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ADVERTISEMENT.

This work is the fifteenth of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States, and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

SPENCER F. BAIRD,

Secretary of the Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, April 15, 1879.

CONTRIBUTIONS

TO THE

NATURAL HISTORY

OF

ARCTIC AMERICA,

MADE IN CONNECTION WITH

THE HOWGATE POLAR EXPEDITION, 1877-78,

BY

LUDWIG KUMLIEN,

NATURALIST OF THE EXPEDITION.



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I N S E C T S.

DIURNAL LEPIDOPTERA.

BY W. H. EDWARDS.

Family, PAPHILIONIDÆ.

Sub-family, PAPHILIONINÆ.

Genus, *Colias*, Fabricius.

1. *C. Hecla*, Lefebvre.

One female was taken at Quickstep Harbor, Gulf of Cumberland, latitude 66°. This species inhabits Southern Greenland and regions to the westward. It has been attributed to Iceland, but, as is now supposed, erroneously. It also inhabits Southern Lapland.

Mr. McLachlan, in his Report on the butterflies collected by the recent British Arctic Expedition, states that *C. Hecla* was taken as far north as latitude 81° 45', at Hayes Sound; and he gives information obtained from Captain Feilden, R. N., attached to the *Alert* as naturalist, on the habits of Lepidoptera in these high latitudes. "During the short period when there is practically no night, butterflies are continuously on the wing, supposing the sun's surface not to be obscured by clouds or passing snow showers. That about one month in each year is the longest period in which it is possible 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." Mr. McLachlan doubts if there is sufficient time in each year for the preparatory stages of the butterfly,—egg, larva, and chrysalis,—and is disposed to think that more than one year is necessary. In the northern United States, the larvæ of *Colias* frequently pass the winter when half-grown, or even younger, and I think it probable this is the habit of *Hecla*. From two to three weeks at the end of the short Arctic summer, and less time at the beginning in the following year, would seem to suffice for the whole round of transformations.

In Dr. Staudinger's Catalogue, *Colias Boothii*, Curtis, is put down as a synonym of *Hecla*; but, in the opinion of Mr. McLachlan, the two are distinct species.

It is remarkable that the collection of butterflies made by the British Expedition, between latitude 78° and 82° , well toward the Arctic Sea, should exhibit a greater number of species, namely, 5, than is known in Southern Greenland, where we are told but 4 species have hitherto been taken, and this northern series does not embrace the genus *Chionobas*, one or two species of which are found in Greenland. Besides *C. Hecla* and *Argynnis Polaris*, taken by Mr. Kumlien, were *Argynnis Charidea*, *Lycæna Aquilo*, and, most surprising of all, *Chrysophanus Phleas*, a species represented throughout the northern United States under a slightly different form, *Americana*.

Family, NYMPHALIDÆ.

Sub-family, NYMPHALINÆ.

Genus, *Argynnis*, Fabricius.

1. *A. Freya*, Thunberg.

Two males were taken in Southwest Greenland. This species is distributed over the boreal regions of both continents; in America, from Greenland to Alaska; and it follows the Rocky Mountains as far to the south as Colorado. It is subject to very little variation.

2. *A. Polaris*, Boisduval.

One male was taken at Quickstep Harbor. This species is more restricted in distribution than *Freya*, and, so far as known, is limited to Northeast America, from Labrador to the Arctic Sea. It was taken by the British Expedition as far to the north as latitude $81^{\circ} 52'$, and by the American Expedition (*Polaris*) at $81^{\circ} 50'$. It varies much in color, and the example sent me by Mr. Kumlien is remarkably melanic on the upper surface, the hind wings especially showing scarcely any fulvous.

Sub-family, SATYRINÆ.

Genus, *Chionobas*, Boisduval.

1. *C. Semidea*, Say.

Oeno, Boisduval.

Two males were taken at Quickstep Harbor. One of these has the upper surface dark blackish-brown, and the discal belt on hind wings beneath distinctly outlined on both edges. The other is light or pale black-brown, and the belt is almost lost in the dense markings which cover the wing. But specimens from the White Mountains of New Hampshire show similar variation. This species inhabits Labrador, and the Rocky Mountains at very high altitudes as far south as Colo-

rado and New Mexico. In the White Mountains it is abundant on the summit of Mount Washington; but in the territory between this region and Labrador it is unknown, as also between Mount Washington and the Rocky Mountains. How far to the northwest of the continent it flies is not known to me. It has not appeared in collections from Alaska, in which *Freyia* was represented in considerable numbers. The peculiar distribution of this species, *C. Semidea*, by which it inhabits mountain summits thousands of miles apart and not the intervening country, and in the White Mountains of New Hampshire is thoroughly isolated and restricted to a very small area, is explained as in the case of plants similarly distributed and isolated (address of Prof. Asa Gray, Dubuque, 1872). The advance to the southward of the glacial ice pushed before it multitudes of plants and animals, forcing them along very distant lines of longitude in many cases; and when the receding of the ice took place, and a milder temperature began to prevail, some species which had obtained a foothold at the south remained there, finding a climate in which they could live, upon lofty mountains only, being unable to exist in the lowlands. In the case of this butterfly, such a climate was found at or near the snow-line in the Rocky Mountains, and upon the summits of the White Mountains.