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REPORT

OF THE

CANADIAN ARCTIC EXPEDITION

1913-18

VOLUME III: INSECTS

INTRODUCTION

AND

LIST OF NEW GENERA AND SPECIES COLLECTED BY THE EXPEDITION

By C. GORDON HEWITT



OTTAWA
THOMAS MULVEY,
PRINTER TO THE KINGS MOST EXCELLENT MAJESTY

1920

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INTRODUCTION.

INTRODUCTION.

Our knowledge of the insect fauna of northern and arctic Canada has hitherto been so meagre, and our collections so lacking in material from that region that the invitation given me in 1913 by the Deputy Minister of Mines to prepare a memorandum of instructions concerning the collection of insects by the Canadian Arctic Expedition which was then being organized was more than welcome, and high hopes were entertained that a rich harvest would result. The sad and untimely death of Mr. James Murray, the marine biologist of the expedition, following the loss of the *Karluk*, placed upon the shoulders of Mr. Frits Johansen, to whom the entomological work had been assigned, a double burden and increased duties and he became responsible for the marine biology in addition to his botanical and entomological work. The large collections of marine and other invertebrates, fishes, and plants testify as to the assiduity with which Mr. Johansen collected. But, as was inevitable the number of insects collected was less than we had originally hoped to receive. Nevertheless, the collection of insects brought back by the expedition was a very representative one, and, as the succeeding reports will show, it has been the means of adding valuable information to our knowledge of the insects of the northern regions of this continent. No less than 8 new genera, 93 new species and 5 new subspecies and varieties have been described in the following pages. In addition, as a result of Mr. Johansen's keen desire to obtain notes on the life-histories and bionomics of these northern forms and the investigations that he carried on under the difficult conditions incident to such work in the north, he has been able to add much to our knowledge of northern insect life, and his notes will be found scattered through the reports in the different orders and families. Mr. Johansen's report on the insect life of the arctic will be read with interest in conjunction with the other reports, since it gives a picture of the conditions under which the insects were found; too often entomologists lose sight of the ecological aspect of an insect fauna, and reports become mere systematic catalogues and lifeless. The abundance and variety of the arctic and sub-arctic insect life will be surprising perhaps to many entomologists who have not hitherto appreciated the burst of plant and insect life that takes place during the short arctic summer when the land is clothed with vegetation and flowers which are visited by innumerable bumble bees, moths and butterflies and other sun-loving insects, enjoying the brief spell of existence that release from the gelid land and water permits.

We desire to express our warm appreciation of the assistance so willingly rendered by the authors whose names appear on the different reports in this volume in working up this interesting collection of the insects of the arctic and sub-arctic region of North America, and we hope that this volume may stimulate further investigation of a fauna of interest alike to the systematist and to those who are interested in the broader question of the distribution of animal life.

C. GORDON HEWITT,

Dominion Entomologist.

OTTAWA, January, 1920.

LIST OF NEW GENERA AND SPECIES COLLECTED BY THE EXPEDITION

By C. Gordon Hewitt

List of New Genera and New Species of Insects, Arachnids and Myriapods collected by the Canadian Arctic Expedition, 1913-18.

Part A. COLLEMBOLA.

New Genera.	Page.	New Species.	Page.
		<i>Achorutes sensilis</i> Folsom	5A
		<i>Onychiurus duodecimpunctatus</i> Folsom	6A
		<i>Entomobrya comparata</i> Folsom	13A

Part B. NEUROPTEROID INSECTS.

		<i>Capnia nearctica</i> Banks	3B
		<i>Anabolia emarginata</i> Banks	4B

Part C. DIPTERA.

		<i>Dicranomyia alascaensis</i> Alexander	4c
		<i>Erioptera angustipennis</i> Alexander	5c
		<i>Limnophila rhicodoptiloides</i> Alexander	6c
		<i>Tricyphona brevifurcata</i> Alexander	6c
		<i>Tricyphona frigida</i> Alexander	7c
		<i>Stygeropsis parrioides</i> Alexander	9c
		<i>Nephroloma arcticola</i> Alexander	10c
		<i>Tipula johanseni</i> Alexander	11c
		“ <i>distava</i> Alexander	12c
		“ <i>hewitti</i> Alexander	14c
		“ <i>subpolaris</i> Alexander	14c
		“ <i>besseloides</i> Alexander	15c
		“ <i>subarctica</i> Alexander	15c
		<i>Aedes nearcticus</i> Dyar	32c
		<i>Tanypus alaskensis</i> Malloch	35c
		<i>Diamesa arctica</i> Malloch	37c
		<i>Prosimulium borealis</i> Malloch	41c
		<i>Simulium similis</i> Malloch	42c
		<i>Rhamphomyia erinacioides</i> Malloch	45c
		“ <i>ursina</i> Malloch	46c
		“ <i>similata</i> Malloch	46c
		“ <i>herschelli</i> Malloch	47c
		“ <i>conservativa</i> Malloch	48c
<i>Mydaeina</i> Malloch	62c	<i>Dolichopus dasyops</i> Malloch	49c
<i>Pogonomyioides</i> Malloch	67c	<i>Hydrophorus pilitarsis</i> Malloch	51c
<i>Cordylurella</i> Malloch	78c	<i>Aphiochaeta alaskensis</i> Malloch	52c
<i>Dasypleuron</i> Malloch	79c	“ <i>platychira</i> Malloch	52c
<i>Allomyia</i> Malloch	80c	<i>Leptocera transversalis</i> Malloch	53c
<i>Neoleria</i> Malloch	83c	<i>Syrphus sodalis</i> var. <i>interruptus</i> Malloch	55c
		<i>Peleteria arctica</i> Malloch	57c
		<i>Phormia caerulea</i> Malloch	59c
		<i>Phaonia minima</i> Malloch	61c
		“ <i>imitatri</i> Malloch	61c
		<i>Mydaeina obscura</i> Malloch	62c
		<i>Aricia borealis</i> Malloch	64c
		<i>Pogonomyia quadrisetosa</i> Malloch	66c
		<i>Pogonomyioides atrata</i> Malloch	67c
		<i>Hydrophoria arctica</i> Malloch	69c
		<i>Alliopsis obesa</i> Malloch	70c
		<i>Hylemyia acrostichalis</i> Malloch	72c
		<i>Phorbia brevitarsata</i> Malloch	73c
		<i>Gonatherus atricornis</i> Malloch	77c
		<i>Cordylurella subvittata</i> Malloch	78c
		<i>Dasypleuron tibialis</i> Malloch	79c
		<i>Allomyia unguiculata</i> Malloch	80c
		<i>Oecothea aristata</i> Malloch	82c
		<i>Neoleria rotundicornis</i> Malloch	83c
		<i>Piophilha borealis</i> Malloch	84c

Part E. COLEOPTERA.

New Genera.	Page.	New Species.	Page.
		<i>Dendroctonus johanseni</i> Swaine.....	5E
		<i>Carphoborus andersoni</i> Swaine.....	6E
		<i>Callidium subopacum</i> Swaine.....	12E
		<i>Trichalophus stefanssoni</i> Leng.....	20E

Part F. HEMIPTERA.

		<i>Euscelis hyperboreus</i> Van Duzee.....	4F
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Part G. HYMENOPTERA AND PLANT GALLS.

		<i>Rhogogastera reliqua</i> MacGillivray.....	4G
		<i>Euura abortiva</i> MacGillivray.....	4G
		“ <i>arctica</i> MacGillivray.....	5G
		<i>Pontania atrata</i> MacGillivray.....	6G
		“ <i>lorata</i> MacGillivray.....	8G
		“ <i>delicatula</i> MacGillivray.....	8G
		“ <i>deminuta</i> MacGillivray.....	9G
		“ <i>quadrifasciata</i> MacGillivray..	10G
		“ <i>subpallida</i> MacGillivray.....	11G
		“ <i>trifasciata</i> MacGillivray.....	11G
		<i>Amauronematus completus</i> MacGillivray	13G
		“ <i>indicatus</i> MacGillivray..	14G
		“ <i>digestus</i> MacGillivray..	14G
		“ <i>cogitatus</i> MacGillivray..	15G
		“ <i>varianus</i> MacGillivray..	16G
		“ <i>aulatus</i> MacGillivray..	16G
		“ <i>magnus</i> MacGillivray..	17G
		<i>Aptesis nivarius</i> Brues.....	21G
		<i>Polyblastus arcticus</i> Brues.....	22G
		<i>Diocles modestus</i> Brues.....	23G
		<i>Bombus neoboreus</i> Sladen.....	28G
		<i>Bombus sylvicola</i> var. <i>johanseni</i> Sladen.	30G

Part H. SPIDERS, MITES AND MYRIAPODS.

Spiders.....		<i>Tmeticus alatus</i> Emerton.....	3H
		<i>Microneta maritima</i> Emerton.....	4H
		<i>Lycosa asivak</i> Emerton.....	5H
		<i>Stigmaeus arcticus</i> Banks.....	11H
Mites.....			
Myriapods.....			
<i>Cryophilus</i> Chamberlin.....	17H	<i>Cryophilus alaskanus</i> Chamberlin.....	18H
		<i>Ethopolys integer</i> Chamberlin.....	20H
		<i>Ethopolys integer</i> subsp. <i>alaskanus</i> Chamberlin.....	21H

Part I. LEPIDOPTERA.

<i>Parrabarrovia</i> Gibson.....	33 I	<i>Oeneis semidea</i> var. <i>arctica</i> Gibson.....	13I
		“ <i>simulans</i> Gibson.....	14I
		“ <i>cairnesi</i> Gibson.....	15I
		“ <i>brucei</i> var. <i>yukonensis</i> Gibson ..	21I
		<i>Brenthis natalahali</i> Gibson.....	21I
		“ <i>distincta</i> Gibson.....	25I
		<i>Parabarrovia keelei</i> Gibson.....	33I
		<i>Anarta subfumosa</i> Gibson.....	34I
		<i>Homoglea murrayi</i> Gibson.....	36I
		<i>Diasemia alaskalis</i> Gibson.....	45I
		<i>Pyla arctiella</i> Gibson.....	46I

SUMMARY.

Part.	Order.	New Gen.	New Sp.	New Subsp.	New Var.
A.	Collembola.....		3		
B.	Neuropteroids.....		2		
C.	Diptera.....	6	47		1
D.	Mallophaga and Anoplura.....				
E.	Colcoptera.....		4		
F.	Hemiptera.....		1		
G.	Hymenoptera.....		21		1
H.	Spiders, Mites and Myriopods—				
	Spiders.....		3		
	Mites.....		1		
	Myriopods.....	1	2	1	
I.	Lepidoptera.....	1	9		2
J.	Orthoptera.....				
	Totals.....	8	93	1	4

Report of the Canadian Arctic Expedition, 1913-18.

Volume I: General Introduction, Narrative, Etc.

Part A: Northern Party, 1913-18.

Part B: Southern Party, 1913-16. By Rudolph Martin Anderson. (*In preparation*).

Volume II: Mammals and Birds.

Part A: Mammals. By Rudolph Martin Anderson. (*In preparation*).

Part B: Birds. By R. M. Anderson and P. A. Taverner. (*In preparation*).

Volume III: Insects.

Introduction. By C. Gordon Hewitt. (*In press*).

Part A: Collembola. By Justus W. Folsom. (*Issued*).

Part B: Neuropteroid Insects. By Nathan Banks. (*Issued*).

Part C: Diptera. By Chas. W. Alexander, Harrison G. Dyar, and J. R. Malloch. (*Issued*).

Part D: Mallophaga and Anoplura. By A. W. Baker, G. F. Ferris, and G. H. F. Nuttall. (*Issued*).

Part E: Coleoptera. By J. M. Swaine, H. C. Fall, C. W. Leng, and J. D. Sherman, Jr. (*Issued*).

Part F: Hemiptera. By E. P. Van Duzee. (*Issued*).

Part G: Hymenoptera and Plant Galls. By Alex. D. MacGillivray, Charles T. Brues, F. W. L. Sladen, and E. Porter Felt. (*Issued*).

Part H: Spiders, Mites, and Myriapods. By J. H. Emerton, Nathan Banks, and Ralph V. Chamberlin. (*Issued*).

Part I: Lepidoptera. By Arthur Gibson. (*Issued*).

Part J: Orthoptera. By E. M. Walker. (*Issued*).

Part K: General Observations on Insect Life in the Arctic. By Frits Johansen. (*In preparation*).

Volume IV: Botany.

Part A: Freshwater Algae and Freshwater Diatoms. By Charles W. Lowe. (*In preparation*).

Part B: Marine Algae. By F. Collins. (*In preparation*).

Part C: Fungi. By John Dearness. (*In preparation*).

Part D: Lichens. By G. K. Merrill. (*In preparation*).

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Part B: General Notes on Arctic Vegetation. By Frits Johansen. (*In preparation*).

Volume VI: Fishes, Tunicates, Etc.

Part A: Fishes. By F. Johansen. (*In preparation*).

Part B: Ascidians, etc. By A. G. Huntsman. (*In preparation*).

Volume VII: Crustacea.

Part A: Decapod Crustaceans. By Mary J. Rathbun. (*Issued*).

Part B: Schizopod Crustaceans. By Waldo L. Schmitt. (*Issued*).

Part C: Cumacea. By W. T. Calman. (*Issued*).

Part D: Isopoda. By Miss P. L. Boone. (*In press*).

Part E: Amphipoda. By Clarence R. Shoemaker. (*Issued*).

Part F: Pycnogonida. Leon J. Cole. (*In press*).

Part G: Euphyllipoda. By F. Johansen. (*In preparation*).

Part H: Cladocera. By Chancey Juday. (*Issued*).

Part I: Ostracoda. By R. W. Sharpe. (*In preparation*).

Part J: Freshwater Copepoda. By C. Dwight Marsh. (*Issued*).

Part K: Marine Copepoda. By A. Willey. (*Issued*).

Part L: Parasite Copepoda. By Chas. B. Wilson. (*Issued*).

Part M: Cirripedia. By H. A. Pilsbry. (*In preparation*).

Volume VIII: Mollusks, Echinoderms, Coelenterates, Etc.

Part A: Mollusks, Recent and Pleistocene. By Wm. H. Dall. (*Issued*).

Part B: Cephalopoda and Pteropoda. By S. S. Berry and W. F. Clapp. (*In preparation*).

Part C: Echinoderms. By Austin H. Clark. (*Issued*).

Part D: Bryozoa. By R. C. Osburn. (*In preparation*).

Part E: Rotatoria. By H. K. Harring. (*In preparation*).

Part F: Chaetognatha. By A. G. Huntsman. (*In preparation*).

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Part I: Hydroids. By McLean Fraser. (*Issued*).

Part J: Porifera.

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Part B: Polychaeta. By Ralph V. Chamberlin. (*In press*).

Part C: Hirudinea. By J. P. Moore. (*In press*).

Part D: Gephyrea. By Ralph V. Chamberlin. (*In press*).

Part E: Acanthocephala. By H. J. Van Cleave. (*Issued*).

Part F: Nematoda. By N. A. Cobb. (*In preparation*).

Part G-H: Trematoda and Cestoda. By A. R. Cooper. (*In press*).

Part I: Turbellaria. By A. Hassell. (*In preparation*).

Part J: Gordiacea.

Part K: Sporozoa. By J. W. Mavor. (*In preparation*).

Part M: Foraminifera. By J. A. Cushman. (*Issued*).

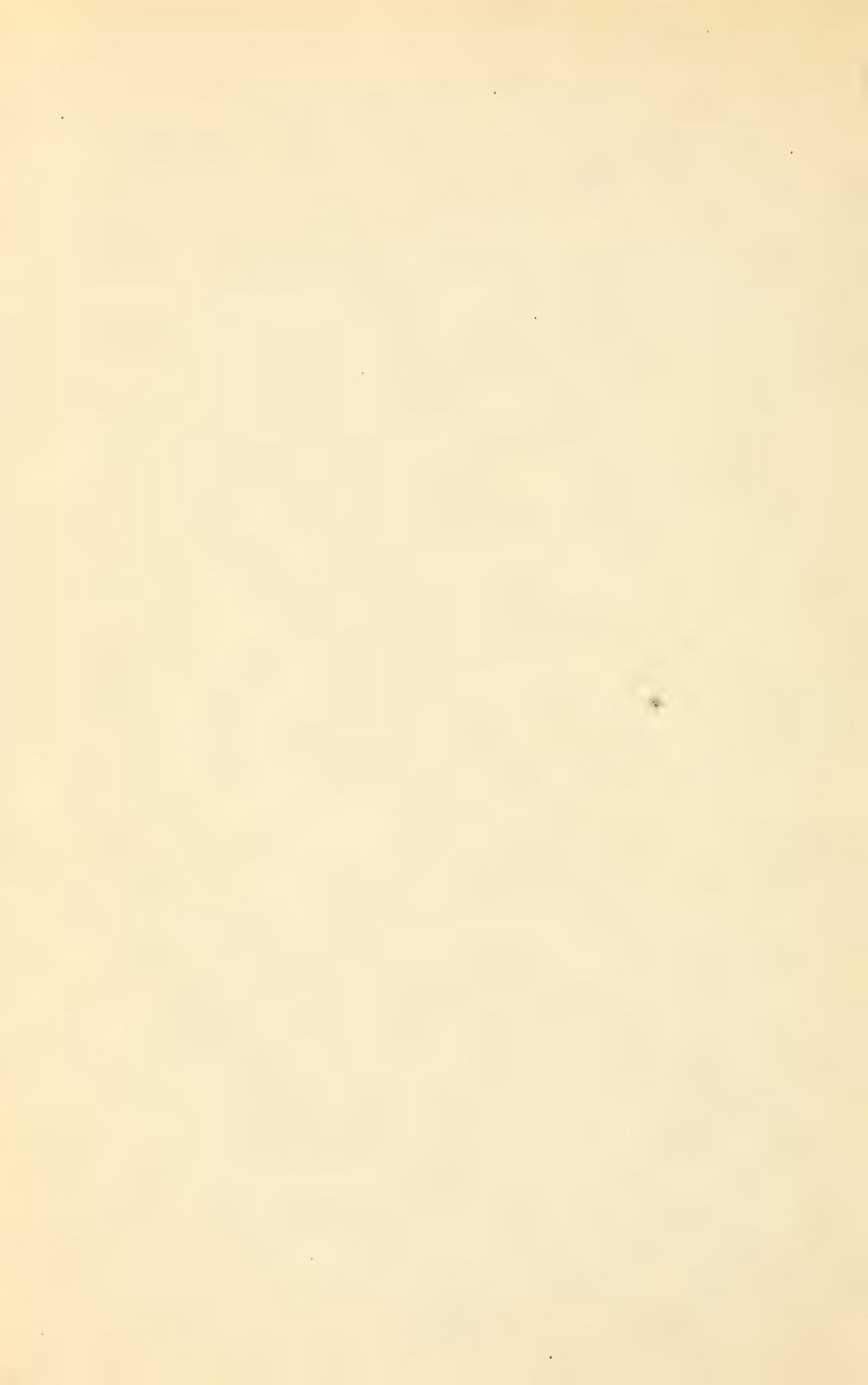
Volume X: Plankton, Hydrography, Tides, Etc.

Part A: Plankton. By Albert Mann. (*In preparation*).

Part B: Marine Diatoms. By L. W. Bailey. (*In preparation*).

Part C: Tidal Observations and Results. By W. Bell Dawson. (*Issued*).

Part D: Hydrography. (*In preparation*).



REPORT
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VOLUME III: INSECTS

PART B: NEUROPTEROID INSECTS

By NATHAN BANKS

SOUTHERN PARTY—1913-16



OTTAWA
J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1918

The Neuropteroid Insects of the Canadian Arctic Expedition, 1913-18.

By NATHAN BANKS.

The Neuropteroid insects taken by the Canadian Arctic Expedition, 1913-16, belong to seven species, two of which are herewith described as new. Most of the specimens collected by Mr. Frits Johansen belong to one species which is common in the Arctic regions.

PERLIDAE.

Alloperla pacifica Banks.

Two from Ketchikan, southern Alaska, September 10, 1916.

Nemoura, sp.

Several specimens, quite possibly of a new species, from Bernard harbour, Northwest Territories, June 30, 1916, and July 30, 1916. They are in poor condition and cannot now be described.

Capnia nearctica, n. sp.

Black. Body long and slender. Pronotum plainly broader than long, a little broader behind than in front, with a deep transverse groove in front parallel to the front margin. Wings in the male not reaching one-fourth way to the tip, in the female reaching to the tip of body. Setæ about one-half the length of the body. In the male the third segment from the tip has a rather large, rounded, median elevation, the surface of which is deeply pitted and provided with short hairs, and behind over the last two segments is a median groove bordered by nearly parallel elevated ridges; in the posterior part the ridges swell out a little; the groove is fully two and a half times as long as broad.

Length, 6 mm.

Many specimens from Bernard harbour, Northwest Territories, Canadian Arctic Expedition, June 25, 1915 (F. Johansen, coll.). Type in Canadian National Collection of Insects, Ottawa, paratype in Museum of Comparative Zoology, Cambridge, Mass. Differs from other species in the shape and sculpture of the tubercle near tip of body.

TRICHOPTERA.

Rhyacophila alberta Banks.

One from Ketchikan, southern Alaska, September 10, 1916.

Chilostigma præterita Walker.

Many specimens. All taken at Bernard harbour, Northwest Territories, September 23, 1915. There is much variation in the extent of the markings on the front wings almost uniformly dark-coloured. Described from Canada. I have seen it from several northern localities and it also occurs in the more northern parts of Europe.

Anabolia emarginata, n. sp.

Black with black bristles, some yellowish bristles on vertex and thorax; antennæ narrowly annulate with pale; legs yellowish brown, spines black. Fore-wings blackish, outer and posterior portions with scattered small pale spots, a distinct whitish hyaline spot over the thyridium and one below it near the end of the anal vein; the hind wings are greyish, darker on the anterior tip; genitalia dark. Venation much as in *A. nigricula* but the wing is rather shorter so that the apical cells are noticeably shorter than in that species. Male genitalia, seen from above show two upper appendages close together, each with an excised tip; from the side the lower appendage is seen to be tipped with two little black teeth. In general similar to *A. nigricula* but the shape of the superior appendages is different, and they are shorter than in that species.

Expanse, 26 mm.

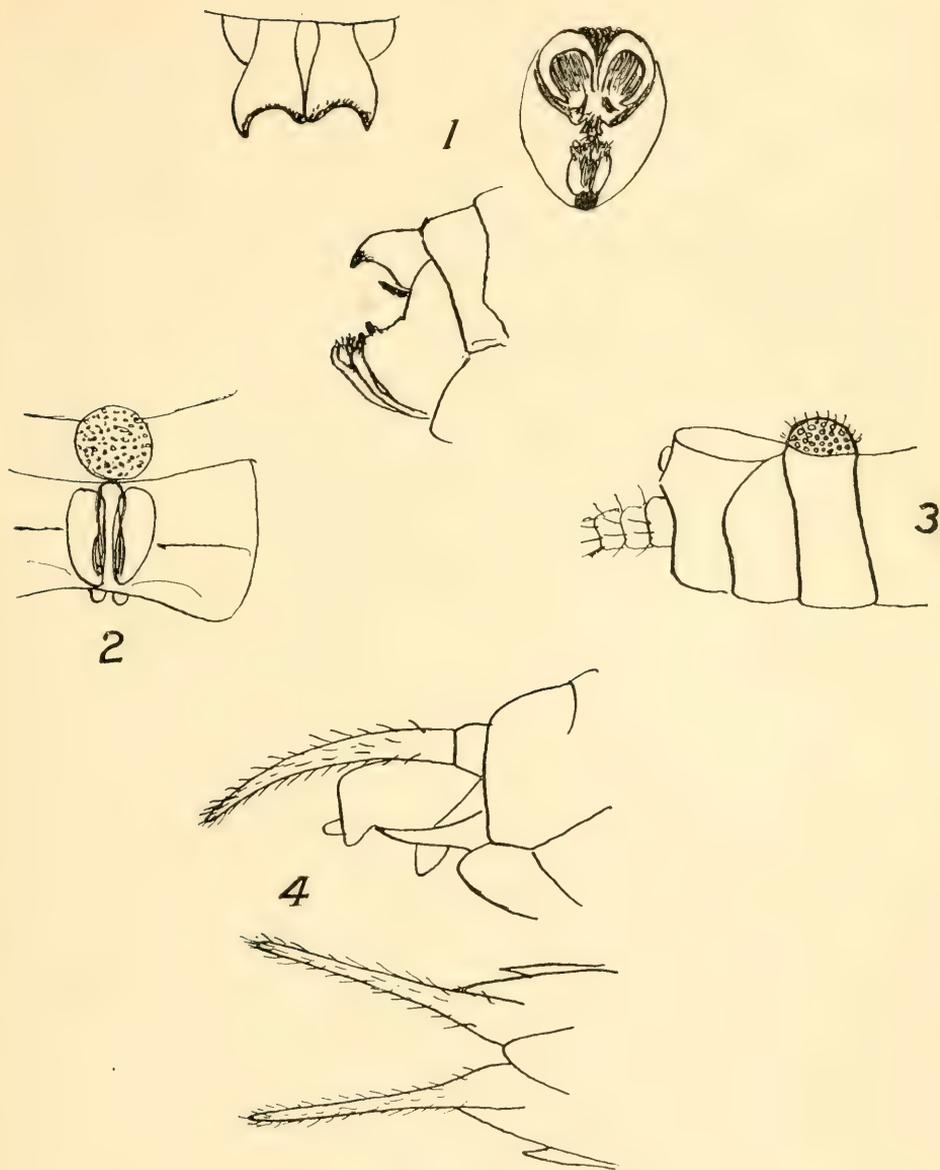
Two males from Teller, Alaska, July 29, 1913 (F. Johansen, coll.) Type in Canadian National Collection of Insects, Ottawa, paratype in Museum of Comparative Zoology, Cambridge, Mass.

Limnephilus, sp.

One female from Nome, Alaska, August 21, 1916 (F. Johansen, coll.) may be the female of *L. harrimani* Bks., known only from the male. *L. harrimani* is closely related to *L. sitchensis*, and so is this form. The body is greyish brown; vertex and thoracic vittæ dull black, latter separated by a grey streak; vertex between lateral ocelli and eyes grey pollinose; palpi, antennæ and legs yellowish, latter with black spines, basal joints of antennæ dark; genitalia pale. Fore wings yellowish brown, marked with darker brown and whitish hyaline much as in *L. sitchensis*; an oblique mark across the thyridial cell, and a large area each side of the anastomosis hyaline, this spot extends over bases of apical and first subapical cells and the tips of discal and thyridial cells. The dark brown is mostly on the posterior part, and along the veins; veins pale, anastomosis and lower stigmal vein darker; hind wings grey hyaline, veins pale. Face with yellowish hair in the middle and black on the sides, vertex, pronotum and mesonotum mostly with yellowish hair; some macrochatæ on vertex dark. Fore wings have the shape of *L. sitchensis*; the discal cell is plainly longer than its pedicel; the first apical is wider at base than the second, the fourth is about one-third as wide at base as the third or fifth; in the hind wings the fourth apical cell is slightly pedicellate. The superior appendages of the female are very long, slender, and divaricate, longer than in *L. sitchensis*, the inferior appendage is much shorter than in that species.

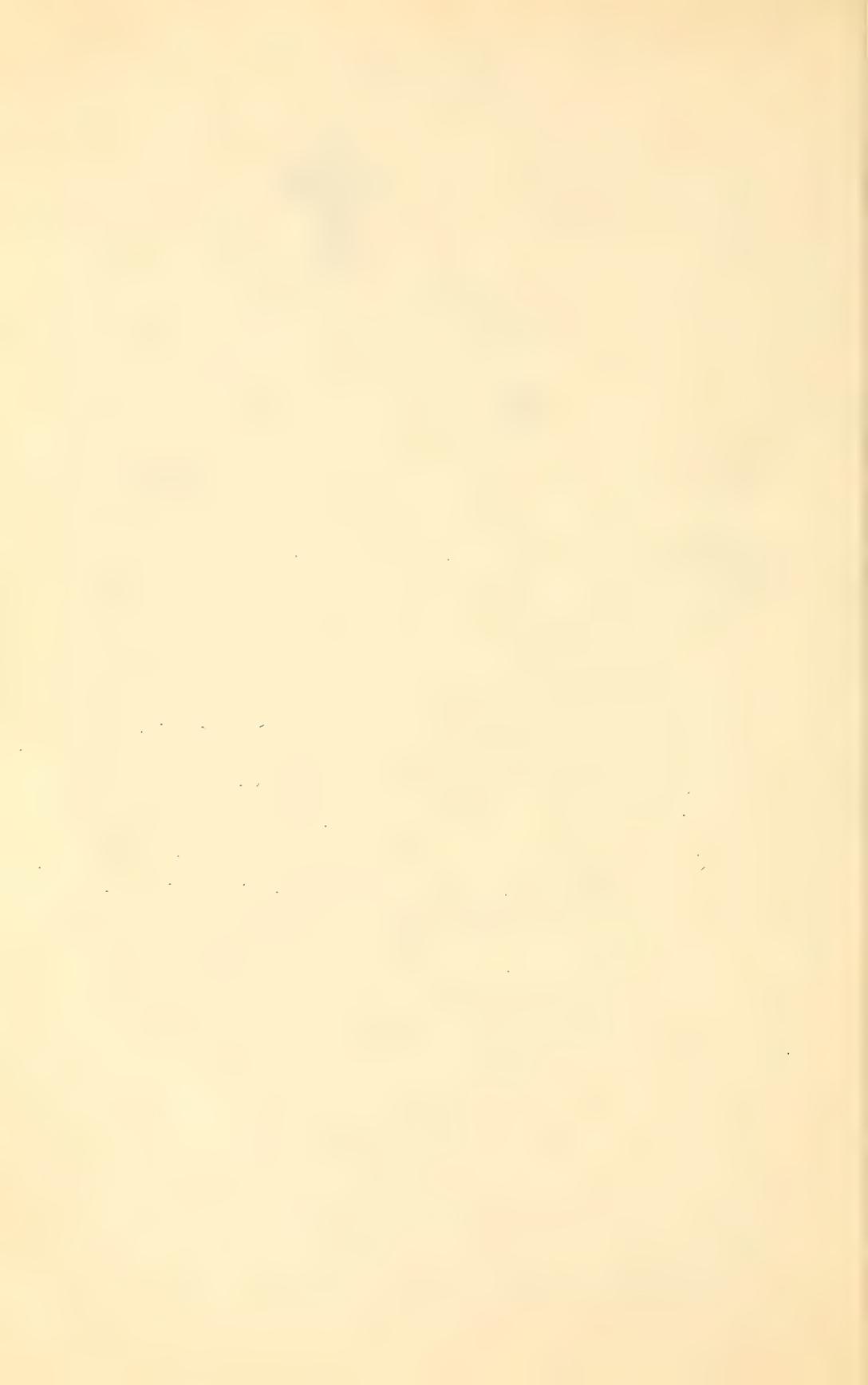
Expanse, 29 mm.

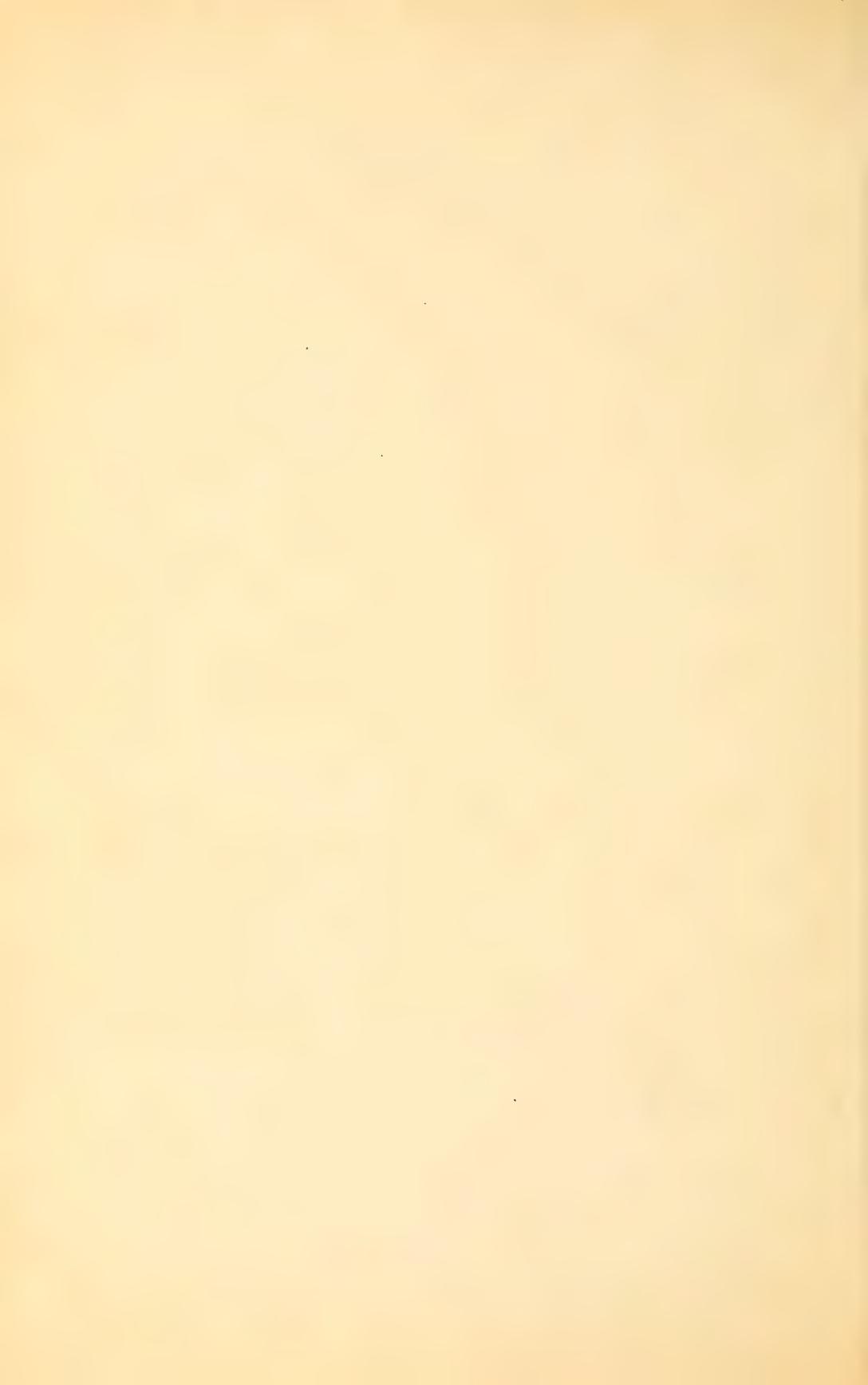
NOTE.—The collection also included a number of immature stages of Neuropteroids, the identification of which was not possible.



EXPLANATION OF PLATE.

- Fig. 1. Dorsal, posterior and lateral views of male genitalia of *Anabolia emarginata*.
 2. Dorsal view of tip of male abdomen of *Capnia nearctica*.
 3. Lateral view of tip of male abdomen of *Capnia nearctica*.
 4. Lateral and dorsal views of female genitalia of *Limnephilus* sp.





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VOLUME III: INSECTS

PART C: DIPTERA

Crane-flies	C. P. Alexander
Mosquitoes	H. G. Dyar
Diptera (excluding the Tipulidæ and Culicidæ)	J. R. Malloch

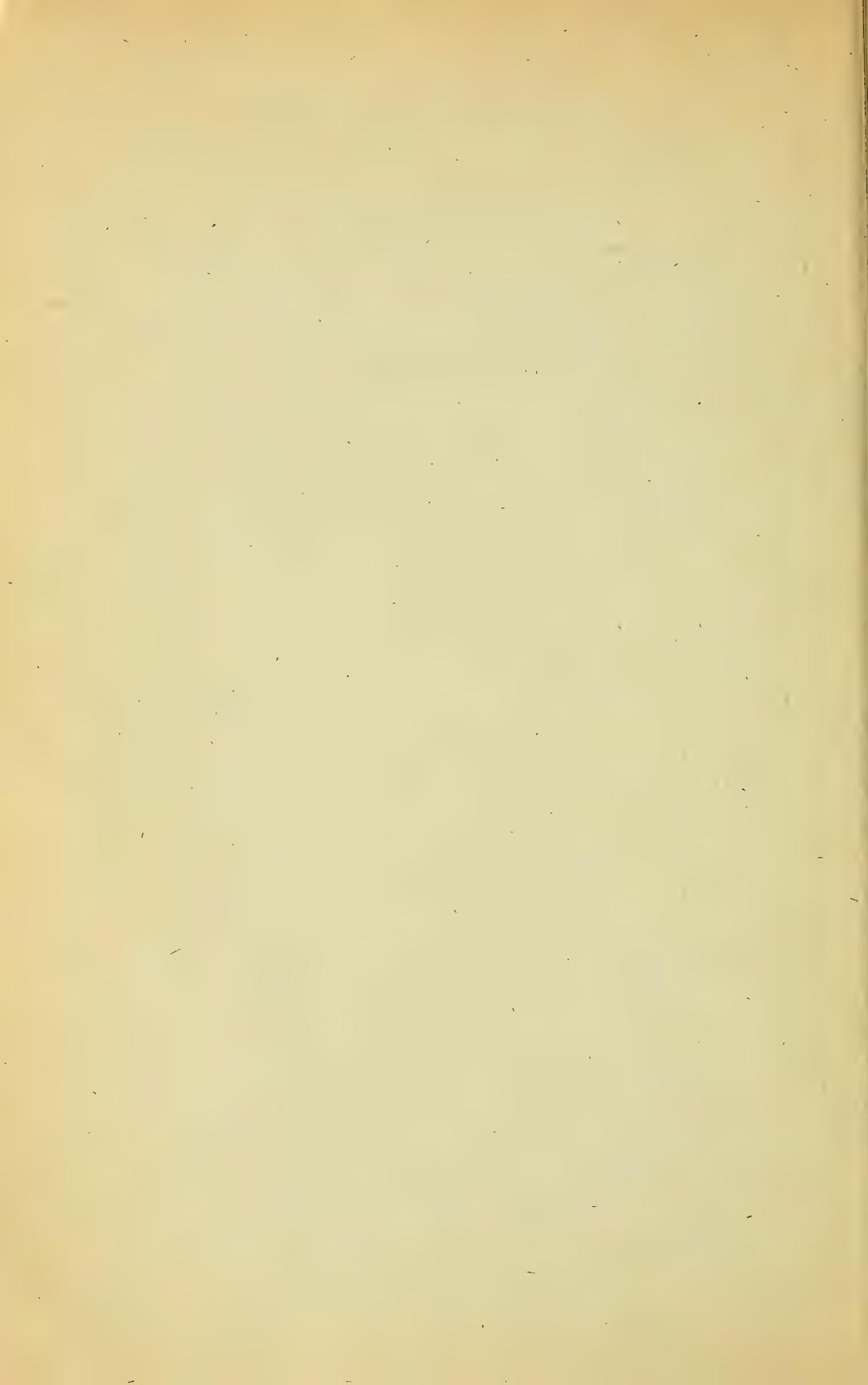
SOUTHERN PARTY—1913-16



OTTAWA
J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1919

Issued July 14th, 1919.



REPORT

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CANADIAN ARCTIC EXPEDITION 1913-18

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PART C: DIPTERA

Crane-flies	C. P. Alexander
Mosquitoes	H. G. Dyar
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SOUTHERN PARTY—1913-16

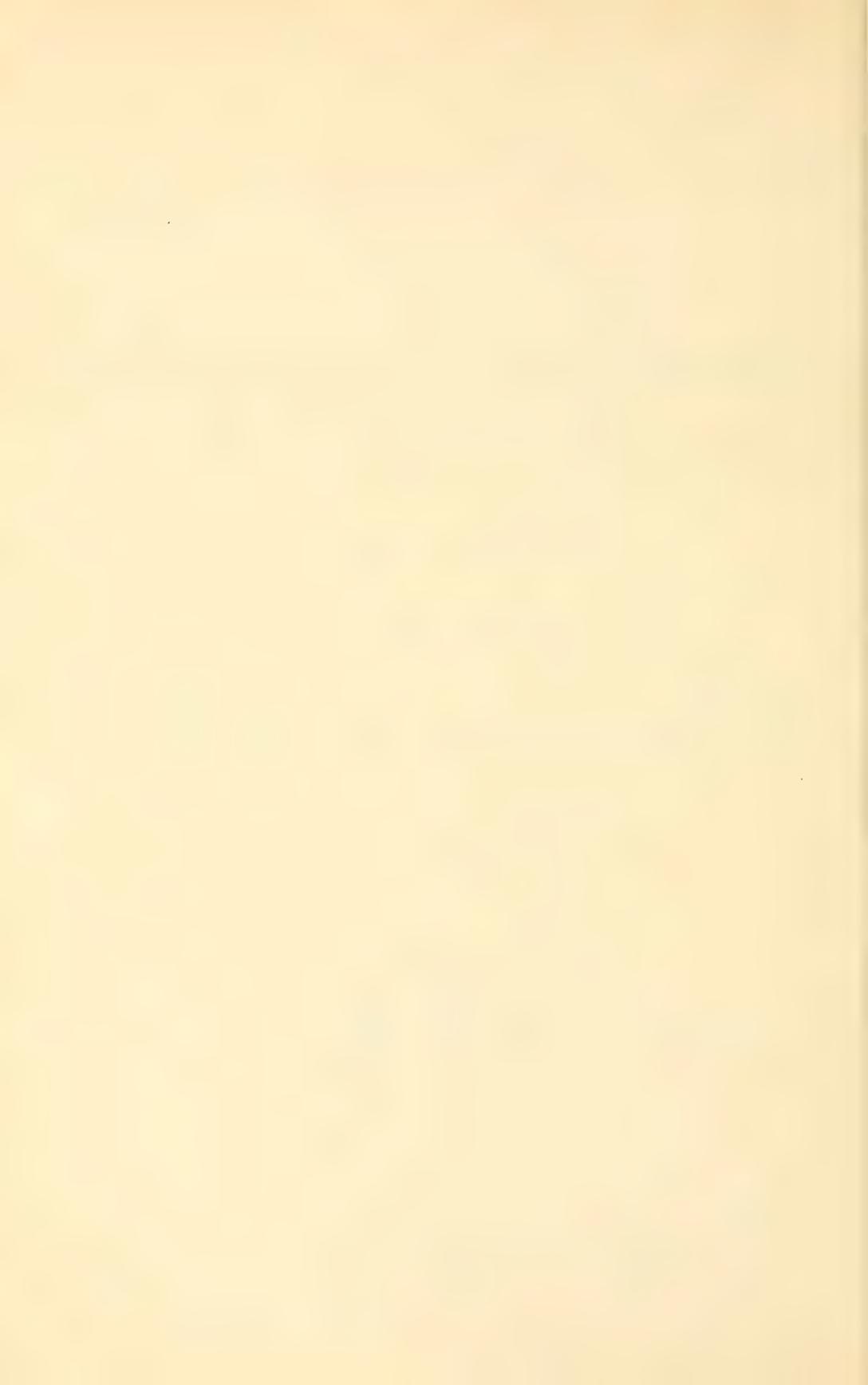


OTTAWA

J. de LABROQUERIE TACHÉ

PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1919



The Crane-flies collected by the Canadian Arctic Expedition, 1913-18.

By CHARLES P. ALEXANDER, Ph. D.

INTRODUCTION.

The collection of crane-flies made by the Canadian Arctic Expedition is quite extensive, and includes about 100 specimens of adults, larvæ, and pupæ. The types and uniques have been placed in the Canadian National Collection; certain of the paratypes and duplicates are retained in the collection of the author. The present report has been divided into two general portions, the first on the taxonomy of the adult flies, the second a consideration of the immature stages and the biological data secured by the collector, Mr. Frits Johansen.

The material represents as satisfactory a collection of Arctic American Tipulidæ as has yet been brought together. The itinerary and general narrative of the Southern Division of the Expedition has been recorded by Dr. R. M. Anderson (1917).¹

BIBLIOGRAPHY.

There have been rather numerous species of crane-flies described from the Canadian Arctic Northwest, the more important reports on these collections being as follows:—

- Kirby, Wm., (1824) in the supplement to Capt. Parry's first voyage described *Stygeropsis parrii* (Kirby).
- Curtis, John (1831) in the appendix to Ross's voyage to the Arctic regions, described *Tipula arctica* Curtis.
- Loew, Hermann (1863-1865) in the Centuries of North American Diptera described the numerous species of Tipulidæ collected by Robert Kennicott, now in the Museum of Comparative Zoology at Cambridge. These specimens bear the general label of "H.B.T.," only a few of them having any more exact label. In another paper (Proceedings of the Academy of Natural Sciences of Philadelphia, September, 1915, pp. 458-465) I have discussed Loew's species and their present condition.
- Osten-Sacken (1859-1869) described most of the Linnobiinæ collected by Kennicott and also (1876) *Tipula besselsi*, from Polaris bay, Greenland, at about 82 degrees north latitude, collected by Dr. E. Bessels in 1872.
- Bergroth (1888) described several new species mostly from Sitka, Alaska. Most of these were rediscovered on the Harriman expedition (see Coquillett).
- Williston (1893) described *Stygeropsis bergrothi* from Alaska. The type was recorded as having been placed in the Kansas University collection, but is not mentioned among the types in Hunter's list (Kansas University Science Bulletin, vol. 8, No. 1, p. 18; 1914) nor have I been able to locate the specimen.
- Doane (1900, 1901) described a very few species from Unalaska, his types being in the collection of the United States National Museum.
- Coquillett (1900), The Crane-flies of the Harriman Expedition to Alaska, the types are now in the collection of the United States National Museum.
- Dietz (1915), two Linnobiinæ crane-flies collected by Francis Harper in the Athabaska country.
- Alexander (1915-date), species collected by Kennicott in the Loew collection but never described by Loew; the types are now in the collection of the Museum of Comparative Zoology.
- The crane-flies of the Pribilof islands, now in the collection of the United States Biological Survey.

The most important collections from the Arctic Northwest may be considered to be the following: Kennicott's collections, the Harriman Expedition, the Pribilof islands collections, and the present one.

¹ Report of the Department of the Naval Service for the Fiscal Year ending March 31st, 1917. Ottawa: A 1-2, pp. 22-70. Also Summary Report of the Geological Survey, Dept. of Mines, for the calendar year 1913. *Ibid.* 1914, 1915, 1916.

. From the above material a good idea of the general faunas of the crane-fly fauna of the Canadian Arctic Northwest may be obtained. The species are almost, if not all, forms of dull, sombre colouration—browns or greys—and most of them are of simple, primitive organization. A considerable number show unmistakable signs of degeneracy in the wings, this condition being particularly noticeable in the Pribilof islands, where fully half of the known species have the wings more or less atrophied. In the present collection, two of the Limnobiine forms showed the first stages of wing-atrophy, but all of the ten Tipuline species are full-winged. Some of the species of Arctic Tipulidæ have the head, the thoracic intervals, the pleura, coxæ, etc., clothed with an abundant long, erect pubescence. Many of the Arctic crane-flies seem to be very local in their distribution. Thus the collections from the Pribilof islands show not one of the species taken elsewhere in the Canadian northwest (with the possible exception of *Trichocera*). Similarly, the collections of the Harriman expedition and the present collections show that the species are in large part very local in their distribution, the natural barriers of mountains and large water-bodies having proved a very efficient check upon their dispersal. In the present collection there are a total of sixteen species, only two or three of which have been found elsewhere; of these *Tipula arctica* and *Stygeropsis parrii* are rather well-known Arctic American species, and the *Trichocera* is probably Holarctic in its distribution.

The collection that is reported upon in this paper is constituted as follows:—

<i>Rhyphidæ</i> —		
<i>Trichocerinæ</i> —		
<i>Trichocera</i>		1 species.
<i>Tipulidæ</i> —		
<i>Limnobiinæ</i> —		
<i>Limnobiini.</i>	<i>Dicranomyia</i>	1 species.
<i>Eriopterini.</i>	<i>Erioptera</i>	1 “
<i>Limnophilini.</i>	<i>Limnophila</i>	1 “
<i>Pediciini.</i>	<i>Tricyphona</i>	2 “
<i>Tipulinæ</i> —		
<i>Tipulini.</i>	<i>Stygeropsis</i>	2 “
	<i>Nephrotoma</i>	1 “
	<i>Tipula</i>	7 “

The general tendencies of distribution of crane-flies in the high Arctic regions are well shown by the above list, the omnipresent *Trichocera*, a dominance of Pediciine and Tipuline genera, with a smattering of *Limnobiini*, *Eriopterini* and *Limnophilini*. The extensive tribes *Antochini* and *Hexatomini* (in the strict sense)¹ seem to be entirely lacking so far as known. The *Ptychopteridæ* are likewise lacking and the single record for the *Tanyderidæ* (*Protoplasa*) is unsatisfactory.

ADULT FLIES.

Family TIPULIDÆ.

Subfamily LIMNOBIINÆ.

Tribe LIMNOBIINI.

Genus *Dicranomyia* Stephens.

Dicranomyia Stephens; Catalogue of British insects, vol. 2, p. 243; 1829.

Dicranomyia alascaensis, n. sp.

Antennæ black; halteres short; wings nearly hyaline, with a large, oval, brown stigma; *Sc*₂ remote from the tip of *Sc*₁; cell *first M*₂ closed; femora yellow, tipped with brown.

¹ Concerning the status of the tribe *Hexatomini*, read the remarks under the genus *Pocillostola*, page 000.

FEMALE.—Length, 5.5 mm.; wing, 6.8 mm.

Rostrum and palpi black. Antennæ black, the basal flagellar segments enlarged, beyond the fifth oval, the last segment elongate. Head dark-coloured, discoloured in the type.

Thorax dark-coloured, discoloured in the type, probably grey pruinose; pleura grey pruinose. Halteres short, pale at the base, the remainder brown. Legs with the coxæ and trochanters yellow; femora dull yellow, the tips broadly brown, narrowest on the fore femora, broader on the posterior femora; tibiæ and tarsi very light brown, the terminal segments of the latter darkened. Wings nearly hyaline; stigma large, oval, brown; veins brown; venation (Pl. I, fig. 1) Sc_2 remote from the tip of Sc_1 so that Sc_1 alone is about equal to the basal deflexion of Cu_1 ; Sc_1 ends just opposite the origin of Rs ; r at the tip of R_1 ; Rs about twice as long as the basal deflexion of R_{4+5} ; cell *first* M_2 closed; basal deflexion of Cu_1 at the fork of M .

Abdomen dark brown, pruinose, the pleural integument and the valves of the ovipositor yellowish.

Locality: Holotype, ♀, Nome, Alaska, August 24, 25, 1916 (F. Johansen). No. 78.

In the elongate Sc_1 this species suggests *D. halterata* Osten-Sacken, but this is about the only feature that the two species have in common. In other respects it seems closer to *D. aquita* Dietz¹ from Taltson river, Mackenzie district (not Rocker river as stated in the original description), but it is a much smaller fly and the details of both colour and venation are different.

Tribe ERIOPTERINI.

Genus *Erioptera* Meigen.

Subgenus *Erioptera* Meigen.

Erioptera Meigen; Illiger's Magazine, vol. 2, p. 262; 1803.

Erioptera (*Erioptera*) *angustipennis*, n. sp.

General colouration dark brown with a grey pruinosity; wings very long and narrow.

MALE.—Length, 4.4 mm.; wing, 5.4 mm.

Rostrum and palpi black. Antennæ black, the flagellar segments oval. Head dark grey.

Mesonotum brown, more greyish on the sides; pseudosutural foveæ conspicuous, transverse, black. Pleura dull grey. Halteres rather elongate, brown. Legs dark brownish black throughout. Wings very long and narrow showing the first stages of atrophy although the venation is normal; membrane slightly suffused with brown; stigma indistinct; veins dark brown; venation (Pl. I, fig. 2) the veins are all very elongated due to the great narrowing of the wing.

Abdomen dull grey, the segments indistinctly paler caudally and here with fringes of long golden hairs that are more sparse elsewhere on the surface; male hypopygium with the pleural appendages slender, pointed at their tips.

Locality: Holotype, ♂, Bernard harbour, Dolphin and Union strait, North-west Territories, August 1-7, 1915 (F. Johansen). No. 1045.

Readily distinguished from all other members of the genus by the long, narrow wings. The second anal vein is straight as in the subgenus *Acyphona* to which group the species may perhaps be better referred.

¹ Canadian Entomologist, vol. 47, pp. 331-332, fig., October, 1915.

Tribe *LIMNOPHILINI*.Genus *Limmophila* Macquart.

Limmophila Macquart; Histoire Naturelle, Diptera; Suité à Buffon, vol. 1, p. 95; 1834.

Subgenus *Dactylolabis* Osten-Sacken.

Dactylolabis Osten-Sacken; Proceedings of the Academy of Natural Sciences of Philadelphia, p. 240; 1859.

***Limmophila (Dactylolabis) rhicnoptiloides*, n. sp.**

General colouration black, dusted with grey; wings long and narrow, the veins heavily spotted and seamed with brown; *Rs* spurred at its origin.

MALE.—Length, 8–8.8 mm.; wing, 8–9 mm.

Rostrum and palpi dark brownish black. Antennæ black, the first segment elongated. Head narrowed behind, dark coloured with a light grey pruinosity; the whole dorsal surface of the head is beset with short, sharp bristles that are directed forwards.

Thorax dark with heavy, clear, light grey bloom; mesonotal praescutum with four brown stripes, the median pair long and parallel. Halteres with the stem pale, the knobs darker brown. Legs with the large coxæ dusted with grey; trochanters dark; remainder of the legs broken. Wings long and narrow, subhyaline, the veins heavily seamed with greyish brown so that most of the wing-surface appears of this dark colour; venation (Pl. I, fig. 3) the wing of the paratype is longer and narrower than that of the type figured; in both wings of this paratype there is a cross-vein in cell R_2 just proximad of the radial cross-vein; *Rs* spurred at its origin.

Abdomen black, sparsely dusted with grey.

Locality: Holotype, ♂, Bernard harbour, Northwest Territories, July 15, 1915 (F. Johansen), No. 1308. Paratopotype, ♂, July 22, 1915, No. 1064.

The wings of this interesting new species are narrower, proportionately, than either *L. montana* Osten-Sacken of eastern North America or *L. damula* Osten-Sacken of western North America and the sector is spurred at its origin. The species shows decided tendencies toward degeneration of the wings and in this respect approaches *L. (D.) wodzickii* (Nowicky), the type of the proposed group *Rhicnoptila* (Beschreibung neuer Dipteren,—Verhandlungen der kaiserlich-königlichen zoologisch-botanischer Gesellschaft in Wien, vol. 17, pp. 337–354, Pl. 11; 1867). This last species is an even more degenerate *Dactylolabis* occurring in the high mountainous regions (6,000 to 8,000 feet) of the Hungarian Tatras (western Carpathians) where it frequents granitic cliffs in places where the rock surface is constantly moistened by dripping water. Here the degenerate condition is apparently brought about by the great altitude and the habitat. In the present species the degeneracy is the result of living in the high arctics and is quite comparable to the condition in *L. wodzickii*. In my opinion the name *Rhicnoptila* has no status at all, although the descriptions of the immature stages indicate some notable peculiarities. But whether these conditions are real or due to the insufficiency of Nowicky's description has not yet been ascertained.

Tribe *PEDICIINI*.Genus *Tricyphona* Zetterstedt.

Tricyphona Zetterstedt; Insecta Lapponica, Diptera, p. 851; 1838.

***Tricyphona brevifurcata*, n. sp.**

Thoracic dorsum pale brownish grey with three conspicuous dark brown stripes; wings with vein R_{4+5} as long or longer than its fork.

MALE.—Length, 10 mm.; wing, about 9 mm.

Rostrum and palpi dark brownish black. Antennæ black, the flagellum broken. Head small, dark brown, somewhat paler laterally.

Mesonotal praescutum pale brownish grey with three dark brown, very distinct, stripes, the median one broadest in front, narrowed behind, and ending before the suture, very narrowly bifid behind; lateral stripes shorter and narrower crossing the suture and suffusing the scutal lobes; scutellum and postnotum dark brown. Pleura dark blue-grey pruinose. Halteres light brown, the knobs darker. Legs with the coxæ sparsely pruinose; trochanters dark brown; remainder of the legs very dark brown, only the fore femora a little brighter at the extreme base. Wings subhyaline; stigma rather indistinct, pale brown; a darker brown spot on the *r-m* crossvein and the basal deflexion of vein $R_4 +_5$; vein *Cu* indistinctly seamed with darker; veins brown; venation (Pl. I, fig. 4) crossvein *r* near the tip of R_1 ; vein $R_4 +_5$ a little longer than the very short fork.

Abdomen elongate, blackish, with numerous, scattered, appressed golden hairs; basal tergites with a transverse linear impressed area before mid-length of the segments, these interrupted medially; the sternites are narrowly and indistinctly margined caudally with pale.

Locality: Holotype, ♂, west of Konganevik, Camden bay, Alaska, July 4, 1914 (F. Johansen). No. 432.

This is a very distinct species of *Tricyphona*, having the fork of vein $R_4 +_5$ shorter than in any other American species of the genus. The wings of the type are badly broken, but otherwise the specimen is in good condition.

Tricyphona frigida, n. sp.

Belongs to the *diaphana* group; size small, wing under 8.5 mm.; general colouration greyish, the thoracic dorsum with narrow brown stripes.

MALE.—Length, 5.8 mm.; wing, 7.8 mm.

FEMALE.—Length, 7.5 mm.; wing, 7.5 mm.

Rostrum, palpi, and antennæ black. Head grey.

Mesonotal praescutum grey with four brown stripes, the median pair separated by a narrow vitta of the ground colour. Pleura grey. Halteres brown, the knobs a little darker. Legs with the coxæ grey; trochanters brownish grey; femora pale brown, passing into dark brown before midlength of the segment; tibiæ and tarsi dark brown. Wings with a strong brownish tinge, the stigma darker brown; indistinct brownish seams along the sector and the cord; venation (Pl. I, fig. 5) *Rs* strongly arcuated at its origin; *r* close to the tip of R_1 ; *r-m* about equal to the basal deflexion of R_5 .

Abdomen brownish grey; valves of the ovipositor brownish horn-colour. Male hypopygium (Pl. II, fig. 20) with the pleura short and stout, the apical lobe densely beset with acute black spines; pleural appendage yellow, at the tip and on the cephalic face with a few elongated stout bristles; at the base of the pleurites, a sickle-shaped hook ending in a short, subacute tip; below this a smaller curved hook directed caudad. In *T. diaphana* (Pl. II, fig. 21) the condition is quite similar, but the pleurites are even shorter and stouter; the hooklike appendage at the base of the pleurite is scimitar-shaped, at the tip produced into a long drawn out point; the smaller ventral hook is straighter.

It is probable that fresh specimens are not coloured as described above. The type-material is badly discoloured and matted and it is difficult to be sure of the exact condition in fresh or better preserved material.

Locality: Holotype, ♂, Ketchikan, southeastern Alaska, September 10, 1916 (F. Johansen). No. 872. Allotype, ♀, with the type, No. 877.

T. frigida belongs to the group of species that includes *exoloma* (Doane) and *diaphana* (Doane), these three species showing the following group characters:—

Full-winged, the wing or its venation showing no tendencies to atrophy; median cross-vein present, closing cell *first* M_2 ; cell R_4 very deep so that the

r-m cross-vein connects with vein R_5 rather than with vein $R_4 + 5$ as in most species of the genus.

It is a much smaller species than either *exoloma* or *diaphana* which have the wings measuring over 10 mm. I am inclined to believe that it is this species that Coquillett records as *diaphana* in the Harriman reports, from the following Alaskan localities:—

Localities: One ♂, Yakutat, Alaska, July 21, 1899; one ♂, Berg bay, June 10, 1899; one ♂, Popof island, July 15, 1899.

It may be that this represents a still undescribed species of the group.

I have the following records for *T. diaphana*:—

Localities: One ♀, Pullman, Wash., May 4, 1898 type; five ♂, ♀, Olympia, Wash., March 16, 1896; one ♂, Seattle, Wash.; one ♂, Vancouver, B.C., March 29, 1902.

Subfamily TIPULINÆ.

Tribe TIPULINI.

Genus *Stygeropsis* Loew.

Stygeropsis Loew; Berliner Entomologische Zeitschrift, vol. 7, p. 298; 1863.

A small genus of northern and Arctic Tipuline crane-flies, occurring in both hemispheres. The generally accepted belief that this genus is closely related to *Ctenophora* and its allies is entirely erroneous. This is best proved by a study of the immature stages which are very Tipuline in nature, in some respects uniting the *Longurio* and *Tipula* types.

Stygeropsis parrii (Kirby).

Ctenophora parrii Kirby; Supplement to Capt. Parry's First Voyage; 1824.

MALE.—Length, 11–13 mm.; wing, 14–15 mm.

FEMALE.—Length, 17·5 mm.; wing, 15·8 mm.

Palpi short, black. Frontal prolongation of the head short, black. Antennæ (Pl. II, fig. 12) black, the first segment elongate, transversely wrinkled; flagellar segments narrow basally, enlarged distally into a blunt serration on the inner face. Head dull black with a sparse yellowish grey bloom, the sides of the vertex clothed with elongate, pale hairs.

Thoracic dorsum light grey with three broad, darker grey stripes, the median one broadest anteriorly; thoracic interspaces with an abundance of long, erect hairs; an indistinct, narrow, blackish, median stripe runs the length of the notum. Pleura grey, the dorso-pleural membrane more yellowish. Halteres brown, the knobs darker. Legs with the coxæ and trochanters dark, the former grey pruinose; femora reddish brown, the tips broadly blackened; tibiæ and tarsi black. Wings with a slight brownish grey tinge, the costal and subcostal cells more brownish; stigma dark brown; obliterative streak before the cord not very distinct; venation (Pl. I, fig. 7) R_{2+3} long, very slightly arcuated at origin; petiole of cell M_1 present but often greatly shortened as in *parrioides*.

Abdomen dark blue-grey, the segments very narrowly ringed with paler on the caudal margin; lateral margins of the tergites broadly paler. Lobes of the male hypopygium conspicuously yellow; female ovipositor with the tergal valves rather high, narrowly blackened at their tips. Male hypopygium having the ninth tergite (Pl. II, fig. 26) large, the caudal margin with a very deep, U-shaped, median notch, the lateral lobes prominent, obliquely truncated; tergite black, the apices of the lobes broadly pale. Ninth pleurite rather extensive, the pleural suture indistinct beneath; outer pleural appendage (Pl. II, fig. 23)

a suboval flattened lobe, dull yellow in colour, slightly broader at the base than at the tip which is obtusely rounded; the outer face of the appendage with sparse, short, scattered hairs; inner pleural appendage (Pl. II, fig. 24) a large, pale brown lobe, flattened, at the tip produced into a long, curved point that is slightly expanded at its tip, the inner face with abundant long, pale hairs. Ninth sternite extensive, a deep split on the mid-ventral line, the margins closely approximated or contiguous.

The following ten specimens are in the collection:

Localities: Nos. 434, 435, 436, and 438, west of Kongenevik, Camden bay, Alaska, July 4, 1914. Nos. 1194, 1195, Collinson point, Alaska, June 22 23, 1914. Nos. 422, 423, 822, and 828, Bernard harbour, Northwest Territories, July 1-14, 1916, and in July-August, 1915.

The most conspicuous differences between this species and the next, *S. parrioides*, are in the dense erect pile of the present species, the clear blue grey colouration, the conspicuous differences in the structure of the antennæ and hypopygium of the male sex, etc.

S. bergrothi Williston¹ is unsatisfactorily described and the type is apparently no longer in existence as was stated earlier in this paper. It is a blackish grey species with the stem of the halteres and the bases of the femora reddish yellow and the wings uniformly tinged with brownish. *S. sordida* Loew (Century 4, No. 42; 1863) has the rostrum black as in the present species and agrees in some other features, but is apparently a different species.

Stygeropsis parrioides, n. sp.

Frontal prolongation of the head light brown; antennæ short, the flagellar segments with an inconspicuous transverse ridge before the middle, this bearing a fringe of short, pale hairs; mesonotum greyish yellow with a narrow, dark brown median line, the sternites and pleurites clear, light grey; abdominal tergites with a broad, dark brown, median line; wings reddish brown; petiole of cell M_1 very short or lacking; pile on the body short, not conspicuous as in *parrii*.

MALE.—Length, 14-15 mm.; wing, 11-12 mm.

Palpi short, dark brown. Frontal prolongation of the head light brown, short; nasus distinct. Antennæ (Pl. II, fig. 13) dark brown, segment one elongate, transversely wrinkled; segment two cyathiform; segment three elongate, broader distally; segments four to seven broad basally with a transverse row of pale hairs before mid-length of the segments, on the ventral face with one or two small spicules; terminal segments gradually attenuated. Vertex greyish brown, with numerous black bristles that are lacking on the median line; vertex produced forward on the median line into a tongue between the antennal bases; genæ with numerous black, bristle-like hairs.

Mesonotal praesutum yellowish grey, brightest before the pseudosutural foveæ, the three usual thoracic stripes not distinct, only a very narrow dark brown median line running the entire length of the mesonotum. Dorsal pleurites concolourous with the notum; sternal pleurites and sternum clear light grey. Halteres dark brown. Legs with the coxæ clear light grey; trochanters brown; femora brown; tibiæ similar, darker at the tips; tarsi dark brown. Wings with a strong reddish brown tinge, cells *C* and *Sc* more saturated; stigma brown; the membrane along vein *Cu* more greyish; venation (Pl. I, fig. 8) *R*s elongate; cell M_1 sessile (as in the genus *Nephrotoma*) or very short-petiolate.

Abdominal tergites reddish brown with a broad, distinct, dark brown, median line; caudal margins of the segments less distinctly brownish; a narrow, sublateral, brown line; extreme lateral margins narrowly dull yellow. Sternites somewhat similar, the basal two-thirds reddish brown, the apical third dark

¹ Kansas University Quarterly, vol. 2, p. 64; 1894.

brown; a very narrow and indistinct median brown line. Male hypopygium with the ninth tergite (Pl. II, fig. 27) short, rather tumid, the caudal margin with a broad, U-shaped, median notch, the caudal margin densely provided with short, black hairs; beneath the tergal lobes, between the pleurites, are two small rounded lobes that are densely set with short black bristles. Ninth pleurite extensive, oval, with numerous hairs; outer pleural lobe (Pl. II, fig. 22) almost circular in outline, the outer face with numerous short hairs; inner pleural lobe (Pl. II, fig. 25) of rather simple structure, two armed, the outer arm directed caudad, at its tip forming a blackened chitinized hook; the inner arm is directed proximad and slightly dorsad, the blunt apex bent very slightly cephalad, almost the whole appendage with dense, pale hairs that are short or absent on the apex of the lobe, longest on the inner margin; viewed from above it is seen that this inner arm sends out a lobule on the inner dorsal side before the apex; the dorsal margin of this lobule is narrowly but heavily chitinized. Suture between the ninth sternite and pleurite not very distinct, the sternal region destitute of hairs.

Locality: Holotype, ♂, west of Konganevik, Camden bay, Alaska, June 1914 (F. Johansen). No. 634. Paratopotypes, seven ♂'s, Nos. 635, 636, June 1914; Nos. 433, 437, 439, 440, and 441, July 4, 1914.

Genus *Nephrotoma* Meigen.

Nephrotoma Meigen; Illiger's Magazine, p. 262; 1803.

Nephrotoma arctica, n. sp.

General colouration black; abdominal tergites with an interrupted orange-yellow stripe on either side of the median line; wings hyaline with the stigma dark brown; a brown cloud at the end of the sector.

MALE.—Length, 12.5–13 mm.; wing, 12–13.2 mm.

FEMALE.—Length, 14 mm.; wing, 13 mm.

Palpi black. Frontal prolongation of the head short, black; nasus elongate, black. Antennæ black, the basal enlargement of the flagellar segments not conspicuous (Pl. II, fig. 14). Head broad, black, faintly shiny; the vertex surrounding the antennal bases yellow.

Pronotal scutum black, scutellum yellowish. Mesonotum black, faintly shiny; in some specimens a narrow yellowish line on the praescutum near the suture and a yellowish mark before the pseudosutural foveæ indicate the usual yellowish ground-colour of the thorax in this genus of flies. Pleura black, faintly dusted with grey; dorso-pleural membranes dull yellow, a linear yellowish mark on the side-pieces of the mesonotal postnotum just in front of the halteres. Halteres dark brown, the head somewhat yellowish. Legs with the coxæ dusted with grey; remainder of the legs dark brown. Wings whitish hyaline, the costal and subcostal cells not brighter; stigma small, dark brown; a paler brown cloud at the end of the sector, extending down to cell *first M*₂; indistinct seams along *Cu* and its branches; veins black; venation (Pl. I, fig. 6) *Rs* rather long for this group of flies, a little longer than *R*₂₊₃; cell *M*₁ sessile or very short-petiolate.

Abdomen greyish black; lateral margins of the tergites very narrowly paler, in some specimens a broad, interrupted, sublateral orange-yellow stripe on either side of the mid-dorsal line. Male hypopygium with the ninth tergite (Pl. III, fig. 28) quadrate, the caudal margin with a small, deep, U-shaped, median notch, the lateral lobes squarely truncated, finely spiculate, the outer lateral angle with a blunt point that is minutely toothed beneath. Outer pleural appendage (Pl. III, fig. 29) an elongate-oval lobe that is produced into a blunt point at the tip; inner pleural appendage chitinized and at its tip produced into a short beak; pleural suture rather long, at its inner end curved slightly

dorsad. Eighth sternite with the caudal margin broadly concave, the lateral angles bearing small tufts of hairs.

The female is similar but of a less heavy build; the abdominal tergites have the same orange-yellow stripes on either side of the broad median area, these most conspicuous on segments three to five where they appear as bright triangles.

Locality: Holotype, ♂, Bernard harbour, Northwest Territories, July 1-14, 1916 (F. Johansen). No. 425. Allotopotype, ♀, July, August, 1915. No. 823. Paratopotypes, five ♂, ♀, Nos. 419, 429, July 1-14, 1916; Nos. 824, 825, and 827, July-August, 1915.

This interesting Arctic *Nephrotoma* belongs to the same group as the Palæartic *N. pratensis* (Linnaeus) and *N. nox* (Riedel) and the *N. penumbra* Alexander from the high mountains of Northeastern North America. I have seen specimens of a species of this same group from Greenland that are close to *pratensis* but seem to represent a new species.

Genus *Tipula* Linnaeus.

Tipula Linnaeus; Systema Naturæ, edition 10, p. 585; 1758.

The present collection included seven species of this genus, the only described one being the common and apparently widely distributed *Tipula arctica* Curtis. I expected that *T. pratorum* Kirby¹ would be found amongst the material but such was not the case, there being no species having the antennal scape yellow. The only species in this collection with any yellow on the antennæ is *T. difflava* which does not agree at all with Kirby's rather unsatisfactory description.

Tipula johanseni, n. sp.

Antennæ black; head grey, along the inner margin of the eye broadly paler; thoracic dorsum with four dark brown stripes; wings with the tip of vein R_2 pale, subatrophied; crossvein *m* obliterated by atrophy.

MALE.—Length, 11·8 mm.; wing, 12·4 mm.

Palpi black. Frontal prolongation of the head dark grey, the nasus short, blunt. Antennæ (Pl. II, fig. 15) black; first segment of the scape relatively short, not as long as the first flagellar segment; flagellar segments rather elongated, the basal swelling oval, shorter than the remainder of the segment. Head dull grey, paler along the inner margin of the eye; sides of the vertex with scattered long, coarse bristles.

Thoracic dorsum dull grey with four dark brown stripes, the median pair narrow, separated from one another by a broad stripe of the ground colour. Pleura dark grey, the dorso-pleural membranes dull yellowish. Halteres rather long, brown, the knobs still darker brown. Legs with the coxæ dull grey and provided with long pale hairs; trochanters black; remainder of the legs broken. Wings light grey, the costal and subcostal cells a little more yellowish; stigma brown; an indistinct dark cloud at the tip of *Rs*; veins dark brown; venation (Pl. I, fig. 11) tip of vein R_2 pale, subatrophied; crossvein *m* obliterated or nearly so.

Abdominal segments blackish, the caudal and lateral margins broadly paler; hypopygium yellow. Male hypopygium with the ninth tergite (Pl. III, fig. 32) not prominent, the sides oblique, the caudal margin very deeply split by a V-shaped median notch that extends almost to the eighth tergite, the lobes thus formed long, subacute. Ninth pleurite extensive, subtriangular, the caudal angle extended out into a short blunt point; outer pleural appendage not prominent, cylindrical to slightly flattened, with long golden hairs; inner pleural appendage greatly compressed. Ninth sternite profoundly incised be-

¹ Fauna Boreali-Americana, Insecta, p. 310; 1837.

neath by a V-shaped notch, beneath the margin of the eighth sternite a small brush of long golden hairs. Eighth sternite unarmed.

Locality: Holotype, ♂, Bernard harbour, Northwest Territories, July 10, 1916 (F. Johansen). No. 213.

Similar to *T. aperta* Alexander (*imperfecta* Alexander, preoccupied) of Labrador in the open cell first M_2 , but distinct in the dark frontal prolongation of the head, the uniformly dark antennæ, the blackish trochanters and abdomen, etc. In *aperta* the tip of R_2 persists for its entire length and the petiole of cell M_1 is very much longer than in the present species.

This interesting species is dedicated to the collector, Mr. F. Johansen.

Tipula diflava, n. sp.

General colouration grey; antennæ black, the second segment abruptly yellow; abdominal tergites orange with three broad black stripes; wings clouded with brown and grey; male hypopygium with the ninth tergite large, the caudal margin deeply notched medially and with a small acute tooth at the base of the notch.

MALE.—Length, 14 mm.; wing, 14.1 mm.

FEMALE.—Length, 20–22 mm.; wing, 17.2–18.3 mm.

Palpi black. Frontal prolongation of the head black, the nasus elongate. Antennæ (Pl. II, fig. 16) with the first scapal segment narrow basally, enlarged distally, black, yellowish at the apex; segment two yellow; flagellum black, the flagellar segments with the basal swelling prominent with about four conspicuous bristles. Head black, dark grey pruinose.

Thorax grey, the mesonotal praescutum with three broad darker grey stripes, the middle one split by a line of the ground-colour; hairs on the thoracic interspaces short, pale, not conspicuous. Halteres yellow, the knobs dark brown, the apices a little brighter. Legs with the coxæ dark grey; trochanters brown; femora brownish yellow broadly tipped with black; tibiae and tarsi dark brown. Wings subhyaline, clouded with brown and grey; cells *C* and *Sc* yellowish; stigma dark brown; a dark brown spot at the origin of *M*, origin and end of the sector; apex of the wing brownish grey, interrupted by cell $R_5^{5/5}$ which is nearly hyaline; conspicuous, brownish grey clouds along vein *Cu*, in the middle and end of cell *M* and including most of cell Cu_1 ; apices of the anal cells largely grey; in the male the pattern is the same but paler; venation (Pl. I, fig. 9), pattern omitted.

Abdomen with the first tergite black; second to sixth orange, with three broad black stripes, a narrow median one, broadening out behind and two sub-lateral stripes; on the caudal margins the black stripes tend to be confluent interrupting the orange; terminal segments largely blackish; lateral margins of the tergite pale yellowish; hypopygium mostly blackish; sternites largely black. Male hypopygium (Pl. III, fig. 34) with the ninth tergite (Pl. III, fig. 33) extensive, the caudal margin with a very deep V-shaped notch, at the base of which is a tiny tooth that sends a carina cephalad onto the dorsum of the sclerite; lateral lobes thin, rounded at their apices. Ninth pleurite complete, moderately large; outer pleural appendage elongate, flattened-cylindrical, pale, with a dense covering of long hairs; inner pleural appendage flattened into an extensive blade, the margin with sharp teeth.

The female is similar but larger; valves of the ovipositor slender, elongate, acicular, not at all like the *arctica* type where the tergal valves are flattened transversely with the outer margin toothed and the sternal valves are very minute.

Locality: Holotype, ♂, Bernard harbour, Northwest Territories, July 12, 1915 (F. Johansen). No. 790. Allotype, ♀, Herschel island, Yukon Territory, July 1916. No. 838. Paratype, ♀, with the allotype. No. 839.

Tipula arctica Curtis.

Tipula arctica Curtis; Description of the insects brought home by Commander J. Clark Ross. Appendix to Ross's Voyage to the Arctic regions, p. lxxvii, Plate A, fig. 15; 1831.

MALE.—Length, 13–17 mm.; wing, 13·5–17·5 mm.

FEMALE.—Length, 20–21·5 mm.; wing, 16–17 mm.

Palpi dark brown. Frontal prolongation of the head rather elongate, blue-grey; nasus stout. Antennæ (Pl. II, fig. 17) deeply serrate, each segment of the flagellum deeply incised beneath, the apical enlargement being only a little smaller than the basal swelling but not provided with verticils. Head blue-grey.

Mesonotal praescutum dull grey with three broad blue-grey stripes, the median one often narrowly split by a vitta of the ground-colour; these stripes are sometimes narrowly margined with brown; the thoracic interspaces with numerous black setigerous punctures; remainder of the thorax blue-grey including the coxæ of the legs. Halteres brown, the knobs darker. Legs with the femora reddish yellow broadly tipped with dark brown; tarsi dark brown. Wings subhyaline with conspicuous brown and grey markings, cells *C* and *Sc* a little more yellowish; a small brown spot at the origin of *Rs*; stigma large, sending a cloud down the cord to cell *first M*₂; greyish brown clouds in the anal cells, at the base of cell *Cu*, at midlength and at the end of *M* and in the apex of the wings; venation (Pl. I, fig. 10).

Abdominal tergites in the male with segment one, black; two to four, reddish yellow with broad sublateral stripes and an indistinct median stripe brownish grey; remaining segments dark brownish grey; sternites two to four, reddish yellow, broadly darkened laterally; terminal sternites brownish grey; the segments of the abdomen are very narrowly and indistinctly margined with paler. Male hypopygium with the ninth tergite (Pl. III, fig. 35) small with a deep and broad rounded caudal notch, the dorsum rounded into a saucer, the lateral lobes with four or five blunt teeth. The inner pleural appendage is illustrated (Plate III, fig. 37).

The female is similar to the male in most respects, but the abdomen is differently coloured being dull grey with a broad, dark brown, interrupted, dorso-median stripe; the basal tergites a little brightened on either side of the dorso-median line; abdomen not excessively elongated as in the related *T. longiventris*; dorsal shield jet-black, shiny; tergal valves of the ovipositor brownish black. The ovipositor (Pl. III, fig. 43) has the dorsal shield elongate, a little longer than the tergal valves of the ovipositor; these tergal valves have about fifteen teeth along the outer lateral margin; the sternal valves are very reduced as in this group of species, acicular, the pair forming a sublyriform organ (Pl. III, fig. 40).

This was the most abundantly represented species in the collection including nearly one-half of the material, as follows:—

Localities: West of Konganevik, Camden bay, Alaska, July 4, 1914 (F. Johansen). Four ♂'s, Nos. 196–199. Port Epworth; mouth of Trée river, Coronation gulf, Arctic Canada, July 16, 1915 (J. J. O'Neill). Two ♂'s, Nos. 102 and 104; one ♀, No. 103. Bernard harbour, Northwest Territories, June 21, 1915, one ♂, No. 1328; July 4, 1915, one ♀, No. 1076; July 7, 1915, one ♂, one ♀, Nos. 1233, 1234; July 12, 1915, two ♀, Nos. 756, 789, one ♂, No. 757; July 19, 1915, ♂, ♀, Nos. 1266, 1267; July 22, 1915, ♂, ♀, Nos. 1062, 1063; July–August, 1915, six ♂, ♀, Nos. 829–834; July 1–14, 1916, seven ♂, ♀, Nos. 420, 421, 424, 426, 427, 428, and 430.

Unless stated otherwise the material was taken by Mr. Johansen. Pupae are pinned with Nos. 197, 199, and 834.

The immature stages of this interesting crane-fly will be considered on pages 18 and 19, under the second part of the report, on the immature stages.

Most species of the genus *Tipula* hold the wings outspread or divaricate in a position of rest. Apparently but few hold them folded incumbent over the abdomen. Two excellent photographs by Mr. G. H. Wilkins, taken at Bernard harbour in July, 1915, show that *T. arctica* falls in this latter group of species. These illustrations show the female fly crawling about over the Arctic vegetation, possibly searching for a place in which to oviposit. (Plate VI).

***Tipula hewitti*, n. sp.**

General colouration grey; mesonotal præscutum with three broad brown stripes; halteres tipped with yellowish orange; legs with the femora dull brownish yellow, broadly tipped with dark brown; wings very indistinctly marked with greyish clouds; male hypopygium with the ninth tergite very narrowly notched medially, the lateral lobes almost contiguous.

MALE.—Length, 13 mm.; wing, 15 mm.

Palpi black. Frontal prolongation of the head short, dark grey; nasus broad, prominent. Antennæ black, the first segment of the scape dusted with grey; flagellum broken. Head grey, the disk of the vertex more brownish; vertex produced cephalad between the antennal bases into a flat tongue that is deeply split by a median groove.

Mesonotum grey, the præscutum with three dark brown stripes, the middle one very broad in front, rapidly narrowed to near the suture, indistinctly split by a grey median vitta; lobes of the scutum with a linear brown line. Pleura grey, the dorso-pleural membrane dull brownish. Halteres brownish yellow, the knobs dark brown tipped with dull yellowish orange. Legs with the coxæ grey; trochanters dark brown; femora dull yellow, the tips broadly dark brown; tibiæ and tarsi dark brown. Wings dull grey; the costal and subcostal-cells more yellowish; stigma brown; a yellowish spot beyond the stigma in cell *second R*₁; indistinct grey clouds along vein *Cu*; venation: petiole of cell *M*₁ short; crossvein *m-cu* obliterated by the fusion of *Cu*₁ on *M*₃₊₄.

Abdomen dark greyish black, the terminal tergites ringed with paler, the lateral margins indistinctly paler. Male hypopygium with the ninth tergite (Pl. III, fig. 36) large, subquadrate, the caudal margin nearly transverse with a very narrow median notch, the adjacent lobes slightly produced caudally at their inner angle and almost touching one another. Ninth pleurite complete; outer pleural appendage (Pl. III, fig. 30) elongate-oval, the apex broadly rounded, the basal two-thirds dusky, the apical third yellowish. Ninth sternite with a deep median notch.

Locality: Holotype, ♂, Bernard harbour, Northwest Territories, July 1-14, 1916 (F. Johansen). No. 418.

I take great pleasure in dedicating this species to Dr. C. Gordon Hewitt, the Dominion Entomologist, to whom I am indebted for many favours.

***Tipula subpolaris*, n. sp.**

MALE.—Length, 13.5 mm.; wing, 13.6 mm.

In most respects very similar to *T. hewitti*, but the male hypopygium is quite different. Unfortunately the type is badly discoloured. The antennæ (Pl. II, fig. 18) have the flagellum black, the individual segments moderately elongated, the basal enlargement being about half as long as the rest of the segment. Tibial spurs long and slender. Basal abdominal tergites with indications of orange on the sides of the median black line. Male hypopygium with the ninth tergite (Pl. III, fig. 38) black, the caudal margin with a broad U-shaped notch. Ninth pleurite complete, black, broadly margined with yellowish; outer pleural appendage subelongate, narrowed toward the apex, dusky basally, passing into rather bright yellow beyond.

Locality: Holotype, ♂, Bernard harbour, Northwest Territories, July-August 1915 (F. Johansen). No. 826.

This species is certainly close to *T. hewitti*, but I cannot make the two agree. Unfortunately each species is represented only by the unique male type and I do not care to remove the abdomen to submit the male genitalia to the critical study that some day may be necessary. More material from the Arctic north-west would probably decide the status of these two species which are closely allied but which certainly appear to be distinct.

***Tipula besseloidea*, n. sp.**

General colouration grey; antennæ rather short, black; body clothed with conspicuous erect hairs; femora light yellowish, tipped with black; ninth tergite of the male hypopygium with a small, U-shaped notch, the lateral lobes rounded.

MALE.—Length, 12 mm.; wing, 15.5 mm.

Palpi black. Frontal prolongation of the head greyish black; nasus prominent. Antennæ (Pl. II, fig. 19) black; first segment of the scape long and slender, clothed with numerous outspreading hairs; flagellar segments very short, the basal swelling of the individual segments being about equal to the remainder of the segment. Head broad, eyes rather small, widely separated; vertical tubercle low; head dark grey with scattered setigerous punctures.

Thorax dark grey, the præscutum with three indistinct, darker grey stripes; thoracic interspaces with an abundant coarse, black hair. Halteres dull brownish yellow. Legs with the coxæ grey clothed with numerous long pale hairs as in *besselsi* O.S.; trochanters dark; femora light brownish yellow, the tips broadly black; tibiæ light brown, the tips broadly black; tarsi dark brown. Wings nearly hyaline, the subcostal cell more yellowish; stigma dark brown, oval; apex of the wings a little darkened; veins dark brown; obliterative streak extending from before the stigma into cell *M*₄; venation: crossvein *m-cu* not far beyond the fork of *M*.

Abdomen dark grey, the segments conspicuously ringed with pale yellowish; lobes of the hypopygium yellow. Male hypopygium with the ninth tergite (Pl. III, fig. 39) rather extensive, the caudal margin somewhat rounded and with a deep, U-shaped, median notch; at the inner margin of the lateral lobes a small tubercle; entire sclerite black, clothed with numerous short, appressed hairs; suture between the tergite and sternite well-defined. Ninth pleurite small, incomplete, the suture indicated only beneath; outer pleural appendage (Pl. III, fig. 31) a small, suboval flattened lobe, pale brownish yellow, the outer face with abundant long pale hairs; inner pleural appendage (Pl. III, fig. 42) elongate, chitinized, at the base a rounded knob clothed with long, delicate pale hairs, the outer margin with four stout bristles. Penis-guard a long, straight chitinized point, gradually narrowed from the base to the acute apex.

Locality: Holotype, ♂, Bernard harbour, Northwest Territories, July 1-14, 1916 (F. Johansen). No. 422. Paratopotype, ♂. No. 417.

This species bears a strong superficial resemblance to *T. besselsi* Osten-Sacken in the grey colouration with conspicuous long, erect pile; the legs are differently coloured and the hypopygium of the male is very differently constructed in the two species. It also resembles *Stygeropis parrii* (Kirby) superficially in colouration and the erect pile, but the verticillate antennæ and nearly hyaline wings of the present species offer easy points for separation.

***Tipula subarctica*, n. sp.**

Related to *T. pribilofensis* Alexander; general colouration dark; abdomen reddish brown with a dark median stripe on both the tergites and sternites: ninth tergite of the male hypopygium prominent with flattened, acute, lateral arms; eighth sternite produced caudad into a broad, flattened, shovel-like, median lobe.

MALE.—Length, 12·5 mm.; wing, 14 mm.

Head discoloured. Antennæ broken.

Pronotal scutum dark, the scutellum dull yellowish. Mesonotal præscutum dark coloured, almost black in the type, but badly discoloured, the thoracic stripes, if present normally, being obliterated; normal specimens are almost certain to be very dark grey. Pleura blackish, grey pruinose; dorso-pleural membranes dull yellow. Halteres brown, the knobs darker. Legs with the coxæ black, grey pruinose; trochanters brown; femora reddish brown, the tips narrowly and indistinctly darkened; tibiæ brown, the apices blackened; tarsi dark brown. Wings nearly hyaline, the costal and subcostal cells concolourous with the rest of the wing; veins brown; wings in the vicinity of the stigmal region injured; venation: R_2 persistent for its entire length; the *m-cu* crossvein inserted just beyond the fork of *M*. The fly is full-winged.

Abdominal tergites reddish brown with a broad, black, median stripe; ninth tergite black; sternites dull brown with an interrupted blackish median stripe. Male hypopygium with the ninth tergite (Pl. III, fig. 41) very large and prominent, black, chitinized, the caudal margin with an acute, V-shaped, median notch, finely denticulate, the lateral angles produced far caudad into flattened ears. Ninth pleurite incomplete, the suture indicated beneath, an acute dorso-caudal arm of the pleurite runs beneath the tergal lobes. Eighth sternite with a broad, shovel-shaped, median lobe extending caudad and dorsad, its caudal margin evenly and gently notched and provided with short, delicate hairs. Eighth tergite completely concealed beneath the seventh tergite.

Locality: Holotype, ♂, west of Kongenevik, Camden bay, Alaska, July 4, 1914 (F. Johansen). No. 442.

This interesting new species is related to *T. pribilofensis* Alexander from the Pribilof islands off the western coast of Alaska. It is an entirely distinct species, being full-winged and the male hypopygium quite differently constructed although both species have the curious spoon-like elongation of the eighth sternite. I have seen another species of the same group from Kamchatka, eastern Siberia *Tipula kamchatkensis* Alexander.

Very recently I have received from Prof. Hine another specimen in much better condition. This specimen may be considered as paratypical and the following additional characters should be noted:

Male:—Length, 14 mm.; wing, 13 mm.

Frontal prolongation of the head dark purplish brown above, more yellow laterally. Antennæ rather long, the scape a very little paler than the dark brownish black flagellum; flagellar segments rather deeply incised beneath. Head light grey, a small brownish blotch on the disk of the vertex. Eyes small; genæ prominent.

Mesonotal stripes very indistinct, brown, ground-colour of the mesonotum, light grey. Pleura light grey, the dorso-pleural membranes light yellow.

Paratype, ♂, Katmai, Alaska, July, 1917 (J. S. Hine).

Specimen in the collection of Prof. Hine.

Family RHYPHIDÆ.

Subfamily TRICHCERINÆ.

Genus *Trichocera* Meigen.

Trichocera Meigen; Illiger's Magazine, vol. 2, p. 262; 1803.

At the present time this genus of flies offers almost insuperable taxonomic difficulties. Some twenty-five or thirty species have been proposed, but that very many of these are synonyms of others is unquestioned. It seems now that the only hope of straightening this apparently hopeless tangle is for some

European student to critically study the existing types and compare the authenticated Palæartic species with a great series from America and elsewhere. If this is done it may be that the correct synonymy can be determined. It is scarcely possible for an American worker to attempt the problem, at least under present European conditions, chiefly because of the impossibility of studying the types of the European species still existant and the added difficulty of obtaining authentically named specimens of the European species, the European specialists, apparently, being as much in doubt concerning the true status of the group as are the American workers.

Until a very recent date the genus *Trichocera*, together with the related genus *Ischnothrix* Bigot, from Cape Horn, was included as a member of the Tipulid tribe, Limnophilini. A critical study of the immature stages by Johannsen, Keilin, de Meijere, Malloch, and others has shown the utter impossibility of such an assignment and it seems better to give it subfamily rank in the family Rhyphidæ.

Trichocera sp.

The present collection included three specimens of *Trichocera* sp., from Bernard harbour, Northwest Territories, June 18, 1915, collected by F. Johansen; two males, Nos. 1301 and 1302 and a female, No. 1300 D.

IMMATURE STAGES.

The present collection of Canadian Arctic crane-flies included a surprising amount of life-history material. This was of very great interest since our knowledge of the younger stages of any Arctic crane-flies is almost negligible. Unfortunately, very little of the material had been reared and consequently the placing of the species has been attended with considerable doubt and difficulty. As a rule it scarcely pays to describe or figure undetermined larvæ or pupæ unless they show conspicuous points of difference in their structure, have a peculiar habitat, or else, as in the present case, come from a region where practically nothing is known concerning the early stages. These Arctic crane-flies, especially of the Tipuline group, are sometimes as beautifully patterned in the larva as they are dull and obscure in the adult. The biological data that were supplied by the collector are incorporated with each species concerned.

HEXATOMINI.

In another paper, not yet published, I have endeavoured to correlate the present classification of crane-flies, based entirely on a study of the adult flies, with a critical survey of all the immature stages that I could obtain. Among other things this study seems to indicate that the tribe Hexatomini is not as clearly set off from the related groups as a study of the adults alone would imply. Several of the groups that have hitherto been considered subordinate groups of the genus *Limnophila*, such as *Ulomorpha*, *Lasiomastix*, *Dicranophragma*, *Pocilostola*, etc., all seem now to be more properly referable to the Hexatomini, or at least closely allied to *Eriocera*, *Penthoptera*, etc. The present species has not been reared and its true affinities must be left in doubt, but I believe that the reference given below will be not entirely erroneous.

Pocilostola supposition.

This is a small group of flies including seven or eight species of the Palæartic region with representatives occurring in Japan. Although no adults of this group of flies or, indeed, any of its relatives have yet been taken in the Canadian Arctic I feel very little hesitation in referring the present larva to the neighbourhood of this genus. It may belong to the subgenus *Phylidorea* Bigot of the genus *Limnophila* Macquart.

Locality: One large larva taken in the melted ponds in the tundra at Demarcation point, Alaska, May, 1914 (F. Johansen).

Length, 19.5 mm.; diameter, 2.4 mm.

Form cylindrical, the anterior segments narrower, the abdominal segments just before the cauda swollen. Body with a covering of short and delicate appressed hairs. Head-capsule of the long narrow structure of the tribe; mandibles (Pl. V, fig. 55) long, sickle-shaped; maxilla (Pl. V, fig. 54) with the outer lobe projecting from the oral opening when the head is completely retracted. Colouration uniform light yellow throughout. Spiracular disk (Pl. IV, fig. 44) small, with four lobes, the lateral and ventral pairs. Lateral lobes rather short and blunt, the ventral edge with an irregular linear brown mark, the outer edge with a dense fringe of long hairs; ventral lobes longer with a long, arcuate, brown line down the inner face; outer edge with a dense fringe of long hairs, those at the tip being very elongate. Anal gills four, short, blunt, oval.

TIPULINI.

A considerable number of Tipuline forms were included in the present collection. Only one of these, *Tipula arctica* Curtis, was reared and the generic reference of the remainder must be considered as being somewhat doubtful. I have studied each of these species, however, in the light of our knowledge of other life-histories, and have placed them as closely as the data will warrant.

Tipula arctica Curtis.

Locality: Larvæ in the ground at Bernard harbour, Northwest Territories, May 27, 1916 (F. Johansen).

A male collected as a larva on May 27 pupated about June 20. (Rearing No. 106.)

LARVÆ. Length, 23-25 mm.; diameter, about 4 mm.

Form cylindrical. Mouth-parts with the mentum (see Pl. V, fig. 53) long and slender with a large, blunt, median tooth and two smaller teeth on either side; directly beneath these lateral teeth similar subequal teeth are (hypopharynx) visible. Labrum as in Pl. V, fig. 52.

Chaetotaxy: Dorsal surface, a transverse row of delicate hair-like setæ across the dorsum of the last thoracic segment and the abdominal segments, there being usually four of these punctures on the first three segments occurring at about mid-length of the segments; on the abdomen they lie on the posterior ring of each segment (see Pl. V, fig. 56); the lateral puncture bears two bristles, the inner punctures a single seta; they correspond exactly to the condition of the ventral segments except that here the solitary anterior bristle has moved caudad into alignment with the posterior paired bristles. In some there are a few weak supplementary bristles in the same line. Ventral surface (Pl. V, fig. 57) similar; two prominent widely separated setigerous punctures, each with two long bristle-like hairs nearer the caudal margin and two other smaller and more delicate bristles slightly cephalad and closer to the median line; these anterior ventral bristles are separated from one another by a distance that is a little less than the distance between them and the larger posterior bristles; on the lateral margin of the segment there is usually a more delicate hair.

Colouration dull yellow, the thoracic segments with abundant, tiny, appressed dark hairs that give a darker appearance to the anterior end of the body.

Spiracular disk (Pl. IV, fig. 45) surrounded by six short lobes, a dorsal pair, rather closely approximated medially, a dorso-lateral pair and a ventral pair. The dorsal pair are shorter than the lateral pair and the inner face in most specimens has a straight or slightly curved, dark brown, line. The lateral lobes are longer and more slender. The ventral lobes are short and broad.

The spiracles are very large and conspicuous, black. In some specimens there are two black dots just above each spiracle and two somewhat similar dots below the spiracles and on the ventral lobes; of these markings the ventral dots are the most constant. Anal gills, four in number, blunt, fleshy.

PUPÆ. Male: Length, 18–23 mm.; dorso-ventral depth, 3·8–4 mm.; dextro-sinistral width, 3·2 mm. Female: Length: 23 mm.; depth and width 4 mm.

MALE. (Pl. V, fig. 50): Colouration brown, the abdomen more yellowish brown; the pleural membrane paler; the breathing-horns, appendages, and sheaths dark brown; spines on the abdomen black.

Antennal bases situated on a high crest, elevated above the level of the breathing-horns. Pronotal breathing horns not conspicuous, short, directed slightly forwards and slightly divergent. On the pronotum a small knob just before the breathing horns; on the præscutum two widely separated tubercles and just behind these but nearer the median line, two smaller tubercles, the space between these tubercles connected by a row of crenulations. Leg-sheaths reaching to the middle of the third abdominal segment; wing-sheaths reaching the base of the second abdominal segment.

Abdominal tergites: segments 1 and 2 with a small tubercle on the caudal ring on either side of the median line; segment 3 with two tubercles on either side, the inner one largest; segments 4 to 6 with three or four tubercles on either side, the inner one largest; segment 7 narrowed, with two lateral spines and two separated blunt tubercles; segment 8 narrowed, the lateral angles ending in powerful tubercles with sharp points. Pleural integument coarsely punctured, on the edge nearest the sternites with a single sharp spine on the caudal ring of segment 1 and on segment 7 and two, one on each ring of segments 2 to 6. Sternites armed with circlets of powerful spines on the caudal ring, on segment 3 there being two, small and widely separated; on segments 4 to 7 there are four such spines, larger and rather approximated. Segment 9 rounded, indistinctly bifid, each side with a small, acute spine at the tip.

FEMALE. (Pl. V, fig. 51) similar to the male above described, the sexual differences being as follows: Sheaths of the tergal valves of the ovipositor elongate, powerful, lying parallel to one another, transversely wrinkled; sheaths of the sternal valves of the ovipositor tiny, located at the apex of the eighth segment.

Mr. Johansen has recently called my attention to the description and figures of the immature stages of this species by Dr. T. C. Nielsen.¹ As there are some discrepancies between the descriptions and figures of the material from northeast Greenland and that from the Canadian Northwest, it is possible that more than one species is involved under the name of *Tipula arctica*.

Stygeropsis, possibly parrii (Kirby).

Locality: Melted ponds in the tundra at Demarcation point, Alaska, May 1914 (F. Johansen).

Two smaller specimens measure as follows: length, 20 to 24 mm.; diameter, 2·2 to 2·5 mm.

A larger larva (No. 5a), length, 38 mm.; diameter, 3·7 mm.

Form cylindrical, moderately elongated. Head-capsule with the antennæ long and slender, from three to four times as long as thick, cylindrical, yellowish.

Chaetotaxy: Setæ very weak and delicate, on the thoracic segments being tiny lateral hairs. Abdominal tergites (Pl. V, fig. 58) with no setæ on the anterior ring; on the posterior ring with the following bristles: a small lateral bristle nearest the false suture; just before the caudal margin of the segment a more or less impressed line, at its outer end with two or three bristles arising from individual punctures; on either side of the reddish dorso-median vitta a prominent

¹The Insects of the "Danmark" Expedition: Meddelelser om Grønland, vol. xliii, Copenhagen, 1910 pp. 57–9, Pl, vii, figs. 1–7.

seta directed proximad; on the penultimate and antepenultimate segments of the abdomen the bristles are very long and delicate. The sternites (Pl. V, fig. 59) similar, but the median bristles lie further cephalad and there is a smaller tiny bristle in its individual puncture just proximad of it; these median bristles are almost in alignment with the lateral bristles. The caudal bristles, three in number, are in alignment and rather widely separated.

Colouration above dark brown, the thoracic region more reddish; a broad, conspicuous dorso-median stripe reddish brown; lower surface greyish with a reddish caste. Skin very smooth without tubercles or roughenings of any sort. The sutures between the individual segments are very well-marked but not conspicuously constricted, at about two-thirds the length of each abdominal segment with a pseudosuture dividing the segment into two rings or annuli.

Spiracular disk (Pl. IV, fig. 46) surrounded by six very long, finger-like lobes, of which the ventral pair are slightly the longer. All the lobes are margined with dark brown and here develop long fringes of delicate pale hairs which are longest at the tips of the lobes, much shortened toward the base of the lobes; down the middle of the inner face of each lobe there is a long, narrow, black stripe extending from the tip back toward the centre of the disk, this mark longest on the ventral lobes; the lateral marks on the lobes are all expanded at their inner ends nearest the spiracles, the outer margins of the ventral lobes united with one another across the disk, between the spiracles, by a narrow, arcuated line. Spiracles large. Anal gills short but slender, inconspicuous, the inner pair very short.

From its great resemblance to the larva of *Stygeropis fuscipennis* Loew of northeastern America I would refer this larva to *Stygeropis* without question. Which species it represents is somewhat doubtful, but very probably either *parrii* or *parrioides*. The *Tipula* No. 1 of Malloch's preliminary classification¹ is *Stygeropis fuscipennis*.

Tipuline No. 1 (*Stygeropis*, supposition).

Locality: Two larvæ from a lake near Bernard harbour, Northwest Territories, June 25, 1915 (F. Johansen).

Two additional specimens from Demarcation point, Alaska (melted ponds in-tundra, May, 1914. No. 7).

Length, 20.5-23 mm.; diameter, 1.8-2 mm.

Form cylindrical, moderately elongated, the anterior end abruptly tapering, the posterior end gradually tapering to the cauda; caudal lobes capable of close application to one another along their inner faces, protecting the spiracles.

Chaetotaxy: Dorsal segments (Pl. V, fig. 60) with the setæ all on the posterior ring, an anterior lateral pair located in the lateral yellow line, consisting of two punctures, the more lateral one of which has a tripartite bristle, the proximal one simple. Nearer the caudal margin of the segments three long lateral bristles in alignment and rather widely separated, the distal one located near the inner margin of the yellow stripe, the inner two closer together located in the black lateral stripes, the innermost on its margin. In alignment with these three and located nearer the mid-dorsal region of the segment, one on either side of the apex of the shield-shaped dorsal mark, are two long bristles. All of these caudal bristles are in alignment with the caudal setæ of the ventral segments.

Lateral setæ: On the dark pleural stripe a group of three small, stout bristles on the posterior ring, arranged in a triangle; a single, longer hair on the anterior ring of the segment, much closer to the ventral edge than to the dorsal edge of the stripe.

Sternal segments with the setæ on the apical ring of the segment arranged as in Pl. V, fig. 61; there are two anterior setæ on each side, and closer to the

¹ Malloch, J. R. "A preliminary classification of Diptera based upon larval and pupal characters," Bull. Illinois State Laboratory of Natural History, vol. 12, pp. 199, 200, figs.; 1917.

median line; of these the distal one is the longest, the proximal one usually very short; there are three posterior setæ on either side, the two proximal being longest and in their own punctures, the third one distal in position, lying close to the black pleural stripe and located in a very small puncture on the margin of the adjoining larger puncture.

Colouration: Dorsum (Pl. V, fig. 60) dull yellow. Just inside the broad lateral stripe and separated from it by a narrow bright yellow line is a narrow dark brown line, almost continuous but slightly interrupted in places; this dark line begins on the mesothorax and continues to the last segment. The dorsum of the abdomen between these dark stripes is handsomely marked with dorsal shields of brown which are narrowly margined with darker brown, the narrow apex of the shield directed caudad; there are about seven of these dorsal shields, the integument on either side of them with three bright yellow dots in straight diverging lines, all of these dots lying on the cephalic ring of the segment. Pleural region dark brown, very broad but paler on the thoracic segments, gradually narrowed and becoming darker toward the end of the body, terminating near the anal gills. This dark pleural stripe is dotted with numerous yellowish spots. Ventral surface abruptly and conspicuously light yellow.

Spiracular disk surrounded by six long, finger-like lobes, the dorsal lobes rather the shortest although still long and finger-like, lying parallel, the ventral lobes longest; all the lobes narrowly margined with black and with a slender black vitta bisecting the inner face of the lobe from the tip inward toward the disk, at the distal end expanded into a blackish apex; the apex and lateral margins bear long fringes of hairs as in *Stygeropsis*, these hairs being longest toward the tips of the lobes. Anal gills six, short but rather slender, inconspicuous, the two lateral pairs longest, the inner pair much shorter.

I would refer this to a position not far removed from *Stygeropsis* although it is very differently coloured from the species last described under that name. However, the structure of the larvæ seems to indicate that it is more probably a *Stygeropsis* than a *Tipula* or a *Nephrotoma*. If the generic reference is correct the larvæ probably belong to either *S. parrii* or *S. parrioides*.

In the specimens from Demarcation point, Alaska, the anterior end of the body is pale and the median dorsal shields are continuous as a practically uninterrupted dorso-median line, only slightly constricted toward the posterior end of each segment; the lateral dorsal stripes are very dark. However, the structure of the spiracular disk and the chætotaxy are entirely the same and I feel sure that all the material pertains to the same species.

In the vial containing the two larvæ from Bernard harbour, described above, there was an additional Tipuline larva that is closest to the Tipuline No. 3 described later, but probably represents a still different species. Because this is the only specimen included in the material it is not further discussed in this report.

Tipuline No. 2.

Locality: Three larvæ, taken at Demarcation point, Alaska, May, 1914. No. 4 (F. Johansen); melted ponds in the tundra.

Length, 20–23 mm.; dextro-sinistral width, 3·3–3·6 mm.; dorso-ventral depth, 2–2·2 mm.

Body moderately elongated, form strongly depressed; thoracic and first abdominal segments with the margins regular; abdominal segments 3 to 8 with a prominent false constriction or pseudo-suture at about two-thirds the length of the segment, the edges of the segments produced laterad to give a serrate appearance to the margins of the abdomen; the anterior ring of each segment has the serration larger than that of the posterior ring so that these alternate; penultimate segment of the abdomen with the caudal angles produced strongly caudad into long, slender lobes.

Chætotaxy: Tergites (Pl. V, fig. 62) with setæ on the posterior ring only, these bristles short and weak, the marginal group lying in or close to the dark lateral stripe, the outer one far removed from the inner pair. Bristles of the disk single, one on either side of the median dorsal stripe. Lateral bristles with two on the posterior ring, one on the anterior ring. Sternites (Pl. V, fig. 63) with no bristles on the anterior ring; posterior ring with two bristles on either side of the median line and at about mid-length of the ring, the distal bristle longest. Nearer the posterior margin and lying farther distad, three setæ almost in a line, rather closely approximated but each one in its own distinct puncture, the proximal two longest, the distal one small and weak.

Colouration: A beautiful larva (Pl. IV, fig. 47), light yellow in colour, the thorax and lateral margins of the abdomen dusky. Three interrupted dark-brown stripes on the dorsum, on the individual segments shaped as follows: on the anterior ring the median mark is rectangular, in front not attaining the segment preceding, connected at its caudal end with the lateral stripes which are dotted with yellow, on the proximal edge clear-cut, laterally passing into the dusky of the margins of the abdomen; posterior ring of each segment with three marks more irregular and diffuse. Sternites dull yellowish with an indistinct irregular dusky square on the anterior ring, this dusky area with an arcuated line of four oval spots across the anterior third and two larger yellow blotches on the posterior two-thirds, one on either side of the median line; on the posterior ring of each segment the dusky marks are irregular, shaped somewhat like an hour-glass.

Spiracular disk (Pl. IV, fig. 48) small, surrounded by six small lobes; dorsal lobes very small but slender, slightly divergent; lateral and ventral lobes long and slender, in some the lateral lobes notably shorter than the ventral pair; inner faces of the lobes unmarked with darker. Ventral lobes with a few long, sensory bristles at the apex; a single long bristle on the ventral face at about mid-length; lateral lobes with a similar group of bristles near the tip and a longer one on the outer face near the apex. Spiracles small, widely separated. Gills six in number, small, slender, inconspicuous, the caudal pair longest, the cephalic pair with a short lobule on the basal inner side so it appears there are six gills of which four are long, two short.

I have no idea to which species this handsome larva belongs. This species and the last are amongst the most beautifully patterned larvæ that I have ever seen. The present species exhibits an unusual degree of depression for this tribe of Tipulidæ and in some respects gives strong indications of how the even more accentuated conditions in the *Cylindrotominae* may have been brought about. It seems probable that this larva belongs to the genus *Tipula* rather than to any of the related genera.

Tipuline No. 3.

Locality: Tundra at Nome, Alaska, August, 1916 (F. Johansen). Three larvæ, two large and one smaller specimen.

Two additional badly shrunken larvæ bearing the following label: "*Tipula* larvæ C, about one-fourth inch below the plant-covering of the tundra behind the winter house, Collinson point, Alaska, September 20, 1913."

Length, 27.5-30 mm.; diameter, 4-5 mm.

Form plump and robust; colouration brown, the body clothed with an abundant appressed dark pubescence, the dorsal ring of each segment that bears the setæ darkest in colour; each segment is divided by 4 or 5 pale transverse false sutures so the abdomen appears multisegmented. The true limits of each segment are readily determined by the caudal row of setæ.

Chætotaxy: Tergites (Pl. V, fig. 64) with four long, powerful bristles in alignment, the median pair closer to one another than either is to the lateral seta; extending proximad from each seta is a narrow, semi-impressed line

destitute of pubescence; each of the outer setigerous areas bears two closely approximated setæ. Lateral setæ two, one on each primary ring at about mid-length, the anterior one lying closer to the ventral margin, the posterior one closer to the dorsal margin. Sternites (Pl. V, fig. 65) with four setigerous areas, the median pair a little anterior to the posterior pair, one on either side of the median line, each area with two stout bristles. The above pertains to the abdominal segments. On the dorsum and lateral portions of the anterior ring of the prothorax at about mid-length there are about ten setigerous areas, the median pair close together and bearing a single seta, the next pair more widely separated, each with two short setæ; the third pair closer to the second pair than they are to one another, likewise with two setæ, one long slender bristle and a shorter slender one; lateral setæ solitary, long and stout, two on each side of the prothorax. The meso- and meta-thoraces at about midlength and almost in alignment have about ten setigerous punctures, the inner six close together and shortest (the innermost simple, the outer two pairs double); lateral bristles longer and more widely separated.

Spiracular disk (Pl. IV, fig. 49) surrounded by six short lobes, not conspicuous. Dorsal lobes short, conical, situated close together on the dorso-median line, divergent apically, broad at the base, tapering rapidly to the acute tip. Lateral lobes longest, elongate-conical, tapering to the rather acute apex. Ventral lobes short, broad, and blunt with a broad blackish blotch on the inner face, in the smaller specimen occurring as two parallel transverse lines beneath each spiracle. Gills short, blunt, dark in colour.

This is probably a species of *Tipula* rather than the related genus, *Nephrotoma*, but the immature stages of the two genera are very similar to one another.

EXPLANATION OF PLATE I.

- Fig. 1. Wing of *Dicranomyia alascaensis*, n. sp.
 " 2. " *Erioptera (Erioptera) angustipennis*, n. sp.
 " 3. " *Limnophila (Dactylolabis) rhicnoptiloides*, n. sp. }
 " 4. " *Tricyphona brevifurcata*, n. sp. }
 " 5. " *T. frigida*, n. sp.
 " 6. " *Nephrotoma arcticola*, n. sp.
 " 7. " *Stygeropsis parrii* (Kirby).
 " 8. " *S. parrioides*, n. sp.
 " 9. " *Tipula difflava*, n. sp. (pattern omitted).
 " 10. " *T. arctica* Curtis.
 " 11. " *T. johanseni*, n. sp.

EXPLANATION OF PLATE II.

- Fig. 12. Antenna of *Stygeropsis parrii*; basal and apical segments.
 " 13. " *S. parrioides*; the same.
 " 14. " *Nephrotoma arcticola*; basal segments.
 " 15. " *Tipula johanseni*; the same.
 " 16. " *T. difflava*; the same.
 " 17. " *T. arctica*; the same.
 " 18. " *T. subpolaris*; the same.
 " 19. " *T. besseloides*; the same.
 " 20. Hypopygium of *Tricyphona frigida*; pleurite and appendages, dorsal aspect.
 " 21. " *T. diaphana* (Doane); the same.
 " 22. " *Stygeropsis parrioides*; outer pleural appendage.
 " 23. " *S. parrii*; the same.
 " 24. " *S. parrii*; inner pleural appendage.
 " 25. " *S. parrioides*; the same.
 " 26. " *S. parrii*; ninth tergite, dorsal aspect.
 " 27. " *S. parrioides*; the same.

EXPLANATION OF PLATE III.

- Fig. 28. Hypopygium of *Nephrotoma arcticola*; ninth tergite, dorsal aspect.
 " 29. " *N. arcticola*; outer pleural appendage.
 " 30. " *Tipula hewitti*; the same.
 " 31. " *T. besseloides*; the same.
 " 32. " *T. johanseni*; ninth tergite, dorsal aspect.
 " 33. " *T. difflava*; the same.
 " 34. " *T. difflava*; lateral aspect; 9 t. ninth tergite; 9 pl. ninth pleurite; 9 s. ninth sternite.
 " 35. " *Tipula arctica*; ninth tergite, dorsal aspect.
 " 36. " *T. hewitti*; the same.
 Fig. 37. Hypopygium of *T. arctica*; inner pleural appendage.
 " 38. " *T. subpolaris*; ninth tergite, dorsal aspect.
 " 39. " *T. besseloides*; the same.
 " 40. Ovipositor of *T. arctica*; female sternal valves.
 " 41. Hypopygium of *T. subarctica*; ninth tergite, dorsal aspect.
 " 42. " *T. besseloides*; inner pleural appendage.
 " 43. Ovipositor of *T. arctica*; dorsal aspect.

EXPLANATION OF PLATE IV.

- Fig. 44. Larva of *Pæcilostola*, supposition; spiracular disk.
 " 45. " *Tipula arctica*; the same.
 " 46. " *Stygeropsis*, supposition; the same.
 " 47. " *Tipuline* No. 2; dorsal aspect of entire larva.
 " 48. " *Tipuline* No. 2; spiracular disk.
 " 49. " *Tipuline* No. 3; the same.

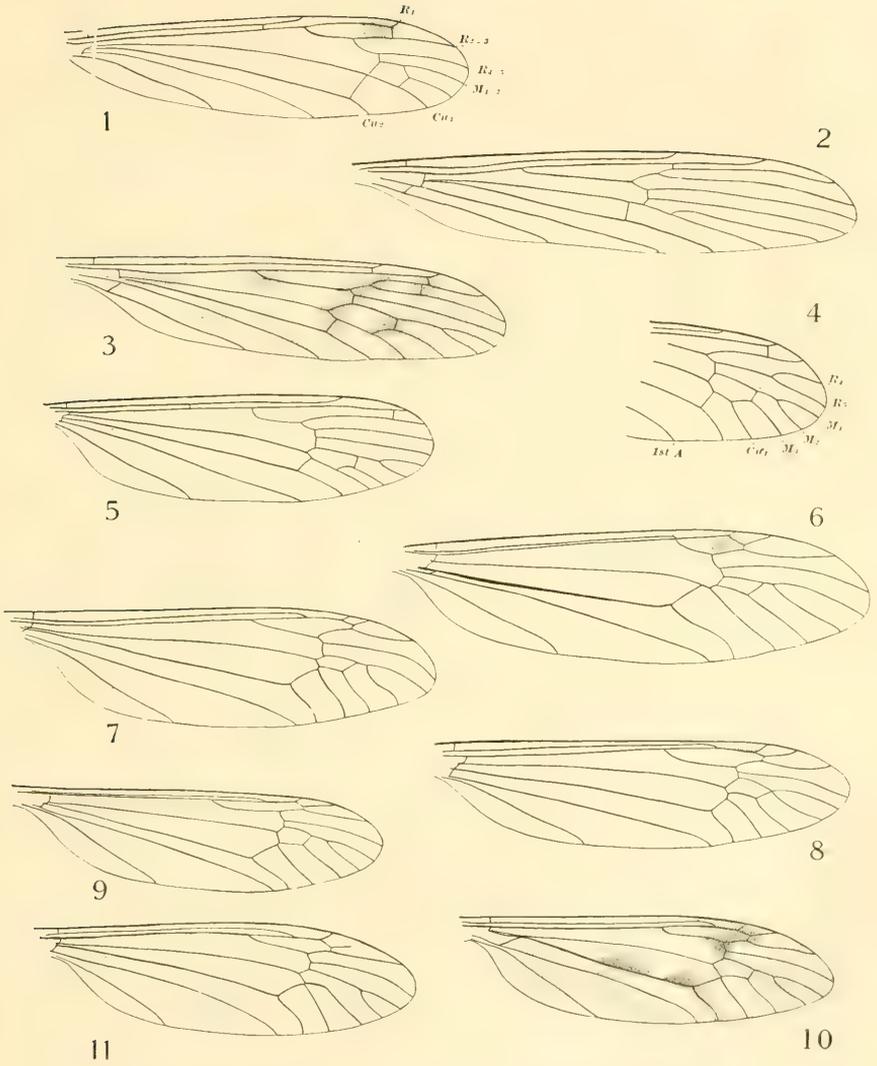
EXPLANATION OF PLATE V.

- Fig. 50. Pupa of *Tipula arctica*; male, lateral aspect.
 " 51. " *T. arctica*; female, dorsal aspect.
 " 52. Larva of *Tipula arctica*; labrum, dorsal aspect.
 " 53. " *T. arctica*; mentum, ventral aspect.
 " 54. " *Pœcilostola*, supp.; outer lobe of maxilla.
 " 55. " *Pœcilostola*, supp.; mandible.
 " 56. " *Tipula arctica*; chaetotaxy of third abdominal tergite; dorsal aspect.
 " 57. " *T. arctica*; the same, third abdominal sternite; ventral.
 " 58. " *Stygeropsis*, supp.; the same, third abdominal tergite; dorsal.
 " 59. " *Stygeropsis*, supp.; the same, third abdominal sternite; ventral.
 " 60. " *Tipuline* No. 1; the same, third tergite; dorsal.
 " 61. " *Tipuline* No. 1; the same, third sternite; ventral.
 " 62. " *Tipuline* No. 2; the same, third tergite; dorsal.
 " 63. " *Tipuline* No. 2; the same, third sternite; ventral.
 " 64. " *Tipuline* No. 3; the same, third tergite; dorsal.
 " 65. " *Tipuline* No. 3; the same, third sternite; ventral.

EXPLANATION OF PLATE VI.

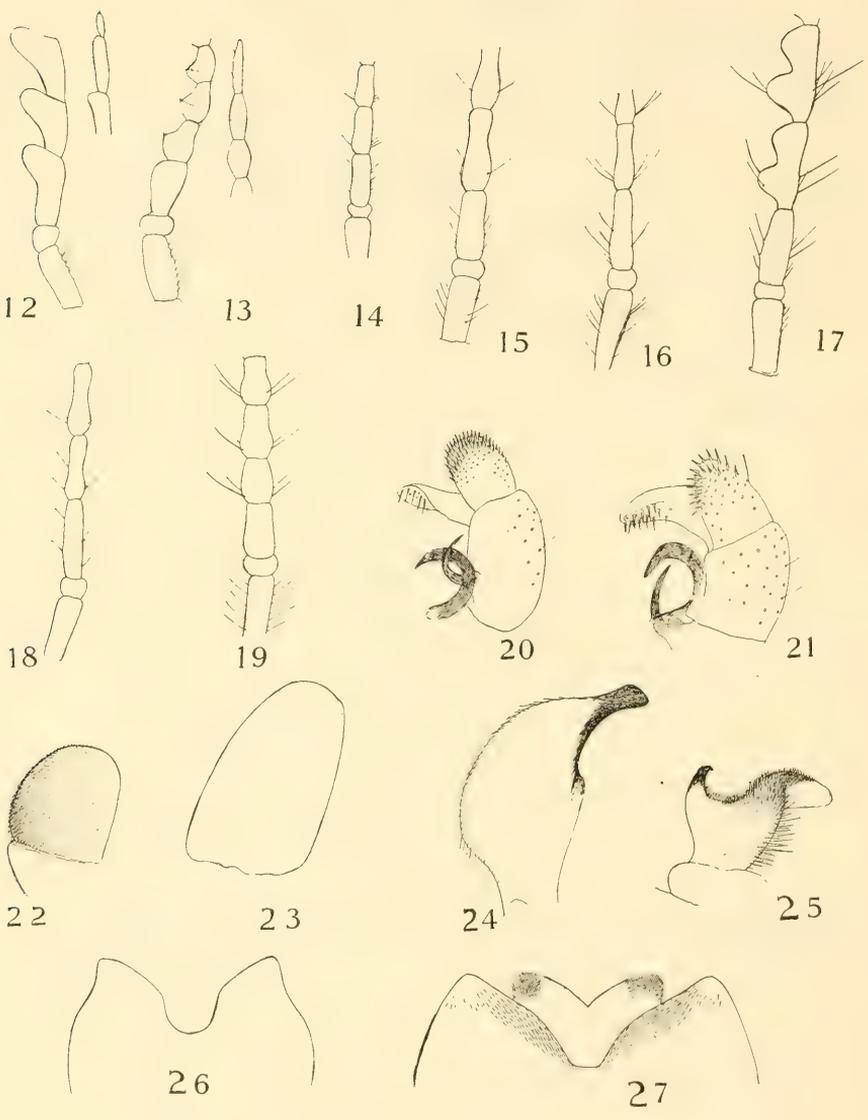
- Figs. 1, 2. Female of *Tipula arctica* Curtis (Photos. by Geo. H. Wilkins)

PLATE I.



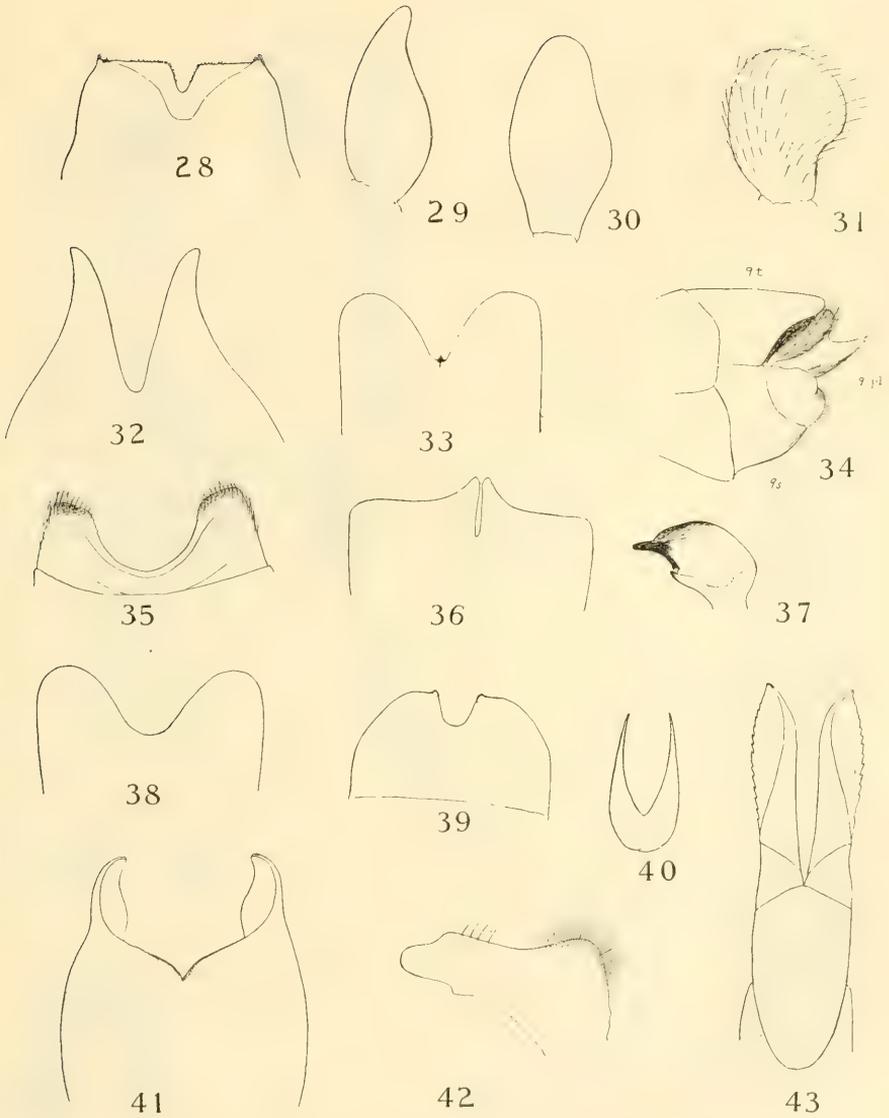
Crane-flies of the Canadian Arctic Expedition, 1913-16.

PLATE II.



Crane-flies of the Canadian Arctic Expedition, 1913-16.

PLATE III.

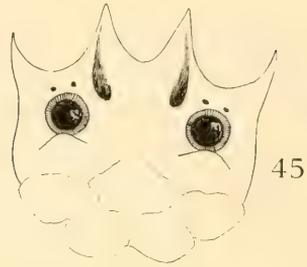


Crane-flies of the Canadian Arctic Expedition, 1913-16.

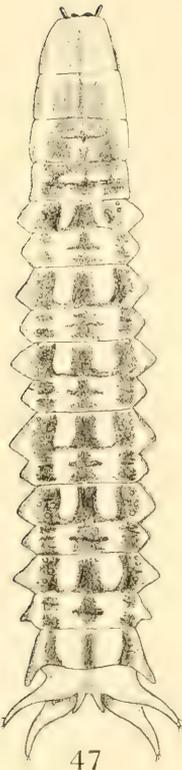
PLATE IV.



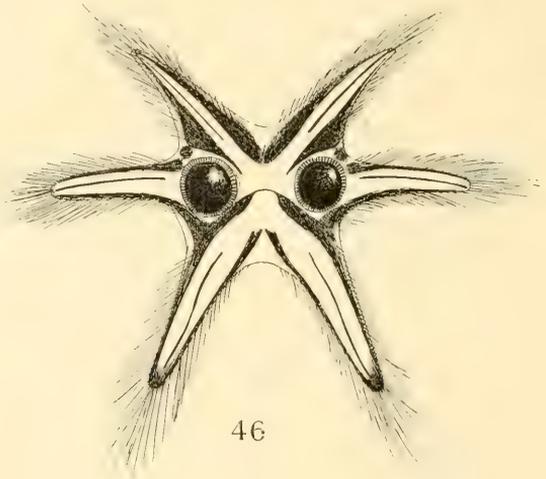
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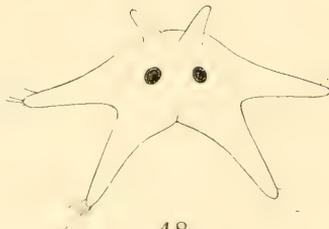
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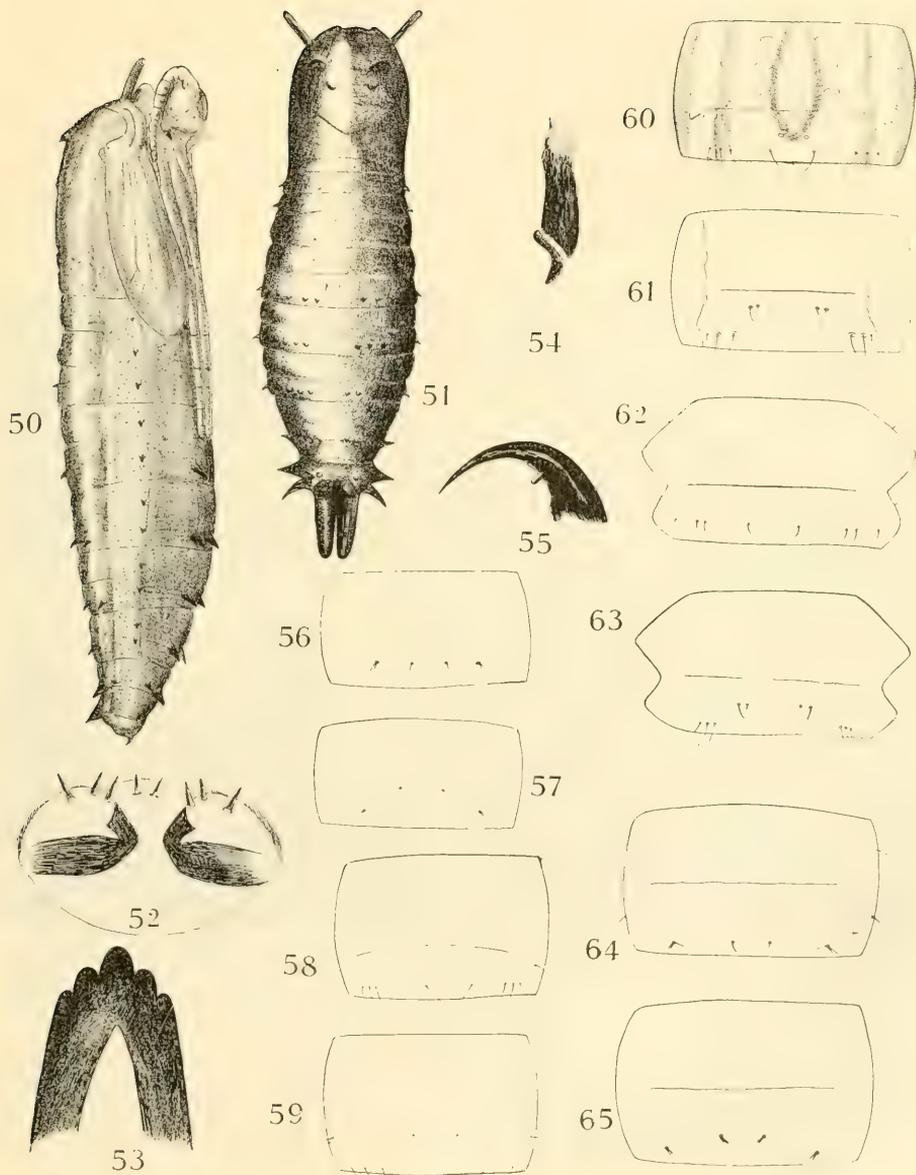
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49

Crane-flies of the Canadian Arctic Expedition, 1913-16.

PLATE V.



Crane-flies of the Canadian Arctic Expedition, 1913-16.

PLATE VI.



Tipula arctica Curtis. (Photograph by G. H. Wilkins).

The Mosquitoes collected by the Canadian Arctic Expedition, 1913-18.

(Diptera, Culicidæ.)

By HARRISON G. DYAR.

INTRODUCTION.

Many stories are current about the extraordinary abundance of mosquitoes in the Arctic regions, rivalling the tropics in this respect. That these stories are not overdrawn, is shown by the accompanying photographs, taken in the deltas of the Colville and Slave rivers by Dr. R. M. Anderson of the Canadian Arctic Expedition. Nevertheless, the number of species present is small in the northern regions, though individuals may be abundant. Along the Arctic coast of the Northwest Territories, here considered, but two species are identified, whereas a collection of an equal number of specimens in the tropics might include thirty or forty species.



Head net, as used in the North for protection against mosquitoes. Delta of Slave River, Great Slave lake, N.W.T., June, 1908.

Mosquitoes on back of man's hooded coat. Near Nigalik, delta of Colville river. Arctic coast of Alaska. July 3, 1909.

The collection before me was made during the years 1913, 1914, 1915, and 1916; but it is disappointingly a small one (134 specimens), and the material is in very poor condition. The region, however, is interesting, embracing the Arctic coast of Alaska and the Canadian Northwest Territories.

***Aedes (Ochlerotatus) nearcticus*, n. sp.**

FEMALE.—Proboscis long; palpi one-fifth the length of proboscis; setæ long and abundant on head, thorax, coxæ, femora, and abdomen, black, becoming whitish in old specimens. Mesonotum with coarse, narrow, curved, dark bronzy brown scales. Abdomen with broad basal segmental dull whitish bands; venter wholly grey-scaled. Integument entirely black. Wing-scales black, some white ones along the costa, subcostal, and first veins. rather numerous toward base.

MALE.—Similar to the female, with the usual sexual differences. Palpi about as long as the proboscis, the last joint slightly thickened; end of long joint and last two joints hairy. Antennæ weakly plumose. The genitalia have the side pieces conical, about three times as long as wide; apical lobe small, conical, nearly bare; basal lobe conical, with long setæ on its lower side, shorter ones without. the margin sometimes seen as a crenulate tuberculous line running upward obliquely from the lobe. Harpes narrow, chitinized on the margins, the tips pointed in a blunt tooth. Harpagones with curved columnar stems, thickened at the basal half, hirsute, with two setæ at the base, the outer part smooth; filament sickle-shaped, widened smoothly at base, the wide part tapering to the middle of the filament. Unci forming a pair of hooks similar to the harpes, but smaller. Basal appendages very small, with stiff spines.

Types and Locality: Bernard harbour, Northwest Territories, July 9, 1915 (Frits Johansen), Canadian Arctic Expedition, No. 1395; ♂, with the same data, No. 1391. According to the notes of the collector, these were bred from pupæ found in a pond (Rearing 59 A). Larvæ were collected June 18, 1915, and adults emerged July 14-23. (Rearing 59).

Also eighty-four specimens from the same locality, bred June 21-July 1, 1916 (Rearings 109, 121), and caught, the latter all ♀♀. Apparently the same species from the following localities: 8 ♀♀, West of Bernard harbour, Dolphin and Union strait, Northwest Territories, July 14, 1916 (F.J.); one ♀, Young point, Northwest Territories, July 18, 1916 (F.J.); 3 ♀♀, Herschel island, Yukon Territory, July 29, 1916 (F.J.); 6 ♀♀, cape Bathurst, Northwest Territories, July 26, 1916 (F.J.); 19 ♀♀, Konganevik, Camden bay, Alaska, July 4, 1914 (F.J.); 1 ♀, Cockburn point, Dolphin and Union strait, Northwest Territories, September 5, 1914 (F.J.). Also bred July 22, 1914, from larvæ collected at Collinson Point, Alaska, June 23, 1914, (Rearing 21).

The species is allied to *A. innuitus* Dyar and Knab, of Greenland; but the male genitalia differ in the shape of the harpes and the filaments of the harpagones. Also allied to *nigripes* Zetterstedt from Lapland, for a discussion of which see Dyar and Knab, *Ins. Ins. Mens.*, v, 167, 1917.

LARVA.—Head rounded, wider than long; antennæ small, uniform, with sparse spicules, the tuft situated near the middle, composed of three short hairs. Head hairs single, at least the lower pair are so, the upper pair are broken in all the specimens; ante-antennal tuft in fours. Body with the skin glabrous; tracheæ thick and uniform, narrowing only in the end of the airtube, where there is a short closing apparatus. Air-tube short, about two and a half times as long as the basal width, tapering outwardly; pecten of 11 to 16 teeth, usually about 14, the single tooth finely pointed and with a rounded branch, followed closely by a three- to four-haired tuft. Lateral comb of the eighth segment of ten to fourteen scales in a patch, the single scale elongate conical from an oval base, with long central thorn and few small lateral spinules. Anal segment with a dorsal plate reaching to about the middle of the side, its edge even but bulging a little posteriorly; barred area preceded by one or two hair tufts, the area situated posteriorly; dorsal hairs a long hair and three-haired tuft on each side.

Locality: Specimens taken from a pond, Bernard harbour, Northwest Territories, June 28, 1915 (Frits Johansen), not isolated, but present in dominating numbers. so that they doubtless belong to the abundant species, *nearcticus*.

Aedes, n. sp.*(Ochlerotatus.)*

A few larvæ collected with *Aedes nearcticus* Dyar at Bernard harbour, Northwest Territories, represent an apparently undescribed form, but as there is no way of associating an adult, a name is not proposed. —

Head hairs single; ante-antennal tuft in two; antennæ long, slender, a two-haired tuft at the middle. Skin glabrous. Lateral comb of the eighth segment of fifteen scales in a narrow patch; single scale with long terminal thorn. Air tube about three times as long as wide, tapered on the outer half; pecten reaching beyond the middle, the last three teeth detached; hair tuft in four, situated within the last tooth. Anal segment ringed by the plate, the brush posteriorly directed; anal gills four, tapered, rather short.

Aedes (Ochlerotatus) sp.

A dozen females from Seward peninsula, Alaska, of an *Aedes* with dark-brown scales over the mesonotum, the pile apparently less abundant than in *A. nearcticus*. No advantage would be gained by attempting to apply a name to this form, which must await the collection of males, or at least more perfect specimens.

Locality: Three ♀♀, Teller, Alaska, July 29, 1913 (Frits Johansen); nine ♀♀, Nome, Alaska, August 24-25, 1916 (F.J.), Canadian Arctic Expedition.

The Diptera collected by the Canadian Expedition, 1913-1918.

(Excluding the Tipulidæ and Culicidæ.)

By J. R. MALLOCH.

INTRODUCTION.

This paper deals with the Diptera collected by the Canadian Arctic Expedition 1913-16, and belonging to the following families: Sciaridæ, Chironomidæ, Simuliidæ, Leptidæ, Empididæ, Dolichopodidæ, Phoridae, Borboridæ, Syrphidæ, Oestridæ, Tachinidæ, Calliphoridae, Anthomyiidæ, Scatophagidæ, Helomyzidæ, Piophilidæ, Ephydridæ, and Chloropidæ. The number of species in the paper is ninety-three, representing fifty-five genera.¹

Some of the genera and species included in this list are new to science, but others are recorded for the first time from Arctic America, having been previously known from the Arctic regions of the Old World. It is probable that many of the forms are circumpolar in their distribution, but the difficulties attendant upon their collection in the latitudes where they occur make it almost impossible to obtain representative collections from many regions.

Collections of Diptera from the far north present characteristics that are unmistakable to the eye of one who has previously studied material in other Arctic collections, since in both the remarkably uniform dull colours and in the genera comprising such collections they differ very strikingly from those of temperate regions. The predominating body-colour is a deep black, relieved occasionally with blue-black species such as the flesh-flies, and as a general rule the flies are hairy or bristly. Most of the forms are scavengers, living on decaying animal or vegetable matter, but a few are parasitic or predaceous. The phytogamous forms are rare, and from the far north no Trypetidæ are recorded, the most northern locality for that family being the Pribilof islands.

The work upon this collection was undertaken with the consent of Dr. Stephen A. Forbes, Chief of the Division of Natural History Survey of Illinois.

SCIARIDÆ.

The larvæ of this family live in decaying vegetable matter, sometimes in fungi, and occasionally in vegetation that has been attacked by other larvæ.

There are three species in this collection, none of which it is possible to identify specifically on account of their being represented only by females, and also owing to their defective condition.

Sciara, sp. 1.

This species has a peculiar wing venation which will enable some future student to associate the specimen with others that may be subsequently obtained.

The first vein ends in the costa midway between the cross-vein and the furcation of media, the latter originates about twice the distance of cross-vein proximad of the latter, runs very close to the upper branch of cubitus to the fork, the anterior branch then runs abruptly forward (towards costa) at almost a right angle to lower branch, curves round when about one-third of the distance to radius and runs to apex of wing, the cell it encloses being narrowed apically.

¹ *Types.* The types of the new species described in this report are deposited in the National Collection of Insects, Ottawa.

The radial vein is setose. Costa extends almost to apex of upper fork of media. The posterior branch of media runs nearly straight from fork to wing margin.

Length, 3 mm.

Locality: Teller, Alaska, August 3, 1913 (F. Johansen).

Sciara, sp. 2.

Two females in poor condition. These differ from the preceding species in having the first vein ending in costa slightly before furcation of media, the latter originating midway from cross-vein to base of radius, and gradually diverging from anterior branch of cubitus, the cell between the anterior branch and radius, and narrowed basally.

Length, 2.75 mm.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, August 22, 1915 (F. Johansen).

Sciara, sp. 3.

This species differ from the preceding one in having the first vein ending in costa a little over midway from cross-vein to fork of media, the latter originating one-third of the distance from cross-vein to base of wing and the third branch of radius ending closer to apex of wing, nearly in vertical line with apex of posterior branch of cubitus.

Length, 3 mm.

Locality: Nome, Alaska, August 21, 1916 (F. Johansen). One female.

CHIRONOMIDÆ.

There are a number of specimens, representing several species, in the collection, but their condition is very bad so that specific identification is not possible except in a few cases. A number of larvæ and pupæ in alcohol lend themselves more readily to description and to generic classification than do the imagines, but so little is known of the immature stages of the many species occurring in the Arctic regions that it is impossible to give specific identifications for the specimens in this collection.

TANYPINÆ.

There are two species of this subfamily in the collection, neither of which is in very good condition. They apparently represent distinct genera.

Tanypus Meigen.

There is one species of this genus in the collection, some specimens of which are in sufficiently good condition to assure their identification.

The larvæ of this genus are met with in both swiftly flowing streams and in standing water, such as lakes and pools, or even in water-barrels or other temporary receptacles.

Tanypus alaskensis, n. sp.

MALE.—Black, subopaque. Legs fuscous. Wings slightly greyish; cross-vein infuscated, but not broadly so. Halteres brown. Plumes of antennæ and hairs of body and legs fuscous.

Palpi long, antepenultimate joint distinctly longer than penultimate, the latter longer than ultimate. Dorsum of thorax with numerous long hairs in the

slightly sunk lines between the areas usually occupied by vittæ in other species, the same areas slightly grey pruinose. Fore tarsi without conspicuously long hairs, basal joint three-fifths as long as fore tibia and twice as long as second joint; fourth tarsal joint on all legs distinctly longer than fifth. Wings narrow, costa extending well round apical curve of wing but falling considerably short of reaching apex.

Length, 6 mm.

Tanypus, sp. 1.

A pupa which may be that of the species described in this paper is very similar to that of *monilis* Meigen. It differs in having the thoracic respiratory organs more elongate, about 2.25 as long as thick, paler in colour, and with a short apical rounded projection. All the abdominal segments have a dark brown line at incisions, both on dorsum and venter; the lateral marginal hairs are very fine and number one or two on each segment near base, the seventh segment has three stronger hairs on each side and the eighth has five or six stronger flattened hairs; caudal fins pointed at apices, with four or five flattened hairs on basal half of outer margin and a slight protuberance at apex, giving each fin a sharply pointed appearance.

Length, 7 mm.

Locality: Inland lake at Bernard harbour, Dolphin and Union strait, Northwest Territories, August 10, 1915 (F. Johansen).

Along with this specimen there is one which evidently belongs to the species described as *Psilotanypus* sp. in this paper.

Psilotanypus, sp.?

PUPA.—Testaceous, with the thoracic markings of the enclosed imago showing through.

Head without tubercles between bases of antennæ. Thorax smooth, the respiratory organs like those of *Procladius concinnus* Loew, but comparatively broader (Pl. VII, figs. 10 and 11). Lateral margins of abdominal segments with narrow flat hairs, each side of eighth segment with 5-6 hairs which are regularly spaced; apical processes very similar to those of *Protenthes bellus* Loew, but broader and less rounded at apices (Pl. VII, fig. 5).

Length: 7-8 mm.

IMAGO.—Head yellowish testaceous, scape of antennæ fuscous, antennal plumes largely fuscous. Thorax testaceous; dorsum with a centrally divided median, and 2 broad, anteriorly interrupted lateral vittæ; scutellum black on base above; sternopleura entirely fuscous; mesopleura and metapleura including postnotum largely fuscous. Abdomen with each dorsal segment with a fuscous spot on each side posteriorly, the spots becoming progressively larger to apex of abdomen; segments 6, 7 and 8 each with a narrow fuscous band across base. Legs testaceous, the knees narrowly fuscous. Wings apparently with a dark area surrounding the cross-veins.

Fore tarsi similar to those of *occidentalis*, from middle of basal joint to apex of fourth with rather long hairs; mid and hind tibiae and tarsi with moderately long hairs; fourth tarsal joint on all legs longer than fifth. Venation very difficult to make out, but the cross-vein like branch of radius between the first and third branches is not distinguishable, and the cubitus forks about midway from cross-vein to margin of wing; in *occidentalis*, the petiole of cubitus is very short.

Length, 7.5 mm.

Locality: From pond at Bernard harbour, Dolphin and Union strait, Northwest Territories, July 3, 1916 (F. Johansen).

CHIRONOMINÆ.

There are representatives of several genera of this subfamily in the collection, some of them represented by larval and pupal stages and some by imagines.

Diamesa Meigen.

This genus is represented in the collection by one species which does not agree in structure with any species known to me.

The larvæ of *Diamesa* species are generally found in fast running water and normally on rock surfaces. I have seen females that were collected while in the act of ovipositing in water caused by the melting of snow on mountains in Montana.

Diamesa arctica, n. sp.

FEMALE.—Black, subopaque. Wings subfuscous, veins thick and dark, cross-vein infuscated. Halteres brown.

Eyes very widely separated, width of frons equal to one-half the width of head; antennæ with 8 joints, the apical one four times as long as preapical, surface hairs long and rather numerous. Pronotum with a deep, moderately wide central, wedge-shaped incision; dorsum of mesonotum and scutellum with rather long fuscous hairs. Abdomen stout, with shaggy fuscous hairs. Legs stouter than in *Wallii* Meigen, and with much more conspicuous hairs; fore tarsi with the basal joint very little more than one-half as long as fore tibia; fourth tarsal joint on all legs sub-equal to or very little shorter than fifth; mid tarsi with a series of minute erect setulae on ventral surface of at least the basal two joints. Venation similar to that of *Wallii*.

Length, 4.5 mm.

Type locality: Colville mountains, Wollaston peninsula, Victoria island, July 22, 1915 (D. Jenness). Paratype, lake Angmaloktok, Colville mountains, Wollaston peninsula, Victoria Island, July 29, 1915 (D. Jenness).

Chironomus.

There are larvæ and pupæ of one species and one imago of possibly another species of this genus in collection.

Chironomus, sp. 1.

A male in rather poor condition resembles closely several species I have described from Pribilof islands. It is entirely black and has the fore tarsi long-haired, characters common to nearly all males of this genus I have seen from the far north. Structurally the specimen agrees very well with one I have described as *conformis* in a paper now in press, but more specimens are necessary to ensure an authentic identification.

Length, 7.5 mm.

Locality: Barter island, Arctic coast of Alaska, July 2, 1914 (D. Jenness).

Chironomus, sp. 2.

LARVA.—Bright red in life. Labium very similar to that of *tentans* Fabricius, but the median tooth is regularly rounded and the small submedian one larger than in that species: the mandible has three teeth in addition to the large apical one. The ventral and respiratory filaments are absent, the dorsal papillæ are small, each with eight long hairs, and the four apical respiratory protuberances between the caudal pseudopods are about three times as long as thick.

Length, 17-19 mm.

PUPA. Similar to that of *tentans*. The second abdominal segment has a transverse line of minute chitinized spinules on posterior margin, and almost the entire dorsal surface covered with small brown scale-like elevations, which are most conspicuous posteriorly; a rather long hair is present on each side of median line posteriorly, and the elevations are absent round the bases of those as well as on a number of small round areas on anterior half of disc; segments 3 to 5 without transverse line posteriorly, but in other respects as second, though the elevations, or scales, become progressively weaker to fifth segment and are present only near posterior margin on sixth and seventh as two small brown patches; eighth segment with each postero-lateral angle armed with a chitinized process similar to that of *decorus* Johannsen.

Length, 14 mm.

Locality: Pool at Collinson point, Alaska, June 22, 1914 (F. Johansen).

Chironomus, sp. 3.

LARVA. This species differs from the previous one only in being smaller, 11 mm., and in having a dark brownish vitta on dorsum of head, and the sub-median labial tooth attached to median one so that it appears more like a protuberance from the side of the latter than a distinct tooth.

Locality: Braekish pond, Bernard harbour, Dolphin and Union strait, Northwest Territories, August 4, 1915 (F. Johansen).

Tanytarsus Van der Wulp.

There are several imagines and some larvæ of this genus in the collection.

Tanytarsus, sp. 1.

Five males in poor condition resemble in most particulars *viridiventris* Malloch. The thorax is black, abdomen fuscous, though probably greenish in life, and legs pale fulvous. The fore tarsi have no long hairs and the basal joint is about 1.5 as long as second. The wings are not in good enough condition to give an accurate idea of the venation.

Length, 3.5 mm.

Locality: Teller, Alaska, August 3, 1913 (F. Johansen).

Tanytarsus, sp. 2.

One male without fore tarsi. Larger than foregoing. Entirely black, including the legs, halteres, and antennal plumes. Wings with very short surface hairs; radius extending to beginning of apical curve of wing; cross-vein slightly before middle.

Length, 4.5 mm.

Locality: Lake Angmaloktok, Colville mountains, Wollaston peninsula, Victoria island, July 22, 1915 (D. Jenness).

Tanytarsus, sp. 3.

LARVA. Orange in life; alcoholic specimens, greenish yellow, head brown.

Base of antennæ pedunculate; basal antennal joint about five times as long as thick, second joint about one-fourth as long as basal, third and fourth joints pale, their combined lengths not equal to length of second and distinctly less than that of the long pair of filaments at apex of second joint, the filament at apex of basal joint not longer than second joint; mandibles stout, with a rather strong, and not very sharp apical tooth, and three small teeth along inner margin:

labium with nine distinct teeth, all of which are rounded at apices, the central one much broader than the first lateral and slightly shorter; surface of the head with the usual hairs. Dorsum of each thoracic segment with four to six long hairs; thoracic pseudopods stout, armed at apices with weak, pale hairs. Dorsal apical papillæ very slightly elevated, each armed with six dark brown hairs; four short, stout, respiratory protuberances caudad of dorsal papillæ and between anal pseudopods, the latter stout and short, the apical armature consisting of rather stout pale thorns.

Length, 8-9 mm.

Locality: Brackish pond at Bernard harbour, Dolphin and Union strait, Northwest Territories, June 6, 1916 (F. Johansen).

Along with this species is one of *Orthocladius* sp. 2. There are no well-defined larval cases in the vial with the larvæ, and only one rude cylindrical "runway" similar to those of *Chironomus* species.

Tanytarsus, sp. 4.

This species is much smaller than the preceding, being about 5-6 mm. in length, and forms a cylindrical case which is very little longer than the larva and is entirely covered with fine particles of sand. There are no filament-like protuberances on the cases before me such as are on cases of some members of this genus found in streams in the more temperate portions of this continent.

Structurally the larva resembles the preceding species, but the labium is not so straight on its anterior outline laterally, being more like that of *Orthocladius nivoriundus* Fitch, the central portion being almost transverse, with broad, poorly defined teeth, and the lateral portions sloping backward, with sharp teeth. The antennæ are almost as in the preceding species.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, from bottom of big lake (20 feet), middle of February, 1916 (F. Johansen). Another vial with date December, 1915, station 42*e*, contains a large number of these larvæ.

Camptocladius Van der Wulp.

Four specimens in the collection appear to belong to this genus. They are all males, but their condition is too poor to enable me to make certain of even their generic status. They, however, have the habitus of *Camptocladius* and probably belong here.

Length, 2.5 mm.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, June 18, 1915 (F. Johansen).

Orthocladius Van der Wulp.

This genus is well represented in northern latitudes; the species occur in the United States very early in the year, March and April being the months in which they are most abundant.

There is one imago of a species in this collection and the larvæ of one, which may or may not be the same species.

Orthocladius, sp. 1.

A male in poor condition closely resembles *nivoriundus* Fitch, but the fore tarsi have much longer hairs, the basal fore tarsal joint is slightly less than three-fifths as long as fore tibia, the wings are milky, and the cross-vein is oblique.

Length, 6 mm.

Locality: Collinson point, Alaska, June 22-23, 1914 (F. Johansen).

This may be the species recorded as *pubitarsis* Zetterstedt, from Greenland, by Lundbeck, but so many of the northern species of *Orthocladius* and *Chironomus* have the same habitus and general characters of colour and hairing of the fore tarsi that it is not possible to say definitely whether Zetterstedt's species occurs there or not without a careful comparison of a series of specimens of species from Europe and Greenland.

Orthocladius, sp. 2.

A species represented by a number of specimens to which I have given this name may not belong to *Orthocladius* in the restricted sense, but is related to that genus.

The colour of the larva in life is greenish or yellowish. In general form the body resembles that of *Campocladius*, tapering to the apex and being without dorsal papillæ and permanently protruded blood-gills. The head is small, tapered anteriorly, about as long as its greatest width, with very minute, unprotruded antennæ, and well developed, distinctly toothed mandibles. The labial plate is armed with about eight rounded teeth, the anterior four being in an almost transverse line. Thoracic pseudopods very small, armed with a few black hairs at apices. Anal pseudopods at extreme apex of last segment, even smaller than the thoracic pair, armed with a few black hairs and some curved thorns at apex. Body without surface hairs.

Length, 3.5-4.5 mm.

Locality: Demarcation point, Alaska, May 16, 1914, in mud of freshwater ponds (F. Johansen).

Genus incertus.

A larva and pupa from the stomach of the Great Lake-trout (*Cristivomer namaycush*) belong to a genus unknown to me. It is my opinion that the genus belongs to Tanyptinæ, but so little is known of the immature stages of the aberrant genera of Chironominae that I cannot be absolutely certain of the relationship of the rather imperfect specimens before me.

LARVA. Testaceous; posterior margin of head, apices of mandibles, and lateral portions of labium dark brown.

Head with sparse, long, erect pale hairs; antennæ either retracted or missing; mandibles very long, apex terminating in a long, slender, sharp tooth, inner margin with three widely spaced, short, truncated teeth; maxillary palpus short, not over 1.5 as long as thick; labium without distinct teeth, minutely irregularly serrated anteriorly, its anterior outline produced anteriorly in centre; hypopharynx with eight to ten small teeth on each side above lateral dark areas of labium; ventral surface of head with a narrow pale central stripe, bordered on each side with blackish brown. Anterior pseudopods short and stout, armed apically with many stiff hairs; body without noticeable hairs; anal pseudopods stout, with apical retractile claws; dorsal papillæ about three times as long as thick, each with about six apical hairs; two apical respiratory protuberances at base of pseudopods dorsally, their length about three times their width, apices sharp.

Length, 15 mm.

PUPA. Testaceous. Head missing. Prothoracic respiratory organs not elevated (possibly missing); wings extending to middle of second abdominal segment; none of the tarsi exceeding apices of wings, the fore and hind legs with the tibiæ and tarsi straight, the mid pair with the tibiæ and tarsi forming a double curve. Incisions between abdominal segments marked by a dark brown line on dorsum and venter; each segment except first and last with three long, slightly flattened hairs on each side; penultimate segment with two large downwardly projecting, posteriorly flattened, projections on posterior margin, which are separated by a distance about equal to their own width; apical segment

flattened on dorsum, laterally sloping ventrad and mesad, armed along the basal two-thirds of its lateral margins with slender, slightly flattened hairs, and with four long, flat hairs on apical third, venter of apical segment with a large bifid protuberance.

Length, 13 mm.

Locality: Lake at Bernard harbour, Northwest Territories, June 26, 1915 (F. Johansen).

In the vial with the specimens is a large sack-shaped cocoon or pocket of a very tough consistency which may belong to this species. It is open at one end and shaped somewhat like the cocoon of *Simulium* except that it does not taper so much at bottom. The surface is coated in part with small pieces of rotten wood.

SIMULIIDÆ.

There are several lots of larvæ, pupæ, and imagines of this family in the collection. The imagines, with few exceptions, are in very poor condition.

The larva and pupa of one species, obtained at Bernard harbour, very closely resemble those of *Simulium vittatum* Zetterstedt, but as is shown in the text following it is specifically distinct.

The larvæ of this family are found only in running water, some species preferring very swift streams with rocky beds, and particularly those parts of the streams where there are falls or declivitous rock-surfaces over which the water moves at an accelerated speed. Other species are found in streams with only a moderate current, and since in these streams the bed is generally more or less muddy and gives an opportunity for a weedy or grassy growth, the larvæ and cocoons are usually found attached to this growth or to roots or fallen branches of trees in the stream.

The imagines are predaceous, usually feeding upon the blood of mammals, and are a great pest in certain parts of North America and Europe. As a general rule the flies do not bite man, but they cause great discomfort by flying precipitately against the face, and by getting into the hair. Their bite is more painful than that of a mosquito.

There are imaginal representatives of two genera and three species in the collection.

Prosimulium Roubaud.

The only species of this genus in the collection is apparently undescribed.

Prosimulium borealis, n. sp.

MALE. Black, opaque. Thorax and abdomen with yellowish white hair. Wings clear. Halteres brown.

Head as in *hirtipes* Fries, the antennæ rather slender, postocular cilia dark. Thorax with long, but not very dense, subdepressed hairs, those on posterior margin and scutellum longer than those on disc; mesopleura with a few long hairs near upper margin. Fore tarsus with basal joint slender, not so thick but 1.5 as long as basal joint of mid tarsus; basal joint of hind tarsus almost as thick as hind tibia, and nearly four times as long as second, not produced at apex; second joint thickest a short distance before apex, three times as long as its greatest diameter, and twice as long as third. Venation similar to that of *pecuarum* Riley, the radial vein with third branch thickened at apex but not distinctly furcate.

Length, 3 mm.

Type locality: Wollaston peninsula, Victoria island, summer, 1915 (D. Jenness).

This species resembles *pleurale* Malloch in having the mesopleura hairy on the upper portion. The third branch of radius in *pleurale* is very distinctly furcate, which is not the case in *borealis*.

A female which is in rather poor condition appears to belong to this species. In colour it is identical with the male, but it is not possible from the condition of the specimen to say whether the mesopleural hairs are present or not. The claws are bifid, as in *pleurale*, but the third branch of radius is as in the male of *borealis*. The basal joint of the hind tarsus is of equal thickness throughout its length, its apex is not produced on posterior side, and its length equals 2.5 the length of second.

Locality: Bernard harbour, Northwest Territories, August 25, 1916 (F. Johansen).

Simulium Latreille.

There are imagines of two species of this genus in the collection. It is not possible to definitely associate the larval and pupal material in the collection with the adults as no specimens were reared. It is highly probable that the pupæ I describe in the following pages belong to species represented in the adult forms, but there appear to be three distinct species in the former and only two in the latter. Unless the species which has sixteen-branched respiratory organs is that of *Prosimulium borealis*, which does not appear probable from what I know of the pupæ of that genus, there must be a third species that occurs at Bernard harbour.

Simulium, sp. 1.

This species closely resembles *venustum* Say in colour, but is larger than the average for that species, being nearly 3 mm. in length. The specimen is in such poor condition that it is impossible to tell whether the scutum is marked or not. The abdomen has the characteristic colouring of the *venustum* group, the basal four segments being opaque black and the apical five shining black dorsally. The legs are black, with the fore coxæ, trochanters, bases of all femora (narrowly), basal half of all tibiæ, basal two-thirds of hind metatarsus, and basal half of second joint of hind tarsus pale yellow; Mid tarsi missing. Wings clear. Halteres yellow.

It is impossible to say anything about the structure of the tarsal claws as the only pair that are left are stuck fast in the mounting medium, and are not visible to the extent of showing if they are simple or not.

Locality: Hood river, Arctic sound, Northwest Territories, August 28, 1915 (R. M. Anderson).

Simulium similis, n. sp.

FEMALE.—Similar to *arcticum* Malloch in general coloration and in structure of tarsal claws.

Black, subopaque, covered with whitish pruinescence. Antennæ, palpi, and proboscis entirely black; front and face with dense whitish pruinescence, the former very faintly shining; hairs of face and frons whitish yellow, those on vertex and upper part of occiput partly brown. Dorsum of thorax, when seen from the front, with an indistinct, broad, whitish pruinose vitta on each side of median line, when viewed from behind with the vittæ less distinctly whitish than the area behind each anterior lateral angle; pile of dorsum all hair-like, rather short and depressed; no erect dark hairs distinguishable. Abdomen with basal four segments opaque; the apical five segments very faintly shining; surface hairs all yellowish. Legs black, basal two-thirds of fore tibiæ dorsally, basal third of mid and hind tibiæ, basal third or basal joint of mid tarsi, basal two-thirds of basal and basal third of second joint of hind tarsi yellowish. The tarsal claws are similar to those of *arcticum* Malloch, but besides the differences

in colour evident from the above description there are no long erect dark hairs on thoracic dorsum as in that species.

Length, 2-3 mm.

Type locality: Hood river, Arctic sound, Northwest Territories, August 28, 1915 (R. M. Anderson). Paratypes, Bathurst inlet, Northwest Territories, September 1, 1915 (R. M. Anderson).

This species is closely related to *arcticum* Malloch, described from British Columbia, but the points mentioned in the description should serve to separate the species.

Simulium, sp. 2.

PUPA.—This species is similar to *johannseni* Hart in having the thoracic respiratory organs each four-branched (Pl. VI, fig. 4). There is also a European species with this characteristic. From *johannseni* the present species differs in the armature of the abdomen. The third and fourth dorsal segments each have eight stout anteriorly directed thorns near the posterior margin, in a transverse series, four on each side, the space between each series of four about three times as wide as the space between the thorns of each series; dorsal segments five to eight inclusive, each with a transverse series of weak, backwardly directed spines near anterior margin, the series of fifth segment much shorter than that on sixth, those on other segments becoming progressively longer and stronger as they near apex; apical segment with two short spines; fourth, fifth, and sixth ventral segments each with two short spines on each side.

Length, 3 mm.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, August 16, 1915, in bed of river (F. Johansen).

Simulium, sp. 3.

PUPA.—Differs from the foregoing in having the thoracic respiratory organs each with twelve or thirteen branches (Pl. VI, fig. 13) and the armature of the abdomen as follows. Third and fourth dorsal segments each with eight very small recurved thorns arranged as in the previous species, fifth segment with the anterior transverse armature almost imperceptible, that on sixth, seventh, and eighth consisting of a series of very small, closely placed spinules that extends entirely across the surface from side to side; apical segment with two very conspicuous upwardly curved thorn-like processes, fifth ventral segment with a pair of small thorns on each side near posterior margin, sixth and seventh each with one such thorn similarly located.

Length, 3.5 mm.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 10, 1916 (F. Johansen).

Simulium, sp. 4.

PUPA.—Differs from the previous species in having sixteen-branched thoracic respiratory organs (Pl. VI, fig. 12). The abdominal armature is as follows: second dorsal segment with eight minute spines on each side—three in a submedian transverse group, three in a sublateral similarly disposed group, and two midway between these groups; third and fourth segments each with the same number of spines as second, but they are stronger, more appreciably recurved apically, and the submedian and intermediate series are not so distinctly separated and appear as a single rather irregular series of five thorns; fifth and sixth segments without well-developed spinules anteriorly; seventh and eighth each with a complete series of spinules near anterior margin; apical segment with two to three small spines on each side; third ventral segment with two thorns on each side, fourth with three, fifth with two, and sixth with one.

Length, 4.5 mm.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, August 16, 1915, in bed of river; same locality, July 10, 1916 (F. Johansen).

With this last lot there a number of larvæ of which I dissected the heads of two. In most respects these larvæ resemble the larva of *johannseni* Hart, but the anal respiratory gills are withdrawn in all the examples so that it is not possible to say what they are like structurally.

I have drawn some of the cephalic parts as a better index to their structure than a written description. One striking feature in the species is the very conspicuously darkened third antennal joint. In most species the antennæ are uniformly coloured. Structurally the larva is a true *Simulium* and very likely that of the last described pupa; both probably belong to *borealis* sp. n. For details of mandibles, labium, antennæ, and maxilla, see Pl. VII, figs. 7, 3, 2, and 1, respectively.

In all specimens of the pupæ of this species there are either fifteen or sixteen thoracic respiratory branches, usually with two or three much shorter than the others, and the arrangement differs noticeably from that in *vittatum* which always has the branches paired to near base and very regular in arrangement and length.

LEPTIDÆ.

There is one specimen of a species of *Ptiolina* in the collection. I have already described this species in a paper on the Diptera of Pribilof islands which is now in press.

Ptiolina arctica Malloch.

One male. Bernard harbour, Dolphin and Union strait, Northwest Territories, July 18, 19, 1915 (F. Johansen).

EMPIDIDÆ.

This family is usually well represented in collections from northern latitudes and in the material before me there are over twenty specimens representing six species of the genus *Rhamphomyia*.

The larvæ of the species which I have found in Illinois are predaceous, and live in earth and decaying wood or leaves. Some species are aquatic in the larval and pupal stages. The imagines of the genera *Empis*, *Rhamphomyia*, and *Hilara* are met with in swarms similar to those of Chironomidæ and Culicidæ, performing a rhythmical aerial up and down flight generally in the lee of a bush or tree, but some species, especially of *Hilara*, fly over water, notably close to the surface of pools in streams. The imagines of most species are predaceous, and in some cases the males capture the prey, fly past a swarm of females with it, inducing females to pursue them, and in the process of transference of the prey to the female copulation takes place.

Rhamphomyia Meigen.

This, the only genus of the family in the present collection, is represented by six species and twenty-two specimens. I have experienced so much trouble in attempting to identify species of this genus through the lack of synopses in the papers I have used that I have drawn up a key to those dealt with in this paper in the hope that subsequent students may find it useful in identifying collections from this region. With one exception I have failed to associate the species before me with any previously described, and even in the case of the

one I have identified I have a slight doubt as to the correctness of my identification because I have not the male before me, and it was from that sex that the species was originally described.

KEY TO SPECIES.

MALES.

1. Halteres black or black-brown..... 2
Halteres yellow..... 4
2. Femora very distinctly thickened; eyes separated by width across posterior ocelli; sixth vein extending to margin of wing; hairs on thorax and abdomen thick..... *erinacioides*, n. sp.
Femora not appreciably thickened, little stouter than tibiae; eyes contiguous or subcontiguous; sixth vein not extending to wing margin; hairs on thorax and abdomen fine 3
3. Hind tarsi with the basal joint thicker than tibiae at apices, and very much thicker than basal joint of fore and mid tarsi; all tibiae and basal two joints of all tarsi with rather dense, long, fine hairs dorsally..... *ursina*, n. sp.
Tarsi not as above, legs without long dense hairs on tibiae and basal two joints of all tarsi, several of the hairs on basal joint of tarsi on all legs conspicuously stronger than the others, bristle-like..... *similata*, n. sp.
4. Hairs of thorax and abdomen yellowish..... *albopilosa* Coquillett.
Hairs on thorax and abdomen black..... *conservativa*, n. sp.

FEMALES.

1. Halteres black..... 2
Halteres yellow..... 4
2. Mid and hind femora with a series of squamulae along the postero-ventral margins; basal joint of hind tarsi at least as thick as apices of tibiae; sixth vein extending to margin of wing..... *herschelli*, n. sp.
Femora devoid of squamulae, at most with hairs or bristles; sixth vein not extending to margin of wing..... 3
3. Tibiae and tarsi with dense short hairs of uniform strength, which nowhere exceed in length the diameter of the part upon which they are situated..... *ursina*, n. sp.
Tibiae and tarsi with sparse, stout bristles, many of which exceed in length the diameter of tibiae or tarsi, those on dorsum of basal joint of tarsi very unequal in length..... *similata*, n. sp.
4. Ventral plate between bases of fore coxae with long pale hairs; hairs on thorax and abdomen yellowish..... *albopilosa* Coquillett? ...
Ventral plate between bases of fore coxae bare; hairs on thorax and abdomen black..... *conservativa*, n. sp.

Rhamphomyia erinacioides, n. sp.

MALE. Black, subopaque. Wings slightly brownish, veins dark brown. Halteres black-brown. Hairs on entire insect fuscous.

Eyes separated by as great a width as distance across posterior ocelli; antennae with basal two joints subequal in length, third joint broad at base, tapered from near base to apex, its entire length slightly more than twice its greatest width and 1.5 as great as first and second combined; apical style thick, one-third as long as third joint; proboscis slender, tapered to apex, its entire length equal to 1.5 the height of head; palpi short; occiput with long, rather thick hairs. Dorsum of mesonotum covered with long, rather dense, upright, thick hairs; ventral prothoracic plate between fore coxae bare, the portions of thorax immediately above bases of fore coxae with long hairs; hairs in front of halteres numerous; scutellum with a closely set fringe of upright hairs along posterior margin (24-30). Abdomen with dense erect stout hairs on entire surface except on the hypopygium; hypopygium large, upper processes long, directed cephalad over dorsum, as shown in Pl. VII, fig. 6, the filament not visible except near base. Femora very noticeably thickened, tibiae and tarsi more slender than usual; all femora with rather dense hairs, which are not so thick as those on abdomen, hind pair with the ventral surfaces devoid of long hairs except on basal third, beyond that with dense microscopic pile; all tibiae with short hairs on dorsal surfaces and dense erect microscopic pile on ventral surfaces:

tarsi not noticeably bristly; claws very long and much curved. Discal cell closed, normal in size, vein closing lower portion of apex much curved; sixth vein faint, but traceable to margin.

Length, 5 mm.

Type locality: West of Kongenevik, Camden Bay, Alaska, July 4, 1914 (F. Johansen). Paratype, Barter island, Arctic coast of Alaska, July 11, 1914 (D. Jenness).

Rhamphomyia ursina, n. sp.

MALE.—Black, slightly shining. Wings slightly brownish, veins black-brown. Halteres brown, knobs black. Hairs on entire insect fuscous.

Eyes contiguous; third antennal joint longer and narrower than in the preceding species; proboscis slender, slightly longer than height of head; palpi small; occiput with numerous slender hairs. Hairs on dorsum of mesonotum very fine, erect, and moderately dense; pleura and prothorax as in preceding species; scutellum with marginal fringe of long hairs (12-16). Abdominal hairs fine and short, moderately dense; hypopygium in type badly crushed, but in general structure similar to that of preceding species, differing essentially in having the two stout anteriorly directed processes covered with soft short hairs. Femora slender, barely stouter than tibiae, fore and mid pairs with moderately long hairs, hind pair almost bare; all tibiae and the basal two joints of all tarsi with dense, long, fine hairs dorsally; basal joint of fore tarsi slender, thinner than tibia and as long as joints two and three combined; basal joint of mid tarsi thicker and distinctly shorter than that of fore tarsi; basal joint of hind tarsi twice as thick as mid pair, and distinctly thicker near apex than hind tibiae at apices. Discal cell normal, the vein closing it on lower portion at apex nearly straight; sixth vein not extending to margin.

Length, 4 mm.

Type locality: On sandy beach Bernard harbour, Dolphin and Union strait, Northwest Territories, July 19, 1915 (F. Johansen).

There are two females in the collection which probably belong to this species. One of them is in fair condition and is described herewith.

Identical in colour with the male.

Eyes separated by a space greater than distance across posterior ocelli; antennae similar in structure to those of male of *erinacioides*. Thorax less densely hairy than in male, the scutellum with about eighteen to twenty bristly hairs. Abdomen pointed apically. Legs slender, tarsi not so much thickened as in the male, the basal joint of the hind pair equal to hind tibia in thickness; hairs on legs short, the longest ones not as long as diameter of tibia; no outstanding bristles on basal joints or tarsi. Venation as in male.

Localities: Sandy beach, Bernard harbour, Dolphin and Union strait, Northwest Territories, July 19, 1915; Bernard harbour, July, 1916 (F. Johansen).

Rhamphomyia similata, n. sp.

MALE.—Similar to the preceding species in colour.

Eyes closely contiguous for a considerable distance below ocelli; third antennal joint about four times as long as its basal width; style short, about equal in length to greatest width of third joint; proboscis nearly twice as long as height of head; occiput with long slender hairs. Dorsum of pronotum with dense, long, erect, slender hairs; pleura and prothorax as in preceding species; scutellum with ten to twelve long hairs on margin. Abdomen with rather sparse hairs, which are longer and more numerous on posterior margins of segments; hypopygium similar to that of *ursina*. Legs rather stout; all femora with short sparse hairs, those on apical half on antero-ventral surface of hind pair more dense and setulose; basal joint of hind tarsi thicker than that of other pairs; all tibiae with numerous

long hairs dorsally, which exceed in length the diameter of tibiae, those on the anterior sides less numerous and bristle-like; basal joint of all tarsi with two or more of the hairs on dorsum conspicuously stronger than the others, ventral surfaces with numerous erect setulae among the hairs. Venation similar to that of *ursina*.

FEMALE.—Agrees in colour with the male.

Eyes separated by about twice the distance across posterior ocelli; antennae as in the male. Thorax less conspicuously hairy than in male, the dorsum slightly brown pruinose, centrally indistinctly bivittate, between the vittae with two-rowed acrostichals; scutellum with eight slender bristles. Abdomen pointed apically, the ovipositor very slender. Legs similar to those of male, except that the basal joint of hind tarsus is not as thick as tibia, and that the hairs are less numerous and more bristly, noticeably so on mid and hind tibiae and tarsi. Venation as in male, the wings darker.

Length, 4–5 mm.

Type locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 18, 1915 (F. Johansen).

A male in the collection lacking abdomen differs slightly from the type, and may belong to a different species.

Locality: Coekburn point, Dolphin and Union strait, Northwest Territories, Canadian Arctic coast, September 5, 1914 (F. Johansen).

Rhamphomyia herschelli, n. sp.

FEMALE.—Black, shining. Wings slightly and evenly browned. Halteres black. Hairs throughout fuscous.

Eyes separated by distinctly more than twice the width across posterior ocelli; third antennal joint three times as long as its basal width; style one-third as long as third antennal joint; proboscis 1.5 as long as height of head; occiput with numerous hairs. Hairs on dorsum of mesonotum short, confined to anterior half of disc, acrostichals two-rowed; scutellum with about ten bristles. Abdomen pointed apically; ovipositor very slender. Legs rather stout, basal joint of fore and mid tarsi each as thick as tibiae at apices; basal joint of hind tarsus thicker than hind tibia at apex; mid and hind femora with a series of squamulae along the postero-ventral margin; tibial bristles very weak and sparse, none nearly equalling diameter of tibiae. Vein closing lower portion of apex of discal cell very much curved; sixth vein extending to wing margin.

Length, 5–6 mm.

Type locality: Herschel island, Yukon Territory, July 29, 1916 (F. Johansen) Two specimens.

This may be the female of *erinaciodes*, but it does not agree with the male in such characters as the very slender tibiae and tarsi as, from previous experience, I should judge it ought to do if it were the male of that species.

Rhamphomyia albopilosa Coquillett.

Rhamphomyia albopilosa Coquillett. Proc. Wash. Acad. Sci., vol. 2, 1900, p. 418.

What I take to be this species is represented in the collection by two females. As the species was originally described from two males, taken at Berg bay, Alaska, the female is described herewith.

FEMALE.—Black, slightly shining, distinctly grey pruinose, especially on pleura and abdomen. Wings slightly and uniformly brownish, veins dark brown. Halteres pale yellow. Hairs on thorax, abdomen, and coxae and femora pale yellow, scutellar bristles, most of the hairs on occiput, and all of those on palpi and antennae black; tibial and tarsal bristles and hairs black.

Eyes widely separated; third antennal joint conical, about 2.5 times as long as its basal width; style slightly over one-third as long as third antennal joint; proboscis fully twice as long as height of head. Hairs on thorax long and soft, the acrostichal series in two to three irregular rows; plate on venter between fore coxæ long-haired; scutellum with four bristles. Abdomen rather acutely pointed apically. Legs very slender; femora with very short surface hairs; fore tibiæ without differentiated bristles; mid and hind tibiæ with a few short bristles on dorsal surfaces which are not as long as the diameter of the tibiæ; tarsi slender, all joints with stiff black setulæ ventrally, and a few differentiated setulæ on dorsum of at least the basal joint. Wing venation normal; the vein closing lower portion of apex of discal cell very oblique, almost straight; sixth vein thick to apex, extending to margin of wing.

Length, 7 mm.

Localities: Herschel island, Yukon Territory, July 29, 1916; Cockburn point, Dolphin and Union strait, Northwest Territories, September 3, 1914 (F. Johansen).

Rhamphomyia conservativa, n. sp.

MALE. Black, subopaque. Wings brownish, more distinctly so basally. Halteres yellowish. Hairs and bristles black.

Eyes contiguous; third antennal joint nearly three times as long as its width at base; style stout, rather more than one-third as long as third antennal joint; proboscis about 1.25 as long as height of head. Dorsum of mesonotum rather densely hairy, the hairs upright, slender, and of moderate length; ventral plate between bases of fore coxæ bare; hairs in front of base of halteres long and dense; scutellum with eight to twelve fine hairs on posterior margin. Abdomen with rather sparse short hairs, which are longer near posterior margins of segments; hypopygium of the same general type as that of *erinacioides*, but the portion that is directed cephalad over dorsum reaches about three-fourths of the way to base and is pale yellow in colour, contrasting strikingly with the dark abdomen; lower posterior angle of hypopygium produced caudad in the form of a short subtriangular process; hypopygial filament very thick for a short distance at base, then becoming abruptly setiform, hidden for the greater portion of its length. Legs slender, femora with a number of very short setulæ on ventral surfaces, which are confined to basal third on hind pair; apical two-thirds of hind femora and the whole of hind tibiæ ventrally with very dense microscopic pile, intermixed on the tibiæ with short erect spinules; basal joint of hind tarsus nearly as long as the next four joints combined, the entire tarsus much shorter than tibia; dorsum of tibiæ and tarsi with short setulæ; tarsal claws very much curved, sickle-shaped, of good size. Venation as in previous species except that the vein closing lower portion of discal cell is distinctly curved.

FEMALE. Similar in colour to the male, the wings more distinctly brownish.

Eyes separated by nearly twice the width across posterior ocelli. Dorsum of mesonotum with fewer and shorter hairs than in the male, the anterior acrostichals four to six-rowed. Abdomen pointed at apex. Legs more setulose than those of the male, the hind femora with setulose hairs on their entire ventral surface; ventral surface of hind tibiæ with short regular setulæ instead of erect pile; basal joint of hind tarsus longer than next four combined; tarsal claws much shorter than in male. Wings broader than in male, the venation similar, but vein closing lower portion of apex of discal cell less curved.

Length, 6.5-7.3 mm.

Type locality: West of Bernard harbour, Dolphin and Union strait, Northwest Territories, July 14, 1916. Paratypes, Herschel island, Yukon Territory, July 29, 1916; Bernard harbour, Northwest Territories, July 10, 18, 19, and August 1-7, 1915; Young point, Northwest Territories, July 18, 1916 (F. Johansen). Nine specimens.

Rhamphomyia sp.

Two larvæ of a species belonging to this genus are in the collection.

In length they are 13 mm., and in colour pure white, with the exception of the cephalic parts which are black. The general structure of the head is the same as that of *Rhamphomyia dimidiata* Loew, a species I have figured and described from Illinois.¹

The mandibles are sharp and much curved, when fully protruded extending beyond apex of the sharply pointed labrum. The prothoracic spiracles are small, rounded, and slightly protruded. Apical segment of abdomen ending in four short, pointed processes, the two upper distinctly smaller than the two lower; spiracles rather small, round, situated on the under side of base of upper processes. No distinguishable hairs on body.

Localities: Demarcation point, Alaska, in wet moss-pillow, May 20, 1914; Bernard harbour, Northwest Territories, June 28, 1915 (F. Johansen).

DOLICHOPODIDÆ.

The larvæ of the dolichopodid genera in this collection are, as far as I know, found in muddy streams or pools. The imagines are predaceous, those of *Hydrophorus* and *Scellus* almost exclusively so, though *Dolichopus* is most frequently found feeding upon the nectar or honeydew on plants.

Dolichopus Latreille.

There are only two specimens of this genus in the collection, one male and one female, possibly representing only one species.

Dolichopus dasyops, n. sp.

MALE.—Blue-black, with a distinct cupreous tinge. Antennæ and arista black; face black, with dense yellowish brown pile; palpi yellow; proboscis black; postocular cilia entirely black; hairs on eyes yellow. Dorsum of thorax with coppery tinge; fringes of squamæ black. Hypopygium black, lamellæ white, blackened on apical margins and with black hairs. Legs yellow, fore coxæ slightly infuscated at bases, mid and hind pairs black; apices of hind tibiæ, apices of basal three, and all of apical two, joints of fore tarsi, all but base of mid tarsi, and entire hind tarsi fuscous. Wings clear, veins dark brown. Halteres yellow.

Eyes hairy; antennæ not elongated, third joint pointed, shorter than high (Pl. VII, fig. 8); arista with second joint much elongated, third densely pubescent; face parallel-sided, about one-sixth the head-width at its middle, not descending to lowest level of eyes. Scutellum with two strong bristles and two weak hairs. Hypopygial lamellæ as in Pl. VII, fig. 9. Fore coxæ with short black hairs, and a few long bristles near apex; fore tibia with three to four antero-dorsal, two postero-dorsal, and three to four posterior bristles; fourth joint of fore tarsi dilated from base to apex, fifth very much broadened, its width about equal to its length; mid tibia with one ventral, two to three antero-ventral, four to five antero-dorsal, and five to six posterior bristles; mid tarsi simple, with a few short bristles on apical half of basal joint, one of which on dorsal surface is conspicuous; hind femora with inconspicuous black hairs on apical portion of postero-ventral surface; hind tibia with short regular hairs on basal two-thirds of antero-ventral surface and one long bristle beyond these, antero- and postero-dorsal surfaces each with about eight long bristles; postero-dorsal surface with a slit at apex which runs forward on to dorsum; posterior surface densely black setulose on apical half; basal joint of hind tarsus with about

¹ Bull. III, State Lab. Nat. Hist., vol. 12, art. 3, p. 401, 1917.

eight bristles in two irregular series. Curve of fourth vein distinct but not abrupt; apices of third and fourth veins subparallel; costa not noticeably swollen at apex of first vein.

Length, 5.25 mm.

Type locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 10, 1916 (F. Johansen).

This species is most closely allied to *brevipennis* Meigen, but differs in having the hind femora without long pale hairs on ventral surface.

Dolichopus, sp.

A female in collection which is in very poor condition may belong to *dasyops*. It agrees very well in colour with the male above described. The wing has a knot-like swelling on the costa at end of first vein. The hind tibia has on basal half of the postero-dorsal surface a distinct groove or channel which is evanescent at its extremities, and at apex on dorsal surface another short groove; the bristles on hind tibia are as follows: five almost exactly on the dorsal surface, six to seven on antero-dorsal surface, and four to five on antero-ventral surface which are very weak but increase in strength to apex.

Locality: Nome, Alaska, August 21, 1916 (F. Johansen).

Scellus Loew.

The flies of this genus are predaceous. There are six described North American species. The single species in the present collection was originally described from northern Europe and was recorded from Fort Resolution, Hudson Bay territory, by Loew. There are no subsequent records for North America.

Scellus spinimanus (Zetterstedt.)

Hydrophorus notatus Zetterstedt, Ins. Lapp., sp. 701, 1838.

Hydrophorus spinimanus, Zetterstedt, Dipt. Scand., vol. 2, p. 445, 1843.

Two males and ten females, Bernard harbour, Northwest Territories, August 26, 1915; two females, Cockburn point, Arctic coast, Northwest Territories, September 7, 1914 (F. Johansen).

Hydrophorus Fallen.

There are three species of this genus in the collection. The imagines are predaceous and run with great facility upon water surfaces. The genus is northern in its distribution.

Hydrophorus innotatus Loew.

Hydrophorus innotatus Loew, Mon. N. Am. Dipt., vol. 2, p. 212, 1864.

Represented in the collection by three specimens: two males, Bernard harbour, Northwest Territories, June, 1915; and one female, Collinson point, Alaska, June 20, 1914 (F. Johansen).

Originally described from Sitka, Alaska. I have seen examples from Pribilof islands.

Hydrophorus signiferus Coquillett.

Hydrophorus signiferus Coquillett, The fur seals and fur seal islands of the north Pacific Ocean, vol. 4, p. 344, 1899.

I identify as this species twelve specimens, representing both sexes.

The species was originally described from a female specimen, and several important characters are omitted. I, therefore, redescribe the species from both sexes.

MALE AND FEMALE.—Black, with a distinct greenish lustre. Frons opaque black-brown; antennæ black; face greenish above, the surface with dense brownish pollen which rarely obscures the entire surface in either sex, face, below, entirely silvery pilose in the male, but in the female the greater portion is brownish pilose with normally a whitish area on each side; postocular region with numerous black bristles and yellow hairs. Thorax almost black, with a cupreous stripe along line of dorso-centrals and a broad sublateral vitta each side. Abdomen with a more pronounced greenish tinge than thorax and usually slightly cupreous on dorsum at base. Legs black, distinctly green-tinged, especially on dorsal surfaces of tibiæ. Wings clear, with a distinct brown spot on cross-vein and another before middle of last section of fourth vein. Squamæ with pale fringes.

MALE.—Third antennal joint short, obtuse at apex; face in both sexes broad, slightly widened below, the upper half slightly vertically rugose. Propleura with a group of bristly black hairs above coxa, among which the normal bristle is barely distinguishable. Scutellum with four strong bristles. Fore femora in male excavated at apex below, and with four to five short stout bristles basal of the excavation, on the anterior side; base of femur slightly swollen, and near its antero-ventral edge with a series of five to seven widely-placed setulæ; ventral surface of fore tibia with a series of closely placed spines; fore tarsi normal; mid and hind femora not swollen, both pairs with a few bristles on apical half of antero- and postero-ventral surfaces; mid and hind tibiæ with a few widely placed bristles.

FEMALE.—Similar to male except that the fore femora are not excavated near apex and lack the group of bristles on the antero-ventral side, and the fore tibia has less regular and slightly longer ventral bristles.

Locality: Teller, Alaska, two specimens, July 29, 1913, and ten specimens, August 6, 1913 (F. Johansen).

Originally described from Commander islands, Bering sea.

Hydrophorus pilitarsis, n. sp.

MALE AND FEMALE.—Similar in colour to the preceding species, differing only in having the postocular cilia on lower half almost entirely yellow, and the fore coxæ with long yellow hairs and only a pair of black bristles at middle and a few black setulæ at apex instead of being almost entirely black setulose.

MALE.—Face widest below middle, slightly narrowed at lowest extremity; antennæ as in *signiferus*. Propleura with one black bristle and a number of long yellow hairs. Fore femora more noticeably swollen than those of *signiferus*, not excavated at apex near base, with seven to eight stout, closely placed, rather short bristles on the ventral surface; a number of long black hairs on apical half of posterior surface; fore tibia thickened on apical half, the antero-ventral surface with dense microscopic pile and very minute spinules; fore tarsi with long black hairs on antero-ventral margin of basal and dorsal surface of next three joints; mid femora with four to five long, black bristles at base on antero-ventral surface and moderately long, black hairs on apical two-thirds of postero-ventral surface, the femora slightly bent; hind femora slender, straight, with short setulose hairs; mid and hind tibiæ with a few short bristles. Last sections of veins three and four conspicuously convergent apically, the dark spot on last section of four nearer middle of that section than it is in *signiferus*.

FEMALE.—Similar to male except that the fore femora are less thickened, lack the basal series of strong bristles, and have the apical series of hairs on postero-ventral surface less closely placed. The mid femora have two to three strong bristles near base. The fore tarsi have only the normal hairs.

Length, 3.5–4.5 mm.

Type locality: Teller, Alaska, five specimens, July 29, 1913; one specimen, August 6, 1913 (F. Johansen).

This species may be distinguished from any previously described from North America by the hairy fore tarsi of the male and the presence of bristles near base of mid femora in both sexes.

PHORIDÆ.

The larvæ of the group in the present collection are found in fungi, manure, or decaying vegetation.

Aphiochaeta Brues.

Aphiochaeta alaskensis, n. sp.

MALE.—Black, subopaque. Legs black, fore tibiæ and tarsi, except tip, brownish yellow, bases of mid and hind tibiæ brown. Wings clear, veins dark. Halteres black, knobs testaceous yellow.

Post-antennal bristles four in number, the lower pair nearly as large as the upper, lower frontal bristles in a nearly straight transverse line; antennæ above the normal size, third joint round, slightly less than half as large as eye; palpi large, conspicuously setose; clypeus projecting, pointed; arista almost bare, longer than width of frons; bristles on cheek long and strong. Dorsum of thorax with rather dense setulose hairs; scutellum with two long apical bristles and two weak lateral hairs; mesopleura with a number of weak, hair-like bristles on upper posterior angle. Abdomen tapered to apex, with a few bristles on apical segment; hypopygium rather large, with a long bristle on each side near base, apical process large, oval. Legs slender; fore tarsi broad, hind femora with short close fringe at base ventrally; hind tibia with a fringe of six to seven short setulæ on the apical three-fourths. Costa extending just short of middle of wing, first division slightly longer than the other two combined, third, half as long as second; costal fringe very long and widely spaced, the bristles nearly twice as long as fork of third vein; fourth vein leaving just beyond fork of third, gently curved at base, nearly straight for the remainder of its length, slightly deflected at tip and ending slightly nearer to apex of wing than does fifth.

FEMALE.—Similar to male. Differs in having the abdomen pointed at apex, the antennæ and palpi smaller, and the fore tarsi slender.

Length, 2 mm.

Type Locality: Nome, Alaska, August 24, 25, 1916 (F. Johansen). Eight specimens.

This species closely resembles *vulgata* Malloch, to which species it runs in my key to North American species.¹ It differs, however, in the much darker palpi, large antennæ, and shorter costa, and in several other characters.

Aphiochaeta platychira, n. sp.

MALE.—Similar in colour to the preceding species except that the halteres are entirely black.

Chætotaxy of head as in *alaskensis* except that the lower post-antennal bristles are very little more than half as large as the upper pair; antennæ normal in size; palpi not as strongly bristled as in *alaskensis*. Mesopleura bare; scutellum with two long bristles. Abdomen narrow, apices of segments laterally with a few long bristles, sixth with a number of bristles on posterior margin; hypopygium small, with one to two short bristles on each side, anal process small. Legs slender; fore tarsi broad, basal joint as broad as apex of tibia, and not over twice as long as broad; hind tibia with very short setulose hairs on postero-dorsal surface. Costa to very slightly short of middle of wing, first division 1.25 as long as next two together, third about two-thirds as long as second; costal fringe very long, the bristles twice as long as fork of third vein; fourth vein leaving beyond fork of third with a slight curve and running nearly straight to margin of wing, ending distinctly nearer to apex of wing than does fifth.

¹ Proc. U. S. Nat. Mus., vol. 43, p. 452, 1912.

Length, 2 mm.

Type Locality: Nome, Alaska, August 21, 24, and 25, 1916 (F. Johansen).

This species runs down to *perplexa* Malloch in the paper previously referred to, but the colour of the legs, and the weaker tibial setulæ are sufficient to warrant their separation.

Aphiochaeta, sp.

A female in poor condition appears to be distinct from the previous species. It has the hind tibial characteristics of that species as well as the bare mesopleura, but in venation it agrees more nearly with *alaskensis*. It is not possible to satisfactorily describe the species.

Locality: Nome, Alaska, August 24, 25, 1916 (F. Johansen).

BORBORIDÆ.

The larvæ of this family live in manure, fungi, decaying vegetation, or, rarely, in putrid water in which there is decaying animal or vegetable matter.

Several species are commonly found in marshy spots, and I have seen the imagines running upon the surface of stagnant water. In winter and early spring some species occur under dry grasses amongst dead leaves, and when disturbed jump violently about much as do springtails found in similar situations.

There is only one species of the family in the collection.

Leptocera Olivier.

The species in this collection seems to be undescribed.

Leptocera transversalis, n. sp.

FEMALE (alcoholic specimen).—Head yellow, ocellar triangle, upper half of occiput, greater portion of third antennal joint, arista, and clypeus black. Thorax black, lateral margins, centre of scutellum, and the pleural sutures broadly, yellowish. Abdomen brownish black dorsally, venter largely yellow. Legs black, trochanters, apices of femora, bases of tibiæ, and the tarsi yellowish. Halteres pale. Wings clear.

Ocellar triangle large, sharp anteriorly, extending over midway from vertex to anterior margin of frons; orbital bristles three to four on each side, short but strong; interfrontalia with short setulose hairs, antennæ rather large, third joint rounded apically; arista very much shorter than in typical *Leptocera*, not twice as long as antenna, thickened at base, distinctly tapered, microscopically pubescent; vibrissa weak, genal bristle absent, the marginal bristles very short; cheek about one-third as high as eye. Thorax with numerous discal setulose hairs and only one distinct pair of bristles in dorso-central series, just in front of scutellum; posthumeral bristles absent; scutellum rounded, with a few very short discal hairs and four moderately long marginal bristles. Legs slender, without any distinct bristles, even on femora; hind tarsi with basal joint twice as long as second. Wing venation as in Pl. VIII, fig. 20, differing from that of most species of this genus in having the cross-veins very nearly directly below apex of first vein.

Length, 2.5 mm.

Type Locality: Pond at Collinson point, Alaska, June 13, 1914 (F. Johansen).

Two specimens.

This species differs so strikingly from others in *Leptocera* that it might be placed in a new genus, but as several workers are now engaged in revising the family I prefer to leave its removal from or retention in the genus to their decision.

SYRPHIDÆ.

The larvæ of the species in the present collection are either aphidophagous (*Syrphus*, etc.) or feed in sewage or decaying vegetable matter such as is found in swampy places (*Helophilus*).

Melanostoma Schiner.

There are at least two species referable to this genus in the collection.

Melanostoma trichopus Thomson.

Syrphus trichopus Thomson, Kongl. Svensk. Fregatten Eugenies Resa Pmk., 1868. Jordan's Diptera, p. 502.

Four specimens agree with the description of this species, which was originally described from California and has since been recorded by Coquillett from Alaska.

Locality: Bernard harbour, Northwest Territories, July 10 and 18-19, and August 16, 1915 (F. Johansen.)

Melanostoma, sp.

A female differs from the preceding species in having the hind tarsi with the apical four joints much flattened and in being larger—8.5 mm. in length.

Locality: Herschel island, Yukon Territory, July 29, 1916 (F. Johansen).

Melanostoma, sp.

One male and one female, taken at Bernard harbour along with *trichopus*, differ from that species in being slightly smaller, 4.5 mm. in length, in having the long hairs absent on the fore and mid tibiae and fore metatarsi, and the hind metatarsi less swollen in both sexes. The head of the male is missing, and that of the female is so much crushed that it is impossible to tell what the profile is like.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 15, 1915 (F. Johansen).

Scaeva Fabricius.**Scaeva pyrastris** Linne.

Musca pyrastris Linne. Syst. Nat., Ed. 10, p. 549, 1758.

This European species seems to be generally distributed throughout the northwestern and western portions of this continent. It is represented in the present collection by two specimens from Barter island, Alaska, June 10, 1914 (D. Jenness).

Sphaerophoria cylindrica Say.

Syrphus cylindricus Say, Am. Ent., vol. 1, pl. 11, 1824.

A single male specimen from Herschel island, Yukon Territory, Canadian Arctic coast, August 13, 1914, differs from the normal North American form in the much darker abdomen and legs, the former having the second, third, and fourth segments each with a narrow, centrally interrupted yellow band, and the fifth segment with two small dorsal spots. Structurally the specimen differs not at all from specimens taken in Illinois and other parts of the United States and Canada.

Syrphus sodalis Williston.

Syrphus sodalis Williston, Synop. N. Am. Syrphidæ, p. 741, 1886.

This species was originally described from Colorado. There are three specimens in the present collection, one from Collinson point, Alaska, June 17, 1914, and two taken west of Kongenevik, Camden bay, Alaska, June 27, 1914 (F. Johansen).

The specimens agree in all particulars with the original description except that the third antennal joint is not distinctly reddish at base in the two last-mentioned examples.

Syrphus sodalis, var., **interruptus** var. n.

A female taken west of Kongenevik, Camden bay, Alaska, July 4, 1914, differs from the other specimens in having the abdominal yellow marks much smaller, the basal segment having two short, spot-like marks which do not reach the lateral margins, and the other segments having narrow, almost linear, marks. The antennæ are entirely black, and the tibiæ yellow. In other respects coloured as type form.

Length, 8 mm.

Helophilus Meigen.

The larvæ of species of this genus are as far as known found in mud and decaying vegetable matter in or along the margins of ponds or streams.

Helophilus dychei Williston.

Helophilus dychei Williston, Can. Ent., vol. 29, p. 135, 1897.

Two specimens of this species are in the collection from Nome, Alaska, August 24 and 25, 1916, and in that from Bernard harbour, Northwest Territories, on *Dryas* flower, July 6, 1916 (F. Johansen).

The species has previously been recorded from Alaska, being originally described from Sitka.

OESTRIDÆ.

Only three imagines of this family are in the present collection, but there are a number of larvæ of two species.

Ædemagena tarandi (Linné.)

Oestrus tarandi Linné. Faune Suecia, p. 1731, 1761.

FEMALE.—Three females of this species were taken.

The species superficially resembles *Hypoderma lineata* De Vill., but the distinct palpi, and larger size, 15 mm, in addition to the differently coloured abdominal hairs readily separate it from that species. A brief description of the species is given as few descriptions in English are available to students.¹

Head black, apex of second antennal joint and arista brown; hairs on frons, parafacial, and the upper half of face black, on occiput except along margin of eyes, on cheeks, and lower half of face pale yellow; palpi and proboscis black. Thoracic dorsum with long, erect, pale yellow hairs in front of suture and on postalar callosity, with black hairs caudad of suture; disc opaque black, with two submedian linear vittæ in front of suture which are evident behind suture as two small spots, and with two broad lateral vittæ behind suture which are present in front of suture as two small spots; pleura and scutellum with long pale yellow hairs. Abdomen with long pale yellow hairs on first segment, and similar hairs of a bright reddish orange colour on segments 2, 3, and 4 both on dorsum and venter. Legs black, tibiæ except bases, and the tarsi tawny; all parts with black and yellow hairs intermixed, the pale hairs longer and more conspicuous at bases of femora and on apical halves of tibiae. Posterior basal cross-vein of wing distad of anterior; fourth vein continuing parallel to third for a considerable distance beyond outer cross-vein before curving forward.

Localities: Teller, Alaska, July 31, 1913; one specimen; Bernard Harbour, Northwest Territories, July 14, 1916, two specimens (F. Johansen).

LARVÆ.—I identify as of this species larvæ taken from under the skin of Barren Ground caribou. The species was originally described from northern Europe and has been recorded from Alaska. The recorded host is the reindeer, but

¹For an account of *Ædemagena tarandi* see G. H. Carpenter, Tonon. Econ. Biol., vol. 5, pp. 149-156, 1910.

I have no doubt that the specimens before me, all of which were taken from caribou, belong to *tarandi*;

Localities: Read island, Dolphin and Union strait, southern side of Wollaston peninsula, Victoria island, May 4, 1915 (D. Jenness); Bernard harbour, Northwest Territories, May 21, 1915 and Richardson sound, Coronation gulf, between Richardson island and Victoria island, March 21, 1916 (F. Johansen).

The mouth-parts of this species are very much aborted, the chitinized hooks so prominent in the larvæ of *Gastrophilus* being entirely absent. The only chitinized portions of the cephalopharyngeal skeleton that I find by dissection are two short rods that connect with the oral opening on its sides, and a poorly chitinized plate which covers the upper portion of the mouth and shields the opening of the oesophagus. The larvæ of *Hypoderma* and those of this genus are very similar, the only noticeable distinction being in the spinal armature of the body—the spines on dorsum of *Hypoderma* being much stronger than those on venter, whereas in *Ædemagena* they are of equal strength.

The antennæ in *Ædemagena* are small, their bases blackened, the distance between their bases about four times the width of their diameter; immediately above the antennæ there is an irregular transverse series of strong thorns, the bases of which are black and the apices yellow. Each segment has a circle of strong backwardly directed thorns anteriorly and another of much weaker forwardly directed ones posteriorly, both of which are interrupted at the transverse depressions which run the entire length of the body. (Pl. VIII, fig. 17). Posterior spiracles large, black, narrowly separated, structure as in Pl. VIII, fig. 14, the minute pale dots more regularly rounded than in drawing.

Length in final stage, 25 mm.; width, 10–12 mm.

Cephenomyia Latreille.

There are several larvæ of a species from the nasal passages of caribou which I identify as belonging to this genus. I can not identify the species from the material before me, but possibly it is undescribed in the imago stage.

Cephenomyia, sp.

LARVA. Whitish testaceous, the spinose armature black or black-tipped; posterior spiracles and mouth-hooks black. A few dots on segments of abdomen, most conspicuous and numerous on apical three segments.

Body much more slender than in *Ædemagena*, slightly tapered at both extremities. Mouth-parts well developed, dorsal view as in Pl. VIII, fig. 16, the hooks long and slender, curved, and sharp at apex. Each segment of body with stout, backwardly directed thorns on anterior half; posterior half of each dorsal segment bare on greater portion of its width, with two small oval swellings on each side, caudad of which there is a transverse series of stout thorns; mesad of these swellings, on each side, there is another, less conspicuous swelling behind which are no thorns; ventral segments similar to dorsal, but the submedian swellings are as distinct as the lateral; posterior spiracles in a very distinct depression, the upper and lower margins of the segment produced, the latter very decidedly elongated, and both evidently capable of retraction so as to shield the spiracles; caudal view as in Pl. VIII, fig. 18.

Length in final stage, 30 mm.; width, 9 mm.

Locality: Bernard harbour, Northwest Territories, May 25, 1916 (F. Johansen).

The larvæ closely resemble specimens before me named by C. H. T. Townsend *Cephenomyia pratti* Hunter. They differ, however, in having on most of the ventral abdominal segments a small median raised area, cephalad of the broad band of spines, upon which there are several strong spines. The

penultimate ventral segment in the arctic species has more numerous anterior spines than has *pratti*, and there are several spines along the latero-ventral margin which I do not find in the latter. The apical spines are much more numerous in the arctic species than in *pratti*.

TACHINIDÆ.

The larvæ of nearly all of the species of this family are internal parasites in other insects, mostly in the larvæ or pupæ.

There are only two species in the collection.

Euphorocera gelida Coquillett.

Euphorocera gelida Coquillett, Revision of the Tachinidæ. Tech. Ser., No. 7, U. S. Dept. Agr., Bur. Ent., p. 101, 1897.

There are thirteen specimens of this species in the collection.

Four of the specimens differ from the others, and from the original description, in having only three pairs of postural dorso-centrals. In other respects the specimens of both lots agree perfectly.

Pinned with several of the imagines is the empty puparium from which the insect emerged. A comparison of these puparia with those of *Euphorocera claripennis* Macquart shows that the two species are not congeneric. The characters of the puparium of *gelida* are as follows:—

Brownish red, subopaque; posterior spiracles black-margined, glossily.

Surface microscopically, transversely striated; incisions between segments defined by a single series of short stitch-like impressions; each abdominal segment with three small depressed areas on centre of side, in each of which there is an irregular line of minute elevations visible only under a high-power lens; no respiratory elevations at base of abdomen; anal opening minute, considerably proximad of apex of abdomen, surrounded by a poorly defined granulose area; spiracles large, slightly elevated, especially above, general appearance and slits as in Pl. VIII, fig. 15.

Length, 8-9.5 mm.; width, 3-3.75 mm.

The puparium of *claripennis* differs in having the posterior spiracles with openings very pronouncedly sinuous, almost W-shaped as in Muscidae, the segments with distinct though microscopic locomotor spinules, and the respiratory organs at base of abdomen in the form of stalks.

Locality: The specimens of *gelida* are from Camden bay, and Demarcation point, Alaska, June and July, 1914 (F. Johansen).

The puparia were from inside of the cocoons of a lepidopteron, *Dasychirus* sp. (?), sometimes as many as six in one cocoon. The records show that the larvæ of the host do not succeed in pupating. (Rearing 10).

Peleteria Robineau-Desvoidy.

This genus is represented in the collection by a single female.

Peleteria arctica, n. sp.

FEMALE.—Black, shining. Head black, cheeks except near posterior margin, face and its sides reddish yellow, densely white pruinose; interfrontalia reddish; orbits black, shining, but obscured by grey pruinescence; antennæ and arista black; proboscis black, palpi ferruginous.

Thorax slightly grey pruinose, not distinctly vittate; scutellum reddish yellow. Abdomen black, slightly grey pruinose on bases of segments; sides of second and third segments broadly reddish. Legs black, hind tibiæ reddish. Wings slightly greyish. Calyptreæ white. Halteres dark brown.

Frons bristled as in *robusta*; cheek with four well-differentiated bristles, two of which are much stronger than the others, the normal hairs strong; third antennal joint very little shorter than second; arista short, thickened to distinctly beyond middle; profile as in Pl. VIII, fig. 21. Dorso-centrals irregular in type, three strong ones on one side and three strong and one weak one on the other; three sternoplurals. Abdominal segments two to four with discal macrochaetæ. Wings as in *robusta*. Fore tarsi dilated.

Length, 9.75mm.

Type Locality: Cockburn point, Northwest Territories, Canadian Arctic coast, September 5, 1914 (F. Johansen).

The only species I find record of from the arctics is *aenea* Staeger, described from Greenland. This species has the abdomen entirely black and is apparently distinct from *arctica*.

CALLIPHORIDÆ.

This family contains a number of genera the larvæ of which feed normally in carrion. The flies are popularly known as flesh-flies, bluebottles, and blow-flies.

Originally the genera now included here formed part of the family Muscidae but within recent years the latter has been divided, several families now containing genera that at one time formed part of the Muscidae. It is at present, according to some entomologists, a debatable point whether our concept of the Muscidae should not be revised to the extent of applying the name to what is now called Anthomyiidae and dropping the last name entirely. With this view I do not agree, but the present paper is not the proper place to discuss the question, more especially as there are no true Muscidae in the collection.

Cynomyia Robineau-Desvoidy.

There is but one species of this genus in the collection.

Cynomyia cadaverina Robineau-Desvoidy.

Cynomyia cadaverina Robineau-Desvoidy. Essai sur les Myodaires, p. 365, 1830.

Twenty-four specimens with data as follows: thirteen specimens, Bernard harbour, Dolphin and Union strait, Northwest Territories, May, June and July, 1915 and 1916 (F. Johansen); six specimens, Barter island, Arctic coast of Alaska June, 20 and 23, and July 2, 1914, and June 15, 1914 (D. Jenness) three specimens, west of Kongenevik, Camden bay, Alaska, June 4, 1914 and two specimens, Nome, Alaska, August 24, 25, 1916 (F. Johansen).

Calliphora Robineau-Desvoidy.

There is one species in the collection, represented by three specimens.

Calliphora viridescens Robineau-Desvoidy.

Calliphora viridescens Robineau-Desvoidy. Essai sur les Myodaires, p. 537, 1830.

This species occurs in Europe and North America. Like the preceding species it is generally distributed throughout North America, and has been previously recorded from Alaska.

Data on specimens: Nome, Alaska, June 21, 1916 (F. Johansen).

Phormia Robineau-Desvoidy.

There are two species in the collection, one of which, *terræ-novæ*, occurs generally throughout North America, and has been reported from Greenland and Alaska.

Phormia terræ-novæ Robineau-Desvoidy.

Phormia terræ-novæ Robineau-Desvoidy. Essai sur les Myodaires, p. 467, 1830.

Thirty-eight specimens with data as follows: sixteen specimens, Bernard harbour, Dolphin and Union strait, Northwest Territories, June, July and August, 1915; one specimen, same locality, July 10, 1916; eight specimens, same locality, June and July, 1916; three specimens, Nome, Alaska, August 24, 25, 1916; five specimens, Teller, Alaska, July and August, 1913; three specimens, Collinson point, Alaska, June, 1914; two specimens, Demarcation point, Alaska, May 13, 1914 (F. Johansen).

Phormia caerulea, n. sp.

MALE AND FEMALE.—Dark metallic blue, without pruinescence. Head black, frons opaque, orbits slightly shining; third antennal joint sometimes brownish; palpi yellow, usually fuscous at apices in male. Dorsum of thorax with two slender, widely separated vittæ on anterior portion mesad of dorso-centrals. Legs black. Wings clear, slightly infuscated at extreme bases. Squamæ brown. Halteres fuscous, paler in female.

MALE.—Frons narrowest at centre, where it is one-fifth the head-width, orbit at widest part, just below ocelli, narrower than interfrontalia; orbits hairy, bristles differentiated but not very strong; arista rather short-plumed, apical third bare; profile as in Plate VIII, figure 19. Thorax not so noticeably depressed as in other species, the postsutural dorso-centrals sometimes well developed, the posterior pair usually so; both spiracles very large, the prothoracic one extending from close to upper margin of pleura to within a short distance of coxa, the covering of both spiracles deep black; lower margin of anterior spiracle with many long bristly hairs; upper calypter with long hairs on upper side, when closed. Hypopygium small; fifth sternite as in *terræ-novæ*. Legs as in *terræ-novæ*. Inner cross-vein very little proximad of apex of first vein; outer cross-vein less distinctly curved than in *terræ-novæ*; fourth vein almost rectangularly bent, usually with a short appendiculate vein at angle.

FEMALE.—Similar to the male in colour.

Differs in structure by having the frons two-fifths the head-width, the orbit half as wide as interfrontalia, with two distinct supraorbital outer bristles.

Length, 6–8.5 mm.

Type locality: Bernard harbour, Northwest Territories, May 24, 1915 (F. Johansen). Paratypes, same locality, May, June, and July, 1915, 1916 (F. Johansen).

This species resembles *Phormia terræ-novæ* very closely in some respects, but is undoubtedly distinct. Zetterstedt described a species from Greenland under the name *groenlandica*, which has been sunk as a synonym of *terræ-novæ*. As both species probably occur in Greenland it is not possible to decide the validity of the accepted synonymy without an examination of the type of Zetterstedt's species.

The appended key gives a summary of the distinguishing characters of the species.

KEY TO SPECIES.

MALES.

1. Eyes separated by a narrow line; anterior thoracic spiracle with yellow-haired covering-flaps *regina* Meigen.
Eyes separated above by a space at least twice as broad as distance across posterior ocelli;
anterior thoracic spiracle with black-haired covering-flaps 2
2. Narrowest part of frons about one-half as great as width of eye seen from above; anterior
thoracic spiracle very large; outer cross-vein of wing very slightly curved. *caerulea*, n. sp.
Narrowest part of frons not over one-fourth as great as width of either eye; anterior
thoracic spiracle not very large; outer cross-vein of wing abruptly bent.
terræ-novæ Robineau-Desvoidy.

FEMALES.

1. Anterior thoracic spiracle with yellow-haired covering-flap; calyptre white. *regina* Meigen.
Anterior thoracic spiracle with black-haired covering-flap; calyptre brown. 2
2. Anterior spiracle very large; orbit about one-half as wide as interfrontalia, face much produced below. *caerula*, n. sp.
- Anterior spiracle not very large; orbit less than one-third as wide as interfrontalia below anterior ocellus; face moderately produced below. *terræ-novæ* Robineau-Desvoidy.

ANTHOMYIIDÆ.

The larvæ of this family are in most cases either scavengers or phytophagous, the greater number belonging to the former category. A few species are aquatic in the larval and pupal stages, and some in the present collection belong to this group.

The imagines of the genus *Fucellia*, and those of the subfamily Coenosiinæ are predaceous, feeding upon other insects, especially Diptera.

Recently I published a key to the subfamilies of Anthomyiidae in *The Canadian Entomologist*, which key may be used to advantage in connexion with the present paper, as the characters used in the key are the basis for the subfamily groupings in this paper.¹

As two of the genera dealt with in this paper are now described for the first time I have given a key to the genera dealt with as an aid to the recognition of the new forms.—

KEYS TO GENERA OF PHAONINÆ IN COLLECTION.

MALES.

1. Hind tibia with a long bristle beyond middle on the postero-dorsal surface. *Phaonia*.
Hind tibia either without any bristle as above, or there are several of equal length in a series on postero-dorsal surface. 2
2. Hind tibia with several long bristles on postero-dorsal surface. 3
Hind tibia with at most a few short bristles on postero-dorsal surface. 4
3. Pteropleura hairy; anterior intra-alar bristle absent or very weak; joints of fore tarsi without long bristles at apices ventrally. *Pogonomyioides*.
Pteropleura bare or with one or two weak hairs; anterior intra-alar bristle strong; basal four joints of fore tarsi with long bristles at apices ventrally. *Pogonomymia*.
4. Third antennal joint very little longer than second; arista much thickened and densely short-haired basally; facialia hairy more than mid-way to antennæ; bristles on tibiæ very weak; lower scale of calyptera attenuated posteriorly. *Mydaeina*.
Third antennal joint much longer than second; species without the above combination of characters. 5
5. Abdomen with dorso-central stripe; mid tibiæ with a number of bristles on posterior and postero-ventral surfaces. *Aricia* pt.
Abdomen with paired spots on dorsum; mid tibiæ with two or three postero-dorsal bristles. *Limnophora*.

FEMALES.

1. None of the orbital bristles directed forward; cruciate frontals absent. 2
At least the lower one of the supraorbital bristles directed forward; cruciate frontals present. 5
2. Hind tibiæ with long, preapical postero-dorsal bristle. *Phaonia*.
Hind tibiæ without a long, preapical postero-dorsal bristle, sometimes a few short bristles present. 3
3. Orbits hairy and with long, slender bristles in two series, the outer series on upper portion of frons directed outward. *Mydaeina*.
Orbits hairy or almost bare, with only one series of bristles. 4
4. Mid tibiæ without short bristles on postero-ventral surface. *Limnophora*.
Mid tibiæ with one or two bristles on postero-ventral surface. *Aricia*.
5. Pteropleura hairy on centre; anterior intra-alar bristle absent. *Pogonomyioides*.
Pteropleura bare, rarely with a few hairs on disc; anterior intra-alar bristle strong. *Pogonomymia*

¹ Can. Ent. vol. 49, p. 406, 1917.

Phaonia Robineau-Desvoidy.

The larvæ of this genus are very little known. The species that have been reared are scavengers in the larval stages, feeding in decaying vegetable matter.

There are several specimens in the collection that are referable to this genus, accepting as the criterion the character furnished by the bristling of the hind tibia.

Phaonia minima, n. sp.

MALE.—Black, shining. Thorax in type so badly crushed that it is impossible to say whether or not it is vittate. Abdomen with slight pruinescence and a dark central longitudinal stripe. Legs black. Squamæ and halteres yellow. Wings yellowish brown on anterior half.

Eyes bare, narrowly separated above, interfrontalia linear on upper half, not wider than orbit; antennæ short, third joint not twice as long as second; arista microscopically pubescent on basal half; cheeks high, but the head is in such poor condition that their armature and comparative height can not be definitely ascertained; palpi broader than normal. Presutural acrostichals strong, with one to two series of shorter hairs between the series; postsutural dorso-centrals four; prealar bristle very small; hypopleura and pteropleura bare. Abdomen narrow, subcylindrical; hypopygium small, fifth ventral sclerite with a rounded excavation, the lateral extensions small, glossy at apex. Legs rather slender, the tarsi noticeably so, and especially the basal joint of fore pair; fore tibia without bristles; mid tibia with one bristle near apex on posterior surface; hind femora slightly curved, thickened apically, the apical third on antero- and postero-ventral surface with a graduated series of long bristles; hind tibia with two antero-ventral, one antero-dorsal, and one long postero-dorsal bristle. Costal thorn small; outer cross-vein straight; last section of fourth vein barely twice as long as preceding section.

FEMALE.—Colour as in the male except that the wings and calyptæ are more conspicuously yellowish.

Eyes more than one-third the head-width, orbits shining, each one-fourth the width of inter-frontalia, orbital bristles normal, rather weak above, strong below; antennæ as in male; cheeks one-fourth as high as eye, invaded on lower half by the bristles of margin, those on margin of moderate length, vibrissæ well differentiated, one strong bristle below vibrissa. Thorax as in male. Legs similar to those of male but the tarsi stouter, the hind femora less distinctly swollen apically, and with fewer bristles.

Length, 4.5 mm.

Type Locality: Nome, Alaska, August 21, 24, and 25, 1916 (F. Johansen). This species is the smallest known to me.

Phaonia imitatrix, n. sp.

MALE.—Black, distinctly shining, thorax and abdomen unmarked. Frontal and facial orbits with dense, silvery pile; cheeks and face very slightly pilose; inter-frontalia opaque black. Wings slightly fuscous, noticeably so at base. Squamæ white. Halteres black.

Eyes hairy, separated by about one-sixth the head-width, orbit about one-third as wide as interfrontalia, bristles strong, with the exception of the upper backwardly directed one, directed inward; antennæ short, not extending below lowest fourth of face, third joint 1.5 as long as second; arista subnude, with an elongate tapered swelling at base; orbits in profile projecting beyond eye as far as width of third antennal joint; cheek as high as one-third the eye-height, protruding at anterior angle further than frons at base of antennæ, marginal bristles numerous, of average strength, a few weak hairs above margin; palpi

about as long as apical portion of proboscis, slender. Dorsum of thorax with long setulose hairs; presutural acrostichals long but not strong, irregularly four-rowed; postsutural dorso-centrals four; prealar bristle very long. Abdomen narrow, subcylindrical, slightly tapered posteriorly; hypopygium small; fifth ventral segment almost transverse apically; dorsum with strong setulose hairs, apical and discal bristles on segments three and four. Legs stout; fore tarsi similar to those of *Trichopticus*, short, and densely short pilose ventrally; fore tibia unarmed; mid femora with slender bristles on postero-ventral surface which are longest on centre; mid tibia with two or three posterior bristles; hind femora with short bristles on basal half ventrally, and an antero-ventral series of long, stout bristles; hind tibia with four to five short antero-ventral, two to three longer antero-dorsal, and one long postero-dorsal, bristles. Costal spine short but distinct; third vein bare, outer cross-vein nearly straight; last section of fourth vein less than 1.5 as long as preceding section.

Length, 7.5 mm.

Type Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July, 1916 (F. Johansen).

This species resembles in general appearance species of *Trichopticus*, but the hind tibiae are not fringed, the tibiae of all legs are less bristly, and the mid femora are normal in shape.

Mydaeina, n. gen.

Generic Characters: MALE.—Eyes distinctly separated, narrowest part of frons about one-sixth as wide as head, orbits with long hairs on entire length from base of antennae to vertex; face and frons slightly projecting; antennae short, third joint equal in length to second; arista tapered, second joint much thickened, as broad as long, third much thickened at base, gradually tapering to a hair at apex, the pubescence dense and short; facial ridges with moderately long hairs which are carried upward half-way to base of antennae; vibrissae poorly differentiated from the long bristly hairs; proboscis stout; palpi slender. Dorsum of thorax with long hairs among which the dorso-centrals are hardly distinguishable; lower scale of calyptrae much larger than the upper, narrowed posteriorly. Abdomen subcylindrical, with four distinct dorsal segments; hypopygium small (Pl. IX, fig. 31); fifth ventral segment with a broad central emargination (Pl. IX, 29). Legs stout, with few distinct bristles, ventral surface of fore tarsal joints with dense erect pile, the bristles sparse short, confined to margins; preapical dorsal bristle of hind tibiae absent or represented by a weak setula. Wing venation as in *Mydaea*, the veins without bristles.

FEMALE.—Differs from the male in having the frons nearly half the head-width, each orbit nearly as wide as interfrontalia and with numerous long hairs, an inward series directed inward, and an outer series, directed outward, longer than the others; head in other respects as male, but the arista is slightly less conspicuously swollen and less hairy. Thorax with the dorso-centrals more distinct than in male.

Mydaeina obscura, n. sp.

MALE AND FEMALE.—Black, opaque, the surface obscured by brownish pruinescence. Calyptrae in male subfuscous, in female yellowish. Halteres yellow. Wings slightly greyish, subfuscous at base.

Head of male as in Pl. IX, fig. 28. Four poorly distinguished postsutural dorso-centrals present; disc of scutellum hairy, margin with four bristles; sternopleura with one large posterior bristle and many long hairs. Legs with very few bristles, those on femora long but hair-like, the tibiae without well-developed apical bristles, one near apex of dorsal surface of hind pair about as long as diameter of tibia; the bristles on tibiae that are sometimes distinct are as follows.

—one on the posterior side at middle of fore pair, one to two on antero-ventral, one to two on antero-dorsal, and one to two on postero-dorsal surface of mid pair, one on antero-ventral, one on antero-dorsal, and one on posterior surface of hind pair. Outer cross-vein in male at its own length from inner and at more than that length from end of fifth vein, in female it is slightly more than its own length from inner, and at its own length from end of fifth; last section of fourth vein four times as long as penultimate in male, three times in female.

Length, 6–7 mm.

Type Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, June, 1916, one male specimen (F. Johansen). Paratypes, same locality, August 4, 1915 (F. Johansen); and Colville mountains, Wollaston peninsula, Victoria island, July 22, 1915 (D. Jenness).

In the collection I find one larva, and several puparia that agree with the puparium mounted on the pin with the type specimen. These puparia (Pl. IX, fig. 22) differ from any others in the family that I have seen. Descriptions of larva and puparium follow.

LARVA.—Whitish testaceous. Cephalopharyngeal skeleton, locomotor spines, and posterior spiracles black.

General form similar to that of *Anthomyiinae* but the apical segment is slightly more elongate, noticeably tapered towards apex, and the spiracles are pedunculate, and situated upon two rounded fleshy elevations (Pl. IX, fig. 25). Antennae very minute; cephalopharyngeal skeleton well developed, mouth-hooks paired, long and slender (Pl. IX, fig. 24). Prothoracic spiracles not developed; body very minutely striated, the segments well differentiated; lateral fusiform area well defined; each segment except apical with four short lateral longitudinal series of dark spot-like markings showing through the skin (Pl. IX, fig. 26); apical segment unmarked, anal opening at anterior margin, with a pseudopod-like protuberance on each side which is about as long as its basal diameter, tapered apically, and armed at apex with numerous short thorns; the ventral surface of each of the other segments with three short transverse series of dark spots, about three in number, the two outer situated at middle, the central one slightly cephalad of these; locomotor spinules on all except apical segment not noticeably elevated.

Length, 10 mm.

PUPARIUM (Pl. IX, fig. 22). Reddish brown, slightly shining, posterior spiracular region black.

Surface minutely transversely striated, and with much less distinct and less regular wrinkles transversely on segments; anterior spiracles not distinguishable; thoracic segments much less distinctly striated than abdominals, and with microscopic locomotor setulae; each abdominal segment with an oval clump of short black thorns on each side of median line on ventral surface, on each side of the incisions also with a band of more minute spinules; antepenultimate segment much constricted and more closely and distinctly longitudinally striated than the others; anal opening in the form of an elongate slit surrounded by a slight rim which encloses a broadly rounded dark brown area 1.5 times as wide as long; on each side of the anal opening and at a considerable distance from it there is a small clump of short, black spines on a slight eminence; posterior spiracles elevated, surrounded by a coarsely granulose blackened area, the openings small, as shown in Pl. IX, fig. 23.

Length, 12.5 mm.

The larvae live in ponds and are truly aquatic. The principal characteristics of the larvae are the clumps of locomotor spines on abdomen, the pseudopod-like anal locomotor organs, and the absence of prothoracic spiracles. The caudal part beyond the constriction in puparium is not occupied by any part of the enclosed imago after the induration of the larval skin, and forms an air chamber which serves to keep the puparium at the surface, the posterior spiracles being in this position and so held that they have direct contact with the atmosphere.

Johansen in his notes sketches one of the puparia so curved that the cephalic extremity extends to or almost to the surface, which is assumably the position immediately before the emergence of the imago, but all the empty puparia in the collection are nearly straight. (Rearing 78).

The puparium of *Hydrophoria*, an aquatic genus, is not conspicuously dissimilar from those of terrestrial Anthomyiidae, showing no caudal modification or specialization such as is shown in the present genus.

The imago bears a resemblance to some species of *Aricia*, but differs in having the facalia hairy for a greater length above the vibrissæ, the third antennal joint much shorter, the under scale of calyptræ much narrower, and the fore tarsi without spines on ventral surfaces. The female resembles *Aricia* also, but has, in addition to the differences present in the males, the orbits much more hairy, the upper portion with a double series of long, hair-like bristles, the outer series directed out over the eyes.

In some respects the genus resembles *Trichophthicus*, especially in the character of the fore tarsi, but the tibiæ in *Trichophthicus* are strongly spinose, the third antennal joint is much longer than the second, and the hind coxæ have hairs above at apex.

Aricia Robineau-Desvoidy.

I refer one species in this collection to this genus, although the male differs in many respects from the genotype, and in general habitus resembles *Trichopticus* Rondani. From *Trichopticus* the present species differs in having the posterior coxæ bare above at apices.

Aricia borealis, n. sp.

MALE. Black, shining. Interfrontalia opaque black, orbits silvery pilose. Thorax very slightly greyish pruinose, not distinctly vittate. Abdomen when viewed from behind, with brownish pruinoscence and a black median longitudinal stripe. Legs black. Wings slightly greyish, fuscous at bases. Squamæ yellow. Halteres black.

Eyes bare, separated by about one-seventh the head-width; orbits linear above, not one-third as wide as interfrontalia at its narrowest point; antennæ short, third joint 1.5 as long as second; arista almost entirely nude; cheek with many long hairs; vibrissa poorly differentiated; orbit in profile projecting beyond eye farther than width of third antennal joint. Presutural acrostichals irregularly four-rowed; postsutural dorso-centrals four in number; prealar bristle weak but distinguishable; sternopleura with long hairs and two strong bristles; pteropleura and hypopleura bare. Abdomen subcylindrical, slightly tapering to apex; fifth sternite with small rounded central excavation in posterior margin. Fore tibia with three to four bristles in a single series on apical third of postero-ventral surface; mid femora slightly attenuated apically, with two to three long bristles at base on anterior side; mid tibia with almost the entire length of the postero-dorsal surface with short bristles, two to three on posterior surface, and three to four on postero-ventral surface beyond middle; hind femora with bristles on entire length of antero-ventral surface, the postero-ventral surface unarmed; hind tibia slightly curved, the apex on ventral side very distinctly produced, anterior and posterior surfaces with short, regular, setulose hairs, those on postero-dorsal surface longest (Pl. IX, fig. 27); hind tarsi with a pair of bristles at base of first joint noticeably longer than the others. Last sections of third and fourth veins parallel; outer cross-vein slightly curved, last section of fourth vein 2.5 as long as preceding section.

Length, 7.5 mm.

Type locality: Bernard harbour, Dolphin and Union, strait, Northwest Territories, July, 1916 (F. Johansen).

With the male are several females which I consider to be of this species. The description is as follows:—

Black, less distinctly shining than the male, the thorax very densely pruinose, the centre with two narrow, pale grey vittæ, and the lateral margins broadly pale grey. Abdomen immaculate. Wings slightly greyish. Calyptræ white. Halteres yellow.

Frons, at vertex, about two-fifths the head-width, slightly broadened anteriorly, each orbit at middle about one-third as wide as interfrontalia, the surface with many short hairs, four to six incurved bristles on lower portion and two slightly outwardly-directed ones on upper portion; cheeks higher than in male and with very few short hairs above the marginal bristles. Thorax much less hairy than in the male, the prealar bristle absent. Abdomen pointed at apex. Bristling of the tibiæ very variable, fore pair with zero to three posterior and zero to three postero-ventral bristles, and very rarely one antero-dorsal; mid pair usually with one or more ventral, two to four antero-dorsal, three to four postero-dorsal, and three to four postero-ventral bristles; hind pair with from two to five bristles on antero-ventral, antero-dorsal and postero-dorsal surfaces.

Localities: one specimen with same data as male; one specimen same locality as foregoing but with date of July 10, 1916; one specimen, Young point, Northwest Territories, July 18, 1916; one specimen, cape Bathurst, Northwest Territories, July 26, 1916; one specimen, west of Konganevik, Camden bay, Alaska, July 4, 1914 (all F. Johansen).

This species differs from any member of this genus known to me in the structure and armature of the hind tibiæ, the bare eyes, almost bare arista, and black halteres.

***Limnophora* Robineau-Desvoidy.**

There are two specimens in the collection referable to this genus, a male and a female, neither of which it is possible to identify conclusively because of the poor condition. The only species of the genus which I have previously seen from the arctics of this continent is *nobilis* Stein. Neither of the specimens before me belongs to that species, and apparently they differ specifically from each other also.

The immature stages of the genus are unknown. The flies are commonly found close to water, being usually abundant on the shores of lakes and rivers, and some of the most aberrant forms occur on the seashore.

I have found one species in Scotland feeding upon insects, but whether it killed the specimens itself or merely appropriated the discarded prey of other predators I can not say as I did not see it catch any flies. The proboscis is not adapted for piercing, though armed at apex with chitinous rods which may serve to abrade the integument and so enable the insect to feed in a predatory manner.

***Limnophora*, sp. 1.**

A male specimen taken at Cockburn point, Dolphin and Union strait, Northwest Territories, September 7, 1914 (F. Johansen), has the eyes separated by slightly more than the distance across posterior ocelli, the orbits narrower than interfrontalia at its narrowest point; arista pubescent; thorax with three strong pairs of postsutural dorso-centrals; presutural acrostichals irregularly four-rowed; abdomen with large, subtriangular, separate, brown spots; fore tibia with one posterior bristle; mid tibia absent; hind tibia with two antero-dorsal, and two weak postero-dorsal bristles; third vein bare at base; veins three and four divergent apically, last section of four about 2.5 as long as preceding section; outer cross-vein straight.

Length, 4.5 mm.

This species differs from any I have seen from North America, but owing to the very close resemblance between species of this genus and the poor state of preservation of the specimen I do not consider it advisable to give it a name.

Limnophora, sp. 2.

A female taken on Herschel island, Yukon Territory, July 29, 1916 (F. Johansen), differs from the foregoing in having four pairs of postsutural dorso-centrals, the acrostichals two-rowed, dorsum of thorax distinctly trivittate, mid tibia with two antero-dorsal and three postero-dorsal bristles, hind tibia with one antero-ventral, two antero-dorsal, and two postero-dorsal bristles, and the last section of fourth vein comparatively longer.

Length, 4.75 mm.

Pogonomyia Rondani.

This genus has much in common with *Trichopticus*. In fact it is difficult to separate the males of some species from those of *Phaonia* and *Trichopticus*. The male of *Pogonomyia nitens* Stein was described as a *Spilogaster*, though the author of that description recognized the female as a *Pogonomyia*—an error which led me into describing the species in that genus under the name *Pogonomyia flavinervis*.

The characters which are of service in separating *Pogonomyia* from *Trichopticus* are summarized as follows:—

MALE.—Eyes bare; prealar bristle long; fore tarsi short and with erect short pile ventrally, the other tarsi spinose ventrally; hind tibiæ not curved, with long and short bristles, without fine hairs; hind coxæ bare above at apices.

FEMALE.—Differs from the male by the widely separated eyes; in other respects similar, but with the lower supraorbital bristle directed forward and with cruciate frontal bristles, characters which separate the genus from both *Phaonia* and *Aricia*.

There is one species in the collection, represented by one female, which lacks the abdomen but is otherwise in good condition. The species resembles *alpicola* Rondani, a European species reported as occurring in North America.

Pogonomyia quadrisetosa, n. sp.

FEMALE.—Black, shining. Orbits, ptilinum, and upper portion of cheeks silvery pilose, face and lower portion of cheeks less distinctly silvery. Dorsum of thorax slightly greyish brown pruinose, with three poorly defined vittæ anteriorly. Abdomen missing. Legs black. Wings clear, veins yellowish except costa and base of first. Calyptræ whitish yellow. Halteres black.

Cruciate frontal bristles strong; orbitals as in *nitens* Stein, except that the weak hairs are more numerous; orbits in profile projecting as far beyond eye as half the length of eye—much farther than in *nitens*; anterior angle of cheeks protruding farther than frons at base of antennæ; third antennal joint slightly longer than second; arista microscopically pubescent; vibrissa very little stronger than the other bristles, the latter covering a larger area than in *nitens*; palpi much shorter than in *nitens*. Thorax with presutural acrostichals weak, irregularly two or three-rowed; postsutural dorso-centrals four in number rather weak; prescutellars as strong as dorso-centrals; pteropleura in type with a long hair near middle. Fore tibia with three to four bristles on apical half of postero-ventral surface; mid femora with a series of long bristles on antero-ventral surface; mid tibia with three to four antero-ventral, four to five antero-dorsal, five to six postero-dorsal bristles, and three to four postero-ventral bristles; hind femora with a series of long bristles on antero-ventral surface; hind tibia with five to seven long bristles on antero-ventral, antero-dorsal, and postero-dorsal surfaces. Venation as in *nitens*.

Length, 6-7 mm.

Type locality: West of Bernard harbour, Dolphin and Union straits, Northwest Territories, July 14, 1916 (F. Johansen).

The type specimen differs from any previously described species of the genus in having four postsutural dorso-centrals. If the specimen is abnormal in this respect it can be separated from *nitens* by the presence of the long bristles on the antero-ventral surface of the mid femora; from the species identified by Stein as *alpicola* Rondani, by the yellowish wings, almost bare arista, and the mid-femoral bristles.

A third species which occurs in the United States, and which resembles *alpicola*, is separable from *quadrisetosa* by the more loosely pilose fore tarsi, the more widely spaced and longer bristles on latero-ventral margins of the mid and hind tarsi, the darker wings, and the shorter papli, the latter being less than half as long as the apical portion of the proboscis.

A fifth, and probably a sixth species, found in Colorado, are very distinct from *quadrisetosa*.

Pogonomyioides, n. gen.

Generic Characters.

FEMALE.—Resembles *Pogonomyia*, differing principally in the prealar bristle being weak or absent and in having the pteropleura with a number of long hairs on centre. The only species of *Pogonomyia* in which I have seen any hairs on the pteropleura is the one described in this paper. In addition to the above characters the intra-alar bristles are practically absent in *Pogonomyioides*, usually only the posterior one being distinguishable and that very weak, and there is no long bristle at apex of fore tibia on venter, nor are there any conspicuous bristles at apices of fore tarsal joints ventrally.

In other respects as *Pogonomyia*.

Type, *Pogonomyioides atrata*, n. sp.

Pogonomyioides atrata, n. sp.

FEMALE.—Puparium: Brownish red, slightly shining. Surface microscopically granulose, almost without striae above, finely but very distinctly transversely striate ventrally, becoming more coarsely so posteriorly. Posterior portion of cephalopharyngeal skeleton very slender, as shown in Pl. IX, fig. 30; dorsal half of thoracic segments absent; apex with a concentrically ridged rim surrounding a small but deep cavity; locomotor processes apparently lacking, except in center of each ventral segment, where there is a single transverse series of microscopic elevations extending nearly across the segments; a single series of small, stitch-like impressions between all segments, which is duplicated and surrounds the lateral fusiform area, three or four, short, irregular, longitudinal series of minute elevations on each segment laterally; base of abdomen with the pair of respiratory tubercles well developed, slender, about six times as long as thick at base; apical segment irregularly shrunken (possibly abnormal), a large depression caudad of spiracles and extending forward to posterior margin of penultimate segment, a subtriangular depression situated in extreme apex, and a large one on lateral area; spiracles slightly elevated, separated by less than three times their own diameter, the openings directed dorsad, ventrad, and laterad respectively.

Length, 6.5 mm.

Imago: Black, slightly shining. Orbits and upper part of cheeks silvery pilose. Thorax with slight greyish pruinescence, distinctly but not conspicuously quadrivittate. Abdomen slightly and evenly grey pruinose. Wings clear. Calyptre yellowish. Halteres black.

Frons about two-fifths the width of head, each orbit above about one-fifth as wide as interfrontalia; interfrontal cruciate bristles strong; orbitals as in

Pogonomyia quadridetosa; antennæ short, third joint less than twice as long as second; arista bare, second joint as long as thick, third swollen for about one-third of its length; cheek about one-fourth as high as eye, densely haired on lower half, the bristly hairs almost uniform in length and strength, vibrissæ well differentiated; palpi slender, nearly as long as apical portion of proboscis. Dorsum of thorax not very conspicuously hairy; presutural acrostichals weak, irregularly four-rowed; postsutural dorso-centrals four, prealar bristle very small; a group of numerous bristly hairs above fore coxæ; sternopleura with very long hairs and two strong bristles, one in front and the other behind. Abdomen with short bristly hairs and no long bristles. Legs similar to those of *Pogonomyia* in form; fore coxæ without stout bristles; fore tibia with two to three weak posterior bristles, apical spines short ventrally; mid femora with a few weak bristles on basal half of antero-ventral surface; mid tibia with two to three antero-ventral, two to four antero-dorsal, four to six postero-dorsal, and two to three postero-ventral bristles on surface; hind femora with rather weak bristles on greater portion of antero-ventral surface; hind tibia with three to four antero-ventral, three to five antero-dorsal, and six to eight postero-dorsal bristles, none of which are very long; mid and hind tarsi with short, rather closely placed bristles. Costal thorn indistinct; outer cross-vein straight; last section of fourth vein about 1.75 as long as preceding section.

Length, 7 mm.

Type locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 7, 1915 (F. Johansen).

I have seen a series of specimens of this species from the arctic region in another collection, and find that the pteropleural hairs are rarely absent. The characterization here given holds good throughout the series.

COENOSIINÆ.

There are two imagines of this sub-family in the collection. Both belong to the genus *Coenosia* and represent different species, but only one is in good enough condition to permit of its identification.

Coenosia octomaculata Zetterstedt.

Coenosia octomaculata Zetterstedt. Ins. Lapp., p. 141, 1840.

This northern European species has not hitherto been recorded from this continent. Although very closely resembling *geniculata* Fallen, it is very readily separated from it by the much smaller lower squama, which barely projects beyond the upper. In the specimen before me the mid tibiæ have the antero-dorsal and postero-dorsal bristles at the same height, whereas in my specimens of *geniculata* from Illinois the antero-dorsal one is much nearer apex of tibia.

Locality: Nome, Alaska, August 24 and 25, 1916 (F. Johansen).

Coenosia, sp.

One female in very poor condition. The legs appear to be black or fuscous, with only the bases of the tibiæ pale.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 10, 1915 (F. Johansen).

ANTHOMYIINÆ.

There is one genus in this collection which has been previously known from arctic Europe only, and another has been listed as belonging to *Anthomyia*. In

order to make clear the generic relations of these I have drawn up an abridged key to genera which is presented herewith.

KEY TO GENERA IN COLLECTION AND THE GENERA MOST CLOSELY ALLIED THERETO.

1. Eyes hairy..... 2
Eyes bare..... 3
2. Abdomen broadly ovate, little longer than broad; eyes in male distinctly separated; in female the width of frons is very little more than that of male.... *Alliopsis* S. and D.
Abdomen narrow, almost parallel-sided, much longer than broad; eyes in male contiguous, in female separated by at least one-third the width of head..... *Lasiops* Meigen.
3. Calyptra decidedly unequal in size, the under one projecting beyond upper..... 4
Calyptra not as above, the lower one not projecting..... 5
4. Lower calypter very much longer than upper; arista plumose..... *Hydrophoria* R.-D.
Lower calypter not much longer than upper; arista almost bare..... *Egle* R.-D.
5. Legs black; arista pubescent or bare..... *Phorbia* R.-D.
Legs black, or with tibiæ pale; arista hairy or plumose..... *Hylemyia* Meigen.
Legs with at least the tibiæ pale; arista pubescent or bare..... *Pegomyia* R.-D.

The last three genera are poorly defined and overlap considerably, but my studies of the family have not been brought to the point where I am prepared to publish reliable characters for their differentiation, so I use the generally accepted characters. I have in preparation a generic synopsis of this and other sub-families which I hope to publish shortly.

Hydrophoria Robineau-Desvoidy.

The only species of this genus on which I possess information concerning the early stages is aquatic. The flies are always found in the vicinity of rivers or ponds.

There is only one species in the present collection, which is described as new.

Hydrophoria arctica, n. sp.

MALE.—Black. Frontal triangle opaque black, orbits, cheeks, and face white pilose. Legs black, tibiæ slightly brownish. Wings greyish, veins black. Squamæ white, with yellow margins. Halteres brownish yellow.

Interfrontalia obliterated below ocelli, the orbits at this point linear; third antennal joint about 1.5 as long as second; arista tapered on basal half, long-haired to middle, bare apically; orbit in profile extending beyond eye as far as width of third antennal joint; cheek 1.5 as high as width of orbit; vibrissa long, marginal bristles on cheek long and strong. Presutural acrostichals weak, hardly distinguishable among the irregularly four rowed hairs, prescutellars hair-like; prealar bristle about one-fourth as long as the bristle behind it; sternopleurals two: two, the lower anterior one weak; upper margin of hypopleuræ hairy proximad of spiracle. Abdomen short and broad, cylindrical, segments with long bristles on posterior margins; hypopygium with basal segment polished, the apical, recurved one slightly prominent, armed with many long strong bristles; fifth ventral segment densely covered with setulose hairs. Fore tibiæ with two bristles; mid tibia with two to three antero-ventral, three to four antero-dorsal, two to three postero-dorsal, and three to four postero-ventral bristles; almost the entire length of mid-femora with long bristles on the antero and postero-ventral surfaces; hind tibia with five to six short bristles on antero-ventral surface, seven to eight irregular ones on antero-dorsal, seven to eight on postero-dorsal surface, one beyond middle being very long. Costal thorn at least as long as inner cross-vein; outer cross-vein very much flexed; last section of fourth vein about 1.5 as long as preceding section.

FEMALE.—Similar in colour to the male.

Frons opaque black, densely brown pruinose, nearly half as broad as head; orbits broad, each at broadest part nearly as broad as orbit at same part; cruciate bristles strong; supra-orbital bristles four in number, the lower one directed

slightly outward and forward, the others directed outward: orbital hairs numerous and nearly as long as the bristles; one to two long bristles situated above vibrissa. Abdomen tapered at apex; last segment not exposed, making it impossible to say if it is armed with curved thorns. Legs and wings as in male.

Length, 6 mm.

Type locality: Cockburn point, Dolphin and Union strait, Northwest Territories, September 5, 1914 (F. Johansen). Allotype, Bernard harbour, Northwest Territories, June 1915, (F. Johansen).

This species agrees with *divisa* Meigen in having the hypopleura with hairs on upper portion, but differs from it and all other species known to me in having the orbit in the female armed with long hairs in addition to the bristles, and in the very conspicuously bristly hypopygium and long costal thorn.

A female specimen, in very poor condition, from Collinson point, Alaska, June 22-23, 1914, may represent a distinct species. The mid tibia on one side is gone, but the one remaining is reddish and less bristly than in *arctica*, but without better preserved examples it is impossible to say definitely as to its specific identity.

Alliopsis Schnabl and Dziedzicki.

Generic Characters.

MALE.—Very robust. Head large, eyes long-haired, narrowly separated above; antennæ shorter than face; arista almost bare; cheeks with very numerous long bristles on lower margin and anteriorly, the vibrissæ not differentiated. Thorax with three pairs of postsutural dorsocentrals; calyptre of moderate size, lower scale not projecting. Abdomen broad ovate, its length barely exceeding its greatest width; hypopygium small; apical visible ventral segment with a wedge-shaped central incision. Legs stout, strongly bristled. Sixth vein extending to margin of wing.

FEMALE.—Head as in male but the eyes are more widely separated; orbital bristles numerous, hair-like, erect and slightly inwardly directed, outer supra-orbitals and cruciate interfrontal bristles absent. In other respects similar to male, the abdomen not so broad and more pointed apically.

Alliopsis obesa, n. sp.

MALE.—Black, shining. Wings slightly greyish, fuscous at base. Squamæ grey, margins brown. Halteres yellow, knobs brown.

Narrowest part of frons as wide as distance across posterior ocelli, the orbits linear above and not over one sixth as wide as interfrontalia; profile as in Pl. X, fig. 33; hairs on eyes pale. Dorsum of thorax with long hairs; aerostichals long and hair-like, irregularly four rowed cephalad of suture; posthumeral and presutural bristles strong, the latter duplicated on both sides, and the former on one side, in type; prescutellar bristles weak; scutellum with four long marginal bristles, numerous long discal hairs, and very distinct ventral pile; propleura above coxæ with a conspicuous clump of long bristly hairs; sternopleurals three in number; hypopleura bare. Abdomen with long setulose hairs on entire surface, those at apices of segments bristle-like; fourth segment the shortest; hypopygium very small, globose, glossy. Legs rather densely covered with moderately long setulose hairs; bristles on fore and mid tibiæ hardly distinguishable from the hairs but apparently as follows: fore tibiæ with two to three on postero-dorsal surface; mid tibiæ with two to three on each of the following surfaces—antero-dorsal, postero-dorsal, and postero-ventral; hind femora with long bristly hairs from base to well beyond middle of postero-dorsal surface, and much stronger bristles on the whole length of antero-ventral surface; hind tibiæ with four to five short bristles on apical half of antero-ventral surface, six to eight longer bristles on entire length of antero-dorsal surface, and six to seven long slender bristles on postero-dorsal surface, the so-called preapical bristle very long, and very slender at apex; tarsi normal. Wings greatly exceeding

apex of abdomen, the length of wing equal to that of entire insect; costa with short black setulae, the costal spine not differentiated; outer cross-vein curved; last section of fourth vein twice as long as preceding section.

Length, 8 mm.

Type locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, June, 1915-16 (F: Johansen).

Alliopsis, sp.

FEMALE.—Similar in colour to *obesa*.

Frons at narrowest part about one-eighth the width of head, the orbits linear and about one-fifth as wide as interfrontalia, bristles as in preceding species: profile as Pl. X, fig. 32, Thorax much less conspicuously haired than in *obesa*, the dorso-centrals stronger and well differentiated; presutural acrostichals irregularly four-rowed, presutural bristle single; prealar as in *obesa*, nearly as long as the bristle behind it; scutellum with a differentiated discal pair of bristles in addition to the marginals. Abdominal hairs very long on lateral margins of segments and on apical two, short on disc, the contrast more striking than in *obesa*; apical genital segment without thorns. Legs less hairy than in *obesa*, the bristles on tibiae strong and distinct; fore tibiae with three long bristles, one on the anterior dorsal surface and two on the posterior; mid tibiae with three antero-dorsal, four to five postero-dorsal, and three postero-ventral bristles; hind femora as in *obesa*, but hind tibiae with four to five long bristles on the basal half of posterior surface in addition to those on the other surfaces, the latter stronger than in *obesa*. Wings as in *obesa*, but the costal setulae are longer, the costal spine is distinct, and the outer cross-vein is straight.

Length, 7.5 mm.

Locality: Camden bay, Alaska, June, 1914 (F. Johansen).

It is possible that the two foregoing forms represent only one species.

The genus *Alliopsis* was erected for the reception of the European arctic species *glacialis* Zetterstedt, and is closely allied to *Lasiops* Meigen, both having the eyes very distinctly hairy, but it may be separated from that genus in the male by much more widely separated eyes, those of *Lasiops* being subcontiguous, and by the very broad abdomen. The female of *Lasiops* has the frons similar to that of *Phorbia*, whereas that of *Alliopsis* is not much wider in the male and all the orbital bristles are directed slightly inward, none directed forward.

Egle Robineau-Desvoidy.

This genus contains several species that have been placed in *Anthomyia* by most authors. From the type of the latter *Egle* differs—at least the species known to me—in having the prothorax bare below and in front of the spiracle.

One species is present in this collection.

Egle radicum (Linné):

Musca radicum Linné, Fauna Suec., 2d ed., p. 454, 1756.

Six specimens, with data as follows: Nome, Alaska, August 21, 1916, two specimens, and August 24-25, 1916, three specimens; and Teller, Alaska, July 29, 1913 (F. Johansen).

This is a European species which occurs throughout North America and has previously been recorded from Alaska.

Schnabl and Dziedziński have erected the genus *Paregle* for the reception of the above species and several others, but I do not think the separation warranted.

Hylemyia Robineau-Desvoidy.

This genus is not well defined, and it is very difficult, in fact almost impossible, to separate some species from the genus *Phorbia* by the application of characters given in published keys to the genera of the family.

The larvæ are very little known; those that are known live either in decaying vegetation or, rarely, in living plants such as wheat.

Hylemyia variata (Fallen.)

Musca variata Fallen. Dipt. Suec., Muse., p. 59, 1820.

There is one female of this species in the collection, taken at Nome, Alaska, August 24 and 25th, 1916 (F. Johansen).

There are records of this European species from many states in North America, its range extending from Massachusetts to Idaho, and south to Louisiana. It has also been recorded from Ontario and Alaska, so that in all probability it is to be found throughout the entire area of North America.

Hylemyia acrostichalis, n. sp.

MALE.—Black, shining. Wings clear. Calyptra white. Halteres yellow.

Eyes separated by not more than width of anterior ocellus; frons not buccate; antennæ nearly as long as face, third joint narrow, about twice as long as second; arista with short, rather dense hairs, the longest hairs longer than diameter of arista at base; cheek not much higher than width of facial orbit in profile, and about one-seventh as high as eye, bristles confined to margin, one short bristle above vibrissa; proboscis not very stout. Prealar bristle long and strong; two pairs of long presutural acrostichals present. Abdomen in type crushed; fifth sternite with a deep central excision, the lateral extensions with a fringe of front hairs on inner margin, and a number of bristles on surface, the longest of which does not exceed in length the lateral extension (Pl. X, fig. 39); hypopygium small (Pl. X, fig. 40). Legs slender; fore tibia with one posterior and a weaker antero-dorsal bristle near middle, and a small sharp bristle at apex on posterior side which is directed downward and slightly backward; fore tarsi slender, longer than tibia; mid femur with five to six bristles on basal half of postero-ventral surface; mid tibia with one to two bristles on each of the following surfaces:—antero-dorsal, postero-dorsal, and postero-ventral; mid tarsus normal, not longer than tibia; hind femur with long widely-spaced bristles on antero- and postero-ventral surfaces, those on the latter weaker and not carried to apex; hind tibia with three to four bristles on each of the following surfaces—antero-ventral, antero-dorsal, and postero-dorsal, those on the latter surface much stronger than the others, especially the one nearest apex, posterior surface with one bristle near middle; hind tarsus normal, shorter than tibia. Costa with weak setule, the costal thorn distinct but not very long; last section of fourth vein 1.75 times as long as preceding section.

FEMALE.—Similar to male in colour.

Frons nearly one-half the head-width; cruciate bristles long; each orbit with one strong bristle below the forwardly directed supraorbital; cheek narrower than in male. Thorax as in male, the bristles stronger. Genital segments not armed with strong spines. Legs similar in armature to those of male. Costal thorn longer than in male, the upper exceeding the inner cross-vein in length; last section of fourth vein very little longer than preceding section.

Length, 6.5 mm.

Type locality: Nome, Alaska, August 21, 1916 (F. Johansen).

This species bears a resemblance to *marginata* Stein, but differs in armature of fifth abdominal sternite, almost contiguous eyes, and armature of legs. From *simpla* Coquillett, an Alaskan species, it is readily separated by the bristling of the hind tibia.

Phorbia Robineau-Desvoidy.

There are apparently four species of this genus in the collection, none of which are in good condition.

Phorbia brevitarsata, n. sp.

MALE.—Black. Anterior portion of interfrontalia, facial orbits, and the greater portion of cheeks rufous. Wings clear. Calyptra yellow. Halteres yellow.

Eyes separated at narrowest part of frons by a distance more than equal to width across posterior ocelli; cruciate bristles long and hair-like; antennae short, third joint 1.5 as long as second; arista much swollen at base, tapered to near apex of basal third, almost bare; facial orbit in profile nearly as broad as height of cheek, the latter one-third as high as eye; vibrissal angle weak, almost on a level with lower margin of eye, the portion ventrad of it nearly vertical; cheek with a few weak marginal hairs. Prealar bristle very short; three to four pairs of weak acrostichals in front of suture. Abdomen subcylindrical, but little tapered posteriorly. Legs rather short and stout; mid tibia with one to two bristles on antero-dorsal and postero-dorsal surfaces; hind femur with an almost complete series of widely spaced bristles on antero-ventral surface and a number of similarly disposed bristles on basal half of postero-ventral surface; hind tibia with long slender bristles on antero-ventral, antero-dorsal, and postero-dorsal and postero-ventral surfaces, those on the dorsal surfaces stronger, more irregular, and more widely spaced than those on ventral surfaces, the postero-ventral surface with the bristles very fine and hair-like and in a double series on basal half; hind tarsus distinctly shorter than hind tibia, the basal joint less than one-third the tibial length. Outer cross-vein of wing oblique; last section of fourth vein about 1.5 as long as preceding section.

FEMALE.—Similar to the male in colour.

Interfrontalia not much wider than orbit; cruciate bristles long and strong; two bristles proximad of anterior supraorbital; facial orbit in profile nearly as wide as height of cheek, the latter half as high as eye. Thorax showing traces of pollinose vittæ, a slender one on each side of anterior acrostichals. Abdomen tapered posteriorly; apex of last genital segment with numerous short stout bristles. Fore tibia with one posterior and one antero-dorsal bristle; hind tibia with fewer hair-like bristles on ventral surfaces than male, those on postero-ventral surface confined to basal half. Costal and radial veins noticeably paler than others; costal thorn of moderate length.

Length, 5 mm.

Type locality: West of Konganevik, Camden bay, Alaska, July 4, 1914, and June 1914 (F. Johansen).

The much-protruded face, pale colour of orbits and cheeks, and armature of the hind tibia of male separates this species from any known to me.

Phorbia, sp. 1.

This species closely resembles *substriata* Stein, but differs in having the facial orbits in profile about as wide as height of cheek, the presutural acrostichals more numerous and much weaker. None of the specimens are in good enough condition to ensure accurate identification.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 18-19, 1915, and July 1916 (F. Johansen).

Two males and three females.

Phorbia, sp. 2.

Closely resembling the preceding species. Differs in having the frons entirely black, the wings less conspicuously yellow at base, and the costal thorn much shorter.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, August 1-7, 1915, and July, 1916 (F. Johansen).

Phorbia, sp. 3.

One male in very poor condition. Resembles *brevitarsata* in armature of the legs, but differs in having the abdomen depressed, and the hind tarsi about as long as the tibia.

Locality: On sandy beach, Bernard harbour, Dolphin and Union strait, Northwest Territories, July 19, 1915 (F. Johansen).

Phorbia, spp.

Five specimens belonging to this genus are in such poor condition that I cannot satisfactorily assign them to any of the preceding species or to any known to me.

Locality: Herschel island, Yukon Territory, July 29, 1916, one female; Bernard harbour, Northwest Territories, July 10, 1915, one male, one female; same locality, June 18, 1915, one female; Collinson point, Alaska, June 20, 1914 (F. Johansen).

Pegomyia Robineau-Desvoidy.

This genus as at present constituted contains species which are very dissimilar in habitus, and my knowledge of the larval habits of a number of the species leads me to consider certain that such species as *unicolor* Stein, *affinis* Stein, and *bicolor* Wiedemann are not congeneric. The first-named I have reared from mushrooms, and the larva resembles much more closely that of *Anthomyia pluvialis* Linné than that of *bicolor*, which is a leaf-miner. The larvæ of *affinis* are found in burrows of rodents and in caves or holes in the ground which mammals or birds frequent and are essentially scavengers: their structure is unknown to me. Both species in the present collection are more closely related to *unicolor* than to *bicolor* and may have the same larval habits.

Pegomyia flavipes (Fallen.)

Anthomyia flavipes Fallen. Dipt. Suec., Muse., p. 90, sp. 125, 1820.

Anthomyia pulchripes Loew. Zeitschr. f. Ges. Naturwiss., 104, 1857.

Pegomyia flavipes (Fallen) Stein, Wien Ent. Zeitg., vol. 25, p. 69, 1906.

This species has the general habitus of *unicolor* Stein, but is considerably darker in colour and is separable from its congeners by the remarkably long bristles on the antero-ventral surface of the hind femora, the longest one being at least three times as long as the diameter of the femora where it is situated. The lower bristle on the postero-dorsal surface of the hind tibia is about half as long as the tibia.

One male specimen in very poor condition, Nome, Alaska, August 21, 1916 (F. Johansen).

Pegomyia albimargo Pandell.

Pegomyia albimargo Pandell, Rev. Ent. France, vol. 20, p. 296, 1901.

Phorbia obscura Meade (nec Macquart). Ent. Month. Mag., vol. 19, p. 216, 1883.

This species is one of the smallest and most variable in colour in the group. Sometimes the whole insect, including the legs, is black, but commonly the abdomen and at least the tibiæ are reddish, or translucent. The thorax is always black and in front is marked with four short vittæ, between which the dorsum is conspicuously white pruinulent. The black antennæ and palpi serve to distinguish the species from *vittigera* Zetterstedt, which it most closely resembles in the chaetotaxy of the legs.

Locality: Three male specimens, Nome, Alaska, August 21 and 24, 1916 (F. Johansen).

Both these European species are recorded herein for the first time from North America.

FUCELLINÆ.

Fucellia Robineau-Desvoidy.

The species of this genus are found along the margins of streams, on the seashore, and on the shores of lakes.

Fucellia punctipennis Becker.

Fucellia punctipennis Becker, Middel. om Grönland, vol. 29, p. 411, 1908.

This species was described from east Greenland and has not since been recorded. All the specimens in the present collection were obtained at Bernard harbour, Dolphin and Union strait, Northwest Territories, May 1916, and June 18, 1915. Eleven specimens (F. Johansen).

Fucellia ariciiformis Holmgren.

Fucellia ariciiformis Holmgren, Kongl. Vetenskap..Forhandl., 1872, No. 6, p. 103.

This species was originally described from Greenland. I have seen examples from Pribilof islands. There are twenty-nine specimens in the present collection: nine from Bernard harbour, Dolphin and Union strait, Northwest Territories, taken May 19, 1916, May 20 and 22, June 25, and July 11, 1915; nineteen from Demarcation point, Alaska, May 15, 1914; and one from Collinson point, Alaska, June 20, 1914 (F. Johansen).

SCATOPHAGIDÆ.

The larvæ of most species of this family feed upon decaying vegetable matter and manure. One North American species, *Hydromyza confluens* Loew, mines, in the larval stage, in the stems of *Nymphaea americana*. The imagines of many species are predaceous, feeding upon other small insects, and most of them are found near water, particularly on the shores of rivers, lakes, and on the seashore. Many species can be obtained only by very thorough sweeping with an insect net over grasses and other herbage growing in ponds and along their extreme margins.

The literature on this family is in deplorable condition from the point of view of one who has to identify species, and in order to make clear the generic concepts of the writer I have drawn up a key to the genera, which is included in this paper.

Very many species of the family occur in northern latitudes—in fact the family is essentially a northern one—and this key will be found useful in future work on arctic Diptera.

Some of the genera are proposed herein for the first time, and several are recorded for the first time from this continent.

KEY TO GENERA.

- | | |
|---|----------------------------|
| 1. Species with three sternopleural bristles..... | 2 |
| Species with two sternopleural bristles..... | 5 |
| Species with one sternopleural bristle..... | 7 |
| 2. First wing-vein bristly on apical half; palpi without long apical bristle; arista short-haired or pubescent; scutellum with two or four bristles; fore femora without closely placed or very strong antero-ventral bristles..... | <i>Orthochaeta</i> Becker. |
| First wing-vein bare, or the species does not have all of the above characters..... | 3 |

KEY TO GENERA—Con.

3. Palpi with long apical bristle which is about as long as the palpus; scutellum with six bristles. *Plethochaeta* Coquillett. 4
 Palpi without long apical bristle; scutellum with two or four bristles. 4
4. Arista plumose. *Pycnoglossa* Coquillett. 4a
 Arista almost bare. 4a
- 4a. Fore femora with anterior and antero-ventral surfaces armed with closely placed black bristles. *Amaurosoma* Becker.
 Fore femora without such bristles. *Pselaphephila* Becker.
5. Third antennal joint with apex rounded; scutellum with two bristles *Hexamitocera* Becker.
 Third antennal joint with upper portion of apex acute or angulate; scutellum with four bristles. 6
6. Arista much thickened on basal half, the second joint much longer than thick, geniculated with third. *Gonatherus* Rondani.
 Arista thickened at base, second joint about as long as thick, not geniculated apically. *Trichopalpus* Rondani, pt.
 (*Chaetosia* Coquillett) 8
7. Pteropleura bare. 8
 Pteropleura hairy on at least part of its surface. 22
8. Head much longer than high, face much retreating below; palpi with long apical bristle, third antennal joint with a long hair on outer side near base of arista. *Acicephala* Coquillett.
 Head at least as high as long, face not much retreating below; third antennal joint without long hair as above. 9
9. Orbital bristles very short, distinguishable only with strong lens; cross-vein absent from base of discal cell. *Hydromyza* Fallen.
 Orbital bristles long; discal cell closed at base. 10
10. Fore tibiae with a short, stout, rectangular spine near apex on under side. *Acanthocnema* Becker. 10a
 Fore tibiae without such rectangularly projecting spine. 10a
- 10a. Fore femur and fore tibiae each with a series of strong bristles on antero- and postero-ventral surfaces. *Norellia* Robineau-Desvoidy.
 Fore femur without strong bristles on antero-ventral surface; bristles on tibia not in two series. 10b
- 10b. Third and fourth wing-veins curved downward on their penultimate sections, the first posterior cell proximad of inner cross-vein distinctly broader than at any other point; stigmal bristle absent; arista pubescent; palpi with long apical bristle; first vein bristly at apex. *Scoliaheps* Becker.
 Wing venation normal, first posterior cell proximad of inner cross-vein not broader than at any other point. 10c
- 10c. First wing-vein bristly on apical half. 11
 First wing-vein bare on apical half. 16
11. Palpi long and slender, armed at apices with a long bristle; arista plumose. 12
 Palpi not armed at apex with a long bristle, or if so the arista is bare or almost so. 13
12. Presutural dorso-central, prothoracic, stigmal, humeral, and tibial bristles strong; legs stout. *Cordylura* Fallen, pt.
 Presutural dorso-central bristles weak or absent, prothoracic and stigmal bristles weak; humeral usually absent; tibiae usually with very weak bristles. *Paralleloma* Becker, pt.
13. Scutellum with six bristles; lower margins of cheeks with numerous long bristles. *Bucephalina*, n. gen. 14
 Scutellum with two or four bristles. 14
14. Male genitalia with very long curled bristles on each side which are directed upward and slightly forward; fore tibiae with short, black spines on inner side. *Pogonota* Zetterstedt.
 Male genitalia without such bristles; fore tibiae without short black spines on inner side. 15
15. Arista subnude; intra-alar bristles absent. *Gimnomera* Rondani.
 Arista plumose, the hairs widely separated; intra-alar bristles distinct. *Megophthalma* Becker.
16. Sixth wing-vein not extending to margin. 17
 Sixth wing-vein extending to margin. 18
17. Arista plumose; eyes concave on lower posterior margin; legs long and slender. *Paralleloma* Becker, pt.
 Arista almost bare; eyes rounded; legs short. *Cordylurella*, n. gen.
18. Prealar bristle more than half as long as the bristle behind it; thoracic and leg bristles long and atrong. 19
 Prealar bristle much less than half as long as the one behind it; thoracic and leg bristles of moderate length. 20a

*This last character does not apply to the European species.

KEY TO GENERA—*Con.*

19. Cheek much less than half as high as eye; palpi with very long apical bristle
Cordylura Fallen, pt.
 Cheek about half as high as eye; palpi without a long apical bristle..... 20
20. Mid femur with a long stout bristle at middle on anterior surface.....*Ceratinostoma* Meade.
 Mid femur without such bristle.....*Sactophaga* Fallen, pt.
- 20a. Third antennal joint rounded at apex; arista almost bare; fore tibiae with short
 bristles, the inner surface with minute black setulae.....*Microprosopa* Becker.
 Third antennal joint angulate or pointed on upper side at apex..... 21
21. Area between dorso-centrals cephalad of suture with more than two series of setulae...
Spathiophora Rondani.
 Area between dorso-centrals cephalad of suture with only two series of setulae.....
Trichopalpus Rondani, pt.
(Opsomyia Coquillett)
22. Fore tibiae with ventral surfaces armed with short stout spines on their entire length;
 male with a large bifid chitinous plate on each side of apical exposed sternite....
Allomyia, n. gen. 23
 Fore tibiae without short stout ventral spines; apical abdominal sternite not as above. 23
23. Apical half of first wing-vein bristly; sixth vein not extending to margin.....
Dasyleuron, n. gen. 24
 Apical half of first wing-vein bare; sixth vein extending to margin..... 24
24. Wings with a number of dark spots, those between third and fourth veins usually
 enclosing rudimentary veinlets.....*Ernoneura* Becker.
 Wings clear, sometimes with the cross-veins clouded, but never with small dark spots
 enclosing veinlets as above.....*Scatophaga* Fallen, pt.

The genotype of *Bucephalina*, gen. nov., is *Cordylura megacephala* Loew, a species originally described from the District of Columbia, which I have seen from Illinois, and from Plummer's island, Maryland.

Gonatherus Rondani.

I refer one species to this genus. It agrees with the general description of the genotype very well except that the female genital segments are not compressed. Nothing has been known up to this time of the immature stages of this genus.

Gonatherus atricornis, n. sp.

PUPARIUM.—Terra-cotta, almost opaque; apices of posterior spiracles glossy black.

Cephalic and thoracic segments missing. Surface rather closely covered with slight, linear, discontinuous, transverse ridges. No protuberances on base of dorsum of abdomen; each segment with a broad transverse band of very minute locomotor spinules on dorsum and venter; apical segment irregularly rugose on surface, viewed from behind with eight distinct marginal and submarginal protuberances, as follows: a large one slightly below transverse line of spiracles, a smaller one below it on margin and another, still smaller, submarginal one slightly ventrad of the lower one, and a large marginal one laterad of anus; spiracles elevated, their height equal to their apical diameter, separated by about three times the width of their diameter, the openings three in number, the upper and lower ones directed straight dorso-ventrad, the outer directed straight laterad, on inner side of disc there is a rounded depression.

Length, 5 mm.

IMAGO. FEMALE.—Black, densely grey pruinose, only the abdomen and legs slightly shining. Head yellowish testaceous, densely whitish pruinose, upper part of occiput and greater portion of frons fuscous, anterior portion of interfrontalia slightly reddish; antennae deep black; proboscis glossy black; palpi whitish yellow, fuscous at apices. Dorsum of thorax with two poorly defined, narrow vittae on anterior half between the acrostichals and dorso-centrals. Legs black; apices of femora below, and all of tibiae reddish, tarsi fuscous. Wings clear, veins dark brown. Calyptæ white. Halteres brown.

Frons about half the width of head, each orbit nearly half as wide as interfrontalia; lower supraorbital bristle directed forward, the upper two slightly backward; antennæ large, third joint broad, its width over half that of eye, apex not acute, entire length on inner side nearly four times that of second; arista microscopically pubescent, second joint about one-fourth as long as third, the latter swollen on its basal two-fifths; profile as in Pl. X, fig. 34; hairs of lower part of occiput mostly white. Dorsum of thorax with two+ three dorso-centrals; acrostichals irregularly two-rowed before suture; discal setulæ sparse and long; scutellum with four long bristles and a number of long setulose discal hairs; sternopleura with two long posterior bristles placed vertically and many long strong hairs; prothoracic and stigmatal bristles strong. Abdomen with numerous long hairs, those on posterior margins strong but not macrochaetæ. Legs normal; fore tibia with two antero-dorsal, two postero-dorsal, and one posterior bristle; mid tibia with one ventral, two antero-dorsal, two postero-dorsal, and one posterior bristles; hind tibia with one large and one to two small antero-ventral, three antero-dorsal, and four to five postero-dorsal bristles. Costa with fine setulæ and more widely spaced spinules; outer cross vein straight, situated at nearly its own length from end of fifth vein, last section of fourth vein nearly twice as long as preceding section.

Length, 5.5 mm.

Type locality: Bernard harbour and cape Krusenstern. Dolphin and Union strait, Northwest Territories, July 3, 1916 (F. Johansen).

I have seen a specimen which I consider belongs to *Gonatherus planiceps* Fallen, the genotype, in another collection from Alaska. From *atricornis* it differs in having the palpi entirely whitish, the legs paler, the wings conspicuously brown along costa and on each side of longitudinal and cross-veins, and in being much less strongly bristled, the acrostichals in front of suture being less numerous and weaker. The two species are very closely related but in my opinion readily separable by the characters indicated herein.

Cordylurella, n. gen.

Generic Characters.

FEMALE.—Head, viewed from above, subspherical, slightly flattened posteriorly; frons one-third or more than one-third the head-width; orbits differentiated; the bristles well developed, similar to those of *Cordylura*; antennæ slightly shorter than face, third joint rounded apically, arista pubescent; palpi without strong apical bristle. Thoracic chaetotaxy as in *Cordylura*. First wing-vein bare; sixth not reaching margin of wing. Legs similar to those of *Cordylura*.

Genotype: *Cordylura nebulosa* Coquillett.

There is a male specimen of a species which I refer to this genus in the collection. I can not identify it as any previously described species, and describe it herewith as new.

Cordylurella subvittata, n. sp.

MALE.—Black, glossy. Head yellow; occiput, ocellar triangle, and greater portion of frontal orbits glossy black, the orbits and triangle slightly pollinose; face and cheeks with distinct white pruinescence; antennæ yellow; arista black; palpi yellow; proboscis yellow at base, becoming brown at apex. Thorax glossy black, lateral margins, a narrow line along course of dorso-centrals, and a broad central vitta covered with very short grey pile, giving the dorsum a subvittate appearance. Abdomen glossy black; surface with long but not dense yellow hairs, bristles on penultimate dorsal segment black; hypopygial forceps yellow except at base. Legs yellow, mid and hind coxæ brown. Wings clear, veins brown. Halteres brown.

Frons over one-half the width of head, orbits narrowed anteriorly; arista much swollen on basal fifth of third joint, microscopically pubescent; palpi slightly dilated, weakly bristled. Thorax without presutural acrostichals; dorso-centrals weak. Scutellum with two apical bristles. Abdomen somewhat incrassated apically, the hypopygium large, forceps long, curved forward, rather slender. Legs normal, so placed in type that it is not possible to say definitely what the arrangement of the bristles is, but they are weak and not numerous, the fore tibia lacking them on posterior surface. Wings extending beyond apex of abdomen, inner cross-vein slightly beyond apex of first vein and almost exactly at middle of discal cell; penultimate section of fourth vein three-fifths as long as ultimate section.

Length, 4 mm.

Type Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 18-19, 1915 (F. Johansen).

This species agrees better with *Cordylurella* than with any other in the appended key to genera though with better material and both sexes available it may be necessary to separate it generically from *nebulosa*. The latter is readily distinguished from *subrittata* by its densely pruinose thorax, more strongly spined legs, the antero-dorsal bristles on the femora being noticeably stronger and more numerous, and the presence of a strong posterior bristle on the fore tibia. The scutellum in *nebulosa* has four bristles.

Dasypleuron, n. gen.

Generic Characters.

Head in type-species so badly crushed that it is not possible to give full description; in general it appears to resemble that of *Cordylurella* but the antennae are not visible owing to the face being crushed in, the apical portion of one arista, which is distinctly pubescent, alone being visible. The thorax has the same chaetotaxy as *Cordylura latifrons* Loew., but the pteropleura has a number of long soft hairs on the middle. Abdomen short and stout, hypopygium occupying over half of the ventral surface, the forceps chitinized and stout, similar to, but larger than, those of *Cordylurella subrittata*. Legs normal. First wing-vein bristly on apical portion; sixth vein incomplete.

Genotype: *Dasypleuron tibialis*, n. sp.

Dasypleuron tibialis, n. sp.

MALE.—Glossy black. Head black; frons brownish red, orbits and triangle black, slightly grey pruinose; palpi black; proboscis glossy black. Thorax slightly pruinose on dorsum, not vittate. Abdomen entirely glossy. Legs black; apices of fore femora, and all tibiae reddish yellow, the mid and hind pair darker apically. Wings clear, veins black. Halteres black. Bristles black, hairs fuscous, those on ventral surfaces of femora paler.

Orbital bristles long and slender; palpi spindle-shaped, with rather weak bristles; proboscis normal. Dorsum of thorax with numerous long setulose hairs on front margin laterally, and laterad of presutural dorso-centrals; presutural acrostichals strong; anterior postsutural dorso-central duplicated in type so that there appears to be two strong and two weak post-suturals; scutellum with four subequal bristles; hairs on pleurae long; prothoracic and stigmatal bristles long and slender; almost entire surface of mesopleura hairy. Abdomen with rather long hairs, basal hypopygial segment with a number of strong bristles; apical visible ventral segment armed with long hairs. Legs normal: femora with long hairs on the ventral and anterior surfaces, those on anterior surface of mid pair and antero-ventral surface of hind pair bristle-like; fore and hind tibiae apparently without bristles, mid pair with one

bristle on dorsal surface near apex. Inner cross-vein distinctly beyond apex of first vein and at three-sevenths from apex of discal cell; penultimate section of fourth vein about half as long as ultimate section.

Length, 4.5 mm.

Type Locality: Collinson point, Alaska, June 20, 1914 (F. Johansen).

Allomyia, n. gen.

I described this genus in a paper, which was completed some time ago, on Pribilof Island Diptera, but it will not go to press until after this paper. I had in that collection the female only. The generic synopsis in this paper and the following description may be accepted as embodying characters of the genus, though it is possible that the furcate processes of the fifth abdominal sternite are not present in the male of the other species.

Allomyia unguiculata, n. sp.

MALE.—Black, thorax and abdomen greyish pruinose. Head brownish, black, anterior portion of frons, lower half of face, and anterior part of cheeks yellowish; antennae black; palpi yellow; proboscis black. Legs black, tibiae brownish, yellow at bases, tarsi brown. Wings clear.

Orbital bristles rather weak; antennae large, third joint about twice as long as second, subangulate at apex on upper side (Pl. X, fig. 37); arista bare, tapered on basal third of apical joint; cheek about one-fourth the eye-height. Dorsum of thorax with five well-developed dorso-centrals; scutellum with short discal hairs and four strong marginal bristles; pteropleura with hairs on centre; sternopleura with long hairs and one strong bristle. Abdomen subcylindrical, narrow, fifth sternite with a large bifid plate on each side (Pl. X, fig. 38), hypopygium small (Pl. X, fig. 36). Legs as in *Dasypleuron*, but the fore tibiae with short ventral spines; tibiae with the bristles as follows—fore tibia with one antero-dorsal and one to two posterior, mid tibia with one antero-dorsal, one postero-dorsal, and one posterior, hind tibia with two antero-ventral near apex, two antero-dorsal, and one postero-dorsal. Inner cross-vein well beyond apex of first and at less than two-fifths from apex of discal cell.

Length, 3.5 mm.

Type locality: Chantry island, Bernard harbour, Dolphin and Union strait, Northwest Territories, June 17, 1916 (F. Johansen).

This specimen was in very poor condition, and in order to get the structures into condition for examination I had to boil it. Originally pinned, it is now preserved in alcohol, in a fragmentary condition.

The foregoing species differs from the genotype in the colour of head and legs, in having the palpi narrower, and the wings longer and with thinner veins.

Ernoneura Becker.

This genus has only once previously been recorded from the western hemisphere. There is only one species of the genus, which was originally described by Zetterstedt from the European arctics.

Ernoneura argus Zetterstedt.

Represented by five specimens taken at Bernard harbour, Dolphin and Union strait, Northwest Territories, three specimens, July 19, 1915, and two specimens, July, 1916.

Becker states that there is no sternopleural bristle present, but it is well developed in the specimens before me.

Scatophaga Fallen.

The members of this genus are much more common in temperate latitudes than in subtropical or tropical, and are, judging from collections I have examined, particularly abundant both in individuals and species in the extreme northern portions of the western hemisphere. In the present collection there are three species represented by thirty-seven specimens.

The larvæ feed upon decaying vegetable matter and in manure; the flies are predaceous, but also feed on the same substances as the larvæ.

In order to make it possible for students of the order to recognize the species before me, I give a key for their identification, using characters similar to those used in a key to part of the same genus in a paper written for the U. S. Bureau of Biological Survey on Pribilof Island Diptera, which at time of writing is ready to go to press.

KEY TO SPECIES.

1. Mid and hind tibiæ with a number of strong outstanding bristles in addition to the long, soft hairs. 2
- Mid and hind tibiæ without strong bristles, with only soft hairs. (Group unrepresented)
2. Cross-veins of wings not infuscated; legs almost entirely black. (Unrepresented)
- Cross-veins of wings very noticeably infuscated; legs almost entirely, or entirely, yellowish or reddish. 3
3. Arista long haired at base; antennæ entirely reddish yellow; apical ventral abdominal segment of male as in Pl. X, fig. 35; pteropleura bare. *suilla* Fabricius.
- Arista bare. 4
4. Hind femur with several long bristles on antero-dorsal surface of apical half; pteropleura and hypopleura bare. *furcata* Say.
- Hind femur without such bristles; pteropleura sometimes with a few long hairs on centre; upper portion of hypopleura with a few long hairs. *rubicunda* Malloch.

Scatophaga suilla (Fabricius).

Musca suilla Fabricius. Ent. Syst., vol. 4, p. 343, 1794.

One male and one female, Nome, Alaska, August 21, 1916 (F. Johansen). A European species previously reported from Alaska.

I have figured the fifth sternite of *suilla* and *lutaria* Fallen to illustrate the specific distinction (Pl. X, fig. 5, 35 and 35a). *Lutaria* occurs in Alaska, Ohio, and New Hampshire.

Scatophaga furcata (Say).

Pyroga furcata Say. Jour. Acad. Nat. Sci. Phila., vol. 3, p. 98, 1823.

Thirty-two specimens from the following localities: Nome, Alaska, August 21-25, 1916, eight specimens (F. Johansen); Barter island, Alaska, July 2, 1914, twelve specimens, June 8, 1914, twelve specimens (D. Jenness); Collinson point, Alaska, June 15, 1914, twelve specimens (F. Johansen); point Pullen, Wollaston peninsula, Victoria island, August 18, 1915, one specimen (D. Jenness).

This very common species occurs throughout North America well into the arctics, and is equally common in Europe.

Scatophaga rubicunda Malloch.

Scatophaga rubicunda Malloch, in press.

This species is represented in the collection by three specimens, one male from Cockburn point, Dolphin and Union strait, Northwest Territories, Canadian Arctic coast, September 7, 1914, and one male and one female from Bernard harbour, Dolphin and Union strait, Northwest Territories, June 17, 1915, and June 20, 1916 (F. Johansen).

I have previously seen it from Pribilof islands, Bering sea.

HELOMYZIDÆ.

The larvæ of this family live in carrion and manure. Some of the species are found in caves and in underground nests of rodents.

The family is represented in this collection by imagines only. In order to facilitate the identification of the genera in this paper a generic synopsis is given herewith.

KEY TO GENERA.

- | | |
|--|--------------------------------|
| 1. Humeral bristle present..... | 2 |
| Humeral bristle absent..... | 3 |
| 2. Thorax with five dorso-centrals..... | <i>Helomyza</i> Loew. |
| Thorax with two dorso-centrals..... | <i>Achaetomus</i> Coquillett. |
| 3. Thorax with one pair of dorso-centrals..... | <i>Porsenus</i> Darlington. |
| Thorax with at least two pairs of dorso-centrals..... | 4 |
| 4. Mid tibiæ with long bristles on middle..... | <i>Oecothea</i> Haliday. |
| Mid tibiæ without bristles except at apex..... | 5 |
| 5. Thorax with five or more pairs of dorso-centrals..... | 6 |
| Thorax with two pairs of dorso-centrals..... | <i>Neoleria</i> , gen. n. |
| Thorax with three pairs of dorso-centrals..... | <i>Tephrochlamys</i> Loew. |
| Thorax with four pairs of dorso-centrals..... | 8 |
| 6. Scutellum with six bristles; inner cross-vein much before end of first vein; mesopleura bare..... | <i>Anorostomoides</i> Malloch. |
| Scutellum with four bristles..... | 7 |
| 7. Inner cross-vein distinctly before end of first vein; frons in male very narrow; propleural and mesopleural bristles present..... | <i>Heteromyza</i> Fallen. |
| Inner cross-vein at or beyond end of first vein; propleural and mesopleural bristles absent; eyes of male widely separated..... | <i>Allophyla</i> Loew. |
| 8. Eyes very small, not much larger than antennæ; arista remarkably long; vibrissæ strong..... | <i>Eccoptomera</i> Loew. |
| Eyes much larger than antennæ; arista short; vibrissæ short and weak; face receding, oral margin not developed..... | <i>Anorostoma</i> Loew. |
| Eyes large; arista long; vibrissæ strong; mouth margin well developed..... | <i>Leria</i> Loew. |

Oecothea Haliday.

There is a large series of a species of this genus in the collection. I cannot identify it with any of the previously described European species and it differs essentially from *fenestralis* Fallen—a species occurring in Europe and North America.

Oecothea aristata, n. sp.

MALE AND FEMALE.—Head, anterior lateral angles of thorax, greater portion of scutellum, hypopygium of male, genital segments of female, and the legs reddish testaceous; upper portion of head and greater portion of occiput, thorax abdomen, coxæ, sometimes median portion of femora, and whole of tarsi fuscous. Wings yellowish, cross-veins not infuscated.

Frons about two-thirds the width of head, orbits with one bristle near middle; interfrontalia with sparse, short hairs; antennæ small, third joint barely longer than second; arista very slender, nearly bare, about 2.5 as long as head, with a very short swelling at base; face with a broad central carina which is flattened and broadened below, covering the entire centre of face, cheeks with one strong vibrissa and a number of short setulæ; eye about equal in height to cheek at posterior margin. Three pairs of postsuturals present; propleura with one bristle; a few short setulæ below anterior spiracle; mesopleura with or without a short bristle; sternopleura with one long bristle and a number of short setulæ; pteropleura bare; hypopleura with a number of minute setulæ below spiracle; scutellum bare on disc, margin with four bristles. Abdomen of male subcylindrical, fifth sternite with short, stubby setulæ on apical half; hypopygium large, knob-like; abdomen of female more flattened, genital segments small. All femora of male slightly thickened, their antero- and postero-ventral surfaces each with a series of short black bristles; femora of female not

so stout and with much weaker and more widely spaced bristles; mid tibia in both sexes with one to four strong antero-dorsal bristles and three to five irregularly placed unequal-sized posterior bristles; hind tibia of male slightly curved, with a very pronounced apical callosity on ventral surface, the entire ventral surface with dense, short, erect hairs; hind tibia of female without a pronounced apical callosity and with much less distinct ventral hairs. Costal spines long and widely spaced; last section of fourth vein about 1.5 as long as preceding section.

Length, 5-7 mm.

Type locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, July 10, 1916 (F. Johansen). Paratypes, same locality as type, August 1-7 and 14, 1915, and September, 1915 (F. Johansen). Thirty-five specimens.

Differs from *fenestralis* Fallen, in being much larger and, in the male, in having the hind tibia with a very decided apical production or callosity, and in both sexes in having the cross-veins not infuscated.

Leria Robineau-Desvoidy.

Represented by one species in the collection.

Leria fraterna (Loew).

Scoliocontra fraterna Loew. Berl. Ent. Zeitschr., 1863, p. 27.

A male specimen, with data as follows: Nome, Alaska, August 24, 26, 1916 (F. Johansen).

This species has previously been recorded from Alaska, and is generally distributed in the United States and Canada.

Neoleria, n. gen.

Generic Characters.

Similar to *Leria*, differing in having only two pairs of well-developed, postsutural, dorso-central, thoracic bristles.

Genotype: *Neoleria rotundicornis*, n. sp.

Neoleria rotundicornis, n. sp.

MALE.—Reddish testaceous, subopaque, upper portion of frons, occiput, dorsum of thorax except humeri and scutellum, greater portion of pleurae, and abdomen except the hypopygium, fuscous, with grey pruinescence. Wings faintly yellowish, veins pale brown.

Frons less than one-half the head-width, orbits differentiated, each with two strong bristles and a few short setulae, interfrontalia with short setulae; antennae large, third joint almost orbicular, second very small; arista about as long as length of frons, with a short swelling at base, apical part not as slender as in *Oecothoa*, with microscopic pubescence; eyes almost round, of moderate size; face almost perpendicular; cheek about half as high as eye, with a few short marginal bristles and one long vibrissa; proboscis stout; palpi normal. Dorsum of thorax with numerous moderately long setulose hairs and two pairs of postsutural, dorso-central bristles; scutellum short and broad, rounded in outline and subconvex on disc, bare except for the four marginal bristles; propleural bristle strong; mesopleura bare except for a few setulae on anterior lower angle; sternopleura with one strong bristle and a few setulose hairs; pteropleura and hypopleura bare. Abdomen with short setulae and a few

longer bristles on posterior margins of segments; hypopygium of moderate size, subglobose. Legs with a few bristles but with numerous short setulose hairs; fore femora with long bristles on postero-dorsal and postero-ventral surfaces; mid femur with at least one moderately strong bristle on anterior surface at middle; mid and hind tibiæ with preapical dorsal bristle, fore pair not visible. Inner cross-vein before extreme apex of first vein and slightly beyond middle of discal cell; outer cross-vein straight, at more than half its own length from end of fifth; last section of fourth nearly 1.5 as long as preceding section; costal spines very little longer than diameter of costal vein.

Length, 4 mm.

Type locality: Nome, Alaska, August 24 and 25, 1916 (F. Johansen).

PIOPHILIDÆ.

The larvæ of all species of this family known to me feed in carrion, or on preserved meats, cheese, etc. I have found some species in numbers on dead animals, especially on the seashore and on the banks of rivers. There is only one specimen in the present collection, which is herein described as new.

Piophila borealis, n. sp.

MALE.—Glossy black.

Head black, interfrontalia, lower part of orbits, face, cheeks, and palpi reddish yellow. Thorax black, humeri, lateral portions of scutellum, and posterior lateral angles of mesonotum translucent red; propleura grey pruinose. Abdomen black. Legs black, trochanters, extreme apices of femora, bases (broadly) and apices (narrowly) of all tibiæ, basal four joints of mid, and three joints of hind, tarsi reddish yellow. Wings clear, veins yellow. Halteres yellow.

Frons plain, with weak setulæ proximad of triangle; anterior orbital bristle very small; central postvertical pair of bristles twice as long and strong as laterals; vibrissa strong; cheek almost as high as eye. Thorax smooth, rather densely covered with short dark hairs; scutellum subtriangular, convex in centre of disc; apical bristles distinctly longer than laterals; propleural bristles of moderate length. Abdomen broad, the surface granulose and armed with rather closely placed short setulose hairs; hypopygium small. Legs normal both in strength and armature. Inner cross-vein slightly beyond apex of first; sections of fourth vein 6:5:7 from base to apex.

Length, 3 mm.

Type locality: West of Konganevik, Camden bay, Alaska, July 4, 1914 (F. Johansen).

This species differs in the colour of the humeri and scutellum from any described in the recent paper on the family by Melander and Spuler.

EPHYDRIDÆ.

The members of this family are found in the vicinity of water, the larvæ being almost without exception aquatic.

There is only one species in this collection.

Scatella brunnipennis Malloch.

I described this species in the paper on Pribilof Island Diptera previously referred to, but which has not yet appeared in print.

Localities: Demarcation point, Alaska, and Collinson point, Alaska, May 16, and June 20, 1914; Collinson point, Alaska, September, 22, 1913; Bernard harbour, Northwest Territories, July, 1915 (F. Johansen).

¹ Bull. 143 Wash. Agr. Exper. Station, 1917.

CHLOROPIDÆ.

There is only one species of this family in the collection.
The larvæ of this species feed in stems of wheat and grasses.

Botanobia (Oscinis) frit (Linné).

Musca frit Linn. Fauna Suecica, 1761, p. 1851.

One specimen in very poor condition.

This European species occurs throughout the United States and Canada, extending into Alaska.

Locality: West of Konganevik, Camden bay, Alaska, July 4, 1914 (F. Johansen).

EXPLANATION OF PLATE VII.

- Fig. 1. *Simulium*, sp. 4, maxilla of larva.
 " 2. Same, labium of larva.
 " 3. Same, mandible of larva.
 " 4. *Simulium*, sp. 2, thoracic respiratory organ of pupa.
 " 5. *Psilotanypus*, sp.? caudal fin of pupa.
 " 6. *Rhamphomyia erinacioides*, apex of abdomen of male, lateral view.
 " 7. *Simulium*, sp. 4, antenna of larva.
 " 8. *Dolichopus dasyops*, antenna of male.
 " 9. Same, hypopygial lamella of male.
 " 10. *Psilotanypus*, sp.? thoracic respiratory organ of pupa, front view.
 " 11. Same, lateral view.
 " 12. *Simulium*, sp. 4, thoracic respiratory organ of pupa.
 " 13. *Simulium*, sp. 3, same as above.

EXPLANATION OF PLATE VIII.

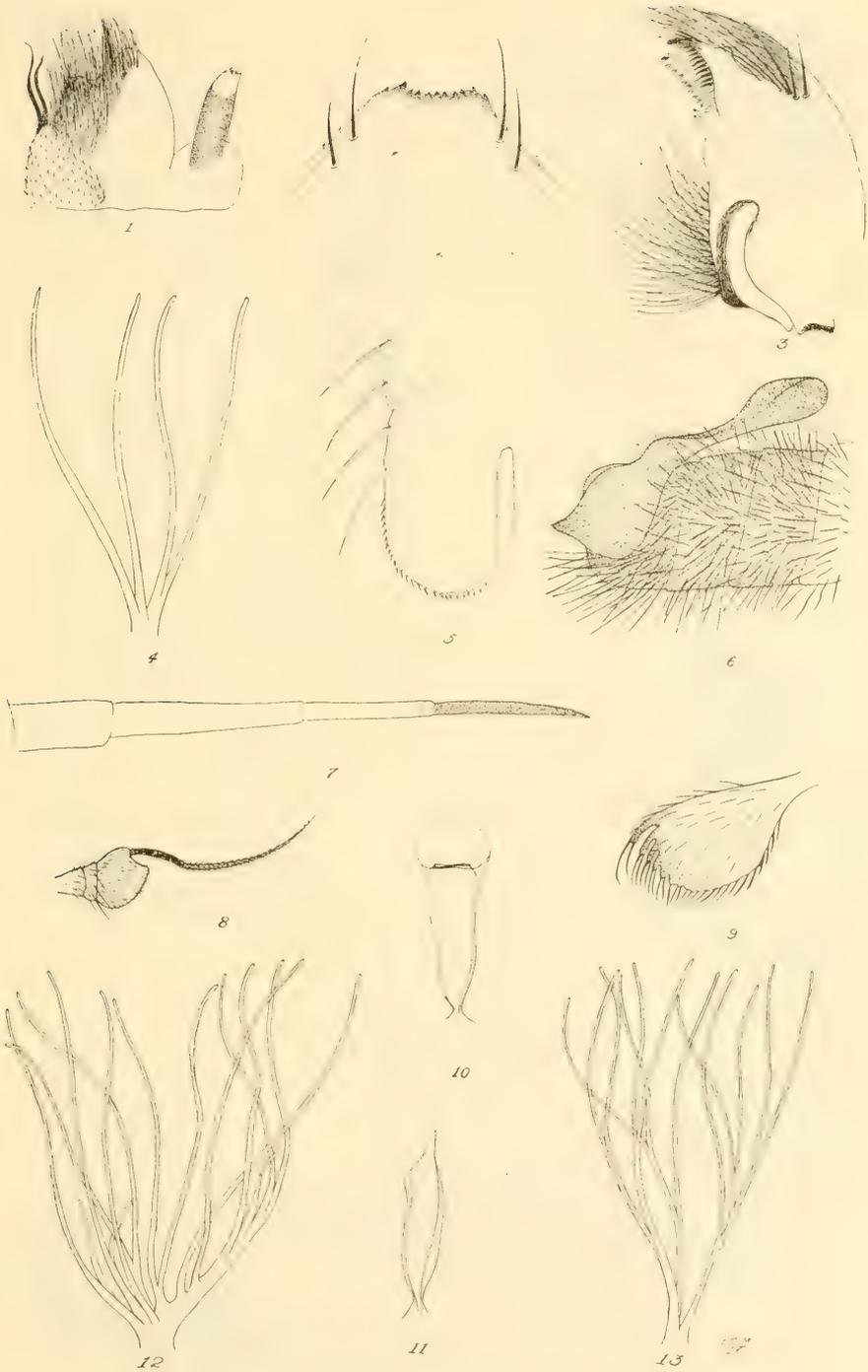
- Fig. 14. *Oedamagena tarandi*, anal spiracles of larva, one outlined only.
 " 15. *Euphorocera gelida*, spiracles of puparium.
 " 16. *Cephenomyia* sp.? cephalopharyngeal skeleton of larva, dorsal view of one-half.
 " 17. *Oedamagena tarandi*, larva, dorsal view.
 " 18. *Cephenomyia* sp.? caudal end of larva.
 " 19. *Phormia cærulea*, lateral view of head of male.
 " 20. *Leptocera transversalis*, wing.
 " 21. *Peleteria arctica*, head of female, lateral view.

EXPLANATION OF PLATE IX.

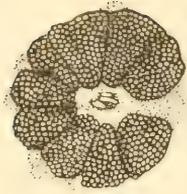
- Fig. 22. *Mydæina obscura*, puparium, lateral view.
 " 23. Same, anal spiracles.
 " 24. Same, cephalopharyngeal skeleton of larva, lateral view.
 " 25. Same, apical segment of larva, dorsal view.
 " 26. Same, antepenultimate segment of larva, lateral view.
 " 27. *Aricia borealis*, posterior tibia of male, lateral view.
 " 28. *Mydæina obscura*, head of male, lateral view.
 " 29. Same, fifth sternite of male, ventral view.
 " 30. *Pogonomyioides atrata*, posterior portion of cephalopharyngeal skeleton of larva, lateral view.
 " 31. *Mydæina obscura*, apex of male abdomen, lateral view.

EXPLANATION FOR PLATE X.

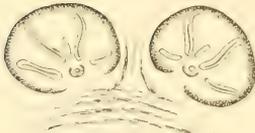
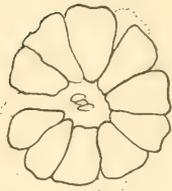
- Fig. 32. *Alliopsis*, sp.? head of female, lateral view.
 " 33. *Alliopsis obesa*, head of male, lateral view.
 " 34. *Gonatherus atricornis*, head of female, lateral view.
 " 35. *Scatophaga sullia*, fifth sternite of male, ventral view.
 " 35a. *Scatophaga lutaria*, same as above.
 " 36. *Allomyia unguiculata*, apical segments of abdomen of male, ventral view.
 " 37. Same, antenna, lateral view.
 " 38. Same, apical segments of abdomen of male, lateral view.
 " 39. *Hylemyia acrostichalis*, fifth abdominal sternite of male, ventral view.
 " 40. Same, hypopygium of male, one side, caudal view.



Diptera collected by the Canadian Arctic Expedition, 1913-16.
(Excluding the Tipulidæ and Culicidæ).



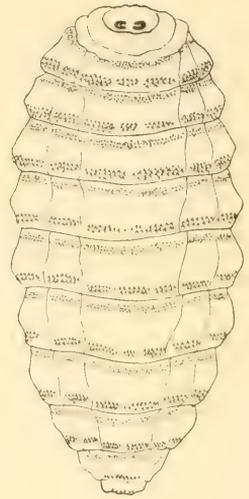
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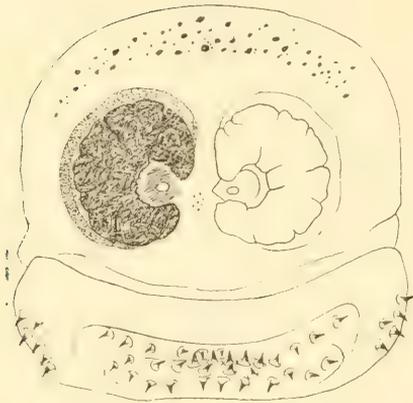
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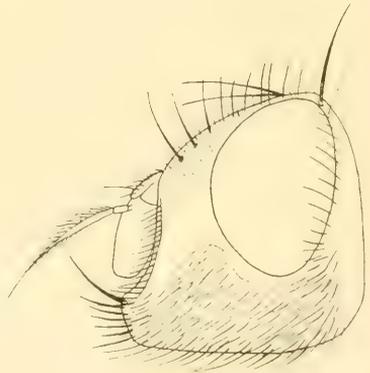
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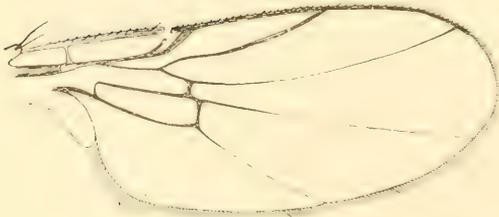
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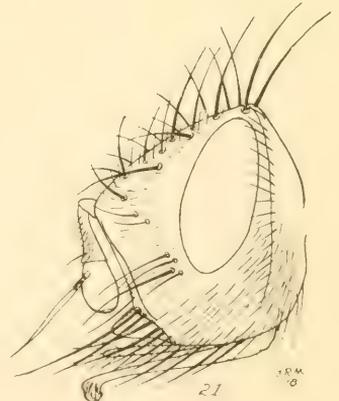
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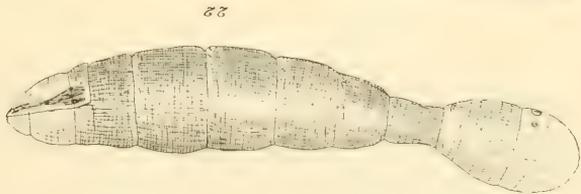
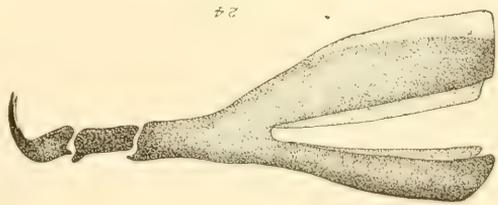
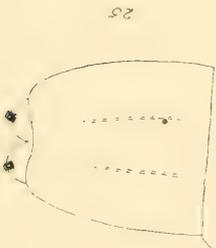
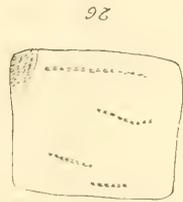
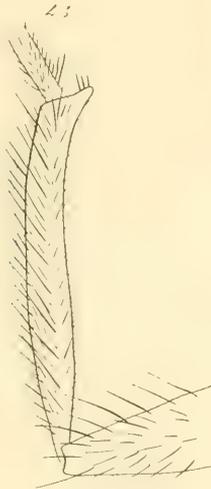
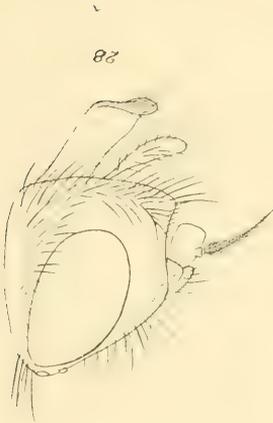
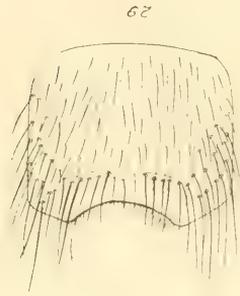
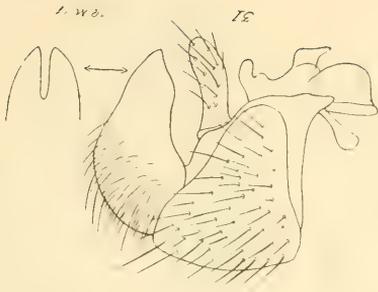


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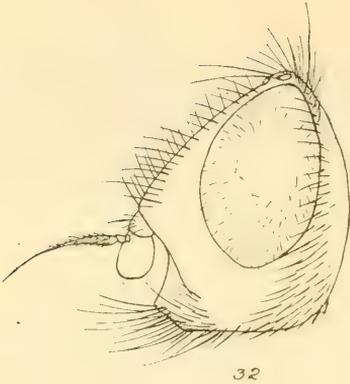
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Diptera collected by the Canadian Arctic Expedition, 1913-16.
(Excluding the Tipulidae and Culicidae).

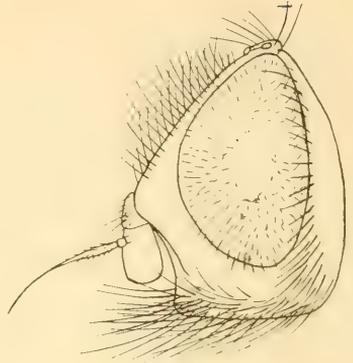
PLATE IX.



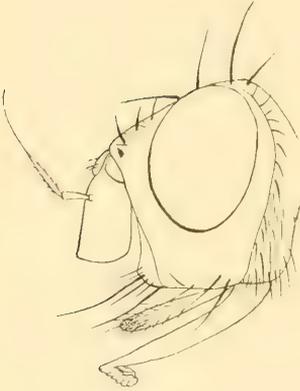
Diptera collected by the Canadian Arctic Expedition, 1913-16.
(Excluding the Tipulidæ and Culicidæ).



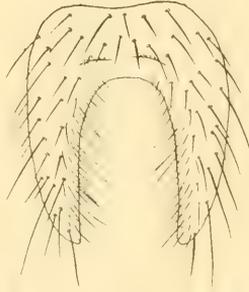
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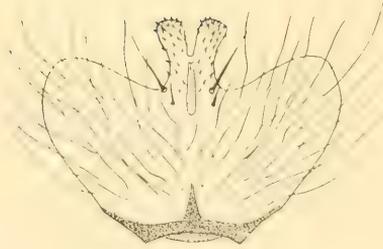
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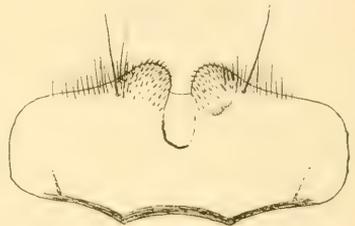
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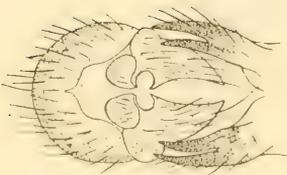
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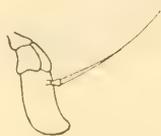
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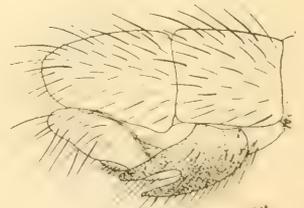
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Diptera collected by the Canadian Arctic Expedition, 1913-16.
(Excluding the Tipulidæ and Culicidæ).

REPORT
OF THE
CANADIAN ARCTIC EXPEDITION
1913-18

VOLUME III: INSECTS

PART A: COLLEMBOLA

By JUSTUS W. FOLSOM

SOUTHERN PARTY—1913-16



OTTAWA
J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1919

Issued July 10th, 1919

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Collembola of the Canadian Arctic Expedition, 1913-18.

By JUSTUS W. FOLSOM

Of the University of Illinois.

This is a report on the Collembola obtained by the Canadian Arctic Expedition, 1913-16. The material, collected by Mr. F. Johansen, consisted of numerous well-preserved specimens, in excellent condition for study, and comprised the following twelve species:—

Podura aquatica L.
Achorutes tullbergi Schäf.
Achorutes sensilis, n. sp.
Achorutes armatus (Nic.)
Onychiurus duodecimpunctatus, n. sp.
Tetracanthella wahlgreni Axels.
Folsomia quadrioculata (Tull.).
Isotoma viridis Bourl.
Isotoma palustris (Müll.).
Entomobrya comparata, n. sp.
Lepidocyrtus cyaneus Tull.
Sminthurides aquaticus (Bourl.).

The types and other specimens upon which this report is based are deposited in the National Collection of Insects, Ottawa.

Podura aquatica Linnaeus.

Plate 1, figs. 1-3.

Podura aquatica—Linnaeus, 1758.—Nicolet, 1841.—Tullberg, 1871, 1872.—Lubbock, 1868, 1873.—Packard, 1873.—Parona, 1879, 1882.—Dalla Torre, 1888, 1895.—Uzel, 1890.—MacGillivray, 1891.—Schött, 1894, 1902.—Reuter, 1895.—Schäffer, 1896, 1900a, 1900b.—Lie-Pettersen, 1896.—Poppe and Schäffer, 1897.—Scherbakov, 1898b.—Carl, 1899, 1901.—Wahlgren, 1899c, 1906a.—Carpenter and Evans, 1899.—Absolon, 1900, 1901.—Willem, 1900.—Börner, 1901a.—Krausbauer, 1901.—Agren, 1903.—Guthrie, 1903.—Axelson, 1906.—(Axelson) Linnaniemi, 1907, 1912.—Folsom, 1916.

Hypogastrura aquatica Bourlet, 1839.
Hydropodura aquatica Börner, 1901b, 1902.
Podura granulata MacGillivray, 1893.

Blackish blue; antennae and legs reddish brown; furcula pale brown. Head hypognathous. Eyes 8 + 8. Ocular areas with conical elevations between the eyes. Postantennal organs apparently absent, represented externally by minute rudiments. Antennæ shorter than the head, stout, cylindrical, with segments about as 4:5:6:7 in relative lengths. Olfactory hairs of fourth antennal segment absent. Sense organ of third antennal segment consisting of a pair of short stiff setæ. Body short and stout. A dorsal subsegment occurs on the anterior part of each body segment except the ninth. Unguis (fig. 1) very long, longer than the tibio-tarsus, slender, curving, unidentate behind the

middle of the inner margin. Unguiculus represented only by a toothlike rudiment. Tenent hair single, unknobbed. Rami of tenaculum quadridentate. Furcula very long, extending as far as the first pair of legs, clearly appended to the fourth abdominal segment. Manubrium short. Dentes long, strongly bowed outward, apically convergent, with an obsolete transverse suture two-fifths from the base, and with the tubercles of the distal third arranged in transverse rings. Mucrones (figs. 2, 3) three-fifths as long as hind ungues, with outer and inner lamellæ, and with a prominent dorsal rounded-triangular basal lobe. Anal spines absent. Body clothing of few minute curving setæ; dens with 12 to 17 long curving dorsal setæ, most of which are in two longitudinal series. Integument tuberculate. Length, 1.3 mm.

Podura aquatica, one of the most abundant collembolans in Europe and North America, occurs on the surface of standing water on the margins of ponds and streams, having special structural adaptations for a semi-aquatic life. It swarms on vegetation or rubbish along the shore, and at times is blown against the shore in masses of enormous numbers. This species often appears in fresh-water aquaria, and is essentially a fresh-water species, though it has been found occasionally in pools of brackish water on the seashore.

The species has been recorded from Siberia. From Canada, I have specimens taken at Arnprior, Ont., May 19, 1917, by Mr. Charles Macnamara.

Great numbers on ponds, Demarcation point, Alaska, May 16, 1914; abundant, large and small, at Bernard harbour, Dolphin and Union strait, Northwest Territories, June 25, 1915. F. Johansen.

Achorutes tullbergi Schäffer.

Plate 1, figs. 4-10; plate 2, fig. 11.

Achorutes dubius Tullberg, 1876.—Uzel, 1890.—Schött, 1894.—Dalla Torre, 1895.—Schäffer, 1896.—Skorikow, 1900.

Achorutes dubius, var. *concolor* Carpenter, 1900.

Achorutes tullbergi Schäffer, 1900a.

Achorutes tullbergi, var. *concolor* Schäffer, 1900a.—Wahlgren, 1907.—Folsom, 1916.

Pigmented with irregular patches of dark blue pigment (typical form) or uniformly pigmented (var. *concolor*). Eyes (fig. 4) eight on each side. Postantennal organs (fig. 4) with four (sometimes five) peripheral tubercles. Antennæ shorter than the head, with segments as 6:7:9:9 in relative lengths. Sense organ of third antennal segment as in fig. 5. Ungues (fig. 6) stout, slightly curving; inner margin unidentate one third from apex. Unguiculi with setaceous prolonged outer margin and with the basal lamella suboblong on the second and third pairs of feet. Tenent hairs knobbed; 2,3,3, as a rule; occasionally 3,3,3, or 1,3,3. Mucrones (figs. 7-9) one-third dentes in length, apically rounded, with narrow outer lamella. Rami of tenaculum quadridentate. Anal spines (figs. 10, 11) two, half as long as hind ungues, arcuate, on prominent contiguous papillæ. Clothing of sparse short curving setæ, with longer setæ on the posterior part of the abdomen. Length, 2 mm.

The specimens collected by the Expedition belong to the variety *concolor* Carp., which has been taken hitherto in Franz Josef Land, Ellesmere land, Bohemia and Massachusetts. The typical form of the species has been reported from Nova Zembla, Spitzbergen and Siberia.

Several specimens on ponds and from rotten driftwood, Bernard harbour, Northwest Territories, May, 25, 1916, June 18, 19, 1915; also several under driftwood, Demarcation point, Alaska, May 16, 1914. F. Johansen.

Achorutes sensilis, n. sp.

Plate 2, figs. 12-18.

Uniform dark blue. Eyes 8 + 8. Postantennal organs (fig. 12) small, slightly longer than the diameter of an eye, with four peripheral tubercles. Antennæ shorter than the head, with segments in relative lengths about as 5:6:7:7. Third antennal segment with many distal lateral sensory setæ (fig. 13). Unguis (fig. 14) long, slender, feebly curving, unidentate two-fifths from the apex. Unguiculus extending one-half as far as the unguis, with proximal half subovate and distal half acuminate. One long knobbed tenent hair. All the distal tibio-tarsal setæ are apically bent and minutely knobbed. Rami of tenaculum tridentate. Dentes three times as long as mucrones, each with a long curving subapical dorsal seta. Muero about as long as hind unguiculus, variable in form (figs. 15, 16), with broad outer lamella and narrow inner lamella. Anal spines (fig. 17) short, stout, feebly curving, one-fifth as long as hind unguis, on contiguous papillæ one-third as long as the spines. Clothing (fig. 18) of few short stout curving setæ and longer stout suberect setæ, the latter often feebly dentate. Maximum length, 2.2 mm.

I regarded this form as being *A. viaticus* Tullberg, until I found the peculiar sense organs of the third antennal segment. In *viaticus*, of which I have many European specimens, the sense organ of the third antennal segment is as in figure 19, with a pair of sense rods, a single finger-like accessory seta, and one guard seta. In this new species there are, however (fig. 13), two pairs of sense rods, each pair with the usual basal ridge; also a distal ovate petiolate papilla, seated in a pit and covered basally with an integumentary fold; and in addition as many as nine lanceolate accessory sensory setæ, with five guard setæ—a wide departure from the condition typical for the genus. The other differences between the two species are of minor importance. In *sensilis*, as compared with *viaticus*, there are not three long knobbed tenent hairs; the tenaculum is not quadridentate; and the anal spines are somewhat shorter, stouter, and less curving. The clothing is of the same general type in the two species; the stout suberect setæ of the body being, however, somewhat shorter than in *viaticus* (compare fig. 18 with fig. 20).

This species occurred in masses on the surface of a pond at Bernard harbour, Northwest Territories, July 5, 1916. F. Johansen.

Achorutes armatus (Nicolet).

Plate 3, figs. 21-25.

Podura armata Nicolet, 1841.

Achorutes armatus Gervais 1844.—Nicolet, 1847. Lubbock, 1868, 1873.—Tullberg, 1871, 1872, 1876.—Parona, 1879, 1882, 1888, 1895.—Tömösváry, 1883.—Oudemans, 1890.—Uzel, 1890, 1891.—MacGillivray, 1891.—Schött, 1891, 1894, 1896, 1902.—Moniez, 1894.—Dalla Torre, 1895.—Reuter, 1895.—Meinert, 1896.—Schäffer, 1896, 1897, 1900a, 1900b.—Carpenter, 1897.—Lie-Pettersen, 1896, 1898.—Pope and Schäffer, 1897.—Scherbakov, 1898b, 1899a.—Carl, 1899, 1901.—Carpenter and Evans, 1899.—Wahlgren, 1900a.—Börner, 1901a.—Krausbauer, 1902.—Willem, 1902.—Agren, 1903, 1904.—Axelson, 1905a, 1905b, 1906.—(Axelson) Linnaniemi, 1907, 1909.—Collinge and Shoebbotham, 1910.—Imms, 1912.—Shoebbotham, 1914.—Folsom, 1916.

Achorutes boletivorus Packard, 1873.—MacGillivray, 1891.—Dalla Torre, 1895.—Guthrie, 1903.

Achorutes marmoratus Packard, 1873.—MacGillivray, 1891.—Harvey, 1893.

Achorutes texensis Packard, 1873.—MacGillivray, 1891.—Dalla Torre, 1895.

Achorutes pratorum Packard, 1873.—MacGillivray, 1891.—Dalla Torre, 1895.

Hypogastrura armata (Axelson) Linnaniemi, 1911, 1912.—Caroli, 1914.

Very variable in colouration. General colour vinaceous, pale violet, greenish grey, or dark blue. One variety is canary yellow marbled with lavender, with two dorsal stripes of the latter colour. The dorsum is commonly mottled or marbled, and the pleura and sternum are pale yellow with round spots made by hypodermal nuclei. A large interocular spot occurs. Ocular patches conspicuous, black. Eyes eight on each side. Postantennal organs (fig. 21) large, with four unequal peripheral tubercles. Antennæ shorter than the head; segments in relative lengths as 5:4:5:6; fourth segment with seven sensory hairs: two outer, two inner, and three dorsal. Between the third and fourth antennal segments is a large ventral eversible bilobed sac. Body stout; abdomen feebly dilated. Unguis (fig. 22) long, slender, slightly curving, unidentate near the middle of the inner margin; lateral margins each unidentate one-fourth from the base. Unguiculus with suboblong basal lamella and setaceous apex, extending almost as far as the tooth of the opposite claw. One long tenent hair, unknobbed. Dentes stout, subcylindrical. Mucrones (fig. 23) half as long as dentes, apically rounded; inner lamella narrow, simple; outer lamella with a large subtriangular dorsal lobe. Anal spines (fig. 24) long, a little longer than the unguis in adult specimens, slender, curving, on large contiguous papillæ, which are one-third to one-half as long as the spines. Clothing (fig. 25) dense, consisting of abundant short setæ and numerous long hairs and setæ, which are frequently serrate. Length, 1.5 mm.

The synonymy of this species I have discussed in a previous paper (Folsom, 1916).

The specimens collected by the Expedition were all of the dark blue variety.

Achorutes armatus, one of the most abundant species of its genus, occurs in large colonies in a great variety of situations; under the loose moist bark of logs, on damp soil under wood or dead leaves, underground among the roots of grasses or other plants, in moss, on pools of fresh water. This species is the one commonly found on fungi, particularly agarics, though it occurs on *Boletus*, *Polyporus*, *Morchella* and other genera as well.

This is one of the most widely distributed species of Collembola. It occurs in all parts of Europe, in Siberia, Spitzbergen, Greenland, Northern Africa (Tripoli), Sumatra, Ceylon, New Zealand, Brazil, Paraguay, Uruguay, Chile, and doubtless throughout the United States. In Canada it has been taken at Arnprior, Ont., in September, by Mr. Charles Macnamara.

Several specimens on ponds, Bernard harbour, Northwest Territories, May 25, 1916; June 18, 25, 1915. Abundant in moss in swamp, Pihumalerksiak island (Cockburn point), Dolphin and Union strait, Northwest Territories, July 15, 1916. F. Johansen.

***Onychiurus duodecimpunctatus*, n. sp.**

Plate 3, figs. 26-30; plate 4, figs. 31, 32.

White. Postantennal organs (fig. 26) elongate, with simple tubercles numbering 32 in one example and 44 in another. Pseudocelli of antennal bases (fig. 27) 6 + 6 (two specimens) or 5 + 5 (one specimen); of posterior border of head 4 + 4 (two specimens) or 5 + 5 (one specimen). Antennæ subequal to head in length. Sense organ of third antennal segment (fig. 28) with five papillae, five guard setae, a pair of sense rods, and two capitate tuberculate sense clubs. Pseudocelli of body (fig. 29) as follows—Prothorax: dorsal, 0; lateral, 1 + 1. Mesothorax: dorsal, 2 + 2; lateral, 1 + 1. Metathorax: dorsal, 2 + 2; lateral, 1 + 1. First abdominal segment: dorsal, 4 + 4. Second abdominal, 4 + 4 (two specimens) or 5 + 5 (one specimen). Third, 5 + 5 (2 spms.) or 4 + 4 (1 spm.). Fourth, 6 + 6 (2 spms.) or 5 + 5 (1 spm.). Fifth, 5 + 5 (2 spms.) or 4 + 4 (1 spm.). Sixth, 0.

Unguis (fig. 30) slender, curving, unidentate beyond the middle of the inner margin. Unguiculus exceeding the unguis, slender, gradually tapering from the base into a fine filament. Anal spines (fig. 31) two, feebly curving, half as long as hind unguis, on separated papillae, one-fourth as long as the spines. Clothing (fig. 32) of short curving simple setae, with long erect simple sensory setae. Length, 2.4 mm.

This species belongs near the common *armatus* Tullberg, and comes nearest to *octopunctatus* Tullberg, a rarely recorded species that has never been fully described. If the form here described proves to agree with *octopunctatus* in respect to pseudocelli and the minute structure of the antennal sense organs, it should be regarded as a variety of that species.

Three cotypes, from rotten driftwood at Bernard harbour, Northwest Territories, June 19, 1915. F. Johansen.

Tetracanthella wahlgreni Axelson.

Plate 4, figs. 33-37; plate 5, figs. 38-41.

Tetracanthella pilosa Schött, 1894 (part), 1902 (part).—Lie-Pettersen, 1896. Wahlgren, 1899b, 1900b, 1906b.—Axelson, 1900.

Tetracanthella coerulea Schäffer, 1900a, 1900b.

Tetracanthella wahlgreni (Axelson) Linnaniemi, 1907, 1912. Bagnall, 1914.

Dark blue. Body elongate, narrowing posteriorly (fig. 33). Eyes on black patches, 8 + 8 (fig. 34); the two inner proximal eyes of each side smaller than the others; the three posterior eyes in a group apart from the five anterior. Postantennal organs (fig. 34) elongate, subelliptical, eight or nine times as long as broad, and four times as long as the diameter of an adjacent eye; sometimes constricted near the middle. Antennae shorter than the head, with segments in relative lengths about as 9:13:10:19. Sense organ of third antennal segment (fig. 35) consisting of a pair of slender curving sense rods, subtended by a thick chitinous ridge, and covered with an integumental fold. Fourth antennal segment with subapical papilla and with slender curving sensory setae. Second, third, and fourth abdominal segments subequal in length dorsally. Genital and anal segments confluent, bearing two pairs of spines (figs. 36, 37). Posterior spines a little longer than hind unguis, feebly curving, on stout papillae almost half as long as the spines. Anterior spines similar to the posterior, but a little shorter. Ano-genital segment with long stiff hairs projecting beyond the apex of the abdomen, which are simple in some specimens but apically bent and knobbed in others. Anus ventral. Unguis stout, untoothed (fig. 38). Unguiculus extending half to three-fifths as far as the unguis, lanceolate, acuminate. Clavate tenent hairs two, extending as far as, or farther than, the unguis. Femur with a single long clavate hair (fig. 33). Furcula short, appended to the fourth abdominal segment, and extending to the posterior margin of the third. Manubrium stout, with several pairs of dorsal setae (fig. 39). Muero and dens not demarkated from each other. Muero-dentes convergent, in form as in figs. 39 and 40; each with three setae: two dorsal and one ventral. Rami of tenaculum bidentate (fig. 39); corpus with a single stout seta. General clothing of few short equal curving simple setae in the middle region of each segment, with long outstanding simple sensory setae in a single transverse series on most of the body segments (fig. 41). Cuticula not tuberculate, but figured. Length, 1.8 mm.

The term *figured*, as applied to the cuticula, means that the integument is divided into minute polygonal areas.

In two specimens the long distal hairs of the abdomen were simple; in one specimen, however, they were distinctly bent apically, with a minute terminal knob, as in my fig. 36. Linnaniemi ('12, p. 104), not having seen these clavate hairs as described by Schött, suggested that the appearance of terminal knobs was due to adherent particles of foreign matter.

As Linnaniemi ('12, p. 102) has shown, the original descriptions of *Tetracanthella pilosa* by Schött were based upon two distinct species; now known respectively as *pilosa* and *wahlgreni*. The specimens that I have studied agree accurately with the description and figures given by Linnaniemi of the latter species.

He says that in Finland *T. wahlgreni* lives under moss and lichens, as well as under stones, on the rocky summits of the mountains, where it may almost always be found, not infrequently in considerable numbers. Sometimes it can be taken also on the surfaces of pools of water. It has made its appearance early in summer, before the snows have melted on the mountain tops. Common as the species is on the summits of the mountains, it is seldom found in the timber region, but oftener, however, in the subalpine zone.

T. wahlgreni has been reported from Norway, Sweden, Finland (north of the Arctic circle), Spitzbergen and Bear island, and is essentially Arctic in its distribution.

Four specimens (one spoiled by dissection), on the surface of a pond in a swamp, Bernard harbour, Northwest Territories, June 18, 1915. F. Johansen.

Folsomia quadrioculata (Tullberg).

Plate 5, figs. 42-47.

Isotoma quadrioculata Tullberg, 1871, 1872, 1876.—Stuxberg, 1887.—Uzel, 1890.—MacGillivray, 1891, 1896.—Moniez, 1891.—Schött, 1894, 1902.—Dalla Torre, 1895.—Reuter, 1895.—Lie-Pettersen, 1896, 1898, 1907.—Meinert, 1896.—Schäffer, 1896, 1900a, 1900b.—Poppe and Schäffer, 1897.—Lubbock, 1898.—Scherbakov, 1898a, 1898b.—Carl, 1899, 1901.—Wahlgren, 1899b, 1900a, 1900b, 1906a, 1906b.—Absolon, 1900.—Skorikow, 1900.—Börner, 1901a.—Krausbauer, 1902.—Agren, 1903, 1905.—Guthrie, 1903.—Axelson, 1904, 1905b, 1906.—Evans, 1908.

Isotoma (Folsomia) quadrioculata Axelson, 1905a.

Folsomia quadrioculata (Axelson) Linnaniemi, 1907, 1909, 1911, 1912.—Collinge and Shoebottom, 1910.

Dull grey to greyish black, pigmented with blackish spots of irregular form, size and distribution. Small specimens may be white, or white with scattered spots of greyish blue. Large specimens are often blackish, mottled with white, or unpigmented, spots; pale across the intersegmental regions and ventrally; with antennæ, legs and manubrium pigmented, and dentes unpigmented. Eyes 2 + 2 (fig. 42), one behind the other, each with its separate pigment spot, the posterior eye being the smaller. Postantennal organs (fig. 42) long, narrow, with parallel sides, feebly curving. Antennæ varying from a little shorter to a little longer than the head; second segment a little longer than the third; fourth segment two to three times as long as the first. Sense organ of third antennal segment as in fig. 43. Fourth antennal segment with slender curving sensory setæ, much like the other setæ. Body stout. Fourth, fifth, and sixth abdominal segments ankylosed; with a trace of a dorsal suture between the fourth and fifth segments. Anus ventro-caudal. Unguis (fig. 44) stout, curving, simple, without teeth. Unguiculus small, extending a little less than half as far as the unguis, lanceolate, pointed, untoothed. Tenent hairs absent. Furcula appended to the fourth abdominal segment, short, extending almost to the posterior margin of the second abdominal segment. Manubrium (fig. 45) with two pairs of ventro-apical chitinous hooks between the bases of the dentes. Dentes (fig. 46) stout, slightly tapering, with a few crenulations near the middle of the dorsal region. Mucrones (fig. 46) bidentate: apical tooth hooked; anteapical tooth usually larger than the other, erect or curving slightly forward. Rami of tenaculum quadridentate; corpus with a single stout curving seta. Clothing of simple-setæ (fig. 47) of three kinds: (1) moderately long stiff dense setæ,

slanting backward; absent on the anterior and posterior regions of the intermediate body segments; (2) fewer setae, suberect or curving forward; (3) long slender outstanding sensory setae. Length, 1.5 mm.

The specimens collected by the Expedition agree with my European examples of the species.

Folsomia quadrioculata occurs on damp ground under stones, wood or fallen leaves, in humus and in moss, under loose bark, in flower pots, and on the seashore under driftwood, stones or seaweed. The species is easily recognized by its broad body, characteristic dirty grey colour and slow movements. When disturbed it springs actively, in spite of its short furcula. In Finland it winters full grown and comes to life now and then on mild days; never appearing on the snow, however, but remaining among leaves or in moss in the woods (Linnaemi, '12).

This species, one of the commonest collembolans in northern and middle Europe, has been reported from the following Arctic localities: Nova Zembla, Spitzbergen, King Charles land, White island, Bear island, Jan Mayen and Greenland.

From Canada, I have received specimens recently from Mr. Charles Macnamara, taken by him in dead leaves, October, 1917, at Arnprior, Ont.

In the United States, the species has been recorded from Minnesota by Guthrie, some of whose specimens I have studied through the courtesy of Prof. Henry F. Nachtrieb.

Bernard harbour, Northwest Territories, on the surface of a pond, June 18, 1915 (2 specimens), July 9, 1915 (1 specimen). F. Johansen.

Isotoma viridis Bourlet.

Plate 6, figs. 48-52.

Isotoma viridis Bourlet, 1839.—Gervais, 1844.—Nicolet, 1847.—Lubbock, 1873.—Parona, 1879, 1883.—Schött, 1891, 1894, 1902.—Dalla Torre, 1895.—Reuter, 1895.—Lie-Pettersen, 1896, 1898, 1907.—MacGillivray, 1896.—Meinert, 1896.—Schäffer, 1896, 1900a, 1900b.—Poppe and Schäffer, 1897.—Scherbakov, 1898a, 1898b, 1899a.—Carl, 1899, 1901.—Absolon, 1900.—Carpenter and Evans, 1899.—Evans, 1901a, 1901b.—Wahlgren, 1899a, 1899b, 1900a, 1900b, 1906a, 1906b, 1907, 1909.—Kieffer, 1900.—Skorikow, 1900.—Willem, 1900.—Börner, 1901a, 1903, 1906.—Folsom, 1902.—Krausbauer, 1902.—Voigts, 1902.—Ågren, 1903, 1904.—Axelson, 1903, 1904, 1905a, 1906.—(Axelson) Linnaemi, 1907, 1909, 1911, 1912.—Guthrie, 1903.—Carpenter, 1907.—Collinge, 1910.—Collinge and Shoebottom, 1910.—Shoebottom, 1914.

Isotoma caerulea Bourlet, 1839.—Gervais, 1844.

Desoria virescens Nicolet, 1841.—Gervais, 1844.

Desoria cylindrica Nicolet, 1841.—Gervais, 1844.

Desoria viatica Nicolet, 1841.—Gervais, 1844.

Desoria pallida Nicolet, 1841.—Gervais, 1844.

Desoria ebriosa Nicolet, 1841.—Gervais, 1844.

Desoria annulata Nicolet, 1841.—Gervais, 1844.

Podura viridis Bourlet, 1843.

Podura annulata Bourlet, 1843.

Heterotoma chlorata Gervais, 1844.

Isotoma Desmarestii Gervais, 1844.

Isotoma virescens Nicolet, 1847.

Isotoma cylindrica Nicolet, 1847.

Isotoma viatica Nicolet, 1847.

Isotoma ebriosa Nicolet, 1847.

Isotoma annulata Nicolet, 1847.—Lubbock, 1873.—Parona, 1883.

Isotoma anglicana Lubbock, 1862, 1873

Isotoma palustris Tullberg, 1871, 1872, 1876.—Uzel, 1890.

Isotoma Belfragei Packard, 1873.—MacGillivray, 1891.

Isotoma tricolor Packard, 1873 (part).—MacGillivray, 1891 (part).

Isotoma purpurascens Packard, 1873.—MacGillivray, 1891.

Isotoma plumbea Packard, 1873.—MacGillivray, 1891.

Isotoma capitola MacGillivray, 1896.

Isotoma glauca MacGillivray, 1896.

Colour very variable: dark green, greenish yellow, dull yellow, lilac, blackish blue, reddish purple, leaden purple or dark brown; usually with small pale dorsal spots. Without longitudinal lines, in the typical form. Eyes 8 + 8, subequal (fig. 48). Postantennal organs (fig. 48) broadly elliptical, oval, or circular; shorter, to a little longer, than the diameter of an eye. Antennæ one and one-half to two times as long as the head, with segments in relative lengths about as 4:7:7:8. Sense organ of third antennal segment consisting of a pair of slender rods. Abdominal segments without ankylosis. Fourth abdominal segment slightly shorter than the third. Ungues (fig. 49) long, slender, slightly curving, with a pair of large lateral teeth, with inner margin bidentate, and with parallel basal folds. Unguiculus extending two-fifths to two-thirds as far as unguis, lanceolate, unidentate near the middle of the inner margin. Tenent hairs absent. Furcula strongly developed, appended apparently to the fifth abdominal segment. Dentes slender, gradually tapering, more than twice as long as manubrium, crenulate dorsally, with a distal bristle extending beyond the micro. Mucrones (fig. 50) falcately and subequally tridentate; second and third teeth opposite each other. Rami of tenaculum quadridentate (fig. 51); corpus with numerous ventral setæ. Clothing (fig. 52) of dense simple or feebly serrate setæ; with long outstanding fringed sensory setæ. Maximum length, 6 mm. (typical form); 7 mm. (var. *arctica*).

The specimens of this well-known species collected by the Expedition agree with my examples from Europe and the United States, but are under the maximum size, being not more than 3 mm. in length. In colour they are clear green with pale spots, or dark blue.

Having examined Packard's types in the Museum of Comparative Zoölogy, Cambridge, Mass., I agree with MacGillivray ('96, p. 58) that *Isotoma Belfragei*, *purpurascens*, *plumbea*, and the Massachusetts specimens of *tricolor*, all belong to *viridis* Bourlet. The Texas specimens, for which MacGillivray retained the name of *tricolor*, are *palustris* Müller.

Isotoma capitola MacG. is synonymous with *viridis* Bourl., as I have found from a cotype sent to me by MacGillivray.

The form referred by MacGillivray to *glauca* Packard is also *viridis* Bourl., and is specifically distinct from Packard's *glauca*.

Isotoma viridis is one of the most abundant collembolans, is the largest known species of its genus in North America and Europe, and may easily be recognized with the naked eye. It belongs primarily to the fauna of the humus, and occurs in almost any soil that is not too dry—in grass lands, woods, swamps, or cultivated fields—congregating under stones, pieces of wood, dead leaves or other protection, and in piles of garbage or manure. It occurs in moss, on pools of water, on the seashore under driftwood or seaweed, and in winter on the snow.

The typical form of *Isotoma viridis*, ranging throughout Europe and the United States, including Alaska, has been reported from the following Arctic localities: Siberia, Spitzbergen, Bear island, Jan Mayen, Iceland and Greenland.

One specimen under old drift-wood logs in tundra behind house at Collinson Point, Alaska, Sept 27, 1913. F. Johansen.

Two specimens, under driftwood, Demarcation point, Alaska, May 16, 1914. F. Johansen.

A few specimens, under loose stones, Bernard harbour, Northwest Territories, May, 1915. F. Johansen.

Isotoma viridis var. **riparia** Nicolet.

Desoria riparia Nicolet, 1841.—Gervais, 1844.

Isotoma riparia Nicolet, 1847.

Isotoma palustris var. *riparia* Tullberg, 1871.

Isotoma palustris Tullberg, 1872 (part).

Isotoma viridis var. *aquatilis* Schött, 1891.

Isotoma viridis var. *riparia* Schött, 1894, 1896, 1902.—Dalla Torre, 1895.—Reuter, 1895.—Schäffer, 1896, 1900a.—Poppe and Schäffer, 1897.—Lie-Pettersen, 1898.—Scherbakov, 1898a, 1898b.—Carl, 1899.—Wahlgren, 1899a, 1906a, 1906b.—Absolon, 1900.—Börner, 1901a.—Voigts, 1902.—Agren, 1903, 1904.—Axelson, 1903, 1905a, 1906.—(Axelson) Linnaniemi, 1907, 1909, 1911, 1912.

Ground colour yellowish, greenish or brownish. The principal characteristic of this variety is a dark blue or blackish median dorsal stripe. Dark spots on the sides of the body segments may or may not be present. Maximum length, 5 mm.

The specimens of *I. viridis riparia* collected by the Expedition are yellowish or greenish, pale ventrally, with or without the lateral dark spots and with the median stripe complete, or fading out posteriorly. Length, 2.5 mm.

This variety prefers humid situations, and is found under damp wood, in moss, on the surface of fresh water, along the shores of ponds or streams and on the seashore under seaweed, driftwood or stones.

The variety *riparia* ranges over north and middle Europe, and has been recorded from Arctic Siberia.

In Canada, Mr. Charles Macnamara has taken this variety at Arnprior, Ont., in March and April.

In the United States, the variety is known to me from New Hampshire, New York, Virginia, and Texas, at present.

A few specimens under loose stones, Bernard harbour, Northwest Territories, May, 1915. F. Johansen.

Isotoma palustris (Müller).

Plate 6, figs. 53-57.

Podura palustris Müller, 1776.—Gmelin, 1778-93.—Bourlet, 1843.

Isotoma palustris Lubbock, 1873.—Reuter, 1876 (part), 1890, 1891, 1895.—Reuter, L. and O. M., 1880.—Tömösváry, 1882.—Parona, 1885, 1895.—Oudemans, 1888.—Dalla Torre, 1888, 1895.—Uzel, 1890, 1891.—Parfitt, 1891.—Schött, 1891, 1894, 1896, 1902.—Lie-Pettersen, 1896, 1898, 1907.—MacGillivray, 1896.—Schäffer, 1896, 1898, 1900a, 1900b.—Poppe and Schäffer, 1897.—Scherbakov, 1898a.—Carl, 1899, 1901.—Carpenter and Evans, 1899.—Absolon, 1900.—Börner, 1901a, 1902.—Krausbauer, 1902.—Agren, 1903.—Guthrie, 1903.—Wahlgren, 1906b, 1907.—Collinge, 1910.—Collinge and Shoebottom, 1910.—Shoebottom, 1914.

Isotoma tricolor Packard, 1873 (part).—MacGillivray, 1891 (part), 1896.

Isotoma aquatilis Lubbock, 1873 (part).—Parona, 1883.

Isotoma Stuxbergii Tullberg, 1876 (part).

Isotoma Tullbergi Moniez, 1889.

Isotoma Stuxbergi Moniez, 1891.

Isotoma aequalis MacGillivray, 1896.

Isotomurus palustris Börner, 1903, 1906.—Axelson, 1905a, 1906.—(Axelson) Linnaniemi, 1911, 1912.—Imms, 1912.

Very variable in colouration. The typical form is yellowish or greenish with blue, purple or blackish pigment; having a median dorsal stripe with irregular margins; and frequently lateral spots, which may coalesce to form a stripe on each side of the body. Head often with a dorsal lunate or anchor-

shaped spot. Eyes 8 + 8 (fig. 53) subequal; or two inner proximal eyes of each group a little smaller than the others. Postantennal organs (fig. 53) near the eyes, elliptical, slightly longer than, to twice as long as, the diameter of an adjacent eye. Antennæ once and one-half to twice as long as the head, with segments in relative lengths about as 3:4:5:6. Sense organ of third antennal segment with a pair of linear feebly curving sense rods, a thick basal ridge, and two guard setæ. Very short curving sensory setæ occur on all the antennal segments as follows: segment 1, 2-5; 2, 3-7; 3, 3-7; 4, 10-15. On the first three segments these are on the under side near the distal outer end; on the fourth segment they occur on the distal half along the outer side (Ågren, '02). Mesonotum almost covering the pronotum. Third abdominal segment a little longer than the fourth (about as 5:4). Abdominal segments without ankylosis. Unguis (fig. 54) stout, curving, with a pair of small lateral teeth, and with inner margin untoothed. Unguiculus broadly lanceolate, with inner lamella roundly dilated basally, untoothed as a rule, extending a little beyond the middle of the unguis. Tenent hairs absent, represented by a single long simple hair. Furcula apparently appended to the fifth abdominal segment, and extending to the anterior border of the ventral tube. Dentes twice as long as manubrium, slender, gradually tapering, crenulate dorsally. Mucro two-thirds as long as hind unguis, quadridentate (fig. 55). Apical tooth small, at the base of the second tooth; second and third teeth dorsal, large, subequal, subconical, slightly hooked, in longitudinal alignment; fourth tooth lateral, oblique, acute, extending almost half the length of the mucro. Basal lateral mucronal seta present. Rami of tenaculum quadridentate (fig. 56); corpus with many (fifteen or more) ventral setæ. General clothing of abundant short simple setæ (fig. 57). Long outstanding feathered sensory setæ occur on the last five abdominal segments; there being one or two pairs of these on each of the segments, and sometimes three pairs on the fourth abdominal segment. Length, 3 mm.

Packard's six cotypes of his *Isotoma tricolor*, from Waco, Texas, in the Museum of Comparative Zoölogy, Cambridge, Mass., for which MacGillivray ('96, p. 48) retained the name of *tricolor*, I found to be *palustris*. In the same tube with them were five specimens of *Isotoma viridis*, from Salem, Mass.

I. aequalis MacG. is also *palustris*, as I have found from a study of a cotype sent to me by MacGillivray.

Isotoma palustris lives in moist places, and is especially abundant along the edges of ponds and streams, frequenting the vegetation in preference to the water, though it is at home on the surface of the water, where it leaps vigorously and repeatedly. The species occurs on the seashore also, under seaweed, driftwood or stones, and is sometimes found on the snow.

This is one of the dominant species of its order. It is cosmopolitan in distribution, everywhere common, and highly variable in colouration, several varieties having received names. The typical form of the species is known from all parts of Europe, from Canada and the United States, Azores islands, India, and Java; the recorded Arctic distribution being as follows: Siberia, Nova Zembla, Spitzbergen, Bear island.

Isotoma palustris var. *prasina* Reuter.

Plate 6, figs. 53-57.

Isotoma Stuxbergi var. *prasina* Reuter, 1891.

Isotoma palustris var. *prasina* Schött, 1894.—Dalla Torre, 1895.—Reuter, 1895.—MacGillivray, 1896.—Schäffer, 1896, 1898, 1900a, 1900b.—Pope and Schäffer, 1897.—Carl, 1899, 1901.—Carpenter and Evans, 1899.—Wahlgren, 1899c, 1906b.—Börner, 1901a.—Krausbauer, 1902.—Ågren, 1903.

Isotoma palustris var. *pallida* Schäffer, 1896.—Börner, 1901a.—Krausbauer, 1902.

Isotomurus palustris var. *prasina* Axelson, 1905a, 1906.—Wahlgren, 1907.—(Axelson) Linnaniemi, 1907, 1911, 1912.

Yellowish green or pale yellowish, varying sometimes into yellowish red or brownish; unicolorous, or with a trace of the median dorsal stripe. Length as great as 4.5 mm.

The specimens collected by the Expedition are uniform olive green in colour, with paler furcula. In some specimens the median dorsal stripe is represented, varying from a mere trace to a well-developed line, on head and body. In some instances the posterior borders of the body segments are edged narrowly with blackish. Maximum length, 3 mm.

These specimens, which I feel obliged to refer to the species *palustris*, differ from typical European and North American examples of the species in having more slender unguis, relatively shorter mucrones, unidentate unguiculi, and particularly in lacking the characteristic long fringed sensory setæ. Furthermore, some of the largest of the curving body-setæ are feebly denticulate. In other respects the specimens agree with *palustris*, as is evident from my figs. 53-57.

The variety *prasina* has been recorded from northern and middle Europe, Bismarck archipelago, Siberia, Nova Zembla, and Ellesmere land.

Many specimens: on ponds at Bernard harbour, Northwest Territories, May 25, 1916, June 16, 18, 25, July 9, 1915; under driftwood, Demarcation point, Alaska, May 16, 1914. F. Johansen.

Entomobrya comparata, n. sp.

Plate 7, figs. 58-63.

This form, like most other species of its genus, varies greatly in colouration. Though the colour varieties intergrade, I have placed them in the following three groups for the purposes of description:—

(1) Pale lemon yellow, including antennæ and legs; furcula white. Eyespots black; also basal antennal ring and a transverse band connecting the eyespots and the bases of the antennæ.

(2) Lemon yellow, with black antennal rings and interocular band, and black median subrescentic spot behind the eyes (fig. 58). Anal segment black dorsally. Antennæ purplish distally. Legs and furcula yellow. This is the commonest form in the collection.

(3) General colour brownish yellow, faintly and minutely mottled with pigment. Segments bordered narrowly with black, as well as the posterior border of the fourth abdominal segment, as in fig. 59. Anal and genital segments black dorsally. Fourth and fifth abdominal segments with a variable amount of pigment ventrally. First antennal segment blackish apically; remaining segments blackish. Femora and tibio-tarsi pigmented distally, and the manubrium dorsally.

Eyes 8 + 8, unequal (fig. 60). Antennæ a little more than twice-as long as the head, with segments in relative lengths about as 4:10:9:12. Abdominal segments in relative lengths as 13:19:14:40:6:4. Fourth abdominal segment therefore about three times as long as the third. Unguis (fig. 61) with a pair of lateral teeth and with inner margin tridentate in profile; all three teeth being actually doubled, however. Unguiculus extending a little beyond the middle of the unguis, broadly lanceolate, simple. One clavate tenent hair. Dentes one third longer than manubrium. Mucrones half as long as hind unguiculi, of the usual form (fig. 62). Rami of tenaculum quadridentate; corpus with one stout curving seta (fig. 63). General clothing of dense short curving fringed setæ. Dorsum of head and body with dense clavate fringed setæ, less abundant on the last three abdominal segments. Antennæ and legs densely setaceous. A few long fringed sensory setæ occur as usual. Length, 1.7 mm.

It is possible that this form is simply a variety of one of the numerous described species of *Entomobrya*, though it does not agree accurately with any published description that I have seen, or with any of the numerous European species in my collection.

Several specimens under driftwood on tundra, Demarcation point, Alaska, May 16, 1914. F. Johansen.

Many specimens under loose stones, Bernard harbour, Northwest Territories, May 1915. F. Johansen.

Lepidocyrtus cyaneus Tullberg.

Plate 7, figs. 64-66.

Lepidocyrtus cyaneus Tullberg, 1871, 1872, 1876.—Reuter, 1876.—Reuter, L. and O. M., 1880.—Moniez, 1891.—Schött, 1894, 1902.—Dalla Torre, 1895.—Lie-Pettersen, 1896, 1898, 1907.—Schäffer, 1896, 1900a, 1900b.—Poppe and Schäffer, 1897.—Scherbakov, 1898a, 1898b.—Carl, 1899, 1901.—Carpenter and Evans, 1899.—Börner, 1901a.—Krausbauer, 1902.—Voigts, 1902.—Axelson, 1903, 1904, 1905a, 1906.—Agren, 1903, 1904.—Wahlgren, 1906a, 1906b.—Carpenter, 1907.—Collinge and Shoebottom, 1910.—(Axelson) Linnaniemi, 1907, 1911, 1912.

Lepidocyrtus purpureus Lubbock, 1873.—Oudemans, 1887.—Reuter, 1890, 1895.—Uzel, 1890.—Parfitt, 1891.—Guthrie, 1903.

Lepidocyrtus violaceus Lubbock, 1873.—Parona, 1882, 1888.—Oudemans, 1887.—Uzel, 1890, 1891.—Tömösváry, 1883.

Lepidocyrtus metallicus Packard, 1873.—MacGillivray, 1891.

Lepidocyrtus assimilis Reuter, 1890, 1895.—Schäffer, 1898.

Lepidocyrtus pallidus Schött, 1893.—Reuter, 1890, 1895.—Lie-Pettersen, 1896.—(Axelson) Linnaniemi, 1912.

Lepidocyrtus cyaneus var. *pallidus* Schött, 1894.—Wahlgren, 1906.

Lepidocyrtus cyaneus var. *assimilis* Schött, 1894.—Dalla Torre, 1895.—Wahlgren, 1908.

Lepidocyrtus elegantulus Meinert, 1896.

Dark blue or violet with iridescent scales. Denuded of scales, dull blue or violet. Legs yellow beyond the coxae; dentes or entire furcula yellow; first and second antennal segments yellow with purple apices; third and fourth antennal segments purple; dorsum of head, and sometimes the mesonotum, yellow; fifth and sixth abdominal segments and the anterior region of the fourth often yellow. Narrow yellow intersegmental bands are often present. The unpigmented regions may be white instead of yellow. Body stout. Mesonotum arched, concealing the pronotum and projecting moderately over the head. Eyes (fig. 64) 8 + 8, on black patches; the two inner proximal eyes of each group smaller than the others. Antennæ one-fourth to one-half longer than the head. Antennal base black. Second and third antennal segments subequal in length; fourth segment one-half to two-thirds longer than the third. Unguis (fig. 65) with a pair of large lateral teeth, and with two pairs of inner teeth, the proximal pair being at the middle of the inner margin. Unguiculus narrow, sublanceolate, pointed, untoothed, extending three-fifths as far as the unguis on the third pair, and about half as far on the first and second pairs of feet. One clavate tenent hair. Fourth abdominal segment three to four times as long as the third. Dentes a little longer than the manubrium. Muero (fig. 66) about as long as hind unguiculus, with long apical tooth and well developed basal spine. Anterior region of head with short stiff fringed clavate setæ. Anterior border of mesonotum with a dense cluster of stiff clavate setæ. Antennæ, legs and posterior region of abdomen with dense fringed setæ. Dentes with two dorsal rows of subclavate fringed setæ. Manubrium and dentes scaly, the ventral scales more numerous than the dorsal. Length, 1 mm.

The preceding description is based upon numerous specimens of typical *L. cyaneus* from Europe and the United States.

Packard's *L. metallicus* is this species, as I have found by a study of his cotypes in the Museum of Comparative Zoölogy, Cambridge, Mass.

The specimens of this species collected by the Expedition are all typical as regards structural details, but most of them are atypical in respect to colouration. Thus, in a heavily pigmented specimen, all four antennal segments are yellow; and most of the denuded specimens are olivaceous, the effect of the yellow ground colour in combination with minute spots of violet pigment.

L. cyaneus is primarily a species of the humus, but occurs also in other situations, as under loose dead bark or in moss. The species is common under sticks or stones on the ground, and is often found on soil that is too dry for the existence of collembolans without scales.

Lepidocyrtus cyaneus has been reported from northern Siberia, Greenland, most parts of Europe, the United States, Africa (Egypt, Kamerun, German East Africa) and the Bismarek archipelago.

Nine specimens, under driftwood on higher, dry tundra, Demarcation point, Alaska, May 16, 1914. F. Johansen.

***Sminthurides aquaticus* (Bourlet).**

Plate 8, figs. 67-72.

Sminthurus aquaticus Bourlet, 1843.—Lubbock, 1873.—Oudemans, 1887.—Uzel, 1890.

Sminthurus apicalis Reuter, 1880.—Levander, 1894.

Sminthurus apicalis Uzel, 1890.

Sminthurus aquaticus Reuter, 1891, 1895.—Schött, 1894.—Lie-Pettersen, 1896, 1898.—Schäffer, 1896.—Poppe and Schäffer, 1897.—Scherbakov, 1898a, 1898b.—Carl, 1899.—Krausbauer, 1902.—Evans, 1908.

Sminthurus amicus Folsom, 1896.

Sminthurus (Sminthurides) aquaticus Börner, 1900.

Prosmnthurus aquaticus Willem, 1900.

Sminthurides aquaticus Börner, 1901a, 1906.—Agren, 1903.—Axelson, 1904, 1905a.—Wahlgren, 1906a.—1906b.—Lie-Pettersen, 1907.—(Axelson) Limmaniem, 1907, 1909, 1911, 1912.—Collinge, 1910.—Collinge and Shoebottom, 1910.

General colour yellow, brownish yellow, greenish, rose, or violet. Eye-spots large, black. Eyes 8 + 8, two in each group being smaller than the others (fig. 67). Antennæ purple, slightly longer than the head, with fourth segment not subsegmented. Antennæ of male with second and third segments modified to form clasping organs. Abdomen segmented dorsally. Unguis of first and second feet (fig. 68) slender, with inner margin unidentate a little beyond the middle; unguiculus extending two-thirds as far as the unguis, lanceolate, acute, with a subapical filament as long, to twice as long, as the claw proper, and extending often a little beyond the unguis. Ungues of third feet (fig. 69) three-fourths as long as those of the other feet, slender, feebly curving, without teeth; unguiculus extending not quite as far as the unguis, broadly lanceolate, untoothed, with apical filament exceeding the unguis. Tenent hairs absent. Third tibio-tarsi with a peculiar distal sense organ (fig. 69) consisting of a pair of slipper-shaped structures, with a stout seta extending beyond the tibio-tarsus. Ventral tube emitting a pair of short rounded sacs. Furcula reaching beyond the mouth. Dentes three times as long as mucrones. Mucrones convergent, spoon-like in general form (figs. 70,71) elliptical from above, with stout pigmented midrib, and three colourless lamellæ as follows: (1) inner dorsal, with radiating ribs terminating in marginal teeth; (2) outer dorsal, with faint radiating ribs due to dorsal ridges, but with entire margin; (3) ventral lamella, narrow and entire. Basal lateral mucronal seta present. Rami of tenaculum tridentate (fig. 72);

corpus with a large anterior lobe extending below the rami, and bearing a pair of long anterior setæ and a pair of short apical setæ. Clothing of curving setæ of moderate length, longer on the posterior part of the abdomen. Ano-genital segment with two slender simple sensory setæ on each side. Integument tuberculate. Length: female, 1 mm.; male, 0.5 mm.

In small specimens the antennæ are shorter than the head. The number of teeth of the inner dorsal lamella increases with age. Thus a female specimen 4 mm. in length had seven teeth, and one 0.9 mm. had seventeen.

The many specimens that I have seen from the United States and Canada agree with the examples that I have received from Europe.

Sminthurides aquaticus var. *levanderi* Reuter.

Sminthurus apicalis var. *Levanderi* Reuter, 1891.

Sminthurus aquaticus var. *levanderi* Schött, 1894.—Krausbauer, 1902.

Sminthurides aquaticus var. *levanderi* Börner, 1901a.—Axelson, 1904, 1905a.—Wahlgren, 1906a, 1906b.—(Axelson) Linnaniemi, 1907, 1909, 1911, 1912.

Light or dark violet in colour; in other respects like the typical form.

The specimens collected by the Expedition belong to this variety, *levanderi*, and were all females, about half-grown.

The genus *Sminthurides* comprises a few species, that are of special interest in several ways. In this genus, as illustrated by *S. aquaticus*, the persistence of traces of segmentation in the abdomen, an archaic character (Willem, '00), helps us to understand the morphology of the trunk in the more specialized sminthurids. The antennæ of the male, with their peculiar hooks and tubercles, are modified to encircle and to hold those of the female at copulation, as described by Reuter ('80) and Levander ('94).

S. aquaticus, like the other species of its genus, lives on the surface of the water of ponds and streams, where it skips about in a lively manner, owing to structural adaptations of the furcula, particularly the large paddle-like mucrones. The species frequents the leaves of various aquatic plants, but occurs sometimes on pools where there is no visible vegetation. A few specimens that I examined at one time had desmids in the alimentary tract. This species is not limited to fresh water, but has been taken on pools of salt water also.

S. aquaticus is a common species in most parts of Europe, and is common also in many parts of the United States.

Fourteen specimens, from the surface of ponds, Bernard harbour, Northwest Territories, May 25, 1916, July 9, 1915. F. Johansen.

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EXPLANATION OF PLATES.

All the figures except Nos. 19, 20, 67, 70 and 71 are from specimens collected by the Expedition.

PLATE 1.

- Fig. 1. *Podura aquatica*, right hand foot, X 337.
 2. *Podura aquatica*, dorsal aspect of left mucro, X 577.
 3. *Podura aquatica*, left mucro, X 577.
 4. *Achorutes tullbergi*, eyes of left side, X 577.
 5. *Achorutes tullbergi*, sense organ of third antennal segment of right side, X 908.
 6. *Achorutes tullbergi*, right mid foot, X 577.
 7. *Achorutes tullbergi*, left mucro, X 577.
 8. *Achorutes tullbergi*, right mucro, X 577.
 9. *Achorutes tullbergi*, left mucro, X 577.
 10. *Achorutes tullbergi*, anal spines, X 908.

PLATE 2.

- Fig. 11. *Achorutes tullbergi*, right anal spine, X 577.
 12. *Achorutes sensilis*, postantennal organ and two eyes of left side, X 577.
 13. *Achorutes sensilis*, sense organs of third antennal segment of left side, X 577.
 14. *Achorutes sensilis*, left hind foot, X 341.
 15. *Achorutes sensilis*, right mucro, X 577.
 16. *Achorutes sensilis*, left mucro, X 577.
 17. *Achorutes sensilis*, left anal spine, X 560.
 18. *Achorutes sensilis*, dorsal setæ of second abdominal segment, X 297.
 19. *Achorutes viaticus*, sense organ of third antennal segment of right side, from a European specimen, X 908.
 20. *Achorutes viaticus*, dorsal setæ of second abdominal segment, from a European specimen, X 337.

PLATE 3.

- Fig. 21. *Achorutes armatus*, left postantennal organ, X 505.
 22. *Achorutes armatus*, right fore foot, X 300.
 23. *Achorutes armatus*, left mucro, X 505.
 24. *Achorutes armatus*, left anal spine, X 505.
 25. *Achorutes armatus*, dorsal setæ of first abdominal segment, X 295.
 26. *Onychiurus duodecimpunctatus*, right postantennal organ, X 505.
 27. *Onychiurus duodecimpunctatus*, pseudocelli of right antennal base, X 295.
 28. *Onychiurus duodecimpunctatus*, sense organ of third antennal segment of left side, X 800.
 29. *Onychiurus duodecimpunctatus*, dorso-lateral aspect, to show pseudocelli, X 35.
 30. *Onychiurus duodecimpunctatus*, left hind foot, X 505.

PLATE 4.

- Fig. 31. *Onychiurus duodecimpunctatus*, right anal spine, X 635.
 32. *Onychiurus duodecimpunctatus*, dorsal setæ of second abdominal segment, X 295.
 33. *Tetracanthella wahlgreni*, X 42.
 34. *Tetracanthella wahlgreni*, eyes and postantennal organ of right side, X 252.
 35. *Tetracanthella wahlgreni*, sense organ of third antennal segment of left side, X 825.
 36. *Tetracanthella wahlgreni*, extremity of abdomen, X 185.
 37. *Tetracanthella wahlgreni*, dorsal aspect of anal spines, X 250.

PLATE 5.

- Fig. 38. *Tetracanthella wahlgreni*, left hind foot, X 505.
 39. *Tetracanthella wahlgreni*, furecula and tenaculum, X 505.
 40. *Tetracanthella wahlgreni*, dorsal aspect of mucrodentes, X 505.
 41. *Tetracanthella wahlgreni*, dorsal setæ of first abdominal segment, X 295.
 42. *Folsomia quadrioculata*, eyes and postantennal organ of left side, X 505.
 43. *Folsomia quadrioculata*, sense organ of third antennal segment of right side, X 825.
 44. *Folsomia quadrioculata*, right hind foot, X 505.
 45. *Folsomia quadrioculata*, portion of furecula, X 505.
 46. *Folsomia quadrioculata*, left aspect of furecula, X 295.
 47. *Folsomia quadrioculata*, dorsal setæ of second abdominal segment, X 295.

PLATE 6.

- Fig. 48. *Isotoma viridis*, eyes and postantennal organ of left side, X 185.
49. *Isotoma viridis*, left hind foot, X 295.
50. *Isotoma viridis*, left mucro, X 635.
51. *Isotoma viridis*, left aspect of tenaculum, X 185.
52. *Isotoma viridis*, dorsal setæ of third abdominal segment, X 145.
53. *Isotoma palustris*, eyes and postantennal organ of left side, X 166.
54. *Isotoma palustris*, left hind foot, X 495.
55. *Isotoma palustris*, left mucro, X 505.
56. *Isotoma palustris*, left aspect of tenaculum, X 250.
57. *Isotoma palustris*, dorsal setæ of second abdominal segment, X 250.

PLATE 7.

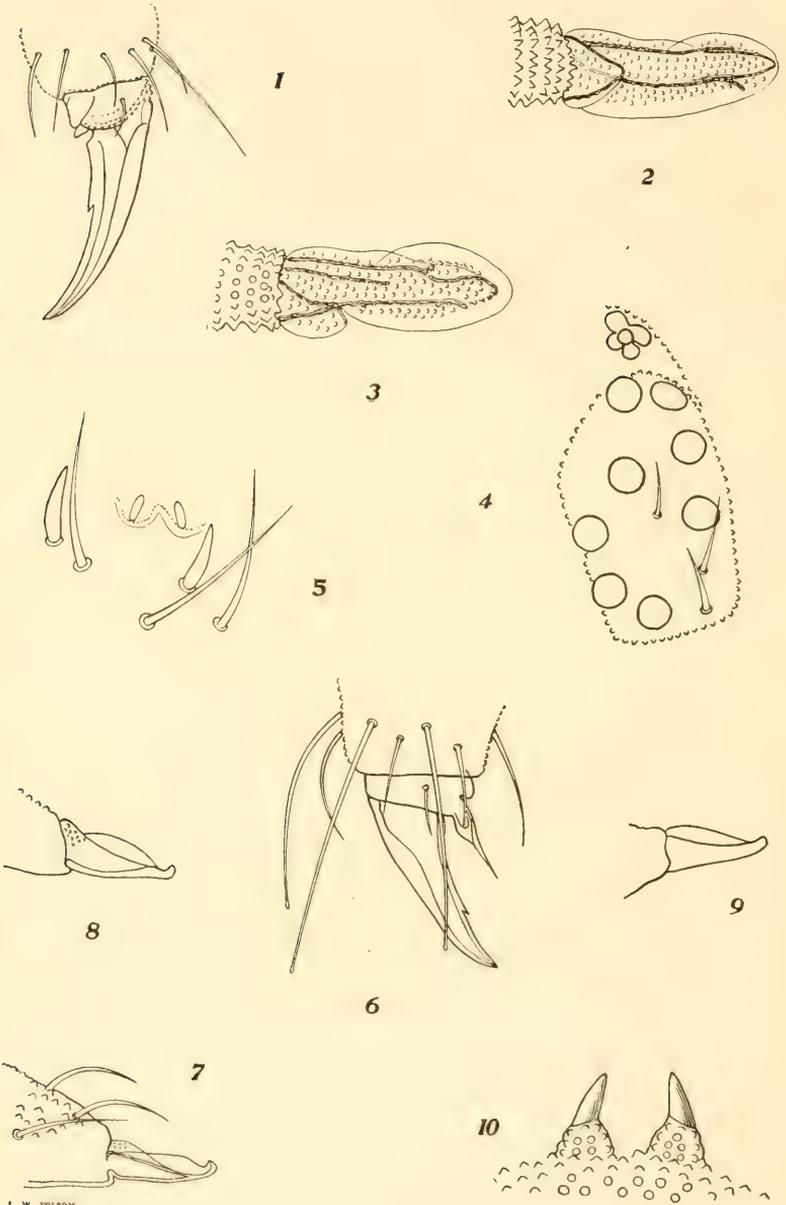
- Fig. 58. *Entomobrya comparata*, dorsal pattern of head, X 77.
59. *Entomobrya comparata*, to show pigmentation, X 34.
60. *Entomobrya comparata*, eyes of right side, X 278.
61. *Entomobrya comparata*, left hind foot, X 475.
62. *Entomobrya comparata*, left mucro and end of dens, X 748.
63. *Entomobrya comparata*, left aspect of tenaculum, X 237.
64. *Lepidocyrtus cyaneus*, eyes of left side, X 282.
65. *Lepidocyrtus cyaneus*, left hind foot, X 748.
66. *Lepidocyrtus cyaneus*, left aspect of left mucro and end of dens, X 748.

PLATE 8.

- Fig. 67. *Sminthurides aquaticus*, eyes of left side, X 400.
68. *Sminthurides aquaticus*, right mid foot, X 1010.
69. *Sminthurides aquaticus*, left hind foot, X 1010.
70. *Sminthurides aquaticus*, dorsal aspect of right mucro, X 513.
71. *Sminthurides aquaticus*, left mucro, X 513.
72. *Sminthurides aquaticus*, right aspect of tenaculum, X 673.

Figures 67, 70 and 71 are from Massachusetts specimens.

PLATE 1



J. W. POLSOX

PLATE 2

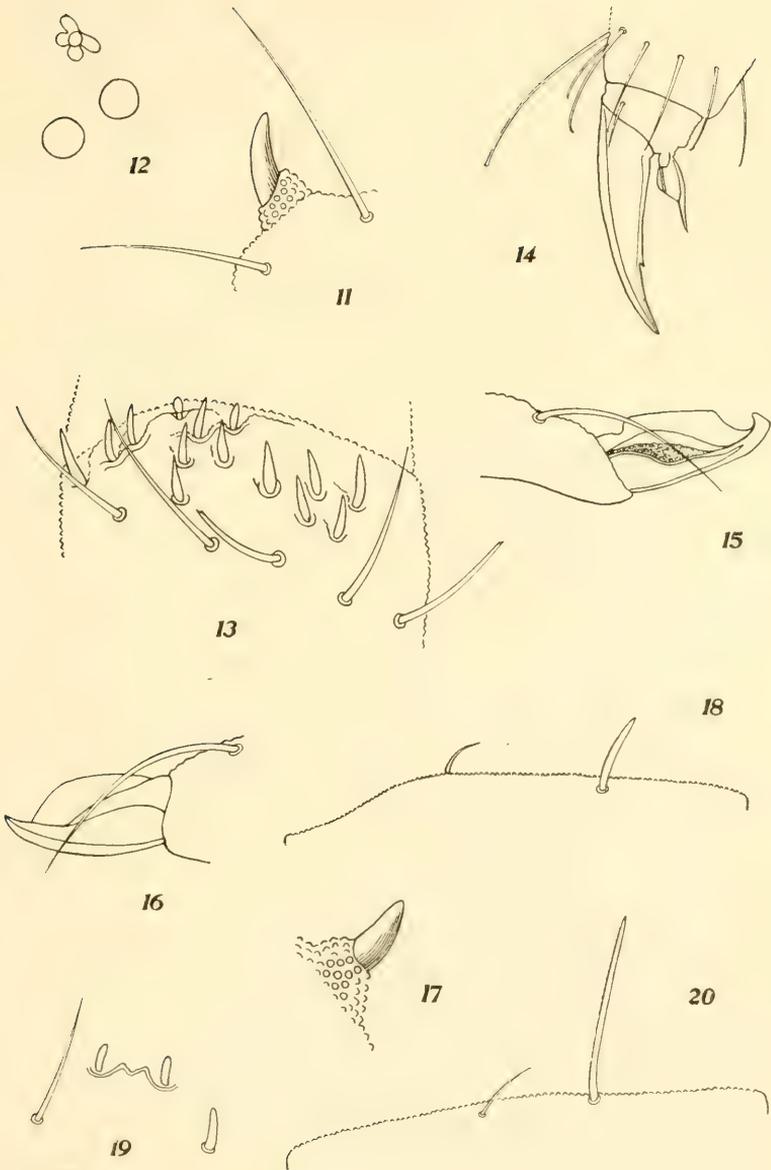


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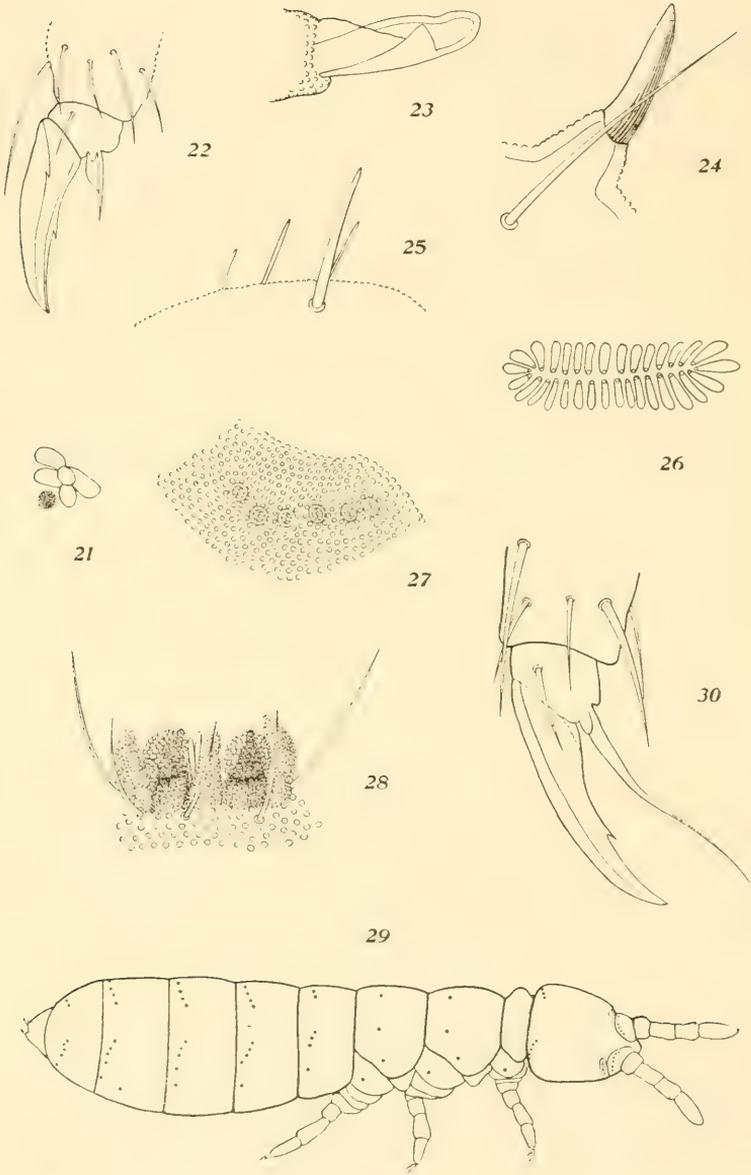


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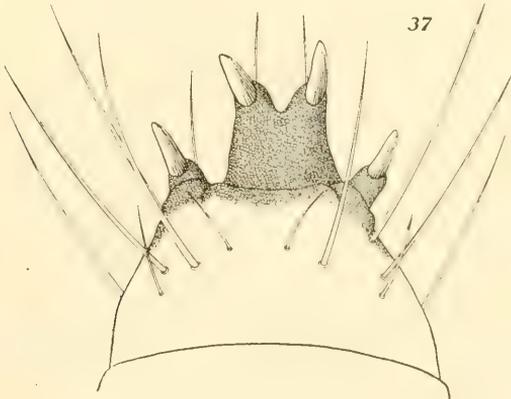
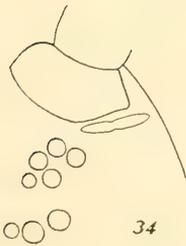
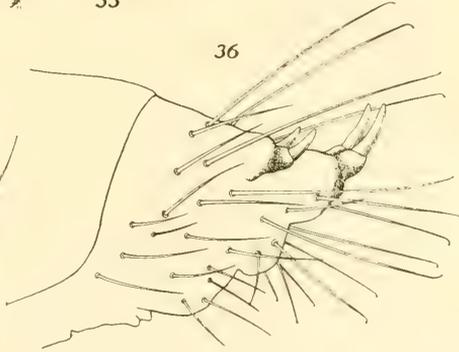
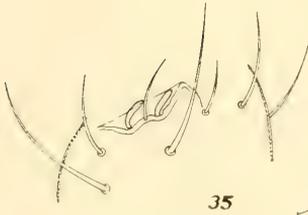
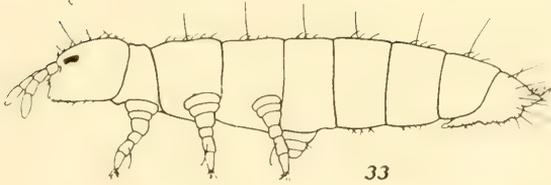
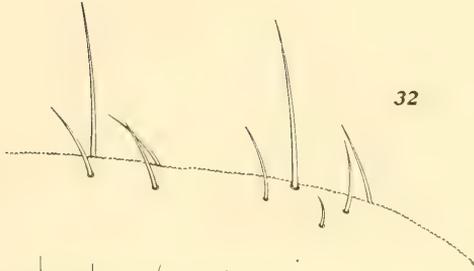
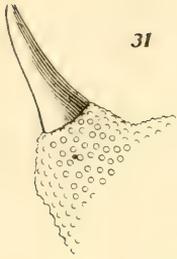


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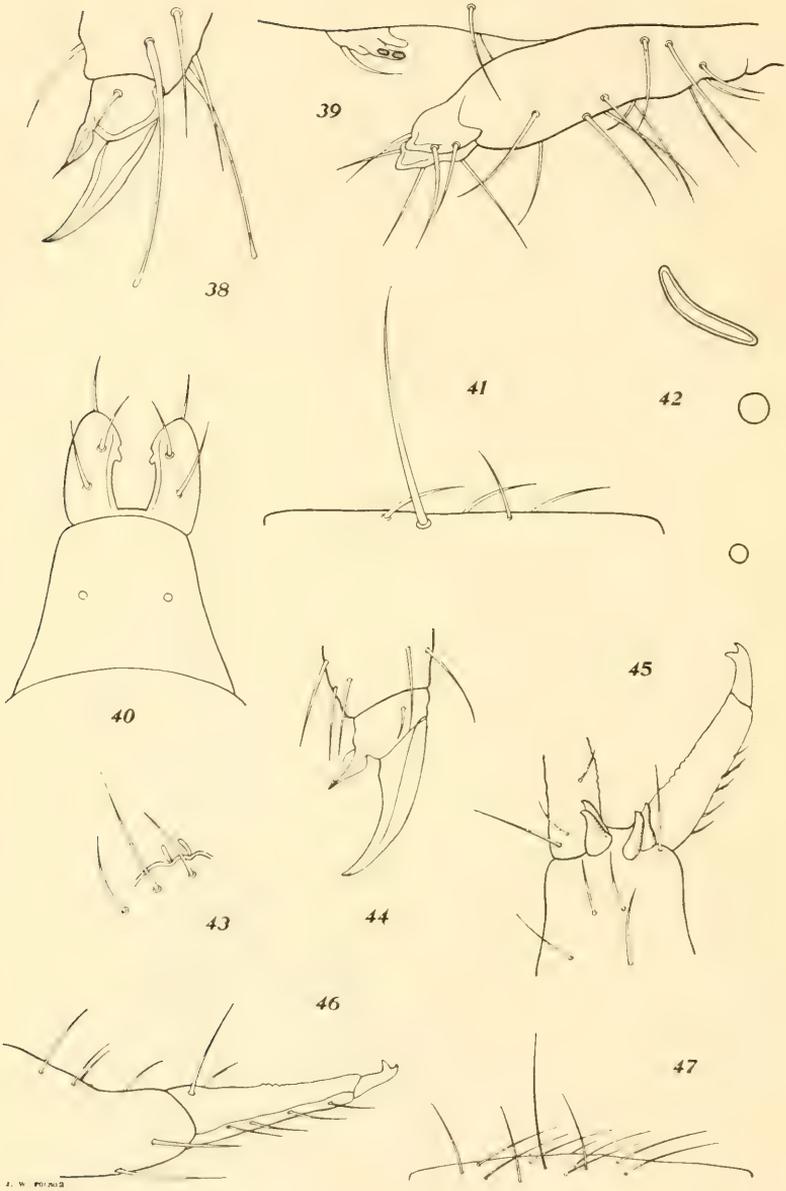


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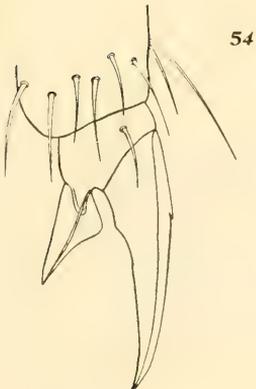
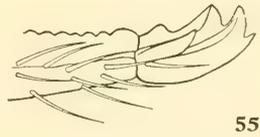
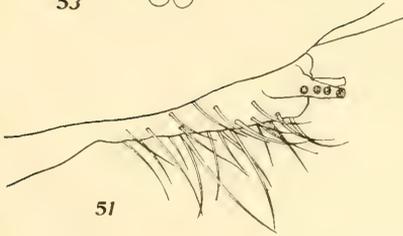
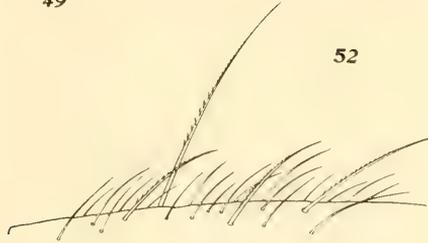
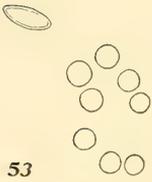
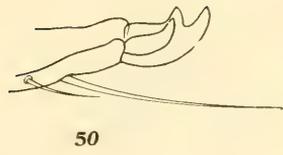
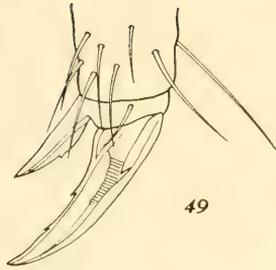
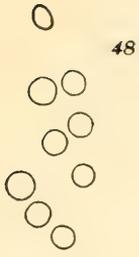
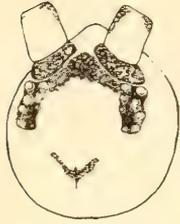


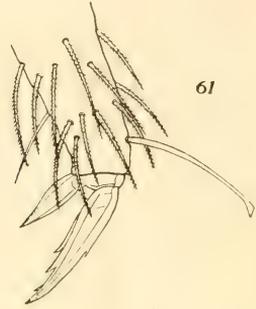
PLATE 7



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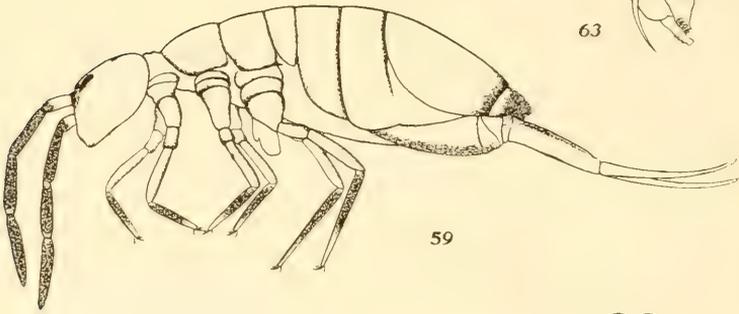
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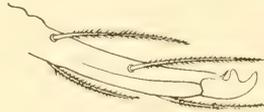
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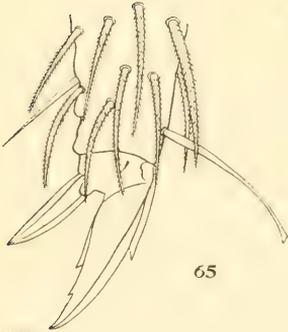
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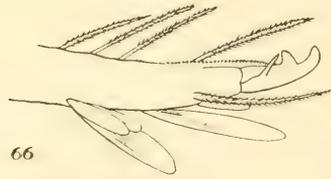
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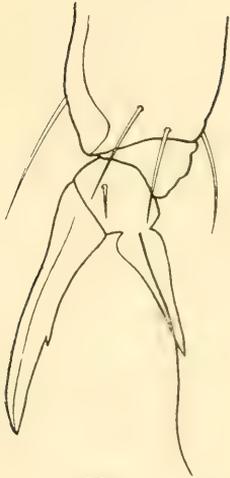


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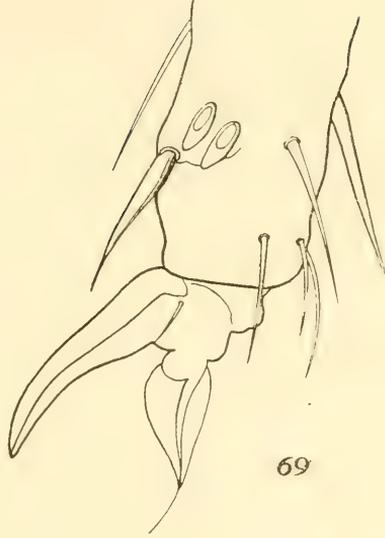


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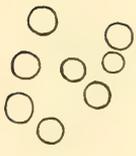
PLATE 8



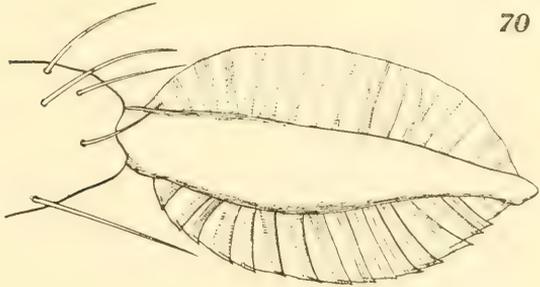
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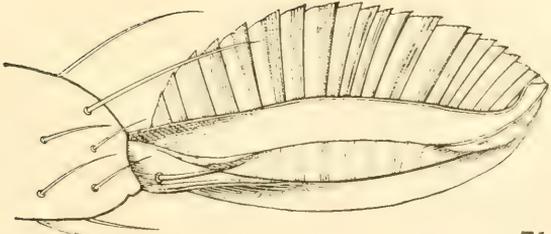
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REPORT
OF THE
CANADIAN ARCTIC EXPEDITION
1913-18

VOLUME III: INSECTS

PART D: MALLOPHAGA AND ANOPLURA

Mallophaga	A. W. Baker
Anoplura	G. F. Ferris and G. H. F. Nuttall.



OTTAWA
J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1919

Issued September 12, 1919

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OTTAWA
J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1918

Mallophaga of the Canadian Arctic Expedition, 1913-18.

A. W. BAKER, *Ontario Agricultural College, Guelph.*

The Mallophaga taken on the Canadian Arctic Expedition comprise a small collection of twenty species occurring in eleven genera. These parasites were taken from thirteen species of bird hosts and one mammal. The collection shows three new records for America, and a considerable number of new host records. The specimens were collected by Mr. Frits Johansen and other members of the expedition.

In preparing this list I have followed Harrison's generic classification, and also have followed his specific synonymy. The result is that a number of common species appear under names which have not previously been given them in papers from this continent. I have also followed Harrison in giving the original bibliographical record for Nitzschian species.

Since the districts where the collections were made are so infrequently worked over I have included the dates of collections for the possible benefit of future collectors. Considerable collections of Mallophaga from Alaskan birds have been worked over by Kellogg and others, and where these workers have made previous records from Alaskan birds of one of the species occurring in this collection, I have made mention of the record.

I append figures of several forms which are new American records or of which descriptions and figures may not be readily available to Canadian students.

I am much indebted to Mr. G. F. Ferris, of Leland Stanford Junior University, for examining a number of species in the collection and comparing them with material in the University collections. I am also indebted to Mr. H. G. Crawford, of the Department of Entomology, Ontario Agricultural College, for preparation of the material for microscopic examination.

Genus **Menopon.**

Menopon striatum Kellogg,

New Mallophaga III, 1899, p. 44, Pl. IV, f. 6.

Numerous specimens, males and females, from Rock Ptarmigan, *Lagopus rupestris* (Gmel.), taken at Bernard harbour, Dolphin and Union strait, Northwest Territories, in October, 1915, and from Willow Ptarmigan, *Lagopus lagopus* (Linn.), taken at Bernard harbour, in March, 1915.

Recorded by Kellogg from *Lagopus lagopus* taken at Kodiak island, Alaska.

Menopon sp.

One specimen too immature for specific identification from a Horned Lark, *Otocoris alpestris* (Linn.), taken at Bernard harbour, Northwest Territories, in August, 1915.

Genus **Myrsidea.**

Myrsidea brunnea Nitzsch.

Zeit. f. ges. Nat. XXVII, 1866, p. 120.

Numerous specimens, males and females, from American Raven, *Corvus corax principalis* (Ridgw.), taken at Bernard harbour, Northwest Territories, in August, 1915.

The expedition specimens under this record approach most nearly to the above species, which was described by Nitzsch from a Nutcracker, *Nucifraga caryocatactes* Linn.

Genus **Trinoton**.

Trinoton anserinum Fabricius.

Syst. Antl., 1805, p. 345.

One female from a Hutchins Goose, *Branta canadensi hutchinsi* (Richardson), taken at Bernard harbour, Northwest Territories, in June, 1915.

Recorded by European writers (*T. conspurcatum* N.) from various species of geese and swans. Recorded by Carriker from a Whistling Swan, *Olor columbianus* (Ord), taken in Nebraska.

Trinoton querquedulae Linné.

Sys. Nat., 1758, p. 612.

One female from a Pintail, *Dafila acuta* (Linn.), taken at Barter island, Alaska, in June, 1914.

Recorded by various writers (*T. luridum* N.) from this and many other species of ducks.

Genus **Ricinus**.

Ricinus clypeatus Mjöberg.

Arkiv. f. Zool., VI, 1910, p. 60, Pl. II, f. 1.

One female from a Horned Lark, *Otocoris alpestris* (Linn.), taken at Bernard harbour, Northwest Territories, in August, 1915.

Described by Mjöberg from two females from the same host in the Museum of Gothenburg.

Genus **Trichodectes**.

Trichodectes sp.

Included in the records of the collection is a statement that a red fox, *Vulpes alascensis* (Merriam), taken along the Sadlerochit river, in northern Alaska, had a species of *Trichodectes* (?) in its fur. Unfortunately no specimens were preserved.

Genus **Goniodes**.

Goniodes mammillatus Rudow.

Zeit, f. ges. Nat. XXXV, 1870, p. 483.

Numerous specimens, males and females, from Rock Ptarmigan, *Lagopus rupestris* (Gmel.), taken at Bernard harbour, Northwest Territories, in June, 1915, and May, 1916, and at Demarcation point, Alaska, in May, 1914; and from Willow Ptarmigan, *Lagopus lagopus* (Linn.), taken at Bernard harbour, Northwest Territories, in February, 1915, and March, 1915, and at Demarcation point, Alaska, in May, 1914.

Recorded by Kellogg from *Lagopus lagopus* taken at Kodiak island, Alaska.

Genus **Lipeurus**.**Lipeurus protervus** Kellogg.

New Mallophaga, III, 1899, p. 31, Pl. III, f. 4.

Many specimens, males and females, from Rock Ptarmigan, *Lagopus rupestris* (Gmel.), taken at Bernard harbour, Northwest Territories, in November, 1915, and May, 1916, and at Demarcation point, Alaska, in May, 1914; and from Willow Ptarmigan, *Lagopus lagopus* (Linn.), taken at Bernard harbour, in February, 1915, and March, 1915, and at Demarcation point, Alaska, in May, 1914.

Also several males and one female from a Lapland Longspur, *Calcarius lapponicus* (Linn.), taken at Demarcation point, Alaska, in May, 1914. Since the species is typically a parasite of grouse, one is led to question the authenticity of this record.

Recorded by Kellogg, and Kellogg and Kuwana from *Lagopus lagopus* from Alaska.

From a comparison of the expedition specimens with the descriptions of European writers, I am led to the conclusion that *L. protervus* is closely related to, if not identical with, the *Nirmus quadrulatus* of Nitzsch. This species, which Harrison looks on as a synonym of *Degeeriella camerata* Nitzsch., has been recorded by a number of European writers from various species of *Tetrao* and *Lagopus*.

Genus **Phlopterus**.**Phlopterus ceblebrachys** Nitzsch.

In Denny, Anoplur. Brit., 1842, p. 92, Pl. I, f. 3.

Numerous specimens, males and females, from Snowy Owl, *Nyctea nyctea* (Linn.), taken at Barter island, Alaska, in June, 1914.

Recorded by Kellogg from the same host taken at point Barrow, Alaska.

I have numerous specimens of this species from the same host taken in Ontario. These specimens are uniformly paler and stouter and the clypeal front more broadly truncate than the expedition specimens. The latter approach more nearly to the descriptions and dimensions given by European writers, especially Piaget, than do my southern specimens. It is doubtful, however, if the two can be separated.

Phlopterus cursor Nitzsch.

In Burmeister Handbuch II, 1838, p. 426.

Mature male and female and numerous immature specimens of both sexes from Short-eared Owl, *Asio flammeus* (Pontoppidan), *A. accipitrinus* (Pall.), taken at Barter island, Alaska, and Demarcation point, Alaska, in May, 1914.

Recorded by Kellogg from the same host taken at point Barrow, Alaska.

Phlopterus dentatus Scopoli.

Ent. Carn. 1763, p. 383.

One female from a Hutchin's Goose, *Branta canadensis hutchinsi* (Richardson), taken at Bernard harbour, Northwest Territories, in June, 1915.

Recorded by European and American writers (*P. icterodes*) from various species of ducks and geese; by Kellogg from *Merganser serrator* Linn., taken at Kodiak island, Alaska.

Philopterus pustulosus Nitzsch.

In Giebel, Zeit. f. ges. Nat., XXVIII, 1866, p. 363.

Two mature males and one female and numerous immature specimens of both sexes from a Parasitic Jaeger, *Stercorarius (Lestris) parasiticus* (Linn.), taken at Camden bay, Alaska, in June, 1914.

Recorded by various European writers from the same host.

Philopterus subflavescens Geoffroy.

Hist. Abr. Ins., II, 1762, p. 599.

Numerous specimens, males and females, from Snow Bunting, *Plectrophenax (Emberiza) nivalis* (Linn.), taken at Demarcation point, Alaska, in May, 1914, and at Bernard harbour, Northwest Territories, in June, 1916; from Lapland Longspur, *Calcarius lapponicus* (Linn.), taken at Demarcation point, Alaska, in May, 1914; and from Gambel's Sparrow, *Zonotrichia leucophrys gambeli* (Nuttall), taken at Demarcation point, Alaska in May 1914. The latter form is somewhat smaller than those from the other two hosts.

Recorded by European and American writers (*P. communis*) from many species of passerine birds.

Philopterus sp.

One immature female from Baird's Sandpiper, *Pisobia (Actodromas) bairdi* (Coues), taken at Bernard Harbour, Northwest Territories, in June, 1916.

The above specimen is too immature for final specific identification. It may be *Philopterus fusiformis* Denny, recorded by different writers from various Sandpipers.

Philopterus sp.

One specimen too immature for specific identification, from a Horned Lark, *Otocoris alpestris* (Linn.), taken at Bernard harbour, Northwest Territories, in June, 1915.

Genus **Degeeriella**.**Degeeriella complexiva** Kell & Chap.,

New Mallophaga III, 1899, p. 75, Pl. VI, f. 3.

Two mature males and one immature specimen from Baird's Sandpiper, *Pisobia (Actodromas) bairdi* (Coues), taken at Bernard harbour, Northwest Territories, in June, 1916.

Recorded by Kellogg and Kuwana from *Tringa canutus*, from Alaska and by Kellogg and Chapman from *Tringa (Arquatella) couesi* from Alaska.

Degeeriella vulgata Kellogg.

New Mallophaga II, 1896, p. 496, Pl. LXVII, f. 3.

One female of this common parasite of Passeres taken from a Gambel's Sparrow, *Zonotrichia leucophrys gambeli* (Nuttall), at Demarcation point, Alaska, in May, 1914.

Genus **Ornithobius**.**Ornithobius goniopleurus** Denny,

Anoplur. Brit. 1842, p. 184, Pl. XXIII, f. 2.

Two females from Hutchin's Goose, *Branta canadensis hutchinsi* (Richardson), taken at Bernard harbour, Northwest Territories, in June, 1915.

Recorded by several writers from *Branta canadensis* and other species of geese and swans.

Genus **Esthiopterum**.**Esthiopterum anseris** Linné,

Syst. Nat. 1758, p. 612.

One female from a Hutchin's Goose, *Branta canadensis hutchinsi* (Richardson), taken at Bernard harbour, Northwest Territories, in June, 1915.

Recorded by European and American writers (*E. jejunum* N.) from various species of geese, including *Branta canadensis*.

LIST OF HOSTS WITH PARASITES.

BIRDS—

- Stercorarius parasiticus* (Linn.).
- Philopterus pustulosus* Nitzsch.
- Dafila acuta* (Linn.).
- Trinoton querquedulae* Linné.
- Branta canadensis hutchinsi* (Richardson).
- Trinoton anserinum* Fabricius.
- Philopterus dentatus* Scopoli.
- Ornithobius goniopleurus* Denny.
- Esthiopterum anseris* Linné.
- Pisobia bairdi* (Coues).
- Philopterus* sp.
- Degeeriella complexiva* Kell & Chap.
- Lagopus lagopus* (Linn.).
- Menopon striatum* Kell.
- Goniodes mammillatus* Rudow.
- Lipeurus protervus* Kell.
- Lagopus rupestris* (Linn.).
- Menopon striatum* Kell.
- Goniodes mammillatus* Rudow.
- Lipeurus protervus* Kell.
- Asio flammeus* (Pontoppidan).
- Philopterus cursor* Nitzsch.
- Nyctea nyctea* (Linn.).
- Philopterus ceblebrachys* Nitzsch.
- Otocoris alpestris* (Linn.).
- Menopon* sp.
- Ricinus clypeatus* Mjoberg.
- Philopterus* sp.
- Corvus corax principalis* (Ridgway.)
- Myrsidea brunnea* Nitzsch.
- Plectrophenax nivalis* (Linn.).
- Philopterus subflavescens* Geoffroy.

Calcarius lapponicus (Linn.).

Lipeurus protervus Kell.

Philopterus subflavescens Geoffroy.

Zonotrichia leucophrys gambeli (Nuttall).

Philopterus subflavescens Geoffroy.

Degeeriella vulgata Kell.

MAMMALS—

Vulpes alascensis (Merriam.)

Trichodectes (?) sp.



1



2



3



4

EXPLANATION OF PLATE.

- Fig. 1. *Myrsidea brunnea* Nitzsch.
Fig. 2. *Philopterus pustulosus* Nitzsch.
Fig. 3. *Ricinus clypeatus* Mjoberg.
Fig. 4. *Ornithobius goniopleurus* Denny.



Anoplura of the Canadian Arctic Expedition, 1913-18.

G. F. FERRIS, *Stanford University, California.*

The material submitted to me for examination contains two species, in addition to specimens of the human louse *Pediculus humanus capitis* which have been examined by Prof. G. H. F. Nuttall and are recorded in this report. The species are as follows:—

Linognathus setesus (Olfers).

Great numbers taken from a white fox, *Alopex lagopus innuitus* (Merriam), Cross island, north coast of Alaska, January 18, 1918, by A. Castel.

This is the first published record of the occurrence of this species from fox, as it had previously been recorded only from the domestic dog but I have at hand specimens from a captive fox in Massachusetts. The specimens from foxes differ not at all from those taken from the dog. The species ordinarily passes under the name of *Linognathus piliferus* (Burm.).

Echinophthirius horridus (Olfers).

Specimens from *Phoca hispida*, Schreber. Collected by F. Johansen. Beaufort sea, Alaska, April, 1914.

These specimens are quite inseparable from others from *Phoca vitulina* Linneus, Shetland islands, and *Phoca richardii geronimensis* Allen, coast of California. The species was ordinarily passed under the name of *Echinophthirius phocæ* (Lucas).

REPORT ON *Pediculus* COLLECTED FROM ESKIMOS.

On the 22nd of November, 1917, I received six specimens of lice from Dr. C. Gordon Hewitt, Dominion Entomologist, Department of Agriculture, Ottawa, the same bearing a label stating that they had been collected from the head hairs of Copper Eskimos, Dolphin and Union straits, Coronation Gulf region, by F. Johansen, of the Canadian Arctic Expedition during the winter of 1915-16¹.

On examination they proved to be 3 males and 3 females *Pediculus humanus capitis*, typical specimens and fairly dark in respect to pigmentation. So far it has been impossible to detect any difference between these and other head lice from different parts of the world.

G. H. F. NUTTALL,

Quick Professor of Biology, Cambridge, England.

November 30, 1917.

¹Specimens of *Pediculus* were also collected on Copper Eskimo by Mr. D. Jenness, ethnologist, of the expedition.

FLEAS.

A small collection of fleas, of great interest on account of the meagre character of our knowledge of the fleas of the Canadian Arctic, was sent to Hon. N. Charles Rothschild, London, England, for identification and report. Unfortunately, however, they have been lost, and consequently no report on this group has been prepared. They were collected from the following hosts:

Continental Arctic Fox, *Alopex lagopus innuitus* (Merriam).

Parry's Ground Squirrel, *Citellus parryii* (Richardson).

Keewatin Arctic Hare, *Lepus arcticus canus* Preble.

C. GORDON HEWITT,

Dominion Entomologist.

REPORT
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PART E: COLEOPTERA

Forest Insects, including Ipidæ, Cerambycidæ, and Buprestidæ	J. M. Swaine
Carabidæ and Silphidæ	H. C. Fall
Coccinellidæ, Elateridæ, Chrysomelidæ, and Rhynchophora (excluding Ipidæ)	C. W. Leng
Dystiscidæ	J. D. Sherman, Jr.



OTTAWA
J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1919

Issued December 12, 1919.

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The Coleoptera collected by the Canadian Arctic Expedition, 1913-18.

FOREST INSECTS.

The Families IPIDAE, CERAMBYCIDAE and BUPRESTIDAE.

By J. M. SWAINE,

Chief, Division of Forest Insects, Entomological Branch, Department of Agriculture, Ottawa.

The forest insect collection was made principally at "Camp creek" and along the adjoining river banks, on the east side of the Coppermine river, Northwest Territories, just below Sandstone rapids. Only a few isolated specimens were obtained in other localities. Along the river near Sandstone rapids is the northern limit of forest trees and to examine this Mr. Johansen made a special trip of over 50 miles. The trees here are white spruce, mostly stunted and growing in a very open stand, as is well shown in the accompanying illustration. Plate I. The examination was made in February at a temperature of about 50 degrees below zero. In addition to pieces of bark containing many dead beetles a section of a trunk and part of a dying branch were brought back by Mr. Johansen.

A large number of trees were dead or showed dead and dying parts, and a superficial examination of these suggested that many of the dead standing trees had been killed by the bark-beetles whose galleries were extremely abundant on the wood surface wherever this was laid bare.

Of the bark-beetles a species of *Dendroctonus* was found at the base of one dead tree; *Polygraphus rufipennis* Ky. and *Pityophthorus nitidus* Sw. apparently occurred in abundance, while an undescribed species of *Carphoborus* was probably less numerous and is represented in the collection by only two specimens exposed in a tunnel in one of the specimen sticks while removing the bark in the laboratory. *Polygraphus rufipennis* and *Pityophthorus nitidus* were the most numerous in the dead trees and occurred throughout the trunk. Usually they were well chitinized and dark in colour. These species were found chiefly in timber of medium size, rarely in very young or very old trees. The *Dendroctonus* beetles came entirely from the base of one large spruce which also carried the two smaller species (*Polygraphus* and *Pityophthorus*) in the upper part. There were many adult *Dendroctonus* beneath the bark, chiefly in cells in a compressed layer of frass lying upon the surface of the wood. They were all very light in colour and had died before maturity. Mr. Johansen believes that all these beetles were dead when he collected the wood. The cause of their death was not apparent, but was probably due to adverse weather conditions.

Cerambycid tunnels cut by larvæ of several species were also abundant in these dead trees, and had apparently been responsible, in part, for their death. The larger trees were usually quite without bark or had retained it only in patches, particularly about the base of the trunk. The wood surface showed many surface tunnels of cerambycid larvæ, and although no living larvæ were found, several dead adults of *Mereum proteus* Ky. were taken from these tunnels beneath the bark. Larval skins were found and dead larvæ which had apparently been killed by parasitic hymenoptera whose cocoons, usually empty, were found beside them. The galleries of wood-boring cerambycid larvæ were also numerous in these trees, and several dead adults were taken from the tunnels by Mr. Johansen.

In his field notes Mr. Johansen says of these tunnels: "The origin of this burrow could always be traced to a wound on the tree, a branch broken off by storms, a fire wound, or bare patch on which the bark had been killed by bark-beetles."

Many of the living trees were examined by Mr. Johansen, and although the young trees and those growing in a close stand were but little affected by insects, numbers of the others had dead and dying parts attacked by bark-beetles or cerambycid grubs.

Dendroctonus was not found at all in these living trees and the tunnels of *Polygraphus* and *Pityophthorus* were less numerous than in the dead timber just described. The cerambycid larvæ appeared to be more destructive. Trees were found with the top dead and the base sound, with fresh cerambycid tunnels in the area between the dead and the healthy wood and extending down into the latter. Many of these tunnels were apparently confined to the inner bark and surface of the wood, while others were started on the wood surface and extended deep into the wood itself.

From the surface tunnels six larvæ were taken, varying in length from 6 mm. to 20 mm. These were kept frozen for eventual rearing; but when thawed out in May, 1916, only two (10 mm. and 15 mm. long) were alive, and these died later before transforming. Dead adults of *Merium proteus* Ky. were found in pupal cells at the ends of these surface tunnels, or in exit tunnels leading from them, so that this species was apparently responsible. Many empty hymenopterous cocoons were found in these tunnels beneath the bark. Mr. Johansen says: "often I would find, instead of the cerambycid larva and adjacent to the larval skin, the cocoon of the parasitic hymenopter; these cocoons were empty or contained dead pupæ, excepting one which held a living larva."

The tunnels extending into the wood were of two sizes and doubtless made by distinct species. The larger of the two was like those in the dead trees already described from which adults of *Xylotrechus undulatus* Say were taken. Only two living larvæ of this wood borer were found; these were lying frozen stiff in the inner ends of the burrows. These *Xylotrechus* tunnels always originated at a wound or other exposed surface. They lie on the outer surface for a short distance and are there filled with boring dust, but extend later deep into the wood, eventually becoming longitudinal; there was practically no boring dust in the part of these uncompleted tunnels lying below the wood surface. This species was also heavily parasitized. In the ends of the larval galleries Mr. Johansen often found, instead of the beetle larva, an empty cocoon of a hymenopterous parasite, and the large number of these, together with the scarcity of the cerambycid larvæ, indicated that the parasites were exerting effective control.

Several sawfly larvæ were using these wood tunnels as a winter retreat. They are discussed elsewhere in the reports of this expedition.

The smaller wood tunnels just referred to were cut by *Neoclytus muricatus* Ky. One dead adult of this species was removed from a tunnel below the wood surface after the material reached our laboratory. These tunnels, in so far as represented in the collection, are on a dead stub projecting from a branch still living when it was collected, but containing tunnels of the *Xylotrechus*.

In closing his field notes Mr. Johansen states that forest insects, including bark-beetles and cerambycid larvæ, have caused serious and extensive injury to the white spruce, even in that region, practically the northern limit of trees on the Coppermine river. He considers that those insects had killed the majority of the numerous dead trees he saw in that locality; and he suggests that the injuries to the most northern trees previously ascribed by Richardson and others to fires and unfavourable climatic conditions may have been really caused by similar insect outbreaks.

Family IPIDAE (Scolytidæ).

Four species of this family were taken by Mr. Johansen in white spruce on the Coppermine river in latitude 67° 30', and another in hemlock bark at Latouche, Alaska.

Genus *Dendroctonus* Erich.

Erickson, Weig., Archiv., 1: 52, 1836.

Dendroctonus johanseni, n. sp.

Plate II, figure 6.

Length 7 mm.; width 3 mm.; colour yellowish brown (immature); rather abundantly clothed with reddish hairs of moderate length; closely allied to *punctatus* Lec.

The *head* has the front convex, broadly transversely impressed towards the epistoma, coarsely, closely irregularly rugosely punctured and hairy; the dorsal process of the epistoma with the sides oblique, not attaining the epistomal margin, followed behind by a short, acute, median, longitudinal carina; the vertex with the longitudinal line impressed; the eyes narrow, wider above; the antennal club slightly longer than wide, the first segment nearly as long as the rest united.

The *pronotum* wider than long, slightly narrower than the elytra, the sides nearly straight on the caudal two-thirds narrowed from the hind angles constricted in front on the sides and dorsum bisinuate on the front margin with wide, oblique, impressions behind the middle; moderately closely and deeply punctured, the punctures irregular, of medium and small sizes, closer on the sides; with a narrow, acute, median carina from the base nearly to the front margin clothed with subrecumbent, short, reddish hairs.

The *elytra* one and one-half times as long as wide; the striæ impressed moderately throughout more strongly towards the suture and on the sides; the stria punctures rather coarse, not deep, rather close, smaller at the base, very little reduced in size on the declivity; the interspaces moderately convex, hardly wider or sometimes narrower than the striæ confusedly roughened with acute granules, moderate in size, becoming more numerous, larger, transverse asperities at the base, and sparse and acute behind; the larger granules uniseriate towards the declivity, reduced in size upon the declivital face with irregular small, feebly granulate punctures on the declivital interspaces; the granules smaller and the punctures more numerous on the lateral interspaces than on the disc; the suture wider with the granules confused throughout; the punctures of the declivital striæ distinct, almost as large as upon the disc; rather sparsely clothed throughout with long, erect, reddish hairs longer upon the declivity. The ventral surface finely granulate punctate. The proepisternal area distinctly moderately punctured, not strongly granulate.

The *male* declivity is brightly polished with the stria punctures somewhat smaller.

Type No. 152, Sandstone rapids, Coppermine river, Northwest Territories, F. Johansen, collector; Feb. 15, 1915, 2510. Host, *Picea canadensis*.

This species together with *micans*, of Europe, and *punctatus* Lec., of the Eastern States, forms a sharply isolated group, distinguished by the coarse stria punctures of the elytral declivity. It is closely allied to *punctatus* Lec. but appears to be distinct. The pronotal carina is barely indicated in *punctatus*, the elytral striæ are only feebly impressed on the disc, the stria punctures smaller and the elytral interspaces wider than the striæ and less coarsely granu-

late than in Arctic species. *D. punctatus* Lec. has been recorded from West Virginia, New York, and Pennsylvania, but has apparently never been taken in Eastern Canada.

Described from about sixty immature adults, taken by Mr. Johansen, dead, in the dried bark at the base of a large dead tree, in February. The beetles had evidently been dead sometime and were brittle, so that many are in poor condition. Mr. Johansen considers these beetles the primary cause of the death of the tree. It appears that some agency, probably abnormal weather conditions, had killed the broods that he found before they emerged from the bark.

Genus *Carphoborus* Eichh.

Eichhoff, Berl. Ent. Zeit., 8: 27, 1864.

Carphoborus andersoni, n. sp.

Plate II, figure 1.

Length, 2.5 mm.; width, 1 mm.; colour, pale reddish (immature).

DESCRIPTION OF THE FEMALE: The head has the front flattened and densely clothed with a brush of rather short yellow hairs; the antennæ slender, the club longer than wide.

The pronotum is slightly wider than long, with the sides arcuately narrowed from base to apex, only feebly constricted in front; the front broadly rounded; the disc closely and deeply but not coarsely punctured, the median line very faint; the pubescence very small, scale-like, not concealing the surface.

The elytra are elongate, the sides subparallel, broadly rounded behind; the bases very strongly elevated and rugose as usual; the striæ distinctly impressed, as wide as the interspaces, the stria punctures coarse and closely placed; the interspaces convex, feebly granulate, clothed with abundant rather slender pale scales which do not entirely hide the surface; the declivity with the 1st interspace but little more elevated than the 2nd and only feebly granulate, the 2nd interspace convex, nearly smooth, narrower behind; the 3rd interspace rather strongly elevated and armed with 5 or 6 rather coarse acute serrations; 5th and 7th interspaces united in a rather broad curve slightly elevated behind and together bearing 3 or 4 acute serrations. This species will go in my key, Dom. Ent. Br. Bull. 14, pt. 2, p. 57, under AA, BB, but is widely separated from *bicristatus* and *bifurcus* by the large size, coarse declivital serrations, less elevated declivital alternate interspaces, and characters of the front.

Type No. 153, Sandstone rapids, Coppermine river, Northwest Territories, F. Johansen, collector; Feb. 15, 1915; 1 paratype (a few fragments); lot 2908. Host, *Picea canadensis*.

One set of tunnels was found in a white spruce limb about one inch in diameter. The nuptial chamber is 6 mm. in diameter with the entrance tunnel indicated and three egg-tunnels; one of these is possibly complete, 6 cm. long, 1 mm. wide, with 28 egg-niches and larval mines developed from 16 of these. The second egg-tunnel is 1 cm. long, with 3 egg-niches cut, and the third tunnel is only started. The egg-niches are small and alternately arranged. The mines are probably not completed; the longest is slightly more than 2 cm in length. Some are moderately elongate and some widen very rapidly. All are filled with white boring dust mixed with red excrement. The species had overwintered as immature larvæ and two young immature adults. The stick was collected in February, 1915.

Genus **Polygraphus** Erich.

Erichson, Weig. Archiv., 1:57.

Polygraphus rufipennis Ky.

Plate II, figure 2.

Kirby, Faun. Bor. Amer., 4:193, tab. 8, fig. 2, *Apate* (*Lepisomus*) 1837, *Apate* (*Lepisomus*) *nigriceps* Ky. Kieby, loc. cit. 194, *Polygraphus saginatus* Mannh. Mannerheim, Bul. Mosc., 237, 1853; *Apate* (*Lepisomus*) *brevicornis* Ky. Kirby, loc. cit., 194, (Probably not *rufipennis*, but injured and unrecognizable.)

A stout cylindrical species, clothed with scales. Length, 2 mm. to 3 mm.; colour black, elytra very dark piceous.

DESCRIPTION OF THE FEMALE.—The head has the front flat, shining, finely and closely punctured, and rather densely clothed with short yellow hairs, denser in a subcircular fringe about the margin of the front, extending about the base of the mandibles and between the sections of the eyes; the vertex and genæ with dense and minute punctulations and a few large, shallow punctures, almost glabrous; the eyes completely divided and surrounded by a narrow shining border; the epistomal margin raised, shining, and very broadly emarginate; the antennal funicle usually with six segments, the pedicel large, the club unsegmented, subacute at the tip, closely pubescent. The *pronotum* is two-thirds as long as wide; the caudal margin subtruncate, bisinuate, the sides on caudal half straight, slightly convergent, deeply, suddenly constricted in front of the middle, front margin broadly arcuate, feebly emarginate at middle line; closely finely granulate-punctate and clothed with short scale-like hairs; with a very fine indistinct median raised line.

The elytra are two and one-half times as long as wide; as wide as the pronotum at the base; the bases individually moderately arcuate, finely raised and crenulate, the striae very faintly indicated; the elytra closely, finely asperate-punctate, with a row of coarser asperities along each interspace and these larger asperities confused and numerous towards the base of the disc; the strial punctures with minute slender inconspicuous setæ; the numerous punctures of the interspaces with short, blunt, stout, scale-like hairs, with those from the row of coarser asperate punctures longer, particularly towards and upon the declivity and on the sides; so the pubescence is rather closely sub-scale-like, with a row of longer, lighter coloured, stout hairs on each interspace, and the finely asperate surface showing through.

THE MALE.—The male has the front convex above with two small approximate tubercles arranged transversely on the middle line; impressed cephalad of the tubercles; the pronotum usually shorter, and more deeply constricted in front.

VARIATIONS.—The size varies from 2 mm. to 3 mm. in length. The colour varies from piceous to nearly black. The front of the male has sometimes only one frontal tubercle and the anterior impression varies in depth. The most interesting variation is in the segmentation of the antennal funicle. This is typically six-segmented, with the second segment small and the distal segments widened. Not infrequently however, we find a reduction in the number. Two more common conditions are with four segments on the outer part of the funicle of which the second segment is partly divided by a deep suture, or with the second and third segments almost entirely fused. It is very evident that the segmentation of the antennal funicle is a variable character in this species, as in other allied species. This subject is further referred to under the Genus *Polygraphus*, Dom. Ent. Br., Bull. 14, Part 2.

This species is abundant throughout the spruce forests of Canada, from the Pacific Coast eastward to Newfoundland. It is rare in pine, and rather commonly found in larch.

About forty specimens were received in the bark of a section from a dead white spruce trunk collected by Mr. Johansen at Camp creek, below Sandstone rapids, Coppermine river, Northwest Territories, February. 15, 1915.

The tunnels of this species, associated with those of *Pityophthorus*, were numerous on the exposed wood surface of dead standing trees and beneath the patches of bark which remained, particularly on the upper portions of the trunk; numbers of dead adults were taken in the tunnels beneath these patches of bark. On the dead and dying parts of the living trees these *Polygraphus* and *Pityophthorus* tunnels were also found, but they were not so numerous here as on the old dead trees, and were not found at all in some of the dying branches and trunks examined. It was evident that cerambycid larvæ had been more injurious than bark-beetles during the season previous to the examination.

Genus *Pityophthorus* Eichh.

Eichhoff, Berl. Ent. Zeit., 8; 39, 45, 46, 1864.

Pityophthorus nitidus Sw.

Plate II, figures 3, 4, 5.

Swaine, Dom. Ent. Br., Dept. Agric. Bull. 14, pt. 1, p. 26, 1917.

DESCRIPTION OF THE FEMALE.—The length, 2.1 mm.; $2\frac{4}{5}$ times as long as the width; the elytral striae not impressed, the striae punctures small; the declivity sulcate-retuse, not acuminate.

The *head* has the front flattened, the flat area bounded by a semi-circular line behind, very densely, minutely punctured and densely pubescent with short yellow hairs: the median carina nearly obsolete except the cephalic end which forms a rather prominent carinate tooth on the epistoma; the eyes rather finely granulate, deeply narrowly emarginate; the antennal club very wide, short oval almost subcircular, the sutures broadly arcuate the third most strongly, the first two segments each distinctly shorter than either of the last two; rather closely pubescent.

The *pronotum* is as long as wide; very broadly rounded behind, strongly arcuate on the sides behind; moderately constricted before the middle, broadly rounded on the front margin which is finely serrate, the asperities slightly stronger at the middle; the summit slightly in front of the middle with a wide transverse impression across the disc immediately behind the summit; finely subcentrically asperate in front, rather coarsely, very densely, subgranulately punctured behind, the punctures smaller towards the lateral margins; with a small impunctate spot on the middle of the side, and a smooth median space.

The *elytra* are slightly less than twice as long as the pronotum, 9:5, faintly narrower than the pronotum; truncate at the base; the sides subparallel for over two-thirds the length then narrowed and rather broadly rounded behind, very faintly sulcate-retuse as viewed from above; the upper part of the declivity distinctly sulcate-retuse; the sutural striae finely impressed; the remaining striae only very faintly indicated, except near the lateral margins the last two strongly impressed, especially behind; the striae punctures small, fairly close and deep, in only moderately regular rows; the interspaces not convex, sparsely uniseriately punctured in the interspaces of the disc, more closely punctured about the base and lateral margins; the ninth interspace moderately convex behind. The *declivity* is broadly sulcate above, the sulcus wide, not deep, not widened behind, shining, the sides feebly retuse, with a row of minute

granules on the suture and along the region of the third interspace; the whole declivity smooth and brightly shining, with the punctures extremely minute, hardly visible except towards the sides. The disc and the declivity are almost glabrous, with only minute very sparse pubescence; the pubescence about the lateral margins very short but distinct. The last sternite is rather deeply, broadly emarginate.

The male has the front flattened as before, but coarsely, fairly closely punctured with a well-developed median carina, and the pubescence almost invisible, the last ventral is emarginate as in the female.

Described from Quebec Province, Tullochgoram; *Picca canadensis*. Other localities: Ste. Anne de Bellevue, Que.; Truro, N.S.

About fifty specimens were received from the bark of a section of a dead white spruce trunk, collected by Mr. Johansen at "Camp creek," below Sandstone rapids, Coppermine river, Northwest Territories, February 15, 1915, in association with *Polygraphus rufipennis* Ky., page .

The Coppermine specimens are constantly somewhat larger than the typical form and the elytral striæ are usually more finely punctured, but they are left for the present under *nitidus* Sw.

Genus *Pseudohylesinus* Swaine.

Dom. Ent. Br., Dept. Agric., Bull. 14; 11, 1917.

Pseudohylesinus tsugae Sw.

Latouche, Alaska, C.A.E., Sept. 13, 1916, F. Johansen, collector. One broken specimen, taken in hemlock bark, is doubtfully referred to this species.

OTHER NORTHERN RECORDS IN OUR COLLECTION.

Dendroctonus valens Lec.

Fort Chipewyan, Alta., June 13, 15, 1914, F. Harper, collector, 9 specimens.

Dryocoetes affaber Mannh.

Yukon Territories; lat. 62° 31'–63° 06' N., long. 137° 30'–139° 30' W., 1916; D. D. Cairnes, collector, 1 specimen.

Orthotomicus vicinus Lec.

Yukon Territories; lat. 62° 31'–63° 06' N., long. 137° 30'–139° 30' W., 1916; D. D. Cairnes, collector, 1 specimen.

Ips perturbatus Eichh.

Yukon Territories; lat. 62° 31'–63° 06' N., long. 137° 30'–139° 30' W., 1916; D. D. Cairnes, collector, 3 specimens, small Arctic race. This is probably the species referred to by Children* as *Bostrichus typographus*.

* Back's Overland Expedition, London, 1836, page 532.

Family CERAMBYCIDAE.

Only four species of this family were obtained in the extreme north including seven specimens in all.

Genus *Criocephalus* Muls.*Criocephalus agrestis* Kirby.

Fn. Bor. Am., IV, p. 140, 1837; Leconte, J. A. P., ser 2, 11, 36, 1850; Leng., Bull. Brooklyn Ent. Soc., VII, 64, 1884; Blatchley, Col. of Indiana, 1015, 1910.

One male from the Arctic coast; length, 2.1 cm., width 5.5 mm. at base of elytra, length of elytra 16.5 mm.; width of pronotum 4.5 mm.; length of pronotum 4 mm. The pronotal impressions moderate; the sides narrowly rounded, with only a few rugosities; punctuation close and minutely granulate. The elytra densely punctured and minutely granulate; the two costæ rather strongly developed. More densely and coarsely granulate-punctuate than usual, but probably conspecific with the more southern forms.

Cape Bathurst, Northwest Territories, August 22, 1914, R. M. Anderson, collector, 886; crawling on beach, probably from driftwood which had come down the Mackenzie river or the Anderson river.

Other northern records: Rampart House, Yukon Territory (18 miles south), D. H. Nelles, collector, 9 specimens; 3 much smaller specimens from the same place may be distinct 14 mm. in length; slender, the pronotum subcircular from above, Dawson, Y.T., VIII, 1909, one specimen.

Genus *Merium* Kirby.*Merium proteus* Kirby.

Fn. Bor. Am. LV, p. 172, t.s.; f.s. 1837; Mannerheim, Bull. Mosc. III, 1853, 247; Leconte, J. A. P., ser. 2, II, p. 32; Leng, Bull. Brooklyn Ent. Soc., VII, p. 100, 1885; Blatchley, Col. of Indiana, p. 1019, 1910; Casey, Memoirs, III, 286, 1912.

Three dead specimens of this well known species were taken from the bark of dead white spruce. One specimen has only faint traces of the pale lines on the elytra; otherwise they need no description.

Coppermine river, below Sandstone rapids, Northwest Territories, February 17, 1915, F. Johansen, collector.

Other northern records: Fort Cudahy, Yukon Territory, August 25, 1896, W. Ogilvie, collector, 3 specimens; Dawson, Yukon Territory, May 17, 1908, 1 specimen.

Genus *Neoclytus* Thomson.*Neoclytus muricatus* Kirby.

Fn. Bor. Am., IV, p. 177, 1837; Leng, Ent. Am., III, 8; Wickham, Can. Ent., XXIX, p. 152, 1897.

Length, 9 mm.; width, 2.5 mm.; brown with grayish white markings; the pronotum as wide as long.

Below Sandstone rapids, Coppermine river, Northwest Territories, February 15, 1915, F. Johansen, collector; one specimen, taken from the pupal cell in small limb of white spruce.

The tunnels of *Neoclytus muricatus* are numerous on a short dead branch from a living tree. Part of the bark had fallen; the branch had been dead for

at least a year; and some of the tunnels were evidently several years old. The tunnels of this species are slender, elongate, winding, more or less longitudinal upon the surface, scoring the wood, then entering the wood through an oval hole to continue below the surface for two or three inches. The pupal period is passed in this tunnel and the adult emerges eventually through a round exit hole. The larvæ of this species had evidently been heavily parasitized, for many empty cocoons of a hymenopterous parasite were attached to the tunnels beneath the bark. One dead adult beetle was found in an exit tunnel just below the wood surface.

Genus *Xylotrechus* Chev.

Xylotrechus undulatus Say.

Long's Expedition, II, p. 291, 1820; Leng, Ent. Am., II, p. 200.

Length of the elytra, 1 cm.; width of pronotum, 4 mm.; length of pronotum, 3.5 mm.; colour dark brown with the transverse markings yellowish white; pronotum with apical band interrupted only at median line, caudal band feebly indicated on the sides, sides of pronotum grayish from superimposed fine gray hairs; elytra with basal line feeble, discal spot strong, median transverse line strong and continued along the suture and side margin forward nearly to the base. The subapical transverse line strong *complete* (this line almost invariably interrupted in the middle in our collection of over 60 specimens) apical marking strong; longitudinal grayish tracings very faint. One specimen below Sandstone rapids, Coppermine river, Northwest Territories, February 15, 1915; F. Johansen, collector.

One specimen was removed in fragments from tunnels in the wood of a white spruce; it had been working in a dead patch on a living tree. A second specimen found in the same stick is lighter brown, and lacks the longitudinal grayish markings.

Cerambycid tunnels which may be those of *Xylotrechus undulatus* are numerous in a part of a branch dying at the time of collection. The surface tunnels are wide and flat, scoring the wood, and filled with frass, freely winding, and very irregular in width. They eventually enter the wood through an oval hole, penetrate to the centre of the branch and continue longitudinally for about two inches. In this last portion the larvæ pass the winter. There were no exit holes.

Monochamus tunnels, probably those of *scutellatus*, were on the large stick. Two larvæ had entered the wood but neither of them emerged. There were no adults in the collection.

OTHER NORTHERN RECORDS IN OUR COLLECTION.

Monochamus scutellatus Say.

Fort Cudahy, Yukon Territory, 25-VIII-96, W. Ogilvie, collector, 1♂, 1♀; Upper Stewart river, Yukon Territory, Jos. Keele, collector, 1881, 1905, 1♀; Rampart House (18 miles south), Yukon Territory, D. A. Nelles collector; Yukon Territory, lat. 62° 31' to 63° 06' N., long. 137° 20' to 129° 30' W., 2♂'s, D. D. Cairnes, collector; Fort Chipewyan, Alta., June 23, 1914, F. Harper, collector; Hudson bay, 1887, J. M. Macoun, collector, 2♀'s.

Pachyta liturata Ky.

Dawson, Yukon Territory.

Acmaeops proteus Ky.

Yukon Territory; lat. $62^{\circ} 31' - 63^{\circ} 06' N.$; long. $137^{\circ} 30' - 139^{\circ} 30' W.$, 1916; D. D. Cairnes, collector, 6 specimens.

Acmaeops pratensis Laich.

Yukon Territory, latitude and longitude as above; 1916, D. D. Cairnes, collector, 1 specimen. Near Sixtymile river, along meridian $141^{\circ} W.$, 1907, T. P. Reilly, collector, 1 specimen. Rampart House (18 miles south), Yukon Territory, D. H. Nelles, collector, 1 specimen. Fort Cudahy, Yukon Territory, 25, VIII, 1896, W. Ogilvie, collector, 2 specimens.

Genus **Callidium** Fabr.**Callidium subopacum**, n. sp.

Length, 9 mm.; body piceous, above dull greenish; antennæ reddish except first segment very slender; above subopaque; head rather obscurely punctured and reticulate, punctures coarser and more distinct behind; median line finely impressed, a wide transverse impression between the eyes; the pronotum much wider than long, nearly as wide as the elytra, widest about the middle, the sides broadly arcuately narrowed in front and more strongly narrowed behind the middle, the sides spongy from exceeding by dense, very deep, subcircular, margined punctures, with rather numerous long brownish hairs, a median amphora-shaped area impressed, the margins rather indefinite, nearly smooth, finely reticulate, the punctures coarse but very shallow, the pubescence red, short and erect, longer in front; the elytra thin, coarsely irregularly punctured, margins of the punctures indefinite, with minute setose punctures in their depth, these feebly granulate only towards the base.

Type, south of Rampart House, Yukon Territory, D. H. Nelles, collector; one paratype, same labels. Two other allied undescribed species are in our collection from southern British Columbia.

Tetropium cinnamopterum Ky.

Fort Cudahy, Yukon Territory, 25-VIII-96, W. Ogilvie, collector, 4 specimens.

Length, 9-10 mm.; slender, piceous below, head and pronotum black, elytra smoky brown; pronotum subangularly rounded on sides, closely punctured and granulate on the sides, smooth, shining, and very sparsely punctured over nearly whole of disc, with a broad and strong anterior impression; the antennæ rather slender.

FAMILY BUPRESTIDAE.

Only one specimen of this Family was included in the collection:

Melanophila longipes Say.

Near Langton bay, Northwest Territories, 1910-11, R. M. Anderson, collector, 1632.

Other northern records in our collection: Near Sixtymile river, along 141^{st} meridian, Yukon Territory, 1907, T. P. Reilly, collector, 1 specimen; Stewart river, Yukon Territory, 1909, D. H. Nelles, collector, 1 specimen.

Occurs throughout Canadian forests from Nova Scotia to British Columbia and the Yukon.

RECORDS OF OTHER NORTHERN SPECIES IN OUR COLLECTION.

Melanophila drummondi Kirby.

Yukon Territory, lat. $62^{\circ} 31' - 63^{\circ} 06'$, long. $137^{\circ} 30' - 139^{\circ} 30'$, 1916, D. D. Cairnes, collector; near Sixtymile river, along 141st meridian, Yukon Territory, 1907, T. P. Reilly, collector, 2 specimens. Abundant throughout British Columbia, extending south into the United States and northward into the Yukon and Alaska. I have taken a series of thirteen near Lesser Slave lake in Alberta, and rarely in the east (Fort Coulonge, Que., in *Pinus strobus*).

Chrysobothris trinervia Kirby.

Near Sixtymile river, along 141st Meridian, Yukon Territory, 1907, Thos. P. Reilly, collector, 1 specimen.

There are two specimens in our collection from Fort Yukon, Alaska. Represented in our collection from Halifax, N.S., across Canada to Alaska and the Yukon.

Buprestis nuttalli Kirby.

Stewart river, Yukon Territory, 1909, D. H. Nelles, collector, 1 specimen.

There are only two small reddish-yellow spots on each elytron and the posterior of these almost obsolete on the right side; the spots on the outer faint but distinct on abdominal segments and coxæ. Represented in our collections from Quebec, Ontario, Alberta, southern British Columbia, Alaska, and the Yukon.

Dicerca prolongata Lec.

Fort Chipewyan, Alta., 15-VI-1914, lake Athabaska, Alta., near shore on portage to lake One, 29-VI-14, F. Harper, collector, 1 specimen.

Dicerca tenebricâ Ky.

Stewart river, Yukon Territory, D. H. Nelles, collector, 1909; Yukon Territory, latitude $62^{\circ} 31' - 63^{\circ} 06' N.$, long. $137^{\circ} 30' - 139^{\circ} 30' W.$, D. D. Cairnes, collector; lake Athabasca, Alta., near shore on portage to lake One, 29-VI-14, F. Harper, collector, 1 specimen; Dawson, Yukon Territory, 20-VI-08, 1 specimen.

Poecilonota, undes. sp.

Stewart river, Yukon Territory, D. H. Nelles, collector, 1909.

Length, 17 mm.; black above, eyes red, venter black with coppery reflections, apparently distinct, 1 specimen.

Family **CARABIDAE.**

By H. C. FALL.

Of the Carabidæ collected by the Canadian Arctic Expedition, a representative lot of 206 specimens has been sent me for identification by Dr. C. Gordon Hewitt, Dominion Entomologist. The number of species in the lot is not large—about fifteen—but of some of them considerable series were evidently taken, only a part of which were submitted.

The chief difficulty encountered in determining any collection of Arctic Carabidæ, centers in that complex of small Pterostichi belonging to the subgenus *Cryobius*, which constitute so characteristic a feature of the Carabid fauna of those regions. The species are numerous, but are still very imperfectly known and to a great extent opinionative, and are not satisfactorily determined in any American collection. Their identification therefore in the following list must for the present be regarded as tentative.

Genus **Carabus** Linn.**Carabus chamissonis** Fisch.

Langton bay (Franklin bay), Northwest Territories, summer, 1911, R. M. Anderson, collector, 1♀; cape Barrow, Coronation gulf, Northwest Territories, August 4, 1915, J. J. O'Neill, collector, 1♂, 1♀.

Genus **Elaphrus** Fab.**Elaphrus riparius** var. **gratiosus** Mann.

Teller, Alaska; July 31, 1913, F. Johansen, collector, two examples in badly damaged condition.

Genus **Nebria** Lat.

A single female of this genus was collected which cannot well be referred to any species thus far recorded from the American continent. It seems in most respects nearest to *obliqua* and *suturalis*, but, unlike them, has elytral interspaces 3.5.7. punctuate. It bears the label—Collinson point, Alaska, May 9, 1914, D. Jenness, collector.¹

Genus **Pelophila**.**Pelophila eschscholtzii** Mann.

Teller, Alaska, July 29, 1913, F. Johansen, collector. A single specimen in poor condition.

¹This specimen was submitted to Dr. E. C. Van Dyke for examination and he believes that it is a black-legged variety of *bifaria*, the typical forms with red legs being found in the Lower Yukon Valley.

Genus **Asaphidion** (**Tachypus** of our lists.)

West of Collinson point, Alaska, June 12, 1914; F. Johansen, collector. A single sample, which, judging from the description, can hardly be *T. elongatus*, the only recorded American species.

Genus **Bembidium** Latr.**Bembidium complanulum** Mann.

Nome, Alaska, August 21-24, 1916. F. Johansen, collector, 1 specimen.

Genus **Pterostichus** Bon.**Pterostichus agonus** Horn.

Seven examples—all ♂'s—from the following localities: Konganevik, Camden bay, Alaska, June 27, 1914, F. Johansen, collector; Collinson point, Alaska, September 27, 1913, and June 1, 1914, F. Johansen, collector; Barter island, Arctic coast of Alaska, June 11, 1914, D. Jenness, collector; Demarcation point, Alaska, May 20, 1914, F. Johansen, collector; Langton bay (Franklin bay), Northwest Territories, summer, 1911, V. Stefánsson, collector.

Horn's statement that the elytral striæ are fine, and the intervals flat, does not apply very well to any of these examples, nor to a specimen in my collection taken by Dr. F. E. Blaisdell at Nome, Alaska. The unique type was from the Yukon river, Alaska.

Pterostichus vindicatus Mann.

Nome, Alaska, August 21 to 24, 1916, F. Johansen, collector; Teller, Alaska, July 24, 1913, F. Johansen, collector.

Pterostichus sp., near the preceding.

Konganevik, Camden bay, Alaska, June, 1914; Demarcation point, Alaska, May 16, 1914; Bernard harbour, Northwest Territories, June 20, 1916; all collected by F. Johansen.

Pterostichus hyperboreus Mann.

Langton bay (Franklin bay), Northwest Territories, summer 1911, V. Stefánsson, collector, 3♂'s, 1♀.

Pterostichus similis Men.

Teller, Alaska, July 24, 1913; F. Johansen, collector.

Pterostichus mandibularis Kby.

Konganevik, Camden bay, Alaska, June 27, 1914; Collinson point, Alaska, September 22 and 27, 1913; Boundary Zone, Demarcation point, Arctic Alaska and Yukon, May 6, 1914; Demarcation point, Alaska, May 14-20, 1914; Cock-

burn point, Dolphin and Union strait, September 7, 1914; Bernard harbour, Dolphin and Union strait, Northwest Territories, June 15, 2 specimens, June 20, 1916, 1 specimen. All collected by F. Johansen. The specimens from the last two named localities have the hind angles of the thorax more obtuse and perhaps represent a distinct species; some variation in this respect however is noticeable among the others.

Genus **Amara** Bon.

Amara haematopa Dej. (similis Kby.)

Bernard harbour, Northwest Territories, May 22, 1915; June 20, 1916; July 9, 1916; 2♂'s, 3♀'s; F. Johansen, collector.

Of these specimens 1♂ and 2♀'s are quite black, 1♂ metallic, the third with faintly greenish elytra. The general form of body is quite like that of *Pterostichus agonus* and it seems not to have been observed by Horn that the penultimate joint of the labial palpus is bisetose in front as in *Pterostichus*, not plurisetose as in the rest of the *Amarae*.

Amara brunnipennis Dej.

The material sent me contains ninety-three samples of this common and widespread boreal species. The following localities are represented, all specimens collected by F. Johansen unless otherwise stated. Nome, Alaska, August 24-25, 1916; Konganevik, Camden bay, Alaska, June 27, 1914; west of Collinson point, Alaska, June 12, 1914, E. deK. Leffingwell, collector; Langton bay (Franklin bay), Northwest Territories, summer of 1911, V. Stefánsson, collector; Cockburn point, Dolphin and Union strait, Northwest Territories, September 7 and 26, 1914; Bernard harbour, Northwest Territories, May 18-September 1, 1915, and 1916; Kugalik river, Wollaston peninsula, Victoria island, August 18, 1915, D. Jenness, collector. Probably Armstrong point, west side of Victoria island, June, 1916, J. Hadley, collector.

Amara glacialis Mann.

Cockburn point, Dolphin and Union strait, Northwest Territories, August 30 and September 7, 1914, twelve ♂'s, eleven ♀'s; Bernard harbour, Northwest Territories, June and July, 1915 and 1916, sixteen ♂'s, nine ♀'s; all collected by F. Johansen.

Lebia (?) sp.

Bernard harbour, Northwest Territories, May 2, 1915, F. Johansen, collector. A mere wreck with dorsum of thorax and all appendages missing. Evidently found in this condition and perhaps not an inhabitant of the region explored. It does not appear to be identical with any of our American species of this genus, none of which have ever been reported from so far north.

Family **SILPHIDAE**.

Genus **Silpha** Linn.

Silpha lapponica Hbst.

Konganevik, Camden bay, Alaska, July 4, 1914, F. Johansen, collector; Nos. 175-6; Port Epworth, Coronation gulf, July 15, 1915 (on dried fish), Nos. 123-7, J. J. O'Neill, collector; Kogluktualuk river (Tree river), Coronation gulf, Northwest Territories, July 1915, J. J. O'Neill, collector, No. 106.

Family COCCINELLIDAE.

By CHAS. W. LENG.

Genus *Coccinella* Linn.*Coccinella quinquenotata* Kirby.

Langton bay, Northwest Territories, 1910-11, No. 1630, R. M. Anderson, collector.

Coccinella nugatoria Mulsant.

Langton bay (Franklin bay), Northwest Territories, summer 1911, No. 1865, V. Stefánsson, collector; Kater point, Bathurst inlet, Northwest Territories, August 24, 1915, J. J. O'Neill, collector, No. 109.

Both of these species are closely related to *Coccinella transversoguttata* Fabricius, a species widely distributed in the northern parts of both hemispheres, the larva feeding on aphids.

Family ELATERIDAE.

By C. W. LENG.

Genus *Hypnoidus* Steph.*Hypnoidus barbatus* Sahlb.

Nome, Alaska, F. Johansen, collector, August 24-25, 1916; Nos. 21, 22.

Family CHRYSOMELIDAE.

By C. W. LENG.

Genus *Chrysomela* Linn.*Chrysomela subsulcata* Mann.

Tundra plateau, Konganevik, Camden bay, Alaska, July 4, 1914, No. 431; tundra at Konganevik, Camden bay, Alaska, June or July, 1914, No. 436; Konganevik, Camden bay, Alaska, June 27, 1914, No. 458; under old driftwood logs in tundra behind house at Collinson point, Alaskan Arctic coast, September 27, 1913, Nos. 1151, 1152; Collinson point, Alaska, June 18, 1914, No. 1171; Collinson point, Alaska, September 2, 1914; tundra east of Collinson point, Alaska, September 2, 1914, No. 1642. The last one was collected as larva June 18, 1914, and pupated July 13, 1914 (breeding record 8). All collected by F. Johansen.

Genus *Lina* Meg.*Lina scripta* Linn.

Collected as pupæ September 10, 1916, on *Alnus* leaves and reared (breeding record 135). Ketchikan, Alaska, September 16-20, 1916, F. Johansen, collector, Nos. 1211 to 1213.

Genus **Galerucella** Crotch.**Galerucella decora** Say.

Langton bay (Franklin bay), Northwest Territories, 1910-11, V. Stefánsson and R. M. Anderson, collectors; Nos. 1700 to 1704 and 1698 to 1699.

Genus **Haltica** Geoff.**Haltica bimarginata** Say.

Langton bay, Northwest Territories, V. Stefánsson and R. M. Anderson, collectors, 1910-11; No. 1631.

Family **DYTISCIDAE**.

By J. D. SHERMAN, JR.

Genus **Hydroporus** Clairv.**Hydroporus humeralis** Aubé.

Teller, Alaska, August, 1913, two specimens; Konganevik, Camden bay, Alaska, June, 1914, three specimens; Demarcation point, Alaska, May, 1914, five specimens; Bernard harbour, Northwest Territories, June, July, six specimens. All collected by F. Johansen. A common, variable, Pacific coast species.

Hydroporus tartaricus Lec.

Collinson point, Alaska, September, 1913, seven specimens; Demarcation point, Alaska, May, 1914, five specimens; Bernard harbour, Northwest Territories, May to August, five specimens; all collected by F. Johansen.

Hydroporus sp. (Perhaps **tristis** Payk.)

Bernard harbour, Northwest Territories, May, July, F. Johansen; two specimens.

Genus **Coelambus** Thom.**Coelambus unguicularis** Cr.

Bernard harbour, Northwest Territories, June, F. Johansen, collector; four specimens.

Genus **Ilybius** Er.**Ilybius angustior** Gyll.

Teller, Alaska, August 1913, F. Johansen, collector; two specimens. Extremely common in Labrador.

Genus **Agabus** Leach.**Agabus nigripalpis** Sahlb.

Teller, Alaska, August 1913, one specimen, F. Johansen, collector; Collinson point, Alaska, September 1913, six specimens, F. Johansen, collector; Barter island, Alaska, July 1914, one specimen, D. Jenness, collector; Demarcation point, Alaska, May 1914, two specimens, F. Johansen, collector; Bernard harbour, Northwest Territories, May to August, forty-two specimens, F. Johansen, collector; Colville mountains, Wollaston peninsula, Victoria island, July 1914, one specimen, D. Jenness, collector.

This variable species, taken by R. Bell at Stupart's bay and cape Digges, Hudson strait, was regarded by Dr. Sharp as probably a variety of *Agabus congener* Payk.

Agabus infuscatus Aube.

A single specimen; Teller, Alaska, July 29, 1913; F. Johansen, collector. Very common at some points in Labrador.

Agabus obsoletus Lec.

Collinson point, Alaska, September 1913; F. Johansen, collector, two specimens.

Described from San Diego, California. I have a large series from Oregon (Corvallis and Gaston).

Genus **Colymbetes** Clairv.**Colymbetes dolobratus** Payk.

Teller, Alaska, July 1913, F. Johansen, collector, two specimens; Bernard harbour, Northwest Territories, May to July, F. Johansen, collector, seven specimens. An Alaskan and Siberian species.

The **RHYNCHOPHORA** (except **IPIDAE**).

By CHAS. W. LENG.

Genus **Lepyrus** Germ.

The species of *Lepyrus* inhabit the northern parts of both hemispheres, extending southward in America to the White mountains of New Hampshire, the swamps of Genesee county, New York, Michigan, Wisconsin, and Colorado. The larvæ live in willows and aspens.

Lepyrus gemellus Kirby.

Langton bay (Franklin bay), Northwest Territories, V. Stefánsson, collector, summer 1911; No. 1687.

Lepyrus capucinus Schall.

Langton bay (Franklin bay), Northwest Territories, V. Stefánsson, collector, summer 1911; Nos. 1671-3.

Lepyrus palustris Scopoli.

Bernard harbour, Northwest Territories, June 4, 1916, F. Johansen, collector; No. 1634.

Genus **Stephanocleonus** Motsch.**Stephanocleonus plumbeus** Leconte.

Bernard harbour, Northwest Territories, July 6-7, 1915, F. Johansen, collector; No. 1249.

Described from the northern shore of Lake Superior; an uncommon species recorded from Telegraph creek, British Columbia, and from Maine, Connecticut, Colorado, and New Mexico.

Genus **Trichalophus** Lec.**Trichalophus stefanssoni**, n. sp.

Oblong-oval, black, thickly clothed above and beneath with short, white, decumbent hairs, sometimes condensed into vaguely defined spots on the elytra and an oblique line at each side of disc of thorax. Beak finely carinate, slightly dilated at apex, antennal groove deep, almost reaching the eye; scape of antennæ almost reaching the eye, funicle seven-jointed, first two joints each longer than the succeeding bead-like joints, club three-jointed, oval, pointed, annulated. Eyes oval, transverse, finely granulated. Head slightly protuberant between and above the eyes. Thorax slightly longer than wide, slightly constricted and narrower in front; surface uneven, a complete median carina with a minute polished tubercle each side thereof being the most conspicuous interruptions of the surface. Elytra oval, convex, with feeble numeral angles, surface irregularly interrupted and tending to form rows of small tubercular elevations. The surface is very minutely punctulate between the elevations, visible only by removing the hairs. Front coxæ contiguous, prominent; middle coxæ separated by less than half their width; also prominent; hind coxæ widely separated, not prominent first again longer, oval at tip. Femora slightly incrassate, tibiæ excavated at apex, with spinulose fringe and a conspicuous spine; tarsi broad, pubescent beneath, third joint divided, claws simple. Resembles in many respects *Trichalophus didymus* Leconte from Vancouver, British Columbia and Colorado, but differs in the shorter antennæ, the carination of the beak, the size and obscure maculation.

Length, including beak, 10-12 mm.; width, at middle of the elytra, 3.5-5.0 mm.

Bernard harbour, (Cockburn point), Northwest Territories; September 26, 1914, F. Johansen, collector, Nos. 919-927; May 22, 1915, F. Johansen, collector, Nos. 929 to 935; July 6, 7, 1915, F. Johansen, collector, No. 1251; June and September, 1916¹, F. Johansen, collector, Nos. 268, 269; July 10, 1916, F. Johansen, collector, Nos. 267, 218; cape Krusenstern, Northwest Territories, July 1916, D. Jenness, collector, No. 292.

No. 929 is designated as the type and is in the National Museum, Ottawa, as well as the other specimens named except No. 925 which is in my own collection.

No. 107, Kogluktualuk river, Coronation gulf, Northwest Territories, July 1915, J. J. O'Neill, collector, differs from the above only by the brownish colour of the hairs, possibly as the result of accidental staining.

¹The one that emerged in September 1916, was collected as a larva June 20, 1916, and pupated August 8, 1916. (Breeding-record 122).

No. 167, Langton bay (Franklin bay), Northwest Territories, summer 1911, V. Stefánsson, collector, is another aberrant specimen, partly denuded, with brownish hairs.

No. 747, Bernard harbour, Northwest Territories, July 17, 1915, F. Johansen, collector, is another still more difficult specimen to place, for it is almost entirely denuded and looks therefore quite different. It is however, the same species as those described above and exhibits actual sculpture of the surface, which is scabrous throughout except that on the front part of the thorax it becomes evidently distinctly punctate.

The tribe Alphini, to which the species described above belongs is represented by numerous species in Siberia. I have tried to identify this species with one of them without success; and as most of the described species occur in the region of Lake Baikal, while it is in northeastern Siberia that the fauna more nearly resembles that of America, it seems probable that it has heretofore escaped discovery, though evidently abundant in the Canadian Arctic Region.

Genus **Sitona** Germ.

Sitona discoidea Gyllenhal (?).

Bernard harbour, Northwest Territories, July 6, 7, 1915; F. Johansen, collector, No. 1248.

The condition of the single specimen of this species makes an exact identification impossible.

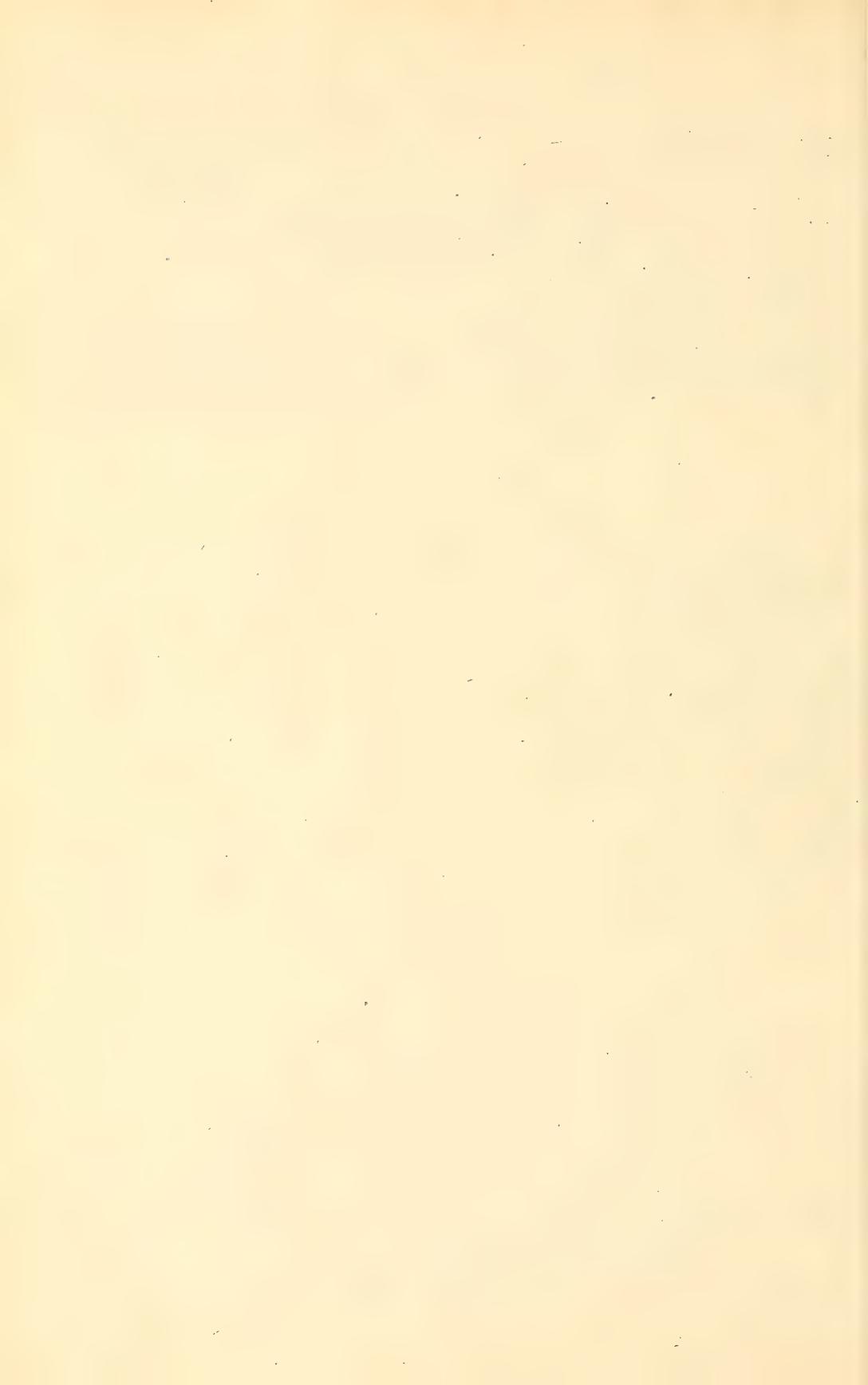




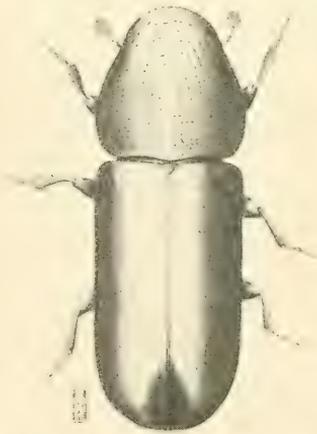
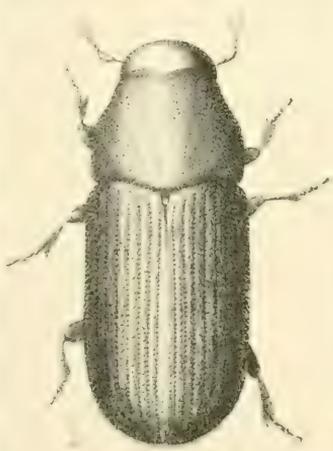
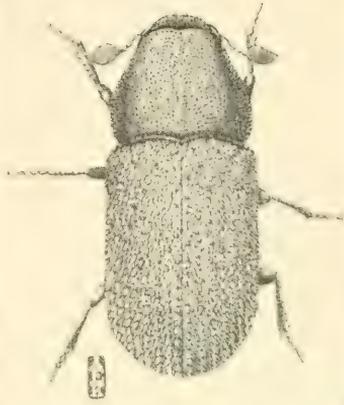
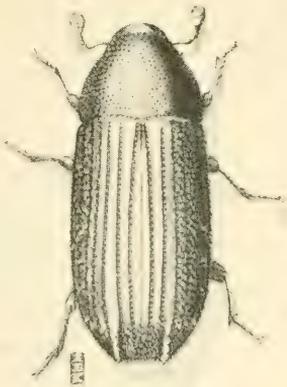
PLATE I. White spruce forest on the Coppermine river, Northwest Territories, below Sandstone rapids, showing also scrub willows; February 15, 1915, F. Johansen, Photo.

EXPLANATION OF PLATE II.

PLATE I. Bark-beetles.

- Fig. 1. *Carphoborus andersoni* Sw.
- Fig. 2. *Polygraphus rufipennis* Ky.
- Fig. 3. *Pityophthorus nitidus* Sw.
- Fig. 4. *Pityophthorus nitidus* Sw., declivity of elytra.
- Fig. 5. *Pityophthorus nitidus* Sw.
- Fig. 6. *Dendroctonus johanseni* Sw.

The drawings are by Mr. A. E. Kellett, Artist Assistant, Entomological Branch, Department of Agriculture, Ottawa.



EXPLANATION OF PLATE III.

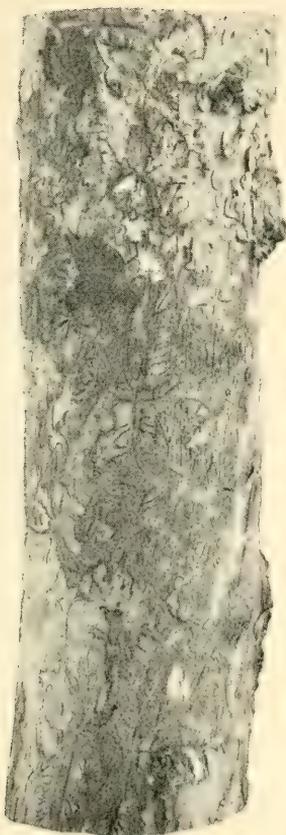
PLATE 2. Spruce from Coppermine River forest, below Sandstone rapids.

Fig. 1. Section showing work of *Polygraphus rufipennis* Ky., beneath the bark.

Fig. 2. Spruce branch showing tunnels of *Carphoborus andersoni* Sw.

Fig. 3. Spruce branch showing tunnels of *Xylotrechus undulatus* and *Neoclytus muricatulus*.

Fig. 4. Same as figure 3, the reverse side.





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PART F: HEMIPTERA

By EDWARD P. VAN DUZEE

SOUTHERN PARTY—1913-16



OTTAWA
J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1919

Hemiptera of the Canadian Arctic Expedition

By EDWARD P. VAN DUZEE.

The small collection of Hemiptera taken by the Canadian Arctic Expedition contains representatives of eleven species of which one is certainly new to science and is here described as *Euseclis hyperboreus*, and another is a Siberian saldid now first reported from North America. The softer Homoptera and Miridae are in many cases too much changed by their immersion in alcohol to admit of positive identification. All the specimens recorded here were taken by Mr. F. Johansen during the progress of the Expedition.

Ligyrocoris constrictus Say.

One specimen taken at Ketchikan, Alaska, September 10, 1916. This species has been found throughout Canada and the northern United States from the Atlantic to the Pacific Oceans.

Stenodema vicinum Provancher.

A single individual taken with the preceding. It is distributed throughout the same territory but extends somewhat farther south in the United States.

Orthotylus sp.

Bernard harbour, Dolphin and Union Strait, Northwest Territories, July 10, 1916. Nine examples. This form is very near *Orthotylus discolor* J. Sahlberg, described from northern Siberia, and may prove to be identical with that species but the present material is in too poor a condition for positive determination. They are of the same size, 3½ mm., and are thickly clothed with stiff black hairs. The base of the vertex is strongly carinate and paler, the posterior field of the pronotum and median line of the scutellum are also pale, the second segment of the antennæ is about as long as the hind margin of the pronotum and distinctly paler in the male, the basal segment being shorter than the head. All these characters and those of the legs are as described by Dr. Reuter for *discolor*, but here the inner margin of the corium as well as the clavus is darker, and the elytra of the females are not shorter and distinctly paler than in the males, at least not so far as I can judge from the condition of these specimens. This form seems to belong to the group of willow-inhabiting species represented by *Orthotylus pullatus* Van D. of the western United States.

Lobopidea sp.

Bernard harbour, Northwest Territories, August 10, 1915. One discoloured and fragmentary specimen certainly represents a small brachypterous species of this genus which was probably green in life.

Limnopus rufoscutellatus Latreille.

Ketchikan, southeastern Alaska, September 10, 1916. Four examples taken running on the surface of a pond. Widely distributed in the northern portions of Europe and America.

Chiloxanthus stellata Curtis.

This large saldid seems to be common in Arctic America. Mr. Johansen took adults at Demarcation point, Alaska, May 16, 1914; west of Kongenevik, Camden bay, Alaska, July 4, 1914, about the margins of a tundra pond; at Bernard harbour, Northwest Territories, July 15, 1915, and August 4 and 25, 1915; and the young at Collinson point, Alaska, September 13, 1913; Collinson point, Alaska, June 25, 1914; and Bernard harbour, Northwest Territories, June 20, 1916. The Philadelphia Academy of Sciences possesses a good series taken near the mouth of the Mackenzie river.

Calacanthia trybomi J. Sahlberg.

Collinson point, Alaska, six adults taken June 23, 1914, and one young, apparently of this species, taken at Bernard harbour, Northwest Territories, July 19, 1915. These adults agree in all respects with the descriptions of *trybomi* by Sahlberg and Reuter and there can hardly be a question of their identity. It is its first-recorded occurrence in North America.

Arctocorixa sp.

Two examples taken from a tundra pond at Teller, Alaska, August 6, 1913.

Euscelis hyperboreus n. sp.

Related to *extrusus* Van D. and *alpinus* Ball, but smaller and narrower than either; pale markings on the vertex forming an angled line at apex, a transverse line between the ocelli, and two quadrate spots occupying the base; fuscous margins of the elytral nervures composed of segregated irroration. Length, 4-4½ mm.

Vertex quite strongly produced, forming a right angle in the female, its median length one half the basal width, the length next the eye two-thirds that on the median line; in the male distinctly shorter; passage to the front well rounded. Front broad and short, the sides slightly incurved to the base of the clypeus. Clypeus broad, oblong, the sides rectilinear and scarcely approaching at apex. Loræ broad, almost reaching the margins of the cheeks below. Pronotum one-fourth longer than the vertex in the female; nearly a half longer in the male. Elytra short, scarcely surpassing the abdomen in the male; attaining the middle of the fifth tergal segment in the female; the costa strongly arcuate with the apex rounded.

Valve of the male as long as the ultimate ventral segment, triangular; plates broad, truncate at apex, together almost quadrangular, their margins with a few stiff bristles. Styles but little surpassing the plates, attaining the apex of the anal tube. Last ventral segment of the female short, broadly excavated; pygofers broad, triangularly narrowed beyond the apex of the last ventral segment.

Colour yellowish testaceous becoming paler beneath and a little tinged with fulvous on the abdomen. Vertex fuscous before an arcuated line either side on the anterior margin from the tip to the ocelli; a transverse line across the surface between the ocelli, and the disk posteriorly pale, the latter divided into two quadrate spots by the fuscous median line. Face fuscous, median line and lateral arcs of the front, sides of the clypeus and disk of the loræ and cheeks pale. Pronotum dusky posteriorly, the anterior submargin marked with a concentric row of about ten dark points. Scutellum with the margins pale and calloused on the basal one-half and the basal angles more or less marked with pale. Elytral nervures pale, mostly margined with lines composed of fuscous irroration. Legs pale, varied with fuscous, the anterior and intermediate femora

being twice-banded. Edge of the connexivum fulvous, the narrow hind edge of the tergal segments and the disk of the fifth and sixth in the female pale.

Described from one male from west of Kongenevik, Camden bay, Alaska, June 27, 1914, and one female from Bernard harbour, Northwest Territories, July 15, 1915. This species approaches *alpinus* in the shape and markings of the vertex and *extrusus* in the colouration of the elytra, but it is smaller and narrower than either, being scarcely longer than *striatulus*.

Holotype, male, in the National collection of Insects, Ottawa.

Allotype, female, in collection of the California Academy of Sciences.

Euscelis sp.

West of Kongenevik, Camden bay, Alaska, June 27, 1914, one example taken in the shelter of the tundra bluffs. This form is very near *Deltocephalus harrimani* Ashmead, also from Alaska, and it probably is that species, but it is impossible to identify it positively from Ashmead's description.

Thamnotettix sp.

Ketchikan, southeastern Alaska, taken on grass, September 10, 1916; one damaged specimen. This pertains to the *inornata* group, and perhaps most closely resembles *titusi* Ball.



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1919

The Saw-flies (Tenthredinoidea) collected by the Canadian Arctic Expedition, 1913-18.

ALEX. D. MACGILLIVRAY¹.

The specimens of Tenthredinoidea collected by this Expedition were secured with one exception, by the entomologist of the expedition, Mr. F. Johansen. When the material obtained is compared with that described by Kincaid, the entomologist of the Harriman Alaska Expedition, a striking difference is noted. There was secured from southern Alaska by the Harriman Expedition representatives of eight groups, families and subfamilies. The collection of the Canadian Arctic Expedition contains representatives of three groups, two of which are represented by single species and specimens, which were collected at Nome, Alaska. One of these belongs to a group not represented in the collection of the Harriman Expedition, the Siricidæ. All of the specimens from the northern part of the Northwest Territories belong to the subfamily Nematinae of the family Tenthredinidæ. This restriction is further striking in that all the species belong to those genera with cleft claws. The larvæ of the species of certain of the genera feed only upon willow, while in others the majority of the species feed upon willow.

Some of the new species² described on the following pages may prove to be the same as some of the species described from the European fauna. There is less liability for confusion and danger from recording species from our fauna that do not belong to it by giving names to these species, and this method has been followed. If later studies prove any of the species to be identical with species described from Siberia or Europe, it will be a simple matter to record them as synonyms. The length given in the case of the larvæ is for individuals supposed to be mature. The statements enclosed by quotation marks are from the original notes prepared by Mr. Johansen, to whom I am indebted for reading the original manuscript of this paper, and for many corrections and suggestions.

The following suggestion of Mr. Johansen will be of great value to future investigators and travellers collecting and breeding saw-flies in the Arctic regions: "From my notes it is evident that no saw-fly imagines are found in the Arctic outside of the months of July and August (9-10 weeks), a fact that I think is worth mentioning in the report, so that one understands that the specimens collected outside this period are all larvæ or pupæ."

Urocerus flavicornis Fab.

A single female collected at Nome, Alaska, specimen No. 83F. This specimen differs from the description of Bradley in that it has the first and sixth and part of the seventh segment of the abdomen and the cornus yellow or brownish instead of the second, seventh, eighth, and sometimes the first more or less.

"A big woodwasp (*Teredo*) caught this summer 1916, in the town of Nome, Alaska, was given to me here. It probably had been imported (as larva or pupa) from the states with lumber, and then emerged in Nome later" Bradley reports this species from Alaska and Siberia.

¹Contributions from the Entomological Laboratories of the University of Illinois, No. 56.

²The types of all new species described in this report are deposited in the National Collection of Insects, Ottawa.

Rhogogastera reliqua, n. sp.

FEMALE.—Head smooth and polished; the clypeus long, the emargination shallow, the bottom of the emargination straight, the sides oblique, the clypeal lobes slightly broader than long their margins rounded; the labrum shield-shaped, pointed, fringed with setæ; the antennal plates large; the antennal furrows deep, extending from the pretentorinæ to the ridge bounding the caudal aspect of the head; each lateral ocellus placed on a swollen ocellar area; the ocellar areas separated by a prominent interocellar furrow, forming a small ocellar basin ventrad of the median ocellus, bounded by the frontal ridges which are confluent on the meson and continuous with the supraclypeal area, the dorsal end of each continuous with an ocellar area; the ocellar furrow distinct, the postocellar area quadrangular; antennæ with first and second segments subequal, the third longer than the fourth and shorter than the fourth and fifth together; the pronotum, mesonotum, metanotum, mesopleuræ, and the metapleuræ polished and setaceous; the claws cleft, the inner ray slightly shorter than the outer; the abdominal segments finely granular and sparsely setaceous; the saw-guides with the dorsal and ventral margins parallel, the caudal end obliquely rounded to a blunt point above; colour green or yellowish green with the following parts black: the dorsal surface of the antennæ, a band covering the antennal furrows, connected between the antennal plates, and extending across the caudal aspect as converging lines to the occipital foramen, the ocellar basin, the interocellar furrow, the transverse furrow of the pronotum, the median furrow of the median lobe of the mesonotum, the furrow separating the median and lateral lobes, the concave part of the mesoscutum, the infolded portion of the mesopostscutellum, the wing veins except the costa and stigma, a spot on the caudal surface of the trochanters, a band on the distal half of the caudal surface of the femora, a band on the caudal surface of the tibiæ, the bottom of the infolding between the mesopostscutellum and the basal plates, and spots on the mesal part of each abdominal tergum, larger on the caudal segments, the lateral margins of the spots irregular, on the cephalic segments deeply squarely emarginate. Length, 10 mm.

Nome, Alaska, August 21–25, 1916. F. Johansen, collector. "On flowers of common, big umbellifer (*Heracleum*)?" Specimen No. 45.

This species is closely related to *evansii* Hargg., from which it is readily separated by the difference in colour, the shape of the saw-guides, and the topography of the head.

Euura abortiva, n. sp.

FEMALE.—Head, except the ventral half of the inner orbits, finely densely punctured; the clypeus roundly rather deeply emarginate, the clypeal lobes broad and broadly rounded; the labrum bluntly pointed and setaceous; the antennal furrows extending from the pretentorinæ to the frontal crest as broad shallow depressions and from the frontal crest to the ocellar furrow in which they terminate in rounded concavities as similar depressions; the ocellar furrow, broad and distinct, distant from the lateral ocelli; the interocellar furrow a slight V-shaped depression extending halfway to the median ocellus; postocellar area continuous with the posterior orbits; ocellar basin represented by a rounded depression adjacent to the median ocellus; ocellar areas swollen with rounded sides and separated by slight depressions from the frontal areas, which are continuous with a poorly defined frontal crest; median fovea distinct, punctiform, continued dorsad as a linear depression slightly interrupting the frontal crest; antennæ short, segments three and four subequal, the segments roughened and densely setaceous with short setæ; pronotum and the median and lateral lobes of the mesonotum finely punctured like the head; mesoscutellum and mesopostscutellum polished; metascutum more closely and coarsely

punctured than the mesoscutum; mesopleura finely densely punctured and setaceous; front wings fully formed, not reaching beyond the seventh abdominal segment, the petiolate cell abbreviated, veins and stigma brownish; hind wings normal in size and venation; claws deeply cleft, the rays subequal; the abdomen finely granular; saw-guides large and broad, the dorsal margin straight, the ventral margin oblique, the distal end obliquely and broadly rounded; cerci long and slender, extending beyond the end of the abdomen; color black with the tegulæ and the legs with the knees, tibiæ, and tarsi yellowish infuscated. Length 4 mm.

Herschel island, Yukon Territory. F. Johansen, collector. Larvæ collected in galls on leaves of *Salix reticulata* L., August 13, 1914. Adults emerged July, 1915. Specimen No. 253.

This specimen was received as a part of Breeding Record 36. "Material (galls) only collected (in 1914) once and from the same host-plant (*Salix reticulata*)." There is the further note on larvæ from willows on Herschel island: "Host-plant *Salix reticulata* L. 2 (3) imagines reared. Galls." Mr. Johansen makes the further suggestion regarding this number: "Larvæ collected as galls on bushy willow, probably *Salix Richardsonii* K., on Herschel island, Yukon Territory, end of July, 1916, were not reared (only in alcohol). Their host-plant is different from that of Rearing Record 36." The structure of the wings of the adult and the habits of the larvæ of the species of *Euura*, which have always been considered as borers in the stem of willow, precludes its inclusion with the other specimen received under this breeding record number and described later as *Pontania delicatula*. I mistrust that the feeding habits of the larvæ of the species of *Euura* do not vary but that in bred individuals, the wings are not always completely matured, with the result that there are specimens bred from galls which lack the free part of R₅ and described as species of *Euura*.

This species is related to *niger* Prov. It is readily separated from this species by the short wings, the difference in the median fovea and frontal crest and in the darker-coloured legs.

Euura arctica, n. sp.

FEMALE.—Head coarsely granular throughout; the clypeus broadly, deeply, angularly emarginate, the clypeal lobes broad and rounded; the labrum broadly rounded and setaceous; the antennal furrows deep and broad from the pretentorinæ to the frontal crest, indefinite on the cephalic aspect, broad and deep adjacent to the lateral ocelli, terminating in a large punctiform depression, not reaching the caudal margin of the head; the interocellar furrow a linear depression extending from the median ocellus to a linear, low, V-shaped ocellar furrow, which is not connected with the antennal furrows; the antennal furrows widened opposite the median ocellus, extending almost to the compound eyes, limited on the ventral side by a distinct elevation; the ocellar area convex, not elevated above the broad flat ocellar basin; ocellar basin limited on the ventral side by strongly elevated frontal areas which are continuous with the frontal crest, separated by a broad concavity which is continuous with the long broad concave median fovea; median fovea limited by low antennal plates; supra-clypeal area broadly convex; antennæ long and slender, the third segment slightly longer than the fourth, the surface of the segments granular and finely setaceous; the pronotum coarsely granular like the head; the median and lateral lobes of the mesonotum uniformly finely granular, the latter sparsely setaceous; the median lobe with a broad longitudinal depression with a mesal carina; the mesoscutellum and mesopostscutellum polished; the metascutum concealed by the wings; the mesopleura with the dorsal portion finely granular and the ventral portion, the mesosternum, and the metapleura, polished; the front wings normal in size, the costa and stigma pale, and the other veins brownish; the claws deeply cleft, the inner ray much shorter than the outer; the abdomen

finely granular; the saw-guides with the dorsal and ventral margins rounded, the distal end bluntly rounded, the distal third and the ventral portion setaceous; the cerci long and pointed; colour black with the following parts infuscated yellowish: the mandibles in part, the tegulæ, the knees, and the tibiæ, and the tarsi. Length, 10 mm.

GALLS.—The galls, Breeding Record 90, considered as belonging to this species, are small reddish globular ones occurring on the leaves and are similar to those of *Pontania* and resemble in appearance and shape those of *Pontania atrata*. The adult has the wing venation typical of the genus *Eurâ*.

"Material (larvæ) collected on *Salix reticulata* both by F. Johansen at Bernard harbour, Northwest Territories, August 16, 1915, in willow catkins; and by R. M. Anderson at Cape Barrow, Northwest Territories, August 14, 1915, in galls on willow leaves. Owing to shortness of jars the two collections were placed together when Dr. Anderson gave me his material in October, 1915, and nothing has come out of (dead?) my larvæ from August 16, at that time nor later. The material from Bernard harbour (if any) probably belongs to the same species as Breeding Record 85; while Breeding Record 90 properly only refers to the material collected by Dr. Anderson."

Bernard harbour and Cape Krusenstern, Northwest Territories. F. Johansen, collector. July 6, 1916. Specimen No. 295.

This species can be separated from *insularis* Kincaid by the form of the median fovea and the frontal crest and the colour of the labrum and legs.

The seven species of *Pontania* described on the following pages can be separated by means of the following table:—

- a Head, including orbits, and the collar black.
 - b Supraclypeal area with its dorsal extent limited by a distinct crestral furrow. *atrata*.
 - bb Supraclypeal area not limited by a distinct crestral furrow.
 - c Tegulæ black.
 - d Ocellar basin flat. *lorata*.
 - dd Ocellar basin deeply furrowed. *delicatula*.
 - cc Tegulæ pale. *demivnata*.
- aa Head with orbits and pronotum with collar resinous or ferruginous.
 - b Mesonotum with the median and lateral lobes black *quadrifasciata*.
 - bb Mesonotum with a large V-shaped resinous or ferruginous mark.
 - c Head with postocellar area longitudinally furrowed; frontal crest large and broadly interrupted. *subpallida*.
 - cc Head with postocellar area not longitudinally furrowed; frontal crest distinct but not large and narrowly interrupted. *trifasciata*.

Pontania atrata, n. sp.

FEMALE.—Head with the surface in great part finely granular; the clypeus short, narrowly roundly emarginate, the clypeal lobes broad and rounded; the supraclypeal area strongly convex, separated from the frontal crest by a deep crestral furrow extending to the antennal furrows; the median fovea large and distinct; the frontal crest large, strongly swollen, interrupted by a broad shallow furrow extending to the crestral furrow; the antennal furrows deep, bounding a strongly elevated frontal area with a large flat or slightly concave ocellar basin extending from the lateral ocelli to the frontal crest; the frontal ridge wanting; vertical furrows punctiform; ocellar and interocellar furrows forming a T-shaped depression, the ocellar furrow not connected with the antennal furrows; the antennæ short and flattened, the third and fourth segments subequal in length, the fifth slightly shorter; the pronotum and median lobe of the mesonotum finely granular, the lateral lobes with the cephalic portion of each granular and the caudal portion smooth and polished; the mesoscutellum, mesopostscutellum, and metascutum smooth and polished; the mesopleura, the

mesosternum, and the metapleura smooth, the former setaceous and the two latter polished; the wings hyaline, the veins brownish, the stigma pale, the free part of R^5 and M^2 interstitial or nearly so; the claws long and slender, deeply cleft, the inner ray two-thirds the length of the outer; the saw-guides broad, the proximal part, of the ventral margin straight and the distal portion rounded to the concave dorsal margin, not tapering, distal end subtruncate, the surface sparsely setaceous; the cerci short and slender, extending to the middle of the saw-guides; colour black, the legs beyond the knees whitish. Length, 5 mm.

MALE.—The male differs from the female in that the median fovea is deeper and more distinctly punctiform, the furrow interrupting the frontal crest is deeper and broader, the ocellar basin is concave but the frontal ridges are wanting, the dorsal half of the head is more coarsely granular than the ventral portion, the vertical furrows are longer and broader and connected with a broad depression representing the ocellar basin, the antennæ are longer but are stout and segments three and four are subequal; the procidentia are short bluntly rounded projections. Length, 5 mm.

LARVA.—Body white, head variable in colour, usually darker than the remainder of the body; ocellaria typical in form and size, the ocellus placed in the center; the antennæ convex oval areas bounded by a brownish line, located ventro-mesad of the ocellaria, and its surface bearing about six minute chitinized areas; head usually darker in colour dorsad of a line drawn through the ocellaria, sometimes with a spot on the dorsal half of the front and a curved fuscous band connecting the ocellaria, the darker colour due in part to the number and intensity of the minute round or oval areas of which they are composed; mandibles distinctly dentate; spinneret large and prominent; microthorax linear, fuscous in colour; prothorax with three annulets, the second much larger than the others and interrupted on the meson and each lateral portion swollen, also each lateral portion of the first annulet; the spiracular area oval, swollen, and transverse, with five to eight setæ; pedal area small with two or three setæ; mesothorax and metathorax with four sparsely setaceous annulets, the first short and greatly swollen, the second and third subequal in length and swollen except the mesal portion of the second, the fourth small, the spiracular area large and swollen, the pedal areas similar to those of the prothorax; abdominal segments one to eight with four annulets, the first more swollen than the fourth, the second and third more swollen than the first, the second with a lighter coloured mesal portion usually bearing a single seta on each side of the meson, annulets with transverse rows of setæ; the spiracular, postspiracular, and pedal areas large and swollen and setaceous; tergum of the tenth segment with small round black spots; prolegs long and blunt, cephalic and mesal portions setaceous; legs with strongly chitinized portions brownish. Length 10-12 mm.

GALLS.—Galls usually located near the midrib and projecting about equally onto both surfaces of the leaf, about the size of a large pea or slightly larger, the surface with depressions with irregular swellings between, in some specimens one-half of the gall bluntly pointed; colour probably brownish or reddish, a single gall on a leaf. Galls formed on leaves of creeping willow *Salix arctica*.

Breeding Record 35. "Host-plant *Salix arctica*. Galls. Several imagines reared. It was noted during the rearing that the emerging imagines were of different sizes (6 or 7 mm.); so that they may well have been of different species."

Herschel island, Yukon Territory. Larvæ collected August 13, 1914. Imagines emerged July, 1915. F. Johansen, collector. Female No. 264; males Nos. 254, 257, 259, 261, 263, and 266.

This species is related to *kincaidi* Marlatt, from which it can be separated by the shape of the median fovea, the deep interruption of the frontal crest, the form of the claws, and the colour.

Pontania lorata, n. sp.

FEMALE.—Head with the dorsal portion finely granular and the ventral portion polished; the clypeus short, broadly roundly emarginate, the clypeal lobes distinct, broadly rounded; the supraclypeal area strongly convex, the crestal furrow wanting; the frontal crest swollen, continuous with the frontal area; median fovea a deep oval pit continuous on the dorsal side with a short shallow linear impression interrupting the ventral portion of the frontal crest; the antennal furrows distinct, broad and bounding a strongly elevated frontal area with a slightly concave ocellar basin; the frontal ridges wanting; the vertical furrows punctiform; the ocellar and interocellar furrows wanting; antennæ wanting beyond the sixth segment, the third and fourth and fifth segments subequal in length; the collar granular and setaceous; the median and lateral lobes of the mesonotum, the mesoscutellum, the mesopostscutellum, and the metascutum polished and setaceous; the mesopleura, mesosternum, and metapleura polished, the former sparsely setaceous; wings hyaline, veins brownish, the stigma pale, the free part of R^5 and M^2 interstitial in one wing and not in the other; claws unevenly cleft, the outer ray long and slender, the inner short and not over one-third the length of the outer; the abdomen finely granular and sparsely setaceous; the saw-guides broad and bluntly rounded on the ventral margin and distal end, not tapering, the dorsal margin convex, the distal portion with a distinct scopa; the cerci long and setaceous, reaching beyond the middle of the saw-guides; colour black, the legs beyond the femora whitish, the distal segments of the mesotarsi and metatarsi infuscated. Length, 4.5 mm.

MALE.—The male differs from the female in having the frontal crest completely interrupted, the ocellar and interocellar furrows faintly indicated, the antennæ longer and more slender but with segments three and four subequal; the precidentia short, broad, and bluntly rounded. Length, 4 mm.

Herschel island, Yukon Territory. Larvæ collected in galls of creeping willow *Salix arctica*. August 13, 1914. Imagines emerged July, 1915. F. Johansen, collector. Female No. 265; males Nos. 255, 258, 260.

The smaller size and the lack of a crestal furrow readily separates this species from *atrata* to which it is quite similar in general appearance. The specimens described under this name were received as a part of Breeding Record No. 35. The difference in head structures and the shape of the saw-guides makes their inclusion with the preceding species impossible.

Pontania delicatula, n. sp.

MALE.—Head with the posterior orbits and postocellar area finely granular, the inner orbits polished for the most part, and the frontal area slightly roughened; the clypeus narrowly, shallowly, semicircularly emarginate, the clypeal lobes broad and truncate; the labrum transverse and truncate; antennal furrows deep between the pretentorinæ and the frontal crest, broad and shallow and almost wanting on the cephalic aspect, terminating in a punctiform depression caudad of the lateral ocelli; the ocellar furrow wanting and the interocellar furrow a short linear depression; the postocellar area short and broad, not elevated; the ocellar area only slightly elevated, continuous with the frontal crest, the frontal crest strongly convex and interrupted on the meson by a deep furrow continuous with a deep concave ocellar basin which extends to the median ocellus; the median fovea a distinct punctiform depression, distinctly separated from the furrow interrupting the frontal crest; the supraclypeal area strongly convex and roughened; the antennæ short, segments three and four subequal, the segments roughened and densely finely setaceous; the pronotum roughened like the head; the median and lateral lobes of the mesonotum finely

granular, the median lobe longitudinally furrowed but without a mesal carina, the parapsidial grooves almost wanting; the mesoscutellum polished, the mesopostscutellum roughened on each side and polished at middle; the metascutum roughened at middle and smooth on each side; the mesopleura smooth and sparsely setaceous, the mesosternum and metapleura polished; the wings normal in size, the stigma pale, the veins brownish; the claws deeply cleft, the inner ray much shorter than the outer; the abdomen with the surface finely densely granular, the last sternum with the caudal margin bluntly pointed; colour black with the following parts yellowish infuscated: the knees, the tibiæ, the tarsi, and the greater part of the last sternum of the abdomen. Length, 4 mm.

LARVA.—Body white with portions of the head darker; ocellaria black, the caudal margin not sharply defined, the ocellus located nearer the mesal than the caudal margin; antennæ short oval areas bounded by a faint brownish line, more than their own length distant from the ocellaria, its surface bearing two groups of closely adjacent minute brownish areas; head white with a brownish area of varying extent formed of minute round brownish spots, sometimes covering the dorsal half of the front and the vertex adjacent to the epicranial stem and extending indistinctly to the ocellaria; mandibles distinctly dentate; spinneret large, its distal end blunt; microthorax linear, brownish; prothorax with three annulets, the first and third very inconspicuous, the second swollen and scarcely emarginate on the meson, bearing three setæ on each side, the spiracular areas small and swollen and each bearing five or six setæ, the pedal area not sharply defined, bearing about three setæ; mesothorax and metathorax with four annulets, the first short and in the mesothorax bearing about six setæ and four in the metathorax, the second and third annulets subequal in length, not strongly swollen and bearing only a few setæ, the fourth annulet inconspicuous; the spiracular areas large and not strongly swollen and setaceous; the pedal areas small and with about three setæ; a brownish chitinized spot near the ventral margin of each spiracular area; abdominal segments one to eight with four annulets, not prominent on any of the segments and inconspicuous on the caudal segments, the first small and bearing three setæ on each side of the meson, the second and third large, each with a row of setæ, the second with the mesal part modified into a more elevated lighter coloured creeping ridge, the fourth small; the spiracular and postspiracular areas subequal in size and bearing setæ; the pedal areas inconspicuous and bearing two or three setæ; annulets indistinguishable on the ninth segment, with three bands of setæ; the tenth tergum without annulets or setæ, usually with transverse rows of minute spots, the caudal end emarginate; prolegs typical in form; spiracles distinct, brownish, not with a fuscous spot on each side. Length, 6.5 to 8 mm.

Herschel island, Arctic coast of Yukon Territory. Larvæ collected in galls on leaves of *Salix reticulata*, August 13, 1914. Imagines emerged July, 1915. Breeding Record 36. F. Johansen, collector. Specimen No. 152.

This species can be separated from *californica* Marlatt, to which it is related by the broad shallow emargination of the clypeus, the broad interruption of the frontal crest and the ventral end of the deep ocellar basin.

Pontania deminuta, n. sp.

FEMALE.—Head finely densely granular, ocellar basin indefinitely rugose; the clypeus narrowly, shallowly, roundly emarginate, the clypeal lobes broad and bluntly angular; the labrum long and rounded; the antennal furrows deep from the pretentorinæ to the frontal crest, broad and shallow from the frontal crest to the lateral ocelli and almost wanting and linear on the dorsal aspect of the head, not interrupting its caudal margin; the ocellar furrow broad and

shallow, connecting with the antennal furrows and a broad shallow interocellar furrow; postocellar area broad and short; the ocellar areas prominent, sharp ridges continuous with a prominent uninterrupted frontal crest, the three bounding a deep ocellar basin extending to the median ocellus; antennal plates thin and prominent with an interrupted crestal furrow dorsad of them; median fovea deep, elongate, punctiform, connecting with a larger round punctiform depression in the ventral part of the frontal crest; the supraclypeal area convex; the antennæ are wanting beyond the second segment; the pronotum finely punctate and setaceous; the median and lateral lobes of the mesonotum finely granular and sparsely setaceous, the median lobe with a mesal carinate depression; the mesoscutum polished; the mesopostscutellum with the mesal portion polished and each lateral portion finely roughened; the metascutum roughened; the wings more or less infuscated, the stigma and the veins including the costa brownish; the claws cleft, the inner ray shorter and stouter than the outer; the abdomen densely finely granular, sparsely setaceous; the saw-guides stout, the dorsal and ventral margins strongly converging, the distal end bluntly pointed; colour black with the tegulæ yellowish and the legs beyond and including the knees strongly infuscated yellowish. Length, 4 mm.

Chantry island, Northwest Territories. August 16, 1915. Specimen No. 132F. The labels of the specimen read as given. Mr. Johansen informs me it should be labelled Bernard harbour and not Chantry island.

This species runs to *atriventris* Marlatt by Marlatt's table. The prominent uninterrupted frontal crest will differentiate it.

***Pontania quadrifasciata*, n. sp.**

FEMALE.—Head sparsely coarsely granular, the granules elongated to fine ridges in certain parts; the clypeus broadly, shallowly, roundly emarginate, the clypeal lobes broad and angular, margin rounded; the antennal furrows deep on the ventral and dorsal portions, not interrupting the caudal margin of the head, the furrows broad and rounded opposite the median ocellus; the ocellar and interocellar furrows forming a distinct Y-shaped depression connected with the antennal furrows; the ocellar areas rounded elevations not connected with the frontal crest; the frontal crest not interrupted, almost wanting except between the antennal foveæ where it forms an elevation continuous with the subconvex supraclypeal area; the median fovea an elongate punctiform depression, twice as long as wide; the ocellar basin distinct, concave, extending from the frontal crest to the median ocellus; antennæ wanting beyond the second segment; the pronotum, the median and lateral lobes of the mesonotum, the mesoscutellum, the mesopleura, the mesosternum, and the metapleura polished and setaceous; the mesopostscutellum and metascutum polished and not setaceous; the wings hyaline, the stigma and part of the costa pale, the veins brownish; the abdomen polished and sparsely setaceous; the saw-guides broad, the dorsal margin straight, the ventral margin convex and curving dorsad to the dorsal margin, forming a long oblique distal end, the dorsal part of which is bluntly pointed and densely setaceous; the cerci long and slender, reaching to the end of the saw-guides; colour black with the following parts yellowish: the clypeus and labrum, the mandibles, the malar space, extending for a short distance on the inner orbits, the outer orbits, an elongate spot caudad of each compound eye, the pronotum broadly, the tegulæ, two spots on the cephalic part of the mesoscutellum, a spot on each mesaxilla, a large triangular spot on the mesopleura, the legs except the proximal part of the coxæ and the trochanters in part, the proximal half of the femora and the tarsi more or less infuscated, the ventral aspect of the abdomen and the last tergum; the saw-guides dark brownish. Length, 6 mm.

Sandstone rapids, Coppermine river, Northwest Territories, Arctic Canada. "Collected as larvæ in cocoons in old cerambycid burrows in bark of white spruce, February 18, 1915. Imago emerged July, 1915. Breeding Record 46". F. Johansen, collector. Specimen No. 1370.

The yellow coxæ and the large yellow spot on each mesopleuron will separate this species from its nearest relative, *truncata* Marlatt.

***Pontania subpallida*, n. sp.**

FEMALE.—Head polished, the orbits setaceous; the clypeus broadly slightly emarginate, almost truncate; the antennal furrows deep and distinct from the pretentorinæ to the caudal margin of the head which they interrupt, broadest between the frontal crest and the lateral ocelli; the ocellar furrow distinct and connecting with the antennal furrows and a short broad interocellar furrow; the postocellar area short and broad with a deep, linear, mesal furrow interrupting the caudal margin of the head; the ocellar areas strongly elevated and more or less separated from the frontal crest, forming a distinct pentagonal area; the frontal crest strongly elevated, its dorsal margin squarely emarginate on the meson, interrupted by a broad furrow extending to the elongate deep punctiform median fovea; ocellar basin deep, bounded by sharp walls, extending from the frontal crest to the ocellar furrow; the supraclpeal area not strongly elevated; antennæ long, the third and fourth segments subequal, the fifth segment shorter, the surface of the segments setaceous; the pronotum setaceous; the median and lateral lobes of the mesonotum, the mesoscutellum, and the mesopostscutellum polished, sparsely setaceous; the metascutum finely transversely striate; the mesopleura, the mesosternum, and the metapleura polished and sparsely setaceous; the wings hyaline, the costa and stigma pale, the veins brownish; the claws deeply cleft, the inner ray shorter than the outer; the abdomen finely granular, very sparsely setaceous; the saw-guides stout, the dorsal margin straight and oblique, the ventral margin curved, the distal end bluntly pointed, the distal and ventral portions with short fine setæ; the cerci long and clavate; body black with the following parts pale or yellowish: the distal half of the antennæ, the mandibles, the labrum the clypeus, the supraclpeal area, the frontal crest in part, the inner and posterior orbits, the cephalic portion of the postocellar area, the pronotum, the tegulæ, a broad band on the parapsidial furrows, the mesoscutellum except the caudal margin, the legs except irregularly infuscated areas, the ventral aspect of the abdomen, the saw-guides, and the three caudal terga. Length, 5.5 mm.

Bernard harbour, Northwest Territories, July 12, 1915. F. Johansen, collector. Specimen No. 797.

The strongly elevated ocellar areas, the large uninterrupted frontal crest, the deep ocellar basin, and the shallow emargination of the clypeus will serve to separate this species from *desmodioides* Walsh, with which it is similar.

***Pontania trifasciata*, n. sp.**

FEMALE.—Head finely closely punctured; the clypeus narrowly roundly emarginate, the clypeal lobes broadly rounded; the labrum rounded; the antennal furrows deep from the pretentorinæ to the dorsal margin of the frontal crest, broad and shallow on the middle of their length, and narrow, deep, converging, linear depressions caudad of the lateral ocelli, not interrupting the caudal margin of the head; the ocellar furrow distinct but broad and shallow; the interocellar furrow deep and expanding toward the median ocellus; the ocellar areas not prominent, with a slightly convex surface; the frontal crest distinct, deeply interrupted at middle by a linear long deep furrow continuous with the median fovea; the supraclpeal area convex, not prominent; the

antennæ slender, the third segment shorter than either the fourth or fifth, the fifth shorter than the fourth, the surface finely punctured and setaceous; the pronotum and the median and lateral lobes of the mesonotum finely densely granular; the mesoscutellum and mesopostscutellum polished; the mesopleura finely densely granular, the mesosternum and metapleura polished; the wings hyaline, the veins and stigma pale; the claws deeply cleft, the inner ray nearly as long as the outer; the abdomen faintly granular, polished; the saw-guides broad and stout, the dorsal margin straight, the ventral margin broadly convex, the convexity continued to the dorsal margin, forming an oblique bluntly pointed distal end, the distal end and the ventral margin setaceous; color black with the following parts yellowish: the posterior and outer orbits, the collar broadly, the tegulæ, a broad V-shaped band covering the parapsidal furrows, the cephalic half of the mesopostscutellum and continuous with a similar spot on each axilla, a large triangular spot on the mesopleura, the legs except the trochanters in part and the proximal portion of the caudal surface of the femora more or less and the tarsi, the ventral aspect of the abdomen, the saw-guides, and the two caudal terga. Length, 6 mm.

Bernard harbour, Northwest Territories, July 15, 1915. Specimen No. 1253.

This species resembles *pomum* Walsh. The punctured head, the shallow emargination of the clypeus, and the general topography of the head will serve to differentiate it.

The collection contained specimens of the galls of the following from which no adults were secured:—

Breeding Record: The larvæ described below were collected on bushy willow (*Salix Richardsonii*) on Herschel island, end of July, 1916. The portions of the plant enclosed with the larvæ in alcohol were the ends of the branches bearing the seed pods and in each case had been mined by a larva. This was considered at first as an indication that it was a species of *Euura*. It may be this or it may be the larva of a species of *Pontania* that has completed its feeding and has left its gall and is boring into the seed pod to make a place for pupation.

LARVA.—Body white, shading to brownish, with a portion of the head and the articulations of the segments of the legs brownish; ocularium round and black, the ocellus situated in its center; antennæ convex oval area near the ventral margin of the ocularia, limited by a brownish line and its surface bearing eight minute brownish areas; head white with minute, round, inconspicuous spots on the dorsal half, forming a fuscous spot on the dorsal half of the front; mandibles distinctly dentate; spinneret prominent, the distal end bluntly rounded; microthorax linear, white; thorax and abdomen with some of the annulets swollen and the summit of the swollen area slightly fuscous and with minute uncoloured spots bearing setæ; prothorax with three annulets, the first and third inconspicuous, the second bearing three setæ on each side of the meson, the spiracular area large and swollen and bearing two setæ, the pedal area swollen and indistinctly separated from the spiracular area; mesothorax and metathorax with four annulets, the first short and swollen, the second and third subequal in length, the mesal portion of the second slightly depressed, the mesal portion of the third swollen and separated from each lateral portion, the lateral portions of the second annulet bearing two setæ and of the third three setæ, the spiracular areas large and each bearing about three inconspicuous setæ, the pedal areas distinctly marked and swollen, setæ inconspicuous; abdominal segments one to eight with four annulets, the first small, the second and third large and swollen and with distinctly elevated lighter coloured mesal creeping ridges, the lateral portions of each bearing about two setæ; spiracular areas swollen and bearing about two setæ and distinctly separated from the swollen pedal areas bearing two or three setæ; annulets indistinct on the ninth and tenth segments; setæ of the tenth segment fairly numerous and without definite arrangement; prolegs long, cylindrical, and typical in form; spiracles

prominent and conspicuous, due to the semioval brownish mark on each side of each spiracle, the metathoracic spiracles distinct, but not functional and without brownish spots. Length, 8 m.

Breeding Record 131: Galls of a species of *Pontania* collected on *Salix reticulata* at Herschel island, Yukon Territory, end of July, 1916. The galls included under this number appear to represent two species, one similar to that of *Pontania atrata* and a very differently shaped gall which consists of two or three closely placed irregular swellings, more prominent on the under than on the upper surface of the leaf. The upper surface is infolded, forming a pocket partially concealing the swollen parts of the gall. Three adults were bred in the same summer but were lost in transit.

Breeding Record 74: Galls of *Pontania* on Creeping willow, *Salix arctica*, Bernard harbour, Northwest Territories, July 19, 1915. Under this number is included two types of galls, one evidently adult, spherical and similar in size to those of *Pontania atrata*, the others are small swellings confined in great part to the ventral surface of the leaf and are probably immature.

Galls of a species of *Pontania* collected (alcohol) at cape Bathurst, Northwest Territories, July 26, 1916, on *Salix arctica*. The galls are large, oval in outline, greatly swollen on the underside of the leaf, and project only slightly on the upper side. Apparently of a different species from any of those described.

Specimens of two minute galls occurring near the center of the leaves of *Salix Richardsonii*. Collected end of July, 1916, on Herschel island, Yukon Territory (alcohol). The galls are small kidney-shaped swellings which are more prominent on the dorsal than on the lower surface, and are evidently immature.

The species of *Amauronematus* described on the following pages can be separated by means of the following table:—

- a Head with the frontal crest not interrupted.
 - b Head mesonotum, and mesopleura wholly or for the most part black.
 - c Antennæ with the third segment distinctly shorter than the fourth; clypeus roundly emarginate..... *completus*.
 - cc Antennæ with the third and fourth segments subequal; clypeus angularly emarginate..... *indicatus*.
 - bb Head, mesonotum, and mesopleura distinctly marked with ferruginous.
 - c Clypeus broadly shallowly emarginate; supra-clypeal area pale..... *digestus*.
 - cc Clypeus narrowly deeply emarginate; supra-clypeal area black..... *cogitatus*.
- aa Head with the frontal crest distinctly interrupted.
 - b Mesonotum, including the mesoscutellum, black..... *varianus*.
 - bb Mesonotum, including the mesoscutellum, entirely or for the most part pale.
 - c Ocellar basin concave and broadly continuous with the median fovea..... *aulatus*.
 - cc Ocellar basin shallow and narrowly continuous with the median fovea..... *magnus*.

Amauronematus completus, n. sp.

MALE.—Head finely densely punctured and setaceous, clypeus and labrum polished; the clypeus narrowly, moderately deeply emarginate, the clypeal lobes large, angularly rounded at apex; the labrum broadly rounded and setaceous; antennal furrows deep depressions adjacent to the pretentorinæ, distinct on the cephalic aspect, and linear adjacent to the lateral ocelli, not reaching the caudal margin of the head; the ocellar and interocellar furrows not well defined; the postocellar area broad, not strongly convex; the portion of the ocellar areas bearing the lateral ocelli small and elevated, flat ventrad of the lateral ocelli and not forming a ridge continuous with the frontal crest; the ocellar basin short, deepest adjacent to the median ocellus; the median fovea a deep pit, three times as long as wide; the frontal crest wanting dorsad of the antennal fossæ and not interrupted on the meson; the supra-clypeal area

strongly convex; the antennæ roughened by closely placed fine pits, setaceous, the third segment distinctly shorter than the fourth and slightly shorter than the fifth; the prothorax, the median and lateral lobes of the mesonotum, the mesopostscutellum, and the mesopleura for the most part finely densely punctured; the mesoscutellum, mesosternum, and metapleura polished with sparse punctures; the wings hyaline, the stigma and the costa pale, the veins brownish; the stigma triangular in outline, the caudal margin almost straight; the claws deeply cleft, the inner ray subequal in length to the outer; the abdomen finely granular and setaceous; the procidentia long and truncated at the caudal end, and constricted at the cephalic end; the colour black with the following parts brownish: the labrum, the distal portion of the femora, the tibiæ, the tarsi except the distal segments of the metatarsi more or less above, and the caudal abdominal sternum. Length, 7 mm.

Collinson point, Alaska, June 20, 1914. F. Johansen, collector. Specimen No. 1166.

This species is related to *borealis* Marlatt from which it can be separated by the difference in the form of the median fovea and ocellar basin.

Amauronematus indicatus, n. sp.

MALE.—Head, the clypeus and labrum, finely densely punctured, the punctures tending to form rugosities; the clypeus deeply roundly emarginate, the clypeal lobes large, angular, rounded at apex; the labrum broadly rounded and polished; the antennal furrows deep broad depressions adjacent to the pretentorinæ and the dorsal part of the antennal fossæ, broad rather shallow but distinct furrows between these depressions and the lateral ocelli and the uninterrupted caudal margin of the head; the ocellar and interocellar furrows broad, deep, rounding furrows, the former connecting with the antennal furrows; the postocellar area strongly convex, its cephalic margin rounded; the portion of the ocellar areas bearing the lateral ocelli slightly elevated and continuous with the strongly elevated uninterrupted frontal crest; the ocellar basin distinct but shallow, extending from the frontal crest to the median ocellus; the median fovea a large subquadrangular depression; the supraclypeal area strongly convex; the antennæ roughened by closely placed fine pits, setaceous, the third segment shorter than the fourth; the prothorax, the median lobe of the mesonotum, the mesopostscutellum, and the metapleura in part finely densely pitted; the lateral lobes of the mesonotum, the mesoscutellum, the metascutum, and the mesosternum polished, sparsely pitted; the wings hyaline, the stigma pale, the veins, including the costa, brownish; the claws deeply cleft, the inner ray distinctly shorter than the outer; the abdomen polished and setaceous; the procidentia concealed; the colour black with the following parts brownish: the labrum, the distal portion of the femora, the tibiæ, the tarsi, and the caudal end of the abdomen. Length, 6.5 mm.

West of Konganevik, Camden bay, Alaska, July 4, 1914. F. Johansen, collector. Specimen No. 521.

This species is very similar to *completus*. The difference in the antennal segments and the clypeal emargination will distinguish them.

Amauronematus digestus, n. sp.

FEMALE.—Head finely roughened, sparsely setaceous; the clypeus polished, narrow and shallowly emarginate, the clypeal lobes minute and rounded; the labrum polished, long and broadly rounded, and setaceous; the antennal furrows deep from the pretentorinæ to the middle of the cephalic margin, broad distinct furrows from this to the lateral ocelli, and deep linear furrows interrupting the caudal margin of the head; the interocellar furrow a broad

concave depression, the ocellar furrow deeper and linear; the postocellar area sharply defined and convex with a mesal furrow; the ocellar areas not strongly elevated and only slightly elevated ventrad of the lateral ocelli, enlarged adjacent to the frontal crest; the frontal crest narrow, strongly elevated, and not interrupted; the ocellar basin distinct but short and surrounding the median ocellus; the median fovea a deep pit twice as long as wide; the supraclypeal area convex and setaceous; antennæ roughened, the third segment shorter than the fourth, the fourth and fifth subequal; the pronotum and the cephalic part of the mesonotum roughened, the remainder of the median lobe and of the lateral lobes polished, with sparse punctures; the mesopleura finely densely roughened; the mesosternum and metapleura polished and setaceous; the wings hyaline, the costa and stigma pale, the veins brownish, and the stigma long with the caudal margin nearly straight; the claws not deeply cleft, the outer ray distinctly longer than the inner; the abdomen indistinctly granular and sparsely setaceous; the saw-guides with the dorsal margin straight, the ventral margin gradually rounded, and the distal end broadly, obliquely, truncately rounded; the colour black with the following parts brownish: the head except the antennal furrows and the median fovea and a spot about the ocelli and the occiput, the pronotum in great part, the tegulæ in part, a V-shaped mark on the parapsidal grooves, the axillæ, the cephalic half of the mesoseutellum, a large mark on each pleuron, the distal third of the femora, the tibiæ, and the saw-guides; the distal segments of the mesotarsi and metatarsi more or less infuscated. Length, 5.5 mm.

West of Konganevik, Camden bay, Alaska, July 4, 1914. Specimen No. 520.

The elongate median fovea, the form of the clypeus, and the colouration will separate this species from *fulvipes* Norton, to which it is related.

Amauronematus cogitatus, n. sp.

FEMALE.—Head, except the clypeus and labrum, roughened throughout, more distinctly on the mesal portion, and setaceous; clypeus polished, narrowly, deeply, roundly emarginate, clypeal lobes large, triangular, blunt projections; the labrum polished, broadly rounded, densely setaceous near the margin; antennal furrows almost completely interrupted ventral of the lateral ocelli, deep and broad ventrad of the interruption, the vertical furrows linear and distinct, not interrupting the caudal margin of the head; the ocellar furrow a broad round depression, almost wanting; the interocellar furrow obsolete, probably represented by a distinct mesal pit in the ocellar furrow; the ocellar areas flat, only slightly elevated for the lateral ocelli, continuous with the frontal crest; the frontal crest not elevated above the ocellar areas, lateral walls precipitous which is due to the deep antennal furrows, interrupted by a deep linear mesal furrow, this furrow not interrupting the ocellar areas and not connected with the minute ocellar basin located ventrad of the median ocellus; the median fovea round, deep, pit-like, and continuous with the furrow interrupting the frontal crest; the supraclypeal area elevated, the mesal portion flat, continuous with the interrupted longitudinal portions of the frontal crest; antennæ wanting beyond the second segment; the pronotum, mesopleura, and metapostseutellum densely finely punctured; the median and lateral lobes of the mesonotum, the mesoseutellum, the metaseutum, the ventral half of the metapleura, and the mesosternum with sparsely placed round pits bearing setae, more abundant on the median lobe of the mesonotum; the wings with the stigma and costa pale, the veins only slightly darkened; the claws deeply cleft, the inner rays shorter than the outer, obliquely truncate; the abdomen polished, sparsely setaceous; the saw-guides stout, convex, the dorsal and ventral margins strongly convergent, the distal end short and bluntly rounded; the colour black with the following parts rufous: the ventral ends of the ocellar areas, the inner

and posterior orbits more or less, the pronotum broadly, the parapsidial furrows more or less, an indefinite spot on the mesoscutellum, each axilla, and the lateral parts of the mesopostscutellum, a large spot on the mesopleura, the knees, the tibiæ, the tarsi variable, and the caudal portion of the abdomen more or less; the labrum and clypeus yellow. Length, 6 mm.

Demarcation point, Alaska. "Collected as pupa in cocoon in moss on tundra May 14, 1914. Imago emerged June 23, 1914. Breeding Record 12a." F. Johansen, collector. Specimen No. 148.

This species is related to *orbitalis* Marlatt. The black tegulæ, the large median fovea, and the form of the frontal crest will separate it from this species.

Amauronematus varianus, n. sp.

FEMALE.—Head with the inner orbits slightly roughened, otherwise polished and setaceous; the clypeus narrowly, deeply, roundly emarginate, the clypeal lobes narrow, angular, and rounded; the antennal furrows broad and deep from the pretentorinæ to the caudal margin of the head, which they interrupt, linear at bottom caudad of the lateral ocelli, not so deep on the middle of their length; the ocellar furrow broad and deep, V-shaped, connected with the antennal furrows; interocellar furrow deep, extending from the median ocellus to the ocellar furrow; the ocellar areas broadly convex; the frontal crest elevated above the ocellar areas, its dorsal surface abrupt, deeply interrupted on the meson by a deep linear furrow, the furrow continuous with the median fovea; the supraclypeal area strongly convex; the ocellar basin shallow, extending from the interrupting furrow of the frontal crest to and around the median ocellus to the interocellar furrow; the postocellar area strongly convex, short and broad; antennæ roughened, finely setaceous, the fourth segment slightly longer than the third; the thorax polished throughout and setaceous; the wings hyaline, the stigma and costa pale, the veins brownish; the claws deeply cleft, the inner ray about one-half the length of the outer; the abdomen polished and setaceous; the saw-guides broad, the ventral margin convex, the distal end bluntly pointed at middle; colour black with the following parts infuscated brownish: the distal one-third of the femora, the tibiæ for the most part, the proximal portion of the tarsi, and the proximal part of the saw-guides. Length, 6.5 mm.

MALE.—The male differs from the female in having the head more coarsely punctured, the emargination of the clypeus broader, the clypeal lobes angular and pointed, the ocellar basin less distinct, the prothorax and mesopleura densely pitted, the dorsal aspect of the mesothorax not so densely pitted as the prothorax; the fourth segment of the antennæ distinctly longer than the third; the procidentia long and broad, the sides nearly straight, and the caudal end truncate; the legs with paler parts much lighter, the dorsal and ventral portions of the caudal segments of the abdomen pale. Length, 6 mm.

West of Konganevik, Camden bay, Alaska, June 27, 1914, the date borne by the specimens. F. Johansen, collector. Specimens No. 524, 525.

This specimen runs to *rapax* Cresson by Marlatt's table. The sharply defined ocellar basin will distinguish it.

Amauronematus aulatus, n. sp.

FEMALE.—Head not punctured but irregularly, obscurely roughened or finely granular; the clypeus polished, roundly and rather shallowly emarginate, the clypeal lobes broad, angular, and rounded; the labrum polished and rounded; the antennal furrows deep depressions from the pretentorinæ to near the middle of the cephalic aspect, where they are interrupted for a short distance, then broadly depressed to the lateral ocelli, linear and divergent caudad of the lateral

ocelli; the ocellar furrow broad and shallow, connected with the antennal furrows; interocellar furrow represented by a triangular punctiform depression connected with the antennal furrows, but distinctly separated from the median ocellus; the ocellar areas convex, continued as slightly elevated ridges to the frontal crest; the frontal crest deeply and broadly interrupted, forming a curved strongly elevated ridge on each side continuous with the broad slightly convex supraclypeal area; median fovea continuous with the broad furrow interrupting the frontal crest, this furrow continuous with the well marked ocellar basin, which extends to and around the median ocellus; the antennæ with the third and fourth segments subequal; the pronotum, the median lobe and the cephalic part of the lateral lobes of the mesonotum, the mesoscutellum the mesopostscutellum, the metascutum, and the metapleura finely densely roughened; the lateral lobes of the mesonotum in great part finely granular or polished with a few punctures; the mesosternum and metapleura finely granular and polished; wings greatly abbreviated, not extending beyond the caudal end of the abdomen, the stigma and costa pale, the veins much darker; the claws deeply cleft, the inner rays shorter and blunter than the outer; the abdomen polished with sparsely distributed punctures in which setæ are attached; the saw-guides broad and stout, the dorsal and ventral margins converging, the distal end long, straight, and oblique on the ventral portion and the much shorter dorsal portion bluntly truncated; the ventral and distal margins setaceous; the cerci long, slender, and pointed; colour black with the following parts brownish: a spot on the frontal crest and ventral part of the ocellar basin, the inner, posterior, and outer orbits, the postocellar area, the collar narrowly, the tegulæ, the median lobe and the caudal half of each lateral lobe of the mesonotum, the cephalic half of the mesoscutellum, a large triangular spot on the mesopleura, and the caudal end of the abdomen more or less; the knees and the tibiæ of the prothoracic and mesothoracic legs infuscated whitish. Length, 6 mm.

Barter island, Alaskan Arctic coast, June 16, 1914. D. Jenness, collector. Specimen No. 866.

This species is related to *digestus* from which it can be separated by the characters given in the table.

***Amauronematus magnus*, n. sp.**

FEMALE.—Head densely finely punctured throughout, probably densely setaceous, though the setæ are in great part wanting on the specimen; clypeus deeply, broadly, angularly emarginate, the clypeal lobes large and bluntly angular; labrum large and truncate; the antennal furrows deep between the pretentorinæ and the frontal crest and lateral ocelli, deep linear furrows caudad of the lateral ocelli, not interrupting the caudal margin of the head; the ocellar furrow broad and indefinite; the interocellar furrow distinct, a rounded depression where it joins the ocellar furrow; the portion of the ocellar areas bearing the lateral ocelli sharply raised, in great part elevated; the frontal crest a sharp V-shaped elevation, deeply interrupted on the meson by a broad, deep, linear furrow continuous with the median fovea; the median fovea a large, deep, punctiform depression; the ocellar basin convex with a distinct linear furrow extending from the median ocellus to the frontal crest, not connected with the furrow interrupting it; the supraclypeal area prominent and convex; the antennæ wanting beyond the second segment; the pronotum, the median lobe of the mesonotum, the greater part of its lateral lobes, the mesopleura, the mesosternum, and the metapleura densely punctured and setaceous; the caudal portion of the lateral lobes of the mesonotum, the mesoscutellum, the mesopostscutellum, and the metascutum sparsely punctured and setaceous; the

wings hyaline, the veins and stigma brownish; the claws deeply cleft, the inner ray distinctly shorter than the outer; the abdomen sparsely granular and setaceous; the saw-guides large, the dorsal margin oblique, the ventral margin convex, the distal portion rounded and forming a sharp point with the dorsal margin; the cerci long and stout, extending to the caudal end of the saw-guides; colour black with the following parts brownish: the margin of the labrum, the clypeal lobes, the mandibles, the superior and outer orbits, the postocellar area in great part, the pronotum broadly, the median lobe of the mesonotum except a triangular mesal black spot, the lateral lobes except a line on each axilla, the mesoscutellum, the mesopleura, the legs beyond the coxæ, the dorsum of the abdomen in great part, and the venter in part at the caudal end. Length, 11.5 mm.

Bernard harbour, Northwest Territories, July 15, 1915. F. Johansen, collector. Specimen No. 1254.

This species is closely related in colour and size to *insularis* Kincaid. It differs in the form of the median fovea and the ocellar areas.

Breeding Records, Undetermined Species.

Breeding Record 7a: "Green coloured" nematid larva (formalin) collected under moss in tundra bluffs at bay coast near winter house at Collinson point, Alaskan Arctic coast, November 29, 1913." F. Johansen, collector. Adult unknown.

Breeding Record 7b: "Sawfly (*Nematus* sp.) pupa in cocoon among dead willow leaves on tundra behind winter house at Collinson point, Alaska. November 21, 1913." F. Johansen, collector. Adult unknown.

Breeding Record 46: "Two cocoons of an unknown species of sawfly larva (green) collected February 18, 1915, in the burrows of a cerambycid larva made under White Spruce bark, Sandstone rapids, Coppermine river, Northwest Territories." F. Johansen, collector. Mr. Johansen states that "these two larvæ had the same appearance (and were taken in the same bark) as the larva from which *Pontania quadrifasciata* was bred."

Breeding Record 84: "Dark green saw-fly larva (20 mm.) On bushy willow, *Salix pulchra*. Collected at Bernard harbour, Northwest Territories, August 4, 1915. Made pupating cocoon in October." F. Johansen, collector. Adult not bred.

Breeding Record 85: "Saw-fly larvæ (black and dark green) 7-11 mm. On female catkins of bushy willow, *Salix pulchra*. Bernard harbour, Northwest Territories, July 16, 1915." F. Johansen, collector. Larva distinctive in colour, marked like many species of *Amawronematus*. The head black except the ventral portion, also the legs except the joints, and the ultimate tergum. The thoracic and abdominal segments with two transverse rows of round or oval blackish spots, larger on the thoracic segments, forming bands on the penultimate tergum. "Saw-fly larvæ in female catkins of bushy willow, *Salix pulchra*. Collected as larvæ at Bernard harbour, Northwest Territories, August 10, 1915." Two cocoons. Adult unknown.

Breeding Record 89: "A saw-fly larva 20 mm. long (pink with dark pigmentation) on leaf of *Salix reticulata*, collected at Bernard harbour, Northwest Territories, August 16, 1915. Pupated after having first assumed a uniformly red-orange colour with black eyes and only a little dark pigment on head and thoracic legs. In December it still had this colour and had begun its pupating cocoon." F. Johansen, collector. Cocoon and dried up larva received, probably a nematid. "A similar larva was collected the same day and place on leaf of bushy willow. Breeding Record 88."

Breeding Record 138: "Saw-fly larvæ (green), Ketchikan; Alaska, September 10, 1916. Made cocoon September 13, 1916." Cocoon contained the dead shrivelled larva of a species of *Trichiosoma*. F. Johansen, collector.

Breeding Records 139 and 140: "Saw-fly larvæ (green) on *Rubus* and *Sambucus*. Ketchikan, Alaska, September 10, 1916. A fortnight later these larvæ, by moulting, acquired a system of black segmental markings connected by a middle-stripe dorsally. Larva of No. 140 dorsal blackish brown, ventral pale. A week later the larva got an orange (also head) colour with black eyes and the same black dorsal markings as the larva from Breeding Record 139." "Record 139. Many larvæ collected, which all, except two, quickly died. May be they are younger stages of larva from Breeding Record 140." Specimen (alcohol) badly shrivelled, host plants would suggest that it might be an emphytid larva, the general habitus is also something the same. F. Johansen, collector.

Breeding Record 150: "Green saw-fly larva. Jasper park, Alberta, September 15, 1916." F. Johansen, collector. A single discoloured badly shrivelled specimen. Head coloured like larvæ of *Emphytinæ*.

The Parasitic Hymenoptera collected by the Canadian Arctic Expedition, 1913-18

By CHARLES T. BRUES

Bussey Institution, Harvard University.

The following report is based on the material collected or reared by Mr. F. Johansen. Most of the material was obtained near the headquarters of the Southern Party of the Expedition at Bernard harbour, Dolphin and Union strait. Three new species¹ are described. It was felt undesirable to give specific names to a number of the specimens.

ICHNEUMONIDÆ.

Amblyteles russatus Cress.

Ichneumon russatus Cresson, Proc. Acad. Nat. Sci., Philadelphia, 1878, p. 353.

One specimen from Bernard harbour, Dolphin and Union strait, Northwest Territories; collected on flowers in a sheltered place, July 18, 1915.

Described originally from Vancouver, B.C.

Amblyteles suturalis Say.

Ichneumon suturalis Say, Boston Journ. Nat. Hist., vol. 1, p. 227 (1836); complete writings, vol. 2, p. 685.

Two specimens from Bernard harbour, Northwest Territories, May 18 and July 12, 1915.

A widely distributed North American species.

Amblyteles spp.

There are four other species in the collection not referable to any palæartic or nearctic species so far as I can ascertain. It seems hardly worth while, however, to add isolated descriptions to those of an already large number of North American species which have not been studied in a comparative way.

Mesoleptus insularis Ashm.

Exolytus insularis Ashmead, Proc. Ent. Soc. Washington, vol. 4, p. 168 (1902).

Three specimens, Bernard harbour, Northwest Territories, August 14, 1915, collected on flowers on southern slope of ridge. Originally described from Popof island, Alaska.

Aptesis nivarius, n. sp.

FEMALE.—Length, 5 mm. Dull ferruginous, varied with black as follows: cheeks near base of mandibles, propleuræ anteriorly, margins of mesopleuræ, and propodeum; antennæ blackish at tips; abdomen piceous along the sides; legs

¹The types of all new species described in this report are deposited in the National Collection of Insects, Ottawa.

honey yellow. Wings reaching slightly beyond apex of propodeum, hyaline, with pale brown neuration. Head almost twice as wide as thick, full behind the eyes which occupy half of the side in top view; paired ocelli equidistant from one another and the eye-margin. Head shagreened above; face rugulose, clypeus strongly protuberant, its lower half smooth, malar space as long as the first flagellar joint. Eyes bare. Antennæ 23-jointed; scape large, oval; first three joints of flagellum subequal, about two and one-half times as long as thick at apex; following growing shorter and thicker; those near the middle quadrate. Mesonotum and scutellum shagreened, flat, separated by a shallow impressed line. Propodeum short, convex above, obliquely truncate behind; shagreened above, very finely rugose behind and on the sides; without distinct areas, although the transverse carina and a small median area are faintly indicated by very delicate lines; posterior angles rounded, without trace of tubercle or tooth. Pleuræ opaque except for a shining area below the base of the hind wing. Petiole of abdomen shagreened or minutely rugose, shining; broad behind, the width at apex four times as great as at base and equal to three-fourths the length. Following segments minutely roughened, more nearly smooth and shining after the third. Ovipositor exerted the length of the abdomen, although its sheaths are only half that length. Legs slender; fourth tarsal joint entire; claws simple. Wings with complete venation in miniature as far as the stigma, and beyond this with a very small rounded radial cell.

One female from Collinson point, Alaska, June 20, 1914. F. Johansen, collector.

Quite distinct in colour of body and antennæ from other nearctic and from European species. The nearly complete neuration of the wings is evidently similar to that described by Davis (Entomological News, vol. 4, p. 32. (1893)), for *Aptesis major*.

Polyblastus arcticus, n. sp.

FEMALE.—Length, 8.5 mm. Black, varied with fulvous, the fulvous markings as follows: face except median band, antennæ, clypeus except extreme base and sides, mandibles except tips, palpi, tegulae, second to fourth segments of abdomen, except spot on tip of fourth, front and middle legs, except coxæ, hind trochanters, basal two-thirds of tibiae, spurs and entire tarsi. Wings strongly tinged with fulvous basally, veins and stigma fuscous. Face very closely punctate, much more finely so at the sides; clypeus convex, smooth and shining, except at the edges, labrum projecting beyond the closed mandibles; antennæ 31-jointed, the first flagellar joint slightly longer than the second, vertex punctulate; head behind shining and almost smooth; mesonotum shining, closely punctate; scutellum strongly sloping and elevated at the apex. Propodeum shining, basal and supermedian areas confluent; petiolar area large, as broad as long, its sides curved. Propleuræ very closely punctate, confluent so below, epomia sharp, but not prominent; mesopleura closely punctate; metapleura rugulose-punctate below. Abdomen as long as the head and thorax; petiole slender, slightly over twice as long as broad at apex which is twice as wide as the base, shining and almost smooth above; spiracles slightly before the middle; discal carinae present only on basal fifth of segment; second segment as long as broad, third and fourth broader than long; ovipositor stout, exerted over half the length of the petiole; without attached eggs; tarsal claws with four or five long pectinations on basal half. Areolet small, indistinctly pentangular, with the outer vein, oblique, partly hyaline; submedian cell slightly longer than median; discoidal vein in hind wing but slightly oblique, broken just below the middle.

† One female. Ketchikan, southern Alaska, September 10, 1914. F. Johansen, collector.

† This species is coloured much like *P. glacialis* Ashm. described from St. Paul island, Alaska, but the carinae of the abdominal petiole are much shorter and the

trochanters pale. It is quite distinct from other North American and from all the European species included by Schmiedeknecht in his *Opuseula Ichneumonologica*.

Stenomacrus borealis Ashm?

Fur Seals and Fur Sea Islands, vol. 4, p. 358 (1899).

One specimen from Herschel island, Yukon Territory, July 29, 1916, is probably this species.

Ophion bilineatum Say.

Ophion bilineatus Say, Contrib. MacLurian Lyc. Arts & Sci., vol. 1, p. 75. (1828); Complete writings, vol. 1, p. 378.

One specimen from Cockburn point, Dolphin and Union strait, Northwest Territories, September 5, 1914. This was collected at a lighted lantern in the evening.

A very abundant and widely distributed North American species.

Dioctes modestus, n. sp.

FEMALE.—Length, 4-4.5 mm.; ovipositor as long as the hind femur. Black, clothed with sparse, short, white hair; the middle of mandibles, tips of front femora, all tibiae and base of tarsi brownish yellow; wings hyaline, stigma and veins pale fuscous. Head broad, twice as wide as thick, strongly excavated medially behind, the temples as deep as the eyes; seen from the front, the face is not narrowed below; malar space as long as the width of mandibles at base. Ocelli large, paired ones closer to the eye margin than to one another. Front and face opaque, minutely roughened, clypeus almost smooth, sub-shining, its lower edge straight. Head behind opaque and finely roughened below, nearly shining above. Eyes bare, twice as high as broad, not emarginate. Antennae 23-jointed; first joint of flagellum one-half longer than the second; four following subequal; those beyond shortening, but all of them longer than thick. Mesonotum subopaque, finely roughened. Scutellum slightly shining; with a deep, smooth, transverse furrow at the base; strongly convex. Propodeum declivous from base, but more strongly so beyond middle, finely rugose, nearly smooth anteriorly on the sides; supermedian and petiolar areas confluent, the latter the broadest, the former reaching almost to the base of the propodeum; lateral and subspiracular carinae present. Pleurae finely roughened, the mesopleura with a smooth space near the root of the hind wing and a trace of fine oblique striae below the root of the fore wing. Abdominal petiole with the spiracles placed before the posterior third, distinctly projecting; widened from just before the middle; more than twice as wide at apex as at base and one-third wider than at spiracles; its surface roughened, except at extreme apex. Second and third segments roughened, especially at base; following nearly smooth, the apical segments not very strongly compressed. Ovipositor issuing at the apex of the fourth ventral segment, strongly curved upward. Submedian cell slightly longer than the median; disco-cubital vein angularly broken, with a stump of a vein; arcolet open, small and petiolate in position; transverse median vein in hind wing not broken. Tarsal claws pectinate.

MALE.—Length, 4-4.25 mm. Essentially like the female; antennae 24-jointed; abdominal petiole more slender, as wide at spiracles as at apex; tibiae darker, pale fuscous.

Four females and two males from Bernard harbour, Northwest Territories, August 7 and 12, 1915, the female type taken on the latter date. F. Johansen, collector.

Quite distinct from any of the palæarctic forms listed by Schmiedeknecht, and so far as I can ascertain not identical with any North American species referred to, either *Diocles*, *Angitia*, or *Limnerium*. The species was reared from a lot of galls from *Salix*, probably produced by a saw-fly. (Breeding Record 37.)

Bathyplectes sp.

A single male from Bernard harbour, Northwest Territories, apparently represents an undescribed species, but the specimen is poor and, in the absence of the female, it seems unwise to give it a name.

BRACONIDÆ.

Meteorus sp.

One specimen from Ketchikan, Alaska, reared October 1 from a cocoon collected September 10, 1916. The cocoon was attached to a pine leaf suspended by a slender thread as is customary with the members of this genus. (Breeding Record 136.)

Apanteles sp.

Twenty-five specimens from Bernard harbour, Northwest Territories, taken during July, 1915.

Apanteles sp.

Eleven specimens from Bernard harbour, Northwest Territories, reared during July and August, 1915, from an unknown caterpillar. (Breeding Record 40a.)

Protapanteles sp.

One specimen from Bernard harbour, Northwest Territories, July 20, 1915.

The Wasps and Bees collected by the Canadian Arctic Expedition, 1913-18.

By F. W. L. SLADEN.

The wasps and bees brought back by the Canadian Arctic Expedition consist of one species of *Vespa*, of which twenty-eight specimens were taken in Alaska, and eight species of bumble-bees (*Bombus*), of which one hundred and fifty specimens have been taken in Canada and Alaska. The purely Canadian material consists of one hundred and eleven specimens of five species of bumble-bees.¹

It is worthy of note that *Vespa* is the only genus of wasps distributed through the temperate region that lives in colonies containing a number of small virgin females or workers which raise the males and the perfect females or queens; and likewise, among the bees, *Bombus* is the only genus enjoying the same manner of life, if we except *Apis*, in which the colony survives the winter. In both *Vespa* and *Bombus* the colony breaks up at the end of the summer, and the sole survivors, the young queens, after impregnation, pass the winter solitarily in a state of complete torpidity, and establish new colonies in the spring.

VESPOIDEA.

Represented by twenty-eight specimens from Alaska of one species of *Vespa*.

Vespa marginata Kirby.

Vespa marginata Kirby, Fauna Boreali Americana, Insecta. 1837.

Vespa albida Sladen, Ottawa Naturalist, xxxii, p. 71.

This species belongs to the *Norvegica* group which is distinguished from the other groups of the genus *Vespa* by the fact that the eyes do not nearly reach to the mandibles, and the sagitæ in the male genitalia are not fused together at the tip. This species may be distinguished in the male and worker by the pale yellow, almost white, markings, combined with two red spots on the second dorsal segment of the abdomen. The red spots are absent in the queen.

MALE.—Black: mandibles; clypeus, except a median longitudinal line, broad in the middle; bilobate spot between antennæ; scape in front; a narrow line on cheek above, behind eyes, another on inner margin of eye; a line on pronotum bordering mesonotum; a small lateral spot on the scutellum, a narrow uninterrupted slightly wavy line on apical margins of dorsal abdominal segments 1 to 5; a narrow line interrupted in the middle on segment 6; two large comma-shaped spots on segment 7 and the margins of ventral segments 2 to 4, pale yellow, almost white. A large red spot on each side of segment 2. Second and base of third antennal joint testaceous beneath. Inner margin of stipes not sharply angled, clothed with dense short red hairs; legs testaceous; coxæ, trochanters and bases of femora black; a black spot on fore tibiæ, apex of femora and of tibiæ, and basal tarsi flavous. Body hairs long, pale, mixed with black, including those on the first segment of abdomen. Length, 13 mm.

¹The types of all new species described in this Report are deposited in the Canadian National Collection, Ottawa.

QUEEN.—Head, thorax and abdomen coloured like the male, but the abdominal segments 1 to 5 have complete pale bands, emarginate in front on each side and narrowly so in the middle; the sixth segment has two spots; the ventral segments 2 to 4 have marginal bands interrupted in the middle; ventral segment 5 has two large spots. No red on second dorsal segment. Length, about 14 mm.

WORKER.—Black, the following parts creamy-white: mandibles except tips, clypeus except a broad longitudinal line, broadest in the middle, scape in front, a bilobate spot above antennae, a narrow line on lower side of emargination of eye, an elongate spot on cheek behind eye, a parallel sided line on margin of pronotum next mesonotum, a small spot on each side of scutellum near wing, complete bands on the apices of dorsal segments 1 to 5, that on segment 5 deeply emarginate on either side anteriorly, narrowly emarginate in middle; that on segment 4 less and on segment 3 still less deeply so; segment 6 with a large spot on either side containing a small black spot; apical margin of ventral segments 2 to 5, greater part of ventral segment 6, apex of femora, line on tibia and part of basal tarsi. The following parts red: irregular spot, often absent, on side of dorsal segment 1; a large, in some specimens a small, spot on side of dorsal segment 2; apex of segment 5; middle of femora, tibiae and tarsi. Hairs on vertex, dorsum of thorax and abdomen mostly black. Hairs on sides and underside of head, thorax and abdomen and on first dorsal segment of abdomen mostly pale. Length, 10 to 11 mm.

One male, Nome, Alaska, August 24-25, 1916 (F. Johansen). One queen and twenty-six workers from a nest taken at Teller, Alaska, by Mr. Johansen on July 26, 1913. The queen is in alcohol, the other specimens dried. Most of the workers are in perfect condition. The nest contained larvæ and was in a hole under an old willow shrub at the brink of the lake. The nest was half hidden in the hole, half protruding from it, and attached to the thick root of the willow, while heather twigs supported the outer layers of the nest.

I have here followed Du Buysson in considering this form to be the *marginata* of Kirby. Kirby's description, however, makes no reference to the red spots on the abdomen or the long malar space.

An old and smaller wasp's nest was found at Teller on August 3, 1913, by Mr. Johansen in an old rusty tin-can lying free on the tundra. Neither this nest nor any of the wasps in it were brought home. Dr. Anderson saw a wasp's nest the size of a man's head on a willow branch on the Hula-Hula river, Alaska, in November, 1908. There is no information to show to which species either of these nests belonged.

SPHECOIDEA.

The collection contains no representatives of this super-family.

APOIDEA

Represented by 150 specimens of bumble-bees. These consist of eight species, belonging to three groups, of the genus *Bombus* Lat. Five of the species were found in Canada.

Bombus Lat.

Kirbyellus Group.

Kirbyellus Group, Franklin. Trans. Amer. Ent. Soc. XXXVIII, p. 289.

Size large. Pile long and fine. Malar space very long, one-third to one-half as long as the eye. Red-haired areas on the abdomen if present, are at the tip only. In the males the genitalia are very different to those of the other groups, and the posterior tibiae are more like those of the female.

Bombus kirbyellus (Curtis) Franklin.

Bombus kirbyellu, Franklin. Trans. Amer. Ent. Soc. XXXVIII, p. 291.

MALE.—Eighth ventral segment of abdomen (inner spatha) tridentate (see figure). Hair colour pale yellow; black between the antennae, on the inner margins of the eyes, on the outer margins of the eyes and on the third segment of the abdomen: there is an indistinct black band on the thorax between the wings but this is partly bleached, and the fourth to the seventh segments of the abdomen are pale red: on the underside the hairs are long, and almost white. Length, about 15 mm.

WORKER.—Hair on head black, on thorax black with a yellow band before and behind, pleura pale yellow. Abdomen: segments 1 and 2 yellow, segment 3 black, segments 4 to 6 dull red; underside with white hairs; legs with long largely pale hairs.

Two males, Nome, Alaska, August 24 to 25, 1916 (F. Johansen); one worker, Nome, Alaska, August 24–25, 1916 (F. Johansen); one worker, Collinson point, Alaska, July 10, 1914 (F. Johansen); one worker, Young point, Northwest Territories, July 21, 1916 (this specimen has the hairs on the legs and underside black).

Specimens of *B. kirbyellus* in the Canadian National Collection include a queen from Bartlett bay, Alaska (lat. 58·26, long. 135·53), 1907 (D. H. Nelles), two from Fullerton, Northwest Territories, July, 1904 (A. Halkett), one from Nottingham island, Hudson strait, 1886 (J. McKenzie), and one from cape Chudleigh, Hudson strait; a worker from Laggan, Alta. (J. Fletcher), and males from Banff, Alta. (N. Sanson).

Bombus polaris (Curtis) Franklin.

Bombus polaris Franklin, Trans. Amer. Ent. Soc. XXXVIII, p. 299.

MALE.—Eighth ventral segment tapering to a blunt point, its side margins deeply incurved (see figure). Hairs on head black with more or less pale yellow on clypeus and vertex. Thorax pale yellow with indistinct interalar black band. Abdomen; basal portion pale yellow, apical portion pale red, with more or less black on the middle portion. Hairs on underside and legs pale with more or less black. Length, 14 to 15 mm.

QUEEN AND WORKER.—Head hairs black. Thorax black, with a broad yellow band in front and a narrower one behind, pleura yellow, lower part black. Abdomen with segments 1, 2 and 3 yellow; segment 4 black; segments 5 and 6 red. Length, queen 16 to 19 mm., workers 11 to 13 mm.

Two males from Nome, Alaska, August 24–25, 1916 (F. Johansen); one queen from west of Collinson point, Alaska, June 11, 1914 (E. deK. Leffingwell); one worker from Kamarkok, west of Herschel island, Yukon Territory, August 3, 1916, and one from Herschel island, near end of July, 1916 (F. Johansen) one queen from Bernard harbour, Northwest Territories, July 2, 1915; two males from Bernard harbour, July 10, 1916 (F. Johansen). The males from Bernard harbour have the coat bleached to a considerable extent, one of them has no black hairs on the abdomen. The queen from Collinson point differs from the description in having segment 3 partly black and segment 4 red.

Bombus neoboreus, n. sp.

This species is distinguished from the other species of the *Kirbyellus* group by the structure of the eighth ventral segment in the male and by the strongly marked melanism in both sexes.

MALE.—Eighth ventral segment truncate (see figure); inner margin of claspers of genitalia nearly straight. Hair black; but a faint tinge of yellow on centre of face and a few yellow hairs on vertex (occiput); thorax with the anterior yellow band well developed, remainder of thorax black with a faint tinge of yellow on the posterior part, and in the type (the lighter example) yellow on the upper part of the pleura. Abdomen black, segment 1 yellow but black in the middle and at the extreme sides; segment 2 yellow, but in the darker example partly black in the middle apically and at the extreme sides basally; segment 3 entirely black but in the lighter example yellow at the sides apically; segments 4 and 5 black and segments 5 and 6 pale red. Hairs on legs and underside black. Length, 16 mm.

QUEEN.—Hair black; that on the head entirely black; on thorax, anterior yellow band more or less encroached upon from behind in the middle by black, posterior yellow band absent or rudimentary, absent in type; pleura black, faintly tinged with yellow over a considerable area in some examples including the type; abdomen, segment 1 yellow only at the sides, black on extreme sides; segment 2 yellow, but black on extreme sides; segment 3 with a little yellow on either side of middle in five specimens including the type, black in the four remaining specimens; apex of segment 4 and whole of segment 5 red in three specimens; segment 4 black and segment 5 tinged with red in eight specimens, including type. Hairs on legs and underside black. Length, 22 to 24 mm.

WORKER.—Coloured like the queen.

One male, Bernard harbour, Northwest Territories, August 17-18, 1915 (F. Johansen); one darker male, Bernard harbour, Northwest Territories, July 10, 1916 (F. Johansen); eleven females, all from Bernard harbour, Northwest Territories, as follows: June 6, June 21, June 25 (type), July 2, July 9, July 30 to August 7, August 8, August 17 to 18 (two), 1915, June 16, July 3, 1916 (F. Johansen); three workers, Bernard harbour, Northwest Territories, July 19, August 10, and August 14, 1915 (F. Johansen).

Bombus arcticus (Kirby) Franklin.

Bombus arcticus Franklin, Trans. Amer. Ent. Soc. XXXVIII, p. 302.

MALE.—Malar space fully one-half as long as the eye, eighth ventral segment obtusely pointed. Head black, a patch of yellow on the vertex. Thorax black with a well-developed anterior yellow band and another equally wide behind; pleura black, the yellow extending only a short way below the bases of the wings. Abdomen, segments 1 and 2 densely clothed with yellow, the remaining segments black. Legs black, underside black. Length, 15-17 mm.

QUEEN.—Malar space about one-half as long as the eye. Head black; in two examples a few of the hairs on the vertex are yellow. Thorax black with a well-developed anterior yellow band and another equally wide behind; pleura black but the yellow extends a short way below the bases of the wings. Abdomen with the two basal segments with dense yellow hair, the remaining segments black. Length, 20-23 mm.

Ten males as follows: four from Bernard harbour, Northwest Territories, August 14, 1915 (F. Johansen); one from Bernard harbour, Northwest Territories, July 10, 1916 (F. Johansen); and five from Herschel island, Yukon Territory, July, 1916 (F. Johansen).

Ten queens as follows: Four from Collinson point, Alaska, July 10, 1914, one of them somewhat undersized (F. Johansen); one from Barter island Alaska, June 25, 1914 (D. Jenness); two from Bernard harbour, Northwest Territories, August 10, 1915 (F. Johansen); two from Bernard harbour, Northwest Territories, August 17-18, 1915 (F. Johansen); one from Herschel island, Yukon Territory, end of July, 1916 (F. Johansen).

In unfaded examples of both males and queens the yellow is of a browner hue than in the other species of the *Kirbyellus* group.

One queen, about 11 mm. long, and five larvæ "secured cape Ross, Melville island, Northwest Territories, June 21, 1916, by Emiu (Eskimo)" (V. Stefansson). The Canadian National Collection contains another queen taken at Melville island, July 20, 1909, by F. C. Hennessey. Both the Melville island specimens differ from those taken on the mainland in being slightly smaller, length 19-20 mm., with the yellow pale and dingy, the yellow band on the posterior part of the thorax narrower than on the anterior part, and the pleura only faintly tinged with yellow. It is possible they represent a distinct variety or even species.

Bombus arcticus is probably the *B. hyperboreus* of European authors, found in Greenland and Arctic Eurasia.

(Two females of another species of the *Kirbyellus* group, *B. strenuus* Cr. from the Kutlan Glacier, Yukon Territory (alt. 9,000 feet), taken by H. F. J. Lambart and Alf. Pattison in June, 1913, are in the Canadian National Collection).

Pratorum Group.

Pratorum Group, Franklin, Trans. Amer. Ent. Soc. XXXVIII, p. 304.

Species of smaller size than those of the *Kirbyellus* group. Malar space shorter, one-quarter to one-third as long as the eye. Male genitalia very different.

Bombus sylvicola Kirby.

Bombus sylvicola Kirby, Fauna Boreali-Americana, Insecta 1837.

Bombus sylvicola Franklin, Trans. Amer. Ent. Soc. XXXVIII, p. 338.

MALE.—Hairs on head black, a patch of yellow on the middle of the face usually reaching upwards to between the antennæ, vertex with a yellow patch, ventro-lateral sides of the head more or less yellow, sometimes entirely black malar space about one-fourth as long as the eye. Thorax with a wide anterior yellow band, a medial and about equally wide black band and a yellow band on the scutellum, the anterior median portion of which is more or less covered with an extension of the black from the medial band; pleura yellow to base of legs. Abdomen, first segment yellow, second and third red, sometimes more or less black in the middle, fourth and fifth yellow with more or less black in the middle, sixth and seventh segments black, often more or less yellow at the sides; hairs on venter mostly pale.

The specimens from Nome and Teller are smaller (average length, 11 mm.) and have the pile somewhat shorter and less shaggy, and on the average more yellow (less black) on the fourth and fifth segments than those from Herschel island (average length, 12.75 mm.), and Bernard harbour (average length, 13.27 mm.). In five of the specimens from Bernard harbour the red extends more or less on to the fourth segment.

QUEEN, REGULAR FORM.—Head black with a patch of pale yellow on middle of face between and below bases of antennæ and a smaller, fainter one above antennæ, vertex yellow. Thorax with a wide pale yellow band in front and a narrower one behind separated by a black band, pleura pale yellow to base of legs. Abdomen: segment 1 pale yellow, segments 2 and 3 red, segments 4, 5 and 6 pale yellow with more or less black in the middle of the segments. Length, 20 mm.

QUEEN, MELANIC VARIETY *johanseni*, n. var.—Head black, face black, a few dingy pale yellow hairs on vertex. Thorax with a band of dingy pale yellow in front, more or less narrowed by encroachment of the black, but black hairs are not mixed in with the yellow to any great extent; a broad black band between the wings and a narrow pale yellow band on the posterior part of the thorax, this band interrupted in the middle by an extension of the black from the interalar band; pleura black, in some specimens faintly tinged with yellow. Abdomen with the first segment pale yellow interrupted in the middle with decumbent dark hair which is scanty; segments 2 and 3 red; segments 4, 5 and 6 black with more or less pale yellow hair on sides of segment 4. Hair on legs and underside black, corbicular fringes tinged with red in the type and in several specimens. Length, 18 to 20 mm.

WORKER, REGULAR FORM.—Coloured like the queen.

WORKER, MELANIC VARIETY *johanseni*.—Coloured like the queen of this variety.

Six males from Nome, Alaska, August 24–25, 1916 (F. Johansen); six males from Teller, Alaska, July 26, and five on July 29, 1913 (F. Johansen); nine males from Herschel island, Yukon Territory, end of July, 1916 (F. Johansen); six males from Bernard harbour, Northwest Territories, July 30 to August 7, 1915 (F. Johansen); one August 8, two August 10, two August 14, 1915, all from Bernard harbour (F. Johansen).

One queen of the regular form from Barter island, Alaska, July 4, 1914 (D. Jenness); one, abdomen missing, from west of Collinson point, Alaska, June 11, 1914 (E. de K. Leffingwell).

Twenty-nine queens of the melanic variety *johanseni*, all taken by Mr. F. Johansen, as follows: One from Bernard harbour, Northwest Territories, July 3 (type), two July 4, one July 6, two July 7, one July 11, one July 12, one July 19, nine July 30 to August 7, one August 8, two August 10, one August 14, all from Bernard harbour in 1915; one Chantry island (Bernard harbour), June 17, one Bernard harbour July 9, and three Bernard harbour July 14, 1916. One queen from Port Epworth, Coronation gulf, taken by Mr. J. J. O'Neill on July 15, 1915, in bad condition, appears to agree with the description of *johanseni*. One queen from Herschel island, Yukon Territory, end of July, 1916 (F. Johansen), has the yellow bands on the thorax as wide as the black band and has a narrow pale yellow band on the apices of segments 2 and 3.

The melanic variety *johanseni* approaches *melanopygus* Nyl., which, according to Franklin, can be readily separated from *sylvicola* by the difference in the coloration of the head and fore part of the thorax, which is of "thoroughly mixed black and yellow hairs." However, in specimens of *melanopygus* from British Columbia the black hairs stand out conspicuously among the yellow on the fore part of the thorax.

B. sylvicola is probably the same species as *lapponicus* Fab. found in Northern Europe and the mountains of Britain. The coloration of both species is the same and the spreading of the red to the fourth segment as noted in five of the Bernard harbour males occurs in varieties of *lapponicus* found in Scotland and the Pyrenees.

Bombus pleuralis (Nyl.) Franklin.

Bombus pleuralis Franklin, Trans. Amer. Ent. Soc. XXXVIII, p. 364.

MALE.—Head and thorax clothed with yellow pile; a few black hairs on the inner and outer margins of the eyes and around the ocelli and a well-defined black interalar band. Abdomen with segments 1 and 2 yellow; segments 3 and 4 bright red, with a few black hairs at the bases of the segments in one specimen; segments 5 to 7 black, a few red hairs on segment 5; venter mostly pale yellow. Length, 13–14 mm.

WORKER.—Head black with a small patch of yellow between the antennæ and extending above them, and another on the vertex. Thorax yellow with a well-defined black interalar band. Abdomen: segments 1 and 2 yellow with, in three specimens, a few dark hairs in the middle, segments 3 and 4 red, 5 and 6 variable. Length, 10–12 mm.

Two males from Nome, Alaska, August 24–25, 1916 (F. Johansen); four workers, Nome, Alaska, August 24–25, 1916 (F. Johansen).

This is Franklin's "colour variant" of *pleuralis*. In the red band on the abdomen it approaches *flavifrons* Cr. and *centralis* Cr. but is distinguished therefrom by the clear black interalar band and the weak yellow on the face. However, extensive collecting of the three forms in Western Canada by the writer shows that *flavifrons* and *centralis* are merely varieties of *pleuralis*. The name *pleuralis* is applied by Vogt to one of the forms of the *Kirbyellus* group.

Bombus frigidus, Smith.

Bombus frigidus, Franklin, Trans. Amer. Ent. Soc. XXXVIII, p. 360.

MALE.—Head and thorax pale yellow, a few black hairs around the margins of the eyes, the insertion of the antennæ and the ocelli, and a well-defined black interalar band. Abdomen: segments 1 and 2 pale yellow, segments 3, 4 and base of 5 black. Apex of 5 and remaining segments dingy white with a ferruginous tinge, evidently faded. Length, 12½ mm.

WORKER.—Face black, vertex pale yellow. Thorax pale yellow with a broad black interalar band. Abdomen: segments 1 and 2 pale yellow, segment 3, and base of 4, black; apex of segment 4 and remaining segments pale ferruginous. Length, 10–11 mm.

One male, Nome, Alaska, August 24, 25, 1916 (F. Johansen); two workers, Nome, Alaska, August 24, 25, 1916 (F. Johansen). (The Canadian National Collection contains a worker of *Bombus mixtus* Cr. taken in the Poreupine Mountain district, Yukon Territory, on June 15, 1912, by D. D. Cairnes.)

Terrestris Group.

Terrestris Group, Franklin, Trans. Amer. Ent. Soc. XXXVIII, p. 261.

Distinguishable from the other groups by its broad face, very short malar space, less than one-fifth as long as the eye, and the very different genitalia of the males.

Bombus lucorum, L.; variety **moderatus** Cr.

Bombus terrestris, var *moderatus* Franklin, Trans. Amer. Ent. Soc. XXXVIII, p. 262.

WORKER.—Head black; thorax black, with an anterior pale yellow band. Abdomen: segment 1 black, pale yellow at the sides; segment 2 pale yellow, segment 3 and base of segment 4 black; apex of segment 4 and segments 5 and 6 white. Length, 12 mm.

One worker, Nome, Alaska, August 24-25, 1916 (F. Johansen). Differs from specimens of the queen in the Canadian National Collection from Banff, Alta., in having the first segment of the abdomen not wholly black.

NOTES ON THE BUMBLE-BEES.

The specimens generally are remarkable for their long shaggy hair and their large size, both well-known attributes of the arctic *Bombi*. Two species, *B. neoboreus* and *B. sylvicola* var. *johanseni* from Bernard harbour, Northwest Territories, show pronounced melanism. Melanism is rare in the North American bumble-bee fauna and has been heretofore met with only in occasional specimens, but there is a large region of pronounced melanism in Northwestern Europe centred in Denmark and extending to the Alps, the British Isles and Southern Scandinavia.

Bombus is particularly well adapted to arctic conditions. These bees develop considerable body heat and their warm coat enables them to keep active in low temperatures. Even in the temperate region the queens of some of the species may be seen collecting nectar and pollen from the willows and other flowers in the sunshine of early morning while frost is still on the ground. The arctic summer permits such activity at almost any hour of the day or night, provided nectar can be obtained, and this probably is an easy matter on account of the numerous flowers.

The home of the bumble-bee colony is always made in a nest composed of warm material, usually the deserted nest of some mammal or bird. The Arctic species, so far as we know, like most of the other species, select nests under the ground, a position which provides good protection from the weather. The brood of *Bombus* needs to be incubated by heat from the body of the adult bees, but can endure a longer-continued and greater degree of chill than that of *Apis* without dying, but its development is retarded and the lustre of the coat of the resulting perfect insect is reduced if the pupae are chilled. A lack of lustre is characteristic of some Arctic specimens of *Bombus*. It is, however, probable that the chilling of the brood is not frequent, because under favourable conditions the queen will, in two or three hours, collect and store in a large waxen cell she constructs in her nest, enough nectar to keep herself and her brood warm for twelve to twenty hours, and, in a later stage of the colony, the workers will accumulate enough honey in the vacated cocoons to last several days.

One of the species of *Bombus* from the Canadian Arctic belongs to the *Pratorum* group, several temperate zone species of which are very hardy and early. *B. pratorum* itself is the earliest species of *Bombus* to start nesting in England, where the young colonies occasionally have to withstand a snowstorm in April. The four other species from the Canadian Arctic belong to the *Kirbyellus* group which is confined to the Arctic and high mountain regions of the northern hemisphere. The brood and adults of this group may be expected to resist cold still better than those of the *Pratorum* group, and to be especially well able to survive, in a state of semi-torpority, a period, lasting several days, when long-continued bad weather prevents the collecting of food, a character already fairly well developed in *Bombus pratorum*.

The taking by an Eskimo at Cape James Ross, Melville island, on June 21, 1916, at a latitude of almost 75°, evidently from a nest, of five nearly full-fed *Bombus* larvae, which were brought back by Mr. Stefansson, indicates that the eggs must have been laid not later than the 8th or 9th of June, and is surely a remarkable record of the favourable conditions that exist for bumble-bee life in the far north, at least in some seasons. Half a dozen *Bombus* cocoons containing dead pupae were taken from the same locality by Mr. Storkerson in April, 1916.

An old *Bombus* nest containing a couple of dead pupae was brought in by Dr. R. M. Anderson on November 12, 1913, from the Sadlerochit river, Alaska; it

was in an old fly-catcher's nest, composed of ptarmigan feathers, hairs of mountain sheep, etc., and was found in a crevice in bare rock at a creek near the camp. Large empty fly cocoons were found in the bird's nest and in some of the bee cells. Another but inhabited nest was found on the southwest coast of Victoria island by Dr. Anderson in July, 1911; this was in an old lemming burrow at the base of a rock, and was of the size of a child's fist.

Many of the specimens of *Bombus* taken carried parasitic mites (*Parasitus bomborum* Andemans) in their coat.

FROM F. JOHANSEN'S FIELD NOTES.

Observations on bumble-bees at the Arctic Coast of North America from Point Barrow in the west to Coronation gulf in the east, and adjoining islands:—

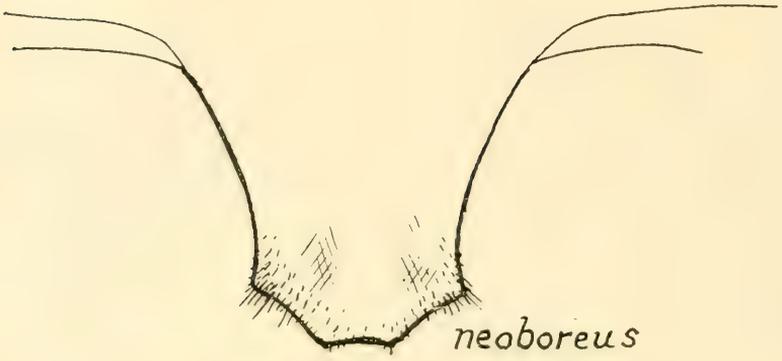
"The first bumble-bees were seen at the beginning or middle of June while the snow was yet covering the ground to a large extent. The summer comes a little earlier west of Mackenzie river than east of it; except when there is an especially early season in the eastern region. The temperature during June is generally above the freezing point, and even if the nights are colder, it is fairly warm during the middle of the day, especially when the sun is out.

"The first bumble-bees seen in the season were mostly flying high up at rapid speed. A few days later the bees were seen feeding on the first flowers out (the male catkins of *Salix pulchra*, *S. anglorum*, and the flowers of *Saxifraga oppositifolia*). From the middle of June additional flowers were out (*Salix ovalifolia*, *Oxytropis nigrescens* and *O. arctobia*, *Pedicularis lanata*, and during the end of June still more (*Salix reticulata*, *Dryas integrifolia*, *Cassiope tetragona*, *Pedicularis arctica*, *P. sudetica*, etc.), all of importance to the bumble-bees, and greatly utilized by them. From July on, there was no lack of flowers; in addition to the above mentioned were *Silene acaule*, *Lupinus nootkatensis*, *Hedysarum mackenzii*, *Astragalus alpinus*, *A. frigidus*, *Saxifraga groenlandica*, *S. tricuspidata*, *S. Cernua*, *Aconitum delphinifolium*, *Pedicularis capitata*, *Polemonium caeruleum*, *Castilleja pallida*, *Myosotis sylvatica*, *Lagotis glauca* and *Lychnis apetala*. Few plants upon which the bees depend for food begin their flowering so late as August; among these are *Epilobium latifolium*, *Campanula uniflora*, and various *Compositae*. Few bumble-bees were seen in September, and none after the first week of this month. Although the temperature in September may be about the same as in June the flowers which are out now are mostly of a kind (*Grasses*, *Compositae*) of little use to the bees, which seem to understand that the winter is near.

"In the preceding notes the many smaller islands skirting the Arctic coast examined are treated as a part of the latter; a few miles of open sea are no barrier for bumble-bees; they are found on all of the islets and show the same characteristics there. The few observations we have from the two large islands (Banks and Victoria islands) farther north show, however, that over there the season is considerably later, and bumble-bees were therefore not seen much before July. On the other hand, it seems the season along the south side of Coronation gulf and in Bathurst inlet is somewhat earlier than along the Arctic coast farther west, and bumble-bees and flowers may be looked for at the end of May in this more southern latitude.

The first bees to appear are naturally all queens; the first workers were noticed in the beginning of July (about July 10) and the first males at the same time."

Two sheets of drawings, showing the 8th ventral segment in males of *Bombus neoboreus*, *kirbyellus*, *polaris* and *arcticus*, accompany this paper.

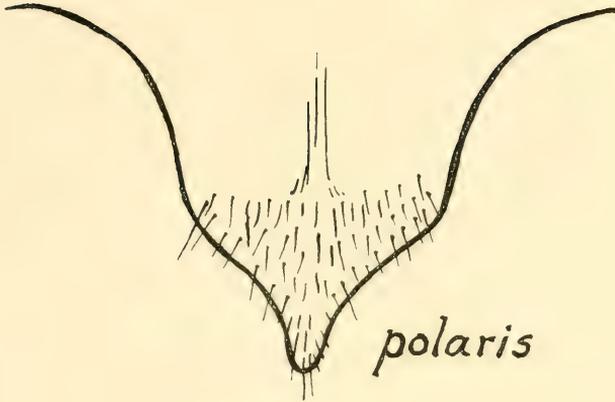


neoboreus

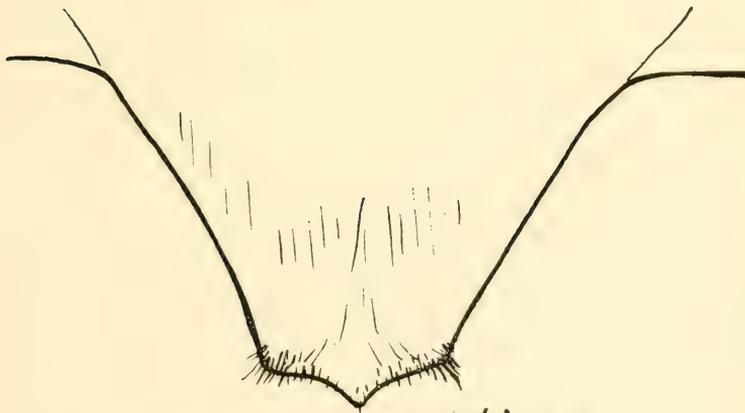


kirbyellus

Eighth Ventral Segment in ♂ *Bombus*.



polaris



arcticus

Eighth Ventral Segment in ♂ *Bombus*.



The Plant Galls collected by the Canadian Arctic Expedition, 1913-18

By E. PORTER FELT.

The following report is based upon the material which was collected by Mr. F. Johansen. It is obviously fragmentary though nevertheless interesting because the records are from a little explored region. The galls on *Salix barclayi* appear to be new and the deformity produced by the Nematid is especially interesting. A provisional identification was obtained through the courtesy of Dr. L. O. Howard from Mr. S. A. Rowher of the United States National Museum. The Eriophyid galls were submitted to Mr. H. E. Hodgkiss of the Agricultural Experiment Station, Geneva, N.Y., and the few comments he saw fit to make are appended to the characterizations of the deformities. It hardly appears wise to bestow names upon these galls and thus add invalid or nearly invalid names to a literature already overburdened with such appellations.

Salix (willow).

Nematid gall on *Salix barclayi*, labelled Teller, Alaska, July 26, 1913, Frits Johansen.

The gall is an irregular, oval, white, woolly mass projecting equally on each surface of the leaf, divided by the midrib and with a major diameter of about 1 cm. The woolly fibers are 2 to 3 mm. long and within the compound mass are two somewhat elongate ovate hollows, one on each side of the midrib.

One gall examined contained a Nematid (possibly a species of *Pteronidea*) and a parasite, a species of *Eurytoma*. The identification of the larva was made by Mr. S. A. Rohwer of the United States National Museum, and that of the parasite by Dr. L. O. Howard, Chief of the Bureau of Entomology.

Cecidomyia species on *Salix barclayi*, labelled Teller, Alaska, July 26, 1913, Frits Johansen.

The gall is a somewhat irregular, rounded elevation, with a diameter of about 4 mm., projecting almost equally from both surfaces of the leaf. It is pale greenish-yellow, the surface with irregular rounded elevations and located near the midrib. The interior is hollow, whitish, and the walls have a thickness of approximately 0.5 mm. This is possibly the work of an *Oligotrophus*.

Willow beak gall (*Phytophaga rigida* O.S.) Specimens labelled *Salix* species, Jasper Park, Alta., middle September, 1916.

The galls are typical for this species except that they are smaller and greatly wrinkled, a condition very suggestive of parasitism. The galls have a length of about 1.5 cm., a diameter of 0.5 cm., and the surface is mostly dark brown or blackened; the distal third of the gall is lighter, rather strongly recurved and with the characteristic partly opened soft tip or beak.

This insect ranges across the continent, if one may safely draw conclusions from specimens of the galls. It is one of the more common willow inhabiting forms, occasionally so abundant as to attack the tips of a considerable proportion of the shoots in individual clumps. There is but one generation annually, the insect wintering in the gall, and the midges appearing in early spring. An extended bibliography is given in New York State Museum Bulletin 186, pages 213-214.

Eriophyes species on *Salix*, labelled Teller, Alaska, July 26, 1913, Frits Johansen.

This is a small irregular pouch gall projecting on the upper surface of the leaf and with a diameter of 1 to 2 mm. The enlargement is greenish or yellowish green. There is a distinct entrance on the lower side of the leaf frequently guarded by a rather thick mass of short, procumbent, whitish hairs. Hodgkiss states that this type of gall does not appear to be described and that no mites were found in the deformities.

Eriophyes species on *Salix*, labelled Teller, Alaska, July 26, 1913, Frits Johansen.

These are purplish brown, sparsely haired pouch galls on the leaves, mostly on the under surface, and sometimes so numerous as to deform the basal half or even the whole leaf. They are more or less coalescent. The individual galls have a diameter of 2 to 3 mm., the vestiture is whitish, short, and sparse. Hodgkiss refers this to *Eriophyes* species, adding that it is possibly new.

Eriophyes species, labelled *Cecidomyia* species, galls on *Salix* leaves, Cockburn point, Dolphin and Union strait, Arctic Canada, August 30, 1914.

The individual galls are oval or subglobose, have a diameter of 2 to 3 mm., project distinctly on the upper surface, are somewhat smooth though sometimes slightly hairy, rounded elevations and on the under surface are indicated mostly by corresponding oval depressions filled, or nearly filled with a mass of yellowish or whitish plant hairs. Hodgkiss refers this to *Eriophyes* n. sp., adding that a single specimen, apparently new to science, was found in this material.

Eriophyes species, labelled *Cecidomyia* (?) galls on leaves of creeping *Salix*, August 16, 1915, rearing 92. Locality, Bernard harbour, Northwest Territories.

The leaves were badly browned and discoloured, though the gall appears similar to the preceding. Hodgkiss states that this type of gall is not mentioned in literature, and that no mites were found in the galls.



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VOLUME III: INSECTS

PART H: SPIDERS, MITES, AND MYRIAPODS

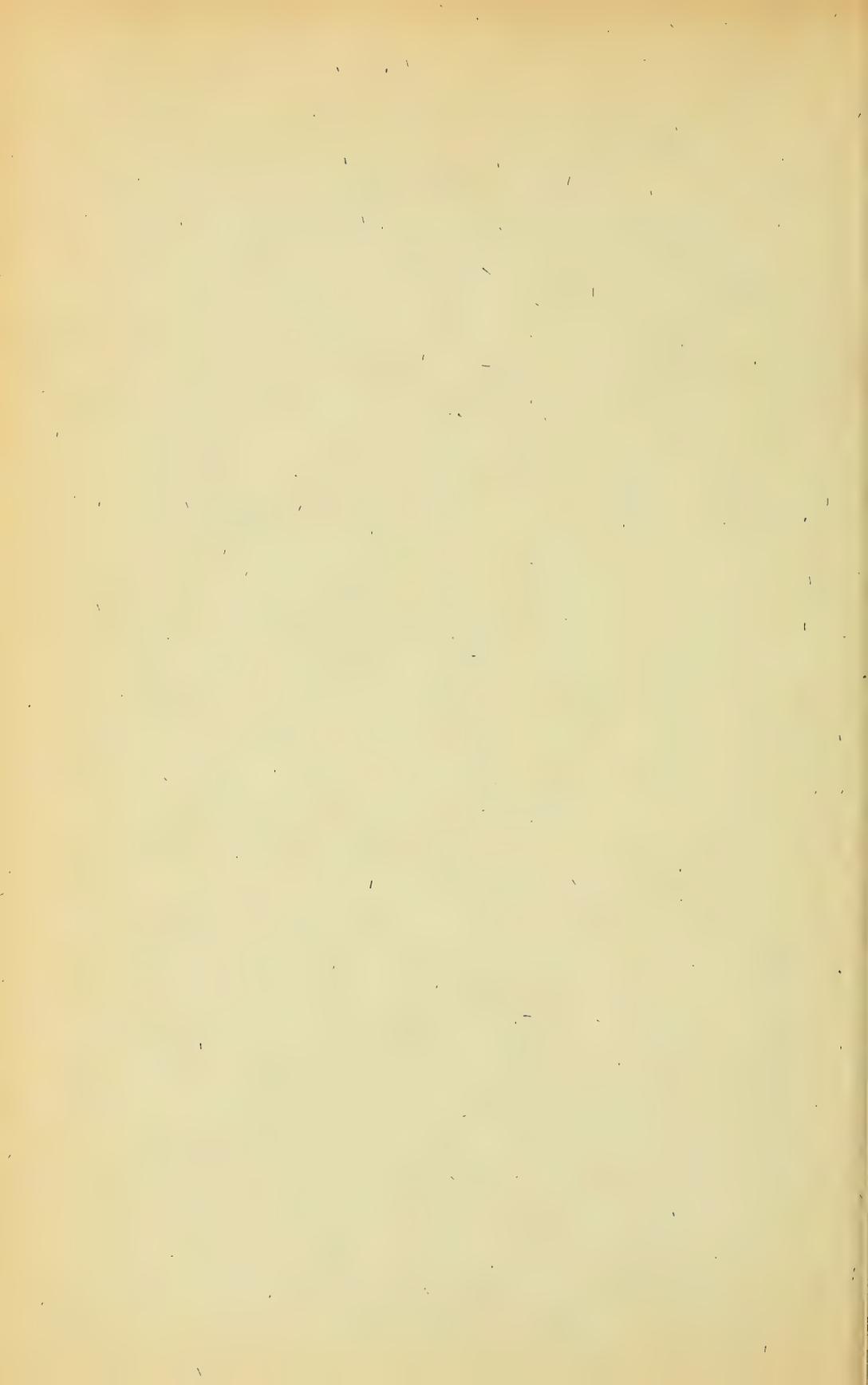
Spiders:	J. H. Emerton
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SOUTHERN PARTY—1913-16



OTTAWA
J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1919

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The Spiders collected by the Canadian Arctic Expedition, 1913-18.

By J. H. EMERTON.

This collection includes thirteen species, three of which are described as new. Two of these are minute spiders, living under loose stones along the shore, and the third is a large *Lycosa*, living in large numbers among the low plants of the tundra. Of the other ten species, three have been found by earlier explorers in Greenland, Spitzbergen, or Siberia, and appear to be exclusively Arctic; the rest have been found much farther south. The four species from Nome and Teller, Alaska, all occur in the White mountains of New Hampshire, and two of them at various stations across the continent and south into the United States. *Lycosa pictilis*, found at Bernard harbour, has long been known in the upper parts of the White mountains, and is also found on the coast of Labrador. *Xysticus bimaculatus*, found also at Bernard harbour, Dolphin and Union strait, Northwest Territories, is known from the Rocky mountains near Banff and from the mountains of Colorado. The two species of *Pardosa* are widely distributed over the northern part of the continent.

All types described in this paper are in the Canadian National Collection of Insects, Ottawa. The specimens were collected by Mr. F. Johansen.

Erigone arctica White (1852).¹

This resembles the common *Erigone dentigera* of the New England coast. The palpus (Pl. I, fig. 1) has the same general length and proportions, but the process of the patella is somewhat longer, and the end of the tibia wider, with the inner and outer points sharper and more divergent than in *dentigera*. It has been found at Cornwallis island and in Spitzbergen.

Locality: Cockburn point, Dolphin and Union strait, Northwest Territory, autumn of 1914.

Typhocraestus spetsbergensis (Thor.) Kulczynski.²

This is 2 mm. long, and grey, without any markings, the legs very little lighter than the thorax. The male palpus has the tibia a little longer than wide and slightly widened at the end. The front edge is nearly straight except a small tooth on the outer corner, which is slightly curved inward at the point (Pl. I, figs. 2 and 4.) The tarsal hook is small and curved in more than half a circle, the basal end showing along the edge of the tarsus when seen from above. The palpal organ is distorted in all the specimens, but shows the slender transparent appendage and the other details as figured by Kulczynski (Pl. I, fig. 3).

Locality: Three males and two young from Spy island (Jones islands, known also as Thetis islands), on the Arctic coast of Alaska, September 3, 1913, under green algæ on the wet seashore. Found also by the English Polar Expedition of 1875-6 in latitude 82° 33' and in Siberia and Spitzbergen.

Tmeticus alatus, n. sp.

A little over 2 mm. long and pale yellow without markings like pale individuals of *Tmeticus flaveolus* Banks and *T. longisetosus* Em. The male palpus seen from above has the tibia longer than wide with a large curved tooth on

¹ Cambridge, Annals and Magazine of Natural History, 1877.

² Memoirs Acad. St. Petersburg, 1902. Strand, Fauna Arctica, 1906. *Erigone spetsbergensis* Thorell, Swedish Acad., 1872.

the inner side extending a little over the tarsus (Pl. I, fig. 5). Seen from the side the tibia is wider than long (Pl. I, fig. 6). The tarsal hook is much like that of *longisetosus*, with two short and stout curved teeth at the end and a narrow, long base on which are several hairs and close to the tarsus three long bristles slightly serrated toward the end somewhat like the bristles in *longisetosus* and *armatus* (Pl. I, fig. 6). The epigynum has a middle lobe widened at the end and covered at the base by two depressions divided by a narrow ridge. At the sides of the epigynum are two thickened spots with hairs directed inward (fig. 7).

Localities: One male and two females from Cockburn point, Northwest Territories, September 26, 1914. Four females and one immature male from Bernard harbour, Dolphin and Union strait, Northwest Territories, June 27, 1916.

Tmeticus brunneus Emerton.¹

Nome Alaska, August 25, 1916. Originally described from the White mountains, New Hampshire, at 4,000 feet elevation.

Microneta maritima, n. sp.

Less than 2 mm. long, and dull grey with paler legs. The mandibles are thickened at the base and narrowed toward the point, with two small teeth where the narrowing begins (Pl. I, fig. 8). The male palpi are, as usual in this genus, large, and the tarsus angular. It has a small process at the base and the middle is extended and flattened into a keel bent inward on the outer side. This shows plainly from above or below when the palpus is curved in the natural position, (Pl. I, fig. 10). The tarsal hook is wide in the middle and turned abruptly upward at the point, as in *olivacea* (Pl. I, fig. 9).

Locality: Cockburn point, Dolphin and Union strait, Northwest Territory, September, 1914, under stones.

Microneta crassimanus Emerton.²

Nome, Alaska, August 1916. Originally described from the White mountains, New Hampshire, at 4,000 feet elevation.

Epeira patagiata Clerck (1757.)

Nome, Alaska, August 25, 1916. The most common round-web spider throughout Canada, the northern United States, and the north of Europe.

Dictyna.

Several immature specimens were found under stones along the shore at Bernard harbour, Northwest Territories, June and July, 1915. They are probably *Dictyna hamifera* Thor., 1872, described from Greenland and among the spiders from the "Danmark Expedition" to northeastern Greenland, 1906-8.

Lycosa pictilis Emerton.³

Several specimens of this bright-coloured spider, including two adult males, were found at Bernard harbour, Northwest Territory. It is common on mount Washington, New Hampshire, from 5,000 to 6,000 feet elevation, and has been found on the coast of Labrador at Hopedale. The *Tarantula exasperans* Cambridge, from Discovery bay, latitude 81° 44', is possibly this species. It is described and figured by Cambridge in 'The Annals and Magazine of Natural

¹ Conn. Acad. 1882 and Conn. Acad. 1909.

² Conn. Acad. 1882.

³ Conn. Acad., 1885.

History', 1877. *T. exasperans* has been identified by Simon and Kulezynski with *Lycosa (Tarantula) alpigena* of the Alps, but I cannot confirm this identification, not having been able to compare European specimens.

The usual markings are shown in Pl. I, fig. 11. The middle stripe of the cephalothorax has a characteristic form, widening behind the eyes, and narrowing again a little farther back. The hinder half of the stripe, especially in young spiders, continues narrow its whole length, but in other individuals and usually in adult males, it widens again opposite the dorsal groove and is sometimes connected by radiating lines with the light areas at the sides. The abdomen has two orange yellow spots at the front end, and sometimes a little orange colour among the grey farther back. The middle spot branches into four black points, and behind it are two or three black spots of variable size on the middle line. Outside of the median spots are four or five pairs of small, bright, white spots alternating with black, forming two lines converging behind (Pl. I, fig. 11). There are great variations from this pattern and one of the Bernard harbour males is marked as in Pl. I, fig. 12. Here there is a middle stripe, which in life is probably covered with orange hairs, and from this branches extend to the white spots. The other markings are obscured in the general grey colour. This variety has been seen in specimens from mount Washington. In all varieties the legs are banded with dark and light grey.

Locality: Bernard harbour, Northwest Territories. Barter island, Alaska, June, 1914.

Lycosa asivak, n. sp.

This species is 12 mm. to 14 mm. long. Fourth leg as long as the body. Black with light grey markings, which are indistinct and sometimes absent in the female. In the male there is a grey stripe in the middle of the cephalothorax from the eyes backward, and on the abdomen a middle grey mark in front, at the sides of which are light spots which unite behind into several transverse markings (Pl. II, fig. 13). The femora are black, but the other joints of the legs are covered above with short grey hairs mixed with longer black ones. The legs and abdomen are covered with fine black hairs, longer than the diameter of the legs. In the female the dorsal markings are much less distinct and usually form on the abdomen a small middle stripe in front and a series of pairs of small white spots. The legs are somewhat lighter in colour toward the end, but there is no strong contrast between the colour of femur and tibia. The fine hairs of the legs and abdomen are shorter in the female than in the male. The epigynum (Pl. II, fig. 14), has a middle lobe as wide as long throughout its length, and thickened in the middle. At the base of this lobe are two pits with oblique and slightly curved margins. The immature females show the undeveloped epigynum as in Pl. II, fig. 15. The male palpus is much like that of *pictilis*, the tibia is a little longer than wide, and about the same length as the patella. The tarsus is a little longer than the tibia. The parts of the palpal organ are small and comparatively simple, (Pl. II, fig. 16) as in *pictilis*.

This spider appears to be very common and over a hundred specimens were taken, including two adult males in June at Bernard harbour, Dolphin and Union strait, Northwest Territories, and two others at Camden bay, Alaska, July 4, 1914. The females taken at the same time were all immature, but adult females were taken later, July 12 and July 19, 1915, at the latter date with their cocoons and eggs.

According to Mr. Johansen's notes, they hide, especially at the breeding season, in holes in the ground or in the sod which they line with silk. In one case a lemming hole was used for this purpose. They were found eating beetles and other spiders, even of the same species. The accompanying photograph

¹Asivak or arshivuk is an Eskimo name for a spider, with slight dialectic differences from northwestern Alaska to Coronation gulf.

(Pl. III.) taken by Mr. G. H. Wilkins of the Expedition, shows the spider in its natural surroundings near the mouth of its hole.

Localities: Bernard harbour, Dolphin and Union strait, Northwest Territories, from June to September. Two males from Camden bay, Alaska, July 4, 1914.

Pardosa glacialis Thorell (1872).

This widely diffused species occurs at Bernard harbour, Northwest Territories, on the north coast of Alaska, and at Teller, Alaska. The forms of the epigynum differ from those in other places, but differ also among themselves. A female from Teller, Alaska, has the epigynum somewhat like variety *brunnea* of New England (Pl. II, fig. 17).

Pardosa groenlandica Thorell (1872).

An adult female and several young were found at Herschel island, Yukon Territory, July, 1916. It lives across Canada and southward on the mountain tops of Colorado.

Xysticus bimaculatus Emerton.¹

Male 5 mm., female 6 mm. long. Pale with light brown and grey markings. The legs are short, the first leg of the male less than one and a half times the length of the body. The first and second legs are covered with fine light brown spots, with some larger marks on the ends of the femur. The third and fourth legs have brown markings on the ends of the joints. The cephalothorax has the middle light area lightly spotted in the front half. The dark areas are closely spotted with brown, darkest toward the abdomen. The abdomen is marked with three or four pairs of oblique light brown spots, the edges of which are irregularly spotted with dark grey, more definitely in the male than female. The whole under side is lightly spotted with brown. The male palpus has the tibia of usual form with a blunt outer process and a double process below, the inner branch of which is slightly curved at the point (Pl. II, fig. 19). The palpal organ is unusually complicated, the lower half of the bulb very much thickened in a curved ridge that ends in a blunt tooth on the inner side. The tube is short and twisted and turned away from the bulb, and under it is a small sharp point. The epigynum has a simple oval opening.

Localities: A male and female, in grass, Bernard harbour, Northwest Territories, August 25, 1915, and one immature female. Bluffs at lake at Konganevik, Camden bay, Alaska, June 27, 1914, young male and female. Found also in the Rocky mountains at Laggan, Alta., and on mount Lincoln, Colorado, at 11,000 feet.

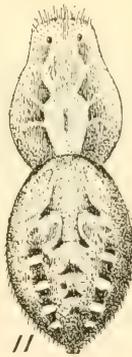
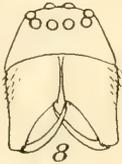
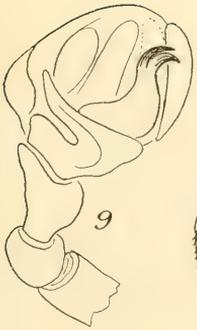
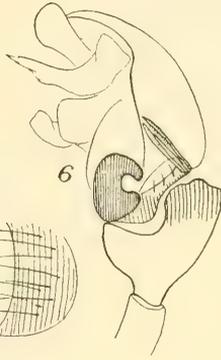
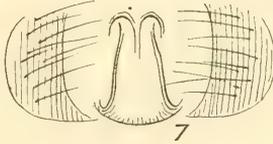
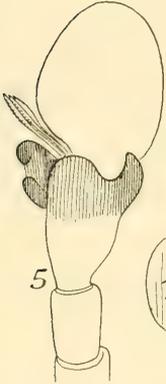
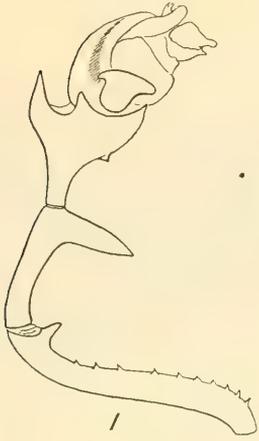
¹Canadian Spiders, Conn. Acad. 1894.

EXPLANATION OF PLATE I.

- Fig. 1. *Erigone arctica*, palpus.
 2. *Typhlocraestus spetsbergensis*, palpus (upper side).
 3. " " (palpal organ showing transparent appendage).
 4. " " (side edge).
 5. *Tmeticus alatus*, male palpus (from above).
 6. " " (side view).
 7. " " epigynum.
 8. *Microneta maritima*, mandibles.
 9. " " "
 10. " " palpus.
 11. *Lycosa pictilis*, usual markings.
 12. *Lycosa pictilis*, occasional variation of markings.

PLATE I.

Spiders collected by the Canadian Arctic Expedition, 1913-18.



Spiders collected by the Canadian Arctic Expedition, 1913-18.

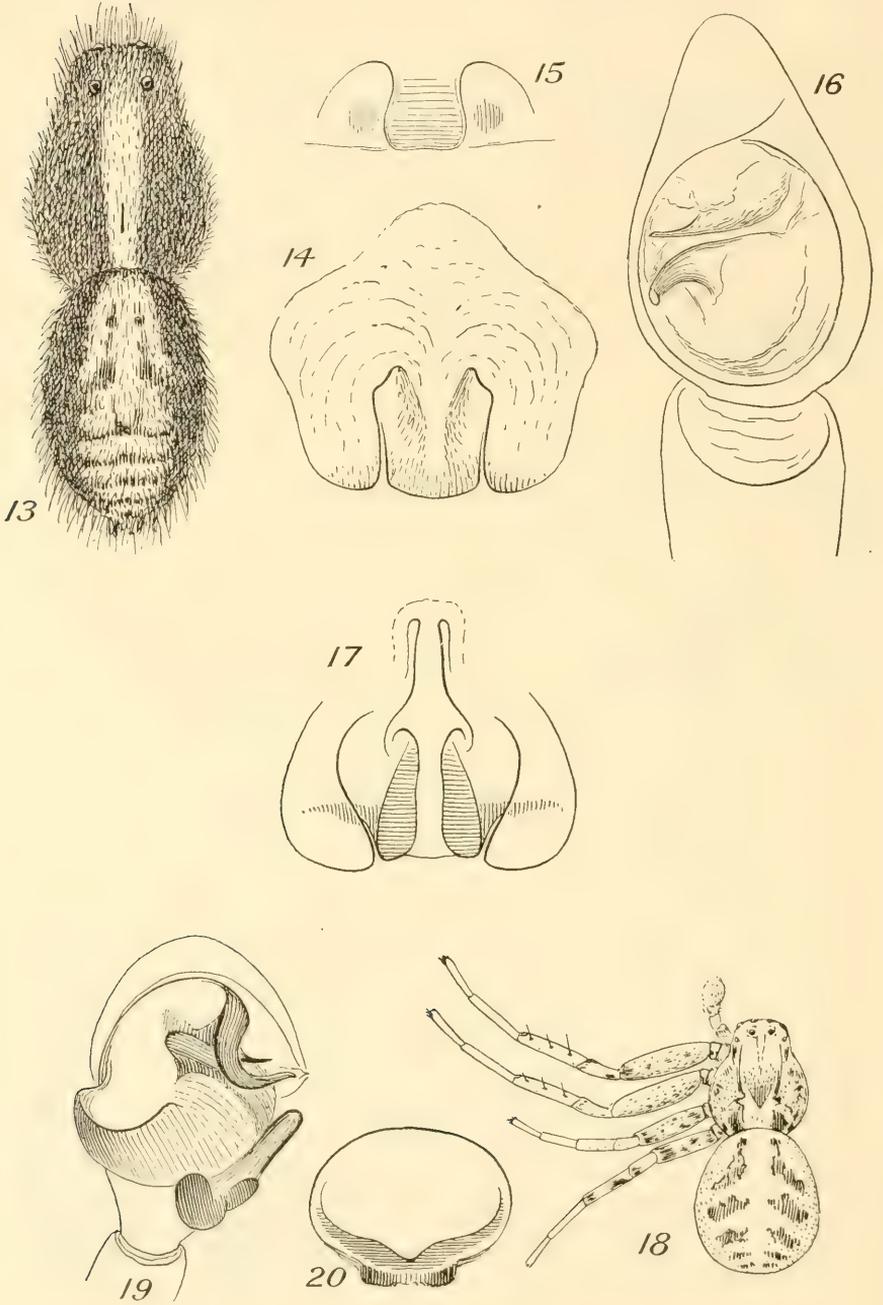


PLATE III.



Lycosa asivak, Bernard harbour, Northwest Territories, July 9, 1915.

EXPLANATION OF PLATE II.

- Fig. 13. *Lycosa asivak*, dorsal markings.
 14. " " epigynum.
 15. " " undeveloped epigynum.
 16. " " male palpus.
 17. *Pardosa glacialis*, epigynum.
 18. *Xysticus bimaculatus*.
 19. " " male palpus.
 20. " " epigynum.

The Acarina collected by the Canadian Arctic Expedition, 1913-18.

By NATHAN BANKS.

The Acarina collected by the Canadian Arctic Expedition, 1913-16, include seventeen species, all but one previously known, and recorded from other arctic and subarctic localities, some from widely separated places indicating their occurrence all through the arctic regions.

The new species of *Stigmaeus* is the first of this genus to be recorded from the arctic regions, but others are known fairly far north and in high mountains, so that one can hardly be surprised. Doubtless it feeds on moss.

EUPODIDÆ.

Rhagidia gelida Thorell.

Bernard harbour, Dolphin and Union strait, Northwest Territories, August 16, June 19, 1915; in rotten driftwood and under stones; "largest one 2 mm. long; the abdomen dark purple-brown, cephalothorax rose, legs orange." [Johansen notes.]

BDELLIDÆ.

Bdella arctica Thorell.

Young point, Northwest Territory, July 22, 1916, on rocks on beach; Bernard harbour, Northwest Territories, August 23, 1915; under stones at beach. "Abdomen dark purple, otherwise rose." [Johansen notes.]

Bdella frigida Banks.

Herschel island, Yukon Territory, July 28, 1916, on ground.

Bdella decipiens Thorell.

Bernard harbour, Northwest Territories, May 18, 1915, under stones.

TETRANYCHIDÆ.

Bryobia praetiosa Koch.

Bernard harbour, Northwest Territories, July 19, 1915, on dead *Salix*-leaves; and October 4, 1914, under stones; eggs doubtless of this species in a cake on stick at Konganevik, Camden bay, Alaska, June 27, 1914.

Stigmaeus arcticus, n. sp.

Body bright rose red, legs rather paler, spotted. Body about one and two-thirds times as long as broad, rounded behind, broadest at humeri, narrowed in front; above with about twenty-four long, stiff, erect, rather thickened bristles, in four longitudinal rows; legs (Pl. IV, fig. 2) short and stout, first pair hardly as long as body, hind pair reaching very little beyond body; other pairs much shorter; all with fairly numerous long hairs; two long claws as long as the width of the tarsal joint; palpi (P. IV, fig. 1) nearly one-third the length

of the body, rather stout and curved downward; apical claw very long and stout, thumb rather slender, slightly narrowed at base, with few bristles near and at tip.

Length, 5 mm.

Locality: Bernard harbour, Dolphin and Union strait, Northwest Territories, Canada. June 18, 1915; from a pond; probably not the normal habitat. Type in Canadian National Collection of Insects, Ottawa.

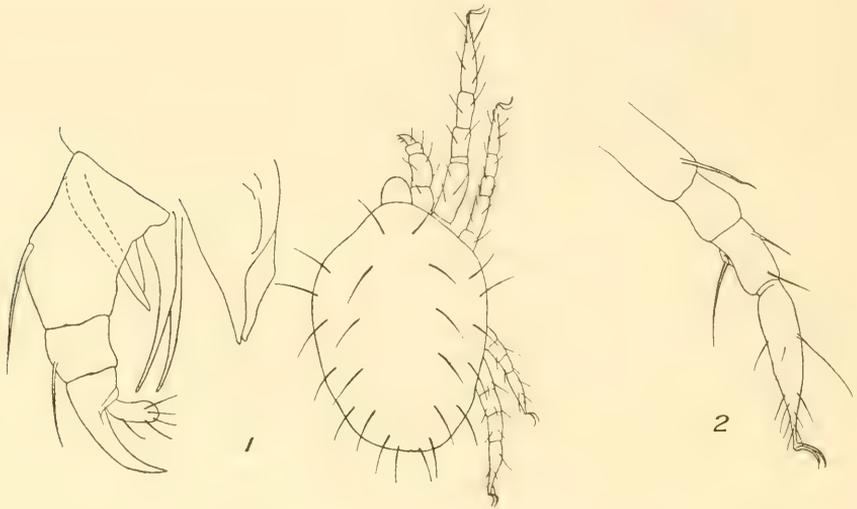


Fig. 1. *Stigmaeus arcticus*, n. sp., palpus.
2. " " " leg.

TROMBIDIIDÆ.

Trombidium succidum Koch.

Bernard harbour, Northwest Territories; June 28; July 6; July 11, 1915, in grass, all tile-red.

HYDRACHNIDÆ.

Eylais falcata Koenike.

Bernard harbour, Northwest Territories, July 5, 1916, in pond; and between Bernard harbour and cape Krusenstern, Northwest Territories, July, 1916.

Hydryphantes ruber De Gerr.

Pond at Chantry island, Dolphin and Union strait, Northwest Territories, June 17, 1916.

Thyas stollii Koenike.

Bernard harbour, Northwest Territories, June 28, 1915; June 30, 1916, in pond; and pond at Chantry island, Northwest Territories, June 17, 1916.

Lebertia porosa Thorell.

Bernard harbour, Northwest Territories, October 6-8, 1915; in stomach of *Salvelinus marstoni* Garm.

Laminipes torris Muller.

Herschel island, Yukon Territory, July 30, 1916, in pond; although no male is present, I feel sure it is this species.

Curvipes reighardi Wolcott.

Pond on Chantry island, Northwest Territories, June 17, 1916; pond at Herschel island, Yukon Territory, July 30, 1916; lake inland from Bernard harbour, Northwest Territories, August 10, 1915; pond at Bernard harbour, Northwest Territories, June 28, 1915; pond at Collinson point, Alaska, June 23, 1914; lake at Konganevik, Alaska, June 26, 1914.

PARASITIDÆ.

Parasitus bomborum Oudemans.

Bernard harbour, Northwest Territories, on *Bombus*, June 16, 1916; June 25, 1915; July 2, 6, 9, 11, 1915; and on the catkins of *Salix*, July 2, 1915.

ORIBATIDÆ.

Galumna lucens Koch.

Barnard harbour, Northwest Territories, May 25, 1916, on surface of pond; Pikumalerksiak island, near Cockburn point, Dolphin and Union strait, Northwest Territories, July 15, 1916, in moss.

Scutovertex nigrofemoratus Koch.

Bernard harbour, Northwest Territories, June 30, 1916, with spider cocoon under a stone.

Scutovertex lineatus Thorell.

Cockburn point, Northwest Territories, September 7, 1914, in colonies in depressions on under sides of flat stones near the seashore; not moving.

The Chilopoda collected by the Canadian Arctic Expedition, 1913-18.

BY RALPH V. CHAMBERLIN.

The Myriapod material secured by the Canadian Arctic Expedition and sent to me for report was collected in the Cape Nome region at Nome and Teller. Only two species are represented, both being chilopods, one of the order Lithobiomorpha and one of the Geophilomorpha. It is noted that other specimens were taken at Ketchikan in southern Alaska, and preserved dry; but these specimens were not included in the material transmitted for study.

All types described in this paper are in the Canadian National Collection of Insects, Ottawa.

Aside from members of the two orders above mentioned, the Scolopendromorpha are also represented, at least in the southern part of Alaska, as I have many specimens of *Otocryptops rubiginosus* Koch from Forrester island, a species occurring also in China and Japan as well as in other northern parts of North America, such as Canada, Minnesota, etc. The common *Otocryptops sexspinosus* Say also occurs. The chilopods now known to be found in Alaska are as follows:

- Otocryptops rubiginosus* Koch.
- Otocryptops sexspinosus* Say.
- Linotaenia chionophila* Wood.
- Arctogeophilus glacialis* Attems.
- Cryophilus alaskanus*, gen. et sp. nov.
- Gnathomerium melanonotum* Wood.
- Geophilus alakanus* Cook.
- Pachymerium ferrugineum* Koch.
- Escaryus albus* Cook.
- Monotarsobius tricalcaratus* Attems.
- Ezembius stejneri* Bollman.
- Oabius uleorus* Chamberlin.
- Paobius boreus* Chamberlin.
- Ethopolys integer alakanus*, subsp. nov.

GEOPHILOMORPHA.

One family, the Chilenophilidæ, is represented in the collection. Three other families of the order are also known to occur in Alaska. The Linotaeniidæ are represented by *Linotaenia chionophila* Wood, a species widespread in the northern United States and Canada and exceedingly close to, if not identical with, the well-known European *L. acuminata* Leach. This species appears to be common on Pribilof, Aleutian, Kadiak, Baranof, Popof and Forrester islands, etc., as well as at points on the mainland. The Schendylidæ have also a single known member here, namely, *Escaryus albus* Cook, which occurs on Pribilof island (St. Paul). The Geophilidæ proper are represented by two species, *Geophilus alakanus* and *Pachymerium ferrugineum* (Koch), the first being known from Sitka and Forrester island, and the second from Yakutat bay and St. Paul island.

CHILENOPHILIDÆ.

The existence of a group of geophiloid genera differing from typical geophilids in having a strongly developed pleurosternal suture on each side of the second maxillary segment was pointed out by Attems in 1909¹, this author designating

¹"Zool. u. anthrop. Ergeb. einer Forschungsreise im West. u. Zent. Südafrika, Myriopoden", in Denks. med.-naturw. Ges. Jena, 1909, 14, p. 22.

the group as a subfamily, Chilenophilinae, in the Geophilidae, and in the same year also by Brölemann¹ who regarded the group as a subtribe, Ribautiina, under his tribe Geophilini. Since then the group has proved to be increasingly large and widespread. One genus has been previously recorded from Alaska, *Arctogeophilus glacialis* Attems being listed in the original account as occurring on both sides of Bering strait, namely, from Naniamo and Konyam bay on Seniavine sound on the Siberian side and from Port Clarence on the Alaskan. I suspect, however, that the specimens from the Alaskan side belong rather to the species described below as new, the two forms being very similar in size, structure and general appearance and both possessing thirty-nine pairs of legs, the two apparently to be distinguished only by critical examination. For the Alaskan species, after much hesitation, I have felt compelled to erect a separate genus, the only alternative being to assume that so experienced a student of the group as Graf Attems was mistaken in his observations on several characters of fundamental importance, which, in the absence of authentic material of his species I do not feel justified in doing. In addition, I have specimens of a species of a third genus from Forrester island, this being *Gnathomerium melanotum* Wood, a form common from California northward through Oregon and Washington into British Columbia. The position of the new genus among the other known genera of the Chilenophilidae may be indicated by means of the following key.

KEY TO GENERA OF CHILENOPHILIDÆ.

- a* Anal legs with an additional article replacing the claw. (Lateral pieces of the labrum separated by the median piece.)
- b* Coxæ of second maxillæ very broadly and completely fused. Ventral pores in four areas. Coxopleural pores small and very numerous both above and below.
Telocricus Chamberlin.
- bb* Coxæ of second maxillæ separated or at most weakly united by a membranous isthmus
- c* With no ventral pores; no finger-like process from distomesal angle of coxa of second maxillæ.
- d* A large lappet on coxa of first maxillæ in addition to one upon succeeding article; prosternum without chitinous lines. *Watophilus* Chamberlin.
- dd* Lappet present only on femuroid of first maxillæ; prosternum with chitinous lines. *Alloschizotaenia* Brölemann.
- cc* Ventral pores present; a finger-like process at distomesal angle of coxa of second maxillæ; first maxillæ without lappets. *Proschizotaenia* Silvestri.
- aa* Anal legs without such additional terminal article in place of the claw, either bearing claws or when clawless composed simply of the usual six articles distad of the coxopleura.
- b* Lateral pieces of labrum overlapping the median piece and in contact at the median line
- c* Ventral pores present; lappets of second maxillæ rudimentary; coxæ of second maxillæ wholly separated. (A clypeal area present.) *Chilenophilus* Attems.
- cc* No ventral pores; lappets of second maxillæ well developed; coxæ of second maxillæ more or less clearly united.
- d* No clypeal area present.
- e* Palpus of second maxillæ quadriarticulate. *Arctogeophilus* Attems.
- cc* Palpus of second maxillæ triarticulate. *Gnathomerium* Ribaut.
- dd* A clypeal area present.
Palpus of second maxillæ triarticulate; anal legs clawless. *Cryophilus* gen. nov.
- bb* Lateral pieces of labrum not in contact at the middle line, more or less widely separated by the median piece.
- c* One or more clypeal areas present.
- d* No ventral pores present.
- e* Distoöctal angle of tibia of palpus of second maxillæ prolonged and strongly chitinized. *Gnathoribautia* Brölemann.
- cc* Distoöctal angle of tibia of second maxillæ not thus prolonged. *Taiyuna* Chamberlin.

¹"A propos d'un Système des Geophilomorphes," in Arch. de Zool. Exp. et Gen., 1909, ser. 5, p. 327.

- dd Ventral pores present, these arranged in four areas. *Nesidiphilus* Chamberlin.
- cc No clypeal area present. (Distoectal angle of coxæ of second maxillæ prolonged.)
 d No ventral pores present; distoectal angle of tibia of second maxillæ prolonged and strongly chitinized. *Brachygonarea* Ribaut.
- dd Ventral pores present; distoectal angle of tibia of second maxillæ not thus prolonged.
 e Lappets present on first maxillæ. *Polygonarea* Attems.
 ee No lappets present on first maxillæ. *Ribautia* Brölemann.

Cryophilus, n. gen.

Frontal suture absent or very vaguely indicated. Prebasal plate not exposed, the cephalic overlapping the basal. Dorsal plates bisulcate.

Antennæ short, filiform.

Clypeal area present, finely aerolated.

Labrum free, tripartite. Median piece distinct and of good size but completely overlapped and covered from below by the lateral pieces which are in contact at the median line. Lateral pieces fringed throughout with numerous, closely arranged, long spinescent processes.

Outer branch of first maxillæ distinctly biarticulate; bearing two membranous lappets of which the distal one is the larger in the genotype. Inner branch undivided, set off by a suture. Coxæ completely coalesced. Coxæ of second maxillæ weakly united at middle by a less chitinous isthmus; pleurosternal sutures strongly developed; pore mesad of anterior part of suture, opening through mesal edge of sclerite; palpus triarticulate, terminating in a large simple claw, none of the joints with processes.

Prehensors large, exposed at the sides and projecting well beyond the front margin of the head. Claw armed at base; femuroid also armed and the intermediate joints with weaker teeth.

Prosternum without chitinous lines. Anterior margin unarmed.

No ventral pores present.

Spiracles circular.

Last ventral plate of intermediate width, sides converging caudad, trapeziform. Tergite of last pediferous segment very broad, moderately narrowed and rounded caudad.

Coxopleuræ moderately inflated, not unusually elongate or exposed at sides of presentum. Pores small and moderately numerous, mostly near edge of ventral plate.

Anal pores present, small.

Anal legs clawless; consisting of six joints beyond coxopleuræ.

Genotype: *C. alaskanus*, n. sp.

This genus is undoubtedly close to *Arctogeophilus*, established as a subgenus in *Geophilus* by Attems,¹ but now obviously distinct from the latter in generic and in subfamily or family standing. Attems' figure of the maxillæ of the genotype of *Arctogeophilus*, *A. glacialis*², shows the palpi of the second pair as quadriarticulate, a condition in which, if correctly represented, the species is unique. Prof. Ribaut segregates the genus *Gnathomerium* from *Arctogeophilus* on the assumption of the correctness of this figure.³ Aside from this character, with the doubt one can scarcely help feeling as to the exactness of Attems' figure, *Cryophilus* differs in the presence of distinct clypeal area, which is definitely denied to *Arctogeophilus* by its author. Also, the figure mentioned represents the segmental pore as enclosed on the mesal side,

¹"Die Myriopoden der Vega Exped.," Arkiv för Zoologi, 1909, 5, p. 23.

²Loc. cit.; pl. 1, f. 2.

³"Sur un Genre Nouveau de la Sous-tribu des Ribautiina," Bull. Soc. d'Hist. nat. et de Sci. biol. de Toulouse, 1910, 43, pp. 105, 106.

whereas in *Cryophilus* it opens freely through the mesal margin of the sclerite, the caudomesal lobe not extending forward to its level.

***Cryophilus alaskanus*, n. sp.**

Colour fulvous throughout, the head of dilute ferruginous cast.

Body strongly narrowed caudad over posterior third, scarcely at all narrowed cephalad.

Cephalic plate widest in front of middle, sides evenly convex; anterior margin wide, arcuate, being concave on each side and protruding slightly between the antennæ; caudal margin truncate or very weakly convex. Longer than wide in ratio 22 : 17. Hairs very few and widely scattered, short.

Antennæ short, attenuated distad, 2.25 times longer than the cephalic plate. Last article of same length as the two preceding ones taken together.

Basal plate overlapped in front by the cephalic, its exposed area being 4 or 4.25 times wider than long.

Claws of prehensors when closed attaining or a little exceeding the distal end of the first antennal article. Claw armed at base with an acute, conical, only slightly darkened tooth. Femuroid armed at distal end with a smaller distally rounded tooth. The intermediate joints with smaller nodules.

Anterior margin of prosternum unarmed mesally slightly concave. Sides in front of rounded caudal cornes straight, slightly diverging cephalad. A little wider than long, the ratio being 9 : 8. Nearly 1.7 times longer than the height of femuroid on its ectal side.

Paired sulci of tergites deep. On some plates a pair of weaker intermediate sulci may be present but on most such are absent.

Presenta in anterior region short. Increasing in length to posterior end of middle region where they are moderately long, always less than half as long as the principal plate, the ratio not exceeding 1 : 2.5. Again decreasing in caudal region.

Spiracles all circular, moderate or small, decreasing gradually caudad.

Anterior ventral plates with a median longitudinal sulcus, the others without sulci. First seven plates with caudad margin angularly produced at middle, the process fitting into an excavation in the succeeding plate.

No ventral pores detected.

Legs of first pair very little smaller than the second ones.

Last ventral plate trapeziform. Caudal and lateral margins straight. Plate with width across anterior end equal to the length.

Pores of coxopleuræ small, about fourteen in number on each side; mostly near edge of ventral plate, a few isolated on side.

Anal-legs, exclusive of coxopleuræ, not or scarcely longer than the penult, moderately crassate in the male; clothed with few long hairs and on ventral surface in the male with more numerous, fine short ones; clawless.

Pairs of legs, thirty-nine.

Length, 18-20 mm.

Locality: Nome, Alaska. Two specimens taken August, 1916. The field label states that the specimens were secured "under logs on tundra," and Mr. Johansen, the collector, notes in his journal that the species occurred "under loose stones, boards, etc., on tundra near town."

Aside from the differences indicated under the account of the genus, this species differs from *A. glacialis*, as described and figured in the original account, in various characters. Thus, the figure and text show the lappets of the first maxillæ of *A. glacialis* to be short, thick, and equal; in the present species they are much longer and proportionately more slender, that of the coxa being at the same time shorter and more slender than that of the succeeding joint, and the second lappet extending beyond the tip of the second joint of the branch, though falling much short of it in *glacialis*. The median region of the united

coxæ of the second maxillæ is narrower and apparently more membranous in *alaskanus* and the anterior margin presents a distinctly reentrant angle at the middle instead of being straight. The cephalic plate is broader anteriorly, the caudal angles more rounded, the anterior margin protruding forward between antennæ instead of being excavated or reentrant, and the hairs are fewer and finer. The exposed area of the basal plate is proportionately longer. There is the likelihood that the specimens secured by the Vega at Port Clarence belong to the present species rather than to the true *glacialis* as fixed by description and figures.

LITHOBIOMORPHA.

Of this order one family is represented in the collection made by the Canadian Expedition. Another family is also known to occur in the Alaskan fauna, the Ethopolidæ, in which a new subspecies of *Ethopolys* from Sitka is described below. It is very probable that members of the Henicopidæ will also be found in the region; for, though this family on the whole is particularly characteristic of the southern hemisphere, *Lamyctes* is not uncommon in north temperate latitudes and the Zygethobiine group is characteristically North American. This group embraces largely mountain-loving forms; and *Zygethobius* is already known to occur in the high mountains of British Columbia which should naturally carry its range into the present territory.

LITHOBIIDÆ.

In addition to the species separately listed below, another species has been recorded from Port Clarence, which is very close to the locality from which the specimens of *E. stejnegeri* were secured by the Expedition. This is *Monotarsobius tricalcaratus* Attems. In the southern part of Alaska, namely from Forrester island, are also found *Oobius ulcorus* Chamberlin and *Paobius boreus* Chamberlin.

Ezembius Chamberlin.

This genus was established for a group of subarctic species of which the one here listed is the genotype. The following Siberian species, among others, belong in the genus: *Ostiacorom*, *princeps*, *sulcipes*, and *scrobiculatus* Stuxberg.

Ezembius stejnegeri (Bollman).

1893. *Lithobius stejnegeri* Bollman, Bull. U.S. Nat. Mus., 46, p. 149

Lithobius sulcipes Bollman, loc. cit., p. 199.

1909. *Monotarsobius arcticus* Attems, Arkiv för Zool., 5, No. 3, p. 19.

Lithobius (*Archilithobius*) *haasei* Attems, loc. cit., p. 22.

Of this species Mr. Johansen secured three females at Teller, Alaska, on July 31, 1913, his note stating that they were found "under old sacks, tins, etc., on tundra behind town."

The species is widespread in this general region, and appears to abound particularly on Pribilof and other islands. After a study of considerable material, I am unable to detect more than one species and conclude that the *sulcipes* of Bollman, and certainly the *Monotarsobius arcticus* and *Lithobius* (*Archilithobius*) *haasei* of Attems, all described from Bering island, are one and the same as *E. stejnegeri*, which in turn, may prove to be identical with *sulcipes* Stuxberg (1875), if not, indeed, with the much earlier *L. sibiricus* of Gerstfeldt (1858).

ETHOPOLIDÆ.

Occasion is taken to describe here a new Alaskan form of *Ethopolys*. As this is regarded as a subspecies of a new species occurring in Washington and Oregon, a description of the latter is also introduced.

Ethopolys Chamberlin.¹

This genus includes a group of North American species known at present only from the region west of the Rocky mountains where they are common and range from southern California, Nevada, and Utah northward into Alaska.

Ethopolys integer, n. sp.

Dorsum mostly dark brown with the caudal plates darker; major plates often darkened over the lateral and caudal borders; major plates of posterior half of body typically with a distinct longitudinal median black stripe, this becoming more indistinct on the anterior plates. Head, as also in part the first dorsal plate in some, reddish brown to chestnut; a blackish median longitudinal stripe extending from caudal margin to frontal suture. Antennæ brown to light chestnut, paler distad. Venter light brown, the fourteenth and fifteenth sternites commonly of chestnut tinge. Prosternum and prehensors also of light chestnut tinge. Legs testaceous, the posterior pairs darker, brown to light chestnut.

Body of same form in male and female. About eight times longer than width of tenth plate. Head and first dorsal plate of same width and narrower than the tenth plate.

Head distinctly wider than long (86 : 79); widest a little caudad of lateral breaks. A V-shaped impression on caudal half of plate. Entire surface subdensely punctuate, the punctæ distinct.

Ocelli from twelve to nineteen in three or four series, but by far most commonly in four; e.g., 1+5, 6, 4, 3; 1+6, 5, 4, 3; 1+5, 5, 4, 2; 1+5, 4, 3, 2; 1+5, 4, 2; 1+6, 5, 3. Single ocellus much largest, clearly separated by a space from the others. Seriate ocelli distinct, regular, decreasing moderately ventrad and cephalad.

Antennæ reaching to from fifth to eighth segments, but mostly to the sixth or seventh. Articles twenty to twenty-four, long and cylindric. Ultimate article long and slender, a little shorter than the two preceding taken together.

Prosternum about 1.7 times wider than long. Chitinous lines well developed excepting toward caudal ends. Finely densely punctuate. Spine inserted on ventral surface a little caudad of the anterior edge; moderately short, uniformly attenuated to an acute point; much stouter than the ordinary bristles. Teeth conical; those adjacent to the diastema on each side largest. Most commonly three or four teeth ectad of diastema but also sometimes only two. Examples of dental formulæ are the following, the left side being represented first: 3-7+6-3, this being the commonest of number and arrangements; 3-6+6-3; 3-5+6-3; 4-6+6-4; 2-6+6-3; 2-6+6-2; 2-6+5-2.

All dorsal plates distinctly and rather coarsely punctuate, and, especially the caudal ones, rather finely rugose and irregularly tuberculate toward lateral borders, the median portion remaining nearly smooth excepting on the fifteenth plate.

Spines of first legs $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the second to tenth pairs, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{1, 1, 3, 3, 2}$, with two accessory claws; of the anal, $\frac{1, 0, 3, 1, 0}{1, 1, 3, 2, 1}$, claw single or with a very minute accessory claw. Last two pairs, or occasionally only the last pair, of coxæ laterally armed.

¹Can. Entomologist, 1912, p. 13.

Claw of female gonopods long and well curved, entire, with no trace of lateral teeth. Basal spines 3+3; acuminate from near middle of length, apically rounded.

Length, 20 to 30 mm.

Localities: Washington state; Pullman and Wenatchee. Oregon: Corvallis.

This species seems to replace *E. sierravagus* north of Oregon. It is very close in general appearance and structure to the latter species.

***Ethopolys integer alaskanus*, n. subsp.**

Though in *E. integer* proper the head and first dorsal plate are strongly and rather coarsely punctate, especially over the anterior portion of the head, these parts in the types of the Alaskan form as represented by the types are smooth and wholly without punctæ or nearly so.

Posterior angles of thirteenth dorsal plate weakly produced, those of the eleventh showing a more slight similar tendency.

The claw of the female gonopods in the two typical females has a distinct tooth on the inner side toward the distal end but none on the outer, being thus bipartite instead of essentially entire as in *integer* or tripartite as in *sierravagus*.

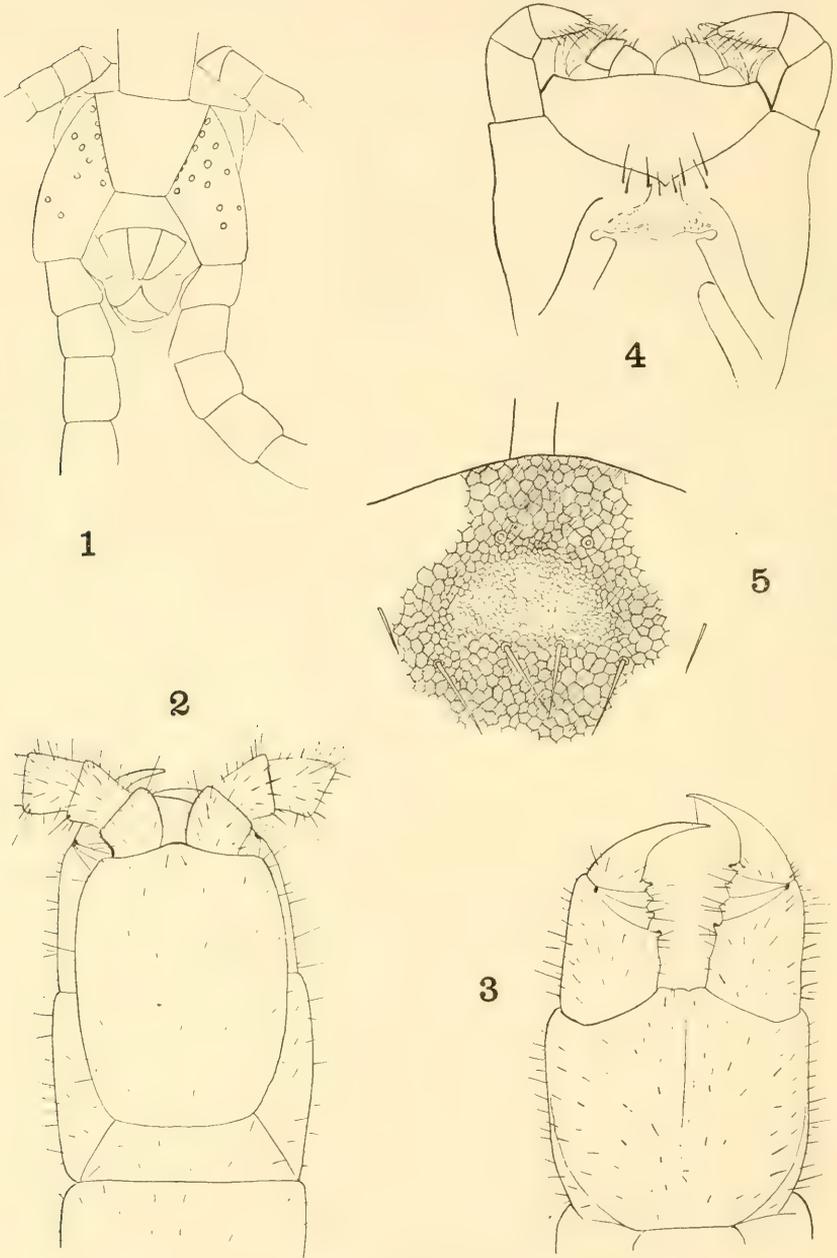
In the types from Forrester island a median dorsal black stripe is distinctly marked from the caudal end of the fourteenth plate cephalad to the frontal suture of the head. These specimens in whole or in part show a distinct reddish or chestnut cast. The specimens from Sitka (males presumably of this subspecies) lack the reddish tinge, the colour being a dull, nearly uniform, dusky olive brown.

Dorsal spines of first legs in Sitka specimens 0, 0, 2, 2, 1. Dorsal spines of second legs in specimens from both localities may be 0, 0, 3, 2, 1 or 0, 0, 3, 2, 2.

Length of maximum female, 23 mm.

Localities: Alaska, Forrester island (Ronald and Prof. H. Heath); and Sitka.

Chilopoda collected by the Canadian Arctic Expedition, 1913-18.



EXPLANATION OF PLATE IV.

- Fig. 1. *Cryophilus alaskanus* Chamberlin, ventral view of caudal end.
 2. *Cryophilus alaskanus* Chamberlin, dorsal view of head and prehensors.
 3. *Cryophilus alaskanus* Chamberlin, ventral view of prehensors.
 4. *Cryophilus alaskanus* Chamberlin, maxillæ.
 5. *Cryophilus alaskanus* Chamberlin, clypeal area.



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PART I: LEPIDOPTERA

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The Lepidoptera collected by the Canadian Arctic Expedition, 1913-18.

(With notes on other species collected in Arctic America.)

By ARTHUR GIBSON,

Entomological Branch, Department of Agriculture, Ottawa.

The collection of lepidoptera made by members of the Southern Party of the Canadian Arctic Expedition during the years 1913 to 1916, is composed largely of butterflies. The material was collected chiefly by Mr. Frits Johansen, although a number of specimens were taken by Mr. D. Jenness and Mr. J. J. O'Neill, other members of the expedition. The localities where the lepidoptera were collected are in some instances the same as those visited by Mr. David T. Hanbury, whose collections were reported upon by Elwes and Hampson¹. A small number of specimens of the families Pyralidæ, Pterophoridaæ, and Tortricidæ were brought back, but these are in such poor condition that it is impossible to determine them. In addition to the collection made by the Southern Party, I have also examined a small collection brought back by the Northern Party made on Victoria island and Melville island.

In the National Collection of Insects at Ottawa there are a number of species which were collected in Arctic regions by officials of the Geological Survey of Canada and which were not obtained by members of the Canadian Arctic Expedition. It has been thought advisable to include the records of such captures in this report.

In the spring of 1917, I had an opportunity of studying portions of the Barnes' collection of lepidoptera, at Decatur, Ill., which is undoubtedly one of the most complete collections of North American lepidoptera in existence. On this occasion I compared some doubtful material with specimens in the collection. I received many favours while in Decatur, not only from Dr. Barnes himself but from Dr. J. McDunnough. To both of these gentlemen I am much indebted. A few other specialists were consulted with regard to doubtful species and such assistance as was received is acknowledged in the text.

In the following pages nine species are described as new, in addition to which two new varieties are recognized. The majority of these new species and new varieties were collected by members of the Canadian Arctic Expedition.

The photographs from which Plates I to III, inclusive, were made, were taken by Mr. A. E. Kellett, Artist Assistant, Entomological Branch, Department of Agriculture, Ottawa.

The arrangement of the species follows Barnes and McDunnough's recently issued Check List of the Lepidoptera of Boreal America.

FAMILY PAPILIONIDÆ.

Genus *Papilio* L.

Papilio machaon aliaska Seudd.

Papilio machaon var. *aliaska* Seudd.: Proc. Bost. Soc. Nat. Hist., XII, 407, 1869.

No specimens of this butterfly were met with by members of the Canadian Arctic Expedition. In the National Collection of Insects at Ottawa there are specimens from: Valley of Mayo river, Yukon Territory, July, 1904 (J. Keele); Gravel river, near Twitya river, Northwest Territories, June 28, 1908 (J. Keele); three miles below summit of Chilkoot pass, July 15, 1886 (McDougall); between latitudes 67° 25' and 66° 30', long. 141°, June 12-27, 1912 (D. D. Cairnes).

Mr. Keele reported that this butterfly was quite common along the shores of Mayo lake and valley of Mayo river, Yukon, during July and August, 1904.

¹ Trans. Ent. Soc. Lond., 1903, part III (Oct.).

Papilio glaucus canadensis R. & J.

Papilio glaucus canadensis R. & J.: Novitates Zoologicae, XIII, 586, 1906.

Two Yukon specimens of the form *canadensis* are in the Canadian National Collection, namely from: Klotassin river area, lat. 62° 31' to 63° 06'; long. 137° 30' to 139° 30', summer, 1916 (D. D. Cairnes), and Frances river (lat. 60° 29'), July 1, 1887 (Dawson and McEvoy).

Genus **Parnassius** Latr.**Parnassius smintheus** Dbldy. and Hew.

Parnassius smintheus Dbldy. & Hew.: Gen. Diur. Lep., pl. 4, 1847.

Two specimens in the Canadian National collection from the following northern localities: White river district, international boundary, Yukon Territory, lat. 61° 55', long. 141°, July 13, 1913 (D. D. Cairnes); White river, Yukon Territory, long. 141°, July 23, 1913 (D. D. Cairnes).

FAMILY **PIERIDAE**.Genus **Pieris** Schrank.**Pieris occidentalis** Reak.

Pieris occidentalis Reak.: Proc. Ent. Soc. Phil., VI, 133, 1866.

One specimen from Bernard harbour, Northwest Territories, July 30, 1915, female (F. Johansen).

In addition to this specimen there is in the Canadian National collection at Ottawa, specimens from the following Arctic localities: Mackenzie river, opposite Gravel river, Northwest Territories, July 18, 1908 (J. Keele); Mt. Eduni, Gravel river, Northwest Territories, July 8, 1908 (J. Keele); Klutlan Glacier, elevation 7,500 feet, 141st meridian, international boundary, June 21, 1913 (E. W. Nesham).

Pieris napi L.

Verity¹ has treated, at length, the various races and forms of this species. More recently, however, Barnes and McDunnough² have discussed the forms of *napi* which occur in the extreme north.

No specimens of this species were collected by members of the Canadian Arctic Expedition but it is of interest to include here records of specimens in the Canadian National collection, which were collected by other explorers.

Pieris napi arctica Verity.

Pieris napi arctica Verity: Rhopalocera Palæarctica, 334, 1911.

In the Ottawa collection there are ten specimens which we have determined as this form, namely from the following localities: White river district, Yukon Territory, lat. 62° 31' to 63° 06', long. 137° 30' to 139° 30', summer 1916, 2 males (D. D. Cairnes); valley of the Mayo river, Yukon Territory, July, 1904, 1 male (J. Keele); Nansen creek, Placer Mining camp, Yukon Territory, July 4-7, 1914, 3 males (D. D. Cairnes); near Bear creek, 120 miles from Whitehorse, on Kluane road, June 17, 1914, 1 male (D. D. Cairnes); between latitudes 67° 25' and 66° 30', long. 141°, June 15, 1912, 1 female (D. D. Cairnes); Pelly river, Yukon Territory, July 13, 1907, 1 female (J. Keele). In the Entomological Record for 1907³ this latter specimen is recorded under the name *hulda*.

¹ Rhopalocera Palæarctica, Vol. 1.

² Cont. Nat. Hist. Lep. N.A., III, No. 2, and IV, No. 2.

³ Rep. Ent. Soc. Ont., 1907.

One of the specimens taken between latitudes $67^{\circ} 25'$ and $66^{\circ} 30'$, long. 141° is shown on Plate III, fig. 3, together with the underside of a specimen from Nansen creek, Yukon Territory (fig. 4). Barnes and McDunnough in their "Contributions," vol. III, No. 2, Plate VI, figure a male and a female of *arctica* from Chatanika, Alaska.

Pieris napi pseudobryoniae Verity.

Pieris napi pseudobryoniae Verity: *Rhopalocera Palæarctica*, 146, 1908.

Specimens of this form in the Ottawa collection are from the following localities: Bartlett bay, off Glacier bay, Alaska, June 10, 1907, 2 males, 1 female (D. H. Nelles); Alaska, 1894, 2 females (Ogilvie). A male and a female from Bartlett bay are shown on Plate III, figs. 1 and 2.

In the Ottawa collection there is a specimen of *napi* taken at Dease lake, northern British Columbia, June 17, 1887 (G. M. Dawson). Fletcher¹ recorded this as *venosa* Scudd. This latter form was described from California. I have recently compared the specimen from Dease lake with Edwards' figure of *oleracca-hiemalis* on Plate 2, Vol. 1, Papilio, and while the veins are more heavily lined, it otherwise is similar to the figure referred to. It is certainly different from specimens of *venosa* from California in the Canadian National collection. Long series of such northern forms are required before one can arrive at any satisfactory decision regarding their status.

Genus **Euchloe** Hbn.

Euchloe creusa Dbldy.

Anthocharis creusa Dbldy.: *Gen. Diur. Lep.*, pl. 7, 1847.

Three specimens from northern localities are in the Canadian National collection, namely from Pelly river, Yukon Territory (W. Ogilvie), and between latitudes $67^{\circ} 25'$ and $66^{\circ} 30'$, June 12-15, 1912 (D. D. Cairnes).

The specimen from Pelly river was named *A. hyantis* some years ago by the late Dr. Fletcher. This latter name, however, according to Barnes and McDunnough², should evidently be used for the Californian race of *creusa*.

In 1908, Mr. C. H. Young, of the Canadian Geological Survey, found the larvæ abundantly at Departure bay, British Columbia, feeding on tower mustard, *Arabis glabra* (L.) Bernh. Unfortunately he did not make any larval notes, but brought to me on his return to Ottawa a number of the chrysalids, from one of which a butterfly had emerged and from another a tachinid parasite of the genus *Exorista*³. The chrysalid is shown on Plate III, fig. 7.

Euchloe ausonides Bdv.

Anthocharis ausonides Bdv.: *Ann. Soc. Ent. Fr.* (2), X, 286, 1852.

Four northern specimens of this species are in the Canadian National collection taken at the following localities: Telegraph creek, Stikine river, northern British Columbia, May 27, 29, 1887 (G. M. Dawson); Cassiar trail, 10 miles west of Dease lake, British Columbia, June 4, 1887 (G. M. Dawson); Pelly river, below Hoole river, Yukon Territory, July 5, 1907 (J. Keele).

¹ *Ann. Rep. Geo. Surv. of Canada*, 1887.

² *Cont. Nat. Hist. Lep. N.A.*, III, 2, 60.

³ The specimen which was much damaged was submitted to Mr. John D. Tothill, who reported that it belonged to the genus *Exorista* and that it may be *E. vulgaris* Fall.

Genus **Eurymus** Swains.**Eurymus meadi** Edw.

Colias meadi Edw.: Trans. Amer. Ent. Soc., III, 267, 1871.

One specimen from Bernard harbour, Dolphin and Union strait, Northwest Territories, July 14, 1916, male (F. Johansen).

This was the only specimen of this butterfly which was in the Arctic collection. It resembles very closely specimens from Colorado in the Canadian National collection. The glandular spot is well developed, and is distinctly tinged with red.

The occurrence of this species at Bernard harbour is a most interesting record. It was captured with specimens of *hecla glacialis*, from which, of course, it was at once separated by the spot referred to.

Eurymus hecla glacialis McLach.

Colias hecla var. *glacialis* McLach.: Jour. Linn. Soc., XIV, 108, 1878.

Twenty-four specimens from the following localities: Collinson point, northern coast of Alaska, July 10, 1914, 4 males, 2 females (F. Johansen). Barter island, northern Alaska, July 4, 1914, July 17, 1914; July 19, 1914; July 21, 1914; 8 males, 3 females (D. Jenness); Herschel island, Yukon Territory, end of July, 1916, 1 female (F. Johansen); Bernard harbour, Northwest Territories, July 14, 1916; August 1, 1915, August 4, 1915; August 17, 1915, August 25, 1915; 3 males, 3 females (F. Johansen).

One of the specimens from Collinson point represents the form *pallida* of Skinner and Mengel. The specimens collected on Barter island were captured while resting on the tundra. Mr. Jenness in a note which accompanied the specimens states: "This butterfly flies with considerable speed in a comparatively straight line for some distance." On Barter island the specimens were all with one exception taken during sunshine, the temperature records noted by Mr. Jenness varying from 44° to 56°F. The exception, a male specimen, was taken on a cloudy day, the temperature at the time being 38°F.

In the males the colour of the upper side of the wings is nearest to orange excepting along the costa and along the inner angle of the secondaries where the scales are greenish-yellow and black intermixed. The black marginal band is wide and in most examples is conspicuously crossed on all wings with yellowish-green veins. The discal spot on the primaries is black, conspicuous, and varies in shape from an almost straight short dash to an enlarged almost rounded spot. The centre of the latter spot is in some specimens filled in with white, in others with red. The underside of the males is fairly constant, the secondaries being greenish-yellow dusted with black. The black dusting is not so heavy along the margins and the marginal area therefore is paler in colour and shows up as a faint marginal band. The discal spot is white, heavily bordered, particularly outwardly with red and frequently prolonged to a point. In some specimens a very small additional spot is present. The primaries beneath are of a similar colour excepting the discal area which is flushed with pale orange. In some examples there is a submarginal row of black spots, in others a single black submarginal spot near the inner angle. The discal spot on the underside of the primaries is conspicuous, and is centred with white or pale orange. The males in expanse of wings vary from 38 to 45 mm.

The females are similar in appearance and resemble very much the figures labelled *hecla* on plate 27 g, vol. v of Seitz's *Macrolepidoptera of the World*, excepting that the marginal band on all wings is decidedly wider. One female from Bernard harbour has the wide band on the primaries with only traces in two instances of the yellowish-green submarginal spots. The secondaries in

this specimen are also darker than in the other examples and the yellowish-green submarginal spots are only faintly represented by a few scales of that colour. This specimen in the width of the band approaches *meadi* Edw. The females vary in size from 42 to 51 mm.

Specimens of both sexes have also been compared with Verity's figures of *hecla*. One or two, possibly more, of our females may be the same as his *chrysothemoides*.

Seven specimens, males, of the same species were brought back by the Northern Party of the Canadian Arctic Expedition. These were collected at Armstrong point, Victoria island, Northwest Territories, July 1-10, 1916 (J. Hadley).

In addition to the above specimens there are 21 other examples in the Canadian National collection taken as follows:

Klutlan glacier, international boundary, June 21, elevation 7,500 feet, 1 male (E. W. Nesham); Alaska, lat. 59° 30', 141st meridian—lat. 69° 40', 141st meridian, June-July, 1912, 2 males, 1 female (J. M. Jessup). This latter is a white female, and is apparently *pallida* S. and M.

Lansing river, Yukon Territory, June 24, 1905, 1 male (J. Keele). This specimen was recorded as *Eurymus boothi* in the Entomological Record for 1905¹.

Ladue river, Yukon Territory, July 4, 1905, 1 male (J. Keele). Previously recorded with specimen from Lansing river as *E. boothi*.

Mayo valley, Yukon Territory, 1904 (J. Keele). In the Entomological Record for 1904² Fletcher recorded this specimen as *E. boothi*, stating that it corresponded exactly with Elwes' fig. 5³. Unfortunately this specimen is in very poor condition. I have compared it with Elwes' figure referred to, and would determine it as *hecla glacialis* not *boothi*.

Kluane road, 135 miles from Whitehorse, Yukon Territory, June 21, 1914, 1 male, 1 female (D. D. Cairnes).

Near mouth of Nansen creek, head of Nisling river, Yukon Territory, July 4, 1914, 2 males, 1 female (D. D. Cairnes); White river district, Yukon Territory, lat. 61° 55', long. 141°, July 16, 1913, 1 male (D. D. Cairnes); Tatenduk river, international boundary, lat. 65° 02', August 3, 1912, 1 male (D. D. Cairnes); Tinder creek, Yukon Territory, July 25, 1912, 1 female (D. D. Cairnes); west branch of the Thelon river, Northwest Territories, July 6, 1900, 1 male (J. Tyrrell); Sore-head river, east coast of Hudson bay, August 15, 1898, 3 males, 2 females (A. P. Low).

Eurymus boothi Curtis.

Colias boothii Curtis: Ross' Nar. Second Voyage N.-W. Pass., App., 65, 1835.

Six specimens, all males, from the following localities: Bernard harbour, Northwest Territories, July 14, 1916, 5 specimens (F. Johansen); Port Epworth, Coronation gulf, July 15, 1915, one specimen (J. J. O'Neill).

I have compared these six specimens with the original figures and description of *boothi* and cannot associate them with any other species. The specimens have also been compared with Elwes' figures⁴ of specimens collected at Port Epworth, Barren Grounds and Gray's bay. In the collection of the National Museum at Ottawa are three specimens taken in the Yukon in 1904 and 1905 which were recorded in the Entomological Record⁵ for 1904 and 1905. I have studied these specimens and am satisfied that they are not *boothi* but similar to other specimens which we have determined as *hecla glacialis* McLach.

¹ Rept. Ent. Soc. Ont., 1905, 96.

² Rept. Ent. Soc. Ont., 1904, 61.

³ Trans. Ent. Soc. Lond., 1903, pl. IX.

⁴ Trans. Ent. Soc. Lond., 1903, pl. IX.

⁵ Reports Ent. Soc. Ont. for years 1904 and 1905.

The pale orange-coloured scales on the primaries of the above specimens of *boothi* are in general similar in shade to Elwes' figures, 1, 4 and 5, already referred to and in Ridgway's Color Standards and Nomenclature (1912) come nearest to light orange-yellow or deep chrome, whereas in all of the specimens which we have determined as *hecla glacialis*, the colour of the wings is not yellow but in most examples is nearest to orange as figured by Ridgway in the work referred to. In these latter specimens too (41 examined) there is an absence of the greenish-yellow scales which in the specimens of *boothi* are present along the marginal band and also for the most part over the entire secondaries. In the three specimens referred to above, recorded erroneously as *boothi* the colour of the secondaries is similar to the colour of the primaries, as is the case in the series of specimens of *glacialis* examined. The discal spot on the secondaries in the latter butterfly is also much larger and redder in colour than in the specimens of *boothi*. The colour of the figures of *boothi* in Ross' Second Voyage referred to above is very close to bright chalcedony yellow (Ridgway, 1912). Verity¹ figures a coloured male (type) of *boothi*, plate XLIII, 37. Two of our specimens resemble this figure very closely.

Examining the six specimens more closely the following differences are apparent:—

Three of the specimens from Bernard harbour, have the marginal band well defined. The band on the primaries in these specimens varies in width at vein 3 from about 1 mm. to about 2 mm. On the secondaries there is the same variation in width. The marginal band on the latter wings in two of the examples ends abruptly at about midway between veins 2 and 3. In the other of these three specimens the band on the secondaries is only clearly defined to vein 4. The other three males have, also, narrow marginal bands but these are not so well defined and are preceded on the primaries by yellowish-green spot-like areas which give them a female-like appearance. In none of the specimens are the veins in the marginal band brightly coloured as in *hecla glacialis*, all are colorous with the band itself, but there are, however, in the marginal band on the primaries a series of transverse, short, greenish-yellow dashes midway between the veins. One specimen in fairly good condition has only a slight tinge of yellow in the discal area, all the wings in general being of a greenish-yellow colour. The discal spot on the primaries varies in size; in two examples it is rounded, in the others more like a short dash.

The underside of the secondaries is of a dull yellowish-green, the submarginal area being paler and showing up as a band. In the better preserved specimens there is a distinct pale yellowish-green streak near the centre. The discal spot on the hind wings is rounded, white in colour, bordered with rosy-red which colour in two examples runs outwardly to a point. In the basal area near the body there is also a conspicuous rosy-red dash similar to that which occurs on *hecla glacialis*. The primaries underneath are in general similar, the yellowish flush in the discal area varying in intensity. In one specimen nearly the whole underside of the primaries is yellowish. In this latter specimen there is a conspicuous row of black submarginal spots. The discal spot is conspicuous, whitish in the centre and margined with black.

The specimens vary in expanse of wings from 36 mm. to 43 mm. Two examples, both from Bernard harbour are shown on Plate IV, figs. 1 and 2.

In the Entomological Record for 1910², I recorded a specimen of *C. boothi* from Dawson, Yukon Territory, 1908 (A. Day). This record should undoubtedly refer to *hecla glacialis*.

¹ Rhopalocera Palæarctica.

² Rep. Ent. Soc. Ont., 1910.

Eurymus eurytheme kootenai Cockle.

Colias kootenai Cockle: Can. Ent. XLII, 203, 1910.

Barnes and McDunnough¹ have recently separated the forms which they considered should be arranged under *eurytheme*. Regarding *kootenai* which they refer to as being evidently the spring form of British Columbia, it is of interest to include here the following records: Pelly river, at mouth of Campbell creek, Yukon Territory, male, July 8, 1907 (J. Keele); Pelly river, near Hoole river, Yukon Territory, male, July 5, 1907 (J. Keele); Klotassin river area, Yukon Territory, 62° 31' to 63° 06'; long. 137° 30' to 139° 30', summer, 1916, male and female (D. D. Cairnes).

The above authors, in the publication referred to figure two males and one female, one of the former being of a specimen from Atlin, B.C., which is adjacent to the Alaskan border.

Eurymus christina Edw.

Colias christina Edw.: Proc. Ent. Soc. Phil., II, 79, 1863.

Mr. Jos. Keele, of the Department of Mines, Ottawa, has on several occasions collected interesting specimens of lepidoptera in northern regions. In 1908 he met with this species on the Mackenzie river opposite Gravel river, Northwest Territories, July 17, 18, 1908, 6 males, 5 females. A single female was also collected by Dr. D. D. Cairnes on the west side of Lake Kluane, near Jacquot's road house, Yukon Territory, Aug. 2, 1914. These specimens are similar to others taken in more southern regions in the provinces of Alberta and Saskatchewan. One of the specimens is apparently the form *gigantea* Stkr. The species was described from material collected "at the portage of Slave river."

In 1888, Mr. F. Bell collected a coliid at Fort Simpson, Northwest Territories, and this was determined by W. H. Edwards as *occidentalis*, and recorded as such by Fletcher². Barnes and McDunnough³ state that possibly the Fort Simpson specimens mentioned by Scudder in his description of *occidentalis* really belonged to a yellow form of *christina*, and for this reason they would restrict the name *occidentalis* to the Vancouver island form which, while close, they mention can at once be distinguished by the much greater suffusion of black at the base of both wings on the upper side, approaching in this respect *chrysomelas* Hy. Edw.

The specimen collected by Mr. Bell and named *occidentalis* for Fletcher by Edwards certainly lacks the suffusion of black at the base of both wings on the upper side and is thus similar to *christina* as we know the latter.

Eurymus pelidne Bdv.

Colias pelidne Bdv.: Icones, pl. VIII, 1832.

In the Canadian National collection there are twelve specimens which we have determined as this species. These specimens were taken as follows: Limestone harbour, opposite northern part of Big island, Hudson strait, July 24, 1897, male (R. Bell); head of Kaliktookduog inlet, north side of Hudson strait, July 26, 1897, male (R. Bell); Sore-head river, east coast of Hudson bay, August 15, 1898, male (A. P. Low); Hannah bay, Hudson bay, female; Koongneow inlet, Hudson strait, July 29, 1897, female (R. Bell); Labrador, July 9, 27, 5 males (A. P. Low); Little Charlton island, James bay, July 14, 1884, male (J. M. Macoun).

¹ Cont. Nat. Hist. Lep. N.A., III, 2, 64.

² An. Rep. Geo. Surv. Can., 1887.

³ Cont. Nat. Hist. Lep. N.A., III, 2, 68.

The specimen from Hannah bay was identified by W. H. Edwards as *pelidne* and that from Koong-neow inlet bears the same name in Fletcher's handwriting. Two of the specimens from Labrador were examined by Dr. H. Skinner. Dr. McDunnough has very kindly sent to me specimens of *pelidne* from Hopedale, Labrador. The specimens from Hudson bay and Labrador we presume are *labradorensis* Seud.

Comparing these specimens with the series determined as *chippewa* referred to below the following differences are apparent. In both sexes of *pelidne* the marginal bands are narrower, especially on the secondaries, and the discal spot on the underside of the secondaries is distinctly margined with red mostly of a purplish shade. Barnes and McDunnough¹ refer to the discal spot of the forewing of *labradorensis* as being entirely absent or only faintly outlined by a few scattering dark scales and figure a male specimen from Hopedale, Labrador.² In our specimens the discal spot is present but faint. Verity³ figures a female from Labrador. The butterfly is also figured by Holland⁴.

Eurymus palaeno chippewa Edw.

Colias helena Edw.: Butt. of N.A., Vol. I, Colias 1;

Colias chippewa Edw.: Proc. Ent. Soc. Phil. 2, 80, 1863 (*helena* preoccupied).

One specimen, a female, taken at Nome, Alaska, August 24-25, 1916 (F. Johansen).

In the Canadian National collection at Ottawa there are fifteen other specimens which we have determined as *chippewa*. They bear labels as follows: Pelly river, Yukon Territory, 15 miles above Woodside river, July 14, 1907, 3 specimens, males (J. Keele); Stewart river, above Nadaleen river, Yukon Territory, July 18, 1905, 2 males (J. Keele); Nansen creek, Placer Mining Camp, Yukon Territory, July 7, 1914, 1 male, 2 females (D. D. Cairnes); Harrington creek, Yukon Territory, lat. 65° 05', long. 141°, July 30, 1912, male (D. D. Cairnes); Ladue river, Yukon Territory, July 4, 1905, male (J. Keele); Champagne Landing, 50 miles from Whitehorse, by Kluane road, Yukon Territory, June 8, 1914, female (D. D. Cairnes); Siwash creek, international boundary, lat. 65° 57', June 30, 2 males (D. D. Cairnes). Mt. Eduni, Gravel river, Northwest Territories, 6,000 feet, July 8, 1908, male (J. Keele); west branch of the Thelon river, Northwest Territories, July 5, 1900, male (J. Tyrrell).

The males are fairly constant in markings, and in general are in good condition. The colour of the upper surface of all wings is chalcedony yellow⁵, the lower wings being not so bright resulting from the dark scales of the underside showing through. The marginal blackish bands are noticeably wide. Underneath the colour varies in the specimens from pale yellow to a decidedly greenish-yellow, the secondaries overlaid with blackish scales as is also the costal area. In all the specimens the discal spot on the secondaries, beneath, is white, faintly margined with yellow. The four females are also similar in appearance, being whitish with broad marginal band on primaries particularly at apex. Edwards' figures⁶ resemble closely specimens in our series as do also those of Verity⁷.

¹ Cont. Nat. Hist. Lep. N.A., III, 2, pl. VII, 6.

² Dr. McDunnough has since informed me that the character is not always constant. In the Barnes collection specimens have recently been added which show the discal spot.

³ *Rhopalocera Palearctica*, pl. XL, 20.

⁴ The Butterfly Book, pl. XXXV, 14; XXXVI, 15, 16.

⁵ Ridgway's Color Standards and Nomenclature, 1912.

⁶ Butt. of N.A., Vol. 1, Colias 1, figs. 5, 6, 7.

⁷ *Rhopalocera Palearctica*, pl. VIII, 43, 44, 45.

Eurymus nastes Bdv.

Colias nastes Bdv.: Icones, p. 245, pl. 8, 1832.

Thirty-eight specimens from the following localities: Barter island, northern Alaska, July 17, 1914, 1 female (D. Jenness); Collinson point, Alaska, July 10, 17, 1914, 2 females (F. Johansen); Cockburn point, Dolphin and Union strait, Northwest Territories, September 2, 1914, 1 male, 1 female (F. Johansen). Bernard harbour, Northwest Territories, 13 males, 20 females, July 30, 1915, August 1, 4, 6, 11, 14, 17, 25, 1915, July 14, 1916 (F. Johansen).

This excellent series has enabled us to form a good idea of the range of variation which may occur within the species. The wing expanse of the males varies from 35 mm. to 38 mm. and the females from 34 mm. to 43 mm. In the males the underside both in colour and markings is fairly constant but the upperside shows more variation. The secondaries are mostly of a pale fluorite green¹ more or less dusted with black. The primaries in most specimens are darker than the secondaries, the whole wings in some examples being heavily dusted with black. In the females there is more colour variation on the undersides, some specimens being greenish-yellow others darker green and others again dark green with a pinkish tinge. In most of the specimens the marginal band of yellow is conspicuous.

Verity² has figured a male and a female (types) of the variety *rossii* Guenée brought back by Captain Ross. None of our males can with certainty be definitely associated with the figure of the male type but one or two of the females match fairly well the figure of the female type. The figures on plate 27 d. of Seitz's *Macrolepidoptera of the World* are more like our specimens.

A single example (female) was brought back by the Northern Party of the Canadian Arctic Expedition. This was collected at Armstrong point, Victoria island, Northwest Territories, early July, 1916 (J. Hadley).

In addition to the above specimens there are in the Canadian National collection three females from Sore-head river, east coast of Hudson bay, August 15, 1898 (A. P. Low), and one male specimen from Labrador (collector and exact locality unknown).

FAMILY SATYRIDAE.

Genus **Coenonympha** Hbn.**Coenonympha kodiak yukonensis** Holland.

Coenonympha kodiak var. *yukonensis* Holland: Ent. News, XI, 386, 1900.

In 1905, Mr. Joseph Keele, of the Department of Mines, Ottawa, collected five specimens of this butterfly as follows: Lansing river, Yukon Territory, June 24, 3 males, 1 female; Ladue river, Yukon Territory, July 4, female.

These specimens are in the National collection at Ottawa. This butterfly was not collected by any members of the Canadian Arctic Expedition.

Genus **Oeneis** Hbn.**Oeneis chryxus** Dbldy. and Hew.

Oeneis chryxus Dbldy. and Hew.: Gen. Diurn. Lep., II, 383, 1851.

In the Canadian National collection are two specimens of this species taken by Mr. J. Keele, on the Pelly river, at Hoole canyon, Yukon Territory, July 3, 1907, both males. One of the specimens, although rubbed, resembles a specimen of the variety *calais* Scud. in the Ottawa National collection from Go Home bay, Ontario.

¹ Ridgway's Color Standards and Nomenclature, 1912.

² *Rhopalocera* Palearctica.

Oeneis jutta Hbn.

Oeneis jutta Hbn.: Eur. Schmett, f. 614, 1800.

In the Canadian National collection are specimens from the following Yukon localities: North Fork Stewart river, Yukon Territory, June 22, 1905, 1 male (J. Keele); Klotassin river area, Yukon Territory, lat. $62^{\circ} 31'$ to $63^{\circ} 06'$; long. $137^{\circ} 30'$ to $139^{\circ} 60'$, summer 1916, 1 male (D. D. Cairnes); Ladue river, Yukon Territory, July 4, 1905, 1 male, 2 females (J. Keele); Lansing river, Yukon Territory, June 24, 1915, 1 female (J. Keele).

In all of these specimens excepting the male, taken on the Ladue river, the median band on the underside of the secondaries is present. In the exception the band is not definitely marked and in general may be referred to the var. *alaskensis* Holl. The specimens on the whole are smaller than *jutta* which occurs commonly at the Mer Bleue, Carlsbad Springs, Ont., a favourite collecting ground near Ottawa.

Oeneis taygete Hbn.

Oeneis taygete Hbn.: Samml. Ex. Schmett, 1816-24.

One specimen, a male, as follows: Bay southwest of cape Krusenstern, Northwest Territories, July 3, 1916 (D. Jenness).

In the Canadian National collection at Ottawa there are nine other specimens bearing locality records as follows: Kluane road, 96 miles from Whitehorse, near Marshall creek, Yukon Territory, June 15, 1914, 1 male (D. D. Cairnes); Sit Down creek, lat. $65^{\circ} 40'$, long. 141° , July 9, 1912, 1 female (D. D. Cairnes); Nation river, lat. $65^{\circ} 31'$ (1700-2500 ft.), July 17, 1912, 1 female (D. D. Cairnes); Siwash creek, Yukon Territory, lat. $65^{\circ} 57'$, long. 141° , June 30, 1912, 1 female (D. D. Cairnes); one other specimen evidently from the Yukon Territory, but without definite data; Labrador, male; King George sound, south side Hudson strait, July 16, 1897, 2 males, 1 female (R. Bell).

In the males the median band on the underside of the secondaries is very distinct, in the females less so. The whitish spots near the margin on the hind wings beneath, are conspicuous on most of the Yukon specimens and equally so on the Labrador specimen.

Holland has given a rather good figure of the species in his Butterfly Book pl. XXVII, 6, the specimen illustrated being from Nain, Labrador. In none of our specimens is the pale yellowish submarginal band on the upperside so marked as indicated in Seitz's figure 50g, vol. v—The Macrolepidoptera of the American Faunistic Region. The submarginal area of the specimens listed above is, in both sexes, similar in colour to the general colour of the primaries. In some of the examples the yellowish spots on the upperside of the secondaries near the margin are very conspicuous. The general colour of the upper surface of the Labrador example is of a golden-brown shade, while that of the Bernard harbour specimen and other males, is of a darker shade of brown. The median band on the underside of the secondaries while conspicuous in all the specimens indicates considerable variation not only in width but also in shape. The number of white scales on both sides of the median band also varies. In all the specimens the veins are white-lined.

The genitalia of the specimen taken on the Kluane road, 96 miles from Whitehorse, Yukon Territory, are shown on Plate 1, fig. 1.

Oeneis semidea Say.

Hipparchia semidea Say: Am. Ent., III, pl. 50, 1828.

In the Canadian National collection there are thirteen specimens of *Oeneis* from the Yukon Territory which I have compared with *semidea* from New Hampshire, and from which they do not differ in characters which seem to me to be important. The genitalia, also, are very close to those of specimens from Mount Washington, New Hampshire, as will be seen by comparing the figures on Plate I, figs. 2 and 3. The underside of these specimens is in general very similar to Edwards' figure 2¹. The females are large, expanding 51-53 mm. The males, excepting one specimen, expand 44-47 mm. the exception having a wing expanse of 53 mm.

These specimens are from the following localities: Mountain 6,500 feet above Wolf canyon, Pelly river, Yukon Territory, July 17, 1907, 2 males (J. Keele); Pelly river at Hoole canyon, Yukon Territory, July 30, 1907, male (J. Keele); Stewart river, Yukon Territory, 4,000 feet above valley, July 18, 1905, male (J. Keele); Mountain top, above Nadaleen river, Yukon Territory, July 10, 1905, male (J. Keele); Mountain near Upper Pelly river, Yukon Territory, July 13, 1907, female (J. Keele); Orange creek, Yukon Territory, lat. 66° 10', international boundary, June 27, 1912, 2 females (D. D. Cairnes); Eduni mountain, 4,500-6,000 feet, Gravel river, Northwest Territories, July 5, 8, 1908, 1 male, 3 females (J. Keele); Gravel river, mountain below Natla river, Northwest Territories, July 2, 1908, female (J. Keele).

The underside of two males, one from Pelly river, Yukon Territory, the other from Gravel river, Northwest Territories, together with a female from Orange creek, Yukon Territory, are shown on Plate II, figs. 1, 2 and 3.

Oeneis semidea var. **arctica**, new variety

Differs from *semidea* from New Hampshire in the general colour of both the upperside and the underside of the wings. The upper side of the wings is pale brown, almost drab², the dark scales of the underside showing through particularly on the secondaries. The underside is of a dull grey-brown, the maculation dark brown and not nearly so contrasting with the ground colour as in *semidea*, the mottlings being much more diffused and there being an absence of the conspicuous whitish areas present in the latter on the underside of the secondaries. The basal area to anal angle is noticeably darkest, inclining to blackish. Fringes whitish, weakly checkered with brown.

Alar expanse, 41 mm.

Type, a male, in the Canadian National collection from Bernard harbour, Northwest Territories, July, 1916 (F. Johansen). (Pl. IV, fig. 4.) Four male paratypes from the same locality and bearing the same data are in general similar, with wing expanse of 37-38 mm. In addition to the five males there are four females which we are placing tentatively with this new variety. Three of these are from Wollaston Land, Victoria island, 1915 (D. Jenness); the fourth is from Bernard harbour, Northwest Territories, July, 1915 (F. Johansen). In these females there is an absence of the black suffusion of the basal area. They have a wing expanse of 41-42 mm. The underside of one of the male paratypes is shown on Pl. II, fig. 4.

The claspers of *semidea arctica* are shown on Pl. I, fig. 4 beside those of *semidea* from New Hampshire. It will be seen that they are very close to those of the latter. The general colour of the arctic specimens as well as the nature of the maculation on the underside of the secondaries, and their smaller wing expanse seem to warrant the naming of this variety or race.

¹Butt. of N.A., Chionobas, IX, f. 2.

²Ridgway's Color Standards and Nomenclature, 1912.

Oeneis simulans, n. sp.

Palpi black, upper fringe mostly white. Antennæ brown, with conspicuous white scales on inner side, knob orange-brown. Body blackish. The upperside of the wings are immaculate, pale brown in colour, almost drab¹, the maculation of the underside showing through particularly on the secondaries. Sex mark faintly indicated. Costa whitish, mottled with black. Underside: primaries dull grey-brown, costa and apex whitish with black mottlings; secondaries pale grey-brown inclining to whitish, particularly on outer half, and mottled and streaked with dark brown, blackish at base and along inner angle. Median band rather indistinct but noticeably defined by blackish shading both on its inner and outer margin. Maculation in general similar to *semidea* but not so contrasting as in this latter species and without the conspicuous whitish areas. Fringes whitish, checkered with pale brown.

Alar expanse, 43 mm.

Type, a male, from Bernard harbour, Northwest Territories, July, 1915 (F. Johansen). Two paratypes from the same locality and bearing the same data. In two of these latter the maculation on the underside of the secondaries is more diffused than in the type, the median band being defined on the outer margin only, the area between this and the base being almost wholly suffused with blackish-brown. A third specimen, which I also associate with the above, differs from the type on the underside of the secondaries in having the median band more heavily suffused with dark brown and more sharply defined with whitish scales on both its inner and outer margin. The outer margin is distinctly angled and in this respect differs from the type. These specimens have a wing expanse of 37-40 mm. The underside of the type specimen is shown on Plate II, fig. 5. All the types are in the Canadian National collection.

With the above males are two females from the same locality which are being placed tentatively with this species. The underside of both of these specimens is much darker than that of the males being more heavily mottled and streaked with dark brown. In one of the females there is hardly any indication of a median band but in the other female the band is noticeably present being rather heavily bordered on the outer margin with blackish-brown.

The above specimens of *O. simulans* were collected at the same locality as were the specimens of *O. semidea arctica*, from which on superficial characters they cannot be separated. The genitalia, however, are quite distinct from any of those figured by Elwes and Edwards² or Barnes and McDunnough³, as will be seen by comparing these with our figure on Pl. 1, fig. 5.

Oeneis peartiae Edw.

Chionobas peartiae Edw.: Butterflies of North America, III, pl. 14, 1897.

Five specimens as follows: Bernard harbour, Northwest Territories, July, 1916, three males, 1 female (F. Johansen); Chantry island, near Bernard harbour, Northwest Territories, August 7, 1915, 1 male (F. Johansen).

These specimens resemble fairly closely, Edwards' figs. 5, 6, 7, and 8, plate XIV, in his Butterflies of North America, Third Series, part XVII, 1897. In the female there is a faint yellowish spot between veins 5 and 6 on each primary towards the apex. This spot is also present on the underside. This specimen is shown on Plate IV, fig. 5. The underside of the same specimen is illustrated on Pl. II, fig. 6.

The male genitalia are shown on Pl. I, fig. 7.

¹ Ridgway's Color Standards and Nomenclature, 1912.

² Trans. Ent. Soc. Lon., Dec. 1893.

³ Cont. Nat. Hist. Lep. N.A., IV, 2, 1918.

Oeneis cairnesi, n. sp.

Upperside ochraceous-buff¹ lightly washed with brown, noticeably so along veins and outer margin, the markings of the underside showing through particularly on the secondaries; costa whitish, mottled with black.

Underside: primaries, centrally similarly coloured to upper side but rather more brownish; costa, apex and outer margin to near inner angle, whitish with dark brown mottlings. In the limbal area between veins 5 and 6 there is a distinct dark brown ocellus with white pupil. Secondaries whitish with brown mottlings, the median band mostly dark brown and well defined, paler in the centre. Area on either side of the median band almost wholly whitish. About midway between the median band and the outer margin there are four round, white spots, the two central ones being much smaller than the two outer ones, which latter are about half the size of the ocellus on the underside of each primary. The four spots are margined with brown, the outer ones distinctly so.

Fringes whitish, checkered with brown. Clothing of palpi black and grayish intermixed. Antennæ brown with white scales, knob orange-brown. Body blackish. Genitalia shown on Plate 1, fig. 6.

Alar expanse 42 mm.

Type, a male, from the White river district, Yukon Territory, lat. 61° 55', long. 141°, July 16, 1913 (D. D. Cairnes); in the Canadian National collection. Named in honour of the late Dr. Cairnes who collected many interesting species when on northern explorations for the Canadian Geological Survey.

Paratypes, one male and two females (expanse 44 mm.) from the same locality. The females are slightly paler in colour than the males and the median band on the underside of the secondaries is not so well defined as in the type.

Before describing the above, I submitted a specimen to Dr. Dyar with a request that he compare it with his species *O. nahanni*. This he very kindly did reporting that it differed chiefly from his species in being too light in colour, in having no ocelli on hind wings above and the markings on these latter wings being more of an open character.

The upperside of the type of *O. cairnesi* is shown on Pl. IV, fig. 6, the underside of the same specimen on Pl. II, fig. 7. The underside of one of the female paratypes is shown on the latter Plate at fig. 8.

Oeneis brucei var. **yukonensis**, new variety.

Differs from *O. brucei* from Colorado in being smaller in wing expanse, in having a conspicuous submarginal row of yellowish spots on the upper side of both primaries and secondaries, in the costa being almost concolorous with wings not white or whitish as in the typical form, and in the median band on the underside of the secondaries being narrower. On either side of the median band the whitish areas are wider and thus more conspicuous, and there is in addition a distinct submarginal blackish line on the underside of the secondaries.

Alar expanse, 41 mm.

Type, a male, from Klutlan glacier, Yukon Territory, elevation 8,200 feet, June 14, 1913 (E. W. Nesham). Paratypes, three males and two females collected in the same locality by Mr. Nesham on June 13-15 at elevations of 8,200-8,500 feet; wing expanse, 38-41 mm. The paratypes are in general similar to the type. One of the female paratypes has on each primary two ocelli, one between veins 2 and 3 and the other between veins 5 and 6. All the types are in the Canadian National collection. The upperside of the type is shown on Pl. IV, fig. 3; the underside of the same specimen on Pl. II, fig. 9. On this latter plate is also shown at figure 10 the upperside of the female paratype with ocelli. The genitalia of one of the male paratypes are shown on Pl. 1,

¹ Ridgway's Color Standards and Nomenclature, 1912.

fig. 8. Barnes and McDunnough¹ have reproduced a drawing of the genitalia of *O. brucei* and a comparison of this with our figure of the genitalia of *O. brucei yukonensis* while indicating a close relationship, at the same time also bears a near resemblance to the figure of *O. katahdin* shown by the same authors on the same plate. With a good series of *O. brucei yukonensis*, the latter may ultimately prove to be of specific rank.

Genus **Erebia** Dal.

Erebia discoidalis Kirby.

Hipparchia discoidalis Kirby: Faun. Bor. Am., IV, 298, 1837.

Among a small collection of lepidoptera given to me by Mr. L. D. Burling, of the Geological Survey of Canada and collected in Alaska by Mr. J. M. Jessup, is a single male specimen of this species. The label covering all the specimens reads: "lat. 59° 30' and 141st meridian—lat. 69° 40' and 141st meridian, June-July, 1912." This specimen is now in the Canadian National collection.

Erebia fasciata Butler.

Erebia fasciata Butler: Cat. Satyr. Brit. Mus., 92, 1868.

Eleven specimens, eight males and three females, as follows: Bay southwest of cape Krusenstern, Northwest Territories, July 3, 1916, 2 specimens (D. Jenness); Bernard harbour, Northwest Territories, August 4, 1915, 2 specimens (F. Johansen); Bernard harbour, Northwest Territories, July, 1916, 7 specimens (F. Johansen).

These specimens show noticeable variation. In two of the males taken at Bernard harbour there is an almost total absence of the reddish patch in the submarginal area of the upper surface of the primaries; in the other males the reddish patch in such area varies not only in size but in intensity of colour. The red in none of the species is as bright as that in Elwes' figure², but is mahogany red³. The number of white scales present in the basal area and in the band beyond the blackish-brown median band on the underside of the secondaries also varies in the specimens. The underside of one specimen matches almost perfectly that figured by Elwes, in the others the whitish or greyish areas are not nearly so distinct.

In the three females the greyish band beyond the dark median band on the underside is very conspicuous there being very little of the reddish colour on the primaries. The reddish area on the upper surface of the primaries is not nearly so bright as in Elwes' fig. 12 in the publication referred to above. The colour of the submarginal band on the underside of the secondaries in our specimen is decidedly greyish, more so than is shown in Elwes' fig. 11 of the male.

In addition to the above specimens there are in the Canadian National collection two specimens collected by the late Dr. D. D. Cairnes, of the Geological Survey; one, a male, collected at lat. 66° 58', international boundary, June 15, 1912, the other, a female, collected at lat. 65° 10', long. 141°, (1,300 feet) on July 30, 1912, (Pl. IV, fig. 7).

Also, seven examples brought back by the Northern Party of the Canadian Arctic Expedition, two males from Armstrong point, Victoria island, Northwest Territories, collected during the period June 20 to July 11, 1916 (J. Hadley), and Walker bay, Victoria island, July 6, 1917 (J. Hadley), respectively, and seven females, six of which are from Armstrong point, Victoria island, June 20 to July 11, 1916 (J. Hadley) and one from Walker bay, Victoria island, July 6, 1917 (J. Hadley). A male from Armstrong point is shown on Pl. IV, fig. 8.

¹ Cont. Nat. Hist. Lep. N.A., IV, 2, pl. XXV.

² Trans. Ent. Soc. Lond., 1903, pl. IX, fig. 11.

³ Ridgway's Color Standards and Nomenclature, 1912.

The specimens collected by Messrs. Cairnes and Hadley are in general similar to the series from Bernard harbour and Cape Krusenstern. The band on the underside of the female collected at lat. $65^{\circ} 10'$ is faint, as is also the reddish area on both upper and lower sides of primaries.

Erebia rossi Curt.

Hipparchia rossii Curt.: Ross' Second Voyage N.-W. Pass, App., 67, 1835.

One specimen, a female, from Wollaston Land, Victoria island, Northwest Territories, July 22, 1915 (D. Jenness); Pl. IV, fig. 9.

On each forewing of the specimen, above, are three ocelli; the two in the sub-apical area are close together, but entirely separated, similar as in the specimen figured by Curtis; the lower spot is the larger. About midway between this latter spot and the hind angle is the third spot which is about the size of the upper of the two spots. The spots are ochraceous-orange in colour, the black pupil showing only in the largest of the three spots. The two upper spots are more distinct on the underside, being slightly paler in colour, of a more uniform size, and each having a distinct black pupil. The third spot is only faintly visible on the underside. The colour of the upperside of the wings is close to light seal brown; the underside is similar but the outer central portion of the primaries is reddish, the discal area being suffused with a paler brown than that of the hind wings. The underside of the secondaries are banded as in Elwes' figure¹.

Two other specimens in the Canadian National collection, both males, one from Kluane P.O., Yukon Territory, June 23, 1914 (D. D. Cairnes), the other from West branch of the Thelon river, Northwest Territories, July 6, 1900 (J. Tyrrell) also appear to be the same species. The one from Kluane is very similar to the Wollaston Land specimen but that from the Thelon river is differently marked approaching Elwes' fig. 2 in the publication referred to.

Erebia disa Thun.

Papilio disa Thun.: Diss. Ent. Ins. Suec., II, 37, 1791.

Two specimens taken as follows: Port Epworth, Coronation gulf, Northwest Territories, July 15, 1915, 1 male, 1 female (J. J. O'Neill).

The former specimen is much like the figure of *disa* on plate 37h, vol. 1, of Seitz's Macrolepidoptera of the World but is much darker brown in colour. The median band on the underside of the secondaries is well defined, the area on either side being greyish-white. The female is in a poor state of preservation.

In the Canadian National collection there are specimens from the Yukon and Northwest Territories, bearing the following labels:—75 miles from Whitehorse, near Canyon river, Yukon Territory, June 11, 1914, 1 male (D. D. Cairnes); Whitehorse, Yukon Territory, (McLaughlin); Lansing river, Yukon Territory, June 24, 1905, 1 female (J. Keele); Siwash creek, Yukon Territory, lat. $65^{\circ} 59'$, long. 141° , July 29, 1912 (D. D. Cairnes); Gravel river, Northwest Territories, June 27, July 20, 1908, 3 specimens, 2 males, 1 female (J. Keele); Black river, Yukon Territory, lat. $66^{\circ} 34'$, June 18, 1912 (D. D. Cairnes).

There is a noticeable variation in these latter specimens, not only in the size of the spots on the primaries, but also in the colour of the lower side of the wings and the faintness or otherwise of the median band on the secondaries. In the specimen from near Canyon river, for instance, the colour of the underside of the secondaries is almost wholly dark brown, very similar to the colour of the reverse side, excepting the outer margin which is greyish.

Some of these examples should doubtless be referred to the var. *mancinus* Dbl. and Hew. The specimen from Lansing river, was recorded by Fletcher as the var. *mancinus* in the Entomological Record for 1905.²

¹ Trans. Ent. Soc. Lond. 1899, pl. XII, fig. 1.

² Rept. Ent. Soc. Ont., 1905, 96.

***Erebia epipsodea* Butl.**

Erebia epipsodea Butl.: Cat. Satyr. Brit. Mus., 80, 1868.

This species which is evidently rare in northern regions was collected by Mr. J. Keele, in the Yukon Territory, on the Pelly river, below Hoole river, July 5, 1907, 1 male. This specimen is in the Canadian National collection. Two other specimens, 1 male and 1 female collected by the late Dr. D. D. Cairnes, in the Klotassin river area, Yukon Territory, lat. $62^{\circ} 31'$ to $63^{\circ} 06'$; long. $137^{\circ} 30'$ to $139^{\circ} 30'$, summer, 1916, are in the same collection. These specimens are similar to examples from more southern localities.

***Erebia youngi* Holl.**

Erebia youngi Holland: Ent. News, XI, 388, 1900.

This species was described from material collected between Fortymile and Mission creeks, northeastern Alaska. No specimens were brought back by the members of the Canadian Arctic Expedition, but in the years 1912 and 1914, Dr. D. D. Cairnes, of the Geological Survey of Canada, brought back from the Yukon, nine specimens, five taken in 1912 (all males), and four in 1914 (three males and one female). The 1912 specimens were taken at Siwash creek, international boundary, lat. $65^{\circ} 57'$ on June 26-30, and the 1914 examples collected at Nansen creek, Placer Mining Camp, Yukon Territory, July 4-7.

In addition to the specimens collected by the late Dr. Cairnes, we also have in the Canadian National collection, a male specimen, collected with other material, the label covering all reading: "Alaska, lat. $59^{\circ} 30'$ and 141st meridian—lat. $69^{\circ} 40'$ and 141st meridian, June-July, 1912 (J. M. Jessup)."

In the female the broad dark median band on the underside of the secondaries is more conspicuous than in the males owing to the fact that the basal and submarginal areas are much paler in colour. In one of the males the submarginal reddish spots on the upperside of the secondaries are almost absent.

When describing *E. youngi*, Holland stated that the species is not far from *E. dabanensis* Erschoff. It certainly is close to this latter species as figured by Elwes¹. A male from Siwash creek, Yukon Territory, is illustrated on Pl. IV, fig. 10.

***Erebia magdalena* Stkr.**

Erebia magdalena Stkr.: Bull. Brooklyn Ent. Soc., III, 35.

In the Canadian National collection there are two specimens of an *Erebia* from the Yukon which we have placed under *magdalena* Stkr. One of these specimens, a male, has been recorded by Fletcher² as this species. It was collected by Mr. Jos. Keele of the Department of Mines, who captured it "on mountain 12 miles up Rackla river, August 2, 1905."

Mr. Keele informed me recently that the specimen was collected on a rocky situation above timber line, the elevation being about 6,000 feet. The other specimen, a female, was collected by the late Dr. D. D. Cairnes, of the Geological Survey, at Nation river, Yukon Territory, lat. $65^{\circ} 30'$, long. 141° , on July 24, 1912.

Comparing these two specimens with three examples of *magdalena* presented to Fletcher some years ago and collected by Bruce in Colorado and now in the Ottawa collection, they differ as follows: the male which is in poor condition, being rubbed, is smaller than the Colorado male, measuring 45 mm. with wings expanded, the former being 49 mm. Otherwise both specimens seem to be similar. The Yukon female is also smaller than the two Colorado females in

¹ Trans. Ent. Soc. Lon., 1899, p. XII.

² Rep. Ent. Soc. Ont., 1905, 96.

the collection, measuring 47 mm., the two latter being 50 mm. and 52 mm. respectively. The general colour in all three specimens is similar, but on the primaries of the Yukon female the whole central area is flushed with dark red, thus approaching *E. fasciata*. The specimens in colour are closest to *bister*¹, none of them being the same shade as figured by Edwards². A comparison of the genitalia of the male from the Yukon with that of a male from Colorado indicates that the clasper, in both specimens is similar and close to that of *E. fasciata* which has been figured by Chapman³.

Erebia sofia Stkr.

Erebia sofia Stkr.: Bull. Brook. Ent. Soc., III, 35, 1880.

In the Canadian National collection are five specimens of this interesting butterfly which were taken as follows: White river district, international boundary, lat. 61° 55', long. 141°, July 16, 1913, 2 males, 1 female (D. D. Cairnes); Bonanza creek, Chisana district, Alaska, August 3, 1913, 1 male (D. D. Cairnes); Harrington creek, Yukon Territory, lat. 65° 05', long. 141°, July 30, 1912, 1 female (D. D. Cairnes).

In specimens of *sofia* examined from Colorado, which are in the Ottawa collection, the six reddish-brown spots comprising the submarginal band on the upper side of the primaries are of similar size and very conspicuous, whereas in the specimens collected by the late Dr. Cairnes, the spots are more or less indefinite and only the upper three approach in size similar spots in Colorado specimens. The lower three spots of the submarginal band are present on the primaries of the above-mentioned specimens, but are much smaller, being about half the size of the upper spots.

In the variety *alaskensis*⁴ "the specimens are all characterized by the reduction of the number of light spots, both on the upper and lower sides of the wings." The author of this variety further states in his description: "In almost all of the specimens before me there are three spots on the primaries above and below and but two spots on the lower side of the secondaries. Only one specimen approximates the typical form in the number of spots on the lower side of the wings."

The specimens in the Canadian National collection do not agree with this description. There is nothing in the above description regarding the difference in the size of the spots on the upper surface of the primaries, and in all of the northern examples before me there are a greater number of white spots on the underside of the secondaries, two specimens (1 male and 1 female) having four spots and three specimens (1 male and two females) having five spots. The single exception from which *sofia* was described had four white spots on the underside of the secondaries. The underside of both wings of one of our specimens is very similar to fig. 51e of *sofia* in vol. V of Seitz's *Macrolepidoptera of the World*. Strecker in his description of *sofia* states that it is on the upper side an almost exact counterpart of *E. kefersteinii*, but as has already been pointed out by Elwes⁵ he probably meant *haberhaueri* which was sent out by mistake under the former name. Our specimens of *sofia* certainly resemble somewhat *haberhaueri* as figured by Seitz. A male from the White river district, Yukon Territory, is shown on Pl. IV, fig. 11. The underside of the female from Harrington creek is shown on Pl. III, fig. 5.

¹ Ridgway's Color Standards and Nomenclature, 1912.

² Butt. of N.A., III, pl. 1, *Erebia*.

³ Trans. Ent. Soc. Lond., 1893, pl. XVI.

⁴ Ent. News, XI, 387, 1900.

⁵ Trans. Ent. Soc. Lond. 1889, p. 333.

FAMILY NYMPHALIDÆ.

Argynnis bischoffi Edw.

Argynnis bischoffi Edw.: Trans. Amer. Ent. Soc., III, 189, 1870.

A single specimen taken on August 7, 1904, at Mayo lake, Yukon Territory (J. Keele) was determined by Fletcher as *A. eurynome* Edw., and has been recorded under this latter name by Keele¹. Several years ago I submitted this specimen to Dr. Skinner, who reported that it was a boreal form of *A. eurynome* Edw. Personally, however, I prefer to place the specimen under the name *bischoffi* Edw., which was described from Alaska, opposite Kodiak. In the description the spots on the underside are referred to as being pale, not silvered. The above specimen (a male) which is in the Canadian National collection, has silvered spots. Edwards, however, has remarked that the species occurs at Sitka, Alaska, in both silvered and unsilvered forms, and figured a specimen of the former². Barnes and McDunnough³ in discussing the species briefly point to the fact that the name *in sens. strict.* can only apply to the unsilvered form.

Genus **Brenthis** Hbn.

Brenthis tricularis Hbn.

Brenthis tricularis Hbn: Samml. Ex. Schmett., II, 1824.

No specimens among the Canadian Arctic Expedition material. There are, however, in the Canadian National collection, specimens from the following northern localities: Nansen creek, Placer Mining camp, Yukon Territory, July 7, 9, 11, 2 females, 1 male (D. D. Cairnes); west branch of Thelon river, Northwest Territories, July 5, 1900, 1 female (J. Tyrrell); Labrador, 1 female (collector unknown); Labrador, July 16, 1894, 1 female (A. P. Low); Charlton island, James bay, July 7, 1887, 1 female (J. M. Macoun).

Brenthis chariclea Schneid.

Papilio chariclea Schneid.: Neu. Mag. V, 588, 1794.

Fourteen specimens from the following localities: Collinson point, Alaska, July 10, 1914, 1 male (F. Johansen); Bernard harbour, Northwest Territories, August 4 and 6, 1915, July 14, 1916, 9 males, 1 female (F. Johansen); Wollaston Land, Victoria island, Northwest Territories, summer 1915, 1 male, 1 female (D. Jenness); Port Epworth, Coronation gulf, Northwest Territories, July 15, 1915, 1 male (J. J. O'Neill).

Three specimens were collected by the Northern Party of the Canadian Arctic Expedition at Armstrong point, Victoria island, Northwest Territories, July 1-10, 1916 (J. Hadley).

In addition to the above examples there are in the National collection at Ottawa further specimens from northern localities, as follows: Slopes of mount Ortell, Yukon Territory, July 16, 1906, 1 male (J. Keele); Ladue river, Yukon Territory, July 4, 1905, 1 male, 1 female (J. Keele); Nansen creek, Placer Mining camp, Yukon Territory, July 7, 1914, 1 female (D. D. Cairnes); Racquet creek, international boundary, lat. 65° 21', August 3, 1912, 2 males (D. D. Cairnes); Orange creek, international boundary, lat. 65° 05', June 12, 1912, 1 male (D. D. Cairnes); on Wagon road, 56 miles from Whitehorse, Yukon Territory, 1 female, August 15, 1908 (Geo. Stewart); Pelly river, Yukon Territory, August 3, 1887 (G. M. Dawson); White river district, Yukon Territory, lat. 61° 55', long. 141°

¹ Rep. upper Stewart river region, Yukon, Geo. Surv. Can. 1906.

² Butt. of N.A. II, pl. 25.

³ Cont. Nat. Hist., Lep. N.A., II, 95.

1 female, July 16, 1913 (D. D. Cairnes); Alaska, collected with other species, the label covering all reading "lat. 59° 30' and 141st meridian-lat. 69° 40' and 141st meridian, June-July, 1912, 1 male (J. M. Jessup)"; Labrador, July 16, 1894, 1 male (A. P. Low); Sore-head river, east coast Hudson bay, lat. 60° 35', 2 males, 3 females (A. P. Low); Kalik-took-duag inlet, north side of Hudson strait, July 26, 1897, 1 female (R. Bell); "Nottingham island, John McKenzie, 1886, 2 females (R. Bell)"; Finlayson river, Yukon Territory, lat. 61° 40', long. 130° 16', July 22, 1887 (McConnell)¹; Finlayson lake, Yukon Territory, July 27, 1887 (McConnell)¹; Pelly or Yukon river, Yukon Territory, August 7, 1887, 3 specimens (McConnell)¹.

Looking over the above series there is of course considerable variation among the specimens not only in the general colour of the upper surface of the wings, but also in the arrangement and colour of the markings on the underside. The median band particularly on the underside of the secondaries shows marked variation. The specimens brought back by members of the Canadian Arctic Expedition and also those from the Yukon Territory approach the variety *arctica* Zett., in fact one of the examples, namely the male from Ladue river, Yukon Territory, was some years ago determined as *arctica* by Dr. Henry Skinner. The specimens from Sore-head river, east coast of Hudson bay, are in general smaller and in the series there is a greater tendency to melanism. The marginal spots on the underside of the secondaries are white, very distinct and tend to coalesce. These examples differ noticeably from the variety *boisdwali* Dup. which is represented in the Labrador specimens above referred to, collected by Dr. A. P. Low.

Two of the males from Bernard harbour, Northwest Territories, were kindly compared by Mr. H. J. Elwes, with specimens in the British Museum from Arctic America. Mr. Elwes reported that they agreed precisely with specimens collected by Hanbury on the same coast.²

The specimen collected by Jessup in Alaska in 1912, in the district between the Porcupine river and the Arctic coast resembles very much Elwes' figure of *chariclea*.³

It is of interest to state that the example from Finlayson river was submitted by Fletcher to W. H. Edwards, and on the envelope in which the specimen was sent, the following appears in Edwards' handwriting: "This is very near *helena*; if not think (it) is *chariclea*. Dyar⁴ refers to *helena* as a variety of *chariclea*."

***Brenthis pales alaskensis* Höll.**

Brenthis pales var. *alaskensis* Holland: Ent. News, XI, 383, 1900.

One specimen, a female, as follows: Bernard harbour, Northwest Territories, August 25, 1915 (F. Johansen).

In the National collection at Ottawa there are also three specimens, both males, two taken on July 25, 1912, at Racquet creek, international boundary, lat. 65° 20' (D. D. Cairnes), and the other collected on July 5, 1900, on the west branch of the Thelon river, Northwest Territories (J. Tyrrell).

The variety *alaskensis* was described from the "mountains between Forty-mile and Mission creeks." One of the males taken at Racquet creek is shown on Pl. V, fig. 5.

***Brenthis natazhati*, n. sp.**

Upper side: ochraceous-orange⁵ the black markings much heavier than in *chariclea* or *freiija*, to which species it is closely related, the median and basal areas of the secondaries being without any orange. The median spots on the primaries coalesce forming a wide distinct band.

¹ Recorded by Fletcher as *chariclea* in Ann. Rep. Geo. Surv. Can. 1887.

² Trans. Ent. Soc. Lond., 1903, 239.

³ Ibid, pl. IX, fig. 8.

⁴ Dyar, H. G., Proc. Ent. Soc. Wash. V, 130.

⁵ Ridgway's Color Standards and Nomenclature, 1912.

On the underside the ground colour of the primaries is of a uniform shade similar to ochraceous-buff¹, the black markings being dull and much reduced. There is an almost total absence of the pale apical patch which is present in the above closely related species. The median band on the secondaries is very faint but the band just beyond the median band is conspicuous and silvery. The two central median triangle-shaped spots of the median band as well as the rhomboid spot are dull silvery as are also the basal spot, which is indistinct, and the marginal row of spots, some of which are reduced in size. Between the marginal row of spots and the white silvery band and between the central silvery spots and the rhomboid spot the colour is similar to the under surface of the primaries. The basal area and the median area below the central silvery spots are dark, almost blackish and heavily pubescent. The antennæ are almost wholly blackish, there being only a few silvery scales laterad. The setæ on the palpi are dark brown.

Alar expanse, 39 mm.

Type, a male, in the Canadian National collection bearing the label "141st meridian, north of mount Natazhat, international boundary survey, elevation 8,600 feet, June 15, 1913 (E. W. Nesham).

Paratypes, three males and two females from the same locality and bearing the same label.

The underside of the secondaries of one of the male paratypes is mostly yellowish-orange in the submarginal area, otherwise all the males are similar in colour and markings. These latter, particularly on the upper surface of the wings are more diffused in two of the specimens than in the type. The upper surface of one of the females is in general darker than in the type and on the underside of this example there are present a greater number of silvery scales in the submarginal area.

Two specimens taken during the Canadian Arctic Expedition, namely at Bernard harbour, Northwest Territories, July 14, 1916, male and female (F. Johansen), although somewhat rubbed are apparently this new species.

The males differ in expanse of wings from 35 to 39 mm. and the females from 37 to 39.5 mm.

The upper side of the male type is figured on Pl. V, fig. 6 and the underside of the same specimen shown on Pl. III, fig. 6. On this latter plate the upperside of a female from Bernard harbour, is shown at fig. 12.

I rather hesitate to add a new name to the *chariclea-freija* group but it seems advisable under the circumstances as I cannot associate the mount Natazhat specimens with any of the known forms. The dull silvered spots on the underside of the secondaries and the general colour of the upper and lower sides of primaries and secondaries should readily separate it from any of the forms in the group referred to.

***Brenthis freija* Thunb.**

Papilio freija Thunb.: Diss. Ent. Succ., II, 34, 1791.

No specimens brought back by members of the Canadian Arctic Expedition, but in the National collection at Ottawa there are examples from the following northern localities: Nansen creek, Placer Mining camp, Yukon Territory, July 7, 1914, 2 males (D. D. Cairnes); on Whitehorse-Dawson wagon road, Yukon Territory, June 2, 1914, 1 male (D. D. Cairnes); near Jo-Jo's Road House on Kluane road, Yukon Territory, June 9, 1914, 2 females (D. D. Cairnes); Champagne Landing, 50 miles from Whitehorse by Kluane road, Yukon Territory, June 8, 1914, 1 female (D. D. Cairnes); Dease lake, northern British Columbia, June 5, 1887 (G. M. Dawson and J. McEvoy); Cassiar trail, 10 miles west of Dease lake, British Columbia, June 4, 1887 (G. M. Dawson

¹ Ridgway's Color Standards and Nomenclature, 1912.

and J. McEvoy); Gravel river, Northwest Territories, June 18, 1908, 1 male (J. Keele).

These specimens are in general similar to examples collected in Alberta and British Columbia. The two examples one from Dease lake, and the other from near Dease lake, were submitted by Fletcher to W. H. Edwards, and the name "*freya*" given.

Three other specimens, males, all below average size, taken in northeastern Alaska, collected with other species, the label covering all reading "lat. 59° 30' and 141st meridian; lat. 69° 40' and 141st meridian; June-July, 1912, (J. M. Jessup)" in the Canadian National collection, I also associate with *freija*.

***Brenthis polaris* Bdv.**

Argynnis polaris Bdv.: Ind. Meth., 15, 1829.

Thirty-two specimens as follows: Barter island, north coast of Alaska, July 5, 1914, 1 male, July 2, 4, 5, 11, 17, 1914, 6 females (D. Jenness); Bernard harbour, Northwest Territories, July, 1916, 7 males, 2 females (F. Johansen); Bernard harbour, Northwest Territories, 3 males, 5 females, July 10-20, 1915 (F. Johansen); Bay southwest of cape Krusenstern, Northwest Territories, July 3, 4, 1916, 2 males (D. Jenness); Lake Angmaloktak, Colville mountains, Wollaston Land, Victoria island, Northwest Territories, July 29, 1915, 1 male (D. Jenness); July 22, 1915, 2 females (D. Jenness); Wollaston Land, Victoria island, summer, 1915, 1 female (D. Jenness); Port Epworth, Coronation gulf, Northwest Territories, July 23, July 30, 1915, 2 females (J. J. O'Neill).

In the National collection at Ottawa are two other specimens, one a female collected at Kalik-took-duag inlet, north side of Hudson strait, July 27, 1897 (R. Bell), the other, a male, from cape Chidley, Hudson strait, 1885 (R. Bell).

The males do not show any material variation. In size they have a wing expanse of from 36 to 43 mm. The upperside of all specimens is similar. The general colour of the underside of the secondaries of two of the specimens inclines to a uniform reddish shade similar to the underside of the primaries. In the females there is a difference in wing expanse, the variation being from 37 mm. to 45 mm. The colour of the upper side of the primaries of this latter sex varies in the specimens from a pale reddish-yellow to a dull bluish-white or dull purplish-white. In a few of the specimens many of the scales particularly towards the hind angle are, under a lens, seen to be decidedly bluish. The reddish bands on the underside of the secondaries vary in colour from pale red similar to the general colour of the primaries beneath, to dull brownish-red.

Mr. Jenness who collected the specimens on Barter island states that they were captured on the tundra early in the afternoons, in most instances between 1 and 2 p.m. in bright sunshine, the temperature varying from 34° F. to 56° F., the majority being taken when the temperature was about 50° F.

In addition to the above specimens, thirty-four examples were brought back by the Northern Party of the Canadian Arctic Expedition, from the following localities: Armstrong point, Victoria island, Northwest Territories, June 20 to July 11, 1916, 15 males, 11 females (J. Hadley); Walker bay, Victoria island, Northwest Territories, July 6, 1917, 4 males, 2 females (J. Hadley); Melville island, main base, August 4 (?), 1916, one male (V. Stefansson); near cape Ross, Melville island, Northwest Territories, about June 20, 1916, 1 male (Castel and Emu). These specimens in general are similar to the examples collected by members of the Southern Party.

The underside of a female from Barter island, Alaska, is shown on Pl. V, fig. 2. On the same plate is also shown the upper side of a male and a female from the same locality (figs. 3 and 4).

Brenthis frigga alaskensis Lehm.

Argynnis frigga form *alaskensis* Lehm.: Macrolepidoptera of the World, (Seitz), V, 424, 1913.

Seven specimens as follows: Barter island, north coast of Alaska, July 4 and 11, 1914, 2 males, 3 females (D. Jenness); Collinson point, Alaska, July 10, 1914, 1 female (F. Johansen); west of Konganevik (Camden Bay), Alaska, July, 1914, 1 male (F. Johansen). Accompanying the specimen from Barter island is a note by Mr. Jenness, which reads as follows: "Flying on tundra in sunshine; light N.W. breeze; temperature 50° F."

I have compared the females with the original figure of *alaskensis* in the work referred to above. They agree fairly well with this illustration. A female from Collinson point, Alaska, is shown on Plate V, fig. 1.

Six examples were brought back by the Northern Party of the Canadian Arctic Expedition, three males and three females. These were collected at Armstrong Point, Victoria island, Northwest Territories, June 20 to July 11, 1916 (J. Hadley).

Brenthis frigga saga Stgr.

Argynnis frigga saga Stgr.: Stett. Ent. Zeit., XXII, 350, 1861.

In the Canadian National collection there are two specimens from the following localities in the Yukon Territory: 96 miles from Whitehorse on Klauane road, near Marshall creek, June 15, 1914, 1 male (D. D. Cairnes); Pelly river, below Hoole river, July 5, 1907, 1 female (J. Keele).

Brenthis frigga improba Butl.

Argynnis improba Butl.: Ent. Mo. Mag., XIII, 206, 1877.

Thirty-four specimens from the following localities: West of Konganevik (Camden bay), Alaska, July, 1914, 5 males, 1 female (F. Johansen); Barter island, Alaska, July 1, 2, 4, 5, 11, 1914, 9 males, 5 females (D. Jenness); Bernard harbour, Northwest Territories, July, 1916, 5 males, 7 females (F. Johansen); Port Epworth, Coronation gulf, July 15, 23, 1915, 1 female, 1 male (J. J. O'Neill).

Three of the above specimens, namely, one male from Barter island, one male from west of Konganevik and one female from Barter island, were forwarded to Mr. H. J. Elwes, of Colesborne, Cheltenham, Eng., who very kindly compared them with the series in the British Museum. He reported that the specimens agreed precisely with examples collected by Hanbury on the same coast further east.

The series above listed is an excellent one. Most of the specimens are in fairly good condition. The males vary in wing expanse from 31 mm. to 36 mm. and the females from 33 mm. to 37 mm. The ground colour of the former shows marked variation. In some of the specimens the colour is very close to hazel¹, in one much brighter, more of a vinaceous-rufous² and in the others dull tawny. In the brighter coloured examples the median band on the upper side of both the primaries and secondaries is very conspicuous. The spots about midway between the median band and the outer margin vary much in size and in a few specimens are joined forming a distinct band.

The underside of the males is fairly constant, the chief differences being on the secondaries, namely in the number of pale, slightly bluish-coloured scales present beyond the reddish-brown median area, in some examples these scales being noticeably abundant and forming almost a wide marginal band

¹Ridgway's Color Standards and Nomenclature, 1912.

²Ibid.

contrasting noticeably with the reddish-brown median area and in others being much reduced in number. The colour of the median area also varies in the specimens from a rather pale reddish-brown to a decidedly dark reddish-brown. The median band is faint in some of the examples.

The underside of the secondaries of the females vary similarly as in the males.

A female from Bernard harbour, Northwest Territories, is shown on Pl. V, fig. 7, together with a male from near Konganevik, Alaska, fig. 8.

In the Entomological Record for 1917¹ I recorded *Brenthis youngi* Holl. from Klutlan glacier, 9,000 feet, June, 1913 (H. F. J. Lambart). On further study, however, this specimen is undoubtedly *improba* Butler. I rather suspected that *youngi* might prove to be the same as *improba* and for this reason I forwarded the Klutlan glacier specimen to Dr. W. J. Holland who reported as follows:—

“I found time this morning, (December 20, 1918), to compare your specimen with my type of *Brenthis youngi*. It is not the same. It is smaller in size, darker both on the upper and lower side of the wings—a far more melanic insect—and consequently different in not having the dark, sharply defined mesial band, characteristic of the secondaries of *B. youngi*. I would call it *B. improba* Butler. It has a fascies quite different from that of *B. youngi*, which is a much lighter insect. Of course, there is a general similarity in the markings of this genus and the species vary principally in the intensity and accentuation of the markings on the different spots. In *B. youngi* the spots are not silvered, or only slightly. I should say very decidedly that this specimen is not a representative of my species.”

Brenthis distincta, n. sp.

Close to *B. alberta* from which it differs in being larger, in the ground colour of the upperside of the wings being of a clear yellowish-red colour, much as in *B. astarte* Dbl. and Hew., in the black marginal band being wider, and on the underside in lacking the dull pubescent-like appearance of *B. alberta*, the median band being decidedly more conspicuous, as are also the other markings on the underside of the secondaries. Discal row of round spots reddish.

Alar expanse, 48 mm.

Type, a female, from Harrington creek, Yukon Territory, lat. 65° 05' July 30, 1912 (D. D. Cairnes). Two paratypes, one male and one female, the former from Eduni mountain, 6,000 feet, Gravel river, Northwest Territories, July 8, 1908, (J. Keele) and the latter from Tindir creek, Yukon Territory, lat. 65° 20' international boundary, July 25, 1912 (D. D. Cairnes). The male paratype (44 mm.) is in general similar to the holotype, but the underside of the female paratype (49 mm.) is redder in colour, the reddish discal row of spots larger and brighter, and the pale areas whiter. This new species is apparently, also, close to *amphilochus* from the Amur. All the types are in the Canadian National collection.

The underside of the type is figured on Pl. IV, fig. 12.

Genus *Phyciodes* Dbl. and Hew.

Phyciodes campestris Behr.

Melitæa campestris Behr.: Proc. Cal. Acad. Nat. Sci., III, 86, 1863.

Five specimens from northern localities are in the Canadian National collection. They were collected as follows: Ladue river, Yukon Territory, July 4, 1905, 1 male, 1 female (J. Keele); Harrington creek, Yukon Territory, lat. 65° 05', long. 141°, August 3, 1912, 1 female (D. D. Cairnes); Upper Liard river, June 26, 1887, lat. 60°, 1 male (G. M. Dawson); Dawson, Yukon Territory, 1908, 1 male (collector unknown).

¹ Rep. Ent. Soc. Ont., 1917.

Genus **Polygonia** Hbn.**Polygonia faunus** Edw.

Grapta faunus Edw.: Proc. Acad. Nat. Sci. Phil., 222, 1862.

Eleven specimens in the Canadian National collection from the following northern localities: Klotassin river area, Yukon Territory, lat. $62^{\circ} 31'$ to $63^{\circ} 06'$, long. $137^{\circ} 30'$ to $139^{\circ} 30'$, summer, 1916 (D. D. Cairnes); Alaska, collected with other species the label covering all reading "lat. $59^{\circ} 30'$, 141st meridian-lat. $69^{\circ} 40'$, 141st meridian, June-July, 1912 (J. M. Jessup)"; Yukon river, international boundary, lat. $64^{\circ} 40'$, August 15, 1912 (D. D. Cairnes); Porcupine river, 80 miles below Rampart House, Yukon Territory, May 25, 1912 (D. D. Cairnes); between lat. $67^{\circ} 25'$ and $66^{\circ} 30'$ long. 141° , June 16, 1912 (D. D. Cairnes); Black river, Yukon Territory, lat. $66^{\circ} 31'$, long. 141° , June 18, 1912 (D. D. Cairnes); six miles south of New Rampart House, Yukon Territory, June 6, 1912 (D. D. Cairnes).

Polygonia zephyrus Edw.

Grapta zephyrus Edw.: Trans. Am. Ent. Soc., III, 16, 1870.

Three specimens in the Canadian National collection from the following northern localities: Klotassin river area, Yukon Territory, lat. $62^{\circ} 31'$ to $63^{\circ} 06'$, long. $137^{\circ} 30'$ to $139^{\circ} 30'$, summer, 1916 (D. D. Cairnes); Alaska, collected with other species, the label covering all reading "lat. $59^{\circ} 30'$, 141st meridian-lat. $69^{\circ} 40'$, 141st meridian, June-July, 1912 (J. M. Jessup)"; between lat. $67^{\circ} 25'$ and $66^{\circ} 30'$, long. 141° , June 16, 1912 (D. D. Cairnes).

Polygonia silenus Edw.

Grapta silenus Edw.: Trans. Am. Ent. Soc., III, 15, 1870.

One specimen in the Canadian National collection from Klotassin river area, Yukon Territory, lat. $62^{\circ} 31'$ to $63^{\circ} 06'$, long. $137^{\circ} 30'$ to $139^{\circ} 30'$, summer, 1916 (D. D. Cairnes).

Polygonia progne Cram.

Papilio progne Cram.: Pap. Exot. I, pl. 5, 1775.

In 1888, Mr. F. Bell, collected two specimens of this species at Fort Simpson, Northwest Territories.¹ One of these, taken on July 20, is in the Canadian National collection.

Genus **Aglais** Dal.**Aglais j-album** Bdv. and LeConte.

Vanessa j-album Bdv. and LeConte: Lep. Am. Sept., 185, 1833.

One specimen in the Canadian National collection from Klotassin river area, Yukon Territory, lat. $62^{\circ} 31'$ to $63^{\circ} 06'$, long. $137^{\circ} 30'$ to $139^{\circ} 30'$, summer, 1916 (D. D. Cairnes).

Aglais milberti Godt.

Vanessa milberti Godt.: Enc. Meth., IX, 307, 1819.

A single specimen of this widely distributed species from Dawson, Yukon Territory (D. D. Cairnes) is in the Canadian National collection.

¹ Ann.-Rep. Geo. Surv. Can., 1887.

Aglais antiopa L.

Papilio antiopa L.: Syst. Nat., 476, 1758.

This common and widely distributed species has occasionally been recorded from northern localities. Fletcher¹ recorded it from ninety miles above Fort Good Hope (lat. 65° 20'), July 19 and from Fort Smith (lat. 60°), August 24 (Dawson and McEvoy). These specimens are not in the Canadian National collection, but we have three specimens, one each from the following places: Fifty miles below Fortymile creek, August 7, 1887 (R. G. McConnell); Artillery lake, Northwest Territories, May 26, 1900 (J. Tyrrell); Yukon river, at international boundary, August 13, 1912 (D. D. Cairnes).

Genus **Basilarchia** Scudd.

Basilarchia arthemis rubrofasciata B. and McD.

Basilarchia arthemis rubrofasciata B. and McD.: Can. Ent., XLVIII, 221, 1916.

Three specimens in the Canadian National collection from the following localities: Gravel river, Northwest Territories, July 16, 1908 (J. Keele); Mackenzie river, opposite Gravel river, Northwest Territories, July 18, 1908 (J. Keele). These records extend considerably the northern range of this form, which was described from examples from the provinces of Alberta, Saskatchewan, and Manitoba.

FAMILY LYCAENIDAE.

Genus **Incisalia** Scudd.

Incisalia irus Godt.

Polyommatus irus Godt.: Enc. Meth., IX, 674, 1823.

Two specimens in the Canadian National collection from the following localities in northern British Columbia: Telegraph creek, Stikine river, British Columbia, May 29, 1887 (Dawson and McEvoy); Cassiar trail, 22 miles east of Telegraph creek, British Columbia, June 1, 1887 (Dawson and McEvoy).

These examples are similar to specimens found in Canada in more southern localities.

Genus **Heodes** Dalm.

Heodes helloides Bdv.

Polyommatus helloides Bdv.: Ann. Soc. Ent. Fr. (2) X, 291, 1852.

In the Canadian National collection there are three specimens of this species from northern localities, namely: Tepe lake, near head of Wolverine creek, Yukon Territory, August 16, 1914, female (D. D. Cairnes); Upper Pelly river, Yukon Territory, August 7, 1887 (Dawson and McEvoy); Siwash creek, Yukon Territory, lat. 65° 59', long. 141°, June 30, 1912, female (D. D. Cairnes).

Heodes hypophlaeas feildeni McLach.

Chrysophanus feildeni McLach.: Jour. Linn. Soc., XIV, 111, 1879.

Two specimens, both males, of what is probably this form. The spots are smaller than in typical *hypophlaeas* and the colour of the primaries is paler.

¹ Ann. Rep. Geo. Surv. Can., 1887.

more of a yellowish shade. The specimens were taken as follows: Bernard harbour, Northwest Territories, August 6, 1915 (F. Johansen); Cockburn point, (near Bernard harbour), Northwest Territories, September 2, 1914 (F. Johansen).

In the Canadian National collection at Ottawa is another specimen taken in the Yukon Territory, namely, in the Klotassin river area, lat. $62^{\circ} 31'$ to $63^{\circ} 06'$, long. $137^{\circ} 30'$ to $139^{\circ} 30'$, summer of 1916 (D. D. Cairnes).

On July 25, 1912, Dr. Cairnes, while at Tindir creek, Yukon Territory, took a female of *hypophlæas* which approaches *arethusa* of Dod. This specimen is also in the Ottawa collection.

Genus *Everes* Hbn.

Everes amyntula Bdv.

Lycæna amyntula Bdv.: Ann. Soc. Ent. Fr. (2), X, 294, 1852.

Fletcher¹ recorded this species from Devil's Portage, Liard river (long. $126^{\circ} 10'$), July 17, 1887 (McConnell.) No specimens were brought back by members of the Canadian Arctic Expedition. In the Government collection at Ottawa are three specimens from the Yukon Territory, taken on the Wagon road, between Dawson and Whitehorse, 1908, by Mr. George Stewart.

Genus *Plebeius* Linn.

Plebeius scudderi Edw.

Lycæna scudderi Edw.: Proc. Acad. Nat. Sci. Phil., XIII, 164, 1861.

In the Canadian National collection there are several specimens from the Yukon and other northern localities which we have associated with this species. Records of these specimens will be of interest to readers of this report. They are from the following localities: Lansing river, Yukon Territory, June 24, 1905 (J. Keele); Pelly river, below Hoole river, Yukon Territory, July 5, 1905 (J. Keele); Upper Pelly river, Yukon Territory, August 3, 1887 (G. M. Dawson); Little Charlton island, Hudson bay, July 14, 1887 (J. M. Macoun); Charlton island, Hudson bay, July 7, 1887 (J. M. Macoun)²; Wagon road, 9 miles from Whitehorse, Yukon Territory, July 7, 1908 (G. Stewart); west side of lake Kluane, near Jacquot's roadhouse, Yukon Territory, August 2, 1914 (D. D. Cairnes); Stewart river, Yukon Territory, July 17, 1905 (J. Keele); Dawson, Yukon Territory, 1908 (collector unknown).³

It must be admitted, however, that there is a misunderstanding regarding the species to which the name *scudderi* should be definitely given. The type locality is "Lake Winnipeg," but I am informed by Dr. J. McDunnough that the actual types cannot be found. Much further study of material from type localities is required of the *scudderi-melissa-anna* group before the standing of these species will be stable.

The specimen from Upper Pelly river, August 3, 1887 (G. M. Dawson), is undoubtedly the specimen referred to by Fletcher in the Annual Report of the Geological Survey of Canada, 1887, p. 230B, under the name of *Lycæna shasta*.

The example from Pelly river below Hoole river, July 5, 1905 (Keele), was recorded in the Entomological Record, 1907,⁴ as *Rusticus anna*.

The underside of the male from west side of lake Kluane, Yukon Territory, is shown on Pl. III, fig. 15.

¹ Ann. Rep. Geo. Survey Can., 1887, 230B.

² Determined as *scudderi* years ago by H. Strecker.

³ Determined as *scudderi* some years ago by H. Skinner

⁴ Rep. Ent. Soc. Ont., 1907.

Plebeius aquilo Bdv.

Argus aquilo Bdv.: Icon. 62, 1833.

Six specimens as follows: Bernard harbour, Northwest Territories, August 1-25, 1915, 1 female, 3 males (F. Johansen); Bernard harbour, Northwest Territories, July 14, 1916, female (F. Johansen); Wollaston land, Victoria island, Northwest Territories, July 1, 1915, male (D. Jenness).

Four other specimens in the National collection at Ottawa from the Yukon Territory, two labelled "Burwash creek, Kluane district, Yukon Territory, August 8, 1914 (D. D. Cairnes)"; one "Kluane P.O., Yukon Territory, June 23, 1914 (D. D. Cairnes)," and the fourth "Harrington creek, Yukon Territory, lat. 65° 05', long. 141°, July 30, 1912 (D. D. Cairnes)," may possibly be a form of the same species. They are larger than the three specimens collected by members of the Canadian Arctic Expedition and the underside is more heavily spotted. Two of these latter specimens are shown on Plate III at figures 16 and 17, together with a male of *aquilo* from Bernard harbour, Northwest Territories (fig. 18).

Plebeius saepiolus Bdv.

Polyommatus saepiolus Bdv.: Ann. Soc. Ent. Fr. (2), X, 297, 1852.

In the Canadian National collection there is a specimen of this widely distributed species from the Yukon: namely from Kluane P.O., Yukon Territory, June 21, 1914 (D. D. Cairnes). Fletcher¹ recorded this species from Devil's Portage, lower Liard (long. 126° 10'), July 17, 1887 (McConnell), and from Finlayson lake, Yukon Territory, July 25, 1887 (Dawson and McEvoy).

Plebeius shasta Edw.

Lycæna shasta Edw.: Proc. Acad. Nat. Sci. Phil. 224, 1862.

It is of interest to note that in the Annual Report of the Geological Survey of Canada, 1887, p. 230B, Fletcher recorded this species from the Upper Pelly river (lat. 61° 50', long. 132°), August 3; Lewes river (lat. 62° 20'), August 21. Recently I located the specimen collected on August 3, 1887, by G. M. Dawson, and it is evident that it should not be referred to as *shasta* Edw. I have included the record under *Plebeius scudderi* Edw. *Shasta* was described from specimens from California.

A specimen of this latter species taken at Crane lake, Saskatchewan, June 2, 1894, by Prof. John Macoun, determined by Dr. J. McDunnough as *shasta minnehaha* Scudd. is in the Canadian National collection. I have not seen any examples from more northern localities.

Genus **Glaucopsyche** Scudd.**Glaucopsyche couperi** Grt.

Glaucopsyche couperi Grt.: Bull. Buff. Soc., I, 185, 1874.

In the Canadian National collection are specimens from the following Yukon and northern British Columbia localities: 96 miles from Whitehorse on Kluane road, near Marshall creek, Yukon Territory, June 15, 1914 (D. D. Cairnes); on Wagon road, between Whitehorse and Dawson, Yukon Territory, 1908 (G. M. Stewart); Mayo lake, Yukon Territory, July 28, 1904 (J. Keele); between lat. 67° 25' and 66° 30', long. 141°, June 12, 1912 (D. D. Cairnes); Dawson, Yukon Territory, 1908 (collector unknown); Frances river, lat. 60° 29', July 1, 1887 (G. M. Dawson); Upper Liard river, Yukon Territory, June 27, 1887 (Dawson and McEvoy). Gravel river, Northwest Territories, below Natla river, June 13, 1908 (J. Keele); Telegraph creek, Stikine river, British Columbia, May 31, 1887 (Dawson and McEvoy); Dease lake, British Columbia, June 5, 1887 (Dawson and McEvoy);

¹ Ann. Rep. Geo. Surv. Can. 1887, 230B.

Genus **Lycaenopsis** Feld.**Lycaenopsis pseudargiolus** Bdv. and Lec.

Argus pseudargiolus Bdv. and Lec.: Lep. Am. Sept, 118, 1833.

Nine specimens of this variable species are in the National collection at Ottawa from the following northern localities: Dease lake, British Columbia, June 8, 1887 (G. M. Dawson); on Whitehorse-Dawson wagon road, Yukon Territory, June 2, 1914 (D. D. Cairnes); Alaska, collected with other species, the label covering all reading "lat. 59° 30', 141st meridian—and lat. 69° 40', 141st meridian, June-July, 1912 (J. M. Jessup); ten miles south of Porcupine river, Yukon Territory, June 8, 1912 (D. D. Cairnes); six miles south of New Rampart House, Yukon Territory, June 6, 1912 (D. D. Cairnes); between lat. 67° 25' and 66° 30', long 141°, June 15, 1912 (D. D. Cairnes).

In the Annual Report of the Geological Survey of Canada, 1887, page 230B, Fletcher refers to specimens collected in the neighbourhood of Dease lake, British Columbia, referring to the same as representing the forms *lucia* Kirby, *marginata* Edw. and *violacea* Edw.

FAMILY **HESPERIIDAE.**Genus **Hesperia** Fabr.**Hesperia centaureæ** Ramb.

Hesperia centaureæ Ramb.: Faun. Ent. And., pl. 8, f. 10, 1839.

No specimens in the Canadian Arctic Expedition collection. In the Atlin district of northern British Columbia the species has been met with.¹ In the Canadian National collection there are three specimens which were taken in Labrador on June 18 and July 16, 1894 (A. P. Low).

Genus **Thanaos** Bdv.**Thanaos persius** Scudd.

Nisoniades persius Scudd.: Proc. Essex Inst., III, 170, 1862.

Two specimens of this *Thanaos* from Dawson, Yukon Territory, 1908 (collector unknown) are in the Canadian National collection.

Both specimens, one a male, the other a female, were determined as *persius*, several years ago by Dr. H. Skinner. According to Skinner² the species has a wide distribution, being found from Alaska to the Gulf of Mexico and from the Atlantic to the Pacific oceans.

Genus **Carterocephalus** Led.**Carterocephalus palæmon** Pall.

Pamphila palæmon Pall.: Reise, I, 471, 1771.

In 1912, the late Dr. D. D. Cairnes collected a single specimen of this species near Siwash creek, Yukon Territory, lat. 65° 59', long. 141°, on June 28. The specimen is in the Canadian National collection.

¹ Rep. Prov. Museum of Nat. Hist., B.C., 1914, (1915), F. 24.

² Trans. Amer. Ent. Soc. XL, p. 204.

FAMILY ARCTIIDAE.

Genus *Lexis* Wallgr.*Lexis bicolor* Grt.*Lithosia bicolor* Grt.: Proc. Ent. Soc. Phil., III, 74, 1864.

In the Canadian National collection there is one specimen of this widely distributed species from Sixtymile river, along 141st meridian river, Yukon Territory, 1907 (Thos. P. Reilly).

Genus *Hyphoraia* Hbn.*Hyphoraia parthenos* Harr.*Arctia parthenos* Harr.: Agassiz's Lake Sup., 309, 1850.

One specimen in the Canadian National collection from the following Yukon locality: Stewart river, above Frazer falls, June 15, 1905 (J. Keele).

Hyphoraia alpina Quens.*Bombyx alpina* Quens.: Acerbi's Travels N. Cape, II, p. 253, pl. 1, f. 4 (1802).

Four specimens reared from larvæ or cocoons collected at Collinson point, Alaska, emerged July 27, August 3, 14, September 2, 1914, 3 males and 1 female (F. Johansen). One of the males is shown on Pl. V, fig. 18.

All of the specimens are in general similar in appearance and resemble fairly closely Seitz's figure of *alpina* Quens. (= *thulea* Dalm.)¹ In these specimens however, the pale coloured spots on the wings in both sexes are decidedly yellowish almost a cream-buff², not whitish as in the figure referred to above. Hampson³ also refers to the spots as being white in the female. The male antennæ in this species are serrate differing from the antennæ of the foregoing species which are pectinate.

The larvæ and cocoons were collected on the tundra, by Mr. Johansen, in the months of May, June, and July. They emerged on the dates mentioned above. (Breeding record 33.)

The following brief description of the larva has been made from a cast skin removed from a cocoon:

Head 3 mm. wide, rounded, somewhat quadrate, black, polished, setæ black; mouth parts reddish. Body blackish, tubercles large and conspicuous, each bearing a bunch of rather long stout hairs, slightly spinulose. The hairs on the dorsum and upper lateral area are yellow and brown intermixed, those along the lower lateral area being of a darker brown shade. Thoracic feet black, reddish at ends; prolegs concolorous with venter.

The cocoon, figured on Pl. III, fig. 8, varies in size from 16-20 mm. in width to about 36 mm. in length. It is rather thin, the pupa inside being readily observable. In colour it is yellowish-white.

PUPA.—Length 19 mm., width at widest part 7 mm.; black, polished, anterior half of abdominal segments slightly pitted and with short setæ, posterior half smooth. Wing-cases and thorax slightly wrinkled. Cremaster roughened, reddish, shaped as shown on Pl. III, fig. 10, and bearing a conspicuous bunch of long, rather slender, dark reddish or blackish bristles slightly curved at ends.

In addition to the above specimen, Mr. Johansen collected a cocoon of what I take to be of this species, on Herschel island, Yukon Territory, end of July, 1916. It was parasitized by *Amblyteles* species⁴ which emerged on August 8, 1916.

¹ Macrolep. World, Div. 1, Palearctica, Vol. 2, pl. 17c.

² Ridgway's Color Standards and Nomenclature, 1912.

³ Cat. Lep. Phalaenæ in B.M., III, 223.

⁴ Det. by C. T. Brues.

Hyphoraia festiva Bork.

Bombyx festiva Bork.: Eur. Schmett., III, p. 191 (1790), nec. Hufn.

Bombyx lapponica Thunb.: Diss. Ent., pt. II, p. 40, f. 7 (1791).

Four specimens of this rare species from the following localities: Bernard harbour, Northwest Territories, July 9, 24, 1915, July 3, 1916, 2 males, 1 female (F. Johansen); Port Epworth, Coronation gulf, Northwest Territories, July 15, 1915, 1 male (J. J. O'Neill). The specimen obtained on July 24, 1915, was reared. (Breeding record 68.)

These specimens resemble rather closely the figure of the species which is given in Seitz's *Macrolepidoptera of the World*.¹ As is to be expected among arctiid moths the markings are variable. Such variation is indicated in the two male specimens figured on Pl. V, figs. 19 and 20. The abdomen of the female is much redder than that of the male as is also the underside of the wings. The antennæ of the males are distinctly pectinate similar to the males of *H. parthenos* Harr.

On July 7, 1915, Mr. Johansen found the cocoon of the moth which emerged on July 24, attached to a stone near a river bed at Bernard harbour, Northwest Territories. His notes indicate that the pupa was 20 mm. long, smooth and black. The resultant moth a female, was kept alive. Mr. Johansen's notes read:

"August 8—Imago still living. During the last few days she laid about one dozen pale-green eggs (1 mm. in diameter) on different places in the jar.

"August 16—Imago dying. She has now laid seventy eggs all told."

The cocoon is thin, pale yellowish-white, oval, 25 mm. long, 14 mm. wide; the pupa and cast larval skin are plainly observable through the cocoon.

The following notes on the larva have been made from the cast skin removed from the cocoon:

Head 3 mm. wide, rounded, black, polished, mouth parts reddish. Body black, tubercles large, each bearing a bunch of spreading, rather long hairs, slightly spinulose, those from the dorsum being mostly of a sordid whitish colour with black and dark brown hairs intermixed, while those from the lower lateral and ventral areas are darker, being black or dark brown. Thoracic feet black, red tipped, shiny; prolegs also black, shiny, crotchets mostly reddish.

PUPA.—Length 18 mm., width at widest part 6.5 mm., polished, anterior half of abdominal segments slightly pitted and with short setæ; posterior half smooth, as in *Hyphoraia alpina* Quens. Wing-cases and thorax slightly wrinkled. Cremaster different from this latter species being shaped as shown on Pl. III at fig. 11, and bearing about forty stout capitate dull reddish bristles.

Seitz² refers to the larva as being dark grey with small black head and long black or foxy red hair. The food plant is given as *Vaccinium uliginosum* and other bog plants.

In addition to the above specimens there is in the Ottawa collection a female bearing the label "Hudson bay, Dr. Bell," which we associate with this species.

Genus Apantesis Wlk.**Apantesis quenseli** Payk.

Bombyx quenselii Payk.: Skriv. of Nat. Selsk., II, 99, 1793.

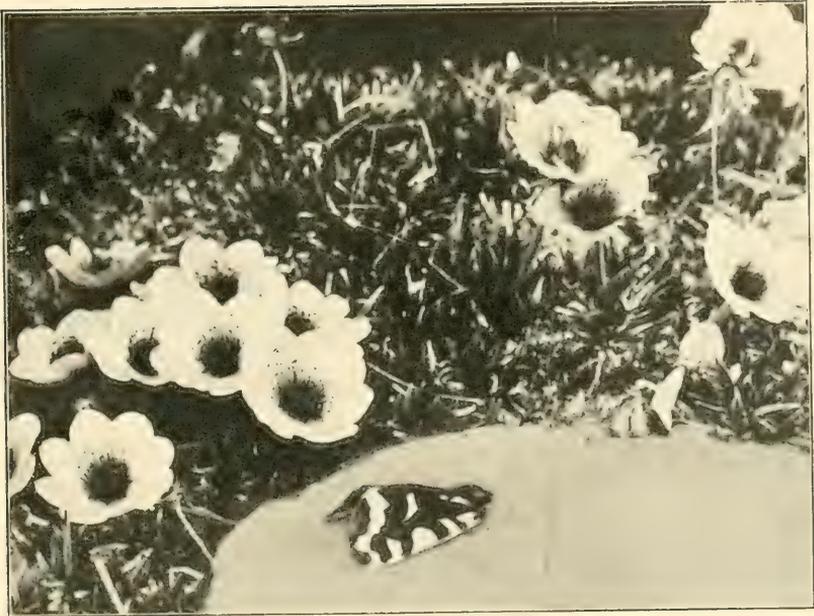
In the Entomological Record for 1915³ I recorded this species from 141st meridian, north of mount Natazht, 6,500 feet, July 1, 1913 (E. W. Nesham).

This specimen, a female, is in the Canadian National collection.

¹ *Macrolepidoptera of the World*, Div. I, Palearctica, Vol. 2, plate 17e

² *Ibid.* p. 95.

³ *Rep. Ent. Soc. Ont.*, 1915.



Dryas octopetala, Bernard harbour, Northwest Territories, July 9, 1915; *Hyphoraia festiva*, male, at rest on rock in foreground
(Photo by G. H. WILKINS.)



Genus **Parasemia** Hbn.

Parasemia plantaginis L.

Bombyx plantaginis L.: Syst. Nat., I, 501, 1758.

One specimen in the Canadian National collection from the following Yukon locality: Lansing river, Yukon Territory, June 24, 1905 (J. Keele).

FAMILY AGARISTIDAE.

Genus **Androloma** Grt.

Androloma mac-cullochi Kirby.

Alypia mac-cullochii Kirby: Faun. Bor. Am., IV, 301, 1837.

One specimen in the Canadian National collection from slopes of mount Ortell, Yukon Territory, July 16, 1905 (J. Keele).

FAMILY NOCTUIDAE.

Genus **Barrovia** B. and McD.

Barrovia fasciata Skin.

Psychophora fasciata Skin.: Ent. News, XIII, 143, 1902.

Two males as follows: Barter island, north coast of Alaska, July 11, 1914, captured in bright sunshine on the tundra, temperature 56° F. (D. Jenness); Herschel island, Yukon Territory, July 29, 1916 (F. Johansen).

Both of these specimens are in fair condition. The species, concerning the generic status of which much has been written, is an interesting one. The type locality is Point Barrow, Alaska. The specimen collected on Barter island is shown on Pl. V, fig. 17.

Genus **Parabarrovia**, n. gen.

(Type *Parabarrovia keelei*, n. sp.)

Agrees with Hampson's characterization of the genus *Agrotiphila*, Section I (*Schöyenia*), excepting that the fore-tibiæ are not spined and veins 3 and 4 of secondaries are stalked.

In the Canadian Entomologist, vol. XLVIII, 290, Barnes and McDunnough erected the genus *Barrovia* with type *fasciata* Skin., placing the genus near *Agrotiphila* Grt., differing therefrom by its unspined fore-tibiæ and hairy vestiture. Dr. McDunnough has recently informed me, however, that this characterization is not correct, as the spined fore-tibiæ of *fasciata* were overlooked at the time. *Barrovia* B. and McD. will, therefore, come very close to *Schöyenia*, from which it differs in antennal structure.

Parabarrovia keelei, n. sp.

Antennæ serrate and fasciculate. Head, thorax, abdomen and feet clothed with black and gray or silvery hairs intermixed. All the wings brownish, semi-translucent, the primaries darker than the secondaries. The median area of the primaries particularly towards the costa is irrorated with white, as is also the costal margin to near apex. Hairs on costa yellowish. The brown neuration of all the wings is conspicuous. Scales on discal vein black, showing as a black streak. Cilia brownish-yellow. Underside of all wings paler than upper side, the scales being of a creamy white colour.

Unfortunately the specimen is rubbed, rendering a more complete description impossible.

Alar expanse, 26 mm.

Type, male, bearing the label "Mountain below Twitya river, near Gravel river, Northwest Territories, July 2, 1908 (J. Keele)."

Paratype, female from the same locality and bearing the same label. This specimen expands 30 mm., and in general is in rather fair condition. The wings are brownish and semi-translucent as in the type and there is a faint indication of a wide darker brown median band on the primaries, the outer third of the wing being faintly irrorated with white. In the median and basal areas whitish scales are also present. The wings of this specimen are more rounded at apex than are those of the type. The latter is figured on Pl. V, fig. 10, the paratype on the same plate at figure 9. Both types are in the Canadian National collection.

Genus *Epipsilia* Hbn.

Epipsilia wockei Moeschler.

Agrotis wockei Moeschler: Wien. Ent. Mon., VI, 130, 1862.

In the Entomological Record for 1908¹ I recorded this species from Labrador, July 19 (A. P. Low). This specimen is in the Canadian National collection.

Hampson gives the following distribution: Labrador; White mountains, New Hampshire; Ala Tau, W. Turkestan.

I have compared our specimen with his figure² with which it agrees very well.

Genus *Anarta* Ochs.

Anarta subfumosa, n.sp.

Head, thorax and abdomen brown, thorax with black and gray hairs intermixed. Antennae moderately serrate and fasciculate. Primaries dull smoky-brown suffused with gray; costal area black along the edge and thinly irrorated with white. Markings on the primaries indistinct, the most apparent being the t. p. line. The basal line and the t. a. line are specially noticeable on the costa. All these lines are whitish. The s. t. line is represented by a series of faint dots. Orbicular and reniform small, whitish. Cilia inner third dark brown, outer two-thirds pale brown. Secondaries white with rather broad dark brown terminal band and dark brown discoidal lunule; basal area darkened. Cilia whitish, inner third pale brown.

Underside of all wings whitish, veins black-lined; discoidal spot on each wing conspicuous; secondaries with dark terminal band

Alar expanse, 26 mm.

Type, a male, (Pl. V, fig. 16) from Armstrong point, Victoria island, Northwest Territories, July, 1916 (J. Hadley). Paratypes, 4 males and 1 female from the same locality, July 1-10, 1916 (J. Hadley). In one of these (male) the median area on the primaries is darkened. In another (male) there are faint golden-yellow scales in the subterminal area and traces of a postmedial line on the secondaries. All are of a similar size to the type. Types in the Canadian National collection.

This species evidently comes nearest to *A. staudingeri* Auriv.

¹ Rep. Ent. Soc. Ont., 1908.

² Pl. LXXIII, Lep. B.M., Vol. IV.

Anarta richardsoni Curt.

Hadená richardsoni Curt.: Ross' Narr. Second Voy., App. p. 72, pl. A, f. 11, 1834.

Two specimens as follows: Bernard harbour, Northwest Territories, July, 1915, male (F. Johansen); Port Epworth, Coronation gulf, Northwest Territories, August 18, 1915, male (J. J. O'Neill).

Four specimens (3 males, 1 female), collected at Armstrong point, Victoria island, Northwest Territories, July 1-10, 1916 (J. Hadley), were brought back by the Northern Party of the Canadian Arctic Expedition.

In the Canadian National collection are two other specimens labelled as follows: Klutlan glacier, Yukon Territory, 9,000 feet, June, 1913 (H. F. J. Lambert); Gravel river, Northwest Territories, July 2, 1908 (J. Keele).

This species has a wide distribution. Hampson records it from Greenland, Hudson bay, Labrador, Alaska, Scandinavia, and Novaya Zembla.

Anarta leucocycla Staud.

Anarta leucocycla Staud.: Stett. Ent. Zeit., 1875, p. 296.

Four specimens, three males and one female, as follows: Bernard harbour, Northwest Territories, August 14-18, 1915, 3 males (F. Johansen); cape Pullen, Wollaston land, Victoria island, Northwest Territories, August 18, 1915, 1 female (D. Jenness).

The only locality given by Hampson, in vol. V of the Catalogue of the Lepidoptera Phalænæ in the British Museum, is Greenland.

The female from cape Pullen is figured on Pl. V, fig. 14.

Anarta cordigera Thunb.

Noctua cordigera Thunb.: Mus. Nat. Acad. Ups. Diss., VI, 72, 1788.

In the Canadian National collection there is one specimen, a female, from the Yukon, collected "60 miles from Whitehorse, Yukon Territory, near Champagne landing, June 10, 1914 (D. D. Cairnes)." Also a specimen, a female, bearing the label "Lake No. 4, Pike's portage, Great Slave lake, May 20, 1900 (J. Tyrrell)."

These specimens, in general, resemble examples in the collection from eastern Ontario.

Genus **Leucania** Ochs.**Leucania yuconensis** Hamp.

Leucania yuconensis Hamp.: Ann. Mag. Nat. Hist., VIII, 425, 1911.

One specimen of this species from the type locality, namely, Dawson, Yukon Territory, 1909, is in the Canadian National collection.

Genus **Sympistis** Hbn.**Sympistis melaleuca** Thunb.

Noctua melaleuca Thunb.: Diss. Ent., II, 42, 1791.

In the Canadian National collection are two specimens of this arctic species, one from Charlton island, James bay, July 8, 1887 (J. M. Macoun), and the other from Burwash creek, Kluane district, Yukon Territory, August 8, 1914 (D. D. Cairnes).

The specimen from Charlton island, is in good condition and was determined some years ago by Dr. Dyar. I have recently compared it with the figure of *melaleuca* on plate 50c, of Seitz's Macrolepidoptera of the World. The Yukon specimen is in rather poor condition, but seems to be this species.

Sympistis zetterstedti Staud.

Anarta zetterstedti Staud.: Stett. Ent. Zeit., 294, 1857.

Two specimens of what is apparently this species taken as follows: Bernard harbour, Northwest Territories, females, August 14, 1915 (F. Johansen).

The specimens unfortunately are in poor condition. This species was taken on the Barren Grounds by Hanbury.

Genus **Parastichtis** Hbn.**Parastichtis verberata** Sm.

Orthosia verberata Sm.: Can. Ent., XXXVI, 153, 1904.

One specimen in the National collection at Ottawa from Bartlett bay, off Glacier bay, Alaska, June 10, 1907 (D. H. Nelles).

This specimen is similar to specimens in the collection from Kaslo, B.C. The type locality is Calgary, Alta. The above specimen agrees fairly well with Hampson's figure.¹

Genus **Homoglæa** Morr.**Homoglæa murrayi**, n. sp.

Head, thorax and abdomen pale drab, immaculate; abdominal hairs darker. Primaries pale drab irrorated with darker brown especially in the median and outer areas; costa pale grayish. T.a. line sepia, darkest on costa, angled inwardly below costa, excurved from cell to inner margin. Orbicular a rather indistinct small greyish annulus. Reniform of moderate size constricted centrally, defined by grey. T.p. line sepia, darkest on costa, greyish on outer edge, dentate, bent outwardly below costa. S.t. line indistinct, greyish on outer edge; a terminal dark line; fringes pale drab. Secondaries pale brownish with darker brown border.

Beneath, both wings whitish, thinly irrorated with brown; discoidal spot dark; on primaries a rather wide smoky longitudinal shading from base to discoidal spot; postmedial line dark; terminal line blackish.

Alar expanse, 36 mm.

Type, a female, from Bernard harbour, Northwest Territories, July 10, 1916 (F. Johansen). Paratype, a female, from the same locality and bearing the same label; both types in the Canadian National collection. A third specimen, also a female, taken at Bernard harbour, Northwest Territories, August 4, 1915 (F. Johansen), is broken and rubbed, but is apparently the same species. The specimen which I have made the type was submitted to Dr. Dyar who reported that it belonged to the genus *Homoglæa*.

The paratype is smaller than the type, expanding 33 mm.; the smoky longitudinal shading of the underside of the primaries is indistinct.

The type is figured on Pl. V, fig. 12.

I have pleasure in naming this new species after the late James Murray, a well known biologist of Scotland, who was attached to the Northern Party of the Canadian Arctic Expedition, Mr. Murray, unfortunately, was lost with several associates, in 1914, in attempting to reach Wrangell island.

¹ Pl. CVII, 1, Lep. B.M., Vol. VI.

Genus *Agroperina* Hamp.*Agroperina lateritia* Hufn.

Phalaena lateritia Hufn.: Berl. Mag., III, 206, 1767.

I have recently received a single worn specimen of this common and wide-spread species from Rev. C. E. Whittaker. The specimen was collected at Whitehorse, Yukon Territory.

Genus *Autographa* Hbn.*Autographa sackeni* Grt.?

Plusia sackeni Grt.: Can. Ent., IX, 135.

In the Entomological Record for 1904¹ we recorded this species from Mayo lake, Yukon Territory, August 7, 1904 (J. Keele).

I submitted this specimen to Dr. R. Ottolengui, and he has kindly studied it and reported that he is practically certain it is *sackeni*. The species was described from Idaho Springs, Colorado, so its occurrence in the Yukon is noteworthy. Dr. Ottolengui states²: "I have never before seen *sackeni* from any section except Colorado. However (unlike *vaccinii* which is found nowhere except on Mount Washington) *sackeni* has been taken on several of the mountains in Colorado."

I cannot, however, agree with Dr. Ottolengui in the above determination. *A. sackeni*, according to the description, should have a distinct golden-yellow patch on the costa, near the base of the wing, described by the author of the species as an "interior golden patch." This character is entirely absent in the specimen under discussion from Mayo lake, and I am inclined to think that it will ultimately prove to be of a species which is at present undescribed. The specimen is figured on Pl. III, fig. 14.

Autographa altera Ottol. ?

Autographa altera Ottol.: Jour. N.Y. Ent. Soc., X, 69, 1902.

One male specimen taken at Bernard harbour, Northwest Territories, August 25, 1915 (F. Johansen).

Unfortunately the specimen is in rather poor condition and it is difficult to definitely determine it. I referred it to Dr. Ottolengui who would not name it otherwise than *altera*? The specimen is shown on Pl. III, fig. 13.

FAMILY LYMANTRIIDAE.

Genus *Gynaephora* Hbn.*Gynaephora rossi* Curtis.

Laria rossii Curtis: Ross' Second Voyage N.-W. Pass, App., 70, 1835.

Ten adult specimens, six males and four females from Demarcation point and Collinson point, Alaska, July, 1914, six males and three females (F. Johansen); Barter island, Alaska, June 24, 1914, female (D. Jenness).

These specimens undoubtedly represent the species described by Curtis. The secondaries are yellowish with black border.

Under the generic name *Dasychira*, this species is referred to in several arctic reports. Its life-history is only partially known, so the following observations are worthy of record.

¹ Rep. Ent. Soc. Ont., 1904.

² In litt., March/16, 1919.

Mr. Johansen in his notes states that the larvæ and cocoons were found rather abundantly in 1914 at Collinson point and Demarcation point on the Alaskan coast. The following are his notes: (Breeding record 15)

- 1914, May 31—Collinson Point—Two large larvæ and two cocoons found on tundra.
 June 1—One of the larvæ collected yesterday began making its cocoon.
 “ 3—Four mature larvæ and six cocoons found.
 “ 4—One mature larva and three cocoons found.
 “ 7—Four cocoons found.
 “ 11—Five cocoons found.
 “ 13—One mature larva and eight cocoons found.
 “ 15—Two larvæ found east of Collinson point.
 “ 18—One cocoon found.
 “ 20—Four cocoons found.
 July 13—First moth emerged.

Other moths emerged on July 15, 16, 18, 20, 22, 27; August 3, 21, 28; September 2, 15, 1914.

Some of the males and females were kept alive by Mr. Johansen and his notes state that copulation took place freely, and that eggs were secured, the same having been deposited upon the cocoon. Pairs were noted to remain in coitu for a whole day. Under natural conditions, Mr. Johansen also found the eggs on empty cocoons. The females which were reared failed to properly develop their wings, these latter in every case being crumpled.

The eggs brought back by Mr. Johansen are 1.2 mm. wide, white, smooth, spherical, depressed above and are stuck firmly together and partially covered with hair. One patch contained over 55 eggs.

The specimen from Barter island emerged from a cocoon found on the ground on June 23. The temperature at the time varied from 36° to 46°F.

On September 7, 1913, Mr. Johansen collected at Collinson point, among old driftwood on tundra elevation, a single specimen of the larva of what is undoubtedly this species. It was placed in alcohol.

The following is a description of the specimen:

Length, 30 mm. (I should think this specimen when alive and walking would easily measure 45 mm.). Head, 3.5 mm. wide, rounded, dull brownish-grey, excepting clypeus and area around antennæ and mouth parts which are shining black, and sides which are reddish-yellow; thickly hairy, the hairs black. Body black, the tubercles with thick bunches of hairs; the lateral hairs are mostly longer than the dorsal hairs and many, brown in colour, are conspicuously feathered and more spreading; the lateral hairs which are not feathered are spinulose and either long brown or dark-reddish brown hairs or are shorter hairs orange-yellow in colour. The dorsal hairs are shorter than the lateral hairs and the feathered ones are bunched together particularly so on the anterior segments, the yellow hairs which also occur on the dorsum being more or less hidden, excepting in the subdorsal area where they are of a brighter yellow and more conspicuous. This specimen is figured on Pl. III, fig. 9.

Other larvæ differ from the above in that all the hairs are lighter in colour and in having the yellowish hairs more noticeably intermixed with the dorsal feathered hairs which in these specimens are greyish.

The larva has been described by Curtis¹ as follows: “Large and hairy of a beautiful shining velvety black, the hairs being somewhat ocherous; there are two tufts of black on the back, followed by two of orange.”

This brief description is, of course, of little value. Dyar who has studied the larva of *rossi* as well as that of *groenlandica* states² that “Curtis must have mixed the species, describing the moth of *rossi* and the larva of *groenlandica*.” Packard described the larva of *rossi* from Polaris bay³ but his description does not agree with the description of the larva described above from Collinson

¹ Ross' Second Voyage.

² Psyche, VIII, 153.

³ Amer. Nat. XI, 52.

point. This latter description is in general similar to Dyar's description of *rossi*¹.

The larvæ reared by Mr. Johansen were fed in captivity on mountain saxifraga (*S. oppositifolia* L.) and willow, chiefly the latter as soon as available.

In the Entomological Record for 1903² the species is recorded from Blackfalds, Alta., where in 1902 and 1903 Mr. P. B. Gregson found the larvæ on willow and poplar. Mr. Gregson at the time forwarded to us some larvæ and from one of these a male moth was reared. Larvæ were also received in 1903 from Mr. D. Tipping, of the same place.

Regarding the occurrence of the species at Blackfalds, Alta., Mr. Gregson reported that he first met with the larvæ on August 27, 1901, on which date he found three specimens feeding on aspen poplar. In some notes which he sent to us at the time it is stated that larvæ seemed to be full grown on September 22, and that since August 27 they had moulted once. They fed very little and hibernated among dead leaves and twigs in a breeding cage which was kept in an outhouse. In the spring of 1902, the larvæ were brought indoors and early strawberry leaves offered as food, until the leaves of aspen poplar appeared. This latter food was continually present in the breeding cage, but unlike the larvæ reared by Mr. Johansen, referred to above, these three Blackfalds larvæ refused all food and eventually spun their cocoons among the dead leaves and twigs at the bottom of the cage. The moths emerged about June 10.

The Blackfalds larvæ are much grayer than the Collinson point larvæ and the upper lateral yellow hairs are decidedly brighter being citron-yellow in colour. The number of yellow hairs, however, varies in the specimens.

Another larva, immature, in the National collection at Ottawa, from Fullerton, Hudson bay, collected on July 7, 1904, by Mr. Andrew Halkett, bears still lighter greyish feathered hairs, but otherwise is similar to the Blackfalds larvæ.

In addition to the larvæ collected at Collinson point and Demarecacion point, Mr. Johansen also collected larvæ at Nome, Alaska, and at Chantry island, Northwest Territories, but unfortunately no adults were reared. These may be *rossi* but owing to the condition of the larvæ brought back it is difficult to determine them definitely.

In addition to the material collected by the Southern Party of the Canadian Arctic Expedition, I have also examined five cocoons collected by members of the Northern Party, namely, four by Messrs. Castel and Emu, from near cape Ross, Melville island, about June 20, 1916. Three of these I would determine as being those of *G. rossi*, but the pupa of the fourth differs from that of the others in having black dorsal hair which according to Dyar³ is a characteristic of *G. groenlandica*. The fifth cocoon is from Armstrong point, Victoria island, Northwest Territories, summer, 1916 (J. Hadley).

From cocoons collected by Mr. Johansen, the tachinid parasite *Euphorocera gelida* Coq. was reared. As many as six puparia were found in one cocoon. The species was determined by Mr. J. R. Malloch, and is referred to in his report on diptera collected by members of the Canadian Arctic Expedition⁴. From Mr. Johansen's notes I gather that he reared also a hymenopterous parasite.

In the Canadian National collection there is a male specimen of the moth from Ashe inlet, North Bluff, Hudson's strait, August 13, 1884 (R. Bell).

¹ Psyche, VII, 328.

² Rept. Ent. Soc. Ont., 1903.

³ Psyche, VIII, 153.

⁴ Rep. Canad. Arct. Exped., 1913-18, III, C, p. 57c. 1919.

FAMILY GEOMETRIDAE.

Genus **Leucobrephos** Grt.**Leucobrephos brephoides** Walk.*Anarta brephoides* Walk.: Cat. Brit. Mus., XI, 702, 1857.

In the Canadian National collection there are seven specimens of this uncommon moth from northern localities, as follows: Mayo river, Yukon Territory, April 16, 1907, 3 males (J. A. Davidson); Janerk, Klutlan glacier, elevation 5,500 feet, 141st meridian, north of mount Natazhat, May 2, 1913, 2 males (E. W. Nesham); Portage at Grand falls, Hamilton river, Labrador, May 12, 1894, 2 males (A. P. Low).

The life-history, habits, and distribution of the insect in Canada were recently published in *The Canadian Entomologist*.¹

Genus **Acidalia** Tr.**Acidalia frigidaria** Moesch.*Acidalia frigidaria* Moesch.: Wien. Ent. Monat., IV, 373, 1860.

One specimen in the Canadian National collection from Baldoff creek, Yukon Territory, White river district, July 7, 1913 (D. D. Cairnes). The species was determined by Mr. L. W. Swett.

Acidalia species.

Three specimens belonging to this genus all collected in the Yukon Territory by the late Dr. D. D. Cairnes, namely, two in White river district, lat. 61° 55', long. 141°, July 16, 1913, and the other near Nation river, lat. 65° 30', long. 141°, are in the Canadian National collection. They probably represent an undescribed species, but unfortunately the specimens are in poor condition.

Genus **Holarctias** Prout.**Holarctias sentinaria** Geyer.*Hæmatopis sentinaria* Geyer in Hubner, Zutr. Exot. Schmett, f. 823, 1837.

One specimen in the Canadian National collection from White river district, Yukon Territory, lat. 61° 45', long. 141°, July 20, 1913, female (D. D. Cairnes). The specimen was determined by Dr. McDunnough.

Genus **Cosymbia** Hbn.**Cosymbia pendulinaria** Guen.*Ephyra pendulinaria* Guen.: Spec. Gen., IX, 414, 1857.

A specimen of what is apparently this species was collected by the late Dr. D. D. Cairnes, near Black river, Yukon Territory, lat. 66° 31', long. 141°, on June 18, 1912; it is in the Canadian National collection. The lines on this specimens are blacker than those of examples in the collection from British Columbia and other localities and the discal spot on all wings is entirely filled with black.

¹ Can. Ent., XLVIII, 133.

Genus **Lygris** Hbn.**Lygris destinata** Moesch.

Lygris destinata Moeschler: Wien. Ent. Monat., 375, IV, 1860.

Among a small collection of lepidoptera made in the Yukon in 1908 by Mr. Geo. Stewart, the specimens being now in the National collection at Ottawa, are three specimens of *Lygris destinata* Hbn. taken at Nordenskiöld, 63 miles from Whitehorse, Yukon Territory, August 23, 1908. With these specimens are two other examples taken on the same day and at the same place, which resemble *destinata* but the antemedian band and the subterminal area are distinctly yellowish, thus approaching, according to Dr. McDunnough, who examined the specimens, *similis* of Walker.

Ten other specimens of what is probably this latter form were brought back by members of the Canadian Arctic Expedition. These were taken as follows: Nome, Alaska, August 24, 25, 1916, 4 specimens (F. Johansen); cape Pullen, Wollaston Land, Victoria island, Northwest Territories, August 18, 1915, 4 specimens (D. Jenness); Bernard harbour, Northwest Territories, August 25, 1915, 2 specimens (F. Johansen).

Unfortunately most of these specimens are in poor condition.

Genus **Dysstroma** Hbn.**Dysstroma truncata** Hufn.

Geometra truncata Hufn.: Berl. Mag., IV, 602, 1769.

One specimen in the Canadian National collection from Bartlett bay off Glacier bay, Alaska, June 10, 1907 (D. H. Nelles).

This specimen is in poor condition but Dr. J. McDunnough who examined it, considered it to be this species. In the Barnes' collection there are specimens of *truncata* from southern Alaska.

Dysstroma citrata Linn.

Phalæna citrata Linn.: Faun. Suec., p. 332, 1761.

One specimen from Latouche, southern Alaska, September 3, 1916 (F. Johansen).

The specimen is in poor condition but is apparently a form of this species.

In addition there is in the Canadian National collection a specimen from the Yukon, namely, from Burwash creek, Kluane district, August 4, 1914 (D. D. Cairnes), the determination of which was confirmed by Mr. Swett.

Genus **Xanthorhoe** Hbn.**Xanthorhoe abrasaria congregata** Wlk.

Thera congregata Wlk.: Cat. Brit. Mus., XXIV, 1,264, 1862.

In the Canadian National collection are four specimens from the Yukon, namely from wagon road between Whitehorse and Dawson, Yukon Territory, July 7 to August 2, 1908 (Geo. Stewart). The species was not met with by Mr. Johansen or other members of the Arctic Expedition.

In Dyar's Catalogue,¹ *congregata* of Walker is given as a synonym of *angulata* of Haworth. This has been corrected by Barnes and McDunnough in their Contributions² and given in their recently issued check list³ as the American race of *abrasaria*.

¹ List of N. A. Lepidoptera, 1902.

² Cont. Nat. Hist. Lep. N. A., II, 5, 204.

³ Check List of the Lep. of Boreal Amer., 1917.

Genus **Psychophora** Kirby.**Psychophora sabini** Kirby.

Psychophora sabini Kirby.: Supp. App. Parry's Voy. Disc. N.W. Passage, 1824.

Two specimens from Bernard harbour, Northwest Territories, July, 1916 (F. Johansen). These specimens agree fairly well with Curtis' figure in the Appendix to Ross' Second Voyage.

Two other specimens, one from Wollaston Land, Victoria island, Northwest Territories, summer, 1915 (D. Jenness); the other from cape Pullen, Wollaston Land, Victoria island, August 18, 1915 (D. Jenness), may also be this species but the specimens are not in very good condition.

Genus **Cidaria** Treit.**Cidaria** species.

Two Yukon specimens are in the Canadian National collection, both collected by the late D. D. Cairnes, one on July 24, 1912, on the Nation river, lat. 65° 30', long. 141°, the other on July 23, 1913, in the White river district, long. 141°. Both specimens were submitted to Mr. L. W. Swett, who determined them as *Cidaria frigidaria* Gn.? He reported that the specimens seemed to be very close to specimens from Lapland determined by Staudinger. Unfortunately, both specimens are in poor condition.

Genus **Dasyuris** Gn.**Dasyuris polata** Dup.

Dasyuris polata Dup.: Hist. Nat. Lep. Fr., VIII, (V), 402, 1830.

Two specimens, on the authority of Mr. L. W. Swett, are at present placed in the Canadian National collection under the above name. Both were studied by Mr. Swett and compared with specimens in the Packard collection. One, a male, was reported to match some of the rubbed specimens in this latter collection. The second specimen, a female, is much larger but was thought by Mr. Swett to be a female of *polata*. Referring to this latter specimen he stated¹ "I think the character of the basal band being accentuated outwardly rather indicates this species or a race of it". Both specimens were collected at Tindir creek, Yukon Territory, international boundary, July 25, 1912 (D. D. Cairnes).

Genus **Oporinia** Hbn.**Oporinia** species.

In the Canadian National collection there is one specimen belonging to this genus which was collected in the Yukon by Mr. Jos. Keele, the label on the specimen reading "Ladue river, August 21, 1905." This specimen was submitted by Mr. L. W. Swett, who named it *Oporinia autumnata*? In reporting upon it Mr. Swett remarked: "The markings are so effaced I cannot tell what race or species it may be. The double lines on the hind wings are nearer together than in typical *autumnata*, and it is not my race *henshawi*."

¹ In litt. March 22, 1919.

Genus **Eulype** Hbn.**Eulype hastata** L.

Phalæna-Geometra hastata L.: Syst. Nat., 527, 1758.

In the Canadian National collection there are nine specimens of this widely distributed and very variable species from the following Yukon localities: Kluane P.O., Yukon Territory, June 23, 1914 (D. D. Cairnes); Klotassin river area, Yukon Territory, lat. 62° 31' to 63° 06', long. 137° 36' to 139° 30', summer of 1916 (D. D. Cairnes); between latitudes 67° 25' and 66° 30', long. 141°, June 18-27, 1912 (D. D. Cairnes); Finlayson river, Yukon Territory, July 25, 1887 (Dawson and McEvoy).

Genus **Isturgia** Hbn.**Isturgia truncataria** Wlk.

Fidonia truncataria Wlk.: Cat. Brit. Mus., XXIV, 1034, 1862.

In the Canadian National collection there are five specimens taken in the Yukon, as follows: 50 to 80 miles from Whitehorse, on Kluane road, Yukon Territory, June 8-12, 1914, 4 examples (D. D. Cairnes); between lat. 67° 25' and 66° 30', long. 141°, June 12, 1912, 1 example (D. D. Cairnes).

Genus **Macaria** Curt.**Macaria granitata** Gn.

Macaria granitata Gn.: Spec. Gen., X, 85, 1857.

This common and widely distributed species was not present in the Arctic collection. There is one specimen in the Ottawa National collection from the Yukon, labelled: Burwash creek, Kluane district, Yukon Territory, August 8, 1914 (D. D. Cairnes).

Genus **Phasiane** Dup.**Phasiane hebetata** Hlst.

Phasiane hebetata Hulst.: Bull. Brook. Ent. Soc., IV, 34, 1881.

No specimens in the Arctic collection. In the National collection at Ottawa, there is one specimen which was collected at Canyon river, 75 miles from Whitehorse, Yukon Territory, June 11, 1914 (D. D. Cairnes).

The species was described from Colorado. It is also known to occur in Arizona and Washington Territory. In addition to the specimen referred to there are in the Ottawa collection specimens from the provinces of Alberta and Saskatchewan. Barnes and McDunnough¹ figure the species in their "Contributions."

Genus **Itame** Hbn.**Itame andersoni** Swett.

Diastictis andersoni Swett.: Can. Ent., XLVIII, 251, 1916.

Three specimens of this species are in the Canadian National collection, all bearing the label "Yukon Territory, collected on the wagon road between Whitehorse and Dawson, August 22, 1908 (Geo. Stewart)." One of the specimens was submitted to Mr. L. W. Swett, who confirmed the determination. The species was described from Atlin, B.C. Recently Blackmore² has figured

¹ Cont. Nat. Hist. Lep. N. A., IV, 2, pl. 21, f. 13, 1918.

² Proc. Ent. Soc. B.C. 10, 1917, (1918) pl. III.

the species but this illustration is much too pale and cannot be considered as satisfactory. The species is figured in colours on Pl. V, fig. 15.

Itame brunneata Thunb.

Phalæna brunneata Thunb.: Diss. Ent., I, 9, 1784.

One specimen from Burwash creek, Kluane district, Yukon Territory, August 8, 1914 (D. D. Cairnes), is in the Canadian National collection. Mr. L. W. Swett compared this example with material in his collection from Europe and reported that it did not match exactly the specimens in his series. He states¹ "Packard's name *ferruginaria* would hold in case this form was not exactly like the European. It could only be a race of the European *brunneata* at best and a series of microscopic slides with life-histories, would be necessary to separate them; in *Itame* the genitalia are not so highly specialized as in some other groups."

The Yukon example is rather darker in colour than the other specimens under the name *brunneata* in the Ottawa government collection from the provinces of Ontario and Nova Scotia.

Genus **Dysmigia** Warr.

Dysmigia loricaria Evers.

Fidonia loricaria Evers.: Bull. Soc. Imp. Nat. Mosc., 59, 1837.

In the Canadian National collection there are eleven Yukon specimens, all males, of this species which were collected by Mr. Geo. Stewart, in 1908, at the following localities: Wagon road between Whitehorse and Dawson, Yukon Territory, August 2, 18, 1908, and Takhuna, Yukon Territory, July 28, 1908.

The species is a common one. We have examples from the provinces of Ontario, Manitoba, and Saskatchewan.

Genus **Aspilates** Tr.

Aspilates orciferaria Wlk.

Napuca orciferata Wlk.: Cat. Brit. Mus., XXVI, 1,693, 1862.

Three male specimens as follows: Bernard harbour, Northwest Territories, July 10, 1916, 2 specimens (F. Johansen); Kugaluk river, Wollaston Land, Victoria island, Northwest Territories, August 18, 1915 (D. Jenness).

In addition to the above the Northern Party of the Canadian Arctic Expedition brought back seven specimens, all collected at Armstrong point, Victoria island, Northwest Territories, June 20 to July 11, 1916 (J. Hadley).

These specimens are much darker than others which we have in the National collection at Ottawa, from Manitoba, Alberta, and Saskatchewan.

We have also specimens of this moth from Nansen creek, Placer Mining camp, Yukon Territory, July 7-10, 1914 (D. D. Cairnes).

Genus **Selenia** Hbn.

Selenia alciphearia Wlk.

Selenia alciphearia Wlk.: Cat. Brit. Mus. XX, 184, 1860.

A specimen of this geometer from Siwash creek, Yukon Territory, lat. 65° 59' long. 141°, June 28, 1912 (D. D. Cairnes), is in the Canadian National collection. It is a female and closely resembles the form *ornata* B. and McD. which occurs on Vancouver island, British Columbia.

¹ In litt. March 22, 1919.

FAMILY PYRALIDAE.

Genus *Loxostege* Hbn.*Loxostege commixtalis* Wlk.

Scopula commixtalis Wlk.: Cat. Brit. Mus., XXXIV, 1,459, 1865

One Yukon specimen of this species is in the Canadian National collection. It bears the following label: Bear creek, 90 miles from Whitehorse, on Klauane road, Yukon Territory, June 13, 1914 (D. D. Cairnes).

Genus *Diasemia* Hbn.*Diasemia alaskalis*, n. sp.

Palpi dark brown, grayish-yellow above; head whitish, brown in centre; thorax reddish-brown; abdomen brown, whitish towards end; legs whitish. Primaries pale brownish with whitish scales along costa from base to reniform and with whitish area from t.p. line to outer margin; veins more or less marked with brown; costal margin yellowish-brown. T.a. line brown, sinuous, indistinct on costa. Orbicular oval, defined by brown, filled with yellowish-brown. Reniform rather large of an elongate-quadrate shape, slightly constricted centrally and filled with yellowish-brown. T.p. line dark brown, slightly dentate, almost straight from costa to vein 4 then incurved to below reniform on vein 2 and then excurved to inner margin. Terminal line brown, widened into conspicuous spots at ends of veins. Fringes pale brown, darker brown centrally. Secondaries whitish, thinly spotted with brown scales; discal spot brown; an inner second brown spot is present midway between the discal spot and the costal margin, as also a brown subterminal line; fringes as on primaries. Underside of all wings white, thinly spotted with brown, with all the markings of the upperside distinctly brown; primaries thinly dusted with brown.

Alar expanse, 22 mm.

Type, a male, in the Canadian National collection from Collinson point, Alaska, July 10, 1914 (F. Johansen). One paratype, bearing label "W. of Konganevik (Camden bay), Alaska, beginning of July, 1914 (F. Johansen)." The primaries of this specimen are more heavily dusted with brown than are those of the type.

Dr. Dyar kindly compared the specimen which I have made the type with material in the United States National Museum and reported that it represented an undescribed species of *Diasemia*.

The type is figured on Pl. V, fig. 11.

Genus *Titanio* Hbn.*Titanio* species—1.

Two specimens collected at Bernard harbour, Northwest Territories, one August 4, 1915, the other in July, 1916 (F. Johansen), were submitted to Dr. Dyar, who reported that they represented an undescribed species of the genus *Titanio* close to *alticolalis* B. and McD. The specimens, however, are considerably rubbed and for this reason I do not at present care to give the species a definite name.

Titanio species—2.

A third specimen from cape Pullen, Wollaston Land, Victoria island, Northwest Territories, July 15, 1915 (D. Jenness), probably also belongs to the genus *Titanio* and represents another undescribed species. It too, unfortunately, is in poor condition.

Genus *Pyla* Grt.*Pyla arctiella*, n. sp.

Palpi black with white scaling; head, thorax and body blackish with bronzy-green iridescence and dusted with white scales, body particularly so on venter, sides and posterior half of dorsum. Primaries dark brown with bronzy-green iridescence and rather heavily dusted throughout with white scales. T.a. line white, wide, almost straight, slightly bent outwardly at centre. T.p. line, white, wide, from costa near apex inwardly oblique to near centre of wing, then continuing in an outcurve to above vein 1b and then outwardly oblique to inner margin. Secondaries pale brownish. Fringes on all wings pale brownish. Legs dark brown, white-scaled. -

Wings beneath smoky-brown, paler along costa and near apex.

Alar expanse, 20 mm.

Type, a female, (Pl. V, fig. 13), from Collinson point, Alaska, July 17, 1914 (F. Johansen), in the Canadian National collection.

The generic determination was made by Dr. Dyar. This new species which is represented by one specimen, is, according to Dr. Dyar's table, close to *bistriatella* Hulst.

FAMILY EUCOSMIDÆ.

Genus *Eucosma* Hbn.

Eighteen specimens from the following localities: Nome, Alaska, August 24, 1916, 4 specimens (F. Johansen); west of Konganevik, Camden bay, Alaska, July, 1914, 5 specimens (F. Johansen); north side of big lake west of Konganevik, Camden bay, Alaska, end of June, 1914, 4 specimens (F. Johansen); Barter island, northern Alaska, June 27, July 11, 1914, 4 specimens (D. Jenness); Bernard harbour, Northwest Territories, July, 1915, 1 specimen (F. Johansen).

Unfortunately the above specimens are in a poor state of preservation. Eleven of them were submitted to Mr. August Busck, of the United States National Museum and were referred to the genus *Eucosma*.

OTHER MICROLEPIDOPTERA.

In addition to the specimens of the genus *Eucosma* a small number of other examples of microlepidoptera were collected by Mr. Johansen at Bernard harbour, Northwest Territories, July and August, 1915; cape Bathurst, Northwest Territories, July, 1916, and Ketchikan, southeastern Alaska, September, 1916. All of the specimens, however, are in very poor condition.

FAMILY HEPIALIDÆ.

Genus *Hepialus* Fabr.*Hepialus* species.

Two specimens were taken at Latouche, southern Alaska, September 3, 1916 (F. Johansen).

These specimens are in very poor condition; the primaries of one are missing and the other specimen is much rubbed and otherwise broken.

LARVÆ COLLECTED DURING THE EXPEDITION.

Various members of the Southern Party of the Canadian Arctic Expedition collected lepidopterous larvæ under stones, etc., and these were placed in alcohol. In most instances the specimens were immature, and without a knowledge of the adults it is not possible to make a report of any value on them. Such larvæ are of the families Nymphalidæ, Noctuidæ, as well as others of the Microfrenatæ.

In 1915 and also in 1916, Mr. Johansen found at Bernard harbour, Northwest Territories, specimens of a small lepidopterous larva feeding commonly in the roots of *Pedicularis lanata*. The first larva was found on July 4, 1915. Under this date Mr. Johansen's note reads: "Larva 10 mm. long, flesh-coloured, with head, neck plate and thoracic feet brown, found in the root of the common red-flowered *Pedicularis*. The larva had made a tunnel 15 mm. long, down the middle of the root." Other larvæ of similar size were collected on July 16. On July 18, a further examination of plants showed that the larva did not confine its burrows to the roots but that it also tunnelled the stem feeding upon the pith. As a rule only one occurred in a plant. The larva was further met with both in the roots and the stems of *Pedicularis* on the island forming the north side of the harbour, at Bernard harbour, on June 10, 1916. Unfortunately no adults were reared from larvæ kept under observation. (Breeding record 71.)

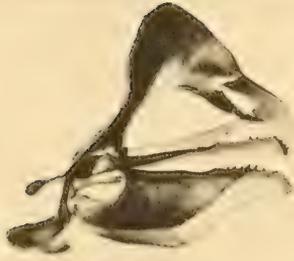
PLATE I.

- Fig. 1. Genitalia of *Oeneis tajgete* Hbn. (Near Whitehorse, Yukon Territory).
2. Genitalia of *Oeneis semidea* Say. (Gravel river, Northwest Territories).
3. Genitalia of *Oeneis semidea* Say. (New Hampshire, U.S.).
4. Genitalia of *Oeneis semidea arctica* Gibson. (Bernard harbour, Northwest Territories).
5. Genitalia of *Oeneis simulans* Gibson. (Bernard harbour, Northwest Territories).
6. Genitalia of *Oeneis cairnesi* Gibson. (Yukon Territory).
7. Genitalia of *Oeneis peartiae* Edw. (Bernard harbour, Northwest Territories).
8. Genitalia of *Oeneis brucei yukonensis* Gibson. (Yukon Territory).

(All magnified 14 times.)



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PLATE II.

- Fig. 1. Underside of *Oeneis semidea* Say, female. (Orange creek, Yukon Territory).
 2. Underside of *Oeneis semidea* Say, male. (Pelly river, Yukon Territory).
 3. Underside of *Oeneis semidea* Say, male. (Gravel river, Northwest Territories; genitalia of this specimen shown on Plate 1, fig. 2).
 4. Underside of *Oeneis semidea arctica* Gibson, paratype, male. (Bernard harbour, Northwest Territories).
 5. Underside of *Oeneis simulans* Gibson, type, male. (Bernard harbour, Northwest Territories).
 6. Underside of *Oeneis peartiae* Edw., female. (Bernard harbour, Northwest Territories).
 7. Underside of *Oeneis cairnesi* Gibson, type, male. (White river district, Yukon Territory).
 8. Underside of *Oeneis cairnesi* Gibson, paratype, female. (White river district, Yukon Territory).
 9. Underside of *Oeneis brucei yukonensis* Gibson, type, male. (Klutlan glacier, Yukon Territory).
 10. Upperside of *Oeneis brucei yukonensis* Gibson, paratype, female, showing ocelli on primaries. (Klutlan glacier, Yukon Territory).

(All natural size).

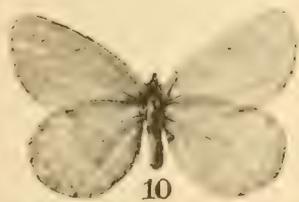


PLATE III.

- Fig. 1. *Pieris napi pseudobryoniae* Verity, male. (Bartlett bay, Alaska).
 2. *Pieris napi pseudobryoniae* Verity, female. (Bartlett bay, Alaska).
 3. *Pieris napi arctica* Verity, female. (Bet. lat. 67° 25' and 66° 30'; long. 141°).
 4. *Pieris napi arctica* Verity, male, underside. (Nansen creek, Yukon Territory).
 5. *Erebia softa* Stkr., female, underside. (Harrington creek, Yukon Territory).
 6. *Brenthis natazhati* Gibson, type, male, underside. (Long. 141°, north of mount Natazhat).
 7. *Euchloe creusa* Dbldy., chrysalis. (Departure bay, British Columbia).
 8. *Hyphoraia alpina* Quens., cocoon. (Collinson point, Alaska).
 9. *Gynaephora rossi* Curtis, larva. (Collinson point, Alaska).
 10. *Hyphoraia alpina* Quens., cremaster, X 9. (Collinson point, Alaska).
 11. *Hyphoraia festiva* Bork., cremaster, X 9. (Bernard harbour, Northwest Territories).
 12. *Brenthis natazhati* Gibson, female. (Bernard harbour, Northwest Territories).
 13. *Autographa altera* Ottol.? male. (Bernard harbour, Northwest Territories).
 14. *Autographa sackeni* Ottol.? male. (Mayo lake, Yukon Territory).
 15. *Plebeius scudderi* Edw., male. (West side of Kluane lake, Yukon Territory).
 16. *Plebeius aquilo* Bdv.?, male. (Burwash creek, Yukon Territory).
 17. *Plebeius aquilo* Bdv.?, male. (Kluane, Yukon Territory).
 18. *Plebeius aquilo* Bdv., male. (Bernard harbour, Northwest Territories).

(All natural size).



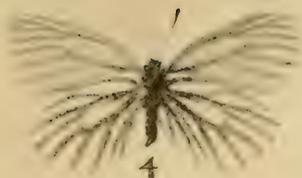
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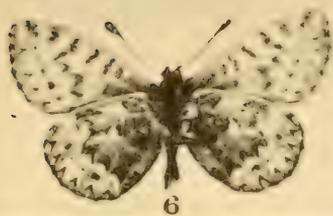
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PLATE IV.

- Fig. 1. *Eurymus boothi* Curtis, male. (Bernard harbour, Northwest Territories).
 2. *Eurymus boothi* Curtis, male. (Bernard harbour, Northwest Territories).
 3. *Oeneis brucei yukonensis* Gibson, type, male. (Klutlan glacier, Yukon Territory).
 4. *Oeneis semidea arctica* Gibson, type, male. (Bernard harbour, Northwest Territories).
 Genitalia of this specimen shown on Plate I, fig. 4.
 5. *Oeneis peartia* Edw., female. (Bernard harbour, Northwest Territories).
 6. *Oeneis cairnesi* Gibson, type, male. (White river district, Yukon Territory).
 7. *Erebia fasciata* Butler, female. (Lat. 65° 10' long. 141°).
 8. *Erebia fasciata* Butler, male. (Armstrong point, Victoria island, Northwest Territories).
 9. *Erebia rossi* Curtis, female. (Wollaston Land, Victoria island, Northwest Territories).
 10. *Erebia youngi* Holl., male. (Siwash creek, Yukon Territory).
 11. *Erebia sofia* Stkr., male. (White river district, Yukon Territory).
 12. *Brenthis distincta* Gibson, type, female. (Harrington creek, Yukon Territory).
 (All natural size).



PLATE V.

- Fig. 1. *Brenthis frigga alaskensis* Lehm., female. (Collinson point, Alaska).
 2. *Brenthis polaris* Bdv., female, underside. (Barter island, Alaska).
 3. *Brenthis polaris* Bdv., male. (Barter island, Alaska).
 4. *Brenthis polaris* Bdv., female. (Barter island, Alaska).
 5. *Brenthis pales alaskensis* Holl., male. (Racquet creek, International Boundary).
 6. *Brenthis natazhati* Gibson, type, male. (International Boundary, north of mount Natazhat).
 7. *Brenthis frigga improba* Butl., female. (Bernard harbour, Northwest Territories).
 8. *Brenthis frigga improba* Butl., male. (W. of Konganevik, Camden bay, Alaska).
 9. *Parabarrovia keelei* Gibson, paratype, female. (Mountain below Twitya river, Northwest Territories).
 10. *Parrabarrovia keelei* Gibson, type, male. (Mountain below Twitya river, Northwest Territories).
 11. *Diasemia alaskalis* Gibson, type, male. (Collinson point, Alaska).
 12. *Homoglaea murrayi* Gibson, type, female. (Bernard harbour, Northwest Territories).
 13. *Pyla arctiella* Gibson, type, female. (Collinson point, Alaska).
 14. *Anarta leucocycla* Staud., female. (Cape Pullen, Victoria island, Northwest Territories).
 15. *Itame andersoni* Swett., male. (60 miles from Whitehorse, Yukon Territory).
 16. *Anarta subfumosa* Gibson, type, male. (Armstrong point, Victoria island, Northwest Territories).
 17. *Barrovia fasciata* Skin., male. (Barter island, Alaska).
 18. *Hyphoraia alpina* Quens., male. (Collinson point, Alaska).
 19. *Hyphoraia festiva* Bork., male. (Bernard harbour, Northwest Territories).
 20. *Hyphoraia festiva* Bork., male. (Port Epworth, Coronation gulf, Northwest Territories).

(All natural size).



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Volume II: Mammals and Birds.

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Part B: Birds. By R. M. Anderson and P. A. Taverner. (*In preparation*).

Volume III: Insects.

Part A: Collembola. By Justus W. Folsom. (*Issued*).

Part B: Neuropteroid Insects. By Nathan Banks. (*Issued*).

Part C: Diptera. By Chas. W. Alexander, Harrison G. Dyar, and J. R. Malloch. (*Issued*).

Part D: Mallophaga and Anoplura. By A. W. Baker, G. F. Ferris, and G. H. F. Nuttall. (*Issued*).

Part E: Coleoptera. By J. M. Swaine, H. C. Fall, C. W. Leng, and J. D. Sherman, Jr. (*Issued*).

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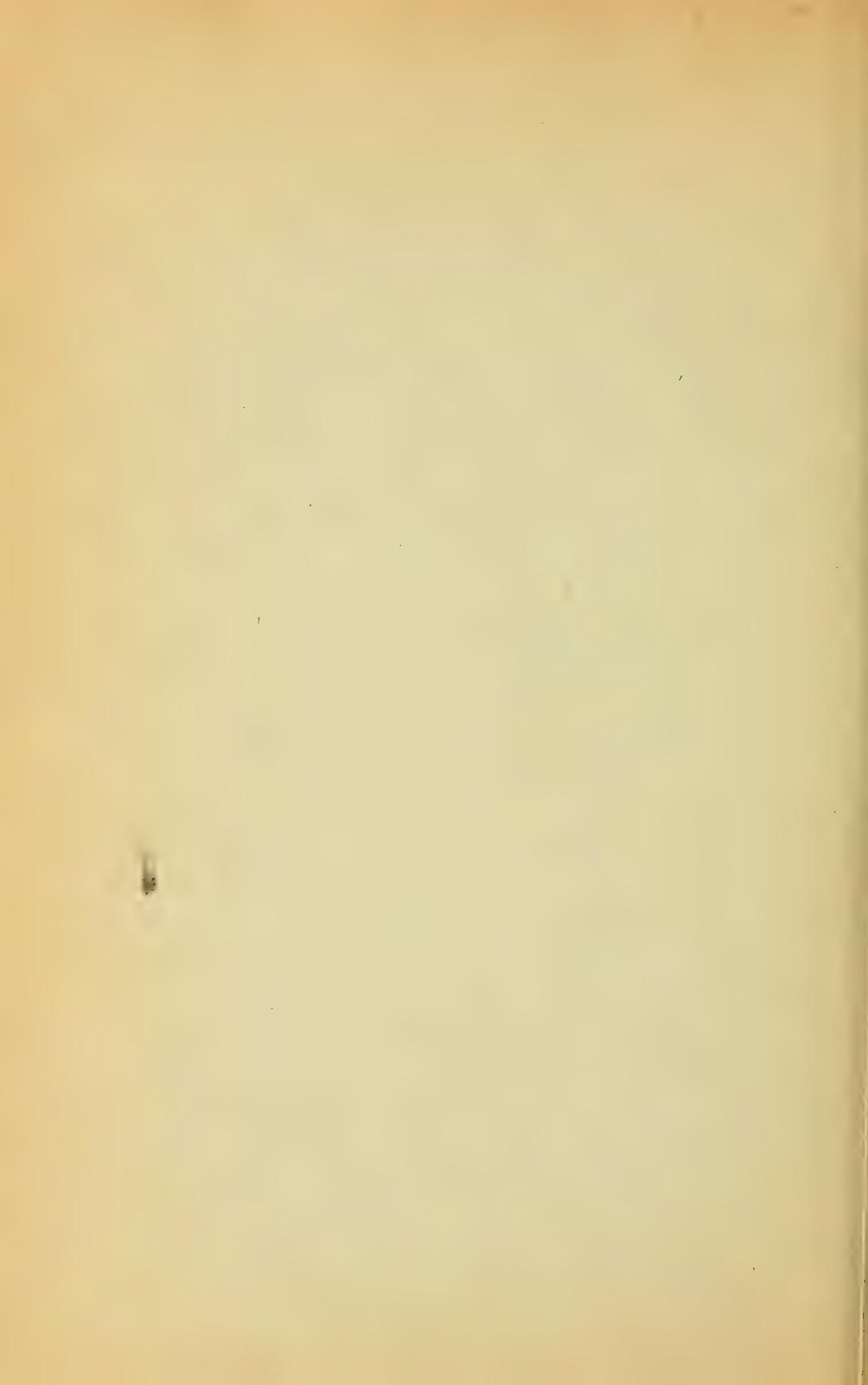
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Tidal Observations. By W. Bell Dawson. (*In preparation*).



REPORT
OF THE
CANADIAN ARCTIC EXPEDITION
1913-18

VOLUME III: INSECTS

PART J: ORTHOPTERA

By E. M. WALKER

SOUTHERN PARTY, 1913-16



OTTAWA
THOMAS MULVEY
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1920

Issued Sept. 4th, 1920

Report of the Canadian Arctic Expedition, 1913-18.

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REPORT

OF THE

CANADIAN ARCTIC EXPEDITION 1913-18

VOLUME III: INSECTS

PART J: ORTHOPTERA

By E. M. WALKER

SOUTHERN PARTY, 1913-16



OTTAWA
THOMAS MULVEY
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1920

Orthoptera Collected in the Canadian Arctic.

By E. M. WALKER.

University of Toronto.

No orthoptera were received among the insects collected by the Canadian Arctic Expedition 1913-18, but we have received a single grasshopper collected by Mr. V. Stefánsson in 1911. The following is a note on this insect:

FAMILY ACRIDIDAE

Melanoplus frigidus (Boheman).

A single female of this species in poor condition, bears label giving the following data:

"No. 1670 [F. J.]. Langton bay (Franklin bay), Northwest Territories, summer of 1911. V. Stefánsson."

In a note to the writer Dr. R. M. Anderson states that "This specimen, brought to us with other insect specimens in 1914 from our old house at Langton bay by a former Eskimo employee, while taken in the Langton bay region, was most probably picked up from twenty to forty miles inland on the Horton river, south side of the Melville mountains, a range of hills about 1,000 feet high, skirt-ing the south side of Franklin bay."

The capture of this Palaearctic species in the above locality was not unexpected as several specimens were taken by Mr. J. M. Jessup on the International boundary, Alaska, lat. 69° 20' N., long. 141° W., on Aug. 8, 1912 (Caudell, *Can. Ent.*, vol. XLVII, 1915, p. 160).

On account of the difficulty of determining species of this group from the female sex alone, the writer submitted this specimen to Mr. Morgan Hebard, who is engaged in a revision of the *Melanopli*. I had determined it as *Podisma frigidum* (Boheman) with some doubt, as it differs slightly in the form of the valves of the ovipositor from the single female European specimen I have of this species, but Mr. Hebard has confirmed the determination. In a letter to the writer he says "You will note the transfer of this species to the genus *Melanoplus*. I am bringing out the data on this change in a paper which will be published shortly."¹ I have been likewise of the opinion, for some time, that this species is a true *Melanoplus*, and it is of special interest as being the only species of this genus known from the Old World, where it is widely distributed in northern regions, having been taken in Norway, Lapland and Siberia, and as a glacial relict in the Swiss Alps and the Tyrol.²

Three other species of Orthoptera are definitely recorded from the Arctic regions of North America. These are *Gomphocerus clavatus* Thomas, *Melanoplus borealis* (Fieber) and *M. fasciatus* (Barnston-Walker).

Gomphocerus clavatus was recorded by Caudell (*loc. cit.*) from the same locality in Alaska where *M. frigidus* was taken. It is a widely distributed species, ranging from eastern Manitoba to the Rocky Mountains and southward to Nebraska, Kansas, Colorado and New Mexico. It is found at high elevations in the mountains of Colorado, Wyoming, Idaho and New Mexico. The genus *Gomphocerus* is of Palaearctic origin, *G. clavatus* being the only American species.

Melanoplus borealis has been until very recently considered as a typically arctic form. It has been recorded from Greenland (Fieber, *Lotos*, III, 1853),

¹Since the above was written a preliminary discussion of this subject has appeared in the following paper by Mr. Hebard: "New Genera and Species of *Melanopli* found within the United States." (*Trans. Am. Ent. Soc.*, XIV, pp. 257-298, 1919).

²Hebard (*op. cit.*) states that the recently described *Podisma prossenii* Puschig from the Eisenhut in Carinthia is also a *Melanoplus*.

Labrador, Hudson Bay and Alaska. The specimens described by Scudder in his "Revision of the Melanopli" came from the Esquimaux village of Ramah, on the coast of Labrador, lat. 57° N., while the Alaska specimens recorded by Caudell (Pap. Harriman Alaska Exp., Proc. Wash. Acad. Sc., vol. II, pp. 511-512, 1900) were taken at Kukak Bay, Alaska Peninsula.

I have a large series of this species from Nain (lat. $56^{\circ} 30''$) and Hopedale (lat. $55^{\circ} 24''$), Coast of Labrador, an examination of which convinced me that they are not specifically distinct from *M. extremus* Walk., a species also recorded from Labrador and Arctic America, which was placed by Scudder in a different section of the genus. On submitting this question to Mr. Hebard, I learned that he had already placed *M. extremus* as a race of *borealis* in his unpublished notes on this group, and Messrs. Morse and Blatchley are also of the opinion that the two forms are conspecific. This being the case, *M. borealis*, as a species, is by no means exclusively arctic, but ranges over nearly the whole of Canada and extends also into various parts of the northern United States. It is, however, a typically boreal form and probably reaches its highest development in the Hudsonian zone.

Melanoplus fasciatus is a species of similar range and has also been recorded from Nain, Labrador, so that it may be fairly included in the arctic fauna.

Several other species of Acrididae have been reported from "Arctic America" chiefly by F. Walker (Cat. Derm. Salt. Brit. Mus., III-IV, 1869-71), but in the absence of definite localities it is uncertain whether they were taken in the Arctic zone proper or the Hudsonian. These are *Acrydium granulatum* Kirby, *Chorthippus curtipennis* (Harr.), *Hippiscus apiculatus* (Harr.) and *Melanoplus femur-rubrum* (DeGeer). The type locality of *A. granulatum* is in lat. 65° , and it was taken by Adam White (Richardson, Arctic Search. Exp., II, p. 360, 1851) at Fort Simpson (lat. $61^{\circ} 30'$) and at the junction of the Mackenzie and Slave rivers, so that it cannot be certainly regarded as arctic on the basis of these records. The other records are indefinite and that of *M. femur-rubrum* almost certainly erroneous, the species referred to being probably *M. borealis*.

A few other Orthoptera may be mentioned as very possibly ranging into the arctic regions. *Melanoplus kennicottii* Scudd. and *M. atlantis* (Riley) were taken by Kennicott on the Yukon river, Alaska. The former has also been recorded from Saskatchewan, Alberta and Montana, while the latter is widely distributed over the greater part of North America, extending into Mexico.

Melanoplus bruneri Scudd. (*M. alaskanus* Scudd.) is also recorded from Alaska and is widely distributed in Canada in the Boreal region.

Acrydium brunneri Boliver (which is perhaps the true *A. granulatum* (Kirby), and *Melanoplus bivittatus* Say are recorded from the Hudson bay region, while *Circotettix verruculatus* (Kirby) ranges far north, the type specimen having come from lat. 57° N.

All the species mentioned above are locusts or "short-horned grasshoppers" (Acrididae), but there is one species of "long-horned grasshopper" (Tettigoniidae), which has some claim to membership in the Arctic Fauna. This is *Idionotus sphagnum* (Walk.) (syn. *I. brevipes*¹ Caud., *Platyceis fletcheri* Caud.), which was originally described from St. Martin's Falls, Hudson Bay. It was redescribed by Caudell (Proc. U.S. Nat. Mus., XXXII, p. 396, 1907) as *Idionotus brevipes* from a single male, taken by Kennicott in "Arctic America" (Caudell, l.c.). This same specimen had already been mentioned but not described by Scudder (Can. Ent., XXVI, p. 182, 1894) in his characterization of the genus *Idionotus*, and is stated to have been "collected by Kennicott somewhere on his explorations in or going to Alaska." This species is now known also from northwestern Ontario, Manitoba and Alberta.

¹I am indebted to Mr. W. S. Blatchley for the synonymy of *Idionotus*⁷*brevipes* Caud. with *Decticus sphagnum* Walk. I had long suspected this to be the case, as we have only one northern Decticine, as far as known.

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1913-18

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AND

LIST OF NEW GENERA AND SPECIES COLLECTED BY THE EXPEDITION

By C. GORDON HEWITT



OTTAWA
THOMAS MULVEY,
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1920

Issued December 10, 1920

*Author
for library*

DIV. INSECTS

REPORT

OF THE

CANADIAN ARCTIC EXPEDITION 1913-18

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PART K: INSECT LIFE ON THE WESTERN ARCTIC COAST OF AMERICA

By FRITS JOHANSEN



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PART K: INSECT LIFE ON THE WESTERN ARCTIC COAST OF AMERICA

By FRITS JOHANSEN



OTTAWA
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PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1921

Insect Life on the Western Arctic Coast of America

By FRITS JOHANSEN¹

Introduction

The territory covered by the Canadian Arctic Expedition, 1913-18, stretches from Wrangell island (about latitude 71 degrees north, longitude 178 degrees west) off Siberia to the new land found north of the Canadian Arctic archipelago (about latitude 80 degrees north, longitude 100 degrees west).

Much of this area, however, was passed only on ship or during sledge-expeditions, and from some localities no collections of insects or plants were made.

The expedition was divided into a northern and a southern party, the northern exploring principally the Arctic ocean and Canadian Arctic archipelago, while the southern investigated the continental coast. Owing to the unfortunate loss of the naturalist of the northern party, Mr. James Murray, with the "Karluk," off Wrangell island, in 1914, the collections made up to then by that party were lost, but the few specimens collected later have a considerable value, owing to the high latitude in which they were found.

Reports on all the entomological specimens appear in this volume. Rearing experiments were made with more than a hundred various insects, etc., but owing to the difficulties incident to a trip of this description, only a quarter of the experiments were successful.

Investigations were made at:²

Teller, Alaska (July-August, 1913).

Camden bay, Alaska (September, 1913 to July, 1914).

Demarcation point, Alaska (May, 1914).

Herschel island, Yukon (July, 1914 and August, 1916).

Peninsula south of Dolphin and Union strait, Northwest Territories (August, 1914 to July, 1916).

Lower part of Coppermine river, Northwest Territories (February, 1915).

Some insects were collected in Alaska at Nome, Latouche and Ketchikan; and at Cape Bathurst, Victoria island and Coronation Gulf, Northwest Territories.

In the present article the natural conditions and the insect life in these localities are described, but descriptive geographical details are omitted. With this series of reports is included a list of flowering plants, by Theo. Holm and the late J. M. Macoun, and vegetation is, therefore, referred to only when it affects insect life.³ The region where the forest insects were found lies in the transition zone between the arctic and the subarctic, on the boundary of the barren grounds, and at some distance from the coast; but it is included in this report because the forest insects are described in the report on Coleoptera.

To this report are added data regarding insect life on some of the islands in the Canadian Arctic archipelago, and a comparison is made between these insects and those of Greenland.

¹The report as originally submitted by the author has been considerably cut down and has been recast into impersonal form to conform to the other reports of the series.

²See map of Western Arctic Coast of America, Fig. 1, p. 41k.

³Specific plant identifications in the present paper are from collections determined by Macoun and Holm. (See Vol. V, Part A, Vascular Plants.)

SOUTH SIDE OF SEWARD PENINSULA, ALASKA (NOME AND TELLER)

This district has been so often and so well described that further description in this report appears unnecessary.

Though the character of the country and climate around Nome is practically the same as at Port Clarence (Teller), that of the coast line is different. At Teller, a long, low sandspit runs from the southeast parallel to the mainland and embraces the spacious harbour of Port Clarence. At the head of the port two sandspits, on the southern of which Teller is situated, mark the entrance to Grantley harbour, which is continued by a channel to Imuruk lake.

The southern spit, only a few feet above the sea, consists of gravel and sand with grass-tufts and flowering plants including *Papaver nudicaule*, *Chamaerium latifolium*, *Artemisia* and *Honkenyia peploides*; the tundra, best developed in depressions, is characterized by creeping willows, *Carex*, etc. A few larger depressions (some artificial) contain water even in August (Pl. V, fig. 1). Just west of the town a large lake stretches almost across the sandspit, separated from Grantley harbour by a swamp, and from Port Clarence by sand hills. This lake is a case of recent marine formations, for marine diatoms are found in it, and Commander Trollope's chart of the place made in 1854 shows a lagoon with an outlet to Port Clarence and connected at high tide with Grantley harbour. Since that time the ends of the lagoon have been filled in by beach-deposits for about 100 yards on each side, leaving a couple of ponds on the Port Clarence side.

On the other sides the lake is surrounded by low hills and elevated tundra intersected by small streams, which carry the melting snow in spring time, but later are dry. The depressions of the higher tundra enclose a few ponds in which are mosses, *Hippuris*, *Utricularia*, etc.; and in the gulches among the hills and in shelter of the banks, willows attain a fair size, though not so high as at Nome. *Hippuris*, *Carex*, etc., cover most of the lake shore, growing on mud or gravel-bottoms; and swamps occur between the lake and the surrounding tundra. (Pl. v, fig. 1).

Insects were very plentiful here, but some of the plants plentiful at Nome were absent, owing, perhaps, to the higher altitude.

The fauna and flora of this part of Seward peninsula may best be compared to the Kotzebue sound area and the Mackenzie delta beyond the tree limit, but little is known of insect life in either of these districts.

The fauna, flora, climate, and general nature of the Nome and Teller areas are so similar that their insect life is here treated as identical. The fresh-water insects include:—

(a) On the surface: Collembola, and swarms of peculiar flies (*Hydrophorus signiferus*) jumping around like the well-known water-bugs (*Hydrometra*). They evade capture by flying, but afterwards "slide" backwards to the surface to pursue their predacious habits. Their development probably takes place in the water, to which they are far more attached as imagines than is the case with tipulidae, mosquitoes, and other aquatic diptera.

(b) Under the surface: coleopterous, trichopterous, and dipterous larvæ, besides the bug *Arctocorixa* sp. and various water-beetles (Dytiscidæ) as *Ilybius angustior*, *Agabus nigripalpis*, *Agabus infuscatus*, *Colymbetes dolobratius*.

The development of the dytiscid larvæ (*Agabus* sp.) outside of the water is interesting. In the sand or mud flats surrounding the lake, the larvæ make their open pupal cells, sheltered by any stone, board, tin can, old sacks, or such waste material as is found near a town or camping place. This material, obstructing the sunlight, renders vegetation scarce and deformed, and the surface is better able to retain the moisture.

A variety of invertebrates were found there, ranging from snails (*Succinea* and *Agriolimax*), myriapods (*Cryophilus alaskanus*, *Arctogeophilus glacialis*, *Ezembius stejnegeri*), mites, spiders (*Pardosa glacialis*), and collembola, to

various insect larvæ (diptera, especially tipulids, and coleoptera) and more secretive living insects (elaterid and carabid beetles *Elaphrus riparius*, *Amara brunnipennis*, *Pterosticus vindicatus*, *P. similis*, *Peophila eschscholzii*, *Bembidium complanatum*, small homoptera, etc.). The finding of myriapods is interesting, because it is the most northern record so far of this order on the American continent. On the tundra itself an occasional hairy lepidopterous larva may be seen, and tiny mites, spiders (*Micranecta crassimana*, *Tmeticus brunneus* and hemiptera; or a phryganeoid (*Anabolia marginata*) resting its frail body on a grass-leaf. Curculionid beetles are also at work as larvæ or adults, and a great number of flies are seen, among which the caribou bot-fly, *Oedemagena (Hypoderma) tarandi*, is perhaps the most interesting, owing to its bumblebee-like appearance and life history. Various species of bumblebees (*Bombus kirbyellus*, *B. polaris*, *B. sylvicola*, *B. pleuralis*, *B. lucorum*, *B. frigidus*) are all attracted to *Epilobium spicatum* and other flowering plants (*Iris*, *Aconitum*, *Delphinium*, Leguminosæ, *Campanula*, *Pedicularis*, etc.), when the male willow catkins have fallen off. The plant which attracts most of the insects at Nome is, however, the imposing *Heracleum lanatum*, which in protected places is more than six feet high and spreads its enormous, sweet-scented cymes towards the sun. On its flowers a number of different flies collect, the tipulid, *Dicranomyia alascaensis*, a phryganeoid (*Limnephelus* sp.), *Vespa marginata*, and the big green saw-fly, *Rhodogaster reliqua*; also various ichneumonids, butterflies, and moths as *Eurymus palaeno chippewa* Edw., *Eucosma* sp., and other microlepidoptera. Few butterflies are seen at the end of August, but an easily scared geometrid moth (*Lygris destinata* L.) is very common at that time. Swarms of mosquitoes (*Aedes* sp.) make themselves felt rather forcibly in the shelter of the gully-banks or over the various ponds and pools on warm, quiet days. The shrubby willows harbour a variety of insects. Mites and saw-flies make galls in the leaves, or the latter are fastened together by a small lepidopterous larva, which skeletonizes the sides of the leaves thus turned inwards. *Lithocolletis* (?) larvæ mining in the leaves of *Petasites*, *Artemisia*, *Saxifraga*, etc., were also observed, and a spider with its web between plant leaves, spinning some of these together as a breeding chamber, where the eggs and recently emerged young may be found at the end of August.

On the tall willow-bushes in the gullies inland the leaf-eating or gall-forming sawfly larvæ (sometimes infected with chalcid parasites) are found. A grey, ball-shaped nest of *Vespa marginata* is occasionally suspended from the lower branches or trunks of these small trees, and partly hidden by the foliage or vegetation, but may be obtained with less risk from the inside of old tin cans or boxes which may be lying around.

Vegetation and insect life in the hills back of the coastal tundra are scantier than on the lowland. Apart from flies and mosquitoes, everywhere present, the most characteristic insect is the bumblebee, but spiders, mites, collembola, small beetles, moths, and craneflies are also found.

Various small arthropods are also found under driftwood and other washed up material on the beach.

The wingless parasites (mallophaga, fleas and lice) on birds, mammal, and human beings, and the foreign insects introduced by whites during the last two decades complete the insect-life in this region.

FROM BERING STRAIT TO POINT BARROW, ALASKA

Little is known of the insects in this region, and no collections were made by the Canadian Arctic Expedition.

The flora and insect-fauna of this region seem to have the same general character as that east of Point Barrow, except perhaps the inner part of Kotzebue sound, where the flora is said to be unusually luxuriant, and the insect life correspondingly richer.

A few insects were collected at Point Barrow (cape Smyth), by the United States International Polar Expedition (Murdoch), and have been provisionally identified by Riley, in the report of the said expedition (Washington, 1884), as follows:—

<i>Chironomus</i> sp.	}	Diptera.
<i>Scatophaga</i> sp.		
Tachinid (<i>Euphorocera</i> ?)		
<i>Anthomyia</i> sp.		
Tipulid (<i>Ctenophora</i> sp.)		
Can. Entomol., 1917-1918.		
<i>Tipula coracina</i> Alex.		
<i>Corāylura</i> sp.		
<i>Oedemagena tarandi</i>		
Phryganeoid		
Perlid (<i>Leptocerus</i> sp.)	}	Neuropteroids.
<i>Bombus moderatus</i>		
“ <i>sylvicola</i>	}	Hymenoptera.
<i>Urocerus flavicornis</i>		
<i>Dasychira rossi</i>	}	Lepidoptera.
<i>Amara obtusa</i>		
Chrysomelid			}	Coleoptera.

COAST BETWEEN POINT BARROW AND MACKENZIE DELTA

The Arctic mountains stretch from cape Lisburne to the Mackenzie delta and their foothills merge gradually into the coastal plain that reaches the Arctic ocean. The beach is formed, sometimes by tundra bluffs up to 30 feet in height and sometimes by low alluvial plains fringed by sandpits and lagoons. The chains of islands off the coast have a similar composition. The width of the coastal plain is greatest at point Barrow, where it is more than 150 miles, but decreases to the southwest, so that the mountains are within 12 miles of the ocean at a point east of the 141st meridian, and the foothills sometimes usurp the place of the plain. The rivers, some very large, of this part of Alaska and Yukon receive many tributaries from the foothills, and when these lateral creeks have finally been left behind, the watercourses run fairly straight to the north, for the hills along the Mackenzie delta prevent an eastern outflow. Ground ice is found to varying depths, especially west of Camden bay. The vegetation is the typical Arctic tundra, best developed in valley-bottoms and in the extensive coastal swamps where most of the many lakes or ponds are situated (Pl. V. fig. 2). An enormous quantity of driftwood, from the Mackenzie, lines the beach at certain places, and the coastline is subjected to a continuous erosion by waves or screw-ice at some parts and upbuilding by sand and gravel at others. Even where the coastal plain is missing, as east of Stokes point, lagoons, sandbars, and gravel spits are formed at or near the mouths of rivers. Shingle point is a conspicuous example of this, presenting a shelter for boats.

Herschel island¹ and the coast opposite and eastward are well covered by vegetation, which is surprisingly abundant on low or protected parts.

The developments of plant and insect life are so intimately connected that the study of one involves the study of both, and also, of course, of climatic conditions, the influence of which has been dealt with in the report on climate and in Mr. F. W. L. Sladen's report.² The development of plant-life especially affects the non-predacious insects such as certain coleoptera, diptera and the lepidoptera, sawflies, and bees.

Such plants as mosses, *Cassiope*, *Saxifraga*, *Ranunculus*, etc., which, during the melting of the snow, are immersed in water, bear green or new leaves at the beginning of May—earlier than is the case with those plants that draw their power only from the sun.

¹ For topographical description see Geol. Surv., Can., Sum. Rept., 1915, p. 236, J. J. O'Neill.

² Report Canadian Arctic Exped., 1915-18, III, G. 1919.

Apart from mosses and grasses and Cyperacæ whose first new leaves are less easily noticed, new leaves and buds were found on plants as follows:—

CAMDEN BAY TO DEMARCATIION POINT, 1914

May 1-10

Cerastium alpinum
Empetrum nigrum
Ledum palustre
Cassiope tetragona

May 21-31

Arenaria peploides
Martensia maritima
Potentilla pulchella } buds only.
Saxifraga decipiens
Papaver nudicaule
Cochlearia groenlandica
Oxytropis nigrescens

June 11-20, New leaves:

Salix pulchra
S. reticulata
Ranunculus nivalis
Anemone parviflora
Taraxacum lyratum
Artemisia comata
Papaver nudicaule
Dryas integrifolia
Lupinus nootkatensis (buds only)
Alopecurus alpinus
Carex stans.
Primula borealis
Elymus mollis
Epilobium latifolium

May 11-20

Vaccinium caespitosum
Oxytropis nigrescens
Betula glandulosa
Pedicularis lanata
Saxifraga oppositifolia (new leaves,
little developed).
S. hieraciifolia
Dryas integrifolia } leaf-buds only.

June 1-10, New Leaves:

Various Caryophyllacea
" *Saxifraga* (e.g. *S. bronchialis*
S. tricuspida)
" Compositæ
Pedicularis lanata
Pyrola grandiflora
Oxyria digyna
Caltha palustris
Equisetum arvense (buds only)
Salix pulchra (only buds)
Juncus vulgaris (only buds)

June 21-30, New leaves:

Equisetum arvense
Sicliaria longipes
Silene acaulis
Polemonium boreale
Petasites frigida
Lloydia serotina
Rubus chamaemorus
Empetrum nigrum

From July onward all the plants have new leaves.

Flowers of the following plants were found. See also Vascular Plants Collected in Arctic North America by the "Gjöa" Expedition (Ostenfeld, 1910).

June 3-4

Salix pulchra (female)
Eriophorum vaginatum
Saxifraga oppositifolia

June 11-15

Salix pulchra (male)
Lycopodium sclago
Ranunculus nivalis
Anemone parviflora
Salix Richardsonii (male and female)

June 17-20

Salix rotundifolia (male and female)
S. ovalifolia var. *camdensis* (male and female)
Cochlearia groenlandica -
Oxyria digyna
Oxytropis nigrescens
Potentilla pulchella
Pedicularis lanata
Dryas integrifolia

June 21-24

Draba alpina, *D. stadnizensis*
Oxytropis nigrescens

June 27-28

Papaver nudicaule
Cassiope tetragona

Primula borealis
Lloydia serotina
Pedicularis arctica
Ranunculus sulphureus
Caltha palustris
Petasites frigida
Salix reticulata
Saxifraga nelsoniana

June 29-30

Pedicularis sudetica
Carex rariflora
Polygonum viviparum
Luzula nivalis
Alsine arotica
Silene acaulis

July 2-7

Eriophorum angustifolium
E. Scheuchzeri
Carex rigida
Lagotis glauca
Polemonium boreale
Cerastium alpinum
Ranunculus Pallastii
Saxifraga hirculus
S. decipiens
Lupinus nootkatensis
Phaca frigida
Parrya macrocarpa

July 11

Artemisia comata

July 17

Taraxacum lyratum
Alopecurus alpinus
Astragalus alpinus
Saxifraga rivularis
S. hieraciifolia
Saussurea angustifolia
Pedicularis capitata
Eutrema edwardsii
Stellaria humifusa
Saxifraga cernua
Lychnis apetala
Senecio atropurpureus
Hierochloë pauciflora
Carex reducta, C. stans
Luzula spicata
Hippuris vulgaris

July 26-29 (Martin point, Alaska)

Flymus mollis
Glyceria tenella
Sedum rhodiola
Stellaria longipes
Hallanthus peploidea
Carex reducta
Carex incurva
Dipontia Fischeri
Mertensia maritima
etc.

August 3 (Icy reef, Alaska)

Draba nivalis
Arctogrostis latifolia
Crepis nana
Epilobium latifolium
Festuca ovina var. brevifolia
Poa arctica
Androsace Chamaejasme

Flowers of *Empetrum nigrum* were found on May 6, 1914, but this may have been a 1913 flower.

Observations on flowers were also made at Shingle point and on Herschel island, Yukon, in the beginning and middle of August, 1914 and 1916. The vegetation at these two localities, and at others equally close to the Mackenzie delta, is apparently a week or more earlier than along the coast west of the International boundary line.

No new flowers were observed west of Mackenzie delta after August 21. The Compositae and grasses are the dominating ones in the end of August.

From the beginning or middle of September the frost gradually kills off the flowers and green leaves, and about the end of September, when the first snow has fallen, the dead fruit-stems and leaves are the main plant parts observed, though hibernating leaf-buds are sometimes seen.

INSECT LIFE ON ALASKAN ARCTIC COAST

October, 1913, to April, 1914.

Insects are scarce along the Alaskan Arctic coast after October and are found only under stones and driftwood, or by digging in the frozen tundra or cutting holes in the freshwater ice. Entomological investigations in northeast Greenland have shown that the hibernation of insects in that region¹ is very similar to that of insects in northern Alaska, though the American Arctic is richer in the number of species, which are mostly different from the Greenlandic.

The main objective of the hibernating insects is to find, before the snow and frost come, some place where the spring water can best be avoided. They therefore take every advantage of cover, especially of those places likely to become free of snow in the early spring. In this, not all are successful, but they are more likely to be found, during the winter, on such exposed localities than on lower ones that have a better vegetation (Pl. III, fig. 1). An exception is, however, formed by certain larvæ, such as large diptera, e.g., tipulidæ, which hibernate down in the ground until the medium surrounding them thaws. Aquatic insects and larvæ that inhabit water all through the year endeavour to bore themselves into the mud, and failing this, are killed, and hibernate only as eggs when the water freezes to the bottom.

Insects hibernating in the latter part of September, of course remain in that state during the winter, though probably in decreased numbers, a great many being killed when the temperature falls to zero Fahrenheit. Most hibernating insects can withstand temperatures down to 50 degrees below, and the mortality may be ascribed rather to factors in the life-cycle of each particular insect than to the cold.

¹ See Meddelelser om Grønland, Vols. 19 (Deichmann) and 43 (Johnsen).

In the fresh waters of northern Alaska insects and larvæ are abundant, even in winter, as compared with those on land. They were observed in frozen ponds and lakes and in a warm creek, a tributary to Sadlerochit river, back of Camden bay. In a pond only 4 feet deep, on which the ice was 10 inches thick on October 9, many copepods, *Limnocalanus johanseni* Marsh, ostracods, and other minute animals, and a number of midge larvæ were found. Ponds such as this would, of course, freeze to the bottom later in the winter. From a neighbouring stream a perlid nymph was obtained from beneath the ice. Examinations of the lakes and ponds in spring and early summer led to the conclusion that the following forms hibernate in or near fresh water:—

Aquatic diptera—larvæ (especially tipulids and muscids).

Dytiscid—beetles.

Trichoptera—larvæ and perlid larvæ.

Mosquitoes—females, a few (*Aedes* sp.).

Various midge larvæ.

Hydrachnid mites.

The warm creek back of Camden bay has its source in three springs, at the foot of a mountain about 25 miles from the coast, and flows for a few miles nearly parallel to Sadlerochit river before joining it. Its rather luxuriant vegetation consists of grasses, sedges, and green algæ¹ on the sandy and muddy bottom, and of an algæ-crust and mosses, as a carpet, on the submerged stones. Parts of stones just above water carried a white crust of siliceous or calcareous algæ, and stones above high-watermark, had a luxurious growth of lichens. The water at the source was steaming and had a temperature here of about 60 degrees F., but became colder as the stream was descended. The steam and the open character of the stream contrasted strangely with the surrounding snow-clad, silent tundra (November, 1913).

In this warm water (above 35 degrees F.), a number of grayling, *Thymallus signifer* Rich, and trout were seen feeding on the rich invertebrate life, which consisted of larvæ of midges, perlids, and phryganeoids. A species of phryganeoid larvæ typical of streaming water, was living inside gravel cocoons attached to the underside of the stones. There were also many amphipods (*Gammarus limnæus*) and small clams (*Pisidium*) and hundreds of snails (*Lymnea caperata*) were clinging to the mosses and algæ. All these, with many microscopic forms, made an unusually rich animal collection.

Apart from the insects found in the warm springs and creeks which keep open all winter, there appears to be no difference between insect life in the upland and that at the coast, except that some species (*Bombus*, *Vespa*, and ants) take advantage of cliff-crevices or old bark on the taller willow trees, to build their nests or to hibernate as larvæ. Observations up the Sadlerochit river were, however, made in November, at which time the cold had killed most of the insects, and much snow covered the ground.

In the reports of the various specialists, information is given concerning the seasonal occurrence of the various insects in their immature stages; and it will be seen that the life history of insects is much the same in the Canadian Arctic as in more southern latitudes. The following tentative table summarizes very roughly the facts concerning the hibernating of arctic insects, not including parasites:—

¹ See this series of reports, Vol. IV, Part A, Freshwater Algæ and Freshwater Diatoms.

Order	Family	Genus	Hibernate as
Orthoptera.....	Acrididæ.....	.....	Nymphs?
Neuropteroids..	Perlidæ.....	.....	Larva (Nymphs)
	Ephemeriidæ.....	.....	Larva (Nymphs)
	Megaloptera.....	<i>Heemerobius</i>	Larva (Nymphs)
	Trichoptera.....	.....	Larva (Pupa?)
Lepidoptera....	Butterflies.....	.....	Larva, Pupa (?), Imago (?)
	Moths.....	.....	Larva
Diptera.....	.....	All those with larva and pupa stages in fresh water and in the ground, except mosquitoes.	Larva (Pupa?)
	.....	All others and mosquitoes..	Imago.
Coleoptera.....	.....	.....	Larva, pupa, or Imago.
Hymenoptera..	Sawflies.....	.....	Larva or pupa.
	Bees and wasps ..	.....	A few queens.
	Parasitic wasps ..	.....	Larva?
Rhynchota.....	Hemiptera.....	.....	Nymphs?
	Homoptera.....	.....	Nymphs?

The three periods of each month under which insect life is described in the following pages must not be taken too literally: future investigations may extend considerably the period in which certain species are out, and also add species not yet found. Nor can observations on reared insects be considered to hold good for insects living under normal conditions. In the main, however, the data given are correct, especially for the more common forms.

Beginning of May, 1-10

Early in May (1914) the weather was warm, the snow started to melt, and the shallow tundra ponds became free of ice. In these ponds various big dipterous larvæ, especially tipulids (*Stygeropsis* sp., etc.), were found lying dead on the bottom or already actively boring in the soft mud. Dytiscid beetles, midge larvæ, etc., are probably also present, but were not noticed until later in the month.

The other hibernating insects, carabid beetles (*Pterosticus mandibularis*, *P. agonus*, *Nebria* sp.), lepidopterous larvæ, collembola, flies, spiders, and mites are still found in plant tufts, under stones, and driftwood, etc., as during September and the winter, keeping immobile until exposed directly to the sun.

Middle of May, 11-21

Even now the hibernating insects are found immobile in their hiding places. The following typical instances are taken from the writer's field-journal:

"May 12, 1914. Demarcation point, Alaska. "Found a full-grown Agrotid (?)-larva $3\frac{1}{2}$ cm. long stuck into a *Dryas* plant on the coastal tundra. The larva lay curled up between the leaves and twigs about $\frac{1}{2}$ -inch below the surface and hidden by dead leaves. Below the larva the ground was completely frozen. When removed the larva moved very slowly; and when laid in a box only used its abdominal feet to take a grip. Later, when brought into the house, the larva livened up completely and began to crawl around. Efforts to rear it were unsuccessful. The day was calm and sunny; temperature from 9 degrees to 30 degrees F. and higher on direct exposures."

The first flies of the year, three kinds, probably hibernating forms, were seen May 13, 1914, at Demarcation point (Pl. III, fig. 2). The weather was still clear, but warmer (35 degrees F.) One species of the flies, *Phormia terranova*,

kept to the south side of the house where the thermometer, hanging free, showed 40 degrees F. at 2 p.m.; on the refuse heaps outside the house the two smaller species (*Fucellia ariciiformis* and *Scatella brunnipennis*) were common; all of them were very much alive.

Early in May owing to the snow and hibernation period the tundra provided poor results in insects, but a few days later, better results were obtained. Under driftwood many collembola of different sizes, white, orange, and violet were found, and various small spiders, with egg cocoons of spiders and mites. The small fly, *Scatella brunnipennis* favoured specially the driftwood on moist, sandy ground; carabid beetles were seen, and young hemiptera (*Chiloxanthes stellatus*) coloured as dead grass and difficult to catch, as were some smaller flies with a similar habitat.

Muscid larvæ (*Rhamphomyia* sp.), orange or green sawfly pupæ (*Amaurone-matus cogitatus*), in transparent pupating cocoons in a special little cell communicating with the air, various beetle larvæ or pupæ, and small staphylinid and carabid beetles, etc., were found in snow-free moss-pillows; and, on the tundra plants, the hairy larvæ of all sizes, and cocoons with larvæ or pupæ of the moth *Gynaephora rossi* and probably, also, of *Hyphoraia alpina*. Sometimes these cocoons contain only the larvæ or pupæ skins or eggs (on the outside) from previous years, or the pupæ cases of the parasitic tachinid fly, (*Euphorocera gelida*). Spiders and leafhoppers (*Chiloxanthes*) are common in the grass.

A small lepidopterous larva is also seen. It has a brown colour, but is paler on the ventral side; it has a chitinous-brown head and neckband and dark thoracic feet. It spins two willow leaves together and skeletonizes them, remaining inside where the larvæ evidently hibernate.

In the now completely melted tundra ponds are smaller, long-legged flies (*Hydrophorus*?) and a number of different collembola (*Podura aquatica*, *Isotoma palustris*, etc.) which are of three sizes. The smallest and most common are black-blue; some, a little larger are grey-brown, and a few—the largest—are green. Smaller dytiscid beetles (*Agabus nigripalpis*, *Hydroporus humeralis*, *H. tartaricus*) are busily investigating the mud. Tiny, dark red water-mites move rapidly around in the water, propelled by their hairy legs, and searching for their prey, of which the brownish midge larvæ (*Tanytus* sp.?) which wriggle along near the surface are probably the most important. Crawling on the muddy bottom are other somewhat larger watermites with tile-red body and dark purple legs; and dark coloured midge larvæ inside mud tubes. Most conspicuous are the big dipterous larvæ (tipulids, etc.); one species (*Styggeopsis* sp.) keeps its long, hairy, anal processes surrounding the spiracles spread out at the surface and floats thus in the water; or it wriggles along over the mud bottom, with the "fan" closed; another species digs, with its head and lateral "legs" conspicuous furrows (tunnels) in the mud, the larvæ when working being completely hidden at one end of the furrow. Other larvæ, found dead, perhaps belong to the genus *Tipula*.

The temperature of the pond mud at 5 p.m., May 21, 1914, at Demarcation point, was 55.5 degrees, or 15.5 degrees warmer than the atmosphere. The ponds, though sometimes free of ice in early May, occasionally freeze over again, but this appears to have no effect on the aquatic animals, though alternating freezing and melting may continue until June.

End of May, 22-31

Insect life during this period is very similar to that observed in the few preceding and following days. The weather was cold and hazy or rainy, and not favourable to rapid development of insect life. Some plants get new leaves about the beginning of May and most of them by the end of May, so that, apart from predacious and carrion-feeding forms, the insects found in May are only larvæ or pupæ, the imagines first appearing when the flowers come out in June.

June 1-9

Excepting the flies mentioned as appearing in May, few insects are seen on the wing even in the beginning of June. Two kinds of flies, however, were observed on Barter island, Alaska; the brown species of *Scatophaga* and minute, black ones, common around freshwater ponds after June 1. In exceptionally early seasons, the *Bombus* queens may be out. (Pl. IV, figs. 1-2).

The greatest number of insects on the ground, besides those mentioned under May, were:

Under driftwood: colonies of Homoptera (wool lice?) 1.3 mm. long, clustered to or creeping slowly on the lower side of or in the cracks of logs. They have dark antennæ and legs, and are flesh-coloured, with a white-grey "coat" especially dorsally, of waxy, grey secretions. The slender, worm-like mycetophilid (?) larvæ of a transparent white or yellow brown colour, besides collembola, mites, etc., are found in rotten driftwood.

In the tundra moss, carabid beetles and various larvæ of coleoptera and tipulids, *T. arctica*, etc., flies, both adults and pupæ, spiders, mites, etc., and small orange-coloured *Cecidomyia* larvæ half hidden in the corners of wet sphagnum leaves, are found.

Larvæ and cocoons of *Gynaephora rossi* with or without parasitic tachinid pupæ are also seen on the tundra, the larvæ feeding on *Salix* buds and *Saxifraga oppositifolia* leaves.

In the ice-free tundra ponds young mosquito larvæ (*Aedes* sp.) of various sizes, besides copepods, "winter eggs" of *Daphnia pulex*, etc., are present.

June 10-20

The most conspicuous insects now seen for the first time, are queens of bumblebees (*Bombus sylvicola*, *B. polaris*, etc.) mostly in strong speed and high flight the first days, but later feeding on the male catkins of the various species of *Salix* just out.

Flies (*Cynomyia cadaverina*, *Scaeva pyrastri*, etc.) are now also out. A black and white striped species (*Syrphus sodalis*?) is typical of the higher, dry places on the tundra; when approached they rise and hover for a while before flying away. The first sawflies, *Amauronematus* sp. and ichneumonids (*Aptesius nivarius*) were seen; the flight of the former is much like that of ants, and only lasts for a short while.

The various arthropods found earlier in the season under stones, driftwood, etc., have now come out from their hiding places. Minute, brown beetles may be seen on the wing on calm, sunny days; and the various carabidæ (*Asaphidion* sp., *Amara brunnipennis*, etc.) besides an occasional curculionid or chrysomelid beetle (*Chrysomela subsulcata*) are found on the tundra, and various spiders (*Lycosa pictilis*, etc.), small hemiptera, etc., and immature stages of various insects.

In the tundra ponds are spiders and small flies (*Leptocera transversalis*?), besides the common, aquatic animals, such as small trichopterous larvæ, dytiscid-beetles, mosquito and tipulid larvæ, mites, etc.

June 21-30

At the end of June a number of flying insects are out—the first tipulid adults (*Stygeropsis porryi*, etc.) mosquitoes (a few *Aedes* sp.), and tineoid imagines (*Eucosma* sp.). These small moths and the hemiptera (*Euscelis hyperboreus*) are characteristic of places having rich vegetation (*Salix*, grasses, etc.), in shelter of tundra-buffs, where the many dead leaves afford good colour protection (brown). On approach the microlepidoptera fly up in a fluttering swirl, and suddenly drop, which makes them difficult to observe and catch. *Bombus arcticus* queens and various flies and sawflies were also found.

On the tundra plants are various hemiptera (*Euscelis hyperboreus*, *Calacanthia trybomi*, etc.) and spiders (*Xysticus bimaculatus*, *Lycosa* sp.); the *Lycosa* makes a funnel-shaped web in fissures of the ground, in which it takes refuge, often first dropping its prey consisting of tipulids, flies, beetles, or other spiders; the *Xysticus* are found among leaves. Now and then a decomposed dead animal harbouring muscid-eggs or larvæ attracts the beetle *Silpha lapponica*. On driftwood sticks or dead leaves are cakes of red mite eggs (*Bryobia praetiosa*) from which the equally red larvæ will emerge in a few days. Conspicuous also are the larvæ and cocoons of *Gynaephora rossi*. The first moths of this species now emerge, unless parasitized by the tachinid fly (*Eurphorocera gelida*) or by an ichneumonid wasp (*Amblyteles* sp.). Of the former (fly) as many as six pupa cases may be found together with the larval skin of the lepidopterous host; some of the cases contain the dead fly-pupa (pale, with grey hairs and legs, eyes red-brown) and attached to it six or more parasitic chalcid larvæ, which later emerge in August through small holes in the pupa case of the fly. Or the *Gynaephora* cocoon may contain the dead lepidopterous larva or pupa, which on opening will be found to contain a fat, white ichneumonid larva filling out most of the host, the internal parts of which it has devoured, while the skin of the caterpillar host protects it from drying up. Sometimes the parasite kills the *Gynaephora* larva before the latter succeeds in making its cocoon and pupating; it is then found that the ichneumonid pupa (another species?) has spun itself to the ground, the caterpillar skin above protecting it from discovery by birds and other enemies.

By digging, or in plants, various larvæ or pupæ of insects (weevils, tipulids, etc.) may be observed.

The freshwater ponds and lakes now contain a rich life. Craneflies, emerging from their pupa cases, float on the surface, or fly over the water, when not resting on grass leaves, etc. Swarms of small flies swarm or spring on the water surface; often they are seen in copulation. The first perlid adults crawl up on grass leaves above the water and leave behind the nymphal skins on the surface. Swimming in the water are thousands of mosquito larvæ now grown considerably (*Aedes* sp. etc.), copepods and the nauplii of the common phyllopod (*Branchinecta paludosa*), besides mites (*Curvipes reighardi*), etc. Crawling or resting on submerged logs, etc., are the large red *Chironomus* larvæ in their mud tubes. They are now pupating, the pupa emerging from its tube to the surface where it floats on one side, until it has shed its larva skin and can assume a vertical position.

July 1-10

The following insects are now seen:—

Flies..	<i>Rhamphomyia erinacioides</i>	
	<i>Syrphus sodalis</i>	
	<i>Aricia borealis</i>	
	<i>Phorbia brevitarsis</i>	
	<i>Piophilha borealis</i>	
	<i>Botanobia frit</i>	
	<i>Tipula subarctica</i>	} Craneflies with nymphs of mites (Hydrachnids?) on some of them.
	<i>Tipula arctica</i>	
	<i>Stygeropsis parrit</i>	
	<i>Trichyphona brevifurcata</i>	
	Sawflies (<i>Amauronematus</i> sp.)	
	Ichneumon fly (on willow plants)	
Midges..	<i>Tanypus alascensis</i>	
	<i>Chironomus</i> sp.	
Mosquitoes..	<i>Aedes nearcticus</i>	
Bumblebees..	<i>Bombus</i> sp.	
Butterflies..	<i>Brenthis frigga alaskensis</i>	
	<i>B. frigga improba</i>	
	<i>B. polaris</i>	
	<i>Colias hecla glacialis</i>	
Moths..	<i>Diasemia alaskalis</i>	
	<i>Eucosma</i> sp.	
	<i>Gynaephora rossi</i>	
	<i>Hyphoraia alpina</i>	

The first butterflies of the season appear at this time (*Brenthis frigga alaskensis* and *B. f. improba*). The smaller form (*improba*) has a fluttering flight and settle on plants with the wings spread out, moving them up and down in the manner characteristic of this genus. Though seen on swampy ground, it seems to favour the drier brown-coloured tundra and the bluffs with their richer growth of flowers. The larger form (*B. f. alaskensis*) is found in similar places, but has a wilder flight and remains longer on the wing. The *colias* butterflies (*Colias hecla glacialis*) appear about the same time, but as noted by D. Jenness on Barter island, the *brenthis* species are slower, more zigzagging in their flight, and do not appear to travel such long distances at a stretch.

Lepidopterous larvæ, 5 mm. long, yellow-green, but head and thoracic legs brown, skeletonize the leaves of *Salix reticulata* and spin them together with the catkins, thus deforming both. Full-grown, black, flat hemiptera (*Chiloxanthes stellatus*) are seen in the dried-out ponds, but appear not to use their wings and to avoid water. Around those ponds with a rich vegetation washed-up plants and shells of a snail (*Aplexa hynorum*) are common.

July 11-21

Additional insects observed:

Bumblebees.	<i>Bombus kirbyellus</i>
Butterflies.	<i>Brenthis chariclea</i>
	<i>Colias nastes</i>
Moths.	<i>Pyla acetiella</i>
	<i>Barrovia fasciata</i>

Scattered driftwood affords good colour protection to certain flies and microlepidoptera.

The ponds, many dry or nearly so, contain the usual life of snails, mites, copepods, metanauplii of *Branchinecta paludosa*, worms, dytiscid beetles, etc. A few predacious larvæ of water-beetles, their discarded skins floating on the surface, feed on the abundant young phyllopod. Three common species of *Salix*—*S. pulchra*, *S. richardsonii*, *S. ovalifolia* var. *camdensis*—have finished flowering, but a fourth, *S. reticulata*, lasts a little longer. The male catkins drop off, but the females remain until the seedwool comes out, or perhaps throughout the winter. Those insects (principally *Bombi*) depending upon the male catkins, must therefore, be satisfied with other flowers, but the sawfly larvæ (different species) boring in the carpels of the female catkins or forming galls on the willow leaves are not so affected.

July 22-31

Toward the end of July, a number of other plants (*Papaver nudicaule*, *Cochlearia officinalis*, *Oxytropis* sp., *Saxifraga oppositifolia*, *Potentilla* sp., etc.) have finished flowering or nearly so, so that the insects must seek other flowers.

On Herschel island the following were noted in addition to the common insects:—

Flies:

<i>Rhamphomyia herschelli</i>	<i>Sphaerophoria cylindrica</i>
<i>R. conservativa</i>	Ichneumonids (<i>Stenomacrus borealis</i>)
<i>Melanostoma</i> sp.	(Spiders) <i>Pardosa groenlandica</i>
<i>Phorbia</i> sp.	(Mites) <i>Bdella frigida</i>
<i>Limnophora</i> sp.	

In Ponds and Lakes

(Mites) <i>Lænnipes torris</i>	Cladocera (<i>Daphnia</i> , etc.)
Copepods (<i>Heterocope</i> , etc.)	Larvæ of <i>Chironomus</i> and <i>Tanytus</i>
Amphipods (<i>Gammarus limnaeus</i>)	(Midges)

On the leaves of the various species of *Salix* are seen galls caused by sawfly larvæ (*Pontania* sp.) Other sawfly larvæ bore in the female catkins of these willows; the larvæ eat their way into the carpels and from these into the main axis of the catkin, which they hollow out. Their presence is detected by the dried-out character of the catkin and by the brown excrement outside.

The two large moths, the arctiid *Hyphoraia alpina* and the lymantriid, *Gynaephora rossi*, appear at about this time. The hairy larvæ of these are difficult to distinguish, especially as the colour of the hairs change after each moulting, but generally the *Hyphoraia* larvæ are the larger and lack the yellow hair-spines on the middle of the back, so that its colour is more uniformly brown. The pupa of the *Hyphoraia* is bald and coal-black and larger than that of the *Gynaephora*. The *Hyphoraia* cocoons, also, are larger—about the size of a pigeon's egg—and more perfect, with the outer layer smoother and whiter than the brownish, more closely spun cocoon of the *Gynaephora*. *Hyphoraia* appears to be quite free from the tachnid parasite *Euphorocera gelida* and almost free from ichneumonid parasites, but the *Gynaephora* is attacked by both. In spite of this, *Gynaephora* is the more abundant. The males first appear, active and well developed, and when the females appear, copulation at once takes place, though the female is in a crumbled state, and so little developed that they can only crawl around. The first act of the females, after being left by the male, is to lay their eggs.

At Martin point, Alaska, at the end of July, 1914, examination was made of the extensive lagoons. They contain about 6 inches of brackish water, covering a bottom sometimes sandy, sometimes gravelly, and, in the deeper places, muddy, the mud being mainly the tubes and excrement of red *Chironomus* larvæ. Some of the ponds contained floating masses of green, thread-like algæ. On the water were flies and the common blue collembola; in the water were the fry of a sculpin (*Oncocottus quadricornis*), water-beetle larvæ, copepods (*Eurytemora* sp., etc.), many full grown male and female *Branchinecta paludosa* and *Lepidurus arcticus* of various sizes, besides the common *Daphnia pulex*. Some of these lagoons were at high tide connected with the beach water; and the temperature of their water was during the middle of the day about 50 degrees F., though the temperature of the air was only around freezing point.

August 1-10

Several more plants (*Lloydia*, *Ranunculus*, *Parrya*, *Eutrema*, *Polemonium*, etc.) of importance to insects finish their flowering at this time and are replaced by flowers of a great number of *Compositæ*.

August 11-20

On Herschel island flying insects were few. The berry-like galls on the leaves of the various species of *Salix* (*S. richardsonii*, *S. anglorum*, *S. reticulata*, etc.) caused by sawfly larvæ (*Pontania* sp.) were very common, from the size of a pinhead to that of a bean, the larvæ inside being of a corresponding size. The colour of the larvæ was pale yellow; the head dark grey, eyes black, thoracic legs light grey. Adults of several species were reared from them and emerged in the following July.

The ponds contained a rich life of invertebrates, of which the large phyllo-pods (*Branchinecta paludosa*) various cladocera (*Eurycerus*, etc.) and copepods (*Diaptomus*, etc.), small midge larvæ and phryganeoid larvæ in tubes, snails (*Aplexa hypnorum*), and worms were the most common (Pl. VII, figs. 1-2).

August 21-31

Insect life is rapidly declining, especially among the less hardy (neuropteroids, lepidoptera, mosquitoes, wasps, sawflies) few of which are seen on the wing, though others (flies, coleoptera, bees, hemiptera) are still numerous.

September 1-30

By the beginning of September, 1913, the first signs of winter were apparent. On September 3, a landing was made on Spy island,¹ one of the Jones islands off the Colville delta, where the only animal life noticed was a few small spiders (*Typhocraestus spitsbergensis*) in plant tufts, and colonies of small grey-violet collembola together with a few oligochaete worms and fly larvæ under the washed-up layer of algæ around the large lagoon. A few of the more hardy insects (flies, etc.) are still on the wing on warm, calm days, besides a number of insects on the ground. The hairy *Gynaephora* or *Hyphoraia* larvæ are crawling around looking for hibernating quarters.

The close of summer arrives between the end of August, at point Barrow, and the middle of September, at the Mackenzie delta, the point being about one degree farther north than the delta.

In the middle of September, 1913, winter had set in at Camden bay. At the end of the month an occasional warm day may melt much of the snow, and insects, though in their quarters for the winter (see below), are more lively. Insects on the wing are absent, but *Scatella brunnipennis*, seemingly associated with the excrement of mice (*Microtus* sp.), whose burrows are common, may be found under driftwood. Small spiders, mites, and Collembola, beetles, carabidae, staphylinidae, the latter in colonies, *Chrysomela subsulcata*, dytiscidae, besides larvæ and pupae of these beetles are also seen in moss-pillows (beetle pupæ often in special small cells), and many empty pupa cases and cocoons of flies and hymenoptera, fly-larvæ, etc. The hemipteron (*Chiloxanthes stellularis*) seems to be one of the few insects moving around freely at the middle of September. A cocoon with a sawfly larvæ was found on a willow branch; but most of the sawflies now hibernate in the ground or among dead leaves.

Large elaterid (?) larvæ are present among plant roots in frozen ground and minute orange dipterous larvæ bore in the root of *Pedicularis*. The depth at which the larvæ of the common tipulids hibernate is interesting. They are found not only in the moss, but about one inch below the plant cover, in solidly frozen "muck." The larva makes, before the ground freezes, a cell a little larger than itself and communicating with the air. In this cell the stiff-frozen larvæ lie, heads uppermost, awaiting spring.

All these hibernating insects on cold days seem to be frozen still or hardly move, but when brought into a warm place will liven up again. The temperature of the snow-covered ground is generally one or two degrees warmer than the air.

MACKENZIE DELTA TO CAPE BATHURST

Trees (not willows) grow farther north along the Mackenzie river than in other parts of the American Arctic except in the region north of Great Bear lake and in the Arctic mountains. North of the woods the delta is one maze of low, flat, alluvial islands covered with dense thickets of willows and alders which gradually diminish in height and luxuriance as the outer rim of the islands is approached (Pl. II, fig. 1). Hills continue south along the east branch of the delta and on the exposed small islands Garry, Pelly, Kendall, Pullen, Hooper, etc., but everywhere the soil is mud and clay. Little is known of the vegetation in these "barren" parts of the delta, and only a few insects have been collected. Plant and insect life seems to be the same both east and west of the delta.

Some hymenoptera and coleoptera were collected by R. M. Anderson², 1910, in the barren and wooded parts of the Mackenzie delta.

¹Vegetation is very scarce on this sandy island.

²"My Life with the Eskimos" (V. Stefansson), New York, 1913, Appendix p. 449.

Judging from the climatic conditions, and the size and extension of the willows, both the vegetation and the insect life must be unusually luxuriant, at least on those portions of the islands in the delta which are not flooded in the spring, or are not too far from the mainland.

Token point is about the eastern limit of Mackenzie delta. The coast is low and flat with numerous lakes and ponds. Some of the islands, such as Nicholson island, and points such as Maitland point, cape Dalhousie, are, however, higher and consist of slate or clay. Farther inland, the so-called "mud-volcanoes" are a characteristic feature of the country. The coast between Nicholson island and cape Bathurst presents gently swelling hills, as high as 200 feet a couple of miles from the beach, and with much vegetation.

It may be assumed that the proximity of this part of the coast to the Mackenzie delta with its comparatively warm and long summer, and to the woods there and along the Eskimo lakes and Anderson river farther east, favours vegetation and insect life.

The east coast of Bathurst peninsula presents steep, slaty cliffs, but the west coast and the two Baillie islands which it faces, are composed mainly of tundra bluffs underlain in places by ground-ice.

Cape Bathurst—village and harbour—is situated at the end of the peninsula on a long spit of gravel and sand, whose shingle bears no lichens, proving that the sea sometimes covers the spit. Where the spit joins the tundra is a belt of tundra sods and barren muck left by the sea, and the bluffs are steeply cut by gullies made by water in the spring. These gullies merge into swampy depressions between the higher parts of the tundra, south of which the typical tundra stretches far inland.

The following insects, etc., were noted at Cape Bathurst:—

- Mosquitoes (*Aedes nearcticus*)
- Diptera (*Arctia borealis*, etc.)
- Microlepidoptera**
- Bumblebees
- Hemiptera (leaf-hoppers)
- Sawfly larvæ (*Pontania* sp.)
- Midge and water-beetle larvæ**
- Copepods (*Cyclops* sp.)
- Cladocera (*Daphnia*, *Chydorus*, *Eurycerus*)
- Snails (*Aplexa hypnorum*)
- Worms (*Lumbriculus*, *Henlea*, etc.)

COAST FROM FRANKLIN BAY TO STAPYLTON BAY

The following insects were collected at Langton bay by V. Stefansson and R. M. Anderson, 1910-11. (See "My Life with the Eskimo," p. 449, and Report of the Canadian Arctic Expedition, 1913-18, vol. iii).

<i>Melanoplus frigidus</i> (grasshopper) . . .	Orthoptera
<i>Bombus sylvicola</i> (June 15, 1910) . . .	Hymenoptera
<i>Pterostichus agonus</i>	} Carabidæ
<i>P. hyperboreus</i>	
<i>Amara brunnipennis</i>	
<i>Carabus chamissonis</i>	} Chrysomelidæ
<i>Galerucella decora</i>	
<i>Haltica bimarginata</i>	} Coccinellidæ
<i>Coccinella quinque-notata</i>	
<i>C. nugatoria</i>	} Buprestidæ
<i>Melanophila longipes</i>	
<i>Silpha lapponica</i>	} Silphidæ
<i>Lepyrus gemellus</i>	
<i>L. capucinus</i>	} Rhyncophora
<i>Tricelophus stefanssoni</i>	

The vegetation and insect life in this section are somewhat similar to those west of cape Bathurst. Stefansson states in "My Life with the Eskimo" that mosquitoes became numerous at Langton bay by June 20, and that, by the end of July, the skins of caribou are full of holes made by the escaping bot

fly, which grows beneath the hide during winter. On the Cape Parry peninsula the coast begins to show outcrops of dolomite in the low cliffs. (Pl. VIII, fig. 1).

The coast around Young point is exceedingly stony, with dolomite outcrops or low cliffs with much debris and gravel. Near the beach, vegetation is entirely absent, but, inland, mosses and lichens are developed, especially in moist places. Here and there a few tufts of *Dryas integrifolia* or *Saxifraga tricuspidata* are seen. Farther inland, vegetation is more apparent, mainly around ponds and in the connecting tundra.

At Young point insect life was similar to but less rich than at Bernard harbour. On July 18, 1916, the weather was cloudy or overcast. The following insects, etc., were observed:—

Diptera: *Aedes nearcticus*
Rhamphomyia conservativa
Aricia borealis
Bombus kirbyellus
(Mite) *Bdella arctica*
Spiders (a few)
Fairy shrimps (*Branchinecta paludosa*)

Vegetation and insect life in the cape Bexley area are exceedingly poor, probably very similar to Young point. A few specimens were collected here in May, 1915, viz., a small spider and fly from under a stone, and some midge larvæ and small dipterous pupæ among green algæ at the beach.

BERNARD HARBOUR—COCKBURN POINT AREA

Generally speaking the coast becomes gradually lower from cape Bexley to east of Bernard harbour, and the outcrops of limestone or dolomite are first found some distance inland. At Cockburn point the coast is low and flat and composed of gravel, limestone fragments and boulders. The country inland is similar to that at Bernard harbour, with boulder-strewn ridges of sand and gravel running out from the higher land behind. The more eastern of two small islands (Pihumalerksiak of the Eskimos) about a mile off Cockburn point was visited in the middle of July, 1916, and some details about its natural features learned. The other island is quite similar.

The island is about 12 feet above sea-level, and is composed of dolomitic limestone, which crops out as flat beds on the north side of the island, but otherwise the rock is mostly covered by gravel and vegetation. The vegetation grows around small ponds (probably all dried up in August), or moss-bogs, or around the boulders, and at the stone heaps (meat-caches) made by visiting Eskimos, where the plants often attain a luxuriant growth. Otherwise, only patches and tufts of plants are found here and there; generally speaking the vegetation is rather scarce and stunted, except in the shelter of the smaller cliffs.

The entomological results were limited to a small sawfly imago and the common, white collembola under stones and driftwood. In the wet moss were secured other dark-blue collembola (*Achorutes armatus*) and some oligochaete worms (*Mesenchytracus*, *Henlea*, *Enchytracus* sp.), beside the mite *Calumna lucens*. There can, of course, be no doubt that at least the larger and more powerful flying insects often visit the island, or may even live there, but the inclement weather at the time of the expedition's visit militated against insect life.

The character of the country at Bernard harbour proper (including Chantry island), is well shown on the contour map prepared by the southern party of the expedition.

With the exception of Chantry island all the islands in the outer harbour at Bernard harbour are composed of gravel, sand, and boulders and are less than 25 feet high. Chantry island is about 85 feet high and of a composition similar to the higher part of the mainland coast.

The rock exposures and areas covered by limestone fragments are barren of vegetation, except for lichens, and vegetation is best developed in the valleys and on the sandy slopes, around the ponds or lakes. On Chantry island are found most of the plants and insects represented on the mainland. The smaller islands in the outer harbour, however, are too exposed for the development of much vegetation and are unable to support some of the plants found on the mainland. Consequently, their insect life is also very limited (Pl. VIII, fig. 2).

The following insects were collected on the harbour island during the middle of May, 1915:

Ichneumon suturalis (wasp)
Brenthis and Noctuid larvæ
 Spiders (*Lycosa* sp.)
 Carabid beetles (*Amara brunneipennis*)
 Lepidopterous and dipterous pupal skins

On Chantry island were collected in the middle of June, 1916:

Bombus spp. (*B. sylvicola*, etc.)
 (*Gynaephora* larvæ) Lepidoptera
 Collembola
 Mycetophilid larvæ
 Mosquitoes and midges (larvæ and pupæ)
 Dytiscids (adults and larvæ)
 Mites (*Baella accipiens*, *Thyas stollii*, *Curvipes reighardi*, *Hydrophantes ruber*)
 Copepods (*Cyclops magnus*)
 Ostracods
 Cladocera (*Daphnia* sp.)

Newly born nauplii and metanauplii of the fairy-shrimp (*Branchinecta paludosa*) were found hiding among the stones in some of the ponds on Chantry island. The temperature of the margin water in the ponds at about 2 p.m. was 50 degrees F. (air 44 degrees F.). There was a considerable difference in the ponds in regard to invertebrate life, those on the higher part of the island being very barren of life.

A comparison of the weather during September of 1914 and 1915 and its influence upon the vegetation and insect life at Bernard harbour is interesting. In 1914 the generally mild weather allowed plants to keep their flowers and ripen their seeds far into the month, and to live until October. Although snow fell in the latter half of the month, most of it soon melted, and freshwater pools did not freeze over until the end of the month. The more hardy of the insects, coleoptera, hemiptera, and also spiders, moved freely around on the ground, though few flying insects were seen after the first week of September.

But in 1915 stormy and wintry weather prevailed during the first fortnight, resulting in the immediate and lasting freezing over of land and water and the subduing of plant and insect life. The milder weather at the end of September was not sufficient to resuscitate them.

VEGETATION AROUND BERNARD HARBOUR

The vegetation found here is similar to that on the coast farther west, and will be treated in the same way here (compare pp. 7-8).

1915

New Leaves observed:

April.

Saxifraga tricuspidata (inner leaves; middle of month).*S. oppositifolia* (inner leaves; end of month).*Dryas integrifolia* (inner leaves; end of month).

May (Middle of Month).

Saxifraga oppositifolia (bud leaves; only when in or near melting water).*S. tricuspidata* (bud leaves).

May (End of Month).

Cerastium alpinum (gravelly places; bud leaves).*Cassiope tetragona* (bud leaves; only when in or near melting water).

June.

Potentilla nivea (leaf buds; June 10).*Arctostaphylos alpina* (leaves: Junes 10; also old leaves and berries).*Silene acaulis* (some new leaves; June 14).*Dryas integrifolia* (some new leaves; June 14).

Mosses (some new leaves; June 14).

Artemisia hyperborea (new leaves; June 20, where exposed to the sun).*Rhododendron lapponicum* (some new leaves; June 23).*Betula glandulosa* (new leaves; June 23; also old catkins).*Elymus mollis* (new leaves; June 24).*Oxyria digyna* (new leaves; June 27).*Salix reticulata* (new leaves; June 27).*Oxytropis* sp. (new leaves; June 27).*Carex scirpoidea*, *C. rupestris* (new leaves; June 28).*Ranunculus affinis* (new leaves; June 28).

July.

Statice armeria (new leaves; July 2).*Epilobium latifolium* (new leaves; July 6).

1915

First Flowers observed:

Saxifraga oppositifolia (June 7 on hilltops, June 12).*Salix anglorum* (first male catkins; June 23).*Anemone parviflora* (June 28; in shelter of boulders).*Pedicularis lanata* (June 28).*Draba alpina* (June 28).*Salix anglorum* (first female catkins; June 28).

July 1-15.

*Eriophorum Scheuchzeri**Dryas integrifolia**Oxytropis arctobia**Potentilla nivea**Arctostaphylos alpina**Parrya macrocarpa**Androsace Chamaejasme**Braya purpurascens**Carex subspathacea**Astragalus aboriginorum**Lesquerella arctica**Silene acaulis**Oxyria digyna**Eriophorum angustifolium**Stellaria longipes**Plantago lanceolata**Antennaria candida**Equisetum arvense**Alopecurus alpinus**Statice armeria**Castilleja pallida**Papaver nudicaule**Erigeron compositus**Artemisia hyperborea**Carex scirpoidea*, *C. rupestris**Taraxacum ceratophorum**Ranunculus affinis**Lychnis affinis**Draba corymbosa**Hesperis pallasii**Saxifraga tricuspidata**Astragalus alpinus**Pedicularis capitata**Oxytropis campestris*, *O. nigrescens**Lychnis apetala**Pedicularis sudetica**Senecio frigidus**Androsace septentrionalis**Salix pulchra* (male and female;

perhaps earlier).

Draba nivalis (perhaps earlier).*Salix reticulata* (male and female).*Rhododendron lapponicum* (perhaps

earlier).

Betula glandulosa (young catkins).*Cassiope tetragona*

July 16-31.

*Hallanthus peplodes**Hedysarum Mackenzii**Saxifraga decipiens**Chrysanthemum integrifolium**Cerastium alpinum**Oxytropis Roaldii**Polygonum viviparum**Epilobium latifolium**Stellaria humifusa**Sisymbrium saphioides*

The flowering period, generally speaking, is about one month for each species. A few observations relating to this matter, of such vital importance to the insects, are given:

1915

Middle of July.

Salix anglorum; male catkins dropped.

Eriophorum Scheuchzeri; unripe fruits.

End of July.

Salix pulchra; male catkins dropped.

Eriophorum angustifolium; unripe fruits.

Beginning of August.

Oxuria digyna; unripe fruits.

Anemone parviflora (June 28; in shelter of boulders).

Draba nivalis; unripe fruits.

Middle of August.

Dryas integrifolia; unripe fruits (a few flowers).

Saxifraga oppositifolia; unripe fruits

End of August.

Androsace septentrionalis; unripe fruits.

Juncus spp.; unripe fruits.

Carex spp.; unripe fruits.

Arcostaphylos alpina; unripe fruits.

Pedicularis lanata; unripe fruits (a few flowers).

September

Though most of the plants have finished their bloom, compositae and grasses are still in flower. If a severe frost comes, as in 1915, about the middle of the month, many of the plants will fail to ripen their seeds, but otherwise it is possible for the flowers of many of the species to finish the cycle. Besides the species given above as having finished their flowering during July and August, seeds of the following were collected during September, 1915.

- Various grasses (*Elymus*, *Alopecurus*, *Poa*, etc.)
- Cochlearia groenlandica*
- Erigeron compositus*
- Oxytropis nigrescens*
- Taraxacum ceratophorum*
- Pedicularis* spp.
- Artemisia* sp.
- Lychnis affinis*
- Armeria vulgaris* (*Statice armeria*)

1916

The first flowers of *Saxifraga oppositifolia* were found the last days of May on a south exposed, snow-free slope, and from *Salix anglorum* the catkins had just emerged. The earliest flowering plants (*Saxifraga*, *Pedicularis*, *Anemone*, *Draba*, *Eriophorum*, etc.) also had flower buds now (1916). On June 6, *Salix pulchra* had the male catkins of the size of a big pea.

By the middle of June the first flowers, the male catkins, of *Salix anglorum* were out on Chantry island, and some days later, June 20, those of *Salix pulchra*. The first flowers of the following species were found:

June 22-23.

- | | |
|------------------------------|-------------------------------|
| <i>Dryas integrifolia</i> | <i>Lesquerella arctica</i> |
| <i>Androsace Chamaejasme</i> | <i>Draba alpina</i> |
| <i>Pedicularis lanata</i> | <i>Braya purpurascens</i> |
| <i>Oxuria digyna</i> | <i>Eriopharum Scheuchzeri</i> |

July 1-15

<i>Oxytropis arctobia</i>	<i>Pedicularis</i> spp. (arctica, etc.)
<i>Parrya arctica</i>	<i>Primula stricta</i>
<i>Eutrema Edwardsii</i>	<i>Erigeron compositus</i> (probably earlier).
<i>Silene acaulis</i>	<i>Saxifraga tricuspidata</i> , <i>S. decipiens</i>
<i>Alopecurus alpinus</i>	<i>Lychnis apetala</i>
<i>Cochlearia groenlandica</i>	<i>Chrysanthemum integrifolium</i>
<i>Anemone parviflora</i> (probably earlier).	<i>Statice armeria</i> (probably earlier)
<i>Arctostaphylos alpina</i>	<i>Saxifraga hirculus</i> , <i>S. rivularis</i>
<i>Stellaria longipes</i> , <i>S. humifusa</i>	<i>Lychnis affinis</i>
<i>Oxytropis campestris</i>	<i>Taraxacum ceratophorum</i> (probably earlier).
<i>Castilleja pallida</i>	<i>Halianthus peploides</i>
<i>Artemisia hyperborea</i>	<i>Androsace septentrionalis</i>
<i>Cassiope tetragona</i>	<i>Mertensia maritima</i>
<i>Papaver nudicaule</i>	<i>Salix reticulata</i>
<i>Plantago lanceolata</i>	<i>Arnica alpina</i>
<i>Astragalus aboriginorum</i>	<i>Draba nivalis</i>
<i>Hesperis pallasii</i>	<i>Antennaria alpina</i>
<i>Carex</i> spp.	<i>Erigeron uniflorus</i>
<i>Eriophorum agustifolium</i>	<i>Senecio palustris</i>
<i>Ranunculus affinis</i>	<i>Cerastium alpinum</i>
<i>Equisetum arvense</i>	
<i>Rhododendron lapponicum</i>	
<i>Potentilla</i> spp.	

INSECT LIFE

Observations for Winters 1914-15 and 1915-16

Insects are scarce in the neighbourhood of Bernard harbour from October to April, inclusive. The best collecting places during the winter are under the shingles—mostly limestone—particularly upon peninsulas and points, where various orange or olive-coloured collembola, besides small reddish mites (*Bryobia praetiosa*), and the common small spiders are common. Of other insects only small hemiptera, flies, staphylinid beetles, beetle-larvæ, or caterpillars, and occasionally a frozen tipulid larva were observed.

No insects were seen on the wing, but parasitic insects, both the mallophaga on the birds, and the fleas and lice on the mammals and Eskimos, were observed. Most conspicuous, however, are the larvæ of the bot-fly (*Oedemagena tarandi*) in the caribou (*Rangifer arcticus*). In November, the grubs are about 1 mm. long, and are found under the skin or in the muscles of their host. They were about 2 mm. long and were encysted on the inner side of their host's skin and in the muscles. The bigger ones had already perfected their emergence holes through the skin and had their posterior end (spiracles) turned toward these openings.

The lakes and ponds contain a large amount of invertebrates during the winter. The insects secured in these lakes were mainly midge larvæ or pupæ in their mud-tubes (*Tanytarsus* sp.) the same stages of trichoptera, and other neuropteroids, perlids, etc., probably are also present, besides water mites (*Lebertia porosa*, etc.).

The summer weather at Bernard harbour in 1916 began about the end of May, but wintry weather predominated during the first half of June, with the net result that insect and plant life was considerably retarded, though earlier than in 1915.

May 1-10, 1915

Collembola, (*Isotoma viridis*, *Entomobrya comparata*, etc.), carabid (*Lebia*, sp. etc.), and staphylinid beetles were noted. Empty hymenoptera cocoons were very common under stones. These cocoons and the empty fly-puparia also found under stones or among plants, are from the previous year, or still older.

May 1-10, 1916

Flies came out, but became numerous only with the warm weather. They probably represent individuals which hibernated as adults. On patches free of snow, caterpillars and smaller more occult living insects may be seen (Pl. IX, fig. 1).

May 11-20, 1915

The first fly was noticed on May 18 and on the same day a large (probably hibernating) parasitic wasp (*Icheumon suturalis*) and collembola, mites (*Bdella decipiens*), small spiders, caterpillars, beetle larvæ, carabids (*Amara brunnicornis*, etc.), all under loose, flat stones. Two of these caterpillars were observed on July 11 to be parasitized by hymenopterous larvæ; three other caterpillars pupated July 13-20.

May 21-31, 1916

Many flies were out on May 21, both the big blue and two smaller species. carabid beetles, spiders, and an ichneumonid wasp were noticed on this day, and the common collembola, spiders, mites, caterpillars, and dipterous larvæ. These dipterous larvæ (*Tipula arctica*, etc.) were placed for rearing (No. 106) and made galleries in the sand in the jar before pupating in June. Parasitic hymenopterous larvæ were noticed in one of the crane-fly larvæ, but efforts to rear it were unsuccessful. Four adults (*Tipula arctica*) emerged July 7. One species of caterpillar was about 1 cm. long, and occurred in numbers crawling on a snow-free, dry sand dune near the beach. These larvæ had perhaps hibernated and they made their cocoons in June. One of the big spiders (*Lycosa* sp.) was caught on May 31 in its funnel-shaped web. The mouth of this web was about 2 cm. in diameter.

The usually warm weather favoured the development of insect life in fresh water; collembola (*Isotoma palustris*, *Sminthurides aquaticus*, etc.), surface-spiders, copepods, dytiscid beetles (*Colymbetes dolabratus*) and mites (*Galumna lucens*) were observed. Freshly-hatched mosquito larvæ (*Aedes* sp.) 2-4 mm. long, were noticed on May 31, or eighteen days earlier than in 1915. On the same day various dytiscid beetles (*Hydroporus* sp., *Collambus unguicularis*, *Agabus nigripalpis*), oligochaete worms (*Henlea* sp.) were also seen, as were tipulid (?) larvæ, midge larvæ, and the empty puparia of *Mydacia obscura*.

May 21-31, 1915

The following additional insects were noted:

Carabid beetles (*Amara hirsutipes*)

Spiders (see above).

Weevils (*Trichalophus stefanssoni*)

Flies (*Phormia coerulescens* and a minute "jumping" fly)

Parasitic insects are not greatly influenced by weather and it is, therefore, unnecessary to deal with them under monthly subdivisions. Observations were made of the two diptera that infest the caribou. All efforts to rear these grubs² from larvæ were unsuccessful, although several methods of rearing were tried. Some of the almost full-grown larvæ were placed on fresh caribou meat, some in bits of caribou skin with larvæ *in situ*, some in a jar with sand, and even a whole caribou skin containing grubs was rolled up to prevent drying. The grubs were never brought through the pupal stage, although some were kept for more than a year. The field observations agree with the account given by G. M. Douglas on the caribou between Great Bear lake and Coppermine river.¹

Two female adults² were caught at Bernard harbour July 14, 1916. The grubs in the caribou skins examined at the end of May, 1915 and 1916, were very numerous and all big. Only two, not full grown, larvæ (22 mm. long) were found; they were wholly white except the light brown fringes of body spines and the dark brown, apical head dot and terminal spiracles. All the other larvæ were from 25 to 30 mm. long; the younger (smaller) of these had the chitinous head, the terminal spiracles, and the body-spines dark brown, and fine dots of lighter

¹ Douglas, G. M., "Lands Forlorn," 1914, p. 191; photograph of grub-infested caribou skin. p. 192.

² *Ædemagena tarandi* (Linné).

brown pigment were scattered regularly in the furrows between the body-tubercles (spine-carriers).

From this latter stage there were all grades of transitions to the dark pupæ (pre-pupæ) (see below); the main colour of the larvæ changing gradually from white to a dirty brown, and finally to almost black (post-larvæ, pre-pupæ), the body tubercles being most strongly coloured in all the larvæ; the chitinous parts also become black. In the black-brown post-larvæ (pre-pupæ) the colour of head, spiracles, and body-spines shades into that of the whole larva.

A shortening of the larvæ now takes place, the terminals being retracted, so that the segments lie telescopically one inside the other. The body-spines and body-tubercles, formerly so pronounced in full grown larvæ, seem to shrink in, so that the segments are smoother and the transversal diameter of the post-larvæ increases until it is almost as large (about 17 mm.) as the longitudinal one. The larval skin dries and becomes more chitinized and stiffer, so as to protect the pupa inside. Of the post-larvæ only six were found in three skins; and the black colour of the pupa shows through its enclosing cyst, though the cyst is less pronounced than in the younger larvæ, because the grub lies half-protruded from its exit-hole, hidden by its host's hairs. A few of the exit-holes were already empty (except for the grub excrement) and the cyst inside (formed by the inner part of the caribou-skin around the larvæ) had become contiguous to the surrounding skin.

In spite, therefore, of all the annoyance and pain caused by these grubs, it seems that the caribou skins heal quickly after the parasites drop out. By the end of June no grubs are in the skin, the holes they made are almost healed and it may be assumed that the pupæ leave the caribou about the end of May and lie on the ground for about a month before the flies appear. Life in the latter stage is probably only short and exclusively devoted to copulation and the laying of eggs on the caribou's hairs, after which the grubs bore through the skin.

The other dipterous parasite of the caribou is also an oestrid, identified by Mr. J. R. Malloch as *Cephenomyia* sp. and was noted at the end of May, 1916. About twelve grubs 2-3mm long were lying in the nasal passage of the caribou, where they can easily attach themselves by the aid of their mouth-hooks and hang suspended. The smallest ones were white-yellow, with red-brown segmentally arranged spinehooks, black jaws, and anal spiracles. The older ones had the spines darker, and grey-black dot pigment on the dorsal side of the body segments. The oldest ones had still more black pigment (especially behind and ventrally) and still darker spines. Efforts to rear the larvæ were unsuccessful.

This is probably the *Tabanus* larvæ about which Grenfell writes and which he figures in his book on Labrador. The eggs are laid in the nostrils of the caribou, and the grubs probably spend all their time in the nasal, bronchial and œsophageal passages of their host.

June 1-10, 1916

A weevil (*Lepyrus palustris*) was found on June 4, and the first bumblebee (*Bombus hyperboreus*) was observed. The ponds yielded midge and large dipterous larvæ. Some of these latter have a habit of mud-burrowing, but one species seems to be more dependent on air, for it occasionally comes to the surface with the five long, ciliated appendages that surround the spiracles spread in star-like fashion. The adhesion of the surface and the hairy appendages appears to be sufficient to keep the whole larvæ suspended. In this position they may frequently be seen burrowing head first in the mud of shallow water. Dytiscid beetles and a small brick-red water mite were noted. On June 8 three caterpillars, collected at the harbour, were placed for rearing. One, a large naked larva, had evidently been washed out from its feeding ground

by melting water. A month later it was in only its post-larval stage and had made its cocoon; it died later. Another, also a naked larva, but only half the size, found in its web, pupated twelve days later; and the imago (a moth) emerged July 10, 1916 (Rearing 113). The third, more hairy, pupated later; but no imago emerged.

On June 10 a carabid larva was placed for rearing. It pupated August 8, but the imago was not discovered until September (Rearing 115). The habits of a dipterous and lepidopterous larva boring in the flower-stem and root of the common *Pedicularis lanata* were noted. The dipterous larva occupies only the upper part of the pith and lies hidden there, often several together. The younger larvæ in grooves in the pith, the older in a burrow resembling that made by the lepidopterous larva. These dipterous larvæ and a few living pupæ collected June 10-16, 1916, were placed for rearing (Rearing 72). One imago emerged July 6. Other larvæ were collected July 16-18, 1915, and pupated three months later, but came no farther.

The boring caterpillars were of a small species, naked and of a brownish colour; they mined both in the pith and in the upper part of the knotty root of the plant. When this larva has the whole stem to itself, it burrows to the top through which the frass is pushed out; but it stops burrowing just short of the "chamber" with the dipterous larvæ and then makes its hole in the outer part of the stem or in the upper part of the root. In 1915 these larvæ were first noticed in July, but in 1916 on June 10. The larvæ kept for rearing made pupating cocoons on July 7, 1916, but never pupated, though efforts were made to keep whole infested *Pedicularis* plants.

June 1-10, 1915

By June 2, the common insects had come from their shelters to enjoy the mild weather. A brown ichneumonid wasp (*Ophion* sp.) was caught inland, and the next day, farther inland, many of the common carabid beetles, a carabid larva, several spiders and small, white collembola and two caterpillars. One of these naked caterpillars proved, later, to be parasitized and the braconid (*Apanteles* sp.) pupæ were discovered July 11, the adults emerging July 16 to August 16 (Rearing 40a). The other naked caterpillar (Rearing 50) began its cocoon a week after it was collected and pupated July 5, 1915; the imago (a small grey moth with black crossbands on the wings) emerged August 10, 1915.

The stomachs of insectivorous birds (Passeres, plovers, etc.) which arrived at Bernard harbour from the month of June on, were examined. The ingenuity of these birds in finding food is astonishing; that they do not starve is shown by the following content of the gizzard of a golden plover, *Pluvialis dominica*: 1 caterpillar, 1 tipulid larva, 2 curculionid larvæ, and half a dozen carabid beetles and weevils. A snow bunting, *Plectrophenax nivalis*, had in its stomach two caterpillars about 1 cm. long.

June 11-20, 1916

Bumblebees (queens) are now seen frequently and are often infested with the parasitic mites (*Parasitus bomborum*) attached mainly to the ventral side. *Saxifraga oppositifolia* is about the only food flower now available, the male catkins of the common willow (*Salix anglorum*) not ripening until after June 15. The usual insects (spiders, carabid beetles, flies, hemipters (*Chiloxanthes stellatus*, etc.) are common, the hemipters now not found exclusively under stones and in plants, but running about freely. On June 20, a big curculionid larva (*Trichalophus stefanssoni*), white, with brown head, was found in its pupating cell under a loose flat stone. It was placed for rearing (No. 122), and during the first week of August it pupated; the beetle emerged about a month later.

In the harbour creek perlid larvæ were noticed. In the ponds mosquito larvæ (*Aedes* sp.) were almost full grown; those placed for rearing (No. 109) began pupating two days later, and the adults emerged during the first week in July. Large dipterous larvæ (tipulid) burrowing in the mud were also seen.

June 11-20, 1915

On June 18, the first bumblebees (queens) of the year were noticed, but none were caught. On the same day some small flies (*Fucellia punctipennis*) were seen half jumping, half flying on the loose sand of an exposed slope. Minute diptera were observed on a snow-free, gravelly flat, but they did not congregate in swarms. Though flying insects were few, large numbers of other insects were found under stones, in plants, etc. In such places the earlier (Carabid beetles, spiders, mites, collembola, etc., besides an occasional weevil or insect larva (tipulidæ, curculionidæ, nematidæ), were frequent. In rotten driftwood were found the mite *Rhagidia gelida* and different collembola (*Onchirurus 12-punctatus*, *Achorutes tullbergi*, etc.). Caterpillars found under stones, on plants, etc., were placed for rearing. One of these (Rearing 51) proved to be parasitized, but lived for about two months, and even began its cocoon; when two large hymenopterous cocoons burst forth, their host died, though slowly. Ponds became richer in invertebrates as the month progresses. At first only a few collembola (*Isotoma palustris*) are seen upon the water, or a couple of dytiscid beetles are busily digging or swimming in waterholes. Mud- and freshwater-algæ support a rich life of microscopic animals (worms, rotifera, etc.).

Most of the temporary ponds are barren of microscopic life; it seems to be a question of suitability of the bottom mud more than of anything else.

On June 18, collembola (*Achorutes armatus*, *Folsomia quadrioculata*, *Tetracanthella wahlgreni*), dytiscid-beetles, or larvæ and many copepods (*Cyclops magnus*) were found in a pond, and, the first time this year, mosquito larvæ (*Aedes nearcticus*) only a few days old and 3-4 mm. long. Some of the mosquito larvæ were placed for rearing (Rearing 59); at the end of the month the largest had double their length, and they began pupating ten days later. The first-reared imagines emerged in the middle of July; their pupa stage is thus of very short duration. In the mud of this pond were found two days later a white dipterous larva and white oligochaete worms; the water temperature was then 44.1 degrees F., (air 32.2 degrees F., noon).

June 21-30, 1916

The first female mosquitoes (*Aedes* sp.) appeared on June 21, and by the end of the month became numerous and very annoying, especially in low-lying and sheltered places. The first crane-flies (*Tipula* sp., etc.) were also noticed on June 21, and their number rapidly increased. Flies, of course, were also common, and the bumblebee queens (*Bombus sylvicola*, *B. neoboreus*, etc.) were busily engaged on the early flowers. Many small midges were noticed above or in the creek outlet.

Various spiders (newborn, pale, grey brown; *Tmetiscus alatus*, etc.), mites (*Scutovortex nigrofemoratus*), collembola, caterpillars, etc., were prevalent.

An almost dry pond contained, the last day of the month, besides the usual dytiscid beetles and mites (*Thyas stollii*), many dytiscid larvæ about 1mm. long, and a number of mosquito pupæ (*Aedes nearcticus*), but very few mosquito larvæ. More interesting, however, were the entomostraca, namely, both sexes of the phyllopod, *Branchinecta paludosa*, now almost full grown. Younger stages of the same branchipod were found in a brackish pond, and many young water fleas (*Daphnia pulex*), midge larvæ and pupæ were found among the thread-algæ in the creek outlet. In the creek back of the harbour the imagines (*Nemoura*

sp.) emerging from perlid nymphs were noticed. The nymphs were crawling up on the stones in the creek. Attached to these stones by their rear suctorial disk-wart were simuliid (black-fly) larvæ up to 1 cm. long. About a dozen were sitting together on each stone and when the stones were lifted, the larvæ released their hold and tried to slip off. When placed in a tumbler, they could easily climb up the glass by the aid of their thoracic (central) "wart-leg" and the suctorial disk at their hind end, somewhat after the manner of a spanner worm. Or they would spin threads from the water-surface to the inside of the glass and ascend on them, but they are not able to float without these threads. When at rest, these larvæ attached themselves to the glass or to the threads by their hind disk and kept the body straight out or at some angle. Only then are their famous plumose gills to be seen on the expanded neck. These are folded up and stretched out, one at a time, continuously, with varying quickness; there is about one second between two "strokes," simultaneously with the maxillæ, but the latter move both together.

The powerful and varied means of locomotion possessed by these simuliids is due to their living in running water, the scarcity of which around Bernard harbour at this period probably explains the scarcity of the fly. Farther east, the species is very common. Efforts to rear the larvæ were unsuccessful.

June 21-30, 1915

Flying insects now are often met with (*Bombus neoboreus*, etc., all queens, various flies, etc.) but the majority of insects are still upon the ground.

The ponds and lakes around the harbour, the lakes being only partly free of ice, were examined. In the ponds were the common mosquito larvæ (*Aedes nearcticus*) and an occasional fly larva (*Rhamphomyia* sp.), freshwater snails (*Aplexa hypnorum*) attached to grass leaves or as empty shells upon the mud bottom, dytiscid beetles, midge larvæ tubes of caddis-flies, etc., and two kinds of water mites. One of these mites (*Thyas stollii*) is 1-1½ mm. long, has black eyes, and a round and flattened abdomen of a bright rose colour. It is always seen crawling over the mud bottom. The other mite (*Curripes reighardi*) is less than 1 mm. long and has the ball-shaped abdomen tile-red with the legs and cephalothorax still darker. It is not so often seen crawling, but generally paddles with all its long-haired legs, rising or sinking in the water at will.

The large lakes contain various trichopterous larvæ in their tubes; they will attach themselves even to a baited hook. The usual dytiscid beetles and various midge larvæ (*Chironomus* sp., etc.), and the larger dipterous larvæ are present. Crawling on the bottom in the marginal water are perlid larvæ (nymphs), evidently near their final transformation, for over the snow covering the lake ice one mild day (June 25) a number of imagines (*Capnia nearctica*), probably of the same species, were seen crawling with wings already, but not fully developed. They may have come up through cracks in the ice, or from the ice-free marginal water. The direction in which they crawled indicated an instinctive knowledge of the location of the shore, even if they are far out on the lake. They perhaps make for the shore to copulate, but their life as imagines is probably very short. Three months later in the same locality, similar instances, but on a larger scale, were seen, only it was then trichopterous imagines. On these lakes the usual collembola (*Podura aquatica*, etc.) assembled in large colonies, the full-grown blue ones carrying their small, brown, young ones on their backs in grebe style. Minute, jumping-flying flies were also common. A larger fly with similar locomotion had half a dozen minute, flat, round mites on the central side of the first abdominal rings.

July 1-10, 1916

Many flowers are out, resulting in a great number of insects. The flying varieties include flies, crane-flies, midges, and mosquitoes. The crane-flies are typical of dry tundra places and are frequent on ponds. Of hymenoptera, various

ichneumonids and an occasional sawfly (*Euura arctica*, etc.) are seen, but bumblebees (*Bombus arcticus*, *B. polaris*, etc.) of both sexes, are the most common. Butterflies now appear for the first time; they comprise species of *Brenthis* and *Oeneis* characteristic of dry tundra swamp, *Colias* (*Eurymus*) species characteristic of wet tundra swamp, and *Erebia fasciata* characteristic of tundra swamp. *Brenthis* flies only for a short while at a stretch and is easily caught, but *Colias* flutters along for a long time before settling. Owing to its colour *Oeneis* is almost impossible to discern on the ground; when scared, its flight is long and nearly straight. *Erebia fasciata* is even more difficult to catch, its flight being higher and longer than that of *Oeneis*. Various moths (*Anarta* sp., *Titania* sp., *Napuca* sp., *Homoglaea* sp., etc.) are now out; most of them are typical of the drier part of the tundra, stony patches, etc., with which their colour blends so well. The large, spotted moth *Hyphoraia* (*Bombyx*) *festiva* now emerges from the cocoons spun to stones, plants, etc.

Of ground insects, various caterpillars, spiders, mites, beetles, etc., may be seen. A small hemiptera (*Orthotylus* sp.?) which resembles an aphid, takes refuge in plant tufts; it is described on the next page.

The temperature of the ponds on the 3rd, taken at 3.30 p.m. was 55 degrees F. or 5 degrees higher than that of the atmosphere. The insects noticed were some fly larvæ and a great number of midge larvæ, and pupæ of various kinds. Attempts to rear them were without success. Larvæ and adults of the large dytiscid beetle (*Colymbetes dolabratus*) were seen; the former were gathering food on the mud bottom, but the latter preferred the rich moss encircling the ponds.

Collembola (*Achorutes sensilis*) and the puparia of the fly (*Mydaciina obscura*) (Rearing 78) are on the ponds; in the water or burrowing in the mud are various mites (*Eylais falcata*, etc.). In the placid water of the mouth of the large creek larvæ of midges, ephemeroïds, perlids, mosquitoes, turbellaria, etc. are found; and on July 10, the *Simulium* larvæ already mentioned had pupated inside their chitinous "house"-cone attached to the same submerged stones on which the larvæ were found. The few pupæ found were scattered over stones, not many on one stone. Each pupa is fastened by the pointed end of its cone, the "gills" protruding from the broad opening at the other end, the pupæ thus having easy access to the water. On the expansion of the creek as it leaves the lake a rich growth of *Hippuris*, etc., from which all stages of *Chironomus* and other midges were collected. In the lake south of the harbour, great masses of dead, freshly-emerged midges were seen floating, sometimes forming almost a "carpet," and supplying food for the trout and stickle-back. These flies had perhaps been killed by parasites, for on placing some of them in formalin, white worms (*Gordius*?) emerged from their bodies. Or perhaps the waves on the now completely open lake had caused their death.

July 1-10, 1915

A great number of different insects were on the wing. Many bumblebees (*Bombus polaris*, *B. sylvicola*, *B. neoboreus*, etc.), all queens, were infested with the parasitic mites (*Parasitus bomborum*) which also crawl over the male willow catkins and the flowers of the common *Pedicularis lanata*. The behaviour of the mites on the flowers was quite different from those on the bees. The latter clung to the hairs of their host, their four pair of legs serving as grips, and they drop off only when their host is put into the killing-bottle. But the mites on the flowers moved freely around by the three last pairs of legs, the first pair being used as constantly vibrating feelers, like a wasp's antennæ. They frequently scratched the abdomen with their legs, and are prone to fight. They had perhaps been left on the flowers by their host and were waiting for a bumblebee to which they could attach themselves. Various other hymenoptera were caught and many of the butterflies and moths before mentioned which now appear. Moths and *Colias* were first noticed on the 3rd, and soon became

common. The first *Brenthis* were seen on the 6th, the first *Oeneis* on the 7th, the first *Erebia* on the 9th. An occasional phryganeoid imago is seen and a great variety of flies, crane-flies, (tipulidæ), and midges. Small jumping-flies were common on dry seaweed July 1. The first biting mosquitoes (*Aedes* sp.) were seen July 9, at the harbour, and soon became troublesome.

Among the many insects found upon the ground, large spiders (*Lycosa* sp.) are seen feeding on other spiders, and beetles. Minute, dark-red mites (*Trombidium succidum*) frequents the gravelly slopes with southern exposure, where an occasional weevil (*Sitona* sp., *Trichalophus* sp.) or chrysomelid beetle, and the common carabids may also be seen. The minute hemiptera (*Ortholytus* sp.?) are seen only on calm, sunny days or in well-sheltered places, otherwise remaining hidden in the plant tufts (*Oxytropis*, *Potentilla*, etc.). They make a noise something like the chirp of the grasshopper. They were first noticed July 6 and were in different stages; the smallest ones moulted, embedding their trunks in a plant stem; the somewhat larger ones had orange abdomen, head, and wings, with blue-black eyes and dark, brown legs. The largest were green with head, eyes, wings, and legs light brown. All had two pairs of rudimentary wings. Other small, wingless, dark brown hemiptera 2 mm. long, were seen. Puparia of various flies taken from plants and moss were placed for rearing on 7th (Rearing 67) and from one of these the imago emerged five days later.

Among the various lepidopterous larvæ and pupæ was the caterpillar mining in the stems and root of *Pedicularis lanata* noticed for the first time this year on the 4th. A cocoon collected on the 7th, had a smooth, black pupa 2 cm. long attached to a stone and proved to be the rare moth *Hyporaja festiva*; the imago emerged on July 24, and began to lay its eggs two weeks later (Rearing 68).

A pond on the tundra near the harbour contained only white oligochaete worms (*Henlea* sp.), thus showing a surprising lack of insect life as compared with other ponds. In a nearby pond were noticed two days later—larvæ of midges, dytiscids and in the overflow from the pond an abundance of animalculæ. On July 6, many larvæ, of all sizes, and pupæ of common mosquitoes (*Aedes* sp.) were found in ponds, and several intermediate stages were noticed; first the abdomen shows the pupal characters; then the thorax; and soon the "pre-pupa" much paler than the immediately following pupa appears. The pupæ are easy to rear, as they need no food, and about a week later the adults emerge (Rearing 59, 59a). Efforts to rear the dystiscid larvæ with these mosquito larvæ as food, failed.

July 11-20, 1916

On the 14th inst., the shores of Dolphin and Union strait were visited and a great number of flying insects were observed. Mosquitoes (*Aedes nearcticus*) were troublesome in sheltered places; flies, *Pogomyia quadrisctosa*, *Rhamphomyia conservativa*, etc.) were noticed on the flowers of *Dryas*, *Potentilla*, etc.; (Pl. I, fig. 1), and two female bot-flies, *Ædemagena* (*Hypoderma*) *tarandi*, were captured. They made no sound until placed in the killing bottle when they produced a buzzing noise of short duration. These are the flies whose maggots are found in the caribou. Many bumblebees (*Bombus sylvicola*, etc.), butterflies (*Colias* sp., *Oeneis* sp., *Brenthis* sp., *Lycaena aquilo*), and various moths were collected; the butterflies had wings scaleless and somewhat torn, where exposed to the wind on the open tundra; the moths were found principally upon the sheltered slopes of gravel ridges. The common invertebrates, including insects, were observed in ponds; even a waterhole with brackish water and many green algæ contained midge larvæ, and was teeming with dark-red copepods (*Eurytemora* sp.) a favourite food for the phyllopods (*Branchinecta paludosa*), also found here.

July 11-20, 1915

Insect life at Bernard harbour is now at its height. The following flying insects were observed:—

Sawflies: *Pontania subpallida*, *Amauronematus magnus*, etc.
 Bumblebees: all three sexes almost all infected with *Parasitus bomborum*.
 Wasps: *Ichneumon* sp., *Apanteles* sp., etc.
 Flies: *Ptiolina* sp., *Rhamphomyia* sp., *Phorbic* sp.
 Crane-flies: *Limnobia* sp., *Tipula* sp.
 Mosquitoes: *Aedes* sp.
 Phryganeoidæ }
 Perlidæ } Adults
 Ephemeroïdæ }
 Butterflies: *Brenthis* sp., *Colias*, sp., *Oeniscs*, sp., *Erebia*, sp.
 Moths

The ground is alive with insect life. Mites (*Trombidium* sp., etc.) are common and their eggs (*Bryobia praetiosa*) are deposited on dead willow leaves, from which the young ones (nymphs) are just emerging. Many spiders (*Lycosa* sp.), are seen, the larger of which line the interior of crevices or lemming-burrows with web; they also construct nets outside for capture, something like a large moth cocoon. The spiders often carry egg-sacks, devour their prey (other spiders, beetles, etc.), inside the burrows or "cocoon." The "cocoon" up to about 3 cm. in diameter are almost globular and firmly spun of close-lying threads, with a "window" of slighter construction. This "cocoon" is perhaps a protective web, closing the burrow outwardly, and used by the female only until the eggs hatch and the young are able to take care of themselves. Collembola, beetles and beetle larvæ (weevils, carabids, etc.) are common. Of hemiptera, various small, wingless forms (*Euscelis hyperboreus*, *Calacanthia trybomi*, etc.) abound in plant tufts. The common Saldid (*Chilozanthes stellatus*) has already been referred to (page 11κ). A microlepidoptera is also common and characteristic of sandy slopes, but seems never to use its wings; it keeps them as a roof for the body, crawls up on the sand and slides suddenly down, when scared, like a leaf-hopper, which insect it resembles in shape and colour. Various lepidopterous larvæ or pupæ were placed for rearing, but without much success. The flower stems of *Pedicularis lanata* held some of these larvæ (rearing 71); and dipterous larvæ and dipterous pupæ were found in moss, and various sawfly larvæ—both the species which make leaf galls and the ones which live in the immature, female catkins—were found on willows. Attempts were made to rear both kinds, but they progressed only as far as the pupal stage. The larvæ inside the galls made their cocoons on October, 1915, and pupated the following June (Rearing 74). The others (Rearing 85) enter the carpels by eating a hole at their base, and their presence is soon shown by yellow-brown excrement. The infested carpels do not ripen, but dry up, because the larva inside feeds on the wall and seeds, and probably later attacks one or more carpels. In due time the larvæ spin cocoons outside the carpels and pupate inside them.

The overflow from the ponds contains oligochaete worms (*Lumbriculus* sp.), larvæ of dytiscids, and minute mosquitoes (midges). (Pl. IX, fig. 2). Trout caught in a large creek near the harbour had in their stomachs large dipterous larvæ, as well as smaller larvæ (*Chironomus* (?)) and larvæ and nymphs of perliids. In the mud of the brackish pond many green algæ, attached to which were numerous fasciæ of "winter-eggs" of *Daphnia pulex* were present and the water teemed with the young cladocera emerged from these. In the water were also many metanaupliæ, about 1 cm. long, of the common phyllopod (*Branchinecta paludosa*), a favourite food for the larvæ and beetles of dytiscids; minute, red collembola, a great number of midges in all stages of development, and copepods were also observed. The curious puparia of the interesting fly, *Mydaeina obscura*, were found on the 19th in this pond. The larvæ burrow in the mud of ponds or lakes, and during the postlarva-pre-pupa stages, remain there looking like brown

willow twigs or large plant seeds, and thus evade the notice of water birds. The pupa now develops in and partly fills the case, which shows three divisions: first, large, swollen, cylindrical front-end with a lid, by the aid of which the fly later emerged; second, a constricted "neck," and finally the "caudal" part, also cylindrical but smaller than the "cephalic" part, and containing air by which the puparium rises to the surface and floats with the air chamber uppermost. Just before the emerging of the imago the puparium becomes U-shaped, the neck curving so that the part of the puparium containing the pupa also touches the water-surface, and the imago can emerge by the opening of the "lid." This process was observed with one of these pupæ collected July 19, 1915, and the imago emerged four days later; from a pupa collected July 3, 1916, the imago emerged the following day (Rearing 78). The fly itself is also aquatic. As soon as the imago has emerged the puparium stretches out again but remains floating.

On the margin of a large lake inland from Bernard harbour, a great number of freshly emerged midges of both sexes were in copula on the 15th. In the marginal water were many *Chironomus* (pupæ and adults), besides perlid and trichopterous larvæ. *Branchinecta paludosa*, amphipods (*Gammarus limnacus*), and other freshwater invertebrates were found in many of the nearby lakes.

July 21-31, 1915

Insect life is now very similar to that in the middle of July. Mosquitoes (*Aedes* sp.) are very numerous and annoying on warm, clear days, most of the larvæ and pupæ in the ponds having transformed (Pl. I, fig. 2). Various flies and crane-flies (*Limnophila* sp., *Styggeropsis* sp., *Nephrotoma* sp., *Tipula* sp., etc.), sawflies, and parasitic wasps are common, but neuropteroid imagines are comparatively few. Bumble bees (*Bombus neoboreus*, *B. sylvicola*, etc.), especially the queens and workers, are busily visiting the many flowers now out. Two of the willow species (*Salix anglorum*, *S. pulchra*) have now dropped most of their male catkins, but those of *S. reticulata* are in full bloom. Many butterflies (*Erebia* sp., *Brenthis* sp., *Colias* sp., *Oeneis* sp., etc.) and moths are seen on clear, calm days; of the former a female specimen of *Pieris occidentalis* was secured. The advent of this butterfly appears to synchronize with the first blooming of the cruciferæ (*Sisymbrium* sp., etc.) on which, probably, the larvæ feed and which the imago seems to prefer. Muscid maggots were noticed in rotten seal-meat, but could not be reared.

August 1-10, 1915

The following flying insects were noticed:

- Bumblebees (*Bombus* sp.)
- Sawflies
- Wasps, parasitic (*Euclyptus* sp., *Diocles* sp.)
- Butterflies (*Colias* sp., *Oeneis* sp., *Brenthis* sp., *Lycæna aquilo*)
- Moths (*Homoglaea*, *Titanio* sp., Microlepidoptera, etc.)
- Crane-flies (*Erioptera* sp., *Tipula* sp., etc.)
- Flies
- Mosquitoes (*Aedes* sp.)
- Neuropteroid imagines

The *Colias* and *Brenthis* prefer low, grassy land or gravel supporting flowers; the moths are found on clayey or gravelly bluffs or slopes. The mosquitoes are less troublesome than in July.

Sawfly larvæ may be seen boring in the female catkins or making galls upon the leaves of willows. A larger sawfly larva fed on the leaves of bushy willow (*Salix pulchra*) from which, owing to its colour and quiescence, it is with difficulty distinguished. Efforts to rear it progressed no farther than the pupating stage, October, 1915. The common hemiptera (*Chiloxanthes stellularis*) and smaller bugs (*Lobopidea* sp., etc.) and the common collembola mites, spiders, beetles, caterpillars, etc., are met with.

On the margin of the brackish pond, now much smaller, imagines of *Mydaëina obscura* were captured. Empty, floating pupa cases of the same species floated on the surface, showing that the imagines had but lately emerged. Dytiscid beetles, midge larvæ, copepods, *Daphnia pulex* (female now with two winter eggs), and almost full-grown *Branchinecta paludosa* (female with eggs) were found in the pond. The bottom of a larger pond inland, consisted of a thick layer of brown detritus mud between the scattered stones and *Carex* vegetation. In or on the bottom were many larvæ and pupæ of midges (*Tanyppus* sp., etc.), beetle larvæ, and the common red watermite (*Curvipes reinhardi*). In the big creek at the harbour on August 6, snails (*Aplexa hypnorun*), perlid and ephemeroïd-nymphs, turbellaria and *Hydra* sp. were collected.

August 11-20, 1915

The flying insects observed were:—

Bumblebees (*Bombus sylvicola*, *B. neoboreus*, *B. arcticus*)
 Butterflies (*Oolias* sp., *Brenthis* sp., *Oencis* sp., *Erebia* sp., *Lycaena* sp., *Chrysophanus* sp.)
 Moths (*Anarta* sp., etc.)
 Wasps, parasitic (*Exolytus insularis*, *Diocetes modestus*, etc.)
 Sawflies
 Crane-flies (*Tipula* sp., etc.)
 Flies (*Melanostoma* sp., etc.)
 Flies, black (*Simulium* sp.)
 Midges (*Occothea aristata*)
 Mosquitoes (*Aedes* sp.)

An ephemeroïd imago was captured on the 16th, just emerging from its nymphal skin.

On the ground, or upon plants are various spiders: the female of the big *Lycosa* species now carry their newborn young in the egg cocoons. Mites (*Rhagidia gelida*) and collembola are frequent. In plant pillows are found various fly pupæ and lepidopterous chrysalides or cocoons; if the latter be a *Gynaephora* it may contain instead of the lepidopterous pupæ the dried-out caterpillar and about a dozen tachinid (*Euphorocera* sp.) puparia. Beneath the surface are larvæ of the common tipulids, and under stones, an occasional brown slug, *Agriolimax hyperboreus*. Leaves of the various willows are often infected by gall-mites (*Eriophyes* sp.), forming small prickly swellings. The sawfly larvæ are most conspicuous upon the willows, the larger species with its post-larval, red colour, and the smaller boring in the female catkins; these latter pupated the following June, but got no further.

On the margins of the two ponds on the ridge about 100 feet high, southwest of the harbour, brown detritus-mud is exposed. The ponds contain a number of invertebrates, including a few males of *Lepidurus arcticus*; most of the females of this crustacean have now deposited their eggs.

The large creek at the harbour is now nearly dry. Here were found turbellaria (now with "winter eggs" inside), perlid, and ephemeroïd nymphs and colonies of *Simulium* pupæ, attached in running water to stones, moss, and grass-stems, the stones being more popular on account of the similarity in colour. In fact it is most difficult to detect these pupæ unless they congregate in large colonies, when the two white, free gill-plumes on the head of each individual show up in the water in undulating streaks. The pupa-cases (August 16) were mostly empty, but some of them contained the pupæ which were infested with one or more minute, bright-red nymphs (three leg pairs) of a watermite, crawling over the dead pupa. They represent probably the larval stage of one of the common hydrachnids. The comparative scarcity of black flies at Bernard harbour may be due to the small amount of streaming freshwater, an element necessary for the complete development of the insect. Conditions may differ farther to the east, judging from the great annoyance travellers have reported from black flies there.

August 21-31, 1915.

Insect life is decreasing. Flowers are less plentiful and certain plants have completed their bloom. A number of insects are, however, on the wing including flies (*Sciara* sp., *Prosimulium borealis*, etc.) crane-flies (*Tipula* sp.), but fewer midges and mosquitoes. An ephemeroïd sub-imago was found upon a stone in the creek bed; the imagines of this suborder first emerge apparently about the middle of August. Of hymenoptera, bumblebees (*Bombus* sp.) are still numerous, and small wasps on willow plants. Of butterflies, the common *Colias* sp. are frequent, and in a lesser degree the *Brenthis* sp. The lycaenids (*Lycaena* sp., *Chrysophanus* sp.) are fewer, and the *Oeneis* sp. and *Erebia* sp. have almost disappeared. Moths (*Autographa* sp., *Lygris* sp., etc.) are seen on slopes; when scared the flight of *Lygris* sp. is short and fluttering, though direct from place to place.

Of ground insects the small tineoid imagines, typical of sandy slopes, and the common, black hemipter (*Chiloxanthes stellatus*) are seen, and on dry tundra swamp some curious smaller flies (*Scellus spinimanus*), their abdomen and eyes having a metallic glitter; though having wings they only crawled or jumped. One of them had its pupa skin still attached to its legs. Two (male and female) small crab-spiders (*Xysticus bimaculatus*) were collected besides the common spiders, collembola and mites (*Bdella arctica*), weevils, carabids, caterpillars, etc. The fresh water still contains a teeming life of entomostraca and dytiscid larvæ, etc.

August 30-31, 1914.

During this period and the first half of September observations on insect life were possible only in 1914. Autumn was heralded by the scarcity of flying insects and by the behaviour of those upon the ground. A big ichneumonid wasp among *Élymus* plants, and the common, small, jumping flies (black spotted wings) under stones were easily captured. The common hymenopterous cocoons, spiders, mites, and collembola, were found and the common glistening carabid beetles (*Amara glacialis*) which were crawling around or had already excavated small grooves in the sand for hibernation. Some of the willow leaves were infested by the gall mites (*Eriophyes* sp.) or had galls produced by sawfly larvæ. The galls were placed for rearing (Rearing 37) and in October the larvæ made their pupating-cocoons outside them. The imagines which emerged in the middle of August, 1915, proved to be parasitic wasps (*Dioctes modestus*) and not sawflies, thus proving that hymenoptera as well as diptera, lepidoptera, and coleoptera are kept in check by these insects.

September 1-10, 1914.

Owing to the mild weather, insect life, during this period, was very similar to that during the latter end of August. Even moths and butterflies (*Colias nastes*, *Chrysophanus hypophlaeus feildeni*) were seen early in the month, bumblebees were seen up to the 5th and parasitic wasps (*Ophion bilineatum*, etc.), until the 7th. A few trichopter imagines and some mosquitoes (*Aedes nearcticus*) were seen, but no crane-flies. Other flies observed were *Hydrophoria* sp., *Rhamphomyia* sp., *Peleteria* sp., *Scatophaga* sp., *Limnophora* sp., and a smaller species (*Scellus spinimanus*).

Among the ground insects noticed were *Chiloxanthes stellatus*, spiders (*Tmeticus alatus*, *Microneta maritima*, *Lycosa* sp.) and mites (*Scutovortex lineatus*). The spiders, *Paradosa glacialis* and *Erigone arctica*, were also seen, as were the common collembola and carabid beetles (*Amara* sp., *Pterostichus mandibularis*, etc.) small black staphylinid beetles, a few smaller dysticids, tipulid larvæ, and caterpillars.

September 11-20, 1914 and 1915

The few insects collected were mostly caterpillars, beetles, spiders, and tipulid larvæ. No flying insects were seen.

September 21-30, 1914

No flying insects were seen. Under loose stones various beetles and caterpillars were found. The small staphylinids were more lively than the carabids (*Amara brunnipennis*, etc.). The weevils lay motionless until touched, when they moved, but slowly. Small spiders, mites, and collembola showed few signs of hibernating. Larger spiders had made globular webs between the sand and gravel; the size of the web in proportion to its builder, but never larger than a walnut.

September 21-30, 1915

The brackish pond was frozen over. The depth below the ice was about 3 feet, and the mud from the bottom gave a strong odour of sulphuretted hydrogen. In the water were many dead midge larvæ, "winter eggs" of *Daphnia pulex*, and rose-purple copepods (*Eurytemora canadensis*) often carrying their eggs.

The large lake southwest of the harbour was covered with ice over which hundreds of imagines of a big caddis-fly (*Chilostigma praeterita*) were crawling. They must have just emerged or perhaps been tempted from their hibernating places by the mild weather. The occurrence of these rather frail imagines in such numbers is surprising; they probably belong to the same species as the large larvæ found in this and other nearby lakes. A male spider, also, was seen crawling over the ice; the same two kinds of arthropods were noticed, a week later, crawling over freshwater ice at Cockburn point, a few miles away, and, the next day, upon lake ice at the harbour.

The big lake of the harbour was found to have a maximum depth of 20 feet; it was frozen over by the 28th. Two days later a sample of sand from the bottom showed a crust of green algæ and detritus and contained red-brown midge larvæ in their sand-covered tubes, besides worms (*Lumbriculus variegatus*), etc.

WEST SIDE OF CORONATION GULF (INCLUDING THE LOWER COPPERMINE RIVER)

East of Bernard harbour the coast shows little change, consisting of gravel or sand, with boulders and outcrops of limestone beds. Liston, Sutton, Lambert, and Douglas islands in Dolphin and Union strait have the same composition, though the limestone (dolomite) is more prevalent than on the mainland.

The east side of the mouth of Coppermine river is a sandpit projecting from a low, gravelly tundra-plain lying at the foot of the clay hills and the west side is formed by an extension of the gravelly clay banks about 100 feet high which, farther inland, form both sides of the river.

The east side of the Bloody fall gorge is formed by very steep and high cliffs, practically without vegetation; on the west side, the vegetation (scrub-willows, etc.) is best developed upon the lower cliffs.

Above Bloody fall the river widens and both sides have high, gravelly, and sandy cliffs, generally steep and barren but sometimes supporting good vegetation including scrub-willows up to 6 feet high. Inland from Escape rapids the hills attain their highest point. Along the river the slopes support the tundra plants, and "niggerheads" are common.

South of Escape rapids the northern limit of trees is represented by a few diminutive white spruce which from this point increase in number and size, especially in small creek valleys joining the river, where some of the trees are about 12 feet high. They gradually decrease in size and number as the valley is ascended, until they disappear altogether.

Groves of white spruce (*Picea canadensis*) become frequent farther up the river. The largest trees were 30 feet high and about 5 feet in circumference near the ground. Even stunted trees were seen from their rings to be about fifty years old, and the largest must have been nearly five hundred years. Samples were secured of the rich growth of lichens found on the dead trees and on the dead branches of the living trees. Many of the trees were attacked by insects and very few young trees were seen, the growth as a whole indicating longevity. Dr. Richardson ascribes the appearance of the forest—in particular the dead trees and stumps—to a deterioration of the climate, fires and exposure to cold north winds. Insects, however, undoubtedly contribute to the destruction and many dead trees have been killed or injured solely by bark beetles and cerambycid larvæ, which were as numerous in some trees as in trees farther south.¹

Owing to their scattered distribution and consequent liability to exposure, the percentage of trees, above a certain size, attacked by insects is larger in this region than farther south. Living as they do under the bark, the insects are not greatly influenced by the cold.²

Three species of bark beetles, *Polygraphus rufipennis*, *Pityophthorus nitidus*, and *Dendroctonus johanseni*, were found in the dead trees, either under or in the bark,³ but the third species was found in only one tree, under the bark at its base. All the beetles were dead, and no immature stages were observed.⁴

Tunnels of Cerambycid larvæ were common upon the dead trees. Dead larvæ, cast skins, or their hymenopterous parasites were found in these burrows, occasional "foreign" insects which had crawled into them later, and a few cerambycid imagines, which possibly belonged to the tunnels.

The living trees contained the *Polygraphus* and *Pityophthorus* mentioned above and *Carphoborus andei oni*, but bark beetles were not nearly so numerous as upon the dead trees.

Depredation to the living trees by boring insects is extensive. The bark-boring—the more destructive—are represented by *Merium proteus* and the wood-boring by *Neoclytus muricatulus* and *Xylothrechus undulatus*. Most of the larvæ were heavily parasitized by immature stages of hymenopterous insects, but all efforts to rear were unsuccessful.

Of harmless insects a few sawfly larvæ in cocoons were found in the cerambycid galleries; they were of two kinds, the smaller a light brown, with dark, dorsal streaks; the large, light green. This green larva was reared (No. 46) and emerged July 13, 1915, when it proved to be a new species, *Pontania quadrifasciata* MacGillivray.

Under spruce bark, or in the cerambycid tunnels, spider webs, fragments of flies and beetles, etc., and a winged ant were observed. This ant and a similar specimen found November, 1913, in an old bird's-nest about 30 miles up Sadlerochit river, represent the only ant material secured by the expedition, and the two localities indicate the probable northern limit for ants in North America.⁵

No other insects were seen along the lower Coppermine river, except a few bot fly-grubs (*Oedemagena tarandi*) from caribou above Bloody falls. Franklin (1st Expedition) states that sandflies were numerous and troublesome in the August evenings, the temperature then being 53 degrees F. at about 67° 12' North; and Richardson (Arctic Searching Expedition) was annoyed by these insects in the same region as late as September 8, in the evening.

¹ Johansen, F., Can. For. Jour., XV, 7, July, 1919, pp. 303-5.

² See Rept. of Can. Arct. Exped., 1913-18, vol. III, Part E, Coleoptera, by J. M. Swaine.

³ A section of a trunk was preserved.

⁴ The observations were made in February, 1915.

⁵ *Formica hereculeana* recorded from Back's Overland Expedition (Great Fish river) by Children.

Apart from the forest insects, the insect life along the west side of Coronation gulf and the lower Coppermine is probably very similar to that at Bernard harbour, though the mosquitoes, etc., become more troublesome farther south.

SOUTH SIDE OF CORONATION GULF (INCLUDING BATHURST INLET, NORTH OF LATITUDE 67½ DEGREES NORTH)

Owing to the milder climate, vegetation and insect life between Coppermine river and Bathurst inlet are at least a week earlier than at Bernard harbour and cessation of plant life is, probably, later (Pl. II, fig. 2). Very few insects were secured by previous expeditions. Hanbury collected butterflies, the earliest ones, apparently at cape Barrow, June 26, while flies, spiders, etc., were noticed on June 10 (Kent peninsula), and the first mosquitoes at Lewes islands on June 27.¹ Insects captured by the Canadian Arctic Expedition were mostly picked up casually, but from them and from the narratives of Hanbury it may be assumed that the insect life is practically the same as at Bernard harbour. The paucity of vegetation on many of the rocky islands causes a scarcity of insect life (Pl. X, fig. 1).

Below is a list of insects secured by Hanbury and by members of the southern party of the Canadian Arctic Expedition; the latter ones are from Tree river and Gray bay, in July, and from cape Barrow (Pl. X, fig. 2), and Bathurst inlet in August and September.

Arachnoidea	{ Spider (<i>Lycosa</i> sp.?)
	{ " (smaller)
	{ <i>Trichalophus stefanssoni</i>
	{ <i>Silpha lapponica</i>
Coleoptera	{ <i>Carabus chamissonis</i>
	{ <i>Coccinella nugatoria</i>
	{ Dvstiscid
Hymenoptera	{ <i>Bombus sylvicola</i>
	{ <i>Euura arctica</i>
Diptera	{ <i>Tipula arctica</i>
	{ <i>Simulium similis</i>
	{ <i>Anarta richardsonii</i>
Lepidoptera (moths)	{ <i>Hyppophila zetterstedti</i> ¹
	{ <i>Hyphoraia festiva</i>
	{ <i>Aspilatus orciferaria</i> ¹
	{ <i>Cidaria</i> sp. ¹
	{ <i>Lycaena orbitulus</i> ¹
	{ <i>Brenthis churcilea</i>
	{ " <i>frigga improba</i>
	{ " <i>polaris</i>
	{ " <i>pales</i> ¹
Lepidoptera (butterflies)	{ <i>Colias boothii</i>
	{ " <i>hecla</i> ¹
	{ " <i>pelidne</i> ¹
	{ " <i>nastes</i> ¹
	{ <i>Erebia disa</i>
	{ " <i>fasciata</i> ¹
	{ " <i>rossi</i> ¹
	{ <i>Oncis bore</i> ¹
	{ " <i>semideia</i> ¹

¹ Secured by Hanbury.

The saw-flies were reared from larvæ collected in galls on leaves of *Salix reticulata* at cape Barrow, August 14, 1915. They pupated the following June, and the adults emerged a few days later (Rearing 90).

" In summer the mosquitoes seem to be much more numerous and troublesome along the south side of Coronation gulf than they are along Dolphin and Union strait, probably because the land near the coast is less barren, and more sheltered from summer winds off the ice. In the vicinity of Hood river and the neighbouring parts of Arctic sound and Bathurst inlet the black flies (*Simuliidae*) were numerous enough to be troublesome in late August and early September, a rare thing on other parts of the Arctic coast with which I am familiar." (R. M. Anderson.)

¹ Hanbury, David T., Sport and Travel in the Northland of Canada, 1905, p.

ARCTIC ARCHIPELAGO

On Banks island a collection of insects, etc., was made by Mr. G. H. Wilkins at cape Kellett, 1914-15, but, with the exception of a couple of spiders in poor condition, identified by J. H. Emerton as young *Pardosa glacialis*, none of these insects have been determined, and little can be said of insect life on this island (Pl. VI, fig. 1). On Melville island a few insects (*Bombus arcticus*, with *Parasitus bomborum*, and lepidoptera (*Brenthis polaris*, cocoons of *Gynaephora rossi*) were collected, 1916, by the northern party of the Canadian Arctic Expedition. Spiders, identified by J. H. Emerton as *Erigone psychrophila*, and flies were collected on King Christian land (Findlay island) by the same party. A list of all insects collected by both parties of the expedition from the western half of Victoria island, from 1915 to 1917, appears below.

The coast of this western part is very similar to that of the mainland. Generally speaking, the northern part of the coast is higher and rocky, but from Simpson bay eastward the coast and land behind it are very low (except in the neighbourhood of Richardson island) and consist mainly of gravel or sandy tundra and boulders. The vegetation is the typically arctic; only in some of the river-beds do willows (*Salix Richardsonii*) attain as much as 8 feet in height.

Araneida.....	2 Spiders
Acari.....	None
Collembola.....	None
Trichoptera.....	Phryganeoid.
Coleoptera.....	{ <i>Agabus nigripalpis</i> (Dytiscid) <i>Carabidæ: Amara brunnipennis</i> , etc.
Hymenoptera.....	{ Parasitic wasp—cocoons (from caterpillar). Sawfly-larva (middle of June, 1915), and galls on willow leaves. <i>Bombus</i> sp. (seen; no specimens collected). <i>Prosimulium borealis</i> <i>Oedamagena tarandi</i> (only larvæ, in caribou). <i>Tanytarsus</i> sp.
Diptera.....	{ <i>Diamesia arctica</i> <i>Mydaeina obscura</i> <i>Scatophaga furcata</i> Tipulid larvæ
Siphonaptera.....	Fleas from Arctic hare.
Butterflies.....	{ <i>Argynnis chariclea</i> " <i>polaris</i> " <i>frigga alaskensis</i> <i>Colias hecla glacialis</i> " <i>nastes</i> <i>Erebia fasciata</i> <i>Lycaena aquilo</i> <i>Psychophora sabini</i> <i>Napuca orciferaria</i> <i>Titanio</i> sp. <i>Anarta leucocycla</i>
Moths.....	{ <i>Lygris destinata</i> <i>Gynaephora rossi</i> (only cocoon) <i>Anarta subfumosa</i> " <i>richardsoni</i>

Summer on Victoria island is generally from a week to a month later than along the south side of Dolphin and Union strait and of Coronation gulf.

According to D. Jenness small blow flies were seen for the first time May 23, 1915, almost a week later than at Bernard harbour, and bumblebees on June 30; about two weeks later. The butterflies and moths were noticed, as early as at Bernard harbour. Mr. Jenness writes that the first *Saxifraga oppositifolia* blossoms appeared on June 7 and were very common July 5; that flies settled in swarms on drying meat, July 2; that the first mosquitoes were seen July 8, became numerous and annoying July 13, and disappeared in a snowstorm August 22; and that plant and insect life were killed by frost on the night of August 24-25 (Pl. VI, fig. 2).

GENERAL (ARCTIC INSECTS)

A comparison of the insects found in the American Arctic and of those found in Greenland, is interesting. Dr. I. C. Nielsen has compared the insect fauna of the west coast of Greenland with that of the east coast.¹

Owing to the severity of the climate on the east coast of Greenland as compared with that on the west coast, insect life is less plentiful, including less than half the number of lepidoptera, one-third that of coleoptera and hymenoptera, one-fourth of hemiptera, one-sixth of diptera, and one-tenth of neuropteroids. Orthoptera and thysanoptera are only found on the west coast and are represented by single species (*Atropos* and *Troctes*, *Forficula*, *Blatta*, and *Physopus*) all probably introduced. No beetles (except perhaps staphylinids) are known on the east coast north of about 75 degrees north.

With the exception of Strepsiptera, most orders of insects are represented in Greenland, but far from all families. Ninety per cent of the hymenoptera are ichneumonids, the remainder, sawflies and bumblebees; the beetles are mainly those feeding upon plants, decayed matter, minute arthropods, or waterbeetles. The hymenoptera, lepidoptera, and hemiptera depend on land vegetation but most of the neuropteroids² and many of the diptera pass the early and longer part of their life in fresh water. Many of the diptera also belong to blood-sucking species feeding upon Eskimos and other mammals or upon decayed matter. Recent Danish authors give the following list of the different orders of insects found in Greenland:

Diptera..	about	170 species	Hemiptera..	about	12 species
Hymenoptera..	"	55 "	Neuropteroids.	"	10 "
Mallophaga	"	40 "	Suctoria.	"	6 "
Lepidoptera.	"	40 "	Siphunculata.	"	6 "
Coleoptera.	"	25 "	Physopoda.	only	1-2 "
Collembola.	"	13 "	Orthoptera	"	1-2 "
Mites.	"	65 "	Spiders.	about	45 "

The insects of Greenland are very similar to those so far found in the American Arctic, though the eastern part of the American Arctic has a far more severe climate than the corresponding degrees of latitude in the western part. The limit of spruce, or of isotherms is, therefore, a better southern boundary on which to base conclusions than any parallel of latitude. Owing to the intimate connexion between plants and insects the tree limit is preferable, especially as the data available are insufficient to warrant the use of isotherms as a base.

The country not forested is known as the "barren grounds" and reaches as close to the pole as explorers have attained. Forest insects cannot, of course, invade these grounds. The next insects to stop are the grasshoppers and probably also the other families of orthoptera.³ No orthoptera have been found in the Canadian Arctic archipelago. From the Arctic mainland the only grasshoppers we secured were a specimen of *Acrididae*, said to have been caught near the divide of the Alaskan Arctic mountains, within, or near, the limit of trees, and the specimen of *Melanoplus frigidus* secured by Mr. V. Stefansson in the summer of 1911 in the vicinity of Langton bay. The absence of grasshoppers in the Arctic is very noticeable and not easily accounted for. It cannot be the absence of suitable food, for grasshoppers eat almost any vegetable, and vegetation is

¹ "The insects of the Danmark Expedition." Meddelelser om Groenland, vol. 43, p. 55. "The insects of East Greenland," Meddelelser om Groenland, vol. 29, pp. 366-369. See also W. Lundbeck: "Entomolog Undersög. i West Greenland, 1889-90," Meddel. om Groenland, vol. VII, pp. 139-41; and W. Lundbeck and K. Henriksen in "Conspectus fauna groenlandica, Land arthropods," Meddel. om Groenland, vol. 22, p. 797, 1918; and W. Lundbeck: "Notitser om Grönlands entomolog. Fauna," pp. 27-34.

T. C. Schiödt "Grönlands Land—, Ferskvands—og Strandbreds—Arthropoder," in Rink "Naturhist Tillaeg til en geographist og Statistisk Beskrivelse af Grönland," 1857, pp. 50-71.

² Trichoptera are the only neuropteroids known from the east coast.

³ The *Forficula* collected on Parry's and Ross' voyages was probably introduced.

abundant. The absence of green leaves for nine months in the year may be a contributing cause, but the permanently frozen ground is probably the main factor. Grasshoppers lay their eggs in the ground, and as the surface, except in bare, sandy places, thaws for only a few inches, it may be impossible for grasshoppers to develop. Mr. Norman Criddle, of Treesbank, Man., states that the grasshoppers known to go farthest north in Canada hibernate as nymphs, and that the eggs are laid about a month after the beginning of spring. In the Arctic this would be about July 1, and the two remaining summer months are perhaps not sufficient for the nymphs to grow large enough to withstand the winter, even if the eggs were laid in the ground and hatched out.¹

The absence of true bees in the Arctic is perhaps due to the scarcity of flowers from which pollen and honey can be secured, and to the absence of suitable trees, etc., for nest-building. Sawflies (*Nematus*) were collected at latitude 72 degrees north, longitude 94 degrees east ("Fox" Expedition), and on Ellesmere island (2nd Fram Expedition). "*Formica rubra*" from Parry's and Ross's voyage was probably introduced, if the identification is correct.

As to the beetles found beyond the tree limit in the American Arctic, it is probable that those dependent on decaying matter, and those directly (chrysomelidæ, rhynchopora, elateridæ) or indirectly (plant-lice-feeders, coccinellidæ) dependent upon green leaves do not go as far north as the predacious families (carabidæ, staphylinidæ) and the water beetles (dytiscidæ).² None of the four first-named families have, it is believed, been found in the Canadian Arctic archipelago. Of the three families of predacious beetles, it may be assumed that those (Carabidæ, Dytiscidæ) depending upon larger prey do not go so far north as the family (staphylinidæ) feeding upon more minute organisms.

Micralymma was collected at cape Sabine; *Lethridius* in Alexandra fjord; *Cryptophagus* in Foulkes fjord (2nd Fram Expedition). The diminishing periods in which fresh water is ice-free as the high north is approached may be related to the eventual disappearance of the dytiscids and other aquatic insects. Dytiscids were collected on Parry's and Ross's voyages.

Of the hemiptera (hemiptera were collected on Parry's and Ross's voyages) the families (aphidæ, etc.), depending upon juicy, green leaves probably do not go as far north as the more agile or occult living families (saldidæ, etc.). Aquatic hemiptera seem to find the arctic ponds unsuited for their development, though some of them (*Corixa*) go as far north as Port Clarence, Alaska.

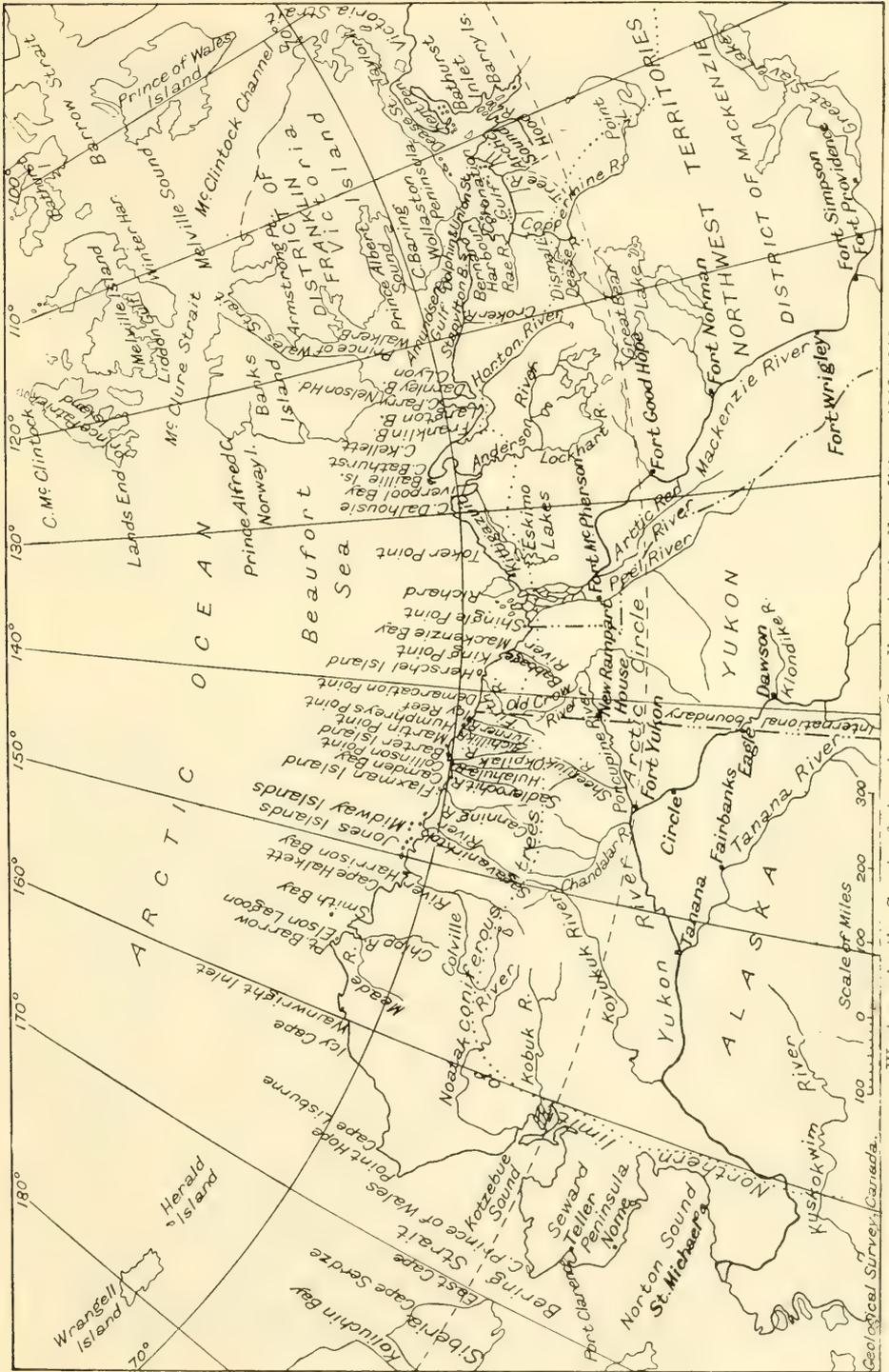
Of neuropteroids, dragon-flies hardly approach the limit of trees, perhaps owing to the same reason as the aquatic hemiptera; and ephemerids and perlids are not known in the Canadian Arctic archipelago. The trichoptera is probably the family of neuropteroids which reaches farthest north (trichopter collected on Parry's and Ross's voyages), though only in certain species (*Apatania*, etc.); probably because their larvæ seem to be little influenced by their surroundings, and are found in both still and running water of high or low temperature.

Spiders (*Opilio* known from Ponds inlet), mites, and collembola, and insects parasitic upon mammals and birds have been found as far north as there is land; and the same seems to be the case with at least some of the lepidoptera (both butterflies and moths) preferring certain plants. It may be assumed that at the highest latitudes (say beyond latitude 80 degrees north) on both sides of Kennedy-Robeson channels these latter orders comprise the bulk of the insect fauna together with sawflies, bumblebees, and parasitic wasps, diptera, and minute hemiptera and beetles.³

¹ Professor E. M. Walker, of Toronto, claims that all the *Melanoplus* species pass the winter in the egg-stage. The northward distribution of grasshoppers on this continent is treated in his Canadian Arctic Expedition report, vol. III, Part J.

² Beetle (*Platyderus*) known from lat. 72° N., long 94° W. ("Fox").

³ See the insects secured by the *Polaris* expedition, and identified by A. S. Packard, Jr., in "The American Naturalist," Vol. XI, 1877, pp. 51-53.



Western Arctic Coast of America; Canadian Arctic Expedition, 1913-1918.

Geological Survey, Canada.



FIG. 1. Fly on *Dryas* flowers. Bernard harbour, Northwest Territories. July 1915. (Photo by G. H. Wilkins.)



FIG. 2. Mosquitoes attacking dog. Bernard harbour. July 6, 1915. (Photo by G. H. Wilkins.)

Arctic Insect Life

PLATE II.



FIG. 1. Arctic willow shrubbery. East branch of Mackenzie river delta, at Nennariak, near south end of Richard island. June, 1914. (Photo by J. J. O'Neill.)

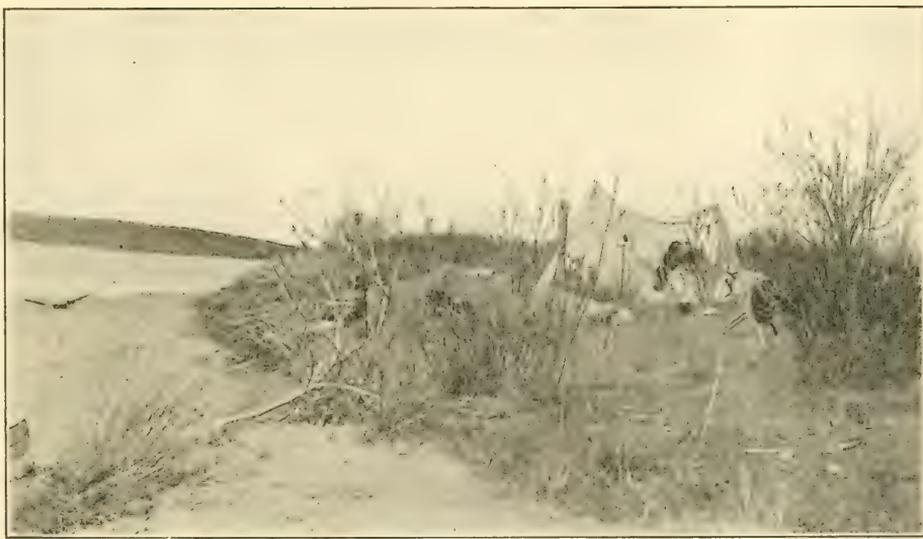


FIG. 2. Arctic willow shrubbery. Mouth of Tree river, Port Epworth, Coronation Gulf. October, 1915. (Photo by J. J. O'Neill.)

Arctic Insect Life

PLATE III.



FIG. 1. Winter conditions.. Wind-swept tundra bluffs at Collinson point, Alaska. February 24, 1914. (Photo by F. Johansen.)



FIG. 2. Early spring. Snow melting on tundra at Demarcation point, Alaska, May 13, 1914. (Photo by F. Johansen.)

Arctic Insect Life

PLATE IV.



FIG. 1. Beginning of summer. Melting tundra pond at Collinson point, Alaska, June 3, 1914. (Photo by F. Johansen.)



FIG. 2. Beginning of summer. Tundra nearly free of snow. Collinson point, Alaska. June 3, 1914. (Photo by F. Johansen.)

Arctic Insect Life

PLATE V.

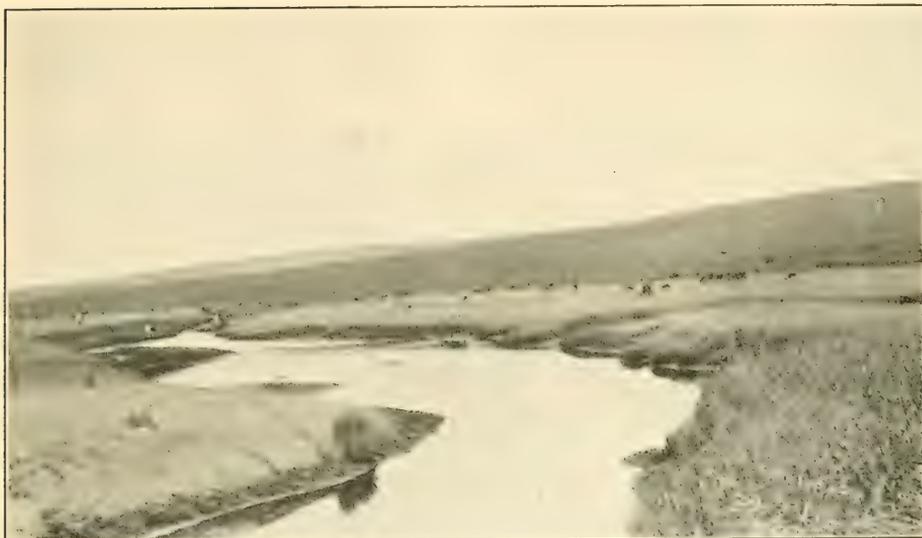


FIG. 1. Tundra ditch at Teller (Port Clarence), Alaska. Reindeer grazing. August, 1913.
(Photo by J. J. O'Neill.)



FIG. 2. Coastal tundra strewn with old driftwood, at Collinson point, Alaska. July 17, 1914. (Photo by F. Johansen.)

Arctic Insect Life

PLATE VI.

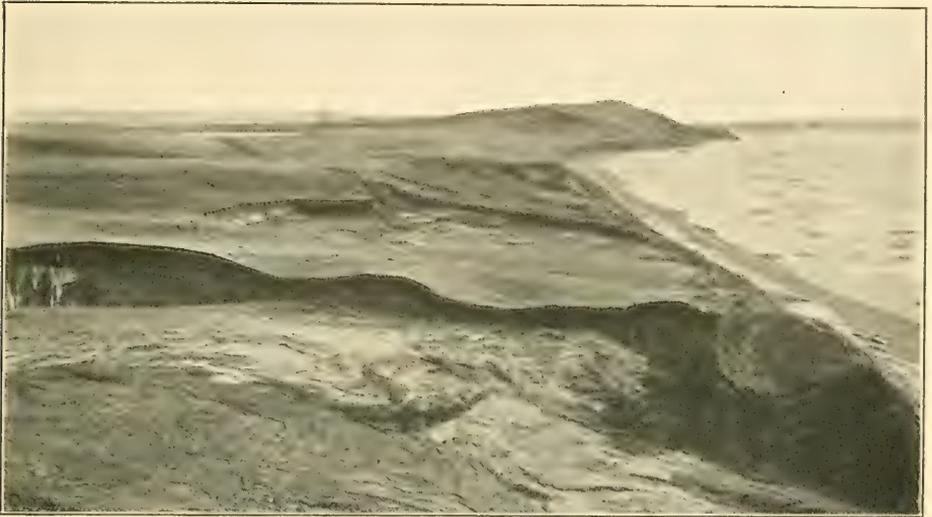


FIG. 1. Southwest coast of Banks island, looking southeast from Cape Kellett, Earth-Slides. August, 1914. (Photo by G. H. Wilkins.)



FIG. 2. Victoria island. Dolomite beds crossing plain, between southwest coast and the Colville hills, about 8 miles inland. Autumn, 1915. (Photo by D. Jenness.)

Arctic Insect Life

PLATE VII.



FIG. 1. Arctic coast at King point, Yukon. Earth-slides. August, 1914. (Photo by John R. Cox.)



FIG. 2. Inland gully on Herschel island, Arctic coast of Yukon Territory. July 29, 1916. (Photo by F. Johansen.)



FIG. 1. Arctic coast near cape Parry, Northwest Territories, Dolomite cliffs. July 24, 1916.
(Photo by G. H. Wilkins.)



FIG. 2. Dolomite outcrops a short distance inland from Bernard harbour, Northwest Territories. June 21, 1916. (Photo by F. Johansen.)

Arctic Insect Life

PLATE IX.



FIG. 1. Snow melting at Bernard harbour, Northwest Territories. May 24, 1915. Note pools. (Photo by F. Johansen.)



FIG. 2. Brook fed by melting snowbank. Bernard harbour, Northwest Territories. July 12, 1915. (Photo by F. Johansen.)

Arctic Insect Life

PLATE X.



FIG. 1. Surface of diabase island in Coronation gulf. Northwest Territories. March 12, 1916. (Photo by F. Johansen.)



FIG. 2. Cape Barrow harbour, Coronation gulf. Typical granite formation of eastern part of Coronation gulf and Bathurst inlet. August 12, 1915. (Photo by G. H. Wilkins.)

Report of the Canadian Arctic Expedition, 1913-18.

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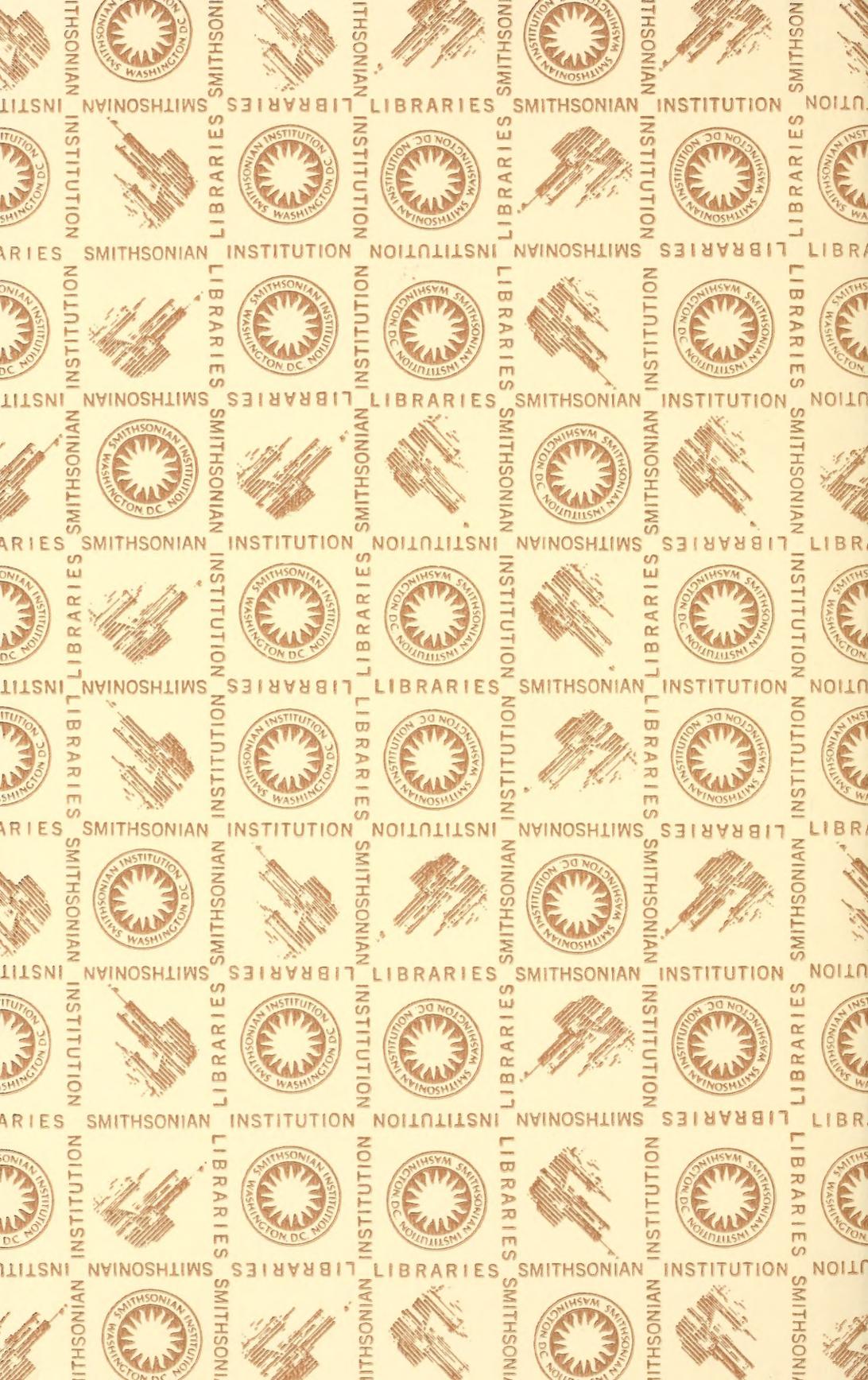
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