mirabilis and three females (♀), having sent two males and two females to Mr. Ramsay, of Sydney, and Mr. T. A. Gulliver, Normanton.

In every one of the above cases the males had a black head.

Of *P. Gouldiæ* I have five red-headed birds, all of which I have proved, by dissection, to be males, and two females having black heads, also similarly sexed.

I regret that I have been unable to discover a nest of either of these lovely little birds, although I have devoted much time in searching for them. I still hope, however, to be able to secure young full-fledged birds and to rear them to naturity, and thus solve this point.

From the evidence which I have now laid beforeyou I think you will agree with me that *Poëphila Gouldiæ* is a distinct species from *Poëphila mirabilis*, and that Mr. Diggles's theory "that the red-headed bird is the female of *P. mirabilis*" must fall to the ground, being incorrect. I hope, ere long, to be able to send the Society more evidence on the subject.

Report on the Insecta (including *Arachnida*) collected by Captain Feilden and Mr. Hart between the Parallels of 78° and 83° North Latitude, during the recent Arctic Expedition. By Robert M'Lachlan, F.R.S., F.L.S., &c.

[Read November 15, 1877.]

This paper concerns the Arthropoda (excluding Crustacea*) of the Voyage of the 'Alert' and 'Discovery' towards the North Pole in the years 1875–1876. The collections were chiefly formed by Capt. H. W. Feilden, R.A., who was attached to the 'Alert' as naturalist; but several interesting contributions resulted from the researches of Mr. Hart, who occupied a similar position on board the 'Discovery.' Neither of these gentlemen was an entomologist. Capt. Feilden had already made for himself a reputation as an ornithologist; Mr. Hart is specially a botanist. The latter could scarcely have been expected to form any extensive zoological collections, a province that more especially pertained to his colleague; and I am sure all will agree that the duties could

* A Report on the Crustacea collected by the Expedition, by Mr. E. J. Miers, of the British Museum, has appeared in the 'Annals and Magazine of Natural History,' ser. 4, vol. xx. pp. 52–66, 96–110 (1877).

not have been better performed. I think also that Capt. Feilden's botanical collections proved of no mean importance.

In stating that neither of the naturalists was an entomologist I do so in no apologetic spirit. On the contrary, I believe that under scarcely any circumstances would it have been possible for a more complete collection of insects to have been made; and when I presently enter into some details, the justice of this remark will become apparent. If we take into consideration the conditions under which these two gentlemen worked, the amount of materials is surprising. We will concede that the chase after a butterfly or a bee in the Arctic regions may be looked upon as a heat-producing exhilarating pursuit; on the other hand, it must be remembered that a very considerable portion of the collection consists of forms that require searching for under the snow or half-frozen earth, and amongst moss and dwarf herbage, necessitating a prostrate position tending to the rapid elimination of heat, and which, if long continued, must detract very strongly from the comfort of the collector.

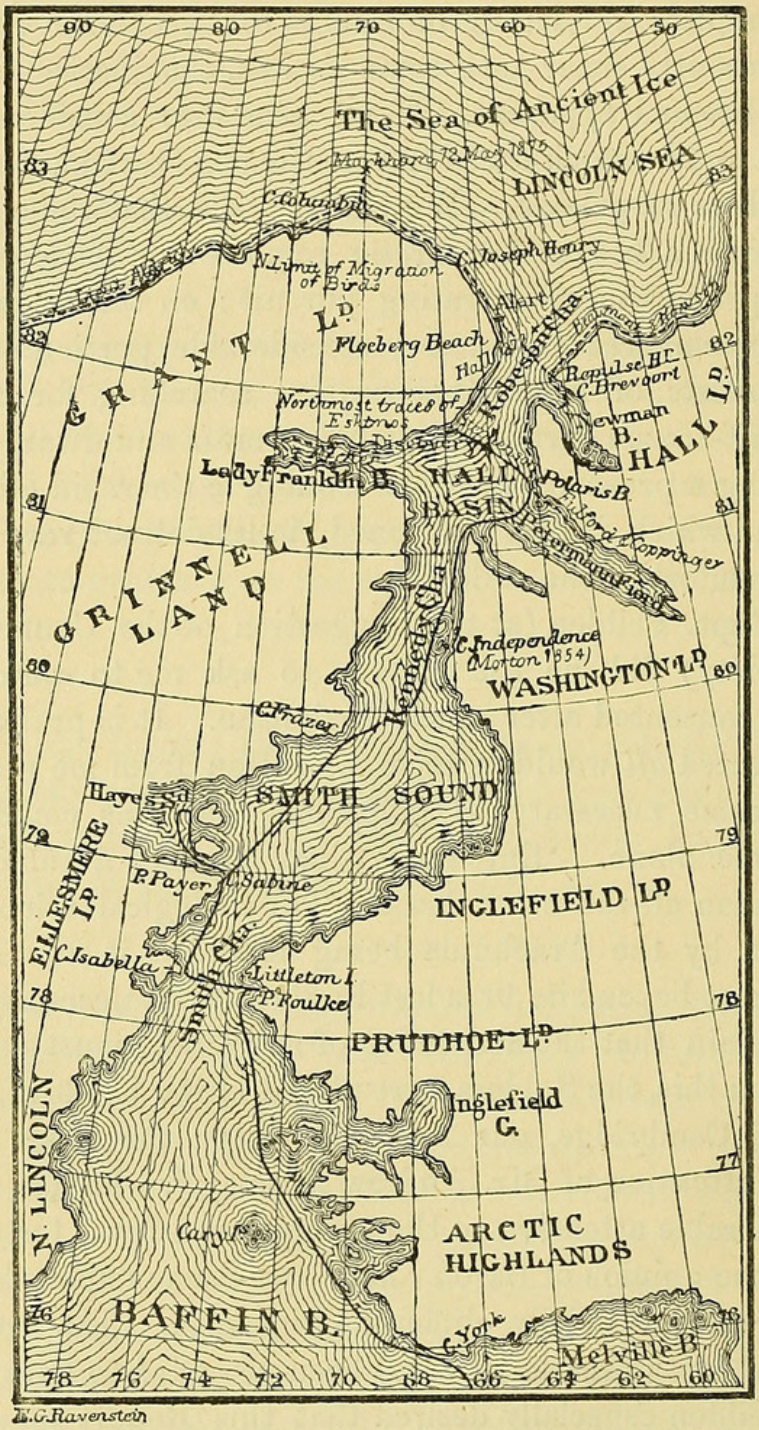
When Capt. Feilden (at the suggestion of the Council of the Royal Society) did me the honour to ask me to work out the Insecta, I consented after much hesitation. It is probable that it was expected *all* would receive attention from me personally. But it became necessary to point out that this could not be done by one alone. Entomology has become a subject more extensive than all the other branches of zoological science combined; and by the Arachnida being included it was here extended almost beyond its broadest limits: it was necessary, therefore, to explain that the assistance of specialists must be sought. Acting upon this, the Spiders were placed in the hands of the Rev. O. Pickard Cambridge, our best authority; the Acari have received the attention of Mr. Andrew Murray *, who has recently paid considerable attention to the group; and I was fortunate in obtaining the opinion of Baron von Osten-Sacken upon the rather numerous and especially difficult Diptera†. The remaining orders have (with occasional help) been attended to by myself.

Capt. Feilden especially desired that this Report should refer only to materials collected from the parallel of 78° northward—in

* Unfortunately this assertion proved almost premature; see the remarks on p. 121.

† Baron von Osten-Sacken has also reported upon the Diptera collected by the American 'Polaris' Expedition (*vide* 'Proc. Bost. Soc. Nat. History,' xix. pp. 41–43, 1877).

other words, that it might show the results of an examination of the Insect fauna of Grinnell-Land. This was not difficult; for the materials collected south of 78° were few and of little special interest. I think Capt. Feilden acted wisely in this. The fauna of the west coast of Greenland, at any rate as far north as Disco



E.G. Ravenstein

SKETCH MAP * showing route of the late Arctic Expedition, and general configuration of Grinnell-Land and opposite shores of Greenland between the parallels 78°–83° N. lat., viz. limits of the collecting district herein described.

* Through the kindness and liberality of Mr. N. M'Coll and the proprietors of the 'Athenæum,' the use of this wood-block has been obtained for the Society.—ED.

Island, is already tolerably well-known. So long ago as 1780 the Danish missionary Otto Fabricius published his 'Fauna Grœnlandica;' more recently, in 1859, Schiödte gave an enumeration of the insects of Greenland in Rink's 'Grönland geographisk og statistisk beskrevet;' and only three years ago the species found in East Greenland received attention in the Report of the second German North-Polar voyage. I have not yet seen a connected Report on the collections formed by the naturalist of the American 'Polaris' expedition: these are from a latitude little inferior to that reached by our own expedition; but they still refer to Greenland on the eastern side of Smith Sound.

It was scarcely to be hoped that the insects from a point so far north as between the parallels of 78° and 83° could be of any great importance. The sequel has, on the contrary, proved to my mind incontestably that the most valuable of the whole zoological collections are the Insecta. The Birds may be looked upon as more or less migratory, seeking high latitudes during the short summer and then retiring southward. The Fishes (excepting the lacustrine), Crustacea, Mollusca, &c. are not subject to the rigid conditions imposed upon the Insects; and of these latter it may, I think, be taken for granted that all (excepting the bird-lice, &c., which are carried hither and thither by their hosts) breed and live continuously in these desolate regions. I have used the term desolate; but the desolation is not of that extreme nature one would expect. I am informed by Professor Oliver that over sixty species of flowering plants have been determined in the collections formed by the naturalists of the expedition between the already given parallels of latitude. This fact at first sight reads more like romance; it is strengthened by another, still more remarkable. Thirty-five specimens of gaily-coloured Butterflies were procured, belonging to certainly five distinct species. It may safely be asserted that there are desert regions in the tropics that would not furnish an equal number. Moreover there are two species of Humble-Bees; and an example of one of these was chased by Capt. Feilden (but not captured) in as far north as lat. 82° 30′.

An analysis of the collections produces the following results:—

Hymenoptera.....	5 species	Mallophaga	7 species
Coleoptera	1 „	Collembola.....	3 „
Lepidoptera 13	„		
Diptera ... about 15	„	Araneidea	6 „
Hemiptera.....	1 „	Acaridea ... about	9 „

In all about 60 species. Schiödte enumerated 80 from Greenland*. Staudinger ('Stettiner entomol. Zeitung,' 1857) found about 312 (excluding Arachnida) in Iceland, of which more than one third were Diptera, and there was no Butterfly.

Carrying the analysis a little more into detail, we find the Hymenoptera represented by two species of *Bombus* and three parasitic forms no doubt infesting the larvæ of Lepidoptera. It appears probable that even in these extreme northern latitudes some of the plants may be dependent upon insects for their fertilization and perpetuation. Capt. Feilden noticed that the *Bombi* especially frequented the flowers of a species of *Pedicularis*; and, according to the researches of Müller ('Befruchtung') and Dr. Ogle ('Popular Science Review,' 1870), the species of this genus are more or less incapable of self-fertilization, or, at any rate there is reason to believe that fertilization is, to a large extent, effected through the agency of insects, and especially of *Bombi*.

The paucity of Coleoptera is somewhat remarkable, the order being represented by only one individual of a common species.

The Lepidoptera form the most striking feature amongst the Insecta, and, I venture to say, also amongst the whole of the zoological collections. It is true that I have been able to find only 13 species; but of these, 5 are showy Butterflies (one of them so protean in aspect that some may incline to the belief that the individuals represent several species) belonging to the genera *Colias*, *Argynnis*, *Chrysophanus*, and *Lycæna*. Butterflies have long been known from the lower portions of Greenland, at any rate as far as Disco Island (69° 30′ N.); the expedition found them at Upernavik (75° N.); they are recorded from East Greenland, collected by the second German Expedition. Former expeditions, in search of a north-west passage, found them spread sparingly over the regions visited by them; but all these localities are in much lower latitudes. Dr. Bessels, of the American 'Polaris' Expedition, obtained two examples of *Argynnis polaris* at Polaris Bay (81° 20′–81° 50′); and this was the first indication of the existence of these insects in extreme high latitudes. But the captures made by Dr. Bessels have been eclipsed, and in a remarkable manner, by the discoveries of Capt. Feilden and Mr. Hart, who brought back from between the parallels of 78° and 83° a collection of butterflies that certainly excited my astonishment as an

* Holmgren, 'Sv. Akad. Handlingar,' viii. (1869), raises the number to 83, and enumerates 64 from Spitzbergen.

entomologist. It would perhaps be rash to assert that any absolutely new species is represented among them; but there are forms so peculiar as to necessitate their description as striking varieties, and to warrant the suspicion that they represent a local insect-fauna; although, before this can be asserted as a fact, it will be necessary that the coast all along the west side of Davis Straits be thoroughly examined. The *Chrysophanus* is perhaps the most remarkable, because it apparently represents a condition of our common *C. phlœas* rather than of its near American relative, *C. americanus*. (The peculiarly boreal or alpine genus *Chionobas* is not in the collection.) When we consider that in Lower Greenland only four species have been discovered, and that in Iceland there are none at all, this result is sufficiently surprising. Their absence from Iceland is somewhat inexplicable; for Dr. Staudinger found 33 species of Lepidoptera (including several minute forms) in that island*. But northern insular faunas appear to be generally poor in Butterflies; and in proof of this, it need only be mentioned that in the British Islands we have but 65 species (and of these, several are more or less casual or sporadic in appearance), whereas Lapland, although so much further north, possesses about 60. The only other especially interesting Lepidopterous insect is *Dasychira grœnlandica*, one of the Bombyces, the hairy larvæ of which were found abundantly, of all sizes up to $1\frac{1}{2}$ inch in length.

Many Lepidopterous larvæ were found in the stomachs of Gulls and Terns; many must fall victims to the attacks of parasitic Hymenoptera and Diptera, which there, as everywhere else, infest them. If we combine these conditions with the struggle for existence that must constantly exist with the elements, it becomes evident that only a small portion can be left to be transformed into the perfect state.

Capt. Feilden, in answer to questions, gave me some valuable and interesting information on the habits of Lepidoptera in these latitudes. He informed me that during the short period when there is practically no night, butterflies are continuously on the wing, supposing the sun's face not to be obscured by clouds or passing snow-showers. Furthermore, he told me that about one month in each year is the longest period in which it is possible

* Four or five species of Butterflies have been recorded from Iceland. No recent visitor to the island has confirmed these reports. Staudinger passed an entire season there in the double capacity of scientific entomologist and collector for sale.

for these insects to appear in the perfect state, and that about six weeks is the limit of time allowed to plant-feeding larvæ, during all the rest of the year the land being under snow and ice. This latter fact is suggestive, as showing the conditions under which the species maintain an existence. We have, however, much yet to learn respecting their life-history. The intense cold is not of great importance. We know already that larvæ may be frozen till they are as brittle as rotten twigs, and still suffer in no way. The principal point may be put as follows:—Is there sufficient time in each year for a larva to hatch from the egg, feed up, and change to chrysalis? The continuous day, no doubt, acts beneficially in this respect on the larvæ of butterflies, such as *Colias* and *Argynnis*, which probably feed only in the day-time; but it must act in the contrary manner on those of *Noctuæ*, &c., which practically feed only at night. Upon reviewing all these conditions, I am disposed to think that more than one year is necessary in most of the species for the undergoing of all their transformations. This indeed is already suspected in certain species that inhabit the boreal and alpine portions of Europe.

The Diptera furnish but few points of special interest. When offal was thrown away, or the carcass of a Musk-ox lay on the ground, "blow-flies" appeared ready to perform the scarcely necessary part of scavengers. The genus *Trichocera*, known with us as the "winter-gnat," appeared after midsummer, the only time it can appear if the genus be allowed to exist at all. Most travellers in high latitudes have complained of the attacks of the myriads of Culicidæ. I am informed that this expedition proved no exception when off the lower portions of the coast of Greenland; but the members of it did not suffer in the extreme north, although Culicidæ were not uncommon.

The few remaining orders of insects offer occasion for no special remarks.

Regarding the collections as a whole, I should say there is evident affinity (in some cases absolute identity) with the fauna of Lapland; but, notwithstanding all that has been urged to the contrary, I incline to the belief in a former extensive circumpolar fauna, of which there now exist but remnants. (I would mention incidentally also that I do not think the two great divisions known as the Palæarctic and Nearctic can be maintained for insects, excepting as terms of convenience.) We know that in Miocene times there existed in the latitudes with which we are now deal-

ing, a flora that must have strongly resembled that now possessed by the southern portions of the United States. This is emphatically shown in the fossil plants collected by Capt. Feilden, and which are now in the hands of Prof. Heer for working out. It is reasonable to suppose that a parallel insect-fauna then existed.

After this, from causes not easy to explain (and it is not necessary here to refer to the various theories advanced in explanation), there came a period of gradual cooling down; and I think all evidence goes to prove that this resulted in the establishment of an arctic or circumpolar fauna. This was probably initiated in the older Pliocene period, and culminated before the establishment of the Glacial epoch, when the mighty masses of ice began to move southward, destroying animal life, or driving what remained of it before them. Again, there came a time when an increasing temperature began to manifest itself. The survivors of the arctic fauna commenced to move northward: a portion of them settled on the tops of high mountains and established the existing alpine fauna; stragglers reached the home of their ancestors in the Arctic regions and became the progenitors of the species now existing there. What is practically this theory was first advanced in 1846 by Edward Forbes, in a paper "On the Geological Relations of the existing Fauna and Flora of the British Isles," published in vol. i. of the 'Memoirs of the Geological Survey of Great Britain.' In one form or other it has since been accepted by Darwin, Lyell, Hooker, and others in England, and by Packard, Grote, and LeConte in America. How far north this fauna may now extend we perhaps never shall know. Sir J. D. Hooker, writing in 1860, expressed an opinion that not far north of 81° would prove to be the limit of flowering plants. The recent expedition found them beyond that limit; and if the coast-line, instead of trending east and west at the highest point reached, had proved to still further extend in a northerly direction, I doubt not that both Phanerogamous plants, and also insects, would have been found.

That both alpine and arctic insects are prone to run into puzzling varieties is known to every entomologist: this is strikingly exhibited in some of the materials now under consideration. If my idea that more than one year is often necessary in these regions for an insect to undergo all its transformations be correct, we have one powerful factor in explaining the causes of variation; and a still more potent one is to be found in the

condition of isolation or segregation that necessarily exists, and which must, in my opinion, result in the production of local forms, which in extreme cases are worthy of the term "species."

In concluding this introductory portion I must express my thanks to Capt. Feilden for the assistance he has rendered me, to those gentlemen who have worked out certain groups, and to the officers of the British Museum for the courtesy exhibited on my various visits to that Institution in order to examine the materials collected by former expeditions, and which will now be augmented by the addition of those enumerated in this Report. With these remarks, I pass on to a detailed examination of the collections*.

HYMENOPTERA.

Apidæ.

Bombus balteatus, *Dahlbom.*

Three ♂, from Hayes Sound (lat. 79°, Aug. 4th, 1875); Port Foulke, July 28th, 1875; and lat. 81° 45′ (*Feilden*).

This (I am informed by Mr. F. Smith, who kindly examined the *Bombi*) is the species described by Curtis in the Appendix to 'Ross's Voyage' as *B. Kirbyellus*. It was also found by the 'Polaris' Expedition. A known Arctic species, occurring also in Lapland.

B. polaris, *Curtis.*

One ♂ from Hayes Sound (*Feilden*). A known Arctic American species †.

Ichneumonidæ.

Ichneumon erythromelas, n. sp.

Black; mesonotum, scutellum, and second abdominal segment bright red. Antennæ very stout, 32-jointed, totally black, with very short yellowish microscopic pubescence. Eyes dark liver-coloured. Head finely sculptured. Mesonotum and scutellum finely punctured; the latter flat, narrower behind than in front, somewhat rounded anteriorly. Metanotum (and the sides of the entire thorax) finely punctured; the areas well defined by narrow raised keels, central area narrower in front than posteriorly.

* A slight sketch of some of the results of the expedition was published by me in the 'Entomologist's Monthly Magazine,' vol. xiii. p. 181 (January 1877). This was drawn up after a hurried glance over the insects of scarcely more than a few minutes' duration, and is very faulty.

† From Disco (*Feilden* and *Hart*) are 5 ♀ and 2 ☿ of *B. hyperboreus*, Schönherr (*B. arcticus*, Kirby, *B. alpinus*, O. Fab. nec L.), which, however, did not appear to occur further north.

Abdomen very short, ovate, finely punctured; basal segment with a small red spot in the middle of the sutural margin; second segment wholly bright red, excepting the narrowly black lateral and posterior margins (beneath it has also a tendency to become reddish), basal foveæ evident, transversely oblong; apical segment with a small greenish-yellow median spot. Legs reddish; coxæ, trochanters, and tibiæ (excepting the extreme tips of these latter) shining black; femora externally with a black line; tarsi blackish externally, excepting the first joint of the intermediate and posterior, which is almost wholly reddish. Wings subhyaline, tinged with smoky brown, paler at the tips; nervures black; stigma blackish, somewhat piceous on its lower edge; areolet distinctly pentagonal. Length 6 millims.; expanse 15 millims.

Two females (one mounted as a microscopic slide) from lat. 82° 29′ (August 8th) and 82° 33′ (June 21st) (*Feilden*); one indicated as found on the surface of the snow at an elevation of 800 feet.

A very striking species, pertaining to Gravenhorst's Section xi.

Cryptus arcticus ?, *Schiödte*.

One ♀ from Rawlings Bay, 21st August (*Feilden*), appears to agree more nearly with this than with any other described species. Already recorded by Schiödte from Greenland.

Proctotrypidæ.

Microgaster, sp.

A mass of yellow cocoons formed by larvæ parasitic upon that of *Dasychira grœnlandica*, from Dobbin Bay, August 14th, 1875 (*Feilden*); but the insects had escaped. Possibly it may have been the species noticed by Packard (American Naturalist, xi. p. 52) as found by Dr. Bessels at Polaris Bay, and described as *M. Hallii*.

COLEOPTERA.

Brachelytra.

Quedius fulgidus, *Erichson*.

One example from Discovery Bay (*Hart*). A very widely distributed species, already recorded from Greenland and the North-American continent, occurring all over Europe, and has been found in the Atlantic islands*.

* There is also an example of *Cryptophagus acutangulus*, Gyllenhal, from Floeberg Beach (*Feilden*); but it was found among rubbish discharged from the 'Alert,' and has no claim to be considered an Arctic insect. I am indebted to Mr. E. C. Rye for the determination of this species.

The insect is variable: the Arctic individual is of the ordinary black British form.

LEPIDOPTERA.

Rhopalocera.

Colias Hecla, *Lefebvre*, var. glacialis.

Agrees with the original description and figure of *Hecla*, and with examples from Lapland, in its general form, breadth of the dark border of the wings, &c.; but differs in its much clearer and paler ground-colour (which may be termed *pale* orange), and in the more conspicuous pale greenish-yellow costal margin of anterior wings. The posterior wings on the underside are more smoky greenish than in those I have seen from Lapland; and in this agree better with Lefebvre's figure; the pale margin is very faintly indicated. In one male the discal spot on the anterior wings is obliterated. Expanse, ♂ 44–48 millims., ♀ 47–51 millims.

Two ♂ and one ♀ from lat. 81° 45′, August 12th, 1876, and one ♀ from Hayes Sound, lat. 79° (*Feilden*), all in the finest possible condition; also a much crippled ♂ just emerged from the chrysalis, from Discovery Bay, July 18th, 1876 (*Hart*).

C. Hecla was originally described as from Iceland; but there is little doubt an error in locality was made, and the type was probably from Greenland. It appears to me that the examples before me from the high north can only with justice be referred to this species; but they form a good local variety, which it is desirable to indicate by name. In the British Museum is a series of individuals from other Arctic voyages, all from considerably lower latitudes, that I think should be likewise referred to *Hecla*; but they vary in the opposite direction to my var. *glacialis*, all being very smoky and dark. It is certainly singular that *glacialis*, although from the extreme north, should be indicated especially by its bright and pale coloration. The two females have an appearance of differing somewhat in form, that from lat. 81° 45′ having the anterior wing apparently more obtuse than in that from Hayes Sound; but there is no other difference.

C. Boothii, Curtis, which has been sometimes associated with *C. Hecla*, is, I am convinced, perfectly distinct therefrom, differing in the very narrow dark border of the wings &c.

ARGYNNIS POLARIS, *Boisduval.*

Six examples. Hayes Sound, lat. 79°, and from lat. 81° 42′ and 81° 52′ (*Feilden*), and Discovery Bay (*Hart*).

These vary very little, and are quite typical. *A. polaris* was the only butterfly obtained in the high north by the American 'Polaris' Expedition.

The species is probably spread over the whole of Arctic America from Labrador northwards; but there appears to be some doubt as to its actual occurrence in the Old World. Judging from the somewhat numerous examples I have seen, it appears to be comparatively the least variable of all the Arctic species of the genus.

A. CHARICLEA, *Schneider.*

Under this head I feel compelled to group 20 examples from various localities, ranging from lat. 79° to 81° 52′ N. (*Feilden* and *Hart*). The places indicated by name are Hayes Sound, Port Foulke, Walrus Island, Franklin-Pierce Bay, Cape Hayes, and Discovery Bay. Never before have I been so perplexed over a series of any insect of which I had made a serious study. Without exaggeration, I may safely say that no two of the twenty individuals are precisely alike; and the extremes present numerous discrepancies. Also I think I may say that not one example precisely resembles the typical *Chariclea* of Northern Europe: but that this latter also is subject to considerable variation is evident; and a comparison of the rather numerous figures of it only added to my perplexity, for no two agree. A visit to the British Museum in order to consult the materials obtained from previous Arctic Expeditions did not in the least help me; for I found just as much uncertainty existing in the arranged collection as in my own mind. The upperside of the insects is subject to great variation, but in a measure that cannot be compared with that presented by the underside of the posterior wings, which is usually considered as furnishing the surest characters in *Argynnis*. I essayed an examination of the anal parts of the males (which I am convinced will often serve to distinguish allied species in Butterflies), but found that it would be necessary to have the insects in a fresh state (or in fluid) if any reliable characters were to be sought in these parts.

It would be utterly useless to attempt to describe the forms; the only thing that could be of service would be to give coloured figures of both sides of nearly every example. Some of them may

perhaps resolve themselves into *arctica* of Zetterstedt and *Boisduvallii* of Duponchel, now both grouped with *Chariclea*. There is, however, one extreme individual that I propose to briefly notice by name.

ARGYNNIS CHARICLEA, var. OBSCURATA.

Wings above smoky greyish-fulvous, the basal portion very densely clothed with long brownish-grey hairs, having a bluish or greenish reflection in certain lights: in the anterior pair the basal third is blackish, the black markings all distinct, the post-median zigzag line complete and rather broad, the submarginal series of spots very large, the border broad, the fringes dirty cream-colour interrupted with blackish; in the posterior wing more than the basal half is blackish, almost confused with the median band, the submarginal series of spots distinct and ordinary, the border surmounted by a series of triangular spots, fringes as in the anterior but less interrupted. Underside—ground-colour of anterior wings brighter; of the discocellular spots only the angulate one and that at the end are distinct; zigzag band distinct, but narrow; submarginal series of spots very indistinct: in the posterior wings the basal half is dark brown, inclosing the median band of pale spots, which is very broad, all the spots more or less coalescent and dirty cream colour; the outer edge of the dark basal portion margined with a narrow whitish line, the space between this and the border light greyish brown, with scarcely any indication of the submarginal series of spots; border broad, dirty cream-colour, surmounted by triangular dark brown spots. Legs and underside of thorax greyish.

There is one ♀ of this from 81° 42′ N. Another specimen in the British Museum from the voyage of the 'Enterprise,' somewhat resembles it, differing principally in the middle spot of the median band of the underside of posterior wings being more produced externally, a point in which great variation is exhibited in all the insects.

In concluding my remarks on the twenty examples referred to *A. Chariclea*, I will only say that, so far as I can see, no two entomologists would probably agree as to the number of so-called species comprised therein, nor do I hope for any immediate settlement of the difficulty. Either there is only one species, or there are several; and in favour of the latter hypothesis it might be argued that we in England have species as closely allied as *A.*

Euphrosyne and *A. Selene*, which we know, from habits, &c., to be perfectly distinct; yet each of these has modified forms in northern and alpine districts.

Chrysophanus phlœas, *Linné*, var. Feildeni.

Differs from typical *phlœas* (and also from *americanus*) in the brilliant copper-colour of the upperside of the anterior wings being much less fiery and more subdued, and with brassy reflection (especially in the ♂), so that the colour might almost be termed brassy rather than coppery; the spots normal in number and position, but smaller; the dark border is narrow and silky greyish black with grey fringe, the dark costal margin scarcely indicated: in the posterior wings the ground is of the same silky greyish black as in the border of the anterior, the pale submarginal band pale orange, with occasionally the faintest indications of bluish spots above it. Beneath, the anterior wings are greyish orange (with the ordinary spots), the border and the posterior wings pale cinereous; on the latter wings the dark dots are very faintly indicated, and there is also only the faintest indication of the red submarginal band. Expanse 28–29 millims.

Three examples (2 ♂, 1 ♀) from lat. 81° 45′ (*Feilden*).

I was at first inclined to place this very distinct variety as a form of *americanus*; but the posterior wings are more tailed than in any examples I have seen of that species, though scarcely so much so as in ordinary *phlœas*. The common origin of both species can scarcely be doubted. No species of *Rumex* was found in these high latitudes; but *Oxyria reniformis* occurred at all the stations, and in all probability serves as the food-plant.

Scudder has recently (Bulletin Buffalo Soc. Nat. Sciences, vol. ii. No. 3) broken up *Chrysophanus* into a multitude of genera in a manner that appears to me likely to add to the perplexity of the student rather than to be of any assistance: *phlœas* and *americanus*, according to his system, fall into the genus *Heodes* (Dalman).

The other Arctic species (*C. Dorcas*, Kirby) differs greatly, and belongs to another group.

Lycæna Aquilo, *Boisduval*.

One ♀ from lat. 81° 45′ (*Feilden*). A known Arctic species, extending from Newfoundland northward. Described by Curtis (in Ross's voyage) as *Polyommatus Franklinii*. Scudder places it and allied species in the genus *Agriades* (Hübner).

Heterocera.

Bombyces.

Dasychira grœnlandica (*Wocke*), *Homeyer, Zweite deutsche Nordpolarfahrt*, Bd. ii. Abth. i. p. 409.

One ♂, lat. 82° 30′, July 6th (*Feilden*); also numerous larvæ (in fluid) in various stages of growth from Hayes Sound, Dumb-Bell Lake, Cape Joseph Henry (82° 45′), &c., collected by Capt. Feilden, and some from Discovery Bay by Mr. Hart; cocoons from Hayes Sound, Dobbin Bay, Franklin-Pierce Bay, &c. (from one of these a parasitic dipterous insect of the family Tachinidæ had emerged). The largest larva is fully 1½ inch long. Capt. Feilden informs me that the principal food-plant is *Saxifraga oppositifolia*; but *Salix arctica* is also noted: in all probability the species feeds on a variety of plants. It is in the British Museum from Winter Cove, taken during the voyage of the 'Enterprise.'

It was found by the second German North-Polar expedition in East Greenland.

No doubt it is the insect alluded to by Dr. Packard (American Naturalist, xi. p. 52) as found by the 'Polaris' expedition; and that author gives a description of the eggs, larva, cocoon, &c. He identifies the species as *Laria Rossii*, Curtis, but, I think, in error; and Wocke is also of this opinion. Curtis's insect is no doubt a true *Dasychira*, and allied; but I consider it something unknown to me. *D. grœnlandica* is a smoky-black species, strongly resembling one of the bombyciform Geometridæ of the genus *Biston*: the anterior wings are smoky blackish, subdiaphanous, with strong black neuration and a black crescentiform mark at the end of the cell; the posterior whitish grey, with fuscous neuration, and without the slightest trace of the broad blackish margin so strongly represented in Curtis's figure—thus, as it appears to me, precluding the possibility of the one being a form of the other. The species indicated by Christoph (Stett. ent. Zeit. 1858, p. 310), and Mœschler (*l. c.* 1870, p. 252), from Labrador, is, in all probability, the true *Rossii*.

Noctuæ.

Mamestra (?) Feildeni, n. sp.

Anterior wings rather broad, the costal margin nearly straight, the apical margin oblique, but not strikingly so. The ground-colour may be described as blackish varied with whitish or grey;

the half-line whitish, rather conspicuous; the inner and elbowed lines only indicated as limiting the broad blackish central portion of the wing, the inner line somewhat angulate in the middle; the elbowed line nearly straight from the costa to the elbow, thence continued in a strongly oblique manner to the inner margin, so that the broad central dark portion is nearly twice as broad on the costal as on the inner margin; beyond the elbowed line the ground colour is much paler, greyish varied with black scales, the somewhat curved subterminal line indicated by a series of about six blackish dots; the ordinary spots (or stigmata) conspicuous; the "orbicular" nearly quadrate, with a black spot on its inner side, the "reniform" large, somewhat filled in with greyish; the space between it and the "orbicular" is black, the two spots connected on their lower edges by a whitish line on the nervure; the claviform only slightly indicated; fringe whitish, intersected with blackish. Posterior wings whitish, with a slight creamy tinge; the inner margin suffused with blackish, the outer margin with a very broad blackish border occupying about one fourth of the wing, in which is included a short pale line at the anal angle; central spot very large, black, half-moon-shaped; fringes silky whitish, the hairs on the base of the inner margin blackish. The underside of both pairs of wings nearly uniformly whitish: the anterior slightly suffused with smoky, the subterminal line distinct; a rather conspicuous lunate blackish central spot; fringe wholly whitish; posterior with a very distinct, nearly rounded, black discal spot; the dark border paler and narrower than on the upperside.

Body blackish, clothed with whitish hairs intermingled with black; those of the abdomen and anal tuft more greyish. Antennæ blackish, serrate internally, each joint being produced into a triangular tooth, with short whitish cilia. Haustellum fuscous, very long. Palpi clothed with long whitish hair-scales, in which a few blackish are intermingled. Eyes distinctly hairy, and with long blackish lashes. Legs black, varied with white (or *vice versâ*); tibiæ with a white fringe internally, and white at the tips; tarsi deep black, strongly (the posterior less conspicuously) annulated with white; spines of the tibiæ and tarsi short but numerous, testaceous. Anal appendages of the ♂ prominent, testaceous: the upper pair rather narrow soon after the base, but very greatly dilated at the apex, the upper edge straight, the apical edge nearly truncate, the lower edge very deeply excised; lower

pair rather broad, somewhat acuminate, curved very strongly upward, the lower edge strongly convex, the upper strongly concave: penis slender, very strongly curved.

Expanse 39 millims.

Only one ♀ from Dobbin Bay, 15th August, 1876 (*Feilden*). It is in a fair condition, but has apparently been crushed in a book.

I am unable to identify this with any described species from Lapland or boreal America, and have therefore ventured to describe it as new, notwithstanding the great variability and uncertainty in boreal Noctuæ. The most conspicuous feature consists of the pale posterior wings, with their very broad blackish border and large black central spot. A systematic examination of the anal appendages of the males of this group will certainly tend to render the separation of species comparatively easy.

I am not clear as to the true generic position. The hairy eyes would place it in *Mamestra* as defined by Grote (Bull. Buffalo Society, ii. p. 3); but the spinous tibiæ and tarsi are opposed to this connexion, as also probably are the serrate antennæ. Owing to the manner in which the example has been crushed, the dorsal crests are not definable.

A Noctua-larva indicated as from Shift-rudder Bay, August 1876 (*Feilden*), and numerous others taken from the stomach of a Tern (Discovery Bay, *Hart*), possibly belong to this species. They are of the form usual in *Mamestra*.

Plusia parilis, *Hübner*.

One worn example from Hayes Sound, lat. 79° (*Feilden*).

A rare insect, recorded from Lapland, Labrador, and Greenland. A specimen from Frau Island, Arctic America (Voyage of the 'Investigator') is in the British Museum, and forms the type of *P. quadriplaga*, Walker, Cat. Brit. Mus. Lepidopt. pt. xii. p. 911.

Geometræ.

Psychophora Sabini, *Kirby*.

Eight examples. Lat. 81° 52′, 82° 27′, and 82° 30′ (*Feilden*), in July and August, and from the 'Discovery's' winter quarters (*Hart*). Also two examples from Upernavik (*Hart*). An individual was seen by Capt. Feilden still further north, but not captured.

A known Arctic species, recorded from most of the Polar expeditions. Taken by Dr. Bessels at Polaris Bay, lat. 81° 38′.

Varies slightly, some examples having the darker central band of the anterior wings distinct, whereas in some it is scarcely indicated. The two from Upernavik are remarkable for being paler (pale silky grey), with no trace of markings. In none are the markings so sharply defined and distinct as indicated by Curtis in his figure (Appendix to Ross's Second Voyage, pl. A. fig. 12). That given by Packard (*Phalænidæ* of North America, pl. viii. fig. 20) is much better.

In Capt. Feilden's collection there is also an empty puparium, with the crippled moth that emerged from it.

Larvæ of a geometridous Moth are in Capt. Feilden's collection—one indicated as from lat. 82° 33′, and others from the stomach of a Tern, lat. 82° 27′. The full-grown larva appears very large for this insect; but still I am inclined to think these pertain thereto, especially as no other Moth of this family was observed. Dr. Bessels appears to have found the same larva at Polaris Bay.

Not being satisfied as to the true position of the insect, I have retained Kirby's generic name. Packard places it in *Glaucopteryx*, Hübner, as adopted by him. I submitted the larvæ to Mr. Buckler, so well-known for his investigations of the larvæ of British species; and he is strongly of opinion that they are related to those of the genus *Coremia*, of which he says they have the characteristic markings. The perfect insect reminds one of the genus *Cheimatobia*; but there is no real relationship.

Pyralidæ.

Scoparia gelida, n. sp.

Anterior wings very narrow and elongate, the costal margin straight, the apex subacute, with very oblique apical margin. Ground-colour smoky blackish, rather silky, sprinkled with white scales; the two transverse lines darker: first line inconspicuous, oblique, slightly angulate; second line distinct, oblique inwardly on the costal margin, then forming a very sharp curve outwardly, running inwardly almost longitudinally to within the level of the reniform spot, and then continued almost straight to the inner margin; it is bordered outwardly by white scales rather more densely placed than on the rest of the wing; the orbicular and reniform spots dark (like the lines), without pale centres; the orbicular small, placed halfway between the first line and the reniform spot; the latter larger, scarcely forming a solid 8; the claviform spot not indicated; fringes pale greyish. Posterior wings

silky pale smoky grey, rather darker at the apex, with the faintest indications of a discal dot; fringes pale silky grey. Underside uniformly very pale silky grey; the anterior pair with the usual spots and second line faintly indicated.

Antennæ black, rather silky. Palpi black, clothed with whitish scales (excepting the terminal point). Body silky blackish; the head and collar (especially beneath) clothed with whitish scales. Abdomen with a large admixture of whitish scales; anal tuft greyish. Legs blackish, considerably clothed with whitish scales; posterior tibiæ and tarsi almost entirely silky whitish.

Expanse 21–23 millims.

Three examples from lat. 82° 30′ (*Feilden*), and two from the 'Discovery's' winter quarters (*Hart*).

Probably belonging to the group of *S. sudetica*. Remarkable for its narrow and pointed anterior wings, dark colour, and the very strongly curved second line ending in the inner margin considerably within the level of the reniform spot.

Tortricidæ.

There are three individuals, belonging to distinct genera and species; only two are in tolerable condition, and I do not consider it prudent to apply names to any of them.

1. *Penthina*, sp., lat. 82° 30′ (*Feilden*). A small species (expanse 16 millims.), with nearly black anterior wings with a broad darker central band.

2. *Mixodia*? sp. From the 'Discovery's' winter quarters (*Hart*). Having somewhat the aspect of *M. Schulziana*, but smaller. In the British Museum are two individuals in wretched condition from Arctic America, representing *Retinia septentrionana* of Walker's Catalogue (pt. xxxviii. p. 373); but they do not agree with the description of *Orthotænia septentrionana*, Curtis, Appendix, Ross's Second Voyage, p. 77.

3. ——. A large insect (expanse 26 millims.) from lat. 82° 30′ (*Feilden*), utterly worn and unrecognizable.

DIPTERA.

The following is Baron von Osten-Sacken's report on this Order:—

Tipulariæ.

Culex.—From Hayes Sound, Aug. 4th, 1875, apparently caught by a spider, which is mounted on the same slide with it. This

may be the same as *Culex caspius*, Pallas, as identified by Curtis in the Insects of Ross's Voyage (p. lxxvi). Schiödte identifies the same species with *C. nigripes*, Zett.; the latter, according to Stæger, also occurs in Greenland, and is the same as *C. pipiens*, O. Fabricius, *nec* Linné (Fn. Grœnl. p. 209). There are also larvæ and pupæ in the collection (*Hart*).

Chironomus is represented by several species, and seems to be of common occurrence. The largest species, from lat. 82° 30′, July 1876 (*Feilden*), is apparently *C. polaris*, Kirby, Suppl. to Appendix of Parry's First Voyage; also in Curtis's Insects of Ross's Voyage, p. lxxvii, pl. A. figs. 2 & 14. The same or a similar black *Chironomus* frequently occurs in temperate latitudes in winter or early spring. A small species occurred near Cape Hilgard (Aug. 14th, 1875, *Feilden*); the same or a similar species lat. 82° 33′, July 25th, 1876 (*Feilden*). From Floe-berg Beach, lat. 82° 27′, July 1876 (*Feilden*), there are two or three species, large and small; the large one appears to be different from *C. polaris*. There are also *Chironomi* from Dobbin Bay, Aug. 14th, 1875 (*Feilden*). Likewise larvæ of the genus (*Feilden & Hart*).

Sciara.—A single example of this genus from lat. 82° 30′, July 1876 (*Feilden*), a ♂ with very large forceps.

Trichocera.—Apparently the common *T. regelationis*, L. Its occurrence in Greenland is mentioned in Stæger's 'Grœnl. Antliater.' I find it from Cape Hilgard, Aug. 14th, 1875, lat. 82° 30′, July 1875; Floeberg Beach, lat. 82° 27′, July 1876, lat. 82° 30′, July 1876; and Dobbin Bay, Aug. 14th, 1875. All these are from Capt. Feilden; but larvæ were also taken by Mr. Hart. In temperate climates *Trichocera* occurs late in autumn, in winter, and in early spring; the occurrence of *T. regelationis* in July and August well characterizes the climate in which they were taken.

Tipula arctica, Curtis.—Several of this were taken by both Capt. Feilden and Mr. Hart.

Tachinidæ.—A species hatched from cocoon of *Dasychira grœnlandica*, Dumb-bell Bay, July 15th, 1876 (*Feilden*), also from another cocoon of the same Moth, Point Foulke, July 28th, 1875 (*Feilden*). Two larger Flies from Discovery Bay, Aug. 15th, 1876, seem likewise to belong to this family. Among the Insects of Ross's Voyage described by Curtis there is a *Tachina hirta*.

Muscidæ.—From lat. 82° 27′ (*Feilden*) is a Fly collected round offal, that may be *Pyrellia cadaverina*, Kirby, Faun. Bor.-Amer. p. 316 (from lat. 65°). Kirby said it was very near *P. cadave-*

rina, L. A number of specimens from Discovery Bay (carcass of a Musk-Ox, *Hart*) also belong to the same species; they agree with the specimens of *P. cadaverina*, Kirby, in the British Museum. The same or a similar fly occurred at lat. 82° 30′ and 82° 33′ (*Feilden*).

Anthomyiidæ.—From Dobbin Bay and Port Foulke, Aug. 14th and July 28th, 1876 (*Feilden*), there are *Anthomyiæ*. An *Anthomyia* is among the insects of Ross's Expedition.

Muscidæ Acalyptera.—Specimens from Floeberg Beach, July 26th, and smaller ones from Discovery Bay, may perhaps belong to this group; but in their present state I can say nothing about them. Curtis described a *Scatophaga apicalis* from Ross's Expedition.

[The chitinous integuments of Dipterous insects were found in the stomach of *Salmonidæ* from a lake at 82° 40′ (*Feilden*).]

HEMIPTERA.

There are no true Hemiptera in the collection from north of 78°*. But the *Anoplura*, or true lice, which are generally considered as degraded forms of this order, are represented by the Walrus-parasite from Walrus Island (*Feilden*), described and badly figured by Boheman as *Hematopinus trichechi* (from Spitzbergen) in the Öfvers Vet. Akad. Förhandlingar, 1865, p. 577. This Louse is found in the axillæ and on other soft parts of the skin of the Walrus (*Trichechus rosmarus*).

MALLOPHAGA.

Docophorus ceblebrachys, *Nitzsch.*

Four examples, on its host *Nyctea scandiaca*, from lat. 82° 30′ (*Feilden*).

Docophorus, sp. ?

One example on *Tetrao rupestris*, from lat. 82° 45′ (*Feilden*).

Docophorus, sp. ?

One example on *Bernicla brenta*, from lat. 82° 33′, 24th June, 1876 (*Feilden*).

Nirmus cingulatus (*Burmeister*), *Nitzsch.*

Three examples on *Tringa canutus*, from lat. 82° 29′, August 8th, 1876 (*Feilden*), appear to accord with the published descrip-

* From Disco Mr. Hart brought several examples of the ♀ of *Dorthesia chiton*, Zetterstedt (*Coccidæ*), already recorded from Greenland.

tion and figures. The species has been already recorded as a parasite on this and allied birds.

NIRMUS PHÆONOTUS, *Nitzsch.*

Three examples on *Phalaropus lobatus*, from lat. 82° 30′, agree well with the description and figures; but the group of species to which it belongs appear to be especially parasitic on Gulls and Terns*.

COLPOCEPHALUM, sp. ?

One example on *Strepsilas interpres*, from lat. 81° 44′, 17th Aug. 1876 (*Feilden*).

MENOPON GONOPHÆUM, *Burmeister*, var. ?

Many examples on *Corvus corax*, from Dobbin Bay, 29th Aug. 1876 (*Feilden*). These do not altogether agree with the figure and description in Giebel's 'Insecta Epizoa;' yet I know not to what else to refer them. Neither do they agree with Denny's figure of *Colpocephalum subæquale*, which Giebel says is not Burmeister's species of that name, and should be transferred to *Menopon*. As the Raven remains, as it were, isolated all the year in these high latitudes, it is quite reasonable to suppose that it may there possess a special parasite.

I do not regard my determinations of the *Mallophaga* as satisfactory; and it is desirable that they be hereafter reviewed by a specialist, which we now have not in this country.

COLLEMBOLA.

ISOTOMA BESSELSII, *Packard* ?

Three examples from Floeberg Beach, July 1876 (*Feilden*), mounted on a slide, may perhaps belong to the above species, diagnosed by Packard (Amer. Naturalist, xi. p. 52) from Polaris Bay.

PODURA HYPERBOREA, *Boheman.*

Several examples from lat. 82° 29′, found on the surface of the snow at an elevation of 800 feet (*Feilden*), appear to agree sufficiently with the description of this species, noticed from Spitzbergen.

LIPURA, sp. ?

Two individuals (mounted on a slide) from lat. 82° 30′, June 6th, 1876 (*Feilden*), appear to pertain to this genus. They are

* Three examples of a *Lipeurus* were found on *Procellaria glacialis* from Baffin Bay (*Feilden*); in all probability an undescribed species.

dark chalybeous in colour. Indicated as having been found under stones.

ARACHNIDA.

Araneidea.

The materials collected on the Expedition have been noticed and described (with other Arctic species) by the Rev. O. Pickard Cambridge, in the 'Annals and Magazine of Natural History,' 4th ser. vol. xx. pp. 273–285, pl. viii. (October 1877).

Fam. Agelenides.

Tegenaria detestabilis, *Cambridge*, sp. n., *l. c.* p. 275.

One example, Dobbin Bay, 28th Aug. 1876 (*Feilden*); found in a cabin on board the 'Alert,' and supposed by Capt. Feilden to have been introduced with plants, which were collected by nearly all the officers.

Fam. Theridiides.

Erigone psychrophila, *Thorell*; *Cambridge*, *l. c.* p. 278, pl. viii. fig. 4.

One example without indication of locality. Two females from lat. 82° 33′, June 21st and 24th, 1876, perhaps also belong here. Capt. Feilden (*in litt.*) says this spider was very common, and occurs as far north as he reached. Found also by the American 'Polaris' Expedition at Polaris Bay. Originally recorded from Spitzbergen.

Erigone provocans, *Cambridge*, sp. n., *l.c.* p. 279, pl. viii. fig. 5.

Adults of both sexes found in lat. 82° 27′ and 82° 33′, June 1876. Capt. Feilden says this also was common.

E. vexatrix, *Cambridge*, sp. n., *l. c.* p. 280, pl. viii. fig. 6.

One adult female from Discovery Bay (*Hart*).

In addition to these there are several examples of the genus declared by Mr. Cambridge to be indeterminable.

Fam. Lycosides.

Lycosa glacialis, *Thorell*; *Cambridge*, *l. c.* p. 281.

Three examples from Hayes Sound, lat. 79° (*Feilden*), and two from Discovery Bay (*Hart*). Found also at Polaris Bay.

Tarentula exasperans, *Cambridge*, sp. n., *l. c.* p. 283, pl. viii. fig. 7.

An adult male from Discovery Bay (*Hart*).

Acaridea.

Mr. Murray's illness, and subsequent death, have prevented me from giving more than a sketch of the genera &c. found during the Expedition, drawn up from disjointed notes furnished by him a few weeks before his decease. In some cases two or three forms are mounted on the same slide; so, for convenience of after reference, the numbers on the slides are here mentioned, and where species were considered by Mr. Murray to be new, the names attached by him on the slides are retained. All were collected by Captain Feilden.

Bdellidæ.

Scirus.

Several examples of a species of this genus from lat. 82° 27′, June 1876 (No. 7).

Bdella.

Possibly two species. A rather large form from lat. 82° 30′, July 1876 (Nos. 3, 4, and 6), and a smaller form from Floeberg Beach, June 1876 (*B. calandroides*, Murray, No. 5).

Hydrachnidæ.

Hydrachna.

One example from the intestines of a *Salmo* caught in a lake at Depôt Point, lat. 82° 40′, Oct. 1875 (No. 2). Another example from the same locality, taken under the same circumstances, is identified as *Eylais* ? sp. (No. 1).

Oribatidæ.

Damæus; near geniculatus, *Koch*.

From lat. 82° 30′. Several examples (Nos. 8, 9, and 10).

Oribata.

Of this genus there are probably three species. One is identified as *O. Lucasii*, Nicolet, from lat. 82° 30′, June 1876; "common under stones" (No. 10). Another, from lat. 82° 27′, June 1876, "extremely common under stones," is considered to be a new species; and the name "*triangularis*, Murray," is attached (No. 11). And there are two other slides (Nos. 6 and 10) on which are examples of the genus, from lat. 82° 27′ and 82° 30′, with no further identification.

SARCOPTIDÆ.

DERMALEICHUS.

One example of this genus of bird-mites, taken from *Stercorarius longicaudatus*, lat. 82° 27′, 8th July, 1876, bears the name "*D. stercorarinus*, Murray" (No. 12).

POSTSCRIPT. March 1878.

Mr. Butler has called my attention to the probability that *Mamestra*(?) *Feildeni* (*antè*, p. 112) is identical with *Anarta Richardsoni*, Curtis (*Hadena Richardsoni*, Curtis, in Appendix to Ross's Voyage,= *algida*, Lefebvre,=*septentrionis*, Walker), a widely-spread Arctic insect.

I was inclined to this opinion when working out the insects; but the contour of the wings appeared too different; though this is perhaps owing to the flattened condition of the type. The markings also do not fully accord with those of any specimen of *Richardsoni* seen by me; but the species is very variable. Having, however, been permitted to denude the anal parts in the type of *septentrionis* and in some examples of *Richardsoni*, I feel compelled to accept the opinion that *Feildeni* must be considered only a variety of *Richardsoni*.

The larva found by the Expedition cannot belong to this species; or, if it does, *Richardsoni* cannot be an *Anarta*.—R. M'L.

Preliminary Notice on the Surface-Fauna of the Arctic Seas, as observed in the recent Arctic Expedition. By EDWARD L. Moss, M.D., late Surgeon H.M.S. 'Alert.' Communicated by Dr. J. MURIE, F.L.S.

[Read November 15, 1877.]

THE seas to the north of the Greenland settlements are subject to such varying conditions at different seasons of the year, that their surface-fauna cannot be supposed to be very constant. But, taking them as we found them, they may, for description's sake, be divided into three zoological regions:—

First. A district in the latitude of Melville Bay, temporarily, at least, monopolized by Peridinea.

Second. A north-water region, including the "north water" of