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ATLANTIC SALMON AND TROUT INVESTIGATIONS, 1939

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ATLANTIC SALMON AND TROUT INVESTIGATION

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ATLANTIC SALMON AND TROUT INVESTIGATIONS
1939

Report No. I. Physiological Factors Involved
in the Smolt Metamorphosis.

By W. S. Hoar

Before migrating from the river to the sea the young salmon undergoes a number of very definite changes. Superficially the plump well fattened little parr becomes thin and slender. A silvery layer of guanin crystals cover the prominent parr markings. There is a precipitous fall in the coefficient of condition of the fish, while gross dissections show that the visceral fat deposits, so prominent in the parr, have been lost. The scale growth is of an intermediate type between that of the river and that formed in the sea (MBS. reports, 1936 and 1937). Unpublished experiments, performed by Dr. A. G. Huntsman and the writer, have demonstrated the complete inability of parr of all sizes to become adapted to salt water. The smolt, on the other hand, may pass directly from the river into the sea. Lovern (1924), from his studies of fat metabolism, concludes that "when the parr becomes a smolt it becomes indistinguishable from an adult salmon except in point of size", and that

"the whole metabolism undergoes a change at this period".

We have also found definite differences in the swelling of parr and smolt tissues when treated with formaldehyde. Anatomical studies of the thyroid gland have shown that this organ undergoes an active hyperplasia at the time of the smolt change (Hear, 1939).

During the past summer experiments were started in an attempt to bring about this transformation experimentally, and thus to learn something of its physiological basis.

Either directly or indirectly the thyroid gland seems to be intimately connected with metamorphosis or change in life as seen in other vertebrates. A host of workers have demonstrated thyroid activity in connection with the amphibian metamorphosis, or have brought about such metamorphosis by a stimulation of this gland or by feeding Gland substance (Gudernatsch, 1914; Grant, 1931 etc.). von Hagen (1936) found an active thyroid in the eel at the time of its metamorphosis.

On the basis of these considerations the following sets of experiments were carried out on salmon parr.

I. Feeding of Thyroid Gland. Compressed thyroid gland tablets, as prepared by Burroughs Wellcome and Co., New York, were used for these experiments.

II. Stimulation of the Thyroid Gland. Intraperitoneal injections of the thyrotropic principle of the anterior pituitary were used to increase the thyroid activity. The hormone - Antuitrin (Thyrotropic) - was supplied by Parke, Davis and Co., Detroit.

III. Administration of Iodides. Swigle (1919) has demonstrated the efficacy of iodides as stimulants of the frog metamorphosis. Intraperitoneal and intramuscular injections of 0.75% potassium iodide were used in this set of experiments on the salmon parr.

The fish were kept in boxes with wire screening at the ends, and oil-cloth on the bottom to prevent chafing.

Feeding of Thyroid Gland.

Experiment 1.

9.0 cm. yearling parr - given 1 gr. thyroid tablet ($2\frac{1}{5}$ ^{gr.} U.S.P. Thyroid) daily from July 11 until July 20, when the fish died. The animal was injured by chafing on the wire screening in the bottom of the box, and this probably caused its death. There was no evidence of definite changes, although the fish became lighter in color.

Experiment 2.

20.5 cm. parr (four winters) - treated orally with 2 gr. thyroid tablets ($4\frac{1}{5}$ gr. U.S.P. Thyroid) daily from July 13 until July 20, when the fish died due to injuries in the box and a very heavy growth of fungus. On July 18 (5 days treatment) and subsequently scales came off very readily in the gloved hand. Scattered flakes of gusnia appeared on the back at about the same time, and the fish became very susceptible to fungus growth.

Note - the smolt loses its scales very readily while it is almost impossible to dislodge scales from the parr by handling.

Experiment 6

16.9 cm. parr (two winters) - treated orally with 2 gr. thyroid tablets (4/5 gr. U.S.P. Thyroid) daily from July 20 until August 6, when fish died due to heavy growth of fungus. Scales came off very readily after 8 days of treatment. After the scaling commenced the fungus was found hard to control even with two salt baths per day - and at last the fish died when the temperature of the water went high.

Experiment 8

14.5 cm. parr (two winter fish) - treated in a manner similar to that of the last two fish from July 31 until August 9, when death occurred. This fish showed no injuries or fungus growth. It had been starved for 18 days previous to experimentation.

Experiment 10

15.8 cm. parr (two winters) - treated in a similar manner to the previous fish from August 5 to August 9, when the animal died. This fish had also been starved since July 13.

Experiment 11 a.

16.8 cm. parr (two winters) - treated in a similar manner from August 15 until August 22. This fish was taken from Smith Brook immediately prior to the commencement of the experiment. The animal died apparently in good shape and without showing any external changes.

Experiment 11b.

14.8 cm. parr (two winters) - the experiment was in every way similar to the last. It was commenced on August 15 and the fish died on August 25.

Discussion

Experiments 2 and 6 show that changes in the ease of seeling and the susceptibility to fungus can be brought about in salmon parr through the administration of compressed thyroid gland. The time required to induce this change depends on the size of the fish (5 days for the 4 year parr as compared to 8 days for the 2-year old).

Experiment 1 is probably without significance.

The other experiments suggest that the parr refuse to respond to the thyroid treatment after the first of August. It remains to be seen whether smaller doses at this season might bring about a change more slowly, and not kill the animal.

On the whole it seems that future work, carried out earlier in the season, with fungus and injuries rigidly controlled and the fish given food, will probably give interesting results.

Injection of Thyrotropic Hormone

Experiment 4

15.8 cm. parr (two winters) - injected daily with $\frac{1}{2}$ cc. of thyrotropic hormone from July 14 until August 16 inclusive. On August 17 the fish was killed because of insufficient hormone to continue the experiment. At that time the fish showed no conclusive evidence of having been effected by the injections.

Experiment 5

13.8 cm. parr (two winters) - injected daily with 1 cc. of thyrotropic hormone from July 20 until July 31. On the latter date the fish died, probably due to faulty technique in injecting.

From July 26 until the end of the experiment scales were found to come off very easily in the gloved hand. This was the only evidence of change.

Experiment 9

15.2 cm. (two winter) parr - treated similarly to that of the previous experiment from August 1 to August 15, when the fish died following the injection. Contrary to experiment 5, there seemed to be no good reason for the death in this case. The fish lost a few scales on August 11, but in general showed much less evidence of being affected than that of the last experiment.

Discussion

Until the autopsy material has been sectioned it cannot be stated whether we succeeded in stimulating the thyroid gland or not. From the gross specimens (experiment 5) it seems that the gland was stimulated, but that the treatment was not prolonged enough to bring about definite results. The death of the fish used in experiment 9 may have been due to the same unknown factors which brought about the death of all fish fed thyroid gland after the beginning of August.

Treatment with Iodides

Experiment 3a.

10.5 cm. parr (yearling) - death occurred directly after the injection of 2 cc. of 5% KI on July 13.

Experiment 3b.

13.5 cm. parr (two winters) - injected $1\frac{1}{2}$ cc. of 5% KI on July 13, and 1 cc. of the same solution on July 14. The fish

died immediately after the latter injection.

Experiment 30.

15.0 cm. parr (two winters) - injected $1\frac{1}{2}$ cc. of 5% KI on July 14. The fish died after a considerable struggle.

Experiment 34.

14.2 cm. parr (two winters) - injected $\frac{1}{2}$ cc. of 5% KI on July 15. The fish died after a violent struggle.

Experiment 3e.

15.0 cm. parr (two winters) - injected $\frac{1}{2}$ cc. of 1% KI on July 15; injected $\frac{1}{2}$ cc. of 0.75% KI daily from July 16 until August 26 when the fish died due to a heavy growth of fungus. The color of the fish became decidedly lighter from August 1 onward and a few scales were lost at different times. The fish, however, could only be classed as a parr, although the weakening of its resistance to fungus probably indicates that the injections were not without their effect.

Experiment 7.

15.4 cm. parr (two winters) - injected $\frac{1}{2}$ cc. of 0.75% KI daily from July 25 until August 28 inclusive. On August 29 the fish was killed - apparently in excellent condition. After August 4 scales were lost at different times, and the fish gradually assumed a bluish silver colour. The tip of the caudal fin became rather dark and the tips of the pectorals somewhat less so. By August 25 this condition was quite pronounced and the fish lost quantities of scales. Under the microscope these scales showed a fair deposit of guanin crystals. Physiological changes were definitely induced in this fish through the treatment.

Experiment 12.

Experiment 12.

14.5 cm. parr (two winters) - injected $\frac{1}{2}$ cc. of 2% KI daily from August 15 until August 19, when the fish died after injection. This fish showed definite signs of being adversely affected by the treatment by the second day.

Experiment 13.

14.0 cm. parr (two winters) - injected $\frac{1}{2}$ cc. of 2% KI on August 19. The fish recovered after a violent struggle, and was injected daily thereafter with one-half the amount of solution ($\frac{1}{4}$ cc.). On August 29 the fish was killed without showing any definite external changes - although it had become lighter and the parr markings were less in evidence. The lightening in color may be merely an adaptation to the light background. Microscopic examination showed some guanin crystals on the scales.

Discussion.

Iodides cannot be tolerated in quantities of more than the equivalent of $\frac{1}{2}$ cc of 1% solution of KI daily. This slowly produces changes in the coloration of the fish and in the ease with which it loses its scales. The autopsy material will show whether the thyroid has been involved in these changes.

Summary.

Physiological changes were induced in parr by all three methods of treatment - administration of compressed thyroid gland, thyrotropic hormone and potassium iodide. These changes involved the loss of scales - a characteristic feature of the smolt - and in some cases definite changes in coloration.

Thyroid tablets produce the most prompt changes, inducing a loss of scales within a week. This change, however, cannot be brought about after the end of July.

Thyrotropic hormone produces change very slowly, and there was not sufficient hormone available to carry on the experiment as long as would be desirable.

Iodides bring about changes very slowly, and the experiments were not commenced soon enough to give spectacular results, although some of the animals showed definite evidence of changes toward the smolt condition.

Note: The autopsy material will be examined microscopically and the results presented later. At present, the work has only gone far enough to show that interesting results may be expected with the experiments started early in the season, the fish fed and the fungus rigidly controlled.

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Appendix 1.

Daily Water Temperatures for the Water of
the Brook where the Experimental Fish were kept.

<u>Date</u>	<u>Time</u>	<u>Temperature</u>
July 14	10 a.m.	15. ° C. Thermometer "p"
15	11.30 a.m.	15.4
16	"	15.0
17	"	17.2
18	"	15.6
19	"	15.6
20	"	15.9
21	5 p.m.	17.5
22	3.30 p.m.	19.4
23	2.30 p.m.	19.4
24	2.30 p.m.	16.2
25	4.0 p.m.	20.2
26	3.30 p.m.	19.8
27	"	17.1
28	"	17.4
29	"	19.8
31	9.00 p.m.	17.9
Aug. 1	"	18.1
2	"	15.8
3	"	15.5
4	"	16.1
5	"	17.5
6	12 M	20.2
7	9.00 a.m.	18.0
8	"	18.0
9	"	17.2
10	"	18.2
11	"	16.9
12	"	15.8
14	"	17.2
15	"	16.2
16	"	-
17	"	17.0
18	"	17.2
19	"	17.2
22	"	18.0
23	"	18.8
24	"	19.0
25	"	18.2
26	"	18.5

Thermometer "W"

ATLANTIC SALMON AND TROUT INVESTIGATIONS
1939

Report No. II.

The Scales of the Moser River Sea-trout.

By W. A. Hoar

A large number of sea-trout descending the Moser River in the spring of 1939 were marked and samples of their scales taken. In addition, scale samples were obtained from a number of the trout returning from the sea.

The scales of these fish carry a very definite record of the winter and summer growth, and have been examined with the following questions in mind:

1. At what age do the Moser River sea-trout migrate to the sea?
2. Is sea-growth clearly differentiated from river-growth on the trout scale?
3. Can the spawning mark be recognized on the trout scale, and if so, what percentage of the fish survive for a second spawning journey?

In order to compare sea growth and river growth precisely measurements were made of the growth of the scales for the summers of 1938 and 1939. In addition, the number of bands was reported in each case - hence the average width of the circulus was calculated. It is evident that such measurements are often arbitrary since it is often difficult to say where winter growth starts and stops or summer growth ends or commences. However, care was taken to select scales with a fairly bold growth and it is believed that the average figures show a reliable order. The detailed measurements

are given in Appendix A (6.5 divisions of the ocular micrometer are equal to 1 mm.)

Weights and lengths were available for the sea-run-trout, and condition factors have been calculated for these fish. The detailed determinations are given in the appendices.

Age of Migration.

An examination of 136 Mill Brook fish, taken between May 3 and 11, shows that without exception the trout of this river migrate to the sea as either 2- or 3-year smolts. The larger number (79.4%) of these have spent but two years in the river. In regard to size the 2-year migrants average 17.0 cm. in length as compared to 19.7 cm. for the 3-year migrants.

The trout and salmon smolts behave very similarly as to the time at which they migrate to the sea. A study of the salmon smolts showed that there were 81.6% of 2-year migrants from Mill Brook in 1939. However, the trout have a considerable advantage over the salmon as far as size is concerned (17.5 cm. compared to 16.1 cm.). It would seem that for both salmon and trout the same factors probably influence the seaward migration. Trout, apparently, grow better than salmon in the fresh water.

28.7% of this group of fish were kelts; and their scales, although not always showing a definite spawning mark, regularly show a full year's bold sea growth. These scales are discussed in detail below. From an examination of the river growth of the kelts it appeared that 21.9% had migrated first as 3-year trout smolts. This figure agrees very closely with that given above.

As to the length of the kelts, the 2-year migrants average 23.8 cm. while the 3-year migrants average 28.9 cm.

Comparison of River and Sea Growth

The following table summarizes the comparison of the river and sea growth of the trout scale. The 1939 circuli were formed in the sea while those of 1938 were formed in the river.

	Number of readings	Width of Circulus Range	Average
2-winter fish			
1938 growth	49	0.10 - 0.17	0.14
1939 "	47	0.12 - 0.25	0.19
3-winter fish			
1938 growth	20	0.06 - 0.22	0.16
1939 "	22	0.15 - 0.26	0.21
All fish			
1938 growth	69	0.06 - 0.22	0.15
1939 "	69	0.12 - 0.26	0.20

In actual practice sea growth is less readily distinguished than a study of the table might lead one to believe. For one thing, the scales from any given fish are not all uniform and several must be examined to get the true picture. Moreover, at times certain of the river bands may be of equal width to the sea bands. In such cases, however, there are always fewer of these probably 1 Or 2 in a season's growth. Lastly it must be emphasized that the differences are always small and of much less magnitude than those found in the salmon scale.

Besides these irregularities in growth, account must be taken of the fact that in any trout or salmon scale the circuli gradually become wider from year to year. To determine whether the sea growth is anything more than this gradual yearly widening it is necessary to compare sea and river growth of fish of the same age. In 1938 growth of the 3-winter fish and the 1939 growth of the 2-winter fish give such a comparison. A difference is still apparent (0.16 compared to 0.19). It can be said moreover that the actual difference in each case is somewhat greater than appears from the figures, since the first 2 or 3 bands of the smolt spring are much narrower than the majority and cut down the average.

As an actual test of these differences the scales of the 3-winter fish were studied to see whether any had first migrated to sea as 2-winter fish and would thus show 2 years of sea growth. In several cases such was definitely the case. Thus, a 38 cm. fish (July 15) added 9 circuli to its scale in 1938, each band averaging 0.22 divisions in width. Again, a 36 cm. fish (July 22) added 7 circuli - average width 0.21 - in 1938. In both cases the growth was typically sea growth. In all, 27% of the 3 winter fish showed evidence of having been twice to the sea. In the trout kelts sea growth is usually quite evident. In a few cases, however, these fish - dealt with in the next section - show no evidence of sea growth. This may mean that they spawn before going to the sea, or that the sea growth is not always evident.

The Spawning Mark

Scales of 40 kelts, taken from the Mill Brook trap between May 3 and 11, were available for the study. At that time none of the fish showed any evidence of growth for the current year.

The edge of the scale of these fish is smooth, not ragged, and shows no evidence of the erosion so characteristic of the salmon kelt scale. Literally, the outer two or three circuli are often cut off, and this is the only evidence of spawning. This is never a conspicuous feature, nor can its presence always be relied on. A large proportion of these trout kelt scales are peculiar in showing little or no winter growth following life in the sea. Broad circuli continue uninterrupted to the periphery of the scale. It does not seem likely that, by May 10, 6 to 8 broad circuli would have been formed during the current year. These are obviously last summer's sea-growth, with no subsequent winter's growth in evidence. The absence of a winter growth record may reflect the trout spawning.

The scales of sea-trout returning from the sea for the second time - presumably 1938 spawners - were also examined. In these evidence of spawning appears, in varying degrees, as a very fine line interrupting the continuity of the sea bands. Generally, 1 or 2 of the circuli, formed just prior to the spawning, have been cut off laterally so that they are present only at the anterior margin. Other scales show only a slight check in the midst of a considerable extent of sea growth. Presumably, these are the scales of fish which as kelts showed no evidence of winter growth.

On the whole it seems apparent that spawning of the sea-trout is recorded on its scale by a slight check in growth. This checking, however, is not great and rarely more evident than the checks and irregularities which are formed in the normal formation of the circuli of the trout or salmon scale. It does not seem that any reliable data could be obtained regarding the numbers of spawned fish from an examination of the Moser River sea-trout.

Sex of the Sea-Trout

It seems worth recording that 90% of the small number of fish (20 specimens) taken ascending the Moser River during the summer were females.

Condition of the Sea-Trout

The average coefficient of condition of 61 sea-trout weighed and measured during July was 1.10. This is considerably lower than that of fish of the same age taken from Goldmine Brook and West Branch Moser River between July 10 and 16 ($K=1.14$ less 25% = 0.91). The trout from the sea are almost 11 cm. longer than the brook trout (15.9 cm. compared to 26.2 cm. on the average). It should be noted that the sea-trout were studied when fresh, the brook trout after preservation in formalin; and that although such treatment of the brook trout will have raised the condition factor the subtraction of 25% was arbitrary. [For the effects of formalin on the condition factor of salmon see former reports].

SUMMARY.

1. The Moser river trout spend either 2 or 3 years in the river before migrating to the sea. The majority leave at the end of the second year.

2. Although salmon and trout migrate to the sea at the same age - presumably influenced by the same stimuli - the trout reach a larger size in fresh water.

3. Sea-growth can, with practice, be recognized with certainty in the scales of the Moser river trout. As criteria, the circuli are wider, bolder and more numerous than those formed in the river.

4. Although spawning always leaves a check on the sea-trout scale this does not take the form of extensive erosion, and is not more evident than irregularities often formed at other times during the growth of the scale. Consequently, it is doubtful whether one can give a reliable interpretation of the spawnings from the sea-trout scale.

5. The coefficient of condition of the fresh run sea-trout is less than that of the trout taken in the brook.

MOSER RIVER SEA-TROUT 1939.

Note: The following data are from trout taken at or near the Moser River Bridge, and fresh run from the sea.

L.	W.	S.	K.	Age	Total Width of all bands	Growth of the Scale during Summer					
						1939		1938		1937	
cm.	oz.			yrs.		Circuli Width	♂	Circuli Width	♂	Circuli Width	♂
July 10											
28	8		1.04	2+	4.7	1.5	8	1.2	9		
26	5		0.81	2+	4.5	1.2	5	0.5	4		
29	9		1.06	3+	5.7	0.9	3½	1.4	8		
27	8		1.13	2+	4.2	1.2	6	0.7	4		
21	3		0.94	2+	3.1	1.2	7	0.7	5		
22	4		1.13	3+	3.5	0.8	4	0.7	6		
25	4		0.71	2+	3.6	1.3	6½	0.5	4		
32	16		1.37	3+	5.4	0.9	4½	1.0	5	1.0	7
29	8		0.90	3+	3.5	0.6	3	0.7	4	1.0	6
July 13											
22	3½	F	0.93	2+(6)							
20	2½	F	0.89	2+(8)							
27	7	F	1.00	2+(6)							
July 14											
24	5	M	1.02	2+SM+(4)m							
24	5	F	1.02	2+SM+(6)m							
28	8	F	1.03	3+(8)m							
25	7	F	1.27	2+SM+(5)m							
23.5	5	M	1.09	3+(4)							
29	10		1.18	3+	3.8	0.7	3	0.9	5	0.5	3
33	14		1.10	3+	6.5	0.8	4	2.2	12	1.1	8
July 15											
23	5½		1.30	3+	4.6	0.9	6	1.0	7	0.8	6
38	28		1.43	3+	5.5	0.7	3	2.0	9	0.7	4
24	7		1.41	2+							

MOSER RIVER SEA-TROUT 1959 (2)

L. on.	W. oz.	S.	K.	Age yrs.	Total Width of all bands	Growth of Scale during Summer									
						1959 Width μ	1959 Circuli μ	1958 Width μ	1958 Circuli μ	1957 Width μ	1957 Circuli μ				
July 15															
20	2		1.16	3+	5.3	1.0	5	1.1	7	1.1	7	0.7	4		
23	6		1.42	2+	3.8	1.2	7	1.0	7	1.0	7	1.0	6		
21	3½	F	1.14	3+	4.6	0.4	2	1.0	7	0.5	5	1.0	6		
23	4	F	0.93	2+	3.2	1.0	8	0.7	4	1.3	8	0.5	4		
27.5	7½	F	1.05	2+	4.5	1.4	7	1.4	7	1.3	8	0.5	4		
26	7	M	1.13	2+	4.9	1.5	7	1.3	8	1.0	7	0.8	5		
July 16															
22	4		1.07	2+	3.6	1.3	8	0.7	5	0.7	5	0.8	5		
27	8		1.15	2+	5.0	1.0	5	0.8	3½	1.5	8	0.8	5		
35.5	20		1.26	3+	5.8	0.8	3½	1.5	8	1.0	7	0.9	6		
July 17															
28	8		1.03	3+	4.5	1.0	4	1.1	6	1.0	6	0.5	6		
26	7		1.10	2+	4.8	1.5	7½	1.0	9	1.0	9	0.9	7		
24	5		1.01	2+	3.5	1.0	5	0.9	7	0.8	7	0.8	7		
22	5		1.28	2+	3.4	0.9	5	0.8	7	1.3	9	0.6	5		
July 18															
22	3		0.77	2+	4.9	1.3	6	1.3	4	0.6	4	0.6	5		
25	6		1.06	3+	3.6	1.2	7	0.6	4	0.6	4	0.6	5		
23	4½		1.06	3+	3.8	1.0	6	0.8	7	0.5	3	0.6	5		
31	15		1.22	2+	3.0	0.9	5	0.5	7	0.8	6	0.8	7		
						2.4	12	1.0	7	1.0	7	0.8	7		

MOSER RIVER SEALS ABOUT 1939 (3)

L. cm.	W. oz.	S.	K.	Age yrs.	Total Width of all bands	Growth of Seals during Summer				
						1939 Circuli Width $\frac{1}{8}$	1938 Circuli Width $\frac{1}{8}$	1937 Circuli Width $\frac{1}{8}$	1936 Circuli Width $\frac{1}{8}$	
25	6		1.06	2+	4.4	1.0	1.0	1.0	1.0	
25	4		0.95	2+	4.2	1.5	0.6	0.6	4	
<u>July 19</u>										
27	8		1.15	3 ^{em}	4.3	1.2	6	0.5	8	
22	4		1.07	3 ^{em}	4.0	0.8	4	0.5	5	
27	8		1.15	3+	3.9	0.9	4	0.7	4	
27	8		1.15	3+	3.8	0.8	4	0.8	4	
27	8		1.15	2+	4.4	1.7	8	0.5	4	
28	9		1.16	3+	4.0	0.7	3 $\frac{1}{2}$	0.6	4	
32	17		1.46	4+	5.7	1.0	4 $\frac{1}{2}$	0.8	5	
<u>July 20</u>										
28	8 $\frac{1}{2}$	F	1.09	2+	4.5	1.1	6	1.0	8	
25	5	F	1.00	2+	3.5	1.5	6	1.0	2	
25	5 $\frac{1}{2}$	F	1.00	2+	4.2	1.3	6	0.8	6	
25	7	F	1.19	2+	4.0	1.5	8 $\frac{1}{2}$	0.8	5	
25.5	7		1.19	2+	4.2	1.6	8	0.6	7	
25.5	8		1.09	2+	4.9	1.6	8	1.0	7	
25.5	7		1.19	2 ^{em}	3.7	1.2	6	0.5	4	
27.7	9		1.20	3 ^{em}	4.2	0.9	4	0.5	3	
<u>July 21</u>										
25.3	4 $\frac{1}{2}$	F	1.01	2+	4.8	2.0	10	0.7	4	
25.3	4	F	0.90	2+	3.8	1.0	6	0.6	4	
25.4	4 $\frac{1}{2}$	F	1.00	2+	4.0	1.4	7	0.6	4	
19.0	2	F	0.83	2 ^{em}	2.2	0.6	5	0.5	2	
25	4 $\frac{1}{2}$	F	1.05	2+	4.1	0.8	7	0.6	4	
25.8	4 $\frac{1}{2}$	F	1.05	2+	3.8	1.5	7	0.5	4	
26	9	F	1.16	2+	4.2	1.2	6	1.5	11	

MOSBY RIVER SEA-TROUT 1939 (4)

Growth of Scale during Summer

1939
Width of all bands
Circuli Width
Circuli Width

Age yrs.

K.

S.

W.

oz.

L.

cm.

July 22

L.	cm.	W.	oz.	S.	K.	Age yrs.	Total Width of all bands	1939 Width	1939 Circuli Width	1938 Width	1938 Circuli Width	1937 Width
26		6			0.97	2+	3.8	1.2	6 $\frac{1}{2}$	0.5	5	
21.5		4			1.15	2+m	4.0	1.4	7	0.5	4	
36		20			1.21	4+	6.1	0.7	3 $\frac{1}{2}$	1.5	7	
26		6 $\frac{1}{2}$			1.05	2+	4.2	1.5	6	1.0	7	
26		7			1.13	2+	3.5	1.3	7	0.7	6	
27		8			1.15	2+	4.5	1.2	6	0.6	4	
24		5 $\frac{1}{2}$			1.13	2+	3.4	1.2	6 $\frac{1}{2}$	0.6	4	
28.5		11 $\frac{1}{2}$			1.42	3+m	4.6	0.8	4	1.3	7	0.8 5

July 23

21						2+m	3.8	1.2	6 $\frac{1}{2}$	0.8	6	
25						2+	5.0	1.9	8 $\frac{1}{2}$	1.3	8	

m - marked fish.

MOSER RIVER SEA-TROUT 1939.

Note: The following data are of scales collected from the sea-trout descending Mill Brook in May, 1939. Fish for which the sex is recorded were obviously in the kelt condition when taken.

<u>No.</u>	<u>L.</u>	<u>S.</u>	<u>History</u>	<u>No.</u>	<u>L.</u>	<u>S.</u>	<u>History</u>
May 3				May 10			
1	19		2	1	18		2.
2	17		2	2	18		2.+(2)
3	22	M	2.1	3	18		3.
4	18.5		3	4	22.5	F	2.1
5	28	F	2.1	5	20	F	3
6	27	M	2.1+(3)	6	18		2.+(3)
7	17.5		2+(3)	7	16		2.
8	26.5		3.1	8	17		2.+(2)
9	18.5		2+(3)	9	26		3.1
10	25	F	2.1	10	15		2.+(1)
11	15		2	11	16		2.
12	17		2	12	16		2.+(1)
13	17.3		2+(3)	13	21	F	2.1
14	17.4		2.	14	25	F	2.1
15	15		2.	15	30	F	3.1
16	20.2		3.	16	15.5		2.
17	15		2.	17	18.0		2
18	17.6		2+(3)	18	17.5		2.+(1)
19	18.3		2+(1)	19	21.0		2.+(2)
20	18.3		2.	20	20.0		2.+(1)
21	24.4		2.1	21	19.0		2.1
22	27.5	M	2.1	22	19.0		2+(7)
23	27	M.	2.1	23	17.0		2.+(1)
24	24.5		2.1	24	21.0		3.
25	18.0		2+(2)	25	16		2.+(3)
26	20		2	26	27	M	3.1
27	19		3	27	17		3.+(1)
28	27	M	2.1	28	33	F	3.1
29	32	F	3.1	29	26	F	3.1
30	19		2+(4)	30	25	F	2.1
31	24.5		2.1	31	15		2.+(1)
32	20		3.	32	20		3.
33	17		2.	33	25	F	2.1
34	15		2.	34	18		2.
35	26		2.	35	19		2+(1)
36	17.5		2+(2)	36	14		2+(2)
37	15.5		2.	37	13.5	?	2.
38	17.3		2.+(1)	38	24		2.1
39	19		3.+(3)	39	2.5	F	3.?
				40	17		2.+(2)
				41	20		2.+(2)
				42	18		2.

MOGEE RIVER SEA-TROUT 1939 (2)

<u>No.</u>	<u>L.</u>	<u>S.</u>	<u>History</u>	<u>No.</u>	<u>L.</u>	<u>S.</u>	<u>History</u>
<u>May 10</u>				<u>May 11</u>			
43	17.5		2.+ (3)	40	22	F	2.1
44	18		2.	41	16		2.+ (2)
45	19.0		2.	42	16		2.+ (1)
46	16.0		2.+ (2)	43	18		2.+ (1)
47	20		2.1	44	20	F	2.1
				45	16		2.1 + (1)
				46	26	F	2.1
				47	25.5	F	2.1
				48	14.5		2.
				49	19.0		3.+ (1)
				50	23	F	2.+ (1)
<u>May 11</u>							
1	16		2.+ (1)				
2	17.5		2.				
3	15.5		2.				
4	15.5		2.				
5	19	F	3.+ (2)				
6	15.5		2.+ (3)				
7	16		2.				
8	15.5		2.+ (1)				
9	15.0		2.				
10	19.0		2.+ (1)				
11	22.5	F	3.				
12	22.5	F	3.+ (3)				
13	25	F	2.1				
14	21		3.				
15	18		3.?				
16	21	F	2.1				
17	21		3.				
18	22.5	F	2.1				
19	11?		2.				
20	13?		2.				
21	19		2.				
22	26	M	2.1				
23	18		2.+ (2)				
24	16		2.+ (2)				
25	18		2.+ (2)				
26	15		2.+ (1)				
27	16		2.				
28	16		2.				
29	15		2.+ (3)				
30	14.5		2.+ (2)				
31	23	F	2.1				
32	21.5	F	2.1				
33	26	M	2.1				
34	24.5	M	2.1				
35	20		2.+ (2)				
36	16		2.+ (1)				
37	16		2.+ (2)				
38	21		3.+ (1)				
39	18		3.				

In the kelt condition and yet apparently all growth was made in the river.

MOSER RIVER TROUT.

<u>Length</u>	<u>Weight</u>	<u>K.</u>	<u>Sex</u>	<u>Age</u>
<u>West Branch - June 13</u>				
16.1 cm.	45.6	1.09	M	2+(4)
18.5	68.0	1.07	F	3
14.0	31.0	1.13	M	2+(1)
17.5	56.5	1.05	M	2+(3)
16.3	41.9	0.97	F	2+(4)
15.0	37.0	1.09	M	2+(4)
11.5	16.4	1.08		

Goldmine Brook - June 16

19.2	88.7	1.25	M	3
14.2	35.2	1.23	M	2+(1)
14.9	39.4	1.19	M	2+(4)
11.4	18.2	1.23	F	2+(2)
11.2	16.5	1.18	F	1+(4)?

Lower Goldmine - July 10

16.5	50.2	1.12	M	2+(4)
17.8	61.0	1.08	M	2+(1)
15.5	43.2	1.16	F	2+(5)
11.7	20.2	1.26	M	2+(6)

ATLANTIC SALMON AND TROUT INVESTIGATIONS 1939.

Report No. III

Measuring the Force of the Wind.

By W. S. Hoar

An attempt was made to design an instrument which would give the force of the wind with somewhat more accuracy than a mere judgment of its strength. Figure 1 shows an instrument which was found to give reasonably good results. The detailed measurements may be obtained from the drawing, which is to scale. A plumb line "P" is attached near one end of a board, while at a corresponding point on the other end of the board a rubber air-ball and a paper cube are suspended from a single point. The air-ball is much heavier than the paper cube. Parallel lines pass through the points of suspension and at right angles to the long axis of the board. Hence, when the plumb line hangs straight on its line, the sphere and cube will be straight on their line. A goniometer is centered at the point of suspension of the sphere and cube. The force of the wind is taken as the number of degrees through which the sphere or cube is deflected.

It is difficult in measuring the wind to get a fair estimate, since the wind never blows steadily but comes in gusts. Three methods might be followed, the strongest "gusts" recorded, the weakest "gusts" recorded, or the variation recorded. The latter method gives the best estimate. The measurements given below are for the "strongest wind".

On the whole it may be said that the instrument gives a rough estimate, but that it is in no sense very precise.

Measurements Made at the Laboratory.

Date	Time	Greatest deflection		Direction	The Beaufort Scale.
		Sphere	Cube		
Aug. 1	9 a.m.	8	45	S-SW	
	2 p.m.	20	90 -	S-SW	
2	9 a.m.	10	70	NW	
	3 p.m.	4	7	NW	
3	9 a.m.	5	35	S-SW	
	3.30 p.m.	5	35	S-SW	
4	9 a.m.	3	20	S-SW	
	10 a.m.	20	90 -	S-SW	
7	9 a.m.	calm			
	4.30 p.m.	calm			
8	10 a.m.	5	40	W	2
	10 a.m.	0	10	S-SE	1
10	11 a.m.	3	30	S-SW	2
	4 p.m.	3	25	S-SW	2
11	9.30 a.m.	4	40	N-NW	
	4.45 p.m.	4	40	N	
12	10 a.m.	1	20	S-SW	1
	9 a.m.	calm			
15	4.30 p.m.	2	15	S-SW	
	10 a.m.	0	4	S	
19	3.30 p.m.	1	20	SE	
	9.30 a.m.	10	90-	W	3
23	11 a.m.	0	20	S-SW	1
	4 p.m.	0	15	S-SW	
24	3.15 p.m.	1	12	S-SW	
	2 p.m.	2	20	E-SE	
26	11 a.m.	3	35	S	
	11 a.m.	10	70	E	3

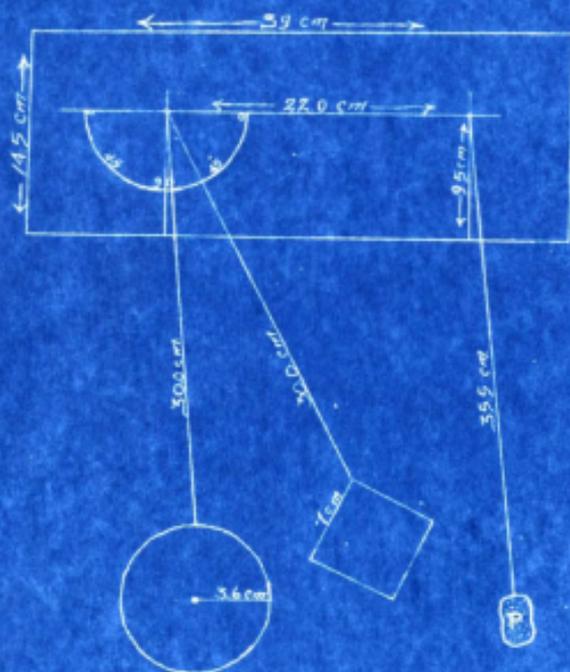


Figure 1

ATLANTIC SALMON AND TROUT INVESTIGATIONS 1939.

Report No. IV

The Moser River Salmon - 1939.

By W. S. Hoar.

The salmon of the Moser River, Nova Scotia, were studied in the usual manner by an examination of the scales and a comparison of the weight-length relationships. A generous sample of smolt scales (100 samples), and kelt scales (35 samples) were available. Scales of the fresh-run sea salmon were fewer (84 samples), due to the fact that the legal commercial fishery of salmon is small - probably 100 fish taken in the nets this season - and the fishermen could not see it to their advantage to save the scales.

Salmon Smolts.

Between May 5 and May 19, 50 scales samples were collected from the smolts descending Mill Brook. On May 29, 44 smolt scale samples were collected from fish going down to the main river. The data is given in detail in Appendix A, and summarized in the following table.

Date and Place	No. of Samples	% of 3-winter Smolts	% showing smolt spring growth
Mill Brook			
May 5 and 6	7	14.3	0.0
May 15	19	31.6	26.3
May 19	23	8.7	65.2
Moser River			
May 5 to 19	49	18.4	40.8
May 29	44	11.1	86.4
Total	93	15.5	63.4

The majority (98%) of the Moser River salmon migrate as either two- or three-year smolts. Of these only 15.5% remain in the river for the extra year. This percentage is small in comparison with the Margaree River where 27% migrate as three-year fish, or in comparison with Forest Glen Brook where 73% of the fish remain in the river for three years. Temperature, hence food, is the most obvious explanation of this difference. The Margaree River, in a more northerly latitude, and with a greater discharge from a higher altitude, never attains the high temperature of the Moser River with its long open spaces and very shallow waters. Consequently, the parr grow faster in the Moser River (average length, 16.1 cm.) than in the Margaree (average smolt length, 15.1 cm.) and go to sea somewhat earlier as smolts. Likewise, there is an apparent difference in the growing conditions of the Moser River proper and Mill Brook. The smolt of the main river are on the average 16.5 cm. long at migration, while those of Mill Brook are 15.7 cm. in length. Moreover, there are 18.4% of three-year smolts descending Mill Brook in comparison with 11.1% from the main river. The records show that the temperature of the main river is higher than that of the brooks from which the smolt of Mill Brook are derived. The explanation of the difference is probably to be sought in this fact.

The data from smolt descending Mill Brook suggest that the three-winter fish tend to leave the river earlier, on the average, than do the two-winter salmon. This might be expected since they are on the average longer (17.1 cm.), than the two-year fish (15.9cm.).

In the studies of the smolt spring growth of the Margaree fish (M.C.S. reports, 1937), we found that over 95% of the fish leaving that river had made some growth for the current year. Of the Moser river fish studied only 63.4% had added broad circuli to the scales this year. There is, however, probably no real difference between the fish of the two rivers in this respect. The Moser River fish were collected about a week earlier than the Margaree fish, and as is evident from the table the amount of spring growth is dependent upon the time when the fish are taken. According to Mr. H. C. White the main run of fish occurs at about the same time in the two rivers.

Some of the smolt scales show rather definite spawning marks. The erosion is never as great as that seen in the large sea-salmon, but evidence of spawning is recorded by a shearing of the winter circuli at the sides of the scale. The tip of the scale often shows no evidence of erosion. Examinations of the parr have shown that it is always the male fish which become sexually mature, and that this is the regular course of events at the end of the second and third years and sometimes at the end of the first year. The scales of the Moser River smolt were examined for evidence of this spawning mark. It is very evident in some cases, in others quite doubtful. From a study of the percentages it seems probable that no mark is formed in certain scales. Moreover, the fall spawning mark can rarely be recognized until some broad spring circuli have been formed. It is of interest to note that about 65% of the three-year smolts show evidence of a spawning mark. This confirms our former findings that

the male parr tend to remain in the river longer than do the females (M.S. reports, 1937).

A rather exceptional smolt of 23 cm. was taken in the Moser River trap on June 6. The scales show that this fish spent four winters in the river and spawned on at least two occasions. This record affords definite evidence that at least some of the large parr, mentioned in the next paragraph, do eventually become smolts and go to sea.

Although it is customary for the salmon to go to sea after two or three years in the river, a certain number of parr both in Moser River and Smith Brook remain in fresh water for four or five years. These fish are always males. Their scales show very rapid spring growth, growth comparable to that of the smolt, and spawning marks are usually evident. Why these fish should spend the extra years in the river is a mystery. It seems probable that the sexual maturation of these fish is in some way responsible, since sexual maturation has been found to inhibit the thyroid gland (Lieber, 1936)[†] and an active hyperplasia of this gland is associated with the smolt metamorphosis (Hoar, 1939)[†].

An interesting comparison may be made between these large parr and an exceptional salmon taken in Mill Lake on July 27th. This fish had been marked as a smolt during the run of May or early June, and had returned to the lake. It appeared to be a typical salmon in every sense. Its condition factor was 0.84, typical of that of the smolt and comparable with that of young salmon forced to remain in fresh water (M.S. reports, 1937). Scale studies show that this was a two-year fish and that it had made exceptionally good growth for

the current year. In the following tabulation it is compared with a typical large parr from Smith Brook.

	Length cm.	Weight grs.	K	Sex	Age yrs	Bands Added this year	%total scale added in 1939
Smolt July 27	19.1	58.25	0.84	F	2+	16	43.8
Parr July 12	19.5	84.0	1.14	M	4+	5	11.3

* Lieber, A. Z. F. wiss. Zool., Abt. A. 148, 364-400, 1936.

† Hoar, W. S. J. Morph. September, 1939.

Salmon Kelts.

Between May 6 and June 7, data were collected from 32 kelts descending from Mill Brook. Appendix B gives the results in detail.

With one possible exception these fish had all spawned as grilse. Their scales do not show any growth for the current year.

34.3% of these fish went to sea first as three-year smolts, and 3.1% (1 fish) as four-year smolts. Thus, the percentage of three-year migrants as shown by the kelt scales is greater than shown by the smolt scales. If one were justified in drawing conclusions from such limited data, it would seem that either the three-year smolt migrants of Moser River ^care more apt to return to the river as grilse- a conclusion not confirmed by the data on sea-run salmon given below - or that the three-year group linger longer

in the river and are the fish caught as kelts in the spring. The latter view seems the more probable.

Considering the age of the migrating smolt in relation to the sex of the fish, the data again show that the males tend to migrate to the sea later. 78% of the three-year migrants were males, and 82% of the two-year migrants females. This fact appears over and over again and appears to be related to the sexual maturation of the male parr.

Only 29% of this group of fish were found to be males. This figure is in fair agreement with that for the Margaree River fish, where 25% of those going to the sea were found to be males, and 23% of those returning.

Sea-run Salmon

84 scale samples were taken from salmon and grilse taken in the vicinity of Moser River. This is probably a very small number of those taken legally and illegally in the region. Poaching seems to account for the most of the fish taken on the coast and in the river - fish not only being caught for local consumption but also, at times, being shipped out on a commercial scale.

Details of the scale readings and condition factor calculations will be found in Appendix C.

The Coefficient of Condition. The salmon and grilse examined during June and July had an average condition factor of 0.96. This is much lower than that of the Saint John salmon, but about the same as that of salmon from the Margaree (M.C.S. Reports for 1937 and 1938). Feeding conditions in the Bay of Fundy are exceptionally good and the

and the difference is to be expected.

Seven grilse taken at Moser River Bridge on August 24 had an average factor of 0.80, showing the expected seasonal decline in condition.

The Scales - The fish of the Moser River are predominantly grilse. Salmon ascending the Moser River must pass through a trap. 487 fish were taken here between June 13 and August 26. Of these 465 or 95.5% were grilse. None of the maiden fish examined had spent more than two winters in the sea.

27.5% of the salmon - grilse excluded - showed a spawning mark on their scales. All of these fish had spawned as grilse. This percentage is high in comparison with certain other rivers (8% for the fish of the Bay of Fundy in 1938), and may indicate that salmon spawning as grilse have a better chance of surviving than those which spawn when older.

24.4% of the fish had migrated to the sea as 3-year smolts. This percentage is somewhat higher than might be expected from the study of the smolt scales. However, the number of sea-run salmon was small and a comparison may not be justified.

Winter growth for 1939 was noted on some of the scales after August 6. This was quite pronounced (3-5 circuli) by August 24.

Many of the grilse scales collected at Moser River bridge on August 24 showed erosion for the current year.

Scale studies show that certain of the spawned salmon return to the river after spending a very short time in the sea. Very little, or no growth may be made beyond the spawning mark on the scale. Thus, a 69 cm. female fish had spawned first as a grilse and again the next

year, and was taken in the river on August 6. Very little growth was evident beyond the spawning marks. Another fish taken at Little Gasperessu Falls on August 12 had made practically no growth since its spawning in 1938, and yet was apparently in good condition.

As evidenced by the spawning of the grilse and the number of short absence spawners, the Moser River salmon tend to return to the river after spending the shortest possible time in the sea.

Summary.

1. 98% of the Moser River fish migrate to the sea as 2- or 3- smolts. Of these 15.5% remain for the extra year. Parr grow faster in Moser River proper than in Mill Brook and its tributaries. Food and temperature are seen to be the factors responsible. The 3-year smolt left Mill Brook earlier than the 2-year olds. The majority of the Moser River smolt show spring growth before going to the sea. 65% of the 3-year smolts show evidence of having spawned as parr. These are presumably the males.
2. 29% of the kelts examined were males. The males, on the average were older at the time of first migrating to the sea as smolts.
3. The coefficient of condition of the Moser River salmon is of about the same order as that of the Margaree fish.
4. 95.5% of the Moser River fish are grilse. None of the maiden fish examined had spent more than 2 years in the sea. The percentage of spawners for the Moser River is fairly high (27.5%). A number of these are the short-absence type of fish,

spending a very brief period in the sea after spawning and making very little growth. 24.4% of the mature salmon studied had migrated to the sea first as 3- year smolts. After August 6 winter growth is common on the scales of fish ascending the Moser River. Erosion is evident on many of the scales by August 24.

Appendix A.

MOGER RIVER SALMON SMOLTS 1939

Mill Brook Trap.

<u>No.</u>	<u>Date</u>	<u>Length</u>	<u>Age</u> (winters)
1	May 5	14.0	2
2		15.0	3
3		17.0	2
4		15.0	2
5		17.0	2
1	May 6	13.4	2
2		14.0	2
1	May 15	16.0	3 (SM after 2nd?)
2		16.0	2
3		15.0	2
4		15.0	2
5		17.0	2+SM+(4)
6		16.0	2?
7		18.0	3 (SM after 2nd?)
8		18.0	3
9		13.0	2
10		15.5	2+(1)
11		16.0	2
12		17.0	2 + (1)
13		16.0	2 + (3)
14		18.5	4 ?
15		20.0	1 + SM + 1
16		14.0	No scales
17		14.0	2
18		15.0	2 + (2)
19		15.0	2
20		15.0	2
1	May 19	15.0	2
2		14.5	2 + (3)
3		17.5	2 + (2)
4		15.0	2 + (2) (SM ?)
5		12.5	2 + (1)
6		15.0	2 + (2)
7		15.0	2
8		17.0	2 + (1)
9		15.0	1 + SM + (2)
10		17.0	2
11		15.0	2 + (1)
12		15.0	2 + (3)
13		15.5	2 (SM ?)
14		16.0	2
15		17.0	2 + SM + (1)
16		15.0	2 + (2)
17		14.5	2 + (3)
18		19.0	1 + SM + SM + (3)
19		16.0	2 + (3)
20		17.0	2 + (2)
21		?	2
22		17.5	2
23		?	2

Appendix A.

MOGGER RIVER SALMON SMOLTS 1939

Mill Brook Trap.

<u>No.</u>	<u>Date</u>	<u>Length</u>	<u>Age (winters)</u>
1	May 5	14.0	2
2		15.0	3
3		17.0	2
4		15.0	2
5	May 6	17.0	2
1		13.4	2
2		14.0	2
1		16.0	3 (SM after 2nd?)
2	May 15	16.0	2
3		15.0	2
4		15.0	2
5		17.0	2+SM+(4)
6		16.0	2?
7		18.0	3 (SM after 2nd?)
8		18.0	3
9		13.0	2
10		15.5	2+(1)
11		16.0	2
12	17.0	2 + (1)	
13	16.0	2 + (3)	
14	18.5	4 ?	
15	20.0	1 + SM + 1	
16	14.0	No scales	
17	14.0	2	
18	15.0	2 + (2)	
19	15.0	2	
20	May 19	15.0	2
1		14.5	2 + (3)
2		17.5	2 + (2)
3		15.0	2 + (2) (SM ?)
4		12.5	2 + (1)
5		15.0	2 + (2)
6		15.0	2
7		17.0	2 + (1)
8		15.0	1 + SM + (2)
9		17.0	2
10		15.0	2 + (1)
11		15.0	2 + (3)
12		15.5	2 (SM ?)
13		16.0	2
14	17.0	2 + SM + (1)	
15	15.0	2 + (2)	
16	14.5	2 + (3)	
17	19.0	1 + SM + SM + (3)	
18	16.0	2 + (3)	
19	17.0	2 + (2)	
20	?	2	
21	17.5	2	
22	?	2	
23	?	2	

Appendix A (continued)

MOSER RIVER SALMON SMOLTS 1939.

Moser River Trap

<u>No.</u>	<u>Date</u>	<u>Length</u>	<u>Age (winters)</u>
1	May 29	17.0	3 + (2) (SM ?)
2		15.5	3 + (2)
3		15.0	3 + (1) ? (SM ?)
4		15.5	2 + (2)
5		17.0	3 + (2)
6		20.0	2 + (3)
7		17.0	2 + (2)
8		15.0	2 + (3)
9		19.0	2 + (3)
10		16.0	2 + (2)
11		15.0	2 + (1)
12		14.0	2 + (3)
13		14.5	2 + (3)
14		13.0	2
15		14.0	2
16		16.5	2 + (3)
17		15.5	2 + (2)
18		16.0	2 + (3)
19		15.0	2 + (3)
20		17.0	2 + (3)
21		17.5	2 + (3)
22		14.5	2 + (3)
23		15.5	2 + (3) (SM ?)
24		16.0	2 + (2)
25		13.0	2
26		15.0	2 + (2) (SM ?)
27		18.5	2 + (4)
28		15.0	2 + (3) (SM ?)
29		15.5	2 + (3)
30		18.0	2 + (3) (SM ?)
31		18.0	2
32		17.0	2 + SM + (4)
33		18.0	2 + (2)
34		17.5	2 + (2) (SM ?)
35	17.0	2 + (3)	
36	17.5	2	
37	19.0	2 + (4) (SM ?)	
38	18.0	2 + (3)	
39	17.0	2	
40	16.0	2 + (3)	
41	19.0	1 + SM + (3)	
42	19.0	2 + (2)	
43	18.0	2 + (4)	
44	18.0	2 + (4)	
45	June 6	23.0	2 + SM + SM + (7)

Appendix B.

SALMON KELTS 1939.

<u>Date</u>	<u>Place</u>	<u>Tag No.</u>	<u>Length</u>	<u>Sex</u>	<u>History</u>
May 6	Moser River		52cm.	M	2? . 1 + SM
7			59	F	3 . 1 + SM
11	Mill Brook Trap	1346	55	F	2 . 1 + SM
		1342	52	F	2 . 1 + SM
		1343	53	F	2 . 1 + SM
		1345	54	F	2 . 1 + SM
		1340	56	F	2 . 1 + SM
		1347	56	F	3 . 1 + SM
		1349	56	F	2 . 1 + SM
		1348	56	F	2 . 1 + SM
15			56	F	3 . 1 + SM
			55	F	2 . 1 + SM
			54	F	2 . 1 + SM
13	Moser River	1350	56	MY?	2 . 1 + SM
19	Mill Brook Trap	8002	55	F	2 . 1 + SM
20		8003	54	F	2 . 1 + SM
27		8004	56	F	2 . 1 + SM
		8005	65	M	2 . 1 + SM
		8006	56	F	3 . 1 + SM
28		8007	56	M	3 . 1 + SM
29		8008	53	F	2 . 1 + SM
		8009	55	F	2 . 1 + SM
		8010	60	M	3 . 1 + SM
		8011	60	M	3 . 1 + SM
31		8013	53	M	3? . 1 + SM
		8014	59	M	4 . 1 + SM -
June 1	Mill Brook Trap	8015	57	F	2 . 1 + SM
4		8016	55	F	2 . 1 + SM
		8017	61	M	3 . 1 + SM
		8018	57	F	2 . 1 + SM
7		8019	68	F	3 . 1 + SM - SMT
Date?		8012	56	F	2 . 1 + SM
<u>1938</u>					
Oct. 29	Johnny Smith Brook		58	M	3 . 1 + SM
Nov. 2			50	F	2 . 1 + SM
3			52	F	2 . 1 + SM
			61	M	3 . 1 + SM
			60	M	2 . 1 + SM
			50	M	2 . 1 + SM

Note: These fish were taken while spawning.

Sea-Run Salmon - 1939

Note - The majority of the salmon were taken from three nets operating outside of Moser River, viz., of Wm. Smith, Clifford Smith and Ernest Smith; and one inside the Moser River estuary, that of Raymond Drillio. The initials in the following table indicate the collector.

Date	Place	Length cm.	Weight lb.	Sex	K	History
June 14	C.S.	28	10			2.2
	E.S.	28	8			2.2
	E.S.	28	9			3.1+SM+1
	W.S.	79	9		0.83	2.2
15	E.S.		9			2.2
	W.S.	69	7		0.97	2.2
	R.D.	77	9		0.89	2.2
	R.D.	78	10 $\frac{1}{2}$		1.00	3.1+SM+1
16	W.S.	76	8 $\frac{1}{2}$		0.88	2.2
	W.S.	81	12		1.02	27.1+SM+1
17	R.D.	79	9		1.09	3.2
21	C.S.		8 $\frac{1}{2}$			3 7.2
	C.S.		14			3.1+SM+1
	C.S.		10			2.1+SM+1+(2)
22	R.D.	73	8 $\frac{1}{2}$		0.97	3.2 (Parr SM)
	R.D.	72	8 $\frac{1}{2}$		1.03	3.2
28	R.D.	72	8 $\frac{1}{2}$		1.03	2.2
July 1	W.S.	79	9		0.83	3.2
	C.S.	77	11		1.09	2.1+SM+1
3	Moser River bridge	75	87			2.2+(4)
4		56	3 $\frac{1}{2}$		0.84	2.1+(8)
	R.D.	54	3 $\frac{1}{2}$		1.01	2.1+(5)
	R.D.	71	7 $\frac{1}{2}$		0.95	3.2
	R.D.	55	4		1.09	2.1+(9)
5	W.S.	71	6		0.76	2.2+(3)
	W.S.	73	7 $\frac{1}{2}$		0.88	2.2
	R.D.	75	10		1.07	2.2+(8)
	C.S.	79	11		1.01	3.2+(3)
	C.S.	71	8 $\frac{1}{2}$		1.08	2.2+(4)
6	Moser River trap	54-56				2.1+(8)
	"	"				2.1+(9)
	"	"				2.1+(8)
	"	"				2.1+(5)
	R.D.	52	3 $\frac{1}{2}$		1.05	2.1+(7)
		75	8 $\frac{1}{2}$		0.94	2.2
		73	8		0.93	3.1+SM+1
7	W.S.	77	11		1.09	2.2+(4)
	W.S.	67	6		0.91	2.2
9	Trap	57	4 ?			? .1+(10)
15	W.S.	73	8		0.93	2.2
	C.S.	69	7		0.97	2.2+(11)

Appendix C - continued

Date	Place	Length Weight		Sex	History	K
		cm.	lb.			
June 12	Necum Teuch		12		3.1+SM+1	
			12		3.2	
13	Moser River	54			3.1	
14	Necum Teuch		8 $\frac{1}{2}$		2.2	
17		66		M	2.1+SM+1	
27	Mill Brook	55		F	2.1+SM	
July 3	Little Gasperreu Falls	79			2.2	
5	Oak Island				2.1+(7)	
9	Gasperreu Falls				2.1	
20	"		2 $\frac{1}{2}$		2.1	
Aug. 12	Little Gasperreu Falls				2.1+SM+(2)	
Aug. 6	Moser River Bridge	56			3.1+(3)	
		54			2.1+(5)	
		55			2.1	
		54			2.1+(9)	
		56		F	2.1	
		53		M	2.1+(8)	
		53		M	2.1	
		69		F	2.1+SM+SM	
		52		M	3.1+(7)	
		55		M	2.1+(10)	
		7		F	2.1	
Aug. 11	Moser River Bridge	56			2.1+(9)	
15	Moser River above trap	50 $\frac{1}{2}$			2.1+(11)	
16	Rocky Island	57			3.1	
	Moser River	55	3		2.1+(10)	0.91
17	Moser River - down trap	52			2.1	
24	Moser River Bridge	71		F	2.2	
		55	3 1/8	F	27.1+(9)	0.85
		53	3	F	2.1	0.91
		52	2 $\frac{1}{2}$	F	7.1	0.81
		52	2 $\frac{1}{2}$	F	2.1+(9)	0.73
		54	2 $\frac{1}{2}$	F	2.1+(10)	0.79
		56	3	F	2.1+(11)	0.77
Aug. 26	Moser River Bridge	54	2 $\frac{1}{2}$	M	2.1+(11)	0.72
26	Rocky Island				3.1+(8)	

Appendix D.

The Salmon Caught in the Shore Nets

Totals

Clifford Smith - 35 or 40 salmon taken

Ernest Smith - 14

William Smith - 10

Raymond Drillie - 16

Day by Day Catch - available data

Clifford Smith - June 9 (1 fish), June 10 (3), June 12 (2), June 13 (1).

Ernest Smith - week of June 4 (2), June 12 (4), June 13 (3),

June 14 (2), June 15 (1)

William Smith - June 11 (1), June 13 (1), June 14(1), June 15 (1),

June 16 (1), June 31 (1) (sic)

Raymond Drillie - June 5 (1), June 8 (1), June 13 (1), June 15 (2),

June 16 (1), June 17 (1), June 22 (2), June 28 (1).

Additional data is found in appendix C.

ATLANTIC SALMON AND TROUT INVESTIGATIONS 1939

Report No. V. Notes on the Fauna and Flora of Moser River
and vicinity, 1939.

By W. S. Hoar

An interesting maze of small islands is found seaward from the Halifax county coast in the vicinity of Moser River, N. S. During the summer of 1939, plants and animals were collected from three of these: Bird Islands - B.I. - on July 30; Halibut Islands (Middle Halibut - M.H.I. - on August 13, and the Outer Halibut Island - O.H.I. - on August 21); and White Islands - W.I.1 and W.H.2 - on August 13 and 21. An attempt was made to compare the conditions found on these islands with the conditions existing on the mainland. The collecting on the mainland was mainly at two points - Moser River Village and vicinity throughout the summer, and at Net Point - N.P. - on July 18, where the mainland runs far out into the sea. In addition some collecting was done at Little Island - L.I. - on July 9, at Camp Cove on July 30, and in the Estuary - E - on July 5. The stippled areas in figure 1 show the places of systematic collecting. The letters given after the place names in the above description are a legend for the appended list of animals and plants.

Bird Islands - The Bird Islands are 4 in number. They are small wind-swept pieces of land, devoid of trees and shrubs and at times, said to be, washed completely over by the waves. Trees are said to have existed on these islands in early times. From an old chart of the region there seems to have been no evidence of them as early as 18 . The islands were formerly suitable for fishing bases, but the last of the shanties was washed away about 25 years ago.

Biologically, one of the most interesting things about the islands is the nesting of Leach's petrel. The burrows of this bird are rather common in the fine black top-soil of the higher parts of the land. The old birds were incubating the eggs there on July 30. The vegetation of these less exposed parts of the island consists for the most part of introduced weeds.

On the more exposed and rocky parts of the island one finds seaside spurge, plantage decipiens, Solidago sempervirens, Cakile americana and little else. A complete list of the plants collected is appended. Young sea-pigeons were found among these exposed rocks.

The tide pools are typical of those of these outer exposed and wave swept shores. Lithothamnion forms a beautiful lichen-like mat in the sheltered pools, while kelp is very plentiful where the waves beat on the exposed rocks. The fauna here is quite varied. A list is appended.

Middle Halibut Island - The outer portion of this island is comparatively low, windswept and devoid of trees. The most of the island - inner portion - is higher, very rocky and covered with white spruce of fair growth. The lower portion is covered with a very thick carpet of crowberry - Empetrum nigrum - in which is scattered Vaccinium Vitis

ides and *V. oxycoccus* and *Maianthemum*. Here a few very stunted spruce trees were found in certain depressions. These trees were about 1½ feet tall, with branches about 5 feet long and so densely matted together that one could easily walk over the depression. Apparently the force of the wind across this low open portion of the island prevented a greater growth. Two men could lie comfortably on the top of one of these trees.

A few nesting petrels were found here but most of the nests were empty. Field mice - *Microtus pennsylvanicus* - are numerous here and this may explain the empty petrel nests. Empty eider duck eggs were evident, and gulls use the place extensively for perching. Cormorants are common on the off-shore rocks.

Outer Halibut Island- This island is larger than the ones previously described, and is covered with a rather good growth of trees - White spruce, maple, ash and alder. Plants collected here will be found in the appended lists.

No petrels were found nesting here.

The tide was too high for good shore collecting, although some dredging was done near-by. This is described below. It was interesting to find 8 goose-barnacles in the driftweed on the outer side of the island. These are not normally found in our latitude and must have been brought in the Gulf Stream.

White Islands - The White Islands were the farthest point from the mainland visited during the season. The conditions here were the most extreme in showing the effect of wind and temperature. The spruce in particular shows a sub-arctic condition on the more exposed portions of the island. The growth is low, gradually rising from trees of

from 2 to 3 feet in height up to 10 or 15 feet; and with their branches so closely matted together that one may climb about on their tops. The tops are rather flat. In less exposed regions, where the growth is in larger areas, conditions are normal, although the trees are of a small size. The condition, on the whole is not nearly as extreme as that found on the coasts of Labrador and Newfoundland (Dr. A. G. Huntsman, personal communication).

A study of the flowering of the yellow rattle - Rhinanthus Crista-galli - indicates that the season here is about 6 weeks later than that on the mainland near Moser River. The plant was found in a similar condition here on August 21 to that at Moser River on July 9. This plant, by the by, grows more luxuriantly on the White Islands than in the fields around Moser River. The season here is so shortened that we find summer and fall flowers in blossom at the same time.

Solidago sempervirens and *Cakile americana* are the conspicuous plants on the open exposed rocks of the islands, although the growth on the less exposed parts is typical of that on the other islands. Plants collected from the White Islands are appended.

Leahe's petrel nests here. Fledglings were found here. The birds were of a fair size and had apparently been deserted by the parents on August 21 (H. C. White, personal communication).

Land snails (*Helix* sp) were rather plentiful. They have not been collected at any other point either on the mainland or islands near by.

Cormorants are reported to have killed all the trees on the Little White Island.

No evidence could be found of either the snakes or the ghosts,

so frequently described by the native people as a part of the fauna of these islands.

Little Island - The terns nest here in large numbers. On July 9 eggs were found in all stages of development from a 5 to 10 somite stage to the hatching birds. No young were found. The large numbers of field mice found here may possibly explain this fact.

Net Point - The shore collecting at Net Point was in a sheltered cove - Mitchell Bay - where the bottom was rather muddy and the rocks less well washed than at more exposed points such as Camp Cove. The fauna was much less varied here than on the outer islands. A list of the forms collected is appended. None of the calcareous algae - Lithothamnion - so common in the pools of the outer islands is found in these sheltered coves and less exposed beaches.

The flora at Net Point is somewhat more extreme than that at Moser River, although the forms are generally similar. Crowberry is very common on the point. A list of the plants collected is appended.

A bog near-by at West Ecum Secum was visited on August 27. It is typical of the bogs of this region. Crowberry, baked apple berry, bunchberry, sedge, and goldenrod (squarrose) are most common in the heart of the bog. The crowberry does not grow as well here as in the more rocky, drier, and exposed localities. At the edge of the bog native Juniper, blueberries, reindeer moss, small spruce and hackmatack, Potentilla tridentata, and cranberries are common.

The Dredging - Dredging was carried out at three different points on August 22 (figure 1). At the first point (1 to 3 fathoms) the bottom was either very soft or very "kelpy". A fair variety of forms, listed at the end of the paper, were obtained.

At the second point (1 to 3 fathoms) the bottom was rocky and the yield predominantly sea urchins and sand dollars.

The third area (3 fathoms) did not differ at all from the second and the operation was not prolonged.

Fishing was also carried on while dredging. The yield was poor (cod, flounder, pollock).

Discussion - In going out to sea from Moser River Village definite seasonal differences in the flowering of the plants is noted. Thus, Rhinanthus Crista-galli was found in blossom 6 weeks later on the White Islands than at Moser River, while it was fully a week later at Net Point than at the latter place (collected July 9 at Moser River, July 18 at Net Point and August 21 at White Island). The season is much shorter on the outer islands and the flowering of the plants correspondingly collapsed as to season. The species do not differ greatly from place to place.

A number of arctic plants are found at Moser River and vicinity: *Potentilla tridentata*, *Rubus chamaemorus*, *Rhodendron canadensis*, *Cornus canadensis*, and *Chiogenes hispidula*. The first three were not collected from the islands but only on the mainland. The condition is not extreme.

The heavy winds leave their mark on the vegetation of the outer islands. In particular, the white spruce tends to be stunted and matted together in its growth with the tops of the trees very flat. This condition is not extreme.

Empetrum nigrum becomes more common as one goes toward the coast and the exposed rocks. It is not however uncommon in the vicinity of Moser River village, especially on the upper hills. It grows more luxuriantly on the exposed rocks.

The marine invertebrates show little striking differences in distribution from place to place. Some forms - Metridium, Clava, Trachydermon, Anomis, Henricia, Ophiopholis - were found only on the outer islands, but, as will be seen from the appended lists, most of the species listed are of rather general distribution.

Littorina radis seems to extend farthest up the estuary. At Lowe's landing the spirals of the shells of this form are greatly eroded. Littorina littorea was found farther down the estuary but L. palliata was not found here at all.

Note: The appended lists are in no sense exhaustive for the region and the identifications have yet to be checked by the experts.

Marine Fauna Listed - 1939

PORIFERA

Reniera mollis - O. H. I. - W. I. 2

Demospongia Unidentified - N. P.

COELENTERATA

Hydrozoa

Compenularia flexuosa - B.I. - M.H. I. - C. C. - N.P. -
W.I. 2 - D1. Common everywhere.

Obelia sp. - B.I.

Clava leptostyla - B.I. - M.H.I. Rather common.

Sertularia pumila - B.I. - M.H.I. - W.I. 2 - D1 -D2.
Common everywhere.

Scyphozoa

Cyanea arctica - N.P. - M.H.I. - numerous disintegrating
specimens seen at Marie Joseph, Aug. 27th.

Aurelia fleavidula - C.C. - N.P.:

Helicystus auricula - D1.

Actinozoa

Metridium marginatum - B.I. - M.H.I. - W.I.2 - Small specimens
(1 inch high) common on outer isles.

unidentified specimen - B.I. - W.I.2 - D1.

NEMATHELMINTHES

Slender white nematod ($\frac{1}{2}$ inch long), possibly Pontonemus marinum
is common everywhere. Listed N.P. - B.I. - O.H.I. - D 2.

NEMERTEA

Unidentified species, bright red in color and about 2 inches
long extended, is common everywhere. Listed from C.C. - M.H.I.-
W.I. 2 - Exam Secum.

BRYOZOA

- Membripora sp. - B.I. - W.I.2 - Very common.
Lichenophora sp. - D1 - Extremely common on the kelp here.

ANNELIDA

- Glycera dibranchiata at Moose Head.
Nereis diversicolor - E.
virens - C.C. - N.P. - D2. Common beneath stones.
Polynoe squamatus - B.I. - W.I.2 - D1 - D.2. Very common.
Spirorbis spirorbis - C.C. - N.P. - B.I. - M.H.I. - O.H.I.
W.I. D.1 Most common annelid. Found
on the sea-weed everywhere.
Unidentified specimens under Lithothamnion - Common.
Glyceridae unidentified - O.H.I. - W.I. 2.
Cases of worms - unidentified - D 2.

MOLLUSCA

Amphineura

- Trechydermon ruber - B.I. - D. 2. Not too common.

Pelecypoda

- Mytilus edulis } E. (skeleton only of Modiola) L.I. sk.-
Modiola modiolus } C.C. sk - N.P. (skeleton only of Modiola)
B.I. - H.I. - W.I. - D2. These are the most
pelecypods found - Modiola being more common
on the outer islands and Mytilus nearer the
mainland.
Mya arenaria - E. - L.I. sk. - C.C. sk. - N.P. - Eoum secum.
Ensis directus - C.C. sk.
Saxiceva arctica - B.I. sk. - W.I.2 - D2 - Common at depths,
and farther out.
Anomia sculesta - B.I. - W.I.2 - O.H.I. - Common on shells
and stones at depths and farther out.
Cardium pinnulatum - D2.
Unidentified species D1.

Gastropods

- Littorina littorea* - Found along the shore everywhere.
The most common mollusc.
- rudis* - Less common, and listed from L.I. - N.P.
E. - W.I. Found farther up the estuary than
the last - as far as Lowe's landing the
specimens here having the spires of the shell
considerably eroded. At Wet Point found
high up on the exposed rocks.
- pellista* - N.P. - C. C. - B.I. - W.I. less common
than the other two and not found in the
estuary.
- Buccinum undatum* - E.sk - C.C.sk. - N.P. sk. - M.H. sk. Empty
egg cases of this form were found in the
drift weed at O.H.I.
- Polynices heros* - E.sk. - Eggs found at N.P.
- Purpura lappalus* - C.C. - N.P. - B.I. - M.H.I. - W.I.1 - W.I.2 -
Eggs found at B.I. and C.C. Empty egg cases
found at Moon Secum Aug. 27. This species is
very common, the numbers increasing as one
goes to the outer islands. At the White
Islands it is almost as common as *Littorina*
- Acmaea testudinalis* - C.C. - N.P. - B.I. - H.I. - W.I. - D.2.
Extremely common everywhere.
- Unidentified (2 species) D1 and D2.

ARTHEROPODA

Amphipoda

- Gammarus locusta* - C.C. - E. - N.P. - B.I. - M.H.I. - W.I.2 -
D.1 - D.2 - Extremely common.
- annulatus* - B.I.
- marina* ? - B.I. - W.I. 2.
- Talorchestia megalothelma* - C.C.

Isopoda

- Jaera marina* - E. - M.P. - B.I.
- Idothea marina* - N.P. - B.I. - W.I. 2

Schizopoda

- Mysis stenopaeis* - N.P. Common.

Cirripedia

- Balanus balanoides* - L.I. - C.C. - N.P. - E.I. - H.I. - W.I.
Extremely common everywhere that rocks
are exposed to the open sea.
- Lepas fascicularis* - O.H.I. - W.I. 2 - Several specimens found
in the drift weed on the outer side of the
islands. Specimens living.

Decapoda

- Cancer irroratus* - C.C. sk - N.P. - E.I. - M.H.I. - O.H.I. sk -
D1 Very common under rocks along the shore.
- borealis* - O.H.I. sk. Less common.
- Crago septemspinosus* - E. - D1 Very numerous at times in lower
part of estuary.
- Palaeomonetes vulgaris* - N.P.
- Pandalus montegui?* D1 - D2 - Very plentiful in the dredgings
- Pagurus* sp - D2. Very small specimens.

Arachnida

- Nymphon longitarse?* - D2.

ECHINODERMATA

Asteroides

- Asterias vulgaris* - C.C. - N.P. - E.I. - M.H.I. - W.I. - D1 - D2.
The most common star-fish. Found everywhere.
- littoralis?* D1.

- Henricia sanguinolenta* - E.I. - D1 Less common near shore.

Echinoides

- Strongylocentrotus drobschiensis* - L. I. sk - C.C. sk - E.I. -
M.H.I. - O.H.I. - W.I. - D2. This form is very
common - the most common echinoderm found in
the district.
- Echinerachnius perma* - D2 - Many at this place.

Ophiuroidea

- Ophiopholis aculeata* - W.I. 2. - D.I. - D.2. Many taken in roots
of kelp while dredging.

CHORDATA

Tunicata

Leptoclinum albidum - D 1.

Unidentified species - C.C. - N.P. - B.I. - W. I. 1

species - D.1 - W.I. 2

species - W.I. 2.

species - D. 2

Pisces

Pholis gunnellus - C.C. - N.P. - B.I. - D2 Common

Anguilla rostrata - N.P.

Myoxocephalus scorpius - N.P. - D.1 - D.2

Urophycis tenuis - N.P.

Pseudopleuronectes americanus - N.P.

Microgadus tomcod - N.P. took 46 specimens 4 to 5 cm. long.

Apeltes quadracus - N.P.

Clupea harengus - N.P. Small specimens (4 to 5 cm.)

Tautoglabrus adspersus - N.P.

Cyclopterus lumpus - N.P. small specimens in rock weed.

Gasterosteus aculeatus - B.I. - W.I. 2.

Anarhichas lupus - taken hereabouts on trawls

Many schools of small 6 inch mackerel at
Marie Joseph on August 27.

Mammalia

Seals seen in large numbers out from Harrigan Cove - July 30

also enroute to the White Islands August 21.

Porpoise skeleton on the beach at Camp Cove July 26.

PLANTS LISTED - NET POINT AND VICINITY, JULY 18

- Empetrum nigrum* - Crowberry - fruit. (green)
Ledum groenlandicum - Labrador Tea.
Vaccinium Vitis - Idea minus - Rock Cranberry.
Cornus canadensis - Bunchberry.
Juniperus communis
Kalmia angustifolia - Lambkill
Vaccinium pennsylvanicum - Blueberry
Eriophorum chamissonis - Cotton grass - flower
Rhinanthus Crista-galli - flower
Sarracenia purpurea - Pitcher plant - flower
Iris versicolor ? - flower
Euphrasia canadensis - flower.
Prunella vulgaris - flower

NEAR MOOSE HEAD - JULY 30

- Calopogon pulchellus* - flower
Melanophyrum lineare - Cow wheat - flower
Scutellaria galericulata - Skull Cap - flower
Myrica carolinensis - Bayberry.

PLANTS LISTED - BIRD ISLANDS - July 30

Rhinanthus Crista-galli - flower
Lathyrus maritimus - flower
Iris ? Blue flag - fruit
Ranunculus -- Buttercup - flower
Potentilla monspeliensis - flower
Potentilla anserina - flower
Euphorbia polygonifolia - fruit ripening
Osunda cinnamomea
Achilles - White yarrow - flower
Thalictrum - Meadow Rue - flower
Empetrum nigrum
Plantago decipiens (borealis)
Mertensia maritima - flower
Convolvulus sepium - flower
Smilacina racemosa - flower?
Epilobium augustifolium - no flowers
Solidago sempervirens - no flowers yet
Cakile americana - flower
A wild lettuce not identified

MIDDLE HALIBUT ISLAND - August 13

Iris - Blue flag - fruit
Rubus - raspberry - ripe fruit
Solidago sempervirens - flower
Empetrum nigrum - very plentiful
Cornus canadensis - fruit
Mertensia maritima - flower
Achilles - white yarrow - flower
Vaccinium pennsylvanicum - fruit - not plentiful
Lathyrus maritimus - flower and fruit
Cirsium alpina - flower. Common on upper rocks
Scutellaris galericulata - flower - common on shore
Chenopodium album - on shore
Vaccinium Vitis-idaea
Cakile americana - flower
Galeopsis tetrahit - flower
Aster novi-belgii - flower
Ribes oxycanthoides - fruit
Plantago decipiens (borealis)
Coelopleurum octaefolium - flower and fruit
Sonchus oleraceus - flower
Maianthemum canadense - May flower
Ranunculus abortivus

PLANTS LISTED - WHITE ISLANDS - AUGUST 13

Ribes oxycanthoides - fruit
Rubus -- rasperry - fruit
Lathyrus maritimus - fruit and flower
Solidage sempervirens - common on rocks
Cakile americana
Plantago decepiens (borealis)
Plantago monspeliensis - stunted
Plantago anserina - abundant
Chenopodium sp.
Streptopus amplexifolius - green fruit
Stellaria sp

- - - - -

OUTER HALIBUT ISLAND - AUGUST 21

Spiranthes Ramanzoffiana - flower
Empetrum nigrum
Lathyrus maritimus - fruit and flowers
Cakile americana - fruit and flower
Plantago decepiens (borealis)
Cornus canadensis - ripe fruit
Achilles borealis ? flower
Aster Novi-belgii - flower
Trianthes americana
Maianthemum canadense
Ribes oxycanthoides - fruit
Iris canadensis ? fruit
Scutellaria galericulata - flower
Myrica carolinensis?
Mertensia maritima - flower
Euphorbia polygonifolia - fruit
Drosera rotundifolia - flower
Sonchus oleraceus
Streptopus amplexifolius, - ripe fruit
Rubus idaeus - fruit
Convolvulus sepium - flower
Potentilla monspeliensis
anserina
Galeopsis tetrahecit
Lycopus virginicus - flower
Veccinum oxycoccus - fruit
Vitis-idea minus - fruit
Viola - fruit
Ligusticum scoticum - flower and green fruit
Impatiens pallida - flower
Monotropa hypopitys
Epilobium coloratum - flower and fruit

OUTER MALIBUT ISLAND (continued)

Aspidium spinulosum
Polypodium vulgare
Galium labradoricum ?
Solidago uniligulata ?
Vicia americana
Rumex sp.
Euphrasia sp.
Chiogenes hispidula - fruit
Prenanthes alba - flower
Chenopodium sp.
Pyrus americana- Mountain ash
Picea canadensis - white spruce
Abies balsamea - Balsam fir
Alnus incana
Acer spicatum

WHITE ISLAND - AUGUST 21

Habenaria obtusata - fruit
Rhinanthus Crista-galli - mostly in flower, some fruit.
Ribes oxycanthoides - fruit
Thalictrum polygamum - flower
Impatiens pallida - flower
Rubus idaeus - fruit
Cakile americana - flowers but mostly fruit
Mertensia maritima - flower and fruit
Achillea sp. - white yarrow
Streptopus amplexifolius - ripe fruit
Convolvulus sepium - flower
Scutellaria galericulata - flower
Lycopus virginicus - fruit and flower
Polypodium vulgare
Vicia sp - flower
Coptis trifolia
Solidago sempervirens - flower
Cirsium alpina - flower
Viola sp.
Galium labradoricum? Bedstraw - fruit
Clintonia borealis - fruit
Aster acuminatus - flower
Plantago decipiens (borealis)
Euphorbia polygonifolia
Trifolium sp. white clover - flower
Ranunculus abortivus - fruit

WHITE ISLANDS - AUGUST 21 (Continued)

Pyrus americana - Mountain ash
Picea canadensis
Abies balsamea
Alnus incana
Acer spicatum
Rumex acetosella - fruit
Oxalis sp.
Solidago uniligulata ? - flower
Vicia americana - flower
Prenanthes alba - flower
Chenopodium sp. - fruit
Linnaea borealis

SEA WEEDS LISTED - 1939

Lithothamnion polymorphus - B.I. - H.I. - W.I. - D2 - Common
Corallina officinalis - L.I.sk - B.I. - H.I. - W.I. - Common
Ascophyllum nodosum - common everywhere
Cladophora erecta
Fucus sp. several species
Chondrus crispus - growing on outer islands and drifting
everywhere.
Porphyra - W. I. 2
Enteromorpha intestinalis - in less exposed pools
Ceramium rubrum - H. I. - W. I.
Leathesia difformis - B.I. - M. H. I.
Laminaria longioruris - B.I. - M.H.I. - W.I. Common
Laminaria digitata - B.I.
Enteromorpha sp. B.I.
Saccorhiza dermatodes ?? B.I.
Corda filum - C.C. - W. I. and common at all points
Alaria sp. B.U.

Note: The list of sea-weeds in particular is extremely incomplete, and the identifications at times questionable. Specimens of the plants have been preserved and the sea-weeds preserved for checking of the species.

ADDITIONAL PLANTS FROM THE MAINLAND - 1939

Note: The species already listed from the islands were common ON the mainland. In addition the following were listed. The list does not pretend to be comprehensive.

FERNS

Polypodium vulgare (island also)
Phegopteris polypodioides
Pteris aquilina
Aspidium Thelypteris
 noveboracense
 spinulosum
Onoclea sensibilis
Osmunda Claytoniana
 connanomea (also listed from B.I.)

FLOWERING PLANTS

Xyris montana - Aug. 26 - flower.
Cuscuta - Dodder - Aug. 20 - flower
Hypericum ellipticum - Aug. 5 - flower
 boreale - Aug. 6 - flower
 virginicum - Aug. 18 - flower
Utricularia vulgaris - Aug. 18 - flower
 intermedia " " "
 purpurea " " "
 cornuta " " "
Solidago squarrosa - Aug. 16 - flower
 rugosa - Aug. 18 - flower
Lobelia Dortmanna - July 20 - flower
Chelone glabra - Aug. 19 - flower
Mentha canadensis - Smith Brook - Aug. 14
Lysimachia terrestris - Aug. 7 - flower
Sisyrinchium angustifolium - July 16 - flower
Rhinanthus Crista-galli - flowers on July 9.
Nymphaea advena - Aug. 22 - flowers
Potentilla tridentata - Aug. 27 - West Ecum Secum - flowers
Epilobium angustifolium - July 24 - flower - August 26 seeds in wind
Pastinaca sativa - Aug. 19 - flower
Carum carvi - July 9 - flower

PLANTS FROM THE MAINLAND (Continued)

Salicornia - West Ecum Secum - Aug. 27.

Eupatorium perfoliatum - Aug. 18 - flower

Cirsium arvense }
Onopordum acanthium } fruit Aug. 26

Senecio aureus - Ragwort - not yet very conspicuous.

Flower and fruit - Aug. 26.

Rubus chamaemorus - Aug. 20 - ripe fruit. West Ecum Secum

Geylussacia

Pontederia cordata - Aug. 26 - most flowers are passed.

Grapholium uliginosum - Aug. 12 - Common

NOTES ON THE FAUNA AND FLORA OF MOSER RIVER

(An Addenda to the Report of 1939)

The following species of animals and plants collected at Moser River and vicinity - 1939 - have been identified by authorities as listed below:

THE MARINE FAUNA

PORIFERA - identified by Dr. M. W. de Leubenfels, 400 South Bonnie Ave., Pasadena, California.

Halichondria panicea Pallas - White Islands, Aug. 21
Torpey Island, Sept. 14
Mitchell Bay, July 18

Haliclona arbuscula - (Probably the species described by Verrill, 1873, page 742, as Chalina arbuscula)
Nicumateau Bay - dredging - 10-12m.
Sept. 17
- Dredging, Sept. 19,
Rocky bottom,

HYDROZOA - Identified by C. McLean Fraser, Department of Zoology, University of British Columbia, Vancouver, Canada.

Obelia articulata (A. Agassiz) - Mitchell Bay, July 18
Dredging off Net Point, Aug. 21

Obelia geniculata (Linn.) - Outer Halibut Id., Aug. 21
White Island, Aug. 21

Campanularia flexuosa (Hincks) - Bird Island, July 30
Halibut Island, Aug. 13

Sertularia pumila (Linn.) - Mitchell Bay, July 18
Bird Island, July 30
Halibut Island, Aug. 13
White Island, Aug. 21. Common everywhere

BRYOZOA - Identified by Dr. Raymond C. Osburn, Department of Zoology, Ohio State University, Columbus, Ohio.

Hippothoa hyalina (L.) - Dredging off Net Point, Aug. 21
Mitchell Bay, July 18
White Island, Aug. 21
Dredge, Outer Halibut Island, Aug. 21
Dredging Nicum Tesu Bay, Sept. 17 and 19.
(S. 5, S. 17, S. 19)

Bryozoa (continued)

- Cribrilina punctata (Hassell) - Dredge off Net Point, Aug. 21
Dredge, Nicumteau Bay, Sept. 17
and 19 (S.5, S.19).
- Cribrilina annulata (Fabr.) - Dredge off Net Point, Aug. 21
Dredge, Nicumteau Bay, Sept. 19 (S.19)
- Callopora craticula (Alder) - Dredge off Net Point, Aug. 21
Torpey Island, Sept. 14
- Callopora surita (Hincks) - Dredge off Net Point, Aug. 21
Torpey Island, Sept. 14
- Lichenophora verrucaria (Fabr.) - Dredge off Net Point, Aug. 21
Dredge, Nicumteau Bay, Sept. 17
(S.5)
- Disperococia harmeri (Osburn) - Dredge off Net Point, Aug. 21
- Electra pilosa (L.) - Mitchell Bay, July 18
Bird Island, July 30
Torpey Island, Sept. 14
Dredge, Nicumteau Bay, Sept. 17 and 19 (S.5,
S. 17, S.19)
- Flustrella hispida (Fabr.) - Bird Island, July 30
White Island, Aug. 21
- Tricellaria peschii (Busk) - Dredge, Nicumteau Bay, Sept. 17 (S.5)
- Howerbankia gracilis Leidy - Dredge, Nicumteau Bay, Sept. 17 (S.17)
- Crisis sp. (immature specimen) - Dredge, Nicumteau Bay, Sept. 19
(S.19)

†Note - Callopora craticula (Alder) also dredged from Nicumteau Bay on Sept. 19 (S.19)

POLYCHAETA - Identified by Mrs. Edith Berkeley, Pacific Biological Station, Nanaimo, B.C.

- Nereis virens (Sars) - Moser River Estuary, July 15
Mitchell Bay, July 18
- Nereis pelagica Linné - Torpey Island, Sept. 14
Dredge off Net Point, Aug. 21
- Harmathoe imbricata Linné - Torpey Island, Sept. 14
Dredge Nicumteau Bay, Sept. 17 (S.5)
" " Sept. 19 (S.19)
Mitchell Bay, July 18
Dredge off Net Point, Aug. 21
- Lepidonotus squematus Linné - White Islands, Aug. 21; Bird I. July 30
Torpey Island, Sept. 14
Dredge, Nicumteau Bay, Sept. 19 (S.20)
Common everywhere.
- Legisca extenuata (Grube) - Torpey Island, Sept. 14
- Nephtys caeca Fabricius - Torpey Island, Sept. 14
- Amphitrite johnstoni Malmgren - Torpey Island, Sept. 14
Dredge off Net Point, Aug. 21
- Spirorbis spirillum Linné - Torpey Island, Sept. 14
Dredging Nicumteau Bay, Sept. 17 (S.5)
" " " Sept. 19 (S.19)
Dredge, Net Point, Aug. 21

POLYCHAETA (Continued)

- Spirorbis granulatus Linne' - (S. quadrangularis Stimpson)
Dredge, Nicumteau Bay Sept. 17 (S.5)
- Spirorbis borealis Daudin - Mitchell Bay, July 18; Bird Is. July 30
White Island, Aug. 21 (Bird I., Ju. 30)
- Dodecaoceria concharum Cersted - Dredge, Nicumteau Bay, Sept. 19 (S.20)
- Amphereis arctica Malmgren - Dredge, Nicumteau Bay, Sept. 19 (S.20)
- Bulalis viridis (Miller) - Dredge, Nicumteau Bay, Sept. 19 (S. 20)
- Cirratulus cirratus Malmgren - White Islands, Aug. 21
Dredge, off Net Point, Aug. 21
- Owenia (Amocheres) fusiformis Belle Chiaje)
- Phyllococe (Aneitides) maculata (Linne'))
- Nephtys sp. (Immature)) Dredge, Nicum-
teau Bay, Sept.
Spiochaetes bombyx (Claparede))
19 (S.22)
- Prinosio streenstrupi Malmgren -)
- Minde sp. (Immature, probably M. nigripes Verrill))
- Polydora concharum Verrill - Dredge, Nicumteau Bay, Sept. 19 (S. 25)
- " ciliata (Johnston) - Bird Is., July 30.
- MOLLUSCA - Identified by William J. Clench, Curator of Mollusks,
Museum of Comparative Zoology, Harvard University, Cambridge,
Mass.

Amphineura

- Lepidochiton marmorea Fabr. - Dredge, Nicumteau Bay, Sept. 17
(S.18)
Dredge, Nicumteau Bay, Sept. 19 (S.20)
Torpey Island, Sept. 14
- Lepidochiton ruber Linne' - Bird Island, July 30
Torpey Island, Sept. 14
- Lepidochiton alba Linne' - White Islands, Aug. 21

Pelecypoda

- Cardium directus Conrad - Camp Cove, July 31
- Cardium pinnulatum Conrad - Dredge, Net Point, Aug. 21
Dredge, Nicumteau Bay, Sept. 19 (S. 22)
- Mericardis borealis novangliae - Dredge, Nicumteau Bay, Sept. 17
(S. 18)
- Astarte elliptica Brown)
- Astarte castanea Say) - Dredge, Nicumteau Bay, Sept. 17 (S.18)
- Astarte quadrens Gould)
- Anomia sculecta Miller - Dredge, Nicumteau Bay, Sept. 19, (S. 20)
White Islands, Aug. 21
Torpey Island, Sept. 14 and Bird Island,
July 30
- Nucula delphinodonta High. and Adams - Dredge, Nicumteau Bay, Sept.
19 (S.22)
- Tellina tenera Say - Dredge, Nicumteau Bay, Sept. 19 (S.23)
- Saxicava arctica Linne' - Bird Island, July 30
White Island, Aug. 21
Halibut Island, Aug. 21
- Mytilus edulis Linne' - Bird Island, July 30
White Island, Aug. 21
Common everywhere.
- Modiolus modiolus Linne' - Common.

MOLLUSCA (Continued)Pelecypoda

- Masserius trivittata Say - Dredge off Net Point, Aug. 21
Dredge, Nicumteau Bay, Sept. 17 and
19 (S.18, S.19, S.22, S.23)
Mitchell Bay, July 18
Torpey Island, Sept. 14
- Lacuna vineta Mont. Dredge off Net Point, Aug. 21
Bird Island, July 30
Mitchell Bay, July 18
Torpey Island, Sept. 14
- Velutina laevigata Linne - Dredge off Net Point, Aug. 21
- Polynices heros Say - Dredge, Nicumteau Bay, Sept. 17 and 19
(S.18, S.22, S.23)
Common everywhere in vicinity
- Lora Harpularia Couthorey - Dredge Nicumteau Bay, Sept. 17 (S.18)
- Lora decussata Couthorey - Dredge, Nicumteau Bay, Sept. 19 (S.22)
- Thyasira trisinuata Orb. - Dredge, Nicumteau Bay, Sept. 19 (S.23)
- Margarites helicina Fabr. - Bird Island, July 30
- Thais lapillus Linne - Bird Island, July 30
Mitchell Bay, July 18
White Island, Aug. 21
Common everywhere.
- Acmaea testudinalis Muller - Bird Island, July 30
Mitchell Bay, July 18
White Island, Aug. 21
Torpey Island, Sept. 14
- Buccinum undatum Linne - Halibut Island, Aug. 21
Common.
- Littorina littorea Linne - Bird Island, July 30
Mitchell Bay, July 18
White Island, Aug. 13
White Island, Aug. 21
- Littorina obtusata Linne - Bird Island, July 30
Mitchell Bay, July 18
White Islands, Aug. 13 and 21
- Littorina saxatilis Olivi - Mitchell Bay, July 18
White Islands, Aug. 13 and 21

ARTHROPODA -

ISOPODA - Identified by Dr. W. G. Van Name, Department of Living
Invertebrates, American Museum of Natural History, New
York City.

- Idothea phosphorea Harger - Torpey Island, Sept. 14
- Idothea baltica (Pallas) - Mitchell Bay, July 18
White Island, Aug. 21
Bird Island, July 30
Torpey Island, Sept. 14
Nicumteau Bay (dredge), Sept. 17
- Jeera marina (Fabricius) - Moser River estuary, July 5
- Edotea montosa (Stimpson) - Dredge, Nicumteau Bay, Sept. 19

ARTHROPODA (Continued)

HYCNOGONIDA - Identified by Dr. W. G. Van Name, American Museum of Natural History, New York City.

Hyconognomus littorale (Stroem) - White Island, Aug. 21

MYSIDACEA - Identified by Prof. W. M. Tattersall, Department of Zoology, University College, Newport Road, CARDIFF.

Mysis stenolepis, Smith - Mitchell Bay, July 18
Torpey Island, Sept. 14

CRUSTACEA - Identified by Dr. J. C. Armstrong, American Museum of Natural History, New York City.

Lepas fascicularis Ellis and Sollander - White Island, Aug. 21
Outer Halibut Island, Aug. 21

Balanus balanoides (L.) - Common.

Eudorella pusilla Sars - Dredge, Nicumteau Bay, Sept. 19 (S.22)

Diastylis quadrispinosus Sars - Dredge, Sept. 19 (S.22)

Ekdiastylis politus (Smith) - Dredge, Sept. 19 (S.20 and S.22)

Ekdiastylis sculptus (Sars) - Dredge, Sept. 19 (S.22)

Urchonella pinguis (Boeck) - Dredge, Sept. 19 (S. 22)

Ampelisca macrocephala Lij. - Dredge, Sept. 19 (S.22)

Callinopus leviusculus (Kroyer) - Torpey Id., Sept. 14.

Gammarus locusta (L.) - Moser River Estuary, July 5

Halibut Island, Aug. 13

White Island, Aug. 21

Torpey Island, Sept. 14

Mitchell Bay, July 18

Bird Island, July 30

Dredge, Outer Halibut Id., Aug. 21

Dredge, Nicumteau Bay, Sept. 17 and 19

(S.5, S.17 and S.19)

Amphithoe rubricosta (Montagu) - Bird Island, July 30

White Island, Aug. 21

Torpey Island, Sept. 14

Dredge, off Net Point, Aug. 21

Jassa pulchella Leach - Halibut Island, Aug. 21

Torpey Island, Sept. 14

Unciola irrorata Say - Dredge, Nicumteau Bay, Sept. 19 (S.22)

Corophium crassicoorne Bruz. - Dredge, Nicumteau Bay, Sept. 19

(S. 22)

Corophium bonelli (M. Edws.) - Dredge, Nicumteau Bay, Sept. 19

(S. 20)

Aeginina longicornis (Kroyer) - Dredge, Nicumteau Bay, Sept. 19

(S. 20)

Caprella linearis (Linn.) - Dredge, Nicumteau Bay, Sept. 19

(S. 24)

Spirontocaris groenlandica (Fab.) - Dredge, Outer Halibut Id.

Aug. 21

Dredge, Nicumteau Bay, Sept. 17 (S.5)

Spirontocaris gaimardii (M. Edws.) - Mitchell Bay, July 18

Dredge off Net Point, Aug. 21

Dredge off Halibut Id. Aug. 21

Dredge, Nicumteau Bay, Sept. 17 and

19 (S.17 and S.19)

ARTHROPODA (Continued)

- Crago septemspinosus (Say) - Mitchell Bay, July 18
Dredge off, Net Point, Aug. 21
Dredge, Nicumteau Bay, Sept. 19 (S. 24)
- Pagurus scadius Benedict - Dredge Nicumteau Bay, Sept. 17 and 19 (S.5 and S.22)
- Pagurus pubescens Kroyer - Dredge off Halibut Island, Aug. 21
Dredge, Nicumteau Bay, Sept. 19 (S.23, S.24, S.25)
- Cancer irroratus Say - Mitchell Bay, July 18
Bird Island, July 30
Torpey Island, Sept. 14
White Island, Aug. 21
Dredge off Net Point, Aug. 21
Dredge Nicumteau Bay, Sept. 17 and 19 (S.5, S.17 and S.19)

ECHINODERMATA - Identified by Dr. H. L. Clark, Museum of Comparative Zoology, Harvard College, Cambridge, Massachusetts.

- Asterias vulgaris Verrill - Mitchell Bay, July 18
Bird Island, July 30
Dredge off Net Point, Aug. 21
Dredge, off Outer Halibut Id. Aug. 21
Torpey Island, Sept. 14
Dredge, Nicumteau Bay, Sept. 19 (S.19)
- Henricis sanguinolenta (O. F. Muller) - Bird Island, July 30
Torpey Island, Sept. 14
- Ophiopholis sculeata (Linnaeus) - Dredge off Net Point, Aug. 21
Torpey Island, Sept. 14
White Island, Aug. 21
- Strongylocentrotus dropachiensis (O. F. Muller) - Dredge Outer Halibut Island, Aug. 21
Common everywhere.

TUNICATA - Identified by Dr. W. C. Van Name, American Museum of Natural History, New York City.

- Ascidia callosa Stimpson - White Island, Aug. 21
Torpey Island, Sept. 14
- Molgula citrina Alder and Hancock - Torpey Island, Sept. 14
- Didemnum albidum (Verrill) - Dredge off Net Point, Aug. 21

PISCES - Identified by Dr. Carl Hubbs, University of Michigan; Dr. Leonard P. Schultz, Curator of Fishes, and Mr. Earl D. Reid, Aid, respectively, in the Division of Fishes, United States National Museum.

<u>Myoxocephalus aeneus</u> ,	Mitchell Bay, July 18
	Dredge off Net Point, Aug. 21
<u>Liparis atlanticus</u> ?	Torpey Island, Sept. 14
<u>Microgadus tomcod</u>	Mitchell Bay, July 18
<u>Apeltes quadracus</u>	" " "
<u>Gasterosteus a.scutellatus</u>	Bird Island, July 30
	White Island, Aug. 21
<u>Cyclopterus lumpus</u>	Torpey Island, Sept. 14
	Mitchell Bay, July 18
<u>Pholis gunnellus</u>	" " "
	Torpey Island, Sept. 14
	White Island, Aug. 21
	Bird Island, July 18
<u>Urophycis tenuis</u>	Mitchell Bay, July 18
<u>Tautoglabrus adspersus</u>	" " "
	Torpey Island, Sept. 14
<u>Clupea harengus</u>	Mitchell Bay, July 18
<u>Pseudopleuronectes americanus</u>	Mitchell Bay, July 18

THE FLORA

Plants from Moser River and vicinity (Halifax Co., N.S.) identified by Prof. F. M. C. Taylor, Department of Botany, University of Toronto, Toronto, Canada.

PTERIDOPHYTA

Polypodium virginianum L.
" *vulgare*
Osmunda regalis
" *cinnamomea*
" *Claytonia* L.
Phegopteris polypodioides

Oncoclea sensibilis
Aspidium thelypteris
" *spinulosum*
" *cristetum*
" *clintonianum*

SPERMATOPHYTA

ANACARDIACEAE

Rhus typhina L.

ARALIACEAE

Arisaema nudicaulis L.

BALSAMINACEAE

Impatiens biflora Walt.

BETULACEAE

Alnus mollis Fern.

BORAGINACEAE

Hertensia maritima (L.) S.F. Gray

CHENOPODIACEAE

Atriplex petula L., var. *retata* (L.) Gray
Chenopodium album L.

CRASSULACEAE

Sedum roseum (L.) Scop.

CRUCIFERAE

Cardi edulenta (Bigel.) Hook.

COMPOSITAE

Achillea Millefolium L.
Aster acuminatus Michx.
Aster novi-belgi L.
Petasites trigonophylla Greene
Prenanthes alba L.
Solidago rugosa Mill.
" *sempervirens* L.
" *uniligulata* (DC.) Porter
Sonchus olerensis L.

CONVOLVULACEAE

Convolvulus Sepium L.

DROSERACEAE

Drosera rotundifolia L.

EMPETRACEAE

Empetrum nigrum L.

ERICACEAE

Arctostaphylos Uva-ursi (L.) Spreng.
Chiogenes hispida (L.) T and G.
Moneses uniflora (L.) Gray
Monotropa uniflora (L.)
Vaccinium macrocarpon Ait.
" *pennsylvanicum* Lam.

GRAMINAE

Ageropyron trachycaulon (Link)
Steud. var. *noviae-angliae* (Scribn.) Fern.
Ammophila breviligulata Fern.

IRIDACEAE

Iris setosa Pall., var. *canadensis* Fost.

JUNCACEAE

Juncus bufonius L.

LABIATAE

Galeopsis Tetrahit L.
Lycopus uniflorus Michx.
Scutellaria epilobiifolia Hem.

The Flora (Continued)

LEGUMINOSAE

- Lathyrus japonicus Willd.
var. glaber (Ser.) Fern.
- Lathyrus palustris L.

LILIACEAE

- Clintonia borealis (Ait.) Ref.
- Meianthemum canadense Desf.
- Smilacina stellata (L.) Desf.
- Streptopus amplexifolius (L.) DC.

MYRICACEAE

- Myrica cerifera L.

ONAGRACEAE

- Circaea alpina L.
- Epilobium angustifolium L.
var. macrophyllum (Hauksk.) Fern.
- Epilobium Hornemannii Reich.
- Epilobium lineare Muhl.

ORCHIDACEAE

- Habenaria obtusata (Pursh.) Rich.
- Spiranthes Romanzoffiana Cham.

OXALIDACEAE

- Oxalis americana Bigel.

PLANTAGINACEAE

- Plantago decipiens Born.

POLYGONACEAE

- Polygonum aviculare L.
- Rumex acetosella L.
- Rumex britannicus L.

PRIMULACEAE

- Trientalis americana (Pers.) Pursh.

RANUNCULACEAE

- Coptis groenlandica (Oeder) Fern.
- Ranunculus cymbalaria Pursh.
- Thalictrum polygamum Muhl.

ROSACEAE

- Potentilla Anserina L.
- Potentilla monspeliensis L.
- Rubus triflorus Rich.

RUBIACEAE

- Galium trifidum L.

SALICACEAE

- Salix pedicellaris Pursh., var.
hypoglaucus Fern.

SCROPHULARIACEAE

- Rhinanthus Crista-galli L.

UMBELLIFERAE

- Ligusticum Scoticum L.

VIOLACEAE

- Viola pallens (Banks) Brain.

VITACEAE

- Vitis vulpina L.

NOTE: Additional collections and dredgings were made after submitting the report of August 30, 1939. On September 14, 1939 Dr. Hartman collected from Torpey Island at low tide. On September 17 and 19 dredgings were made from the "Zoarces" in Nicumtesu Bay, as listed below:

- 15 - Nicumtesu Bay, 2:05 pm. Sept. 17, 1939, Depth 10-12 m.
- 17 - Nicumtesu Bay, 1:46 pm. Sept. 17, 1939, Depth 10-12 m.
- 19 - Nicumtesu Bay, Sept. 19, 1939, Rocky bottom, Dredge came up full of sea weeds
- 20 - Nicumtesu Bay, Sept. 19, 1939, Rocky bottom, Bottom very catchy - covered with Lithothamnion.
- 21 - Nicumtesu Bay, Sept. 19, 1939, Rocky bottom.
- 22 - Nicumtesu Bay, Sept. 19, 1939. Fine sand on bottom.
- 23 - Nicumtesu Bay, Sept. 19, 1939. Very fine sand on bottom.
- 24 - Nicumtesu Bay, Sept. 19, 1939. Very fine sand on bottom.
- 25 - Nicumtesu Bay, Sept. 19, 1939. Gravel and sand on bottom.

