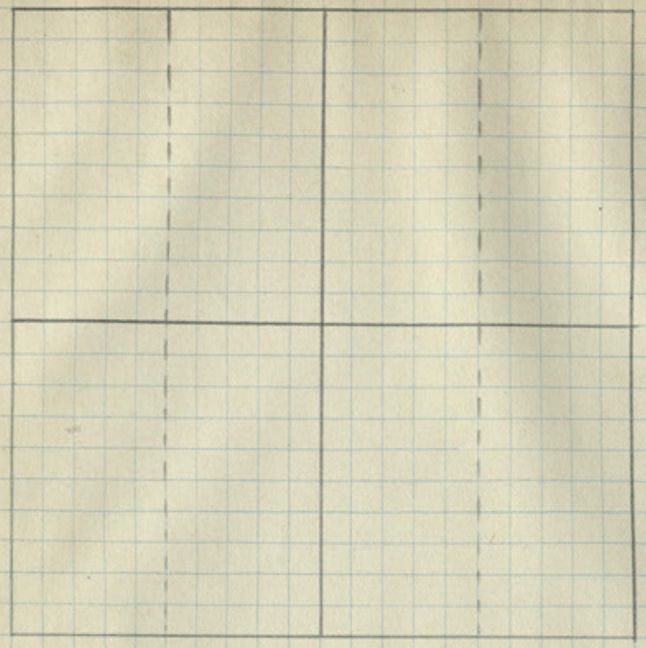
The most numerous plant in this association is Alsine but because of its small size is relatively inconspicuous. Except when its white-petalled flowers, large in proportion to the plant, are open it is scarcely discernible, but when open the blossoms star the gravel.

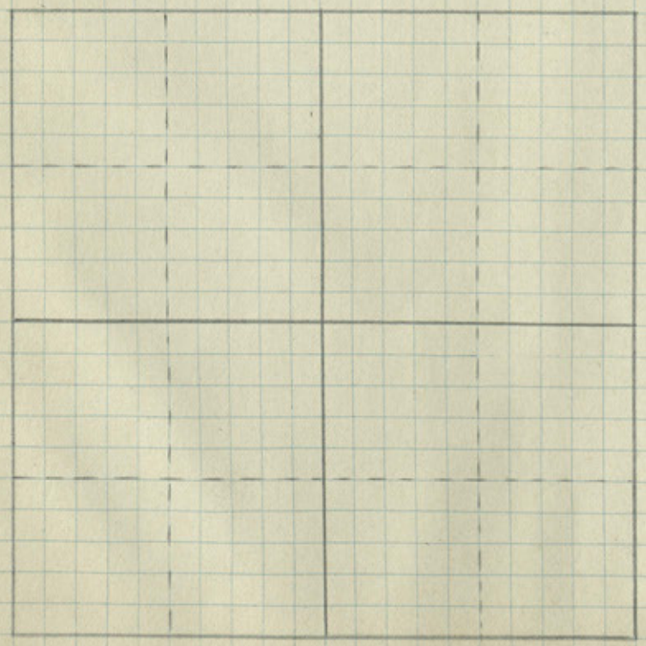
Quadrat Study No. 2.- June 28, 1914.

This major quadrat lay but a few yards from Quadrat No. 1 and was selected as representing the same phase and aspect of the old gravel beach association as does Quadrat No. 1. It lies about five yards nearer the shore than does Quadrat No. 1, but all the factors of its habitat are apparently the same.

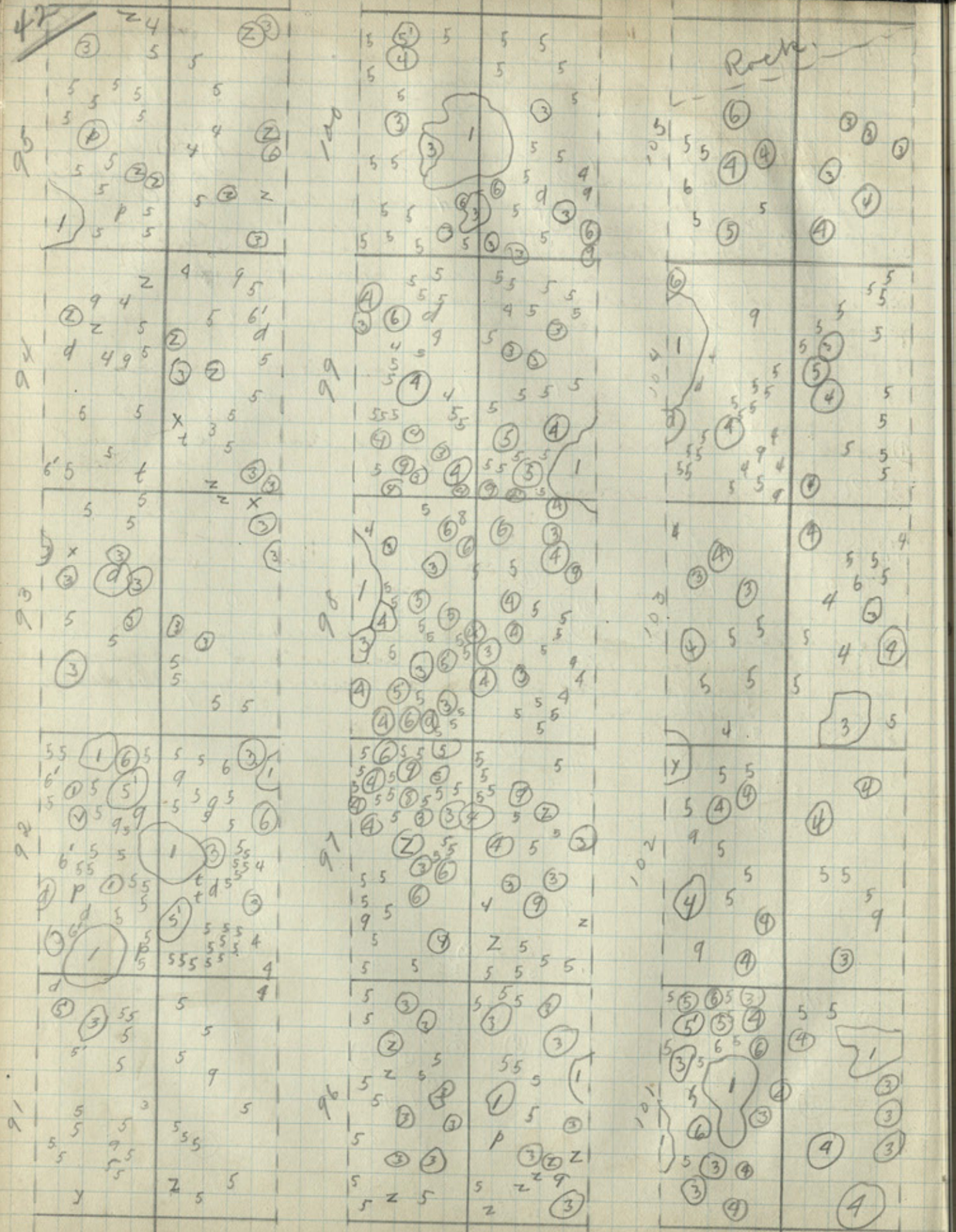








38



This transect from the limits of the high tide across the gravel beach association to the edge of the rocky ground is one hundred meters long and one meter wide. It indicates very well not only the character of the association but the number and frequency of the plant individuals found in it. The transect is across a slope of some degrees toward the south; the gravel is of uniform size and no large boulders or rock ledges lie on the surface. In choosing the transect a stretch was chosen which did not contain a preponderance of any one species; such spots are found when Aphyse, Draba, Lepidella, Cochlearia, or Melandrium are grouped in large numbers, apparently because the seeds of a few favored old plants have been fortunate in finding a time and place favorable for very good germination.

The aspect of the association can not well be represented on the transect without greater attention to the size of the plants than I could afford to give. Usually the most conspicuous flower at this season is Saxifraga oppositifolia. Next in order come Alsine, Draba, Salix; Papaver and Erastium; Melandrium and Cochlearia. The rest of the plants are rather insignificant in size, and number except the tiny Alsine sp. which though inconspicuous for its size, is by far the most numerous individual. When in bloom or on large tufts it becomes more conspicuous.

The areas of greatest frequency are usually low swells as of places where the underlying ledges more closely approach the surface so that the water supply seeping over them becomes available to the plants. The areas of least frequency such as quadrat 38 lie in gaps, No 38 itself lying at the depth of one of these gaps.

June 3.

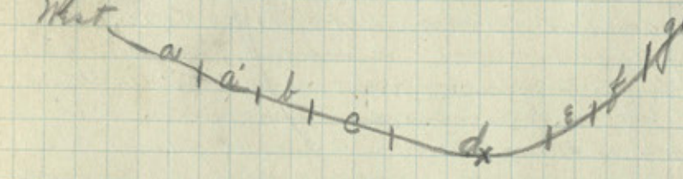
In a walk back over the slopes today I found many plants of Saxifraga nivalis turning green, and studded in the center of the rosette with a cluster of buds. The plant looks much like a pyrola.

Back along the side of the fjord I found a luxuriant heath slope, with moss and bog adjacent. In the heath I found great mats of Salix arctica, Myrtillus uliginosum, Rhododendron lapponicum, and Empetrum nigrum.

Along a gorge that opens upon the fjord I found a dense growth of Pyrola, bronzed and ruddy green.

June 13. I found Cochlearia, Oxyria, Draba and Potentilla pulchella in blossom. The first named has been in bloom for several days. Salix both pacifolia and glauca is evergreen in bloom.

A description of a cross section of Purling Br. (Alpine Br. of Campanula Brook) ravine, in order to state better the floristic composition.



This cross section is taken where the brook flows nearly due south so that the sun shines directly into it. On the east a rounded rather steep slope rises, while on the west a longer gentler slope pertains. The east slope is covered with a great drift of snow collected in the lee of the hill while the west slope is swept almost clean throughout the winter. This a' is free from snow when the first sun begins to warm the hill, and but little lies on a' or b. c and d are free of snow early, but e, f, and g are long covered. Even after the last three are bare, the cold water from the drift above trickles over them or sinks down through the soil. The west slope is gravelly, and not rich in humus being so windswept, but the wet east slope catches the wind-blown dust, dry vegetation of winter, and whatever humus is carried to it, so it is probably more fertile. A stream of cold water flows gurgling down the middle of d.

The plants in "a" are scattered-Papaver radicatum; Saxifraga tricuspidata in clumps and mats; Dryas integrifolia, the most abundant; few small Salix arctica; clumps or tufts of Festuca ovina, carex rupestris (or nardina) and Elyna Bellardi; small full-blossomed clumps of Potentilla vahliana; a few less conspicuous clumps of Potentilla nivea; and scattered plants of Melandrium triflorum and apetalum.

a' is slightly moister because there is somewhat of a depression, and though the prevailing plant, forming almost a continuous mat is Dryas integrifolia, there are mats of

Cassiope tetragona and Myrtillus uliginosum here and there with a scattered specimen of Festuca ovina and Carex nardina.

In the dry portion of a' the vegetation is the same with the exception of a few clumps of Saxifraga oppositifolia.

In b are found all the forms that occur in a with scattered plants of Campanula uniflora. Myrtillus uliginosum is more abundant than in a' and Carex nardina and Festuca ovina are more numerous. A few Draba hirta and D. nivalis and a few tufts of Saxifraga oppositifolia also get in.

c which becomes moor-like contains much moss with much Salix arctica and a preponderance of Luzula (multiflora?) Carex sp., and Polygonum viviparum with some Poa sp. and Glyceria sp.

d, the moor-like base of the valley is dominantly Cyperaceae and Graminae, especially Festuca ovina, in continuous beds mixed with Hierochloe alpina (usually a plant of dry places) Polygonum viviparum, Alopecurus alpinus, Carex nardina, Poa sp., Potentilla sp (unguiculata?), some Pedicularis hirsuta, Stellaria longipes, Salix arctica, Cerastium alpinum, Ranunculus sulfureus, Bistorta plumosa; along the banks of the streamlet itself are a few Koenigia islandica, and abundant Ranunculus pygmaeus; some Saxifraga cernua and nivalis, and a few plants of Draba fladnigensis.

e is dominantly Salix arctica, with Juncus biglumis and Luzula sp (multiflora(?)) with widely scattered plants of Oxyria digyna, Alopecurus alpinus, Potentilla nivea and chamissonis and Pedicularis hirsuta. Much moss grows throughout this area.

In f moss is dominant with much Oxyria digyna and Ranunculus pygmaeus. Luzula (multiflora?) is next in abundance to the moss. A little Cerastium alpinum, Festuca ovina, Poa sp, Saxifraga stellaris var comosa, S. cernua, and Alopecurus alpinus also occur throughout the area.

g is in places dominantly Luzula with a little Salix arctica and Papaver radicatum in the wetter places; in the drier places dominantly Cassiope tetragona-heath.

The Summer of 1916. Umanak, Thule.

— May 1. The plain at Umanak is in many places already quite free of snow and in the driest summer patches the tips of some of the plants and the cushions of some of the rosettes are showing green.

— May 7. The first willow "pussies" peped out from the buds, fuzzy and quite white, almost a month earlier than two years ago. The rosettes of Draba hirta, Cochlearia, Potentilla pulchella, Alsine stricta, and Saxifraga nivalis are showing green. Purple tips, stud the heads of Saxifraga oppositifolia. The caterpillars, of which I found the first on May 1st. are everywhere in the clumps of willow.

— May 14. Clusters of buds show in the clumps of Papaver radicatum, in Draba hirta, alpina, and lactea, in Cochlearia officinalis, Cerastium alpinum, Saxifraga nivalis and Potentilla pulchella. The buds of the Papaver are dark hairy balls. Even now Draba hirta and Draba alpina may be easily distinguished. The former has a frosted silvery hairiness, the latter a yellowish-swarthy hairiness. Also the tips of the buds of the former are whiter than the yellowish tips of the other. The buds of Draba nivana and Cochlearia officinalis are quite large. But those of the three last mentioned plants are still very small. The red clusters of leaves and buds are now showing in the young plants of Oxyria digyna. All vegetation is far in advance of two years ago.

— May 14.

On a visit to Parker Snow Bay, I noted the following plants of which I collected last year's growth of some:

1 Cochlearia officinalis
2 Cerastium alpinum
3 Alopecurus alpinus
4 Papaver radicatum
5 Melandrium triflorum
6 Glyceria maritima
7 " angustata?)
8 Saxifraga Stellaris (comosa)
9 Salix arctica
10 Potentilla nivea
11 Saxifraga cernua
12 " nivalis
13 Cerastium trigynum
14 Poa sp.
15 " cenisia
16 Draba alpina,
17 " hirta
18 " nivalis
19 " subcapitata
20 Potentilla rubricaulis
21 Festuca ovina
22 Campanula uniflora
23 Antagrostis latifolia
24 Alsine verna (or Stricta
25 Luzula (arcuata)
26 Potentilla Vahliana
27 Pedicularis hirsuta
28 Taraxacum hyparcticum
29 Saxifraga tricuspidata
30 Catabrosia aquatica
31 Oxyria digyna
32 Polygonum viviparum
33 Cassiope tetragona
34 Glyceria tenella?
35 Calamagrostis purpurascens
36 Salix herbacea
37 Antennaria alpina
38 Myrtillus uliginosum
39 Silene acaulis
40 Melandrium apetalum

41 Melandrium affine
42 Saxifraga groenlandica
43 Arctica alpina
44 Tricetum spicatum
45 Carex maritima
46 Cystopteris fragilis.
47 Carex nardina
48 " rupestris
49 " misandra
50 Hierochloa alpina
51 Eriophorum Scheuchzeri.
52 Dryas integrifolium
53 Saxifraga oppositifolia

In a patch of wet peat ground that had a few years past been burned bare, new vegetation was coming in. Some clumps of Alopecurus alpinus had grown up from roots not destroyed by the fire, and Papaver, Glyceria, Draba hirta, Melandrium triflorum, Saxifraga cernua, and Potentilla rubricaulis were establishing themselves along the edges.

The slopes facing the south in Parker Snow Bay are densely covered where the talus has been at the angle of repose for some time with a dense growth of grass, forbs in the characteristic clump form. These Arctic are composed almost exclusively of Alopecurus alpinus, in which the other plants must compete for existence. In no place in the north have I seen such an extensive slope so richly mantled with verdure. Even the green slopes at Etah rank second to these. As on all these slopes, enriched by the guano of the Alle alle, this luxuriant growth of Alopecurus is made up of large tufts between which are deep pits or trenches often filled at the bottom, with water. Often the grass laps over these pits or trenches making the slope look like a continuous turf. In these Arctic grow also:

Cochlearia officinalis
Cerastium alpinum
Papaver radicatum (in bare places)
Salix arctica
Potentilla nivea
Arastium trigynum
Potentilla rubricaulis
Arctagrostis borealis (in places where water seeps freely)
Pedicularis hirsuta
Taraxacum hyparcticum
Polygonum viviparum
Carex misandra

These are the commonest plants that compete with the Alopecurus successfully enough to survive and flourish highly.

About a mile and three quarters out along the North slope of the fjord away from the igloo-sites, a deep gorge cleaves the cliffs. This gorge opens out toward the Southward in to a roughly semi-circular valley, the head of which is a dry slope. On this slope I found:

Festuca ovina
Campanula uniflora
Luzula
Potentilla Vahliana
Pedicularis hirsuta
Saxifraga tricuspidata
Oxyria digyna (beside a draw)
Polygonum viviparum " " "
Cassiope tetragona
Glyceria tenella

Poa sp.
Calamagrostis purpurascens.
Salix herbacea
Antennaria herbacea
Myrtillens uliginosum
Trisetum spicatum
Carex maritima
Dryas integrifolia
Silene acaulis
Melandrium apetalum (by dunes) affine
Saxifraga groenlandica
Arnica alpina
Carex nardina
Hierochloa alpina
Saxifraga oppositifolia

Nowhere have I found so much Antennaria as at the head of this gorge and on the plateau above it. It grows in greater profusion here than at any place I have hitherto found it. I found Cystopteris fragilis in a characteristic habit in a damp shady debris ledge far up on the cliffs and Eriophorum Scheuchzeri in a soggy pool on a kind of bench on the cliff. I found Arnica, Campanula and Antennaria associated as usual.

I had not time to walk over the delta at the head of the fjord.

May 17.

The first full-open flowers of Saxifraga oppositifolia appeared today

May 19.

The first flowers of Draba hirta and Cochlearia officinalis came but full-open this morning.

May 24 and 25

I went over to the southeast slope of Umanak to collect some turf plants and study the groups and associations of plants there.

The area is a dry gravelly plain of small extent gradually merging with the slope of the butte, so that its western end is but an extension of the slope extending directly to the sea. Very little vegetation grows upon the more exposed portion of the plain but in a semicircular terrace just to the eastward of the butte, Dryas integrifolia and Salix arctica with a few clumps of Hedysarum spicatum and Elyna Bellardi form a relief feature. All these grow in the characteristic forms of tufts swept by winds from a prevailing direction. Lying protected in the lee of the butte from all winds but the northeasterly winds, they are modified only by the latter, so that the extension of growth is in a general northwesterly direction. The Dryas exhibits a form of tuft quite like a windswept snowdrift on the ice, i. e. a semi-circular or a drumlin form. In the former case the convex side is shorn off from old growth of the plant, the old original

root being approximately at the center of the arc. The tuft is piled up like a drift highest in the middle and sloping toward both ends and sides, but a kind of middle ridge rises from it. On the side toward the wind the dead branches of old growth converge toward the center and on this slope of the tuft no bloom appears. On the lee side the growth is lush and in some of the larger tufts full of bloom. In these larger tufts the middle ridge is high enough to shelter the inflorescence from the force of the wind.

In the Cottonsedge the inflorescence is most abundant just beside the lee of dome-like drift. In these domes the middle ridge is wanting or barely noticeable.

The Salix tufts are quite similar to those of Dryas except that the catkins come up more uniformly all over the ridge & dome. Even here however the growth and inflorescence are best on the protected lee side.

In both Dryas and Salix tufts much of the wind-driven material is piled up over the top of the dome or ridge. These ridges and domes reach a maximum height of three or four inches above the general surface. Like sands they travel slowly with the wind the dead growth behind them, the freshest growth in advance.

Composition & associations
Spring and forms of Dryas.

May 25.

I collected some typical tufts of Hierochloe, Luzula, Festuca and Potentilla on the gravel plain not far from Peter's house. I was much interested in the elaborate root systems of the grasses and sedges - all fibrous; whereas the root-systems of the Potentilla were multiple tap roots with generally one dominant strong one.

May 26.

I collected some mats of Glyceria maritima and Stellaria humifusa on the little point across the isthmus beyond Soren-tags monument.

May 31. -

I climbed to the top of the butte here. The top is a fairly level surface sloping from the northeast to the southwest, from 6 to 10 feet high. It is about 40 to 60 yards in diameter, roughly elliptical, with the longer axes at right angles to the slope. The surface has two or three round dimple-like hollows in it, and toward the southwest side, several small valleys lie parallel to each other. The higher edge of the surface is covered with coarser detritus than the lower, in which considerable gravel and granite and other boulders are mingled with the disintegrating diabase of which the top of the butte is composed. The lower half of the butte is almost a pure disintegration product of the sill diabase. Nowhere on the top is the disintegrated material deep. Almost everywhere the rock lies within a few inches of the surface and in many places it forms the surface. Even where the debris is deepest it is so shallow that the more solid metamorphic plates along old joints, or old segregations either project, or may be distinguished by ridges slightly above the general level. Along the south southwest edge the disintegrated rock is blown away as soon as it comes to the projecting ledges and chunks of live rock material projects like a veritable bad-lands in miniature. The entire cap of the entire butte is the heavy sill of ~~basalt~~ basic intrusive which lies over the ridges and hills back of the bay.

Naturally this top is exceedingly dry and but few plants may be found upon it. Yet altogether sixteen species have found a foothold there, despite the difficulty of access and the struggle to maintain an existence against tremendous odds. The species found there on the tops are:

Potentilla pulchella
" nivea
" Vahliana
Elyna bellardi
Luzula (small form)
Salix arctica
Silene acaulis
Alsine stricta (?)
Saxifraga oppositifolia
" tricuspidata
Dryas integrifolia
Arabastrum alpinum
Festuca ovina
Trisetum subspicatum
Carex nardina
Papaver radicatum

Of these Saxifraga tricuspidata and oppositifolia were most numerous, occurring sparingly over the entire top. Scattered Salix arctica and Elyna bellardi also occurred pretty generally. Potentilla pulchella was the commonest of the potentillas with P. nivea next. I found but one plant of P. Vahliana. Luzula and Festuca occurred most in the dimples and valleys where they were not numerous but not rare. Silene acaulis grew over the whole top but was rare everywhere. I found but two plants of Alsine. Dryas was probably the next numerous of all the plants, even more numerous than the Saxifragas. It occurred everywhere. Cerastium and Carex nardina I found most abundantly in the dimples and valleys where Papaver radicatum was also fairly abundant.

June 1.

Vegetation of all kinds is far in advance here of his years ago. Nearly all the gramineae and cyperaceae show signs of beginning growth. Poa, Glyceria, and Luzula particularly are growing green, while the carpels of Arbs along the shore are quite green and pink, and the clumps of Phippsia algida are showing the tips of their flowerheads. Salix arctica is everywhere in catkin, the pistillate and staminate flowers both. Pollination is in many catkins quite complete, and anthers and stigmas on some plants are already quite withered. Oxyria shows red clumps. The first broad heart-shaped leaves of Polygonum are being succeeded by one, two, or even three narrower leaves. Stellaria humifusa shows emerald green along the ice-foot. Cerastium alpinum in sunny protected places is in bloom. Alsine is bright green, and Silene acaulis is showing the tips of buds. The muddy rosettes of Melandrium are fast enlarging and the new flower stalks are knobs at the centre. Papaver radicatum has great abundance of dark, hairy buds, as large as worm's eggs. Cochlearia is at blossom on the sunny ledges. Tesquerella is setting buds. All the species of Draba are in bud and Draba hirta and gladiensis are in bloom. Saxifraga oppositifolia is at its glory on the plain here now. Saxifraga tricuspidata and bivalis have large buds. Dryas is budding. Potentilla nivea and pulchella are in blossom. The purple tips of Chamaenerion show above the ground. Rhododendron, Myrtillus, Empetrum and Cassiope are growing bright. Pyrola is in bud and the shiny new pink and green leaves are full size. Pedicularis hirsuta, Campanula gieseckeana, Antennaria alpina, and Arnica alpina all have new rosettes of leaves centered by clusters of buds. Taraxacum phymatocarpum has large buds. The warm April and May, with much water warmed by an unclouded sun brought forth the vegetation earlier than usual this year, in all places where the abundant snowfall of the winter was not piled up in too high drifts. This ought to be a favorable season for the ripening of many fruits.

June 2, 3, 4, 5. Umiatakseak.

List of plants noted or collected on Umiatakseak.

Saxifraga oppositifolia
" tricuspidata
Salix arctica
" herbacea
Polygonum viviparum
Dryas integrifolia type
" ssp. canescens.
Cassiope tetragona
Myrtillus uliginosum
Hierochloa alpina
Luzula 2 sp.
Carex misandra
" nardina
" rigida, var. Bigelovii
Lycopodium Selago
Pyrola grandiflora
Antennaria alpina
Campanula uniflora
Melandrium affine
" apetalum (?)
Arnica alpina
Calamagrostis purpurascens.
Taraxacum pumilum
Festuca ovina
Trisetum spicatum
Poa 2 sp.
Glyceria (angustata ?)
Cerastium alpinum
Alsine stricta
Elyna bellardi
Draba hirta
" nivalis
" subcapitata
Dryas integrifolia
Potentilla nivea
" Vahliana
Papaver radicatum
Pedicularis hirsuta
Silene acaulis.
Eriophorum sp.
(Polygalaceum ?).

The region over which I traveled on Umiatakseak is at an average elevation of 600 to 800 feet above sea-level. I did not get up to the high plateau level. The lower portion is in places a chaos of shattered quartzite, of which the ledges crop out here and there, the cliffs generally very much fractured. Generally however, the ground rock is covered over with morainic material, sometimes places somewhat assorted. This material is very thin in places - on some ledges and plateaus; at other places it forms regular moraine country of incomplete and chaotic drainage systems.

The whole area is swept by fierce south east winds so that the snow is unevenly distributed over it. Large drifts lie in the lee of the moraines, and rock ridges; they all tend to show that a prevailing strong wind comes from the south east, off the undulating mountain to the sea. Further up on the lakes the wind is along the axis of the fjord.

The vegetation is everywhere sparse. There are no grass-slopes and the only substance to turf is small patches of sedge with mingling of Poa, Luzula and Festuca, in the swales and ooze among the moraines or in the irregular valleys running from them. Almost the whole area in a sense is xerophytic and most of the plants noted either grew act over or else were restricted to very small localities.

I found Pyrola, Antennaria, Campanula, Festuca, and Calamagrostis as a characteristic rocky, sandy, dry heath association much frequented by ptarmigan. The Pyrola did not extend over a thousand laterally, but over the whole slope from top to bottom, as if it had disseminated its seeds downward by gravity. The scabs of last year were mature. Nowhere have I found a greater profusion of old flowering stalks, and new bud-stalks as in this patch. They were very numerous indeed. The antennaria and calamagrostis were abundant too in restricted localities, but nowhere did I find an abundance of Campanula uniflora.

Some of the rockier terraces and gravelly moraines were void of vegetation but generally some Dryas and Elyna appeared.

June 6 and 7.

Heavy wind yesterday and today, with driving snow has done much damage to the beautiful patches of Saxifraga oppositifolia which has for the past ten days been at the height of its beauty about the house. It was such a warm wind that the snow melted soon after falling so most of the vegetation was hastened, rather than retarded.

June 10. Brinville Bay on slope just east of glacier by which Eskimos goes to Etukdlek.

List of plants noted.

Lycopodium selago
Hierochloa alpina
Alopecurus alpinus
Arctagrostis latifolia
Calamagrostis purpurascens
Trisetum spicatum
Poa (canina ?)
Glyceria maritima
Festuca ovina (type ssp. brevifolia)
Eriophorum scheuchzeri
" polystachium
Elyna bellardi
Carex rigida var. Bigelovii
" nardina
Juncus biglumis
Luzula ssp.
" ssp.
Salix arctica
Glyceria digyna
Polygonum viviparum
Stellaria humifusa
" longipes
Arachnum adpressum
Alsine verna
Silene acaulis
Melandrium apetalum
" affine
Papaver radicatum
Cochlearia officinalis
Lesquerella arctica
Draba nivalis
" hirta
" fladnizensis
" subcapitata
" alpina
" crassifolia (?)
Saxifraga nivalis
" tricuspidata
" oppositifolia
" Stellaris v. comosa
Dryas integrifolia (type ssp. canescens)
Potentilla pulchella
" nivea
" Vahliana
Empetrum nigrum v. purpureum
Chamaenerion latifolium
Pyrola grandiflora
Cassiope tetragona
Vaccinium vitis-idaea
Myrtillus uliginosum
Statice maritima
Pedicularis hirsuta
Campanula uniflora

Antennaria alpina
Arnica alpina.

The vegetation is nowhere luxuriant, and generally confined to the lower dunes, ridges, moraines, and terraces. The new plant I found here was Vaccinium vitis-idaea, growing common over the sunny leggs and gravel-banks, just to the eastward of the route to Thordlik perhaps a quarter of a mile to the eastward. It grew especially on the sunny slopes of the gravel banks or slides that faced the bay, and especially on the fore-face of gravel creeps.

Cassiope tetragona was blooming everywhere; Draba flodmzensis was beginning to, Dryas integrifolia was in full bloom. The unusual features of the vegetation here were the great abundance of Empetrum nigrum which grew luxuriant over the southward facing slopes of the hills and terraces; the relative abundance of Statice maritima on the clay-gravel flats; and the profusion of Silene acaulis growing over the flats and slopes near the sea. The most abundant grass was Hierochloa alpina. Vegetation not so far advanced as at Umanak.

June 11. Slope facing south just to the east of the mouth of Gzenodle Bay.

List of plants noted.

Cystopteris fragilis
Hierochloa alpina
Arctagrostis alpinus
Calamagrostis purpurascens
Trisetum spicatum
Poa
Glyceria maritima
Phippsia algida
Festuca ovina
Euphorbium Schenchzeri
Elyna bellardi
Carex misandra
" nardina
" regida v. Bigelowii
Luzula
Salix arctica
Azyna digyna
Polygonum viviparum
Stellaria humifusa
" longipes
Cerastium alpinum
Alsine verna
Silene acaulis
Melandrium apetalum
Ranunculus sulfureus
Papaver radicatum
Cochlearia officinalis
Draba alpina
Draba subcapitata
" hirta
" flodmzensis
Saxifraga oppositifolia
" nivalis
" tricuspidata
" gorelandica
Dryas integrifolia (all forms)
Potentilla nivea
" rubicaulis
" pulchella
Empetrum nigrum v. purpureum
Chamaenerium latifolium
Pyrola grandiflora
Rhododendron lapponicum
Cassiope tetragona
Myosotis alpigenum
Pedicularis hirsuta
"
Campanula uniflora
Antennaria alpina
Taraxacum pumilum

This slope is a typical wet or damp heath with an excepts of Cassiope tetragona. The vegetation was particularly luxuriant, and had I had time to have looked over a larger area I should certainly have found more species. Ranunculus sulfureus, Papaver radicatum and Rhododendron lapponicum were in bloom, the first blossoms of these plants that I have seen this year. Vegetation as at Umanak.

June 13. On plain and slope near Igloo and Tupiks, Saunders Island.

List of plants noted.

Hierochloa alpina
Alopecurus alpinus
Aira
Trisetum spicatum
Poa cenisia
Poa sp.
Glyceria maritima
Festuca ovina
Eruphorum polystachium
Elyna bellardi
Carex nardina
" regida v. Bagdorii
Luzula
Salix arctica
" herbacea
Azyna digyna
Polygonum viviparum
Stellaria humifusa
" longipes.
Cerastium alpinum
Alsine verna
Silene acaulis
Melandrium apetalum
" triflorum
Ranunculus sulfureus
Papaver radicatum
Cochlearia officinalis
Draba hirta
" alpina
" nivalis
" subcapitata
" flodmzensis
Saxifraga oppositifolia
" tricuspidata
" nivalis
" caespatosa ?
" groenlandica
" flagellaris
" hirculus
" cernua
" rivularis
Potentilla rubicaulis
" nivea
" pulchella
Chamaenerion latifolium
Pyrola grandiflora
Cassiope tetragona
Dryas integrifolia (all forms)
Pedicularis hirsuta
Taraxacum pumilum

Nowhere is the vegetation luxuriant though the Hotels are richly carpeted with Alopecurus, in which Arastrum Cochlearia and a few others succeed in maintaining a healthy existence. The hotels are all just beneath the bad cliffs and extend from the foot of the cliffs to the top. From centuries' accumulation of dung upon the ledges, the crevices and rifts in the rock everywhere are fertilized and vegetation has taken hold in the most difficult and inaccessible of places on the vertical face of the cliffs.

The lagoons, filled with Luzula, grass and sedge, among the old beaches, and the gravel ridges have a varied vegetation but sparse. Saxifraga groenlandica presents a great diversity of forms here, from a dwarf caespitose clump in cold damp swale, to a luxuriant

herbaceous form on a warm fertile old bone pile. Saxifraga flagellaris and hirculus are relatively abundant along the lagoons of the plain. I have not found them on the mainland as yet along Nelson-Holme Sound, though both grow at Etah.

June 15.

The vegetation here is just about coming into its best development. For the next two weeks the season is at its best, I think. On the plain here all the plants are fast coming into bloom, and about headquarters the ground is quite white. White predominates as a color. All the Draba with their forms, varieties and hybrids are in bloom, and form the preponderance of color, though Cerastium alpinum and Papaver radicatum, v. albiflorum, are important accessions. The most insignificant Alsine verna is by far the most numerous of the plants but its small flower, beautiful though it is, is relatively inconspicuous. It is curious that about this house the albiflorum form of Papaver is preponderant with a sparse intermingling of the yellow form while at the old Mission the yellow form is dominant with a little white. Between the two houses the transition from one to the other is continuous.

Next to white, pink is now the commonest color, for the dainty clumps of Silene acaulis are quite numerous. It is the only pink flower, up here if we except the dainty and tiny bell of Myrtillus uliginosum. About the house the wonderful purple of Saxifraga oppositifolia was quite wiped out by the wind a week ago, but across the point it is still regally supreme. Some pink creeps into Pedicularis hirsuta, now in full bloom, but it is not conspicuous.

Yellow Lesquerella, Potentilla pulchella, nivea, and rubricaulis, and Taraxacum pumilum are not uncommon; in the hills Potentilla nivea and Vahliana give a golden color to the drier places, while on the plains and in the hills, too, the rich creamy wheels of the Dryas, and the waxy bells of the Cassiope give a distinctive color to patches of the landscape. It is on the damp rock-ledges too, that Vaccinium uliginosum[1] bears the greatest profusion of its little pink bells, though the plains and slopes have an abundance.

The Melandrium and Saxifraga have not yet assumed an important part in the floral revenue but they are fast developing. It is the high tide of Arabis, Draba, Papaver, Alsine and Silene and Lesquerella. Dryas, Cassiope, Melandrium, and Saxifraga are not yet at their best, while Pyrola, Chamaenerion, Antennaria, Arnica, and Campanula

are just beginning to take a part. Hierochloe, Alopecurus, Poa, Glyceria, and Festuca are just developing. Phippsia is just in bloom. Luzula and Elyna are blooming, and I have seen a little Carex rigida? Bigelowii. Eriophorum of both forms has just begun to bloom, but I have seen no Juncus.

Lichens –

Litt.

#1. Black, frondose form, rock-inhabiting.

#2. Orange-red - granular form.

#3 Gray granular form with pearl fruiting surfaces.

#4 " " " " blue-green " "

#5 Pearl-gray frondose form.

#6 White-gray or green-gray frondose form, much lobed and dissected.

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♂

1	Catkin ¼ to ½ in length	half developed	Surface 6 in sun Surface 2½ in shade
2	" ½ to 1 "	(fully develope	1½ " ½
3	" beginning to show red		3 " 12
4	" faint red stamen exserted		♀
5	" many red stamen few open with yellow		first red pistil exserted
6	" few " black (scanty yellow)		all " " Exserted
7	" all " "		Spongy ~~first~~ pistils ~~within~~ pale
			all " " "
			fertilization over.

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